SEE SHEET 2 FOR INDEX OF SHEETS

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6	C 1986-1-64	FM 1314

STATE	DISTRICT	COUNTY
TEXAS	HOU	MONTGOMERY

CONTROL	SECTION	JOB	SHEET NO.
1986	01	064	1

FM 1314
FUNCTION CLASSIFICATION:
URBAN MINOR ARTERIAL

DESIGN SPEED
MAINLANES .....45 MPH
DESIGN ADT
MAINLANES
2024 17,900
2044 25,300

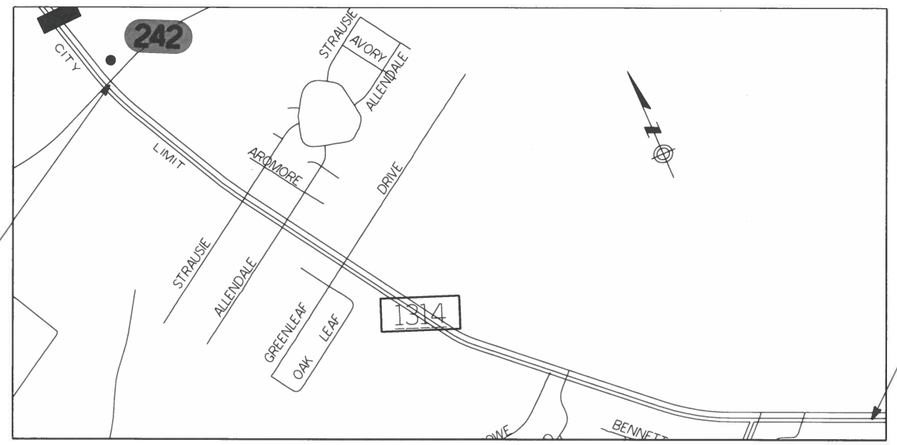
PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

PROJECT NO. : C 1986-1-64
CSJ: 1986-01-064
MONTGOMERY COUNTY
FM 1314
FROM SH 242 TO NORTH OF MCQUEEN ROAD

REGISTERED ACCESSIBILITY (RAS) INSPECTION REQUIRED
TDLR NO. TABS2024013200

FOR THE CONSTRUCTION TO WIDEN TO A 4 LANE ROADWAY
CONSISTING OF GRADING, ORDINARY COMPACTION OF EXISTING SUBGRADE, ASPHALT STAB BASE, CONCRETE PAVEMENT, SIGNING, AND PAVEMENT MARKING ADDING SIDEWALK AND SHARED USE PATH AND DRAINAGE.

CSJ	COUNTY	LIMITS	ROADWAY		BRIDGE		TOTAL	
			FT	MI	FT	MI	FT	MI
1986-01-064	MONTGOMERY	FROM SH 242 TO NORTH OF MCQUEEN ROAD	11,701.84	2.216	0.00	0.000	11,701.84	2.216

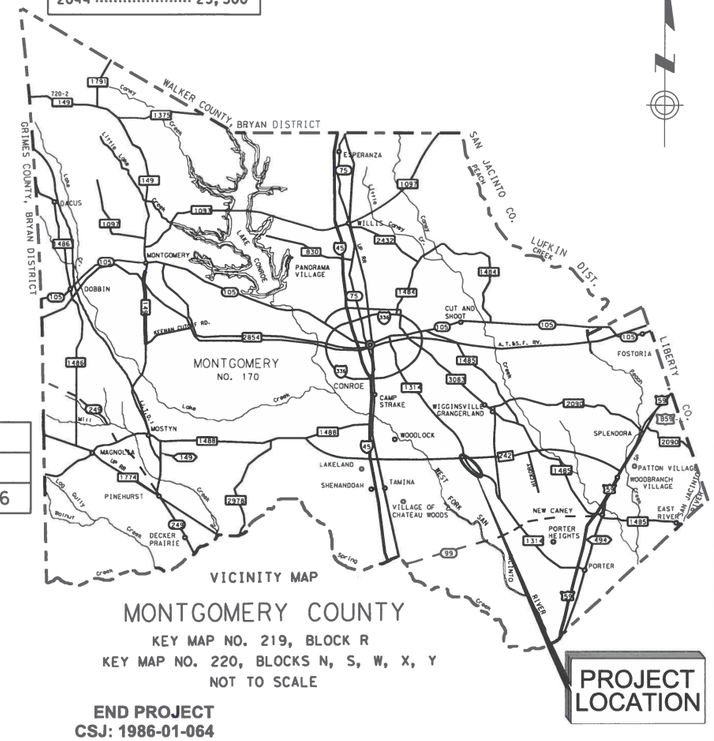


PROJECT LOCATION MAP

0 0.25 MI 0.5 MI
SCALE IN FEET

BEGIN PROJECT
CSJ: 1986-01-064
STA. 468+00.00
REF. MARKER: 438+0.988
MILE POINT: 9.846
X: 3867818.6385
Y: 10076602.5832
LAT: 30.2130547
LONG: -95.3578648

END PROJECT
CSJ: 1986-01-064
STA. 585+00.00
REF. MARKER: 440+1.082
MILE POINT: 12.065
X: 3875758.0436
Y: 10068476.4755
LAT: 30.1896982
LONG: -95.3339647



VICINITY MAP
MONTGOMERY COUNTY
KEY MAP NO. 219, BLOCK R
KEY MAP NO. 220, BLOCKS N, S, W, X, Y
NOT TO SCALE

NO RAILROADS
NO EXCEPTIONS
EQUATIONS:
Sta 518+98.85 BK = Sta 518+97.02 AH
Sta 541+71.48 BK = Sta 541+71.47 AH

Texas Department of Transportation

SUBMITTED FOR LETTING: 3/14/24
Stephen M Dingman PE
AREA ENGINEER

APPROVED FOR LETTING: 4/2/2024
DocuSigned by:
Vanessa Espinoza , P.E.
DD00BA93EE02450...
FOR DISTRICT ENGINEER

COUNTY MONTGOMERY PROJ. NO. C 1986-1-64
HWY. NO. FM 1314 LETTING DATE JUNE 2024
CONTRACTOR NAME
CONTRACT BEGIN DATE
WORK COMPLETED DATE
DATE OF ACCEPTANCE

CSJ: 1986-01-064

NOTES:

1. SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, NOVEMBER 1, 2014 AND THE SPECIFICATION ITEMS LISTED AND DATED AS FOLLOWS SHALL GOVERN ON THIS PROJECT: REQUIRED LABOR PROVISION FOR STATE PROJECTS: SP000 - - - 008.

GENERAL

	1	TITLE SHEET
	2	INDEX OF SHEETS
	3, 3A	FM 1314 EXISTING TYPICAL SECTION
	4, 4A	FM 1314 PROPOSED TYPICAL SECTION
	5, 5A-5M	GENERAL NOTES
	6, 6A-6C	ESTIMATE & QUANTITY SHEET
	7	FM 1314 TRAFFIC CONTROL QUANTITY SUMMARY
	8	FM 1314 ROADWAY QUANTITY SUMMARY
	9, 9A	DRIVEWAY AND INTERSECTION QUANTITY SUMMARY
	10	SUMMARY OF DRAINAGE QUANTITIES
	10A	PUMP STATION QUANTITY SUMMARY
	11	FM 1314 PAVEMENT MARKING QUANTITY SUMMARY
	12	SUMMARY OF SMALL SIGNS
	13	FM 1314 SW3P QUANTITY SUMMARY

TRAFFIC CONTROL PLAN DETAILS

	14	CONSTRUCTION NARRATIVE
	15-16	TCP PHASE 2 STEP 1
	17-19	TCP PHASE 2 STEP 2
	20-25	TCP PHASE 2 STEP 3
	26-31	PHASE 3
	32-37	PHASE 4

TRAFFIC CONTROL PLAN STANDARDS

*	38-49	BC(1)-21 THRU BC(12)-21
*	50	TCP(1-1)-18
*	51	TCP(1-2)-18
*	52	TCP(1-4)-18
*	53	TCP(1-5)-18
*	54	TCP(2-1)-18
*	55	TCP(2-2)-18
*	56	TCP(2-4)-18
*	57	TCP(2-5)-18
*	58	TCP(2-6)-18
*	59	TCP(3-1)-13
*	60	TCP(3-2)-13
*	61	TCP(3-3)-14
*	62	TCP(3-4)-13
*	63	WZ(STPM)-23
*	64	WZ(UL)-13
*	65	WZ(BRK)-13
*	66, 66A	LPCB-13
*	67	EDGECON -21

ROADWAY DETAILS

	68, 68A-68B	FM 1314 CONTROL INDEX SHEET
	69, 69A	FM 1314 HORIZONTAL ALIGNMENT
	70	FM 1314 VERTICAL ALIGNMENT
	71-76	FM 1314 PROPOSED ROADWAY PLAN & PROFILE
	77-87	FM 1314 SIDEWALK AND DRIVEWAY LAYOUT

ROADWAY DETAILS STANDARDS

*	88	CCCG-22
*	89, 89A-89C	PED-18
*	90	CC&DID (HOU DIST)
*	91	HOU-MEDNS (HOU DIST)
*	92, 92A	CRCP-HS (HOU DIST)
*	93	CRCP-FT (HOU DIST)
*	94, 94A	CPJ (HOU DIST)
*	95, 95A-95B	DD (HOU DIST)

RETAINING WALL DETAILS

	96-97	RETAINING WALL DETAIL

DRAINAGE DETAILS

	98	OVERALL DRAINAGE AREA MAP
	99-109	DRAINAGE AREA MAP
	110-111	RUNOFF COMPUTATIONS
	112-115	STORM SEWER COMPUTATIONS
	116	INLET COMPUTATIONS
	117	NB DITCH TABLE
	118	SB DITCH TABLE
	119-129	NB DRAINAGE PLAN & PROFILE
	130-140	SB DRAINAGE PLAN & PROFILE
	141-147	ROADSIDE DITCH PROFILES
	148	DRAINAGE LATERALS
	149	CULVERT LAYOUTS
	150	RCB MANHOLE INLET RISER DETAILS
	151	MISCELLANEOUS DRAINAGE DETAILS
	152-153	JUNCTION BOX DETAILS B525JB
	154, 154A-154B	JUNCTION BOX DETAILS B565MH1
	155, 155A	JUNCTION BOX DETAILS B567MH1
	156	PUMP STATION SH 242 EB FRONTAGE RD
	157	PUMP STATION SITE LAYOUT
	158	PUMPS OF HOUSTON AUTOMATIC PUMP STATION
	159-160	PUMP STATION ELECTRICAL SERVICE

DRAINAGE STANDARDS

*	161	HIL-AD/AAD (HOU DIST)
*	162	MH-A/B (HOU DIST)
*	163	MSD (HOU DIST)
*	164, 164A	E&BD (HOU DIST)
*	165	SETP-PD
*	166	PW
*	167	ECD
*	168	SCP-4
*	169	SCP-5
*	170	SCP-6
*	171	SCP-8
*	172	SCP-12
*	173	SCP-MD
*	174	CRR
*	175	CH-PW-0
*	176	BCS
*	177	ED(1)-14
*	178	ED(5)-14
*	179	ED(7)-14
*	180	CLF-10

PAVEMENT MARKING AND DELINEATION DETAILS

	181-191	FM 1314 SIGNING AND PAVEMENT MARKING LAYOUT

PAVEMENT MARKING AND DELINATION STANDARDS

*	192	PM(1)-22
*	192A	PM(2)-22
*	192B	PM(3)-22
*	192C	PM(4)-22A
*	192D	PM(WAS)-07 (HOU DIST)
*	192E	PM(CLL)-14 (HOU DIST)
*	193	D&OM(1)-20
*	194	D&OM(2)-20
*	195	D&OM(3)-20
*	196	D&OM(4)-20
*	197	D&OM(5)-20
*	198	D&OM(6)-20
*	199	DOM(VIA)-20
*	200	SMD(GEN)-08
*	201	SMD(SLIP-1)-08
*	202	SMD(SLIP-2)-08
*	203	SMD(SLIP-3)-08
*	204	CPM(1)-23

SW3P DETAILS

	205-214	FM 1314 SW3P LAYOUT
	215, 215A	SW3P
	216	EPIC

TEMPORARY EROSION CONTROL STANDARDS

*	217	EC(1)-16
*	218	EC(2)-16
*	219	EC(3)-16
*	220	FSSSCW-15 (HOU DIST)

STATE OF TEXAS
MICAH J. SCHLUTER
136908
LICENSED
PROFESSIONAL ENGINEER

Micah J. Schluter P.E.
03.20.24

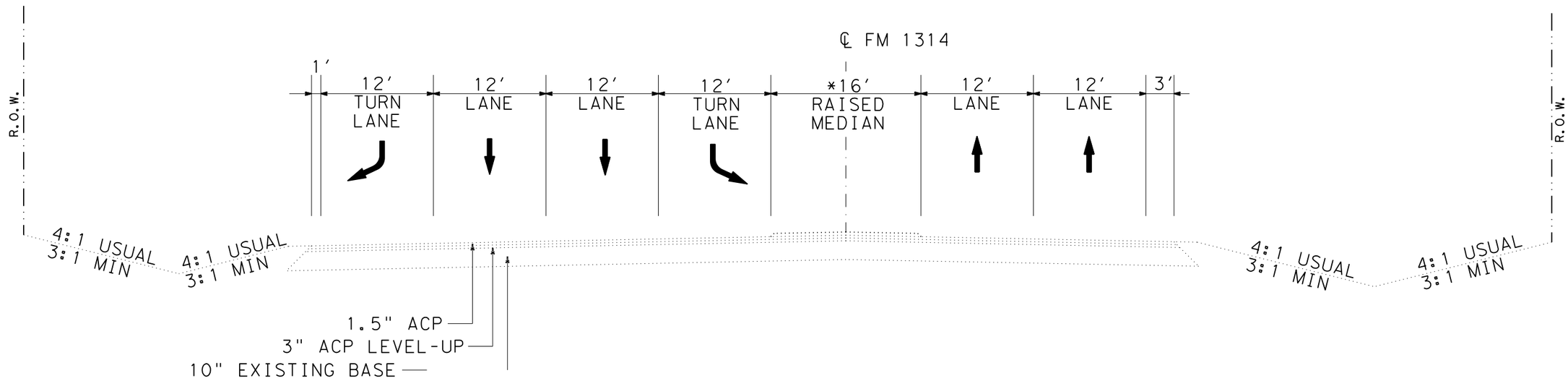
INDEX OF SHEETS

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

SHEET 1 OF 1

Texas Department of Transportation

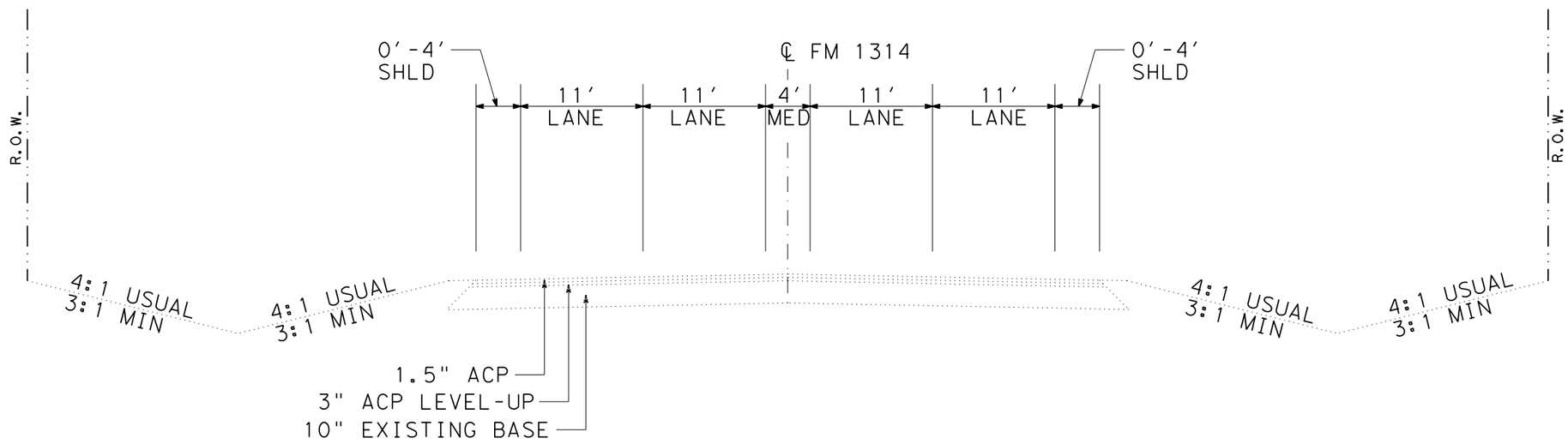
CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		2



EXISTING TYPICAL SECTION
STA 468+00.00 TO STA 481+00.00

*RAISED MEDIAN ENDS AT STA 470+08.00
FLUSH MEDIAN TAPERS DOWN FROM
16′ AT STA. 470+08.00 TO
4′ AT STA. 475+32.50

WS: WHITE SOLID
WB: WHITE BROKEN
YS: YELLOW SOLID
YB: YELLOW BROKEN



EXISTING TYPICAL SECTION
STA 481+00.00 TO STA 525+24.16

NOT TO SCALE

STATE OF TEXAS
MICAH J. SCHLUTER
136908
LICENSED
PROFESSIONAL ENGINEER

Micah J. Schluter, P.E.
03.14.24

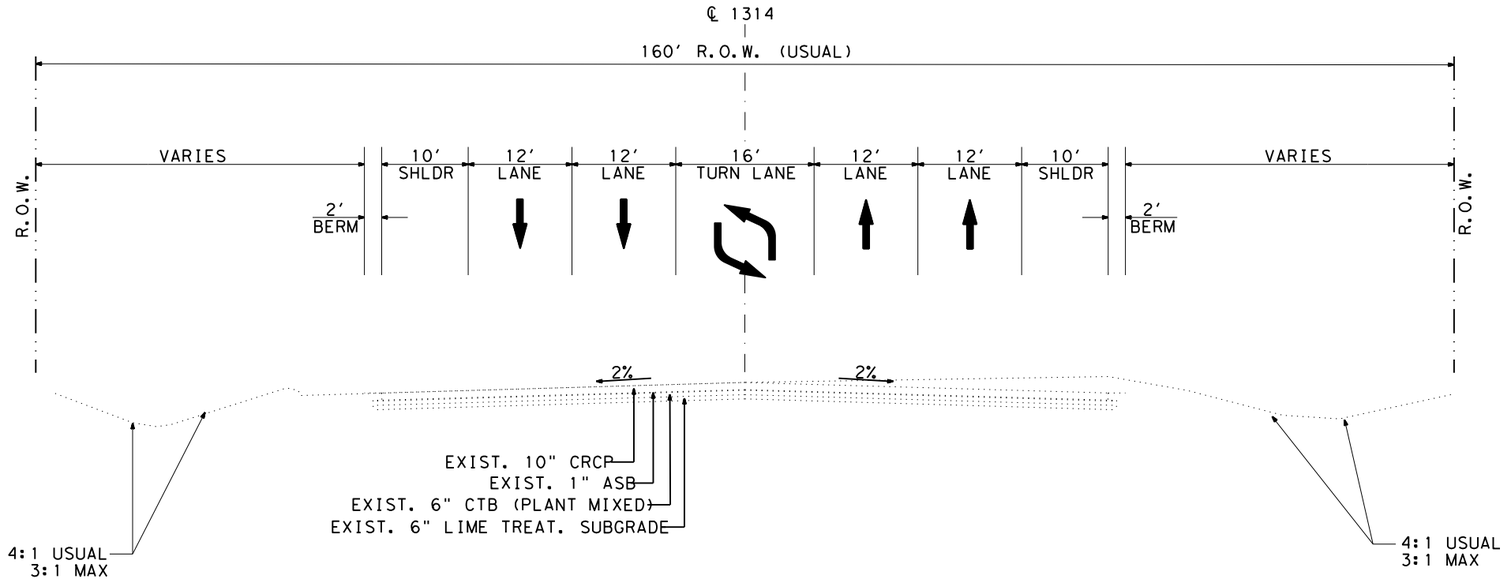
FM 1314 EXISTING TYPICAL SECTION

SHEET 1 OF 2

®2024 Texas Department of Transportation

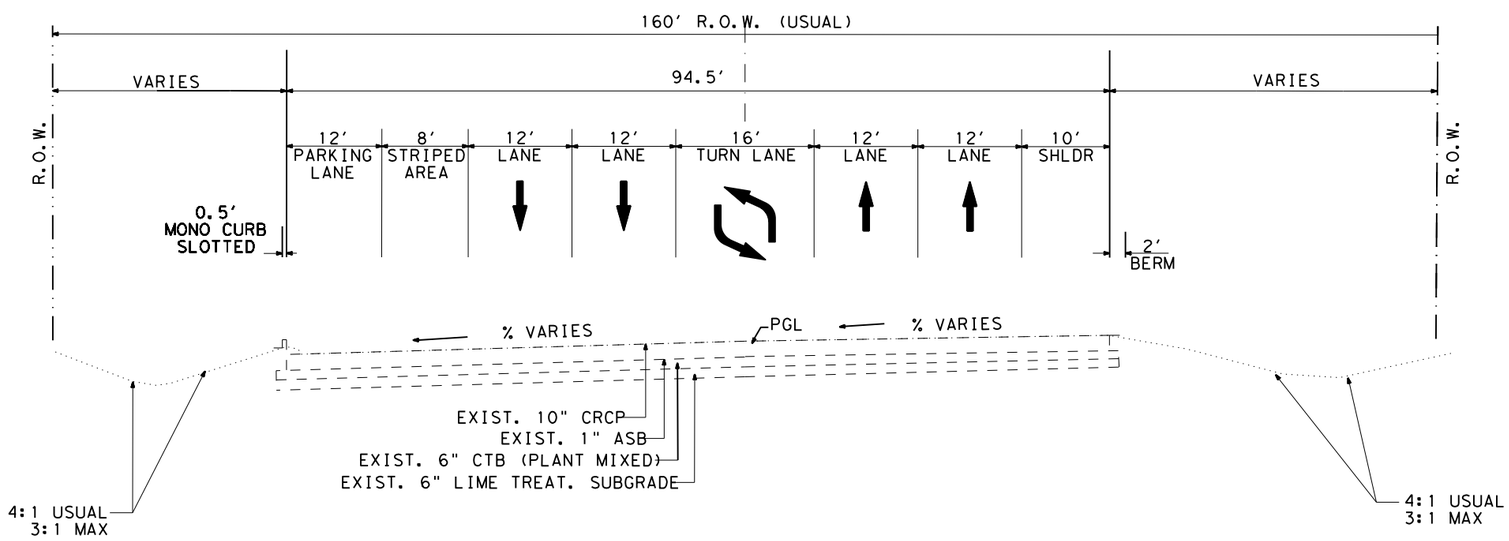
CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		3

DATE: 03/04/2024 03:57 PM
FILE: pw:\\txdot.projectwiseonline.com:TXDOT3\Documents\12 - HOU\Design Projects\198601064\4 - Design\Plan Set\1. General\003 FM 1314 EXISTING TYPICAL SECTION



EXISTING TYPICAL SECTION
STA 525+24.16 TO STA 540+14.00
STA 549+28.00 TO STA 585+00.00

WS: WHITE SOLID
WB: WHITE BROKEN
YS: YELLOW SOLID
YB: YELLOW BROKEN



EXISTING TYPICAL SECTION
STA 540+14.00 TO STA 549+28.00

NOT TO SCALE

STATE OF TEXAS
MICAH J. SCHLUTER
136908
LICENSED
PROFESSIONAL ENGINEER

Micah J. Schluter, P.E.
03.14.24

FM 1314 EXISTING TYPICAL SECTION

SHEET 2 OF 2

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		3A

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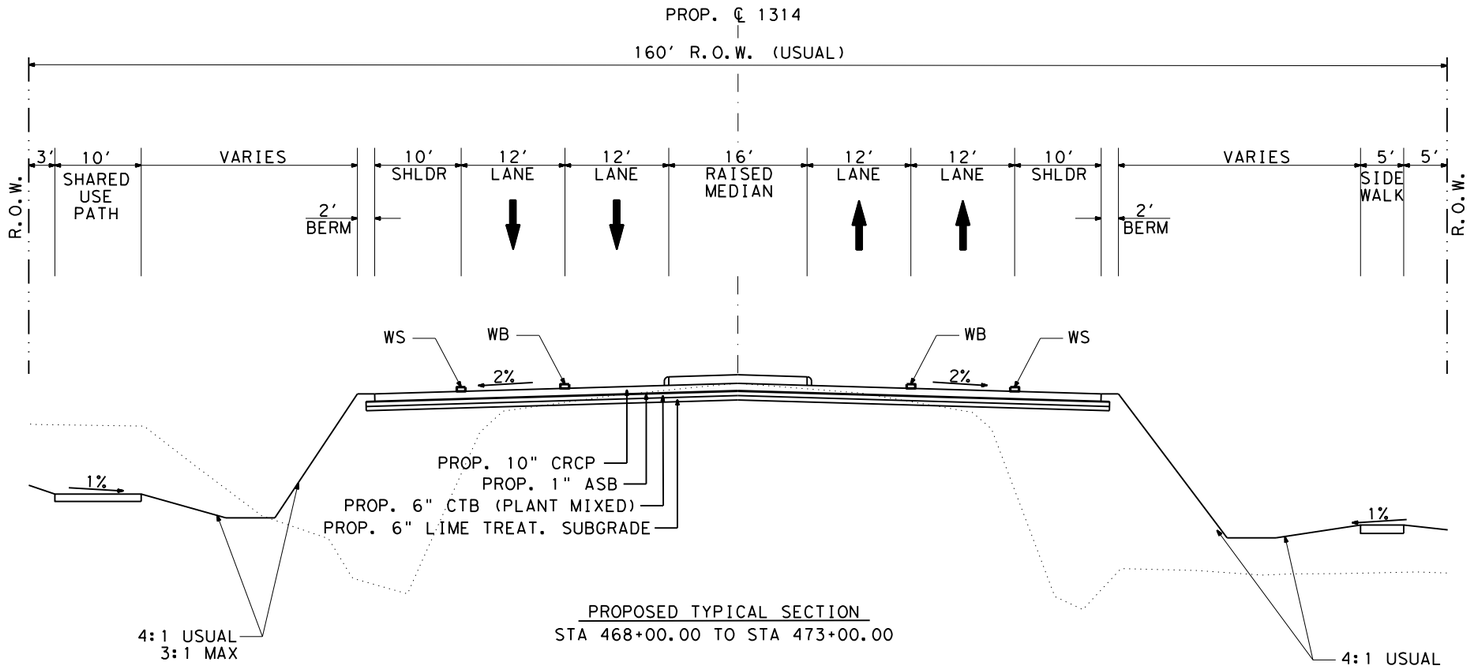
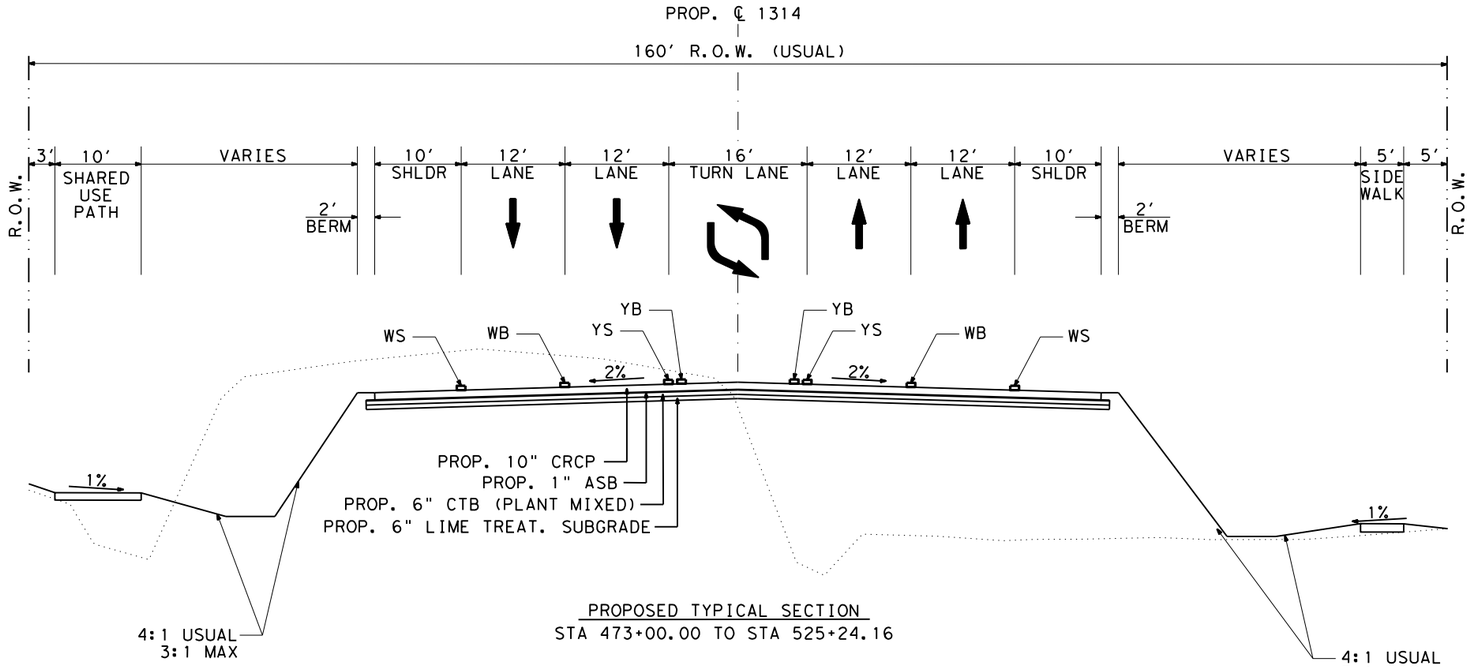
DWN:
CKD:



PROPOSED TYPICAL SECTION
STA 468+00.00 TO STA 473+00.00



PROPOSED TYPICAL SECTION
STA 473+00.00 TO STA 525+24.16

WS: WHITE SOLID
WB: WHITE BROKEN
YS: YELLOW SOLID
YB: YELLOW BROKEN

NOT TO SCALE

STATE OF TEXAS
MICAH J. SCHLUTER
136908
LICENSED
PROFESSIONAL ENGINEER

Micah J. Schluter, P.E.
03.14.24

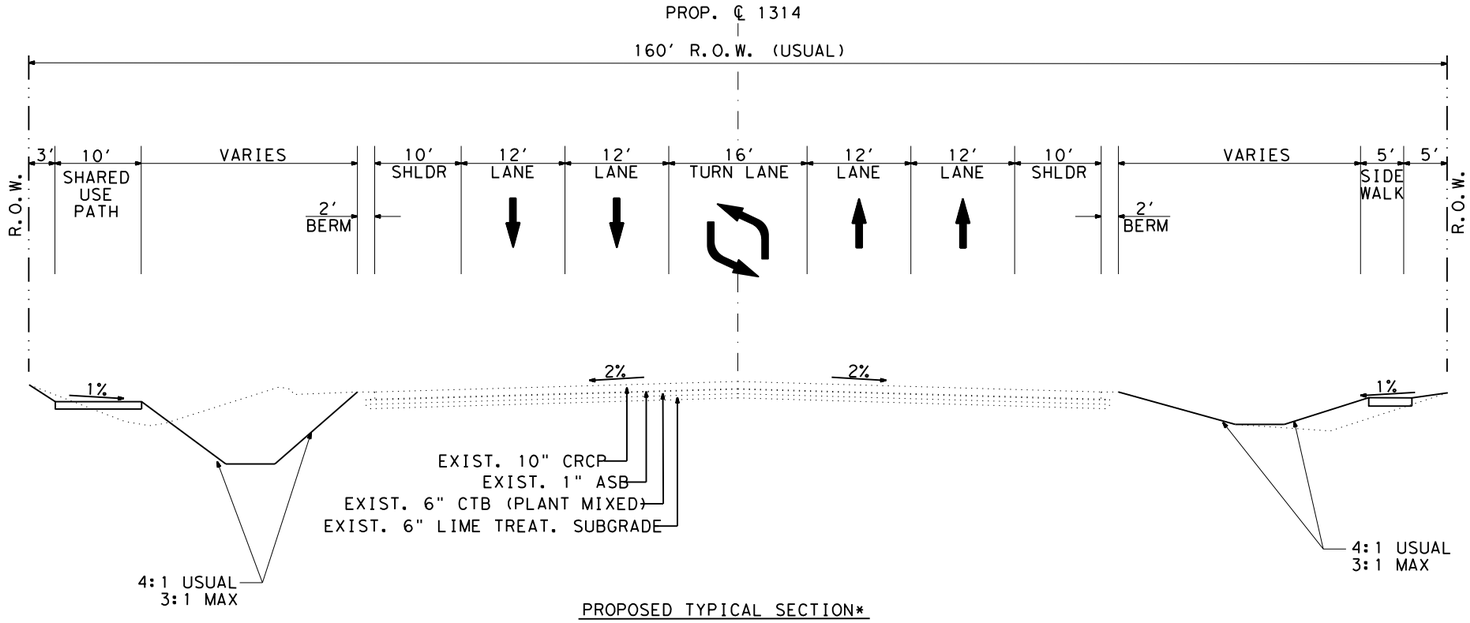
FM 1314 PROPOSED TYPICAL SECTION

SHEET 1 OF 2

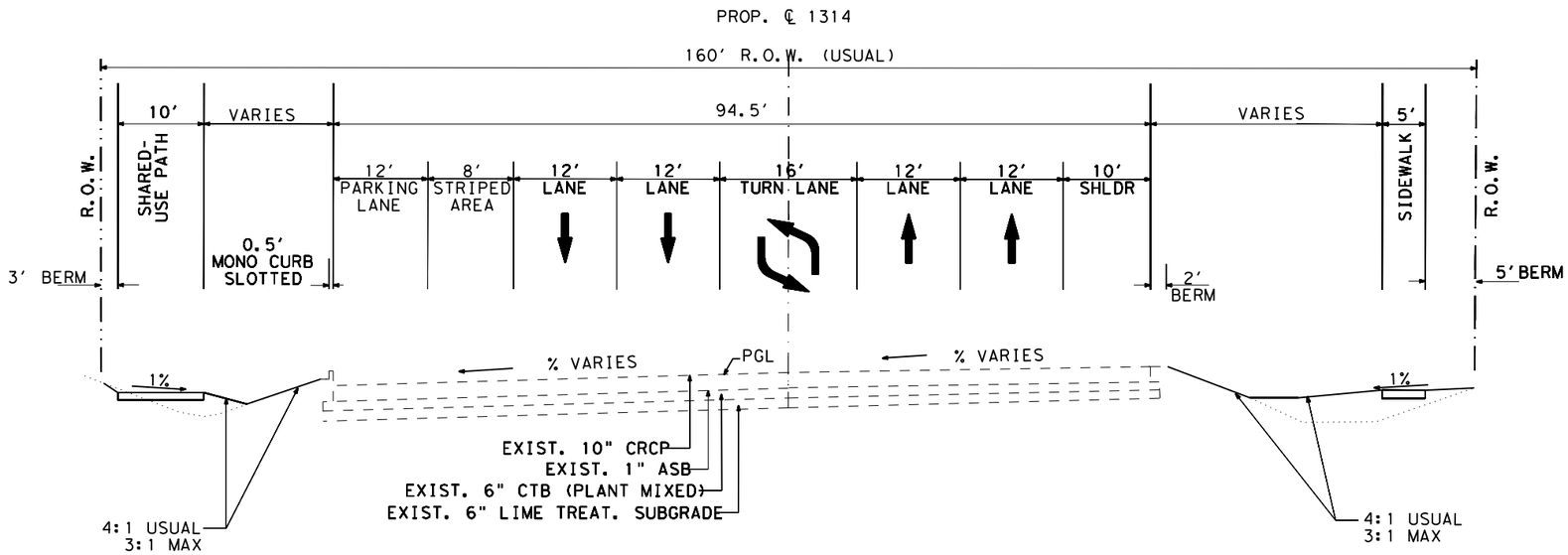
Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		4

* SIDEWALK, SHARED USED PATH AND DRAINAGE WORK ONLY



PROPOSED TYPICAL SECTION*
STA 525+24.16 TO STA 540+14.00
STA 549+28.00 TO STA 585+00.00



PROPOSED TYPICAL SECTION*
STA 540+14.00 TO STA 549+28.00

NOT TO SCALE

STATE OF TEXAS
MICAH J. SCHLUTER
136908
LICENSED
PROFESSIONAL ENGINEER

Micah J. Schluter, P.E.

03.14.24

FM 1314
PROPOSED TYPICAL SECTION

SHEET 2 OF 2

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		4A

DATE: 03/04/2024 03:57 PM
FILE: pw:\\txdot.projectwiseonline.com:TXDOT3\Documents\12 - HOU\Design Projects\198601064\4 - Design\Plan Set\1. General\004 FM 1314 PROPOSED TYPICAL SECTION

County: Montgomery **Control:** 1986-01-064

Highway: FM 1314

General Notes:

General:

Area Engineer contact information for this project follows:

Abraham M. Guzman, P.E. 936-538-3300 Abraham.Guzman@txdot.gov
Matthew M. Connelly, P.E. 936-538-3300 Matthew.Connelly@txdot.gov

Submit any questions about this project via the Letting Pre-Bid Q&A web page, located at:

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

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

Large files with relevant project documentation, such as Geotech reports, As-Built plans, and cross-sections will continue to be provided on the following FTP site:

Index of /pub/txdot-info/Pre-Letting Responses/Houston District (state.tx.us) or

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

If fixed features require, the governing slopes shown may vary between the limits shown and to the extent determined by the Engineer.

Superelevate the curves to match the existing surface.

Notify the Engineer immediately if discrepancies are discovered in the horizontal control or the benchmark data.

References to manufacturer's trade name or catalog numbers are for the purpose of identification only. Similar materials from other manufacturers are permitted if they are of equal quality, comply with the specifications for this project, and are approved, except for roadway illumination, electrical, and traffic signal items.

The cost for materials, labor, and incidentals to provide for traffic across the roadway and for ingress and egress to private property in accordance with Section 7.2.4 of the standard specifications is subsidiary to the various bid items. Restore access roadways to their original condition upon completing construction.

Grade street intersections and median openings for surface drainage.

SHEET 5

County: Montgomery **Control:** 1986-01-064

Highway: FM 1314

If a foundation is to be placed where a riprap surface or an asphalt concrete surface presently exists, use caution in breaking out the existing surface for placement. Break out no greater area than is required to place the foundation. After placing the foundation, wrap the periphery with 0.5 in. pre-molded mastic expansion joint. Then replace the remaining portion of the broken out surface with Class A or Class C concrete or cold mix asphalt concrete to the exact slope, pattern, and thickness of the existing riprap or asphalt. Payment for breaking out the existing surface, wrapping the foundation, and replacing the surface is subsidiary to the various bid items.

The lengths of the posts for ground mounted signs and the tower legs for the overhead sign supports are approximate. Verify the lengths before ordering these materials to meet the existing field conditions and to conform to the minimum sign mounting heights shown in the plans.

Furnish aluminum Type A signs instead of plywood signs for signs shown on the Summary of Small Signs sheet.

Clearly mark or highlight on the shop drawings, the items being furnished for this project. Submit required shop drawings in accordance with the shop drawing distribution list shown in the note for Item 5 for review and distribution.

Right of way parcels or utility adjustments shown to be unclear on the plans but not listed on the special provisions will have no effect on construction.

Make requests for additional soil information for this project at the Area Engineer's office.

Procure permits and licenses, which are to be issued by the City, County, or Municipal Utility District.

General: Site Management

Mow the grass and weeds within the project limits a maximum of 3 times a year as directed. This work is subsidiary to the various bid items.

Mark stations every 100 ft. and maintain the markings for the project duration. Remove the station markings at the completion of the project. This work is subsidiary to the various bid items.

Do not mix or store materials, or store or repair equipment, on top of concrete pavement or bridge decks unless authorized by the Engineer. Permission will be granted to store materials on surfaces if no damage or discoloration will result.

Personal vehicles of employees are not permitted to park within the right of way, including sections closed to public traffic. Employees may park on the right of way at the Contractor's office, equipment, and materials storage yard sites.

Assume ownership of debris and dispose of at an approved location. Do not dispose of debris on private property unless approved in writing by the District Engineer.

Control the dust caused by construction operations. For sweeping the base material in preparation for laying asphalt and for sweeping the finished concrete pavement, use one of the following types of sweepers or approved equal:

Tricycle Type	Truck Type - 4 Wheel
Wayne Series 900	M-B Cruiser II
Elgin White Wing	Wayne Model 945
Elgin Pelican	Mobile TE-3
	Mobile TE-4
	Murphy 4042

General: Traffic Control and Construction

Schedule construction operations such that preparing individual items of work follows in close sequence to constructing storm drains in order to provide as little inconvenience as practical to the businesses and residents along the project.

Schedule work so that the base placement operations follow the subgrade work as closely as practical to reduce the hazard to the traveling public and to prevent undue delay caused by wet weather.

This project requires extensive grading operations in an environmentally sensitive area.

If relocating mailboxes, place them with the post firmly in the ground at nearby locations. Upon completing the project, the Engineer will locate the final mailbox placement. Perform this work in accordance with the requirements of the Item, “Mailbox Assemblies,” except for measurement and payment. This work is subsidiary to the various bid items.

If fences cross construction easements shown on the plans and work is required beyond the fences, remove and replace the fences as directed. This work and the materials are subsidiary to the various bid items.

When design details are not shown on the plans, provide signs and arrows conforming to the latest “Standard Highway Sign Designs for Texas” manual.

General: Utilities

Consider the locations of underground utilities depicted in the plans as approximate and employ responsible care to avoid damaging utility facilities. Depending upon scope and magnitude of planned construction activities, advanced field confirmation by the utility owner or operator may be prudent. Where possible, protect and preserve permanent signs, markers, and designations of underground facilities.

SHEET 5A

County: Montgomery **Control:** 1986-01-064

Highway: FM 1314

If the Contractor damages or causes damage (breaks, leaks, nicks, dents, gouges, etc.) to the utility, contact the utility facility owner or operator immediately.

At least 72 hours before starting work, make arrangements for locating existing Department-owned above ground and underground fiber optic, communications, power, illumination, and traffic signal cabling and conduit. Do this by calling the Department’s Houston District Traffic Signal Operations Office at 713-802-5662, or by e-mailing the Department’s Houston District Traffic Signal Operations Office at: HOU-LocateRequest@txdot.gov, to schedule marking of underground lines on the ground. Use caution if working in these areas to avoid damaging or interfering with existing facilities.

Notify the Engineer at least 48 hours before constructing junction boxes at storm drain and utility intersections.

Install or remove poles and luminaires located near overhead or underground electrical lines using established industry and utility safety practices. Consult the appropriate utility company before beginning such work.

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

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

Perform electrical work in conformance with the National Electrical Code (NEC) and Department’s standard sheets.

Before beginning any underground work, notify the City of Houston’s Chief Inspector, Public Works and Engineering, to establish the locations of any existing electrical systems for lighting facilities within the limits of this project.

Item 5: Control of Work

Before contract letting, cross-section data for this project will be available to the prospective bidders in PDF format on the Department’s Houston District website located at:

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

The cross-section data provided above is for non-construction purposes only and it is the responsibility of the prospective bidder to validate the data with the appropriate plans, specifications, and estimates for the projects.

Submit shop drawings electronically for the fabrication of items as documented in Table 1 or below. Information and requirements for electronic submittals can be viewed in the "Guide to Electronic Shop Drawing Submittal" which can be accessed through the following web link, https://ftp.txdot.gov/pub/txdot-info/library/pubs/bus/bridge/e_submit_guide.pdf References to 11 in. x 17 in. sheets in individual specifications for structural items imply electronic CAD sheets.

Table 1

2014 Construction Specification Required Shop/Working Drawing Submittals - TxDOT Generated Plans

Spec Item No.'s	Product	Submittal Required	Approval Required (Y/N)	Contractor/ Fabricator P.E. Seal Required	Reviewing Party	Shop or Working Drawing (Note 1)
7.16.1&.2	Construction Load Analyses	Y	Y	Y	B	WD
400	Excavation and Backfill for Structures (cofferdams)	Y	N	Y	A	WD
403	Temporary Special Shoring	Y	N	Y	C	WD
420	Formwork/Falsework	Y	N	Y	A	WD
423	Retaining Walls, (calcs req'd.)	Y	Y	Y	C	SD
425	Optional Design Calculations (Prstrs Bms)	Y	Y	Y	B	SD
425	Prestr Concr Sheet Piling	Y	Y	N	B	SD
425	Prestr Concr Beams	Y	Y	N	B	SD
425	Prestr Concr Bent	Y	Y	N	B	SD
426	Post Tension Details	Y	Y	N	B	SD
434	Elastomeric Bearing Pads (All)	Y	Y	N	B	SD
441	Bridge Protective Assembly	Y	Y	N	B	SD
441	Misc Steel (various steel assemblies)	Y	Y	N	B	SD
441	Steel Pedestals (bridge raising)	Y	Y	N	B	SD
441	Steel Bearings	Y	Y	N	B	SD
441	Steel Bent	Y	Y	N	B	SD
441	Steel Diaphragms	Y	Y	N	B	SD
441	Steel Finger Joint	Y	Y	N	B	SD
441	Steel Plate Girder	Y	Y	N	B	SD
441	Steel Tub-Girders	Y	Y	N	B	SD
441	Erection Plans, including Falsework	Y	N	Y	A	WD
449	Sign Structure Anchor Bolts	Y	Y	N	T	SD
450	Railing	Y	Y	N	A	SD
462	Concrete Box Culvert	Y	Y	N	C	SD
462	Concrete Box Culvert (Alternate Designs Only,calcs reqd.)	Y	Y	Y	B	SD
464	Reinforced Concrete Pipe (Jack and Bore only; ONLY when requested)	Y	Y	Y	A	SD
465	Pre-cast Junction Boxes, Grates, and Inlets	Y	Y	N	A	SD
465	Pre-cast Junction Boxes, Grates, and Inlets (Alternate Designs Only, calcs req'd.)	Y	Y	Y	B	SD
466	Pre-cast Headwalls and Wingwalls	Y	Y	N	A	SD
467	Pre-cast Safety End Treatments	Y	Y	N	A	SD
495	Raising Existing Structure (calcs reqd.)	Y	Y	Y	B	SD
610	Roadway Illumination Supports (Non-Standard only, calcs reqd.)	Y	Y	Y	BRG	SD
613	High Mast Illumination Poles (Non-standard only, calcs reqd.)	Y	Y	Y	BRG	SD
627	Treated Timber Poles	Y	Y	N	T	SD
644	Special Non-Standard Supports (Bridge Mounts, Barrier Mounts, Etc.)	Y	Y	Y	T	SD
647	Large Roadside Sign Supports	Y	Y	Y	T	SD
650	Cantilever Sign Structure Supports - Alternate Design Calcs.	Y	Y	Y	T	SD
650	Sign Structures	Y	Y	N	T	SD
680	Installation of Highway Traffic Signals	Y	Y	N	T	SD
682	Vehicle and Pedestrian Signal Heads	Y	Y	N	T	SD
684	Traffic Signal Cables	Y	Y	N	T	SD
685	Roadside Flashing Beacon Assemblies	Y	Y	N	T	SD
686	Traffic Signal Pole Assemblies (Steel) (Non-Standard only)	Y	Y	Y	T	SD
687	Pedestal Pole Assemblies	Y	Y	N	T	SD
688	Detectors	Y	Y	N	A	SD
784	Repairing Steel Bridge Members	Y	Y	Y	B	WD
SS	Prestr Concr Crown Span	Y	Y	N	B	SD
SS	Sound Barrier Walls	Y	Y	Y	A	SD
SS	Camera Poles	Y	Y	Y	TMS	SD
SS	Pedestrian Bridge (Calcs req'd.)	Y	Y	Y	B	SD
SS	Screw-In Type Anchor Foundations	Y	Y	N	T	SD
SS	Fiber Optic/Communication Cable	Y	Y	N	TMS	SD
SS	Spread Spectrum Radios for Signals	Y	Y	N	T	SD
SS	VIVDS System for Signals	Y	Y	N	T	SD
SS	CTMS Equipment	Y	Y	N	TMS	SD

Notes:

1. Document flow for Working Drawings differs from Shop Drawings in that Working Drawings must be submitted to the Engineer rather than the Engineer of Record and they are for the information of the Engineer only; an approval stamp and distribution to all project offices is not required.

Key to Reviewing Party

A - Area Office

Area Office	Email Address
Montgomery Area Office	HOU-MONTAShpDrwgs@txdot.gov

B - Houston Bridge Engineer

Bridge Design (Houston TxDOT)	HOU-BrgShpDrwgs@txdot.gov

BRG - Austin Bridge Division

Bridge Design (Austin TxDOT)	BRG_ShopPlanReview@txdot.gov

C - Construction Office

Construction	HOU-ConstrShpDrwgs@txdot.gov
Laboratory	HOU-LabShpDrwgs@txdot.gov

SHEET 5B

County: Montgomery **Control:** 1986-01-064

Highway: FM 1314

County: Montgomery **Control:** 1986-01-064

Highway: FM 1314

T - Traffic Engineer	
Traffic Operations	HOU-TrfShpDrwgs@txdot.gov
TMS – Traffic Management System	
Computerized Traffic Management Systems (CTMS)	HOU-CTMSShpDrwgs@txdot.gov

Item 7: Legal Relations and Responsibilities

Do not initiate activities in a Project Specific Location (PSL), associated with a U.S. Army Corps of Engineers (USACE) permit area, that have not been previously evaluated by the USACE as part of the permit review of this project. Such activities include those pertaining to, but are not limited to, haul roads, equipment staging areas, borrow and disposal sites. Associated defined here means materials are delivered to or from the PSL. The permit area includes the waters of the U.S. or associated wetlands affected by activities associated with this project. Special restrictions may be required for such work. Assume responsibility for consultations with the USACE regarding activities, including PSLs that have not been previously evaluated by the USACE. Provide the Department with a copy of consultations or approvals from the USACE before initiating activities.

The Contractor may proceed with activities in PSLs that do not affect a USACE permit area if a self-determination has been made that the PSL is non-jurisdictional or if proper USACE clearances have been obtained in jurisdictional areas or have been previously evaluated by the USACE as part of the permit review of this project. The Contractor is solely responsible for documenting any determinations that their activities do not affect a USACE permit area. Maintain copies of their determinations for review by the Department or any regulatory agency.

Document and coordinate with the USACE, if required, before hauling any excavation from or hauling any embankment to a USACE permit area by either 1 or 2 below:

1. **Restricted Use of Materials for the Previously Evaluated Permit Areas.** Document both the Project Specific Locations (PSL) and their authorization. Maintain copies for review by the Department or any regulatory agency. When an area within the project limits has been evaluated by the USACE as part of the permit process for this project:
   a. Suitable excavation of required material in the areas shown on the plans and cross sections as specified in the Item, “Excavation” is used for permanent or temporary fill (under the Item, “Embankment”) within a USACE permit area.
   b. Suitable embankment (under the Item, “Embankment”) from within the USACE permit area is used as fill within a USACE evaluated area.
   c. Unsuitable excavation or excess excavation, “Waste” (under the Item, “Excavation”), that is disposed of at a location approved within a USACE evaluated area.

SHEET 5C

County: Montgomery **Control:** 1986-01-064

Highway: FM 1314

2. **Contractor Materials from Areas Other than Previously Evaluated Areas.** Provide the Department with a copy of USACE coordination or approvals before initiating any activities for an area within the project limits that has not been evaluated by the USACE or for any off right of way locations used for the following, but not limited to, haul roads, equipment staging areas, borrow and disposal sites:
   a. The Item, “Embankment” used for temporary or permanent fill within a USACE permit area.
   b. Unsuitable excavation or excess excavation, “Waste” (under the Item, “Excavation”), that is disposed of outside a USACE evaluated area.

The total area disturbed for this project is 31.08 acres. The disturbed area in this project, the project locations in the Contract, and Contractor project specific locations (PSLs) within 1 mile of the project limits for the Contract, will further establish the authorization requirements for storm water discharges. The Department will obtain an authorization to discharge storm water from the Texas Commission on Environmental Quality (TCEQ) for the construction activities shown on the plans. The Contractor is to obtain required authorization from the TCEQ for Contractor PSLs for construction support activities on or off the ROW. When the total area disturbed in the Contract and PSLs within 1 mile of the project limits exceeds 5 acres, provide a copy of the Contractor NOI for PSLs on the ROW to the Engineer (to the appropriate MS4 operator when on an off-state system route) and to the local government that operates a separate storm drain system.

Before bidding on this project, obtain a copy of the complete U.S. Army Corps of Engineers X Nationwide Permit at the Area Engineer’s office. Review the permit before bidding on the project and become aware of its conditions.

Do not place temporary fill in areas determined to be wetlands. This prohibition includes constructing staging areas, temporary fills or other actions that would result in placing fill in wetlands within the right of way, which are not addressed in the plans. The Engineer will coordinate with the Houston District Environmental Section to determine if wetlands are present on this project before placing temporary fill. If wetlands exist, obtain the appropriate permits from the U.S. Army Corps of Engineers.

This project requires permits with environmental resource agencies. There is a high probability of encountering environmentally sensitive areas on Contractor designated project specific locations (PSLs) for this project (haul roads, equipment staging areas, borrow pits, disposal sites, field offices, storage areas, parking areas, etc.). This Item provides listings of regulatory agencies the Contractor may need to contact for this project.

Maintain the roadway slope stability. Maintaining slope stability is subsidiary to the various bid items.

The nesting / breeding season for migratory birds is February 15 through September 30.

Conduct any tree removal outside of the migratory bird nesting season. If this is not possible due to scheduling, then exercise caution to remove only those trees with no active nests. Do not destroy nests on structures or in trees within the project limits during the nesting / breeding season.
Take measures to prevent the building of nests on any structures or trees within the project limits throughout the duration of the construction if work / removal will be performed during the nesting / breeding season. This can be accomplished by application of bird repellent gel, netting by hand every 3 to 4 days, or any other non-threatening method approved by the Houston District Environmental Section. Obtain this approval well in advance of the planned use. Contact the Houston District Environmental Section at 713-802-5244. The cost of this work is subsidiary to the various bid items.

No significant traffic generator events have been identified.

Item 8: Prosecution and Progress

The road-user cost liquidated damages are $ 57,826 per day. After the project is substantially complete, the liquidated damages become those based on contract administration costs.

The Department will not adjust the number of days for the project and milestones, if any, due to differences in opinion regarding any assumptions made in the preparation of the schedule or for errors, omissions, or discrepancies found in the time determination schedule.

Working days will be computed and charged based on a *5-day* workweek in accordance with Section 8.3.1.1.

The maximum number of days the time charges on this contract may be suspended due to contractor mobilization, and material fabrication/accumulation or processing delays is 90 days. The Engineer and the Contractor may mutually agree, in writing, to decrease this maximum number of days.

The Lane Closure Assessment Fee is $ 600. This fee applies to the Contractor for closures or obstructions that overlap into restricted hour traffic for each hour or portion thereof, per lane, regardless of the length of lane closure or obstruction. For Restricted Hours subject to Lane Assessment Fee refer to the Item, “Barricades, Signs, and Traffic Handling.” The time increment for the Lane Closure Assessment fee for this project is one hour.

Item 100: Preparing Right of Way

Obtain a City of Houston plumbing permit and a demolishing permit or removing permit before demolishing or removing existing houses or commercial buildings.

Clean existing ditches under fill sections of undesirable materials including grass, muck, and trash. Perform this work in accordance with the Construction section of the Item, “Preparing Right of Way.” This work is subsidiary to this bid Item.

SHEET 5D

County: Montgomery **Control:** 1986-01-064

Highway: FM 1314

The Item, “Preparing Right of Way” will be measured for payment only in those designated areas shown on the plans. Preparing right of way necessary to perform construction that is outside designated areas is subsidiary to this bid Item.

Remove abandoned utilities that are in conflict with the new utilities, at no expense to the Department.

Reestablish and maintain right of way stakes after completing the right of way preparation activities and until the new utilities are in place.

Remove and assume ownership of the existing ground mounted signs within the limits of roadway construction unless otherwise noted or directed. This work is subsidiary to the Item, “Preparing Right of Way.”

Item 104: Removing Concrete

Removing concrete curb is paid as a separate bid item if the existing pavement on which it rests is not removed at the same time.

Item 105: Removing Treated and Untreated Base and Asphalt Pavement

Removing curb on cement-treated and untreated base or on cement treatment being removed at the same time is subsidiary to this bid Item.

Obtain a secured site for the stockpile of the treated material to be salvaged from this project. Haul and stockpile 10,000 CY to 901 N. FM 3083 E. Conroe, TX 77303. This work is subsidiary to this bid Item.

Item 104: Removing Concrete
Item 105: Removing Treated and Untreated Base and Asphalt Pavement
Item 305: Salvaging, Hauling, and Stockpiling Reclaimable Asphalt Pavement

Case 2 - ACP over cement or lime treatment

Removing the Asphalt Concrete Pavement (ACP) material is paid under the Item, “Salvaging, Hauling, and Stockpiling Reclaimable Asphalt Pavement.”

Removing the cement or lime treatment is paid under the Item, “Removing Treated and Untreated Base and Asphalt Pavement.”

Remove the ACP separately from the cement or lime treatment. Make the removed depth as uniform as possible during each removal pass if the pavement depth being removed is composed of different asphalt layers. Unless otherwise approved, stockpile the RAP of differing types of quality separately by its intended use such as for the asphalt treatment, cement treatment, lime treatment, or asphalt concrete pavement. Break, crush, or mill the stockpiled materials so that 100 percent pass the 2-in. sieve.

10,000 CY of RAP generated by this project will become the property of The Texas Department of Transportation. Stockpile the material at The Department's Maintenance yard at 901 N. FM 3083 E. Conroe, TX 77303. The remaining RAP generated will become the property of the Contractor for use in the current construction project or in future projects.

Item 110: Excavation

If manipulating the excavated material requires moving the same material more than once to accomplish the desired results, the excavation is measured and paid for only once regardless of the manipulation required.

Transition the ditch grades and channel bottom widths at structure locations. Use only approved channel excavation in the embankment.

Item 132: Embankment

If salvaged base is used for the embankment material, break it into small pieces to achieve the required density and to facilitate placing in the embankment. Obtain approval of the material before placing in the embankment.

Furnish Type C material with a maximum Liquid Limit (LL) of 65, a minimum Plasticity Index (PI) of 5, and composed of suitable earth material such as loam, clay, or other materials that form a suitable embankment.

The embankment material used on the project which has a Liquid Limit exceeding 45 will be tested for Liquid Limits at the rate of one test per 20,000 cu. yd. or per total quantity less than 20,000 cu. yd., unless otherwise directed. Only use material that passes the above tests.

Furnish material with a maximum Liquid Limit (LL) of 65.

Item 162: Sodding for Erosion Control
Item 166: Fertilizer
Item 168: Vegetative Watering

Refer to the "Fertilizer, Seed, Sod, Straw, Compost, and Water" plan sheet for material specifications, application rates, and for watering requirements.

Item 260: Lime Treatment (Road-Mixed)

For slurry placing, before discharging through the distributors, sufficiently agitate or mix the lime and water to place the lime in suspension and to obtain a uniform mixture.

The Engineer will observe the lime treatment that the Contractor elects to open to construction traffic immediately after compaction. If the construction traffic damages the subgrade, route the traffic off the damaged section in accordance with the standard specification. If the construction

SHEET 5E

County: Montgomery **Control:** 1986-01-064

Highway: FM 1314

traffic does not damage the subgrade, cure the subgrade until other courses of material cover it. Apply these courses within 14 days with a maximum curing period of 7 days.

Place the hydrated and the commercial lime as a water suspension or slurry according to the slurry placing method shown in Section 260.4.3.2, "Slurry Placement."

Use the type of lime at particular locations as directed.

Place the quicklime dry or as a slurry.

For the dry quicklime, a spreader box is not required if the lime material is evenly distributed.

In limited areas, the Contractor may construct the lime slurry subgrade under a sequence of work in which the application, mixing, and compaction are completed in the same working day, if approved by the Engineer.

Provide documentation from certified public scales showing gross, tare, and net weights. Provide producer's delivery tickets also showing gross, tare, and net weights. Completely empty the lime trailers at the project site. The Engineer may direct the Contractor to reweigh any shipment of lime on certified scales. The cost of this operation is subsidiary to the Item, "Lime Treatment (Road-Mixed)."

The percentage of lime shown on the plans is estimated on the basis of engineering tests. If soil tests made during construction indicate properties different than those originally anticipated, the Engineer may vary the percentage of the lime to provide soil characteristics similar to those of the preliminary tests.

Mix the lime with the new base material in an approved pug mill type stationary mixer.

Item 276: Cement Treatment (Plant-Mixed)

Before placing the new base, wet and coat the vertical construction joints between the new base and the previously placed base with dry cement.

If the total thickness of the cement treatment is greater than 8 in., compact it in multiple lifts in accordance with Section 276.4.3, "Compaction." Place the courses in the same working day unless otherwise approved.

Use Class N Cement Treatment containing 4.5 percent cement based on the dry weight of the aggregate. There is no minimum compressive strength requirement for this Item.

The requirement for core drilling to determine the thickness of cement treatment is waived if using less than 500 sq. yd. at one location.

For widening the existing pavement, the Engineer may waive the requirements for preparing the subgrade by scarifying and compacting if the as-cut subgrade can be maintained to the density of

the natural ground and to a uniform consistency when placing the base course. Keep the subgrade wet.

Compact in accordance with the standard specifications and complete the finishing operations within a period of 5 hours after adding the cement to the base material.

Cure the final course of cement treatment using an asphalt distributor that distributes the approved curing material and water mixture material at a rate of 0.25 gallons per square-yard evenly and smoothly or as recommended by the manufacturer at the recommended dilution rate, under a pressure necessary for proper distribution. Provide a curing material meeting the requirements of the Item, "Asphalts, Oils, and Emulsions" for curing the cement treatment. Use the following materials for curing the courses of cement treatment:

Curing Material	Application
Water	All courses, except final course
PCE	Final course

Continue curing until placing another course or opening the finished section to traffic.

Spread the material so that the layers of base are uniform in depth and in loose density before compacting.

Type E material consists of Type A material, crushed concrete (except under flexible pavement), or Reclaimed Asphalt Pavement (RAP) meeting the requirements of the Item, "Flexible Base." If approved, the 50 percent maximum RAP limitation may be waived.

Unless otherwise directed, place the next pavement layer within 7 working days of placing the base.

If using crushed stone for the Type E material under this Item, ensure it meets the requirements for the Item, "Flexible Base," Type A, Grade 1-2. Texas Test Method TEX-117-E is not required for this Item.

If using Recycled Type E cement treatment under proposed flexible pavement, produce it using the existing base salvaged from within this project or from other approved Department projects and salvaged asphalt concrete pavement. Do not use crushed concrete under flexible pavement.

If using Recycled Type E cement treatment under proposed concrete pavement, produce it using the existing base salvaged from within this project or from other approved Department projects, salvaged asphalt concrete pavement, or crushed concrete. If using crushed concrete as an aggregate, meet the requirements of Grade 3.

If using salvaged existing base and asphalt concrete pavement as described above, size it so that all the material, except the existing individual aggregate, passes the 2-in. sieve and is of a gradation that allows satisfactory compaction. Provide salvaged material that does not contain

SHEET 5F

County: Montgomery **Control:** 1986-01-064

Highway: FM 1314

deleterious material such as clay or organic material. Provide material passing the No. 40 sieve, defined as soil binder, with a maximum Plasticity Index of 10 and a maximum Liquid Limit of 35 when tested in accordance with test method TEX-106-E.

Meet the following additional requirements if the base and ACP are salvaged from other Department projects:

1. Obtain written approval before using the material.
2. Salvage and stockpile by approved methods.
3. Stockpile the material for exclusive use by the Department.

Item 292: Asphalt Treatment (Plant-Mixed)

If using the iron ore topsoil as the primary aggregate, meaning 80 percent or more by weight of the total mixture, the requirements for the water susceptibility test are waived.

Mixtures containing the iron ore topsoil are exempted from test methods TEX-217-F (Part I, separation of deleterious material and Part II, decantation test for coarse aggregate) and TEX-203-F (Sand Equivalent Test).

Assume responsibility for proportioning the materials entering the asphalt mixture, regardless of the type of plant used.

Furnish the mix designs for approval.

Meet the following grading requirements:

Sieve Size	Percent Passing Grade 4 (Bondbreaker)
1-3/4 in.	-
1 in.	-
1/2 in.	100
No. 4	30 - 70
No. 40	15 - 45

Physical requirements are as follows:

Maximum Plasticity Index (PI) = 8
Maximum Liquid Limit (LL) = 35
Maximum Wet Ball Mill = 50 (crushed stone)
Maximum LA Abrasion = 50 (iron ore)

If blending the materials, perform the Wet Ball Mill test for the composite aggregate.

Form bituminous mix incorporating 3.5 to 7 percent asphaltic binder by dry weight.

For nominal aggregate size less than 0.5 in., design the mix in accordance with test method TEX-204-F.

If the layer thickness after placing is 1.25 in. or less, the bondbreaker is exempt from the in-place density control described in Section 292.4.5, “Compaction.”

Item 305: Salvaging, Hauling, and Stockpiling Reclaimable Asphalt Pavement

Keep the removed depth as uniform as possible during each removal pass if the pavement depth being removed is composed of different asphalt layers. Stockpile the RAP of differing types of quality separately by its intended use such as for asphalt treatment, cement treatment, lime treatment, or asphalt concrete pavement (level up). Break, crush, or mill the stockpiled materials so that 100 percent passes the 2-in. sieve.

Verify the depth of asphalt pavement to be removed before beginning the removal.

Deliver the first 10,000 CY of the RAP material to 901 N. FM 3083 E. Conroe, TX 77303.

Item 360: Concrete Pavement

Where the pavement curb is left off for a later tie, provide the dowels or the tie bars as indicated on the paving detail sheets. The dowel bars and tie bars are subsidiary to the various bid items.

Repair portions of the concrete pavement surfaces that are damaged while in a plastic state before that area receives permanent pavement markings and opens to traffic. Perform repairs that are structurally equivalent to and cosmetically uniform with the adjacent undamaged areas. Do not repair by grouting onto the surface.

On pavement widening, hand finishing in place of the longitudinal float will be permitted.

Where existing pavement is widened with new pavement, place the new pavement a minimum of 2 ft. wide.

Equip the batching plants to proportion by weight, aggregates and bulk cement, using approved proportioning devices and approved automatic scales.

For mono curb, the curb height transitions will be paid at the contract unit price of the larger curb height in the transition. The 2.5-in. laydown curbs for driveways will be paid at the unit price bid for the Item, “Conc Curb (Mono) (Ty II).”

High-early strength cement may be used for frontage road and city street intersection construction.

Do not use limestone dust of fracture as fine aggregate.

SHEET 5G

County: Montgomery **Control:** 1986-01-064

Highway: FM 1314

If the concrete design requires greater than 5.5 sacks of cementitious material per cubic yard, obtain written approval. If placing concrete pavement mixes from April 1 to October 31, inclusive, use Mix Design Option 1 as specified in Section 421.4.2.6.1.

Perform saw cutting as shown on the plans in accordance with Section 360.4.10, “Sawing Joints.” This saw cutting is subsidiary to this bid Item.
Complete the entire Fast Track Concrete construction process, from the time the Fast Track Work Area is closed to traffic, to the time the Fast Track Work Area is opened to traffic. The Fast Track operation includes, but is not limited to, traffic control, existing pavement and subgrade removal, preparation of subgrade, placement of steel, placement of Fast Track concrete pavement, cure time, striping, etc. Perform work in the Fast Track Work Area in an expeditious manner, within the allowable time period for any area shown below:

Fast Track Work Area	Allowable Duration
1. FM 1314/ E Strausie Ln Intersection Sta. 488+01.42 LT	2 weekdays maximum
2. FM 1314/ W Strausie Ln Intersection Sta. 488+18.50 RT	2 weekdays maximum
3. FM 1314/ E Allendale Ln Intersection Sta. 494+67.78 LT	2 weekdays maximum
4. FM 1314/ W Allendale Ln Intersection Sta. 494+72.91 RT	2 weekdays maximum
5. FM 1314/ Greenbough Intersection Sta. 504+56.70 LT	2 weekdays maximum
6. FM 1314/ Greenleaf Dr Intersection Sta. 504+57.80 RT	2 weekdays maximum
7. FM 1314/ Jim Stowe Rd Intersection Sta. 536+80.00 RT	2 weekdays maximum
8. FM 1314/ Pinewood Village 1 Intersection Sta. 538+60.00 RT	2 weekdays maximum
9. FM 1314/ Pinewood Village 2 Intersection Sta. 539+25.00 RT	2 weekdays maximum
10. FM 1314/ Calhoun Dr Sta. 566+25.00 RT	2 weekdays maximum

Failure to perform any Fast Track Work Area construction within the above time frames will be cause for the Engineer to require the Contractor to shut down all other construction operations to ensure all resources are directed toward the completion of the Fast Track operation. This shutdown will remain in force until the Fast Track operation is complete. Such a shutdown will not warrant additional time, time suspension, or any additional costs to the Department.

Unless otherwise directed in writing, provide Class HES concrete with a minimum average flexural strength of 425 psi or a minimum average compressive strength of 3,000 psi in 16 hours.

When directed in writing, open the pavement to traffic before the minimum requirements have been attained.

When needed, place and remove forms in accordance with Section 360.4.5, except do not remove forms until at least 6 hours after concrete has been placed. The time for the form removal may be extended with the direction of the Engineer if weather or other conditions make it advisable.

Sprinkling and rolling, required for the compaction of the rough subgrade in advance of fine grading are subsidiary to this Item. Maintenance of a moist condition of the subgrade in advance of fine-grading and concrete is subsidiary work, as provided above.

Item 360: All Concrete Items

For the Department's concrete cylinder split samples, transport the test cylinders to the Houston District Laboratory located at 7600 Washington Avenue in Houston, or to the appropriate Area Laboratory, when applicable. Transporting the test cylinders is subsidiary to the various bid items.

Item 400: Excavation and Backfill for Structures

Plugging existing pipe culverts is subsidiary to the various bid items.

If Recycled Cement Treatment (Type D) is included in the plans, the following additional requirements apply:

1. Use only approved sand, crushed concrete, or salvaged base free from deleterious matter, as aggregate for cement-stabilized backfill.
2. Provide crushed concrete or salvaged base backfill material in accordance with the Item, "Cement Treatment (Plant-Mixed) (Type D)" (base or crushed concrete), except the recycled Type D material must not contain Reclaimed Asphalt Pavement (RAP).
3. For backfill material below the spring line of pipes, use cement-stabilized sand rather than Recycled Type D backfill material.
4. For the cement-stabilized sand backfill, use a minimum of 7 percent of hydraulic cement based on the dry weight of backfill material. The cement content for the crushed concrete and salvaged base is specified in the Item, "Cement Treatment (Plant-Mixed) (Type D)."

SHEET 5H

County: Montgomery **Control:** 1986-01-064

Highway: FM 1314

5. Place and compact the stabilized backfill material using a gradation that provides a dense mass without segregating and is impervious to passing of water.

Item 432: Riprap

If stone riprap is shown on the plans, use common stone riprap in accordance with Section 432.2.3.3, placed dry in accordance with Section 432.3.2.3. Do not grout. Crushed concrete may also be used.

Item 423: Retaining Walls

Provide an exposed aggregate surface finish on retaining walls unless otherwise shown on the plans.

Provide and maintain positive drainage away from the earth wall system, including the leveling pad, for the contract duration.

Approved Concrete Block Retaining Wall Systems are listed at the website below or from the Department's home page>Business>Bridge>Retaining Walls>Approved Concrete Block Retaining Wall Systems:

https://www.txdot.gov/business/resources/highway/bridge/approved-systems/concrete-block-retaining-wall.html

Item 462: Concrete Box Culverts and Drains
Item 464: Reinforced Concrete Pipe

Concrete collars are subsidiary to the various bid items except for those specified on the plans for stage construction, which are paid for under the Item, "Concrete Substructures" as "Cl C Conc (Collar)."

Rubber gaskets are required for concrete pipe joints except for connections of safety end treatments, driveway culverts, and joints between the existing pipes and extensions.

If performing the work under the Item, "Jacking, Boring, or Tunneling Pipe or Box," use tongue and groove pipe instead of rubber gaskets at these locations.

Open, install, and backfill each section, or a portion of a section, in the same day at locations requiring pipe culverts under existing roadways.

Place the pipe drains across existing roadways half at a time to allow passage of traffic. No trenches may remain open overnight.

Known locations of existing stub-outs are shown on the plans, but these stub-outs may be in a different position or condition. Delays, inconveniences, or additional work required will not be a basis for additional compensation.

County: Montgomery **Control:** 1986-01-064

Highway: FM 1314

Provide leave-outs or holes in the proposed storm drain structures and pipes for drainage during interim construction. This work is subsidiary to the various bid items.

The flowline elevations of side road structures are based on the proposed ditches. Field-verify these elevations and adjust them as necessary to meet the field conditions. Before placing these structures, prepare and submit for approval, the data (revised elevation, alignment, length, etc.) for the adjusted structures.

If groundwater is encountered while installing the storm drain system, install a suitable dewatering system to facilitate construction of the storm drains. The costs for materials and labor required to install and maintain this system are subsidiary to the Item, "Reinforced Concrete Pipe."

Refer to "FM 1314 IMPROVEMENTS SUE QUALITY LEVELS A-D" prepared by KMCE for SUE information.

Item 465: Junction Boxes, Manholes, and Inlets

If required on the plans, build manholes and inlets to stage 1 construction, cover with temporary pavement, and complete in a later phase of construction. This temporary covering and pavement are subsidiary to the various bid items.

Construct manholes and inlets in graded areas, first to an elevation at least 4 in. above the top of the highest entering pipe and cover with a wooden cover. Complete the construction of such manholes and inlets to the finished elevation when completing the grading work for such manholes and inlets. Adjust the final elevation, if required, since this elevation is approximate.

Construct manholes and inlets in paved areas to an elevation so their temporary wooden covers are flush with the surface of the base material.

Do not leave excavations or trenches open overnight.

Items 496: Removing Structures

Do not permit debris resulting from the structure removal or construction activities to enter a natural or manmade waterway such as drainage channels, rivers, streams, bays, etc. Remove debris which falls into such waterways. This work is subsidiary to the Item, "Removing Structures."

Item 502: Barricades, Signs, and Traffic Handling

Use a traffic control plan for handling traffic through the various phases of construction. Follow the phasing sequence unless otherwise agreed upon by the Area Engineer and the Project Manager. Ensure this plan conforms to the latest "Texas Manual on Uniform Traffic Control Devices" and the latest Barricade and Construction (BC) Standard Sheets. The latest versions of

SHEET 5I

County: Montgomery **Control:** 1986-01-064

Highway: FM 1314

Work Zone Standard Sheets WZ (BTS-1) and WZ (BTS-2) are the traffic control plan for the signal installations.

Submit changes to the traffic control plan to the Area Engineer. Provide a layout showing the construction phasing, signs, striping, and signalizations for changes to the original traffic control plan.

Furnish and maintain the barricades and warning signs, including the necessary temporary and portable traffic control devices, during the various phases of construction. Place and construct these barricades and warning signs in accordance with the latest "Texas Manual on Uniform Traffic Control Devices" for typical construction layouts.

Cover work zone signs when work related to the signs is not in progress, or when any hazard related to the signs no longer exists.

Keep the delineation devices, signs, and pavement markings clean. This work is subsidiary to the Item, "Barricades, Signs, and Traffic Handling."

If a section is not complete before the end of the workday, pull back the base material to the existing pavement edge on a 6H: 1V slope. Edge drop-offs during the hours of darkness are not permitted.

Before detouring traffic onto the mainlane shoulders, remove dirt, debris, vegetation, and other deleterious material from the surface of the shoulders. Appropriately sign the detour in an approved manner. This work is subsidiary to the various bid items.

Cover or remove the permanent signs and construction signs that are incorrect or that do not apply to the current situation for a particular phase.

Replace the overhead signs, informational signs, and exit signs to be removed, with temporary signs providing the correct information to the traveling public. Size the replacement signs and include them in the traffic control plan.

Do not mount signs on drums or barricades, except those listed in the latest Barricades and Construction standard sheets.

Use traffic cones for daytime work only. Replace the cones with plastic drums during nighttime hours.

Place positive barriers to protect drop-off conditions greater than 2 ft. within the clear zone that remain overnight.

Do not reduce the existing number of lanes open to traffic except as shown on the following time schedule:

County: Montgomery **Control:** 1986-01-064

Highway: FM 1314

One Lane Closure

Day	Daytime Closure Hours	Nighttime Closure Hours	Restricted Hours Subject to Lane Assessment Fee
Monday	8:30 AM – 2:30 PM	9:00 PM – 5:00 AM	5:00 AM – 8:30 AM 2:30 PM – 9:00 PM
Tuesday	8:30 AM – 2:30 PM	9:00 PM – 5:00 AM	5:00 AM – 8:30 AM 2:30 PM – 9:00 PM
Wednesday	8:30 AM – 2:30 PM	9:00 PM – 5:00 AM	5:00 AM – 8:30 AM 2:30 PM – 9:00 PM
Thursday	8:30 AM – 2:30 PM	9:00 PM – 5:00 AM	5:00 AM – 8:30 AM 2:30 PM – 9:00 PM
Friday	8:30 AM – 2:30 PM	9:00 PM – 5:00 AM	5:00 AM – 8:30 AM 2:30 PM – 9:00 PM
Saturday/Sunday	NO	WEEKEND	CLOSURES

Two Lane Closure

Day	Daytime Closure Hours	Nighttime Closure Hours	Restricted Hours Subject to Lane Assessment Fee
Monday	8:30 AM – 2:30 PM	9:00 PM – 5:00 AM	5:00 AM – 8:30 AM 2:30 PM – 9:00 PM
Tuesday	8:30 AM – 2:30 PM	9:00 PM – 5:00 AM	5:00 AM – 8:30 AM 2:30 PM – 9:00 PM
Wednesday	8:30 AM – 2:30 PM	9:00 PM – 5:00 AM	5:00 AM – 8:30 AM 2:30 PM – 9:00 PM
Thursday	8:30 AM – 2:30 PM	9:00 PM – 5:00 AM	5:00 AM – 8:30 AM 2:30 PM – 9:00 PM
Friday	8:30 AM – 2:30 PM	9:00 PM – 5:00 AM	5:00 AM – 8:30 AM 2:30 PM – 9:00 PM
Saturday/Sunday	NO	WEEKEND	CLOSURES

The above times are approved for the traffic control conditions listed. The Area Engineer may approve other closure times if traffic counts warrant. The Area Engineer may reduce the above times for special events.

Law enforcement assistance will be required for this project and is expected to be required for major traffic control changes and lane closures. Coordinate with local law enforcement and arrange for law enforcement as directed or agreed by the Engineer. Before payment will be made, complete the "Daily Report on Law Enforcement Force Account Work" (Form 318), provided by the Department and submit daily invoices that agree with this form for any day during the month in which approved services were provided.

SHEET 5J

County: Montgomery **Control:** 1986-01-064

Highway: FM 1314

Provide full-time, off-duty, uniformed, certified peace officers, as part of traffic control operations. The peace officers must be able to show proof of certification by the Texas Commission on Law Enforcement Officers Standards. The cost of the officers is paid for on a force account basis.

During construction, remove, cover, adjust, or replace overhead sign panels to correspond with each current traffic control phase. The desirable size of letters for freeways is 10 in., the minimum is 8 in. This work is subsidiary to Item 502.

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.

Item 506: Temporary Erosion, Sedimentation and Environmental Controls

A Storm Water Pollution Prevention Plan (SWP3) is required. Since the disturbed area is more than 5 acres, a "Notice of Intent" (NOI) is also required.

Use appropriate measures to prevent, minimize, and control the spill of hazardous materials in the construction staging area. Remove and dispose of materials in compliance with State and Federal laws.

Before starting construction, review with the Engineer the SWP3 used for temporary erosion control as outlined on the plans. Before construction, place the temporary erosion and sedimentation control features as shown on the SWP3.

Schedule the seeding or sodding work as soon as possible. The project schedule provides for a vegetation management plan.

After completing earthwork operations, restore and reseed the disturbed areas in accordance with the Department's specifications for permanent or temporary erosion control.

Implement temporary and permanent erosion control measures to comply with the National Pollution Discharge Elimination System (NPDES) general permit under the Clean Water Act.

Before starting grading operations and during the project duration, place the temporary or permanent erosion control measures to prevent sediment from leaving the right of way.

Item 512: Portable Traffic Barrier

Transport Low Profile Concrete Barriers (LPCB) used for traffic handling from the Department's stockpile located on the north side of IH 610 at Long Drive.

County: Montgomery **Control:** 1986-01-064

Highway: FM 1314

After completing the project, return Low Profile Concrete Barriers (LPCB) used for traffic handling, to the Department's stockpile located on the north side of IH 610 at Long Drive. After completing the project, return the associated LPCB connecting hardware to the area office or as directed.

Item 529: Concrete Curb, Gutter, and Combined Curb and Gutter
Item 530: Intersections, Driveways, and Turnouts
Item 531: Sidewalks

An air-entraining admixture is not required.

For concrete curbs, use Grade 7 aggregate conforming to Section 421.2.6 of the Item, "Hydraulic Cement Concrete."

For driveways and turnouts, coarse aggregate Grade No. 3 through No. 8 conforming to the gradation requirements specified in the Item, "Hydraulic Cement Concrete" will be permitted.

For reinforcing steel in sidewalks and pedestrian ramps, use No. 4 bars at a maximum 18 in. spacing center-to-center in both directions.

Item 585: Ride Quality for Pavement Surfaces

To eliminate the need for corrective action due to excessive deviations in the final surface layers, exercise caution to ensure satisfactory profile results in the intermediate paving layers (mixture).

Milling will not be allowed as a corrective action for excessive deviations in the final surface layer of hot-mix asphalt.

For concrete or asphalt curb and gutter sections or frontage roads, use Surface Test Type B and Pay Adjustment Schedule 2 except for the outside lane. Use Surface Test Type B and Pay Adjustment Schedule 3 for the outside lane.

For Jointed Reinforced Concrete Pavement (JRCP), use Surface Test Type A.

For all other roads (cross streets and intersections), use Surface Test Type A.

Item 628: Electrical Services

If the specifications for electrical items require UL-listed products, this means UL-listed or CSA-listed.

Item 644: Small Roadside Sign Assemblies

Sign locations shown on the plans are approximate. Before placing them, obtain approval of and then stake the exact locations for these signs.

SHEET 5K

County: Montgomery **Control:** 1986-01-064

Highway: FM 1314

Use the Texas Universal Triangular Slip Base with the concrete foundation for small ground mounted signs, unless otherwise shown in the plans.

Remove existing street name signs from existing stop signs and re-install them above the new stop signs. Removing and re-installing existing street name signs is subsidiary to the Item, "Small Roadside Sign Assemblies."

When design details are not shown on the plans, provide signs and arrows conforming to the latest "Standard Highway Sign Designs for Texas" manual.

Use Type E Super High Specific Intensity (Fluorescent Prismatic) yellow green reflective sheeting background to fabricate school signs (S1-1, S3-1, S4-3, S5-1, W16-2, SW16-9p, and SW16-7pL(R)).

Assume ownership of the removed existing signposts. Store removed sign panels at the Contractor's field office, to be picked up by the maintenance office. This work is subsidiary to this item.

Locations of the relocated signs are approximate. Before placing them, obtain approval of and then stake the exact locations for these signs.

Replace existing signs that become damaged during relocation at no expense to the Department.

Item 662: Work Zone Pavement Markings

At the end of each workday, mark roadways that remain open to traffic during construction operations with standard pavement markings, in accordance with the latest "Texas Manual on Uniform Traffic Control Devices."

Using raised markers for removable work zone pavement markings on final concrete surfaces is optional.

Do not use raised pavement markers as optional work zone pavement markings on final asphalt surfaces.

For transition lane lines and detour lane lines, use raised pavement markers as shown for solid lines on the latest Barricade and Construction standard sheet for "Work Zone Pavement Marking Details."

Item 662: Work Zone Pavement Markings
Item 666: Reflectorized Pavement Markings
Item 6038: Multipolymer Pavement Markings (MPM)

Use Type III glass beads for thermoplastic and multipolymer pavement markings.

Use a 0.100 in. (100 mil) thickness for thermoplastic pavement markings, measured to the top of the thermoplastic, not including the exposed glass beads.

Use a 0.022 in. (22 mil) thickness for multipolymer pavement markings, measured to the top of the multipolymer, not including the exposed glass beads.

For roadways with asphalt surfaces to be striped with work zone or permanent thermoplastic markings, the Contractor has the option to apply paint and beads markings for a maximum 30-day period until placing the thermoplastic markings, or until starting the succeeding phase of work on the striped area. Maintain the paint and beads markings, at no expense to the Department, until placing the thermoplastic markings or starting the succeeding phase of work on the striped area. The work zone markings, whether paint and beads or thermoplastic, are paid under the Item, "Work Zone Pavement Markings" and the markings are paid for only once for the given phase of construction.

If using paint and bead markings as described above, purchase the traffic paint from the open market.

If the Type II markings become dirty and require cleaning by washing, brushing, compressed air, or other approved methods before applying the Type I thermoplastic markings, this additional cleaning is subsidiary to the Item, "Reflectorized Pavement Markings."

Establish the alignment and layout for work zone striping and permanent striping.

Stripe all roadways before opening them to traffic.

Place pavement markings under these items in accordance with details shown on the plans, the latest "Texas Manual on Uniform Traffic Control Devices," or as directed.

When design details are not shown on the plans, provide pavement markings for arrows, words, and symbols conforming to the latest "Standard Highway Sign Designs for Texas" manual.

Item 672: Raised Pavement Markers

If other operations are complete on the project and if the curing time period is not yet elapsed, the contract time will be suspended until the curing is done.

Before placing the raised pavement markers on concrete pavement, blast clean the surface using an abrasive-blasting medium. This work is subsidiary to the Item, "Raised Pavement Markers."

Provide epoxy adhesive that is machine-mixed or nozzle-mixed and dispensed. Equip the machine or nozzle with a mechanism to ensure positive mix measurement control.

SHEET 5L

County: Montgomery **Control:** 1986-01-064

Highway: FM 1314

Item 677: Eliminating Existing Pavement Markings and Markers

Remove existing pavement markings on concrete or asphalt surfaces by flail milling or as directed.

Item 678: Pavement Surface Preparation for Markings

Do not blast clean asphalt concrete pavement. Clean asphalt concrete pavement as required under the applicable specifications or as directed.

On new concrete pavement or on existing concrete pavement when placing a new stripe on a new location, remove the curing compounds and contamination from the pavement surface by flail milling or as directed. In addition, air-blast the surface with compressed air just before placing the new stripe.

On existing concrete pavement when placing a new stripe on an existing location, after removing the existing stripe under the Item, "Eliminating Existing Pavement Markings and Markers," air-blast the surface with compressed air just before placing the new stripe.

Do not clean concrete pavement by grinding.

Item 6185: Truck Mounted Attenuator (TMA) and Trailer Attenuator (TA)

A shadow vehicle with Truck Mounted Attenuators (TMAs) or Trailer Attenuators (TAs) is required as shown on the appropriate Traffic Control Plan (TCP) sheets. TMAs/TAs must meet the requirements of the Compliant Work Zone Traffic Control Device List.

Level 3 Compliant TMAs/TAs are required for this project.

In addition to the shadow vehicles with TMAs/TAs that are specified as being required on the TCP layout sheets for this project, provide additional shadow vehicles with TMAs/TAs as shown on the TCP Standard sheets. The Contractor is responsible for determining if one or more of these operations will be ongoing at the same time to determine the total number of TMAs/TAs needed on the project.

County: Montgomery **Control:** 1986-01-064

Highway: FM 1314

Basis of Estimate

Item	Description	Limit and Rate	Unit
260	Lime Treatment (Road-Mixed) For materials used as subgrade * • Lime(HYD, COM, or QK)(SLRY) or QK(DRY)	 6 % by weight based on 100 Lb. / Cu. Ft. subgrade	SY TON
275	Cement Treatment (Road-Mixed) For materials used as subgrade * • Cement	 6 % by weight based on 100 Lb. / Cu. Ft. subgrade	SY TON
292	Asphalt Treatment (Plant-Mixed) • Asphalt • Aggregate	110 Lb. / Sq. Yd.-In. 5 % by weight 95 % by weight	TON

* If used in existing roadway base, rate will be determined on a case by case basis.

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 1986-01-064 **DISTRICT** Houston **COUNTY** Montgomery
HIGHWAY FM 1314

			CONTROL SECTION JOB		**1986-01-064**	TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00126152**		
			COUNTY		**Montgomery**		
			HIGHWAY		**FM 1314**		
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	100-6002	PREPARING ROW	STA	116.000		116.000	
	104-6011	REMOVING CONC (MEDIANS)	SY	440.000		440.000	
	104-6017	REMOVING CONC (DRIVEWAYS)	SY	2,899.000		2,899.000	
	104-6021	REMOVING CONC (CURB)	LF	8,973.000		8,973.000	
	104-6025	REMOVE CONC (WINGWALL)	CY	69.000		69.000	
	105-6106	REMOVING STAB BASE AND ASPH PAV(6"-9")	SY	37,710.000		37,710.000	
	110-6001	EXCAVATION (ROADWAY)	CY	23,077.000		23,077.000	
	132-6006	EMBANKMENT (FINAL)(DENS CONT)(TY C)	CY	13,972.000		13,972.000	
	162-6002	BLOCK SODDING	SY	73,197.000		73,197.000	
	166-6001	FERTILIZER	AC	15.330		15.330	
	168-6001	VEGETATIVE WATERING	MG	1,839.000		1,839.000	
	260-6006	LIME TRT (EXST MATL) (6")	SY	19,296.000		19,296.000	
	260-6012	LIME(HYD,COM OR QK)(SLRY)OR QK(DRY)	TON	261.000		261.000	
	275-6001	CEMENT	TON	261.000		261.000	
	275-6002	CEMENT TREAT (EXIST MATL) (6")	SY	19,296.000		19,296.000	
	276-6224	CEM TRT(PLNT MX) (CL N)(TY E)(GR 4)(6")	SY	38,593.000		38,593.000	
	292-6017	ASPHALT STAB BASE (GR 4)(PG 64)	TON	2,073.000		2,073.000	
	305-6005	SALV, HAUL & STKPL RCL APH PV (6 TO 8")	SY	4,921.000		4,921.000	
	305-6012	SLV, HAUL & STKPL RCL APH PV (6 TO 12")	SY	37,710.000		37,710.000	
	360-6004	CONC PVMT (CONT REINF - CRCP) (10")	SY	37,697.000		37,697.000	
	360-6043	CONC PVMT (CONT REINF)(FAST TRK)(13")	SY	13,967.000		13,967.000	
	400-6005	CEM STABIL BKFL	CY	17,062.000		17,062.000	
	400-6007	CUT & RESTORE CONC PAVING	SY	6.000		6.000	
	400-6008	CUT & RESTORE ASPH PAVING	SY	66.000		66.000	
	400-6009	CEMENT STAB BACKFILL (INLET OR MH)	CY	905.000		905.000	
	402-6001	TRENCH EXCAVATION PROTECTION	LF	16,442.000		16,442.000	
	403-6001	TEMPORARY SPL SHORING	SF	4,200.000		4,200.000	
	423-6008	RETAINING WALL (CAST - IN - PLACE)	SF	974.000		974.000	
	432-6003	RIPRAP (CONC)(6 IN)	CY	138.000		138.000	
	432-6010	RIPRAP (CONC)(CL B)(5 IN)	CY	2,615.000		2,615.000	
	462-6003	CONC BOX CULV (4 FT X 2 FT)	LF	31.000		31.000	
	462-6004	CONC BOX CULV (4 FT X 3 FT)	LF	1,468.000		1,468.000	
	462-6005	CONC BOX CULV (4 FT X 4 FT)	LF	120.000		120.000	
	462-6006	CONC BOX CULV (5 FT X 2 FT)	LF	70.000		70.000	
	462-6007	CONC BOX CULV (5 FT X 3 FT)	LF	2,345.000		2,345.000	
	462-6011	CONC BOX CULV (6 FT X 4 FT)	LF	6,648.000		6,648.000	
	462-6020	CONC BOX CULV (8 FT X 5 FT)	LF	112.000		112.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 1986-01-064 **DISTRICT** Houston **COUNTY** Montgomery
HIGHWAY FM 1314

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**1986-01-064**			
		PROJECT ID		**A00126152**			
		COUNTY		**Montgomery**			
		HIGHWAY		**FM 1314**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	462-6041	CONC BOX CULV (12 FT X 6 FT)	LF	1,436.000		1,436.000	
	462-6176	CONC BOX CULV (12 FT X 5 FT)	LF	4,050.000		4,050.000	
	464-6003	RC PIPE (CL III)(18 IN)	LF	733.000		733.000	
	464-6005	RC PIPE (CL III)(24 IN)	LF	207.000		207.000	
	465-6166	INLET (COMPL)(TY AAD)	EA	12.000		12.000	
	465-6173	MANH (COMPL)(TY A)	EA	1.000		1.000	
	465-6225	JCT BOX (COMPL)(SPL)	EA	3.000		3.000	
	465-6282	INLET (STAGE II)(TY AD) (SPECIAL)	EA	53.000		53.000	
	465-6284	MANHOLE (COMPL)(SPECIAL)	EA	6.000		6.000	
	466-6097	HEADWALL (CH - PW - 0) (DIA= 24 IN)	EA	2.000		2.000	
	466-6179	WINGWALL (PW - 1) (HW=4 FT)	EA	1.000		1.000	
	466-6180	WINGWALL (PW - 1) (HW=5 FT)	EA	2.000		2.000	
	466-6183	WINGWALL (PW - 1) (HW=8 FT)	EA	1.000		1.000	
	467-6134	SET (TY I)(S= 4 FT)(HW= 2 FT)(6:1) (P)	EA	2.000		2.000	
	467-6142	SET (TY I)(S= 4 FT)(HW= 3 FT)(6:1) (P)	EA	4.000		4.000	
	467-6168	SET (TY I)(S= 5 FT)(HW= 2 FT)(6:1) (P)	EA	2.000		2.000	
	467-6174	SET (TY I)(S= 5 FT)(HW= 3 FT)(6:1) (P)	EA	7.000		7.000	
	467-6395	SET (TY II) (24 IN) (RCP) (6: 1) (P)	EA	4.000		4.000	
	476-6077	JACK BOR TUN BOX CULV (6 FT X 3 FT)	LF	410.000		410.000	
	481-6016	PIPE (PVC) (SCH 40) (12 IN)	LF	72.000		72.000	
	481-6033	PIPE (MISC) (6 IN)	LF	129.000		129.000	
	496-6004	REMOV STR (SET)	EA	159.000		159.000	
	496-6006	REMOV STR (HEADWALL)	EA	2.000		2.000	
	496-6007	REMOV STR (PIPE)	LF	2,846.000		2,846.000	
	496-6008	REMOV STR (BOX CULVERT)	LF	777.000		777.000	
	500-6001	MOBILIZATION	LS	1.000		1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	39.000		39.000	
	506-6001	ROCK FILTER DAMS (INSTALL) (TY 1)	LF	204.000		204.000	
	506-6011	ROCK FILTER DAMS (REMOVE)	LF	204.000		204.000	
	506-6020	CONSTRUCTION EXITS (INSTALL) (TY 1)	SY	222.000		222.000	
	506-6024	CONSTRUCTION EXITS (REMOVE)	SY	222.000		222.000	
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	7,895.000		7,895.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	7,895.000		7,895.000	
	508-6001	CONSTRUCTING DETOURS	SY	10,237.000		10,237.000	
	512-6010	PORT CTB (FUR & INST)(LOW PROF)(TY 2)	LF	740.000		740.000	
	512-6021	PORT CTB (DES SOURCE)(LOW PROF)(TY 1)	LF	3,260.000		3,260.000	
	512-6033	PORT CTB (MOVE)(LOW PROF)(TY 1)	LF	3,260.000		3,260.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 1986-01-064 **DISTRICT** Houston **COUNTY** Montgomery
HIGHWAY FM 1314

							TOTAL EST.	TOTAL FINAL
			CONTROL SECTION JOB		**1986-01-064**			
			PROJECT ID		**A00126152**			
			COUNTY		**Montgomery**			
			HIGHWAY		**FM 1314**			
ALT	**BID CODE**	**DESCRIPTION**		**UNIT**	EST.	FINAL		
	512-6034	PORT CTB (MOVE)(LOW PROF)(TY 2)		LF	680.000		680.000	
	512-6045	PORT CTB (STKPL)(LOW PROF)(TY 1)		LF	3,260.000		3,260.000	
	512-6046	PORT CTB (STKPL)(LOW PROF)(TY 2)		LF	740.000		740.000	
	529-6022	CONC CURB (DOWEL) (TY II)		LF	1,010.000		1,010.000	
	530-6025	DRIVEWAYS (CONC) (FAST TRACK)		SY	7,820.000		7,820.000	
	531-6002	CONC SIDEWALKS (5")		SY	15,234.000		15,234.000	
	531-6010	CURB RAMPS (TY 7)		EA	20.000		20.000	
	550-6009	CHAIN LINK FENCE(INSTALL)(6)(BARB TOP)		LF	52.000		52.000	
	550-6022	GATE (INSTALL)(DOUBLE)(6' X 16')		EA	1.000		1.000	
	628-6327	ELC SRV TY C 240/480 100(SS)SS(E)SF(U)		EA	1.000		1.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)		EA	16.000		16.000	
	644-6033	IN SM RD SN SUP&AM TYS80(1)SA(U)		EA	1.000		1.000	
	644-6068	RELOCATE SM RD SN SUP&AM TY 10BWG		EA	11.000		11.000	
	644-6070	RELOCATE SM RD SN SUP&AM TY S80		EA	1.000		1.000	
	644-6076	REMOVE SM RD SN SUP&AM		EA	15.000		15.000	
	662-6060	WK ZN PAV MRK REMOV (W)4"(BRK)		LF	6,320.000		6,320.000	
	662-6063	WK ZN PAV MRK REMOV (W)4"(SLD)		LF	29,767.000		29,767.000	
	662-6075	WK ZN PAV MRK REMOV (W)24"(SLD)		LF	36.000		36.000	
	662-6095	WK ZN PAV MRK REMOV (Y)4"(SLD)		LF	31,256.000		31,256.000	
	666-6212	REFL PAV MRK TY II (Y) 12" (SLD)		LF	1,010.000		1,010.000	
	666-6225	PAVEMENT SEALER 6"		LF	31,528.000		31,528.000	
	666-6226	PAVEMENT SEALER 8"		LF	504.000		504.000	
	666-6230	PAVEMENT SEALER 24"		LF	72.000		72.000	
	666-6231	PAVEMENT SEALER (ARROW)		EA	28.000		28.000	
	666-6232	PAVEMENT SEALER (WORD)		EA	4.000		4.000	
	666-6285	REF PROF PAV MRK TY I(W)6"(SLD)(090MIL)		LF	11,717.000		11,717.000	
	666-6289	REF PROF PAV MRK TY I(Y)6"(SLD)(090MIL)		LF	10,903.000		10,903.000	
	666-6293	REF PROF PAV MRK TY I(Y)6"(BRK)(090MIL)		LF	2,722.000		2,722.000	
	672-6007	REFL PAV MRKR TY I-C		EA	155.000		155.000	
	672-6009	REFL PAV MRKR TY II-A-A		EA	272.000		272.000	
	672-6010	REFL PAV MRKR TY II-C-R		EA	25.000		25.000	
	677-6002	ELIM EXT PAV MRK & MRKS (6")		LF	42,905.000		42,905.000	
	678-6002	PAV SURF PREP FOR MRK (6")		LF	31,528.000		31,528.000	
	678-6004	PAV SURF PREP FOR MRK (8")		LF	504.000		504.000	
	678-6008	PAV SURF PREP FOR MRK (24")		LF	72.000		72.000	
	678-6009	PAV SURF PREP FOR MRK (ARROW)		EA	28.000		28.000	
	678-6016	PAV SURF PREP FOR MRK (WORD)		EA	4.000		4.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 1986-01-064 **DISTRICT** Houston **COUNTY** Montgomery
HIGHWAY FM 1314

		CONTROL SECTION JOB		**1986-01-064**		TOTAL EST.	TOTAL FINAL
		PROJECT ID		**A00126152**			
		COUNTY		**Montgomery**			
		HIGHWAY		**FM 1314**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	6001-6001	PORTABLE CHANGEABLE MESSAGE SIGN	DAY	120.000		120.000	
	6038-6005	MULTIPOLYMER PAV MRK (W)(6")(BRK)	LF	3,093.000		3,093.000	
	6038-6007	MULTIPOLYMER PAV MRK (W)(8")(SLD)	LF	504.000		504.000	
	6038-6013	MULTIPOLYMER PAV MRK (W)(24")(SLD)	LF	72.000		72.000	
	6038-6024	MULTIPOLYMER PAV MRK (BLK)(6")(BRK)	LF	3,093.000		3,093.000	
	6038-6025	MULTIYPOLYMER PAV MRK (W) (ARROW)	EA	28.000		28.000	
	6038-6027	MULTIPOLYMER PAV MRK (W) (WORD)	EA	4.000		4.000	
	6185-6002	TMA (STATIONARY)	DAY	104.000		104.000	
	6185-6003	TMA (MOBILE OPERATION)	HR	80.000		80.000	
	7024-6001	AUTOMATIC PUMPING STATION	LS	1.000		1.000	
	08	CONTRACTOR FORCE ACCOUNT EROSION CONTROL MAINTENANCE (NON-PARTICIPATING)	LS	1.000		1.000	
		CONTRACTOR FORCE ACCOUNT LAW ENFORCEMENT (NON-PARTICIPATING)	LS	1.000		1.000	
		CONTRACTOR FORCE ACCOUNT SAFETY CONTINGENCY (NON-PARTICIPATING)	LS	1.000		1.000	

CSJ 1986-01-064	508 6001	512 6010	512 6021	512 6033	512 6034	512 6045	512 6046	662 6060	662 6063	662 6075	662 6095	677 6002
	CONSTRUCTIN G DETOURS	PORT CTB (FUR & INST)(LOW PROF)(TY 2)	PORT CTB (DES SOURCE)(LOW PROF)(TY 1)	PORT CTB (MOVE)(LOW PROF)(TY 1)	PORT CTB (MOVE)(LOW PROF)(TY 2)	PORT CTB (STKPL)(LOW PROF)(TY 1)	PORT CTB (STKPL)(LOW PROF)(TY 2)	WK ZN PAV MRK REMOV (W)4"(BRK)	WK ZN PAV MRK REMOV (W)4"(SLD)	WK ZN PAV MRK REMOV (W)24"(SLD)	WK ZN PAV MRK REMOV (Y)4"(SLD)	ELIM EXT PAV MRK & MRKS (6")
	SY	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF
PHASE 2 STEP 1 SHEET 1 OF 2	200	0	0	0	0	0	0	0	510	0	1020	2678
PHASE 2 STEP 1 SHEET 2 OF 2	489	0	0	0	0	0	0	0	163	0	326	856
SUBTOTAL	**689**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**673**	**0**	**1346**	**3533**
PHASE 2 STEP 2 SHEET 1 OF 3	127	0	0	0	0	0	0	129	935	0	1020	1658
PHASE 2 STEP 2 SHEET 2 OF 3	2554	0	0	0	0	0	0	56	1425	0	450	1560
PHASE 2 STEP 2 SHEET 3 OF 3	655	0	0	0	0	0	0	0	943	0	0	336
SUBTOTAL	**3336**	**0**	**0**	**0**	**0**	**0**	**0**	**186**	**3303**	**0**	**1470**	**3553**
PHASE 2 STEP 3 SHEET 1 OF 6	0	0	0	0	0	0	0	0	926	0	1020	375
PHASE 2 STEP 3 SHEET 2 OF 6	0	0	0	0	0	0	0	0	550	0	2400	4396
PHASE 2 STEP 3 SHEET 3 OF 6	0	0	0	0	0	0	0	0	0	0	180	372
PHASE 2 STEP 3 SHEET 4 OF 6	50	0	0	0	0	0	0	0	0	0	0	65
PHASE 2 STEP 3 SHEET 5 OF 6	2358	0	0	0	0	0	0	0	0	0	0	1200
PHASE 2 STEP 3 SHEET 6 OF 6	810	0	0	0	0	0	0	0	0	0	0	805
SUBTOTAL	**3218**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1476**	**0**	**3600**	**7213**
PHASE 3 SHEET 1 OF 6	0	12	0	0	0	0	0	204	707	0	1020	0
PHASE 3 SHEET 2 OF 6	638	68	1080	0	0	0	0	600	2400	0	2400	2338
PHASE 3 SHEET 3 OF 6	615	228	460	0	0	0	0	600	2400	0	2400	7028
PHASE 3 SHEET 4 OF 6	647	192	640	0	0	0	0	600	2400	0	2400	7595
PHASE 3 SHEET 5 OF 6	720	160	830	0	0	0	0	600	2400	0	2400	6600
PHASE 3 SHEET 6 OF 6	373	80	230	0	0	0	0	450	1800	0	1800	5045
SUBTOTAL	**2993**	**740**	**3240**	**0**	**0**	**0**	**0**	**3054**	**12107**	**0**	**12420**	**28606**
PHASE 4 SHEET 1 OF 6	0	0	20	0	12	0	60	231	808	0	1020	0
PHASE 4 SHEET 2 OF 6	0	0	0	1180	20	0	0	600	2400	0	2400	0
PHASE 4 SHEET 3 OF 6	0	0	0	362	228	0	0	600	2400	24	2400	0
PHASE 4 SHEET 4 OF 6	0	0	0	606	200	0	0	600	2400	12	2400	0
PHASE 4 SHEET 5 OF 6	0	0	0	838	120	0	0	600	2400	0	2400	0
PHASE 4 SHEET 6 OF 6	0	0	0	274	100	3260	680	450	1800	0	1800	0
SUBTOTAL	**0**	**0**	**20**	**3260**	**680**	**3260**	**740**	**3081**	**12208**	**36**	**12420**	**0**
PROJECT TOTALS	**10237**	**740**	**3260**	**3260**	**680**	**3260**	**740**	**6320**	**29767**	**36**	**31256**	**42905**

FM 1314 TRAFFIC CONTROL QUANTITY SUMMARY

SHEET 1 OF 1

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		7

CSJ 1986-01-064 ROADWAY QUANTITIES	100	104	104	105	110	132	260	260	275	275	276
	6002	6011	6021	6106	6001	6006	6006	6012	6001	6002	6224
	PREPARING ROW	REMOVING CONC (MEDIANS)	REMOVING CONC (CURB)	REMOVING STAB BASE AND ASPH PAV(6"-9")	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL)(DENS CONT)(TY C)	LIME TRT (EXST MATL) (6")	LIME(HYD,COM OR QK)(SLRY)OR QK(DRY)	CEMENT	CEMENT TREAT (EXIST MATL) (6")	CEM TRT(PLNT MX) (CL N)(TY E)(GR 4)(6")
	STA	SY	LF	SY	CY	CY	SY	TON	TON	SY	SY
STA. 467+90 TO 473+00	5	440	492	2882	1274	163	0	0	0	0	0
STA. 473+00 TO 485+00	12	0	2010	8000	5218	1522	5599	76	76	5599	11198
STA. 485+00 TO 497+00	12	0	1694	8000	4656	1069	3254	44	44	3254	6507
STA. 497+00 TO 509+00	12	0	1930	8000	3766	2832	4057	55	55	4057	8115
STA. 509+00 to 521+00	12	0	2090	8000	3107	2076	4728	64	64	4728	9455
STA. 521+00 TO 533+00	12	0	757	2828	2655	1433	1658	22	22	1658	3317
STA. 533+00 TO 545+00	12	0	0	0	601	1811	0	0	0	0	0
STA. 545+00 TO 557+00	12	0	0	0	710	1550	0	0	0	0	0
STA. 557+00 TO 569+000	12	0	0	0	947	1212	0	0	0	0	0
STA. 569+00 TO 581+00	12	0	0	0	125	304	0	0	0	0	0
STA. 581+00 TO 584+00	3	0	0	0	18	0	0	0	0	0	0
PROJECT TOTALS	**116**	**440**	**8973**	**37710**	**23077**	**13972**	**19296**	**261**	**261**	**19296**	**38593**

CSJ 1986-01-064 ROADWAY QUANTITIES	292	305	360	360	432	529	531	531	666 *	6001	6185	6185
	6017	6012	6004	6043	6003	6022	6002	6010	6212	6001	6002	6003
	ASPHALT STAB BASE (GR 4)(PG 64)	SLV, HAUL & STKPL RCL APH PV (6 TO 12")	CONC PVMT (CONT REINF - CRCP) (10")	CONC PVMT (CONT REINF)(FAST TRK)(13")	RIPRAP (CONC)(6 IN)	CONC CURB (DOWEL) (TY II)	CONC SIDEWALKS (5")	CURB RAMPS (TY 7)	REFL PAV MRK TY II (Y) 12" (SLD)	PORTABLE CHANGEABLE MESSAGE SIGN	TMA (STATIONARY)	TMA (MOBILE OPERATION)
	TON	SY	SY	SY	CY	LF	SY	EA	LF	DAY	DAY	HR
STA. 467+90 TO 473+00	0	2882	0	2882	138	1010	595	0	1010	60	52	40
STA. 473+00 TO 485+00	602	8000	10938	298	0	0	1996	0	0	0	0	0
STA. 485+00 TO 497+00	350	8000	6356	4841	0	0	1733	8	0	0	0	0
STA. 497+00 TO 509+00	436	8000	7926	3274	0	0	1840	4	0	0	0	0
STA. 509+00 to 521+00	508	8000	9238	1970	0	0	1908	0	0	0	0	0
STA. 521+00 TO 533+00	178	2828	3239	702	0	0	1894	0	0	0	0	0
STA. 533+00 TO 545+00	0	0	0	0	0	0	1876	6	0	0	0	0
STA. 545+00 TO 557+00	0	0	0	0	0	0	1957	0	0	0	0	0
STA. 557+00 TO 569+000	0	0	0	0	0	0	1435	2	0	0	0	0
STA. 569+00 TO 581+00	0	0	0	0	0	0	0	0	0	0	0	0
STA. 581+00 TO 584+00	0	0	0	0	0	0	0	0	0	60	52	40
PROJECT TOTALS	**2073**	**37710**	**37697**	**13967**	**138**	**1010**	**15234**	**20**	**1010**	**120**	**104**	**80**

* FOR USE ON CONC CURB (DOWEL) (TY II)

FM 1314
ROADWAY QUANTITY

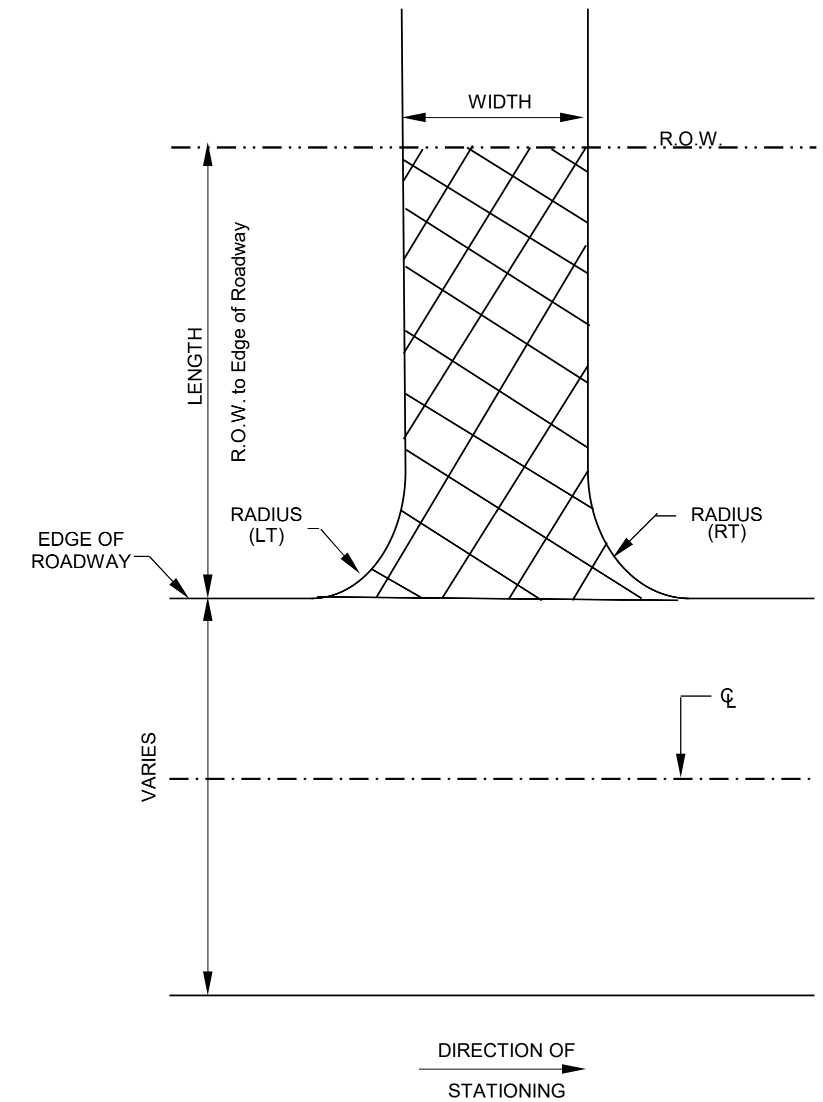
SHEET 1 OF 1

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		8

SUMMARY OF DRIVEWAYS AND INTERSECTIONS

SIGNING & PAVEMENT MARKING LAYOUT SHEET	DRWY NO	APPROX RDWY STA AT CL DRWY	SURF TYPE	EXISTING DRIVEWAY ITEM 305 6005 SALV, HAUL & STKPL RCL APH PV (6" TO 8") SY	PROPOSED DRIVEWAY LT RADIUS FT	RT RADIUS FT	LENGTH FT	WIDTH FT	ITEM 530 6025 DRIVEWAYS (CONC) (FAST TRACK) SY
1	1	471+26.09 LT	FAST TRACK	61	15	15	36	11	61
2	1A	477+50+00 RT	FAST TRACK	53	15	15	38	8	53
3	2	485+27.67 RT	FAST TRACK	84	25	25	38	9	84
3	3	485+45.98 LT	FAST TRACK	125	25	25	38	20	125
3	4	486+45.30 LT	FAST TRACK	83	15	15	38	16	83
3	5	489+27.89 LT	FAST TRACK	140	25	25	38	23	140
3	6	489+55.02 RT	FAST TRACK	94	25	25	38	12	94
3	7	490+89.10 LT	FAST TRACK	215	25	25	38	42	215
3	8	492+15.87 RT	FAST TRACK	124	25	25	38	20	124
3	9	493+45.86 LT	FAST TRACK	219	30	30	38	40	219
3	10	494+02.70 LT	FAST TRACK	196	30	30	38	37	196
3	11	496+05.36 RT	FAST TRACK	162	25	25	38	27	162
4	12	497+55.03 RT	FAST TRACK	202	25	25	38	31	202
4	13	497+79.55 LT	FAST TRACK	130	25	25	38	21	130
4	14	499+77.69 RT	FAST TRACK	172	25	25	38	31	172
4	15	499+79.59 LT	FAST TRACK	194	25	25	38	36	194
4	16	502+03.79 LT	FAST TRACK	117	25	25	38	17	117
4	17	502+65.74 RT	FAST TRACK	187	25	25	38	35	187
4	18	506+64.64 LT	FAST TRACK	61	15	15	38	10	61
5	18A	510+14.68 RT	FAST TRACK	117	25	25	38	17	117
5	19	510+88.46 LT	FAST TRACK	82	25	25	38	8	82
5	20	515+03.00 LT	FAST TRACK	166	25	25	38	29	166
5	21	515+22.68 RT	FAST TRACK	118	25	25	38	15	118
5	22	519+30.11 LT	FAST TRACK	130	25	25	38	20	130
5	23	519+72.63 RT	FAST TRACK	154	25	25	39	28	154
6	24	521+93.47 LT	FAST TRACK	115	25	25	38	14	115
6	25	524+65.27 RT	FAST TRACK	207	25	25	46	34	207
E STRAUSIE LN		488+01.42 LT	FAST TRACK	196	35	35	59	20	196
W STRAUSIE LN		488+18.50 RT	FAST TRACK	203	35	35	58	20	203
E ALLENDALE LN		494+67.78 LT	FAST TRACK	205	35	35	58	21	205
W ALLENDALE LN		494+72.91 RT	FAST TRACK	209	35	35	58	21	209
GREENBOUGH		504+56.70 LT	FAST TRACK	206	35	35	58	20	206
GREENLEAF DR		504+57.80 RT	FAST TRACK	196	35	35	58	18	196
SUBTOTAL				4921					4921
TOTAL				4921					-



DRIVEWAY DETAIL
NTS

SUMMARY OF DRIVEWAY & INTERSECTION QUANTITIES

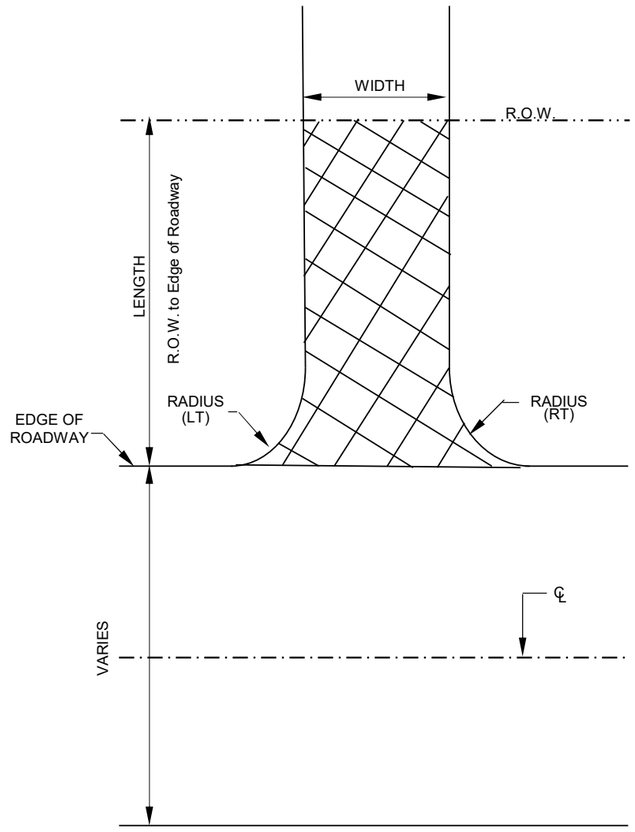
SHEET 1 OF 2

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6			9
STATE	STATE DIST. NO.	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY
1986	01	064	FM 1314

SUMMARY OF DRIVEWAYS AND INTERSECTIONS

			EXISTING DRIVEWAY		PROPOSED DRIVEWAY				
SIGNING &	DRWY	APPROX	SURF	ITEM 104	LT	RT	LENGTH	WIDTH	ITEM 530
PAVEMENT MARKING	NO	RDWY STA	TYPE	6017	RADIUS	RADIUS			6026
LAYOUT SHEET		AT CL DRWY		REMOVE					DRIVEWAYS
				CONCRETE DRIVEWAY					(CONC)
									(FAST TRACK)
				SY	FT	FT	FT	FT	SY
6	26	528+66.68 RT	FAST TRACK	116	20	20	39	23	116
6	27	529+25.00 LT	FAST TRACK	107	20	20	38	21	107
6	28	530+75.00 LT	FAST TRACK	81	20	20	38	15	81
6	29	531+90.00 RT	FAST TRACK	104	20	20	39	20	104
7	30	533+00.00 LT	FAST TRACK	76	15	15	38	15	76
7	31	535+00.00 LT	FAST TRACK	75	20	20	38	14	75
7	32	537+75.00 LT	FAST TRACK	98	20	20	37	19	98
7	33	540+00.00 LT	FAST TRACK	115	15	0	38	26	115
7	34	543+25.00 RT	FAST TRACK	98	15	15	38	20	98
7	35	544+10.00 LT	FAST TRACK	127	15	25	29	32	127
8	36	545+20.00 RT	FAST TRACK	102	15	15	38	20	102
8	37	550+25.00 RT	FAST TRACK	66	15	15	35	14	66
8	37A	555+60.00 RT	FAST TRACK	69	15	15	37	14	69
8	37B	556+38.00 RT	FAST TRACK	74	15	15	37	16	74
9	38	561+75.00 RT	FAST TRACK	111	15	15	38	25	111
9	39	562+50.00 RT	FAST TRACK	108	15	15	38	24	108
9	40	566+15.00 LT	FAST TRACK	68	15	15	35	14	68
10	41	574+59.00 RT	FAST TRACK	112	20	20	36	24	112
10	42	576+17.00 RT	FAST TRACK	221	25	25	39	47	221
10	43	578+14.00 RT	FAST TRACK	69	15	15	37	11	69
11	44	581+23.00 LT	FAST TRACK	128	25	25	39	25	128
JIM STOWE RD		536+80.00 RT	FAST TRACK	161	35	35	38	24	161
PINEWOOD VILLAGE 1		538+60.00 RT	FAST TRACK	106	20	35	37	17	106
PINEWOOD VILLAGE 2		539+25.00 RT	FAST TRACK	105	35	20	39	17	105
CALHOUN DR		566+25.00 RT	FAST TRACK	232	40	40	38	39	232
VILLAGE WOODS DR		572+59.00 RT	FAST TRACK	170	35	35	37	24	170
SUBTOTAL				2899					2899
TOTAL				2899					7820



DRIVEWAY DETAIL
NTS

SUMMARY OF DRIVEWAY & INTERSECTION QUANTITIES

SHEET 2 OF 2

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6			9A
STATE	STATE DIST. NO.	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY
1986	01	064	FM 1314

SUMMARY OF DRAINAGE QUANTITIES

LOCATION	104 6025	400 6002	400 6003	400 6005	400 6008	400 6009	402 6001	403 6001	423 6008	432 6010	465 6225	462 6003	462 6004	462 6005	462 6006	462 6007	462 6011	462 6020	462 6041	462 6176	464 6005
	REMOVE CONC (WINGWALL)	STRUCT EXCAV (BOX) *	STRUCT EXCAV (PIPE) *	CEM STABIL BKFL	CUT & RESTORE ASPH PAVING	CEMENT STAB BACKFILL (INLET OR MH)	TRENCH EXCAVATION PROTECTION	TEMPORARY SPL SHORING	RETAINING WALL (CAST - IN - PLACE)	RIPRAP (CONC) (CL B) (5 IN)	JCT BOX (COMPL) (SPL)	CONC BOX CULV (4 FT X 2 FT)	CONC BOX CULV (4 FT X 3 FT)	CONC BOX CULV (4 FT X 4 FT)	CONC BOX CULV (5 FT X 2 FT)	CONC BOX CULV (5 FT X 3 FT)	CONC BOX CULV (6 FT X 4 FT)	CONC BOX CULV (8 FT X 5 FT)	CONC BOX CULV (12 FT X 6 FT)	CONC BOX CULV (12 FT X 5 FT)	RC PIPE (CL III) (24 IN)
	CY	CY	CY	CY	SY	CY	LF	SF	SF	CY	EA	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF
STA 468+00 TO 585+00																					
FM1314 NB																					
SHEET 1 OF 11			15	13						80											27
SHEET 2 OF 11		43		20		26	30			462			30								
SHEET 3 OF 11		3037	25	818		128	1200			1			1200								45
SHEET 4 OF 11		3731	89	1077		89	1200			150			170				1030				24
SHEET 5 OF 11		4278		1070		38	1200										1200				
SHEET 6 OF 11		2149		663		51	814									414	400				
SHEET 7 OF 11		2311		889		51	1200			210						1200					
SHEET 8 OF 11		1067		444	66	13	600									600					
SHEET 9 OF 11		31		18						192		31									
SHEET 10 OF 11										462											
SHEET 11 OF 11			35	20									31								
FM1314 SB																					
SHEET 1 OF 11			30	26						160											54
SHEET 2 OF 11		78	0	37		26	13			462			38				13				
SHEET 3 OF 11		4196	13	1070		102	1214			1							1200				14
SHEET 4 OF 11		3711		1099		51	1243			260							1200				43
SHEET 5 OF 11		3911		1070		38	1200										1200				
SHEET 6 OF 11		1522		1610		38	1317				1						405	112		800	
SHEET 7 OF 11		6542		1689		51	1200													1200	
SHEET 8 OF 11		6258		1689		64	1200													1200	
SHEET 9 OF 11		7457		1670		77	1190	4200		105	2								136	850	
SHEET 10 OF 11		12974		1921		38	1401								70	131			1200		
SHEET 11 OF 11	69	1179		147		26	220		974	70				120					100		
PROJECT TOTALS	69	64475	208	17062	66	905	16442	4200	974	2615	3	31	1468	120	70	2345	6648	112	1436	4050	207

SUMMARY OF DRAINAGE QUANTITIES

LOCATION	465 6166	465 6282	465 6284	466 6097	466 6179	466 6180	466 6183	467 6134	467 6142	467 6168	467 6174	467 6395	476 6077	481 6016	496 6004	496 6006	496 6007	496 6008
	INLET (COMPL) (TY AAD)	INLET (STAGE II) (TY AD) (SPECIAL)	MANHOLE (COMPL) (SPECIAL)	HEADWALL (CH - PW - 0) (DIA= 24 IN)	WINGWALL (PW - 1) (HW=4 FT)	WINGWALL (PW - 1) (HW=5 FT)	WINGWALL (PW - 1) (HW=8 FT)	SET (TY I) (S= 4 FT) (HW= 2 FT) (6:1) (P)	SET (TY I) (S= 4 FT) (HW= 3 FT) (6:1) (P)	SET (TY I) (S= 5 FT) (HW= 2 FT) (6:1) (P)	SET (TY I) (S= 5 FT) (HW= 3 FT) (6:1) (P)	SET (TY II) (24 IN) (RCP) (6:1) (P)	JACK BOR TUN BOX CULV (6 FT X 3 FT)	PIPE (PVC) (SCH 40) (12 IN)	REMOV STR (SET)	REMOV STR (HEADWALL)	REMOV STR (PIPE)	REMOV STR (BOX CULVERT)
	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	LF	LF	EA	EA	LF	LF
STA 468+00 TO 585+00																		
FM1314 NB																		
SHEET 1 OF 11												2			2		26	
SHEET 2 OF 11	2				1										1			
SHEET 3 OF 11		10												50	12		525	
SHEET 4 OF 11	2	5		1											11		182	10
SHEET 5 OF 11	3													22	12		230	
SHEET 6 OF 11	1	3													8		56	66
SHEET 7 OF 11		4													10			188
SHEET 8 OF 11	1																	
SHEET 9 OF 11						1		2							2	1	30	16
SHEET 10 OF 11																		
SHEET 11 OF 11									2						2		30	
FM1314 SB																		
SHEET 1 OF 11												2						
SHEET 2 OF 11	2					1			2						1			
SHEET 3 OF 11		8													30		804	
SHEET 4 OF 11		4		1											18		426	
SHEET 5 OF 11		3													12		178	
SHEET 6 OF 11		3													6			118
SHEET 7 OF 11		4													7		160	
SHEET 8 OF 11		5													9			170
SHEET 9 OF 11		4	2				1						410		8	1		209
SHEET 10 OF 11			3							2	6				8		199	
SHEET 11 OF 11	1		1								1							
PROJECT TOTALS	12	53	6	2	1	2	1	2	4	2	7	4	410	72	159	2	2846	777

* FOR CONTRACTOR'S INFORMATION ONLY. STRUCTURAL EXCAVATION FOR PIPE AND BOX WILL NOT BE PAID FOR DIRECTLY BUT ARE SUBSIDIARY TO PERTINENT ITEMS.

OMEGA ENGINEERS, INC.
16360 PARK TEN PLACE, Ste. #325
HOUSTON TEXAS, 77084
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:281 647 9182 F:281 647 9184

Texas Department of Transportation

FM 1314

SUMMARY OF DRAINAGE QUANTITIES

SHEET 1 OF 1

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.	SHEET NO.
CK: SF	6	SEE COVER SHEET	10
DRN: MS	STATE	DIST.	COUNTY
APPVD: BV	TEXAS	HOU	MONTGOMERY
CONT.	SECT.	JOB	HIGHWAY NO.
1986	01	064	FM 1314

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SUMMARY OF QUANTITIES									
SHEET #	LOCATION	400 6007 CUT & RESTORE CONCRETE PAVING	464 6003 RC PIPE (CL III)(18 IN)	465 6173 MANH (COMPL) (TY A)	481 6033 PIPE (MISC) (6 IN)	550 6009 CHAIN LINK FENCE (INSTALL)(6')(BARB TOP)	550 6022 GATE (INSTALL) (DOUBLE) (6'X16')	7024 6001 AUTOMATIC PUMP STATION	0628 6327 SRV TY C 240/480 100 (SS) SS (E) SF (U)
		SY	LF	EA	LF	LF	EA	EA	EA
1	PUMP STATION SH 242 EB FR	6	733	1	129	52	1	1	1
	PROJECT TOTALS	**6**	**733**	**1**	**129**	**52**	**1**	**1**	**1**

REV NO.	DATE	BY	REVISION

CivilTech Engineering, Inc.
11821 Telge Road
Cypress, Texas 77429
PH: (281) 304-0200 - FX: (281) 304-0210
Firm Registration No. F-382

Texas Department of Transportation

FM 1314

PUMP STATION QUANTITY SUMMARY

SHEET 1 OF 1

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6	SEE COVER SHEET		10A
STATE	DIST.	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.
1986	01	064	FM 1314

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CSJ 1986-01-064	666	666	666	666	666	666	666	666	672	672	672
	6225	6226	6230	6231	6232	6285	6289	6293	6007	6009	6010
	PAVEMENT SEALER 6"	PAVEMENT SEALER 8"	PAVEMENT SEALER 24"	PAVEMENT SEALER (ARROW)	PAVEMENT SEALER (WORD)	REF PROF PAV MRK TY I(W)6"(SLD)(090MIL)	REF PROF PAV MRK TY I(Y)6"(SLD)(090MIL)	REF PROF PAV MRK TY I(Y)6"(BRK)(090MIL)	REFL PAV MRKR TY I-C	REFL PAV MRKR TY II-A-A	REFL PAV MRKR TY II-C-R
	LF	LF	LF	EA	EA	LF	LF	LF	EA	EA	EA
BEGIN TO STA. 473+00	1338	504	0	4	4	835	16	0	12	0	25
STA. 473+00 TO 485+00	6600	0	0	4	0	2400	2400	600	30	60	0
STA. 485+00 TO 497+00	5847	0	48	8	0	2061	2068	517	30	52	0
STA. 497+00 TO 509+00	6194	0	24	4	0	2220	2219	555	30	55	0
STA. 509+00 to 521+00	6600	0	0	4	0	2400	2400	600	30	60	0
STA. 521+00 TO 533+00	4950	0	0	4	0	1800	1800	450	23	45	0
PROJECT TOTALS	**31528**	**504**	**72**	**28**	**4**	**11717**	**10903**	**2722**	**155**	**272**	**25**

CSJ 1986-01-064	678	678	678	678	678	6038	6038	6038	6038	6038	6038
	6002	6004	6008	6009	6016	6005	6007	6013	6024	6025	6027
	PAV SURF PREP FOR MRK (6")	PAV SURF PREP FOR MRK (8")	PAV SURF PREP FOR MRK (24")	PAV SURF PREP FOR MRK (ARROW)	PAV SURF PREP FOR MRK (WORD)	MULTIPOLYMER PAV MRK (W)(6")(BRK)	MULTIPOLYMER PAV MRK (W)(8")(SLD)	MULTIPOLYMER PAV MRK (W)(24")(SLD)	MULTIPOLYMER PAV MRK (BLK)(6")(BRK)	MULTIYPOLYMER PAV MRK (W) (ARROW)	MULTIPOLYMER PAV MRK (W) (WORD)
	LF	LF	LF	EA	EA	LF	LF	LF	LF	EA	EA
BEGIN TO STA. 473+00	1338	504	0	4	4	243	504	0	243	4	4
STA. 473+00 TO 485+00	6600	0	0	4	0	600	0	0	600	4	0
STA. 485+00 TO 497+00	5847	0	48	8	0	600	0	48	600	8	0
STA. 497+00 TO 509+00	6194	0	24	4	0	600	0	24	600	4	0
STA. 509+00 to 521+00	6600	0	0	4	0	600	0	0	600	4	0
STA. 521+00 TO 530+00	4950	0	0	4	0	450	0	0	450	4	0
PROJECT TOTALS	**31528**	**504**	**72**	**28**	**4**	**3093**	**504**	**72**	**3093**	**28**	**4**

FM 1314 PAVEMENT MARKING QUANTITY SUMMARY

SHEET 1 OF 1

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		11

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SUMMARY OF SMALL SIGNS

LAYOUT SHEET NO.	SIGN NO.	SIGN TYPE	SIGN TEXT	SIGN DIMENSIONS (IN)	PLYWOOD SIGNS	ALUMINUM SIGNS TYPE A	644 - INS SM RD SN SUP & AM						636 - REPLACE EXISTING SIGNS	
							TYPE OF MOUNT						TYPE OF SIGNS	
							6001 10BWG (1) SA (P) EA	6033 TYSBO (1) SA (U) EA	6068 RELOC 10BWG EA	6070 RELOC TYSBO EA		6076 REMOVE SM RD SN SUP&AM EA	6001 (TY A) SF	6003 (TY D) SF
1 OF 11	1	R3-7R	RIGHT LANE MUST TURN RIGHT	30 X 30		X	X					X		
	2	R3-7R	RIGHT LANE MUST TURN RIGHT	30 X 30		X	X					X		
	3	M4-5B	TO	24 X 12		X		X				X		
		M1-1	45	24 X 24		X								
		M6-1LB	ARROW LEFT	21 X 15		X								
		M4-5	TO	24 X 12		X								
		M1-4	59	24 X 24		X								
		M6-1R	ARROW RIGHT	21 X 15		X								
	4	R3-7L	LEFT LANE MUST TURN RIGHT	30 X 30		X	X					X		
	5	R3-7L	LEFT LANE MUST TURN RIGHT	30 X 30		X	X					X		
	6	M3-3	SOUTH	24 X 12		X	X					X		
		M1-6F	FM 1314	24 X 24		X								
	7	R3-8	"DIRECTIONAL SIGN"	36 X 24		X			X					
2 OF 11	8	M4-6A	BEGIN	24 X 12		X	X							
		R3-9B	TWO-WAY LEFT TURN ONLY	24 X 36		X								
	9	M4-6	END	24 X 12		X	X							
		R3-9B	TWO-WAY LEFT TURN ONLY	24 X 36		X								
	10	R2-1	SPEED LIMIT (55)	24 X 30		X	X					X		
	11	R3-8	"DIRECTIONAL SIGN"	36 X 24		X			X					
3 OF 11	12	M2-1	JCT	24 X 12		X	X					X		
		M1-6T	242 TEXAS	24 X 24		X								
	13	D3-1G	STRAUSIE LN	18 X 6		X	X					X		
		R1-1	STOP	18 X 18		X								
	14	D3-1G	STRAUSIE LN	18 X 6		X	X					X		
		R1-1	STOP	18 X 18		X								
	15	D3-1G	ALLENDALE LN	18 X 6		X	X					X		
		R1-1	STOP	18 X 18		X								
	16	W14-1aR	DEAD END ARROW RIGHT	18 X 6		X	X					X		
		D3-1G	ALLENDALE LN	18 X 6		X								
		R1-1	STOP	18 X 18		X								
4 OF 11	17	W14-1aR	DEAD END ARROW RIGHT	18 X 6		X	X					X		
		D3-1G	GREENBOUGH	18 X 6		X								
		R1-1	STOP	18 X 18		X								
	18	D3-1G	GREENLEAF DR	18 X 6		X	X					X		
		R1-1	STOP	18 X 18		X								
	19	R2-1	SPEED LIMIT (55)	24 X 30		X	X					X		
6 OF 11	20		SCHOOL	-		X								
			SPEED LIMIT 35 WHEN FLASHING	-		X								
7 OF 11	21		ADOPT A HWY LITTER CONTROL	-		X				X				
	22		JIM STOWE RD	-		X			X					
			STOP	-		X								
	23		MEDIAN CURVE?	-		X			X					
	24		PINEWOOD VILLAGE DR	-		X			X					
			STOP	-		X								
8 OF 11	25		END SCHOOL ZONE	-		X			X					
			SPEED LIMIT (55)	-		X								
9 OF 11	26		FIRE TRUCK CROSSING	-		X			X					
	27		CALHOUN RD	-		X			X					
			STOP	-		X								
	28		INTERSECTION AHEAD	-		X			X					
			VILLAGE WOODS DR	-		X								
10 OF 11	29		DEAD END --->	-		X			X					
			FM 1314	-		X								
			VILLAGE WOODS DR	-		X								
			STOP	-		X								
11 OF 11	30		SPEED LIMIT (55)	-		X			X					
			SUBTOTAL				16	1	11	1		15		

ALL SIGNS SHALL BE ERECTED ACCORDING TO THE LOCATION SHOWN ON THE LAYOUT SHEETS EXCEPT THAT THE ENGINEER MAY SHIFT A SIGN IN ORDER TO SECURE A MORE DESIRABLE LOCATION. THE CONTRACTOR WILL STAKE ALL SIGN LOCATIONS, AND NO CHANGES IN THOSE LOCATIONS SHALL BE MADE WITHOUT PRIOR APPROVAL OF THE ENGINEER.

ALUMINUM SIGN BLANKSITY A)

Min. Thickness

0.080"
0.100"
0.125"

SUMMARY OF SMALL SIGNS

DISTRICT	COUNTY	CONTROL	SECTION	JOB	SHEET NO.
HOU	MONTGOMERY	1986	01	064FM1314	12

SHEET 1 OF 1

STD-N29

CSJ 1986-01-064	162 6002	166 6001	168 6001	506 6001	506 6011	506 6020	506 6024	506 6038	506 6039
	BLOCK SODDING	FERTILIZER	VEGETATIVE WATERING	ROCK FILTER DAMS (INSTALL) (TY 1)	ROCK FILTER DAMS (REMOVE)	CONSTRUCTION EXITS (INSTALL) (TY 1)	CONSTRUCTION EXITS (REMOVE)	TEMP SEDMT CONT FENCE (INSTALL)	TEMP SEDMT CONT FENCE (REMOVE)
	SY	AC	MG	LF	LF	SY	SY	LF	LF
SHEET 1 OF 10	2,821	0.58	70	0	0	111	111	446	446
SHEET 2 OF 10	8,031	1.66	199	80	80	0	0	420	420
SHEET 3 OF 10	6,816	1.41	169	0	0	0	0	609	609
SHEET 4 OF 10	6,942	1.43	172	124	124	0	0	1,444	1,444
SHEET 5 OF 10	7,499	1.55	186	0	0	0	0	1,298	1,298
SHEET 6 OF 10	9,485	1.96	235	0	0	0	0	1,796	1,796
SHEET 7 OF 10	6,340	1.52	182	0	0	0	0	545	545
SHEET 8 OF 10	7,525	1.55	186	0	0	0	0	933	933
SHEET 9 OF 10	7,644	1.58	190	0	0	0	0	139	139
SHEET 10 OF 10	10,094	2.09	250	0	0	111	111	265	265
PROJECT TOTALS	**73,197**	**15.33**	**1,839**	**204**	**204**	**222**	**222**	**7,895**	**7,895**

NOTE: ITEM 506-6020 CONSTRUCTION EXITS (INSTALL)(TY 1) LOCATIONS TO BE DETERMINED BY THE ENGINEER.

FM 1314
SW3P
QUANTITY
SUMMARY

SHEET 1 OF 1

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		13

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DW:
CK:

TRAFFIC CONTROL PLAN NOTES AND OBJECTIVES

1. MINIMIZE IMPACT TO FM 1314 TRAFFIC.
2. MAINTAIN ALL MOVEMENTS OR PROVIDE SHORT TERM DETOURS IN ALL PHASES. MUST BE APPROVED BY THE ENGINEER.
3. ENSURE ACCESS TO ADJACENT PROPERTY.
4. SET UP TRAFFIC CONTROL FOR ALL PHASES PER TRAFFIC CONTROL STANDARD SHEETS AND/OR TEXAS MUTCD AND/OR AS DIRECTED BY THE ENGINEER.
5. CONTRACTOR SHALL BEGIN PLACING STORM SEWER AT 585+00.00 AND PROGRESS TOWARDS THE NORTH.
6. CONTRACTOR IS RESTRICTED FROM WORKING IN ANY AREAS WHERE UTILITY CONFLICTS HAVE NOT BEEN RESOLVED.
7. SCHEDULE ANY WORK NEAR SAN JACINTO ELEMENTARY SCHOOL (WITHIN THE SCHOOL ZONE) SO THAT THERE IS NO IMPACT TO SCHOOL ACTIVITIES.

PHASE 1 - PLACE SILT FENCE, INSTALL PUMP STATION, INSTALL TRUNK LINE & STORM SEWER, REMOVE RAISED MEDIAN AT SH 242.
PHASE 2 - CONSTRUCT FAST TRACK PAVEMENT AND TEMPORARY PAVEMENT NEAR BEGINNING OF PROJECT AT SH 242.
PHASE 3 - CONSTRUCT FM 1314 SOUTHBOUND LANES.
PHASE 4 - CONSTRUCT FM 1314 NORTHBOUND LANES
PHASE 5 - REMOVE TEMPORARY PAVEMENT, PLACE FINAL PAVEMENT MARKINGS, CONSTRUCT RAISED MEDIAN AT SH 242 INTERSECTION, PLACE DRAINAGE RIP RAP, PLACE SIDEWALK AND SHARED USE PATH, PLACE BLOCK SOD, PLACE SIGNS, AND FINAL CLEANUP.

PHASE 1 STEP 1
PREPARE RIGHT OF WAY
PLACE SILT FENCE AND ROCK FILTER DAMS ALONG DITCH THROUGHOUT PROJECT.
INSTALL PUMP STATION AT SH 242.
PLACE CONSTRUCTION EXITS.

PHASE 1 STEP 2
REMOVE AND REPLACE EXISTING RETAINING WALL AT ARTAVIA CHANNEL OUTFALL.
PLACE 4'X4' REINFORCED CONCRETE BOX.
REMOVE AND REPLACE EXISTING SET'S AT ARTAVIA CHANNEL OUTFALL.
REMOVE TRUNK LINE DRAINAGE STRUCTURES ALONG SOUTHBOUND SIDE FROM STA. 525+00 TO STA. 584+00.
INSTALL STORM SEWER TRUNKLINE ALONG SOUTHBOUND SIDE FROM STA. 525+00 TO STA. 584+00.
INSTALL INLETS FOR TRUNK LINE ALONG SOUTHBOUND SIDE FROM STA. 525+00 TO STA. 584+00.
INSTALL STORM SEWER ALONG NORTHBOUND SIDE AND LATERAL AT SAN JACINTO ELEMENTARY FROM STA. 528+80 TO STA. 550+00 (LATERAL LOCATION).
REMOVE AND REPLACE DRIVEWAYS AND INTERSECTIONS ALONG NORTHBOUND AND SOUTHBOUND SIDES FROM STA. 525+00 TO STA. 584+00.
*UTILIZE CUT AND RESTORE ASPHALT PAVEMENT WHEN CONSTRUCTING TRUNK LINE AND STORM SEWERS ACROSS DRIVEWAYS AND INTERSECTIONS TO MAINTAIN ACCESS

PHASE 1 STEP 3
REMOVE DRAINAGE STRUCTURES FOR SOUTHBOUND SIDE FROM STA. 473+07.66 TO STA. 525+00.
INSTALL STORM SEWER FOR SOUTHBOUND SIDE FROM STA. 473+07.66 TO STA. 525+24.00
PLACE INLETS FOR SOUTHBOUND SIDE FROM STA. 473+07.66 TO STA. 525+24.00.
REMOVE RAISED MEDIAN AT SH 242.
*UTILIZE CUT AND RESTORE ASPHALT PAVEMENT WHEN CONSTRUCTING TRUNK LINE AND STORM SEWERS ACROSS DRIVEWAYS AND INTERSECTIONS TO MAINTAIN ACCESS

PHASE 2 STEP 1
REMOVE CURB ON SOUTHBOUND SIDE AS NEEDED AT BEGINNING OF PROJECT NEAR SH 242 FROM STA. 470+00 TO STA. 489+04.67
REMOVE EXISTING ASPHALT PAVEMENT AS NEEDED ALONG SOUTHBOUND SIDE OF BEGINNING OF PROJECT NEAR SH 242 FROM STA. 470+00 TO STA. 489+04.67
PLACE FAST TRACK PAVEMENT ALONG SOUTHBOUND SIDE OF BEGINNING OF PROJECT NEAR SH 242 FROM STA. 470+00 TO STA. 489+04.67
PLACE TEMPORARY PAVEMENT ON SOUTHBOUND SIDE OF BEGINNING OF PROJECT NEAR SH 242 FROM STA. 470+00 TO STA. 475+26.00

PHASE 2 STEP 2
REMOVE CURB ON NORTHBOUND SIDE AS NEEDED OF BEGINNING OF PROJECT NEAR SH 242 FROM STA. 470+00 TO STA. 489+04.67
REMOVE EXISTING ASPHALT PAVEMENT AS NEEDED ALONG NORTHBOUND SIDE OF BEGINNING OF PROJECT NEAR SH 242 FROM STA. 470+00 TO STA. 473+08.00
PLACE FAST TRACK PAVEMENT ALONG NORTHBOUND SIDE OF BEGINNING OF PROJECT NEAR SH 242 FROM STA. 470+00 TO STA. 473+08.00
PLACE TEMPORARY PAVEMENT ON NORTHBOUND SIDE OF BEGINNING OF PROJECT NEAR SH 242 FROM STA. 471+36.00 TO STA. 489+04.67
CONSTRUCT FAST TRACK DRIVEWAY AT STA. 471+00 ON NORTHBOUND SIDE

PHASE 2 STEP 3
REMOVE REMAINING EXISTING ASPHALT PAVEMENT FROM STATION 470+00.00 TO STA. 473+08.00.
PLACE FAST TRACK PAVEMENT IN REMAINING MIDDLE AREA BETWEEN STA. 470+00.00 TO STA. 473+08.00
REMOVE CURB ON NORTHBOUND SIDE FROM STA. 507+91.00 TO STA. 528+49.97
PLACE TEMPORARY PAVEMENT ON NORTHBOUND SIDE FROM STA. 507+91.00 TO STA. 528+49.97

PHASE 3
PLACE LOW PROFILE CONCRETE BARRIER ALONG SOUTHBOUND SIDE FROM STA. 473+08.00 TO STA. 525+24.00
EXCAVATE AND EMBANK ALONG SOUTHBOUND SIDE AS NEEDED FROM STA. 473+08.00 TO STA. STA. 525+24.00
REMOVE CURB ALONG SOUTHBOUND SIDE FROM STA. 473+08.00 TO STA. 525+24.00
REMOVE EXISTING ASPHALT PAVEMENT ALONG SOUTHBOUND SIDE FROM STA. 473+08.00 TO STA. 525+24.00
CONSTRUCT FAST TRACK DRIVEWAYS ALONG SOUTHBOUND ROADWAY FROM STA. 477+30.69 TO STA. 525+04.00
PLACE CEMENT/LIME TREATED SUBGRADE, CEMENT TREATED BASE, ASPHALT BONDBREAKER, AND CONCRETE PAVEMENT ALONG SOUTHBOUND ROADWAY FROM STA. 473+08.00 TO STA. 525+24.00
PLACE TEMPORARY PAVEMENT ALONG SOUTHBOUND SIDE FROM STA. 475+25.98 TO STA. 527+11.67

PHASE 4
REMOVE TEMPORARY PAVEMENT ALONG NORTHBOUND SIDE FROM STA. 471+36.00 TO STA. 489+04.67 AND STA. 507+91.00 TO STA. 528+49.97
PLACE LOW PROFILE CONCRETE BARRIER ALONG NORTHBOUND SIDE FROM 473+08.00 TO STA. 525+24.00
EXCAVATE AND EMBANK ALONG NORTHBOUND SIDE AS NEEDED FROM STA. 473+08.00 TO STA. STA. 525+24.00
REMOVE CURB ALONG NORTHBOUND SIDE FROM STA. 489+04.67 TO STA. 507+91.00
REMOVE EXISTING ASPHALT PAVEMENT ALONG NORTHBOUND SIDE FROM STA. 473+07.66 TO STA. 525+24.00
REMOVE DRAINAGE STRUCTURES FOR NORTHBOUND SIDE FROM STA. 473+07.66 TO STA. 525+24.00
INSTALL STORM SEWER FOR NORTHBOUND SIDE FROM STA. 473+07.66 TO STA. 525+24.00
PLACE INLETS FOR NORTHBOUND SIDE FROM STA. 473+07.66 TO STA. 525+24.00
CONSTRUCT FAST TRACK DRIVEWAYS ALONG NORTHBOUND ROADWAY FROM STA. 485+10.71 TO STA. 522+26.55
PLACE CEMENT/LIME TREATED SUBGRADE, CEMENT TREATED BASE, ASPHALT BONDBREAKER, AND CONCRETE PAVEMENT ALONG NORTHBOUND ROADWAY FROM STA. 473+08.00 TO STA. 525+24.00

PHASE 5
REMOVE REMAINING TEMPORARY PAVEMENT ALONG SOUTHBOUND ROAD
PLACE FINAL PAVEMENT MARKINGS
CONSTRUCT PROPOSED RAISED MEDIAN AND CONCRETE CURB AROUND RAISED MEDIAN. PAINT CURB WITH YELLOW PAINT.
PLACE 5 INCH RIP RAP FOR DRAINAGE. (SEE DRAINAGE SHEETS FOR AREAS)
PLACE SIDEWALK AND SHARED USE PATHS ALONG PROJECT.
PLACE BLOCK SOD ALONG DITCH AREAS SHOWN ON SW3P SHEETS AND WATER EACH SECTION FOR 20 DAYS.
PLACE SIGNS.
FINAL CLEANUP

NOTE:
24" TEMPORARY CMP WILL BE PLACED UNDER DRIVEWAYS TO ENSURE POSITIVE DRAINAGE.
THIS IS SUBSIDIARY TO THE VARIOUS BID ITEMS.

INLETS PLACED IN PHASE 1 WILL BE COVERED WITH A STEEL PLATE SO THAT
THE CONSTRUCTION DETOUR DOES NOT INTERFERE HARM ANY DRAINAGE STRUCTURES.
THIS IS SUBSIDIARY TO ITEM 512 CONSTRUCTION DETOURS.

STATE OF TEXAS
MICAH J. SCHLUTER
136908
LICENSED
PROFESSIONAL ENGINEER

Micah J. Schluter, P.E.
04.02.24

FM 1314 CONSTRUCTION NARRATIVE

SHEET 1 OF 1

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		14

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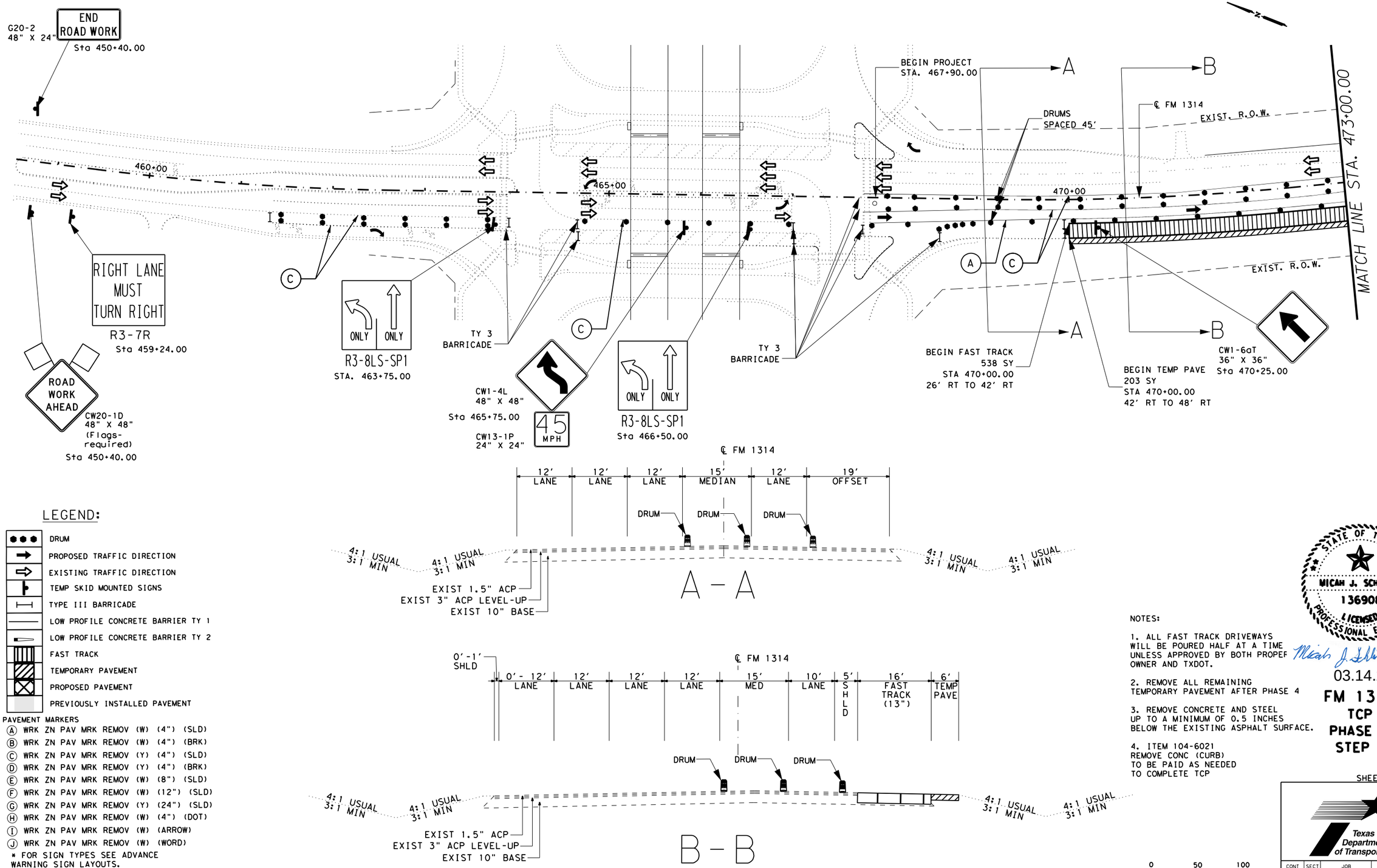

LEGEND:

- DRUM
- PROPOSED TRAFFIC DIRECTION
- EXISTING TRAFFIC DIRECTION
- TEMP SKID MOUNTED SIGNS
- TYPE III BARRICADE
- LOW PROFILE CONCRETE BARRIER TY 1
- LOW PROFILE CONCRETE BARRIER TY 2
- FAST TRACK
- TEMPORARY PAVEMENT
- PROPOSED PAVEMENT
- PREVIOUSLY INSTALLED PAVEMENT

PAVEMENT MARKERS

- (A) WRK ZN PAV MRK REMOV (W) (4") (SLD)
- (B) WRK ZN PAV MRK REMOV (W) (4") (BRK)
- (C) WRK ZN PAV MRK REMOV (Y) (4") (SLD)
- (D) WRK ZN PAV MRK REMOV (Y) (4") (BRK)
- (E) WRK ZN PAV MRK REMOV (W) (8") (SLD)
- (F) WRK ZN PAV MRK REMOV (W) (12") (SLD)
- (G) WRK ZN PAV MRK REMOV (Y) (24") (SLD)
- (H) WRK ZN PAV MRK REMOV (W) (4") (DOT)
- (I) WRK ZN PAV MRK REMOV (W) (ARROW)
- (J) WRK ZN PAV MRK REMOV (W) (WORD)

* FOR SIGN TYPES SEE ADVANCE WARNING SIGN LAYOUTS.

NOTES:

1. ALL FAST TRACK DRIVEWAYS WILL BE POURED HALF AT A TIME UNLESS APPROVED BY BOTH PROPEF OWNER AND TXDOT.

2. REMOVE ALL REMAINING TEMPORARY PAVEMENT AFTER PHASE 4

3. REMOVE CONCRETE AND STEEL UP TO A MINIMUM OF 0.5 INCHES BELOW THE EXISTING ASPHALT SURFACE.

4. ITEM 104-6021 REMOVE CONC (CURB) TO BE PAID AS NEEDED TO COMPLETE TCP

STATE OF TEXAS
MICAH J. SCHLUTER
136908
LICENSED
PROFESSIONAL ENGINEER

Micah J. Schluter, P.E.
03.14.24

FM 1314
TCP
PHASE 2
STEP 1

SHEET 1 OF 2

0 50 100
SCALE IN FEET

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		15

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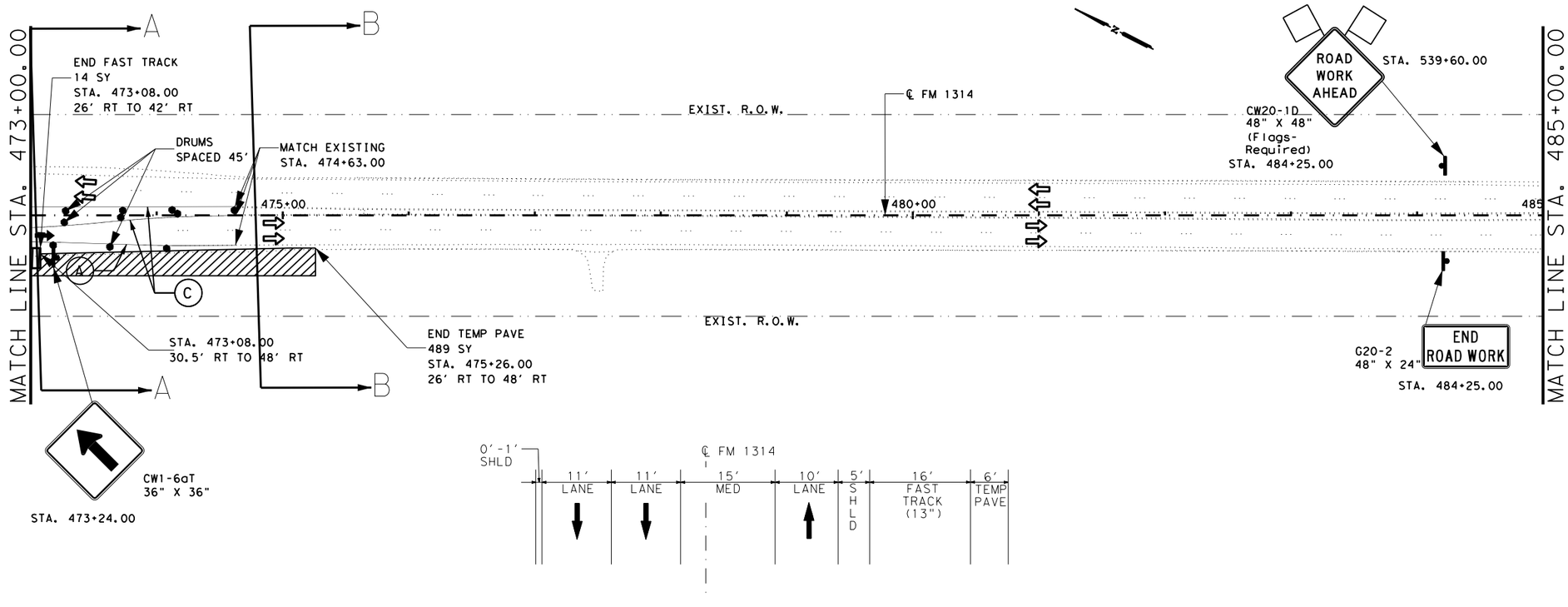

LEGEND:

- DRUM
- PROPOSED TRAFFIC DIRECTION
- EXISTING TRAFFIC DIRECTION
- TEMP SKID MOUNTED SIGNS
- TYPE III BARRICADE
- LOW PROFILE CONCRETE BARRIER TY 1
- LOW PROFILE CONCRETE BARRIER TY 2
- FAST TRACK
- TEMPORARY PAVEMENT
- PROPOSED PAVEMENT
- PREVIOUSLY INSTALLED PAVEMENT

PAVEMENT MARKERS

- (A) WRK ZN PAV MRK REMOV (W) (4") (SLD)
- (B) WRK ZN PAV MRK REMOV (W) (4") (BRK)
- (C) WRK ZN PAV MRK REMOV (Y) (4") (SLD)
- (D) WRK ZN PAV MRK REMOV (Y) (4") (BRK)
- (E) WRK ZN PAV MRK REMOV (W) (8") (SLD)
- (F) WRK ZN PAV MRK REMOV (W) (12") (SLD)
- (G) WRK ZN PAV MRK REMOV (Y) (24") (SLD)
- (H) WRK ZN PAV MRK REMOV (W) (4") (DOT)
- (I) WRK ZN PAV MRK REMOV (W) (ARROW)
- (J) WRK ZN PAV MRK REMOV (W) (WORD)

* FOR SIGN TYPES SEE ADVANCE WARNING SIGN LAYOUTS.

NOTES:

1. ALL FAST TRACK DRIVEWAYS WILL BE POURED HALF AT A TIME UNLESS APPROVED BY BOTH PROPEF OWNER AND TXDOT.
2. REMOVE ALL REMAINING TEMPORARY PAVEMENT AFTER PHASE 4
3. REMOVE CONCRETE AND STEEL UP TO A MINIMUM OF 0.5 INCHES BELOW THE EXISTING ASPHALT SURFACE.
4. ITEM 104-6021 REMOVE CONC (CURB) TO BE PAID AS NEEDED TO COMPLETE TCP

STATE OF TEXAS
MICAH J. SCHLUTER
136908
LICENSED
PROFESSIONAL ENGINEER

Micah J. Schluter, P.E.
03.14.24

FM 1314
TCP
PHASE 2
STEP 1

SHEET 2 OF 2

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		16

0 50 100
SCALE IN FEET

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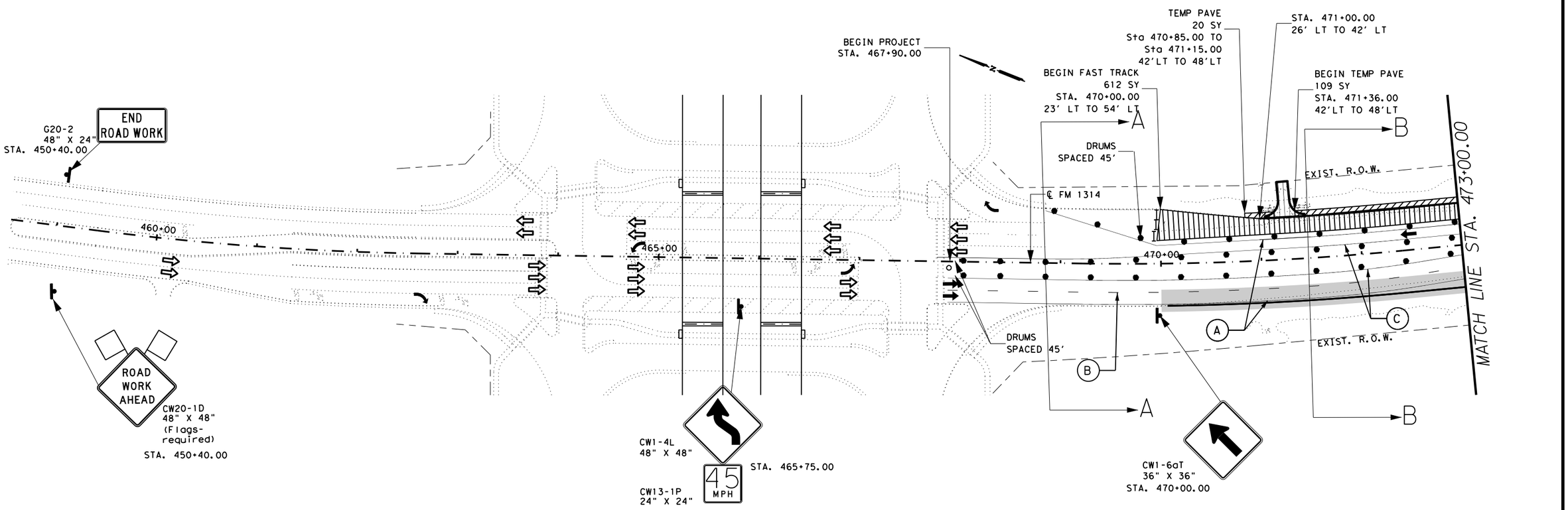

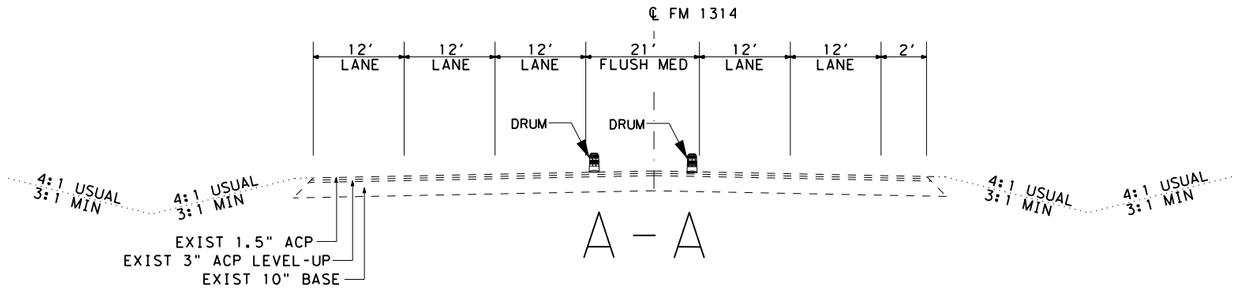

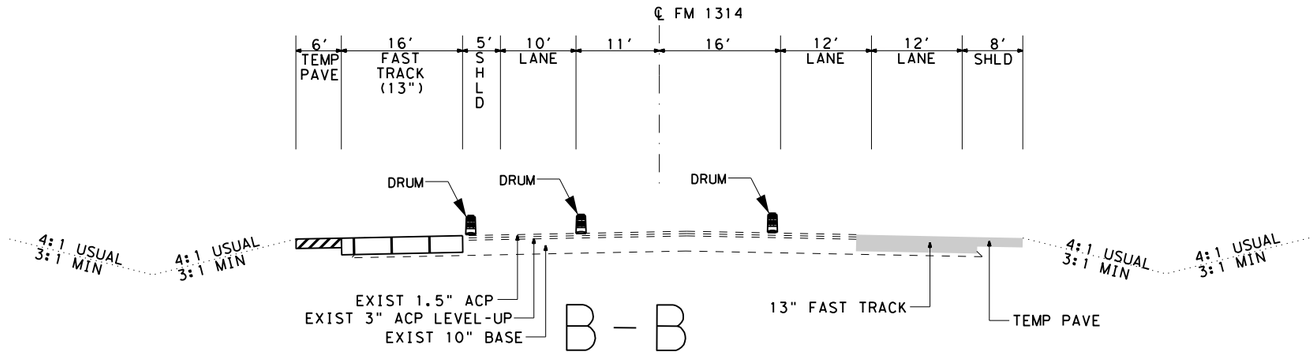

LEGEND:

- DRUM
- PROPOSED TRAFFIC DIRECTION
- EXISTING TRAFFIC DIRECTION
- TEMP SKID MOUNTED SIGNS
- TYPE III BARRICADE
- LOW PROFILE CONCRETE BARRIER TY 1
- LOW PROFILE CONCRETE BARRIER TY 2
- FAST TRACK
- TEMPORARY PAVEMENT
- PROPOSED PAVEMENT
- PREVIOUSLY INSTALLED PAVEMENT

PAVEMENT MARKERS

- (A) WRK ZN PAV MRK REMOV (W) (4") (SLD)
- (B) WRK ZN PAV MRK REMOV (W) (4") (BRK)
- (C) WRK ZN PAV MRK REMOV (Y) (4") (SLD)
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- (F) WRK ZN PAV MRK REMOV (W) (12") (SLD)
- (G) WRK ZN PAV MRK REMOV (Y) (24") (SLD)
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STATE OF TEXAS
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Micah J. Schluter, P.E.
03.14.24

FM 1314
TCP
PHASE 2
STEP 2

SCALE IN FEET: 0 50 100

SHEET 1 OF 3

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		17

DATE: 02/07/2024 08:01 AM
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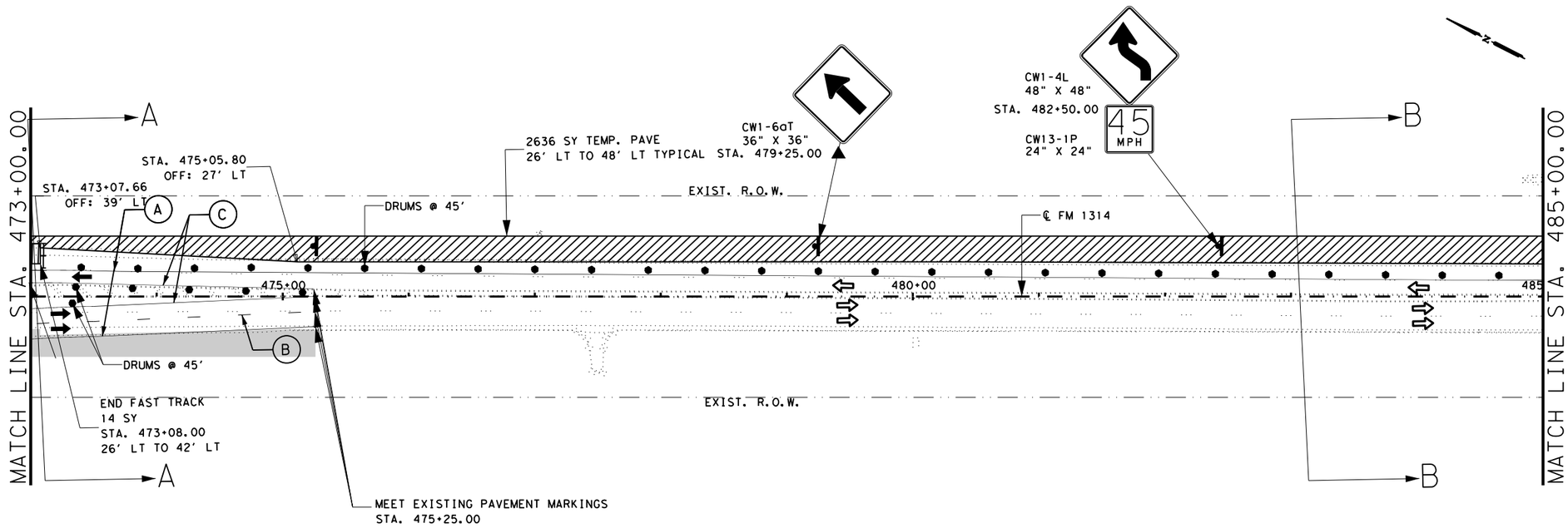

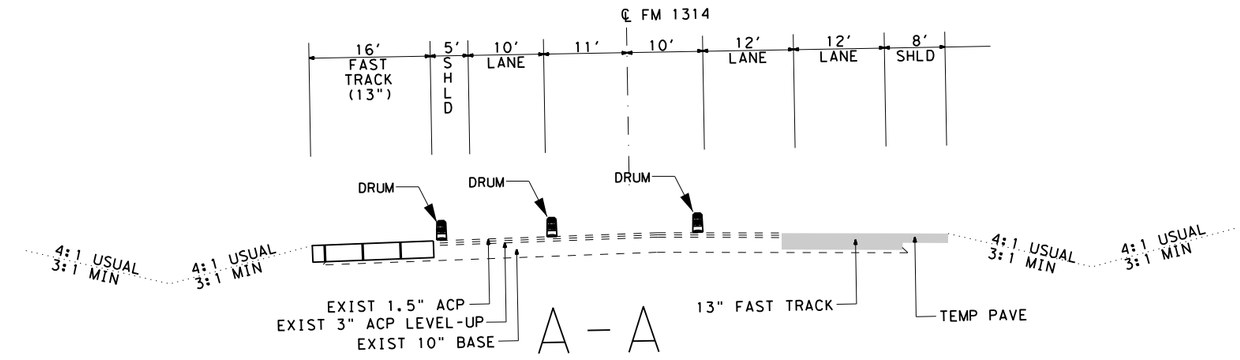

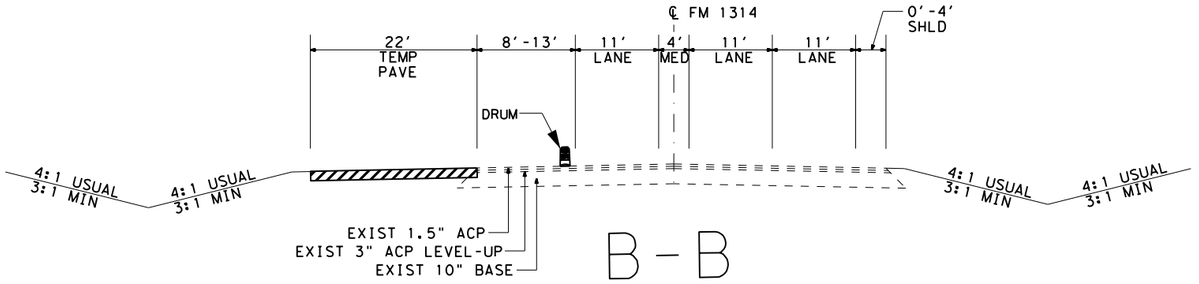

LEGEND:

- DRUM
- PROPOSED TRAFFIC DIRECTION
- EXISTING TRAFFIC DIRECTION
- TEMP SKID MOUNTED SIGNS
- TYPE III BARRICADE
- LOW PROFILE CONCRETE BARRIER TY 1
- LOW PROFILE CONCRETE BARRIER TY 2
- FAST TRACK
- TEMPORARY PAVEMENT
- PROPOSED PAVEMENT
- PREVIOUSLY INSTALLED PAVEMENT

PAVEMENT MARKERS

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- (E) WRK ZN PAV MRK REMOV (W) (8") (SLD)
- (F) WRK ZN PAV MRK REMOV (W) (12") (SLD)
- (G) WRK ZN PAV MRK REMOV (Y) (24") (SLD)
- (H) WRK ZN PAV MRK REMOV (W) (4") (DOT)
- (I) WRK ZN PAV MRK REMOV (W) (ARROW)
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FM 1314
TCP
PHASE 2
STEP 2

SHEET 2 OF 3

0 50 100
SCALE IN FEET

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		18

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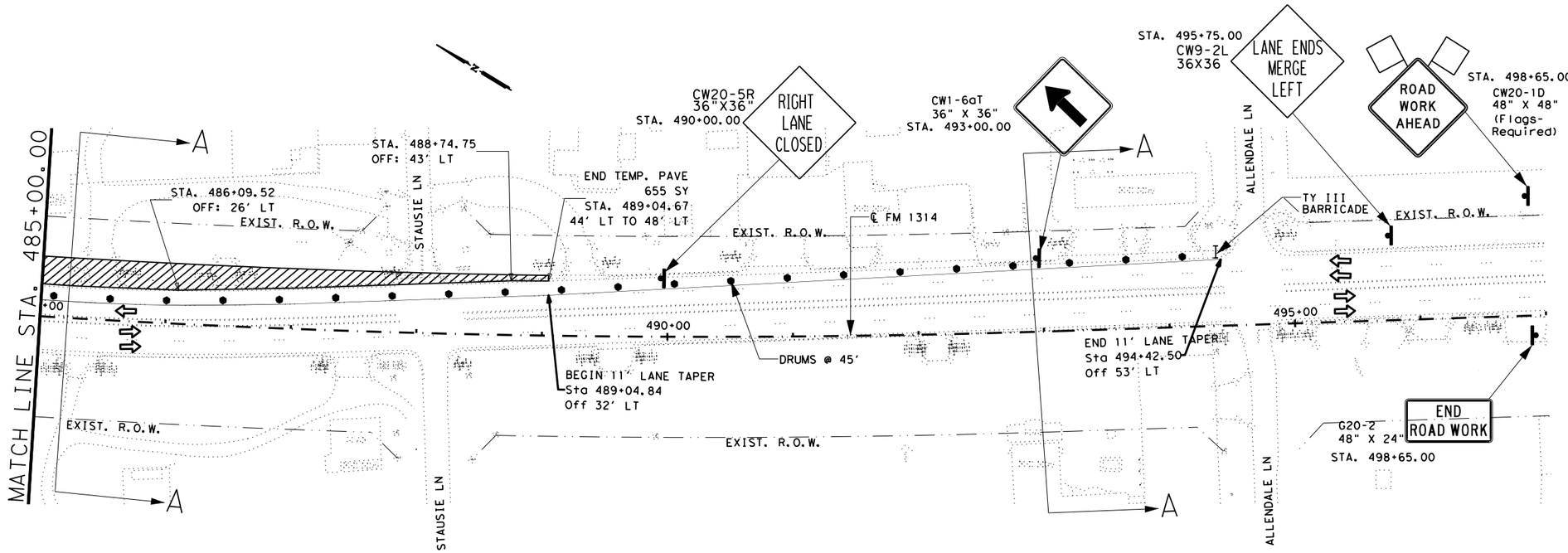

LEGEND:

- DRUM
- PROPOSED TRAFFIC DIRECTION
- EXISTING TRAFFIC DIRECTION
- TEMP SKID MOUNTED SIGNS
- TYPE III BARRICADE
- LOW PROFILE CONCRETE BARRIER TY 1
- LOW PROFILE CONCRETE BARRIER TY 2
- FAST TRACK
- TEMPORARY PAVEMENT
- PROPOSED PAVEMENT
- PREVIOUSLY INSTALLED PAVEMENT

PAVEMENT MARKERS

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- (J) WRK ZN PAV MRK REMOV (W) (WORD)

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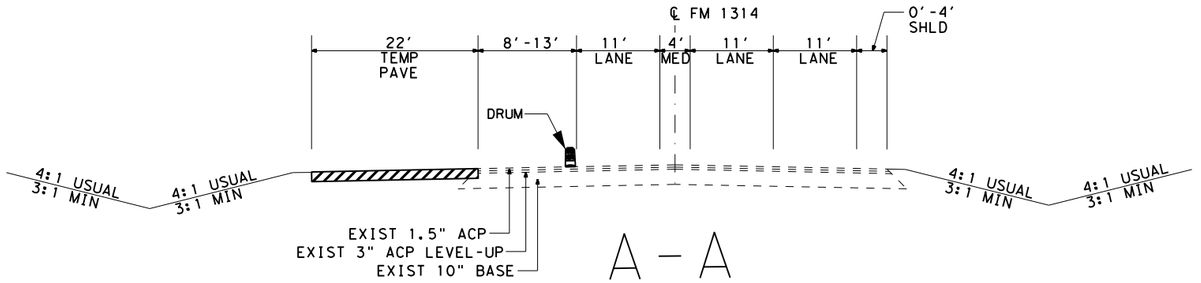

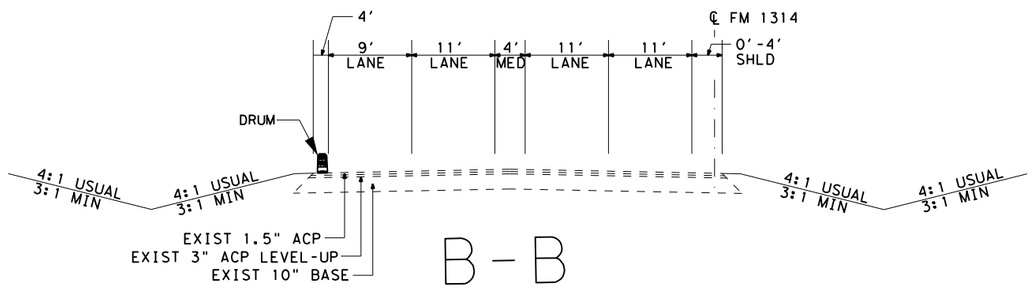

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FM 1314
TCP
PHASE 2
STEP 2

SCALE IN FEET: 0 50 100

SHEET 3 OF 3

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		19

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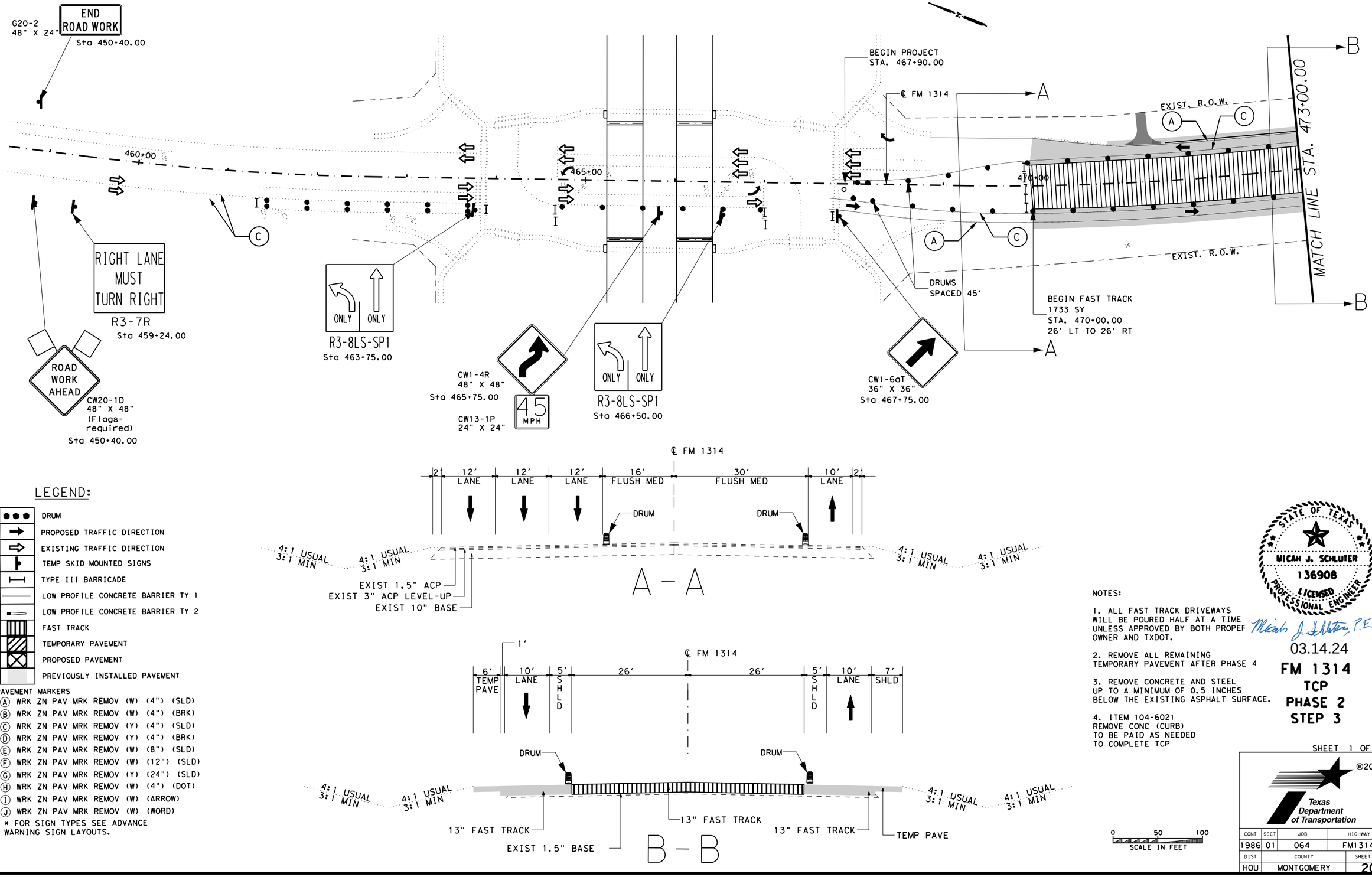

LEGEND:

- DRUM
- PROPOSED TRAFFIC DIRECTION
- EXISTING TRAFFIC DIRECTION
- TEMP SKID MOUNTED SIGNS
- TYPE III BARRICADE
- LOW PROFILE CONCRETE BARRIER TY 1
- LOW PROFILE CONCRETE BARRIER TY 2
- FAST TRACK
- TEMPORARY PAVEMENT
- PROPOSED PAVEMENT
- PREVIOUSLY INSTALLED PAVEMENT

PAVEMENT MARKERS

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- (D) WRK ZN PAV MRK REMOV (Y) (4") (BRK)
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- (J) WRK ZN PAV MRK REMOV (W) (WORD)

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NOTES:

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STATE OF TEXAS
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Micah J. Schluter, P.E.
03.14.24

FM 1314
TCP
PHASE 2
STEP 3

SHEET 1 OF 6

Texas Department of Transportation

0 50 100
SCALE IN FEET

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		20

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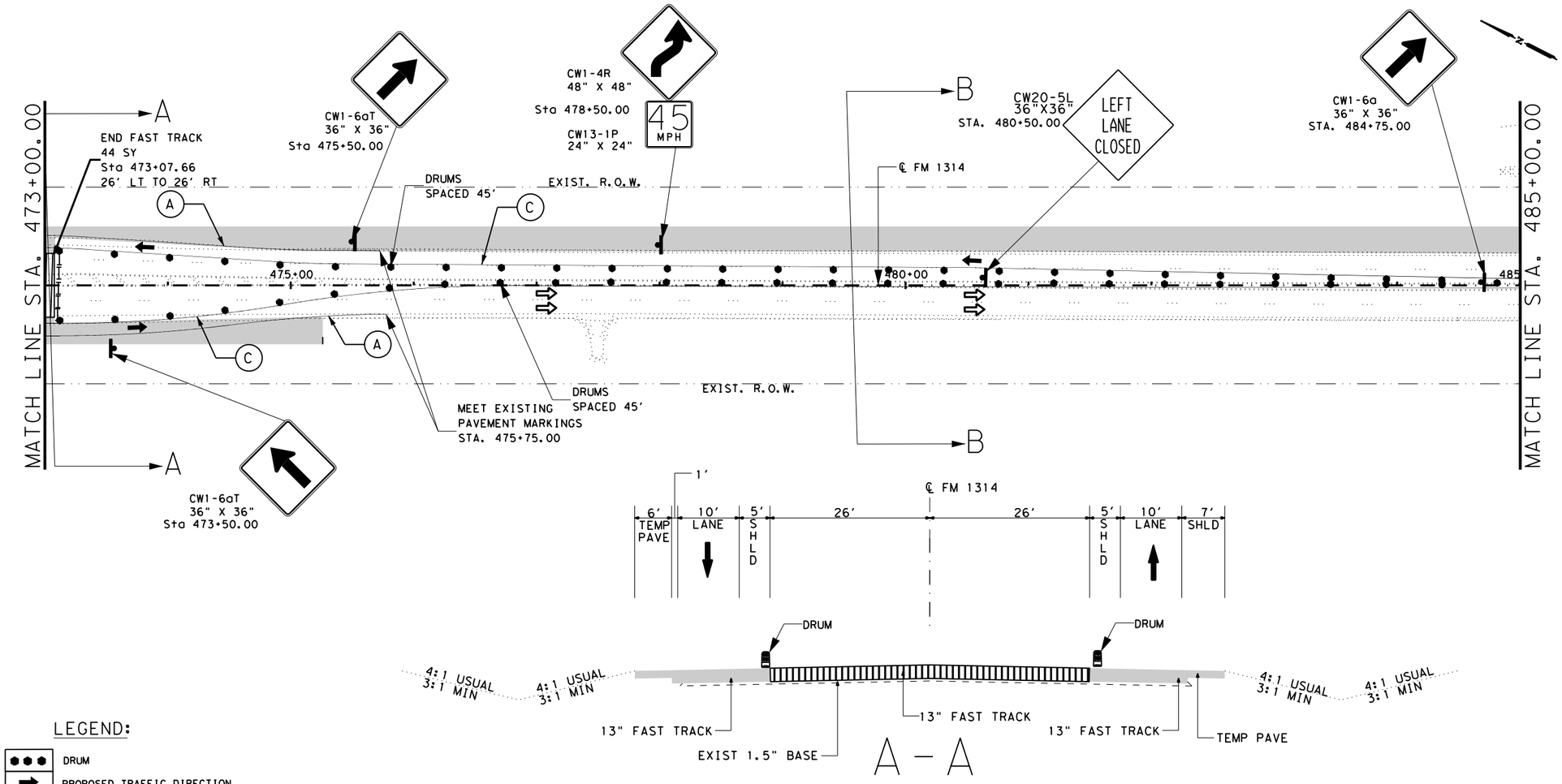
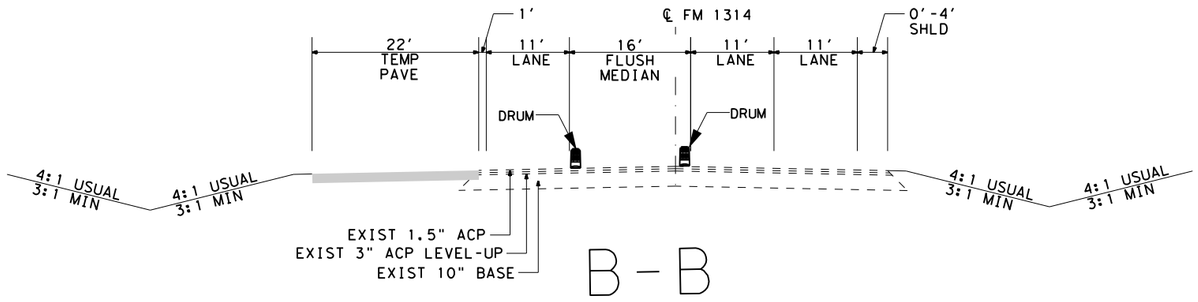


A – A



B – B

LEGEND:

- DRUM
- PROPOSED TRAFFIC DIRECTION
- EXISTING TRAFFIC DIRECTION
- TEMP SKID MOUNTED SIGNS
- TYPE III BARRICADE
- LOW PROFILE CONCRETE BARRIER TY 1
- LOW PROFILE CONCRETE BARRIER TY 2
- FAST TRACK
- TEMPORARY PAVEMENT
- PROPOSED PAVEMENT
- PREVIOUSLY INSTALLED PAVEMENT

PAVEMENT MARKERS

- (A) WRK ZN PAV MRK REMOV (W) (4") (SLD)
- (B) WRK ZN PAV MRK REMOV (W) (4") (BRK)
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- (G) WRK ZN PAV MRK REMOV (Y) (24") (SLD)
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* FOR SIGN TYPES SEE ADVANCE WARNING SIGN LAYOUTS.

NOTES:

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STATE OF TEXAS
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03.14.24

FM 1314
TCP
PHASE 2
STEP 3

SHEET 2 OF 6

0 50 100
SCALE IN FEET

®2024
Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		21

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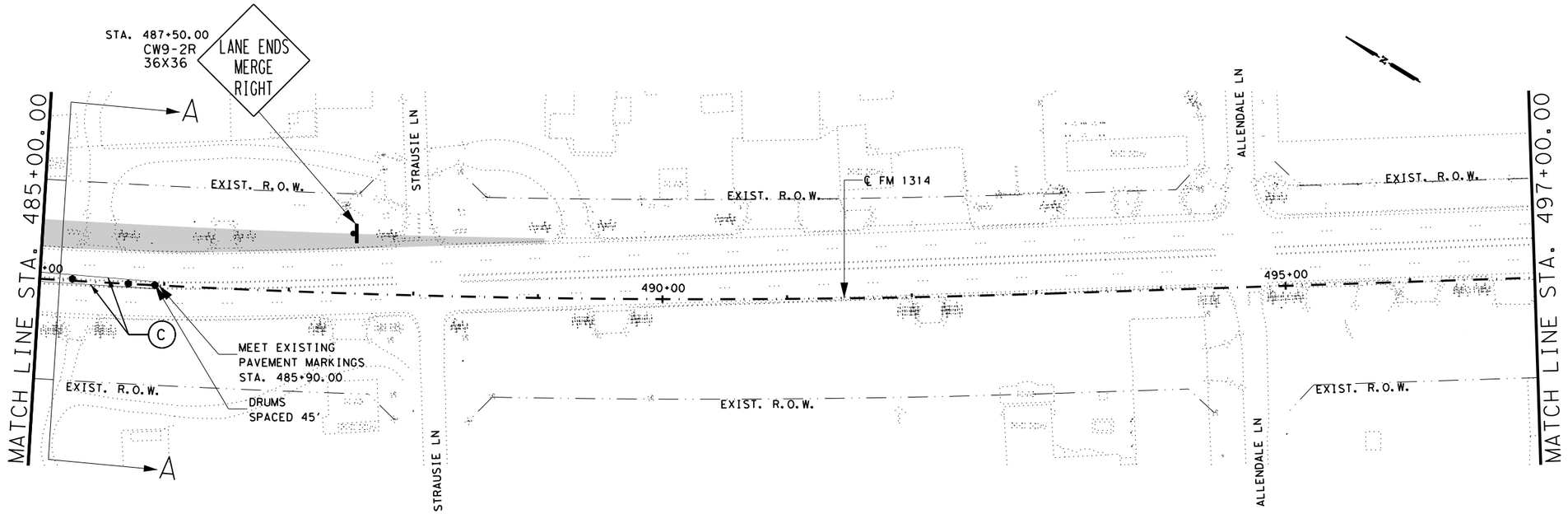

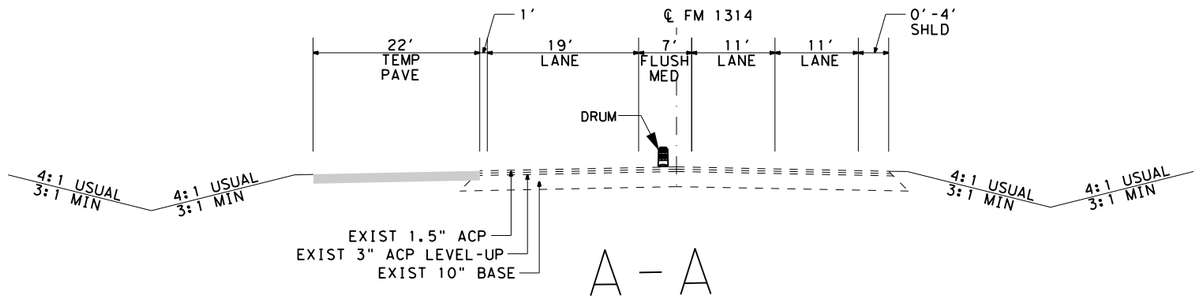

LEGEND:

- DRUM
- PROPOSED TRAFFIC DIRECTION
- EXISTING TRAFFIC DIRECTION
- TEMP SKID MOUNTED SIGNS
- TYPE III BARRICADE
- LOW PROFILE CONCRETE BARRIER TY 1
- LOW PROFILE CONCRETE BARRIER TY 2
- FAST TRACK
- TEMPORARY PAVEMENT
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PAVEMENT MARKERS

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03.14.24

FM 1314
TCP
PHASE 2
STEP 3

SHEET 3 OF 6

0 50 100
SCALE IN FEET

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		22

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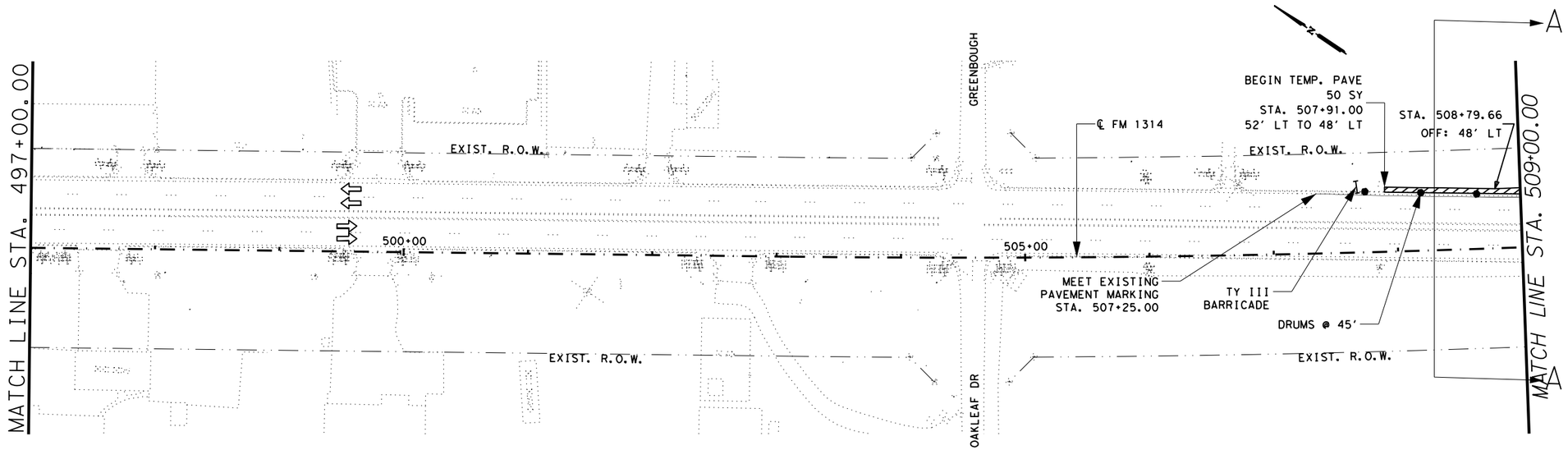

LEGEND:

- DRUM
- PROPOSED TRAFFIC DIRECTION
- EXISTING TRAFFIC DIRECTION
- TEMP SKID MOUNTED SIGNS
- TYPE III BARRICADE
- LOW PROFILE CONCRETE BARRIER TY 1
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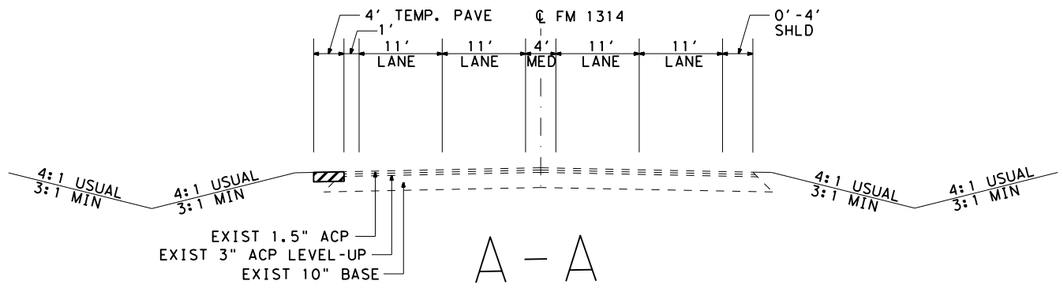

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136908
LICENSED
PROFESSIONAL ENGINEER

Micah J. Schluter P.E.
03.14.24

FM 1314
TCP
PHASE 2
STEP 3

SHEET 4 OF 6

0 50 100
SCALE IN FEET

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		23

DATE: 02/08/2024 09:07 PM
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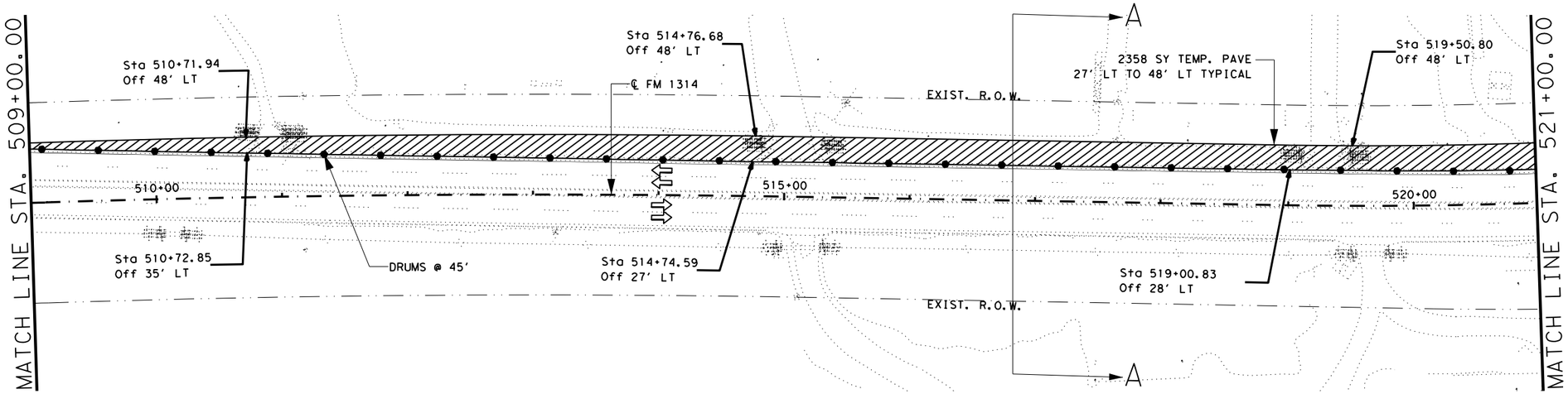


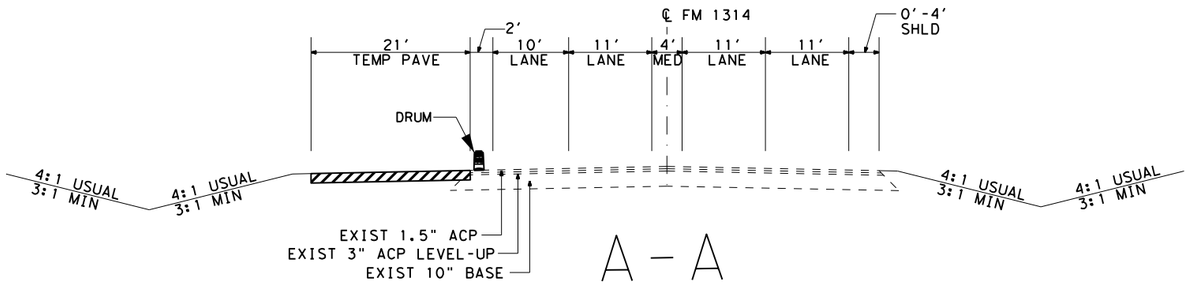
LEGEND:

- DRUM
- PROPOSED TRAFFIC DIRECTION
- EXISTING TRAFFIC DIRECTION
- TEMP SKID MOUNTED SIGNS
- TYPE III BARRICADE
- LOW PROFILE CONCRETE BARRIER TY 1
- LOW PROFILE CONCRETE BARRIER TY 2
- FAST TRACK
- TEMPORARY PAVEMENT
- PROPOSED PAVEMENT
- PREVIOUSLY INSTALLED PAVEMENT

PAVEMENT MARKERS

- (A) WRK ZN PAV MRK REMOV (W) (4") (SLD)
- (B) WRK ZN PAV MRK REMOV (W) (4") (BRK)
- (C) WRK ZN PAV MRK REMOV (Y) (4") (SLD)
- (D) WRK ZN PAV MRK REMOV (Y) (4") (BRK)
- (E) WRK ZN PAV MRK REMOV (W) (8") (SLD)
- (F) WRK ZN PAV MRK REMOV (W) (12") (SLD)
- (G) WRK ZN PAV MRK REMOV (Y) (24") (SLD)
- (H) WRK ZN PAV MRK REMOV (W) (4") (DOT)
- (I) WRK ZN PAV MRK REMOV (W) (ARROW)
- (J) WRK ZN PAV MRK REMOV (W) (WORD)

* FOR SIGN TYPES SEE ADVANCE WARNING SIGN LAYOUTS.



