SEE SHEET 2 FOR INDEX OF SHEETS

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

FHWA TEXAS DIVISION	PROJECT NO.		SHEET NO.
	F 2023(209), ETC.		1
STATE	DISTRICT	COUNTY	
TEXAS	LFK	HOUSTON, ETC.	
CONTROL	SECTION	JOB	HIGHWAY NO.
2707	01	011, ETC.	FM 2781

FUNCTIONAL CLASS.: RURAL MAJOR COLLECTOR

(CCSJ 2707-01-011)
*DESIGN SPEED = 30 MPH
ADT (2033) = 800
ADT (2053) = 1,100

(CSJ 2707-02-008)
*DESIGN SPEED = 30 MPH
ADT (2033) = 800
ADT (2053) = 1,100

(CSJ 2707-01-014)
*DESIGN SPEED = 30 MPH
ADT (2033) = 800
ADT (2053) = 1,100

DESIGN SPEED APPLICABLE ONLY TO THE DESIGN ELEMENTS AFFECTED BY THE SCOPE OF THE HSIP PROJECT.

PLANS OF PROPOSED STATE HIGHWAY IMPROVEMENT

PROJECT NO. F 2023(209), ETC.

FM 2781
HOUSTON COUNTY, ETC

(CSJ 2707-01-014) NET LENGTH OF ROADWAY = 40,502.50 FT. = 7.67 MI.
(CCSJ 2707-01-011) NET LENGTH OF ROADWAY = 22,256.50 FT. = 4.21 MI.
(CSJ 2707-02-008) NET LENGTH OF ROADWAY = 2,504 FT. = 0.47 MI.
NET LENGTH OF PROJECT = 65,263 FT. = 12.35 MI.

(CSJ 2707-01-014) LIMITS: FROM SH 7 TO COUNTY ROAD 551
(CCSJ 2707-01-011) LIMITS: FROM CR 551 TO TRINITY COUNTY LINE
(CSJ 2707-02-008) LIMITS: FROM HOUSTON COUNTY LINE TO FM 358
FOR THE CONSTRUCTION OF RESTORATION
CONSISTING OF RECONSTRUCT AND WIDEN PAVEMENT

BEGIN PROJECT
CSJ: 2707-01-014
STA 3+12
REF MRK = 358-0.009
LAT 31.3594435°
LONG -95.1858593°

PREVIOUS PROJECT TIE
PROJECT NO: FH-L-33-1(1)
CSJ: 2707-01-002
TIE-IN STA 3+12

END PROJECT
CSJ: 2707-01-014
STA 408+00
REF MRK = 364+1.663
LAT 31.254110°
LONG -95.210882°

PREVIOUS PROJECT TIE
PROJECT NO: FH L33-1(2)
CSJ: 2707-01-003
TIE-IN STA 407+00

END PROJECT
CSJ: 2707-01-011
STA 25+14
REF MRK = 368+1.807
LAT 31.1977172°
LONG -95.2304929°

PREVIOUS PROJECT TIE
PROJECT NO: S 2686(1)A
CSJ: 2707-01-001
TIE-IN STA 25+14

BEGIN PROJECT
CSJ: 2707-01-011
STA 408+00
REF MRK = 364+1.663
LAT 31.254110°
LONG -95.210882°

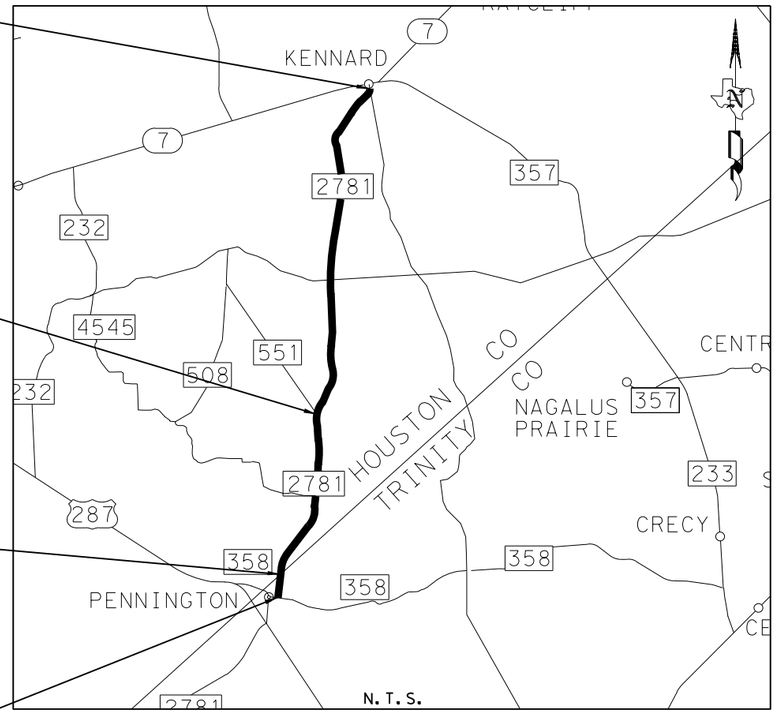
PREVIOUS PROJECT TIE
PROJECT NO: FH L33-1(2)
CSJ: 2707-02-003
TIE-IN STA 407+00

BEGIN PROJECT
CSJ: 2707-02-008
STA 25+14
REF MRK = 368+1.807
LAT 31.1977172°
LONG -95.2304929°

PREVIOUS PROJECT TIE
PROJECT NO: S 2686(1)A
CSJ: 2707-02-001
TIE-IN STA 25+14

END PROJECT
CSJ: 2707-02-008
STA 0+10
REF MRK = 370+0.417
LAT 31.1909510°
LONG -95.2319716°

PREVIOUS PROJECT TIE
PROJECT NO: S 2686(1)A
CSJ: 2707-02-001
TIE-IN STA 0+10



EXCEPTIONS: NONE
RAILROAD CROSSINGS: NONE
EQUATIONS: STA 147+42.30 BK = STA 147+29.60 FWD = +12.70 FT
STA 300+01.80 BK = STA 300+00.00 FWD = +1.80 FT
STA 469+30.50 = STA 186+40 (REVERSAL)

SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, NOVEMBER 1, 2014 AND SPECIFICATION ITEMS LISTED AND DATED AS FOLLOWS, SHALL GOVERN ON THIS PROJECT: REQUIRED CONTRACT PROVISIONS FOR ALL FEDERAL-AID CONSTRUCTION CONTRACTS (FORM FHWA 1273, JULY 2022).

FINAL PLANS

LETTING DATE: _____
DATE CONTRACTOR BEGAN WORK: _____
DATE WORK WAS COMPLETED: _____
DATE WORK WAS ACCEPTED: _____
FINAL CONTRACT COST: $ _____
CONTRACTOR: _____

CONSTRUCTION WORK ON THIS PROJECT WAS PERFORMED IN ACCORDANCE WITH PLANS, CONTRACT AND APPROVED CHANGE ORDERS.

_____ DATE _____

BARRICADES AND WARNING SIGNS

PROVIDE AND ERECT BARRICADES AND WARNING SIGNS IN ACCORDANCE WITH THE BARRICADE & CONSTRUCTION STANDARDS, TCP STANDARDS, THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" AND AS DIRECTED.

RECOMMENDED FOR LETTING: 9/23/2022

DocuSigned by: Jennifer Adams CE1DDBE07C00426
DISTRICT ADVANCE TRANSPORTATION PLANNING DIRECTOR

APPROVED FOR LETTING: 9/23/2022

DocuSigned by: Kelly O. Morris, P.E. F044211639424B4
DISTRICT ENGINEER

FILE: c:\txdot\pw\online\txdot3\sergio.zapata\d0361218\LFK*TitleSheet*Dist Rev.dgn
DATE: 9/23/2022 11:09:53 AM

SHEET NO.	DESCRIPTION
	GENERAL
1	TITLE SHEET
2	INDEX OF SHEETS
3-5	TYPICAL SECTIONS
6, 6A-6G	GENERAL NOTES
7, 7A-7C	ESTIMATE & QUANTITY SHEET
8-27	QUANTITY SUMMARIES
28-32	SUMMARY OF SMALL SIGNS
	TRAFFIC CONTROL PLAN
33	TCP SEQUENCE OF CONSTRUCTION
# 34-45	BC(1)-21 THRU BC(12)-21
# 46	TCP(2-1)-18
# 47	TCP(2-2)-18
# 48	TCP(3-1)-13
# 49	TCP(3-3)-14
# 50	TCP(S-1)-08A
# 51	TCP(S-2)-08A
# 52	TCP(S-2c)-10
# 53	WZ(RS)-22
# 54	WZ(BRK)-13
# 55	WZ(STPM)-13
	ROADWAY DETAILS
56, 56A	SUPERELEVATION DATA
57	SIDE ROAD DETAILS
58	DRIVEWAY DETAILS
58A	MISCELLANEOUS DETAILS
59	MBGF LAYOUT
# 60	NON-MOW STRIP DETAILS (LUFKIN DISTRICT STANDARD)
# 61	GF(31)-19
# 62	SGT(11S)31-18
# 63	SGT(12S)31-18
# 64	SGT(15)31-20
65	MAILBOX TURNOUT DETAILS
# 66-69	MB(1)-21 THRU MB(4)-21
# 69A	WF(2)-10
	DRAINAGE DETAILS
70	DRAINAGE AREA MAP & HYDROLOGIC DATA
71	HYDRAULIC DATA
72-86	CULVERT LAYOUTS
87	STRUCTURAL WINGWALL EXTENSIONS
88-89	MISCELLANEOUS DRAINAGE DETAILS
90	BCS
# 91	CH-PW-0
# 92	CH-PW-S
# 92A	CH-FW-0
# 93	CH-FW-15
# 94	PSET-SC
# 95	PSET-SP
# 96	PW
# 96A	FW-0
# 97-98	SCC-5 & 6
# 99-100	SCC-7
# 101-102	SCC-9
# 103-104	MC-7-10
# 105-106	MC-8-13
# 107-108	SRR
# 109-110	TYPE T631

SHEET NO.	DESCRIPTION
	TRAFFIC ITEMS
# 111-114A	D & OM(1)-20 THRU D & OM(5)-20
# 114B	D & OM(VIA)-20
# 115-116	PM(1)-20 THRU PM(2)-20
# 117-121	RS(1)-13 THRU RS(5)-13
122	SIGN DETAILS
# 123	SMD(GEN)-08
# 124-126	SMD(SLIP-1)-08 THRU SMD(SLIP-3)-08
# 127	SMD(TWT)-08
# 128-130	TSR(3)-13 THRU TSR(5)-13
	ENVIRONMENTAL ISSUES
131	TXDOT SWP3 INDEX
132-133	EPIC
134-161	SWP3 LAYOUTS
162	BLOCK SOD DETAILS
163	TREE REMOVAL AND TRIMMING DETAILS
# 164-166	EC(1)-16 THRU EC(3)-16

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED
PROFESSIONAL ENGINEER

DocuSigned by:
CMB, P.E.
AF852E728AEC4C0...
9/22/2022

THE STANDARD SHEETS SPECIFICALLY IDENTIFIED BY # HAVE BEEN SELECTED BY ME OR UNDER MY RESPONSIBLE SUPERVISION AS BEING APPLICABLE TO THIS PROJECT.

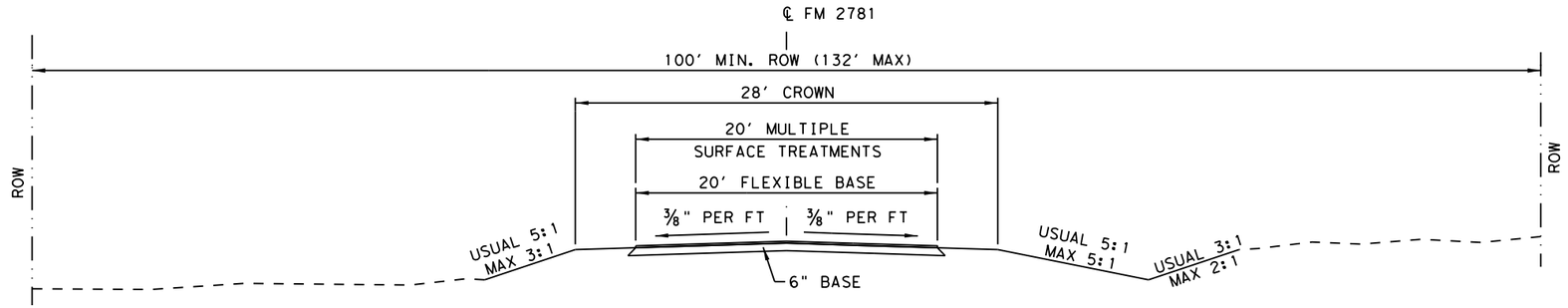
DocuSigned by:
CMB, P.E.
AF852E728AEC4C0...
CHARLES M. BRAZIL, P.E. — 9/22/2022 DATE

INDEX OF SHEETS

TEXAS DEPARTMENT OF TRANSPORTATION

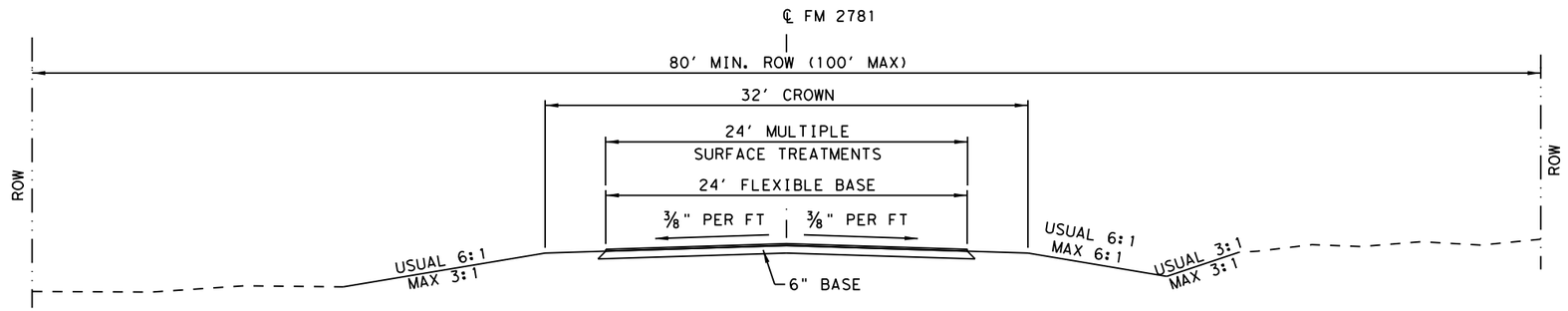
CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		2

9/14/2022 8:10:34 AM
c:\txdot\pw*online\txdot3\sergio.zapata\d0361218\Index of Sheets.dgn



EXISTING TYPICAL SECTION

STA 14+00 TO STA 469+30.50
STA 186+40 TO STA 0+10



EXISTING TYPICAL SECTION

STA 3+12 TO STA 14+00

SCALE 1" = 10'

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED PROFESSIONAL ENGINEER

DocuSigned by:
cmb, P.E.
AF8525728AEC4C0...
9/23/2022

TYPICAL SECTIONS

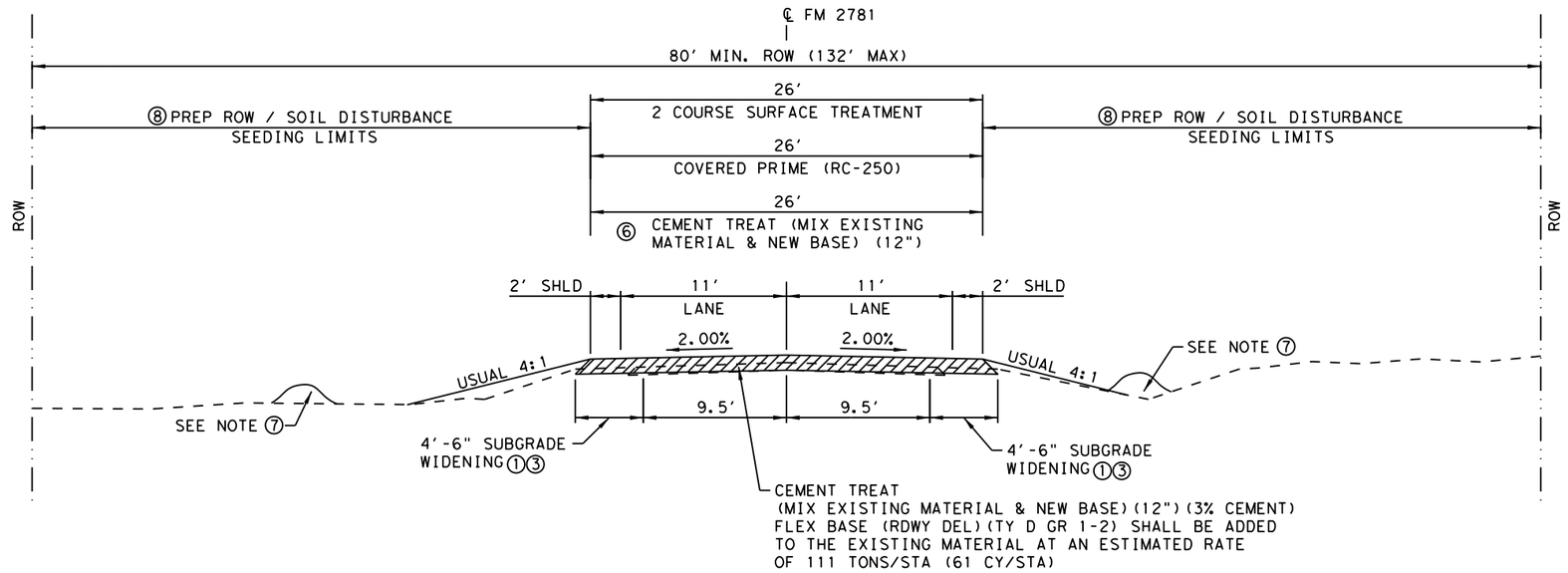
EQUATIONS: STA 147+42.30 BK = STA 147+29.60 FW = +12.70 FT
STA 300+01.80 BK = STA 300+00.00 FWD = +1.80 FT
STA 469+30.50 = STA 186+40 (REVERSAL)

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 1 OF 3

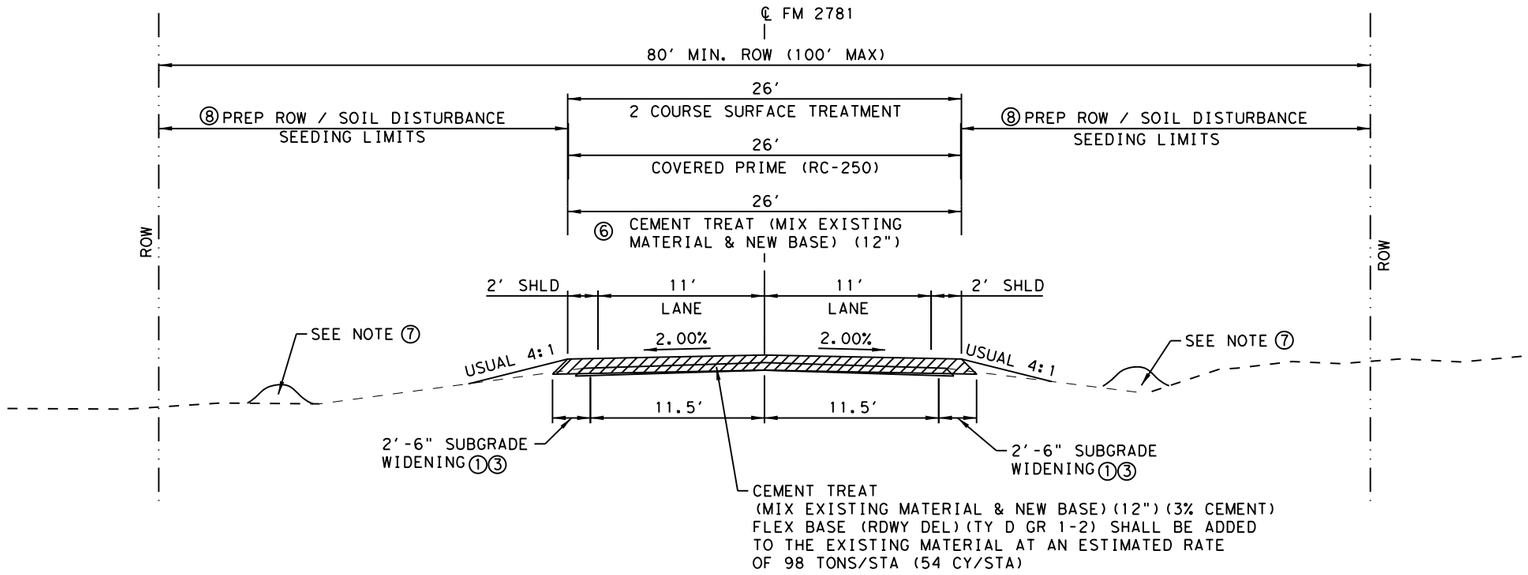
CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		3

9/23/2022 10:39:02 AM
c:\txdot\pw*online\txdot3\sergio.zapata\d0361218\typicals1.dgn



PROPOSED TYPICAL SECTION (FULL REHAB)

STA 14+00 TO STA 140+50
STA 174+20 TO STA 266+52
STA 313+49 TO STA 318+46
STA 346+50 TO STA 352+70
STA 363+69 TO STA 376+97
STA 414+19 TO STA 469+30.50
STA 186+40 TO STA 0+10 (REVERSAL)



PROPOSED TYPICAL SECTION (FULL REHAB)

STA 3+12 TO STA 14+00

NOTES:

① USE CARE WHEN SCARIFYING, RESHAPING AND WIDENING OVER CROSS-DRAINAGE STRUCTURES. DEPTH OF WIDENING MAY NEED TO BE REDUCED TO ACCOMMODATE DRAINAGE FEATURES.

② USE EXCESS EMBANKMENT FROM SUBGRADE WIDENING TO MEET MAXIMUM SLOPE REQUIREMENTS. ADDITIONAL EMBANKMENT MAY BE REQUIRED AND WILL BE PAID FOR AS EMBANKMENT (VEHICLE)(ORD COMP)(TY B).

③ REMOVAL OF EXISTING SURFACE AND/OR BASE WILL BE SUBSIDIARY TO ITEM 112 "SUBGRADE WIDENING".

④ SEE SUPERELEVATION DATE SHEETS FOR SUPERELEVATION INFORMATION.

⑤ THERE ARE LOCATIONS WITHIN THE PROJECT LIMITS WHERE TXDOT MAINTENANCE FORCES HAVE REPAIRED BASE FAILURES. THESE LOCATIONS WERE REPAIRED WITH APPROXIMATELY 12" CEMENT TREATED BASE. THE LOCATION AND LENGTH OF REPAIRS IS UNKNOWN. REGARDLESS OF EXISTING MATERIAL ENCOUNTERED, SCARIFY & RESHAPE TO DEPTHS AND WIDTHS SHOWN ON TYPICAL SECTIONS. THERE WILL BE NO ADDITIONAL COMPENSATION FOR AREAS PREVIOUSLY REPAIRED.

⑥ BASE WORK SHALL BE LIMITED TO 1 MILE, UNLESS OTHERWISE APPROVED.

⑦ BLADE OFF 4" EXISTING TOPSOIL AND WINDROW OUTSIDE WORK AREA AND THEN RETURN TO SLOPES UPON COMPLETION OF ROADWAY WORK. BLADING OFF AND RETURNING EXISTING TOPSOIL TO SLOPES WILL BE PAID FOR ONE TIME UNDER ITEM 150 BLADING (STA).

⑧ NO TREE REMOVAL IN THE DAVY CROCKETT NATIONAL FOREST. LIMBING IS ALLOWED. REFER TO THE TREE REMOVAL AND TRIMMING DETAIL AND EPIC FOR LOCATIONS AND MORE INFORMATION. SEE SWP3 FOR LIMITS OF SOIL DISTURBANCE AND SEEDING WITHIN THE NATIONAL FOREST.

EQUATIONS: STA 147+42.30 BK = STA 147+29.60 FW = +12.70 FT
STA 300+01.80 BK = STA 300+00.00 FWD = +1.80 FT
STA 469+30.50 = STA 186+40 (REVERSAL)

SCALE 1" = 10'

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED
PROFESSIONAL ENGINEER

DocuSigned by:
cmb, P.E.
AF8B2E728AE54C9...
9/23/2022

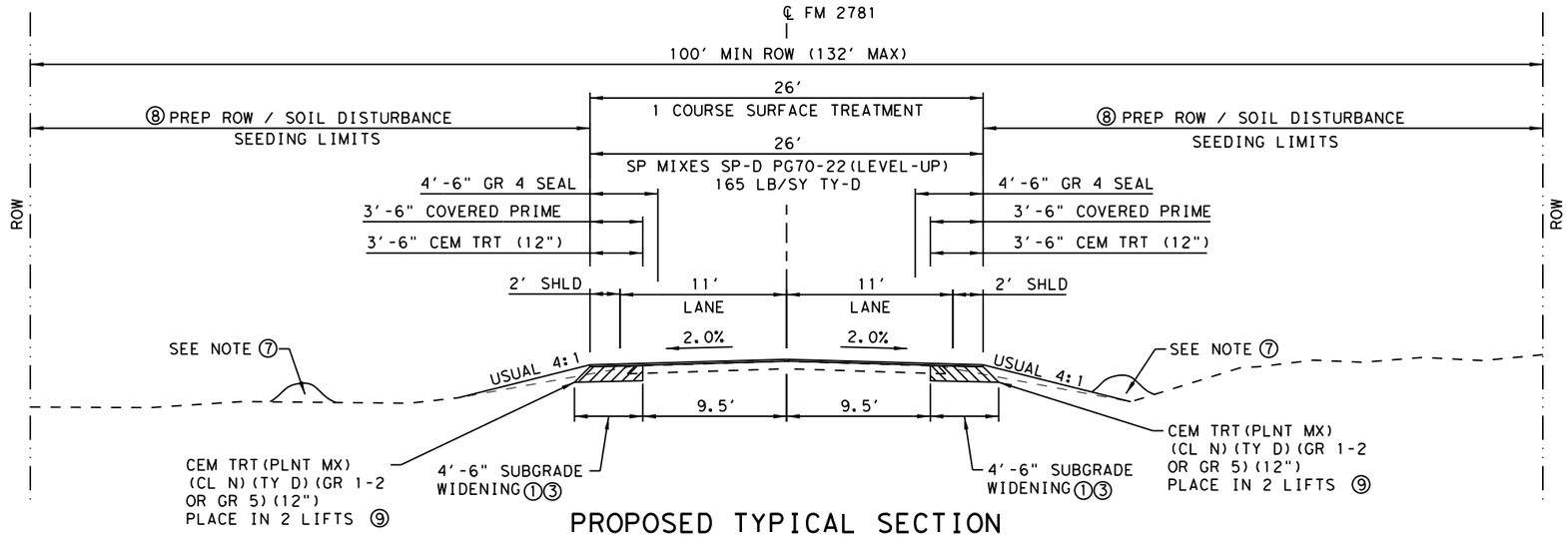
TYPICAL SECTIONS

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 2 OF 3

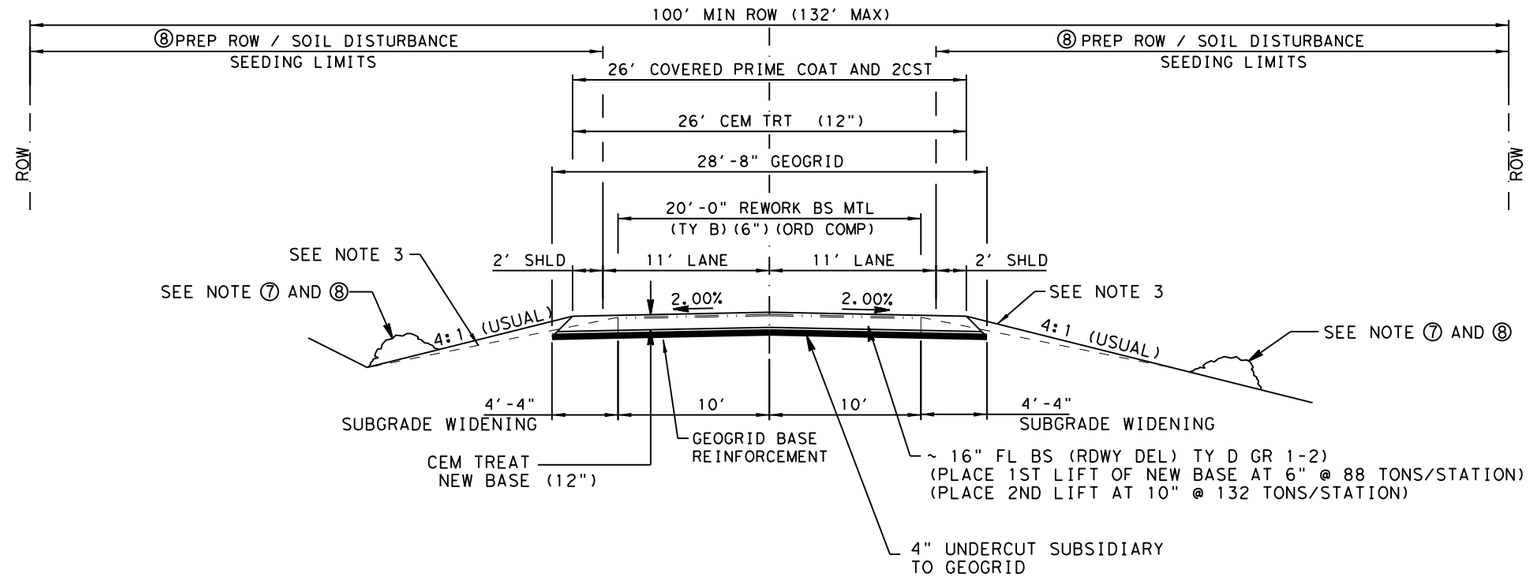
CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		4

9/23/2022 10:39:03 AM
c:\txdot\pw*online\txdot3\sergio.zapata\d0361218\typicals1.dgn



PROPOSED TYPICAL SECTION (WIDENING)

STA 266+52 TO STA 313+49
STA 318+46 TO STA 346+50
STA 352+70 TO STA 363+69
STA 376+97 TO STA 414+19



PROPOSED TYPICAL SECTION (GEOGRID)

STA 140+50 TO STA 174+20

* EXACT LOCATION OF GEOGRID MAY BE ADJUSTED IN THE FIELD AS DIRECTED

NOTES:

① USE CARE WHEN SCARIFYING, RESHAPING AND WIDENING OVER CROSS-DRAINAGE STRUCTURES. DEPTH OF WIDENING MAY NEED TO BE REDUCED TO ACCOMMODATE DRAINAGE FEATURES.

② USE EXCESS EMBANKMENT FROM SUBGRADE WIDENING TO MEET MAXIMUM SLOPE REQUIREMENTS. ADDITIONAL EMBANKMENT MAY BE REQUIRED AND WILL BE PAID FOR AS EMBANKMENT (VEHICLE)(ORD COMP)(TY B).

③ REMOVAL OF EXISTING SURFACE AND/OR BASE WILL BE SUBSIDIARY TO ITEM 112 "SUBGRADE WIDENING".

④ SEE SUPERELEVATION RATE SHEETS FOR SUPERELEVATION INFORMATION.

⑤ THERE ARE LOCATIONS WITHIN THE PROJECT LIMITS WHERE TXDOT MAINTENANCE FORCES HAVE REPAIRED BASE FAILURES. THESE LOCATIONS WERE REPAIRED WITH APPROXIMATELY 12" CEMENT TREATED BASE. THE LOCATION AND LENGTH OF REPAIRS IS UNKNOWN. REGARDLESS OF EXISTING MATERIAL ENCOUNTERED, SCARIFY & RESHAPE TO DEPTHS AND WIDTHS SHOWN ON TYPICAL SECTIONS. THERE WILL BE NO ADDITIONAL COMPENSATION FOR AREAS PREVIOUSLY REPAIRED.

⑥ BASE WORK SHALL BE LIMITED TO 1 MILE, UNLESS OTHERWISE APPROVED.

⑦ BLADE OFF 4" EXISTING TOPSOIL AND WINDROW OUTSIDE WORK AREA AND THEN RETURN TO SLOPES UPON COMPLETION OF ROADWAY WORK. BLADING OFF AND RETURNING EXISTING TOPSOIL TO SLOPES WILL BE PAID FOR ONE TIME UNDER ITEM 150 BLADING (STA).

⑧ NO TREE REMOVAL IN THE DAVY CROCKETT NATIONAL FOREST. LIMBING IS ALLOWED. REFER TO THE TREE REMOVAL AND TRIMMING DETAIL AND EPIC FOR LOCATIONS AND MORE INFORMATION. SEE SWP3 FOR LIMITS OF SOIL DISTURBANCE AND SEEDING WITHIN THE NATIONAL FOREST

⑨ D-GR HMA TY-B (64-22)(10") MAY BE USED AT THE OPTION OF THE CONTRACTOR IN LIEU OF CEM TRT (PLNT MX)(CL N)(TY D)(GR 1-2 OR GR 5). PLACE IN 2 LIFTS UNLESS OTHERWISE APPROVED.

EQUATIONS: STA 147+42.30 BK = STA 147+29.60 FW = +12.70 FT
STA 300+01.80 BK = STA 300+00.00 FWD = +1.80 FT
STA 469+30.50 = STA 186+40 (REVERSAL)

SCALE 1" = 10'

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED
PROFESSIONAL ENGINEER

DocuSigned by:
cmb, P.E.
AF852F728AF5469...
9/23/2022

TYPICAL SECTIONS

TEXAS DEPARTMENT OF TRANSPORTATION
©2022 SHEET 3 OF 3

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		5

9/23/2022 10:39:04 AM
c:\txdot\pw*online\txdot3\sergio.zapata\d0361218\typicals1.dgn

GENERAL NOTES:

Existing regulatory, warning and guide signs within project limits are to remain visible to the traveling public at all times. If a sign must be repositioned during construction operations, move and install the sign to an approved location. Use care when working near existing signs and repair or replace signs damaged by work operations. All work involved repositioning existing signs will be subsidiary to various bid items.

Furnish materials and make repairs to the existing roadway at any location damaged by construction operations. This work shall be done in an approved manner and will be subsidiary to various bid items.

Ensure drainage structures and outfall channels constructed on this project are free of silt and debris at the time of project acceptance. Final clean out work will be subsidiary to various bid items.

Maintain adequate surface drainage throughout the project limits during all phases of construction.

Roadway cross slopes shall conform approximately to the existing surface, unless otherwise directed.

Provide suitable access at all times to adjacent businesses, private property and side roads.

When construction work necessitates the moving of mailboxes, temporarily relocate them as necessary to keep them clear of construction operations and convenient for the mail carrier. Mounts for temporarily relocating mailboxes shall conform to the Department's "Compliant Work Zone Traffic Control Device List" or the mailbox standard. Temporary relocation of mailboxes will be subsidiary to various bid items.

Remove dirt, silt, rocks, debris and other foreign matter that accumulates in structures due to the Contractor's operations as directed. Keep stream channels open at all times. This work will not be paid for directly, but will be subsidiary to pertinent Items.

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

Jesse Sisco. Area Engineer Jesse.Sisco@txdot.gov
Praveen Ramanathan, Asst. Area Engineer Praveen.Ramanathan@txdot.gov

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

All contractor questions will be reviewed by the Engineer. Once a response is developed, it will be posted to TxDOT's Public FTP at the following Address:
https://ftp.dot.state.tx.us/pub/txdot-info/Pre-Letting%20Responses/

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

The contractor's attention is directed to the EPIC sheet(s) included in this plan set for additional information regarding environmental permits, issues, and commitments.

Project Mowing

Mow the highway right of way within the project limits a maximum of 3 cycles per year as directed. Mowing will not be measured or paid for directly, but will be subsidiary to various bid items.

Mow at locations where contract work, equipment or stockpiles conflict with TxDOT's mowing operations. Mowing will not be measured or paid for directly, but will be subsidiary to various bid items.

The equipment used for mowing shall consist of approved mowing units capable of mowing on slopes without marring finished slope surfaces or injuring existing growth. The minimum cutting width shall not be less than 5 ft., unless otherwise approved.

Mow all areas of existing vegetation and vegetation placed during the project as directed. The mowing height shall be 5 in. unless otherwise directed. Repair portions of sod or grass that are injured during mowing operations as directed.

Mow as close as possible to all fixed objects, exercising extreme care not to damage trees, plants, shrubs, signs, delineators or other appurtenances which are part of the facility. Hand trim around such objects, unless otherwise specified.

Use safety chains or other manufacturer's safety device to prevent damage to people or property caused by flying debris propelled out from under rotary mowers. Chains shall be a minimum size of 5/16 in. and links spaced side by side around the mower's front, sides and rear. When mowing at the specified cutting height, the chains shall be long enough to drag the ground. If at any time, it is determined mowing or trimming equipment is defective to the point that it may affect the quality of work or create an unsafe condition, then that equipment shall be immediately repaired or replaced.

Litter Pickup

Remove litter from the right of way in the limits of this project a maximum of 3 cycles per year as directed. Litter pickup will not be measured or paid for directly, but will be subsidiary to various bid items.

In addition to the requirements in Item 5, Section 11, Final Cleanup; remove litter from the right of way at locations where the Contractor may be required to mow. Litter pickup will not be measured or paid for directly, but will be subsidiary to various bid items.

The equipment used for litter pickup shall be approved.

Collect and dispose of all litter deposited by construction operations or the traveling public including cans, bottles, paper, plastic items, metal scraps, lumber, etc. from within the project right of way or as directed. Properly dispose of all collected litter. Do not dump or stockpile collected litter on State property.

For removal of large dead animals, contact nearest TxDOT maintenance section for disposal instructions. Do not bury animal carcasses on State property.

Item 5: Control of the Work

There are several existing sewer manholes within the right of way. Work around them with care to prevent damage to the sewer system.

In the event utility lines needing unforeseen adjustments are encountered during construction operations, alter operations and continue to prosecute the contract in such a manner that will allow utility adjustments to be made by others. An extension of working time may be granted for any delays caused by the utility adjustments if deemed necessary.

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

Item 7: Legal Relations and Responsibilities

No significant traffic generator events identified.

This project has a soil disturbance of 5 acres or more.

The Department will be considered a primary operator for Operational Control Over Plans and Specifications as defined in TPDES GP TXR 150000 for construction activities in the right of way. The Department will post a large site notice, file a notice of intent (NOI), notice of change (NOC), if applicable, and a notice of termination (NOT) along with other requirements per TPDES GP TXR 150000 as the entity having operational control over plans and specifications for work shown on the plans in the right of way.

The Contractor will be considered a primary operator for Day-to-Day Operational Control as defined in TPDES GP TXR 150000 for construction activities in the right of way. In addition to the Department's actions, the Contractor shall file a NOI, NOC, if applicable, and NOT and post a large site notice along with other requirements as the entity of having day-to-day operational control of the work shown on the plans in the right of way. This is in addition to the Contractor

being responsible for TPDES GP TXR 150000 requirements for on- right of way and off- right of way PSL's. Adhere to all requirements of the SWP3 as shown on the plans.

Dispose of all vegetative matter and any other materials removed from State Right of Way in accordance with applicable environmental laws, rules, regulations and requirements.

Burning locations must be approved by the Engineer prior to beginning. Burning activities must be conducted in compliance with Texas Commission on Environmental Quality (TCEQ) regulations. Notify the Engineer when burning activities will take place.

In order to maintain compliance with Chapter 64 of the Texas Parks and Wildlife Code and Migratory Bird Treaty Act (MBTA), construction activities that may affect nests (i.e. tree removal, tree limbing, bridge work) shall be conducted outside of the nesting season (March 15 to September 15). In the event birds or active nests (eggs and/or nestlings present) are encountered, contact the engineer prior to conducting work.

Portions of this project are in the Davy Crockett National Forest. Refer to the EPIC, SWP3 and Tree Removal and Trimming Detail for more information regarding station limits and restrictions.

Item 8: Prosecution and Progress

For this project, working days will be computed and charged in accordance with Item 8, Section 3.1.4 "Standard Workweek".

Submit monthly progress schedules no later than the 20th calendar day of the month. Failure to comply with this deadline may result in the Engineer withholding progress (monthly) payments.

Provide a Critical Path Method (CPM) Construction Schedule unless otherwise approved.

Item 100: Preparing Right of Way

The equipment used to trim limbs shall be approved. A boom axe will not be allowed.

Item 105: Removing Treated and Untreated Base and Asphalt Pavement

Material removed by this operation will become the property of the Contractor.

Item 110: Excavation
Item 132: Embankment

Hauling materials with scrapers across or along existing roadways will not be permitted without written permission.

Grading required for shaping driveways and side road turnouts for pipe culverts at all access locations, will be subsidiary to various bid items.

All blading, rolling, and scraper work to construct and remove temporary slopes adjacent to pavement drop-offs, will be subsidiary to various bid items.

Compact embankment material used to reshape existing slopes to a density comparable with adjacent undisturbed material to the satisfaction of the Engineer.

Item 150: Blading

Use blading to reshape slopes and ditches as directed.

Mix a minimum width of 6 ft. from the edge of pavement and a depth of 6 inches using approved equipment prior to blading operations to reshape front slopes. Mixing will be subsidiary to Item 150.

Item 158: Specialized Excavation Work

Use specialized excavation work at structures to improve drainage as directed.

Item 162: Sodding for Erosion Control

Provide Bermuda block sod unless St. Augustine is the prevailing grass cover at particular placement locations. Provide St. Augustine block sod at those locations.

Item 166: Fertilizer

Fertilize all seeded or sodded areas.

Item 168: Vegetative Watering

Equip water trucks with sprinkler systems capable of watering all of the entire seeded or sodded areas from the roadway.
Water all newly placed sodded or seeded areas at the time of installation. Thereafter, maintain the sodded or seeded areas in a well-watered condition, at no time allow the areas to dry to a condition where water stress is evident.

Item 169: Soil Retention Blankets
In areas designated for soil retention blankets (SRB) in the plans, furnish only spray-on products listed on the Approved Product List for Erosion Control Products based upon the Class and Type specified in the plans. Any substitution to spray –on products must be approved in writing, be listed on the Approved Product List for Erosion Control Products based upon Class and Type, and shall not contain UV degradable, photodegradable or polypropylene materials.

Item 247: Flexible Base

Provide flexible base with a minimum plasticity index of 2.

Provide flexible base material with a minimum Bar Linear Shrinkage of 2% as determined by Test Method Tex-107-E, Part II.

Stockpiling of base material will not be required if testing has been performed and the material has been approved at the source. Deliver approved specified materials to the project.

Compaction requirements for flexible base are ordinary compaction.

Item 275: Cement Treatment (Road-Mixed)

No strength requirement is specified. The target cement content is 3%.

Compact and sprinkle pulverized sections for dust control as directed for traffic use.

Cement treat pulverized sections within 2 days, unless otherwise approved.

Pulverization and cement treatment of the existing roadway will not be allowed from October 1 through March 31 without written permission.

Provide all profile measurement to the Engineer in electronic data files within 3 days after placement of the prime coat using the format specified in Tex-1001-S. The Engineer will use Department software to evaluate longitudinal profiles to determine areas requiring corrective action. Correct 0.1-mi. sections having an average international roughness index (IRI) value greater than 100.0 in. per mile to an IRI value of 100.0 in. per mile or less for each wheel path, unless otherwise shown on the plans.

Item 302: Aggregates for Surface Treatments

When using Type E, furnish Type E aggregate consisting of crushed stone or natural limestone rock asphalt.

When using Type PE aggregate, furnish Type PE aggregate consisting of precoated crushed stone or natural limestone rock asphalt.

Aggregate stockpile locations shall be approved prior to stockpiling.

Locate aggregate stockpiles off the highway right of way unless otherwise approved.

When directed, flush aggregate stockpiled for surface treatment with water to remove excessive dust particles, in such sequence that will permit free water to drain from the stockpiled aggregate prior to surfacing operations. This work will be subsidiary to various bid items.

No surface aggregate classification is required.

The target asphalt content for pre-coating will be 1.0%.

Item 316: Seal Coat

Apply the covered prime weekly.

Open season for asphalt placement is from May 1 thru August 31. Do not place asphalt outside the open season without written approval.

The uniformity and rate of distribution of asphaltic material will be checked periodically during construction. Apply the seal coat in lane widths unless otherwise directed. Where extra width of surfacing has been provided in transitions and climbing lanes, seal the entire surface width.

Resurface county road turnouts and intersection areas as directed.

Place surface on driveways and other road turnouts prior to placing the final roadway surface.

Cease application of asphalt 2 hr. before sunset unless otherwise directed.

Cure the first course of the surface treatment as directed prior to placing the second course.

Cure the surface treatment as directed prior to placement of the overlay.

Cure the covered prime a minimum of 14 days prior to placement of the surface treatment.

Use precoated aggregate with AC-15P, and use non-precoated aggregate with RC-250 and CRS-2P.

Furnish medium pneumatic tire rollers in accordance Item 210, "Rolling". Provide enough rollers to perform the work as directed.

Sweep all roadways with a powered rotary broom prior to placement of the surface treatment to remove all loose or excess material or debris. After rolling, sweep as soon as aggregate has sufficiently bonded to remove excess. Use a vacuum broom on all roadway sections having curb and gutter and all roadway sections within the city limits of any city.

Blade the existing paved shoulders prior to surface treatment operations to remove existing overgrowth. This work will be subsidiary to Item 316.

Item 400: Excavation and Backfill for Structures

When cutting an existing roadway open to traffic, complete all operations including structural excavation, laying pipe and backfilling within daylight hours the day they are initiated.

Replace excavated material deemed unsuitable for backfilling with material approved by the Engineer, paid for under the pertinent bid items or as extra work. This provision does not apply to excavated materials that are too wet and are replaced for the contractor's convenience to expedite the work.

When excavation does not generate enough material to complete the backfill, additional material must be approved prior to use. Additional material will be subsidiary to various bid items.

Item 420: Concrete Substructures

Limit work on structures crossing the roadway to one side of the roadway at a time. No work shall begin on the opposite side of the roadway until backfilling of the initially extended portion of the structure is completed.

Item 427: Surface Finishes for Concrete

Provide a rub finish for Surface Area I.

Item 432: Riprap

Stone riprap will require the placement of filter fabric prior to placement of stones.

Welded wire fabric will not be allowed for reinforcing concrete riprap. Reinforcing shall consist of No. 3 or 4 bars meeting the requirements of grade 60 reinforcing steel. Place bars on 12 in. centers in each direction, supported on reinforcing chairs.

Item 462: Concrete Box Culverts and Drains

Provide cast-in-place box culverts.

Limit work on box culverts crossing the roadway to one side of the roadway at a time. No work shall begin on the opposite side of the roadway until backfilling of the first side of the box culvert being extended is complete.

Item 464: Reinforced Concrete Pipe

Lay each private entrance or side road pipe culvert to the line and grade as directed.

At locations where existing driveway pipes are to be removed and replaced, replace the top *6"* in. of the existing driveway with material equal to or better than the existing driveway material. This work will be subsidiary to various bid items.

Limit work on pipe culverts crossing the road to one side of the roadway at a time. No work shall begin on the opposite side of the roadway until backfilling the first side of the pipe culvert being extended is complete.

When excavation does not generate enough material to complete the backfill, additional material must be approved prior to use and will be paid for under Item 132.

Item 466: Headwalls and Wingwalls

Provide cast-in-place headwalls and wingwalls.

Item 467: Safety End Treatment

Use Type II precast concrete units of the same style and design.

Provide 12 in. deep toewalls on Type II precast safety end treatments.

To improve drainage, grade existing ditch within ten feet of proposed safety end treatment. This work shall be subsidiary to Item 467.

When excavation does not generate enough material to complete the backfill, additional material must be approved prior to use. Additional material will be subsidiary to various bid items.

Check each location where safety end treatments are to be installed to verify pipe lengths shown will produce the desired slope. Extra pipe will be paid for, but removing and replacing safety end treatment units previously installed under this Contract will not be paid for.

Place safety end treatments along the same slope as the pipe.

Item 480: leaning Existing Culverts

Certain box culverts will require cleaning to remove silt and other debris. Waters carried by these box culverts have been determined to be waters of the United States and are under jurisdiction of the U.S. Army Corps of Engineers. Silt and other debris removal shall be immediately hauled to an upland location for dumping. Material will not be side cast into either the water channel or its banks. Removal of the sediment is limited to the minimum necessary to restore the waterway to its configuration when the structure was built. No work will be allowed outside of the right-of-way. This work shall also be restricted to a distance of no more than 20 ft. from the end of the structure.

Item 502: Barricades, Signs, and Traffic Handling

Traffic Control Plan (TCP):

Ensure the Contractor's Responsible Person (CRP) or their alternate for Barricades, Signs and Traffic Handling is available at all times and able to receive instructions from the Engineer or authorized Department representative. The CRP shall be a person that is usually at the project site during normal working hours.

For protection of the traveling public, direct traffic through the work area using signs, flaggers and other devices. Required signs are shown in the plans on the Barricade and Construction Standards and Traffic Control Plan Sheets. The latest edition of the "Texas Manual on Uniform Traffic Control Devices" shall also be used as a guide for handling traffic on this project.

Use "Do Not Pass" (R4-1) signs to mark the beginnings of roadway sections where passing is prohibited and use "Pass With Care" (R4-2) signs to mark the beginnings of roadway sections where passing is permitted. Install signs at the time signing for project limits are erected. Sign placement shall be verified and approved.

Furnishing, erecting, relocating and removing temporary speed zone signs is subsidiary to Item 502.

In general, restrict construction work to single lane widths. Control traffic in accordance with standard drawings WZ(BTS-1) "Traffic Signal Installation Typical Details"; WZ(BTS-2) "Traffic Signal Installation Barricades and Signs"; and, Part VI of the "Texas Manual on Uniform Traffic Control Devices for Streets and Highways". Unless otherwise approved, use an

advance warning, flashing arrow panel in addition to the necessary signs, barricades, or other traffic control devices at the work area.

Restrict construction work to single lane widths with only minor disruptions in traffic flow. Lane closures shall conform to the Traffic Control Plan for lane closures as shown in the plans. No overnight closures will be permitted.

Limit lane closures for multilane roads (4 or more lanes) to 2 mi. in length, unless otherwise approved.

Limit lane closures for 2 lane roads to 1 mi. in length, unless otherwise approved.

Lane closure lengths can exclude the end tapers.

Plan the sequence of work to minimize the time lane closures are in place. Install lane closures only where construction operations are anticipated to start within 1 hr. and limited to the amount of lane that can be reached by the construction activity within 2 hr. unless otherwise approved.

Provide flashing arrow panels to supplement required signs and devices for lane closures.

Provide temporary rumble strips as shown on work zone rumble strip standards.

Provide a pilot car to lead traffic through the work area. The pilot car will not be paid for directly, but will be subsidiary to various bid items.

Halt traffic during the time asphalt is being applied to the roadway. No vehicles will be allowed to pass the asphalt distributor during asphalt application.

Provide adequate flaggers to protect the traveling public when working on or near a roadway carrying traffic. All flaggers shall wear hardhats and reflective vests.

Install "Be Prepared to Stop" (CW3-4) and "Flagger Ahead" (CW20-7aD) signs when flaggers are present. Position the signs where good visibility and traffic control can be maintained.

Use a flashing arrow board in addition to the required signs to warn motorists of flaggers.

Use additional flaggers at roadway intersections to direct traffic entering the work area, when deemed necessary by the Engineer.

Open all traffic lanes to traffic at the close of work each day.

Install "Pavement Ends" (CW8-3) and "30 mph" (CW13-1P) signs where the paved surface of the road ends. Use flashing arrow panels to supplement these signs during nighttime hours.

Provide one high-intensity yellow, rotating dome-light on all equipment such as distributors, spreader boxes, lay-down machines, dump trucks, rollers, backhoes, road graders, loaders, etc. within the work zone. Mount lights high enough to be visible from all directions and operating

when the equipment is in the work zone. On all other equipment such as automobiles, trailers, etc. use emergency flashers while within the work zone.

Install "Shoulder Drop-Off" (CW8-17) and “Uneven Lanes” (CW8-11) signs at one-half mile spacings as the hot mix asphalt is placed, unless otherwise directed. Maintain signs until the condition is eliminated.

Install vertical panels or drums at 100-ft. spacings where drop-offs or construction work occurs along edges of existing pavement. Unless otherwise authorized, these shall remain in place until final striping.

Install "Slow Down on Wet Road" (CW8-5aT), "Shoulder Drop-Off" (CW8-17) “Uneven Lanes” (CW8-11), “Bump” (CW8-1) and "Soft Shoulder" (CW8-4) signs during construction as directed.

Restrict construction operations so that no drop off along the edge of pavement will remain overnight.

All blading, rolling and scraper work to construct and remove temporary slopes adjacent to pavement drop-offs, will be considered subsidiary to various bid items.

Notify the Engineer prior to placing any materials or equipment on the right of way. Locate equipment, stockpiles or other materials not in use as far as possible from the driving lanes and in no case closer than 30 ft. unless otherwise authorized. Any equipment, stockpiles, or materials placed within 30 ft. of the driving lane must have adequate signs, barricades or other warning devices as approved. As a minimum place an 8 ft. wide TY III Barricade or barrels on the approach side of each site that is within 30 ft. of the driving lane. Use TY III Barricade or barrels for the site similarly on the departure side if the location is within 30 ft. of the opposing traffic lane.

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.

Texas Transportation Code 547.105 authorizes the use of warning lights to promote safety and provides an effective means of gaining the travelling public’s attention as they drive in areas where construction crews are present. In order to influence the public to move over when high risk construction activities are taking place, minimize the utilization of blue warning lights. These lights must be used only while performing work on or near the travel lanes or shoulder where the travelling public encounters construction crews that are not protected by a standard work zone set up such as a lane closure, shoulder closure, or one-way traffic control. Refrain

from leaving the warning lights engaged while travelling from one work location to another or while parked on the right of way away from the pavement or a work zone.

Temporary stop lines as shown on TCP (2-2)-18 should be omitted.

Provide an illuminated flagger station when nighttime work is performed.

Install "Stay Alert" (G20-10T) and "OBEY" (R20-3T) signs at the beginning of the construction zone at “T” intersections as directed.

All workers on TxDOT right-of-way shall wear reflective clothing meeting ANSI Class II requirements during the day and ANSI Class III requirements during the night.

Item 504: Field Office and Laboratory

Provide a Type D Structure. Asphalt content will be determined by the ignition method.

Item 506: Temporary Erosion, Sedimentation, and Environmental Controls

Locations and types of BMPs may require adjustments prior to or after placement as directed by the Engineer. Adjustments should be made to ensure BMPs are working effectively and maintain compliance with the Construction General Permit. Notify the Engineer prior to making adjustments.

Item 540: Metal Beam Guard Fence

Use round timber posts.

Use timber post on all metal beam guard fence installations except where steel posts are required. Determine length of steel posts for low fill culvert post mounting in the field to insure proper metal beam guard fence height.

At the close of work each day, protect the ends of metal beam guard fence in an approved manner, so that no blunt ends are exposed to approaching traffic. Plastic drums will be required at these locations.

For existing non-mow strip to remain in place, backfill top 4” in an existing abandoned post hole with HMA and backfill below 4” with suitable earth material. This work will be subsidiary to Item 540.

The removal of existing HMA/Base to place MBGF posts is subsidiary to the various bid items.

Form or core holes and recesses. Percussion drilling is not permitted.

Item 560: Mailbox Assemblies

Repair and, if necessary, replace mailboxes damaged by construction operations.

The number and type of mailbox assemblies shown in the plans are for estimating purposes; actual quantities may vary.

Mount 2 reflectors, 1 on each side of the post. Use 1 size 3 reflector mounted on the upstream and downstream sides of the post as directed for single and double mailbox assemblies.

Use 1 strip of reflective sheeting on the upstream and downstream sides of post for multiple mailbox assemblies in lieu of the Type 2 object marker shown on the mailbox standards. Each strip shall be approximately 12 in. wide. Use reflective sheeting conforming to DMS-8600.

Item 585: Ride Quality for Pavement Surfaces

Use Surface Test Type B pay adjustment schedule 2.

Ride quality requirements are waived.

Use Surface Test Type A.

Item 644: Small Roadside Sign Assemblies

Install adjacent signs with bottom edges at equal heights.

Sign placement shall be in accordance with the "Sign Crew Field Book" and as shown on the plans, except that the Engineer may shift the sign supports, within design guidelines, where necessary to secure a more desirable location or to avoid conflict with utilities. Stake all sign support locations for verification and approval.

Existing supports shall not be reused, and shall become the property of the Contractor.

Salvage all sign blanks to be removed and deliver the same day to TxDOT's facility at *Houston County Maintenance Facility, 1123 East Loop 304, Crockett, TX 75835.*

Place relocated signs as close as feasible to existing signs, unless placement conflicts with the Sign Crew Field Book.

Prior to ordering signs, advisory speeds at horizontal curves shall be verified by the department.

Wrap red retroreflective tape (NGIP Code 801-49-87-1008) around the support post of all STOP, YIELD, and DO NOT ENTER signs. Tape shall be placed approximately 4 feet above the surface of the edge of the roadway adjacent to the sign and shall be wrapped to a height of 12 inches. The tape and the placement of the tape on the sign posts shall be subsidiary to the sign assembly.

Item 658: Delineator and Object Marker Assemblies

Install delineators on the departure side of the posts when mounting to metal beam guard fence and guardrail end treatments.

Install CTB barrier reflectors on top of concrete bridge rail and concrete barriers.

Install D-SW delineators on the departure side of steel bridge rail posts.

Item 662: Work Zone Pavement Markings

Place standard work zone pavement markings before traffic is routed over detours.

Install standard work zone pavement markings on the level-up course of the overlay.

Standard work zone pavement markings shall be paint and glass beads or thermoplastic.

Install short term pavement markings (removable) on the hot mix asphalt immediately following final rolling.

Install short term pavement markings (removable) on the finish course of the overlay immediately following final rolling, offset from lane lines so there will be no conflict with permanent stripes.

Place short term pavement markings on the level-up course of the hot mix asphalt and the existing pavement after planing.

Place short term pavement markings on the surface treatment and level-up course immediately following final rolling.

After placement of permanent striping on the finish course, remove all short term pavement markings.

Furnish Type II glass beads conforming to DMS-8290, "Glass Traffic Beads", for hot applied thermoplastic and traffic paint markings.

Item 666: Reflectorized Pavement Markings

Remove loose aggregate immediately prior to placing pavement markings.

Place reflectorized pavement markings no sooner than 3 days nor later than 14 days after placement of the surface treatment.

Type I markings must meet the minimum retroreflectivity values for edgeline markings, centerline or no passing barrier-line, and lane lines when measured any time after 3 days, but not later than 10 days after application.

Before construction operations begin, observe and mark existing passing/no passing zones. Passing/no passing zones shall be verified prior to placement of permanent pavement markings.

Furnish Type II glass beads conforming to DMS-8290, "Glass Traffic Beads", for Type I and II Markings.

Use Type II pavement markings as a sealer for Type I pavement markings.

Place a minimum of 500 ft. of 4 in. double yellow no passing lines on the approach to all stop condition intersections for two lane roads unless otherwise shown in the plans or directed.

Item 3076: Dense-Graded Hot-Mix Asphalt

Trial batches may be required whenever the design has not been produced in the previous 12 months. Trial batches will be subsidiary to the bid item.

No surface aggregate classification is required.

TX-203 Will be ran on the complete mix and a requires minimum of 45%

No Department-owned RAP is available.

RAP produced from this project may be used in the HMA mixtures. All RAP not utilized in the HMA shall be delivered to the TxDOT maintenance facility located at *Houston County Maintenance Facility, 1123 East Loop 304, Crockett, TX 75835*

Operate the spreading and finishing machine at a uniform forward speed consistent with the plant production rate, hauling capability, and roller train capacity to result in a continuous operation. The speed shall be slow enough so that stopping between trucks is not ordinarily required. If, in the opinion of the Engineer, sporadic delivery of material is adversely affecting the HMA placement, the Engineer may require paving operations to cease until acceptable methods are employed to minimize starting and stopping of the paver.

Add hydrated lime to all HMA mixtures at a minimum rate of 1.0% by weight of the total aggregate, except for those mixtures containing RAP and/or RAS. Mixtures that contain RAP and/or RAS shall be designed at a rate of minimum 0.5 % of lime by weight and the test results will be evaluated by the engineer to determine if lime or a liquid anti-strip additive will be used. The hydrated lime shall meet the requirements of DMS-6350, "Lime and Lime Slurry". The hydrated lime shall be added in accordance with the construction method in Item 301, "Asphalt Antistripping Agents". This lime will be subsidiary to this item.

Cover each load of mixture with waterproof tarpaulins.

Limit uneven pavement to 2 days production.

For HMA placements greater than 2 inches, construct longitudinal joints adjacent to travel ways with a maximum 1 inch vertical edge and an adjacent 3:1 maximum taper.

Along outside pavement edges construct a 3:1 maximum taper or backfill the same day as shown on the plans or as directed.

Remove and properly dispose of any piles of asphaltic concrete and all other debris left on the right of way daily.

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

Two (2) TMAs (stationary) will be required for this project. The contractor will be responsible for determining if multiple operations will be on going at the same time to determine the total number of TMAs needed for the project.

Two (2) TMAs will be required on all other roadways for each mobile operation. Quantities were estimated based on one mobile working operation, as per the number of working days. If multiple crews are utilized, additional TMAs will be required.

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 2707-01-011 **DISTRICT** Lufkin **COUNTY** Houston, Trinity
HIGHWAY FM 2781

			CONTROL SECTION JOB	**2707-01-011**		**2707-01-014**		**2707-02-008**		TOTAL EST.	TOTAL FINAL
			PROJECT ID	**A00053679**		**A00184412**		**A00053684**			
			COUNTY	**Houston**		**Houston**		**Trinity**			
			HIGHWAY	**FM 2781**		**FM 2781**		**FM 2781**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL	EST.	FINAL	EST.	FINAL		
	100-6002	PREPARING ROW	STA	224.000		405.000		25.000		654.000	
	104-6017	REMOVING CONC (DRIVEWAYS)	SY			235.000				235.000	
	112-6001	SUBGRADE WIDENING (ORD COMP)	STA	222.570		405.020		25.040		652.630	
	132-6019	EMBANKMENT (VEHICLE)(ORD COMP)(TY B)	CY	9,222.000		18,362.000		1,214.000		28,798.000	
	150-6001	BLADING	STA	222.570		405.020		25.040		652.630	
	158-6003	SPEC EXCAV WORK (HYD EXCAVATOR)	HR	34.500		91.000		14.500		140.000	
	162-6002	BLOCK SODDING	SY	1,841.000		5,690.000		772.000		8,303.000	
	164-6009	BROADCAST SEED (TEMP) (WARM)	SY	47,145.000		86,295.000		2,637.000		136,077.000	
	164-6011	BROADCAST SEED (TEMP) (COOL)	SY	47,145.000		86,295.000		2,637.000		136,077.000	
	164-6054	BOND FBR MTRX SEED (PERM)(RURAL)(SAND)	SY	94,290.000		172,589.000		5,274.000		272,153.000	
	168-6001	VEGETATIVE WATERING	MG	3,808.560		7,017.520		226.360		11,052.440	
	169-6002	SOIL RETENTION BLANKETS (CL 1) (TY B)	SY			1,435.000				1,435.000	
	204-6003	SPRINKLING (DUST CONTROL)	MG	625.000		831.000		72.000		1,528.000	
	247-6133	FL BS (RDWY DEL) (TY D GR 1-2)	TON	26,833.000		34,203.000		2,958.000		63,994.000	
	251-6025	REWORK BS MTL (TY B) (6") (ORD COMP)	SY			10,524.000				10,524.000	
	275-6001	CEMENT	TON	1,125.000		1,737.000		130.000		2,992.000	
	275-6023	CEMENT TREAT(MX EXST MTL & NW BS)(12")	SY	62,508.000		73,420.000		7,234.000		143,162.000	
	275-6035	CEMENT TREAT (NEW BASE)(12")	SY			9,772.000				9,772.000	
	276-6232	CEM TRT(PLNT MX) (CLN)(TYA)(GR1-2)(12")	SY	481.000		9,103.000				9,584.000	
	316-6029	ASPH (RC-250)	GAL	15,747.000		23,074.000		1,809.000		40,630.000	
	316-6151	AGGR(TY-PE GR-4 SAC-A)	CY	476.000		868.000		54.000		1,398.000	
	316-6402	AGGR (TY-PE, E, L OR PL GR 3)	CY	494.000		825.000		63.000		1,382.000	
	316-6417	AGGR (TY E OR L GR 5)	CY	450.000		659.000		52.000		1,161.000	
	316-6530	ASPH (AC-15P OR CRS-2P)	TON	249.000		413.000		28.000		690.000	
	351-6008	FLEXIBLE PAVEMENT STRUCTURE REPAIR(12")	SY	100.000		400.000				500.000	
	400-6005	CEM STABIL BKFL	CY	20.000		32.000				52.000	
	402-6001	TRENCH EXCAVATION PROTECTION	LF	20.000				6.000		26.000	
	403-6001	TEMPORARY SPL SHORING	SF	249.000		972.000		86.000		1,307.000	
	420-6057	CL C CONC (WINGWALLS)	CY			13.000				13.000	
	420-6071	CL C CONC (COLLAR)	EA	2.000		7.000		2.000		11.000	
	420-6077	CL E CONC (SEAL SLAB)(NON-REINF)	CY			5.000				5.000	
	432-6002	RIPRAP (CONC)(5 IN)	CY			0.900				0.900	
	432-6026	RIPRAP (STONE COMMON)(DRY)(18 IN)	CY	49.000		133.000				182.000	
	450-6018	RAIL (TY T631)	LF			26.300				26.300	
	462-6050	CONC BOX CULV (5 FT X 2 FT)(EXTEND)	LF			22.000				22.000	
	462-6055	CONC BOX CULV (6 FT X 4 FT)(EXTEND)	LF			27.000				27.000	
	462-6062	CONC BOX CULV (7 FT X 7 FT)(EXTEND)	LF			48.000				48.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 2707-01-011 **DISTRICT** Lufkin **COUNTY** Houston, Trinity
HIGHWAY FM 2781

			CONTROL SECTION JOB	**2707-01-011**		**2707-01-014**		**2707-02-008**		TOTAL EST.	TOTAL FINAL
			PROJECT ID	**A00053679**		**A00184412**		**A00053684**			
			COUNTY	**Houston**		**Houston**		**Trinity**			
			HIGHWAY	**FM 2781**		**FM 2781**		**FM 2781**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL	EST.	FINAL	EST.	FINAL		
	462-6064	CONC BOX CULV (8 FT X 5 FT)(EXTEND)	LF			50.000				50.000	
	462-6100	CONC BOX CULV (9 FT X 4 FT)(EXTEND)	LF			22.000				22.000	
	464-6003	RC PIPE (CL III)(18 IN)	LF	556.000		2,176.000		170.000		2,902.000	
	464-6005	RC PIPE (CL III)(24 IN)	LF	112.000		218.000		54.000		384.000	
	464-6007	RC PIPE (CL III)(30 IN)	LF	4.000		26.000				30.000	
	464-6008	RC PIPE (CL III)(36 IN)	LF	14.000						14.000	
	464-6009	RC PIPE (CL III)(42 IN)	LF	10.000		24.000		8.000		42.000	
	464-6011	RC PIPE (CL III)(54 IN)	LF					28.000		28.000	
	465-6158	INLET(COMPL)(PAZD)(FG)(3FTX3FT-3FTX3FT)	EA					1.000		1.000	
	466-6010	HEADWALL (CH - FW - 0) (DIA= 42 IN)	EA			2.000				2.000	
	466-6025	HEADWALL (CH - FW - 15) (DIA= 42 IN)	EA	1.000						1.000	
	466-6099	HEADWALL (CH - PW - 0) (DIA= 30 IN)	EA			1.000				1.000	
	466-6102	HEADWALL (CH - PW - 0) (DIA= 42 IN)	EA	1.000						1.000	
	466-6104	HEADWALL (CH - PW - 0) (DIA= 54 IN)	EA					2.000		2.000	
	466-6105	HEADWALL (CH - PW - 0) (DIA= 60 IN)	EA	1.000						1.000	
	466-6130	HEADWALL (CH - PW - S) (DIA= 24 IN)	EA	1.000						1.000	
	466-6132	HEADWALL (CH - PW - S) (DIA= 30 IN)	EA			2.000				2.000	
	466-6135	HEADWALL (CH - PW - S) (DIA= 42 IN)	EA			1.000		2.000		3.000	
	466-6136	HEADWALL (CH - PW - S) (DIA= 48 IN)	EA			1.000				1.000	
	466-6151	WINGWALL (FW - 0) (HW=4 FT)	EA			1.000				1.000	
	466-6193	WINGWALL (PW - 2) (HW=4 FT)	EA			1.000				1.000	
	466-6195	WINGWALL (PW - 2) (HW=6 FT)	EA			4.000				4.000	
	466-6196	WINGWALL (PW - 2) (HW=7 FT)	EA			2.000				2.000	
	466-6198	WINGWALL (PW - 2) (HW=9 FT)	EA			2.000				2.000	
	467-6358	SET (TY II) (18 IN) (RCP) (4: 1) (C)	EA	4.000		12.000				16.000	
	467-6363	SET (TY II) (18 IN) (RCP) (6: 1) (P)	EA	42.000		156.000		12.000		210.000	
	467-6390	SET (TY II) (24 IN) (RCP) (4: 1) (C)	EA	2.000		3.000				5.000	
	467-6395	SET (TY II) (24 IN) (RCP) (6: 1) (P)	EA	10.000		16.000		4.000		30.000	
	467-6419	SET (TY II) (30 IN) (RCP) (4: 1) (C)	EA	2.000		3.000				5.000	
	467-6450	SET (TY II) (36 IN) (RCP) (4: 1) (C)	EA	4.000						4.000	
	480-6001	CLEAN EXIST CULVERTS	EA	2.000		3.000				5.000	
	496-6016	REMOV STR (PIPE)	EA	17.000		77.000		8.000		102.000	
	500-6001	MOBILIZATION	LS	0.320		0.640		0.040		1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	29.000						29.000	
	506-6002	ROCK FILTER DAMS (INSTALL) (TY 2)	LF	40.000		500.000		30.000		570.000	
	506-6011	ROCK FILTER DAMS (REMOVE)	LF	40.000		500.000		30.000		570.000	
	506-6020	CONSTRUCTION EXITS (INSTALL) (TY 1)	SY			22.000		22.000		44.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 2707-01-011 **DISTRICT** Lufkin **COUNTY** Houston, Trinity
HIGHWAY FM 2781

			CONTROL SECTION JOB		**2707-01-011**		**2707-01-014**		**2707-02-008**		TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00053679**		**A00184412**		**A00053684**			
			COUNTY		**Houston**		**Houston**		**Trinity**			
			HIGHWAY		**FM 2781**		**FM 2781**		**FM 2781**			
ALT	**BID CODE**	**DESCRIPTION**		**UNIT**	EST.	FINAL	EST.	FINAL	EST.	FINAL		
	506-6024	CONSTRUCTION EXITS (REMOVE)		SY			22.000		22.000		44.000	
	506-6034	CONSTRUCTION PERIMETER FENCE		LF	471.000						471.000	
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)		LF	4,237.000		15,207.000		1,570.000		21,014.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)		LF	4,237.000		15,207.000		1,570.000		21,014.000	
	530-6004	DRIVEWAYS (CONC)		SY			235.000				235.000	
	530-6005	DRIVEWAYS (ACP)		SY	1,570.000		3,375.000		339.000		5,284.000	
	530-6006	DRIVEWAYS (SURF TREAT)		SY	1,231.000		4,782.000		269.000		6,282.000	
	530-6009	TURNOUTS (SURF TREAT)		SY	106.000		706.000		29.000		841.000	
	540-6001	MTL W-BEAM GD FEN (TIM POST)		LF			897.400				897.400	
	540-6020	MTL W - BEAM GD FEN (LOW FILL CULVERT)		LF			26.300				26.300	
	544-6001	GUARDRAIL END TREATMENT (INSTALL)		EA			4.000				4.000	
	552-6003	WIRE FENCE (TY C)		LF	1,627.000						1,627.000	
	552-6005	GATE (TY 1)		EA	1.000						1.000	
	560-6007	MAILBOX INSTALL-S (WC-POST) TY 3		EA	3.000		25.000		1.000		29.000	
	560-6008	MAILBOX INSTALL-D (WC-POST) TY 3		EA	1.000		3.000				4.000	
	560-6021	MAILBOX INSTALL-M (TWG-POST) TY 7		EA			6.000				6.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)		EA	1.000		1.000				2.000	
	644-6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)		EA	2.000						2.000	
	644-6007	IN SM RD SN SUP&AM TY10BWG(1)SA(U)		EA	1.000						1.000	
	644-6030	IN SM RD SN SUP&AM TYS80(1)SA(T)		EA	2.000						2.000	
	644-6033	IN SM RD SN SUP&AM TYS80(1)SA(U)		EA	1.000		1.000				2.000	
	644-6060	IN SM RD SN SUP&AM TYTWT(1)WS(P)		EA	14.000		34.000		4.000		52.000	
	644-6061	IN SM RD SN SUP&AM TYTWT(1)WS(T)		EA	1.000		2.000				3.000	
	644-6076	REMOVE SM RD SN SUP&AM		EA	22.000		38.000		4.000		64.000	
	658-6062	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)		EA			8.000				8.000	
	658-6109	INSTL OM ASSM (OM-2Z)(WFLX)SRF(BI)		EA	18.000		52.000		10.000		80.000	
	662-6004	WK ZN PAV MRK NON-REMOV (W)4"(SLD)		LF	89,026.000		161,952.000		10,016.000		260,994.000	
	662-6034	WK ZN PAV MRK NON-REMOV (Y)4"(SLD)		LF	89,026.000		161,952.000		10,016.000		260,994.000	
	662-6095	WK ZN PAV MRK REMOV (Y)4"(SLD)		LF	5,022.000		9,135.000		567.000		14,724.000	
	662-6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2		EA	558.000		1,015.000		63.000		1,636.000	
	666-6343	REF PROF PAV MRK TY I(W)6"(SLD)(100MIL)		LF	44,513.000		81,005.000		5,008.000		130,526.000	
	666-6344	REF PROF PAV MRK TY I(Y)4"(BRK)(100MIL)		LF					500.000		500.000	
	666-6346	REF PROF PAV MRK TY I(Y)6"(BRK)(100MIL)		LF	4,390.000		6,780.000		510.000		11,680.000	
	666-6347	REF PROF PAV MRK TY I(Y)6"(SLD)(100MIL)		LF	20,914.000		37,676.000		1,551.000		60,141.000	
	668-6076	PREFAB PAV MRK TY C (W) (24") (SLD)		LF			25.000		20.000		45.000	
	672-6009	REFL PAV MRKR TY II-A-A		EA	482.000		811.000		46.000		1,339.000	
	681-6001	TEMP TRAF SIGNALS		EA	2.000						2.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 2707-01-011 **DISTRICT** Lufkin **COUNTY** Houston, Trinity
HIGHWAY FM 2781

			CONTROL SECTION JOB	**2707-01-011**		**2707-01-014**		**2707-02-008**		TOTAL EST.	TOTAL FINAL
			PROJECT ID	**A00053679**		**A00184412**		**A00053684**			
			COUNTY	**Houston**		**Houston**		**Trinity**			
			HIGHWAY	**FM 2781**		**FM 2781**		**FM 2781**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL	EST.	FINAL	EST.	FINAL		
	3076-6071	D-GR HMA TY-D PG 64-22 (EXEMPT)	TON			192.000				192.000	
	3077-6051	SP MIXESSP-DPG70-22	TON	148.000		2,790.000				2,938.000	
	3084-6001	BONDING COURSE	GAL	89.000		1,691.000				1,780.000	
	5001-6001	GEOGRID BASE REINFORCEMENT (TY I)	SY			9,772.000				9,772.000	
	6001-6002	PORTABLE CHANGEABLE MESSAGE SIGN	EA			2.000				2.000	
	6056-6002	PREFORMED CENTERLINE RUMBLE STRIP	LF	720.000		1,675.000		190.000		2,585.000	
	6185-6002	TMA (STATIONARY)	DAY	160.000		314.000		26.000		500.000	
	6185-6005	TMA (MOBILE OPERATION)	DAY	8.000		14.000		2.000		24.000	
	18	EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)	LS	1.000						1.000	
		SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000						1.000	

ROADWAY SUMMARY

STATION TO STATION			LENGTH	WIDTH	AREA	ITEM NO.	251	112	150	132	204	247	275		6035	276	316								3077	3084	5001
						BID CODE	6025	6001	6001	6019	6003	6133	6023	6001	GEOGRI	6232	6029	6417	6530	6402	6530		6151		6051	6001	6001
																	COVERED	PRIME	1ST CRSE SURF TRT		2ND CRSE SURF TRT						
										(5)		(2)	(3) (4)						(7)	(1) (6)	(7)	(1) (6)						
							REWORK BS MTL (TY B) (6") (ORD COMP)	SUBGRADE WIDENING (ORD COMP)	BLADING	EMBANKMENT (VEHICLE) (ORD COMP) (TY B)	SPRINKLING (DUST CONTROL)	FL BS (RDWY DEL) (TY D GR 1-2)	CEMENT TREAT (MX EXST MTL & NW BS) (12")	CEMENT (3% BY WT)	CEMENT TREAT (NEW BASE) (12")	CEM TRT (PLNT MX) (CLN) (TY A) (GR1-2) (12")	ASPH (RC-250)	AGGR (TY E OR L GR 5)	ASPH (AC-15P OR CRS-2P)	AGGR (TY-PE, E, L OR PL GR 3)	ASPH (AC-15P OR CRS-2P)		AGGR (TY-PE GR-4 SAC-A)	SP MIXES SP-D PG70-22	BONDING COURSE	GEOGRID BASE REINFORCEMENT (TYI)
											10 GAL/SY			36 LBS/SY			0.25 GAL/SY	1 CY/140 SY	0.50 GAL/SY	1 CY/115 SY	0.42 GAL/SY		1 CY/135 SY	165 LB/SY	0.05 GAL/SY	
CCSJ 2707-01-011			FT	FT	SY		SY	STA	STA	CY	MG	TON	SY	TON	SY	SY	GAL	CY	GAL	TON	CY	GAL	TON	CY	TON	GAL	SY
CSJ 2707-01-014																											
3+12.00	TO	14+00.00	1088	26	3143			10.88	10.88	403	31	1138	3143	57			786	22	1572	7	27	1320	6	23			
14+00.00	TO	140+50.00	12650	26	36544			126.50	126.50	4685	365	14943	36544	658			9136	261	18272	78	318	15348	65	271			
140+50.00	TO	147+42.30	692.3	26	2000	2154		6.92	6.92	256	20	619		36	2000		500	14	1000	4	17	840	4	15			2000
147+29.60	TO	174+20.00	2690.4	26	7772	8370		26.90	26.90	996	78	2406		140	7772		1943	56	3886	17	68	3264	14	58			7772
174+20.00	TO	266+52.00	9232	26	26670			92.32	92.32	3419	267	10905	26670	480			6668	191	13335	57	232	11201	48	198			
266+52.00	TO	300+01.80	3349.8	26	9677			33.50	33.50	1241						2605	651	19	1675	7	29	4064	17	72	798	484	
300+00.00	TO	313+49.00	1349	26	3897			13.49	13.49	500						1049	262	7	675	3	12	1637	7	29	322	195	
313+49.00	TO	318+46.00	497	26	1436			4.97	4.97	184	14	587	1436	26			359	10	718	3	12	603	3	11			
318+46.00	TO	346+50.00	2804	26	8100			28.04	28.04	1039						2181	545	16	1402	6	24	3402	14	60	668	405	
346+50.00	TO	352+70.00	620	26	1791			6.20	6.20	230	18	732	1791	32			448	13	896	4	16	752	3	13			
352+70.00	TO	363+69.00	1099	26	3175			10.99	10.99	407						855	214	6	550	2	10	1334	6	24	262	159	
363+69.00	TO	376+97.00	1328	26	3836			13.28	13.28	492	38	1569	3836	69			959	27	1918	8	33	1611	7	28			
376+97.00	TO	408+00.00	3103	26	8964			31.03	31.03	1149						2413	603	17	1552	7	27	3765	16	66	740	448	
SUPERELEVATION CORRECTION										550		1304															
CSJ 2707-01-014 TOTAL							10524	405.02	405.02	15551	831	34203	73420	1498	9772	9103	23074	659	47451	203	825	49141	210	868	2790	1691	9772
CSJ 2707-01-011																											
408+00.00	TO	414+19.00	619	26	1788			6.19	6.19	229						481	120	3	310	1	5	751	3	13	148	89	
414+19.00	TO	425+38.00	1119	26	3233			11.19	11.19	414	32	1322	3233	58			808	23	1617	7	28	1358	6	24			
425+38.00	TO	469+30.50	4392.5	26	12689			43.93	43.93	1627	127	5189	12689	228			3172	91	6345	27	110	5329	23	94			
186+40.00 (REVERSAL)	TO	25+14.00 (REVERSAL)	16126	26	46586			161.26	161.26	5973	466	19049	46586	839			11647	333	23293	99	405	19566	83	345			
SUPERELEVATION CORRECTION										538		1273															
CSJ 2707-01-011 TOTAL							0	222.57	222.57	8781	625	26833	62508	1125	0	481	15747	450	31565	134	548	27004	115	476	148	89	0
CSJ 2707-02-008																											
25+14.00 (REVERSAL)	TO	0+10.00 (REVERSAL)	2504	26	7234			25.04	25.04	927	72	2958	7234	130			1809	52	3617	15	63	3038	13	54			
CSJ 2707-02-008 TOTAL							0	25.04	25.04	927	72	2958	7234	130	0	0	1809	52	3617	15	63	3038	13	54	0	0	0
PROJECT TOTALS							10524	652.63	652.63	25259	1528	63994	143162	2753	9772	9584	40630	1161	82633	352	1436	79183	338	1398	2938	1780	9772

(1) FOR CONTRACTORS INFORMATION ONLY.
(2) FLEX BASE UNIT WEIGHT ESTIMATE = 135 LBS/CF.
(3) 3% CEMENT IS ESTIMATED, ACTUAL PERCENT OF CEMENT TO BE DETERMINED FROM BLENDED SAMPLE.
(4) SCARIFY AND RESHAPE EXISTING MATERIAL SUBSIDIARY TO ITEM 275.
(5) USE AS DIRECTED FOR CONSTRUCTING FRONT SLOPES.
(6) USE PRECOATED AGGREGATE WITH AC-15P. USE NON-PRECOATED AGGREGATE WITH CRS-2P.

(7) TONS = $\frac{\text{RATE X (SGA)}}{2000}$ X SY

SPECIFIC GRAVITY OF ASPHALT (SGA)
ESTIMATED AT 1.02 X 8.3269

EQUATIONS: STA 147+42.30 BK = STA 147+29.60 FW = +12.70 FT
STA 300+01.80 BK = STA 300+00.00 FWD = +1.80 FT
STA 469+30.50 = STA 186+40 (REVERSAL)

QUANTITY SUMMARIES

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 1 OF 20

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		8

EROSION CONTROL SUMMARY

ITEM NO.	158	164			168	506						
BID CODE	6003	6009	6011	6054	6001 (11)	6002	6011	6020	6024	6034	6038	6039
LIMITS	SPEC EXCAV WORK (HYD EXCAVATOR)	BROADCAST SEED (TEMP) (WARM)	BROADCAST SEED (TEMP) (COOL)	BOND FBR MTRX SEED (PERM) (RURAL) (SAND)	VEGETATIVE WATERING	ROCK FILTER DAMS (INSTALL) (TY 2)	ROCK FILTER DAMS (REMOVE)	CONSTRUCTION EXITS (INSTALL) (TY 1)	CONSTRUCTION EXITS (REMOVE)	CONSTRUCTION PERIMETER FENCE	TEMP SEDMT CONT FENCE (INSTALL)	TEMP SEDMT CONT FENCE (REMOVE)
CCSJ 2707-01-011	HR	SY	SY	SY	MG	LF	LF	SY	SY	LF	LF	LF
CSJ 2707-01-014												
3+12 TO 408+00	50	86295	86295	172589	6903.6	500	500	22	22		15207	15207
CSJ 2707-01-014 TOTAL	**50**	**86295**	**86295**	**172589**	**6903.6**	**500**	**500**	**22**	**22**	**0**	**15207**	**15207**
CSJ 2707-01-011												
408+00.00 TO 469+30.5	20									471		
186+40 (REVERSAL) TO 25+14 (REVERSAL)		47145	47145	94290	3771.6	40	40				4237	4237
CSJ 2707-01-011 TOTAL	**20**	**47145**	**47145**	**94290**	**3771.6**	**40**	**40**	**0**	**0**	**471**	**4237**	**4237**
CSJ 2707-02-008												
25+14 (REVERSAL) TO 0+10 (REVERSAL)	10	2637	2637	5274	211.0	30	30	22	22		1570	1570
CSJ 2707-02-008 TOTAL	**10**	**2637**	**2637**	**5274**	**211.0**	**30**	**30**	**22**	**22**	**0**	**1570**	**1570**
PROJECT TOTALS	**80**	**136077**	**136077**	**272153**	**10886.2**	**570**	**570**	**44**	**44**	**471**	**21014**	**21014**

NOTE: LOCATIONS AND TYPES OF BMP'S MAY REQUIRE ADJUSTMENTS PRIOR TO OR AFTER PLACEMENT AS DIRECTED BY THE ENGINEER. ADJUSTMENTS SHOULD BE MADE TO ENSURE BMP'S ARE WORKING EFFECTIVELY AND MAINTAIN COMPLIANCE WITH THE CONSTRUCTION GENERAL PERMIT. NOTIFY THE ENGINEER PRIOR TO MAKING ADJUSTMENTS.

(11) 2 APPLICATIONS AT 10 GAL/SY PER APPLICATION

MAILBOX SUMMARY

ITEM NO.	530	560		
BID CODE	6009	6007	6008	6003
LOCATION	TURNOUTS (SURF TREAT)	MAILBOX INSTALL-S (WC-POST) TY 3	MAILBOX INSTALL-D (WC-POST) TY 3	MAILBOX INSTALL-M (TWG-POST) TY 1
CCSJ 2707-01-014	SY	EA	EA	EA
CSJ 2707-01-014				
STA 7+00, LT	29	2		
STA 7+60, LT	20	1		
STA 9+80, LT	20			1
STA 12+35, LT	21			1
STA 15+00, LT	24		1	1
STA 23+70, LT	19	1		
STA 38+40, LT	19	1		
STA 41+60, LT	19	1		
STA 64+50, RT	19	1		
STA 130+50, RT	19	1		
STA 156+20, LT	29			1
STA 160+30, LT	29	1		
STA 170+00, LT	29	1		
STA 174+90, LT	18	1		
STA 202+87, RT	19	1		
STA 250+10, RT	19		1	
STA 265+10, RT	29	1		
STA 274+60, RT	21	1		1
STA 287+80, RT	30	1		
STA 334+00, RT	19	1		
STA 352+20, RT	29	1		
STA 356+40, RT	19	1		
STA 360+00, RT	29	1		
STA 366+80, RT	18	1		
STA 370+60, RT	21		1	1
STA 372+40, RT	34	1		
STA 376+50, RT	29	1		
STA 378+50, RT	18	1		
STA 382+20, RT	29	1		
STA 391+80, RT	29	1		
CSJ 2707-01-014 TOTAL	**706**	**25**	**3**	**6**
CSJ 2707-01-011				
STA 186+00 (REVERSAL), RT	29	1		
STA 173+33 (REVERSAL), RT	29	1		
STA 119+70 (REVERSAL), LT	29	1		
STA 68+00 (REVERSAL), RT	19		1	
CSJ 2707-01-011 TOTAL	**106**	**3**	**1**	**0**
CSJ 2707-02-008				
STA 7+63 (REVERSAL), RT	29	1		
CSJ 2707-02-008 TOTAL	**29**	**1**	**0**	**0**
PROJECT TOTALS	**841**	**29**	**4**	**6**

TRAFFIC CONTROL SUMMARY

ITEM NO.	662				6001	681	6185	
BID CODE	6004 (10)	6034 (10)	6111 (10)	6095 (10)	6002	6001	6002	6005
LIMITS	WK ZN PAV MRK NON-REMOV (W) 4" (SLD)	WK ZN PAV MRK NON-REMOV (Y) 4" (SLD)	WK ZN PAV MRK SHT TERM (TAB) TY Y-2	WK ZN PAV MRK REMOV (Y) 4" (SLD)	PORTABLE CHANGEABLE MESSAGE SIGN	TEMP TRAF SIGNALS	TMA (STATIONARY)	TMA (MOBILE OPERATION)
CCSJ 2707-01-011	LF	LF	EA	LF	EA	EA	DAY	DAY
CSJ 2707-01-014								
3+12 TO 408+00	161,952	161,952	1,015	9,135	2		314	14
CSJ 2707-01-014 TOTAL	**161,952**	**161,952**	**1,015**	**9,135**	**2**	**0**	**314**	**14**
CSJ 2707-01-011								
408+00 TO 469+30.5	24,522	24,522	154	1,386			30	**8**
186+40 (REVERSAL) TO 25+14 (REVERSAL)	64,504	64,504	404	3,636		**2**	130	
CSJ 2707-01-011 TOTAL	**89,026**	**89,026**	**558**	**5,022**	**0**	**2**	**160**	**8**
CSJ 2707-02-008								
25+14 (REVERSAL) TO 0+10 (REVERSAL)	10,016	10,016	63	567			26	2
CSJ 2707-02-008 TOTAL	**10,016**	**10,016**	**63**	**567**	**0**	**0**	**26**	**2**
PROJECT TOTALS	**260,994**	**260,994**	**1,636**	**14,724**	**2**	**2**	**500**	**24**

(10) ONE APPLICATION ON COVERED PRIME, ONE APPLICATION ON 1CST.

EQUATIONS:
STA 147+42.30 BK = STA 147+29.60 FW = +12.70 FT
STA 300+01.80 BK = STA 300+00.00 FWD = +1.80 FT
STA 469+30.50 = STA 186+40 (REVERSAL)

QUANTITY SUMMARIES

TEXAS DEPARTMENT OF TRANSPORTATION

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		9

PERMANENT PAVEMENT MARKINGS & MARKERS SUMMARY

ITEM NO.			666			668	672	6056
BID CODE			6343	6346	6347	6076	6009	6002
			(12)	(13)	(14)		(15)	(16)
LIMITS			REF PROF PAV MRK TY I (W)6"(SLD) (100MIL)	REF PROF PAV MRK TY I (Y)6"(BRK) (100MIL)	REF PROF PAV MRK TY I (Y)6"(SLD) (100MIL)	PREFAB PAV MRK TY C (W) (24") (SLD)	REFL PAV MRKR TY II-A-A	PREFORMED CENTERLINE RUMBLE STRIP
CCSJ 2707-01-011			LF	LF	LF	LF	EA	LF
CSJ 2707-01-014								
3+12	TO	408+00	81005	6780	37676	25	811	1675
CSJ 2707-01-014 TOTAL			81005	6780	37676	25	811	1675
CSJ 2707-01-011								
408+00	TO	469+30.5	12261	1080	6594		135	135
186+40 (REVERSAL)	TO	25+14 (REVERSAL)	32252	3310	14320		347	585
CSJ 2707-01-011 TOTAL			44513	4390	20914	0	482	720
CSJ 2707-02-008								
25+14 (REVERSAL)	TO	0+10 (REVERSAL)	5008	510	1551	20	46	190
CSJ 2707-02-008 TOTAL			5008	510	1551	20	46	190
PROJECT TOTALS			130526	11680	60141	45	1339	2585

(12) TWO SOLID WHITE EDGE LINES FOR LENGTH OF PROJECT.
(13) BROKEN YELLOW AT RATE OF 10' EVERY 40'.
(14) DOUBLE SOLID YELLOW FOR SINGLE NO PASS LINES.
(15) BASED ON 1 EVERY 40' FOR NO PASS ZONES AND 1 EVERY 80' FOR PASSING ZONES.
(16) BASED ON 5' EVERY 40' FOR TWO WAY PASSING ZONES.

FLEXIBLE BASE REPAIR (12") SUMMARY

ITEM NO.	105	3077	351
BID CODE	6020	6001	6008
	(8)	(8)	(9)
LOCATION	REMOVING STAB BASE & ASPH PAV (12")	SP MIXES SP-B PG64-22	FLEXIBLE PAVEMENT STRUCTURE REPAIR (12")
CCSJ 2707-01-011	SY	TON	SY
CSJ 2707-01-014			
AS DIRECTED	400	264	400
CSJ 2707-01-014 TOTAL	400	264	400
CSJ 2707-01-011			
AS DIRECTED	100	66	100
CSJ 2707-01-011 TOTAL	100	66	100
CSJ 2707-02-008			
AS DIRECTED	0	0	0
CSJ 2707-02-008 TOTAL	0	0	0
PROJECT TOTALS	500	330	500

(8) FOR CONTRACTOR'S INFORMATION ONLY.
(9) TO BE USED AS DIRECTED.

METAL BEAM GUARD FENCE SUMMARY

ITEM NO.	132	169	450	540		544	658	3076	3076
BID CODE	6019	6002	6018	6001	6020	6001	6062	6071	6071
LOCATION	EMBANKMENT (VEHICLE) (ORD COMP) (TY B)	SOIL RETENTION BLANKETS (CL 1) (TY B)	RAIL (TY T631)	MTL W-BEAM GD FEN (TIM POST)	MTL W - BEAM GD FEN (LOW FILL CULVERT)	GUARDRAIL END TREATMENT (INSTALL)	INSTL DEL ASSM (D-SW) SZ 1(BRF) GF2(BI)	D-GR HMA TY-D PG64-22 (EXEMPT) (4") (440 LBS/SY)	D-GR HMA TY-D PG64-22 (EXEMPT) (10") (1100 LBS/SY)
	CY	SY	LF	LF	LF	EA	EA	TON	TON
PINEY CREEK	443	1,435	26.3	897.4	26.3	4	8	152	40
CSJ 2707-01-014 TOTAL	443	1,435	26.3	897.4	26.3	4	8	152	40
PROJECT TOTALS	443	1,435	26.3	897.4	26.3	4	8	152	40

PREP ROW SUMMARY

ITEM NO.			100	552		
BID CODE			6002	6003	6005	(17)
STATION TO STATION			PREPARING ROW	WIRE FENCE (TY C)	GATE (TY 1)	WIRE FENCE (TY C) (REMOVE)
CCSJ 2707-01-011			STA	LF	EA	LF
CSJ 2707-01-014						
3+12	TO	408+00	405			
CSJ 2707-01-014 TOTAL			405	0	0	0
CSJ 2707-01-011						
408+00	TO	469+30.50	62			
25+14 (REVERSAL)	TO	186+40 (REVERSAL)	162	1627	1	1595
CSJ 2707-01-011 TOTAL			224	1627	1	1595
CSJ 2707-02-008						
25+14 (REVERSAL)	TO	0+10 (REVERSAL)	25			
CSJ 2707-02-008 TOTAL			25	0	0	0
PROJECT TOTALS			654	1627	1	1595

(17) SUBSIDIARY TO ITEM 552

SMALL SIGN SUMMARY

ITEM NO.			644							
BID CODE			6001	6004	6007	6030	6033	6060	6061	6076
LIMITS			IN SM RD SN SUP&AM TY10BWG(1)SA(P)	IN SM RD SN SUP&AM TY10BWG (1)SA(T)	IN SM RD SN SUP&AM TY10BWG(1)SA(U)	IN SM RD SN SUP&AM TYS80(1)SA(T)	IN SM RD SN SUP&AM TYS80(1)SA(U)	IN SM RD SN SUP&AM TYTWT (1)WS(P)	IN SM RD SN SUP&AM TYTWT (1)WS(T)	REMOVE SM RD SN SUP&AM
STATION	TO	STATION	EA	EA	EA	EA	EA	EA	EA	EA
CCSJ 2707-01-011										
CSJ 2707-01-014										
3+12	TO	408+00	1				1	34	2	38
CSJ 2707-01-014 TOTAL			1	0	0	0	1	34	2	38
CSJ 2707-01-011										
408+00	TO	25+14 (REVERSAL)	1	2	1	2	1	14	1	22
CSJ 2707-01-011 TOTAL			1	2	1	2	1	14	1	22
CSJ 2707-02-008										
25+14 (REVERSAL)	TO	0+10 (REVERSAL)						4		4
CSJ 2707-02-008 TOTAL			0	0	0	0	0	4	0	4
PROJECT TOTALS			2	2	1	2	2	52	3	64

QUANTITY SUMMARIES

TEXAS DEPARTMENT OF TRANSPORTATION

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		10

SUMMARY OF DRIVEWAY AND SIDEROADS

ID	STATION	OFFSET	EXIST SURF	RCS	AVG WIDTH	LENGTH	RADIUS FT		EXISTING STRUCTURE	OFFSET FROM CL		PROPOSED STRUCTURE	REMOVING CONC (DRIVEWAYS)	(2) BLOCK SODDING	VEGETATIVE WATERING	464 RC PIPE (CL III)		465 INLET (COMPL) (PAZD (FG) (3FTX3F-3FTX3FT)	467 SET (TY II) (1)		496 REMOV STR (PIPE)	530 DRIVEWAYS (CONC)	530 DRIVEWAYS		
															(10 GAL/SY /2 APP)	(18 IN)	(24 IN)		(18 IN) (RCP) (6:1) (P)	(24 IN) (RCP) (6:1) (P)			(ACP) (440 LBS/ SY)	(ACP) (660 LBS/ SY)	DRIVE WAYS (SURF TREAT)
					FT	FT	LT	RT		EXIST FT	PROP FT		SY	SY	MG	LF	LF	EA	EA	EA	EA	SY	SY	SY	SY
CSJ 2707-01-014																									
D1	3+95	R	DIRT	R	15	27	15	15	EXIST 15" X 22' RCP	27	27	REM EXIST 15" X 22' & INSTALL 18" X 26' RCP W/SET		28	0.56	26			2		1				56
D2	4+02	L	ASPH	C	37	27	20	20	NO PIPE			NO STRUCTURE WORK											130		
D3	4+73	R	DIRT	R	11	27	15	15	EXIST 15" X 19' RCP	29	29	REM EXIST 15" X 19' & INSTALL 18" X 28' RCP W/SET		28	0.56	28			2		1				44
D4	5+37	L	CONC	C	73	27	20	20	NO PIPE			NO STRUCTURE WORK	235									235			
D5	5+79	R	ASPH	C	51	27	20	20	NO PIPE			NO STRUCTURE WORK											172		
D5A	6+07	L	DIRT	R	12	27	15	15	EXIST 15" X 16' RCP	26	26	REM EXIST 15" X 16' & INSTALL 18" X 16' RCP W/SET		28	0.56	16			2		1				47
D6	6+61	R	GRAVEL	S	14	27	15	15	EXIST 18" X 31' RCP	28	28	INSTALL SET		28	0.56				2						53
D7	6+60	L	GRAVEL	S	19	27	15	15	EXIST 15" X 41' CMP	26	28	REM EXIST 15" X 41' & INSTALL 18" X 24' RCP W/SET		28	0.56	24			2		1				69
D8	7+42	L	ASPH	R	11	27	15	15	EXIST 18" X 21' RCP	26	29	REM EXIST 18" X 21' & INSTALL 18" X 22' RCP W/SET		28	0.56	22			2		1		44		
D9	7+63	R	ASPH	R	13	27	SEE D10	15	EXIST 18" X 40' RCP	26	26	REM EXIST 18" X 40' & INSTALL 18" X 42' RCP W/SET		14	0.28	42			1		1		48		
D10	7+82	R	ASPH	R	11	27	15	15	SEE D9	26	26	SEE D9		14	0.28				1				42		
D11	9+55	L	DIRT	R	16	27	15	15	EXIST 18" X 20' RCP	25	31	REM EXIST 18" X 20' & INSTALL 18" X 28' RCP W/SET		28	0.56	28			2		1				59
D12	9+56	R	ASPH	R	11	27	15	15	EXIST 18" X 20' RCP	28	28	INSTALL SET		28	0.56				2				44		
D13	10+27	R	ASPH	R	13	27	15	15	EXIST 18" X 33' RCP	29		INSTALL SET		28	0.56				2				50		
D14	10+26	L	GRAVEL	S	22	27	15	15	EXIST 18" X 43' RCP	27	31	REM EXIST 18" X 43' & INSTALL 18" X 44' RCP W/SET		28	0.56	44			2		1				85
D15	10+96	L	DIRT	R	15	27	15	15	EXIST 18" X 18'HDPE	30	30	REM EXIST 18" X 18' HDPE & INSTALL 18" X 24' RCP W/SET		28	0.56	24			2		1				56
D16	11+68	L	GRAVEL	R	10	27	15	15	EXIST 15" X 38' RCP	31	31	REM EXIST 15" X 38' & INSTALL 18" X 24' RCP W/SET		28	0.56	24			2		1				40
D17	12+13	L	ASPH	R	10	27	15	15	EXIST 15" X 14' RCP	31	31	REM EXIST 15" X 14' & INSTALL 18" X 20' RCP W/SET		28	0.56	20			2		1		40		
D18	13+40	R	ASPH	R	13	27	15	15	EXIST 18" X 21' RCP	23		REM EXIST 18" X 21' & INSTALL 18" X 20' RCP W/SET		28	0.56	20			2		1		52		
												CSJ 2707-01-014 SHEET TOTALS	235	420	8.4	318	0	0	30	0	12	235	622	0	509

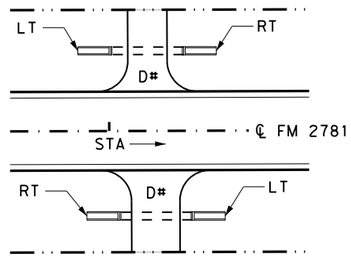
NOTE: A FULL TOPOGRAPHICAL SURVEY WAS NOT PERFORMED. STATIONS WERE ACQUIRED USING A DIGITAL MEASURING INSTRUMENT (DMI). THE STATIONS SHOWN ARE APPROXIMATE AND SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO COMMENCEMENT OF WORK.

R - RESIDENTIAL
C - COMMERCIAL
S - SIDEROAD

(1) PROVIDE 12" DEEP TOEWALL FOR ALL SET'S.

(2)

REQUIRED BLOCK SODDING AT EACH SET END	
CULVERT SIZE	SY
18"	14
24"	17
36"	22



DRIVEWAYS

QUANTITY SUMMARIES

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 4 OF 20

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		11

SUMMARY OF DRIVEWAY AND SIDEROADS (CONTINUED)

ID	STATION	OFFSET	EXIST SURF	RCS	AVG WIDTH	LENGTH	RADIUS FT		EXISTING STRUCTURE	OFFSET FROM CL		PROPOSED STRUCTURE	104 REMOVING CONC (DRIVEWAYS)	162 (2) BLOCK SODDING	168 VEGETATIVE WATERING (10 GAL/SY /2 APP)	464 RC PIPE (CL III) (18 IN)	464 RC PIPE (CL III) (24 IN)	465 INLET (COMPL) (PAZD (FG) (3FTX3F-3FTX3FT)	467 SET (TY II) (1) (18 IN) (RCP) (6:1) (P)	467 SET (TY II) (1) (24 IN) (RCP) (6:1) (P)	496 REMOV STR (PIPE)	530 DRIVEWAYS (CONC)	530 DRIVEWAYS (ACP) (440 LBS/SY)	530 DRIVEWAYS (ACP) (660 LBS/SY)	6006 DRIVEWAYS (SURF TREAT)
										EXIST	PROP														
					FT	FT	LT	RT		FT	FT		SY	SY	MG	LF	LF	EA	EA	EA	EA	SY	SY	SY	SY
CSJ 2707-01-014 (CONTINUED)																									
D19	14+55	R	ASPH	R	13	27	15	15	EXIST 15" X 18' CMP	28	33	REM EXIST 15" X 18" CMP & INSTALL 18" X 48' RCP W/SET		28	0.56	48			2		1		51		
D20	15+33	L	ASPH	S	38	37	20	20	NO PIPE			NO STRUCTURE WORK											175		
D21	16+45	R	ASPH	R	13	53	15	15	NO PIPE			NO STRUCTURE WORK											87		
D22	21+30	R	GRAVEL	R	14	53	15	15	NO PIPE			NO STRUCTURE WORK													93
D23	23+26	L	GRAVEL	R	15	53	15	15	EXIST 12" X 24' CMP	23	30	REM EXIST 12" X 24' & INSTALL 24" X 22' RCP W/SET		34	0.68		22			2	1				99
D24	27+85	R	DIRT	R	16	37	15	15	EXIST 18" X 21' RCP	26	27	REM EXIST 18" X 21' & INSTALL 24" X 32' RCP W/SET		34	0.68		24			2	1				76
D25	37+95	L	ASPH	R	41	37	15	15	EXIST 15" X 20' CMP	25	27	REM EXIST 15" X 20' & INSTALL 18" X 20' RCP W/SET		28	0.56	20			2		1		72		
D26	41+80	L	ASPH	R	12	53	15	15	EXIST 18" X 22' RCP	23	29	REM EXIST 18" X 22' & INSTALL 18" X 22' RCP W/SET		28	0.56	22			2		1		81		
D27	43+47	R	DIRT	R	11	53	15	15	EXIST 15" X 14' CMP	25	25	REM EXIST 15" X 14' & INSTALL 18" X 24' RCP W/SET		28	0.56	24			2		1				76
D28	52+72	R	DIRT	R	12	37	15	15	EXIST 12" X 25' RCP	25	25	REM EXIST 12" X 25' & INSTALL 18" X 22' RCP W/SET		28	0.56	22			2		1				60
D29	57+90	R	DIRT	S	31	37	15	10	EXIST 15" X 36' RCP	26	26	REM EXIST 15" X 36' & INSTALL 18" X 36' RCP W/SET		28	0.56	36			2		1				139
D30	60+10	L	DIRT	R	17	37	15	15	EXIST 18" X 23' RCP	25	27	REM EXIST 18" X 23' & INSTALL 18" X 36' RCP W/SET		28	0.56	36			2		1				75
D31	63+79	R	DIRT	R	21	37	15	15	EXIST 18" X 23' CMP	25	27	REM EXIST 18" X 23' & INSTALL 18" X 24' RCP W/SET		28	0.56	24			2		1				93
D32	66+80	R	DIRT	R	17	37	15	15	EXIST 12" X 23' CMP	24	24	REM EXIST 12" X 23' & INSTALL 18" X 24' RCP W/SET		28	0.56	24			2		1				81
D33	67+90	L	DIRT	R	13	37	15	15	NO PIPE			NO STRUCTURE WORK													64
D34	128+55	R	ASPH	S	25	53	15	15	NO PIPE			NO STRUCTURE WORK												158	
D35	128+80	L	DIRT	R	40	53	15	15	EXIST 18" X 40' CMP	26	26	REM EXIST 18" X 40' & INSTALL 18" X 20' RCP W/SET		28	0.56	20			2		1				81
D36	130+20	R	ASPH	R	14	53	15	15	NO PIPE			NO STRUCTURE WORK											93		
D37	136+84	R	DIRT	R	13	53	15	15	EXIST 15" X 14' CMP	29	29	REM EXIST 15" X 14' & INSTALL 18" X 26' RCP W/SET		28	0.56	26			2		1				87
D38	147+25	R	DIRT	R	16	37	15	15	EXIST 18" X 25' RCP	26	26	INSTALL 18" SET		28	0.56				2						77
												CSJ 2707-01-014 SHEET TOTALS	0	404	8.08	302	46	0	24	4	13	0	559	158	1101

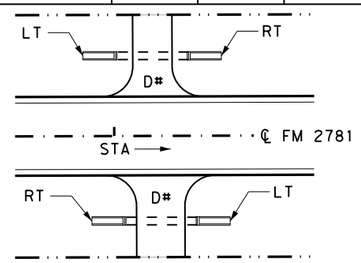
NOTE: A FULL TOPOGRAPHICAL SURVEY WAS NOT PERFORMED. STATIONS WERE ACQUIRED USING A DIGITAL MEASURING INSTRUMENT (DMI). THE STATIONS SHOWN ARE APPROXIMATE AND SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO COMMENCEMENT OF WORK.

R - RESIDENTIAL
C - COMMERCIAL
S - SIDEROAD

(1) PROVIDE 12" DEEP TOEWALL FOR ALL SET'S.

(2)

REQUIRED BLOCK SODDING AT EACH SET END	
CULVERT SIZE	SY
18"	14
24"	17
36"	22



DRIVEWAYS

QUANTITY SUMMARIES

TEXAS DEPARTMENT OF TRANSPORTATION
©2022
SHEET 5 OF 20

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		12

9/20/2022 2:04:48 PM
c:\txdot\pw\online\txdot3\sergio.zapata\d0361218\Driveway Sums.dgn

SUMMARY OF DRIVEWAY AND SIDEROADS (CONTINUED)

ID	STATION	OFFSET	EXIST SURF	RCS	AVG WIDTH	LENGTH	RADIUS FT		EXISTING STRUCTURE	OFFSET FROM CL		PROPOSED STRUCTURE	REMOVING CONC (DRIVEWAYS)	(2) BLOCK SODDING	VEGETATIVE WATERING	RC PIPE (CL III)		INLET (COMPL) (PAZD (FG) (3FTX3F-3FTX3FT)	SET (TY II) (1)		REMOV STR (PIPE)	DRIVEWAYS (CONC)	DRIVEWAYS		
										EXIST	PROP				(10 GAL/SY /2 APP)	(18 IN)	(24 IN)		(18 IN) (RCP) (6:1) (P)	(24 IN) (RCP) (6:1) (P)			(ACP) (440 LBS/ SY)	(ACP) (660 LBS/ SY)	DRIVE WAYS (SURF TREAT)
					FT	FT	LT	RT		FT	FT		SY	SY	MG	LF	LF	EA	EA	EA	EA	SY	SY	SY	SY
	ITEM NO.												104	162	168	464		465	467		496	530			
	BID CODE												6017	6002	6001	6003	6005	6158	6363	6395	6016	6004	6005		6006
CSJ 2707-01-014 (CONTINUED)																									
D39	149+91	L	DIRT	R	16	37	15	15	EXIST 15" X 22' CMP	26	26	REM EXIST 15" X 22' & INSTALL 18" X 20' RCP W/SET		28	0.56	20			2		1				76
D40	152+80	R	GRAVEL	R	21	37	15	15	EXIST 18" X 32' CMP	27	27	REM EXIST 18" X 32' & INSTALL 18" X 28' RCP W/SET		28	0.56	28			2		1				97
D41	153+50	L	DIRT	R	15	37	15	15	EXIST 18" X 18' RCP	21	22	REM EXIST 18" X 18' & INSTALL 18" X 22' RCP W/SET		28	0.56	22			2		1				72
D42	156+38	R	GRAVEL	R	11	37	10	10	EXIST 18" X 24' CMP	25	25	REM EXIST 18" X 24' & INSTALL 18" X 18' RCP W/SET		28	0.56	18			2		1				70
D43	160+38	R	ASPH	S	16	53	15	15	EXIST 15" X 19' RCP	27	27	REM EXIST 15" X 19' & INSTALL 18" X 30' RCP W/SET		28	0.56	30			2		1		118		
D44	169+82	R	ASPH	R	14	37	15	15	NO PIPE			NO STRUCTURE WORK											68		
D45	175+15	L	GRAVEL	R	11	37	15	15	EXIST 16" X 35' STEEL	24	29	REM EXIST 16" X 35' & INSTALL 18" X 18' RCP W/SET		28	0.56	18			2		1				56
D46	177+76	R	GRAVEL	S	15	53	10	10	EXIST 18" X 21'	24	24	REM EXIST 18" X 21' & INSTALL 18" X 22' RCP W/SET		28	0.56	22			2		1				92
D47	178+96	L	DIRT	R	16	37	15	15	EXIST 18" X 21' RCP	25	25	REM EXIST 18" X 21' & INSTALL 18" X 24' RCP W/SET		28	0.56	24			2		1				76
D48	183+65	L	DIRT	R	21	53	15	15	EXIST 18" X 39' CMP	27	27	REM EXIST 18" X 39' & INSTALL 18" X 36' RCP W/SET		28	0.56	36			2		1				134
D49	201+39	L	ASPH	S	16	37	70	5	NO PIPE			NO STRUCTURE WORK												111	
D50	202+24	L	ASPH	S	12	37	10	20	NO PIPE			NO STRUCTURE WORK												62	
D51	202+31	R	ASPH	R	12	37	15	15	NO PIPE			NO STRUCTURE WORK												60	
D52	207+38	L	DIRT	R	20	37	15	15	EXIST 18" X 25' RCP	23	25	REM EXIST 18" X 25' & INSTALL 18" X 32' RCP W/SET		28	0.56	32			2		1				93
D53	222+95	L	DIRT	R	14	37	15	15	EXIST 24" X 20' STEEL	31	31	REM EXIST 24" X 20' & INSTALL 18" X 38' RCP W/SET		28	0.56	38			2		1				68
D54	229+25	L	ASPH	R	17	37	15	15	EXIST 30" X 22' CMP	31	31	REM EXIST 30" X 22' & INSTALL 18" X 32' RCP W/SET		28	0.56	32			2		1		81		
D55	237+70	L	DIRT	R	15	44	15	15	EXIST 24" X 20' CMP	24	24	REM EXIST 24" X 20' & INSTALL 24" X 20' RCP W/SET		34	0.68		20			2	1				90
D56	242+25	R	ASPH	S	15	37	15	15	EXIST 24" X 31' CMP	28	28	REM EXIST 24" X 31' & INSTALL 24" X 30' RCP W/SET		34	0.68		30			2	1		72		
D56A	249+20	L	DIRT	R	18	37	15	15	EXIST 15" X 21' CMP	24	25	REM EXIST 15" X 21' & INSTALL 24" X 24' RCP W/SET		34	0.68		24			2	1				85
D57	249+85	R	GRAVEL	R	20	37	15	15	EXIST 18" X 20' RCP	26	27	REM EXIST 18" X 20' & INSTALL 18" X 20' RCP W/SET		28	0.56	20			2		1				93
												CSJ 2707-01-014 SHEET TOTALS	0	466	9.32	340	74	0	26	6	16	0	339	233	1102

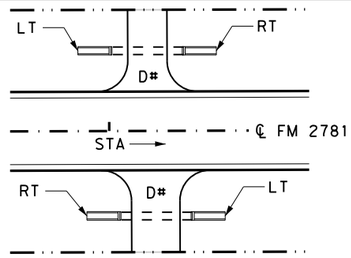
NOTE: A FULL TOPOGRAPHICAL SURVEY WAS NOT PERFORMED. STATIONS WERE ACQUIRED USING A DIGITAL MEASURING INSTRUMENT (DMI). THE STATIONS SHOWN ARE APPROXIMATE AND SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO COMMENCEMENT OF WORK.

R - RESIDENTIAL
C - COMMERCIAL
S - SIDEROAD

(1) PROVIDE 12" DEEP TOEWALL FOR ALL SET'S.

(2)

REQUIRED BLOCK SODDING AT EACH SET END	
CULVERT SIZE	SY
18"	14
24"	17
36"	22



DRIVEWAYS

QUANTITY SUMMARIES

TEXAS DEPARTMENT OF TRANSPORTATION
©2022
SHEET 6 OF 20

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		13

SUMMARY OF DRIVEWAY AND SIDEROADS (CONTINUED)

ID	STATION	OFFSET	EXIST SURF	RCS	AVG WIDTH	LENGTH	RADIUS FT		EXISTING STRUCTURE	OFFSET FROM CL		PROPOSED STRUCTURE	104 REMOVING CONC (DRIVEWAYS)	162 (2) BLOCK SODDING	168 VEGETATIVE WATERING (10 GAL/SY /2 APP)	464 RC PIPE (CL III) (18 IN)	464 RC PIPE (CL III) (24 IN)	465 INLET (COMPL) (PAZD (FG) (3FTX3F-3FTX3FT)	467 SET (TY II) (1) (18 IN) (RCP) (6:1) (P)	467 SET (TY II) (1) (24 IN) (RCP) (6:1) (P)	496 REMOV STR (PIPE)	530 6004 DRIVEWAYS (CONC)	530 6005 DRIVEWAYS (ACP) (440 LBS/SY)	530 6005 DRIVEWAYS (ACP) (660 LBS/SY)	530 6006 DRIVEWAYS DRIVE WAYS (SURF TREAT)
					FT	FT	LT	RT		EXIST FT	PROP FT		SY	SY	MG	LF	LF	EA	EA	EA	EA	SY	SY	SY	SY
CSJ 2707-01-014 (CONTINUED)																									
D58	249+95	L	ASPH	R	14	37	15	15	EXIST 18" X 20' RCP	23	23	INSTALL 18" SET		28	0.56				2				68		
D59	253+20	L	ASPH	S	21	37	15	15	EXIST 18" X ?' CMP	22	27	REM EXIST 18" X ?' & INSTALL 18" X 40' RCP W/SET		28	0.56	40			2		1		97		
D60	254+89	R	GRAVEL	R	20	37	15	15	NO PIPE			NO STRUCTURE WORK													93
D61	255+18	L	ASPH	R	20	37	15	15	EXIST 15" X 22' RCP	21	24	REM EXIST 15" X 22' RCP & INSTALL 18" X 26' RCP W/SET		28	0.56	26			2		1		93		
D62	264+19	L	ASPH	R	12	37	15	15	EXIST 15" X 31' CMP	24	28	REM EXIST 15" X 31' CMP & INSTALL 18" X 24' RCP W/SET		28	0.56	24			2		1		60		
D63	267+69	R	DIRT	R	15	37	15	15	EXIST 18" X 20' RCP	23	25	REM EXIST 18" X 20' RCP & INSTALL 18" X 26' RCP W/SET		28	0.56	26			2		1				72
D64	270+15	L	DIRT	R	17	37	15	15	EXIST 18" X 21' HDPE	25	25	REM EXIST 18" X 21' HDPE & INSTALL 18" X 32' RCP W/SET		28	0.56	32			2		1				81
D65	274+12	L	ASPH	R	15	37	15	15	EXIST 18" X 21' RCP	25	25	REM EXIST 18" X 21' RCP & INSTALL 18" X 28' RCP W/SET		28	0.56	28			2		1		72		
D66	274+42	R	ASPH	R	14	37	25	15	NO PIPE			NO STRUCTURE WORK											78		
D67	276+34	R	GRAVEL	R	10	37	15	15	EXIST 18" X 20' RCP	23	24	REM EXIST 18" X 20' RCP & INSTALL 18" X 24' W/SET		28	0.56	24			2		1				52
D68	281+04	L	DIRT	R	12	37	15	15	EXIST 18" X 20' RCP	23	24	REM EXIST 18" X 20' RCP & INSTALL 18" X 28' RCP W/SET		28	0.56	28			2		1				60
D69	281+82	R	ASPH	R	12	53	15	15	EXIST 18" X 60' CMP	27	27	REM EXIST 18" X 60' CMP & INSTALL 18" X 32' RCP W/SET		28	0.56	32			2		1		81		
D70	284+13	R	DIRT	R	13	53	15	15	EXIST 18" X 22' RCP	25	25	REM EXIST 2 ~ 18" X 6' RCP JT, INSTALL 2 ~ 18" X 8' RCP W/SET		28	0.56	16			2						87
D71	287+03	L	ASPH	R	11	37	15	15	EXIST 18" X 23' RCP	25	25	REM 18" X 6' RCP JT, INSTALL 18" X 6' RCP W/SET		28	0.56	6			2				56		
D72	287+70	L	DIRT	R	15	37	15	15	EXIST 18" X 21' RCP	25		REM EXIST 18" X 21' RCP & INSTALL 18" X 24' RCP W/SET		28	0.56	24			2		1				72
D73	318+99	L	ASPH	C	17	53	25	25	EXIST 18" X 60' CMP	25	26	REM EXIST 18" X 60" CMP & INSTALL 18" X 44' RCP W/SET		28	0.56	44			2		1		130		
D74	334+29	L	GRAVEL	R	16	37	20	10	EXIST 18" X 34' RCP	25	25	REM EXIST 18" X 6' RCP JT, INSTALL 18" X 6' RCP W/SET		28	0.56	6			2						78
D75	334+37	R	DIRT	R	12	37	15	15	EXIST 18" X 18' RCP	25	29	REM EXIST 18" X 18' RCP & INSTALL 18" X 24' RCP W/SET		28	0.56	24			2		1				60
D76	338+24	L	GRAVEL	C	24	37	20	20	EXIST 15" X 34' PLASTIC	27	27	REM EXIST 18" X 18' PLASTIC, INSTALL 18" X 34' RCP W/SET		28	0.56	34			2		1				118
												CSJ 2707-01-014 SHEET TOTALS	0	476	9.52	414	0	0	34	0	13	0	735	0	773

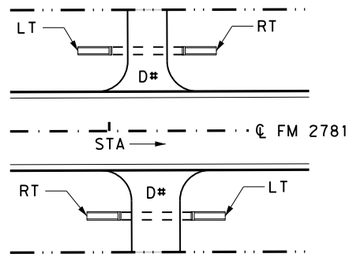
NOTE: A FULL TOPOGRAPHICAL SURVEY WAS NOT PERFORMED. STATIONS WERE ACQUIRED USING A DIGITAL MEASURING INSTRUMENT (DMI). THE STATIONS SHOWN ARE APPROXIMATE AND SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO COMMENCEMENT OF WORK.

R - RESIDENTIAL
C - COMMERCIAL
S - SIDEROAD

(1) PROVIDE 12" DEEP TOEWALL FOR ALL SET'S.

(2)

REQUIRED BLOCK SODDING AT EACH SET END	
CULVERT SIZE	SY
18"	14
24"	17
36"	22



DRIVEWAYS

QUANTITY SUMMARIES

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 7 OF 20

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		14

SUMMARY OF DRIVEWAY AND SIDEROADS (CONTINUED)

ID	STATION	OFFSET	EXIST SURF	RCS	AVG WIDTH	LENGTH	RADIUS FT		EXISTING STRUCTURE	OFFSET FROM CL		PROPOSED STRUCTURE	REMOVING CONC (DRIVEWAYS)	(2) BLOCK SODDING	VEGETATIVE WATERING	464 RC PIPE (CL III)		465 INLET (COMPL) (PAZD (FG) (3FTX3F-3FTX3FT)	467 SET (TY II) (1)		496 REMOV STR (PIPE)	530 DRIVEWAYS (CONC)	530 DRIVEWAYS		
										EXIST	PROP				(10 GAL/SY /2 APP)	(18 IN)	(24 IN)		(18 IN) (RCP) (6:1) (P)	(24 IN) (RCP) (6:1) (P)			(ACP) (440 LBS/SY)	(ACP) (660 LBS/SY)	DRIVE WAYS (SURF TREAT)
					FT	FT	LT	RT		FT	FT		SY	SY	MG	LF	LF	EA	EA	EA	EA	SY	SY	SY	SY
CSJ 2707-01-014 (CONTINUED)																									
D77	349+18	R	DIRT	R	24	37	15	15	EXIST 18" X 38' RCP	25	25	REM EXIST 18" X 38' RCP & INSTALL 18" X 28' RCP W/SET		28	0.56	38			2		1				109
D78	349+28	L	DIRT	R	42	37	15	15	EXIST 18" X 60' CMP	22	27	REM EXIST 18" X 60' CMP & INSTALL 18" X 64' RCP W/SET		28	0.56	64			2		1				184
D79	352+26	L	ASPH	R	11	37	15	15	EXIST 18" X 26' RCP	30	30	REMOVE EXIST 18" X 26' RCP & INSTALL 18" X 36' RCP W/SET		28	0.56	36			2		1		56		
D80	356+78	R	GRAVEL	R	11	37	15	15	EXIST 24" X 25' RCP	30	31	REM EXIST 2 ~ 24" X 25' RCP & INSTALL 24" X 24' RCP W/SET		34	0.68		24			2	1				56
D81	360+20	L	ASPH	C	20	37	25	25	EXIST 15" X 33' CMP	30	30	REM EXIST 15" X 33' CMP & INSTALL 18" X 32' RCP W/SET		28	0.56	32			2		1		112		
D82	363+53	L	GRAVEL	C	22	37	30	30	EXIST 18" X 52' CMP	29	29	REM EXIST 18" X 52' CMP & INSTALL 18" X 52' RCP W/SET		28	0.56	52			2		1				133
D83	363+66	R	GRAVEL	C	14	37	25	25	EXIST 18" X 41' CMP	24	24	REM EXIST 18" X 41' CMP & INSTALL 18" X 40' RCP W/SET		28	0.56	40			2		1				88
D84	367+24	R	GRAVEL	C	15	37	25	25	EXIST 18" X 62' CMP	25	33	REM EXIST 18" X 62' CMP & INSTALL 18" X 42' RCP W/SET		28	0.56	42			2		1				92
D85	368+82	L	GRAVEL	C	20	37	15	15	EXIST 18" X 42' CMP	27	27	REM EXIST 18" X 43' CMP & INSTALL 18" X 42' RCP W/SET		28	0.56	42			2		1				101
D86	369+22	R	ASPH	R	12	37	15	15	EXIST 18" X 22' RCP	27	27	INSTALL 2 ~ 18" X 4' RCP W/SET		28	0.56	8			2				60		
D87	370+65	L	ASPH	R	18	37	15	15	EXIST 18" X 37' CMP	21	25	REM EXIST 18" X 37' CMP & INSTALL 18" X 36' RCP W/SET		28	0.56	26			2		1		85		
D88	371+02	R	DIRT	R	11	37	15	15	EXIST 18" X 14' RCP	26	32	REM EXIST 18" X 14' RCP & INSTALL 18" X 30' RCP W/SET		28	0.56	30			2		1				56
D89	371+94	L	ASPH	R	10	37	15	15	EXIST 18" X 20' RCP	23	24	REM EXIST 18" X 20' RCP & INSTALL 18" X 24' RCP W/SET		28	0.56	24			2		1		52		
D90	372+14	R	DIRT	R	17	37	15	15	EXIST 18" X 25' RCP	25	33	REM EXIST 18" X 25' RCP & INSTALL 18" X 40' RCP W/SET		28	0.56	40			2		1				81
D91	372+93	R	ASPH	R	11	37	15	15	EXIST 24" X 20' RCP	28	33	REM EXIST 24" X 20' RCP & INSTALL 24" X 20' RCP W/SET		34	0.68		20			2	1		56		
D92	375+09	L	GRAVEL	C	17	37	25	25	EXIST 18" X 44' CMP	25	25	REM EXIST 18" X 44' CMP & INSTALL 18" X 44' RCP W/SET		28	0.56	44			2		1				99
D93	376+03	L	ASPH	C	10	37	15	15	EXIST 15" X 22' RCP	24	26	REM EXIST 15" X 22' RCP & INSTALL 18" X 28' RCP W/SET		28	0.56	28			2		1		52		
D94	377+13	L	ASPH	C	10	37	15	15	EXIST 18" X 20' RCP	24	24	REM EXIST 18" X 20' RCP & INSTALL 18" X 20' RCP W/SET		28	0.56	20			2		1		52		
D95	378+22	R	GRAVEL	C	21	37	25	25	EXIST 18" X 40' CMP	22	34	REM EXIST 18" X 40' CMP & INSTALL 18" X 54' RCP W/SET		28	0.56	54			2		1				124
D96	378+35	L	ASPH	R	11	37	15	15	EXIST 18" X 24' RCP	21	25	REM EXIST 18" X 24' RCP & INSTALL 18" X 32' RCP W/SET		28	0.56	32			2		1		56		
												CSJ 2707-01-014 SHEET TOTALS	0	572	11.44	652	44	0	36	4	19	0	581	0	1123

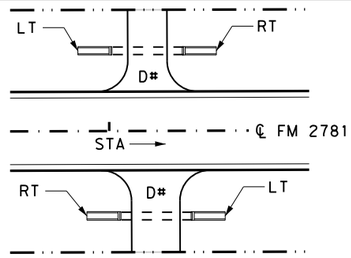
NOTE: A FULL TOPOGRAPHICAL SURVEY WAS NOT PERFORMED. STATIONS WERE ACQUIRED USING A DIGITAL MEASURING INSTRUMENT (DMI). THE STATIONS SHOWN ARE APPROXIMATE AND SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO COMMENCEMENT OF WORK.

R - RESIDENTIAL
C - COMMERCIAL
S - SIDEROAD

(1) PROVIDE 12" DEEP TOEWALL FOR ALL SET'S.

(2)

REQUIRED BLOCK SODDING AT EACH SET END	
CULVERT SIZE	SY
18"	14
24"	17
36"	22



DRIVEWAYS

QUANTITY SUMMARIES

TEXAS DEPARTMENT OF TRANSPORTATION
©2022
SHEET 8 OF 20

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		15

9/20/2022 2:04:51 PM
c:\txdot\pw\online\txdot3\sergio.zapata\d0361218\Driveway Sums.dgn

SUMMARY OF DRIVEWAY AND SIDEROADS (CONTINUED)

ID	STATION	OFFSET	EXIST SURF	RCS	AVG WIDTH	LENGTH	RADIUS FT		EXISTING STRUCTURE	OFFSET FROM CL		PROPOSED STRUCTURE	REMOVING CONC (DRIVEWAYS)	(2) BLOCK SODDING	VEGETATIVE WATERING	RC PIPE (CL III)		INLET (COMPL) (PAZD (FG) (3FTX3F-3FTX3FT)	SET (TY II) (1)		REMOV STR (PIPE)	DRIVEWAYS (CONC)	DRIVEWAYS		
										EXIST	PROP				(10 GAL/SY /2 APP)	(18 IN)	(24 IN)		(18 IN) (RCP) (6:1) (P)	(24 IN) (RCP) (6:1) (P)			(ACP) (440 LBS/ SY)	(ACP) (660 LBS/ SY)	DRIVE WAYS (SURF TREAT)
					FT	FT	LT	RT		FT	FT		SY	SY	MG	LF	LF	EA	EA	EA	EA	SY	SY	SY	SY
ITEM NO.													104	162	168	464		465	467		496	530			
BID CODE													6017	6002	6001	6003	6005	6158	6363	6395	6016	6004	6005		6006
CSJ 2707-01-014 (CONTINUED)																									
D97	382+42	L	GRAVEL	R	14	37	15	15	EXIST 18" X 19' RCP	23	25	REM EXIST 18" X 19" RCP & INSTALL 18" X 32' RCP W/SET		28	0.56	32			2		1				69
D98	389+13	R	GRAVEL	C	23	37	15	15	EXIST 24" X 27' CMP	26	26	REM EXIST 24" X 27' CMP & INSTALL 24" X 28' RCP W/SET		34	0.68		28			2	1				105
D99	390+95	L	ASPH	R	13	37	15	15	EXIST 18" X 25' CMP	27	27	REM EXIST 18" X 25' CMP & INSTALL 18" X 30' RCP W/SET		28	0.56	30			2		1		72		
D100	392+81	L	ASPH	R	11	37	10	15	EXIST 18" X 20' RCP	27	27	REM EXIST 18" X 20' RCP & INSTALL 18" X 22' RCP W/SET		28	0.56	22			2		1		76		
												CSJ 2707-01-014 SHEET TOTALS	**0**	**118**	**2.36**	**84**	**28**	**0**	**6**	**2**	**4**	**0**	**148**	**0**	**174**
												CSJ 2707-01-014 TOTALS	**235**	**2456**	**49.12**	**2110**	**192**	**0**	**156**	**16**	**77**	**235**	**2984**	**391**	**4782**
CCSJ 2707-01-011																									
D101	408+14	R	ASPH	S	24	53	30	30	EXIST 18" X 72' CMP	34	34	REM EXIST 18" X 72' CMP & INSTALL 18" X 52' RCP W/SET		28	0.56	52			2		1			195	
D102	441+48	R	GRAVEL	S	24	53	30	30	EXIST 18" X 65' CMP	25	28	REM EXIST 18" X 65' CMP & INSTALL 18" X 56' RCP W/SET		28	0.56	56			2		1				198
D103	450+30	L	GRAVEL	S	24	53	30	30	NO PIPE			NO STRUCTURE WORK													184
D104	183+38 (REVERSAL)	L	GRAVEL	R	16	37	30	30	NO PIPE			NO STRUCTURE WORK													119
D105	180+84 (REVERSAL)	R	GRAVEL	R	9	53	15	15	EXIST 18" X 20' RCP	28	28	REM EXIST 18" X 20' RCP & INSTALL 18" X 20' RCP W/SET		28	0.56	20			2		1				71
D106	173+30 (REVERSAL)	L	ASPH	R	12	37	15	15	EXIST 15" X 20' RCP	25	25	REM EXIST 15" X 20' RCP & INSTALL 18" X 24' RCP W/SET		28	0.56	24			2		1		61		
D107	167+24 (REVERSAL)	L	ASPH	S	30	37	30	30	NO PIPE			NO STRUCTURE WORK												166	
D108	167+24 (REVERSAL)	R	DIRT	R	13	37	15	15	EXIST 24" X 22' RCP	33	33	REM EXIST 2 ~ 24" X 4' RCP JT, INSTALL 2 ~ 24" X 8' RCP W/SET		34	0.68		16			2					64
D109	154+76 (REVERSAL)	R	GRAVEL	S	24	37	20	30	EXIST 18" X 38' RCP	31	31	INSTALL 18" SET		28	0.56				2					131	
D110	154+19 (REVERSAL)	L	ASPH	R	11	37	15	15	EXIST 18" X 20' RCP	26	26	REM EXIST 2 ~ 18" X 6' RCP JT, INSTALL 2 ~ 18" X 8' RCP W/SET		28	0.56	16			2				56		
D110A	146+16 (REVERSAL)	L	DIRT	R	14	37	15	15	EXIST 18" X 20' RCP	27	27	REM EXIST 2 ~ 18" X 6' RCP JT. INSTALL 2 ~ 18" X 12' RCP W/SET		28	0.56	24			2						68
D110B	140+84	L	DIRT	R	12	37	15	15	EXIST 24" X 24' RCP	24	24	INSTALL 24" SET		34	0.68					2					60
D111	134+28 (REVERSAL)	L	ASPH	R	13	37	15	15	EXIST 18" X 22' RCP	27	27	REM EXIST 2 ~ 18" X 6' RCP JT. INSTALL 2 ~ 18" X 10' RCP W/SET		28	0.56	20			2				64		
D112	120+29 (REVERSAL)	L	ASPH	R	13	37	15	15	EXIST 18" X 28' RCP	24	24	INSTALL 2 ~ 18" X 4' RCP W/SET		28	0.56	8			2				65		
												CCSJ 2707-01-011 SHEET TOTALS	**0**	**320**	**6.4**	**220**	**16**	**0**	**18**	**4**	**4**	**0**	**246**	**492**	**764**

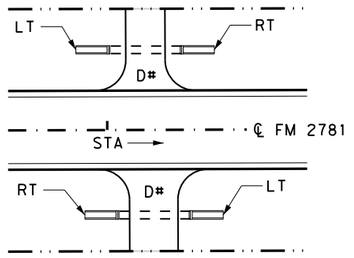
NOTE: A FULL TOPOGRAPHICAL SURVEY WAS NOT PERFORMED. STATIONS WERE ACQUIRED USING A DIGITAL MEASURING INSTRUMENT (DMI). THE STATIONS SHOWN ARE APPROXIMATE AND SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO COMMENCEMENT OF WORK.

R - RESIDENTIAL
C - COMMERCIAL
S - SIDEROAD

(1) PROVIDE 12" DEEP TOEWALL FOR ALL SET'S.

(2)

REQUIRED BLOCK SODDING AT EACH SET END	
CULVERT SIZE	SY
18"	14
24"	17
36"	22



DRIVEWAYS

QUANTITY SUMMARIES

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 9 OF 20

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		16

SUMMARY OF DRIVEWAY AND SIDEROADS (CONTINUED)

ID	STATION	OFFSET	EXIST SURF	RCS	AVG WIDTH	LENGTH	RADIUS FT		EXISTING STRUCTURE	OFFSET FROM CL		PROPOSED STRUCTURE	REMOVING CONC (DRIVEWAYS)	(2) BLOCK SODDING	VEGETATIVE WATERING	464 RC PIPE (CL III)		465 INLET (COMPL) (PAZD (FG) (3FTX3F-3FTX3FT)	467 SET (TY II) (1)		496 REMOV STR (PIPE)	530 DRIVEWAYS (CONC)	530 DRIVEWAYS		
										EXIST	PROP				(10 GAL/SY /2 APP)	(18 IN)	(24 IN)		(18 IN) (RCP) (6:1) (P)	(24 IN) (RCP) (6:1) (P)			(ACP) (440 LBS/SY)	(ACP) (660 LBS/SY)	DRIVE WAYS (SURF TREAT)
					FT	FT	LT	RT		FT	FT		SY	SY	MG	LF	LF	EA	EA	EA	EA	SY	SY	SY	SY
CCSJ 2707-01-011 (CONTINUED)																									
D113	119+03 (REVERSAL)	R	ASPH	R	17	37	15	15	EXIST 18" X 40' RCP/HDPE	25	26	REM EXIST 18" X 40' RCP/HDPE & INSTALL 18" X 32' RCP W/SET		28	0.56	32			2		1		81		
D114	111+21 (REVERSAL)	L	ASPH	R	11	37	15	15	EXIST 24" X 20' RCP	24	27	REM EXIST 24" X 20' RCP & INSTALL 24" X 24' RCP W/SET		34	0.68		24			2	1		56		
D115	106+35 (REVERSAL)	L	ASPH	S	19	37	25	30	NO PIPE			NO STRUCTURE WORK												131	
D116	106+13 (REVERSAL)	R	GRAVEL	S	20	37	15	30	NO PIPE			NO STRUCTURE WORK												129	
D117	95+96 (REVERSAL)	R	GRAVEL	R	11	37	15	15	EXIST 15" X 22' RCP	28	28	REM EXIST 15" X 22' RCP & INSTALL 18" X 22' RCP W/SET		28	0.56	22			2		1				56
D118	95+96 (REVERSAL)	L	DIRT	R	10	37	15	15	EXIST 15" X 20' RCP	27	27	REM EXIST 15" X 20' RCP & INSTALL 18" X 26' RCP W/SET		28	0.56	26			2		1				52
D119	81+50 (REVERSAL)	R	DIRT	R	12	37	15	15	EXIST 18" X 20' RCP	27	27	REM EXIST 18" X 20' RCP & INSTALL 18" X 32' RCP W/SET		28	0.56	32			2		1				60
D120	70+65 (REVERSAL)	L	GRAVEL	R	11	37	15	15	EXIST 18" X 28' RCP	27	28	REM EXIST 18" X 28' RCP & INSTALL 18" X 32' RCP W/SET		28	0.56	32			2		1				56
D121	68+36 (REVERSAL)	L	ASPH	R	11	37	15	15	EXIST 18" X 20' RCP	26	30	REM EXIST 18" X 20' RCP & INSTALL 18" X 38' RCP W/SET		28	0.56	38			2		1		56		
D122	68+13 (REVERSAL)	R	ASPH	R	14	37	15	15	EXIST 15" X 22' RCP	27	35	REM EXIST 15" X 22' RCP & INSTALL 18" X 38' RCP W/SET		28	0.56	38			2		1		68		
D123	66+92 (REVERSAL)	L	GRAVEL	R	11	37	10	15	EXIST 18" X 20' RCP	28	28	REM EXIST 18" X 20' RCP & INSTALL 18" X 30' RCP W/SET		28	0.56	30			2		1				56
D124	66+56 (REVERSAL)	R	ASPH	R	11	37	15	15	EXIST 18" X 20' RCP	25	26	REM EXIST 18" X 20' RCP & INSTALL 18" X 28' RCP W/SET		28	0.56	28			2		1		57		
D125	52+87 (REVERSAL)	L	ASPH	R	14	37	15	15	NO PIPE			NO STRUCTURE WORK											70		
D125A	47+60 (REVERSAL)	L	DIRT	R	11	37	15	15	EXIST 18" X 22' RCP	27	27	REM EXIST 2 ~ 18" X 6' RCP JT. INSTALL 2 ~ 18" X 6' RCP W/SET		28	0.56	12			2						57
D126	47+47 (REVERSAL)	R	ASPH	R	11	37	15	15	EXIST 18" X 20' RCP	32	32	REM EXIST 2 ~ 18" X 6' RCP JT. INSTALL 2 ~ 18" X 6' RCP W/SET		28	0.56	12			2				56		
D127	46+22 (REVERSAL)	L	DIRT	R	14	37	15	15	NO PIPE			NO STRUCTURE WORK													70
D128	33+17 (REVERSAL)	L	ASPH	R	11	37	15	15	EXIST 21" X 31' STEEL	30	30	REM EXIST 21" X 31' STEEL & INSTALL 24" X 22' RCP W/SET		34	0.68		22			2	1		56		
D129	32+33 (REVERSAL)	R	DIRT	R	12	37	15	15	EXIST 16" X 26' STEEL	27	27	REM EXIST 16" X 26' STEEL & INSTALL 18" X 20' RCP W/SET		28	0.56	20			2		1				60
D130	24+90 (REVERSAL)	R	ASPH	R	15	37	15	15	EXIST 24" X 20' RCP	28	28	REM EXIST 24" X 20' RCP & INSTALL 24" X 26' RCP W/SET		34	0.68		26			2	1		72		
CCSJ 2707-01-011 SHEET TOTALS													**0**	**438**	**8.76**	**322**	**72**	**0**	**24**	**6**	**13**	**0**	**572**	**260**	**467**
CCSJ 2707-01-011 TOTALS													**0**	**758**	**15.16**	**542**	**88**	**0**	**42**	**10**	**17**	**0**	**818**	**752**	**1231**

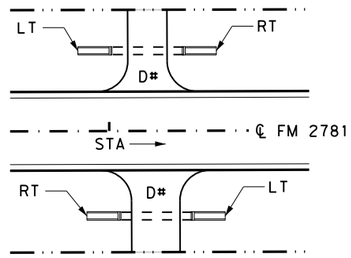
NOTE: A FULL TOPOGRAPHICAL SURVEY WAS NOT PERFORMED. STATIONS WERE ACQUIRED USING A DIGITAL MEASURING INSTRUMENT (DMI). THE STATIONS SHOWN ARE APPROXIMATE AND SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO COMMENCEMENT OF WORK.

R - RESIDENTIAL
C - COMMERCIAL
S - SIDEROAD

(1) PROVIDE 12" DEEP TOEWALL FOR ALL SET'S.

(2)

REQUIRED BLOCK SODDING AT EACH SET END	
CULVERT SIZE	SY
18"	14
24"	17
36"	22



DRIVEWAYS

QUANTITY SUMMARIES

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 10 OF 20

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		17

SUMMARY OF DRIVEWAY AND SIDEROADS (CONTINUED)

ID	STATION	OFFSET	EXIST SURF	RCS	AVG WIDTH	LENGTH	RADIUS FT		EXISTING STRUCTURE	OFFSET FROM CL		PROPOSED STRUCTURE	REMOVING CONC (DRIVEWAYS)	(2) BLOCK SODDING	VEGETATIVE WATERING (10 GAL/SY /2 APP)	464 RC PIPE (CL III) (18 IN)	464 RC PIPE (CL III) (24 IN)	465 INLET (COMPL) (PAZD (FG) (3FTX3F-3FTX3FT)	467 SET (TY II) (1) (18 IN) (RCP) (6:1) (P)	467 SET (TY II) (1) (24 IN) (RCP) (6:1) (P)	496 REMOV STR (PIPE)	530 DRIVEWAYS (CONC)	530 DRIVEWAYS (ACP) (440 LBS/SY)	530 DRIVEWAYS (ACP) (660 LBS/SY)	6006 DRIVEWAYS DRIVE WAYS (SURF TREAT)
					FT	FT	LT	RT		EXIST FT	PROP FT		SY	SY	MG	LF	LF	EA	EA	EA	EA	SY	SY	SY	SY
CSJ 2707-02-008																									
D131	21+19 (REVERSAL)	R	DIRT	R	13	37	15	15	EXIST 24" X 20' RCP	27	27	REM EXIST 24" X 20' RCP & INSTALL 24" X 24' RCP W/SET		34	0.68		24			2	1				64
D132	19+94 (REVERSAL)	L	ASPH	R	13	37	15	15	EXIST 24" X 30' STEEL	28	28	REM EXIST 24" X 30' STEEL & INSTALL 24" X 30' RCP W/SET		34	0.68		30			2	1		64		
D133	12+17 (REVERSAL)	L	DIRT	R	17	37	15	15	NO PIPE			NO STRUCTURE WORK													81
D134	7+74 (REVERSAL)	L	ASPH	R	13	37	15	15	EXIST 18" X 26' STEEL	29	29	REM EXIST 18" X 26' STEEL & INSTALL 18" X 34' RCP W/SET		28	0.56	34			2		1		64		
D135	4+87 (REVERSAL)	R	DIRT	R	13	37	15	15	EXIST 18" X 20' RCP	26	29	REM EXIST 18" X 20' RCP, INSTALL 18" X 26' RCP W/SET (RT) & INLET (LT)(CONNECT TO D136 PIPE)		14	0.28	26		1	1		1				64
D136	4+51 (REVERSAL)	R	ASPH	C	16	37	15	15	EXIST 18" X 32' RCP	27	29	REM EXIST 18" X 32' RCP, INSTALL 18" X 36' RCP W/SET (LT) & INLET (RT)(CONNECT TO D135 PIPE)		14	0.28	36			1		1		77		
D137	2+73 (REVERSAL)	R	ASPH	C	16	37	15	15	EXIST 18" X 30' RCP	27	27	REM EXIST 18" X 30' RCP & INSTALL 18" X 24' RCP W/SET		28	0.56	24			2		1		78		
D138	2+25 (REVERSAL)	R	ASPH	R	11	37	15	15	EXIST 18" X 20' RCP	28	28	REM EIXST 18" X 20' RCP & INSTALL 18" X 26' RCP W/SET		28	0.56	26			2		1		56		
D139	1+37 (REVERSAL)	L	DIRT	R	12	37	15	15	EXIST 18" X 20' RCP	26	26	REM EXIST 18" X 20' RCP & INSTALL 18" X 24' RCP W/SET		28	0.56	24			2		1				60
CSJ 2707-02-008 TOTALS													0	208	4.16	170	54	1	10	4	8	0	339	0	269
PROJECT TOTALS													235	3422	68.44	2822	334	1	208	30	102	235	4141	1143	6282

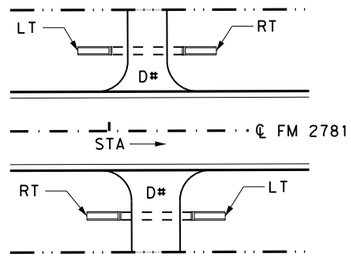
NOTE: A FULL TOPOGRAPHICAL SURVEY WAS NOT PERFORMED. STATIONS WERE ACQUIRED USING A DIGITAL MEASURING INSTRUMENT (DMI). THE STATIONS SHOWN ARE APPROXIMATE AND SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO COMMENCEMENT OF WORK.

R - RESIDENTIAL
C - COMMERCIAL
S - SIDEROAD

(1) PROVIDE 12" DEEP TOEWALL FOR ALL SET'S.

(2)

REQUIRED BLOCK SODDING AT EACH SET END	
CULVERT SIZE	SY
18"	14
24"	17
36"	22



DRIVEWAYS

QUANTITY SUMMARIES

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 11 OF 20

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		18

ROADWAY CULVERT SUMMARY

STA	DESCRIPTION: EXISTING STRUCTURE	DESCRIPTION: PROPOSED STRUCTURE	ITEM NO. / BID CODE: 132 / 6019 EMBANKMENT (VEHICLE) (ORD COMP) (TY B) CY	158 / 6003 SPEC EXCAV WORK (HYD EXCAVATOR) HR	162 / 6002 BLOCK SODDING SY	168 / 6001 VEGETATIVE WATERING (10 GAL/SY /2 APPS) MG	400 / 6005 CEM STABIL BKFL CY	402 / 6001 TRENCH EXCAVATION PROTECTION LF	403 / 6001 TEMPORARY SPL SHORING SF	420 / 6071 CL C CONC (COLLAR) EA	420 / 6057 CL C CONC (WINGWALLS) CY	420 / 6077 CL E CONC (SEAL SLAB) (NON-REINF) CY	432 / 6002 RIPRAP (CONC) (5 IN) CY	432 / 6026 RIPRAP (STONE COMMON) (DRY) (18 IN) CY	462 / 6050 CONC BOX CULV (5 FT X 2 FT) (EXTEND) LF	462 / 6055 CONC BOX CULV (6 FT X 4 FT) (EXTEND) LF	462 / 6062 CONC BOX CULV (7 FT X 7 FT) (EXTEND) LF	462 / 6064 CONC BOX CULV (8 FT X 5 FT) (EXTEND) LF
CSJ 2707-01-014																		
16+14	EXIST 30" X 42' RCP	LT: EXT W/ 4' RCP (CL III) (30 IN) & ADD SET (TY II)(30 IN)(RCP)(4:1)(C) RT: ADD COLLAR, EXT W/ 6' RCP (CL III) (30 IN) & ADD CH-PW-O (30 IN)(2:1)	138	8	20	0.4	2			1				5				
34+86	EXIST 42" X 43' RCP	LT: REM 6', EXT W/ 12' RCP (CL III) (42 IN) & ADD CH-FW-O (DIA=42 IN)(2:1) RT: REM 4', EXT W/ 12' RCP (CL III) (42 IN) & ADD CH-FW-O (DIA=42 IN)(2:1)	198	2	28	0.6	27		54					11				
50+03	EXIST 2 ~ 7' X 7' X 34' MC7 BOX W/ MCW-F2	LT: REM MCW-F2, EXT W/ 2 ~ 12' CONC BOX CULV (7 FT X 7 FT) & ADD PW-2(HW=9 FT)(2:1) RT: REM MCW-F2, EXT W/ 2 ~ 12' CONC BOX CULV (7 FT X 7 FT) & ADD PW-2(HW=9 FT)(2:1)	148	1	167	3.3			319			5		15			48	
55+00	EXIST 6' X 4' X 38' SC30 BOX W/ FW-30 (30° RFS)	LT: REM FW-30, EXT W/ 16' CONC BOX CULV (6 FT X 4 FT) & ADD PW-2(HW=6 FT)(2:1) RT: REM FW-30, EXT W/ 11' CONC BOX CULV (6 FT X 4 FT) & ADD PW-2(HW=6 FT)(2:1)	232	1	249	5.0								13		27		
71+65	EXIST 24" X 61' RCP (15° RFS)	LT: REM 4', EXT W/ 6' RCP (CL III) (24 IN) & ADD CH-PW-S(DIA=30 IN)(2:1) RT: ADD CH-PW-S(DIA=48 IN)(2:1)	96	2	218	4.4												
82+08	EXIST 30" X 58' RCP (30° LFS)	LT: ADD COLLAR, EXT W/4' RCP (CL III), ADD CH-PW-S (DIA=30 IN)(30 DEG) (2:1) RT: EXT W/ 4' RCP (CL III) (30 IN) & ADD CH-PW-S(DIA=42 IN)(30 DEG)(2:1)	85	1	195	3.9				1				10				
91+22	EXIST 18" X 43' RCP	LT: EXT W/ 4' RCP (CL III) (18 IN) & ADD SET (TY II)(18 IN)(RCP)(4:1)(C) RT: REM 4', EXT W/ 6' RCP (CL III) (18 IN) & ADD SET (TY II)(18 IN)(RCP)(4:1)(C)	34	1	109	2.2												
106+65	EXIST 18" X 48' RCP (30° LFS)	LT: REM 6' RCP, EXT W/12' RCP(CL III)(18 IN) & ADD SET (TY II)(18 IN)(RCP)(4:1)(C) RT: REM 6' RCP, EXT W/12' RCP (CL III)(18 IN) & ADD SET (TY II)(18 IN)(RCP)(4:1)(C)	82	2	192	3.8			45									
114+00	EXIST 18" X 41' RCP	LT: EXT W/ 8' RCP (CL III)(18 IN) & ADD SET (TY II)(18 IN)(RCP)(4:1)(C) RT: ADD COLLAR, EXT W/ 4' RCP (CL III)(18 IN) & ADD SET (TY II)(18 IN)(RCP)(4:1)(C)	54	1	119	2.4	1			1								
160+30	EXIST 24" X 38' RCP	LT: ADD COLLAR, EXT W/ 4' RCP (CL III) (24 IN) & ADD SET (TY II)(24 IN)(RCP)(4:1)(C) RT: ADD COLLAR, EXT W/ 4' RCP (CL III) (24 IN) & ADD SET (TY II)(24 IN)(RCP)(4:1)(C)	56	1	119	2.4				2								
183+00	EXIST 24" X 42' RCP	LT: EXT W/ 4' RCP (CL III) (24 IN) & ADD SET (TY II)(24 IN)(RCP)(4:1)(C) RT: EXT W/ 8' RCP (CL III) (24 IN) & ADD CH-PW-O(DIA=30 IN)(2:1)	93	2	149	3.0	1							2				
		CSJ 2707-01-014 SHEET TOTALS	1216	22	1565	31.4	31	0	418	5	0	5	0	56	0	27	48	0

THE STRUCTURES ON THE PROJECT ARE OPERATING AT AN ESTIMATED MINIMUM 5 YEAR FREQUENCY. THE OPERATION OF THESE STRUCTURES WILL NOT BE SIGNIFICANTLY ALTERED BY THIS PROJECT. DUE CONSIDERATION HAS BEEN GIVEN TO THE EFFECTS OF HEADWATERS AND VELOCITIES ASSOCIATED WITH THE STRUCTURES. ADDITIONAL STUDIES ARE NOT REQUIRED. CAUTION TO BE USED WHEN WORKING OVER CULVERTS.

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED PROFESSIONAL ENGINEER

DocuSigned by:
cmb P.E.
AF852E728AEC4C0...
9/22/2022

QUANTITY SUMMARIES

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 12 OF 20

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		19

ROADWAY CULVERT SUMMARY (CONTINUED)

STA	DESCRIPTION: EXISTING STRUCTURE	DESCRIPTION: PROPOSED STRUCTURE	CONC BOX CULV (9 FT X 4 FT) EXTEND	RC PIPE (CL III)						WINGWALL					HEADWALL				
ITEM NO.			462	464						466									
BID CODE			6100	6003	6005	6007	6008	6009	6011	6151	6193	6195	6196	6198	6010	6025	6099	6102	6104
										(FW-0)	(PW-2)				(CH-FW-0)	(CH-FW-15)	(CH - PW - 0)		
				(18 IN)	(24 IN)	(30 IN)	(36 IN)	(42 IN)	(54 IN)	(HW= 4 FT)	(HW= 4 FT)	(HW= 6 FT)	(HW= 7 FT)	(HW= 9 FT)	(DIA= 42 IN)	(DIA= 42 IN)	(DIA= 30 IN)	(DIA= 42 IN)	(DIA= 54 IN)
			LF	LF	LF	LF	LF	LF	LF	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA
CSJ 2707-01-014 (CONTINUED)																			
16+14	EXIST 30" X 42' RCP	LT: EXT W/ 4' RCP (CL III) (30 IN) & ADD SET (TY II)(30 IN)(RCP)(4:1)(C) RT: ADD COLLAR, EXT W/ 6' RCP (CL III) (30 IN) & ADD CH-PW-0 (30 IN)(2:1)				10												1		
34+86	EXIST 42" X 43' RCP	LT: REM 6', EXT W/ 12' RCP (CL III) (42 IN) & ADD CH-FW-0 (DIA=42 IN)(2:1) RT: REM 4', EXT W/ 12' RCP (CL III) (42 IN) & ADD CH-FW-0 (DIA=42 IN)(2:1)						24							2				
50+03	EXIST 2 ~ 7' X 7' X 34' MC7 BOX W/ MCW-F2	LT: REM MCW-F2, EXT W/ 2 ~ 12' CONC BOX CULV (7 FT X 7 FT) & ADD PW-2(HW=9 FT)(2:1) RT: REM MCW-F2, EXT W/ 2 ~ 12' CONC BOX CULV (7 FT X 7 FT) & ADD PW-2(HW=9 FT)(2:1)												2					
55+00	EXIST 6' X 4' X 38' SC30 BOX W/ FW-30 (30° RFS)	LT: REM FW-30, EXT W/ 16' CONC BOX CULV (6 FT X 4 FT) & ADD PW-2(HW=6 FT)(2:1) RT: REM FW-30, EXT W/ 11' CONC BOX CULV (6 FT X 4 FT) & ADD PW-2(HW=6 FT)(2:1)										2							
71+65	EXIST 24" X 61' RCP (15° RFS)	LT: REM 4', EXT W/ 6' RCP (CL III) (24 IN) & ADD CH-PW-S(DIA=30 IN)(2:1) RT: ADD CH-PW-S(DIA=48 IN)(2:1)			6														
82+08	EXIST 30" X 58' RCP (30° LFS)	LT: ADD COLLAR, EXT W/4' RCP (CL III), ADD CH-PW-S (DIA=30 IN)(30 DEG) (2:1) RT: EXT W/ 4' RCP (CL III) (30 IN) & ADD CH-PW-S(DIA=42 IN)(30 DEG)(2:1)				8													
91+22	EXIST 18" X 43' RCP	LT: EXT W/ 4' RCP (CL III) (18 IN) & ADD SET (TY II)(18 IN)(RCP)(4:1)(C) RT: REM 4', EXT W/ 6' RCP (CL III) (18 IN) & ADD SET (TY II)(18 IN)(RCP)(4:1)(C)		10															
106+65	EXIST 18" X 48' RCP (30° LFS)	LT: REM 6' RCP, EXT W/12' RCP(CL III)(18 IN) & ADD SET (TY II)(18 IN)(RCP)(4:1)(C) RT: REM 6' RCP, EXT W/12' RCP (CL III)(18 IN) & ADD SET (TY II)(18 IN)(RCP)(4:1)(C)		24															
114+00	EXIST 18" X 41' RCP	LT: EXT W/ 8' RCP (CL III)(18 IN) & ADD SET (TY II)(18 IN)(RCP)(4:1)(C) RT: ADD COLLAR, EXT W/ 4' RCP (CL III)(18 IN) & ADD SET (TY II)(18 IN)(RCP)(4:1)(C)		12															
160+30	EXIST 24" X 38' RCP	LT: ADD COLLAR, EXT W/ 4' RCP (CL III) (24 IN) & ADD SET (TY II)(24 IN)(RCP)(4:1)(C) RT: ADD COLLAR, EXT W/ 4' RCP (CL III) (24 IN) & ADD SET (TY II)(24 IN)(RCP)(4:1)(C)			8														
183+00	EXIST 24" X 42' RCP	LT: EXT W/ 4' RCP (CL III) (24 IN) & ADD SET (TY II)(24 IN)(RCP)(4:1)(C) RT: EXT W/ 8' RCP (CL III) (24 IN) & ADD CH-PW-0(DIA=30 IN)(2:1)			12														
CSJ 2707-01-014 SHEET TOTALS			0	46	26	18	0	24	0	0	0	2	0	2	2	0	1	0	0

THE STRUCTURES ON THE PROJECT ARE OPERATING AT AN ESTIMATED MINIMUM 5 YEAR FREQUENCY. THE OPERATION OF THESE STRUCTURES WILL NOT BE SIGNIFICANTLY ALTERED BY THIS PROJECT. DUE CONSIDERATION HAS BEEN GIVEN TO THE EFFECTS OF HEADWATERS AND VELOCITIES ASSOCIATED WITH THE STRUCTURES. ADDITIONAL STUDIES ARE NOT REQUIRED. CAUTION TO BE USED WHEN WORKING OVER CULVERTS.

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED PROFESSIONAL ENGINEER

DocuSigned by:
AF8525728AFC4C9...
9/22/2022

QUANTITY SUMMARIES

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 13 OF 20

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		20

ROADWAY CULVERT SUMMARY (CONTINUED)

STA	DESCRIPTION		ITEM NO.	466					467					480	658
			BID CODE	6105	6130	6132	6135	6136	6358	6363	6390	6419	6450	6001	6109
				HEADWALL					SET (TY II)					CLEAN EXIST CULVERTS	INSTL OM ASSM (OM-2Z) (WFLX) SRF (BI)
	EXISTING STRUCTURE	PROPOSED STRUCTURE		(CH - PW - 0)	(CH - PW - S)				(18 IN) (RCP) (4:1) (C)	(18 IN) (RCP) (6:1) (P)	(24 IN) (RCP) (4:1) (C)	(30 IN) (RCP) (4:1) (C)	(36 IN) (RCP) (4:1) (C)		
				(DIA= 60 IN)	(DIA= 24 IN)	(DIA= 30 IN)	(DIA= 42 IN)	(DIA= 48 IN)							
				EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA
CSJ 2707-01-014 (CONTINUED)															
16+14	EXIST 30" X 42' RCP	LT: EXT W/ 4' RCP (CL III) (30 IN) & ADD SET (TY II)(30 IN)(RCP)(4:1)(C) RT: ADD COLLAR, EXT W/ 6' RCP (CL III) (30 IN) & ADD CH-PW-0 (30 IN)(2:1)										1			3
34+86	EXIST 42" X 43' RCP	LT: REM 6', EXT W/ 12' RCP (CL III) (42 IN) & ADD CH-FW-0 (DIA=42 IN)(2:1) RT: REM 4', EXT W/ 12' RCP (CL III) (42 IN) & ADD CH-FW-0 (DIA=42 IN)(2:1)													2
50+03	EXIST 2 ~ 7' X 7' X 34' MC7 BOX W/ MCW-F2	LT: REM MCW-F2, EXT W/ 2 ~ 12' CONC BOX CULV (7 FT X 7 FT) & ADD PW-2(HW=9 FT)(2:1) RT: REM MCW-F2, EXT W/ 2 ~ 12' CONC BOX CULV (7 FT X 7 FT) & ADD PW-2(HW=9 FT)(2:1)													4
55+00	EXIST 6' X 4' X 38' SC30 BOX W/ FW-30 (30° RFS)	LT: REM FW-30, EXT W/ 16' CONC BOX CULV (6 FT X 4 FT) & ADD PW-2(HW=6 FT)(2:1) RT: REM FW-30, EXT W/ 11' CONC BOX CULV (6 FT X 4 FT) & ADD PW-2(HW=6 FT)(2:1)													4
71+65	EXIST 24" X 61' RCP (15° RFS)	LT: REM 4', EXT W/ 6' RCP (CL III) (24 IN) & ADD CH-PW-S(DIA=30 IN)(2:1) RT: ADD CH-PW-S(DIA=48 IN)(2:1)				1		1						1	3
82+08	EXIST 30" X 58' RCP (30° LFS)	LT: ADD COLLAR, EXT W/4' RCP (CL III), ADD CH-PW-S (DIA=30 IN)(30 DEG) (2:1) RT: EXT W/ 4' RCP (CL III) (30 IN) & ADD CH-PW-S(DIA=42 IN)(30 DEG)(2:1)				1	1								4
91+22	EXIST 18" X 43' RCP	LT: EXT W/ 4' RCP (CL III) (18 IN) & ADD SET (TY II)(18 IN)(RCP)(4:1)(C) RT: REM 4', EXT W/ 6' RCP (CL III) (18 IN) & ADD SET (TY II)(18 IN)(RCP)(4:1)(C)							2						2
106+65	EXIST 18" X 48' RCP (30° LFS)	LT: REM 6' RCP, EXT W/12' RCP(CL III)(18 IN) & ADD SET (TY II)(18 IN)(RCP)(4:1)(C) RT: REM 6' RCP, EXT W/12' RCP (CL III)(18 IN) & ADD SET (TY II)(18 IN)(RCP)(4:1)(C)							2					1	2
114+00	EXIST 18" X 41' RCP	LT: EXT W/ 8' RCP (CL III)(18 IN) & ADD SET (TY II)(18 IN)(RCP)(4:1)(C) RT: ADD COLLAR, EXT W/ 4' RCP (CL III)(18 IN) & ADD SET (TY II)(18 IN)(RCP)(4:1)(C)							2						2
160+30	EXIST 24" X 38' RCP	LT: ADD COLLAR, EXT W/ 4' RCP (CL III) (24 IN) & ADD SET (TY II)(24 IN)(RCP)(4:1)(C) RT: ADD COLLAR, EXT W/ 4' RCP (CL III) (24 IN) & ADD SET (TY II)(24 IN)(RCP)(4:1)(C)									2				2
183+00	EXIST 24" X 42' RCP	LT: EXT W/ 4' RCP (CL III) (24 IN) & ADD SET (TY II)(24 IN)(RCP)(4:1)(C) RT: EXT W/ 8' RCP (CL III) (24 IN) & ADD CH-PW-0(DIA=30 IN)(2:1)									1				2
		CSJ 2707-01-014 SHEET TOTALS		0	0	2	1	1	6	0	3	1	0	2	30

THE STRUCTURES ON THE PROJECT ARE OPERATING AT AN ESTIMATED MINIMUM 5 YEAR FREQUENCY. THE OPERATION OF THESE STRUCTURES WILL NOT BE SIGNIFICANTLY ALTERED BY THIS PROJECT. DUE CONSIDERATION HAS BEEN GIVEN TO THE EFFECTS OF HEADWATERS AND VELOCITIES ASSOCIATED WITH THE STRUCTURES. ADDITIONAL STUDIES ARE NOT REQUIRED. CAUTION TO BE USED WHEN WORKING OVER CULVERTS.

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED PROFESSIONAL ENGINEER

DocuSigned by:
AF8525728AEC4C9...
9/22/2022

QUANTITY SUMMARIES

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 14 OF 20

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		21

ROADWAY CULVERT SUMMARY (CONTINUED)

STA	DESCRIPTION: EXISTING STRUCTURE	DESCRIPTION: PROPOSED STRUCTURE	ITEM NO. / BID CODE: 132 / 6019 EMBANKMENT (VEHICLE) (ORD COMP) (TY B) CY	158 / 6003 SPEC EXCAV WORK (HYD EXCAVATOR) HR	162 / 6002 BLOCK SODDING SY	168 / 6001 VEGETATIVE WATERING (10 GAL/SY /2 APPS) MG	400 / 6005 CEM STABIL BKFL CY	402 / 6001 TRENCH EXCAVATION PROTECTION LF	403 / 6001 TEMPORARY SPL SHORING SF	420 / 6071 CL C CONC (COLLAR) EA	420 / 6057 CL C CONC (WINGWALLS) CY	420 / 6077 CL E CONC (SEAL SLAB) (NON-REINF) CY	432 / 6002 RIPRAP (CONC) (5 IN) CY	432 / 6026 RIPRAP (STONE COMMON) (DRY) (18 IN) CY	462 / 6050 CONC BOX CULV (5 FT X 2 FT) (EXTEND) LF	462 / 6055 CONC BOX CULV (6 FT X 4 FT) (EXTEND) LF	462 / 6062 CONC BOX CULV (7 FT X 7 FT) (EXTEND) LF	462 / 6064 CONC BOX CULV (8 FT X 5 FT) (EXTEND) LF
CSJ 2707-01-014 (CONTINUED)																		
202+34	EXIST 18" X 41' (15° LFS)	LT: ADD SET (TY II)(18 IN)(RCP)(4:1)(C) RT: EXT W/ 4' RCP (CL III) (18 IN) & ADD SET (TY II)(18 IN)(RCP)(4:1)(C)	28	2	95	1.9												
235+10.16 TO 235+39.83	EXIST 3 - 9' X 8' X 33' MC9-1 BOX & MCW-F2	LT: RETROFIT WINGWALL, SEE STRUCTURAL WING WALL EXTENSION SHEET, INSTALL T631 RAIL RT: RETROFIT WINGWALL, SEE STRUCTURAL WING WALL EXTENSION SHEET, INSTALL MBGF & NON-MOW STRIP	68	3	202	4.0					13			40				
259+74	EXIST 30" X 41' RCP	LT: EXT W/ 4' RCP (CL III) (30 IN) & ADD SET (TY II)(30 IN)(RCP)(4:1)(C) RT: REM 6', EXT W/ 4' RCP (CL III) (30 IN) & ADD SET (TY II)(30 IN)(RCP)(4:1)(C)	55	2	120	2.4												
264+10	EXIST 18" X 41' RCP	LT: EXT W/ 4' RCP (CL III) (18 IN) & ADD SET (TY II)(18 IN)(RCP)(4:1)(C) RT: REM 4', EXT W/ 4' RCP (CL III) (18 IN) & ADD SET (TY II)(18 IN)(RCP)(4:1)(C)	28	1	98	2.0												
302+05	EXIST 2 ~ 8' X 5' X 41' MC30 BOX W/ MCW-F1 (30° LFS)	LT: REM MCW-F1, EXT W/ 2 ~ 14' CONC BOX CULV (8 FT X 5 FT) & ADD PW-2(HW=7 FT)(2:1) RT: REM MCW-F1, EXT W/ 2 ~ 11' CONC BOX CULV (8 FT X 5 FT) & ADD PW-2(HW=7 FT)(2:1)	482	4	616	12.3			303					16				50
321+75	EXIST 18" X 40' RCP	LT: ADD COLLAR, EXT W/ 4' RCP (CL III) (18 IN) & ADD SET (TY II)(18 IN)(RCP)(4:1)(C) RT: ADD COLLAR, EXT W/ 4' RCP (CL III)(18 IN) & ADD SET (TY II)(18 IN)(RCP)(4:1)(C)	38	2	103	2.1				2								
354+48	EXIST 5' X 2' X 35' BOX W/ FC-3	LT: REM FC-3, EXT W/ 11' CONC BOX CULV (5 FT X 2 FT) & ADD FW-0 (HW=4 FT)(2:1) RT: REM FC-3, EXT W/ 11' CONC BOX CULV (5 FT X 2 FT) & ADD PW-2(HW=4 FT)(2:1)	168	1	207	4.1							0.9		22			
385+40	EXIST 9' X 4' X 35' BOX W/ FC-3	LT: REM FC-3, EXT W/ 11' CONC BOX CULV (9 FT X 4 FT) & ADD PW-2(HW=6 FT)(2:1) RT: REM FC-3, EXT W/ 11' CONC BOX CULV (9 FT X 4 FT) & ADD PW-2(HW=6 FT)(2:1)	285	4	228	4.6	1		251		21							
		CSJ 2707-01-014 SHEET TOTALS	**1152**	**19**	**1669**	**33.4**	**1**	**0**	**554**	**2**	**13**	**0**	**0.9**	**77**	**22**	**0**	**0**	**50**
		CSJ 2707-01-014 TOTALS	**2368**	**41**	**3234**	**64.8**	**32**	**0**	**972**	**7**	**13**	**5**	**0.9**	**133**	**22**	**27**	**48**	**50**
CCSJ 2707-01-011																		
430+92	EXIST 36" X 42' RCP	LT: ADD SET (TY II)(36 IN)(RCP)(4:1)(C) RT: REM 6', EXT W/ 6' RCP (CL III) (36 IN) & ADD SET (TY II)(36 IN)(RCP)(4:1)(C)	62	1	133	2.7	8							16				
458+03	EXIST 30" X 42' RCP	LT: ADD SET (TY II)(30 IN)(RCP)(4:1)(C) RT: EXT W/ 4' RCP (CL III) (30 IN) & ADD SET (TY II)(30 IN)(RCP)(4:1)(C)	54	2	128	2.6												
		CCSJ 2707-01-011 SHEET TOTALS	**116**	**3**	**261**	**5.3**	**8**	**0**	**0**	**0**	**0**	**0**	**0**	**16**	**0**	**0**	**0**	**0**

THE STRUCTURES ON THE PROJECT ARE OPERATING AT AN ESTIMATED MINIMUM 5 YEAR FREQUENCY. THE OPERATION OF THESE STRUCTURES WILL NOT BE SIGNIFICANTLY ALTERED BY THIS PROJECT. DUE CONSIDERATION HAS BEEN GIVEN TO THE EFFECTS OF HEADWATERS AND VELOCITIES ASSOCIATED WITH THE STRUCTURES. ADDITIONAL STUDIES ARE NOT REQUIRED. CAUTION TO BE USED WHEN WORKING OVER CULVERTS.

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED PROFESSIONAL ENGINEER

DocuSigned by:
CMB, P.E.
AF852572BA5C4C9...
9/22/2022

QUANTITY SUMMARIES

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 15 OF 20

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		22

ROADWAY CULVERT SUMMARY (CONTINUED)

STA	DESCRIPTION		ITEM NO.	462	464						466									
			BID CODE	6100	6003	6005	6007	6008	6009	6011	6151	6193	6195	6196	6198	6010	6025	6099	6102	6104
	EXISTING STRUCTURE	PROPOSED STRUCTURE		CONC BOX CULV (9 FT X 4 FT) EXTEND	RC PIPE (CL III)						WINGWALL					HEADWALL				
											(FW-0)	(PW-2)				(CH-FW-0)	(CH-FW-15)	(CH - PW - 0)		
					(18 IN)	(24 IN)	(30 IN)	(36 IN)	(42 IN)	(54 IN)	(HW= 4 FT)	(HW= 4 FT)	(HW= 6 FT)	(HW= 7 FT)	(HW= 9 FT)	(DIA= 42 IN)	(DIA= 42 IN)	(DIA= 30 IN)	(DIA= 42 IN)	(DIA= 54 IN)
				LF	LF	LF	LF	LF	LF	LF	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA
CSJ 2707-01-014 (CONTINUED)																				
202+34	EXIST 18" X 41' (15° LFS)	LT: ADD SET (TY II)(18 IN)(RCP)(4:1)(C) RT: EXT W/ 4' RCP (CL III) (18 IN) & ADD SET (TY II)(18 IN)(RCP)(4:1)(C)			4															
235+10.16 TO 235+39.83	EXIST 3 - 9' X 8' X 33' MC9-1 BOX & MCW-F2	LT: RETROFIT WINGWALL, SEE STRUCTURAL WING WALL EXTENSION SHEET, INSTALL T631 RAIL RT: RETROFIT WINGWALL, SEE STRUCTURAL WING WALL EXTENSION SHEET, INSTALL MBGF & NON-MOW STRIP																		
259+74	EXIST 30" X 41' RCP	LT: EXT W/ 4' RCP (CL III) (30 IN) & ADD SET (TY II)(30 IN)(RCP)(4:1)(C) RT: REM 6', EXT W/ 4' RCP (CL III) (30 IN) & ADD SET (TY II)(30 IN)(RCP)(4:1)(C)					8													
264+10	EXIST 18" X 41' RCP	LT: EXT W/ 4' RCP (CL III) (18 IN) & ADD SET (TY II)(18 IN)(RCP)(4:1)(C) RT: REM 4', EXT W/ 4' RCP (CL III) (18 IN) & ADD SET (TY II)(18 IN)(RCP)(4:1)(C)			8															
302+05	EXIST 2 ~ 8' X 5' X 41' MC30 BOX W/ MCW-F1 (30° LFS)	LT: REM MCW-F1, EXT W/ 2 ~ 14' CONC BOX CULV (8 FT X 5 FT) & ADD PW-2(HW=7 FT)(2:1) RT: REM MCW-F1, EXT W/ 2 ~ 11' CONC BOX CULV (8 FT X 5 FT) & ADD PW-2(HW=7 FT)(2:1)												2						
321+75	EXIST 18" X 40' RCP	LT: ADD COLLAR, EXT W/ 4' RCP (CL III) (18 IN) & ADD SET (TY II)(18 IN)(RCP)(4:1)(C) RT: ADD COLLAR, EXT W/ 4' RCP (CL III)(18 IN) & ADD SET (TY II)(18 IN)(RCP)(4:1)(C)			8															
354+48	EXIST 5' X 2' X 35' BOX W/ FC-3	LT: REM FC-3, EXT W/ 11' CONC BOX CULV (5 FT X 2 FT) & ADD FW-0 (HW=4 FT)(2:1) RT: REM FC-3, EXT W/ 11' CONC BOX CULV (5 FT X 2 FT) & ADD PW-2(HW=4 FT)(2:1)									1	1								
385+40	EXIST 9' X 4' X 35' BOX W/ FC-3	LT: REM FC-3, EXT W/ 11' CONC BOX CULV (9 FT X 4 FT) & ADD PW-2(HW=6 FT)(2:1) RT: REM FC-3, EXT W/ 11' CONC BOX CULV (9 FT X 4 FT) & ADD PW-2(HW=6 FT)(2:1)		22									2							
		CSJ 2707-01-014 SHEET TOTALS		**22**	**20**	**0**	**8**	**0**	**0**	**0**	**1**	**1**	**2**	**2**	**0**	**0**	**0**	**0**	**0**	**0**
		CSJ 2707-01-014 TOTALS		**22**	**66**	**26**	**26**	**0**	**24**	**0**	**1**	**1**	**4**	**2**	**2**	**2**	**0**	**1**	**0**	**0**
CCSJ 2707-01-011 (CONTINUED)																				
430+92	EXIST 36" X 42' RCP	LT: ADD SET (TY II)(36 IN)(RCP)(4:1)(C) RT: REM 6', EXT W/ 6' RCP (CL III) (36 IN) & ADD SET (TY II)(36 IN)(RCP)(4:1)(C)						6												
458+03	EXIST 30" X 42' RCP	LT: ADD SET (TY II)(30 IN)(RCP)(4:1)(C) RT: EXT W/ 4' RCP (CL III) (30 IN) & ADD SET (TY II)(30 IN)(RCP)(4:1)(C)					4													
		CCSJ 2707-01-011 SHEET TOTALS		**0**	**0**	**0**	**4**	**6**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

THE STRUCTURES ON THE PROJECT ARE OPERATING AT AN ESTIMATED MINIMUM 5 YEAR FREQUENCY. THE OPERATION OF THESE STRUCTURES WILL NOT BE SIGNIFICANTLY ALTERED BY THIS PROJECT. DUE CONSIDERATION HAS BEEN GIVEN TO THE EFFECTS OF HEADWATERS AND VELOCITIES ASSOCIATED WITH THE STRUCTURES. ADDITIONAL STUDIES ARE NOT REQUIRED. CAUTION TO BE USED WHEN WORKING OVER CULVERTS.

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED PROFESSIONAL ENGINEER

DocuSigned by:
CMB, P.E.
AF852572BA5C4C8...
9/22/2022

QUANTITY SUMMARIES

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 16 OF 20

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		23

ROADWAY CULVERT SUMMARY (CONTINUED)

STA	DESCRIPTION		ITEM NO.	466					467					480	658
			BID CODE	6105	6130	6132	6135	6136	6358	6363	6390	6419	6450	6001	6109
				HEADWALL					SET (TY II)						
	EXISTING STRUCTURE	PROPOSED STRUCTURE		(CH - PW - 0)	(CH - PW - S)									CLEAN EXIST CULVERTS	INSTL OM ASSM (OM-2Z) (WFLX) SRF (BI)
				(DIA= 60 IN)	(DIA= 24 IN)	(DIA= 30 IN)	(DIA= 42 IN)	(DIA= 48 IN)	(18 IN) (RCP) (4:1) (C)	(18 IN) (RCP) (6:1) (P)	(24 IN) (RCP) (4:1) (C)	(30 IN) (RCP) (4:1) (C)	(36 IN) (RCP) (4:1) (C)		
				EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA
CSJ 2707-01-014 (CONTINUED)															
202+34	EXIST 18" X 41' (15° LFS)	LT: ADD SET (TY II) (18 IN) (RCP) (4:1) (C) RT: EXT W/ 4' RCP (CL III) (18 IN) & ADD SET (TY II) (18 IN) (RCP) (4:1) (C)							2						2
235+10.16 TO 235+39.83	EXIST 3 - 9' X 8' X 33' MC9-1 BOX & MCW-F2	LT: RETROFIT WINGWALL, SEE STRUCTURAL WING WALL EXTENSION SHEET, INSTALL T631 RAIL RT: RETROFIT WINGWALL, SEE STRUCTURAL WING WALL EXTENSION SHEET, INSTALL MBGF & NON-MOW STRIP													4
259+74	EXIST 30" X 41' RCP	LT: EXT W/ 4' RCP (CL III) (30 IN) & ADD SET (TY II) (30 IN) (RCP) (4:1) (C) RT: REM 6', EXT W/ 4' RCP (CL III) (30 IN) & ADD SET (TY II) (30 IN) (RCP) (4:1) (C)										2			2
264+10	EXIST 18" X 41' RCP	LT: EXT W/ 4' RCP (CL III) (18 IN) & ADD SET (TY II) (18 IN) (RCP) (4:1) (C) RT: REM 4', EXT W/ 4' RCP (CL III) (18 IN) & ADD SET (TY II) (18 IN) (RCP) (4:1) (C)							2						2
302+05	EXIST 2 ~ 8' X 5' X 41' MC30 BOX W/ MCW-F1 (30° LFS)	LT: REM MCW-F1, EXT W/ 2 ~ 14' CONC BOX CULV (8 FT X 5 FT) & ADD PW-2 (HW=7 FT) (2:1) RT: REM MCW-F1, EXT W/ 2 ~ 11' CONC BOX CULV (8 FT X 5 FT) & ADD PW-2 (HW=7 FT) (2:1)													4
321+75	EXIST 18" X 40' RCP	LT: ADD COLLAR, EXT W/ 4' RCP (CL III) (18 IN) & ADD SET (TY II) (18 IN) (RCP) (4:1) (C) RT: ADD COLLAR, EXT W/ 4' RCP (CL III) (18 IN) & ADD SET (TY II) (18 IN) (RCP) (4:1) (C)							2					1	2
354+48	EXIST 5' X 2' X 35' BOX W/ FC-3	LT: REM FC-3, EXT W/ 11' CONC BOX CULV (5 FT X 2 FT) & ADD FW-0 (HW=4 FT) (2:1) RT: REM FC-3, EXT W/ 11' CONC BOX CULV (5 FT X 2 FT) & ADD PW-2 (HW=4 FT) (2:1)													2
385+40	EXIST 9' X 4' X 35' BOX W/ FC-3	LT: REM FC-3, EXT W/ 11' CONC BOX CULV (9 FT X 4 FT) & ADD PW-2 (HW=6 FT) (2:1) RT: REM FC-3, EXT W/ 11' CONC BOX CULV (9 FT X 4 FT) & ADD PW-2 (HW=6 FT) (2:1)													4
		CSJ 2707-01-014 SHEET TOTALS		**0**	**0**	**0**	**0**	**0**	**6**	**0**	**0**	**2**	**0**	**1**	**22**
		CSJ 2707-01-014 TOTALS		**0**	**0**	**2**	**1**	**1**	**12**	**0**	**3**	**3**	**0**	**3**	**52**
CCSJ 2707-01-011 (CONTINUED)															
430+92	EXIST 36" X 42' RCP	LT: ADD SET (TY II) (36 IN) (RCP) (4:1) (C) RT: REM 6', EXT W/ 6' RCP (CL III) (36 IN) & ADD SET (TY II) (36 IN) (RCP) (4:1) (C)											2		2
458+03	EXIST 30" X 42' RCP	LT: ADD SET (TY II) (30 IN) (RCP) (4:1) (C) RT: EXT W/ 4' RCP (CL III) (30 IN) & ADD SET (TY II) (30 IN) (RCP) (4:1) (C)										2		1	2
		CCSJ 2707-01-011 SHEET TOTALS		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**2**	**1**	**4**

THE STRUCTURES ON THE PROJECT ARE OPERATING AT AN ESTIMATED MINIMUM 5 YEAR FREQUENCY. THE OPERATION OF THESE STRUCTURES WILL NOT BE SIGNIFICANTLY ALTERED BY THIS PROJECT. DUE CONSIDERATION HAS BEEN GIVEN TO THE EFFECTS OF HEADWATERS AND VELOCITIES ASSOCIATED WITH THE STRUCTURES. ADDITIONAL STUDIES ARE NOT REQUIRED. CAUTION TO BE USED WHEN WORKING OVER CULVERTS.

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED PROFESSIONAL ENGINEER

DocuSigned by:
CMB, P.E.
AF8525728A5C4C9...
9/22/2022

QUANTITY SUMMARIES

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 17 OF 20

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		24

ROADWAY CULVERT SUMMARY (CONTINUED)

STA	DESCRIPTION: EXISTING STRUCTURE	DESCRIPTION: PROPOSED STRUCTURE	ITEM NO.	132	158	162	168	400	402	403	420			432		462			
			BID CODE	6019	6003	6002	6001	6005	6001	6001	6071	6057	6077	6002	6026	6050	6055	6062	6064
				EMBANKMENT (VEHICLE) (ORD COMP) (TY B)	SPEC EXCAV WORK (HYD EXCAVATOR)	BLOCK SODDING	VEGETATIVE WATERING (10 GAL/SY /2 APPS)	CEM STABIL BKFL	TRENCH EXCAVATION PROTECTION	TEMPORARY SPL SHORING	CL C CONC (COLLAR)	CL C CONC (WINGWALLS)	CL E CONC (SEAL SLAB) (NON-REINF)	RIPRAP (CONC) (5 IN)	RIPRAP (STONE COMMON) (DRY) (18 IN)	CONC BOX CULV (5 FT X 2 FT) (EXTEND)	CONC BOX CULV (6 FT X 4 FT) (EXTEND)	CONC BOX CULV (7 FT X 7 FT) (EXTEND)	CONC BOX CULV (8 FT X 5 FT) (EXTEND)
				CY	HR	SY	MG	CY	LF	SF	EA	CY	CY	CY	CY	LF	LF	LF	LF
CCSJ 2707-01-011 (CONTINUED)																			
177+00 (REVERSAL)	EXIST 18" X 42' RCP	LT/EAST: REM 6', EXT W/ 4' RCP (CL III) (18 IN) & ADD SET (TY II) (18 IN) (RCP) (4:1) (C) RT/WEST: REM 4', EXT W/ 6' RCP (CL III) (18 IN) & ADD SET (TY II) (18 IN) (RCP) (4:1) (C)		21	2	93	1.9												
167+67 (REVERSAL)	EXIST 24" X 42' RCP	LT/EAST: REM 6', EXT W/ 8' RCP (CL III) (24 IN) & ADD SET (TY II) (24 IN) (RCP) (4:1) (C) RT/WEST: REM 6', EXT W/ 8' RCP (CL III) (24 IN) & ADD SET (TY II) (24 IN) (RCP) (4:1) (C)		41	4	112	2.2			42									
148+30 (REVERSAL)	EXIST 42" X 46' RCP	LT/EAST: REM & RESET 12' RCP, EXT W/ 4' RCP (CL III) (42 IN) & ADD CH-PW-0 (DIA=60 IN) (2:1) RT/WEST: REM & RESET 6' RCP, ADD COLLAR, EXT W/6' RCP (CL III) (42 IN) & ADD CH-PW-0 (DIA=42 IN) (2:1)		100	3	197	3.9	10	20	207	1				8				
113+27 (REVERSAL)	EXIST 24" X 59' (15° LFS)	LT/EAST: REM 6', EXT W/ 8' RCP (CL III) (24 IN) & ADD CH-PW-S (DIA=24 IN) (2:1) RT/WEST: ADD CH-FW-15 (DIA=42 IN) (2:1)		66	0.5	163	3.3								11				
105+86 (REVERSAL)	EXIST 18" X 54' (30° LFS)	LT/EAST: REM 4', EXT W/4' RCP (CL III) (18 IN) & ADD SET (TY II) (18 IN) (RCP) (4:1) (C) RT/WEST: REM 6' RCP, ADD COLLAR, RESET 6' RCP & ADD SET (TY II) (18 IN) (RCP) (4:1) (C)		25	1	113	2.3	1			1				5				
77+00 (REVERSAL)	EXIST 36" X 42' RCP	LT/EAST: ADD SET (TY II) (36 IN) (RCP) (4:1) (C) RT/WEST: REM 6', EXT W/ 8' RCP (CL III) (36 IN) & ADD SET (TY II) (36 IN) (RCP) (4:1) (C)		72	1	144	2.9	1							9				
		CCSJ 2707-01-011 SHEET TOTALS		**325**	**11.5**	**822**	**16.5**	**12**	**20**	**249**	**2**	**0**	**0**	**0**	**33**	**0**	**0**	**0**	**0**
		CCSJ 2707-01-011 TOTALS		**441**	**14.5**	**1083**	**21.8**	**20**	**20**	**249**	**2**	**0**	**0**	**0**	**49**	**0**	**0**	**0**	**0**
CSJ 2707-02-008																			
19+22 (REVERSAL)	EXIST 2 ~ 54" X 48' RCP	LT/EAST: EXT W/ 2 ~ 6' RCP (CL III) (54 IN) & ADD CH-PW-0 (DIA=54 IN) (2:1) RT/WEST: REM 6', EXT W/ 2 ~ 8' RCP (CL III) (54 IN) & ADD CH-PW-0 (DIA=54 IN) (2:1)		167	3	257	5.1		6	86	2								
15+75 (REVERSAL)	EXIST 42" X 54' RCP (15° RFS)	LT/EAST: EXT W/ 4' RCP (CL III) (42 IN) & ADD CH-PW-S (DIA=42 IN) (2:1) RT/WEST: EXT W/ 4' RCP (CL III) (42 IN) & ADD CH-PW-S (DIA=42 IN) (2:1)		97	1	207	4.1												
0+23 (REVERSAL)	EXIST 18" X 73' RCP	LT/EAST: ADD SET (TY II) (18 IN) (RCP) (6:1) (P) RT/WEST: ADD SET (TY II) (18 IN) (RCP) (6:1) (P)		23	0.5	100	2.0												
		CSJ 2707-02-008 TOTALS		**287**	**4.5**	**564**	**11.2**	**0**	**6**	**86**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		PROJECT TOTALS		**3096**	**60**	**4881**	**97.8**	**52**	**26**	**1307**	**11**	**13**	**5**	**0.9**	**182**	**22**	**27**	**48**	**50**

THE STRUCTURES ON THE PROJECT ARE OPERATING AT AN ESTIMATED MINIMUM 5 YEAR FREQUENCY. THE OPERATION OF THESE STRUCTURES WILL NOT BE SIGNIFICANTLY ALTERED BY THIS PROJECT. DUE CONSIDERATION HAS BEEN GIVEN TO THE EFFECTS OF HEADWATERS AND VELOCITIES ASSOCIATED WITH THE STRUCTURES. ADDITIONAL STUDIES ARE NOT REQUIRED. CAUTION TO BE USED WHEN WORKING OVER CULVERTS.

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED PROFESSIONAL ENGINEER

DocuSigned by:
AF852E728AE04C9...
9/22/2022

QUANTITY SUMMARIES

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 18 OF 20

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		25

ROADWAY CULVERT SUMMARY (CONTINUED)

STA	DESCRIPTION: EXISTING STRUCTURE	DESCRIPTION: PROPOSED STRUCTURE	ITEM NO.	462	464						466									
			BID CODE	6100	6003	6005	6007	6008	6009	6011	6151	6193	6195	6196	6198	6010	6025	6099	6102	6104
				CONC BOX CULV (9 FT X 4 FT) EXTEND	RC PIPE (CL III)						WINGWALL					HEADWALL				
											(FW-0)	(PW-2)				(CH-FW-0)	(CH-FW-15)	(CH - PW - 0)		
					(18 IN)	(24 IN)	(30 IN)	(36 IN)	(42 IN)	(54 IN)	(HW= 4 FT)	(HW= 4 FT)	(HW= 6 FT)	(HW= 7 FT)	(HW= 9 FT)	(DIA= 42 IN)	(DIA= 42 IN)	(DIA= 30 IN)	(DIA= 42 IN)	(DIA= 54 IN)
				LF	LF	LF	LF	LF	LF	LF	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA
CCSJ 2707-01-011 (CONTINUED)																				
177+00 (REVERSAL)	EXIST 18" X 42' RCP	LT/EAST: REM 6', EXT W/ 4' RCP (CL III) (18 IN) & ADD SET (TY II)(18 IN)(RCP)(4:1)(C) RT/WEST: REM 4', EXT W/ 6' RCP (CL III) (18 IN) & ADD SET (TY II)(18 IN)(RCP)(4:1)(C)			10															
167+67 (REVERSAL)	EXIST 24" X 42' RCP	LT/EAST: REM 6', EXT W/ 8' RCP (CL III) (24 IN) & ADD SET (TY II)(24 IN)(RCP)(4:1)(C) RT/WEST: REM 6', EXT W/ 8' RCP (CL III) (24 IN) & ADD SET (TY II)(24 IN)(RCP)(4:1)(C)				16														
148+30 (REVERSAL)	EXIST 42" X 46' RCP	LT/EAST: REM & RESET 12' RCP, EXT W/ 4' RCP (CL III)(42 IN) & ADD CH-PW-0(DIA=60 IN)(2:1) RT/WEST: REM & RESET 6' RCP, ADD COLLAR, EXT W/6' RCP (CL III)(42 IN) & ADD CH-PW-0 (DIA=42 IN)(2:1)							10										1	
113+27 (REVERSAL)	EXIST 24" X 59' (15° LFS)	LT/EAST: REM 6', EXT W/ 8' RCP (CL III) (24 IN) & ADD CH-PW-S(DIA=24 IN)(2:1) RT/WEST: ADD CH-FW-15 (DIA=42 IN)(2:1)				8												1		
105+86 (REVERSAL)	EXIST 18" X 54' (30° LFS)	LT/EAST: REM 4', EXT W/4' RCP (CL III)(18 IN) & ADD SET (TY II)(18 IN)(RCP)(4:1)(C) RT/WEST: REM 6' RCP, ADD COLLAR, RESET 6' RCP & ADD SET (TY II)(18 IN)(RCP)(4:1)(C)			4															
77+00 (REVERSAL)	EXIST 36" X 42' RCP	LT/EAST: ADD SET (TY II)(36 IN)(RCP)(4:1)(C) RT/WEST: REM 6', EXT W/ 8' RCP (CL III) (36 IN) & ADD SET (TY II)(36 IN)(RCP)(4:1)(C)							8											
		CCSJ 2707-01-011 SHEET TOTALS		0	14	24	0	8	10	0	0	0	0	0	0	0	1	0	1	0
		CCSJ 2707-01-011 TOTALS		0	14	24	4	14	10	0	0	0	0	0	0	0	1	0	1	0
CSJ 2707-02-008 (CONTINUED)																				
19+22 (REVERSAL)	EXIST 2 ~ 54" X 48' RCP	LT/EAST: EXT W/ 2 ~ 6' RCP (CL III) (54 IN) & ADD CH-PW-0(DIA=54 IN)(2:1) RT/WEST: REM 6', EXT W/ 2 ~ 8' RCP (CL III) (54 IN) & ADD CH-PW-0(DIA=54 IN)(2:1)								28										2
15+75 (REVERSAL)	EXIST 42" X 54' RCP (15° RFS)	LT/EAST: EXT W/ 4' RCP (CL III) (42 IN) & ADD CH-PW-S(DIA=42 IN)(2:1) RT/WEST: EXT W/ 4' RCP (CL III) (42 IN) & ADD CH-PW-S(DIA=42 IN)(2:1)							8											
0+23 (REVERSAL)	EXIST 18" X 73' RCP	LT/EAST: ADD SET (TY II)(18 IN)(RCP)(6:1)(P) RT/WEST: ADD SET (TY II)(18 IN)(RCP)(6:1)(P)																		
		CSJ 2707-02-008 TOTALS		0	0	0	0	0	8	28	0	0	0	0	0	0	0	0	0	2
		PROJECT TOTALS		22	80	50	30	14	42	28	1	1	4	2	2	2	1	1	1	2

THE STRUCTURES ON THE PROJECT ARE OPERATING AT AN ESTIMATED MINIMUM 5 YEAR FREQUENCY. THE OPERATION OF THESE STRUCTURES WILL NOT BE SIGNIFICANTLY ALTERED BY THIS PROJECT. DUE CONSIDERATION HAS BEEN GIVEN TO THE EFFECTS OF HEADWATERS AND VELOCITIES ASSOCIATED WITH THE STRUCTURES. ADDITIONAL STUDIES ARE NOT REQUIRED. CAUTION TO BE USED WHEN WORKING OVER CULVERTS.

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED PROFESSIONAL ENGINEER

DocuSigned by:
P.E.
AF852E728AEC4C9...
9/22/2022

QUANTITY SUMMARIES

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 19 OF 20

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		26

ROADWAY CULVERT SUMMARY (CONTINUED)

STA	DESCRIPTION: EXISTING STRUCTURE	DESCRIPTION: PROPOSED STRUCTURE	ITEM NO. 466 HEADWALL (CH - PW - 0) (DIA= 60 IN)	(CH - PW - S) (DIA= 24 IN)	(CH - PW - S) (DIA= 30 IN)	(CH - PW - S) (DIA= 42 IN)	(CH - PW - S) (DIA= 48 IN)	ITEM NO. 467 SET (TY II) (18 IN) (RCP) (4:1) (C)	(18 IN) (RCP) (6:1) (P)	(24 IN) (RCP) (4:1) (C)	(30 IN) (RCP) (4:1) (C)	(36 IN) (RCP) (4:1) (C)	ITEM NO. 480 CLEAN EXIST CULVERTS	ITEM NO. 658 INSTL OM ASSM (OM-2Z) (WFLX) SRF (BI)
		BID CODE	6105	6130	6132	6135	6136	6358	6363	6390	6419	6450	6001	6109
			EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA
CCSJ 2707-01-011 (CONTINUED)														
177+00 (REVERSAL)	EXIST 18" X 42' RCP	LT/EAST: REM 6', EXT W/ 4' RCP (CL III) (18 IN) & ADD SET (TY II)(18 IN)(RCP)(4:1)(C) RT/WEST: REM 4', EXT W/ 6' RCP (CL III) (18 IN) & ADD SET (TY II)(18 IN)(RCP)(4:1)(C)						2						2
167+67 (REVERSAL)	EXIST 24" X 42' RCP	LT/EAST: REM 6', EXT W/ 8' RCP (CL III) (24 IN) & ADD SET (TY II)(24 IN)(RCP)(4:1)(C) RT/WEST: REM 6', EXT W/ 8' RCP (CL III) (24 IN) & ADD SET (TY II)(24 IN)(RCP)(4:1)(C)								2				2
148+30 (REVERSAL)	EXIST 42" X 46' RCP	LT/EAST: REM & RESET 12' RCP, EXT W/ 4' RCP (CL III)(42 IN) & ADD CH-PW-0(DIA=60 IN)(2:1) RT/WEST: REM & RESET 6' RCP, ADD COLLAR, EXT W/6' RCP (CL III)(42 IN) & ADD CH-PW-0 (DIA=42 IN)(2:1)	1											4
113+27 (REVERSAL)	EXIST 24" X 59' (15° LFS)	LT/EAST: REM 6', EXT W/ 8' RCP (CL III) (24 IN) & ADD CH-PW-S(DIA=24 IN)(2:1) RT/WEST: ADD CH-FW-15 (DIA=42 IN)(2:1)		1										2
105+86 (REVERSAL)	EXIST 18" X 54' (30° LFS)	LT/EAST: REM 4', EXT W/4' RCP (CL III)(18 IN) & ADD SET (TY II)(18 IN)(RCP)(4:1)(C) RT/WEST: REM 6' RCP, ADD COLLAR, RESET 6' RCP & ADD SET (TY II)(18 IN)(RCP)(4:1)(C)						2					1	2
77+00 (REVERSAL)	EXIST 36" X 42' RCP	LT/EAST: ADD SET (TY II)(36 IN)(RCP)(4:1)(C) RT/WEST: REM 6', EXT W/ 8' RCP (CL III) (36 IN) & ADD SET (TY II)(36 IN)(RCP)(4:1)(C)										2		2
		CCSJ 2707-01-011 SHEET TOTALS	**1**	**1**	**0**	**0**	**0**	**4**	**0**	**2**	**0**	**2**	**1**	**14**
		CCSJ 2707-01-011 TOTALS	**1**	**1**	**0**	**0**	**0**	**4**	**0**	**2**	**2**	**4**	**2**	**18**
CSJ 2707-02-008 (CONTINUED)														
19+22 (REVERSAL)	EXIST 2 ~ 54" X 48' RCP	LT/EAST: EXT W/ 2 ~ 6' RCP (CL III) (54 IN) & ADD CH-PW-0(DIA=54 IN)(2:1) RT/WEST: REM 6', EXT W/ 2 ~ 8' RCP (CL III) (54 IN) & ADD CH-PW-0(DIA=54 IN)(2:1)												4
15+75 (REVERSAL)	EXIST 42" X 54' RCP (15° RFS)	LT/EAST: EXT W/ 4' RCP (CL III) (42 IN) & ADD CH-PW-S(DIA=42 IN)(2:1) RT/WEST: EXT W/ 4' RCP (CL III) (42 IN) & ADD CH-PW-S(DIA=42 IN)(2:1)				2								2
0+23 (REVERSAL)	EXIST 18" X 73' RCP	LT/EAST: ADD SET (TY II)(18 IN)(RCP)(6:1)(P) RT/WEST: ADD SET (TY II)(18 IN)(RCP)(6:1)(P)							2					4
		CSJ 2707-02-008 TOTALS	**0**	**0**	**0**	**2**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**10**
		PROJECT TOTALS	**1**	**1**	**2**	**3**	**1**	**16**	**2**	**5**	**5**	**4**	**5**	**80**

THE STRUCTURES ON THE PROJECT ARE OPERATING AT AN ESTIMATED MINIMUM 5 YEAR FREQUENCY. THE OPERATION OF THESE STRUCTURES WILL NOT BE SIGNIFICANTLY ALTERED BY THIS PROJECT. DUE CONSIDERATION HAS BEEN GIVEN TO THE EFFECTS OF HEADWATERS AND VELOCITIES ASSOCIATED WITH THE STRUCTURES. ADDITIONAL STUDIES ARE NOT REQUIRED. CAUTION TO BE USED WHEN WORKING OVER CULVERTS.

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED PROFESSIONAL ENGINEER

DocuSigned by:
AF852E728AEC4C9...
9/22/2022

QUANTITY SUMMARIES

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 20 OF 20

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		27

SUMMARY OF SMALL SIGNS

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX) POST TYPE	POSTS	ANCHOR TYPE	MOUNTING DESIGNATION PREFABRICATED	MOUNTING DESIGNATION 1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE
							FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	1 or 2	UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	P = "Plain" T = "T" U = "U"		TY N TY S
1	S1	R1-1	STOP	36 x 36	X		TWT	1	WS	P		
1	S2	M1-6F	<FM SHIELD> FARM ROAD (ROUTE #)	24 x 24	X		TWT	1	WS	P		
			2781									
		D10-7aT	<3 DIGIT VERTICAL NUMBER>	3 x 10	X							
			358									
		D10-7aT	<3 DIGIT VERTICAL NUMBER>	3 x 10	X							
1	S3	W11-8L	SYMBOL - BE ALERT FOR EMRGNCY VEHS LT	36 x 36	X		TWT	1	WS	P		
1	S4	D1-2	(DESTINATION - 2 LINE)	78 x 30	X		S80	1	SA	U		
			(LT)(Crockett)									
			(Lufkin)(RT)									
1	S5	R2-1	SPEED LIMIT (SPEED)	30 x 36	X		TWT	1	WS	P		
			35									
1	S6	M2-1	JCT <AUXILIARY SIGN>	21 x 15	X		TWT	1	WS	P		
		M1-6T	(ROUTE #) TEXAS	24 x 24	X							
			7									
1	S7	S3-1	<SYMBOL - SCHOOL BUS STOP AHEAD>	36 x 36	X		TWT	1	WS	P		
1	S8	W3-1	SYMBOL - STOP AHEAD	36 x 36	X		TWT	1	WS	P		
1	S9	W11-8R	SYMBOL - BE ALERT FOR EMRGNCY VEHS RT	36 x 36	X		TWT	1	WS	P		
1	S10	S3-1	<SYMBOL - SCHOOL BUS STOP AHEAD>	36 x 36	X		TWT	1	WS	P		
1	S11	R2-1	SPEED LIMIT (SPEED)	30 x 36	X		TWT	1	WS	P		
			50									
1	S12	R2-1	SPEED LIMIT (SPEED)	30 x 36	X		TWT	1	WS	P		
			35									
2	S13	I-2aT	(CITY NAME) CITY LIMIT	48 x 24	X		TWT	1	WS	P		
			(Kennard)									
			(Pop 337)									
		I-2aT	(CITY NAME) CITY LIMIT	48 x 24	X							
			(Kennard)									
			(Pop 337)									
2	S14	R2-1	SPEED LIMIT (SPEED)	30 x 36	X		TWT	1	WS	P		
			55									
2	S15	R2-1	SPEED LIMIT (SPEED)	30 x 36	X		TWT	1	WS	P		
			50									
3	S16	D20-1T	COUNTY ROAD (NUMBER)	24 x 24	X		TWT	1	WS	P		
			4600									
			<ARROW RIGHT>									
3	S17	R1-1	STOP	36 x 36	X		TWT	1	WS	P		
3	S18	D20-1T	COUNTY ROAD (NUMBER)	24 x 24	X		TWT	1	WS	P		
			4600									
			<ARROW LEFT>									

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

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

http://www.txdot.gov/

NOTE:

1. Sign supports shall be located as shown on the plans, except that the Engineer may shift the sign supports, within design guidelines, where necessary to secure a more desirable location or to avoid conflict with utilities. Unless otherwise shown on the plans, the Contractor shall stake and the Engineer will verify all sign support locations.
2. For installation of bridge mount clearance signs, see Bridge Mounted Clearance Sign Assembly (BMCS)Standard Sheet.
3. For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD(GEN).

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	2707	01	011, ETC.	FM 2781
4-16	DIST	COUNTY		SHEET NO.
8-16	LFK	HOUSTON, ETC.		28

18

DATE: 9/19/2022 2:53:20 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0361218\SOSS.dgn

SUMMARY OF SMALL SIGNS

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX) POST TYPE: FRP = Fiberglass, TWT = Thin-Wall, 10BWG = 10 BWG, S80 = Sch 80	POSTS: 1 or 2	ANCHOR TYPE: UA=Universal Conc, UB=Universal Bolt, SA=Slipbase-Conc, SB=Slipbase-Bolt, WS=Wedge Steel, WP=Wedge Plastic	MOUNTING DESIGNATION: PREFABRICATED P = "Plain", T = "T", U = "U"	MOUNTING DESIGNATION: 1EXT or 2EXT = # of Ext, BM = Extruded Wind Beam, WC = 1.12 #/ft Wing Channel, EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE: TY N, TY S
4	S19	W11-7	SYMBOL - BE ALERT FOR EQUESTRIANS	36 x 36	X		10BWG	1	SA	P		
		W7-3aP	NEXT (MI) MILES <PLAQUE>	24 x 18	X							
			6									
5	S20	M1-6F	<FM SHIELD> FARM ROAD (ROUTE #)	24 x 24	X		TWT	1	WS	P		
			2781									
		D10-7aT	<3 DIGIT VERTICAL NUMBER>	3 x 10	X							
			360									
		D10-7aT	<3 DIGIT VERTICAL NUMBER>	3 x 10	X							
			360									
6	S21	R1-1	STOP	36 x 36	X		TWT	1	WS	P		
7	S22	D20-1T	COUNTY ROAD (NUMBER)	24 x 24	X		TWT	1	WS	P		
			4608									
			<ARROW RIGHT>									
7	S23	R1-1	STOP	36 x 36	X		TWT	1	WS	P		
8	S24	D20-1T	COUNTY ROAD (NUMBER)	24 x 24	X		TWT	1	WS	P		
			4608									
			<ARROW LEFT>									
8	S25	D20-1T	COUNTY ROAD (NUMBER)	24 x 24	X		TWT	1	WS	P		
			4608									
			<ARROW RIGHT>									
8	S26	R1-1	STOP	36 x 36	X		TWT	1	WS	P		
8	S27	D20-1T	COUNTY ROAD (NUMBER)	24 x 24	X		TWT	1	WS	P		
			4608									
			<ARROW LEFT>									
9	S28	D20-1T	COUNTY ROAD (NUMBER)	24 x 24	X		TWT	1	WS	P		
			4610									
			<ARROW LEFT>									
9	S29	R1-1	STOP	36 x 36	X		TWT	1	WS	P		
9	S30	R1-1	STOP	36 x 36	X		TWT	1	WS	P		
9	S31	D20-1T	COUNTY ROAD (NUMBER)	24 x 24	X		TWT	1	WS	P		
			4610									
			<ARROW RIGHT>									
9	S32	M1-6F	<FM SHIELD> FARM ROAD (ROUTE #)	24 x 24	X		TWT	1	WS	P		
			2781									
		D10-7aT	<3 DIGIT VERTICAL NUMBER>	3 x 10	X							
			362									
		D10-7aT	<3 DIGIT VERTICAL NUMBER>	3 x 10	X							
			362									
11	S33	D20-1T	COUNTY ROAD (NUMBER)	24 x 24	X		TWT	1	WS	P		
			4615									
			<ARROW LEFT>									
11	S34	R1-1	STOP	36 x 36	X		TWT	1	WS	P		

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

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

http://www.txdot.gov/

NOTE:

1. Sign supports shall be located as shown on the plans, except that the Engineer may shift the sign supports, within design guidelines, where necessary to secure a more desirable location or to avoid conflict with utilities. Unless otherwise shown on the plans, the Contractor shall stake and the Engineer will verify all sign support locations.
2. For installation of bridge mount clearance signs, see Bridge Mounted Clearance Sign Assembly (BMCS)Standard Sheet.
3. For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD(GEN).

Texas Department of Transportation — Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	2707	01	011, ETC.	FM 2781
4-16	DIST	COUNTY		SHEET NO.
8-16	LFK	HOUSTON, ETC.		29

18

DATE: 8/5/2022 1:09:11 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0361218\SOSS.dgn

SUMMARY OF SMALL SIGNS

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX) POST TYPE: FRP = Fiberglass, TWT = Thin-Wall, 10BWG = 10 BWG, S80 = Sch 80	POSTS: 1 or 2	ANCHOR TYPE: UA=Universal Conc, UB=Universal Bolt, SA=Slipbase-Conc, SB=Slipbase-Bolt, WS=Wedge Steel, WP=Wedge Plastic	MOUNTING DESIGNATION: PREFABRICATED P = "Plain", T = "T", U = "U"	MOUNTING DESIGNATION: 1EXT or 2EXT = # of Ext, BM = Extruded Wind Beam, WC = 1.12 #/ft Wing Channel, EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE: TY N, TY S
11	S35	D20-1T	COUNTY ROAD (NUMBER)	24 x 24	X		TWT	1	WS	P		
			4615									
			<ARROW RIGHT>									
14	S36	M1-6F	<FM SHIELD> FARM ROAD (ROUTE #)	24 x 24	X		TWT	1	WS	P		
			2781									
		D10-7aT	<3 DIGIT VERTICAL NUMBER>	3 x 10	X							
			364									
		D10-7aT	<3 DIGIT VERTICAL NUMBER>	3 x 10	X							
			364									
16	S37	I-2cT	Baker Springs	78 x 12	X		TWT	1	WS	T		
17	S38	I-2cT	Baker Springs	78 x 12	X		TWT	1	WS	T		
17	S39	R1-1	STOP	36 x 36	X		TWT	1	WS	P		
18	S40	W11-7	SYMBOL - BE ALERT FOR EQUESTRIANS	36 x 36	X		10BWG	1	SA	P		
		W7-3aP	NEXT (MI) MILES <PLAQUE>	24 x 18	X							
			6									
18	S41	M1-6F	<FM SHIELD> FARM ROAD (ROUTE #)	24 x 24	X		TWT	1	SA	P		
		D10-7aT	<3 DIGIT VERTICAL NUMBER>	3 x 10	X							
			366									
		D10-7aT	<3 DIGIT VERTICAL NUMBER>	3 x 10	X							
			366									
19	S42	D7-6aTL	HISTORICAL MARKER 1 MILE ON LEFT	48 x 48	X		TWT	1	WS	T		
			10963									
19	S43	R1-1	STOP	36 x 36	X		TWT	1	WS	P		
21	S44	D20-1T	COUNTY ROAD (NUMBER)	24 x 24	X		TWT	1	WS	P		
			4570									
			<ARROW LEFT>									
21	S45	R1-1	STOP	36 x 36	X		TWT	1	WS	P		
21	S46	D7-7aTR	HISTORICAL MARKER <ARROW RIGHT>	48 x 48	X		S80	1	SA	U		
			10963									
		D7-7aTL	HISTORICAL MARKER <ARROW LEFT>	48 x 48	X							
			10936									
21	S47	D3-3bTL	Hill	54 x 36	X		10BWG	1	SA	T		
			Cemetery									
			<ARROW LEFT>									
		D3-3bTR	Hill	54 x 36	X							
			Cemetery									
			<ARROW RIGHT>									
21	S48	D20-1T	COUNTY ROAD (NUMBER)	24 x 24	X		TWT	1	WS	P		
			4570									
			<ARROW RIGHT>									
21	S49	D20-1T	COUNTY ROAD (NUMBER)	24 x 24	X		TWT	1	WS	P		
			4545									
			<ARROW RIGHT>									

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

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

http://www.txdot.gov/

NOTE:

1. Sign supports shall be located as shown on the plans, except that the Engineer may shift the sign supports, within design guidelines, where necessary to secure a more desirable location or to avoid conflict with utilities. Unless otherwise shown on the plans, the Contractor shall stake and the Engineer will verify all sign support locations.
2. For installation of bridge mount clearance signs, see Bridge Mounted Clearance Sign Assembly (BMCS)Standard Sheet.
3. For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD(GEN).

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	2707	01	011, ETC.	FM 2781
4-16	DIST	COUNTY		SHEET NO.
8-16	LFK	HOUSTON, ETC.		30

DATE: 8/5/2022 1:09:12 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0361218\SOSS.dgn

DATE: 8/5/2022 1:09:12 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0361218\SOSS.dgn

SUMMARY OF SMALL SIGNS

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

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
21	S50	D3-3bTL	Lake Creek	#N/A	X		10BWG	1	SA	T		
			Cemetery									
			<ARROW LEFT>									
		D3-3bTR	Lake Creek	#N/A	X							
			Cemetery									
			<ARROW RIGHT>									
21	S51	R1-1	STOP	36 x 36	X		TWT	1	WS	P		
22	S52	D20-1T	COUNTY ROAD (NUMBER)	24 x 24	X		TWT	1	WS	P		
			4545									
			<ARROW LEFT>									
23	S53	M1-6F	<FM SHIELD> FARM ROAD (ROUTE #)	24 x 24	X		TWT	1	WS	P		
			2781									
		D10-7aT	<3 DIGIT VERTICAL NUMBER>	3 x 10	X							
			368									
		D10-7aT	<3 DIGIT VERTICAL NUMBER>	3 x 10	X							
			368									
23	S54	D7-6aTR	HISTORICAL MARKER 1 MILE ON RIGHT	48 x 48	X		10BWG	1	SA	U		
			10963									
23	S55	D20-1T	COUNTY ROAD (NUMBER)	24 x 24	X		TWT	1	WS	P		
			4550									
			<BI-DIRECTION ARROW>									
23	S56	R1-1	STOP	36 x 36	X		TWT	1	WS	P		
23	S57	R1-1	STOP	36 x 36	X		TWT	1	WS	P		
24	S58	D20-1T	COUNTY ROAD (NUMBER)	24 x 24	X		TWT	1	WS	P		
			4550									
			<BI-DIRECTION ARROW>									
27	S59	I-2dT	Trinity	54 x 24	X		S80	1	SA	T		
			COUNTY LINE									
		D10-7aT	<3 DIGIT VERTICAL NUMBER>	3 x 10	X							
			370									
		D10-7aT	<3 DIGIT VERTICAL NUMBER>	3 x 10	X							
			370									
		R19-10aT	<FOLDING SIGN>	36 x 30	X							
			BURN BAN									
			IN EFFECT									
27	S60	I-2dT	Houston	66 x 24	X		S80	1	SA	T		
			COUNTY LINE									
		R19-10aT	<FOLDING SIGN>	36 x 30	X							
			BURN BAN									
			IN EFFECT									
27	S61	M2-1	JCT <AUXILIARY SIGN>	21 x 15	X		TWT	1	WS	P		
		M1-6F	<FM SHIELD> FARM ROAD (ROUTE #)	24 x 24	X							
			358									
27	S62	W3-1	SYMBOL - STOP AHEAD	36 x 36	X		TWT	1	WS	P		
28	S63	R2-1	SPEED LIMIT (SPEED)	30 x 36	X		TWT	1	WS	P		

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

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

http://www.txdot.gov/

NOTE:

1. Sign supports shall be located as shown on the plans, except that the Engineer may shift the sign supports, within design guidelines, where necessary to secure a more desirable location or to avoid conflict with utilities. Unless otherwise shown on the plans, the Contractor shall stake and the Engineer will verify all sign support locations.
2. For installation of bridge mount clearance signs, see Bridge Mounted Clearance Sign Assembly (BMCS)Standard Sheet.
3. For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD(GEN).

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	2707	01	011, ETC.	FM 2781
4-16	DIST	COUNTY		SHEET NO.
8-16	LFK	HOUSTON, ETC.		31

SUMMARY OF SMALL SIGNS

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

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
28	S64	M3-1	NORTH <AUXILIARY SIGN>	24 x 12	X		TWT	1	WS	P		
		M1-6F	<FM SHIELD> FARM ROAD (ROUTE #) 2781	24 x 24	X							

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

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

http://www.txdot.gov/

NOTE:

1. Sign supports shall be located as shown on the plans, except that the Engineer may shift the sign supports, within design guidelines, where necessary to secure a more desirable location or to avoid conflict with utilities. Unless otherwise shown on the plans, the Contractor shall stake and the Engineer will verify all sign support locations.
2. For installation of bridge mount clearance signs, see Bridge Mounted Clearance Sign Assembly (BMCS)Standard Sheet.
3. For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD(GEN).

SHEET 5 OF 5

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

FILE:	sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT	May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS		2707	01	011, ETC.	FM 2781
4-16		DIST	COUNTY		SHEET NO.
8-16		LFK	HOUSTON, ETC.		32

18

DATE: 8/5/2022 1:09:13 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0361218\SOSS.dgn

FULL REHAB SEQUENCE OF CONSTRUCTION

(STA 3+12 TO STA 140+50)
(STA 174+20 TO STA 266+52)
(STA 313+49 TO STA 318+46)
(STA 363+69 TO STA 376+97)
(STA 414+19 TO STA 469+30.50)
(STA 186+40 TO STA 0+10 (REVERSAL)

1. WIDEN SUBGRADE LT & RT.
2. SCARIFY & RESHAPE EXISTING BASE TO WIDTH SHOWN ON TYPICAL SECTIONS, SUBSIDIARY TO ITEM 275.
3. PLACE FLEX BASE AT RATE PER STATION AS DIRECTED.
4. CEMENT TREAT (MIX EXIST MATL & NEW BS), 12" DEPTH.
5. PLACE COVERED PRIME WEEKLY.
6. APPLY TWO COURSE SURFACE TREATMENT.
7. SEED AND FERTILIZE.
8. PLACE FINAL PAVEMENT MARKINGS AND MARKERS.

WIDENING SEQUENCE OF CONSTRUCTION

(STA 266+52 TO STA 313+49)
(STA 318+46 TO STA 346+50)
(STA 352+70 TO STA 363+69)
(STA 376+97 TO STA 414+19)

1. WIDEN SUBGRADE LT & RT.
2. PLACE 12" CEM TRT(PLNT MX).
3. PLACE COVERED PRIME WEEKLY.
4. PLACE GR 4 SEAL OVER WIDENING.
5. PLACE LEVEL-UP FULL WIDTH.
6. APPLY ONE COURSE SURFACE TREATMENT.
7. SEED AND FERTILIZE.
8. PLACE FINAL PAVEMENT MARKINGS AND MARKERS.

GEOGRID SEQUENCE OF CONSTRUCTION

(STA 140+50 TO STA 174+20)

1. INSTALL TEMP TRAFFIC SIGNALS.
2. REMOVE EXISTING 6" PAVEMENT LEFT.
3. WIDEN SUBGRADE LEFT.
4. UNDERCUT 4" LEFT, SUBSIDIARY TO PLACING GEOGRID.
5. PLACE GEOGRID LEFT AS DIRECTED BY ENGINEER.
6. PLACE 16" FLEX BASE LEFT AT RATE PER STATION AS DIRECTED.
7. SWITCH TRAFFIC TO THE NEWLY PLACED FLEXBASE AND COMPLETE STEPS 2-6 RIGHT.
8. REMOVE SIGNAL AND CEMENT TREAT (NEW BASE) 12" UNDER TRAFFIC.
9. PLACE COVERED PRIME WEEKLY.
10. APPLY TWO COURSE SURFACE TREATMENT.
11. SEED AND FERTILIZE.
12. PLACE FINAL PAVEMENT MARKINGS AND MARKERS.

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED
PROFESSIONAL ENGINEER

DocuSigned by:
cmb, P.E.
AF852E728A5C4C0...
9/22/2022

TCP SEQUENCE OF CONSTRUCTION

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		33

DATE: 8/5/2022 1:09:26 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0361222\bc-21.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

SHEET 1 OF 12

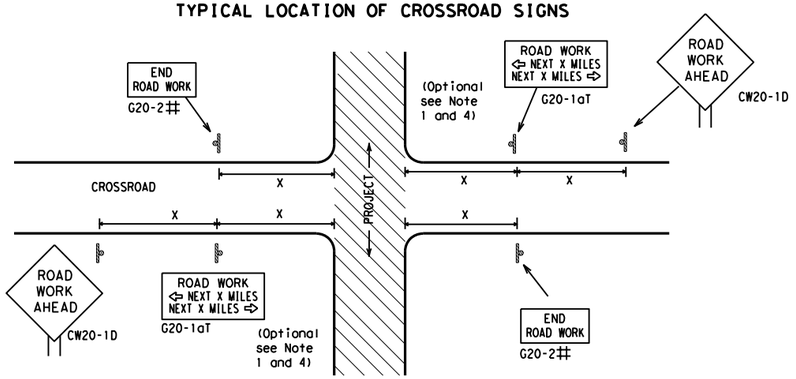
Texas Department of Transportation | Traffic Safety Division Standard

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 4-03 7-13 9-07 8-14 5-10 5-21	2707	01	011, ETC.	FM 2781
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON, ETC.		34

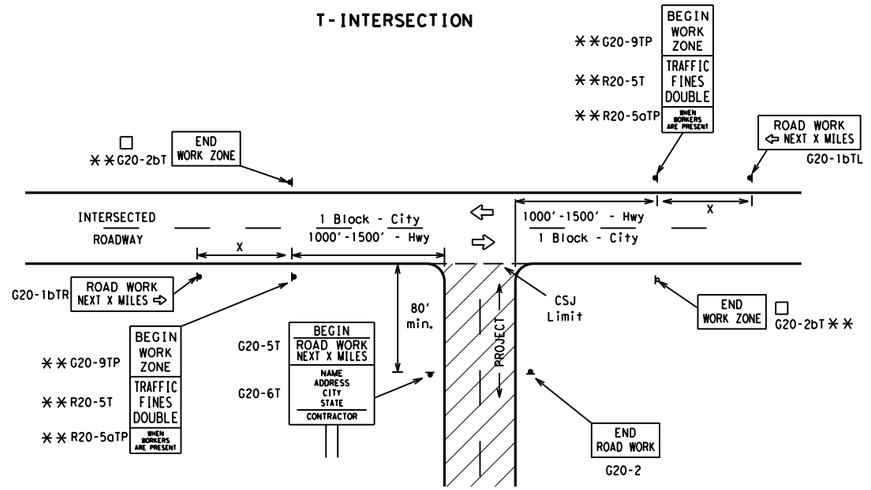
TYPICAL LOCATION OF CROSSROAD SIGNS



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]

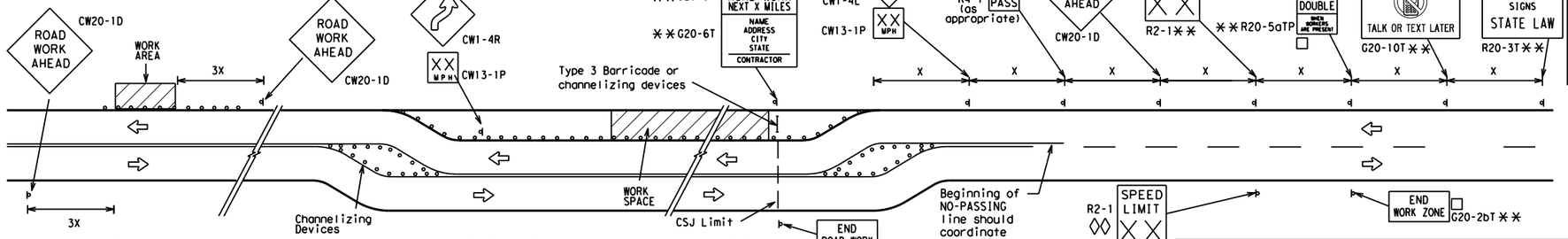
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

△ 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.

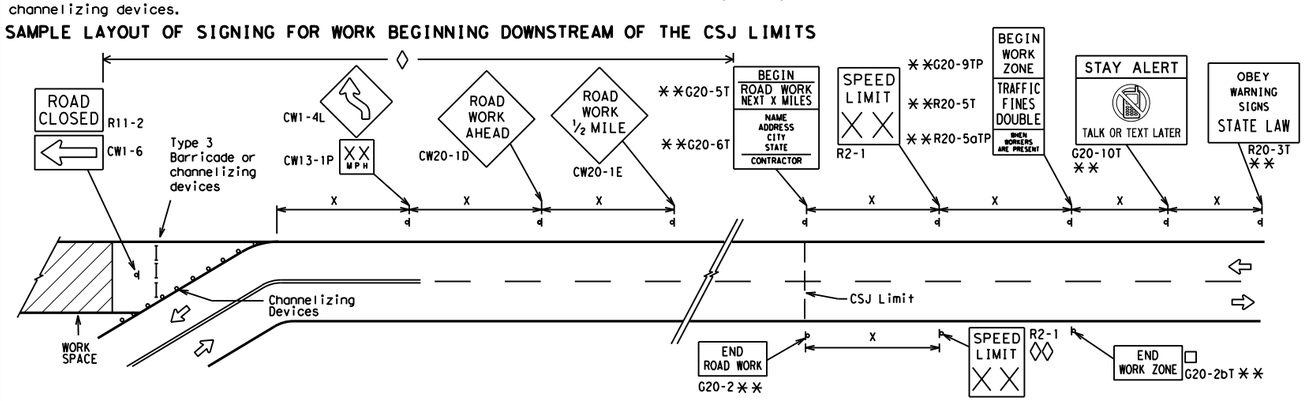
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



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.

SHEET 2 OF 12

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	2707	01	011, ETC.	FM 2781
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	LFK	HOUSTON, ETC.		35

DATE: 8/5/2022 1:09:26 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0361222\bc-21.dgn

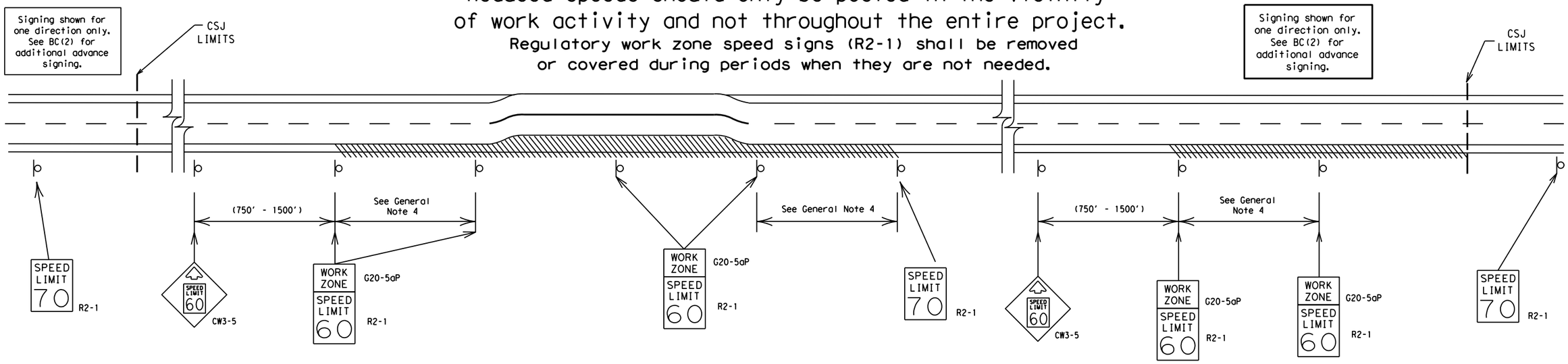
DATE: 8/5/2022 1:09:27 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0361222\bc-21.dgn

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.