NOTES:

1. ALL FAST TRACK DRIVEWAYS WILL BE POURED HALF AT A TIME UNLESS APPROVED BY BOTH PROPEF OWNER AND TXDOT.

2. REMOVE ALL REMAINING TEMPORARY PAVEMENT AFTER PHASE 4

3. REMOVE CONCRETE AND STEEL UP TO A MINIMUM OF 0.5 INCHES BELOW THE EXISTING ASPHALT SURFACE.

4. ITEM 104-6021 REMOVE CONC (CURB) TO BE PAID AS NEEDED TO COMPLETE TCP

STATE OF TEXAS
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FM 1314
TCP
PHASE 2
STEP 3

SHEET 5 OF 6

0 50 100
SCALE IN FEET

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		24

DATE: 02/07/2024 01:57 PM
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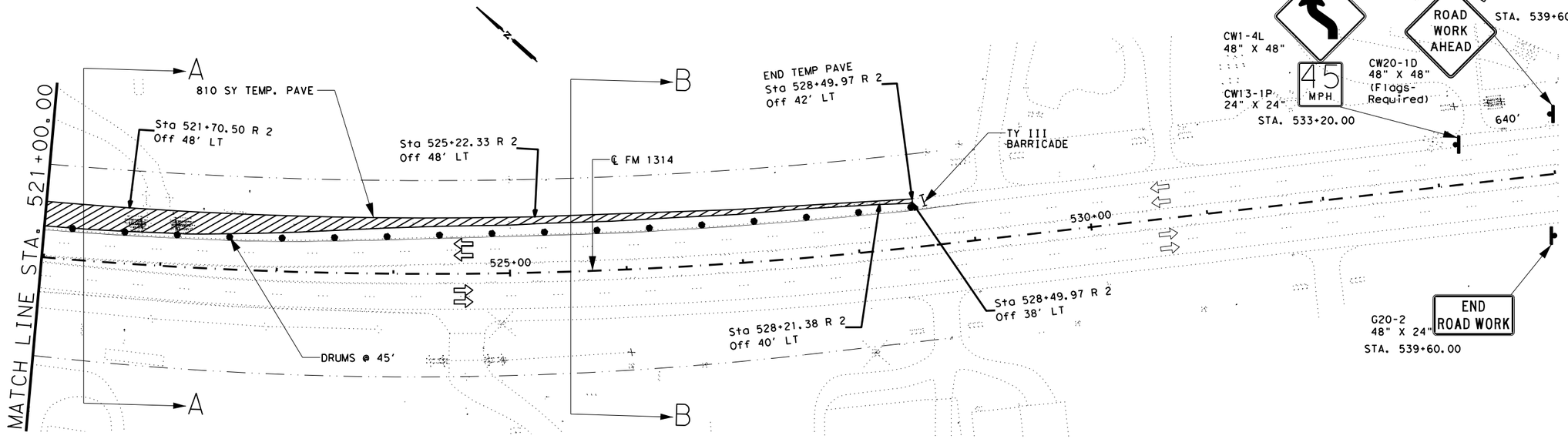

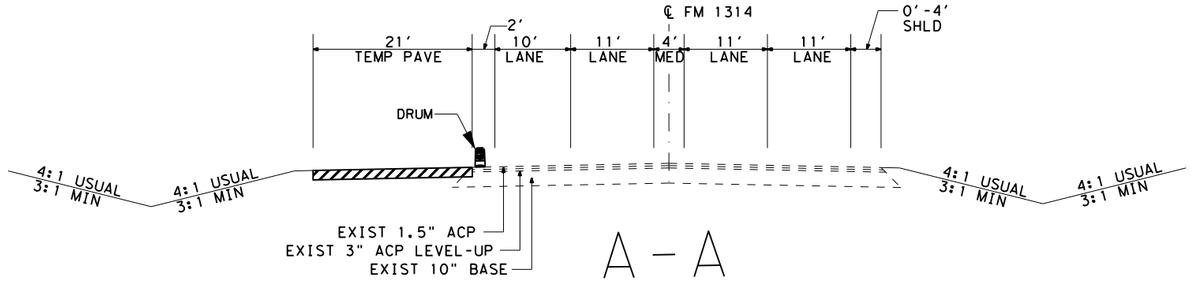

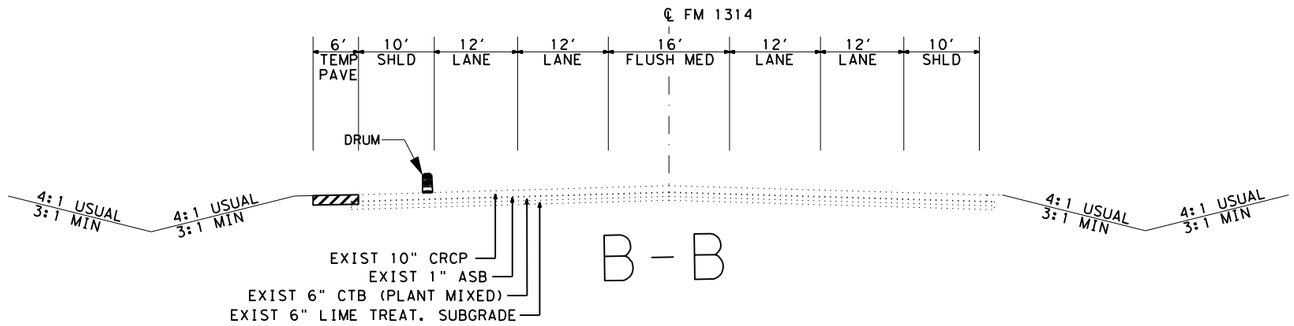

LEGEND:

- DRUM
- PROPOSED TRAFFIC DIRECTION
- EXISTING TRAFFIC DIRECTION
- TEMP SKID MOUNTED SIGNS
- TYPE III BARRICADE
- LOW PROFILE CONCRETE BARRIER TY 1
- LOW PROFILE CONCRETE BARRIER TY 2
- FAST TRACK
- TEMPORARY PAVEMENT
- PROPOSED PAVEMENT
- PREVIOUSLY INSTALLED PAVEMENT

PAVEMENT MARKERS

- (A) WRK ZN PAV MRK REMOV (W) (4") (SLD)
- (B) WRK ZN PAV MRK REMOV (W) (4") (BRK)
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2. REMOVE ALL REMAINING TEMPORARY PAVEMENT AFTER PHASE 4

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4. ITEM 104-6021
REMOVE CONC (CURB)
TO BE PAID AS NEEDED
TO COMPLETE TCP

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FM 1314
TCP
PHASE 2
STEP 3

SHEET 6 OF 6

0 50 100
SCALE IN FEET

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		25

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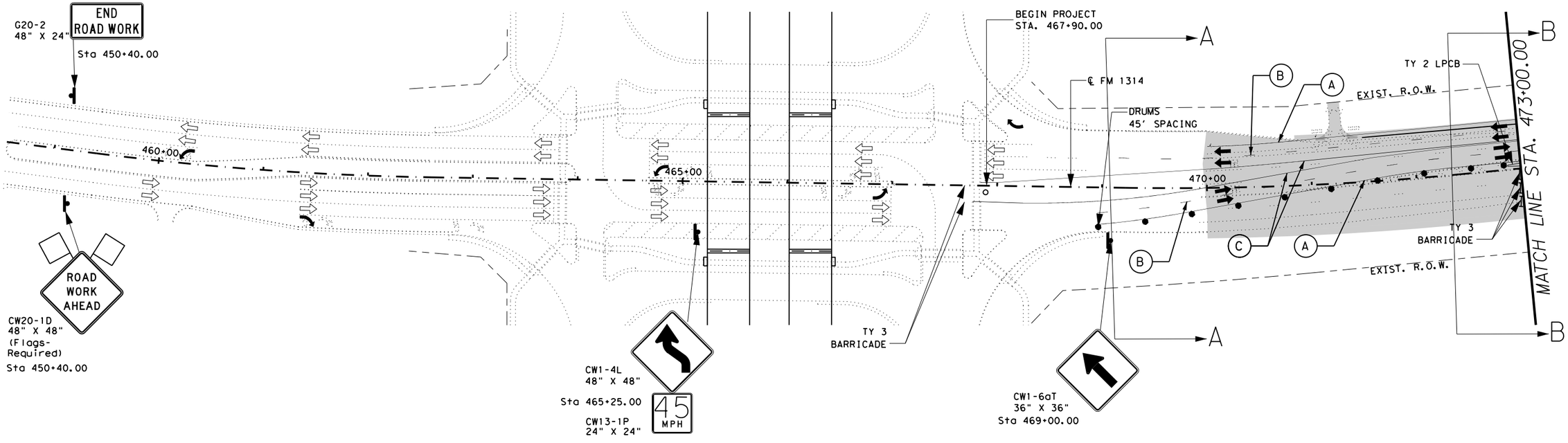

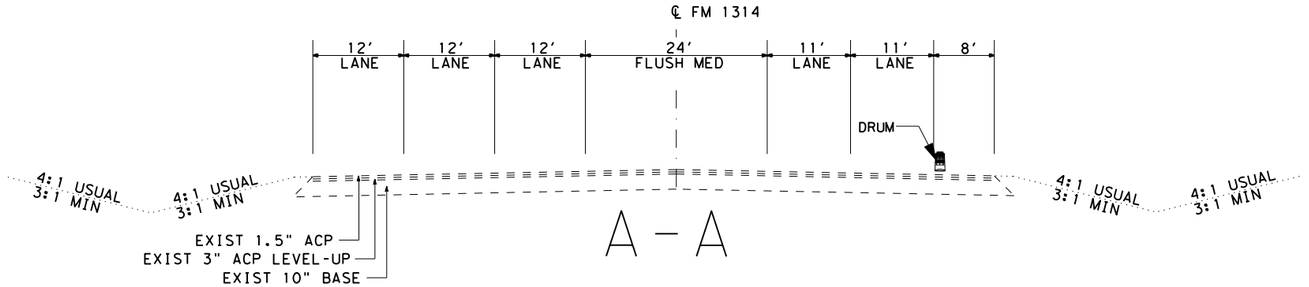

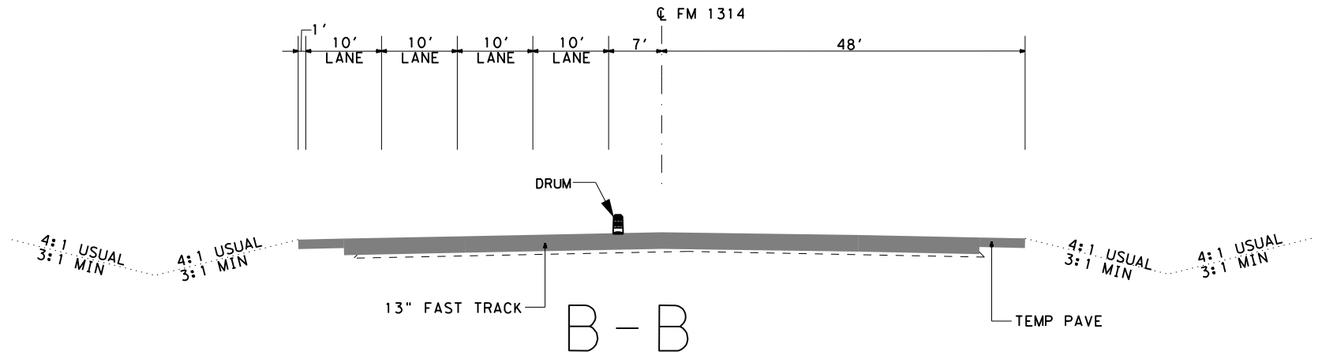

LEGEND:

- DRUM
- PROPOSED TRAFFIC DIRECTION
- EXISTING TRAFFIC DIRECTION
- TEMP SKID MOUNTED SIGNS
- TYPE III BARRICADE
- LOW PROFILE CONCRETE BARRIER TY 1
- LOW PROFILE CONCRETE BARRIER TY 2
- FAST TRACK
- TEMPORARY PAVEMENT
- PROPOSED PAVEMENT
- PREVIOUSLY INSTALLED PAVEMENT

PAVEMENT MARKERS

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FM 1314
TCP
PHASE 3

SHEET 1 OF 6

0 50 100
SCALE IN FEET

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		26

DATE: 02/07/2024 08:15 AM
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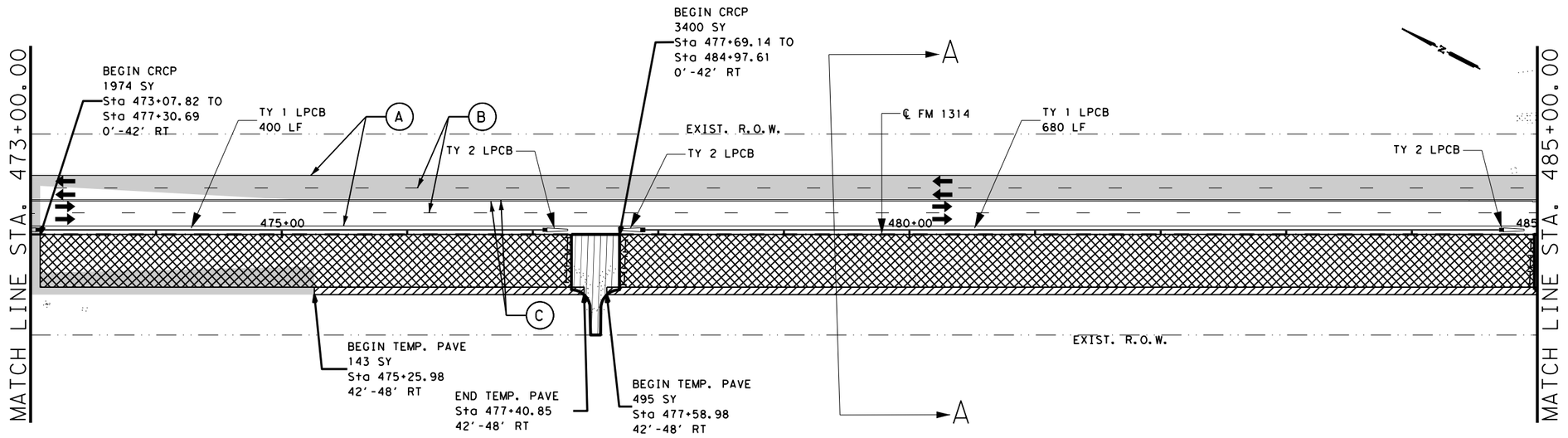

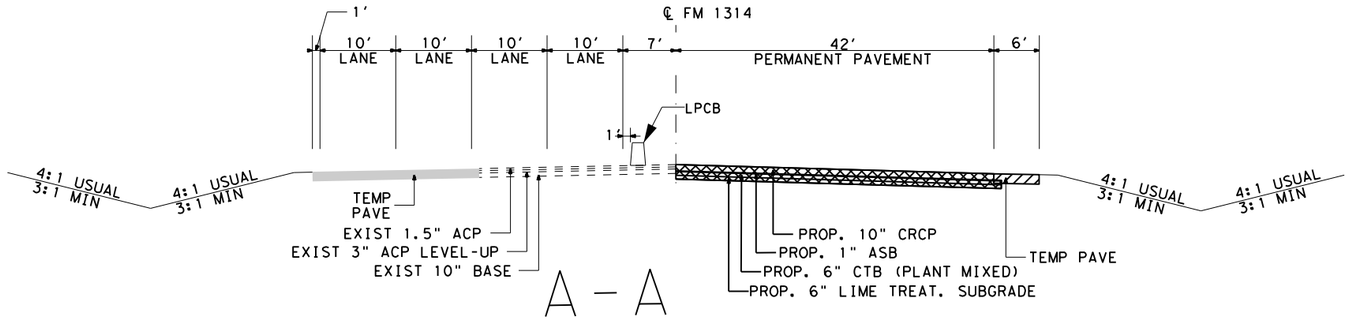

LEGEND:

- DRUM
- PROPOSED TRAFFIC DIRECTION
- EXISTING TRAFFIC DIRECTION
- TEMP SKID MOUNTED SIGNS
- TYPE III BARRICADE
- LOW PROFILE CONCRETE BARRIER TY 1
- LOW PROFILE CONCRETE BARRIER TY 2
- FAST TRACK
- TEMPORARY PAVEMENT
- PROPOSED PAVEMENT
- PREVIOUSLY INSTALLED PAVEMENT

PAVEMENT MARKERS

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- (J) WRK ZN PAV MRK REMOV (W) (WORD)

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NOTES:

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2. REMOVE ALL REMAINING TEMPORARY PAVEMENT AFTER PHASE 4

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4. ITEM 104-6021
REMOVE CONC (CURB)
TO BE PAID AS NEEDED
TO COMPLETE TCP

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03.14.24

FM 1314
TCP
PHASE 3

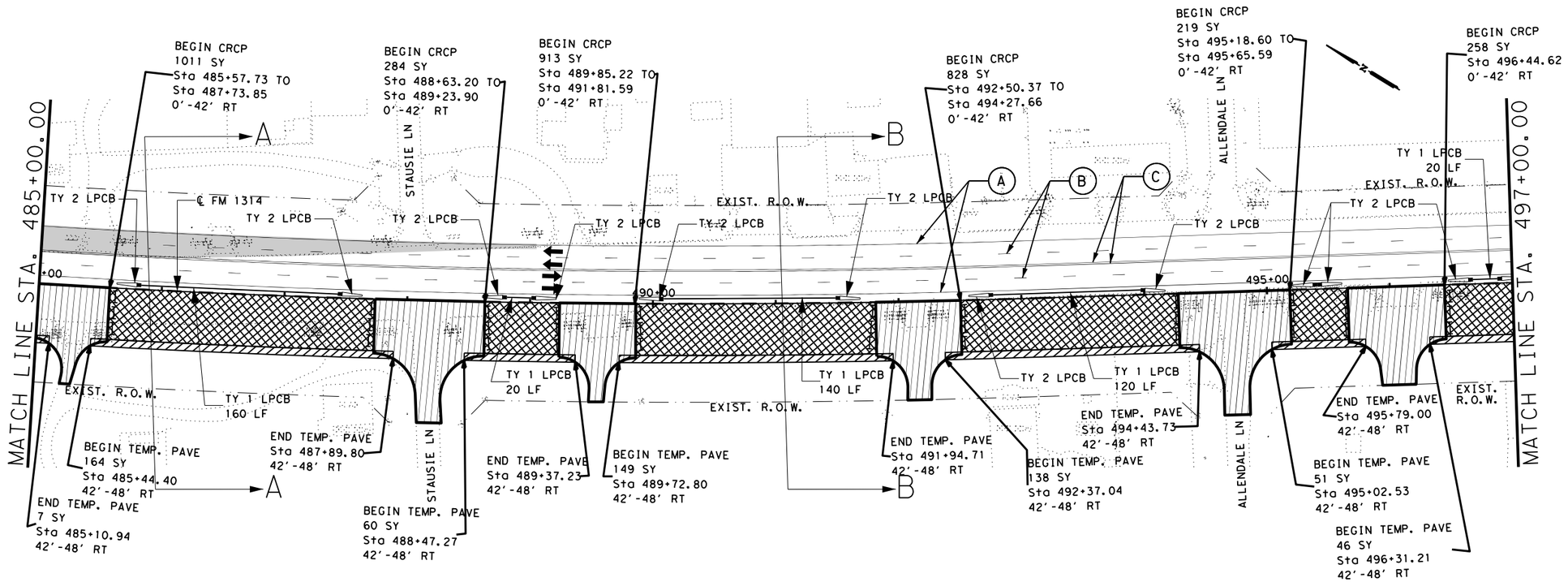
SCALE IN FEET 0 50 100

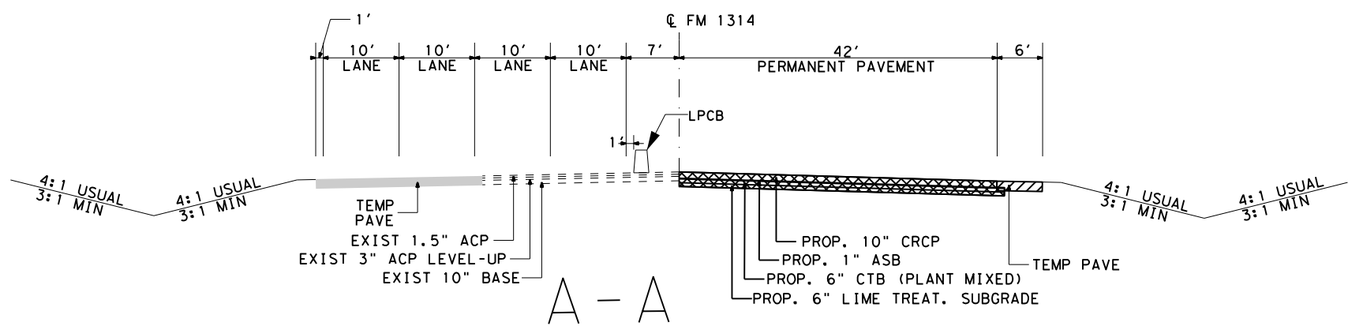
SHEET 2 OF 6

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		27

DATE: 02/07/2024 08:04 PM
FILE: pw:\\txdot.projectwiseonline.com:TXDOT3\Documents\12 - HOU\Design Projects\198601064\4 - Design\Plan Set\2. TCP\PHASE 3\027 TCP PHASE 3 SHEET 2 OF 6





LEGEND:

- DRUM
- PROPOSED TRAFFIC DIRECTION
- EXISTING TRAFFIC DIRECTION
- TEMP SKID MOUNTED SIGNS
- TYPE III BARRICADE
- LOW PROFILE CONCRETE BARRIER TY 1
- LOW PROFILE CONCRETE BARRIER TY 2
- FAST TRACK
- TEMPORARY PAVEMENT
- PROPOSED PAVEMENT
- PREVIOUSLY INSTALLED PAVEMENT

PAVEMENT MARKERS

- (A) WRK ZN PAV MRK REMOV (W) (4") (SLD)
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* FOR SIGN TYPES SEE ADVANCE WARNING SIGN LAYOUTS.

NOTES:

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2. REMOVE ALL REMAINING TEMPORARY PAVEMENT AFTER PHASE 4

3. REMOVE CONCRETE AND STEEL UP TO A MINIMUM OF 0.5 INCHES BELOW THE EXISTING ASPHALT SURFACE.

4. ITEM 104-6021 REMOVE CONC (CURB) TO BE PAID AS NEEDED TO COMPLETE TCP

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FM 1314
TCP
PHASE 3

SCALE IN FEET 0 50 100

SHEET 3 OF 6

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		28

DATE: 02/07/2024 08:06 PM
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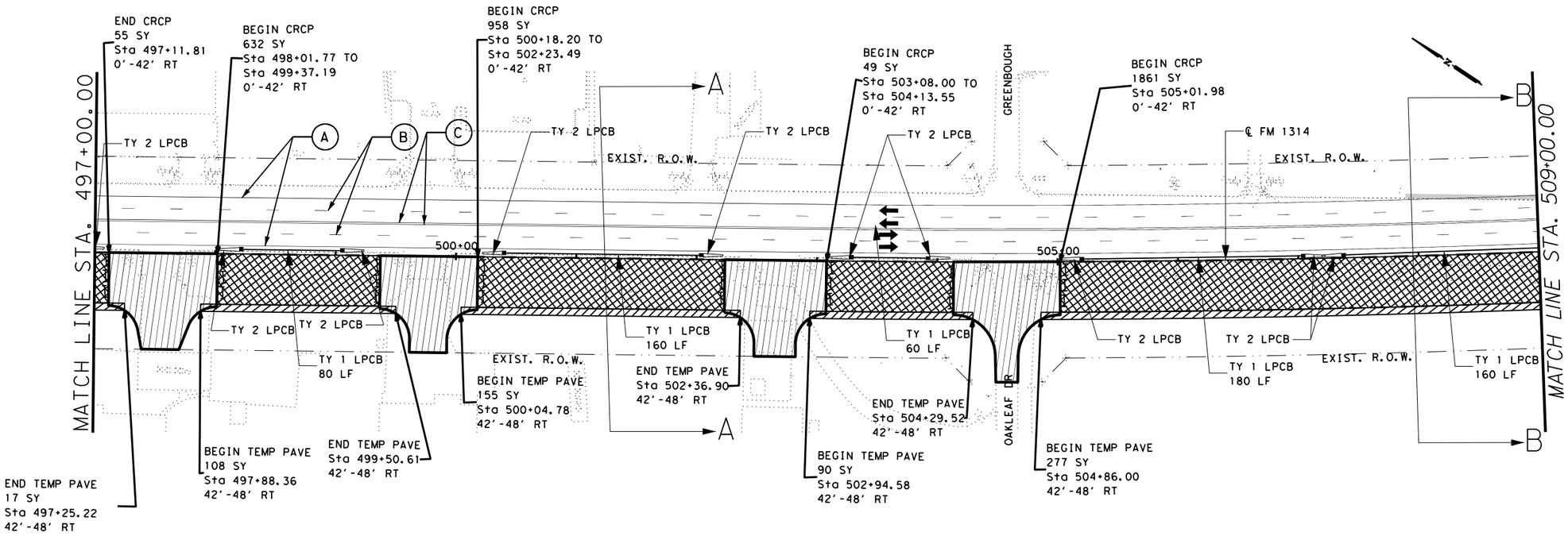

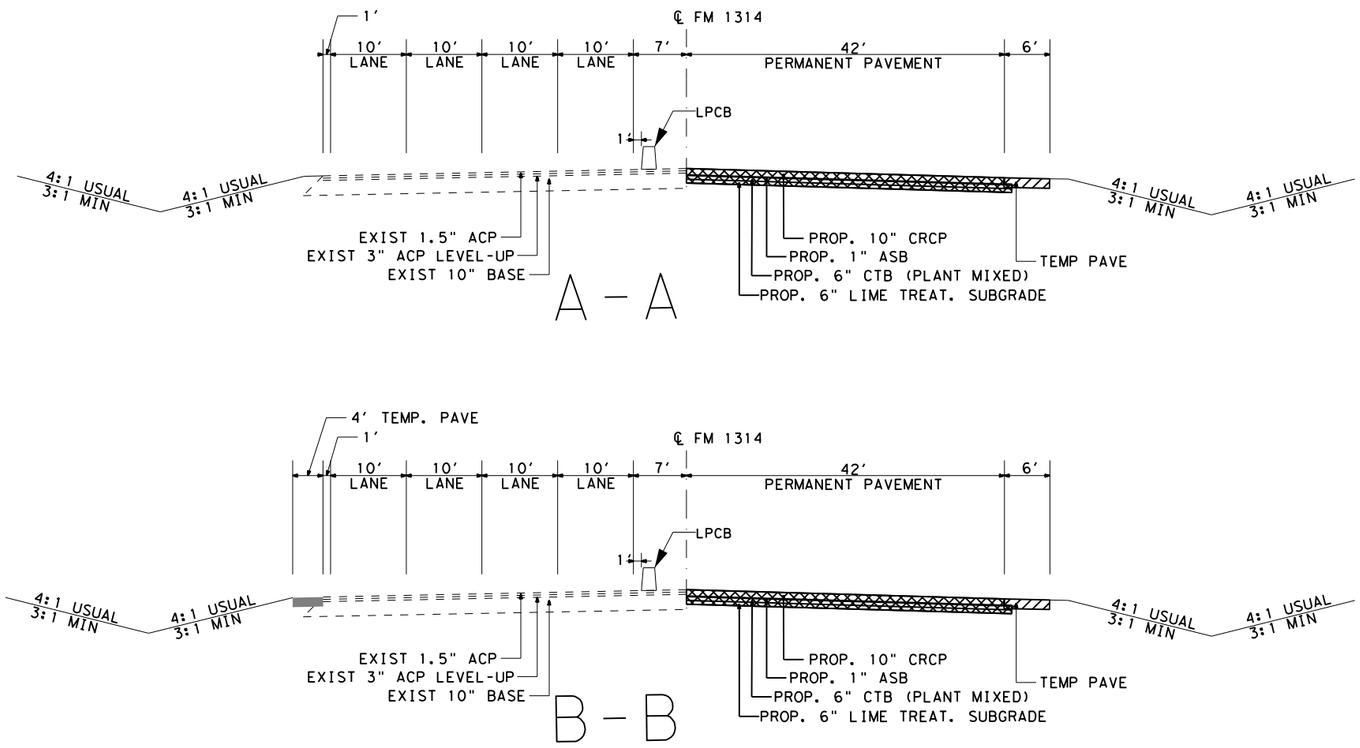

LEGEND:

- DRUM
- PROPOSED TRAFFIC DIRECTION
- EXISTING TRAFFIC DIRECTION
- TEMP SKID MOUNTED SIGNS
- TYPE III BARRICADE
- LOW PROFILE CONCRETE BARRIER TY 1
- LOW PROFILE CONCRETE BARRIER TY 2
- FAST TRACK
- TEMPORARY PAVEMENT
- PROPOSED PAVEMENT
- PREVIOUSLY INSTALLED PAVEMENT

PAVEMENT MARKERS

- (A) WRK ZN PAV MRK REMOV (W) (4") (SLD)
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* FOR SIGN TYPES SEE ADVANCE WARNING SIGN LAYOUTS.

NOTES:

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4. ITEM 104-6021
REMOVE CONC (CURB)
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PHASE 3

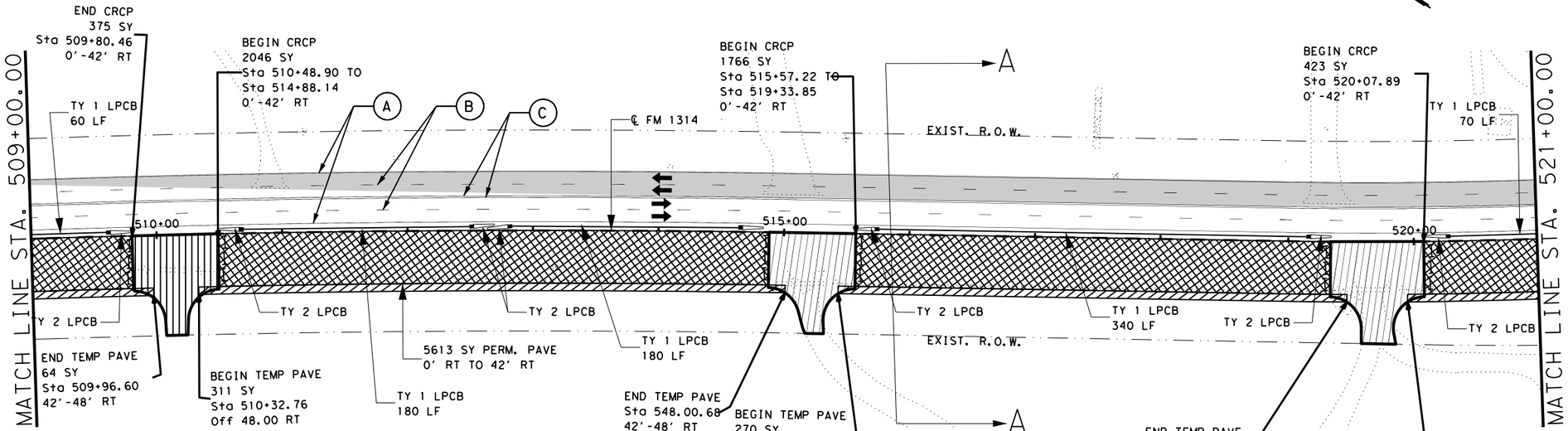
SCALE IN FEET 0 50 100

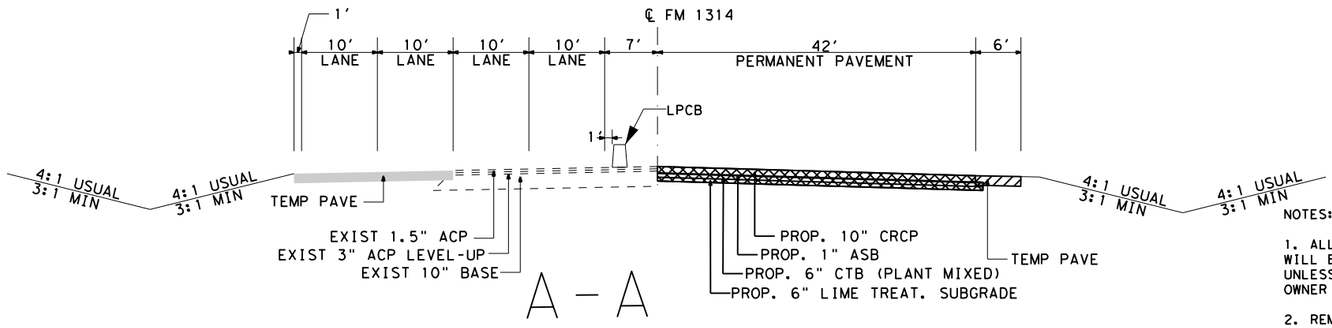
SHEET 4 OF 6

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		29

DATE: 02/07/2024 08:09 PM
FILE: pw:\\txdot.projectwiseonline.com:TXDOT3\Documents\12 - HOU\Design Projects\198601064\4 - Design\Plan Set\2. TCP\PHASE 3\029 TCP PHASE 3 SHEET 4 OF 6





LEGEND:

- DRUM
- PROPOSED TRAFFIC DIRECTION
- EXISTING TRAFFIC DIRECTION
- TEMP SKID MOUNTED SIGNS
- TYPE III BARRICADE
- LOW PROFILE CONCRETE BARRIER TY 1
- LOW PROFILE CONCRETE BARRIER TY 2
- FAST TRACK
- TEMPORARY PAVEMENT
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- PREVIOUSLY INSTALLED PAVEMENT

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FM 1314
TCP
PHASE 3

SCALE IN FEET: 0 50 100

SHEET 5 OF 6

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		30

DATE: 02/07/2024 08:18 AM
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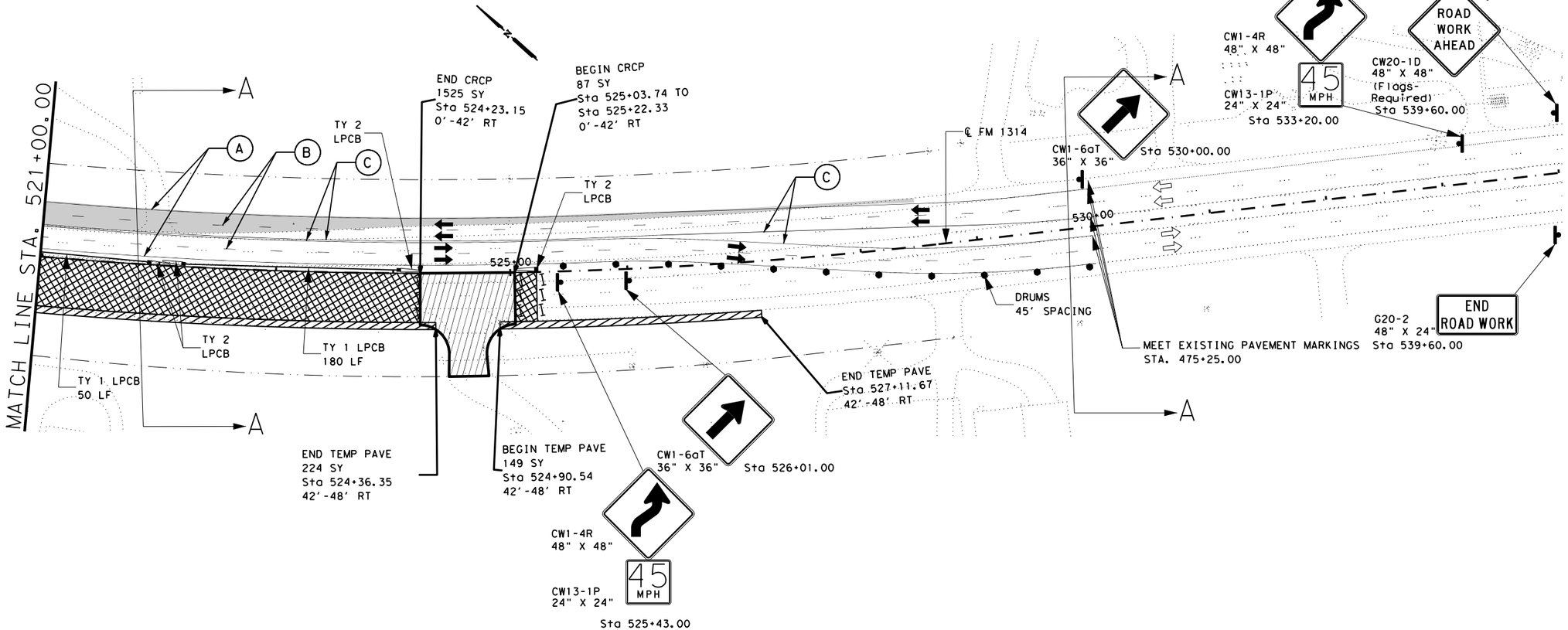

LEGEND:

- DRUM
- PROPOSED TRAFFIC DIRECTION
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- TEMP SKID MOUNTED SIGNS
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- LOW PROFILE CONCRETE BARRIER TY 1
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- (J) WRK ZN PAV MRK REMOV (W) (WORD)

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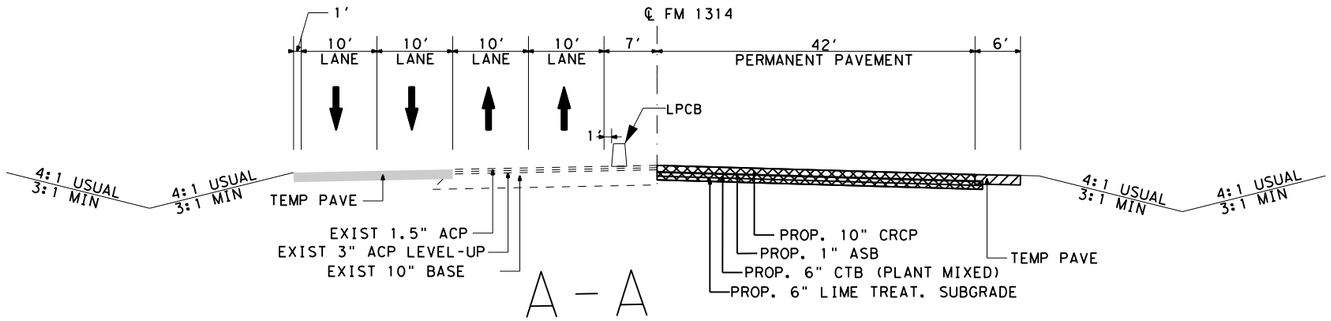

NOTES:

1. ALL FAST TRACK DRIVEWAYS WILL BE POURED HALF AT A TIME UNLESS APPROVED BY BOTH PROPEF OWNER AND TXDOT.
2. REMOVE ALL REMAINING TEMPORARY PAVEMENT AFTER PHASE 4
3. REMOVE CONCRETE AND STEEL UP TO A MINIMUM OF 0.5 INCHES BELOW THE EXISTING ASPHALT SURFACE.
4. ITEM 104-6021 REMOVE CONC (CURB) TO BE PAID AS NEEDED TO COMPLETE TCP

STATE OF TEXAS
MICAH J. SCHLUTER
136908
LICENSED
PROFESSIONAL ENGINEER

Micah J. Schluter, P.E.
03.14.24

FM 1314
TCP
PHASE 3

SHEET 6 OF 6

0 50 100
SCALE IN FEET

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		31

DATE: 02/07/2024 02:13 PM
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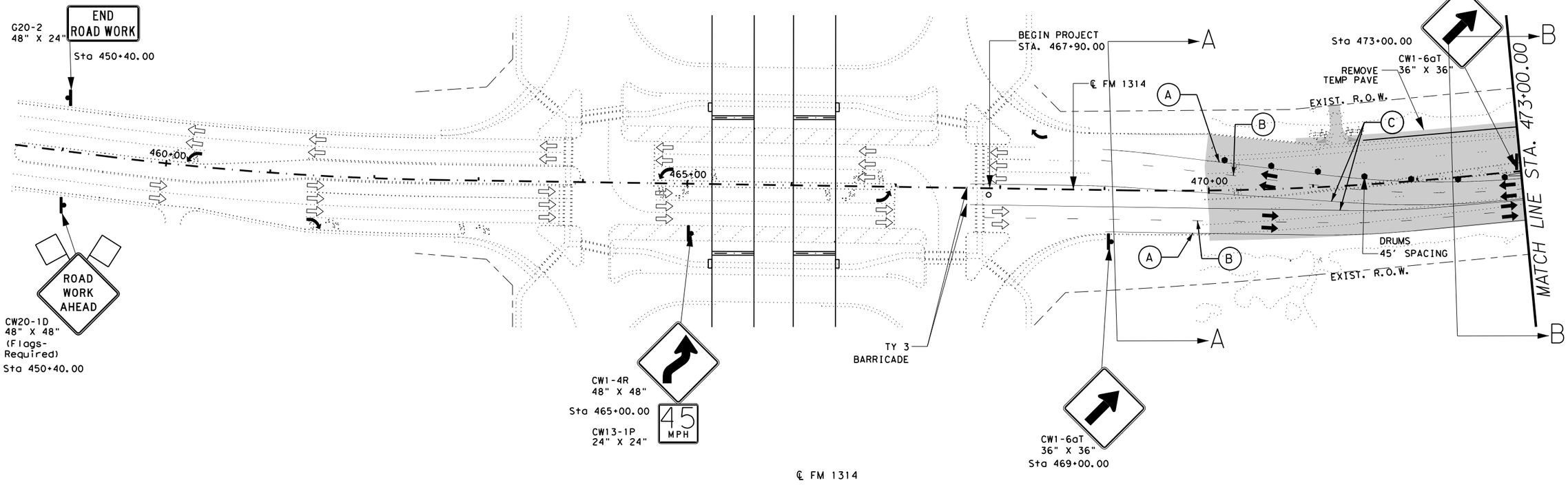

LEGEND:

- DRUM
- PROPOSED TRAFFIC DIRECTION
- EXISTING TRAFFIC DIRECTION
- TEMP SKID MOUNTED SIGNS
- TYPE III BARRICADE
- LOW PROFILE CONCRETE BARRIER TY 1
- LOW PROFILE CONCRETE BARRIER TY 2
- FAST TRACK
- TEMPORARY PAVEMENT
- PROPOSED PAVEMENT
- PREVIOUSLY INSTALLED PAVEMENT

PAVEMENT MARKERS

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FM 1314
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PHASE 4

SHEET 1 OF 6

0 50 100
SCALE IN FEET

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		32

DATE: 02/07/2024 08:14 PM
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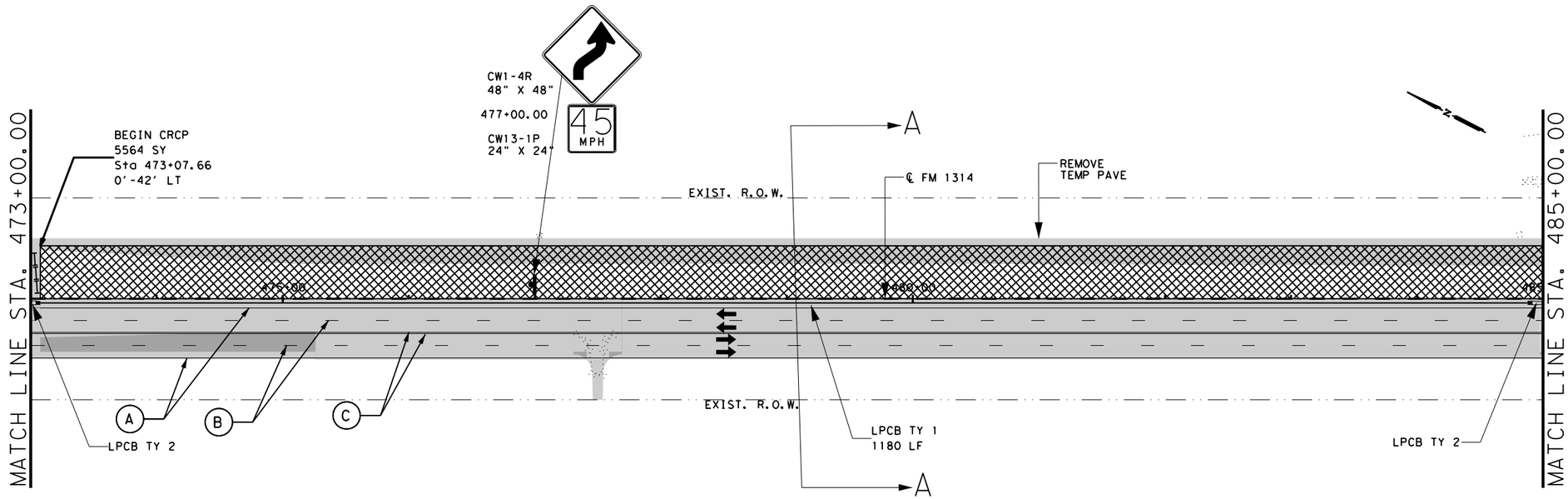

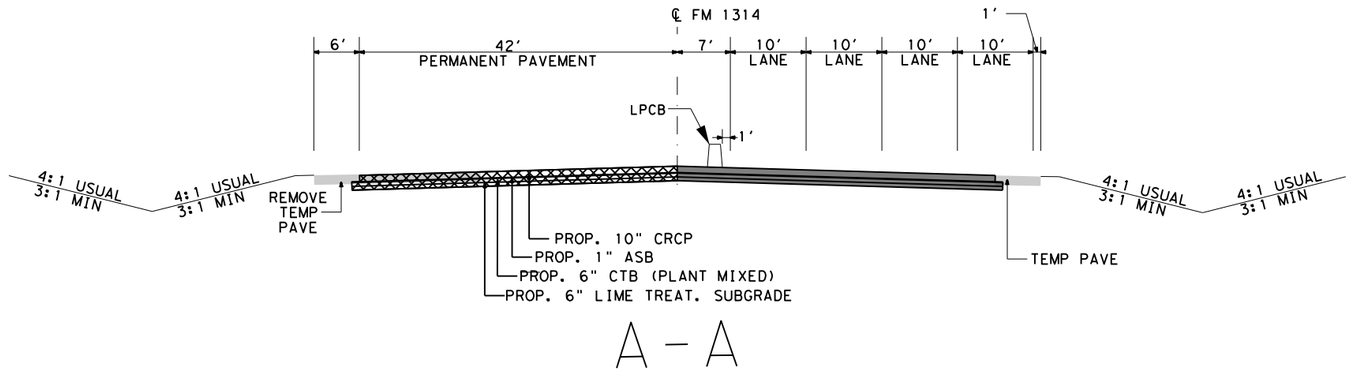

LEGEND:

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- PROPOSED TRAFFIC DIRECTION
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- TYPE III BARRICADE
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- LOW PROFILE CONCRETE BARRIER TY 2
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4. ITEM 104-6021 REMOVE CONC (CURB) TO BE PAID AS NEEDED TO COMPLETE TCP

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Micah J. Schluter, P.E.
03.14.24

FM 1314
TCP
PHASE 4

SCALE IN FEET 0 50 100

SHEET 2 OF 6

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		33

DATE: 02/07/2024 08:15 PM
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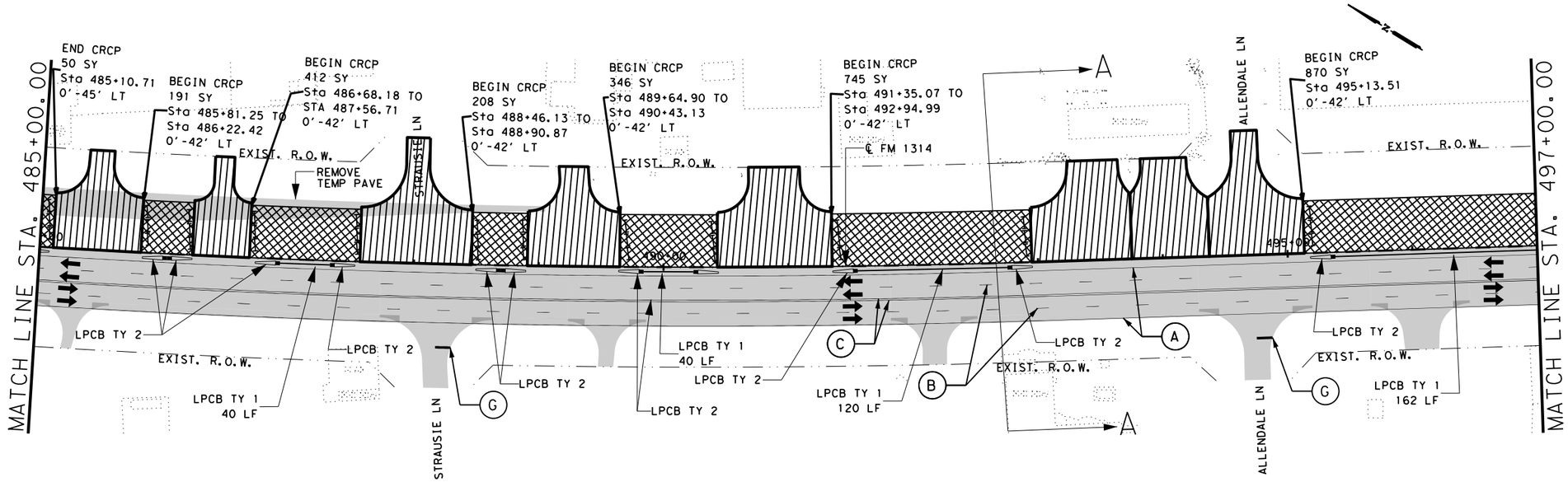

LEGEND:

- DRUM
- PROPOSED TRAFFIC DIRECTION
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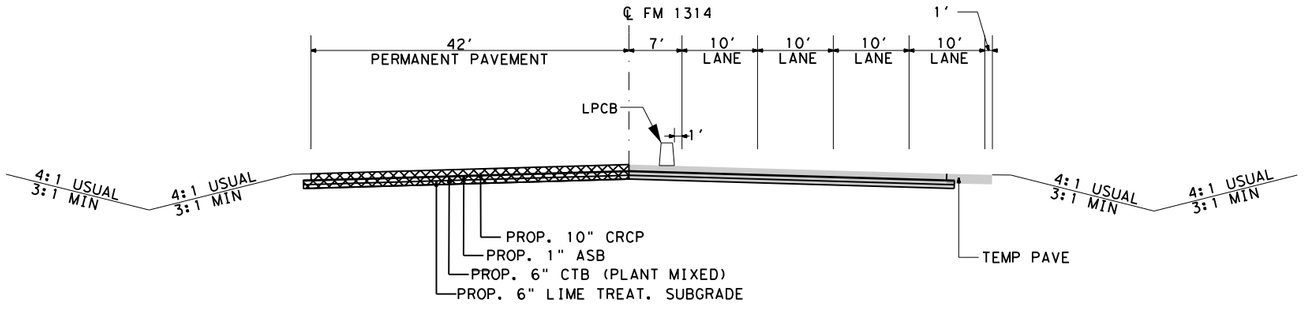

A – A

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03.14.24

FM 1314
TCP
PHASE 4

SHEET 3 OF 6

0 50 100
SCALE IN FEET

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		34

DATE: 02/07/2024 08:17 PM
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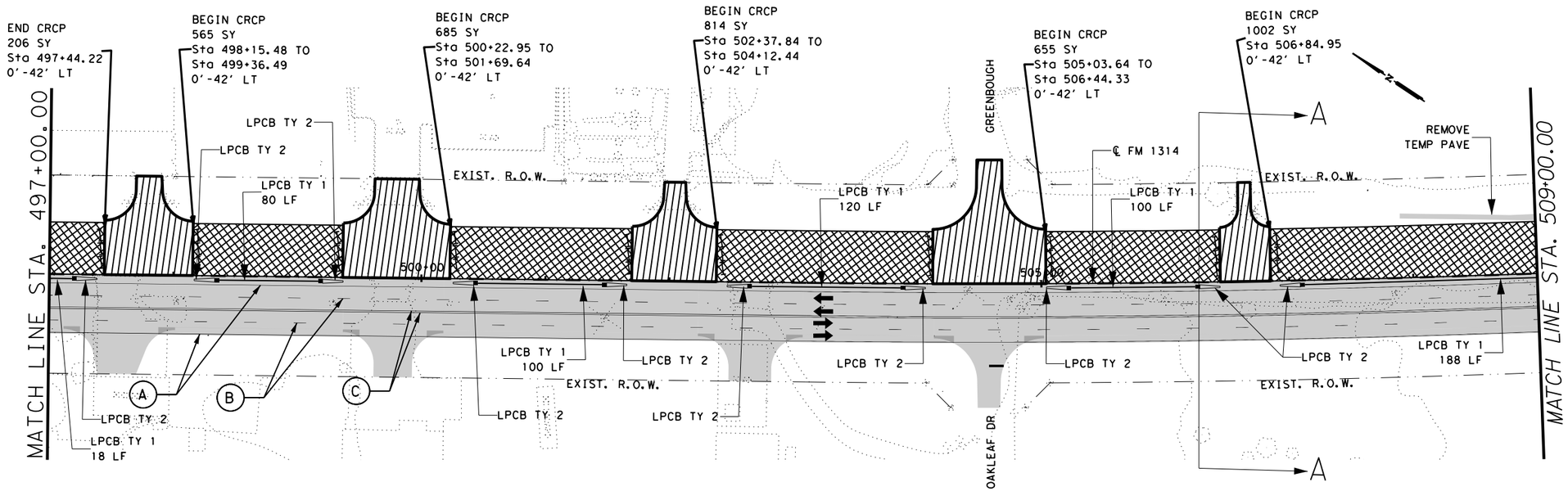

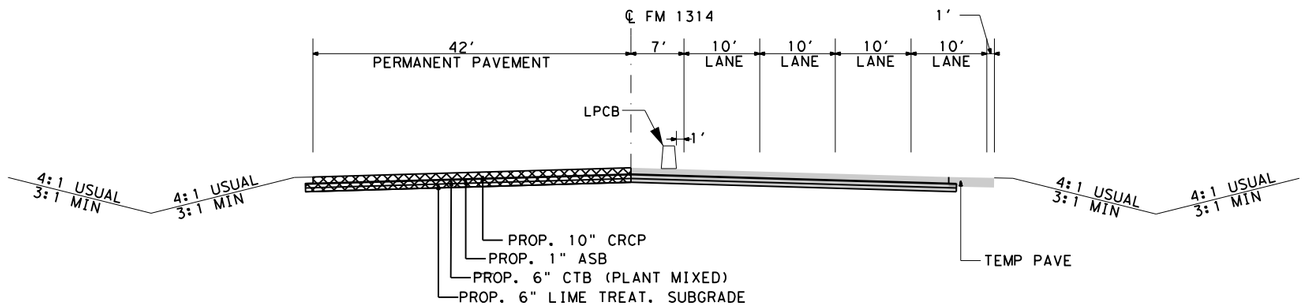

A – A

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FM 1314
TCP
PHASE 4

SHEET 4 OF 6

0 50 100
SCALE IN FEET

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		35

DATE: 02/07/2024 08:18 PM
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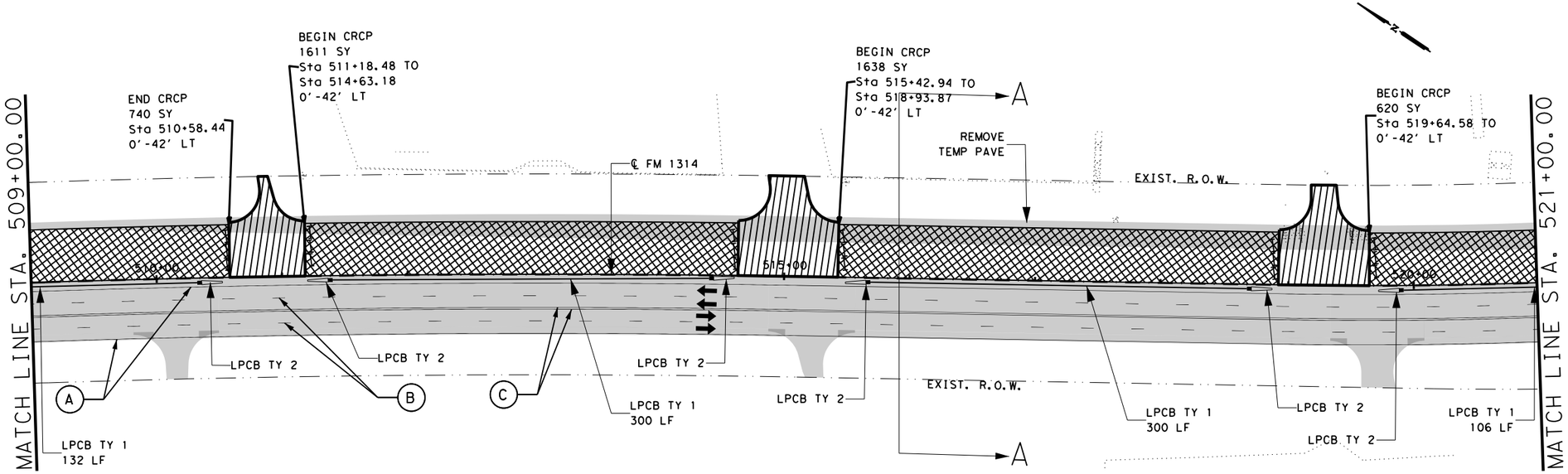

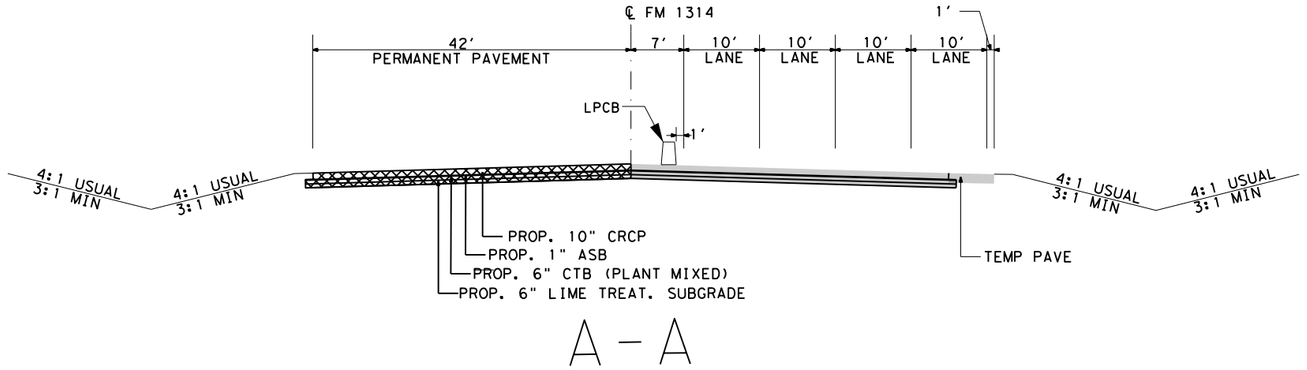

A – A

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FM 1314
TCP
PHASE 4

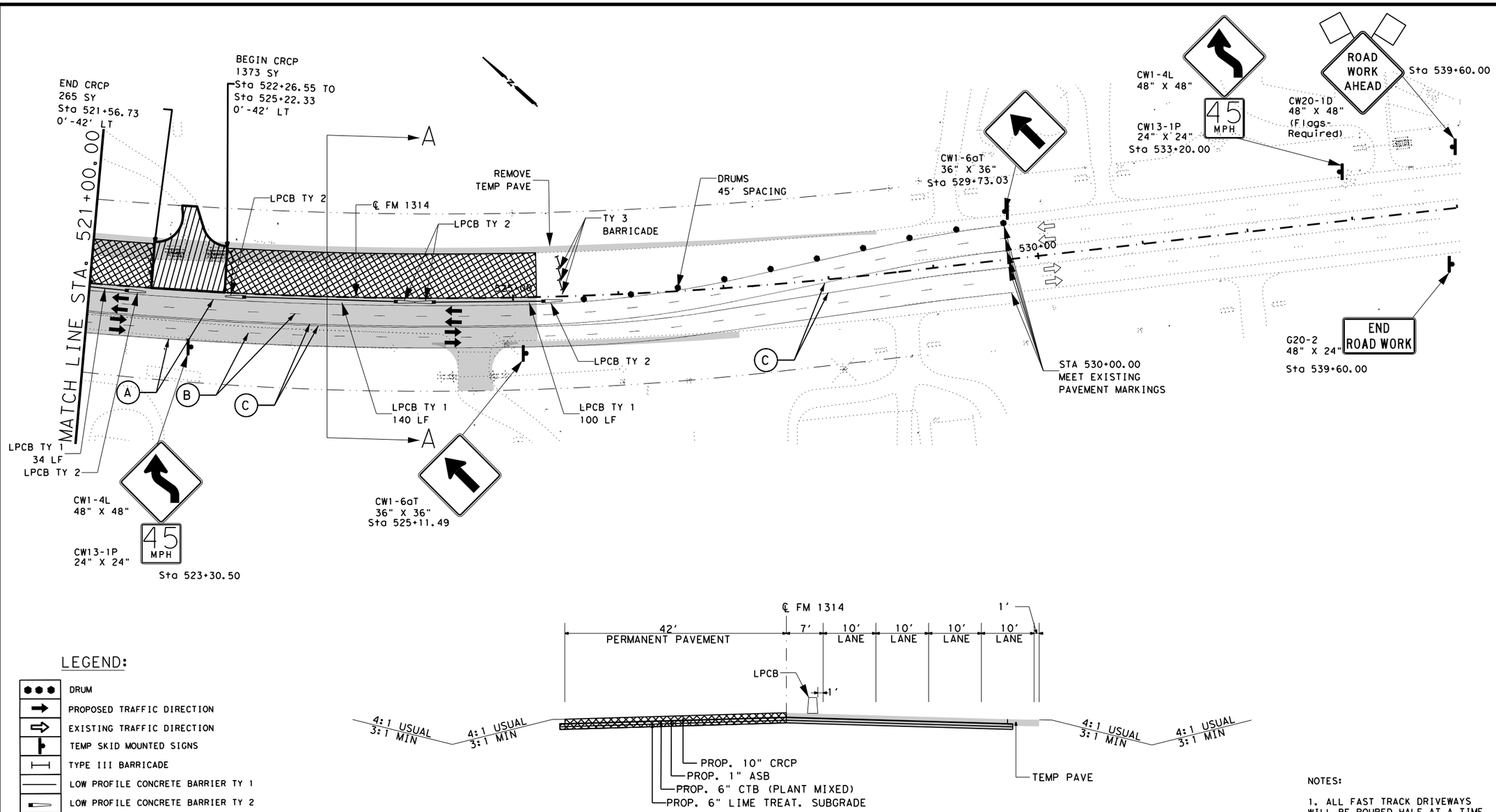
SCALE IN FEET: 0 50 100

SHEET 5 OF 6

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		36

DATE: 02/07/2024 08:18 PM
FILE: pw:\\txdot.projectwiseonline.com:TXDOT3\Documents\12 - HOU\Design Projects\198601064\4 - Design\Plan Set\2. TCP\PHASE 4\036 TCP PHASE 4 SHEET 5 OF 6



A – A

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FM 1314
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PHASE 4

SCALE IN FEET: 0 50 100

SHEET 6 OF 6

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		37

DATE: 02/07/2024 08:19 PM
FILE: pw:\\txdot.projectwiseonline.com:TXDOT3\Documents\12 - HOU\Design Projects\1986010641\4 - Design\Plan Set\2. TCP\PHASE 4\037 TCP PHASE 4 SHEET 6 OF 6.dgn

BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

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

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

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

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

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

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

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

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

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

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

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

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

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

WORKER SAFETY NOTES:

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

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

COMPLIANT WORKZONE TRAFFIC CONTROL DEVICES

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

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

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

DATE: 01/15/2024 01:11 PM
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SHEET 1 OF 12

Texas Department of Transportation — Traffic Safety Division Standard

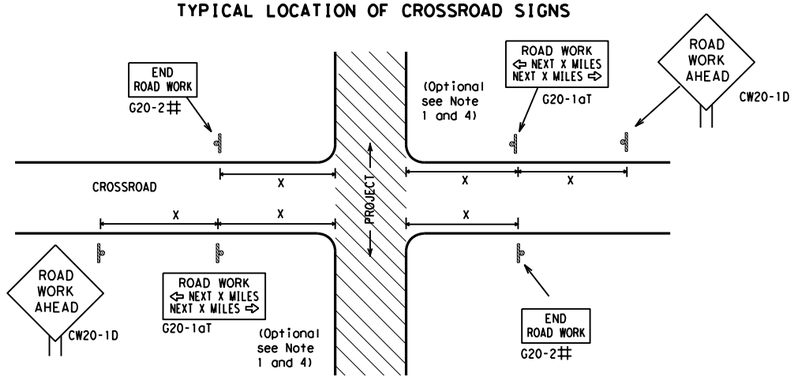
BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	1986	01	064	FM1314
4-03 7-13	DIST	COUNTY		SHEET NO.
9-07 8-14	HOU	MONTGOMERY		38
5-10 5-21				

DATE: 01/15/2024 01:11 PM
FILE: DOCUMENT NAME

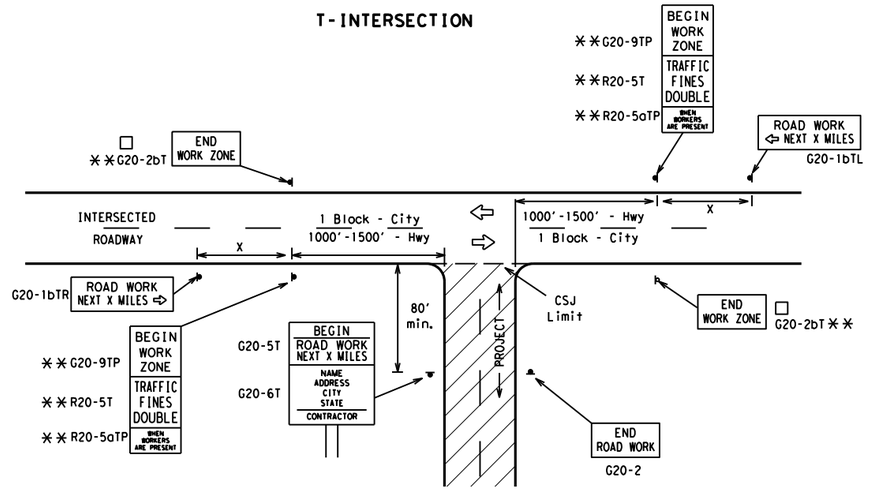
TYPICAL LOCATION OF CROSSROAD SIGNS



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

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

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

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

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

SIZE

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

SPACING

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

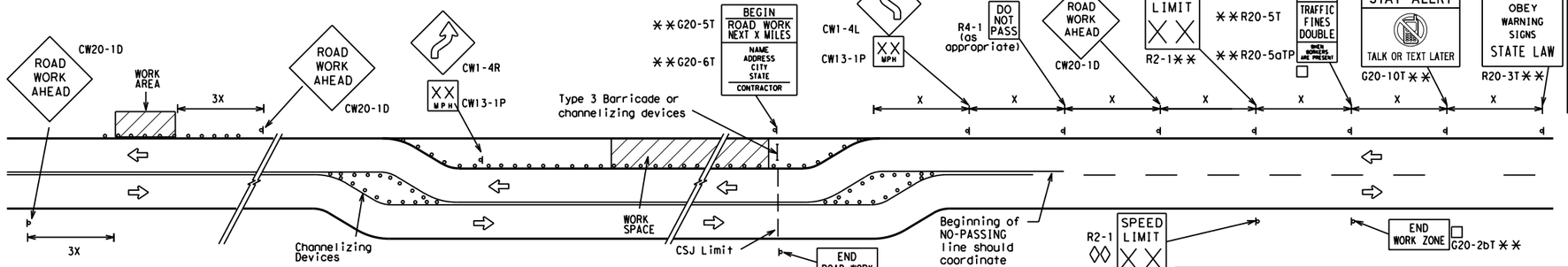
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

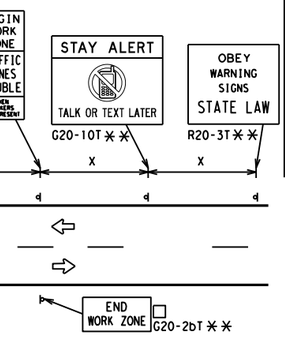
1. Special or larger size signs may be used as necessary.
2. Distance between signs should be increased as required to have 1500 feet advance warning.
3. Distance between signs should be increased as required to have 1/2 mile or more advance warning.
4. 36" x 36" "ROAD WORK AHEAD" (CW20-1D)signs may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

WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS

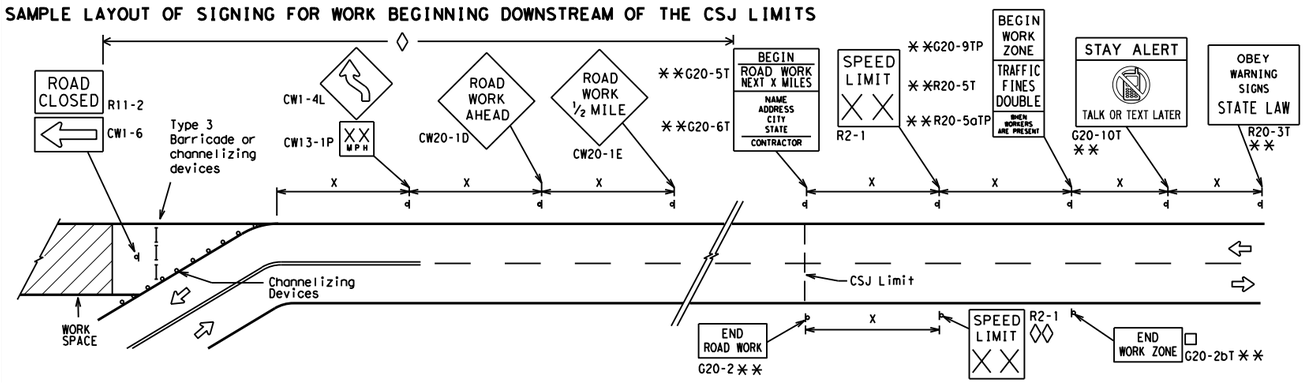


When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD"(CW20-1D)signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing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

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS



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



NOTES

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

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

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

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

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

LEGEND

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

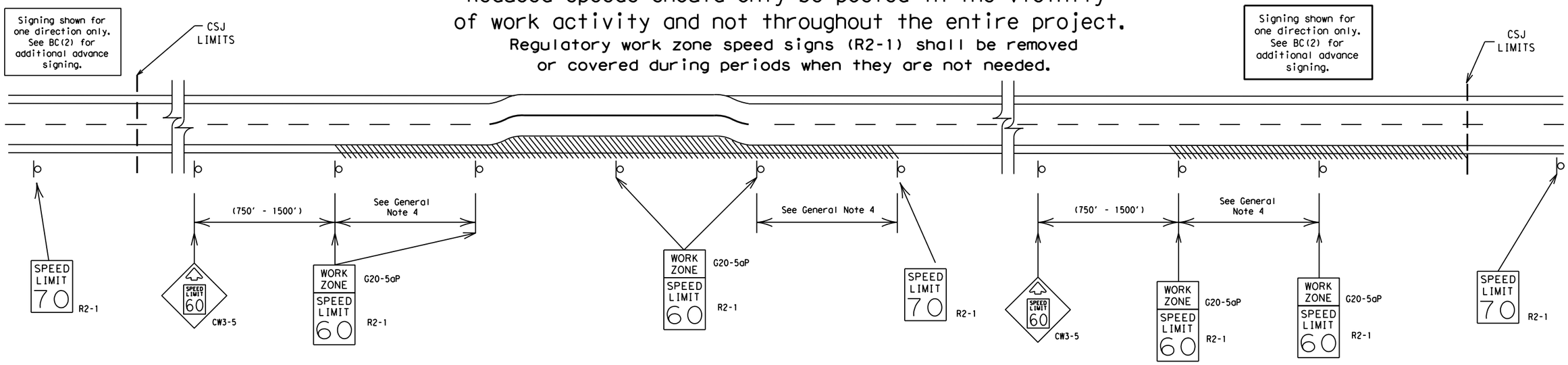
FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	1986	01	064	FM1314
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	HOU	MONTGOMERY		39

TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

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

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



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

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

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

SHORT TERM WORK ZONE SPEED LIMITS

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

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

GENERAL NOTES

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	1986	01	064	FM1314
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	HOU	MONTGOMERY		40

DATE: 01/15/2024 01:11 PM
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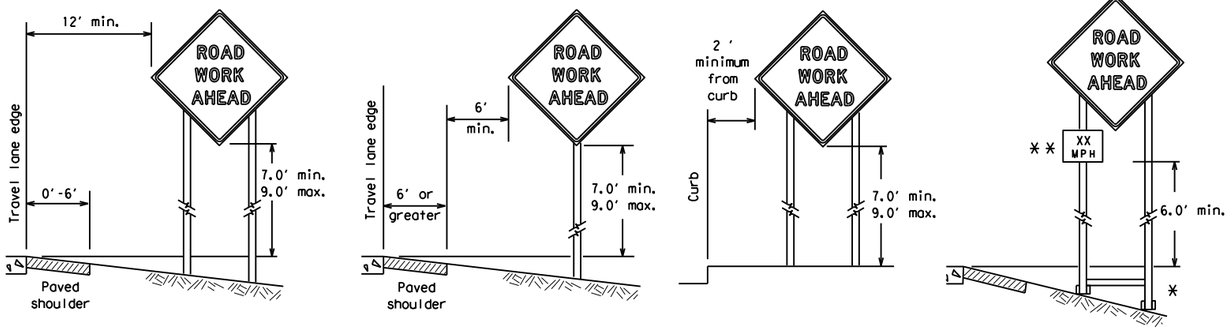
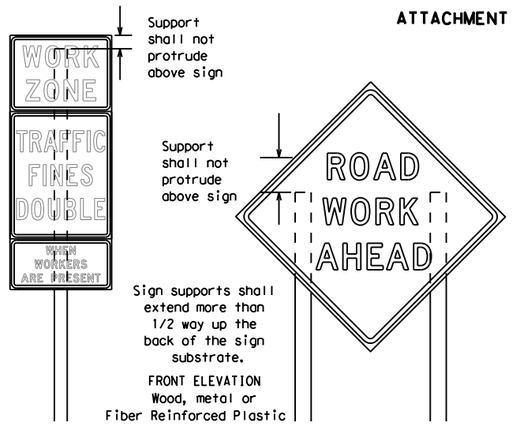
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

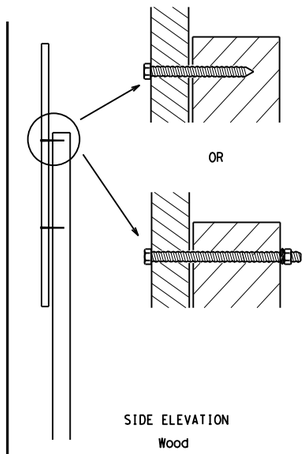


* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

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

ATTACHMENT FOR SIGN SUPPORTS





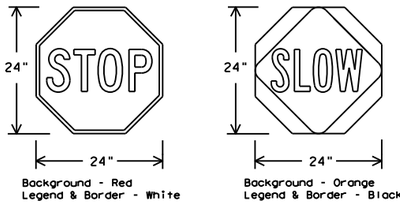
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

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

STOP/SLOW PADDLES

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



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

CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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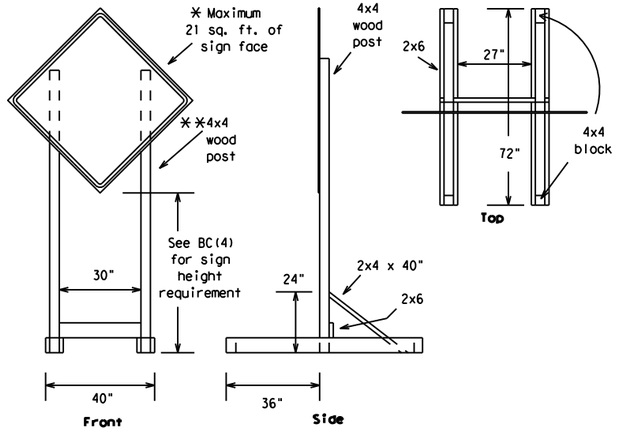
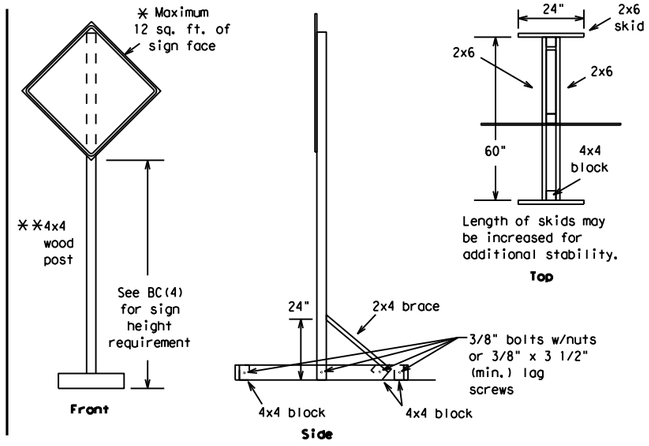
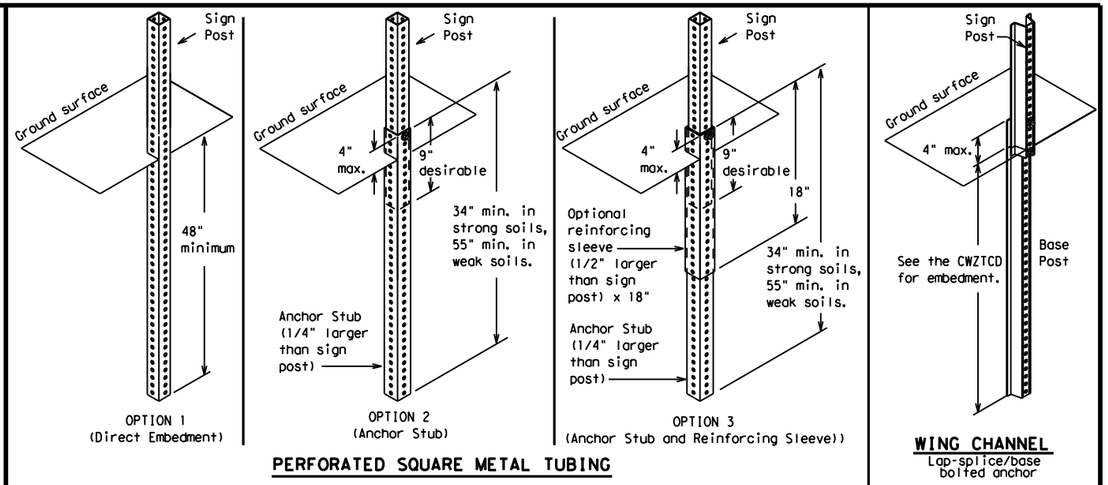
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	HOU	MONTGOMERY		41





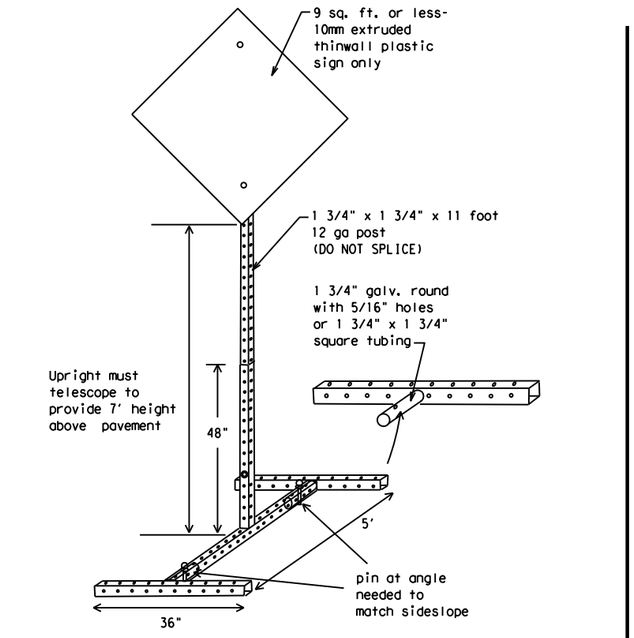
SKID MOUNTED WOOD SIGN SUPPORTS

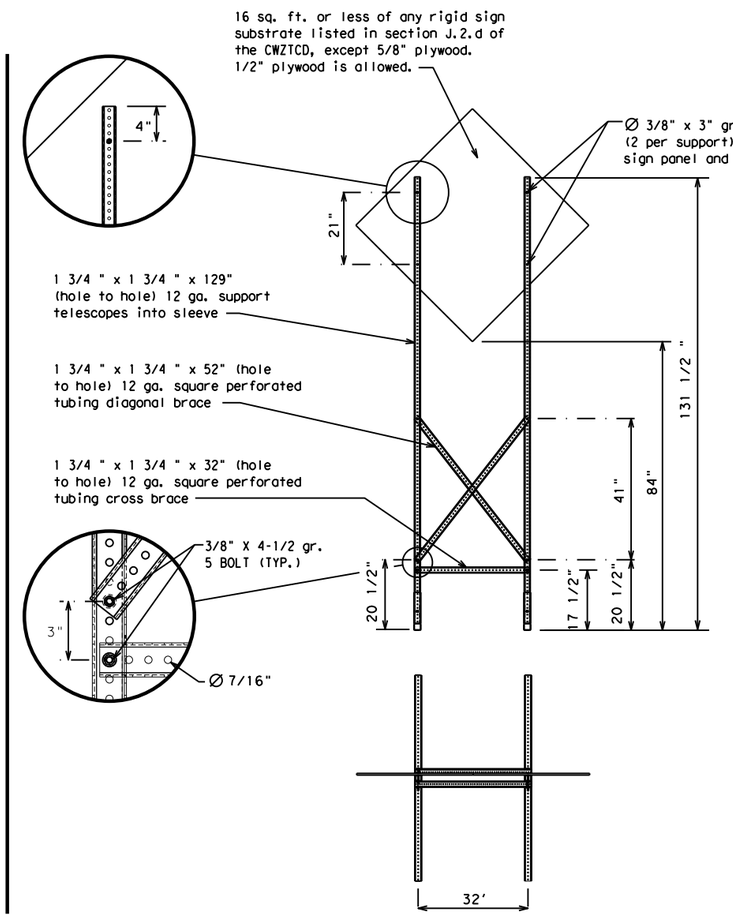
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS

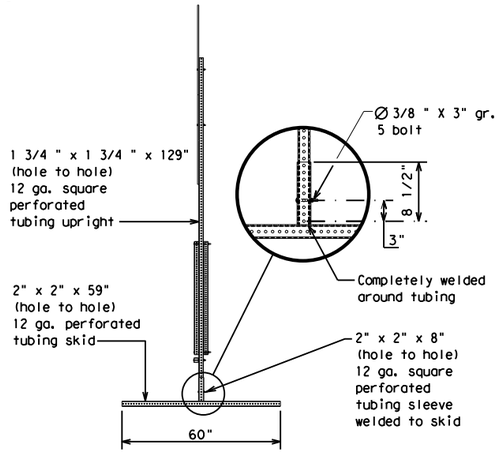


GROUND MOUNTED SIGN SUPPORTS

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.







SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

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

WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

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

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

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

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	HOU	MONTGOMERY		42

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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

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

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

WORDING ALTERNATIVES

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

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

FULL MATRIX PCMS SIGNS

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	1986	01	064	FM1314
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	HOU	MONTGOMERY		43

100

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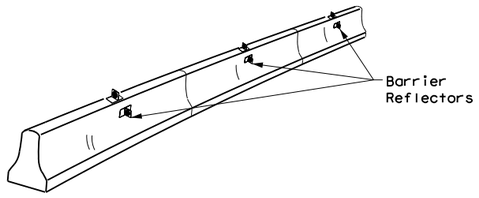
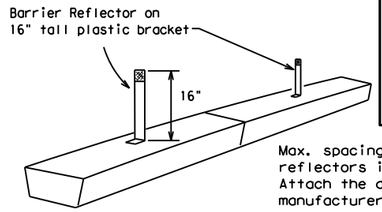
1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost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



CONCRETE TRAFFIC BARRIER (CTB)

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

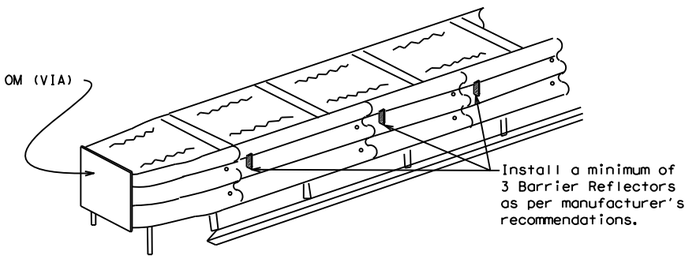


Max. spacing of barrier reflectors is 20 feet. Attach the delineators as per manufacturer's recommendations.

LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES

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

LOW PROFILE CONCRETE BARRIER (LPCB)

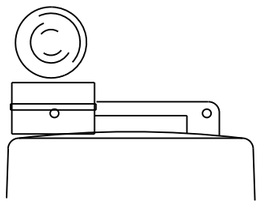


DELINEATION OF END TREATMENTS

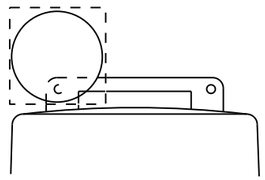
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



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



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

WARNING LIGHTS

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

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

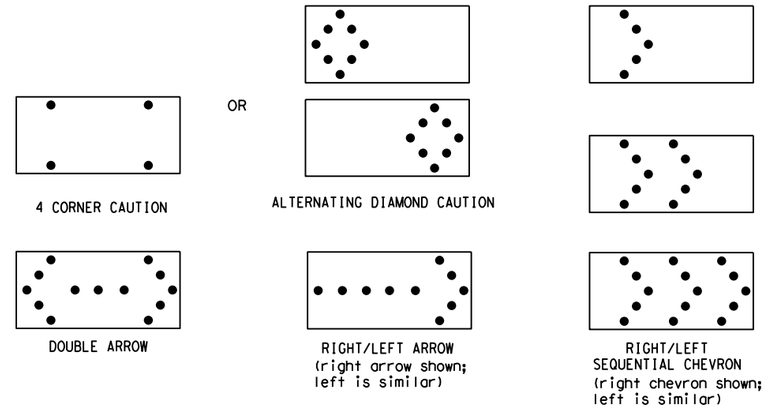
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

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

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

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

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



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

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

ATTENTION

Flashing Arrow Boards shall be equipped with automatic dimming devices.

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

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

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

Texas Department of Transportation

Traffic Safety Division Standard

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

BC(7)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	1986	01	064	FM1314
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	HOU	MONTGOMERY		44

DATE: 01/15/2024 01:11 PM
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GENERAL NOTES

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

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

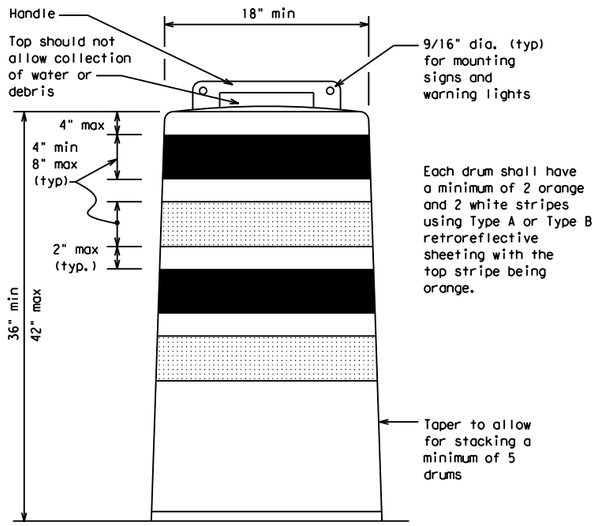
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

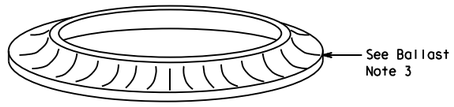
RETROREFLECTIVE SHEETING

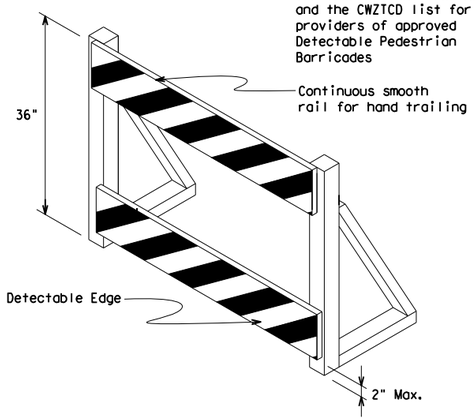
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall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

BALLAST

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

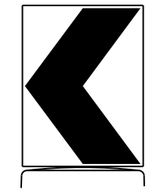




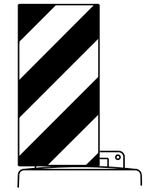


DETECTABLE PEDESTRIAN BARRICADES

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



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



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

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

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

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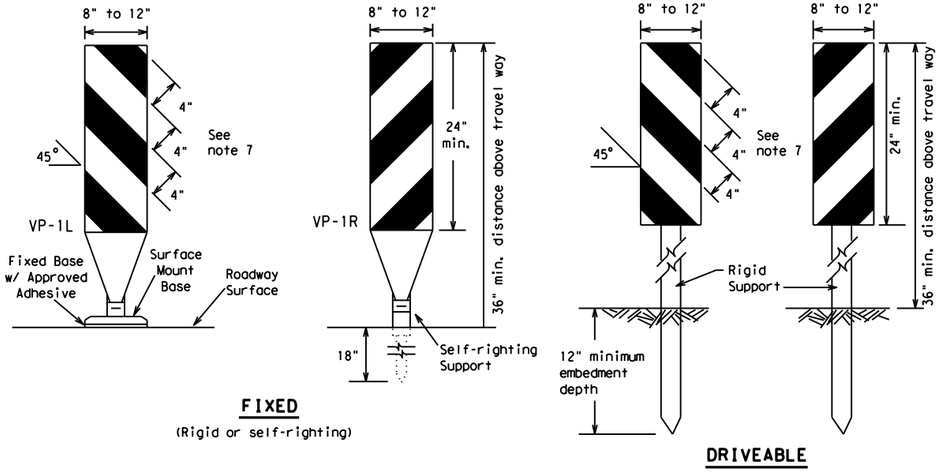
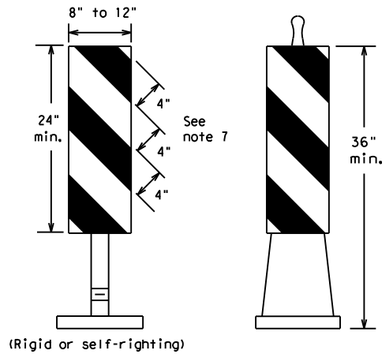
REVISIONS	1986	01	064	FM1314
4-03 8-14	DIST	COUNTY		SHEET NO.
9-07 5-21	HOU	MONTGOMERY		45
7-13				

102



FIXED
(Rigid or self-righting)

DRIVEABLE

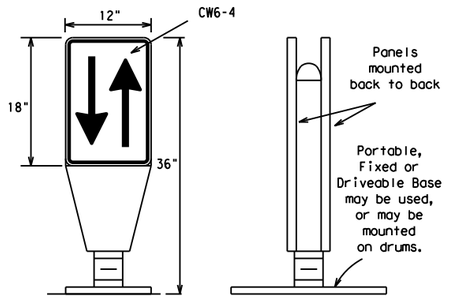


(Rigid or self-righting)

PORTABLE

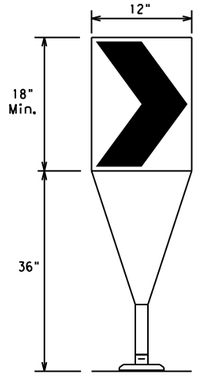
VERTICAL PANELS (VPs)

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



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

OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



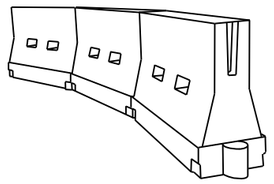
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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

CHEVRONS

GENERAL NOTES

1. Work Zone channelizing devices illustrated on this sheet may be installed in close proximity to traffic and are suitable for use on high or low speed roadways. The Engineer/Inspector shall ensure that spacing and placement is uniform and in accordance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
2. Channelizing devices shown on this sheet may have a driveable, fixed or portable base. The requirement for self-righting channelizing devices must be specified in the General Notes or other plan sheets.
3. Channelizing devices on self-righting supports should be used in work zone areas where channelizing devices are frequently impacted by errant vehicles or vehicle related wind gusts making alignment of the channelizing devices difficult to maintain. Locations of these devices shall be detailed elsewhere in the plans. These devices shall conform to the TMUTCD and the "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
4. The Contractor shall maintain devices in a clean condition and replace damaged, nonreflective, faded, or broken devices and bases as required by the Engineer/Inspector. The Contractor shall be required to maintain proper device spacing and alignment.
5. Portable bases shall be fabricated from virgin and/or recycled rubber. The portable bases shall weigh a minimum of 30 lbs.
6. Pavement surfaces shall be prepared in a manner that ensures proper bonding between the adhesives, the fixed mount bases and the pavement surface. Adhesives shall be prepared and applied according to the manufacturer's recommendations.
7. The installation and removal of channelizing devices shall not cause detrimental effects to the final pavement surfaces, including pavement surface discoloration or surface integrity. Driveable bases shall not be permitted on final pavement surfaces. The Engineer/Inspector shall approve all application and removal procedures of fixed bases.



LONGITUDINAL CHANNELIZING DEVICES (LCD)

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

WATER BALLASTED SYSTEMS USED AS BARRIERS

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

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

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

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

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

Texas Department of Transportation — Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-21

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9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	HOU	MONTGOMERY		46

DATE: 01/15/2024 01:11 PM
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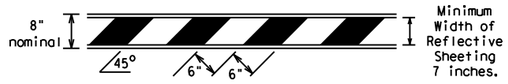
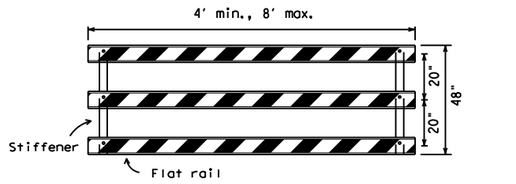
TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



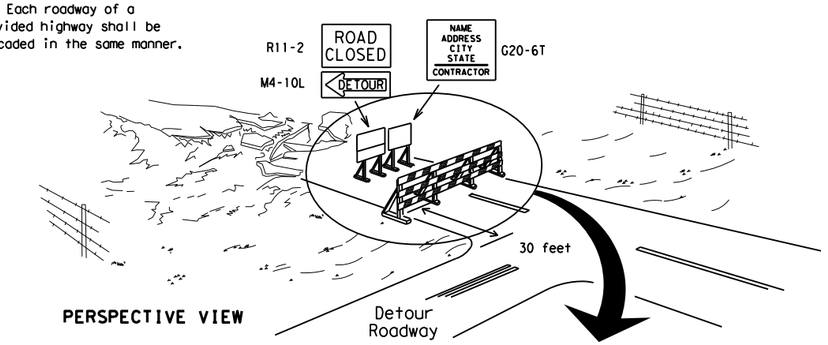
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

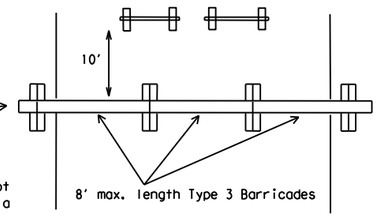
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

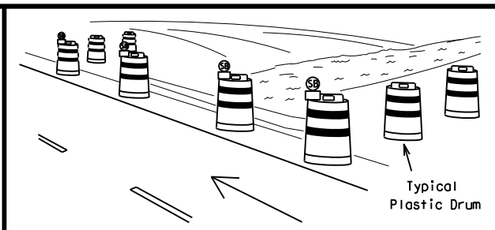
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

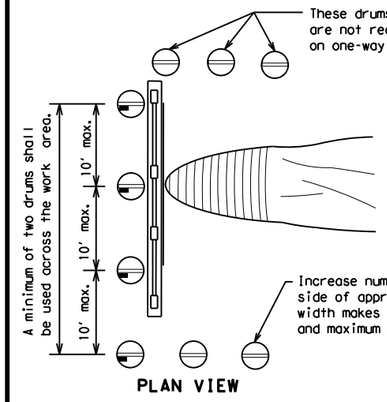
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

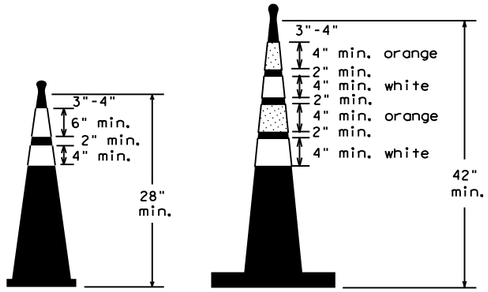
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



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

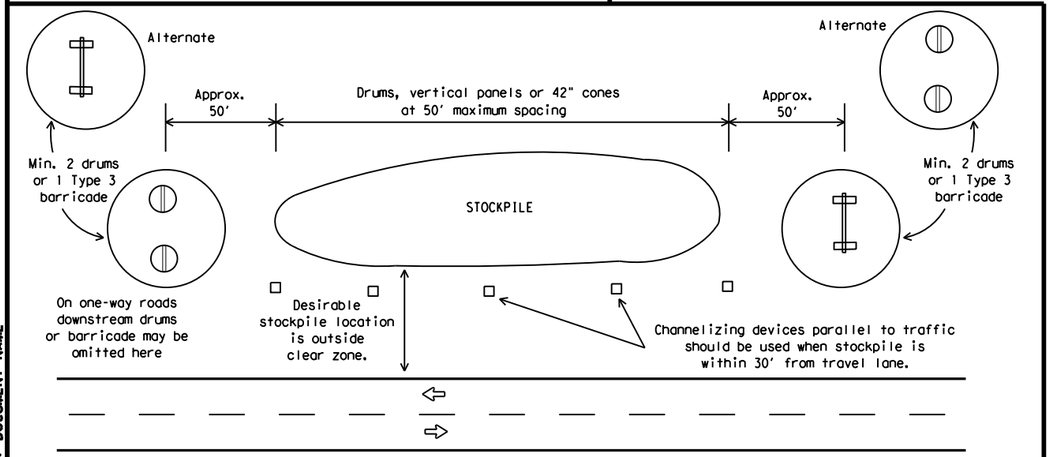
PLAN VIEW

CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



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

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



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

Texas Department of Transportation — Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-21

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9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	HOU	MONTGOMERY		47

DATE: 01/15/2024 01:11 PM
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WORK ZONE PAVEMENT MARKINGS

GENERAL

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

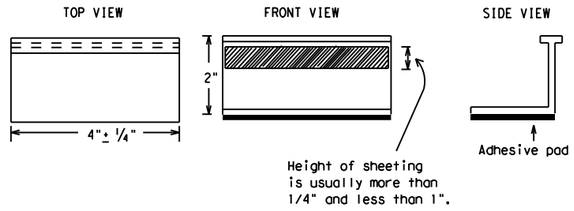
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

REMOVAL OF PAVEMENT MARKINGS

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

Temporary Flexible-Reflective Roadway Marker Tabs



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

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

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	1986	01	064	FM1314
2-98 9-07 5-21	DIST	COUNTY		SHEET NO.
1-02 7-13	HOU	MONTGOMERY		48
11-02 8-14				

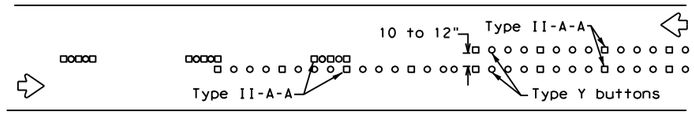
105

DATE: 01/15/2024 01:11 PM
FILE: DOCUMENT NAME

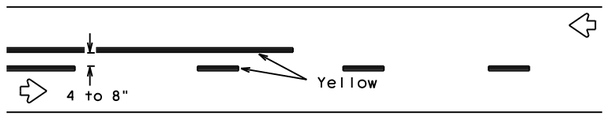
DATE: 01/15/2024 01:11 PM
FILE: DOCUMENT NAME

PAVEMENT MARKING PATTERNS

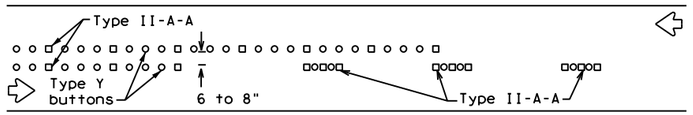
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



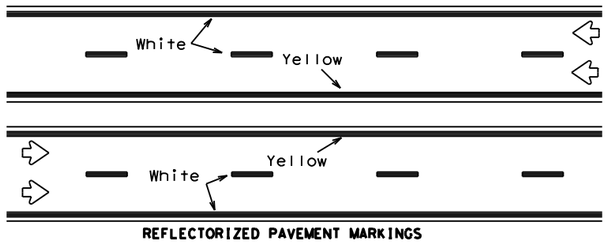
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



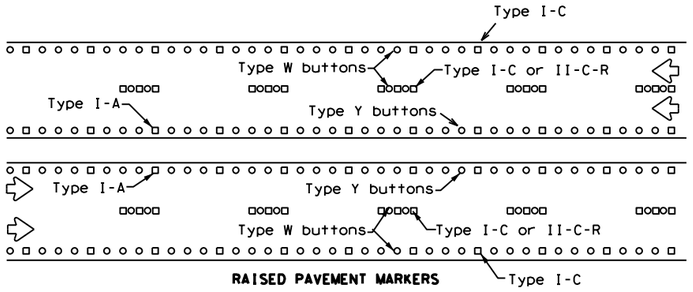
RAISED PAVEMENT MARKERS - PATTERN B

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

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



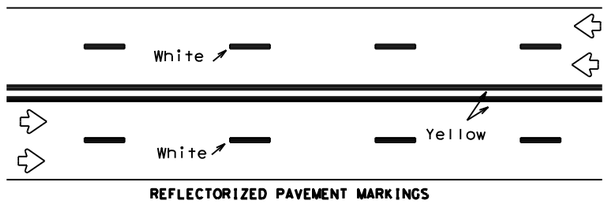
REFLECTORIZED PAVEMENT MARKINGS



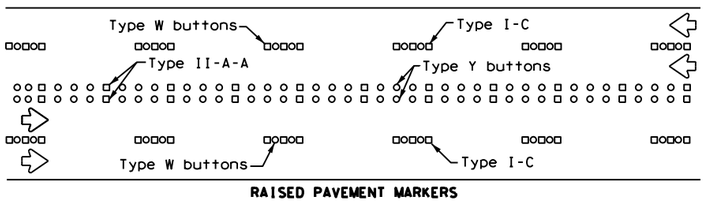
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



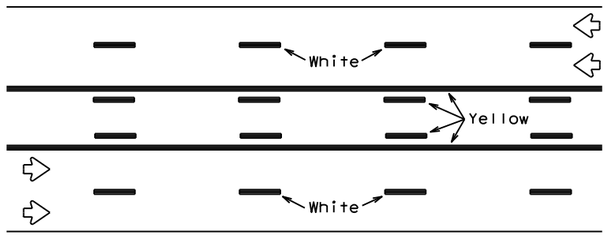
REFLECTORIZED PAVEMENT MARKINGS



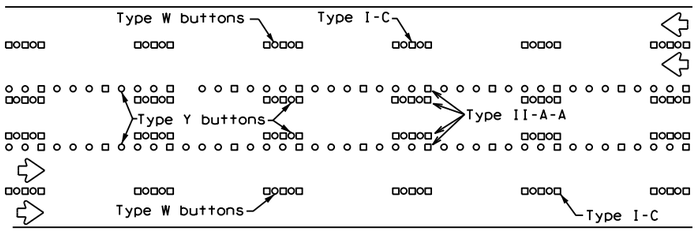
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

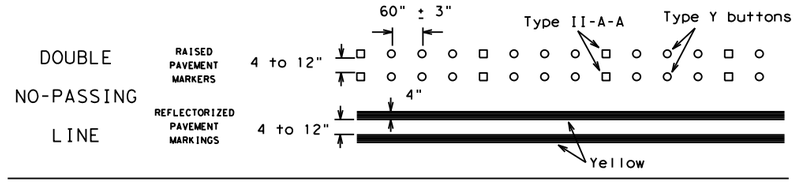
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

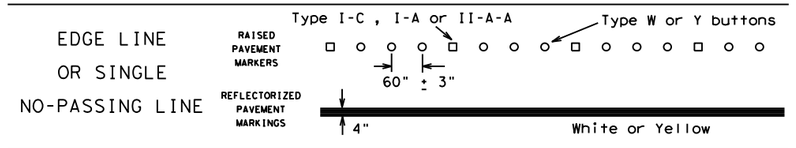
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

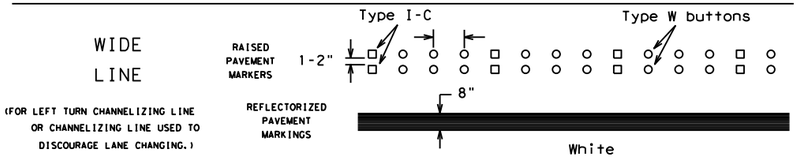


EDGE LINE OR SINGLE NO-PASSING LINE



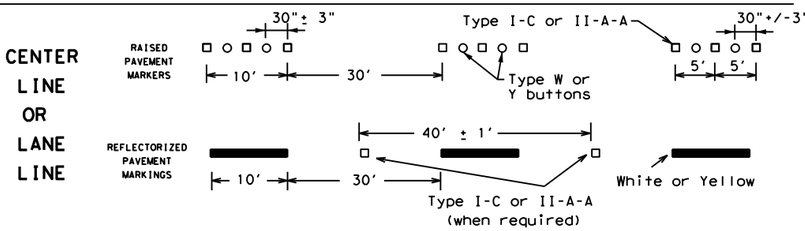
WIDE LINE

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

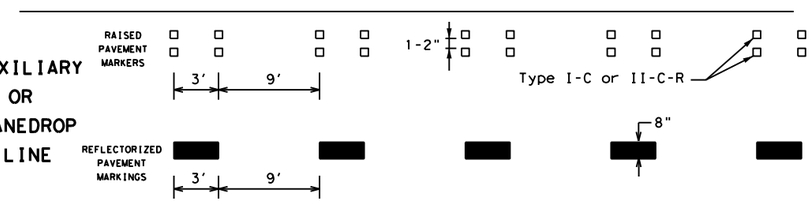


BROKEN LINES

CENTER LINE OR LANE LINE

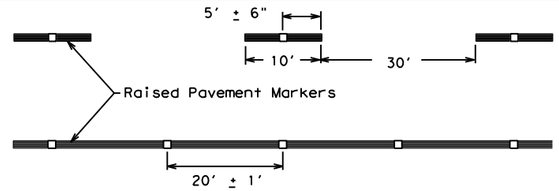


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

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



Centerline only - not to be used on edge lines

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

Texas Department of Transportation

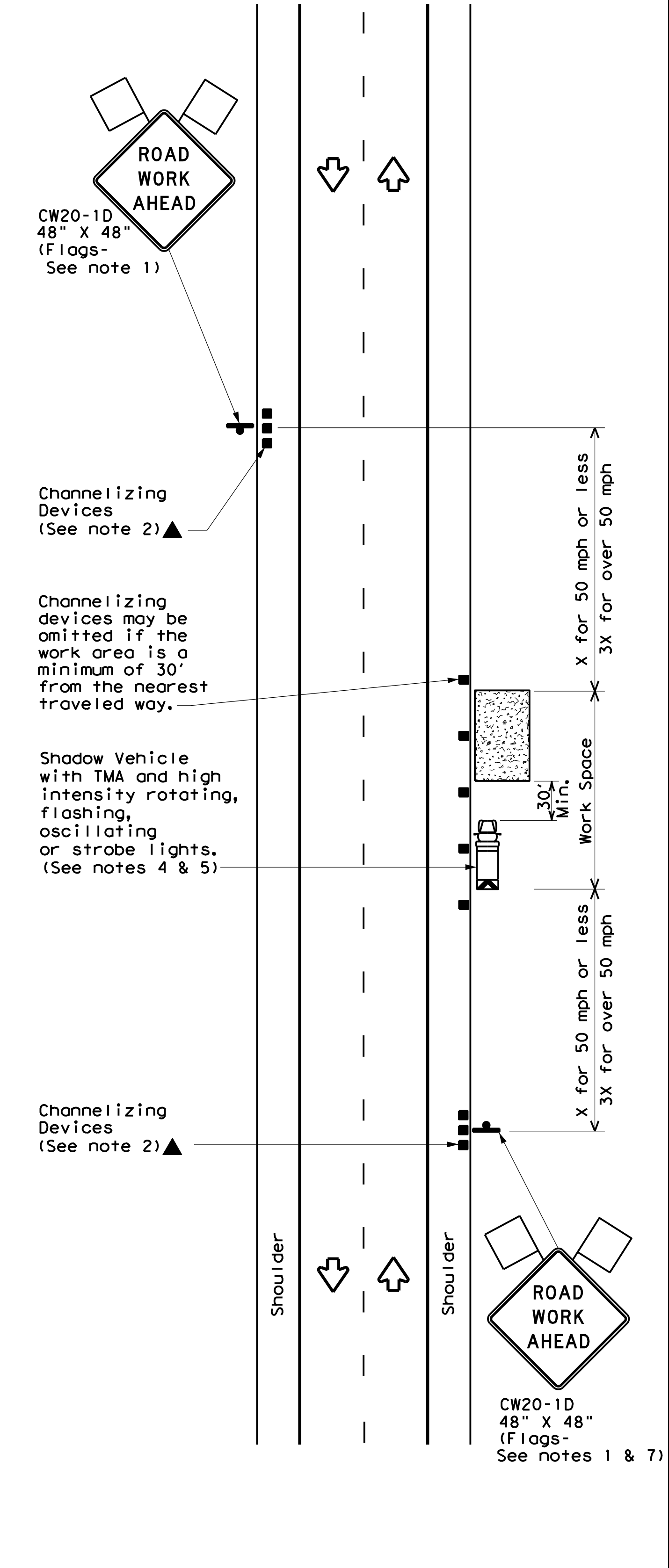
Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 1-97 9-07 5-21 2-98 7-13 11-02 8-14	1986	01	064	FM1314
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		49

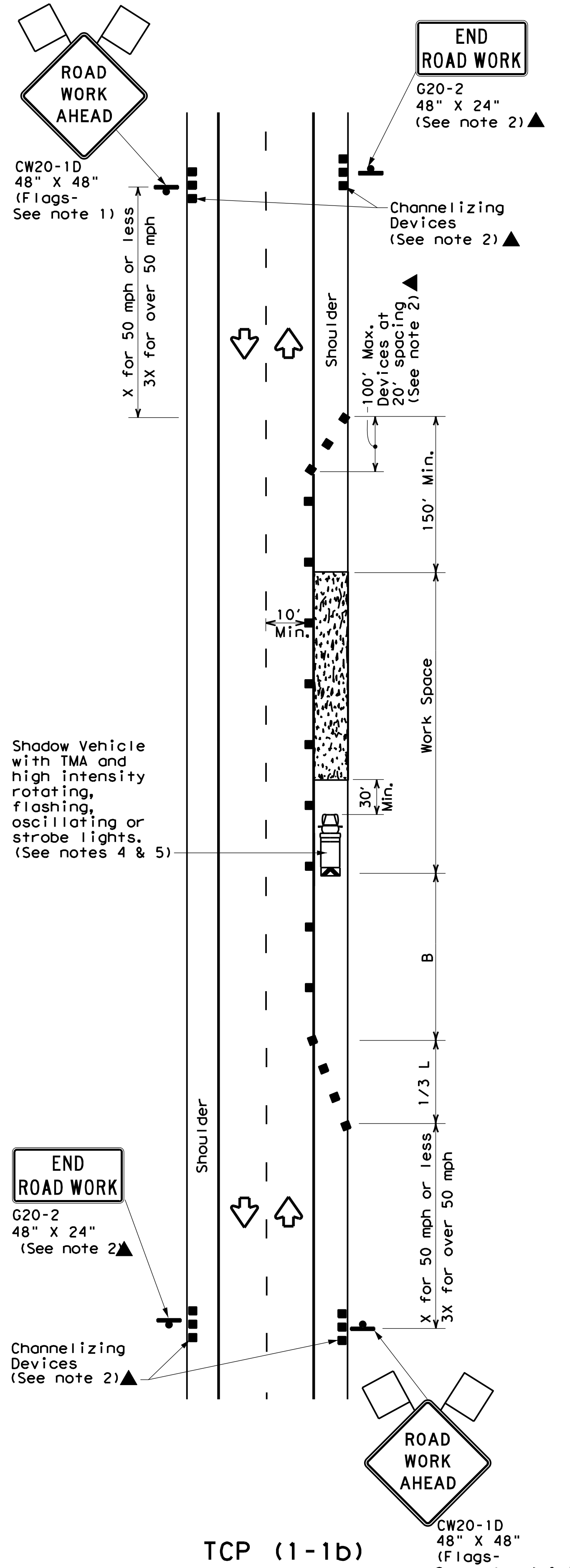
106



TCP (1-1a)

WORK SPACE NEAR SHOULDER

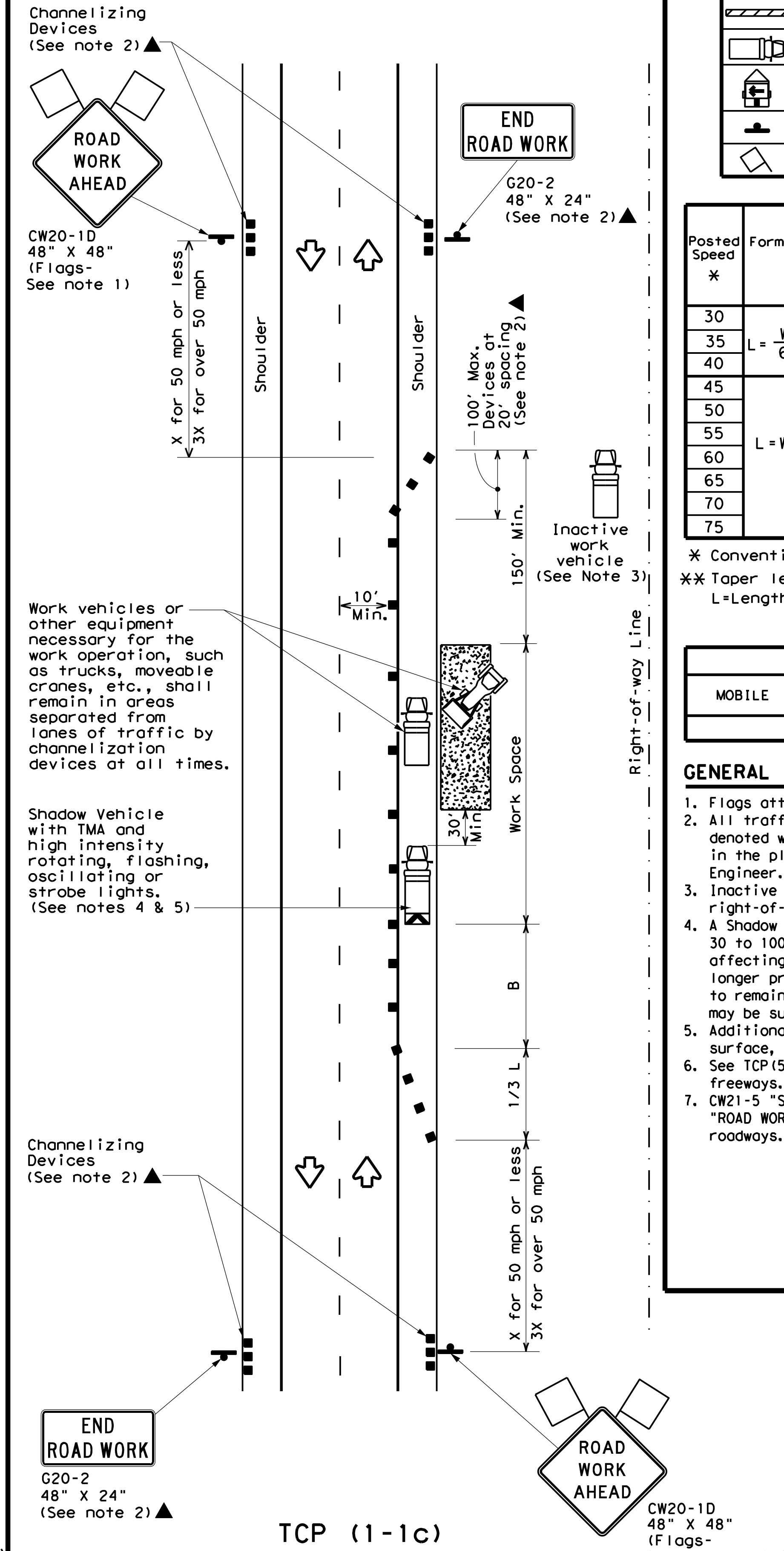
Conventional Roads



TCP (1-1b)

WORK SPACE ON SHOULDER

Conventional Roads



TCP (1-1c)

WORK VEHICLES ON SHOULDER

Conventional Roads

LEGEND

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

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

* Conventional Roads Only

** Taper lengths have been rounded off.

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

TYPICAL USAGE

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(1-1)-18

FILE: tcp1-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT 1986	SECT 01	JOB 064	HIGHWAY FM1314
REVISIONS 2-94 4-98 8-95 2-12 1-97 2-18	DIST HOU		COUNTY MONTGOMERY	SHEET NO. 50

151

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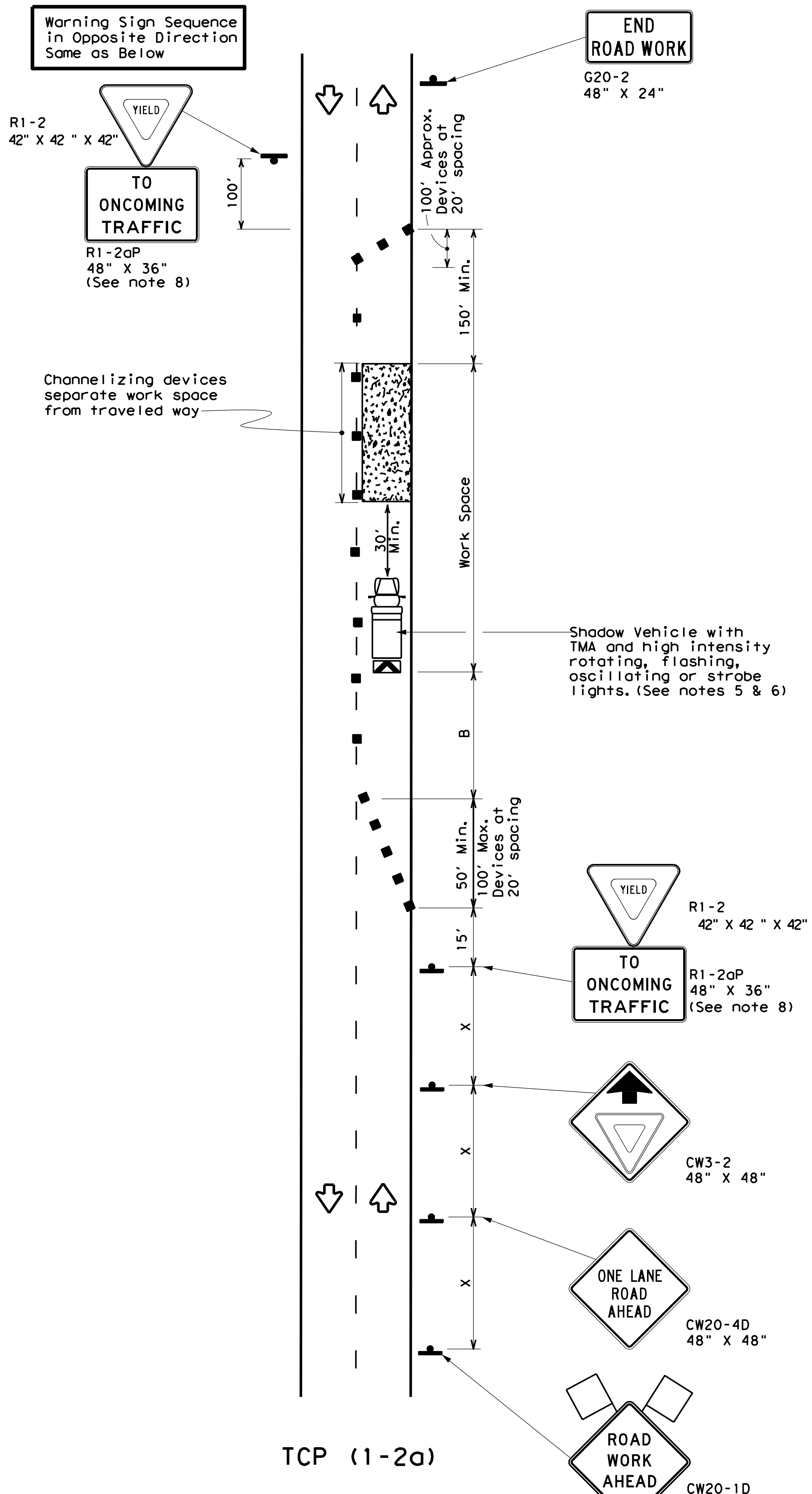
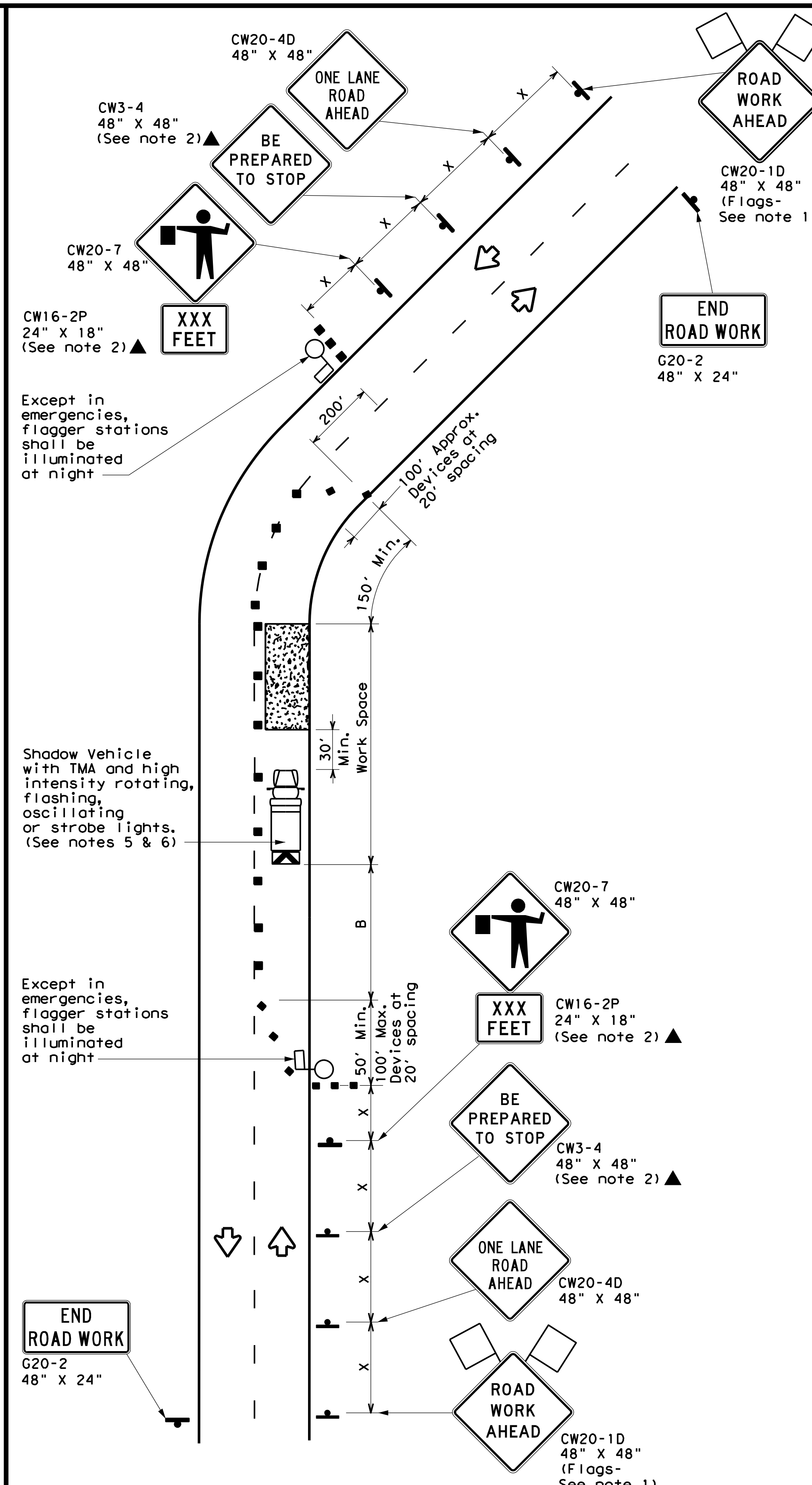


TCP (1-2a)

ONE LANE TWO-WAY CONTROL WITH YIELD SIGNS

(Less than 2000 ADT - See note 7)



TCP (1-2b)

ONE LANE TWO-WAY CONTROL WITH FLAGGERS

LEGEND

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

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

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

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

GENERAL NOTES

1. Flags attached to signs where shown are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. The CW3-4 "BE PREPARED TO STOP" sign may be installed after the CW20-4D "ONE LANE ROAD AHEAD" sign, but proper sign spacing shall be maintained.
4. Sign spacing may be increased or an additional CW20-1D "ROAD WORK AHEAD" sign may be used if advance warning ahead of the flagger or R1-2 "YIELD" sign is less than 1500 feet.
5. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
6. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.

TCP (1-2a)

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

TCP (1-2b)

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

Texas Department of Transportation | Traffic Operations Division Standard

TRAFFIC CONTROL PLAN ONE-LANE TWO-WAY TRAFFIC CONTROL

TCP(1-2)-18

FILE: tcp1-2-18.dgn	DN:	CK:	DW:	CK:	
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY	
REVISIONS 4-90 4-98 2-94 2-12 1-97 2-18	1986	01	064	FM1314	
	DIST	COUNTY		SHEET NO.	
	HOU	MONTGOMERY		51	

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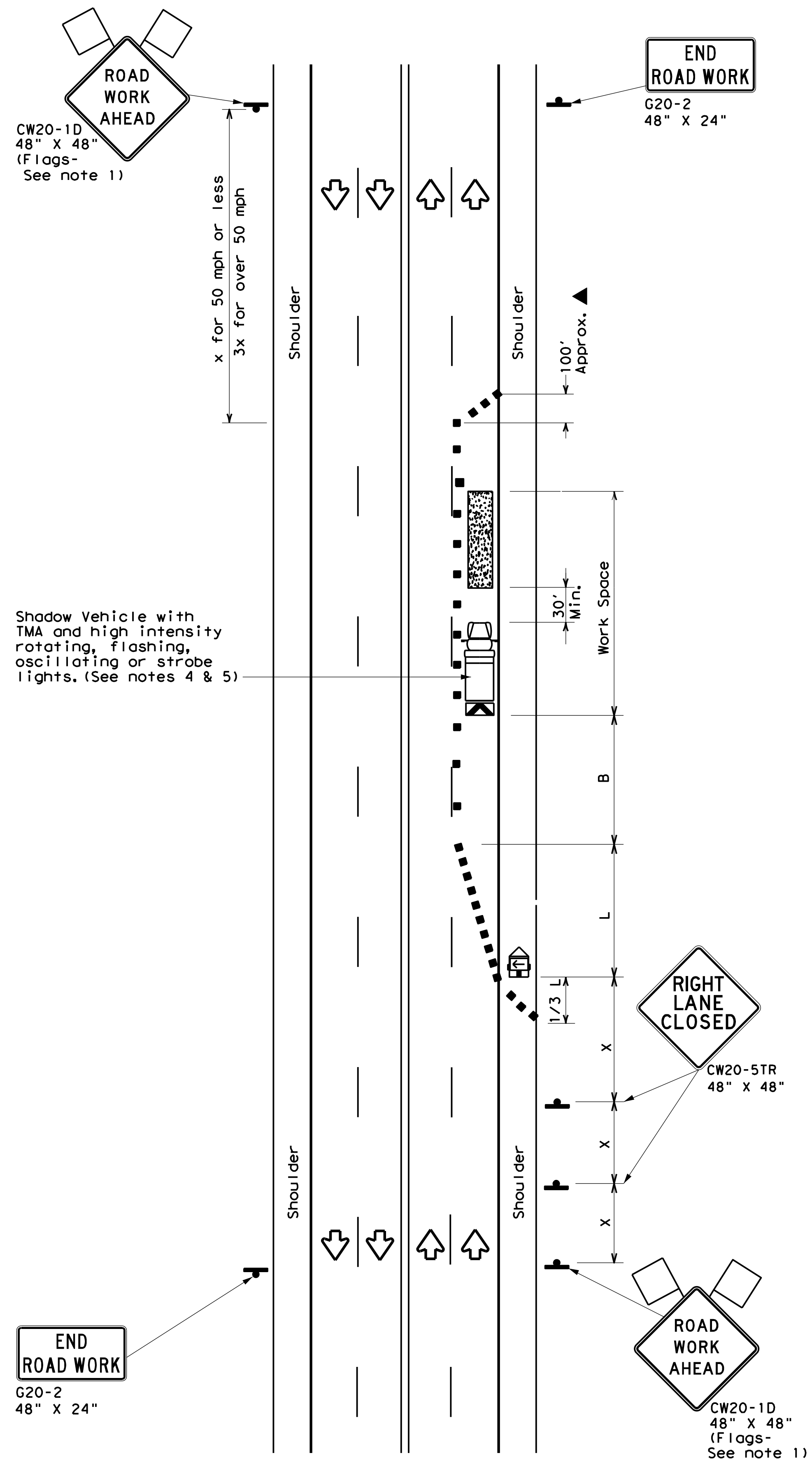
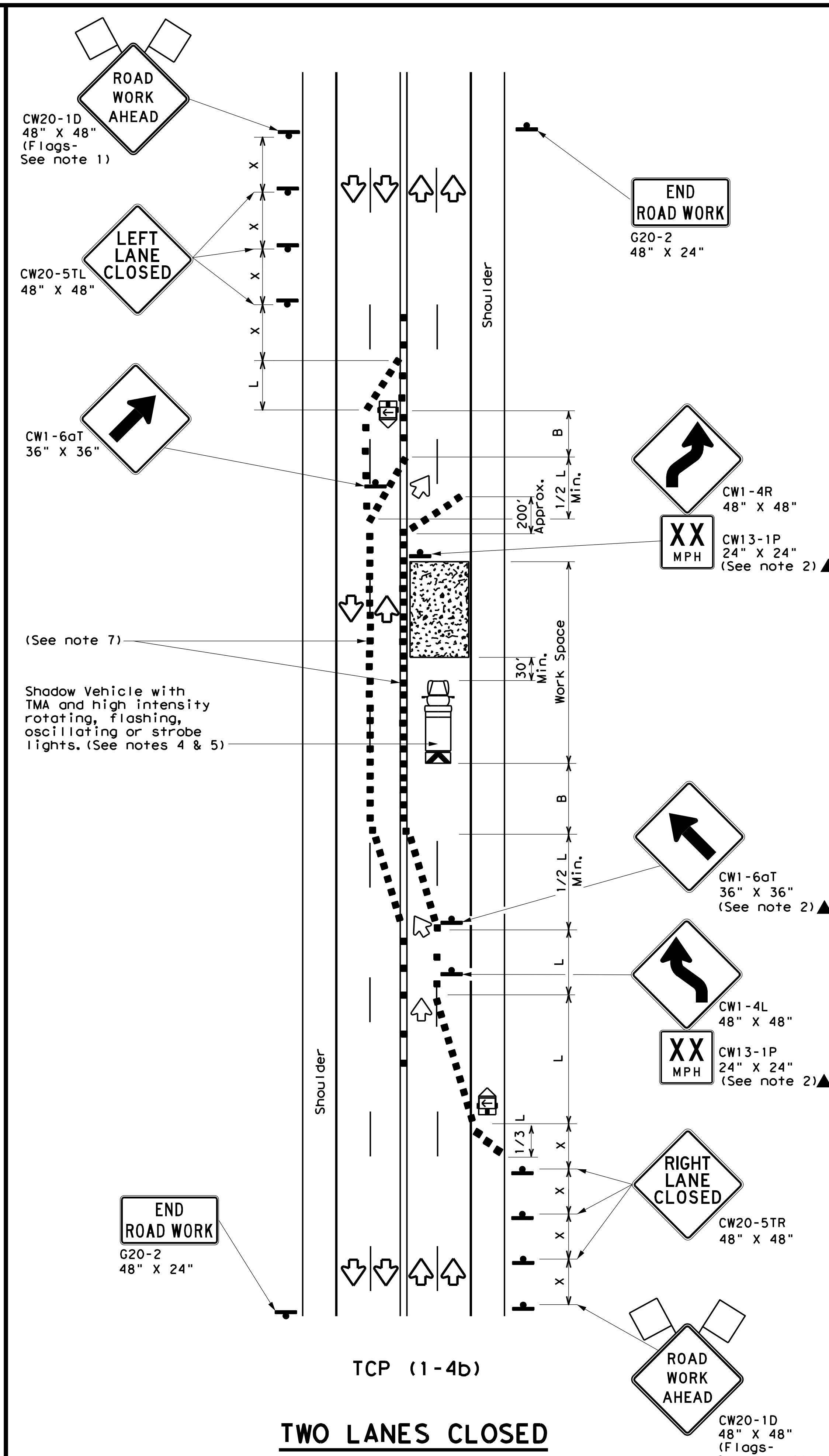


TCP (1-4a)

ONE LANE CLOSED



TCP (1-4b)

TWO LANES CLOSED

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

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

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

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

GENERAL NOTES

1. Flags attached to signs where shown are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. The CW20-1D "ROAD WORK AHEAD" sign may be repeated if the visibility of the work zone is less than 1500 feet.
4. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
5. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.

TCP (1-4a)

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

TCP (1-4b)

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

Texas Department of Transportation — Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LANE CLOSURES ON MULTILANE CONVENTIONAL ROADS

TCP(1-4)-18

FILE: tcp1-4-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 2-12 1-97 2-18	1986	01	064	FM1314
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		52

154

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DATE: 01/16/2024 08:41 AM
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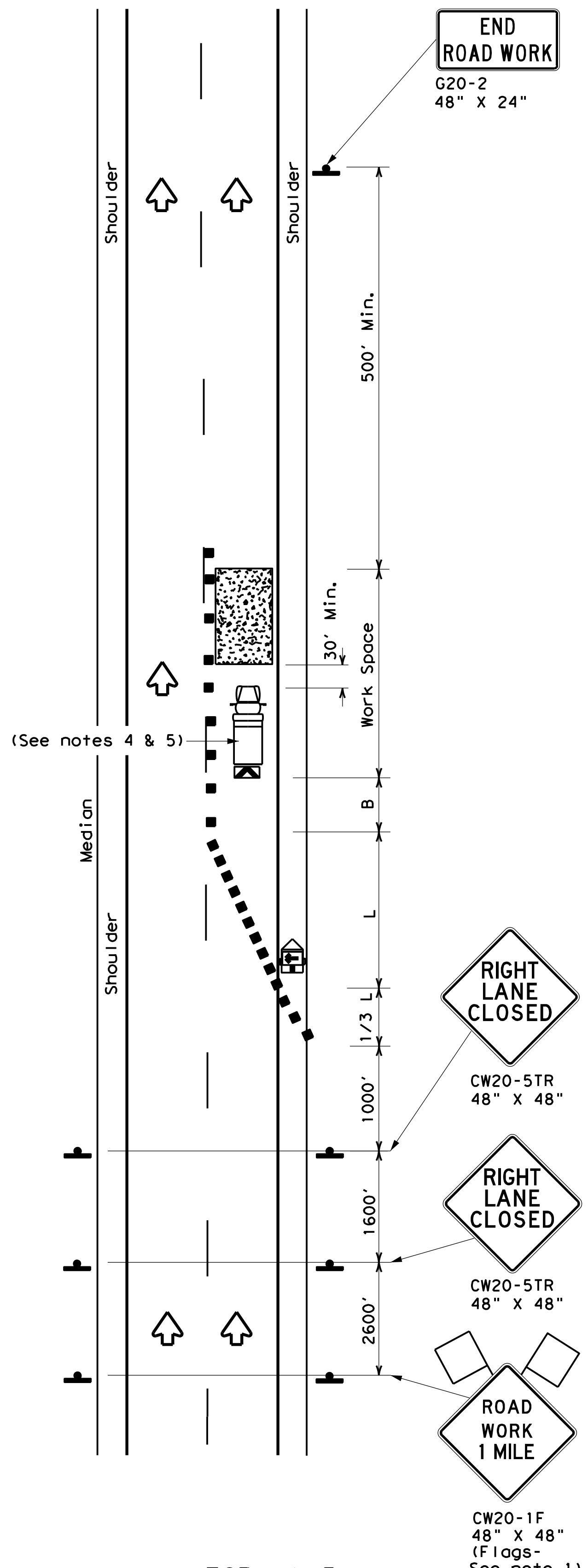
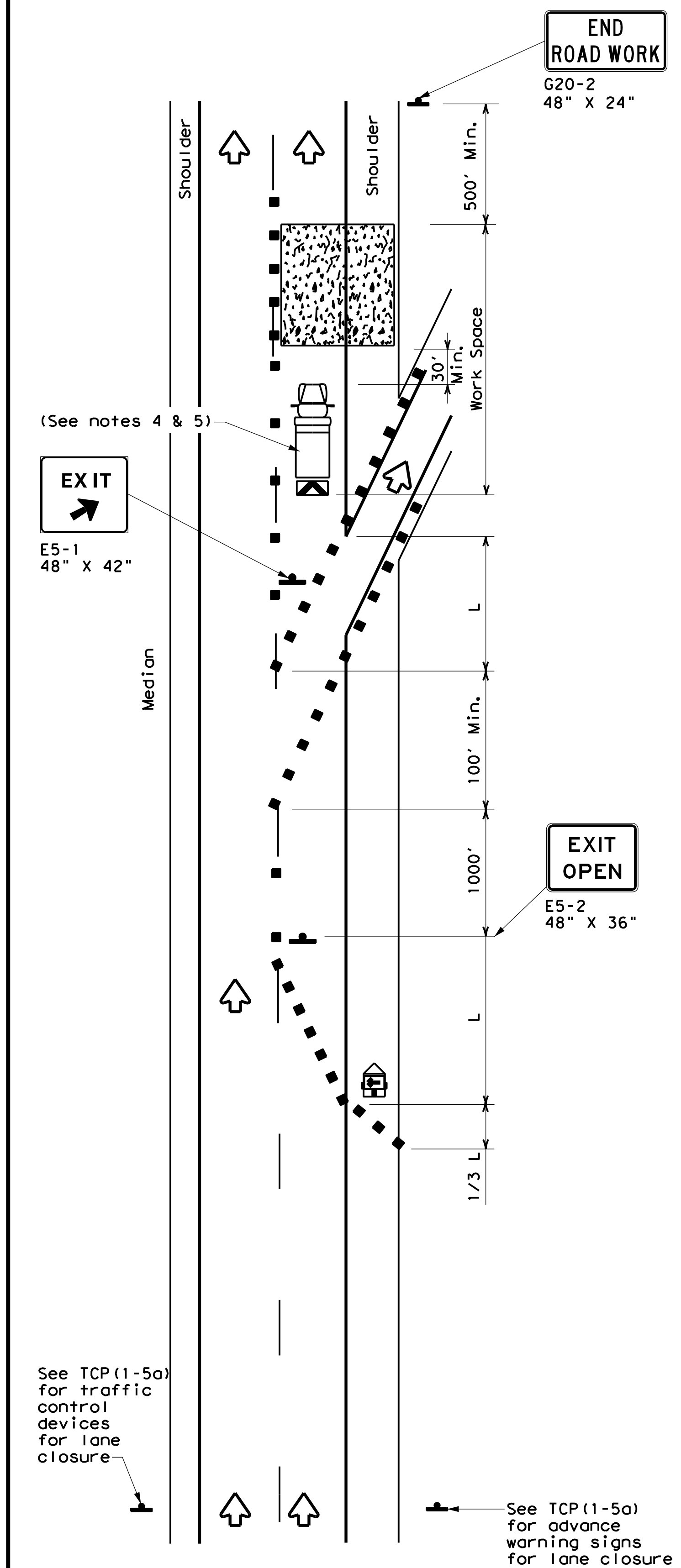


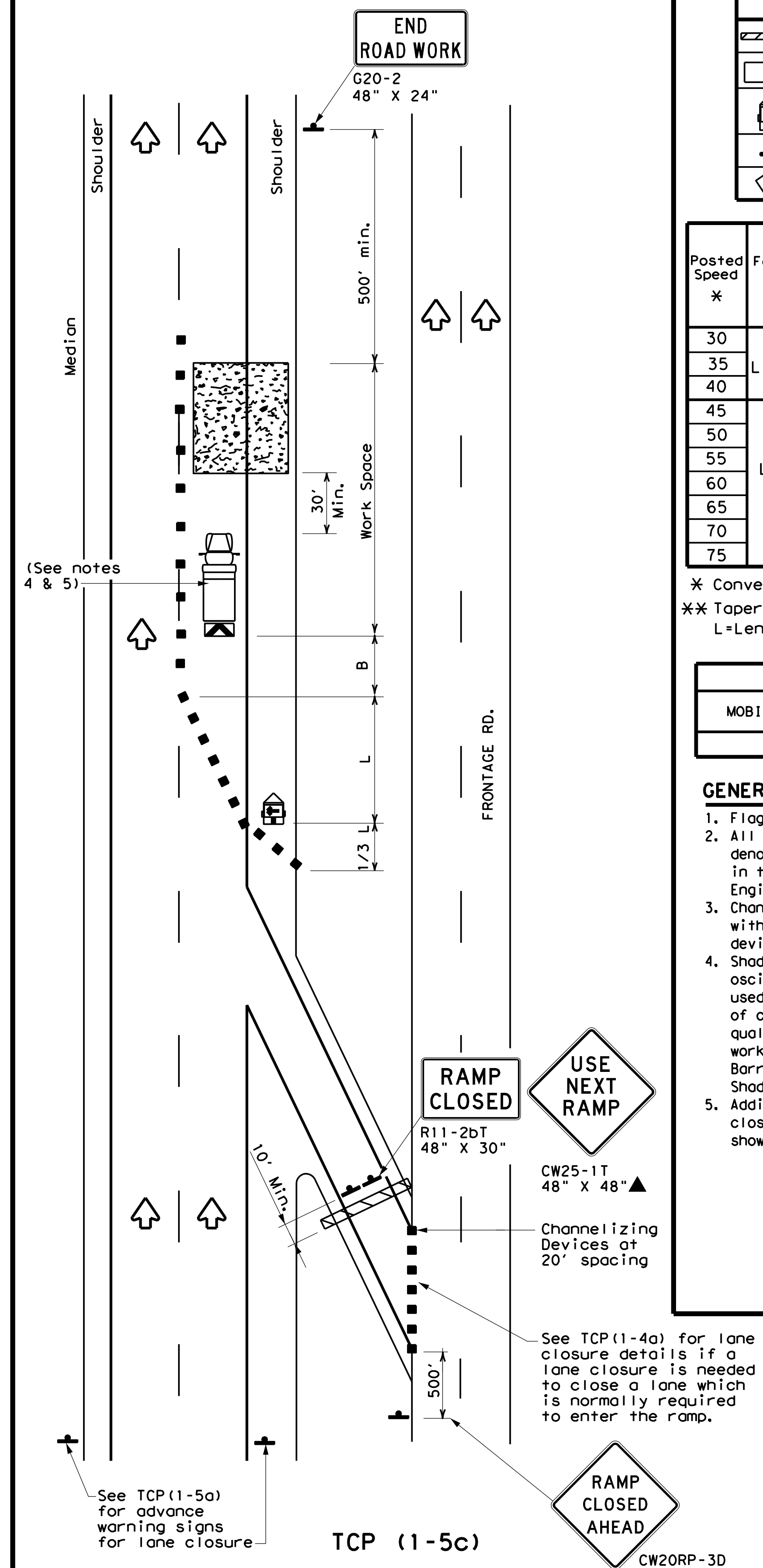
TCP (1-5a)

ONE LANE CLOSURE



TCP (1-5b)

LANE CLOSURE NEAR EXIT RAMPS



TCP (1-5c)

LANE CLOSURE NEAR ENTRANCE RAMPS

LEGEND

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. Channelizing devices used to close lanes may be supplemented with the Chevron Alignment Sign placed on every other channelizing device. Chevrons may be attached to plastic drums as per BC Standards.
4. Shadow Vehicle with TMA and high intensity rotating, flashing, oscillating or strobe lights. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
5. Additional Shadow Vehicles with TMAs may be positioned in each closed lane, on the shoulder or off the paved surface, next to those shown in order to protect a wider work space.

Texas Department of Transportation — Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LANE CLOSURES FOR DIVIDED HIGHWAYS

TCP(1-5)-18

FILE: tcp1-5-18.dgn	DN:	CK:	DW:	CK:
©TxDOT February 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-18	1986	01	064	FM1314
	DIST		COUNTY	SHEET NO.
	HOU		MONTGOMERY	53

DATE: 01/16/2024 08:41 AM
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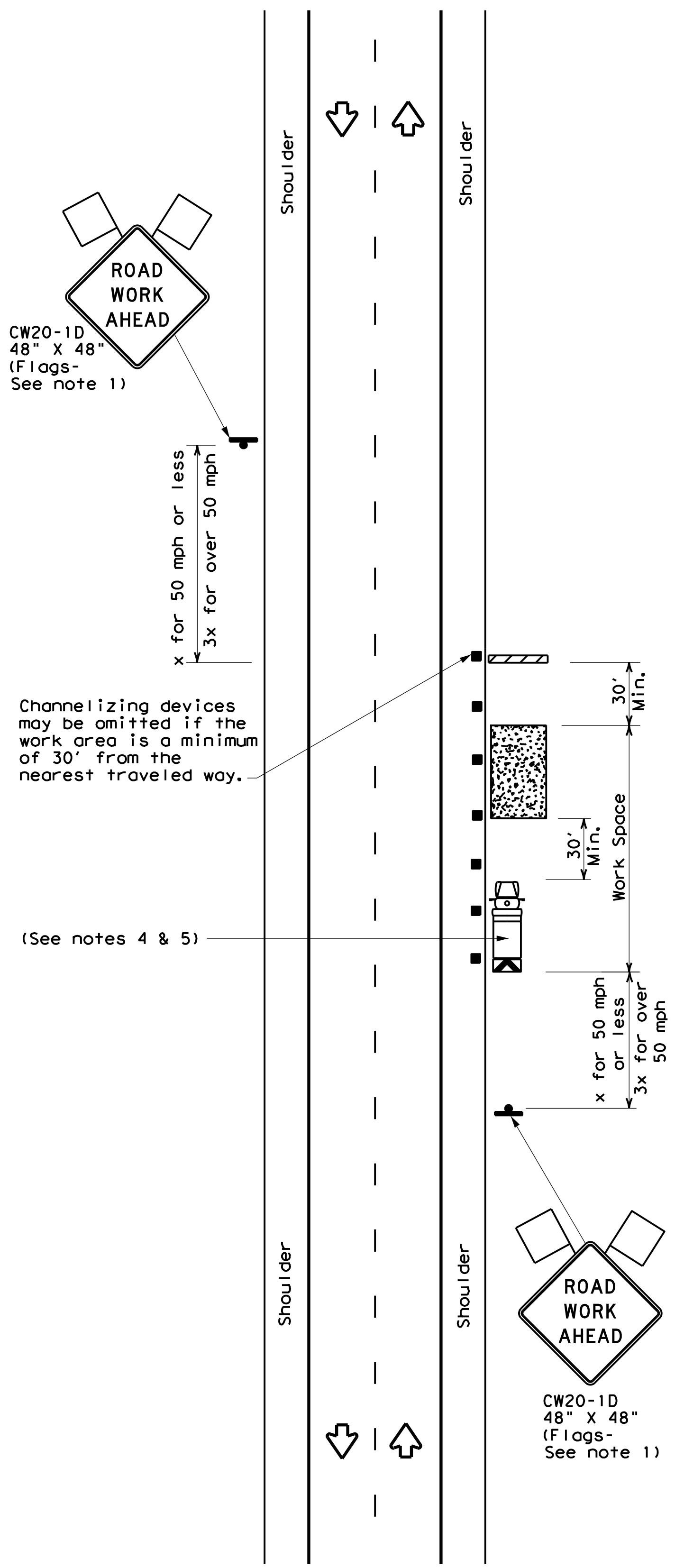
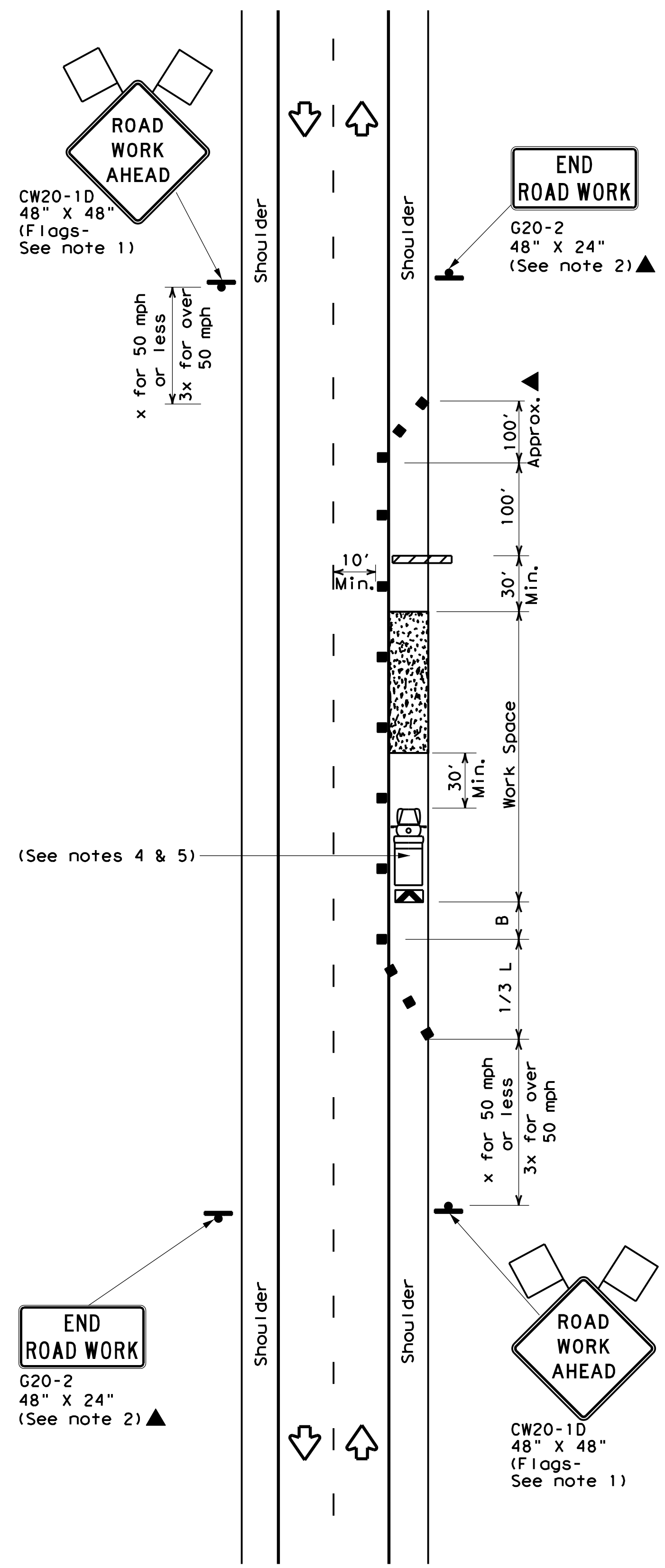


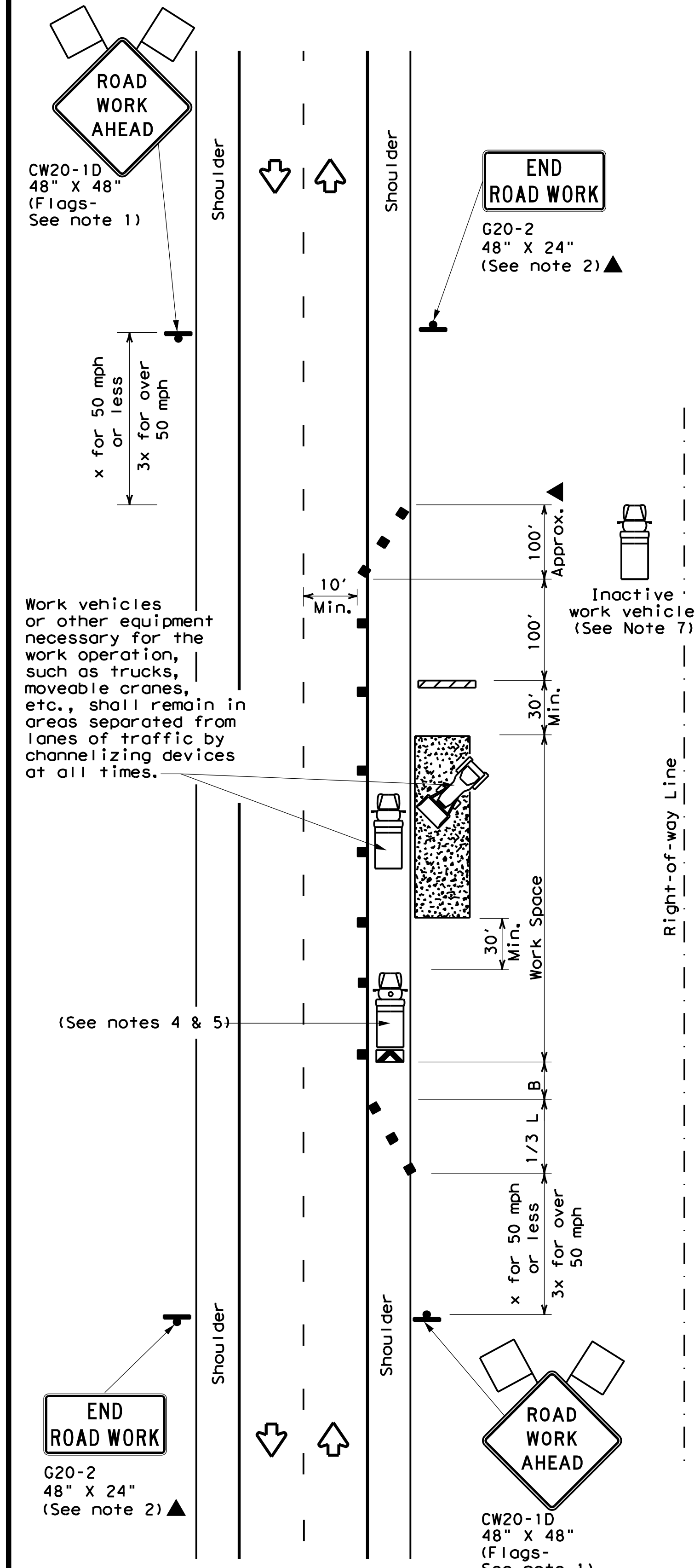
TCP (2-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (2-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (2-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

LEGEND

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

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

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

TYPICAL USAGE

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

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

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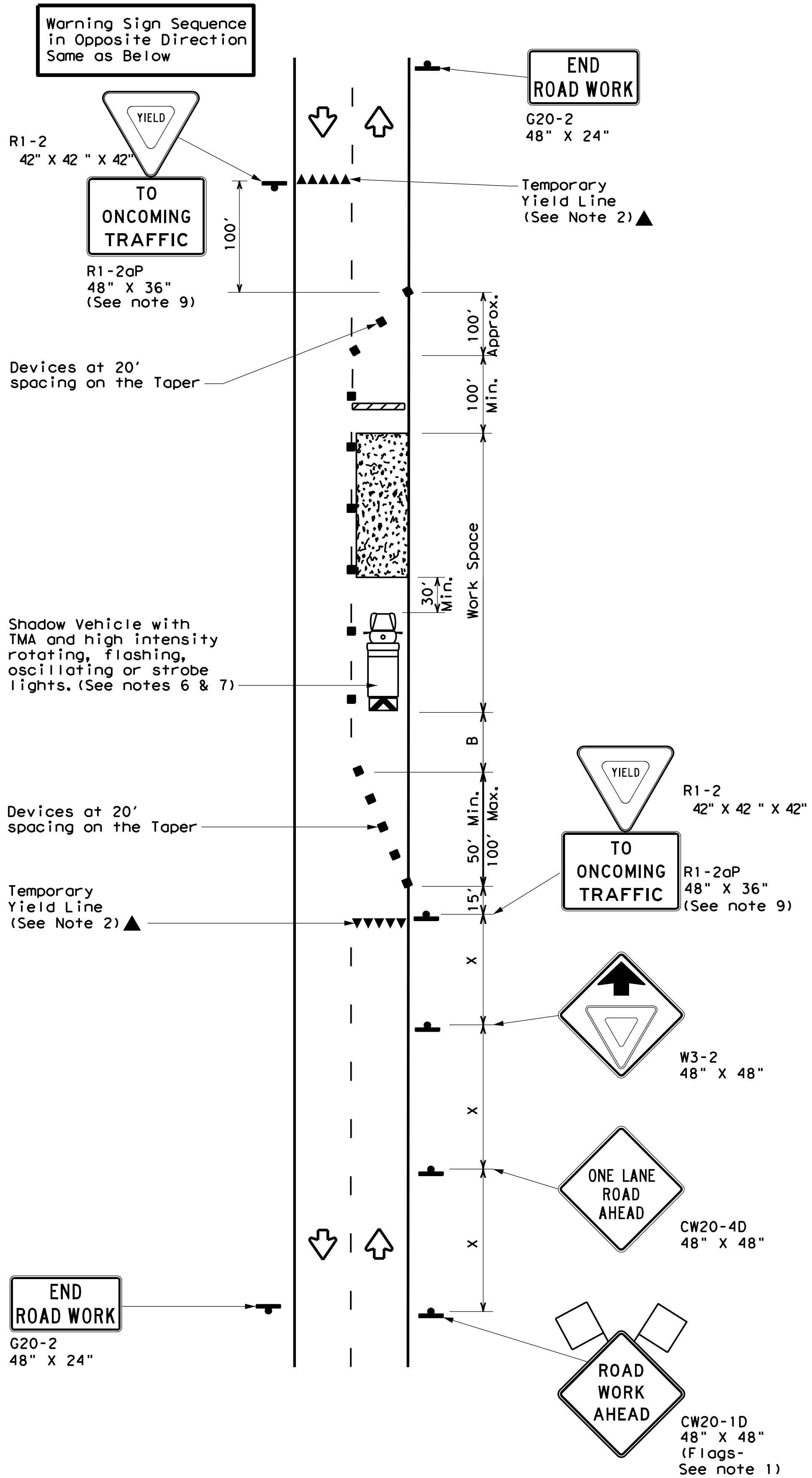
2-94 4-98	DIST		COUNTY	SHEET NO.
8-95 2-12 / 1-97 2-18	HOU		MONTGOMERY	54

161



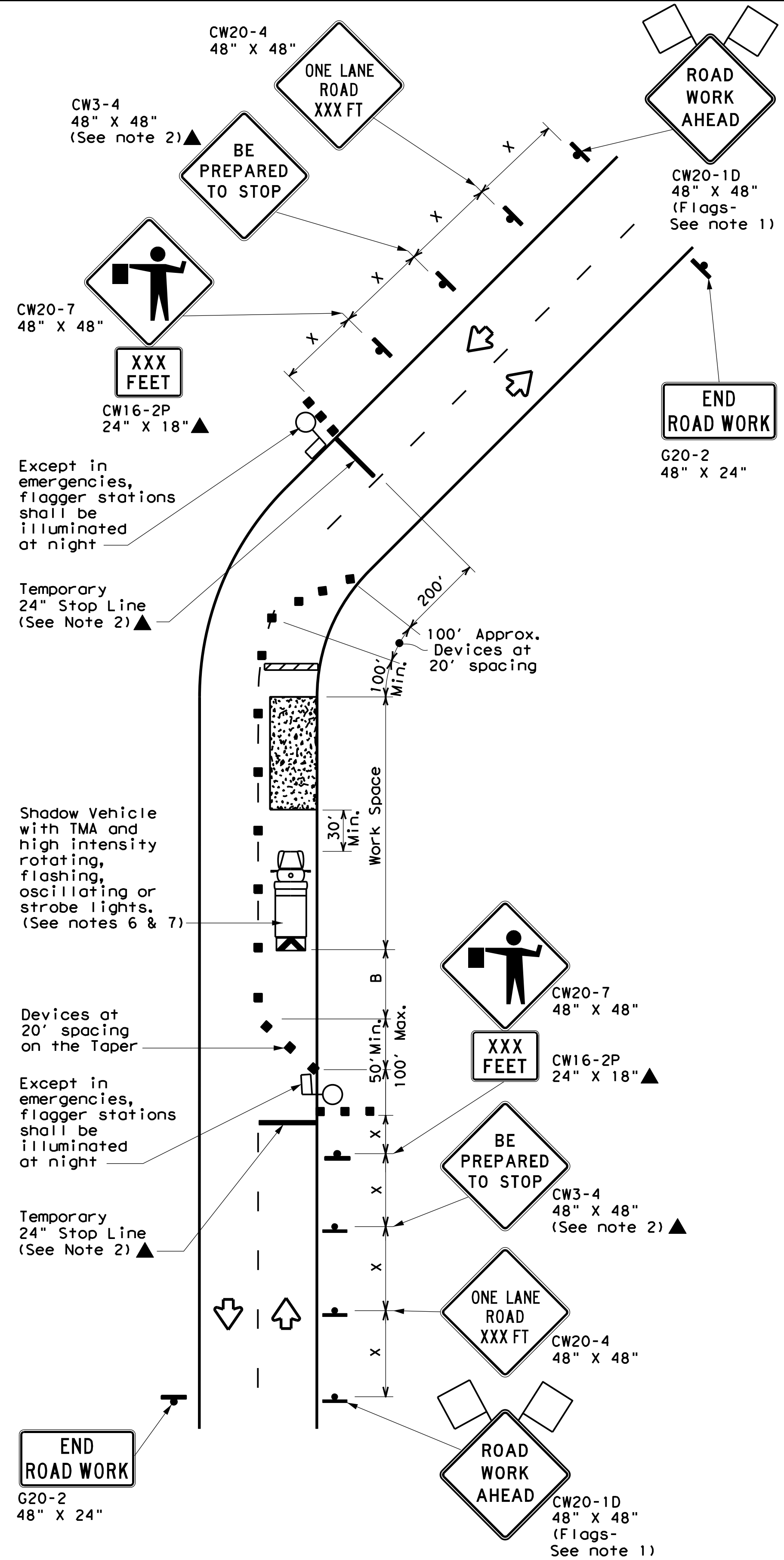
TCP (2-2a)

2-LANE ROADWAY WITHOUT PAVED SHOULDERS

ONE LANE TWO-WAY

CONTROL WITH YIELD SIGNS

(Less than 2000 ADT - See Note 9)



TCP (2-2b)

2-LANE ROADWAY WITHOUT PAVED SHOULDERS

ONE LANE TWO-WAY

CONTROL WITH FLAGGERS

LEGEND

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

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

* Conventional Roads Only

** Taper lengths have been rounded off.

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

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

GENERAL NOTES

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

TCP (2-2a)

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

TCP (2-2b)

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN ONE-LANE TWO-WAY TRAFFIC CONTROL

TCP(2-2)-18

FILE: tcp2-2-18.dgn	DN:	CK:	DW:	CK:

REVISIONS	CONT	SECT	JOB	HIGHWAY
8-95 3-03	1986	01	064	FM1314
1-97 2-12	DIST	COUNTY		SHEET NO.
4-98 2-18	HOU	MONTGOMERY		55

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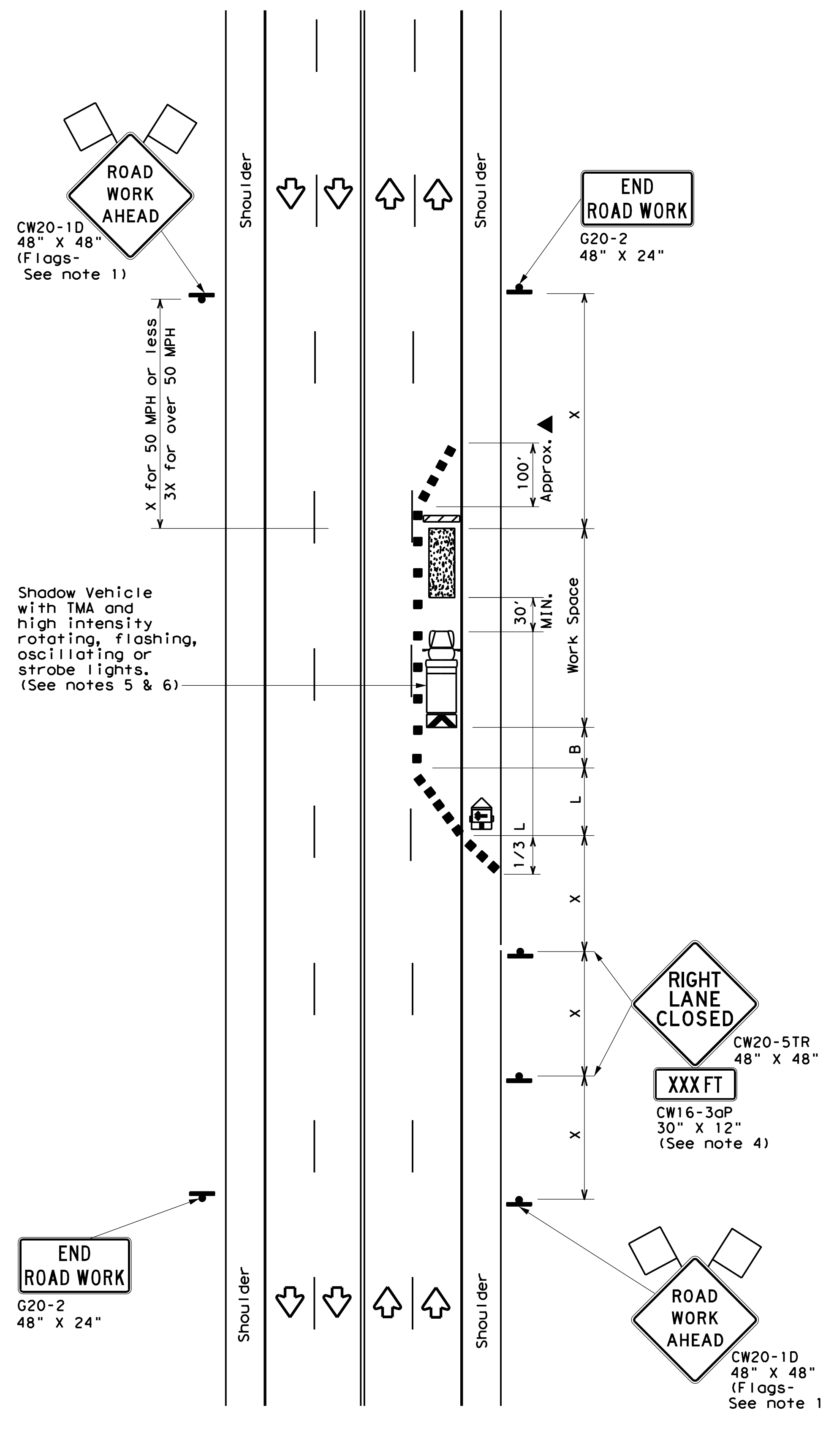
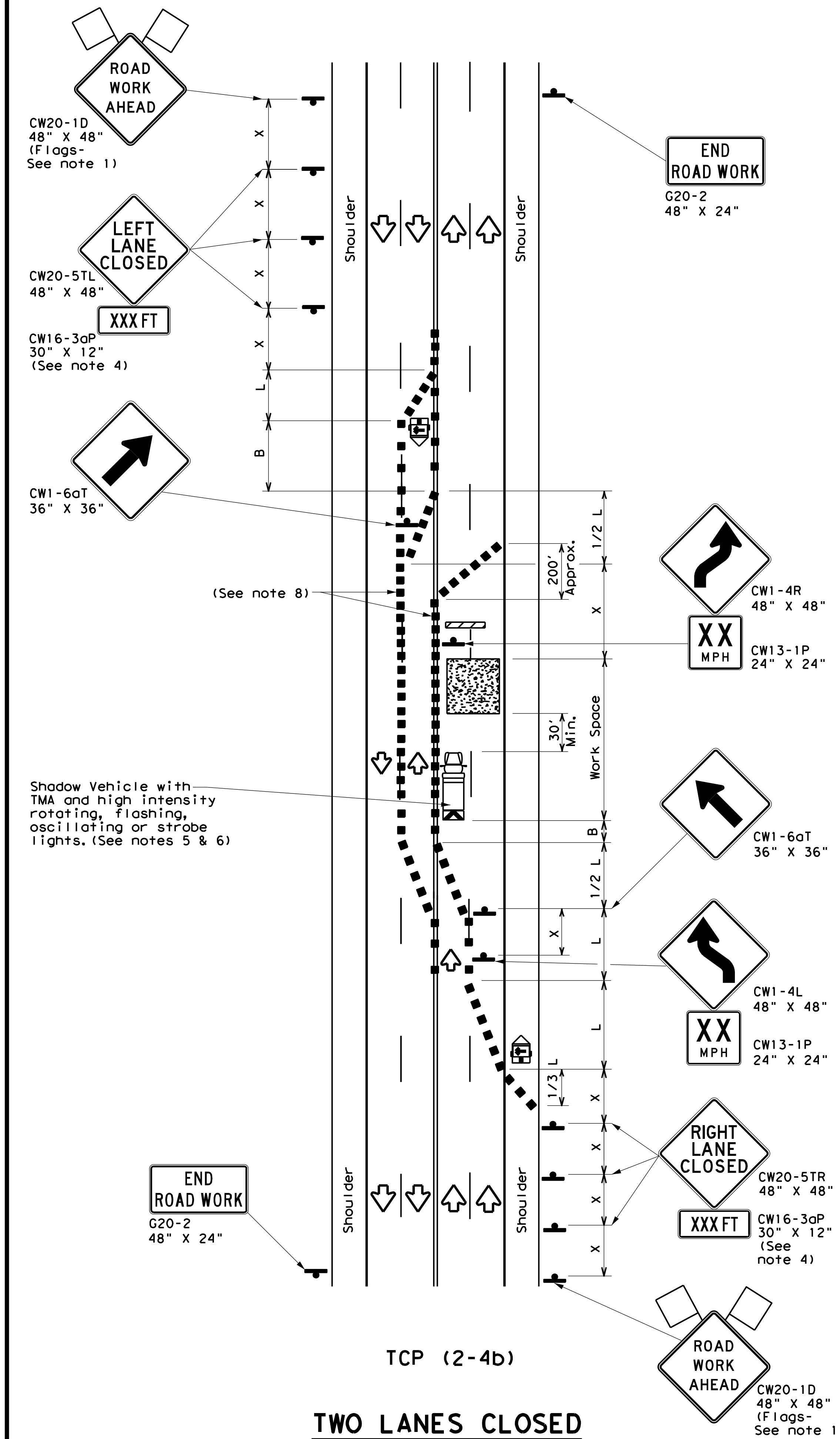


TCP (2-4a)

ONE LANE CLOSED



TCP (2-4b)

TWO LANES CLOSED

LEGEND

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

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

TCP (2-4a)

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

TCP (2-4b)

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LANE CLOSURES ON MULTILANE CONVENTIONAL ROADS

TCP(2-4)-18

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© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03 1-97 2-12 4-98 2-18	1986	01	064	FM1314
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		56

164

LEGEND

Symbol	Meaning	Symbol	Meaning
(barricade)	Type 3 Barricade	(devices)	Channelizing Devices
(vehicle)	Heavy Work Vehicle	(TMA)	Truck Mounted Attenuator (TMA)
(arrow board)	Trailer Mounted Flashing Arrow Board	(M)	Portable Changeable Message Sign (PCMS)
(sign)	Sign	(arrow)	Traffic Flow
(flag)	Flag	(flagger)	Flagger

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

* Conventional Roads Only

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

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

GENERAL NOTES

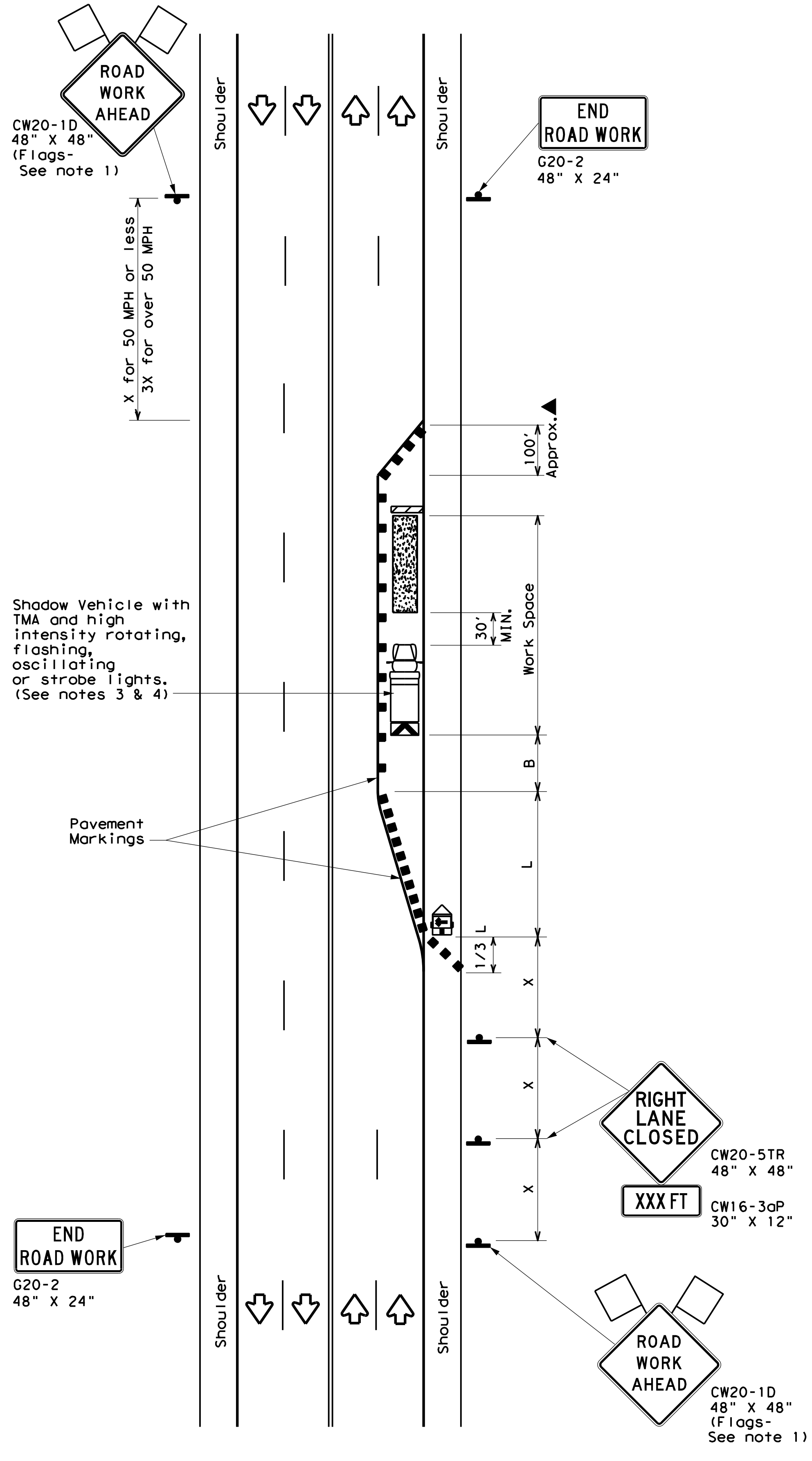
1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew eposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substitutued for the Shadow Vehicle and TMA.
4. Additional Shadow Vehicles with TMAs may be positioned in each closed lane, on the shoulder or off the paved surface, next to those shown in order to protect a wider work space.
5. The downstream taper is optional. When used, it should be 100 feet approximately per lane, with channelizing devices spaced at 20 feet.

TCP (2-5a)

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

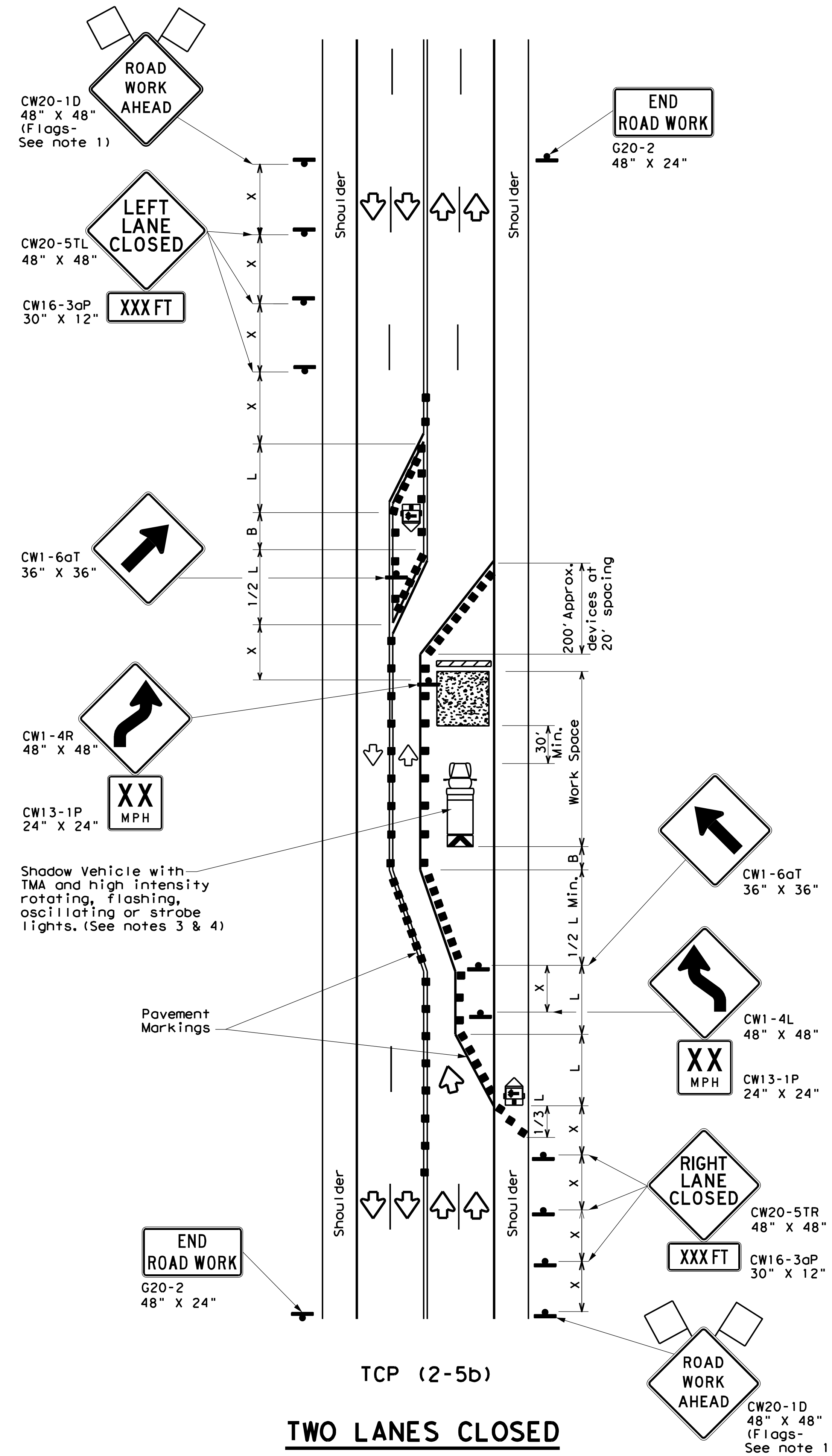
TCP (2-5b)

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



TCP (2-5a)

ONE LANE CLOSED



TCP (2-5b)

TWO LANES CLOSED

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Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LONG TERM LANE CLOSURES MULTILANE CONVENTIONAL RDS.

TCP(2-5)-18

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© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
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	HOU		MONTGOMERY	57

165

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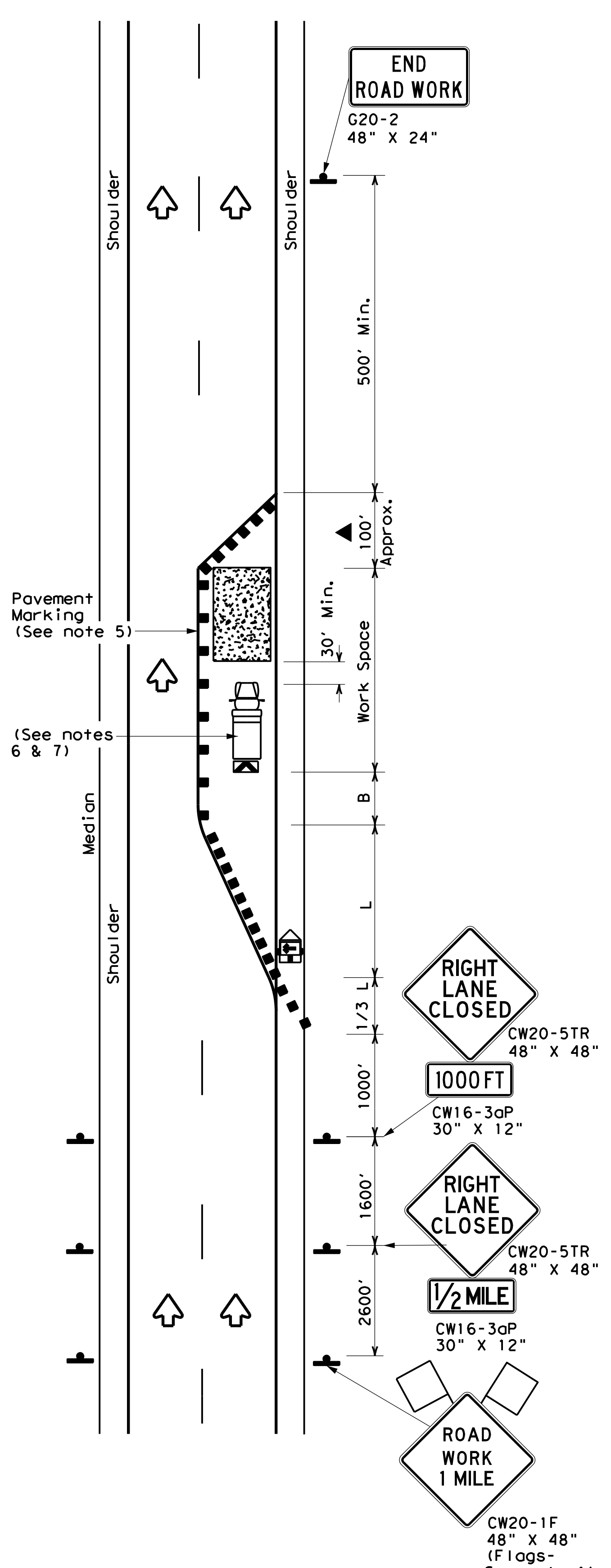
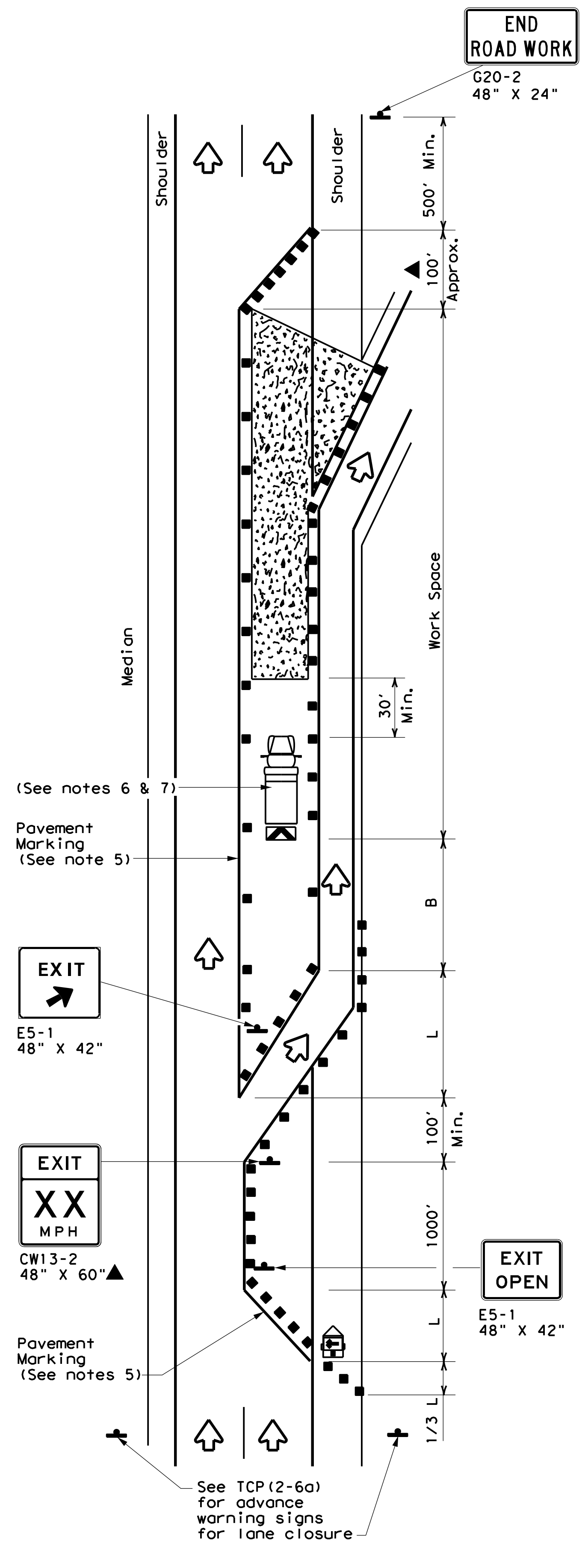


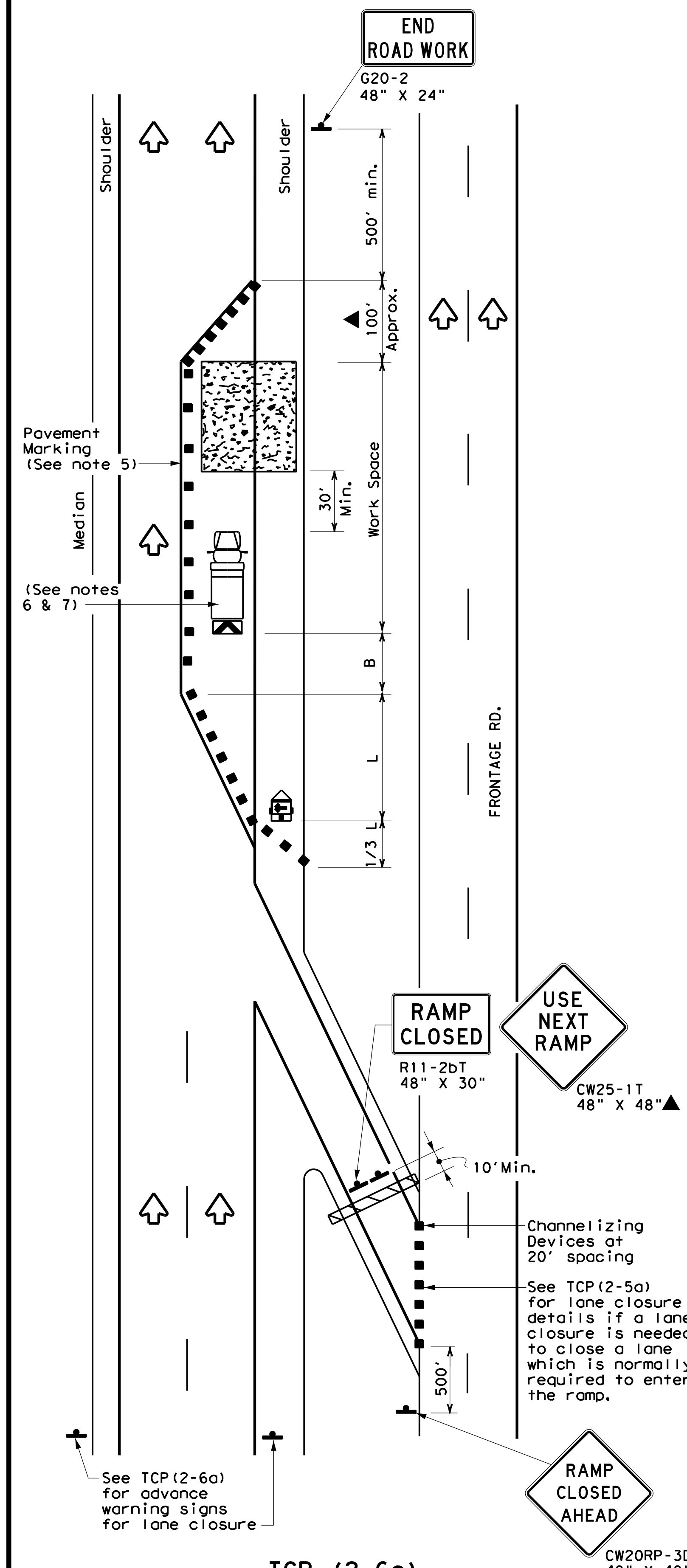
TCP (2-6a)

ONE LANE CLOSURE



TCP (2-6b)

LANE CLOSURE NEAR EXIT RAMPS



TCP (2-6c)

LANE CLOSURE NEAR ENTRANCE RAMPS

LEGEND

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. Channelizing devices used to close lanes may be supplemented with the Chevron Alignment Sign placed on every other channelizing device. Chevrons may be attached to plastic drums as per BC Standards.
4. Channelizing devices used along the work space or along tangent sections may be supplemented with vertical panels (VP) placed on everyother channelizing device. If night time conditions make it difficult to see at least two VPs, the VPs may be placed on each channelizing device.
5. The placement of pavement markings may be omitted on Intermediate-term stationary work zones with the approval of the Engineer.
6. Shadow Vehicle with TMA and high intensity rotating, flashing,oscillating or strobe lights. Shadow Vehicle with TMA and high intensity rotating, flashing, oscillating or strobe lights. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
7. Additional Shadow Vehicles with TMAs may be positioned in each closed lane, on the shoulder or off the paved surface, next to those shown in order to protect a wider work space.

Texas Department of Transportation — Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LANE CLOSURES ON DIVIDED HIGHWAYS

TCP(2-6)-18

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© TxDOT December 1985	CONT	SECT	JOB		HIGHWAY
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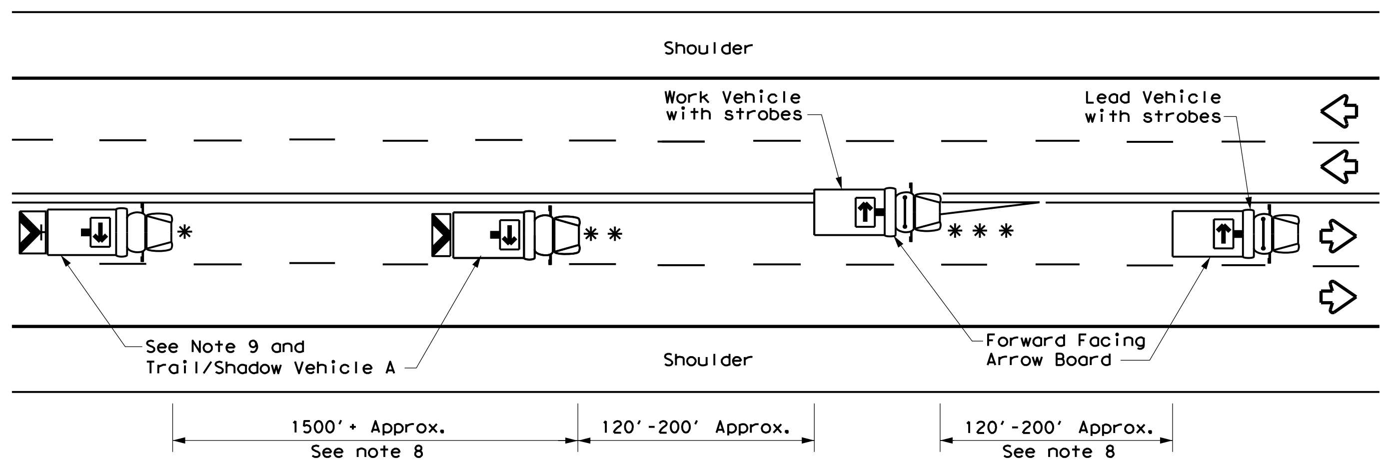
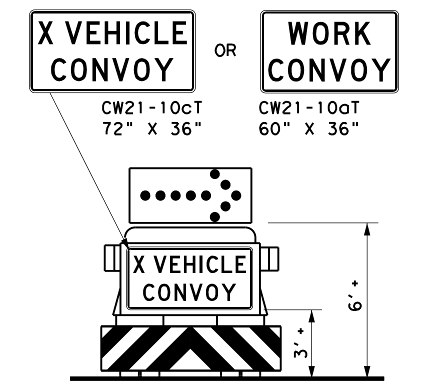
	HOU	MONTGOMERY		58	



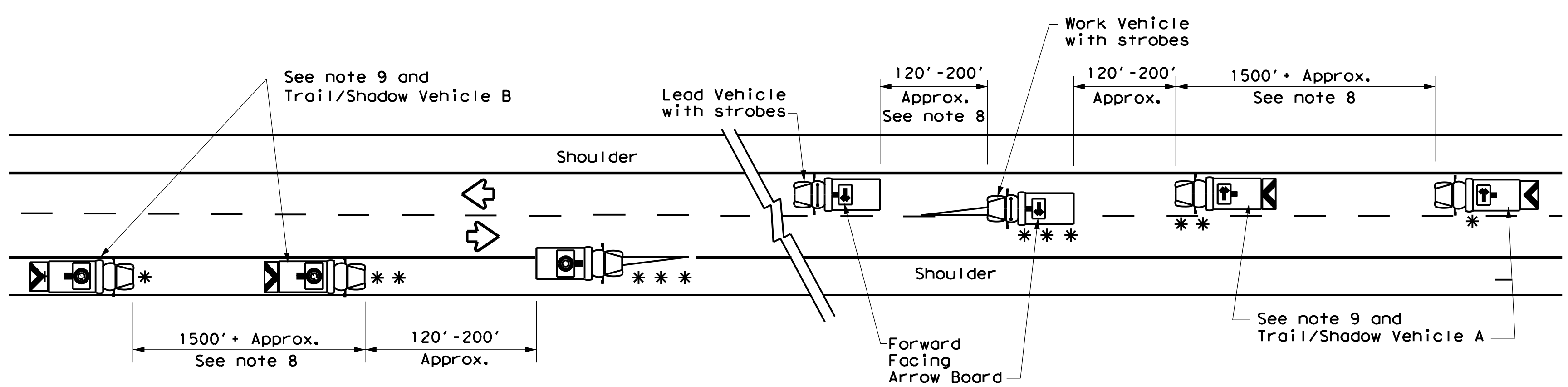
TCP (3-1a)

UNDIVIDED MULTILANE ROADWAY



TRAIL/SHADOW VEHICLE A

with RIGHT Directional
display Flashing Arrow Board

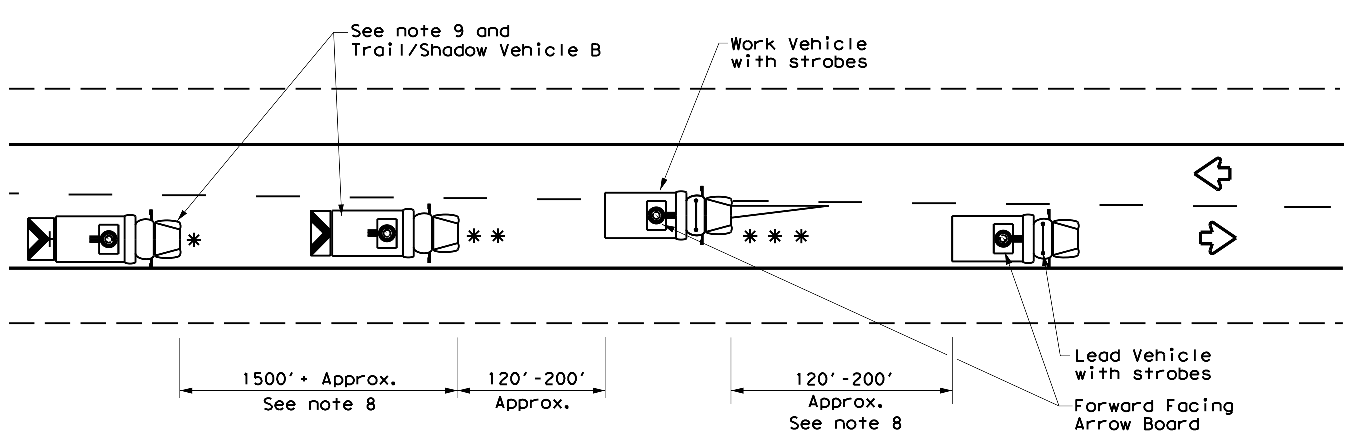


WORK ON SHOULDER

WORK ON TRAVEL LANE

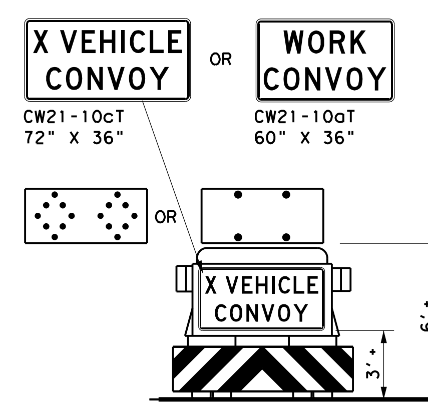
TCP (3-1b)

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

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

TYPICAL USAGE

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

GENERAL NOTES

1. TRAIL, SHADOW, and LEAD vehicles shall be equipped with arrow boards as illustrated. When a LEAD vehicle is not used 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.

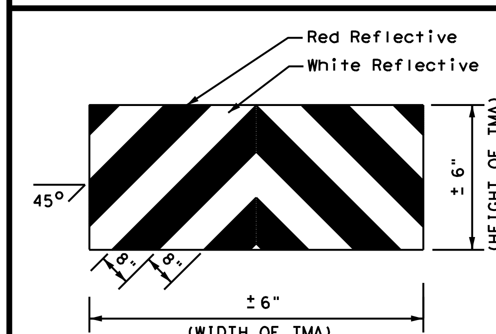
6. Each vehicle shall have two-way radio communication capability.