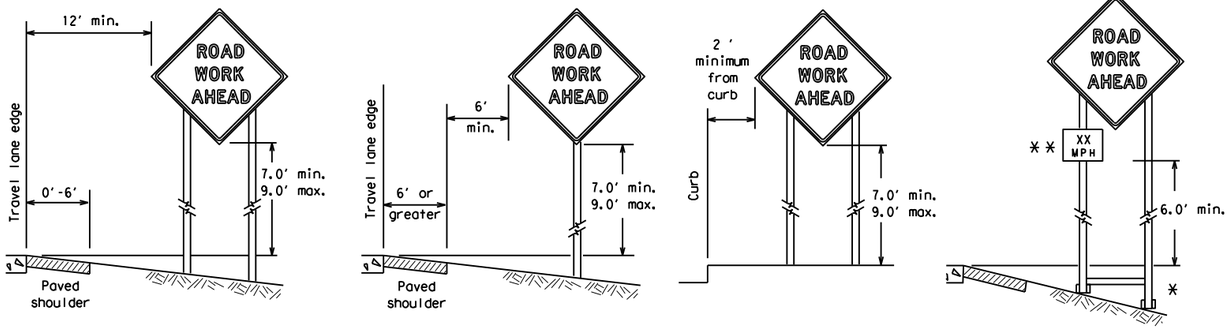
Texas Department of Transportation | Traffic Safety Division Standard

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	2707	01	011, ETC.	FM 2781
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	LFK	HOUSTON, ETC.		36

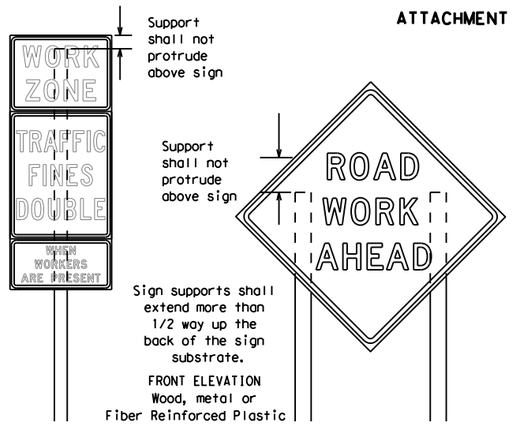
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

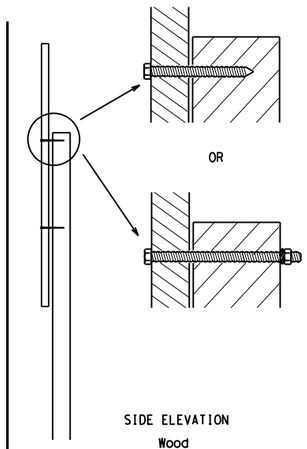


* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

** 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





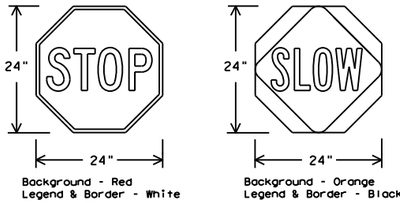
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

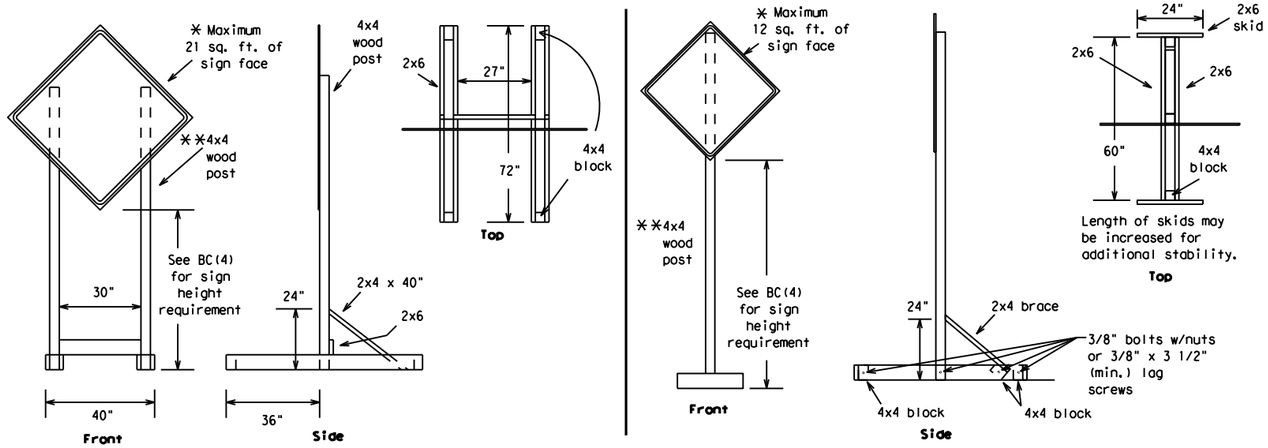
Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

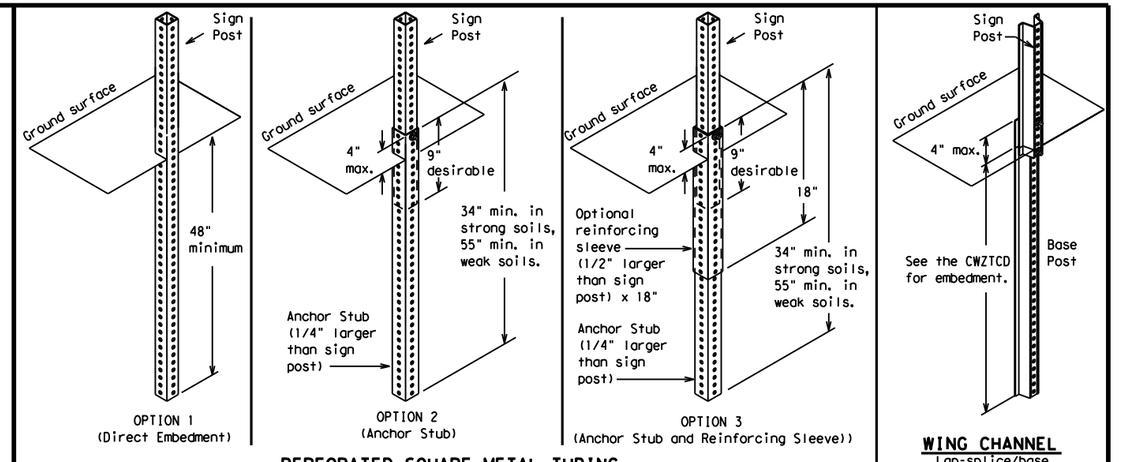
FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	2707	01	011, ETC.	FM 2781
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	LFK	HOUSTON, ETC.		37

DATE: 8/5/2022 1:09:27 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0361222\bc-21.dgn



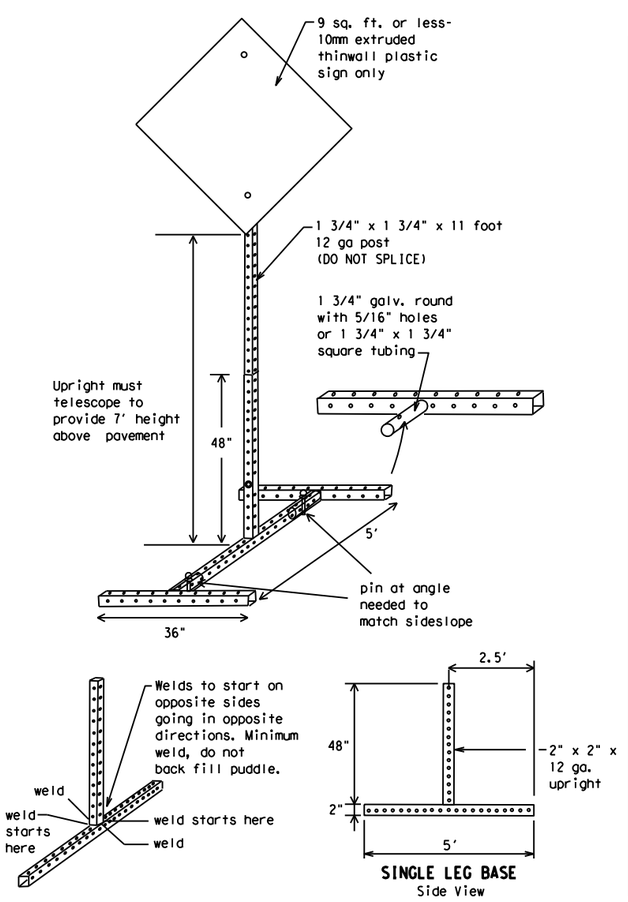
SKID MOUNTED WOOD SIGN SUPPORTS

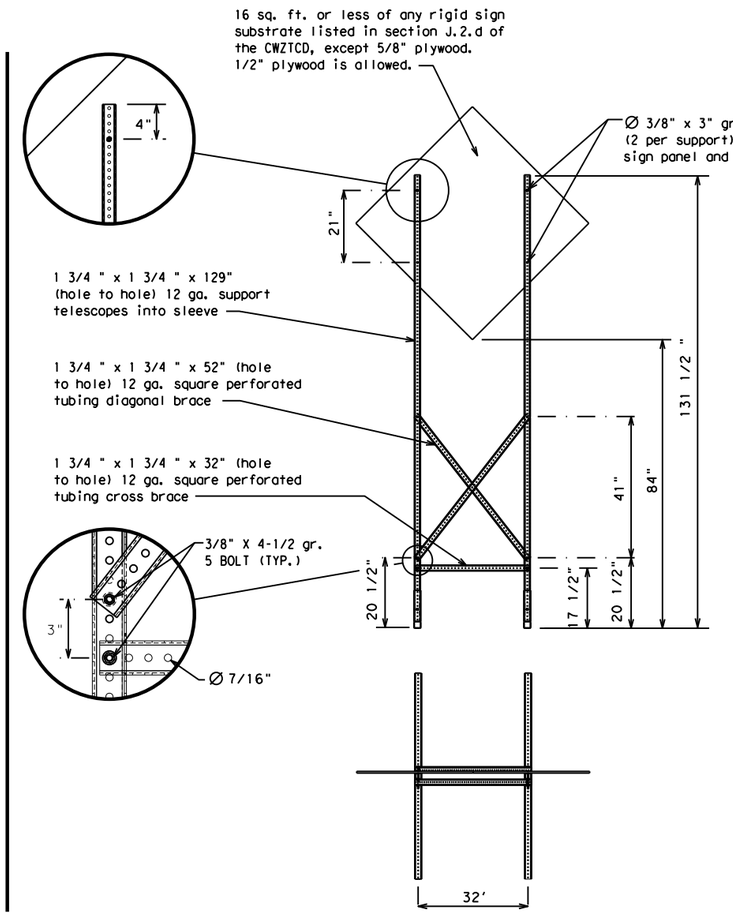
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS

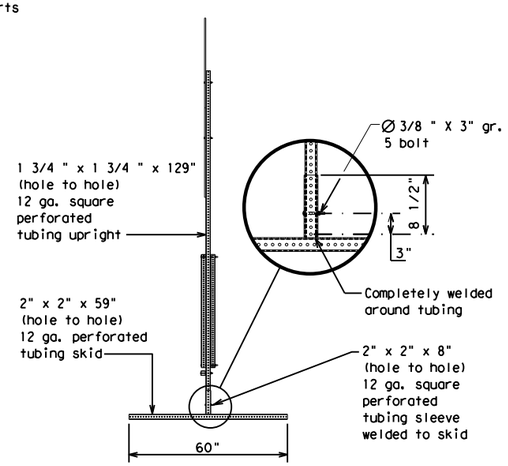


GROUND MOUNTED SIGN SUPPORTS

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
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	2707	01	011, ETC.	FM 2781
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	LFK	HOUSTON, ETC.		38

DATE: 8/5/2022 1:09:28 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0361222\bc-21.dgn

DATE: 8/5/2022 1:09:28 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0361222\bc-21.dgn

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
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.

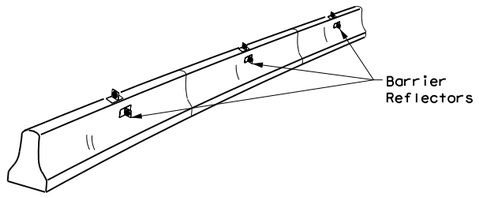
Texas Department of Transportation — Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-21

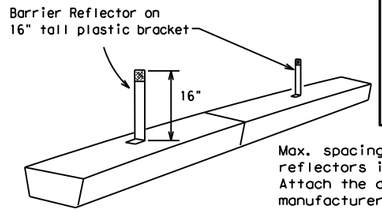
FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	2707	01	011, ETC.	FM 2781
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	LFK	HOUSTON, ETC.		39

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.

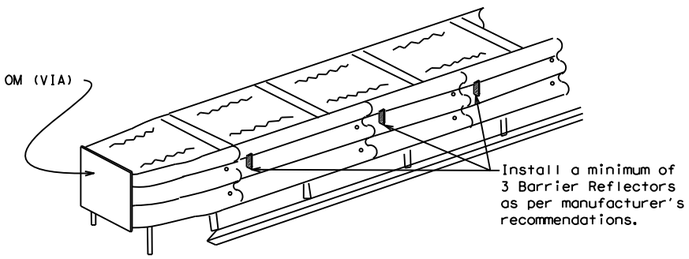


Max. spacing of barrier reflectors is 20 feet. Attach the delineators as per manufacturer's recommendations.

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)

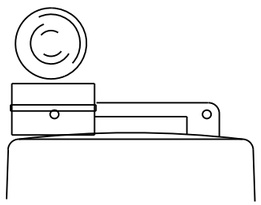


DELINEATION OF END TREATMENTS

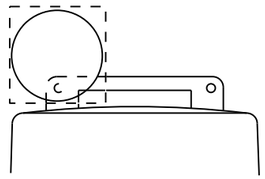
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

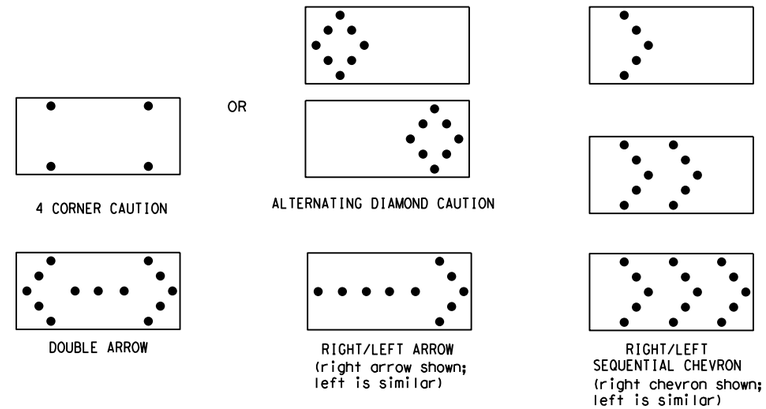
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing 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

SHEET 7 OF 12

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	2707	01	011, ETC.	FM 2781
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	LFK	HOUSTON, ETC.		40

101

GENERAL NOTES

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

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

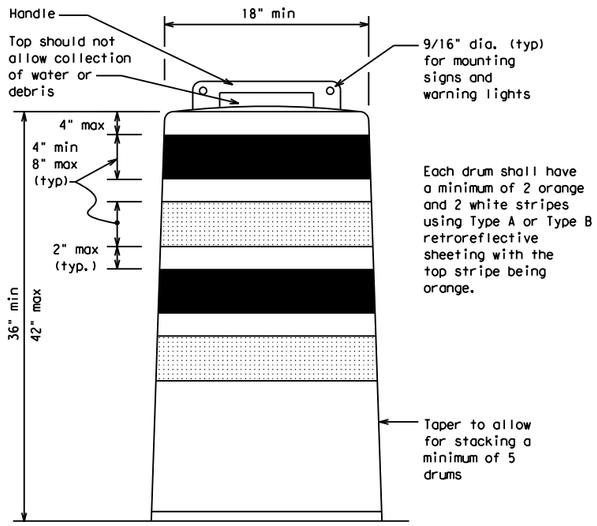
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

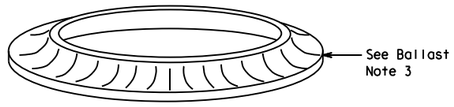
RETROREFLECTIVE SHEETING

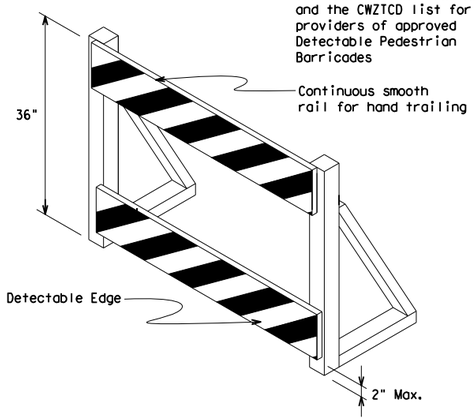
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials," Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall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

BALLAST

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

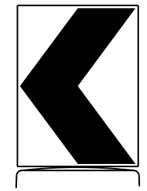




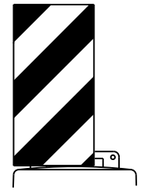


DETECTABLE PEDESTRIAN BARRICADES

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



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



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

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

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

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

Texas Department of Transportation | Traffic Safety Division Standard

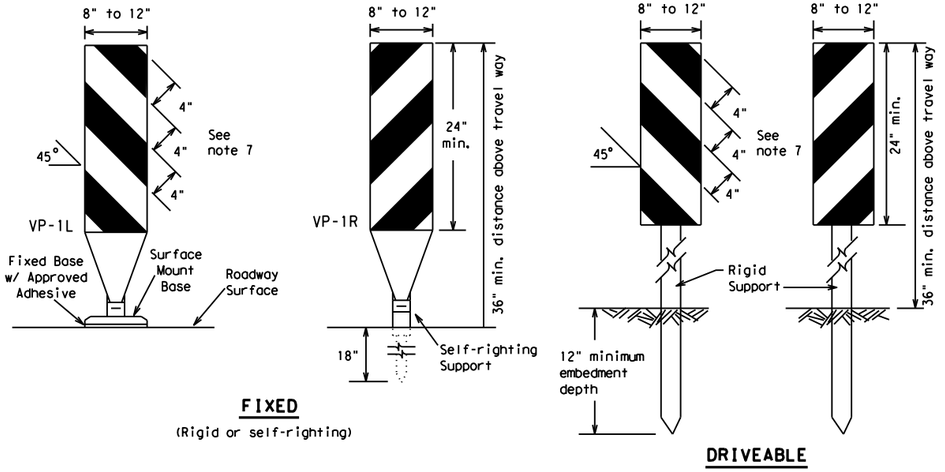
BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	2707	01	011, ETC.	FM 2781
4-03 8-14	DIST	COUNTY		SHEET NO.
9-07 5-21	LFK	HOUSTON, ETC.		41
7-13				

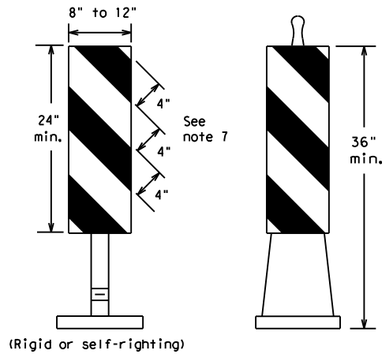
102

DATE: 8/5/2022 1:09:30 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0361222\bc-21.dgn



FIXED
(Rigid or self-righting)

DRIVEABLE

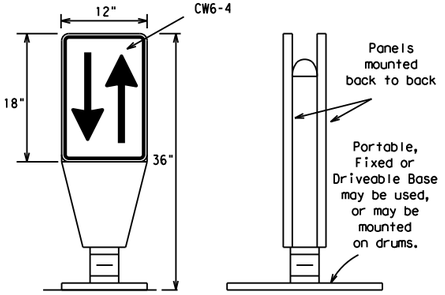


(Rigid or self-righting)

PORTABLE

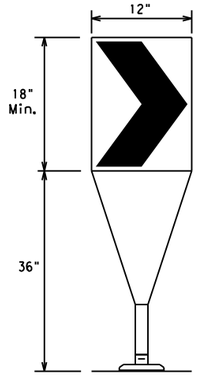
VERTICAL PANELS (VPs)

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.

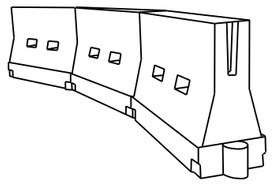
OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



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



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

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.

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

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

SHEET 9 OF 12

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	2707	01	011, ETC.	FM 2781
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	LFK	HOUSTON, ETC.		42

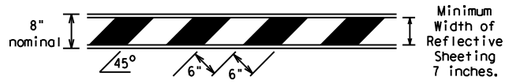
103

DATE: 8/5/2022 1:09:30 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0361222\bc-21.dgn

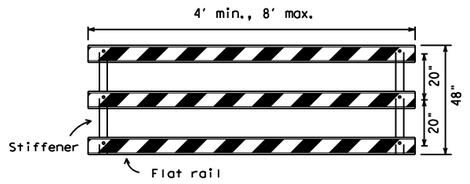
TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



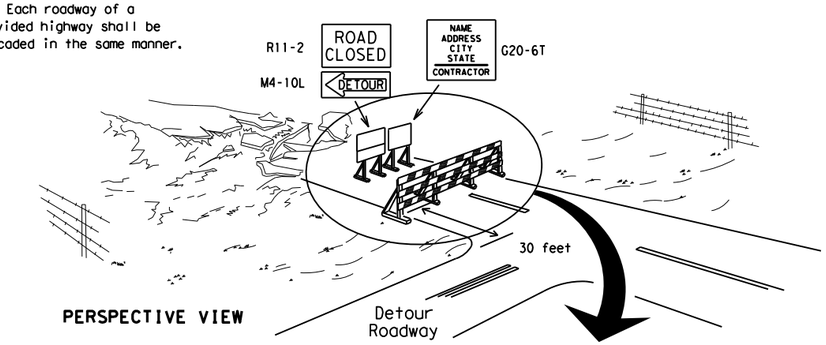
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

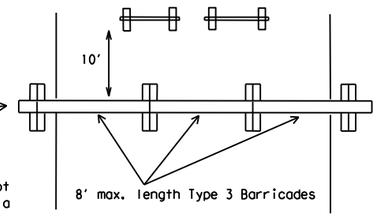
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

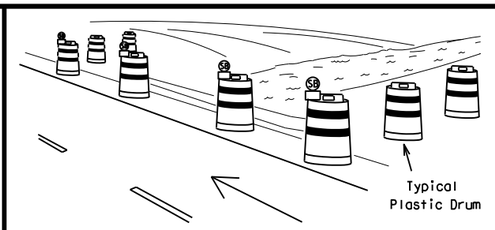
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

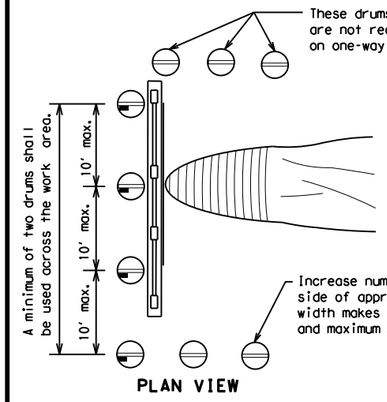
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

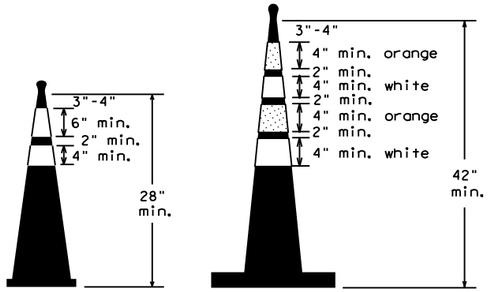
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



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

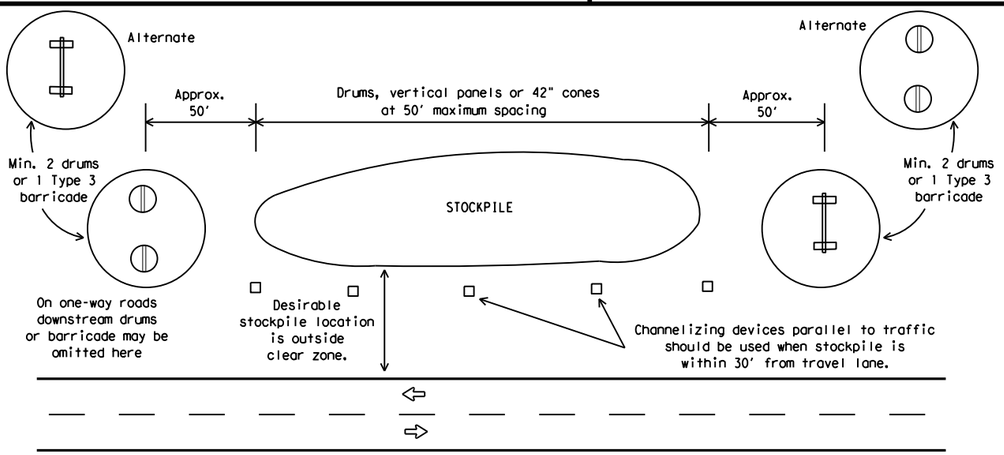
PLAN VIEW

CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



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

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



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

SHEET 10 OF 12

Texas Department of Transportation — Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS 9-07 8-14 7-13 5-21	2707	01	011, ETC.	FM 2781
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON, ETC.		43

104

DATE: 8/5/2022 1:09:31 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0361222\bc-21.dgn

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.

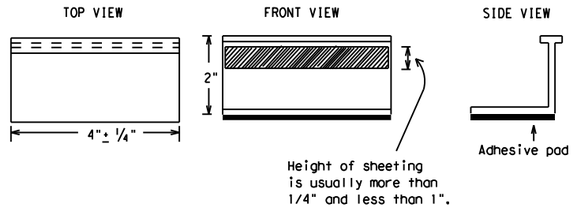
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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	2707	01	011, ETC.	FM 2781
2-98 9-07 5-21	DIST	COUNTY		SHEET NO.
1-02 7-13	LFK	HOUSTON, ETC.		44
11-02 8-14				

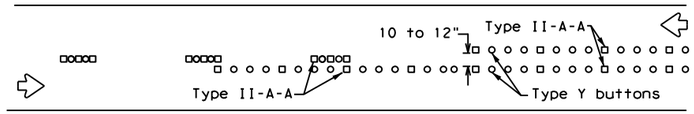
105

DATE: 8/5/2022 1:09:32 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0361222\bc-21.dgn

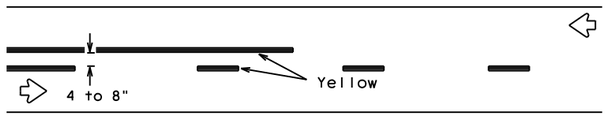
DATE: 8/5/2022 1:09:32 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0361222\bc-21.dgn

PAVEMENT MARKING PATTERNS

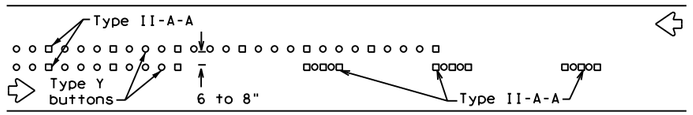
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



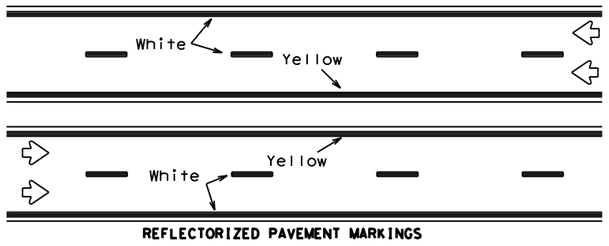
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



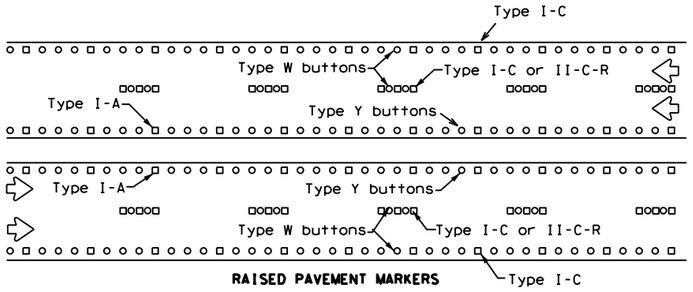
RAISED PAVEMENT MARKERS - PATTERN B

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



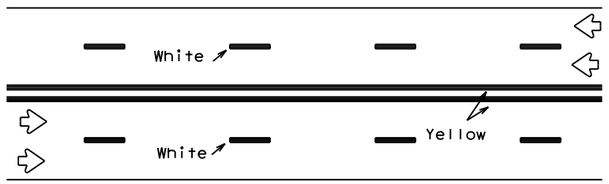
REFLECTORIZED PAVEMENT MARKINGS



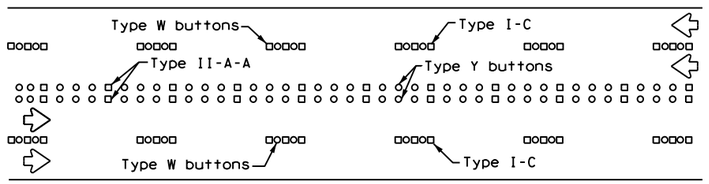
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



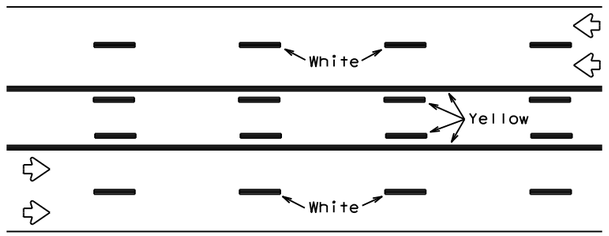
REFLECTORIZED PAVEMENT MARKINGS



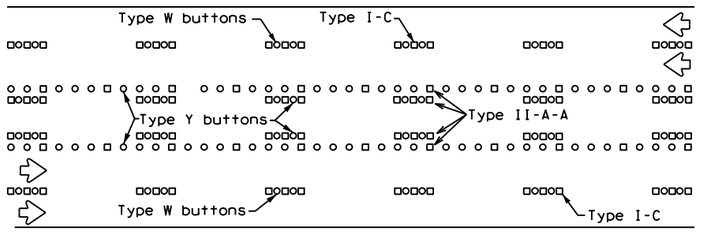
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

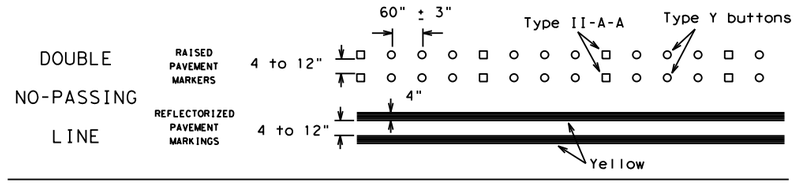
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

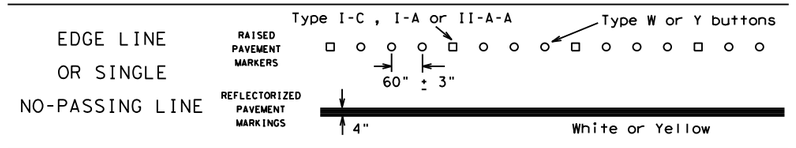
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

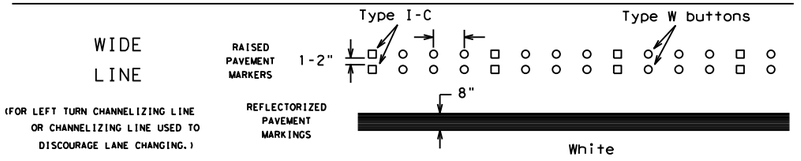


EDGE LINE OR SINGLE NO-PASSING LINE



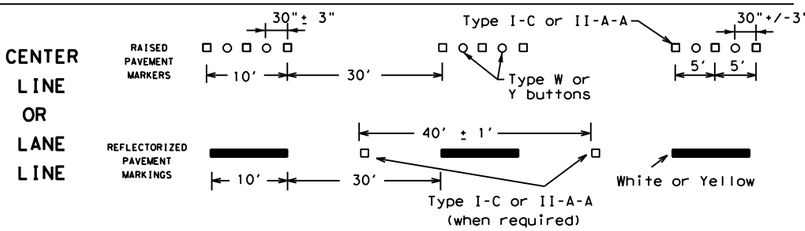
WIDE LINE

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

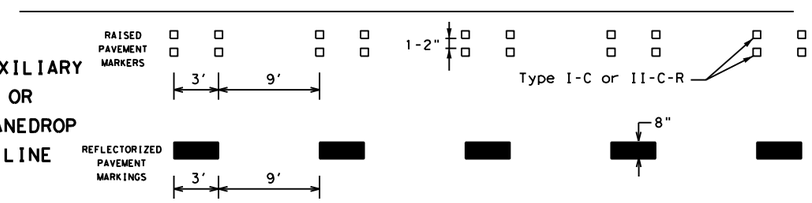


BROKEN LINES

CENTER LINE OR LANE LINE

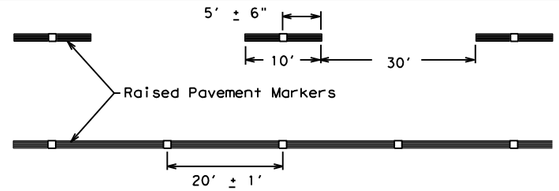


AUXILIARY OR LANEDROP LINE



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."

SHEET 12 OF 12

Texas Department of Transportation | Traffic Safety Division Standard

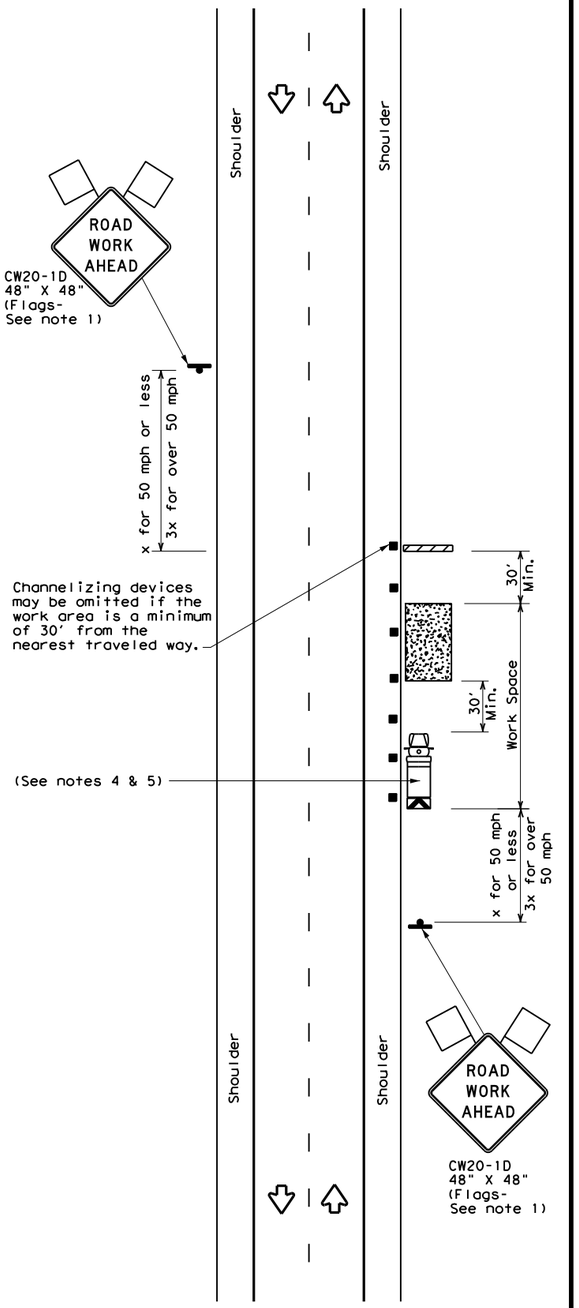
BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

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	2707	01	011, ETC.	FM 2781
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON, ETC.		45

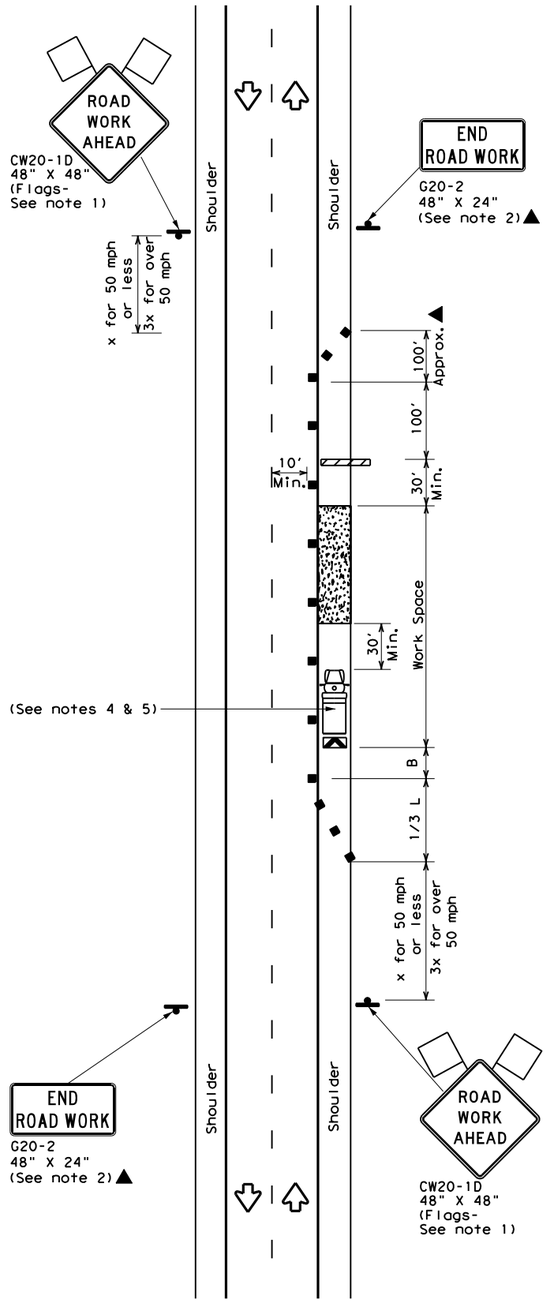
106

DATE: 8/5/2022 1:09:38 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0361222\tcp2-1-18.dgn



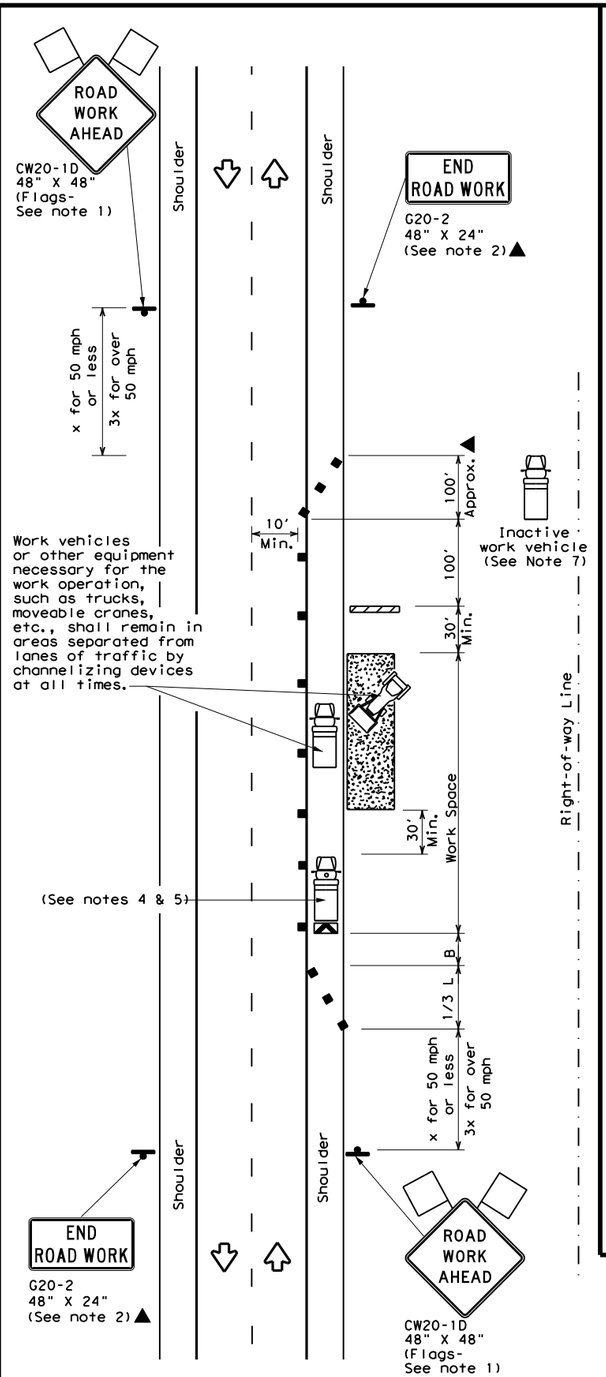
TCP (2-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (2-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (2-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

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

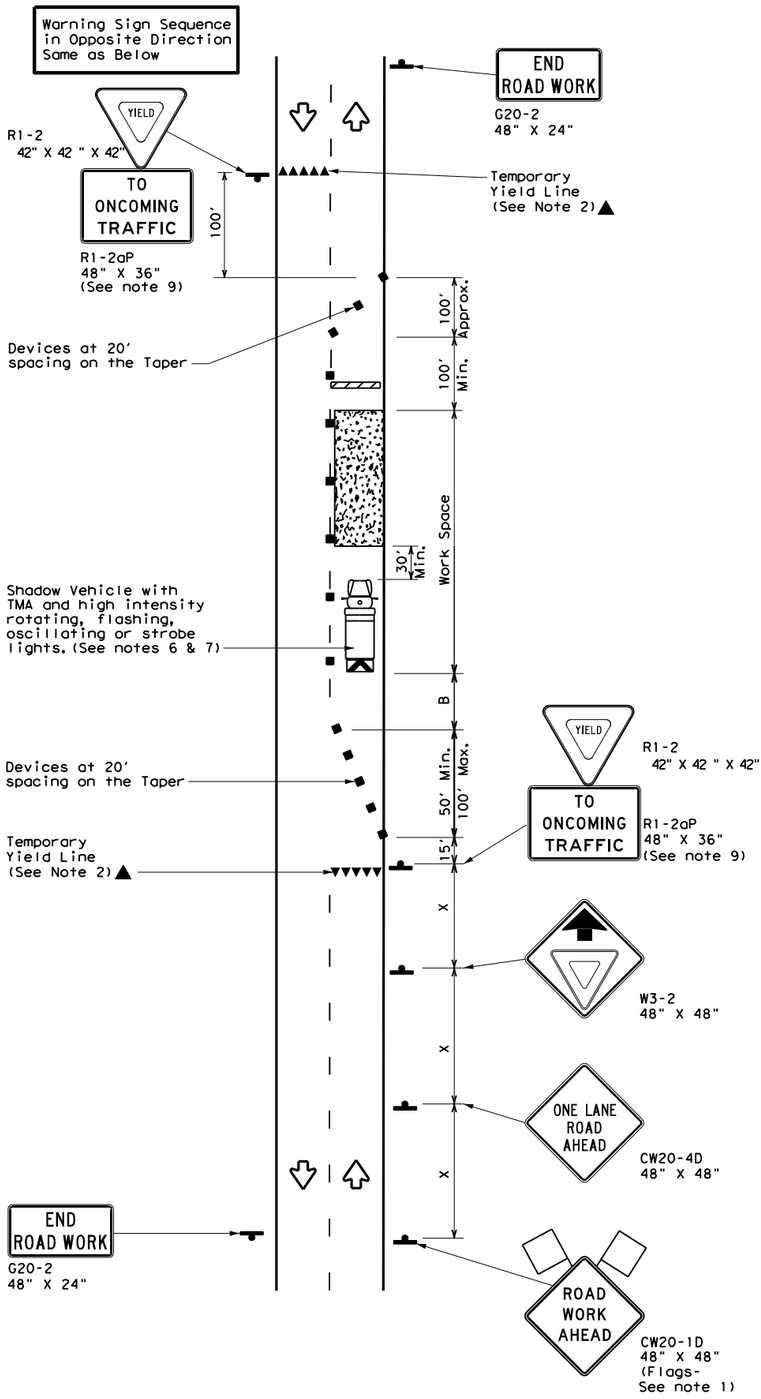
Texas Department of Transportation

Traffic Operations Division Standard

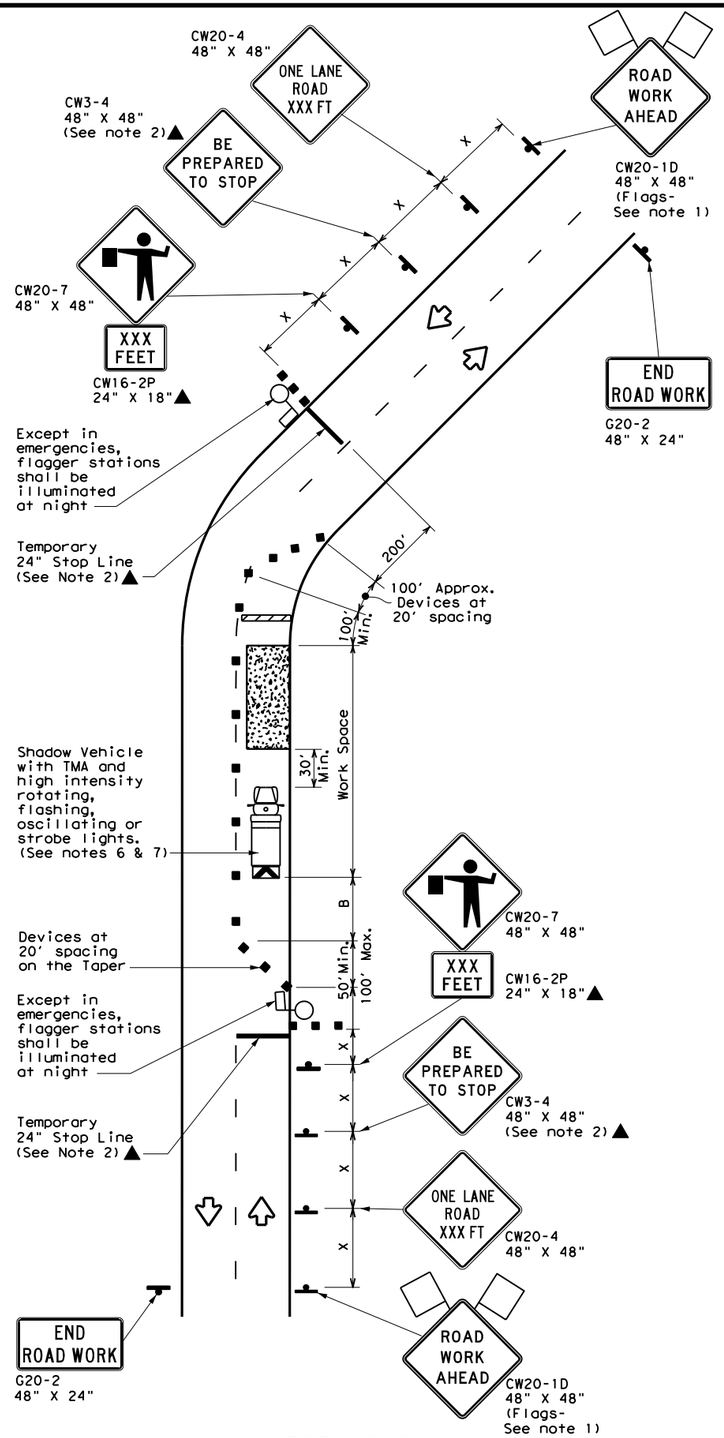
TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(2-1)-18

FILE: tcp2-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	2707	01	011, ETC.	FM 2781
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	LFK	HOUSTON, ETC.		46
1-97 2-18				



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



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

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

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

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

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

GENERAL NOTES

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

TCP (2-2a)

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

TCP (2-2b)

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

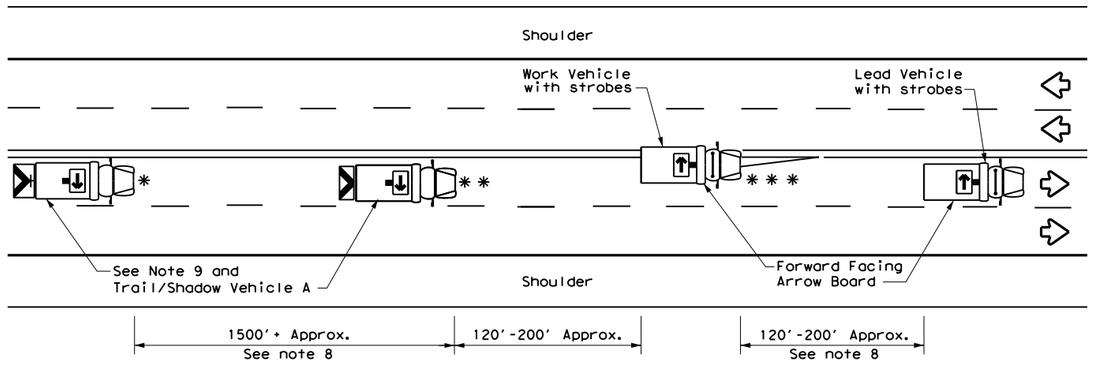
Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
ONE-LANE TWO-WAY
TRAFFIC CONTROL

TCP(2-2)-18

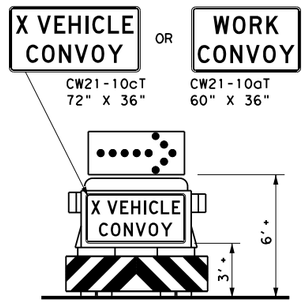
FILE: tcp2-2-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03 1-97 2-12 4-98 2-18	2707	01	011, ETC.	FM 2781
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON, ETC.		47

DATE: 8/5/2022 1:09:46 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0361222\tcp2-2-18.dgn



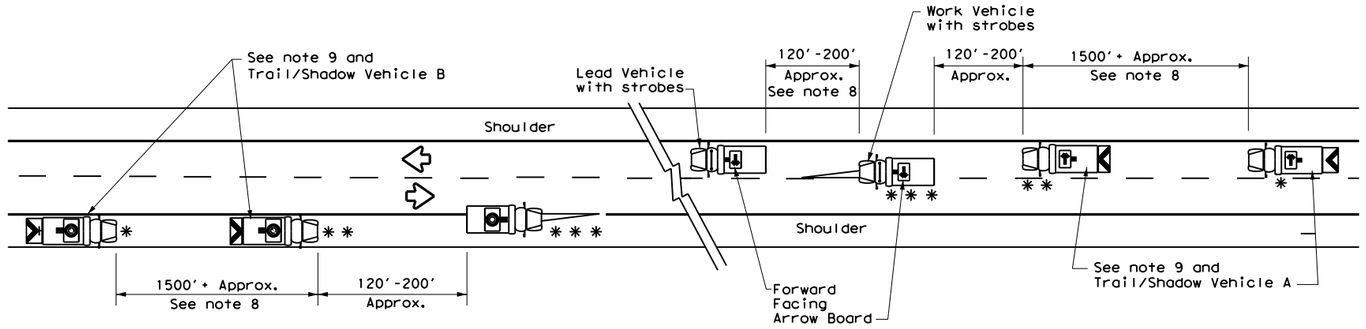
TCP (3-1a)

UNDIVIDED MULTILANE ROADWAY



TRAIL/SHADOW VEHICLE A

with RIGHT Directional display Flashing Arrow Board

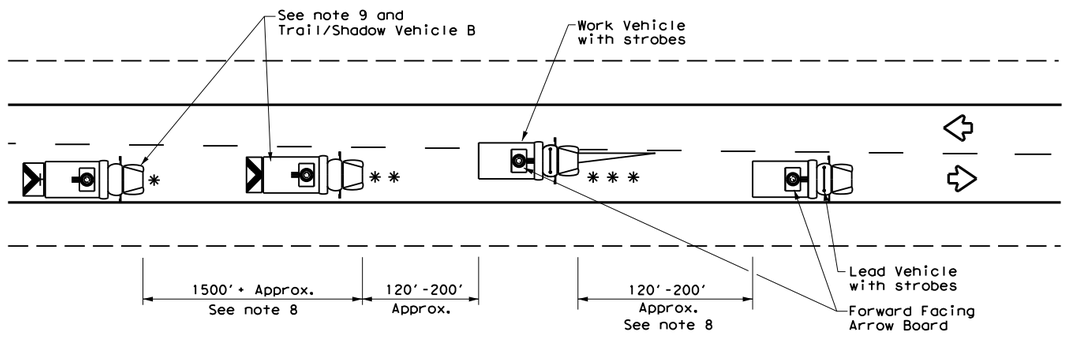


WORK ON SHOULDER

WORK ON TRAVEL LANE

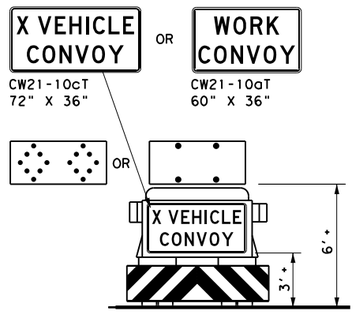
TCP (3-1b)

TWO-WAY ROADWAY WITH PAVED SHOULDERS



TCP (3-1c)

TWO-WAY ROADWAY WITHOUT PAVED SHOULDERS



TRAIL/SHADOW VEHICLE B

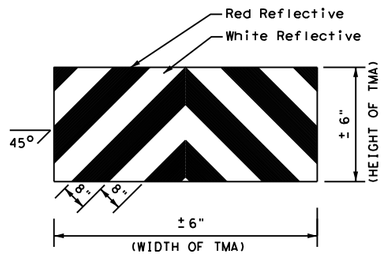
with Flashing Arrow Board in CAUTION display

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

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

GENERAL NOTES

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



STRIPING FOR TMA

Texas Department of Transportation

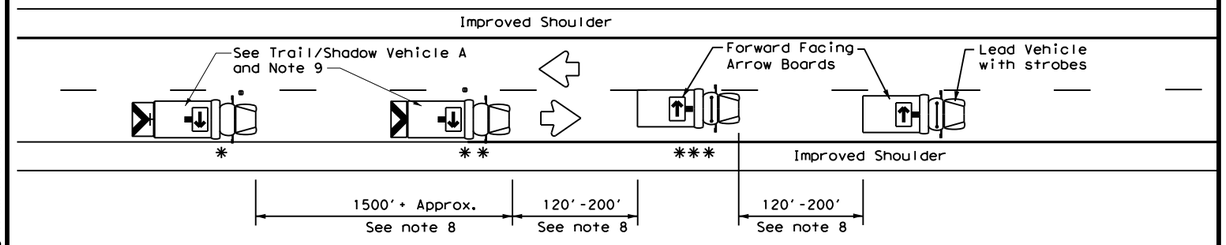
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS UNDIVIDED HIGHWAYS

TCP(3-1)-13

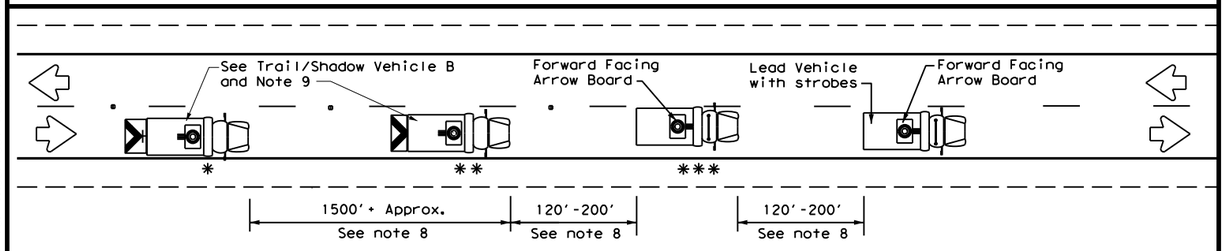
FILE: tcp3-1.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 7-13 1-97	2707	01	011, ETC.	FM 2781
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON, ETC.		48

DATE: 8/5/2022 1:09:53 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0361222\tcp3-1.dgn



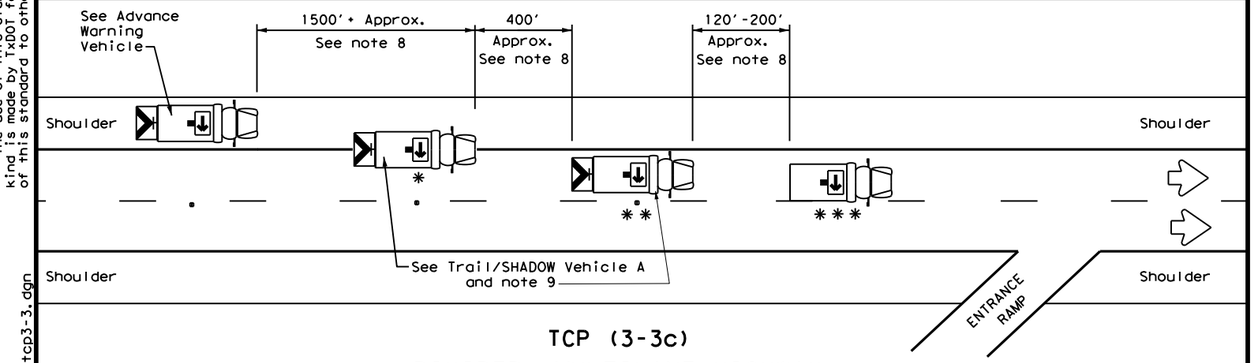
TCP (3-3a)

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



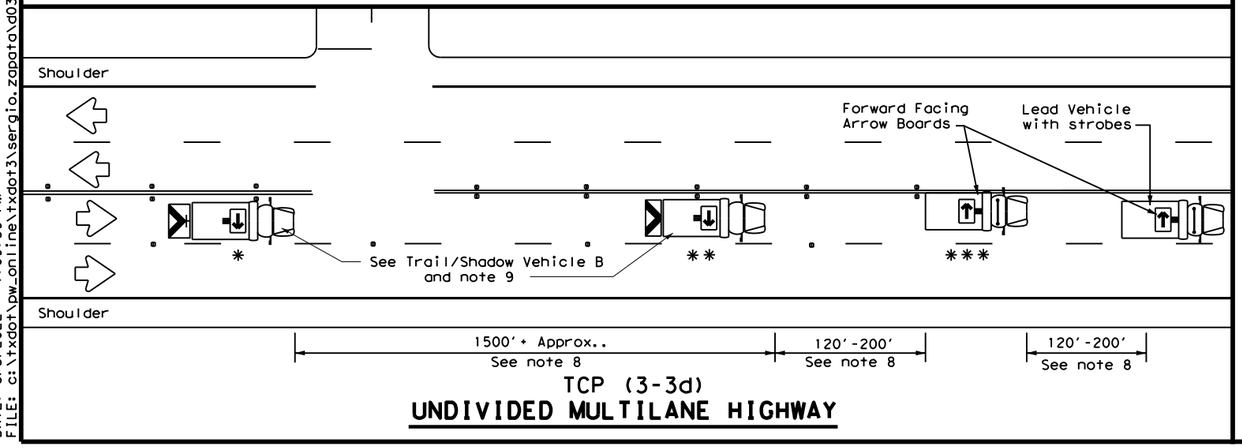
TCP (3-3b)

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



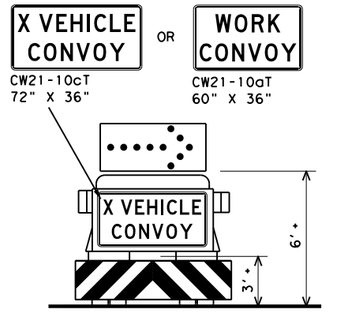
TCP (3-3c)

DIVIDED MULTILANE HIGHWAY



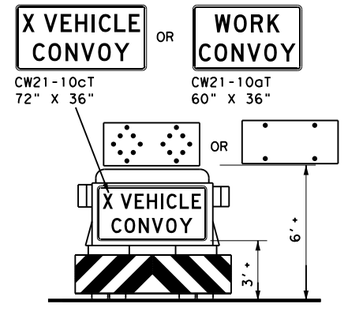
TCP (3-3d)

UNDIVIDED MULTILANE HIGHWAY



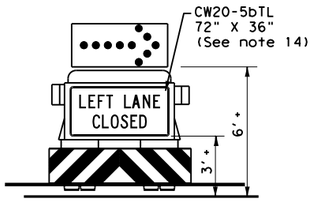
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display
Flashing Arrow Board

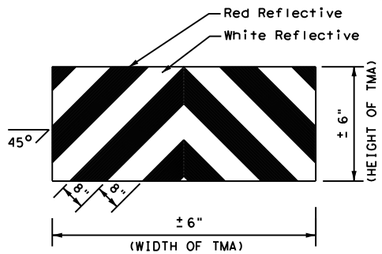


TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board
in Caution Mode



ADVANCE WARNING VEHICLE



STRIPING FOR TMA

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

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

GENERAL NOTES

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

Texas Department of Transportation

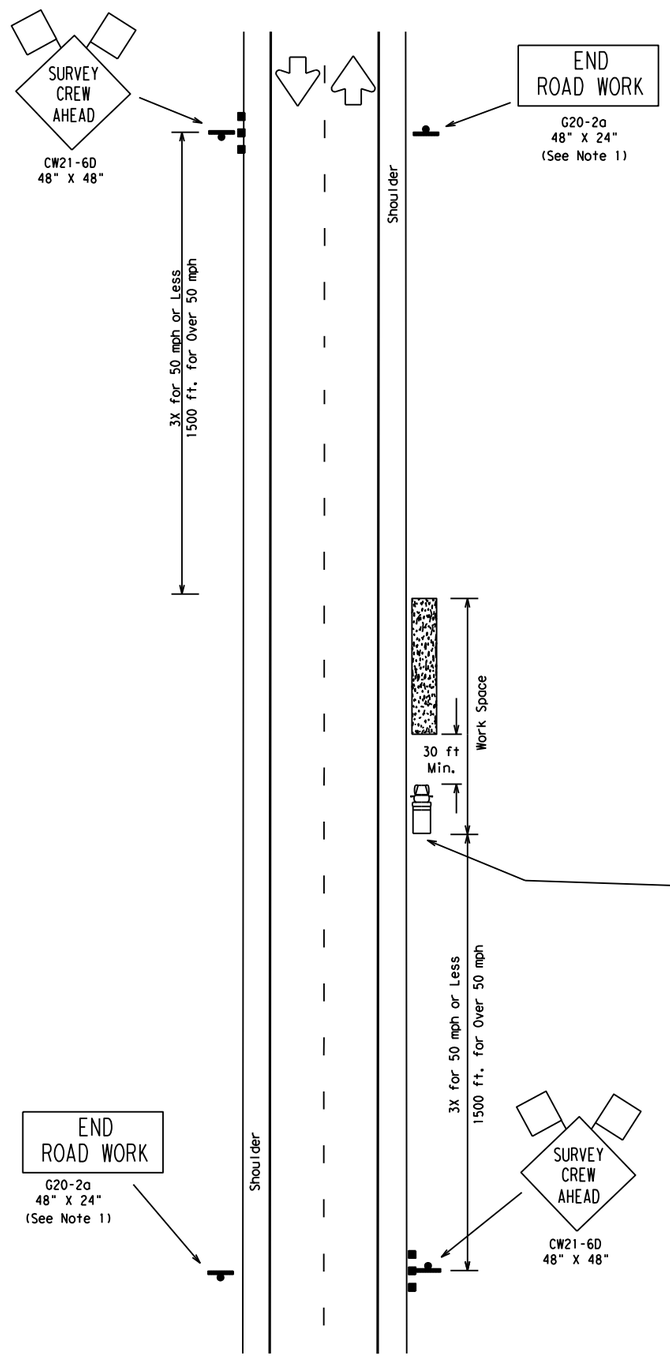
Traffic Operations Division Standard

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

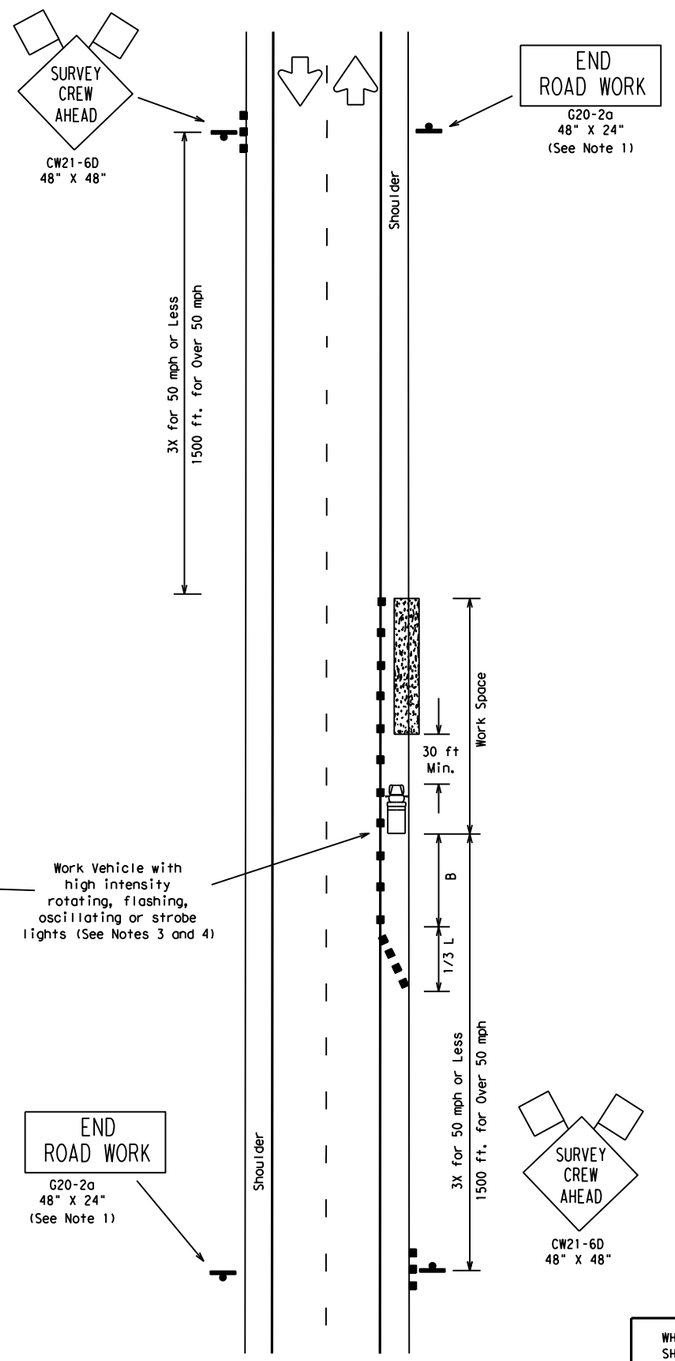
FILE: tcp3-3.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT September 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	2707	01	011, ETC.	FM 2781
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 7-13	LFK	HOUSTON, ETC.		49
1-97 7-14				

177

DATE: 8/5/2022 1:09:59 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0361222\tcp3-3.dgn



TCP (S-1a)
WORK OFF SHOULDER OR PAVED SURFACE



TCP (S-1b)
WORK ON SHOULDER

LEGEND

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

Posted Speed ✳	Formula	Minimum Desirable Taper Lengths ✳✳ 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Device On a Taper	On a Tangent	Min. Sign Spacing "X" Distance	Longitudinal Buffer Space "B"
30	$L=\frac{WS^2}{60}$	150'	165'	180'	30'	60'-75'	120'	90'
35		205'	225'	245'	35'	70'-90'	160'	120'
40		265'	295'	320'	40'	80'-100'	240'	155'
45	L=WS	450'	495'	540'	45'	90'-110'	320'	195'
50		500'	550'	600'	50'	100'-125'	400'	240'
55		550'	605'	660'	55'	110'-140'	500'	295'
60		600'	660'	720'	60'	120'-150'	600'	350'
65		650'	715'	780'	65'	130'-165'	700'	410'
70		700'	770'	840'	70'	140'-175'	800'	475'
75		750'	825'	900'	75'	150'-185'	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
	✓	✓		

DEFINITIONS:
SHORT DURATION - work that occupies a location up to 1 hour.
SHORT TERM STATIONARY - daytime work that occupies a location for more than 1 hour within a single daylight period.

GENERAL NOTES:

1. The G20-2a "END ROAD WORK" sign may be placed on the back of the CW21-6D "SURVEY CREW AHEAD" sign or may be omitted for short duration (less than 1 hour) work.
2. Channelizing devices on the shoulder taper and tangent section may be omitted for short duration (less than 1 hour) work.
3. If line-of-sight requirements for surveying operations will preclude the placement of the Work Vehicle to protect workers, the channelizing devices mentioned in Note 2 are required.
4. ⚠ A Shadow Vehicle with a Truck Mounted Attenuator and flashing warning lights/arrow panel in caution mode may be used in lieu of the Work Vehicle to protect the work space.
5. The CW20-1D "ROAD WORK AHEAD" sign may be substituted for the CW21-6D "SURVEY CREW AHEAD" sign.
6. This plan may also be used for shoulder work or off shoulder work for multilane undivided roadways.
7. The CW21-6D "SURVEY CREW AHEAD" sign for low volume intersecting side roads is desirable, but is not required when working less than 15 minutes in area of the side road, as determined by the Engineer.

TCP(S-1a)

8. Cones may be placed at edge of pavement adjacent to the work space to enhance safety.

WHENEVER POSSIBLE, SURVEY PARTIES SHOULD AVOID, BY THE USE OF OFFSET LINES, ANY UNNECCESSARY PERIODS OF TIME ON THE ROAD SURFACE.

8-18-08 Revision
⚠ Corrected misspelling.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC CONTROL PLAN FOR SURVEYING OPERATIONS

TCP(S-1)-08A

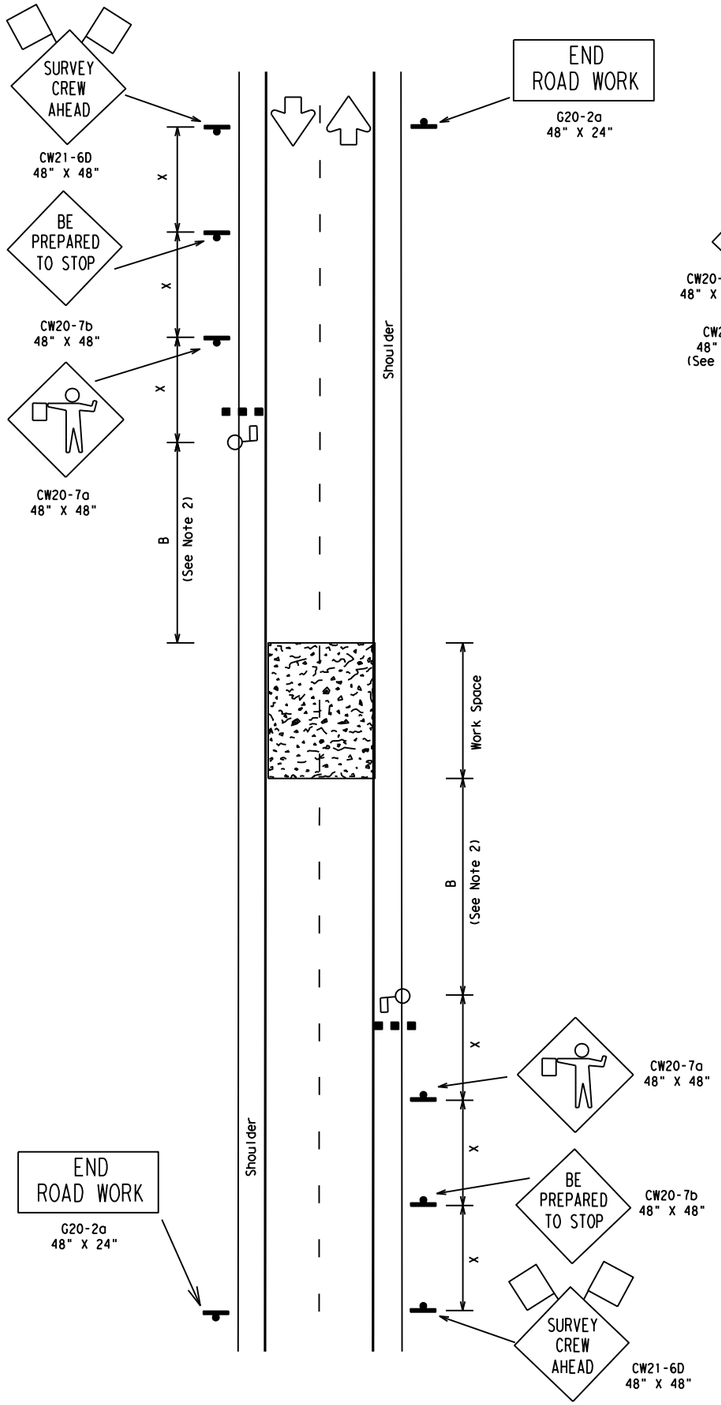
DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS
8-08

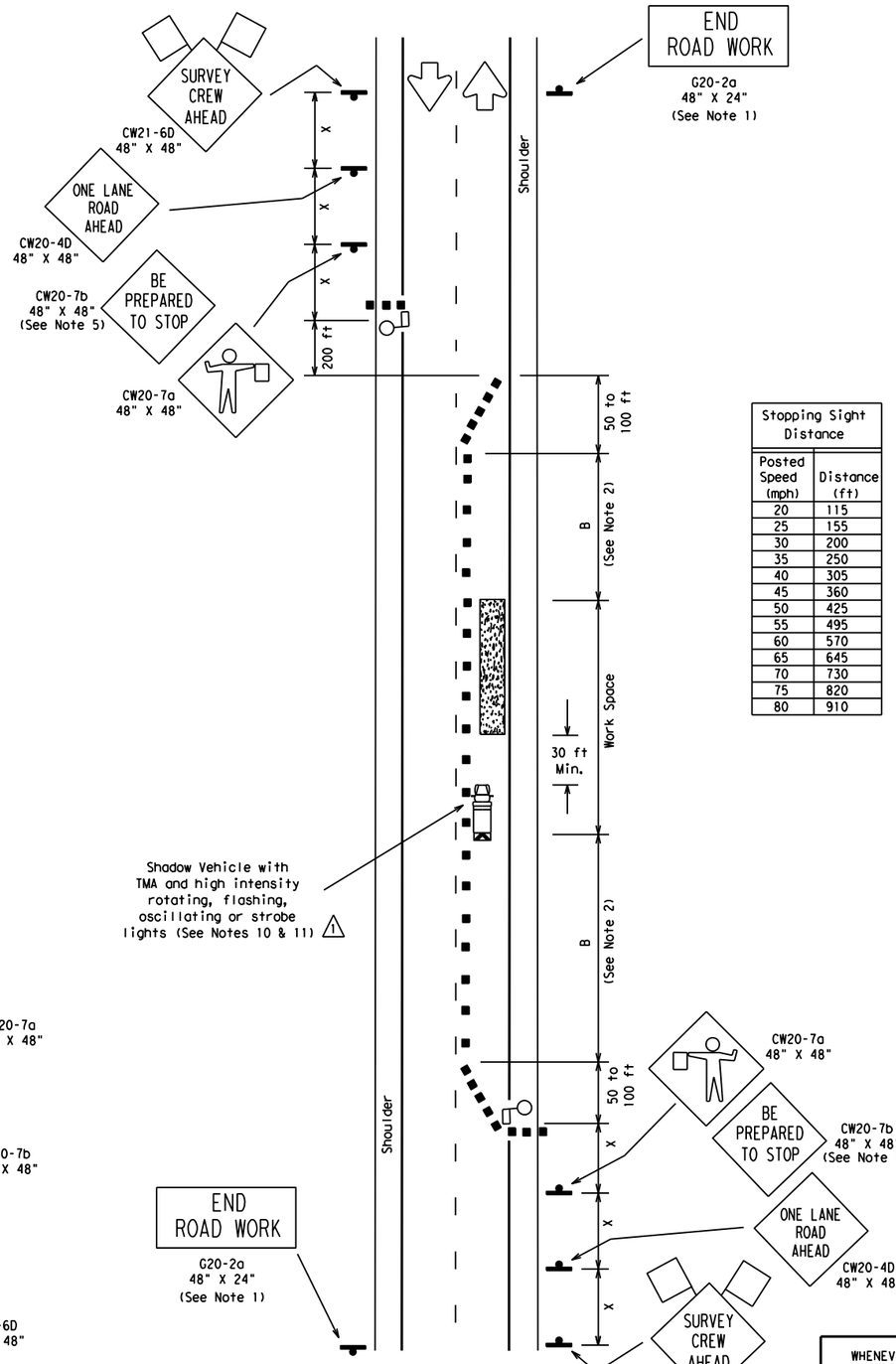
CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781

DIST	COUNTY	SHEET NO.
LFK	HOUSTON, ETC.	50

DATE: 8/5/2022 1:10:04 PM
FILE: c:\txdot\pw\online\txdot3\sergio.zapata\d0361222\tcps1.dgn



TCP (S-2a)
ROAD CLOSED FOR LESS THAN 20 MINUTES -
OFF PEAK TRAFFIC HOURS
WITH OR WITHOUT SHOULDERS



TCP (S-2b)
WORK IN ROADWAY
OFF PEAK TRAFFIC HOURS
WITH OR WITHOUT SHOULDERS

Stopping Sight Distance	
Posted Speed (mph)	Distance (ft)
20	115
25	155
30	200
35	250
40	305
45	360
50	425
55	495
60	570
65	645
70	730
75	820
80	910

LEGEND

Type III Barricade ■ ■ Channelizing Devices Flag
Heavy Work Vehicle Truck Mounted Attenuator (TMA)
Trailer Mounted Flashing Arrow Panel
Portable Changeable Message Sign (PCMS)
Flagger Sign Post

Posted Speed ✳	Formula	Minimum Desirable Taper Lengths ✳✳ 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Device On a Taper	On a Tangent	Min. Sign Spacing "X" Distance	Longitudinal Buffer Space "B"
30	$L=\frac{WS^2}{60}$	150'	165'	180'	30'	60'-75'	120'	90'
35		205'	225'	245'	35'	70'-90'	160'	120'
40		265'	295'	320'	40'	80'-100'	240'	155'
45	L=WS	450'	495'	540'	45'	90'-110'	320'	195'
50		500'	550'	600'	50'	100'-125'	400'	240'
55		550'	605'	660'	55'	110'-140'	500'	295'
60		600'	660'	720'	60'	120'-150'	600'	350'
65		650'	715'	780'	65'	130'-165'	700'	410'
70		700'	770'	840'	70'	140'-175'	800'	475'
75		750'	825'	900'	75'	150'-185'	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
	✓	✓		

DEFINITIONS:
SHORT DURATION - work that occupies a location up to 1 hour.
SHORT TERM STATIONARY - daytime work that occupies a location for more than 1 hour within a single daylight period.

GENERAL NOTES:
1. The G20-2a "END ROAD WORK" sign may be placed on the back of the CW21-6D "SURVEY CREW AHEAD" sign or may be omitted for short duration (less than 1 hour) work.
2. Adequate Stopping Sight Distance (see Stopping Sight Distance table) should be maintained from approaching traffic to the flagger or a queue of stopped vehicles. The Buffer Space "B" should be extended around curves or other obstacles, when necessary, to have adequate Stopping Sight Distance to the flagger station.
3. Flaggers should use two-way radios or other means of communication while flagging.
4. The length of the work space should be based on the ability of the flaggers to communicate.
5. CW20-1D "ROAD WORK AHEAD" signs may be substituted for CW21-6D "SURVEY CREW AHEAD" signs.
6. The CW21-6D "SURVEY CREW AHEAD" sign for low volume intersecting side roads is desirable, but is not required when working less than 15 minutes in area of the side road, as determined by the Engineer.

TCP(S-2a)

7. Road closures shall be less than 20 minutes. Closures less than 5 minutes are desirable.
8. Sign spacing should be increased if traffic repeatedly queues past the CW20-7b "BE PREPARED TO STOP" sign.
9. The surveying instrument should not be located on the paved surface.

TCP (S-2B)

10. For short duration work the Shadow Vehicle with a TMA may be replaced by another Work Vehicle with high intensity rotating, flashing or strobe lights.
11. Shadow Vehicles with a TMA are desirable when workers or equipment are in the work space. When approved by the engineer, Type III barricades or other channelizing devices may be substituted for the Shadow Vehicle.
12. The CW20-7b "BE PREPARED TO STOP" sign is optional. When used, it should be installed after the CW20-4D "ONE LANE ROAD AHEAD" sign.

WHENEVER POSSIBLE, SURVEY PARTIES SHOULD AVOID, BY THE USE OF OFFSET LINES, ANY UNNECCESSARY PERIODS OF TIME ON THE ROAD SURFACE.

8-18-08 Revision
1 Corrected referrence to notes.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC CONTROL PLAN FOR SURVEYING OPERATIONS

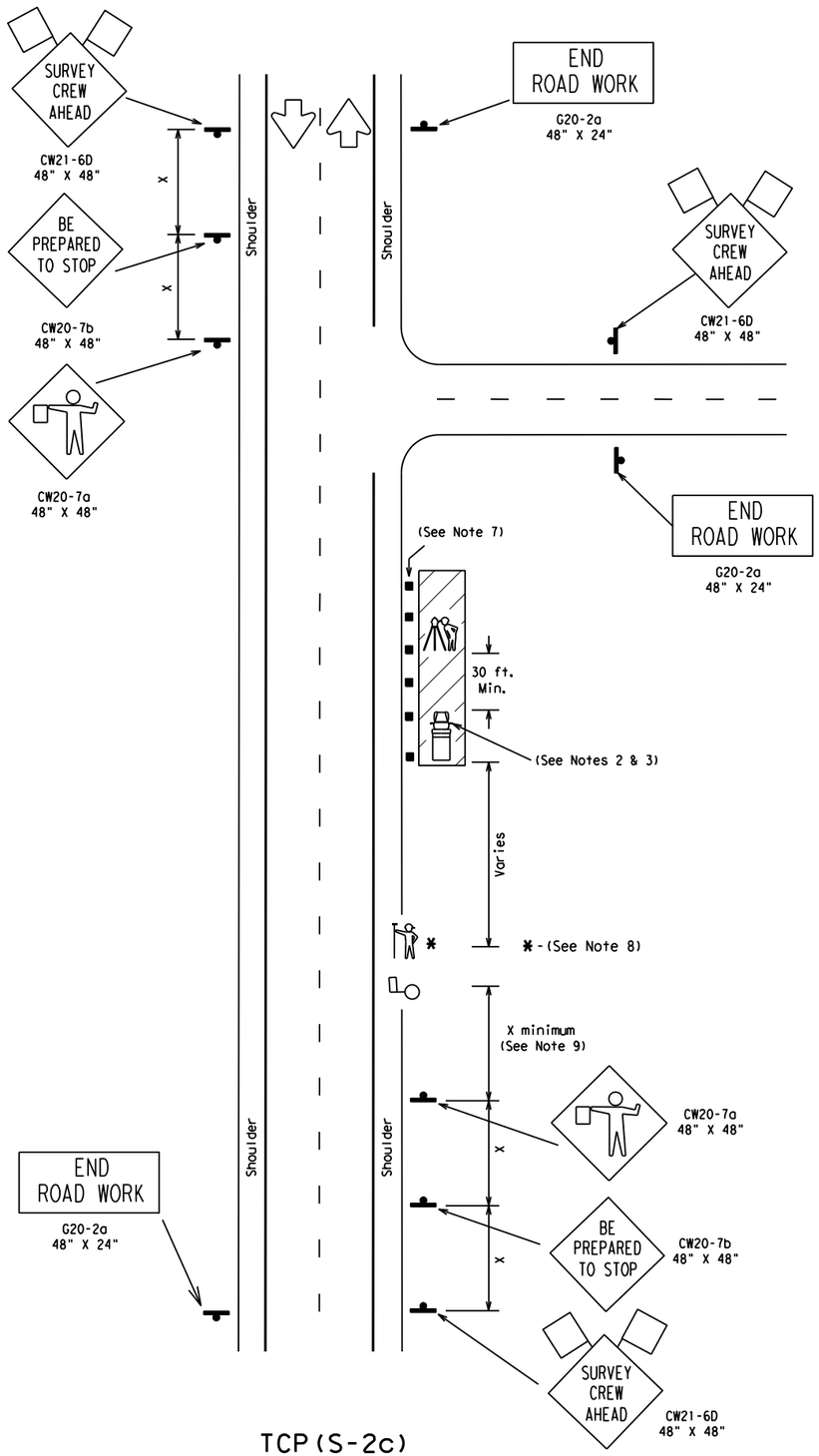
TCP(S-2)-08A

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

REVISIONS
8-08

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		51

DATE: 8/5/2022 1:10:10 PM
FILE: c:\txdot\pwonline\txdot3\sergio.zapata\d0361222\tcps2.dgn



TCP(S-2c)

Stopping Sight Distance	
Posted Speed (mph)	Distance (ft)
20	115
25	155
30	200
35	250
40	305
45	360
50	425
55	495
60	570
65	645
70	730
75	820
80	910

LEGEND

Type III Barricade ■ ■ Channelizing Devices Flag

Work Vehicle Truck Mounted Attenuator (TMA)

Flagger Sign Post Survey Rodman Instrument Person

Posted Speed*	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Device On a Taper	On a Tangent	Min. Sign Spacing "X" Distance	Longitudinal Buffer Space "B"
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60'-75'	120'	90'
35		205'	225'	245'	35'	70'-90'	160'	120'
40		265'	295'	320'	40'	80'-100'	240'	155'
45	L=WS	450'	495'	540'	45'	90'-110'	320'	195'
50		500'	550'	600'	50'	100'-125'	400'	240'
55		550'	605'	660'	55'	110'-140'	500'	295'
60		600'	660'	720'	60'	120'-150'	600'	350'
65		650'	715'	780'	65'	130'-165'	700'	410'
70		700'	770'	840'	70'	140'-175'	800'	475'
75		750'	825'	900'	75'	150'-185'	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
	✓	✓		

DEFINITIONS:

MOBILE - work that moves continously or intermittently (stopping up to approximately 15 minutes).

SHORT DURATION - work that occupies a location up to 1 hour.

SHORT TERM STATIONARY - daytime work that occupies a location for more than 1 hour within a single daylight period.

GENERAL NOTES:

1. The G20-2a "END ROAD WORK" sign may be placed on the back of the CW21-6D "SURVEY CREW AHEAD" sign or may be omitted for short duration (less than 1 hour) work.
2. Work Vehicle with high intensity rotating, flashing, oscillating or strobe lights should be used to protect work space.
3. When approved by the engineer, Type III barricades or other channelizing devices may be substituted for the Heavy Work Vehicle.
4. CW20-1D "ROAD WORK AHEAD" signs may be substituted for CW21-6D "SURVEY CREW AHEAD" SIGNS.
5. The CW21-6D "SURVEY CREW AHEAD" sign for low volume intersecting side roads may be omitted when approved by the Engineer.
6. The Surveying Instrument shall not be located on the paved surface.
7. Cones at edge of pavement adjacent to instrument person may be omitted when approved by the Engineer.
8. Rodman may only enter roadway when accompanied by flagger and as traffic allows.
9. The distance between the advance warning signs and the work should not exceed a two mile maximum.
10. Flaggers and Survey Crew should use two-way radios or other means of communication.
11. Survey Crew and Flaggers shall wear high-visibility apparel meeting the ANSI 107-2007 standard performance for Class 2 or Class 3 risk exposure.
12. Additional traffic control devices may be required to address local site conditions.
13. Stopping Sight Distance shall be maintained from approaching traffic to the flagger. See "Stopping Sight Distance" table.

SURVEY PARTIES SHOULD AVOID ANY UNNECCESSARY PERIODS OF TIME ON THE ROAD SURFACE.

This TCP is to cover two lane rural type roadways as determined by the Engineer. All other type roadways will be covered by other established Survey TCP'S.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC CONTROL PLAN FOR SURVEYING OPERATIONS

TCP(S-2c)-10

REVISIONS

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

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781

DIST	COUNTY	SHEET NO.
LFK	HOUSTON, ETC.	52

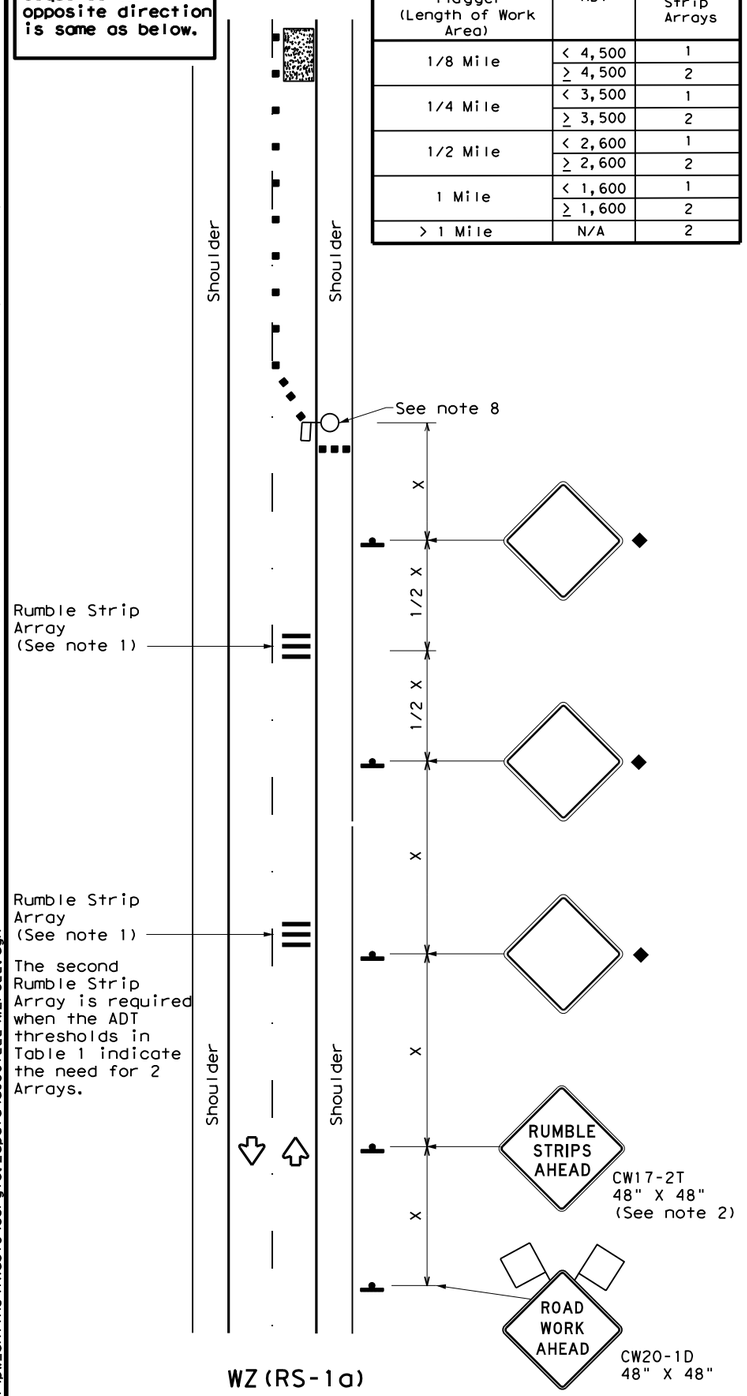
212A

DATE: 8/5/2022 1:10:14 PM
FILE: c:\txdot\pw\online\txdot3\sergio.zapata\d0361222\tcps2c.dgn

DATE: 8/5/2022 1:10:20 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0361222\wzrs22.dgn

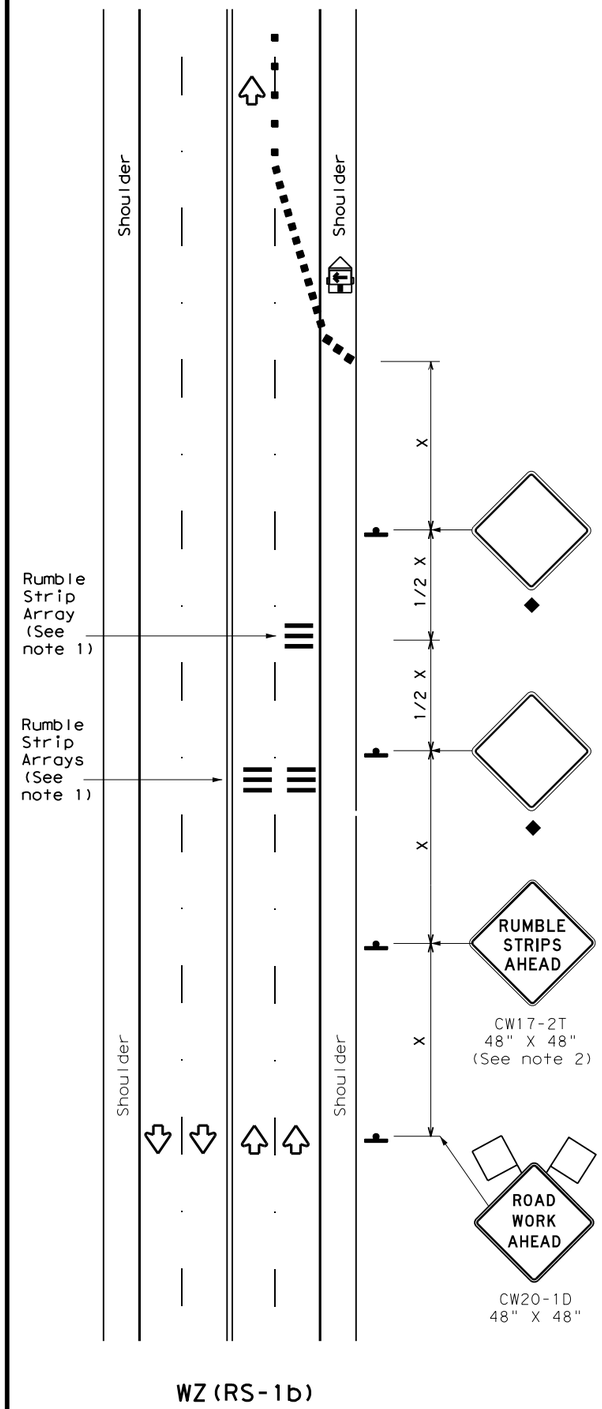
Warning sign and rumble strip sequence in opposite direction is same as below.

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



WZ(RS-1a)

RUMBLE STRIPS ON ONE-LANE TWO-WAY APPLICATION



WZ(RS-1b)

RUMBLE STRIPS FOR LANE CLOSURE ON CONVENTIONAL ROADWAY

GENERAL NOTES

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

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

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

* Conventional Roads Only

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

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

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

* For posted speeds in excess of 65 MPH, it is recommended that spacing is increased as speed limits increase. Increasing space between rumble strips will improve effectiveness.

TABLE 2	
Speed	Approximate distance between strips in an array
≤ 40 MPH	10'
> 40 MPH & ≤ 55 MPH	15'
= 60 MPH	20'
≥ 65 MPH	* 35' +

Texas Department of Transportation

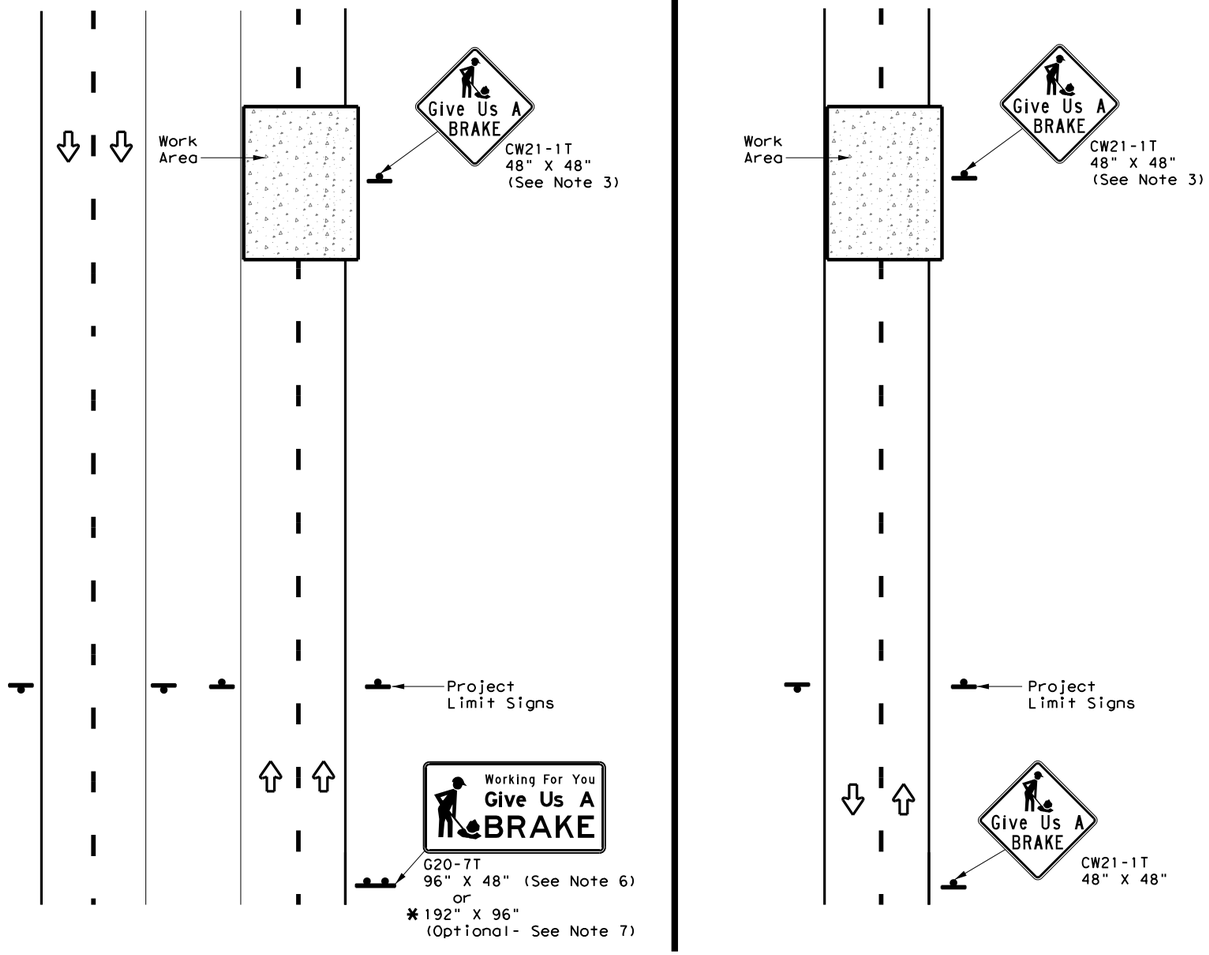
Traffic Safety Division Standard

TEMPORARY RUMBLE STRIPS

WZ(RS)-22

FILE: wzrs22.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-14 1-22 4-16	2707	01	011, ETC.	FM 2781
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON, ETC.		53

117



DIVIDED HIGHWAY

UNDIVIDED HIGHWAY

SIGNS ARE SHOWN FOR ONE DIRECTION OF TRAVEL

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

SUMMARY OF LARGE SIGNS

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

▲ See Note 6 Below

LEGEND	
	Sign
	Large Sign
	Traffic Flow

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

WORK ZONE "GIVE US A BRAKE" SIGNS

WZ(BRK)-13

FILE: wzbrk-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 1995	CONT	SECT	JOB	HIGHWAY
REVISIONS	2707	01	011, ETC.	FM 2781
6-96 5-98 7-13	DIST	COUNTY		SHEET NO.
8-96 3-03	LFK	HOUSTON, ETC.		54

116

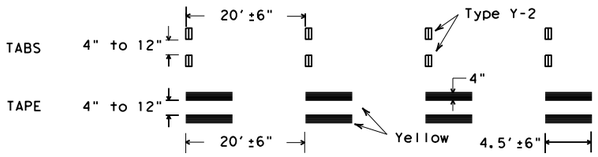
DATE: 8/5/2022 1:10:26 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0361222\wzbrk-13.dgn

DATE: 8/5/2022 1:10:31 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0361222\wzstpm-13.dgn

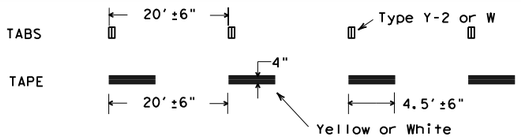
WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

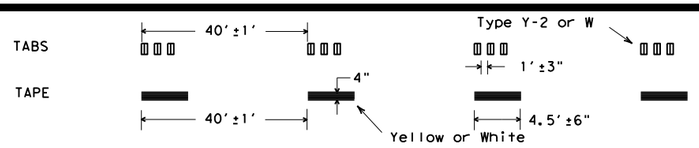


SINGLE NO-PASSING LINE or CHANNELIZATION LINE



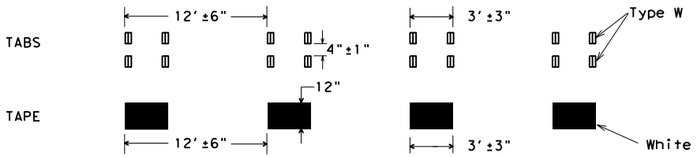
BROKEN LINES

(FOR CENTER LINE OR LANE LINE)

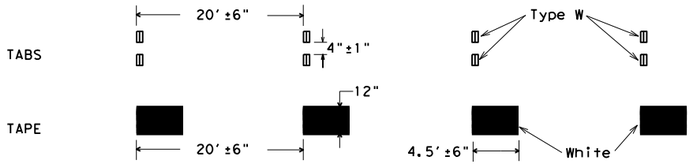


WIDE DOTTED LINES

(FOR LANE DROP LINES)



WIDE GORE MARKINGS



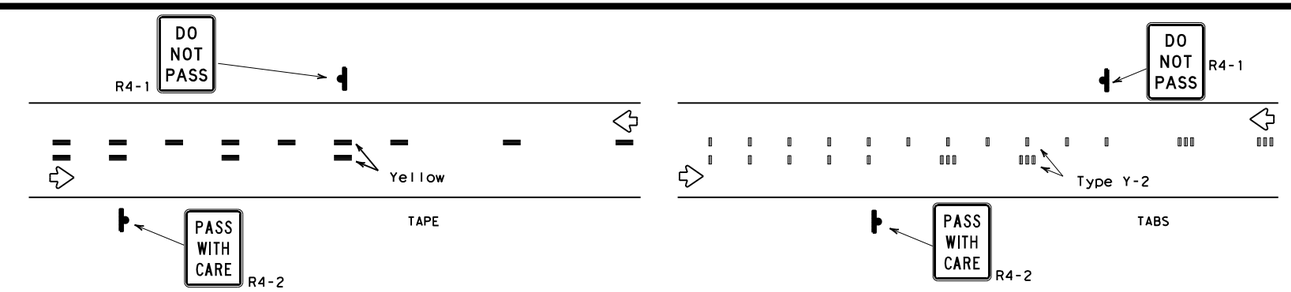
NOTES:

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

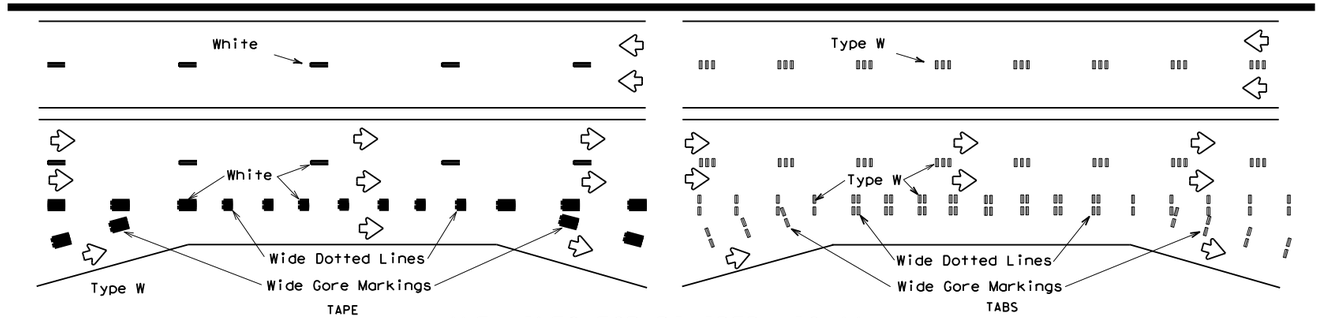
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS (TABS)

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

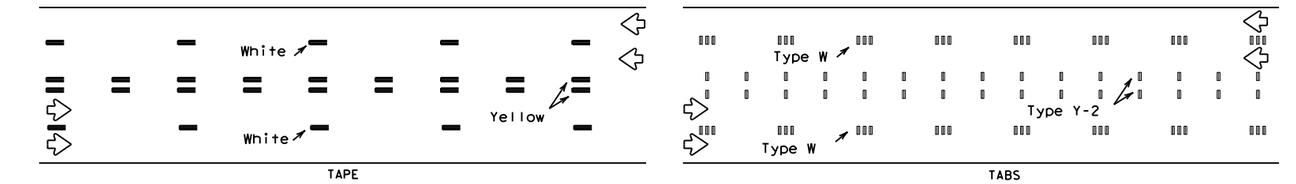
WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS



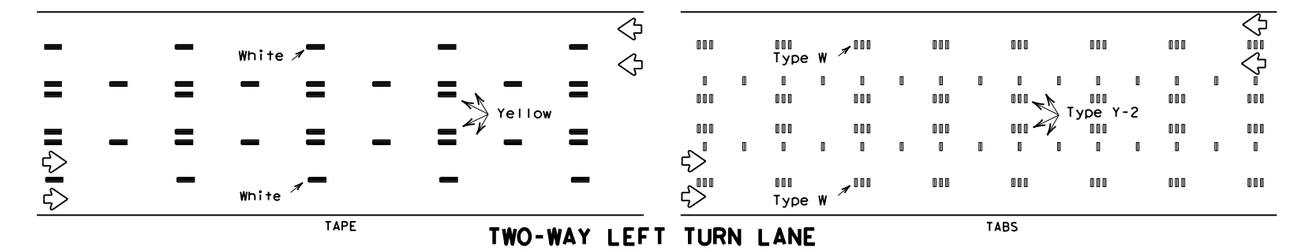
CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO LANE TWO-WAY HIGHWAYS



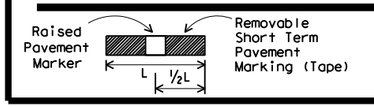
LANE LINES FOR DIVIDED HIGHWAY



LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



TWO-WAY LEFT TURN LANE



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

PREFABRICATED PAVEMENT MARKINGS

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

RAISED PAVEMENT MARKERS

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

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

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

Texas Department of Transportation

Traffic Operations Division Standard

WORK ZONE SHORT TERM PAVEMENT MARKINGS

WZ(STPM)-13

FILE:	wzstpm-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT	April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS		2707	01	011, ETC.	FM 2781
1-97		DIST	COUNTY		SHEET NO.
3-03		LFK	HOUSTON, ETC.		55
7-13					

FM 2781 SUPERELEVATION TABLE

CURVE NUMBER	STATION	TRAVEL LANE CROSS SLOPE LEFT (%)	TRAVEL LANE CROSS SLOPE RIGHT (%)	
	BEGIN PROJECT			
	11+11 END NC	-2.00	-2.00	
	SUPERELEVATION TRANSITION			
1	12+53 BEGIN FS	6.00	-6.00	
	14+52 END FS			
	SUPERELEVATION TRANSITION			112.1 TONS FLEXBASE 47.3 SY EMBANKMENT
	15+94 BEGIN NC	-2.00	-2.00	
	19+68 END NC			
	SUPERELEVATION TRANSITION			
2	20+74 BEGIN FS	-2.80	2.80	
	23+45 END FS			
	SUPERELEVATION TRANSITION			39.6 TONS FLEXBASE 16.7 SY EMBANKMENT
	24+51 BEGIN NC	-2.00	-2.00	
	35+93 END NC			
	SUPERELEVATION TRANSITION			
3	37+71 BEGIN FS	-5.60	5.60	
	39+28 END FS			
	SUPERELEVATION TRANSITION			61.0 TONS FLEXBASE 25.8 SY EMBANKMENT
	41+05 BEGIN NC	-2.00	-2.00	
	69+14 END NC			
	SUPERELEVATION TRANSITION			
4	70+78 BEGIN FS	-5.00	5.00	
	74+33 END FS			
	SUPERELEVATION TRANSITION			121.1 TONS FLEXBASE 51.1 SY EMBANKMENT
	75+97 BEGIN NC	-2.00	-2.00	
	78+69 END NC			
	SUPERELEVATION TRANSITION			
5	80+57 BEGIN FS	-6.00	6.00	
	86+45 END FS			
	SUPERELEVATION TRANSITION			147.9 TONS FLEXBASE 62.4 SY EMBANKMENT
	88+32 BEGIN NC	-2.00	-2.00	
	141+28 END NC			
	SUPERELEVATION TRANSITION			
6	143+15 BEGIN FS	6.00	-6.00	
	145+81 END FS			
	SUPERELEVATION TRANSITION			53.2 TONS FLEXBASE 22.4 SY EMBANKMENT
	147+68 BEGIN NC	-2.00	-2.00	
	215+65 END NC			
	SUPERELEVATION TRANSITION			
7	217+01 BEGIN FS	-3.80	3.80	
	219+69 END FS			
	SUPERELEVATION TRANSITION			93.8 TONS FLEXBASE 39.6 SY EMBANKMENT
	221+04 BEGIN NC	-2.00	-2.00	
	252+87 END NC			
	SUPERELEVATION TRANSITION			
8	254+27 BEGIN FS	-4.00	4.00	
	256+38 END FS			
	SUPERELEVATION TRANSITION			79.5 TONS FLEXBASE 33.5 SY EMBANKMENT
	257+79 BEGIN NC	-2.00	-2.00	

FM 2781 SUPERELEVATION TABLE (CONT'D)

CURVE NUMBER	STATION	TRAVEL LANE CROSS SLOPE LEFT (%)	TRAVEL LANE CROSS SLOPE RIGHT (%)	
		-2.00	-2.00	
	273+86 END NC			
	SUPERELEVATION TRANSITION			
9	274+99 BEGIN FS	2.80	-2.80	
	276+72 END FS			
	SUPERELEVATION TRANSITION			89.8 TONS FLEXBASE 37.9 SY EMBANKMENT
	277+85 BEGIN NC	-2.00	-2.00	
	285+39 END NC			
	SUPERELEVATION TRANSITION			
10	286+47 BEGIN FS	-2.60	2.60	
	I END FS			
	SUPERELEVATION TRANSITION			9.8 TONS FLEXBASE 4.1 SY EMBANKMENT
	288+97 BEGIN NC	-2.00	-2.00	
	313+49 END NC			
	SUPERELEVATION TRANSITION			
11	314+89 BEGIN FS	4.00	-4.00	
	317+06 END FS			
	SUPERELEVATION TRANSITION			144.8 TONS FLEXBASE 61.1 SY EMBANKMENT
	318+46 BEGIN NC	-2.00	-2.00	
	346+50 END NC			
	SUPERELEVATION TRANSITION			
12	347+91 BEGIN FS	-4.00	4.00	
	351+30 END FS			
	SUPERELEVATION TRANSITION			100 TONS FLEXBASE 42.2 SY EMBANKMENT
	352+70 BEGIN NC	-2.00	-2.00	
	363+69 END NC			
	SUPERELEVATION TRANSITION			
13	365+05 BEGIN FS	3.80	-3.80	
	375+61 END FS			
	SUPERELEVATION TRANSITION			250.5 TONS FLEXBASE 105.7 SY EMBANKMENT
	376+97 BEGIN NC	-2.00	-2.00	
	414+19 END NC			
	SUPERELEVATION TRANSITION			
14	415+83 BEGIN FS	-5.00	5.00	
	424+38 END FS			
	SUPERELEVATION TRANSITION			250.7 TONS FLEXBASE 105.8 SY EMBANKMENT
	426+01 BEGIN NC	-2.00	-2.00	

SCALE 1" = 100'

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED
PROFESSIONAL ENGINEER

DocuSigned by:
P.E.
AF852E728AEC4C0...
9/2/2022

SUPER ELEVATION DATA

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 1 OF 2

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		56

9/2/2022 2:56:34 PM
c:\txdot\projects\0707202201\design\lopez\d0361206\Superelevation Data.dgn
DOCUMENT NAME

FM 2781 SUPERELEVATION TABLE (CONT'D)

CURVE NUMBER	STATION		TRAVEL LANE CROSS SLOPE LEFT (%)	TRAVEL LANE CROSS SLOPE RIGHT (%)
		>	-2.00	-2.00
	456+71	END NC		
	SUPERELEVATION TRANSITION			
	457+74	BEGIN FS		
15		>	2.40	-2.40
	471+94	END FS		
	SUPERELEVATION TRANSITION			
	472+97	BEGIN NC		
		>	-2.00	-2.00
	150+01	END NC		
	SUPERELEVATION TRANSITION			
	151+04	BEGIN FS		
16		>	2.40	-2.40
	158+32	END FS		
	SUPERELEVATION TRANSITION			
	159+35	BEGIN NC		
		>	-2.00	-2.00
	127+39	END NC		
	SUPERELEVATION TRANSITION			
	128+42	BEGIN FS		
17		>	-2.40	2.40
	132+63	END FS		
	SUPERELEVATION TRANSITION			
	133+66	BEGIN NC		
		>	-2.00	-2.00
	105+73	END NC		
	SUPERELEVATION TRANSITION			
	107+37	BEGIN FS		
18		>	-5.00	5.00
	117+11	END FS		
	SUPERELEVATION TRANSITION			
	118+74	BEGIN NC		
		>	-2.00	-2.00
	43+15	END NC		
	SUPERELEVATION TRANSITION			
	44+78	BEGIN FS		
19		>	5.00	-5.00
	53+98	END FS		
	SUPERELEVATION TRANSITION			
	55+62	BEGIN NC		
		>	-2.00	-2.00
	+	END NC		
	END PROJECT			

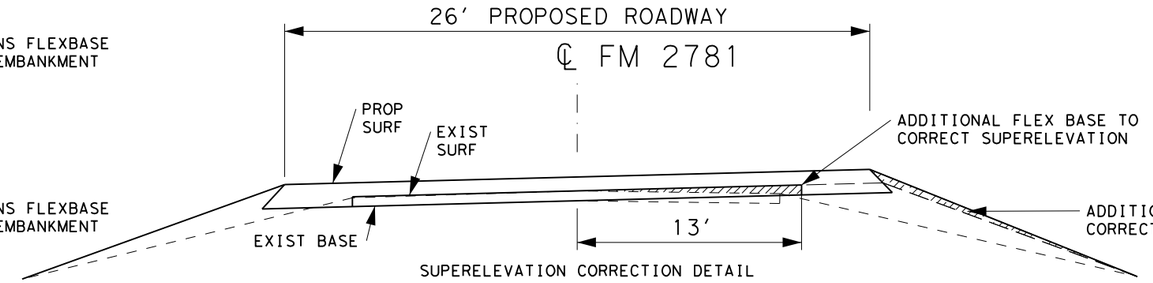
305.9 TONS FLEXBASE
129.2 SY EMBANKMENT

129.4 TONS FLEXBASE
54.6 SY EMBANKMENT

166.4 TONS FLEXBASE
70.2 SY EMBANKMENT

190.5 TONS FLEXBASE
80.4 SY EMBANKMENT

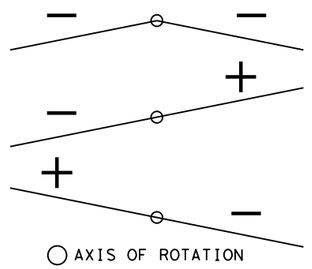
229.8 TONS FLEXBASE
97 SY EMBANKMENT



SUPERELEVATION CORRECTION DETAIL

NC = NORMAL CROWN
FS = FULL SUPERELEVATION
NOTE: ALL TRANSITIONS ARE ????????