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

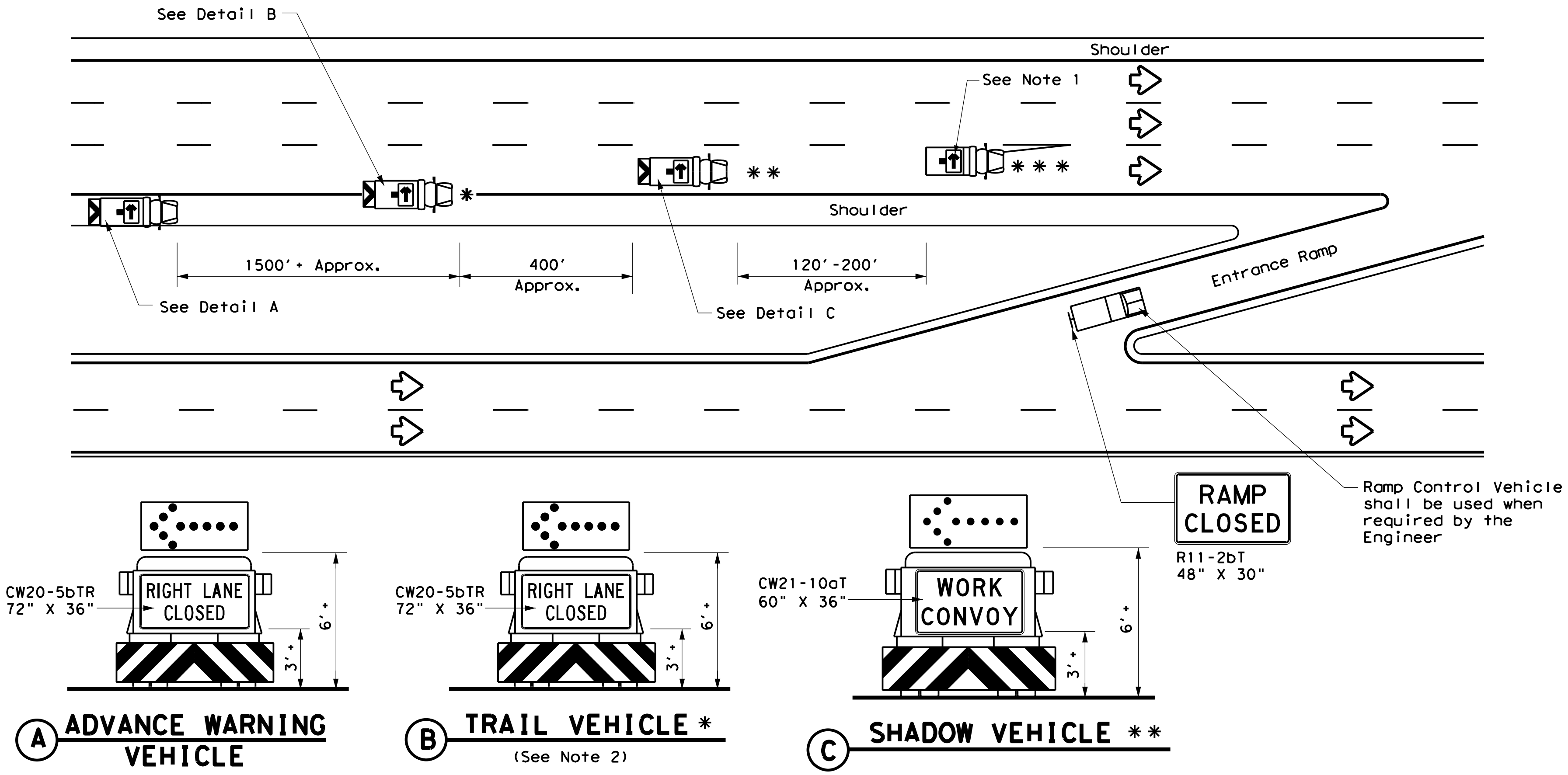
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS UNDIVIDED HIGHWAYS

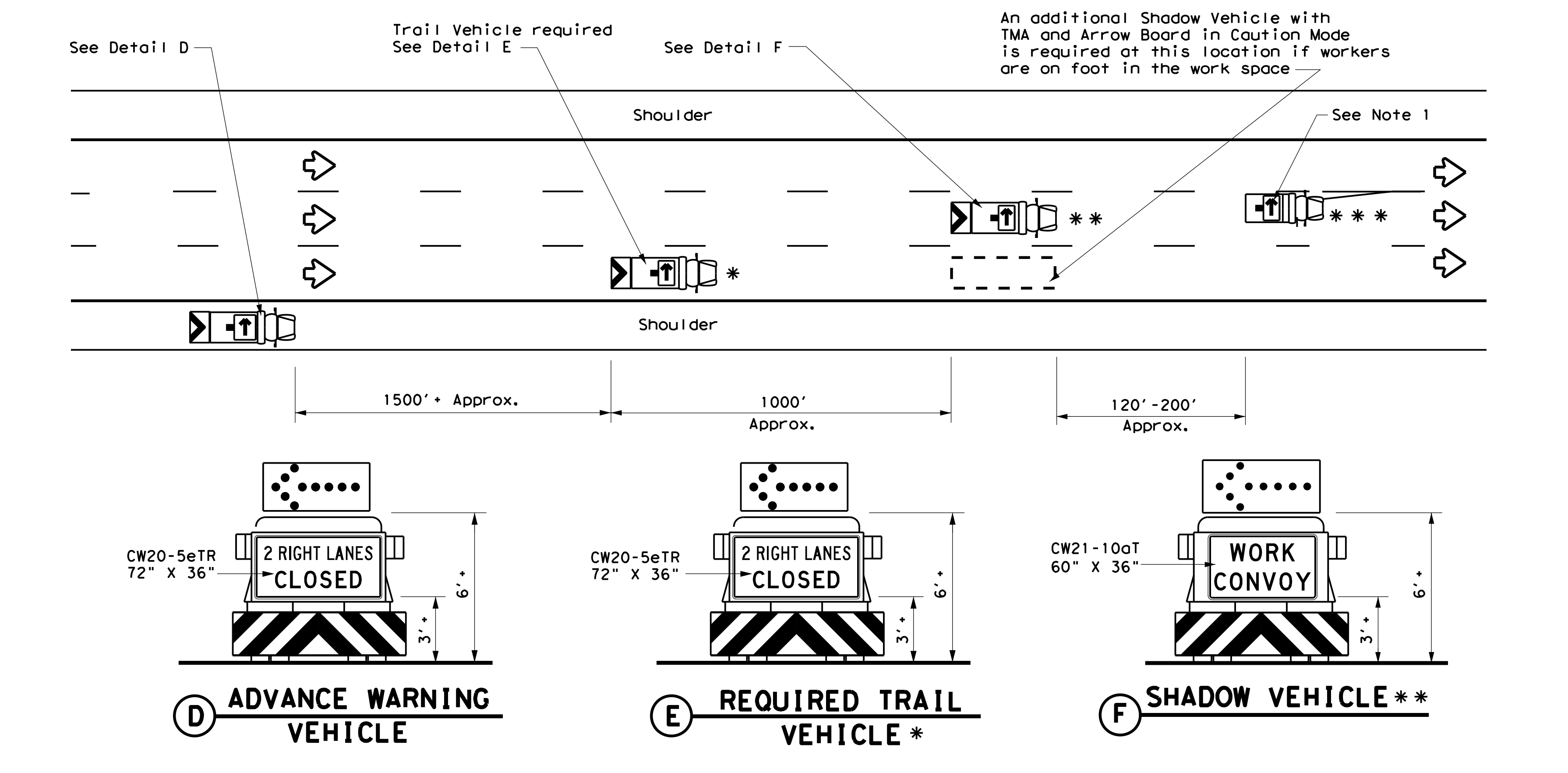
TCP(3-1)-13

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	1986	01	064	FM1314
	DIST		COUNTY	SHEET NO.
	HOU		MONTGOMERY	59

175



RIGHT LANE CLOSURE ON DIVIDED HIGHWAY - TCP(3-2a)



INTERIOR LANE CLOSURE ON MULTI-LANE DIVIDED HIGHWAY - TCP(3-2b)

LEGEND

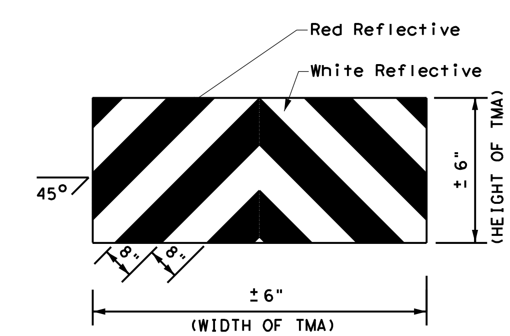
Symbol	Description	Symbol	ARROW BOARD DISPLAY
*	Trail Vehicle		
**	Shadow Vehicle		
***	Work Vehicle		RIGHT Directional
	Heavy Work Vehicle		LEFT Directional
	Truck Mounted Attenuator (TMA)		Double Arrow
	Traffic Flow		CAUTION (Alternating Diamond or 4 Corner Flash)

TYPICAL USAGE

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

GENERAL NOTES

1. ADVANCE WARNING, TRAIL and SHADOW vehicles shall be equipped with Type B or Type C flashing arrow boards as per the Barricade and Construction (BC) standards. Arrow boards on WORK vehicles will be optional based on the type of work being performed. The arrow boards shall be operated from inside the vehicle.
2. For TCP(3-2a) the Engineer will determine if the TRAIL VEHICLE is required based on prevailing roadway conditions, traffic volume, and sight distance restrictions. All other vehicles shown for both TCP(3-2a) and TCP(3-2b) are required.
3. 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.
4. The use of truck mounted attenuators (TMA) on the ADVANCE WARNING, SHADOW, and TRAIL vehicles are required.
5. Reflective sheeting on the rear of the TMA shall meet or exceed the reflectivity and color requirements of DMS 8300, Type A.
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 may vary according to terrain, work activity and other factors.
9. Standard 48" X 48" diamond shaped warning signs with the same message as those shown may be used where adequate mounting space exists.
10. The signs shown should be used on the Advance Warning Vehicle. As an option, a portable changeable message sign (PCMS) or a 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, must 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. Standard diamond shape versions of the CW20-5 series signs may be used as an option if the rectangular signs shown are not available.
12. The principles on this sheet may be used to close lanes from the left side of the roadway considering the number of lanes, shoulder width, sight distance,and ramp frequency.
13. Signs and flashing arrow board modes shall be appropriately altered when implementing left lane closures or interior closures which close the left lanes.
14. The Advance Warning Vehicle may straddle the edgeline when shoulder width makes it necessary.



STRIPING FOR TMA

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS DIVIDED HIGHWAYS

TCP(3-2)-13

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© TxDOT December 1985	CONT 1986	SECT 01	JOB 064	HIGHWAY FM1314
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176

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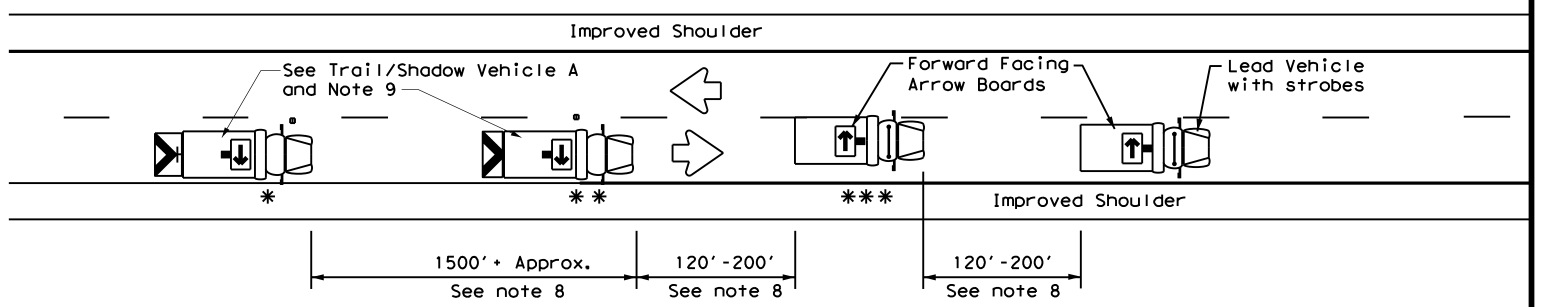
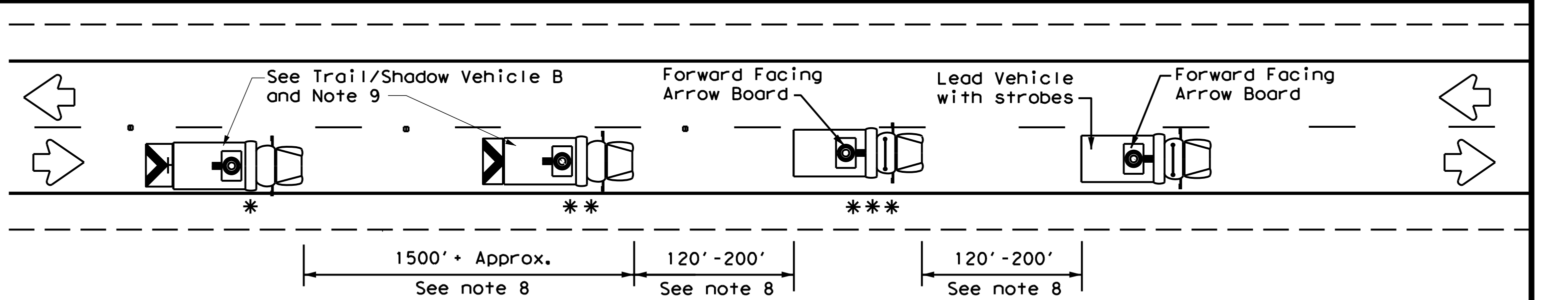


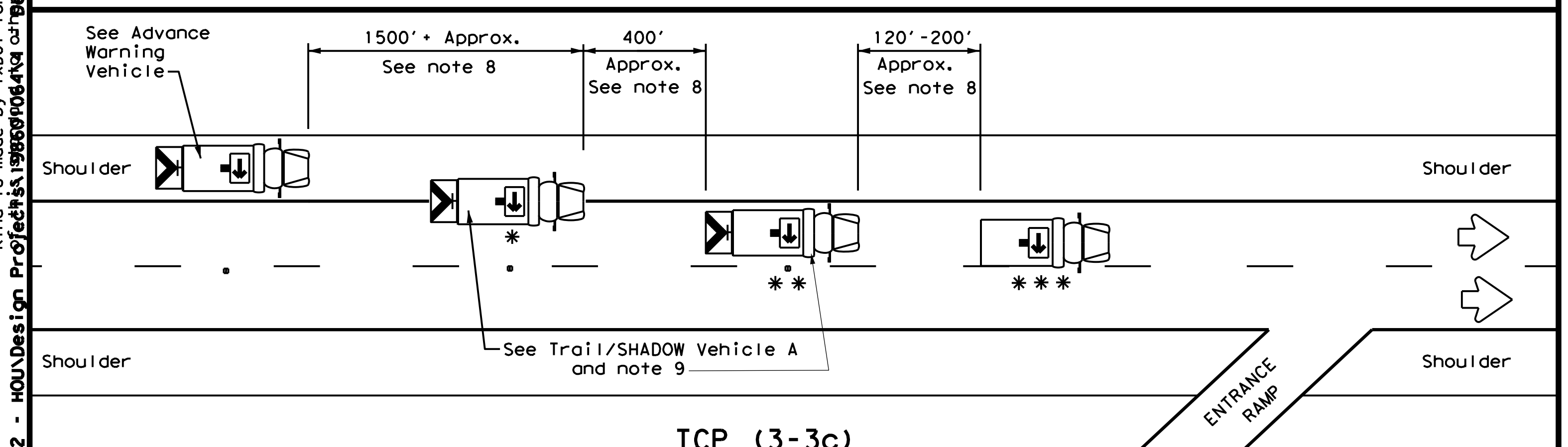
TCP (3-3a)

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



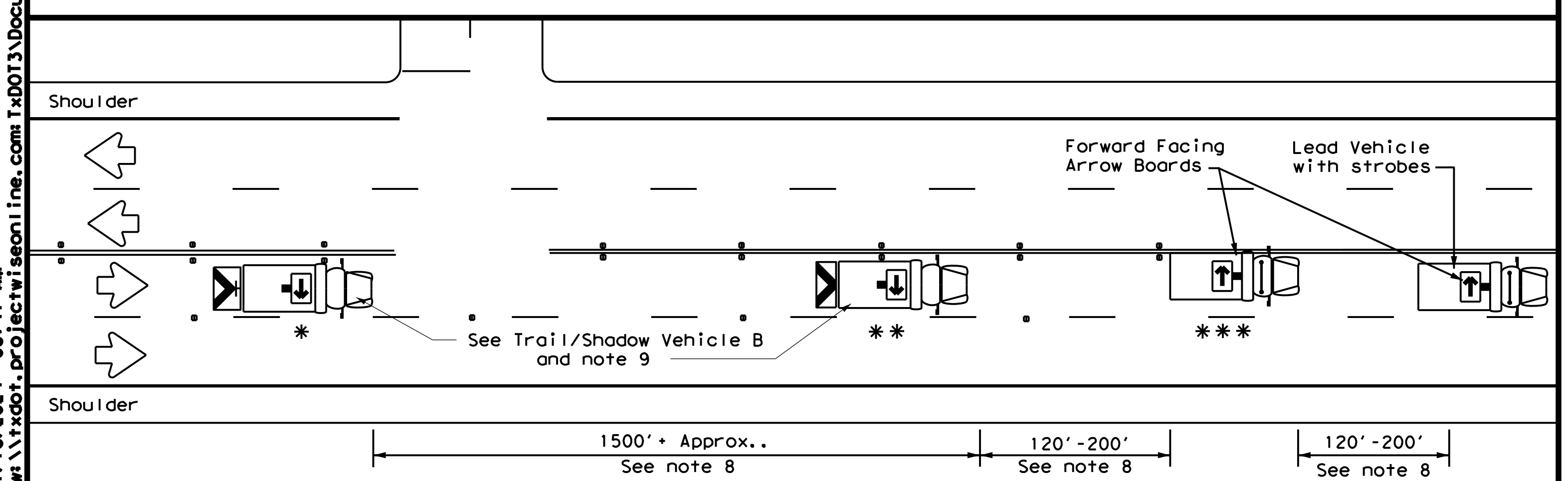
TCP (3-3b)

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



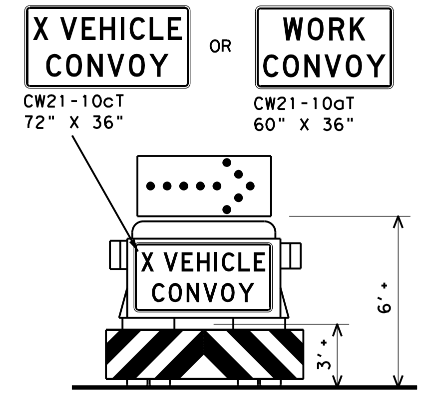
TCP (3-3c)

DIVIDED MULTILANE HIGHWAY



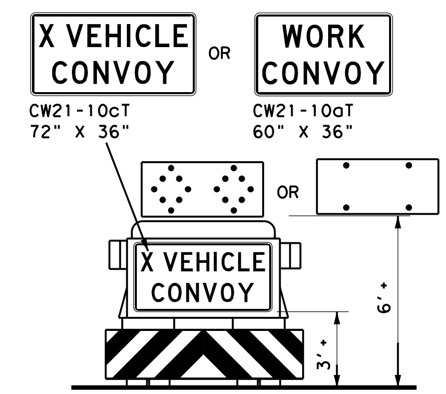
TCP (3-3d)

UNDIVIDED MULTILANE HIGHWAY



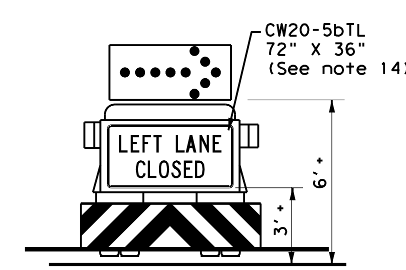
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display Flashing Arrow Board

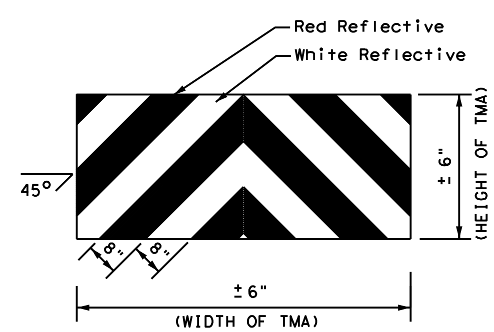


TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board in Caution Mode



ADVANCE WARNING VEHICLE



STRIPING FOR TMA

LEGEND

Symbol	Description	Arrow Board Display	
*	Trail Vehicle	ARROW BOARD DISPLAY	
**	Shadow Vehicle		
***	Work Vehicle	(symbol)	RIGHT Directional
(symbol)	Heavy Work Vehicle	(symbol)	LEFT Directional
(symbol)	Truck Mounted Attenuator (TMA)	(symbol)	Double Arrow
(symbol)	Traffic Flow	(symbol)	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.

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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 2-94 4-98 8-95 7-13 1-97 7-14		1986	01	064	FM1314
		DIST	COUNTY		SHEET NO.
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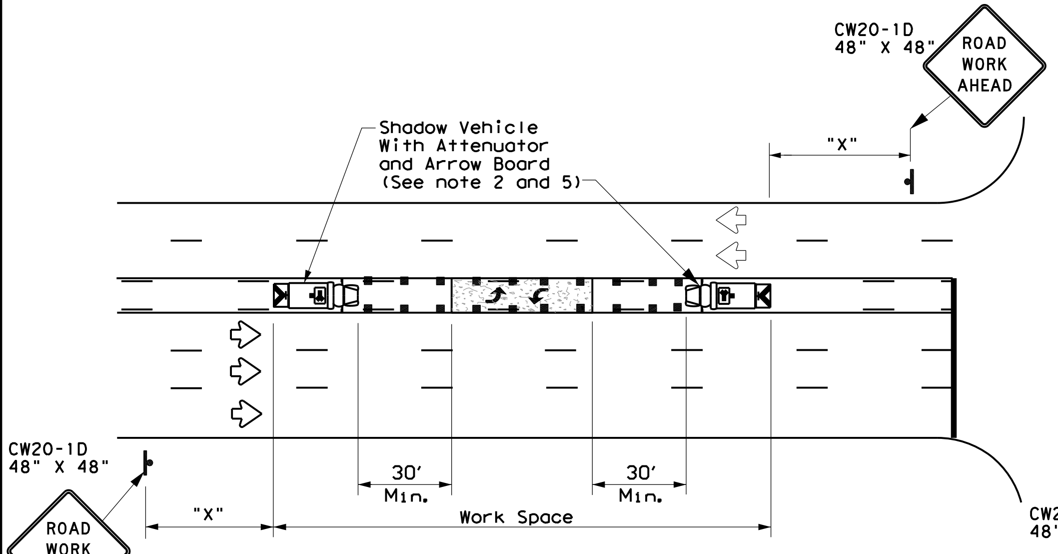
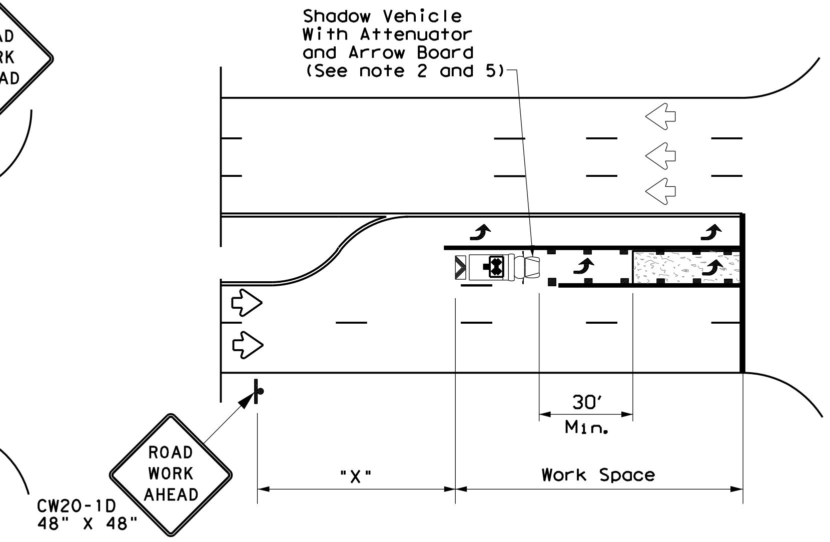
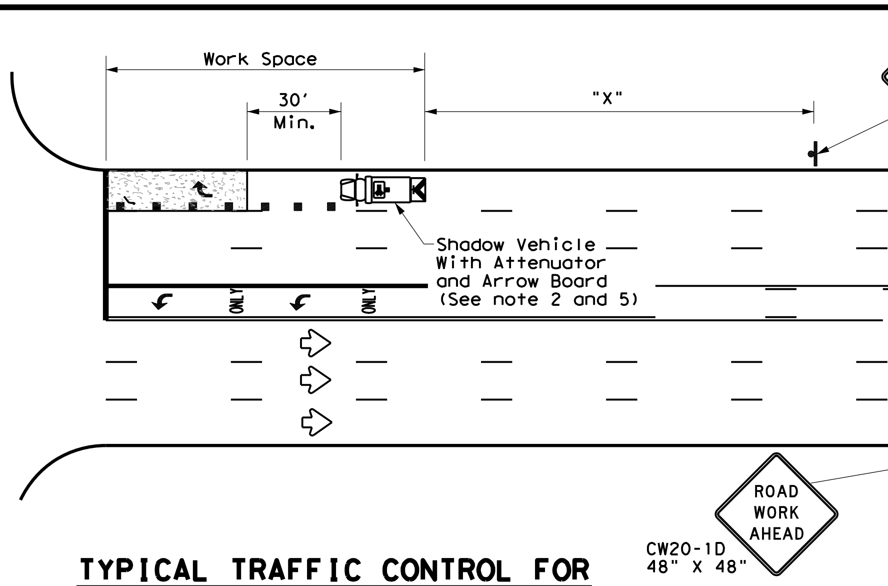


TYPICAL TRAFFIC CONTROL FOR CONTINUOUS LEFT TURN LANE SYMBOL MARKINGS



TYPICAL TRAFFIC CONTROL FOR OUTSIDE DUAL LEFT TURN LANE SYMBOL MARKINGS



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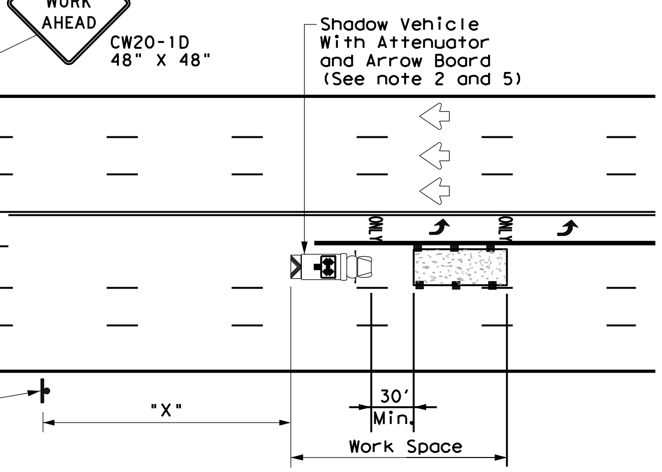
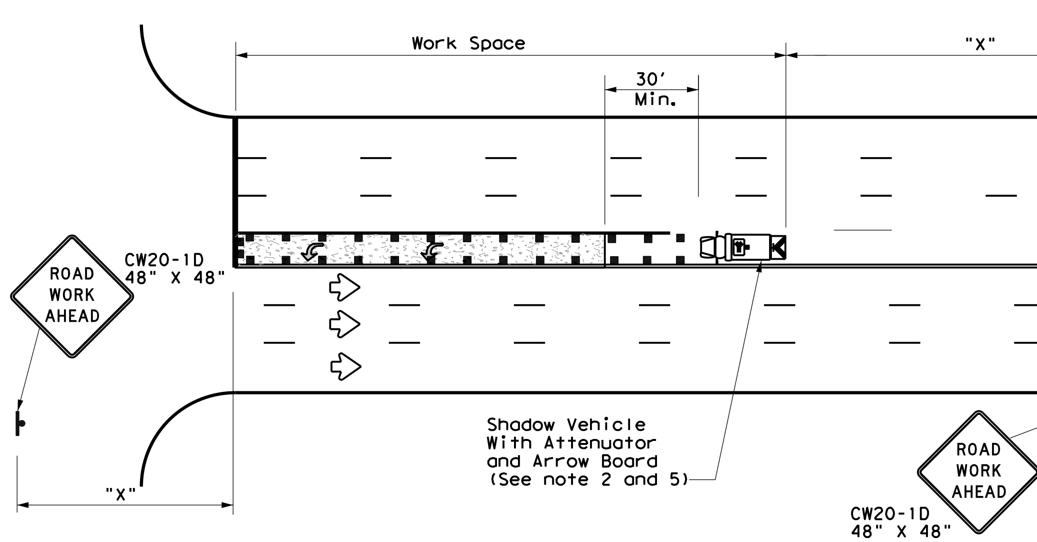
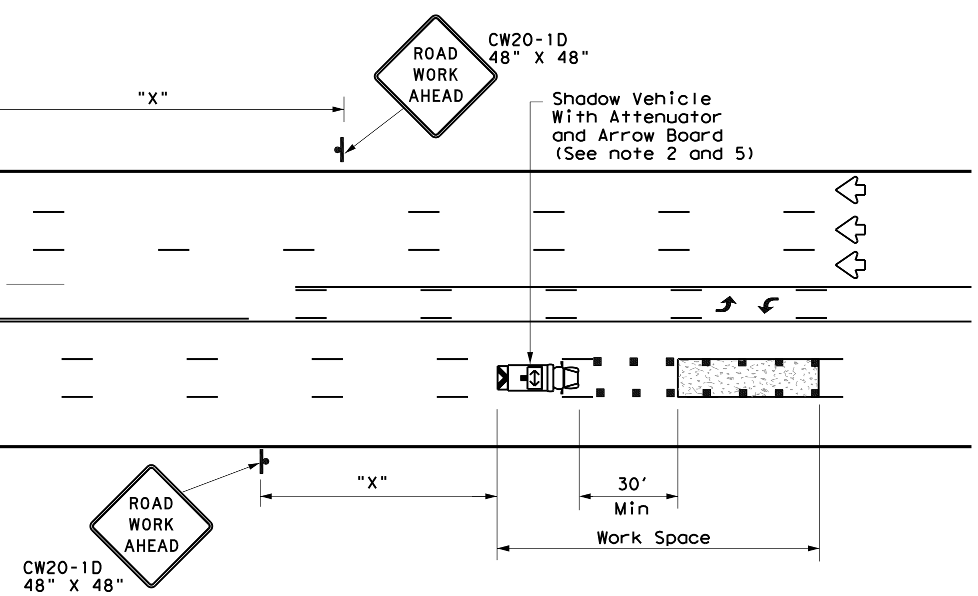


TYPICAL TRAFFIC CONTROL FOR INSIDE LANE MARKINGS



TYPICAL TRAFFIC CONTROL FOR LEFT TURN LANE MARKINGS



TYPICAL TRAFFIC CONTROL FOR CENTER LANE MARKINGS

LEGEND

Symbol	Description	Symbol	Arrow Board Display
*	Trail Vehicle		
**	Shadow Vehicle		
***	Work Vehicle		RIGHT Directional
	Heavy Work Vehicle		LEFT Directional
	Truck Mounted Attenuator (TMA)		Double Arrow
	Traffic Flow	■ ■ ■	Channelizing Devices

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

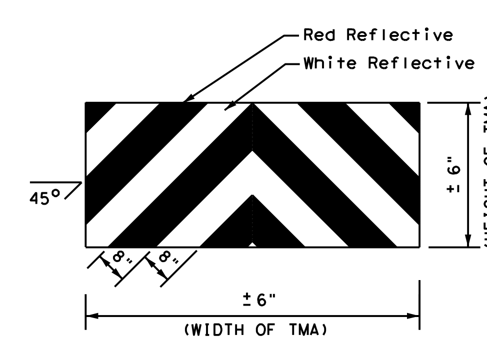
* Conventional Roads Only

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

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

GENERAL NOTES

1. This traffic control plan is for use on conventional roads posted at 45 mph or less and is intended for mobile operations that move continuously or intermittently (stopping up to approximately 15 minutes) such as short-line striping and in-lane rumble strips. When activities are anticipated to take longer amounts of time or traffic conditions warrant, a short duration or short-term stationary traffic control plan should be used.
2. A Truck Mounted Attenuator shall be used on Shadow Vehicle. Striping on the back panel of all truck mounted attenuators shall be 8" red and white reflective sheeting placed in an inverted "V" design. Reflective sheeting shall meet or exceed the reflectivity and color requirements of departmental material specification DMS-8300, Type A.
3. All traffic control devices shall be in accordance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD), latest edition.
4. The use of yellow rotating beacons or strobe lights on vehicles are required. Blue high intensity rotating, flashing, oscillating or strobe lights when mounted on the drivers side of the vehicle may be operated simultaneously with the amber beacons or strobe lights.
5. Flashing arrow board shall be used on Shadow Vehicle. Flashing arrow board shall be Type B or Type C as per BC Standards. The arrow board operation shall be controlled from inside the truck.



STRIPING FOR TMA

Texas Department of Transportation

Traffic Operations Division Standard

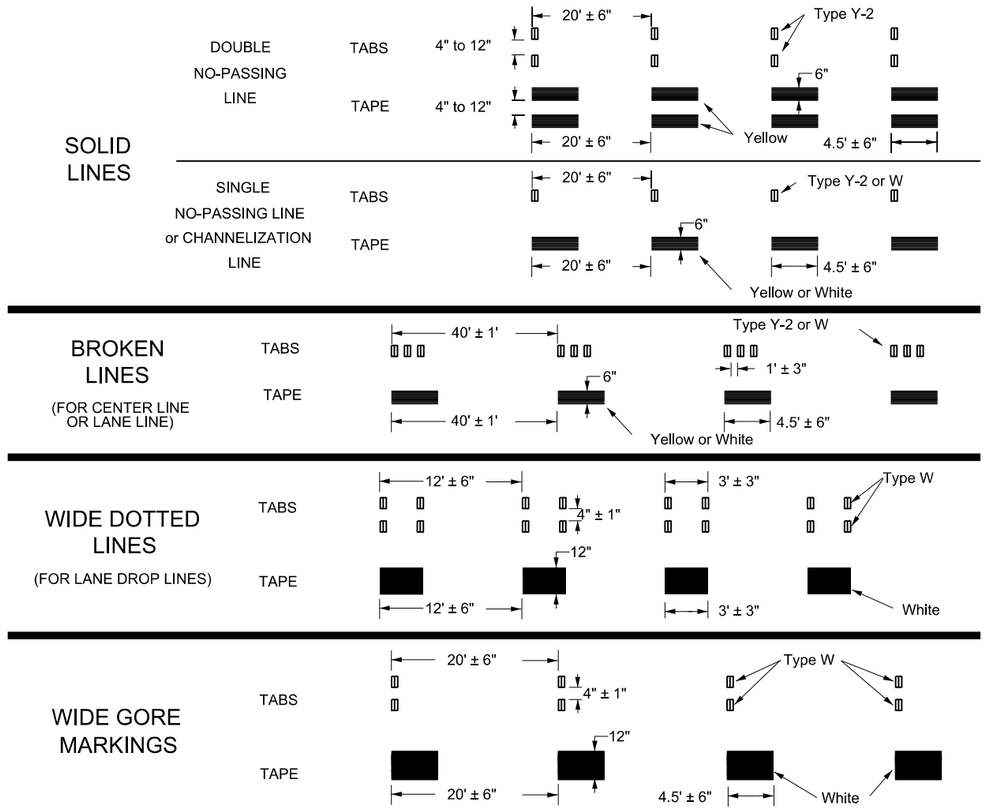
TRAFFIC CONTROL PLAN MOBILE OPERATIONS FOR ISOLATED WORK AREAS UNDIVIDED HIGHWAYS

TCP(3-4)-13

FILE: tcp3-4.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT July, 2013	CONT	SECT	JOB	HIGHWAY
REVISIONS	1986	01	064	FM1314
	DIST		COUNTY	SHEET NO.
	HOU		MONTGOMERY	62

178

WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS



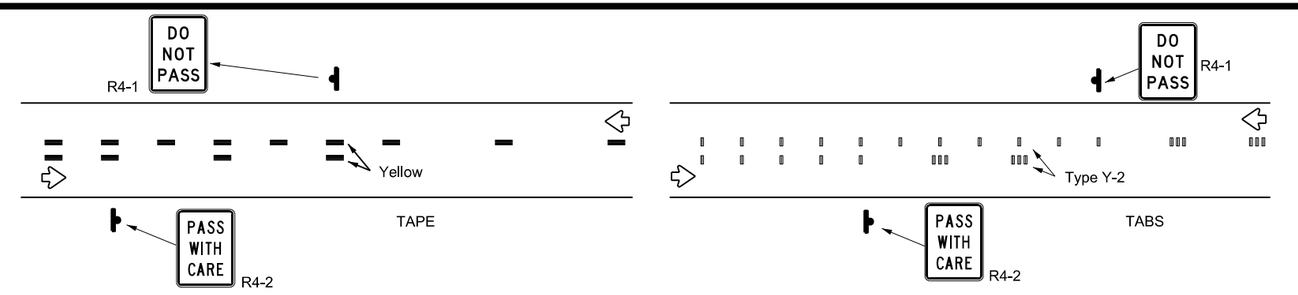
NOTES:

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.

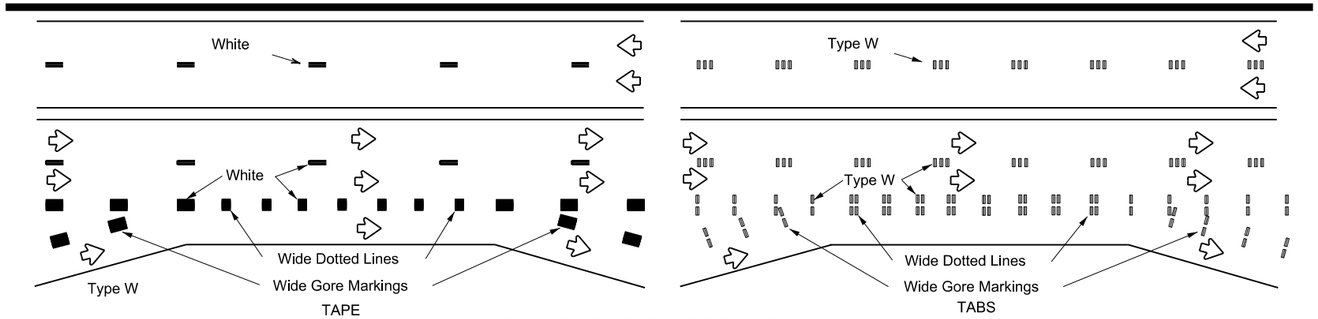
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS (TABS)

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.

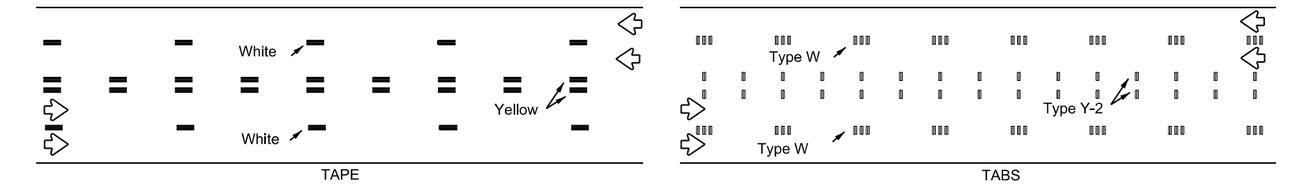
WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS



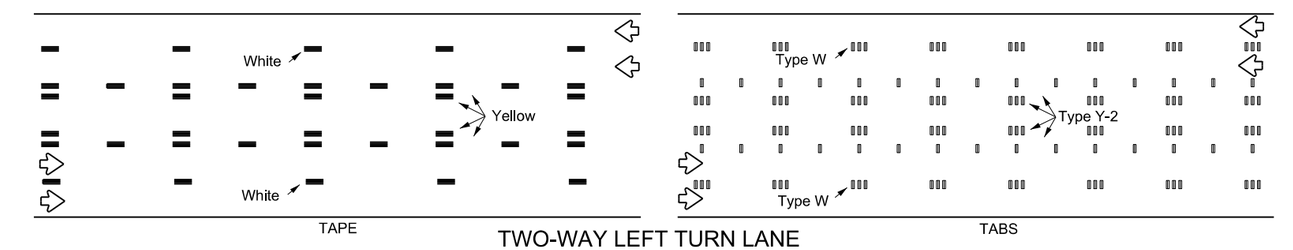
CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO LANE TWO-WAY HIGHWAYS



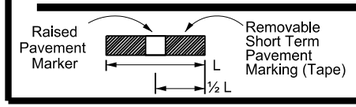
LANE LINES FOR DIVIDED HIGHWAY



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 Safety Division Standard

WORK ZONE SHORT TERM PAVEMENT MARKINGS

WZ(STPM)-23

FILE: wzstpm-23.dgn	DN:	CK:	DW:	CK:
© TxDOT February 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS	1986	01	064	FM1314
4-92 7-13 1-97 2-23 3-03	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		63

111

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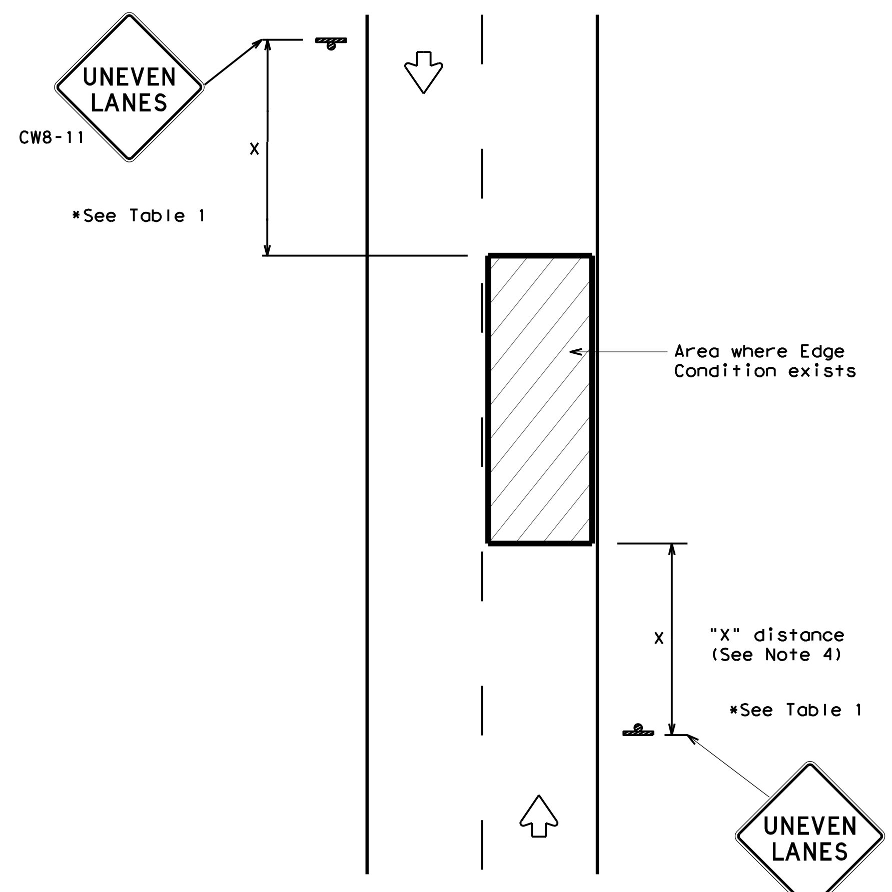
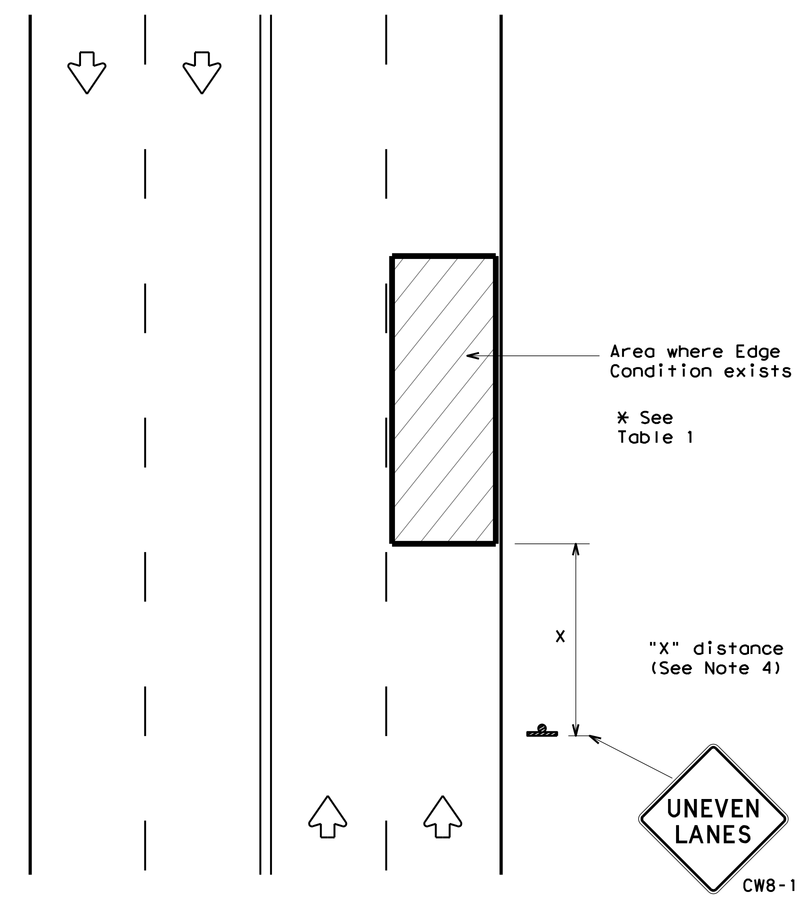
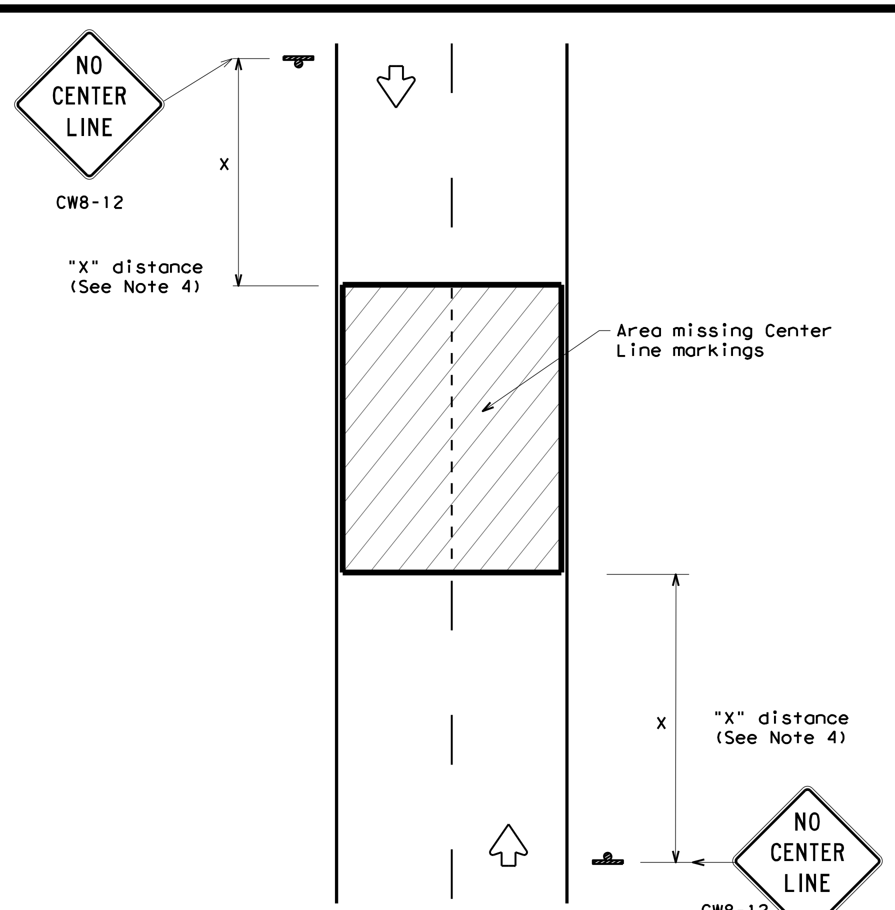


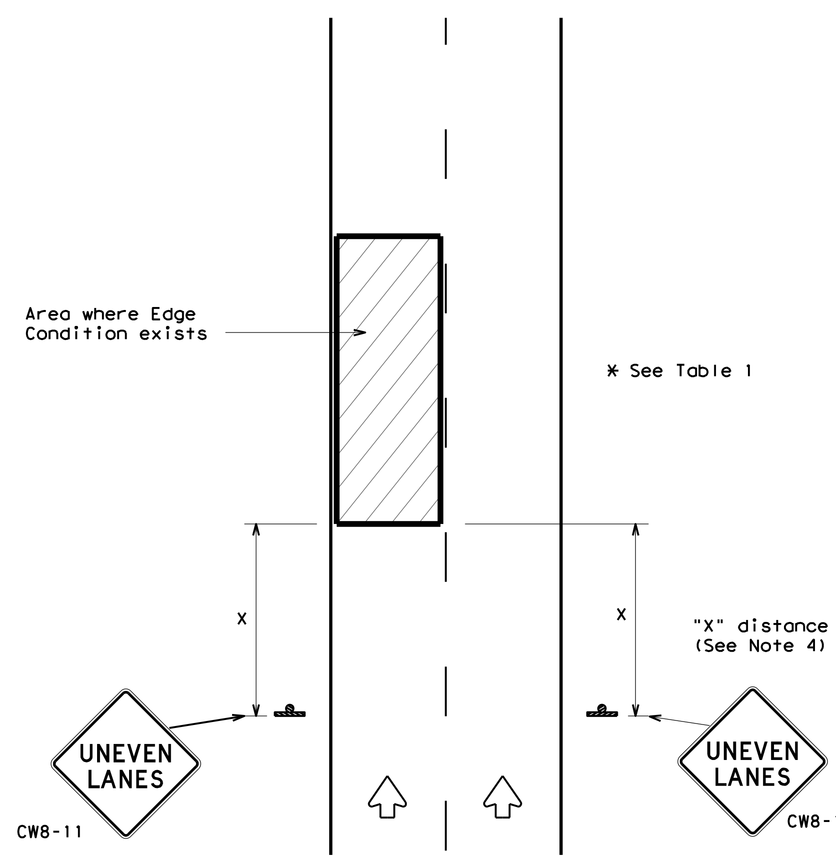
UNEVEN LANES
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
FOUR LANE CONVENTIONAL ROAD



NO CENTER LINE
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
DIVIDED ROADWAY

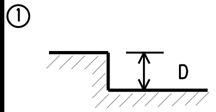
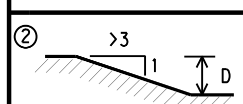
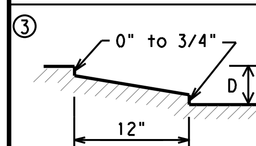
DEPARTMENTAL MATERIAL SPECIFICATIONS	
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY (REMOVABLE) PREFABRICATED PAVEMENT MARKINGS	DMS-8241
SIGN FACE MATERIALS	DMS-8300

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"

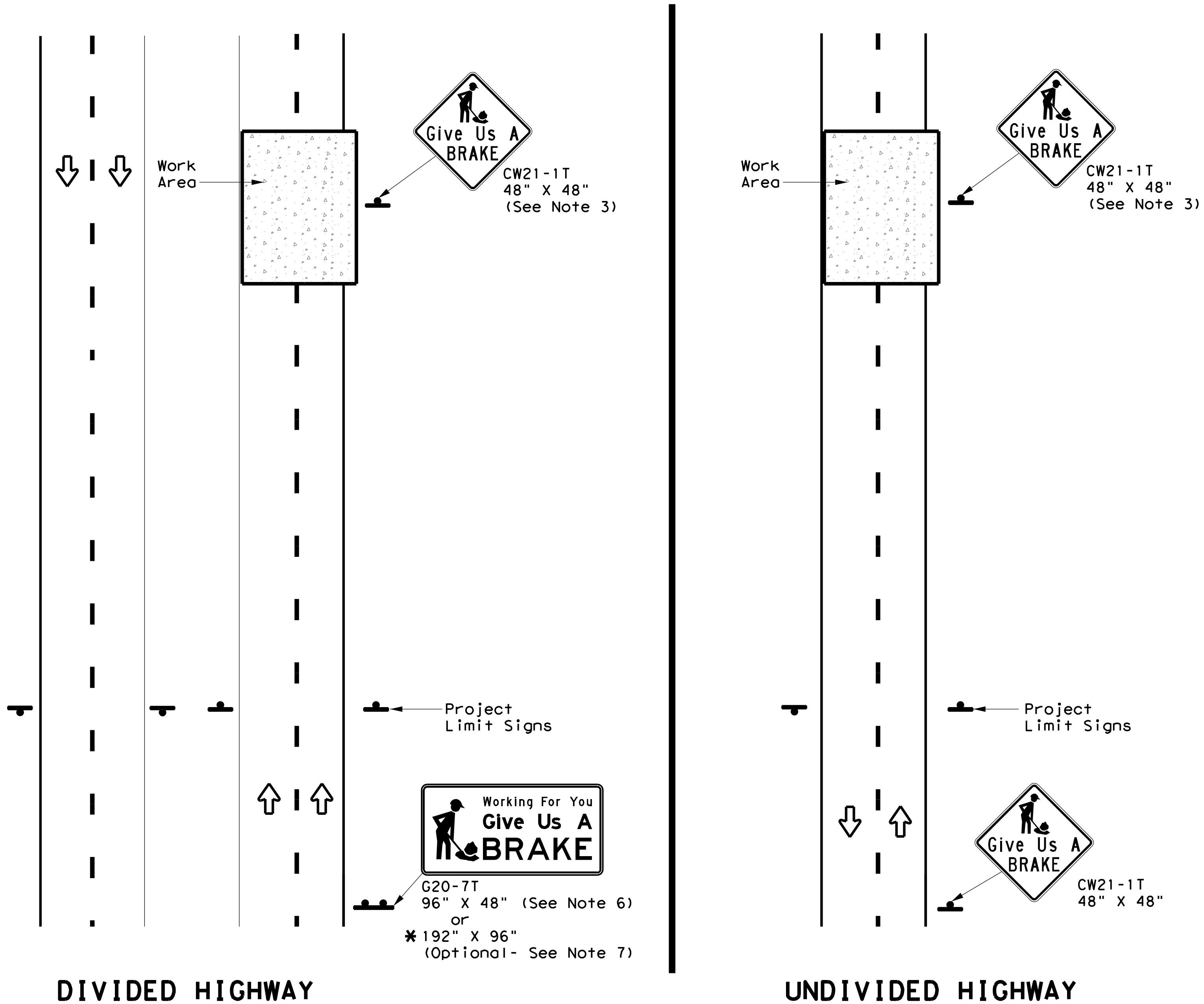
Texas Department of Transportation — Traffic Operations Division Standard

SIGNING FOR UNEVEN LANES

WZ(UL)-13

FILE: wzul-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 1992	CONT 1986	SECT 01	JOB 064	HIGHWAY FM1314
REVISIONS 8-95 2-98 7-13 1-97 3-03	DIST HOU		COUNTY MONTGOMERY	SHEET NO. 64

112



SIGNS ARE SHOWN FOR ONE DIRECTION OF TRAVEL

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

SUMMARY OF LARGE SIGNS

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

▲ See Note 6 Below

LEGEND	
(symbol)	Sign
(symbol)	Large Sign
(symbol)	Traffic Flow

DEPARTMENTAL MATERIAL SPECIFICATIONS	
PLYWOOD SIGN BLANKS	DMS-7100
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

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

GENERAL NOTES

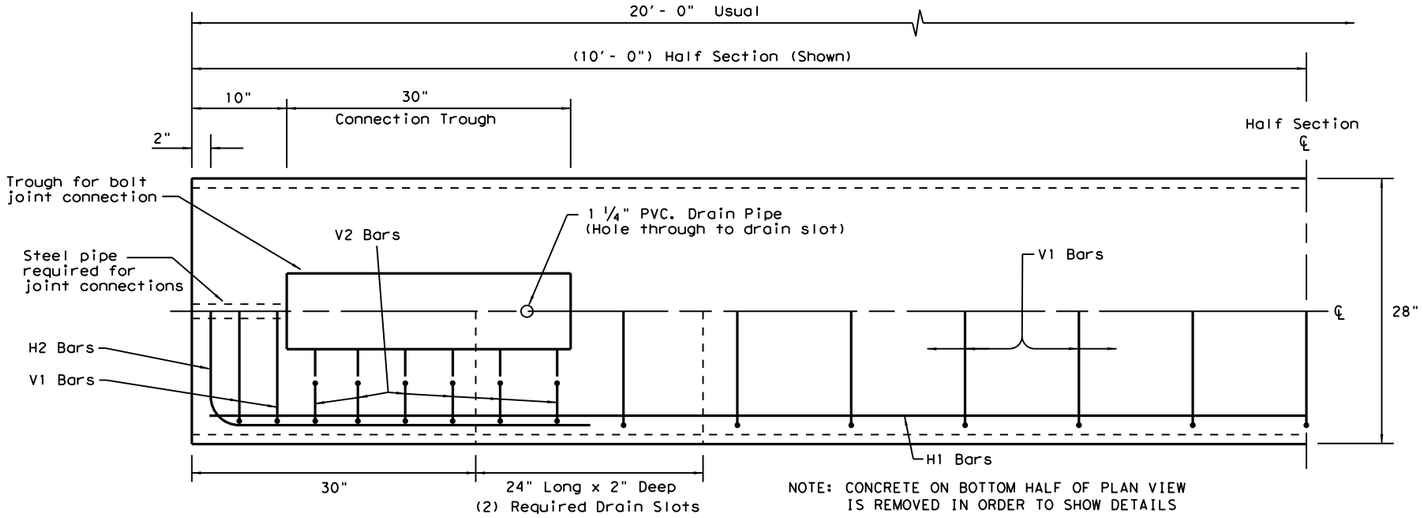
1. See BC and SMD sheets for additional sign support details.
2. Sign locations shall be approved by the Engineer.
3. For projects more than two miles in length, Give Us a BRAKE signs should be repeated halfway through the project. The Give Us a Brake (CW21-1T) may be used for this purpose.
4. Work zone speed limits are sometimes used in conjunction with GIVE US A BRAKE signing. See BC(3) for location and spacing of construction speed zone signing when required.
5. Give Us a Brake (CW21-1T) signs and supports shall be considered subsidiary to Item 502, "Barricades, Signs and Traffic Handling."
6. The 96" X 48" Working For You Give Us A BRAKE (G20-7T) may use a 1/2" or 5/8" plywood substrate or 0.125" aluminum sheeting substrate and may be supported by two 4" x 6" wood posts with drilled holes for breakaway as per BC(5) and will be subsidiary to Item 502.
7. The Working For You Give Us A BRAKE (G20-7T) 192" X 96" sign shall be paid for under the following specification items:
   - Item 636 - Aluminum Signs
   - Item 647 - Large Roadside Sign Supports and Assemblies.
   - Item 416 - Drilled Shaft Foundations
8. All signs shall be constructed in accordance with the details found in the "Standard Highway Sign Designs for Texas," latest edition. Sign details not shown in this manual shall be shown in the plans or the Engineer shall provide a detail to the Contractor before the sign is manufactured.

Texas Department of Transportation — Traffic Operations Division Standard

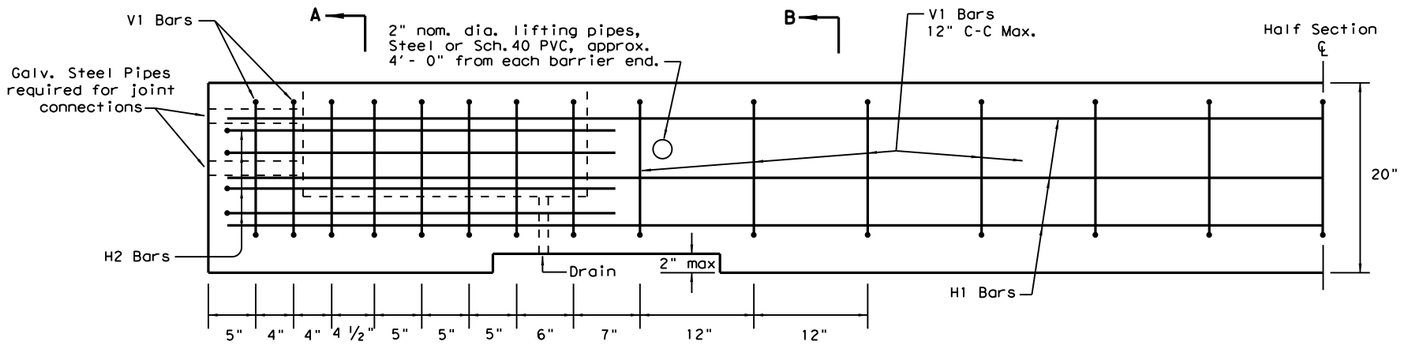
WORK ZONE "GIVE US A BRAKE" SIGNS

WZ(BRK)-13

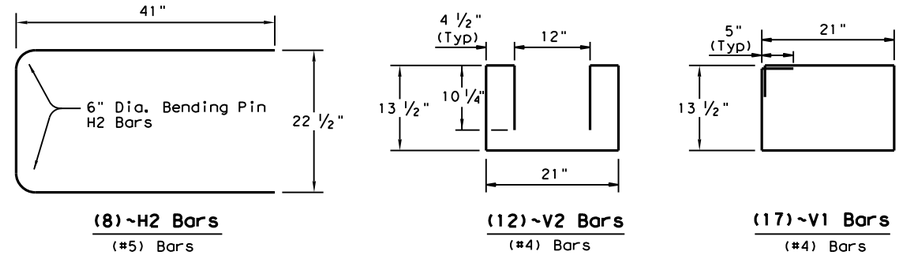
FILE: wzbrk-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT August 1995	CONT 1986	SECT 01	JOB 064	HIGHWAY FM1314
REVISIONS 6-96 5-98 7-13 8-96 3-03	DIST HOU	COUNTY MONTGOMERY		SHEET NO. 65



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

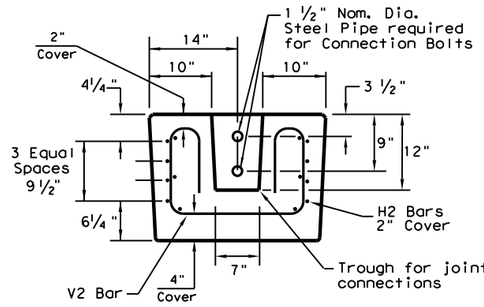


ELEVATION
(TYPE 1) BARRIER SEGMENT
(SYMMETRICAL ABOUT CENTER LINES)

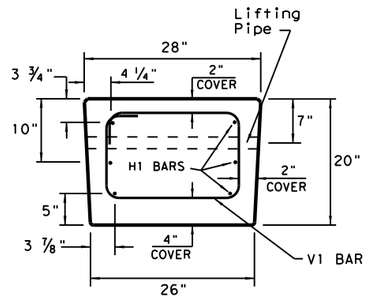


REINFORCING STEEL DETAILS
TYPE 1 - BARRIER SEGMENT

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



SECTION A-A



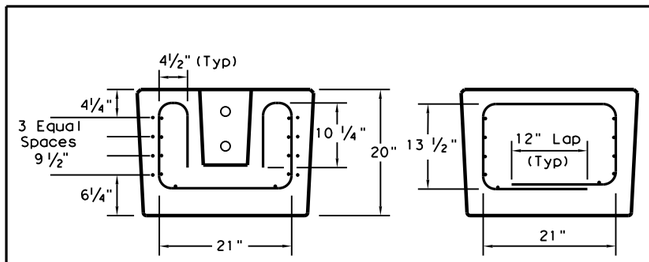
SECTION B-B

GENERAL NOTES

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

FOR CONTRACTORS INFORMATION ONLY

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



SECTION A-A SECTION B-B

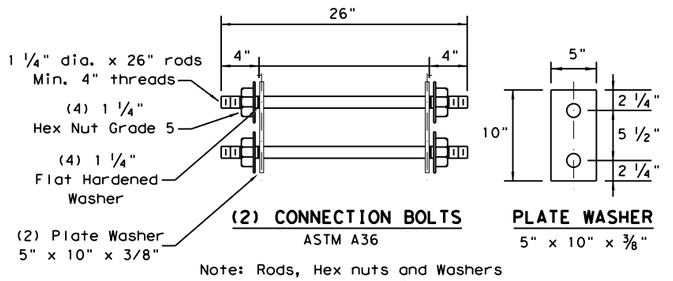
(WWR) GENERAL NOTES

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

REQUIRED (WWR) WIRE DESIGN

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

WELDED WIRE REINFORCEMENT (WWR)- OPTIONAL REINFORCING



(2) CONNECTION BOLTS
ASTM A36

PLATE WASHER
5" x 10" x ⅜"

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

SHEET 1 OF 2

Texas Department of Transportation — Design Division Standard

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

FILE: lpcb13.dgn	DN: TxDOT	CK: AM	DW: VP	CK:
©TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	1986	01	064	FM1314
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		66

DATE: $DATE$
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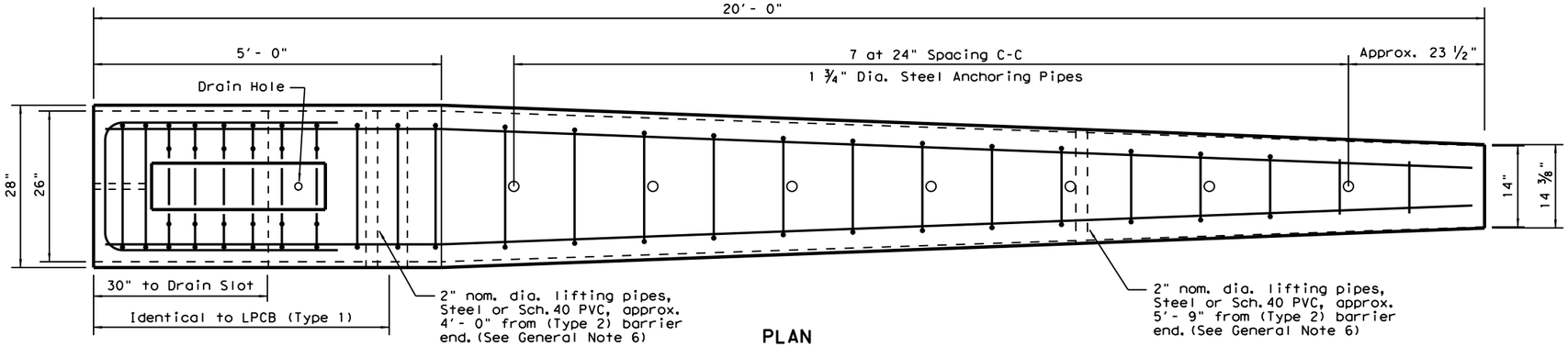
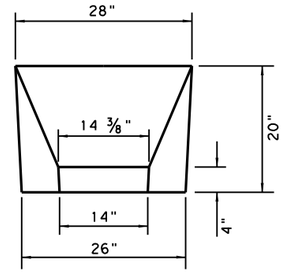
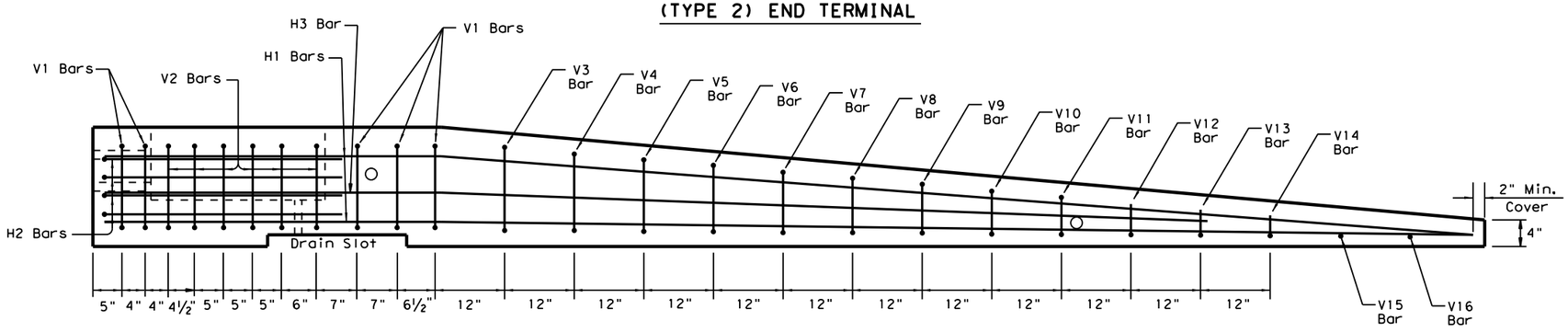


PLAN
(TYPE 2) END TERMINAL



APPROACH VIEW

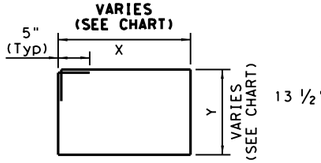


ELEVATION
(TYPE 2) END TERMINAL

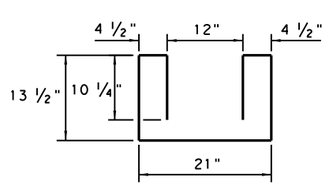
Note:
Anchoring pipes not shown in Elevation View

TYPE 2 - NOTES

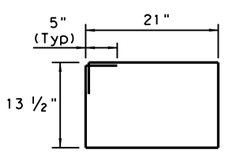
1. Welded wire reinforcment (WWR) is "not" an option for Type 2 Barrier.
2. Type 2 Barrier shall be used as an end treatment for the Type 1 barrier segments, when applicable.
3. The end treatment can be used without the anchor pins in locations that can accommodate approximately 4 ft. of lateral displacement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



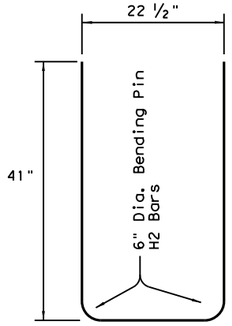
V3-V14 Bars



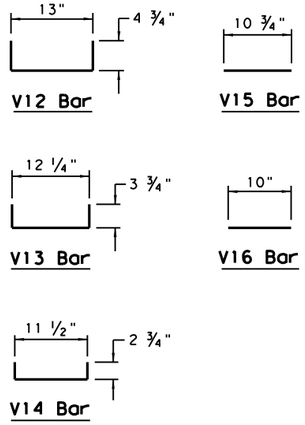
(6)~V2 Bars



(5)~V1 Bars



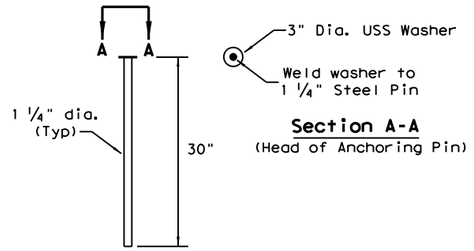
(4)~H2 Bars
(#5) Bars



Note: All V Bars are (#4)

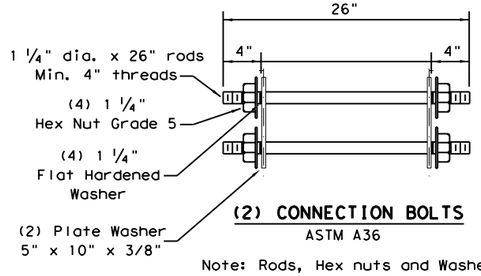
BAR (#4)	X (IN.)	Y (IN.)
V3 BAR	20 ¼	14 ½
V4 BAR	19 ½	13 ½
V5 BAR	18 ½	12 ¼
V6 BAR	17 ½	11 ¼
V7 BAR	17	10 ¼
V8 BAR	16 ¼	9
V9 BAR	15 ½	8
V10 BAR	14 ½	7
V11 BAR	13 ¾	6

REINFORCING STEEL DETAILS
TYPE 2 - END TERMINAL



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

Section A-A
(Head of Anchoring Pin)

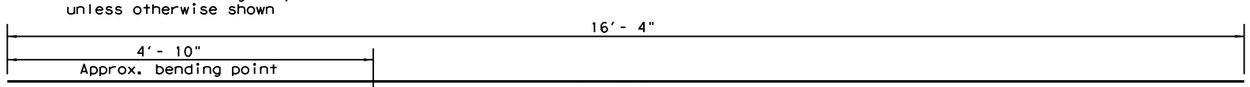


(2) CONNECTION BOLTS
ASTM A36

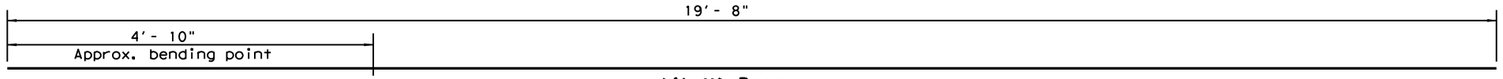
PLATE WASHER
5" x 10" x ⅜"

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

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



(2)~H3 Bars
(#5) Bar



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

(4)~H1 Bars
(#5) Bar

FOR CONTRACTORS INFORMATION ONLY

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

SHEET 2 OF 2

Texas Department of Transportation

Design Division Standard

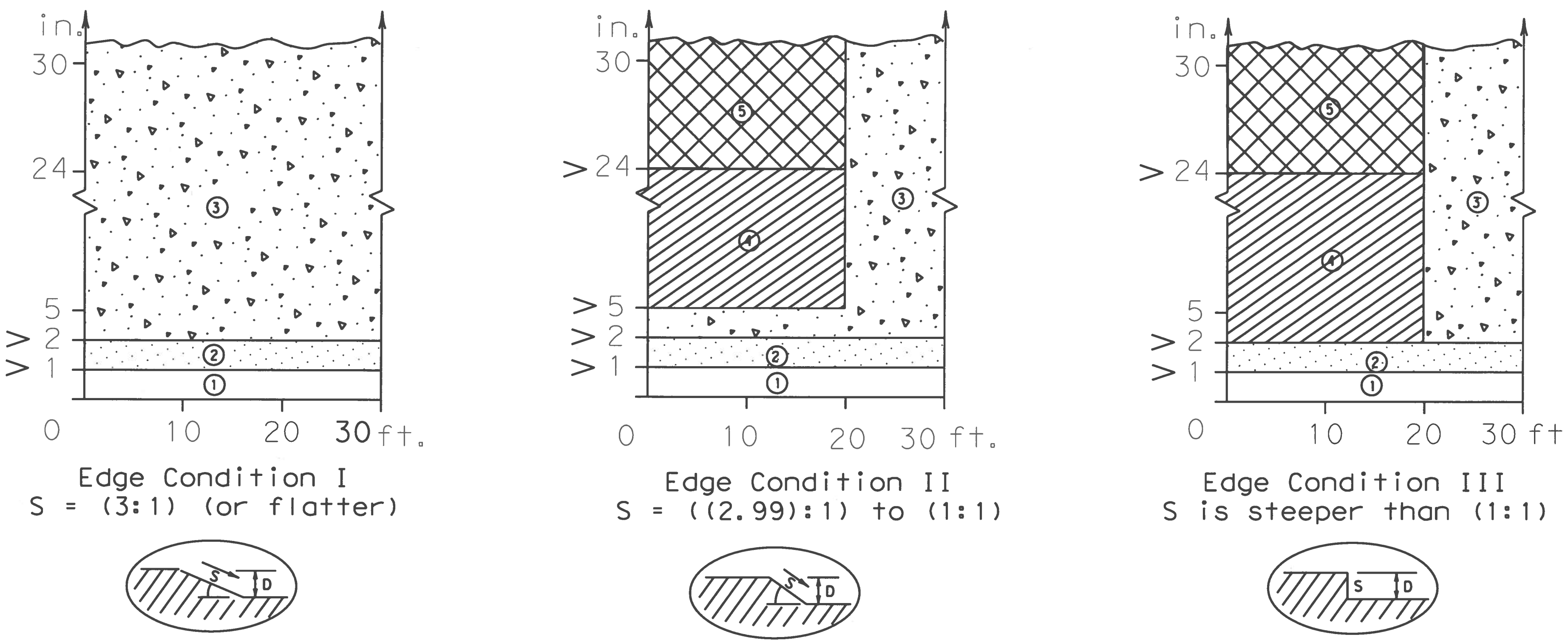
LOW PROFILE CONCRETE BARRIER
PRECAST BARRIER (TYPE 2)
LPCB-13

FILE: lpcb13.dgn	DN: TxDOT	CK: AM	DW: VP	CK:
© TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	1986	01	064	FM1314
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		66A

DATE: $DATE$
FILE: $FILE$

DEFINITION OF TREATMENT ZONES FOR VARIOUS EDGE CONDITIONS

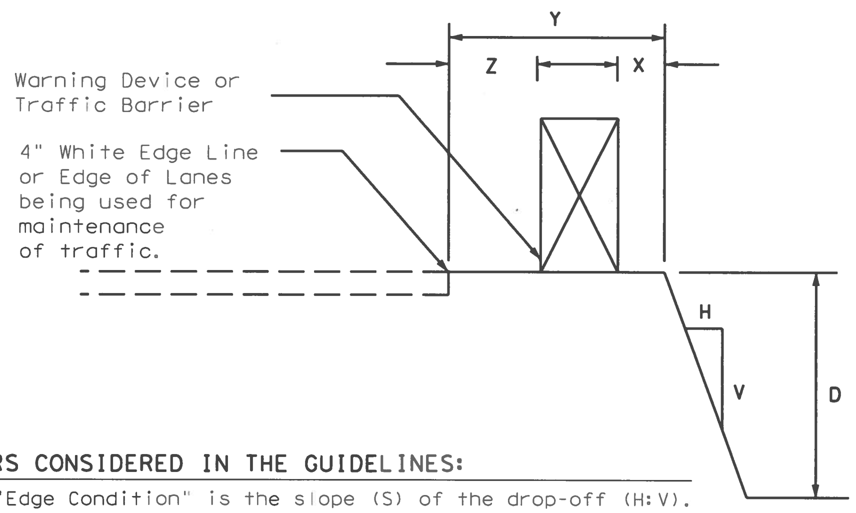
Edge Height (D) in Inches versus Lateral Clearance (Y) in Feet



Edge Condition I
S = (3:1) (or flatter)

Edge Condition II
S = ((2.99):1) to (1:1)

Edge Condition III
S is steeper than (1:1)



FACTORS CONSIDERED IN THE GUIDELINES:

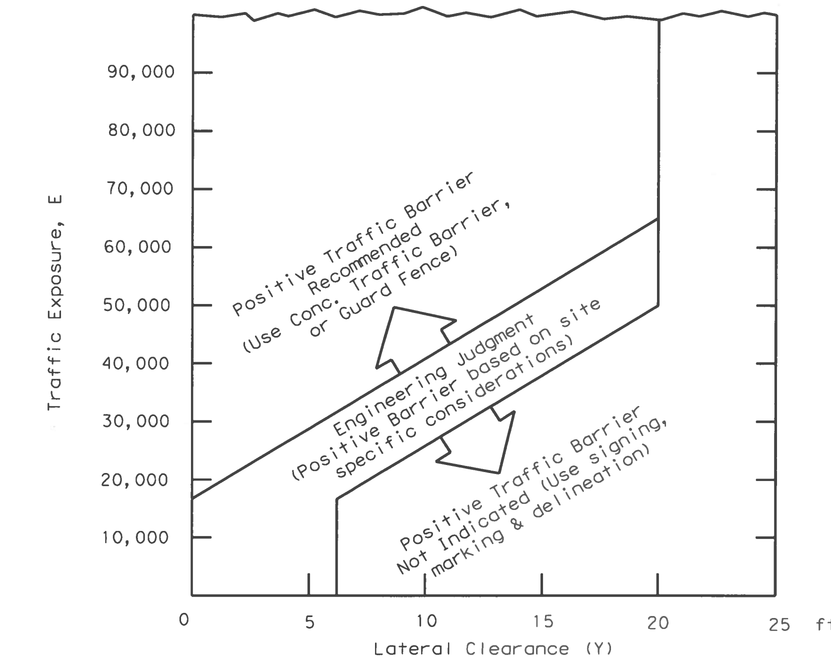
1. The "Edge Condition" is the slope (S) of the drop-off (H:V). The "Edge Height" is the depth of the drop-off "D".
2. Distance "X" is to be the maximum practical under job conditions. Two feet minimum for high speed conditions. Distance "Y" is the lateral clearance from edge of travel lane to edge of dropoff. Distance "Z" does not have a minimum.
3. In addition to the factors considered in the guidelines, each construction zone drop-off situation should be analyzed individually, taking into account other variables, such as: traffic mix, posted speed in the construction zone, horizontal curvature, and the practicality of the treatment options.
4. The conditions for indicating the use of positive or protective barriers are given by Zone-5 and Figure-1. Traffic barriers are primarily applicable for high speed conditions. Urban areas with speeds of 30 mph or less may have a lesser need for signing, delineation, and barriers. Right-angled edges, however, with "D" greater than 2 inches and located within a lateral offset of 6 feet, may indicate a higher level of treatment.
5. If the distance "Y" must be less than 3 feet, the use of a positive barrier may not be feasible. In such a case, consider either: 1) narrowing the lanes to a desired 11 to 12 feet or 10 foot minimum (see CW20-8 sign), or 2) provide an edge slope such as Edge Condition I.

Zone	Treatment Types Guidelines:
①	No treatment
②	CW 8-11 "Uneven Lanes" signs.
③	CW 8-9a Shoulder Drop-Off" or CW 8-11 signs plus vertical panels.
④	CW8-9a or CW 8-11, signs plus drums. Where restricted space precludes the use of drums, use vertical panels. An edge slope to that of the profered Edge Condition I.
⑤	Check indications (Figure-1) for possitive barrier. Where positive barrier is not indicated, the treatment shown above for Zone-4 may be used after consideration of other applicable factors.

Edge Condition Notes:

1. Edge Condition I: Most vehicles are able to traverse an edge condition with a slope rate of (3 to 1) or flatter. The slope must be constructed with a compacted material capable of supporting vehicles.
2. Edge Condition II: Most vehicles are able to traverse an edge condition with a slope between (2.99 to 1) and (1 to 1) so long as "D" does not exceed 5 inches. Under-carriage drag on most automobiles will occur when "D" exceeds 6 inches. As "D" exeeds 24 inches, the possibility for rollover is greater in most vehicles.
3. Edge Condition III: When slopes are greater than (1 to 1) and where "D" is greater than 2 inches, a more difficult control factor may exist for some vehicles, if not properly treated. For example, where "D" is greater than 2 inches and up to 24 inches different types of vehicles may experience different steering control at different edge heights. Automobiles might experience more steering control differential when "D" is greater than 2 inches and up to 5 inches. Trucks, particularly those with high loads, have more steering control differential when "D" is greater than 5 inches and up to 24 inches. When "D" exceeds 24 inches, the possibility of rollover is greater for most vehicles.
4. Milling or overlay operations that result in Edge Condition III should not be in place without appropriate warning treatments, and these conditions should not be left in place for extended periods of time.

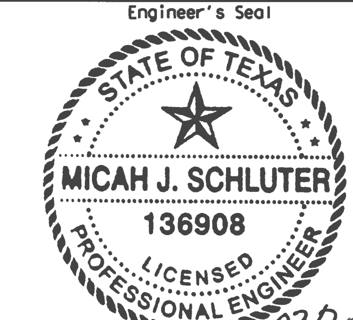
FIGURE-1: CONDITIONS INDICATING USE OF POSITIVE BARRIER FOR ZONE 5 (▩)



1. E = ADT x T
   Where ADT is that portion of the average daily traffic volume traveling within 20 feet (generally two adjacent lanes) of the edge dropoff condition; and, T is the duration time in years of the dropoff condition.
2. Figure-1 provides a practical approach to the use of positive barriers for the protection of vehicles from pavement drop-offs. Other factors, such as the presence of heavy machinery, construction workers, or the mix and volume of traffic may make the use of positive barriers appropriate, even when the edge condition alone may not justify the use of a barrier.
3. An approved end treatment should be provided for any positive barrier end located within the clear zone.

These guidelines apply to temporary traffic control areas or work zones where continuous pavement edges or drop-offs exists parallel and adjacent to a lane used by traffic. The edge conditions may be present between shoulders and travel lanes, between adjacent or opposing travel lanes, or at intermediate points across the width of the paved surface. Due to the variability in construction operations, tolerances in the variables may be allowed by the engineer. These guidelines do not apply to short term operations. These guidelines do not constitute a rigid standard or policy; rather, they are guidance to be used in conjunction with engineering judgement. These guidelines may be updated on the Design Division's on-line manuals.

Engineer's Seal



03/20/2024

Date

Micah J. Schluter, P.E.

Texas Department of Transportation — Traffic Safety Division Standard

TREATMENT FOR VARIOUS EDGE CONDITIONS

FILE: edgecon.dgn	DN:	CK:	DW:	CK:
© TxDOT August 2000	CONT	SECT	JOB	HIGHWAY
REVISIONS 03-01 08-01 9-21	1986	01	064	FM1314
	DIST		COUNTY	SHEET NO.
	HOU		MONTGOMERY	67

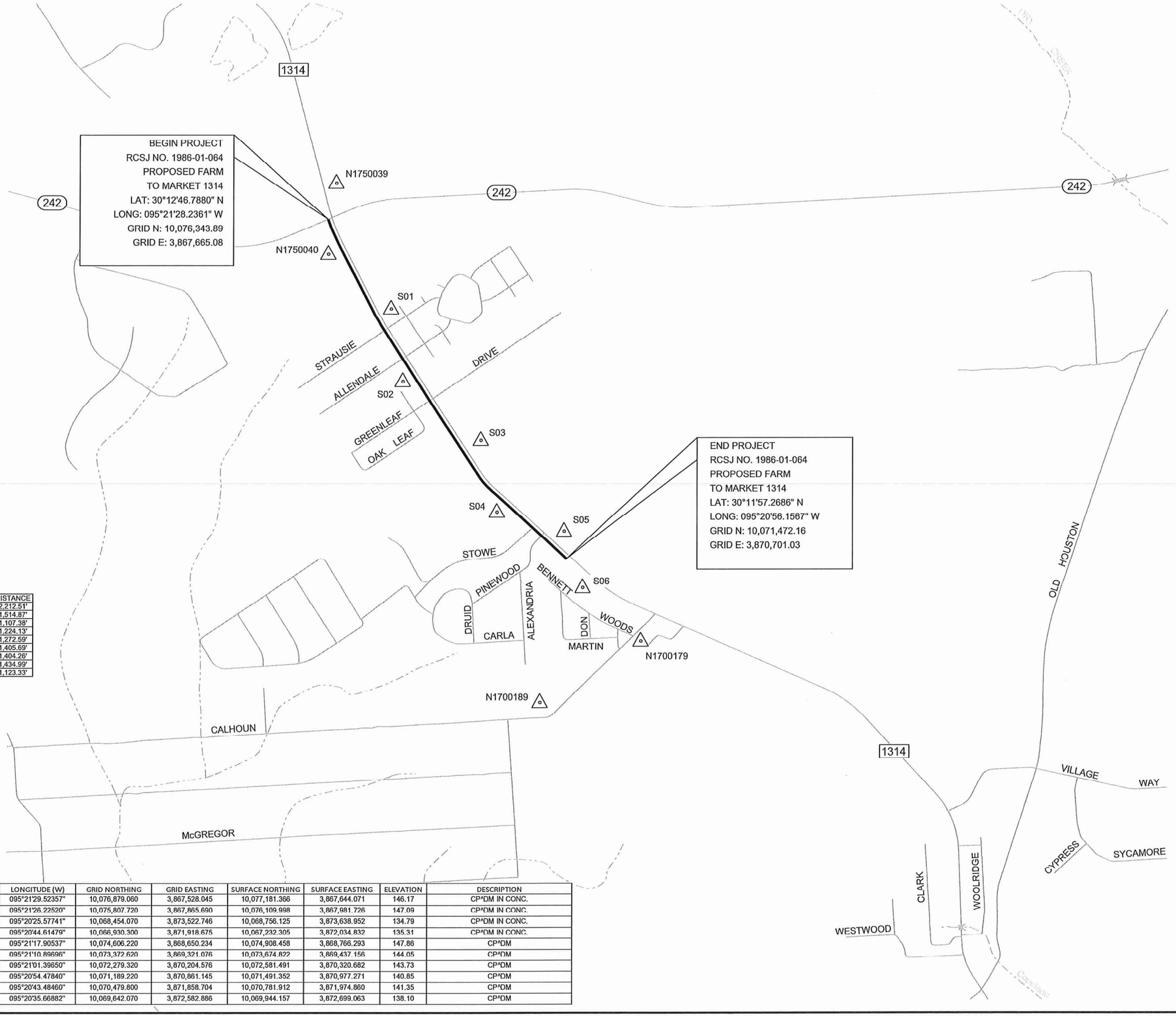
DATE: 01/16/2024 08:41 AM
FILE: pw:\\txdot.projectwiseonline.com:TxDOT3\Documents\12 - HOU\Design Projects\...

NOTES:

1. ALL BEARINGS ARE REFERENCED TO THE TEXAS COORDINATE SYSTEM OF 1983, CENTRAL ZONE (NAD83, 2011 ADJUSTMENT, EPOCH 2010.00).

2. ALL DISTANCES AND COORDINATES ARE IN US SURVEY FEET DISPLAYED IN SURFACE VALUES WITH THE TxDOT SURFACE ADJUSTMENT FACTOR OF 1.000030.

3. ALL ELEVATIONS ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) USING GEOID12B.



TRAVERSE TABLE

FROM	TO	BEARING	DISTANCE
N1700189	N1700179	N 46°28'15" E	2,212.51'
N1700179	S06	N 38°20'54" W	1,514.87'
S06	S05	N 40°50'31" W	1,107.38'
S05	S04	N 54°34'51" W	1,224.13'
S04	S03	N 31°03'39" W	1,272.59'
S03	S02	N 38°56'30" W	1,405.69'
S02	S01	N 28°32'17" W	1,404.26'
S01	N1750040	N 33°08'36" W	1,434.99'
N1750040	N1750039	N 17°29'35" W	1,123.33'

PT#	LATITUDE (N)	LONGITUDE (W)	GRID NORTHING	GRID EASTING	SURFACE NORTHING	SURFACE EASTING	ELEVATION	DESCRIPTION
N1750039	30°12'52.14070"	095°21'29.52357"	10,076,879.060	3,867,528.045	10,077,181.366	3,867,644.071	146.17	CP^DM IN CONC.
N1750040	30°12'41.39720"	095°21'26.22520"	10,075,807.720	3,867,865.690	10,076,109.998	3,867,981.726	147.09	CP^DM IN CONC.
N1700179	30°11'26.17198"	095°20'25.57741"	10,068,454.070	3,873,522.746	10,068,756.125	3,873,638.952	134.79	CP^DM IN CONC.
N1700189	30°11'11.81618"	095°20'44.61479"	10,066,930.300	3,871,918.675	10,067,232.305	3,872,034.832	135.31	CP^DM IN CONC.
S01	30°12'29.16871"	095°21'17.90537"	10,074,606.220	3,868,650.234	10,074,908.458	3,868,766.293	147.86	CP^DM
S02	30°12'16.67302"	095°21'10.89696"	10,073,372.620	3,869,321.076	10,073,674.822	3,869,437.156	144.05	CP^DM
S03	30°12'05.47034"	095°21'01.39650"	10,072,279.320	3,870,204.576	10,072,581.491	3,870,320.682	143.73	CP^DM
S04	30°11'54.39975"	095°20'54.47840"	10,071,189.220	3,870,861.145	10,071,491.352	3,870,977.271	140.85	CP^DM
S05	30°11'46.94214"	095°20'43.48460"	10,070,479.800	3,871,858.704	10,070,781.912	3,871,974.860	141.35	CP^DM
S06	30°11'38.33684"	095°20'35.66882"	10,069,642.070	3,872,582.886	10,069,944.157	3,872,699.063	138.10	CP^DM

THE SURVEY CONTROL INFORMATION HAS BEEN ACCEPTED AND INCORPORATED INTO THIS PS&E

STATE OF TEXAS
REGISTERED
JIBRAEL K. AHMAD
6183
PROFESSIONAL
LAND SURVEYOR
10/16/20

I HEREBY CERTIFY THAT THIS CONTROL MAP WAS PREPARED UNDER MY SUPERVISION IN DECEMBER 2019.

JONES|CARTER
2322 West Grand Parkway North, Suite 150
• Katy, Texas 77449 • 832.913.4000
Texas Board of Professional Land Surveying
Registration No. 10194039

CONTROL INDEX SHEET
FARM TO MARKET 1314

1 OF 3

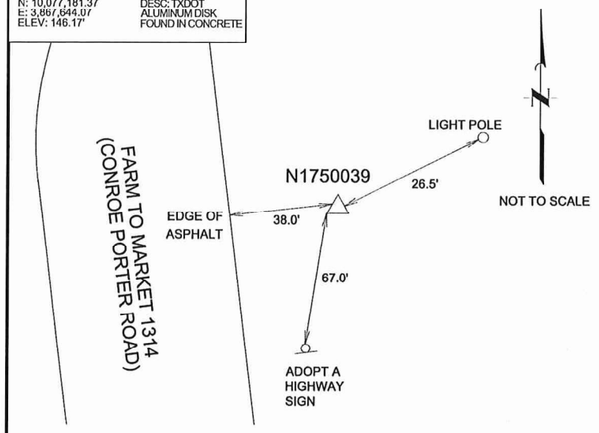
FED. RD. DIV. NO.	FEDERAL AID PROJECT	SHEET NO.
06		68

STATE	DIST.	COUNTIES	
TEXAS	HOU.	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY
1986	01	064	FM 1314

N1750039

N: 10,077,181.37
E: 3,867,644.07
ELEV: 146.17'

DESC: TXDOT ALUMINUM DISK FOUND IN CONCRETE

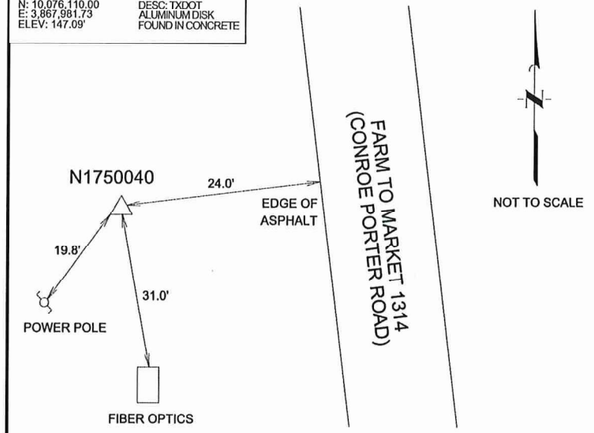


CONTROL POINT N1750039 IS A TXDOT ALUMINUM DISK FOUND IN CONCRETE, ON THE EAST SIDE OF FARM TO MARKET 1314 APPROXIMATELY 570' NORTH OF STATE HIGHWAY 242.

N1750040

N: 10,076,110.00
E: 3,867,961.73
ELEV: 147.09'

DESC: TXDOT ALUMINUM DISK FOUND IN CONCRETE

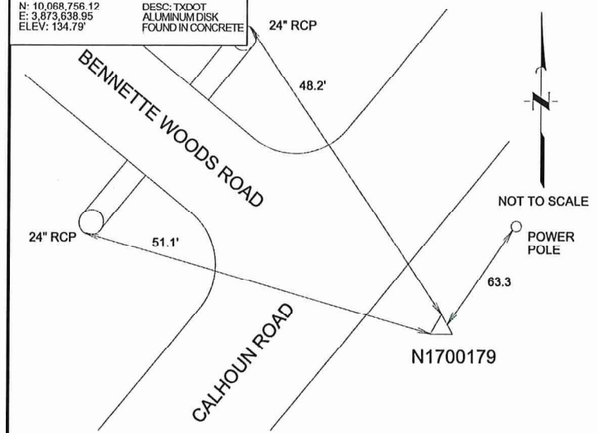


CONTROL POINT N1750040 IS A TXDOT ALUMINUM DISK FOUND IN CONCRETE, ON THE WEST SIDE OF FARM TO MARKET 1314 APPROXIMATELY 570' SOUTH OF STATE HIGHWAY 242.

N1700179

N: 10,068,756.12
E: 3,873,638.95
ELEV: 134.79'

DESC: TXDOT ALUMINUM DISK FOUND IN CONCRETE

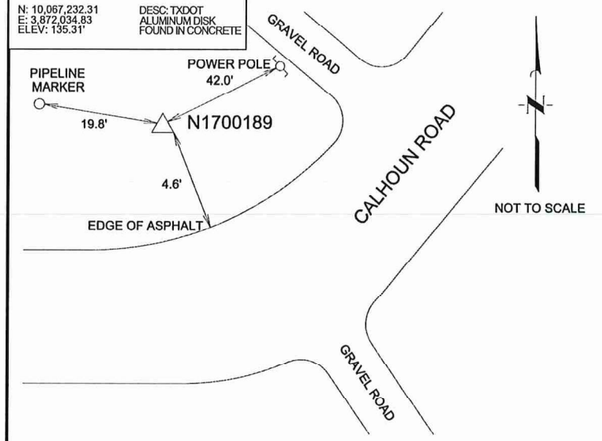


CONTROL POINT N1700179 IS A TXDOT ALUMINUM DISK FOUND IN CONCRETE, ON THE SOUTHEAST SIDE OF THE INTERSECTION OF CALHOUN ROAD AND BENNETTE WOODS ROAD.

N1700189

N: 10,067,232.31
E: 3,872,034.83
ELEV: 135.31'

DESC: TXDOT ALUMINUM DISK FOUND IN CONCRETE

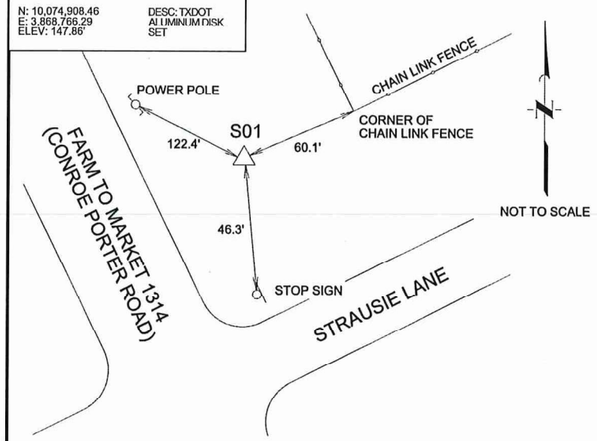


CONTROL POINT N1700189 IS A TXDOT ALUMINUM DISK FOUND IN CONCRETE, ON THE NORTHWEST SIDE OF CALHOUN ROAD APROXIMATLY 885' SOUTHEAST OF EAST DRIVE.

S01

N: 10,074,908.46
E: 3,868,766.29
ELEV: 147.86'

DESC: TXDOT ALUMINUM DISK SET

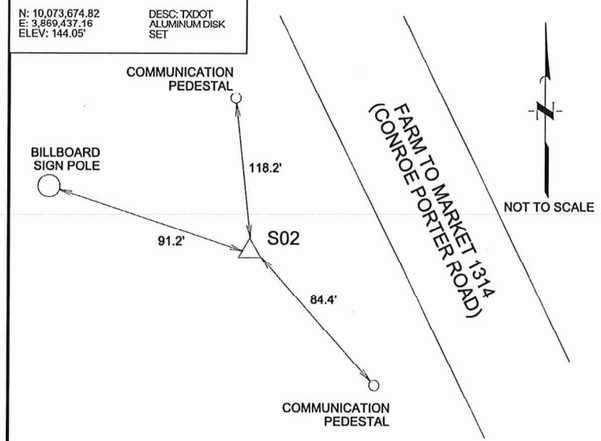


CONTROL POINT S01 IS A TXDOT ALUMINUM DISK SET, ON THE NORTHEAST INTERSECTION OF FARM TO MARKET 1314 AND STRAUSIE LANE.

S02

N: 10,073,674.82
E: 3,869,437.16
ELEV: 144.05'

DESC: TXDOT ALUMINUM DISK SET

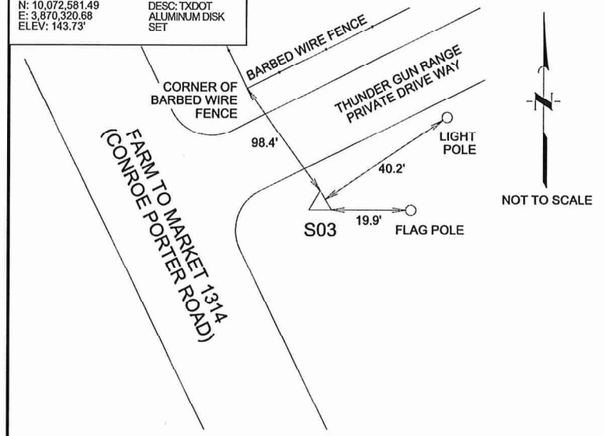


CONTROL POINT S02 IS A TXDOT ALUMINUM DISK SET, ON THE SOUTHWEST SIDE OF FARM TO MARKET 1314 APPROXIMATELY 340' NORTHWEST OF GREENLEAF DRIVE.

S03

N: 10,072,581.49
E: 3,870,320.68
ELEV: 143.73'

DESC: TXDOT ALUMINUM DISK SET

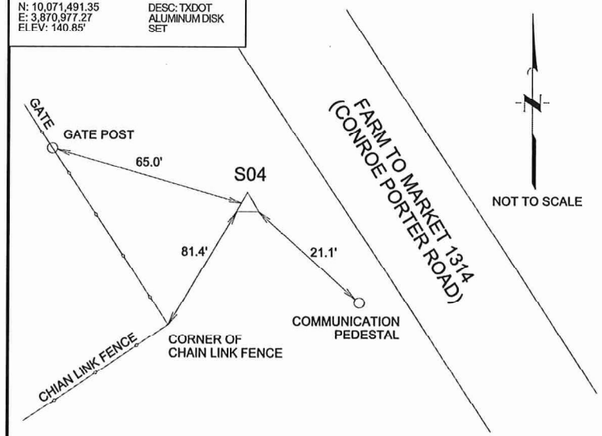


CONTROL POINT S03 IS A TXDOT ALUMINUM DISK SET, ON THE NORTHEAST SIDE OF FARM TO MARKET 1314 APPROXIMATELY 1,500' SOUTHEAST OF GREENLEAF DRIVE.

S04

N: 10,071,491.35
E: 3,870,977.27
ELEV: 140.85'

DESC: TXDOT ALUMINUM DISK SET

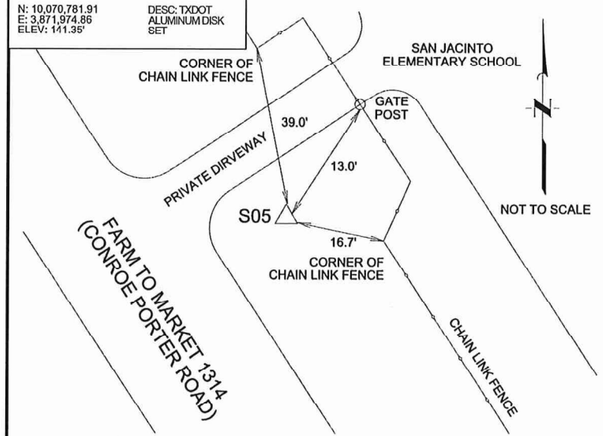


CONTROL POINT S04 IS A TXDOT ALUMINUM DISK SET, ON THE SOUTHWEST SIDE OF FARM TO MARKET 1314 APPROXIMATELY 900' NORTHWEST OF JIM STOWE ROAD.

S05

N: 10,070,781.91
E: 3,871,974.86
ELEV: 141.35'

DESC: TXDOT ALUMINUM DISK SET



CONTROL POINT S05 IS A TXDOT ALUMINUM DISK SET, ON THE NORTHEAST SIDE OF FARM TO MARKET 1314 APPROXIMATELY 100' SOUTHEAST OF PINEWOOD VILLAGE DRIVE.

NOTES:

1. ALL BEARINGS ARE REFERENCED TO THE TEXAS COORDINATE SYSTEM OF 1983, CENTRAL ZONE (NAD83, 2011 ADJUSTMENT, EPOCH 2010.00).

2. ALL DISTANCES AND COORDINATES ARE IN US SURVEY FEET DISPLAYED IN SURFACE VALUES WITH THE TxDOT SURFACE ADJUSTMENT FACTOR OF 1.000030.

3. ALL ELEVATIONS ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) USING GEOID12B.

THE SURVEY CONTROL INFORMATION HAS BEEN ACCEPTED AND INCORPORATED INTO THIS PS&E.

STATE OF TEXAS
REGISTERED
JIBRAEL K. AHMAD
6183
PROFESSIONAL
LAND SURVEYOR

10/16/20

I HEREBY CERTIFY THAT THIS CONTROL MAP WAS PREPARED UNDER MY SUPERVISION IN DECEMBER 2019.

JONES|CARTER
2322 West Grand Parkway North, Suite 150
• Katy, Texas 77449 • 832.913.4000
Texas Board of Professional Land Surveying
Registration No. 10194039

HORIZONTAL & VERTICAL CONTROL SHEET
FARM TO MARKET 1314

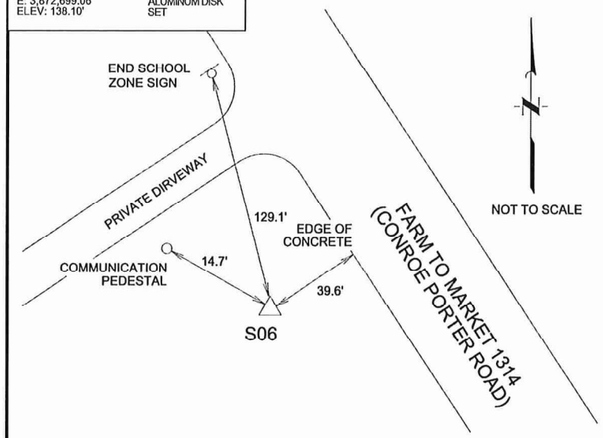
FED. RD. DIV. NO.	FEDERAL AID PROJECT		SHEET NO.
06			68A

STATE	DIST.	COUNTIES	
TEXAS	HOU.	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY
1986	01	064	FM 1314

S06

N: 10,069,944.16
E: 3,672,699.06
ELEV: 138.10'

DESC: TXDOT ALUMINUM DISK SET



CONTROL POINT S06 IS A TXDOT ALUMINUM DISK SET, ON THE SOUTHWEST SIDE OF FARM TO MARKET 1314 APPROXIMATELY 1,200' SOUTH OF PINEWOOD VILLAGE DRIVE.

NOTES:

1. ALL BEARINGS ARE REFERENCED TO THE TEXAS COORDINATE SYSTEM OF 1983, CENTRAL ZONE (NAD83, 2011 ADJUSTMENT, EPOCH 2010.00).

2. ALL DISTANCES AND COORDINATES ARE IN US SURVEY FEET DISPLAYED IN SURFACE VALUES WITH THE TxDOT SURFACE ADJUSTMENT FACTOR OF 1.000030.

3. ALL ELEVATIONS ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) USING GEOID12B.

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LAND SURVEYOR

10/16/20

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HORIZONTAL & VERTICAL CONTROL SHEET
FARM TO MARKET 1314

FED. RD. DIV. NO.	FEDERAL AID PROJECT		SHEET NO.
06			68B
STATE	DIST.	COUNTIES	
TEXAS	HOU.	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY
1986	01	064	FM 1314

Beginning chain NEWPROP010924 description
Feature: Road_Centerline FM 1314

Point NEWPROP0109241 X 3,867,246.4881 Y 10,078,411.8258 Sta 449+00.00

Course from NEWPROP0109241 to PC NEWPROP010924_3 S 15° 11′ 36.72" E Dist 1,040.6406

Curve Data

Curve NEWPROP010924_3
P.I. Station 461+00.79 X 3,867,561.1918 Y 10,077,253.0070
Delta = 6° 23′ 56.00" (LT)
Degree = 1° 59′ 59.47"
Tangent = 160.1505
Length = 319.9680
Radius = 2,865.0000
External = 4.4726
Long Chord = 319.8017
Mid. Ord. = 4.4657
P.C. Station 459+40.64 X 3,867,519.2195 Y 10,077,407.5596
P.T. Station 462+60.61 X 3,867,620.1274 Y 10,077,104.0951
C.C. X 3,870,284.0765 Y 10,078,158.4196
Back = S 15° 11′ 36.72" E
Ahead = S 21° 35′ 32.72" E
Chord Bear = S 18° 23′ 34.72" E

Course from PT NEWPROP010924_3 to PC NEWPROP010924_6 S 21° 35′ 32.72" E Dist 661.5692

Curve Data

Curve NEWPROP010924_6
P.I. Station 470+81.58 X 3,867,922.2465 Y 10,076,340.7344
Delta = 6° 22′ 08.72" (LT)
Degree = 1° 59′ 59.47"
Tangent = 159.4031
Length = 318.4779
Radius = 2,865.0000
External = 4.4310
Long Chord = 318.3139
Mid. Ord. = 4.4242
P.C. Station 469+22.18 X 3,867,863.5859 Y 10,076,488.9514
P.T. Station 472+40.66 X 3,867,996.9872 Y 10,076,199.9396
C.C. X 3,870,527.5350 Y 10,077,543.2759
Back = S 21° 35′ 32.72" E
Ahead = S 27° 57′ 41.44" E
Chord Bear = S 24° 46′ 37.08" E

Course from PT NEWPROP010924_6 to PC NEWPROP010924_9 S 27° 57′ 41.44" E Dist 1,255.3308

Curve Data

Curve NEWPROP010924_9
P.I. Station 489+04.44 X 3,868,777.1000 Y 10,074,730.3800
Delta = 5° 26′ 31.09" (LT)
Degree = 0° 40′ 00.00"
Tangent = 408.4545
Length = 816.2947
Radius = 8,594.3600
External = 9.7006
Long Chord = 815.9879
Mid. Ord. = 9.6897
P.C. Station 484+95.99 X 3,868,585.5846 Y 10,075,091.1526
P.T. Station 493+12.28 X 3,869,001.9670 Y 10,074,389.3963
C.C. X 3,876,176.6628 Y 10,079,120.8617
Back = S 27° 57′ 41.44" E
Ahead = S 33° 24′ 12.53" E
Chord Bear = S 30° 40′ 56.98" E

Course from PT NEWPROP010924_9 to PC NEWPROP01092_12 S 33° 24′ 12.53" E Dist 998.6458

Curve Data

Curve NEWPROP01092_12
P.I. Station 506+11.10 X 3,869,717.0101 Y 10,073,305.1199
Delta = 2° 51′ 44.32" (LT)
Degree = 0° 28′ 36.73"
Tangent = 300.1775
Length = 600.2302
Radius = 12,015.0000
External = 3.7492
Long Chord = 600.1678
Mid. Ord. = 3.7480
P.C. Station 503+10.93 X 3,869,551.7529 Y 10,073,555.7124
P.T. Station 509+11.16 X 3,869,894.5747 Y 10,073,063.0922
C.C. X 3,879,582.0483 Y 10,080,170.3476
Back = S 33° 24′ 12.53" E
Ahead = S 36° 15′ 56.84" E
Chord Bear = S 34° 50′ 04.68" E

Course from PT NEWPROP01092_12 to PC NEWPROP01092_15 S 36° 15′ 57.13" E Dist 0.1899

Curve Data

Curve NEWPROP01092_15
P.I. Station 512+11.54 X 3,870,072.2600 Y 10,072,820.9000
Delta = 2° 51′ 44.81" (RT)
Degree = 0° 28′ 36.73"
Tangent = 300.1918
Length = 600.2587
Radius = 12,015.0000
External = 3.7495
Long Chord = 600.1963
Mid. Ord. = 3.7484
P.C. Station 509+11.35 X 3,869,894.6870 Y 10,073,062.9391
P.T. Station 515+11.61 X 3,870,237.5244 Y 10,072,570.2952
C.C. X 3,860,207.2133 Y 10,065,955.6837
Back = S 36° 15′ 56.84" E
Ahead = S 33° 24′ 12.04" E
Chord Bear = S 34° 50′ 04.44" E

Course from PT NEWPROP01092_15 to PC NEWPROP01092_18 S 33° 24′ 12.86" E Dist 387.2410

Equation: Sta 518+98.85 (BK) = Sta 518+97.02 (AH) End Region 1 / Begin Region 2

Curve Data

Curve NEWPROP01092_18
P.I. Station 523+84.47 X 3,870,719.0700 Y 10,071,840.0900
Delta = 14° 32′ 41.65" (LT)
Degree = 1° 30′ 00.00"
Tangent = 487.4508
Length = 969.6605
Radius = 3,819.7200
External = 30.9772
Long Chord = 967.0590
Mid. Ord. = 30.7280
P.C. Station 518+97.02 X 3,870,450.7133 Y 10,072,247.0212
P.T. Station 528+66.68 X 3,871,081.0223 Y 10,071,513.5953
C.C. X 3,873,639.4722 Y 10,074,349.8949
Back = S 33° 24′ 12.38" E
Ahead = S 47° 56′ 54.03" E
Chord Bear = S 40° 40′ 33.21" E

Course from PT NEWPROP01092_18 to PC NEWPROP01092_21 S 47° 56′ 54.03" E Dist 547.7310

Curve Data

STATE OF TEXAS
MICAH J. SCHLUTER
136908
LICENSED
PROFESSIONAL ENGINEER
Micah J. Schluter, P.E.
03.14.24

FM 1314 HORIZONTAL ALIGNMENT DATA

SHEET 1 OF 2

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Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		69

DATE: 02/07/2024 09:14 AM
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DW:
CK:

Curve Data

Curve NEWPROP01092_21

P.I. Station	535+39.65	X	3,871,580.7300	Y	10,071,062.8400
Delta =	2° 30′ 15.74" (RT)				
Degree =	1° 00′ 00.00"				
Tangent =	125.2386				
Length =	250.4374				
Radius =	5,729.5800				
External =	1.3686				
Long Chord =	250.4175				
Mid. Ord. =	1.3683				
P.C. Station	534+14.41	X	3,871,487.7352	Y	10,071,146.7249
P.T. Station	536+64.85	X	3,871,669.9706	Y	10,070,974.9718
C.C.		X	3,867,650.0604	Y	10,066,892.2755
Back = S	47° 56′ 54.03" E				
Ahead = S	45° 26′ 38.29" E				
Chord Bear = S	46° 41′ 46.16" E				

Course from PT NEWPROP01092_21 to PC NEWPROP01092_24 S 45° 26′ 38.29" E Dist 506.6283

Equation: Sta 541+71.48 (BK) = Sta 541+71.47 (AH)

End Region 2

Begin Region 3

Curve Data

Curve NEWPROP01092_24

P.I. Station	544+70.41	X	3,872,243.9900	Y	10,070,409.7800
Delta =	5° 58′ 24.16" (LT)				
Degree =	1° 00′ 00.00"				
Tangent =	298.9397				
Length =	597.3379				
Radius =	5,729.5800				
External =	7.7933				
Long Chord =	597.0674				
Mid. Ord. =	7.7827				
P.C. Station	541+71.47	X	3,872,030.9761	Y	10,070,619.5181
P.T. Station	547+68.81	X	3,872,477.6740	Y	10,070,223.3483
C.C.		X	3,876,050.8863	Y	10,074,702.2143
Back = S	45° 26′ 38.29" E				
Ahead = S	51° 25′ 02.44" E				
Chord Bear = S	48° 25′ 50.37" E				

Course from PT NEWPROP01092_24 to PC NEWPROP01092_27 S 51° 25′ 02.44" E Dist 228.8125

Curve Data

Curve NEWPROP01092_27

P.I. Station	557+65.34	X	3,873,256.6700	Y	10,069,601.8700
Delta =	15° 15′ 48.29" (LT)				
Degree =	1° 00′ 00.00"				
Tangent =	767.7165				
Length =	1,526.3418				
Radius =	5,729.5800				
External =	51.2050				
Long Chord =	1,521.8325				
Mid. Ord. =	50.7515				
P.C. Station	549+97.62	X	3,872,656.5388	Y	10,070,080.6510
P.T. Station	565+23.97	X	3,873,961.6744	Y	10,069,297.9664
C.C.		X	3,876,229.7512	Y	10,074,559.5170
Back = S	51° 25′ 02.44" E				
Ahead = S	66° 40′ 50.73" E				
Chord Bear = S	59° 02′ 56.59" E				

Course from PT NEWPROP01092_27 to PC NEWPROP01092_30 S 66° 40′ 50.73" E Dist 1,092.5119

Curve Data

Curve NEWPROP01092_30

P.I. Station	577+91.55	X	3,875,125.7100	Y	10,068,796.1900
Delta =	3° 30′ 00.96" (RT)				
Degree =	1° 00′ 00.00"				
Tangent =	175.0679				
Length =	350.0268				
Radius =	5,729.5800				
External =	2.6740				
Long Chord =	349.9724				
Mid. Ord. =	2.6727				
P.C. Station	576+16.48	X	3,874,964.9428	Y	10,068,865.4913
P.T. Station	579+66.50	X	3,875,281.9462	Y	10,068,717.2026
C.C.		X	3,872,696.8661	Y	10,063,603.9407
Back = S	66° 40′ 50.73" E				
Ahead = S	63° 10′ 49.77" E				
Chord Bear = S	64° 55′ 50.25" E				

Course from PT NEWPROP01092_30 to PC NEWPROP01092_33 S 63° 10′ 49.77" E Dist 632.6779

Curve Data

Curve NEWPROP01092_33

P.I. Station	587+74.26	X	3,876,002.8100	Y	10,068,352.7600
Delta =	3° 30′ 01.40" (LT)				
Degree =	1° 00′ 00.00"				
Tangent =	175.0739				
Length =	350.0390				
Radius =	5,729.5800				
External =	2.6742				
Long Chord =	349.9845				
Mid. Ord. =	2.6729				
P.C. Station	585+99.18	X	3,875,846.5684	Y	10,068,431.7501
P.T. Station	589+49.22	X	3,876,163.5829	Y	10,068,283.4566
C.C.		X	3,878,431.6485	Y	10,073,545.0121
Back = S	63° 10′ 49.77" E				
Ahead = S	66° 40′ 51.17" E				
Chord Bear = S	64° 55′ 50.47" E				

Course from PT NEWPROP01092_33 to PC NEWPROP01092_36 S 66° 40′ 51.17" E Dist 1,399.3647

STATE OF TEXAS
MICAH J. SCHLUTER
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Micah J. Schluter, P.E.

03.14.24

FM 1314 HORIZONTAL ALIGNMENT DATA

SHEET 2 OF 2

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		69A

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Feature: Road_Centerline FM 1314

		STATION	ELEV	GRADE	TOTAL L	BACK L	AHEAD L
VPI	1	470+00.00	149.8360				
VPC		470+88.75	149.2059	-0.7100	K = 114.0		
VPI	2	471+50.00	148.7710		122.4968	61.2484	61.2484
Low Point		471+69.69	148.9185				
VPT		472+11.25	148.9943	0.3645			
VPC		472+32.10	149.0703	0.3645	K = 231.0	SSD = 1903.3	
VPI	3	473+00.00	149.3178		135.7972	67.8986	67.8986
High Point		473+16.31	149.2238				
VPT		473+67.90	149.1662	-0.2233			
VPC		475+81.57	148.6890	-0.2233	K = 231.0		
VPI	4	476+00.00	148.6478		36.8638	18.4319	18.4319
VPT		476+18.43	148.6360	-0.0637			
VPC		483+50.00	148.1697	-0.0637	K = 544.3		
Low Point		483+84.70	148.1586				
VPI	5	484+00.00	148.1378		100.0000	50.0000	50.0000
VPT		484+50.00	148.1978	0.1200			
VPC		491+49.93	149.0376	0.1200	K = 418.7	SSD = 4567.6	
VPI	6	491+99.93	149.0976		100.0000	50.0000	50.0000
High Point		492+00.16	149.0677				
VPT		492+49.93	149.0382	-0.1189			
VPC		500+50.00	148.0872	-0.1189	K = 1232.4	SSD = 13347.5	
VPI	7	501+00.00	148.0278		100.0000	50.0000	50.0000
VPT		501+50.00	147.9278	-0.2000			
VPC		504+50.00	147.3278	-0.2000	K = 1111.1		
VPI	8	505+00.00	147.2278		100.0000	50.0000	50.0000
VPT		505+50.00	147.1728	-0.1100			
VPC		507+50.00	146.9528	-0.1100	K = 1315.8	SSD = 14247.6	
VPI	9	508+00.00	146.8978		100.0000	50.0000	50.0000
VPT		508+50.00	146.8048	-0.1860			
VPC		511+00.59	146.3387	-0.1860	K = 826.2		
VPI	10	511+50.59	146.2457		100.0000	50.0000	50.0000
VPT		512+00.59	146.2132	-0.0650			
VPC		514+50.00	146.0512	-0.0650	K = 632.8	SSD = 6878.3	
VPI	11	515+00.00	146.0187		100.0000	50.0000	50.0000
VPT		515+50.00	145.9072	-0.2230			

End Region 1

Equation: Sta 518+98.85 (BK) = Sta 518+97.02 (AH) ----------

Begin Region 2

VPC		521+48.17	144.5693	-0.2230	K = 310.7		
VPI	12	521+98.17	144.4578		100.0000	50.0000	50.0000
Low Point		522+17.45	144.4921				
VPT		522+48.17	144.5073	0.0989			
VPI	13	524+98.17	144.7545	0.0989			
VPI	14	525+06.37	144.7920	0.4575			

Ending profile PROF010924 description

STATE OF TEXAS
MICAH J. SCHLUTER
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03.14.24

FM 1314
VERTICAL ALIGNMENT

SHEET 1 OF 1

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CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		70

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CK:
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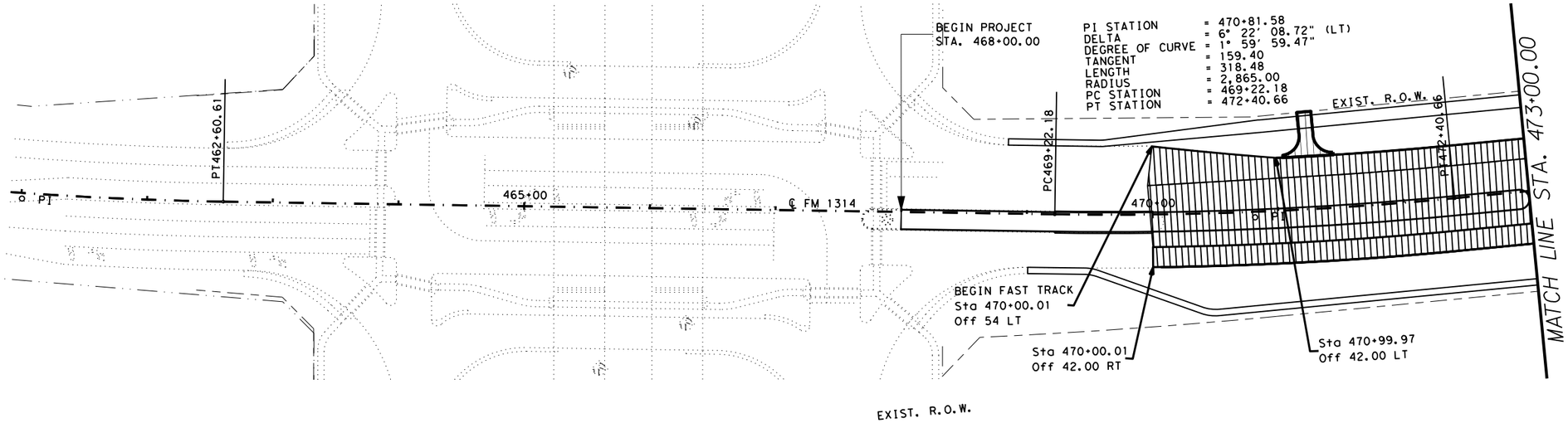

LEGEND:

- DRIVEWAY
- (A) CONC CURB (DOWEL)
- (B) 6" RIPRAP (CONC) (CL B)
- EXIST. DITCH
- PROP. RDWY.
- CENTER LINE
- EXIST ROW
- EXIST. RDWY.
- PROP. SIDEWALK
- PROP. TY 7 CURB RAMP

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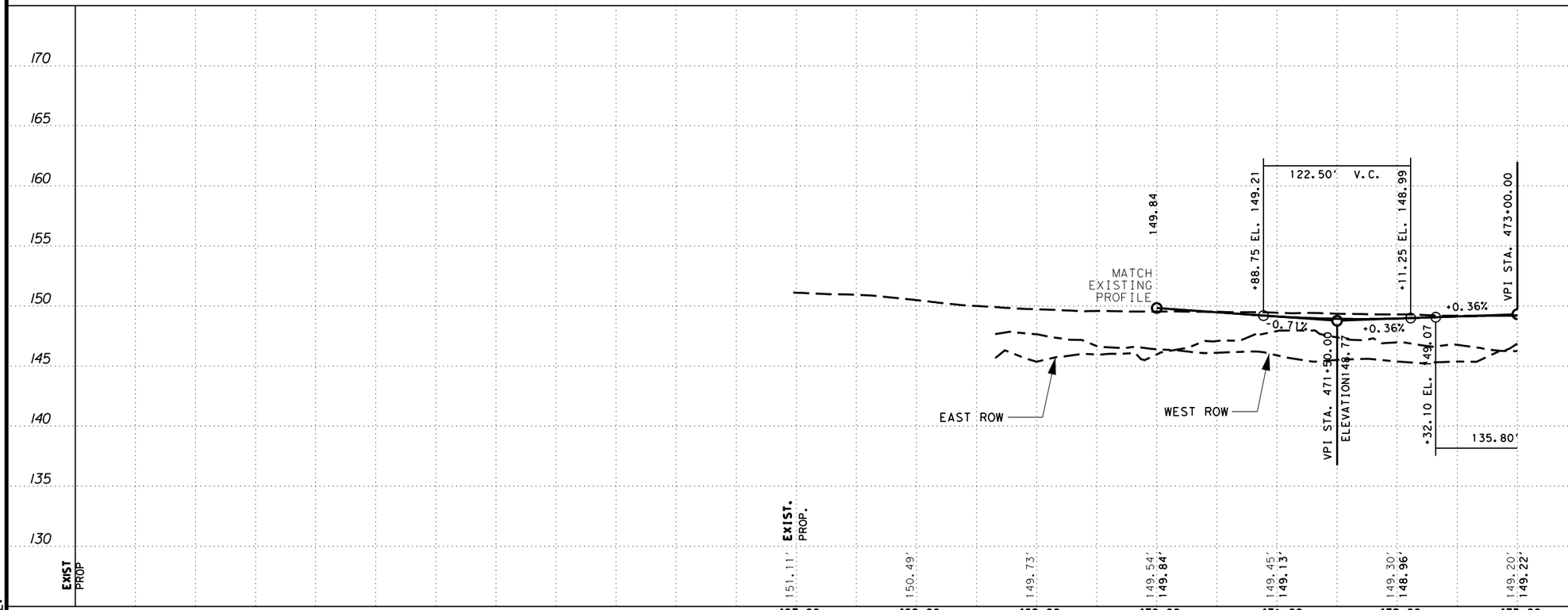
SCALE IN FEET



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STATE OF TEXAS
MICAH J. SCHLUTER
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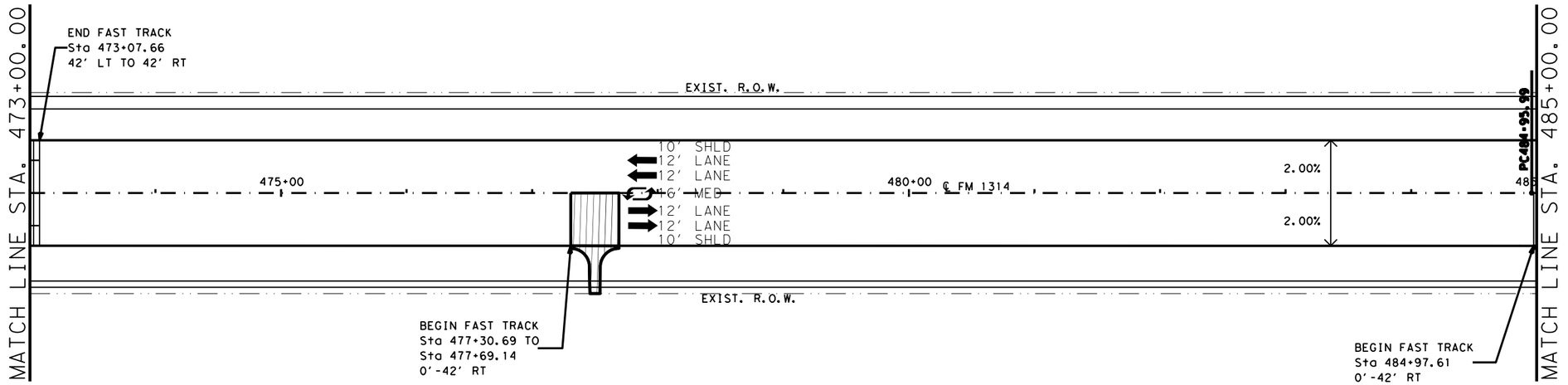
Micah J. Schluter P.E.
03.14.24

FM 1314
PROPOSED PLAN & PROFILE

SHEET 1 OF 6

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		71



LEGEND:

- DRIVEWAY
- (A) CONC CURB (DOWEL)
- (B) 6" RIPRAP (CONC) (CL B)
- EXIST. DITCH
- PROP. RDWY.
- CENTER LINE
- EXIST ROW
- EXIST. RDWY.
- PROP. SIDEWALK
- PROP. TY 7 CURB RAMP

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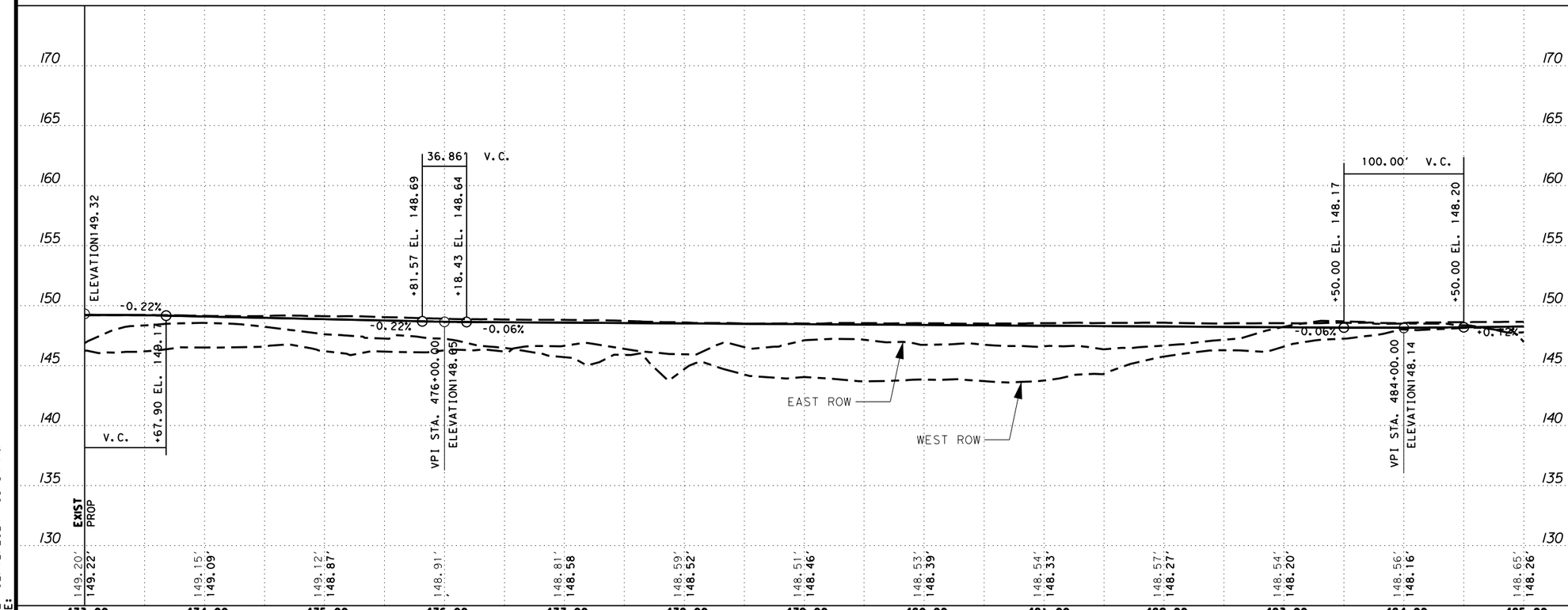

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FM 1314
PROPOSED PLAN & PROFILE

SHEET 2 OF 6

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		72

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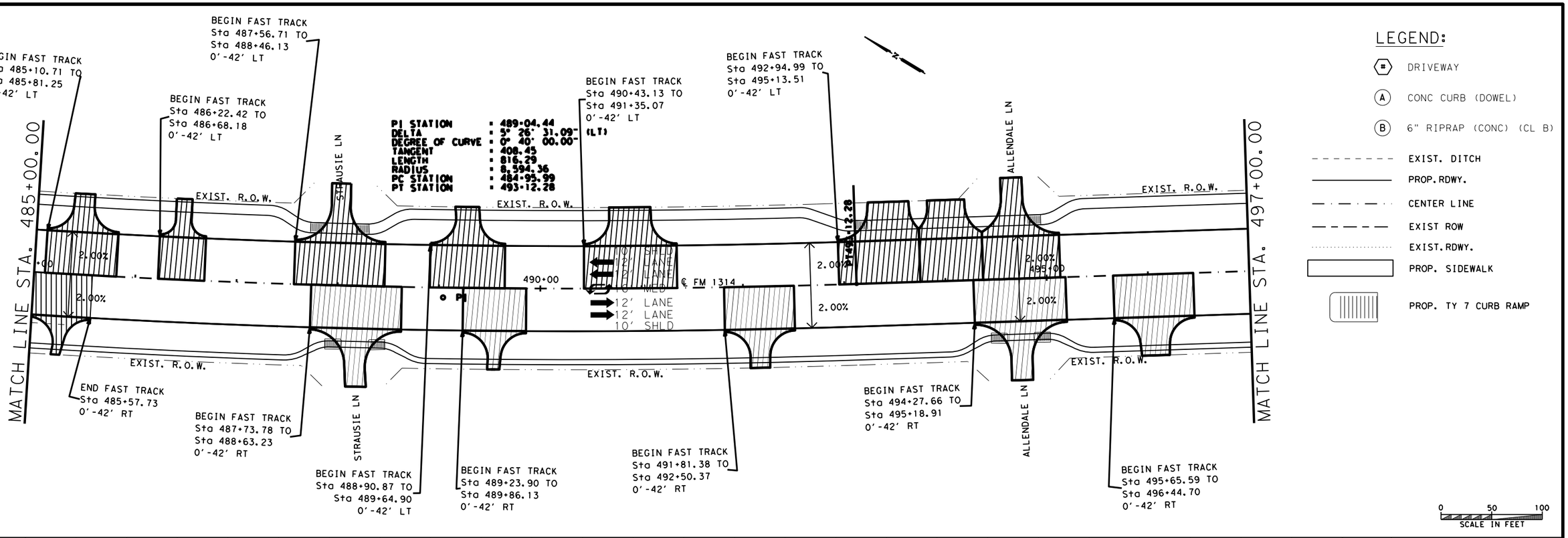

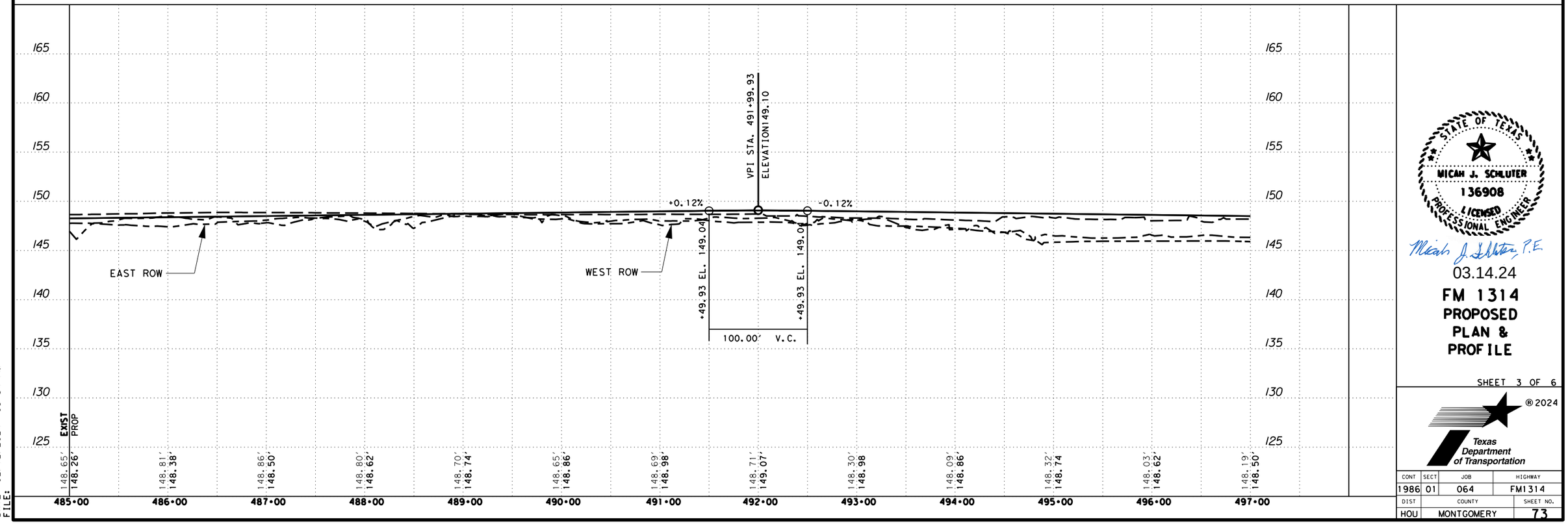

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03.14.24

FM 1314
PROPOSED PLAN & PROFILE

SHEET 3 OF 6

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		73

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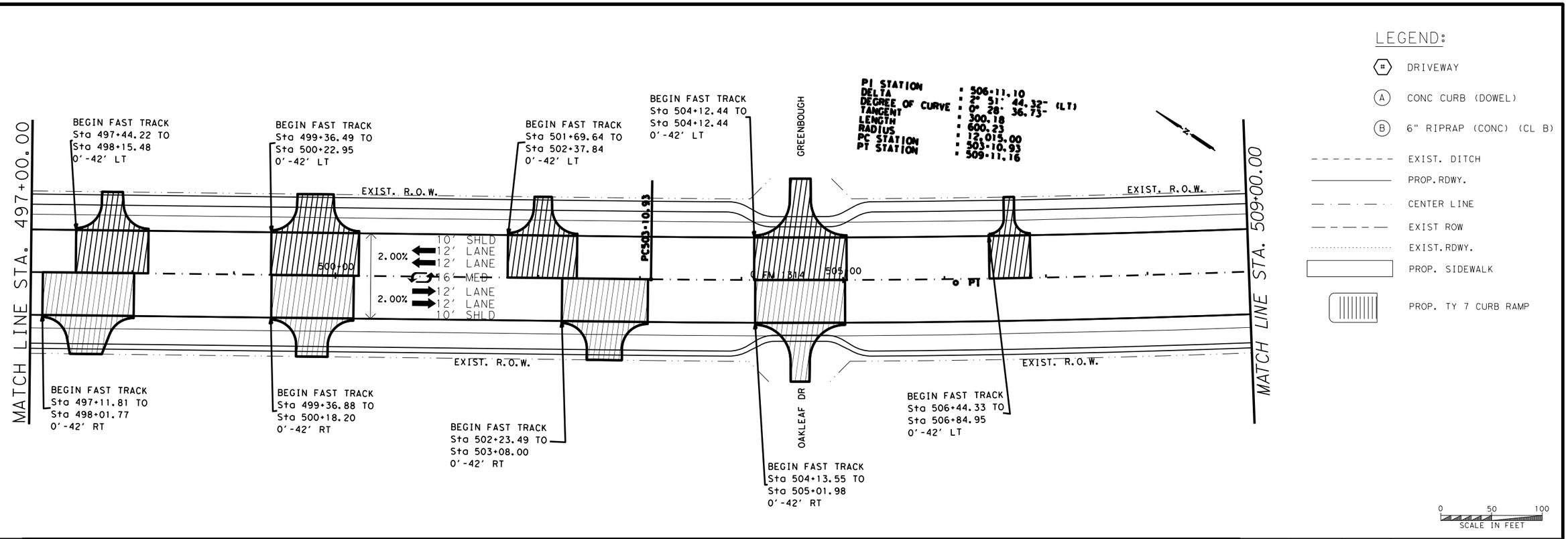

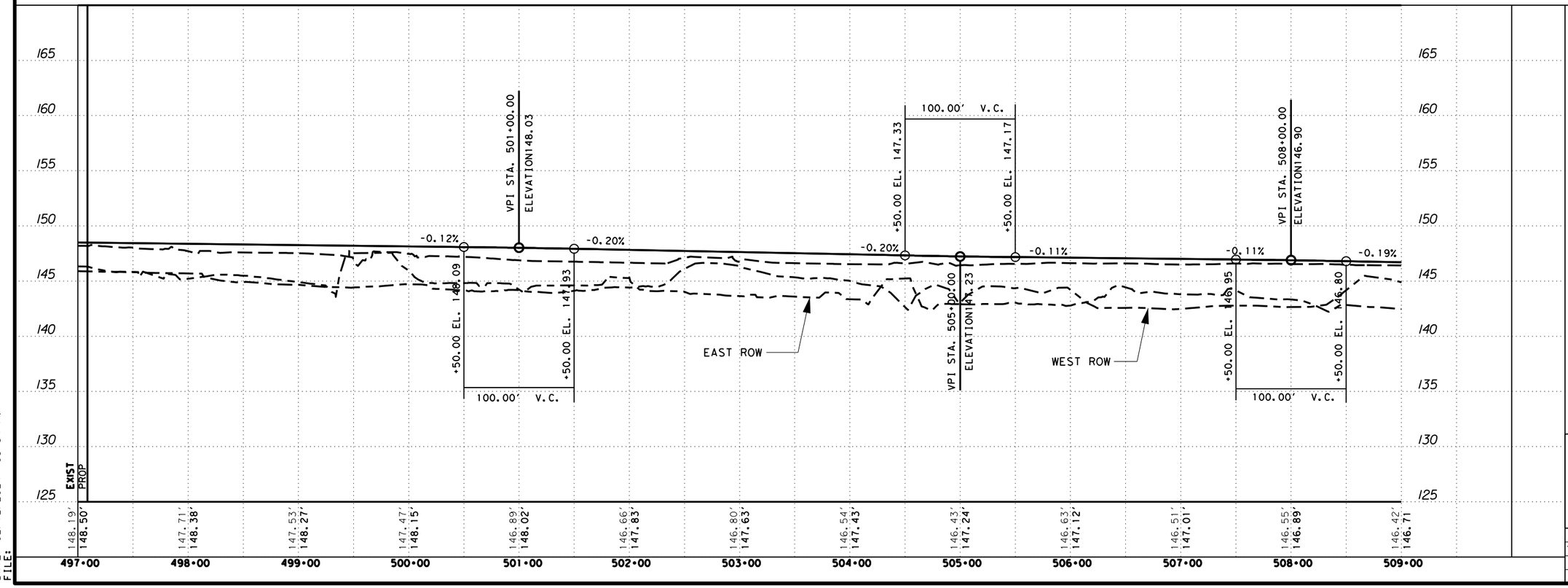

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MICAH J. SCHLUTER
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Micah J. Schluter P.E.
03.14.24

FM 1314 PROPOSED PLAN & PROFILE

SHEET 4 OF 6

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		74

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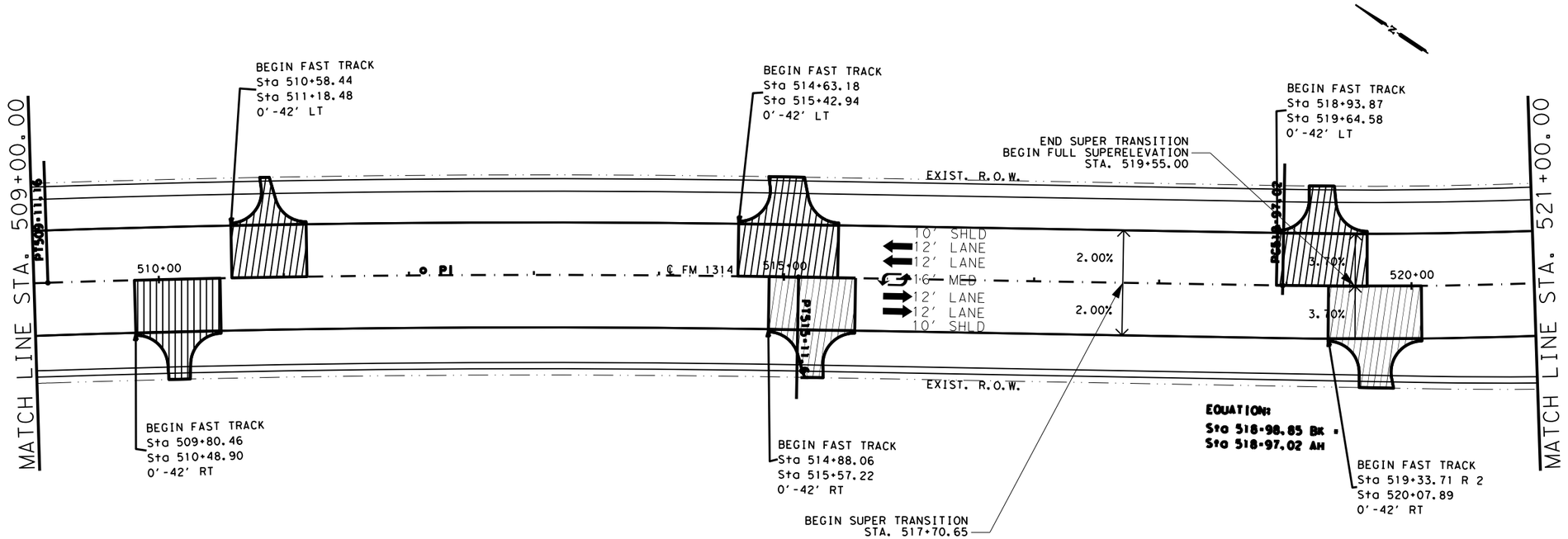

LEGEND:

- (#) DRIVEWAY
- (A) CONC CURB (DOWEL)
- (B) 6" RIPRAP (CONC) (CL B)
- EXIST. DITCH
- PROP. RDWY.
- CENTER LINE
- EXIST ROW
- EXIST. RDWY.
- PROP. SIDEWALK
- PROP. TY 7 CURB RAMP

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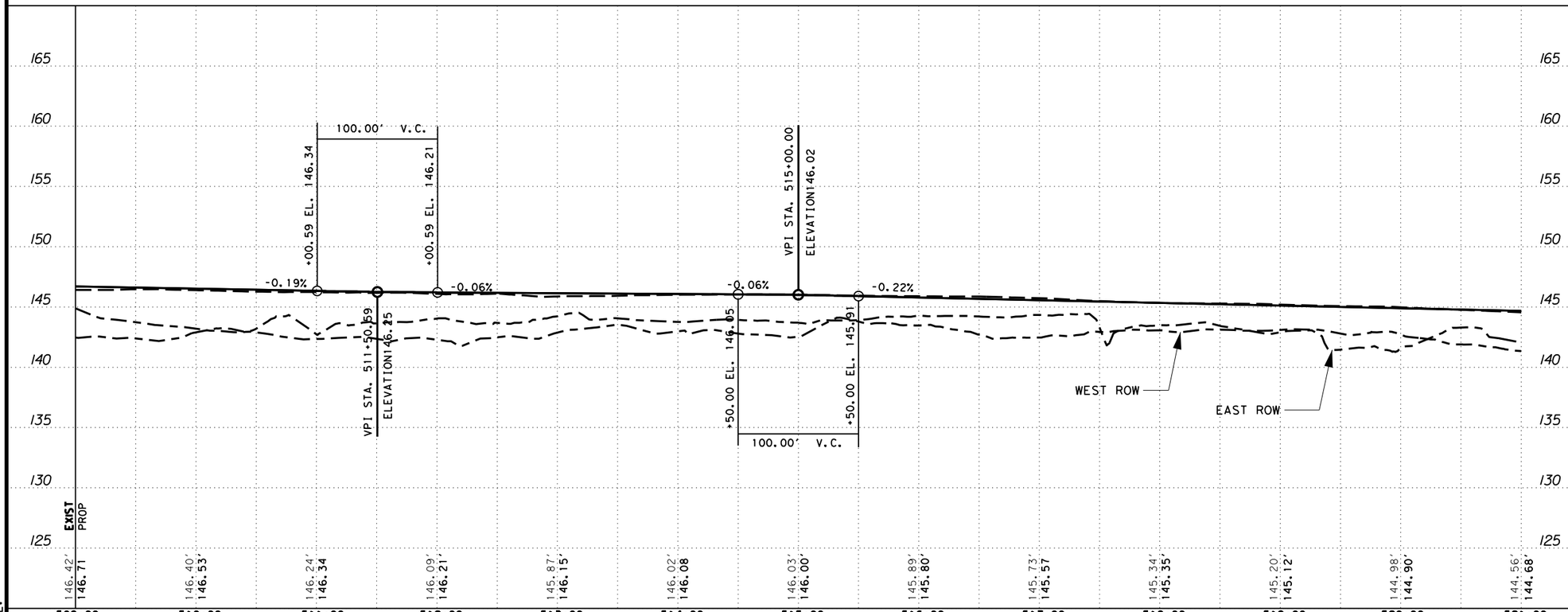
SCALE IN FEET



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STATE OF TEXAS
MICAH J. SCHLUTER
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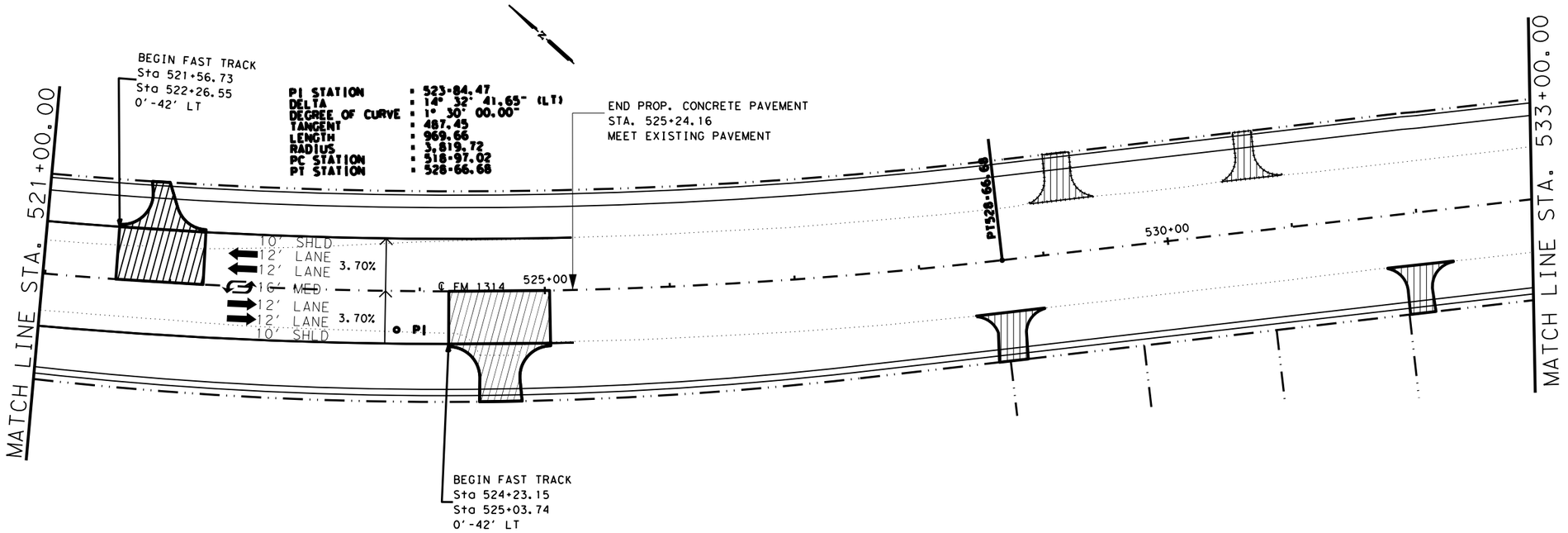
FM 1314
PROPOSED
PLAN &
PROFILE

SHEET 5 OF 6

Texas Department of Transportation

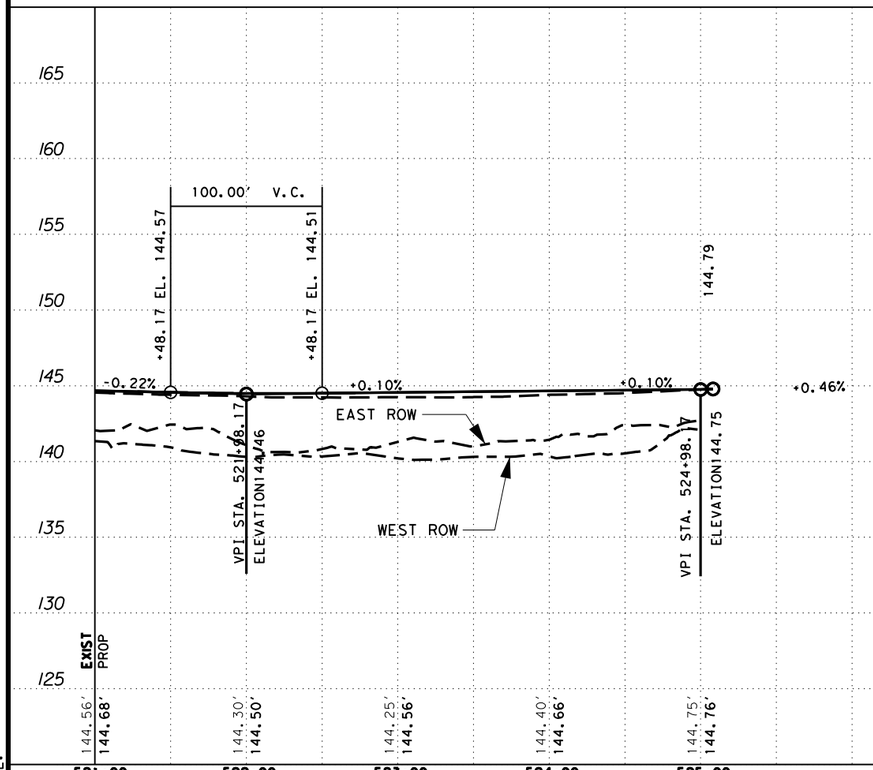
CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		75



LEGEND:

- DRIVEWAY
- (A) CONC CURB (DOWEL)
- (B) 6" RIPRAP (CONC) (CL B)
- EXIST. DITCH
- PROP. RDWY.
- CENTER LINE
- EXIST ROW
- EXIST. RDWY.
- PROP. SIDEWALK
- PROP. TY 7 CURB RAMP

0 50 100
SCALE IN FEET



STATE OF TEXAS
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Micah J. Schluter, P.E.
03.14.24

FM 1314
PROPOSED PLAN & PROFILE

SHEET 6 OF 6

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		76

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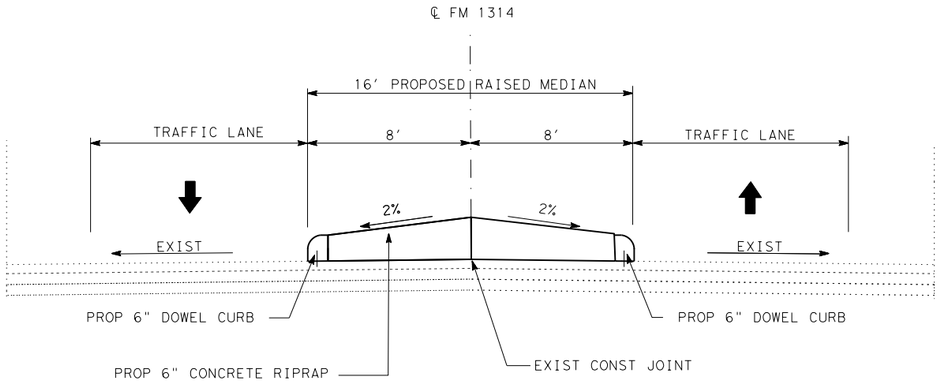
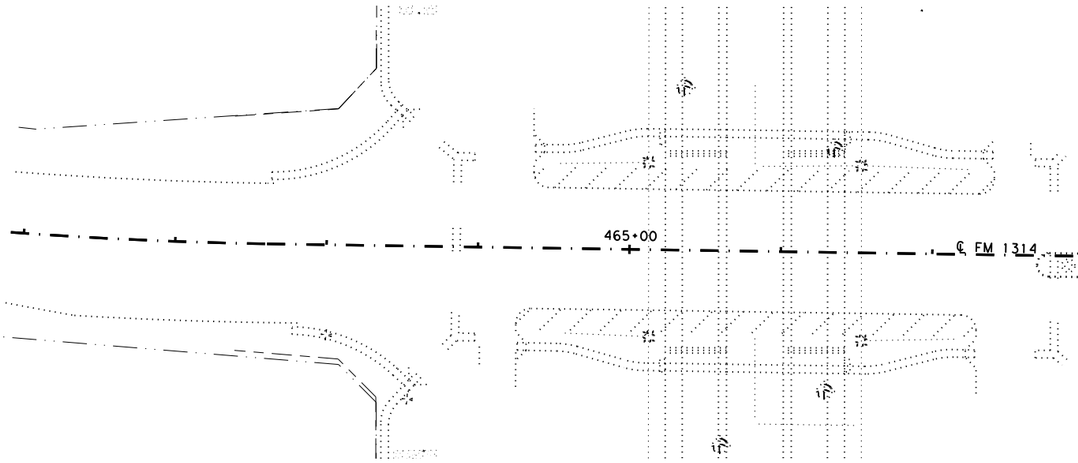


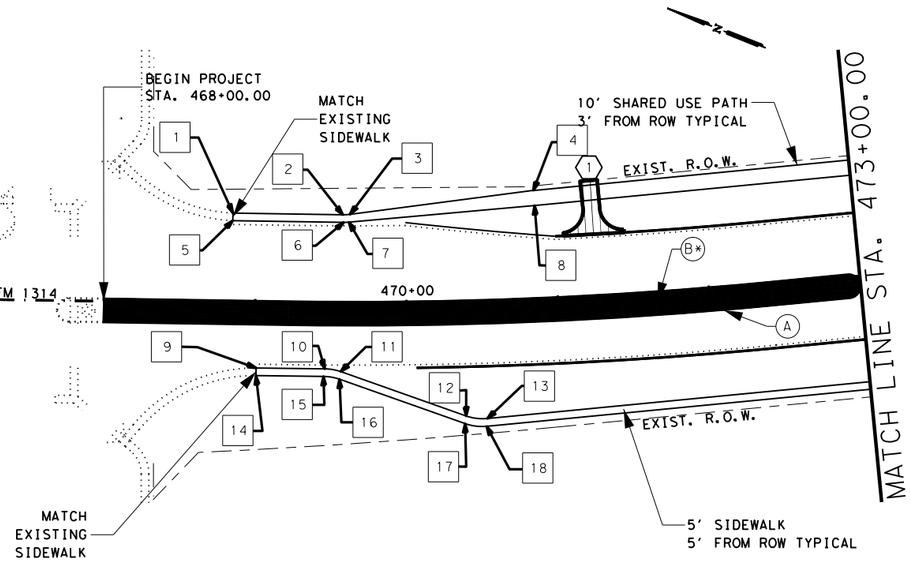
PROPOSED MEDIAN TYPICAL SECTION 16'

	POINT ID	STATION AND OFFSET
R=33'	1	Sta 468+84.43 Off 59.55 LT
	2	Sta 469+57.78 Off 59.33 LT
R=33'	3	Sta 469+62.64 Off 59.61 LT
	4	Sta 470+86.86 Off 72.87 LT
R=33'	5	Sta 468+84.43 Off 54.55 LT
	6	Sta 469+58.40 Off 54.32 LT
R=33'	7	Sta 469+61.90 Off 54.46 LT
	8	Sta 470+87.21 Off 62.89 LT

LEGEND:

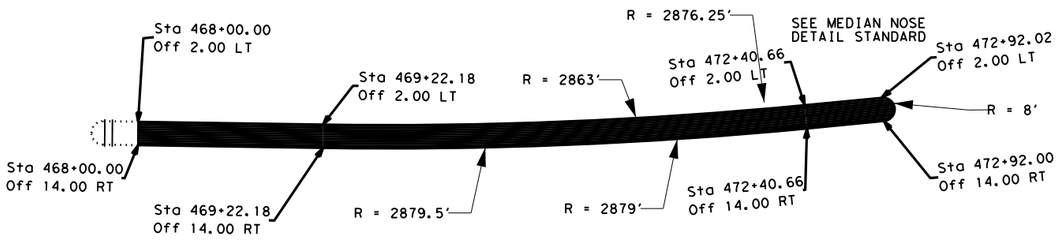
- DRIVEWAY
- (A) CONC CURB (DOWEL)
- (B) 6" RIPRAP (CONC) (CL B)
- EXIST. DITCH
- PROP. RDWY.
- CENTER LINE
- EXIST ROW
- EXIST. RDWY.
- PROP. SIDEWALK
- PROP. TY 7 CURB RAMP





* REINFORCING STEEL SHALL BE #4 BARS AT 18" C-C IN BOTH DIRECTIONS.

USE ITEM 666-6212 TO PAINT DOWEL CURB AROUND MEDIAN.



MEDIAN DETAILS

POINTS ARE BASED ON EDGE OF CURB

	POINT ID	STATION AND OFFSET
	9	Sta 469+01.29 Off 42.50 RT
R=33'	10	Sta 469+46.31 Off 42.47 RT
	11	Sta 469+56.74 Off 44.30 RT
R=33'	12	Sta 470+37.45 Off 74.40 RT
	13	Sta 470+51.18 Off 76.52 RT
	14	Sta 469+01.30 Off 47.50 RT
R=33'	15	Sta 469+45.47 Off 47.47 RT
	16	Sta 469+55.88 Off 49.29 RT
R=33'	17	Sta 470+36.72 Off 79.47 RT
	18	Sta 470+50.43 Off 81.58 RT

NOTE: ALL FAST TRACK DRIVEWAYS WILL BE POURED HALF AT A TIME UNLESS APPROVED BY PROPERTY OWNER OR TXDOT.

0 50 100
SCALE IN FEET

STATE OF TEXAS
MICAH J. SCHLUTER
136908
LICENSED
PROFESSIONAL ENGINEER

Micah J. Schluter P.E.

03.14.24

FM 1314 SIDEWALK AND DRIVEWAY LAYOUT

SHEET 1 OF 11

Texas Department of Transportation

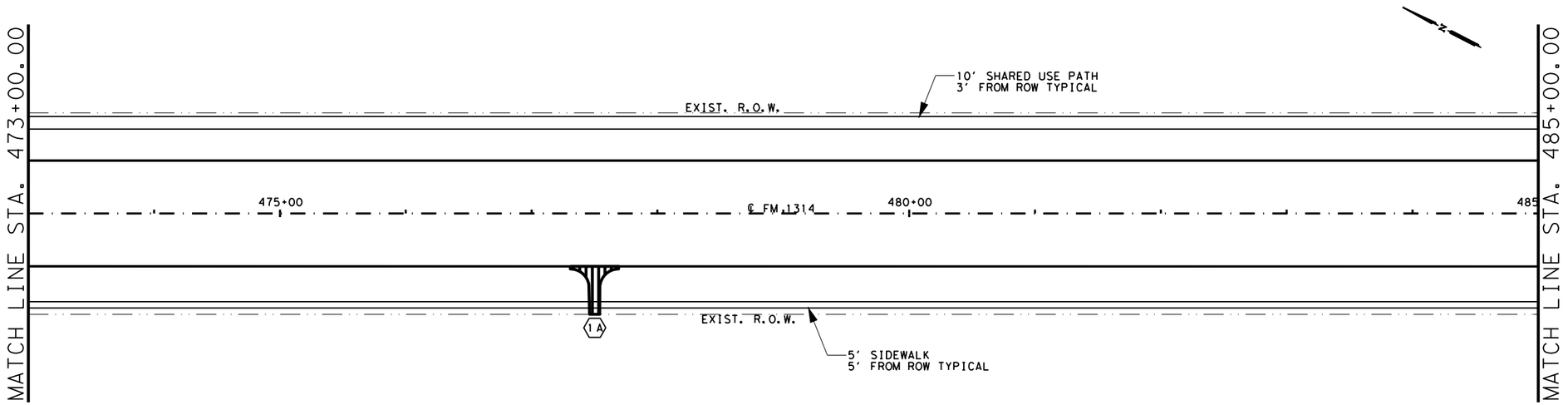
CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		77

DATE: 02/28/2024 03:34 PM
FILE:

CK:
DW:
CK:
DN:

LEGEND:

- DRIVEWAY
- (A) CONC CURB (DOWEL)
- (B) 6" RIPRAP (CONC) (CL B)
- EXIST. DITCH
- PROP. RDWY.
- CENTER LINE
- EXIST ROW
- EXIST. RDWY.
- PROP. SIDEWALK
- PROP. TY 7 CURB RAMP



NOTE: ALL FAST TRACK DRIVEWAYS WILL BE POURED HALF AT A TIME UNLESS APPROVED BY PROPERTY OWNER OR TXDOT.

0 50 100
SCALE IN FEET

STATE OF TEXAS
MICAH J. SCHLUTER
136908
LICENSED
PROFESSIONAL ENGINEER

Micah J. Schluter, P.E.
03.14.24

FM 1314 SIDEWALK AND DRIVEWAY LAYOUT

SHEET 2 OF 11

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		78

DATE: 02/28/2024 03:34 PM
FILE:

	POINT ID	STATION AND OFFSET
R=33'	1	Sta 487+30.95 Off 76.91 LT
	2	Sta 487+48.27 Off 72.07 LT
R=33'	3	Sta 487+58.04 Off 66.13 LT
	4	Sta 487+75.49 Off 61.24 LT
R=33'	5	Sta 488+27.34 Off 61.24 LT
	6	Sta 488+44.79 Off 66.13 LT
R=33'	7	Sta 488+54.56 Off 72.07 LT
	8	Sta 488+71.88 Off 76.91 LT
R=33'	9	Sta 487+28.14 Off 66.91 LT
	10	Sta 487+45.42 Off 62.08 LT
R=33'	11	Sta 487+55.21 Off 56.13 LT
	12	Sta 487+72.63 Off 51.24 LT
R=33'	13	Sta 488+30.20 Off 51.24 LT
	14	Sta 488+47.63 Off 56.13 LT
R=33'	15	Sta 488+57.41 Off 62.08 LT
	16	Sta 488+74.69 Off 66.91 LT

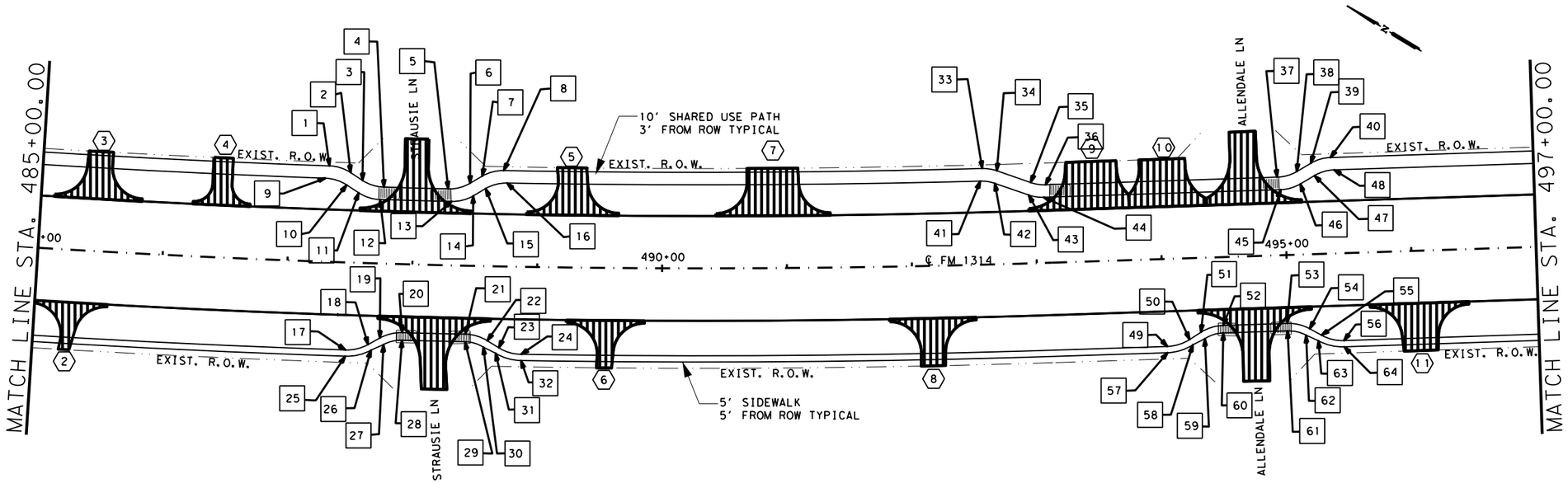
TWO TY 7 CURB RAMP

	POINT ID	STATION AND OFFSET
R=33'	33	Sta 492+58.38 Off 76.98 LT
	34	Sta 492+70.12 Off 74.85 LT
R=33'	35	Sta 492+97.14 Off 64.66 LT
	36	Sta 493+09.07 Off 62.48 LT
R=33'	37	Sta 494+94.56 Off 62.48 LT
	38	Sta 495+10.41 Off 66.53 LT
R=33'	39	Sta 495+21.91 Off 72.83 LT
	40	Sta 495+37.76 Off 76.88 LT
R=33'	41	Sta 492+56.55 Off 66.98 LT
	42	Sta 492+68.27 Off 64.85 LT
R=33'	43	Sta 492+95.30 Off 54.65 LT
	44	Sta 493+07.20 Off 52.48 LT
R=33'	45	Sta 494+97.12 Off 52.48 LT
	46	Sta 495+12.96 Off 56.53 LT
R=33'	47	Sta 495+24.47 Off 62.83 LT
	48	Sta 495+40.32 Off 66.88 LT

TWO TY 7 CURB RAMP

LEGEND:

- DRIVEWAY
- (A) CONC CURB (DOWEL)
- (B) 6" RIPRAP (CONC) (CL B)
- EXIST. DITCH
- PROP. RDWY.
- CENTER LINE
- EXIST ROW
- EXIST. RDWY.
- PROP. SIDEWALK
- PROP. TY 7 CURB RAMP



TWO TY 7 CURB RAMP

	POINT ID	STATION AND OFFSET
R=35'	17	Sta 487+48.80 Off 70.09 RT
	18	Sta 487+66.53 Off 75.09 RT
R=35'	19	Sta 487+75.84 Off 75.09 RT
	20	Sta 487+93.43 Off 75.09 RT
R=35'	21	Sta 488+43.6 Off 75.09 RT
	22	Sta 488+61.2 Off 75.09 RT
R=35'	23	Sta 488+70.5 Off 75.09 RT
	24	Sta 488+88.2 Off 75.09 RT
R=40'	25	Sta 487+48.80 Off 75.09 RT
	26	Sta 487+69.06 Off 75.09 RT
R=29'	27	Sta 487+78.86 Off 75.09 RT
	28	Sta 487+93.54 Off 75.09 RT
R=29'	29	Sta 488+43.64 Off 75.09 RT
	30	Sta 488+58.2 Off 75.09 RT
R=40'	31	Sta 488+68.0 Off 75.09 RT
	32	Sta 488+88.2 Off 75.09 RT

TWO TY 7 CURB RAMP

	POINT ID	STATION AND OFFSET
R=35'	49	Sta 494+02.41 Off 70.10 RT
	50	Sta 494+20.30 Off 65.18 RT
R=35'	51	Sta 494+29.55 Off 59.68 RT
	52	Sta 494+47.44 Off 54.76 RT
R=35'	53	Sta 494+98.84 Off 54.76 RT
	54	Sta 495+16.69 Off 59.66 RT
R=35'	55	Sta 495+25.99 Off 65.17 RT
	56	Sta 495+43.84 Off 70.07 RT
R=40'	57	Sta 494+02.41 Off 75.10 RT
	58	Sta 494+22.86 Off 69.48 RT
R=29'	59	Sta 494+32.62 Off 64.84 RT
	60	Sta 494+47.48 Off 60.76 RT
R=29'	61	Sta 494+98.84 Off 60.76 RT
	62	Sta 495+13.63 Off 64.82 RT
R=40'	63	Sta 495+23.43 Off 69.47 RT
	64	Sta 495+43.84 Off 75.07 RT

NOTE: ALL FAST TRACK DRIVEWAYS WILL BE POURED HALF AT A TIME UNLESS APPROVED BY PROPERTY OWNER OR TXDOT.

0 50 100
SCALE IN FEET

STATE OF TEXAS
MICAH J. SCHLUTER
136908
LICENSED
PROFESSIONAL ENGINEER

Micah J. Schluter P.E.

03.14.24

FM 1314 SIDEWALK AND DRIVEWAY LAYOUT

SHEET 3 OF 11

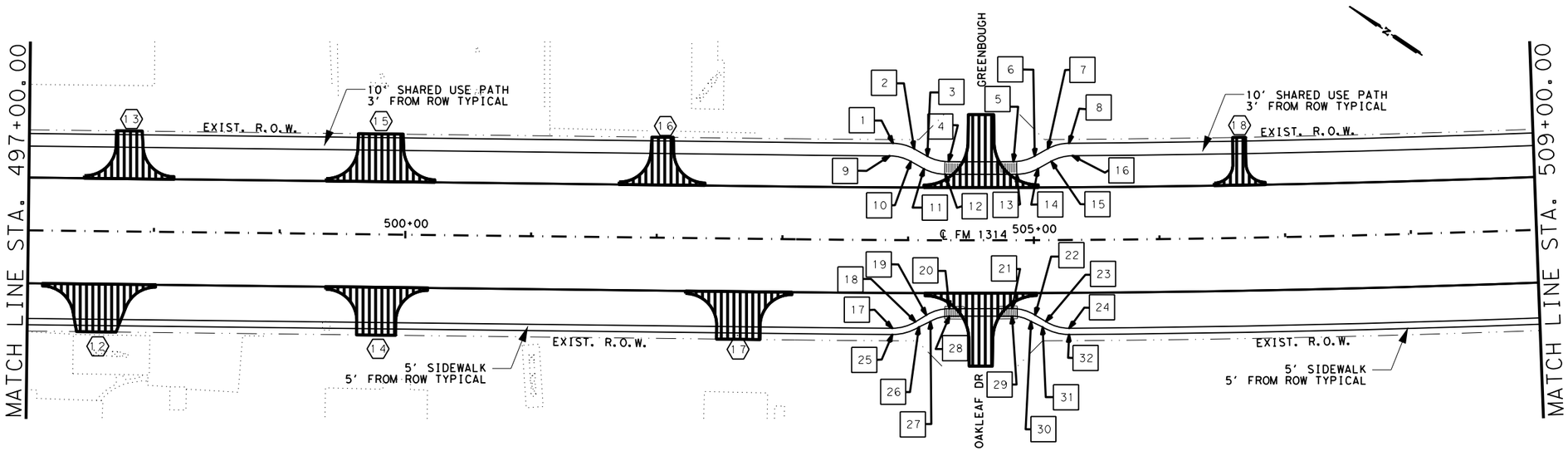
Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		79

DATE: 02/28/2024 07:15 PM
FILE:

	POINT ID	STATION AND OFFSET
R=35'	1	Sta 503+87.55 Off 76.90 LT
	2	Sta 504+04.48 Off 72.58 LT
R=35'	3	Sta 504+15.05 Off 66.80 LT
	4	Sta 504+32.08 Off 62.44 LT
R=35'	5	Sta 504+83.97 Off 62.44 LT
	6	Sta 505+01.03 Off 66.82 LT
R=35'	7	Sta 505+11.56 Off 72.60 LT
	8	Sta 505+28.51 Off 76.93 LT
R=35'	9	Sta 503+84.99 Off 66.90 LT
	10	Sta 504+01.89 Off 62.59 LT
R=35'	11	Sta 504+12.47 Off 56.79 LT
	12	Sta 504+29.48 Off 52.44 LT
R=35'	13	Sta 504+86.57 Off 52.44 LT
	14	Sta 505+03.61 Off 56.82 LT
R=35'	15	Sta 505+14.15 Off 62.60 LT
	16	Sta 505+31.09 Off 66.93 LT

TWO TY 7 CURB RAMP



TWO TY 7 CURB RAMP

	POINT ID	STATION AND OFFSET
R=35'	17	Sta 503+87.87 Off 70.07 RT
	18	Sta 504+06.21 Off 64.83 RT
R=35'	19	Sta 504+14.79 Off 59.51 RT
	20	Sta 504+33.03 Off 54.31 RT
R=35'	21	Sta 504+82.47 Off 54.31 RT
	22	Sta 505+00.75 Off 59.53 RT
R=35'	23	Sta 505+09.28 Off 64.84 RT
	24	Sta 505+27.66 Off 70.10 RT
R=40'	25	Sta 503+87.87 Off 75.07 RT
	26	Sta 504+08.83 Off 69.08 RT
R=29'	27	Sta 504+17.92 Off 64.61 RT
	28	Sta 504+33.01 Off 60.31 RT
R=29'	29	Sta 504+82.47 Off 60.31 RT
	30	Sta 504+97.61 Off 64.63 RT
R=40'	31	Sta 505+06.66 Off 69.09 RT
	32	Sta 505+27.66 Off 75.10 RT

NOTE: ALL FAST TRACK DRIVEWAYS WILL BE POURED HALF AT A TIME UNLESS APPROVED BY PROPERTY OWNER OR TXDOT.

0 50 100
SCALE IN FEET

LEGEND:

- DRIVEWAY
- (A) CONC CURB (DOWEL)
- (B) 6" RIPRAP (CONC) (CL B)
- EXIST. DITCH
- PROP. RDWY.
- CENTER LINE
- EXIST ROW
- EXIST. RDWY.
- PROP. SIDEWALK
- PROP. TY 7 CURB RAMP

STATE OF TEXAS
MICAH J. SCHLUTER
136908
LICENSED
PROFESSIONAL ENGINEER

Micah J. Schluter, P.E.

03.14.24

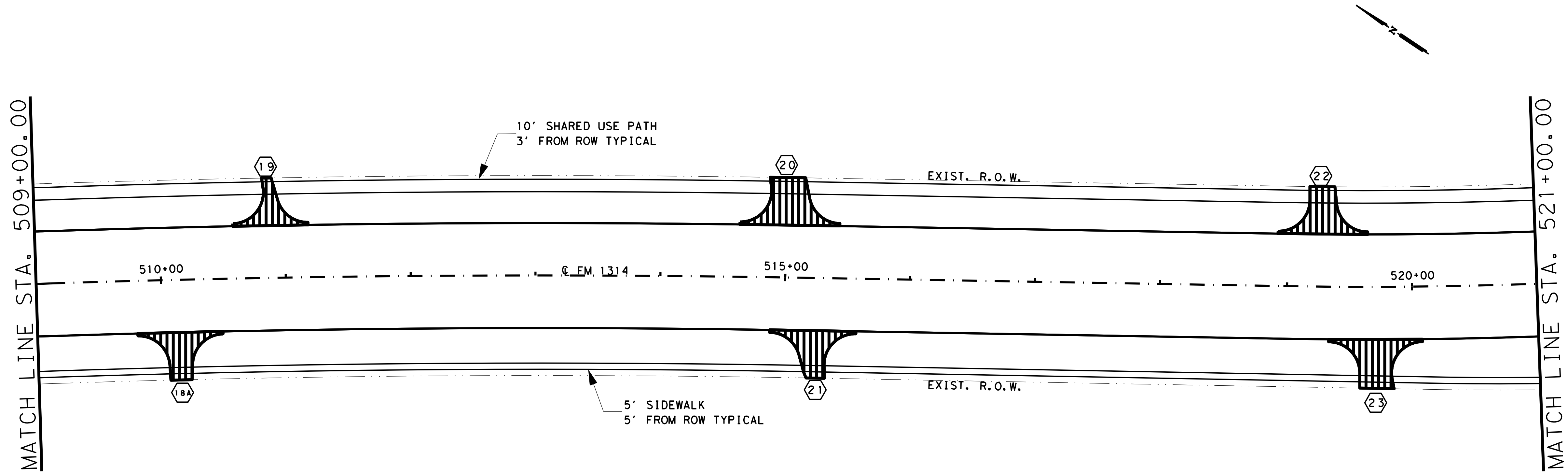
FM 1314 SIDEWALK AND DRIVEWAY LAYOUT

SHEET 4 OF 11

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		80

DATE: 02/28/2024 07:15 PM
FILE:



LEGEND:

- DRIVEWAY
- A CONC CURB (DOWEL)
- B 6" RIPRAP (CONC) (CL B)
- EXIST. DITCH
- PROP. RDWY.
- CENTER LINE
- EXIST ROW
- EXIST. RDWY.
- PROP. SIDEWALK
- PROP. TY 7 CURB RAMP

NOTE: ALL FAST TRACK DRIVEWAYS WILL BE POURED HALF AT A TIME UNLESS APPROVED BY PROPERTY OWNER OR TXDOT.

0 50 100
SCALE IN FEET

STATE OF TEXAS
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Micah J. Schluter, P.E.
03.14.24

FM 1314 SIDEWALK AND DRIVEWAY LAYOUT

SHEET 5 OF 11

Texas Department of Transportation

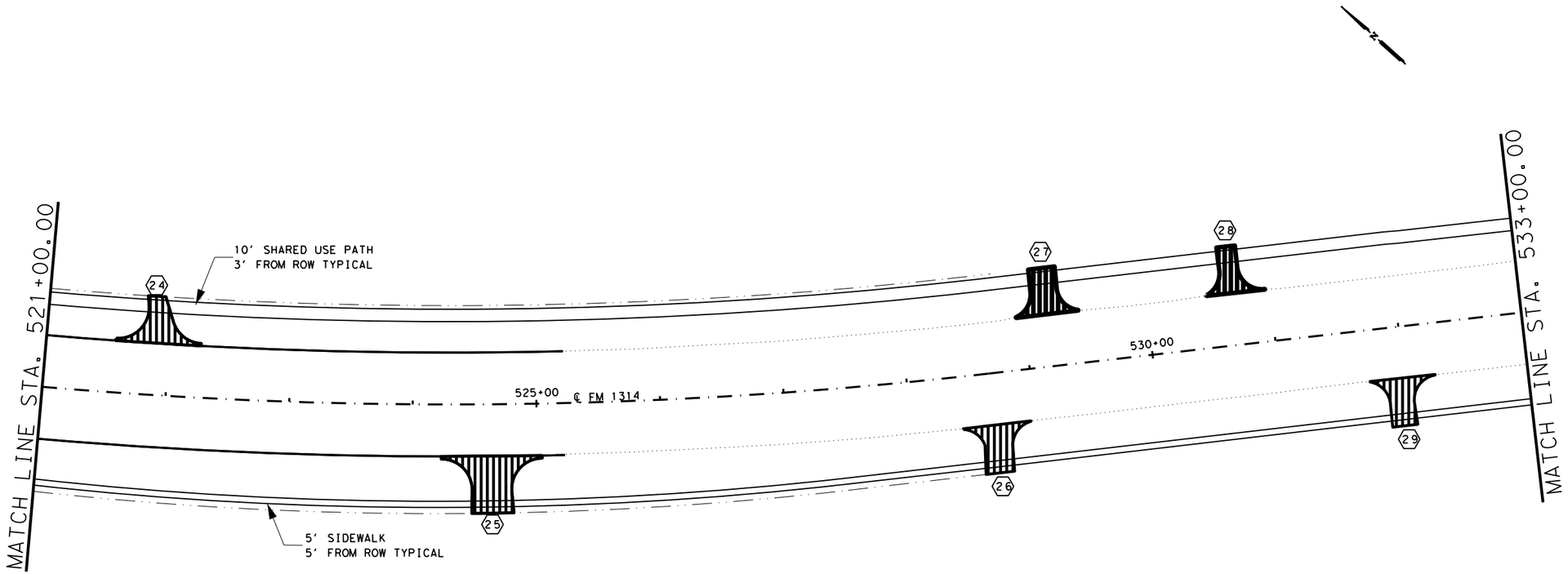
CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		81

DATE: 02/28/2024 07:15 PM
FILE:

CK:
DW:
CK:
DN:

LEGEND:

- DRIVEWAY
- (A) CONC CURB (DOWEL)
- (B) 6" RIPRAP (CONC) (CL B)
- EXIST. DITCH
- PROP. RDWY.
- CENTER LINE
- EXIST ROW
- EXIST. RDWY.
- PROP. SIDEWALK
- PROP. TY 7 CURB RAMP



NOTE: ALL FAST TRACK DRIVEWAYS WILL BE POURED HALF AT A TIME UNLESS APPROVED BY PROPERTY OWNER OR TXDOT.

0 50 100
SCALE IN FEET

STATE OF TEXAS
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Micah J. Schluter, P.E.
03.14.24

FM 1314 SIDEWALK AND DRIVEWAY LAYOUT

SHEET 6 OF 11

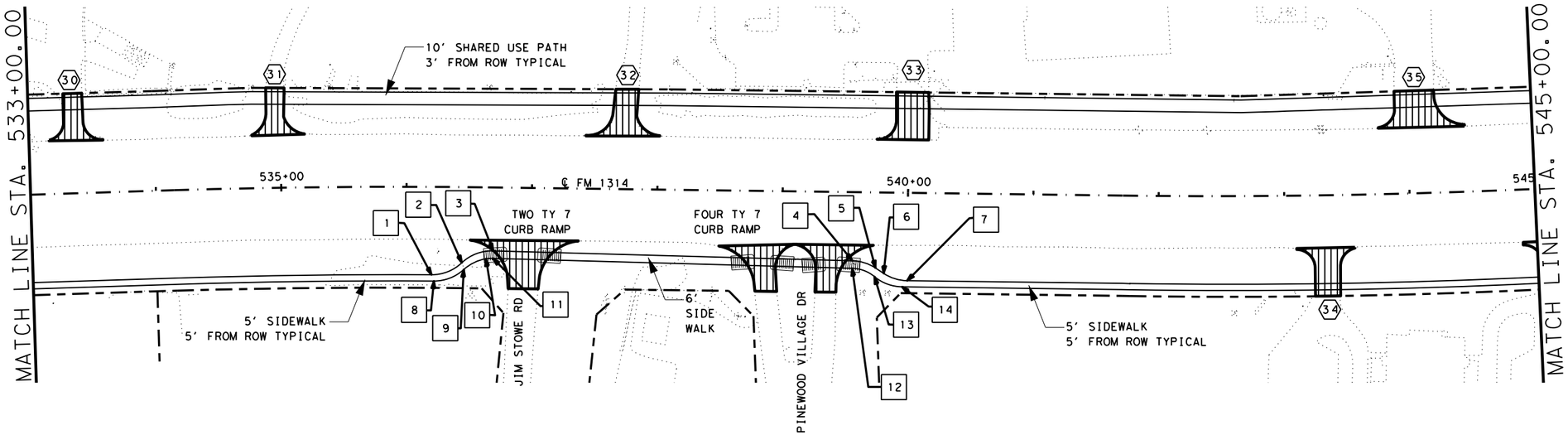
Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		82

DATE: 02/28/2024 07:15 PM
FILE:

LEGEND:

- DRIVEWAY
- (A) CONC CURB (DOWEL)
- (B) 6" RIPRAP (CONC) (CL B)
- EXIST. DITCH
- PROP. RDWY.
- CENTER LINE
- EXIST ROW
- EXIST. RDWY.
- PROP. SIDEWALK
- PROP. TY 7 CURB RAMP



	POINT ID	STATION AND OFFSET
R=35'	1	Sta 536+20.25 Off 70.00 RT
R=35'	2	Sta 536+44.65 Off 60.29 RT
	3	Sta 536+69.72 Off 50.48 RT
R=35'	4	Sta 539+56.39 Off 54.73 RT
	5	Sta 539+74.71 Off 60.23 RT
R=35'	6	Sta 539+81.39 Off 64.50 RT
	7	Sta 540+00.22 Off 70.00 RT
R=35'	8	Sta 536+22.25 Off 75.00 RT
R=35'	9	Sta 536+46.19 Off 65.74 RT
R=29'	10	Sta 536+64.10 Off 56.93 RT
	11	Sta 536+69.63 Off 56.48 RT
R=29'	12	Sta 539+56.30 Off 60.73 RT
R=35'	13	Sta 539+74.12 Off 67.20 RT
	14	Sta 539+96.16 Off 75.00 RT

NOTE: ALL FAST TRACK DRIVEWAYS WILL BE POURED HALF AT A TIME UNLESS APPROVED BY PROPERTY OWNER OR TXDOT.

0 50 100
SCALE IN FEET

STATE OF TEXAS
MICAH J. SCHLUTER
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PROFESSIONAL ENGINEER

Micah J. Schluter, P.E.
03.14.24

FM 1314 SIDEWALK AND DRIVEWAY LAYOUT

SHEET 7 OF 11

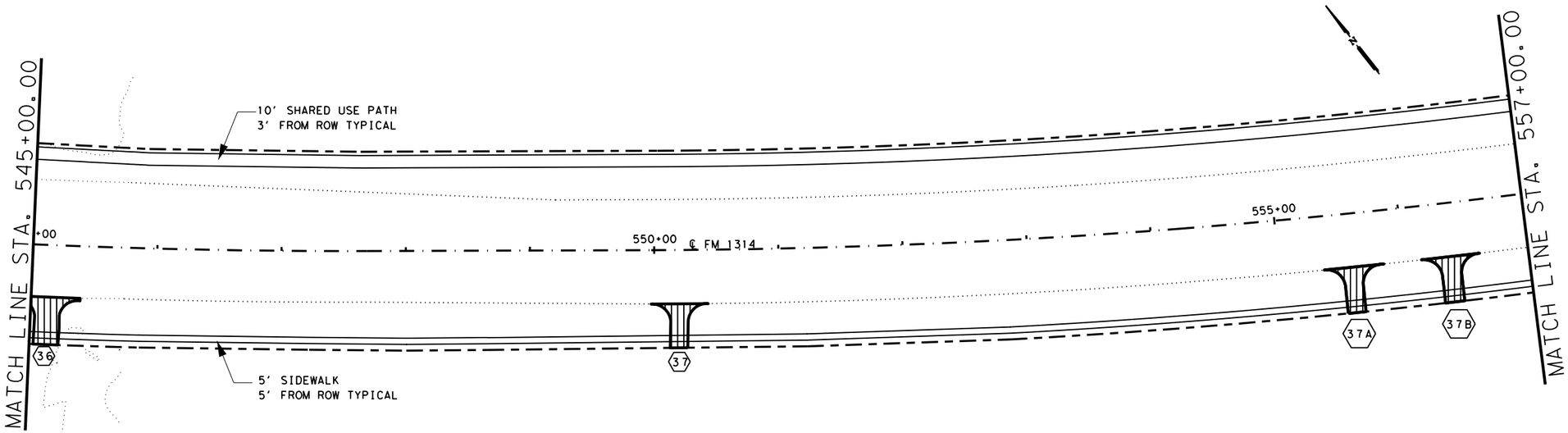
Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		83

DATE: 02/28/2024 03:34 PM
FILE:

LEGEND:

- DRIVEWAY
- (A) CONC CURB (DOWEL)
- (B) 6" RIPRAP (CONC) (CL B)
- EXIST. DITCH
- PROP. RDWY.
- CENTER LINE
- EXIST ROW
- EXIST. RDWY.
- PROP. SIDEWALK
- PROP. TY 7 CURB RAMP



NOTE: ALL FAST TRACK DRIVEWAYS WILL BE POURED HALF AT A TIME UNLESS APPROVED BY PROPERTY OWNER OR TXDOT.

0 50 100
SCALE IN FEET

STATE OF TEXAS
MICAH J. SCHLUTER
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03.14.24

FM 1314 SIDEWALK AND DRIVEWAY LAYOUT

SHEET 8 OF 11

Texas Department of Transportation

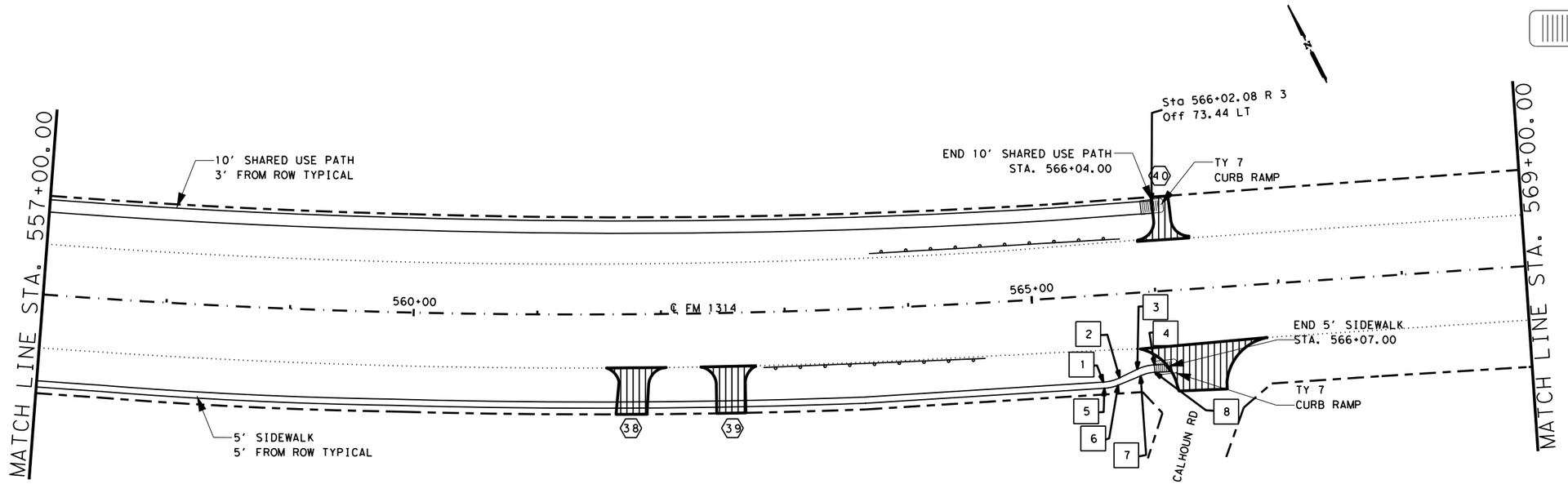
CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		84

DATE: 02/28/2024 03:34 PM
FILE:

CK:
DW:
CK:
DN:

LEGEND:

- DRIVEWAY
- (A) CONC CURB (DOWEL)
- (B) 6" RIPRAP (CONC) (CL B)
- EXIST. DITCH
- PROP. RDWY.
- CENTER LINE
- EXIST ROW
- EXIST. RDWY.
- PROP. SIDEWALK
- PROP. TY 7 CURB RAMP



	POINT ID	STATION AND OFFSET
R=35'	1	Sta 565+53.26 Off 70.32 RT
	2	Sta 565+66.69 Off 67.73 RT
R=35'	3	Sta 565+81.36 Off 61.75 RT
	4	Sta 565+95.49 Off 59.18 RT
R=35'	5	Sta 565+53.71 Off 75.33 RT
	6	Sta 565+65.01 Off 73.52 RT
R=29'	7	Sta 565+83.62 Off 67.31 RT
	8	Sta 565+95.33 Off 65.17 RT

NOTE: ALL FAST TRACK DRIVEWAYS WILL BE POURED HALF AT A TIME UNLESS APPROVED BY PROPERTY OWNER OR TXDOT.

0 50 100
SCALE IN FEET

STATE OF TEXAS
MICAH J. SCHLUTER
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PROFESSIONAL ENGINEER

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03.14.24

FM 1314 SIDEWALK AND DRIVEWAY LAYOUT

SHEET 9 OF 11

Texas Department of Transportation

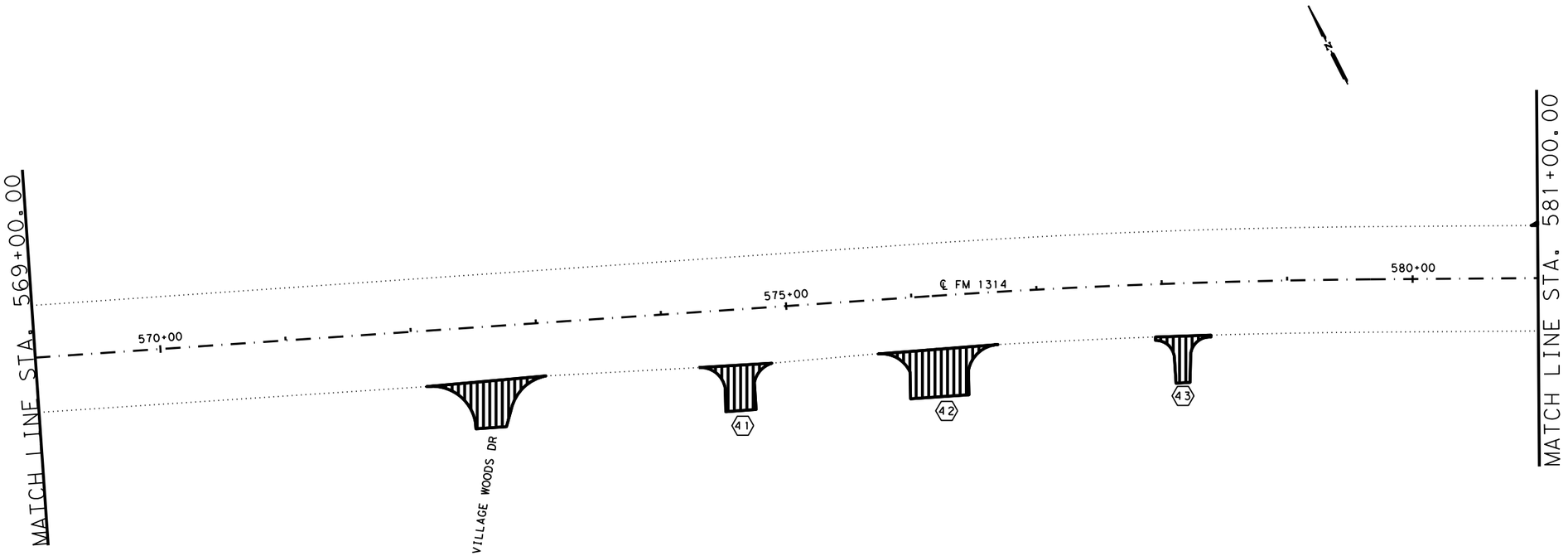
CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		85

DATE: 02/28/2024 03:34 PM
FILE:

CK:
DW:
CK:
DN:

LEGEND:

- DRIVEWAY
- (A) CONC CURB (DOWEL)
- (B) 6" RIPRAP (CONC) (CL B)
- EXIST. DITCH
- PROP. RDWY.
- CENTER LINE
- EXIST ROW
- EXIST. RDWY.
- PROP. SIDEWALK
- PROP. TY 7 CURB RAMP



NOTE: ALL FAST TRACK DRIVEWAYS WILL BE POURED HALF AT A TIME UNLESS APPROVED BY PROPERTY OWNER OR TXDOT.

0 50 100
SCALE IN FEET

STATE OF TEXAS
MICAH J. SCHLUTER
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03.14.24

FM 1314 SIDEWALK AND DRIVEWAY LAYOUT

SHEET 10 OF 11

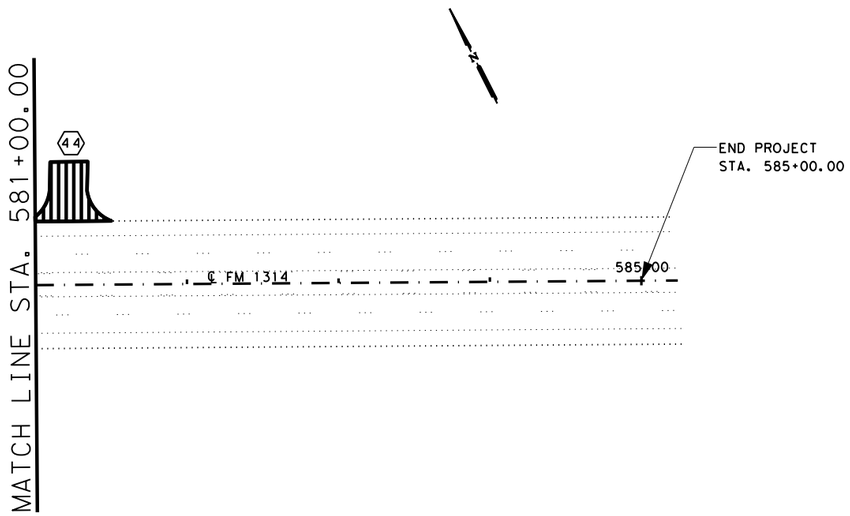
Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		86

DATE: 02/28/2024 03:34 PM
FILE:

LEGEND:

- DRIVEWAY
- (A) CONC CURB (DOWEL)
- (B) 6" RIPRAP (CONC) (CL B)
- EXIST. DITCH
- PROP. RDWY.
- CENTER LINE
- EXIST ROW
- EXIST. RDWY.
- PROP. SIDEWALK
- PROP. TY 7 CURB RAMP



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0 50 100
SCALE IN FEET

STATE OF TEXAS
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Micah J. Schluter, P.E.
03.14.24

FM 1314 SIDEWALK AND DRIVEWAY LAYOUT

SHEET 11 OF 11

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		87

DATE: 02/29/2024 07:31 AM
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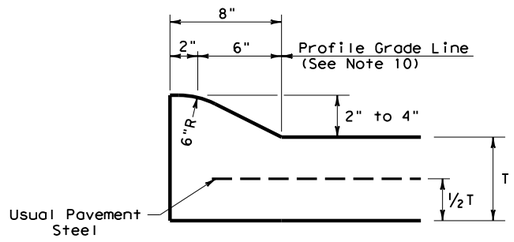
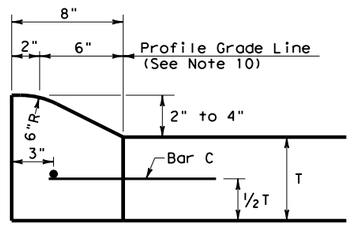
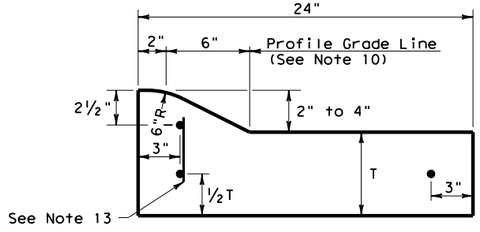


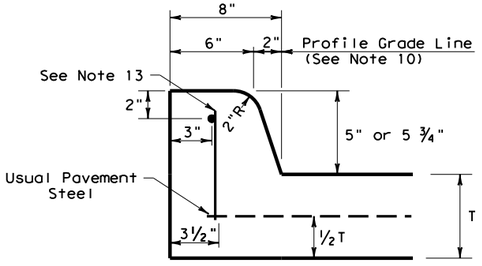
TYPE I CURB (MONOLITHIC)
2" - 4" HEIGHT



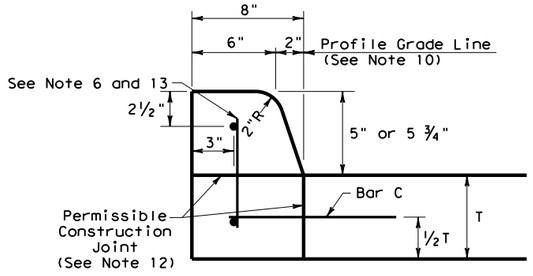
TYPE I CURB
2" - 4" HEIGHT



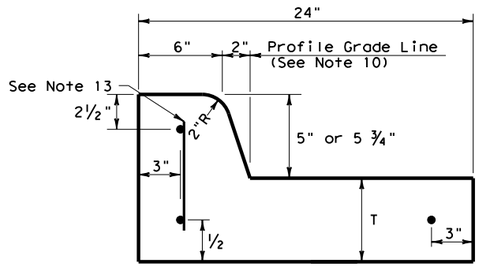
TYPE I CURB AND GUTTER
2" - 4" HEIGHT



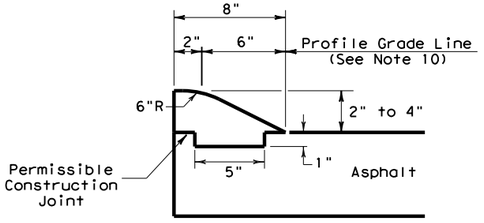
TYPE II CURB (MONOLITHIC)
5" - 5 ¾" HEIGHT



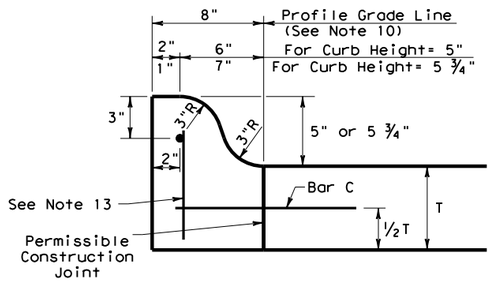
TYPE II CURB
5" - 5 ¾" HEIGHT



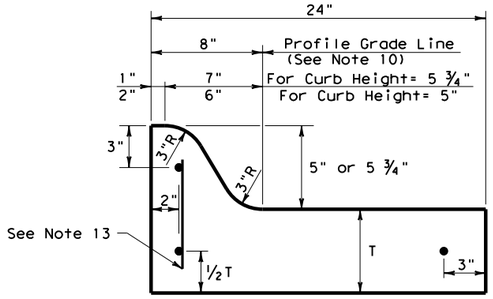
TYPE II CURB AND GUTTER
5" - 5 ¾" HEIGHT



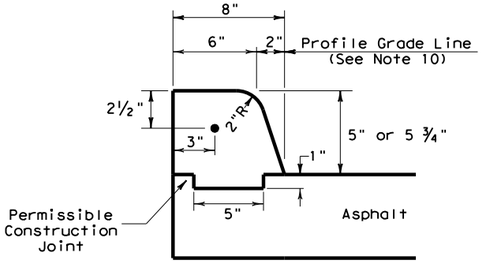
TYPE III CURB (KEYED)
2" - 4" HEIGHT



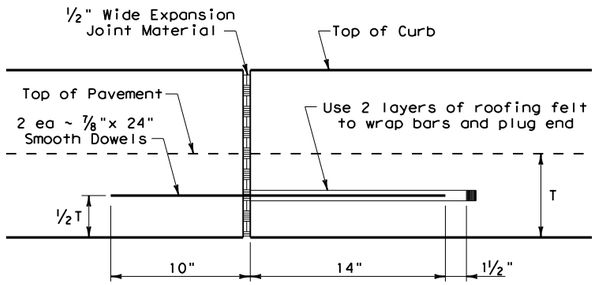
TYPE IIa CURB
5" - 5 ¾" HEIGHT



TYPE IIa CURB AND GUTTER
5" - 5 ¾" HEIGHT

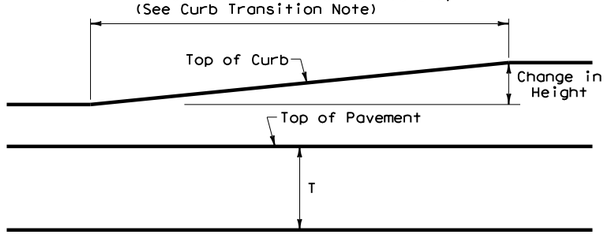


TYPE IV CURB (KEYED)
5" - 5 ¾" HEIGHT



EXPANSION JOINT DETAIL

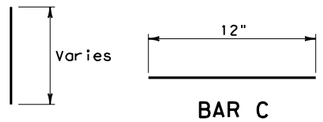
CURB TRANSITION NOTE:
Field conditions may require a longer or shorter transition, and shall be shown elsewhere in the plans, or as directed by the Engineer.



CURB TRANSITION
Note: To be paid for as Highest Curb

GENERAL NOTES

1. All materials and construction shall be in accordance with Item 529, "Concrete Curb, Gutter, and Combined Curb and Gutter."
2. Concrete shall be Class A.
3. When reinforcing bars are used, they shall be No.4 unless otherwise shown. The use of fiber reinforced concrete in lieu of reinforcing steel is acceptable. Use fibers meeting the requirements of DMS 4550, "Fibers for Concrete," and dose fibers in accordance with Material Producers List (MPL) "Fibers for Class A and B Concrete Applications."
4. Round exposed sharp edges with a rounding tool, to a minimum radius of ¼ inch.
5. All existing curbs and driveways to be removed shall be sawed or removed at existing joints.
6. Where concrete curb is to be placed on existing concrete pavement, Bar B may be drilled and grouted in place, or may be inserted into fresh concrete.
7. Expansion and contraction joints shall be constructed to match pavement joints in all curbs and curb and gutter adjacent to jointed concrete pavement. Where placement of curb or curb and gutter is not adjacent to concrete pavement, expansion joints shall be provided at structures, curb returns at streets, and at locations directed by The Engineer.
8. Vertical and horizontal dowel bars and transverse reinforcing bars shall be placed at four feet C~C.
9. Dimension 'T' shown is the thickness of concrete pavement. When curb is installed adjacent to flexible pavement dimension 'T' is 8" maximum.
10. Usual profile grade line. Refer to typical sections and plan-profile sheets for exact locations.
11. One-half inch expansion joint material shall be provided where curb or curb and gutter is adjacent to sidewalk or riprap.
12. When horizontal permissible construction joints are used, the longitudinal pavement steel shall be placed in accordance with pavement details shown elsewhere in the plans. Reinforcing steel for curb section shall then conform to that required for concrete curb.
13. Bar B placement as needed (typically at four ft. C-C) to support curb reinforcing steel during concrete placement.



BAR B

BAR C

Texas Department of Transportation

Design Division Standard

CONCRETE CURB AND CURB AND GUTTER

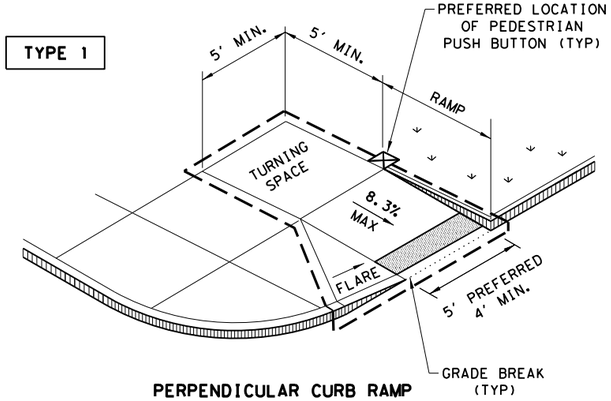
CCCG-22

FILE: cccg21.dgn	DN: TXDOT		CK: AN	DW: CS		CK: KM	
© TxDOT: JUNE 2022	CONT	SECT	JOB		HIGHWAY		
REVISIONS	1986	01	064		FM1314		
	DIST	COUNTY				SHEET NO.	
	HOU	MONTGOMERY				88	

DATE: $DATE$
FILE: $FILE$

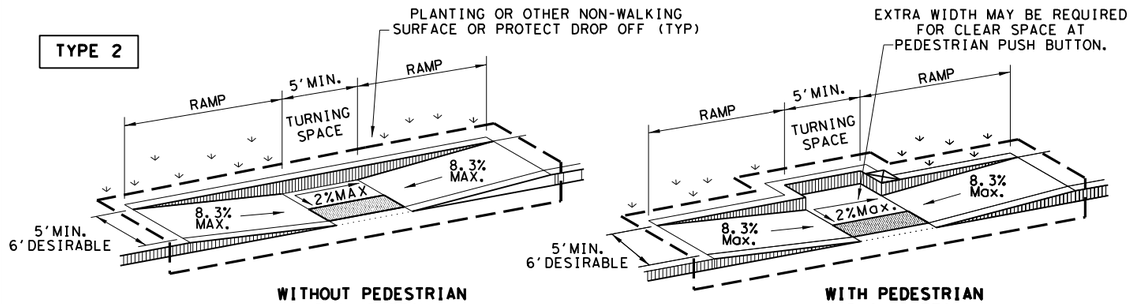
DATE: $DATE$
FILE: $FILE$

TYPE 1



PERPENDICULAR CURB RAMP

TYPE 2

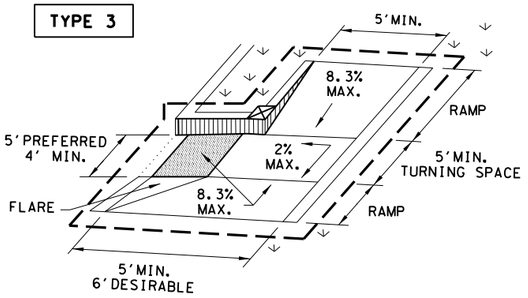


WITHOUT PEDESTRIAN PUSH BUTTON

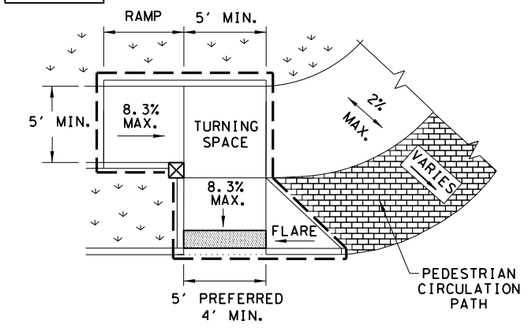
WITH PEDESTRIAN PUSH BUTTON

PARALLEL CURB RAMP

TYPE 3

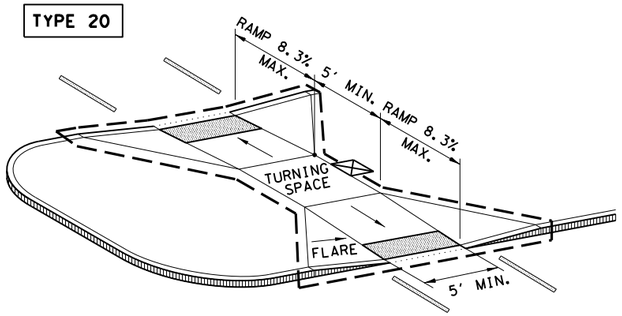


TYPE 6



COMBINATION CURB RAMPS

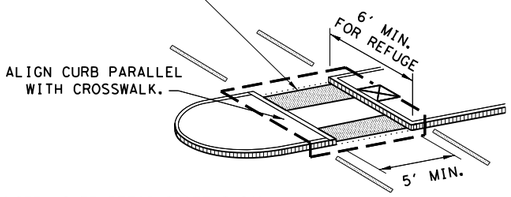
TYPE 20



CURB RAMPS AT MEDIAN ISLANDS

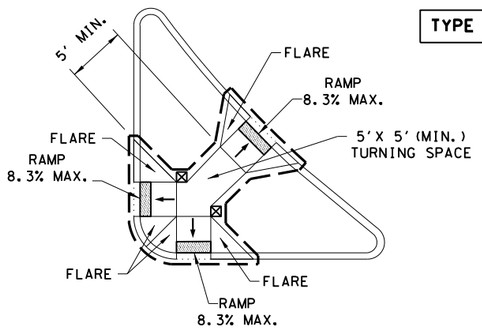
TYPE 21

INSTALL DETECTABLE WARNING SURFACE AT EACH END OF THE CUT-THROUGH RAMP WITH A MINIMUM 2' USUAL SIDEWALK SURFACE BETWEEN. IF MEDIAN IS LESS THAN 6' WIDE, ELIMINATE DETECTABLE WARNING SURFACES.



NOTE: CURB DETAILS ARE SHOWN ELSEWHERE IN THE PLANS.

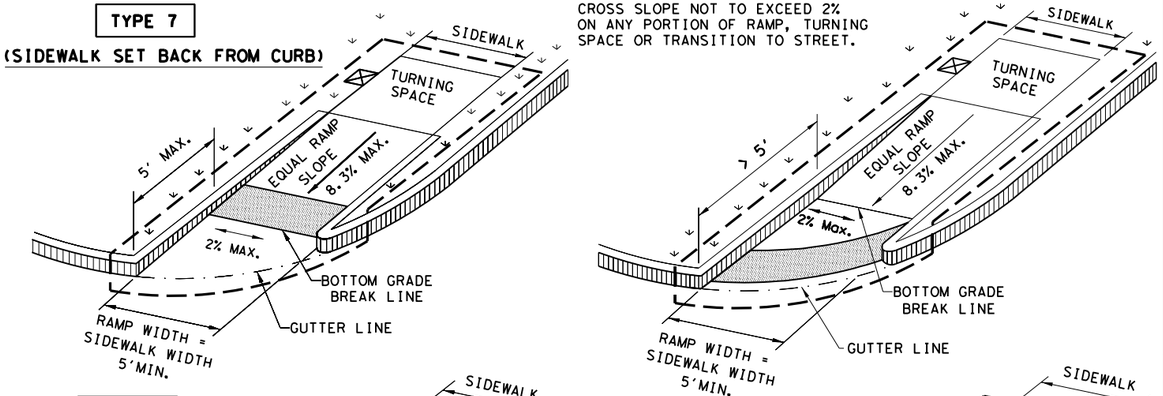
TYPE 22



COMBINATION ISLAND RAMPS

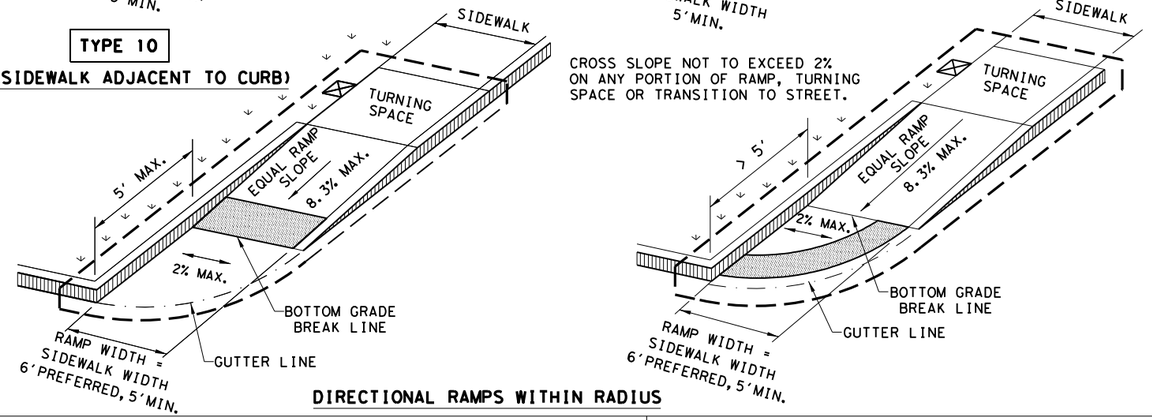
TYPE 7
(SIDEWALK SET BACK FROM CURB)

CROSS SLOPE NOT TO EXCEED 2% ON ANY PORTION OF RAMP, TURNING SPACE OR TRANSITION TO STREET.



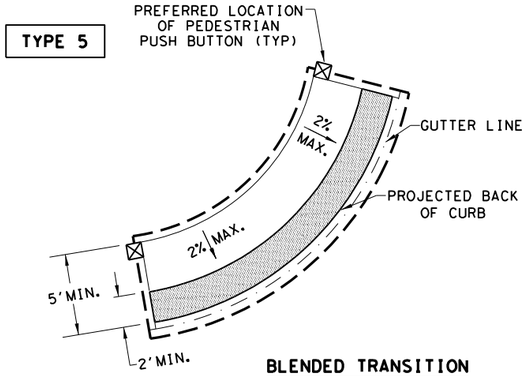
TYPE 10
(SIDEWALK ADJACENT TO CURB)

CROSS SLOPE NOT TO EXCEED 2% ON ANY PORTION OF RAMP, TURNING SPACE OR TRANSITION TO STREET.



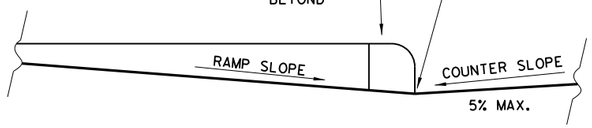
DIRECTIONAL RAMPS WITHIN RADIUS

TYPE 5



BLENDED TRANSITION
(FLUSH LANDING)

BOTTOM GRADE BREAK OF CURB RAMP WILL NORMALLY BE AT GUTTER LINE. SURFACE SLOPES AT GRADE BREAKS SHALL BE FLUSH.



TYPICAL SECTION OF PERPENDICULAR CURB RAMP AT CONNECTION TO ROADWAY

NOTES / LEGEND:

SEE GENERAL NOTES ON SHEET 2 OF 4 FOR MORE INFORMATION.

DENOTES PLANTING OR NON-WALKING SURFACE NOT PART OF PEDESTRIAN CIRCULATION PATH.

DETECTABLE WARNING SURFACE

DENOTES PREFERRED LOCATION OF PEDESTRIAN PUSH BUTTON IF APPLICABLE.

GUTTER LINE

GRADE BREAK

RAMP LIMITS OF PAYMENT

Texas Department of Transportation

Design Division Standard

PEDESTRIAN FACILITIES CURB RAMPS

PED-18

FILE: ped18	DN: TxDOT	DW: VP	CK: KM	CK: PK & JG
© TxDOT: MARCH, 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	1986	01	064	FM1314
REVISED 08,2005 REVISED 06,2012 REVISED 01,2018	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		89

DATE: $DATE$
FILE: $FILE$

GENERAL NOTES

CURB RAMPS

1. Install a curb ramp or blended transition at each pedestrian street crossing.
2. All slopes shown are maximum allowable. Cross slopes of 1.5% and lesser running should be used. Adjust curb ramp length or grade of approach sidewalks as directed.
3. Maximum allowable cross slope on sidewalk and curb ramp surfaces is 2%.
4. The minimum sidewalk width is 5'. Where the sidewalk is adjacent to the back of curb, a 6' sidewalk width is desirable. Where a 5' sidewalk cannot be provided due to site constraints, sidewalk width may be reduced to 4' for short distances. 5'x 5' passing areas at intervals not to exceed 200' are required.
5. Turning Spaces shall be 5'x 5' minimum. Cross slope shall be maximum 2%.
6. Clear space at the bottom of curb ramps shall be a minimum of 4'x 4' wholly contained within the crosswalk and wholly outside the parallel vehicular travel path.
7. Provide flared sides where the pedestrian circulation path crosses the curb ramp. Flared sides shall be sloped at 10% maximum, measured parallel to the curb. Returned curbs may be used only where pedestrians would not normally walk across the ramp, either because the adjacent surface is planted, substantially obstructed, or otherwise protected.
8. Additional information on curb ramp location, design, light reflective value and texture may be found in the latest draft of the Proposed Guidelines for Pedestrian Facilities in the Public Right of Way (PROWAG) as published by the U.S. Architectural and Transportation Barriers Compliance Board (Access Board).
9. To serve as a pedestrian refuge area, the median should be a minimum of 6' wide, measured from back of curbs. Medians should be designed to provide accessible passage over or through them.
10. Small channelization islands, which do not provide a minimum 5'x 5' landing at the top of curb ramps, shall be cut through level with the surface of the street.
11. Crosswalk dimensions, crosswalk markings and stop bar locations shall be as shown elsewhere in the plans. At intersections where crosswalk markings are not required, curb ramps shall align with theoretical crosswalks unless otherwise directed.
12. Provide curb ramps to connect the pedestrian access route at each pedestrian street crossing. Handrails are not required on curb ramps.
13. Curb ramps and landings shall be constructed and paid for in accordance with Item 531 "Sidewalks".
14. Place concrete at a minimum depth of 5" for ramps, flares and landings, unless otherwise directed.
15. Furnish and install No. 3 reinforcing steel bars at 18" o.c. both ways, unless otherwise directed.
16. Provide a smooth transition where the curb ramps connect to the street.
17. Curbs shown on sheet 1 within the limits of payment are considered part of the curb ramp for payment, whether it is concrete curb, gutter, or combined curb and gutter.
18. Existing features that comply with applicalble standards may remain in place unless otherwise shown on the plans.

DETECTABLE WARNING MATERIAL

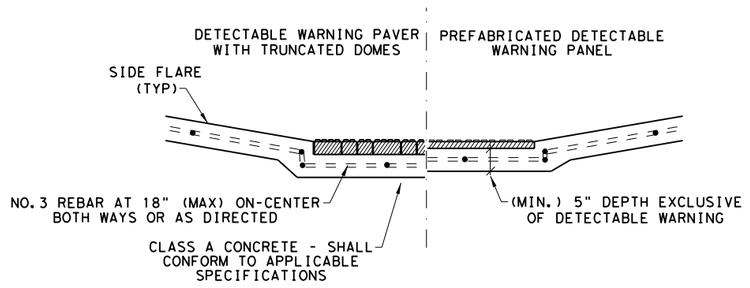
19. Curb ramps must contain a detectable warning surface that consists of raised truncated domes complying with PROWAG. The surface must contrast visually with adjoining surfaces, including side flares. Furnish and install an approved cast-in-place dark brown or dark red detectable warning surface material adjacent to uncolored concrete, unless specified elsewhere in the plans.
20. Detectable Warning Materials must meet TxDOT Departmental Materials Specification DMS 4350 and be listed on the Material Producer List. Install products in accordance with manufacturer's specifications.
21. Detectable warning surfaces must be firm, stable and slip resistant.
22. Detectable warning surfaces shall be a minimum of 24 inches in depth in the direction of pedestrian travel, and extend the full width of the curb ramp or landing where the pedestrian access route enters the street.
23. Detectable warning surfaces shall be located so that the edge nearest the curb line is at the back of curb and neither end of that edge is greater than 5 feet from the back of curb. Detectable warning surfaces may be curved along the corner radius.
24. Shaded areas on Sheet 1 of 4 indicate the approximate location for the detectable warning surface for each curb ramp type.

DETECTABLE WARNING PAVERS (IF USED)

25. Furnish detectable warning paver units meeting all requirements of ASTM C-936, C-33. Lay in a two by two unit basket weave pattern or as directed.
26. Lay full-size units first followed by closure units consisting of at least 25 percent (25%) of a full unit. Cut detectable warning paver units using a power saw.

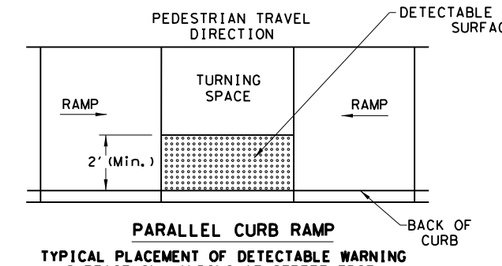
SIDEWALKS

27. Provide clear ground space at operable parts, including pedestrian push buttons. Operable parts shall be placed within unobstructed reach range specified in PROWAG section R406.
28. Place traffic signal or illumination poles, ground boxes, controller boxes, signs, drainage facilities and other items so as not to obstruct the pedestrian access route or clear ground space.
29. Street grades and cross slopes shall be as shown elsewhere in the plans.
30. Changes in level greater than 1/4 inch are not permitted.
31. The least possible grade should be used to maximize accessibility. The running slope of sidewalks and crosswalks within the public right of way may follow the grade of the parallel roadway. Where a continuous grade greater than five percent (5%) must be provided, handrails may be desirable to improve accessibility. Handrails may also be needed to protect pedestrians from potentially hazardous conditions. If provided, handrails shall comply with PROWAG R409.
32. Handrail extensions shall not protrude into the usable landing area or into intersecting pedestrian routes.
33. Driveways and turnouts shall be constructed and paid for in accordance with Item "Intersections, Driveways and Turnouts". Sidewalks shall be constructed and paid for in accordance with Item, "Sidewalks".
34. Sidewalk details are shown elsewhere in the plans.

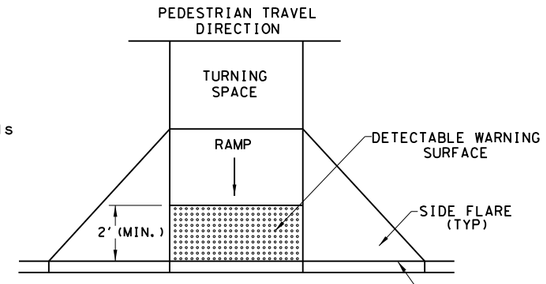


SECTION VIEW DETAIL
CURB RAMP AT DETECTIBLE WARNINGS

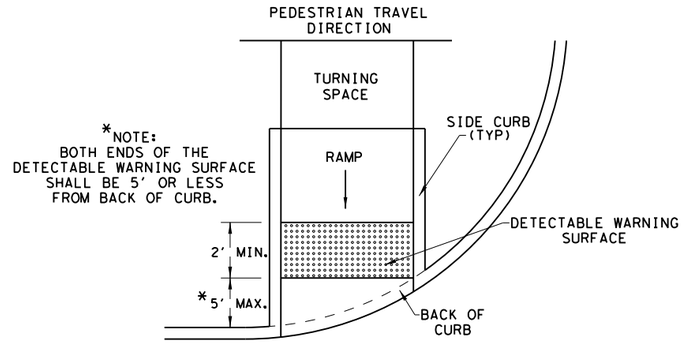
DETECTABLE WARNING SURFACE DETAILS



PARALLEL CURB RAMP
TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON LANDING AT STREET EDGE.



PERPENDICULAR CURB RAMP
TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON SLOPING RAMP RUN.



DIRECTIONAL CURB RAMP
TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON SLOPING RAMP RUN.

Texas Department of Transportation | Design Division Standard

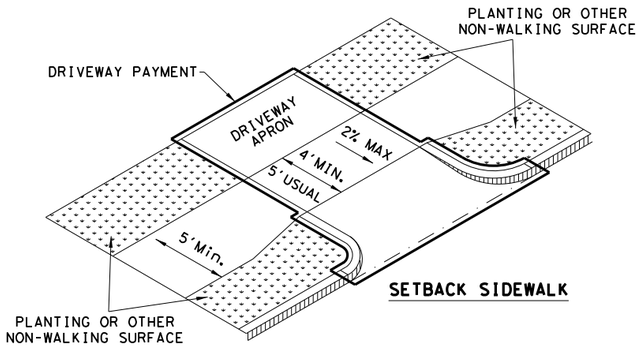
PEDESTRIAN FACILITIES CURB RAMPS

PED-18

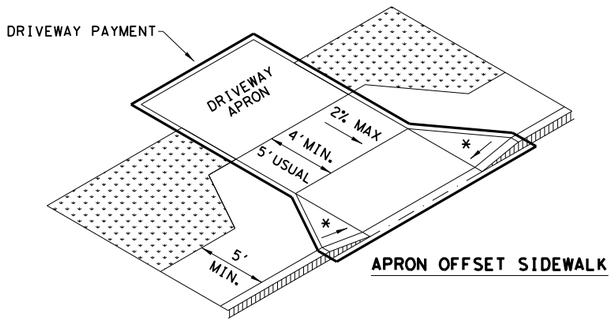
FILE: ped18	DN: TxDOT		DW: VP	CK: KM	CK: PK & JG
© TxDOT: MARCH, 2002	CONT	SECT	JOB		HIGHWAY
REVISIONS	1986	01	064		FM1314
REVISED 08, 2005 REVISED 06, 2012 REVISED 01, 2018	DIST	COUNTY			SHEET NO.
	HOU	MONTGOMERY			89A

DATE: $DATE$
FILE: $FILE$

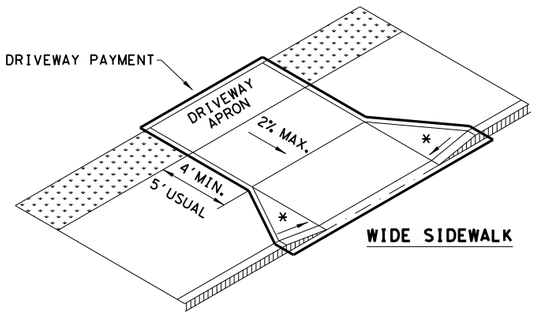
SIDEWALK TREATMENT AT DRIVEWAYS



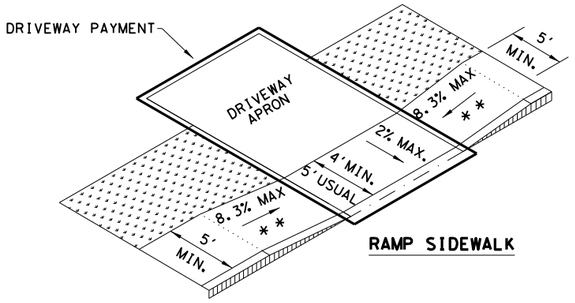
SETBACK SIDEWALK



APRON OFFSET SIDEWALK



WIDE SIDEWALK

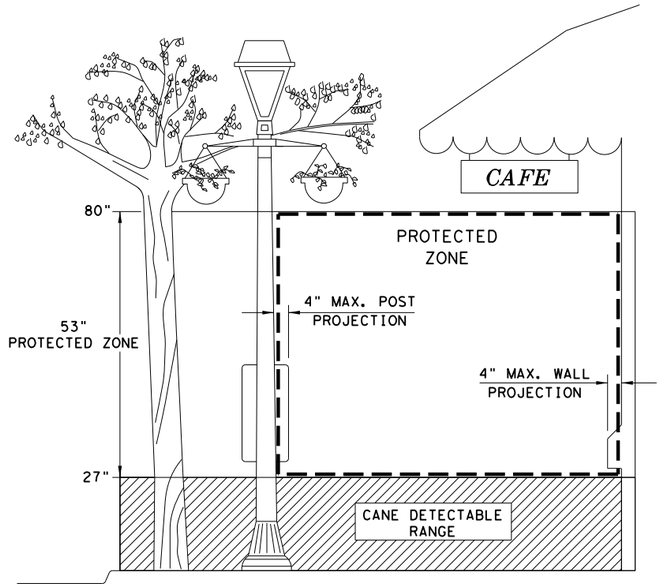


RAMP SIDEWALK

NOTES:

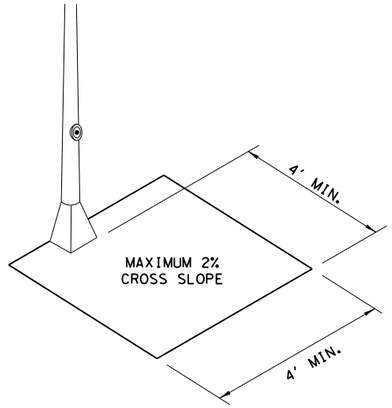
* WHERE DRIVEWAYS CROSS THE PEDESTRIAN ROUTE, SIDES SHALL BE FLARED AT 10% MAX SLOPE.

* * IF CURB HEIGHT IS GREATER THAN 6 INCHES, USE GRADE LESS THAN OR EQUAL TO 5%. HANDRAIL AND DETECTABLE WARNING ARE NOT REQUIRED.

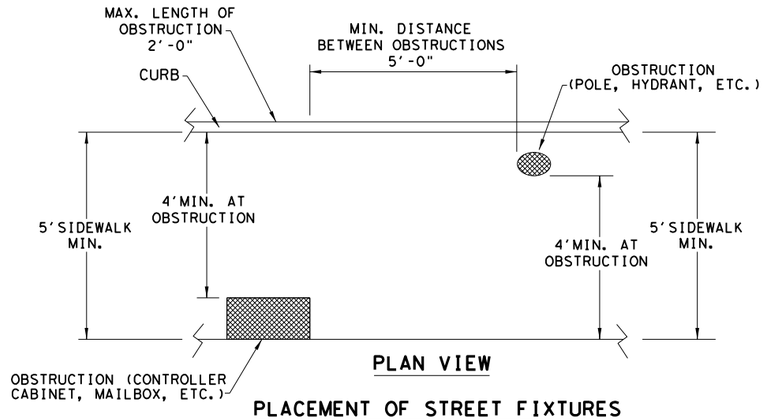


PROTECTED ZONE

NOTE: IN PEDESTRIAN CIRCULATION AREA, MAXIMUM 4" PROJECTION FOR POST OR WALL MOUNTED OBJECTS BETWEEN 27" AND 80" ABOVE THE SURFACE.



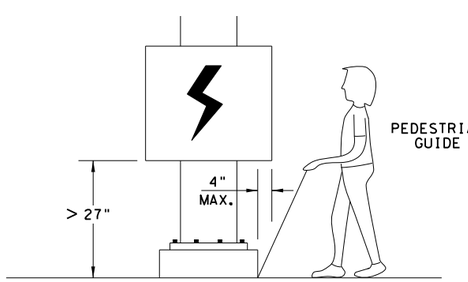
CLEAR SPACE ADJACENT TO PEDESTRIAN PUSH BUTTON



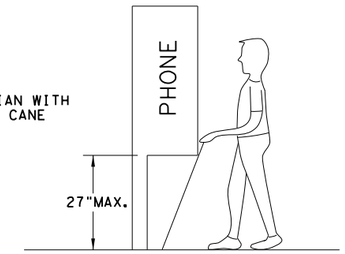
PLAN VIEW

PLACEMENT OF STREET FIXTURES

NOTE: ITEMS NOT INTENDED FOR PUBLIC USE. MINIMUM 4' X 4' CLEAR GROUND SPACE REQUIRED AT PUBLIC USE FIXTURES.



WHEN AN OBSTRUCTION OF A HEIGHT GREATER THAN 27" FROM THE SURFACE WOULD CREATE A PROTRUSION OF MORE THAN 4" INTO THE PEDESTRIAN CIRCULATION AREA, CONSTRUCT ADDITIONAL CURB OR FOUNDATION AT THE BOTTOM TO PROVIDE A MAXIMUM 4" OVERHANG.



PROTRUDING OBJECTS OF A HEIGHT ≤ 27" ARE DETECTABLE BY CANE AND DO NOT REQUIRE ADDITIONAL TREATMENT.

DETECTION BARRIER FOR VERTICAL CLEARANCE < 80"

Texas Department of Transportation

Design Division Standard

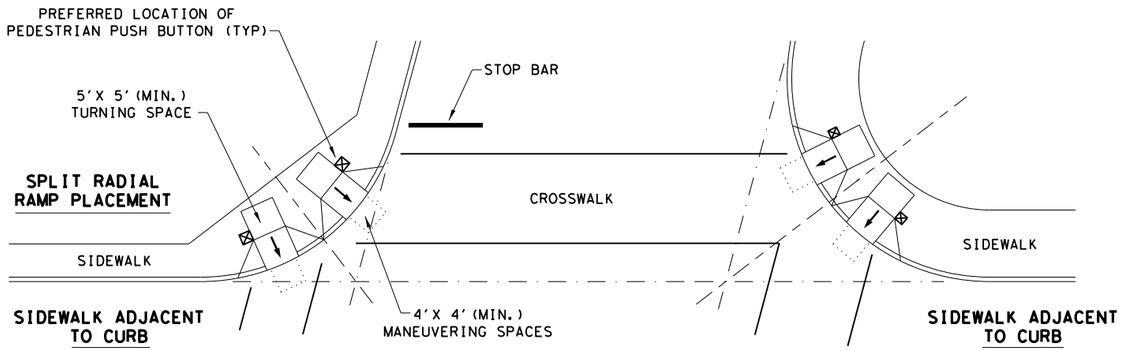
PEDESTRIAN FACILITIES CURB RAMPS

PED-18

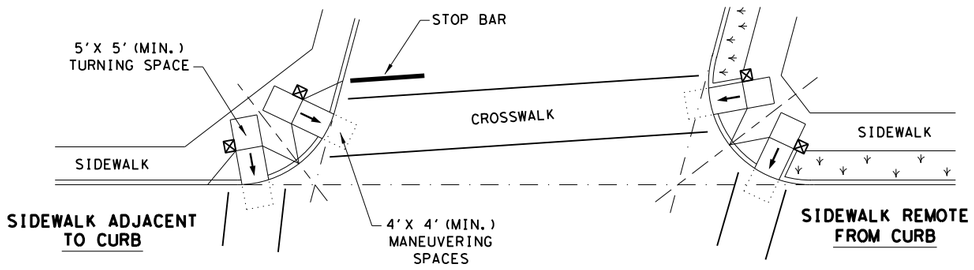
FILE: ped18	DN: TxDOT	DW: VP	CK: KM	CK: PK & JG	
© TxDOT: MARCH, 2002	CONT	SECT	JOB	HIGHWAY	
REVISIONS	1986	01	064	FM1314	
REVISED 08, 2005 REVISED 06, 2012 REVISED 01, 2018	DIST	COUNTY		SHEET NO.	
	HOU	MONTGOMERY		89B	

DATE: $DATE$
FILE: $FILE$

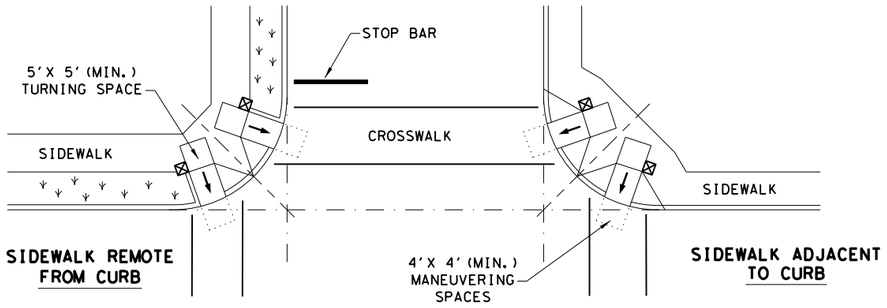
TYPICAL CROSSING LAYOUTS
SEE SHEET 1 OF 4 FOR DETAILS AND DIMENSIONS



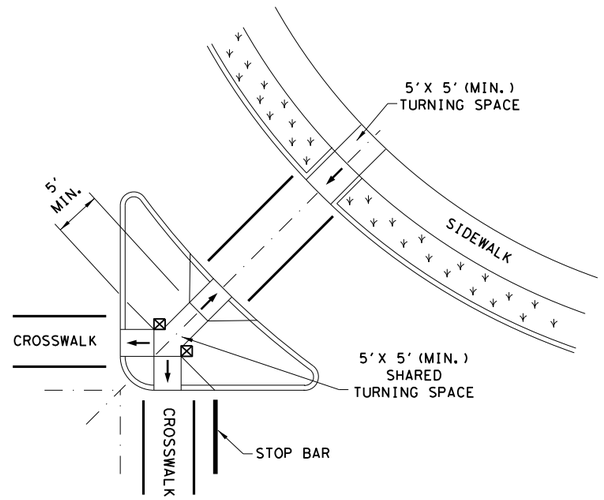
SKEWED INTERSECTION WITH "LARGE" RADIUS



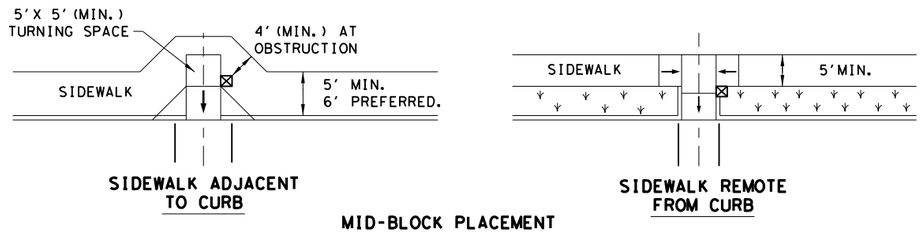
SKEWED INTERSECTION WITH "SMALL" RADIUS



NORMAL INTERSECTION WITH "SMALL" RADIUS



AT INTERSECTION
W/FREE RIGHT TURN & ISLAND



MID-BLOCK PLACEMENT
PERPENDICULAR RAMPS

LEGEND:

SHOWS DOWNWARD SLOPE. →

DENOTES PREFERRED LOCATION OF PEDESTRIAN PUSH BUTTON (IF APPLICABLE). ☒

DENOTES PLANTING OR NON-WALKING SURFACE NOT PART OF PEDESTRIAN CIRCULATION PATH.

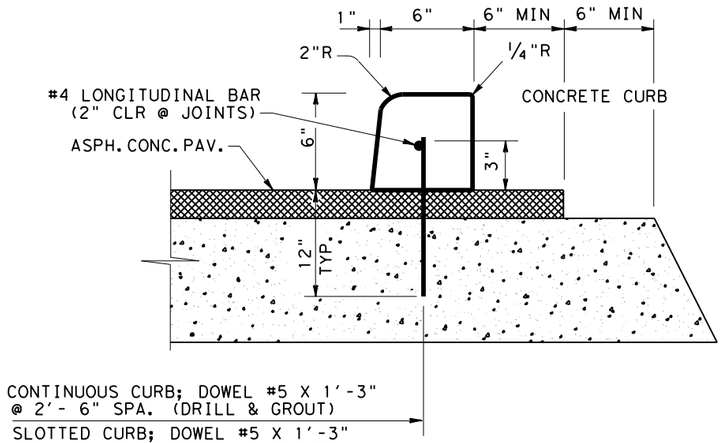
SHEET 4 OF 4

Texas Department of Transportation — Design Division Standard

PEDESTRIAN FACILITIES
CURB RAMPS

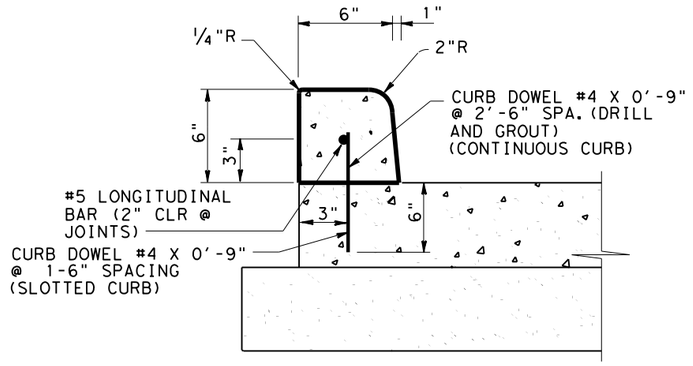
PED-18

FILE: ped18	DN: TxDOT	DW: VP	CK: KM	CK: PK & JG
© TxDOT: MARCH, 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	1986	01	064	FM1314
REVISED 08, 2005 REVISED 06, 2012 REVISED 01, 2018	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		89C



SHOWN ON EXISTING OR PROPOSED ACP PAVEMENT

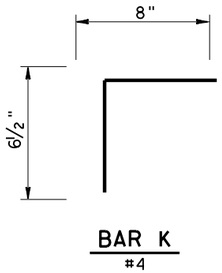
(PAY ITEM 529-6011) - FOR CONTINUOUS



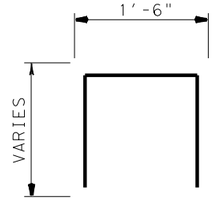
SHOWN ON EXISTING OR PROPOSED CONCRETE PAVEMENT

(PAY ITEM 529-6011) - FOR CONTINUOUS

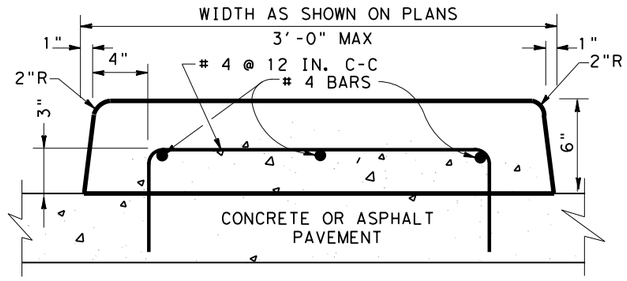
CONCRETE CURB (DOWEL) (6 IN.)



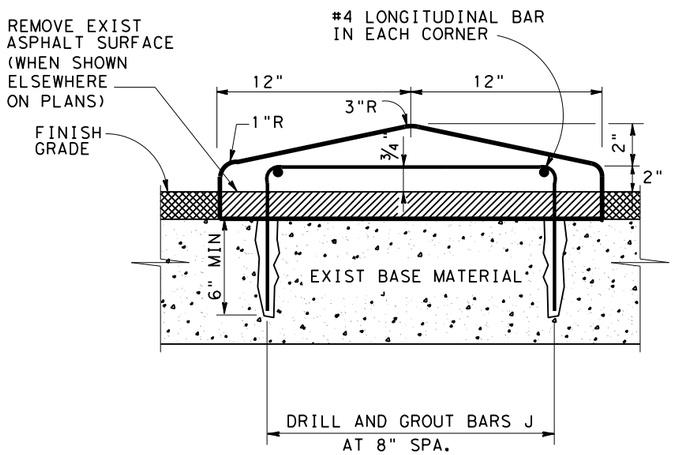
BAR K
#4



BAR J
#4

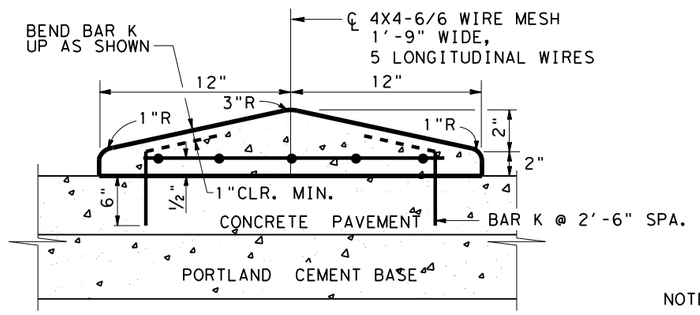


ITEM 536-6001 CONCRETE MEDIAN
SEE NOTE 2



SHOWN ON EXISTING ACP PAVEMENT

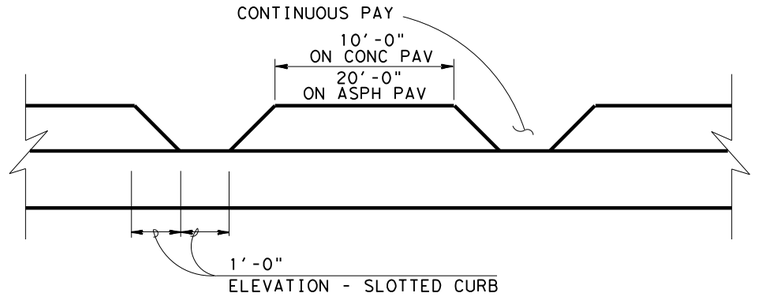
SEE NOTE 2 - ITEM 536-6003 CONC DIRECTIONAL ISLAND



SHOWN ON EXISTING OR PROPOSED CONCRETE PAVEMENT

SEE NOTE 2 - ITEM 536-6003 CONC DIRECTIONAL ISLAND

CONCRETE DIRECTIONAL ISLAND



ELEVATION - SLOTTED CURB

ITEM 529-6012 CONCRETE CURB (SLOTTED) - ON CONC.
ITEM 529-6009 CONC CURB (DOWEL)(SLOTTED) - ON ASPH.

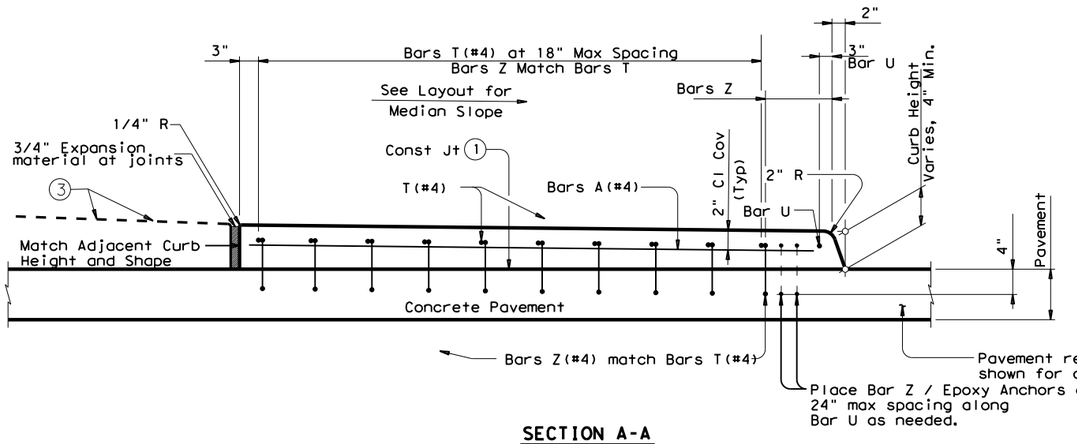
NOTES:

1. DRILL AND GROUT BARS SHOWN AS PER ITEM 420.4.7.10, 6" EMBEDMENT, MINIMUM ON CONC.
2. INSTALL A 2 INCH DRAINAGE OPENING AT 10 FT C-C WHEN CURB/ISLAND IS NOT ON TOP OF CROSS SECTION. (LOCATED ON A 2 OR 3 PERCENT TRANSVERSE GRADE, OR SUPERELEVATION.)

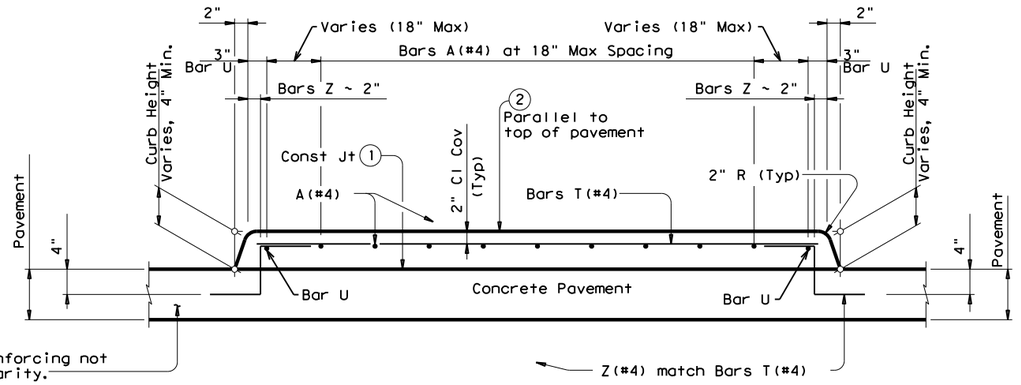
Texas Department of Transportation
Houston District

CONCRETE CURB AND DIRECTIONAL ISLAND DETAILS
CC & DID

FILE: STDB-9.dgn	DN:	CK:	DW:	CK:
©TxDOT 2014	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS	HOU	6		90
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	MONTGOMERY	1986	01	064	FM1314



SECTION A-A

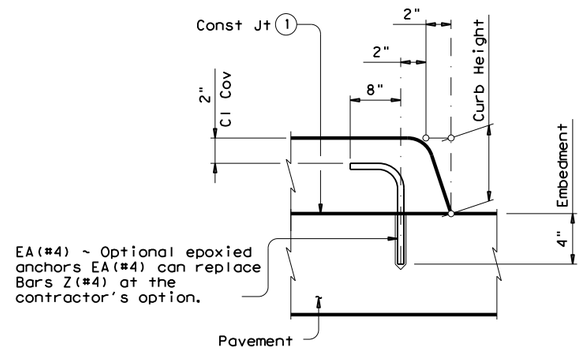


SECTION B-B

(1) Provide broom finish to top of pavement where raised median area is defined.

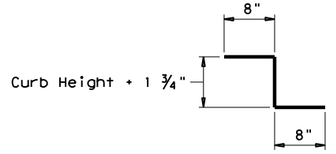
(2) Unless noted otherwise on the pavement details.

(3) Unless otherwise directed, place concrete riprap over pavement or base. If not over pavement or base, place sod or seed.

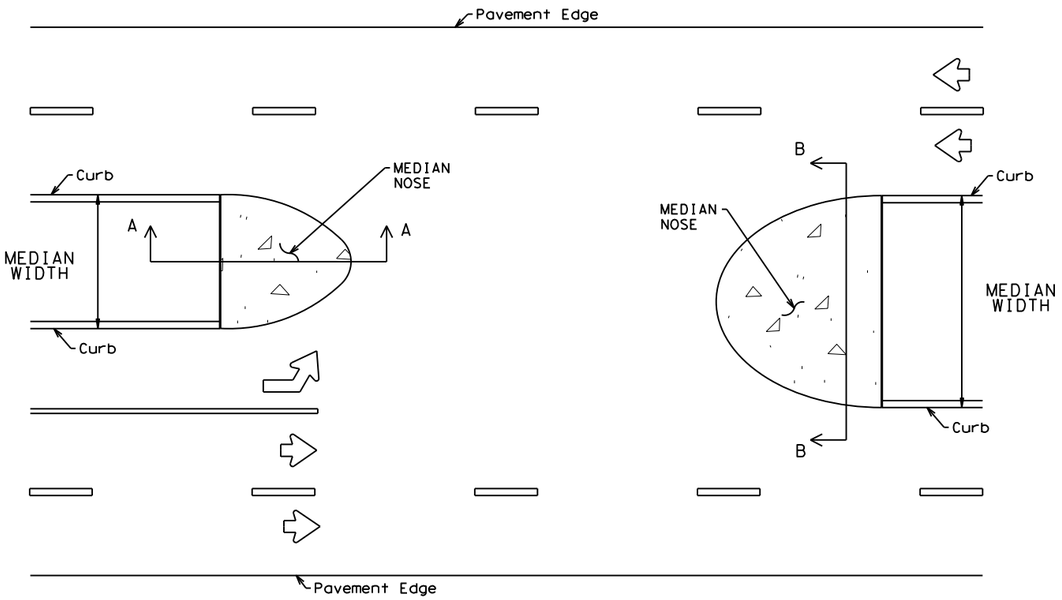


OPTIONAL EPOXY ANCHORS

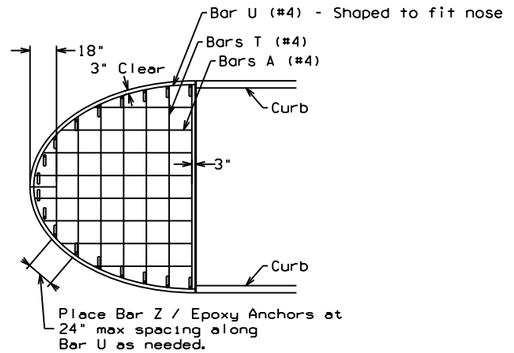
Embed EA(#4) bar into concrete with a Type III (Class C) epoxy meeting the requirements of DMS-6100, "Epoxies and Adhesives". Follow manufacturer's directions for installing the epoxied anchor bars.



BARS Z(#4)



PLAN



REINFORCING

MATERIAL NOTES:
Provide Grade 60 reinforcement. Welded wire reinforcement (WWR) meeting ASTM A497 of equivalent size and spacing may be substituted for Bars A and Bars T.

Epoxy coat reinforcement if pavement reinforcement is required to be epoxy coated.

DESIGNER NOTES:
Provide Median Slope in Design Layouts.

SHEET 1 OF 1

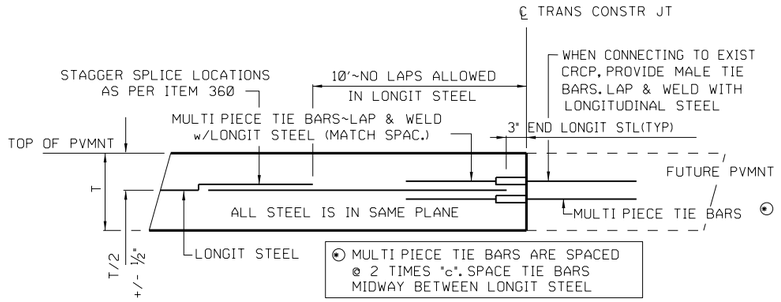
Texas Department of Transportation
Houston District

MEDIAN NOSE DETAILS

HOU-MEDNS-22

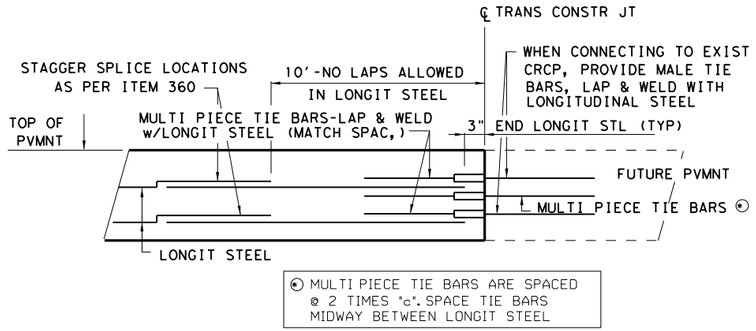
FILE: stdB13.dgn	DN: NHEB	CK: TxDOT	DW: NHEB	CK: TxDOT		
©TxDOT FEBRUARY 2022	DISTRICT	PROJECT				SHEET
REVISIONS	HOU					91
03/15 FOR 2014 SPECS 02/23 ADDED NOTE FOR FINISH BEHIND MEDIAN NOSE	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	MONTGOMERY		1986	01	064	FM1314

PATH:
LEVELS DISPLAYED
60
1



SECTION - SINGLE STEEL MAT

AT END OF PROJECT OR TEMPORARY END OF PAVEMENT



SECTION - DOUBLE STEEL MAT

AT END OF PROJECT OR TEMPORARY END OF PAVEMENT

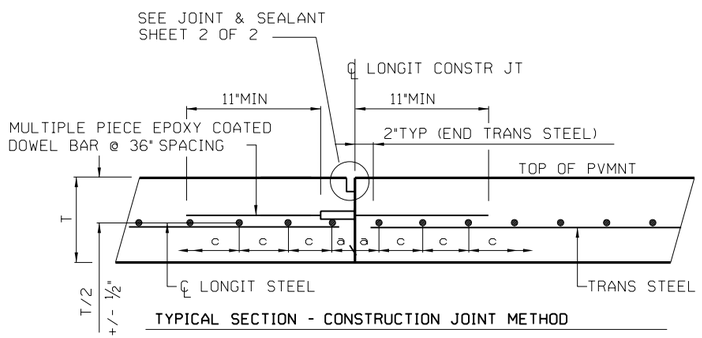
GENERAL NOTES

1. DETAILS FOR 7.0 IN. TO 13.0 IN. THICK CONCRETE PAVEMENT ARE SHOWN ON STANDARD CRCP(1)-17. DETAILS FOR 14 IN. TO 15 IN. THICK CONCRETE PAVEMENT ARE SHOWN ON STANDARD CRCP(2)-17.
2. DOWELS AND TIE BARS - DOWELS ARE ONE INCH MINIMUM DIAMETER. ENSURE DOWELS ARE FREE OF GREASE AND ARE EPOXY COATED. DO NOT SHEAR CUT DOWELS DURING FABRICATION. PROVIDE TIE BARS PER ITEM 360. FURNISH MULTI PIECE TIE BARS AND DOWELS WITH STOP COUPLINGS AND WITH THREADS ON THE BARS.
3. USE CHAIRS OF SUFFICIENT STRUCTURAL QUALITY AND NUMBER TO SUPPORT THE MAT TO THE VERTICAL TOLERANCES. CHAIRS WILL BE APPROVED BY THE ENGINEER AND DO NOT REQUIRE GALVANIZING.
4. MECHANICALLY PLACING REINFORCING STEEL IS NOT ALLOWED. NO BARS, DOWELS OR TIE BARS MAY BE VIBRATED INTO POSITION.
5. WHERE DIFFERENT THICKNESS PAVEMENTS MEET, TRANSITION THE THINNER SECTION TO THE THICKER SECTION OVER A DISTANCE OF 20 FT. PLACE REINFORCING STEEL WITHIN THE TRANSITION THE SAME AS IN THE THICKER PAVEMENT.
6. PERFORM WELDING PER ITEM 448. FURNISH WELDABLE REBAR PER ITEM 440.

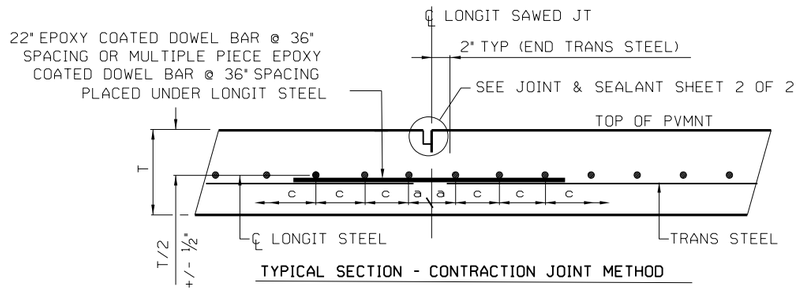
LONGITUDINAL DOWEL JOINT DETAILS

LOCATE WHERE SHOWN IN THE PLANS OR AS APPROVED. CONTRACTOR MAY USE EITHER METHOD

SINGLE STEEL MAT

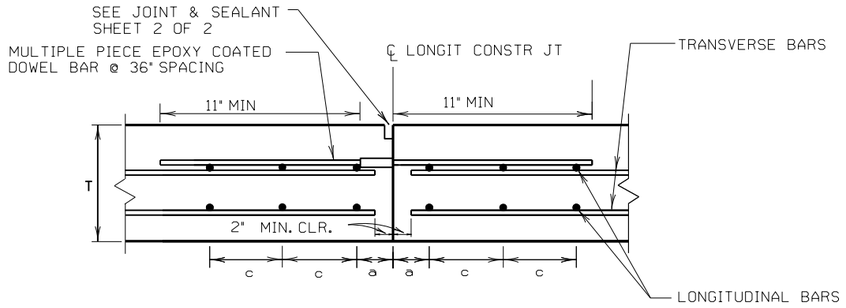


TYPICAL SECTION - CONSTRUCTION JOINT METHOD

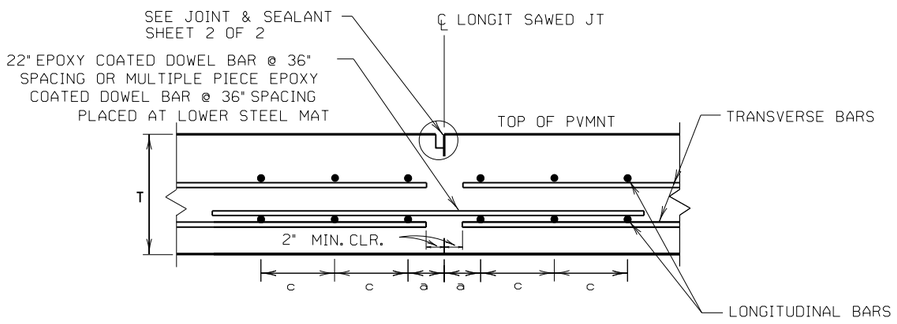


TYPICAL SECTION - CONTRACTION JOINT METHOD

DOUBLE STEEL MAT



TYPICAL SECTION - CONSTRUCTION JOINT METHOD



TYPICAL SECTION - CONTRACTION JOINT METHOD

SHEET 1 OF 2

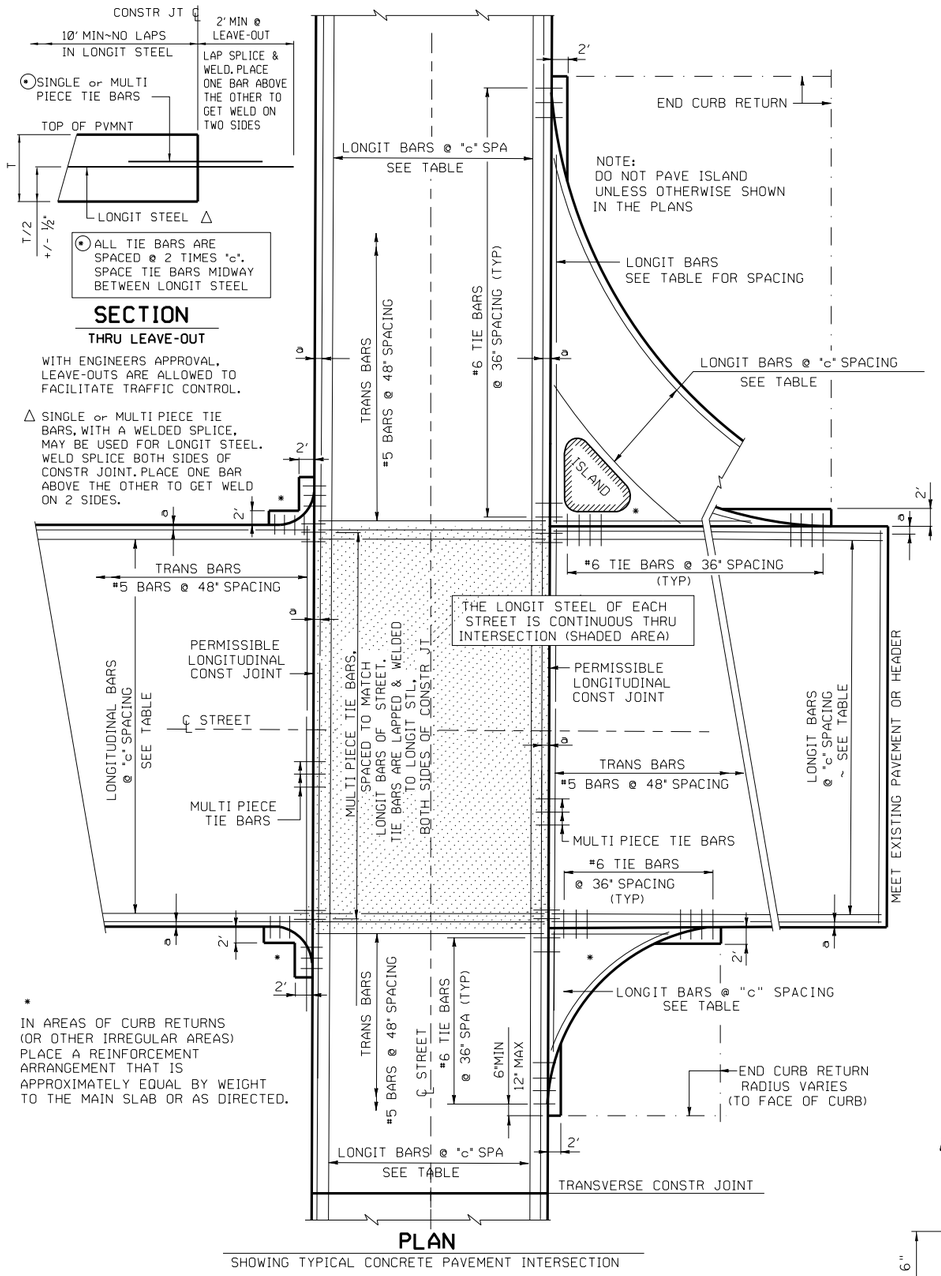
Texas Department of Transportation
Houston District

CONTINUOUSLY REINFORCED CONCRETE PAVEMENT HOUSTON SUPPLEMENT CRCP-HS

DN: -	CK: -	DW: -	CK: -	
DISTRICT	PROJECT NO.			SHEET
HOU				92
COUNTY	CONTROL	SECTION	JOB	HIGHWAY
MONTGOMERY	1986	01	064	FM1314

REVISIONS
4/12 CHANGED CTE FROM 6.0 TO 5.0
8/14 UPDATE TO REFERENCE CRCP-13 STND.
2/15 REVISED GENERAL NOTES, MINOR CORRECTIONS.
4/17 REVISED NOTE #3 OF GENERAL NOTES, MINOR CORRECTIONS.

STD-B1A



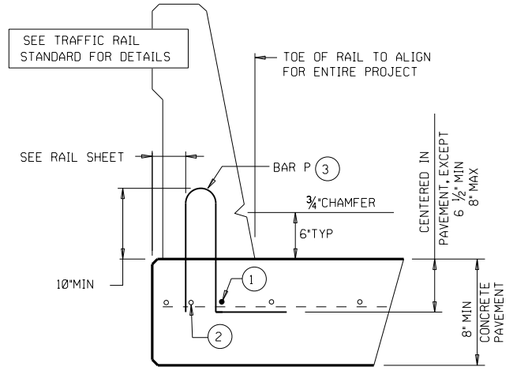
PLAN

SHOWING TYPICAL CONCRETE PAVEMENT INTERSECTION

(1) AS AN AID IN SUPPORTING REINFORCEMENT, ADDITIONAL LONGITUDINAL BARS MAY BE USED IN THE SLAB WITH THE APPROVAL OF THE ENGINEER. FURNISH SUCH BARS AT NO EXPENSE TO THE DEPARTMENT.

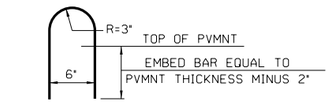
(2) LONGITUDINAL SLAB BAR MAY BE ADJUSTED LATERALLY 3" +/- TO TIE REINFORCING.

(3) ANCHORAGE BAR SHOWN IS FOR AN SSTR OR T551 RAIL. SEE RAILING DETAIL SHEET FOR SPACING OF BAR P. FOR OTHER RAIL TYPES SEE RAILING DETAIL SHEET.

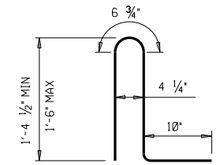


RAIL DETAIL

FOR ADDITIONAL DETAILS, SEE RAIL STANDARD SHEET.
THE MINIMUM LENGTH OF A CONCRETE RAILING PANEL IS FIVE FEET.

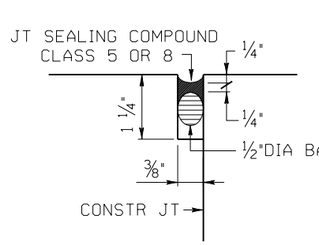


BAR A (#3)

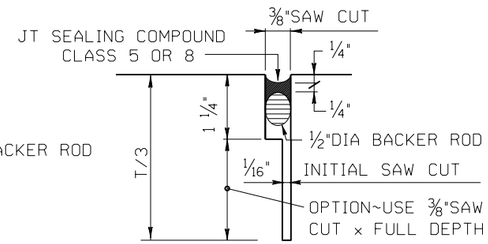


BAR P (#5)

RAIL ANCHOR INSTALLED IN PAVEMENT (3)

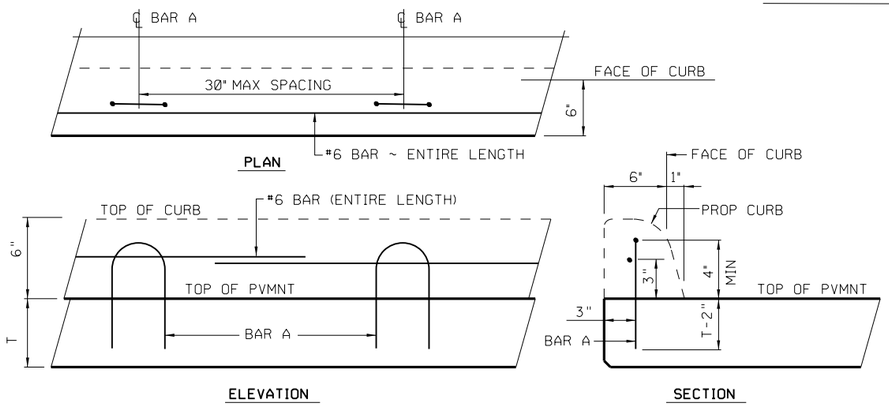


DETAIL 1 ~ CONSTR JOINT



DETAIL 2 ~ SAWED JOINT

JOINT AND SEALANT DETAILS



CURB DETAIL

SEE CC & DID STANDARD

SHEET 2 OF 2

Texas Department of Transportation
Houston District

CONTINUOUSLY REINFORCED CONCRETE PAVEMENT HOUSTON SUPPLEMENT CRCP-HS

DN: -	CK: -	DW: -	CK: -	
DISTRICT	PROJECT NO.			SHEET
HOU				92A
COUNTY	CONTROL	SECTION	JOB	HIGHWAY
MONTGOMERY	1986	01	064	FM1314

REVISIONS
4/12 CHANGED CTE FROM 6.0 TO 5.0 (ON SHEET 1)
2/15 MINOR CORRECTIONS.

STD-B1B

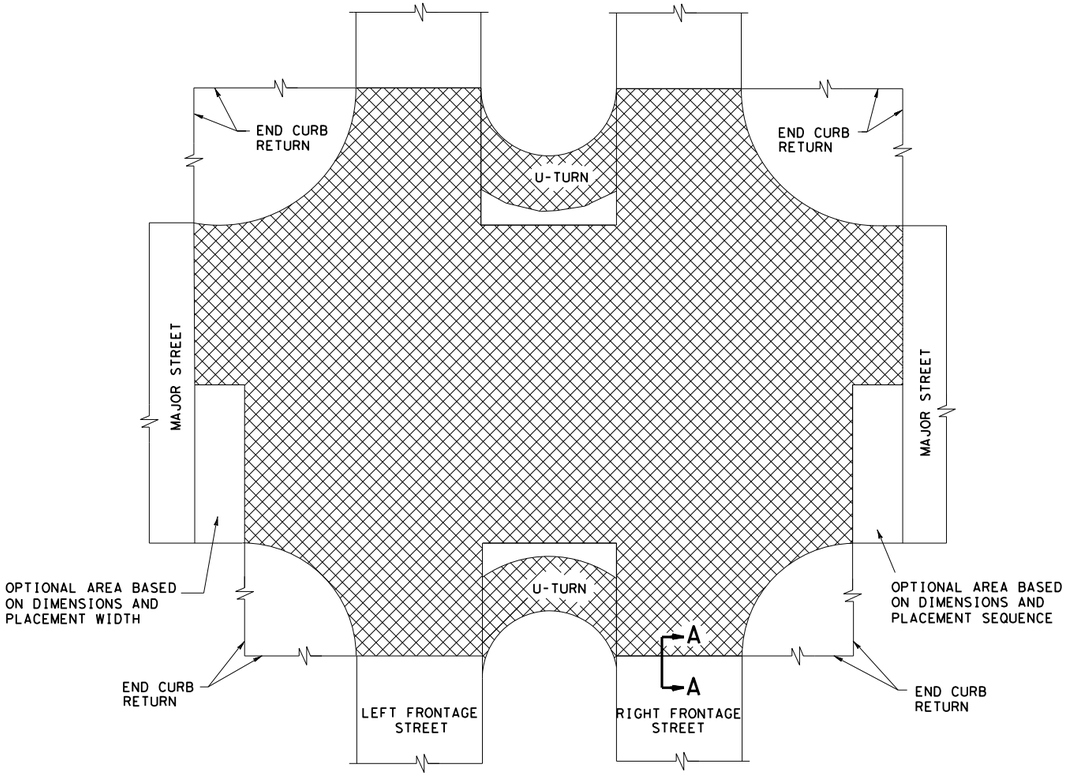


FIGURE 2

INTERSECTION OF MAJOR STREET
WITH FRONTAGE STREET

FAST TRACK PAVING AREA

TYPICAL PAVING PLANS

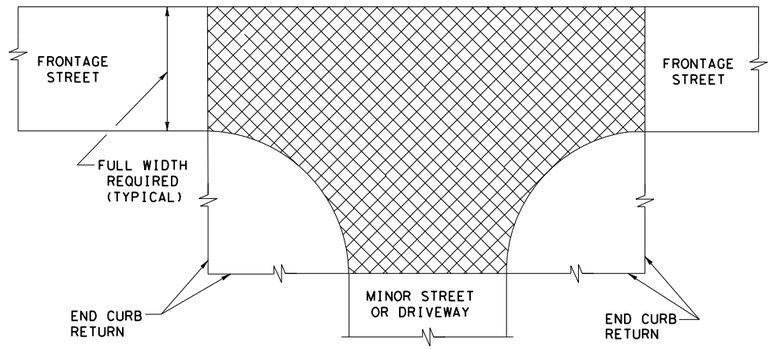


FIGURE 3

INTERSECTION OF MINOR STREET OR
DRIVEWAY WITH FRONTAGE STREET

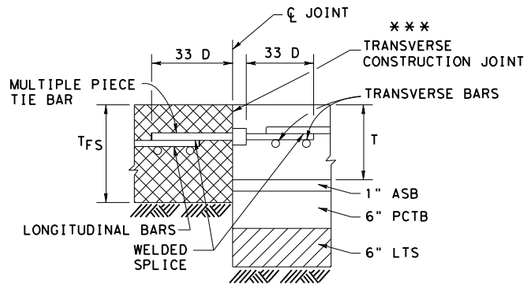
TABLE 1

EQUIVALENT PAVEMENT THICKNESS	
T * (IN.)	T_{FS} ** (IN.)
<=12"	T+3"
>12"	15"

*WITH BASE STRUCTURE OF:
1" ASPHALT STABILIZED BASE
6" PORTLAND CEMENT TREATED BASE
6" LIME TREATED SUBGRADE

**ON AS CUT SUBGRADE

***SEE JOINT SEALING DETAILS ON CRCP STANDARDS



SINGLE MAT

TRANSVERSE CONSTRUCTION JOINTS

SECTION A - A
FIGURE 1

GENERAL NOTES

1. DEFINITION OF TERMS

   T_{FS} - FAST TRACK CONCRETE PAVING DEPTH AT INTERSECTIONS AND LEAVE OUTS.
   T - NOMINAL CONCRETE PAVING DEPTH AS SHOWN IN THE PLANS.
   DETERMINE FAST TRACK CONCRETE PAVING DEPTH USING TABLE 1 AND THE NOMINAL CONCRETE PAVING DEPTH "T" SHOWN IN THE PLANS.

2. AT INTERSECTIONS AND LEAVE-OUT LOCATIONS USE THE SAME LONGITUDINAL AND TRANSVERSE BAR SPACING FOR THE FAST TRACK PAVING AREA AS THAT USED FOR THE ADJACENT CONCRETE PAVING DEPTH "T"(EXCEPT BAR SIZE SHALL BE #7 ON SINGLE MAT). FOR SINGLE MAT FAST TRACK PAVING, PLACE THE LONGITUDINAL AND TRANSVERSE BARS FOR THE FAST TRACK PAVING AREA AT THE HORIZONTAL PLANE ELEVATION THAT IS TWO TIE-BAR DIAMETERS LOWER THAN THAT USED FOR THE ADJACENT CONCRETE PAVEMENT DEPTH "T", AS SHOWN IN FIGURE 1. USE SINGLE MAT STEEL IN FAST TRACK PAVING AREAS ADJACENT TO PAVEMENT SLABS WITH SINGLE MAT REINFORCING. USE DOUBLE MAT STEEL IN FAST TRACK PAVING AREAS ADJACENT TO PAVEMENT SLABS WITH DOUBLE MAT REINFORCING.

3. THE REQUIRED FAST TRACK PAVING AREAS WILL BE SHOWN ON THE PLANS. THE CONTRACTOR HAS THE OPTION TO UTILIZE FAST TRACK CONCRETE PAVING AT U-TURNS, AT INTERSECTIONS, AT MINOR STREETS, AND AT DRIVEWAYS WITH FRONTAGE ROAD LEAVE-OUT AREAS THAT ARE NOT SHOWN ON THE PLANS, WITH PRIOR WRITTEN APPROVAL FROM THE ENGINEER. TYPICAL PAVING PLANS FOR THE INTERSECTION OF A MAJOR STREET WITH THE FRONTAGE ROAD ARE SHOWN AS FIGURE 2, AND FOR THE INTERSECTION OF A MINOR STREET OR DRIVEWAY WITH THE FRONTAGE ROAD AS FIGURE 3. FAST TRACK PAVE THE FRONTAGE ROAD FOR THE FULL FRONTAGE ROAD WIDTH AND PLACE IN STAGES AS REQUIRED.

4. USE ADDITIONAL #6 REINFORCING STEEL BARS (MINIMUM 42 INCHES LONG) AND SPACE THEM MIDWAY BETWEEN ALTERNATE LONGITUDINAL BARS ALONG THE THE TRANSVERSE CONSTRUCTION JOINT FORMED AT THE FAST TRACK PAVING INTERFACE (T_{FS}) WITH THE ADJACENT PAVEMENT SLAB (T).

5. SPLICE LENGTH IS A MINIMUM OF 33 TIMES THE NOMINAL STEEL DIAMETER.

6. PLACE THE CONCRETE PLACEMENT AT A UNIFORM DEPTH THROUGHOUT THE FAST TRACK CONCRETE PAVING AREA.

7. FOR CONTINUOUS SECTIONS OF ROADWAY WHERE FAST TRACK PAVING IS THE PRIMARY PAVEMENT TYPE, USE THE BAR SIZE AND SPACING FROM THE CRCP STANDARDS THAT CORRESPONDS TO THE FAST TRACK SLAB THICKNESS.

8. USE LONGITUDINAL TIE-BARS OF THE SAME SIZE DIAMETER AND SPACING AS THE LONGITUDINAL BAR. A SINGLE PIECE TIE-BAR MAY BE USED IF THE 33 TIMES DIAMETER TIE-BAR PROJECTION DOES NOT INTERFERE WITH THE SAFE HANDLING OF TRAFFIC.

9. BASE THE DEPTH OF SAW CUTS FOR SAWED JOINTS ON THE FAST TRACK CONCRETE PAVEMENT THICKNESS.

10. THIS STANDARD IS NOT INTENDED TO REPLACE OTHER STANDARDS EXCEPT WHERE SPECIFICALLY STATED HEREIN. FOR PAVING DETAILS NOT SHOWN ON THIS DRAWING, REFER TO THE STANDARD SHEETS FOR CONTINUOUSLY REINFORCED CONCRETE PAVEMENT SHOWN ELSEWHERE IN THE PLANS.

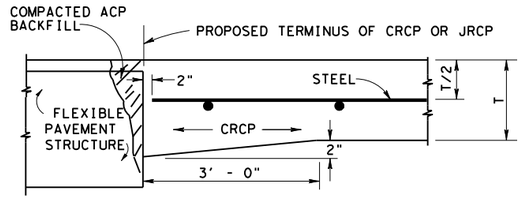
LEGEND

ASB - ASPHALT STABILIZED BASE
CRCP - CONTINUOUSLY REINFORCED CONCRETE PAVEMENT
D - DIAMETER
LTS - LIME TREATED SUBGRADE
PCTB - PORTLAND CEMENT TREATED BASE

Texas Department of Transportation
Houston District

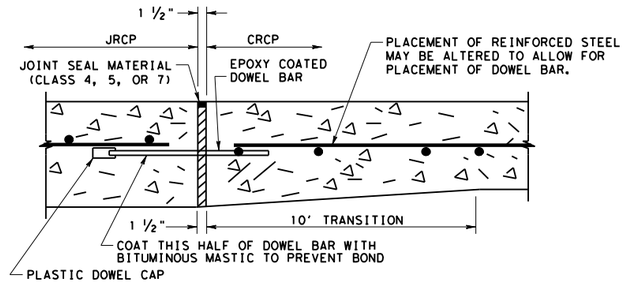
FAST TRACK CONTINUOUSLY REINFORCED CONCRETE PAVEMENT
DETAILS
CRCP-FT

FILE: STDB-4.dgn	DN:	CK:	DW:	CK:	
© TxDOT DEC. 2009	DIST	FED REG	PROJECT NO.		SHEET
REVISIONS 5/05 2004 SPECS 2/15 2014 SPECS	HOU	6			93
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	MONTGOMERY		1986	01	064	FM1314



NOTE:
ADDITIONAL CONCRETE FOR THICKENED EDGE IS SUBSIDIARY TO VARIOUS BID ITEMS. BACKFILL DISTURBED MATERIAL IN THE FLEXIBLE PAVEMENT WITH ACP. THIS ACP IS SUBSIDIARY TO VARIOUS BID ITEMS.

JUNCTURE A & B - CRCP OR JRCP WITH FLEXIBLE TYPE PAVEMENT STRUCTURE

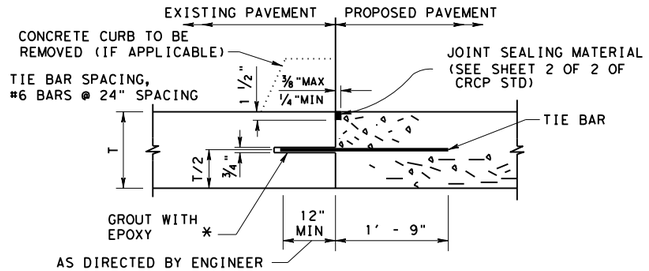


FOR DETAILS NOT SHOWN, SEE TRANSVERSE EXPANSION JOINT DETAILS ELSEWHERE IN PLANS.

DETAIL "B" - DOWEL ASSEMBLY AT EXPANSION JOINT

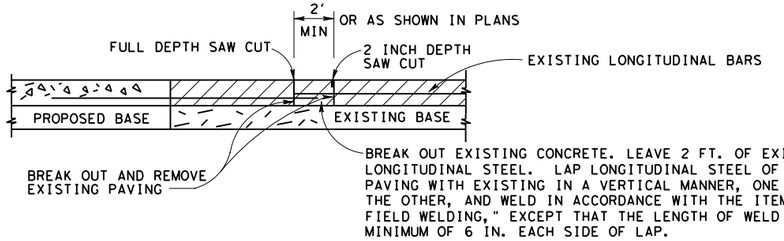
DOWEL BAR DATA			
SLAB THICKNESS(T)	6"-7.5"	8"-10"	10.5"-15"
DOWEL SIZE	1"	1 ¼"	1 ½"
DOWEL LENGTH	18"	20"	22"
DOWEL BAR SPACING	12"	12"	12"

TABLE A - DOWEL BAR DATA



JUNCTURE D - TYPICAL CONNECTION TO EXISTING CONCRETE

*FOR EPOXY TYPE SEE ITEM 361.



JUNCTURE F - "BREAK BACK" CONCRETE CRCP WITH CRCP OR JRCP WITH JRCP

GENERAL NOTES

1. FOR FURTHER INFORMATION REGARDING PLACING CONCRETE AND REINFORCEMENT, REFER TO THE GOVERNING SPECIFICATION FOR CONCRETE PAVEMENT.
2. THE DESIGN REQUIREMENTS FOR THE PAVEMENT STRUCTURE, I.E. BAR SPACING, BAR SIZE LAP REQUIREMENTS, ETC., ARE SHOWN ON THE APPROPRIATE PAVEMENT DESIGN DETAIL.
3. SLEEPER SLAB AND ADDITIONAL REINFORCING REQUIRED ON THIS DRAWING ARE INCIDENTAL TO THE VARIOUS BID ITEMS.
4. USE THE SIZE, SPACING, AND LENGTH OF DOWEL BARS SHOWN IN TABLE "A".
5. WHERE THERE WILL BE A JUNCTURE AND ADDITIONAL JRCP PAVING WILL BE PLACED AT A FUTURE DATE, MULTIPLE PIECE DOWEL BARS WILL BE PERMITTED AT THE JUNCTURE. PROVIDE MULTIPLE PIECE DOWEL BAR ASSEMBLIES WITH A MINIMUM ULTIMATE TENSILE STRENGTH OF 60.0 KIPS AND THAT HAVE SMOOTH EPOXY COATED BARS. ENSURE THE MULTIPLE PIECE DOWEL BAR ASSEMBLIES HAVE STOP TYPE COUPLINGS AND HAVE HAVE ROLLED THREADS ON THE BARS. DISMANTLE THE BAR AND FIT THE COUPLING PORTION USED IN CONSTRUCTION, WITH A PLASTIC CAP. FURNISH THE REMAINING PORTION OF THE BAR TO THE ENGINEER.
6. WHERE THE PAVING IS CRCP AND A RAMP COMPOSED OF A FLEXIBLE PAVEMENT WILL BE USED AT THE JUNCTURE UNTIL FUTURE PAVING IS CONSTRUCTED, MULTIPLE PIECE TIE BARS MAY BE USED IF PERMITTED BY THE ENGINEER. IF USED, ENSURE THE MULTIPLE PIECE TIE BAR ASSEMBLIES HAVE STOP TYPE COUPLINGS AND ROLLED THREADS ON THE BARS. FURNISH MULTIPLE PIECE TIE BAR ASSEMBLIES THAT DEVELOP A MINIMUM ULTIMATE TENSILE STRENGTH EQUAL TO 1.25 TIMES THE YIELD STRENGTH OF THE TRANSVERSE BARS BEING JOINED. FOR TIE BARS, USE DEFORMED REINFORCING BARS. TIE BAR ASSEMBLIES MADE FROM STEELS OTHER THAN ASTM GRADE 60 AND WITH DEFORMATIONS OTHER THAN ASTM STD. MAY BE USED PROVIDED THEY PROVE SATISFACTORY TO THE ENGINEER AND ARE IN EVERY RESPECT THE EQUAL TO THE ASSEMBLIES SPECIFIED. LABORATORY TESTING OF THE PROPOSED ASSEMBLIES, AT THE CONTRACTOR'S EXPENSE, MAY BE REQUIRED. LAP AND WELD ONE PORTION OF THE TIE BAR ASSEMBLY TO EACH LONGITUDINAL BAR IN ACCORDANCE WITH THE ITEM "STRUCTURAL FIELD WELDING "AND THE OTHER PORTION INTO THE COUPLING PRIOR TO PAVING. ENSURE MULTIPLE PIECE TIE BAR LENGTHS CONFORM TO THE TIE BAR LENGTHS SHOWN ELSEWHERE IN THE PLANS. ADDITIONAL "SHEAR STEEL" WILL ALSO BE REQUIRED AND MAY BE USED WITH MULTIPLE PIECE ASSEMBLIES AS PREVIOUSLY DESCRIBED. USE ADDITIONAL STEEL BARS OF EQUAL DIAMETER AT A SPACING DOUBLE THAT OF THE LONGITUDINAL STEEL AND ENSURE THE LENGTH IS 66 TIMES THE TIE BAR DIAMETER.
7. DO NOT SHEAR CUT DOWEL BARS.
8. ENSURE DOWEL BAR EPOXY COATING CONFORMS TO ARTICLE 440.2.7., "EPOXY COATING".
9. REPLACE ANY BENT LONGITUDINAL REINFORCING. IF THERE IS NOT SUFFICIENT EXPOSED REINFORCING TO PROVIDE A MINIMUM OF A 33 TIMES BAR DIAMETER LAP, REMOVE THE EXISTING PAVEMENT AND SUFFICIENTLY EXPOSE THE EXISTING REINFORCING TO PROVIDE A 33 TIMES BAR DIAMETER LAP. REPLACE ANY SHEAR BARS THAT ARE DISTURBED, BY DRILLING AND GROUTING AS REQUIRED BY NOTE 12 BELOW. PERFORM THIS CORRECTIVE ACTION AT NO EXPENSE TO THE DEPARTMENT.
10. TIE BARS AND DOWEL BARS OMITTED, LOST, OR DAMAGED SHALL BE REPAIRED BY DRILLING AND EPOXY GROUTING AT NO EXPENSE TO THE DEPARTMENT.
11. JUNCTURES A & B ARE ONLY SUITABLE FOR MINOR STREETS WITH LOW TRAFFIC VOLUMES.
12. FURNISH ADDITIONAL SHEAR BARS (DIAMETER "D") OF THE SAME SIZE AS LONGITUDINAL BARS AND SPACE THEM MIDWAY BETWEEN ALTERNATE LONGITUDINAL BARS ALONG THE TRANSVERSE CONSTRUCTION JOINT FORMED AT THE LEAVE-OUT.

LEGEND

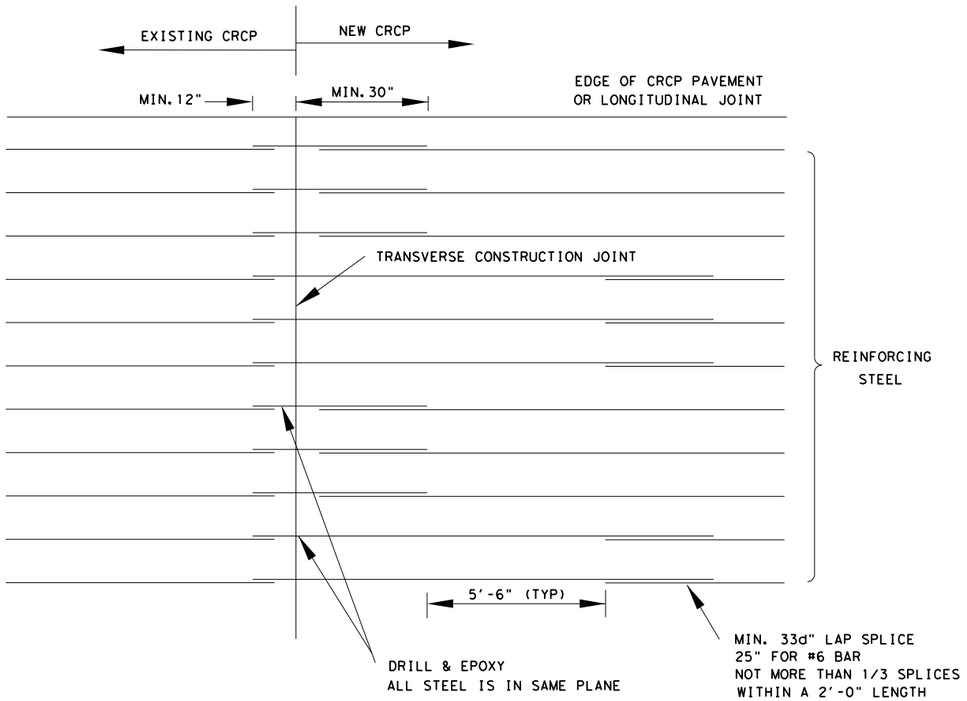
ACP - ASPHALT CONCRETE PAVEMENT
CRCP - CONTINUOUSLY REINFORCED CONCRETE PAVEMENT
JRCP - JOINTED REINFORCED CONCRETE PAVEMENT
T - THICKNESS

Texas Department of Transportation
Houston District

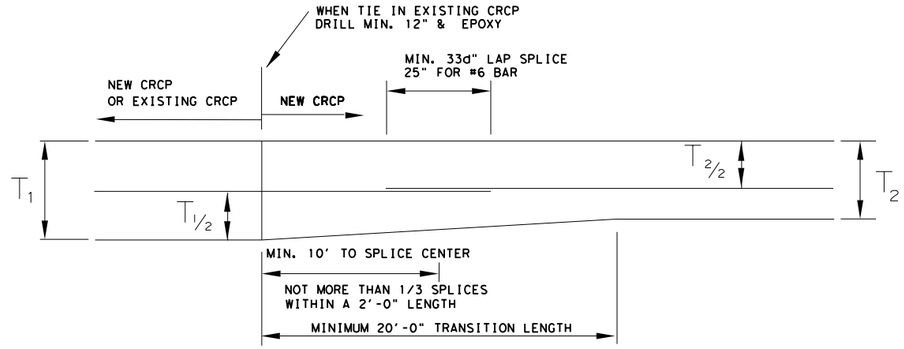
CONCRETE PAVEMENT JUNCTURES

CPJ

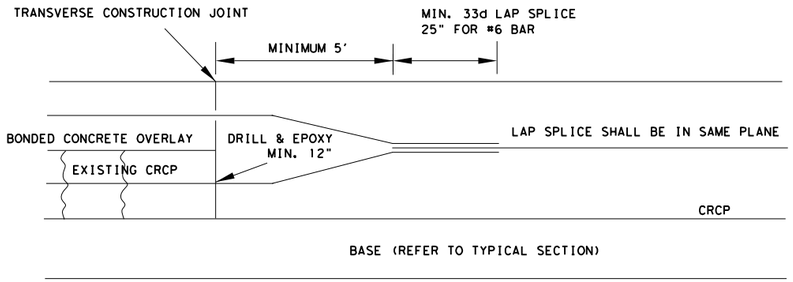
FILE: STDB-5.dgn	DN:	CK:	DW:	CK:	
© TxDOT DEC. 2009	DIST	FED REG	PROJECT NO.		SHEET
REVISIONS 5/05 2004 SPECS REVISED 4/2008 2/15 2014 SPECS	HOU	6			94
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	MONTGOMERY		1986	01	064	FM1314



EXISTING CRCP TO NEW CRCP

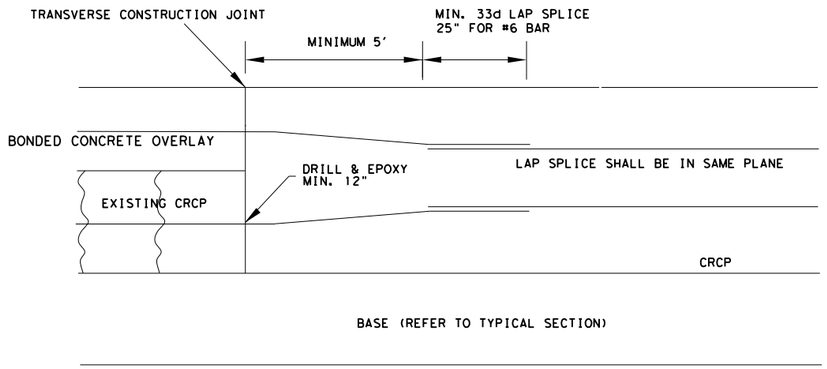


CRCP THICKNESS TRANSITION



CRCP BONDED OVERLAY TO CRCP TRANSITION

(ONE LAYER STEEL)



CRCP BONDED OVERLAY TO CRCP TRANSITION

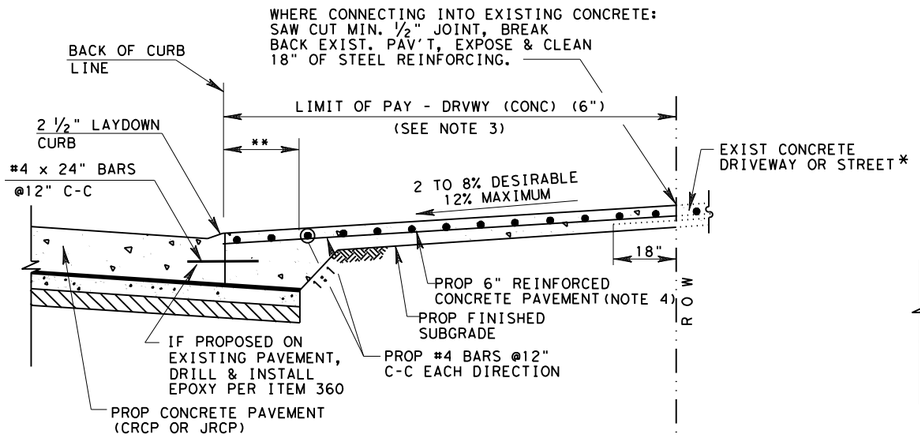
(TWO LAYER STEEL)

Texas Department of Transportation
Houston District

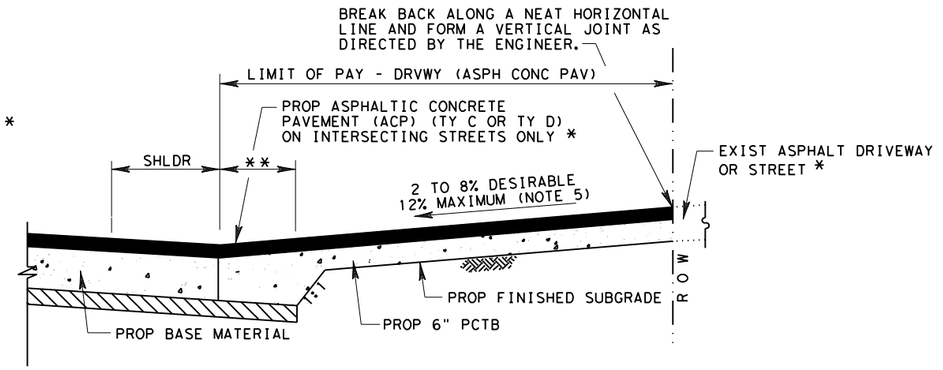
CONCRETE PAVEMENT JUNCTURES

CPJ

FILE: STDB-5.dgn	DN:	CK:	DW:	CK:		
© TxDOT DEC. 2009	DIST	FED REG	PROJECT NO.			SHEET
REVISIONS 5/05 2004 SPECS REVISED 4/2008 2/15 2014 SPECS	HOU	6				94A
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	MONTGOMERY		1986	01	064	FM1314



PROPOSED DRIVEWAY DETAIL
REINFORCED CONCRETE AT CONCRETE
CURB AND GUTTER ROADWAY



PROPOSED DRIVEWAY DETAIL
ASPHALT W/ PCTB AT ASPHALT ROADWAY

NOTES:

1. ALSO SEE SHEET 2 OF 2 FOR DRIVEWAY SLOPES WITH PROPOSED SIDEWALKS.
2. FOR INTERSECTIONS BUILT WITH CRCP PAVEMENT SEE CRCP DETAIL.
3. FAST TRACK CONCRETE IS PAID AS DRVWY (CONC) (FAST TRACK).
4. THICKNESS OF DRIVEWAY IS 6 INCHES FOR REGULAR AND FAST TRACK CONCRETE.
5. MAXIMUM SLOPE IS: 12% RESIDENTIAL
   8% OTHERS

LEGEND:

PCTB- PORTLAND CEMENT TREATED BASE

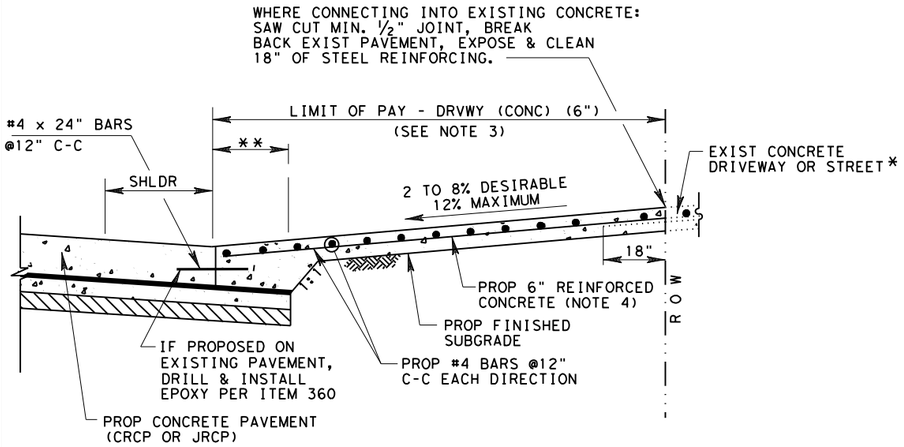
JRCP- JOINTED REINFORCED CONCRETE PAVEMENT

CRCP- CONTINUOUSLY REINFORCED CONCRETE PAVEMENT

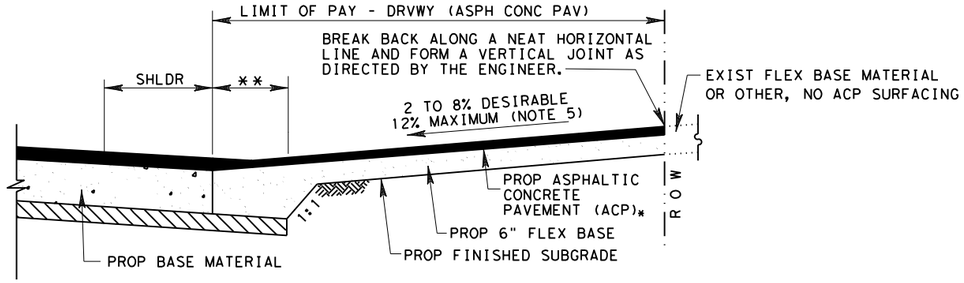
ACP- ASPHALTIC CONCRETE PAVEMENT

* FOR STREET INTERSECTIONS REFER TO PAVING DETAILS AND INTERSECTION DETAILS FOR REINFORCING STEEL AND SECTION REQUIREMENTS.

** PROPOSED LIMIT OF ROADWAY BASE AND/OR SUBGRADE



PROPOSED DRIVEWAY DETAIL
REINFORCED CONCRETE AT CONCRETE ROADWAY



PROPOSED DRIVEWAY DETAIL
ASPHALT W/ FLEX BASE AT ASPHALT ROADWAY

SHEET 1 OF 3

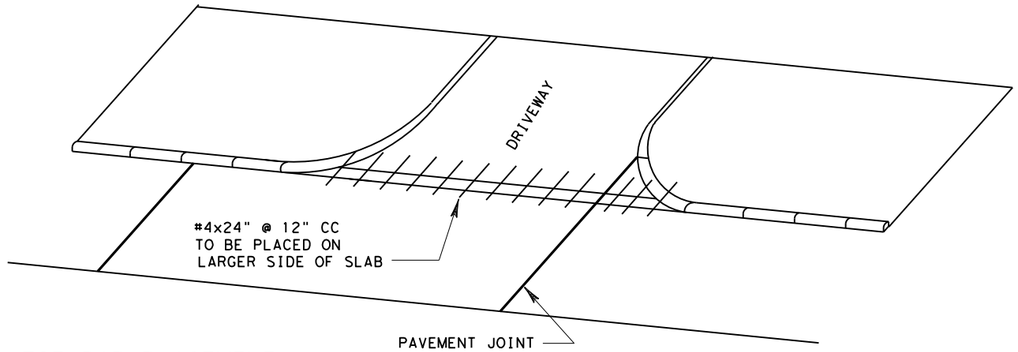
Texas Department of Transportation
Houston District

DRIVEWAY DETAILS

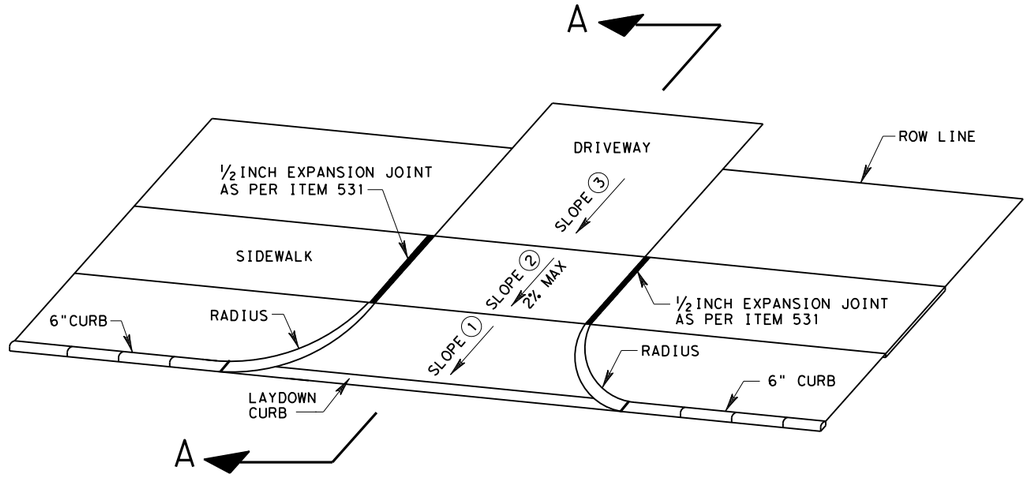
DD

FILE: STDB-8a.dgn	DN:	CK:	DW:	CK:		
© TxDOT SEPT. 2004	DIST	FED REG	PROJECT NO.			SHEET
REVISIONS 11/15 ADDED NOTE FOR PCTB 3/17 MODIFIED PAVEMENT SLOPES	HOU	6				95
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	MONTGOMERY		1986	01	064	FM1314

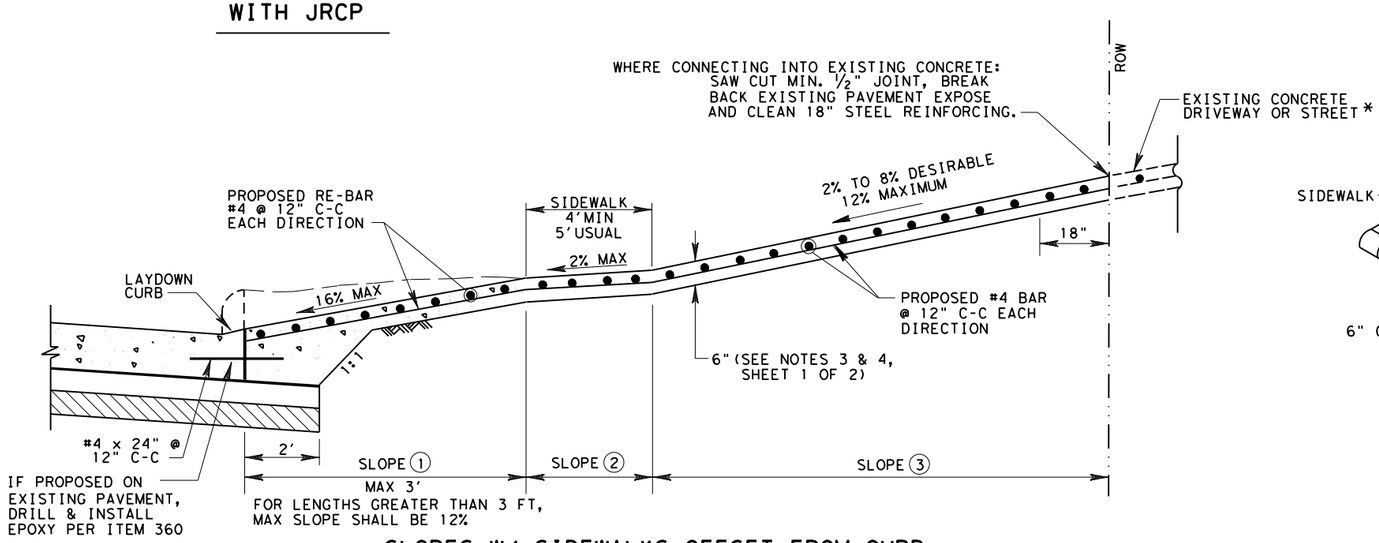
STDB8A



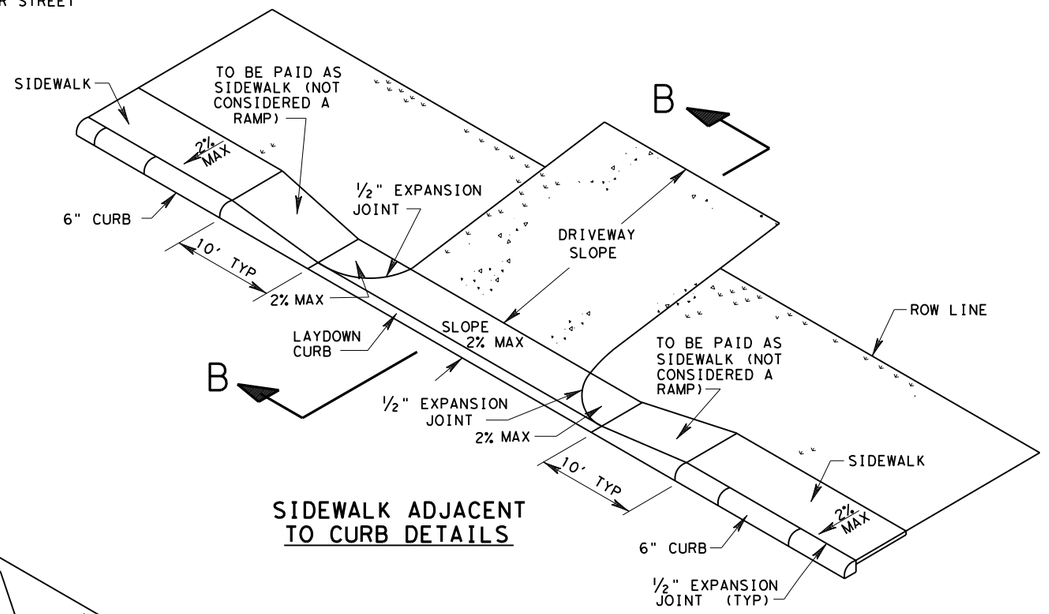
TIE BAR PLACEMENT WITH JRCP



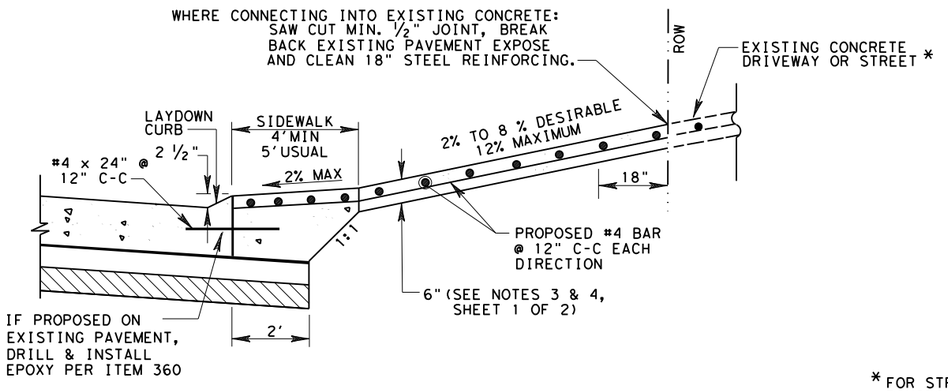
SIDEWALK OFFSET FROM CURB DETAILS



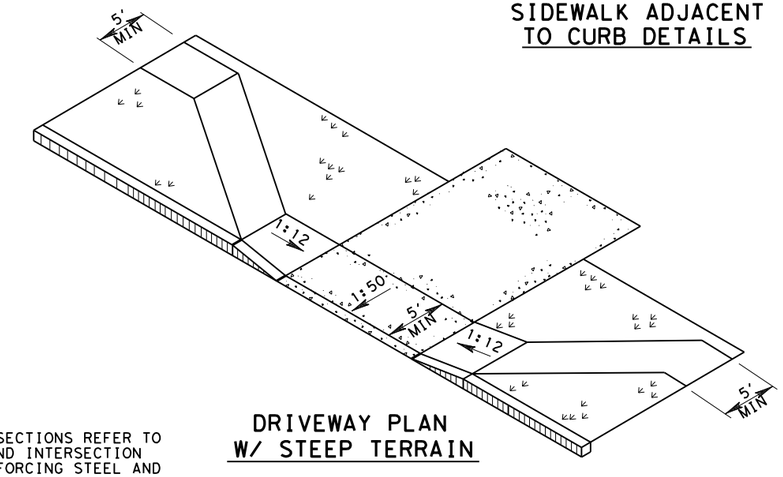
SLOPES W/ SIDEWALKS OFFSET FROM CURB (SECTION A-A)



SIDEWALK ADJACENT TO CURB DETAILS



DRIVEWAY SLOPES W/ SIDEWALKS ADJACENT TO CURB (SECTION B-B)



DRIVEWAY PLAN W/ STEEP TERRAIN

* FOR STREET INTERSECTIONS REFER TO PAVING DETAILS AND INTERSECTION DETAILS FOR REINFORCING STEEL AND SECTION REQUIREMENTS.

SHEET 2 OF 3

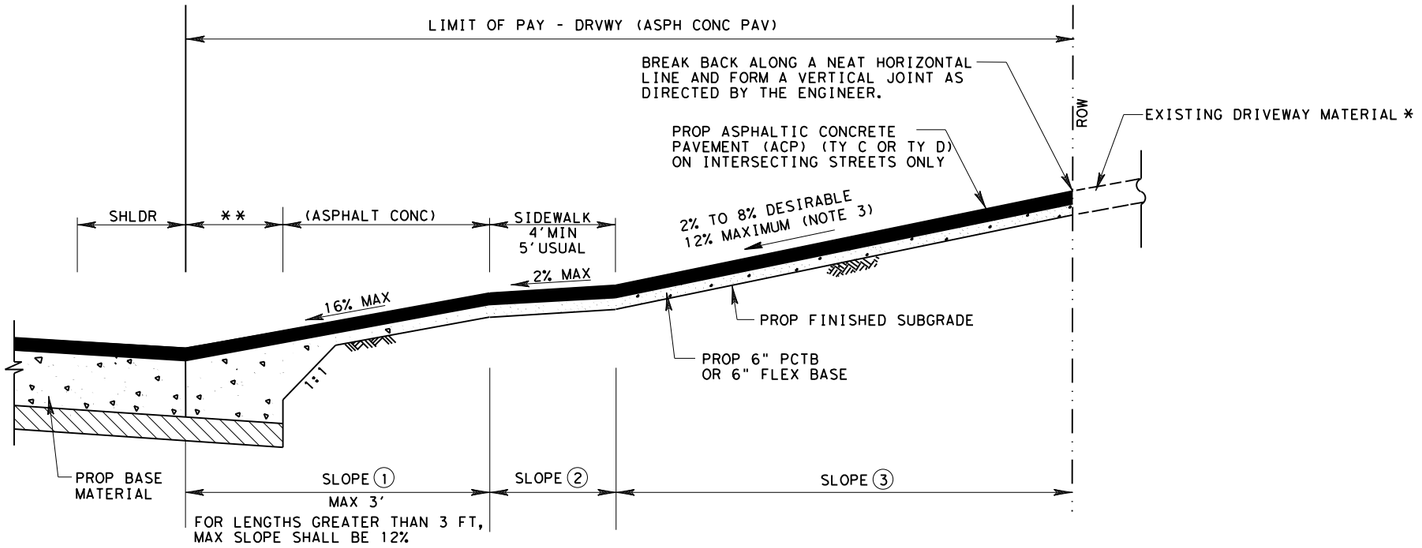
Texas Department of Transportation
Houston District

DRIVEWAY DETAILS

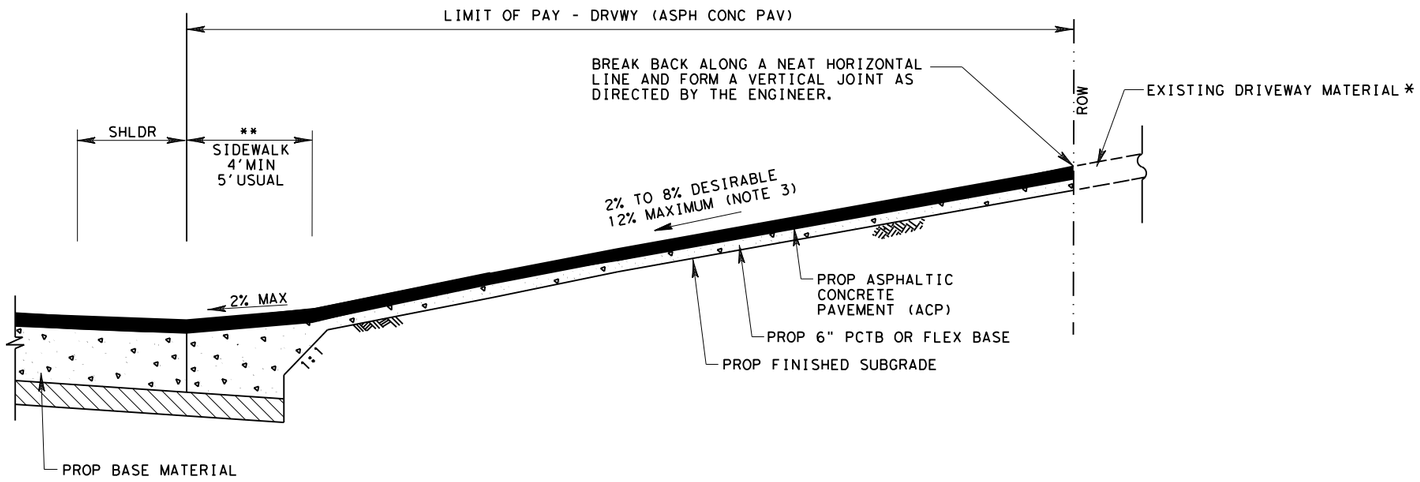
DD

FILE: STDB-8b.dgn	DN:	CK:	DW:	CK:		
©TxDOT SEPT. 2004	DIST	FED REG	PROJECT NO.			SHEET
REVISIONS	HOU	6				95A
9/09 ADDED NOTE FOR ITEM 360.	COUNTY		CONTROL	SECT	JOB	HIGHWAY
1/15 ADDED NOTE FOR PCTB	MONTGOMERY		1986	01	064	FM1314

STDB8B



PROPOSED DRIVEWAY SLOPES
WITH SIDEWALKS OFFSET



PROPOSED DRIVEWAY SLOPES
WITH SIDEWALKS ADJACENT

NOTES:

1. ALSO SEE SHEET 2 OF 3 FOR DRIVEWAY SLOPES WITH PROPOSED SIDEWALKS.
2. FOR INTERSECTIONS BUILT WITH CRCP PAVEMENT SEE CRCP DETAIL.
3. MAXIMUM SLOPE IS: 12% RESIDENTIAL 8% OTHERS

LEGEND:

PCTB- PORTLAND CEMENT TREATED BASE

ACP- ASPHALTIC CONCRETE PAVEMENT

* FOR STREET INTERSECTIONS REFER TO PAVING DETAILS AND INTERSECTION DETAILS.

** PROPOSED LIMIT OF ROADWAY BASE AND/OR SUBGRADE

Texas Department of Transportation
Houston District

DRIVEWAY DETAILS

DD

FILE: STDB-8c.dgn	DN:	CK:	DW:	CK:		
© TxDOT SEPT. 2004	DIST	FED REG	PROJECT NO.			SHEET
REVISIONS 11/15 ADDED NOTE FOR PCTB 3/17 MODIFIED PAVEMENT SLOPES	HOU	6				95B
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	MONTGOMERY		1986	01	064	FM1314

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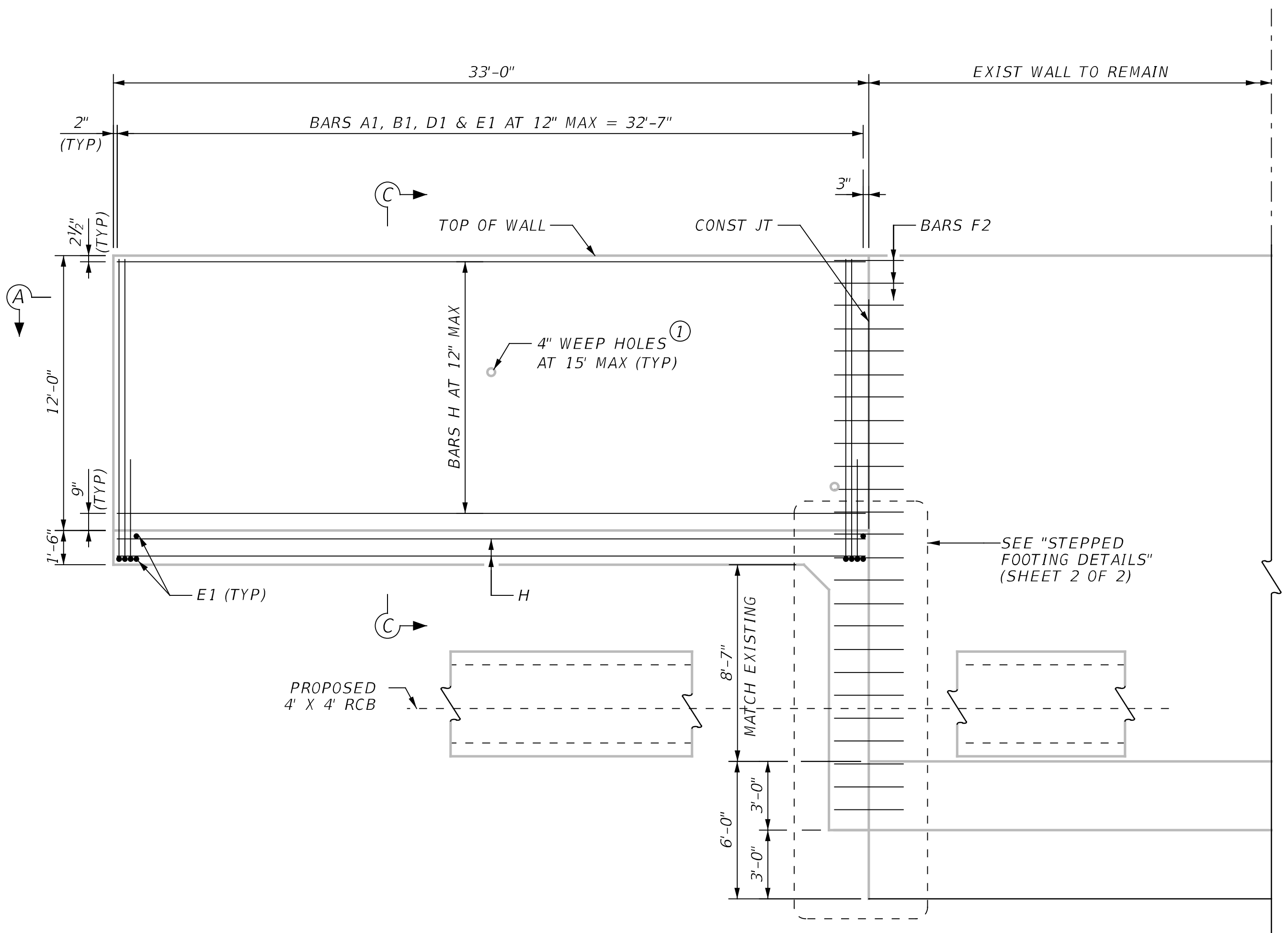
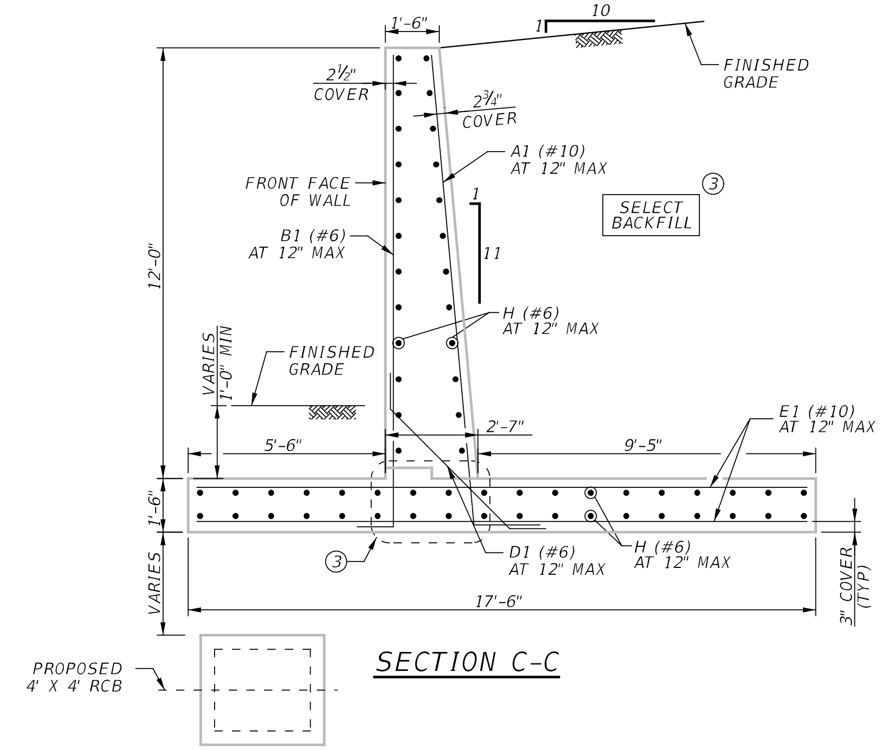
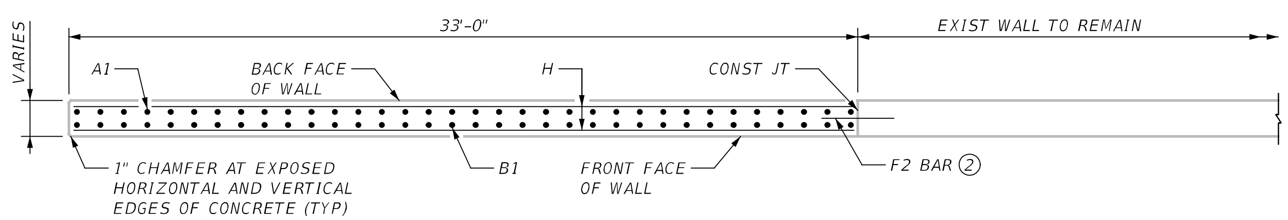


HEADWALL PARTIAL ELEVATION



SECTION C-C

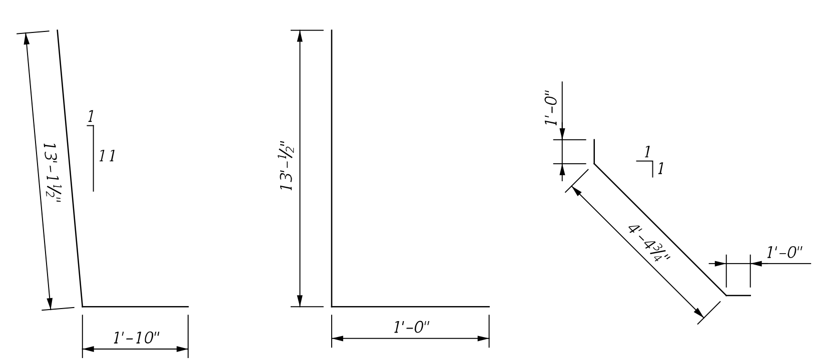
③ SEE "SELECT BACKFILL DETAIL" (SHEET 2 OF 2).



SECTION A-A

① INSTALL 4" WEEP HOLES AT 15' MAX WITH SLOPE TO DRAIN. PLACE 1' HARDWARE CLOTH CENTERED BEHIND OPENING. THE FILTER MATERIAL MUST COMPLY WITH TxDOT SPECIFICATIONS.

② F2 BARS TO REMAIN AFTER DEMOLITION OF 33' X 12' WALL. CLEAN, STRAIGTEN AND EXTEND F2 BARS INTO NEW WALL.



BARS A1 BARS B1 BARS D

GENERAL NOTES:

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

THE CONTRACTOR MUST VERIFY THE LOCATION AND DEPTH OF ALL UTILITIES PRIOR TO THE COMMENCEMENT OF ANY EXCAVATION OR CONSTRUCTION.

THE CONTRACTOR MUST COMPLY WITH THE GEOTECHNICAL REPORT TITLED "GEOTECHNICAL INVESTIGATION PROPOSED HEADWALL STRUCTURE AT THE FM 1314 AND NORTH/SOUTH DRAINAGE CHANNEL INTERSECTION MONTGOMERY COUNTY, TEXAS" AND DATED MARCH 30, 2020.

THE CONTRACTOR WILL BE RESPONSIBLE FOR ALL THE CONSTRUCTION METHODS AND THE STABILITY OF ALL STRUCTURES DURING CONSTRUCTION.

THE CONTRACTOR WILL NOT PLACE BACKFILL AGAINST ANY STRUCTURAL WALLS UNTIL THE WALLS HAVE ATTAINED THE SPECIFIED CONCRETE STRENGTH.

CONSTRUCTION JOINTS NOT INDICATED ON THE DRAWINGS MUST BE SUBMITTED TO THE ENGINEER OF RECORD FOR APPROVAL PRIOR TO CONSTRUCTION.

THE CONTRACTOR MUST CONSTRUCT ALL FOUNDATIONS IN EXCAVATIONS FREE OF STANDING WATER.

FOUNDATION SLAB MUST BEAR ON NOT LESS THAN 4,000 PSF UNDISTURBED SOIL. THE CONTRACTOR IS RESPONSIBLE TO COMPACT THE SOIL FOR ANY CONDITION NOT MEETING THE ABOVE BEARING CAPACITY.

ALL DIMENSIONS AND OTHER GEOMETRIC INFORMATION SHOWN IS BASED ON THE EXISTING DESIGN PLANS SIGNED AND SEALED BY VASILEIOS SAMARAS, P.E 119161. 06/09/2020

DEMOLITION NOTES:

REMOVE EXIST 33' X 12' RETAINING WALL ALONG CONSTRUCTION JOINT.

EXISTING BARS F2 AND Z2 AT CONSTRUCTION JOINT TO REMAIN IN PLACE.

BARS F2 AND Z2 SHALL BE CLEANED, STRAIGTENED AND EXTENDED INTO NEW WALL.

MATERIAL NOTES:

PROVIDE CLASS "C" CONCRETE STRENGTH (f'c=3,600 psi) FOR THE RETAINING WALLS, FOOTINGS, AND CONCRETE CLOSURES.

PROVIDE GRADE 60 REINFORCING STEEL.

BACKFILL NOTES:

PROVIDE TYPE BS SELECT BACKFILL AS PER ITEM 423 "RETAINING WALLS". SEE SHEET 3 OF 3 FOR LIMITS.

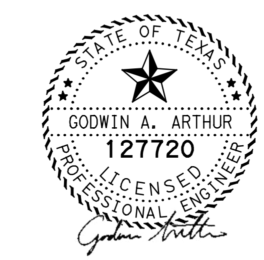
DRAINAGE NOTES:

INSTALL 4" WEEPHOLES AT 15' MAX WITH SLOPE TO DRAIN. PLACE 1' HARDWARE CLOTH CENTERED BEHIND OPENING.

THE FILTER MATERIAL MUST COMPLY WITH TxDOT SPECIFICATIONS.

COVER DIMENSIONS ARE CLEAR DIMENSIONS, UNLESS NOTED OTHERWISE.

REINFORCING BAR DIMENSIONS SHOWN ARE OUT-TO-OUT OF BAR.



3/4/2024

OMEGA ENGINEERS, INC.
16360 PARK TEN PLACE, Ste. #325
HOUSTON TEXAS, 77084
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:281 647 9182 F:281 647 9184

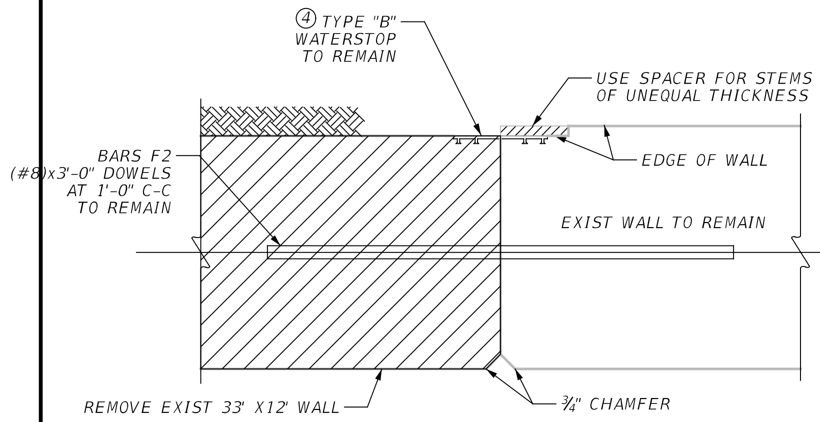
Texas Department of Transportation

FM 1314

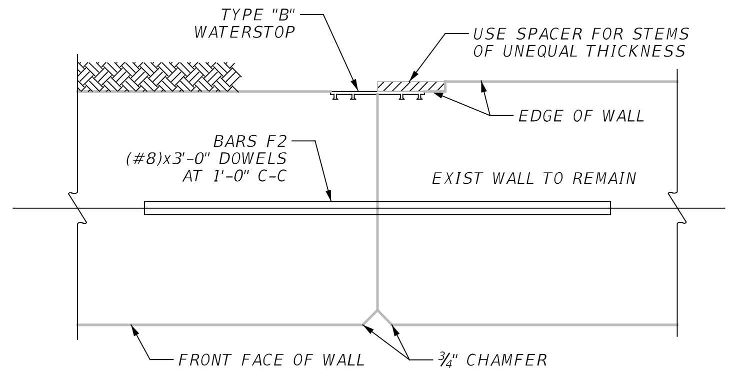
RETAINING WALL DETAILS

SHEET 1 OF 2

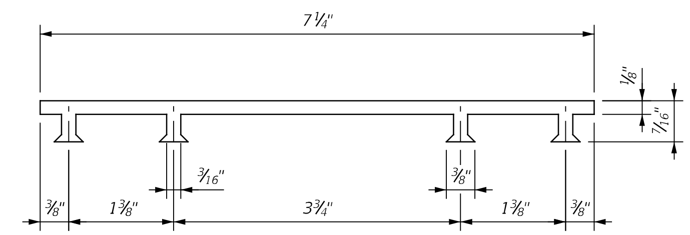
DSN: YK	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
CK: SF	6	SEE COVER SHEET		96
DRN: MS	STATE	DIST.	COUNTY	
APPVD: PB	TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.	
1986	01	064	FM 1314	



WALL DEMOLITION DETAIL ⑤



NEW CONSTRUCTION JOINT



PVC WATERSTOP TYPE "B"

NOTE: DIMENSIONS AND SHAPES MAY VARY SLIGHTLY DEPENDING ON MANUFACTURER.

④ CARE SHOULD BE TAKEN NOT TO DAMAGE TYPE "B" WATERSTOP

⑤ REFERENCE DEMOLITION NOTES ON SHEET 1 OF 2

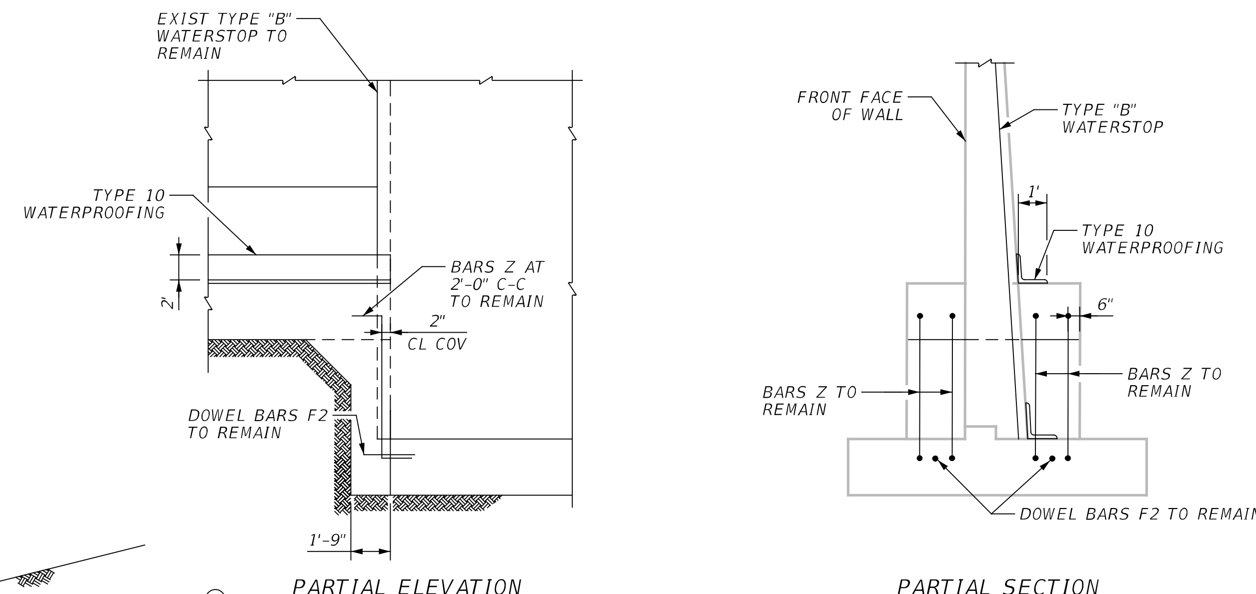
TABLE OF ESTIMATED QUANTITIES (ONE RETAINING WALL)

BAR	NO.	SIZE	LENGTH	WEIGHT
A1	33	#10	15'-0"	2130
B1	33	#6	14'-1"	698
D1	33	#6	6'-5"	318
E1	66	#10	17'-0"	4828
H	60	#6	32'-8"	2944
REINFORCING STEEL (LB) ⑥				10,918
CLASS C CONC (CY) ⑥				76

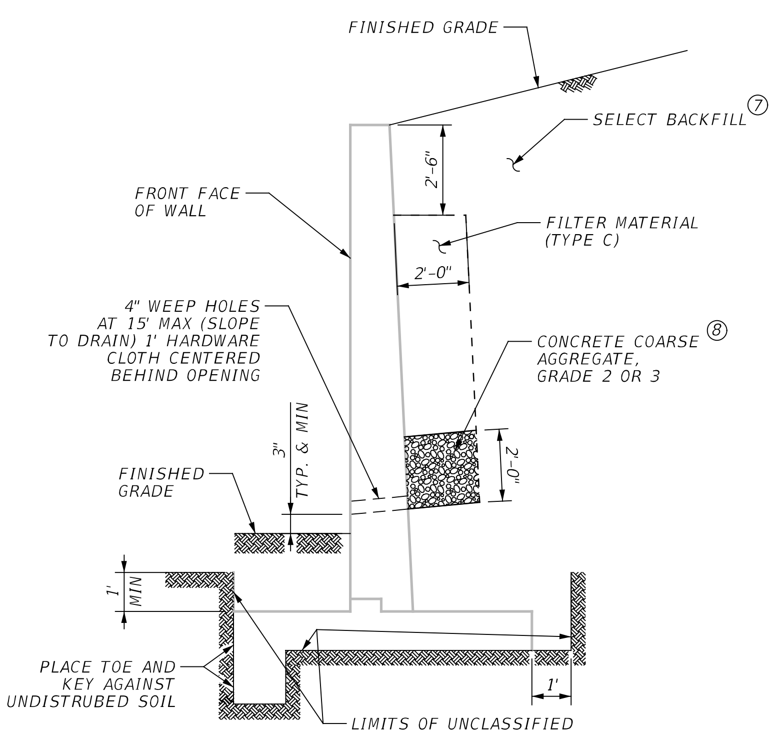
⑥ QUANTITIES ARE FOR CONTRACTOR'S INFORMATION ONLY.

⑦ LIMITS OF SELECT BACKFILL. PROVIDE TYPE BS SELECT BACKFILL IN ACCORDANCE WITH ITEM 423 "RETAINING WALLS" TO THE LIMITS SHOWN.

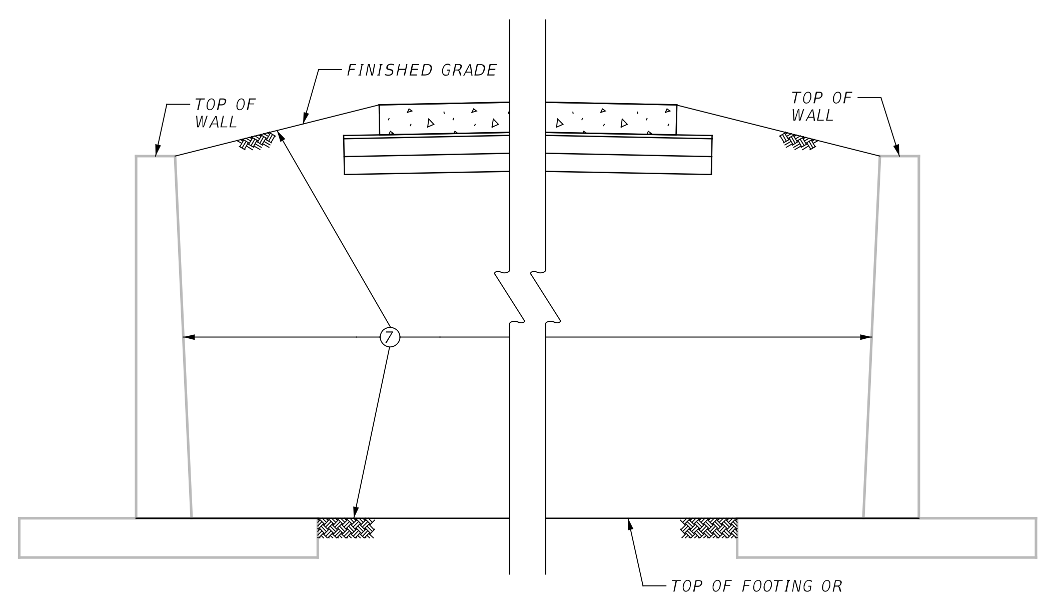
⑧ CRUSHED BLAST FURNACE SLAG, RECYCLED CRUSHED HYDRAULIC CEMENT CONCRETE OR COMBINATION THERE OF MAY NOT BE USED.



STEPPED FOOTING DETAILS



DRAINAGE DETAILS AND EXCAVATION DIAGRAM



SELECT BACKFILL DETAIL

3/11/2024

OMEGA ENGINEERS, INC.
16360 PARK TEN PLACE, Ste. #325
HOUSTON TEXAS, 77084
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:281 647 9182 F:281 647 9184

Texas Department of Transportation
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FM 1314
RETAINING WALL DETAILS

SHEET 2 OF 2

DSN: YK	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
CK: SF	6	SEE COVER SHEET		97
DRN: MS	STATE	DIST.	COUNTY	
APPVD: PB	TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.	
1986	01	064	FM 1314	

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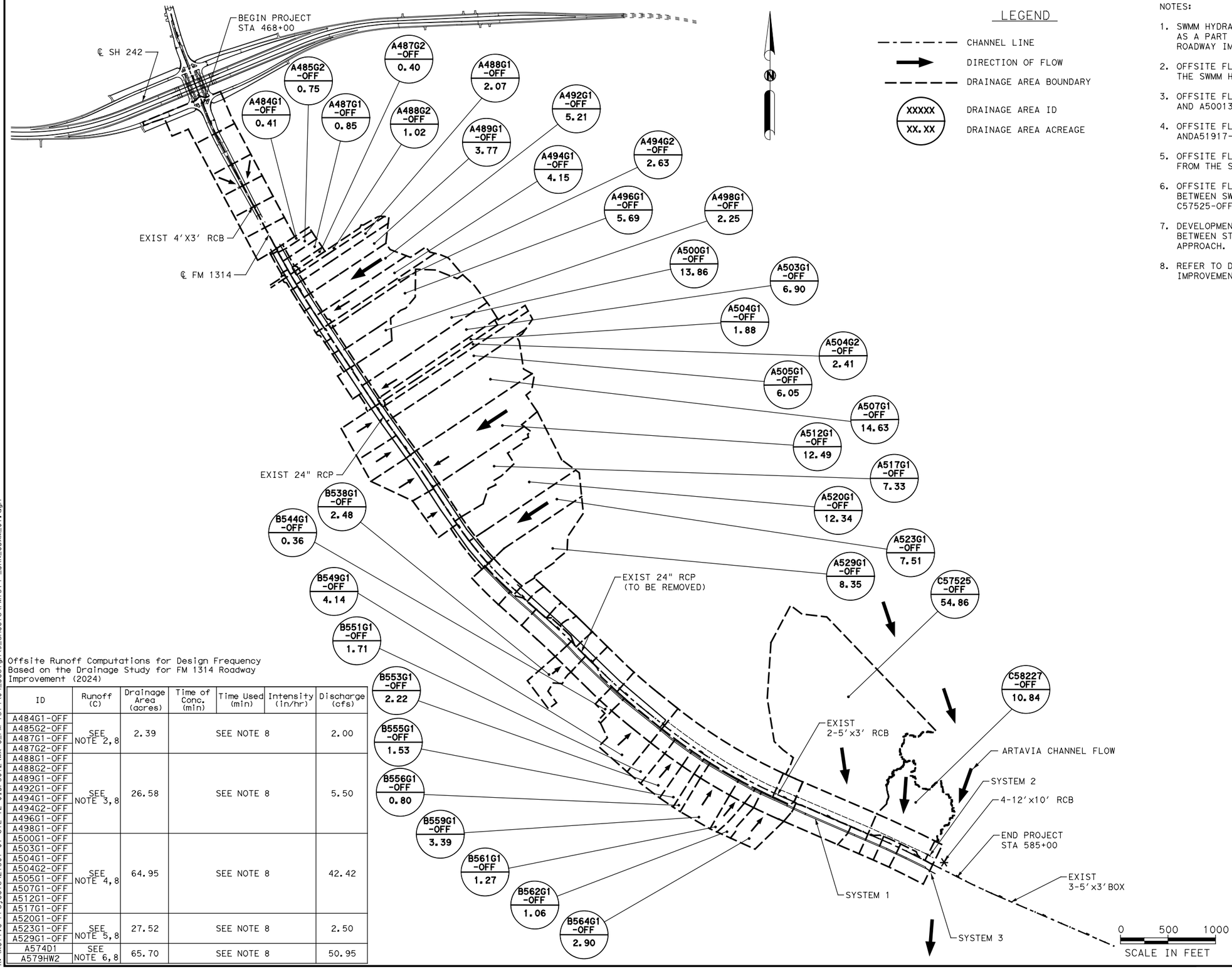
3/11/2024 ... AM



LEGEND

- CHANNEL LINE
- DIRECTION OF FLOW
- DRAINAGE AREA BOUNDARY
- XXXXX / XX.XX — DRAINAGE AREA ID / DRAINAGE AREA ACREAGE

NOTES:

1. SWMM HYDRAULIC MODEL IS DEVELOPED BY WOOLPERT AS A PART OF THE "DRAINAGE STUDY FOR FM 1314 ROADWAY IMPROVEMENTS (2024)
2. OFFSITE FLOW CORRESPONDING TO DA ID A4887-OFF FROM THE SWMM HYDRAULIC MODEL.
3. OFFSITE FLOW CORRESPONDING TO DA ID A4959-OFF,A49511-OFF AND A50013-OFF FROM THE SWMM HYDRAULIC MODEL.
4. OFFSITE FLOW CORRESPONDING TO DA ID A5115-OFF ANDA51917-OFF FROM THE SWMM HYDRAULIC MODEL.
5. OFFSITE FLOW CORRESPONDING TO DA ID A52919-OFF FROM THE SWMM HYDRAULIC MODEL.
6. OFFSITE FLOW CALCULATED FROM THE FLOW DIFFERENCE BETWEEN SWMM HYDRAULIC MODEL (DA ID C569D31, C582D33, C57525-OFF AND C58227-OFF) AND DEVELOPMENT STRIP FLOW.
7. DEVELOPMENT STRIP IS CONSIDERED FOR THE DESIGN BETWEEN STA 529+00 AND STA 564+00 AS A CONSERVATIVE APPROACH.
8. REFER TO DRAINAGE STUDY FOR FM1314 ROADWAY IMPROVEMENTS (2024) FOR THE HYDROLOGIC PARAMETERS.

Offsite Runoff Computations for Design Frequency Based on the Drainage Study for FM 1314 Roadway Improvement (2024)

ID	Runoff (C)	Drainage Area (acres)	Time of Conc. (min)	Time Used (min)	Intensity (in/hr)	Discharge (cfs)
A484G1-OFF A485G2-OFF A487G1-OFF A487G2-OFF	SEE NOTE 2,8	2.39	SEE NOTE 8			2.00
A488G1-OFF A488G2-OFF A489G1-OFF A492G1-OFF A494G1-OFF A494G2-OFF A496G1-OFF A498G1-OFF	SEE NOTE 3,8	26.58	SEE NOTE 8			5.50
A500G1-OFF A503G1-OFF A504G1-OFF A504G2-OFF A505G1-OFF A507G1-OFF A512G1-OFF A517G1-OFF	SEE NOTE 4,8	64.95	SEE NOTE 8			42.42
A520G1-OFF A523G1-OFF A529G1-OFF	SEE NOTE 5,8	27.52	SEE NOTE 8			2.50
A574D1 A579HW2	SEE NOTE 6,8	65.70	SEE NOTE 8			50.95

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GOLAM MOHIUDDIN
140020
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS
3/6/2024

CivilTech Engineering, Inc.
11821 Telge Road
Cypress, Texas 77429
PH: (281) 304-0200 - FX: (281) 304-0210
Firm Registration No. F-382

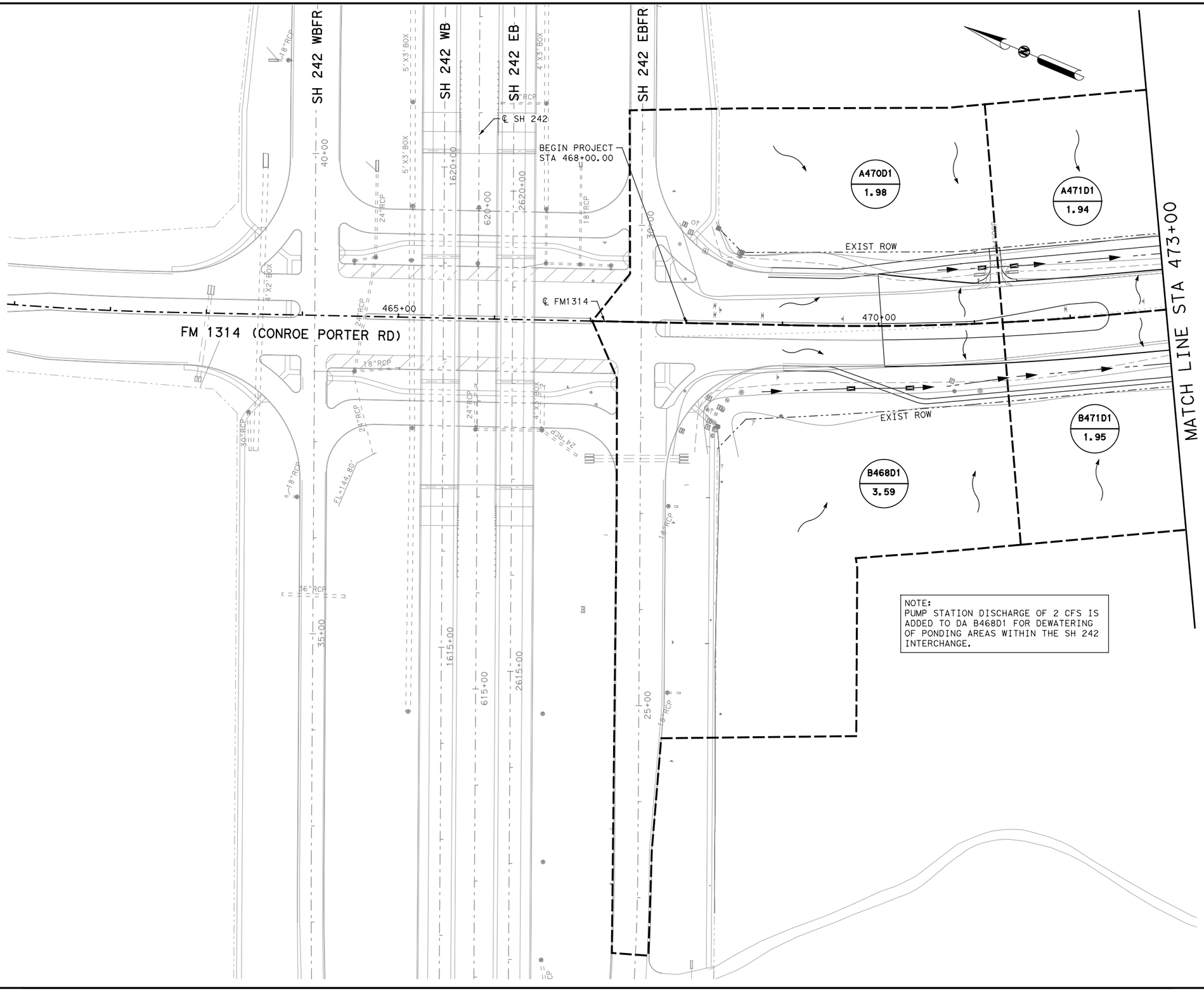
Texas Department of Transportation

FM 1314

OVERALL DRAINAGE AREA MAP

SHEET 1 OF 1

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.	SHEET NO.
CK: SF	6	SEE COVER SHEET	98
DRN: MS	STATE	DIST.	COUNTY
APPVD: PB	TEXAS	HOU	MONTGOMERY
CONT.	SECT.	JOB	HIGHWAY NO.
1986	01	064	FM 1314



LEGEND

- DIRECTION OF FLOW
- OR PROP MANHOLE
- OR PROP GRATE INLET
- PROP SET
- PROP ℄ DITCH
- DRAINAGE AREA BOUNDARY
- XXXXX / XX.XX — DRAINAGE AREA ID / DRAINAGE AREA ACREAGE

NOTES:

1. SEE RUNOFF COMPUTATIONS SHEET FOR ALL DRAINAGE AREA CALCULATIONS.

0 50 100
SCALE IN FEET

STATE OF TEXAS
SHERVIN S. FARD
99431
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P.E
3/4/2024

OMEGA ENGINEERS, INC.
16360 PARK TEN PLACE, Ste. #325
HOUSTON TEXAS, 77084
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
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FM 1314

DRAINAGE AREA MAP

BEGIN TO STA 473+00

SHEET 1 OF 11

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
CK: SF	6	SEE COVER SHEET		99
DRN: MS	STATE	DIST.	COUNTY	
APPVD: PB	TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.	
1986	01	064	FM 1314	

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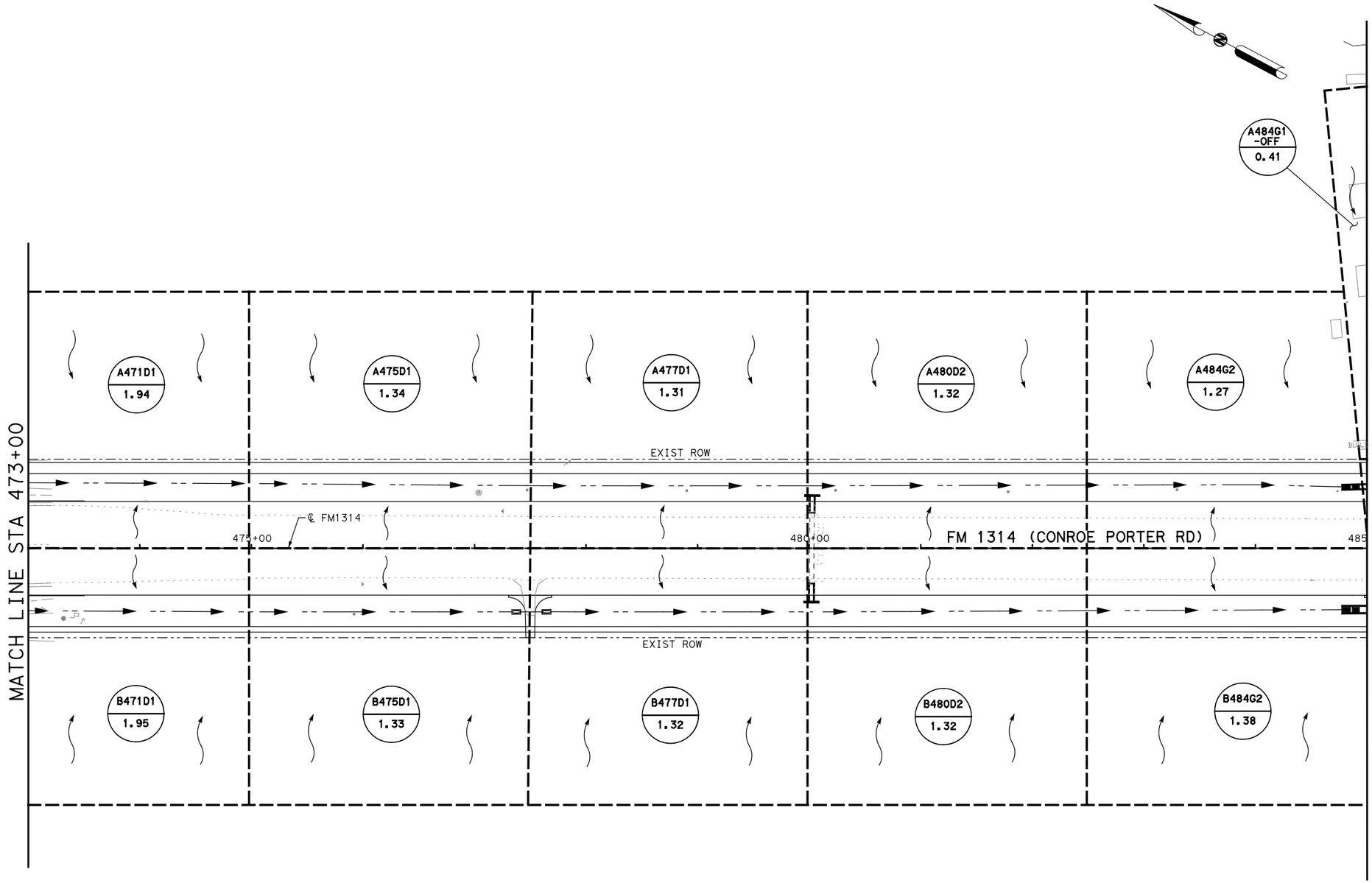

LEGEND

- DIRECTION OF FLOW
- OR PROP MANHOLE
- OR PROP GRATE INLET
- PROP SET
- PROP ℄ DITCH
- DRAINAGE AREA BOUNDARY
- XXXXX / XX.XX — DRAINAGE AREA ID / DRAINAGE AREA ACREAGE

NOTES:

1. SEE RUNOFF COMPUTATIONS SHEET FOR ALL DRAINAGE AREA CALCULATIONS.

0 50 100
SCALE IN FEET

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FM 1314

DRAINAGE AREA MAP

STA 473+00 TO STA 485+00

SHEET 2 OF 11

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
CK: SF	6	SEE COVER SHEET		100
DRN: MS	STATE	DIST.	COUNTY	
APPVD: PB	TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.	
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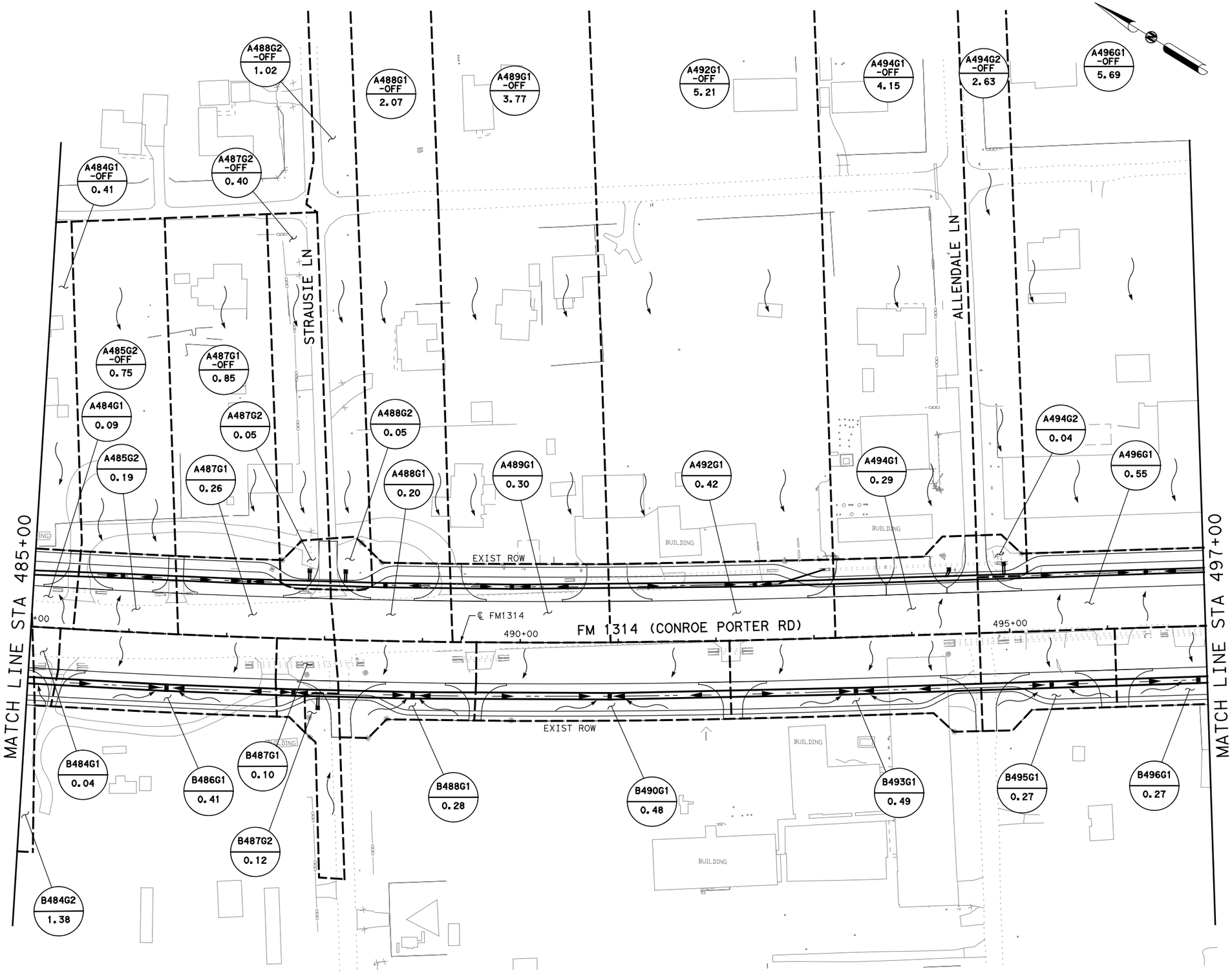

LEGEND

- DIRECTION OF FLOW
- OR PROP MANHOLE
- OR PROP GRATE INLET
- PROP SET
- PROP ℄ DITCH
- DRAINAGE AREA BOUNDARY
- XXXXX — DRAINAGE AREA ID
- XX.XX — DRAINAGE AREA ACREAGE

NOTES:

1. SEE RUNOFF COMPUTATIONS SHEET FOR ALL DRAINAGE AREA CALCULATIONS.

0 50 100
SCALE IN FEET

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FM 1314

DRAINAGE AREA MAP

STA 485+00 TO STA 497+00

SHEET 3 OF 11

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.	SHEET NO.
CK: SF	6	SEE COVER SHEET	101
DRN: MS	STATE	DIST.	COUNTY
APPVD: PB	TEXAS	HOU	MONTGOMERY
CONT.	SECT.	JOB	HIGHWAY NO.
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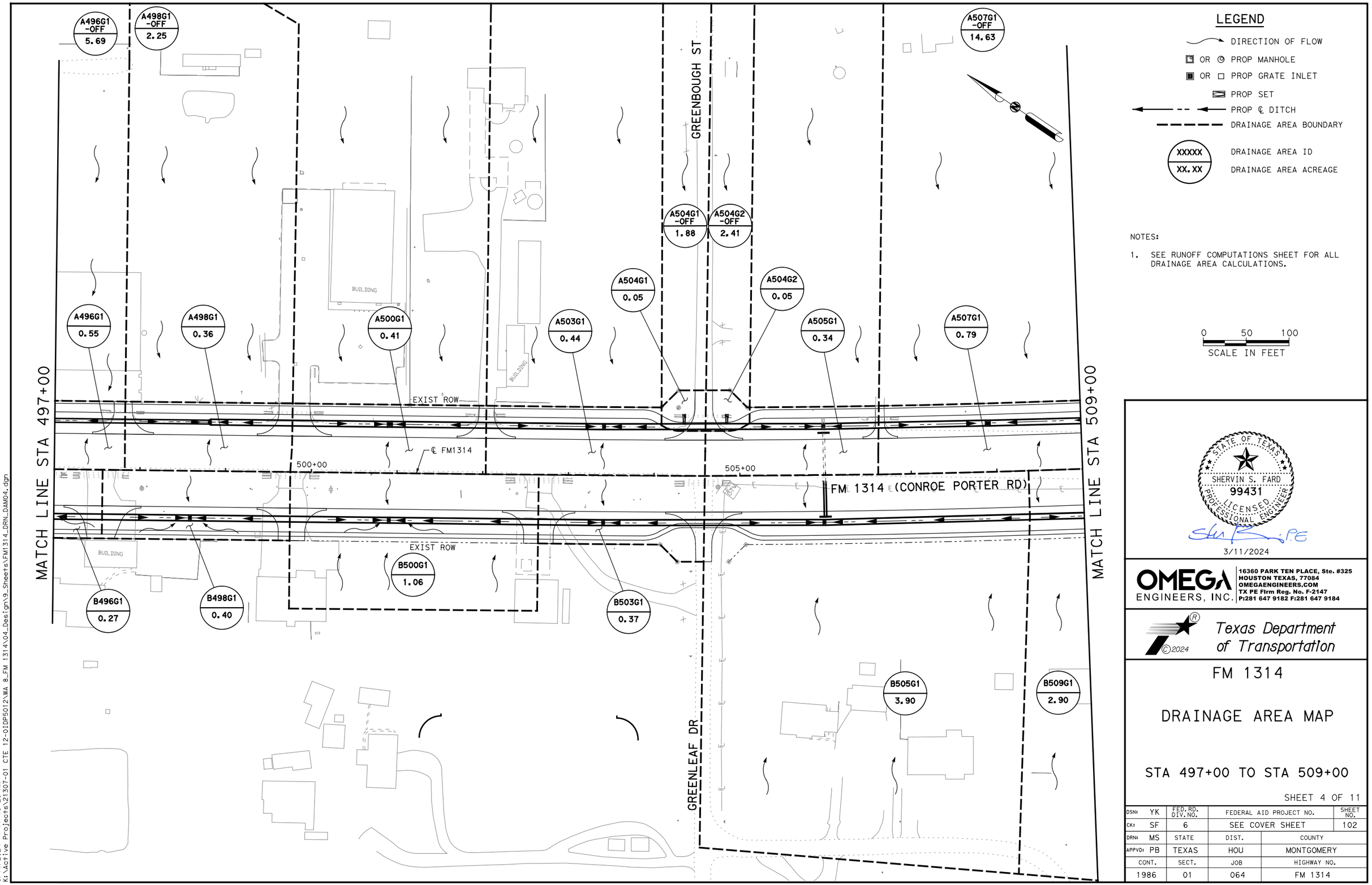

LEGEND

- DIRECTION OF FLOW
- OR PROP MANHOLE
- OR PROP GRATE INLET
- PROP SET
- PROP ℄ DITCH
- DRAINAGE AREA BOUNDARY
- XXXXX / XX.XX — DRAINAGE AREA ID / DRAINAGE AREA ACREAGE

NOTES:

1. SEE RUNOFF COMPUTATIONS SHEET FOR ALL DRAINAGE AREA CALCULATIONS.

0 50 100
SCALE IN FEET

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DRAINAGE AREA MAP

STA 497+00 TO STA 509+00

SHEET 4 OF 11

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.	SHEET NO.
CK: SF	6	SEE COVER SHEET	102
DRN: MS	STATE	DIST.	COUNTY
APPVD: PB	TEXAS	HOU	MONTGOMERY
CONT.	SECT.	JOB	HIGHWAY NO.
1986	01	064	FM 1314

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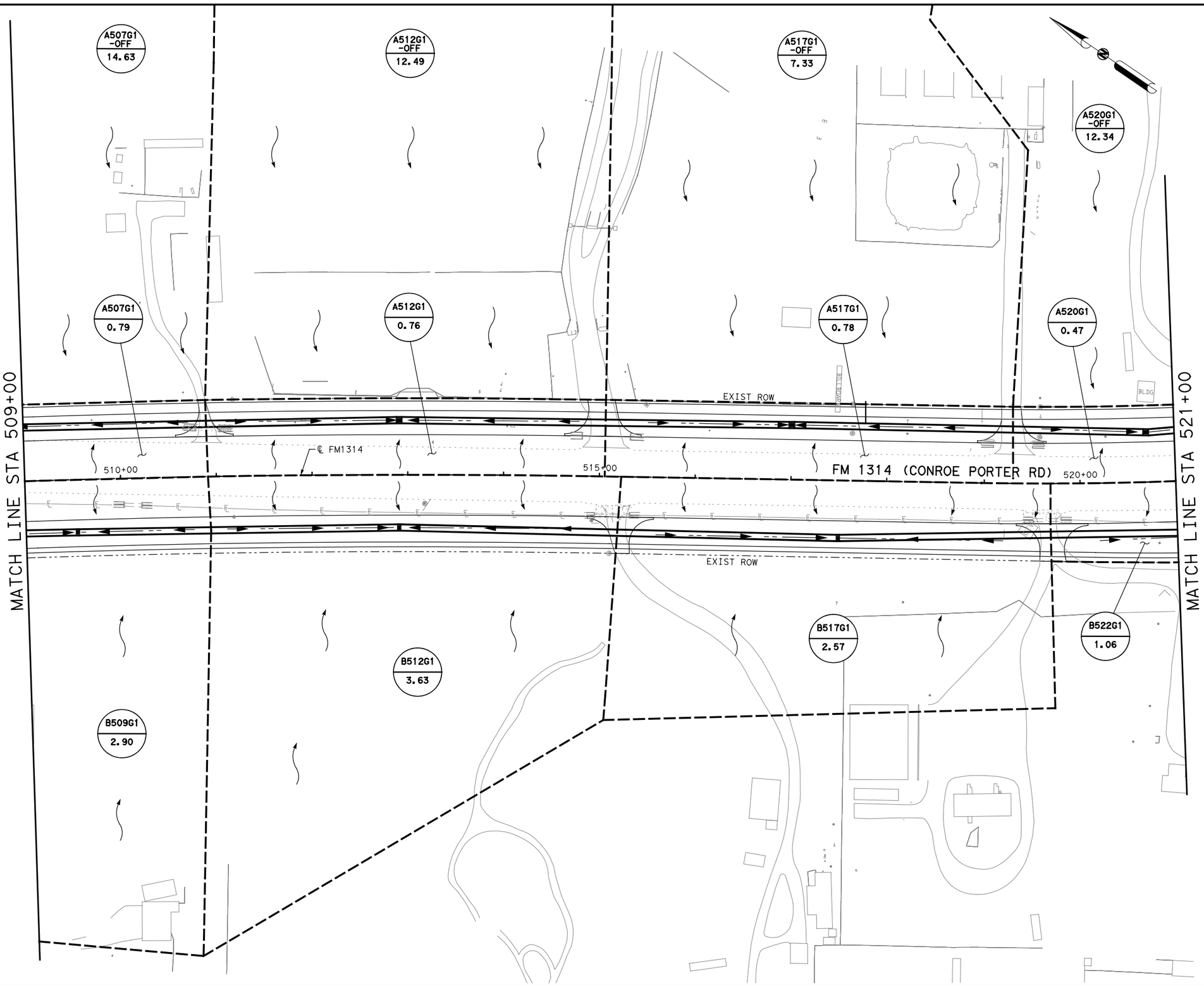

LEGEND

- DIRECTION OF FLOW
- OR PROP MANHOLE
- OR PROP GRATE INLET
- PROP SET
- PROP ℄ DITCH
- DRAINAGE AREA BOUNDARY
- XXXXX — DRAINAGE AREA ID
- XX.XX — DRAINAGE AREA ACREAGE

NOTES:

1. SEE RUNOFF COMPUTATIONS SHEET FOR ALL DRAINAGE AREA CALCULATIONS.

0 50 100
SCALE IN FEET

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DRAINAGE AREA MAP

STA 509+00 TO STA 521+00

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.	SHEET NO.
CK: SF	6	SEE COVER SHEET	103
DRN: MS	STATE	DIST.	COUNTY
APPVD: PB	TEXAS	HOU	MONTGOMERY
CONT.	SECT.	JOB	HIGHWAY NO.
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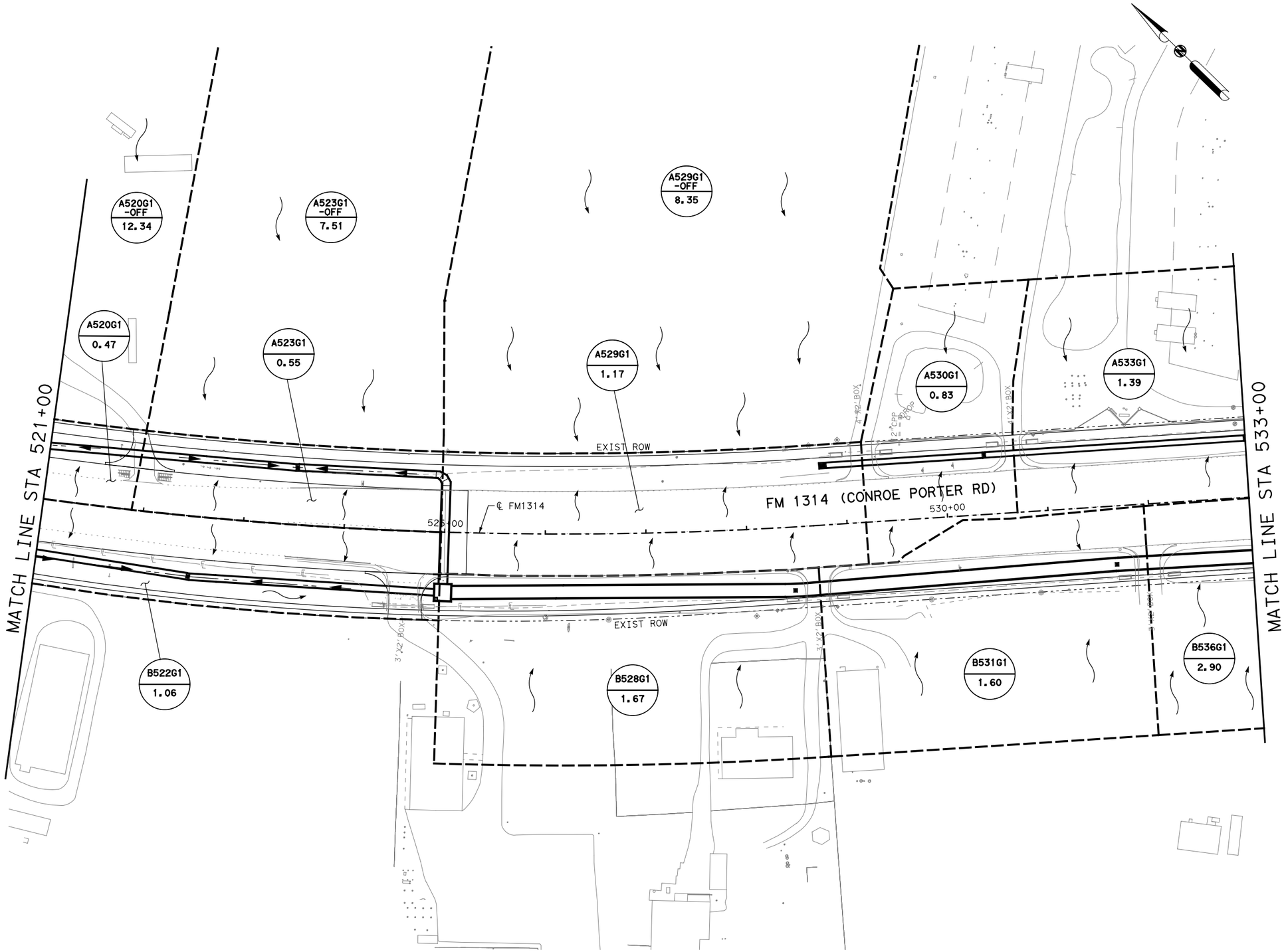

LEGEND

- DIRECTION OF FLOW
- OR PROP MANHOLE
- OR PROP GRATE INLET
- PROP SET
- PROP ℄ DITCH
- DRAINAGE AREA BOUNDARY
- XXXXX / XX.XX — DRAINAGE AREA ID / DRAINAGE AREA ACREAGE

NOTES:

1. SEE RUNOFF COMPUTATIONS SHEET FOR ALL DRAINAGE AREA CALCULATIONS.

0 50 100
SCALE IN FEET

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DRAINAGE AREA MAP

STA 521+00 TO STA 533+00

SHEET 6 OF 11

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
CK: SF	6	SEE COVER SHEET		104
DRN: MS	STATE	DIST.	COUNTY	
APPVD: PB	TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.	
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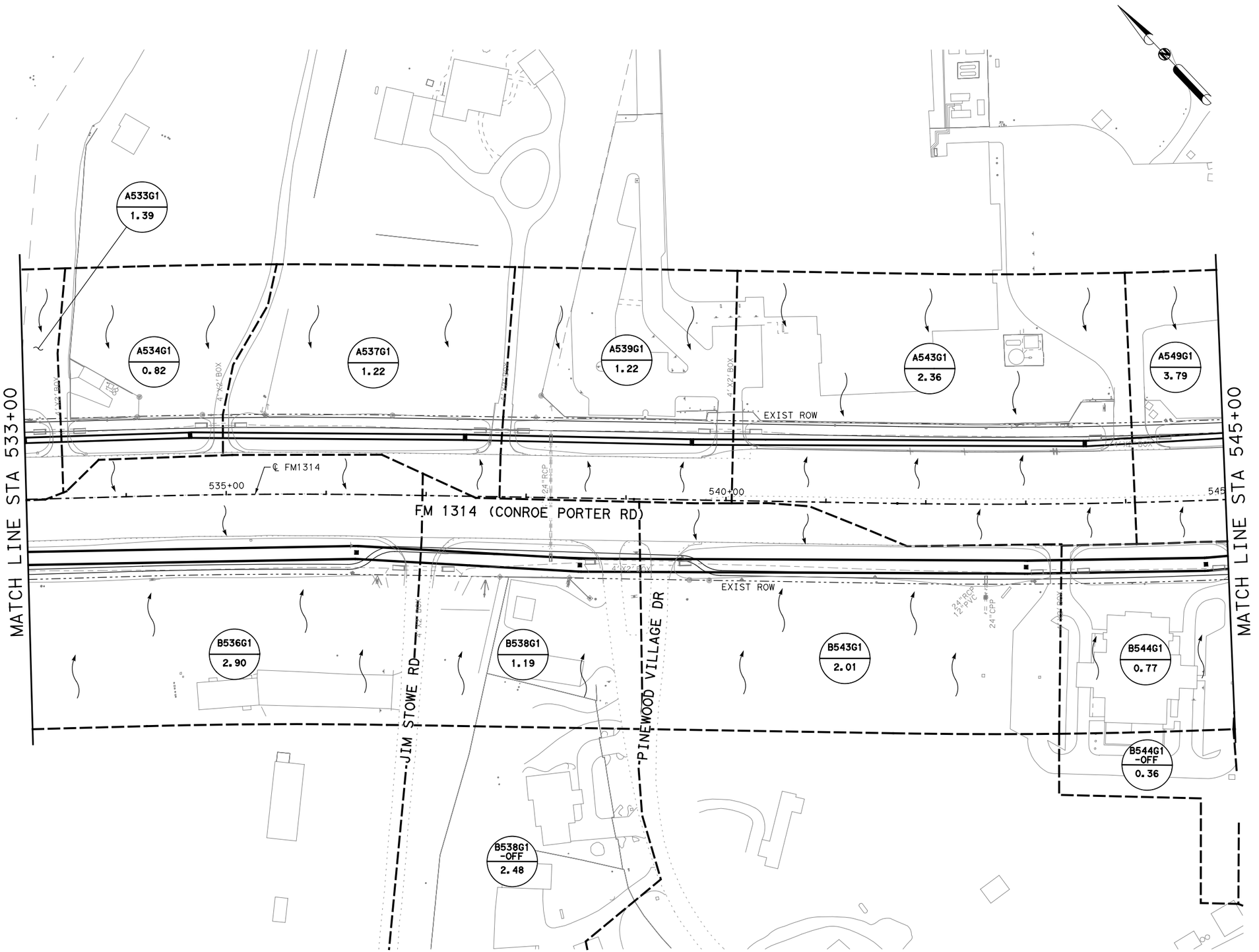

LEGEND

- DIRECTION OF FLOW
- OR PROP MANHOLE
- OR PROP GRATE INLET
- PROP SET
- PROP ℄ DITCH
- DRAINAGE AREA BOUNDARY
- XXXXX / XX.XX — DRAINAGE AREA ID / DRAINAGE AREA ACREAGE

NOTES:

1. SEE RUNOFF COMPUTATIONS SHEET FOR ALL DRAINAGE AREA CALCULATIONS.

0 50 100
SCALE IN FEET

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FM 1314

DRAINAGE AREA MAP

STA 533+00 TO STA 545+00

SHEET 7 OF 11

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.	SHEET NO.
CK: SF	6	SEE COVER SHEET	105
DRN: MS	STATE	DIST.	COUNTY
APPVD: PB	TEXAS	HOU	MONTGOMERY
CONT.	SECT.	JOB	HIGHWAY NO.
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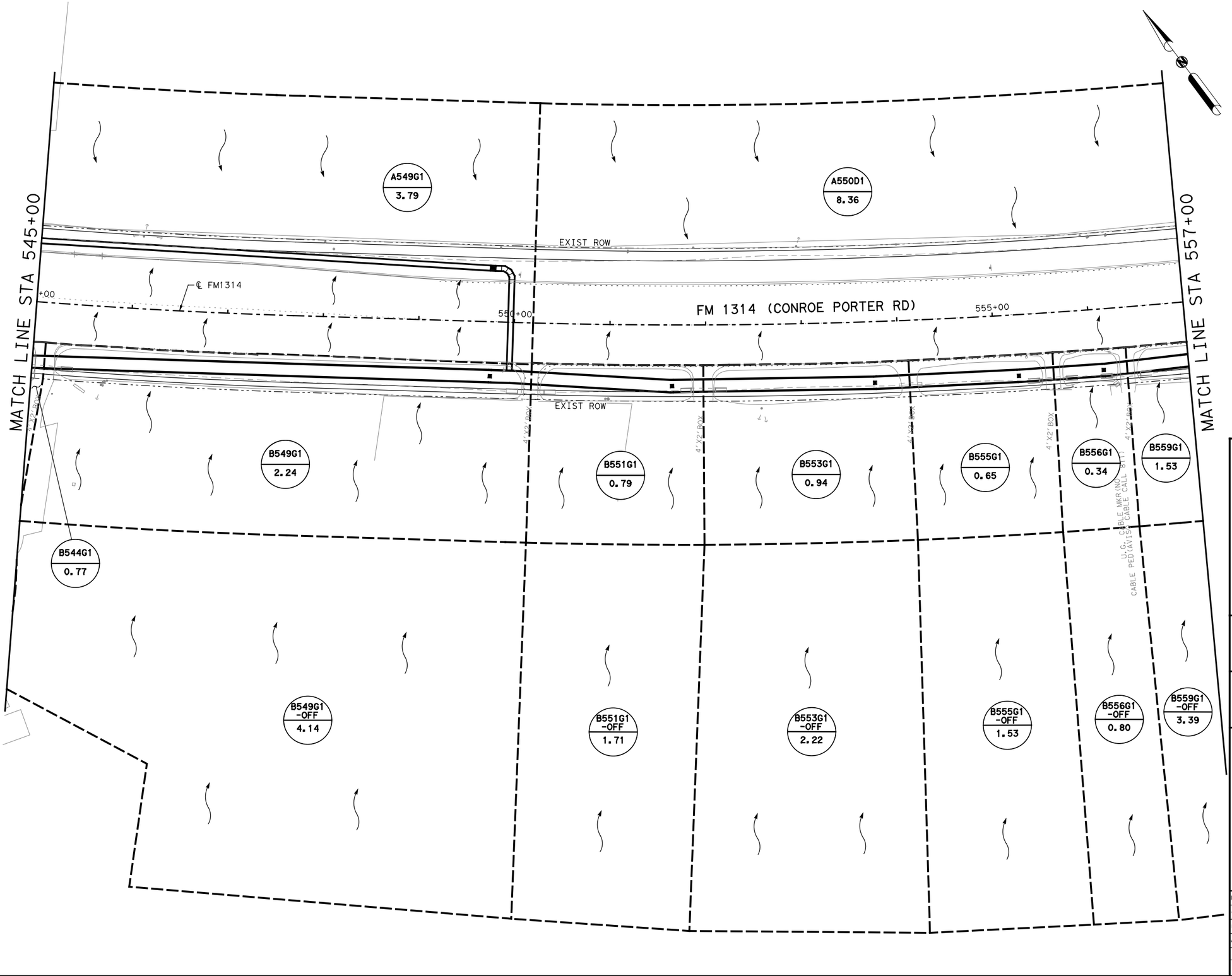

LEGEND

- DIRECTION OF FLOW
- OR PROP MANHOLE
- OR PROP GRATE INLET
- PROP SET
- PROP ℄ DITCH
- DRAINAGE AREA BOUNDARY
- XXXXX / XX.XX — DRAINAGE AREA ID / DRAINAGE AREA ACREAGE

NOTES:

1. SEE RUNOFF COMPUTATIONS SHEET FOR ALL DRAINAGE AREA CALCULATIONS.

0 50 100
SCALE IN FEET

STATE OF TEXAS
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FM 1314

DRAINAGE AREA MAP

STA 545+00 TO STA 557+00

SHEET 8 OF 11

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.	SHEET NO.
CK: SF	6	SEE COVER SHEET	106
DRN: MS	STATE	DIST.	COUNTY
APPVD: PB	TEXAS	HOU	MONTGOMERY
CONT.	SECT.	JOB	HIGHWAY NO.
1986	01	064	FM 1314

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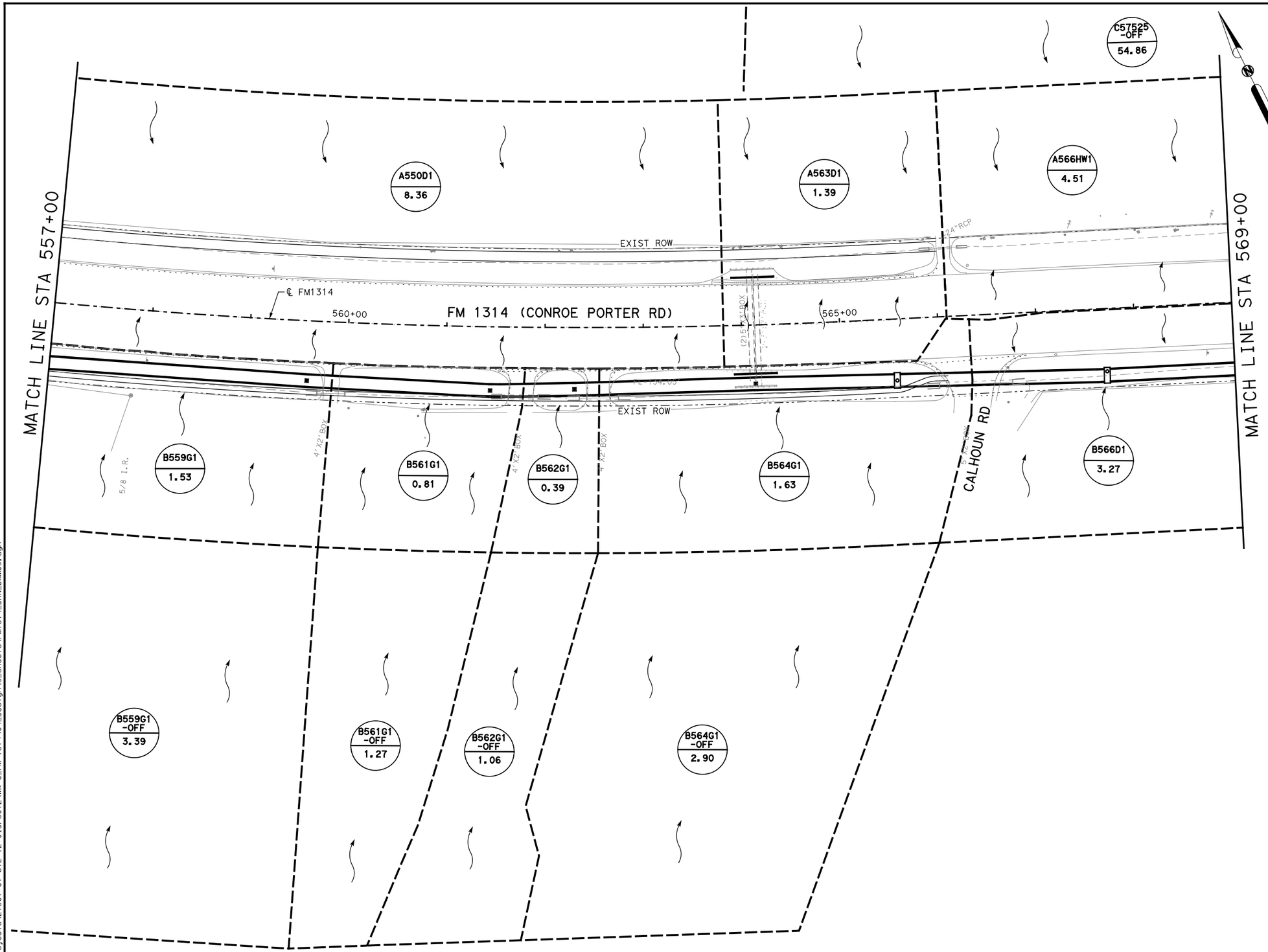

LEGEND

- DIRECTION OF FLOW
- OR PROP MANHOLE
- OR PROP GRATE INLET
- PROP SET
- PROP ℄ DITCH
- DRAINAGE AREA BOUNDARY
- XXXXX / XX.XX — DRAINAGE AREA ID / DRAINAGE AREA ACREAGE

NOTES:

1. SEE RUNOFF COMPUTATIONS SHEET FOR ALL DRAINAGE AREA CALCULATIONS.

0 50 100
SCALE IN FEET

STATE OF TEXAS
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99431
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FM 1314

DRAINAGE AREA MAP

STA 557+00 TO STA 569+00

SHEET 9 OF 11

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
CK: SF	6	SEE COVER SHEET		107
DRN: MS	STATE	DIST.	COUNTY	
APPVD: PB	TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.	
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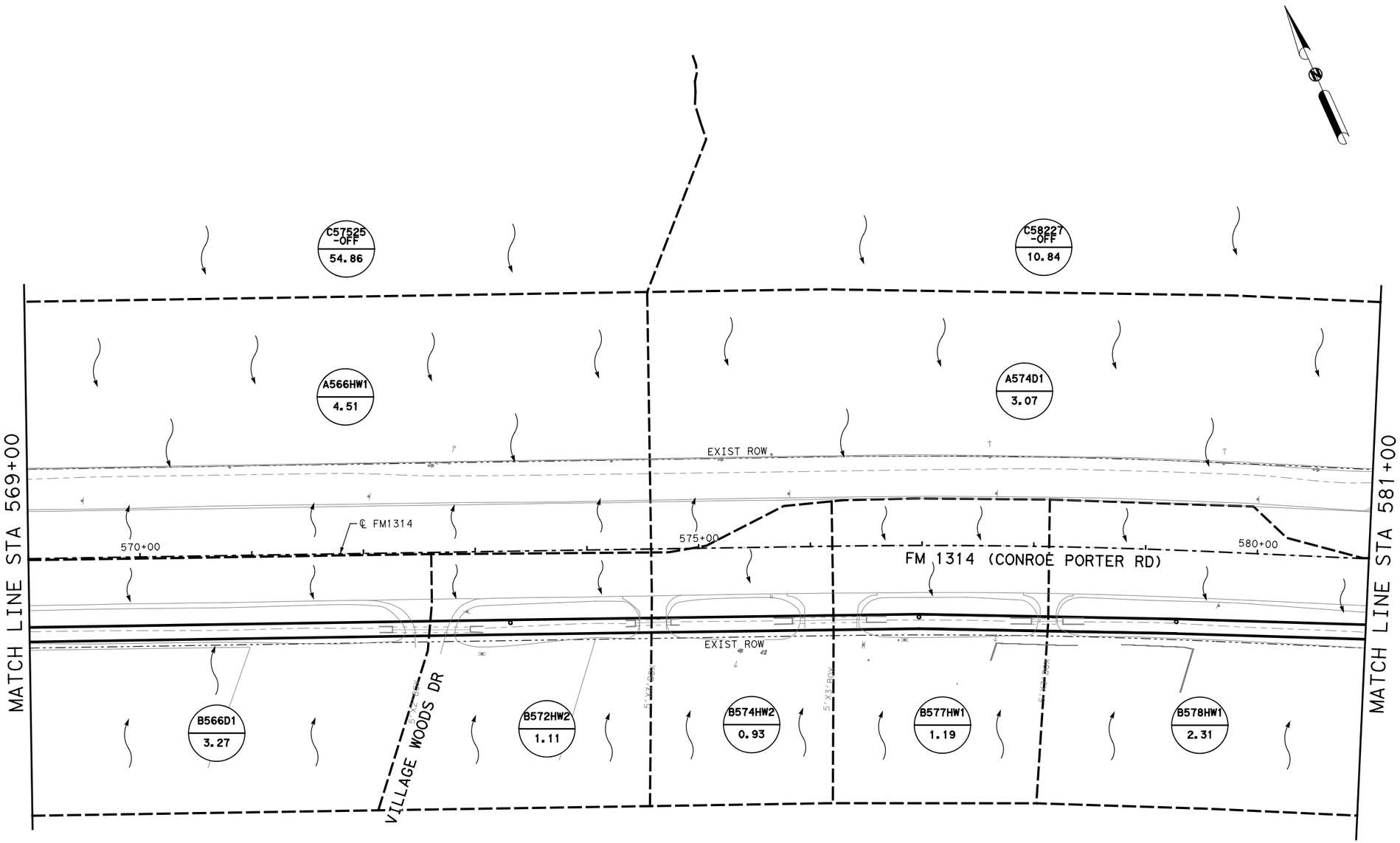

LEGEND

- DIRECTION OF FLOW
- OR PROP MANHOLE
- OR PROP GRATE INLET
- PROP SET
- PROP ℄ DITCH
- DRAINAGE AREA BOUNDARY
- XXXXX / XX.XX — DRAINAGE AREA ID / DRAINAGE AREA ACREAGE

NOTES:

1. SEE RUNOFF COMPUTATIONS SHEET FOR ALL DRAINAGE AREA CALCULATIONS.

0 50 100
SCALE IN FEET

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DRAINAGE AREA MAP

STA 569+00 TO STA 581+00

SHEET 10 OF 11

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.	SHEET NO.
CK: SF	6	SEE COVER SHEET	108
DRN: MS	STATE	DIST.	COUNTY
APPVD: PB	TEXAS	HOU	MONTGOMERY
CONT.	SECT.	JOB	HIGHWAY NO.
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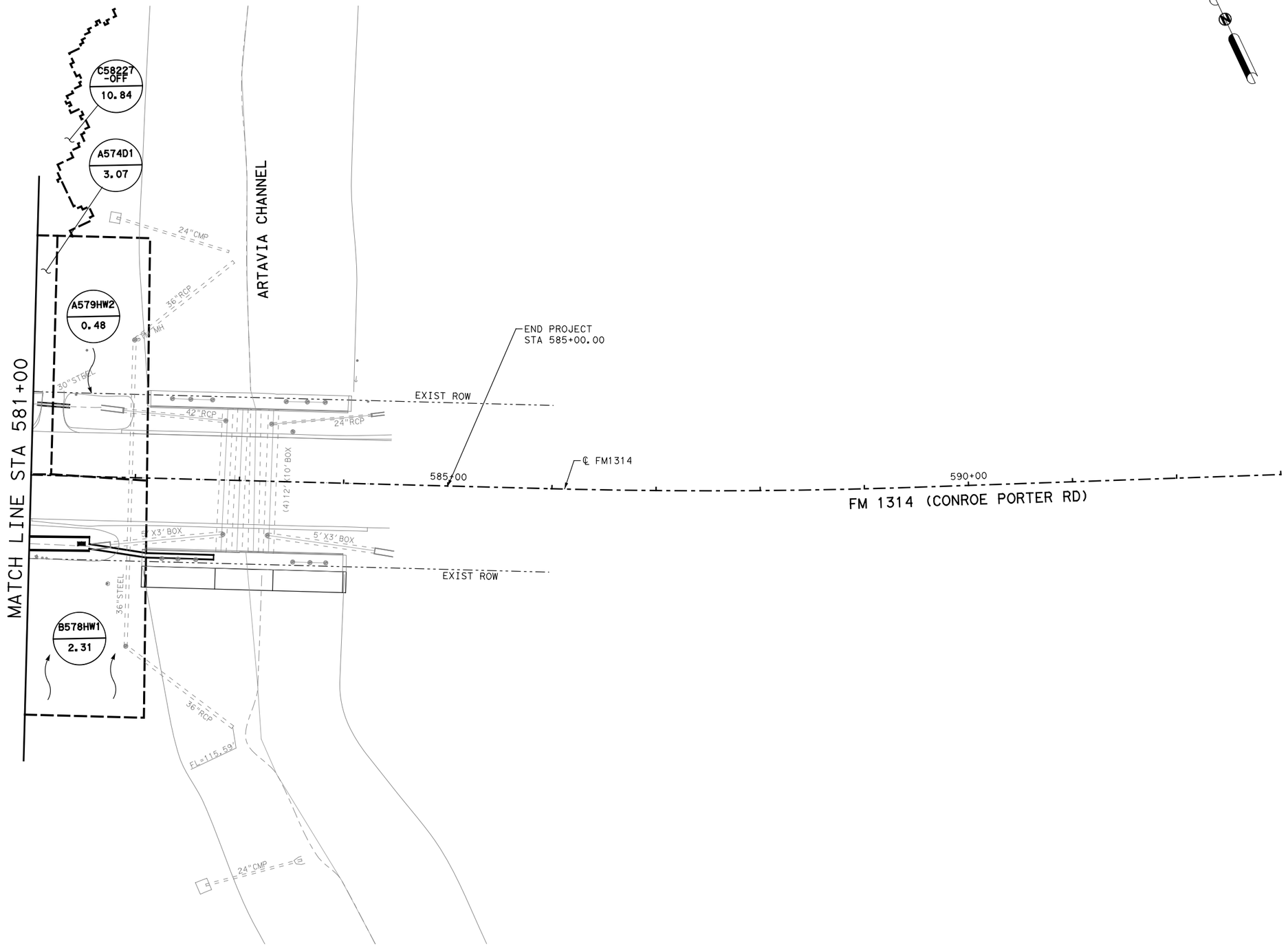

LEGEND

- DIRECTION OF FLOW
- OR PROP MANHOLE
- OR PROP GRATE INLET
- PROP SET
- PROP ℄ DITCH
- DRAINAGE AREA BOUNDARY
- XXXXX / XX.XX — DRAINAGE AREA ID / DRAINAGE AREA ACREAGE

NOTES:

1. SEE RUNOFF COMPUTATIONS SHEET FOR ALL DRAINAGE AREA CALCULATIONS.

0 50 100
SCALE IN FEET

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DRAINAGE AREA MAP

STA 581+00 TO END

SHEET 11 OF 11

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
CK: SF	6	SEE COVER SHEET		109
DRN: MS	STATE	DIST.	COUNTY	
APPVD: PB	TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.	
1986	01	064	FM 1314	

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GEOPAK 2013 Drainage (STORM DRAIN DESIGN)
Project Name: FM1314
Job Number: 21307-01
Project Description: Storm Sewer
Design Frequency: 2 Year
Measurement Unit: English
County: MONTGOMERY
Runoff Computations for Design Frequency

FM1314 SYS 1												
ID	Runoff Composite (C)	Runoff Pavement (C)	Runoff Grass (C)	Runoff Development strip (C)	Drainage Subarea Pavement (acres)	Drainage Subarea Grass (acres)	Drainage Subarea Development Strip (acres)	Drainage Area (acres)	Time of Conc. (min)	Time Used (min)	Intensity (in/hr)	Discharge (cfs)
A470D1	0.76	0.90	0.35	0.65	1.40	0.43	0.15	1.98	13.00	13.00	4.96	7.48
A471D1	0.70	0.90	0.35	0.65	1.12	0.60	0.22	1.94	15.00	15.00	4.68	6.32
A475D1	0.70	0.90	0.35	0.65	0.75	0.40	0.19	1.34	12.00	12.00	5.12	4.76
A477D1	0.70	0.90	0.35	0.65	0.75	0.40	0.16	1.31	12.00	12.00	5.12	4.65
A480D2	0.70	0.90	0.35	0.65	0.75	0.40	0.17	1.32	17.00	17.00	4.43	4.09
A484G1	0.68	0.90	0.35	0.65	0.05	0.04	0.00	0.09	4.00	10.00	5.47	0.32
A484G2	0.70	0.90	0.35	0.65	0.71	0.38	0.18	1.27	17.00	17.00	4.43	3.95
A485G2	0.69	0.90	0.35	0.65	0.11	0.09	0.00	0.19	5.00	10.00	5.47	0.71
A487G1	0.69	0.90	0.35	0.65	0.13	0.08	0.05	0.26	6.00	10.00	5.47	0.97
A487G2	0.55	0.90	0.35	0.65	0.02	0.03	0.00	0.05	2.00	10.00	5.47	0.16
A488G1	0.70	0.90	0.35	0.65	0.11	0.05	0.04	0.20	5.00	10.00	5.47	0.76
A488G2	0.54	0.90	0.35	0.65	0.02	0.03	0.00	0.05	2.00	10.00	5.47	0.15
A489G1	0.72	0.90	0.35	0.65	0.20	0.09	0.01	0.30	7.00	10.00	5.47	1.17
A492G1	0.85	0.90	0.35	0.65	0.35	0.01	0.06	0.42	8.00	10.00	5.47	1.96
A494G1	0.88	0.90	0.35	0.65	0.27	0.01	0.01	0.29	6.00	10.00	5.47	1.40
A494G2	0.50	0.90	0.35	0.65	0.01	0.03	0.00	0.04	2.00	10.00	5.47	0.12
A496G1	0.77	0.90	0.35	0.65	0.40	0.12	0.03	0.55	9.00	10.00	5.47	2.31
A498G1	0.78	0.90	0.35	0.65	0.28	0.08	0.00	0.36	6.00	10.00	5.47	1.53
A500G1	0.76	0.90	0.35	0.65	0.31	0.10	0.00	0.41	7.00	10.00	5.47	1.73
A503G1	0.77	0.90	0.35	0.65	0.30	0.08	0.06	0.44	8.00	10.00	5.47	1.85
A504G1	0.42	0.90	0.35	0.65	0.01	0.04	0.00	0.05	2.00	10.00	5.47	0.12
A504G2	0.42	0.90	0.35	0.65	0.01	0.04	0.00	0.05	2.00	10.00	5.47	0.11
A505G1	0.78	0.90	0.35	0.65	0.22	0.04	0.08	0.34	7.00	10.00	5.47	1.45
A507G1	0.79	0.90	0.35	0.65	0.60	0.13	0.06	0.79	11.00	11.00	5.29	3.28
A512G1	0.78	0.90	0.35	0.65	0.52	0.10	0.14	0.76	9.00	10.00	5.47	3.26
A517G1	0.77	0.90	0.35	0.65	0.53	0.12	0.13	0.78	11.00	11.00	5.29	3.18
A520G1	0.82	0.90	0.35	0.65	0.36	0.04	0.07	0.47	8.00	10.00	5.47	2.13
A523G1	0.83	0.90	0.35	0.65	0.43	0.03	0.09	0.55	9.00	10.00	5.47	2.52
A529G1	0.87	0.90	0.35	0.65	1.10	0.05	0.02	1.17	12.00	12.00	5.12	5.23
A530G1	0.82	0.90	0.35	0.65	0.62	0.05	0.16	0.83	8.00	10.00	5.47	3.72
A533G1	0.70	0.90	0.35	0.65	0.88	0.50	0.01	1.39	12.00	12.00	5.12	4.98
A534G1	0.70	0.90	0.35	0.65	0.45	0.23	0.14	0.82	13.00	13.00	4.96	2.85
A537G1	0.70	0.90	0.35	0.65	0.40	0.12	0.70	1.22	15.00	15.00	4.68	4.00
A539G1	0.76	0.90	0.35	0.65	0.62	0.08	0.52	1.22	7.00	10.00	5.47	5.07
A543G1	0.86	0.90	0.35	0.65	2.10	0.10	0.16	2.36	9.00	10.00	5.47	11.12
A549G1	0.70	0.90	0.35	0.65	2.00	1.03	0.76	3.79	16.00	16.00	4.55	12.05
B468D1	0.80	0.90	0.35	0.65	2.34	0.15	1.10	3.59	13.00	13.00	4.96	14.16
B471D1	0.70	0.90	0.35	0.65	0.53	0.12	1.30	1.95	15.00	15.00	4.68	6.36
B475D1	0.70	0.90	0.35	0.65	0.40	0.12	0.81	1.33	12.00	12.00	5.12	4.73
B477D1	0.70	0.90	0.35	0.65	0.40	0.12	0.80	1.32	12.00	12.00	5.12	4.70
B480D2	0.70	0.90	0.35	0.65	0.40	0.12	0.80	1.32	17.00	17.00	4.43	4.10
B484G1	0.70	0.90	0.35	0.65	0.02	0.02	0.00	0.04	2.00	10.00	5.47	0.17
B484G2	0.70	0.90	0.35	0.65	0.88	0.50	0.00	1.38	17.00	17.00	4.43	4.27
B486G1	0.49	0.90	0.35	0.65	0.10	0.30	0.01	0.41	6.00	10.00	5.47	1.10
B487G1	0.43	0.90	0.35	0.65	0.02	0.08	0.00	0.10	5.00	10.00	5.47	0.23
B487G2	0.43	0.90	0.35	0.65	0.01	0.09	0.02	0.12	5.00	10.00	5.47	0.28
B488G1	0.55	0.90	0.35	0.65	0.10	0.18	0.00	0.28	4.00	10.00	5.47	0.84
B490G1	0.52	0.90	0.35	0.65	0.15	0.33	0.00	0.48	6.00	10.00	5.47	1.36
B493G1	0.45	0.90	0.35	0.65	0.05	0.37	0.07	0.49	6.00	10.00	5.47	1.20
B495G1	0.74	0.90	0.35	0.65	0.15	0.05	0.07	0.27	3.00	10.00	5.47	1.11
B496G1	0.75	0.90	0.35	0.65	0.15	0.04	0.08	0.27	3.00	10.00	5.47	1.13
B498G1	0.73	0.90	0.35	0.65	0.27	0.11	0.02	0.40	4.00	10.00	5.47	1.61
B500G1	0.54	0.90	0.35	0.65	0.30	0.64	0.12	1.06	7.00	10.00	5.47	3.11
B503G1	0.72	0.90	0.35	0.65	0.20	0.09	0.08	0.37	5.00	10.00	5.47	1.48
B505G1	0.41	0.90	0.35	0.65	0.05	3.17	0.68	3.90	16.00	16.00	4.55	7.27
B509G1	0.41	0.90	0.35	0.65	0.08	2.38	0.44	2.90	13.00	13.00	4.96	5.89
B512G1	0.48	0.90	0.35	0.65	0.08	2.13	1.42	3.63	13.00	13.00	4.96	8.69
B517G1	0.43	0.90	0.35	0.65	0.08	1.95	0.54	2.57	12.00	12.00	5.12	5.71
B522G1	0.46	0.90	0.35	0.65	0.08	0.74	0.24	1.06	13.00	13.00	4.96	2.40
B528G1	0.70	0.90	0.35	0.65	1.00	0.55	0.12	1.67	14.00	14.00	4.82	5.62
B531G1	0.70	0.90	0.35	0.65	1.00	0.56	0.04	1.60	16.00	16.00	4.55	5.08
B536G1	0.70	0.90	0.35	0.65	1.50	0.77	0.63	2.90	19.00	19.00	4.20	8.53
B538G1	0.70	0.90	0.35	0.65	0.50	0.22	0.47	1.19	8.00	10.00	5.47	4.55
B543G1	0.70	0.90	0.35	0.65	0.80	0.33	0.88	2.01	14.00	14.00	4.82	6.77

FM1314 SYS 1												
ID	Runoff Composite (C)	Runoff Pavement (C)	Runoff Grass (C)	Runoff Development strip (C)	Drainage Subarea Pavement (acres)	Drainage Subarea Grass (acres)	Drainage Subarea Development Strip (acres)	Drainage Area (acres)	Time of Conc. (min)	Time Used (min)	Intensity (in/hr)	Discharge (cfs)
B544G1	0.70	0.90	0.35	0.65	0.38	0.18	0.21	0.77	11.00	11.00	5.29	2.85
B549G1	0.66	0.90	0.35	0.65	0.30	0.18	1.76	2.24	24.00	24.00	3.75	5.53
B551G1	0.70	0.90	0.35	0.65	0.30	0.12	0.37	0.79	14.00	14.00	4.82	2.66
B553G1	0.70	0.90	0.35	0.65	0.30	0.10	0.54	0.94	17.00	17.00	4.43	2.93
B555G1	0.70	0.90	0.35	0.65	0.30	0.15	0.20	0.65	16.00	16.00	4.55	2.08
B556G1	0.70	0.90	0.35	0.65	0.18	0.10	0.06	0.34	13.00	13.00	4.96	1.18
B559G1	0.70	0.90	0.35	0.65	0.35	0.04	1.14	1.53	18.00	18.00	4.31	4.62
B561G1	0.70	0.90	0.35	0.65	0.30	0.12	0.39	0.81	12.00	12.00	5.12	2.91
B562G1	0.70	0.90	0.35	0.65	0.23	0.13	0.03	0.39	11.00	11.00	5.29	1.44
B564G1	0.70	0.90	0.35	0.65	0.44	0.10	1.09	1.63	13.00	13.00	4.96	5.65
B538G1-OFF	0.45	0.90	0.35	0.65	0.10	1.73	0.65	2.48	16.00	16.00	4.55	5.07
B544G1-OFF	0.49	0.90	0.35	0.65	0.07	0.25	0.04	0.36	12.00	12.00	5.12	0.89
B549G1-OFF	0.38	0.90	0.35	0.65	0.08	3.80	0.26	4.14	27.00	27.00	3.52	5.54
B551G1-OFF	0.39	0.90	0.35	0.65	0.10	1.57	0.04	1.71	19.00	19.00	4.20	2.80
B553G1-OFF	0.37	0.90	0.35	0.65	0.05	2.12	0.05	2.22	20.00	20.00	4.10	3.37
B555G1-OFF	0.36	0.90	0.35	0.65	0.02	1.50	0.01	1.53	19.00	19.00	4.20	2.31
B556G1-OFF	0.36	0.90	0.35	0.65	0.01	0.78	0.01	0.80	17.00	17.00	4.43	1.28
B559G1-OFF	0.40	0.90	0.35	0.65	0.05	2.87	0.47	3.39	27.00	27.00	3.52	4.77
B561G1-OFF	0.39	0.90	0.35	0.65	0.05	1.14	0.08	1.27	17.00	17.00	4.43	2.18
B562G1-OFF	0.40	0.90	0.35	0.65	0.05	0.92	0.09	1.06	17.00	17.00	4.43	1.87
B564G1-OFF	0.43	0.90	0.35	0.65	0.05	2.16	0.69	2.90	26.00	26.00	3.59	4.48

NOTE 1:
PUMP STATION DISCHARGE OF 2 CFS IS ADDED TO DA B468D1 FOR DEWATERING OF PONDING AREAS WITHIN THE SH 242 INTERCHANGE.