SIGN CONVENTION



SCALE 1" = 100'

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED PROFESSIONAL ENGINEER

DocuSigned by:
cmb P.E.
AF852E728AEC4C0...
9/2/2022

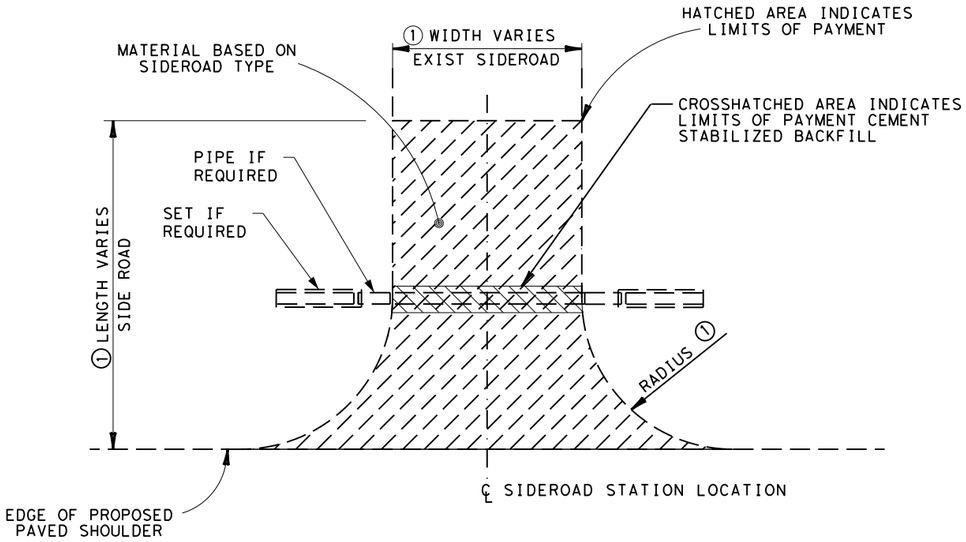
SUPER ELEVATION DATA

TEXAS DEPARTMENT OF TRANSPORTATION

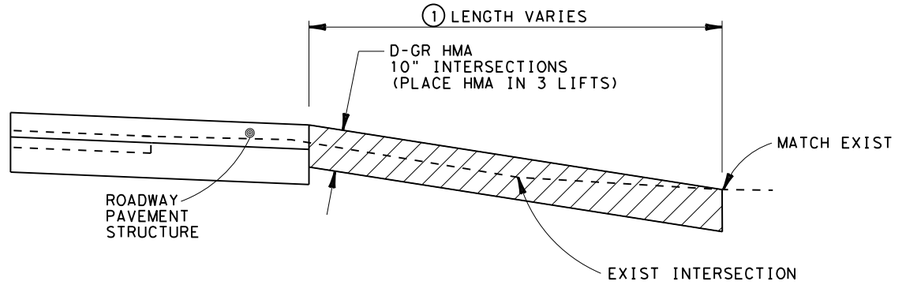
SHEET 2 OF 2

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		56 A

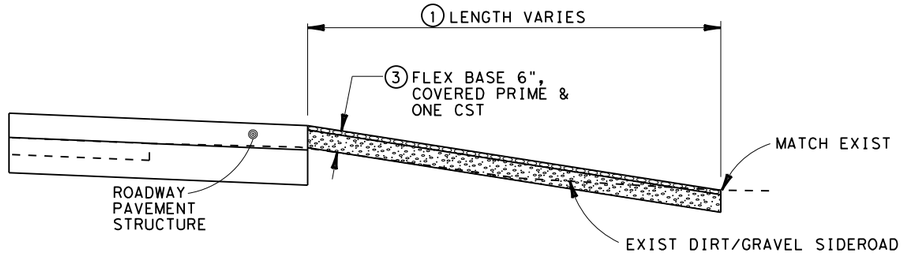
9/2/2022 3:01:57 PM
c:\txdot\pw*online\txdot3\diego.lopez\d0361206\Superelevation Data.dgn



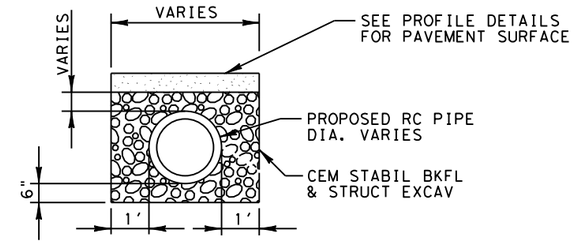
TYPICAL PLAN VIEW OF SIDE ROADS



PROFILE OF STATE HIGHWAY INTERSECTIONS



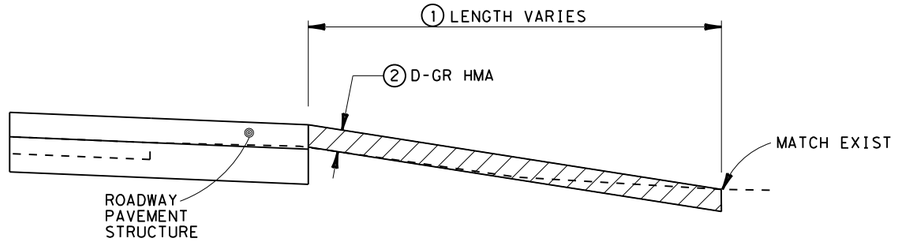
PROFILE OF DIRT/GRAVEL SIDEROADS



SECTION A-A
STRUCTURE CEM STABIL BKFL

CEMENT STABILIZED BACKFILL NOTES:

1. LIMITS OF STRUCTURAL EXCAVATION SHOULD BE DEFINED BY SAWCUTTING. THIS WORK WILL BE CONSIDERED SUBSIDIARY TO ITEM 400.



PROFILE OF ASPHALT SIDE ROADS

GENERAL NOTES:

1. CONCRETE SURFACE - USE REINFORCING STEEL CONSISTING OF NO.3 OR 4 BARS MEETING THE REQUIREMENTS OF GRADE 60 REINFORCING STEEL. PLACE BARS ON 12 INCH CENTERS IN EACH DIRECTION, SUPPORTED ON REINFORCING CHAIRS.
2. CONCRETE SURFACE - WELDED WIRE FABRIC WILL NOT BE ALLOWED FOR REINFORCING.
3. CONCRETE SURFACE - UNLESS OTHERWISE DIRECTED, INSTALL 1/2 INCH PREMOLDED EXPANSION JOINT MATERIAL BETWEEN EXISTING CONCRETE AND NEW CONCRETE.
4. PREPARATION AND CONSTRUCTION OF SIDEROADS SHALL BE PAID FOR UNDER ITEM 530 INTERSECTIONS AND TURNOUTS. NO ADDITIONAL PAYMENT WILL BE MADE FOR REMOVAL OF EXISTING GRAVEL AND DIRT DRIVEWAYS. THE NECESSARY EXCAVATION, GRADING, COMPACTION, HMA AND INCIDENTALS WILL BE CONSIDERED SUBSIDIARY TO ITEM 530.
5. D-GR HMA TYPE & RATE AS SHOWN ELSEWHERE IN PLANS. FOR D-GR HMA THICKER THAN 4", PLACE IN 2 LIFTS.
6. WHEN EXCAVATION DOES NOT GENERATE ENOUGH MATERIAL TO COMPLETE THE BACKFILL, ADDITIONAL MATERIAL MUST BE APPROVED PRIOR TO USE. ADDITIONAL MATERIAL WILL BE SUBSIDIARY TO VARIOUS BID ITEMS.

DETAIL NOTES:

① SEE SUMMARY ELSEWHERE IN PLANS FOR LENGTH, WIDTH AND RADIUS.

② THICKNESS SHOWN ELSEWHERE IN THE PLANS.

③ FULL DEPTH HMA MAY BE USED IN LIEU OF FLEX BASE, COVERED PRIME & ONE CST.

N. T. S.

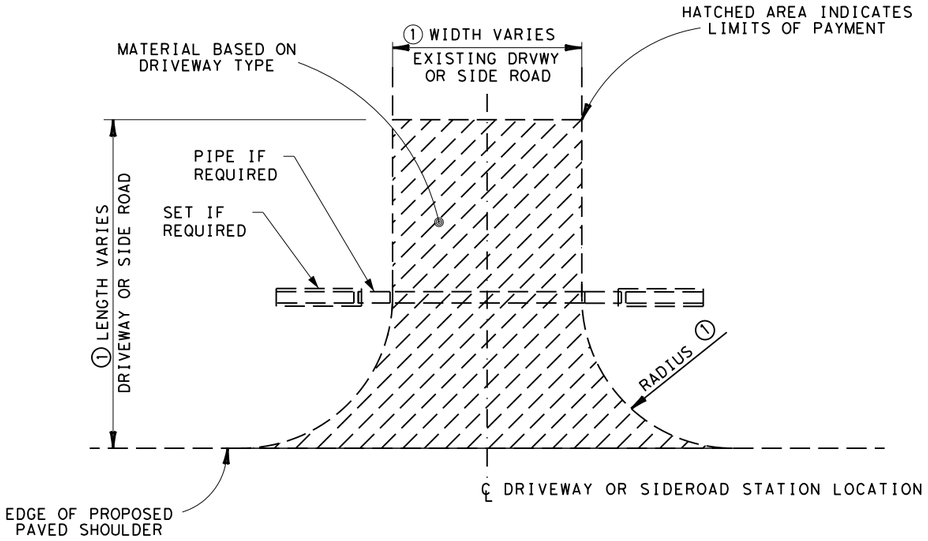
STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED PROFESSIONAL ENGINEER

DocuSigned by:
cmb P.E.
AF852E728AEC4C8...
9/2/2022

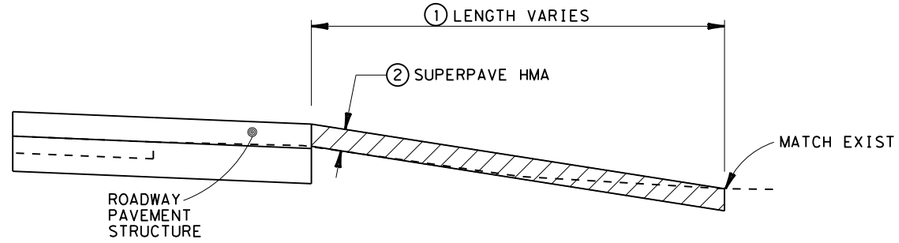
SIDE ROAD DETAILS

TEXAS DEPARTMENT OF TRANSPORTATION

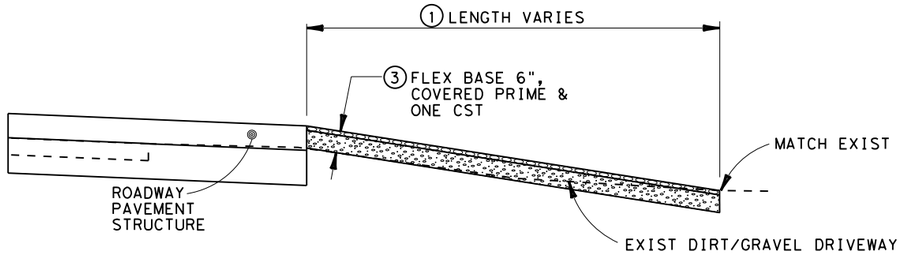
CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		57



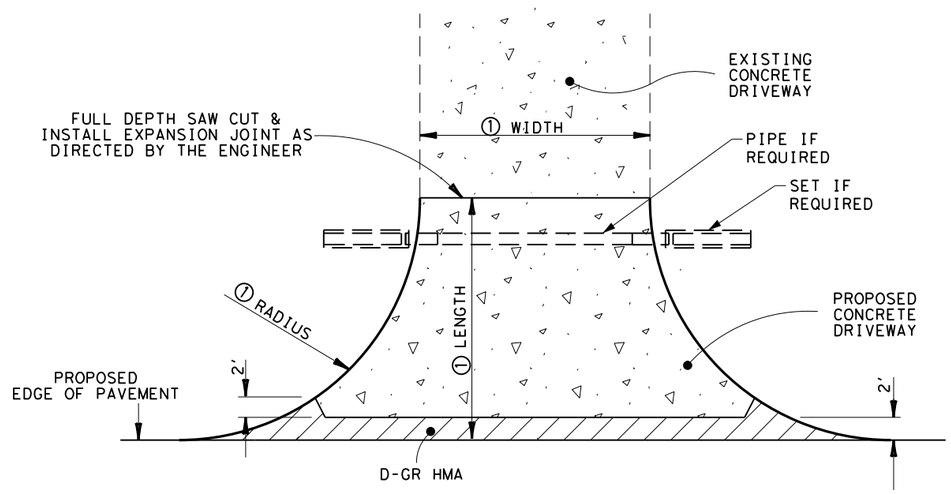
TYPICAL PLAN VIEW OF NON-CONC DRIVEWAYS



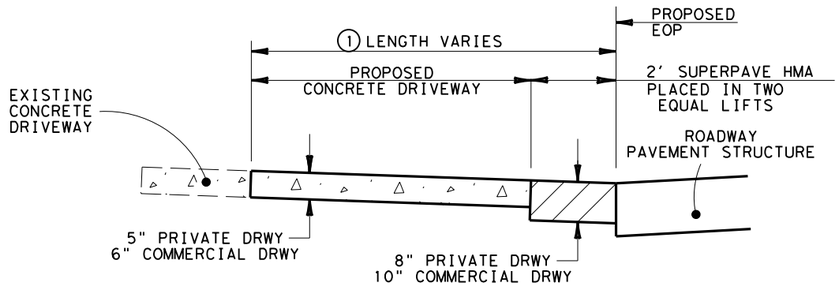
PROFILE OF ASPHALT DRIVEWAY



PROFILE OF DIRT/GRAVEL DRIVEWAYS



TYPICAL PLAN VIEW OF CONCRETE DRIVEWAYS



PROFILE OF CONCRETE DRIVEWAYS

GENERAL NOTES:

1. CONCRETE SURFACE - USE REINFORCING STEEL CONSISTING OF NO.3 OR 4 BARS MEETING THE REQUIREMENTS OF GRADE 60 REINFORCING STEEL. PLACE BARS ON 12 INCH CENTERS IN EACH DIRECTION, SUPPORTED ON REINFORCING CHAIRS.
2. CONCRETE SURFACE - WELDED WIRE FABRIC WILL NOT BE ALLOWED FOR REINFORCING.
3. CONCRETE SURFACE - UNLESS OTHERWISE DIRECTED, INSTALL 1/2 INCH PREMOLDED EXPANSION JOINT MATERIAL BETWEEN EXISTING CONCRETE AND NEW CONCRETE.
4. PREPARATION AND CONSTRUCTION OF DRIVEWAYS SHALL BE PAID FOR UNDER ITEM 530 DRIVEWAYS. NO ADDITIONAL PAYMENT WILL BE MADE FOR REMOVAL OF EXISTING GRAVEL AND DIRT DRIVEWAYS. THE NECESSARY EXCAVATION, GRADING, COMPACTION, HMA AND INCIDENTALS WILL BE CONSIDERED SUBSIDIARY TO ITEM 530.
5. SUPERPAVE HMA TYPE & RATE AS SHOWN ELSEWHERE IN PLANS. FOR D-GR HMA THICKER THAN 4", PLACE IN 2 LIFTS.
6. WHEN EXCAVATION DOES NOT GENERATE ENOUGH MATERIAL TO COMPLETE THE BACKFILL, ADDITIONAL MATERIAL MUST BE APPROVED PRIOR TO USE. ADDITIONAL MATERIAL WILL BE SUBSIDIARY TO VARIOUS BID ITEMS.

DETAIL NOTES:

① SEE SUMMARY ELSEWHERE IN PLANS FOR LENGTH, WIDTH AND RADIUS.

② THICKNESS SHOWN ELSEWHERE IN THE PLANS.

③ FULL DEPTH HMA MAY BE USED IN LIEU OF FLEX BASE, COVERED PRIME & ONE CST.

N. T. S.

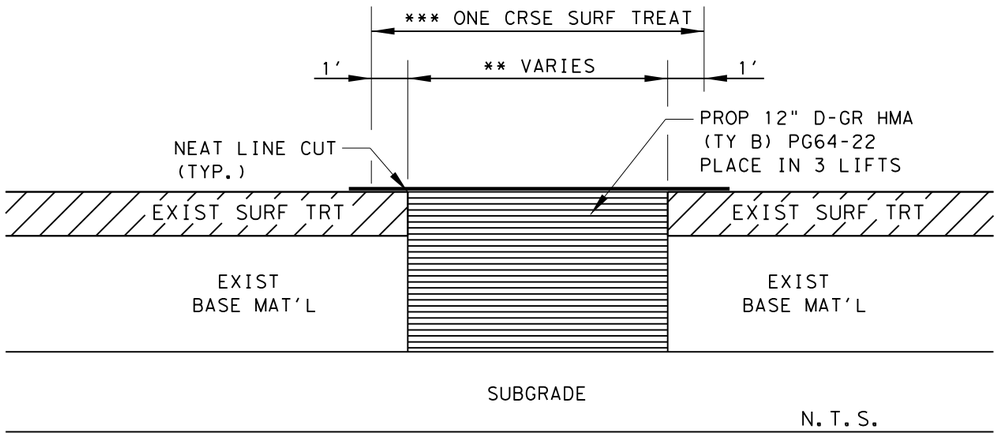
STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED PROFESSIONAL ENGINEER

DocuSigned by:
AF852572BAEC469...
9/2/2022

DRIVEWAY DETAILS

TEXAS DEPARTMENT OF TRANSPORTATION

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		58



ITEM 351 FULL DEPTH BASE REPAIR DETAIL

LOCATIONS AS DIRECTED

** MINIMUM DIMENSIONS 6' WIDTH X 25' LENGTH

*** OCST SUBSIDIARY TO ITEM 351

NOTES:

1. MAKE FULL DEPTH SAW CUTS AROUND THE PERIMETER OF THE AREA TO BE REPAIRED. MAKE THE CUT AT RIGHT ANGLES TO THE PAVEMENT EDGE AND TO THE CENTER LINE OF THE PAVEMENT.
2. ADDITIONAL SAW CUTS MAY BE REQUIRED WITHIN THE AREA OF THE REPAIR TO FACILITATE REMOVAL OF THE CONCRETE OR TO ALLEVIATE BINDING OF THE FULL DEPTH SAW CUT AT THE REPAIR EDGE. THESE CUTS WILL BE SUBSIDIARY TO ITEM 351.
3. CLEAN AND FILL THE SAW CUTS WHICH EXTEND OUTSIDE THE AREA OF THE REPAIR WITH A SEALANT APPROVED BY THE ENGINEER.
4. SUBGRADE PREPARATION AND SEALANT IS SUBSIDIARY.
5. REMOVE AND REPLACE UNSUITABLE SUBGRADE MATERIALS AS DIRECTED BY THE ENGINEER AND PAID FOR IN ACCORDANCE WITH ARTICLE 4.5 AND 4.6
6. COMPLETE THE REMOVAL AND REPLACEMENT OF EXISTING PAVEMENT IN ONE WORKING DAY.
7. CONCRETE JOINT REPAIRS SHALL MEET A 10-FT STRAIGHTEDGE SURFACE TEST TYPE A WITH A 1/4" VARIATION.
8. THE CONTRACTOR WILL WORK ON ONE SIDE OF THE ROAD AT A TIME & ONE LANE AT A TIME UNLESS OTHERWISE DIRECTED.
9. SEAL COAT ITEM 316 IS CONSIDERED SUBSIDIARY TO ITEM 351.

N.T.S.

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED
PROFESSIONAL ENGINEER

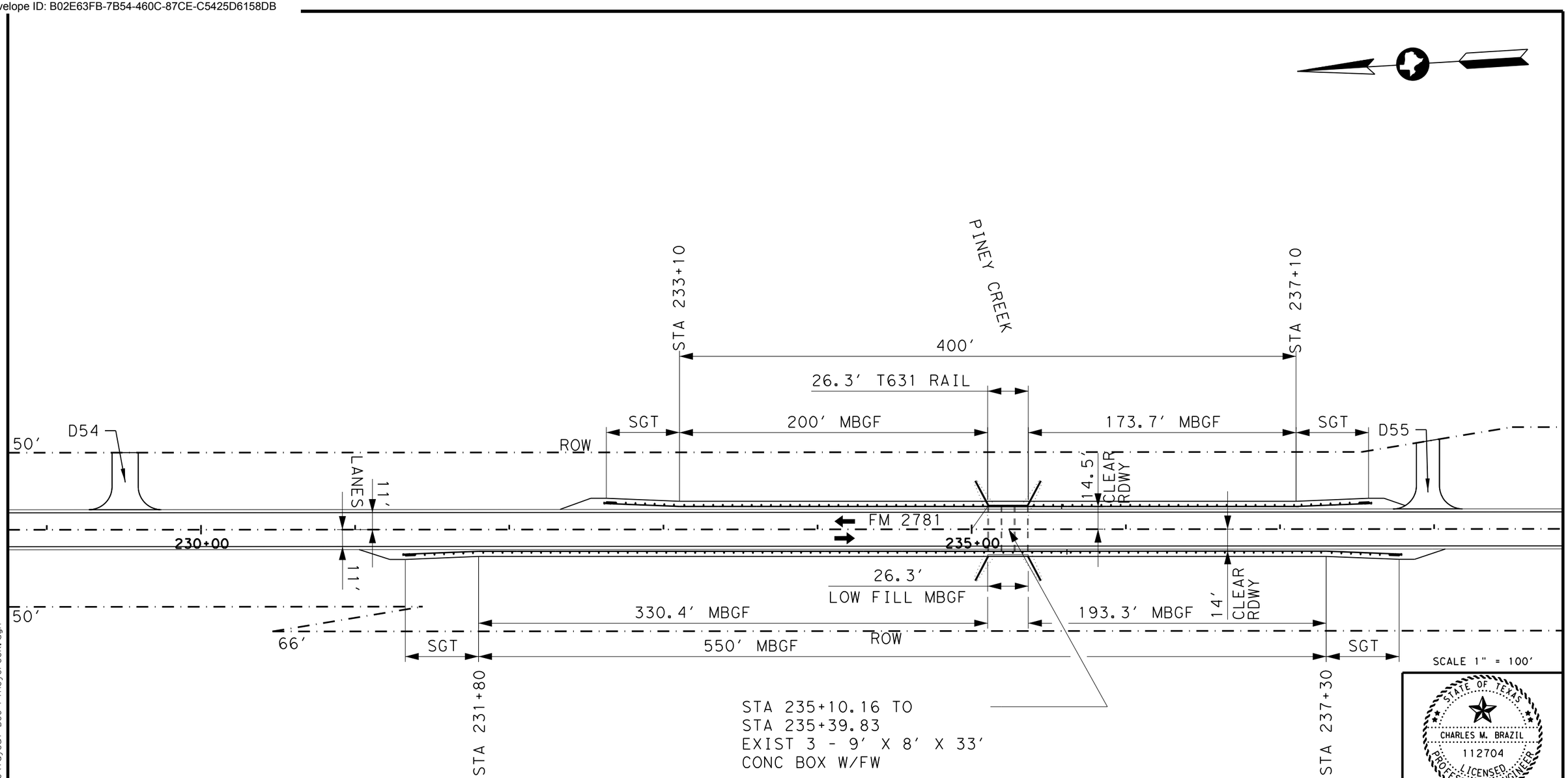
DocuSigned by:
CMB, P.E.
AF852E728AEC4C0...
9/2/2022

MISCELLANEOUS DETAIL

TEXAS DEPARTMENT OF TRANSPORTATION

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		58A

9/2/2022 11:54:17 AM
c:\txdot\pw*online\txdot3\sergio.zapata\d0361223\MISCELLANEOUS DETAILS.dgn



SCALE 1" = 100'

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED
PROFESSIONAL ENGINEER

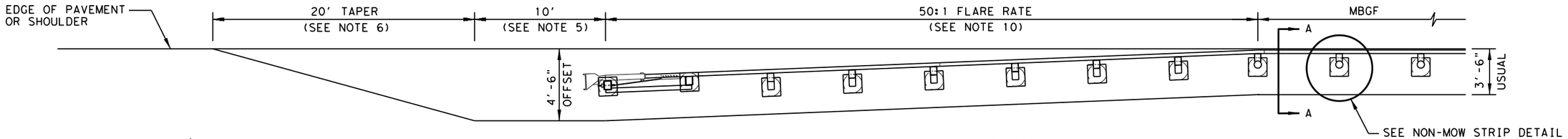
DocuSigned by:
AF852E728A5C469...
9/2/2022

MBGF LAYOUT

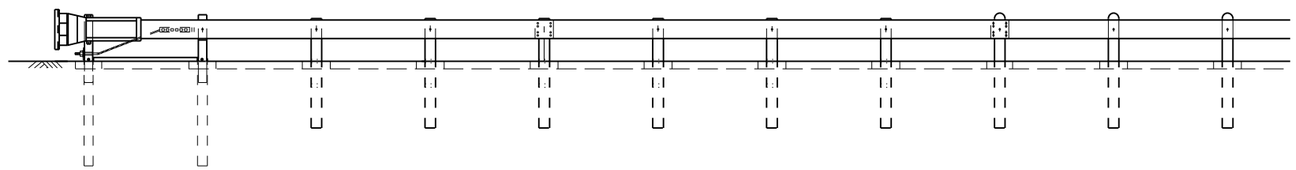
TEXAS DEPARTMENT OF TRANSPORTATION

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		59

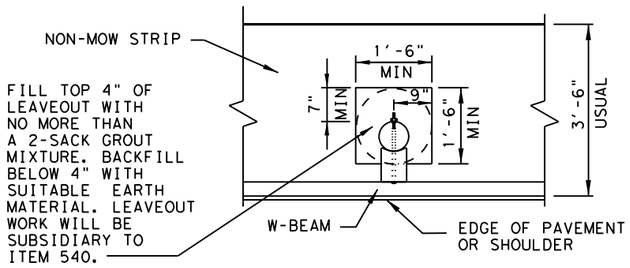
9/1/2022 7:51:10 AM
c:\txdot\pw*online\txdot3\sergio.zapata\d0361206\layout*BCC*PineyCreek.dgn



PLAN

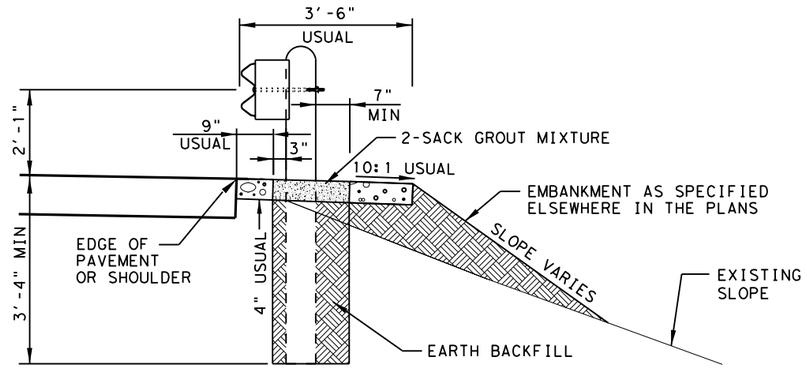


ELEVATION



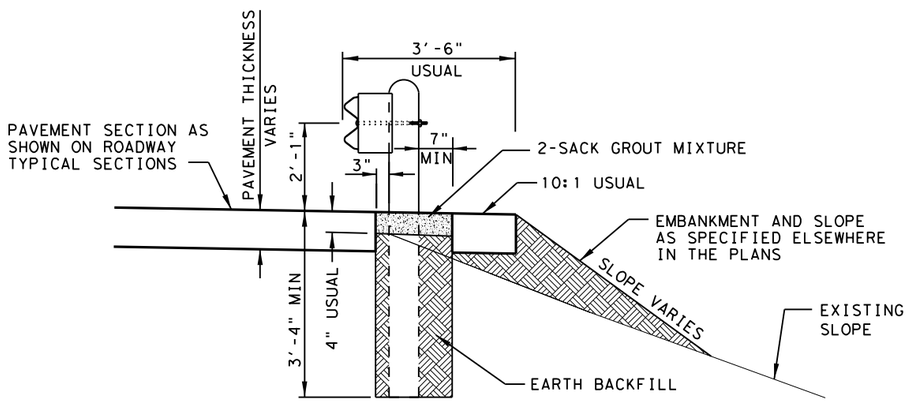
NON-MOW STRIP DETAIL

HOT MIX ASPHALTIC PAVEMENT NON-MOW STRIP
WITH 18"X18" OR 18" DIA. MINIMUM LEAVEOUT



SECTION A-A

ASPHALTIC NON-MOW STRIP



OPTIONAL SECTION A-A

WIDEN PAVEMENT SECTION

GENERAL NOTES

1. NON-MOW STRIPS SHALL BE HOT MIX ASPHALTIC PAVEMENT UNLESS OTHERWISE SHOWN ON THE PLANS. HOT MIX ASPHALTIC PAVEMENT SHALL MEET THE REQUIREMENTS OF AND BE PLACED IN ACCORDANCE WITH THE PERTINENT BID ITEM AS SHOWN ON THE PLANS. OTHER MATERIALS MAY BE USED AS INDICATED ELSEWHERE IN THE PLANS. MATERIALS FOR THE OPTIONAL WIDENED PAVEMENT SECTION SHALL BE AS SHOWN IN THE ROADWAY TYPICAL SECTIONS.
2. THE TYPE OF APPROVED POST WILL BE SHOWN ELSEWHERE IN THE PLANS. SEE THE APPLICABLE STANDARD SHEETS FOR ADDITIONAL DETAILS AND INFORMATION.
3. THE LIMITS OF PAYMENT FOR HOT MIX ASPHALTIC PAVEMENT WILL INCLUDE LEAVEOUTS FOR POST.
4. THE LEAVEOUTS SHALL BE FILLED WITH NO MORE THAN A 2-SACK GROUT MIXTURE AND PLACED IN ACCORDANCE WITH SECTION 421.2.7, "MORTAR AND GROUT". PAYMENT FOR FURNISHING AND PLACING THE GROUT MIXTURE WILL BE CONSIDERED SUBSIDIARY TO THE VARIOUS BID ITEMS.
5. THE NON-MOW STRIP SHALL BE EXTENDED FULL WIDTH FOR 10' IN ADVANCE OF THE GUARDRAIL END TREATMENT UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
6. A 20' TAPER WILL BE USED IN ADVANCE OF GUARDRAIL UNLESS OTHERWISE SHOWN IN THE PLANS, OR DIRECTED BY THE ENGINEER.
7. EXACT LOCATION OF MBGF PLACEMENT WILL BE SHOWN ELSEWHERE IN THE PLANS TO MEET APPROPRIATE CLEAR ROADWAY WIDTH AND CLEAR ZONE REQUIREMENTS.
8. EXCAVATION REQUIRED TO CONSTRUCT NON-MOW STRIP WILL NOT BE MEASURED OR PAID FOR DIRECTLY BUT WILL BE SUBSIDIARY TO PERTINENT ITEMS.
9. THE FLARE RATE MAY BE DECREASED OR ELIMINATED IF DIRECTED BY THE ENGINEER.
10. WHEN THE EXISTING NON-MOW STRIP IS TO REMAIN IN PLACE, FILLING THE EXISTING POST HOLES WITH GROUT AND DIGGING NEW POST HOLES WILL BE SUBSIDIARY. THE TOP 4 INCHES OF A POST HOLE WITHIN AN EXISTING NON-MOW STRIP SHALL BE BACKFILLED WITH HMA. THIS WORK WILL NOT BE PAID FOR BUT WILL BE SUBSIDIARY TO ITEM 542.

NOT TO SCALE

REVISED: 2-19-09
ADDED EDGE OF PAVEMENT OR SHOULDER LINE TO PLAN VIEW AND DETAIL.
REVISED: 7-16-10
CHANGED DEPTH OF NON-MOW STRIP FROM 5" TO 4".
REVISED: 12-30-11
REVISED HEIGHT OF W-BEAM ABOVE PAVEMENT SURFACE
REVISED: 9-29-16
REVISED SLOPE BEHIND POSTS; REMOVED SLOPE GENERAL NOTE
REVISED: 10-20-2016
MODIFIED TITLE BLOCK
REVISED: 04-07-2017
ADDED NOTE 10
REVISED: 07-10-2017
REVISED SLOPE BEHIND MBGF
REVISED: 02-02-2018
REVISED SPECIFICATION REFERENCE IN NOTE 4

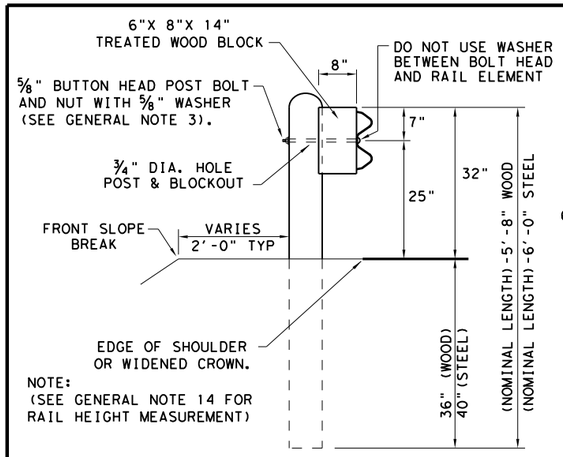
LUFKIN DISTRICT STANDARD

NON-MOW STRIP DETAILS

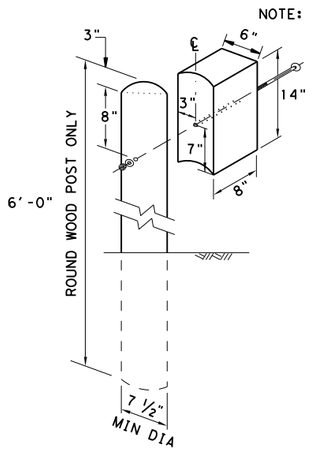
TEXAS DEPARTMENT OF TRANSPORTATION

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		60

DATE: 8/5/2022
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0504776\gf3119.dgn

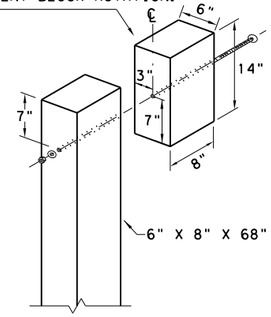


TYPICAL POST PLACEMENT

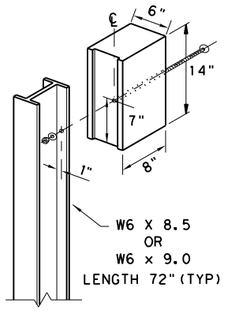


WOOD BLOCK TO ROUND WOOD POST

NOTE: TOENAIL WITH ONE 16D GALV. NAIL TO PREVENT BLOCK ROTATION.

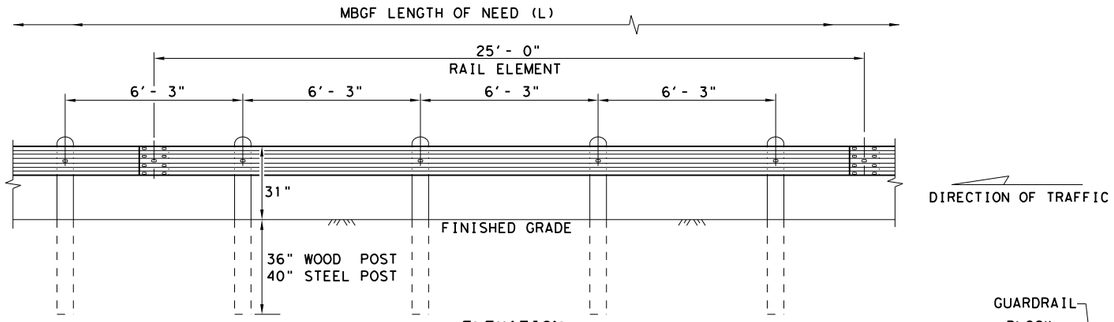


WOOD BLOCK TO RECTANGULAR WOOD POST



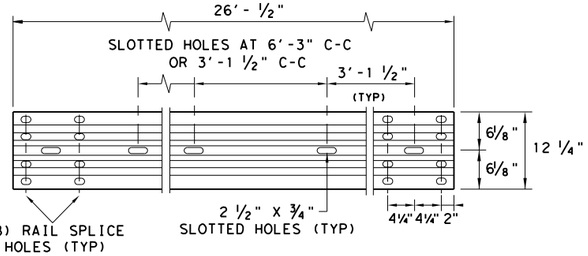
ROUTED WOOD BLOCK TO I-BEAM STEEL POST

NOTE: ** "WOOD" INDICATES DIMENSIONS FOR BOTH ROUND AND RECTANGULAR WOOD POST SYSTEMS.



ELEVATION
MID-SPAN RAIL SPLICE

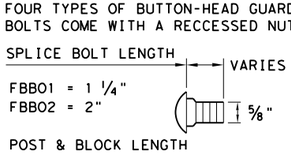
SHOWING A 25'- 0" SECTION OF W-BEAM RAIL. (SEE GENERAL NOTE 2)



ELEVATION 25'- 0" (NOM.) W-BEAM SECTION

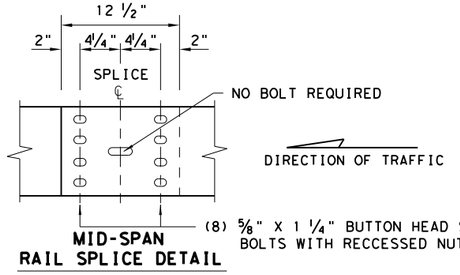
NOTES: SEE GENERAL NOTE 2 FOR ALLOWABLE RAIL TYPES.
SEE RAIL SPLICE DETAIL FOR REQUIRED HARDWARE.

NOTE:
FOUR TYPES OF BUTTON-HEAD GUARD RAIL BOLTS COME WITH A RECCESSED NUT.



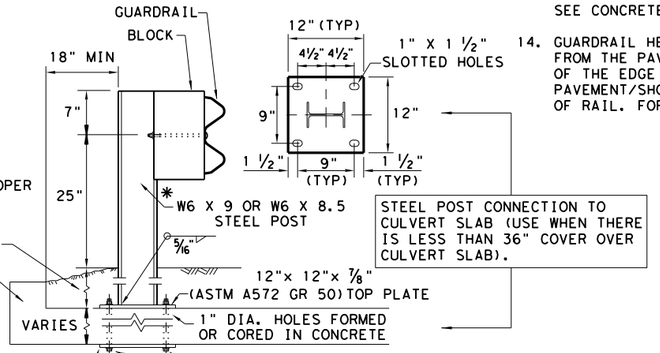
BUTTON HEAD BOLT

NOTE: SEE GENERAL NOTE 3 FOR SPLICE & POST BOLT DETAILS.



MID-SPAN RAIL SPLICE DETAIL

NOTE: GF(31), MID-SPAN RAIL SPLICES ARE REQUIRED WITH 6'-3" POST SPACINGS.



LOW FILL CULVERT POST

NOTE: TWO INSTALLATION OPTIONS.

1. BOLT-THROUGH OPTION: REQUIRES A 6" MIN. SLAB THICKNESS. ⅞" DIA (ASTM A449) HEAVY HEX BOLTS WITH TWO HARDENED WASHER EACH AND HEAVY HEX NUTS.
   NOTE: BOLT LENGTH = SLAB PLUS 2 ¼" MIN.

2. EPOXY ANCHOR OPTION: THIS OPTION MAY ONLY BE USED IF THE CULVERT SLAB IS 9" MIN. THICK. THREADED ANCHOR RODS MUST BE ⅞" DIA. ASTM A449 OR A193 GRADE B7 WITH HEAVY HEX NUT, AND ONE HARDENED WASHER EACH. EMBED ANCHOR RODS 6" WITH HILTI HIT RE 500 EPOXY ADHESIVE. OTHER TYPE III CLASS C EPOXY ADHESIVES MEETING THE REQUIREMENTS OF DMS-6100, "EPOXIES AND ADHESIVES", MAY BE USED IF IT CAN BE DEMONSTRATED THAT THEY MEET OR EXCEED THE STRENGTH OF HILTI HIT RE 500 WITH THE SAME EMBEDMENT DEPTH AND THREADED ROD DIA. FOLLOW THE MANUFACTURER'S REQUIREMENTS FOR INSTALLING EPOXIED THREADED RODS. EXTEND RODS ¼" MIN. BEYOND NUT.

NOTE: CULVERTS OF 25 FT. OR LESS, SEE GF(31)LS STANDARD FOR "LONG SPAN" OPTION.

NOTE: TRANSISTIONS TO BRIDGE RAILS OR TRAFFIC BARRIERS.
SEE GF(31)TL3 TR STANDARD FOR HIGH-SPEED TL-3 TRANSITIONS.
SEE GF(31)TL2 TR STANDARD FOR LOW-SPEED TL-2 TRANSITIONS.

GENERAL NOTES

1. THE TYPE OF POST (ROUND WOOD POST, RECTANGULAR WOOD POST, OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. THE EXACT POSITION OF MBGF SHALL BE SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER. STEEL POSTS TO BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING."
2. RAIL ELEMENTS SHALL MEET THE REQUIREMENTS OF ITEM 540, "METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED IN THE PLANS. THE CONTRACTOR MAY FURNISH RAIL ELEMENTS OF 25'- 0", OR 12'- 6" (NOM.) LENGTHS. RAIL ELEMENTS MAY HAVE SLOTTED HOLES AT 3'-1 ½" C-C OR 6'-3" C-C. A SPECIAL LENGTH OF RAIL MAY BE MANUFACTURED TO ACCOMMODATE THE DOWNSTREAM ANCHOR TERMINAL (DAT) AND THE TRANSITION SECTIONS OF GUARDRAIL.
3. BUTTON HEAD "POST BOLTS & NUTS" SHALL MEET THE REQUIREMENTS OF (ASTM A307), AND SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT AND ⅝" WASHER (FWC16a) AND NOT MORE THAN 1" BEYOND IT. TRIM REMAINING BOLT LENGTH TO MEET REQUIRED LENGTH.
4. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING." FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
5. CROWN SHALL BE WIDENED TO ACCOMMODATE THE METAL BEAM GUARD FENCE.
6. THE LATERAL APPROACH TO THE GUARD FENCE, SHALL HAVE A MAXIMUM SLOPE OF 1V:10H.
7. IF SHOWN ELSEWHERE IN THE PLANS OR AS DIRECTED BY THE ENGINEER, THE GUARD FENCE MAY BE FLARED AT A RATE OF 25:1 OR FLATTER.
8. UNLESS OTHERWISE SHOWN IN THE PLANS, GUARD FENCE PLACED IN THE VICINITY OF CURBS SHALL BE POSITIONED SO THAT THE FACE OF CURB IS LOCATED DIRECTLY BELOW OR BEHIND THE FACE OF THE RAIL. RAIL PLACED OVER CURBS SHALL BE INSTALLED SO THAT THE POST BOLT IS LOCATED APPROXIMATELY 25 INCHES ABOVE THE GUTTER PAN OR EDGE OF SHOULDER.
9. APPLICATIONS IN SOLID ROCK ARE ONLY ALLOWED WITH STEEL POSTS. IF SOLID ROCK IS ENCOUNTERED WITHIN 0 TO 18" OF THE FINISHED GRADE, DRILL A 24" DIA. HOLE, 24" INTO THE ROCK. IF SOLID ROCK IS ENCOUNTERED BELOW 18", DRILL A 12" DIA. HOLE, 12" INTO THE ROCK OR TO THE STANDARD EMBEDMENT DEPTH, WHICHEVER MAYBE LESS. ANY EXCESS POST LENGTH, AFTER MEETING THESE DEPTHS, MAY BE FIELD CUT TO ENSURE PROPER GUARDRAIL MOUNTING HEIGHT. BACKFILL WITH COARSE AGGREGATE MATERIAL.
10. POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
11. SPECIAL FABRICATION WILL BE REQUIRED AT INSTALLATION LOCATIONS HAVING A CURVATURE OF LESS THAN 150 FT. RADIUS.
12. UNLESS OTHERWISE SHOWN IN THE PLANS, A COMPOSITE MATERIAL BLOCK THAT MEETS THE REQUIREMENTS OF DMS-7210, "COMPOSITE MATERIAL POSTS AND BLOCKS FOR METAL BEAM GUARD FENCE" MAY BE SUBSTITUTED FOR BLOCKS OF SIMILAR DIMENSIONS. THE CONSTRUCTION DIVISION, TXDOT MAINTAINS A MATERIAL PRODUCER LIST (MPL) FOR PRODUCERS OF MATERIALS CONFORMING TO DMS-7210 ONLY PRODUCERS ON THE MPL MAY FURNISH COMPOSITE MATERIAL BLOCKS.
13. FOR THE LOW FILL CULVERT OPTION, POSTS LOCATED PARTIALLY OR WHOLLY BETWEEN PRECAST BOX CULVERT UNITS, THE USE OF A CAST-IN-PLACE CONCRETE CLOSURE BETWEEN BOXES IS REQUIRED. THE LENGTH OF THE CAST-IN-PLACE CONCRETE CLOSURE SHALL ACCOMMODATE THE PLACEMENT OF THE LOW FILL CULVERT OPTION. SEE CONCRETE CLOSURE DETAILS ON BRIDGE STANDARD SCP-MD.
14. GUARDRAIL HEIGHT MEASUREMENT: WHEN THE GUARDRAIL IS LOCATED ABOVE PAVEMENT, MEASURE THE HEIGHT FROM THE PAVEMENT TO THE TOP OF THE W-BEAM RAIL. WHEN THE GUARDRAIL IS LOCATED UP TO 2 FT. OFF OF THE EDGE OF PAVEMENT OR FOR A PAVEMENT OVERLAY, USE A 10-FOOT STRAIGHTEDGE TO EXTEND THE PAVEMENT/SHOULDER SLOPE TO THE BACK OF RAIL, MEASURE FROM THE BOTTOM OF STRAIGHTEDGE TO THE TOP OF RAIL. FOR GUARDRAIL LOCATED DOWN A 10:1 SLOPE, MEASURE FROM THE NOMINAL TERRAIN.

Texas Department of Transportation — Design Division Standard

METAL BEAM GUARD FENCE
TL-3 MASH COMPLIANT
GF(31)-19

FILE: gf3119.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	2707	01	011, ETC.	FM 2781
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON, ETC.		61

DATE: 8/5/2022
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0504776\sgt11s3118.dgn

(SEE GN NOTE 15)
STANDARD 31" MBGF

ITEM (6)
INNER SIDE SLIDER
(ISS) PANEL FOR RAIL 3

FIELD-SIDE
(RAIL 3)

NOTE:
RECESSED HEX NUTS FACING
TRAFFIC-SIDE **SEE DETAIL (C)**

REFERENCE LINE USED TO INSTALL
LINE POST(9) THRU POST(2)

POST 1 OFFSET DISTANCE MEASURED
7-⅝" FROM REFERENCE LINE

POST 9 | POST 8 | POST 7 | POST 6 | POST 5 | POST 4 | POST 3 | POST 2

RAIL 4 | RAIL 3 | RAIL 2 | RAIL 1

ITEM (10)
CABLE ASSEMBLY

ITEM (2)
GROUNDSTRUT

NO BLOCKOUT
AT (POST 1)

CABLES

ITEM (5)
TRAFFIC SIDE SLIDER
(TSS) PANEL FOR RAIL 2

NOTE: SECURE THE (TSS) PANEL TO OUTSIDE
OF RAIL 2 WITH THE PANEL ARROWS
POINTING TOWARDS THE HEAD.

NOTES:
1. ITEM (12) COMPOSITE BLOCKOUTS INSTALLED AT LINE POST(9) THRU LINE POST(2).
2. DO NOT INSTALL A BLOCKOUT AT LINE POST(1).

PLAN VIEW

MBGF
RAIL 2

INSTALL GUARD FENCE RECESSED
HEX NUTS ON TRAFFIC-SIDE

MBGF
RAIL 1

DETAIL (C)

TRAFFIC FLOW

ITEM (25)
MAX-TENSION HEAD
SEE DETAIL (A)

END PAYMENT (SGT) BY EACH

DO NOT BOLT
RAIL TO POST 6

BEGIN LENGTH OF NEED

INSTALLATION LENGTH 55'- ½"

49'-8 ⅝"

6'-3" | 6'-3" | 6'-3" | 6'- ¾" | 6'-3" | 6'-3" | 6'-3" | 37 ½" | 5'-3 ⅛"

RAIL
HEIGHT
31"

ARROWS

DETAIL (D)

RAIL
HEIGHT
31"

HEAD
HEIGHT

DETAIL (B)

ITEM (13) RAIL 4 | ITEM (13) RAIL 3 | ITEM (13) RAIL 2 | ITEM (13) RAIL 1

FINISHED
GRADE

CABLES

FINISHED
GRADE

ITEM (10)
CABLE
ASSEMBLY

ITEM (2)
GROUNDSTRUT

32-¼"

68-⅛"

POST 9 | POST 8 | POST 7 | POST 6 | POST 5 | POST 4 | POST 3 | POST 2 | POST 1

ITEM (4)
I-BEAM
W6 X 9

NO BLOCKOUT
AT (POST 1)

SOIL
ANCHOR POST
ITEM (1)

(8) X-LITE LINE POST - ITEM (11)

ELEVATION VIEW

A

A

TSS PANEL
GALVANIZED
ITEM (5)

RSS PLATE
GALVANIZED
ITEM (8)

INSTALL THE TSS AND RSS
WITH THE ARROWS POINTING
TOWARDS THE MAX-HEAD

TSS PANEL AND RSS PLATE
DETAIL (D)

HEAD
HEIGHT
32-¼"

TOP OF POST

31-⅞"

FINISHED
GRADE

40-⅛"

68-⅛"
ANCHOR POST
DEPTH

ITEM (1)
ANCHOR

ITEM (11)
LINE POSTS
2 THRU 9
(NOTE: ITEM (4) POST 1 (NOT SHOWN),
TO BE INSTALLED AT SAME DEPTH
AS LINE POSTS.)

SOIL ANCHOR, POST 1
& LINE POST 2 THRU 9

SECTION VIEW A-A

NOTE:
USE THE MASH APPROVED
X-TENSION CABLE ASSEMBLY.

7 ⅝"
2 ⅛"

UPPER CABLE
(BACK SIDE)

LOWER CABLE
(TRAFFIC SIDE)

DETAIL (B)

CABLE
FRICTION PLATE
HEAD UNIT
ITEM (9)

NOTE:
INSTALL ⅝" RECESSED HEX
NUTS ON TRAFFIC SIDE.

ITEM (24)
ITEM (21)

ITEM (20)
8X

ITEM (17)
8X

ITEM (23)
6X
3 SCREWS
EACH SIDE

ITEM (22)
BRACKET
SHIPPED FLAT

(RAIL 1)

ITEM (3)

ITEM (16)
4X

* ITEM (25)
HIGH INTENSITY
REFLECTIVE SHEETING

NOTE: DELINEATION MARKER IN
ACCORDANCE WITH TEXAS MUTCD.

SPLICE FOR IMPACT-HEAD
TO GUARD FENCE (RAIL1)

DETAIL (A)

APPROX 5'-10"

5'-0"

50' APPROACH GRADING

STANDARD
MBGF

2'-0"

EDGE OF PAVEMENT

NOTE: ADJUST WIDTH ACCORDINGLY WHEN OFFSET IS USED. (OFFSET "OPTION" SHOWN)

2'-0" MAX.
RAIL OFFSET

APPROACH GRADING
(1V:10H OR FLATTER)
SEE PRODUCT ASSEMBLY MANUAL
FOR ADDITIONAL GUIDANCE.

NOTE: TXDOT GENERIC APPROACH GRADING LAYOUT
USED FOR ALL TANGENT TYPE END TREATMENTS.

APPROACH GRADING AT GUARDRAIL END TREATMENTS

TRAFFIC FLOW

GENERAL NOTES

1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: LINDSAY TRANSPORTATION SOLUTIONS (LTS) - BARRIER SYSTEMS, INC. AT (707) 374-6800
2. FOR INSTALLATION, REPAIR, & MAINTENANCE REFER TO THE; MAX-TENSION INSTALLATION INSTRUCTION MANUAL. P/N MANMAX REV D (ECN 3516).
3. APPLY HIGH INTENSITY REFLECTIVE SHEETING, "OBJECT MARKER" ON THE FRONT FACE OF THE DEVICE PER MANUFACTURE'S RECOMMENDATIONS. OBJECT MARKER SHALL CONFORM TO THE STANDARDS REQUIRED IN TEXAS MUTCD.
4. FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TXDOT'S LATEST ROADWAY MOW STRIP STANDARD.
5. ALL STEEL COMPONENTS ARE GALVANIZED PER ASTM A123 OR EQUIVALENT UNLESS OTHERWISE STATED.
6. SYSTEM SHOWN USING STEEL WIDE FLANGE POST WITH COMPOSITE BLOCKOUTS.
7. COMPOSITE MATERIAL BLOCKOUT THAT MEETS THE REQUIREMENTS OF DMS-7210, MAY BE SUBSTITUTED FOR BLOCKOUTS SIMILAR DIMENSIONS. SEE CONSTRUCTION DIVISION MATERIAL PRODUCER LIST(MPL)FOR CERTIFIED PRODUCERS.
8. REFER TO INSTALLATION MANUAL FOR SPECIFIC PANEL LAPPING GUIDANCE.
9. IF SOLID ROCK IS ENCOUNTERED SEE THE MANUFACTURER'S INSTALLATION MANUAL FOR INSTALLATION GUIDANCE.
10. POSTS SHALL NOT BE SET IN CONCRETE.
11. A DRIVING CAP WITH A TIMBER OR PLASTIC INSERT SHALL BE USED WHEN DRIVING POST TO PREVENT DAMAGE TO THE GALVANIZING ON TOP OF THE POST.
12. MAX-TENSION SYSTEM SHALL NEVER BE INSTALLED WITHIN A CURVED SECTION OF GUARDRAIL.
13. IF A DELINEATION MARKER IS REQUIRED, MARKER SHALL BE IN ACCORDANCE WITH TEXAS MUTCD.
14. THE SYSTEM IS SHOWN WITH 12'-6" MBGF PANELS, 25'-0" MBGF PANELS ARE ALSO ALLOWED.
15. A MINIMUM OF 12'-6" OF 12GA. MBGF IS REQUIRED IMMEDIATELY DOWNSTREAM OF THE MAX-TENSION SYSTEM.

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	BSI-1610060-00	SOIL ANCHOR - GALVANIZED	1
2	BSI-1610061-00	GROUND STRUT - GALVANIZED	1
3	BSI-1610062-00	MAX-TENSION IMPACT HEAD	1
4	BSI-1610063-00	W6x9 I-BEAM POST 6FT.-GALVANIZED	1
5	BSI-1610064-00	TSS PANEL - TRAFFIC SIDE SLIDER	1
6	BSI-1610065-00	ISS PANEL - INNER SIDE SLIDER	1
7	BSI-1610066-00	TOOTH - GEOMET	1
8	BSI-1610067-00	RSS PLATE - REAR SIDE SLIDER	1
9	B061058	CABLE FRICTION PLATE - HEAD UNIT	1
10	BSI-1610069-00	CABLE ASSEMBLY - MASH X-TENSION	2
11	BSI-1012078-00	X-LITE LINE POST-GALVANIZED	8
12	B090534	8" W-BEAM COMPOSITE-BLOCKOUT XT110	8
13	BSI-4004386	12'-6" W-BEAM GUARD FENCE PANELS 12GA.	4
14	BSI-1102027-00	X-LITE SQUARE WASHER	1
15	BSI-2001886	⅝" X 7" THREAD BOLT HH (GR.5)GEOMET	1
16	BSI-2001885	¾" X 3" ALL-THREAD BOLT HH (GR.5)GEOMET	4
17	4001115	⅝" X 1 ¼" GUARD FENCE BOLTS (GR.2)MGAL	48
18	2001840	⅝" X 10" GUARD FENCE BOLTS MGAL	8
19	2001636	⅝" WASHER F436 STRUCTURAL MGAL	2
20	4001116	⅝" RECESSED GUARD FENCE NUT (GR.2)MGAL	59
21	BSI-2001888	⅝" X 2" ALL THREAD BOLT (GR.5)GEOMET	1
22	BSI-1701063-00	DELINEATION MOUNTING (BRACKET)	1
23	BSI-2001887	¼" X ¾" SCREW SD HH 410SS	7
24	4002051	GUARDRAIL WASHER RECT AASHTO FWR03	1
* 25	SEE NOTE BELOW	HIGH INTENSITY REFLECTIVE SHEETING	1
** 26	4002337	8" W-BEAM TIMBER-BLOCKOUT, PDB01B	8
** 27	BSI-4004431	25' W-BEAM GUARDRAIL PANEL,8-SPACE,12GA.	2
28	MANMAX Rev-(D)	MAX-TENSION INSTALLATION INSTRUCTIONS	1

* TO BE PROVIDED BY DISTRIBUTOR OR CONTRACTOR.

** ALTERNATIVE ITEMS NOT SHOWN.
ITEM(26) 8" WOOD-BLOCKOUTS
ITEM(27) 25'GUARD FENCE PANELS

NOTE:
THIS STANDARD IS A BASIC REPRESENTATION OF THE MAX-TENSION END TERMINAL, IT IS NOT INTENDED TO REPLACE THE PRODUCT DESCRIPTION ASSEMBLY MANUAL.

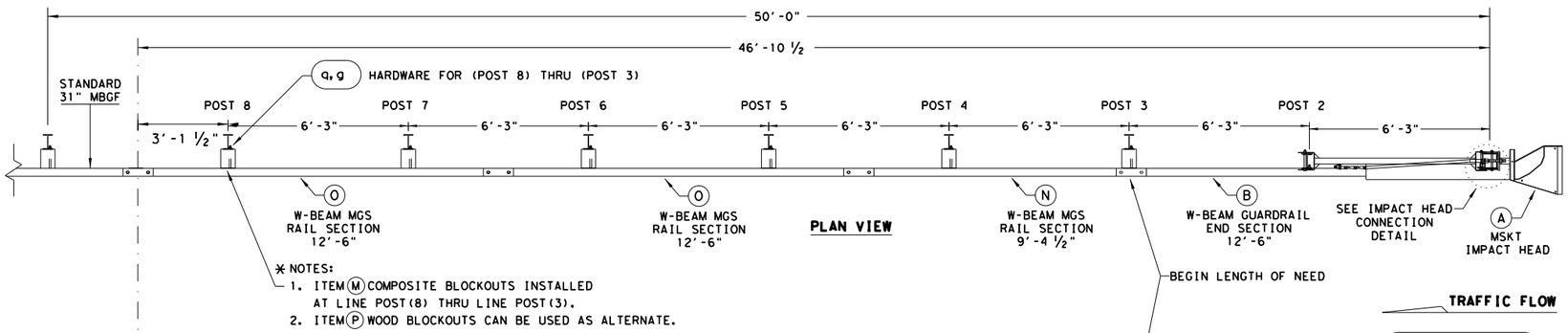
Texas Department of Transportation

Design Division Standard

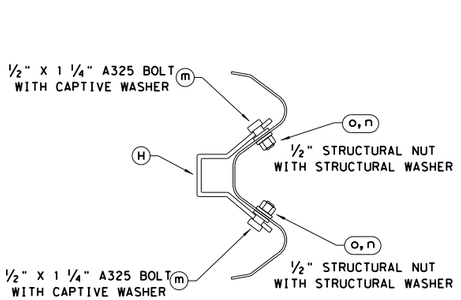
MAX-TENSION END TERMINAL
MASH - TL-3
SGT(11S)31-18

FILE: sgt11s3118.dgn	DN: TxDOT	CK: KM	DW: TxDOT	CK: CL
© TxDOT: FEBRUARY 2018	CONT	SECT	JOB	HIGHWAY
REVISIONS	2707	01	011, ETC.	FM 2781
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON, ETC.		62

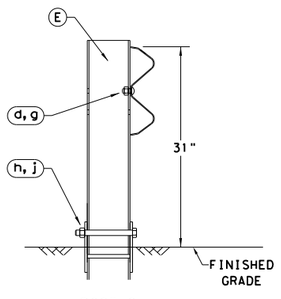
DATE: 8/5/2022
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0504776\sgt12s3118.dgn



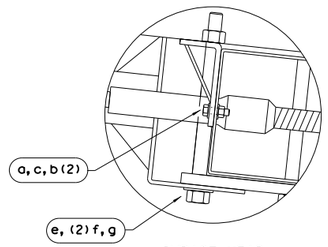
NOTE: SEE (GENERAL NOTE 14) FOR DRIVING CAP INFORMATION.



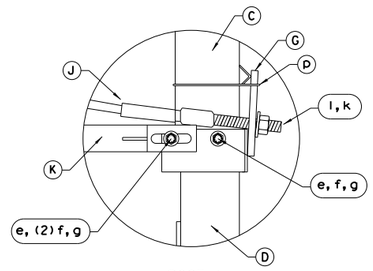
SECTION B-B
ANCHOR BRACKET



POST 2
SECTION A-A



IMPACT HEAD
CONNECTION DETAIL



POST 1
CONNECTION DETAIL

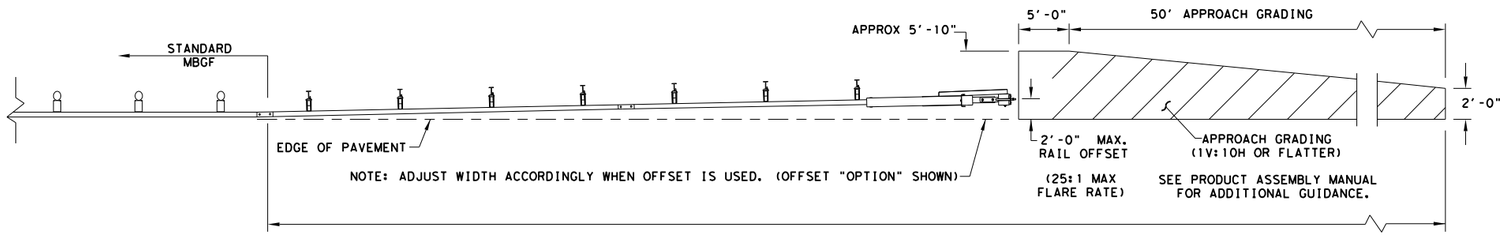
GENERAL NOTES

1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: ROAD SYSTEMS, INC. (432)263-2435. 3616 OLD HOWARD COUNTY AIRPORT, BIG SPRING, TX 79720
2. FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE; MSKT END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY MANUAL (PUBLICATION~062717).
3. APPLY HIGH INTENSITY REFLECTIVE SHEETING, "OBJECT MARKER" ON THE FRONT FACE OF THE DEVICE PER MANUFACTURER'S RECOMMENDATIONS. OBJECT MARKER SHALL CONFORM TO THE STANDARDS REQUIRED IN TEXAS MUTCD.
4. FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TXDOT'S LATEST ROADWAY MOW STRIP STANDARD.
5. HARDWARE (BOLTS, NUTS, & WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
6. SYSTEM SHOWN USING STEEL WIDE FLANGE POSTS WITH COMPOSITE BLOCKOUTS.
7. A COMPOSITE MATERIAL BLOCKOUTS THAT MEETS THE REQUIREMENTS OF DMS-7210, MAY BE SUBSTITUTED FOR BLOCKOUTS OF SIMILAR DIMENSIONS. SEE CONSTRUCTION DIVISION MATERIAL PRODUCER LIST (MPL) FOR CERTIFIED PRODUCERS.
8. IF SOLID ROCK IS ENCOUNTERED IN THE AREA OF (POST 1) AND / OR (POST 2) CONTACT THE MANUFACTURER, & REFER TO THE LATEST ROADWAY MBGF STANDARD FOR INSTALLATION GUIDANCE.
9. POSTS SHALL NOT BE SET IN CONCRETE.
10. SYSTEM MUST BE ATTACHED TO STANDARD 31" MBGF.
11. UNDER NO CIRCUMSTANCES SHALL THE GUARDRAIL WITHIN THE MSKT SYSTEM BE CURVED.
12. A FLARE RATE OF UP TO 25:1 MAY BE USED TO PREVENT THE TERMINAL HEAD FROM ENCROACHING ON THE SHOULDER. THE FLARE MAY BE DECREASED OR ELIMINATED FOR SPECIFIC INSTALLATIONS, IF DIRECTED BY THE ENGINEER.
13. THE SYSTEM IS SHOWN WITH TWO 12'-6" MBGF PANELS, ONE 25'-0" MBGF PANEL IS ALSO ALLOWED IN THEIR PLACE.
14. A DRIVING CAP WITH A TIMBER OR PLASTIC INSERT SHALL BE USED WHEN DRIVING POSTS 3-8 TO PREVENT DAMAGE TO THE GALVANIZING ON TOP OF THE POST. SPECIAL DRIVING CAP TO BE USED ON LOWER POSTS 1 & 2 TO PREVENT DAMAGE TO THE WELDED PLATES.

ITEM	QTY	MAIN SYSTEM COMPONENTS	ITEM NUMBERS
A	1	MSKT IMPACT HEAD	MS3000
B	1	W-BEAM GUARDRAIL END SECTION, 12 Ga.	SF1303
C	1	POST 1 - TOP (6" X 6" X ⅛" TUBE)	MTPHP1A
D	1	POST 1 - BOTTOM (6' W6X15)	MTPHP1B
E	1	POST 2 - ASSEMBLY TOP	UHP2A
F	1	POST 2 - ASSEMBLY BOTTOM (6' W6X9)	HP2B
G	1	BEARING PLATE	E750
H	1	CABLE ANCHOR BOX	S760
J	1	BCT CABLE ANCHOR ASSEMBLY	E770
K	1	GROUND STRUT	MS785
L	6	W6x9 OR W6x8.5 STEEL POST	P621
M	6	COMPOSITE BLOCKOUTS	CBSP-14
N	1	W-BEAM MGS RAIL SECTION (9'-4 ½")	G12025
O	2	W-BEAM MGS RAIL SECTION (12'-6")	G1203A
P	6	WOOD BLOCKOUT 6" X 8" X 14"	P675
Q	1	W-BEAM MGS RAIL SECTION (25'-0")	G1209
		SMALL HARDWARE	
a	2	⅝" x 1" HEX BOLT (GRD 5)	B5160104A
b	4	⅝" WASHER	W0516
c	2	⅝" HEX NUT	N0516
d	25	⅝" Dia. x 1 ¼" SPLICE BOLT (POST 2)	B580122
e	2	⅝" Dia. x 9" HEX BOLT (GRD A449)	B580904A
f	3	⅝" WASHER	W050
g	33	⅝" Dia. H.G.R NUT	N050
h	1	¾" Dia. x 8 ½" HEX BOLT (GRD A449)	B340854A
j	1	¾" Dia. HEX NUT	N030
k	2	1 ANCHOR CABLE HEX NUT	N100
l	2	1 ANCHOR CABLE WASHER	W100
m	8	½" x 1 ¼" A325 BOLT WITH CAPTIVE WASHER	SB12A
n	8	½" STRUCTURAL NUTS	N012A
o	8	1 1/16" O.D. x 9/16" I.D. STRUCTURAL WASHERS	W012A
p	1	BEARING PLATE RETAINER TIE	CT-100ST
q	6	⅝" x 10" H.G.R. BOLT	B581002
r	1	OBJECT MARKER 18" X 18"	E3151

SEE NOTES: *

ALTERNATIVE ITEMS NOT SHOWN. **
* ITEM(P) 8" WOOD-BLOCKOUT
** ITEM(Q) 25'GUARD FENCE PANEL



NOTE: ADJUST WIDTH ACCORDINGLY WHEN OFFSET IS USED. (OFFSET "OPTION" SHOWN)

APPROACH GRADING AT GUARDRAIL END TREATMENTS

NOTE: TXDOT GENERIC APPROACH GRADING LAYOUT USED FOR ALL TANGENT TYPE END TREATMENTS.

NOTE: THIS STANDARD IS A BASIC REPRESENTATION OF THE MSKT END TERMINAL, IT IS NOT INTENDED TO REPLACE THE PRODUCT DESCRIPTION ASSEMBLY MANUAL.

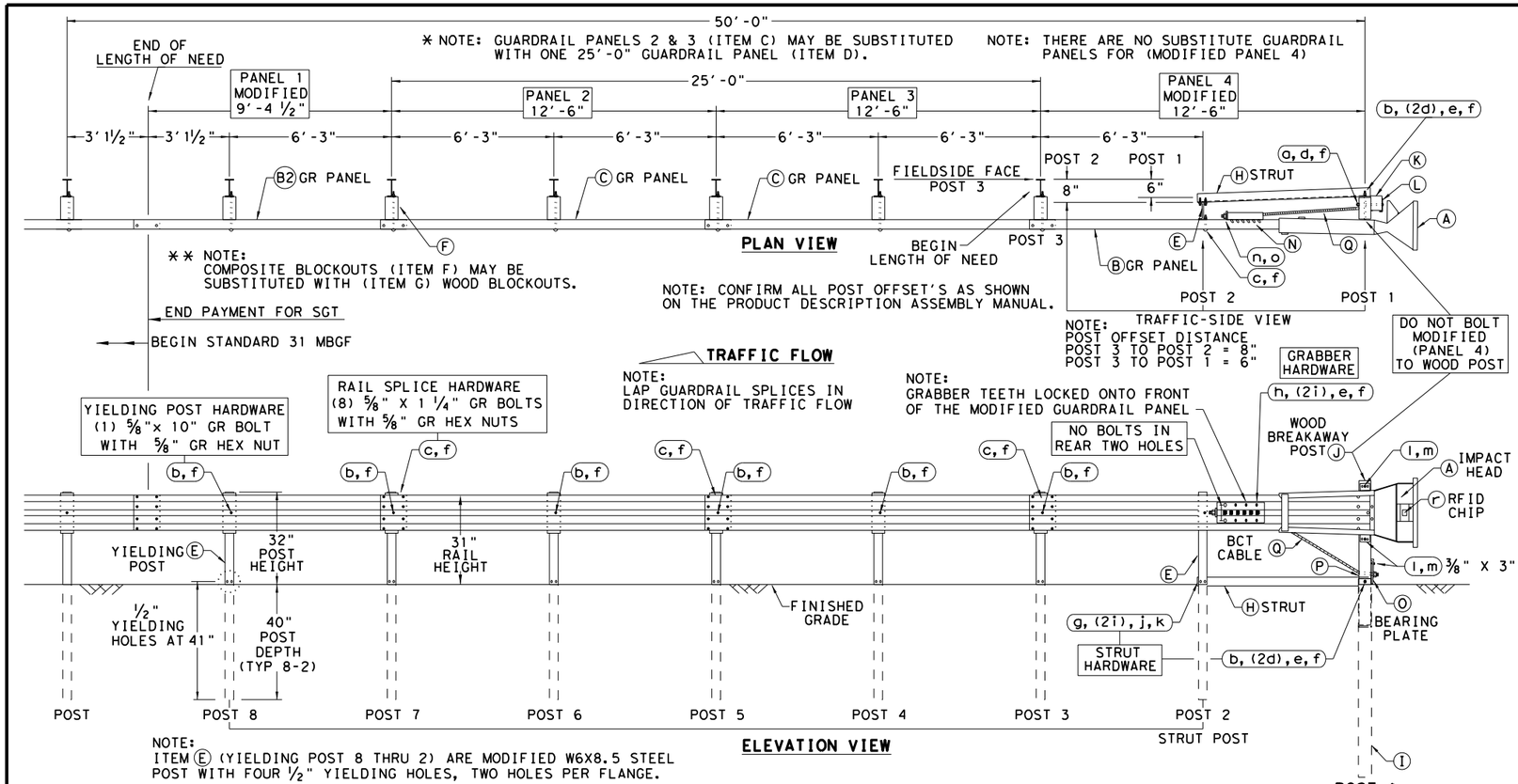
Texas Department of Transportation

Design Division Standard

SINGLE GUARDRAIL TERMINAL
MSKT-MASH-TL-3
SGT(12S)31-18

FILE: sgt12s3118.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CL	
© TxDOT: APRIL 2018	CONT	SECT	JOB	HIGHWAY	
REVISIONS	2707	01	011, ETC.	FM 2781	
	DIST	COUNTY		SHEET NO.	
	LFK	HOUSTON, ETC.		63	

DATE: 8/5/2022
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0504776\sgt153120.dgn

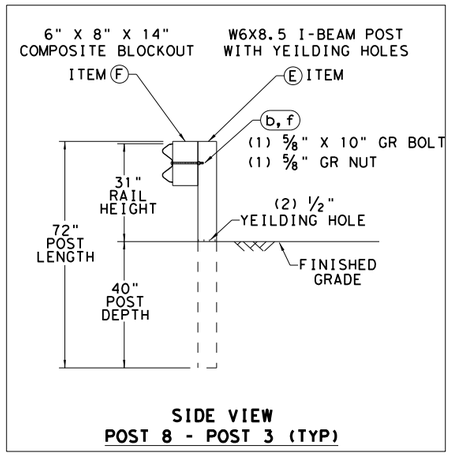


GENERAL NOTES

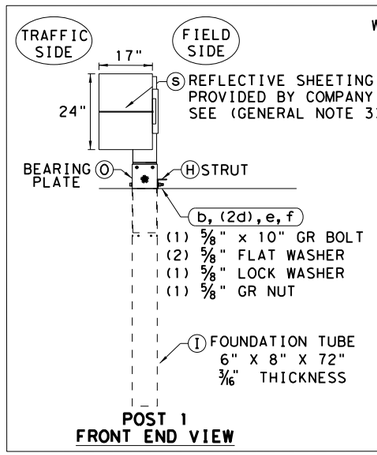
1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: SPIG INDUSTRY, INC. AT 1(267) 644-9510. 14675 INDUSTRIAL PARK RD; BRISTOL, VA 24202
2. FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE MANUFACTURER'S; SGET END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY MANUAL.
3. MANUFACTURER WILL APPLY HIGH INTENSITY REFLECTIVE SHEETING, "OBJECT MARKER" TO THE FACE PLATE OF THE DEVICE PER MANUFACTURER'S RECOMMENDATIONS. THE OBJECT MARKER SHALL CONFORM TO THE STANDARDS REQUIRED IN TEXAS MUTCD.
4. THE NOMINAL HEIGHT OF THE GUARDRAIL BEAM IS 31 INCHES WITH A TOLERANCE OF +/- ONE INCH.
5. FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TXDOT'S LATEST ROADWAY MOW STRIP STANDARD.
6. (POST 2 THROUGH POST 8) ARE MODIFIED STEEL-YIELDING POSTS WITH YIELDING HOLES AT GROUND LEVEL. THERE ARE NO SUBSTITUTE POSTS.
7. POSTS SHALL NOT BE SET IN CONCRETE.
8. IF SOLID ROCK IS ENCOUNTERED FOR ANY OF THE POSTS IN THE SYSTEM, CONTACT THE MANUFACTURER FOR SPECIFIC INSTALLATION GUIDANCE.
9. HARDWARE (BOLTS, NUTS, & WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445,"GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
10. A COMPOSITE MATERIAL BLOCKOUT THAT MEETS DMS-7210 REQUIREMENTS MAY BE SUBSTITUTED FOR AN APPROVED WOOD BLOCKOUT. SEE CONSTRUCTION DIVISION MATERIAL PRODUCER LIST (MPL) FOR CERTIFIED PRODUCERS.
11. THE ENTIRE SYSTEM MUST BE INSTALLED IN A STRAIGHT LINE WITHOUT ANY CURVE. HOWEVER, THE SYSTEM CAN BE OFFSET BY TWO FEET AS SHOWN ON THE APPROACH GRADING DETAIL TO HELP OFF-SET THE IMPACT HEAD FROM SHOULDER OF THE ROAD.

ITEM	QTY	MAIN SYSTEM COMPONENTS	ITEM #
A	1	SGET IMPACT HEAD	SIH1A
B	1	MODIFIED GUARDRAIL PANEL 12'-6" 12GA	126SPZGP
B2	1	MODIFIED GUARDRAIL PANEL 9'-4 1/2" 12GA	GP94
C	2	STANDARD GUARDRAIL PANEL 12'-6" 12GA	GP126
D *	1	STANDARD GUARDRAIL PANEL 25'-0" 12GA	GP25
E	7	MODIFIED YIELDING I-BEAM POST W6x8.5	YP6MOD
F	6	COMPOSITE BLOCKOUT 6" X 8" X 14"	CBO8
G **	6	WOOD BLOCKOUT 6" X 8" X 14"	WBO8
H	1	STRUT 3" X 3" X 80" x 1/4" A36 ANGLE	STR80
I	1	FOUNDATION TUBE 6" X 8" X 72" x 3/16"	FNDT6
J	1	WOOD BREAKAWAY POST 5 1/2" x 7 1/2" x 50"	WBRK50
K	1	WOOD STRIKE BLOCK	WSBLK14
L	1	STRIKE PLATE 1/4" A36 BENT PLATE	SPLT8
M	1	REINFORCEMENT PLATE 12 GA. GR55	REPLT17
N	1	GUARDRAIL GRABBER 2 1/2" X 2 1/2" X 16 1/2"	GGR17
O	1	BEARING PLATE 8" X 8 5/8" X 5/8" A36	BPLT8
P	1	PIPE SLEEVE 4 1/4" X 2 3/8" O.D. (2 1/8" I.D.)	PSLV4
Q	1	BCT CABLE 3/4" X 81" LENGTH	CBL81
		SMALL HARDWARE	
a	1	5/8" X 12" GUARDRAIL BOLT 307A HDG	12GRBLT
b	7	5/8" X 10" GUARDRAIL BOLT 307A HDG	10GRBLT
c	33	5/8" X 1 1/4" GR SPLICE BOLTS 307A HDG	1GRBLT
d	3	5/8" FLAT WASHER F436 A325 HDG	58FW436
e	1	5/8" LOCK WASHER HDG	58LW
f	39	5/8" GUARDRAIL HEX NUT HDG	58HN563
g	2	1/2" X 2" STRUT BOLT A325 HDG	2BLT
h	6	1/2" X 1 1/4" PLATE BOLT A325 HDG	125BLT
i	16	1/2" FLAT WASHER F436 A325 HDG	12FWF436
j	8	1/2" LOCK WASHER HDG	12LW
k	8	1/2" HEX NUT A563 HDG	12HN563
l	4	3/8" X 3" HEX LAG SCREW GR5 HDG	38LS
m	4	3/8" FLAT WASHER F436 A325 HDG	38FW844
n	2	1" FLAT WASHER F436 A325 HDG	1FWF436
o	2	1" HEX NUT A563DH HDG	1HN563
p	1	18" TO 24" LONG ZIP TIE RATED 175-200LB	ZPT18
q	1	1 1/2" X 4" SCH-40 PVC PIPE	PSPCR4
r	1	RFID CHIP RATED MIL-STD-810F	RFID810F
s	1	IMPACT HEAD REFLECTIVE SHEETING	RS30M

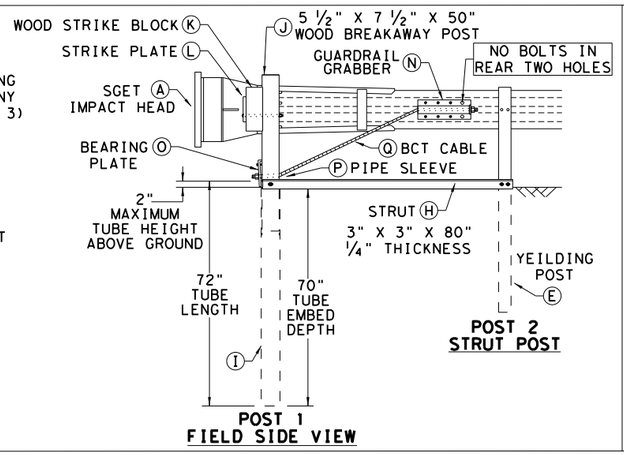
* ALTERNATIVE ITEMS
** NOTE: SEE PLAN VIEW



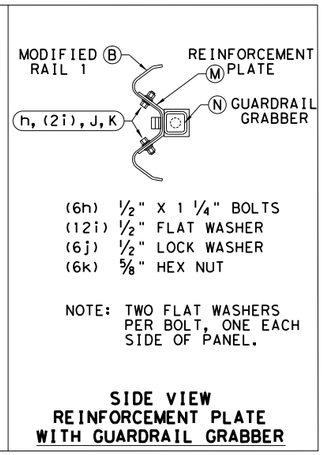
SIDE VIEW
POST 8 - POST 3 (TYP)



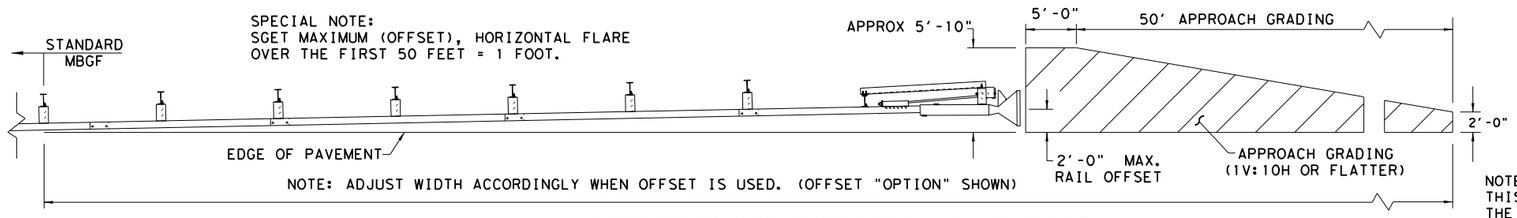
POST 1
FRONT END VIEW



POST 1
FIELD SIDE VIEW
POST 2
STRUT POST



SIDE VIEW
REINFORCEMENT PLATE
WITH GUARDRAIL GRABBER



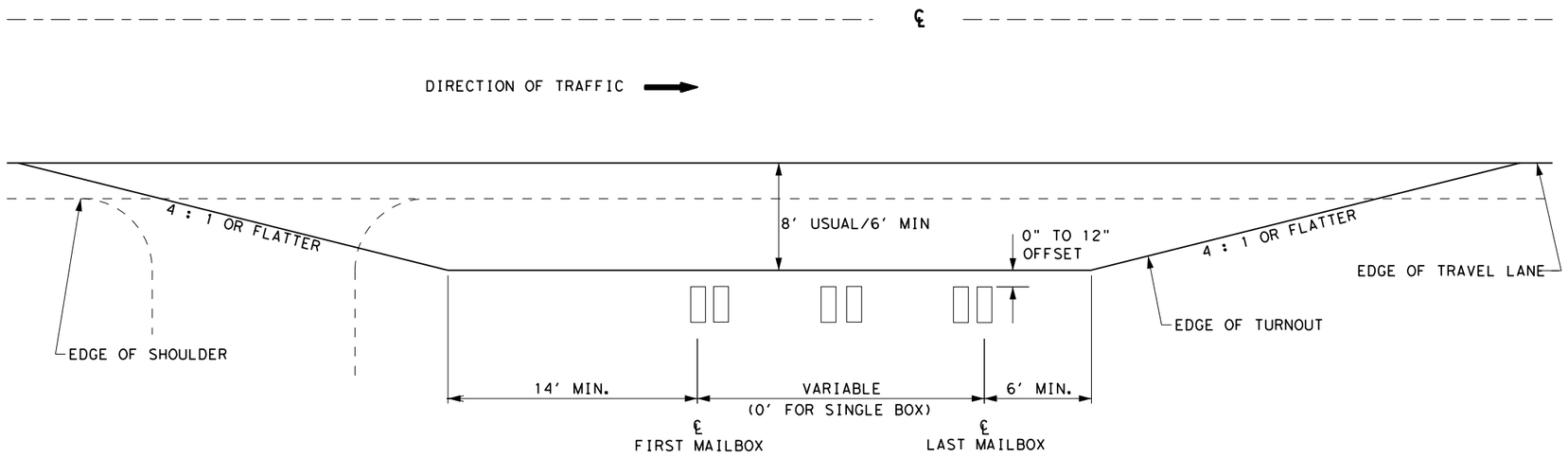
APPROACH GRADING AT GUARDRAIL END TREATMENTS

NOTE:
THIS STANDARD IS A BASIC REPRESENTATION OF THE SGET TERMINAL SYSTEM AND IS NOT INTENDED TO REPLACE THE MANUFACTURER'S ASSEMBLY MANUAL.

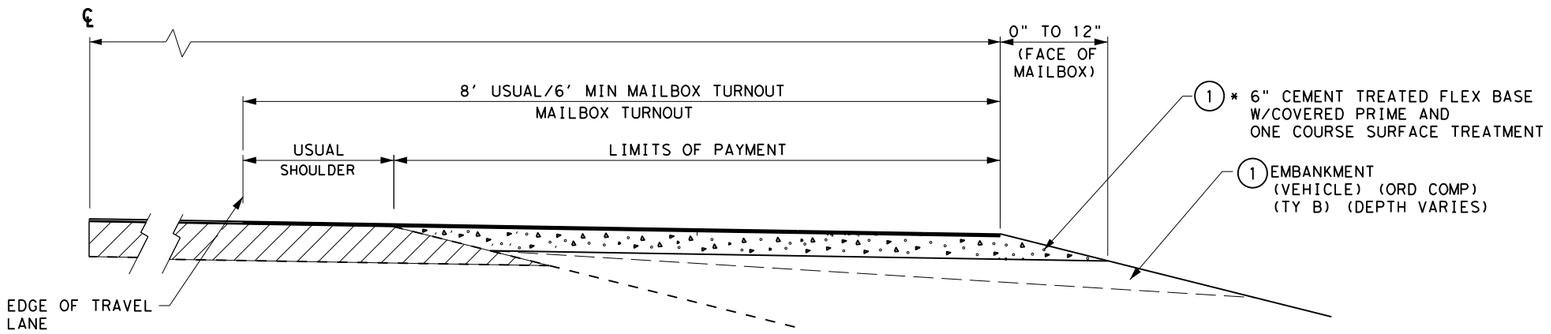
Texas Department of Transportation
Design Division Standard

SPIG INDUSTRY, LLC
SINGLE GUARDRAIL TERMINAL
SGET - TL-3 - MASH
SGT(15)31-20

FILE: sgt153120.dgn	DN: TxDOT	CK: KM	DW: VP	CK: VP	
©TxDOT: APRIL 2020	CONT	SECT	JOB	HIGHWAY	
REVISIONS	2707	01	011, ETC.	FM 2781	
	DIST	COUNTY		SHEET NO.	
	LFK	HOUSTON, ETC.		64	



PLAN



TYPICAL SECTION

(1) SUBSIDIARY TO ITEM 530 (TURNOUTS)

* D-GR HMA TY-D PG64-22 (5") MAY BE USED AT THE OPTION OF THE CONTRACTOR IN LIEU OF CEMENT TREAT, FLEX BASE, COVERED PRIME AND SURFACE TREATMENT.
PLACE IN 2 LIFTS UNLESS OTHERWISE APPROVED.

NOT TO SCALE

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED
PROFESSIONAL ENGINEER

DocuSigned by:
cmb, P.E.
AF852E728A5046C...
8/5/2022

MAILBOX TURNOUT DETAILS

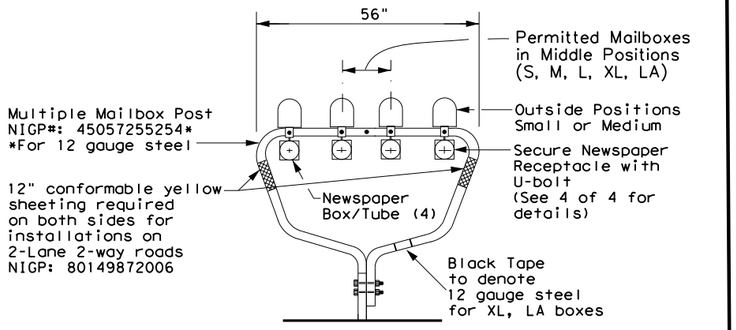
TEXAS DEPARTMENT OF TRANSPORTATION

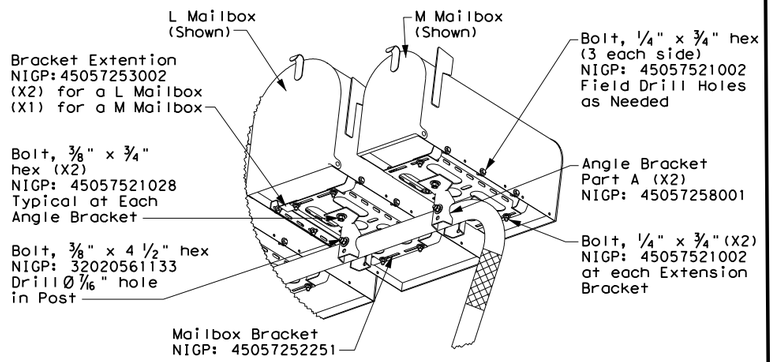
CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		65

8/5/2022 1:12:08 PM
c:\txdot\pw\online\txdot3\sergio.zapata\d0504776\Mailbox Turnout Details.dgn

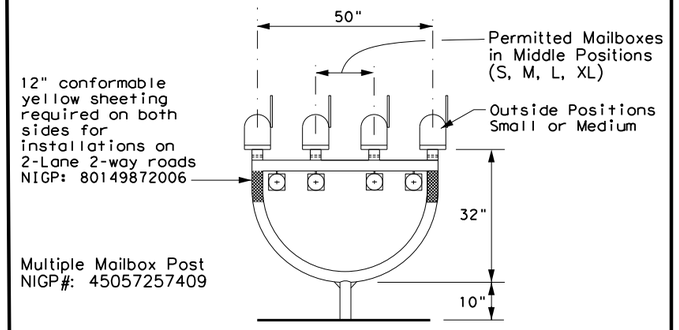
DATE: 8/5/2022 1:12:14 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0504776\mb-21(1).dgn

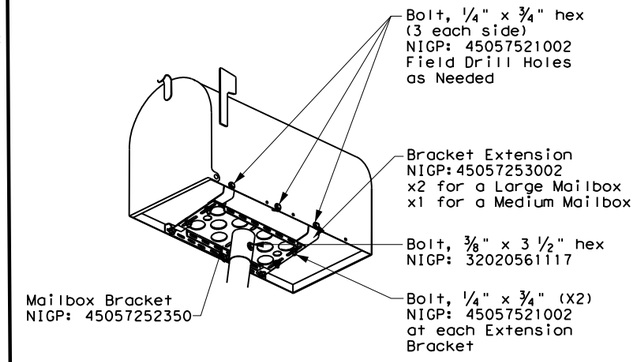
TYPE 1 - MULTIPLE





TYPE 4 - MULTIPLE





MAILBOX SIZES

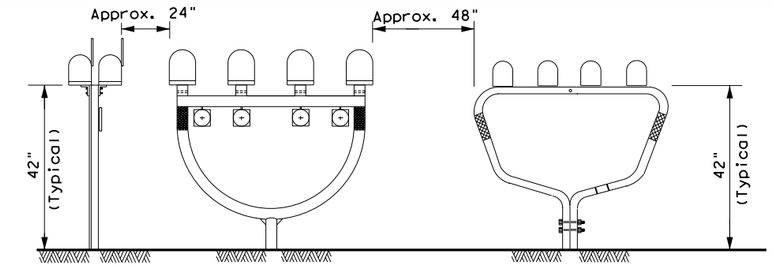
MAILBOX SIZE	TYPICAL DIMENSIONS			MAX **
	LENGTH	WIDTH	HEIGHT	WEIGHT
SMALL	19 1/2"	6"	7"	6 LBS
MEDIUM	22 1/2" *	8" *	11 1/2" *	8 LBS
LARGE	23 1/2"	11 1/2"	13 1/2"	11 LBS
EXTRA LARGE	18"	14"	12"	13 LBS
LOCKABLE	18"	11 1/2"	15"	23 LBS

* See Note 1.
** Excluding Molded Plastic on 4 X 4 Post

GENERAL NOTES:

1. Dimensions shown (length, width, and height) are typical, not maximums. However, anytime a medium size mailbox is mounted on a single/double mount or on the outside position on a multi mount, the dimensions shown are maximums.
2. Mailboxes shall be made of light weight sheet metal or light weight plastic. Heavy steel, cast iron or decorative mailboxes shall not be used on the state highway system.

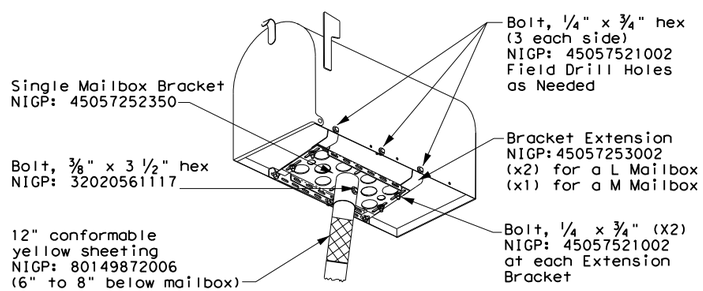
TYPICAL INSTALLATION MEASUREMENTS

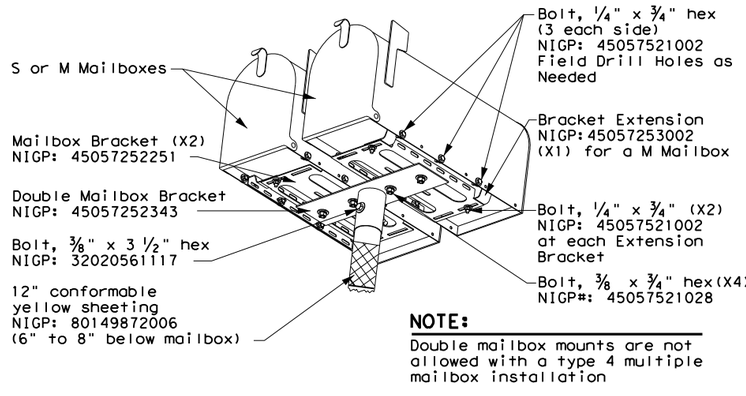


NOTE:

Mailbox installations in sidewalk areas shall be in accordance with the latest TxDOT Design Standard sheets PED-Pedestrian Facilities Curb Ramps.

TYPE 2 and 4 - SINGLE/DOUBLE

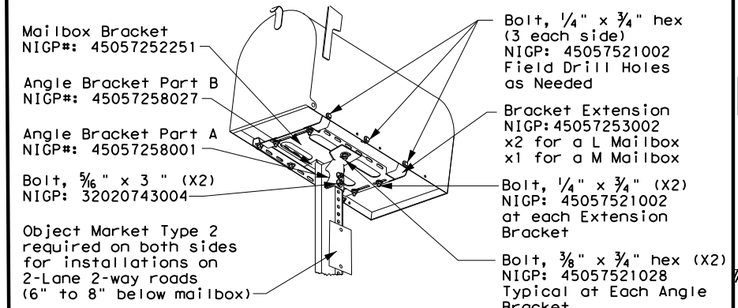


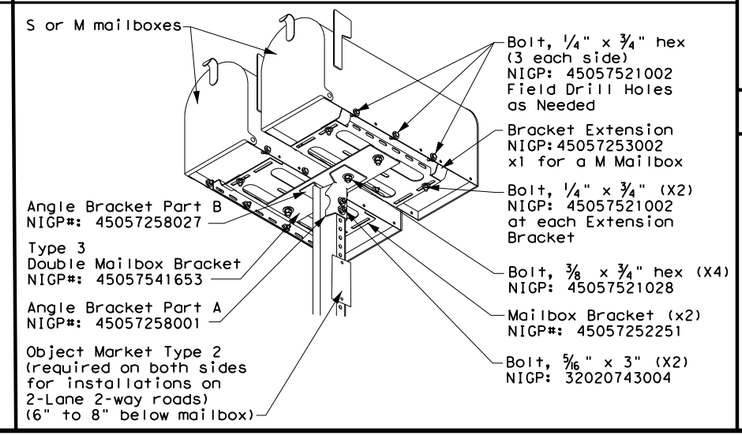


NOTE:

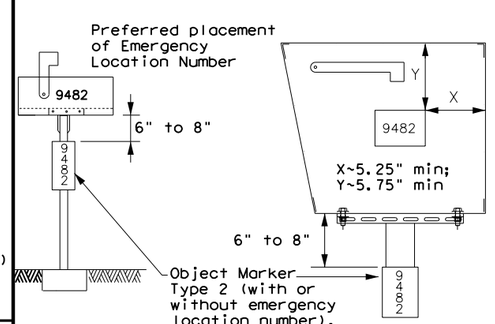
Double mailbox mounts are not allowed with a type 4 multiple mailbox installation

TYPE 3 - SINGLE/DOUBLE





PLACEMENT OF EMERGENCY LOCATION NUMBER

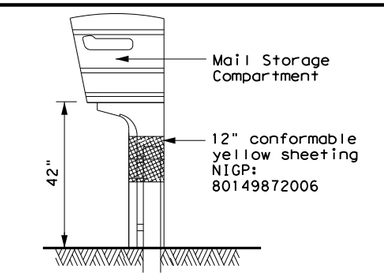


NOTES:

1. Location numbers are provided by homeowner. Minimum size 1" height.
2. Location number is typically placed on the mailbox in a contrasting color.
3. Black numbers may be placed on the Type 2 object marker if the numbers cannot be placed on the mailbox.
4. Alternatively, a green or blue plate with white numbers attached may be mounted below the object marker. Other contrasting color configuration, as approved, may be used.
5. See 3 of 4 for Foundation details.
6. See 4 of 4 for Hardware details.

SHEET 1 OF 4

TYPE 5



Typical Molded Plastic Mailbox

Texas Department of Transportation — Maintenance Division Standard

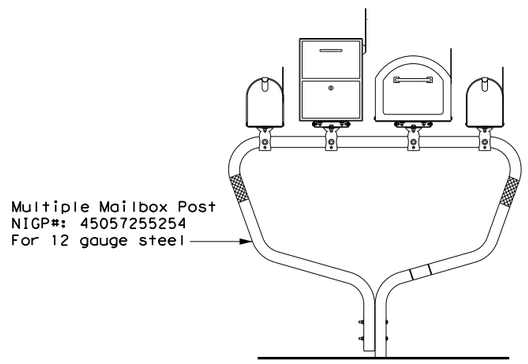
MAILBOX MOUNTING AND ASSEMBLY

MB(1)-21

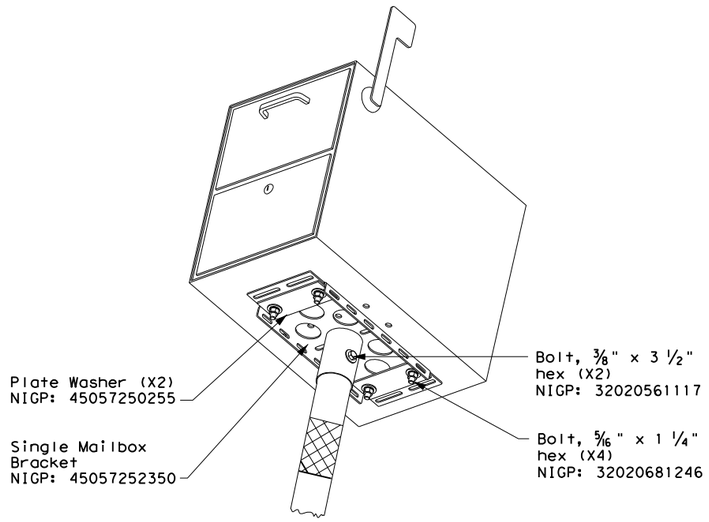
FILE: MB-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT March 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS 2/2005 11/2009 4/2015 6/2005 1/2011 11/2006 7/2014	2707	01	011, ETC.	FM 2781
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON, ETC.		66

DATE: 8/5/2022 1:12:15 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0504776\mb-21(1).dgn

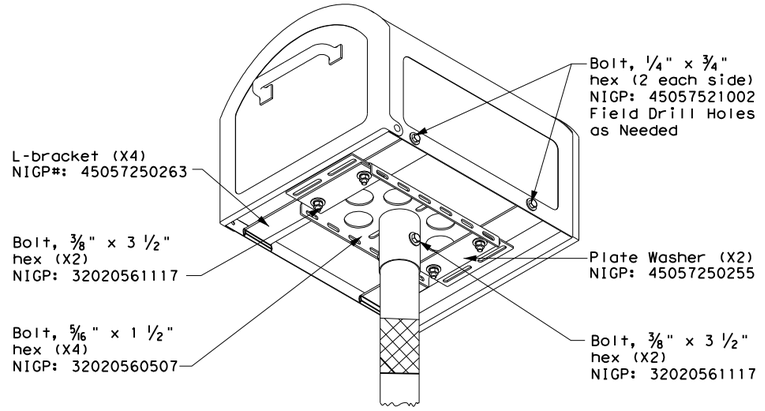
TYPE 1- MULTI LOCKABLE AND XL MAILBOX



TYPE 2/4 - SINGLE LOCKABLE MAILBOX

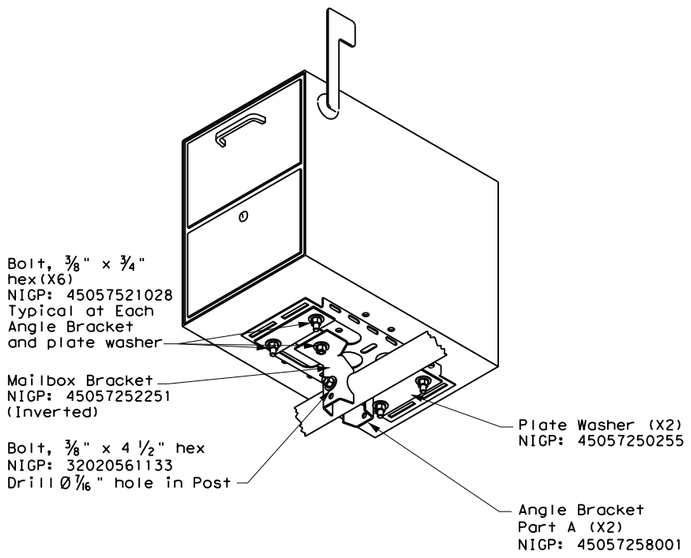


TYPE 2/4 - SINGLE XL MAILBOX

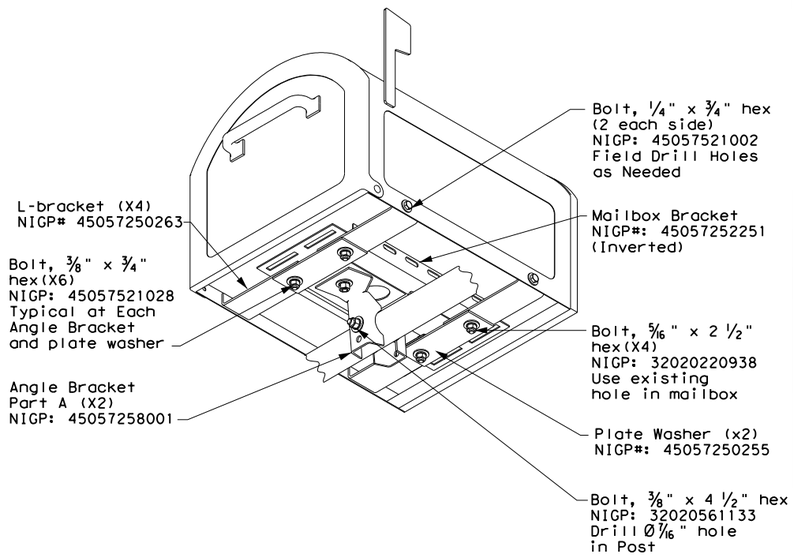


NOTE:
Follow same configuration when mounting an XL mailbox on a Type 4 multi post.

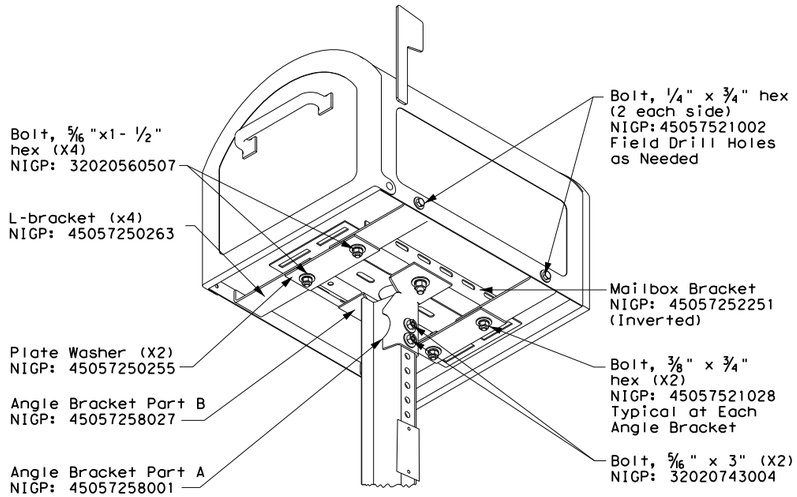
TYPE 1 MULTI – LOCKABLE ARCHITECTURAL (LA)



TYPE 1 MULTI – XL MAILBOX



TYPE 3 - XL MAILBOX MOUNTING



Texas Department of Transportation — Maintenance Division Standard

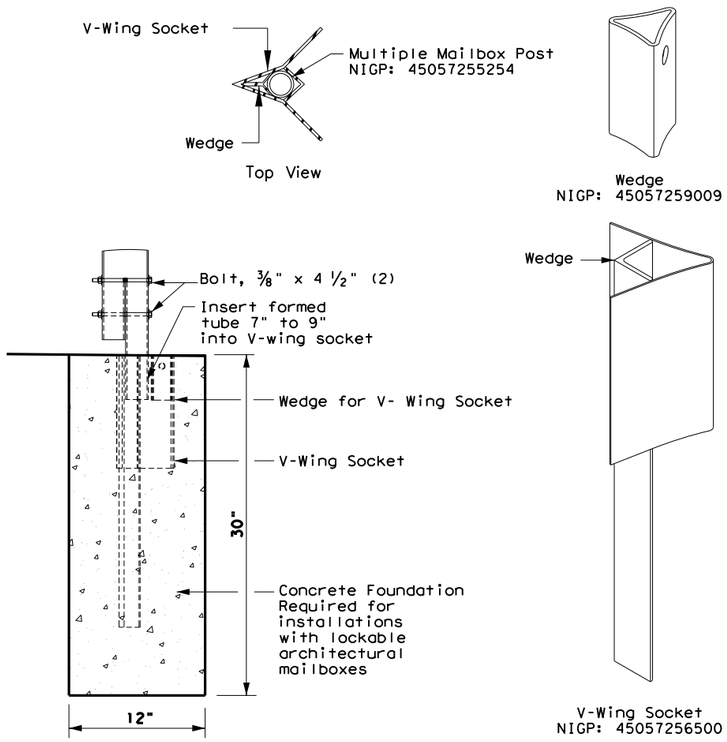
XL AND LOCKABLE ARCHITECTURAL MAILBOX ASSEMBLY

MB(2)-21

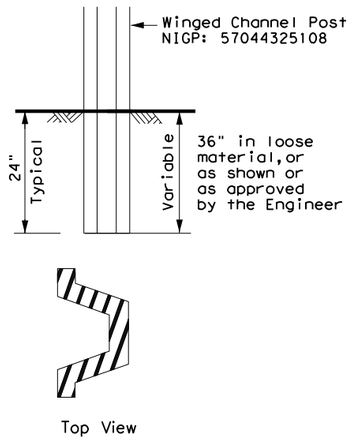
FILE: MB-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT March 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS 2/2005 11/2009 4/2015 6/2005 1/2011 11/2006 7/2014	2707	01	011, ETC.	FM 2781
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON, ETC.		67

DATE: 8/5/2022 1:12:16 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0504776\mb-21(1).dgn

TYPE 1 - SUPPORT/FOUNDATION
Thin Wall Tube w/ V-LOC Anchorage

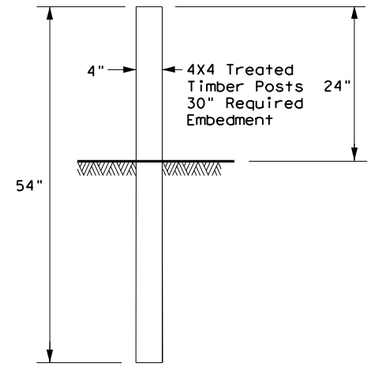


TYPE 3 - SUPPORT/FOUNDATION

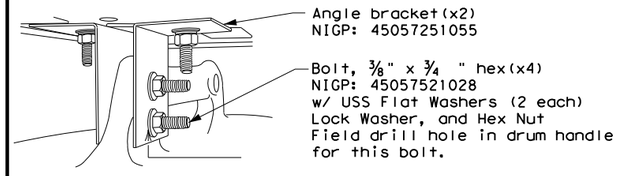


NOTES:
1. Attach Object Marker (OM) facing direction of traffic.
2. OM will also be required on opposite side if installed on a 2-Lane, 2-Way roadway.

TYPE 5 - SUPPORT/FOUNDATION



TYPE 6 - TEMPORARY MAILBOX SUPPORT

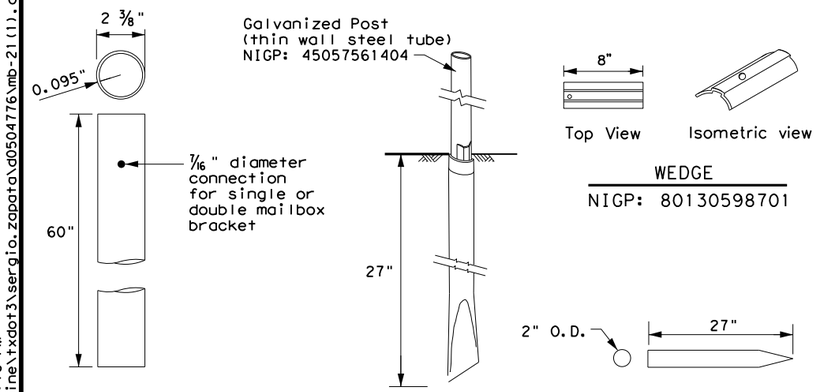


Plastic Drum NIGP: 55093383655
Rubber Collar NIGP: 55093387102

NOTES:
1. Place on approved plastic drum as shown in the Compliant Work Zone Traffic Control Devices (CWZTCD).
2. Existing attachment hardware shall be used unless damaged. Damaged hardware shall be replaced.

GENERAL NOTES:
1. Erect post plumb or vertical.
2. When galvanized part is required galvanize in accordance with Item 445.
3. Use a concrete footing as shown or when directed. Concrete footing will be required when soils do not hold the support/foundations in a stable condition, only on Type 1, Type 2, and Type 4

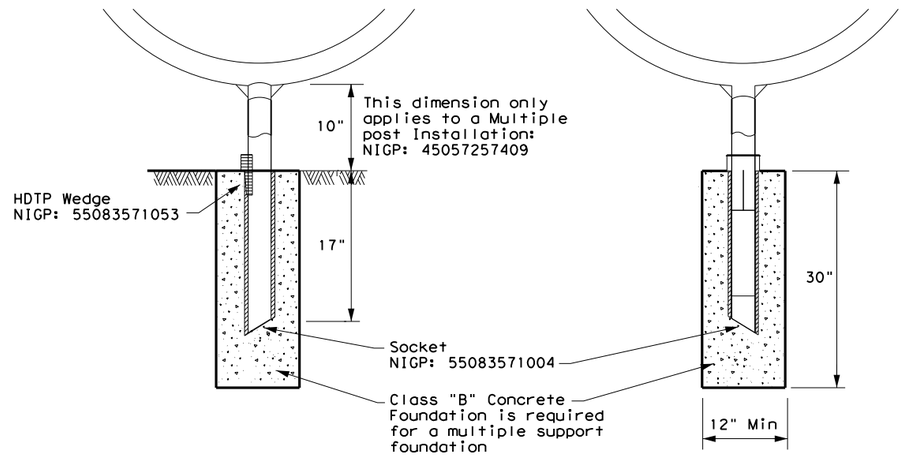
TYPE 2 - SUPPORT/FOUNDATION
Thin Wall Steel Tube w/Wedge Anchor System



MAILBOX POST

WEDGE ANCHOR
NIGP: 80130238407

TYPE 4 - SUPPORT/FOUNDATION
Whitecoated steel post NIGP: 45057561107
Multiple post NIGP: 45057257409
Recycled Rubber post (RR) NIGP: 45057561057



SHEET 3 OF 4

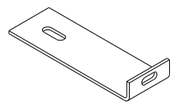
Texas Department of Transportation | Maintenance Division Standard

MAILBOX SUPPORT AND FOUNDATION

MB(3)-21

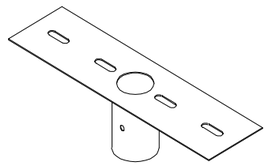
FILE: MB-21.dgn	DN:	CK:	DW:	CK:
© TxDOT March 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS 2/2005 11/2009 4/2015 6/2005 1/2011 11/2006 7/2014	2707	01	011, ETC.	FM 2781
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON, ETC.		68

TYPE	TYPE 1	TYPE 2	TYPE 3	TYPE 4			TYPE 5	TYPE 6
Configuration	Multiple	Single or Double	Single or Double	Single	Double	Multiple	Single	Single
Mailbox Size NIGP #	Outside Position: S or M Inside Position: S, M, L, XL, or LA	Single: S, M, L, XL, or LA Double: SS, SM, MM	Single: S, M, L, or XL Double: SS, SM, MM	S, M, L, XL, or LA	SS, SM, or MM	Outside Position: S or M Inside Position: S, M, L, or XL	Molded Plastic	S, or M
Mailbox Post NIGP #	45057255254 (Galvanized Multiple)	45057561404 (Thin Walled Gavanize)	57044325108 (Wing Channel Post)	45057561107 (Thin walled white powder coated) 45057561057 (Recycled Rubber Post: S or M only)	45057561107 (Thin Walled White Powder Coated)	45057257409 (White Powder Coated Multiple)	4x4 Timber	Construction Barrel
Post and Mailbox Hardware NIGP #	45057259009 (Wedge) 45057256500 (V-Wing Socket) 45057253002 (Bracket Extension) 45057252251 (Mailbox Bracket) 45057258001 (Part A Angle Bracket x2) 45057250255 (Plate Washer for XL/LA x2) 45057250263 (L-Bracket for XL x4)	80130598701 (Wedge) 80130238407 (Wedge Anchor) 45057253002 (Bracket Extension) 45057252343 (Double MB Bracket) 45057252350 (S. Mailbox Bracket) 45057252251 (Mailbox Bracket) 45057250255 (Plate Washer for XL/LA x2) 45057250263 (L-Bracket forXL x4)	45057541653 (Type 3 Double Mailbox Bracket) 45057252251 (Mailbox Bracket) 45057253002 (Bracket Extension) 45057258001 (Part A Angle Bracket) 45057258027 (Part B Angle Bracket) 45057250255 (Plate Washer for XL x2) 45057250263 (L-Bracket for XL x4)	55083571053 (Wedge) 55083571004 (Socket) 45057252350 (Single Mailbox Bracket) 45057253002 (Bracket Extension) 45057250255 (Plate Washer for XL/LA x2) 45057250263 (L-Bracket for XL x4)	55083571053 (Wedge) 55083571004 (Socket) 45057253002 (Bracket Extension) 45057252343 (Double Mount Bracket) 45057252251 (Mailbox Bracket x2)	55083571053 (Wedge) 55083571004 (Socket) 45057253002 (Bracket Extension) 45057252350 (Single Mount Bracket) 45057250255 (Plate Washer for XL x2) 45057250263 (L-Bracket for XL x4)	None	45057251055 Angle Bracket (x2)
Foundation Used	Class B Concrete (Required for LA Mailboxes)	Class B Concrete (Required for LA Mailboxes)	None	Class B Concrete (not used with recycled rubber post, required for LA Mailboxes)	Class B Concrete (not required)	Class B Concrete	None	None



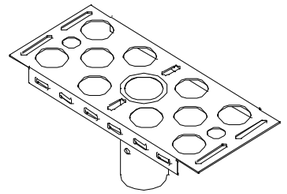
NIGP: 45057250263

L-Bracket x4 for
XL sized mailboxes



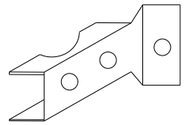
NIGP: 45057252343

Double Mailbox Bracket
For Type 2 and Type 4
double mount



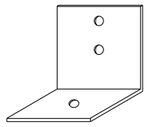
NIGP: 45057252350

Single Mailbox Bracket
For Type 2 single and for
Type 4 single and multi mount



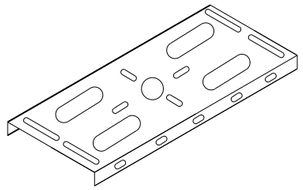
NIGP: 45057258001

Part "A" Angle Bracket
For Type 1 multi (2 per mailbox)
and Type 3 single and double



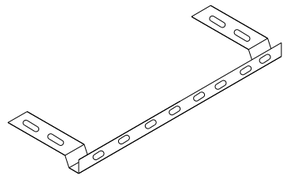
NIGP: 45057251055

Type 6 Angle Bracket
(2 per mailbox)



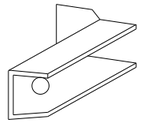
NIGP: 45057252251

Mailbox Bracket
For Type 1 multi and
any double mount (use 2)



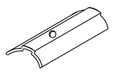
NIGP: 45057253002

Bracket Extension
Use 1 for a medium Mailbox
Use 2 for a Large Mailbox



NIGP: 45057258027

Part "B" Angle Bracket
For Type 3 single
and double



NIGP: 80130598701

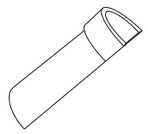
Wedge for Type 2

NIGP: 45057250255

Plate Washer for Architecural
and XL Mailboxes

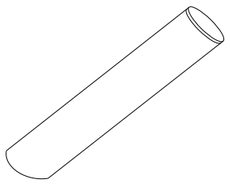
NIGP: 45057541653

Type 3 double mailbox bracket



NIGP: 55083571053

Type 4 Mailbox Wedge

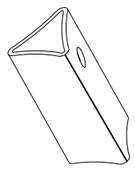


NIGP: 55083571004

Type 4 Mailbox Socket

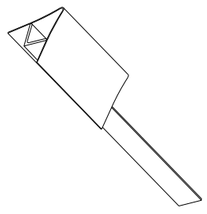
NIGP: 80130238407

Type 2 Wedge Anchor



NIGP: 45057259009

Wedge for Type 1 V-wing Socket



NIGP: 45057256500

V-wing Socket for
Type 1 Foundation

NIGP #	OBJECT MARKERS AND CONFORMABLE SHEETING
55008311759	Type 2 OM 4"x4" (3 Needed) for Type 3 Wing Channel Post
55008312906	Type 2 OM 6"x12" (1 needed) for Type 3 Wing Channel Post
80149872006	12" Conformable Reflective Yellow Sheeting for Flexible Posts

NOTES:

1. Type 2 object marker in accordance with Traffic Engineering Standard Delineators & Object Markers.
2. A light weight receptacle for newspaper delivery can be attached to mailbox posts if the receptacle does not touch the mailbox, present a hazard to traffic or delivery of the mail, extend beyond the front of the mailbox, or display advertising, except the publication title.