NOTE 2:
SEE THE SWMM HYDRAULIC MODEL ASSOCIATED WITH THE WOOLPERT/CIVILTECH "DRAINAGE STUDY FOR FM 1314 ROADWAY IMPROVEMENTS (2024)".

STATE OF TEXAS
SHERVIN S. FARD
99431
LICENSED PROFESSIONAL ENGINEER
3/11/2024

OMEGA ENGINEERS, INC.
16360 PARK TEN PLACE, Ste. #325
HOUSTON TEXAS, 77084
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:281 647 9182 F:281 647 9184

Texas Department of Transportation

FM 1314

RUNOFF COMPUTATIONS

SHEET 1 OF 2

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
CK: SF	6	SEE COVER SHEET		110
DRN: MS	STATE	DIST.	COUNTY	
APPVD: PB	TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.	
1986	01	064	FM 1314	

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GEOPAK 2013 Drainage (STORM DRAIN DESIGN)
Project Name: FM1314
Job Number: 21307-01
Project Description: Storm Sewer
Design Frequency: 2 Year
Measurement Unit: English
County: MONTGOMERY
Runoff Computations for Design Frequency

FM1314 SYS 2														
ID	Runoff (C)	Runoff Pavement (C)	Runoff Grass (C)	Runoff Development strip (C)	Drainage Subarea Pavement (acres)	Drainage Subarea Grass (acres)	Drainage Subarea Development Strip (acres)	Drainage Area (acres)	Time of Conc. (min)	Time Used (min)	Intensity (in/hr)	Discharge (cfs)	Offsite Discharge (cfs)	
A579HW2	0.70	0.90	0.35	0.65	0.25	0.13	0.10	0.48	12.00	12.00	5.12	1.72	50.95	SEE NOTE 2 AND OVERALL DRAINAGE AREA MAP SHEET
A574D1	0.70	0.90	0.35	0.65	1.80	0.98	0.29	3.07	17.00	17.00	4.43	9.51		
A566HW1	0.70	0.90	0.35	0.65	1.92	0.85	1.74	4.51	18.00	18.00	4.31	13.62		
A563D1	0.70	0.90	0.35	0.65	0.75	0.40	0.24	1.39	13.00	13.00	4.96	4.85		
A550D1	0.70	0.90	0.35	0.65	5.00	2.78	0.58	8.36	23.00	23.00	3.83	22.40		

GEOPAK 2013 Drainage (STORM DRAIN DESIGN)
Project Name: FM1314
Job Number: 21307-01
Project Description: Storm Sewer
Design Frequency: 2 Year
Measurement Unit: English
County: MONTGOMERY
Runoff Computations for Design Frequency

FM1314 SYS 3												
ID	Runoff (C)	Runoff Pavement (C)	Runoff Grass (C)	Runoff Development strip (C)	Drainage Subarea Pavement (acres)	Drainage Subarea Grass (acres)	Drainage Subarea Development Strip (acres)	Drainage Area (acres)	Time of Conc. (min)	Time Used (min)	Intensity (in/hr)	Discharge (cfs)
B578HW1	0.70	0.90	0.35	0.65	1.20	0.62	0.49	2.31	17.00	17.00	4.43	7.16
B577HW1	0.70	0.90	0.35	0.65	0.65	0.35	0.19	1.19	11.00	11.00	5.29	4.39
B574HW2	0.74	0.90	0.35	0.65	0.54	0.18	0.21	0.93	9.00	10.00	5.47	3.76
B572HW2	0.70	0.90	0.35	0.65	0.63	0.35	0.13	1.11	12.00	12.00	5.12	3.98
B566D1	0.70	0.90	0.35	0.65	0.80	0.12	2.35	3.27	14.00	14.00	4.82	11.02

NOTE 1:
PUMP STATION DISCHARGE OF 2 CFS IS ADDED TO DA B468D1 FOR DEWATERING OF PONDING AREAS WITHIN THE SH 242 INTERCHANGE.

NOTE 2:
SEE THE SWMM HYDRAULIC MODEL ASSOCIATED WITH THE WOOLPERT/CIVILTECH "DRAINAGE STUDY FOR FM 1314 ROADWAY IMPROVEMENTS (2024)".

STATE OF TEXAS
SHERVIN S. FARD
99431
PROFESSIONAL LICENSED ENGINEER
P.E

3/6/2024

OMEGA ENGINEERS, INC.
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HOUSTON TEXAS, 77084
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
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Texas Department of Transportation

FM 1314

RUNOFF COMPUTATIONS

SHEET 2 OF 2

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.	SHEET NO.
CK: SF	6	SEE COVER SHEET	111
DRN: MS	STATE	DIST.	COUNTY
APPVD: PB	TEXAS	HOU	MONTGOMERY
CONT.	SECT.	JOB	HIGHWAY NO.
1986	01	064	FM 1314

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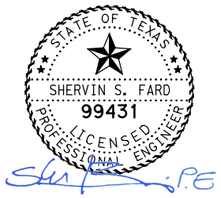
GEOPAK 2013 Drainage (STORM DRAIN DESIGN)
Project Name: FM1314
Job Number: 21307-01
Project Description: Storm Sewer
Design Frequency: 2 Year
Measurement Unit: English
County: MONTGOMERY
Conveyance Configuration Data

NOTE:
SEE THE SWMM HYDRAULIC MODEL ASSOCIATED WITH THE WOOLPERT/CIVILTECH "DRAINAGE STUDY FOR FM 1314 ROADWAY IMPROVEMENTS (2024)".

FM1314 SYS 1											
ID	Upstream ID	Downstream ID	Length (ft)	Shape	No.	Rise (ft)	Span (ft)	n	Slope %	Upstream Invert (ft)	Downstream Invert (ft)
B582BEND	B582BEND	SYSA-OUT	66.30	Box	1	4.00	4.00	0.013	0.13	116.32	116.24
B581MH1	B581MH1	B582BEND	55.67	Box	1	4.00	4.00	0.013	0.10	116.37	116.32
B579MH1	B579MH1	B581MH1	227.07	Box	1	6.00	12.00	0.013	0.10	116.61	116.38
B576MH1	B576MH1	B579MH1	230.22	Box	1	6.00	12.00	0.013	0.10	116.84	116.61
B573MH1	B573MH1	B576MH1	365.55	Box	1	6.00	12.00	0.013	0.10	117.20	116.84
B567MH1	B567MH1	B573MH1	570.49	Box	1	6.00	12.00	0.013	0.10	117.77	117.20
B565MH1	B565MH1	B567MH1	204.07	Box	2	3.00	6.00	0.013	0.25	118.28	117.77
B564G1	B564G1	B565MH1	142.97	Box	1	5.00	12.00	0.013	0.10	127.41	127.26
B562G1	B562G1	B564G1	182.50	Box	1	5.00	12.00	0.013	0.10	127.59	127.41
B561G1	B561G1	B562G1	83.49	Box	1	5.00	12.00	0.013	0.10	127.68	127.59
B559G1	B559G1	B561G1	184.59	Box	1	5.00	12.00	0.013	0.10	127.86	127.68
B556G1	B556G1	B559G1	349.28	Box	1	5.00	12.00	0.013	0.10	128.22	127.86
B555G1	B555G1	B556G1	86.50	Box	1	5.00	12.00	0.013	0.10	128.31	128.22
B553G1	B553G1	B555G1	148.18	Box	1	5.00	12.00	0.013	0.10	128.46	128.31
B551G1	B551G1	B553G1	209.86	Box	1	5.00	12.00	0.013	0.10	128.67	128.46
A549BEND-STUBIN	A549BEND-STUBIN	B551G1	168.67	Box	1	5.00	12.00	0.013	0.10	128.84	128.67
A549BEND	A549BEND	A549BEND-STUBIN	106.00	Box	1	3.00	5.00	0.013	1.96	132.06	129.84
B549G1-STUBIN	B549G1	A549BEND-STUBIN	19.76	Box	1	5.00	12.00	0.013	0.10	128.86	128.84
A549G1	A549G1	A549BEND	17.46	Box	1	3.00	5.00	0.013	0.10	132.08	132.06
B544G1	B544G1	B549G1	498.64	Box	1	5.00	12.00	0.013	0.10	129.36	128.86
A543G1	A543G1	A549G1	607.88	Box	1	3.00	5.00	0.013	0.10	132.69	132.08
B543G1	B543G1	B544G1	177.49	Box	1	5.00	12.00	0.013	0.10	129.54	129.36
A539G1	A539G1	A543G1	390.55	Box	1	3.00	5.00	0.013	0.10	133.09	132.69
B538G1	B538G1	B543G1	443.96	Box	1	5.00	12.00	0.013	0.10	129.99	129.54
A537G1	A537G1	A539G1	224.52	Box	1	3.00	5.00	0.013	0.10	133.31	133.09
B536MH1	B536G1	B538G1	221.36	Box	1	5.00	12.00	0.013	0.10	130.22	129.99
A534G1	A534G1	A537G1	272.59	Box	1	3.00	5.00	0.013	0.10	133.59	133.31
B531G1-STUBIN	B531G1	B536G1	461.30	Box	1	5.00	12.00	0.013	0.10	130.68	130.22
A533G1	A533G1	A534G1	163.05	Box	1	3.00	5.00	0.013	0.10	133.75	133.59
B528G1	B528G1	B531G1	317.92	Box	1	5.00	12.00	0.013	0.10	131.00	130.68
A530G1	A530G1	A533G1	257.52	Box	1	3.00	5.00	0.013	0.10	134.01	133.75
B525JB	B525JB	B528G1	345.71	Box	1	5.00	12.00	0.013	0.10	131.35	131.00
A529G1	A529G1	A530G1	156.22	Box	1	3.00	5.00	0.013	0.10	134.17	134.01
B522G1	B522G1	B525JB	249.16	Box	1	4.00	6.00	0.013	0.10	134.20	133.95
A524BEND	A524BEND	B525JB	110.01	Box	1	5.00	8.00	0.013	0.85	132.39	131.40
B517G1	B517G1	B522G1	504.65	Box	1	4.00	6.00	0.013	0.10	134.71	134.20
A523G1	A523G1	A524BEND	143.02	Box	1	4.00	6.00	0.013	0.10	133.13	132.98
B512G1	B512G1	B517G1	455.51	Box	1	4.00	6.00	0.013	0.10	135.17	134.71
A520G1	A520G1	A523G1	272.22	Box	1	4.00	6.00	0.013	0.10	133.41	133.13
B509MH1	B509G1	B512G1	332.97	Box	1	4.00	6.00	0.013	0.10	135.50	135.17
A517G1	A517G1	A520G1	364.33	Box	1	4.00	6.00	0.013	0.10	133.76	133.41
B505G1	B505G1	B509G1	354.75	Box	1	4.00	6.00	0.013	0.10	135.86	135.50
A512G1	A512G1	A517G1	404.96	Box	1	4.00	6.00	0.013	0.10	134.17	133.76
B503G1	B503G1	B505G1	255.69	Box	1	4.00	6.00	0.013	0.10	136.12	135.86
A507G1	A507G1	A512G1	496.12	Box	1	4.00	6.00	0.013	0.10	134.67	134.17
B500G1	B500G1	B503G1	247.66	Box	1	4.00	6.00	0.013	0.10	136.37	136.12
A505G1	A505G1	A507G1	188.30	Box	1	4.00	6.00	0.013	0.77	136.16	134.67
B498G1	B498G1	B500G1	229.52	Box	1	4.00	6.00	0.013	0.10	136.60	136.37
A504STUBIN2	A504STUBIN2	A505G1	111.22	Box	1	4.00	6.00	0.013	0.10	136.27	136.16
B496G1	B496G1	B498G1	165.52	Box	1	4.00	6.00	0.013	0.10	136.77	136.60
A504G2	A504G2	A504STUBIN2	11.06	Circular	1	2.00	n/a	0.012	1.00	137.27	137.15
A504STUBIN1	A504STUBIN1	A504STUBIN2	49.76	Box	1	4.00	6.00	0.013	0.10	136.32	136.27
B495G1	B495G1	B496G1	147.52	Box	1	4.00	6.00	0.013	0.10	136.92	136.77
A503G1	A503G1	A504STUBIN1	92.31	Box	1	4.00	6.00	0.013	0.10	136.41	136.32
A504G1	A504G1	A504STUBIN1	11.16	Circular	1	2.00	n/a	0.012	1.00	137.50	137.37
B493G1	B493G1	B495G1	197.52	Box	1	4.00	6.00	0.013	0.10	137.12	136.92
A500G1	A500G1	A503G1	246.08	Box	1	4.00	6.00	0.013	0.10	136.66	136.41
B490G1	B490G1	B493G1	248.93	Box	1	4.00	6.00	0.013	0.10	137.37	137.12
A498G1	A498G1	A500G1	206.21	Box	1	4.00	6.00	0.013	0.10	136.87	136.66
B488G1	B488G1	B490G1	198.80	Box	1	4.00	6.00	0.013	0.10	137.57	137.37
A496G1	A496G1	A498G1	237.52	Box	1	3.00	4.00	0.013	0.10	138.11	137.87
B487STUBIN1	B487STUBIN1	B488G1	95.37	Box	1	4.00	6.00	0.013	0.10	137.67	137.57
A494STUBIN2	A494STUBIN2	A496G1	143.76	Box	1	3.00	4.00	0.013	0.10	138.26	138.11
B487G1	B487G1	B487STUBIN1	23.92	Box	1	4.00	6.00	0.013	0.10	137.69	137.67
B487G2	B487G2	B487STUBIN1	13.96	Circular	1	2.00	n/a	0.012	1.00	138.78	138.63



3/6/2024

OMEGA ENGINEERS, INC.
16360 PARK TEN PLACE, Ste. #325
HOUSTON TEXAS, 77084
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:281 647 9182 F:281 647 9184

FM 1314

STORM SEWER COMPUTATIONS

SHEET 1 OF 4

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.	
CK: SF	6	SEE COVER SHEET		112	
DRN: MS	STATE	DIST.	COUNTY		
APPVD: PB	TEXAS	HOU	MONTGOMERY		
CONT.	SECT.	JOB	HIGHWAY NO.		
1986	01	064	FM 1314		

FM1314 SYS 1											
ID	Upstream ID	Downstream ID	Length (ft)	Shape	No.	Rise (ft)	Span (ft)	n	Slope %	Upstream Invert (ft)	Downstream Invert (ft)
A494G2	A494G2	A494STUBIN2	11.76	Circular	1	2.00	n/a	0.012	1.00	138.87	138.74
A494STUBIN1	A494STUBIN1	A494STUBIN2	59.67	Box	1	3.00	4.00	0.013	0.10	138.32	138.26
B486G1	B486G1	B487G1	127.34	Box	1	4.00	6.00	0.013	0.10	137.82	137.69
A492G1	A492G1	A494STUBIN1	193.62	Box	1	3.00	4.00	0.013	0.10	138.51	138.32
A494G1	A494G1	A494STUBIN1	8.59	Circular	1	2.00	n/a	0.012	1.00	138.90	138.80
B484G1	B484G1	B486G1	148.15	Box	1	4.00	6.00	0.013	0.09	137.96	137.82
A489G1	A489G1	A492G1	245.86	Box	1	3.00	4.00	0.013	0.10	138.76	138.51
B484G2	B484G2	B484G1	2.91	Box	1	4.00	6.00	0.013	0.10	137.96	137.96
A488G1	A488G1	A489G1	126.66	Box	1	3.00	4.00	0.013	0.10	138.89	138.76
A488STUBIN1	A488STUBIN1	A488G1	39.49	Box	1	3.00	4.00	0.013	0.10	138.93	138.89
A488G2	A488G2	A488STUBIN1	11.46	Circular	1	2.00	n/a	0.012	1.00	139.56	139.43
A487STUBIN1	A487STUBIN1	A488STUBIN1	36.75	Box	1	3.00	4.00	0.013	0.10	138.97	138.93
A487G1	A487G1	A487STUBIN1	60.35	Box	1	3.00	4.00	0.013	0.10	139.03	138.97
A487G2	A487G2	A487STUBIN1	11.46	Circular	1	2.00	n/a	0.012	1.00	139.63	139.51
A485G2	A485G2	A487G1	126.66	Box	1	3.00	4.00	0.013	0.10	139.16	139.03
B477HW1	B477HW1	B477HW2	20.00	Box	1	3.00	4.00	0.013	0.10	143.62	143.60
A484G1	A484G1	A485G2	96.62	Box	1	3.00	4.00	0.013	0.10	139.26	139.16
A484G2	A484G2	A484G1	2.92	Box	1	3.00	4.00	0.013	0.10	139.27	139.26
B469HW1	B469HW1	B470HW1	54.20	Circular	1	2.00	n/a	0.012	0.50	144.60	144.33
A471HW1	A471HW1	A471HW2	26.45	Circular	1	2.00	n/a	0.012	0.10	144.31	144.29

Design Frequency: 2 Year
Measurement Unit: English
County: MONTGOMERY
Conveyance Configuration Data

FM1314 SYS 2											
ID	Upstream ID	Downstream ID	Length (ft)	Shape	No.	Rise (ft)	Span (ft)	n	Slope %	Upstream Invert	Downstream Invert (ft)
A579HW1	A579HW1	A579HW2	30.53	Box	1	3.00	4.00	0.013	0.65	133.30	133.10
A565HW1	A565HW1	A566HW1	30.99	Box	1	2.00	4.00	0.013	0.32	133.80	133.70

Design Frequency: 2 Year
Measurement Unit: English
County: MONTGOMERY
Conveyance Configuration Data

FM1314 SYS 3											
ID	Upstream ID	Downstream ID	Length (ft)	Shape	No.	Rise (ft)	Span (ft)	n	Slope %	Upstream Invert	Downstream Invert (ft)
B577HW2	B577HW2	B578HW1	29.66	Box	1	3.00	5.00	0.013	0.34	132.50	132.40
B575HW1	B575HW1	B577HW1	67.61	Box	1	3.00	5.00	0.013	0.15	132.70	132.60
B574HW1	B574HW1	B574HW2	33.00	Box	1	3.00	5.00	0.013	0.58	132.99	132.80
B572HW1	B572HW1	B572HW2	70.00	Box	1	2.00	5.00	0.013	0.14	133.20	133.10

NOTE:
SEE THE SWMM HYDRAULIC MODEL ASSOCIATED WITH THE WOOLPERT/CIVILTECH "DRAINAGE STUDY FOR FM 1314 ROADWAY IMPROVEMENTS (2024)".

STATE OF TEXAS
SHERVIN S. FARD
99431
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PROFESSIONAL ENGINEER
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3/11/2024

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HOUSTON TEXAS, 77084
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:281 647 9182 F:281 647 9184

Texas Department of Transportation

FM 1314

STORM SEWER COMPUTATIONS

SHEET 2 OF 4

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.	SHEET NO.
CK: SF	6	SEE COVER SHEET	113
DRN: MS	STATE	DIST.	COUNTY
APPVD: PB	TEXAS	HOU	MONTGOMERY
CONT.	SECT.	JOB	HIGHWAY NO.
1986	01	064	FM 1314

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GEOPAK 2013 Drainage (STORM DRAIN DESIGN)
Project Name: FM1314
Job Number: 21307-01
Project Description: Storm Sewer
Design Frequency: 2 Year
Measurement Unit: English
County: MONTGOMERY
Conveyance Hydraulic Computations

NOTE:
SEE THE SWMM HYDRAULIC MODEL ASSOCIATED WITH THE WOOLPERT/CIVILTECH "DRAINAGE STUDY FOR FM 1314 ROADWAY IMPROVEMENTS (2024)".

FM1314 SYS 1												
ID	Upstream ID	Downstream ID	Upstream HGL (ft)	Downstream HGL (ft)	Discharge (cfs)	Capacity (cfs)	Slope %	Loss (ft)	Uniform		Actual	
									Velocity (ft/s)	Depth (ft)	Velocity (ft/s)	Depth (ft)
B582BEND	B582BEND	SYSA-OUT	See Note									
B581MH1	B581MH1	B582BEND	See Note									
B579MH1	B579MH1	B581MH1	120.56	120.05	356.48	535.06	0.10	0.05	6.67	4.46	8.09	3.67
B576MH1	B576MH1	B579MH1	120.95	120.56	356.48	534.79	0.10	0.05	6.67	4.46	7.51	3.95
B573MH1	B573MH1	B576MH1	121.46	120.95	356.48	533.70	0.10	0.04	6.67	4.46	7.22	4.12
B567MH1	B567MH1	B573MH1	122.18	121.46	356.48	533.11	0.10	0.08	6.67	4.46	6.98	4.26
B565MH1	B565MH1	B567MH1	123.91	122.18	356.48	265.90	0.25	0.20	10.00	3.00	9.90	3.00
B564G1	B564G1	B565MH1	131.11	130.28	356.48	416.95	0.10	0.07	6.86	4.33	9.85	3.02
B562G1	B562G1	B564G1	131.50	131.11	346.35	418.86	0.10	0.05	6.66	4.33	7.80	3.70
B561G1	B561G1	B562G1	131.68	131.50	343.04	417.94	0.10	0.06	6.60	4.33	7.31	3.91
B559G1	B559G1	B561G1	131.97	131.68	337.95	417.26	0.10	0.05	6.50	4.33	7.03	4.00
B556G1	B556G1	B559G1	132.34	131.97	328.56	418.11	0.10	0.04	6.81	4.02	6.67	4.10
B555G1	B555G1	B556G1	132.47	132.34	326.11	418.42	0.10	0.04	6.76	4.02	6.59	4.12
B553G1	B553G1	B555G1	132.66	132.47	321.71	418.52	0.10	0.04	6.67	4.02	6.44	4.16
B551G1	B551G1	B553G1	132.88	132.66	315.42	416.63	0.10	0.04	6.54	4.02	6.26	4.20
A549BEND-STUBIN	A549BEND-STUBIN	B551G1	134.12	132.88	309.96	417.52	0.10	1.10	6.42	4.02	6.13	4.22
A549BEND	A549BEND	A549BEND-STUBIN	134.85	130.87	61.75	291.49	1.96	1.11	12.63	0.98	12.04	1.03
B549G1-STUBIN	B549G1	A549BEND-STUBIN	134.15	134.12	248.21	417.90	0.10	0.01	6.08	3.40	4.14	5.00
A549G1	A549G1	A549BEND	134.93	134.85	61.75	65.69	0.10	0.06	4.44	2.78	4.43	2.79
B544G1	B544G1	B549G1	134.45	134.15	237.14	418.31	0.10	0.01	5.81	3.40	3.95	5.00
A543G1	A543G1	A549G1	135.29	134.93	44.70	65.96	0.10	0.04	4.01	2.23	3.14	2.85
B543G1	B543G1	B544G1	134.56	134.45	233.40	418.02	0.10	0.01	5.99	3.25	3.89	5.00
A539G1	A539G1	A543G1	135.45	135.29	33.58	65.84	0.10	0.02	3.62	1.86	2.58	2.60
B538G1	B538G1	B543G1	134.69	134.56	226.63	418.33	0.10	0.02	6.10	3.09	3.78	5.00
A537G1	A537G1	A539G1	135.54	135.45	28.51	65.91	0.10	0.01	3.61	1.58	2.41	2.37
B536MH1	B536G1	B538G1	134.77	134.69	217.01	418.61	0.10	0.02	5.85	3.09	3.84	4.70
A534G1	A534G1	A537G1	135.63	135.54	24.51	65.70	0.10	0.01	3.30	1.48	2.20	2.23
B531G1-STUBIN	B531G1	B536G1	134.91	134.77	208.48	418.01	0.10	0.02	5.62	3.09	3.81	4.56
A533G1	A533G1	A534G1	135.69	135.63	21.66	65.77	0.10	0.02	3.33	1.30	2.12	2.04
B528G1	B528G1	B531G1	135.03	134.91	203.40	417.12	0.10	0.02	5.77	2.94	4.00	4.23
A530G1	A530G1	A533G1	135.73	135.69	13.23	65.65	0.10	0.01	2.85	0.93	1.36	1.94
B525JB	B525JB	B528G1	136.16	135.03	197.78	417.00	0.10	1.01	5.61	2.94	4.09	4.03
A529G1	A529G1	A530G1	135.75	135.73	6.07	65.88	0.10	0.01	2.18	0.56	0.70	1.72
B522G1	B522G1	B525JB	136.80	136.16	83.76	122.36	0.10	0.04	4.70	2.97	6.31	2.21
A524BEND	A524BEND	B525JB	136.43	136.16	114.02	706.43	0.84	0.31	10.53	1.35	2.99	4.76
B517G1	B517G1	B522G1	137.50	136.80	81.37	122.99	0.10	0.04	4.57	2.97	5.23	2.59
A523G1	A523G1	A524BEND	136.65	136.43	114.02	122.93	0.10	0.03	5.12	3.71	5.52	3.44
B512G1	B512G1	B517G1	137.98	137.50	75.65	122.52	0.10	0.04	4.63	2.72	4.52	2.79
A520G1	A520G1	A523G1	136.99	136.65	110.67	122.61	0.10	0.03	4.97	3.71	5.24	3.52
B509MH1	B509G1	B512G1	138.25	137.98	66.95	122.77	0.10	0.03	4.51	2.47	3.96	2.81
A517G1	A517G1	A520G1	137.40	136.99	107.70	119.25	0.09	0.04	4.83	3.71	5.00	3.59
B505G1	B505G1	B509G1	138.50	138.25	61.04	122.80	0.10	0.03	4.33	2.35	3.70	2.75
A512G1	A512G1	A517G1	137.76	137.40	97.68	122.93	0.10	0.04	5.06	3.22	4.46	3.65
B503G1	B503G1	B505G1	138.65	138.50	53.75	122.39	0.10	0.01	4.26	2.10	3.39	2.64
A507G1	A507G1	A512G1	138.12	137.76	87.59	122.92	0.10	0.03	4.92	2.97	4.07	3.59
B500G1	B500G1	B503G1	138.80	138.65	52.27	122.88	0.10	0.01	4.14	2.10	3.43	2.54
A505G1	A505G1	A507G1	137.99	136.03	77.47	341.26	0.77	0.10	9.59	1.35	9.52	1.36
B498G1	B498G1	B500G1	138.93	138.80	49.16	122.67	0.10	0.00	4.14	1.98	3.37	2.43
A504STUBIN2	A504STUBIN2	A505G1	138.38	137.99	69.19	122.96	0.10	0.02	4.44	2.60	6.31	1.83
B496G1	B496G1	B498G1	139.03	138.93	47.54	122.67	0.10	0.00	4.00	1.98	3.39	2.33
A504G2	A504G2	A504STUBIN2	138.38	138.38	0.61	26.36	1.00	0.00	3.31	0.22	0.30	1.24
A504STUBIN1	A504STUBIN1	A504STUBIN2	138.50	138.38	68.58	122.96	0.10	0.02	4.62	2.47	5.41	2.11
B495G1	B495G1	B496G1	139.13	139.03	46.42	122.67	0.10	0.00	3.91	1.98	3.41	2.27
A503G1	A503G1	A504STUBIN1	138.71	138.50	67.97	122.96	0.10	0.05	4.58	2.47	5.19	2.18
A504G1	A504G1	A504STUBIN1	138.50	138.50	0.62	26.36	1.00	0.00	3.32	0.22	0.34	1.13
B493G1	B493G1	B495G1	139.26	139.13	45.31	122.97	0.10	0.01	4.07	1.86	3.42	2.21
A500G1	A500G1	A503G1	139.00	138.71	59.29	122.46	0.10	0.04	4.44	2.23	4.30	2.30
B490G1	B490G1	B493G1	139.44	139.26	44.11	122.57	0.10	0.01	3.96	1.86	3.43	2.14
A498G1	A498G1	A500G1	139.16	139.00	50.31	122.67	0.10	0.02	4.23	1.98	3.59	2.34
B488G1	B488G1	B490G1	139.59	139.44	42.75	122.58	0.10	0.01	3.84	1.86	3.44	2.07
A496G1	A496G1	A498G1	140.51	139.52	48.09	48.36	0.10	0.01	4.05	2.97	7.29	1.65
B487STUBIN1	B487STUBIN1	B488G1	139.66	139.59	41.91	122.75	0.10	0.01	4.03	1.73	3.47	2.02
A494STUBIN2	A494STUBIN2	A496G1	140.77	140.51	45.10	48.36	0.10	0.02	4.05	2.78	4.70	2.40
B487G1	B487G1	B487STUBIN1	139.69	139.66	41.84	122.48	0.10	0.01	4.02	1.73	3.50	1.99
B487G2	B487G2	B487STUBIN1	139.66	139.66	0.28	26.36	1.00	0.00	2.62	0.15	0.17	1.03

STATE OF TEXAS
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LICENSED PROFESSIONAL ENGINEER
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Texas Department of Transportation

FM 1314

STORM SEWER COMPUTATIONS

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
CK: SF	6	SEE COVER SHEET		114
DRN: MS	STATE	DIST.	COUNTY	
APPVD: PB	TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.	
1986	01	064	FM 1314	

FM1314 SYS 1												
ID	Upstream ID	Downstream ID	Upstream HGL (ft)	Downstream HGL (ft)	Discharge (cfs)	Capacity (cfs)	Slope %	Loss (ft)	Uniform		Actual	
									Velocity (ft/s)	Depth (ft)	Velocity (ft/s)	Depth (ft)
A494G2	A494G2	A494STUBIN2	140.77	140.77	0.81	26.36	1.00	0.00	3.58	0.25	0.26	2.00
A494STUBIN1	A494STUBIN1	A494STUBIN2	140.91	140.77	44.29	48.50	0.10	0.06	3.98	2.78	4.41	2.51
B486G1	B486G1	B487G1	139.79	139.69	41.61	122.75	0.10	0.01	4.00	1.73	3.48	2.00
A492G1	A492G1	A494STUBIN1	141.13	140.91	42.21	48.38	0.10	0.02	4.06	2.60	4.07	2.59
A494G1	A494G1	A494STUBIN1	140.91	140.91	2.08	26.32	1.00	0.01	4.75	0.39	0.66	2.00
B484G1	B484G1	B486G1	139.95	139.79	40.50	114.69	0.09	0.05	3.64	1.86	3.43	1.97
A489G1	A489G1	A492G1	141.38	141.13	39.56	48.33	0.10	0.02	3.81	2.60	3.77	2.62
B484G2	B484G2	B484G1	139.97	139.95	20.25	122.42	0.10	0.02	3.03	1.11	1.69	1.99
A488G1	A488G1	A489G1	141.50	141.38	37.70	48.34	0.10	0.02	3.91	2.41	3.60	2.62
A488STUBIN1	A488STUBIN1	A488G1	141.55	141.50	36.25	47.93	0.10	0.02	3.76	2.41	3.47	2.61
A488G2	A488G2	A488STUBIN1	141.56	141.55	0.83	26.36	1.00	0.00	3.61	0.25	0.27	2.00
A487STUBIN1	A487STUBIN1	A488STUBIN1	141.59	141.55	35.42	48.53	0.10	0.01	3.67	2.41	3.37	2.63
A487G1	A487G1	A487STUBIN1	141.65	141.59	34.76	48.52	0.10	0.01	3.90	2.23	3.31	2.63
A487G2	A487G2	A487STUBIN1	141.60	141.59	0.66	26.36	1.00	0.00	3.36	0.23	0.21	2.00
A485G2	A485G2	A487G1	141.74	141.65	33.29	48.34	0.10	0.01	3.74	2.23	3.17	2.62
B477HW1	B477HW1	B477HW2	143.65	143.65	27.25	48.36	0.10	0.00	3.10	1.20	1.40	2.70
A484G1	A484G1	A485G2	141.85	141.74	32.08	48.51	0.10	0.04	3.60	2.23	3.10	2.59
A484G2	A484G2	A484G1	141.86	141.85	16.04	48.35	0.10	0.01	3.09	1.30	1.55	2.59
B469HW1	B469HW1	B470HW1	144.72	144.34	16.16	18.61	0.49	0.00	2.20	0.50	0.60	2.44
A471HW1	A471HW1	A471HW2	145.57	145.52	7.48	8.34	0.10	0.00	2.10	0.41	0.42	2.16

NOTE:
SEE THE SWMM HYDRAULIC MODEL ASSOCIATED WITH THE WOOLPERT/CIVILTECH "DRAINAGE STUDY FOR FM 1314 ROADWAY IMPROVEMENTS (2024)".

GEOPAK 2013 Drainage (STORM DRAIN DESIGN)
Project Name: FM1314
Job Number: 21307-01
Project Description: Storm Sewer
Design Frequency: 2 Year
Measurement Unit: English
County: MONTGOMERY
Conveyance Hydraulic Computations

FM1314 SYS 2												
ID	Upstream ID	Downstream ID	Upstream HGL (ft)	Downstream HGL (ft)	Discharge (cfs)	Capacity (cfs)	Slope %	Loss (ft)	Uniform		Actual	
									Velocity (ft/s)	Depth (ft)	Velocity (ft/s)	Depth (ft)
A579HW1	A579HW1	A579HW2	136.10	135.41	87.74	123.76	0.65	0.34	9.65	2.27	9.49	2.31
A565HW1	A565HW1	A566HW1	137.19	136.84	50.82	51.24	0.32	0.19	6.42	1.98	6.35	2.00

GEOPAK 2013 Drainage (STORM DRAIN DESIGN)
Project Name: FM1314
Job Number: 21307-01
Project Description: Storm Sewer
Design Frequency: 2 Year
Measurement Unit: English
County: MONTGOMERY
Conveyance Hydraulic Computations

FM1314 SYS 3												
ID	Upstream ID	Downstream ID	Upstream HGL (ft)	Downstream HGL (ft)	Discharge (cfs)	Capacity (cfs)	Slope %	Loss (ft)	Uniform		Actual	
									Velocity (ft/s)	Depth (ft)	Velocity (ft/s)	Depth (ft)
B577HW2	B577HW2	B578HW1	133.64	133.60	15.62	120.82	0.34	0.03	4.49	0.70	2.60	1.20
B575HW1	B575HW1	B577HW1	133.89	133.84	13.25	80.03	0.15	0.02	3.17	0.84	2.13	1.24
B574HW1	B574HW1	B574HW2	134.01	133.99	11.36	157.90	0.58	0.02	4.72	0.48	1.90	1.19
B572HW1	B572HW1	B572HW2	134.23	134.19	11.02	45.71	0.14	0.02	2.97	0.74	2.03	1.09

STATE OF TEXAS
SHERVIN S. FARD
99431
LICENSED
PROFESSIONAL ENGINEER
P.E

3/6/2024

OMEGA ENGINEERS, INC.
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HOUSTON TEXAS, 77084
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
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Texas Department of Transportation

FM 1314

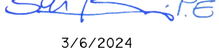
STORM SEWER COMPUTATIONS

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.	SHEET NO.
CK: SF	6	SEE COVER SHEET	115
DRN: MS	STATE	DIST.	COUNTY
APPVD: PB	TEXAS	HOU	MONTGOMERY
CONT.	SECT.	JOB	HIGHWAY NO.
1986	01	064	FM 1314

GEOPAK 2013 Drainage (STORM DRAIN DESIGN)
Project Name: FM1314
Job Number: 21307-01
Project Description: Storm Sewer
Design Frequency: 2 Year
Measurement Unit: English
County: MONTGOMERY
Sag Inlet Computation Data

NOTE:
SEE THE SWMM HYDRAULIC MODEL ASSOCIATED WITH THE WOOLPERT/CIVILTECH "DRAINAGE STUDY FOR FM 1314 ROADWAY IMPROVEMENTS (2024)".

FM1314 SYS 1																		
ID	Type	Discharge (cfs)	Discharge (cfs)		Ponded Width (ft)		Max Allow Pond Width (ft)	Slope %		Length (ft)	Width (ft)	Depr.	Area (ft)	Perim. (ft)	Capacity (cfs)	Allowable Ponded Depth (ft)	Ponded Depth (ft)	Transverse Slope (%)
			Left	Right	Left	Right		Left	Right									
B564G1	Grate	10.12	5.06	5.06	6.28	6.28	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	13.63	1.50	0.83	0.13
B562G1	Grate	3.31	1.66	1.66	4.13	4.13	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	13.63	1.50	0.36	0.13
B561G1	Grate	5.09	2.55	2.55	4.85	4.85	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	13.63	1.50	0.48	0.13
B559G1	Grate	9.39	4.70	4.70	6.10	6.10	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	13.63	1.50	0.72	0.13
B556G1	Grate	2.45	1.23	1.23	3.69	3.69	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	13.63	1.50	0.30	0.13
B555G1	Grate	4.40	2.20	2.20	4.59	4.59	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	13.63	1.50	0.44	0.13
B553G1	Grate	6.29	3.15	3.15	5.26	5.26	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	13.63	1.50	0.55	0.13
B551G1	Grate	5.46	2.73	2.73	4.98	4.98	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	13.63	1.50	0.50	0.13
B549G1	Grate	11.07	5.54	5.54	6.49	6.49	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	13.63	1.50	0.99	0.13
A549G1	Grate	17.05	8.53	8.53	7.64	7.64	12.00	0.20	0.20	4.96	2.48	n/a	8.28	9.92	27.25	1.50	0.82	0.13
B544G1	Grate	3.74	1.87	1.87	4.33	4.33	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	13.63	1.50	0.39	0.13
A543G1	Grate	11.12	5.56	5.56	6.51	6.51	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	13.63	1.50	1.00	0.13
B543G1	Grate	6.77	3.39	3.39	5.40	5.40	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	13.63	1.50	0.58	0.13
A539G1	Grate	5.07	2.54	2.54	4.85	4.85	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	13.63	1.50	0.48	0.13
B538G1	Grate	9.62	4.81	4.81	6.16	6.16	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	17.59	2.50	0.75	0.13
A537G1	Grate	4.00	2.00	2.00	4.44	4.44	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	13.63	1.50	0.41	0.13
B536G1	Grate	8.53	4.27	4.27	5.89	5.89	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	13.63	1.50	0.68	0.13
A534G1	Grate	2.85	1.43	1.43	3.90	3.90	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	13.63	1.50	0.33	0.13
B531G1	Grate	5.08	2.54	2.54	4.85	4.85	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	13.63	1.50	0.48	0.13
A533G1	Grate	8.43	4.22	4.22	5.86	5.86	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	13.63	1.50	0.67	0.13
B528G1	Grate	5.62	2.81	2.81	5.04	5.04	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	13.63	1.50	0.51	0.13
A530G1	Grate	7.16	3.58	3.58	5.52	5.52	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	13.63	1.50	0.60	0.13
A529G1	Grate	6.07	3.04	3.04	5.19	5.19	12.00	0.20	0.20	4.96	2.48	n/a	8.28	9.92	27.25	1.50	0.41	0.13
B522G1	Grate	2.40	1.20	1.20	3.07	3.07	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	11.13	1.00	0.29	0.13
B517G1	Grate	5.71	2.86	2.86	4.25	4.25	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	13.63	1.50	0.52	0.13
A523G1	Grate	3.35	1.68	1.68	3.48	3.48	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	13.63	1.50	0.36	0.13
B512G1	Grate	8.70	4.35	4.35	4.98	4.98	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	13.63	1.50	0.69	0.13
A520G1	Grate	2.97	1.49	1.49	3.33	3.33	12.00	0.20	0.20	4.96	2.48	n/a	8.28	9.92	27.25	1.50	0.26	0.13
B509G1	Grate	5.91	2.96	2.96	4.31	4.31	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	13.63	1.50	0.53	0.13
A517G1	Grate	10.02	5.01	5.01	3.40	3.40	12.00	0.20	0.20	4.96	2.48	n/a	8.28	9.92	27.25	1.50	0.58	0.13
B505G1	Grate	7.29	3.65	3.65	4.66	4.66	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	13.63	1.50	0.61	0.13
A512G1	Grate	10.09	5.05	5.05	5.26	5.26	12.00	0.20	0.20	4.96	2.48	n/a	8.28	9.92	27.25	1.50	0.58	0.13
B503G1	Grate	1.48	0.74	0.74	2.57	2.57	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	13.63	1.50	0.21	0.13
A507G1	Grate	10.12	5.06	5.06	5.27	5.27	12.00	0.20	0.20	4.96	2.48	n/a	8.28	9.92	31.47	2.00	0.58	0.13
B500G1	Grate	3.11	1.56	1.56	3.39	3.39	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	13.63	1.50	0.35	0.13
A505G1	Grate	8.28	4.14	4.14	4.88	4.88	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	13.63	1.50	0.66	0.13
B498G1	Grate	1.61	0.81	0.81	2.65	2.65	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	13.63	1.50	0.22	0.13
B496G1	Grate	1.13	0.57	0.57	2.32	2.32	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	13.63	1.50	0.18	0.13
A504G2	Grate	0.61	0.31	0.31	1.84	1.84	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	15.73	1.50	0.12	0.13
B495G1	Grate	1.11	0.56	0.56	2.30	2.30	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	13.63	1.50	0.17	0.13
A503G1	Grate	8.68	4.34	4.34	4.97	4.97	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	15.73	2.00	0.69	0.13
A504G1	Grate	0.62	0.31	0.31	1.85	1.85	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	15.73	1.50	0.12	0.13
B493G1	Grate	1.20	0.60	0.60	2.37	2.37	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	13.63	1.50	0.18	0.13
A500G1	Grate	8.98	4.49	4.49	5.04	5.04	12.00	0.20	0.20	4.96	2.48	n/a	8.28	9.92	27.25	1.50	0.53	0.13
B490G1	Grate	1.36	0.68	0.68	2.48	2.48	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	13.63	1.50	0.20	0.13
A498G1	Grate	2.22	1.11	1.11	2.98	2.98	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	13.63	1.50	0.28	0.13
B488G1	Grate	0.84	0.42	0.42	2.07	2.07	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	13.63	1.50	0.14	0.13
A496G1	Grate	2.99	1.50	1.50	3.34	3.34	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	13.63	2.00	0.34	0.13
B487G1	Grate	0.23	0.12	0.12	1.28	1.28	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	13.63	1.50	0.06	0.13
B487G2	Grate	0.28	0.14	0.14	1.38	1.38	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	15.73	1.50	0.07	0.13
A494G2	Grate	0.81	0.41	0.41	2.04	2.04	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	15.73	1.50	0.14	0.13
B486G1	Grate	1.11	0.56	0.56	2.30	2.30	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	13.63	1.50	0.17	0.13
A492G1	Grate	2.65	1.33	1.33	3.19	3.19	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	13.63	1.50	0.31	0.13
A494G1	Grate	2.08	1.04	1.04	2.91	2.91	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	15.73	1.50	0.26	0.13
B484G1	Grate	20.25	10.13	10.13	6.83	6.83	12.00	0.20	0.20	4.96	2.48	n/a	8.28	9.92	38.54	1.50	0.92	0.13
A489G1	Grate	1.86	0.93	0.93	2.79	2.79	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	13.63	1.50	0.25	0.13
B484G2	Grate	20.25	10.13	10.13	6.83	6.83	12.00	0.20	0.20	4.96	2.48	n/a	8.28	9.92	38.54	1.50	0.92	0.13
A488G1	Grate	1.45	0.73	0.73	2.54	2.54	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	13.63	1.50	0.21	0.13
A488G2	Grate	0.83	0.42	0.42	2.07	2.07	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	15.73	1.50	0.14	0.13
A487G1	Grate	1.47	0.74	0.74	2.56	2.56	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	13.63	1.50	0.21	0.13
A487G2	Grate	0.66	0.33	0.33	1.89	1.89	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	15.73	1.50	0.12	0.13
A485G2	Grate	1.21	0.61	0.61	2.37	2.37	12.00	0.20	0.20	2.48	2.48	n/a	4.14	9.92	13.63	1.50	0.18	0.13
A484G1	Grate	16.04	8.02	8.02	6.26	6.26	12.00	0.20	0.20	4.96	2.48	n/a	8.28	9.92	38.54	1.50	0.79	0.13
A484G2	Grate	16.04	8.02	8.02	6.26	6.26	12.00	0.20	0.20	4.96	2.48	n/a	8.28	9.92	38.54	1.50	0.79	0.13



3/6/2024

OMEGA ENGINEERS, INC.
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TX PE Firm Reg. No. F-2147
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FM 1314

INLET COMPUTATIONS

SHEET 1 OF 1

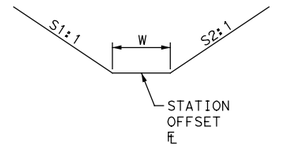
DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.	SHEET NO.
CK: SF	6	SEE COVER SHEET	116
DRN: MS	STATE	DIST.	COUNTY
APPVD: PB	TEXAS	HOU	MONTGOMERY
CONT.	SECT.	JOB	HIGHWAY NO.
1986	01	064	FM 1314

3/6/2024 4:01:18 PM
K:\Active Projects\21307-01 CTE 12-01DP5012\WA 8_FM 1314\04_Design\9_Sheets\FM1314_DRN_DATA06.dgn

FM1314 NB DITCHES SYS 1																	
STATION	OFFSET (FT)	FLOWLINE (FT)	S1:1	W (FT)	S2:1	AREA ID	GRADE (FT/FT)	GRADE (%)	DEPTH (FT)	FLOW AREA (SF)	WETTED PERIMETER (FT)	HYDRAULIC RADIUS (FT)	MANNING'S n-VALUE	VELOCITY (FT/S)	VELOCITY HEAD (FT)	DISCHARGE (CFS)	DITCH CAPACITY (CFS)
470+63.00	-57.00	144.36	3.00	0.00	3.00	A470D1	0.0010	0.10	3.00	27.00	18.97	1.42	0.013	4.59	0.33	6.82	123.82
471+41.00	-58.00	144.29	3.00	0.00	3.00	A471D1	0.0004	0.04	3.00	27.00	18.97	1.42	0.013	2.90	0.13	12.75	78.31
471+56.00	-58.00	144.28	3.00	0.00	3.00	A471D1	0.0004	0.04	3.00	27.00	18.97	1.42	0.013	2.90	0.13	12.75	78.31
475+11.00	-58.00	144.14	3.00	0.00	3.00	A475D1	0.0004	0.04	3.00	27.00	18.97	1.42	0.013	2.90	0.13	14.48	78.31
477+61.00	-56.00	144.04	3.00	0.00	3.00	A477D1	0.0010	0.10	3.00	27.00	18.97	1.42	0.013	4.59	0.33	16.54	123.82
480+02.00	-56.00	143.80	3.00	0.00	3.00	A480D2	0.0005	0.05	3.00	27.00	18.97	1.42	0.013	3.28	0.17	27.99	88.43
480+41.00	-56.00	143.78	3.00	0.00	3.00	A480D2	0.0005	0.05	3.00	27.00	18.97	1.42	0.013	3.24	0.16	27.99	87.56
484+00.00	-57.00	143.60	3.00	0.00	3.00	A484G2	0.0017	0.17	3.00	27.00	18.97	1.42	0.013	6.00	0.56	32.08	161.92
485+65.00	-57.00	146.95	3.00	0.00	3.00	A485G2	0.0440	4.40	1.50	6.75	9.49	0.71	0.030	8.30	1.07	0.40	56.04
486+31.00	-57.00	146.95	3.00	0.00	3.00	A485G2	0.0290	2.90	1.50	6.75	9.49	0.71	0.030	6.74	0.71	0.40	45.50
486+61.00	-57.00	147.15	3.00	0.00	3.00	A487G1	0.0109	1.09	1.50	6.75	9.49	0.71	0.030	4.13	0.27	0.49	27.89
487+44.00	-57.00	147.40	3.00	0.00	3.00	A487G1	0.0390	3.90	1.50	6.75	9.49	0.71	0.030	7.82	0.95	0.49	52.76
489+07.00	-57.00	147.91	3.00	0.00	3.00	A488G1	0.0270	2.70	1.50	6.75	9.49	0.71	0.030	6.50	0.66	0.73	43.90
489+49.00	-57.00	147.78	3.00	0.00	3.00	A489G1	0.0335	3.35	1.50	6.75	9.49	0.71	0.030	7.24	0.81	0.62	48.90
490+59.00	-57.00	147.34	3.00	0.00	3.00	A489G1	0.0140	1.40	1.50	6.75	9.49	0.71	0.030	4.68	0.34	0.62	31.61
491+21.00	-57.00	147.44	3.00	0.00	3.00	A492G1	0.0088	0.88	1.50	6.75	9.49	0.71	0.030	3.71	0.21	0.88	25.08
492+75.50	-57.00	146.91	3.00	0.00	3.00	A492G1	0.0152	1.52	1.50	6.75	9.49	0.71	0.030	4.87	0.37	0.88	32.91
495+25.00	-57.00	144.44	3.00	0.00	3.00	A496G1	0.0054	0.54	2.00	12.00	12.65	0.95	0.030	3.53	0.19	1.00	42.40
497+60.00	-57.00	144.98	3.00	0.00	3.00	A496G1	0.0098	0.98	2.00	12.00	12.65	0.95	0.030	4.75	0.35	1.00	57.05
497+99.00	-57.00	144.75	3.00	0.00	3.00	A498G1	0.0137	1.37	1.50	6.75	9.49	0.71	0.030	4.63	0.33	0.74	31.22
499+41.00	-57.00	143.84	3.00	0.00	3.00	A498G1	0.0035	0.35	1.50	6.75	9.49	0.71	0.030	2.34	0.09	0.74	15.81
500+20.00	-57.00	144.95	3.00	0.00	3.00	A500G1	0.0255	2.55	1.50	6.75	9.49	0.71	0.030	6.32	0.62	2.99	42.65
501+83.00	-57.00	144.00	3.00	0.00	3.00	A500G1	0.0094	0.94	1.50	6.75	9.49	0.71	0.030	3.83	0.23	2.99	25.83
502+31.00	-57.00	143.00	3.00	0.00	3.00	A503G1	0.0088	0.88	1.50	6.75	9.49	0.71	0.013	8.58	1.14	2.89	57.93
504+00.00	-57.00	142.52	3.00	0.00	3.00	A503G1	0.0083	0.83	1.50	6.75	9.49	0.71	0.013	8.34	1.08	2.89	56.30
505+16.00	-57.00	142.00	3.00	0.00	3.00	A505G1	0.0078	0.78	1.50	6.75	9.49	0.71	0.013	8.09	1.02	2.76	54.59
506+51.00	-57.00	141.80	3.00	0.00	3.00	A505G1	0.0083	0.83	1.50	6.75	9.49	0.71	0.013	8.34	1.08	2.76	56.30
506+77.00	-57.00	143.00	3.00	0.00	3.00	A507G1	0.0150	1.50	2.00	12.00	12.65	0.95	0.030	5.87	0.54	3.37	70.47
510+71.00	-57.00	141.50	3.00	0.00	3.00	A507G1	0.0007	0.07	2.00	12.00	12.65	0.95	0.030	1.28	0.03	3.37	15.33
511+11.00	-57.00	143.16	3.00	0.00	3.00	A512G1	0.0056	0.56	1.50	6.75	9.49	0.71	0.030	2.96	0.14	3.36	19.96
514+78.00	-57.00	143.22	3.00	0.00	3.00	A512G1	0.0057	0.57	1.50	6.75	9.49	0.71	0.030	2.99	0.14	3.36	20.15
515+50.00	-57.00	141.20	3.00	0.00	3.00	A517G1	0.0013	0.13	1.50	6.75	9.49	0.71	0.030	1.43	0.03	3.34	9.63
518+80.00	-57.00	141.20	3.00	0.00	3.00	A517G1	0.0011	0.11	1.50	6.75	9.49	0.71	0.030	1.31	0.03	3.34	8.86
519+60.00	-57.00	141.47	3.00	0.00	3.00	A520G1	0.0025	0.25	1.50	6.75	9.49	0.71	0.030	1.98	0.06	0.99	13.33
521+50.00	-57.00	141.54	3.00	0.00	3.00	A520G1	0.0043	0.43	1.50	6.75	9.49	0.71	0.030	2.60	0.10	0.99	17.52
522+30.00	-57.00	140.22	3.00	0.00	3.00	A523G1	0.0040	0.40	1.50	6.75	9.49	0.71	0.030	2.50	0.10	1.12	16.85
524+70.00	-57.00	140.75	3.00	0.00	3.00	A523G1	0.0085	0.85	1.50	6.75	9.49	0.71	0.030	3.64	0.21	1.12	24.57
525+20.00	-56.00	141.93	3.00	0.00	3.00	A529G1	0.0090	0.90	1.50	6.75	9.49	0.71	0.030	3.75	0.22	3.04	25.29
529+45.00	-59.00	141.66	3.00	0.00	3.00	A530G1	0.0120	1.20	1.50	6.75	9.49	0.71	0.030	4.34	0.29	1.86	29.27
530+98.00	-59.00	141.00	3.00	0.00	3.00	A533G1	0.0050	0.50	1.50	6.75	9.49	0.71	0.030	2.78	0.12	2.49	18.80
533+65.00	-60.00	141.00	3.00	0.00	3.00	A534G1	0.0135	1.35	1.50	6.75	9.49	0.71	0.030	4.60	0.33	1.43	31.08
535+25.00	-59.00	138.75	3.00	0.00	3.00	A537G1	0.0008	0.08	1.50	6.75	9.49	0.71	0.013	2.65	0.11	2.00	17.87
538+05.00	-60.00	139.59	3.00	0.00	3.00	A539G1	0.0023	0.23	1.50	6.75	9.49	0.71	0.030	1.90	0.06	2.54	12.84
540+36.00	-60.00	139.00	3.00	0.00	3.00	A543G1	0.0022	0.22	1.50	6.75	9.49	0.71	0.013	4.25	0.28	5.56	28.72
544+50.00	-62.00	139.00	3.00	0.00	3.00	A549G1	0.0016	0.16	1.50	6.75	9.49	0.71	0.030	1.60	0.04	6.03	10.79
547+60.00	-60.00	138.50	3.00	0.00	3.00	A549G1	0.0093	0.93	1.50	6.75	9.49	0.71	0.030	3.81	0.23	6.03	25.71

FM1314 NB DITCHES SYS 2																	
STATION	OFFSET (FT)	FLOWLINE (FT)	S1:1	W (FT)	S2:1	AREA ID	GRADE (FT/FT)	GRADE (%)	DEPTH (FT)	FLOW AREA (SF)	WETTED PERIMETER (FT)	HYDRAULIC RADIUS (FT)	MANNING'S n-VALUE	VELOCITY (FT/S)	VELOCITY HEAD (FT)	DISCHARGE (CFS)	DITCH CAPACITY (CFS)
550+30.00	-55.00	135.95	3.00	0.00	3.00	A550D1	0.0015	0.15	2.50	18.75	15.81	1.19	0.013	4.89	0.37	45.97	91.69
563+84.00	-62.00	134.00	3.00	0.00	3.00	A563D1	0.0016	0.16	3.00	27.00	18.97	1.42	0.013	5.75	0.51	50.82	155.15
566+24.00	-62.00	133.70	3.00	0.00	3.00	A566HW1	0.0002	0.02	4.00	48.00	25.30	1.90	0.013	2.72	0.12	74.75	130.65
574+62.00	-67.00	133.50	3.00	0.00	3.00	A574D1	0.0003	0.03	4.00	48.00	25.30	1.90	0.013	3.09	0.15	90.69	148.49
581+35.00	-67.00	133.10	3.00	0.00	3.00	A579HW2	0.0154	1.54	4.00	48.00	25.30	1.90	0.030	9.43	1.38	92.41	452.78

NOTE:
SEE THE SWMM HYDRAULIC MODEL ASSOCIATED WITH THE WOOLPERT/CIVILTECH "DRAINAGE STUDY FOR FM 1314 ROADWAY IMPROVEMENTS (2024)".



DITCH TYPICAL SECTION

3/6/2024

OMEGA ENGINEERS, INC.
16360 PARK TEN PLACE, Ste. #325
HOUSTON TEXAS, 77084
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:281 647 9182 F:281 647 9184

Texas Department of Transportation

FM 1314

NB DITCH TABLE

SHEET 1 OF 1

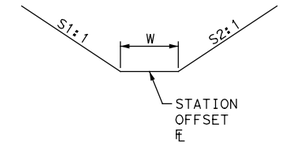
DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
CK: SF	6	SEE COVER SHEET		117
DRN: MS	STATE	DIST.	COUNTY	
APPVD: PB	TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.	
1986	01	064	FM 1314	

3/6/2024 4:01:19 PM
K:\Active Projects\21307-01 CTE 12-01DP5012\WA 8_FM 1314\04_Design\9_Sheets\FM1314_DRN_DATA07.dgn

FM1314 SB DITCHES SYS 1																	
STATION	OFFSET (FT)	FLOWLINE (FT)	S1:1	W (FT)	S2:1	AREA ID	GRADE (FT/FT)	GRADE (%)	DEPTH (FT)	FLOW AREA (SF)	WETTED PERIMETER (FT)	HYDRAULIC RADIUS (FT)	MANNING'S n-VALUE	VELOCITY (FT/S)	VELOCITY HEAD (FT)	DISCHARGE (CFS)	DITCH CAPACITY (CFS)
468+80.00	70.00	144.90	3.00	0.00	3.00	B468D1	0.0031	0.31	3.00	27.00	18.97	1.42	0.013	8.09	1.02	9.37	218.36
470+28.00	65.00	144.33	3.00	0.00	3.00	B468D1	0.0001	0.01	3.00	27.00	18.97	1.42	0.013	1.72	0.05	9.37	46.33
470+71.00	64.00	144.32	3.00	0.00	3.00	B468D1	0.0010	0.10	3.00	27.00	18.97	1.42	0.013	4.59	0.33	9.37	123.82
471+41.00	57.00	144.24	3.00	0.00	3.00	B471D1	0.0010	0.10	3.00	27.00	18.97	1.42	0.013	4.59	0.33	15.73	123.82
475+11.00	57.00	143.87	3.00	0.00	3.00	B475D1	0.0010	0.10	3.00	27.00	18.97	1.42	0.013	4.59	0.33	18.86	123.82
477+61.00	57.00	143.55	3.00	0.00	3.00	B477D1	0.0010	0.10	3.00	27.00	18.97	1.42	0.013	4.59	0.33	21.76	123.82
477+90.00	57.00	143.51	3.00	0.00	3.00	B477D1	0.0037	0.37	3.00	27.00	18.97	1.42	0.013	8.82	1.21	21.76	238.18
480+03.00	57.00	142.72	3.00	0.00	3.00	B480D2	0.0003	0.03	3.00	27.00	18.97	1.42	0.013	2.43	0.09	33.55	65.52
480+21.00	57.00	142.72	3.00	0.00	3.00	B480D2	0.0002	0.02	3.00	27.00	18.97	1.42	0.013	2.10	0.07	33.55	56.74
485+43.00	55.00	147.60	3.00	0.00	3.00	B486G1	0.0101	1.01	1.50	6.75	9.49	0.71	0.030	3.99	0.25	0.18	26.90
487+47.00	55.00	147.25	3.00	0.00	3.00	B486G1	0.0061	0.61	1.50	6.75	9.49	0.71	0.030	3.09	0.15	0.18	20.85
487+56.00	55.00	147.75	3.00	0.00	3.00	B487G1	0.0071	0.71	1.50	6.75	9.49	0.71	0.030	3.34	0.17	0.10	22.51
487+76.85	55.00	147.45	3.00	0.00	3.00	B487G1	0.0145	1.45	1.50	6.75	9.49	0.71	0.030	4.77	0.35	0.10	32.17
488+61.07	55.00	147.50	3.00	0.00	3.00	B488G1	0.0149	1.49	1.50	6.75	9.49	0.71	0.030	4.83	0.36	0.14	32.61
489+37.00	55.00	147.95	3.00	0.00	3.00	B488G1	0.0194	1.94	1.50	6.75	9.49	0.71	0.030	5.52	0.47	0.14	37.25
489+72.00	55.00	147.11	3.00	0.00	3.00	B490G1	0.0071	0.71	1.50	6.75	9.49	0.71	0.030	3.34	0.17	0.22	22.51
491+94.00	55.00	147.20	3.00	0.00	3.00	B490G1	0.0091	0.91	1.50	6.75	9.49	0.71	0.030	3.77	0.22	0.22	25.44
492+36.00	55.00	147.10	3.00	0.00	3.00	B493G1	0.0104	1.04	1.50	6.75	9.49	0.71	0.030	4.04	0.25	0.35	27.28
494+27.00	55.00	146.25	3.00	0.00	3.00	B493G1	0.0029	0.29	1.50	6.75	9.49	0.71	0.030	2.14	0.07	0.35	14.41
495+18.03	55.00	145.75	3.00	0.00	3.00	B495G1	0.0457	4.57	1.50	6.75	9.49	0.71	0.030	8.46	1.11	0.37	57.13
495+78.00	55.00	145.85	3.00	0.00	3.00	B495G1	0.0311	3.11	1.50	6.75	9.49	0.71	0.030	6.98	0.76	0.37	47.10
496+31.00	55.00	145.83	3.00	0.00	3.00	B496G1	0.0205	2.05	1.50	6.75	9.49	0.71	0.030	5.67	0.50	0.38	38.25
497+25.00	55.00	145.27	3.00	0.00	3.00	B496G1	0.0197	1.97	1.50	6.75	9.49	0.71	0.030	5.56	0.48	0.38	37.51
497+89.00	55.00	143.50	3.00	0.00	3.00	B498G1	0.0046	0.46	1.50	6.75	9.49	0.71	0.013	6.17	0.59	0.54	41.68
499+42.00	55.00	143.50	3.00	0.00	3.00	B498G1	0.0039	0.39	1.50	6.75	9.49	0.71	0.013	5.67	0.50	0.54	38.30
500+20.00	55.00	143.20	3.00	0.00	3.00	B500G1	0.0098	0.98	1.50	6.75	9.49	0.71	0.013	9.04	1.27	1.04	61.03
502+31.00	55.00	143.60	3.00	0.00	3.00	B500G1	0.0079	0.79	1.50	6.75	9.49	0.71	0.013	8.10	1.02	1.04	54.66
503+03.00	55.00	144.50	3.00	0.00	3.00	B503G1	0.0340	3.40	2.00	12.00	12.65	0.95	0.030	8.84	1.21	0.49	106.10
504+14.00	55.00	143.50	3.00	0.00	3.00	B503G1	0.0041	0.41	2.00	12.00	12.65	0.95	0.030	3.07	0.15	0.49	36.80
505+02.00	55.00	142.50	3.00	0.00	3.00	B505G1	0.0100	1.00	1.50	6.75	9.49	0.71	0.013	9.13	1.30	2.43	61.65
508+25.00	55.00	142.00	3.00	0.00	3.00	B505G1	0.0022	0.22	1.50	6.75	9.49	0.71	0.013	4.27	0.28	2.43	28.85
508+50.00	55.00	143.43	3.00	0.00	3.00	B509G1	0.0149	1.49	1.50	6.75	9.49	0.71	0.030	4.83	0.36	1.97	32.60
510+76.00	55.00	142.12	3.00	0.00	3.00	B509G1	0.0020	0.20	1.50	6.75	9.49	0.71	0.030	1.76	0.05	1.97	11.89
511+11.00	55.00	141.75	3.00	0.00	3.00	B512G1	0.0020	0.20	1.50	6.75	9.49	0.71	0.030	1.75	0.05	2.90	11.80
514+81.00	55.00	142.30	3.00	0.00	3.00	B512G1	0.0048	0.48	1.50	6.75	9.49	0.71	0.030	2.73	0.12	2.90	18.43
515+60.00	60.00	142.25	3.00	0.00	3.00	B517G1	0.0045	0.45	1.50	6.75	9.49	0.71	0.030	2.65	0.11	1.78	17.86
519+20.00	60.00	142.50	3.00	0.00	3.00	B517G1	0.0064	0.64	1.50	6.75	9.49	0.71	0.030	3.16	0.16	1.78	21.36
520+20.00	60.00	141.40	3.00	0.00	3.00	B522G1	0.0060	0.60	1.00	3.00	6.32	0.47	0.030	2.34	0.08	0.41	7.01
524+10.00	60.00	140.20	3.00	0.00	3.00	B522G1	0.0012	0.12	1.00	3.00	6.32	0.47	0.030	1.06	0.02	0.41	3.18
525+20.00	63.00	140.30	3.00	0.00	3.00	B528G1	0.0009	0.09	1.50	6.75	9.49	0.71	0.030	1.19	0.02	2.81	8.06
528+96.00	63.00	139.50	3.00	0.00	3.00	B531G1	0.0013	0.13	1.50	6.75	9.49	0.71	0.030	1.40	0.03	2.54	9.48
532+35.00	63.00	139.30	3.00	0.00	3.00	B536G1	0.0041	0.41	1.50	6.75	9.49	0.71	0.030	2.52	0.10	4.27	17.02
537+28.00	67.00	139.15	3.00	0.00	3.00	B538G1	0.0032	0.32	2.50	18.75	15.81	1.19	0.030	3.12	0.15	4.81	58.56
540+00.00	58.00	140.40	3.00	0.00	3.00	B543G1	0.0048	0.48	1.50	6.75	9.49	0.71	0.030	2.74	0.12	3.38	18.47
543+65.00	60.00	140.00	3.00	0.00	3.00	B544G1	0.0100	1.00	1.50	6.75	9.49	0.71	0.030	3.96	0.24	1.87	26.72
545+51.00	60.00	138.50	3.00	0.00	3.00	B549G1	0.0038	0.38	1.50	6.75	9.49	0.71	0.030	2.42	0.09	5.98	16.36
550+53.00	60.00	137.75	3.00	0.00	3.00	B551G1	0.0031	0.31	1.50	6.75	9.49	0.71	0.030	2.20	0.08	2.73	14.85
552+30.00	62.00	138.30	3.00	0.00	3.00	B553G1	0.0150	1.50	1.50	6.75	9.49	0.71	0.030	4.85	0.36	3.15	32.72
554+35.00	62.00	139.30	3.00	0.00	3.00	B555G1	0.0100	1.00	1.50	6.75	9.49	0.71	0.030	3.96	0.24	2.19	26.72
555+79.00	64.00	137.80	3.00	0.00	3.00	B556G1	0.0195	1.95	1.50	6.75	9.49	0.71	0.030	5.52	0.47	1.23	37.29
556+70.00	60.00	135.80	3.00	0.00	3.00	B559G1	0.0017	0.17	1.50	6.75	9.49	0.71	0.030	1.64	0.04	4.69	11.05
560+10.00	60.00	135.20	3.00	0.00	3.00	B561G1	0.0018	0.18	1.50	6.75	9.49	0.71	0.030	1.69	0.04	2.55	11.43
561+99.00	63.00	135.00	3.00	0.00	3.00	B562G1	0.0159	1.59	1.50	6.75	9.49	0.71	0.030	4.99	0.39	1.66	33.69
562+94.00	60.00	135.00	3.00	0.00	3.00	B564G1	0.0108	1.08	1.50	6.75	9.49	0.71	0.013	9.49	1.40	3.37	64.07
565+45.00	60.00	134.25	3.00	0.00	3.00	B564G1	0.0041	0.41	1.50	6.75	9.49	0.71	0.013	5.87	0.54	3.37	39.62

FM1314 SB DITCHES SYS 3																	
STATION	OFFSET (FT)	FLOWLINE (FT)	S1:1	W (FT)	S2:1	AREA ID	GRADE (FT/FT)	GRADE (%)	DEPTH (FT)	FLOW AREA (SF)	WETTED PERIMETER (FT)	HYDRAULIC RADIUS (FT)	MANNING'S n-VALUE	VELOCITY (FT/S)	VELOCITY HEAD (FT)	DISCHARGE (CFS)	DITCH CAPACITY (CFS)
566+73.00	70.00	133.40	4.00	4.00	4.00	B566D1	0.0004	0.04	3.00	48.00	28.74	1.67	0.030	1.33	0.03	11.02	63.69
572+95.00	70.00	133.10	4.00	4.00	4.00	B572HW2	0.0008	0.08	3.00	48.00	28.74	1.67	0.030	1.92	0.06	15.00	91.92
574+75.00	66.00	132.80	4.00	4.00	4.00	B574HW2	0.0009	0.09	3.00	48.00	28.74	1.67	0.030	2.13	0.07	18.76	102.36
576+50.00	66.00	132.60	4.00	4.00	4.00	B577HW1	0.0007	0.07	3.00	48.00	28.74	1.67	0.030	1.82	0.05	23.16	87.53
578+28.00	66.00	132.40	4.00	4.00	4.00	B578HW1	0.0022	0.22	3.00	48.00	28.74	1.67	0.030	3.25	0.16	30.31	156.00

NOTE:
SEE THE SWMM HYDRAULIC MODEL ASSOCIATED WITH THE WOOLPERT/CIVILTECH "DRAINAGE STUDY FOR FM 1314 ROADWAY IMPROVEMENTS (2024)".



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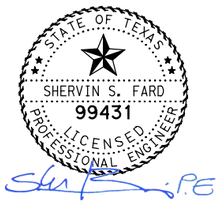

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Texas Department of Transportation

FM 1314

SB DITCH TABLE

SHEET 1 OF 1

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
CK: SF	6	SEE COVER SHEET		118
DRN: MS	STATE	DIST.	COUNTY	
APPVD: PB	TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.	
1986	01	064	FM 1314	

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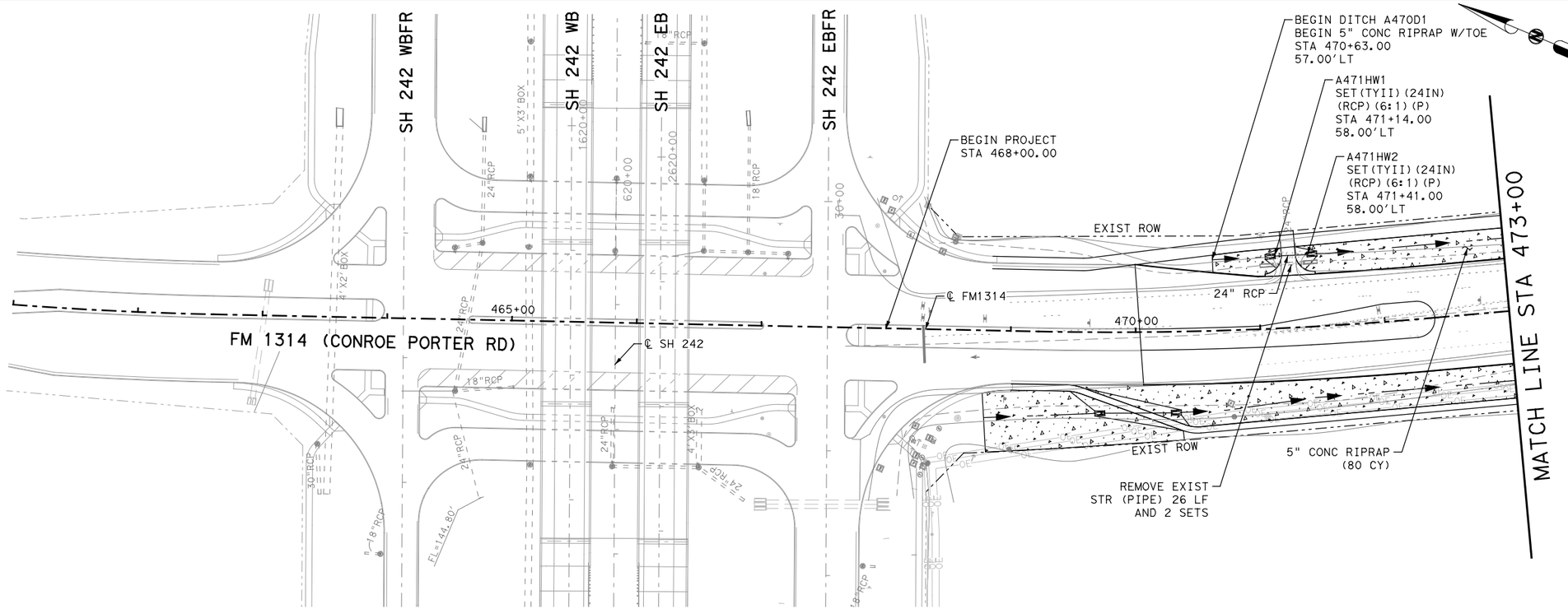

LEGEND

- OR ○ PROP MANHOLE
- ■ OR □ PROP GRATE INLET
- PROP SET
- PROP ℄ DITCH
- EXISTING STORM SEWER
- PROP STORM SEWER
- CONCRETE RIPRAP

NOTES:

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0 50 100 (H)
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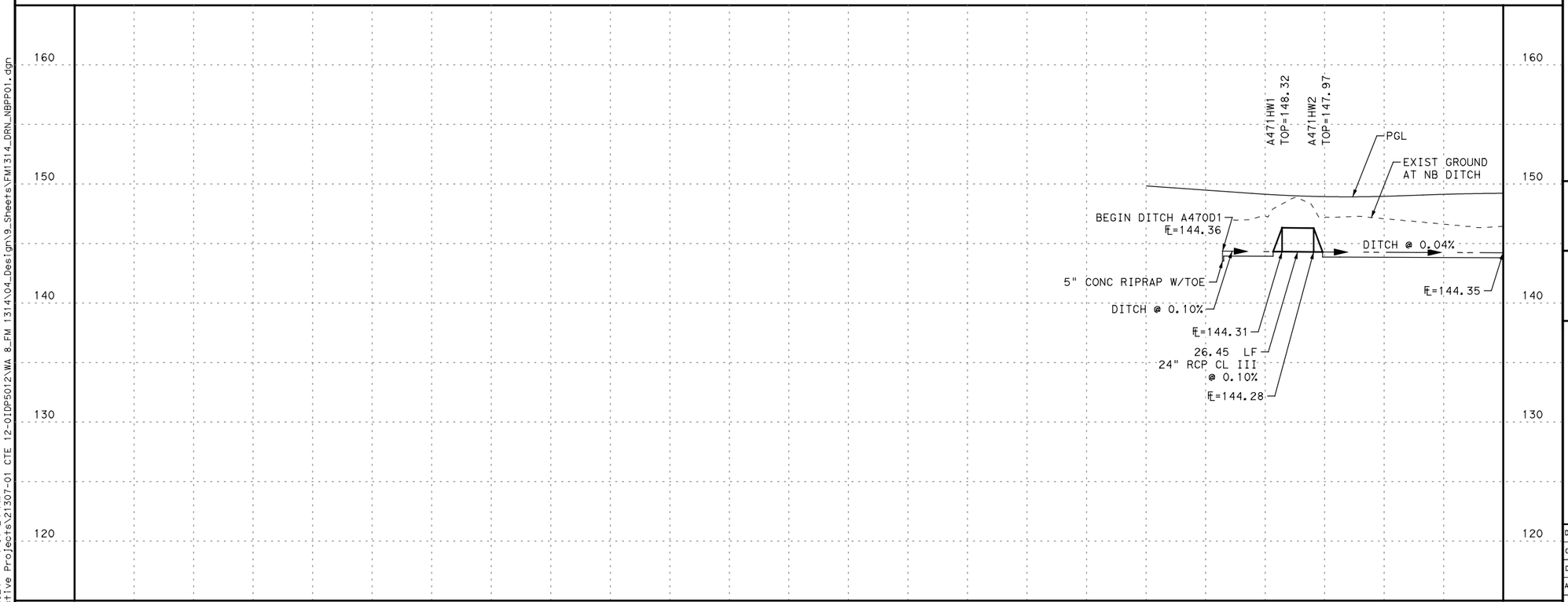
SCALE IN FEET



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Texas Department of Transportation

FM 1314

NB DRAINAGE PLAN & PROFILE

BEGIN TO STA 473+00

SHEET 1 OF 11

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
CK: SF	6	SEE COVER SHEET		119
DRN: MS	STATE	DIST.	COUNTY	
APPVD: PB	TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.	
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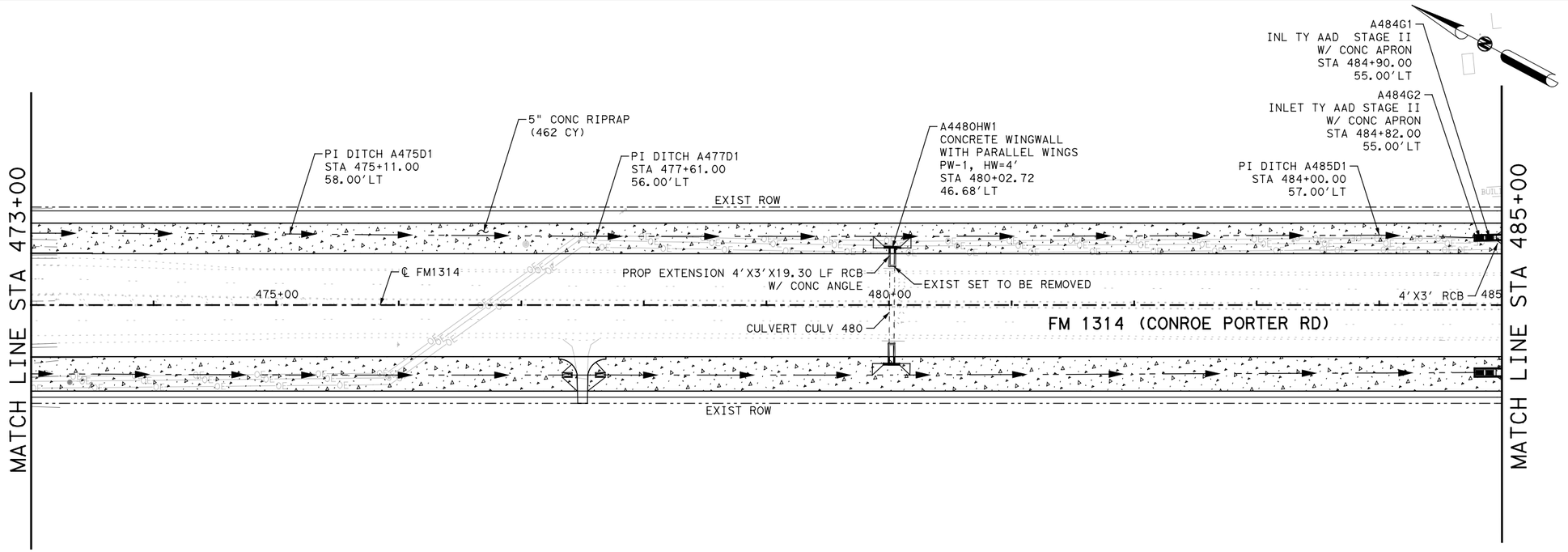

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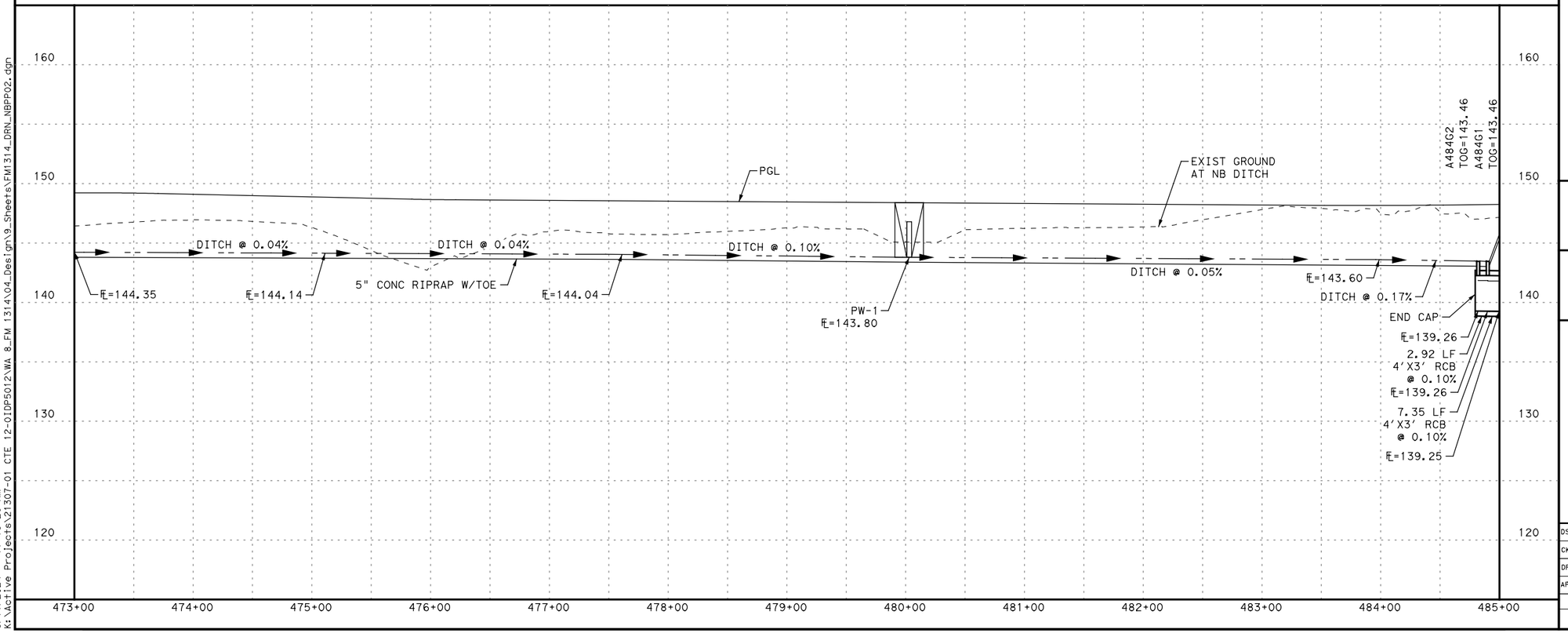

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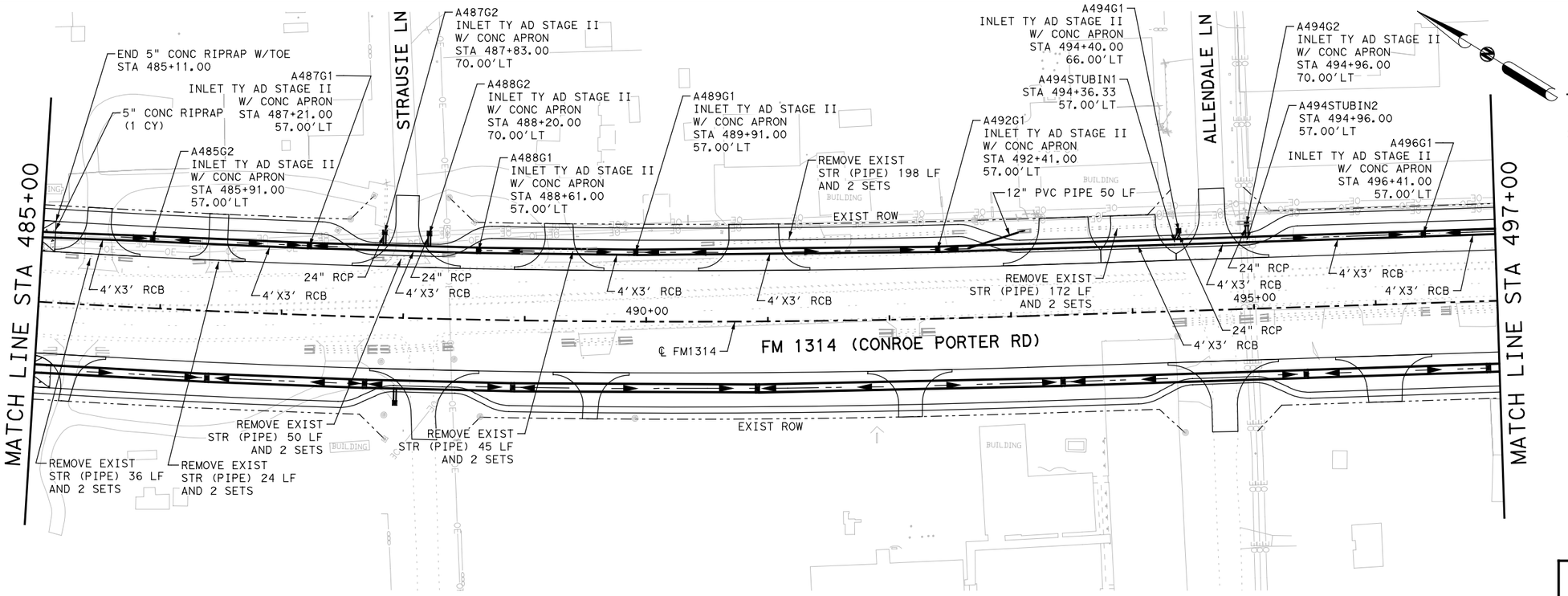
FM 1314

NB DRAINAGE PLAN & PROFILE

STA 473+00 TO STA 485+00

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
CK: SF	6	SEE COVER SHEET		120
DRN: MS	STATE	DIST.	COUNTY	
APPVD: PB	TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.	
1986	01	064	FM 1314	



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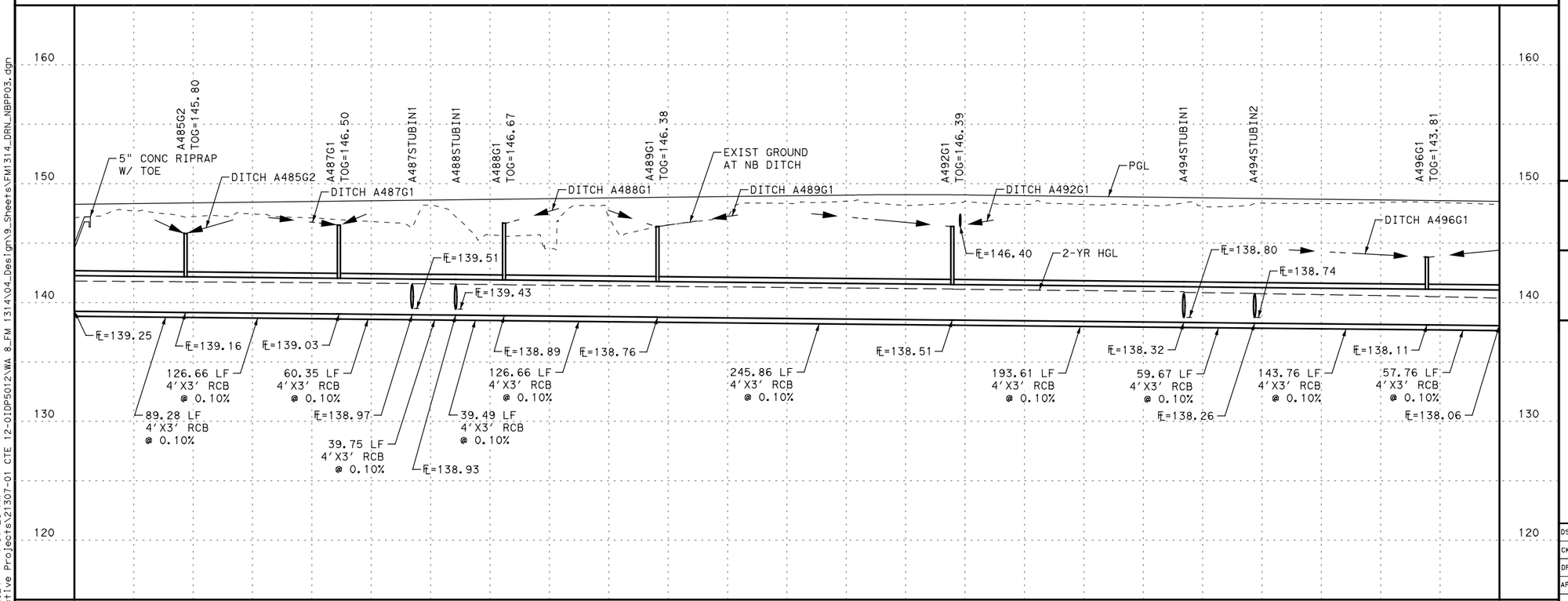

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FM 1314

NB DRAINAGE PLAN & PROFILE

STA 485+00 TO STA 497+00

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
CK: SF	6	SEE COVER SHEET		121
DRN: MS	STATE	DIST.	COUNTY	
APPVD: PB	TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.	
1986	01	064	FM 1314	

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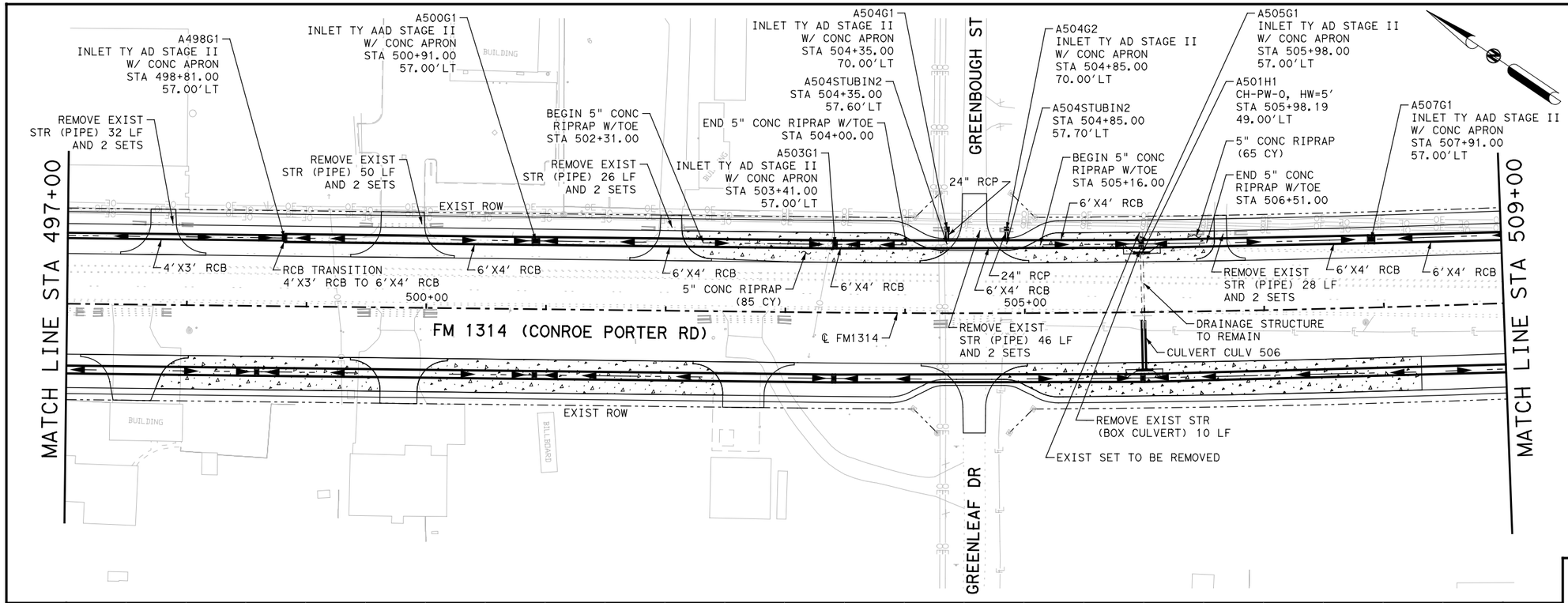

LEGEND

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- PROP ℄ DITCH
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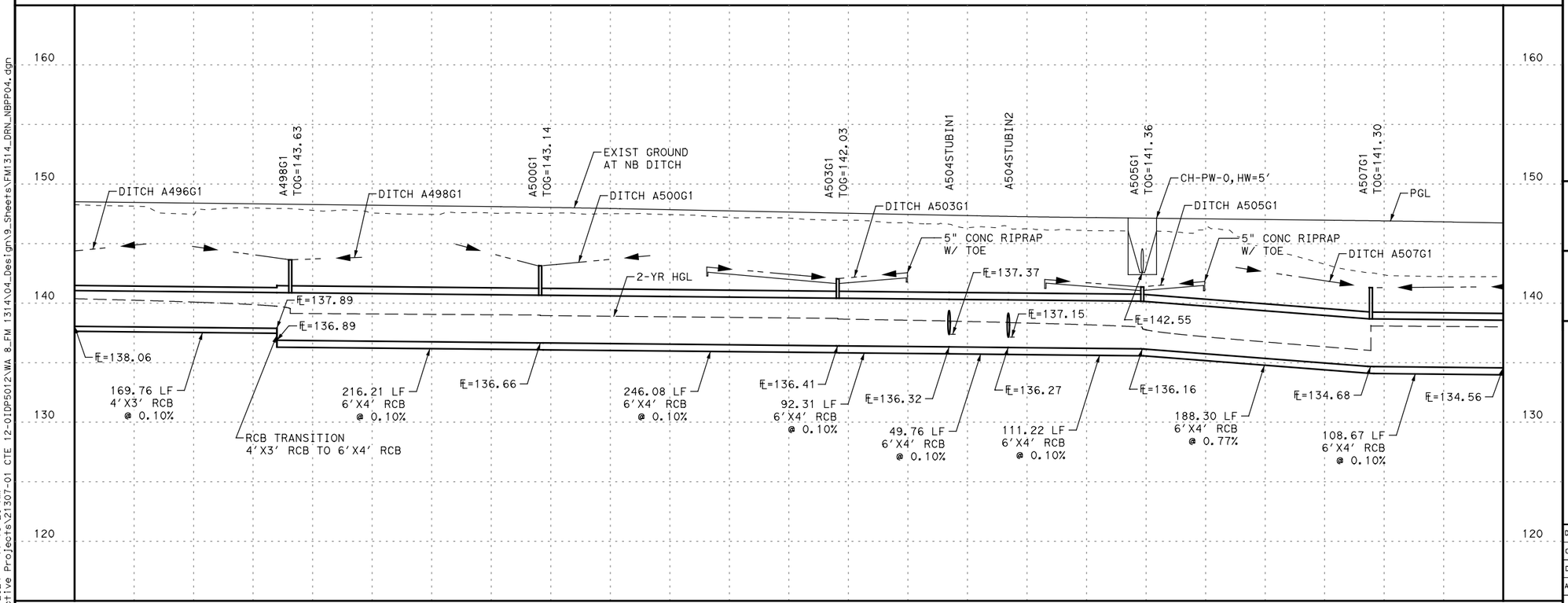

STATE OF TEXAS
SHERVIN S. FARD
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Texas Department of Transportation

FM 1314

NB DRAINAGE PLAN & PROFILE

STA 497+00 TO STA 509+00

SHEET 4 OF 11

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.	
CK: SF	6	SEE COVER SHEET		122	
DRN: MS	STATE	DIST.	COUNTY		
APPVD: PB	TEXAS	HOU	MONTGOMERY		
CONT.	SECT.	JOB	HIGHWAY NO.		
1986	01	064	FM 1314		

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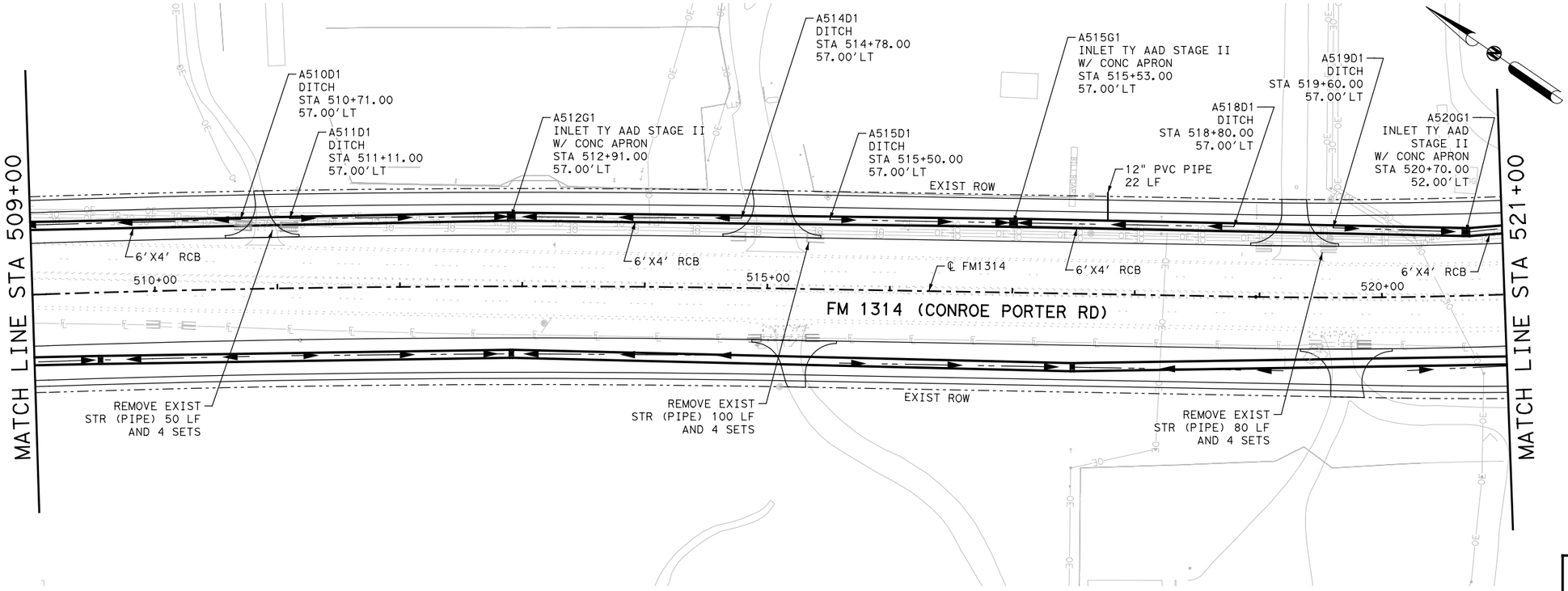

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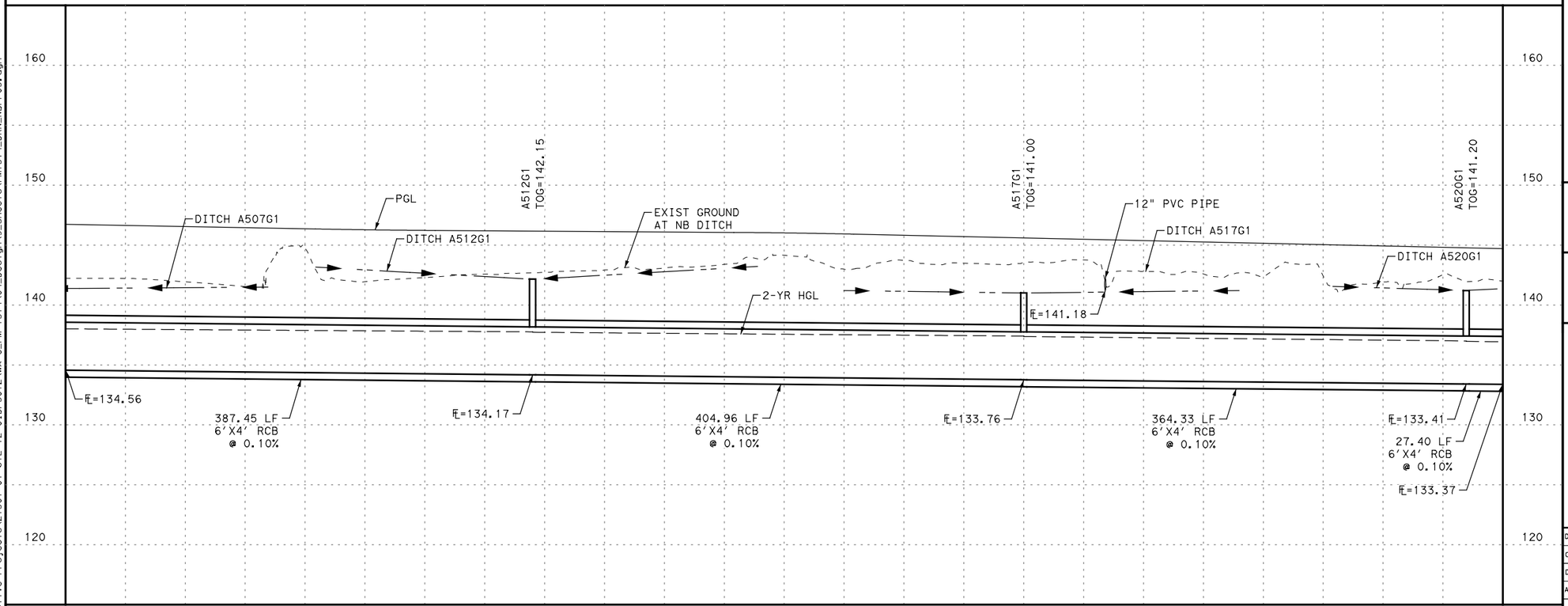

SHERVIN S. FARD
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LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS
3/6/2024

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FM 1314

NB DRAINAGE PLAN & PROFILE

STA 509+00 TO STA 521+00

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
CK: SF	6	SEE COVER SHEET		123
DRN: MS	STATE	DIST.	COUNTY	
APPVD: PB	TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.	
1986	01	064	FM 1314	

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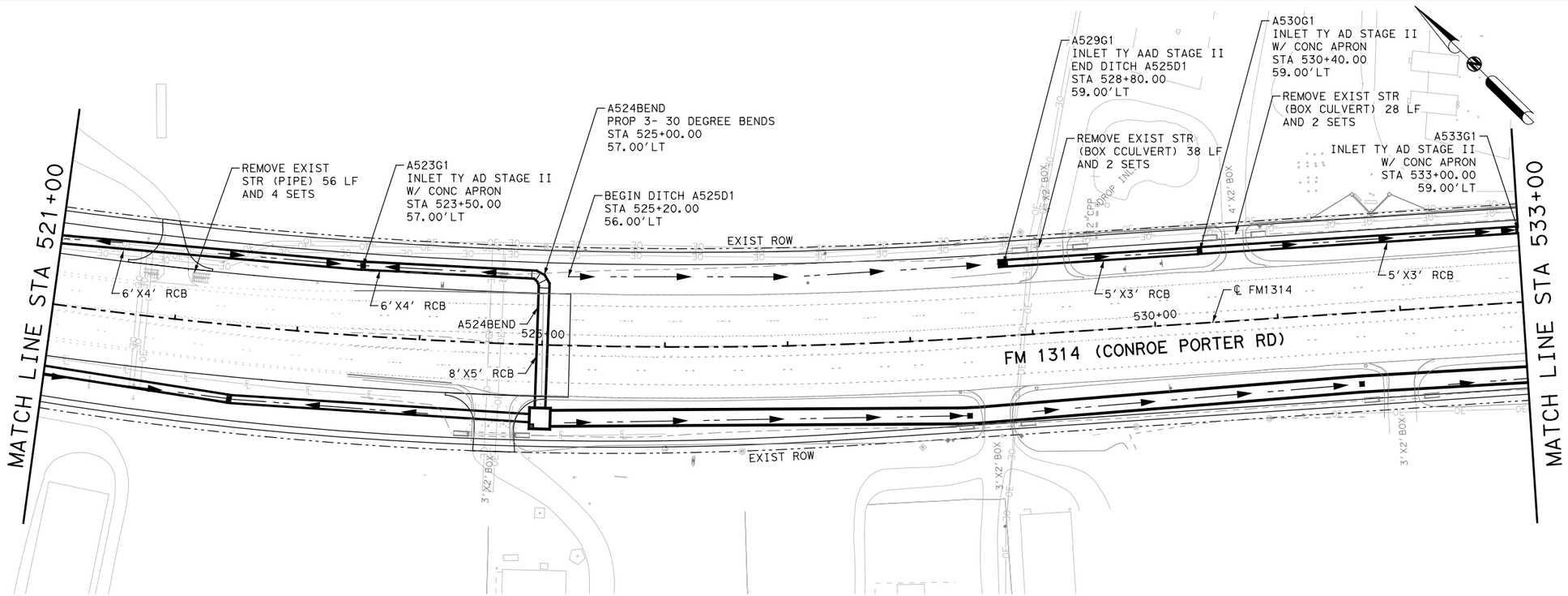

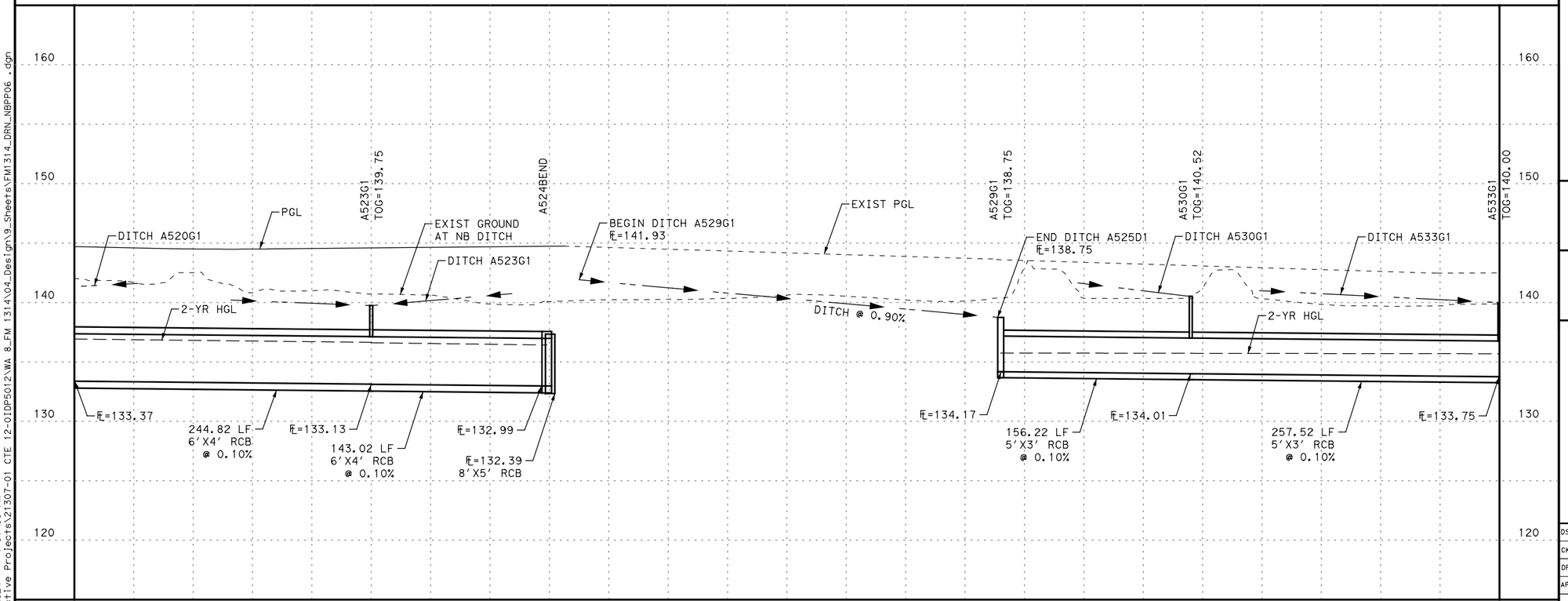

LEGEND

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0 5 10 (V)
SCALE IN FEET

STATE OF TEXAS
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FM 1314

NB DRAINAGE PLAN & PROFILE

STA 521+00 TO STA 533+00

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
CK: SF	6	SEE COVER SHEET		124
DRN: MS	STATE	DIST.	COUNTY	
APPVD: PB	TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.	
1986	01	064	FM 1314	

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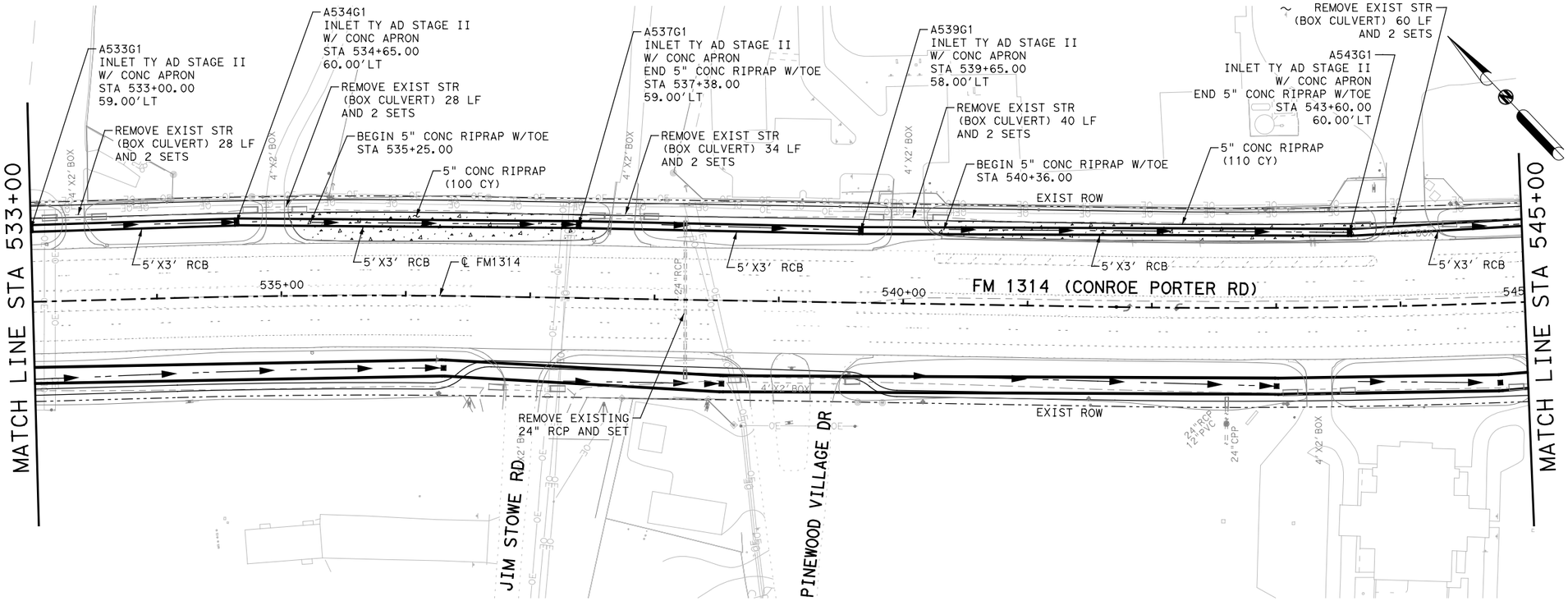

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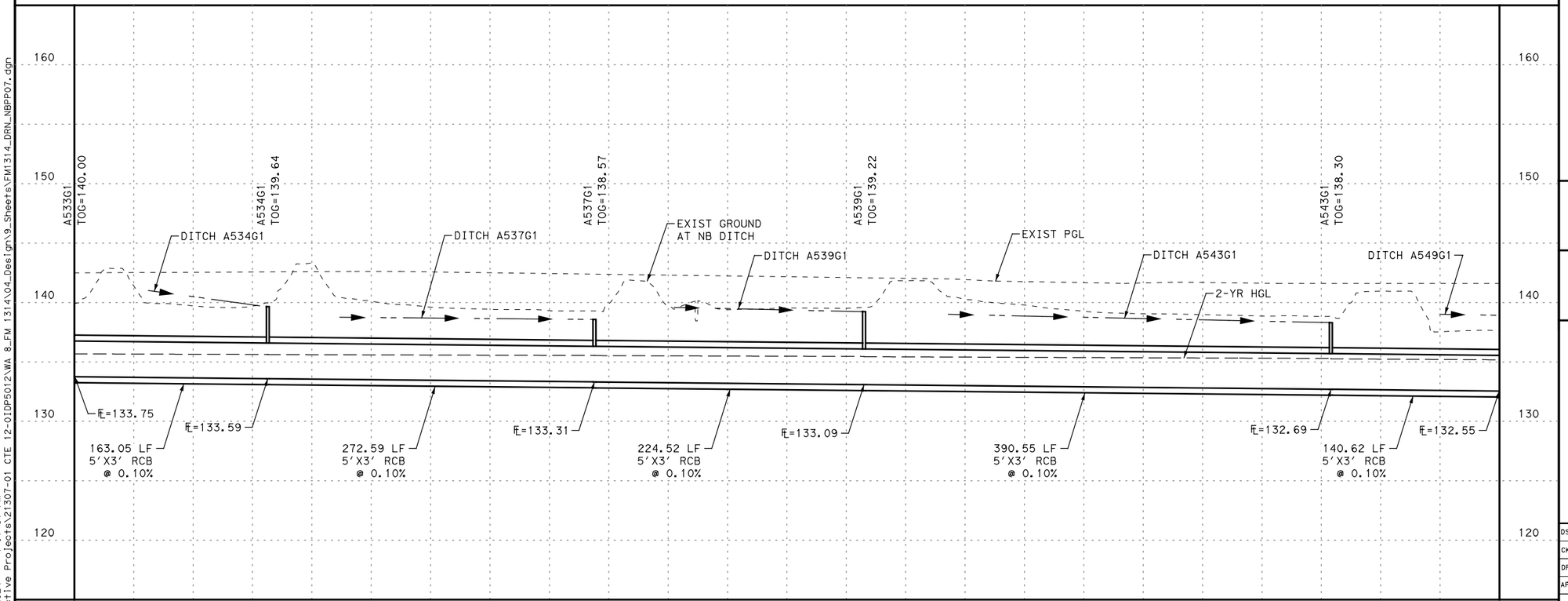

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Texas Department of Transportation

FM 1314

NB DRAINAGE PLAN & PROFILE

STA 533+00 TO STA 545+00

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
CK: SF	6	SEE COVER SHEET		125
DRN: MS	STATE	DIST.	COUNTY	
APPVD: PB	TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.	
1986	01	064	FM 1314	

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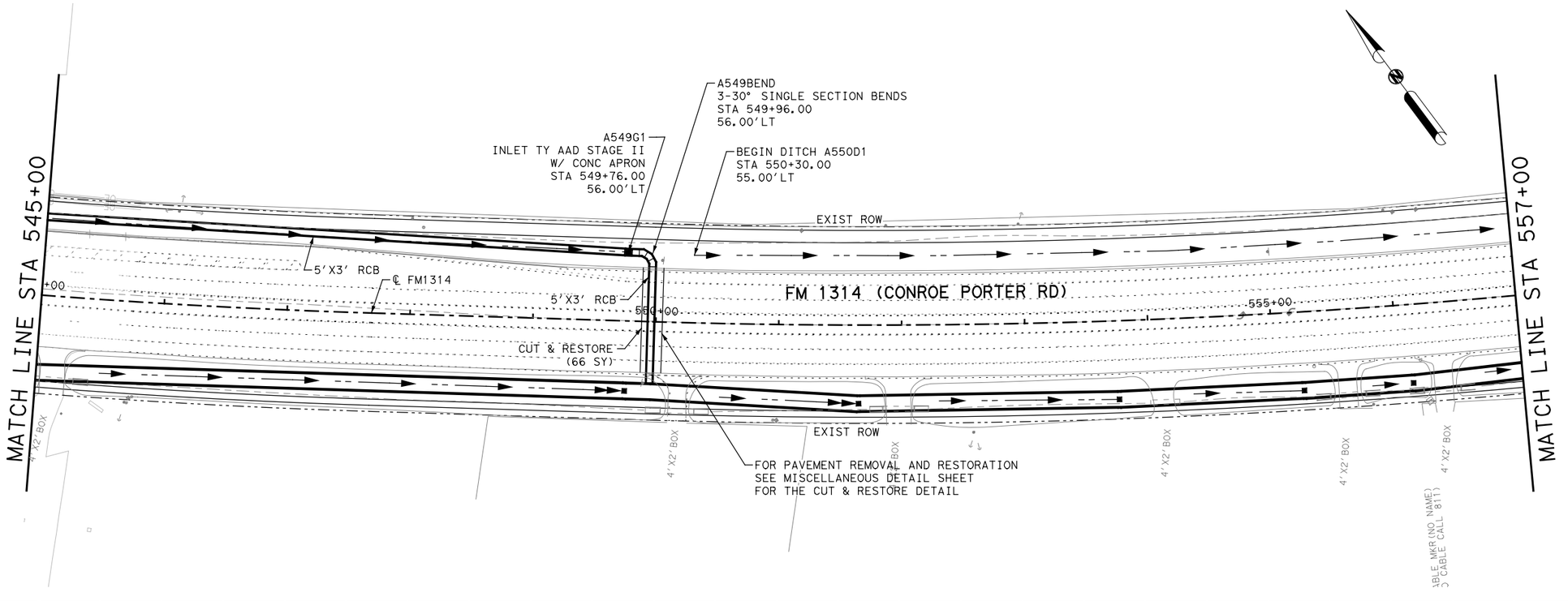

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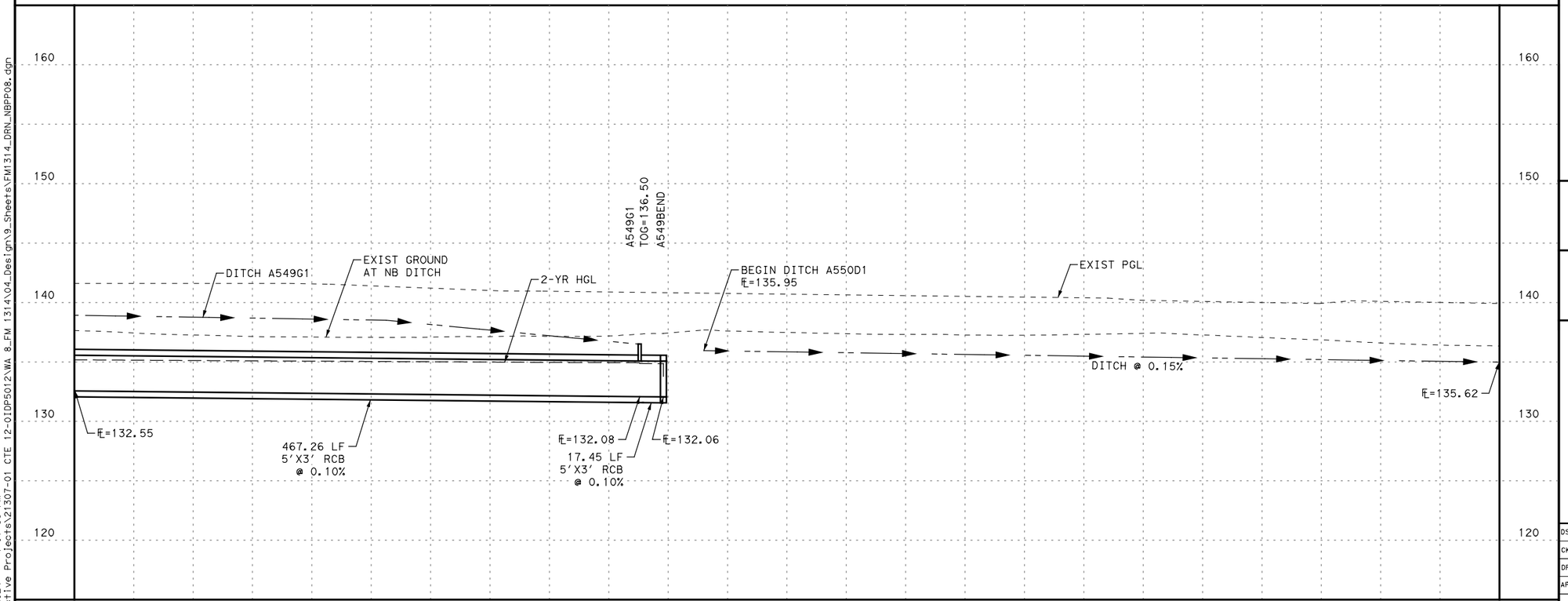
5. PIPE LENGTHS SHOWN IN PROFILE ARE FROM INSIDE FACE OF STRUCTURE TO INSIDE FACE OF STRUCTURE.
6. 2-YR HGL SHOWN IS FOR PROPOSED STORM SEWER ONLY. HGL FOR DITCHED AND EXIST STORM SEWER INTENTIONALLY EXCLUDED.
7. THE CONTRACTOR TO PROVIDE STRUCTURAL SUPPORT AS NECESSARY TO AVOID DAMAGE TO THE UTILITIES/GAS PIPELINES/POWER POLES DURING CONSTRUCTION.

0 50 100 (H)
0 5 10 (V)
SCALE IN FEET



STATE OF TEXAS
SHERVIN S. FARD
99431
LICENSED
PROFESSIONAL ENGINEER
3/6/2024

OMEGA ENGINEERS, INC.
16360 PARK TEN PLACE, Ste. #325
HOUSTON TEXAS, 77084
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:281 647 9182 F:281 647 9184

Texas Department of Transportation

FM 1314

NB DRAINAGE PLAN & PROFILE

STA 545+00 TO STA 557+00

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
CK: SF	6	SEE COVER SHEET		126
DRN: MS	STATE	DIST.	COUNTY	
APPVD: PB	TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.	
1986	01	064	FM 1314	

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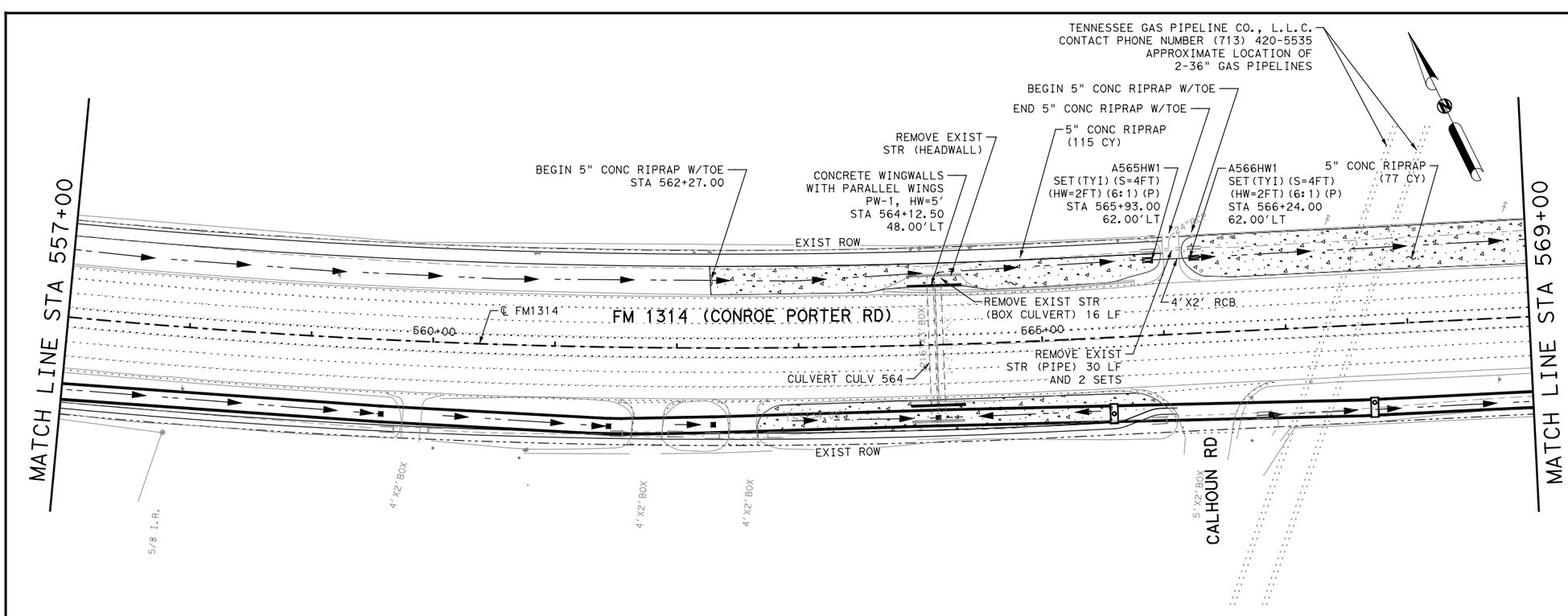

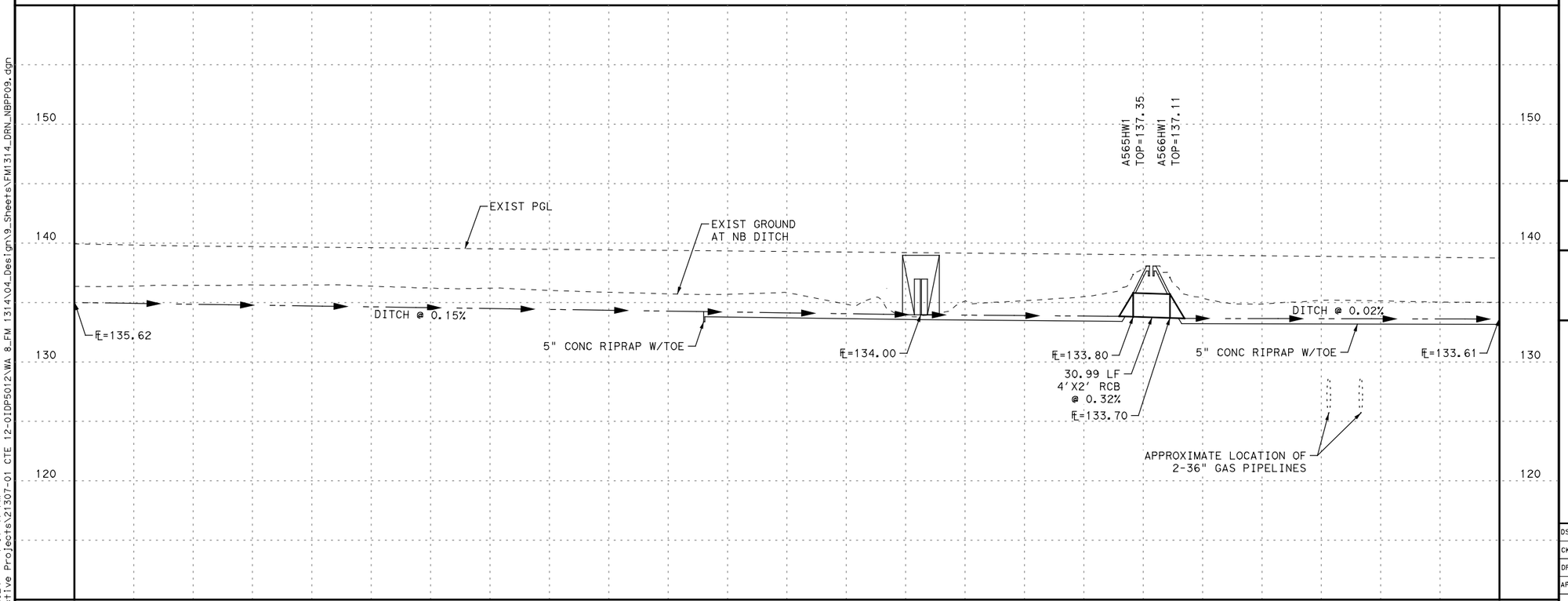

LEGEND

- OR ○ PROP MANHOLE
- OR ▫ PROP GRATE INLET
- PROP SET
- PROP ℄ DITCH
- EXISTING STORM SEWER
- PROP STORM SEWER
- CONCRETE RIPRAP

NOTES:

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0 50 100 (H)
0 5 10 (V)
SCALE IN FEET

STATE OF TEXAS
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3/6/2024

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FM 1314

NB DRAINAGE PLAN & PROFILE

STA 557+00 TO STA 569+00

SHEET 9 OF 11

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
CK: SF	6	SEE COVER SHEET		127
DRN: MS	STATE	DIST.	COUNTY	
APPVD: PB	TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.	
1986	01	064	FM 1314	

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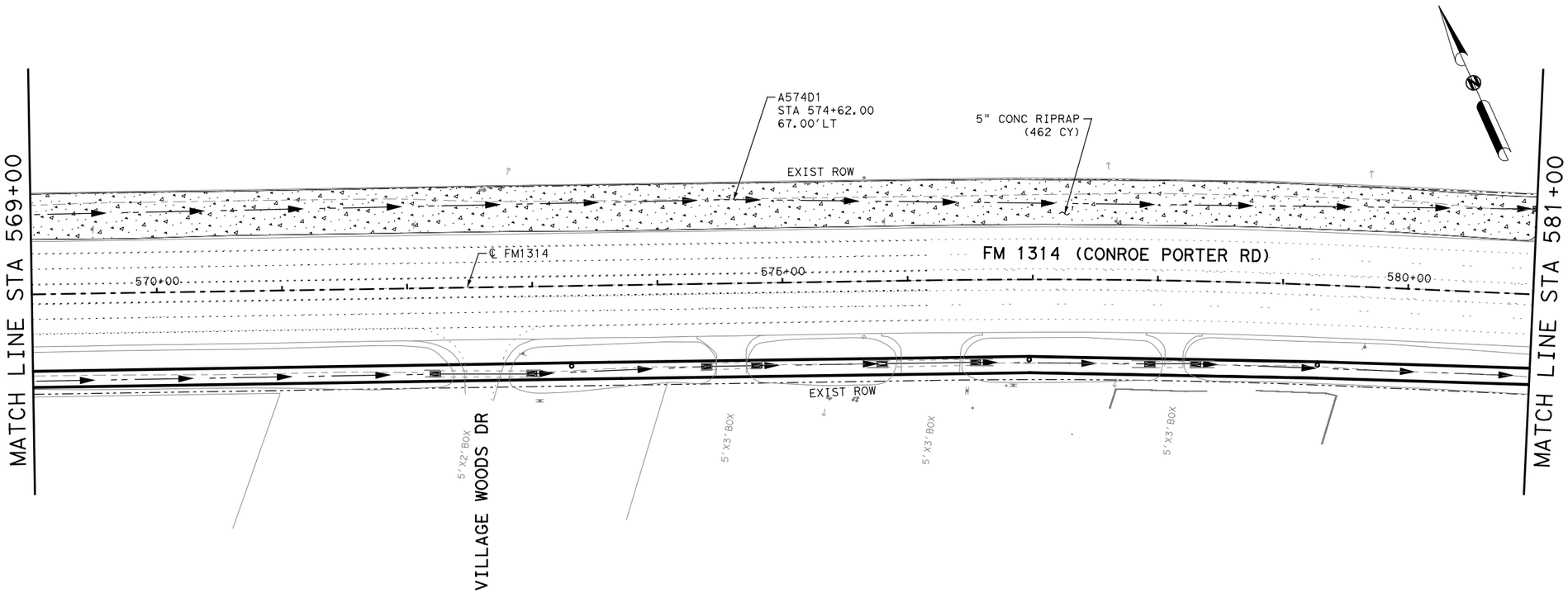

LEGEND

- OR ○ PROP MANHOLE
- OR ▫ PROP GRATE INLET
- PROP SET
- PROP ℄ DITCH
- EXISTING STORM SEWER
- PROP STORM SEWER
- CONCRETE RIPRAP

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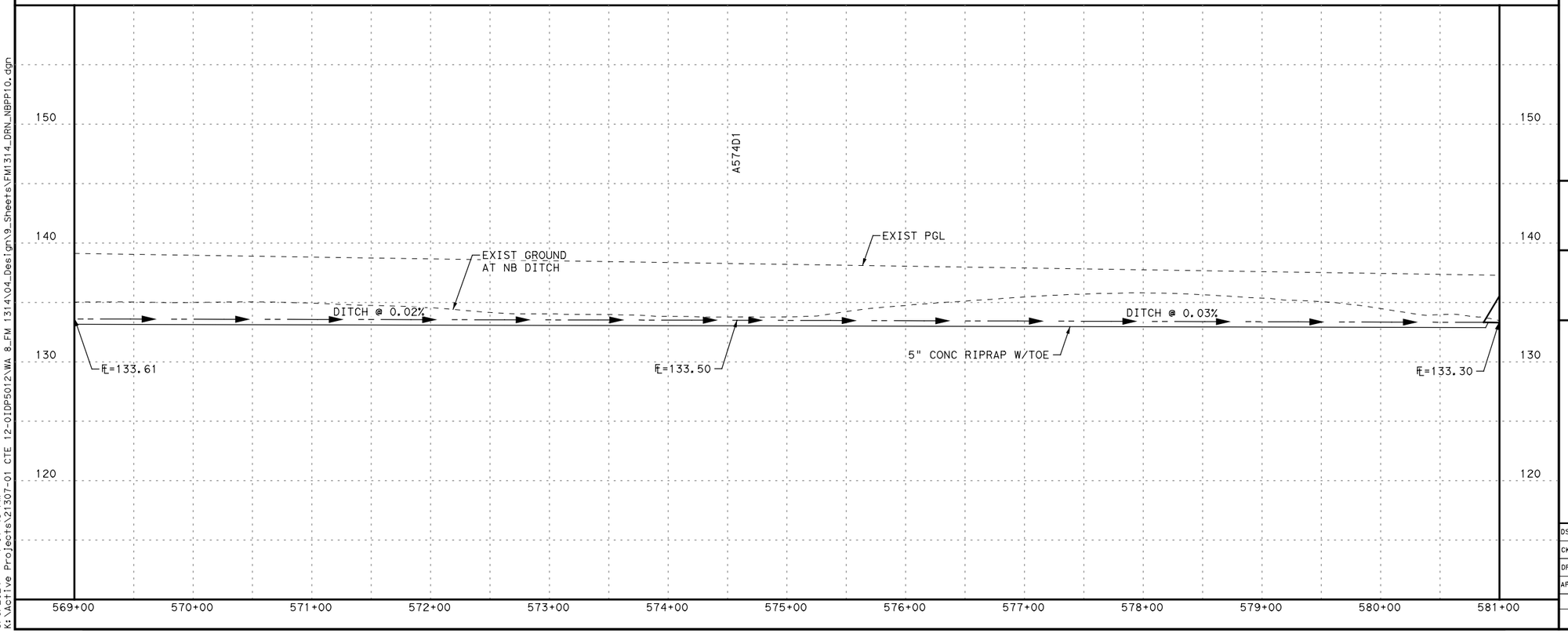
0 5 10 (V)
SCALE IN FEET



STATE OF TEXAS
SHERVIN S. FARD
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LICENSED
PROFESSIONAL ENGINEER
P.E

3/6/2024

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Texas Department of Transportation

FM 1314

NB DRAINAGE PLAN & PROFILE

STA 569+00 TO STA 581+00

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.	SHEET NO.
CK: SF	6	SEE COVER SHEET	128
DRN: MS	STATE	DIST.	COUNTY
APPVD: PB	TEXAS	HOU	MONTGOMERY
CONT.	SECT.	JOB	HIGHWAY NO.
1986	01	064	FM 1314

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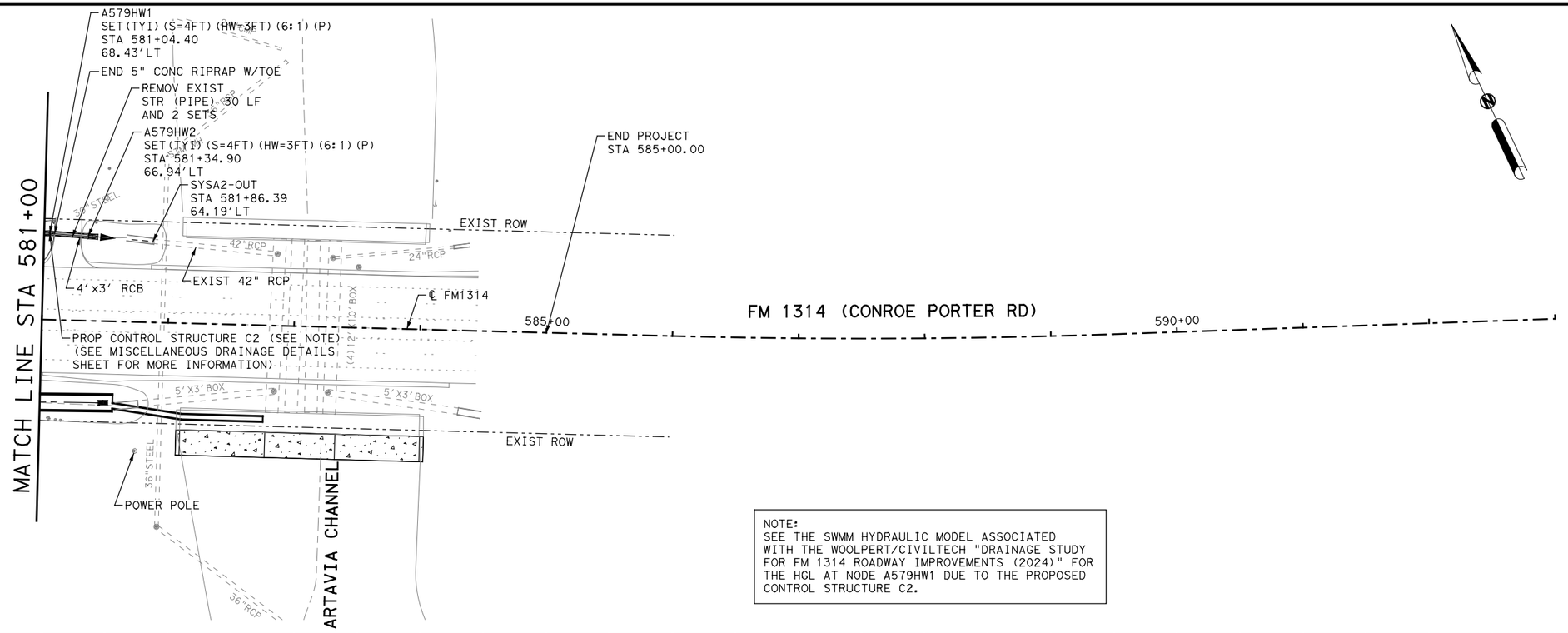

NOTE:
SEE THE SWMM HYDRAULIC MODEL ASSOCIATED WITH THE WOOLPERT/CIVILTECH "DRAINAGE STUDY FOR FM 1314 ROADWAY IMPROVEMENTS (2024)" FOR THE HGL AT NODE A579HW1 DUE TO THE PROPOSED CONTROL STRUCTURE C2.

LEGEND

- OR ○ PROP MANHOLE
- ■ OR ▫ PROP GRATE INLET
- PROP SET
- PROP ℄ DITCH
- EXISTING STORM SEWER
- PROP STORM SEWER
- CONCRETE RIPRAP

NOTES:

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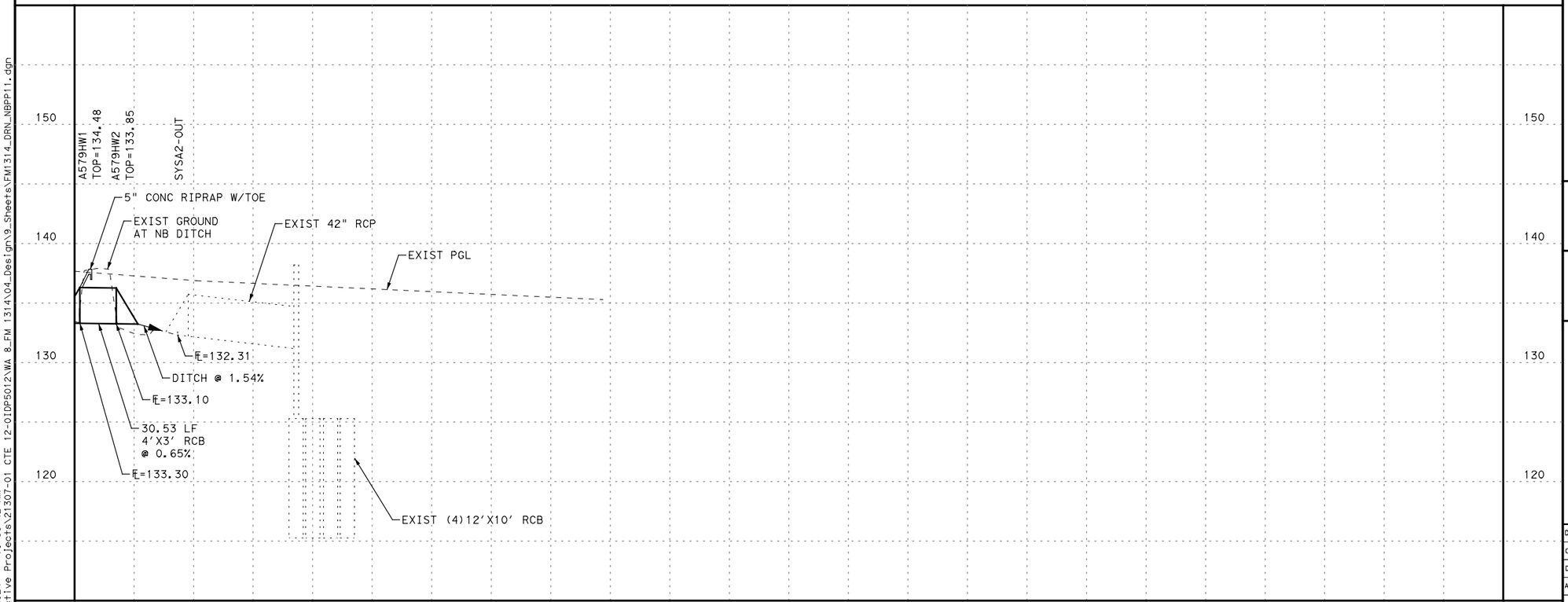
0 5 10 (V)
SCALE IN FEET



STATE OF TEXAS
SHERVIN S. FARD
99431
LICENSED
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P.E

3/7/2024

OMEGA ENGINEERS, INC.
16360 PARK TEN PLACE, Ste. #325
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Texas Department of Transportation

FM 1314

NB DRAINAGE PLAN & PROFILE

STA 581+00 TO END

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
CK: SF	6	SEE COVER SHEET		129
DRN: MS	STATE	DIST.	COUNTY	
APPVD: PB	TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.	
1986	01	064	FM 1314	

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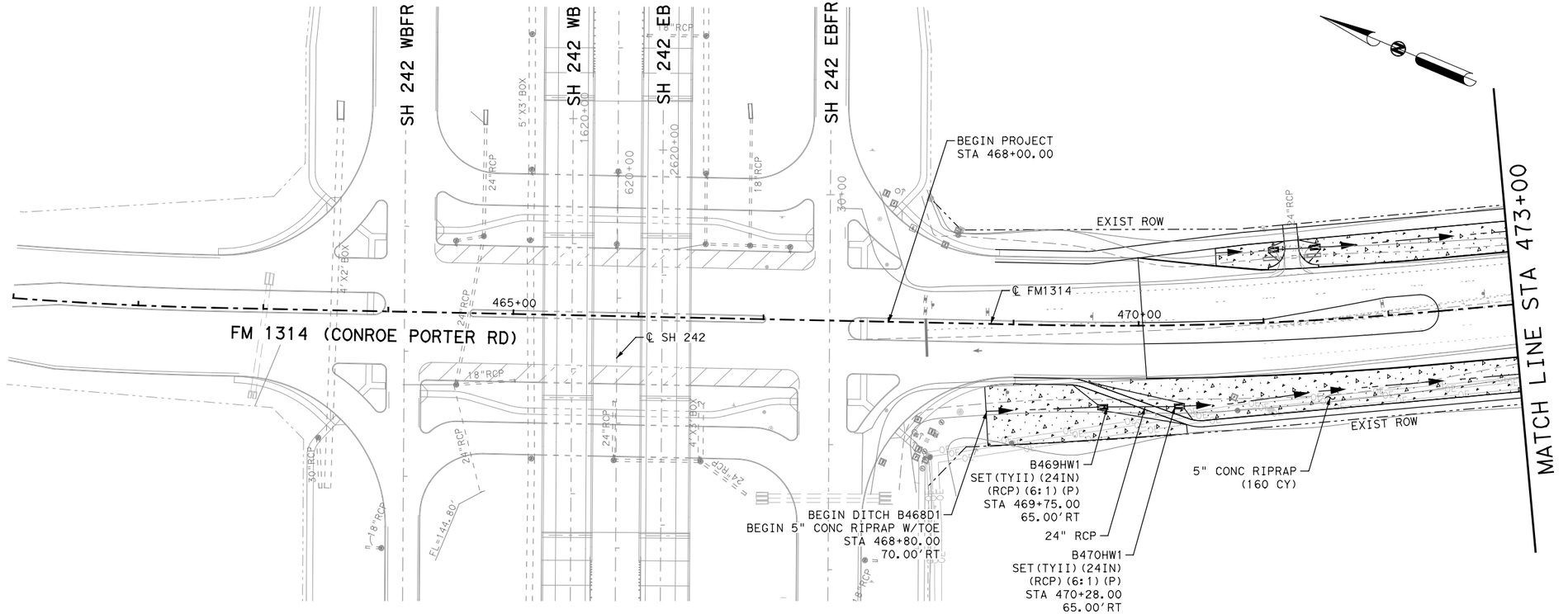

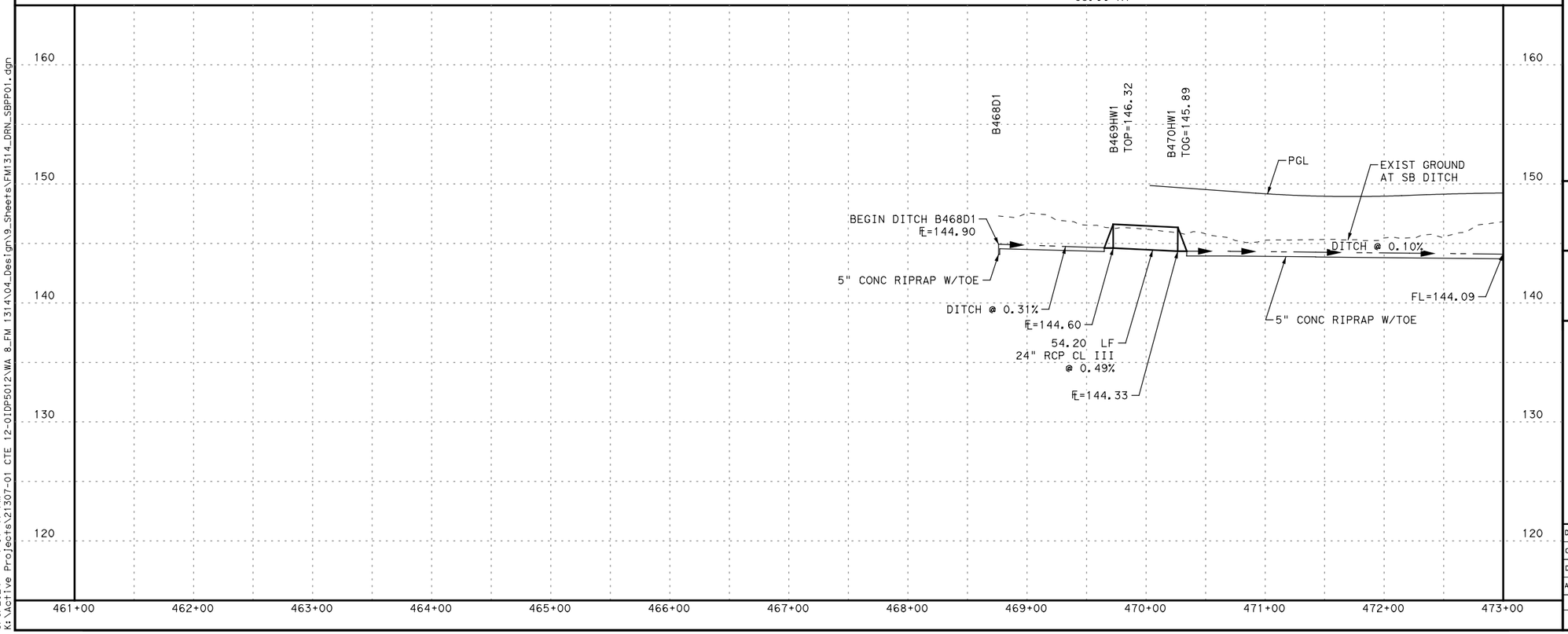

LEGEND

- OR ○ PROP MANHOLE
- OR ▫ PROP GRATE INLET
- PROP SET
- PROP ℄ DITCH
- EXISTING STORM SEWER
- PROP STORM SEWER
- CONCRETE RIPRAP

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0 50 100 (H)
0 5 10 (V)
SCALE IN FEET

STATE OF TEXAS
SHERVIN S. FARD
99431
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P.E

3/6/2024

OMEGA ENGINEERS, INC.
16360 PARK TEN PLACE, Ste. #325
HOUSTON TEXAS, 77084
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:281 647 9182 F:281 647 9184

Texas Department of Transportation

FM 1314

SB DRAINAGE PLAN & PROFILE

BEGIN TO STA 473+00

SHEET 1 OF 11

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
CK: SF	6	SEE COVER SHEET		130
DRN: MS	STATE	DIST.	COUNTY	
APPVD: PB	TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.	
1986	01	064	FM 1314	

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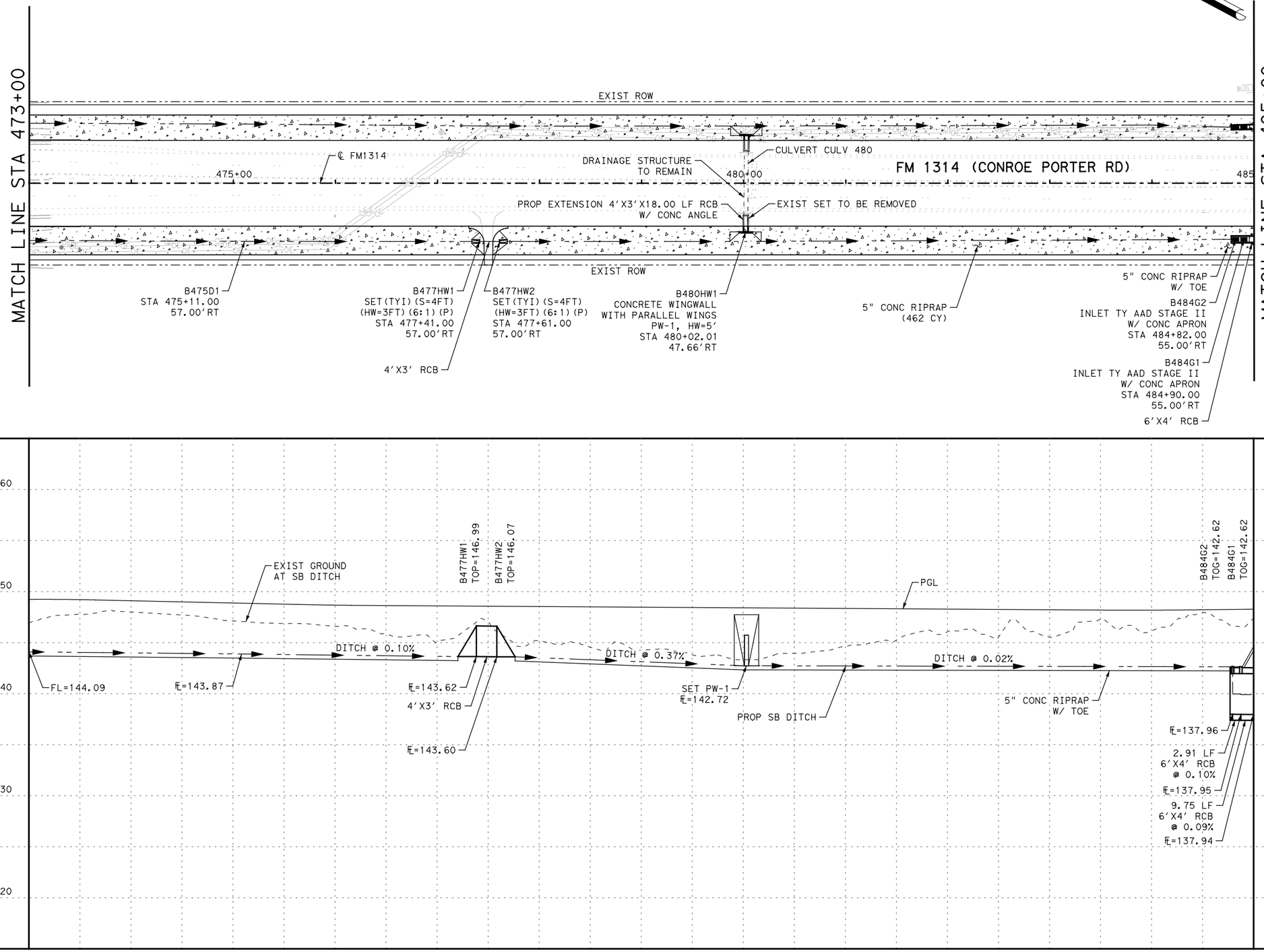

LEGEND

- OR ○ PROP MANHOLE
- OR ▫ PROP GRATE INLET
- PROP SET
- PROP ℄ DITCH
- EXISTING STORM SEWER
- PROP STORM SEWER
- CONCRETE RIPRAP

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0 50 100 (H)
0 5 10 (V)
SCALE IN FEET

STATE OF TEXAS
SHERVIN S. FARD
99431
LICENSED
PROFESSIONAL ENGINEER
3/6/2024

OMEGA ENGINEERS, INC.
16360 PARK TEN PLACE, Ste. #325
HOUSTON TEXAS, 77084
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:281 647 9182 F:281 647 9184

FM 1314

SB DRAINAGE PLAN & PROFILE

STA 473+00 TO STA 485+00

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
CK: SF	6	SEE COVER SHEET		131
DRN: MS	STATE	DIST.	COUNTY	
APPVD: PB	TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.	
1986	01	064	FM 1314	

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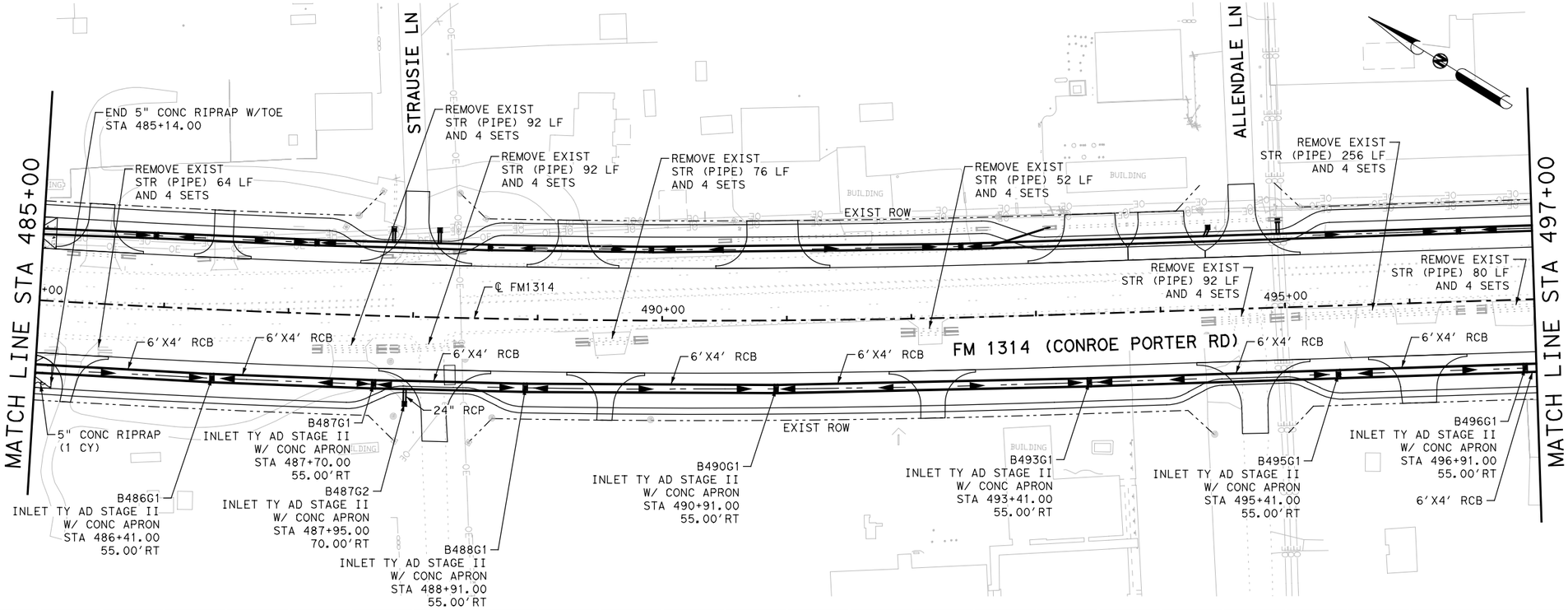

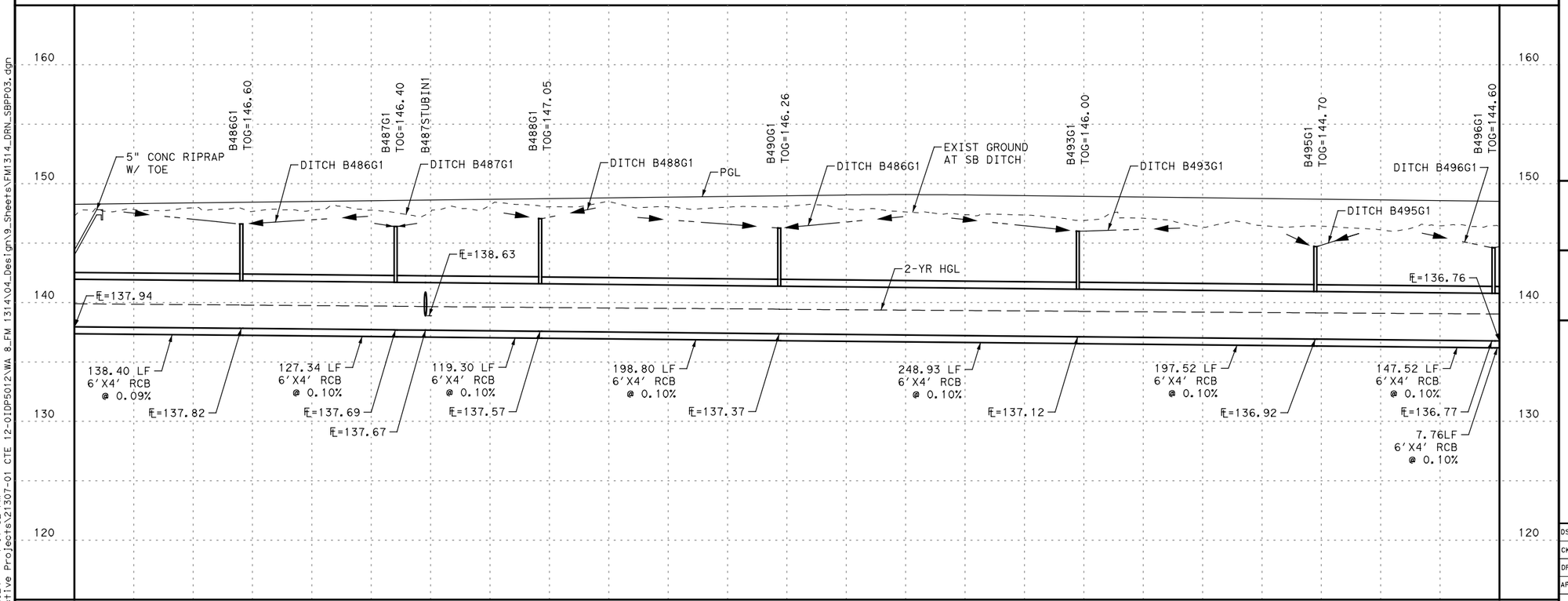

LEGEND

- OR ○ PROP MANHOLE
- OR ▫ PROP GRATE INLET
- PROP SET
- PROP ℄ DITCH
- EXISTING STORM SEWER
- PROP STORM SEWER
- CONCRETE RIPRAP

NOTES:

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0 50 100 (H)
0 5 10 (V)
SCALE IN FEET

STATE OF TEXAS
SHERVIN S. FARD
99431
LICENSED PROFESSIONAL ENGINEER
3/6/2024

OMEGA ENGINEERS, INC.
16360 PARK TEN PLACE, Ste. #325
HOUSTON TEXAS, 77084
OMEGAENGINEERS.COM
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Texas Department of Transportation

FM 1314

SB DRAINAGE PLAN & PROFILE

STA 485+00 TO STA 497+00

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
CK: SF	6	SEE COVER SHEET		132
DRN: MS	STATE	DIST.	COUNTY	
APPVD: PB	TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.	
1986	01	064	FM 1314	

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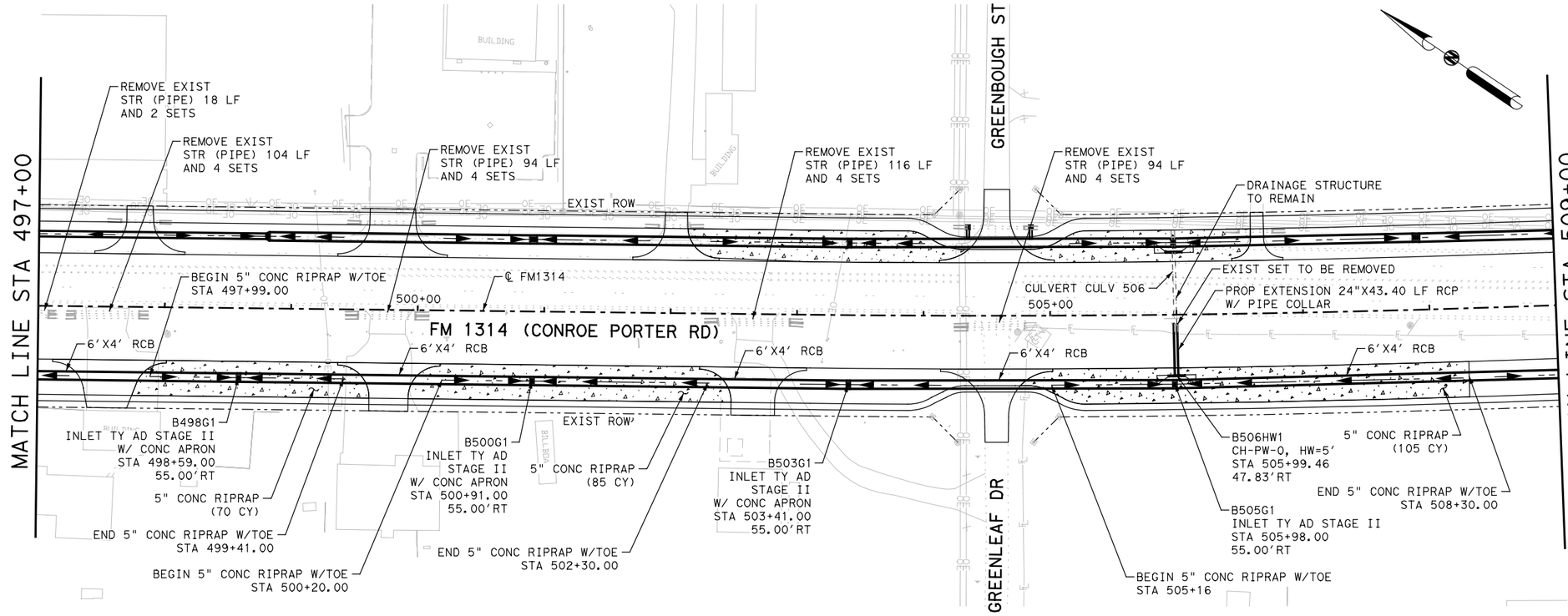

LEGEND

- OR ○ PROP MANHOLE
- ■ OR ▫ PROP GRATE INLET
- PROP SET
- PROP ℄ DITCH
- EXISTING STORM SEWER
- PROP STORM SEWER
- CONCRETE RIPRAP

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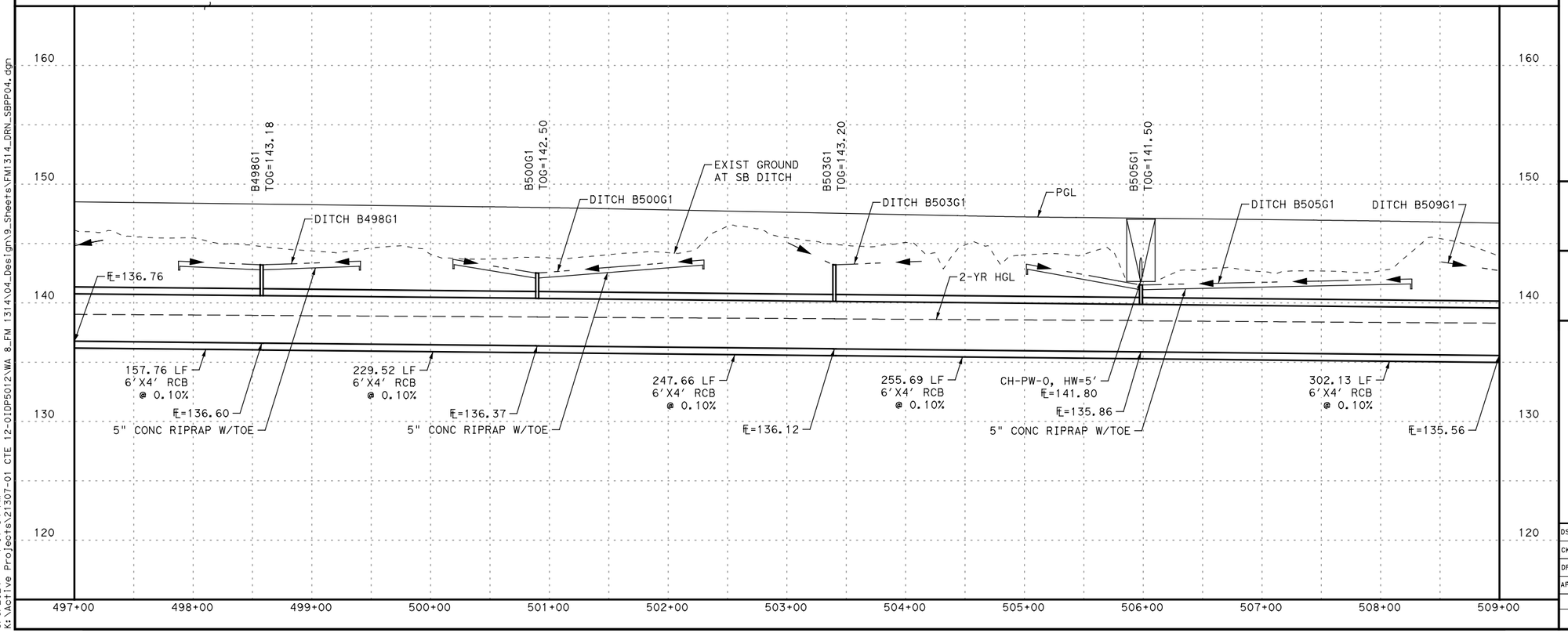
0 5 10 (V)
SCALE IN FEET



STATE OF TEXAS
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P.E
3/6/2024

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FM 1314

SB DRAINAGE PLAN & PROFILE

STA 497+00 TO STA 509+00

SHEET 4 OF 11

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
CK: SF	6	SEE COVER SHEET		133
DRN: MS	STATE	DIST.	COUNTY	
APPVD: PB	TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.	
1986	01	064	FM 1314	

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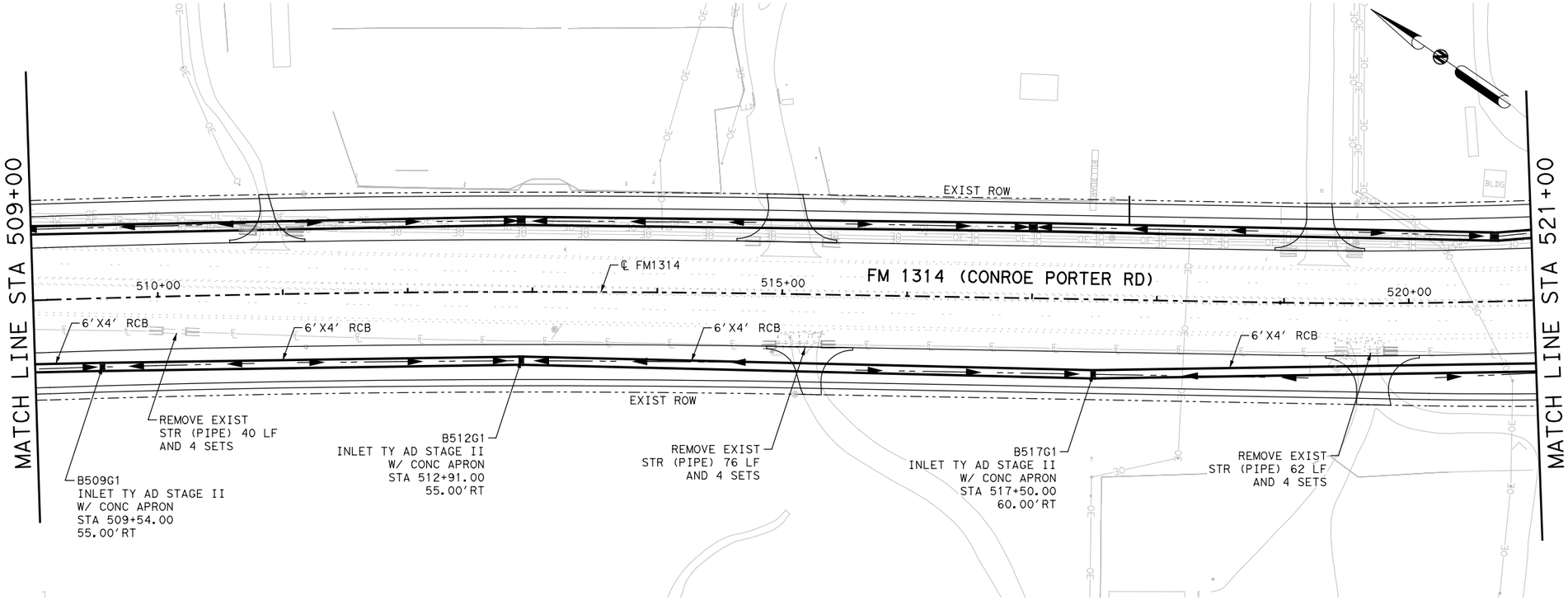

LEGEND

- OR ○ PROP MANHOLE
- ■ OR □ PROP GRATE INLET
- PROP SET
- PROP ℄ DITCH
- EXISTING STORM SEWER
- PROP STORM SEWER
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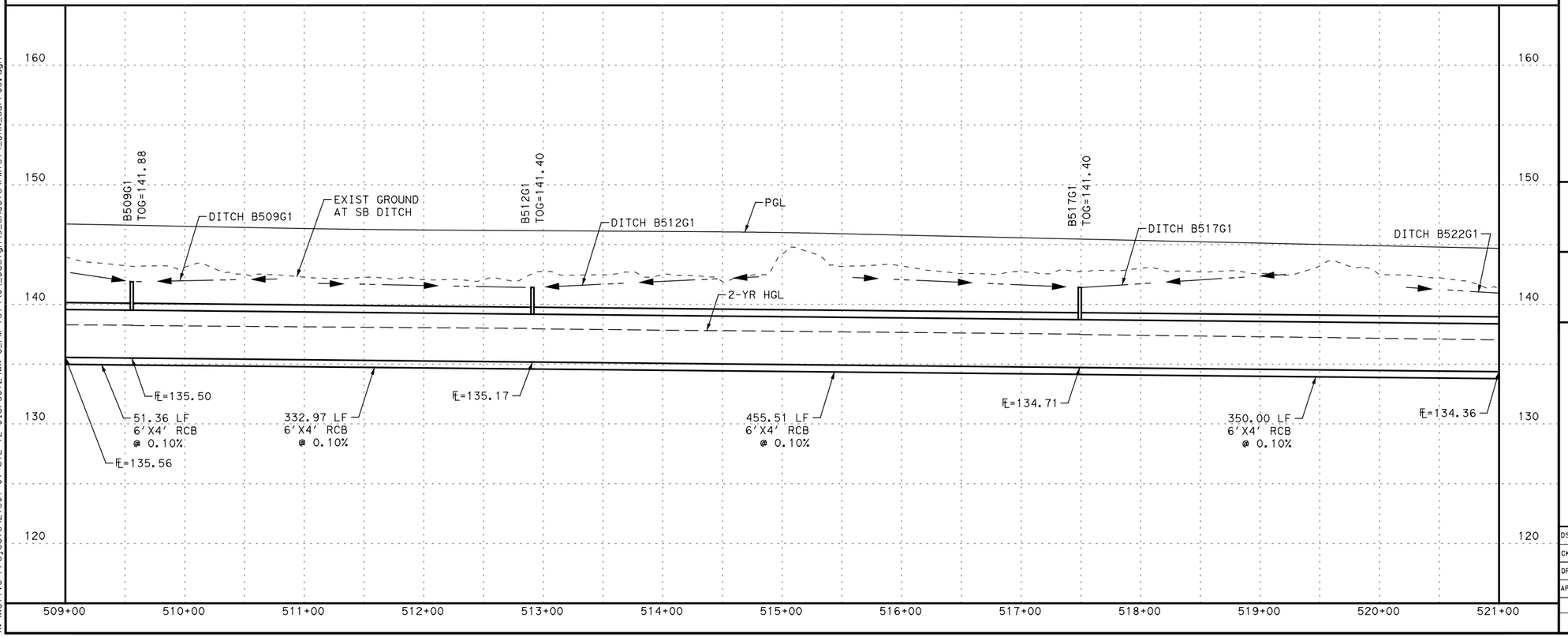
0 5 10 (V)
SCALE IN FEET



3/6/2024

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FM 1314

SB DRAINAGE PLAN & PROFILE

STA 509+00 TO STA 521+00

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
CK: SF	6	SEE COVER SHEET		134
DRN: MS	STATE	DIST.	COUNTY	
APPVD: PB	TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.	
1986	01	064	FM 1314	

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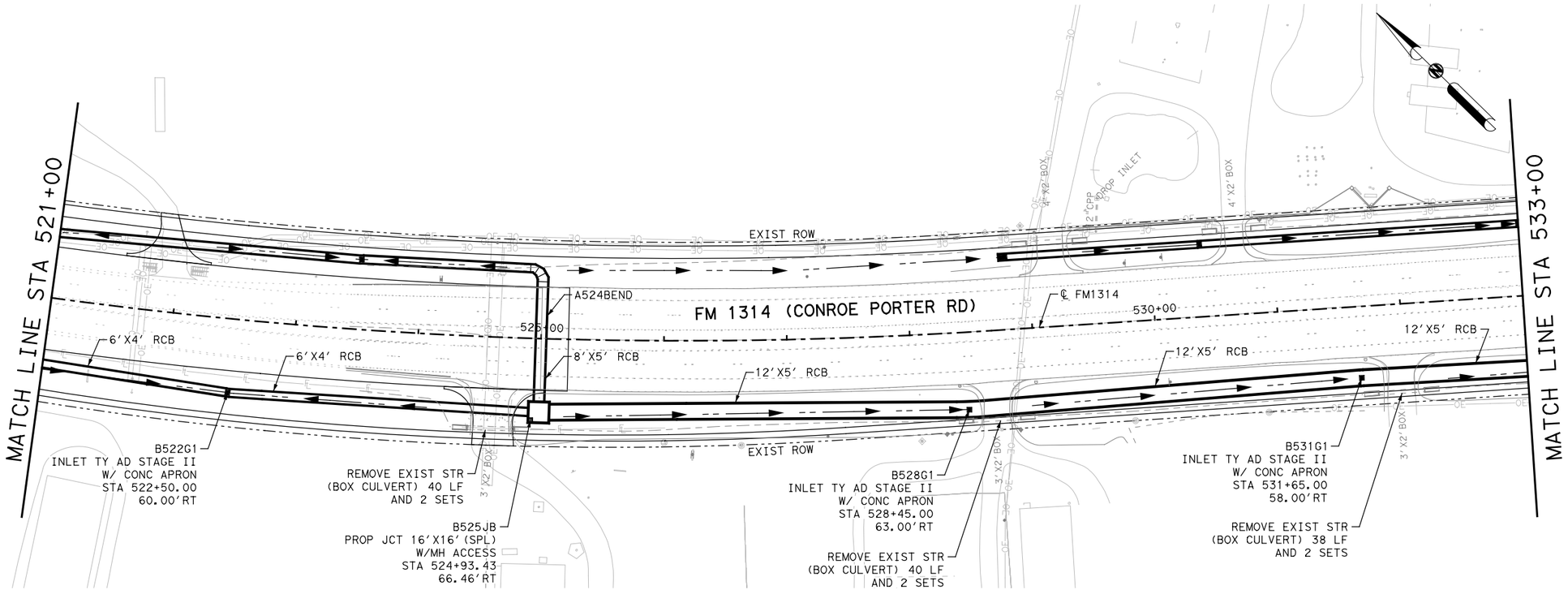

LEGEND

- OR ○ PROP MANHOLE
- ■ OR □ PROP GRATE INLET
- PROP SET
- PROP ℄ DITCH
- EXISTING STORM SEWER
- PROP STORM SEWER
- CONCRETE RIPRAP

NOTES:

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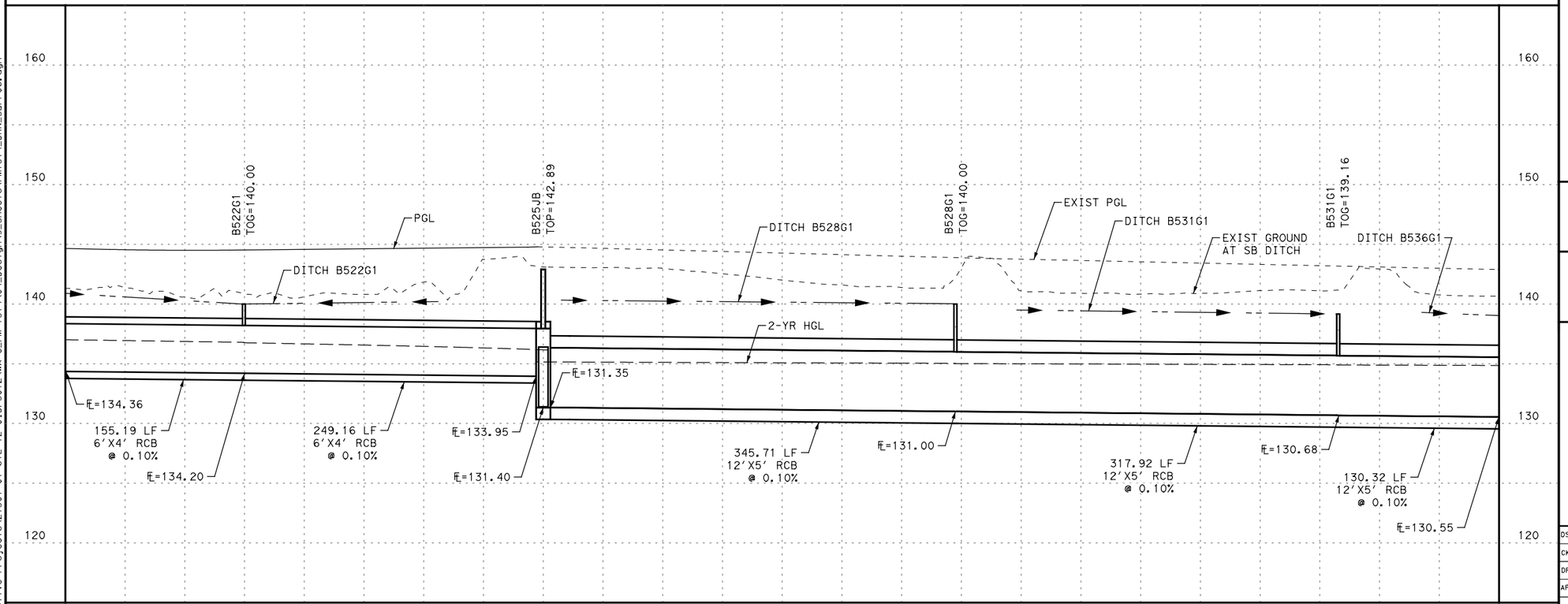
2. REFER TO ROADSIDE DITCH PROFILES FOR DITCH FLOWLINE ELEVATIONS.
3. ALL STATIONING IS REFERENCED TO THE ℄ FM 1314 UNLESS OTHERWISE NOTED
4. CONTRACTOR TO VERIFY EXACT LOCATION OF EXISTING UNDERGROUND UTILITIES PRIOR TO ANY TRENCHING AND EXCAVATION.
5. PIPE LENGTHS SHOWN IN PROFILE ARE FROM INSIDE FACE OF STRUCTURE TO INSIDE FACE OF STRUCTURE.
6. 2-YR HGL SHOWN IS FOR PROPOSED STORM SEWER ONLY. HGL FOR DITCHED AND EXIST STORM SEWER INTENTIONALLY EXCLUDED.
7. THE CONTRACTOR TO PROVIDE STRUCTURAL SUPPORT AS NECESSARY TO AVOID DAMAGE TO THE UTILITIES/GAS PIPELINES/POWER POLES DURING CONSTRUCTION.

0 50 100 (H)
0 5 10 (V)
SCALE IN FEET



STATE OF TEXAS
SHERVIN S. FARD
99431
LICENSED
PROFESSIONAL ENGINEER
P.E
3/6/2024

OMEGA ENGINEERS, INC.
16360 PARK TEN PLACE, Ste. #325
HOUSTON TEXAS, 77084
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:281 647 9182 F:281 647 9184

Texas Department of Transportation

FM 1314

SB DRAINAGE PLAN & PROFILE

STA 521+00 TO STA 533+00

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
CK: SF	6	SEE COVER SHEET		135
DRN: MS	STATE	DIST.	COUNTY	
APPVD: PB	TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.	
1986	01	064	FM 1314	

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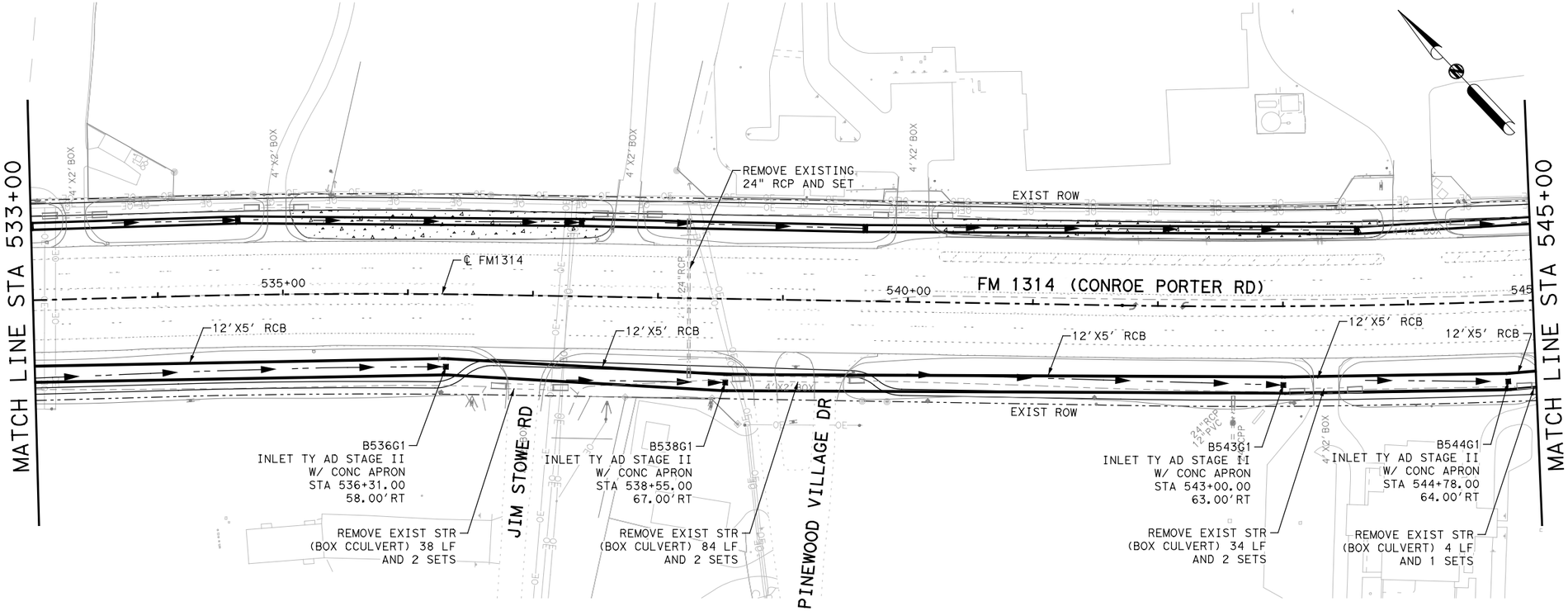

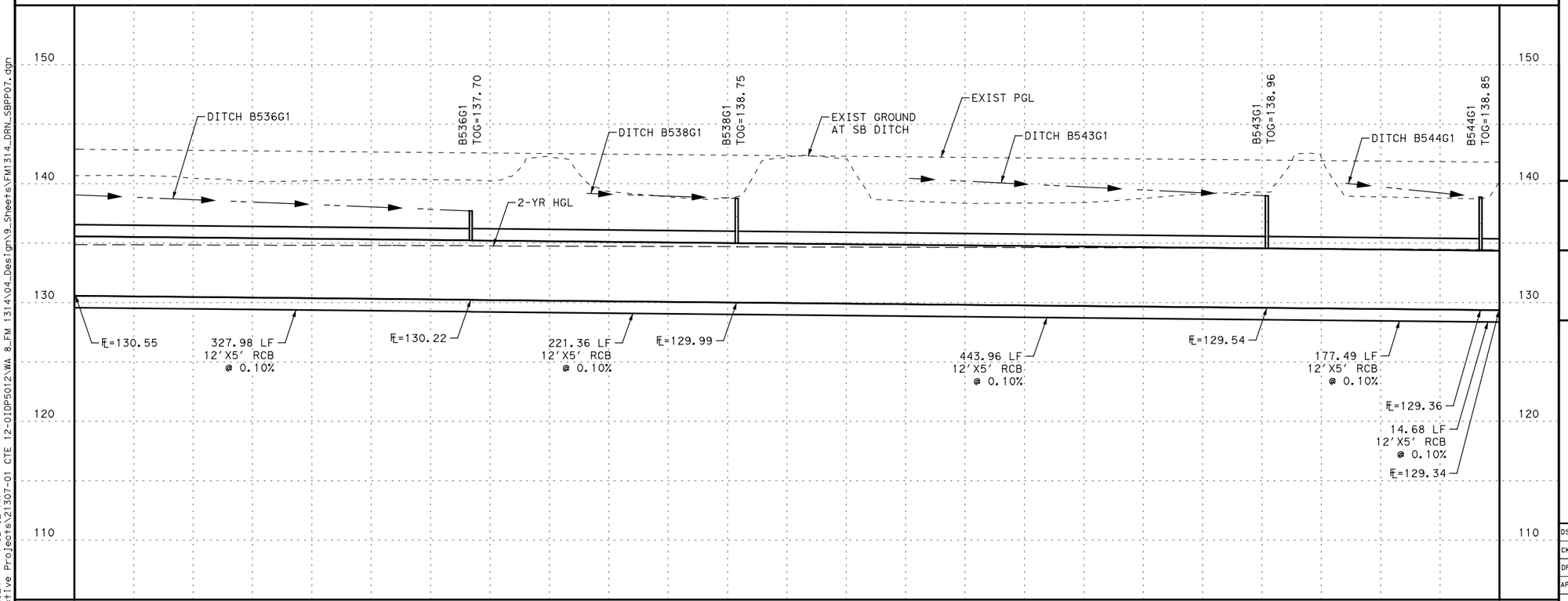

LEGEND

- OR ○ PROP MANHOLE
- OR ▫ PROP GRATE INLET
- PROP SET
- PROP ℄ DITCH
- EXISTING STORM SEWER
- PROP STORM SEWER
- CONCRETE RIPRAP

NOTES:

1. SEE ROADWAY PLAN AND PROFILE SHEETS FOR ADDITIONAL INFORMATION.
2. REFER TO ROADSIDE DITCH PROFILES FOR DITCH FLOWLINE ELEVATIONS.
3. ALL STATIONING IS REFERENCED TO THE ℄ FM 1314 UNLESS OTHERWISE NOTED
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5. PIPE LENGTHS SHOWN IN PROFILE ARE FROM INSIDE FACE OF STRUCTURE TO INSIDE FACE OF STRUCTURE.
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0 50 100 (H)
0 5 10 (V)
SCALE IN FEET

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Texas Department of Transportation

FM 1314

SB DRAINAGE PLAN & PROFILE

STA 533+00 TO STA 545+00

SHEET 7 OF 11

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.	
CK: SF	6	SEE COVER SHEET		136	
DRN: MS	STATE	DIST.	COUNTY		
APPVD: PB	TEXAS	HOU	MONTGOMERY		
CONT.	SECT.	JOB	HIGHWAY NO.		
1986	01	064	FM 1314		

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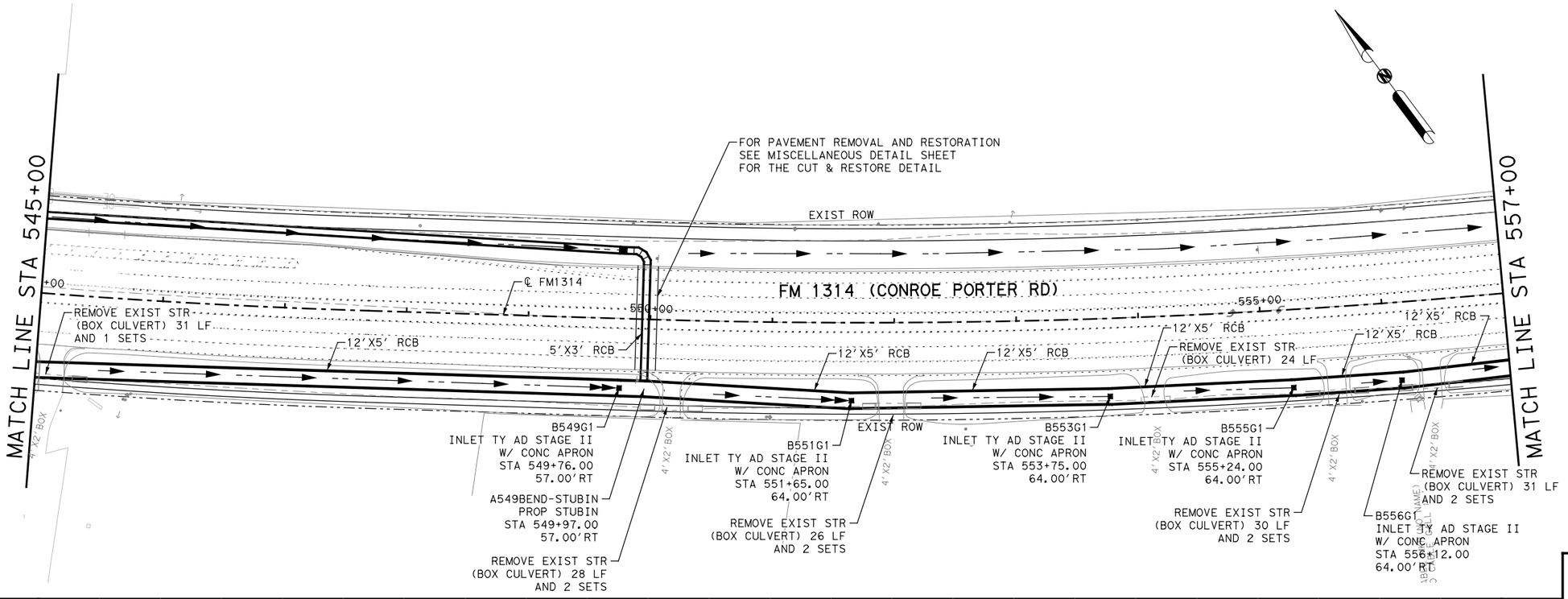

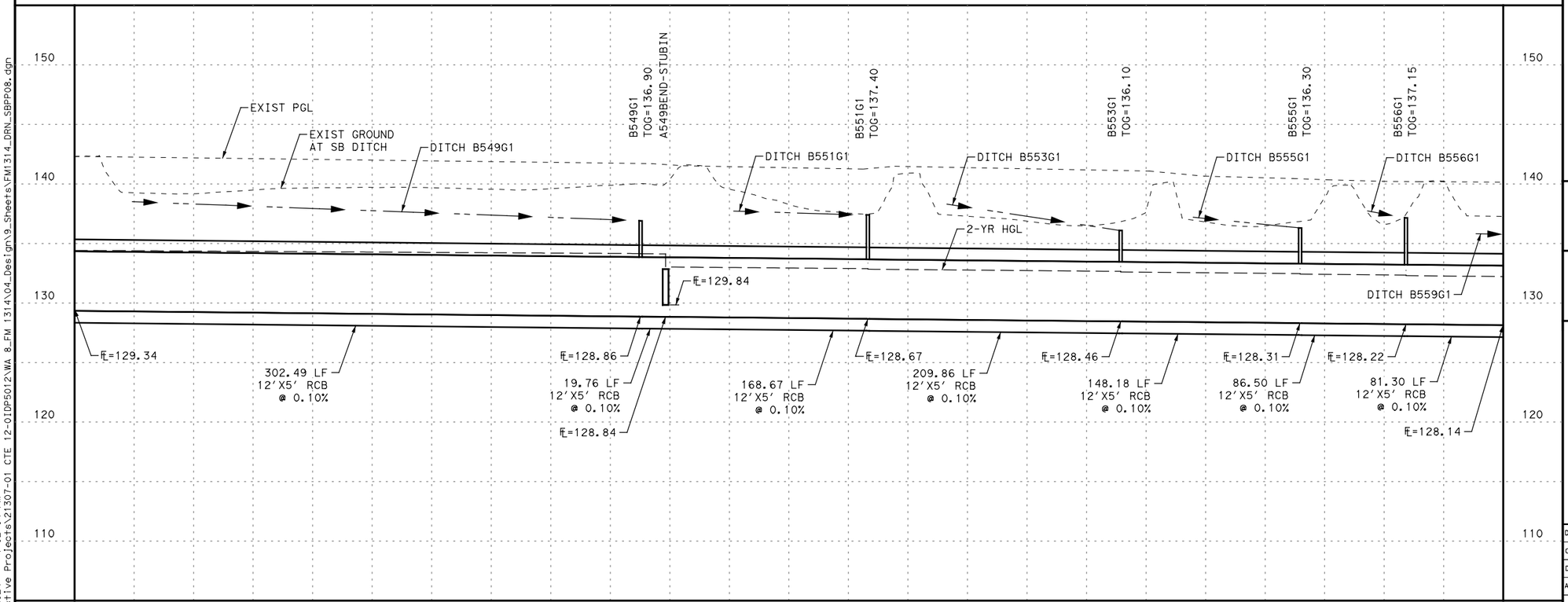

LEGEND

- OR ○ PROP MANHOLE
- OR ▫ PROP GRATE INLET
- PROP SET
- PROP ℄ DITCH
- EXISTING STORM SEWER
- PROP STORM SEWER
- CONCRETE RIPRAP

NOTES:

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0 50 100 (H)
0 5 10 (V)
SCALE IN FEET

STATE OF TEXAS
SHERVIN S. FARD
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P.E
3/6/2024

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FM 1314

SB DRAINAGE PLAN & PROFILE

STA 545+00 TO STA 557+00

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.	SHEET NO.
CK: SF	6	SEE COVER SHEET	137
DRN: MS	STATE	DIST.	COUNTY
APPVD: PB	TEXAS	HOU	MONTGOMERY
CONT.	SECT.	JOB	HIGHWAY NO.
1986	01	064	FM 1314

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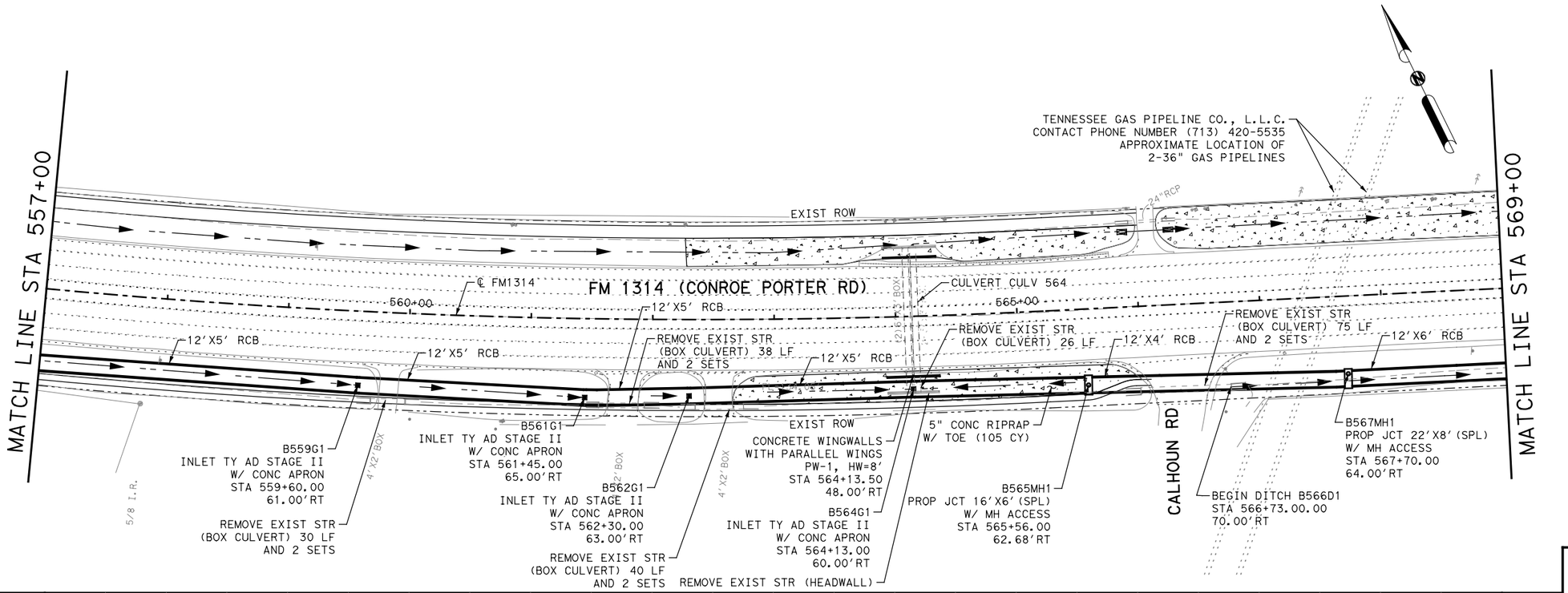

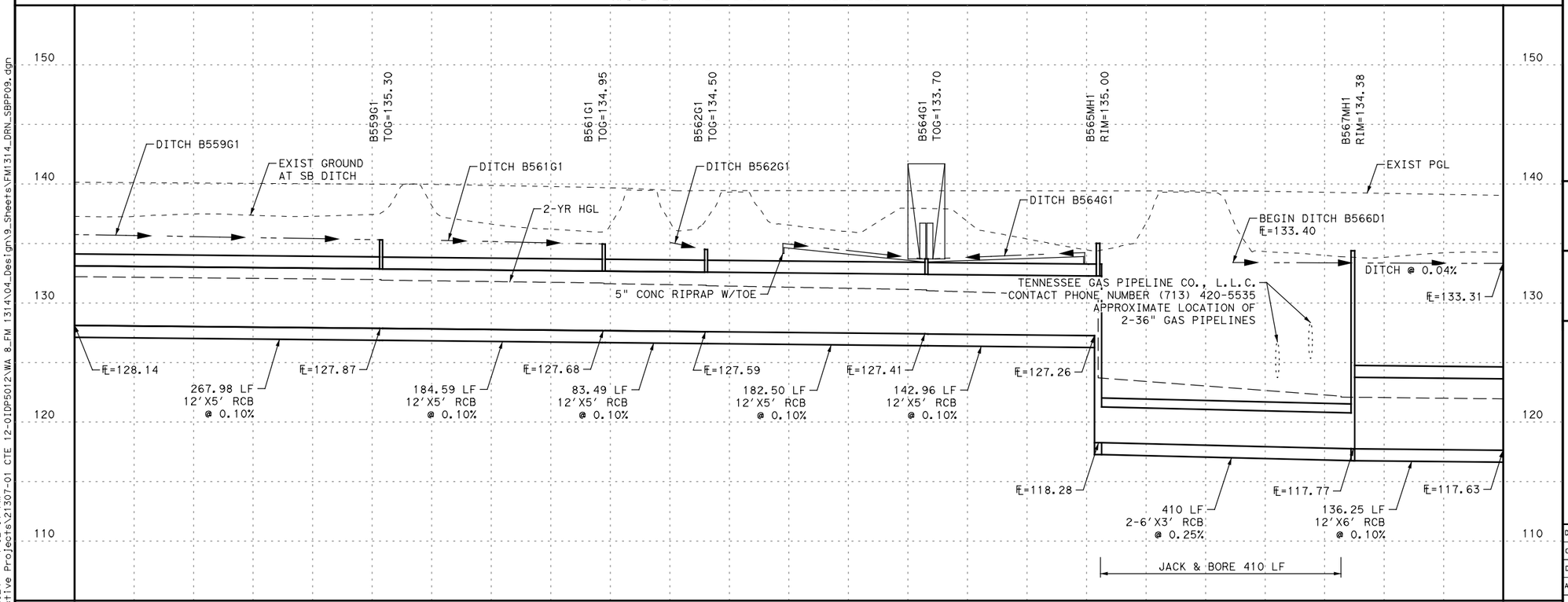

LEGEND

- ■ OR ○ PROP MANHOLE
- ■ OR ▫ PROP GRATE INLET
- PROP SET
- PROP ℄ DITCH
- EXISTING STORM SEWER
- PROP STORM SEWER
- CONCRETE RIPRAP

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0 5 10 (V)
SCALE IN FEET

STATE OF TEXAS
SHERVIN S. FARD
99431
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P.E
3/6/2024

OMEGA ENGINEERS, INC.
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Texas Department of Transportation

FM 1314

SB DRAINAGE PLAN & PROFILE

STA 557+00 TO STA 569+00

SHEET 9 OF 11

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
CK: SF	6	SEE COVER SHEET		138
DRN: MS	STATE	DIST.	COUNTY	
APPVD: PB	TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.	
1986	01	064	FM 1314	

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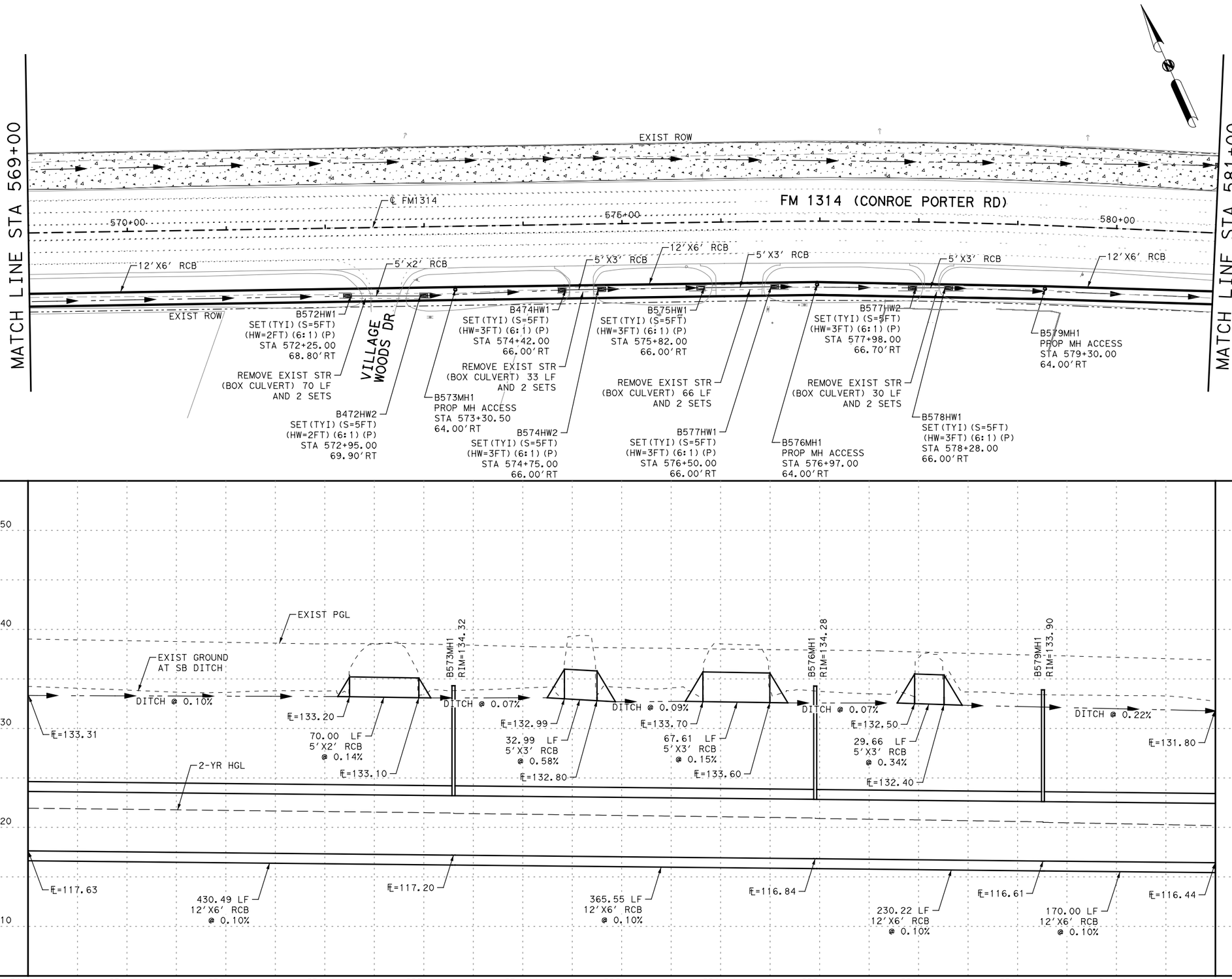

LEGEND

- OR ○ PROP MANHOLE
- OR ▫ PROP GRATE INLET
- PROP SET
- PROP ℄ DITCH
- EXISTING STORM SEWER
- PROP STORM SEWER
- CONCRETE RIPRAP

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0 50 100 (H)
0 5 10 (V)
SCALE IN FEET

STATE OF TEXAS
SHERVIN S. FARD
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LICENSED PROFESSIONAL ENGINEER
.PE
3/6/2024

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FM 1314

SB DRAINAGE PLAN & PROFILE

STA 569+00 TO STA 581+00

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.	SHEET NO.
CK: SF	6	SEE COVER SHEET	139
DRN: MS	STATE	DIST.	COUNTY
APPVD: PB	TEXAS	HOU	MONTGOMERY
CONT.	SECT.	JOB	HIGHWAY NO.
1986	01	064	FM 1314

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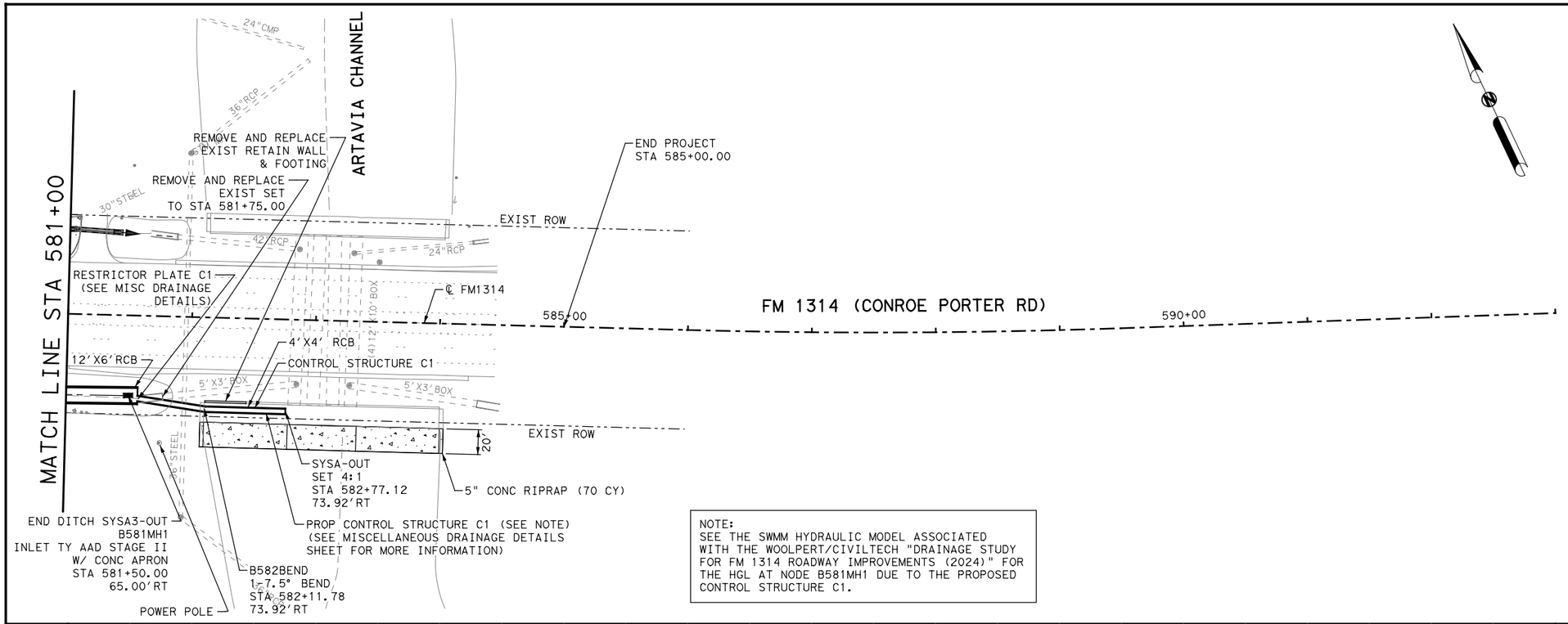
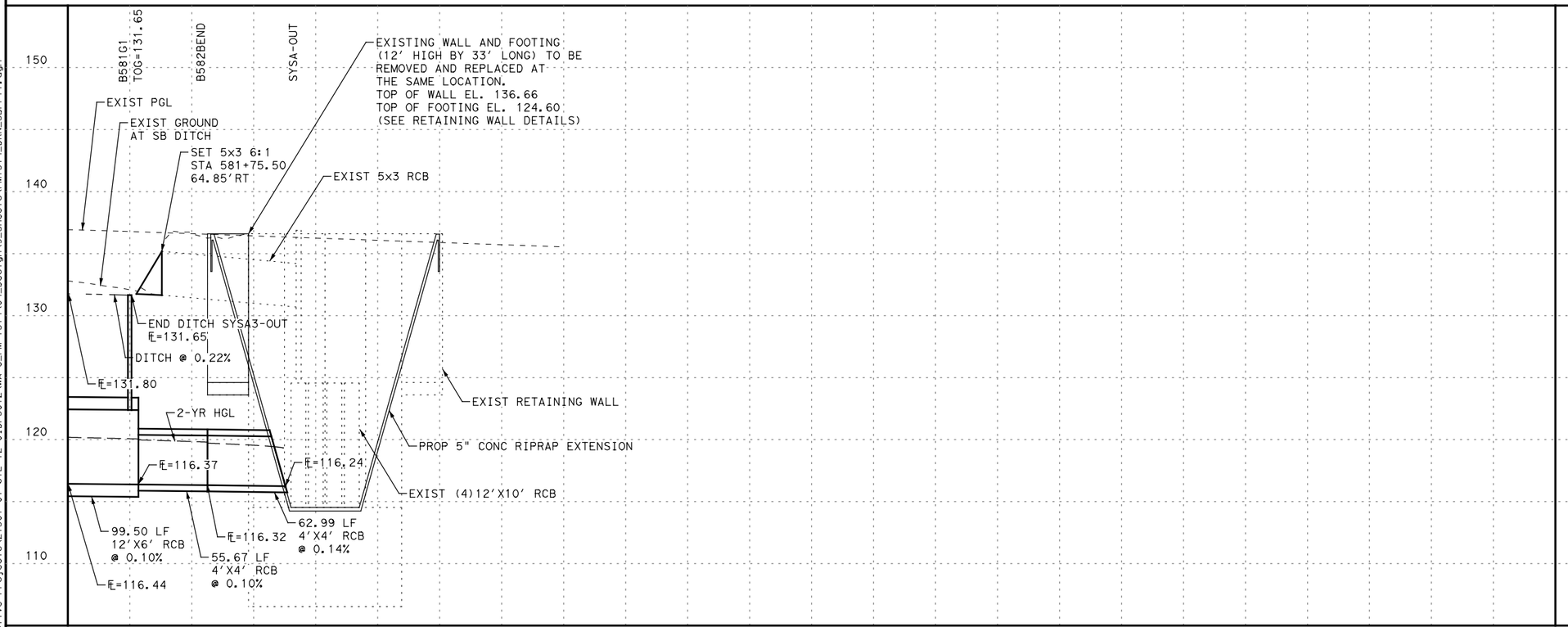


NOTE:
SEE THE SWMM HYDRAULIC MODEL ASSOCIATED WITH THE WOOLPERT/CIVILTECH "DRAINAGE STUDY FOR FM 1314 ROADWAY IMPROVEMENTS (2024)" FOR THE HGL AT NODE B581MH1 DUE TO THE PROPOSED CONTROL STRUCTURE C1.



LEGEND

- OR ○ PROP MANHOLE
- ■ OR ▫ PROP GRATE INLET
- PROP SET
- PROP ℄ DITCH
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- PROP STORM SEWER
- CONCRETE RIPRAP

NOTES:

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0 50 100 (H)
0 5 10 (V)
SCALE IN FEET

STATE OF TEXAS
SHERVIN S. FARD
99431
LICENSED PROFESSIONAL ENGINEER
P.E
3/6/2024

OMEGA ENGINEERS, INC.
16360 PARK TEN PLACE, Ste. #325
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OMEGAENGINEERS.COM
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Texas Department of Transportation

FM 1314

SB DRAINAGE PLAN & PROFILE

STA 581+00 TO END

SHEET 11 OF 11

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.	SHEET NO.
CK: SF	6	SEE COVER SHEET	140
DRN: MS	STATE	DIST.	COUNTY
APPVD: PB	TEXAS	HOU	MONTGOMERY
CONT.	SECT.	JOB	HIGHWAY NO.
1986	01	064	FM 1314

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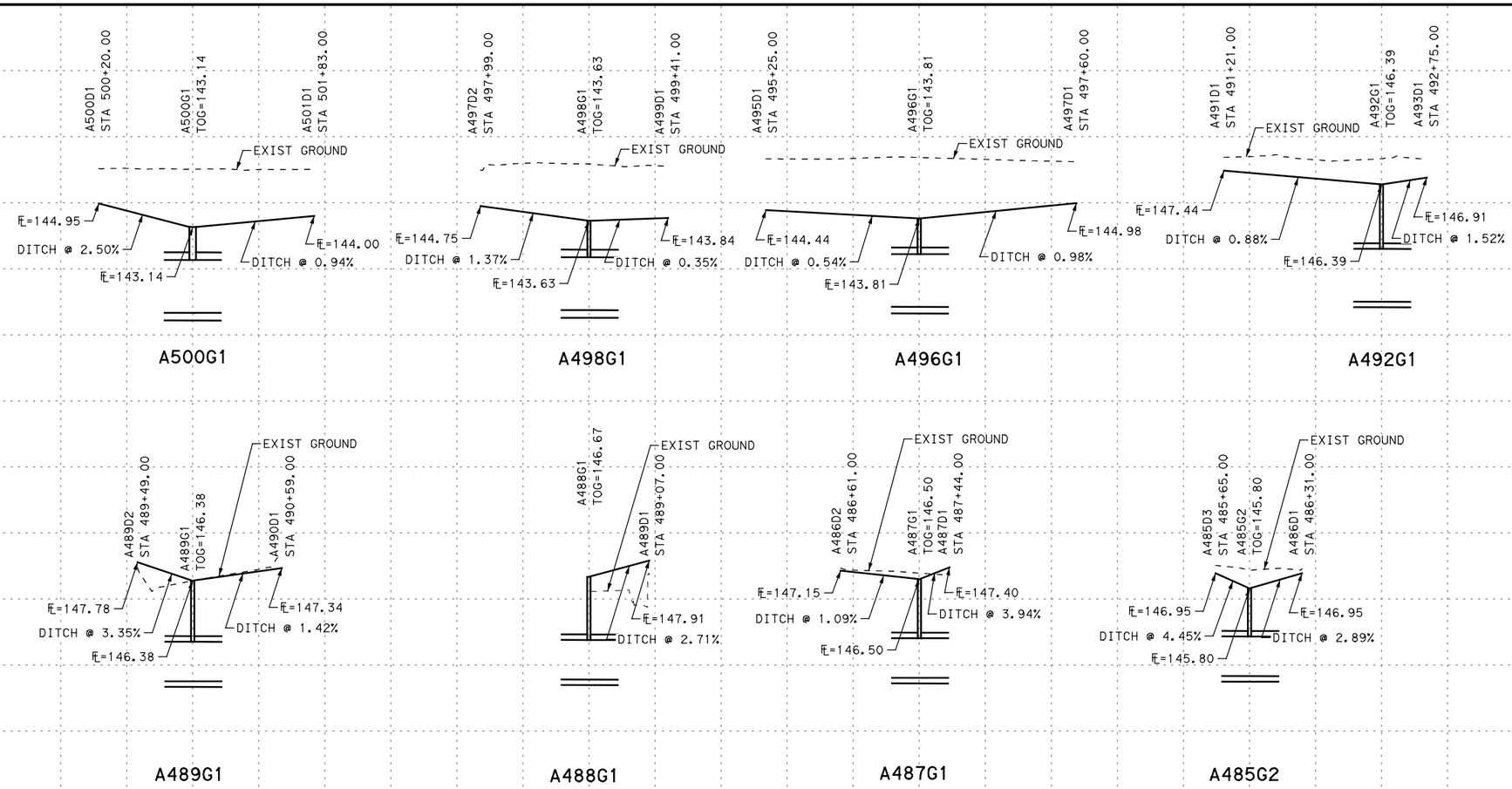

NOTE:

1. REFER TO NB AND SB DITCH TABLES FOR DITCH GEOMETRY.

0 50 100 (H)
0 5 10 (V)
SCALE IN FEET

STATE OF TEXAS
SHERVIN S. FARD
99431
LICENSED PROFESSIONAL ENGINEER
P.E

3/4/2024

OMEGA ENGINEERS, INC.
16360 PARK TEN PLACE, Ste. #325
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Texas Department of Transportation

FM 1314

ROADSIDE DITCH PROFILES

SHEET 1 OF 7

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
CK: SF	6	SEE COVER SHEET		141
DRN: MS	STATE	DIST.	COUNTY	
APPVD: PB	TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.	
1986	01	064	FM 1314	

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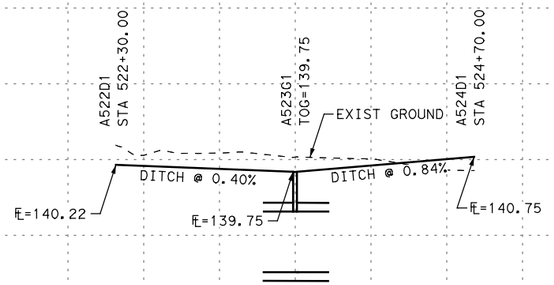

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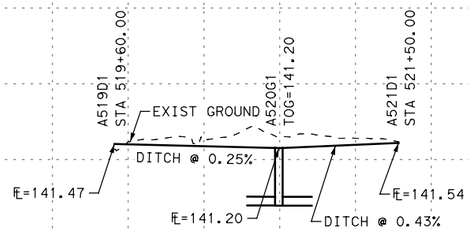

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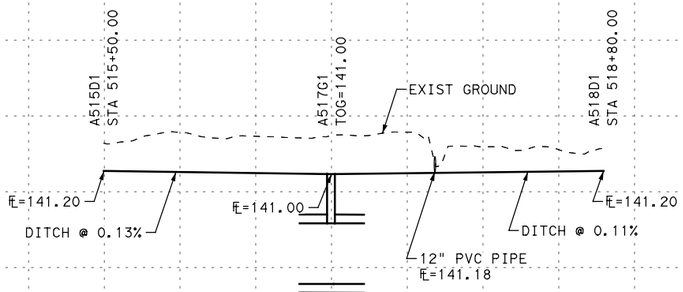

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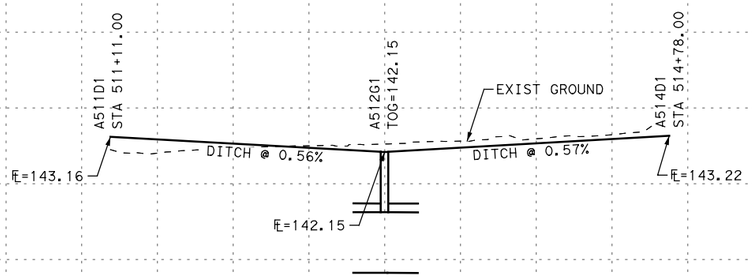

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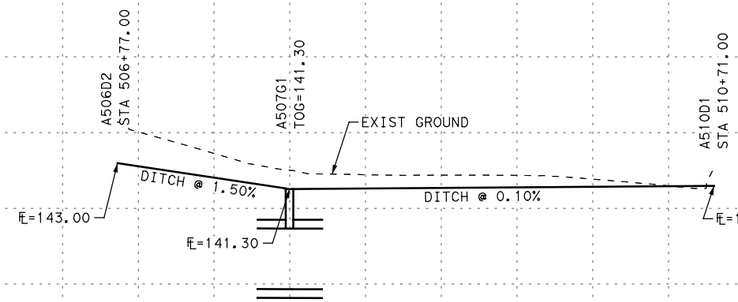

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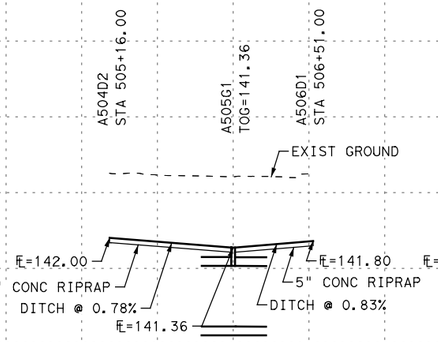

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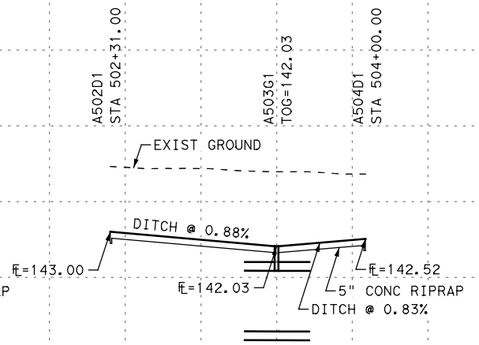

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NOTE:

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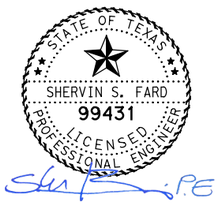
0 5 10 (V)
SCALE IN FEET



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Texas Department of Transportation

FM 1314

ROADSIDE DITCH PROFILES

SHEET 2 OF 7

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.	SHEET NO.
CK: SF	6	SEE COVER SHEET	142
DRN: MS	STATE	DIST.	COUNTY
APPVD: PB	TEXAS	HOU	MONTGOMERY
CONT.	SECT.	JOB	HIGHWAY NO.
1986	01	064	FM 1314

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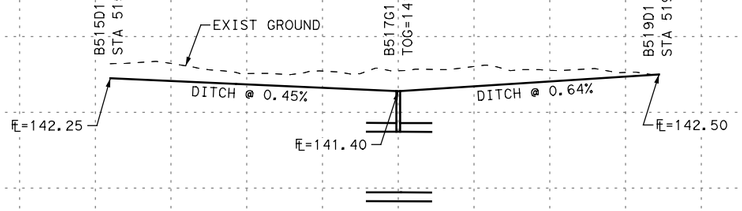

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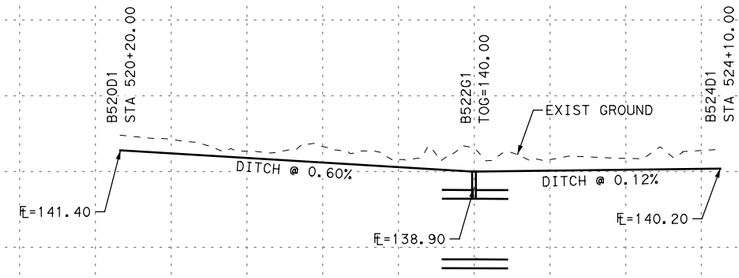

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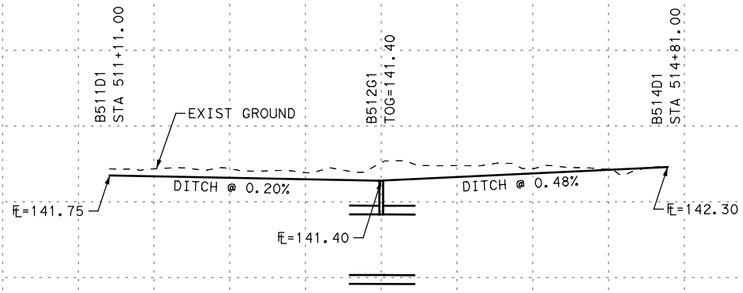

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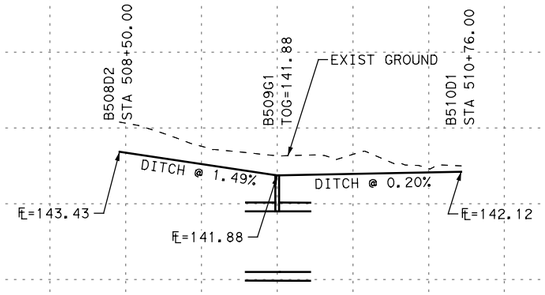

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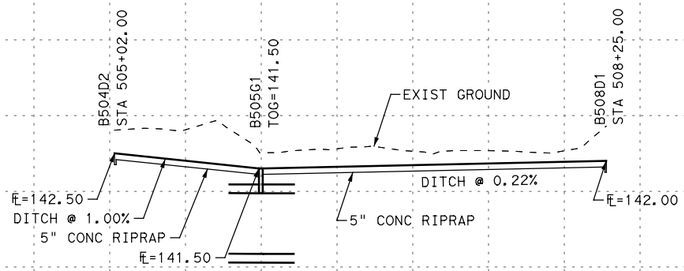

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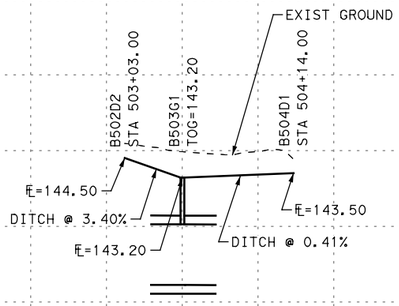

B503G1

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0 50 100 (H)
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SCALE IN FEET

STATE OF TEXAS
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P.E

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ROADSIDE DITCH PROFILES

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
CK: SF	6	SEE COVER SHEET		143
DRN: MS	STATE	DIST.	COUNTY	
APPVD: PB	TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.	
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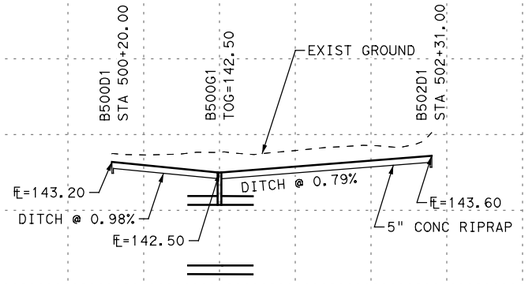

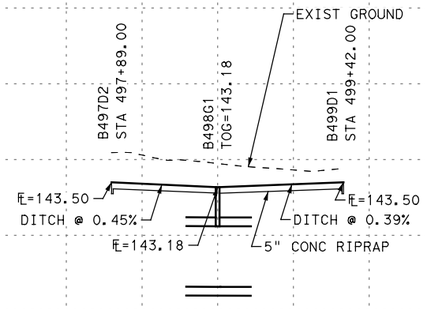

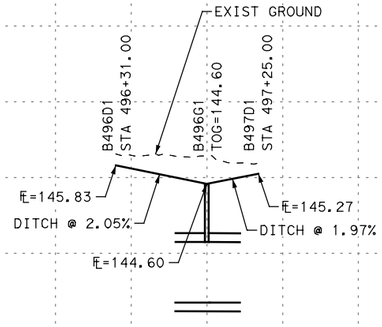

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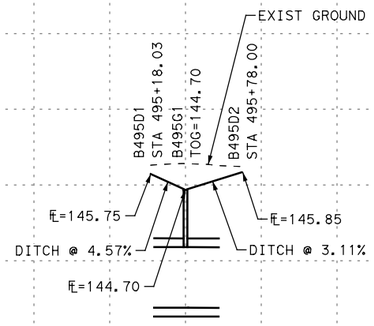

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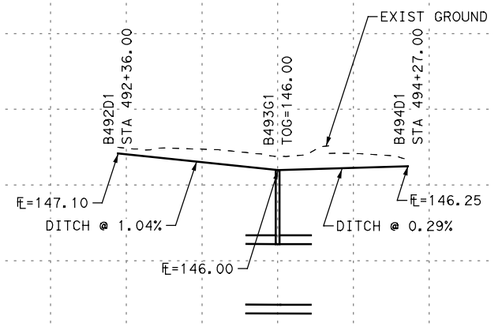

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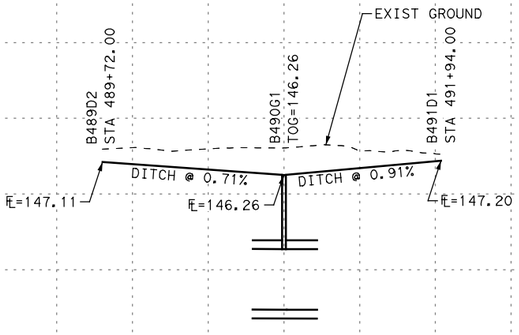

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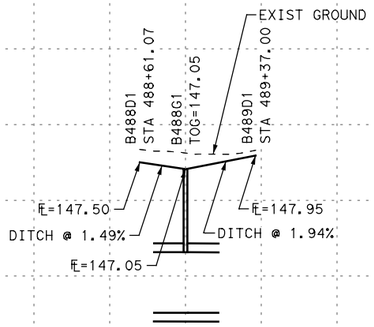

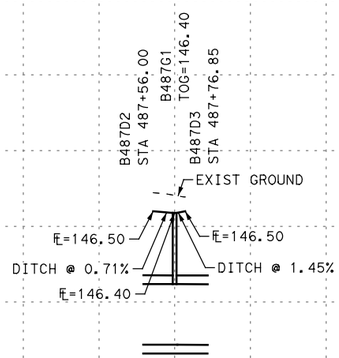

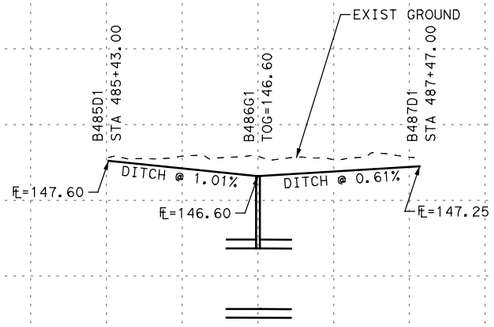

B488G1

B487G1

B486G1

NOTE:

1. REFER TO NB AND SB DITCH TABLES FOR DITCH GEOMETRY.

0 50 100 (H)
0 5 10 (V)
SCALE IN FEET

3/4/2024

OMEGA ENGINEERS, INC.
16360 PARK TEN PLACE, Ste. #325
HOUSTON TEXAS, 77084
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TX PE Firm Reg. No. F-2147
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Texas Department of Transportation

FM 1314

ROADSIDE DITCH PROFILES

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
CK: SF	6	SEE COVER SHEET		144
DRN: MS	STATE	DIST.	COUNTY	
APPVD: PB	TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.	
1986	01	064	FM 1314	

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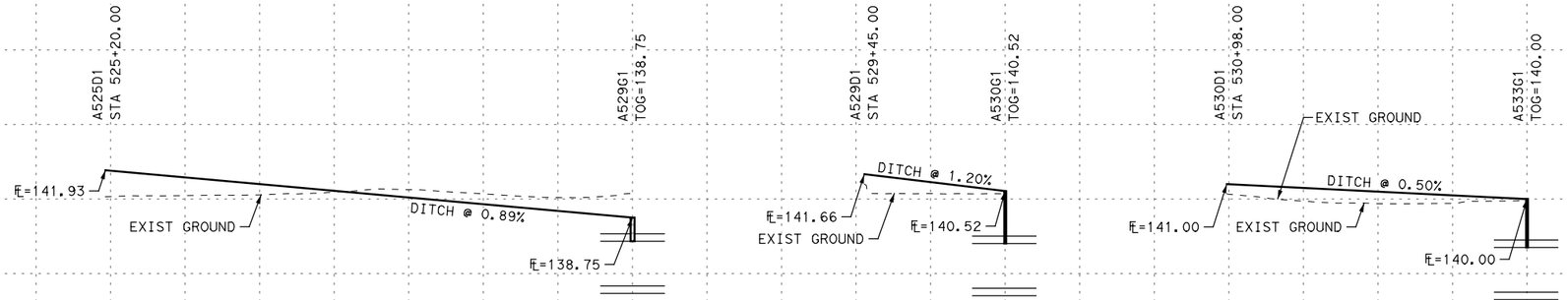

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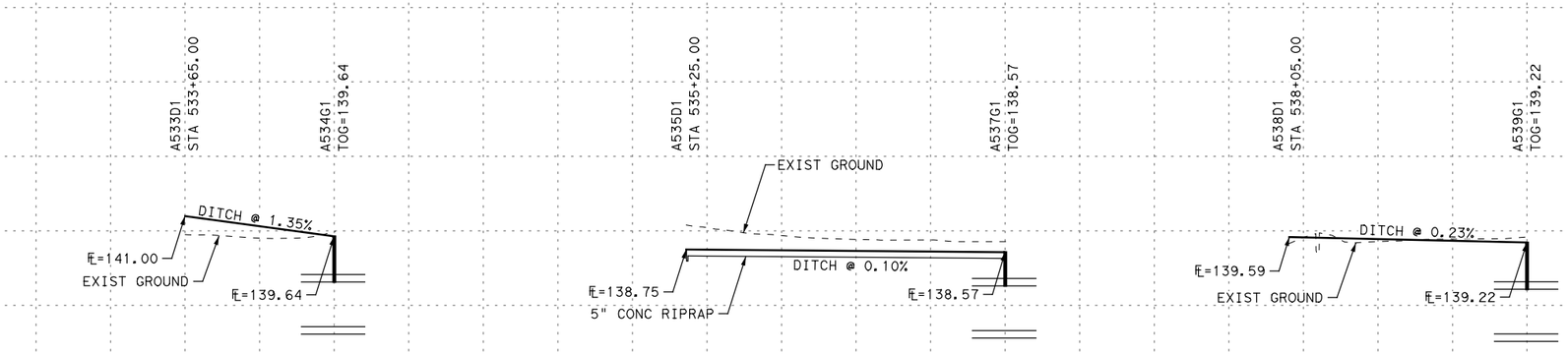

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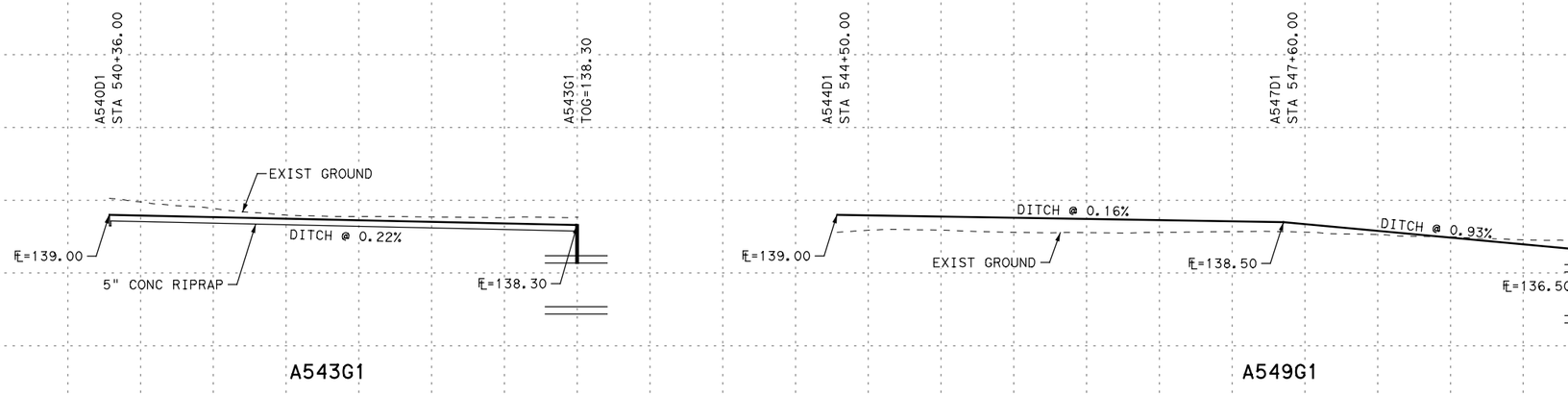

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NOTE:

1. REFER TO NB AND SB DITCH TABLES FOR DITCH GEOMETRY.

0 50 100 (H)
0 5 10 (V)
SCALE IN FEET

STATE OF TEXAS
SHERVIN S. FARD
99431
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PROFESSIONAL ENGINEER
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ROADSIDE DITCH PROFILES

SHEET 5 OF 7

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.	SHEET NO.
CK: SF	6	SEE COVER SHEET	145
DRN: MS	STATE	DIST.	COUNTY
APPVD: PB	TEXAS	HOU	MONTGOMERY
CONT.	SECT.	JOB	HIGHWAY NO.
1986	01	064	FM 1314

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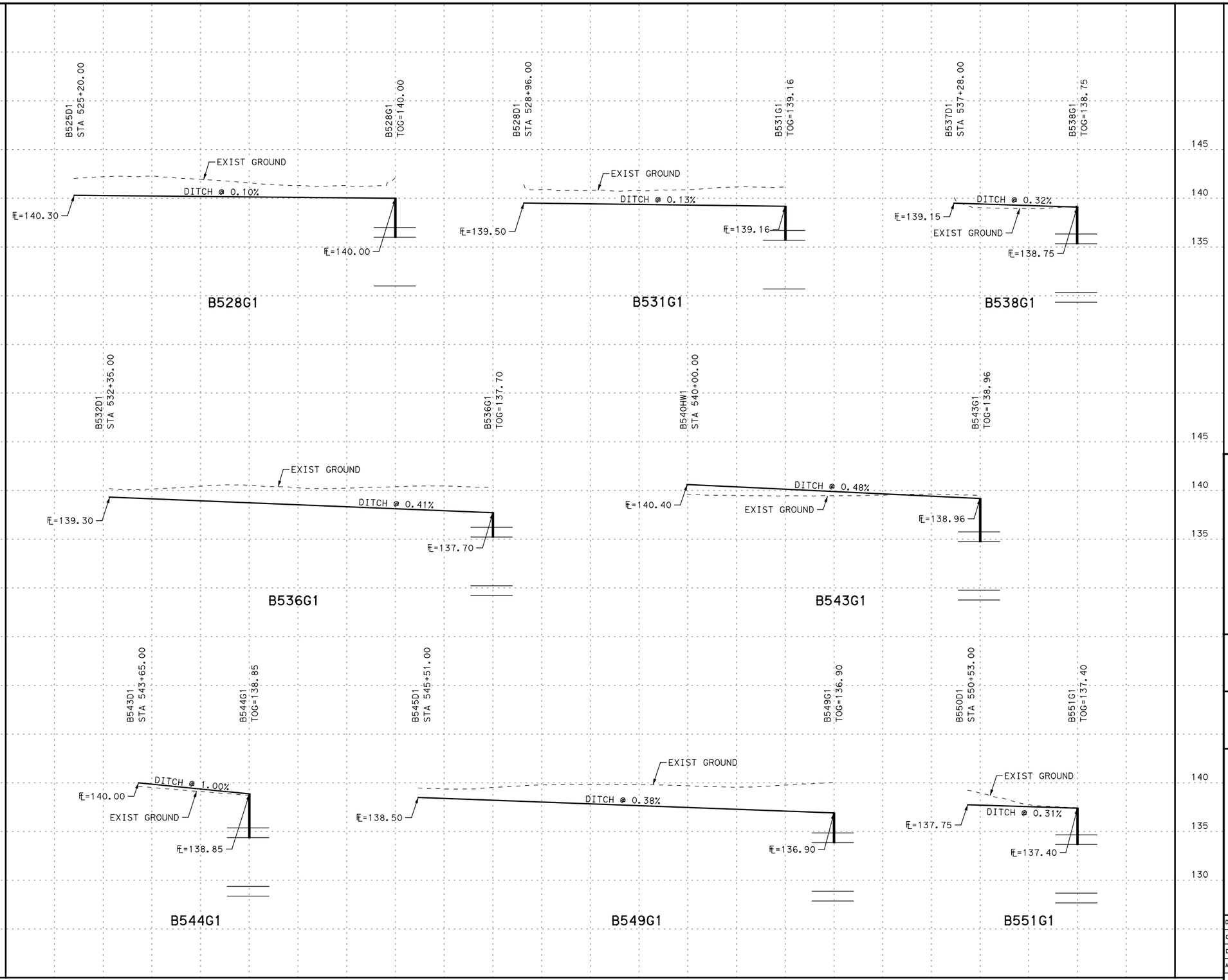

NOTE:

1. REFER TO NB AND SB DITCH TABLES FOR DITCH GEOMETRY.

0 50 100 (H)
0 5 10 (V)
SCALE IN FEET

STATE OF TEXAS
SHERVIN S. FARD
99431
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ROADSIDE DITCH PROFILES

SHEET 6 OF 7

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.	SHEET NO.
CK: SF	6	SEE COVER SHEET	146
DRN: MS	STATE	DIST.	COUNTY
APPVD: PB	TEXAS	HOU	MONTGOMERY
CONT.	SECT.	JOB	HIGHWAY NO.
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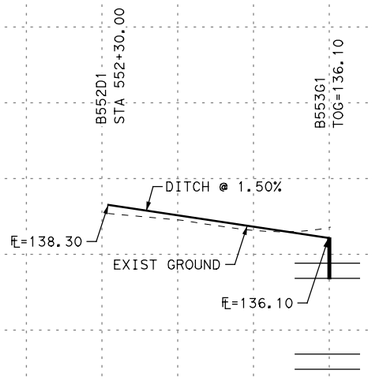

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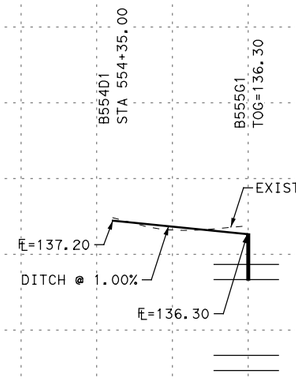

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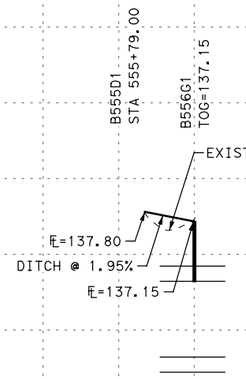

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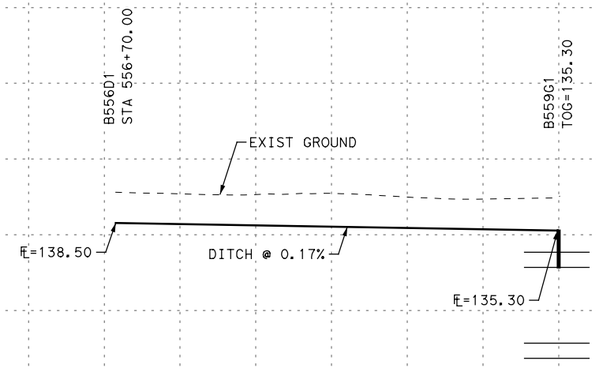

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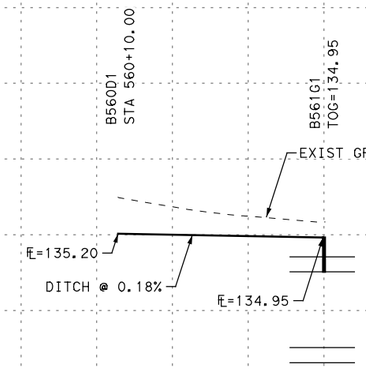

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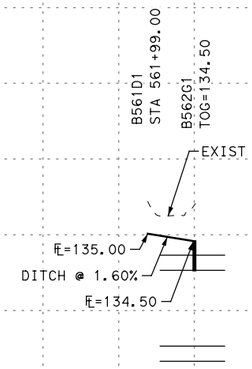

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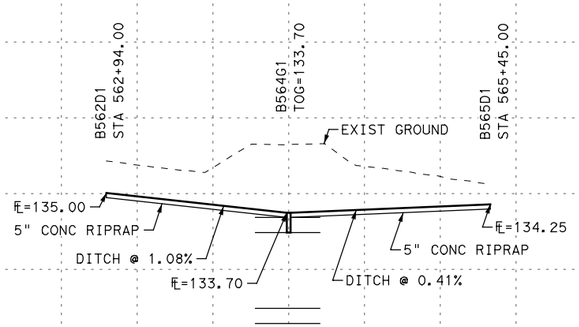

B564G1

NOTE:

1. REFER TO NB AND SB DITCH TABLES FOR DITCH GEOMETRY.

0 50 100 (H)
0 5 10 (V)
SCALE IN FEET

STATE OF TEXAS
SHERVIN S. FARD
99431
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ROADSIDE DITCH PROFILES

SHEET 7 OF 7

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
CK: SF	6	SEE COVER SHEET		147
DRN: MS	STATE	DIST.	COUNTY	
APPVD: PB	TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.	
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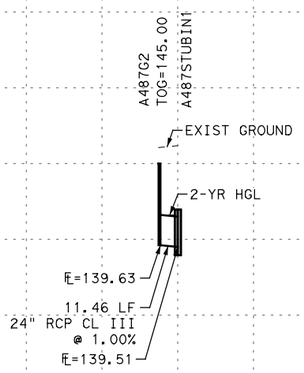

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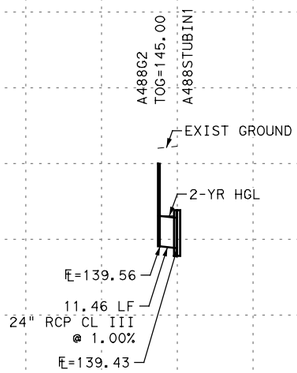

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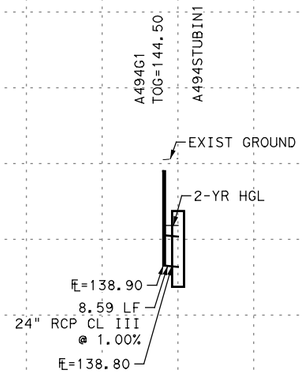

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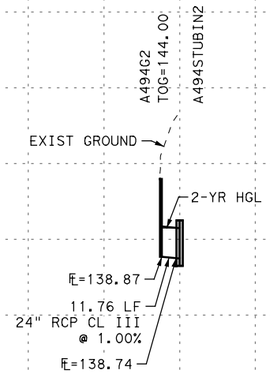

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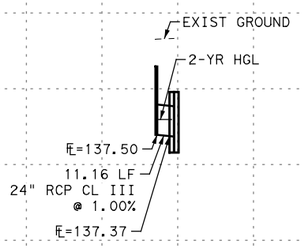

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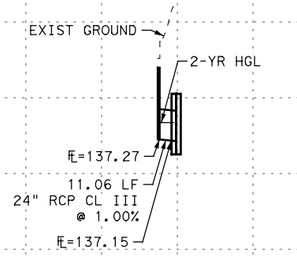

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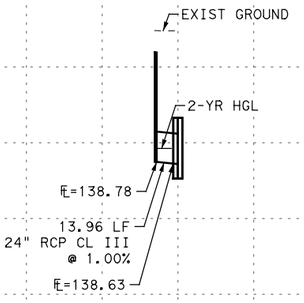

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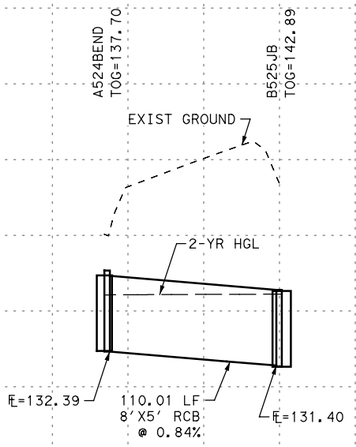

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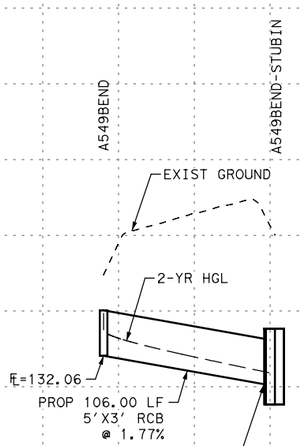

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0 5 10 (V)
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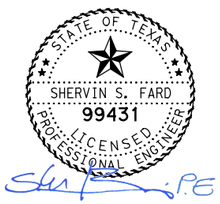

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DRAINAGE LATERALS

SHEET 1 OF 1

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
CK: SF	6	SEE COVER SHEET		148
DRN: MS	STATE	DIST.	COUNTY	
APPVD: PB	TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.	
1986	01	064	FM 1314	

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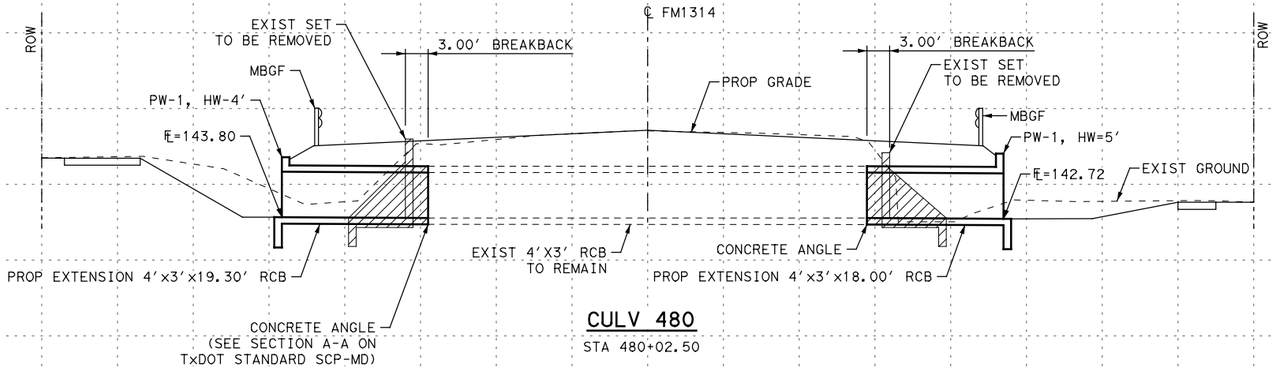
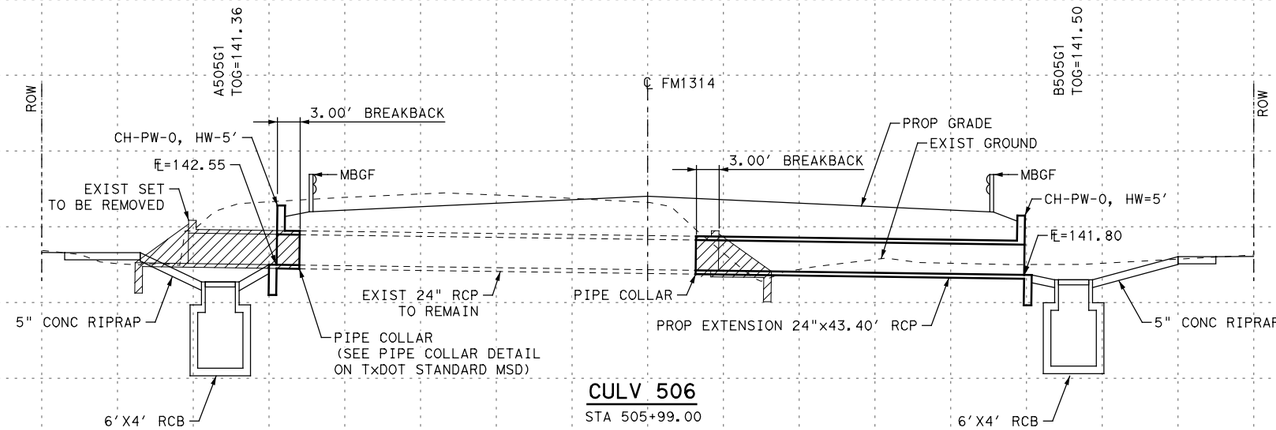


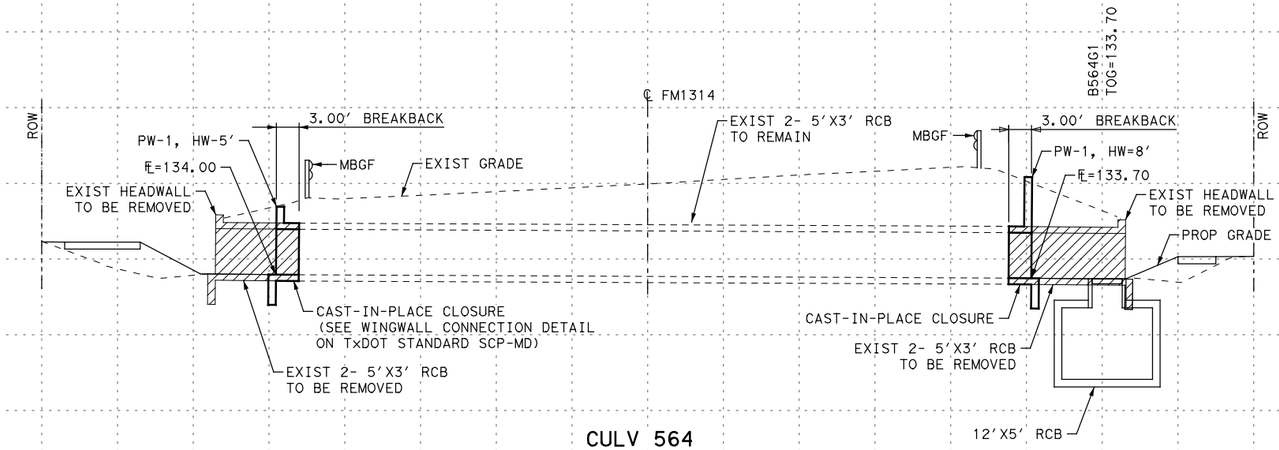
CULV 480

STA 480+02.50



CULV 506

STA 505+99.00



CULV 564

STA 564+13.00

LEGEND

REMOVAL

0 10 20 (H)
0 5 10 (V)
SCALE IN FEET

STATE OF TEXAS
SHERVIN S. FARD
99431
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P.E.

3/4/2024

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FM 1314

CULVERT LAYOUTS

SHEET 1 OF 1

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.	SHEET NO.
CK: SF	6	SEE COVER SHEET	149
DRN: MS	STATE	DIST.	COUNTY
APPVD: PB	TEXAS	HOU	MONTGOMERY
CONT.	SECT.	JOB	HIGHWAY NO.
1986	01	064	FM 1314

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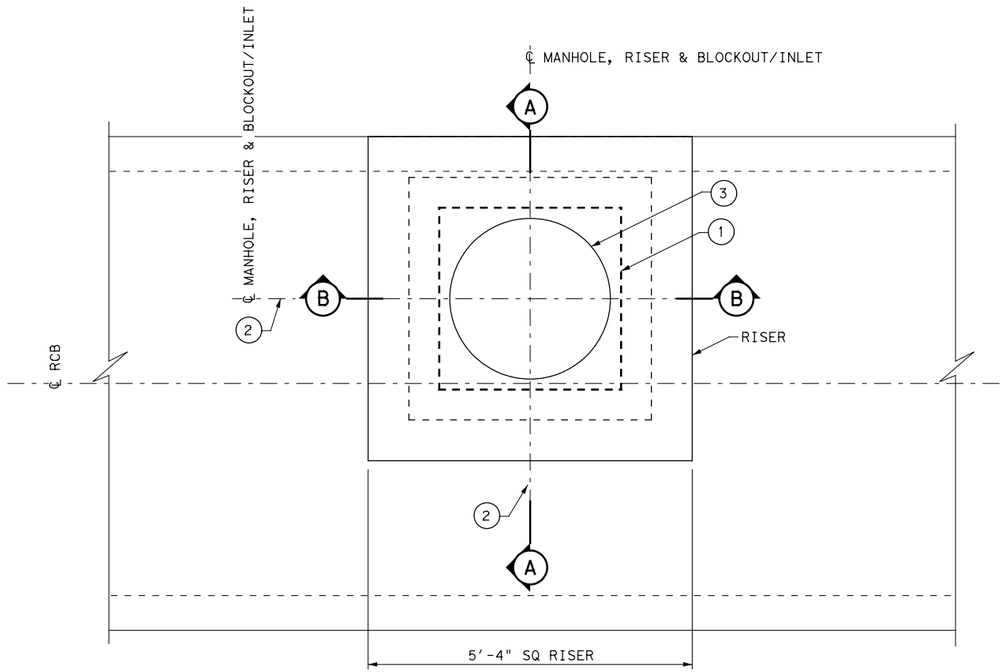
NODE ID *	TYPE	ALIGNMENT	STA	OFFSET	D
B567MH1	MANHOLE	FM1314	567+70.00	64.00'RT	4.00'
B573MH1	MANHOLE	FM1314	573+30.50	64.00'RT	4.00'
B576MH1	MANHOLE	FM1314	576+97.00	64.00'RT	4.00'
B579MH1	MANHOLE	FM1314	579+30.00	64.00'RT	4.00'

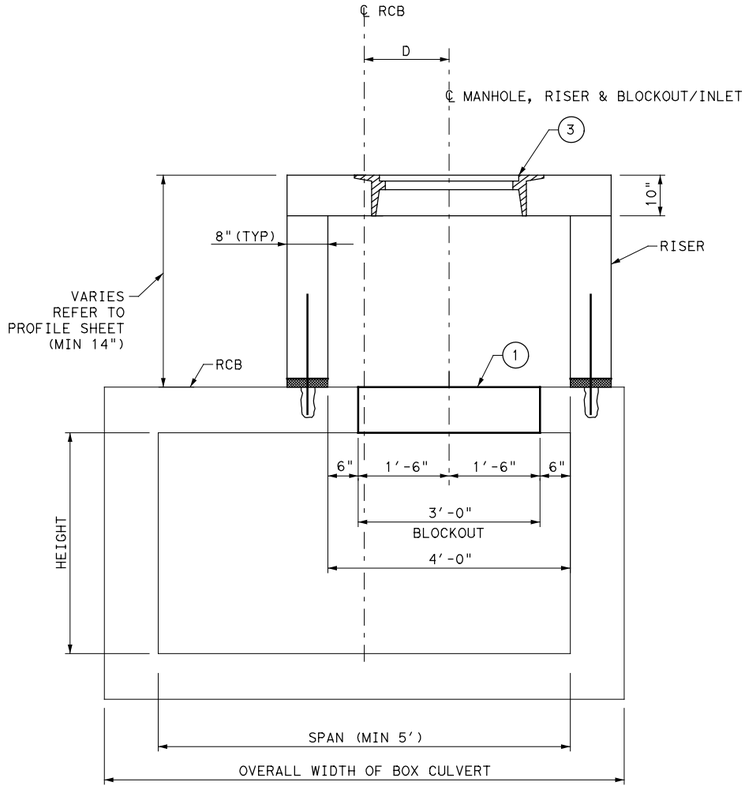
* FOR INLETS/MANHOLES ON TOP OF RCB NOT SHOWN IN TABLE, D= 0. THE CENTER OF RCB SHALL BE CENTERED ON THE CENTER OF STRUCTURE.



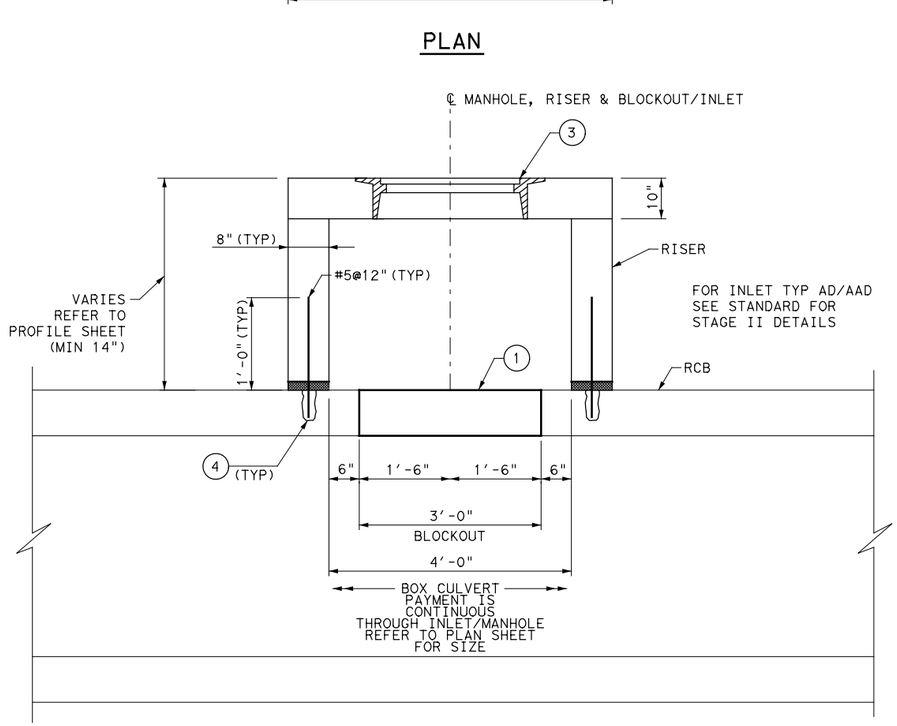
PLAN

NOTES:

1. PROVIDE 3'-0" X 3'-0" BLOCKOUT, FIELD CUT BARS AS DIRECTED, AND GROUT EXPOSED FACES TO SMOOTH FINISH. BLOCKOUT AND ASSOCIATED WORK AND MATERIALS WILL NOT BE PAID FOR DIRECTLY, BUT WILL BE SUBSIDIARY TO ITEM 465.
2. ORIENT BLOCKOUT USING MANHOLE LOCATION OR AS DIRECTED.
3. SEE MH-A/B TYPE B AND INLET TYPE AD STANDARD SHEETS FOR RISER DETAILS.
4. DRILL & EPOXY DOWELS INTO BOX CULVERT. MINIMUM EMBEDMENT SHALL BE 2" LESS THAN THE THICKNESS OF THE TOP SLAB OF THE BOX CULVERT, UP TO A MAXIMUM OF 6".
5. D= DISTANCE BETWEEN ℄ OF MANHOLE AND ℄ OF RCB.



SECTION A-A



SECTION B-B

STATE OF TEXAS
SHERVIN S. FARD
99431
LICENSED
PROFESSIONAL ENGINEER
P.E
3/4/2024

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RCB MANHOLE INLET RISER DETAILS

SHEET 1 OF 1

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
CK: SF	6	SEE COVER SHEET		150
DRN: MS	STATE	DIST.	COUNTY	
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CONT.	SECT.	JOB	HIGHWAY NO.	
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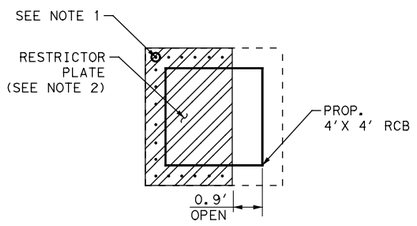
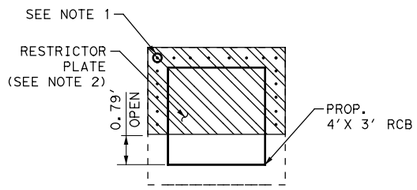


RESTRICTOR PLATE C1

NTS

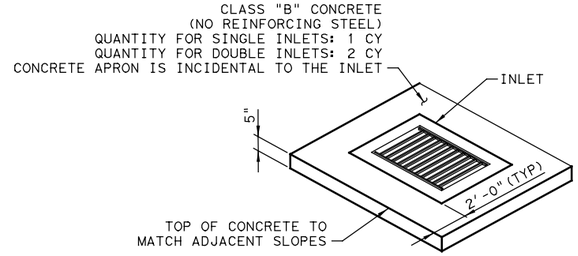
RESTRICTOR PLATE NOTES

1. HOLES IN PLATE TO BE 9/16" DIA W/ 1/2" DIA THREADED ANCHOR RODS DRILLED & EMBEDDED 6" INTO RCB (HILTI HY150 EPOXY W/ HILTI HIT ANCHOR RODS OR EQUAL) EVENLY SPACED 6" MAX
2. PLATE TO BE 7/8" THICK A36 STEEL GALVANIZED
3. RESTRICTOR PLATE SHALL BE PAID FOR UNDER ITEM 464.
4. SEE THE SWMM HYDRAULIC MODEL ASSOCIATED WITH THE CIVILTECH "DRAINAGE STUDY FOR FM 1314 ROADWAY IMPROVEMENTS(2024)" FOR THE HGL AT THE PROPOSED CONTROL STRUCTURE C1.



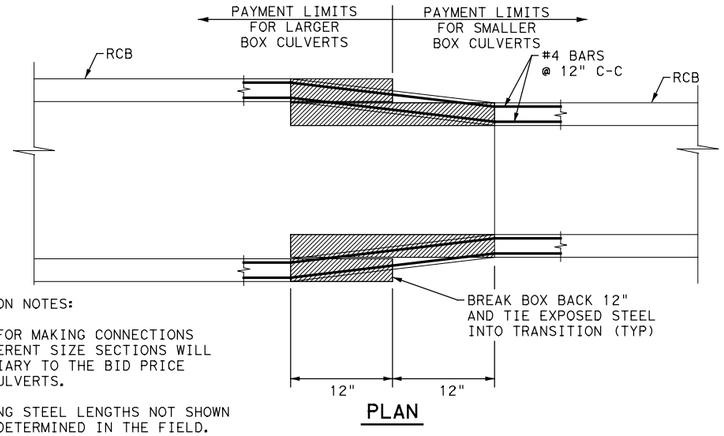
RESTRICTOR PLATE C2

NTS



CONCRETE APRON DETAIL

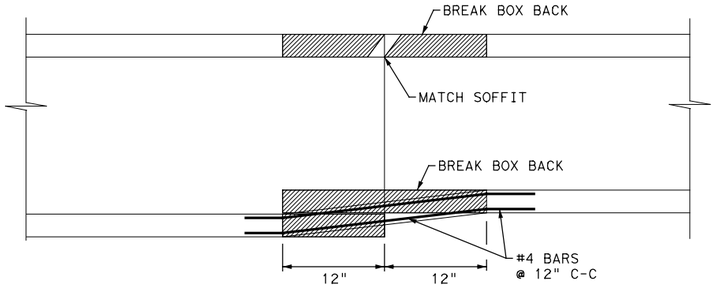
NTS
TYPE AD INLET SHOWN
TYPE AAD INLET SIMILAR



PLAN

RCB TRANSITION NOTES:

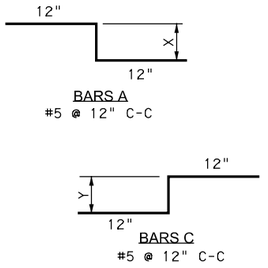
1. ALL COST FOR MAKING CONNECTIONS WITH DIFFERENT SIZE SECTIONS WILL BE SUBSIDIARY TO THE BID PRICE FOR BOX CULVERTS.
2. REINFORCING STEEL LENGTHS NOT SHOWN SHALL BE DETERMINED IN THE FIELD.
3. PRECAST JOINT CONNECTIONS WILL BE ACCEPTED UPON APPROVAL BY THE ENGINEER.



SECTION

RCB TRANSITION DETAIL

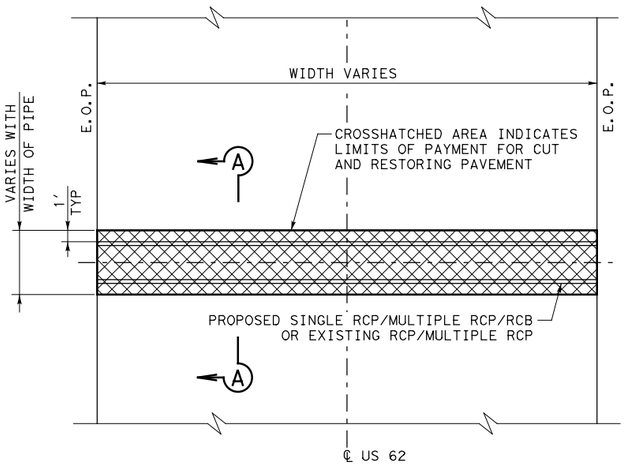
NTS



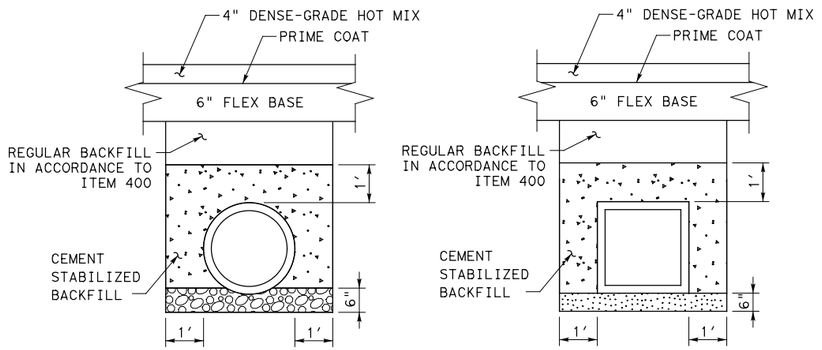
COVER DIMENSIONS ARE CLEAR DIMENSIONS UNLESS NOTED OTHERWISE. REINFORCING BAR DIMENSIONS SHOWN ARE OUT-TO-OUT OF BARS.

RCB TRANSITION MATERIAL NOTES:

1. PROVIDE CLASS C CONCRETE STRENGTH f'C = 3.600 psi.
2. PROVIDE GRADE 60 REINFORCING STEEL.



PLAN



SECTION A-A

CUT & RESTORE NOTES

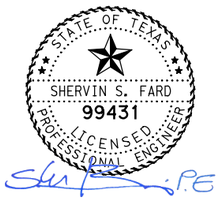
1. FOR PAYMENT OF FLOWABLE FILL REFER TO SUMMARY OF DRAINAGE ITEMS - ITEM 400.
2. THE LENGTH LIMITS FOR FLOWABLE FILL SHALL EXTEND 1' BEYOND THE PAVEMENT EDGE.
3. ANY EXCAVATION WIDTH EXCEEDING THE LIMITS SHOWN SHALL BE BACKFILLED IN ACCORDANCE WITH THIS SHEET.
4. FOR CUT AND RESTORE, PAVEMENT STRUCTURE QUANTITIES SHALL BE SUBSIDIARY TO ITEM 400-6008 CUT AND RESTORE ASPH PAVING.
5. BEDDING SHALL BE SUBSIDIARY TO ITEMS 462 & 464.

LEGEND

COMPACTED GRANULAR MATERIAL

FINE GRANULAR MATERIAL (2 IN. MIN)

CUT & RESTORE DETAIL



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Texas Department of Transportation

FM 1314

MISCELLANEOUS DRAINAGE DETAILS

SHEET 1 OF 1

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
CK: SF	6	SEE COVER SHEET		151
DRN: MS	STATE	DIST.	COUNTY	
APPVD: PB	TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.	
1986	01	064	FM 1314	

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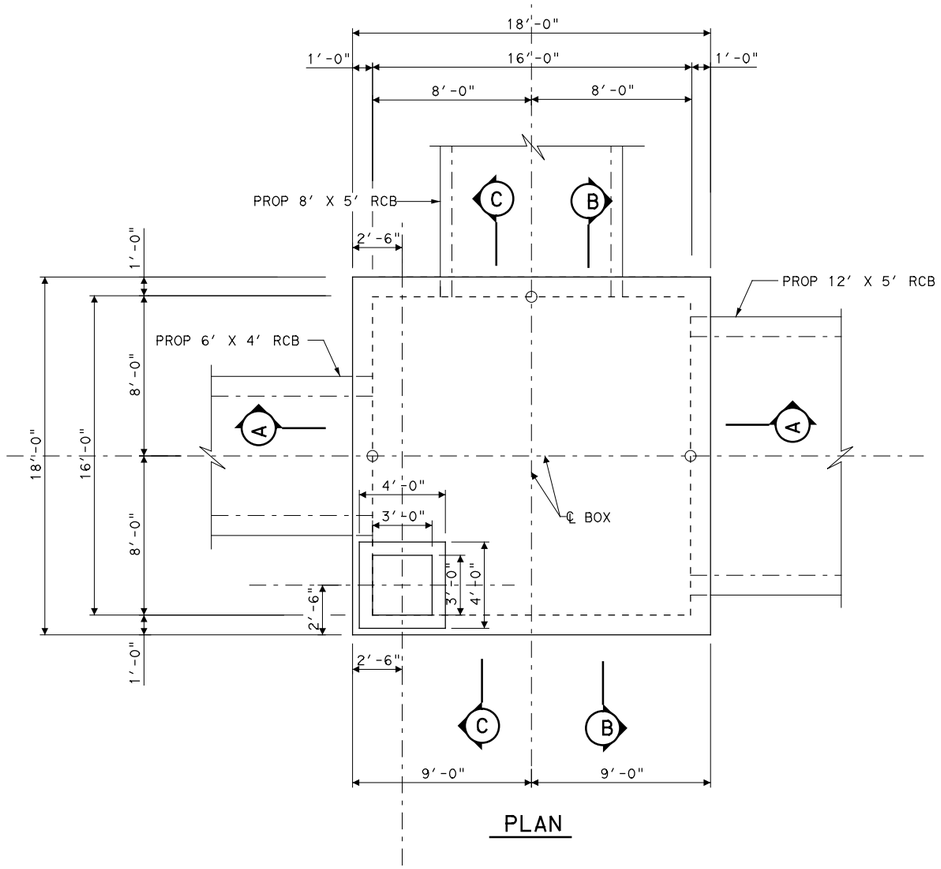
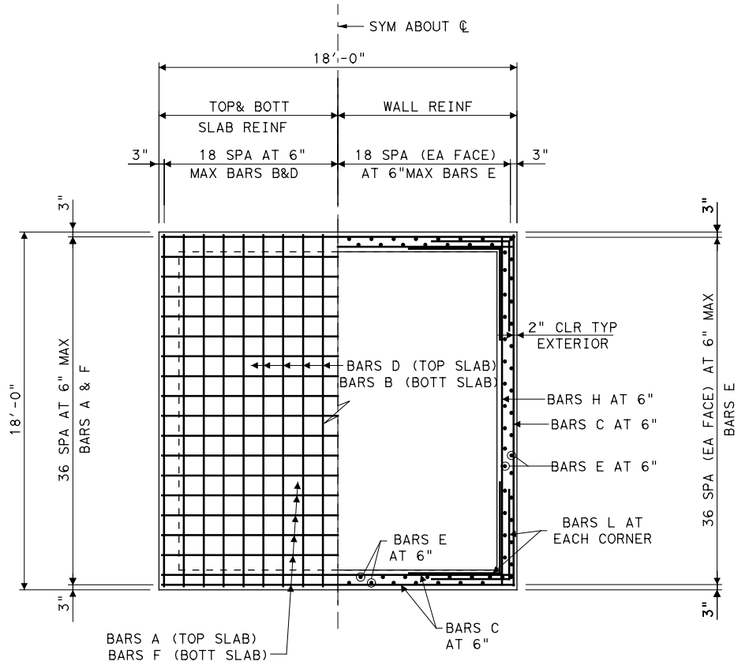


PLAN



PLAN SHOWING REINFORCING

NOTE: CUT AND BEND REINFORCING TO CLEAR OPENINGS

BAR TABLE	
BAR	SIZE
A	#7
B	#7
C	#5
D	#7
E	#5
F	#7
G	#5
H	#4
L	#5

ESTIMATED QUANTITIES		
ITEM	UNIT	QUANTITY
JCT BOX (COMPL) (SPL)	EA	1
CLASS C CONC *	CY	45.5

* CLASS C CONC QUANTITY IS FOR CONTRACTOR'S INFORMATION ONLY

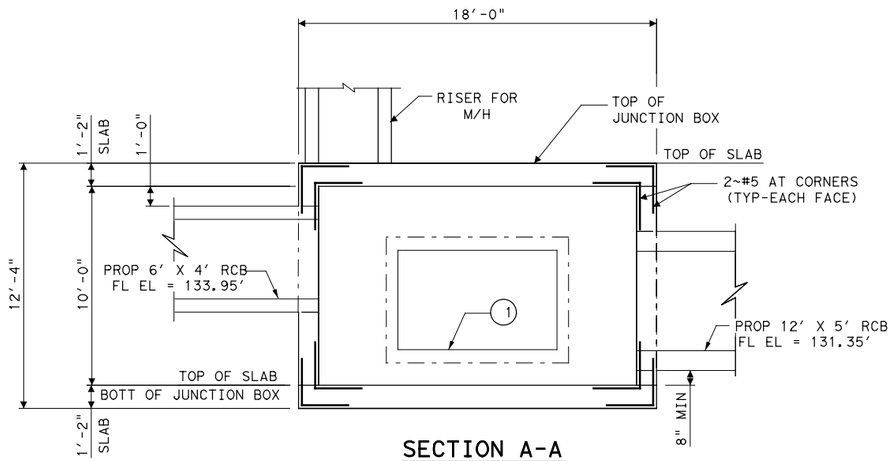
(1) PROPOSED 8′X5′ RCB, FLOW ELEV =131.40′

(2) PROPOSED 12′X5′ RCB, FLOW ELEV =131.35′

(3) PROPOSED 6′X4′ RCB, FLOW ELEV =133.95′

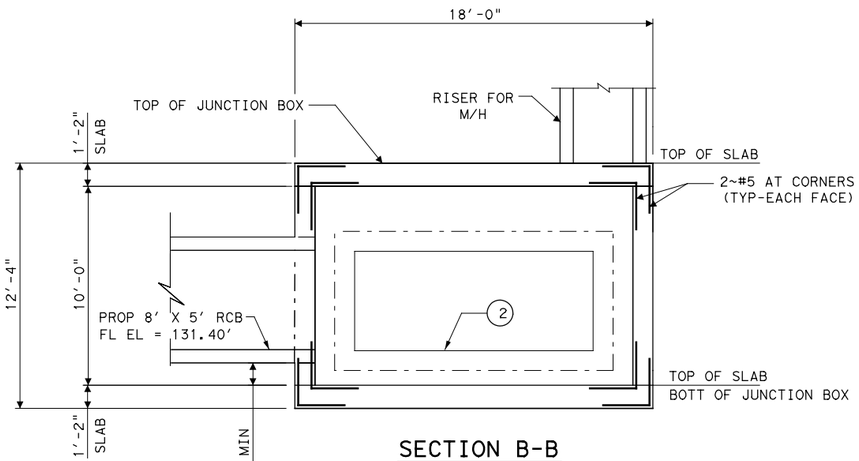
GENERAL NOTES:

1. DESIGNED ACCORDING TO AASHTO LRFD SPECIFICATIONS WITH CURRENT INTERIMS
2. ALL REINFORCING STEEL TO BE GRADE 60.
3. REINFORCING STEEL TO BE ADJUSTED TO PROVIDE A MINIMUM OF 2" OF CLEAR COVER UNLESS OTHERWISE NOTED.
4. FIELD VERIFY ALL DIMENSIONS PRIOR TO ORDERING MATERIALS AND COMMENCING WORK.



SECTION A-A

NOTE: CUT AND BEND WALL REINFORCING TO CLEAR OPENINGS



SECTION B-B

NOTE: CUT AND BEND WALL REINFORCING TO CLEAR OPENINGS

STATE OF TEXAS
GODWIN A. ARTHUR
127720
PROFESSIONAL ENGINEER
LICENSED

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JUNCTION BOX DETAILS B525JB

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
CK: SF	6	SEE COVER SHEET		152
DRN: MS	STATE	DIST.	COUNTY	
APPVD: PB	TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.	
1986	01	064	FM 1314	

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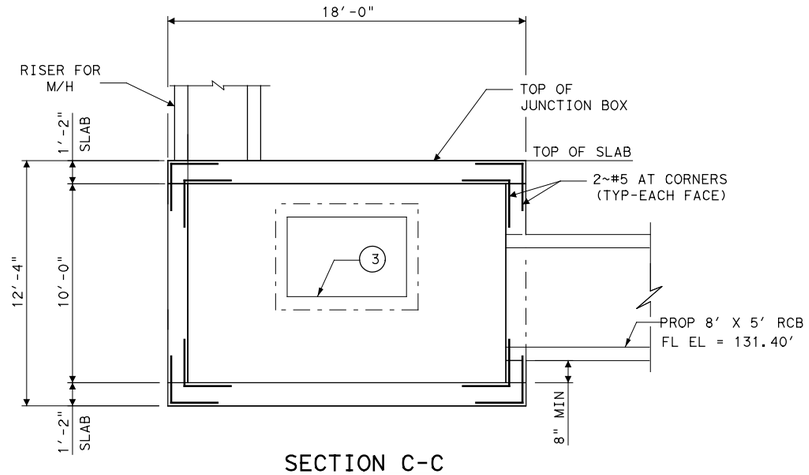
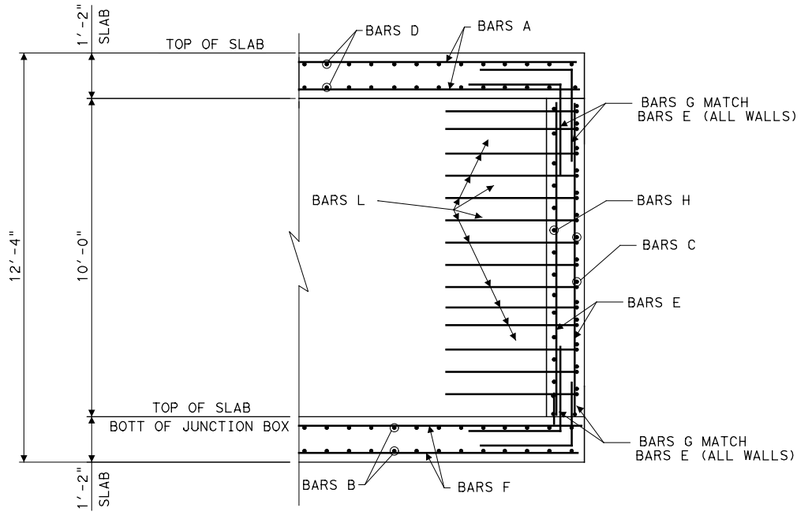


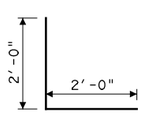
SECTION C-C

NOTE: CUT AND BEND WALL REINFORCING TO CLEAR OPENINGS



TYPICAL REINFORCING DETAIL

NOTE: CUT AND BEND WALL REINFORCING TO CLEAR OPENINGS



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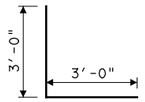

BARS-G

GODWIN A. ARTHUR
127720
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS
3/4/2024

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FM 1314

JUNCTION BOX DETAILS
B525JB

SHEET 2 OF 2

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
CK: SF	6	SEE COVER SHEET		153
DRN: MS	STATE	DIST.	COUNTY	
APPVD: PB	TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.	
1986	01	064	FM 1314	

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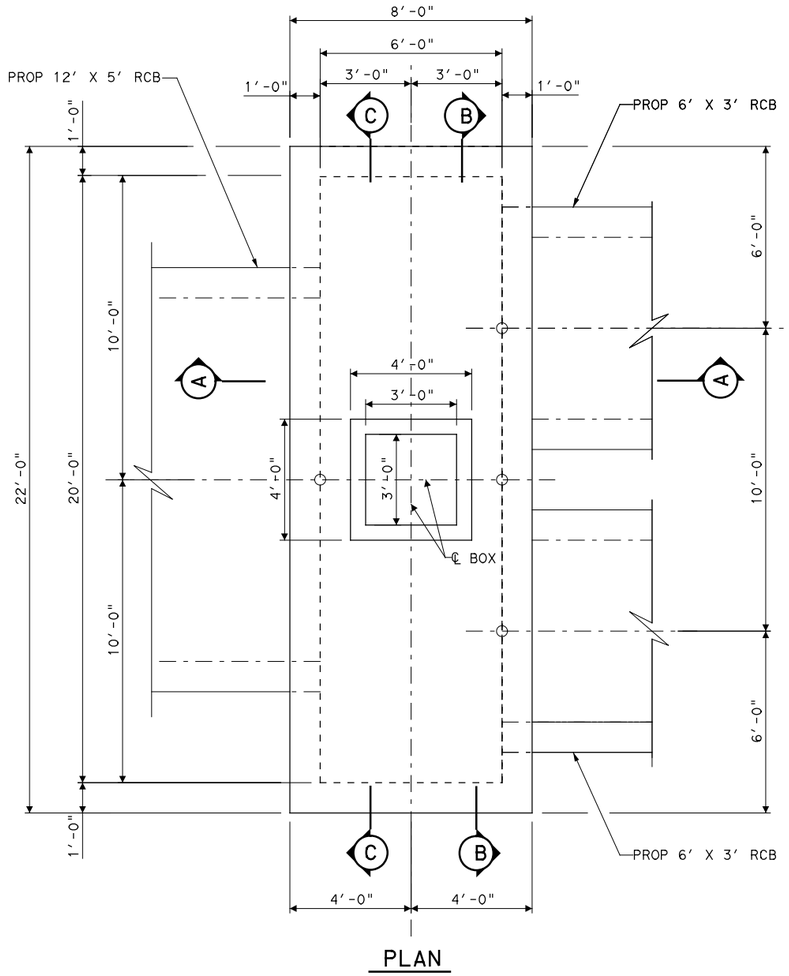
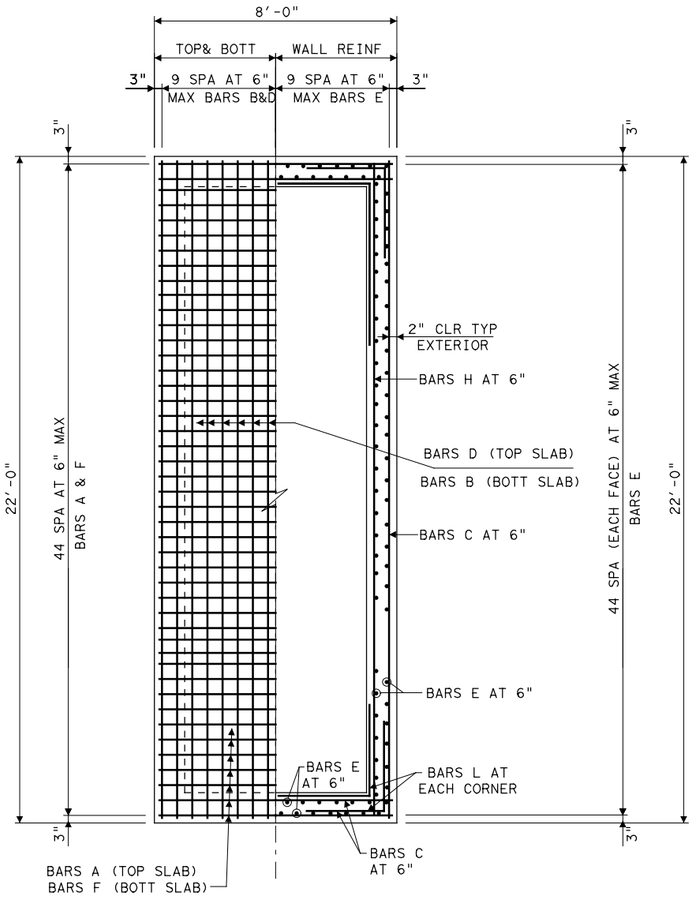


PLAN



PLAN SHOWING REINFORCING

ESTIMATED QUANTITIES

ITEM	UNIT	QUANTITY
JCT BOX (COMPL) (SPL)	EA	1
CLASS C CONC *	CY	47.9

* CLASS C CONC QUANTITY IS FOR CONTRACTOR'S INFORMATION ONLY

BAR TABLE

BAR	SIZE
A	#6
B	#8
C	#5
D	#8
E	#6
F	#6
G	#6
H	#5
L	#5

GENERAL NOTES:

1. DESIGNED ACCORDING TO AASHTO LRFD SPECIFICATIONS WITH CURRENT INTERIMS
2. ALL REINFORCING STEEL TO BE GRADE 60.
3. REINFORCING STEEL TO BE ADJUSTED TO PROVIDE A MINIMUM OF 2" OF CLEAR COVER UNLESS OTHERWISE NOTED.
4. FIELD VERIFY ALL DIMENSIONS PRIOR TO ORDERING MATERIALS AND COMMENCING WORK.

STATE OF TEXAS
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JUNCTION BOX DETAILS B565MH1

SHEET 1 OF 3

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
CK: SF	6	SEE COVER SHEET		154
DRN: MS	STATE	DIST.	COUNTY	
APPVD: PB	TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.	
1986	01	064	FM 1314	

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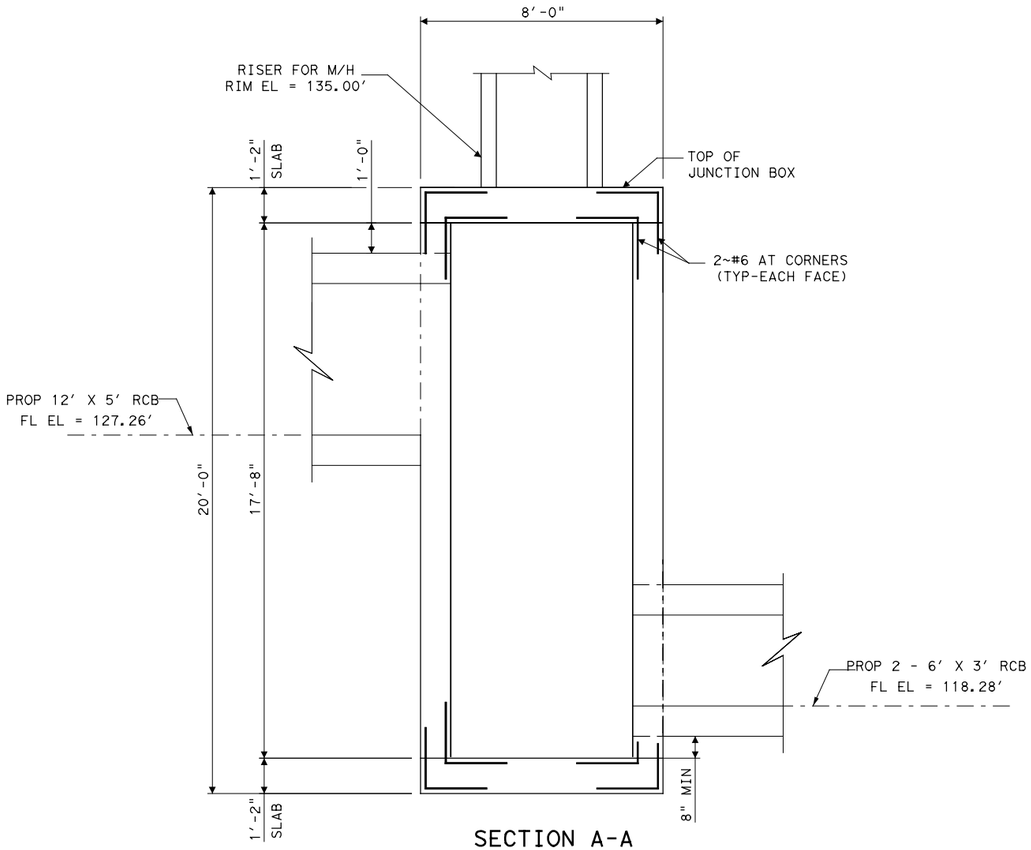
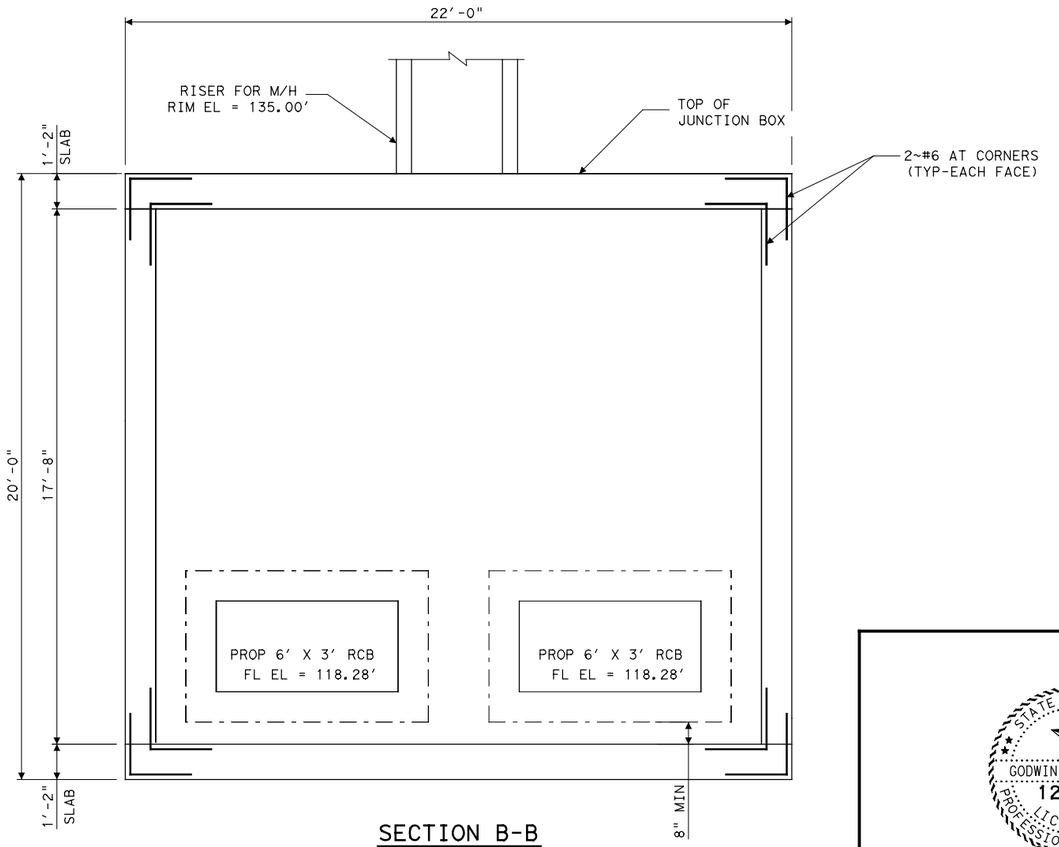


SECTION A-A

NOTE: CUT AND BEND WALL REINFORCING TO CLEAR OPENINGS



SECTION B-B

NOTE: CUT AND BEND WALL REINFORCING TO CLEAR OPENINGS

STATE OF TEXAS
GODWIN A. ARTHUR
127720
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JUNCTION BOX DETAILS
B565MH1

SHEET 2 OF 3

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
CK: SF	6	SEE COVER SHEET		154A
DRN: MS	STATE	DIST.	COUNTY	
APPVD: PB	TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.	
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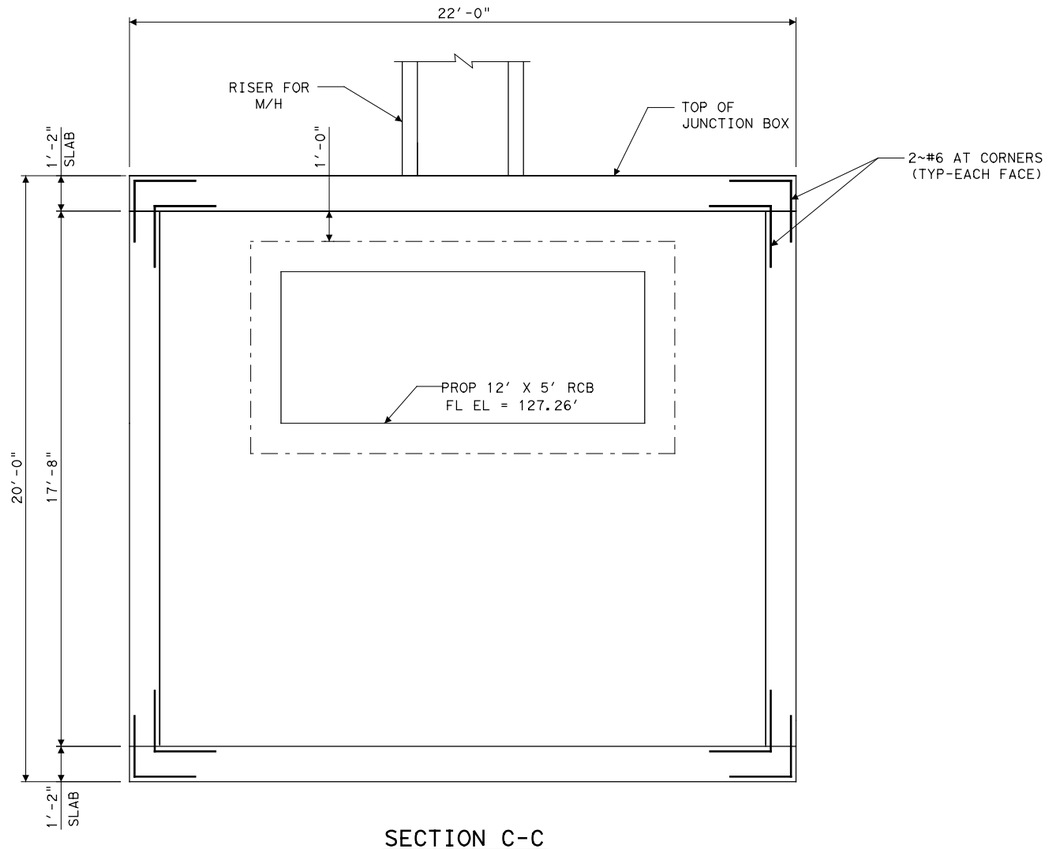
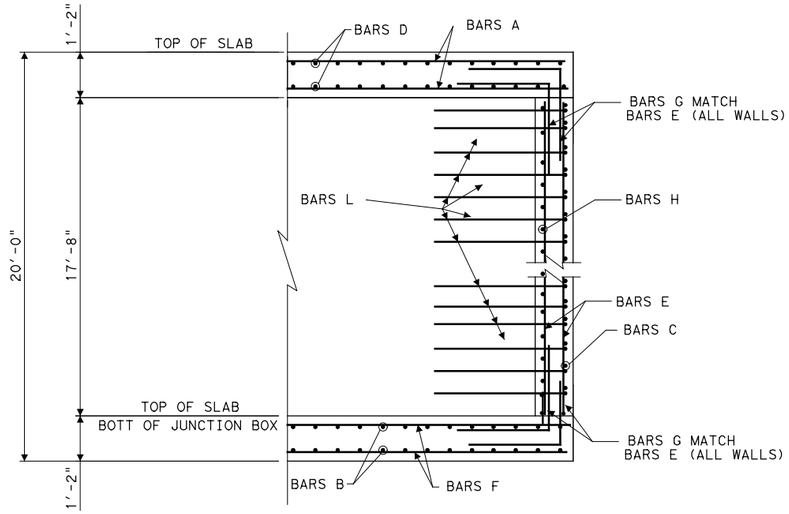


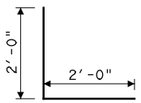
SECTION C-C

NOTE: CUT AND BEND WALL REINFORCING TO CLEAR OPENINGS



TYPICAL REINFORCING DETAIL

NOTE: CUT AND BEND WALL REINFORCING TO CLEAR OPENINGS



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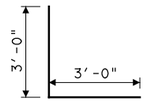

BARS-G

3/4/2024

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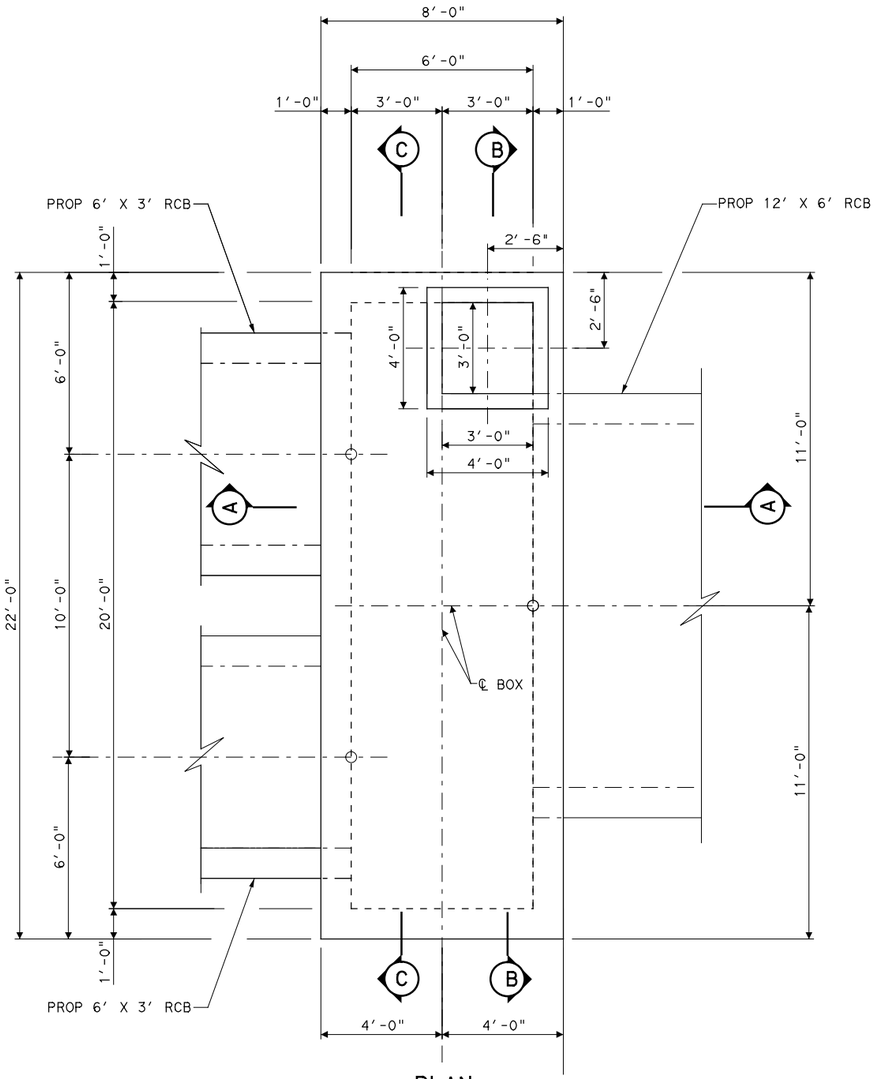
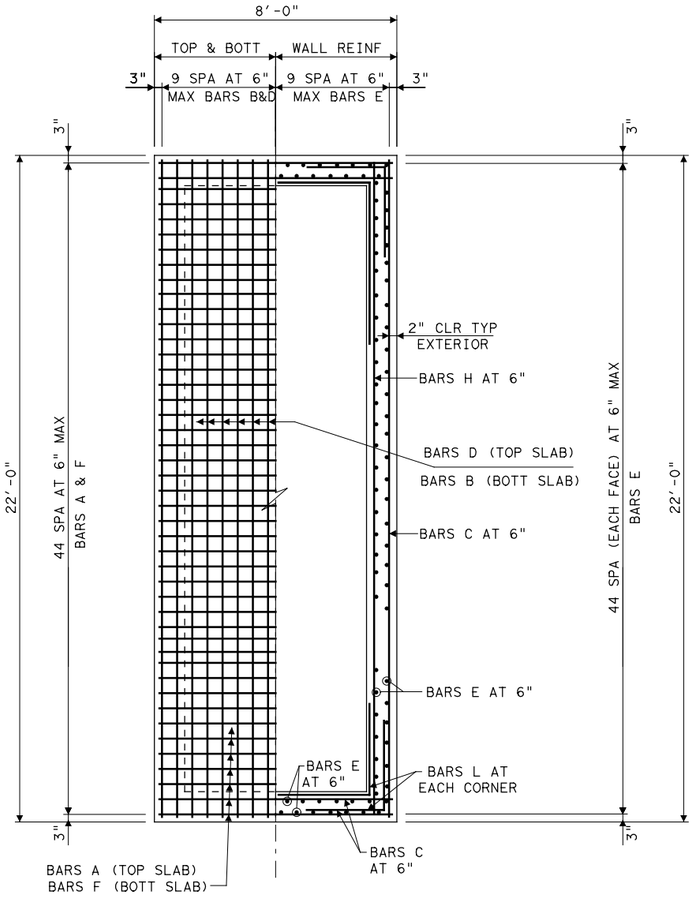
JUNCTION BOX DETAILS B565MH1

SHEET 3 OF 3

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.	SHEET NO.
CK: SF	6	SEE COVER SHEET	154B
DRN: MS	STATE	DIST.	COUNTY
APPVD: PB	TEXAS	HOU	MONTGOMERY
CONT.	SECT.	JOB	HIGHWAY NO.
1986	01	064	FM 1314



PLAN



PLAN SHOWING REINFORCING

ESTIMATED QUANTITIES

ITEM	UNIT	QUANTITY
JCT BOX (COMPL) (SPL)	EA	1
CLASS C CONC *	CY	33

* CLASS C CONC QUANTITY IS FOR CONTRACTOR'S INFORMATION ONLY

BAR TABLE

BAR	SIZE
A	#6
B	#8
C	#5
D	#8
E	#6
F	#6
G	#6
H	#5
L	#5

GENERAL NOTES:

1. DESIGNED ACCORDING TO AASHTO LRFD SPECIFICATIONS WITH CURRENT INTERIMS
2. ALL REINFORCING STEEL TO BE GRADE 60.
3. REINFORCING STEEL TO BE ADJUSTED TO PROVIDE A MINIMUM OF 2" OF CLEAR COVER UNLESS OTHERWISE NOTED.
4. FIELD VERIFY ALL DIMENSIONS PRIOR TO ORDERING MATERIALS AND COMMENCING WORK.

STATE OF TEXAS
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127720
LICENSED
PROFESSIONAL ENGINEER

3/4/2024

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JUNCTION BOX DETAILS
B567MH1

SHEET 1 OF 2

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
CK: SF	6	SEE COVER SHEET		155
DRN: MS	STATE	DIST.	COUNTY	
APPVD: PB	TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.	
1986	01	064	FM 1314	

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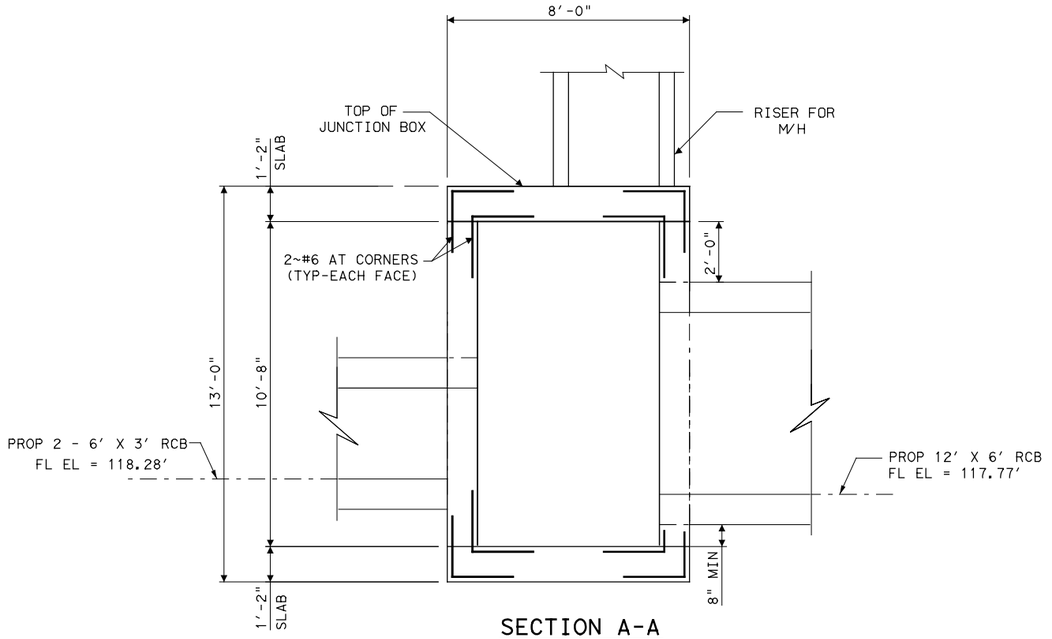
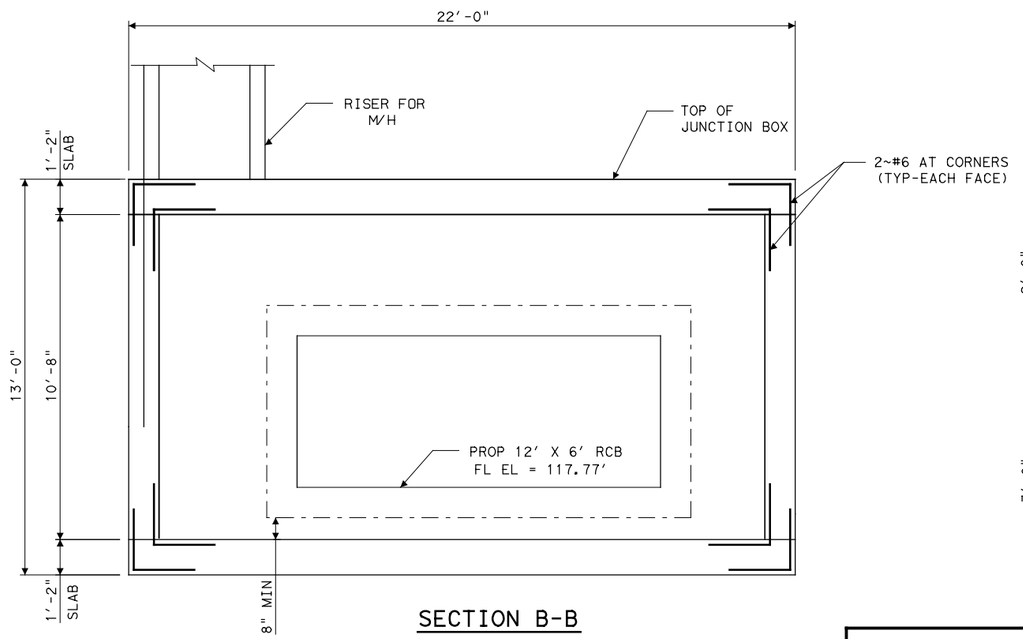


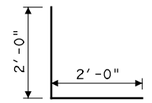
SECTION A-A

NOTE: CUT AND BEND WALL REINFORCING TO CLEAR OPENINGS



SECTION B-B

NOTE: CUT AND BEND WALL REINFORCING TO CLEAR OPENINGS



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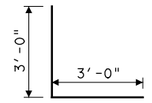
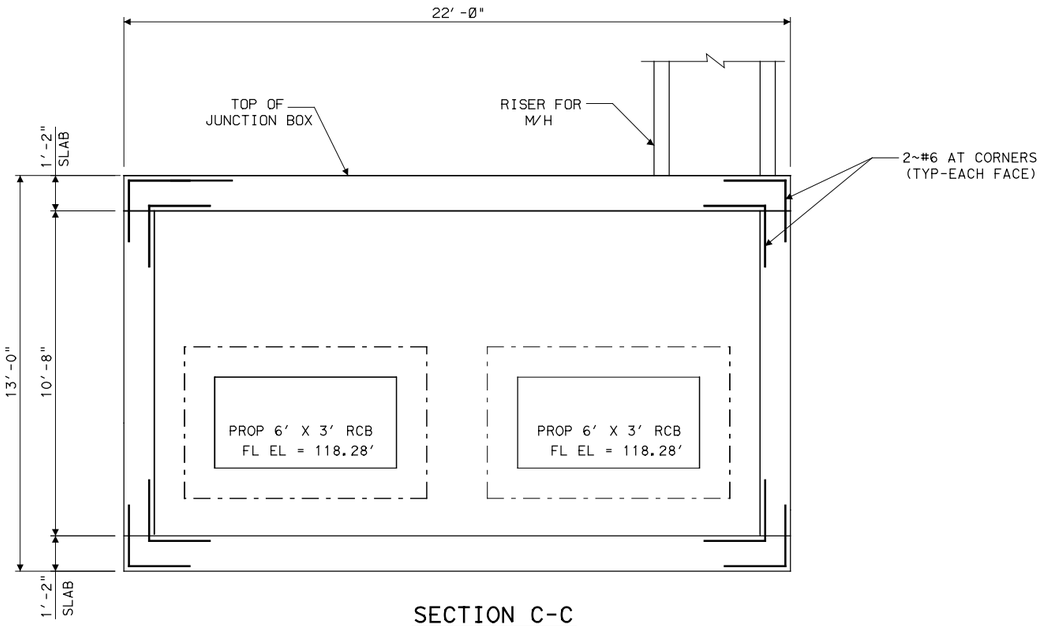
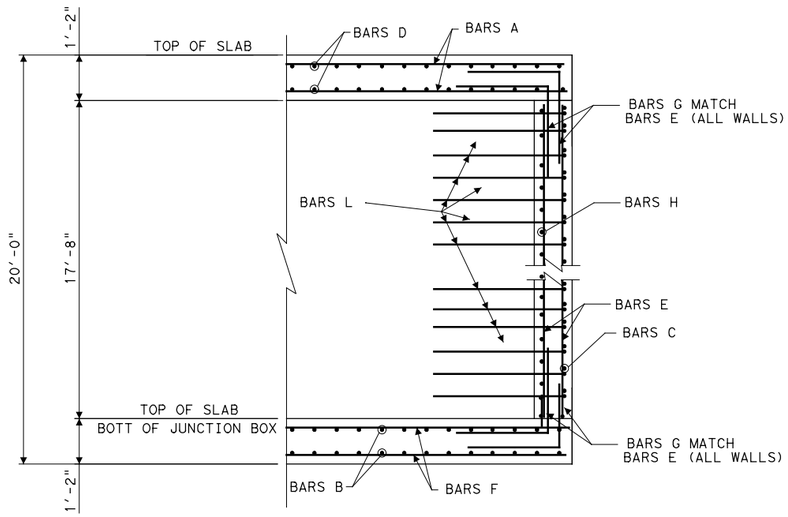


BARS-G



SECTION C-C

NOTE: CUT AND BEND WALL REINFORCING TO CLEAR OPENINGS



TYPICAL REINFORCING DETAIL

NOTE: CUT AND BEND WALL REINFORCING TO CLEAR OPENINGS

STATE OF TEXAS
GODWIN A. ARTHUR
127720
LICENSED PROFESSIONAL ENGINEER

3/4/2024

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JUNCTION BOX DETAILS B567MH1

DSN: YK	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
CK: SF	6	SEE COVER SHEET		155A
DRN: MS	STATE	DIST.	COUNTY	
APPVD: PB	TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.	
1986	01	064	FM 1314	

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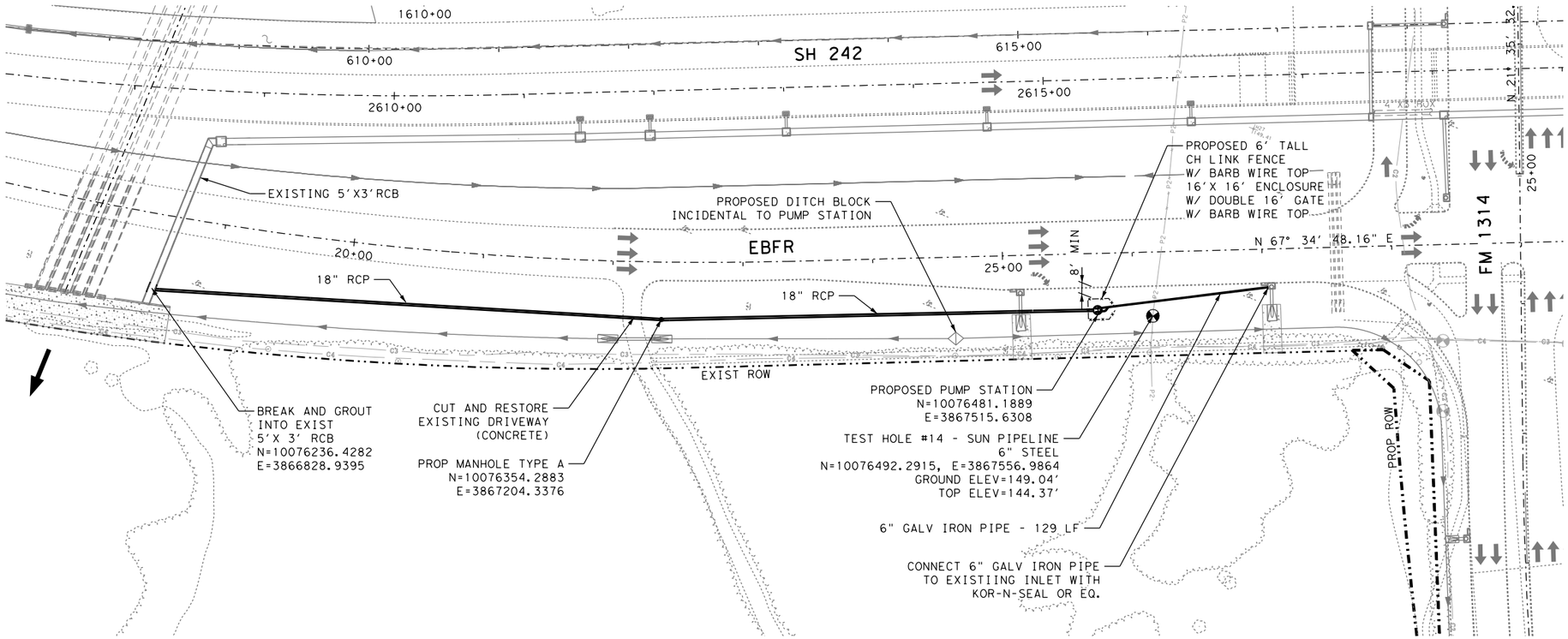
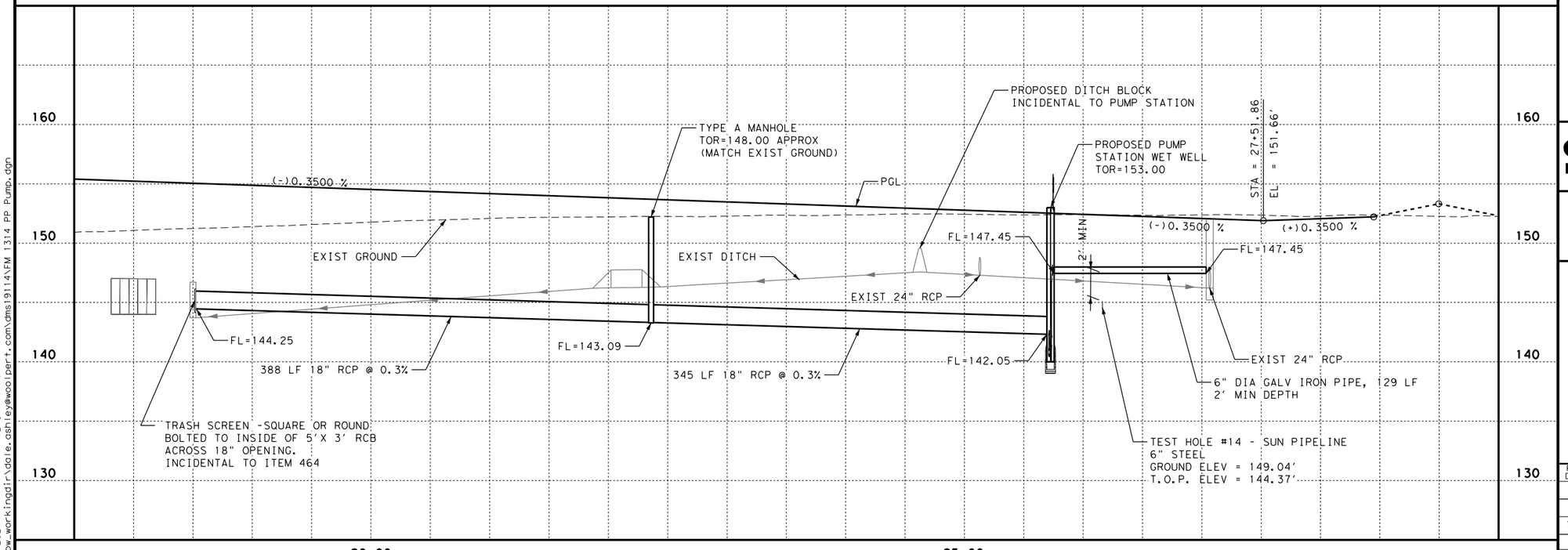


LEGEND

- MANHOLE
- GRATE INLET
- CURB INLET
- CURB INLET WITH EXTENSION
- ℄ PROPOSED DITCH
- EXISTING STORM SEWER
- PROPOSED STORM SEWER
- DIRECTION OF FLOW
- PROPOSED CONCRETE RIPRAP

0 50 100 (H)
0 5 10 (V)



REV NO.	DATE	BY	REVISION

STATE OF TEXAS
BARRY VANDERWALT
81580
LICENSED
PROFESSIONAL ENGINEER

3/8/2024

CivilTech Engineering, Inc.
11821 Telge Road
Cypress, Texas 77429
PH: (281) 304-0200 - FX: (281) 304-0210
Firm Registration No. F-382

Texas Department of Transportation

FM 1314

PUMP STATION
SH 242 EB FRONTAGE RD

SHEET 1 OF 1

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6	SEE COVER SHEET		156
STATE	DIST.	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.
1986	01	064	FM 1314

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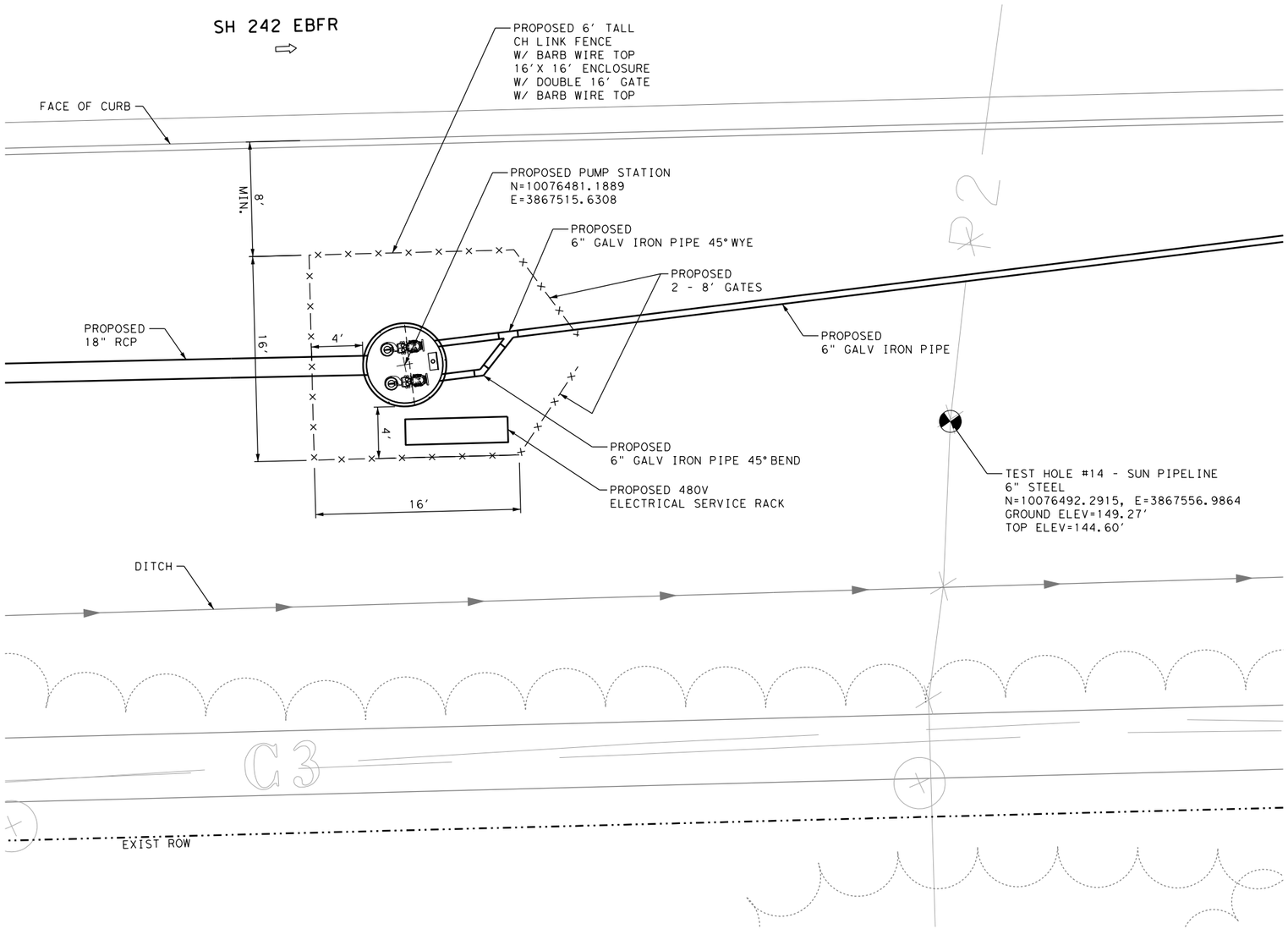

LEGEND

- MANHOLE
- GRATE INLET
- CURB INLET
- CURB INLET WITH EXTENSION
- ℄ PROPOSED DITCH
- EXISTING STORM SEWER
- PROPOSED STORM SEWER
- DIRECTION OF FLOW
- PROPOSED CONCRETE RIPRAP

0 5 10

REV NO.	DATE	BY	REVISION

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PUMP STATION SITE LAYOUT

SHEET 1 OF 1

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6	SEE COVER SHEET		157
STATE	DIST.	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.
1986	01	064	FM 1314

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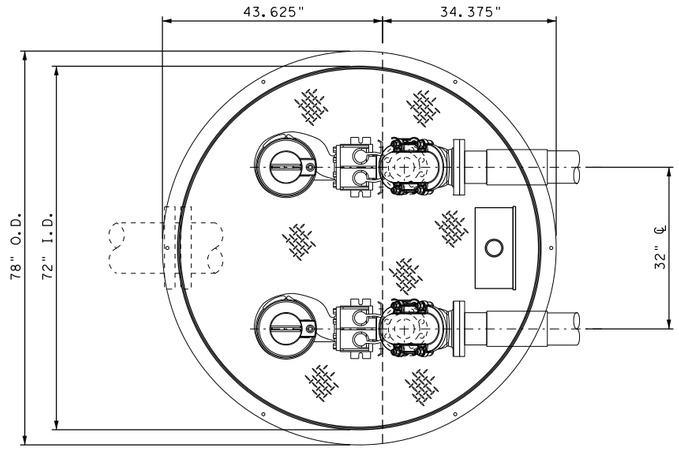

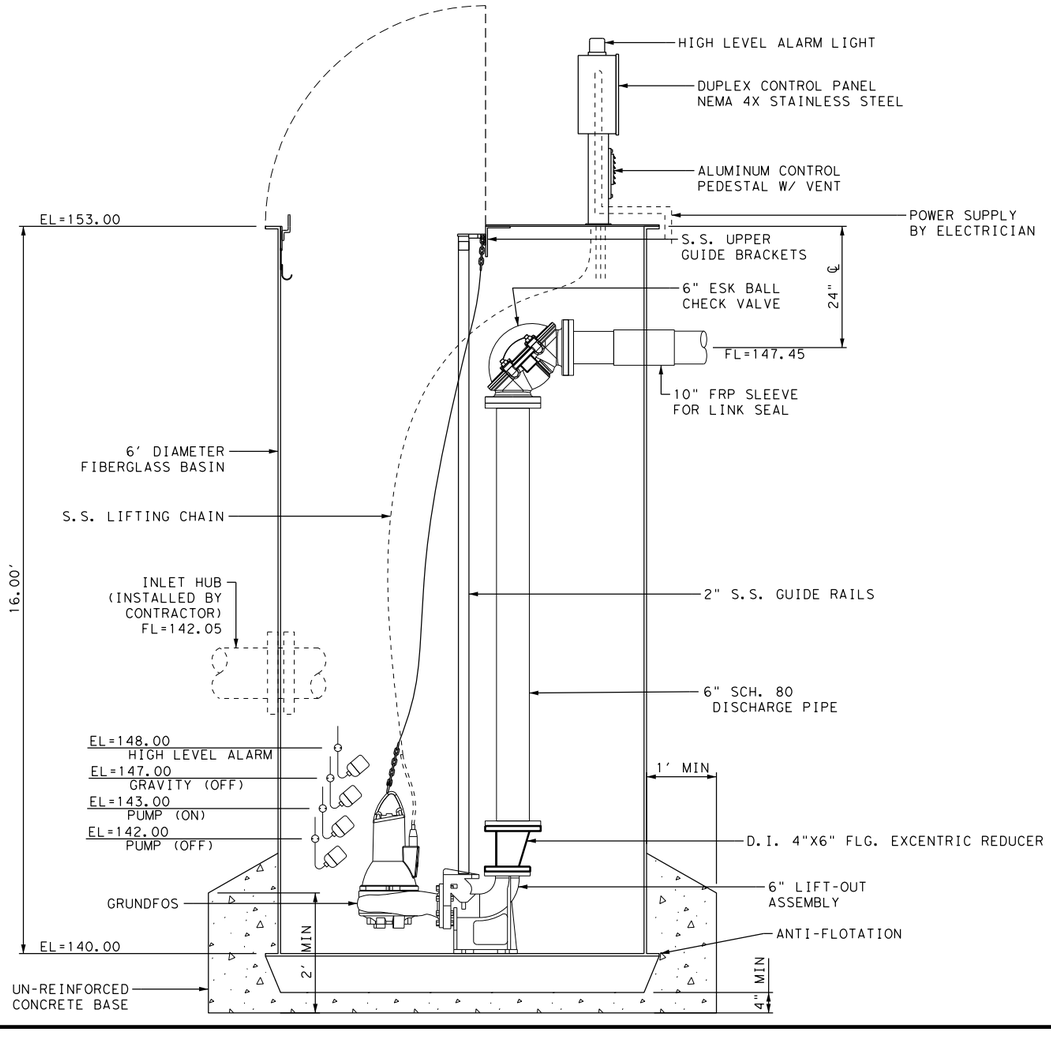

SPECIFICATIONS

GENERAL:
FURNISH AND INSTALL A FULLY ASSEMBLED PUMP STATION CONSISTING OF PUMPS, WET WELL, INTERNALDISCHARGE PIPING, CHECK VALVES, SHUTOFF VALVES, QUICK DISCONNECT SLIDE RAIL ELBOWS, LIFT CHAIN, AND CONTROL PANEL WITH PEDESTAL SUPPORT AS MANUFACTURED. A 1-YEAR MANUFACTURERS WARRANTY MUST BE PROVIDED.

WET WELL:
FIBERGLASS REINFORCED POLYESTER WET WELLS SHALL BE MANUFACTURED FROM COMMERCIAL GRADE POLYESTER RESIN OR VINYL ESTER RESIN, WITH FIBERGLASS REINFORCEMENTS.

THE RESIN SYSTEM SHALL BE SUITABLE FOR ATMOSPHERES CONTAINING HYDROGEN SULPHIDE ACID AS WELL AS OTHER GASES ASSOCIATED WITH THE WASTEWATER COLLECTION SYSTEM.

NON-CLOG PUMPS:
THE PUMPS SHALL BE 4" CENTRIFUGAL FOR HANDLING WASTEWATER, PROCESS WATER AND UNSCREENED RAW SEWAGE

NON-CLOG DESIGN,
3 HP, 460 V, 3 PH. THE PUMPS SHALL BE MANUFACTURED BY GRUNDFOS.

GUIDE RAIL SYSTEM:
TWO RAIL PIPES SHALL BE USED TO GUIDE THE PUMP FROM THE SURFACE TO THE DISCHARGE BASE CONNECTION.

THE GUIDE RAILS SHALL BE 2 INCH STAINLESS STEEL PIPE.

THE GUIDE RAILS SHALL BE FIRMLY ATTACHED TO THE ACCESS HATCH FRAME.

SYSTEMS DEEPER THAN 10 FEET SHALL USE INTERMEDIATE GUIDE BRACKETS.

CONTROLS:
PROVIDE A "EP" CONTROL PANEL WITH A 100SF PLUG-IN CONTROLLER WITH RUN LIGHTS, SEAL FAILURE LIGHTS, SEAL FAILURE TEST LIGHT, H-O-A ALARM TEST SWITCH, FLOAT INDICATOR LIGHTS, AND ALTERNATION.

THE TYPE NEMA 4X ENCLOSURE SHALL HAVE A CLEAR PLEXIGLASS DEADFRONT WITH MAIN DISCONNECT INTERLOCK.

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PUMPS OF HOUSTON AUTOMATIC PUMP STATION

SHEET 1 OF 1

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6	SEE COVER SHEET		158
STATE	DIST.	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.
1986	01	064	FM 1314

MODEL NO.:	PUMPS: SL1.30.A40.30.EX.4.61R.C

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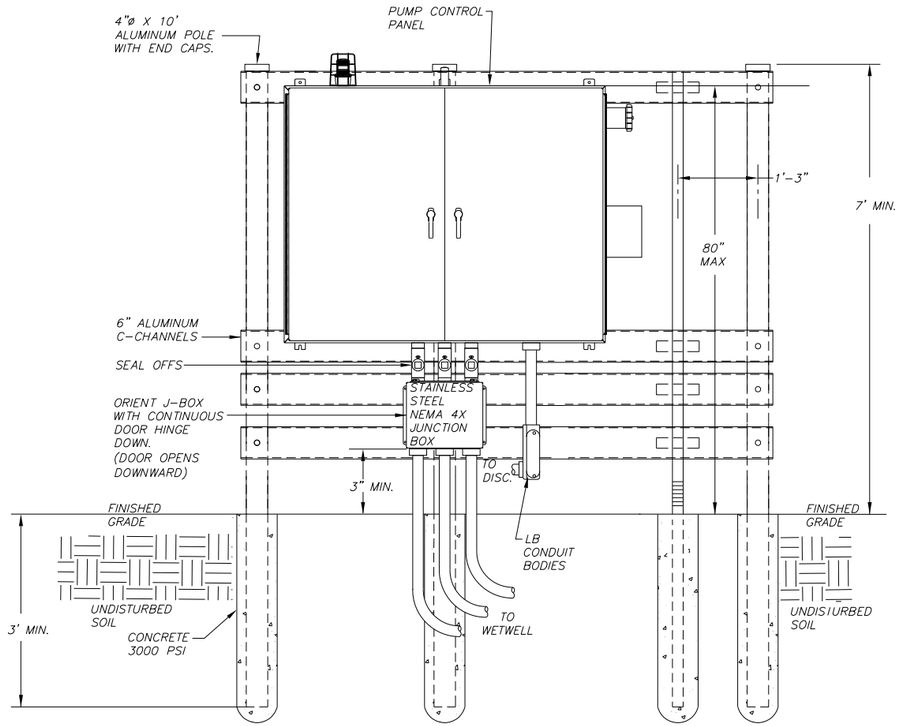
c:\pw_workingdir\dale.ashley@woolpert.com\dms19114\FM 1314 Pump Detail P0H.dgn

GENERAL NOTES

1.) ALL CONDUIT PENETRATIONS INTO THE TOP OR SIDES OF THE ENCLOSURE ARE REQUIRED TO BE MADE USING MYERS HUBS.

2.) ALL CONDUIT PENETRATIONS INTO ELECTRICAL EQUIPMENT SHALL BE INSTALLED ALONG BOTTOM OF EACH ENCLOSURE.



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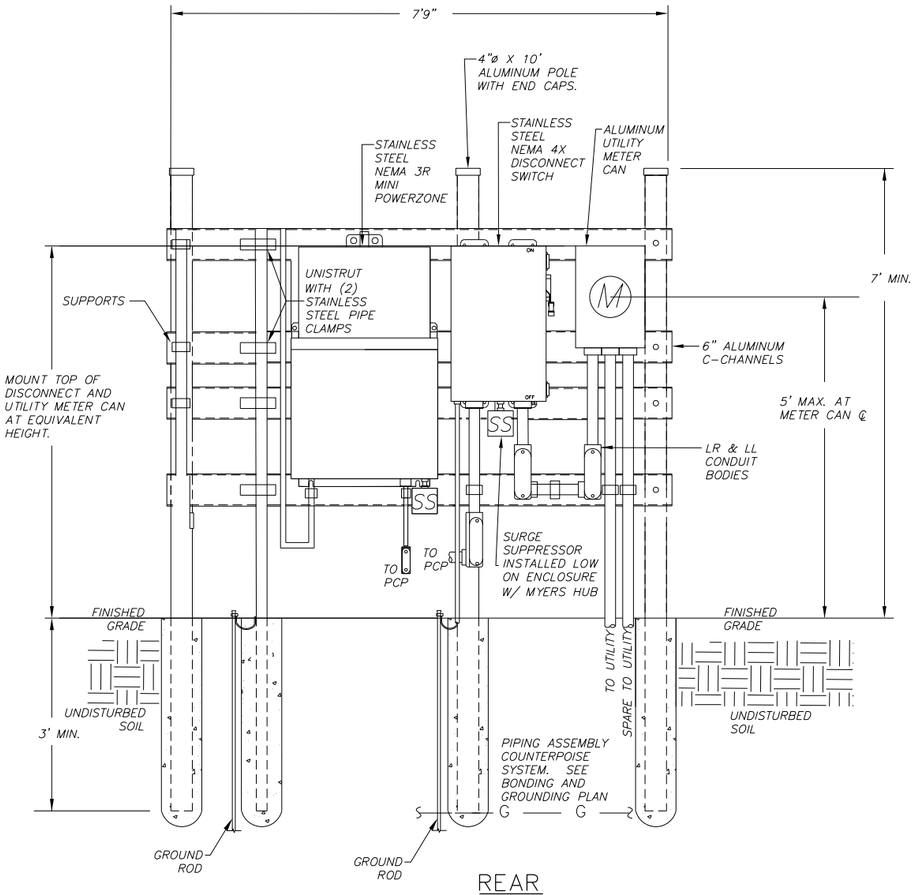

REAR

ELEVATION VIEW

STANDARD 480V-3Ø (0-30HP) DUPLEX PUMP STATION
ELECTRICAL EQUIPMENT RACK ELEVATION

REV NO.	DATE	BY	REVISION

STATE OF TEXAS
BARRY VANDERWALT
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PUMP STATION ELECTRICAL SERVICE

SHEET 1 OF 2

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6	SEE COVER SHEET		159
STATE	DIST.	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.
1986	01	064	FM 1314

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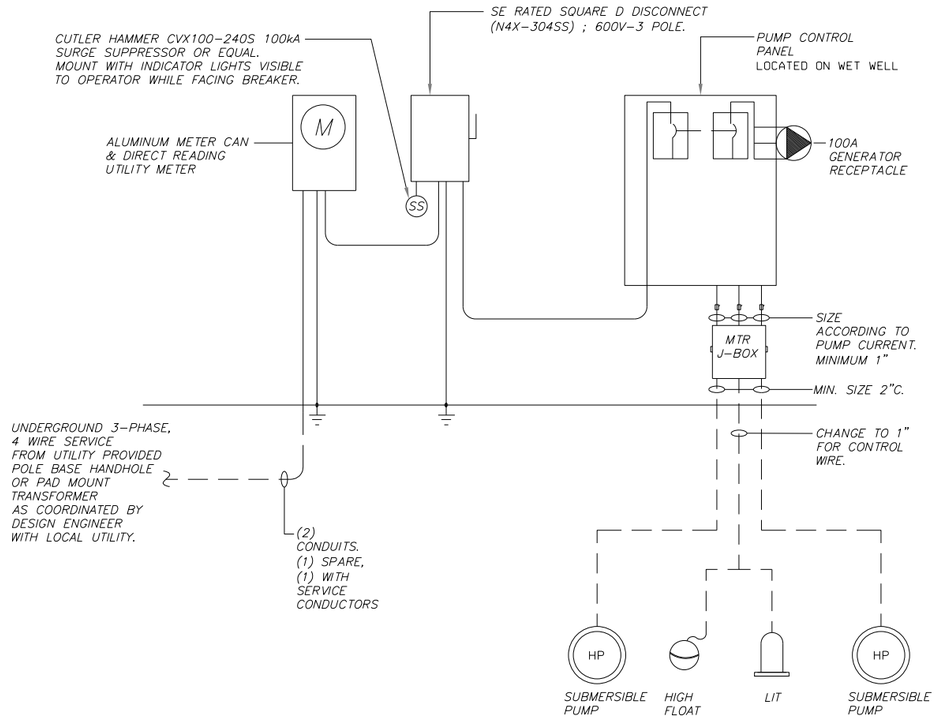
GENERAL NOTES:

1.) MINIMUM EQUIPMENT AIC RATINGS:
240V SERVICE 35,000AIC
480V SERVICE 65,000AIC
EQUIPMENT AIC RATINGS SHOWN TO ESTABLISH MINIMUM ACCEPTABLE RATING. DESIGNER TO COORDINATE REQUIRED AIC RATINGS WITH SITE SPECIFIC ELECTRICAL SERVICE CHARACTERISTICS AND IN NO CASE LOWER THEN ESTABLISHED MINIMUMS.

2.) THIS PLAN DOES NOT INDICATE ALL CONDUIT & WIRE REQUIRED; SEE ADDITIONAL REQUIREMENTS ON ELEMENTARY & PLAN DRAWINGS.

PROVIDE MINIMUM SERVICES UTILITY SIZES AS FOLLOWS:

SERVICE SIZE:	CONDUIT SIZE:	CONDUCTOR SIZE:	GROUND SIZE:
100A	(1)2"	(4)#2	(1)#8



GENERIC SINGLE LINE DRAWING- REVISE ACCORDINGLY TO PROVIDE SITE SPECIFIC DETAILS INCLUDING UTILITY COORDINATION, SERVICE SIZE AND GENERATOR SIZE. SIZE SERVICE, GENERATOR, CONDUIT AND WIRE PER SITE SPECIFIC WELL HORSEPOWER.

ELECTRICAL RISER DIAGRAM (480/3-PHASE)

N.T.S.

PANEL: MPZ 15KVA POWER ZONE, MCB:INCLUDED VOLTAGE: 480V/208/120V,3P,4W

MOUNTING: WALL POLES: 18 25,000AIC MIN

LOCATION: EQUIPMENT RACK NEMA 3R SS ENCLOSURE

CIR. NO.	DESCRIPTION	TRIP	POLES	REMARKS
1,3,5	PUMP 1	20	3	
2,4,6	PUMP 2	20	3	
7	SPARE	20	1	
8	SPARE	20	1	
9-17	SPACE	20	1	
10-12	SPACE	20	1	
14,16,18	SURGE SUPPRESSION	30	3	

PROVIDE PANEL WITH 35KAIC RATING.
PROVIDE PANEL WITH EXTERNAL CUTLER HAMMER CVX100 SERIES SPD

PANEL SCHEDULE

N.T.S.

REV NO.	DATE	BY	REVISION

STATE OF TEXAS
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81580
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Cypress, Texas 77429
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Texas Department of Transportation

FM 1314

PUMP STATION
ELECTRICAL SERVICE

SHEET 2 OF 2

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6	SEE COVER SHEET		160
STATE	DIST.	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.
1986	01	064	FM 1314

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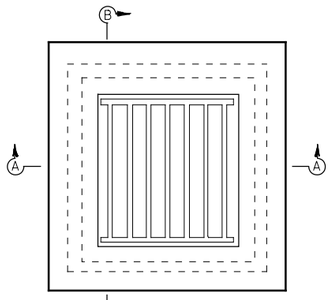
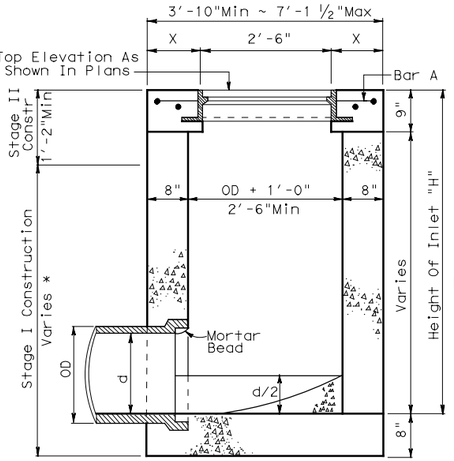
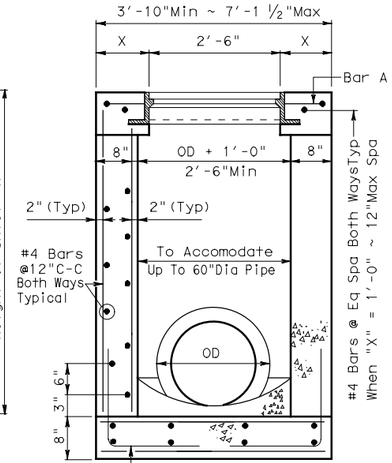


* But Not Less Than Six Inches Over Highest Entering Pipe.

X = 8" Min to 3'-9" Max

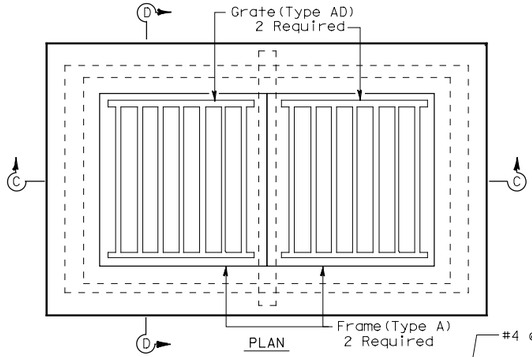


SECTION A-A



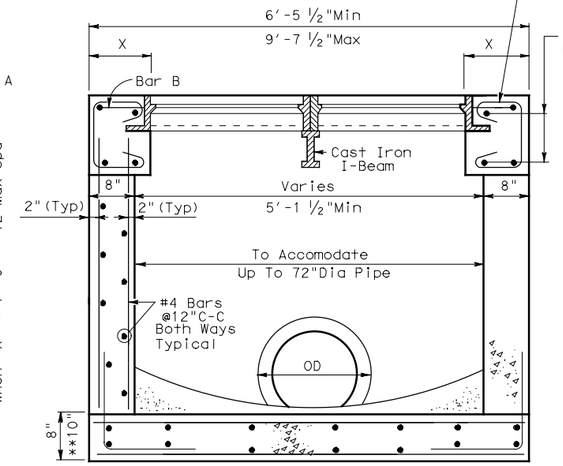
SECTION B-B

INLET TYPE AD

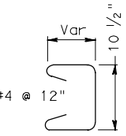


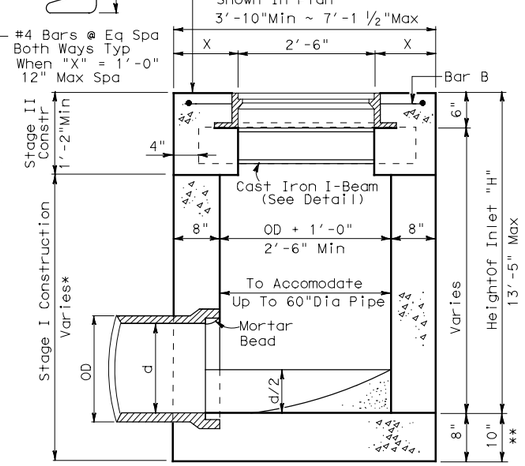
* But Not Less Than Six Inches Over Highest Entering Pipe.

** For Pipe Diameters 66" And Greater



SECTION C-C





SECTION D-D

INLET TYPE AAD

GENERAL NOTES:

Type AD Inlet contains a single frame with grate. Type AAD Inlet contains a double frame and double grate with an I-beam.

Frame and Grates may be gray cast iron.

The Furnishing And Installation Of Cast Iron I-Beams Shall Be Considered Incidental To Inlet (Compl) (Ty AAD) Or Inlet (Stage II) (Ty AAD) As The Case May Be.

Where Size Of Pipes Passing Thru Inlet Exceeds 30", Increase Inside Width To Diameter Of Pipe Plus 1'-0" (OD + 1'-0")

Cast Iron Manhole Steps (See Manhole Details) Spaced At 16" Centers And Located On Wall Specified By The Engineer Shall Be Provided And Installed Where "D" Exceeds 5'-0".

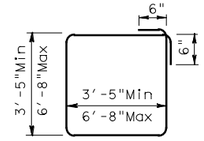
See Standard or Detail Sheet For Excavation and Backfill Diagrams.

Type AD & AAD Inlets Shall Be Built To Stage I And Finished After All Grading Operations Are Substantially Completed.

Shop Drawings Will Be Required For Precast Construction Of Inlets.

Upon installation of the grates the threads of the bolts shall be coated with thread lock type adhesive (Lockite or equal). Reapply thread lock adhesive each time grates are removed.

Bolted grates and frames are a matched set, do not unbolt without "Match Marking" so that grates and frames are re-installed as originally built.



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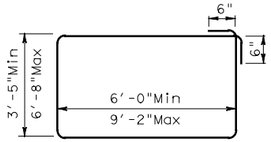

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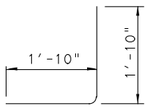
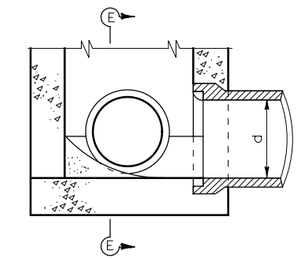
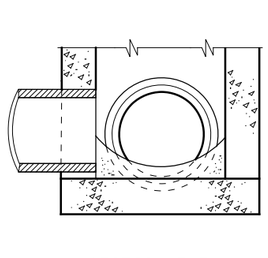


BAR L (#4)

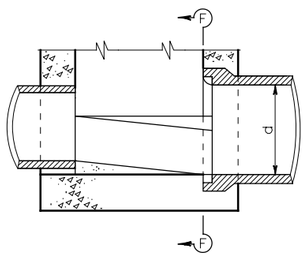


PART SECTION AT INVERT

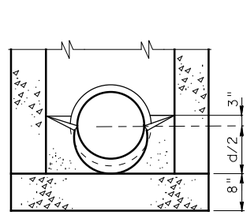


SECTION E-E

Showing Shaping Of Invert, Pipe Entering From Adjacent Sides

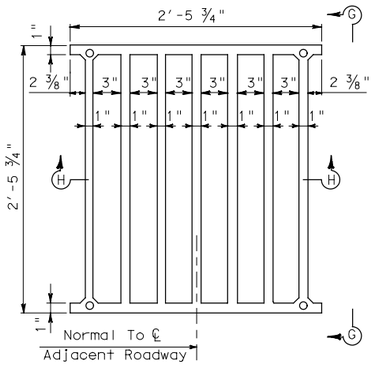


PART SECTION AT INVERT



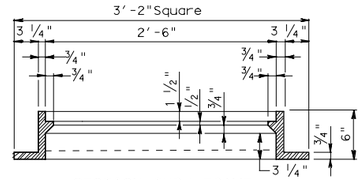
SECTION F-F

Showing Shaping Of Invert, Pipe Entering From Opposite Sides

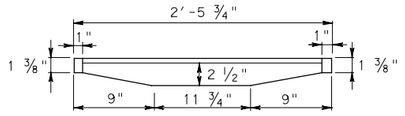


PLAN

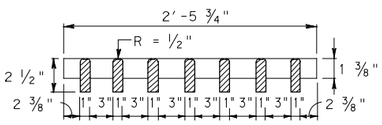
Provide 4 ~ Stainless Steel Hex Head Bolts per Grate



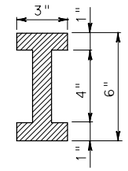
SECTION THRU FRAME



ELEVATION G-G



SECTION H-H



SECTION OF CAST IRON I-BEAM

d = Diameter
R = Radius

FRAME AND GRATE

Type AD ~ Neenah No. 3418 or EJIW No. V-4880-2
Type AAD ~ Neenah No. 3418-2 or EJIW No. V-4881-2

NOT FOR TRAFFIC LOADS

Texas Department of Transportation
Houston District

INLETS TYPE AD & AAD

HIL-AD/AAD

FILE: STDD5.DGN	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT	STD:	
© TxDOT 2014	DIST	FED REG	PROJECT NO.			SHEET
REVISIONS	HOU	6	SEE COVER SHEET			161
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	MONTGOMERY		1986	01	064	FM 1314

DATE: 3/4/2024 8:03:35 AM
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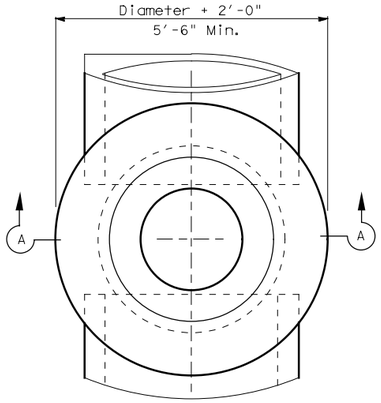
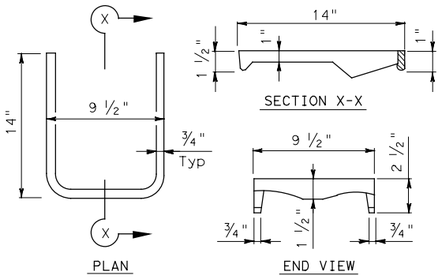
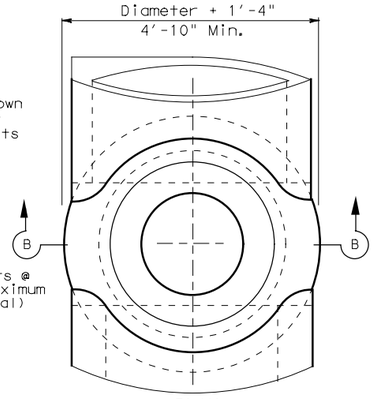


PLAN
OVER 12' HEIGHT

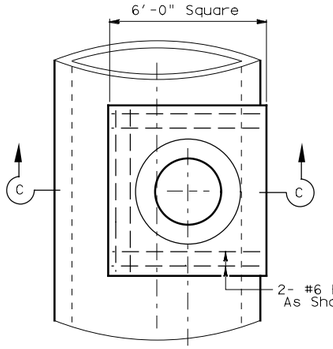


PLAN END VIEW

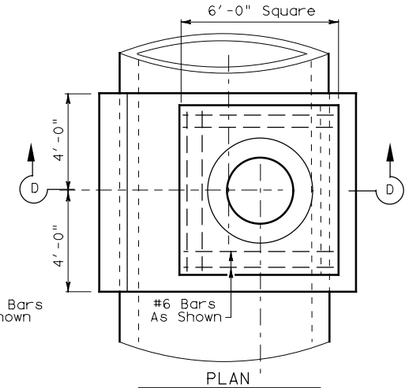
CAST IRON MANHOLE STEPS
(In Stock Locally)



PLAN
12' HEIGHT & UNDER



PLAN
MONOLITHIC SEWERS



PLAN
PRECAST PIPE SEWERS

GENERAL NOTES:

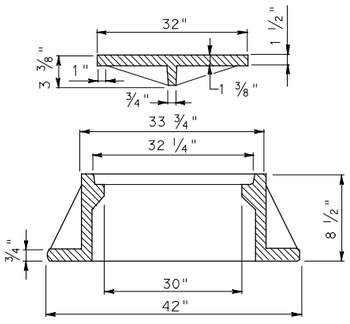
See Standard or Detail Sheet For Excavation And Backfill Diagrams.

All Manholes In Graded Areas Shall Be Built To Stage I And Finished After All Grading Operations Are Substantially Completed.

* But Not Less Than 6 Inches Above Highest Pipe.

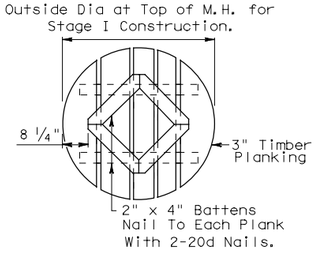
"T" Thickness Of Shell Equals That Of Larger Diameter Pipe.

Optional Monolithic Or Precast Designs Permitted. Optional Designs Shall Be Signed & Sealed By A Registered Professional Engineer.



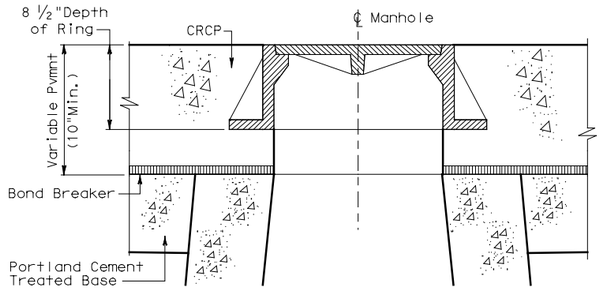
Heavy Duty 30"ID Ring as Required. Vulcan No. V-1419 w/ribbed cover, Neenah No. R1740-BTX

RING AND COVER



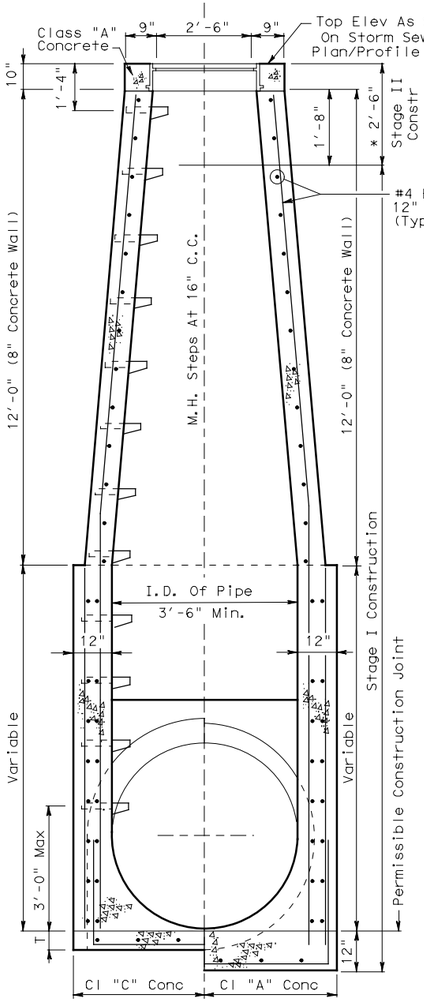
PLAN

TEMPORARY TIMBER COVER



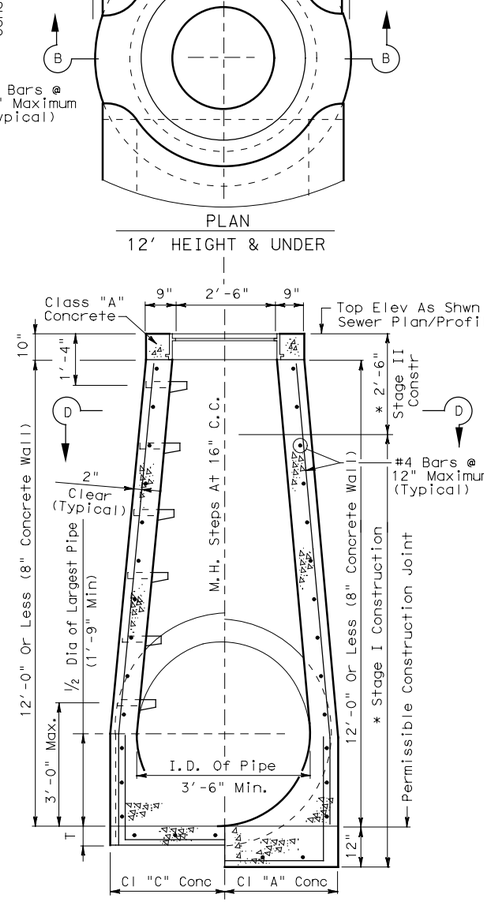
RING AND COVER CAST
MONOLITHICALLY WITH PAVEMENT

FOR DIRECT TRAFFIC



MONOLITHIC SEWERS PRECAST PIPE SEWERS

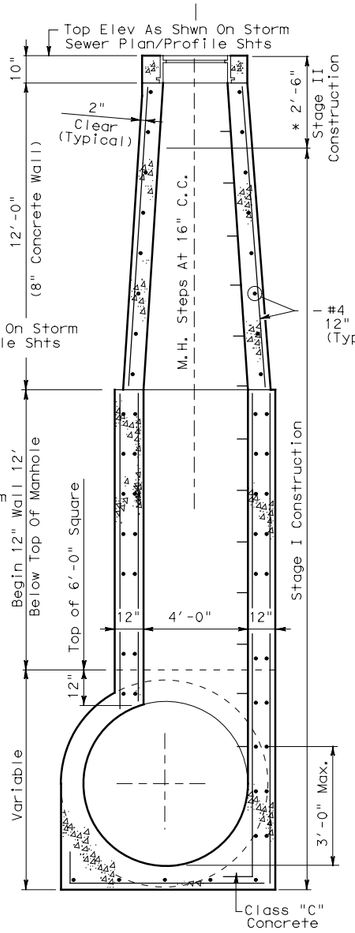
SECTION A-A



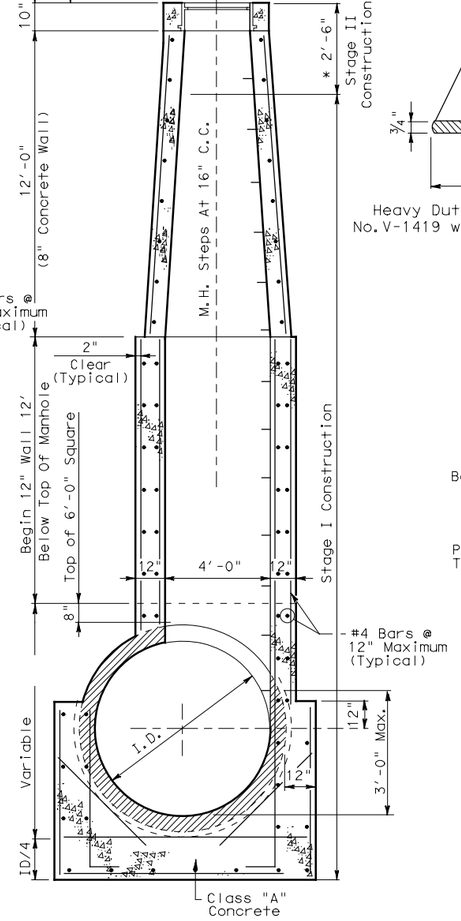
MONOLITHIC SEWERS PRECAST PIPE SEWERS

SECTION B-B

MANHOLE - TYPE A
FOR PIPES 54" AND SMALLER



SECTION C-C



SECTION D-D

MANHOLE - TYPE B
FOR PIPES 60" AND LARGER

d = Diameter
R = Radius

Texas Department of Transportation
Houston District

MANHOLES TYPE A & B

MH-A/B

FILE: STDD10.DGN	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT	STD:	
©TxDOT December 2006	DIST	FED REG	PROJECT NO.			SHEET
REVISIONS 3/15 MINOR CORRECTIONS	HOU	6	SEE COVER SHEET			162
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	MONTGOMERY		1986	01	064	FM 1314

STD-D10

DATE: 3/4/2024 8:03:36 AM
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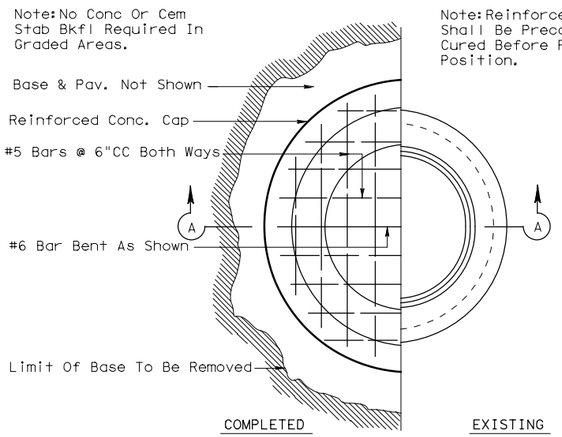
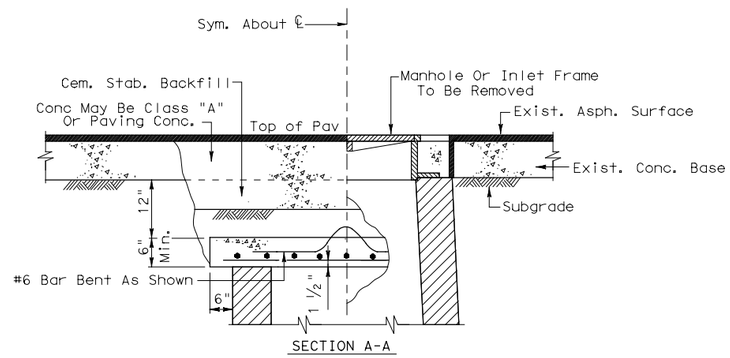
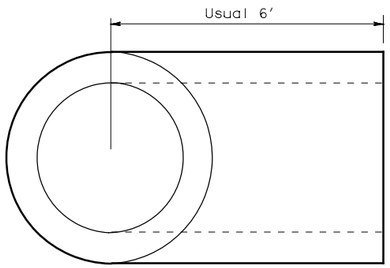




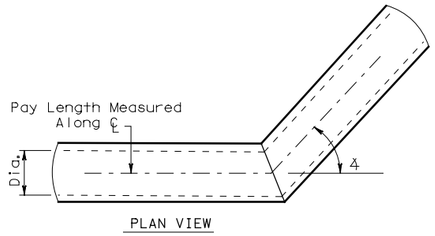
SECTION A-A

DETAIL SHOWING METHOD OF CAPPING ABANDONED MANHOLES OR INLETS (GRADED OR PAVED AREAS)



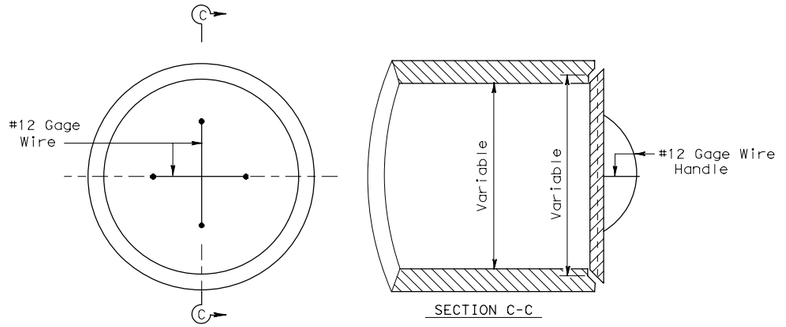
Note: Jointing Material Shall Conform To Requirements Of Item "Reinforced Concrete Pipe." Material For Tees Shall Conform To Requirements Of Item "Reinforced Concrete Pipe." Payment For Tee To Be In Accordance With Item "Reinforced Concrete Pipe."

PRECAST STORM SEWER TEE



BENDING DETAIL

Note: Bending Of Proposed Pipe Sewer Or RCP In A Vertical & /Or Horizontal Plane Shall Be Accomplished By The Use Of A "Pipe Collar" Or A "Precast Elbow", As Approved By The Engineer.
Price Of "Pipe Collar" Or, "Precast Elbow" Shall Be Subsidiary To The Unit Prices Bid For Item Reinforced Concrete Pipe.
Pay Length Measurement To Be Along Horizontal ℄ & Horizontal Plane Of Pipes.

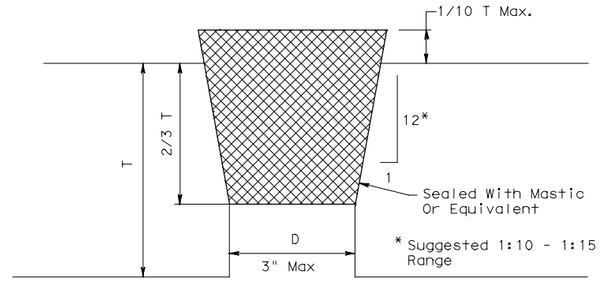


SECTION C-C

Note: The Price Of Plug Shall Be Subsidiary To The Unit Bid Price For Pipe Sewer Or RCP. Mortar Joints To Be Used As Directed By The Engineer. Removal Of The Existing Plugs For Storm Sewer Or RCP Conns. Shall Be Considered Incidental To Item "Excavation And Backfill For Structures."

Concrete Plug For End Of Pipe Culvert Or Sewer

CONCRETE PLUG FOR PIPE

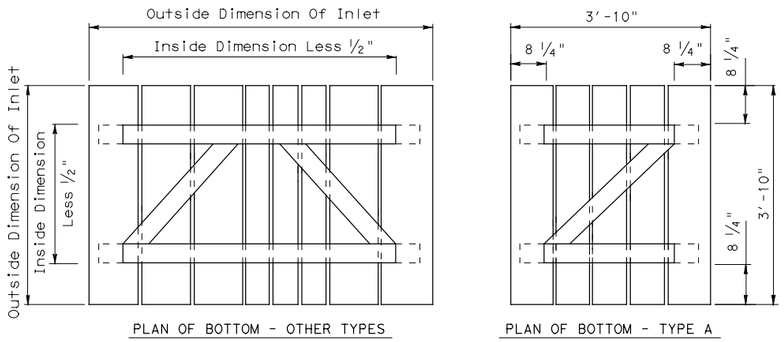


T = Wall Thickness On Top Of Box Or Pipe
D = Diameter Of Lifting Hole

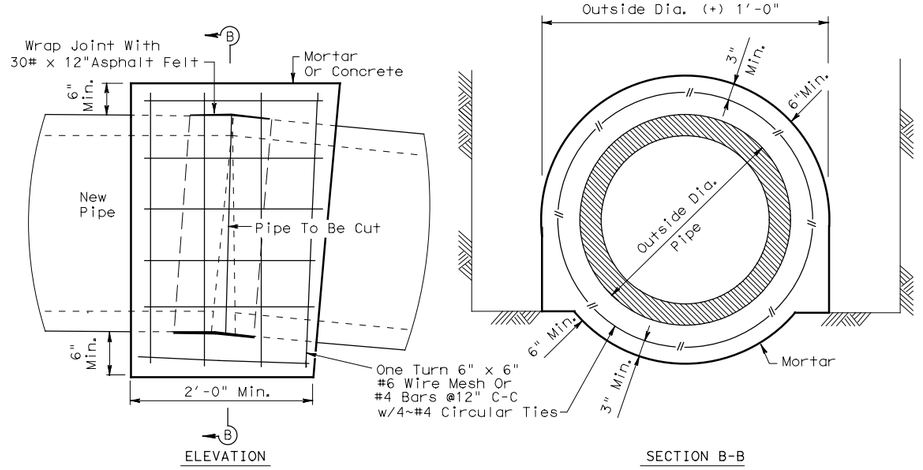
Minimum Length Of Plug Is 2/3 T +/-
Minimum Diameter At Bottom Of Plug = D - ⅛"
Maximum 1/10 T Of Plug Not Seated In Lifting Hole

Note: The Plug Shall Be Cast With The Same Taper As The Lifting Hole.

DETAIL OF PLUG FOR LIFTING HOLES IN RCB AND RCP



TEMPORARY COVERS FOR ALL TYPES OF INLETS



PIPE COLLAR DETAIL

For Horizontal Or Vertical Placement

d = Diameter
R = Radius

Texas Department of Transportation
Houston District (Bridge)

MISCELLANEOUS SEWER DETAILS

MSD

FILE: STDD11.DGN	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK:	
© TxDOT Mar 2004	DISTRICT	FED REG	PROJECT NO.		SHEET
REVISIONS 3/2015 2014 Specs	HOU	6	SEE COVER SHEET		163
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	MONTGOMERY		1986	01	064	FM 1314

DATE: 3/4/2024 8:03:36 AM
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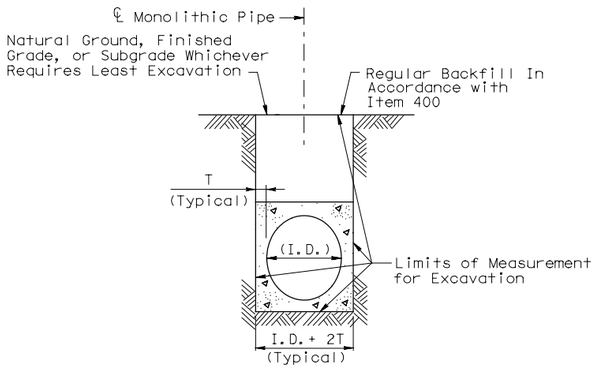
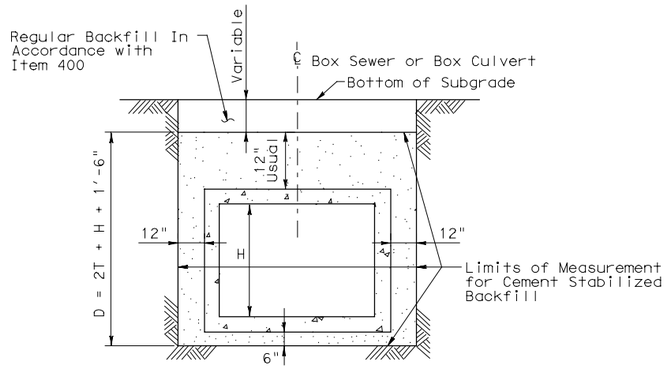


EXCAVATION DETAIL

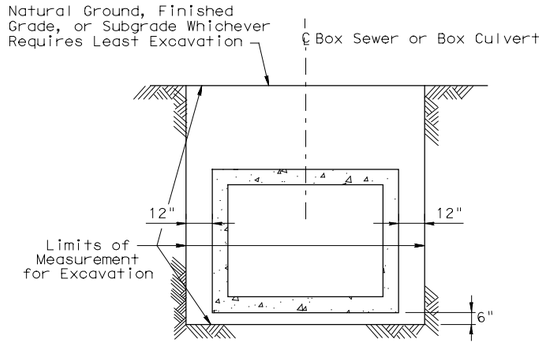
MONOLITHIC PIPE
IN A PAVED OR GRADED AREA



BACKFILL DETAIL

BOX CULVERTS
IN A GRADED OR PAVED AREA
INCLUDING DETOURS *

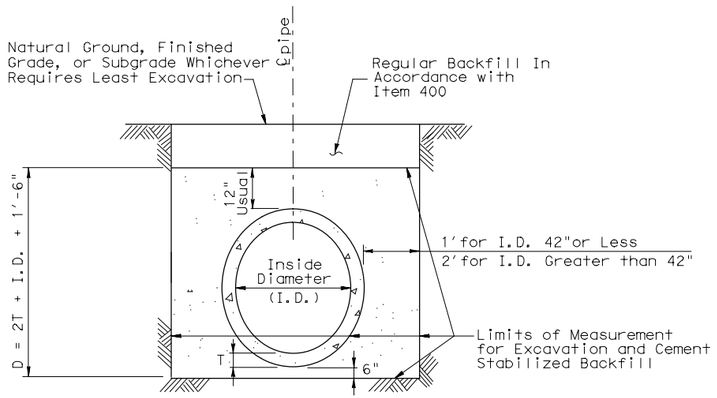
REINFORCED CONCRETE PIPE			
EXCAVATION AND BACKFILL QUANTITIES			
PIPE DIA. IN.	T FT.	CULVERT OR SEWER EXCAVATION IN A PAVED OR GRADED AREA C.Y. PER L.F. PER FT. OF DEPTH	CEMENT STABILIZED BACKFILL IN A PAVED OR GRADED AREA C.Y. PER L.F. OF PIPE
18	0.19	0.144	0.383
24	0.23	0.165	0.478
30	0.29	0.188	0.586
36	0.33	0.210	0.692
42	0.38	0.231	0.808
48	0.42	0.327	1.394
54	0.46	0.349	1.560
60	0.50	0.370	1.731
66	0.54	0.392	1.907
72	0.58	0.414	2.088
78	0.62	0.435	2.275
84	0.67	0.457	2.474



EXCAVATION DETAIL

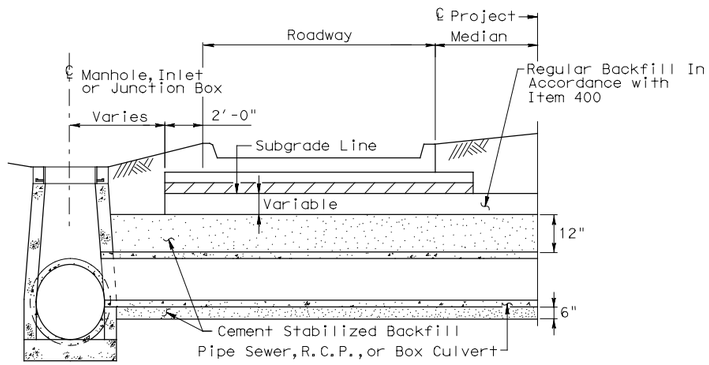
BOX CULVERTS
IN A GRADED AREA

MONOLITHIC PIPE		
EXCAVATION QUANTITIES		
PIPE DIA. IN.	T FT.	EXCAVATION C.Y. PER L.F. PER FT. OF DEPTH
36	0.417	0.142
42	0.458	0.164
48	0.458	0.182
54	0.500	0.204
60	0.583	0.228
66	0.583	0.247
72	0.625	0.269
78	0.625	0.287
84	0.625	0.306



EXCAVATION & BACKFILL DETAIL

REINFORCED CONCRETE PIPE
IN A GRADED OR PAVED AREA
INCLUDING DETOURS



BACKFILL DETAIL

AT MANHOLE, INLET OR JUNCTION BOX

D = Depth
H = Height
T = Thickness
R = Radius
Dia = Diameter

NOTE:

Cement stabilized backfill may be omitted in private driveways as indicated elsewhere in the plans.

Rubber gaskets shall be required for all joints on proposed cross drainage, pipe culverts and proposed storm sewer systems, unless otherwise shown in the plans.

* Backfill with cement stabilized material will be required for all structures under detours unless noted otherwise in the General Notes.

Texas Department of Transportation
Houston District

EXCAVATION AND BACKFILL DIAGRAMS

E&BD

FILE: STDE1.DGN	DN: TxDot	CK: TxDot	DW: TxDot	CK: TxDot
© TxDOT FEB 2010	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS REVISED 11/05. REVISED 2/2010 Added note to Table 1,Sht 2 of 2. REVISED 6/12 REVISED 9/14	HOU	6	SEE COVER SHEET	164
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	MONTGOMERY	1986	01	064	FM 1314

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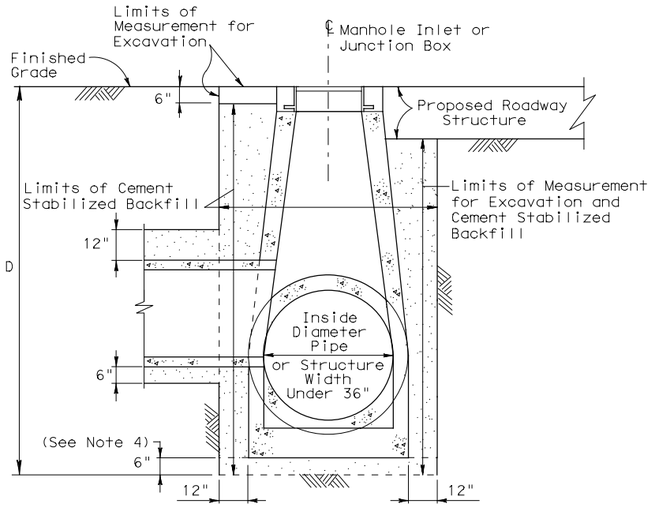
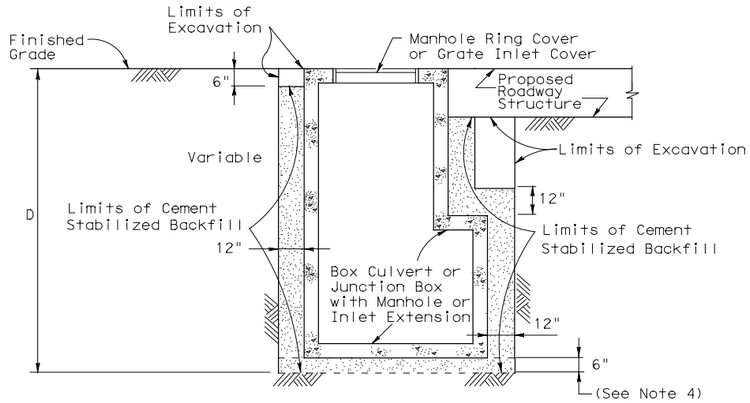


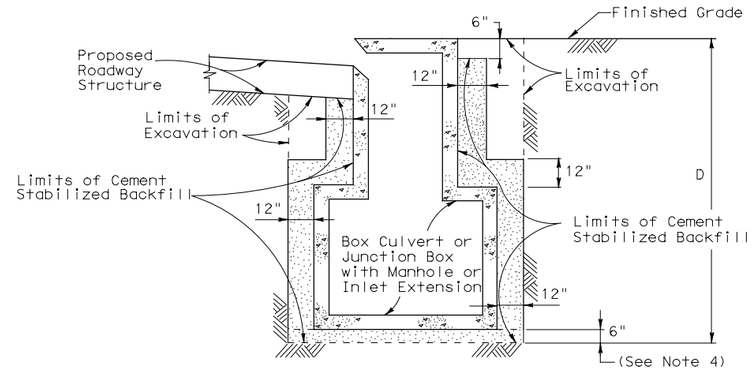
EXCAVATION AND BACKFILL DETAIL

MANHOLES SMALLER THAN 36 IN.
IN A PAVED OR GRADED AREAS
N.T.S.



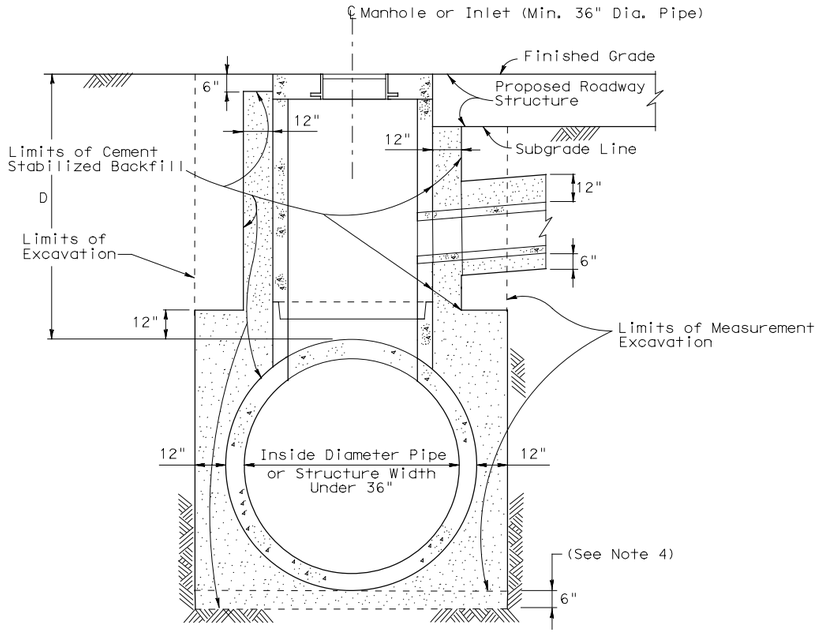
EXCAVATION AND BACKFILL DETAIL

JUNCTION BOXES IN A
PAVED OR GRADED AREA
N.T.S.



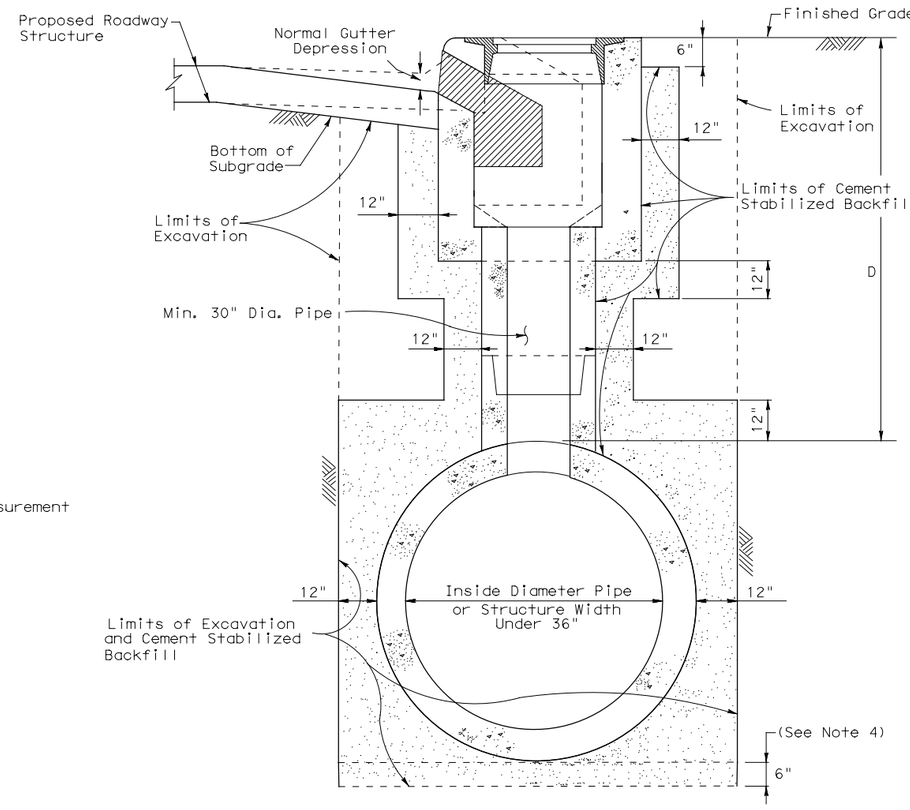
EXCAVATION AND BACKFILL DETAIL

INLET EXTENSIONS ON A BOX CULVERT
IN A PAVED OR GRADED AREA
N.T.S.



EXCAVATION AND BACKFILL DETAIL

MANHOLES 36 IN. AND GREATER
IN A PAVED OR GRADED AREA
N.T.S.



EXCAVATION AND BACKFILL DETAIL

CURB INLETS IN A PAVED OR GRADED AREA
N.T.S.

TABLE 1	
SCHEDULE FOR PAY QUANTITIES OF CEMENT STABILIZED BACKFILL (SEE NOTE 1)	
MANHOLE OR INLET DEPTH (D) IN FEET	CEMENT STABILIZED BACKFILL IN CUBIC YARDS
0 through 5	5.75
> 5 through 10	8.25
greater than 10	12.75

TO BE PAID UNDER ITEM 400-6009 CEMENT STABILIZED BACKFILL (INLET OR MANHOLE)

NOTES:

1. The Contractor is paid a fixed estimated amount for cement stabilized backfill based on depth (D) and Table. 1.
2. Proposed roadway structure includes pavement, base and any subgrade.
3. For backfill of intersecting pipes and box culverts, see "Excavation and Backfill Diagram for Pipes and Box Culverts."
4. 6" cement stabilized backfill will be required only for precast units.

SHEET 2 OF 2

D = Depth
H = Height
T = Thickness
R = Radius
Dia = Diameter

Texas Department of Transportation
Houston District

EXCAVATION AND BACKFILL DIAGRAMS

E&BD

FILE: STDE1.DGN	DN: TxDot	CK: TxDot	DW: TxDot	CK: TxDot
© TxDOT FEB 2010	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS REVISED 2/2010 Added note to Table 1. REVISED 6/12 REVISED 9/14 REVISED 3/15	HOU	6	SEE COVER SHEET	164A
	COUNTY		CONTROL SECT JOB	HIGHWAY
	MONTGOMERY		1986 01 064	FM 1314

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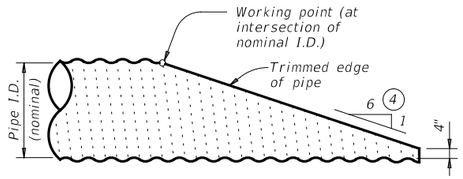
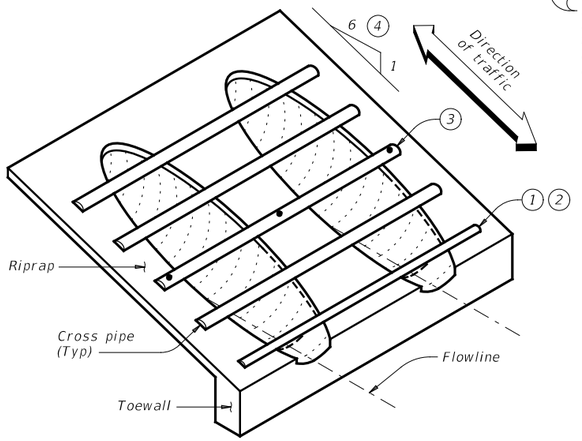


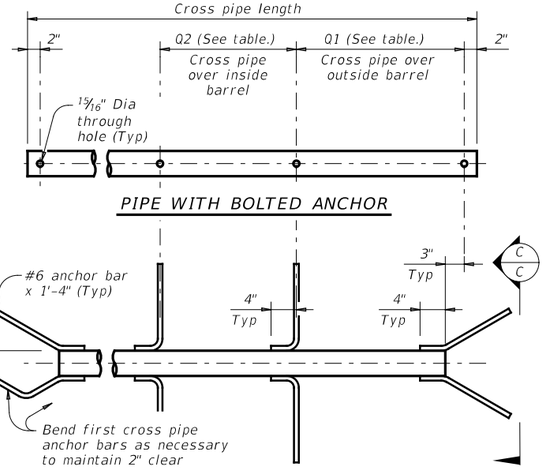
NOTE: All cross pipes, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

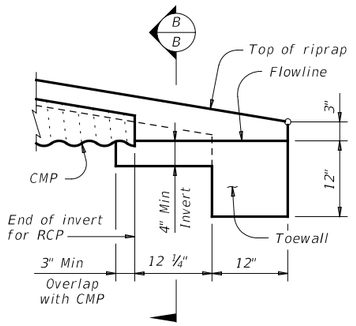
(Showing corrugated metal pipe (CMP) culvert Details at reinforced concrete pipe (RCP) culvert are similar.)