BID CODES FOR CONTRACTS

MB-(X) ASSM TY (XXX) (X)

Type of Mailbox
- S = Single
- D = Double
- M = Multiple
- MP = Molded Plastic

Type of Post
- WC = Winged Channel Post
- RR = Recycled Rubber
- TWW = Thin Walled White Tubing
- TWG = Thin Walled Galvanized Tubing
- TIM = Timber

Type of Foundation
- Ty 1 = V-Loc
- Ty 2 = Wedge Anchor Steel System
- Ty 3 = Winged Channel post
- Ty 4 = Wedge Anchor Plastic System
- Ty 5 = 4 X 4 Post

DATE: 8/5/2022 1:12:16 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0504776\mb-21(1).dgn

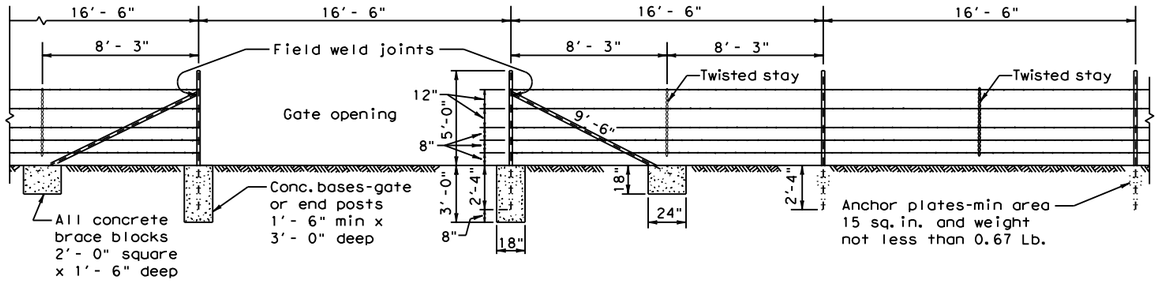
Texas Department of Transportation — Maintenance Division Standard

NIGP PARTS LIST AND COMPATIBILITY

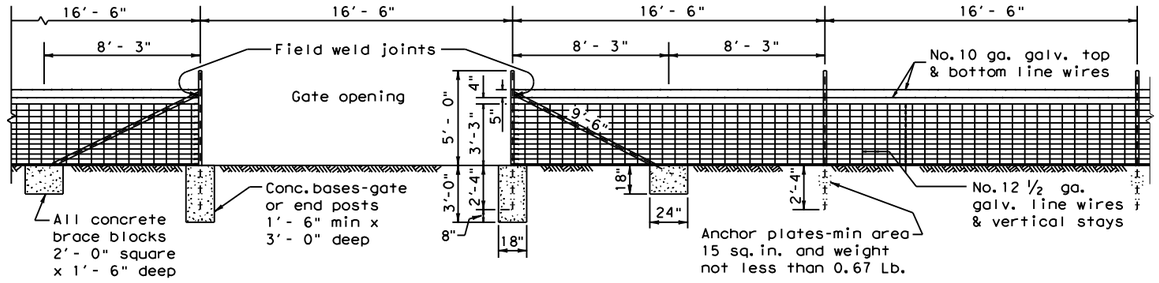
MB(4)-21

FILE: MB-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT March 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS 2/2005 11/2009 4/2015 6/2005 1/2011 11/2006 7/2014	2707	01	011, ETC.	FM 2781
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON, ETC.		69

DATE: 9/2/2022
FILE: c:\txdot\pw_online\txdot3\cathy.loerch\d0504776\wf210.dgn

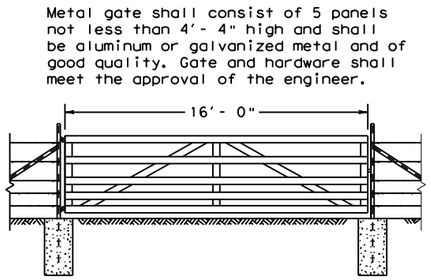


SECTION GALVANIZED BARBED WIRE FENCE WITH METAL POSTS
BRACING DETAIL USED AT ENDS AND GATES
TYPE "C" FENCE
(See General Note 8)

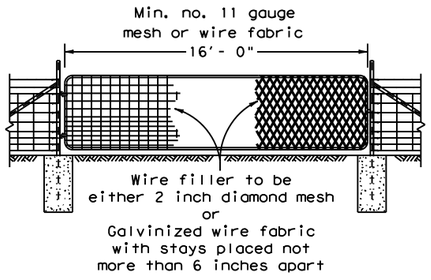


SECTION GALVANIZED WOVEN WIRE FENCE WITH METAL POSTS
BRACING DETAIL USED AT ENDS AND GATES
TYPE "D" FENCE
(See General Note 8)

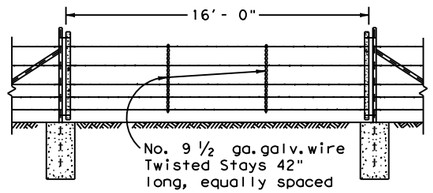
Note:
For Steel pipe and T-Post requirements. (See General Notes 6 & 7)



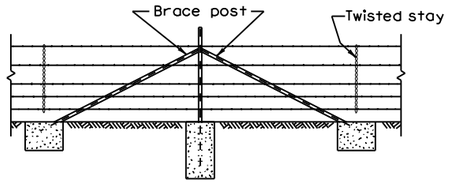
DETAIL TYPE 1 GATE



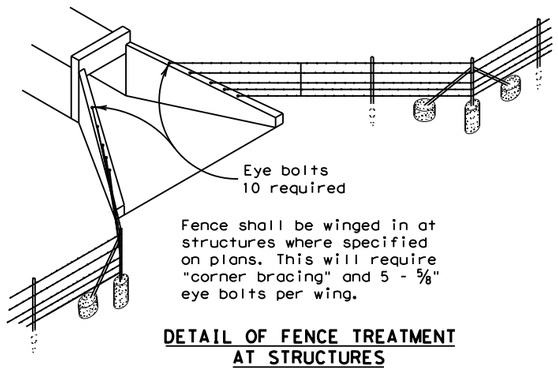
DETAIL TYPE 2 GATE



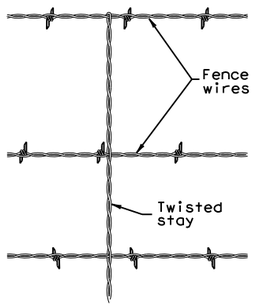
DETAIL TYPE 3 GATE



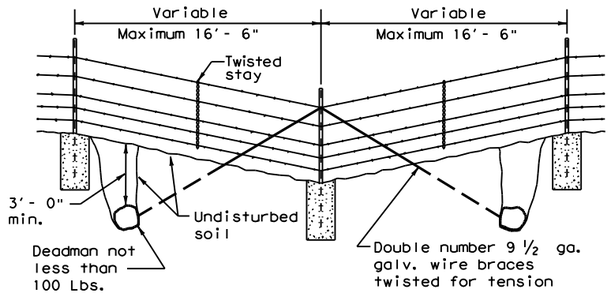
CORNER OR PULL POST ASSEMBLY



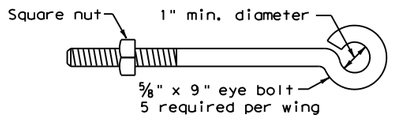
DETAIL OF FENCE TREATMENT AT STRUCTURES



DETAIL OF STAY
(Barbed Wire Fence)



DETAIL OF FENCE SAG



DETAIL OF EYE BOLT

GENERAL NOTES

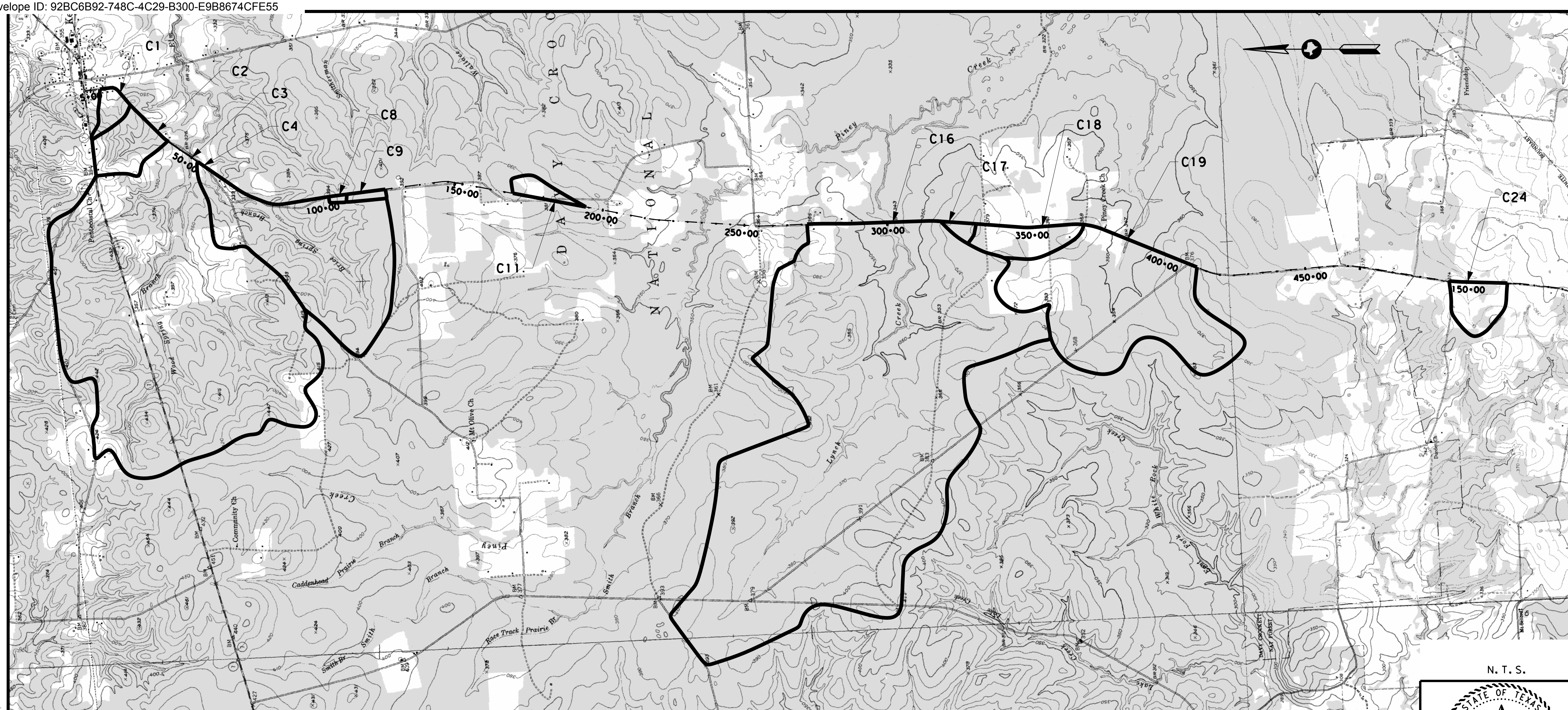
1. Any high point which interferes with the placing of wire mesh shall be excavated to provide a 2 inch clearance.
2. Latches for Type 1 and Type 2 gates shall be good commercial quality and design latch of the spring, fork or chain type. All latches shall be suitable to the gate and shall be approved by the Engineer.
3. Hinges for Type 2 gates shall be a commercial design approved by the Engineer suitable for post and gate.
4. Concrete shall be of the design and consistency approved by the Engineer and shall contain not less than 4 sacks of cement per cubic yard. Concrete footings are to be crowned at the top to shed water.
5. Steel anchor plates shall be of a design and thickness sufficient to prevent turning of the post in firm soil.
6. Steel pipe end posts, corner and pull posts shall be a minimum of 2" Std. pipe (2.375" O.D., 0.154" wall thickness) with a 1¼" Std. pipe brace (1.660" O.D., 0.140" wall thickness), with a 2"x2"x1/4" angle, or other as approved by the Engineer. Fasteners for securing barbed wire or woven wire fence to metal posts shall be a minimum of 11 gauge galvanized steel wire. Tubular posts shall be fitted with water malleable iron caps.
7. If Steel pipe is used for posts and braces, use standard pipe in accordance with ASTM A 53, Class B or A 501. For T-Posts use steel that meets ASTM A 702. Metal line posts shall be not less than 6'-6" in length and shall weigh not less than (1.33 lbs./lin.ft.). These Items shall be in accordance with Item 552, "Wire Fence."
8. Barbed Wire shall be in accordance with ASTM A 121, Class 1 Design designation 12-2-4-1 4R or 12-2-5-1 4R, or as approved by the Engineer.

   Woven Wire Fence (Type D) shall be in accordance with ASTM A 116, Class 1 No. 12-1/2 Grade 60 (See Table 1 ASTM A 116) to the height and design shown on the plans, or as approved by the Engineer.
9. The location of gates and corner posts will be as indicated elsewhere in these plans.

Texas Department of Transportation
Design Division Standard

BARBED WIRE AND WOVEN WIRE FENCE
(STEEL POSTS)
WF(2)-10

FILE: wf210.dgn	DN: TxDOT	CK: AM	DW: VP	CK:
©TxDOT 1996	CONT	SECT	JOB	HIGHWAY
REVISIONS	2707	01	011,etc	FM 2781
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON, etc		69A



HYDROLOGIC DATA

CULVERT ID	STATION	STRUCTURE SIZE	METHOD	AREA	AREA	TIME OF CONCENTRATION	INTENSITY				RUNOFF COEFFICIENT	OmegaEM	FLOW RATE			
							2 YR	5 YR	10 YR	100 YR			2 YR	5 YR	10 YR	100 YR
				ACRES	SQ. MILES	MIN	IN/HR						CFS			
C1	16+14	30" RCP	RATIONAL	29.820		38.8	2.47	3.21	3.86	6.21	0.28		20.70	26.90	32.40	52.00
C2	34+86	42" RCP	RATIONAL	87.271		55.1	1.96	2.56	3.08	4.99	0.30		50.70	66.20	79.80	129.40
C3	50+03	2-7' x 7' BOX	OMEGA		2.587							- 0.127	401.88	740.76	969.27	1976.41
C4	55+00	6' x 4' BOX	OMEGA	524.354	0.819							- 0.127	172.05	280.23	348.83	611.99
C8	106+65	18" RCP	RATIONAL	3.442		28.3	3.00	3.89	4.67	7.44	0.29		3.00	3.90	4.70	7.40
C9	114+00	18" RCP	RATIONAL	9.561		53.1	2.01	2.62	3.16	5.12	0.29		5.60	7.30	8.80	14.20
C11	183+00	24" RCP	RATIONAL	26.955		75.5	1.57	2.06	2.48	4.05	0.31		13.10	17.20	20.70	33.80
C16	302+05	2-8' x 5' BOX	OMEGA		3.894							- 0.127	371.70	626.39	801.71	1503.30
C17	321+75	18" RCP	RATIONAL	11.932		48.2	2.14	2.79	3.36	5.44	0.29		7.4	9.70	11.60	18.80
C18	354+48	5' x 2' BOX	RATIONAL	82.286		65.7	1.73	2.27	2.73	4.45	0.28		40.7	53.20	64.10	104.30
C19	385+40	9' x 4' BOX	OMEGA		0.937							- 0.127	191.58	322.09	406.15	739.00
C24	148+30	42" RCP	RATIONAL	68.112		30.4	2.87	3.73	4.48	7.16	0.29		56.7	73.60	88.60	141.30

USGS MAPS:
PENNINGTON, FODICE, KENNARD
& BEREA QUADRANGLES
HOUSTON COUNTY
7.5 MINUTE SERIES

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED
PROFESSIONAL ENGINEER

DocuSigned by:
P.E.
AF858E728A5C460...
8/5/2022

DRAINAGE AREA MAP & HYDROLOGIC DATA

TEXAS DEPARTMENT OF TRANSPORTATION

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST		COUNTY	SHEET NO.
LFK		HOUSTON, ETC.	70

8/5/2022 1:12:30 PM
c:\txdot\pw*online\txdot3\sergio.zapata\d0361225\DrainMap.dgn

HYDRAULIC DATA

CULVERT ID	STATION	STRUCTURE SIZE	FREQUENCY	Q	EXISTING CULVERT			PROP ALLOW HW ELEV	PROPOSED CULVERT			COMMENTS
					HW	TW	V (OUT)		HW	TW	V (OUT)	
				CFS	FT	FT	FPS	FT	FT	FT	FPS	
C1	16+14	30" RCP	2-YR	20.70	94.2	93.35	7.2	97.63	94.41	93.32	7.26	EXISTING STRUCTURE DESIGNED AT 2-YR FREQUENCY
			5-YR	26.90	94.62		7.72		95.03		7.78	
			10-YR	32.40	95.05		8.10		95.73		8.13	
			100-YR	52.00	97.23		10.93		97.94		9.90	
C2	34+86	42" RCP	2-YR	50.70	93.97	92.79	8.62	97.15	94.31	92.75	8.79	EXISTING STRUCTURE DESIGNED AT 2-YR FREQUENCY
			5-YR	66.20	94.62		9.32		95.30		9.47	
			10-YR	79.80	95.29		9.85		96.40		9.97	
			100-YR	129.40	96.97		11.69		97.50		10.53	
C3	50+03	2-7' x 7' BOX	2-YR	401.88	94.01	92.91	6.12	98.63	94.02	92.91	6.12	EXISTING STRUCTURE DESIGNED AT 5-YR FREQUENCY
			5-YR	740.76	96.40		15.43		96.54		15.08	
			10-YR	969.27	98.21		16.51		98.24		16.15	
			100-YR	1976.41	99.10		16.93		99.57		16.76	
C4	55+00	6' x 4' BOX	2-YR	172.05	95.89	93.70	10.31	97.99	95.94	93.63	10.39	EXISTING STRUCTURE DESIGNED AT 2-YR FREQUENCY
			5-YR	280.23	97.87		11.37		98.35		11.56	
			10-YR	348.83	97.96		11.40		98.44		11.59	
			100-YR	611.99	98.17		11.48		98.66		11.66	
C8	106+65	18" RCP	2-YR	3.00	93.40	92.54	6.50	96.79	93.52	92.38	6.59	EXISTING STRUCTURE DESIGNED AT 2-YR FREQUENCY
			5-YR	3.90	93.53		6.94		93.67		6.74	
			10-YR	4.70	93.67		7.26		93.79		7.05	
			100-YR	7.40	94.06		8.07		94.18		7.92	
C9	114+00	18" RCP	2-YR	5.60	94.59	93.90	5.00	98.33	95.75	96.63	9.25	EXISTING STRUCTURE DESIGNED AT 2-YR FREQUENCY
			5-YR	7.30	94.72		5.56		95.99		9.76	
			10-YR	8.80	94.86		6.09		96.24		10.07	
			100-YR	14.20	96.01		8.17		97.50		11.32	
C11	183+00	24" RCP	2-YR	13.10	94.73	92.49	10.95	98.05	94.89	92.17	11.37	EXISTING STRUCTURE DESIGNED AT 2-YR FREQUENCY
			5-YR	17.20	95.14		11.58		95.30		12.07	
			10-YR	20.70	95.56		12.06		95.72		12.53	
			100-YR	33.80	97.80		13.76		98.04		14.19	
C16	302+05	2-8' x 5' BOX	2-YR	371.70	92.57	91.44	6.93	96.31	92.59	91.44	6.93	EXISTING STRUCTURE DESIGNED AT 5-YR FREQUENCY
			5-YR	626.39	93.99		11.03		94.30		10.80	
			10-YR	801.71	95.46		11.73		95.46		11.73	
			100-YR	1503.30	96.99		12.42		97.11		12.47	
C17	321+75	18" RCP	2-YR	7.40	96.22	95.19	6.68	97.94	96.49	95.17	6.66	EXISTING STRUCTURE DESIGNED AT 2-YR FREQUENCY
			5-YR	9.70	96.61		7.15		97.13		7.11	
			10-YR	11.60	97.02		7.44		97.79		7.36	
			100-YR	18.80	98.09		8.95		98.23		7.63	
C18	354+48	5' x 2' BOX	2-YR	40.70	94.42	93.56	7.52	96.72	94.49	93.49	7.70	EXISTING STRUCTURE DESIGNED AT 2-YR FREQUENCY
			5-YR	53.20	94.89		8.13		94.96		8.32	
			10-YR	64.10	95.37		8.58		95.44		8.78	
			100-YR	104.30	96.89		9.08		96.90		8.98	
C19	385+40	9' x 4' BOX	2-YR	191.58	96.07	94.68	7.94	98.58	96.16	94.68	7.94	EXISTING STRUCTURE DESIGNED AT 2-YR FREQUENCY
			5-YR	322.09	97.79		10.48		98.34		10.48	
			10-YR	406.15	98.79		11.01		98.83		10.73	
			100-YR	739.00	99.09		11.14		99.11		10.86	
C24	148+30	42" RCP	2-YR	56.70	94.73	91.58	14.24	97.42	95.17	91.40	15.16	EXISTING STRUCTURE DESIGNED AT 2-YR FREQUENCY
			5-YR	73.60	95.49		15.02		95.93		15.95	
			10-YR	88.60	96.30		15.67		96.90		16.60	
			100-YR	141.30	97.28		16.34		97.29		16.82	

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED
PROFESSIONAL ENGINEER

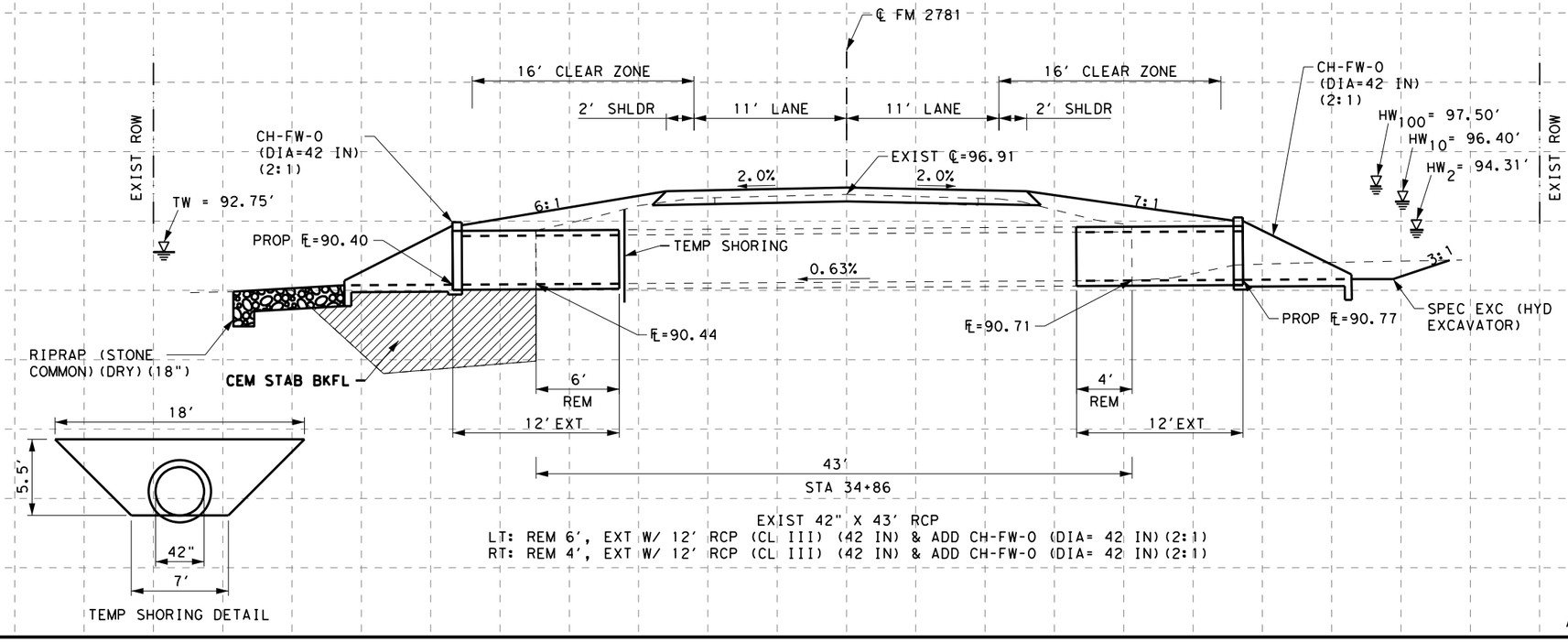
DocuSigned by:
AF8525729AFC469...
5/2/2022

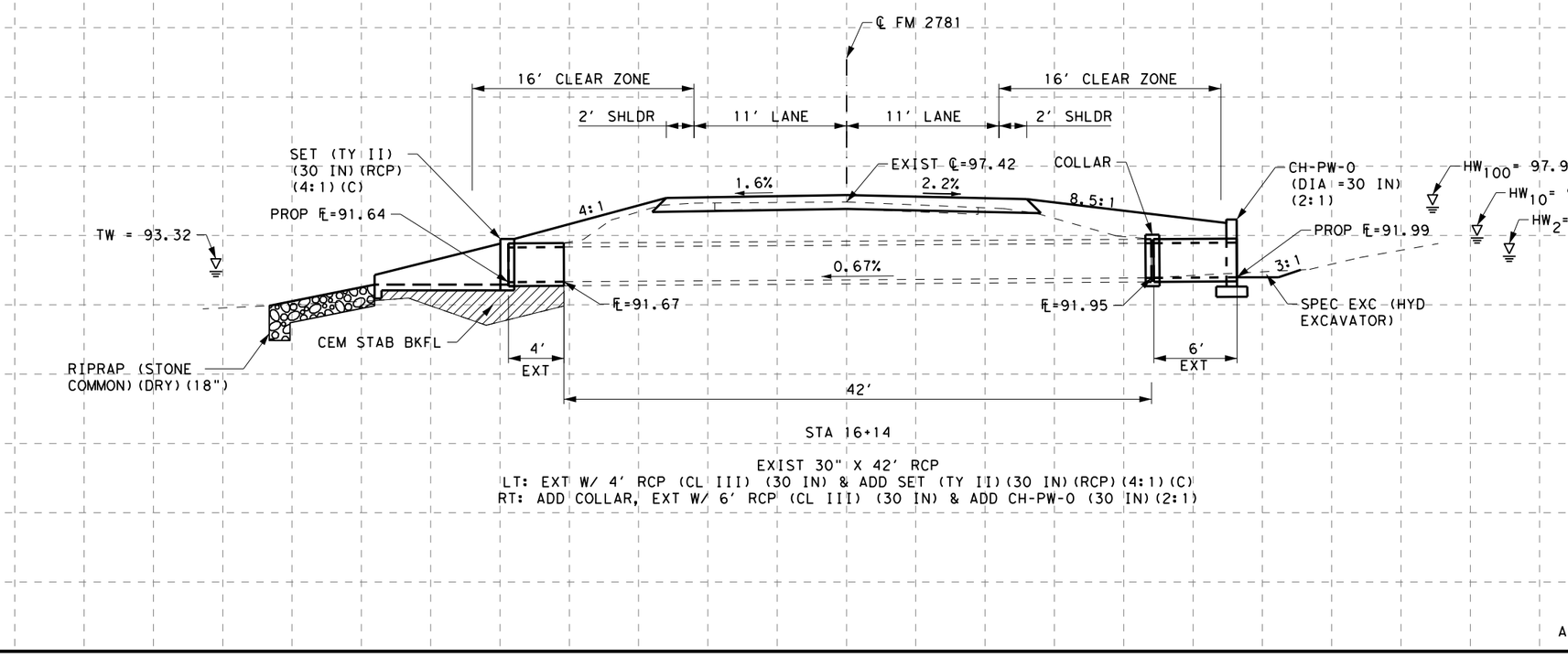
HYDRAULIC DATA

TEXAS DEPARTMENT OF TRANSPORTATION
©2022

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		71

9/1/2022 11:49:27 AM
c:\txdot\pw\online\txdot3\sergio.zapata\d0361225\HydraulicData.dgn





SCALE 1" = 10'

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED PROFESSIONAL ENGINEER

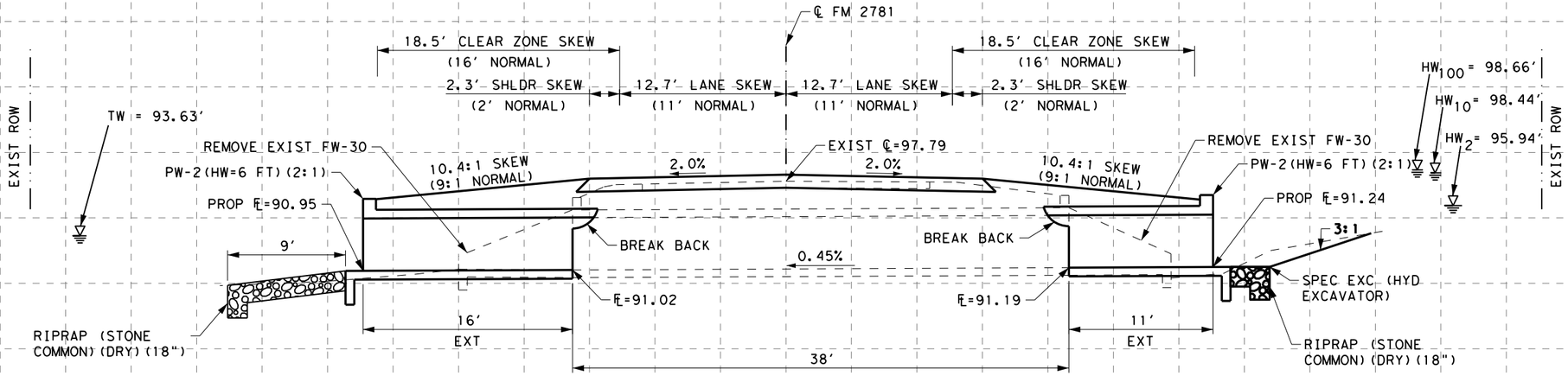
DocuSigned by:
AF858E788A5C469...
8/5/2022

CULVERT LAYOUTS

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 1 OF 15

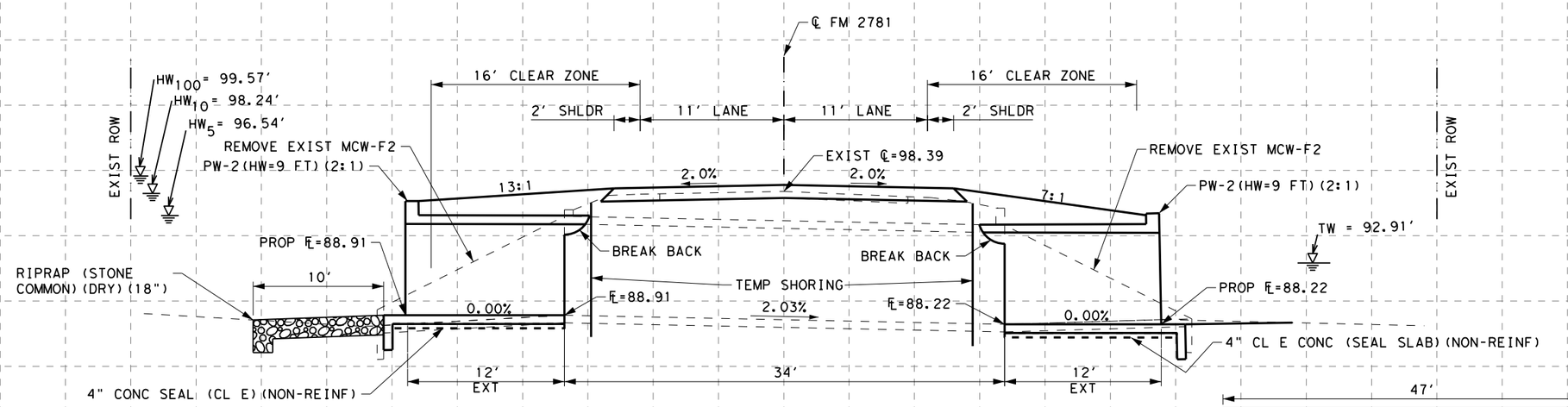
CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		72



STA 55+00

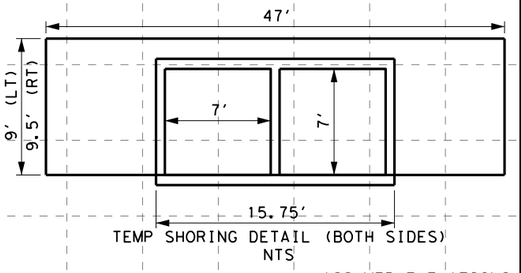
EXIST 6' X 4' X 38' SC30 BOX CULVERT W/ FW-30 (30° RFS)
LT: REM FW-30, EXT W/ 16' CONC BOX CULV (6 FT X 4 FT) & ADD PW-2(HW=6 FT)(2:1)
RT: REM FW-30, EXT W/ 11' CONC BOX CULV (6 FT X 4 FT) & ADD PW-2(HW=6 FT)(2:1)

ASSUMED ELEVATIONS



STA 50+03

EXIST 2 ~ 7' X 7' X 34' MC7 BOX CULVERTS W/ MCW-F2
LT: REM MCW-F2, EXT W/ 2 ~ 12' CONC BOX CULV (7 FT X 7 FT) & ADD PW-2(HW=9 FT)(2:1)
RT: REM MCW-F2, EXT W/ 2 ~ 12' CONC BOX CULV (7 FT X 7 FT) & ADD PW-2(HW=9 FT)(2:1)



TEMP SHORING DETAIL (BOTH SIDES)
NTS

ASSUMED ELEVATIONS

SCALE 1" = 10'

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED
PROFESSIONAL ENGINEER

DocuSigned by:
cmb, P.E.
AF852E728AEC468...
9/2/2022

CULVERT LAYOUTS

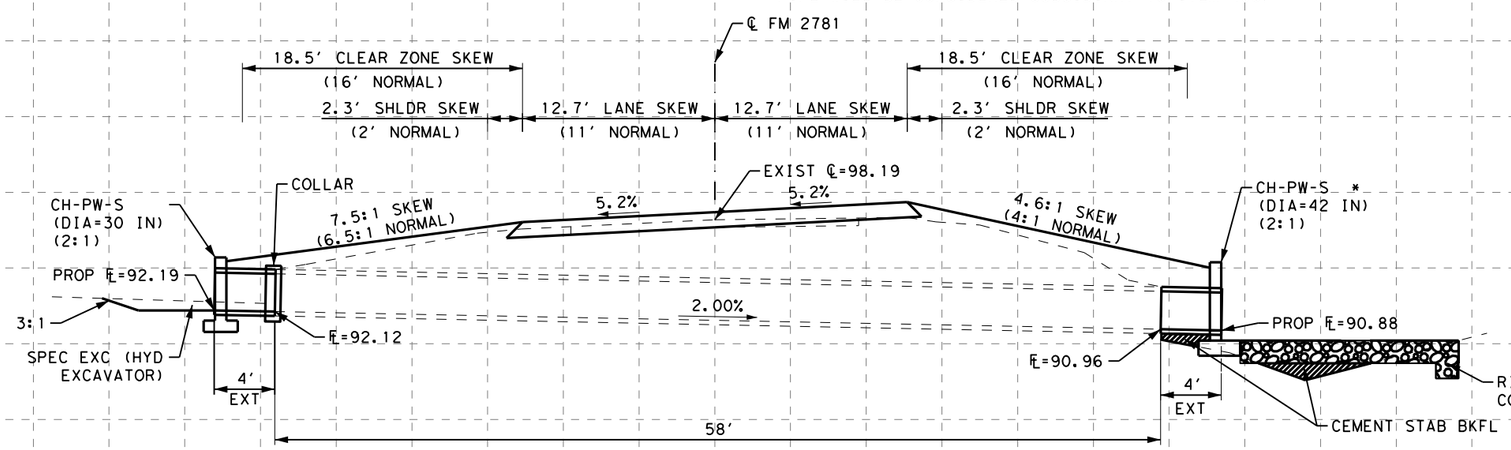
TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 2 OF 15

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		73

8/29/2022 9:46:02 PM
c:\txdot\pw\online\txdot3\sergio.zapata\d0361225\culvert*layout*02.dgn

* THE HEADWALL SHALL BE PAID FOR UNDER ITEM 466, HEADWALL (CH-PW-S)(SL=2:1)(DIA=42IN). ALL DIMENSIONS SHALL CONFORM TO THE DESIGN FOR A 42 IN DIAMETER PIPE AS SHOWN ON THE STANDARD CH-PW-S, EXCEPT FOR THE "K" DIMENSION (TOP OF PIPE TO TOP OF HEADWALL). ADDITIONAL CONCRETE AND REINFORCEMENT REQUIRED AS A RESULT OF THE SMALLER DIAMETER PIPE WILL BE CONSIDERED SUBSIDIARY TO ITEM 466.



STA 82+08

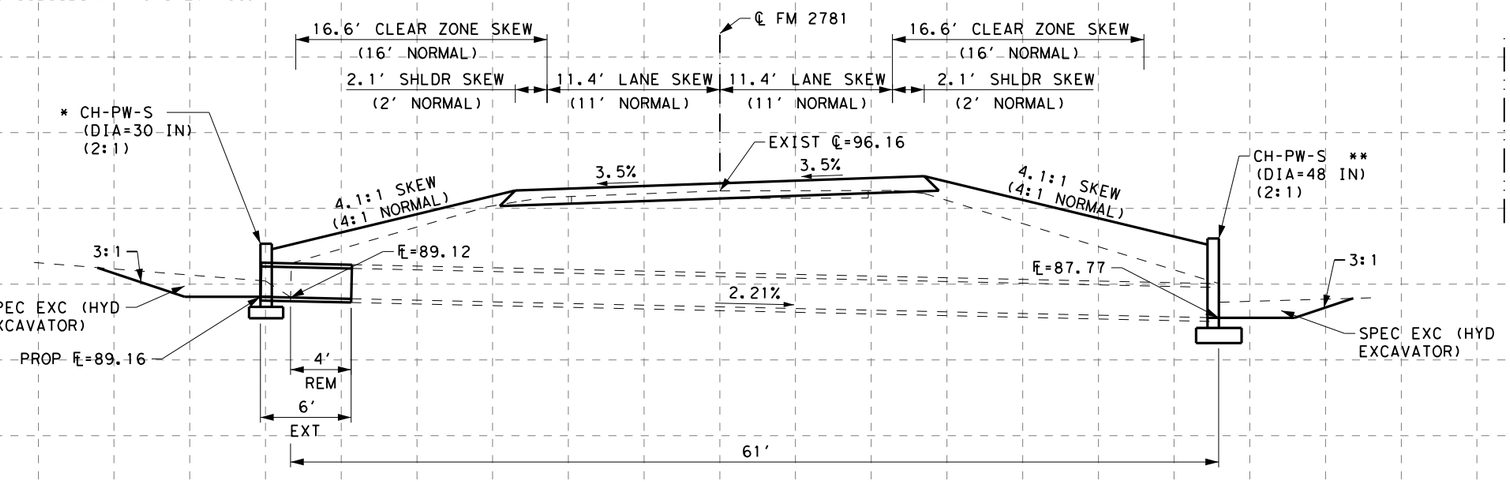
EXIST 30" X 58' (30° LFS)
LT: ADD COLLAR, EXT W/ 4' RCP (CL III),ADD CH-PW-S(DIA=30 IN)(30 DEG)(2:1)
RT: EXT W/ 4' RCP (CL III) (30 IN) & ADD CH-PW-S(DIA=42 IN)(30 DEG)(2:1)

ASSUMED ELEVATIONS

50 40 30 20 10 0 10 20 30 40 50

* THE HEADWALL SHALL BE PAID FOR UNDER ITEM 466, HEADWALL (CH-PW-S)(SL=2:1)(DIA=30IN). ALL DIMENSIONS SHALL CONFORM TO THE DESIGN FOR A 30 IN DIAMETER PIPE AS SHOWN ON THE STANDARD CH-PW-S, EXCEPT FOR THE "K" DIMENSION (TOP OF PIPE TO TOP OF HEADWALL). ADDITIONAL CONCRETE AND REINFORCEMENT REQUIRED AS A RESULT OF THE SMALLER DIAMETER PIPE WILL BE CONSIDERED SUBSIDIARY TO ITEM 466.

** THE HEADWALL SHALL BE PAID FOR UNDER ITEM 466, HEADWALL (CH-PW-S)(SL=2:1)(DIA=48IN). ALL DIMENSIONS SHALL CONFORM TO THE DESIGN FOR A 48 IN DIAMETER PIPE AS SHOWN ON THE STANDARD CH-PW-S, EXCEPT FOR THE "K" DIMENSION (TOP OF PIPE TO TOP OF HEADWALL). ADDITIONAL CONCRETE AND REINFORCEMENT REQUIRED AS A RESULT OF THE SMALLER DIAMETER PIPE WILL BE CONSIDERED SUBSIDIARY TO ITEM 466.



STA 71+65

EXIST 24" X 61' (15° RFS)
LT: REM 4', EXT W/ 6' RCP (CL III) (24 IN) & ADD CH-PW-S(DIA=30 IN)(2:1)
RT: ADD CH-PW-S(DIA=48 IN)(2:1)
CLEAN EXIST CULVERT

ASSUMED ELEVATIONS

50 40 30 20 10 0 10 20 30 40 50

SCALE 1" = 10'

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED
PROFESSIONAL ENGINEER

DocuSigned by:
AF855E728A5C469...
8/5/2022

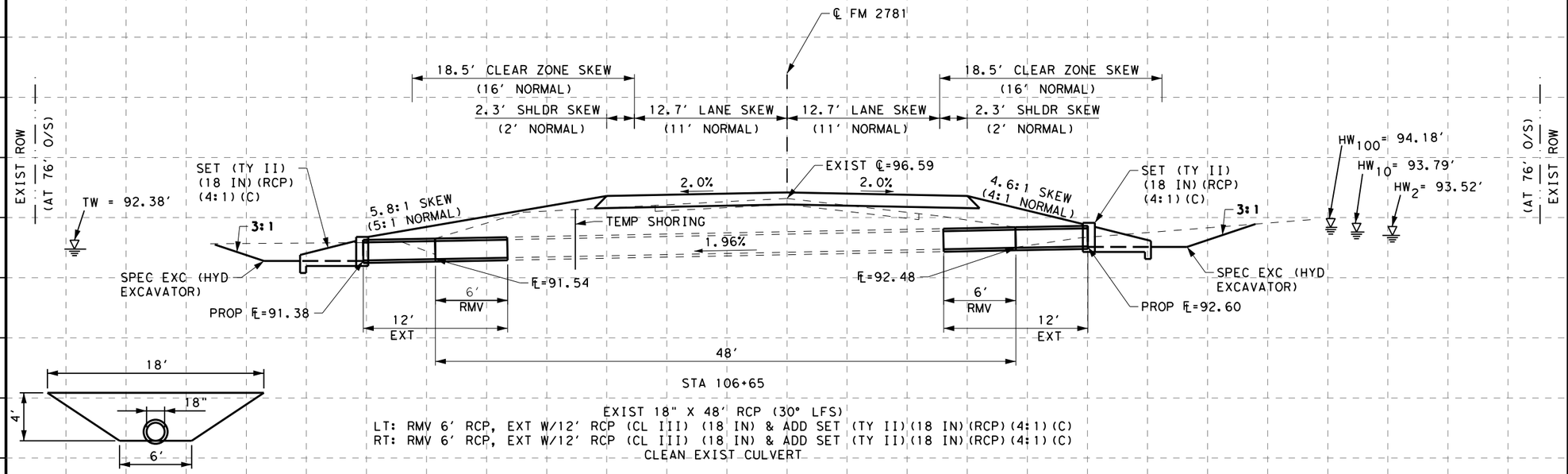
CULVERT LAYOUTS

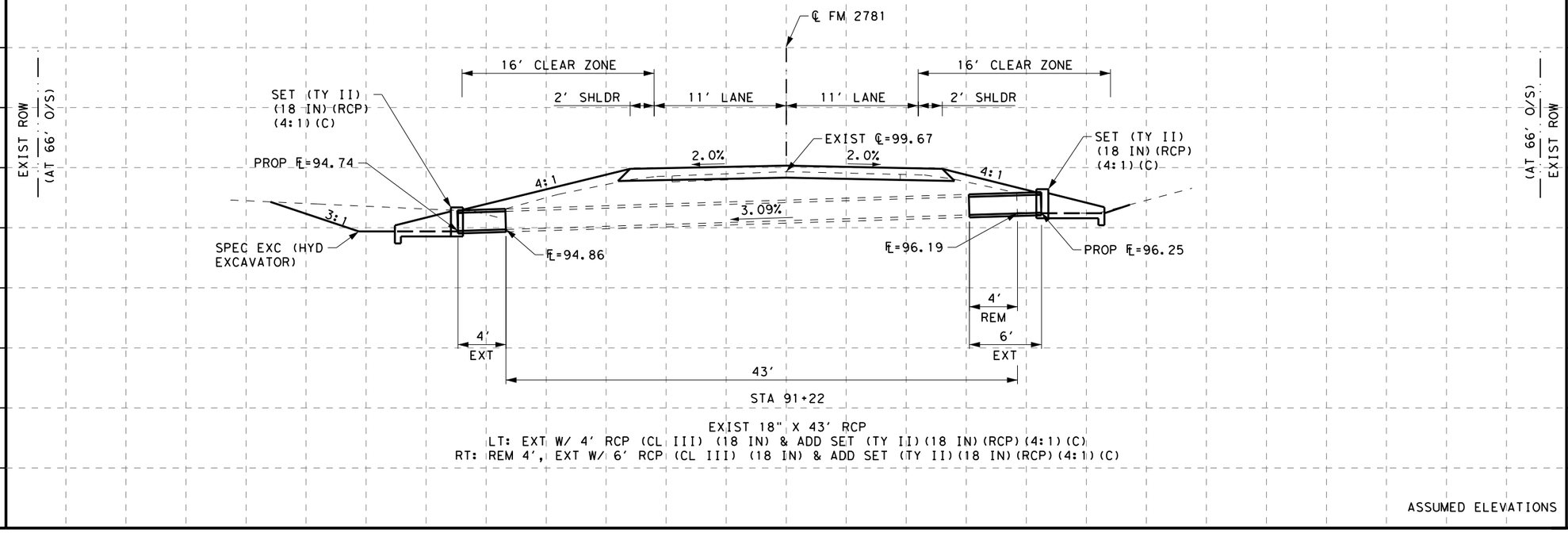
TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 3 OF 15

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		74

8/5/2022 1:13:12 PM
c:\txdot\pw\online\txdot3\sergio.zapata\d0361225\culvert*layout*03.dgn





SCALE 1" = 10′

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED
PROFESSIONAL ENGINEER

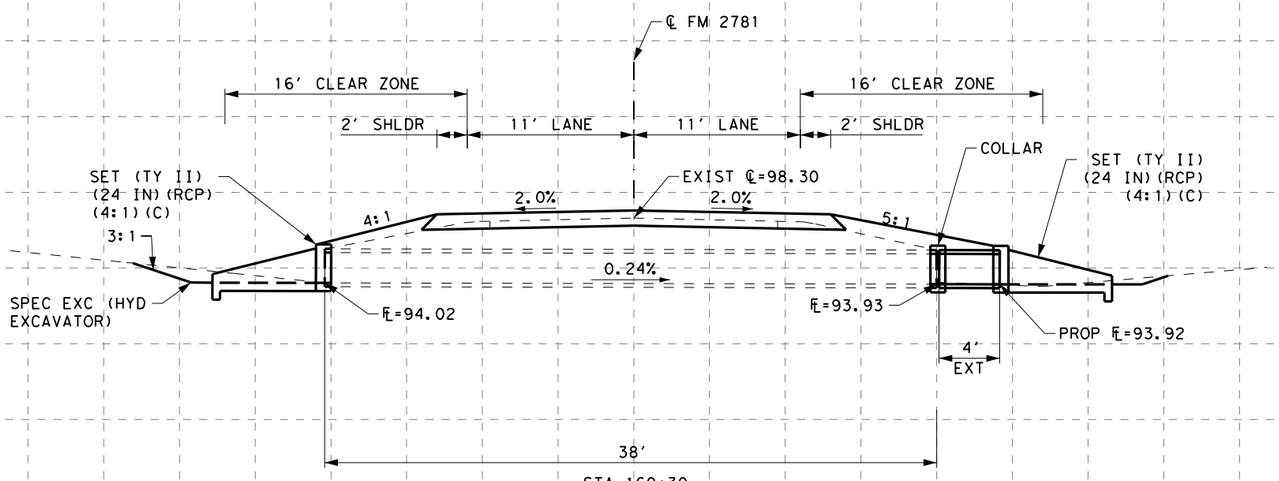
DocuSigned by:
CMB, P.E.
AF858E728A5C469...
8/5/2022

CULVERT LAYOUTS

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 4 OF 15

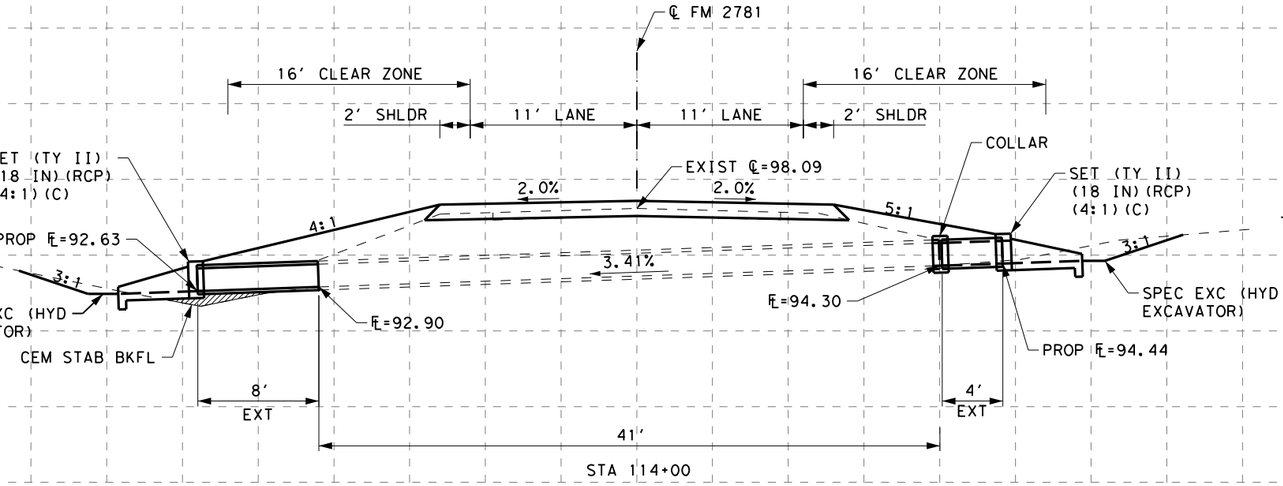
CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		75



EXIST 24" X 38' RCP
LT: ADD COLLAR, EXT W/ 4' RCP (CL III) (24") & ADD SET (TY II) (24 IN) (RCP) (4:1) (C)
RT: ADD COLLAR, EXT W/ 4' RCP (CL III) (24") & ADD SET (TY II) (24 IN) (RCP) (4:1) (C)

ASSUMED ELEVATIONS

50 40 30 20 10 0 10 20 30 40 50



EXIST 18" X 41' RCP
LT: EXT W/ 8' RCP (CL III) (18 IN) & ADD SET (TY II) (18 IN) (RCP) (4:1) (C)
RT: ADD COLLAR, EXT W/ 4' RCP (CL III) (18 IN) & ADD SET (TY II) (18 IN) (RCP) (4:1) (C)

ASSUMED ELEVATIONS

50 40 30 20 10 0 10 20 30 40 50

SCALE 1" = 10'

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED
PROFESSIONAL ENGINEER

DocuSigned by:
cmb
AF852E728AEC4C9...
9/2/2022

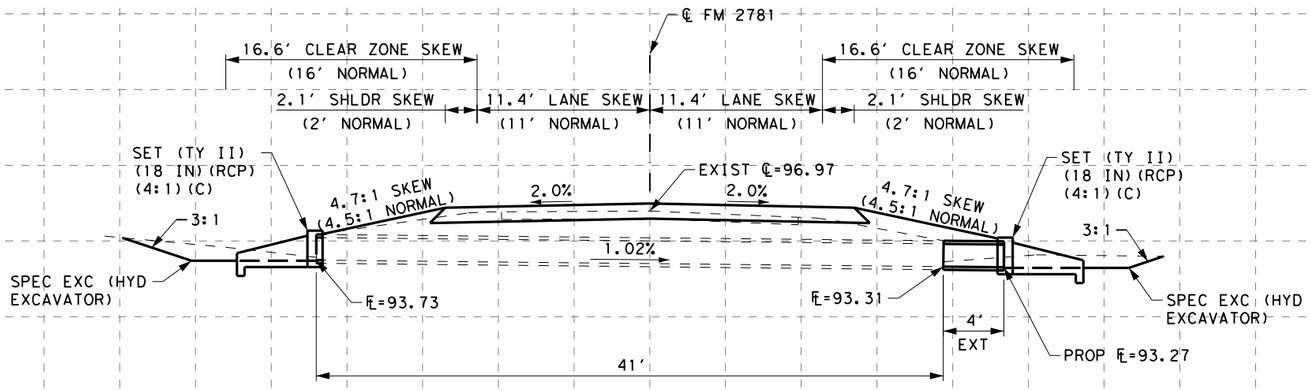
CULVERT LAYOUTS

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 5 OF 15

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		76

8/30/2022 3:22:40 PM
c:\txdot\pw\online\txdot3\sergio.zapata\d0361225\culvert*layout*05.dgn



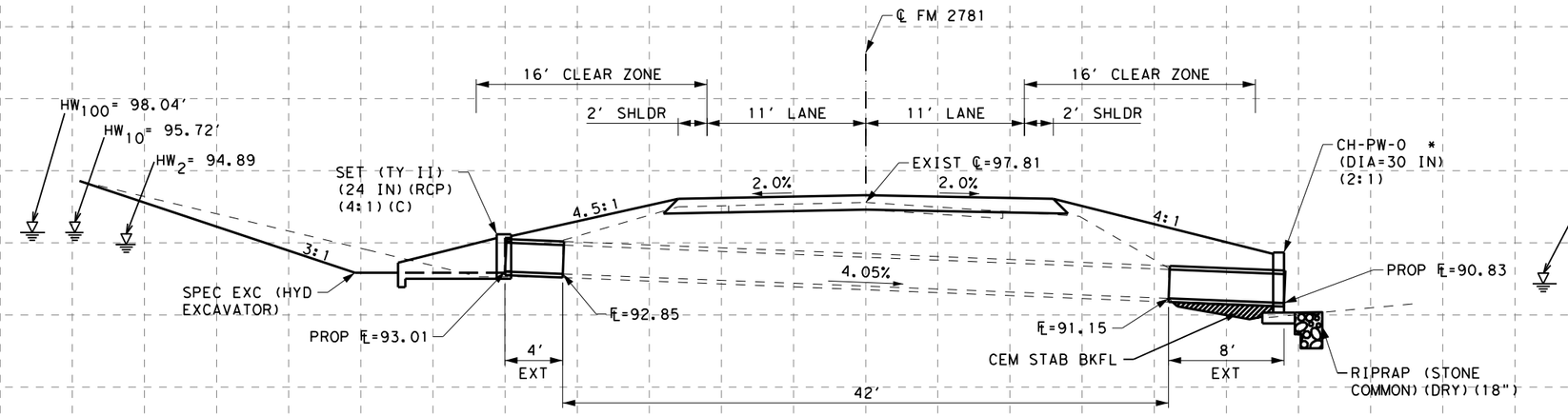
STA 202+34

EXIST 18" X 41' (15° LFS)
LT: ADD SET (TY II)(18 IN)(RCP)(4:1)(C)
RT: EXT W/ 4' RCP (CL III) (18 IN) & ADD SET (TY II)(18 IN)(RCP)(4:1)(C)

ASSUMED ELEVATIONS

50 40 30 20 10 0 10 20 30 40 50

* THE HEADWALL SHALL BE PAID FOR UNDER ITEM 466, HEADWALL (CH-PW-0)(SL=2:1)(DIA=30IN). ALL DIMENSIONS SHALL CONFORM TO THE DESIGN FOR A 30 IN DIAMETER PIPE AS SHOWN ON THE STANDARD CH-PW-0, EXCEPT FOR THE "K" DIMENSION (TOP OF PIPE TO TOP OF HEADWALL). ADDITIONAL CONCRETE AND REINFORCEMENT REQUIRED AS A RESULT OF THE SMALLER DIAMETER PIPE WILL BE CONSIDERED SUBSIDIARY TO ITEM 466.



STA 183+00

EXIST 24" X 42' RCP
LT: EXT W/ 4' RCP (CL III) (24 IN) & ADD SET (TY II)(24 IN)(RCP)(4:1)(C)
RT: EXT W/ 8' RCP (CL III) (24 IN) & ADD CH-PW-0(DIA=30 IN)(2:1)

ASSUMED ELEVATIONS

50 40 30 20 10 0 10 20 30 40 50

SCALE 1" = 10'

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED
PROFESSIONAL ENGINEER

DocuSigned by:
AF858E728A5C469...
8/5/2022

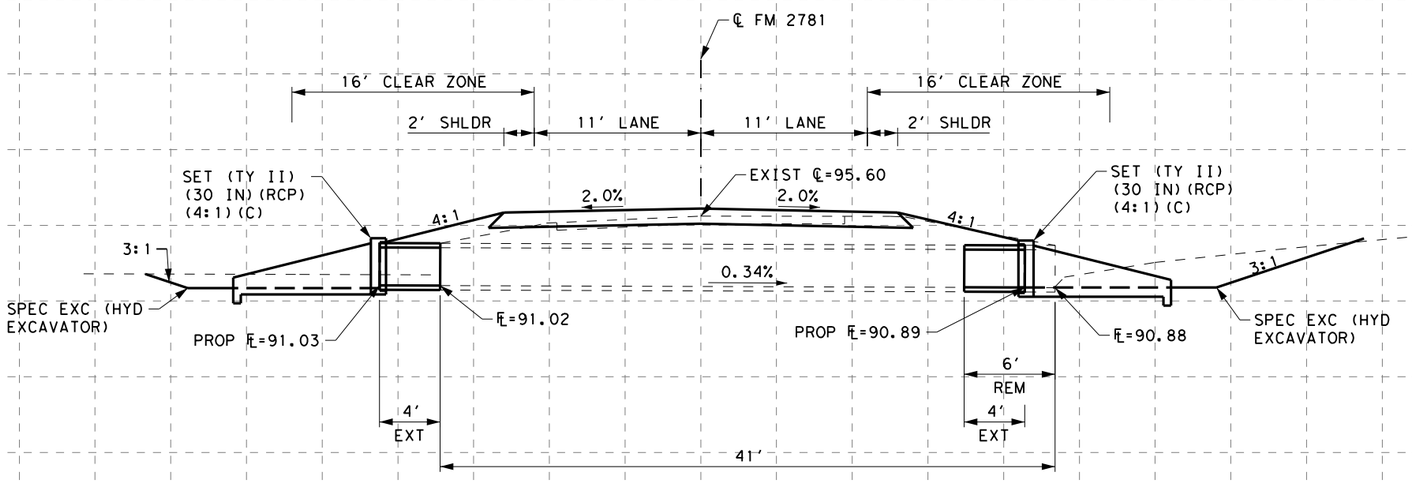
CULVERT LAYOUTS

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 6 OF 15

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		77

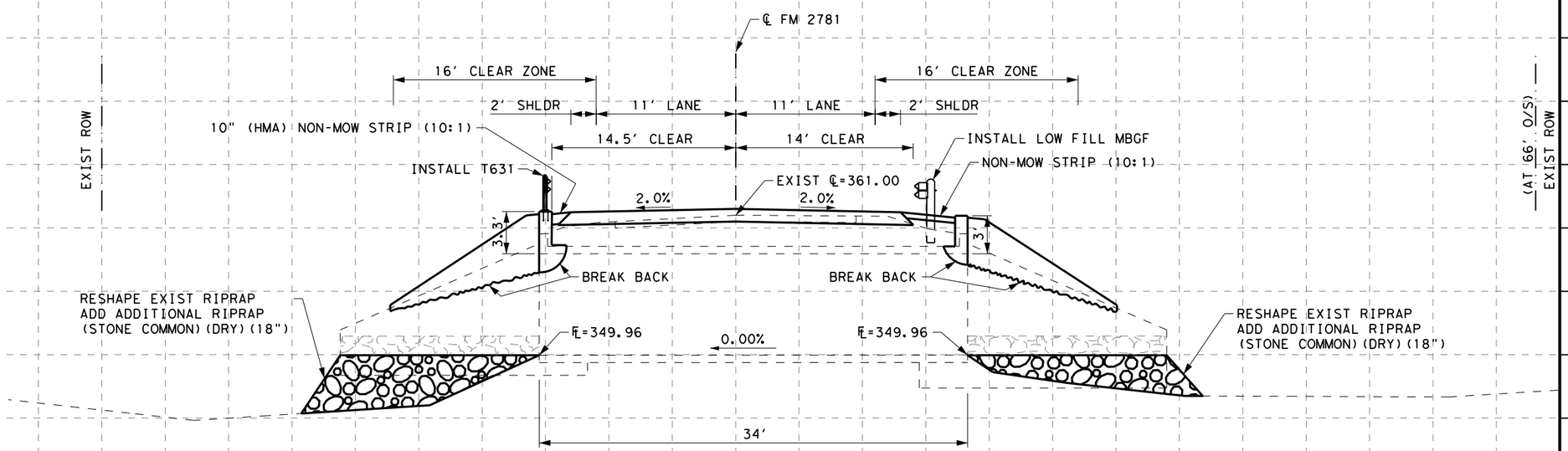
8/5/2022 1:13:30 PM
c:\txdot\pw\online\txdot3\sergio.zapata\d0361225\culvert*layout*06.dgn



STA 259+74

EXIST 30" X 41' RCP
LT: EXT W/ 4' RCP (CL III) (30 IN) & ADD SET (TY II)(30 IN)(RCP)(4:1)(C)
RT: REM 6', EXT W/ 4' RCP (CL III) (30 IN) & ADD SET (TY II)(30 IN)(RCP)(4:1)(C)

ASSUMED ELEVATIONS



PINEY CREEK
STA 235+10.16 TO STA 235+39.83
EXIST 3 - 9' X 8' X 33'-0", MC9-1 & MCW-F2
LT: RETROFIT WINGWALL, SEE STRUCTURAL WING WALL EXTENSION SHEET, INSTALL T631 RAIL
PROP RT: RETROFIT WINGWALL, SEE STRUCTURAL WING WALL EXTENSION SHEET, INSTALL MBGF & NON-MOW STRIP

ASSUMED ELEVATIONS

SCALE 1" = 10'

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED PROFESSIONAL ENGINEER

DocuSigned by:
AF852E728AEC4C9...
9/2/2022

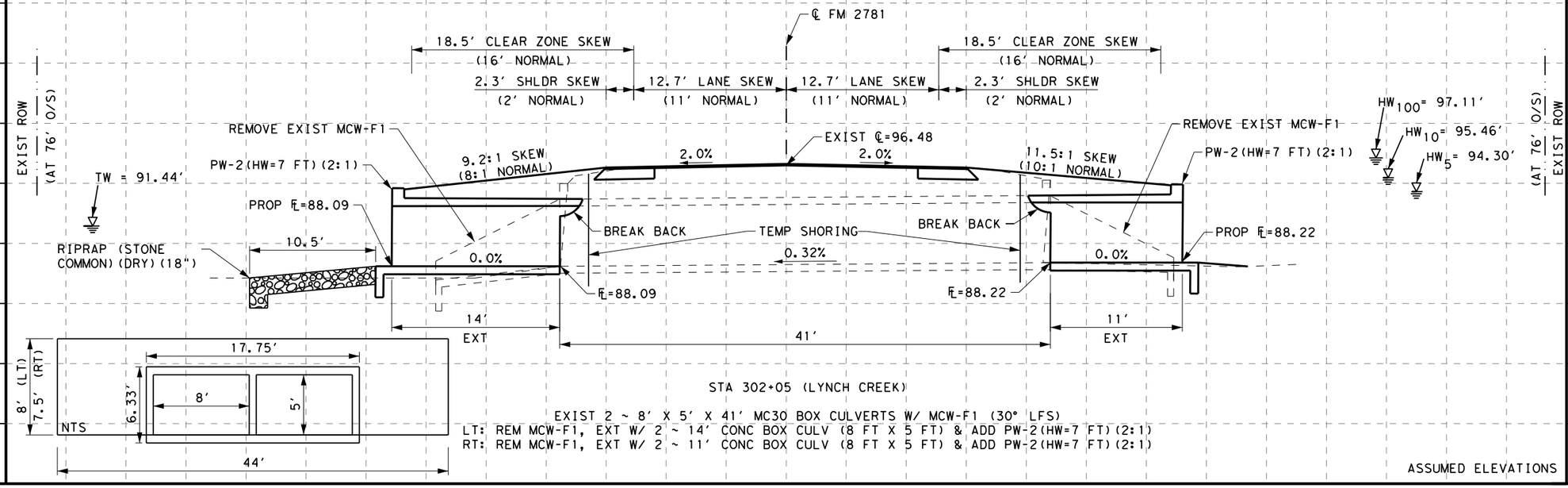
CULVERT LAYOUTS

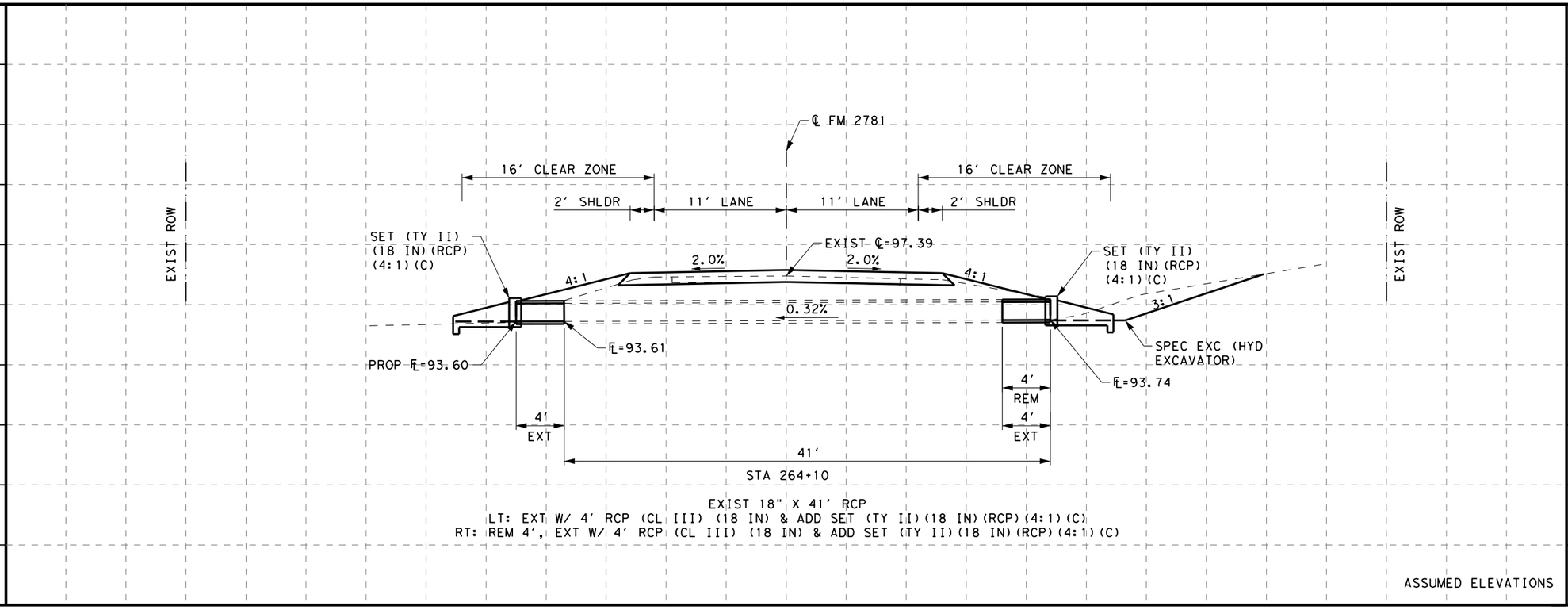
TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 7 OF 15

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		78

8/30/2022 3:24:55 PM
c:\txdot\pw\online\txdot3\sergio.zapata\d0361225\culvert*layout*07.dgn





SCALE 1" = 10'

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED
PROFESSIONAL ENGINEER

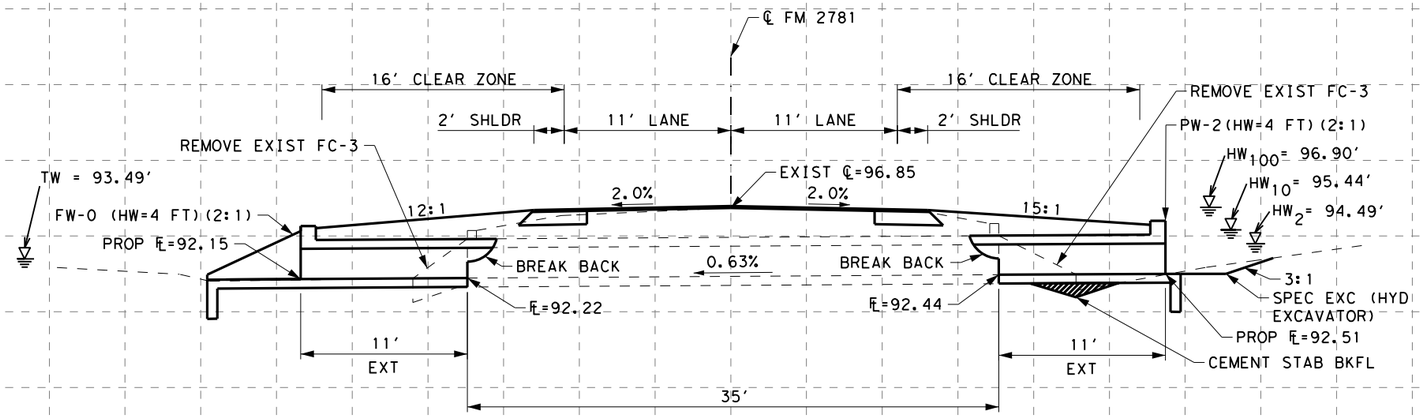
DocuSigned by:
AF852E728AEC4C9...
P.E.
9/2/2022

CULVERT LAYOUTS

TEXAS DEPARTMENT OF TRANSPORTATION
©2022 SHEET 8 OF 15

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		79

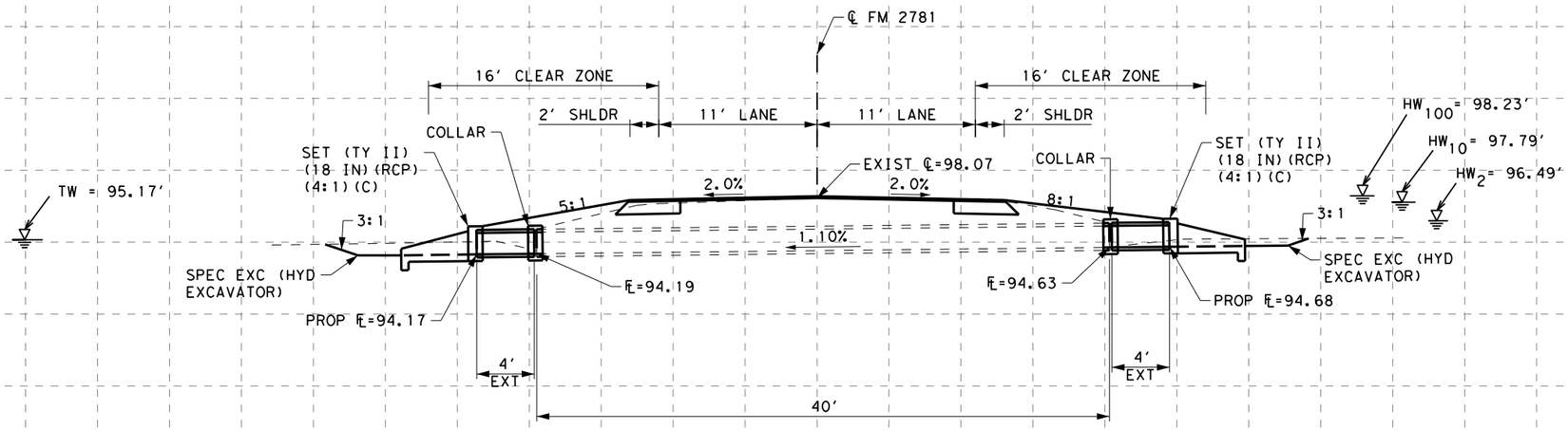
8/30/2022 10:49:07 AM
c:\txdot\pw\online\txdot3\sergio.zapata\d0361225\culvert*layout*08.dgn



STA 354+48

EXIST 5' X 2' X 35' BOX CULVERT W/ FC-3
LT: REM FC-3, EXT W/ 11' CONC BOX CULV (5 FT X 2 FT) & ADD FW-0(HW=4 FT)(2:1)
RT: REM FC-3, EXT W/ 11' CONC BOX CULV (5 FT X 2 FT) & ADD PW-2(HW=4 FT)(2:1)

ASSUMED ELEVATIONS



STA 321+75

EXIST 18" X 40' RCP
LT: ADD COLLAR, EXT W/ 4' RCP (CL III) (18 IN) & ADD SET (TY II)(18 IN)(RCP)(4:1)(C)
RT: ADD COLLAR, EXT W/ 4' RCP (CL III) (18 IN) & ADD SET (TY II)(18 IN)(RCP)(4:1)(C)
CLEAN EXIST CULVERT

ASSUMED ELEVATIONS

SCALE 1" = 10'

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED PROFESSIONAL ENGINEER

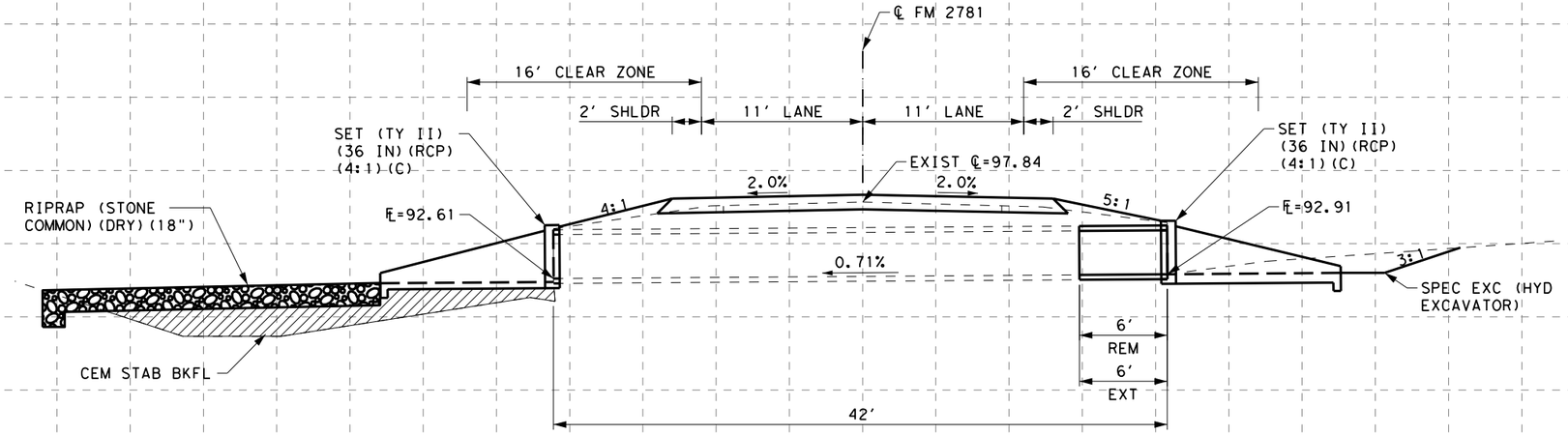
DocuSigned by:
cmb P.E.
AF858E788A5C469...
8/5/2022

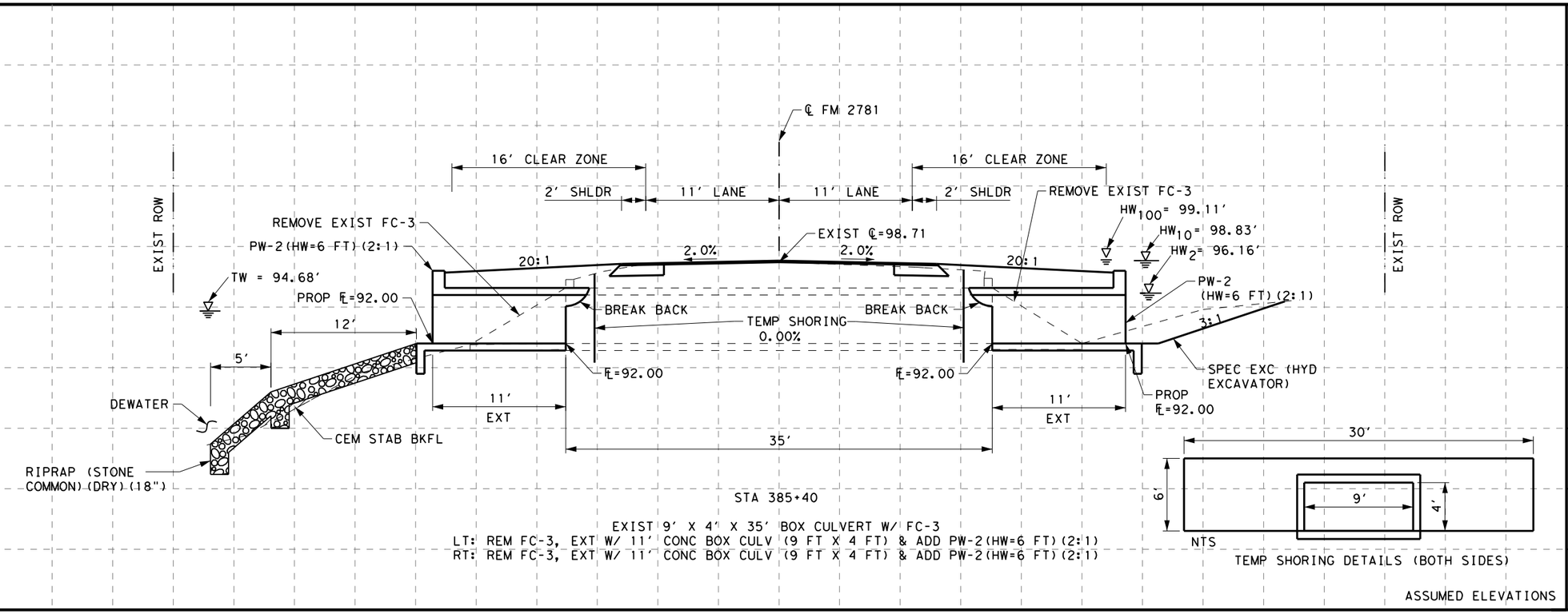
CULVERT LAYOUTS

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 9 OF 15

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		80





SCALE 1" = 10'

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED PROFESSIONAL ENGINEER

DocuSigned by:
AF852E728AEC4C8...
8/2/2022

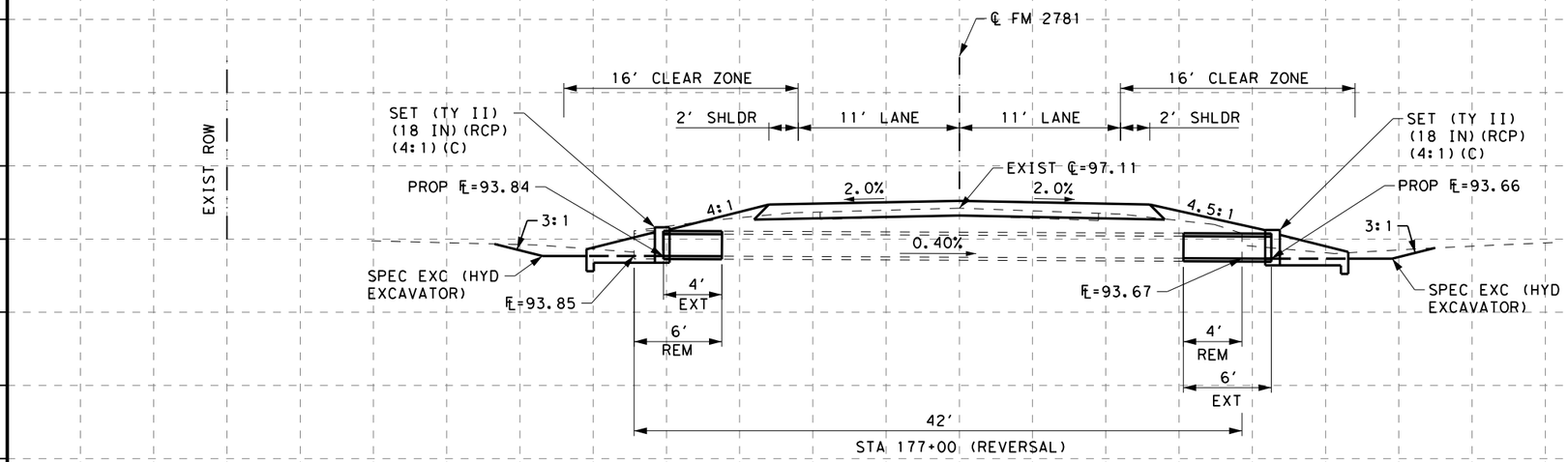
CULVERT LAYOUTS

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 10 OF 15

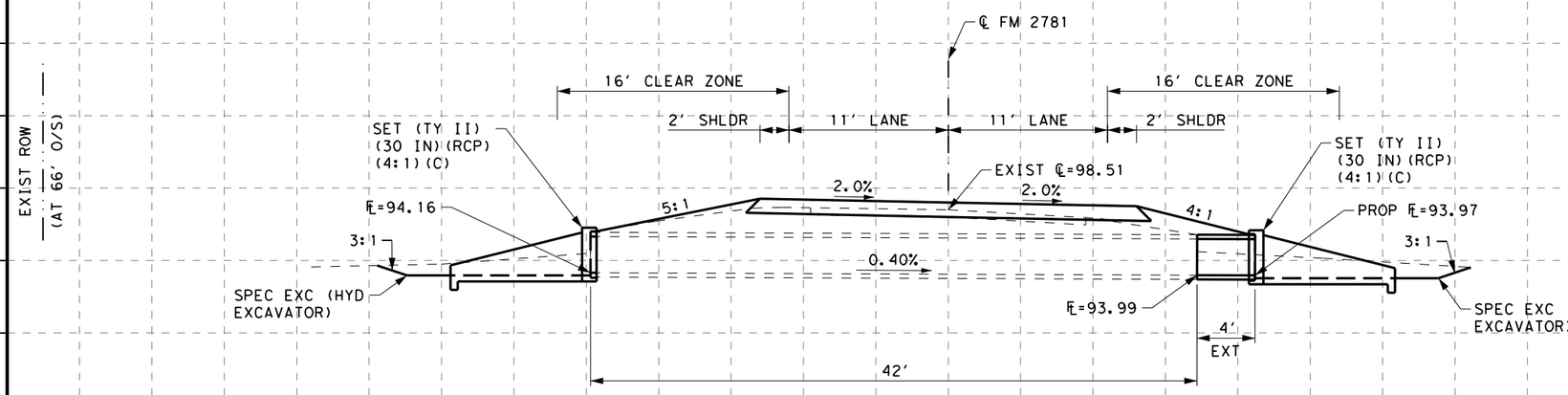
CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		81

8/31/2022 3:20:35 PM
c:\txdot\pw\online\txdot3\sergio.zapata\d0361225\culvert*layout*10.dgn



EXIST 18" X 42' RCP
LT/EAST: REM 6', EXT W/ 4' RCP (CL III) (18 IN) & ADD SET (TY II) (18 IN) (RCP) (4:1) (C)
RT/WEST: REM 4', EXT W/ 6' RCP (CL III) (18 IN) & ADD SET (TY II) (18 IN) (RCP) (4:1) (C)

ASSUMED ELEVATIONS



STA 458+03

EXIST 30" X 42' RCP
LT: ADD SET (TY II) (30 IN) (RCP) (4:1) (C)
RT: EXT W/ 4' RCP (CL III) (30 IN) & ADD SET (TY II) (30 IN) (RCP) (4:1) (C)
CLEAN EXIST CULVERT

ASSUMED ELEVATIONS

SCALE 1" = 10'

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED PROFESSIONAL ENGINEER

DocuSigned by:
cmb
AF858E728A5C46C...
8/5/2022

CULVERT LAYOUTS

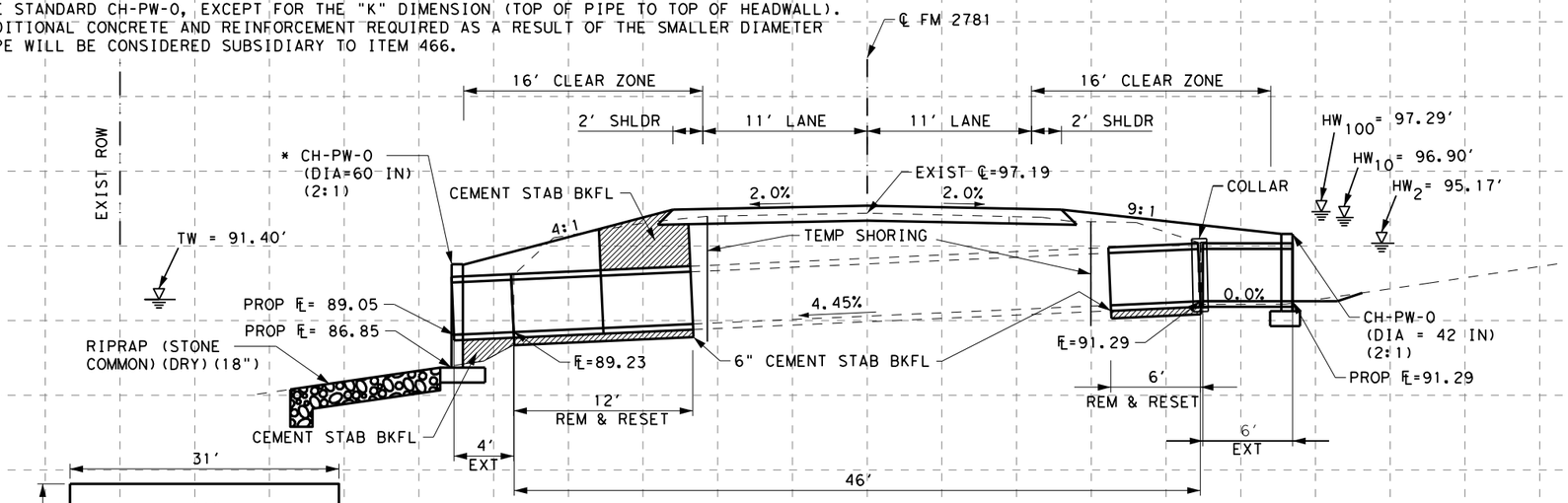
TEXAS DEPARTMENT OF TRANSPORTATION

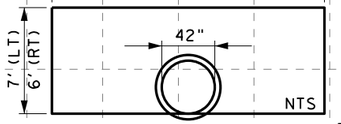
SHEET 11 OF 15

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		82

8/5/2022 1:14:07 PM
c:\txdot\pw\online\txdot3\sergio.zapata\d0361225\culvert*layout*11.dgn

* THE HEADWALL SHALL BE PAID FOR UNDER ITEM 466, HEADWALL (CH-PW-0)(SL=2:1)(DIA=60IN). ALL DIMENSIONS SHALL CONFORM TO THE DESIGN FOR A 60 IN DIAMETER PIPE AS SHOWN ON THE STANDARD CH-PW-0, EXCEPT FOR THE "K" DIMENSION (TOP OF PIPE TO TOP OF HEADWALL). ADDITIONAL CONCRETE AND REINFORCEMENT REQUIRED AS A RESULT OF THE SMALLER DIAMETER PIPE WILL BE CONSIDERED SUBSIDIARY TO ITEM 466.





TEMP SHORING DETAILS

STA 148+30 (REVERSAL)

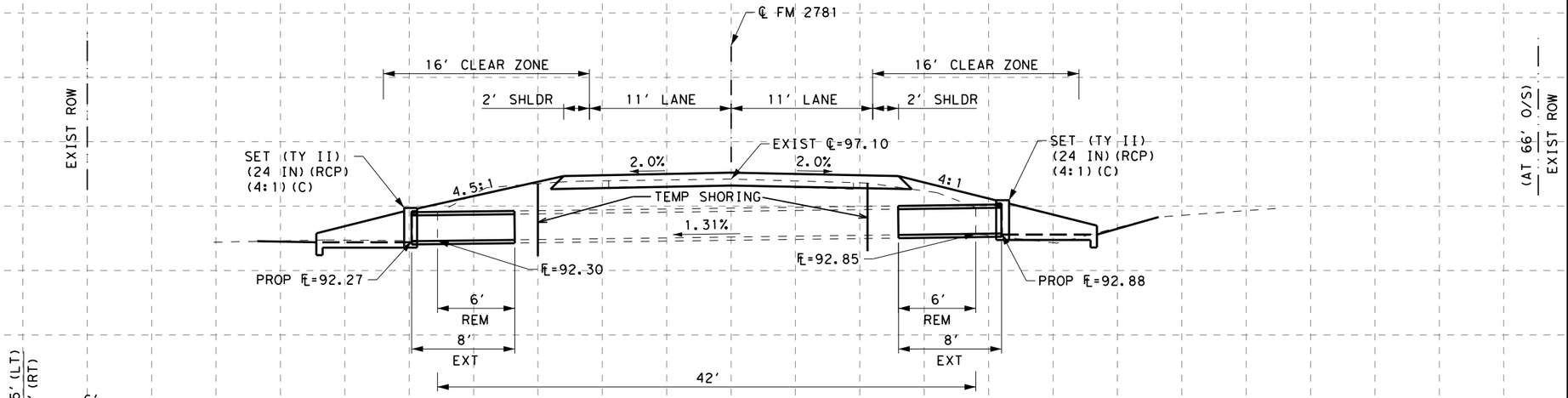
EXIST 42" X 46'

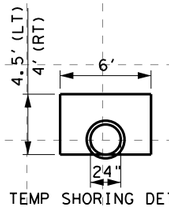
LT/EAST: REM & RESET 12', EXT W/ 4' RCP (CL III) (42 IN) & ADD CH-PW-0(DIA=60 IN)(2:1)

RT/WEST: REM & RESET 6' RCP, ADD COLLAR, EXT W/ 6' RCP (CL III)(42 IN) & ADD CH-PW-0 (DIA = 42 IN)(2:1)

ASSUMED ELEVATIONS

50 40 30 20 10 0 10 20 30 40 50





TEMP SHORING DETAILS
TYP BOTH SIDES

STA 167+67 (REVERSAL)

EXIST 24" X 42' RCP

LT/EAST: REM 6', EXT W/ 8' RCP (CL III) (24 IN) & ADD SET (TY II)(24 IN)(RCP)(4:1)(C)

RT/WEST: REM 6', EXT W/ 8' RCP (CL III) (24 IN) & ADD SET (TY II)(24 IN)(RCP)(4:1)(C)

ASSUMED ELEVATIONS

50 40 30 20 10 0 10 20 30 40 50

SCALE 1" = 10'

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED PROFESSIONAL ENGINEER

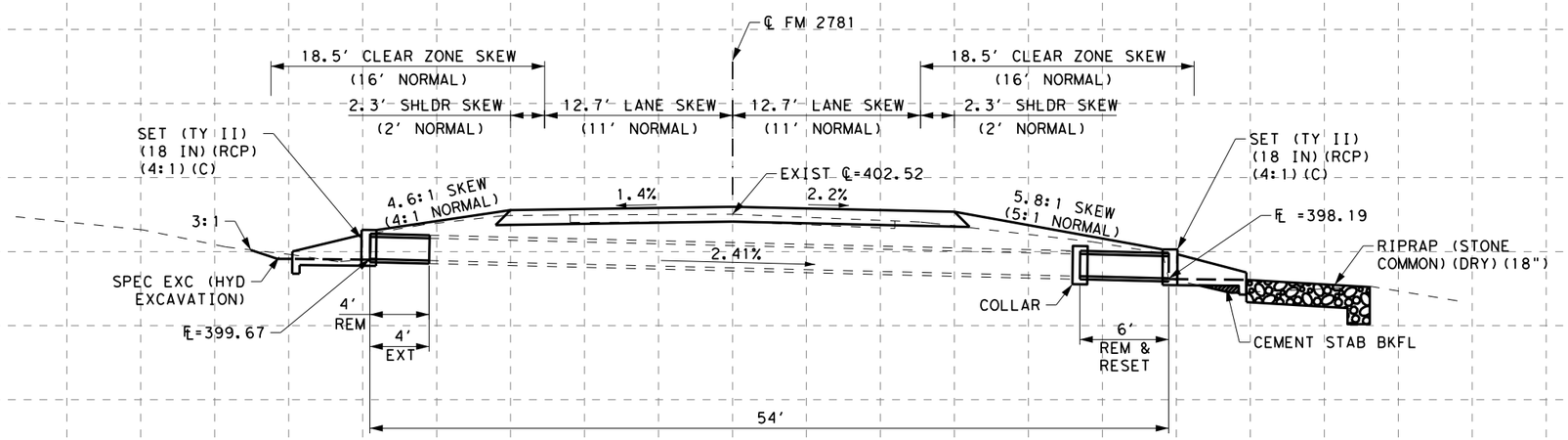
DocuSigned by:
AF859E728AE6469...
9/22/2022

CULVERT LAYOUTS

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 12 OF 15

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		83



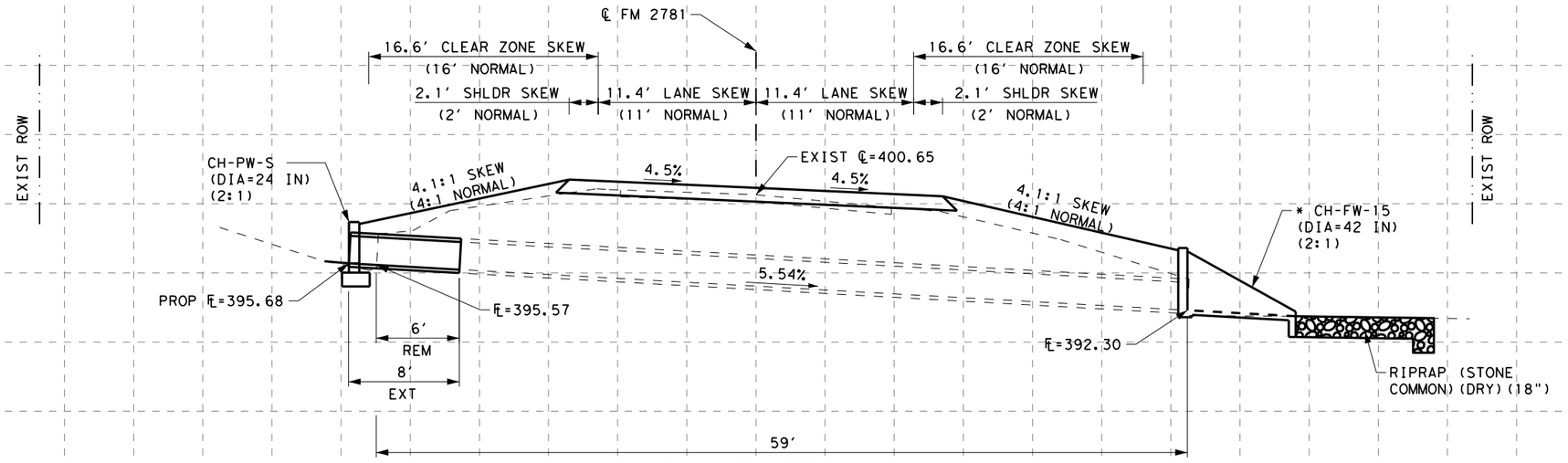
STA 105+86 (REVERSAL)

EXIST 18" X 54' (30° LFS)
LT/EAST: REM 4', EXT W/4' RCP (CL III) (18 IN) & ADD SET (TY II)(18 IN)(RCP)(4:1)(C)
RT/WEST: REM & RESET 6' RCP (CL III),ADD COLLAR; ADD SET (TY II)(18 IN)(RCP)(4:1)(C)
CLEAN EXIST CULVERT

ASSUMED ELEVATIONS

50 40 30 20 10 0 10 20 30 40 50

* THE HEADWALL SHALL BE PAID FOR UNDER ITEM 466, HEADWALL (CH-FW-15)(SL= 2:1)(DIA=42IN), ALL DIMENSIONS SHALL CONFORM TO THE DESIGN FOR A 24 IN DIAMETER PIPE AS SHOWN ON THE STANDARD CH-FW-15, EXCEPT FOR THE "K" DIMENSION (TOP OF PIPE TO TOP OF HEADWALL), ADDITIONAL CONCRETE AND REINFORCEMENT REQUIRED AS A RESULT OF THE SMALLER DIAMETER PIPE WILL BE CONSIDERED SUBSIDIARY TO ITEM 466.



STA 113+27 (REVERSAL)

EXIST 24" X 59' (15° LFS)
LT/EAST: REM 6', EXT W/ 8' RCP (CL III) (24 IN) & ADD CH-PW-S(DIA=24 IN)(2:1)
RT/WEST: ADD CH-FW-15 (DIA 42 IN)(2:1)

50 40 30 20 10 0 10 20 30 40 50

SCALE 1" = 10'

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED
PROFESSIONAL ENGINEER

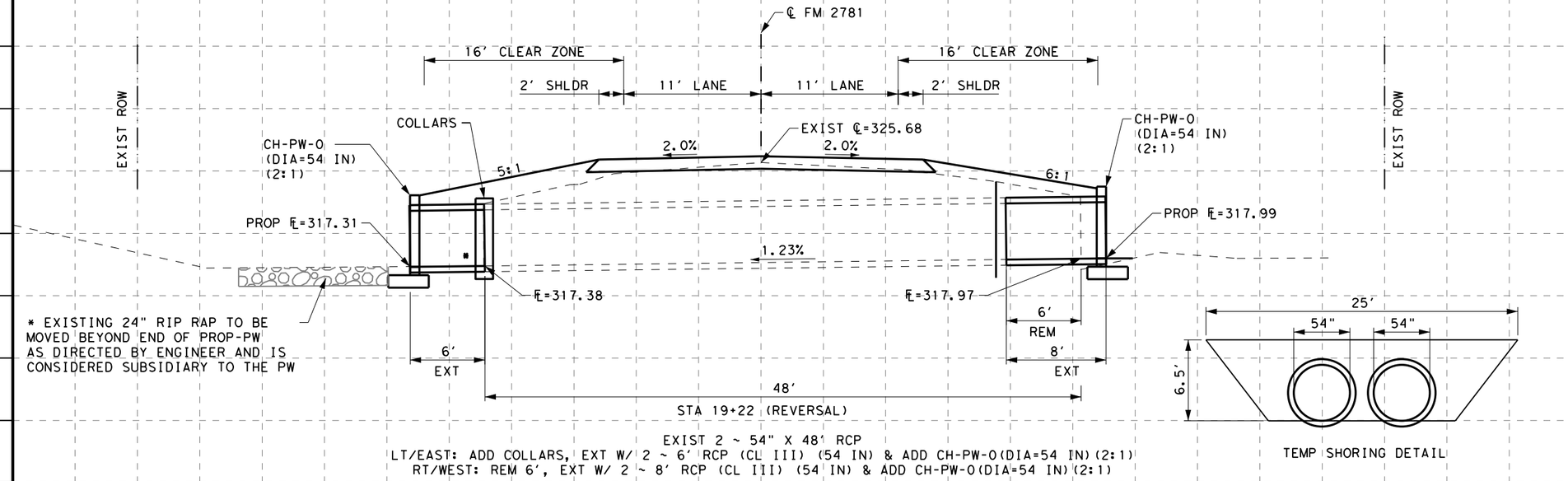
DocuSigned by:
cmb, P.E.
AF859E728AE64C9...
9/22/2022

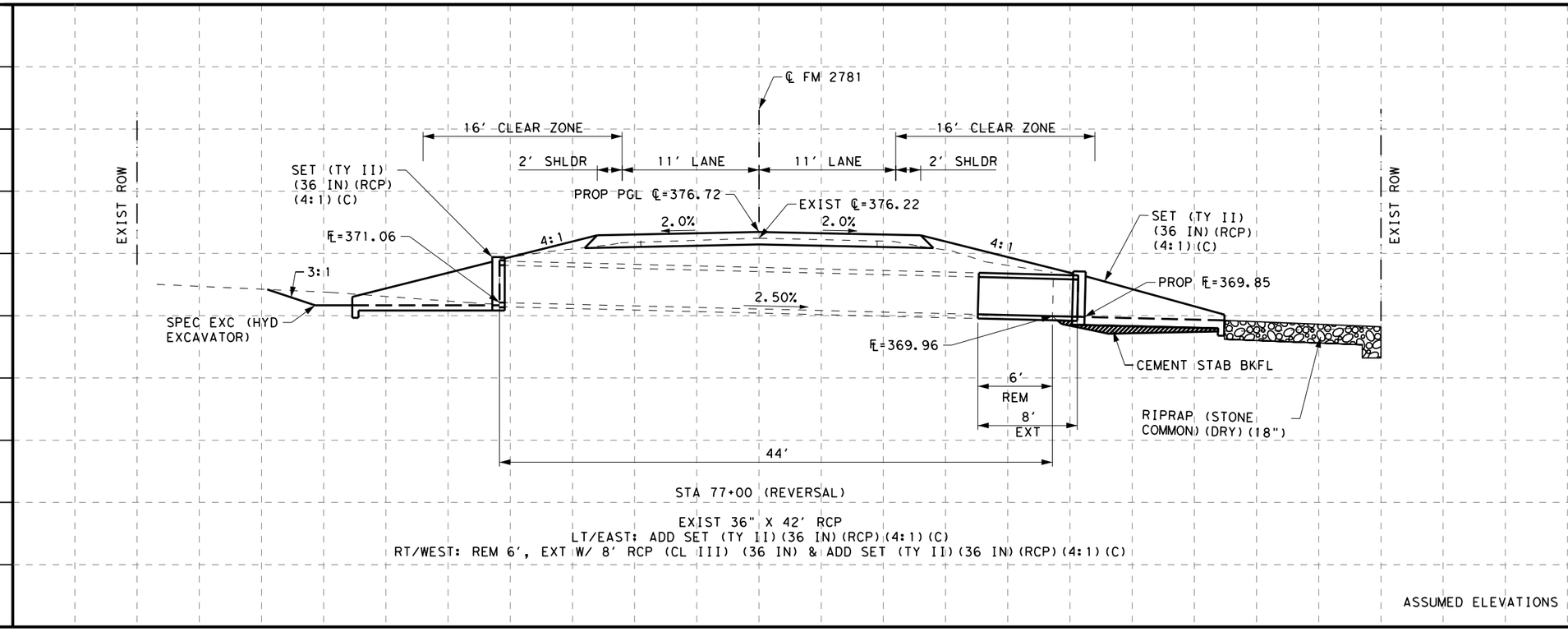
CULVERT LAYOUTS

TEXAS DEPARTMENT OF TRANSPORTATION
©2022 SHEET 13 OF 15

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		84

9/21/2022 3:52:07 PM
c:\txdot\pw\online\txdot3\sergio.zapata\d0361225\culvert*layout*13.dgn





SCALE 1" = 10'

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED
PROFESSIONAL ENGINEER

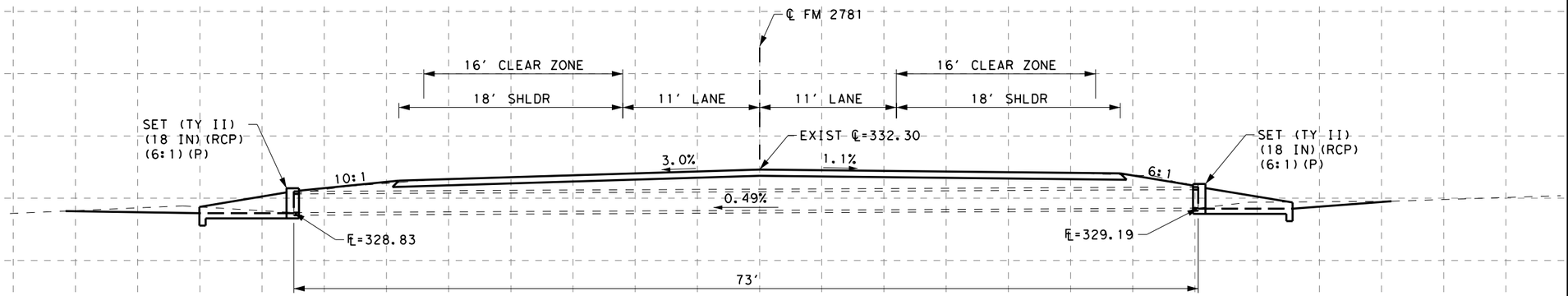
DocuSigned by:
cmb, P.E.
AF859E728AEC4C9...
9/22/2022

CULVERT LAYOUTS

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 14 OF 15

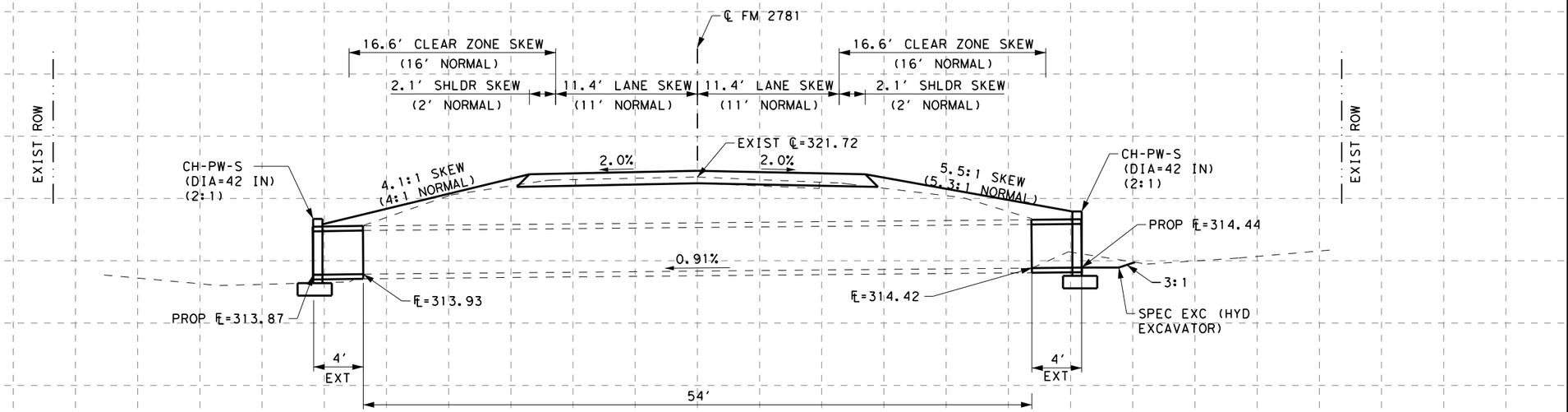
CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		85



STA 0+23 (REVERSAL)

EXIST 18" X 73'
LT/EAST: ADD SET (TY II)(18 IN)(RCP)(6:1)(P)
RT/WEST: ADD SET (TY II)(18 IN)(RCP)(6:1)(P)

ASSUMED ELEVATIONS



STA 15+75 (REVERSAL)

EXIST 42" X 54' (15° RFS)
LT/EAST: EXT W/ 4' RCP (CL III) (42 IN) & ADD CH-PW-S (DIA=42 IN)(2:1)
RT/WEST: EXT W/ 4' RCP (CL III) (42 IN) & ADD CH-PW-S (DIA=42 IN)(2:1)

ASSUMED ELEVATIONS

SCALE 1" = 10'

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED
PROFESSIONAL ENGINEER

DocuSigned by:
cmb, P.E.
AF859E728AE64C9...
9/22/2022

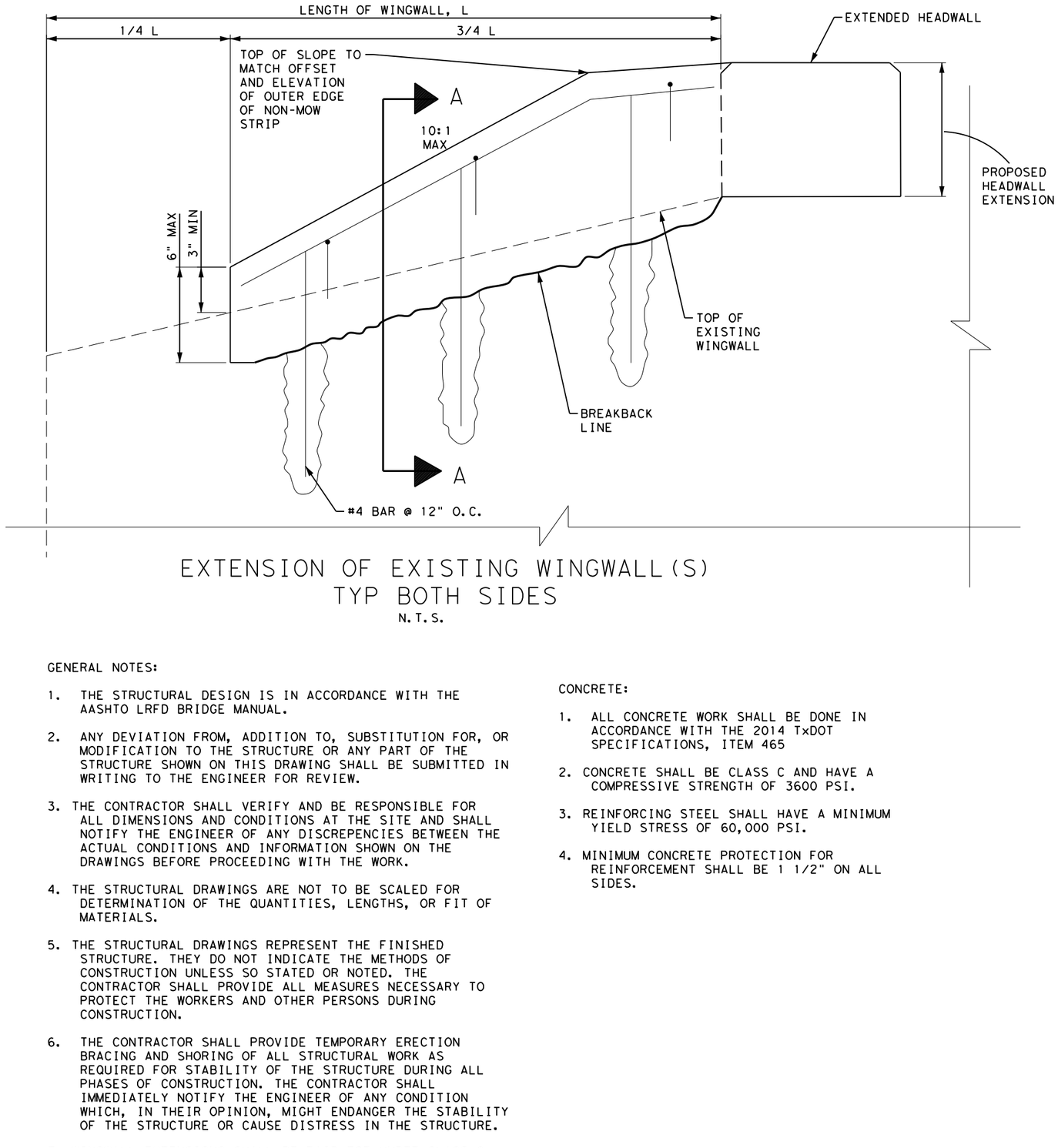
CULVERT LAYOUTS

TEXAS DEPARTMENT OF TRANSPORTATION

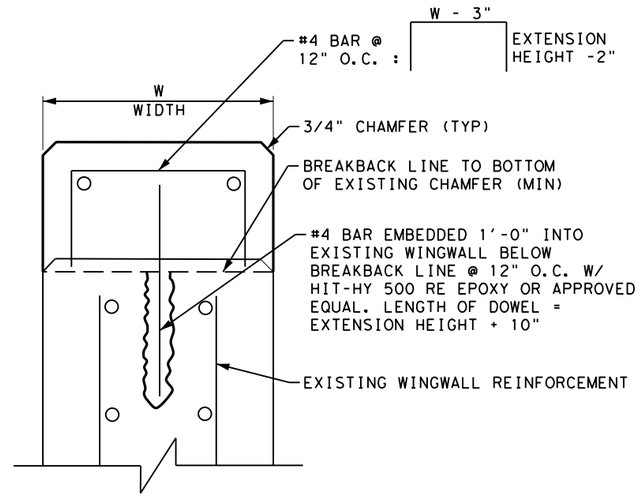
SHEET 15 OF 15

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		86

9/22/2022 8:42:15 AM
c:\txdot\pw\online\txdot3\sergio.zapata\d0361225\culvert*layout*15.dgn



EXTENSION OF EXISTING WINGWALL(S)
TYP BOTH SIDES
N.T.S.



SECTION A-A
N.T.S.

GENERAL NOTES:

1. THE STRUCTURAL DESIGN IS IN ACCORDANCE WITH THE AASHTO LRFD BRIDGE MANUAL.

2. ANY DEVIATION FROM, ADDITION TO, SUBSTITUTION FOR, OR MODIFICATION TO THE STRUCTURE OR ANY PART OF THE STRUCTURE SHOWN ON THIS DRAWING SHALL BE SUBMITTED IN WRITING TO THE ENGINEER FOR REVIEW.

3. THE CONTRACTOR SHALL VERIFY AND BE RESPONSIBLE FOR ALL DIMENSIONS AND CONDITIONS AT THE SITE AND SHALL NOTIFY THE ENGINEER OF ANY DISCREPENCIES BETWEEN THE ACTUAL CONDITIONS AND INFORMATION SHOWN ON THE DRAWINGS BEFORE PROCEEDING WITH THE WORK.

4. THE STRUCTURAL DRAWINGS ARE NOT TO BE SCALED FOR DETERMINATION OF THE QUANTITIES, LENGTHS, OR FIT OF MATERIALS.

5. THE STRUCTURAL DRAWINGS REPRESENT THE FINISHED STRUCTURE. THEY DO NOT INDICATE THE METHODS OF CONSTRUCTION UNLESS SO STATED OR NOTED. THE CONTRACTOR SHALL PROVIDE ALL MEASURES NECESSARY TO PROTECT THE WORKERS AND OTHER PERSONS DURING CONSTRUCTION.

6. THE CONTRACTOR SHALL PROVIDE TEMPORARY ERECTION BRACING AND SHORING OF ALL STRUCTURAL WORK AS REQUIRED FOR STABILITY OF THE STRUCTURE DURING ALL PHASES OF CONSTRUCTION. THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER OF ANY CONDITION WHICH, IN THEIR OPINION, MIGHT ENDANGER THE STABILITY OF THE STRUCTURE OR CAUSE DISTRESS IN THE STRUCTURE.

7. WINGWALL EXTENSIONS SHALL BE PAID FOR UNDER CLASS C CONCRETE. BREAKBACK, REINFORCEMENT, DOWELS, ETC. TO INSTALL EXTENSIONS SHALL BE SUBSIDIARY TO CLASS C CONCRETE.

CONCRETE:

1. ALL CONCRETE WORK SHALL BE DONE IN ACCORDANCE WITH THE 2014 TxDOT SPECIFICATIONS, ITEM 465

2. CONCRETE SHALL BE CLASS C AND HAVE A COMPRESSIVE STRENGTH OF 3600 PSI.

3. REINFORCING STEEL SHALL HAVE A MINIMUM YIELD STRESS OF 60,000 PSI.

4. MINIMUM CONCRETE PROTECTION FOR REINFORCEMENT SHALL BE 1 1/2" ON ALL SIDES.

SCALE 1" = 100'

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED PROFESSIONAL ENGINEER

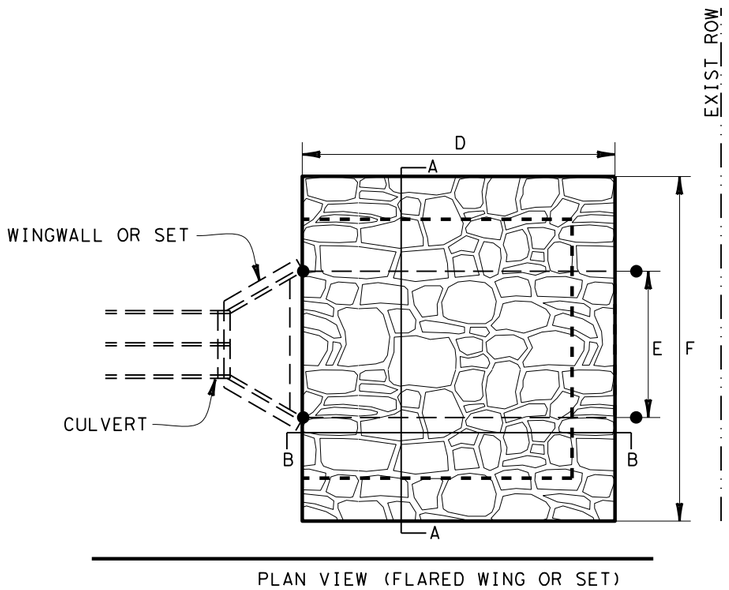
DocuSigned by:
cmb P.E.
AF852E728AFC4C8...
9/2/2022

STRUCTURAL WINGWALL EXTENSIONS

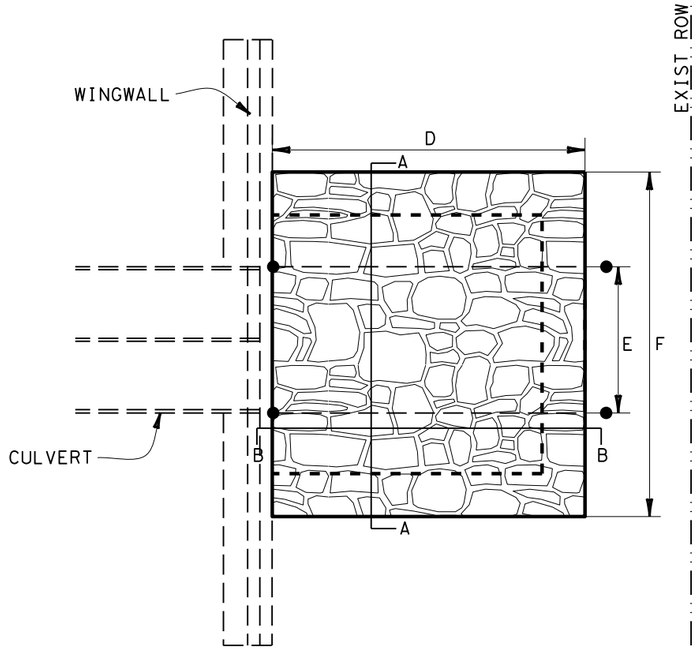
TEXAS DEPARTMENT OF TRANSPORTATION

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		87

8/30/2022 3:48:43 PM
c:\txdot\pw*online\txdot3\sergio.zapata\d0361225\STRUCTURAL WINGWALL EXTENSIONS.dgn



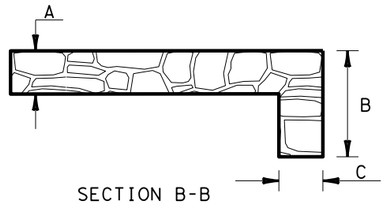
PLAN VIEW (FLARED WING OR SET)



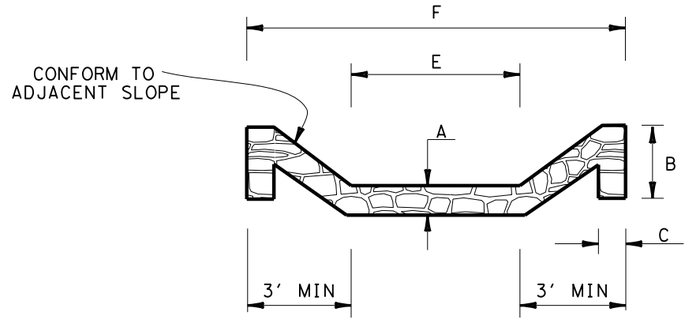
PLAN VIEW (PARALLEL WING)

RIPRAP DETAIL

NOT TO SCALE



SECTION B-B



SECTION A-A

ELEVATION VIEWS

NOTE: CEMENT STABILIZE BACKFILL AS DIRECTED

① ESTIMATED USING CULVERT LAYOUTS

② WIDTH OF CHANNEL TO BE VERIFIED IN THE FIELD

RIPRAP DIMENSIONS				
USUAL DIMENSIONS	A	B	C	Riprap Size
	1.5'	2.5'	1.5'	18"
LOCATION	① D	E	② F	CY
FM 2781 (CSJ: 2707-01-011, etc)				
STA 16+14	7.6'	3.3'	9.3'	5
STA 34+86	8'	13.4'	19.4'	11
STA 50+03	10'	15.8'	21.8'	15
STA 55+00 (RT)	3'	8.3'	14.3'	4
STA 55+00 (LT)	9'	8.3'	14.3'	9
STA 82+08	14.4'	3.1'	9.1'	10
STA 183+00	2'	3'	9'	2
STA 235+10.16 TO STA 235+39.83	-	-	-	40
STA 302+05	10.5'	17.8'	23.8'	16
STA 385+40	17'	10.2'	16.2'	21
STA 430+92	23.1'	3.8'	9.8'	16
STA 148+30 (REV)	10'	4.3'	10.3'	8
STA 113+27 (REV)	10'	9.3'	15.3'	11
STA 105+86 (REV)	8.3'	2.3'	8.3'	5
STA 77+00 (REV)	12.6'	3.8'	9.8'	9

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED
PROFESSIONAL ENGINEER

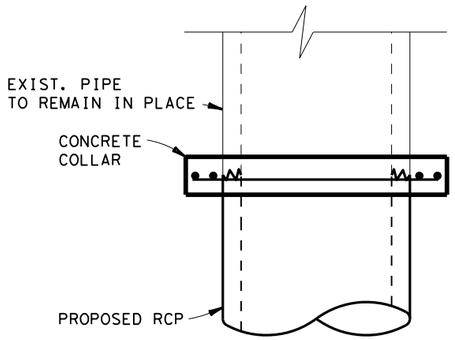
DocuSigned by:
cmb, P.E.
AF852E728AE64C8...
9/2/2022

MISCELLANEOUS DRAINAGE DETAILS

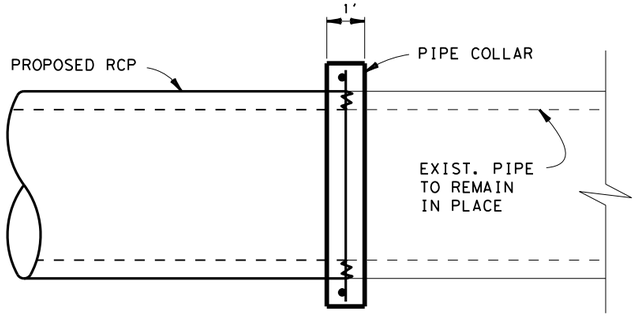
TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 1 OF 2

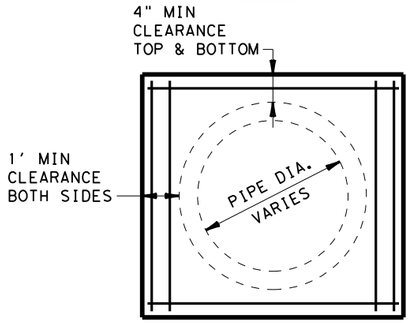
CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		88



PLAN



ELEVATION



SECTION

CONCRETE COLLAR NOTES:

1. A CLASS "C" CONCRETE COLLAR SHALL BE USED WHERE CONNECTING RCP TO EXISTING CMP & RCP, WHEN INSTALLING VERTICAL RCP BENDS AND AS DIRECTED BY THE ENGINEER.
2. REINFORCEMENT SHALL BE #4 BARS FIELD CUT TO FIT INSTALLATION.
3. REINFORCING BARS SHALL HAVE A MINIMUM OF 1 ½" OF CLEAR COVER.
4. CONCRETE COLLAR SHALL CONFORM TO THE OUTSIDE DIAMETER OF THE RCP.

CONCRETE COLLAR

N. T. S.

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED
PROFESSIONAL ENGINEER

DocuSigned by:
cmb P.E.
AF852E728A5C46C...
8/5/2022

MISCELLANEOUS DRAINAGE DETAILS

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 2 OF 2

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		89

8/5/2022 1:14:49 PM
c:\txdot\pw*online\txdot3\sergio.zapata\d0361219\MiscellaneousDrainageDetails.dgn

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)
50+03 (Both)	2 ~ 7'x 7'	3'	MC-7-10	PW-2	0°	2:1	8"	7"	1.000'	8.667'	N/A	N/A	15.333'	15.750'	N/A	0.0	1.2	37.8	520
55+00 (Both)	1 ~ 6'x 4'	3'	SCC-5&6	PW-2	30°	2:1	8"	7"	1.000'	5.667'	N/A	N/A	10.777'	8.275'	N/A	0.0	0.6	16.6	232
302+05 (Both)	2 ~ 8'x 5'	5'	MC-8-13	PW-2	30°	2:1	8"	7"	1.000'	6.667'	N/A	N/A	13.087'	20.496'	N/A	0.0	1.6	26.0	336
354+48 (Lt)	1 ~ 5'x 2'	2'	SCC-5&6	FW-0	0°	2:1	8"	7"	1.000'	3.417'	6.167'	3.560'	7.121'	N/A	N/A	0.9	0.2	1.9	27
354+48 (Rt)	1 ~ 5'x 2'	4'	SCC-5&6	PW-2	0°	2:1	8"	7"	1.000'	3.667'	N/A	N/A	6.333'	6.167'	N/A	0.0	0.2	3.7	45
385+40 (Both)	1 ~ 9'x 4'	4'	SCC-9	PW-2	0°	2:1	8"	7"	1.000'	5.667'	N/A	N/A	9.333'	10.167'	N/A	0.0	0.8	14.8	200

DATE: 8/5/2022 1:14:58 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0504752\bcsstde1-20.dgn

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

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

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

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

C = Curb height

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

Hw = Height of wingwall

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

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

Lw = Length of longest wingwall.

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

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

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

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

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

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

SPECIAL NOTE:

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

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

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED
PROFESSIONAL ENGINEER

DocuSigned by:
cmb, P.E.
AF85E728A5B4C9...
8/5/2022

Texas Department of Transportation

Bridge Division Standard

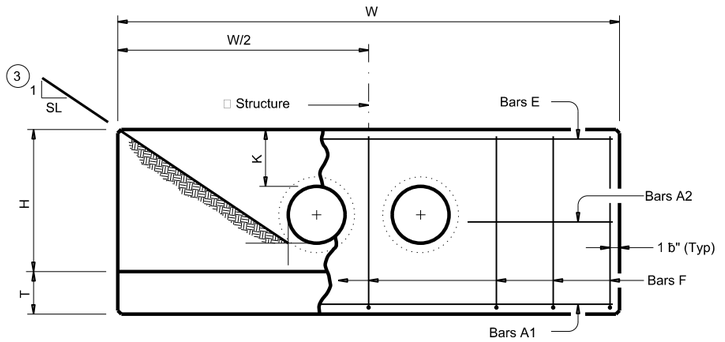
BOX CULVERT SUPPLEMENT
WINGS AND END TREATMENTS

BCS

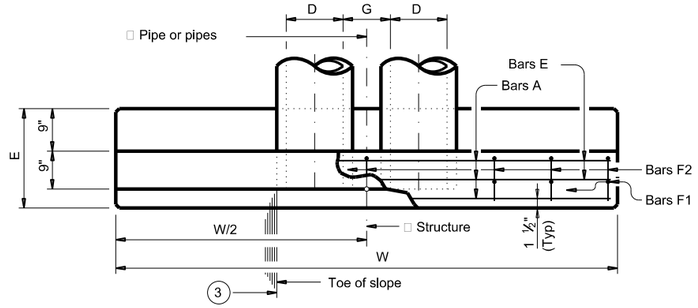
FILE: bcsstde1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2707	01	011, ETC.	FM 2781
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON, ETC.		90

TABLE OF VARIABLE DIMENSIONS AND QUANTITIES FOR ONE HEADWALL (5)

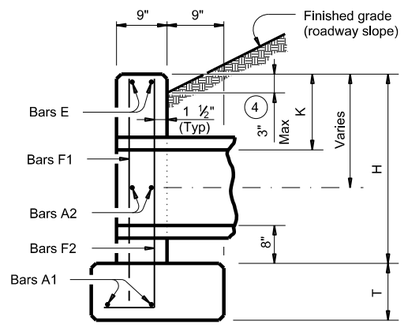
Slope	Dia of Pipe (D)	Values for One Pipe W	Values for One Pipe Reinf (Lbs) (1)	Values for One Pipe Conc (CY) (2)	Values To Be Added for Each Addt'l Pipe W	Values To Be Added for Each Addt'l Pipe Reinf (Lbs) (1)	Values To Be Added for Each Addt'l Pipe Conc (CY) (2)
2:1	12"	9' - 0"	122	1.1	1' - 9"	15	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



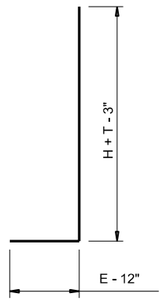
ELEVATION



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

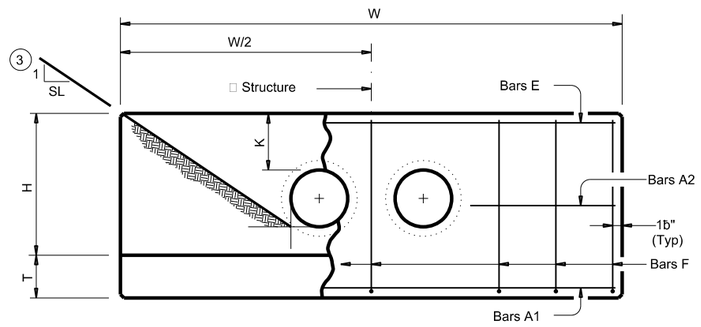
CH-PW-0

FILE: chpw0ste-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2707	01	011, ETC.	FM 2781
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON, ETC.		91

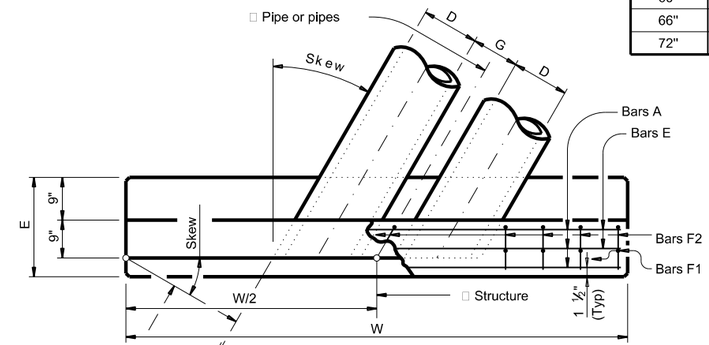
DATE: 8/5/2022 1:15:03 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0504752\chpw0ste-20.dgn

TABLE OF VARIABLE DIMENSIONS AND QUANTITIES FOR ONE HEADWALL (5)

Slope	Dia of Pipe (D)	15° Skew						30° Skew						45° Skew					
		Values for One Pipe			Values To Be Added for Each Addt'l Pipe			Values for One Pipe			Values To Be Added for Each Addt'l Pipe			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)	W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)
2:1	12"	9' - 4"	124	1.1	1' - 9 ¾"	15	0.2	10' - 5"	130	1.2	2' - 0"	16	0.2	12' - 9"	159	1.5	2' - 5 ¾"	17	0.3
	15"	10' - 7"	136	1.3	2' - 3"	17	0.2	11' - 10"	159	1.5	2' - 6"	18	0.2	14' - 6"	191	1.8	3' - 0 ¾"	20	0.3
	18"	11' - 11"	165	1.5	2' - 9"	19	0.3	13' - 3"	174	1.7	3' - 1"	29	0.3	16' - 3"	207	2.1	3' - 9 ¼"	33	0.4
	21"	13' - 2"	203	1.9	3' - 2 ¼"	31	0.4	14' - 9"	233	2.1	3' - 6 ¾"	33	0.4	18' - 0"	276	2.6	4' - 4 ¼"	36	0.5
	24"	14' - 6"	240	2.1	3' - 8 ¼"	34	0.4	16' - 2"	251	2.4	4' - 1 ¾"	36	0.5	19' - 10"	318	2.9	5' - 0 ¾"	39	0.6
	27"	15' - 9"	258	2.5	4' - 0 ¾"	38	0.5	17' - 7"	292	2.8	4' - 6 ¼"	39	0.6	21' - 7"	342	3.4	5' - 6 ¼"	44	0.7
	30"	17' - 1"	297	2.8	4' - 5 ¾"	40	0.6	19' - 1"	311	3.1	5' - 0"	42	0.6	23' - 4"	388	3.8	6' - 1 ¾"	47	0.8
	33"	18' - 5"	320	3.3	4' - 9 ¾"	43	0.6	20' - 6"	358	3.6	5' - 4 ¾"	46	0.7	25' - 1"	439	4.4	6' - 7 ¼"	51	0.9
	36"	19' - 8"	401	4.0	5' - 3"	47	0.9	21' - 11"	422	4.5	5' - 10 ¾"	50	0.9	26' - 10"	517	5.5	7' - 2 ¼"	55	1.2
	42"	22' - 3"	476	5.0	6' - 0 ¾"	53	1.1	24' - 10"	528	5.6	6' - 8 ¾"	56	1.2	30' - 5"	634	6.9	8' - 3"	76	1.4
	48"	25' - 11"	577	6.6	6' - 9 ¾"	60	1.3	28' - 10"	637	7.3	7' - 7 ¼"	79	1.5	35' - 4"	791	9.0	9' - 3 ¾"	88	1.8
	54"	28' - 6"	711	7.8	7' - 9"	83	1.6	31' - 9"	781	8.7	8' - 8"	81	1.8	38' - 11"	958	10.7	10' - 7 ¼"	97	2.2
	60"	31' - 1"	805	9.2	8' - 6 ¼"	91	1.9	34' - 8"	881	10.2	9' - 6 ¼"	97	2.1	42' - 5"	1,113	12.5	11' - 8"	124	2.6
	66"	33' - 8"	907	10.6	9' - 0 ¾"	98	2.1	37' - 6"	1,028	11.8	10' - 1 ¼"	102	2.4	46' - 0"	1,235	14.5	12' - 4 ¼"	132	2.9
	72"	36' - 3"	1,071	12.1	9' - 8"	105	2.4	40' - 5"	1,207	13.5	10' - 9 ¼"	110	2.6	49' - 6"	1,446	16.6	13' - 2 ¼"	141	3.2
3:1	12"	13' - 6"	178	1.6	1' - 9 ¾"	15	0.2	15' - 0"	189	1.8	2' - 0"	15	0.2	18' - 5"	237	2.2	2' - 5 ¾"	17	0.2
	15"	15' - 3"	212	1.9	2' - 3"	17	0.2	17' - 0"	223	2.1	2' - 6"	17	0.3	20' - 10"	276	2.6	3' - 0 ¾"	20	0.3
	18"	17' - 1"	231	2.3	2' - 9"	19	0.3	19' - 1"	259	2.5	3' - 1"	29	0.3	23' - 4"	318	3.1	3' - 9 ¼"	32	0.4
	21"	18' - 11"	306	2.7	3' - 2 ¼"	31	0.4	21' - 1"	339	3.0	3' - 6 ¾"	33	0.4	25' - 10"	413	3.7	4' - 4 ¼"	36	0.5
	24"	20' - 8"	345	3.1	3' - 8 ¾"	35	0.4	23' - 1"	384	3.5	4' - 1 ¾"	36	0.5	28' - 3"	462	4.2	5' - 0 ¾"	40	0.6
	27"	22' - 6"	376	3.7	4' - 0 ¾"	38	0.5	25' - 1"	438	4.1	4' - 6 ¼"	39	0.6	30' - 9"	522	5.0	5' - 6 ¼"	44	0.7
	30"	24' - 4"	422	4.1	4' - 5 ¾"	40	0.6	27' - 2"	466	4.6	5' - 0"	42	0.6	33' - 3"	578	5.6	6' - 1 ¾"	47	0.8
	33"	26' - 2"	476	4.8	4' - 10"	43	0.6	29' - 2"	522	5.3	5' - 4 ¾"	46	0.7	35' - 9"	644	6.5	6' - 7 ¼"	51	0.9
	36"	27' - 11"	590	5.9	5' - 3"	47	0.8	31' - 2"	645	6.6	5' - 10 ¾"	50	0.9	38' - 2"	787	8.0	7' - 2 ¼"	56	1.2
	42"	31' - 7"	684	7.3	6' - 0 ¼"	53	1.1	35' - 3"	776	8.2	6' - 8 ¾"	56	1.2	43' - 2"	933	10.0	8' - 3"	79	1.4
	48"	36' - 9"	880	9.6	6' - 9 ¾"	61	1.3	41' - 0"	953	10.7	7' - 7 ¼"	81	1.5	50' - 2"	1,166	13.1	9' - 3 ¾"	88	1.8
	54"	40' - 5"	1,065	11.4	7' - 9"	85	1.6	45' - 0"	1,185	12.7	8' - 8"	89	1.8	55' - 2"	1,435	15.5	10' - 7 ¼"	97	2.2
	60"	44' - 0"	1,224	13.3	8' - 6 ¼"	93	1.9	49' - 1"	1,356	14.8	9' - 6 ¼"	96	2.1	60' - 1"	1,635	18.2	11' - 8"	124	2.6
	66"	47' - 7"	1,357	15.4	9' - 1"	98	2.1	53' - 1"	1,497	17.2	10' - 1 ¼"	103	2.3	65' - 1"	1,892	21.1	12' - 4 ¼"	130	2.9
	72"	51' - 3"	1,624	17.7	9' - 8"	105	2.3	57' - 2"	1,787	19.7	10' - 9 ¼"	109	2.6	70' - 0"	2,218	24.1	13' - 2 ¼"	139	3.2
4:1	12"	17' - 7"	232	2.1	1' - 9 ¾"	15	0.2	19' - 8"	259	2.4	2' - 0"	16	0.2	24' - 0"	314	2.9	2' - 5 ¾"	18	0.2
	15"	19' - 11"	272	2.5	2' - 3"	17	0.2	22' - 3"	301	2.8	2' - 6"	18	0.3	27' - 3"	361	3.5	3' - 0 ¾"	21	0.3
	18"	22' - 3"	313	3.0	2' - 9"	19	0.3	24' - 10"	344	3.3	3' - 1"	29	0.3	30' - 5"	427	4.0	3' - 9 ¼"	32	0.4
	21"	24' - 7"	407	3.6	3' - 2 ¼"	31	0.4	27' - 5"	446	4.0	3' - 6 ¾"	33	0.4	33' - 7"	549	4.9	4' - 4 ¼"	36	0.5
	24"	26' - 11"	455	4.1	3' - 8 ¾"	35	0.4	30' - 0"	499	4.5	4' - 1 ¾"	36	0.5	36' - 9"	609	5.6	5' - 0 ¾"	40	0.6
	27"	29' - 3"	514	4.8	4' - 0 ¾"	38	0.5	32' - 7"	562	5.4	4' - 6 ¼"	40	0.6	39' - 11"	703	6.6	5' - 6 ¼"	43	0.7
	30"	31' - 7"	568	5.4	4' - 5 ¾"	40	0.6	35' - 3"	620	6.0	5' - 0"	42	0.6	43' - 2"	768	7.4	6' - 1 ¾"	49	0.8
	33"	33' - 11"	634	6.2	4' - 10"	43	0.7	37' - 10"	710	7.0	5' - 4 ¾"	46	0.7	46' - 4"	848	8.5	6' - 7 ¼"	52	0.9
	36"	36' - 3"	776	7.7	5' - 3"	48	0.9	40' - 5"	868	8.6	5' - 10 ¾"	49	0.9	49' - 6"	1,058	10.6	7' - 2 ¼"	56	1.1
	42"	40' - 11"	921	9.6	6' - 0 ¼"	53	1.0	45' - 7"	1,022	10.7	6' - 8 ¾"	57	1.2	55' - 10"	1,262	13.1	8' - 3"	78	1.4
	48"	47' - 7"	1,152	12.6	6' - 10"	61	1.3	53' - 1"	1,268	14.0	7' - 7 ¼"	80	1.5	65' - 1"	1,587	17.2	9' - 3 ¾"	86	1.8
	54"	52' - 3"	1,416	14.9	7' - 9 ¼"	86	1.6	58' - 4"	1,589	16.6	8' - 8"	89	1.8	71' - 5"	1,924	20.4	10' - 7 ¼"	95	2.2
	60"	56' - 11"	1,606	17.5	8' - 6 ¾"	92	1.9	63' - 6"	1,806	19.5	9' - 6 ¼"	95	2.1	77' - 9"	2,192	23.9	11' - 8"	122	2.6
	66"	61' - 7"	1,819	20.2	9' - 0 ¾"	97	2.1	68' - 8"	2,019	22.5	10' - 1 ¼"	101	2.4	84' - 2"	2,472	27.6	12' - 4 ¼"	131	2.9
	72"	66' - 3"	2,150	23.2	9' - 8"	104	2.4	73' - 11"	2,379	25.9	10' - 9 ¼"	108	2.6	90' - 6"	2,937	31.7	13' - 2 ¼"	138	3.2
6:1	12"	25' - 11"	342	3.1	1' - 9 ¾"	15	0.2	28' - 10"	374	3.5	2' - 0"	16	0.2	35' - 4"	456	4.3	2' - 5 ¾"	17	0.2
	15"	29' - 3"	390	3.7	2' - 3"	17	0.2	32' - 7"	442	4.2	2' - 6"	18	0.2	39' - 11"	549	5.1	3' - 0 ¾"	20	0.3
	18"	32' - 7"	459	4.4	2' - 9"	20	0.3	36' - 4"	515	4.9	3' - 1"	29	0.3	44' - 7"	629	6.0	3' - 9 ¼"	33	0.4
	21"	36' - 0"	608	5.3	3' - 2 ¼"	31	0.4	40' - 2"	660	5.9	3' - 6 ¾"	33	0.4	49' - 2"	823	7.2	4' - 4 ¼"	38	0.5
	24"	39' - 4"	672	6.0	3' - 8 ¾"	35	0.4	43' - 11"	748	6.7	4' - 1 ¾"	36	0.5	53' - 9"	920	8.2	5' - 0 ¾"	42	0.6
	27"	42' - 8"	770	7.1	4' - 0 ¾"	38	0.5	47' - 8"	852	8.0	4' - 6 ¼"	41	0.5	58' - 4"	1,039	9.7	5' - 6 ¼"	45	0.7
	30"	46' - 1"	839	8.0	4' - 5 ¾"	40	0.6	51' - 5"	949	8.9	5' - 0"	44	0.6	62' - 11"	1,162	10.9	6' - 1 ¾"	48	0.8
	33"	49' - 5"	947	9.2	4' - 10"	45	0.7	55' - 2"	1,040	10.3	5' - 4 ¾"	48	0.7	67' - 6"	1,292	12.6	6' - 7 ¼"	50	0.9
	36"	52' - 10"	1,151	11.4	5' - 3"	49	0.8	58' - 11"	1,287	12.7	5' - 10 ¾"	51	1.0	72' - 1"	1,583	15.6	7' - 2 ¼"	55	1.1
	42"	59' - 6"	1,365	14.2	6' - 0 ¼"	55	1.0	66' - 5"	1,530	15.8	6' - 8 ¾"	57	1.2	81' - 4"	1,875	19.4	8' - 3"	76	1.4
	48"	69' - 4"	1,737	18.5	6' - 10"	59	1.3	77' - 4"	1,942	20.7	7' - 7 ¼"	79	1.5	94' - 9"	2,368	25.3	9' - 3 ¾"	86	1.8
	54"	76' - 1"	2,138	22.0	7' - 9 ¼"	83	1.6	84' - 10"	2,378	24.6	8' - 8"	87	1.8	103' - 11"	2,912	30.1	10' - 7 ¼"	95	2.2
	60"	82' - 10"	2,426	25.8	8' - 6 ¾"	90	1.9	92' - 5"	2,681	28.8	9' - 6 ¼"	94	2.1	113' - 2"	3,294	35.3	11' - 8"	122	2.6
	66"	89' - 7"	2,730	29.9	9' - 0 ¾"	96	2.1	99' - 11"	3,038	33.3	10' - 1 ¼"	101	2.4	122' - 4"	3,697	40.8	12' - 4 ¼"	130	2.9
	72"	96' - 3"	3,218	34.2	9' - 8"	102	2.4	107' - 5"	3,580	38.2	10' - 9 ¼"	108	2.6	131' - 6"	4,372	46.8	13' - 2 ¼"	139	3.2



ELEVATION

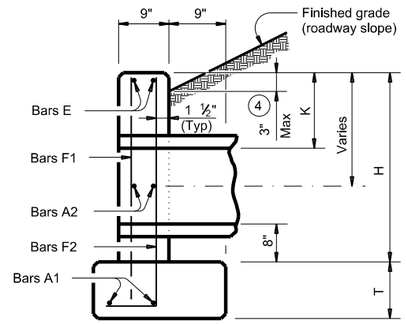


Lengths of wings based on SL:1 slope along this line.

3 Toe of slope

PLAN OF SKEWED PIPES

Showing 30° skew.



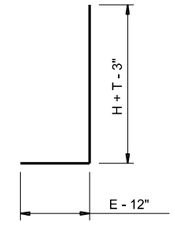
SECTION AT CENTER OF PIPE

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"	~



BARS F2

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.

(1) Total quantites 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).

Texas Department of Transportation | Bridge Division Standard

CONCRETE HEADWALLS WITH PARALLEL WINGS FOR SKEWED PIPE CULVERTS

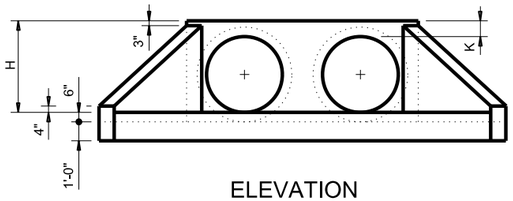
CH-PW-S

FILE: chpwsste-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2707	01	011, ETC.	FM 2781
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON, ETC.		92

DATE: 8/5/2022 1:15:07 PM
c:\txdot\pw_online\txdot3\sergio.zapata\d0504752\chpwsste-20.dgn

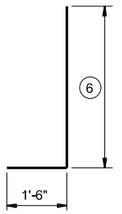
TABLE OF VARIABLE DIMENSIONS AND QUANTITIES FOR ONE HEADWALL (5)

Slope	Dia of Pipe (D)	Values for One Pipe W	X	Y	L	Reinf (Lbs)	Conc (CY) (1)	Values to be Added for Each Addt'l Pipe X and W	Reinf (Lbs)	Conc (CY) (1)
2:1	12"	4' - 7 ½"	2' - 6"	2' - 10"	3' - 3 ¼"	88	0.6	1' - 9"	20	0.2
	15"	5' - 5 ¾"	2' - 9 ½"	3' - 4"	3' - 10 ¼"	103	0.7	2' - 2"	24	0.3
	18"	6' - 4 ¼"	3' - 1"	3' - 10"	4' - 5"	124	0.9	2' - 8"	32	0.3
	21"	7' - 2 ¾"	3' - 4 ½"	4' - 4"	5' - 0"	143	1.1	3' - 1"	43	0.4
	24"	8' - 2 ½"	3' - 9 ½"	4' - 10"	5' - 7"	164	1.3	3' - 7"	50	0.5
	27"	9' - 1"	4' - 1"	5' - 4"	6' - 2"	179	1.5	3' - 11"	56	0.6
	30"	9' - 11 ½"	4' - 4 ½"	5' - 10"	6' - 8 ¾"	203	1.7	4' - 4"	65	0.8
	33"	10' - 10"	4' - 8"	6' - 4"	7' - 3 ¾"	224	2.0	4' - 8"	71	0.9
	36"	11' - 8 ¼"	4' - 11 ½"	6' - 10"	7' - 10 ¾"	249	2.2	5' - 1"	81	1.0
	42"	13' - 5 ¼"	5' - 6 ½"	7' - 10"	9' - 0 ½"	298	2.8	5' - 10"	97	1.3
	48"	15' - 9"	6' - 1 ½"	9' - 4"	10' - 9 ¼"	360	3.8	6' - 7"	117	1.7
	54"	17' - 5 ¾"	6' - 8 ½"	10' - 4"	11' - 11 ¼"	427	4.5	7' - 6"	151	2.1
	60"	19' - 2 ¾"	7' - 3 ½"	11' - 4"	13' - 1"	481	5.3	8' - 3"	174	2.5
	66"	20' - 11 ½"	7' - 10 ½"	12' - 4"	14' - 3"	544	6.2	8' - 9"	194	2.9
	72"	22' - 8 ½"	8' - 5 ½"	13' - 4"	15' - 4 ¾"	601	7.1	9' - 4"	213	3.3
3:1	12"	6' - 3"	2' - 6"	4' - 3"	4' - 11"	118	0.8	1' - 9"	22	0.2
	15"	7' - 5"	2' - 9 ½"	5' - 0"	5' - 9 ¼"	137	1.1	2' - 2"	28	0.3
	18"	8' - 6 ¾"	3' - 1"	5' - 9"	6' - 7 ¾"	170	1.3	2' - 8"	37	0.5
	21"	9' - 8 ¾"	3' - 4 ½"	6' - 6"	7' - 6"	195	1.6	3' - 1"	48	0.6
	24"	11' - 0"	3' - 9 ½"	7' - 3"	8' - 4 ½"	227	2.0	3' - 7"	58	0.7
	27"	12' - 2"	4' - 1"	8' - 0"	9' - 2 ¾"	251	2.3	3' - 11"	67	0.8
	30"	13' - 4"	4' - 4 ½"	8' - 9"	10' - 1 ¼"	293	2.7	4' - 4"	77	1.0
	33"	14' - 5 ¾"	4' - 8"	9' - 6"	10' - 11 ¾"	318	3.1	4' - 8"	84	1.2
	36"	15' - 7 ¾"	4' - 11 ½"	10' - 3"	11' - 10"	351	3.5	5' - 1"	96	1.4
	42"	17' - 11 ½"	5' - 6 ½"	11' - 9"	13' - 6 ¾"	432	4.5	5' - 10"	119	1.7
	48"	21' - 1 ¾"	6' - 1 ½"	14' - 0"	16' - 2"	537	6.1	6' - 7"	146	2.3
	54"	23' - 5 ½"	6' - 8 ½"	15' - 6"	17' - 10 ¾"	630	7.3	7' - 6"	186	2.9
	60"	25' - 9 ¼"	7' - 3 ½"	17' - 0"	19' - 7 ½"	719	8.7	8' - 3"	219	3.4
	66"	28' - 1"	7' - 10 ½"	18' - 6"	21' - 4 ¼"	811	10.1	8' - 9"	242	3.9
	72"	30' - 4 ¾"	8' - 5 ½"	20' - 0"	23' - 1 ¼"	924	11.7	9' - 4"	272	4.4
4:1	12"	7' - 10 ¾"	2' - 6"	5' - 8"	6' - 6 ½"	148	1.1	1' - 9"	24	0.3
	15"	9' - 4"	2' - 9 ½"	6' - 8"	7' - 8 ½"	181	1.5	2' - 2"	32	0.4
	18"	10' - 9 ½"	3' - 1"	7' - 8"	8' - 10 ¼"	221	1.9	2' - 8"	42	0.5
	21"	12' - 2 ¾"	3' - 4 ½"	8' - 8"	10' - 0"	260	2.3	3' - 1"	57	0.7
	24"	13' - 9 ½"	3' - 9 ½"	9' - 8"	11' - 2"	301	2.8	3' - 7"	67	0.9
	27"	15' - 3"	4' - 1"	10' - 8"	12' - 3 ¾"	334	3.3	3' - 11"	77	1.0
	30"	16' - 8 ¼"	4' - 4 ½"	11' - 8"	13' - 5 ¾"	385	3.8	4' - 4"	89	1.3
	33"	18' - 1 ¾"	4' - 8"	12' - 8"	14' - 7 ½"	425	4.5	4' - 8"	101	1.4
	36"	19' - 7"	4' - 11 ½"	13' - 8"	15' - 9 ¼"	472	5.1	5' - 1"	115	1.7
	42"	22' - 5 ¾"	5' - 6 ½"	15' - 8"	18' - 1"	583	6.5	5' - 10"	141	2.1
	48"	26' - 6 ¼"	6' - 1 ½"	18' - 8"	21' - 6 ¾"	730	8.9	6' - 7"	175	2.8
	54"	29' - 5"	6' - 8 ½"	20' - 8"	23' - 10 ¼"	875	10.7	7' - 6"	226	3.6
	60"	32' - 3 ¾"	7' - 3 ½"	22' - 8"	26' - 2"	996	12.7	8' - 3"	264	4.3
	66"	35' - 2 ½"	7' - 10 ½"	24' - 8"	28' - 5 ¾"	1,140	14.9	8' - 9"	300	4.9
	72"	38' - 1 ¼"	8' - 5 ½"	26' - 8"	30' - 9 ½"	1,297	17.3	9' - 4"	334	5.6
6:1	12"	11' - 2"	2' - 6"	8' - 6"	9' - 9 ¾"	224	1.9	1' - 9"	28	0.4
	15"	13' - 2 ¼"	2' - 9 ½"	10' - 0"	11' - 6 ½"	268	2.5	2' - 2"	37	0.5
	18"	15' - 2 ½"	3' - 1"	11' - 6"	13' - 3 ¼"	330	3.2	2' - 8"	50	0.7
	21"	17' - 2 ¾"	3' - 4 ½"	13' - 0"	15' - 0 ¼"	387	3.9	3' - 1"	69	0.9
	24"	19' - 4 ½"	3' - 9 ½"	14' - 6"	16' - 9"	453	4.8	3' - 7"	80	1.2
	27"	21' - 4 ¾"	4' - 1"	16' - 0"	18' - 5 ¾"	512	5.7	3' - 11"	96	1.4
	30"	23' - 5 ¼"	4' - 4 ½"	17' - 6"	20' - 2 ½"	593	6.7	4' - 4"	110	1.7
	33"	25' - 5 ½"	4' - 8"	19' - 0"	21' - 11 ¼"	675	7.8	4' - 8"	127	2.0
	36"	27' - 5 ¾"	4' - 11 ½"	20' - 6"	23' - 8"	735	9.0	5' - 1"	144	2.3
	42"	31' - 6 ¼"	5' - 6 ½"	23' - 6"	27' - 1 ½"	922	11.5	5' - 10"	179	3.0
	48"	37' - 3 ½"	6' - 1 ½"	28' - 0"	32' - 4"	1,191	15.9	6' - 7"	231	4.0
	54"	41' - 4 ¼"	6' - 8 ½"	31' - 0"	35' - 9 ½"	1,424	19.2	7' - 6"	300	5.0
	60"	45' - 4 ¾"	7' - 3 ½"	34' - 0"	39' - 3"	1,631	22.9	8' - 3"	353	6.0

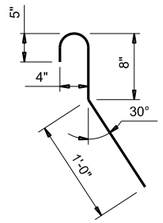


ELEVATION

(Showing dimensions.)



BARS V



BARS CL

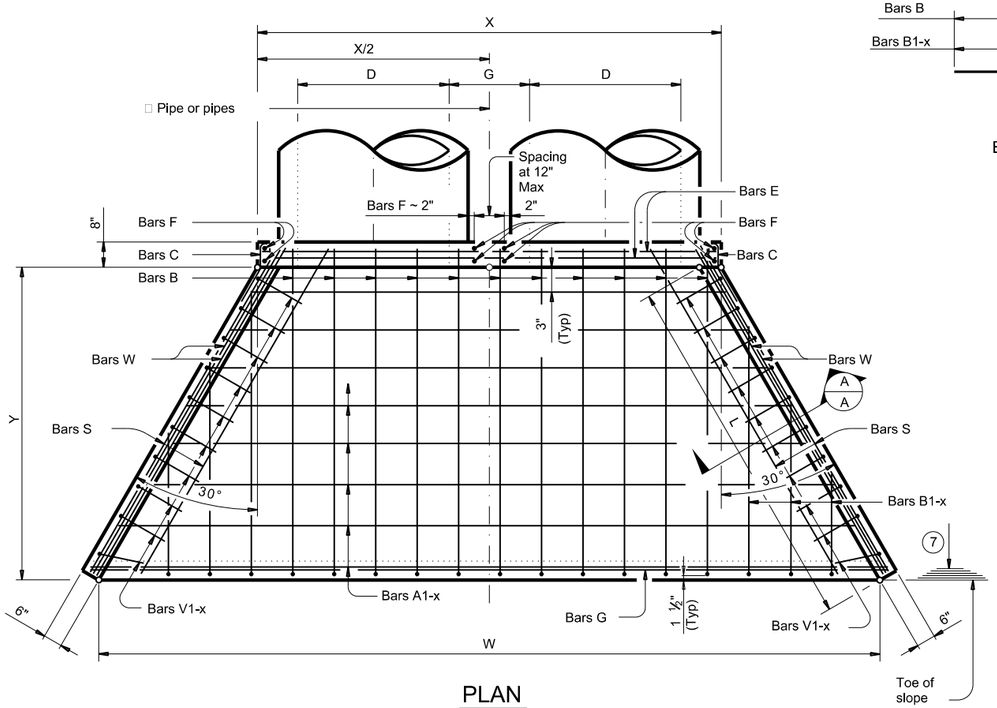
(Length = 2'-5")

TABLE OF REINFORCING STEEL (5)

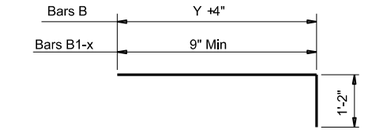
Bar	Size	Spa	No.
A	#4	1' - 0"	~
B	#3	1' - 6"	~
C	#4	1' - 0"	~
D	#3	1' - 0"	~
E	#5	~	4
F	#5	~	~
G	#3	~	2
S	#4	~	6
V	#4	1' - 0"	~
W	#5	~	4

TABLE OF CONSTANT DIMENSIONS

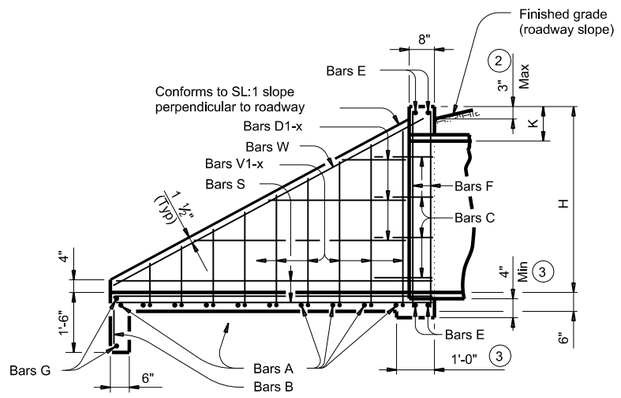
Dia of Pipe (D)	G	K (4)	H
12"	0' - 9"	1' - 0"	2' - 0"
15"	0' - 11"	1' - 0"	2' - 3"
18"	1' - 2"	1' - 0"	2' - 6"
21"	1' - 4"	1' - 0"	2' - 9"
24"	1' - 7"	1' - 0"	3' - 0"
27"	1' - 8"	1' - 0"	3' - 3"
30"	1' - 10"	1' - 0"	3' - 6"
33"	1' - 11"	1' - 0"	3' - 9"
36"	2' - 1"	1' - 0"	4' - 0"
42"	2' - 4"	1' - 0"	4' - 6"
48"	2' - 7"	1' - 3"	5' - 3"
54"	3' - 0"	1' - 3"	5' - 9"
60"	3' - 3"	1' - 3"	6' - 3"
66"	3' - 3"	1' - 3"	6' - 9"
72"	3' - 4"	1' - 3"	7' - 3"



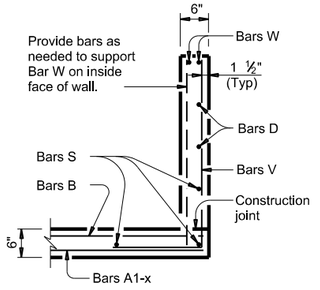
PLAN



BARS B and B1-x



TYPICAL WING ELEVATION



SECTION A-A

(1) Quantities shown are for concrete pipe and will increase slightly for metal pipe installations.

(2) 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.

(3) Provide a 1'-0" footing as shown where required to maintain 4" minimum cover for pipes.

(4) Dimensions shown are usual and maximum.

(5) Quantities shown are for one structure end only (one headwall).

(6) Min Length = 6" + 3" x $\left(\frac{12 \times H}{12 \times L} - 7\right)$

Max Length = 12 x H + 3" x $\left(\frac{12 \times H}{12 \times L} - 7\right)$ -

(7) Lengths of wings based on SL:1 slope along this line.

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 FLARED WINGS FOR 0° SKEW PIPE CULVERTS

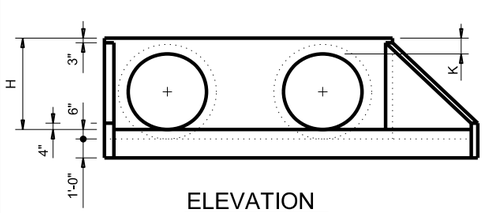
CH-FW-0

FILE: chfw00se-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2707	01	011, ETC.	FM 2781
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON, ETC.		92A

DATE: 8/25/2022 1:11:08 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0504752\chfw00se-20.dgn

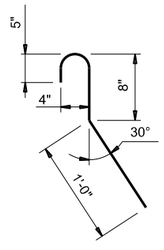
TABLE OF VARIABLE DIMENSIONS AND QUANTITIES FOR ONE HEADWALL (5)

Slope	Dia of Pipe (D)	Values for One Pipe W	X	Y	L	Reinf (Lbs)	Conc (CY) (1)	Values to be Added for Each Addt'l Pipe X and W	Reinf (Lbs)	Conc (CY) (1)
2:1	12"	3' - 3 ½"	2' - 8 ¾"	2' - 10"	3' - 3 ¼"	85	0.5	1' - 9 ¾"	20	0.2
	15"	3' - 10 ½"	3' - 0 ¼"	3' - 4"	3' - 10 ¼"	97	0.6	2' - 3"	25	0.3
	18"	4' - 5 ½"	3' - 4"	3' - 10"	4' - 5"	119	0.8	2' - 9 ¼"	32	0.4
	21"	5' - 0 ¾"	3' - 7 ½"	4' - 4"	5' - 0"	134	0.9	3' - 2 ¼"	43	0.5
	24"	5' - 9 ¼"	4' - 0 ¾"	4' - 10"	5' - 7"	154	1.1	3' - 8 ½"	51	0.6
	27"	6' - 4 ½"	4' - 4 ½"	5' - 4"	6' - 2"	164	1.3	4' - 0 ¾"	57	0.7
	30"	6' - 11 ½"	4' - 8"	5' - 10"	6' - 8 ¾"	187	1.5	4' - 5 ¾"	67	0.8
	33"	7' - 6 ½"	4' - 11 ¾"	6' - 4"	7' - 3 ¾"	205	1.7	4' - 10"	73	0.9
	36"	8' - 1 ¾"	5' - 3 ¼"	6' - 10"	7' - 10 ¾"	231	1.9	5' - 3 ¼"	82	1.1
	42"	9' - 3 ¾"	5' - 10 ½"	7' - 10"	9' - 0 ½"	271	2.4	6' - 0 ½"	100	1.4
	48"	10' - 9 ½"	6' - 5 ¾"	9' - 4"	10' - 9 ¼"	325	3.2	6' - 9 ¾"	121	1.8
	54"	11' - 11 ¾"	7' - 1"	10' - 4"	11' - 11 ¼"	384	3.8	7' - 9 ¼"	154	2.2
	60"	13' - 1 ¾"	7' - 8 ¼"	11' - 4"	13' - 1"	431	4.5	8' - 6 ½"	178	2.6
	66"	14' - 4"	8' - 3 ½"	12' - 4"	14' - 3"	489	5.3	9' - 0 ¾"	198	3.0
	72"	15' - 6 ¼"	8' - 10 ¾"	13' - 4"	15' - 4 ¾"	537	6.1	9' - 8"	220	3.3
3:1	12"	4' - 1 ¼"	2' - 8 ¾"	4' - 3"	4' - 11"	108	0.7	1' - 9 ¾"	23	0.2
	15"	4' - 10"	3' - 0 ¼"	5' - 0"	5' - 9 ¼"	127	0.9	2' - 3"	29	0.3
	18"	5' - 7"	3' - 4"	5' - 9"	6' - 7 ¾"	156	1.1	2' - 9 ¼"	37	0.5
	21"	6' - 3 ¾"	3' - 7 ½"	6' - 6"	7' - 6"	177	1.3	3' - 2 ¼"	49	0.6
	24"	7' - 2"	4' - 0 ¾"	7' - 3"	8' - 4 ½"	204	1.6	3' - 8 ½"	59	0.7
	27"	7' - 11"	4' - 4 ½"	8' - 0"	9' - 2 ¾"	225	1.9	4' - 0 ¾"	68	0.9
	30"	8' - 7 ¾"	4' - 8"	8' - 9"	10' - 1 ¼"	260	2.2	4' - 5 ¾"	79	1.0
	33"	9' - 4 ½"	4' - 11 ¾"	9' - 6"	10' - 11 ¾"	282	2.5	4' - 10"	86	1.2
	36"	10' - 1 ¼"	5' - 3 ¼"	10' - 3"	11' - 10"	313	2.9	5' - 3 ¼"	97	1.4
	42"	11' - 7"	5' - 10 ½"	11' - 9"	13' - 6 ¾"	379	3.7	6' - 0 ½"	122	1.8
	48"	13' - 5 ¾"	6' - 5 ¾"	14' - 0"	16' - 2"	465	4.9	6' - 9 ¾"	152	2.4
	54"	14' - 11 ½"	7' - 1"	15' - 6"	17' - 10 ¾"	544	5.9	7' - 9 ¼"	190	3.0
	60"	16' - 5"	7' - 8 ¼"	17' - 0"	19' - 7 ½"	616	7.0	8' - 6 ½"	224	3.5
	66"	17' - 10 ¾"	8' - 3 ½"	18' - 6"	21' - 4 ¼"	701	8.1	9' - 0 ¾"	248	4.0
	72"	19' - 4 ¼"	8' - 10 ¾"	20' - 0"	23' - 1 ¼"	786	9.4	9' - 8"	281	4.6
4:1	12"	4' - 11"	2' - 8 ¾"	5' - 8"	6' - 6 ½"	136	0.9	1' - 9 ¾"	26	0.3
	15"	5' - 9 ½"	3' - 0 ¼"	6' - 8"	7' - 8 ½"	162	1.2	2' - 3"	33	0.4
	18"	6' - 8 ¼"	3' - 4"	7' - 8"	8' - 10 ¼"	198	1.5	2' - 9 ¼"	43	0.6
	21"	7' - 6 ¾"	3' - 7 ½"	8' - 8"	10' - 0"	232	1.8	3' - 2 ¼"	57	0.7
	24"	8' - 6 ¾"	4' - 0 ¾"	9' - 8"	11' - 2"	264	2.2	3' - 8 ½"	68	0.9
	27"	9' - 5 ¼"	4' - 4 ½"	10' - 8"	12' - 3 ¾"	292	2.6	4' - 0 ¾"	79	1.1
	30"	10' - 4"	4' - 8"	11' - 8"	13' - 5 ¾"	333	3.0	4' - 5 ¾"	91	1.3
	33"	11' - 2 ½"	4' - 11 ¾"	12' - 8"	14' - 7 ½"	368	3.5	4' - 10"	104	1.5
	36"	12' - 1"	5' - 3 ¼"	13' - 8"	15' - 9 ¼"	411	4.0	5' - 3 ¼"	115	1.7
	42"	13' - 10"	5' - 10 ½"	15' - 8"	18' - 1"	495	5.1	6' - 0 ½"	144	2.2
	48"	16' - 2 ¼"	6' - 5 ¾"	18' - 8"	21' - 6 ¾"	612	6.8	6' - 9 ¾"	183	3.0
	54"	17' - 11 ¼"	7' - 1"	20' - 8"	23' - 10 ¼"	729	8.2	7' - 9 ¼"	231	3.7
	60"	19' - 8 ¼"	7' - 8 ¼"	22' - 8"	26' - 2"	824	9.8	8' - 6 ½"	270	4.4
	66"	21' - 5 ½"	8' - 3 ½"	24' - 8"	28' - 5 ¾"	947	11.4	9' - 0 ¾"	305	5.0
	72"	23' - 2 ½"	8' - 10 ¾"	26' - 8"	30' - 9 ½"	1,060	13.2	9' - 8"	342	5.7
6:1	12"	6' - 6 ¾"	2' - 8 ¾"	8' - 6"	9' - 9 ¾"	192	1.4	1' - 9 ¾"	30	0.4
	15"	7' - 8 ¾"	3' - 0 ¼"	10' - 0"	11' - 6 ½"	230	1.9	2' - 3"	40	0.5
	18"	8' - 10 ¾"	3' - 4"	11' - 6"	13' - 3 ¼"	281	2.4	2' - 9 ¼"	51	0.7
	21"	10' - 0 ¾"	3' - 7 ½"	13' - 0"	15' - 0 ¼"	334	2.9	3' - 2 ¼"	69	1.0
	24"	11' - 4 ¼"	4' - 0 ¾"	14' - 6"	16' - 9"	377	3.5	3' - 8 ½"	83	1.3
	27"	12' - 6 ¼"	4' - 4 ½"	16' - 0"	18' - 5 ¾"	428	4.2	4' - 0 ¾"	98	1.5
	30"	13' - 8 ¼"	4' - 8"	17' - 6"	20' - 2 ½"	488	4.9	4' - 5 ¾"	113	1.8
	33"	14' - 10 ¼"	4' - 11 ¾"	19' - 0"	21' - 11 ¼"	551	5.7	4' - 10"	130	2.0
	36"	16' - 0 ¼"	5' - 3 ¼"	20' - 6"	23' - 8"	606	6.5	5' - 3 ¼"	145	2.4
	42"	18' - 4 ½"	5' - 10 ½"	23' - 6"	27' - 1 ½"	740	8.4	6' - 0 ½"	184	3.1
	48"	21' - 6 ¾"	6' - 5 ¾"	28' - 0"	32' - 4"	946	11.4	6' - 9 ¾"	240	4.1
	54"	23' - 10 ¾"	7' - 1"	31' - 0"	35' - 9 ½"	1,124	13.8	7' - 9 ¼"	303	5.2
	60"	26' - 2 ¾"	7' - 8 ¼"	34' - 0"	39' - 3"	1,278	16.4	8' - 6 ½"	358	6.2



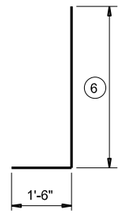
ELEVATION

(Showing dimensions.)

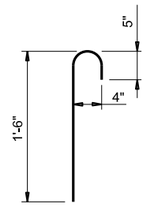


BARS CL

(Length = 2'-5")

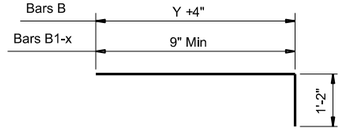


BARS VL and VS



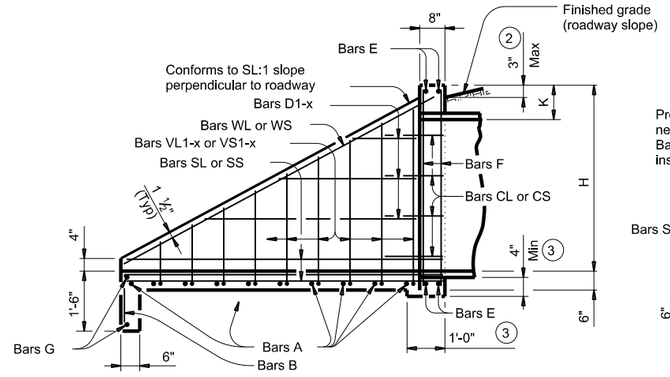
BARS CS

(Length = 2'-3")

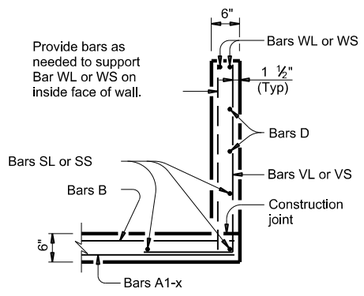


BARS B and B1-x

PLAN



TYPICAL WING ELEVATION



SECTION A-A

TABLE OF REINFORCING STEEL (5)

Bar	Size	Spa	No.
A	#4	1' - 0"	~
B	#3	1' - 6"	~
CL & CS	#4	1' - 0"	~
D	#3	1' - 0"	~
E	#5	~	4
F	#5	~	~
G	#3	~	2
SL & SS	#4	~	6
VL & VS	#4	1' - 0"	~
WL & WS	#5	~	4

TABLE OF CONSTANT DIMENSIONS

Dia of Pipe (D)	G	K (4)	H
12"	0' - 9"	1' - 0"	2' - 0"
15"	0' - 11"	1' - 0"	2' - 3"
18"	1' - 2"	1' - 0"	2' - 6"
21"	1' - 4"	1' - 0"	2' - 9"
24"	1' - 7"	1' - 0"	3' - 0"
27"	1' - 8"	1' - 0"	3' - 3"
30"	1' - 10"	1' - 0"	3' - 6"
33"	1' - 11"	1' - 0"	3' - 9"
36"	2' - 1"	1' - 0"	4' - 0"
42"	2' - 4"	1' - 0"	4' - 6"
48"	2' - 7"	1' - 3"	5' - 3"
54"	3' - 0"	1' - 3"	5' - 9"
60"	3' - 3"	1' - 3"	6' - 3"
66"	3' - 3"	1' - 3"	6' - 9"
72"	3' - 4"	1' - 3"	7' - 3"

(1) Quantities shown are for concrete pipe and will increase slightly for metal pipe installations.

(2) 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.

(3) Provide a 1'-0" footing as shown where required to maintain 4" minimum cover for pipes.

(4) Dimensions shown are usual and maximum.

(5) Quantities shown are for one structure end only (one headwall).

(6) Min Length = 6" 3" x $\left(\frac{12 \times H \ 7\text{-}}{12 \times L}\right)$

Max Length = 12 x H 3" x - $\left(\frac{12 \times H \ 7\text{-}}{12 \times L}\right)$ -

(7) Lengths of wings based on SL:1 slope along this line.

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 FLARED WINGS FOR 15° SKEW PIPE CULVERTS

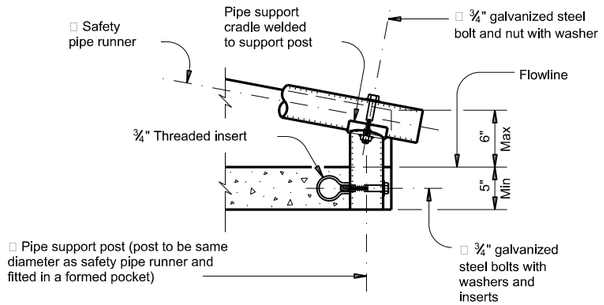
CH-FW-15

FILE: chfw15se-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2707	01	011, ETC.	FM 2781
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON, ETC.		93

DATE: 8/25/2022 3:39:56 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0504752\chfw15se-20.dgn

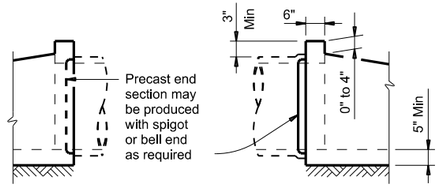
REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

Pipe I.D.	RCP Wall "B" Thickness	TP Wall Thickness (8)	"D" (1)	Slope	Min Length of Unit	Single Pipe		Multiple Pipes	
						Skew	Pipe Runners Required	Skew	Pipe Runners Required
12"	2"	1.15"	17.00"	3:1	2' - 11"	≤ 45°	No	≤ 45°	No
				4:1	3' - 6"				
				6:1	4' - 9"				
15"	2 ¼"	1.30"	20.50"	3:1	3' - 8"	≤ 45°	No	≤ 45°	No
				4:1	4' - 7"				
				6:1	6' - 5"				
18"	2 ½"	1.60"	24.00"	3:1	4' - 6"	≤ 45°	No	≤ 45°	No
				4:1	5' - 8"				
				6:1	8' - 0"				
24"	3"	1.95"	31.00"	3:1	6' - 2"	≤ 45°	No	= 30°	No
				4:1	7' - 10"			> 30°	Yes
				6:1	11' - 3"				
30"	3 ½"	2.65"	38.50"	3:1	7' - 10"	= 15°	No	= 15°	No
				4:1	10' - 1"	> 15°	Yes	> 15°	Yes
				6:1	14' - 8"				
36"	4"	2.75"	45.50"	3:1	9' - 5"	= 0°	No	≥ 0°	Yes
				4:1	12' - 3"	> 0°	Yes		
				6:1	17' - 11"				
42"	4 ½"	2.7"	52.50"	3:1	11' - 1"	≥ 0°	Yes	≥ 0°	Yes
				4:1	14' - 5"				
				6:1	21' - 2"				



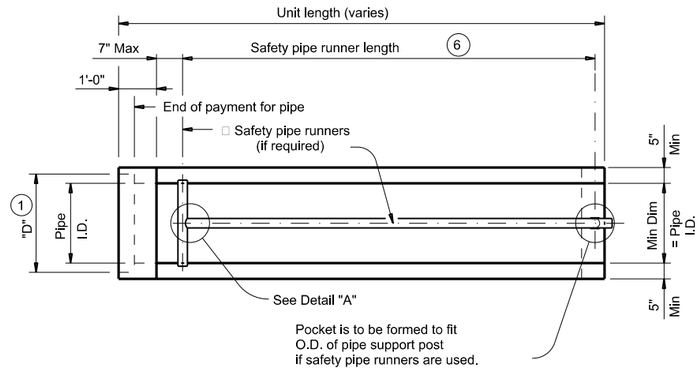
END DETAIL FOR INSTALLATION OF SAFETY PIPE RUNNERS

(If required)



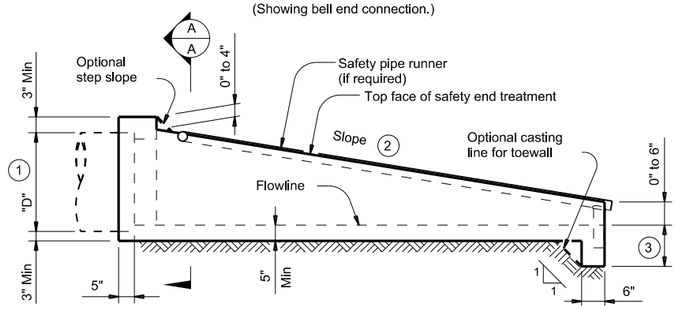
OPTIONAL JOINT FOR RCP

(Showing joint between RCP and precast safety end treatment)



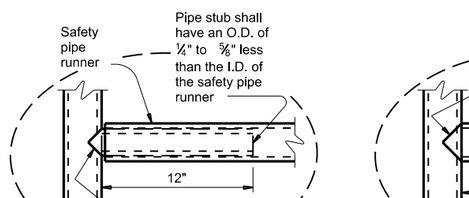
PLAN

(Showing bell end connection.)

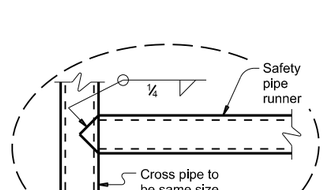


LONGITUDINAL ELEVATION

(Showing bell end connection.)



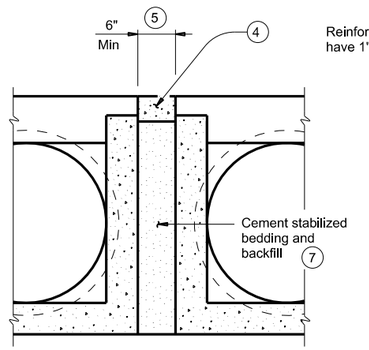
OPTION A



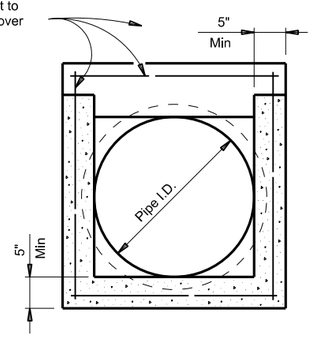
OPTION B

DETAIL A

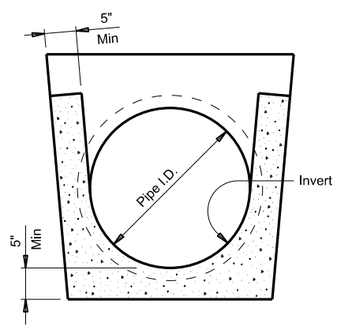
(If required)



MULTIPLE PIPE INSTALLATION

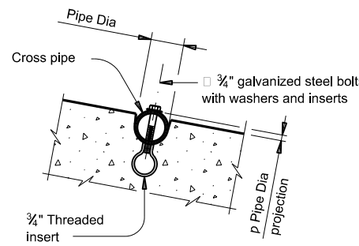


OPTION WITH SQUARE BOTTOM



OPTION WITH INVERT BOTTOM

SECTION A-A



INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)

SAFETY PIPE RUNNER DIMENSIONS

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

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

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

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

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

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

(6) Measured along slope.

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

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

GENERAL NOTES:

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

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

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

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

A. Provide minimum reinforcing of #4 at 6" (Grade 40) or #4 at 9" (Grade 60) each way or 6"x6" - D12 x D12 or 5"x5" - D10 x D10 welded wire reinforcement (WWR).

B. For precast (steel formed) sections, provide Class "C" concrete (f'c = 3,600 psi).

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

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

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

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

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

Texas Department of Transportation

Bridge Division Standard

PRECAST SAFETY END TREATMENT

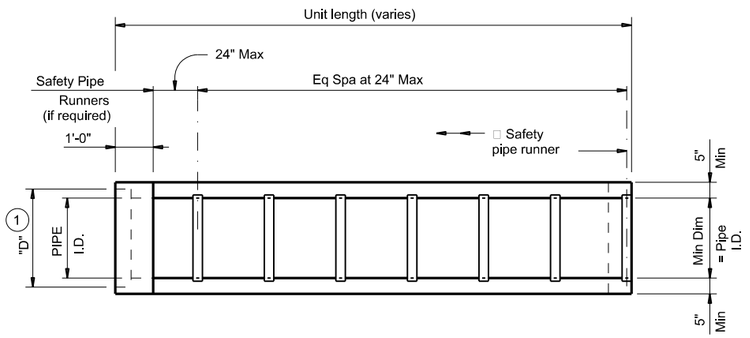
TYPE II ~ CROSS DRAINAGE

PSET-SC

FILE: psetscss-21.dgn	DN: RLW	CK: KLR	DW: JTR	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS 12-21: Added 42" TP	2707	01	011, ETC.	FM 2781
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON, ETC.		94

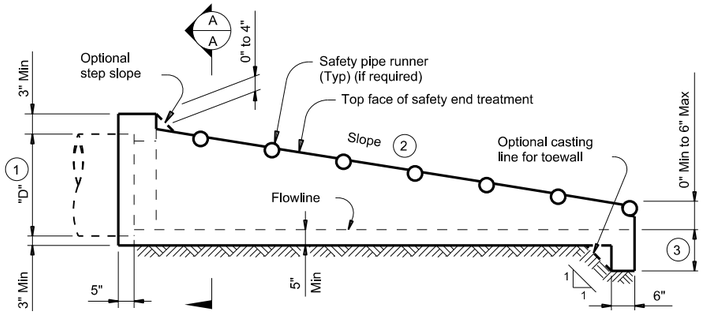
DATE: 8/5/2022 1:15:16 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0504752\psetscss-21.dgn

DATE: 8/5/2022 1:15:20 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0504752\psetspss-21.dgn



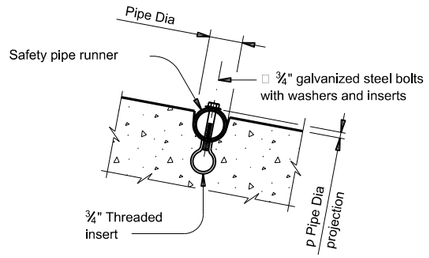
PLAN

(Showing bell end connection.)



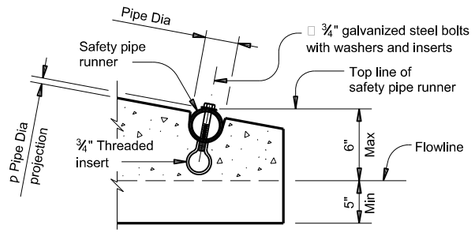
LONGITUDINAL ELEVATION

(Showing bell end connection.)

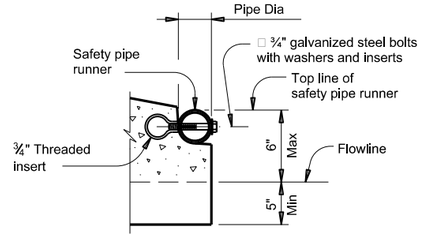


INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)



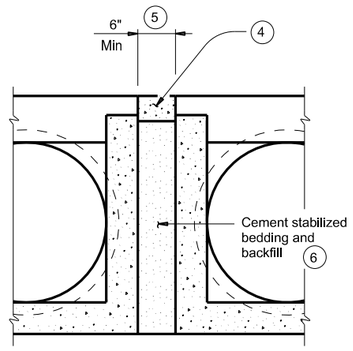
OPTION A



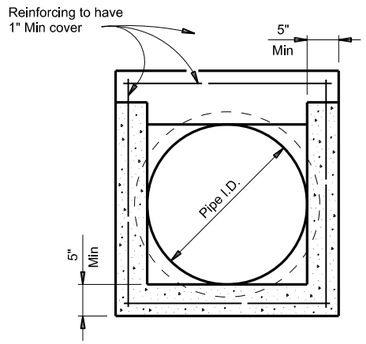
OPTION B

END DETAILS FOR INSTALLATION OF SAFETY PIPE RUNNERS

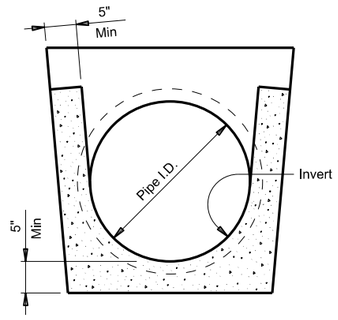
(If required)



MULTIPLE PIPE INSTALLATION

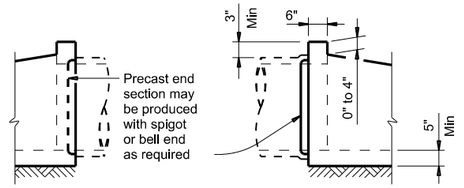


OPTION WITH SQUARE BOTTOM



OPTION WITH INVERT BOTTOM

SECTION A-A



OPTIONAL JOINT FOR RCP

(Showing joint between RCP and precast safety end treatment.)

REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

Pipe I.D.	RCP Wall "B" Thickness	TP Wall Thickness (7)	"D" (1)	Slope	Min Length	Pipe Runners Required		Required Pipe Runner Size		
						Single Pipe	Multiple Pipe	Nominal Dia.	O.D.	I.D.
12"	2"	1.15"	17.00"	6:1	4' - 9"	No	Yes, for > 2 pipes	3" STD	3.500"	3.068"
15"	2 ¼"	1.30"	20.50"	6:1	6' - 5"	No	Yes, for > 2 pipes	3" STD	3.500"	3.068"
18"	2 ½"	1.60"	24.00"	6:1	8' - 0"	No	Yes, for > 2 pipes	3" STD	3.500"	3.068"
24"	3"	1.95"	31.00"	6:1	11' - 3"	No	Yes, for > 2 pipes	3" STD	3.500"	3.068"
30"	3 ½"	2.65"	38.50"	6:1	14' - 8"	No	Yes	4" STD	4.500"	4.026"
36"	4"	2.75"	45.50"	6:1	17' - 11"	Yes	Yes	4" STD	4.500"	4.026"
42"	4 ½"	2.7"	52.50"	6:1	21' - 2"	Yes	Yes	4" STD	4.500"	4.026"

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

(2) Slope as shown elsewhere in the plans. Slope of 6:1 or flatter is required for vehicle safety.

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

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

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

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

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

GENERAL NOTES:

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

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

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

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

A. Provide minimum reinforcing of #4 at 6" (Grade 40) or #4 at 9" (Grade 60) each way or 6"x6" - D12 x D12 or 5"x5" - D10 x D10 welded wire reinforcement (WWR).

B. For precast (steel formed) sections, provide Class "C" concrete (f'c = 3,600 psi).

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

Pipe runners are designed for a traversing load of 10,000 Lbs at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.

Provide pipe runners meeting the requirements of ASTM A53 (Type E or S, Grade B), ASTM A500 (Grade B), or API 5LX52.

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

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

Texas Department of Transportation

Bridge Division Standard

PRECAST SAFETY END TREATMENT

TYPE II ~ PARALLEL DRAINAGE

PSET-SP

FILE: psetspss-21.dgn	DN: RLW	CK: KLR	DW: JTR	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS 12-21: Added 42" TP	2707	01	011, ETC.	FM 2781
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON, ETC.		95

DATE: 8/5/2022 1:15:24 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0504752\pwstde01-20.dgn

TABLE OF DIMENSIONS AND REINFORCING STEEL
(Wings for one structure end)

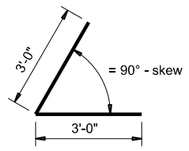
Dimensions					Variable Reinforcing				Estimated Quantities per ft of wing (2~wings) (4)		Estimated Quantities per ft of Toewall (1~toewall)	
Maximum Wingwall Height Hw	W	X	Y	Z	Bars J1		Bars J2					
					Size	Spa	Size	Spa	Reinf (Lb/Ft)	Conc (CY/Ft)	Reinf (Lb/Ft)	Conc (CY/Ft)
2'-6"	2'-10"	10"	1'-0"	7"	#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)

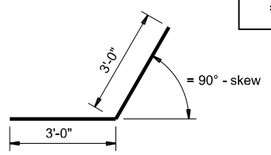
Bar	Size	No.	Spa
D1	#6	~	1'-0"
D2	#6	~	1'-0"
E1	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	~	8"
M1	#4	4	~
P	#4	~	1'-0"
V	#4	~	1'-0"

TABLE OF TOEWALL REINFORCING

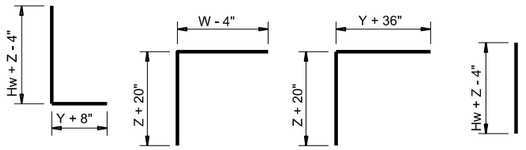
Bar	Size	No.	Spa
J3	#4	~	1'-0"
M2	#4	2	~
E2	#4	~	1'-0"



BARS D1



BARS D2



BARS J1 BARS J2 BARS J3 BARS V

WING DIMENSION FORMULAS:

(All values are in feet.)

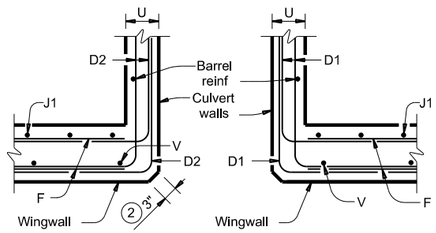
Hw = H + T + C
Lw = (Hw) (SL) ÷ cosine (θ) for Type PW-1
= (Hw - 1') (SL) ÷ cosine (θ) for Type PW-2 and Hw 4' ≥
= (Hw - 0.5') (SL) ÷ cosine (θ) for Type PW-2 and Hw 4' <

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

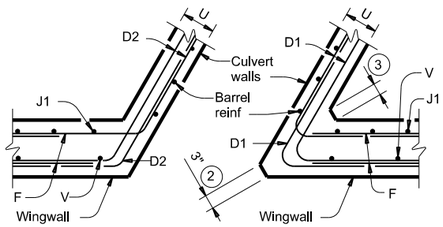
For precast culverts:
Ltw = [(N) (2 U + S) + (N - 1) (0.5')] ÷ cosine (θ)
Total Wingwall Area (two wings ~ SF)
= (2)(Hw)(Lw) for Type PW-1
= (2)(Hw)(Lw) - 6 SF for Type PW-2 and Hw 4' ≥
= (2)(Hw)(Lw) - 1.5 SF for Type PW-2 and Hw 4' <

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

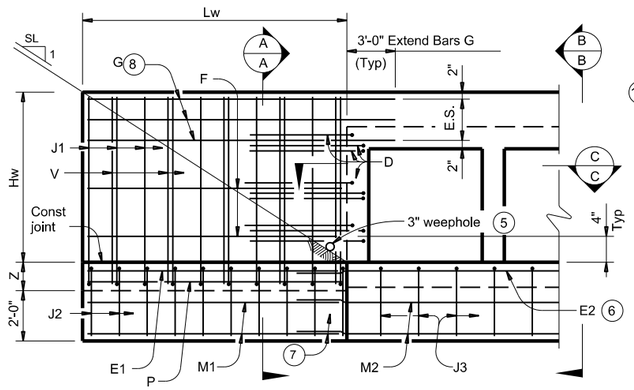
See applicable box culvert standard sheet for S, H, T, and U values.



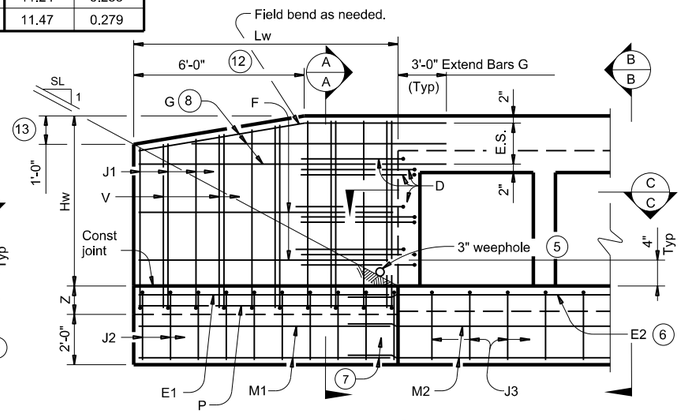
SECTION C-C - PW-1



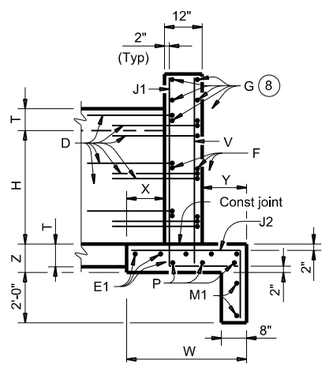
SECTION C-C - PW-2



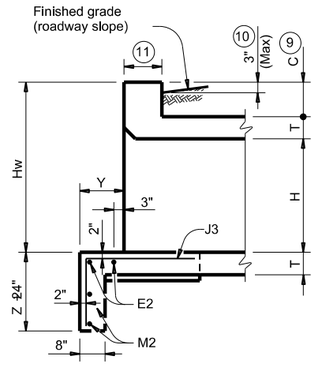
PARTIAL ELEVATION - PW-1



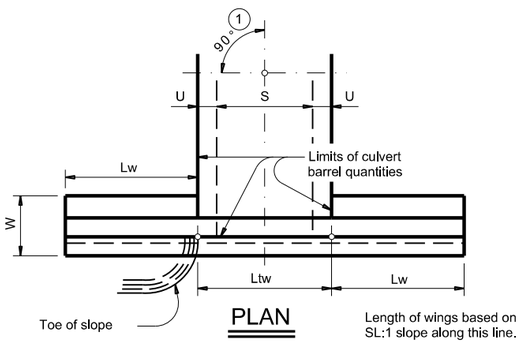
PARTIAL ELEVATION - PW-2



SECTION A-A
(Showing wing reinforcement.)



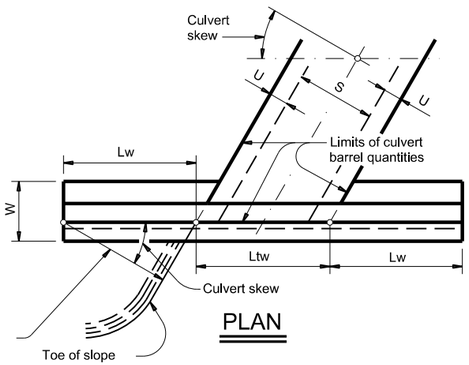
SECTION B-B
(Showing wing reinforcement.)



PLAN

Length of wings based on SL:1 slope along this line.

DETAILS FOR NON-SKEWED BOX CULVERTS



PLAN

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

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

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

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

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

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

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

Texas Department of Transportation
Bridge Division Standard

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

PW

FILE: pwstde01-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2707	01	011, ETC.	FM 2781
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON, ETC.		96

DATE: 8/25/2022 1:56:23 PM
FILE: c:\txdot\pw_online\txdot03\sergio.zapata\d0504752\fw-0stde-20.dgn

TABLE OF DIMENSIONS AND REINFORCING STEEL
(Wings for one structure end)

Maximum Wingwall Height Hw	Dimensions W	X	Y	Z	Variable Reinforcing Bars J1 Size	Bars J1 Spa	Bars J2 Size	Bars J2 Spa	Estimated Quantities per ft of wing length (2~wings) (3) Reinf (Lb/Ft)	Conc (CY/Ft)
2'-6"	2'-5"	1'-0"	9"	7"	#4	1'-0"	#4	1'-0"	33.73	0.248
3'-0"	2'-5"	1'-0"	9"	7"	#4	1'-0"	#4	1'-0"	37.07	0.261
3'-6"	2'-5"	1'-0"	9"	7"	#4	1'-0"	#4	1'-0"	37.74	0.273
4'-0"	2'-5"	1'-0"	9"	7"	#4	1'-0"	#4	1'-0"	38.41	0.285
4'-6"	3'-2"	1'-6"	1'-0"	7"	#4	1'-0"	#4	1'-0"	41.75	0.330
5'-0"	3'-2"	1'-6"	1'-0"	7"	#4	1'-0"	#4	1'-0"	45.09	0.343
5'-6"	3'-2"	1'-6"	1'-0"	7"	#4	1'-0"	#4	1'-0"	45.75	0.355
6'-0"	3'-2"	1'-6"	1'-0"	7"	#4	1'-0"	#4	1'-0"	46.42	0.367
7'-0"	3'-8"	1'-9"	1'-3"	7"	#4	1'-0"	#4	1'-0"	52.77	0.414
8'-0"	4'-2"	2'-0"	1'-6"	8"	#5	1'-0"	#4	1'-0"	60.19	0.486
9'-0"	4'-8"	2'-3"	1'-9"	8"	#4	6"	#4	6"	81.49	0.535
10'-0"	5'-2"	2'-6"	2'-0"	8"	#5	6"	#4	6"	97.25	0.584
11'-0"	5'-8"	2'-9"	2'-3"	8"	#6	6"	#5	6"	133.65	0.634
12'-0"	6'-2"	3'-0"	2'-6"	9"	#7	6"	#5	6"	162.29	0.721
13'-0"	6'-8"	3'-3"	2'-9"	11"	#7	6"	#5	6"	178.80	0.856
14'-0"	7'-2"	3'-6"	3'-0"	1'-0"	#8	6"	#5	6"	216.78	0.959
15'-0"	7'-8"	4'-0"	3'-0"	1'-1"	#9	6"	#6	6"	283.06	1.068
16'-0"	8'-2"	4'-6"	3'-0"	1'-3"	#9	6"	#6	6"	297.02	1.234

TABLE OF WINGWALL REINFORCING
(2~wings)

Bar	Size	No.	Spa
D	#5	~	1'-0"
E	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	4	~
M	#4	4	~
P	#4	~	1'-0"
R	#5	6	~
V	#4	~	1'-0"

TABLE OF ESTIMATED CULVERT TOEWALL QUANTITIES

Bar	Size	No.	Spa
L	#4	~	1'-6"
Q	#4	1	~
Reinf (Lb/Ft)			2.45
Conc (CY/Ft)			0.037

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

Hw = H + T + C - 0.250'
A = (Hw - 0.333') (SL)
B = (A) tangent (30°)
Lw = (A) ÷ cosine (30°)

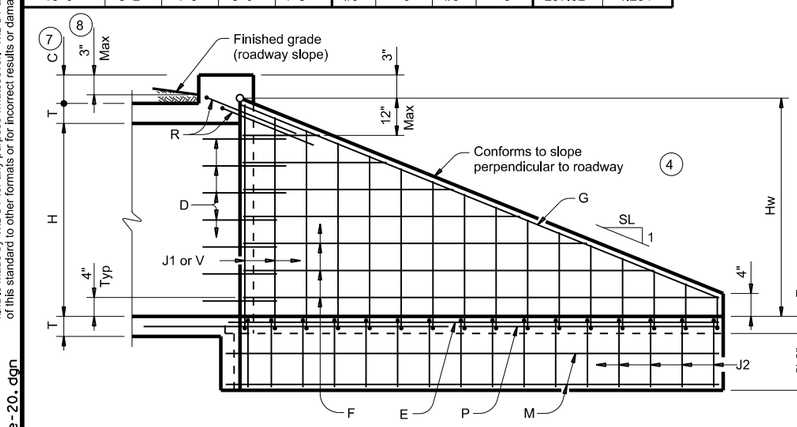
For cast-in-place culverts:
Ltw = (N) (S) + (N + 1) (U)

For precast culverts:
Ltw = (N) (2U + S) + (N - 1) (0.5')

Total wingwall area (two wings ~ SF) = (Hw + 0.333') (Lw)

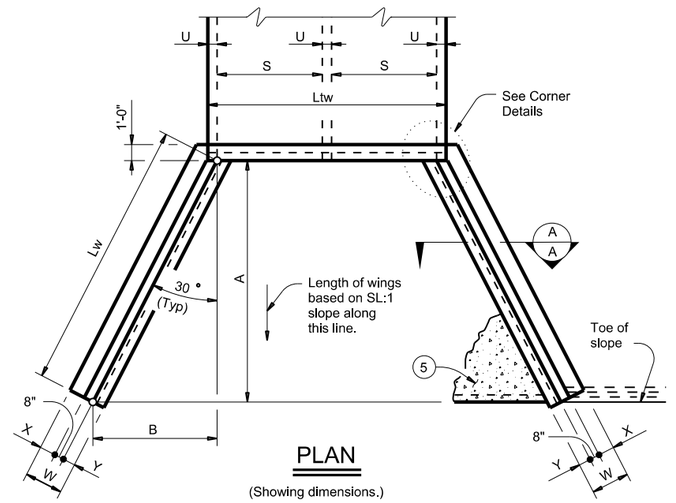
Hw = Height of wingwall
SL:1 = Side slope ratio (horizontal:1 vertical)
Lw = Length of wingwall
Ltw = Culvert toewall length
N = Number of culvert spans

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



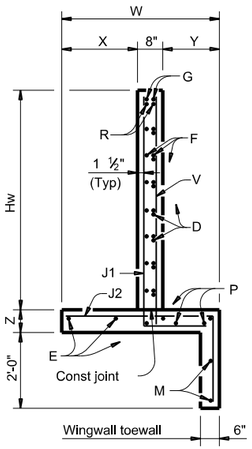
INSIDE ELEVATION

(Showing reinforcing. Culvert and culvert toewall reinforcing not shown for clarity.)

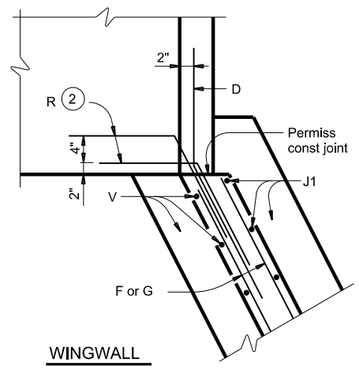


PLAN

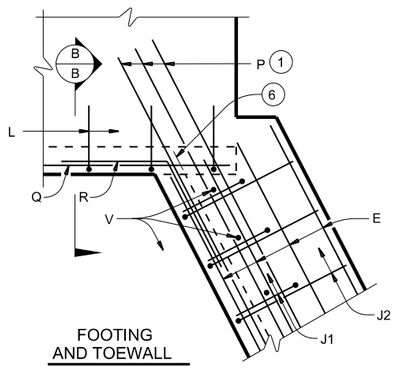
(Showing dimensions.)



SECTION A-A



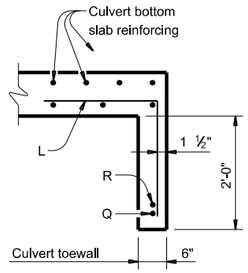
WINGWALL



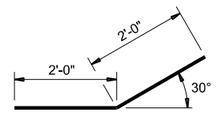
FOOTING AND TOEWALL

CORNER DETAILS

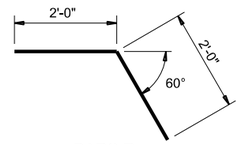
(Culvert and culvert toewall reinforcing not shown for clarity.)



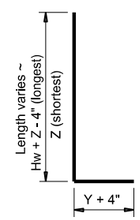
SECTION B-B (5)



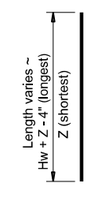
BARS D



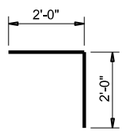
BARS R



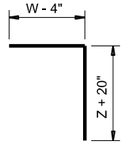
BARS J1



BARS V



BARS L



BARS J2

(1) Extend Bars P 3'-0" minimum into bottom slab of box culvert.

(2) Adjust as necessary to maintain 1 1#2" clear cover and 4" minimum between bars.

(3) Quantities shown are based on an average wing height for two wings (one structure end). To determine total quantities for two wings, multiply the tabulated values by Lw.

(4) Recommended values of side slope are: 2:1, 3:1, 4:1, and 6:1.

(5) When shown elsewhere on the plans, construct 5" deep concrete riprap. Payment for riprap is as required by Item 432, "Riprap". Unless otherwise shown on the plans or directed by the Engineer, provide a 6" wide by 1'-6" deep reinforced concrete toewall along all edges of the riprap adjacent to natural ground; reinforce the toewall by extending typical riprap reinforcing into the toewall; and extend construction joints or grooved joints oriented in the direction of flow across the full distance of the riprap at intervals of approximately 20'. When such riprap is provided, the culvert toewall shown in SECTION B-B will not be required.

(6) At Contractor's option, culvert toewall may be ended flush with wingwall toewall. Adjust reinforcing as needed.

(7) 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.

(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.

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

GENERAL NOTES:
Designed according to AASHTO LRFD Bridge Design Specifications.
When structure is founded on solid rock, depth of toewalls for culverts and wingwalls may be reduced or eliminated as directed by the Engineer.
See Box Culvert Supplement (BCS) standard sheet for additional dimensions and information.
The quantities for concrete and reinforcing steel resulting from the formulas given on this sheet are for Contractor's information only.

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

Texas Department of Transportation

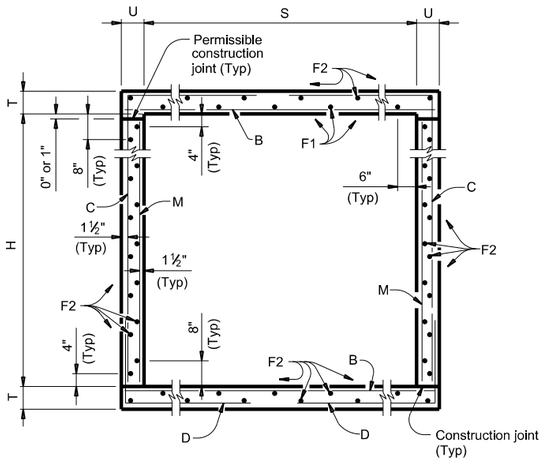
Bridge Division Standard

CONCRETE WINGWALLS
WITH FLARED WINGS FOR 0° SKEW BOX CULVERTS

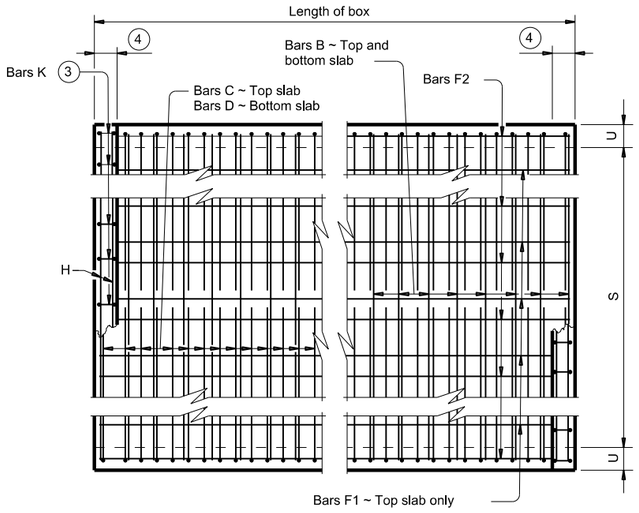
FW-0

FILE: fw-0stde-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2707	01	011, ETC.	FM 2781
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON, ETC.		96A

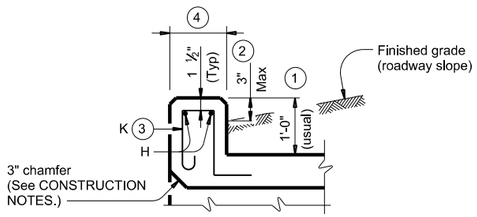
DATE: 8/5/2022 1:15:31 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0504752\scc56ste-21.dgn



TYPICAL SECTION



PLAN OF REINF STEEL



SECTION THRU CURB

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

2. For vehicle safety, the following requirements must be met:
   · For structures without bridge rail, construct curbs no more than 3" above finished grade.
   · For structures with bridge rail, construct curbs flush with finished grade.
   Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

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

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

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

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

CONSTRUCTION NOTES:

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

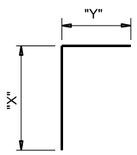
MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Provide Class C concrete (f'c = 3,600 psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete (f'c = 4,000 psi) for top slabs of:
· culverts with overlay,
· culverts with 1-to-2 course surface treatment, or
· culverts with the top slab as the final riding surface.
Provide bar laps, where required, as follows:
· Uncoated or galvanized ~ #4 = 1'-8" Min
· Uncoated or galvanized ~ #5 = 2'-1" Min
· Uncoated or galvanized ~ #6 = 2'-6" Min

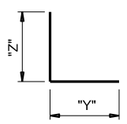
GENERAL NOTES:

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

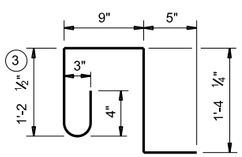
Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.



BARS C



BARS D



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

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

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

SCC-5 & 6

FILE: scc56ste-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2707	01	011, ETC.	FM 2781
04/2021 Updated X values.	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON, ETC.		97

SECTION DIMENSIONS				⑤ FILL HEIGHT	BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																										QUANTITIES					
					Bars B					Bars C							Bars D							Bars M ~ #4				Bars F1 ~ #4 at 18" Spa			Bars F2 ~ #4 at 18" Spa			Bars H 4 ~ #4		Bars K		Per Foot of Barrel		Curb		Total	
S	H	T	U		No.	Size	Spa	Length	Weight	No.	Size	Spa	Length	Weight	" X "	" Y "	No.	Size	Spa	Length	Weight	" Y "	" Z "	No.	Spa	Length	Weight	No.	Length	Wt	No.	Length	Weight	Length	Wt	No.	Wt	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)
5' - 0"	2' - 0"	8"	7"	26'	108	#6	9"	5' - 11"	960	108	#5	9"	6' - 3"	704	2' - 6"	3' - 9"	108	#5	9"	6' - 5"	723	3' - 9"	2' - 8"	108	9"	2' - 0"	144	4	39' - 9"	106	22	39' - 9"	584	5' - 11"	16	14	39	0.391	80.5	0.5	55	16.1	3,276
5' - 0"	2' - 0"	9"	7"	30'	108	#6	9"	5' - 11"	960	108	#5	9"	6' - 4"	713	2' - 7"	3' - 9"	108	#5	9"	6' - 6"	732	3' - 9"	2' - 9"	108	9"	2' - 0"	144	4	39' - 9"	106	22	39' - 9"	584	5' - 11"	16	14	39	0.429	81.0	0.5	55	17.6	3,294
5' - 0"	3' - 0"	8"	7"	26'	108	#6	9"	5' - 11"	960	108	#5	9"	7' - 3"	817	3' - 6"	3' - 9"	108	#5	9"	6' - 5"	723	3' - 9"	2' - 8"	108	9"	3' - 0"	216	4	39' - 9"	106	26	39' - 9"	690	5' - 11"	16	14	39	0.434	87.8	0.5	55	17.8	3,567
5' - 0"	3' - 0"	9"	7"	30'	108	#6	9"	5' - 11"	960	108	#5	9"	7' - 4"	826	3' - 7"	3' - 9"	108	#5	9"	6' - 6"	732	3' - 9"	2' - 9"	108	9"	3' - 0"	216	4	39' - 9"	106	26	39' - 9"	690	5' - 11"	16	14	39	0.472	88.3	0.5	55	19.3	3,585
5' - 0"	4' - 0"	8"	7"	26'	108	#6	9"	5' - 11"	960	108	#5	9"	8' - 3"	929	4' - 6"	3' - 9"	108	#5	9"	6' - 5"	723	3' - 9"	2' - 8"	108	9"	4' - 0"	289	4	39' - 9"	106	26	39' - 9"	690	5' - 11"	16	14	39	0.477	92.4	0.5	55	19.5	3,752
5' - 0"	4' - 0"	9"	7"	30'	108	#6	9"	5' - 11"	960	108	#5	9"	8' - 4"	939	4' - 7"	3' - 9"	108	#5	9"	6' - 6"	732	3' - 9"	2' - 9"	108	9"	4' - 0"	289	4	39' - 9"	106	26	39' - 9"	690	5' - 11"	16	14	39	0.515	92.9	0.5	55	21.1	3,771
5' - 0"	5' - 0"	8"	7"	26'	108	#6	9"	5' - 11"	960	108	#5	9"	9' - 3"	1,042	5' - 6"	3' - 9"	108	#5	9"	6' - 5"	723	3' - 9"	2' - 8"	108	9"	5' - 0"	361	4	39' - 9"	106	30	39' - 9"	797	5' - 11"	16	14	39	0.521	99.7	0.5	55	21.3	4,044
5' - 0"	5' - 0"	9"	7"	30'	108	#6	9"	5' - 11"	960	108	#5	9"	9' - 4"	1,051	5' - 7"	3' - 9"	108	#5	9"	6' - 6"	732	3' - 9"	2' - 9"	108	9"	5' - 0"	361	4	39' - 9"	106	30	39' - 9"	797	5' - 11"	16	14	39	0.559	100.2	0.5	55	22.8	4,062
6' - 0"	2' - 0"	8"	7"	20'	108	#6	9"	6' - 11"	1,122	108	#5	9"	6' - 7"	742	2' - 6"	4' - 1"	108	#5	9"	6' - 9"	760	4' - 1"	2' - 8"	108	9"	2' - 0"	144	5	39' - 9"	133	25	39' - 9"	664	6' - 11"	18	16	45	0.440	89.1	0.5	63	18.1	3,628
6' - 0"	2' - 0"	9"	7"	26'	108	#6	9"	6' - 11"	1,122	162	#5	6"	6' - 8"	1,126	2' - 7"	4' - 1"	162	#5	6"	6' - 10"	1,155	4' - 1"	2' - 9"	108	9"	2' - 0"	144	5	39' - 9"	133	25	39' - 9"	664	6' - 11"	18	16	45	0.485	108.6	0.5	63	19.9	4,407
6' - 0"	2' - 0"	10"	8"	30'	108	#6	9"	7' - 1"	1,149	162	#5	6"	6' - 10"	1,155	2' - 8"	4' - 2"	162	#5	6"	7' - 0"	1,183	4' - 2"	2' - 10"	82	12"	2' - 0"	110	5	39' - 9"	133	25	39' - 9"	664	7' - 1"	19	18	50	0.551	109.9	0.5	69	22.6	4,463
6' - 0"	3' - 0"	8"	7"	20'	108	#6	9"	6' - 11"	1,122	108	#5	9"	7' - 7"	854	3' - 6"	4' - 1"	108	#5	9"	6' - 9"	760	4' - 1"	2' - 8"	108	9"	3' - 0"	216	5	39' - 9"	133	29	39' - 9"	770	6' - 11"	18	16	45	0.484	96.4	0.5	63	19.9	3,918
6' - 0"	3' - 0"	9"	7"	26'	108	#6	9"	6' - 11"	1,122	162	#5	6"	7' - 8"	1,295	3' - 7"	4' - 1"	162	#5	6"	6' - 10"	1,155	4' - 1"	2' - 9"	108	9"	3' - 0"	216	5	39' - 9"	133	29	39' - 9"	770	6' - 11"	18	16	45	0.528	117.3	0.5	63	21.6	4,754
6' - 0"	3' - 0"	10"	8"	30'	108	#6	9"	7' - 1"	1,149	162	#5	6"	7' - 10"	1,324	3' - 8"	4' - 2"	162	#5	6"	7' - 0"	1,183	4' - 2"	2' - 10"	82	12"	3' - 0"	164	5	39' - 9"	133	29	39' - 9"	770	7' - 1"	19	18	50	0.601	118.1	0.5	69	24.6	4,792
6' - 0"	4' - 0"	8"	7"	20'	108	#6	9"	6' - 11"	1,122	108	#5	9"	8' - 7"	967	4' - 6"	4' - 1"	108	#5	9"	6' - 9"	760	4' - 1"	2' - 8"	108	9"	4' - 0"	289	5	39' - 9"	133	29	39' - 9"	770	6' - 11"	18	16	45	0.527	101.0	0.5	63	21.6	4,104
6' - 0"	4' - 0"	9"	7"	26'	108	#6	9"	6' - 11"	1,122	162	#5	6"	8' - 8"	1,464	4' - 7"	4' - 1"	162	#5	6"	6' - 10"	1,155	4' - 1"	2' - 9"	108	9"	4' - 0"	289	5	39' - 9"	133	29	39' - 9"	770	6' - 11"	18	16	45	0.571	123.3	0.5	63	23.4	4,996
6' - 0"	4' - 0"	10"	8"	30'	108	#6	9"	7' - 1"	1,149	162	#5	6"	8' - 10"	1,493	4' - 8"	4' - 2"	162	#5	6"	7' - 0"	1,183	4' - 2"	2' - 10"	82	12"	4' - 0"	219	5	39' - 9"	133	29	39' - 9"	770	7' - 1"	19	18	50	0.650	123.7	0.5	69	26.5	5,016
6' - 0"	5' - 0"	8"	7"	20'	108	#6	9"	6' - 11"	1,122	108	#5	9"	9' - 7"	1,080	5' - 6"	4' - 1"	108	#5	9"	6' - 9"	760	4' - 1"	2' - 8"	108	9"	5' - 0"	361	5	39' - 9"	133	33	39' - 9"	876	6' - 11"	18	16	45	0.570	108.3	0.5	63	23.3	4,395
6' - 0"	5' - 0"	9"	7"	26'	108	#6	9"	6' - 11"	1,122	162	#5	6"	9' - 8"	1,633	5' - 7"	4' - 1"	162	#5	6"	6' - 10"	1,155	4' - 1"	2' - 9"	108	9"	5' - 0"	361	5	39' - 9"	133	33	39' - 9"	876	6' - 11"	18	16	45	0.614	132.0	0.5	63	25.1	5,343
6' - 0"	5' - 0"	10"	8"	30'	108	#6	9"	7' - 1"	1,149	162	#5	6"	9' - 10"	1,661	5' - 8"	4' - 2"	162	#5	6"	7' - 0"	1,183	4' - 2"	2' - 10"	82	12"	5' - 0"	274	5	39' - 9"	133	33	39' - 9"	876	7' - 1"	19	18	50	0.700	131.9	0.5	69	28.5	5,345
6' - 0"	6' - 0"	8"	7"	20'	108	#6	9"	6' - 11"	1,122	108	#5	9"	10' - 7"	1,192	6' - 6"	4' - 1"	108	#5	9"	6' - 9"	760	4' - 1"	2' - 8"	108	9"	6' - 0"	433	5	39' - 9"	133	37	39' - 9"	982	6' - 11"	18	16	45	0.613	115.6	0.5	63	25.0	4,685
6' - 0"	6' - 0"	9"	7"	26'	108	#6	9"	6' - 11"	1,122	162	#5	6"	10' - 8"	1,802	6' - 7"	4' - 1"	162	#5	6"	6' - 10"	1,155	4' - 1"	2' - 9"	108	9"	6' - 0"	433	5	39' - 9"	133	37	39' - 9"	982	6' - 11"	18	16	45	0.657	140.7	0.5	63	26.8	5,690
6' - 0"	6' - 0"	10"	8"	30'	108	#6	9"	7' - 1"	1,149	162	#5	6"	10' - 10"	1,830	6' - 8"	4' - 2"	162	#5	6"	7' - 0"	1,183	4' - 2"	2' - 10"	82	12"	6' - 0"	329	5	39' - 9"	133	37	39' - 9"	982	7' - 1"	19	18	50	0.749	140.2	0.5	69	30.5	5,675

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

DATE: 8/5/2022 1:15:31 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0504752\scc56ste-21.dgn

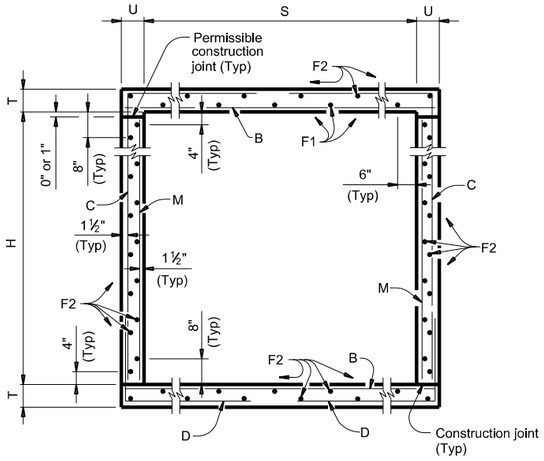
HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation — Bridge Division Standard

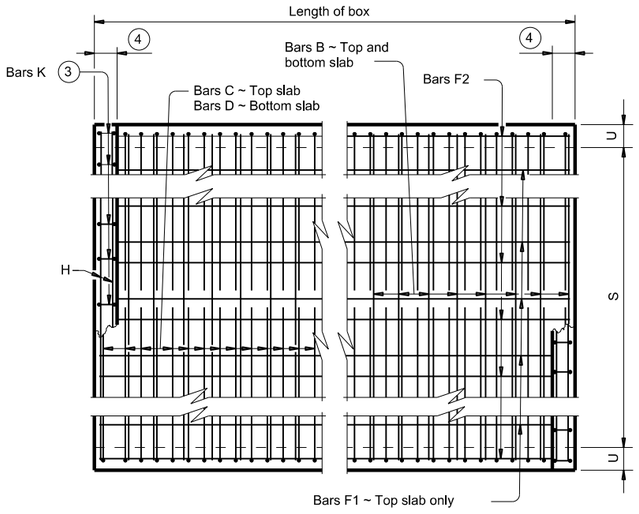
SINGLE BOX CULVERTS CAST-IN-PLACE
0' TO 30' FILL

SCC-5 & 6

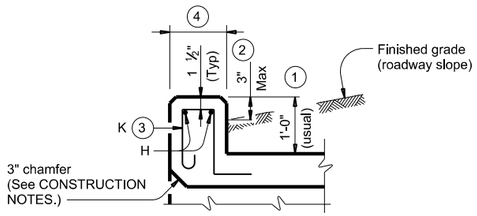
FILE: scc56ste-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2707	01	011, ETC.	FM 2781
04/2021 Updated X values.	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON, ETC.		98



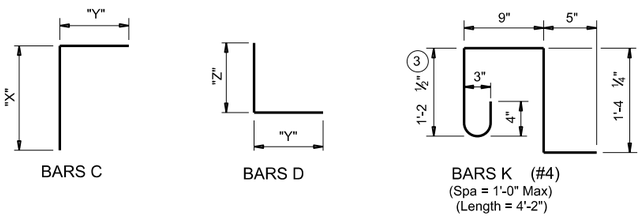
TYPICAL SECTION



PLAN OF REINF STEEL



SECTION THRU CURB



BARS C

BARS D

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

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

2. For vehicle safety, the following requirements must be met:
   · For structures without bridge rail, construct curbs no more than 3" above finished grade.
   · For structures with bridge rail, construct curbs flush with finished grade.
   Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

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

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

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

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

CONSTRUCTION NOTES:

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

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Provide Class C concrete (f'c = 3,600 psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete (f'c = 4,000 psi) for top slabs of:
· culverts with overlay,
· culverts with 1-to-2 course surface treatment, or
· culverts with the top slab as the final riding surface.
Provide bar laps, where required, as follows:
· Uncoated or galvanized ~ #4 = 1'-8" Min
· Uncoated or galvanized ~ #5 = 2'-1" Min
· Uncoated or galvanized ~ #6 = 2'-6" Min

GENERAL NOTES:

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

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

HL93 LOADING

SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE

0' TO 30' FILL

SCC-7

FILE: scc07ste-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2707	01	011, ETC.	FM 2781
04/2021 Updated X values.	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON, ETC.		99

DATE: 8/5/2022 1:15:36 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0504752\scc07ste-21.dgn

SECTION DIMENSIONS				(5) FILL HEIGHT	BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																												QUANTITIES					
					Bars B					Bars C							Bars D							Bars M ~ #4				Bars F1 ~ #4 at 18" Spa			Bars F2 ~ #4 at 18" Spa			Bars H 4 ~ #4		Bars K		Per Foot of Barrel		Curb		Total	
S	H	T	U		No.	Size	Spa	Length	Weight	No.	Size	Spa	Length	Weight	" X "	" Y "	No.	Size	Spa	Length	Weight	" Y "	" Z "	No.	Spa	Length	Weight	No.	Length	Wt	No.	Length	Weight	Length	Wt	No.	Wt	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)
7' - 0"	3' - 0"	8"	7"	16'	108	#6	9"	7' - 11"	1,284	162	#5	6"	7' - 11"	1,338	3' - 6"	4' - 5"	162	#5	6"	7' - 1"	1,197	4' - 5"	2' - 8"	108	9"	3' - 0"	216	5	39' - 9"	133	31	39' - 9"	823	7' - 11"	21	18	50	0.533	124.8	0.6	71	21.9	5,062
7' - 0"	3' - 0"	9"	7"	20'	108	#6	9"	7' - 11"	1,284	162	#5	6"	8' - 0"	1,352	3' - 7"	4' - 5"	162	#5	6"	7' - 2"	1,211	4' - 5"	2' - 9"	108	9"	3' - 0"	216	5	39' - 9"	133	31	39' - 9"	823	7' - 11"	21	18	50	0.583	125.5	0.6	71	23.9	5,090
7' - 0"	3' - 0"	10"	8"	23'	108	#6	9"	8' - 1"	1,311	162	#5	6"	8' - 2"	1,380	3' - 8"	4' - 6"	162	#5	6"	7' - 4"	1,239	4' - 6"	2' - 10"	82	12"	3' - 0"	164	5	39' - 9"	133	31	39' - 9"	823	8' - 1"	22	20	56	0.663	126.3	0.6	78	27.1	5,128
7' - 0"	3' - 0"	11"	8"	30'	108	#6	9"	8' - 1"	1,311	162	#5	6"	8' - 3"	1,394	3' - 9"	4' - 6"	162	#5	6"	7' - 5"	1,253	4' - 6"	2' - 11"	82	12"	3' - 0"	164	5	39' - 9"	133	31	39' - 9"	823	8' - 1"	22	20	56	0.714	127.0	0.6	78	29.2	5,156
7' - 0"	4' - 0"	8"	7"	16'	108	#6	9"	7' - 11"	1,284	162	#5	6"	8' - 11"	1,507	4' - 6"	4' - 5"	162	#5	6"	7' - 1"	1,197	4' - 5"	2' - 8"	108	9"	4' - 0"	289	5	39' - 9"	133	31	39' - 9"	823	7' - 11"	21	18	50	0.576	130.8	0.6	71	23.6	5,304
7' - 0"	4' - 0"	9"	7"	20'	108	#6	9"	7' - 11"	1,284	162	#5	6"	9' - 0"	1,521	4' - 7"	4' - 5"	162	#5	6"	7' - 2"	1,211	4' - 5"	2' - 9"	108	9"	4' - 0"	289	5	39' - 9"	133	31	39' - 9"	823	7' - 11"	21	18	50	0.627	131.5	0.6	71	25.7	5,332
7' - 0"	4' - 0"	10"	8"	23'	108	#6	9"	8' - 1"	1,311	162	#5	6"	9' - 2"	1,549	4' - 8"	4' - 6"	162	#5	6"	7' - 4"	1,239	4' - 6"	2' - 10"	82	12"	4' - 0"	219	5	39' - 9"	133	31	39' - 9"	823	8' - 1"	22	20	56	0.712	131.9	0.6	78	29.1	5,352
7' - 0"	4' - 0"	11"	8"	30'	162	#6	6"	8' - 1"	1,967	162	#5	6"	9' - 3"	1,563	4' - 9"	4' - 6"	162	#5	6"	7' - 5"	1,253	4' - 6"	2' - 11"	82	12"	4' - 0"	219	5	39' - 9"	133	31	39' - 9"	823	8' - 1"	22	20	56	0.763	149.0	0.6	78	31.1	6,036
7' - 0"	5' - 0"	8"	7"	16'	108	#6	9"	7' - 11"	1,284	162	#5	6"	9' - 11"	1,676	5' - 6"	4' - 5"	162	#5	6"	7' - 1"	1,197	4' - 5"	2' - 8"	108	9"	5' - 0"	361	5	39' - 9"	133	35	39' - 9"	929	7' - 11"	21	18	50	0.619	139.5	0.6	71	25.4	5,651
7' - 0"	5' - 0"	9"	7"	20'	108	#6	9"	7' - 11"	1,284	162	#5	6"	10' - 0"	1,690	5' - 7"	4' - 5"	162	#5	6"	7' - 2"	1,211	4' - 5"	2' - 9"	108	9"	5' - 0"	361	5	39' - 9"	133	35	39' - 9"	929	7' - 11"	21	18	50	0.670	140.2	0.6	71	27.4	5,679
7' - 0"	5' - 0"	10"	8"	23'	108	#6	9"	8' - 1"	1,311	162	#5	6"	10' - 2"	1,718	5' - 8"	4' - 6"	162	#5	6"	7' - 4"	1,239	4' - 6"	2' - 10"	82	12"	5' - 0"	274	5	39' - 9"	133	35	39' - 9"	929	8' - 1"	22	20	56	0.761	140.1	0.6	78	31.1	5,682
7' - 0"	5' - 0"	11"	8"	30'	162	#6	6"	8' - 1"	1,967	162	#5	6"	10' - 3"	1,732	5' - 9"	4' - 6"	162	#5	6"	7' - 5"	1,253	4' - 6"	2' - 11"	82	12"	5' - 0"	274	5	39' - 9"	133	35	39' - 9"	929	8' - 1"	22	20	56	0.813	157.2	0.6	78	33.1	6,366
7' - 0"	6' - 0"	8"	7"	16'	108	#6	9"	7' - 11"	1,284	162	#5	6"	10' - 11"	1,845	6' - 6"	4' - 5"	162	#5	6"	7' - 1"	1,197	4' - 5"	2' - 8"	108	9"	6' - 0"	433	5	39' - 9"	133	39	39' - 9"	1,036	7' - 11"	21	18	50	0.663	148.2	0.6	71	27.1	5,999
7' - 0"	6' - 0"	9"	7"	20'	108	#6	9"	7' - 11"	1,284	162	#5	6"	11' - 0"	1,859	6' - 7"	4' - 5"	162	#5	6"	7' - 2"	1,211	4' - 5"	2' - 9"	108	9"	6' - 0"	433	5	39' - 9"	133	39	39' - 9"	1,036	7' - 11"	21	18	50	0.713	148.9	0.6	71	29.1	6,027
7' - 0"	6' - 0"	10"	8"	23'	108	#6	9"	8' - 1"	1,311	162	#5	6"	11' - 2"	1,887	6' - 8"	4' - 6"	162	#5	6"	7' - 4"	1,239	4' - 6"	2' - 10"	82	12"	6' - 0"	329	5	39' - 9"	133	39	39' - 9"	1,036	8' - 1"	22	20	56	0.811	148.4	0.6	78	33.1	6,013
7' - 0"	6' - 0"	11"	8"	30'	162	#6	6"	8' - 1"	1,967	162	#5	6"	11' - 3"	1,901	6' - 9"	4' - 6"	162	#5	6"	7' - 5"	1,253	4' - 6"	2' - 11"	82	12"	6' - 0"	329	5	39' - 9"	133	39	39' - 9"	1,036	8' - 1"	22	20	56	0.862	165.5	0.6	78	35.1	6,697
7' - 0"	7' - 0"	8"	7"	16'	108	#6	9"	7' - 11"	1,284	162	#5	6"	11' - 11"	2,014	7' - 6"	4' - 5"	162	#5	6"	7' - 1"	1,197	4' - 5"	2' - 8"	108	9"	7' - 0"	505	5	39' - 9"	133	39	39' - 9"	1,036	7' - 11"	21	18	50	0.706	154.2	0.6	71	28.8	6,240
7' - 0"	7' - 0"	9"	7"	20'	108	#6	9"	7' - 11"	1,284	162	#5	6"	12' - 0"	2,028	7' - 7"	4' - 5"	162	#5	6"	7' - 2"	1,211	4' - 5"	2' - 9"	108	9"	7' - 0"	505	5	39' - 9"	133	39	39' - 9"	1,036	7' - 11"	21	18	50	0.756	154.9	0.6	71	30.8	6,268
7' - 0"	7' - 0"	10"	8"	23'	108	#6	9"	8' - 1"	1,311	162	#5	6"	12' - 2"	2,056	7' - 8"	4' - 6"	162	#5	6"	7' - 4"	1,239	4' - 6"	2' - 10"	108	9"	7' - 0"	505	5	39' - 9"	133	39	39' - 9"	1,036	8' - 1"	22	20	56	0.860	157.0	0.6	78	35.0	6,358
7' - 0"	7' - 0"	11"	8"	30'	162	#6	6"	8' - 1"	1,967	162	#5	6"	12' - 3"	2,070	7' - 9"	4' - 6"	162	#5	6"	7' - 5"	1,253	4' - 6"	2' - 11"	108	9"	7' - 0"	505	5	39' - 9"	133	39	39' - 9"	1,036	8' - 1"	22	20	56	0.912	174.1	0.6	78	37.1	7,042