ISOMETRIC VIEW OF TYPICAL INSTALLATION

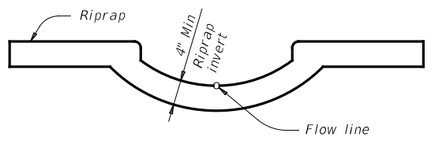


CROSS PIPE DETAILS



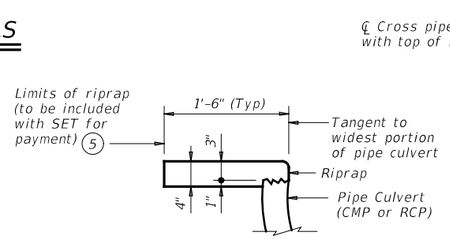
DETAIL "A"

(Showing invert with corrugated metal pipe (CMP) culvert. Reinforced concrete pipe (RCP) culvert details are similar. Cross pipes not shown for clarity.)

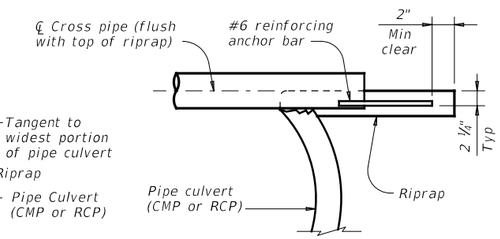


SECTION B-B

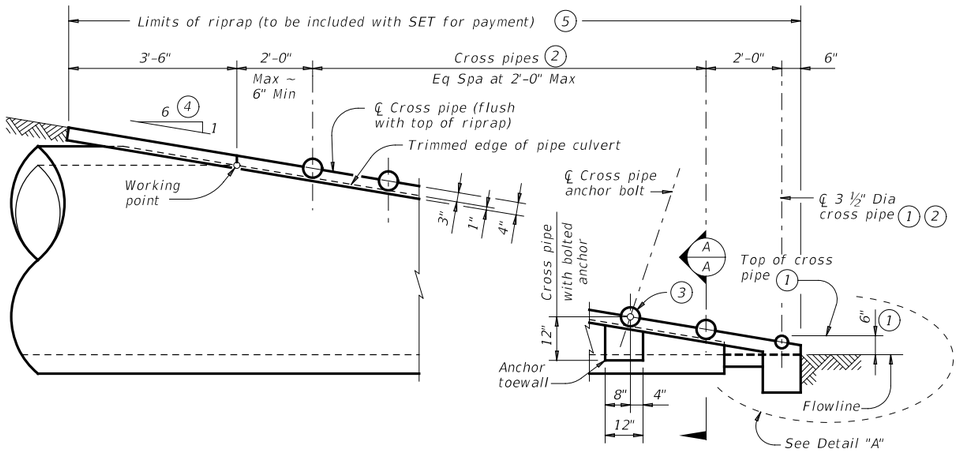
(Cross pipes not shown for clarity.)



SHOWING TYPICAL PIPE CULVERT AND RIPRAP

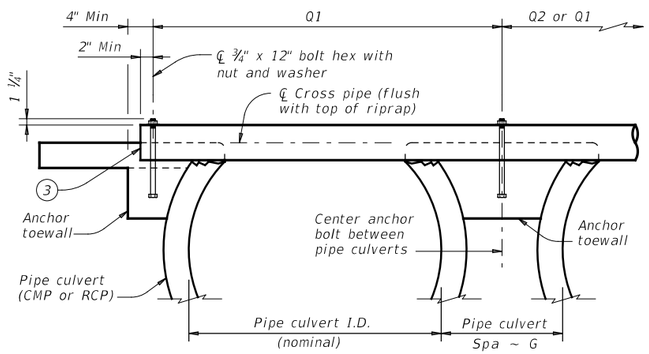


SHOWING CROSS PIPE WITH ANCHOR BAR



SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

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



SHOWING CROSS PIPE WITH BOLTED ANCHOR

SECTION A-A

CROSS PIPE LENGTHS, REQUIRED PIPE SIZES, AND RIPRAP QUANTITIES (2)

Nominal Culvert I.D.	Conc Riprap (CY) (6)	Pipe Culvert Spa ~ G	Single Barrel ~ Q1	Multi-Barrel ~ Q1	Q2	Conditions for Use of Cross Pipes	Cross Pipe Sizes
12"	0.6	0' - 9"	N/A	2' - 1"	1' - 9"	3 or more pipe culverts	3" Std (3.500" O.D.)
15"	0.7	0' - 11"	N/A	2' - 5"	2' - 2"		
18"	0.8	1' - 2"	N/A	2' - 10"	2' - 8"		
21"	0.9	1' - 4"	N/A	3' - 2"	3' - 1"		
24"	0.9	1' - 7"	N/A	3' - 6"	3' - 7"		
27"	1.0	1' - 8"	N/A	3' - 10"	3' - 11"	3 or more pipe culverts	3 1/2" Std (4.000" O.D.)
30"	1.1	1' - 10"	N/A	4' - 2"	4' - 4"	2 or more pipe culverts	
33"	1.2	1' - 11"	4' - 2"	4' - 5"	4' - 8"	All pipe culverts	
36"	1.3	2' - 1"	4' - 5"	4' - 9"	5' - 1"	All pipe culverts	4" Std (4.500" O.D.)
42"	1.5	2' - 4"	4' - 11"	5' - 5"	5' - 10"		
48"	1.7	2' - 7"	5' - 5"	6' - 0"	6' - 7"	All pipe culverts	5" Std (5.563" O.D.)
54"	2.0	3' - 0"	5' - 11"	6' - 9"	7' - 6"		
60"	2.2	3' - 3"	6' - 5"	7' - 4"	8' - 3"		
66"	2.4	3' - 3"	6' - 11"	7' - 10"	8' - 9"		
72"	2.7	3' - 4"	7' - 5"	8' - 5"	9' - 4"		

(1) The proper installation of the first cross pipe is critical for vehicle safety. Place the top of the first cross pipe no more than 6" above the flow line.

(2) Provide cross pipes, except the first bottom pipe, of the size shown in the table. Provide a 3 1#2" standard pipe (4" O.D.) for the first bottom pipe.

(3) Install the third cross pipe from the bottom of the culvert using a bolted connection. Ensure that riprap concrete does not flow into the cross pipe so as to permit disassembly of the bolted connection to allow cleanout access. At the Contractor's option, install all other cross pipes using the bolted connection details.

(4) Match cross slope as shown elsewhere in the plans. Cross slope of 6:1 or flatter is required for vehicle safety.

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

(6) 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.

MATERIAL NOTES:

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

Provide cross pipes that meet the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 (Gr B), or API 5LX52.

Provide ASTM A307 bolts and nuts.

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

GENERAL NOTES:

Cross pipes are designed for a traversing load of 10,000 pounds at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.

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

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

Payment for riprap and toewall is included in the Price Bid for each Safety End Treatment.

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

FOR 12" DIA TO 72" DIA PIPE CULVERTS TYPE II ~ PARALLEL DRAINAGE

SETP-PD

FILE: setppdse-20.dgn	DN: GAF	CK: CAT	DW: JRP	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1986	01	064	FM 1315
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		165

DATE: 3/4/2024 8:03:40 AM
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TABLE OF DIMENSIONS AND REINFORCING STEEL
(Wings for one structure end)

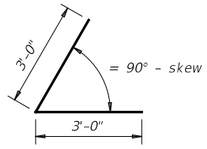
Dimensions					Variable Reinforcing				Estimated Quantities per ft of wing (2~wings) (4)		Estimated Quantities per ft of Toewall (1~toewall)	
					Bars J1		Bars J2					
Maximum Wingwall Height Hw	W	X	Y	Z	Size	Spa	Size	Spa	Reinf (Lb/Ft)	Conc (CY/Ft)	Reinf (Lb/Ft)	Conc (CY/Ft)
2'-6"	2'-10"	10"	1'-0"	7"	#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)

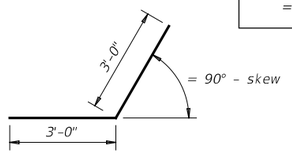
Bar	Size	No.	Spa
D1	#6	~	1'-0"
D2	#6	~	1'-0"
E1	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	~	8"
M1	#4	4	~
P	#4	~	1'-0"
V	#4	~	1'-0"

TABLE OF TOEWALL REINFORCING

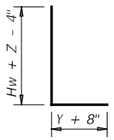
Bar	Size	No.	Spa
J3	#4	~	1'-0"
M2	#4	2	~
E2	#4	~	1'-0"



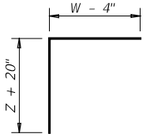
BARS D1



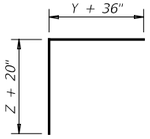
BARS D2



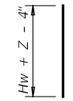
BARS J1



BARS J2



BARS J3



BARS V

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

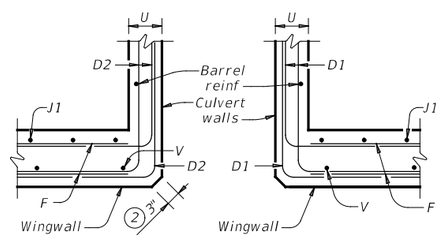
Hw = H + T + C
Lw = (Hw) (SL) ÷ cosine (θ) for Type PW-1
= (Hw - 1') (SL) ÷ cosine (θ) for Type PW-2 and Hw ≥ 4'
= (Hw - 0.5') (SL) ÷ cosine (θ) for Type PW-2 and Hw < 4'

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

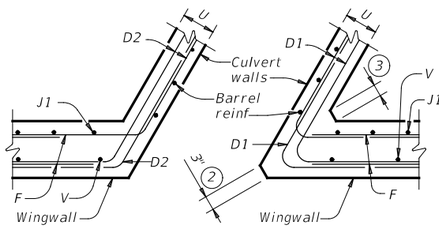
For precast culverts:
Ltw = [(N) (2 U + S) + (N - 1) (0.5')] ÷ cosine (θ)
Total Wingwall Area (two wings ~ SF)
= (2)(Hw)(Lw) for Type PW-1
= (2)(Hw)(Lw) - 6 SF for Type PW-2 and Hw ≥ 4'
= (2)(Hw)(Lw) - 1.5 SF for Type PW-2 and Hw < 4'

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

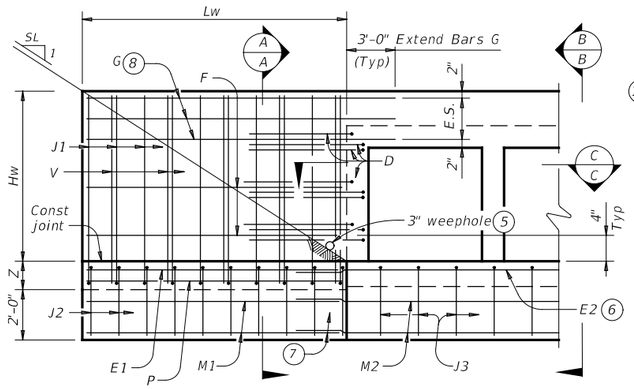
See applicable box culvert standard sheet for S, H, T, and U values.



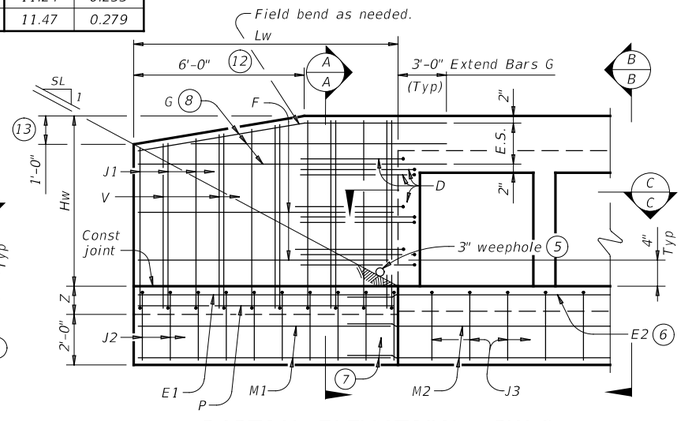
SECTION C-C - PW-1



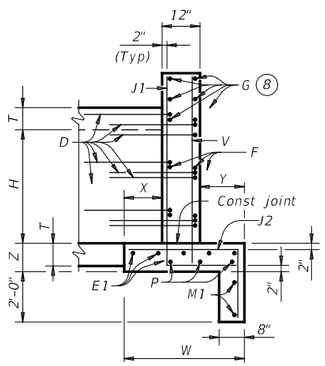
SECTION C-C - PW-2



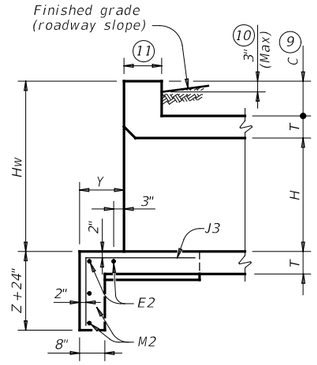
PARTIAL ELEVATION - PW-1



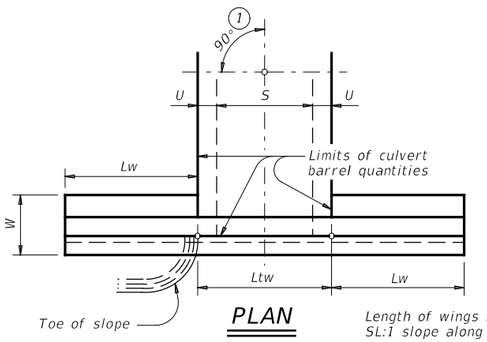
PARTIAL ELEVATION - PW-2



SECTION A-A
(Showing wing reinforcement.)

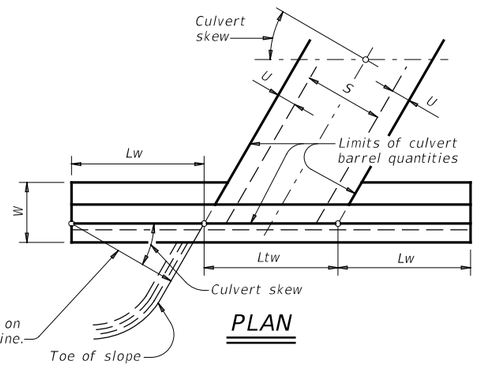


SECTION B-B
(Showing wing reinforcement.)



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 reinforcing 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
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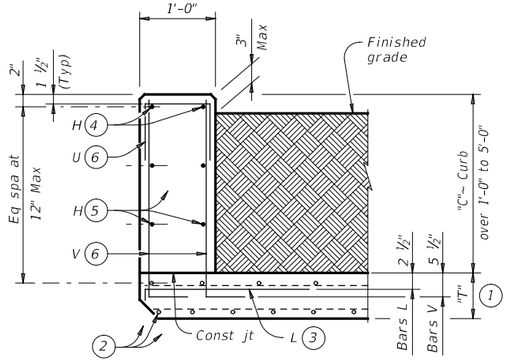
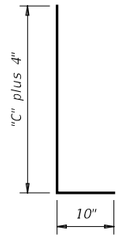
	HOU	MONTGOMERY		166

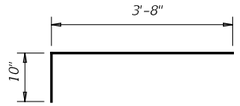


TYPICAL SECTION

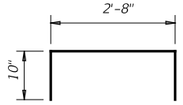
Used for curbs over 1'-0" to 5'-0"



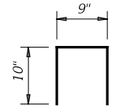
BARS V (#5) (6)
Spaced at 12" Max



BARS L (#5) (3)
Spaced at 12" Max



OPTIONAL BARS L (#5) (3) (7)
Spaced at 12" Max



BARS U (#4) (6)
Spaced at 12" Max

(1) *"T" is equal to the culvert top slab thickness. For precast boxes with slabs less than 8" thick, see SCP-MD standard for additional details.*

(2) *Adjust normal culvert slab bars as necessary to clear obstructions.*

(3) *Place bars L as shown. Tilt hook as necessary to maintain cover.*

(4) *Place normal culvert curb bars H(#4) as shown. Adjust as necessary to clear obstructions.*

(5) *Additional bars H(#4) as required to maintain 12" Max spacing.*

(6) *Replace normal culvert curb bars K with one bar U and two bars V as shown spaced at 12" Max. Adjust length of bars V as necessary to maintain clear cover.*

(7) *Optional bars L are to be used only for precast box culverts with 3'-0" closure pour.*

(8) *Quantities shown are for Contractor's information only. Quantities are per linear foot of curb length. The value in table can be interpolated for intermediate values of curb height, "C". Quantity includes bars K (when applicable).*

TABLE OF ESTIMATED CURB QUANTITIES (8)

Curb Height "C"	Conc (CY/LF)	Reinf Steel (Lb/LF)
1'-0"	0.037	10.4
1'-6"	0.056	14.5
2'-0"	0.074	15.6
2'-6"	0.093	18.0
3'-0"	0.111	19.0
3'-6"	0.130	21.3
4'-0"	0.148	22.4
4'-6"	0.167	24.8
5'-0"	0.185	25.9

CONSTRUCTION NOTES:

Adjust reinforcing steel as necessary to provide 1 ¼" cover.

For vehicle safety, top of the curb must not project more than 3" above the finished grade.

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) minimum for curbs.

Provide bar laps, where required, as follows:

- *Uncoated or galvanized ~ #4 = 1'-8" Min*

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

These extended curb details have sufficient strength to allow for future retrofit of Type T631 or T631LS railing. These details are suitable for use with PR11, PR22 and PR3 type rails. These details are not suitable for the mounting of other rail types. For new construction using T631 or T631LS railing, use the T631-CM standard.

This Curb is considered as part of the Box Culvert for payment.

Cover dimensions are clear dimensions, unless noted otherwise.

Reinforcing bar dimensions shown are out-to-out of bar.

Texas Department of Transportation

Bridge Division Standard

EXTENDED CURB DETAILS

FOR BOX CULVERTS WITH CURBS OVER 1'-0" TO 5'-0" TALL

ECD

FILE: ecdstde1-20.dgn	DN: GAF	CK: TxDOT	DW: TxDOT	CK: GAF
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	HOU	MONTGOMERY		167

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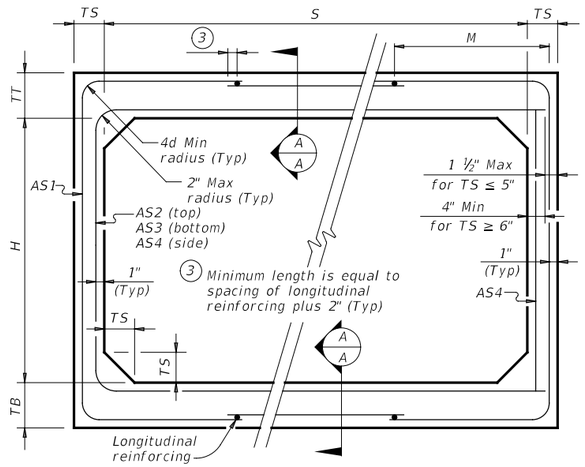
BOX DATA

SECTION DIMENSIONS					Fill Height	M (Min)	REINFORCING (sq. in. / ft.) (2)							(1) Lift Weight
S (ft.)	H (ft.)	TT (in.)	TB (in.)	TS (in.)	(ft.)	(in.)	AS1	AS2	AS3	AS4	AS5	AS7	AS8	(tons)
4	2	7.5	6	5	< 2	–	0.18	0.27	0.15	0.12	0.18	0.18	0.14	4.5
4	2	5	5	5	2 < 3	38	0.18	0.19	0.17	0.12	–	–	–	3.6
4	2	5	5	5	3 – 5	38	0.13	0.13	0.13	0.12	–	–	–	3.6
4	2	5	5	5	10	38	0.12	0.12	0.12	0.12	–	–	–	3.6
4	2	5	5	5	15	38	0.14	0.16	0.16	0.12	–	–	–	3.6
4	2	5	5	5	20	38	0.18	0.20	0.21	0.12	–	–	–	3.6
4	2	5	5	5	25	38	0.23	0.25	0.25	0.12	–	–	–	3.6
4	2	5	5	5	30	38	0.28	0.30	0.30	0.12	–	–	–	3.6
4	3	7.5	6	5	< 2	–	0.18	0.31	0.18	0.12	0.18	0.18	0.14	5.0
4	3	5	5	5	2 < 3	38	0.15	0.23	0.20	0.12	–	–	–	4.1
4	3	5	5	5	3 – 5	38	0.12	0.16	0.16	0.12	–	–	–	4.1
4	3	5	5	5	10	38	0.12	0.14	0.14	0.12	–	–	–	4.1
4	3	5	5	5	15	38	0.12	0.18	0.18	0.12	–	–	–	4.1
4	3	5	5	5	20	38	0.14	0.23	0.24	0.12	–	–	–	4.1
4	3	5	5	5	25	38	0.17	0.29	0.29	0.12	–	–	–	4.1
4	3	5	5	5	30	38	0.21	0.35	0.35	0.12	–	–	–	4.1
4	4	7.5	6	5	< 2	–	0.18	0.33	0.20	0.12	0.18	0.18	0.14	5.5
4	4	5	5	5	2 < 3	38	0.12	0.26	0.23	0.12	–	–	–	4.6
4	4	5	5	5	3 – 5	38	0.12	0.18	0.18	0.12	–	–	–	4.6
4	4	5	5	5	10	38	0.12	0.15	0.15	0.12	–	–	–	4.6
4	4	5	5	5	15	38	0.12	0.19	0.20	0.12	–	–	–	4.6
4	4	5	5	5	20	38	0.12	0.25	0.25	0.12	–	–	–	4.6
4	4	5	5	5	25	38	0.14	0.31	0.31	0.12	–	–	–	4.6
4	4	5	5	5	30	38	0.17	0.37	0.37	0.12	–	–	–	4.6

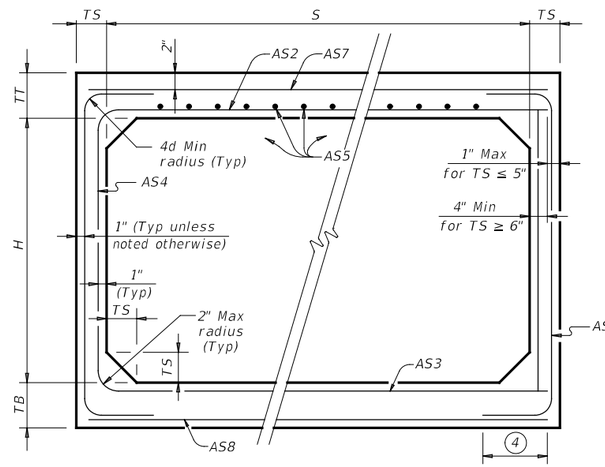
(1) For box length = 8'-0"

(2) AS1 thru AS4, AS7 and AS8 are minimum required areas of reinforcement per linear foot of box length. AS5 is minimum required area of reinforcement per linear foot of box width.



CORNER OPTION "A" CORNER OPTION "B"

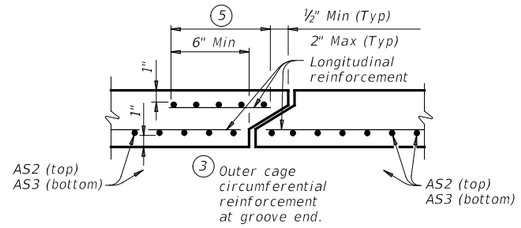
FILL HEIGHT 2 FT AND GREATER



CORNER OPTION "A" CORNER OPTION "B"

FILL HEIGHT LESS THAN 2 FT

(4) Length is equal to spacing of longitudinal reinforcing plus 2". (10" Min) (Typ)



SECTION A-A

(Showing top and bottom slab joint reinforcement.)

MATERIAL NOTES:

Provide 0.03 sq. in./ft. minimum longitudinal reinforcement at each face in slabs and walls. This minimum requirement may be met by the transverse wires when wire mesh reinforcement is used.

Provide Class H concrete (f`c = 5,000 psi).

GENERAL NOTES:

Designs shown conform to ASTM C1577. Refer to ASTM C1577 for information or details not shown.

See Box Culverts Precast Miscellaneous Details (SCP-MD) standard sheet for details and notes not shown.

In lieu of furnishing the designs shown on this sheet, the contractor may furnish an alternate design that is equal to or exceeds the box design for the design fill height in the table. Submit shop plans for alternate designs in accordance with Item "Precast Concrete Structural Members (Fabrication)".

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS PRECAST

4'-0" SPAN

SCP-4

FILE: scp04sts-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1986	01	064	FM 1314
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		168

DATE: 3/4/2024 8:03:43 AM
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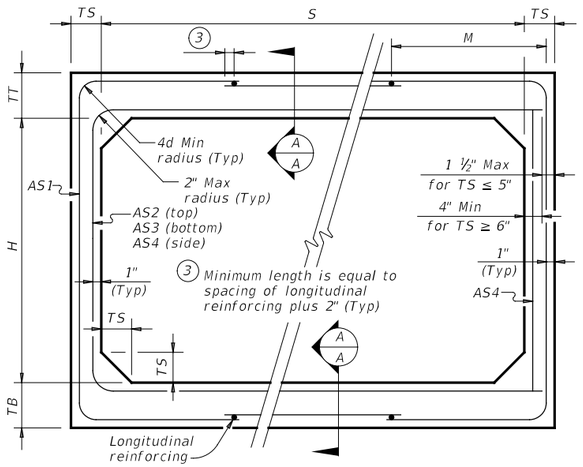
BOX DATA

SECTION DIMENSIONS					Fill Height	M (Min)	REINFORCING (sq. in. / ft.) (2)							(1) Lift Weight
S (ft.)	H (ft.)	TT (in.)	TB (in.)	TS (in.)	(ft.)	(in.)	AS1	AS2	AS3	AS4	AS5	AS7	AS8	(tons)
5	2	8	7	6	< 2	–	0.19	0.27	0.18	0.14	0.19	0.19	0.17	6.0
5	2	6	6	6	2 < 3	44	0.22	0.20	0.16	0.14	–	–	–	5.1
5	2	6	6	6	3 – 5	44	0.16	0.14	0.14	0.14	–	–	–	5.1
5	2	6	6	6	10	36	0.15	0.14	0.14	0.14	–	–	–	5.1
5	2	6	6	6	15	36	0.20	0.18	0.18	0.14	–	–	–	5.1
5	2	6	6	6	20	36	0.26	0.23	0.24	0.14	–	–	–	5.1
5	2	6	6	6	25	36	0.33	0.29	0.29	0.14	–	–	–	5.1
5	2	6	6	6	30	36	0.39	0.34	0.35	0.14	–	–	–	5.1
5	3	8	7	6	< 2	–	0.19	0.31	0.21	0.14	0.19	0.19	0.17	6.6
5	3	6	6	6	2 < 3	45	0.18	0.24	0.19	0.14	–	–	–	5.7
5	3	6	6	6	3 – 5	36	0.14	0.17	0.16	0.14	–	–	–	5.7
5	3	6	6	6	10	36	0.14	0.16	0.17	0.14	–	–	–	5.7
5	3	6	6	6	15	35	0.16	0.21	0.22	0.14	–	–	–	5.7
5	3	6	6	6	20	35	0.21	0.27	0.28	0.14	–	–	–	5.7
5	3	6	6	6	25	35	0.26	0.34	0.34	0.14	–	–	–	5.7
5	3	6	6	6	30	35	0.31	0.41	0.41	0.14	–	–	–	5.7
5	4	8	7	6	< 2	–	0.19	0.33	0.24	0.14	0.19	0.19	0.17	7.2
5	4	6	6	6	2 < 3	45	0.16	0.27	0.22	0.14	–	–	–	6.3
5	4	6	6	6	3 – 5	45	0.14	0.19	0.18	0.14	–	–	–	6.3
5	4	6	6	6	10	36	0.14	0.18	0.18	0.14	–	–	–	6.3
5	4	6	6	6	15	35	0.14	0.23	0.24	0.14	–	–	–	6.3
5	4	6	6	6	20	35	0.17	0.30	0.31	0.14	–	–	–	6.3
5	4	6	6	6	25	35	0.21	0.37	0.38	0.14	–	–	–	6.3
5	4	6	6	6	30	35	0.25	0.44	0.45	0.14	–	–	–	6.3
5	5	8	7	6	< 2	–	0.19	0.35	0.26	0.14	0.19	0.19	0.17	7.8
5	5	6	6	6	2 < 3	45	0.14	0.29	0.24	0.14	–	–	–	6.9
5	5	6	6	6	3 – 5	45	0.14	0.21	0.20	0.14	–	–	–	6.9
5	5	6	6	6	10	45	0.14	0.19	0.20	0.14	–	–	–	6.9
5	5	6	6	6	15	36	0.14	0.24	0.25	0.14	–	–	–	6.9
5	5	6	6	6	20	35	0.15	0.31	0.32	0.14	–	–	–	6.9
5	5	6	6	6	25	35	0.18	0.38	0.39	0.14	–	–	–	6.9
5	5	6	6	6	30	35	0.21	0.46	0.47	0.14	–	–	–	6.9

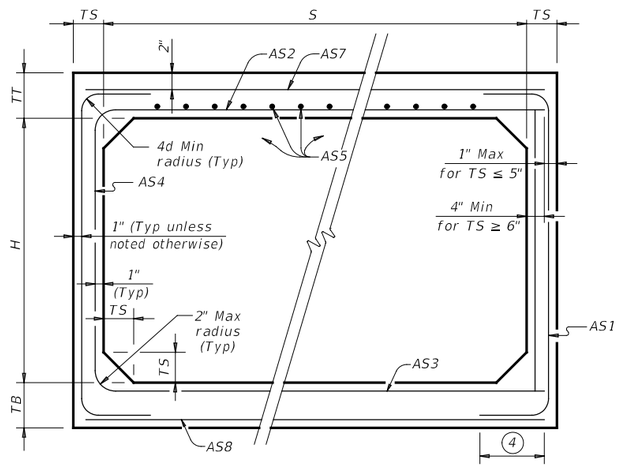
(1) For box length = 8'-0"

(2) AS1 thru AS4, AS7 and AS8 are minimum required areas of reinforcement per linear foot of box length. AS5 is minimum required area of reinforcement per linear foot of box width.



CORNER OPTION "A" CORNER OPTION "B"

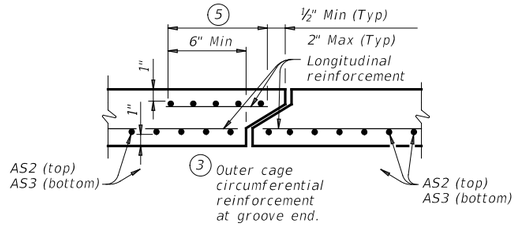
FILL HEIGHT 2 FT AND GREATER



CORNER OPTION "A" CORNER OPTION "B"

FILL HEIGHT LESS THAN 2 FT

(4) Length is equal to spacing of longitudinal reinforcing plus 2". (10" Min) (Typ)



SECTION A-A

(Showing top and bottom slab joint reinforcement.)

MATERIAL NOTES:

Provide 0.03 sq. in./ft. minimum longitudinal reinforcement at each face in slabs and walls. This minimum requirement may be met by the transverse wires when wire mesh reinforcement is used.

Provide Class H concrete (f`c = 5,000 psi).

GENERAL NOTES:

Designs shown conform to ASTM C1577. Refer to ASTM C1577 for information or details not shown.

See Box Culverts Precast Miscellaneous Details (SCP-MD) standard sheet for details and notes not shown.

In lieu of furnishing the designs shown on this sheet, the contractor may furnish an alternate design that is equal to or exceeds the box design for the design fill height in the table. Submit shop plans for alternate designs in accordance with Item "Precast Concrete Structural Members (Fabrication)".

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS PRECAST

5'-0" SPAN

SCP-5

FILE: scp05sts-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020 REVISIONS	CONT	SECT	JOB	HIGHWAY
	1986	01	064	FM 1314
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		169

DATE: 3/4/2024 8:03:44 AM
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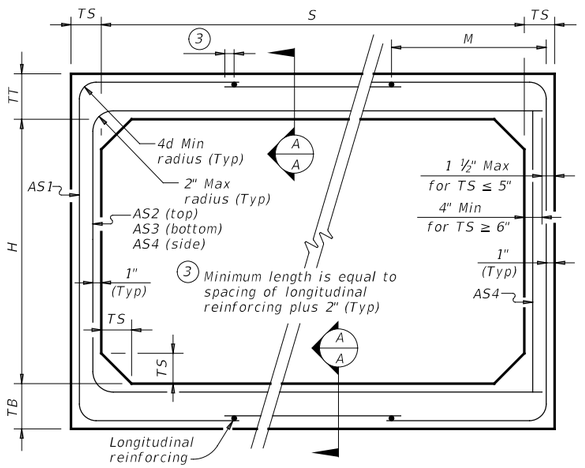
BOX DATA

SECTION DIMENSIONS					Fill Height	M (Min)	REINFORCING (sq. in. / ft.) (2)							(1) Lift Weight
S (ft.)	H (ft.)	TT (in.)	TB (in.)	TS (in.)	(ft.)	(in.)	AS1	AS2	AS3	AS4	AS5	AS7	AS8	(tons)
6	2	8	7	7	< 2	–	0.23	0.27	0.19	0.17	0.19	0.19	0.17	7.2
6	2	7	7	7	2 < 3	43	0.25	0.21	0.17	0.17	–	–	–	6.8
6	2	7	7	7	3 – 5	43	0.20	0.17	0.17	0.17	–	–	–	6.8
6	2	7	7	7	10	39	0.20	0.17	0.17	0.17	–	–	–	6.8
6	2	7	7	7	15	39	0.26	0.20	0.20	0.17	–	–	–	6.8
6	2	7	7	7	20	39	0.34	0.26	0.26	0.17	–	–	–	6.8
6	2	7	7	7	25	39	0.43	0.32	0.32	0.17	–	–	–	6.8
6	2	7	7	7	30	39	0.52	0.38	0.39	0.17	–	–	–	6.8
6	3	8	7	7	< 2	–	0.20	0.31	0.22	0.17	0.19	0.19	0.17	7.9
6	3	7	7	7	2 < 3	43	0.21	0.24	0.19	0.17	–	–	–	7.5
6	3	7	7	7	3 – 5	39	0.17	0.18	0.17	0.17	–	–	–	7.5
6	3	7	7	7	10	39	0.17	0.18	0.19	0.17	–	–	–	7.5
6	3	7	7	7	15	38	0.22	0.24	0.24	0.17	–	–	–	7.5
6	3	7	7	7	20	38	0.28	0.31	0.31	0.17	–	–	–	7.5
6	3	7	7	7	25	38	0.35	0.38	0.39	0.17	–	–	–	7.5
6	3	7	7	7	30	38	0.42	0.46	0.46	0.17	–	–	–	7.5
6	4	8	7	7	< 2	–	0.19	0.34	0.25	0.17	0.19	0.19	0.17	8.6
6	4	7	7	7	2 < 3	43	0.19	0.27	0.21	0.17	–	–	–	8.2
6	4	7	7	7	3 – 5	39	0.17	0.21	0.19	0.17	–	–	–	8.2
6	4	7	7	7	10	39	0.17	0.20	0.21	0.17	–	–	–	8.2
6	4	7	7	7	15	38	0.18	0.27	0.27	0.17	–	–	–	8.2
6	4	7	7	7	20	38	0.24	0.34	0.35	0.17	–	–	–	8.2
6	4	7	7	7	25	38	0.29	0.43	0.42	0.17	–	–	–	8.2
6	4	7	7	7	30	38	0.35	0.51	0.52	0.17	–	–	–	8.2
6	5	8	7	7	< 2	–	0.19	0.37	0.28	0.17	0.19	0.19	0.17	9.3
6	5	7	7	7	2 < 3	43	0.17	0.30	0.24	0.17	–	–	–	8.9
6	5	7	7	7	3 – 5	43	0.17	0.23	0.21	0.17	–	–	–	8.9
6	5	7	7	7	10	39	0.17	0.22	0.23	0.17	–	–	–	8.9
6	5	7	7	7	15	38	0.17	0.28	0.29	0.17	–	–	–	8.9
6	5	7	7	7	20	38	0.20	0.37	0.38	0.17	–	–	–	8.9
6	5	7	7	7	25	38	0.25	0.45	0.46	0.17	–	–	–	8.9
6	5	7	7	7	30	38	0.30	0.54	0.55	0.17	–	–	–	8.9
6	6	8	7	7	< 2	–	0.19	0.38	0.30	0.17	0.19	0.19	0.17	10
6	6	7	7	7	2 < 3	52	0.17	0.32	0.26	0.17	–	–	–	9.6
6	6	7	7	7	3 – 5	52	0.17	0.24	0.22	0.17	–	–	–	9.6
6	6	7	7	7	10	43	0.17	0.23	0.24	0.17	–	–	–	9.6
6	6	7	7	7	15	39	0.17	0.29	0.31	0.17	–	–	–	9.6
6	6	7	7	7	20	39	0.18	0.38	0.39	0.17	–	–	–	9.6
6	6	7	7	7	25	38	0.23	0.46	0.48	0.17	–	–	–	9.6
6	6	7	7	7	30	38	0.27	0.55	0.57	0.17	–	–	–	9.6

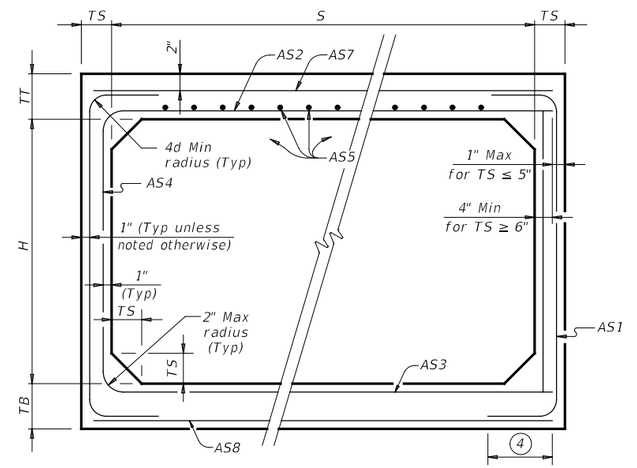
(1) For box length = 8'-0"

(2) AS1 thru AS4, AS7 and AS8 are minimum required areas of reinforcement per linear foot of box length. AS5 is minimum required area of reinforcement per linear foot of box width.



CORNER OPTION "A" CORNER OPTION "B"

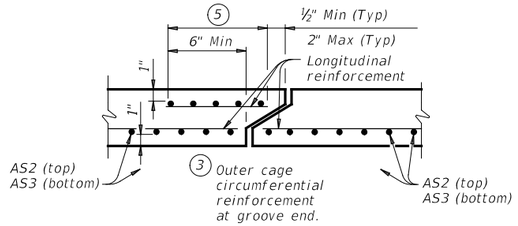
FILL HEIGHT 2 FT AND GREATER



CORNER OPTION "A" CORNER OPTION "B"

FILL HEIGHT LESS THAN 2 FT

(4) Length is equal to spacing of longitudinal reinforcing plus 2". (10" Min) (Typ)



SECTION A-A

(Showing top and bottom slab joint reinforcement.)

MATERIAL NOTES:

Provide 0.03 sq. in./ft. minimum longitudinal reinforcement at each face in slabs and walls. This minimum requirement may be met by the transverse wires when wire mesh reinforcement is used.

Provide Class H concrete (f`c = 5,000 psi).

GENERAL NOTES:

Designs shown conform to ASTM C1577. Refer to ASTM C1577 for information or details not shown.

See Box Culverts Precast Miscellaneous Details (SCP-MD) standard sheet for details and notes not shown.

In lieu of furnishing the designs shown on this sheet, the contractor may furnish an alternate design that is equal to or exceeds the box design for the design fill height in the table. Submit shop plans for alternate designs in accordance with Item "Precast Concrete Structural Members (Fabrication)".

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS PRECAST

6'-0" SPAN

SCP-6

FILE: scp06sts-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020 REVISIONS	CONT	SECT	JOB	HIGHWAY
	1986	01	064	FM 1314
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		170

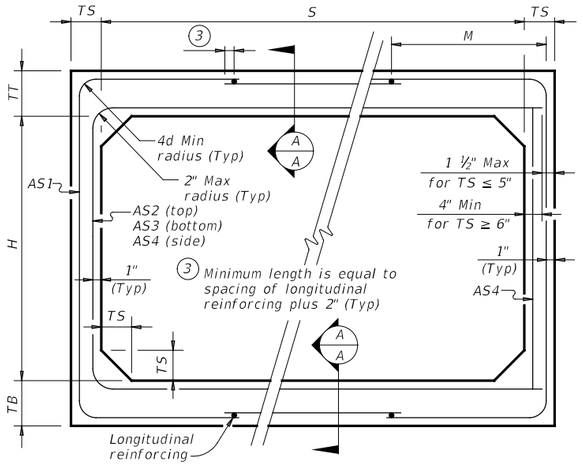
DATE:
FILE:

BOX DATA

SECTION DIMENSIONS					Fill Height	M (Min)	REINFORCING (sq. in. / ft.) (2)							(1) Lift Weight
S (ft.)	H (ft.)	TT (in.)	TB (in.)	TS (in.)	(ft.)	(in.)	AS1	AS2	AS3	AS4	AS5	AS7	AS8	(tons)
8	3	8	8	8	< 2	–	0.31	0.35	0.25	0.19	0.19	0.19	0.19	10.4
8	3	8	8	8	2 < 3	55	0.35	0.29	0.28	0.19	–	–	–	10.4
8	3	8	8	8	3 – 5	50	0.28	0.23	0.24	0.19	–	–	–	10.4
8	3	8	8	8	10	45	0.29	0.25	0.26	0.19	–	–	–	10.4
8	3	8	8	8	15	45	0.39	0.33	0.34	0.19	–	–	–	10.4
8	3	8	8	8	20	45	0.51	0.43	0.44	0.19	–	–	–	10.4
8	3	8	8	8	25	45	0.63	0.53	0.54	0.19	–	–	–	10.4
8	4	8	8	8	< 2	–	0.27	0.38	0.29	0.19	0.19	0.19	0.19	11.2
8	4	8	8	8	2 < 3	50	0.31	0.34	0.32	0.19	–	–	–	11.2
8	4	8	8	8	3 – 5	50	0.25	0.27	0.27	0.19	–	–	–	11.2
8	4	8	8	8	10	45	0.26	0.28	0.29	0.19	–	–	–	11.2
8	4	8	8	8	15	41	0.34	0.37	0.38	0.19	–	–	–	11.2
8	4	8	8	8	20	41	0.44	0.48	0.49	0.19	–	–	–	11.2
8	5	8	8	8	< 2	–	0.24	0.40	0.32	0.19	0.19	0.19	0.19	12.0
8	5	8	8	8	2 < 3	50	0.28	0.37	0.35	0.19	–	–	–	12.0
8	5	8	8	8	3 – 5	45	0.23	0.29	0.30	0.19	–	–	–	12.0
8	5	8	8	8	10	45	0.23	0.31	0.32	0.19	–	–	–	12.0
8	5	8	8	8	15	41	0.30	0.41	0.42	0.19	–	–	–	12.0
8	5	8	8	8	20	41	0.39	0.52	0.54	0.19	–	–	–	12.0
8	6	8	8	8	< 2	–	0.22	0.42	0.35	0.19	0.19	0.19	0.19	12.8
8	6	8	8	8	2 < 3	50	0.25	0.40	0.38	0.19	–	–	–	12.8
8	6	8	8	8	3 – 5	50	0.21	0.32	0.33	0.19	–	–	–	12.8
8	6	8	8	8	10	45	0.22	0.33	0.34	0.19	–	–	–	12.8
8	6	8	8	8	15	41	0.28	0.43	0.45	0.19	–	–	–	12.8
8	6	8	8	8	20	41	0.36	0.55	0.57	0.19	–	–	–	12.8
8	7	8	8	8	< 2	–	0.20	0.44	0.37	0.19	0.19	0.19	0.19	13.6
8	7	8	8	8	2 < 3	55	0.23	0.43	0.41	0.19	–	–	–	13.6
8	7	8	8	8	3 – 5	55	0.19	0.34	0.35	0.19	–	–	–	13.6
8	7	8	8	8	10	50	0.20	0.34	0.36	0.19	–	–	–	13.6
8	7	8	8	8	15	41	0.26	0.45	0.47	0.19	–	–	–	13.6
8	7	8	8	8	20	41	0.33	0.57	0.60	0.19	–	–	–	13.6
8	8	8	8	8	< 2	–	0.20	0.45	0.40	0.19	0.19	0.19	0.19	14.4
8	8	8	8	8	2 < 3	65	0.21	0.45	0.44	0.19	–	–	–	14.4
8	8	8	8	8	3 – 5	65	0.19	0.36	0.38	0.19	–	–	–	14.4
8	8	8	8	8	10	55	0.19	0.35	0.38	0.19	–	–	–	14.4
8	8	8	8	8	15	45	0.24	0.46	0.49	0.19	–	–	–	14.4
8	8	8	8	8	20	45	0.31	0.59	0.62	0.19	–	–	–	14.4

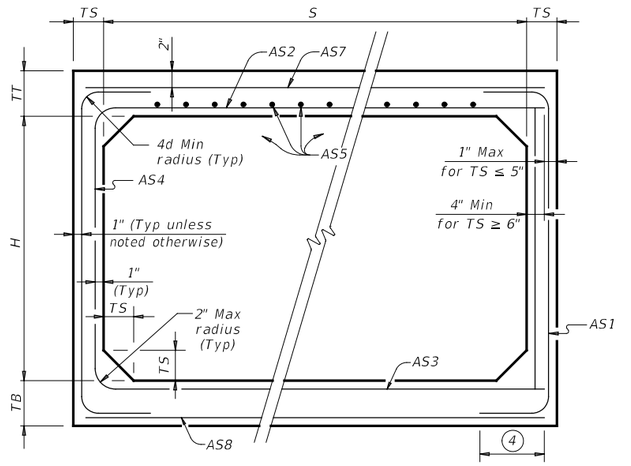
(1) For box length = 8'-0"

(2) AS1 thru AS4, AS7 and AS8 are minimum required areas of reinforcement per linear foot of box length. AS5 is minimum required area of reinforcement per linear foot of box width.



CORNER OPTION "A" CORNER OPTION "B"

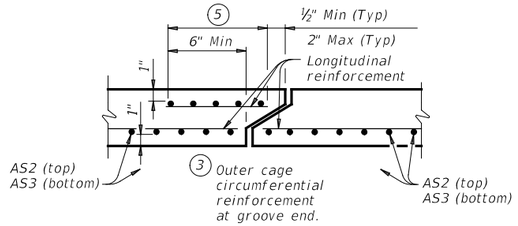
FILL HEIGHT 2 FT AND GREATER



CORNER OPTION "A" CORNER OPTION "B"

FILL HEIGHT LESS THAN 2 FT

(4) Length is equal to spacing of longitudinal reinforcing plus 2". (10" Min) (Typ)



SECTION A-A

(Showing top and bottom slab joint reinforcement.)

MATERIAL NOTES:

Provide 0.03 sq. in./ft. minimum longitudinal reinforcement at each face in slabs and walls. This minimum requirement may be met by the transverse wires when wire mesh reinforcement is used.

Provide Class H concrete (f`c = 5,000 psi).

GENERAL NOTES:

Designs shown conform to ASTM C1577. Refer to ASTM C1577 for information or details not shown.

See Box Culverts Precast Miscellaneous Details (SCP-MD) standard sheet for details and notes not shown.

In lieu of furnishing the designs shown on this sheet, the contractor may furnish an alternate design that is equal to or exceeds the box design for the design fill height in the table. Submit shop plans for alternate designs in accordance with Item "Precast Concrete Structural Members (Fabrication)".

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS PRECAST

8'-0" SPAN

SCP-8

FILE: scp08sts-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020 REVISIONS	CONT	SECT	JOB	HIGHWAY
	1986	01	064	FM 1315
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		171

DATE: 3/4/2024 8:03:47 AM
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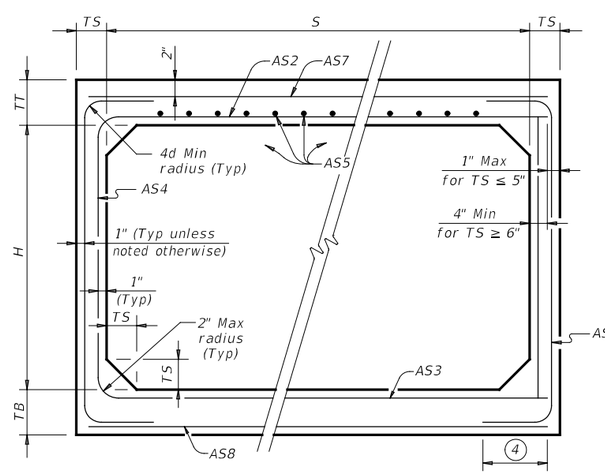
BOX DATA

SECTION DIMENSIONS					Fill Height	M (Min)	REINFORCING (sq. in. / ft.) ②							① Lift Weight
S (ft.)	H (ft.)	TT (in.)	TB (in.)	TS (in.)	(ft.)	(in.)	AS1	AS2	AS3	AS4	AS5	AS7	AS8	(tons)
12	4	12	12	12	< 2	–	0.38	0.31	0.29	0.29	0.29	0.29	0.29	22.8
12	4	12	12	12	2 < 3	73	0.44	0.37	0.30	0.29	–	–	–	22.8
12	4	12	12	12	3 – 5	66	0.37	0.30	0.29	0.29	–	–	–	22.8
12	4	12	12	12	10	66	0.44	0.34	0.35	0.29	–	–	–	22.8
12	4	12	12	12	15	59	0.60	0.46	0.48	0.29	–	–	–	22.8
12	4	12	12	12	20	59	0.78	0.60	0.61	0.29	–	–	–	22.8
12	4	12	12	12	25	59	0.97	0.74	0.75	0.29	–	–	–	22.8
12	5	12	12	12	< 2	–	0.34	0.33	0.29	0.29	0.29	0.29	0.29	24.0
12	5	12	12	12	2 < 3	66	0.41	0.40	0.33	0.29	–	–	–	24.0
12	5	12	12	12	3 – 5	61	0.34	0.33	0.30	0.29	–	–	–	24.0
12	5	12	12	12	10	59	0.41	0.38	0.39	0.29	–	–	–	24.0
12	5	12	12	12	15	59	0.55	0.51	0.52	0.29	–	–	–	24.0
12	5	12	12	12	20	59	0.71	0.66	0.67	0.29	–	–	–	24.0
12	5	12	12	12	25	59	0.88	0.81	0.82	0.29	–	–	–	24.0
12	6	12	12	12	< 2	–	0.32	0.36	0.32	0.29	0.29	0.29	0.29	25.2
12	6	12	12	12	2 < 3	66	0.38	0.43	0.36	0.29	–	–	–	25.2
12	6	12	12	12	3 – 5	59	0.32	0.36	0.33	0.29	–	–	–	25.2
12	6	12	12	12	10	59	0.38	0.41	0.42	0.29	–	–	–	25.2
12	6	12	12	12	15	53	0.51	0.55	0.57	0.29	–	–	–	25.2
12	6	12	12	12	20	53	0.65	0.71	0.72	0.29	–	–	–	25.2
12	6	12	12	12	25	53	0.81	0.87	0.89	0.29	–	–	–	25.2
12	7	12	12	12	< 2	–	0.30	0.39	0.35	0.29	0.29	0.29	0.29	26.4
12	7	12	12	12	2 < 3	66	0.35	0.46	0.39	0.29	–	–	–	26.4
12	7	12	12	12	3 – 5	59	0.29	0.38	0.36	0.29	–	–	–	26.4
12	7	12	12	12	10	59	0.36	0.43	0.45	0.29	–	–	–	26.4
12	7	12	12	12	15	53	0.47	0.58	0.61	0.29	–	–	–	26.4
12	7	12	12	12	20	53	0.61	0.75	0.77	0.29	–	–	–	26.4
12	8	12	12	12	< 2	–	0.29	0.41	0.38	0.29	0.29	0.29	0.29	27.6
12	8	12	12	12	2 < 3	66	0.33	0.49	0.42	0.29	–	–	–	27.6
12	8	12	12	12	3 – 5	59	0.29	0.41	0.38	0.29	–	–	–	27.6
12	8	12	12	12	10	59	0.34	0.46	0.48	0.29	–	–	–	27.6
12	8	12	12	12	15	53	0.44	0.61	0.64	0.29	–	–	–	27.6
12	8	12	12	12	20	53	0.57	0.78	0.81	0.29	–	–	–	27.6
12	8	12	12	12	25	53	0.69	0.96	0.99	0.29	–	–	–	27.6

BOX DATA

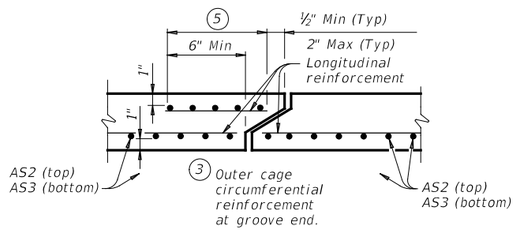
SECTION DIMENSIONS					Fill Height	M (Min)	REINFORCING (sq. in. / ft.) ②							① Lift Weight
S (ft.)	H (ft.)	TT (in.)	TB (in.)	TS (in.)	(ft.)	(in.)	AS1	AS2	AS3	AS4	AS5	AS7	AS8	(tons)
12	9	12	12	12	< 2	–	0.29	0.43	0.40	0.29	0.29	0.29	0.29	28.8
12	9	12	12	12	2 < 3	66	0.30	0.51	0.45	0.29	–	–	–	28.8
12	9	12	12	12	3 – 5	66	0.29	0.43	0.41	0.29	–	–	–	28.8
12	9	12	12	12	10	59	0.32	0.47	0.51	0.29	–	–	–	28.8
12	9	12	12	12	15	53	0.42	0.63	0.67	0.29	–	–	–	28.8
12	9	12	12	12	20	53	0.53	0.81	0.85	0.29	–	–	–	28.8
12	9	12	12	12	25	53	0.69	0.96	0.99	0.29	–	–	–	28.8
12	10	12	12	12	< 2	–	0.29	0.45	0.43	0.29	0.29	0.29	0.29	30.0
12	10	12	12	12	2 < 3	73	0.29	0.54	0.48	0.29	–	–	–	30.0
12	10	12	12	12	3 – 5	66	0.29	0.45	0.43	0.29	–	–	–	30.0
12	10	12	12	12	10	59	0.31	0.49	0.53	0.29	–	–	–	30.0
12	10	12	12	12	15	53	0.40	0.65	0.70	0.29	–	–	–	30.0
12	10	12	12	12	20	53	0.51	0.84	0.88	0.29	–	–	–	30.0
12	10	12	12	12	25	53	0.62	1.03	1.07	0.29	–	–	–	30.0
12	11	12	12	12	< 2	–	0.29	0.47	0.45	0.29	0.29	0.29	0.29	31.2
12	11	12	12	12	2 < 3	80	0.29	0.56	0.51	0.29	–	–	–	31.2
12	11	12	12	12	3 – 5	73	0.29	0.47	0.46	0.29	–	–	–	31.2
12	11	12	12	12	10	66	0.29	0.51	0.55	0.29	–	–	–	31.2
12	11	12	12	12	15	59	0.38	0.67	0.72	0.29	–	–	–	31.2
12	11	12	12	12	20	53	0.48	0.85	0.91	0.29	–	–	–	31.2
12	11	12	12	12	25	53	0.59	1.05	1.10	0.29	–	–	–	31.2
12	12	12	12	12	< 2	–	0.29	0.49	0.48	0.33	0.29	0.29	0.29	32.4
12	12	12	12	12	2 < 3	93	0.29	0.59	0.53	0.29	–	–	–	32.4
12	12	12	12	12	3 – 5	80	0.29	0.49	0.48	0.29	–	–	–	32.4
12	12	12	12	12	10	73	0.29	0.52	0.58	0.29	–	–	–	32.4
12	12	12	12	12	15	59	0.37	0.69	0.74	0.29	–	–	–	32.4
12	12	12	12	12	20	59	0.46	0.87	0.93	0.29	–	–	–	32.4



CORNER OPTION "A" CORNER OPTION "B"

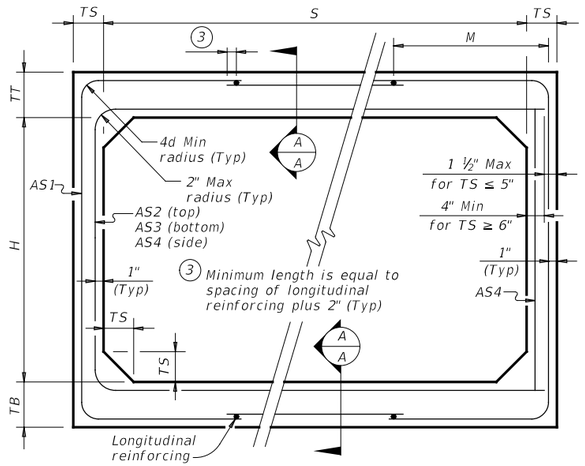
FILL HEIGHT LESS THAN 2 FT

④ Length is equal to spacing of longitudinal reinforcing plus 2". (10" Min) (Typ)



SECTION A-A

(Showing top and bottom slab joint reinforcement.)



CORNER OPTION "A" CORNER OPTION "B"

FILL HEIGHT 2 FT AND GREATER

① For box length = 8'-0"

② AS1 thru AS4, AS7 and AS8 are minimum required areas of reinforcement per linear foot of box length. AS5 is minimum required area of reinforcement per linear foot of box width.

MATERIAL NOTES:

Provide 0.03 sq. in./ft. minimum longitudinal reinforcement at each face in slabs and walls. This minimum requirement may be met by the transverse wires when wire mesh reinforcement is used.

Provide Class H concrete (f`c = 5,000 psi).

GENERAL NOTES:

Designs shown conform to ASTM C1577. Refer to ASTM C1577 for information or details not shown.

See Box Culverts Precast Miscellaneous Details (SCP-MD) standard sheet for details and notes not shown.

In lieu of furnishing the designs shown on this sheet, the contractor may furnish an alternate design that is equal to or exceeds the box design for the design fill height in the table. Submit shop plans for alternate designs in accordance with Item "Precast Concrete Structural Members (Fabrication)".

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS PRECAST

12'-0" SPAN

SCP-12

FILE: scp12sts-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		172

DATE: 3/4/2024 8:03:48 AM
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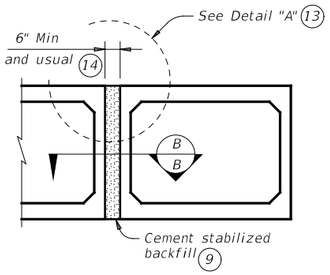
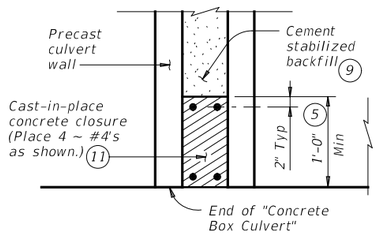
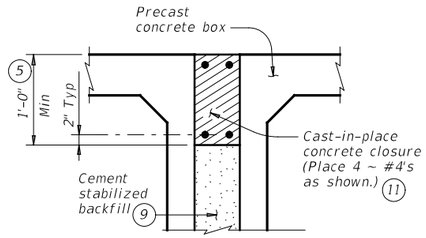


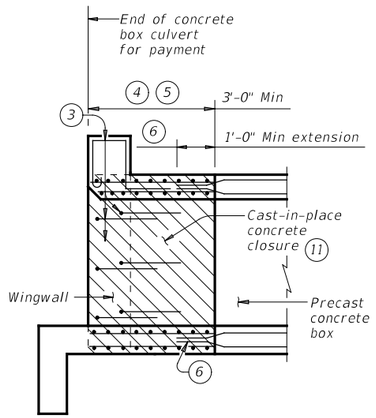
MULTIPLE UNIT PLACEMENT



SECTION B-B

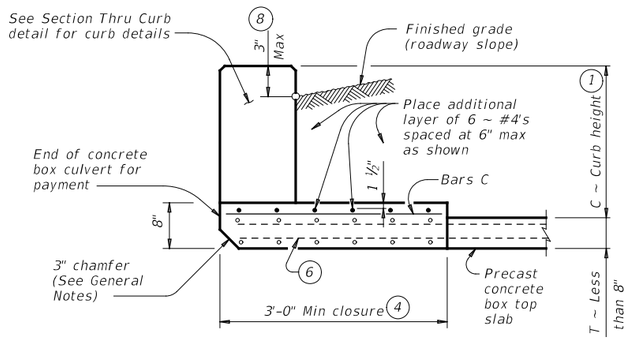


DETAIL "A" (13)

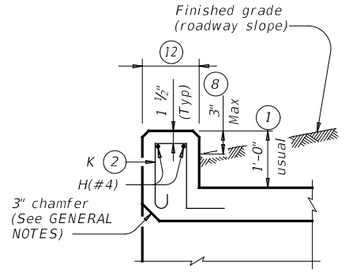


WINGWALL CONNECTION

(Also applies to safety end treatment.)

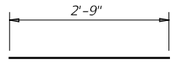


SECTION THRU TOP SLABS LESS THAN 8"

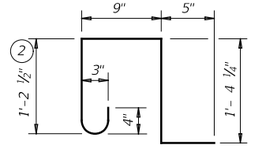


SECTION THRU CURB

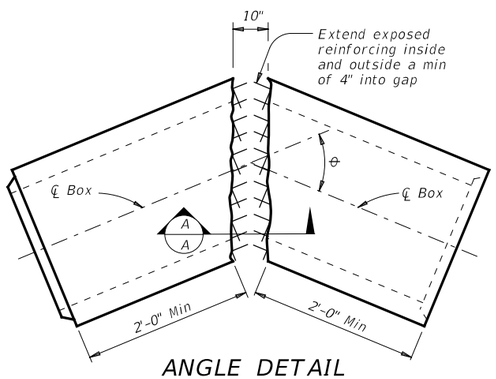
QUANTITIES PER FOOT OF CURB (10)	
Reinforcing Steel	4.12 Lb
Concrete	0.037 CY



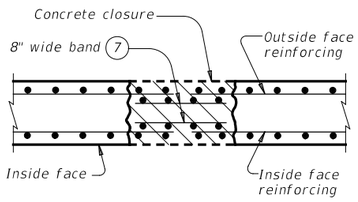
BARS C (#4)
(Spa = 1'-0" Max)



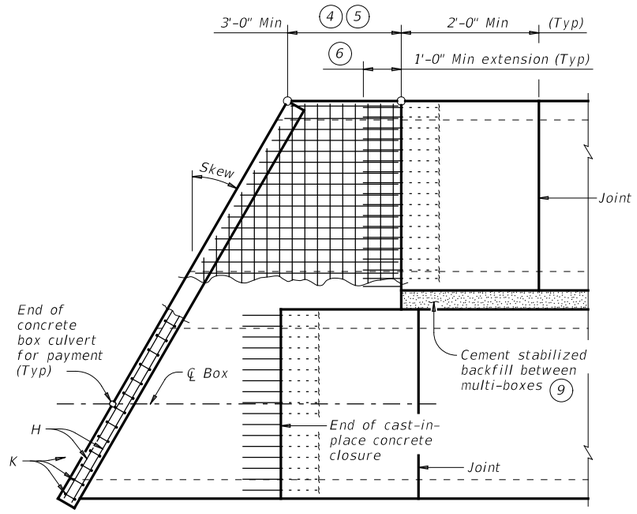
BARS K (#4)
(Spa = 1'-0" Max)
(Length = 4'-2")



ANGLE DETAIL



SECTION A-A



PLAN OF SKEWED ENDS

(Showing multi-box placement.)

(1) 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail, bicycle 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.

(2) 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.

(3) Extend curb, wingwall, or safety end treatment reinforcing into concrete closure. Bend or trim, as necessary, any reinforcing that does not fit into closure area.

(4) Provide a 3'-0" Min cast-in-place concrete closure. Break back boxes in the field or cast boxes short. Provide bands of reinforcing in the closure that are the same size and spacing as in the precast box section. Provide #4 longitudinal reinforcement spaced at 12 inches Max within the closure. Except where shown otherwise, construct the cast-in-place closure flush with the inside and outside faces of the precast box section.

(5) For multiple unit placements, adjust the length of the closure for the interior walls as necessary. Provide a 3'-0" Min cast-in-place closure in the top slab, bottom slab, and exterior wall. See Section B-B detail when interior walls are cast full length.

(6) Extend precast box reinforcing a minimum of 1'-0" into concrete closure (Typ).

(7) Place bands of reinforcing matching the inside and outside face reinforcing in the gaps of the top and bottom slabs. Place a band matching the outside face reinforcing of the wall in the gaps of the walls (placed in the outside face only). Tack weld the bands to the exposed reinforcing at each point of contact.

(8) 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.

(9) Cement stabilized backfill between boxes is considered part of the box culvert for payment.

(10) All curb concrete and reinforcing is considered part of the box culvert for payment.

(11) Any additional concrete and reinforcing required for the closures will be considered subsidiary to the box culvert for payment.

(12) 1'-0" typical. 2'-3" when the Box Culvert Rail Mounting Details (RAC) standard sheet is referred to elsewhere in the plans.

(13) For multiple unit placement with overlay, with 1 to 2 course surface treatment, or with the top slab as the final riding surface, provide wall closure as shown in Detail "A".

(14) This dimension may be increased with approval of the Engineer to allow the precast boxes to be tunneled or jacked in accordance with Item 476, "Jacking, Boring, or Tunneling Pipe or Box". No payment will be made for any additional material in the gap between adjacent boxes.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
Provide ASTM A1064 welded wire reinforcement.
Provide Class C concrete (f'c = 3,600 psi) for the closures.
Provide cement stabilized backfill meeting the requirements of Item 400, "Excavation and Backfill for Structures."
Any additional concrete required for the closures will be considered subsidiary to the box culvert.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
Refer to the Single Box Culverts Precast (SCP) standard sheets for details and notes not shown.
Chamfer the bottom edge of the top slab closure 3 inches at culvert closure ends.

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

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

BOX CULVERTS PRECAST MISCELLANEOUS DETAILS

SCP-MD

FILE: scpmdsts-20.dgn	DN: GAF	CK: LMW	DW: BWH/TxDOT	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1986	01	064	FM 1314
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		173

DATE:
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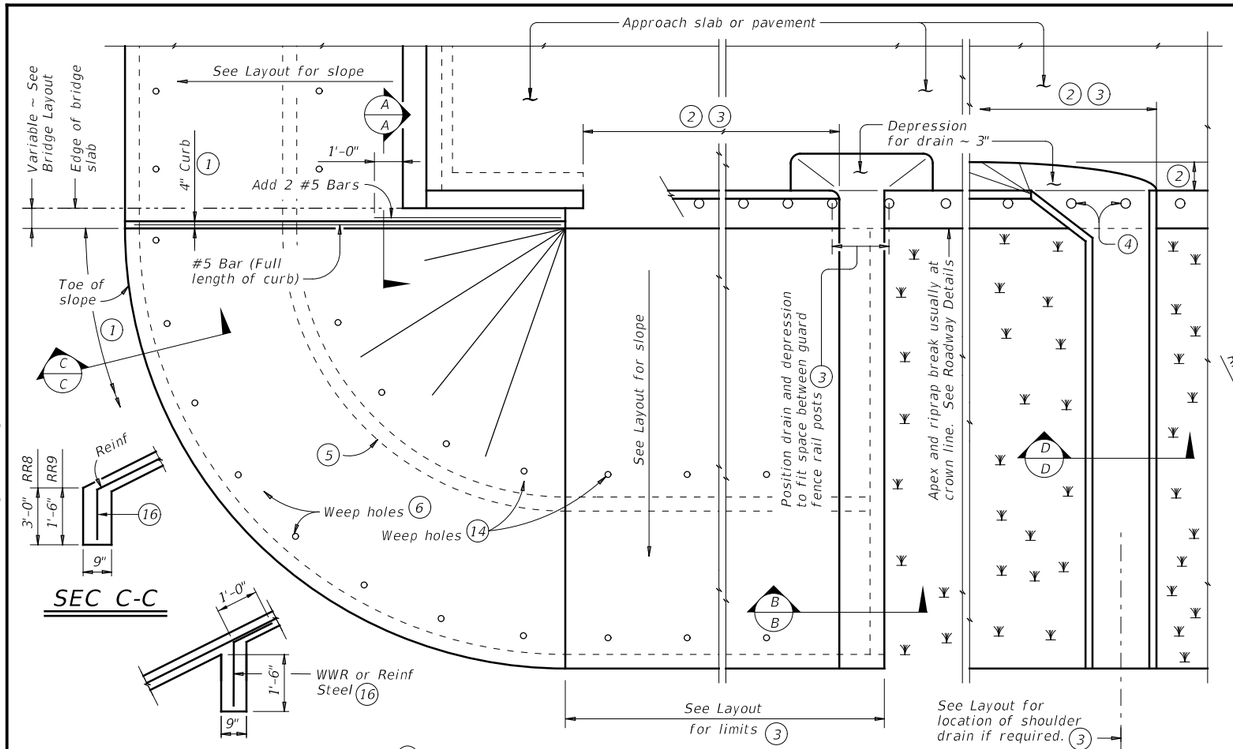
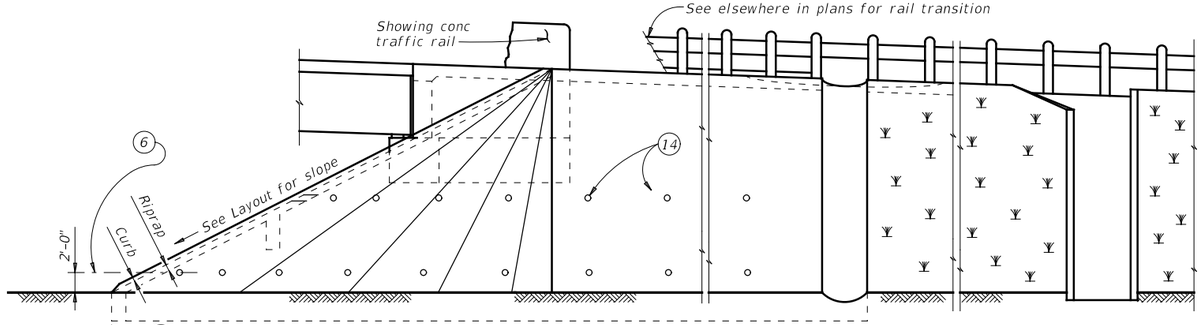


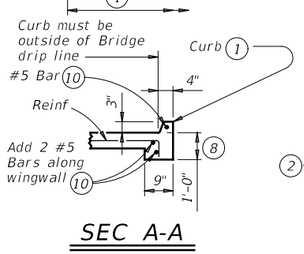
PLAN

SEC C-C

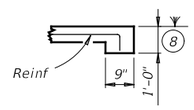
INTERMEDIATE TOEWALL (5)



ELEVATION

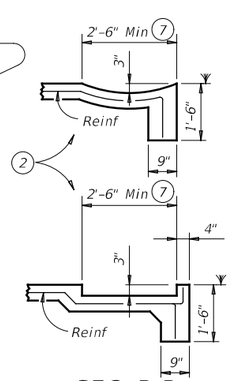


SEC A-A



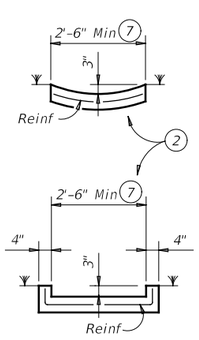
SEC B-B

(No drain)



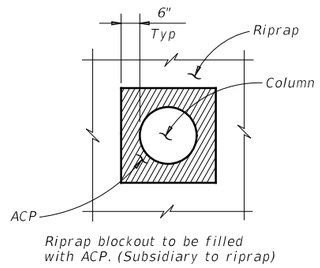
SEC B-B

(Shoulder drain integral with riprap)



SEC D-D

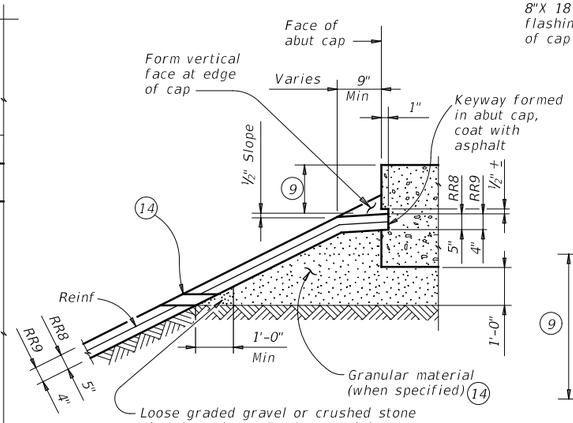
(Shoulder drain)



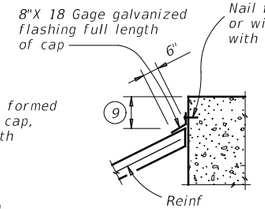
Riprap blockout to be filled with ACP. (Subsidiary to riprap)

RIPRAP DETAIL AT COLUMNS

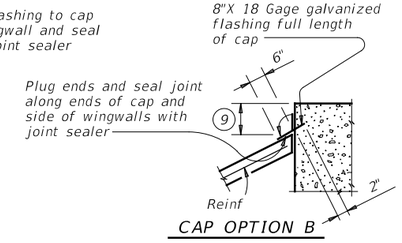
(As directed by the Engineer)



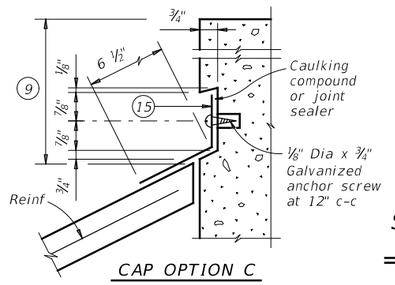
SHOWING KEYWAY OPTION



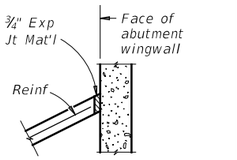
CAP OPTION A



CAP OPTION B

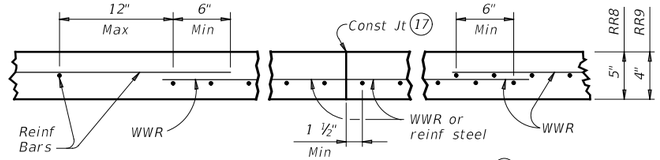


CAP OPTION C



SECT THRU RIPRAP AT WINGWALL (12)

SECTIONS THRU RIPRAP AT CAP (11)



REINFORCEMENT DETAILS (13)

See General Notes for optional synthetic fiber reinforcement.

(1) When riprap is shown extended around header on layout, extend slab and toewall as shown and eliminate 4" curb.

(2) Limits and configuration of drains and depressions are as shown elsewhere in plans or as directed by the Engineer.

(3) Location of shoulder drain must consider limitations imposed by rail transition. Do not locate shoulder drains at expansion joints between approach slab and concrete pavement.

(4) See details elsewhere in plans for installation of guard fence posts through concrete riprap.

(5) Provide intermediate toewall only when designated elsewhere in the plans or included in the specifications.

(6) Provide lower level of 2" Dia weep holes at 10' c-c backed by 1 CF packet of gravel and galvanized hardware cloth at all locations unless directed by the Engineer to eliminate.

(7) Use wider or other drain configurations if shown elsewhere in plans or if directed by the Engineer.

(8) Wall extension may be reduced or modified if approved by the Engineer. Increase wall extension to 1'-6" whenever the optional intermediate toewall is called for in the plans.

(9) Top of cap to top of riprap dimension varies as directed by the Engineer. Should be 9" Min for beam/slab type bridges and 1'-6" for slab span, box beam, or slab beam bridges.

(10) #5 bars shown are required even when synthetic fiber reinforcing option is selected.

(11) Provide sealing option for joint between the face of cap and riprap as designated by the Engineer or as shown elsewhere on plans.

(12) Flashing (shown in Cap Option A) may be used at wingwall in addition to Exp Jt Mat'l if shown on plans or directed by the Engineer.

(13) Provide #3 reinforcing bars at 18" Spa c-c. Provide Welded Wire Reinforcement (WWR) as 6x6-D2.9xD2.9 or D3xD3. Combinations of WWR and reinforcing bars may be used if both are permitted. Use lap splices of a minimum 6 inches, measured from the transverse wire of WWR, and the ends of reinforcing bars.

(14) If granular material is specified, provide upper level of 2" Dia weep holes at 10' c-c backed by galvanized hardware cloth.

(15) 8" x 18 Gage Galv Sheet Metal

(16) Provide WWR or #3 bars, with 1'-0" extension into slope.

(17) WWR or reinforcing steel is continuous through riprap construction joints. Provide WWR or reinforcing steel that extends 1'-1" minimum into adjacent riprap on each side of construction joint even if synthetic reinforcing fiber is utilized.

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

GENERAL NOTES:

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

Provide Grade 60 reinforcing steel.

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

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

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

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

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

See Layout for limits of riprap.

RR8 is to be used on stream crossings.

RR9 is to be used on other embankments.

Texas Department of Transportation

Bridge Division Standard

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

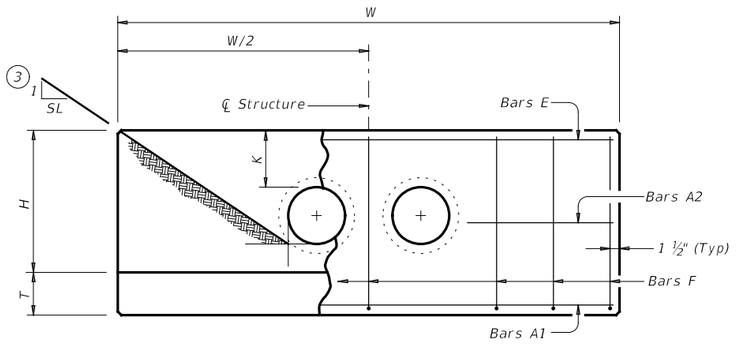
CRR

FILE: crrstde1-19.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	1986	01	064	FM 1315
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		174

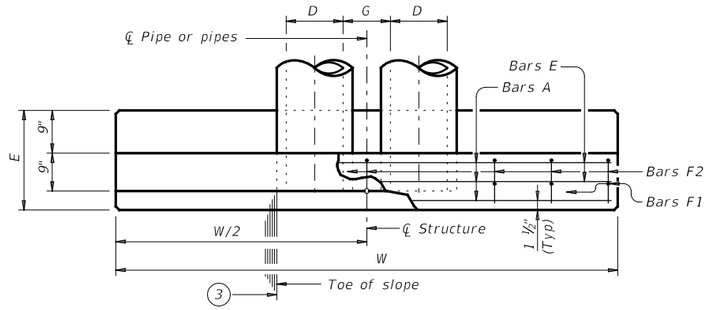
DATE:
FILE:

TABLE OF VARIABLE DIMENSIONS AND QUANTITIES FOR ONE HEADWALL (5)

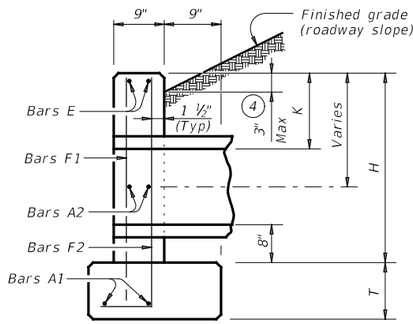
Slope	Dia of Pipe (D)	Values for One Pipe			Values To Be Added for Each Addt'l Pipe		
		W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)
2:1	12"	9' – 0"	122	1.1	1' – 9"	15	0.2
	15"	10' – 3"	136	1.3	2' – 2"	16	0.2
	18"	11' – 6"	163	1.5	2' – 8"	19	0.3
	21"	12' – 9"	200	1.8	3' – 1"	31	0.4
	24"	14' – 0"	217	2.1	3' – 7"	34	0.4
	27"	15' – 3"	254	2.4	3' – 11"	37	0.5
	30"	16' – 6"	272	2.7	4' – 4"	40	0.6
	33"	17' – 9"	314	3.1	4' – 8"	43	0.6
	36"	19' – 0"	371	3.9	5' – 1"	46	0.8
	42"	21' – 6"	442	4.9	5' – 10"	52	1.0
	48"	25' – 0"	569	6.4	6' – 7"	59	1.3
	54"	27' – 6"	701	7.5	7' – 6"	82	1.6
	60"	30' – 0"	794	8.8	8' – 3"	90	1.8
	66"	32' – 6"	894	10.2	8' – 9"	96	2.0
	72"	35' – 0"	1,055	11.7	9' – 4"	103	2.3
3:1	12"	13' – 0"	175	1.6	1' – 9"	14	0.2
	15"	14' – 9"	193	1.9	2' – 2"	17	0.2
	18"	16' – 6"	228	2.2	2' – 8"	19	0.3
	21"	18' – 3"	299	2.6	3' – 1"	31	0.4
	24"	20' – 0"	323	3.0	3' – 7"	33	0.4
	27"	21' – 9"	371	3.5	3' – 11"	37	0.5
	30"	23' – 6"	415	4.0	4' – 4"	40	0.5
	33"	25' – 3"	469	4.6	4' – 8"	43	0.6
	36"	27' – 0"	556	5.7	5' – 1"	46	0.8
	42"	30' – 6"	675	7.1	5' – 10"	52	1.0
	48"	35' – 6"	837	9.2	6' – 7"	59	1.3
	54"	39' – 0"	1,015	11.0	7' – 6"	84	1.6
	60"	42' – 6"	1,171	12.9	8' – 3"	91	1.8
	66"	46' – 0"	1,298	14.9	8' – 9"	98	2.0
	72"	49' – 6"	1,561	17.1	9' – 4"	103	2.3
4:1	12"	17' – 0"	229	2.0	1' – 9"	15	0.2
	15"	19' – 3"	266	2.4	2' – 2"	17	0.2
	18"	21' – 6"	308	2.9	2' – 8"	19	0.3
	21"	23' – 9"	382	3.5	3' – 1"	31	0.3
	24"	26' – 0"	430	3.9	3' – 7"	34	0.4
	27"	28' – 3"	486	4.7	3' – 11"	37	0.5
	30"	30' – 6"	539	5.2	4' – 4"	40	0.6
	33"	32' – 9"	603	6.0	4' – 8"	42	0.6
	36"	35' – 0"	738	7.5	5' – 1"	47	0.8
	42"	39' – 6"	881	9.3	5' – 10"	52	1.0
	48"	46' – 0"	1,102	12.1	6' – 7"	61	1.3
	54"	50' – 6"	1,364	14.4	7' – 6"	84	1.6
	60"	55' – 0"	1,547	16.9	8' – 3"	91	1.8
	66"	59' – 6"	1,741	19.5	8' – 9"	98	2.0
	72"	64' – 0"	2,077	22.4	9' – 4"	102	2.3
6:1	12"	25' – 0"	336	3.0	1' – 9"	14	0.2
	15"	28' – 3"	384	3.6	2' – 2"	17	0.2
	18"	31' – 6"	452	4.2	2' – 8"	19	0.3
	21"	34' – 9"	581	5.1	3' – 1"	31	0.4
	24"	38' – 0"	644	5.8	3' – 7"	34	0.4
	27"	41' – 3"	737	6.9	3' – 11"	37	0.5
	30"	44' – 6"	807	7.7	4' – 4"	39	0.6
	33"	47' – 9"	912	8.9	4' – 8"	44	0.6
	36"	51' – 0"	1,108	11.0	5' – 1"	48	0.8
	42"	57' – 6"	1,318	13.7	5' – 10"	54	1.0
	48"	67' – 0"	1,682	17.9	6' – 7"	59	1.3
	54"	73' – 6"	2,072	21.3	7' – 6"	83	1.6
	60"	80' – 0"	2,351	24.9	8' – 3"	89	1.8
	66"	86' – 6"	2,643	28.9	8' – 9"	96	2.0
	72"	93' – 0"	3,121	33.1	9' – 4"	101	2.3



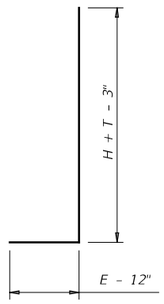
ELEVATION



PLAN OF NON-SKEWED PIPES



SECTION AT CENTER OF PIPE



BARS F2

(1) Total quantities include one 3'-1" lap for bars over 60' in length.

(2) Quantities shown are for concrete pipe and will increase slightly for metal pipe installations.

(3) Indicated slope is perpendicular to centerline pipe or pipes.

(4) For vehicle safety, construct curbs no more than 3" above finished grade. Reduce curb heights, if necessary, to meet these requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

(5) Dimensions shown are usual and maximum.

(6) Quantities shown are for one structure end only (one headwall).

TABLE OF CONSTANT DIMENSIONS

Dia of Pipe (D)	G	K (5)	H	T	E
12"	0' – 9"	1' – 0"	2' – 8"	0' – 9"	1' – 9"
15"	0' – 11"	1' – 0"	2' – 11"	0' – 9"	1' – 9"
18"	1' – 2"	1' – 0"	3' – 2"	0' – 9"	1' – 9"
21"	1' – 4"	1' – 0"	3' – 5"	0' – 9"	2' – 0"
24"	1' – 7"	1' – 0"	3' – 8"	0' – 9"	2' – 0"
27"	1' – 8"	1' – 0"	3' – 11"	0' – 9"	2' – 3"
30"	1' – 10"	1' – 0"	4' – 2"	0' – 9"	2' – 3"
33"	1' – 11"	1' – 0"	4' – 5"	0' – 9"	2' – 6"
36"	2' – 1"	1' – 0"	4' – 8"	1' – 0"	2' – 6"
42"	2' – 4"	1' – 0"	5' – 2"	1' – 0"	2' – 9"
48"	2' – 7"	1' – 3"	5' – 11"	1' – 0"	3' – 0"
54"	3' – 0"	1' – 3"	6' – 5"	1' – 0"	3' – 3"
60"	3' – 3"	1' – 3"	6' – 11"	1' – 0"	3' – 6"
66"	3' – 3"	1' – 3"	7' – 5"	1' – 0"	3' – 9"
72"	3' – 4"	1' – 3"	7' – 11"	1' – 0"	4' – 0"

TABLE OF REINFORCING STEEL (6)

Bar	Size	Spa	No.
A1	#5	~	2
A2	#5	1' – 6"	~
E	#5	~	2
F	#5	1' – 0"	~

MATERIAL NOTES:
Provide Grade 60 reinforcing steel.
Provide Class C concrete (f'c = 3,600 psi).

GENERAL NOTES:
Designed according to AASHTO LRFD Bridge Design Specifications.
Do not mount bridge rails of any type directly to these culvert headwalls.
This standard may not be used for wall heights, H, exceeding the values shown.

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

Texas Department of Transportation

Bridge Division Standard

CONCRETE HEADWALLS WITH PARALLEL WINGS FOR NON-SKEWED PIPE CULVERTS

CH-PW-0

FILE: chpw0ste-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	1986	01	064	FM 1315
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		175

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DATE:
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Culvert Station and/or Creek Name followed by applicable end (Lt, Rt or Both)	Description of Box Culvert 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 Ratio (SL:1)	T Culvert Top Slab Thickness (In)	U Culvert Wall Thickness (In)	C Estimated Curb Height (Ft)	Hw Height of Wingwall (1) (Ft)	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 (CY)	Class "C" Conc (Curb) (2) (CY)	Class "C" Conc (Wingwall) (3) (CY)	Total Wingwall Area (SF)
CULVERT 480 Sta 480+02.50 (Lt)	1 ~ 4' X 3'	2.5'	SCP-4	PW-1	0	4:1	5"	5"	0.750	4.167	N/A	N/A	16.667	4.833	N/A	0.0	0.1	9.8	139
CULVERT 480 Sta 480+02.50 (Rt)	1 ~ 4' X 3'	2.5'	SCP-4	PW-1	0	4:1	5"	5"	1.208	4.625	N/A	N/A	18.500	4.833	N/A	0.0	0.2	12.1	171
CULVERT 564 Sta 564+13.00 (Lt)	2 ~ 5' X 3'	3'	SCP-5	PW-1	0	4:1	6"	6"	0.750	4.250	N/A	N/A	17.000	6.000	N/A	0.0	0.2	10.1	145
CULVERT 564 Sta 564+13.00 (Rt)	2 ~ 5' X 3'	3'	SCP-5	PW-1	0	4:1	6"	6"	4.000	7.500	N/A	N/A	30.000	6.000	N/A	0.0	0.9	27.6	450

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.

STATE OF TEXAS
SHERVIN S. FARD
99431
LICENSED
PROFESSIONAL ENGINEER
3/4/2024

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	1986	01	064	FM 1314
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		176

3/14/2024
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GENERAL NOTES FOR ALL ELECTRICAL WORK

1. The location of all conduits, junction boxes, ground boxes, and electrical services is diagrammatic and may be shifted to accommodate field conditions.

2. Provide new and unused materials. Ensure that all materials and installations comply with the applicable articles of the National Electrical Code (NEC), TxDOT standards and specifications, National Electrical Manufacturers Association (NEMA), and are listed by Underwriters Laboratories (UL) or a Nationally Recognized Testing Lab (NRTL). NRTLs such as Canadian Standard Association (CSA), Intertek Testing Services NA Inc., or FM Approvals LLC can be considered equivalent to UL. Where reference is made to NEMA listed devices, International Electrotechnical Commission (IEC) listed devices will not be considered an acceptable equal to a NEMA listed device. Acceptable devices may have both a NEMA and IEC listing. Faulty fabrication or poor workmanship in any material, equipment, or installation is justification for rejection. Replace or reinstall rejected material or equipment at no additional cost to the Department.

3. Miscellaneous nuts, bolts and hardware, except for high strength bolts, may be stainless steel when plans specify galvanized, provided the bolt size is ½ in. or less in diameter.

4. Provide the following test equipment as required by the Engineer to confirm compliance with the contract and the NEC: voltmeter, ammeter, megohm meter (1000 volt DC), ground resistance tester, torque wrenches, and torque screwdrivers. Ensure all equipment has been properly calibrated within the last year. Provide calibration certification to the Engineer upon request. Operate test equipment during inspection as requested by the Engineer.

5. Install grounding as shown on the plans and in accordance with the NEC. Ensure all metallic conduits; metal poles; luminaires; and metal enclosures are bonded to the equipment grounding conductor. Provide stranded bare copper or green insulated grounding conductors. Ground rods, connectors, and bonding jumpers are subsidiary to the various bid items.

6. When required by the Engineer, notify the Department in writing of materials from the Material Producers List (MPL) intended for use on each project. Prequalified materials are listed on the MPL on TxDOT's website under "Roadway Illumination and Electrical Supplies." No substitutions will be allowed for materials on this list.

CONDUIT

A. MATERIALS

1. Provide conduit, junction boxes, fittings, and hardware as per TxDOT Departmental Material Specification (DMS) 11030 "Conduit" and Item 618 "Conduit" of TxDOT's "Standard Specifications For Construction And Maintenance Of Highways, Streets, And Bridges," latest edition. Provide conduits listed under Item 618 on the MPL under "Roadway Illumination and Electrical Supplies." Provide conduit types according to the descriptive code or as shown on the plans. Do not substitute other types of conduits for those shown. Provide liquidtight flexible metal conduit (LFMC) when flexible conduit is called for on galvanized steel rigid metallic conduit (RMC) systems. Provide liquidtight flexible nonmetallic conduit (LFNC) when flexible conduit is called for on polyvinyl chloride (PVC) systems.

2. Provide galvanized steel RMC for all exposed conduits, unless otherwise shown on the plans. Properly bond all metal conduits.

3. Unless otherwise shown on the plans, provide junction boxes with a minimum size as shown in the following table, which applies to the greatest number of conductors entering the box through one conduit with no more than four conduits per box. When a mixture of conductor sizes is present, count the conductors as if all are of the larger size. For situations not applicable to the table, size junction boxes in accordance with NEC.

AWG	3 CONDUCTORS	5 CONDUCTORS	7 CONDUCTORS
#1	10" x 10" x 4"	12" x 12" x 4"	16" x 16" x 4"
#2	8" x 8" x 4"	10" x 10" x 4"	12" x 12" x 4"
#4	8" x 8" x 4"	10" x 10" x 4"	10" x 10" x 4"
#6	8" x 8" x 4"	8" x 8" x 4"	10" x 10" x 4"
#8	8" x 8" x 4"	8" x 8" x 4"	8" x 8" x 4"

4. Junction boxes with an internal volume of less than 100 cu. in. and supported by entering raceways must have threaded entries or hubs identified for the intended purpose and supported by connection of two or more rigid metal conduits. Secure conduit within 3 ft. of the enclosure or within 18 in. of the enclosure if all conduit entries are on the same side. Mechanically secure all junction boxes with an internal volume greater than 100 cu. inches.

5. Provide hot dipped galvanized cast iron or sand cast aluminum outlet boxes for junction boxes containing only 10 AWG or 12 AWG conductors. Do not use die cast aluminum boxes. Size outlet boxes according to the NEC.

6. Do not use intermediate metal conduit (IMC) or electrical metallic tubing (EMT) unless specifically required by the plan sheets. When EMT is called for, provide junction boxes made from galvanized steel sheeting, listed and approved for outdoor use, unless otherwise noted on the plans. Size all galvanized steel junction boxes in accordance with the NEC. Provide junction boxes for IMC conduit systems that meet the same requirements for junction boxes used with RMC systems.

7. Provide PVC junction boxes intended for outdoor use on PVC conduit systems, unless otherwise noted on the plans.

8. Provide PVC elbows in PVC conduit systems, unless otherwise shown on the plans. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the PVC conduit system. When galvanized steel RMC elbows are specifically called for in the plans and any portion of the RMC elbow is buried less than 18 in., ground the RMC elbow by means of a grounding bushing on a rigid metal extension. Grounding of the rigid metal elbow is not required if the entire RMC elbow is encased in a minimum of 2 in. of concrete. PVC extensions are allowed on these concrete encased rigid metal elbows. RMC or PVC elbows are subsidiary to various bid items.

9. When required, provide High-Density Polyethylene (HDPE) conduit with factory installed internal conductors according to Item 622 "Duct Cable." At the Contractor's request and with approval by the Engineer, substitute HDPE conduit with no conductors for bored schedule 40 or schedule 80 PVC conduit bid under Item 618. Ensure bored HDPE substituted for PVC is schedule 40 and of the same size PVC called for in the plans. Ensure the substituted HDPE meets the requirements of Item 622, except that the conduit is supplied without factory-installed conductors. Make the transition of the HDPE conduit to PVC (or RMC elbow when required) at the bore pit. Provide conduit of the size and schedule as shown on the plans. Do not extend substituted conduit into ground boxes or foundations. Provide PVC or galvanized steel RMC elbows as called for at all ground boxes and foundations.

10. Use two-hole straps when supporting 2 in. and larger conduits. On electrical service poles, properly sized stainless steel or hot dipped galvanized one-hole standoff straps are allowed on the service riser conduit.

B. CONSTRUCTION METHODS

1. Provide and install expansion joint conduit fittings on all structure-mounted conduits at the structure's expansion joints to allow for movement of the conduit. In addition, provide and install expansion joint fittings on all continuous runs of galvanized steel RMC conduit externally exposed on structures such as bridges at maximum intervals of 150 ft. When requested by the project Engineer, supply manufacturer's specification sheet for expansion joint conduit fittings. Repair or replace expansion joint fittings that do not allow for movement at no additional cost to the Department. Provide the method of determining the amount of expansion to the Engineer upon request. Do not use LFMC or LFNC as a substitute for the required expansion conduit fittings.

2. Space all conduit supports at maximum intervals of 5 ft. Install conduit spacers when attaching metal conduit to surface of concrete structures. See "Conduit Mounting Options" on ED(2). Install conduit support within 3 ft. of all enclosures and conduit terminations.

3. Do not attach conduit supports directly to pre-stressed concrete beams except as shown specifically in the plans or as approved by the Engineer.

4. Unless otherwise shown on the plans, jack or bore conduit placed beneath existing roadways, driveways, sidewalks, or after the base or surfacing operation has begun. Backfill and compact the bore pits below the conduit per Item 476 "Jacking, Boring, or Tunneling Pipe or Box" prior to installing conduit or duct cable to prevent bending of the connections.

5. When placing conduit in the sub-grade of new roadways, backfill all trenches with excavated material unless otherwise noted on the plans. When placing conduit in the sub-base of new roadways, backfill all trenches with cement-stabilized base as per requirements of Items 110 "Excavation", 400 "Excavation and Backfill for Structures", 401 "Flowable Backfill", 402 "Trench Excavation Protection", and 403 "Temporary Special Shoring."

6. Provide and place warning tape approximately 10 in. above all trenched conduit as per Item 618.

7. During construction, temporarily cap or plug open ends of all conduit and raceways immediately after installation to prevent entry of dirt, debris and animals. Temporary caps constructed of durable duct tape are allowed. Tightly fix the tape to the conduit opening. Clean out the conduit and prove it clear in accordance with Item 618 prior to installing any conductors.

8. Ensure conduit entry into the top of any enclosure is waterproof by installing conduit sealing hubs or using boxes with threaded bosses. This includes surface mounted safety switches, meter cans, service enclosures, auxiliary enclosures and junction boxes. Grounding bushings on water tight sealing hubs are not required.

9. Fit the ends of all PVC conduit terminations with bushings or bell end fittings. Provide and install a grounding type bushing on all metal conduit terminations.

10. Install a bonding jumper from each grounding bushing to the nearest ground rod, grounding lug, or equipment grounding conductor. Ensure all bonding jumpers are the same size as the equipment grounding conductor. Bonding of conduit used as a casing under roadways for duct cable is not required, if the duct extends the full length through the casing.

11. At all electrical services, install a 6 AWG solid copper grounding electrode conductor.

12. Place conduits entering ground boxes so that the conduit openings are between 3 in. and 6 in. from the bottom of the box. See the ground box detail on sheet ED(4).

13. Seal ends of all conduits with duct seal, expandable foam, or by other methods approved by the Engineer. Seal conduit immediately after completion of conductor installation and pull tests. Do not use duct tape as a permanent conduit sealant. Do not use silicone caulk as a conduit sealant.

14. File smooth the cut ends of all mounting strut and conduit. Before installing, paint the field cut ends of all mounting strut and RMC (threaded or non-threaded) with zinc rich paint (94% or more zinc content) to alleviate overspray. Use zinc rich paint to touch up galvanized material as allowed under Item 445 "Galvanizing." Do not paint non-galvanized material with a zinc rich paint as an alternative for materials required to be galvanized.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS CONDUITS & NOTES

ED(1)-14

FILE:	ed1-14.dgn	DN:	CK:	DW:	CK:
© TxDOT	October 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS		1986	01	064	FM 1314
		DIST	COUNTY		SHEET NO.
		HOU	MONTGOMERY		177

ELECTRICAL SERVICES NOTES

1. Provide new materials. Ensure installation and materials comply with the applicable provisions of the National Electrical Code (NEC) and National Electrical Manufacturers Association (NEMA) standards. Ensure material is Underwriters Laboratories (UL) listed. Provide and install electrical service conduits, conductors, disconnects, contactors, circuit breaker panels, and branch circuit breakers as shown on the Electrical Service Data chart in the plans. Faulty fabrication or poor workmanship in material, equipment, or installation is justification for rejection. Where manufacturers provide warranties and guarantees as a customary trade practice, furnish these to the State.

2. Provide electrical services in accordance with Electrical Details standard sheets, Departmental Material Specification (DMS) 11080 "Electrical Services,"DMS 11081 "Electrical Services-Type A," DMS 11082 "Electrical Services-Type C," DMS 11083 "Electrical Services-Type D," DMS 11084 "Electrical Services-Type T," DMS 11085 "Electrical Services-Pedestal (PS)", and Item 628 "Electrical Services" of the Standard Specifications. Provide electrical service types A, C, and D, as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies," Item 628. Provide other service types as detailed on the plans.

3. Provide all work, materials, services, and any incidentals needed to install a complete electrical service as specified in the plans.

4. Coordinate with the Engineer and the utility provider for metering and compliance with utility requirements. Primary line extensions, connection charges, meter charges, and other charges by the utility company to provide power to the location are paid for in accordance with Item 628. Get approval for the costs associated with these charges prior to engaging the utility company to do the work. Consult with the utility provider to determine costs and requirements, and coordinate the work as approved.

5. The enclosure manufacturer will provide Master Lock Type 2 with brass tumblers keyed #2195 for all custom electrical enclosures. Installing Contractor is to provide Master Lock #2195 Type 2 with brass tumblers for "off the shelf" enclosures. Master Lock #2195 keys and locks become property of the State. Unless otherwise approved, do not energize electrical service equipment until locks are installed.

6. Enclosures with external disconnects that de-energize all equipment inside the enclosure do not need a dead front trim. Protect incoming line terminations from incidental contact as required by the NEC.

7. When galvanized is specified for nuts, screws, bolts or miscellaneous hardware, stainless steel may be used.

8. Provide wiring and electrical components rated for 75°C. Provide red, black, and white colored XHHW service entrance conductors of minimum size 6 American Wire Gauge (AWG). Identify size 6 AWG conductors by continuous color jacket. Identify electrical conductors sized 4 AWG and larger by continuous color jacket or by colored tape. Mark at least 6 inches of the conductor's insulation with half laps of colored tape, when identifying conductors. Ensure each service entrance conductor exits through a separately bushed non-metallic opening in the weatherhead. The lengths of the conductors outside the weatherhead are to be 12 inches minimum, 18 inches maximum, or as required by utility.

9. All electrical service conduit and conductors attached to the electrical service including the riser or the elbow below ground are subsidiary to the electrical service. For an underground utility feed, all service conduit and conductors after the elbow, including service conduit and conductors for the utility pole riser when furnished by the Contractor, will be paid for separately.

10. Provide rigid metal conduit (RMC) for all conduits on service, except for the ½ in. PVC conduit containing the electrical service grounding electrode conductor. Size the service entrance conduit as shown in the plans. Ensure conduit for branch circuit entry to enclosure is the same size as that shown on the layout sheets for branch circuit conduit. Extend all rigid metal conduits a minimum of 6 inches underground and then couple to the type and schedule of the conduit shown on the layout for that particular branch circuit. Install a grounding bushing on the RMC where it terminates in the service enclosure.

11. Use of liquidtight flexible metal conduit (LFMC) is allowed between the meter and service enclosure when they are mounted 90 to 180 degrees to each other. Size the LFMC the same size as service entrance conduit. LFMC must not exceed 3 feet in length. Strap LFMC within 1 foot of each end. LFMC less than 12 inches in length need not be strapped. Each end of LFMC must have a grounding bushing or be terminated with a grounding fitting. The LFMC must contain a grounded (neutral) conductor. Ensure any bend in LFMC never exceeds 180 degrees. A pull test is required on all installed conductors, with at least six inches of free conductor movement demonstrated to the satisfaction of the Engineer.

12. Ensure all mounting hardware and installation details of services conform to utility company specifications.

13. For all electrical service enclosures listed under Item 628 on the MPL, the UL 508 enclosure manufacturers will prepare and submit a schematic drawing unique to each service. Before shipment to the job site, place the applicable laminated schematic drawings and the laminated plan sheet showing the electrical service data chart used to build the enclosure in the enclosure's data pocket. The installing contractor will copy and laminate the actual project plan sheets detailing all equipment and branch circuits supplied by that service. The laminated plan sheets are to be placed in the service enclosure's document pocket. Reduce 11 in. x 17 in. plan sheets to 8 ½ in. x 11 in. before laminating. If the installation differs from the plan sheets, the installing contractor is to redline plan sheets before laminating.

14. When providing an "Off The Shelf" Type D or Type T service, provide laminated plan sheets detailing equipment and branch circuits supplied by that service. Reduce 11 in. x 17 in. plan sheets to 8 ½ in. x 11 in before laminating. Deliver these drawings before completion of the work to the Engineer, instead of placing in enclosure that has no door pocket.

15. Do not install conduit in the back wall of a service enclosure where it would penetrate the equipment mounting panel inside the enclosure. Provide grounding bushings on all metal conduits, and terminate bonding jumpers to grounding bus. Grounding bushings are not required when the end of the metal conduit is fitted with a conduit sealing hub or threaded boss, such as a meter base hub.

SERVICE ASSEMBLY ENCLOSURE

1. Provide threaded hub for all conduit entries into the top of enclosure.

2. Type galvanized steel (GS) enclosures may be used for Type C panelboards and for Type D and T services that do not use an enclosure mounted photocell or lighting contactor. Provide GS enclosures in accordance with DMS 11080, 11082, 11083, and 11084.

3. Provide aluminum (AL) and stainless steel (SS) enclosures for Types A, C, and D in accordance with DMS 11080, 11081, 11082, 11083, and 11084. Do not paint stainless steel.

4. Provide pedestal service (PS) enclosures in accordance with ED(9) and DMS 11080 and 11085. Do not provide GS pedestal services. If GS is shown in the PS descriptive code, provide an AL enclosure.

MAIN DISCONNECT & BRANCH CIRCUIT BREAKERS

1. Field drill flange-mounted remote operator handle if needed, to ensure handle is lockable in both the "On" and "Off" positions.

2. When the utility company provides a transformer larger than 50 KVA, verify that the available fault current is less than the circuit breaker's ampere interrupting capacity (AIC) rating and provide documentation from the electric utility provider to the Engineer.

PHOTOELECTRIC CONTROL

1. Provide photocell as listed on the MPL. Move, adjust, or shield the photocell from stray or ambient night time light to ensure proper operation. Mount photocell facing north when practical. Mount top of pole photocells as shown on Top Mounted Photocell Detail.

* ELECTRICAL SERVICE DATA

Elec. Service ID	Plan Sheet Number	Electrical Service Description	Service Conduit **Size	Service Conductors No./Size	Safety Switch Amps	Main Ckt. Bkr. Pole/Amps	Two-Pole Contactor Amps	***Panelbd/ Loadcenter Amp Rating	Branch Circuit ID	Branch Ckt. Bkr. Pole/Amps	Branch Circuit Amps	KVA Load
FM1314 & SH242	XX	ELC SRV TY C 240/480 100(SS)SS(E)SF(U)	2"	4/#2	100	3P/100	N/A	100	PUMP #1	3P/20	12.5	10.4
EB FR									PUMP #2	3P/20	12.5	10.4
									SURGE SUPPRESSION	3P/30	20.0	16.6

* Example only, not for construction. All new electrical services must have electrical service data chart specific to that service as shown in the plans.

** Verify service conduit size with utility. Size may change due to utility meter requirements. Ensure conduit size meets the National ELectrical Code.

***Panelbd/Load center contained in control system cabinet.

EXPLANATION OF ELECTRICAL SERVICE DESCRIPTIVE CODE

ELEC SERV TY X XXX/XXX XXX (XX) XX (X) XX (X)

Schematic Type

Service Voltage V / V

Disconnect Amp Rating
000 indicates main lug only/
Typically Type T

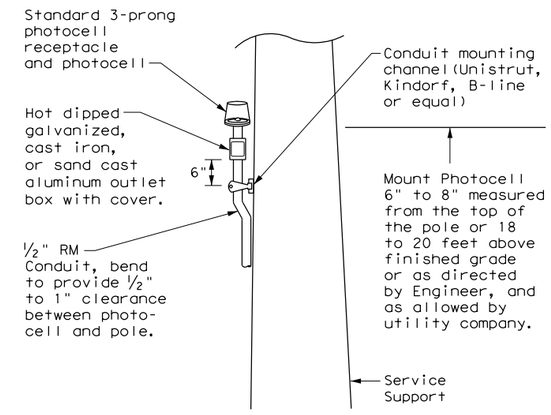
(SS)= Safety Switch Ahead of Meter-Check with Utility
(NS)= No safety Switch Ahead of Meter-Check with Utility

Enclosure Type
GS= Galvanized steel("off the shelf")
SS= Stainless steel(Custom Enclosure)See MPL
AL= Aluminum (Custom Enclosure)See MPL

Photocell Mounting Location
(E)= Inside Service/Enclosure Mounted
(T)= Top of pole
(L)= Luminaire mounted
(N)= None/No Photocell or Lighting Contactor Required

Service Support Type
GC= Granite concrete
OC= Other concrete
TP= Timber pole
SP= Steel pole
SF= Steel frame
OT= Pole by others or paid for separately
EX= Existing pole
TS= Service on traffic signal pole
PS= Pedestal Service

O= Overhead Service Feed from Utility
U= Underground Service Feed from Utility



TOP MOUNTED PHOTOCELL

Install conduit strap maximum 3 feet from box. 5 foot maximum spacing between straps supporting conduit.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE NOTES & DATA

ED(5)-14

FILE: ed5-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	1986	01	064	FM 1314
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		178

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3/14/2024
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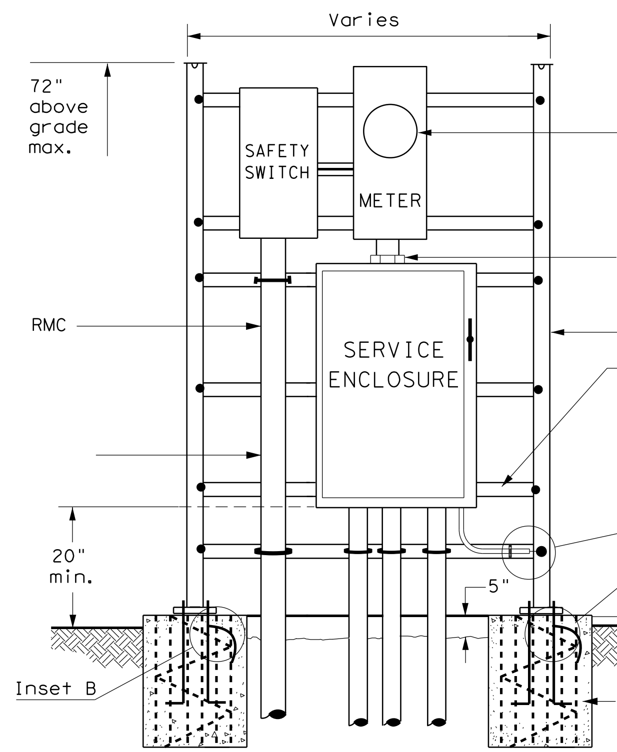
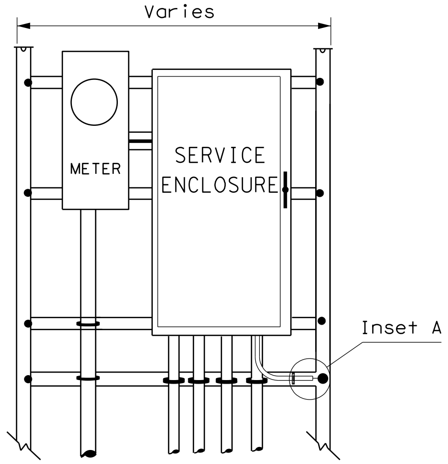
SUPPORT TYPE STEEL POLE (SP) AND STEEL FRAME (SF)

1. Provide steel pole and steel frame supports as per TxDOT Departmental Material Specification (DMS)11080 "Electrical Services." Mount all equipment and conduit on 12 gauge galvanized steel or stainless steel channel strut, 1 ½ in. or 1 ⅝ in. wide by 1 in. up to 3 ¾ in. deep Unistrut, Kindorf, B-line or equal. Bolt or weld all channel and hardware to vertical members as approved. Do not stack channel. File smooth and paint field cut ends of all channel with zinc-rich paint before installing.
2. Provide poles for overhead service with an eyebolt or similar fitting for attachment of the service drop to the pole in conformance with the electric utility provider's specifications.
3. Provide and install galvanized ¾ in. x 18 in. x 4 in. (dia. x length x hook length) anchor bolts for underground service supports. Provide and install galvanized ¾ in. x 56 in. x 4 in. anchor bolts for overhead service supports. Ensure anchor bolts have 3 in of thread, with 3 ¼ in. to 3 ½ in. of the exposed anchor bolt projecting above finished foundation. Provide and install leveling nuts for all anchor bolts.
4. Bond one of the anchor bolts to the rebar cage with 6 AWG bare stranded copper conductor. Use listed mechanical connectors rated for embedment in concrete. See Inset B.
5. Furnish and install rigid metallic ells in all steel pole and steel frame foundations for all conduits entering the service from underground.
6. Use class C concrete for foundations. Ensure reinforcing steel is Grade 60 with 3" of unobstructed concrete cover.
7. Drill and tap steel poles and frames for ½ in. X 13 UNC tank ground fitting. For steel pole service supports, provide and install tank ground fitting 4 in. to 6 in. below electrical service enclosure. Provide properly sized hole through the bottom of the enclosure for the service grounding electrode conductor. Ensure electrical service grounding electrode conductor is as short and straight as possible from the enclosure to the tank ground fitting. For steel frame service supports, provide and install tank ground fitting on steel frame post. Install service grounding electrode conductor in a non-metallic conduit or tubing from the enclosure to the steel frame post. Connect electrical service grounding electrode conductor to the tank ground fitting. See steel frame and steel pole details and Inset A for more information. Size service entrance conduit and branch circuit conduit as shown in the plans. For underground conduit runs from the electrical service, extend RMC from the service enclosure to an RMC elbow, and then connect the schedule type and size of conduit shown in the plans. Provide and install grounding bushings where RMC terminates in the enclosure. Grounding bushings are not required when RMC is fitted into a sealing hub or threaded boss.
8. If Steel pole or frame is painted, bond each separate painted piece with a bonding jumper attached to a tapped hole.
9. Provide ¼" - 20 machine screws for bonding. Do not use sheet metal screws. Remove all non-conductive material at contact points. Terminate bonding jumpers with listed devices. Install minimum size 6 AWG stranded copper bonding jumpers. Make up all threaded bonding connections wrench tight.
10. Avoid contact of the service drop and service entrance conductors with the metal pole to prevent abrasion of the insulated conductors.
11. Shop drawings are not required for service support structure unless specifically stated elsewhere or directed by the Engineer.



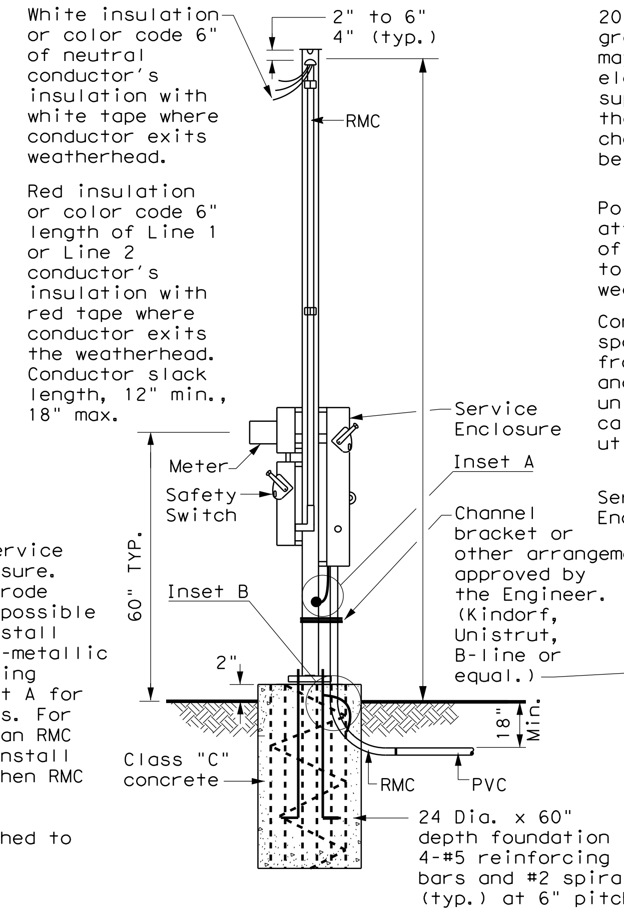
WITH SAFETY SWITCH



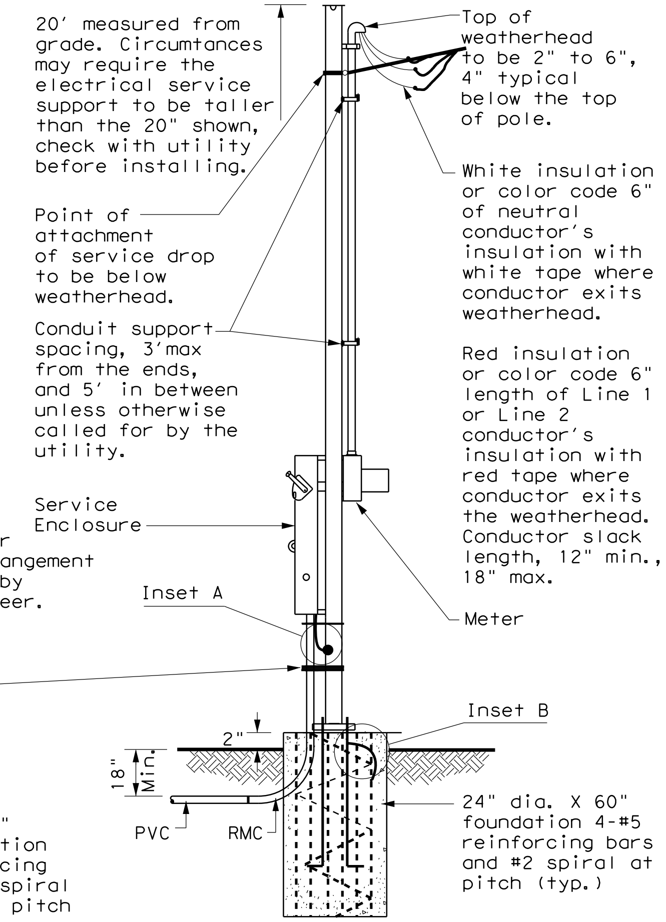
WITHOUT SAFETY SWITCH

FRONT VIEW

SERVICE SUPPORT TYPE SF(U) - UNDERGROUND SERVICE

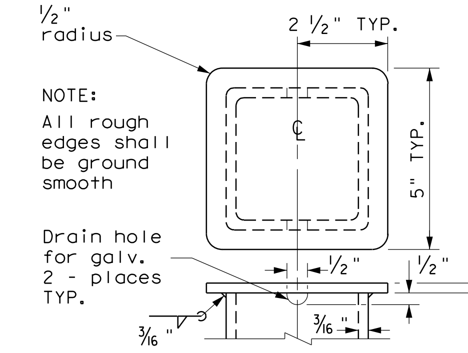


WITH SAFETY SWITCH

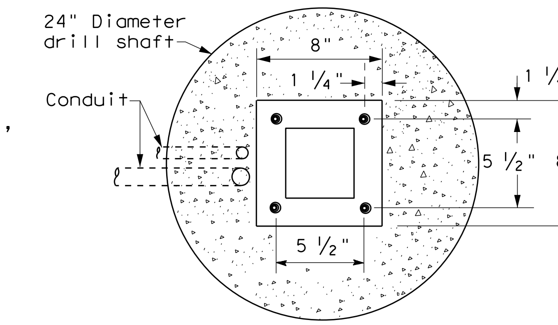


WITHOUT SAFETY SWITCH

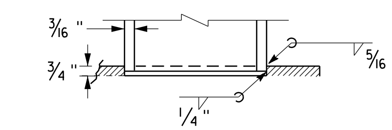
SERVICE SUPPORT TYPE SP (O) - OVERHEAD SERVICE



POLE TOP PLATE

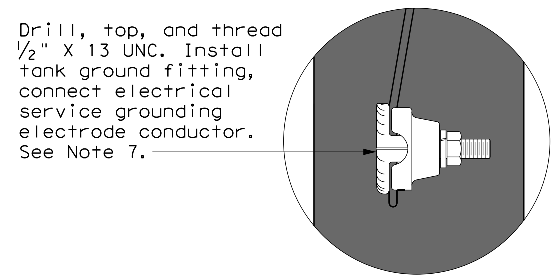


BASE PLATE DETAIL



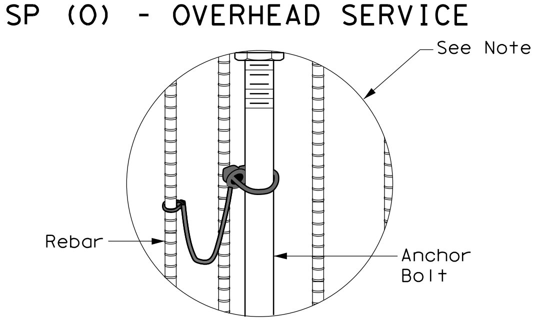
BOTTOM OF POLE

SERVICE SUPPORT TYPE SF & SP

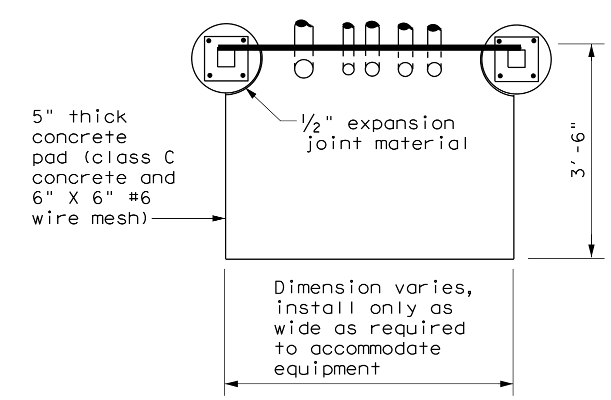


FRONT VIEW

INSET A

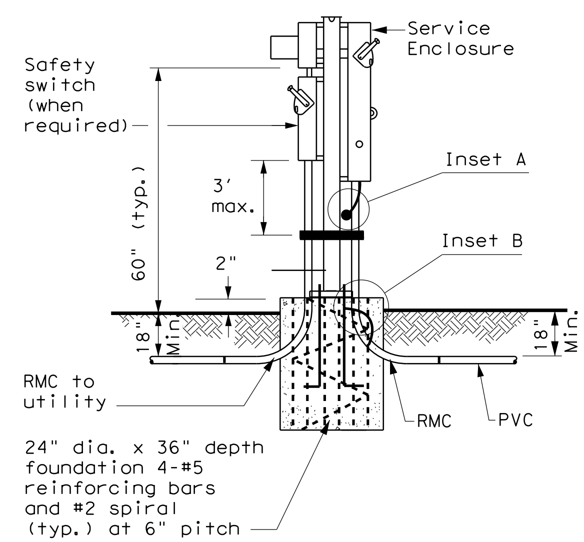


INSET B



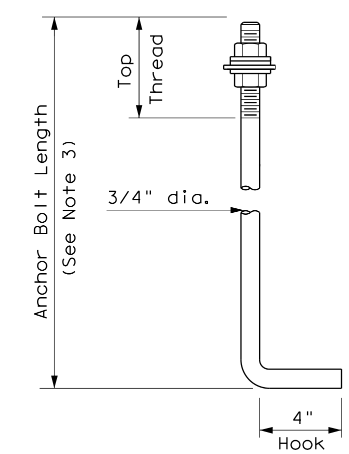
TOP VIEW

SERVICE SUPPORT TY SF (O) & SF (U)



WITH SAFETY SWITCH

SERVICE SUPPORT TYPE SP(U) - UNDERGROUND SERVICE



HOOKED ANCHOR DETAIL

Texas Department of Transportation | Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE SUPPORT TYPES SF & SP

ED(7)-14

FILE: ed7-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT			
© TxDOT October 2014	CONT	SECT	JOB	HIGHWAY			
REVISIONS	1986	01	064	FM 1314			
	DIST		COUNTY	SHEET NO.			
	HOU		MONTGOMERY	179			

71G

3/14/2024
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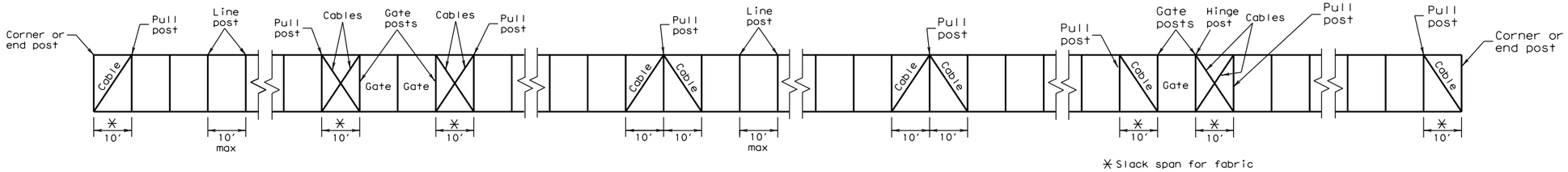
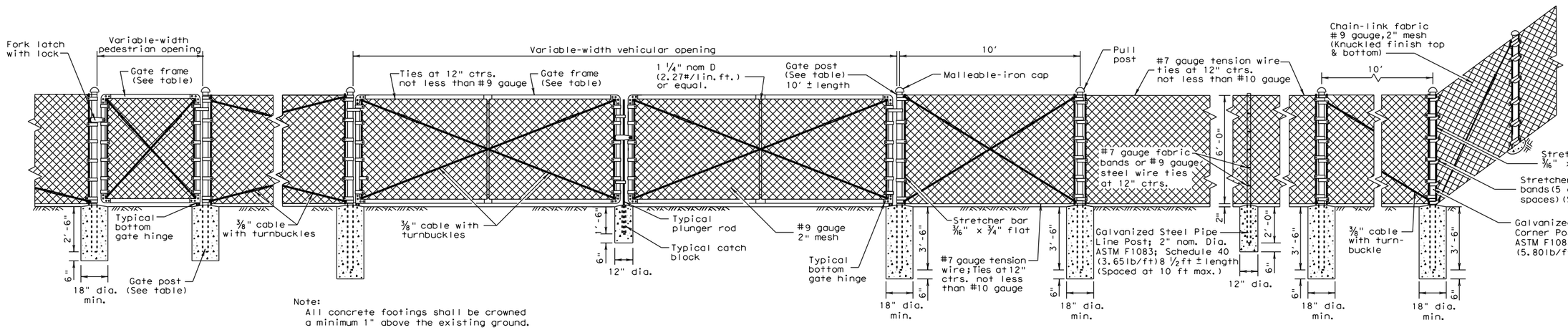


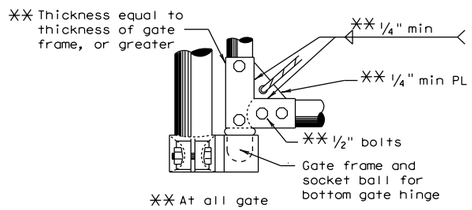
TYPICAL CABLE AND POST ARRANGEMENT



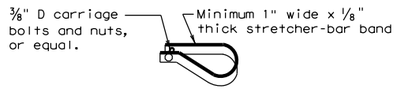
Note:
All concrete footings shall be crowned a minimum 1" above the existing ground.

CHAIN-LINK BARRIER FENCE (6 FT.)

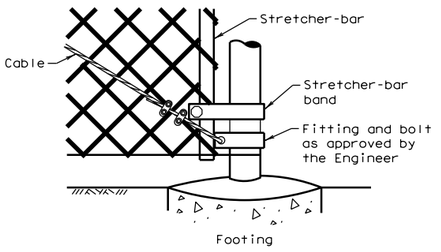
Foundation designs shown are "minimums" for a 6 ft. fence.
Taller fences may require larger foundation designs.



TYPICAL BOTTOM GATE HINGE



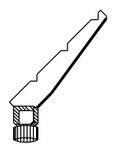
TYPICAL STRETCHER-BAR BAND



TERMINAL POST DETAIL

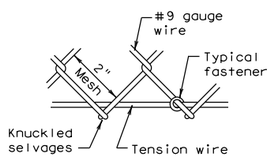
GATE (TYPES AND SIZES)	
Single Inclusive	Double Inclusive
Up to 6' Over 6' to 12' Over 12' to 18' Over 18'	Up to 12' Over 12' to 26' Over 26' to 36' Over 36'

GATE FRAME (WEIGHT)		GATE POST (WEIGHT)	
SIZE	WT./LIN. FT.	SIZE	WT./LIN. FT.
1 ½" nom dia. or equal	2.72 Lbs.	2 ½" nom dia. or equal	5.79 Lbs.
		3 ½" nom dia. or equal	9.11 Lbs.
		6" nom dia.	18.97 Lbs.
		8" nom dia.	24.70 Lbs.



"OPTIONAL" 3 WIRE 45° BARBED WIRE ARM

Barbed wire arm related items shall conform to Item 550, "Chain Link Fence."



FABRIC & TENSION WIRE DETAIL, TOP & BOTTOM

GENERAL NOTES

1. Items hereon shall conform to Item 550, "Chain Link Fence."
2. Typical installation plan may vary as shown elsewhere on the plans or as directed by the Engineer. Location of gates shown elsewhere on plans.
3. Gate-frame members shall be bolted, at frame corners, to joint fittings with four ½" bolts per joint.
4. All cable connections are to be made with two ⅜" cable clamps.
5. All pull posts and end posts and their foundations shall have the same respective dimensions as those shown for corner post.
6. All pull post shall be furnished with two stretcher bars.
7. One end of each turnbuckle may be attached directly to fittings with a clevis.
8. Concrete footings are to be crowned at the top to shed water.

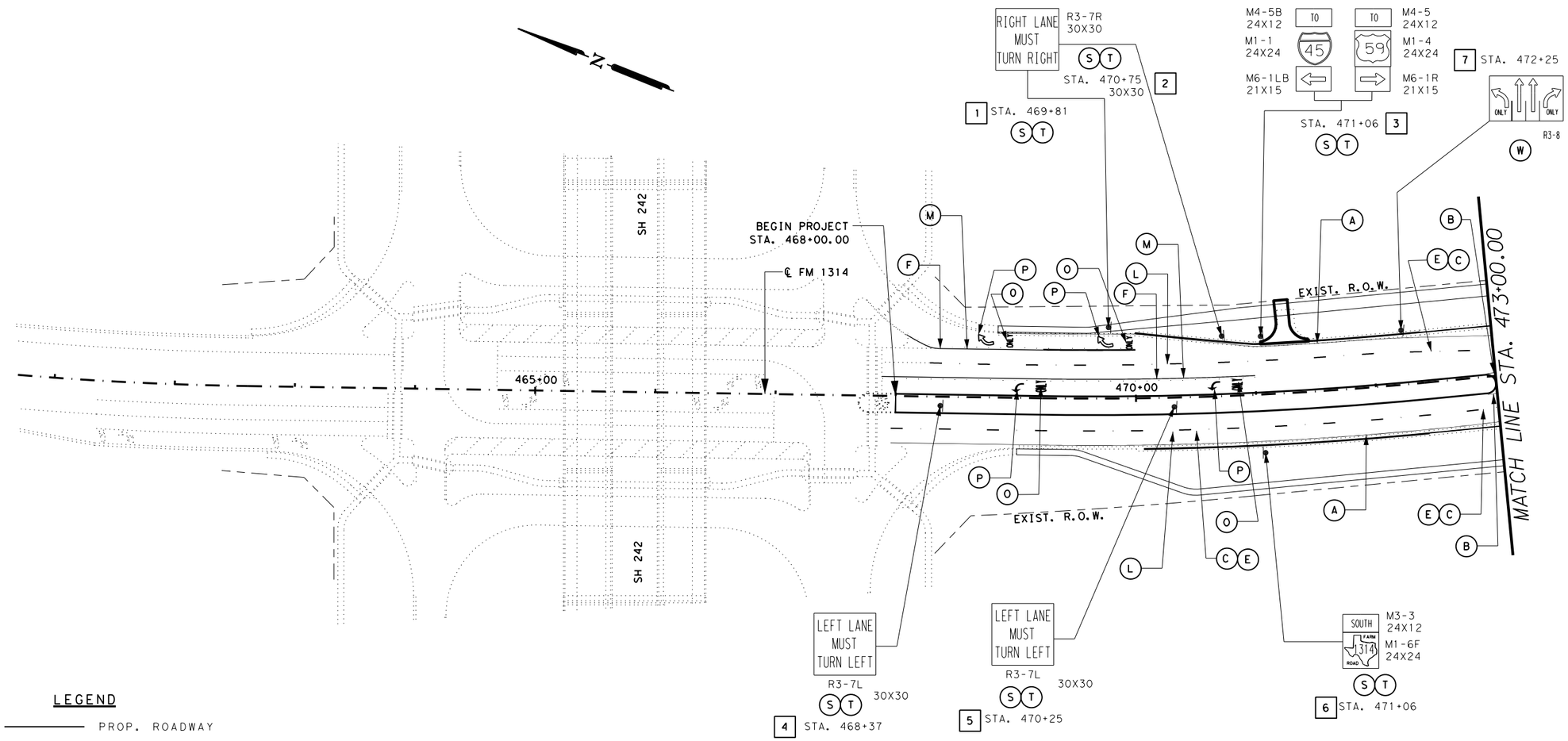
Texas Department of Transportation

Design Division Standard

CHAIN LINK FENCE

CLF-10

FILE: clf10.dgn	DN: TxDOT	CK: AM	DW: BD	CK: VP
© TxDOT 1996	CONT	SECT	JOB	HIGHWAY
REVISIONS	1986	01	064	FM 1314
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		180



LEGEND

- PROP. ROADWAY
- EXIST. R.O.W.
- EXIST. ROADWAY
- TRAFFIC FLOW ARROW
- (#) DRIVEWAY NUMBER

(A) PROP. REF PROF PAV MRK TY I (W)6"(SLD)(090MIL)

(B) PROP. REF PROF PAV MRK TY I (Y)6"(SLD)(090MIL)

(C) PROP. MULTIPOLYMER PAV MRK (W)(6")(BRK)

(D) PROP. REF PROF PAV MRK TY I (Y)6"(BRK)(090MIL)

(E) PROP. MULTIPOLYMER PAV MRK (BLK)(6")(BRK)

(F) PROP. MULTIPOLYMER PAV MRK (W)(8")(SLD)

(G) PROP. MULTIPOLYMER PAV MRK (W)(12")(SLD)

(H) PROP. MULTIPOLYMER PAV MRK (W)(24")(SLD)

(I) PROP. REFL PAV MRKR TY II - A - A SPACED AT 20'

(J) PROP. REFL PAV MRKR TY II - A - A SPACED AT 40'

(K) PROP. REFL PAV MRKR TY I-C SPACED AT 20'

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(M) PROP. REFL PAV MRKR TY II-CR SPACED AT 20'

(N) PROP. REFL PAV MRKR TY II-CR SPACED AT 80'

(O) PROP. MULTIPOLYMER PAV MRK (W)(WORD)

(P) PROP. MULTIPOLYMER PAV MRK (W)(ARROW)

(S) PROP. SIGN

(T) REMOVE SIGN

(U) REMOVE SIGN ONLY

(V) PROP. SIGN ONLY

(W) RELOCATE SIGN

FOR PAVEMENT MARKINGS AND MARKERS SEE STANDARDS:
PM(1)-22, PM(2)-22, PM(3)-22, PM(4)-22A, PM(WAS)-07 (HOU DIST),
AND PM(CLL)-14 (HOU DIST) FOR SMALL SIGN INSTALLATION,
SEE SIGN MOUNTING DETAIL STANDARDS

0 50 100
SCALE IN FEET

STATE OF TEXAS
MICAH J. SCHLUTER
136908
LICENSED
PROFESSIONAL ENGINEER

Micah J. Schluter, P.E.

03.14.24

FM 1314
SIGNING AND PAVEMENT MARKING LAYOUT

SHEET 1 OF 11

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		181

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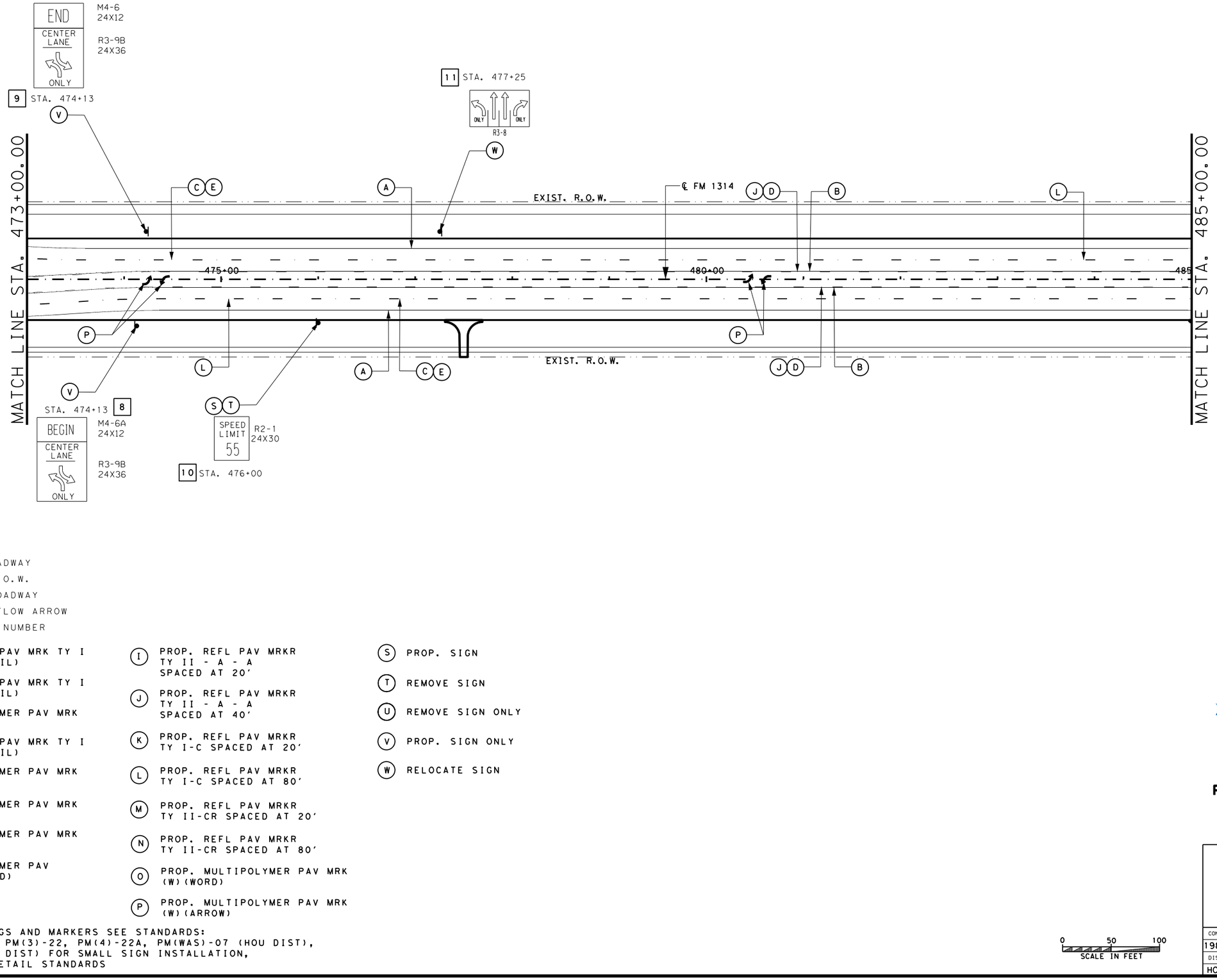

LEGEND

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(S) PROP. SIGN
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SCALE IN FEET

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03.14.24

FM 1314
SIGNING AND PAVEMENT MARKING LAYOUT

SHEET 2 OF 11

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		182

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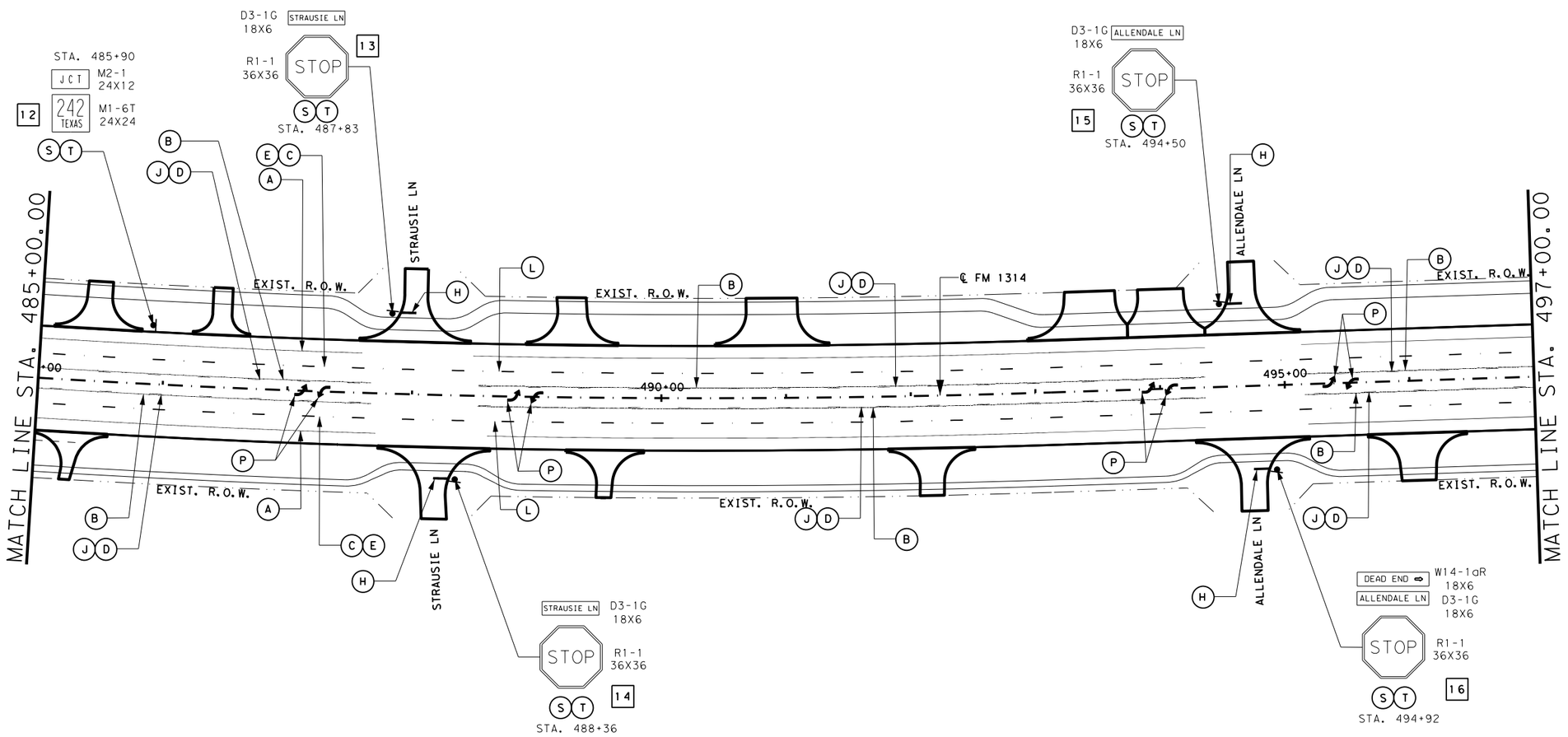

LEGEND

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(D) PROP. REF PROF PAV MRK TY I (Y)6"(BRK)(090MIL)

(E) PROP. MULTIPOLYMER PAV MRK (BLK)(6")(BRK)

(F) PROP. MULTIPOLYMER PAV MRK (W)(8")(SLD)

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(O) PROP. MULTIPOLYMER PAV MRK (W)(WORD)

(P) PROP. MULTIPOLYMER PAV MRK (W)(ARROW)

(S) PROP. SIGN

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DATE: 02/28/2024 09:36 PM
FILE:

SCALE IN FEET 0 50 100

STATE OF TEXAS
MICAH J. SCHLUTER
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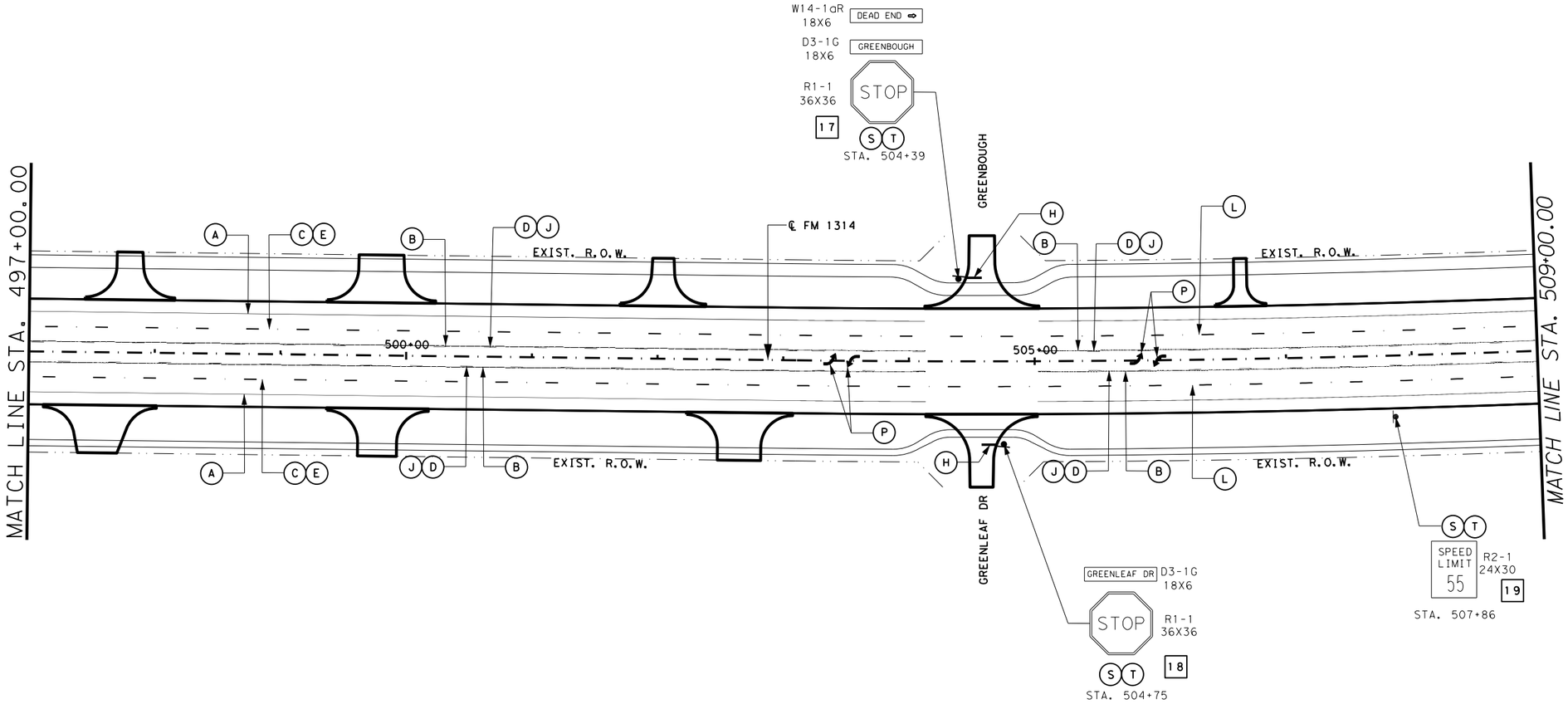
FM 1314
SIGNING AND PAVEMENT MARKING LAYOUT

SHEET 3 OF 11

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		183



LEGEND

PROP. ROADWAY
EXIST. R.O.W.
EXIST. ROADWAY
TRAFFIC FLOW ARROW
(#) DRIVEWAY NUMBER

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FM 1314
SIGNING AND PAVEMENT MARKING LAYOUT

SHEET 4 OF 11

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		185

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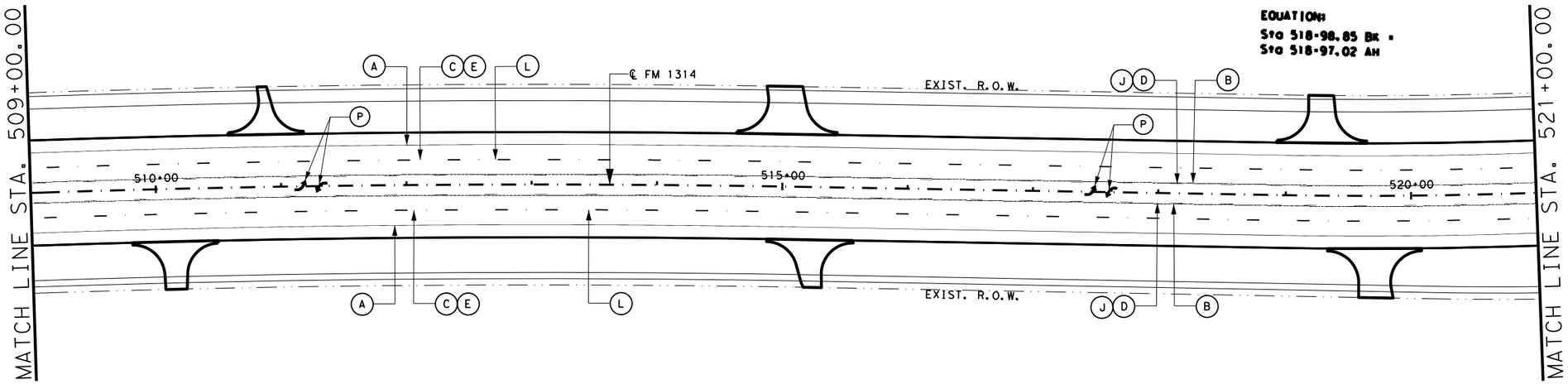

LEGEND

PROP. ROADWAY
EXIST. R.O.W.
EXIST. ROADWAY
TRAFFIC FLOW ARROW
DRIVEWAY NUMBER

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(D) PROP. REF PROF PAV MRK TY I (Y)6"(BRK)(090MIL)

(E) PROP. MULTIPOLYMER PAV MRK (BLK)(6")(BRK)

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SIGNING AND PAVEMENT MARKING LAYOUT

SHEET 5 OF 11

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		185

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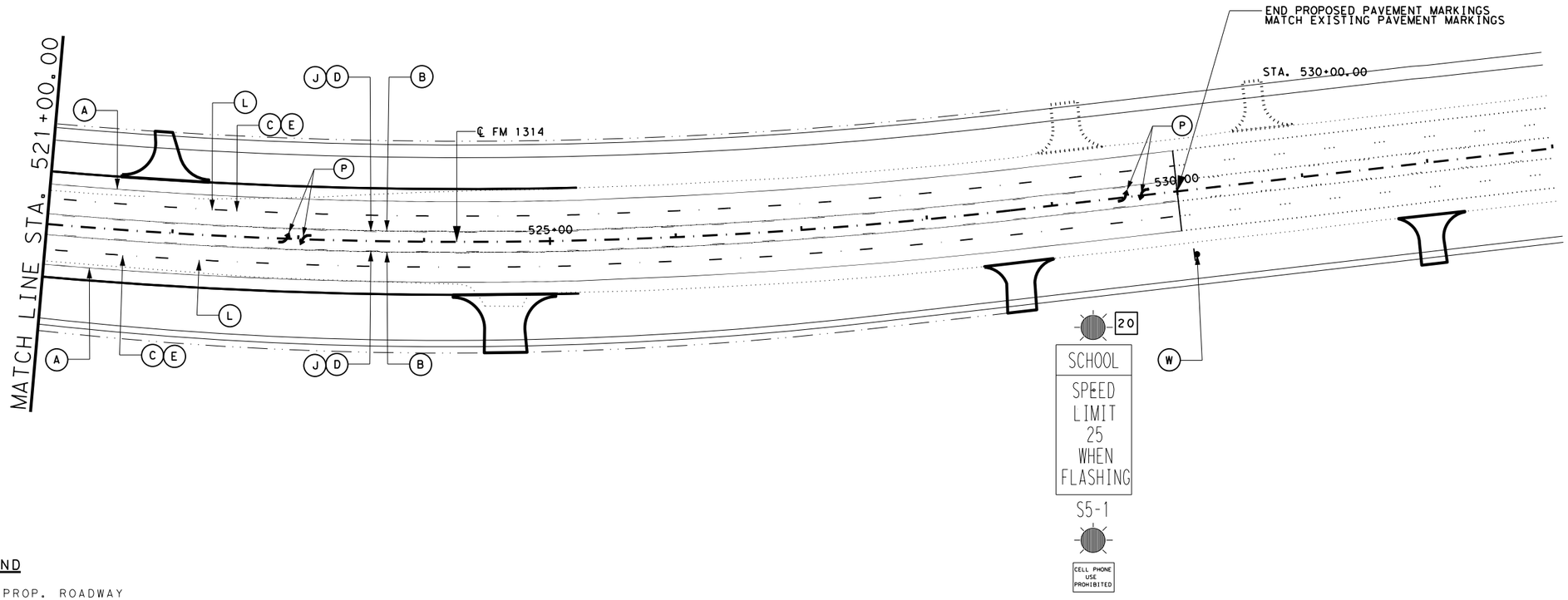

LEGEND

- PROP. ROADWAY
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- EXIST. ROADWAY
- TRAFFIC FLOW ARROW
- (#) DRIVEWAY NUMBER

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(D) PROP. REF PROF PAV MRK TY I (Y)6"(BRK)(090MIL)

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(N) PROP. REFL PAV MRKR TY II-CR SPACED AT 80'

(O) PROP. MULTIPOLYMER PAV MRK (W)(WORD)

(P) PROP. MULTIPOLYMER PAV MRK (W)(ARROW)

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SIGNING AND PAVEMENT MARKING LAYOUT

SHEET 6 OF 11

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		186

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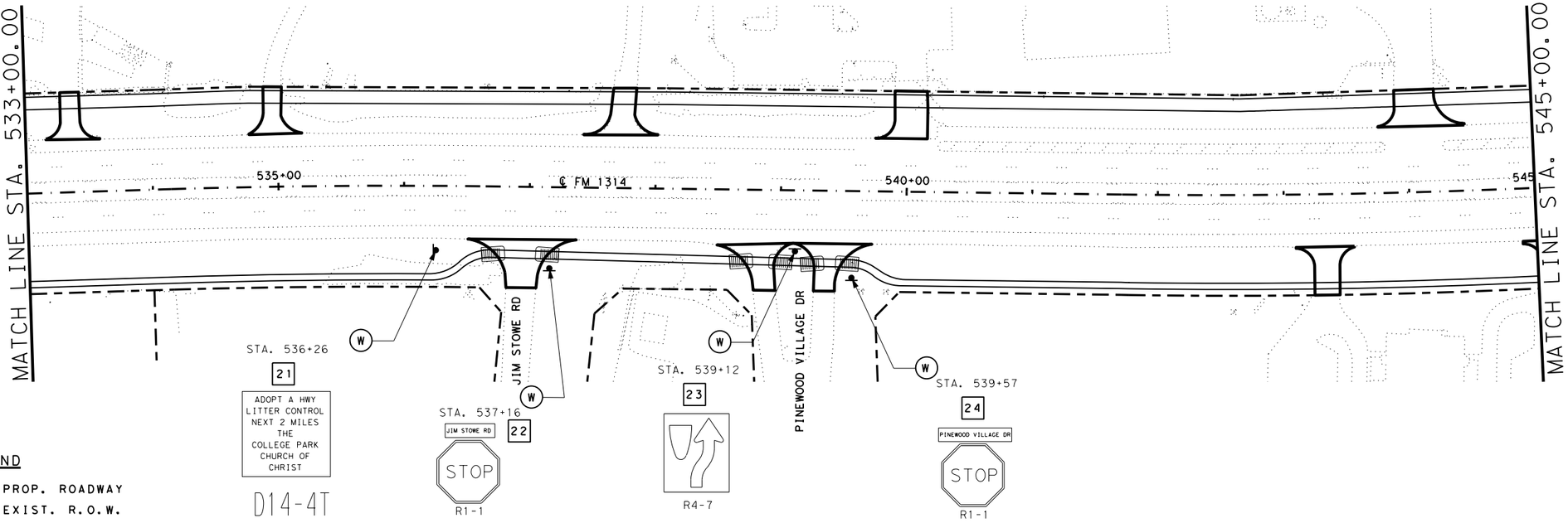

LEGEND

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(O) PROP. MULTIPOLYMER PAV MRK (W)(WORD)

(P) PROP. MULTIPOLYMER PAV MRK (W)(ARROW)

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SHEET 7 OF 11

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		187

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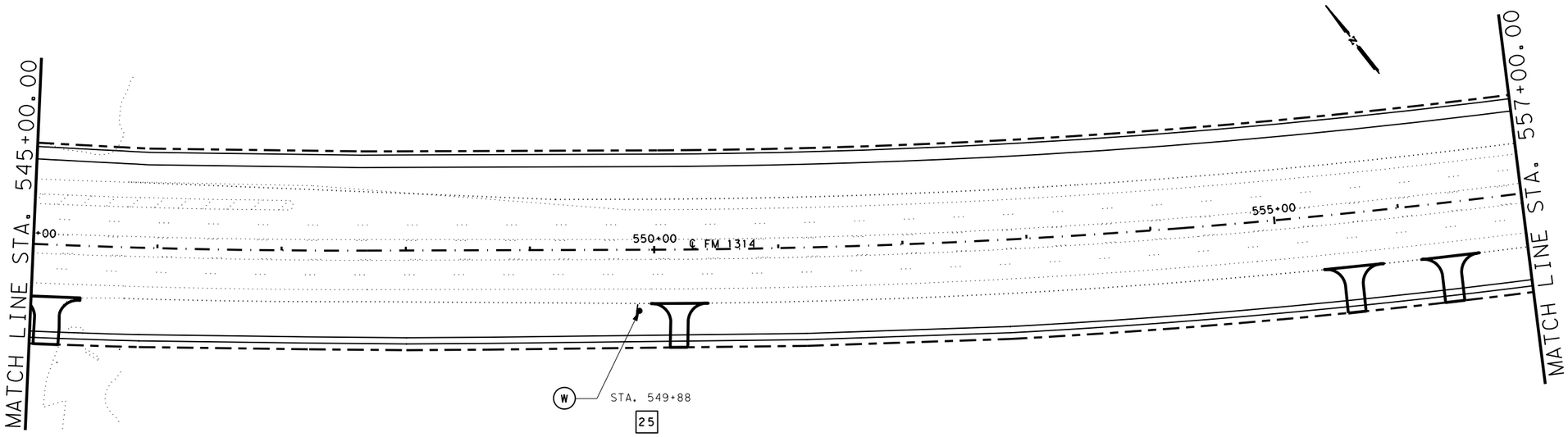

LEGEND

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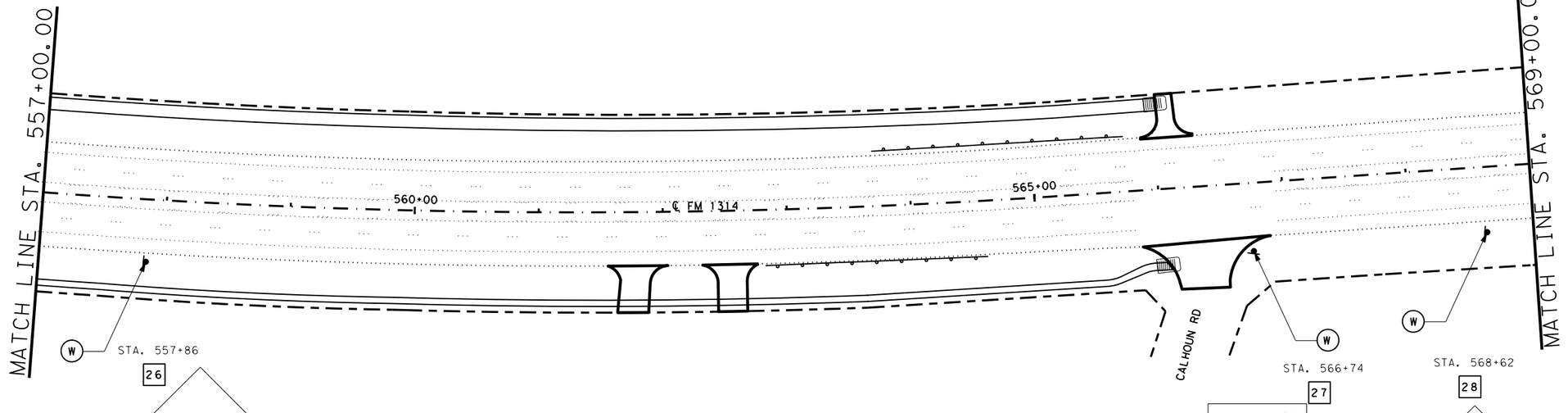
SHEET 8 OF 11

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		188



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PROFESSIONAL ENGINEER

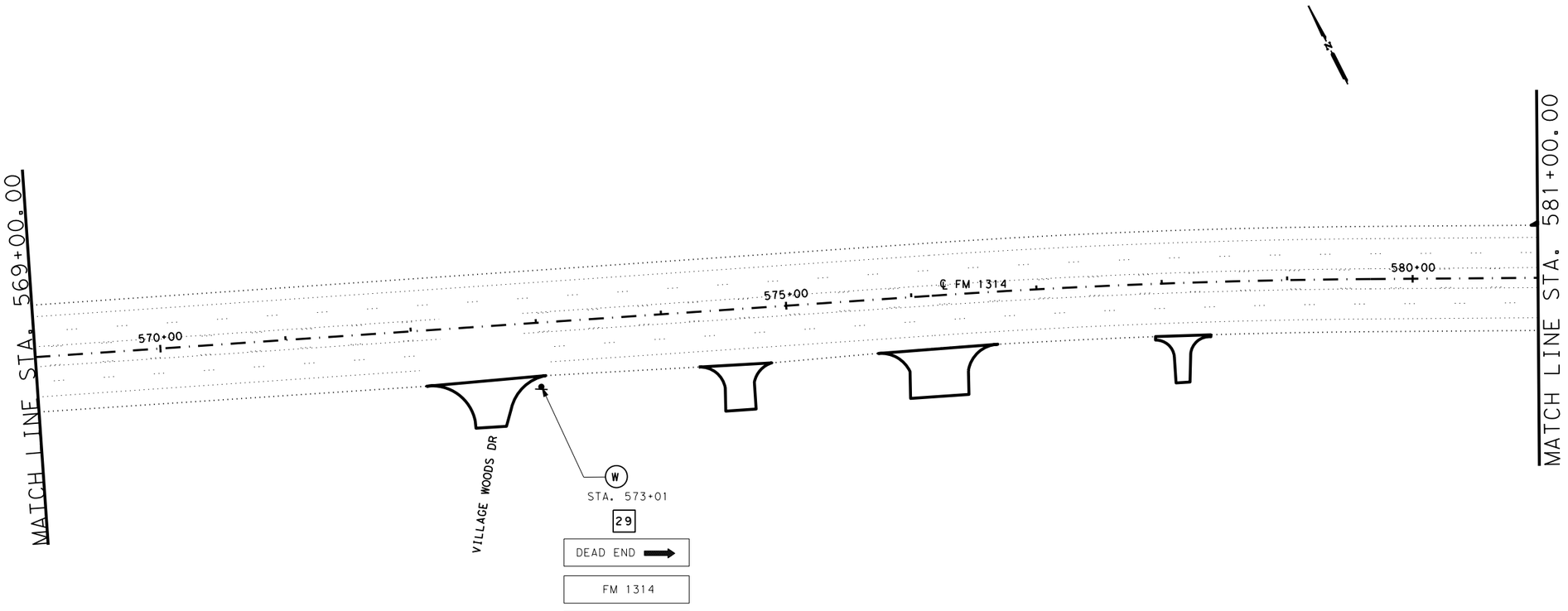
Micah J. Schluter, P.E.
03.14.24

FM 1314
SIGNING AND PAVEMENT MARKING LAYOUT

SHEET 9 OF 11

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		189



LEGEND

- PROP. ROADWAY
- EXIST. R.O.W.
- EXIST. ROADWAY
- TRAFFIC FLOW ARROW
- DRIVEWAY NUMBER

(A) PROP. REF PROF PAV MRK TY I (W)6"(SLD)(090MIL)

(B) PROP. REF PROF PAV MRK TY I (Y)6"(SLD)(090MIL)

(C) PROP. MULTIPOLYMER PAV MRK (W)(6")(BRK)

(D) PROP. REF PROF PAV MRK TY I (Y)6"(BRK)(090MIL)

(E) PROP. MULTIPOLYMER PAV MRK (BLK)(6")(BRK)

(F) PROP. MULTIPOLYMER PAV MRK (W)(8")(SLD)

(G) PROP. MULTIPOLYMER PAV MRK (W)(12")(SLD)

(H) PROP. MULTIPOLYMER PAV MRK (W)(24")(SLD)

(I) PROP. REFL PAV MRKR TY II - A - A SPACED AT 20'

(J) PROP. REFL PAV MRKR TY II - A - A SPACED AT 40'

(K) PROP. REFL PAV MRKR TY I-C SPACED AT 20'

(L) PROP. REFL PAV MRKR TY I-C SPACED AT 80'

(M) PROP. REFL PAV MRKR TY II-CR SPACED AT 20'

(N) PROP. REFL PAV MRKR TY II-CR SPACED AT 80'

(O) PROP. MULTIPOLYMER PAV MRK (W)(WORD)

(P) PROP. MULTIPOLYMER PAV MRK (W)(ARROW)

(S) PROP. SIGN

(T) REMOVE SIGN

(U) REMOVE SIGN ONLY

(V) PROP. SIGN ONLY

(W) RELOCATE SIGN

FOR PAVEMENT MARKINGS AND MARKERS SEE STANDARDS:
PM(1)-22, PM(2)-22, PM(3)-22, PM(4)-22A, PM(WAS)-07 (HOU DIST),
AND PM(CLL)-14 (HOU DIST) FOR SMALL SIGN INSTALLATION,
SEE SIGN MOUNTING DETAIL STANDARDS

DATE: 02/28/2024 09:55 PM
FILE:

0 50 100
SCALE IN FEET

STATE OF TEXAS
MICAH J. SCHLUTER
136908
LICENSED
PROFESSIONAL ENGINEER

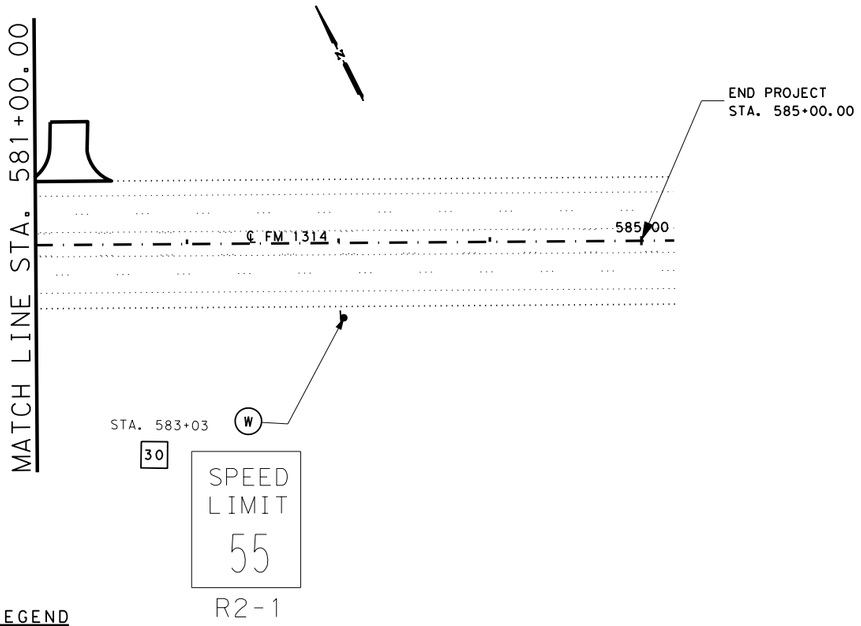
Micah J. Schluter, P.E.
03.14.24

FM 1314
SIGNING AND PAVEMENT MARKING LAYOUT

SHEET 10 OF 11

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		190



LEGEND

- PROP. ROADWAY
- EXIST. R.O.W.
- EXIST. ROADWAY
- TRAFFIC FLOW ARROW
- (#) DRIVEWAY NUMBER

(A) PROP. REF PROF PAV MRK TY I (W)6"(SLD)(090MIL)

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(C) PROP. MULTIPOLYMER PAV MRK (W)(6")(BRK)

(D) PROP. REF PROF PAV MRK TY I (Y)6"(BRK)(090MIL)

(E) PROP. MULTIPOLYMER PAV MRK (BLK)(6")(BRK)

(F) PROP. MULTIPOLYMER PAV MRK (W)(8")(SLD)

(G) PROP. MULTIPOLYMER PAV MRK (W)(12")(SLD)

(H) PROP. MULTIPOLYMER PAV MRK (W)(24")(SLD)

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(J) PROP. REFL PAV MRKR TY II - A - A SPACED AT 40'

(K) PROP. REFL PAV MRKR TY I-C SPACED AT 20'

(L) PROP. REFL PAV MRKR TY I-C SPACED AT 80'

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(P) PROP. MULTIPOLYMER PAV MRK (W)(ARROW)

(S) PROP. SIGN

(T) REMOVE SIGN

(U) REMOVE SIGN ONLY

(V) PROP. SIGN ONLY

(W) RELOCATE SIGN

FOR PAVEMENT MARKINGS AND MARKERS SEE STANDARDS:
PM(1)-22, PM(2)-22, PM(3)-22, PM(4)-22A, PM(WAS)-07 (HOU DIST),
AND PM(CLL)-14 (HOU DIST) FOR SMALL SIGN INSTALLATION,
SEE SIGN MOUNTING DETAIL STANDARDS

DATE: 02/29/2024 08:10 AM
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SCALE IN FEET

STATE OF TEXAS
MICAH J. SCHLUTER
136908
LICENSED
PROFESSIONAL ENGINEER

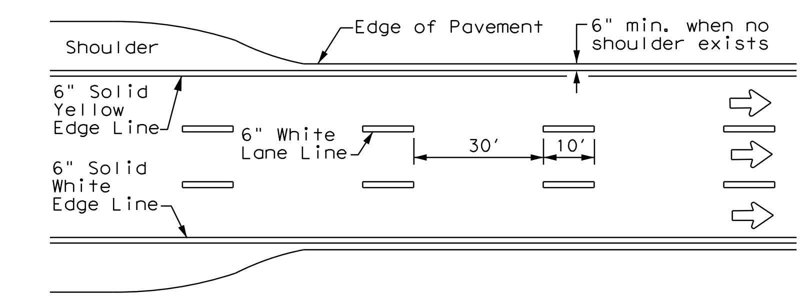
Micah J. Schluter, P.E.
03.14.24

FM 1314
SIGNING AND PAVEMENT MARKING LAYOUT

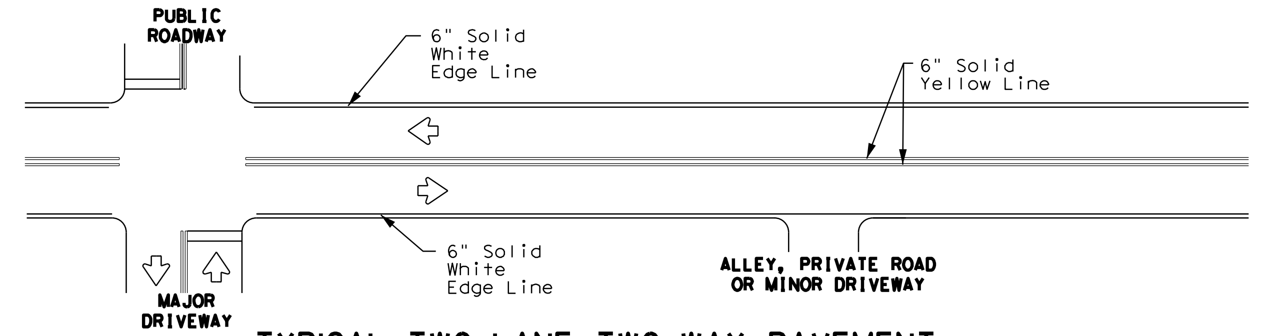
SHEET 11 OF 11

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		191



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



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

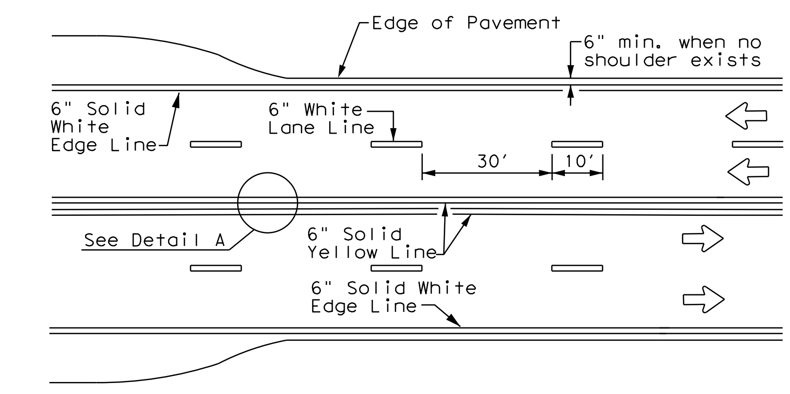
GENERAL NOTES

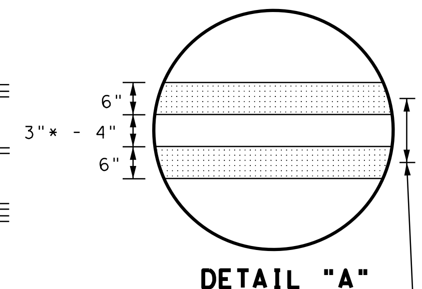
1. Edge line striping shall be as shown in the plans or as directed by the Engineer. The edge line should not be placed less than 6 inches from the edge of pavement. This distance may vary due to pavement raveling or other conditions. Edge lines are not required in curb and gutter sections of roadways.

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 center of edge line to the center of edge line 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.





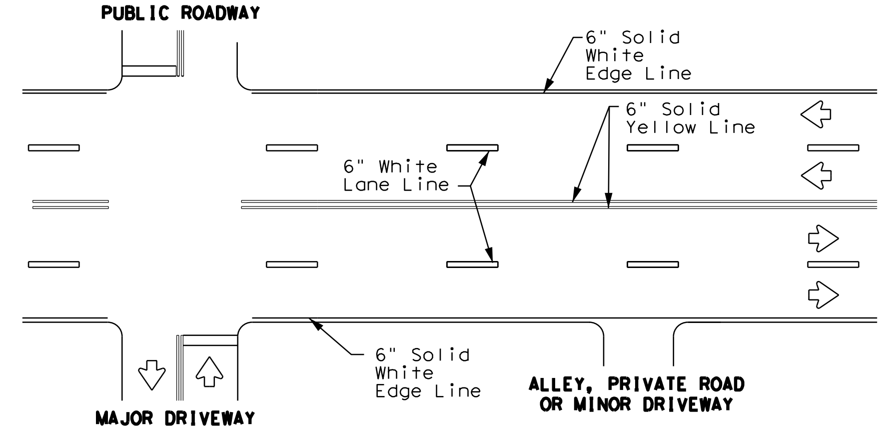
DETAIL "A"

9"** min. - 10" typ.
(18" max. for traveled way greater than 48' only)

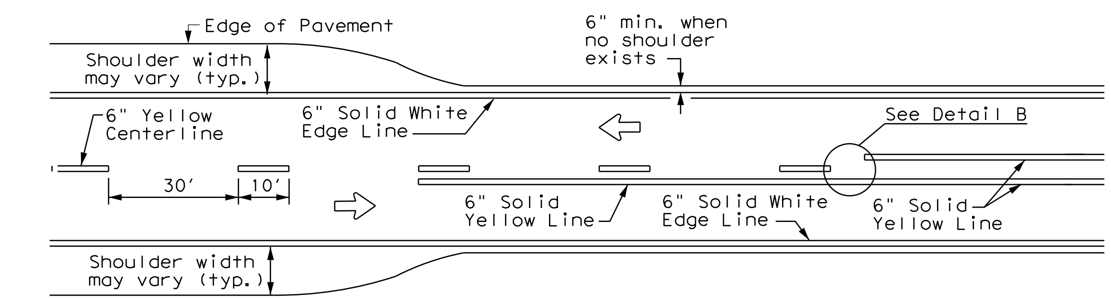
CENTERLINE AND LANE LINES
FOUR LANE TWO-WAY ROADWAY
WITH OR WITHOUT SHOULDERS

* 2" minimum for restripe projects when approved by the Engineer.

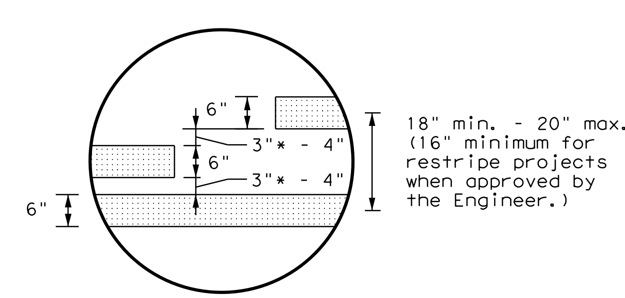
** 8" minimum for restripe projects when approved by the Engineer.



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



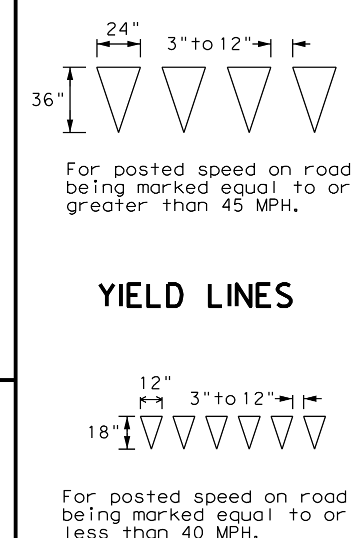
TWO LANE TWO-WAY ROADWAY
WITH OR WITHOUT SHOULDERS

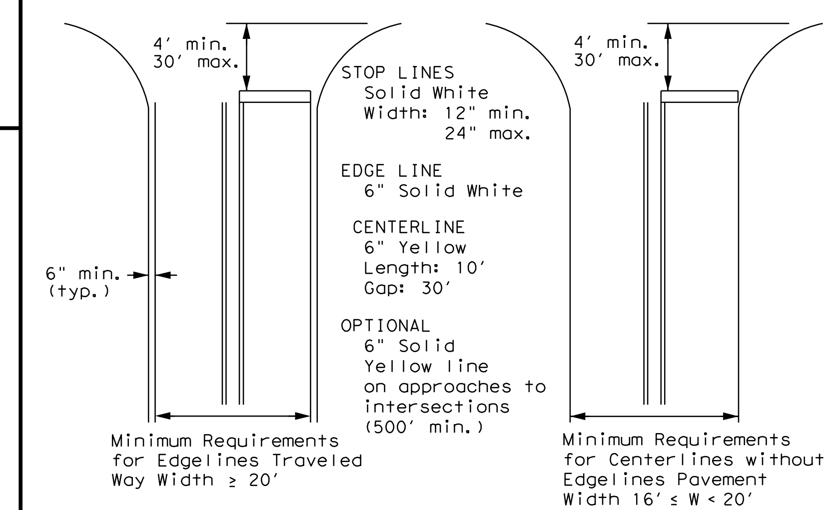


18" min. - 20" max. (16" minimum for restripe projects when approved by the Engineer.)

DETAIL "B"

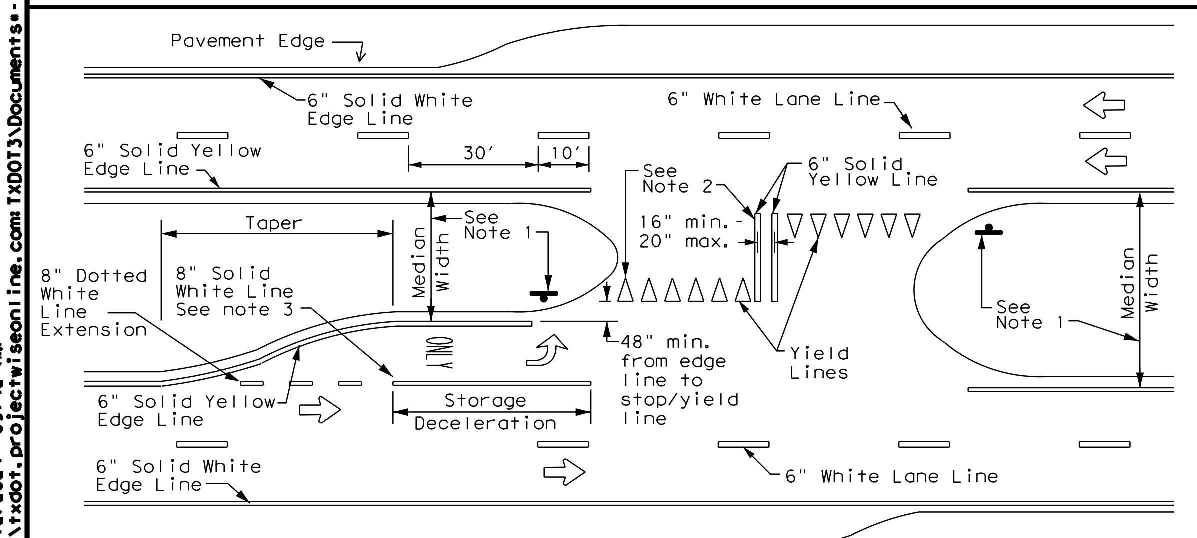
* 2" minimum for restripe projects when approved by the Engineer.





NOTE: Traveled way is exclusive of shoulder widths. Refer to General Note 2 for additional details.

GUIDE FOR PLACEMENT OF STOP LINES,
EDGE LINE & CENTERLINE
Based on Traveled Way and Pavement Widths for Undivided Roadways



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 and stop bars are optional as determined by the Engineer.

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

Texas Department of Transportation
Traffic Safety Division Standard

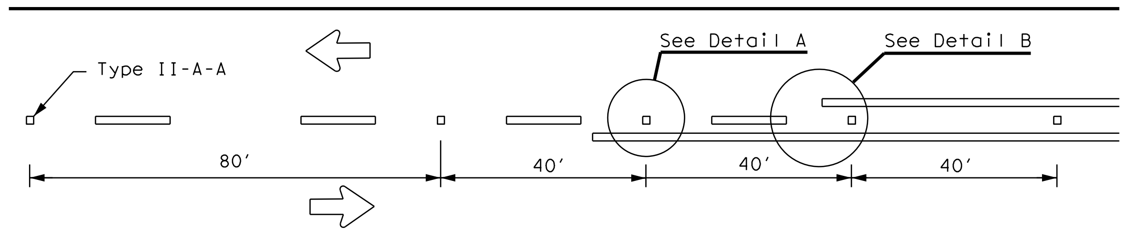
TYPICAL STANDARD PAVEMENT MARKINGS

PM(1)-22

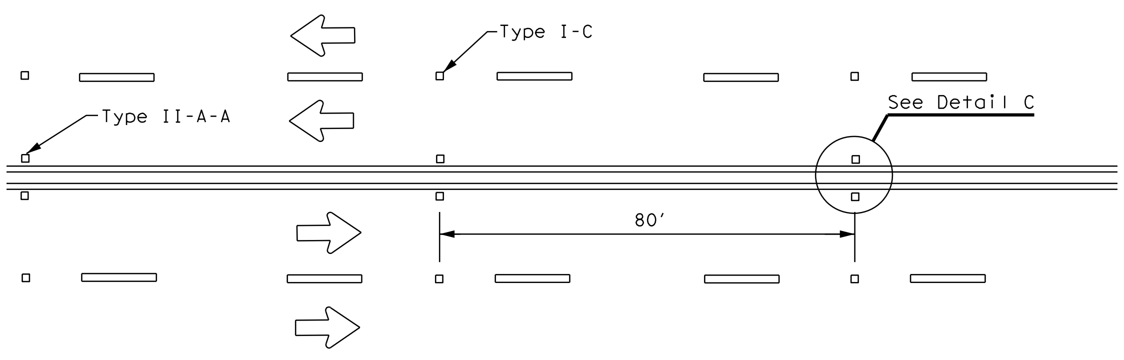
FILE: pm1-22.dgn	DN:	CK:	DW:	CK:
©TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS 11-78 8-00 6-20 8-95 3-03 12-22 5-00 2-12	1986	01	064	FM1314
	DIST		COUNTY	SHEET NO.
	HOU		MONTGOMERY	192

22A

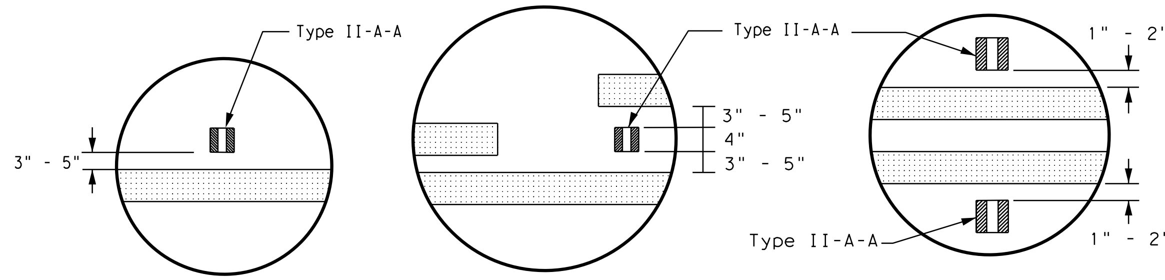
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE



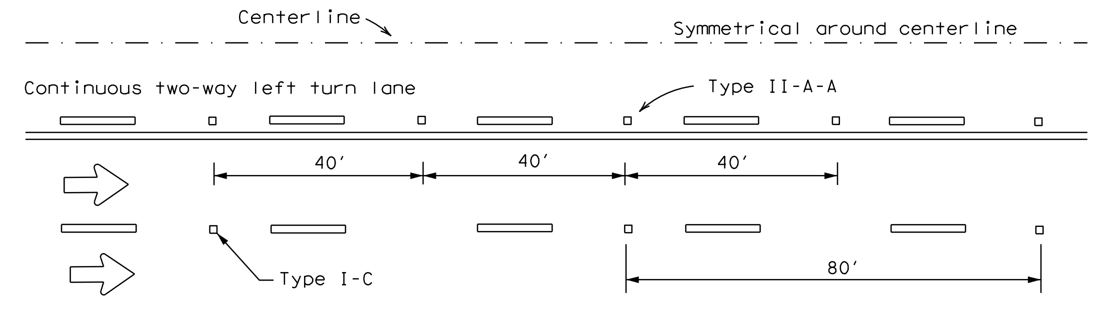
CENTERLINE FOR ALL TWO LANE TWO-WAY ROADWAYS



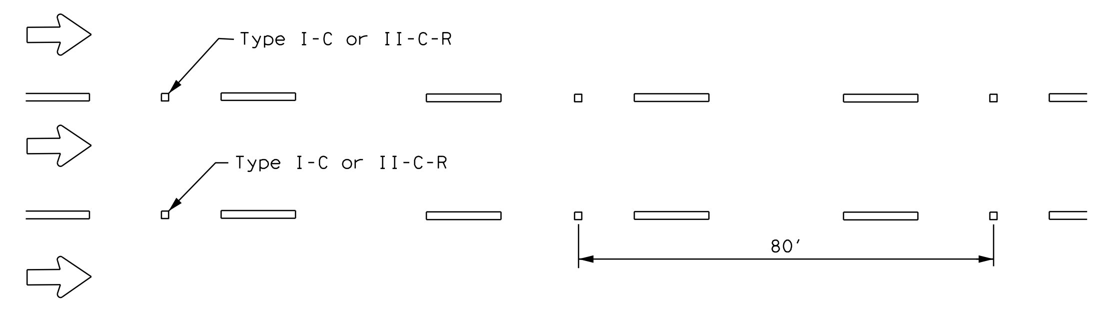
CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY ROADWAYS



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



CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



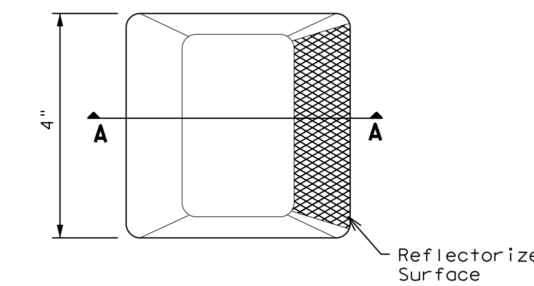
LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

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

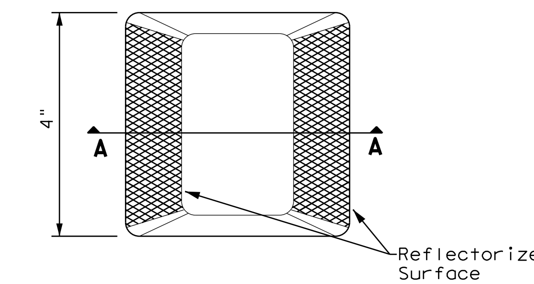
See Note 3.

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

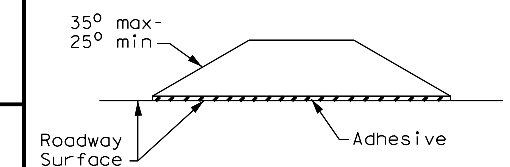
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)

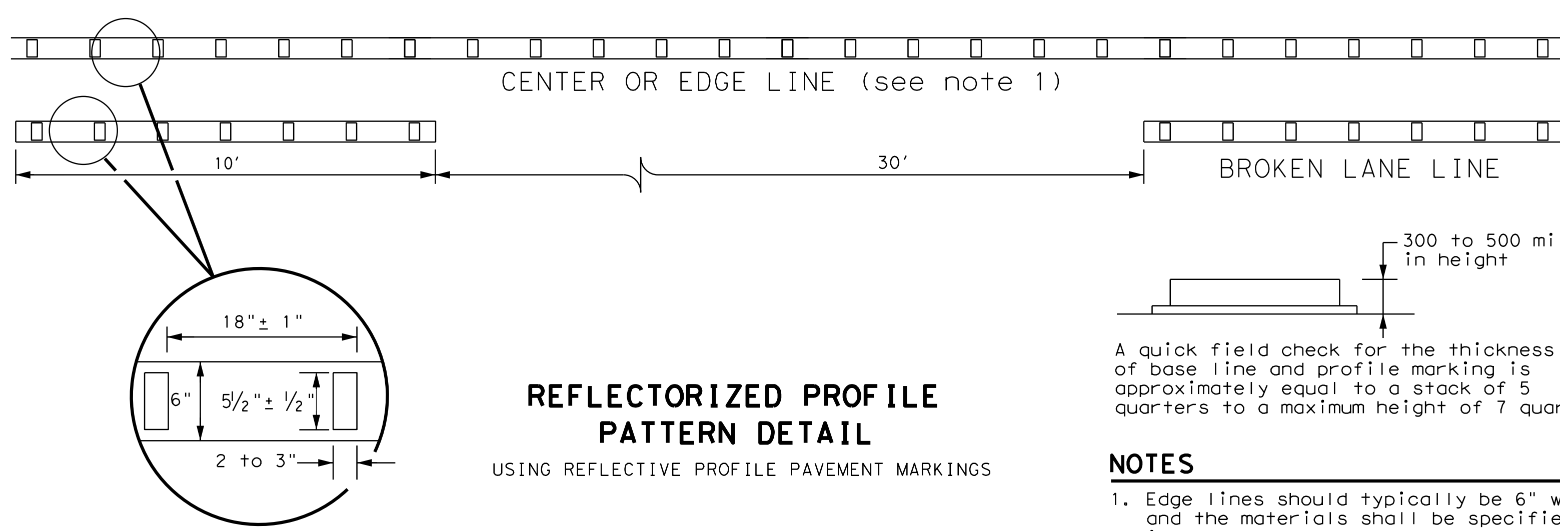


Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS



6" EDGE LINE, 6" CENTERLINE OR 6" LANE LINE

REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS

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

NOTES

1. Edge lines should typically be 6" wide and the materials shall be specified in the plans.
2. 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 along 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.
3. Use raised pavement marker Type I-C with undivided roadways, flush medians, and two way left turn lanes. Use raised pavement marker Type II-C-R with divided highways and raised medians.

Texas Department of Transportation

Traffic Safety Division Standard

POSITION GUIDANCE USING RAISED MARKERS REFLECTORIZED PROFILE MARKINGS PM(2)-22

FILE: pm2-22.dgn	DN:	CK:	DW:	CK:
© TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-77 8-00 6-20 4-92 2-10 12-22 5-00 2-12	1986	01	064	FM1314
	DIST		COUNTY	SHEET NO.
	HOU		MONTGOMERY	192A

DATE: 02/12/2024 09:43 AM
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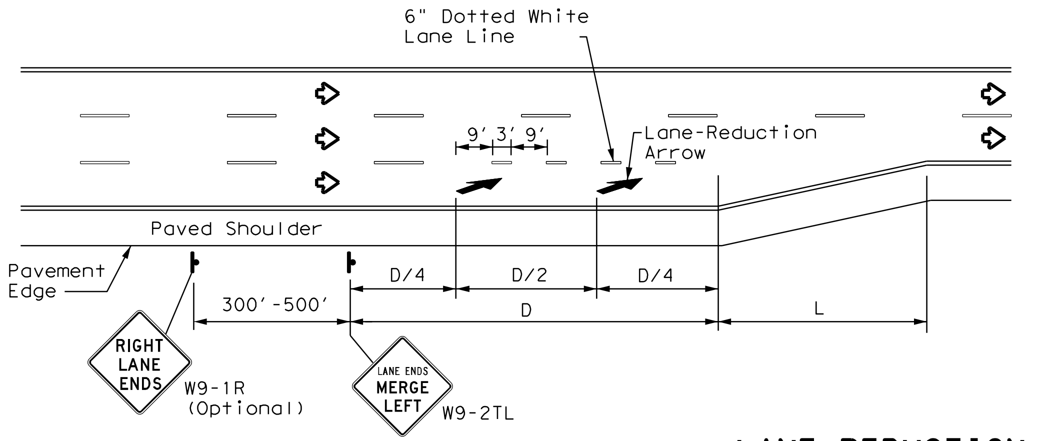


LANE REDUCTION

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 RIGHT LANE ENDS (W9-1R) 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.

ADVANCED WARNING SIGN DISTANCE (D)

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	

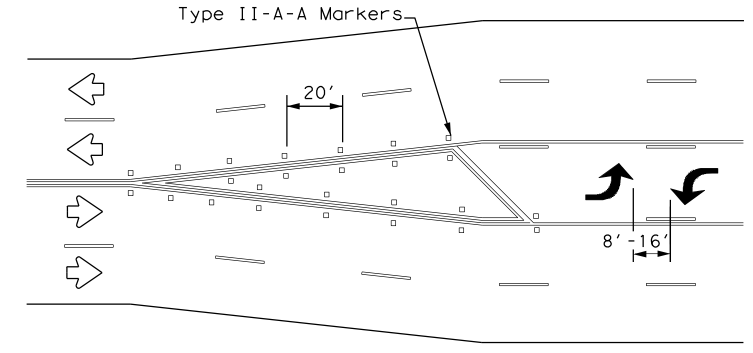
GENERAL NOTES

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. See Chapter 3 of the Roadway Design Manual for additional information on turning lanes or storage lengths.

MATERIAL SPECIFICATIONS

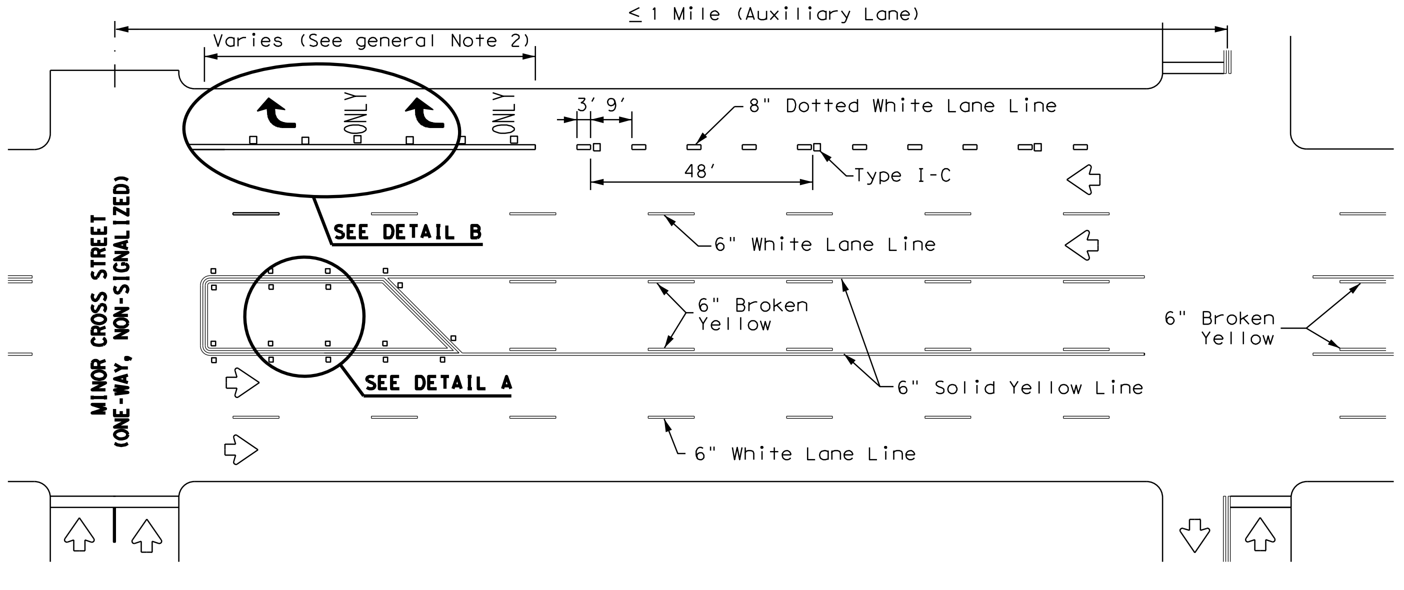
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

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

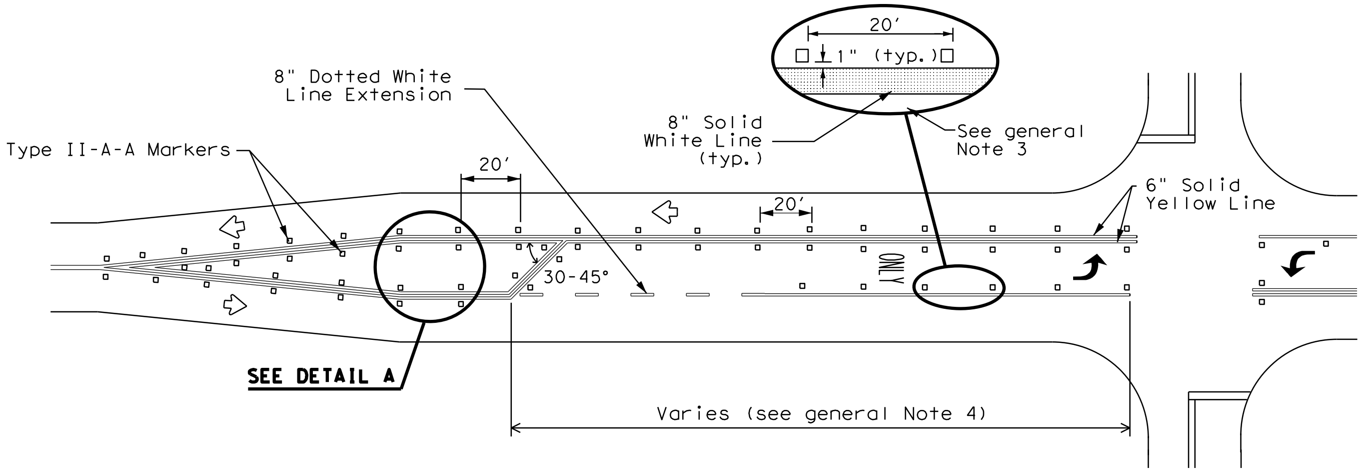


A two-way left-turn (TWLT) lane-use arrow pavement marking should be used at or just downstream from the beginning of a two-way left-turn lane within a corridor. Repeating the marking after each intersection or dedicated turn bay is not required unless stated elsewhere in the plans.

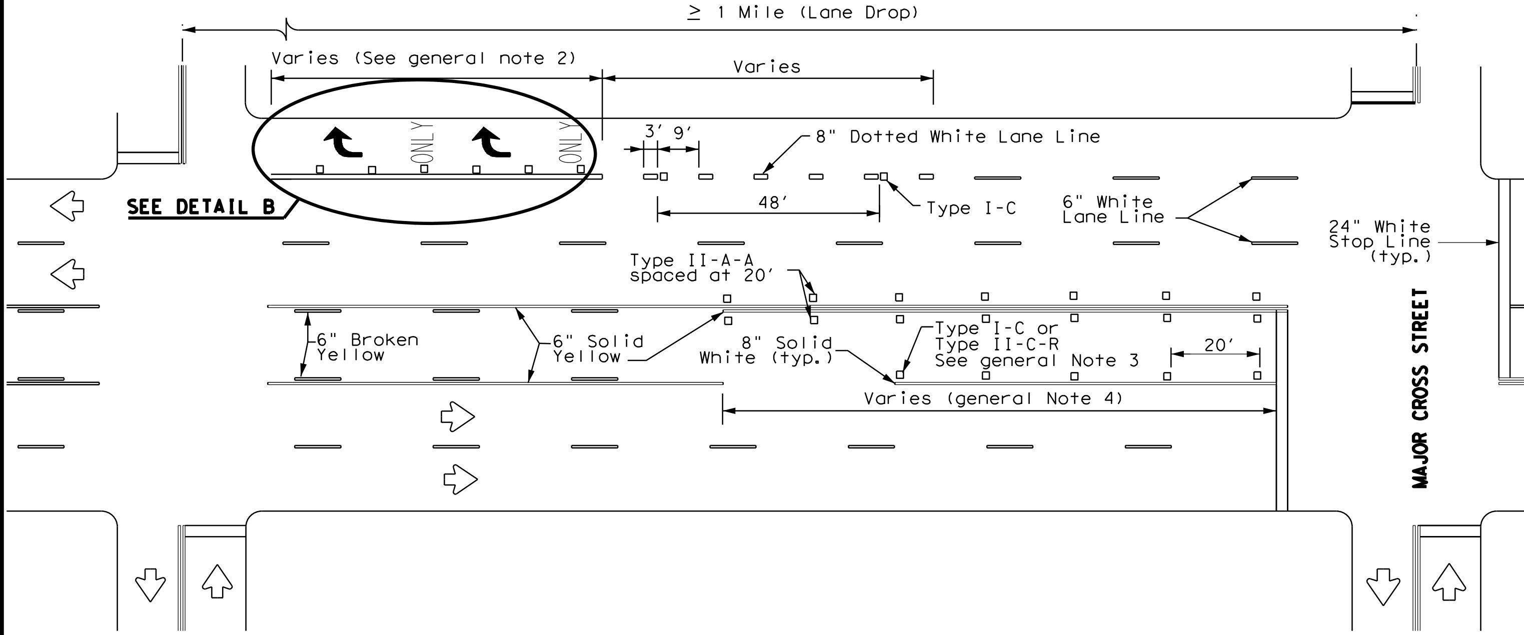
TYPICAL TRANSITION FOR TWLTL AND DIVIDED HIGHWAY



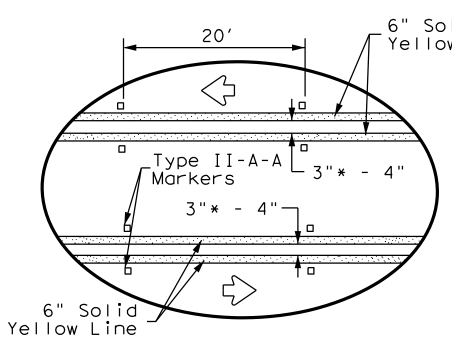
TYPICAL TWLTL AT ONE-WAY STREET AND RIGHT TURN AUXILIARY LANE



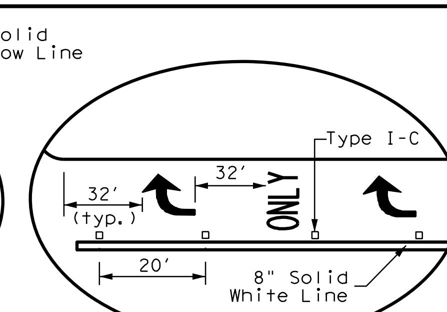
TYPICAL TWO-LANE ROADWAY INTERSECTION WITH LEFT TURN BAYS



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



DETAIL A



DETAIL B

* 2" minimum allowed for restripe projects when approved by the Engineer.

Texas Department of Transportation

Traffic Safety Division Standard

TWO-WAY LEFT TURN LANES, RURAL LEFT TURN BAYS, AND LANE REDUCTION PAVEMENT MARKINGS

PM(3)-22

FILE: pm3-22.dgn	DN:	CK:	DW:	CK:
©TxDOT December 2022	CONT 1986	SECT 01	JOB 064	HIGHWAY FM1314
REVISIONS 4-98 3-03 6-20 5-00 2-10 12-22 8-00 2-12	DIST HOU	COUNTY MONTGOMERY		SHEET NO. 192B

22C

DATE: 02/12/2024 09:45 AM
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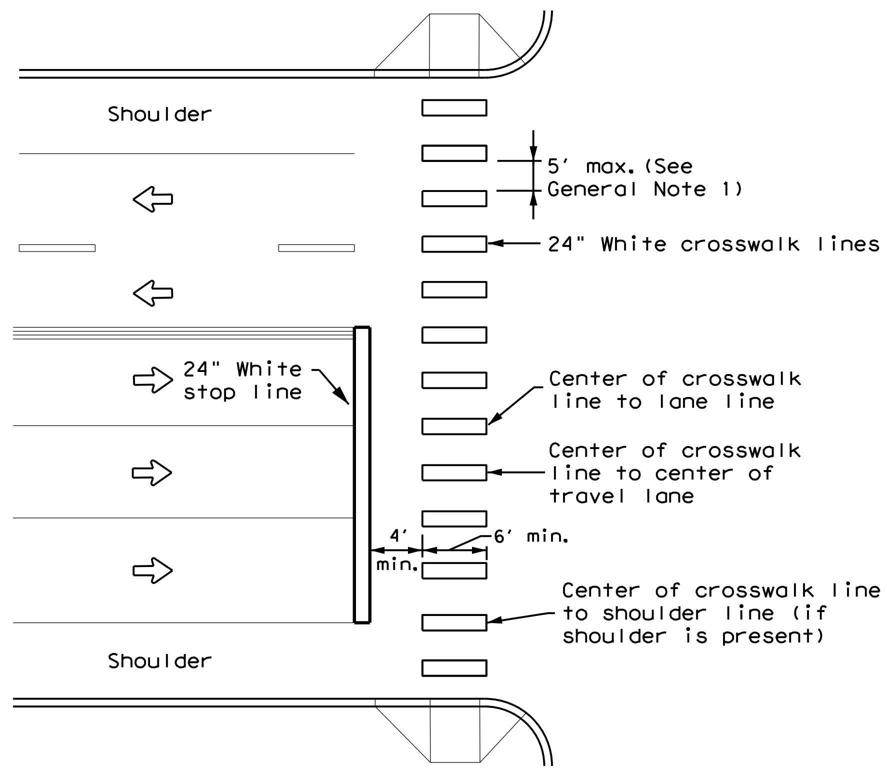


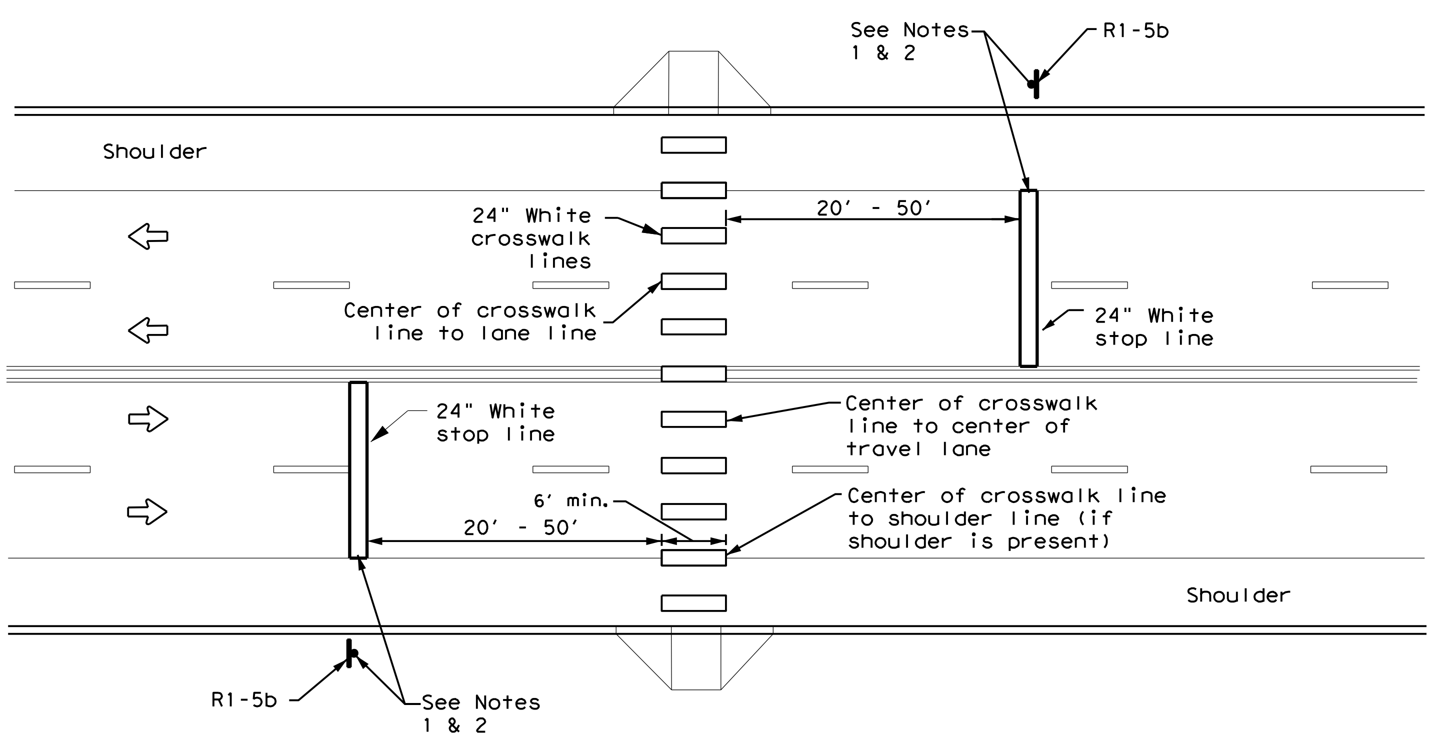
HIGH-VISIBILITY LONGITUDINAL CROSSWALK AT CONTROLLED APPROACH

GENERAL NOTES

1. Longitudinal crosswalk lines should not be placed in the wheel path of vehicles. Center the crosswalk lines on travel lanes, lane lines, and shoulder lines (if present).
2. A minimum 6" clear distance shall be provided to the curb face. If the last crosswalk line falls into this distance it must be omitted.
3. For divided roadways, adjustments in spacing of the crosswalk lines should be made in the median so that the crosswalk lines are maintained in their proper location across the travel portion of the roadway.
4. At skewed crosswalks, the crosswalk lines are to remain parallel to the lane lines.
5. Each crosswalk shall be a minimum of 6' wide.
6. The High-Visibility Longitudinal Crosswalk is the preferred crosswalk pattern on State Highways. Other crosswalk patterns as shown in the "Texas Manual on Uniform Traffic Control Devices" may be used. All crosswalk designs and dimension shall comply with the "Texas Manual on Uniform Traffic Control Devices."
7. Final placement of Stop Bar and Crosswalk shall be approved by the Engineer in the field.

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

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



UNSIGNALIZED MIDBLOCK HIGH-VISIBILITY LONGITUDINAL CROSSWALK

NOTES:

1. Use stop bars with Stop Here For Pedestrians (R1-5b) signs at unsignalized midblock cross walks.
2. Use stop bars with STOP HERE ON RED (R10-6 or R10-6a) signs at mid block crosswalks controlled by traffic signals or pedestrian hybrid beacons.

Texas Department of Transportation

Traffic Safety Division Standard

CROSSWALK PAVEMENT MARKINGS

PM(4)-22A

FILE: pm4-22a.dgn	DN:	CK:	DW:	CK:
© TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	1986	01	064	FM1314
6-20 6-22 12-22	DIST		COUNTY	SHEET NO.
	HOU		MONTGOMERY	192C

220

DATE: 02/29/2024 07:27 AM
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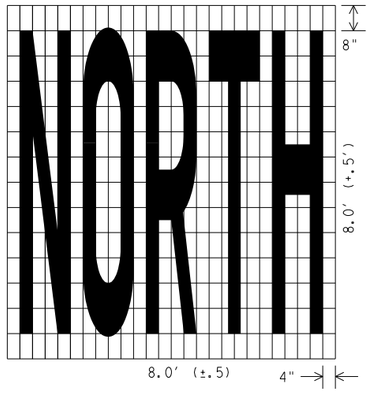
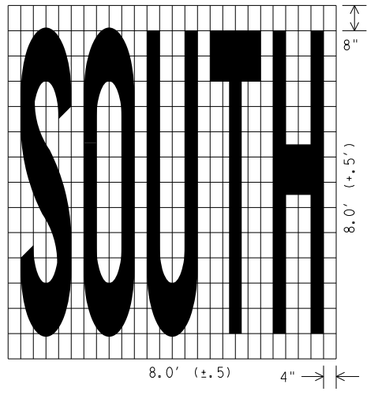
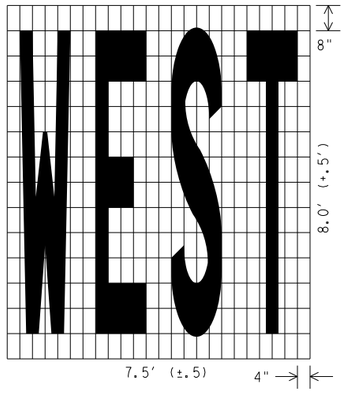
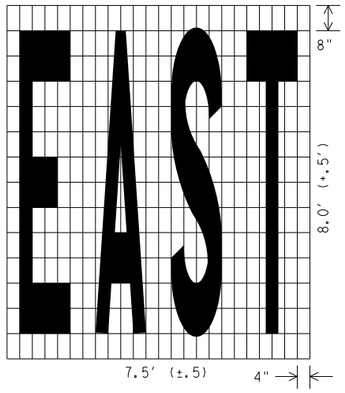
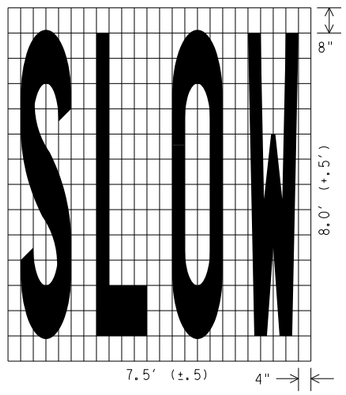
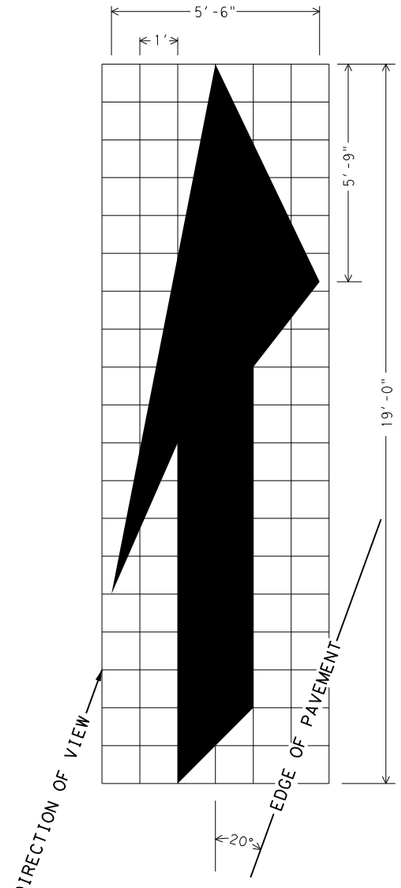






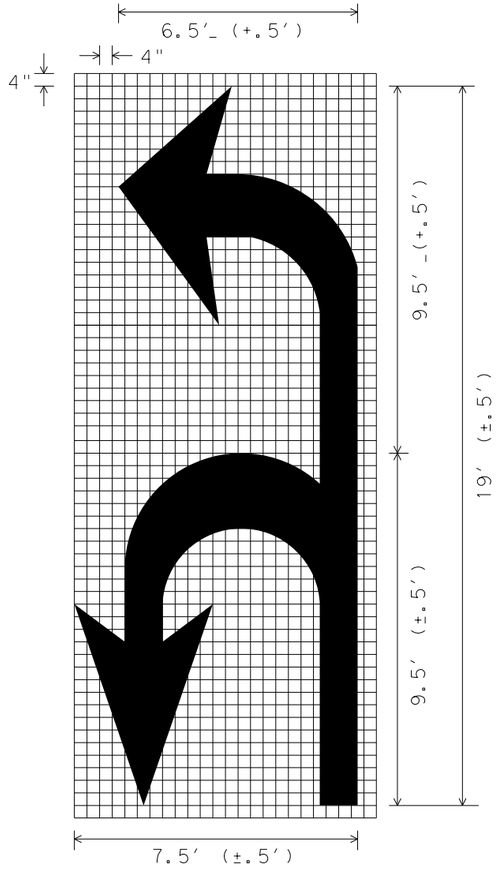




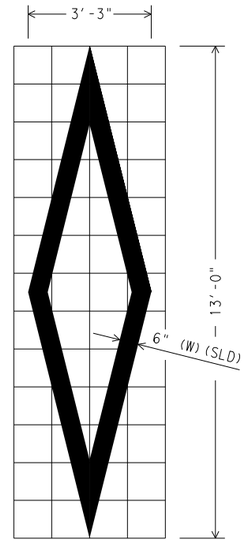


ISOMETRIC ARROW

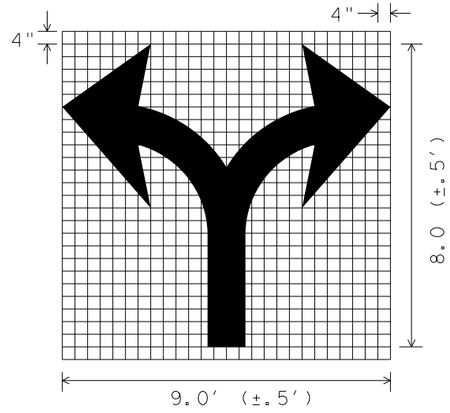
12 INCH GRID
AREA = 42 SQ. FT.
RIGHT LANE DROP ARROW
(FOR LEFT LANE, USE MIRROR IMAGE)



U-L ARROW



DIAMOND SYMBOL



SCALE 1/4" = 1′

Texas Department of Transportation
Houston District

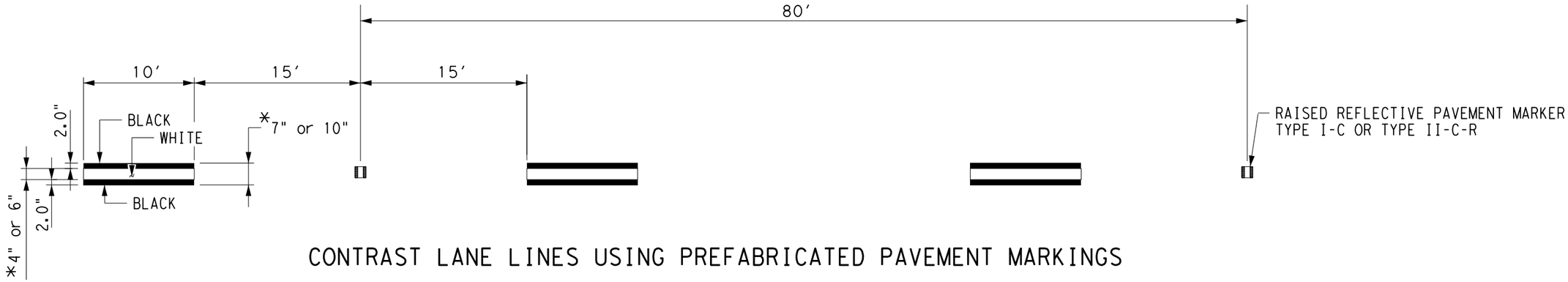
PAVEMENT MARKINGS (WORDS, ARROWS & SYMBOLS)

PM(WAS)-07

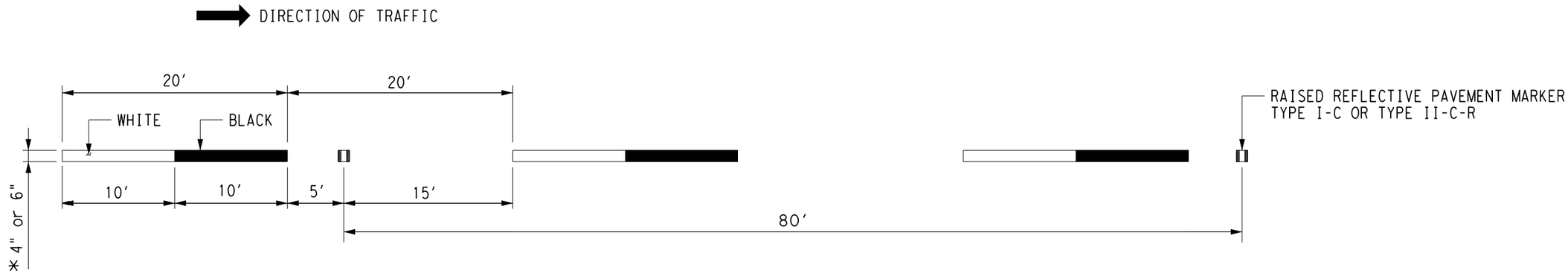
FILE:	DN:	CK:	DW:	CK:
© TxDOT 2007	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS 03-19-07	HOU	6		192D

COUNTY	CONTROL	SECT	JOB	HIGHWAY
MONTGOMERY	1986	01	064	FM1314

STD-N31



CONTRAST LANE LINES USING PREFABRICATED PAVEMENT MARKINGS



CONTRAST LANE LINES USING LIQUID APPLICATIONS
(MULTIPOLYMER, THERMOPLASTIC, ETC.)

✳ AS SHOWN ON THE PLANS.

Texas Department of Transportation
Houston District

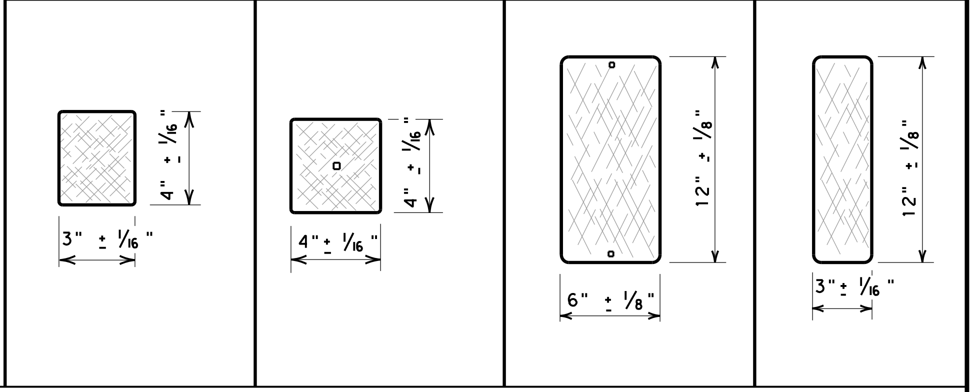
PAVEMENT MARKINGS
(CONTRAST LANE LINES)

PM(CLL)-14

FILE:	DN:	CK:	DW:	CK:
© TxDOT 2003	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS 01-10-06 02-12-08 10-2019 9" to 10"	HOU	6		192E
	COUNTY	CONTROL	SECT JOB	HIGHWAY
	MONTGOMERY	1986	01 064	FM1314

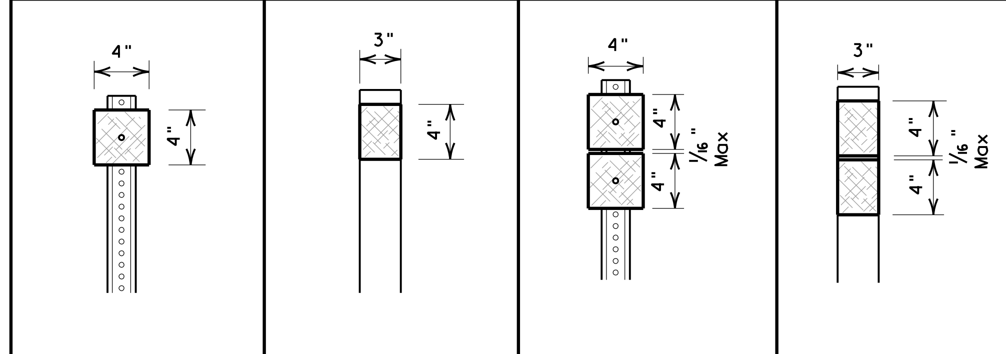
STD N-30

REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS



	SIZE 1	SIZE 2	SIZE 3	SIZE 4
DEVICE	3" ± 1/16" × 4" ± 1/16"	4" ± 1/16" × 4" ± 1/16"	6" ± 1/8" × 12" ± 1/8"	3" ± 1/16" × 12" ± 1/8"
SHEETING	Yellow, White or Red Type B or C reflective sheeting			
NOTE	1. Size 1 and 4 - Direct applied reflective sheeting for use on flexible post (flx). 2. Size 2 and 3 - For use on wing channel (wc) post only. Use approved metal, plastic or fiberglass backplate with 17/64" mounting holes.			

DELINEATORS



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

D & OM DESCRIPTIVE CODES

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

NUMBER OF REFLECTORS
S = Single
D = Double

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

REFLECTOR UNIT SIZE
1 or 2

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

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

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

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

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

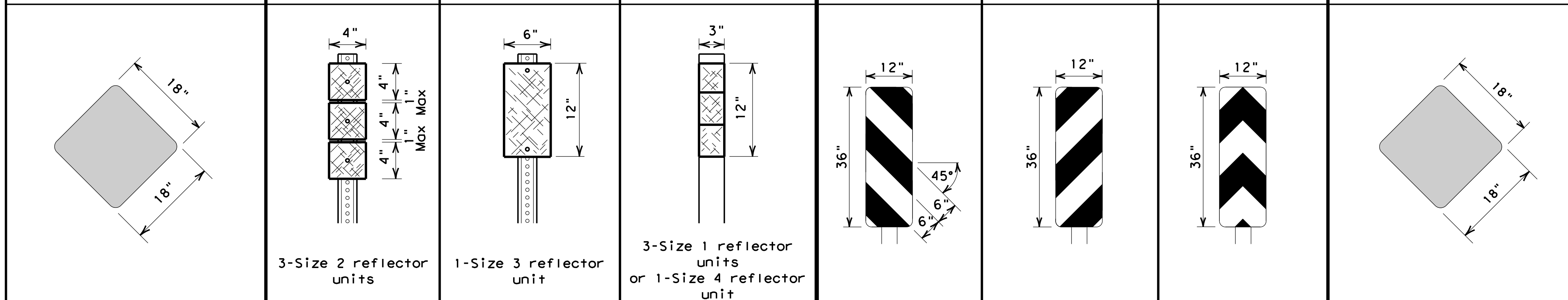
NUMBER OF REFLECTORS OR DIRECTION
X = 3-Size 2 reflector units (Type 2 only)
Y = 1-Size 3 reflector unit (Type 2 only)
Z = 3-Size 1 or 1-Size 4 reflector unit(s)(Type 2 only)
L = Left Side (Type 3 Object Marker only)
R = Right Side (Type 3 Object Marker only)
C = Center (Type 3 Object Marker only)

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

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

DIRECTION
If Required
BI = Bi-Directional

OBJECT MARKERS

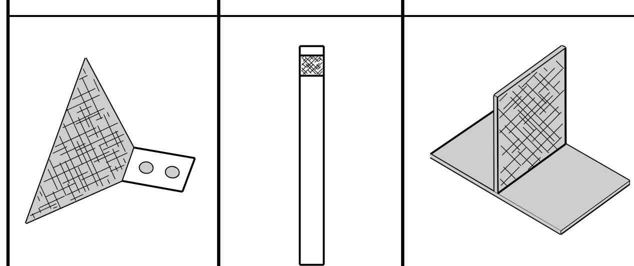


	Type 1 (OM-1)	Type 2 (OM-2)			Type 3 (OM-3)			Type 4 (OM-4)
	OM-1	OM-2X	OM-2Y	OM-2Z	OM-3L	OM-3R	OM-3C	OM-4
DEVICE		3-Size 2 reflector units	1-Size 3 reflector unit	3-Size 1 reflector units or 1-Size 4 reflector unit				
SHEETING	Yellow-Type B_{FL} or C_{FL} Sheeting	Yellow - Type B or C Sheeting			Alternating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

DEPARTMENTAL MATERIAL SPECIFICATIONS

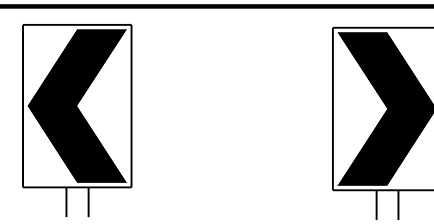
FLEXIBLE DELINEATOR & OBJECT MARKER POSTS (EMBEDDED & SURFACE MOUNT TYPES)	DMS-4400
SIGN FACE MATERIALS	DMS-8300
DELINEATORS, OBJECT MARKERS AND BARRIER REFLECTORS	DMS-8600

BARRIER REFLECTORS (BRF)



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

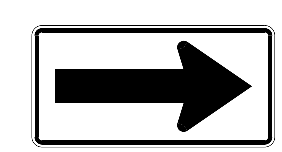
CHEVRONS



W1-8

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

ONE DIRECTION LARGE ARROW



W1-6

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

NOTE

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

NOTE:

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

Texas Department of Transportation — Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION

D & OM(1)-20

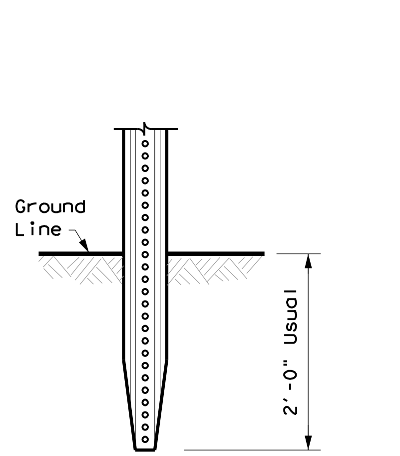
FILE: dom1-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT	
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY	
REVISIONS	1986	01	064	FM1314	
10-09 3-15 4-10 7-20	DIST	COUNTY		SHEET NO.	
	HOU	MONTGOMERY		193	

20A

POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

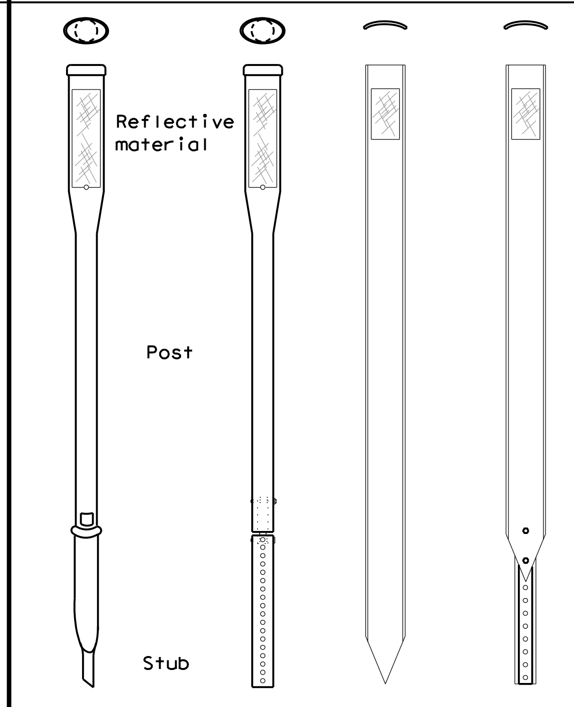


NOTES

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.

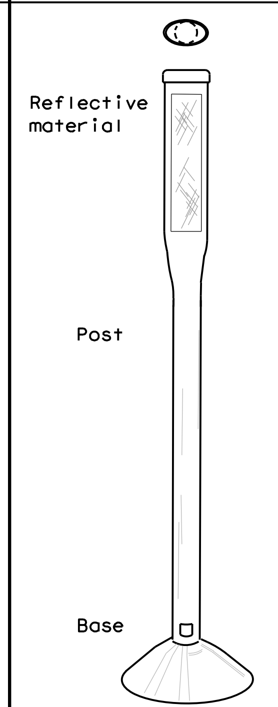
FLEXIBLE POSTS (YFLX, WFLX)

GND



EMBEDDED

SRF



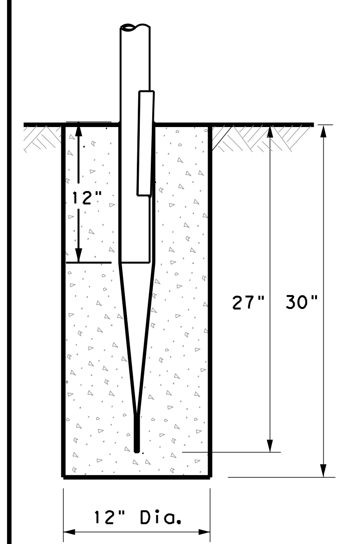
SURFACE MOUNT

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.

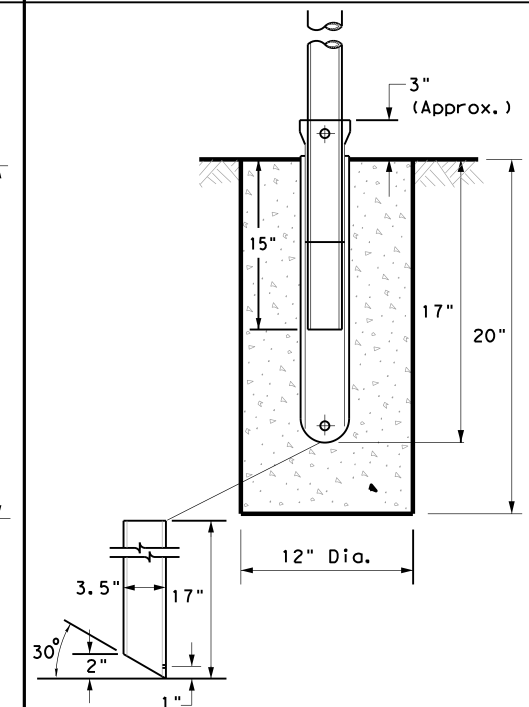
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

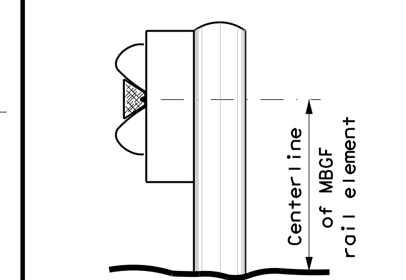
NOTE

1. Install per manufacturer's recommendations.

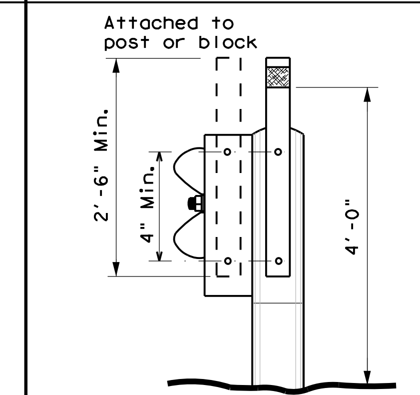
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

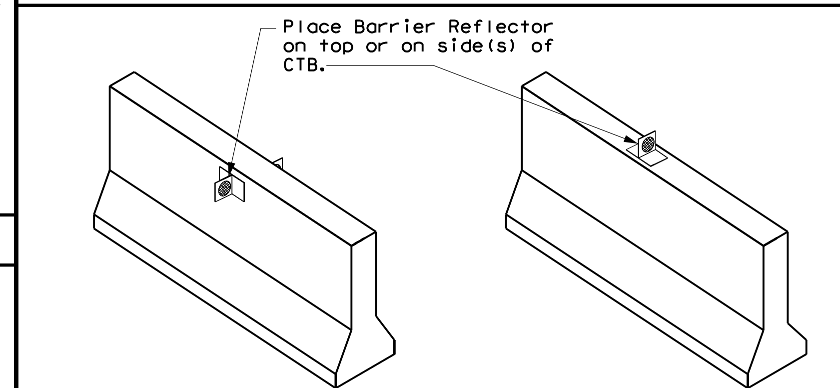
GF1



GF2



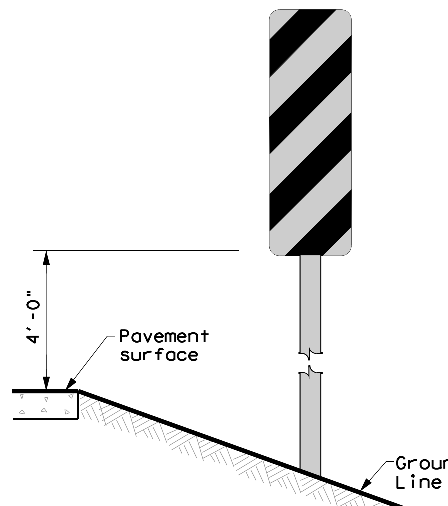
CONCRETE TRAFFIC BARRIER (CTB)



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.

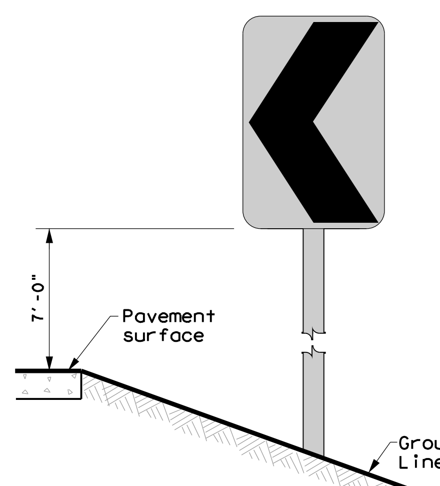
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



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)

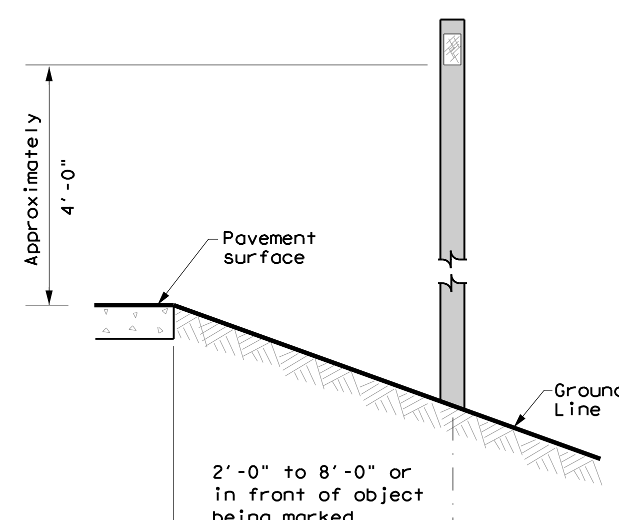
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



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	1986	01	064	FM1314
10-09 3-15	DIST		COUNTY	SHEET NO.
4-10 7-20	HOU		MONTGOMERY	194

20B

DATE: 01/17/2024 10:39 AM
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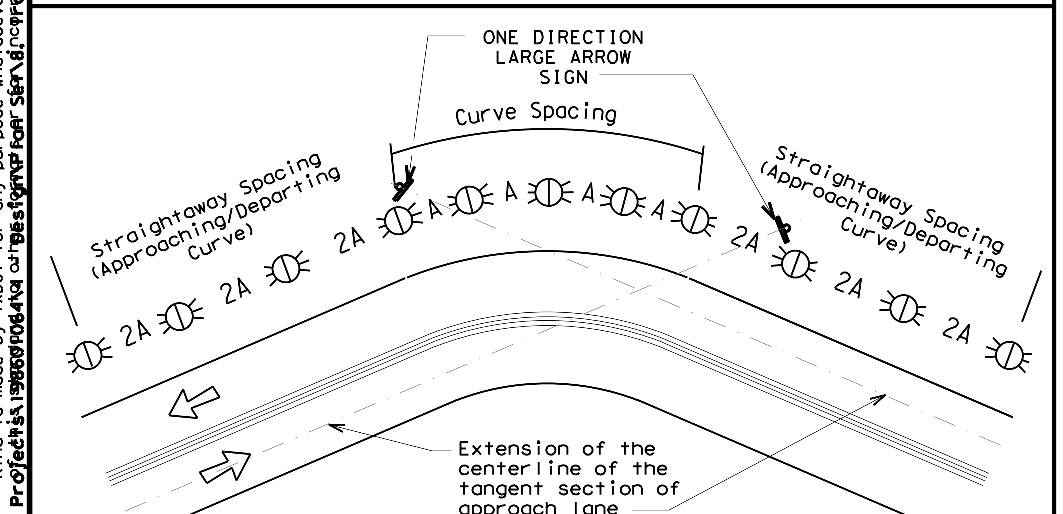
DATE: 01/17/2024 10:39 AM
FILE: pw:\\txdot.projectwiseonline.com:TXDOT3\Documents\12 - HOU\Design Projects\...

MINIMUM WARNING DEVICES AT CURVES WITH ADVISORY SPEEDS

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

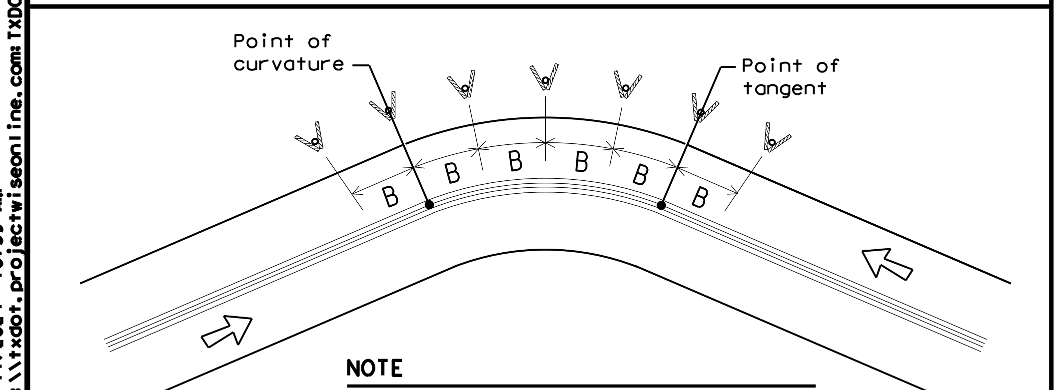
SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



NOTE

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

SUGGESTED SPACING FOR CHEVRONS ON HORIZONTAL CURVES



NOTE

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

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS KNOWN

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

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

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS NOT KNOWN

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

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

DELINEATOR AND OBJECT MARKER APPLICATION AND SPACING

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

NOTES

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

LEGEND

Symbol	Meaning
(symbol)	Bi-directional Delineator
(symbol)	Delineator
(symbol)	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 1986	SECT 01	JOB 064	HIGHWAY FM1314
REVISIONS 3-15 8-15 8-15 7-20	DIST HOU	COUNTY MONTGOMERY		SHEET NO. 195

20C

DATE: 01/17/2024 10:44 AM
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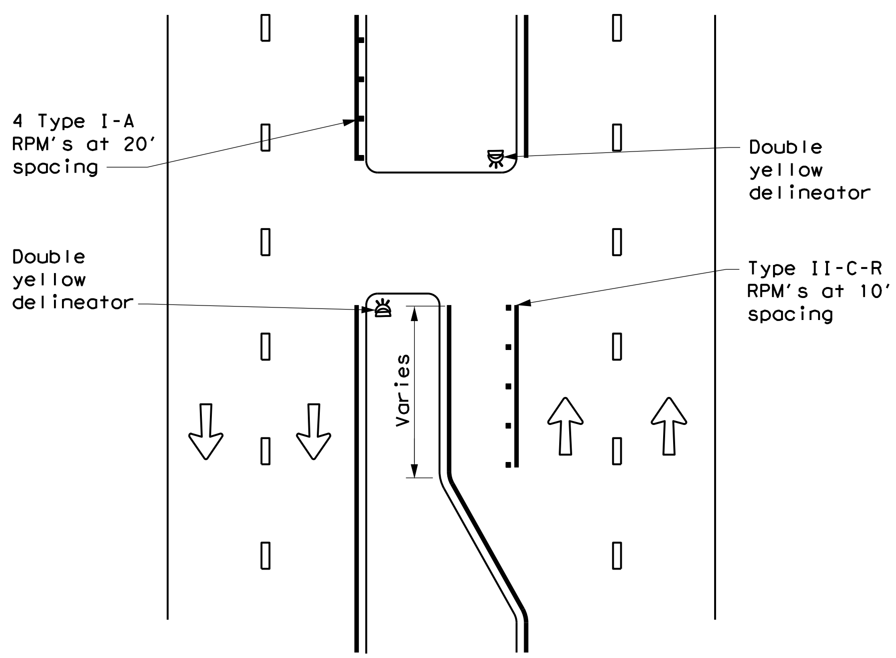
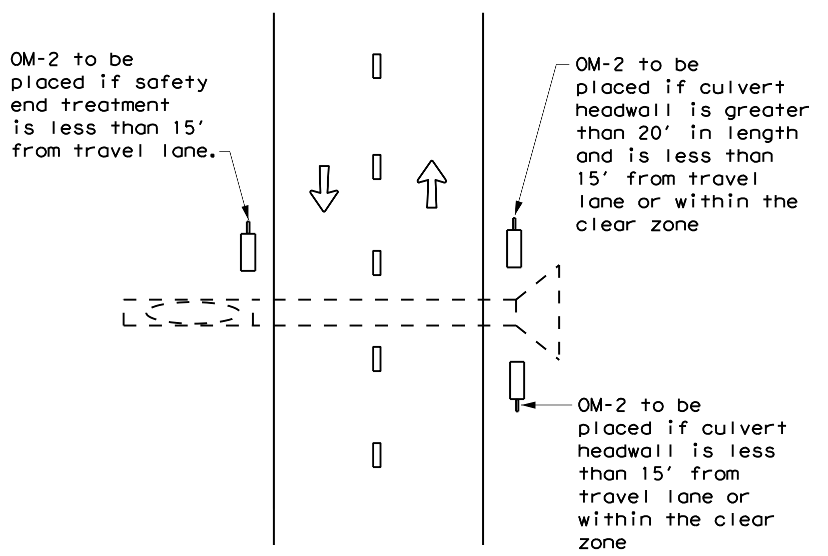
CROSSOVERS



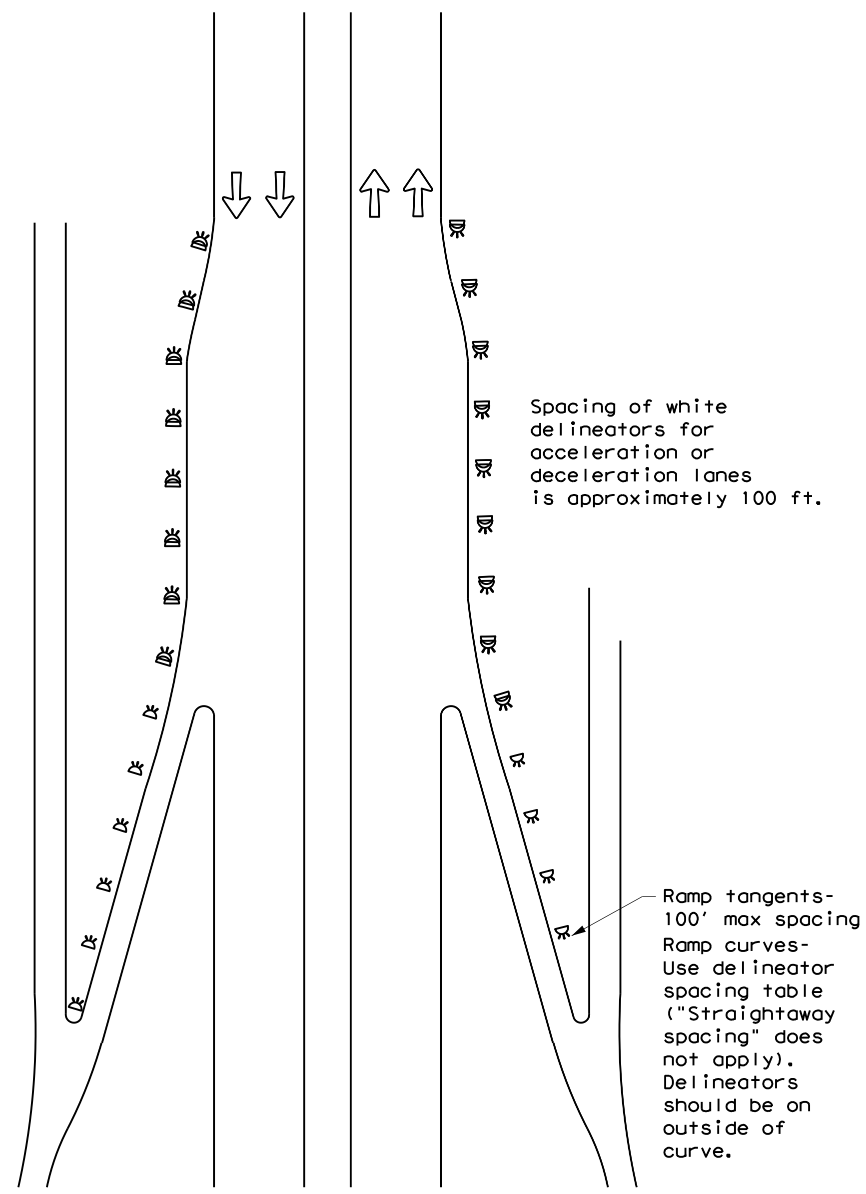
DETAIL 1

FOR CULVERTS WITHOUT MBGF



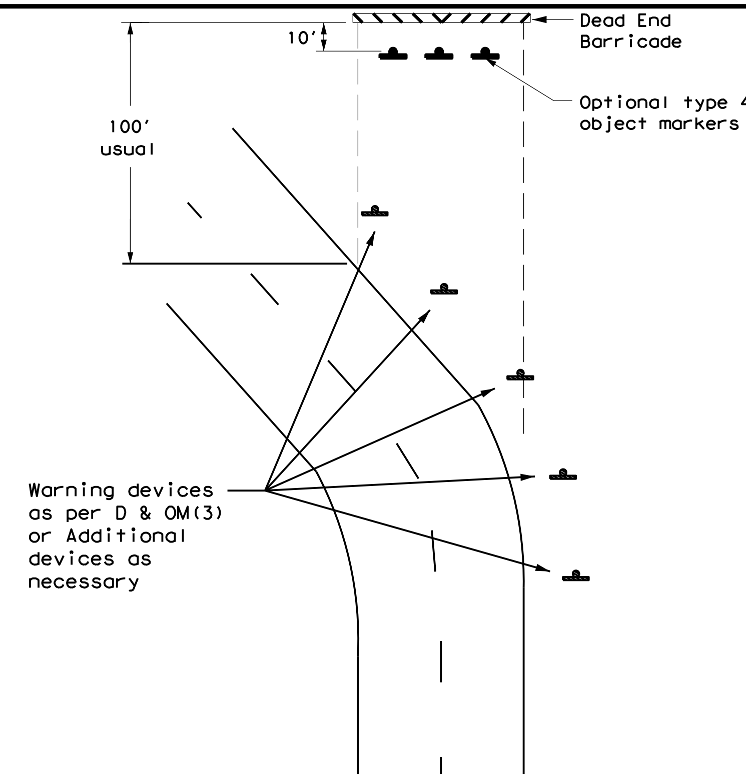
DETAIL 2

FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES



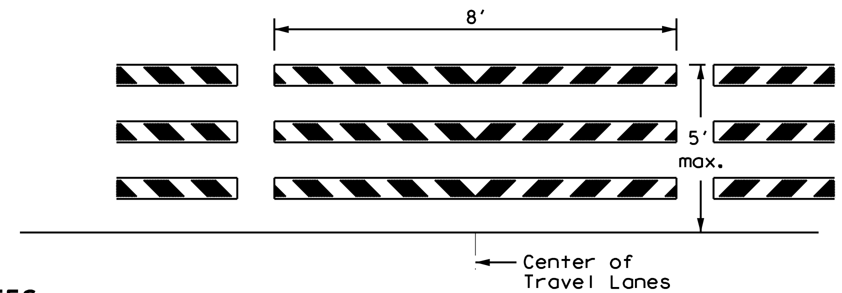
DETAIL 3

TYPICAL APPLICATION OF DEAD END BARRICADE



DETAIL 4

TYPICAL DEAD END BARRICADE INSTALLATION



NOTES

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

DETAIL 5

LEGEND

Symbol	Description
	Bidirectional Delineator
	Delineator
	OM-3
	Barricade
	Sign
	OM-2
	Double Delineator

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

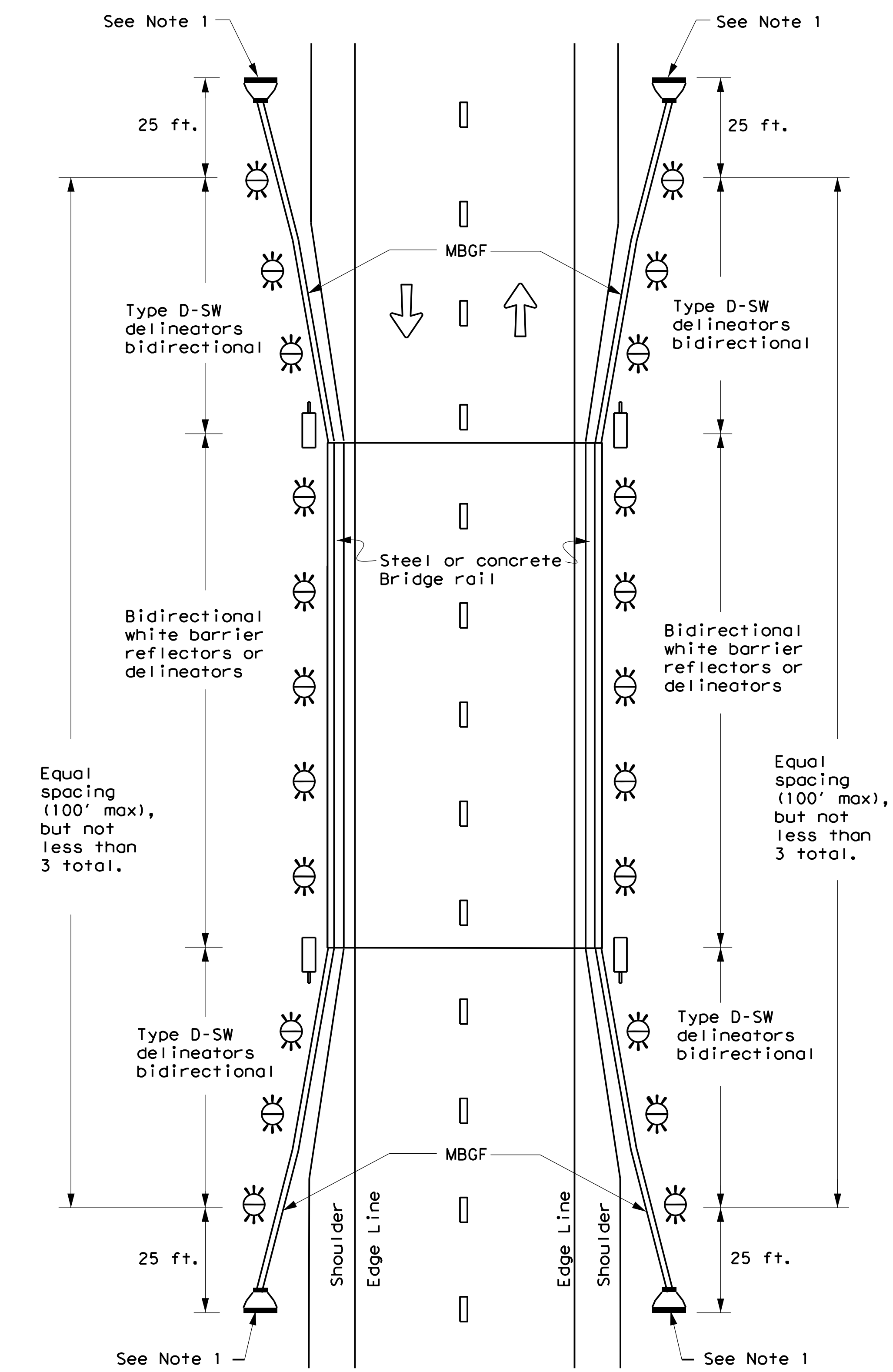
D & OM(4)-20

FILE: dom4-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS 3-15 7-20	1986	01	064	FM1314
	DIST		COUNTY	SHEET NO.
	HOU		MONTGOMERY	196

20D

TWO-WAY, TWO LANE ROADWAY WITH REDUCED WIDTH APPROACH RAIL	TWO-WAY, TWO LANE ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)	TWO-WAY, TWO LANE ROADWAY BRIDGE WITH NO APPROACH RAIL

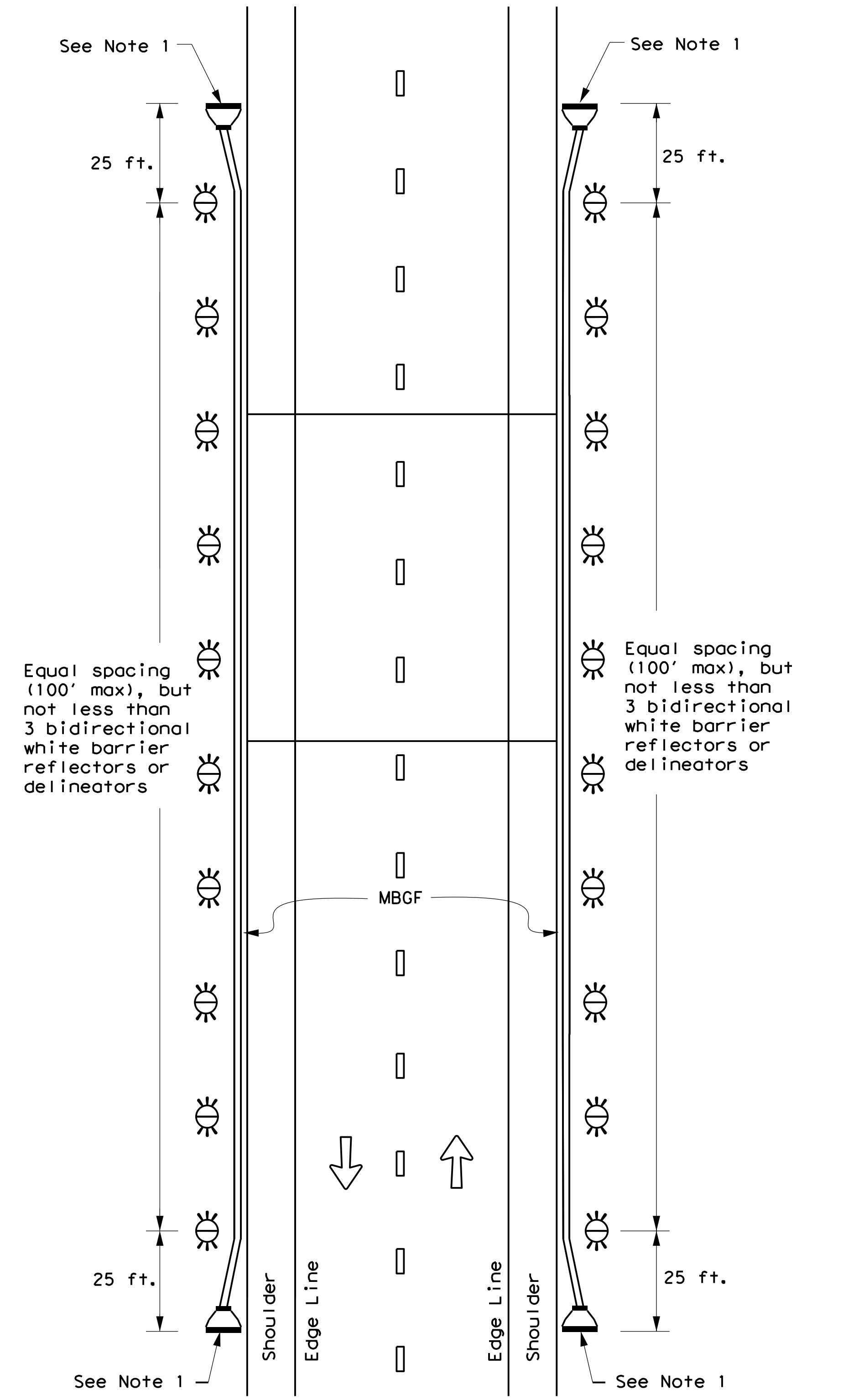
TWO-WAY, TWO LANE ROADWAY WITH REDUCED WIDTH APPROACH RAIL



NOTE:

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

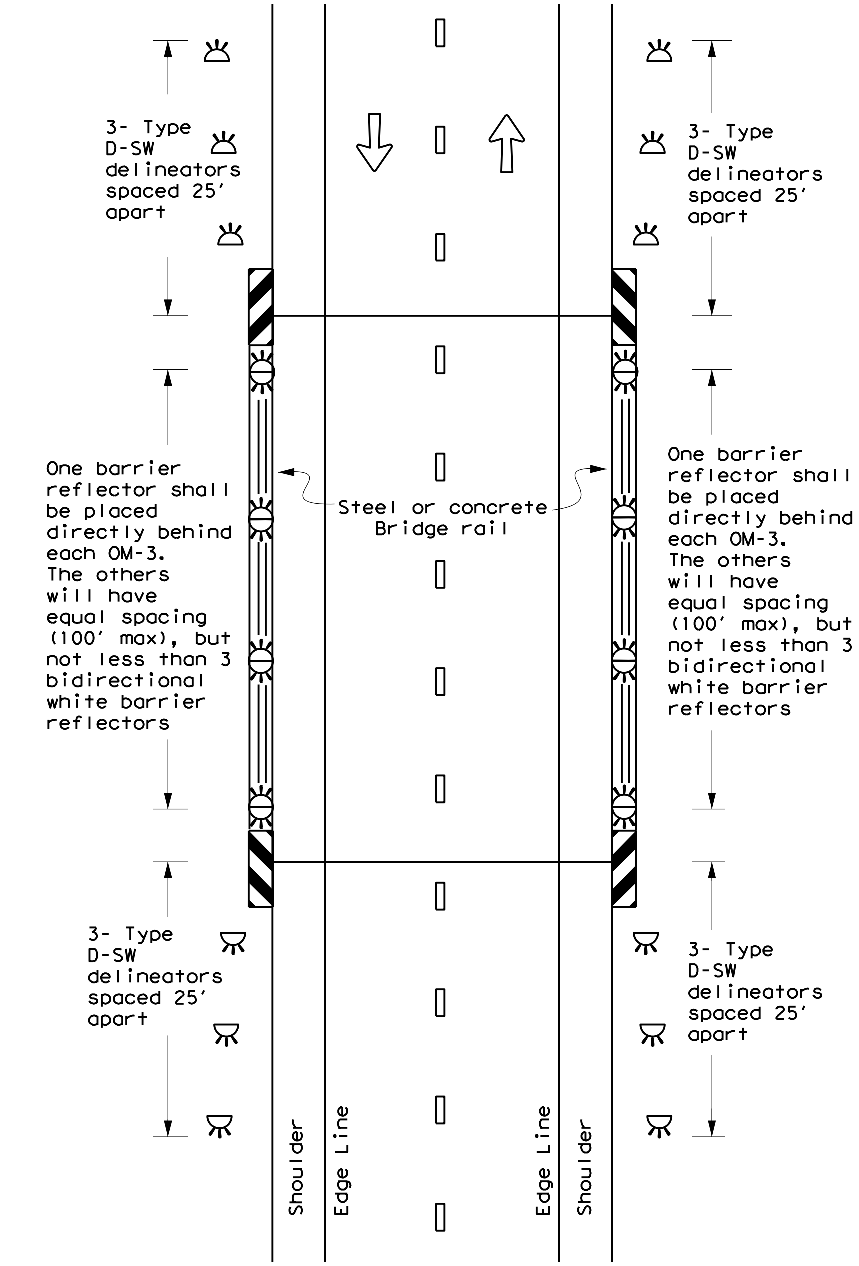
TWO-WAY, TWO LANE ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



NOTE:

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

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



LEGEND

Symbol	Description
	Bidirectional Delineator
	Delineator
	OM-3
	OM-2
	Terminal End
	Traffic Flow

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(5)-20

FILE: dom5-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT

REVISIONS	CONT	SECT	JOB	HIGHWAY
7-20	1986	01	064	FM1314
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		197

20E

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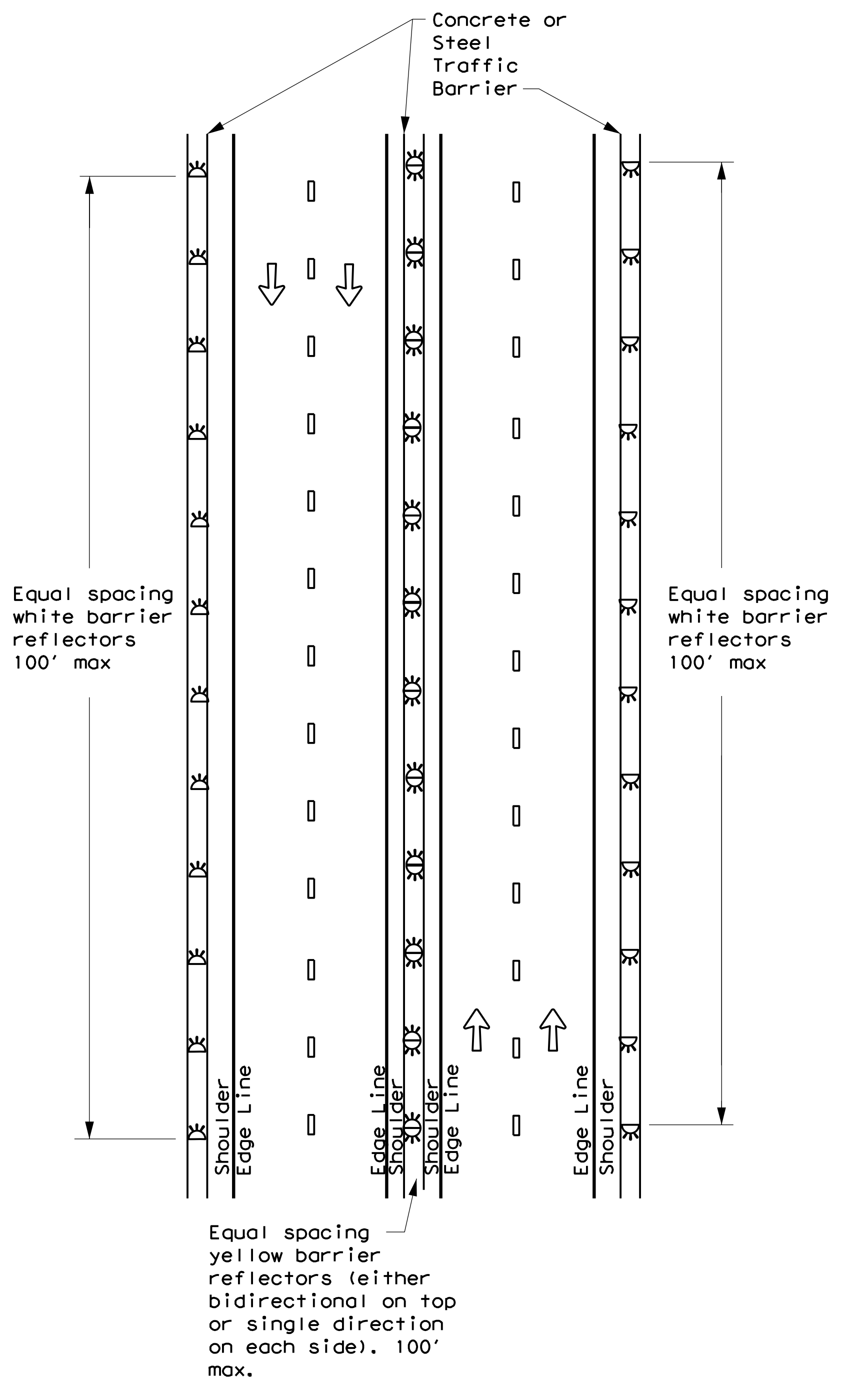
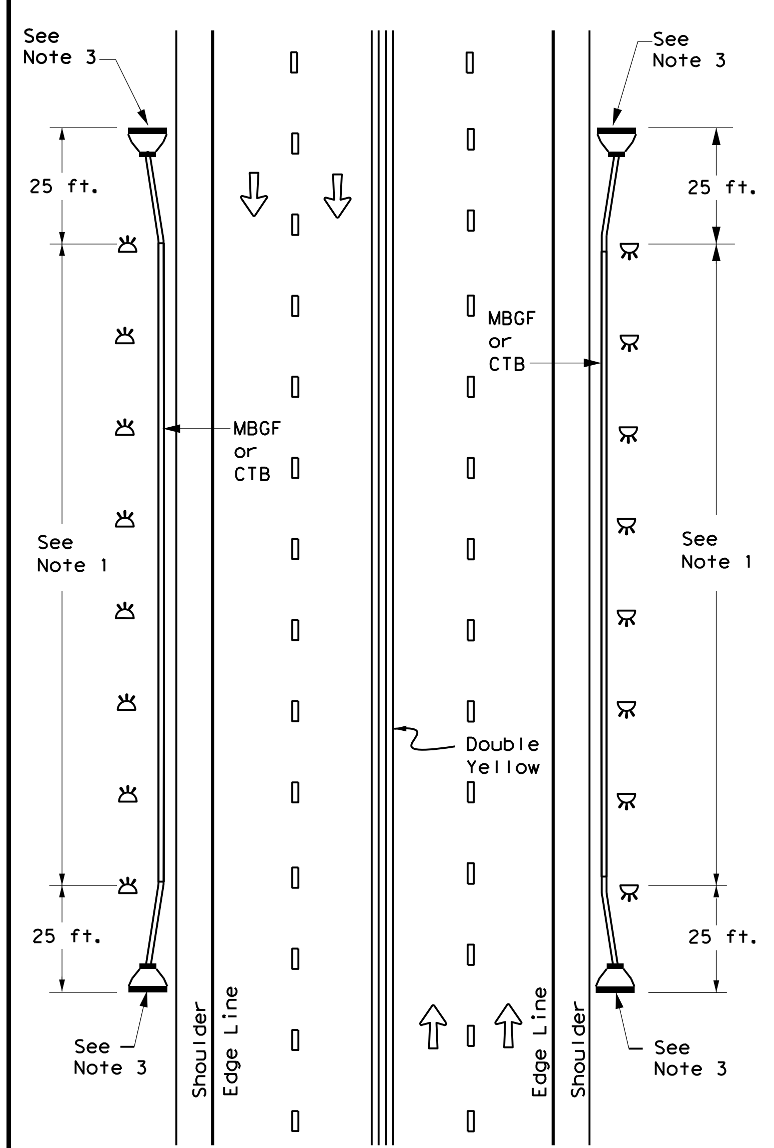
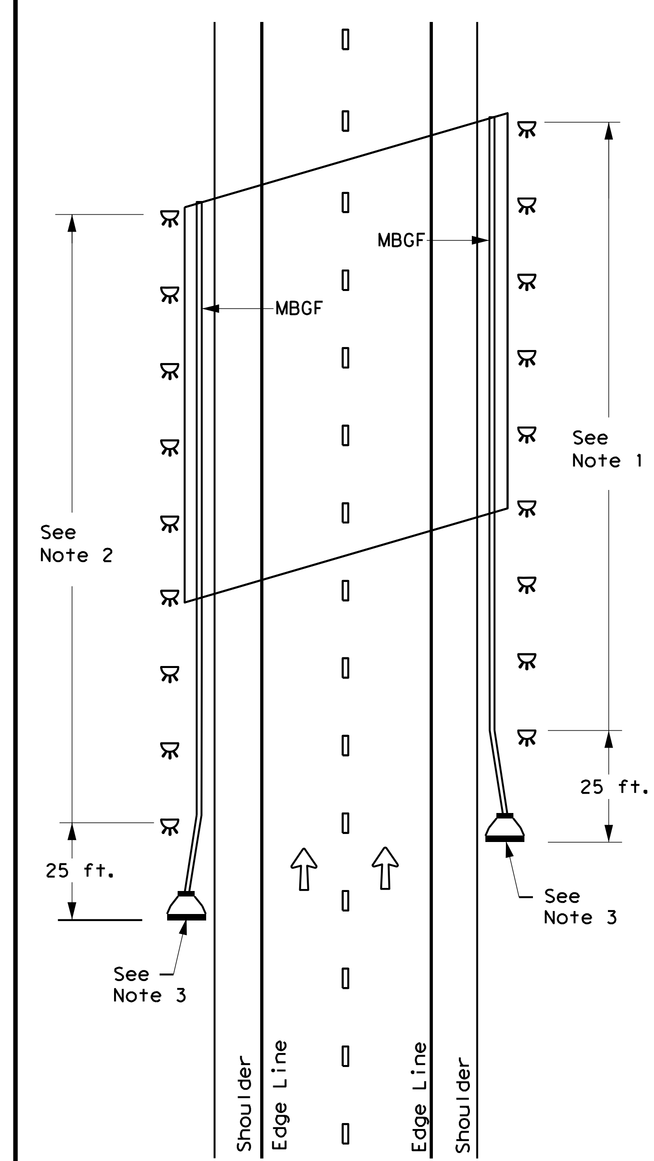
CONTINUOUS CONCRETE OR STEEL BARRIER



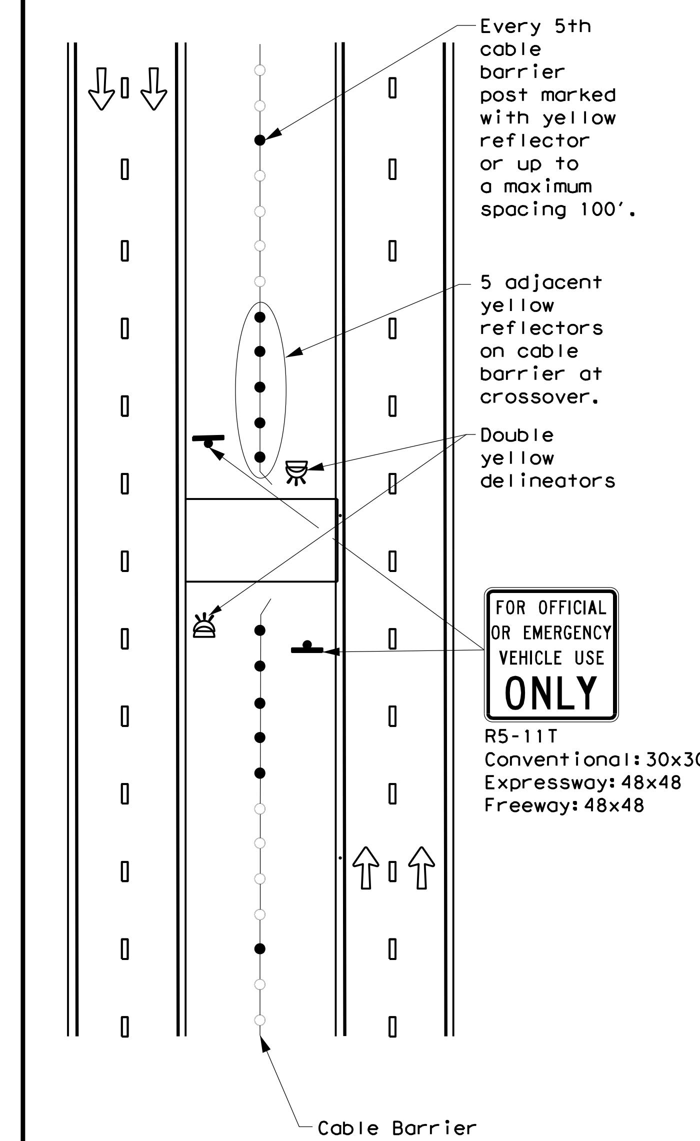
MULTI-LANE UNDIVIDED, TWO-WAY ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



DIVIDED ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



EMERGENCY CROSSOVER



NOTES

1. Equal spacing (100' max), but not less than 3 single directional white barrier reflectors or delineators. On Continuos Barrier, equal spacing (100' max.)

2. Equal spacing (100' max), but not less than 3 single directional yellow barrier reflectors or delineators.

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

LEGEND

	Bidirectional Delineator
	Delineator
	OM-3
	OM-2
	Terminal End
	Traffic Flow

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(6)-20

FILE: dom6-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT August 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	1986	01	064	FM1314
7-20	DIST		COUNTY	SHEET NO.
	HOU		MONTGOMERY	198

20F

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DATE: 01/17/2024 10:44 AM
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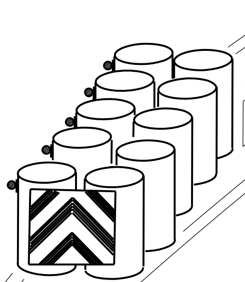
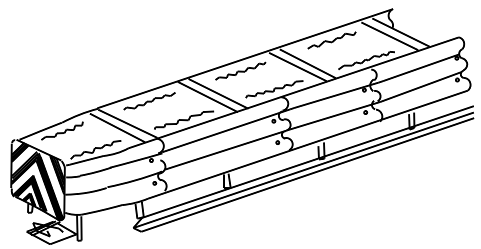
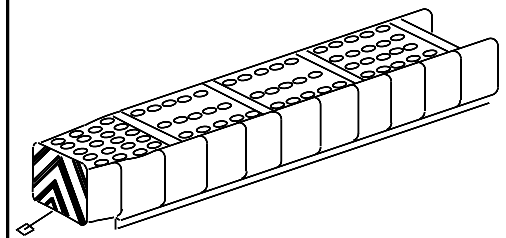
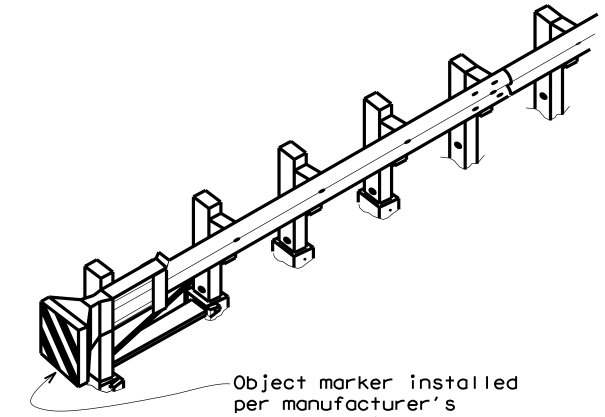
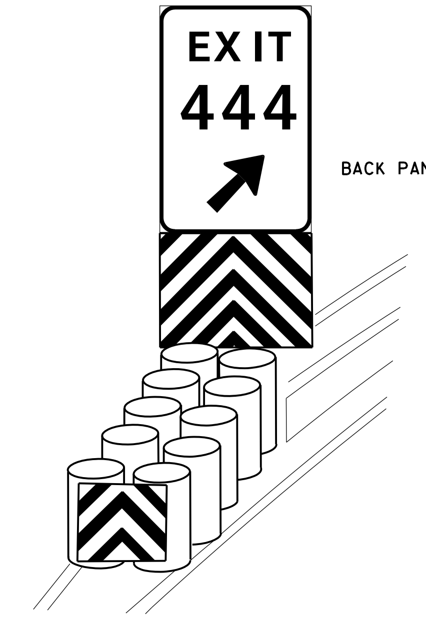
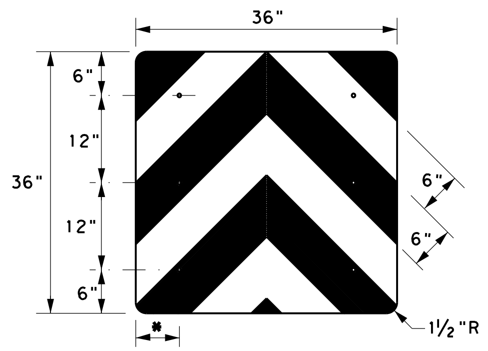


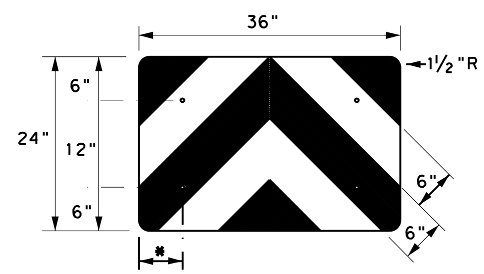




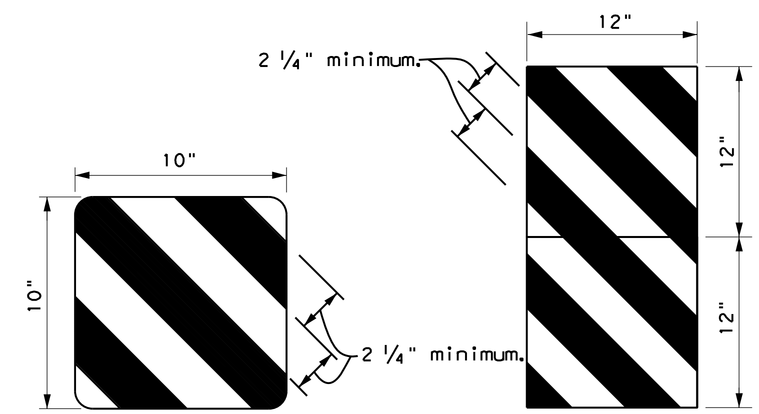




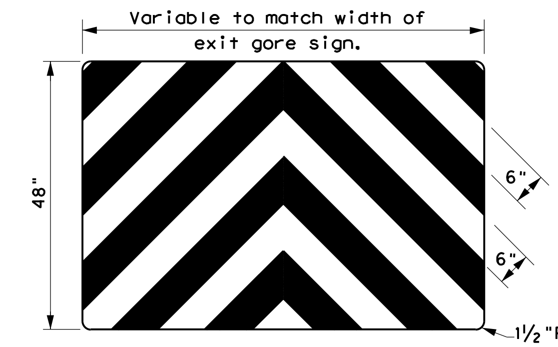


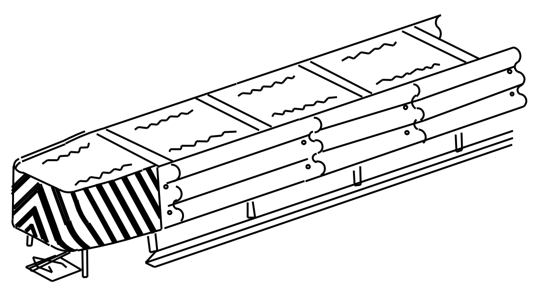


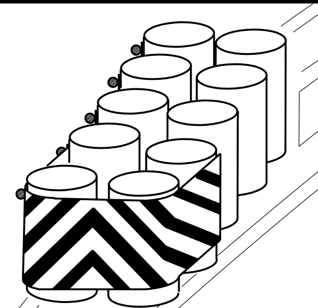
* Adjust to fit attenuator per manufacturer's recommendation, or as directed by the Engineer

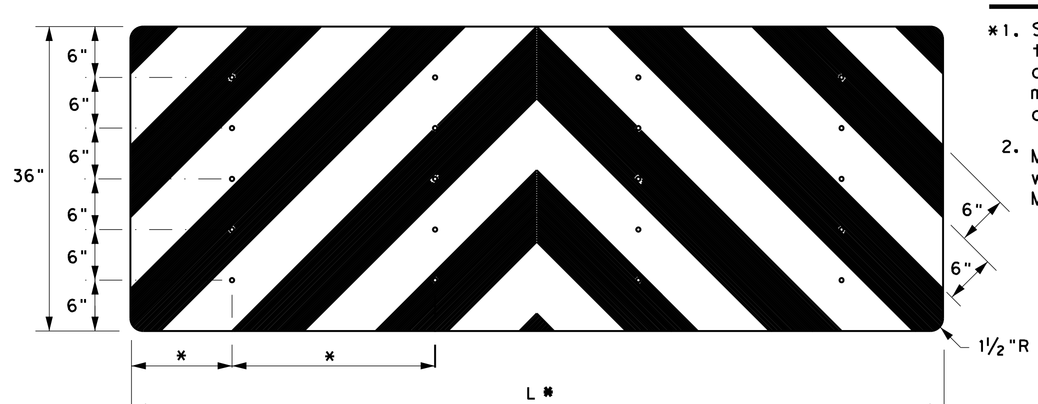


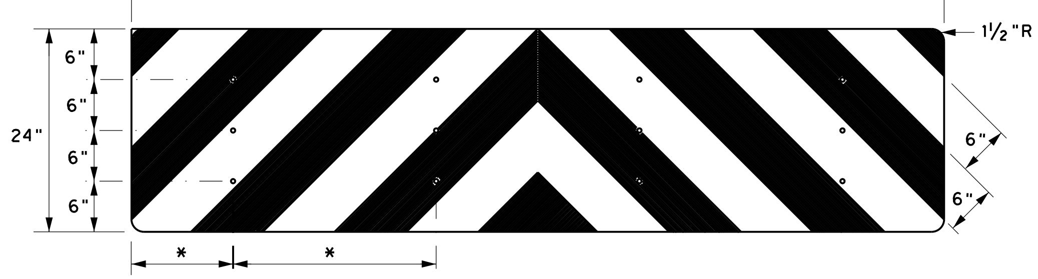
OBJECT MARKERS SMALLER THAN 3 FT²











NOTES

*1. Spacing should be adjusted to attach through centerline of drum, per attenuator manufacturers recommendation, or as directed by the Engineer.

2. Mounting should be flush with top of attenuator. Minimum size 96" x 24".

NOTES

1. Object Markers shall conform to the Texas MUTCD and meet the color and reflectivity requirement of Department Material Specification DMS 8300. Background shall be yellow reflective sheeting (Type B or C) and Chevron shall be black.

2. Object Markers may be fabricated from adhesive backed reflective sheeting applied directly to guardrail end treatment, or applied directly to an "end cap" as per the manufacturer's recommendation. Direct applied sheeting shall provide a smooth surface and have no wrinkles, air bubbles, cuts or tears. A radius at the corners is not required for direct applied sheeting.

3. Object Marker size may be reduced to fit smaller devices. Width of alternating black and yellow stripes are typically 6". Object Markers smaller than 3ft may have reduced width stripes of a minimum of 2 ¼".

4. Pop rivets, screws, or nuts and bolts may be used to attach object markers and reflectors. Holes, slots or other openings may be cut or drilled through object markers to allow cable or other attachments.

5. Object Marker at nose of attenuator is subsidiary to the attenuator.

6. See D & OM (1-4) for required barrier reflectors.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS

D & OM(VIA)-20

FILE: domvia20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT December 1989	CONT	SECT	JOB	HIGHWAY
REVISIONS	1986	01	064	FM1314
4-92 8-04	DIST	COUNTY		SHEET NO.
8-95 3-15 4-98 7-20	HOU	MONTGOMERY		199

20G

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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)

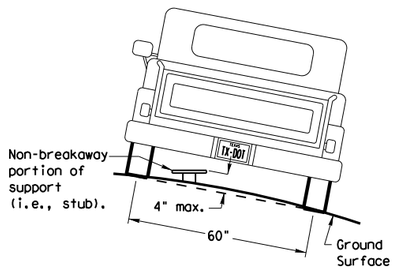
Anchor Type

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))

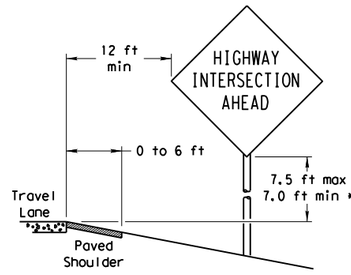
REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



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).

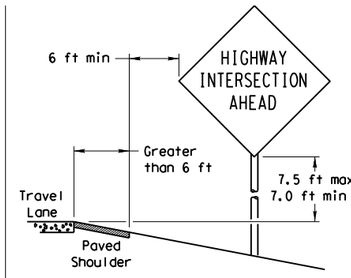
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

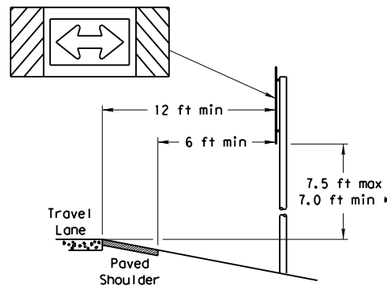
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



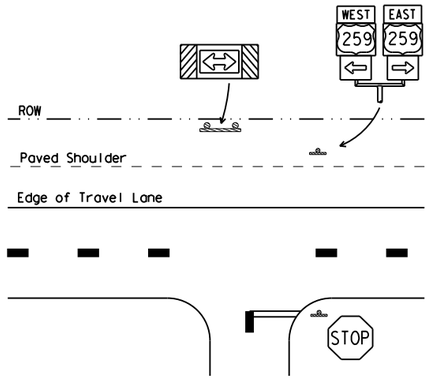
GREATER THAN 6 FT. WIDE

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.

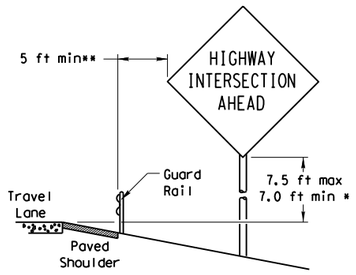
T-INTERSECTION



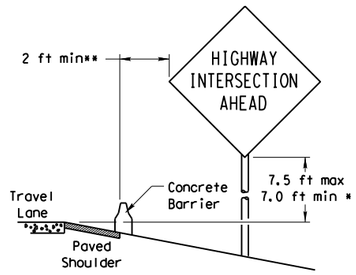
When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.



BEHIND BARRIER



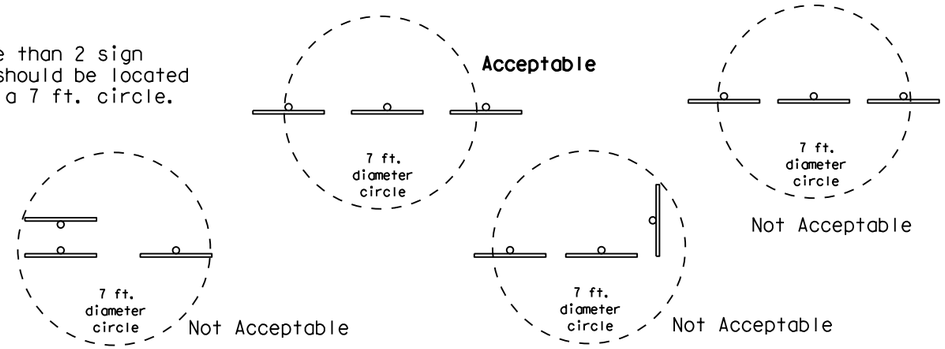
BEHIND GUARDRAIL



BEHIND CONCRETE BARRIER

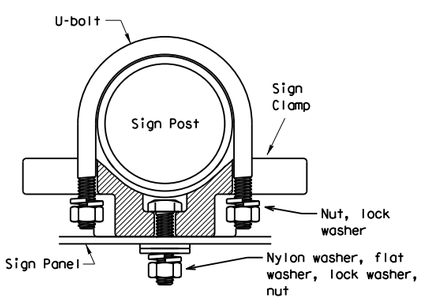
**Sign clearance based on distance required for proper guard rail or concrete barrier performance.

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



TYPICAL SIGN ATTACHMENT DETAIL

Single Signs

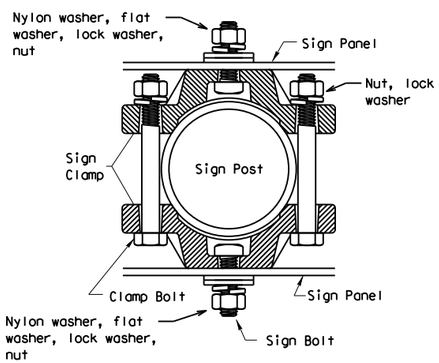


Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

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.

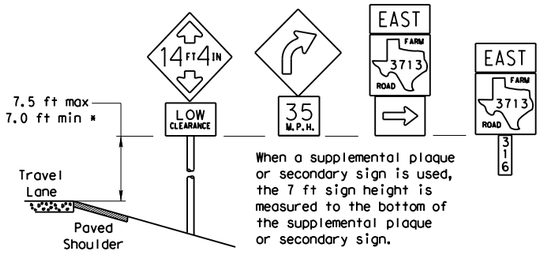
Sign clamps may be either the specific size clamp or the universal clamp.

Back-to-Back Signs



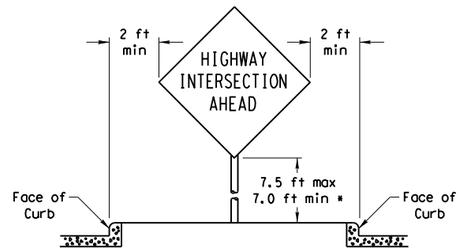
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



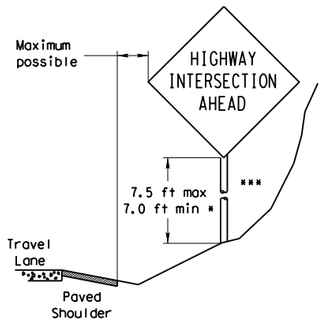
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

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.

* 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

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

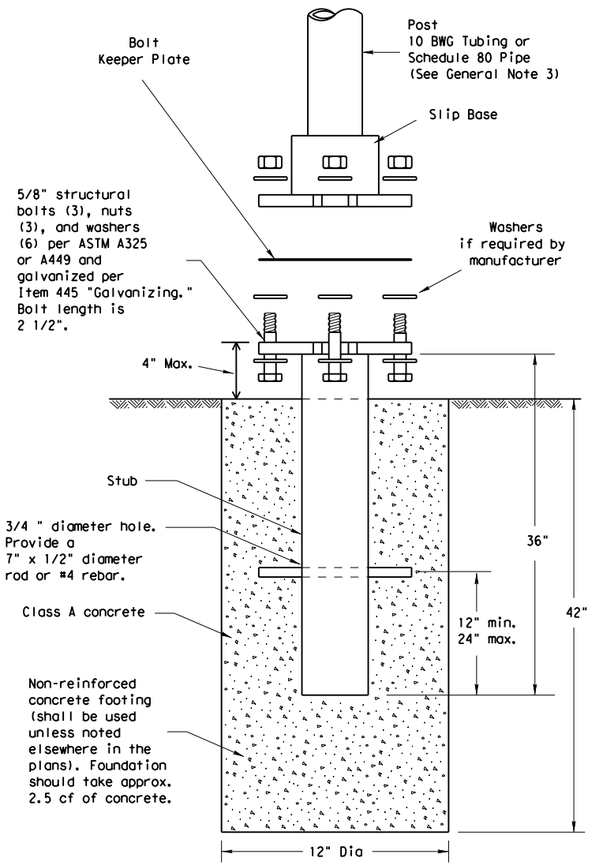
SMD(GEN)-08

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

REVISIONS	CONT	SECT	JOB	HIGHWAY
9-08	1986	01	064	FM1314
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		200

DATE:
FILE:

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.

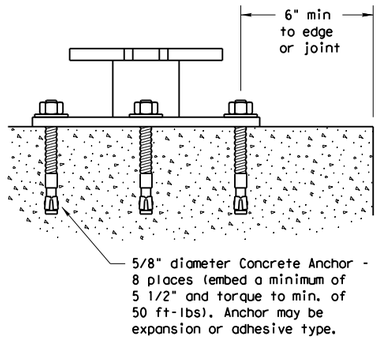
   Schedule 80 Pipe (2.875" outside diameter)
   - 0.276" nominal wall thickness
   - Steel tubing per ASTM A500 Gr C
   - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
     - 46,000 PSI minimum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

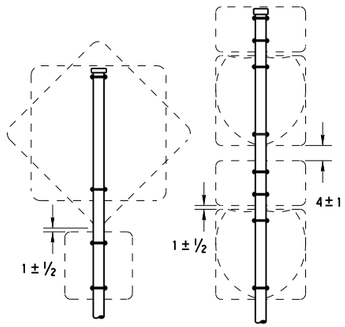
SMD(SLIP-1)-08

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

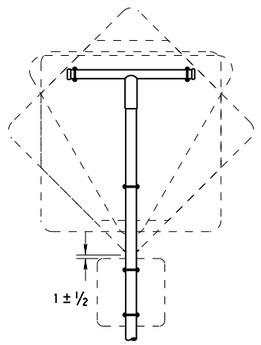
REVISIONS
9-08

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		201

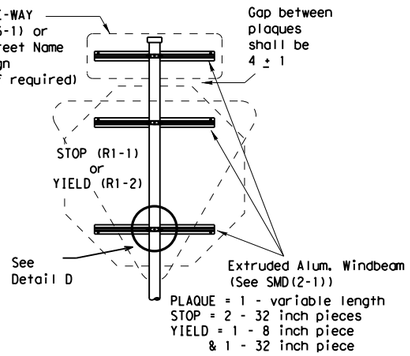
DATE:
FILE:



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

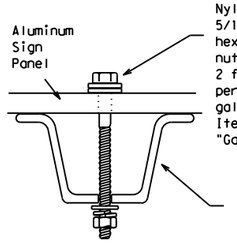


SM RD SGN ASSM TY XXXXX(1)XX(T)



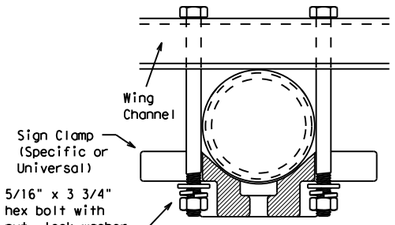
PLAQUE = 1 - variable length
STOP = 2 - 32 inch pieces
YIELD = 1 - 8 inch piece
& 1 - 32 inch piece

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



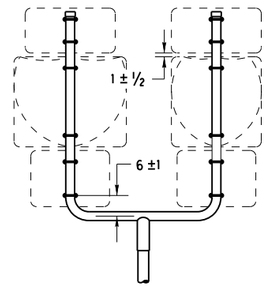
Top View

Detail A



Top View

Detail B



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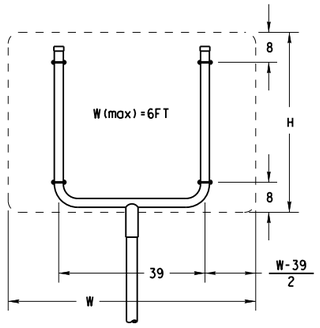
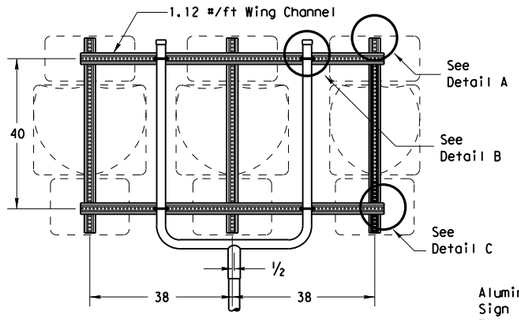
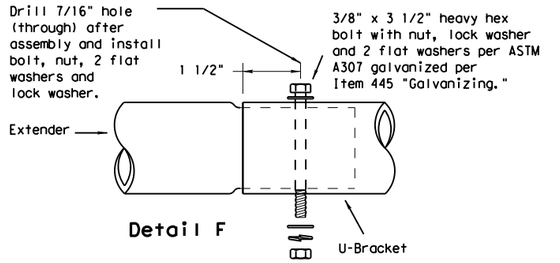


SM RD SGN ASSM TY XXXXX(1)XX(U)

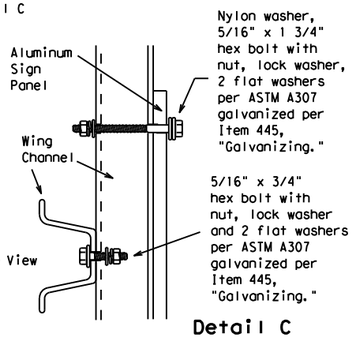


SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)

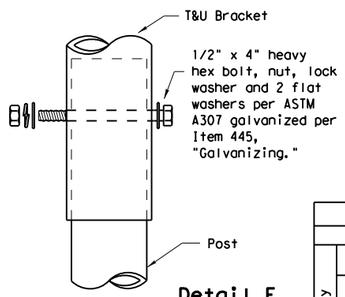


Detail F

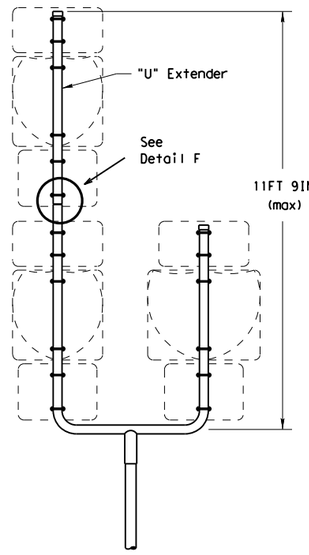
Splices shall only be allowed behind the sign substrate.



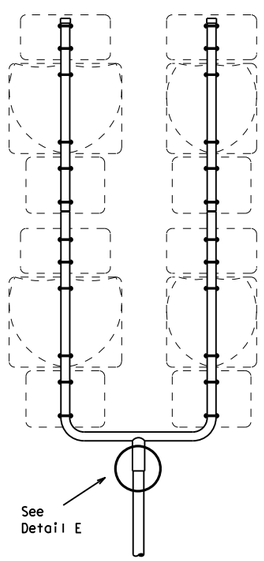
Detail C



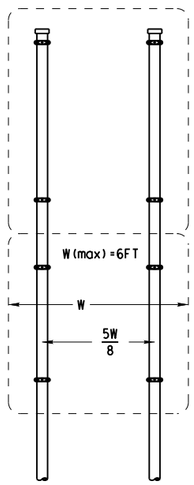
Detail E



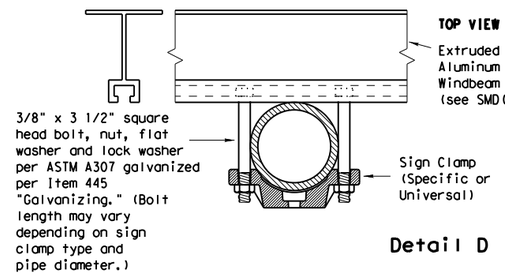
SM RD SGN ASSM TY S80(1)XX(U-1EXT)



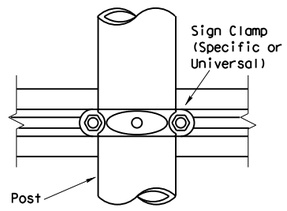
SM RD SGN ASSM TY S80(1)XX(U-2EXT)

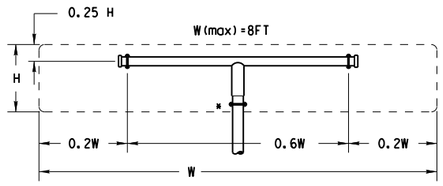


SM RD SGN ASSYM TY XXXXX(2)XX(P)



Detail D

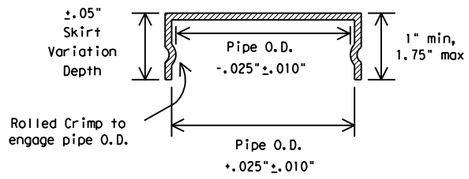




All dimensions are in english unless detailed otherwise.

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

FRICTION CAP DETAIL



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

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

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

GENERAL NOTES:

1.

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

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

REQUIRED SUPPORT

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

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-2)-08

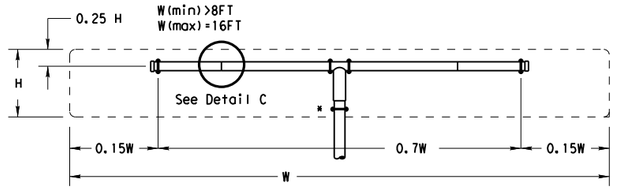
DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		202

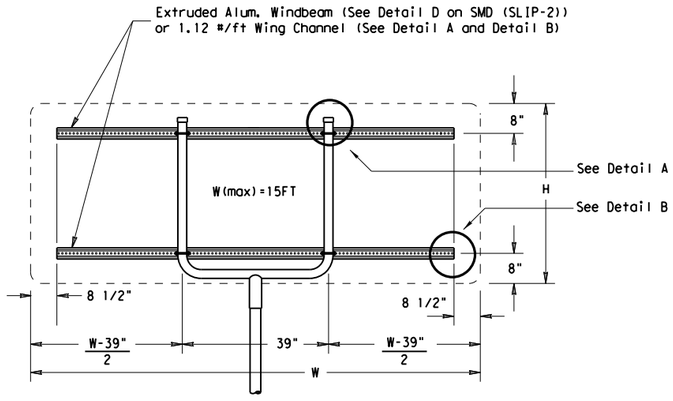
9-08 REVISIONS

DATE:
FILE:

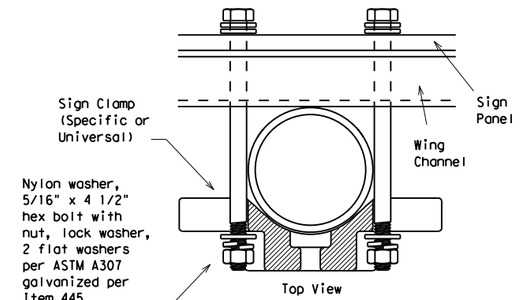
DATE:
FILE:



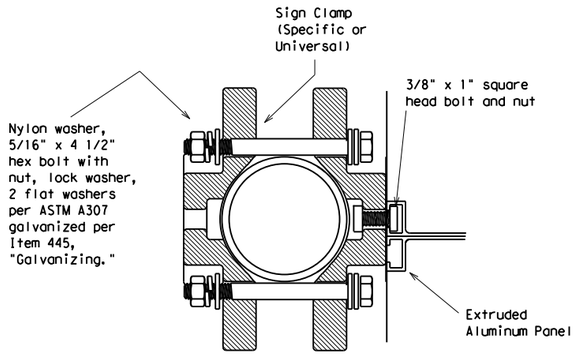
SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)
(* - See Note 12)



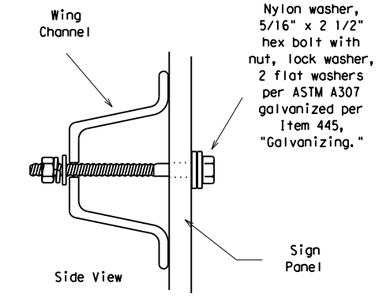
SM RD SGN ASSM TY XXXXX(1)XX(U-XX)



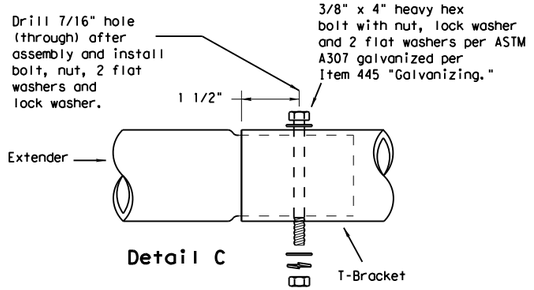
Detail A



Detail D
EXTRUDED ALUMINUM SIGN WITH T BRACKET

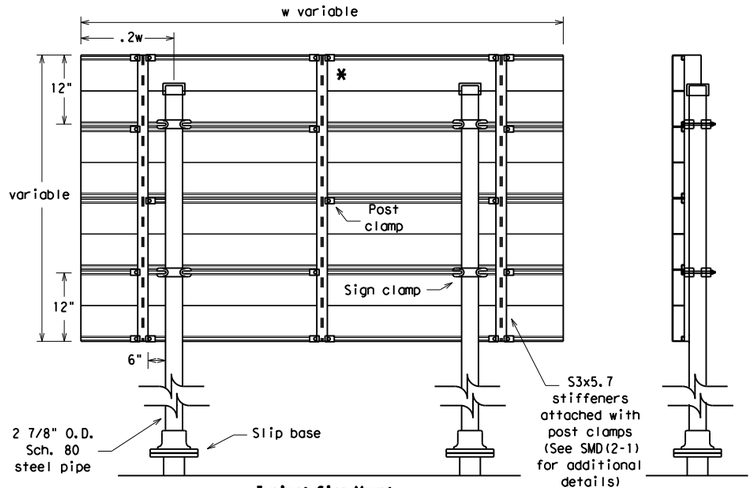


Detail B



Detail C

Splices shall only be allowed behind the sign substrate.

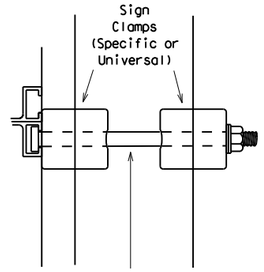


Typical Sign Mount

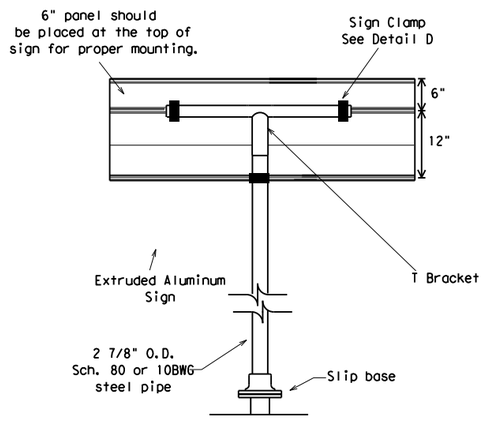
SM RD SGN ASSM TY S80(2)XX(P-EXAL)

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

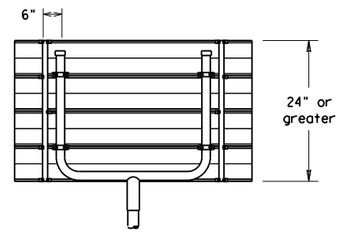
See Detail E
for clamp installation



Detail E



Extruded Aluminum Sign
With T Bracket



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

See Detail E
for clamp installation

GENERAL NOTES:

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

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

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

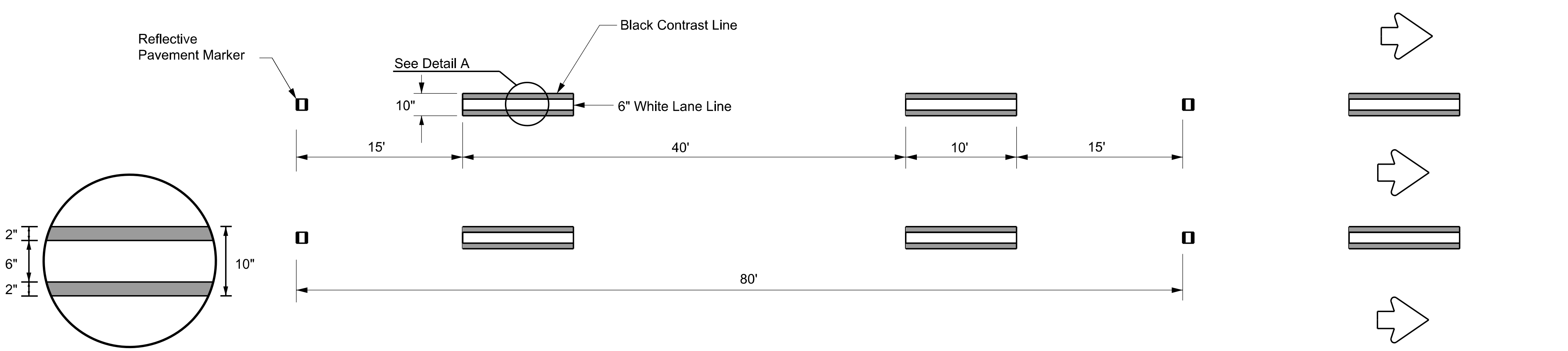
Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
TRIANGULAR SLIPBASE SYSTEM

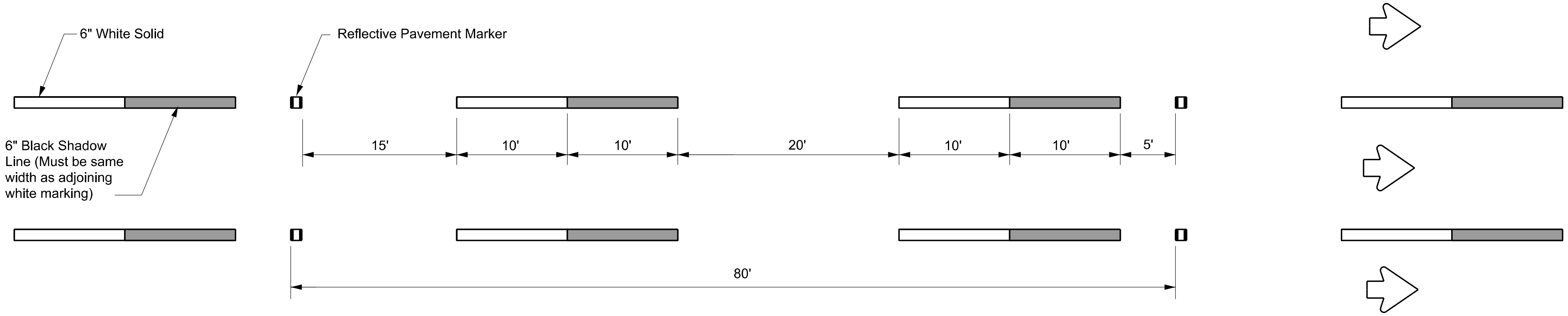
SMD(SLIP-3)-08

REVISIONS
9-08

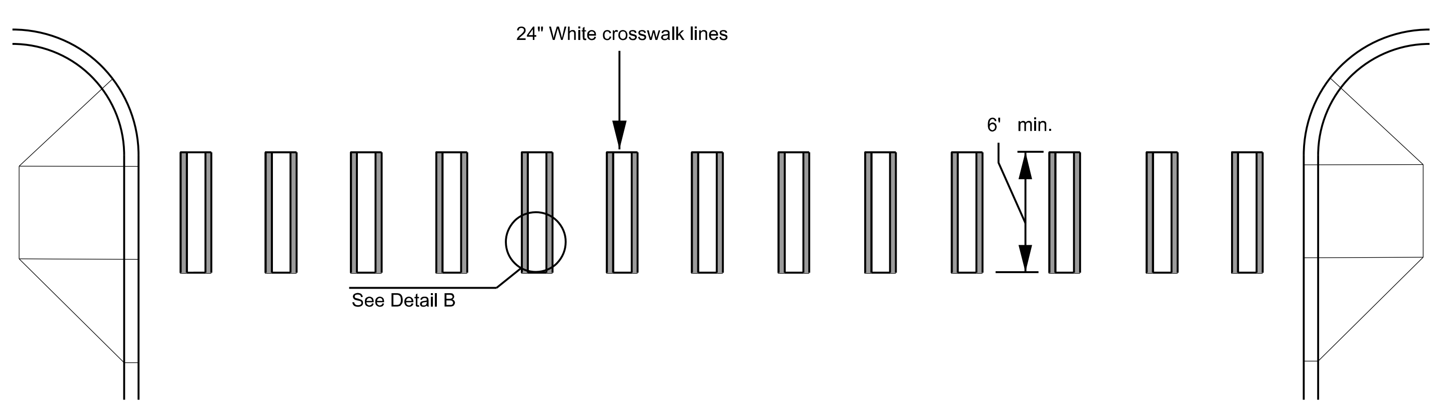
DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		203

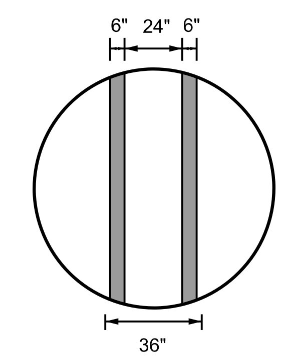


CONTRAST LANE LINE DESIGN



SHADOW LANE LINE DESIGN





DETAIL "B"

(See PM(4) for crosswalk line placement details)

CONTRAST CROSSWALK DESIGN

GENERAL NOTES

1. Contrast and Shadow markings may only be used on concrete pavements.
2. Contrast and Shadow markings shall not be used on edge lines.
3. Contrast lane lines shall be permanent prefabricated pavement markings meeting DMS 8240.
4. Shadow lane line designs shall be a liquid markings system approved by TxDOT.
5. All raised reflective pavement markers placed in broken lines shall be placed in line with and midway between the white stripes.
6. See PM(2) for raised reflective pavement markings installation details.

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.

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Texas Department of Transportation

Traffic Safety Division Standard

CONTRAST AND SHADOW PAVEMENT MARKINGS

CPM(1)-23

FILE: CPM(1)-23.dgn	DN:	CK:	DW:	CK:
© TxDOT February 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS	1986	01	064	FM1314
5-14 2-23	DIST		COUNTY	SHEET NO.
	HOU		MONTGOMERY	204

22N

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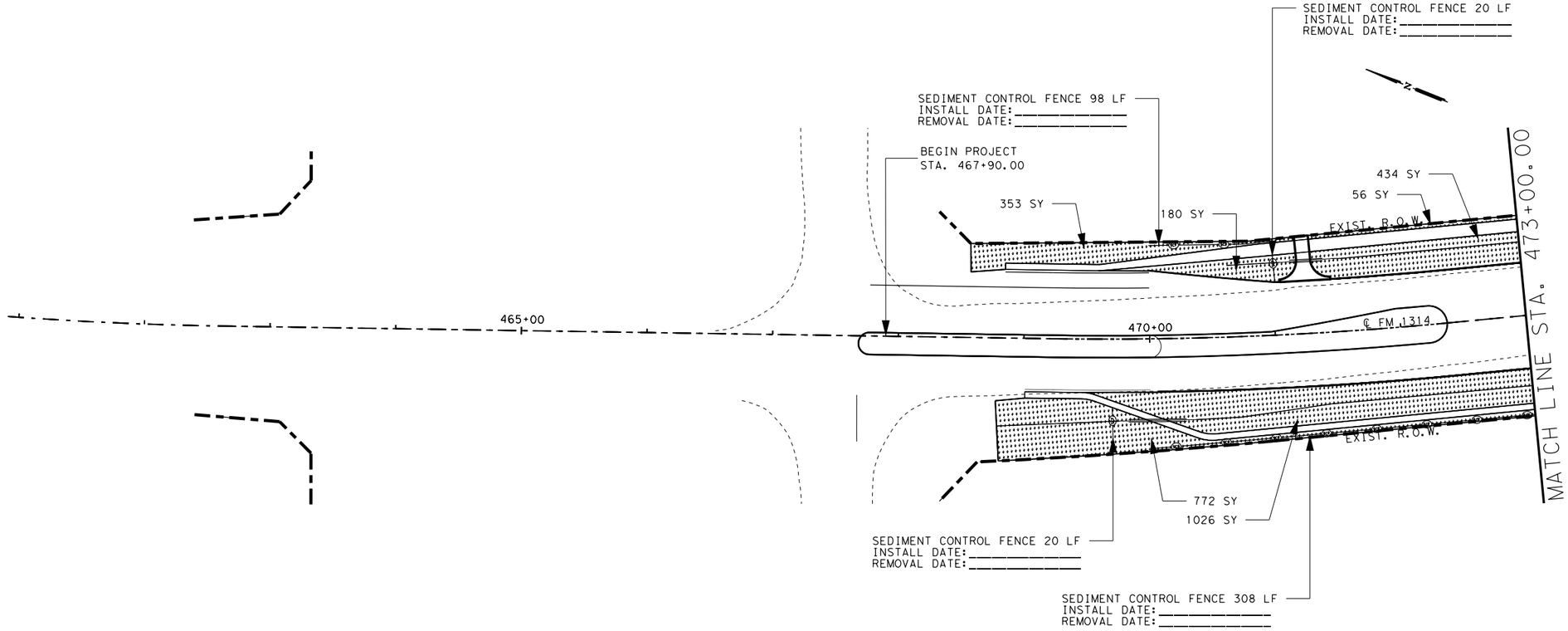
LEGEND

- EXISTING ROADWAY/DRIVEWAY
- EXISTING ROW
- PROPOSED ROADWAY/DRIVEWAY
- SCF — SEDIMENT CONTROL FENCE (SCF)
- BLOCK SOD
- ROCK FILTER DAM
- CONSTRUCTION ENTRANCE



STATE OF TEXAS
MICAH J. SCHLUTER
136908
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PROFESSIONAL ENGINEER

03.14.24

FM 1314
SWP3
LAYOUT

SHEET 1 OF 10

0 50 100
SCALE IN FEET

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		205

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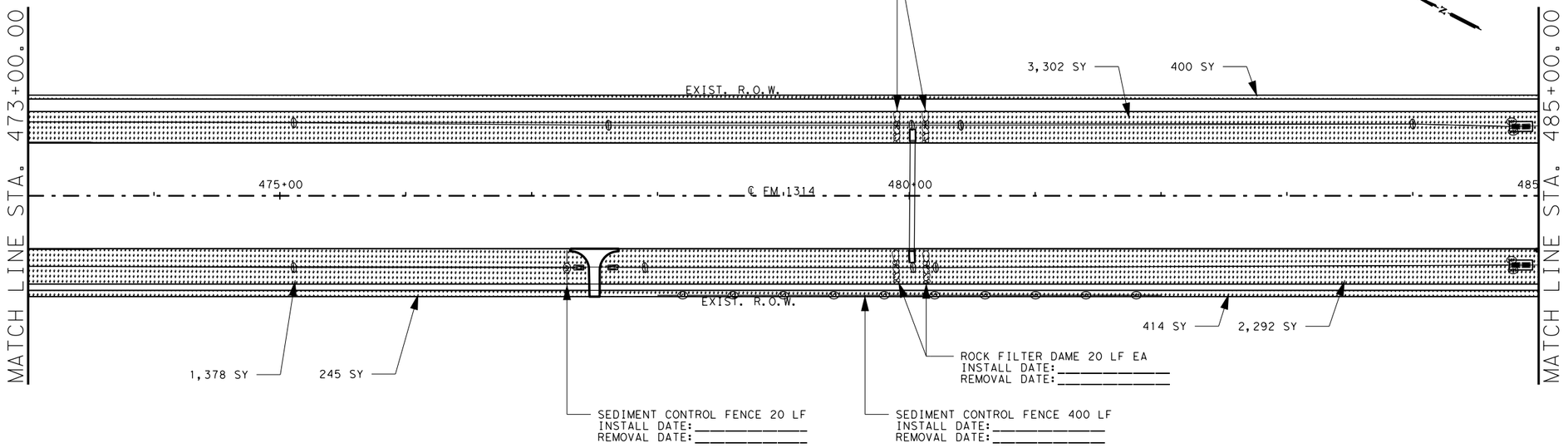
LEGEND

- EXISTING ROADWAY/DRIVEWAY
- EXISTING ROW
- PROPOSED ROADWAY/DRIVEWAY
- SCF — SEDIMENT CONTROL FENCE (SCF)
- BLOCK SOD
- ROCK FILTER DAM
- CONSTRUCTION ENTRANCE



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FM 1314
SWP3
LAYOUT

SHEET 2 OF 10

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Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		206

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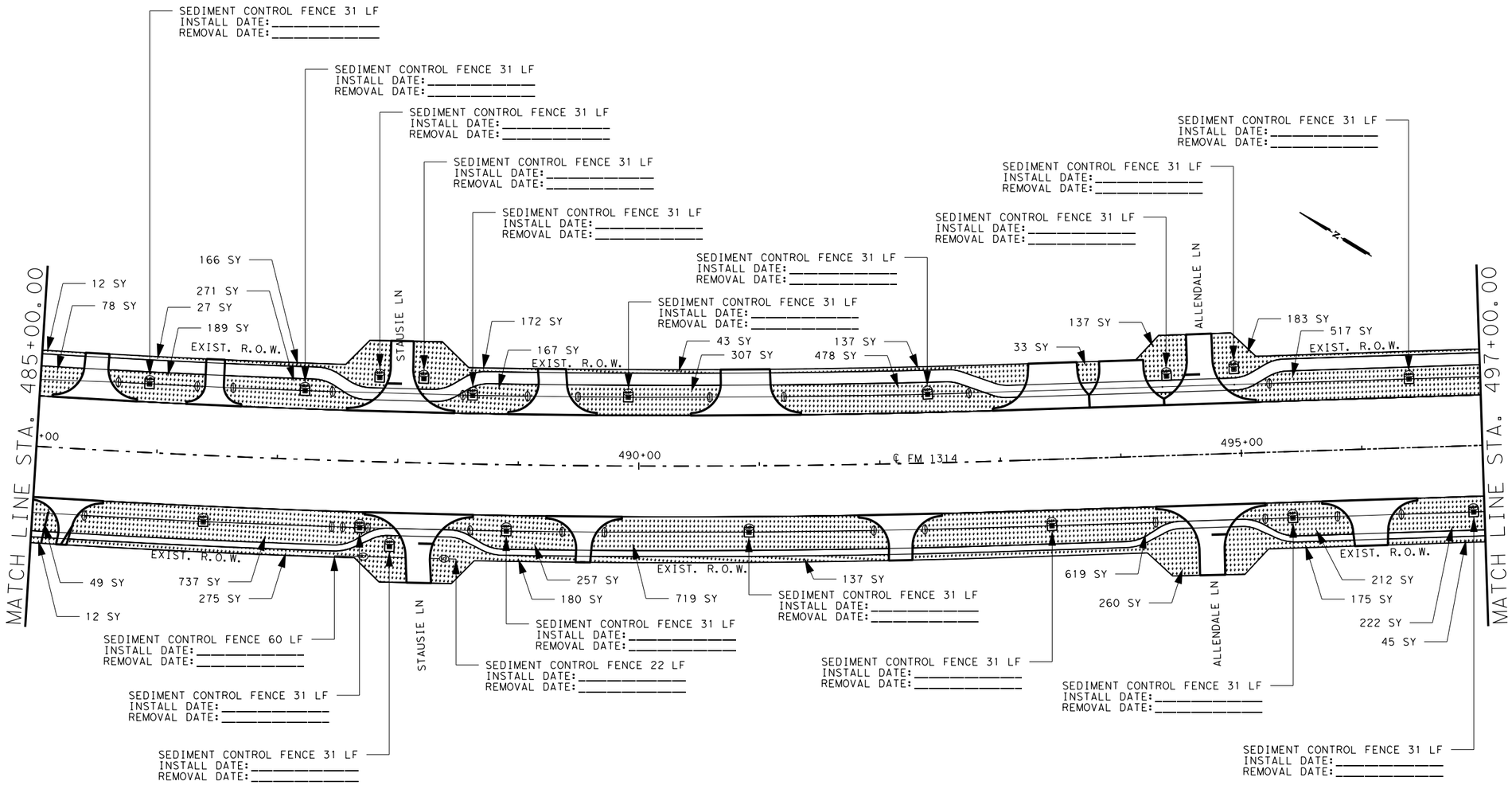
LEGEND

- EXISTING ROADWAY/DRIVEWAY
- EXISTING ROW
- PROPOSED ROADWAY/DRIVEWAY
- SCF — SEDIMENT CONTROL FENCE (SCF)
- BLOCK SOD
- ROCK FILTER DAM
- CONSTRUCTION ENTRANCE



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SWP3
LAYOUT

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		207

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LEGEND

- EXISTING ROADWAY/DRIVEWAY
- EXISTING ROW
- PROPOSED ROADWAY/DRIVEWAY
- SCF — SEDIMENT CONTROL FENCE (SCF)
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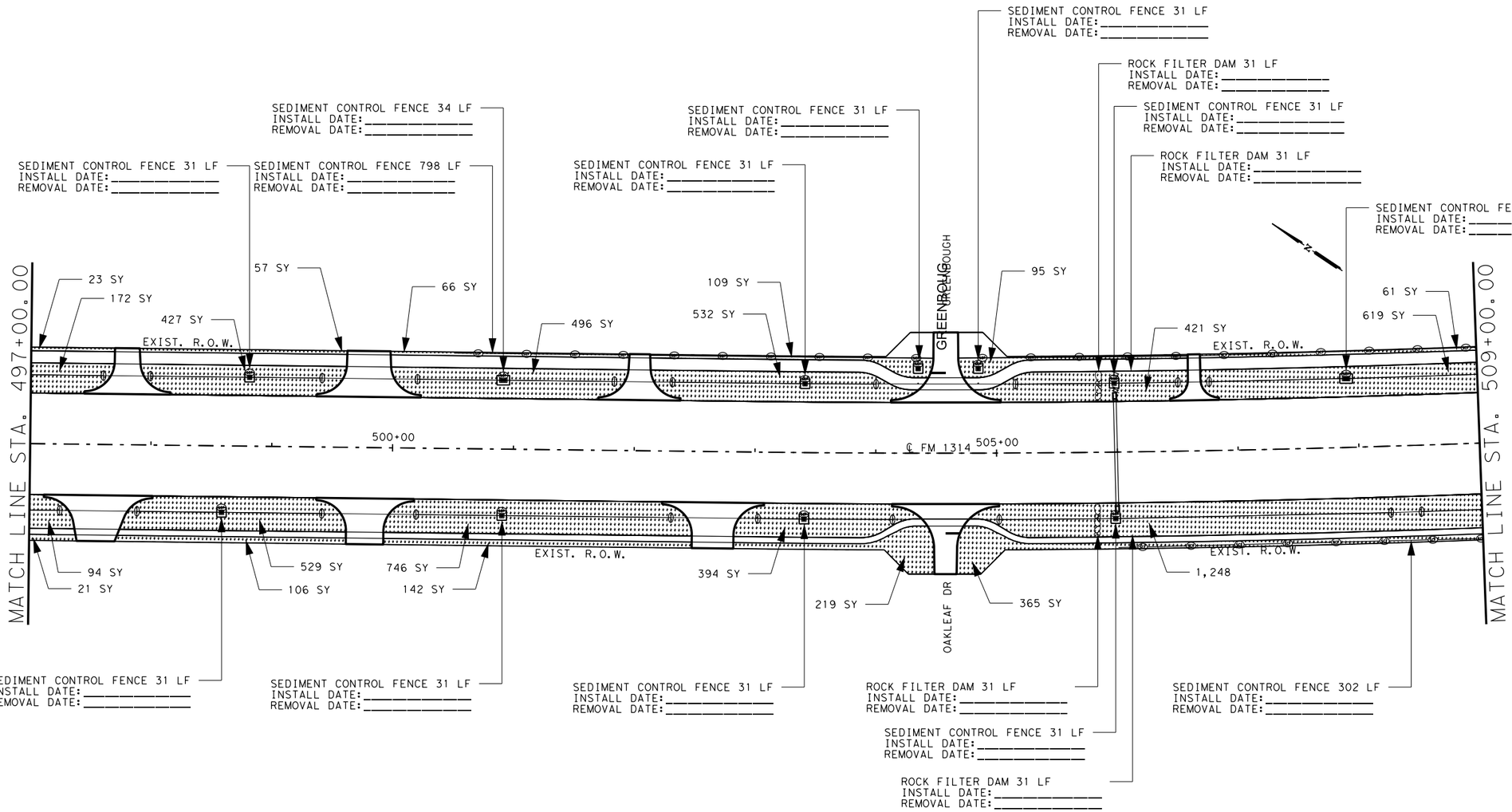

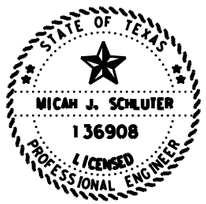

03.14.24
FM 1314
SWP3
LAYOUT

SHEET 4 OF 10

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		208

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SCALE IN FEET

DATE:
FILE:

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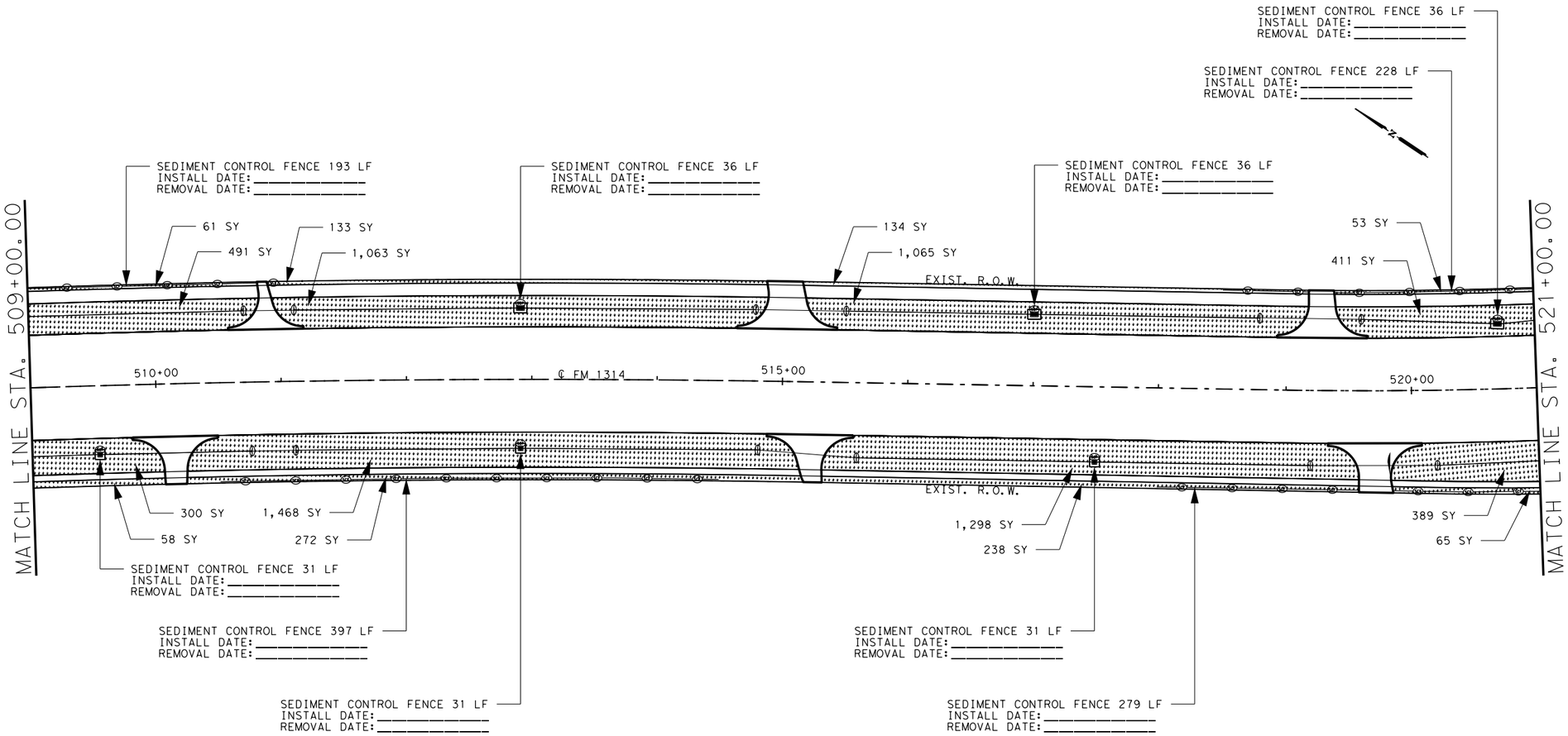
LEGEND

- EXISTING ROADWAY/DRIVEWAY
- EXISTING ROW
- PROPOSED ROADWAY/DRIVEWAY
- SCF — SEDIMENT CONTROL FENCE (SCF)
- BLOCK SOD
- ROCK FILTER DAM
- CONSTRUCTION ENTRANCE



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FM 1314
SWP3
LAYOUT

SHEET 5 OF 10

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SCALE IN FEET

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Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		209

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LEGEND

- EXISTING ROADWAY/DRIVEWAY
- EXISTING ROW
- PROPOSED ROADWAY/DRIVEWAY
- SCF — SEDIMENT CONTROL FENCE (SCF)
- BLOCK SOD
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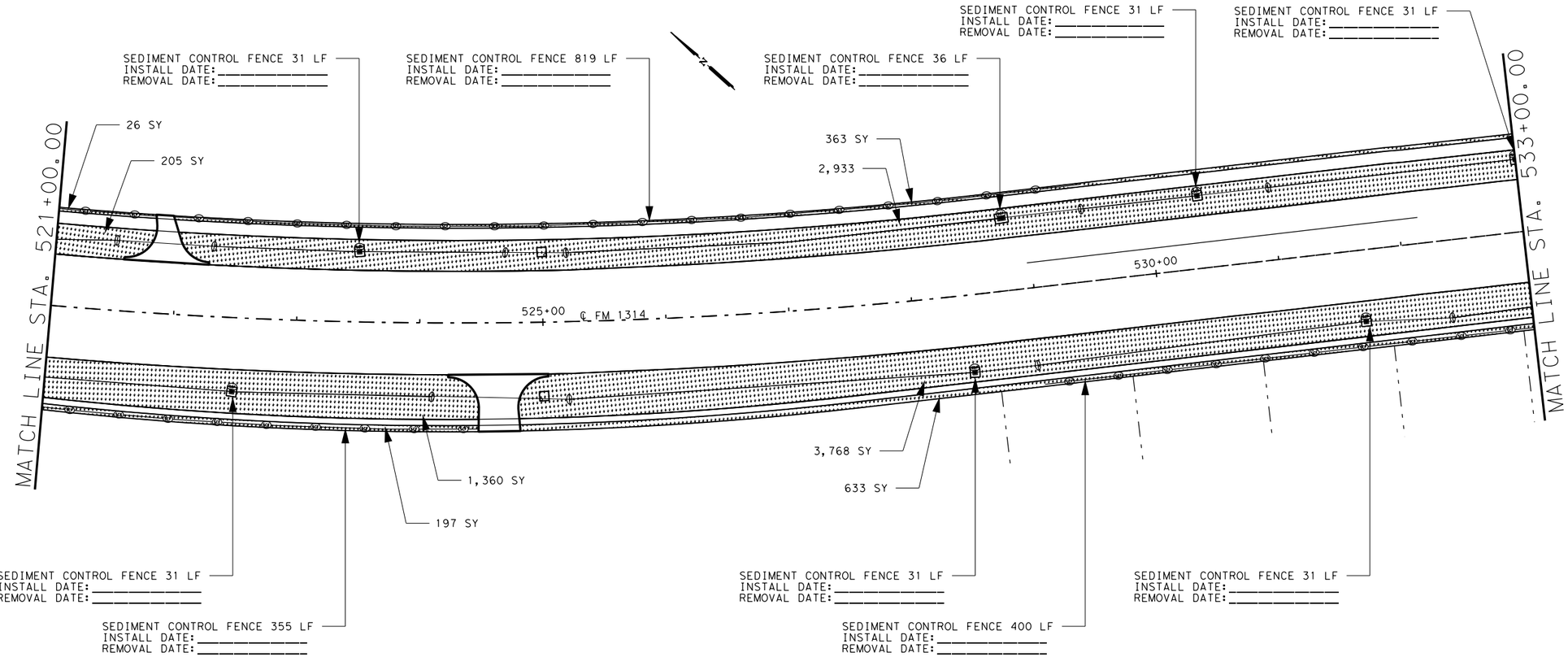

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FM 1314
SWP3
LAYOUT

SHEET 6 OF 10

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SCALE IN FEET

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		210

DATE:
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LEGEND

- EXISTING ROADWAY/DRIVEWAY
- EXISTING ROW
- PROPOSED ROADWAY/DRIVEWAY
- SCF — SEDIMENT CONTROL FENCE (SCF)
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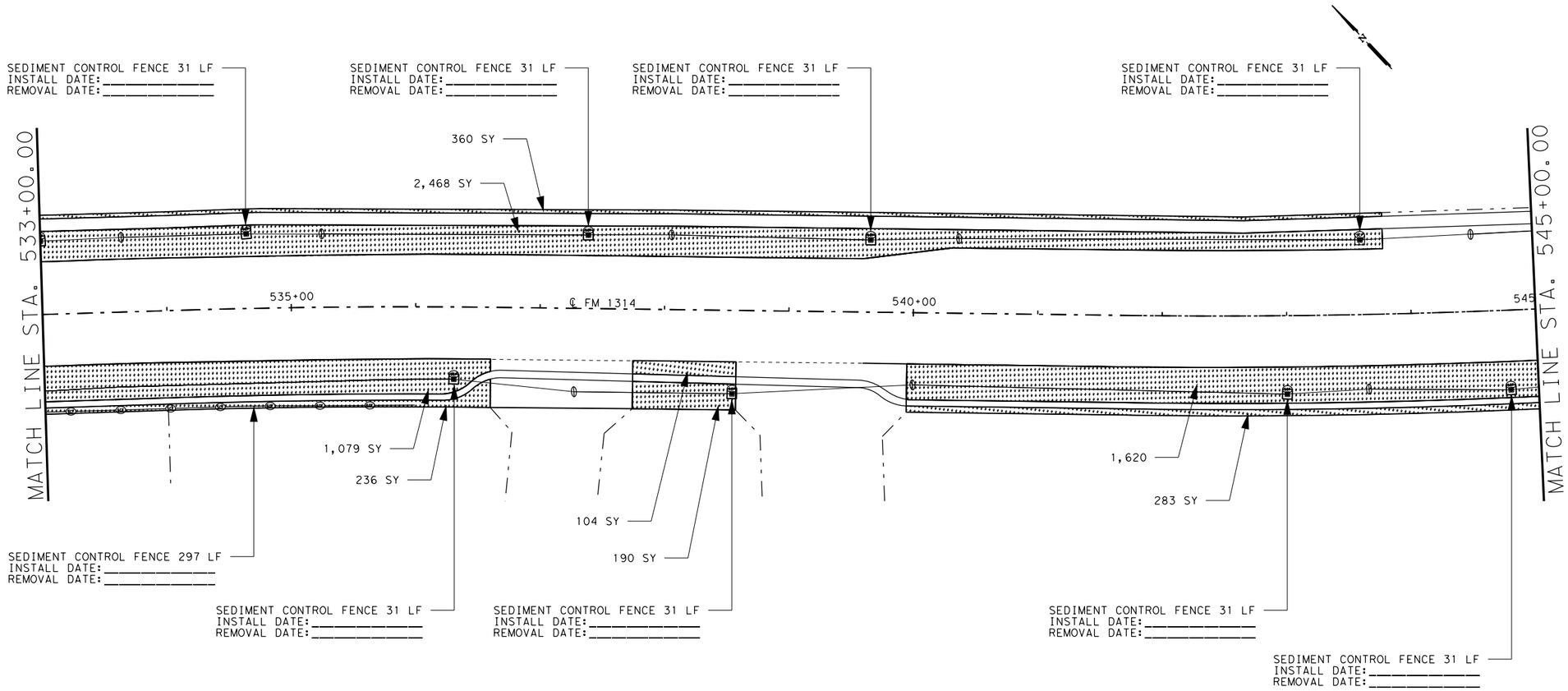

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FM 1314
SWP3
LAYOUT

SHEET 7 OF 10

0 50 100
SCALE IN FEET

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		211

DATE:
FILE:

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LEGEND

- EXISTING ROADWAY/DRIVEWAY
- EXISTING ROW
- PROPOSED ROADWAY/DRIVEWAY
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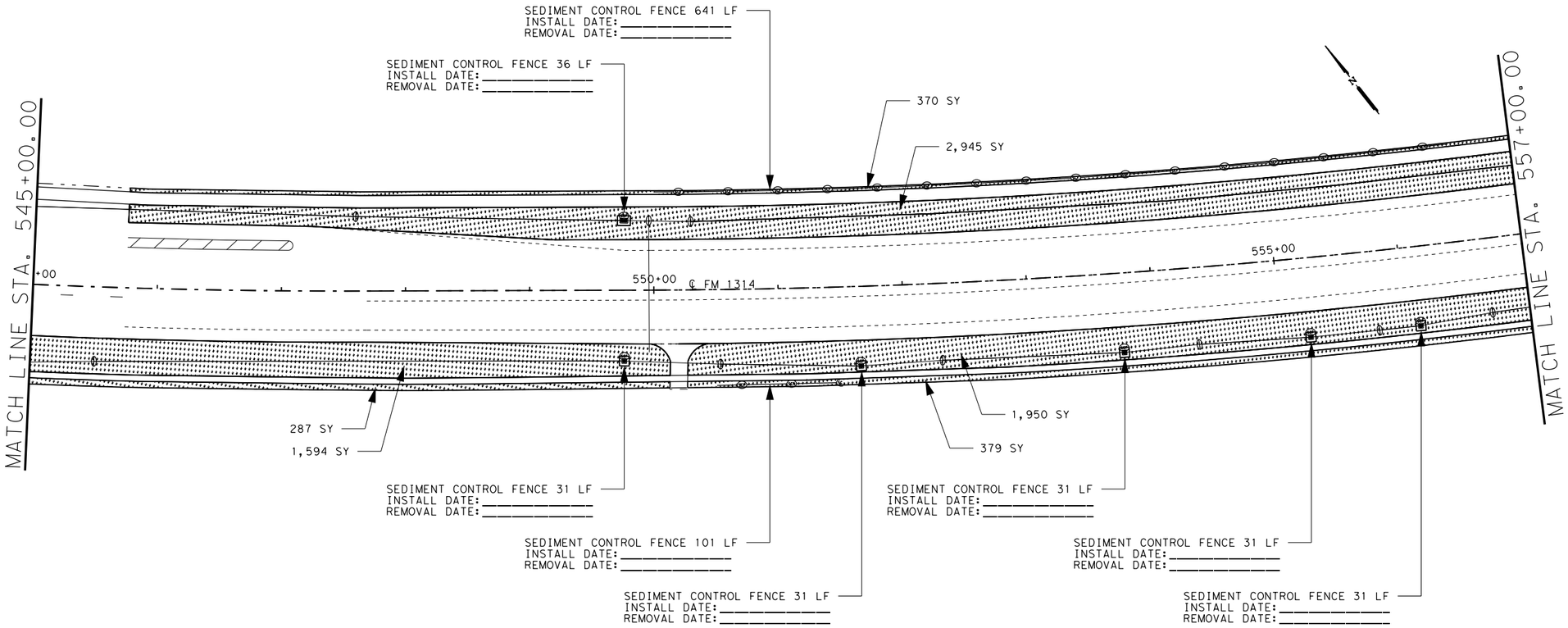

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FM 1314
SWP3
LAYOUT

SHEET 8 OF 10

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SCALE IN FEET

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		212

DATE:
FILE:

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DN:

LEGEND

- EXISTING ROADWAY/DRIVEWAY
- EXISTING ROW
- PROPOSED ROADWAY/DRIVEWAY
- SCF — SEDIMENT CONTROL FENCE (SCF)
- BLOCK SOD
- ROCK FILTER DAM
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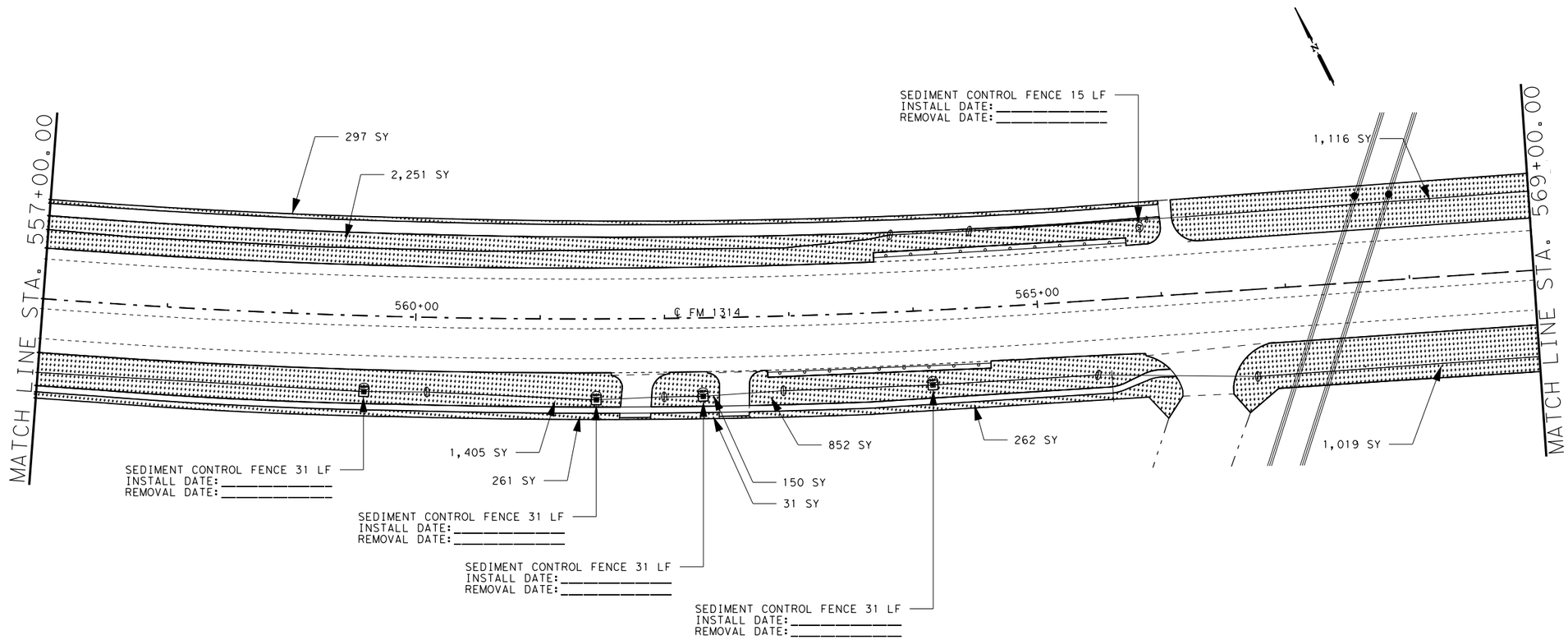

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FM 1314
SWP3
LAYOUT

SHEET 9 OF 10

0 50 100
SCALE IN FEET

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		213

DATE:
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LEGEND

- EXISTING ROADWAY/DRIVEWAY
- EXISTING ROW
- PROPOSED ROADWAY/DRIVEWAY
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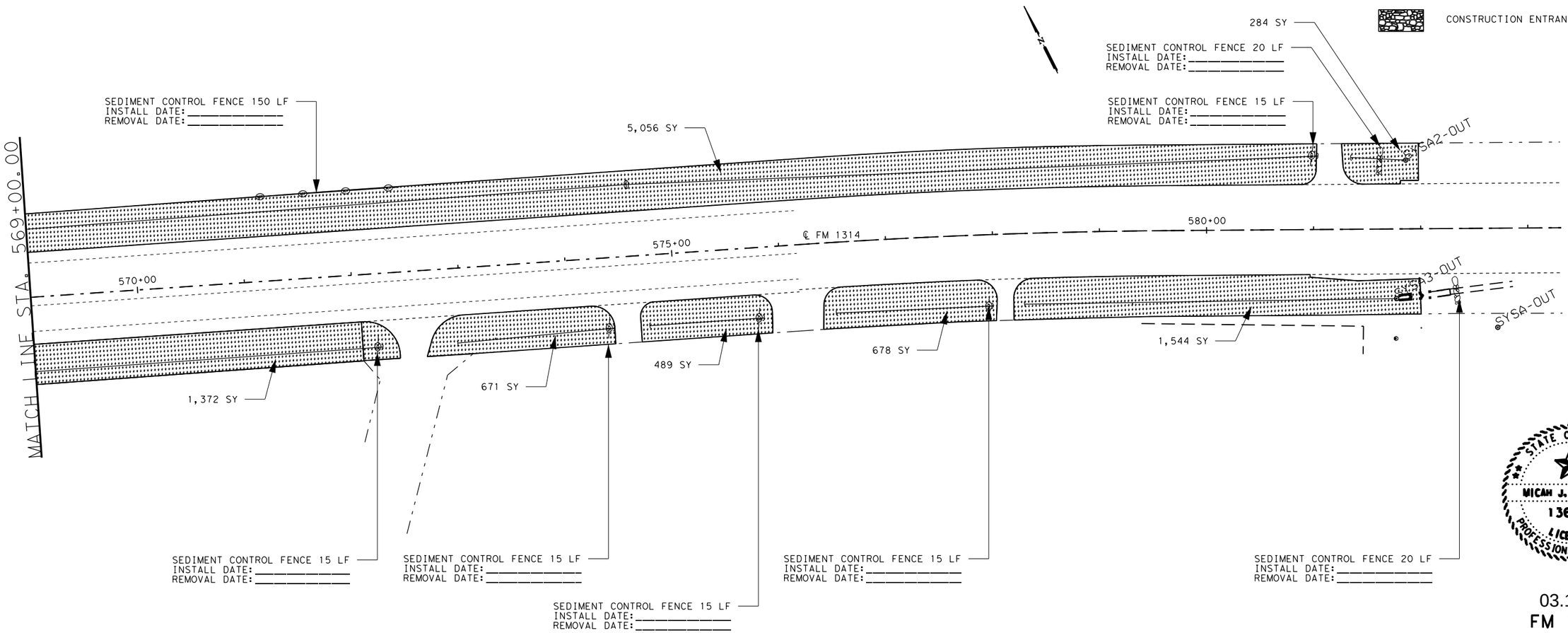

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SWP3
LAYOUT

SHEET 10 OF 10

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SCALE IN FEET

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
1986	01	064	FM1314
DIST	COUNTY		SHEET NO.
HOU	MONTGOMERY		214

DATE:
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STORMWATER POLLUTION PREVENTION PLAN (SWP3):

This SWP3 has been developed in accordance with the TPDES Construction General Permit TXR150000 (CGP). The Texas Department of Transportation (TxDOT) ensures that project specifications include adequate best management practices (BMPs) for this project.

For all projects with soil disturbing activity and for projects that have Environmental, Permits, Issues, and Commitments (EPICs) dependent on stormwater controls and water quality measures TxDOT will maintain a SWP3 with all pertinent records, correspondence, environmental documents, etc. at the project field office, Area Office, or electronically.

This SWP3 is consistent with requirements specified in applicable stormwater plans and the projects environmental permits, issues, and commitments (EPICs). A copy of the CGP is included in Attachment 2.12 of the SWP3 binder.

1.0 SITE/PROJECT DESCRIPTION

1.1 PROJECT CONTROL SECTION JOB (CSJ):
1986-01-064

1.2 PROJECT LIMITS:
From: SH 242

To: NORTH OF MCQUEEN ROAD

1.3 PROJECT COORDINATES:
BEGIN: (Lat) 30.2130547 ,(Long) -95.3578648

END: (Lat) 30.1896982 ,(Long) -95.3339647

1.4 TOTAL PROJECT AREA (Acres): 26.88

1.5 TOTAL AREA TO BE DISTURBED (Acres): 15.50

1.6 NATURE OF CONSTRUCTION ACTIVITY:
GRADING, SUBGRADE, ASB
CONCRETE PAVEMENT, SIGNING,
PAVEMENT MARKINGS, SIDEWALK AND DRAINAGE

1.7 MAJOR SOIL TYPES:

Soil Type	Description
BoyC	Boy loamy fine sand, 1 to 5 percent slopes
BozA	Boy-Urban land complex, 0 to 1 percent slopes
SosA	Sorter-Tarkington complex, 0 1 percent slopes
SouA	Sorter-Urban land complex, 0 to 1 percent slopes
URLX	Urban land

1.8 PROJECT SPECIFIC LOCATIONS (PSLs):
PSLs must be depicted on the Environmental Layout Sheets in Attachment 1.2 of this SWP3. PSLs may be identified during preconstruction meetings or during the construction process. Please choose from the options below:

☐ PSLs determined during preconstruction meeting
☒ PSLs determined during construction
☐ No PSLs planned for construction

Type	Sheet #s
CONSTRUCTION EXITS	

All off-ROW PSLs required by the Contractor are the Contractor's responsibility. The Contractor shall secure all permits required by local, state, federal laws for off-ROW PSLs. The contractor shall provide diagrams, areas of disturbance, acreage, and BMPs for all off-ROW PSLs within one mile of the project.

1.9 CONSTRUCTION ACTIVITIES:
(Use the following list as a starting point when developing the Construction Activity Schedule and Ceasing Record in Attachment 2.5.)

☒ Mobilization
☒ Install sediment and erosion controls
☐ Blade existing topsoil into windrows, prep ROW, clear and grub
☒ Remove existing pavement
☒ Grading operations, excavation, and embankment
☒ Excavate and prepare subgrade for proposed pavement widening
☒ Remove existing culverts, safety end treatments (SETs)
☐ Remove existing metal beam guard fence (MBGF), bridge rail
☒ Install proposed pavement per plans
☒ Install culverts, culvert extensions, SETs
☐ Install mow strip, MBGF, bridge rail
☒ Place flex base
☒ Rework slopes, grade ditches
☐ Blade windrowed material back across slopes
☒ Revegetation of unpaved areas
☒ Achieve site stabilization and remove sediment and erosion control measures
☐ Other: _____
☐ Other: _____
☐ Other: _____

1.10 POTENTIAL POLLUTANTS AND SOURCES:

☒ Sediment laden stormwater from stormwater conveyance over disturbed area
☐ Fuels, oils, and lubricants from construction vehicles, equipment, and storage
☐ Solvents, paints, adhesives, etc. from various construction activities
☐ Transported soils from offsite vehicle tracking
☒ Construction debris and waste from various construction activities
☐ Contaminated water from excavation or dewatering pump-out water
☐ Sanitary waste from onsite restroom facilities
☐ Trash from various construction activities/receptacles
☐ Long-term stockpiles of material and waste
☐ Discharges from concrete washout activities, runoff from concrete cutting activities, and other concrete related activities.
☐ Other: _____
☐ Other: _____
☐ Other: _____

1.11 RECEIVING WATERS:
Receiving waters must be depicted on the Environmental Layout Sheets in Attachment 1.2 of this SWP3. Include Segment # for receiving waters.

Tributaries	Classified Waterbody
EAST DRAINAGE CHANNEL MUD 157	WEST FORK OF SAN JACINTO RIVER

* Add (*) for impaired waterbodies with pollutant in ().

1.12 ROLES AND RESPONSIBILITIES: TxDOT

☒ Development of plans and specifications
☒ Submit Notice of Intent (NOI) to TCEQ (≥5 acres)
☒ Post Construction Site Notice
☒ Submit NOI/CSN to local MS4
☒ Perform SWP3 inspections
☒ Maintain SWP3 records and update to reflect daily operations
☒ Complete and submit Notice of Termination to TCEQ
☒ Maintain SWP3 records for 3 years
☐ Other: _____
☐ Other: _____
☐ Other: _____

1.13 ROLES AND RESPONSIBILITIES: CONTRACTOR

☒ Day To Day Operational Control
☒ Submit Notice of Intent (NOI) to TCEQ (≥5 acres)
☒ Post Construction Site Notice
☒ Submit NOI/CSN to local MS4
☒ Maintain schedule of major construction activities
☒ Install, maintain and modify BMPs
☒ Complete and submit Notice of Termination to TCEQ
☒ Maintain SWP3 records for 3 years
☐ Other: _____
☐ Other: _____
☐ Other: _____

1.14 LOCAL MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) OPERATOR COORDINATION:

MS4 Entity
MONTGOMERY COUNTY EAST DRAINAGE CHANNEL MUD 157

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136908
LICENSED
PROFESSIONAL ENGINEER

Micah J. Schluter P.E.
03.14.24

STORMWATER POLLUTION PREVENTION PLAN (SWP3)

July 2023 Sheet 1 of 2

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
			215
STATE	STATE DIST.	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.
1986	01	064	FM1314

STORMWATER POLLUTION PREVENTION PLAN (SWP3):

2.0 BEST MANAGEMENT PRACTICES (BMPs) AND CONTROLS, INSPECTION, AND MAINTENANCE

The Contractor shall be the responsible party for implementing the BMPs described herein and for complying with the SWP3 for control of erosion and sedimentation during day-to-day operations. The Contractor shall implement changes to this SWP3 approved by TxDOT within the times specified in this SWP3 or the CGP.

2.1 EROSION CONTROL AND SOIL STABILIZATION BMPs:

T / P

- ☐ ☐ Protection of Existing Vegetation
- ☐ ☐ Vegetated Buffer Zones
- ☐ ☐ Soil Retention Blankets
- ☐ ☐ Geotextiles
- ☐ ☐ Mulching/ Hydromulching
- ☐ ☐ Soil Surface Treatments
- ☐ ☐ Temporary Seeding
- ☐ ☒ Permanent Planting, Sodding or Seeding
- ☐ ☐ Biodegradable Erosion Control Logs
- ☒ ☐ Rock Filter Dams/ Rock Check Dams
- ☐ ☐ Vertical Tracking
- ☐ ☒ Interceptor Swale
- ☐ ☐ Riprap
- ☐ ☐ Diversion Dike
- ☐ ☐ Temporary Pipe Slope Drain
- ☐ ☐ Embankment for Erosion Control
- ☐ ☐ Paved Flumes
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____

2.2 SEDIMENT CONTROL BMPs:

T / P

- ☐ ☐ Biodegradable Erosion Control Logs
- ☐ ☐ Dewatering Controls
- ☒ ☐ Inlet Protection
- ☒ ☐ Rock Filter Dams/ Rock Check Dams
- ☐ ☐ Sandbag Berms
- ☒ ☐ Sediment Control Fence
- ☒ ☐ Stabilized Construction Exit
- ☐ ☐ Floating Turbidity Barrier
- ☐ ☐ Vegetated Buffer Zones
- ☐ ☐ Vegetated Filter Strips
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

Sediment control BMPs requiring design capacity calculations (See SWP3 Attachment 1.3.):

T / P

- ☐ ☐ Sediment Trap
  - ☐ Calculated volume runoff from 2-year, 24-hour storm for each acre of disturbed area
  - ☐ 3,600 cubic feet of storage per acre drained
- ☐ ☐ Sedimentation Basin
  - ☐ Not required (<10 acres disturbed)
  - ☐ Required (>10 acres) and implemented.
    - ☐ Calculated volume runoff from 2-year, 24-hour storm for each acre of disturbed area
    - ☐ 3,600 cubic feet of storage per acre drained
  - ☐ Required (>10 acres), but not feasible due to:
    - ☐ Available area/Site geometry
    - ☐ Site slope/Drainage patterns
    - ☐ Site soils/Geotechnical factors
    - ☐ Public safety
    - ☐ Other: _____

2.3 PERMANENT CONTROLS:

(Coordinate post-construction BMPs with appropriate TxDOT maintenance sections.)

BMPs To Be Left In Place Post Construction:

Type	Stationing	
	From	To

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

2.4 OFFSITE VEHICLE TRACKING CONTROLS:

- ☐ Excess dirt/mud on road removed daily
- ☐ Haul roads dampened for dust control
- ☐ Loaded haul trucks to be covered with tarpaulin
- ☐ Stabilized construction exit
- ☐ Daily street sweeping
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

2.5 POLLUTION PREVENTION MEASURES:

- ☐ Chemical Management
- ☐ Concrete and Materials Waste Management
- ☐ Debris and Trash Management
- ☐ Dust Control
- ☐ Sanitary Facilities
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

2.6 VEGETATED BUFFER ZONES:

Natural vegetated buffers shall be maintained as feasible to protect adjacent surface waters. If vegetated natural buffer zones are not feasible due to site geometry, the appropriate additional sediment control measures have been incorporated into this SWP3.

Type	Stationing	
	From	To

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

2.7 ALLOWABLE NON-STORMWATER DISCHARGES:

- ☒ Fire hydrant flushings
- ☒ Irrigation drainage
- ☒ Pavement washwater (where spills or leaks have not occurred, and detergents are not used)
- ☒ Potable water sources
- ☒ Springs
- ☒ Uncontaminated groundwater
- ☒ Water used to wash vehicles or control dust
- ☒ Other allowable non-stormwater discharges as allowed by TPDES GP TXR150000.

2.8 DEWATERING:

Dewatering discharges of accumulated stormwater, groundwater, and surface water including discharges from dewatering of trenches, excavations, foundations, vaults, and other points of accumulation are prohibited unless managed by appropriate controls to prevent and minimize the offsite discharge of sediment and other pollutants.

2.9 INSPECTIONS:

All disturbed areas and erosion and sediment control devices shall be inspected at least once every seven (7) days. Inspections shall be performed by TxDOT as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.5 of this SWP3.

When dewatering activities are present, a daily inspection will be conducted once per day during those activities and documented in accordance with CGP and TxDOT requirements.

2.10 MAINTENANCE:

Control measures shall be properly installed according to specifications. If it is determined that a BMP or control measure is not operating effectively, maintenance must be accomplished as soon as possible and before the next anticipated rain event, but in no case later than 7 calendar days after being able to access the site. Maintenance shall be performed by the Contractor as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.5 of this SWP3.

STATE OF TEXAS
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Micah J. Schluter, P.E.

03.14.24

STORMWATER POLLUTION PREVENTION PLAN (SWP3)

July 2023 Sheet 2 of 2

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
			215 A
STATE	STATE DIST.	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONT.	SECT.	JOB	HIGHWAY NO.
1986	01	064	FM1314

I. STORMWATER POLLUTION PREVENTION

Texas Pollutant Discharge Elimination System (TPDES) TXR 150000: Stormwater Discharge Permit or Construction General Permit is 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. Refer to the TxDOT SWP3 Summary Sheets, SWP3 Binder Template, and Form 2118.

No Additional Comments

II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS

United States Army Corps of Engineers (USACE) Permit is required for filling, dredging, excavating or other work in water bodies, rivers, creeks, streams, wetlands or wet areas. The Contractor must adhere to all of the terms and general conditions associated with the following permit(s). If additional work not represented in the plans is required, contact the Engineer immediately.

☐ No United States Army Corps (USACE) Permit Required

☐ Work is authorized by the United States Army Corps of Engineers (USACE) under a Nationwide Permit (NWP) without a Pre-Construction Notification (PCN). Project specific permit was not issued by USACE, therefore is not in the plan set. The USACE general conditions are in the “General Notes."

☒ Work is authorized by the United States Army Corps of Engineers (USACE) under a Nationwide Permit (NWP) with a Pre-Construction Notification (PCN). The project specific permit issued by the United States Army Corps of Engineers (USACE) is included in the plan set. The USACE general conditions are in the “General Notes."

☐ Work is authorized by the United States Army Corps of Engineers (USACE) under a Individual Permit (IP). The project specific permit issued by the United States Army Corps of Engineers (USACE) is included in the plan set.

☐ Work would be authorized by the United States Army Corps of Engineers (USACE) permit. The project specific permit issued by the USACE will be provided to the contractor.

United States Coast Guard (USCG) Permit is required for projects that involve the construction or modification (including changes to lighting) of a bridge or causeway across a water body determined to be navigable by the United States Coast Guard (USCG) under Section 9 of the Rivers and Harbors Act. If additional work not represented in the plans is required, contact the Engineer immediately.

☒ No United States Coast Guard (USCG) Coordination Required

☐ United States Coast Guard (USCG) Permit

☐ United States Coast Guard (USCG) Exemption

No Additional Comments

A NWP 14 is needed for this project. Please refer to the permit to see wetland areas where work is authorized. If work in wetlands or streams outside of the areas identified in the permit is needed, please contact the environmental PM before initiating activities.

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 area and contact the Engineer immediately.

No Additional Comments

IV. VEGETATION RESOURCES

Preserve native vegetation to the extent practical. Refer to TxDOT Standard Specifications in order to comply with requirements for invasive species, beneficial landscaping and tree/brush removal.

No Additional Comments

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

If any of the listed species below are observed, cease work in the area, do not disturb species or habitat and contact the Engineer immediately.

The work may not remove active nests (from bridges, structures, or vegetation adjacent to the roadway, etc.) during nesting season (February 15 to October 1). If removal of structures or vegetation is necessary during the nesting season, the Contractor shall conduct a bird survey no more than 3 days in advance of the clearing/demolish start date. All bird surveys shall be conducted by a Field Biologist and adhere to the guidance document “Avoiding Migratory Birds and Handling Potential Violations” found in the TxDOT Environmental Compliance Toolkits at the time of the survey. (See below for Field Biologist and Ornithologist qualifications)

No Additional Comments

Field Biologist, Ornithologist – a field biologist is defined as an individual qualified to perform field investigations, presence/absence surveys and habitat surveys for protected avian species or species of concern. A mandatory bachelor’s degree in biology or a related science is required. At a minimum, the Field Biologist, Ornithologist, shall have completed and reported a minimum of three presence/absence and habitat surveys for protected avian species in the past five years. A minimum of three projects must have been conducted in Texas. Surveys shall have been performed for documentation of species in accordance with a protocol approved by USFWS or TPWD, or following generally accepted methodologies.

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

Refer to TxDOT Standard Specifications in the event potentially contaminated materials are observed, such as dead or distressed vegetation, trash disposal areas, drums, canisters, barrels, leaching or seepage of substances, unusual smells or odors, or stained soil, cease work in the area and contact the Engineer immediately.

No Additional Comments

VII. OTHER ENVIRONMENTAL ISSUES

Comments:

Once the Nationwide Permit (NWP) has been issued, the AO and TxDOT Engineer would be notify when activities permitted under the United States Army Corps of Engineers (USACE).

DATE: Feb 23, 2024
FILE:

Version 2.2

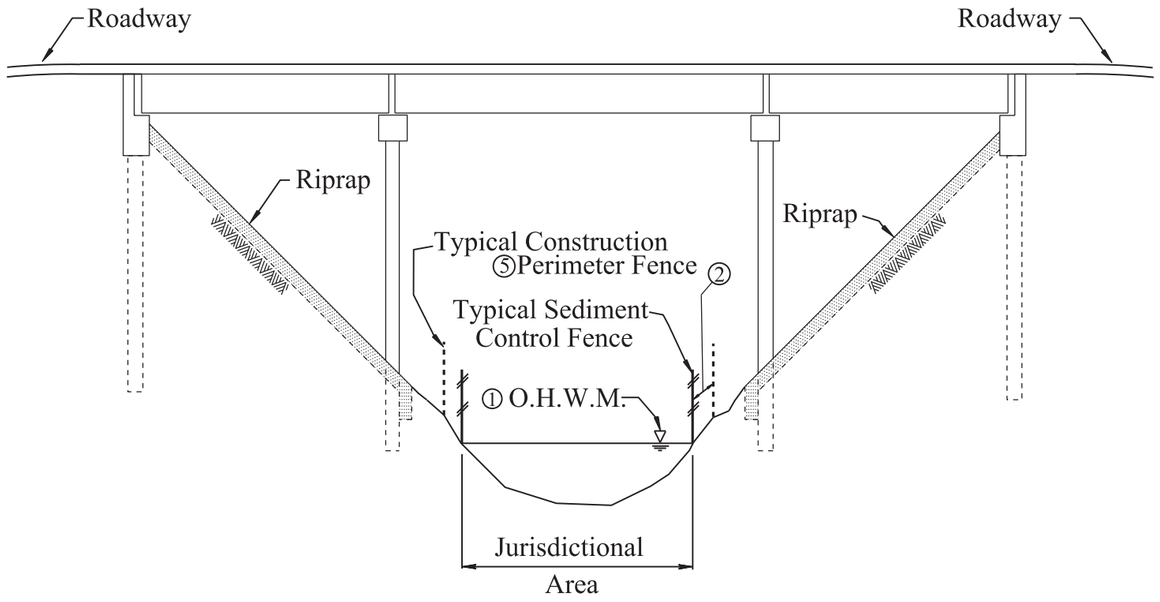
Texas Department of Transportation

TxDOT Houston District

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

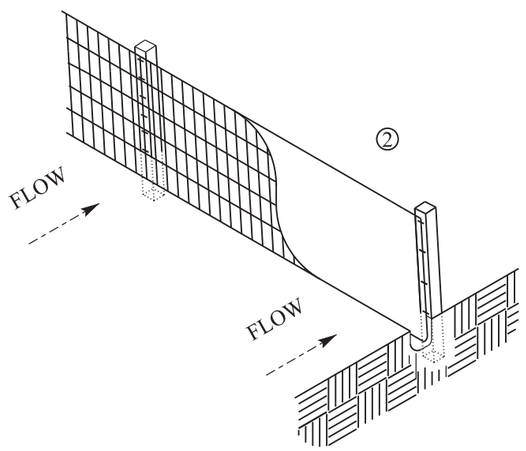
EPIC

FILE: EPIC Sheet.dgn	DN:	CK:	DW:	CK:
© TxDOT: March 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	1986	01	064	FM 1314
UPDATED section V. text and added definition (10/17) ADDED USCG and USACE notes in Section VII (04/18)	DIST	COUNTY		SHEET NO.
	HOU	Montgomery		216



TYPICAL RELATIONSHIP OF O.H.W.M., SEDIMENT CONTROL & CONSTRUCTION FENCING, PILING/DRILL SHAFT & RIPRAP TOE WALLS

N.T.S.



TEMPORARY SEDIMENT CONTROL FENCE

1.50" Radius, 0.50" Border, Black on White;
[WETLAND AREA] C; [DO NOT ENTER] C;
CIRCLE, DIAG LINE, RED

GENERAL DESIGN CONSIDERATIONS

1. Ordinary high water mark (elevation) (O.H.W.M.) is determined by the Environmental Project Manager and elevation is set by a Surveyor.

2. All non-permitted jurisdictional wetlands and waters within or adjacent to the project area shall be avoided and protected by signage and fencing, including both sediment control and construction fencing (see note 5). Construction equipment, materials/sediment are not allowed in the non-permitted wetlands/waters.

3. Any wetlands permitted for impacts/fill and non-permitted wetlands are shown elsewhere on plans or United States Army Corps of Engineers (USACE) permit.

4. The Contractor will be required to obtain the appropriate permits if she/he alters the construction method or deviates from the permit.

5. See item 506 for temporary sediment control fence and for construction perimeter fence. See item 502 for signs.

Texas Department of Transportation

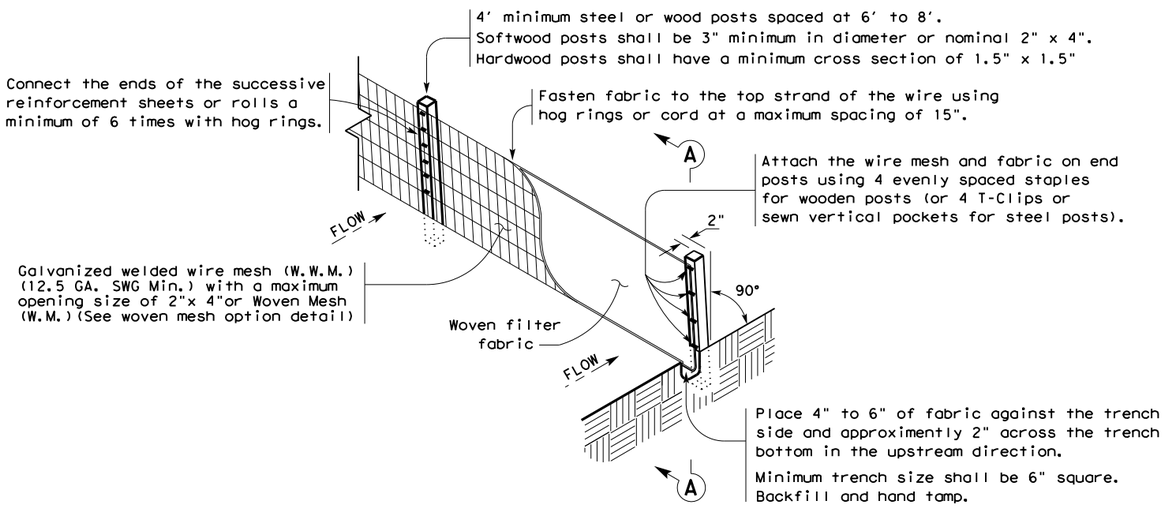
TxDOT Houston District

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

EPIC

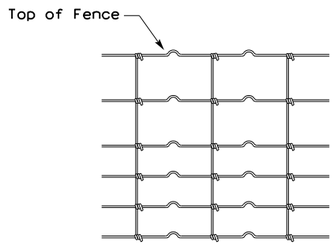
FILE: Wetland EPIC Sheet.dgn	DN:	CK:	DW:	CK:
© TxDOT: March 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	1986	01	064	FM 1314
ADDED construction fencing (06/17)	DIST	COUNTY		SHEET NO.
UPDATED typical relationship diagram (09/17)	HOU	Montgomery		
UPDATED notes 2 and 5 (09/17)				
UPDATED note 5 (05/18)				

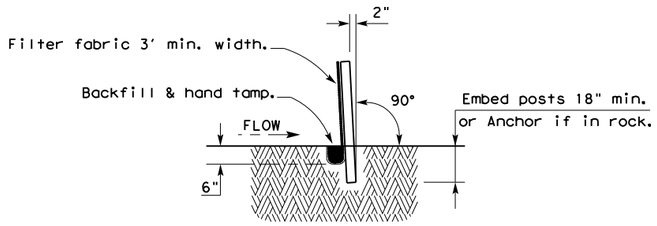
DATE:
FILE:



TEMPORARY SEDIMENT CONTROL FENCE

SCF





SECTION A-A

HINGE JOINT KNOT WOVEN MESH (OPTION) DETAIL

Galvanized hinge joint knot woven mesh (12.5 GA.SWG Min.) requires a minimum of five horizontal wires spaced at a maximum of 12 inches apart and all vertical wires spaced at a maximum of 12 inches apart.

SEDIMENT CONTROL FENCE USAGE GUIDELINES

A sediment control fence may be constructed near the downstream perimeter of a disturbed area along a contour to intercept sediment from overland runoff. A 2 year storm frequency may be used to calculate the flow rate to be filtered.

Sediment control fence should be sized to filter a maximum flow through rate of 100 GPM/FT^2. Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.

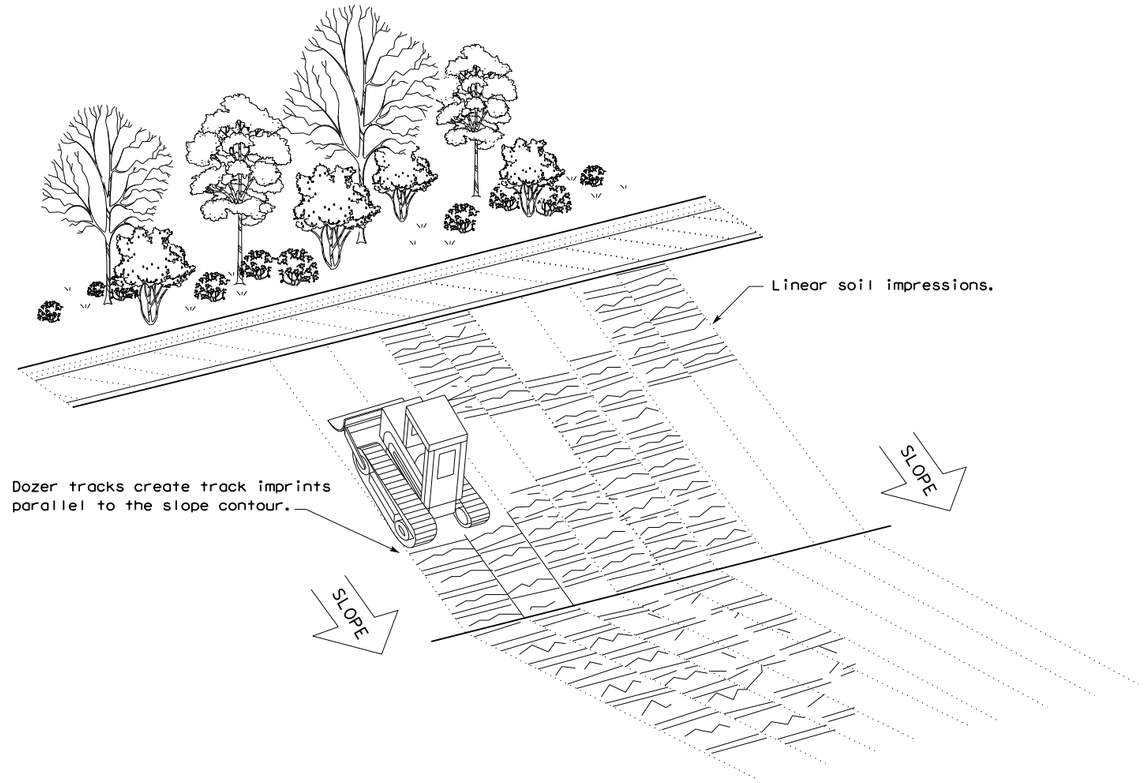
LEGEND

Sediment Control Fence

SCF

GENERAL NOTES

1. Vertical tracking is required on projects where soil distributing activities have occurred unless otherwise approved.
2. Perform vertical tracking on slopes to temporarily stabilize soil.
3. Provide equipment with a track undercarriage capable of producing linear soil impressions measuring a minimum of 12" in length by 2" to 4" in width by 1/2" to 2" in depth.
4. Do not exceed 12" between track impressions.
5. Install continous linear track impressions where the minimum 12" length impressions are perpendicular to the slope or direction of water flow.



VERTICAL TRACKING

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

FENCE & VERTICAL TRACKING

EC(1)-16

FILE: ec116	DN: TxDOT		CK: KM		DW: VP		DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY		
REVISIONS	1986	01	064		FM1314		
	DIST	COUNTY					SHEET NO.
	HOU	MONTGOMERY					217

$DATE$
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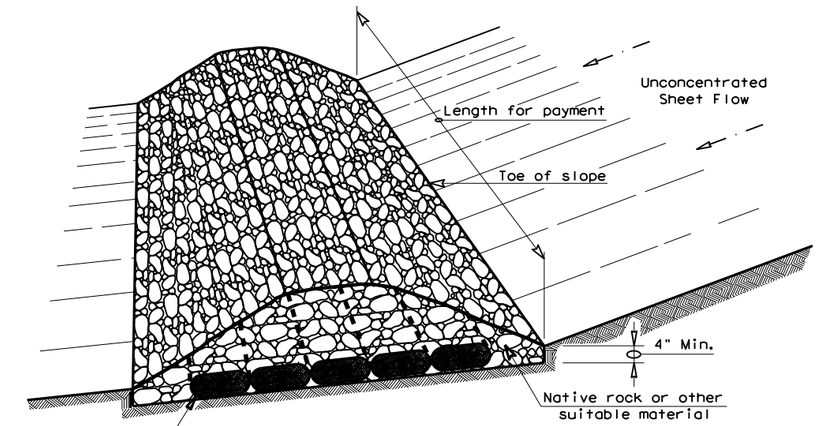
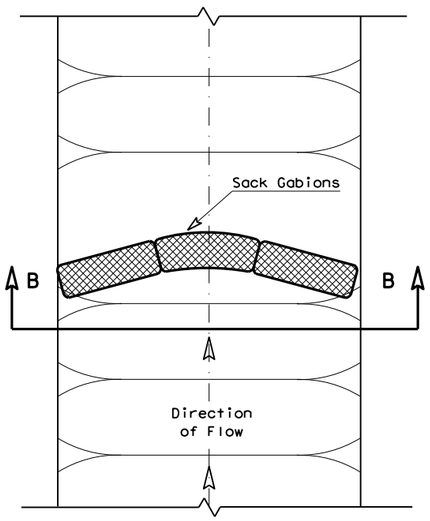
DATE: $DATE$
FILE: $FILE$

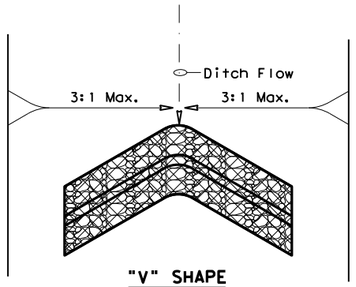


FILTER DAM AT TOE OF SLOPE

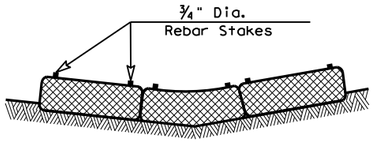
RFD1



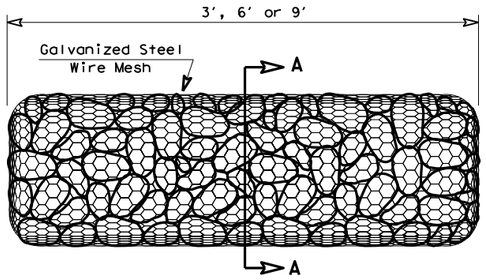
PLAN VIEW



"V" SHAPE PLAN VIEW

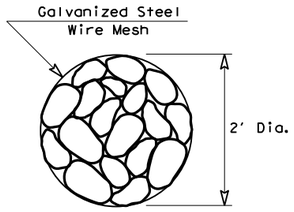


SECTION B-B

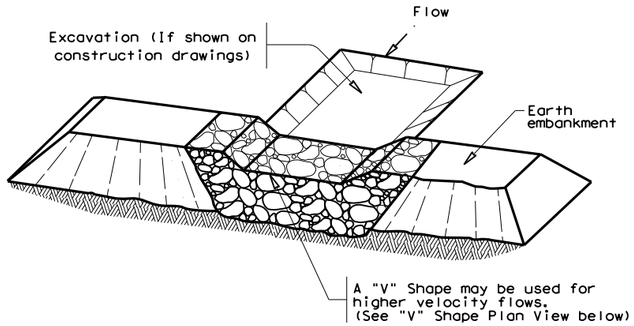


TYPE 4 (SACK GABIONS)

RFD4

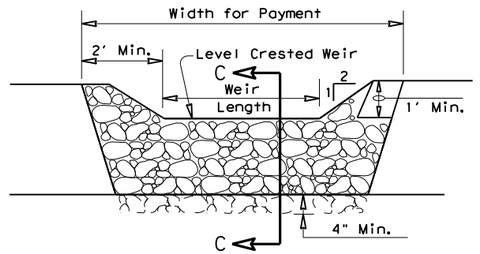


SECTION A-A

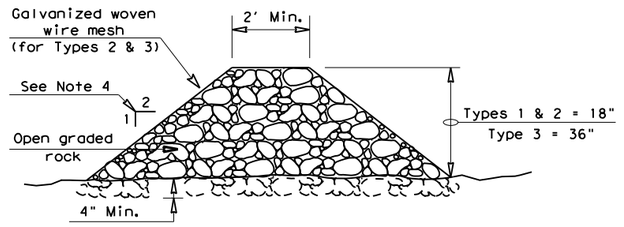


FILTER DAM AT SEDIMENT TRAP

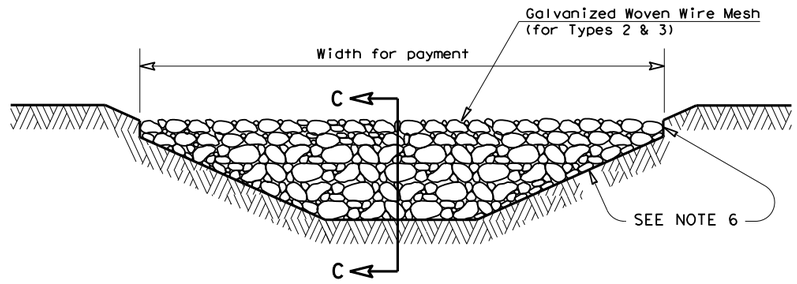
RFD1 OR RFD2



PROFILE



SECTION C-C



FILTER DAM AT CHANNEL SECTIONS

RFD1 OR RFD2 OR RFD3

ROCK FILTER DAM USAGE GUIDELINES

Rock Filter Dams should be constructed downstream from disturbed areas to intercept sediment from overland runoff and/or concentrated flow. The dams should be sized to filter a maximum flow through rate of 60 GPM/FT^2 of cross sectional area. A 2 year storm frequency may be used to calculate the flow rate.

Type 1 (18" high with no wire mesh) (3" to 6" aggregate): Type 1 may be used at the toe of slopes, around inlets, in small ditches, and at dike or swale outlets. This type of dam is recommended to control erosion from a drainage area of 5 acres or less. Type 1 may not be used in concentrated high velocity flows (approximently 8 Ft/Sec or more) in which aggregate wash out may occur. Sandbags may be used at the embedded foundation (4" deep min.) for better filtering efficiency of low flows if called for on the plans or directed by the Engineer.

Type 2 (18" high with wire mesh) (3" to 6" aggregate): Type 2 may be used in ditches and at dike or swale outlets.

Type 3 (36" high with wire mesh) (4" to 8" aggregate): Type 3 may be used in stream flow and should be secured to the stream bed.

Type 4 (Sack gabions) (3" to 6" aggregate): Type 4 May be used in ditches and smaller channels to form an erosion control dam.

Type 5: Provide rock filter dams as shown on plans.

GENERAL NOTES

1. If shown on the plans or directed by the Engineer, filter dams should be placed near the toe of slopes where erosion is anticipated, upstream and/or downstream at drainage structures, and in roadway ditches and channels to collect sediment.
2. Materials (aggregate, wire mesh, sandbags, etc.) shall be as indicated by the specification for "Rock Filter Dams for Erosion and Sedimentation Control".
3. The rock filter dam dimensions shall be as indicated on the SW3P plans.
4. Side slopes should be 2:1 or flatter. Dams within the safety zone shall have sideslopes of 6:1 or flatter.
5. Maintain a minimum of 1' between top of rock filter dam weir and top of embankment for filter dams at sediment traps.
6. Filter dams should be embedded a minimum of 4" into existing ground.
7. The sediment trap for ponding of sediment laden runoff shall be of the dimensions shown on the plans.
8. Rock filter dam types 2 & 3 shall be secured with 20 gauge galvanized woven wire mesh with 1" diameter hexagonal openings. The aggregate shall be placed on the mesh to the height & slopes specified. The mesh shall be folded at the upstream side over the aggregate and tightly secured to itself on the downstream side using wire ties or hog rings. For in stream use, the mesh should be secured or staked to the stream bed prior to aggregate placement.
9. Sack Gabions should be staked down with ¾" dia. rebar stakes, and have a double-twisted hexagonal weave with a nominal mesh opening of 2 ½" x 3 ¼"
10. Flow outlet should be onto a stabilized area (vegetation, rock, etc.).
11. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

PLAN SHEET LEGEND

Type 1 Rock Filter Dam	RFD1
Type 2 Rock Filter Dam	RFD2
Type 3 Rock Filter Dam	RFD3
Type 4 Rock Filter Dam	RFD4

Texas Department of Transportation

Design Division Standard

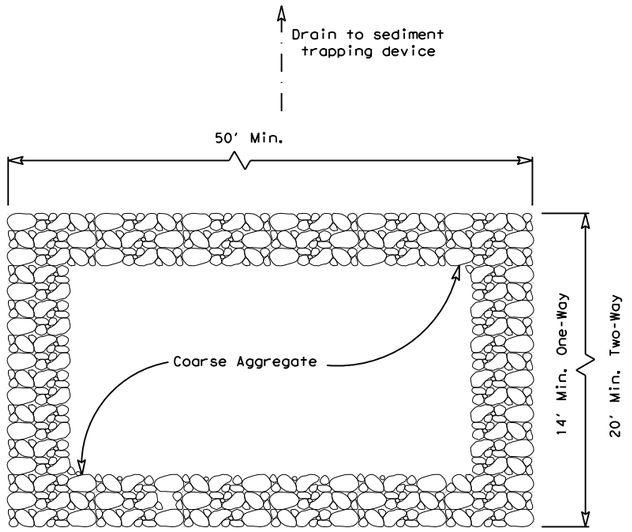
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

ROCK FILTER DAMS

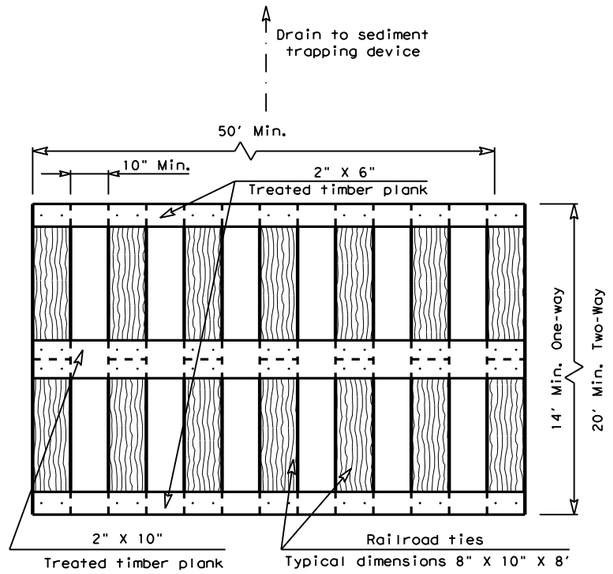
EC(2)-16

FILE: ec216	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	1986	01	064	FM1314
	DIST	COUNTY		SHEET NO.
	HOU	MONTGOMERY		218

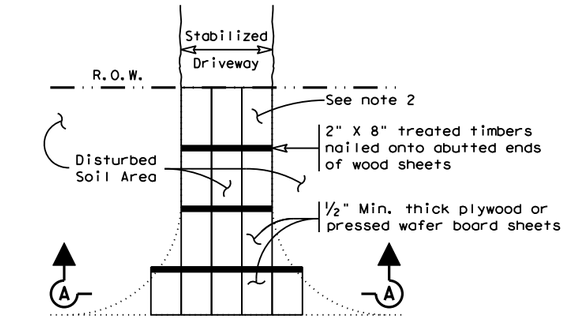
DATE:
FILE:



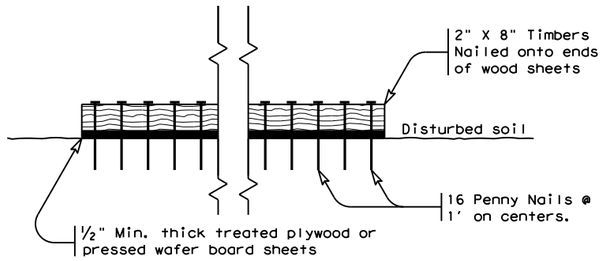
PLAN VIEW



PLAN VIEW



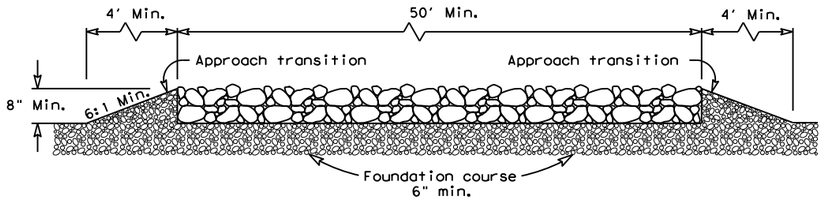
PLAN VIEW



SECTION A-A

CONSTRUCTION EXIT (TYPE 3)

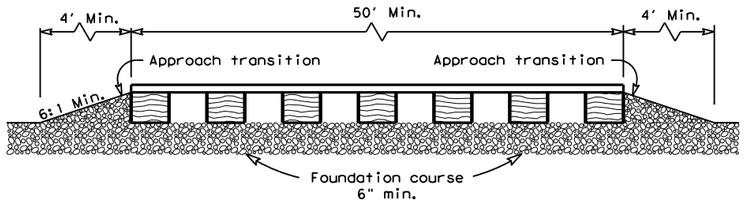
SHORT TERM



ELEVATION VIEW

CONSTRUCTION EXIT (TYPE 1)

ROCK CONSTRUCTION (LONG TERM)



ELEVATION VIEW

CONSTRUCTION EXIT (TYPE 2)

TIMBER CONSTRUCTION (LONG TERM)

GENERAL NOTES (TYPE 1)

1. The length of the type 1 construction exit shall be as indicated on the plans, but not less than 50'.
2. The coarse aggregate should be open graded with a size of 4" to 8".
3. The approach transitions should be no steeper than 6:1 and constructed as directed by the Engineer.
4. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other materialas approved by the Engineer.
5. The construction exit shall be graded to allow drainage to a sediment trapping device.
6. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
7. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.

GENERAL NOTES (TYPE 2)

1. The length of the type 2 construction exit shall be as indicated on the plans, but not less than 50'.
2. The treated timber planks shall be attached to the railroad ties with ½"x 6" min. lag bolts. Other fasteners may be used as approved by the Engineer.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The approach transitions shall be no steeper than 6:1 and constructed as directed by the Engineer.
5. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other material as approved by the Engineer.
6. The construction exit should be graded to allow drainage to a sediment trapping device.
7. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
8. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.

GENERAL NOTES (TYPE 3)

1. The length of the type 3 construction exit shall be as shown on the plans, or as directed by the Engineer.
2. The type 3 construction exit may be constructed from open graded crushed stone with a size of two to four inches spread a min. of 4" thick to the limits shown on the plans.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

CONSTRUCTION EXITS

EC(3)-16

FILE: ec316	DN: TxDOT		CK: KM		DW: VP	DN/CK: LS
	CONT	SECT	JOB		HIGHWAY	
REVISIONS	1986	01	064		FM1314	
	DIST	COUNTY			SHEET NO.	
	HOU	MONTGOMERY			219	

TYPE OF WORK — ITEMS AND REQUIREMENTS FOR EACH TYPE OF WORK

SODDING	PERMANENT SEEDING	TEMPORARY SEEDING	Reference Item 161, 162, 164, 166, 168 of the Texas Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges 2014 for specifications, dimensions, volumes and measurements that are not shown. Use latest Houston District, Special Provisions for those items indicated.		
	✓		**161-6017 COMPOST MANUF TOPSOIL (BIP)(4") SY**	APPLICATION RATE Item 161.2.1. Compost Manufactured Topsoil (CMT)	Item 161.2. Materials. Submit quality control (QC) documentation to the Engineer. Compost producer's STA certification must be dated to meet STA requirements (certification must be within 30 or 90 days per STA requirements). Lab analysis performed by an STA-certified lab must be dated within 30 days before delivery of the compost.
✓			**162-6002 BLOCK SODDING SY**	GRASS SPECIES Item 162.2. Materials. Common Bermuda (Cynodon Dactylon)	Item 162.2.1. Block Sod. Use block palletized or roll type sod. **REMOVE PLASTIC BACKING FROM ROLL TYPE SOD.** Place sod within 48 hours of delivery to site. No exceptions. Place sod with joints alternating on each row to prevent continuous joint lines. Peg sod as needed with wood pegs to hold sod in place. Pegging sod is subsidiary to Item 162.
	✓		**164-6066 DRILL SEEDING(PERM)(WARM OR COOL) SY** Item 164.1. Description Provide and install seeding as shown on District Standard	PLANTING MONTH / SEED MIX March, April, May, June, July, August, September, October: Hulled - Bermudagrass (Cynodon dactylon) - 40.0 lbs PLS/acre Foxtail Millet (Setaria italica) - 34.0 lbs PLS/acre Green Sprangletop (Leptochloa dubia) - 4.0 lbs PLS/acre Sideoats Grama (Bouteloua curtipendula) - 3.2 lbs PLS/acre Little Bluestem (Schizachyrium scoparium) - 1.4 lbs PLS/acre November, December, January, February, Unhulled - Bermudagrass (Cynodon dactylon) - 40.0 lbs PLS/acre Oats (Avena sativa) - 72.0 lbs PLS/acre Green Sprangletop (Leptochloa dubia) - 4.0 lbs PLS/acre Sideoats Grama (Bouteloua curtipendula) - 3.2 lbs PLS/acre Little Bluestem (Schizachyrium scoparium) - 1.4 lbs PLS/acre	PLS (Pure Live Seed) Provide documentation of PLS requirements per Item 164.2.1. CONSTRUCTION. Cultivate the area to a depth of 4 inches before placing the seed unless otherwise directed. When performing permanent seeding after an established temporary seeding, cultivate the seedbed to a depth of 4 inches or mow the area before placement of the permanent seed. Plant the seed and place the straw or hay mulch after the area has been completed to lines and grades as shown on the plans. Drill Seeding. Plant seed or seed mixture uniformly over the area shown on the plans at a depth of 1/4 to 1/3 inch using a cultipacker(turfgrass) type seeder. Plant seed along the contour of the slopes. Use broadcast seeding method where site conditions prevent drill seeding method. Broadcast Seeding. Distribute the dry seed or dry seed mixture uniformly over the areas shown on the plans using hand or mechanical distribution on top of soil.
	✓		**164-6052 BROADCAST SEED(PERM)(SPECIAL MIX) SY** Item 164.1. Description Provide and install seeding as shown on District Standard		
		✓	**164-6051 DRILL SEED(TEMP)(WARM OR COOL) SY** Item 164.1. Description Provide and install seeding as shown on District Standard	PLANTING MONTH / SEED MIX March, April, May, June, July, August, September, October: Foxtail Millet (Setaria italica) - 34.0 lbs PLS/acre November, December, January, February, Oats (Avena sativa - 72.0 lbs PLS/acre	
		✓	**164-6009 BROADCAST SEED(TEMP)(WARM) SY** Item 164.1. Description Provide and install seeding as shown on District Standard		
	✓	✓	**162-6003 STRAW OR HAY MULCH SY**	APPLICATION RATE Immediately after planting the seed or seed mixture, apply straw or hay mulch uniformly over the seeded area. Apply straw or hay mulch at 2 tons per acre. Use tacking agent with straw or hay mulch as described on this sheet.	Use straw or hay mulch in conformance with Article 162.2.5, "Mulch." Use biodegradable tacking agents only applied at a rate in accordance with manufacturer's recommendations. Use the following products or an approved equal(see note this sheet): Conweb/Contac Guar Gum, Profile Products Corporation, (307) 655-9565, Ramtec/Procol/Viscol Guar Gum, Ramtec Corporation, (800) 366-1180
✓	✓	✓	**166-6001 FERTILIZER AC** Item 166.2. Materials Use fertilizer as shown on District Standard	APPLICATION RATE Deliver and evenly distribute fertilizer at a rate of 4000 lbs/acre.	Use a **NON-CHEMICAL** fertilizer which meets all the following criteria: (1) BRAND NAME must be registered with the Texas State Chemist as a commercial fertilizer. (2) Meets USEPA guidelines for unrestricted use. (3) Derived from biological sources such as, but not limited to: sewage sludge, manures, vegetation, etc. (4) In granular form and essentially dust free. Submit proof of registration and nutrient source to Engineer. Use the following products or an approved equal(see note this sheet): Sigma, SIGMA AgriScience, 281-851-6749 Sustanite-standard grade, Automation Nation, Inc., 713-675-4999 Milorganite, MMSD, 800-287-9645 Agricultural Organic P/L, Ag Org, INC., 713-523-4396
✓	✓	✓	**168-6001 VEGETATIVE WATERING MG**	APPLICATION RATE Item 168.3 Construction. 6000 gallons/acre per working day x 20 consecutive working days = 120,000 gallons total/acre	Begin watering immediately after installation of seed or sod. Replace, fertilize, and water any seed or sod in poor condition due to the failure to apply the specified amount of water within the time allowed at no expense to the Department.

SEQUENCE OF WORK

BLOCK SOD	PERMANENT SEEDING	TEMPORARY SEEDING
1. FERTILIZER 2. CULTIVATE SOIL (ITEM 162.3) 3. SOD 4. VEGETATIVE WATERING	1. FERTILIZER 2. COMPOST MANUFACTURED TOPSOIL 3. CULTIVATE SOIL (ITEMS 164.3 AND 161.3.1) 4. PERMANENT SEEDING 5. STRAW OR HAY MULCH 6. VEGETATIVE WATERING	1. FERTILIZER 2. CULTIVATE SOIL (PER ITEM 164.3) 3. TEMPORARY SEEDING 4. STRAW OR HAY MULCH 5. VEGETATIVE WATERING

Texas Department of Transportation

HOUSTON DISTRICT

FERTILIZER, SEED, SOD, STRAW, COMPOST, AND WATER

FSSSCW-15

REVISIONS
10/2014 UPDATED TO 2014 SPECS 3/2015 MINOR CORRECTIONS 3/2023 ADDED SHEET ABBREVIATION

FILE: OCT 2014

ORIGINAL:

FED DIV	STATE	PROJECT NUMBER			SHEET
6	TEXAS				220
DIST	COUNTY	CONTROL	SECT	JOB	HIGHWAY
12	MONTGOMERY	1986	01	064	FM1314