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

DATE: 8/5/2022 1:15:36 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0504752\scc07ste-21.dgn

HL93 LOADING SHEET 2 OF 2

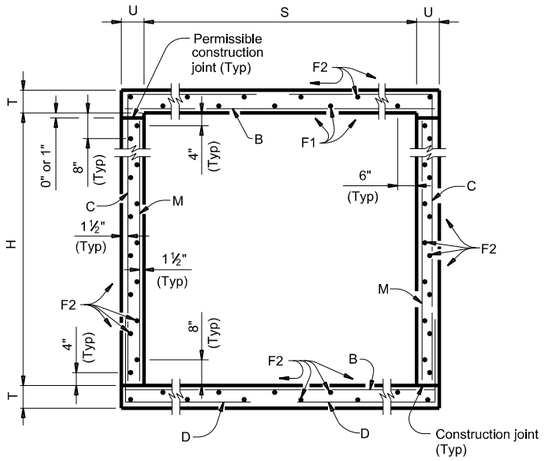
Texas Department of Transportation

Bridge Division Standard

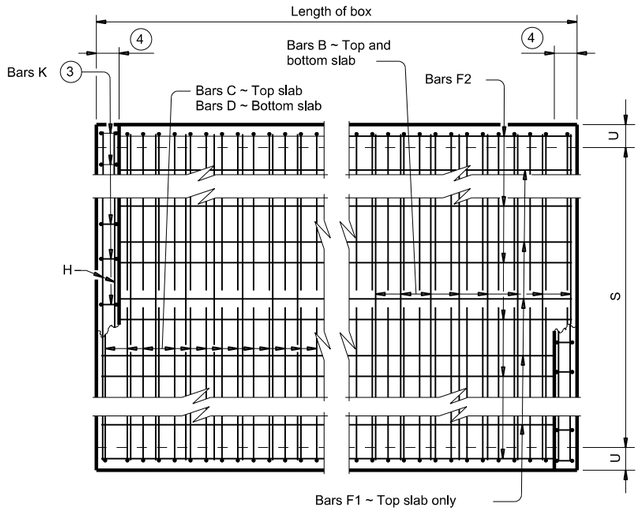
SINGLE BOX CULVERTS CAST-IN-PLACE
0' TO 30' FILL

SCC-7

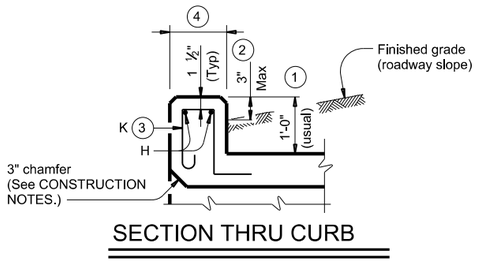
FILE: scc07ste-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2707	01	011, ETC.	FM 2781
04/2021 Updated X values.	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON, ETC.		100



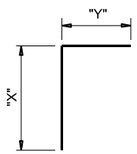
TYPICAL SECTION



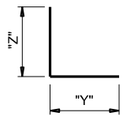
PLAN OF REINF STEEL



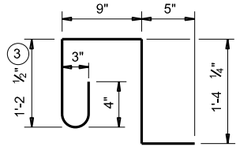
SECTION THRU CURB



BARS C



BARS D



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

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

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

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

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

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

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

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

CONSTRUCTION NOTES:

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

MATERIAL NOTES:

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

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

GENERAL NOTES:

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

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

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

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

SCC-9

FILE: scc09ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2707	01	011, ETC.	FM 2781
04/2021 Updated X values.	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON, ETC.		101

DATE: 8/5/2022 1:15:41 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0504752\scc09ste-21.dgn

SECTION DIMENSIONS				(5) FILL HEIGHT	BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																												QUANTITIES					
					Bars B					Bars C							Bars D							Bars M ~ #4				Bars F1 ~ #4 at 18" Spa			Bars F2 ~ #4 at 18" Spa			Bars H 4 ~ #4		Bars K		Per Foot of Barrel		Curb		Total	
S	H	T	U		No.	Size	Spa	Length	Weight	No.	Size	Spa	Length	Weight	" X "	" Y "	No.	Size	Spa	Length	Weight	" Y "	" Z "	No.	Spa	Length	Wt	No.	Length	Wt	No.	Length	Weight	Length	Wt	No.	Wt	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)
9' - 0"	4' - 0"	8"	7"	10'	162	#6	6"	9' - 11"	2,413	108	#6	9"	10' - 0"	1,622	4' - 6"	5' - 6"	108	#6	9"	8' - 7"	1,392	5' - 6"	3' - 1"	108	9"	4' - 0"	289	7	39' - 9"	186	35	39' - 9"	929	9' - 11"	26	22	61	0.675	170.8	0.8	87	27.8	6,918
9' - 0"	4' - 0"	8"	7"	13'	162	#6	6"	9' - 11"	2,413	162	#6	6"	10' - 0"	2,433	4' - 6"	5' - 6"	162	#6	6"	8' - 7"	2,089	5' - 6"	3' - 1"	108	9"	4' - 0"	289	7	39' - 9"	186	35	39' - 9"	929	9' - 11"	26	22	61	0.675	208.5	0.8	87	27.8	8,426
9' - 0"	4' - 0"	9"	8"	16'	162	#6	6"	10' - 1"	2,454	162	#6	6"	10' - 2"	2,474	4' - 7"	5' - 7"	162	#6	6"	8' - 9"	2,129	5' - 7"	3' - 2"	82	12"	4' - 0"	219	7	39' - 9"	186	35	39' - 9"	929	10' - 1"	27	24	67	0.772	209.8	0.8	94	31.6	8,485
9' - 0"	4' - 0"	11"	8"	20'	162	#6	6"	10' - 1"	2,454	162	#6	6"	10' - 4"	2,514	4' - 9"	5' - 7"	162	#6	6"	8' - 11"	2,170	5' - 7"	3' - 4"	82	12"	4' - 0"	219	7	39' - 9"	186	35	39' - 9"	929	10' - 1"	27	24	67	0.899	211.8	0.8	94	36.7	8,566
9' - 0"	4' - 0"	12"	9"	23'	162	#6	6"	10' - 3"	2,494	162	#6	6"	10' - 5"	2,535	4' - 10"	5' - 7"	162	#6	6"	9' - 0"	2,190	5' - 7"	3' - 5"	108	9"	4' - 0"	289	7	39' - 9"	186	35	39' - 9"	929	10' - 3"	27	24	67	1.000	215.6	0.8	94	40.8	8,717
9' - 0"	4' - 0"	13"	10"	26'	162	#6	6"	10' - 5"	2,535	162	#6	6"	10' - 7"	2,575	4' - 11"	5' - 8"	162	#6	6"	9' - 2"	2,230	5' - 8"	3' - 6"	108	9"	4' - 0"	289	7	39' - 9"	186	35	39' - 9"	929	10' - 5"	28	24	67	1.103	218.6	0.8	95	44.9	8,839
9' - 0"	4' - 0"	14"	11"	30'	162	#6	6"	10' - 7"	2,575	162	#6	6"	10' - 9"	2,616	5' - 0"	5' - 9"	162	#6	6"	9' - 4"	2,271	5' - 9"	3' - 7"	108	9"	4' - 0"	289	7	39' - 9"	186	35	39' - 9"	929	10' - 7"	28	24	67	1.208	221.7	0.8	95	49.1	8,961
9' - 0"	5' - 0"	8"	7"	10'	162	#6	6"	9' - 11"	2,413	108	#6	9"	11' - 0"	1,784	5' - 6"	5' - 6"	108	#6	9"	8' - 7"	1,392	5' - 6"	3' - 1"	108	9"	5' - 0"	361	7	39' - 9"	186	39	39' - 9"	1,036	9' - 11"	26	22	61	0.718	179.3	0.8	87	29.5	7,259
9' - 0"	5' - 0"	8"	7"	13'	162	#6	6"	9' - 11"	2,413	162	#6	6"	11' - 0"	2,677	5' - 6"	5' - 6"	162	#6	6"	8' - 7"	2,089	5' - 6"	3' - 1"	108	9"	5' - 0"	361	7	39' - 9"	186	39	39' - 9"	1,036	9' - 11"	26	22	61	0.718	219.1	0.8	87	29.5	8,849
9' - 0"	5' - 0"	9"	8"	16'	162	#6	6"	10' - 1"	2,454	162	#6	6"	11' - 2"	2,717	5' - 7"	5' - 7"	162	#6	6"	8' - 9"	2,129	5' - 7"	3' - 2"	82	12"	5' - 0"	274	7	39' - 9"	186	39	39' - 9"	1,036	10' - 1"	27	24	67	0.821	219.9	0.8	94	33.6	8,890
9' - 0"	5' - 0"	11"	8"	20'	162	#6	6"	10' - 1"	2,454	162	#6	6"	11' - 4"	2,758	5' - 9"	5' - 7"	162	#6	6"	8' - 11"	2,170	5' - 7"	3' - 4"	82	12"	5' - 0"	274	7	39' - 9"	186	39	39' - 9"	1,036	10' - 1"	27	24	67	0.949	222.0	0.8	94	38.7	8,972
9' - 0"	5' - 0"	12"	9"	23'	162	#6	6"	10' - 3"	2,494	162	#6	6"	11' - 5"	2,778	5' - 10"	5' - 7"	162	#6	6"	9' - 0"	2,190	5' - 7"	3' - 5"	108	9"	5' - 0"	361	7	39' - 9"	186	39	39' - 9"	1,036	10' - 3"	27	24	67	1.056	226.1	0.8	94	43.0	9,139
9' - 0"	5' - 0"	13"	10"	26'	162	#6	6"	10' - 5"	2,535	162	#6	6"	11' - 7"	2,819	5' - 11"	5' - 8"	162	#6	6"	9' - 2"	2,230	5' - 8"	3' - 6"	108	9"	5' - 0"	361	7	39' - 9"	186	39	39' - 9"	1,036	10' - 5"	28	24	67	1.165	229.2	0.8	95	47.4	9,262
9' - 0"	5' - 0"	14"	11"	30'	162	#6	6"	10' - 7"	2,575	162	#6	6"	11' - 9"	2,859	6' - 0"	5' - 9"	162	#6	6"	9' - 4"	2,271	5' - 9"	3' - 7"	108	9"	5' - 0"	361	7	39' - 9"	186	39	39' - 9"	1,036	10' - 7"	28	24	67	1.276	232.2	0.8	95	51.8	9,383
9' - 0"	6' - 0"	8"	7"	10'	162	#6	6"	9' - 11"	2,413	108	#6	9"	12' - 0"	1,947	6' - 6"	5' - 6"	108	#6	9"	8' - 7"	1,392	5' - 6"	3' - 1"	108	9"	6' - 0"	433	7	39' - 9"	186	43	39' - 9"	1,142	9' - 11"	26	22	61	0.761	187.8	0.8	87	31.2	7,600
9' - 0"	6' - 0"	8"	7"	13'	162	#6	6"	9' - 11"	2,413	162	#6	6"	12' - 0"	2,920	6' - 6"	5' - 6"	162	#6	6"	8' - 7"	2,089	5' - 6"	3' - 1"	108	9"	6' - 0"	433	7	39' - 9"	186	43	39' - 9"	1,142	9' - 11"	26	22	61	0.761	229.6	0.8	87	31.2	9,270
9' - 0"	6' - 0"	9"	8"	16'	162	#6	6"	10' - 1"	2,454	162	#6	6"	12' - 2"	2,960	6' - 7"	5' - 7"	162	#6	6"	8' - 9"	2,129	5' - 7"	3' - 2"	82	12"	6' - 0"	329	7	39' - 9"	186	43	39' - 9"	1,142	10' - 1"	27	24	67	0.870	230.0	0.8	94	35.6	9,294
9' - 0"	6' - 0"	11"	8"	20'	162	#6	6"	10' - 1"	2,454	162	#6	6"	12' - 4"	3,001	6' - 9"	5' - 7"	162	#6	6"	8' - 11"	2,170	5' - 7"	3' - 4"	82	12"	6' - 0"	329	7	39' - 9"	186	43	39' - 9"	1,142	10' - 1"	27	24	67	0.998	232.1	0.8	94	40.7	9,376
9' - 0"	6' - 0"	12"	9"	23'	162	#6	6"	10' - 3"	2,494	162	#6	6"	12' - 5"	3,021	6' - 10"	5' - 7"	162	#6	6"	9' - 0"	2,190	5' - 7"	3' - 5"	108	9"	6' - 0"	433	7	39' - 9"	186	43	39' - 9"	1,142	10' - 3"	27	24	67	1.111	236.7	0.8	94	45.2	9,560
9' - 0"	6' - 0"	13"	10"	26'	162	#6	6"	10' - 5"	2,535	162	#6	6"	12' - 7"	3,062	6' - 11"	5' - 8"	162	#6	6"	9' - 2"	2,230	5' - 8"	3' - 6"	108	9"	6' - 0"	433	7	39' - 9"	186	43	39' - 9"	1,142	10' - 5"	28	24	67	1.226	239.7	0.8	95	49.8	9,683
9' - 0"	6' - 0"	14"	11"	30'	162	#6	6"	10' - 7"	2,575	162	#6	6"	12' - 9"	3,102	7' - 0"	5' - 9"	162	#6	6"	9' - 4"	2,271	5' - 9"	3' - 7"	108	9"	6' - 0"	433	7	39' - 9"	186	43	39' - 9"	1,142	10' - 7"	28	24	67	1.344	242.7	0.8	95	54.6	9,804
9' - 0"	7' - 0"	8"	7"	10'	162	#6	6"	9' - 11"	2,413	108	#6	9"	13' - 0"	2,109	7' - 6"	5' - 6"	108	#6	9"	8' - 7"	1,392	5' - 6"	3' - 1"	108	9"	7' - 0"	505	7	39' - 9"	186	43	39' - 9"	1,142	9' - 11"	26	22	61	0.805	193.7	0.8	87	33.0	7,834
9' - 0"	7' - 0"	8"	7"	13'	162	#6	6"	9' - 11"	2,413	162	#6	6"	13' - 0"	3,163	7' - 6"	5' - 6"	162	#6	6"	8' - 7"	2,089	5' - 6"	3' - 1"	108	9"	7' - 0"	505	7	39' - 9"	186	43	39' - 9"	1,142	9' - 11"	26	22	61	0.805	237.5	0.8	87	33.0	9,585
9' - 0"	7' - 0"	9"	8"	16'	162	#6	6"	10' - 1"	2,454	162	#6	6"	13' - 2"	3,204	7' - 7"	5' - 7"	162	#6	6"	8' - 9"	2,129	5' - 7"	3' - 2"	82	12"	7' - 0"	383	7	39' - 9"	186	43	39' - 9"	1,142	10' - 1"	27	24	67	0.920	237.5	0.8	94	37.6	9,592
9' - 0"	7' - 0"	11"	8"	20'	162	#6	6"	10' - 1"	2,454	162	#6	6"	13' - 4"	3,244	7' - 9"	5' - 7"	162	#6	6"	8' - 11"	2,170	5' - 7"	3' - 4"	82	12"	7' - 0"	383	7	39' - 9"	186	43	39' - 9"	1,142	10' - 1"	27	24	67	1.047	239.5	0.8	94	42.6	9,673
9' - 0"	7' - 0"	12"	9"	23'	162	#6	6"	10' - 3"	2,494	162	#6	6"	13' - 5"	3,265	7' - 10"	5' - 7"	162	#6	6"	9' - 0"	2,190	5' - 7"	3' - 5"	108	9"	7' - 0"	505	7	39' - 9"	186	43	39' - 9"	1,142	10' - 3"	27	24	67	1.167	244.6	0.8	94	47.5	9,876
9' - 0"	7' - 0"	13"	10"	26'	162	#6	6"	10' - 5"	2,535	162	#6	6"	13' - 7"	3,305	7' - 11"	5' - 8"	162	#6	6"	9' - 2"	2,230	5' - 8"	3' - 6"	108	9"	7' - 0"	505	7	39' - 9"	186	43	39' - 9"	1,142	10' - 5"	28	24	67	1.288	247.6	0.8	95	52.3	9,998
9' - 0"	7' - 0"	14"	11"	30'	162	#6	6"	10' - 7"	2,575	162	#6	6"	13' - 9"	3,346	8' - 0"	5' - 9"	162	#6	6"	9' - 4"	2,271	5' - 9"	3' - 7"	108	9"	7' - 0"	505	7	39' - 9"	186	43	39' - 9"	1,142	10' - 7"	28	24	67	1.412	250.6	0.8	95	57.3	10,120
9' - 0"	8' - 0"	8"	7"	10'	162	#6	6"	9' - 11"	2,413	108	#6	9"	14' - 0"	2,271	8' - 6"	5' - 6"	108	#6	9"	8' - 7"	1,392	5' - 6"	3' - 1"	108	9"	8' - 0"	577	7	39' - 9"	186	47	39' - 9"	1,248	9' - 11"	26	22	61	0.848	202.2	0.8	87	34.7	8,174
9' - 0"	8' - 0"	8"	7"	13'	162	#6	6"	9' - 11"	2,413	162	#6	6"	14' - 0"	3,407	8' - 6"	5' - 6"	162	#6	6"	8' - 7"	2,089	5' - 6"	3' - 1"	108	9"	8' - 0"	577	7	39' - 9"	186	47	39' - 9"	1,248	9' - 11"	26	22	61	0.848	248.0	0.8	87	34.7	10,007
9' - 0"	8' - 0"	9"	8"	16'	162	#6	6"	10' - 1"	2,454	162	#6	6"	14' - 2"	3,447	8' - 7"	5' - 7"	162	#6	6"	8' - 9"	2,129	5' - 7"	3' - 2"	108	9"	8' - 0"	577	7	39' - 9"	186	47	39' - 9"	1,248	10' - 1"	27	24	67	0.969	251.0	0.8	94	39.5	10,135
9' - 0"	8' - 0"	11"	8"	20'	162	#6	6"	10' - 1"	2,454	162	#6	6"	14' - 4"	3,488	8' - 9"	5' - 7"	162	#6	6"	8' - 11"	2,170	5' - 7"	3' - 4"	108	9"	8' - 0"	577	7	39' - 9"	186	47	39' - 9"	1,248	10' - 1"	27	24	67	1.097	253.1	0.8	94	44.6	10,217
9' - 0"	8' - 0"	12"	9"	23'	162	#6	6"	10' - 3"	2,494	162	#6	6"	14' - 5"	3,508	8' - 10"	5' - 7"	162	#6	6"	9' - 0"	2,190	5' - 7"	3' - 5"	108	9"	8' - 0"	577	7	39' - 9"	186	47	39' - 9"	1,248	10' - 3"	27	24	67	1.222	255.1	0.8	94	49.7	10,297
9' - 0"	8' - 0"	13"	10"	26'	162	#6	6"	10' - 5"	2,535	162	#6	6"	14' - 7"	3,548	8' - 11"	5' - 8"	162	#6	6"	9' - 2"	2,230	5' - 8"	3' - 6"	108	9"	8' - 0"	577	7	39' - 9"	186	47	39' - 9"	1,248	10' - 5"	28	24	67	1.350	258.1	0.8	95	54.8	10,419
9' - 0"	8' - 0"	14"	11"	30'	162	#6	6"	10' - 7"	2,575	162	#6	6"	14' - 9"	3,589	9' - 0"	5' - 9"	162	#6	6"	9' - 4"	2,271	5' - 9"	3' - 7"	108	9"	8' - 0"	577	7	39' - 9"	186	47	39' - 9"	1,248	10' - 7"	28	24	67	1.479	261.2	0.8	95	60.0	10,541
9' - 0"	9' - 0"	8"	7"	10'	162	#6	6"	9' - 11"	2,413	108	#6	9"	15' - 0"	2,433	9' - 6"	5' - 6"	108	#6	9"	8' - 7"	1,392	5' - 6"	3' - 1"	162	6"	9' - 0"	974	7	39' - 9"	186	51	39' - 9"	1,354	9' - 11"	26	22	61	0.891	218.8	0.8	87	36.4	8,839
9' - 0"	9' - 0"	8"	7"	13'	162	#6	6"	9' - 11"	2,413	162	#6	6"	15' - 0"	3,650	9' - 6"	5' - 6"	162	#6	6"	8' - 7"	2,089	5' - 6"	3' - 1"	162	6"	9' - 0"	974	7	39' - 9"	186	51	39' - 9"	1,354	9' - 11"	26	22	61	0.891	266.7	0.8	87	36.4	10,753
9' - 0"	9' - 0"	9"	8"	16'	162	#6	6"	10' - 1"	2,454	162	#6	6"	15' - 2"	3,690	9' - 7"	5' - 7"	162	#6	6"	8' - 9"	2,129	5' - 7"	3' - 2"	162	6"	9' - 0"	974	7	39' - 9"	186	51	39' - 9"	1,354	10' - 1"	27	24	67	1.019	269.7	0.8	94	41.5	10,881
9' - 0"	9' - 0"	11"	8"	20'	162	#6	6"	10' - 1"	2,454	162	#6	6"	15' - 4"	3,731	9' - 9"	5' - 7"	162	#6	6"	8' - 11"	2,170	5' - 7"	3' - 4"	162	6"	9' - 0"	974	7	39' - 9"	186	51	39' - 9"	1,354	10' - 1"	27	24	67	1.146	271.7	0.8	94	46.6	10,963
9' - 0"	9' - 0"	12"	9"	23'	162	#6	6"	10' - 3"	2,494	162	#6	6"	15' - 5"	3,751	9' - 10"	5' - 7"	162	#6	6"	9' - 0"	2,190	5' - 7"	3' - 5"	162	6"	9' - 0"	974	7	39' - 9"	186	51	39' - 9"	1,354	10' - 3"	27	24	67	1.278	273.7	0.8	94	51.9	11,043
9' - 0"	9' - 0"	13"	10"	26'	162	#6	6"	10' - 5"	2,535	162	#6	6"	15' - 7"	3,792	9' - 11"	5' - 8"	162	#6	6"	9' - 2"	2,230	5' - 8"	3' - 6"	162	6"	9' - 0"	974	7	39' - 9"	186	51	39' - 9"	1,354	10' - 5"	28	24	67	1.412	276.8	0.8	95	57.3	11,166
9' - 0"	9' - 0"	14"	11"	30'	162	#6	6"	10' - 7"	2,575	162	#6	6"	15' - 9"	3,832	10' - 0"	5' - 9"	162	#6	6"	9' - 4"	2,271	5' - 9"	3' - 7"	162	6"	9' - 0"	974	7	39' - 9"	186	51	39' - 9"	1,354	10' - 7"	28	24	67	1.547	279.8	0.8	95	62.7	11,287

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

DATE: 8/5/2022 1:15:42 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0504752\scc09ste-21.dgn

HL93 LOADING

Texas Department of Transportation

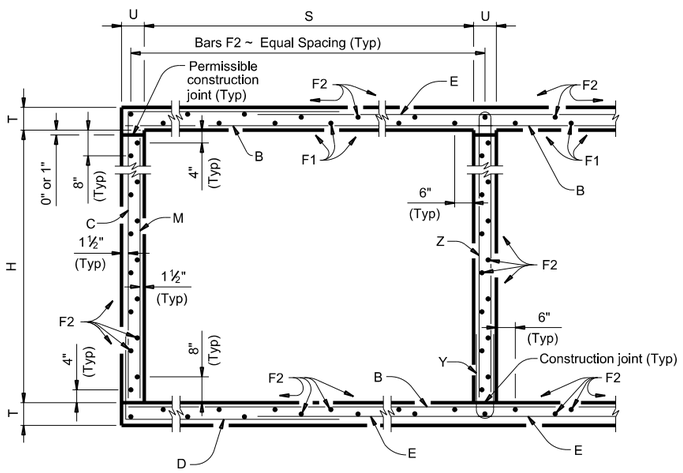
Bridge Division Standard

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

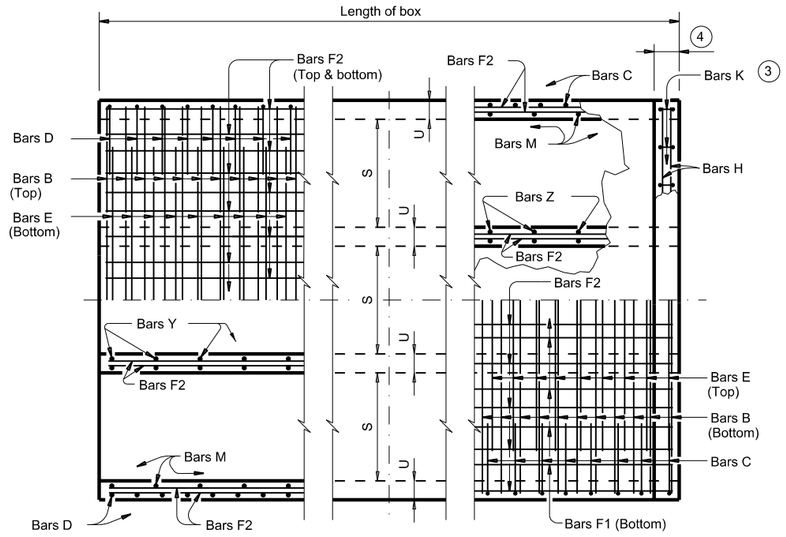
SCC-9

FILE: scc09ste-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2707	01	011, ETC.	FM 2781
04/2021 Updated X values.	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON, ETC.		102

DATE: 8/5/2022 1:15:46 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0504752\mc710ste-20.dgn



TYPICAL SECTION



PART PLANS

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

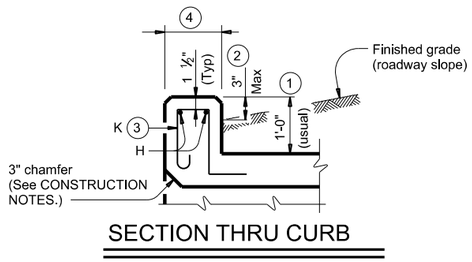
2. For vehicle safety, the following requirements must be met:
   · For structures without bridge rail, construct curbs no more than 3" above finished grade.
   · For structures with bridge rail, construct curbs flush with finished grade.
   Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

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

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

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

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



SECTION THRU CURB

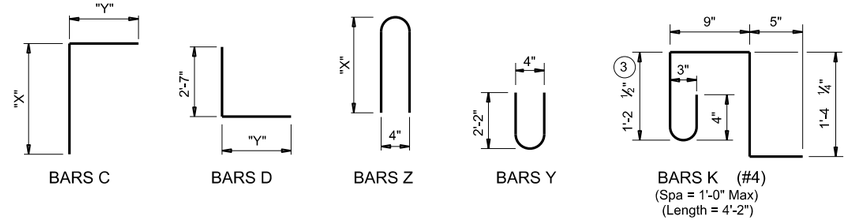
TABLE OF BAR DIMENSIONS		
H	"X"	"Y"
3'-0"	3'-6 ½"	4'-5"
4'-0"	4'-6 ½"	4'-5"
5'-0"	5'-6 ½"	4'-5"
6'-0"	6'-6 ½"	4'-5"
7'-0"	7'-6 ½"	4'-5"

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

MATERIAL NOTES:
Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Provide Class C concrete (f'c = 3,600 psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete (f'c = 4,000 psi) for top slabs of:
· culverts with overlay,
· culverts with 1-to-2 course surface treatment, or
· culverts with the top slab as the final riding surface.
Provide bar laps, where required, as follows:
· Uncoated or galvanized ~ #4 = 1'-8" Min
· Uncoated or galvanized ~ #5 = 2'-1" Min
· Uncoated or galvanized ~ #6 = 2'-6" Min

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

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



HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation — Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE
7'-0" SPAN
0' TO 10' FILL

MC-7-10

FILE: mc710ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2707	01	011, ETC.	FM 2781
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON, ETC.		103

NUMBER OF SPANS	SECTION DIMENSIONS				BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																																QUANTITIES					
					Bars B					Bars C & D							Bars E					Bars F1 ~ #4				Bars F2 ~ #4				Bars M ~ #4				Bars Y & Z ~ #4								Bars H 4 ~ #4		Bars K		Per Foot of Barrel		Curb		Total	
	S	H	T	U	No.	Size	Spa	Length	Wt	No.	Size	Spa	Bars C		Bars D		No.	Size	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Bars Y		Bars Z		Length	Wt	No.	Wt	Conc (CY)	Renf (Lb)	Conc (CY)	Renf (Lb)	Conc (CY)	Renf (Lb)
													Length	Wt	Length	Wt																					Length	Wt	Length	Wt										
2	7' - 0"	3' - 0"	8"	7"	108	#6	9"	15' - 6"	2,514	162	#5	6"	7' - 11"	1,338	7' - 0"	1,183	108	#6	9"	11' - 5"	1,852	10	18"	39' - 9"	266	54	18"	39' - 9"	1,434	108	9"	3' - 0"	216	54	9"	4' - 7"	165	7' - 3"	262	15' - 6"	41	34	95	0.972	230.8	1.2	136	40.0	9,366
3	7' - 0"	3' - 0"	8"	7"	108	#6	9"	23' - 1"	3,744	162	#5	6"	7' - 11"	1,338	7' - 0"	1,183	108	#6	9"	19' - 0"	3,082	15	18"	39' - 9"	398	77	18"	39' - 9"	2,045	108	9"	3' - 0"	216	108	9"	4' - 7"	331	7' - 3"	523	23' - 1"	62	50	139	1.412	321.5	1.7	201	58.2	13,061
4	7' - 0"	3' - 0"	8"	7"	108	#6	9"	30' - 8"	4,975	162	#5	6"	7' - 11"	1,338	7' - 0"	1,183	108	#6	9"	26' - 7"	4,312	20	18"	39' - 9"	531	100	18"	39' - 9"	2,655	108	9"	3' - 0"	216	162	9"	4' - 7"	496	7' - 3"	785	30' - 8"	82	64	178	1.851	412.3	2.3	260	76.3	16,751
5	7' - 0"	3' - 0"	8"	7"	108	#6	9"	38' - 3"	6,205	162	#5	6"	7' - 11"	1,338	7' - 0"	1,183	108	#6	9"	34' - 2"	5,542	25	18"	39' - 9"	664	123	18"	39' - 9"	3,266	108	9"	3' - 0"	216	216	9"	4' - 7"	661	7' - 3"	1,046	38' - 3"	102	80	223	2.290	503.0	2.8	325	94.4	20,446
6	7' - 0"	3' - 0"	8"	7"	108	#6	9"	45' - 10"	7,435	162	#5	6"	7' - 11"	1,338	7' - 0"	1,183	108	#6	9"	41' - 9"	6,773	30	18"	39' - 9"	797	146	18"	39' - 9"	3,877	108	9"	3' - 0"	216	270	9"	4' - 7"	827	7' - 3"	1,308	45' - 10"	122	94	262	2.729	593.9	3.4	384	112.6	24,138
2	7' - 0"	4' - 0"	8"	7"	108	#6	9"	15' - 6"	2,514	162	#5	6"	8' - 11"	1,507	7' - 0"	1,183	108	#6	9"	11' - 5"	1,852	10	18"	39' - 9"	266	54	18"	39' - 9"	1,434	108	9"	4' - 0"	289	54	9"	4' - 7"	165	9' - 3"	334	15' - 6"	41	34	95	1.037	238.6	1.2	136	42.6	9,680
3	7' - 0"	4' - 0"	8"	7"	108	#6	9"	23' - 1"	3,744	162	#5	6"	8' - 11"	1,507	7' - 0"	1,183	108	#6	9"	19' - 0"	3,082	15	18"	39' - 9"	398	77	18"	39' - 9"	2,045	108	9"	4' - 0"	289	108	9"	4' - 7"	331	9' - 3"	667	23' - 1"	62	50	139	1.498	331.2	1.7	201	61.6	13,447
4	7' - 0"	4' - 0"	8"	7"	108	#6	9"	30' - 8"	4,975	162	#5	6"	8' - 11"	1,507	7' - 0"	1,183	108	#6	9"	26' - 7"	4,312	20	18"	39' - 9"	531	100	18"	39' - 9"	2,655	108	9"	4' - 0"	289	162	9"	4' - 7"	496	9' - 3"	1,001	30' - 8"	82	64	178	1.959	423.7	2.3	260	80.6	17,209
5	7' - 0"	4' - 0"	8"	7"	108	#6	9"	38' - 3"	6,205	162	#5	6"	8' - 11"	1,507	7' - 0"	1,183	108	#6	9"	34' - 2"	5,542	25	18"	39' - 9"	664	123	18"	39' - 9"	3,266	108	9"	4' - 0"	289	216	9"	4' - 7"	661	9' - 3"	1,335	38' - 3"	102	80	223	2.420	516.3	2.8	325	99.6	20,977
6	7' - 0"	4' - 0"	8"	7"	108	#6	9"	45' - 10"	7,435	162	#5	6"	8' - 11"	1,507	7' - 0"	1,183	108	#6	9"	41' - 9"	6,773	30	18"	39' - 9"	797	146	18"	39' - 9"	3,877	108	9"	4' - 0"	289	270	9"	4' - 7"	827	9' - 3"	1,668	45' - 10"	122	94	262	2.881	608.9	3.4	384	118.6	24,740
2	7' - 0"	5' - 0"	8"	7"	108	#6	9"	15' - 6"	2,514	162	#5	6"	9' - 11"	1,676	7' - 0"	1,183	108	#6	9"	11' - 5"	1,852	10	18"	39' - 9"	266	60	18"	39' - 9"	1,593	108	9"	5' - 0"	361	54	9"	4' - 7"	165	11' - 3"	406	15' - 6"	41	34	95	1.102	250.4	1.2	136	45.2	10,152
3	7' - 0"	5' - 0"	8"	7"	108	#6	9"	23' - 1"	3,744	162	#5	6"	9' - 11"	1,676	7' - 0"	1,183	108	#6	9"	19' - 0"	3,082	15	18"	39' - 9"	398	85	18"	39' - 9"	2,257	108	9"	5' - 0"	361	108	9"	4' - 7"	331	11' - 3"	812	23' - 1"	62	50	139	1.584	346.1	1.7	201	65.1	14,045
4	7' - 0"	5' - 0"	8"	7"	108	#6	9"	30' - 8"	4,975	162	#5	6"	9' - 11"	1,676	7' - 0"	1,183	108	#6	9"	26' - 7"	4,312	20	18"	39' - 9"	531	110	18"	39' - 9"	2,921	108	9"	5' - 0"	361	162	9"	4' - 7"	496	11' - 3"	1,217	30' - 8"	82	64	178	2.067	441.8	2.3	260	85.0	17,932
5	7' - 0"	5' - 0"	8"	7"	108	#6	9"	38' - 3"	6,205	162	#5	6"	9' - 11"	1,676	7' - 0"	1,183	108	#6	9"	34' - 2"	5,542	25	18"	39' - 9"	664	135	18"	39' - 9"	3,585	108	9"	5' - 0"	361	216	9"	4' - 7"	661	11' - 3"	1,623	38' - 3"	102	80	223	2.549	537.5	2.8	325	104.8	21,825
6	7' - 0"	5' - 0"	8"	7"	108	#6	9"	45' - 10"	7,435	162	#5	6"	9' - 11"	1,676	7' - 0"	1,183	108	#6	9"	41' - 9"	6,773	30	18"	39' - 9"	797	160	18"	39' - 9"	4,248	108	9"	5' - 0"	361	270	9"	4' - 7"	827	11' - 3"	2,029	45' - 10"	122	94	262	3.032	633.2	3.4	384	124.7	25,713
2	7' - 0"	6' - 0"	8"	7"	108	#6	9"	15' - 6"	2,514	162	#5	6"	10' - 11"	1,845	7' - 0"	1,183	108	#6	9"	11' - 5"	1,852	10	18"	39' - 9"	266	66	18"	39' - 9"	1,752	108	9"	6' - 0"	433	54	9"	4' - 7"	165	13' - 3"	478	15' - 6"	41	34	95	1.167	262.2	1.2	136	47.8	10,624
3	7' - 0"	6' - 0"	8"	7"	108	#6	9"	23' - 1"	3,744	162	#5	6"	10' - 11"	1,845	7' - 0"	1,183	108	#6	9"	19' - 0"	3,082	15	18"	39' - 9"	398	93	18"	39' - 9"	2,469	108	9"	6' - 0"	433	108	9"	4' - 7"	331	13' - 3"	956	23' - 1"	62	50	139	1.671	361.0	1.7	201	68.6	14,642
4	7' - 0"	6' - 0"	8"	7"	108	#6	9"	30' - 8"	4,975	162	#5	6"	10' - 11"	1,845	7' - 0"	1,183	108	#6	9"	26' - 7"	4,312	20	18"	39' - 9"	531	120	18"	39' - 9"	3,186	108	9"	6' - 0"	433	162	9"	4' - 7"	496	13' - 3"	1,434	30' - 8"	82	64	178	2.175	459.9	2.3	260	89.3	18,655
5	7' - 0"	6' - 0"	8"	7"	108	#6	9"	38' - 3"	6,205	162	#5	6"	10' - 11"	1,845	7' - 0"	1,183	108	#6	9"	34' - 2"	5,542	25	18"	39' - 9"	664	147	18"	39' - 9"	3,903	108	9"	6' - 0"	433	216	9"	4' - 7"	661	13' - 3"	1,912	38' - 3"	102	80	223	2.679	558.7	2.8	325	110.0	22,673
6	7' - 0"	6' - 0"	8"	7"	108	#6	9"	45' - 10"	7,435	162	#5	6"	10' - 11"	1,845	7' - 0"	1,183	108	#6	9"	41' - 9"	6,773	30	18"	39' - 9"	797	174	18"	39' - 9"	4,620	108	9"	6' - 0"	433	270	9"	4' - 7"	827	13' - 3"	2,390	45' - 10"	122	94	262	3.183	657.6	3.4	384	130.7	26,687
2	7' - 0"	7' - 0"	8"	7"	108	#6	9"	15' - 6"	2,514	162	#5	6"	11' - 11"	2,014	7' - 0"	1,183	108	#6	9"	11' - 5"	1,852	10	18"	39' - 9"	266	66	18"	39' - 9"	1,752	108	9"	7' - 0"	505	54	9"	4' - 7"	165	15' - 3"	550	15' - 6"	41	34	95	1.231	270.0	1.2	136	50.4	10,937
3	7' - 0"	7' - 0"	8"	7"	108	#6	9"	23' - 1"	3,744	162	#5	6"	11' - 11"	2,014	7' - 0"	1,183	108	#6	9"	19' - 0"	3,082	15	18"	39' - 9"	398	93	18"	39' - 9"	2,469	108	9"	7' - 0"	505	108	9"	4' - 7"	331	15' - 3"	1,100	23' - 1"	62	50	139	1.757	370.7	1.7	201	72.0	15,027
4	7' - 0"	7' - 0"	8"	7"	108	#6	9"	30' - 8"	4,975	162	#5	6"	11' - 11"	2,014	7' - 0"	1,183	108	#6	9"	26' - 7"	4,312	20	18"	39' - 9"	531	120	18"	39' - 9"	3,186	108	9"	7' - 0"	505	162	9"	4' - 7"	496	15' - 3"	1,650	30' - 8"	82	64	178	2.283	471.3	2.3	260	93.6	19,112
5	7' - 0"	7' - 0"	8"	7"	108	#6	9"	38' - 3"	6,205	162	#5	6"	11' - 11"	2,014	7' - 0"	1,183	108	#6	9"	34' - 2"	5,542	25	18"	39' - 9"	664	147	18"	39' - 9"	3,903	108	9"	7' - 0"	505	216	9"	4' - 7"	661	15' - 3"	2,200	38' - 3"	102	80	223	2.809	571.9	2.8	325	115.2	23,202
6	7' - 0"	7' - 0"	8"	7"	108	#6	9"	45' - 10"	7,435	162	#5	6"	11' - 11"	2,014	7' - 0"	1,183	108	#6	9"	41' - 9"	6,773	30	18"	39' - 9"	797	174	18"	39' - 9"	4,620	108	9"	7' - 0"	505	270	9"	4' - 7"	827	15' - 3"	2,750	45' - 10"	122	94	262	3.334	672.6	3.4	384	136.8	27,288

DATE: 8/5/2022 1:15:47 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0504752\mc710ste-20.dgn

HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

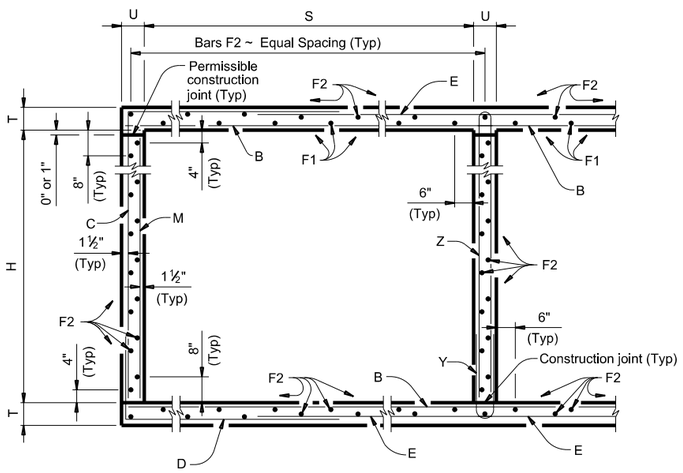
MULTIPLE BOX CULVERTS CAST-IN-PLACE

7'-0" SPAN

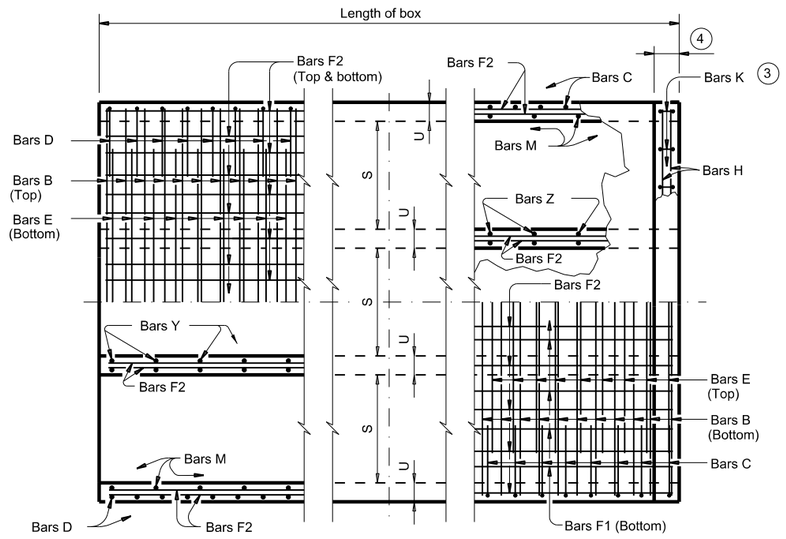
0' TO 10' FILL

MC-7-10

FILE: mc710ste-20.dgn	DN: TBE		CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY	
REVISIONS	2707	01	011, ETC.	FM 2781	
	DIST	COUNTY		SHEET NO.	
	LFK	HOUSTON, ETC.		104	



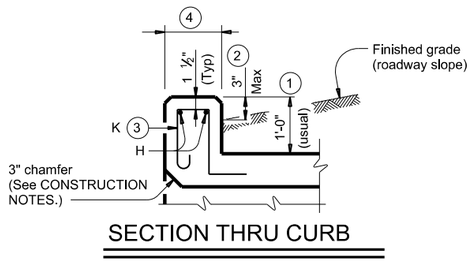
TYPICAL SECTION



BOTTOM SLAB

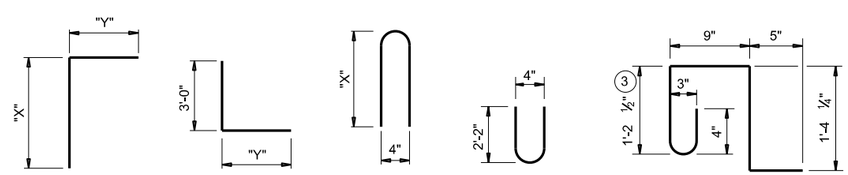
TOP SLAB

PART PLANS



SECTION THRU CURB

TABLE OF BAR DIMENSIONS		
H	"X"	"Y"
3'-0"	3'-6 ½"	5'-1"
4'-0"	4'-6 ½"	5'-1"
5'-0"	5'-6 ½"	5'-1"
6'-0"	6'-6 ½"	5'-1"
7'-0"	7'-6 ½"	5'-1"
8'-0"	8'-6 ½"	5'-1"



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

2. For vehicle safety, the following requirements must be met:
   · For structures without bridge rail, construct curbs no more than 3" above finished grade.
   · For structures with bridge rail, construct curbs flush with finished grade.
   Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

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

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

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

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

CONSTRUCTION NOTES:

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

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Provide Class C concrete (f'c = 3,600 psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete (f'c = 4,000 psi) for top slabs of:
· culverts with overlay,
· culverts with 1-to-2 course surface treatment, or
· culverts with the top slab as the final riding surface.
Provide bar laps, where required, as follows:
· Uncoated or galvanized ~ #4 = 1'-8" Min
· Uncoated or galvanized ~ #5 = 2'-1" Min
· Uncoated or galvanized ~ #6 = 2'-6" Min

GENERAL NOTES:

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

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

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE

8'-0" SPAN
0' TO 13' FILL

MC-8-13

FILE: mc813ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2707	01	011, ETC.	FM 2781
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON, ETC.		105

DATE: 8/5/2022 1:15:51 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0504752\mc813ste-20.dgn

DISCLAIMER:
The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE: 8/5/2022 1:15:51 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0504752\mc813ste-20.dgn

NUMBER OF SPANS	SECTION DIMENSIONS				BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																																		QUANTITIES					
					Bars B					Bars C & D							Bars E					Bars F1 ~ #4				Bars F2 ~ #4				Bars M ~ #4				Bars Y & Z ~ #4								Bars H 4 ~ #4		Bars K		Per Foot of Barrel		Curb		Total	
	S	H	T	U	No.	Size	Spa	Length	Wt	No.	Size	Spa	Bars C Length	Bars C Wt	Bars D Length	Bars D Wt	No.	Size	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Bars Y Length	Bars Y Wt	Bars Z Length	Bars Z Wt	No.	Spa	Length	Wt	Length	Wt	No.	Wt	Conc (CY)	Renf (Lb)	Conc (CY)	Renf (Lb)	Conc (CY)	Renf (Lb)
2	8' - 0"	3' - 0"	8"	7"	162	#6	6"	17' - 6"	4,258	108	#6	9"	8' - 8"	1,406	8' - 2"	1,325	162	#6	6"	12' - 9"	3,102	12	18"	39' - 9"	319	56	18"	39' - 9"	1,487	108	9"	3' - 0"	216	54	9"	4' - 7"	165	7' - 3"	262	17' - 6"	47	38	106	1.071	313.5	1.3	153	44.2	12,693
3	8' - 0"	3' - 0"	8"	7"	162	#6	6"	26' - 1"	6,347	108	#6	9"	8' - 8"	1,406	8' - 2"	1,325	162	#6	6"	21' - 4"	5,191	18	18"	39' - 9"	478	80	18"	39' - 9"	2,124	108	9"	3' - 0"	216	108	9"	4' - 7"	331	7' - 3"	523	26' - 1"	70	56	156	1.560	448.5	1.9	226	64.3	18,167
4	8' - 0"	3' - 0"	8"	7"	162	#6	6"	34' - 8"	8,435	108	#6	9"	8' - 8"	1,406	8' - 2"	1,325	162	#6	6"	29' - 11"	7,279	24	18"	39' - 9"	637	104	18"	39' - 9"	2,762	108	9"	3' - 0"	216	162	9"	4' - 7"	496	7' - 3"	785	34' - 8"	93	72	200	2.048	583.5	2.6	293	84.5	23,634
5	8' - 0"	3' - 0"	8"	7"	162	#6	6"	43' - 3"	10,524	108	#6	9"	8' - 8"	1,406	8' - 2"	1,325	162	#6	6"	38' - 6"	9,368	30	18"	39' - 9"	797	128	18"	39' - 9"	3,399	108	9"	3' - 0"	216	216	9"	4' - 7"	661	7' - 3"	1,046	43' - 3"	116	90	251	2.537	718.6	3.2	367	104.7	29,109
6	8' - 0"	3' - 0"	8"	7"	162	#6	6"	51' - 10"	12,612	108	#6	9"	8' - 8"	1,406	8' - 2"	1,325	162	#6	6"	47' - 1"	11,457	36	18"	39' - 9"	956	152	18"	39' - 9"	4,036	108	9"	3' - 0"	216	270	9"	4' - 7"	827	7' - 3"	1,308	51' - 10"	138	106	295	3.026	853.6	3.8	433	124.9	34,576
2	8' - 0"	4' - 0"	8"	7"	162	#6	6"	17' - 6"	4,258	108	#6	9"	9' - 8"	1,568	8' - 2"	1,325	162	#6	6"	12' - 9"	3,102	12	18"	39' - 9"	319	56	18"	39' - 9"	1,487	108	9"	4' - 0"	289	54	9"	4' - 7"	165	9' - 3"	334	17' - 6"	47	38	106	1.136	321.2	1.3	153	46.8	13,000
3	8' - 0"	4' - 0"	8"	7"	162	#6	6"	26' - 1"	6,347	108	#6	9"	9' - 8"	1,568	8' - 2"	1,325	162	#6	6"	21' - 4"	5,191	18	18"	39' - 9"	478	80	18"	39' - 9"	2,124	108	9"	4' - 0"	289	108	9"	4' - 7"	331	9' - 3"	667	26' - 1"	70	56	156	1.646	458.0	1.9	226	67.8	18,546
4	8' - 0"	4' - 0"	8"	7"	162	#6	6"	34' - 8"	8,435	108	#6	9"	9' - 8"	1,568	8' - 2"	1,325	162	#6	6"	29' - 11"	7,279	24	18"	39' - 9"	637	104	18"	39' - 9"	2,762	108	9"	4' - 0"	289	162	9"	4' - 7"	496	9' - 3"	1,001	34' - 8"	93	72	200	2.156	594.8	2.6	293	88.8	24,085
5	8' - 0"	4' - 0"	8"	7"	162	#6	6"	43' - 3"	10,524	108	#6	9"	9' - 8"	1,568	8' - 2"	1,325	162	#6	6"	38' - 6"	9,368	30	18"	39' - 9"	797	128	18"	39' - 9"	3,399	108	9"	4' - 0"	289	216	9"	4' - 7"	661	9' - 3"	1,335	43' - 3"	116	90	251	2.667	731.7	3.2	367	109.9	29,633
6	8' - 0"	4' - 0"	8"	7"	162	#6	6"	51' - 10"	12,612	108	#6	9"	9' - 8"	1,568	8' - 2"	1,325	162	#6	6"	47' - 1"	11,457	36	18"	39' - 9"	956	152	18"	39' - 9"	4,036	108	9"	4' - 0"	289	270	9"	4' - 7"	827	9' - 3"	1,668	51' - 10"	138	106	295	3.177	868.5	3.8	433	130.9	35,171
2	8' - 0"	5' - 0"	8"	7"	162	#6	6"	17' - 6"	4,258	108	#6	9"	10' - 8"	1,730	8' - 2"	1,325	162	#6	6"	12' - 9"	3,102	12	18"	39' - 9"	319	62	18"	39' - 9"	1,646	108	9"	5' - 0"	361	54	9"	4' - 7"	165	11' - 3"	406	17' - 6"	47	38	106	1.201	332.8	1.3	153	49.4	13,465
3	8' - 0"	5' - 0"	8"	7"	162	#6	6"	26' - 1"	6,347	108	#6	9"	10' - 8"	1,730	8' - 2"	1,325	162	#6	6"	21' - 4"	5,191	18	18"	39' - 9"	478	88	18"	39' - 9"	2,337	108	9"	5' - 0"	361	108	9"	4' - 7"	331	11' - 3"	812	26' - 1"	70	56	156	1.733	472.8	1.9	226	71.3	19,138
4	8' - 0"	5' - 0"	8"	7"	162	#6	6"	34' - 8"	8,435	108	#6	9"	10' - 8"	1,730	8' - 2"	1,325	162	#6	6"	29' - 11"	7,279	24	18"	39' - 9"	637	114	18"	39' - 9"	3,027	108	9"	5' - 0"	361	162	9"	4' - 7"	496	11' - 3"	1,217	34' - 8"	93	72	200	2.264	612.7	2.6	293	93.1	24,800
5	8' - 0"	5' - 0"	8"	7"	162	#6	6"	43' - 3"	10,524	108	#6	9"	10' - 8"	1,730	8' - 2"	1,325	162	#6	6"	38' - 6"	9,368	30	18"	39' - 9"	797	140	18"	39' - 9"	3,717	108	9"	5' - 0"	361	216	9"	4' - 7"	661	11' - 3"	1,623	43' - 3"	116	90	251	2.796	752.7	3.2	367	115.1	30,473
6	8' - 0"	5' - 0"	8"	7"	162	#6	6"	51' - 10"	12,612	108	#6	9"	10' - 8"	1,730	8' - 2"	1,325	162	#6	6"	47' - 1"	11,457	36	18"	39' - 9"	956	166	18"	39' - 9"	4,408	108	9"	5' - 0"	361	270	9"	4' - 7"	827	11' - 3"	2,029	51' - 10"	138	106	295	3.328	892.6	3.8	433	137.0	36,138
2	8' - 0"	6' - 0"	8"	7"	162	#6	6"	17' - 6"	4,258	108	#6	9"	11' - 8"	1,893	8' - 2"	1,325	162	#6	6"	12' - 9"	3,102	12	18"	39' - 9"	319	68	18"	39' - 9"	1,806	108	9"	6' - 0"	433	54	9"	4' - 7"	165	13' - 3"	478	17' - 6"	47	38	106	1.265	344.5	1.3	153	51.9	13,932
3	8' - 0"	6' - 0"	8"	7"	162	#6	6"	26' - 1"	6,347	108	#6	9"	11' - 8"	1,893	8' - 2"	1,325	162	#6	6"	21' - 4"	5,191	18	18"	39' - 9"	478	96	18"	39' - 9"	2,549	108	9"	6' - 0"	433	108	9"	4' - 7"	331	13' - 3"	956	26' - 1"	70	56	156	1.819	487.6	1.9	226	74.7	19,729
4	8' - 0"	6' - 0"	8"	7"	162	#6	6"	34' - 8"	8,435	108	#6	9"	11' - 8"	1,893	8' - 2"	1,325	162	#6	6"	29' - 11"	7,279	24	18"	39' - 9"	637	124	18"	39' - 9"	3,293	108	9"	6' - 0"	433	162	9"	4' - 7"	496	13' - 3"	1,434	34' - 8"	93	72	200	2.372	630.6	2.6	293	97.5	25,518
5	8' - 0"	6' - 0"	8"	7"	162	#6	6"	43' - 3"	10,524	108	#6	9"	11' - 8"	1,893	8' - 2"	1,325	162	#6	6"	38' - 6"	9,368	30	18"	39' - 9"	797	152	18"	39' - 9"	4,036	108	9"	6' - 0"	433	216	9"	4' - 7"	661	13' - 3"	1,912	43' - 3"	116	90	251	2.926	773.7	3.2	367	120.3	31,316
6	8' - 0"	6' - 0"	8"	7"	162	#6	6"	51' - 10"	12,612	108	#6	9"	11' - 8"	1,893	8' - 2"	1,325	162	#6	6"	47' - 1"	11,457	36	18"	39' - 9"	956	180	18"	39' - 9"	4,780	108	9"	6' - 0"	433	270	9"	4' - 7"	827	13' - 3"	2,390	51' - 10"	138	106	295	3.479	916.8	3.8	433	143.0	37,106
2	8' - 0"	7' - 0"	8"	7"	162	#6	6"	17' - 6"	4,258	108	#6	9"	12' - 8"	2,055	8' - 2"	1,325	162	#6	6"	12' - 9"	3,102	12	18"	39' - 9"	319	68	18"	39' - 9"	1,806	108	9"	7' - 0"	505	54	9"	4' - 7"	165	15' - 3"	550	17' - 6"	47	38	106	1.330	352.1	1.3	153	54.5	14,238
3	8' - 0"	7' - 0"	8"	7"	162	#6	6"	26' - 1"	6,347	108	#6	9"	12' - 8"	2,055	8' - 2"	1,325	162	#6	6"	21' - 4"	5,191	18	18"	39' - 9"	478	96	18"	39' - 9"	2,549	108	9"	7' - 0"	505	108	9"	4' - 7"	331	15' - 3"	1,100	26' - 1"	70	56	156	1.905	497.0	1.9	226	78.1	20,107
4	8' - 0"	7' - 0"	8"	7"	162	#6	6"	34' - 8"	8,435	108	#6	9"	12' - 8"	2,055	8' - 2"	1,325	162	#6	6"	29' - 11"	7,279	24	18"	39' - 9"	637	124	18"	39' - 9"	3,293	108	9"	7' - 0"	505	162	9"	4' - 7"	496	15' - 3"	1,650	34' - 8"	93	72	200	2.480	641.9	2.6	293	101.8	25,968
5	8' - 0"	7' - 0"	8"	7"	162	#6	6"	43' - 3"	10,524	108	#6	9"	12' - 8"	2,055	8' - 2"	1,325	162	#6	6"	38' - 6"	9,368	30	18"	39' - 9"	797	152	18"	39' - 9"	4,036	108	9"	7' - 0"	505	216	9"	4' - 7"	661	15' - 3"	2,200	43' - 3"	116	90	251	3.056	786.8	3.2	367	125.5	31,838
6	8' - 0"	7' - 0"	8"	7"	162	#6	6"	51' - 10"	12,612	108	#6	9"	12' - 8"	2,055	8' - 2"	1,325	162	#6	6"	47' - 1"	11,457	36	18"	39' - 9"	956	180	18"	39' - 9"	4,780	108	9"	7' - 0"	505	270	9"	4' - 7"	827	15' - 3"	2,750	51' - 10"	138	106	295	3.631	931.7	3.8	433	149.1	37,700
2	8' - 0"	8' - 0"	8"	7"	162	#6	6"	17' - 6"	4,258	108	#6	9"	13' - 8"	2,217	8' - 2"	1,325	162	#6	6"	12' - 9"	3,102	12	18"	39' - 9"	319	74	18"	39' - 9"	1,965	108	9"	8' - 0"	577	54	9"	4' - 7"	165	17' - 3"	622	17' - 6"	47	38	106	1.395	363.8	1.3	153	57.1	14,703
3	8' - 0"	8' - 0"	8"	7"	162	#6	6"	26' - 1"	6,347	108	#6	9"	13' - 8"	2,217	8' - 2"	1,325	162	#6	6"	21' - 4"	5,191	18	18"	39' - 9"	478	104	18"	39' - 9"	2,762	108	9"	8' - 0"	577	108	9"	4' - 7"	331	17' - 3"	1,244	26' - 1"	70	56	156	1.992	511.8	1.9	226	81.6	20,698
4	8' - 0"	8' - 0"	8"	7"	162	#6	6"	34' - 8"	8,435	108	#6	9"	13' - 8"	2,217	8' - 2"	1,325	162	#6	6"	29' - 11"	7,279	24	18"	39' - 9"	637	134	18"	39' - 9"	3,558	108	9"	8' - 0"	577	162	9"	4' - 7"	496	17' - 3"	1,867	34' - 8"	93	72	200	2.588	659.8	2.6	293	106.1	26,684
5	8' - 0"	8' - 0"	8"	7"	162	#6	6"	43' - 3"	10,524	108	#6	9"	13' - 8"	2,217	8' - 2"	1,325	162	#6	6"	38' - 6"	9,368	30	18"	39' - 9"	797	164	18"	39' - 9"	4,355	108	9"	8' - 0"	577	216	9"	4' - 7"	661	17' - 3"	2,489	43' - 3"	116	90	251	3.185	807.8	3.2	367	130.6	32,680
6	8' - 0"	8' - 0"	8"	7"	162	#6	6"	51' - 10"	12,612	108	#6	9"	13' - 8"	2,217	8' - 2"	1,325	162	#6	6"	47' - 1"	11,457	36	18"	39' - 9"	956	194	18"	39' - 9"	5,151	108	9"	8' - 0"	577	270	9"	4' - 7"	827	17' - 3"	3,111	51' - 10"	138	106	295	3.782	955.8	3.8	433	155.1	38,666

HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

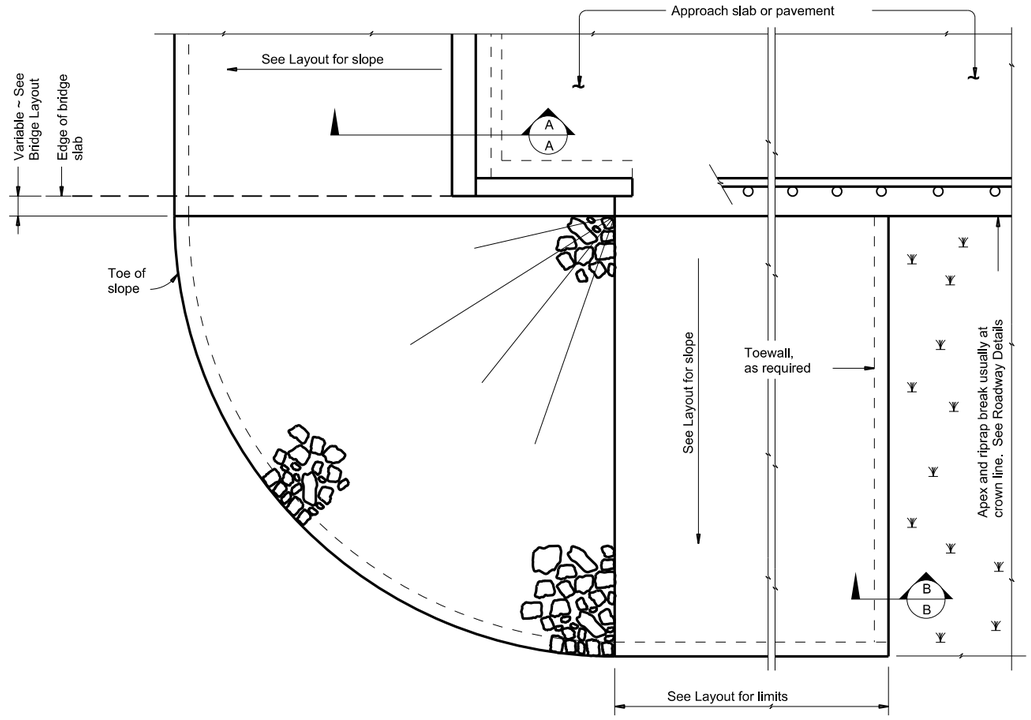
MULTIPLE BOX CULVERTS CAST-IN-PLACE

8'-0" SPAN

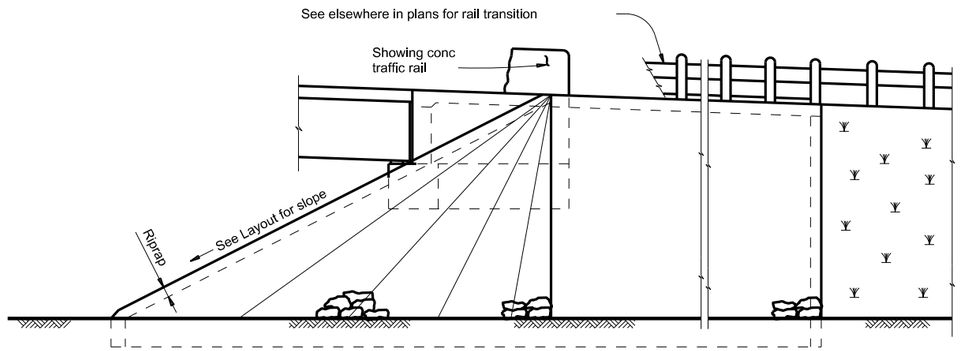
0' TO 13' FILL

MC-8-13

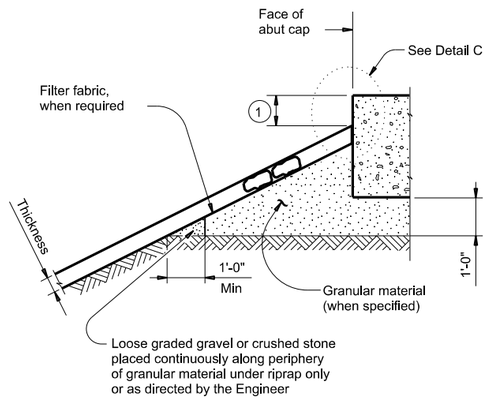
FILE: mc813ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2707	01	011, ETC.	FM 2781
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON, ETC.		106



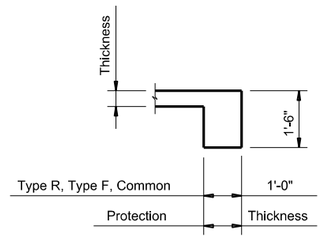
PLAN



ELEVATION

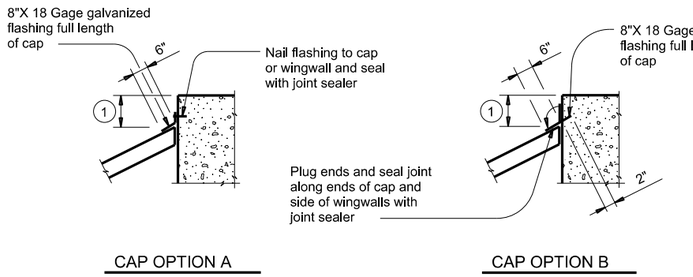


SECTION A-A AT CAP



SECTION B-B

Provide toewall when shoulder drain is located adjacent to limits of stone riprap. Omit toewall when thickness of protection riprap is greater than 18".



CAP OPTION A

CAP OPTION B

DETAIL C

(1) Top of cap to top of riprap dimension varies as directed by the Engineer. Provide 9" Min for beam/slab type bridges and 1'-6" for slab span, box beam, or slab beam bridges.

GENERAL NOTES:

Refer to Item 432, "Riprap" for stone size and gradation, and construction details. See Layout for limits and thickness of riprap specified.

See elsewhere in plans for locations and details of shoulder drains.

DATE: 8/5/2022 1:15:56 PM
FILE: c:\txdot\pw_online\txdot03\sergio.zapata\d0504752\srrstde1-19.dgn

SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

STONE RIPRAP

SRR

FILE: srrstde1-19.dgn	DN: AES	CK: JGD	DW: BWH	CK: AES
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	2707	01	011, ETC.	FM 2781
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON, ETC.		107

DATE: 8/5/2022 1:15:57 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0504752\srrstde1-19.dgn

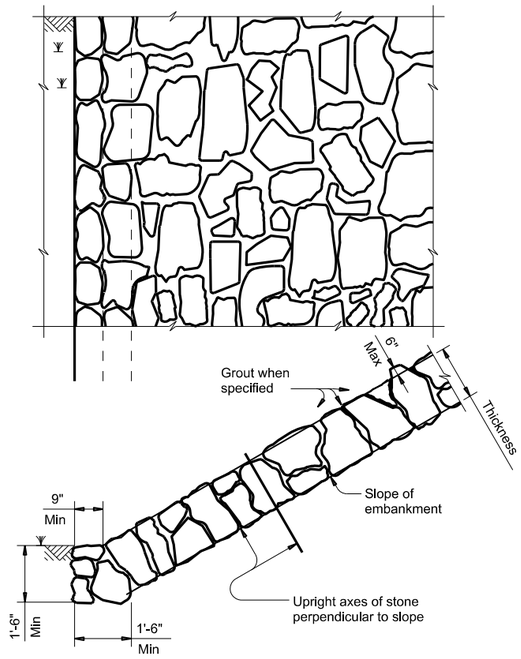


FIGURE 1 ~ TYPE R STONE RIPRAP

dry or grouted

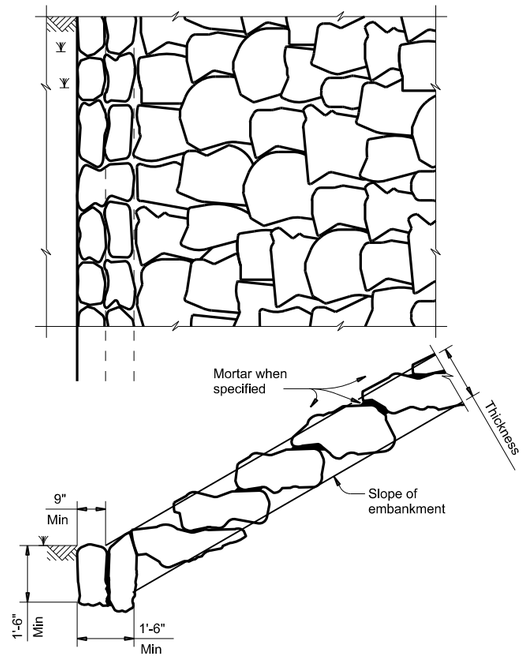


FIGURE 2 ~ TYPE F STONE RIPRAP

dry or mortared

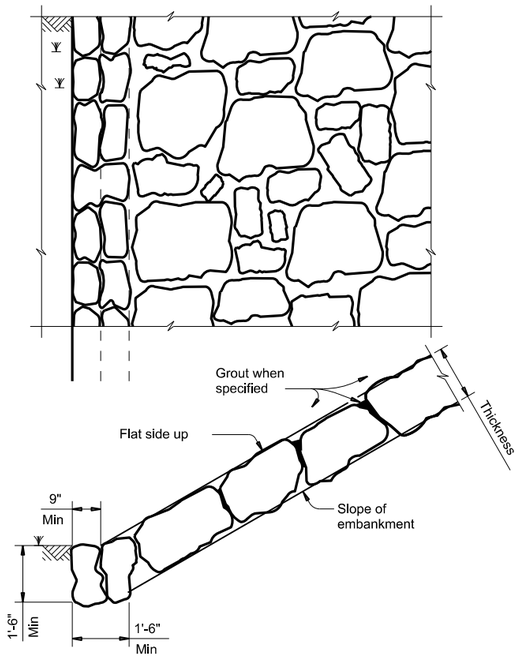


FIGURE 3 ~ TYPE F STONE RIPRAP

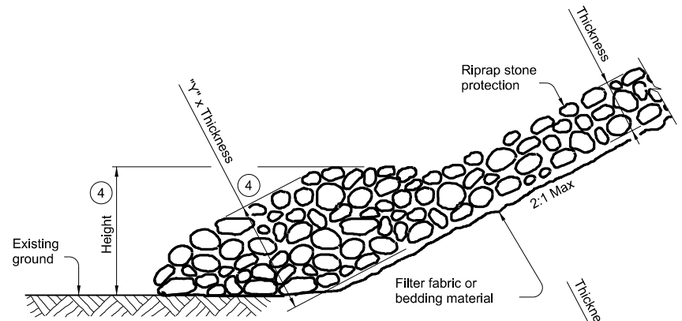
grouted

2 Provide bedding material instead of filter fabric if shown elsewhere in plans. See Layout for thickness of bedding material.

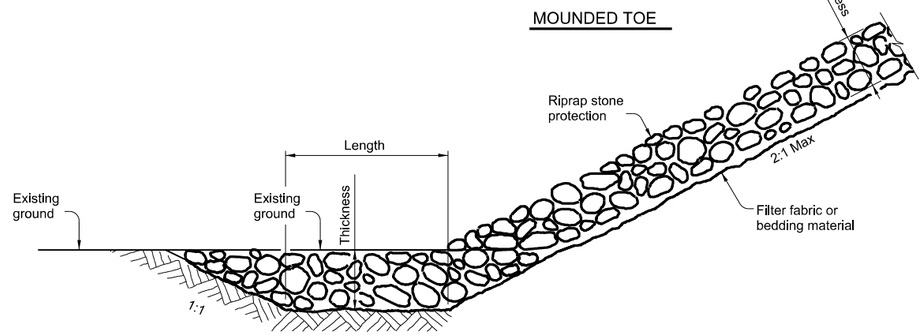
3 Minimum toe depth is the larger of the maximum scour depth or 2 times the riprap thickness.

4 "Y" and Height need to be defined. See layout or detail sheet for values if this option is used.

5 List Stone Protection as size (XX inch) and thickness (YY inch) on the layout.
Example: Riprap (Stone Protection) XX inch, Thickness = YY inch.



MOUNDED TOE



EXTENDED ROCK FILLED TRENCH

PROTECTION STONE RIPRAP TOE OPTIONS (5)

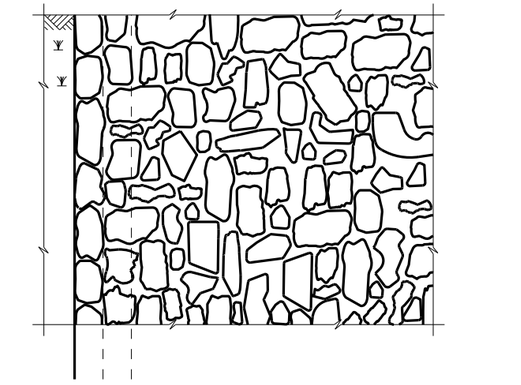


FIGURE 4 ~ COMMON STONE RIPRAP

dry or grouted

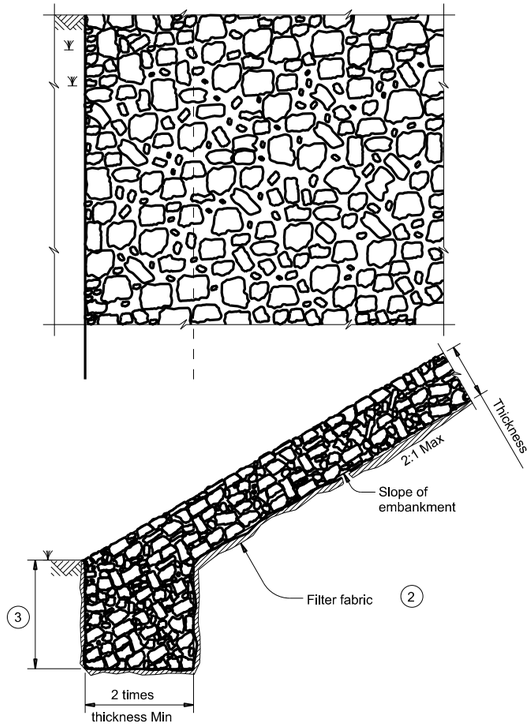


FIGURE 5 ~ PROTECTION STONE RIPRAP (5)

SHEET 2 OF 2

Texas Department of Transportation

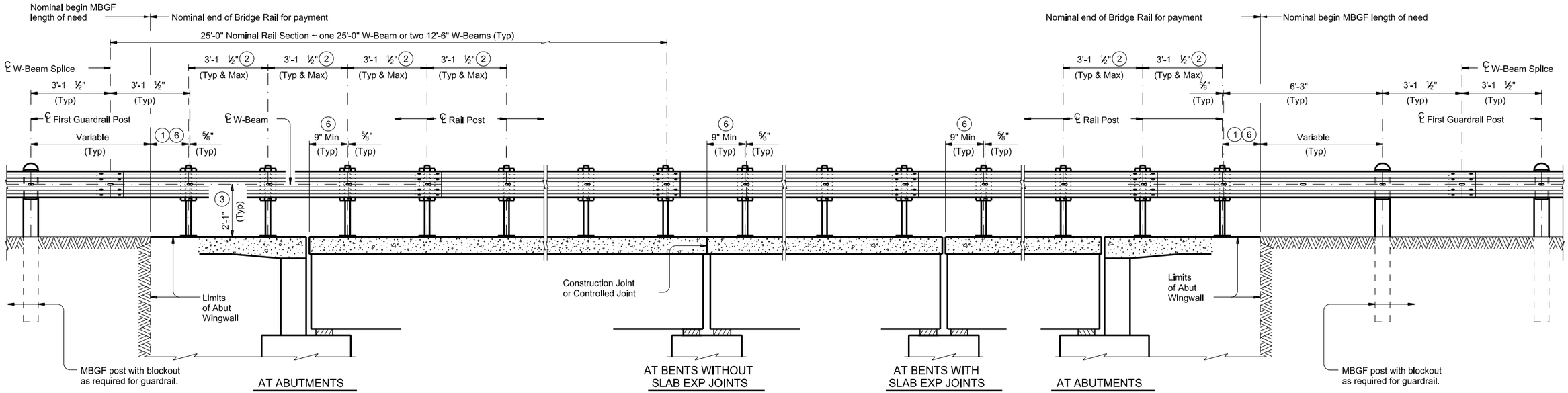
Bridge Division Standard

STONE RIPRAP

SRR

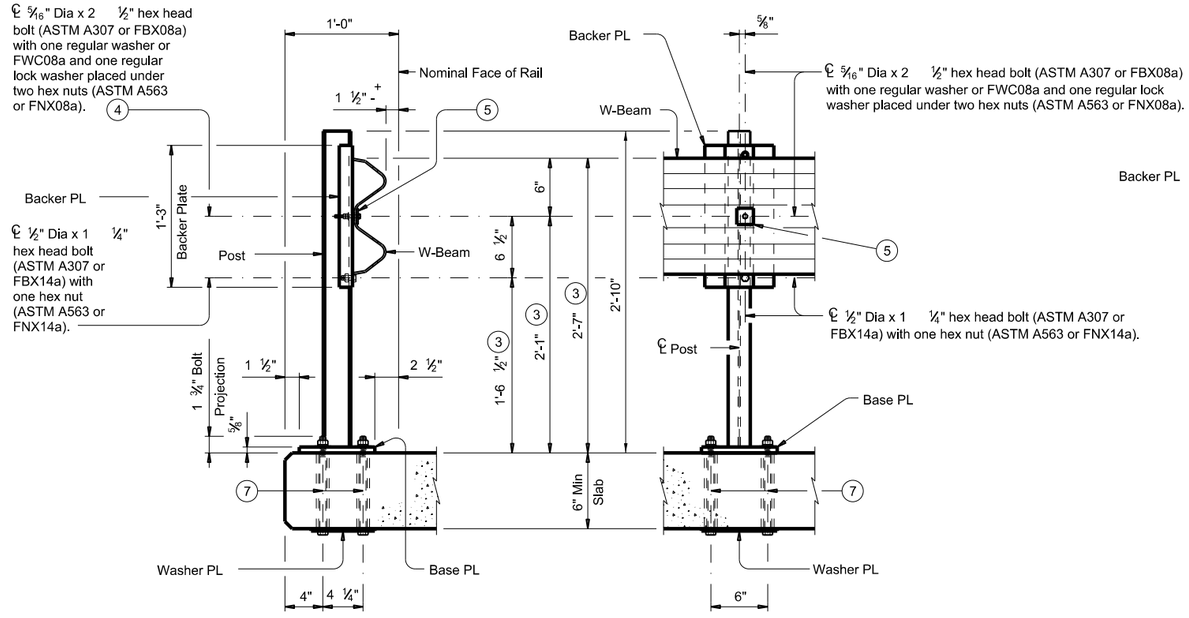
FILE: srrstde1-19.dgn	DN: AES	CK: JGD	DW: BWH	CK: AES
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	2707	01	011, ETC.	FM 2781
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON, ETC.		108

DATE: 8/5/2022 1:16:01 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0504752\rlstd038-20.dgn



ROADWAY ELEVATION OF RAIL

Showing without overlay.

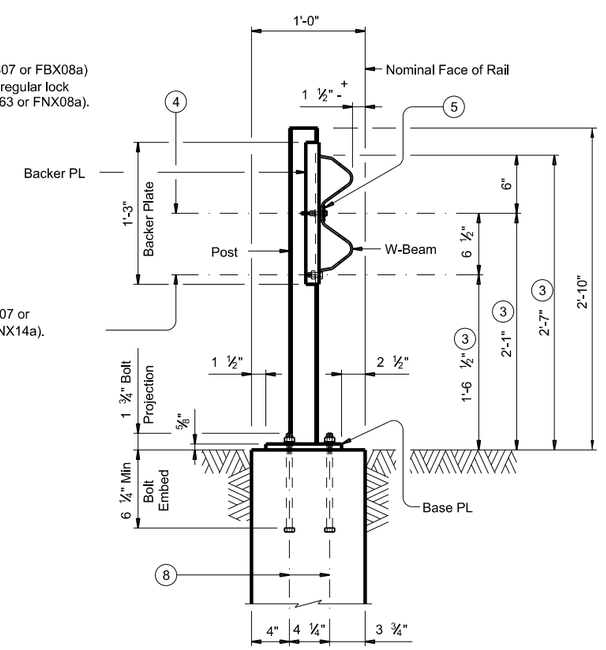


RAIL SECTION

TRAFFIC SIDE RAIL VIEW

RAIL DETAILS ON BRIDGE SLAB

Showing without overlay.



RAIL SECTION ON ABUTMENT WINGWALL

Showing without overlay.

1. 9" Min, 5'-9" Max
2. Maintain 3'-1 ½" Rail Post spacing wherever possible for use with nominal 25'-0" or 12'-6" W-Beam sections. Symmetry of post spacing on both sides and along the structure is not necessary.
3. Increase 2" for structures with overlay.
4. Tighten the first hex nut by hand until the top and bottom edges of the W-Beam engage the Backer Plate (Backer Plate should be snug against the post). Then tighten hex nut one revolution with wrench and secure with the second hex nut.
5. PL ⅛ x 1 ¾ x 1 ¾ with ⅜ Dia Hole centered in PL (ASTM A36). Square Guardrail Washer (FWR01).
6. The post nearest to a slab joint or end of structure may be shifted up to 9" in order to satisfy the minimum offset dimension. Drill a new ¾" Dia hole on the centerline of W-beam for shifted post. Paint hole with two coats of zinc-rich paint conforming to the Item "Galvanizing". All other posts must remain on the typical spacing.
7. □ ⅞" Dia formed holes for □ ⅝" Dia heavy hex head anchor bolt (ASTM F3125 Gr A325 or A449) or threaded rod (ATSM A193 Gr B7 or F1554 Gr 105) with one hardened steel washer (ASTM F436) and one regular lock washer placed under heavy hex nut (ASTM A563). One additional heavy hex nut must be furnished and tack weled for each threaded rod. See "Cast-In-Place & Formed Hole Anchor Bolt Options".
8. □ ⅝" Dia heavy hex head anchor bolt (ASTM F3125 Gr A325 or A449) or threaded rod (ATSM A193 Gr B7 or F1554 Gr 105) with one hardened steel washer (ASTM F436) and one regular lock washer placed under heavy hex nut (ASTM A563). One additional heavy hex nut must be furnished and tack weled for each threaded rod. See "Cast-In-Place & Formed Hole Anchor Bolt Options".

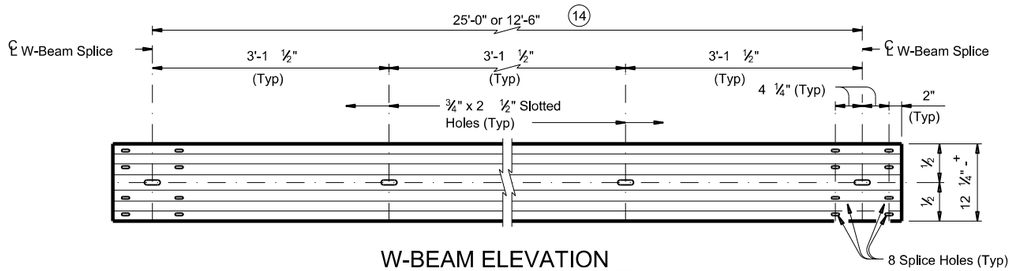
Texas Department of Transportation

Bridge Division Standard

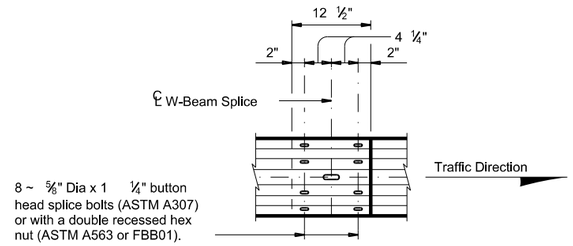
TRAFFIC RAIL

TYPE T631

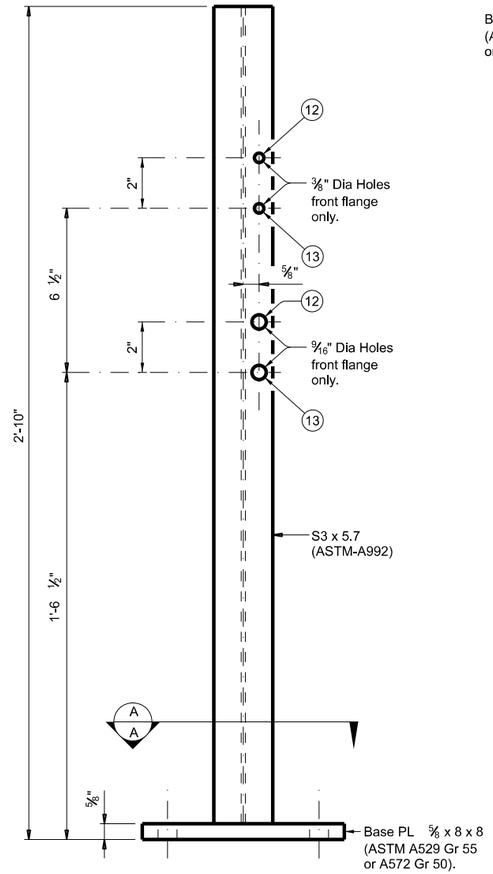
FILE: rlstd038-20.dgn	DN: TxDOT	CK: AES	DW: JTR	CK: AES
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS 07-20: Allowing 9'-4 sections. ½" or 6'-3" W-Beam	2707	01	011, ETC.	FM 2781
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON, ETC.		109



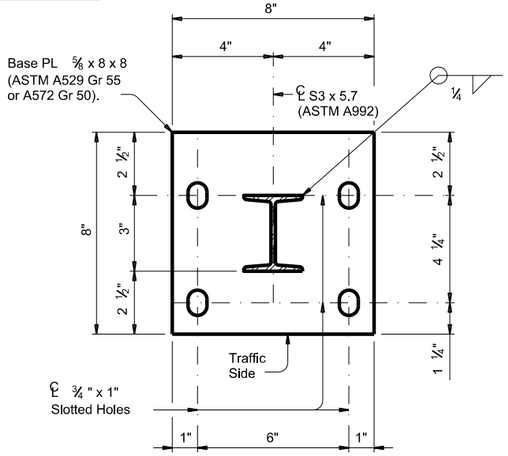
W-BEAM ELEVATION



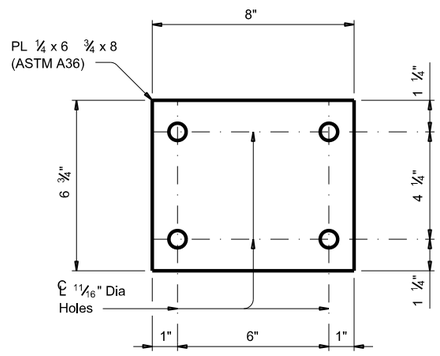
W-BEAM SPLICE ELEVATION



POST ELEVATION

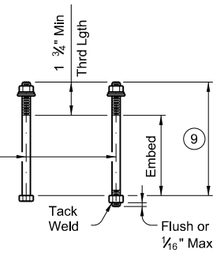


SECTION A-A



WASHER PLATE DETAIL

□ ⅝" Dia heavy hex head anchor bolt (ASTM F3125 Gr A325 or A449) or threaded rod (ATSM A193 Gr B7 or F1554 Gr 105) with one hardened steel washer (ASTM F436) and one regular lock washer placed under heavy hex nut (ASTM A563). One additional heavy hex nut must be furnished and tack welded for each threaded rod.



CAST-IN-PLACE & FORMED HOLE ANCHOR BOLT OPTIONS (10)

(9) See "Rail Details On Bridge Slab" and/or "Rail Section On Abutment Wingwall".

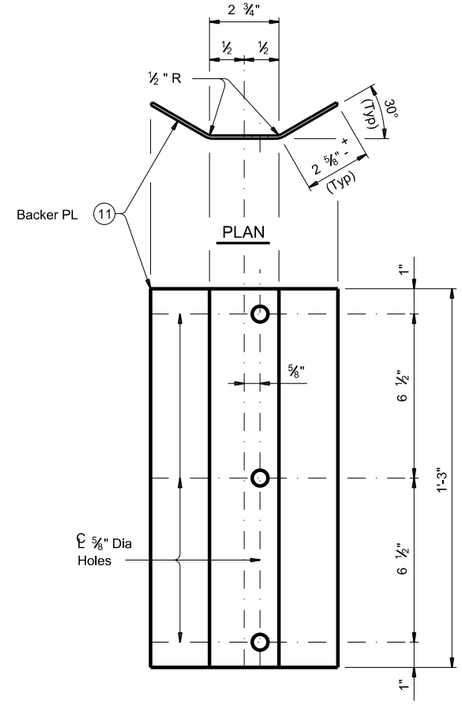
(10) See "Material Notes" for anchor bolt information.

(11) Backer PL ⅛ x 8 x 1'-3" (ASTM A1011 CS or SS Gr 33, or A1008 CS or SS Gr 33 (11 Gage acceptable)).

(12) Used for structures with overlay.

(13) Used for structures without overlay.

(14) At the nominal end of the bridge rail for payment, one 9'-4 ½" or 6'-3" W-beam section is permitted in order to achieve the required W-Beam splice location on the MBGF.



BACKER PLATE

MBGF AND END TREATMENT NOTES:

This traffic railing must be anchored by metal beam guard fence (MBGF) and guard fence end treatments. Determine MBGF length of need in accordance with the Roadway Design Manual, unless otherwise specified. The minimum MBGF length of need required for anchoring the railing is 25' of MBGF plus the appropriate end treatment.

CONSTRUCTION NOTES:

Face of rail post must be plumb unless otherwise approved by the Engineer. Post must be perpendicular to adjacent roadway grade. Use epoxy mortar under post base plates if gaps larger than 1/16" exist.

Fully anchored guardrail must be attached to each end of rail. A metal beam guard fence transition is not used with this rail.

At the Contractor's option anchor bolts may be an adhesive anchor system. See "Material Notes".

Test adhesive anchors in accordance with Item 450.3.3, "Tests". Test 3 anchors per 100 anchors installed. Perform corrective measures to provide adequate capacity if any of the tests do not meet the required test load. Repair damage from testing as directed.

It is recommended to show a Rail Layout with rail posts and W-beam splices. Fabricator must submit erection drawings to the Engineer for approval.

Round or chamfer exposed edges of rail post and backer plate to approximately 1/16" by grinding.

Shop drawings are not required for this rail.

MATERIAL NOTES:

Galvanize all steel components.

Anchor bolts for base plate must be ⅝" Dia ASTM F3125 Gr A325 or A449 bolts (or ASTM A193 Gr B7 or F1554 Gr 105 threaded rods with one tack welded heavy hex nut each) with one hardened steel washer (ASTM F436) and one regular lock washer placed under each heavy hex nut. Nuts must conform to ASTM A563 requirements.

Optional adhesive anchorage system must be ⅝" Dia ASTM A193 Gr B7 or F1554 Gr 105 fully threaded rods with one hardened steel washer (ASTM F436) and one regular lock washer placed under each heavy hex nut. Nuts must conform to ASTM A563 requirements. Embed fully threaded rod into slab and/or abutment wingwall using a Type III, Class C, D, E, or F anchor adhesive. Minimum adhesive anchor embedment depth is 4 ¾". Anchor adhesive chosen must be able to achieve a nominal bond strength in tension of a single anchor, Na, of 8 kips (edge distance must be accounted for). Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use. Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing."

W-beam must meet the requirements of Item 540, "Metal Beam Guard Fence" except as modified in the plans. The Contractor may furnish rail elements of 25'-0" or 12'-6" (Nominal) lengths and a single rail element of 9'-4 ½" or 6'-3" (Nominal) length.

W-Beam must have slotted holes at 3'-1 ½".

Some part numbers from the "Task Force 13" Guide to Standardized Highway Barrier Hardware have been furnished for quick reference.

GENERAL NOTES:

This railing has been successfully evaluated by full-scale crash test to meet MASH TL-3 criteria. This railing can be used for speeds of 50 mph and greater.

This rail is designed to deflect approximately 4' to 4'-6" as it contains and redirects the errant vehicle. This rail may not be installed on top of or behind curbs that project above finished grade, on bridges with expansion joints providing more than 5" movement, on retaining walls, or on grade separations and interchanges.

Repairs to impact-damaged post and base plate unit are not permitted. Replace all impact-damaged posts with a new post and base plate unit.

Average weight of railing with no overlay: 20 plf total.

Texas Department of Transportation — Bridge Division Standard

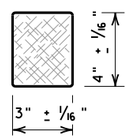
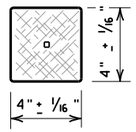
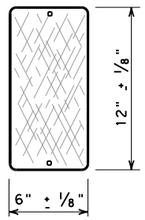
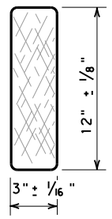
TRAFFIC RAIL

TYPE T631

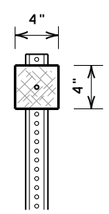
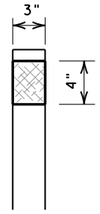
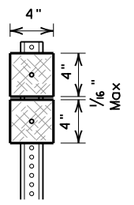
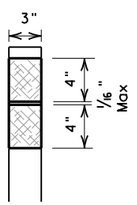
FILE: tlstd038-20.dgn	DN: TxDOT	CK: AES	DW: JTR	CK: AES
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	2707	01	011, ETC.	FM 2781
07-20: Allowing 9'-4 ½" or 6'-3" W-Beam sections.	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON, ETC.		110

DATE: 8/5/2022 1:16:02 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0504752\rlstd038-20.dgn

REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

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

DELINEATORS

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

D & OM DESCRIPTIVE CODES

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

NUMBER OF REFLECTORS
S = Single
D = Double

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

REFLECTOR UNIT SIZE
1 or 2

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

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

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

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

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

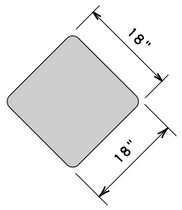
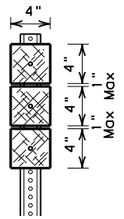
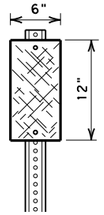
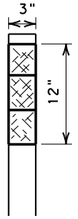
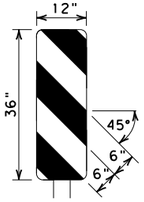
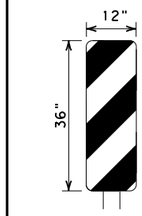
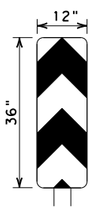
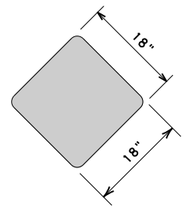
NUMBER OF REFLECTORS OR DIRECTION
X = 3-Size 2 reflector units (Type 2 only)
Y = 1-Size 3 reflector unit (Type 2 only)
Z = 3-Size 1 or 1-Size 4 reflector unit(s)(Type 2 only)
L = Left Side (Type 3 Object Marker only)
R = Right Side (Type 3 Object Marker only)
C = Center (Type 3 Object Marker only)

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

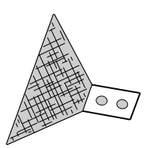
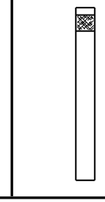
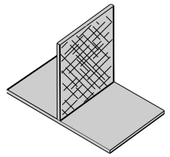
TYPE OF MOUNT
GND = Embedded (drivable)
SRF = Surface Mount
WAS = Wedge Anchor Steel
WAP = Wedge Anchor Plastic

DIRECTION
If Required
BI = Bi-Directional

OBJECT MARKERS

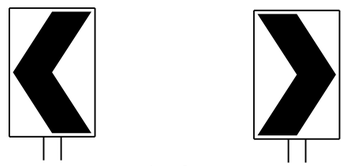
	Type 1 (OM-1)	Type 2 (OM-2)			Type 3 (OM-3)			Type 4 (OM-4)
	OM-1	OM-2X	OM-2Y	OM-2Z	OM-3L	OM-3R	OM-3C	OM-4
DEVICE								
		3-Size 2 reflector units	1-Size 3 reflector unit	3-Size 1 reflector units or 1-Size 4 reflector unit				
SHEETING	Yellow-Type B_{FL} or C_{FL} Sheeting	Yellow - Type B or C Sheeting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

BARRIER REFLECTORS (BRF)

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

CHEVRONS

DEVICE



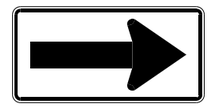
W1-8

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

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

ONE DIRECTION LARGE ARROW

DEVICE



W1-6

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

NOTE:

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

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

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	2707	01	011, ETC.	FM 2781
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	LFK	HOUSTON, ETC.		111

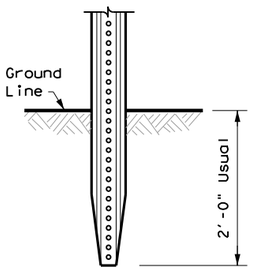
20A

DATE: 8/5/2022 1:16:11 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0361228\dom1-20.dgn

POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

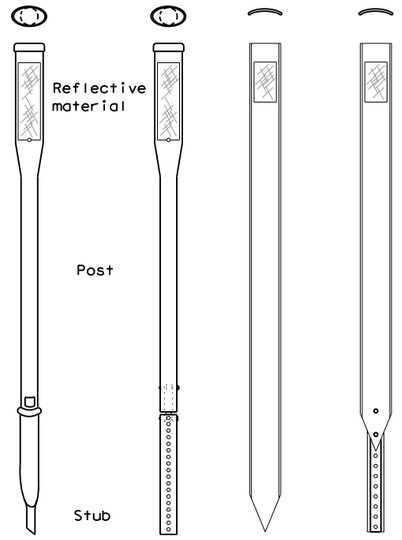


NOTES

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

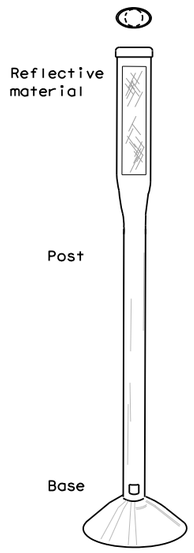
FLEXIBLE POSTS (YFLX, WFLX)

GND



EMBEDDED

SRF



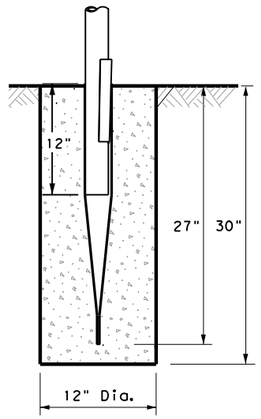
SURFACE MOUNT

NOTES

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

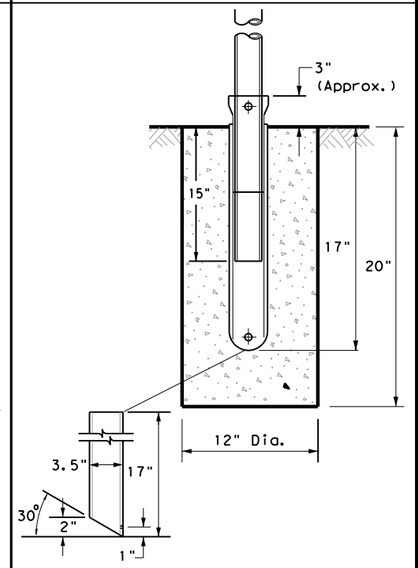
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

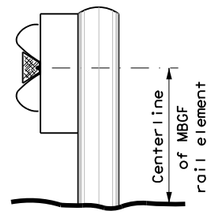
NOTE

1. Install per manufacturer's recommendations.

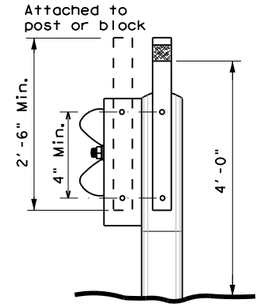
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

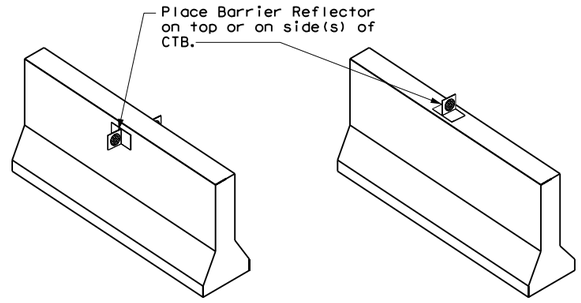
GF1



GF2



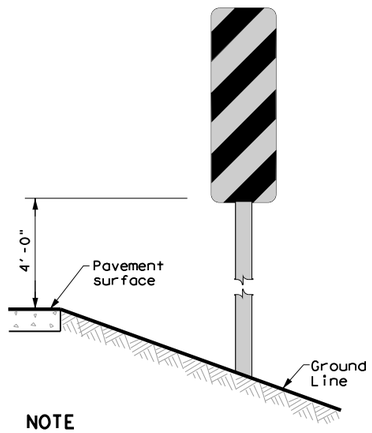
CONCRETE TRAFFIC BARRIER (CTB)



GENERAL NOTES

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

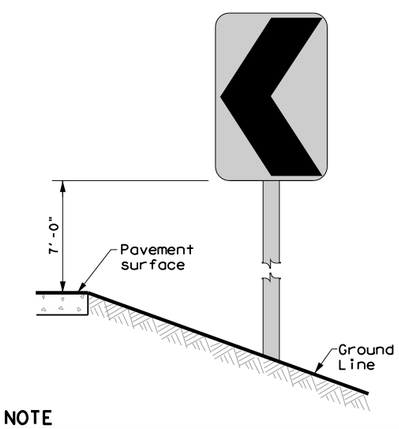
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



NOTE

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

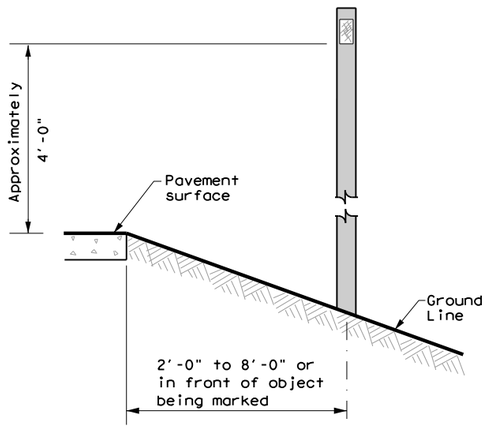
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



NOTE

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

DELINEATORS AND TYPE 2 OBJECT MARKERS



See general notes 1, 2 and 3.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER INSTALLATION

D & OM(2)-20

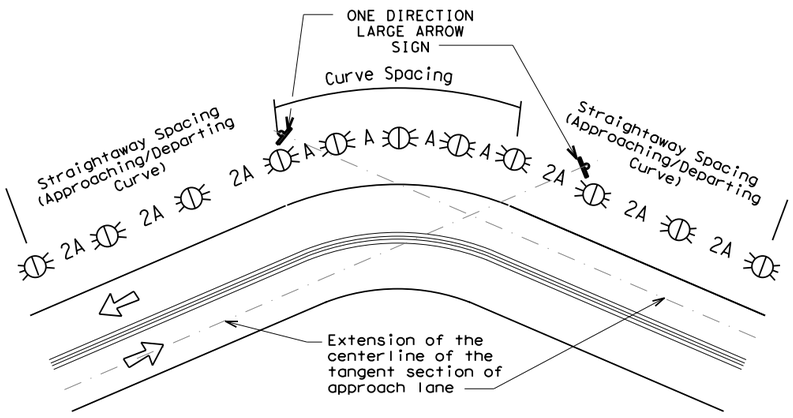
FILE: dom2-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	2707	01	011, ETC.	FM 2781
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	LFK	HOUSTON, ETC.		112

20B

MINIMUM WARNING DEVICES AT CURVES WITH ADVISORY SPEEDS

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

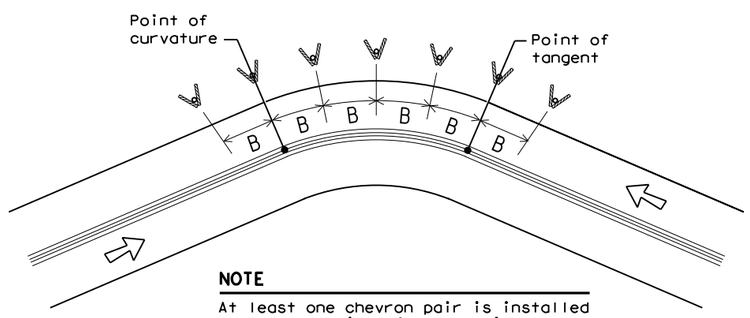
SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



NOTE

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

SUGGESTED SPACING FOR CHEVRONS ON HORIZONTAL CURVES



NOTE

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

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS KNOWN

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

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

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS NOT KNOWN

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

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

DELINEATOR AND OBJECT MARKER APPLICATION AND SPACING

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

NOTES

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

LEGEND

	Bi-directional Delineator
	Delineator
	Sign

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

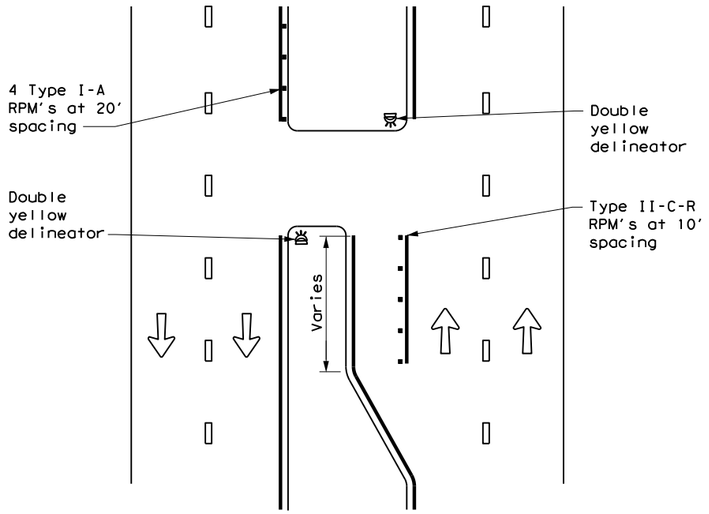
D & OM(3)-20

FILE: dom3-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	2707	01	011, ETC.	FM 2781
3-15 8-15	DIST	COUNTY		SHEET NO.
8-15 7-20	LFK	HOUSTON, ETC.		113

20C

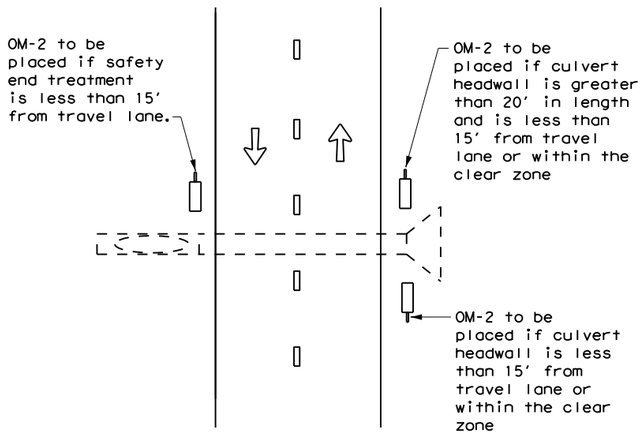
DATE: 8/5/2022 1:16:19 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0361228\dom3-20.dgn

CROSSOVERS



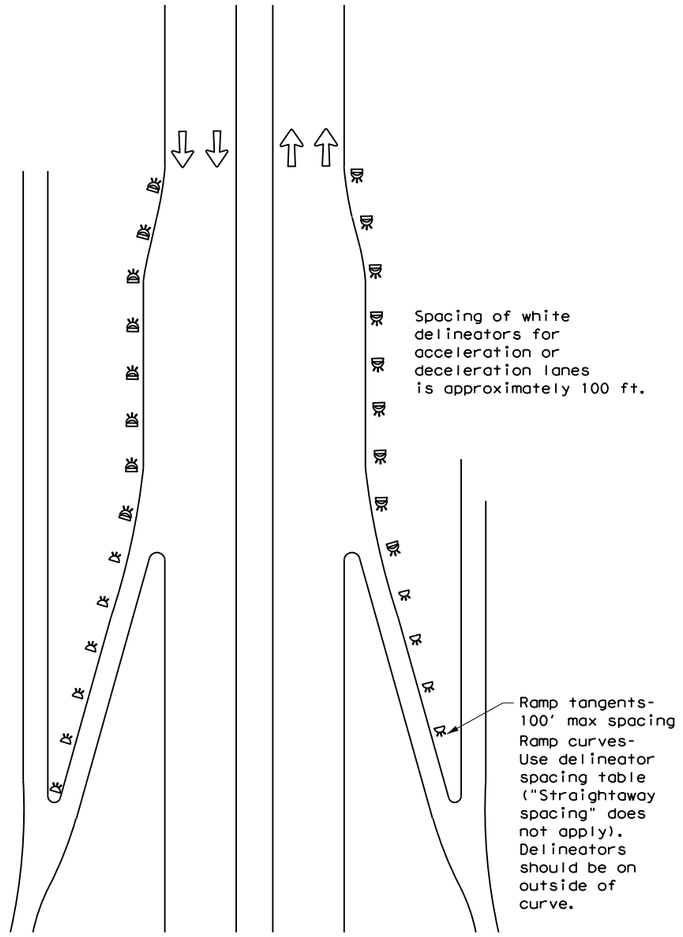
DETAIL 1

FOR CULVERTS WITHOUT MBGF



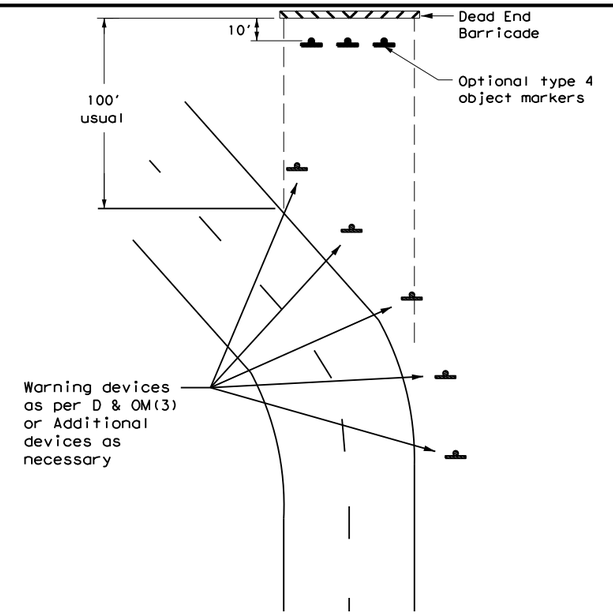
DETAIL 2

FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES



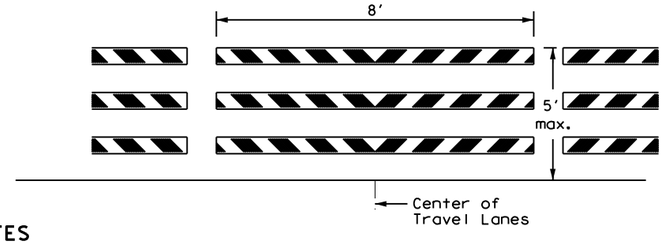
DETAIL 3

TYPICAL APPLICATION OF DEAD END BARRICADE



DETAIL 4

TYPICAL DEAD END BARRICADE INSTALLATION



NOTES

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

DETAIL 5

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

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(4)-20

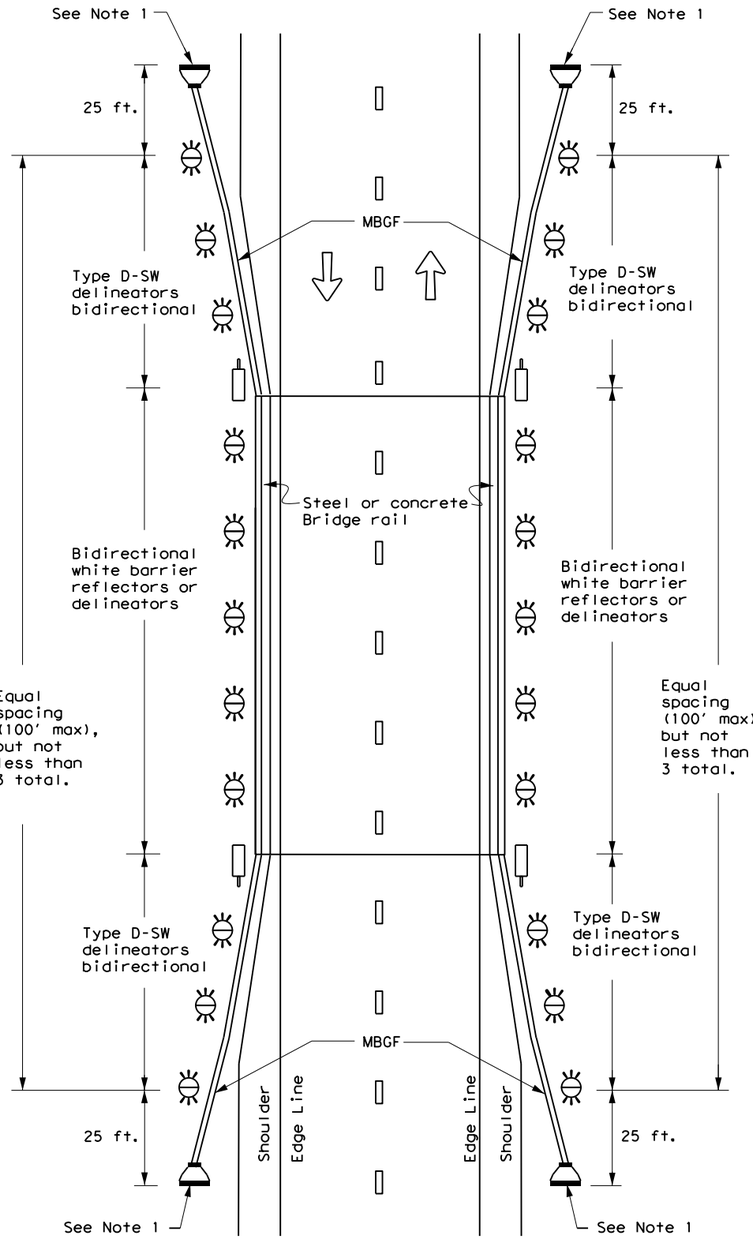
FILE: dom4-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	2707	01	011, ETC.	FM 2781
3-15	DIST	COUNTY		SHEET NO.
7-20	LFK	HOUSTON, ETC.		114

20D

DATE: 8/5/2022 1:16:22 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0361228\dom4-20.dgn

DATE: 9/14/2022 8:09:18 AM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0361228\dom5-20.dgn

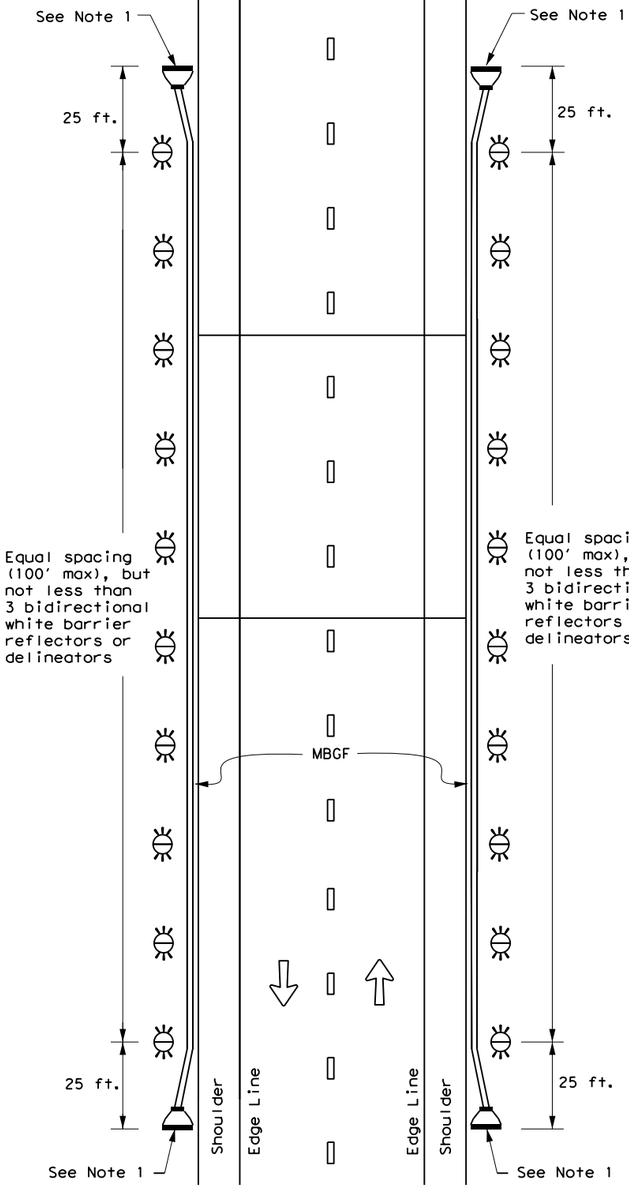
TWO-WAY, TWO LANE ROADWAY WITH REDUCED WIDTH APPROACH RAIL



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.

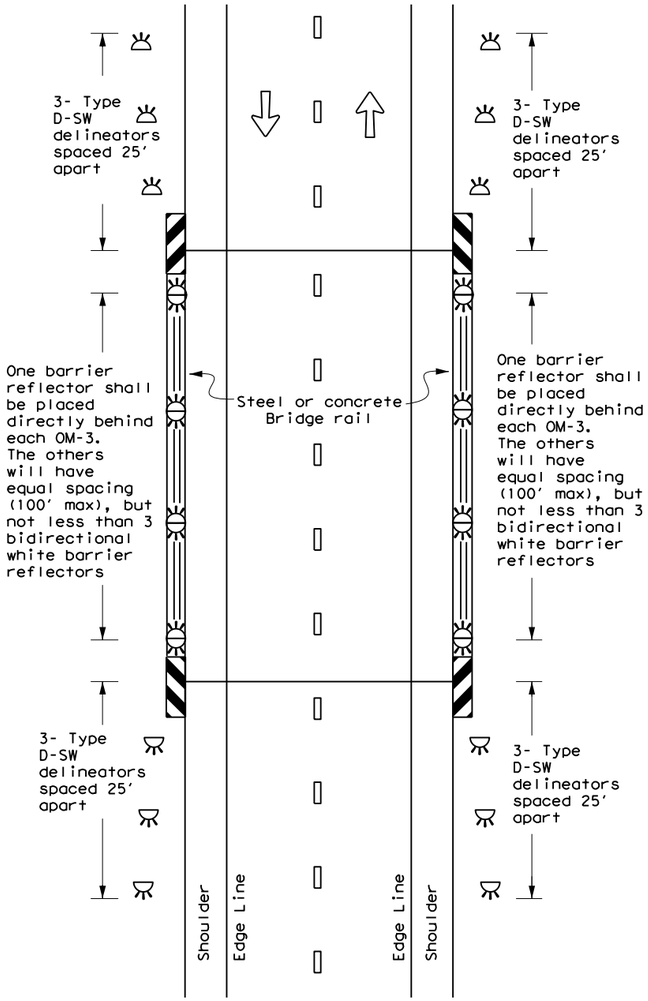
TWO-WAY, TWO LANE ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



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

	Bidirectional Delineator
	Delineator
	OM-3
	OM-2
	Terminal End
	Traffic Flow

Texas Department of Transportation

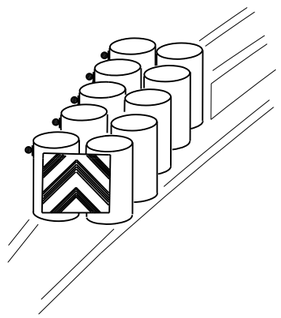
Traffic Safety Division Standard

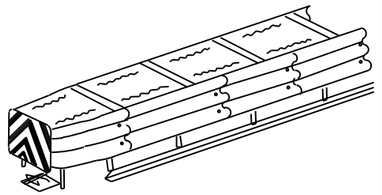
DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

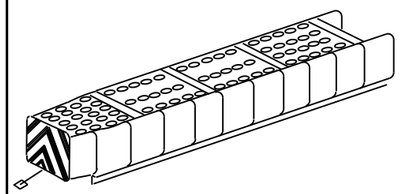
D & OM(5)-20

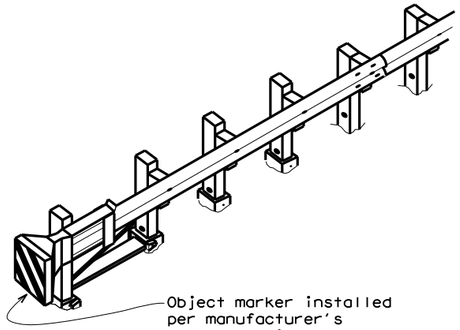
FILE: dom5-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT August 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	2707	01	011, ETC.	FM 2781
7-20	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON, ETC.		114A

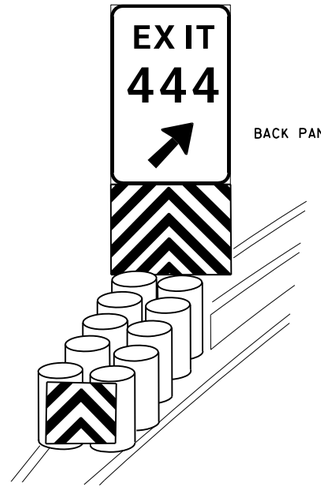
20E

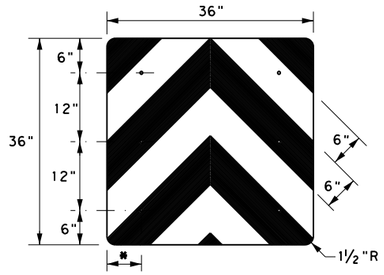


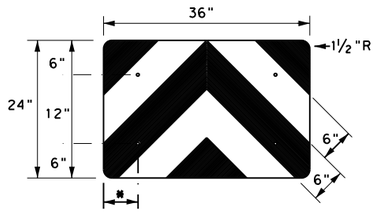




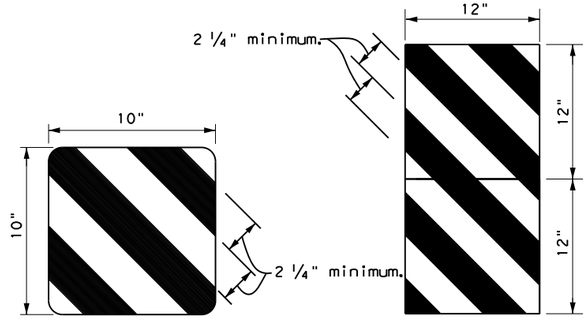




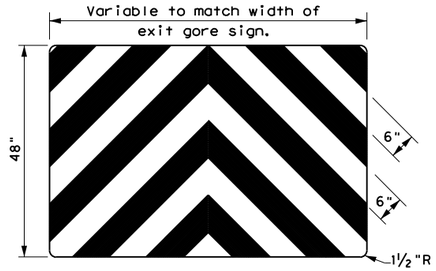


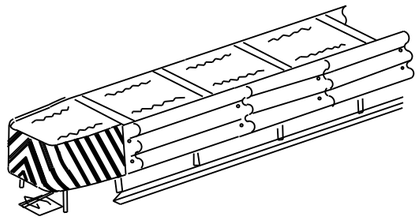


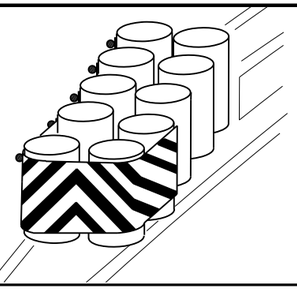
* Adjust to fit attenuator per manufacturer's recommendation, or as directed by the Engineer

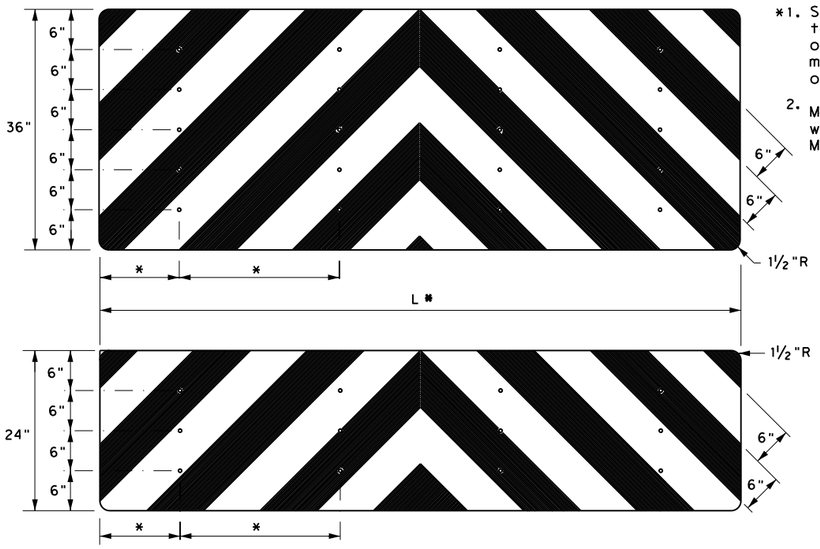


OBJECT MARKERS SMALLER THAN 3 FT^2









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

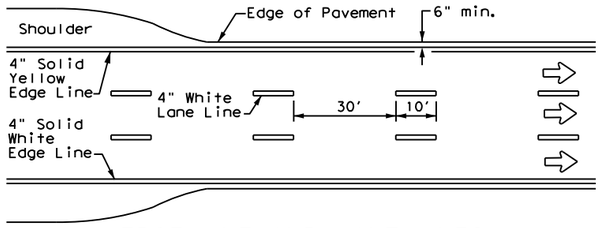
DELINEATOR & OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS

D & OM(VIA)-20

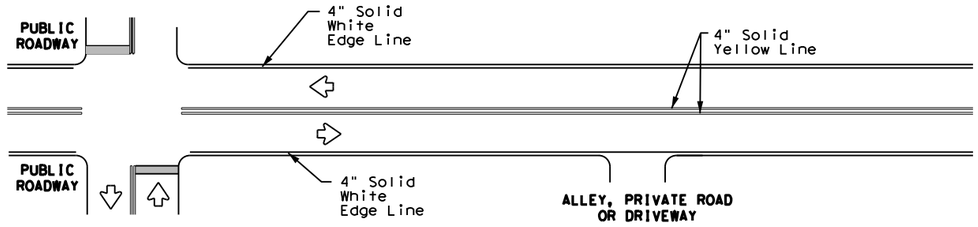
FILE: domvia20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT December 1989	CONT	SECT	JOB	HIGHWAY
REVISIONS	2707	01	011, ETC.	FM 2781
4-92 8-04	DIST	COUNTY		SHEET NO.
8-95 3-15	LFK	HOUSTON, ETC.		114B
4-98 7-20				

20G

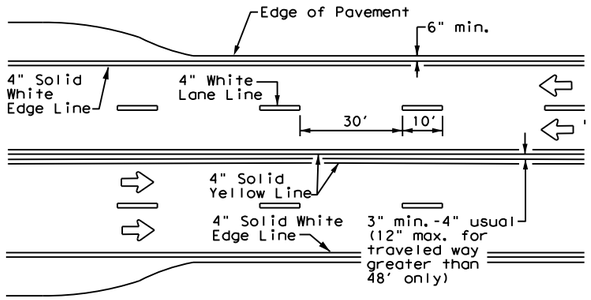
DATE: 9/14/2022 8:09:22 AM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0361228\domvia-20.dgn



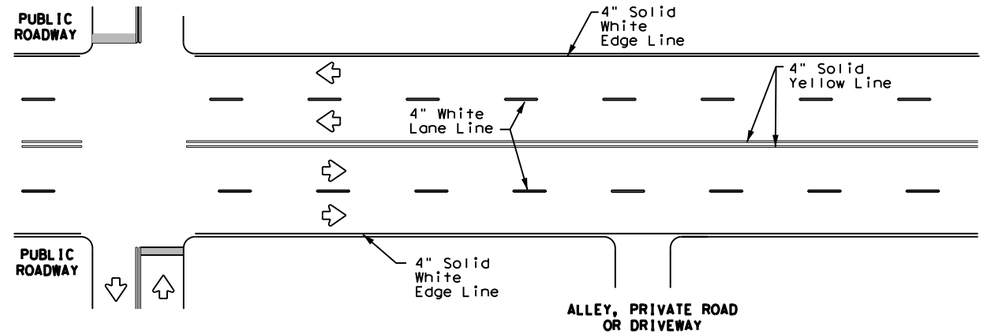
EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



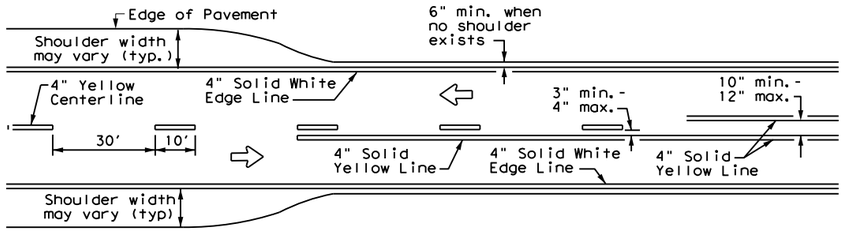
TYPICAL TWO-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



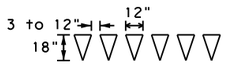
CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



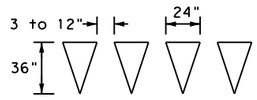
TYPICAL MULTI-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS

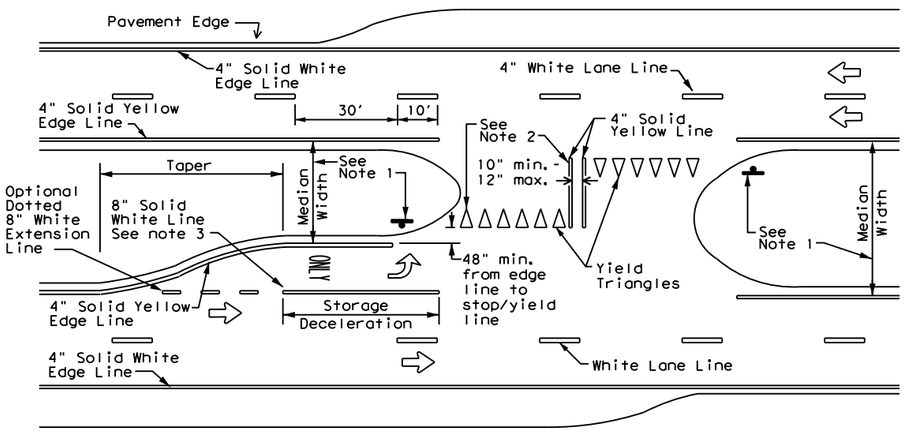


For posted speed on road being marked equal to or less than 40 MPH.



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

YIELD LINES



FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTES

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

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

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

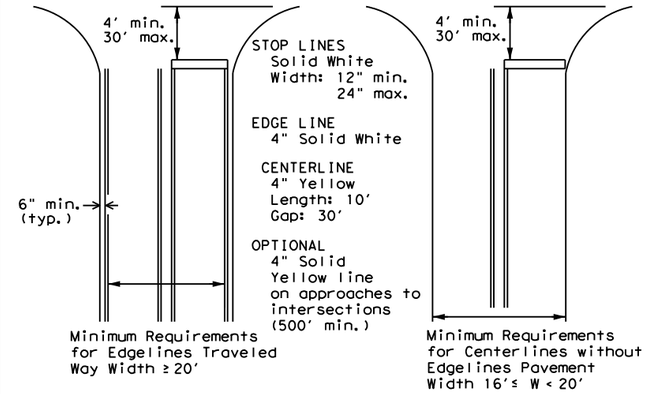
GENERAL NOTES

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

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

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

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



GUIDE FOR PLACEMENT OF STOP LINES, EDGE LINE & CENTERLINE

Based on Traveled Way and Pavement Widths for Undivided Highways

Texas Department of Transportation

Traffic Safety Division Standard

TYPICAL STANDARD PAVEMENT MARKINGS

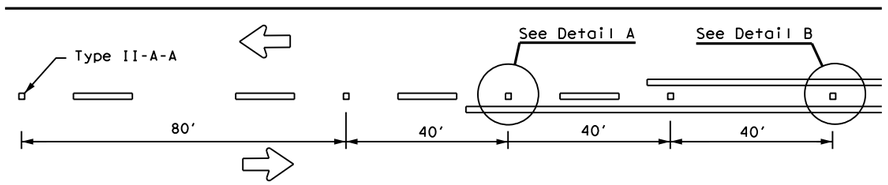
PM(1)-20

FILE: pm1-20.dgn	DN:	CK:	DW:	CK:
© TxDOT November 1978	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03	2707	01	011, ETC.	FM 2781
5-00 2-12	DIST	COUNTY		SHEET NO.
8-00 6-20	LFK	HOUSTON, ETC.		115

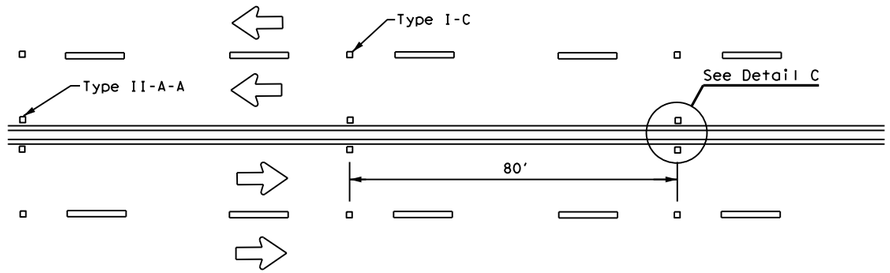
22A

DATE: 8/5/2022 1:16:27 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0361228\pm1-20.dgn

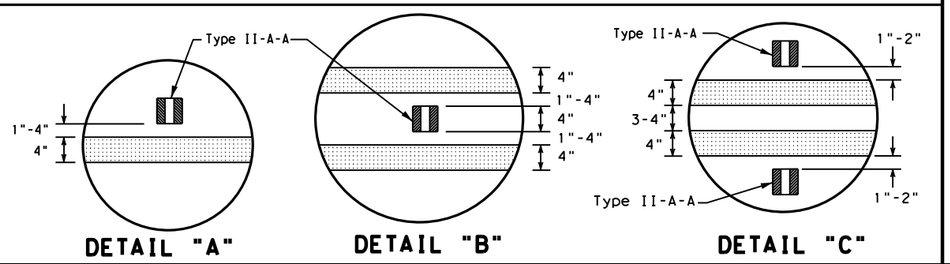
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE



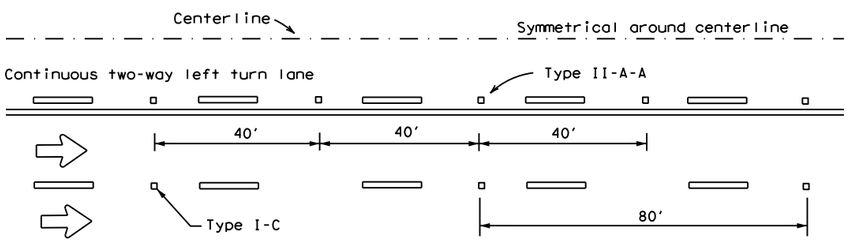
CENTERLINE FOR ALL TWO LANE ROADWAYS



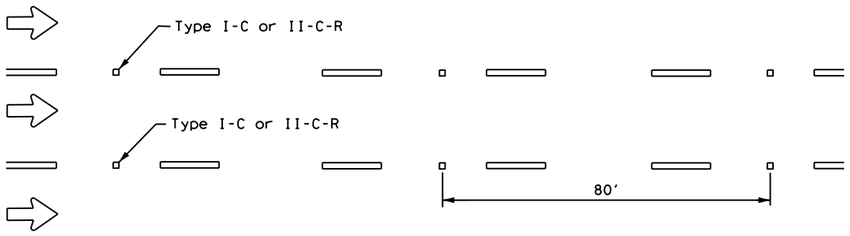
CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY HIGHWAYS



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

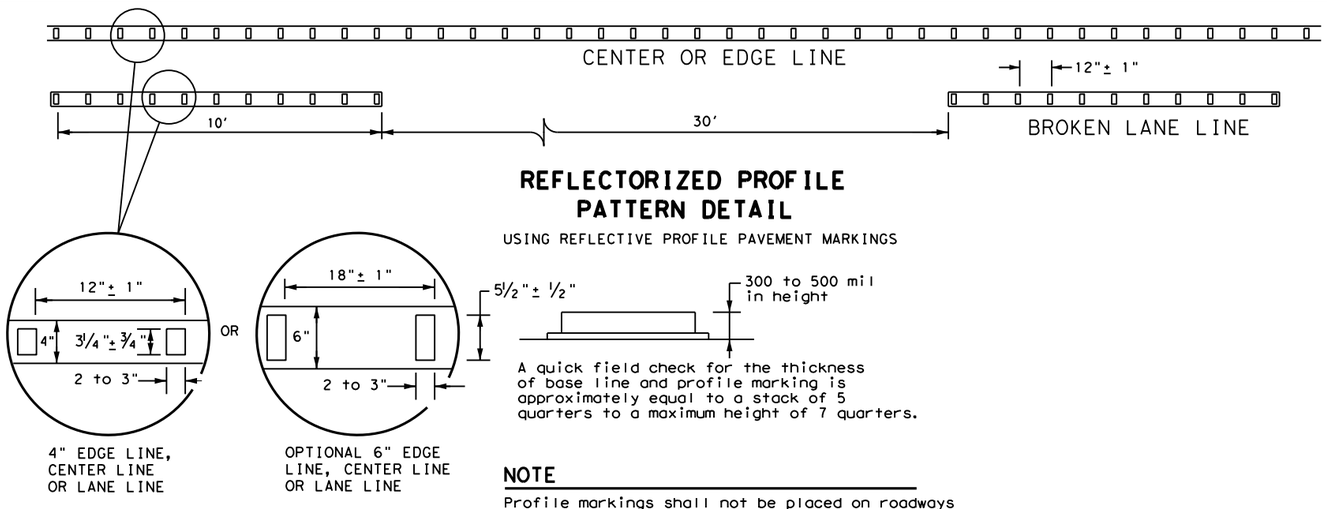


CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



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

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



REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS

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.

4" EDGE LINE, CENTER LINE OR LANE LINE

OPTIONAL 6" EDGE LINE, CENTER LINE OR LANE LINE

NOTE

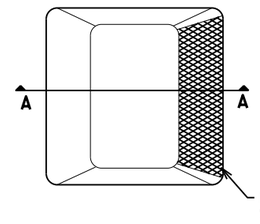
Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

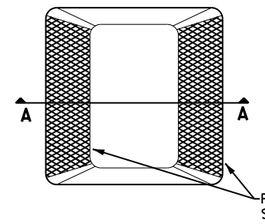
1. All raised pavement markers placed in broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.

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

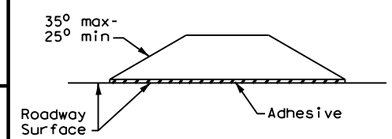
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)



Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS

Texas Department of Transportation

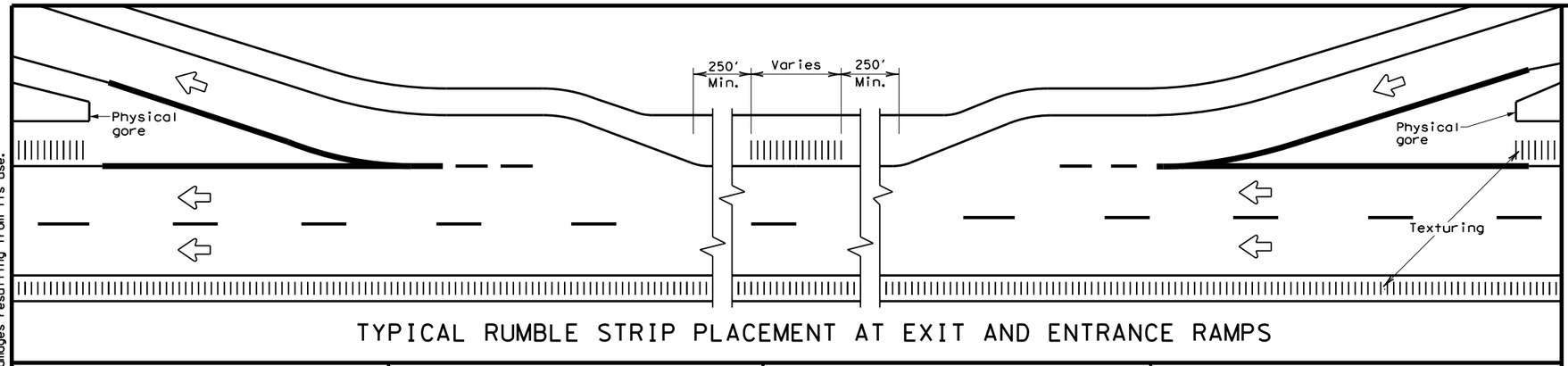
Traffic Safety Division Standard

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

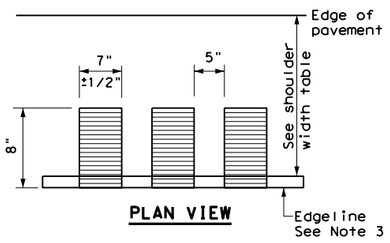
FILE: pm2-20.dgn	DN:	CK:	DW:	CK:
©TxDOT April 1977	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-92 2-10 5-00 2-12 8-00 6-20	2707	01	011, ETC.	FM 2781
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON, ETC.		116

22B

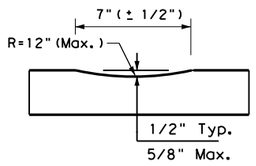
DATE: 8/5/2022 1:16:30 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0361228\pm2-20.dgn



TYPICAL RUMBLE STRIP PLACEMENT AT EXIT AND ENTRANCE RAMPS

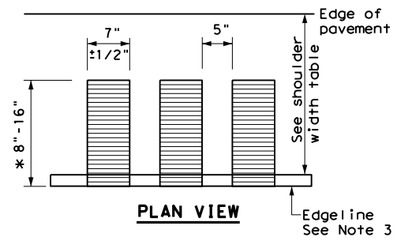


PLAN VIEW



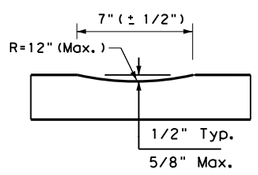
PROFILE VIEW
OPTION 1

CONTINUOUS MILLED DEPRESSIONS
(Rumble Stripes)



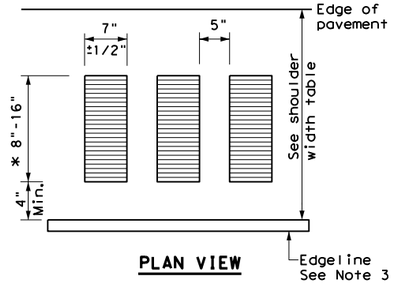
PLAN VIEW

* This distance may vary based on width of shoulder



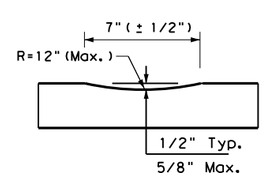
PROFILE VIEW
OPTION 2

CONTINUOUS MILLED DEPRESSIONS
(Rumble Stripes)



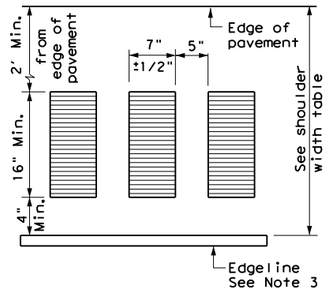
PLAN VIEW

* This distance may vary based on width of shoulder

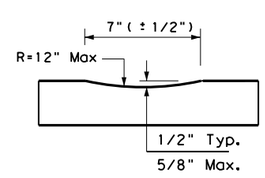


PROFILE VIEW
OPTION 3

CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)



PLAN VIEW



PROFILE VIEW
OPTION 4

CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)

GENERAL NOTES

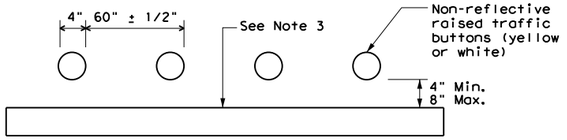
1. Rumble strips and profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
2. Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
3. Use Standard Sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, pavement markings, and profile markings.
4. See the table below for determining what options may be used for edgeline rumble strips.

WHEN INSTALLING MILLED DEPRESSION EDGELINE RUMBLE STRIPS:

5. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Operations Division.
6. Pavement markings can be applied over milled shoulder rumble strips to create an edgeline rumble stripe.
7. Breaks in edgeline rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections and driveways with high usage of large trucks when installed on conventional highways.
8. Rumble strips shall not be placed across exit or entrance ramps, acceleration and deceleration lanes, crossovers, gore areas or intersections with other roadways.
9. Consideration should be given to noise levels when edgeline rumble strips are installed near residential areas, schools, churches, etc. A minimum of 3/8 inches depth of milled rumble strip may be considered in these areas.
10. On roadways with high bicycle activity, consideration should be given before the installation of edgeline rumble strips. Things to consider include size of rumble strips, rumble strip material and location of rumble strips on the shoulder. If the designer determines that gaps are needed in the rumble strips due to bicycle use of the road, then follow the requirement shown in FHWA Technical Advisory T5040.39, or latest version. A detail of the spacing shall be included in the plans.

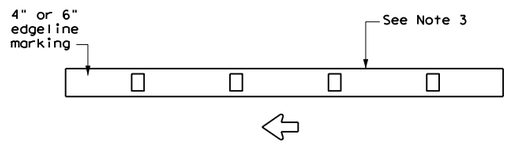
WHEN INSTALLING RAISED OR PROFILE EDGELINE RUMBLE STRIPS:

11. Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per the manufacturer's recommendations.
12. Non-reflective traffic buttons shall be placed adjacent to the pavement marking delineating the edgeline when used as a rumble strip. The color of the button should match the color of the adjacent edgeline marking (white or yellow). The buttons will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
13. Non-reflective traffic buttons shall not be placed across exit or entrance ramps, acceleration and deceleration lanes, crossovers, gore areas or intersections with other roadways.
14. Breaks in edgeline rumble strips using raised traffic buttons shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossing, intersections and driveways with high usage of large trucks when installed on conventional highways.
15. The minimum distance between the edgeline and the buttons should be used if the shoulder is less than 8 feet in width.
16. Raised profile thermoplastic markings used as edgelines may substitute for buttons.



PLAN VIEW
OPTION 5

RAISED EDGELINE RUMBLE STRIPS



PLAN VIEW
OPTION 6

PROFILE EDGELINE MARKINGS

SHOULDER WIDTH TABLE		
EQUAL TO OR LESS THAN 2 FEET	GREATER THAN 2 FEET LESS THAN 4 FEET	EQUAL TO OR GREATER THAN 4 FEET
Option 1, 5 OR 6	Option 1, 2, 3, 5 or 6	Option 2, 4, 5 OR 6

Texas Department of Transportation

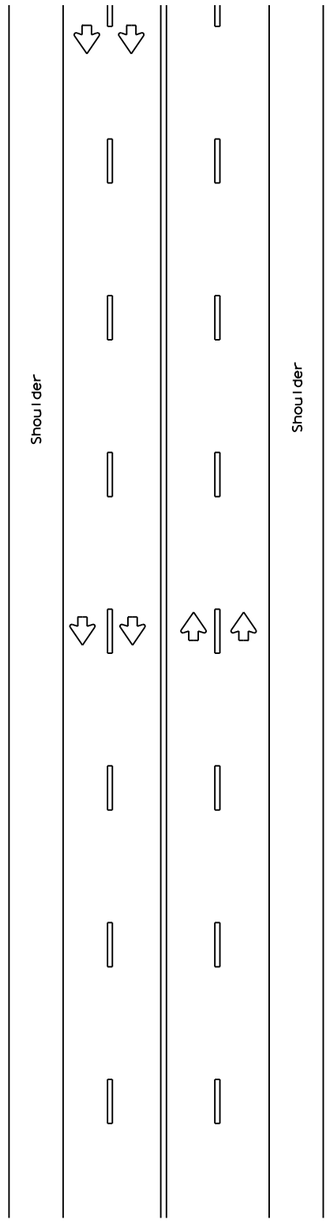
Traffic Operations Division Standard

EDGELINE RUMBLE STRIPS ON FREEWAYS AND DIVIDED HIGHWAYS
RS(1)-13

FILE: rs(1)-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2006	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-10 10-13	2707	01	011, ETC.	FM 2781
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON, ETC.		117

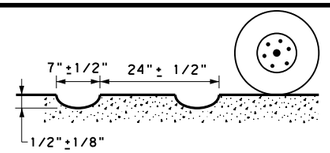
DATE:
FILE:

DATE:
FILE:

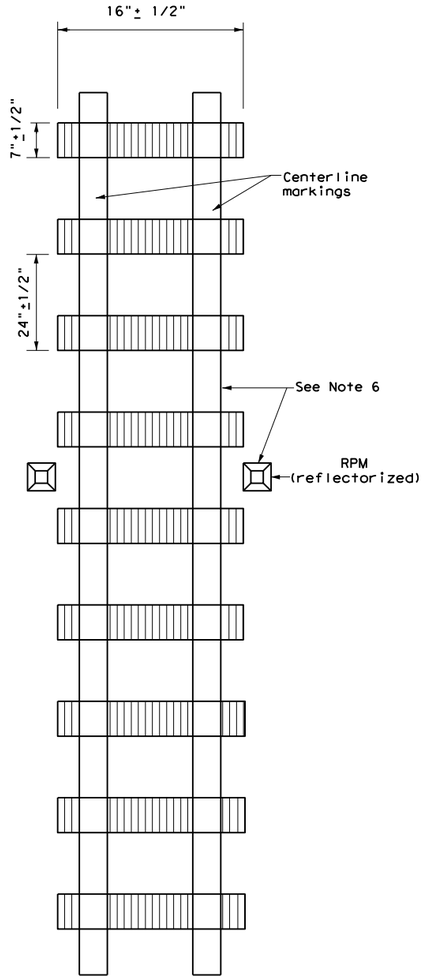


MULTILANE UNDIVIDED HIGHWAY WITH SHOULDER

CENTERLINE RUMBLE STRIPS

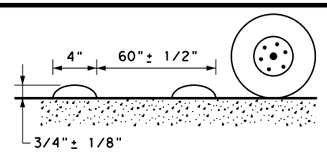


PROFILE VIEW

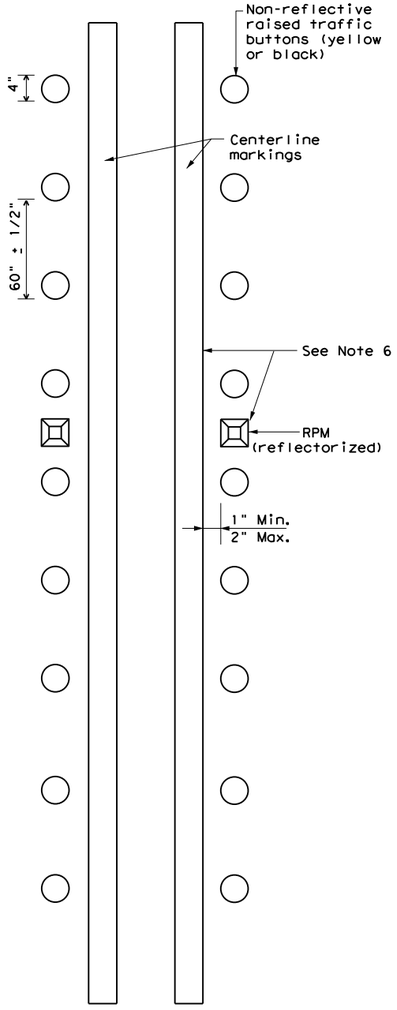


PLAN VIEW
OPTION 1

MILLED CENTERLINE RUMBLE STRIPS

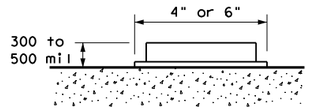


PROFILE VIEW

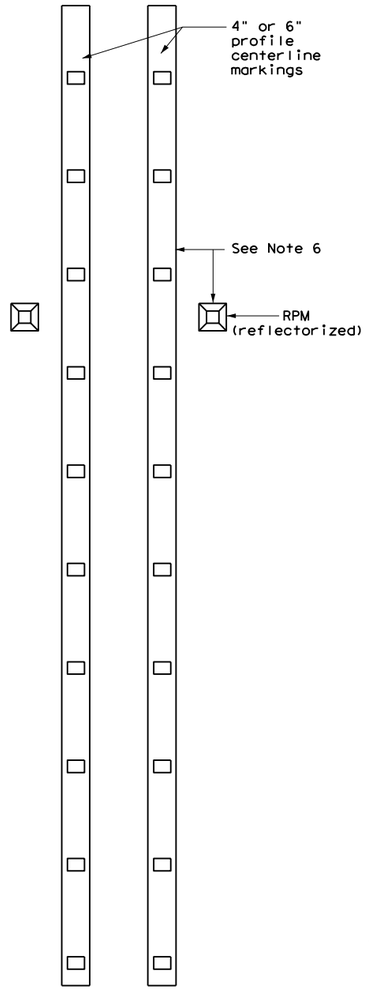


PLAN VIEW
OPTION 2

RAISED CENTERLINE RUMBLE STRIPS



PROFILE VIEW



PLAN VIEW
OPTION 3

PROFILE CENTERLINE MARKINGS

GENERAL NOTES

1. This standard sheet provides guidelines for installing centerline rumble strips on multilane undivided highways.
2. Centerline and edgeline rumble strips or profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
3. Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
4. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Operations Division.
5. Breaks in milled centerline rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossing, intersections and driveways with high usage of large trucks.
6. Use Standard Sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, pavement markings and profile markings.
7. Consideration should be given to noise levels when centerline rumble strips are installed near residential areas, schools, churches, etc. A minimum of 3/8 inch depth of milled rumble strip may be considered in these areas.
8. Pavement markings must be applied over milled centerline rumble strips for normal centerline spacing. For wider medians, specify in the plans the exact placement of the rumble strips. Place the rumble strips under each centerline marking or centered in the middle of the median.

WHEN INSTALLING CENTERLINE RUMBLE STRIPS:

9. Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per manufacturer's recommendations.
10. When using non-reflective raised traffic buttons as a centerline rumble strip, the button shall be placed adjacent to the pavement marking delineating the centerline. The color of the button should be yellow for a continuous no passing roadway. The button will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.

WHEN INSTALLING EDGELINE RUMBLE STRIPS WITH OR WITHOUT CENTERLINE RUMBLE STRIPS ON UNDIVIDED HIGHWAYS:

11. See standard sheet RS(4).

Texas Department of Transportation®

Traffic Operations Division Standard

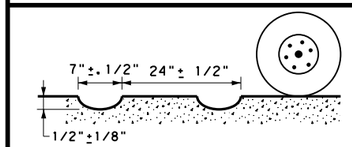
CENTERLINE RUMBLE STRIPS ON MULTILANE UNDIVIDED HIGHWAYS

RS(2)-13

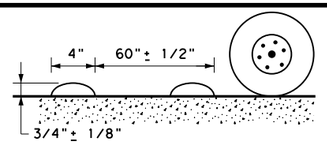
FILE: rs(2)-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
	CONT	SECT	JOB	HIGHWAY
REVISIONS	2707	01	011, ETC.	FM 2781
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON, ETC.		118

DATE:
FILE:

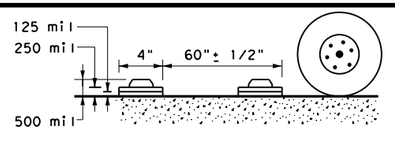
CENTERLINE RUMBLE STRIPS



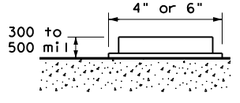
MILLED RUMBLE STRIPS



RAISED TRAFFIC BUTTONS

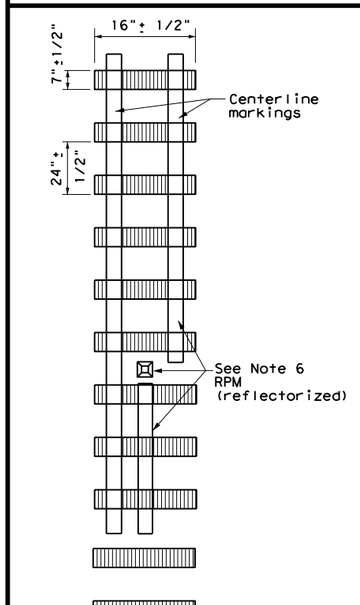


PREFORMED THERMOPLASTIC STRIPS



PROFILE MARKINGS

PROFILE VIEW

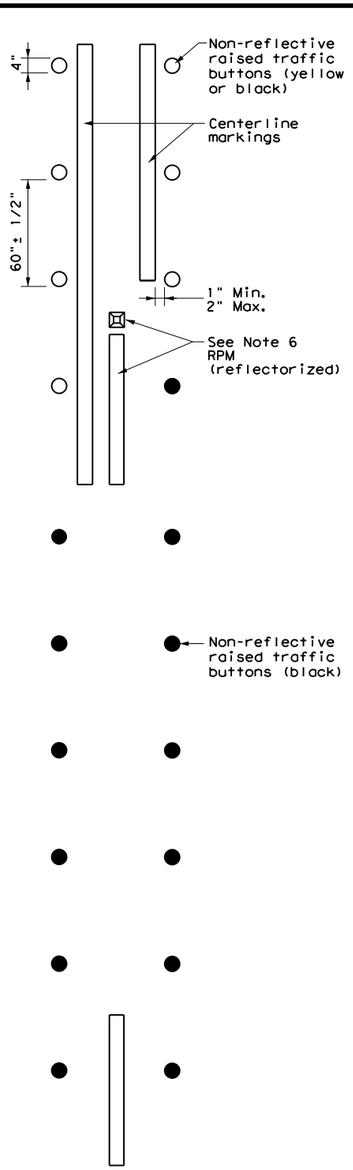


PLAN VIEW
OPTION 1

TWO LANE TWO-WAY ROADWAYS

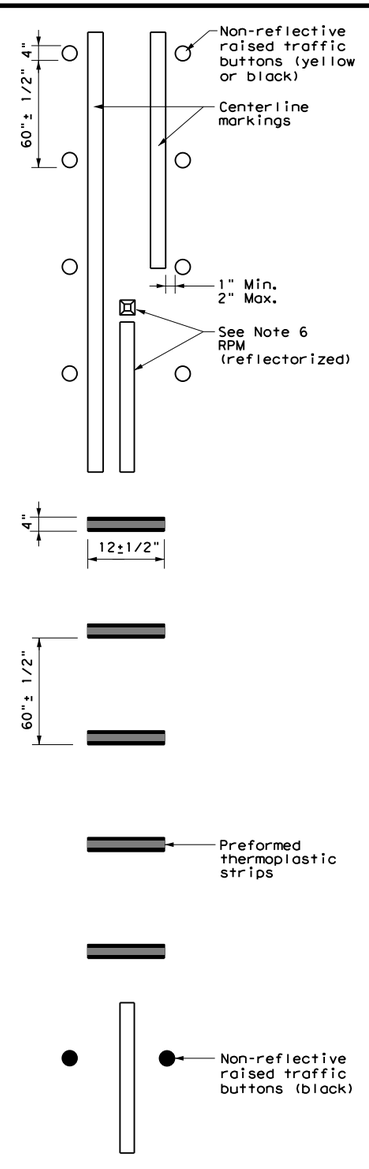
PLAN VIEW
OPTION 1

MILLED CENTERLINE RUMBLE STRIPS



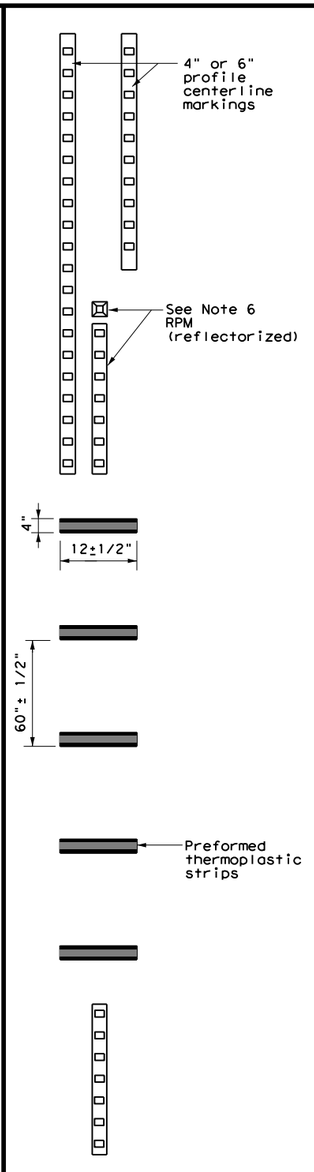
PLAN VIEW
OPTION 2

RAISED CENTERLINE RUMBLE STRIPS



PLAN VIEW
OPTION 3

RAISED CENTERLINE RUMBLE STRIPS AND PREFORMED THERMOPLASTIC STRIPS



PLAN VIEW
OPTION 4

PROFILE CENTERLINE MARKINGS AND PREFORMED THERMOPLASTIC STRIPS

GENERAL NOTES

1. This standard sheet provides guidelines for installing centerline rumble strips on two-lane highways with or without shoulders.
2. Centerline and edgeline rumble strips or profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
3. Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
4. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Operations Division.
5. Breaks in milled centerline rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections and driveways with high usage of large trucks.
6. Use Standard Sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, and dimensions pavement markings and profile markings.
7. Consideration should be given to noise levels when centerline rumble strips are installed near residential areas, schools, churches, etc. A minimum of 3/8 inch depth of milled rumble strip may be considered in these areas.
8. Pavement markings must be applied over milled centerline rumble strips.

WHEN INSTALLING CENTERLINE RUMBLE STRIPS:

9. Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per manufacturer's recommendations.
10. When using non-reflective raised traffic buttons as a centerline rumble strip, the button shall be placed adjacent to the pavement marking delineating the centerline. The buttons will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
11. The color of the button should be yellow for a continuous no passing roadway. Black buttons should be used in areas where passing is allowed.

WHEN INSTALLING EDGELINE RUMBLE STRIPS WITH OR WITHOUT CENTERLINE RUMBLE STRIPS ON UNDIVIDED HIGHWAYS:

12. See standard sheet RS(4).

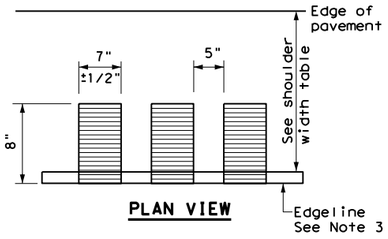
Texas Department of Transportation®

Traffic Operations Division Standard

CENTERLINE RUMBLE STRIPS ON TWO LANE TWO-WAY HIGHWAYS

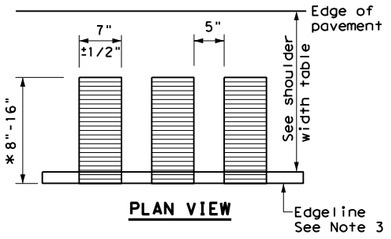
RS(3)-13

FILE: rs(3)-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2013	CONT	SECT	JOB	HIGHWAY
REVISIONS	2707	01	011, ETC.	FM 2781
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON, ETC.		119



PROFILE VIEW
OPTION 1

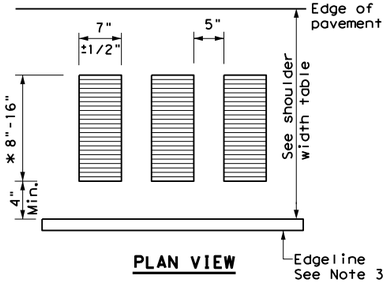
CONTINUOUS MILLED DEPRESSIONS
(Rumble Stripes)



* This distance may vary based on width of shoulder

PROFILE VIEW
OPTION 2

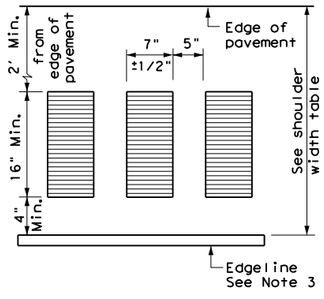
CONTINUOUS MILLED DEPRESSIONS
(Rumble Stripes)



* This distance may vary based on width of shoulder

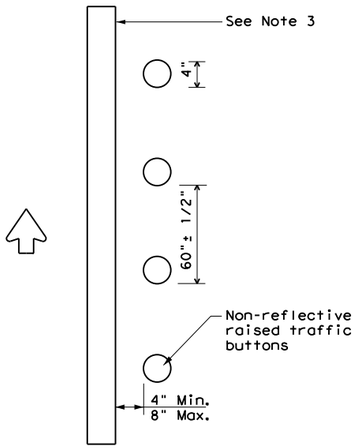
PROFILE VIEW
OPTION 3

CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)



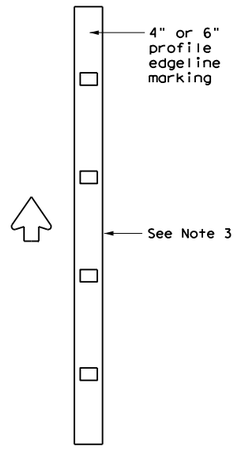
PROFILE VIEW
OPTION 4

CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)



PLAN VIEW
OPTION 5

RAISED EDGELINE RUMBLE STRIPS



PLAN VIEW
OPTION 6

PROFILE EDGELINE MARKINGS

SHOULDER WIDTH TABLE		
EQUAL TO OR LESS THAN 2 FEET	GREATER THAN 2 FEET LESS THAN 4 FEET	EQUAL TO OR GREATER THAN 4 FEET
Option 1, 5 OR 6	Option 1, 2, 3 5 OR 6	Option 2, 4, 5 OR 6

GENERAL NOTES

1. Rumble strips and profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
2. Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
3. Use Standard Sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, pavement markings, and profile markings.
4. See the table below for determining what options may be used for edgeline rumble strips.

WHEN INSTALLING MILLED DEPRESSION EDGELINE RUMBLE STRIPS:

5. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Operations Division.
6. Pavement markings can be applied over milled shoulder rumble strips to create an edgeline rumble stripe.
7. Breaks in edgeline rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections and driveways with high usage of large trucks when installed on conventional highways.
8. Rumble strips shall not be placed across exit or entrance ramps, acceleration and deceleration lanes, crossovers, gore areas or intersections with other roadways.
9. Consideration should be given to noise levels when edgeline rumble strips are installed near residential areas, schools, churches, etc. A minimum of 3/8 inches depth of milled rumble strip may be considered in these areas.
10. On roadways with high bicycle activity, consideration should be given before the installation of edgeline rumble strips. Things to consider include size of rumble strips, rumble strip material and location of rumble strips on the shoulder. If the designer determines that gaps are needed in the rumble strips due to bicycle use of the road, then follow the requirement shown in FHWA Technical Advisory T5040.39, or latest version. A detail of the spacing shall be included in the plans.

WHEN INSTALLING RAISED OR PROFILE EDGELINE RUMBLE STRIPS:

11. Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per the manufacturer's recommendations.
12. Non-reflective traffic buttons shall be placed adjacent to the pavement marking delineating the edgeline when used as a rumble strip. The color of the button should match the color of the adjacent edgeline marking (white or yellow). The buttons will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
13. Non-reflective traffic buttons shall not be placed across exit or entrance ramps, acceleration and deceleration lanes, crossovers, gore areas or intersections with other roadways.
14. Breaks in edgeline rumble strips using raised traffic buttons shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossing, intersections and driveways with high usage of large trucks when installed on conventional highways.
15. The minimum distance between the edgeline and the buttons should be used if the shoulder is less than 8 feet in width.
16. Raised profile thermoplastic markings used as edgelines may substitute for buttons.

Texas Department of Transportation

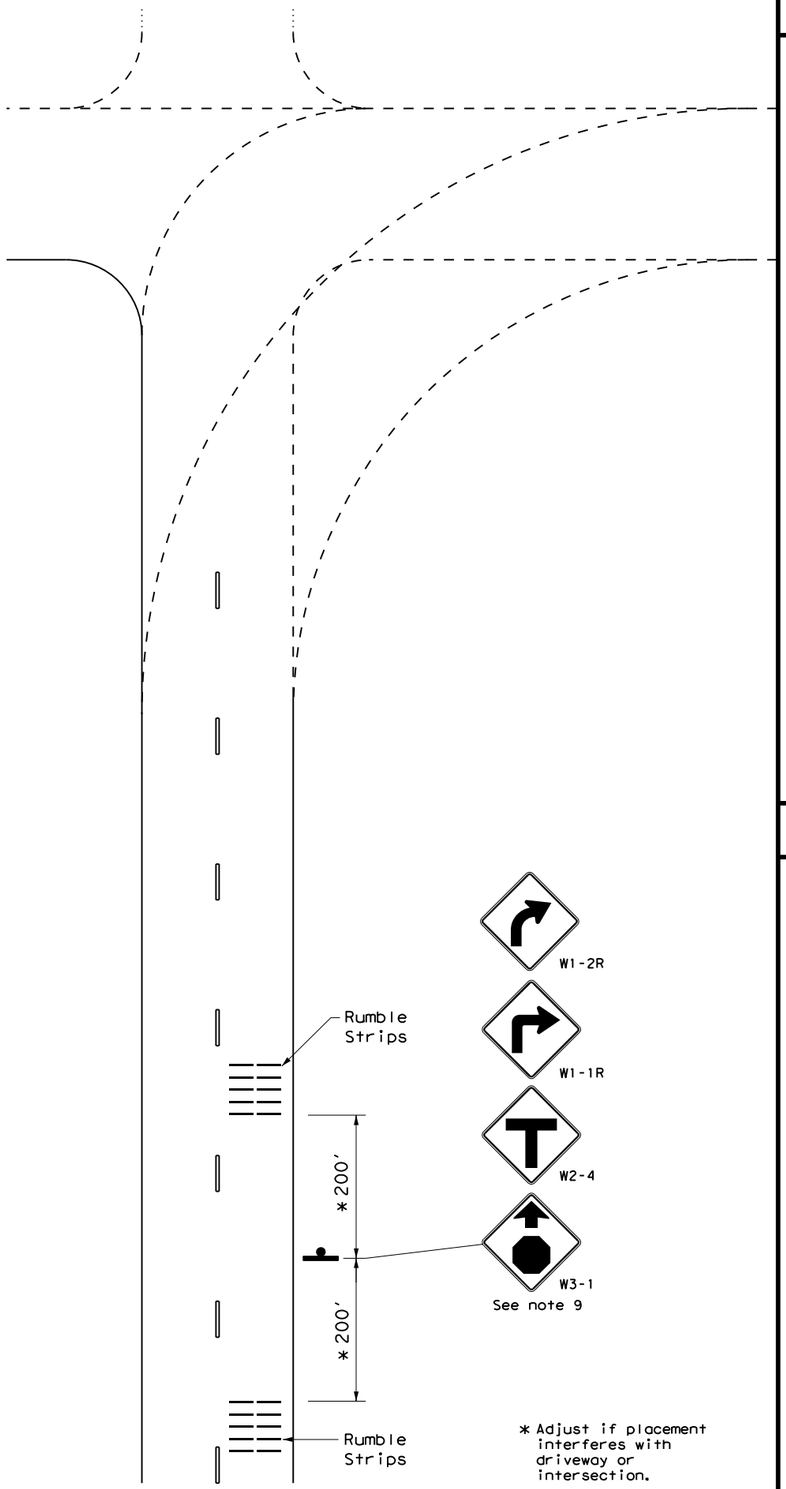
Traffic Operations Division Standard

EDGELINE RUMBLE STRIPS ON UNDIVIDED OR TWO LANE HIGHWAYS
RS(4)-13

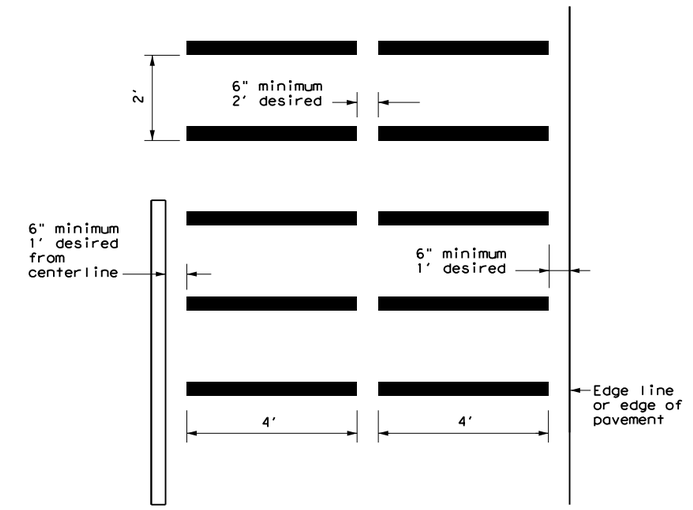
FILE: rs(4)-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2013	CONT	SECT	JOB	HIGHWAY
REVISIONS	2707	01	011, ETC.	FM 2781
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON, ETC.		120

DATE:
FILE:

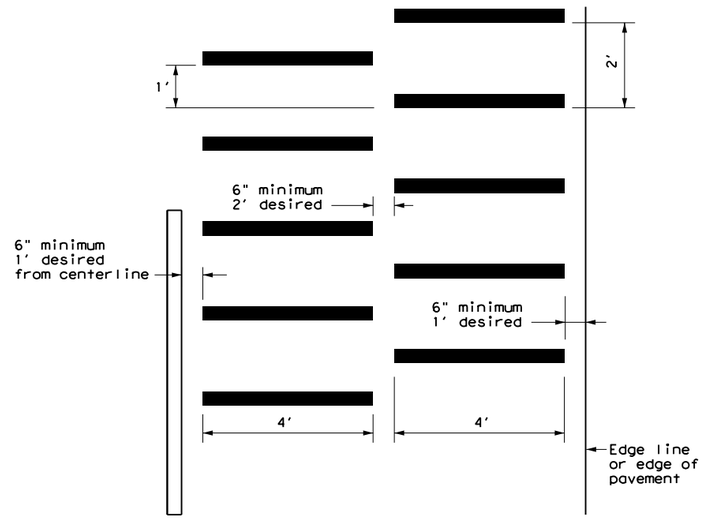
DATE:
FILE:



STANDARD PATTERN



ALTERNATIVE PATTERN



GENERAL NOTES

1. Transverse or in-lane rumble strips should only be used at high incident and special geometric locations. These special geometric locations may include: approaches to rural, high speed signalized or Stop -controlled intersections with sight restrictions and/or high crash rates, approaches to unexpected urban intersections, approaches to newly installed Stop or signalized controlled intersections, approaches to toll plazas, approaches to hazardous horizontal curves, and approaches to railroad grade crossings.

2. When used, the rumble strips shall be placed 200 feet prior to and after the placement of the warning device.

3. The use of rumble strips should not be widespread or used indiscriminately.

4. Preformed black raised rumble strips should be used. They should be installed in accordance with the manufacturer's recommendations.

5. A list of approved, preformed raised rumble strips can be obtained from the Traffic Operations Division.

6. Consideration should be given to noise levels when in -lane or transverse rumble strips are installed near residential areas, schools, churches, etc.

7. The use of the "Rumble Strips Ahead" sign may be used in advance of in -lane or transverse rumble strips, based on engineering judgement. This sign is typically not necessary for rumble strip installations built to the guidelines on this standard sheet. When used, this sign should be spaced in advance of the rumble strips based on the guidelines for advance placement of warning sign included in the "Texas Manual on Uniform Traffic Control Devices".

8. Consideration should be given to bicyclists. A 12 inch gap from the edge line may be used to accommodate bicyclists when a usable shoulder is not available. Additional gaps in the in -lane or transverse rumble strips are not recommended since they could cause motorists to swerve to avoid the rumble strips.

9. Other signs can be used as conditions warrant.

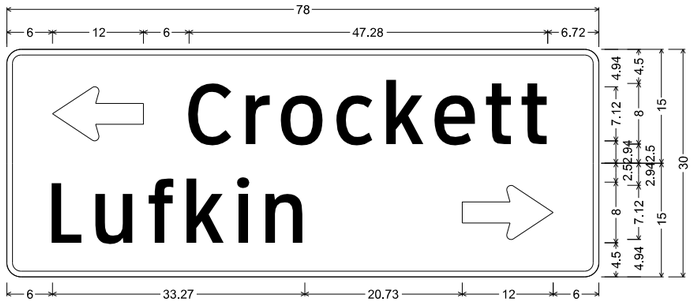
Texas Department of Transportation

Traffic Operations Division Standard

TRANSVERSE OR IN-LANE RUMBLE STRIPS

RS(5)-13

FILE: rs(5)-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT April 2006	CONT	SECT	JOB	HIGHWAY
REVISIONS	2707	01	011, ETC.	FM 2781
2-10	DIST	COUNTY		SHEET NO.
10-13	LFK	HOUSTON, ETC.		121



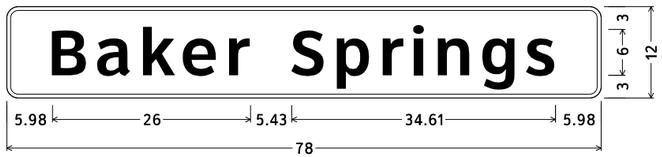
D1-2 8in LT-RT;

1.88" Radius, 0.75" Border, White on, Green;
Standard Arrow Custom 12.00" X 7.13" 180'; "Crockett", ClearviewHwy-3-W;

1.88" Radius, 0.75" Border, White on, Green;
"Lufkin", ClearviewHwy-3-W; Standard Arrow Custom 12.00" X 7.13" 0';
Table of letter and object lefts

⇦	C	r	o	c	k	e	t	t
6.00	24.00	31.46	36.20	43.53	50.12	56.45	63.14	67.84

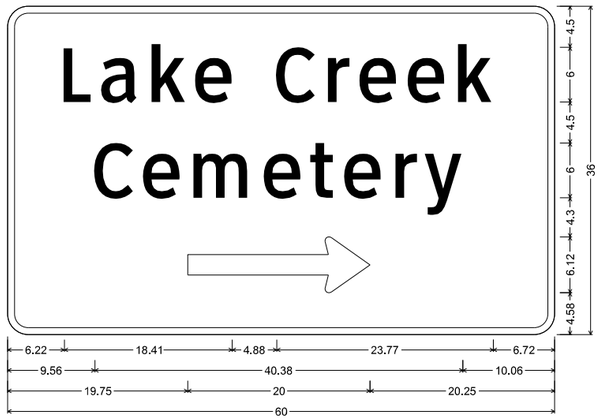
L	u	f	k	l	n	⇨
6.00	11.79	18.66	23.81	30.32	34.20	60.00



I-2cT 6in;
1.50" Radius, 0.50" Border, White on Green;
"Baker Springs", ClearviewHwy-5-W-R;
Table of letter and object lefts

B	a	k	e	r
5.98	11.85	17.88	23.10	29.20

S	p	r	i	n	g	s
37.41	43.34	49.37	53.37	56.59	62.42	68.15

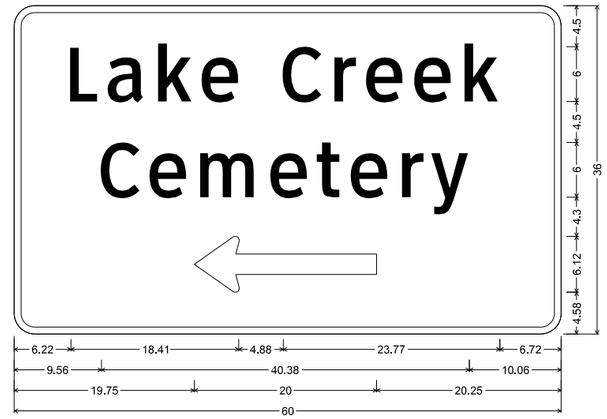


D3-3bTL_VARx36;
2.25" Radius, 0.75" Border, White on, Green;
"Lake Creek", ClearviewHwy-3-W; "Cemetery", ClearviewHwy-3-W;
Standard Arrow Custom 20.00" X 6.13" 0';
Table of letter and object lefts

L	a	k	e	C	r	e	e	k
6.22	10.33	15.89	20.63	29.51	35.11	38.67	43.95	49.48

C	e	m	e	t	e	r	y
9.56	14.92	20.48	28.17	33.19	36.99	42.51	45.77

⇨
19.75

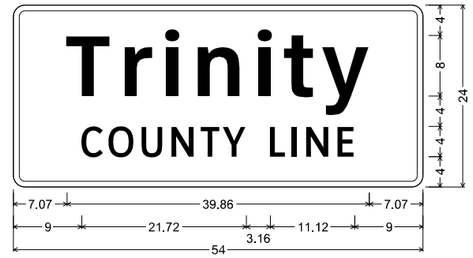


D3-3bTL_VARx36;
2.25" Radius, 0.75" Border, White on, Green;
"Lake Creek", ClearviewHwy-3-W; "Cemetery", ClearviewHwy-3-W;
Standard Arrow Custom 20.00" X 6.13" 180';
Table of letter and object lefts

L	a	k	e	C	r	e	e	k
6.22	10.33	15.89	20.63	29.51	35.11	38.67	43.95	49.48

C	e	m	e	t	e	r	y
9.56	14.92	20.48	28.17	33.19	36.99	42.51	45.77

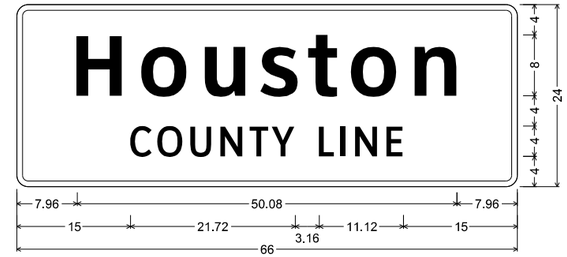
⇦
19.75



I-2dT 8in;
1.50" Radius, 0.75" Border, White on, Green;
"Trinity", ClearviewHwy-5-W-R;
"COUNTY LINE", ClearviewHwy-3-W;
Table of letter and object lefts

T	r	i	n	i	t	y
7.07	14.71	20.04	24.33	32.24	35.72	40.69

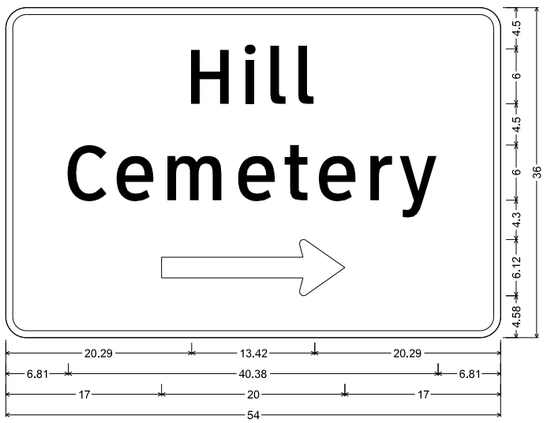
C	O	U	N	T	Y	L	I	N	E
9.00	12.57	16.93	20.89	24.66	27.64	33.88	36.77	38.65	42.79



I-2dT 8in;
1.50" Radius, 0.75" Border, White on, Green;
"Houston", ClearviewHwy-5-W-R; "COUNTY LINE", ClearviewHwy-3-W;
Table of letter and object lefts

H	o	u	s	t	o	n
7.96	16.41	24.82	32.10	38.47	44.07	52.48

C	O	U	N	T	Y	L	I	N	E
15.00	18.57	22.93	26.89	30.66	33.64	39.88	42.77	44.65	48.79

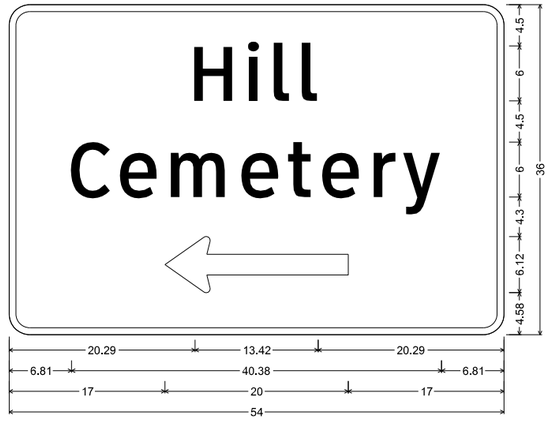


D3-3bTL_VARx36;
2.25" Radius, 0.75" Border, White on, Green;
"Hill", ClearviewHwy-3-W; "Cemetery", ClearviewHwy-3-W;
Standard Arrow Custom 20.00" X 6.13" 0';
Table of letter and object lefts

H	i	l	l
20.29	26.05	28.97	32.02

C	e	m	e	t	e	r	y
6.81	12.17	17.73	25.42	30.44	34.24	39.76	43.02

⇨
17.00



D3-3bTL_VARx36;
2.25" Radius, 0.75" Border, White on, Green;
"Hill", ClearviewHwy-3-W; "Cemetery", ClearviewHwy-3-W;
Standard Arrow Custom 20.00" X 6.13" 180';
Table of letter and object lefts

H	i	l	l
20.29	26.05	28.97	32.02

C	e	m	e	t	e	r	y
6.81	12.17	17.73	25.42	30.44	34.24	39.76	43.02

⇦
17.00

N. T. S.

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED
PROFESSIONAL ENGINEER

DocuSigned by:
cmb, P.E.
AF858E728A5C4C9...
8/5/2022

SIGN DETAILS

TEXAS DEPARTMENT OF TRANSPORTATION
©2022

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		122

8/5/2022 1:16:55 PM
c:\txdot\pw\online\txdot3\sergio.zapata\d0361228\SIGN DETAILS.dgn

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)

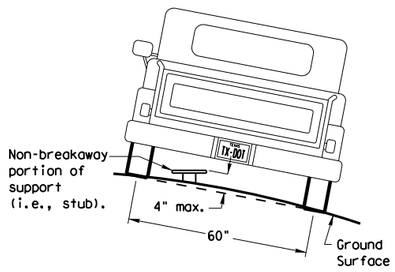
Anchor Type

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-3))

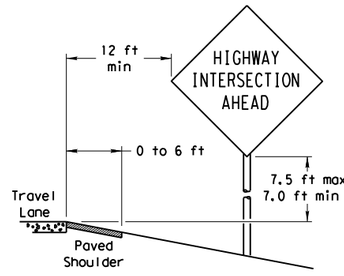
REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



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).

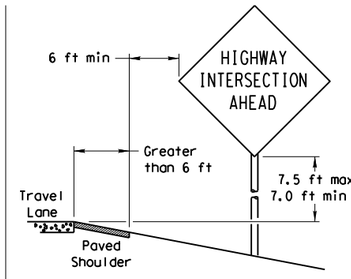
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

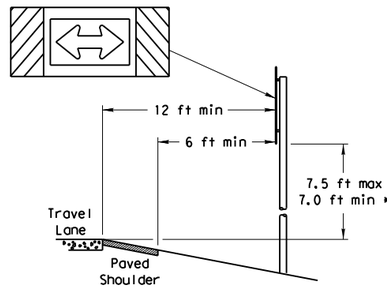
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



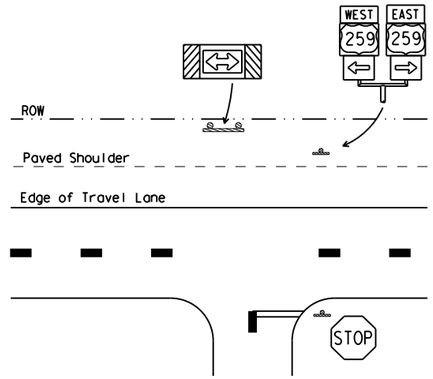
GREATER THAN 6 FT. WIDE

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.

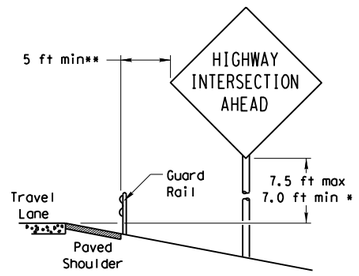
T-INTERSECTION



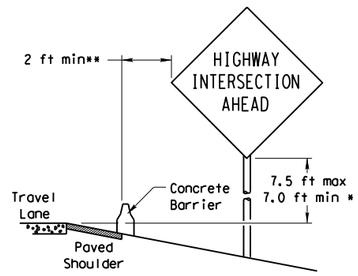
When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.



BEHIND BARRIER



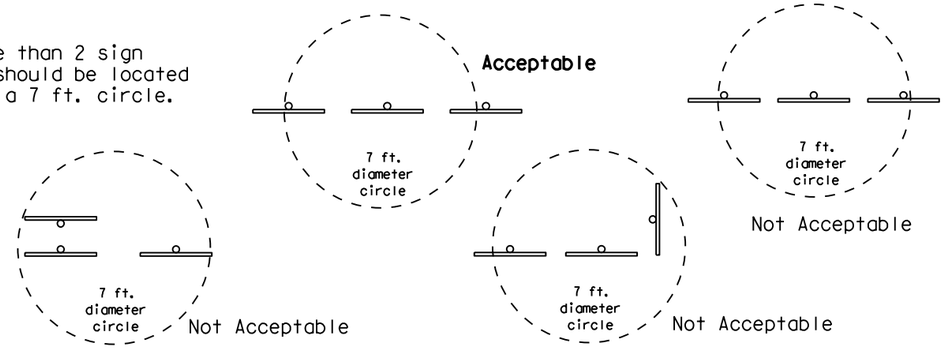
BEHIND GUARDRAIL



BEHIND CONCRETE BARRIER

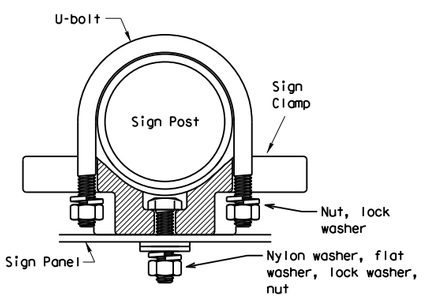
**Sign clearance based on distance required for proper guard rail or concrete barrier performance.

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

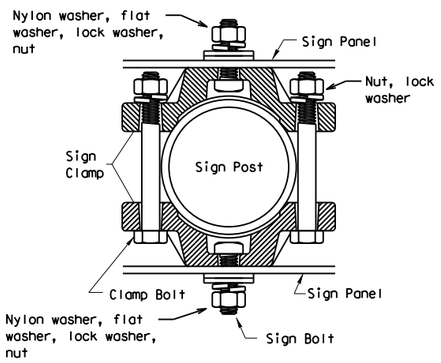


TYPICAL SIGN ATTACHMENT DETAIL

Single Signs



Back-to-Back Signs



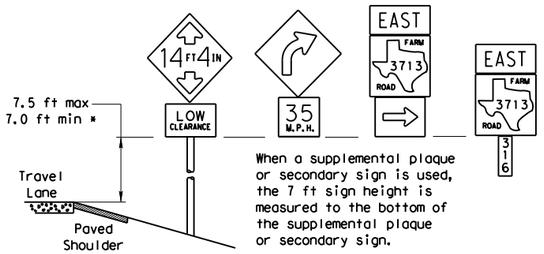
Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

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

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

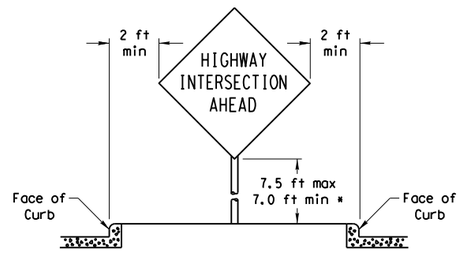
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



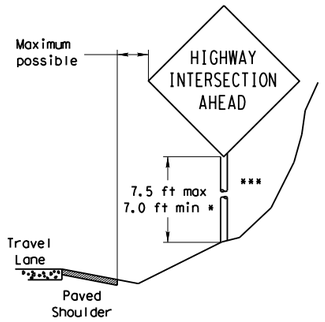
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

CURB & GUTTER OR RAISED ISLAND



RESTRICTED RIGHT-OF-WAY

(When 6 ft min. is not possible.)



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

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

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

* 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

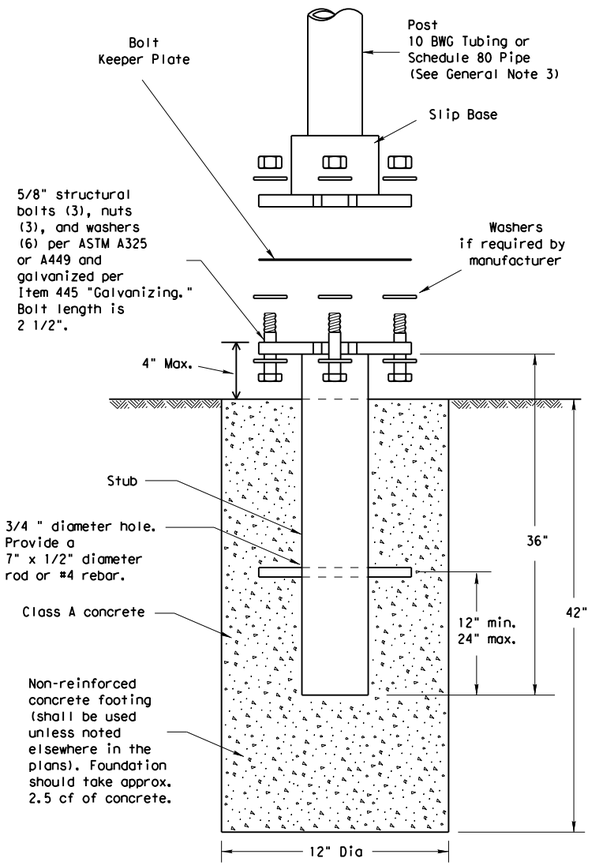
CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781

DIST	COUNTY	SHEET NO.
LFK	HOUSTON, ETC.	123

9-08 REVISIONS

DATE: 8/5/2022 1:16:59 PM
FILE: c:\txdot\pw\online\txdot3\sergio.zapata\d0361228\smdgen.dgn

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.

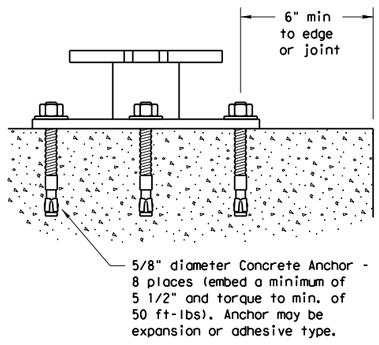
   Schedule 80 Pipe (2.875" outside diameter)
   - 0.276" nominal wall thickness
   - Steel tubing per ASTM A500 Gr C
   - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
     - 46,000 PSI minimum 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

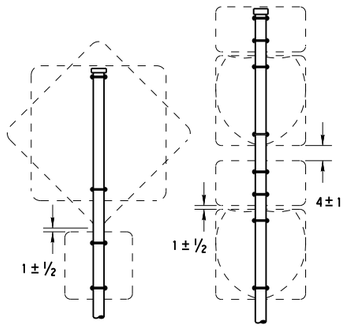
DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS 9-08

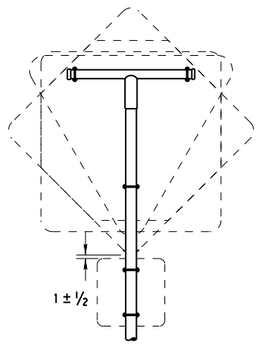
CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781

DIST	COUNTY	SHEET NO.
LFK	HOUSTON, ETC.	124

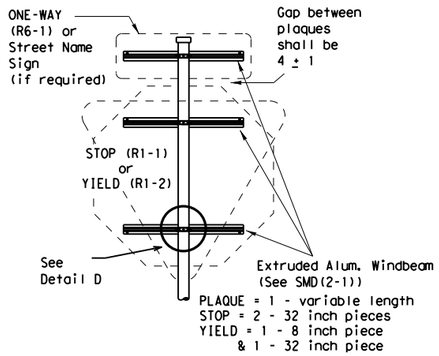
DATE: 8/5/2022 1:17:02 PM
FILE: c:\txdot\pw*online\txdot3\sergio.zapata\d0361228\smdsl.dgn



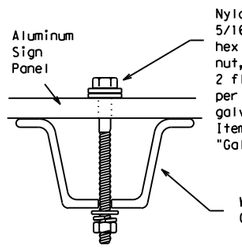
SM RD SGN ASSM TY XXXXX(1)XX(P)



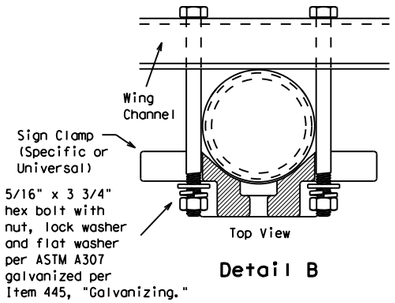
SM RD SGN ASSM TY XXXXX(1)XX(T)



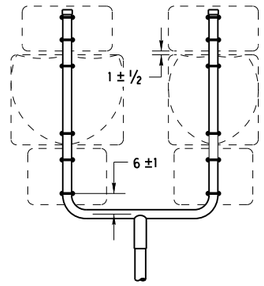
SM RD SGN ASSM TY XXXXX(1)XX(P-BM)



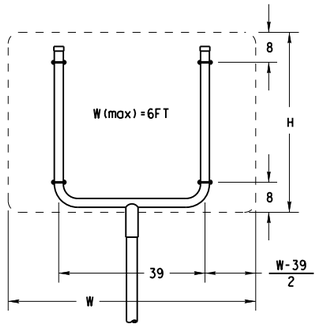
Detail A



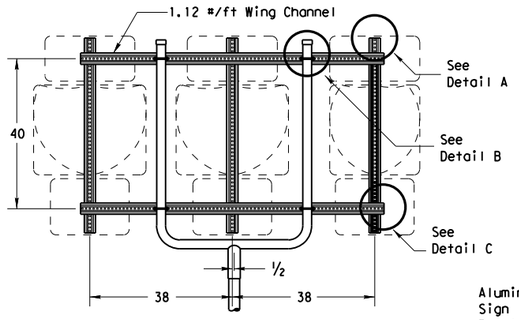
Detail B



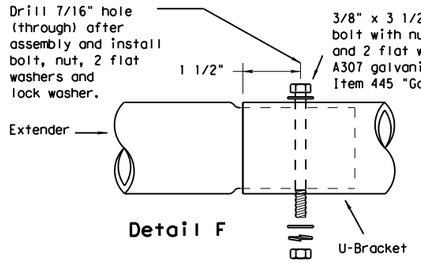
SM RD SGN ASSM TY XXXXX(1)XX(U)



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

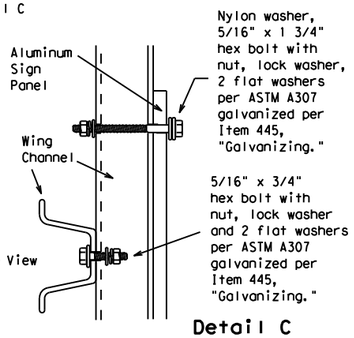


SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)

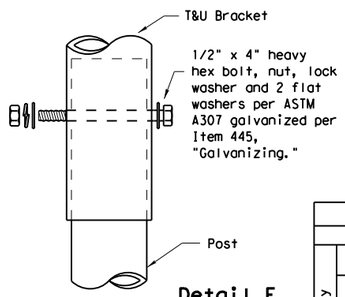


Detail F

Splices shall only be allowed behind the sign substrate.



Detail C



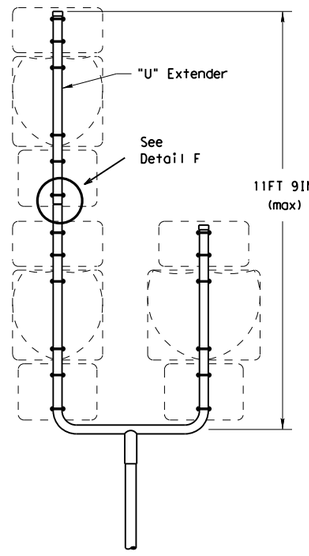
Detail E

GENERAL NOTES:

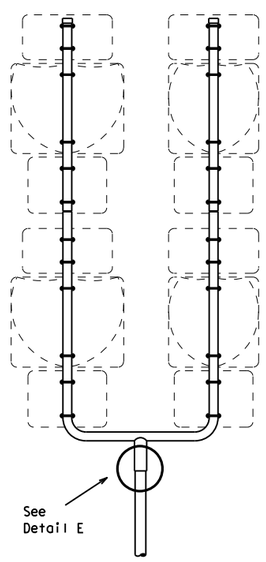
1.

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

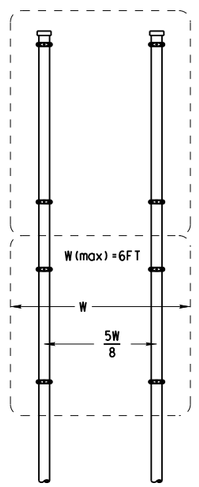
2. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
3. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
4. Aluminum sign blanks shall conform to Departmental Material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



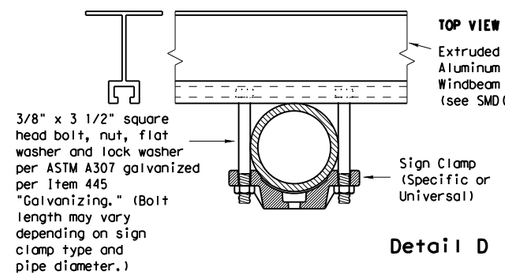
SM RD SGN ASSM TY S80(1)XX(U-1EXT)



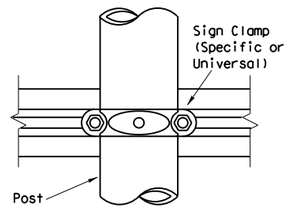
SM RD SGN ASSM TY S80(1)XX(U-2EXT)



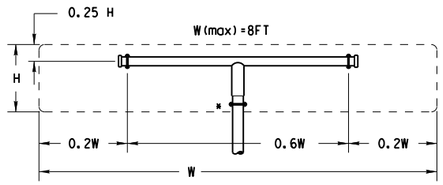
SM RD SGN ASSYM TY XXXXX(2)XX(P)



Detail D



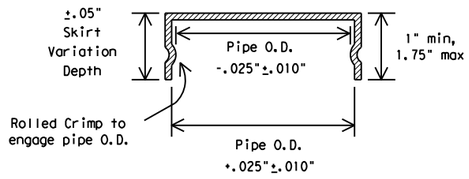
REQUIRED SUPPORT		
	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)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



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

All dimensions are in english unless detailed otherwise.

FRICTION CAP DETAIL



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

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

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

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

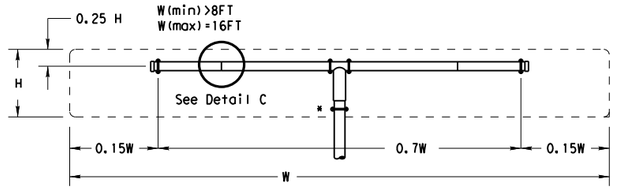
SMD(SLIP-2)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		125

9-08 REVISIONS

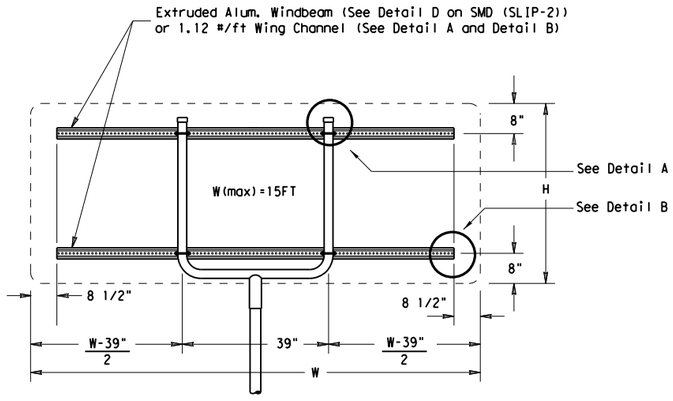
26C

DATE: 8/5/2022 1:17:06 PM
FILE: c:\txdot\pw*online\txdot3\sergio.zapata\d0361228\smds2.dgn

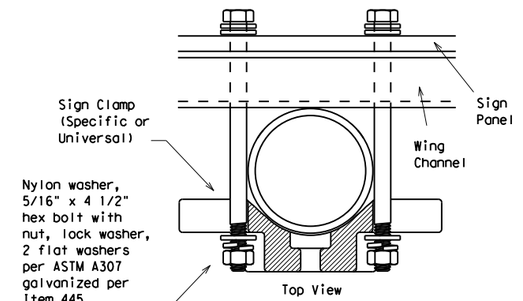


SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)

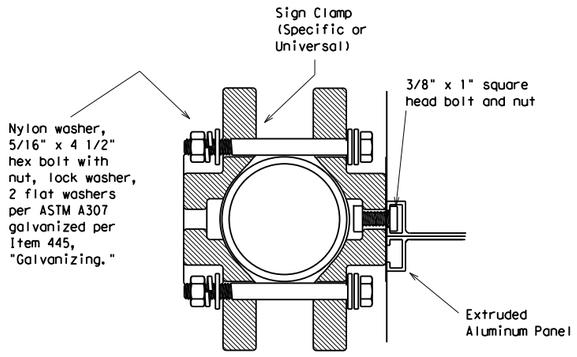
(* - See Note 12)



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

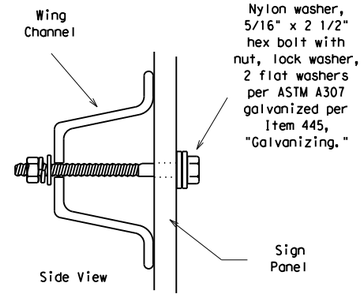


Detail A

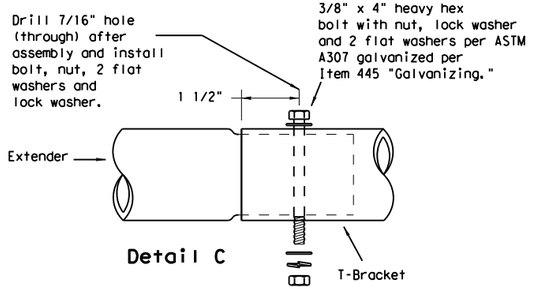


Detail D

EXTRUDED ALUMINUM SIGN WITH T BRACKET

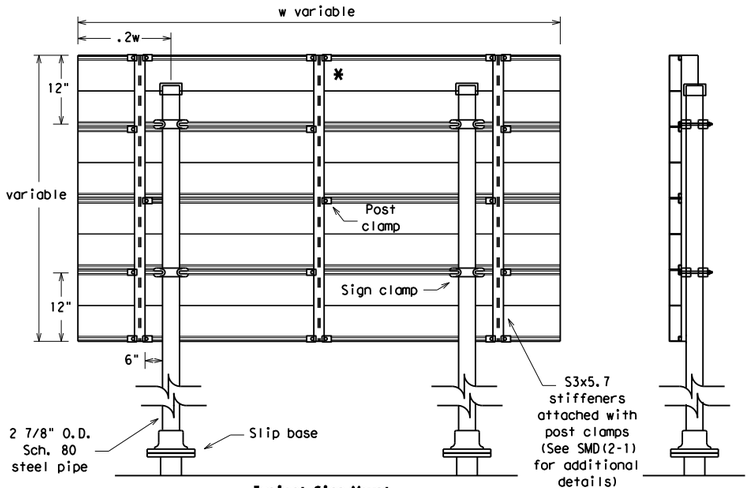


Detail B



Detail C

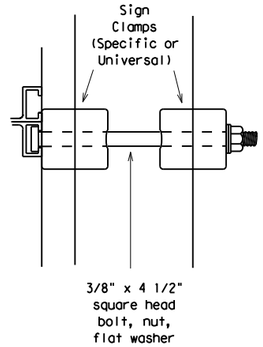
Splices shall only be allowed behind the sign substrate.



Typical Sign Mount

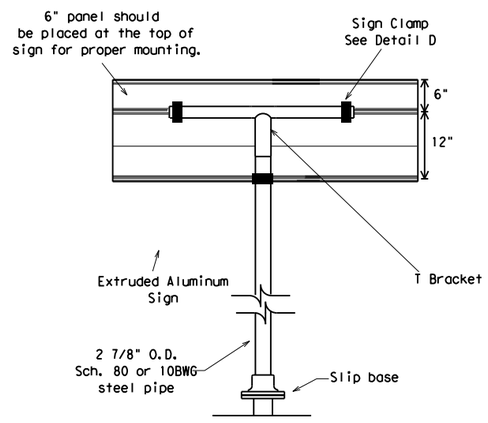
SM RD SGN ASSM TY S80(2)XX(P-EXAL)

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

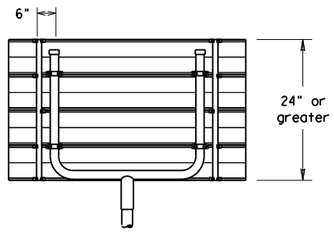


Detail E

See Detail E
for clamp installation



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

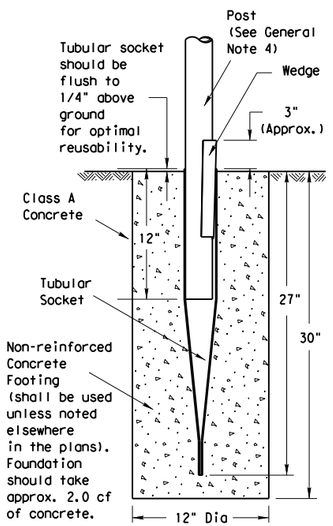
REVISIONS
9-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		126

DATE: 8/5/2022 1:17:10 PM
FILE: c:\txdot\pwonline\txdot3\sergio.zapata\d0361228\smds3.dgn

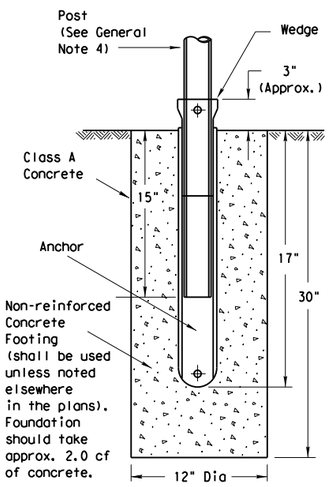
DISCLAIMER:
The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

Wedge Anchor Steel System



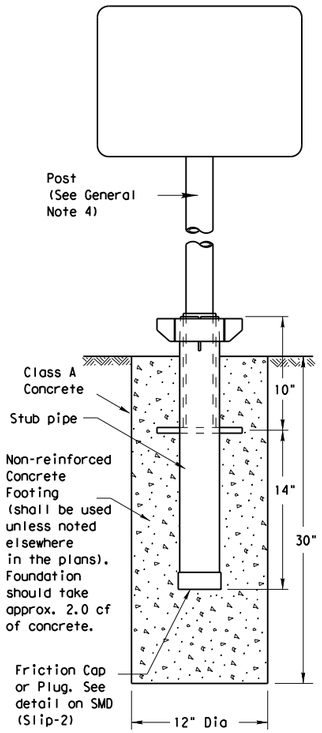
SM RD SGN ASSM TY TWT(X)WS(X)

Wedge Anchor High Density Polyethylene (HDPE) System

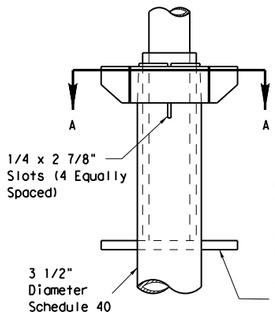


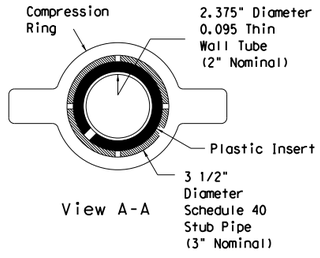
SMD RD SGN ASSM TY TWT(X)WP(X)

Universal Anchor System with Thin-Walled Tubing Post



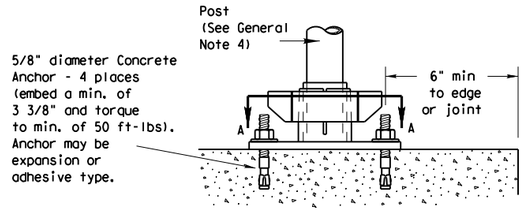
SM RD SGN ASSM TY TWT(X)UA(P)



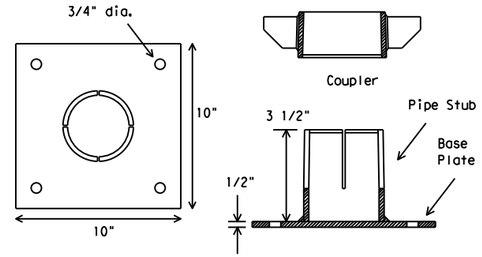


View A-A

Plastic insert must be used when using the TWT with either the Universal Anchor System or the Bolt Down Universal Anchor System. The insert should be approx. 10" long and cover the tubing from just above the top of the stub pipe to the bottom of the sign post when using the Universal Anchor System. The insert should be cut to approx. 4 1/2" when used with the Bolt Down Universal Anchor System.

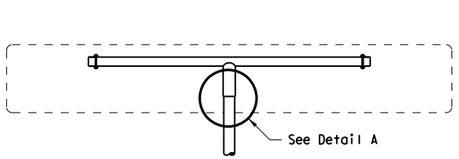


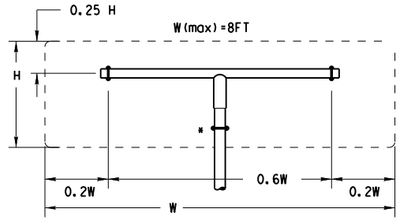
Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. A heavy hex nut per ASTM A563 and hardened washer per ASTM F436. The stud bolt shall have minimum yield and ultimate tensile strengths of 50 and 75 ksi, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Top of bolt shall extend at least flush with top of nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 3 3/8" minimum embedment, shall have a minimum allowable tension and shear of 2450 and 1525 psi, respectively. 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.



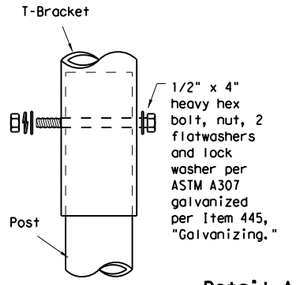
SM RD SGN ASSM TY TWT(X)UB(P)

Sign Installation Using a Prefabricated T-Bracket for Thin-Wall Tubing Post





SM RD SGN ASSM TY TWT(X)XX(T)
(* - See General Note 6)



Detail A

9/16" hole may need to be drilled through post to accommodate bolt.

NOTE

The devices shall be installed per manufacturer's recommendations.
Installation procedures shall be provided to the Engineer by Contractor.

GENERAL NOTES:

1. The Wedge Anchor System and the Universal Anchor System with thin wall tubing post may be used to support up to 10 square feet of sign area.
2. The tubular socket, wedge and prefabricated T-bracket shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to the approval of the TxDOT Traffic Standards Engineer.
3. Except for posts (13 BWG Tubing), clamps, nuts and bolts, all components shall be prequalified. A list of prequalified vendors may be obtained from the Material Producer List web page. The website address is: http://www.txdot.gov/business/producer list.htm
4. Material used as post with this system shall conform to the following specifications:
   13 BWG Tubing (2.375" outside diameter) (TWT)
   0.095" nominal wall thickness
   Seamless or electric-resistance welded steel tubing
   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
   18% minimum elongation in 2"
   Wall thickness (uncoated) shall be within the range of .083" to .099"
   Outside diameter (uncoated) shall be within the range of 2.369" to 2.381"
   Galvanization per ASTM 123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.
5. Sign blanks shall be the sizes and shapes shown on the plans.
6. Additional sign clamp required on the "T-bracket" post for 24" high signs. Place clamp at least 3" above bottom of sign when possible.
7. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
8. See the Traffic Operations Division website for detailed drawings of sign clamps and Wedge Anchor System components. The website address is: http://www.txdot.gov/publications/traffic.htm

WEDGE ANCHOR SYSTEM INSTALLATION PROCEDURE

1. Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18". When solid rock is encountered below ground level, the foundation shall extend in the solid rock a minimum depth of 18" or provide a minimum foundation depth of 30". If solid rock is encountered, the socket/stub may be reduced in length as required to a minimum length of 18". Any material removed from the socket/stub shall be from the bottom and the clearance requirements given on SMD(GEN) must be followed. The inner surfaces of the socket/stub must remain free of concrete or other debris.
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. Place concrete into hole until it is approximately flush with the ground. Concrete shall be Class A.
3. Insert tubular socket into concrete until top of socket is approximaely 1/4 " above the concrete footing.
4. Plumb the socket. Allow a minimum 4 days for concrete to set, unless otherwise directed by Engineer..
5. Attach the sign to the sign post.
6. Insert the sign post into socket and align sign face with roadway.
7. Drive the wedge into the socket to secure post. This will leave approximately 3 inches of the wedge exposed.

UNIVERSAL ANCHOR SYSTEM INSTALLATION PROCEDURE

1. Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18". When solid rock is encountered below ground level, the foundation shall extend in the solid rock a minimum depth of 18" or provide a minimum foundation depth of 30". If solid rock is encountered, the socket/stub may be reduced in length as required to a minimum length of 18". Any material removed from the socket/stub shall be from the bottom and the clearance requirements given on SMD(GEN) must be followed. The inner surfaces of the socket/stub must remain free of concrete or other debris.
2. Insert base post in hole to depths shown and backfill hole with concrete.
3. Level and plumb the base post using a torpedo level and allow concrete adequate time to set. The bottom of the slots provided in the stub pipe shall remain above the top of the concrete foundation.
4. Attach the sign to the sign post.
5. Install plastic insert around bottom of post.
6. Insert sign post into base post. Lower until the post comes to rest on steel rod.
7. Seat compression ring using a hammer. Typically, the top of compression ring will be approximately level with top of stub post when optimally installed.
8. Check sign post by hand to ensure it is unable to turn. If loose, increase the tightening of the compression ring.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS WEDGE & UNIVERSAL ANCHOR WITH THIN WALL TUBING POST

SMD(TWT)-08

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

9-08 REVISIONS

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781

DIST	COUNTY	SHEET NO.
LFK	HOUSTON, ETC.	127

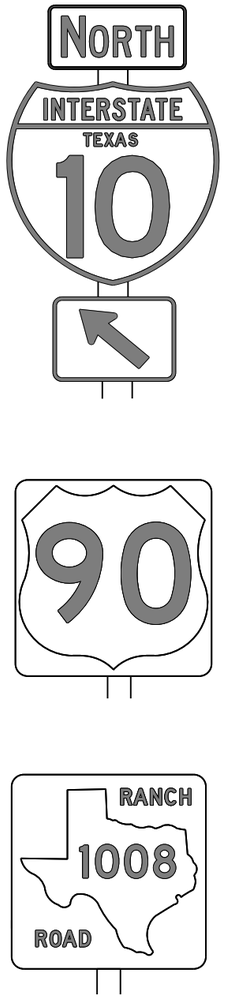
26E

DATE: 8/5/2022 1:17:13 PM
FILE: c:\txdot\pw\online\txdot3\sergio.zapata\d0361228\smdtwt.dgn

DATE: 8/5/2022 1:17:17 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0361228\tsr3-13.dgn

REQUIREMENTS FOR INDEPENDENT MOUNTED ROUTE SIGNS

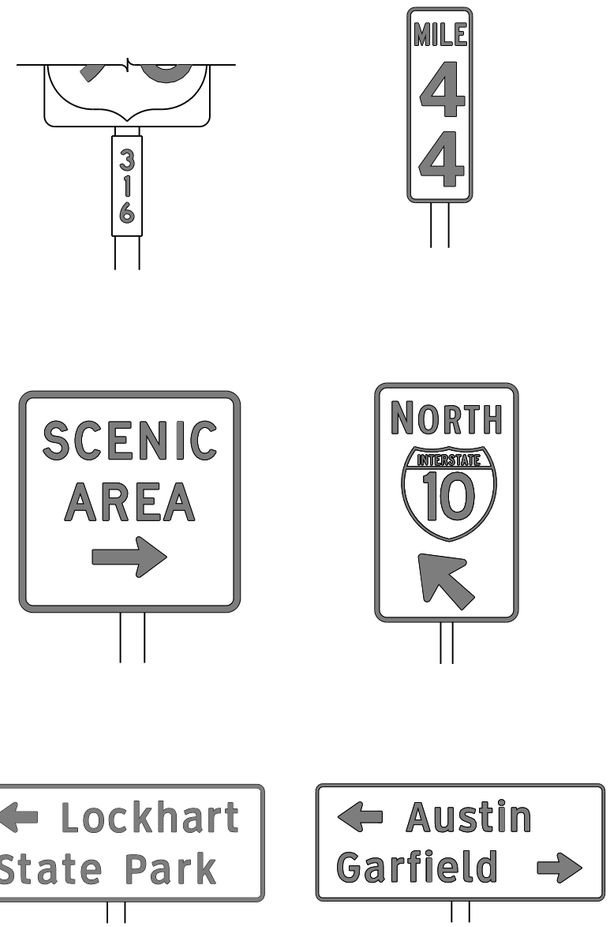
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE A SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & BORDERS	ALL OTHERS	TYPE B or C SHEETING



TYPICAL EXAMPLES

REQUIREMENTS FOR BLUE, BROWN & GREEN D AND I SERIES GUIDE SIGNS

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	ALL	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE D SHEETING
LEGEND, SYMBOLS & BORDERS	ALL OTHERS	TYPE B OR C SHEETING



TYPICAL EXAMPLES

GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).

2. White legend shall use the Clearview Alphabet. The following Clearview fonts shall be used to replace the existing white Federal Highway Administration (FHWA) Standard Highway Alphabets, when not specified in the SHSD, or in the plans.

B	CV-1W
C	CV-2W
D	CV-3W
E	CV-4W
Emod	CV-5WR
F	CV-6W

3. Route sign legend (ie. IH, US, SH and FM shields) shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets B, C, D, E, Emod or F).

4. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.

5. Independent mounted route sign with white or colored legend and borders shall be applied by screening process with transparent color ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof. White legend, symbols and borders on all other signs shall be cut-out white sheeting applied to colored background sheeting.

6. Information regarding borders and radii for signs is found in the "Standard Highway Sign Designs for Texas". Dimensions shown and described for borders and corner radii on parent sign are nominal. Borders may vary in width as much as 1/2 inch. Corner radii above 3 inches may vary in width as much as 1 inch. Borders and corner radii within a parent sign must be of matching widths. The sign area outside the corner radius should be trimmed or rounded.

7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.

8. Mounting details of roadside signs are shown in the "SMD series" Standard Plan Sheets.

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

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

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

http://www.txdot.gov/

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

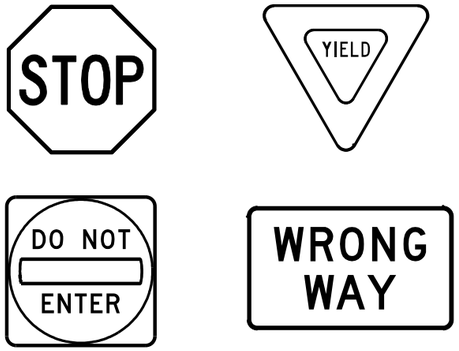
TSR(3)-13

FILE: tsr3-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	2707	01	011, ETC.	FM 2781
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	LFK	HOUSTON, ETC.		128

DATE: 8/5/2022 1:17:21 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0361228\tsr4-13.dgn

REQUIREMENTS FOR RED BACKGROUND REGULATORY SIGNS

(STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)



REQUIREMENTS FOR FOUR SPECIFIC SIGNS ONLY

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	WHITE	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE B OR C SHEETING
LEGEND	RED	TYPE B OR C SHEETING

REQUIREMENTS FOR WHITE BACKGROUND REGULATORY SIGNS

(EXCLUDING STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)

TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND, BORDERS AND SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).
2. Sign legend shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets (B, C, D, E, Emod or F).
3. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.
4. Black legend and borders shall be applied by screening process or cut-out acrylic non-reflective black film to background sheeting, or combination thereof.
5. White legend and borders shall be applied by screening process with transparent colored ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof.
6. Colored legend shall be applied by screening process with transparent colored ink, transparent colored overlay film or colored sheeting to background sheeting, or combination thereof.
7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.
8. Mounting details for roadside mounted signs are shown in the "SMD series" Standard Plan Sheets.

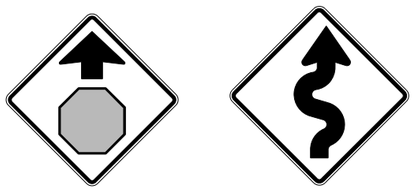
ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080
7.5 to 15	0.100
Greater than 15	0.125

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

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

http://www.txdot.gov/

REQUIREMENTS FOR WARNING SIGNS



TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	FLOURESCENT YELLOW	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

REQUIREMENTS FOR SCHOOL SIGNS

TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	FLOURESCENT YELLOW GREEN	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
SYMBOLS	RED	TYPE B OR C SHEETING

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(4)-13

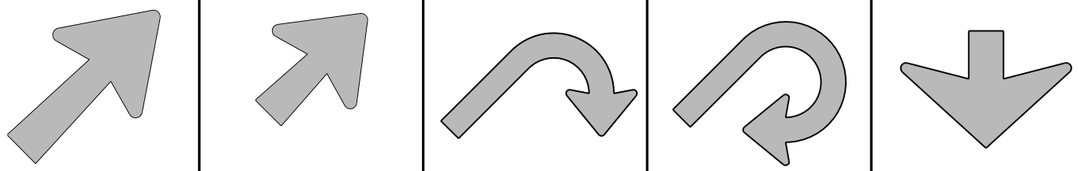
FILE: tsr4-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	2707	01	011, ETC.	FM 2781
12-03 7-13 9-08	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON, ETC.		129

4

DATE: 8/5/2022 1:17:25 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0361228\tsr5-13.dgn

ARROW DETAILS

for Large Ground-Mounted and Overhead Guide Signs



TYPE	LETTER SIZE	USE
A-1	10.67" U/L and 10" Caps	Single Lane Exits
A-2	13.33" U/L and 12" Caps	
A-3	16" & 20" U/L	
B-1	10.67" U/L and 10" Caps	Multiple Lane Exits
B-2	13.33" U/L and 12" Caps	
B-3	16" & 20" U/L	

CODE	USED ON SIGN NO.
E-3	E5-1aT
E-4	E5-1bT

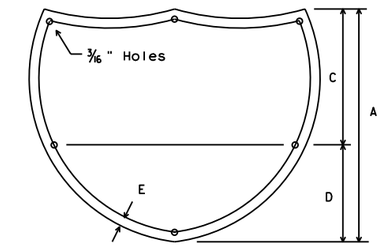
NOTE

Arrow dimensions are shown in the "Standard Highway Sign Designs for Texas" manual.

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

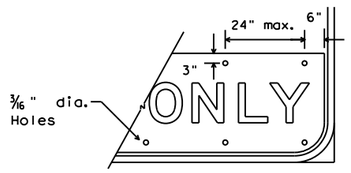
http://www.txdot.gov/

SIGN BLANK PUNCHING DETAILS FOR ATTACHMENTS WHEN SPECIFIED TO BE TYPE A ALUMINUM SIGNS (FOR MOUNTING TO GUIDE SIGN FACE)

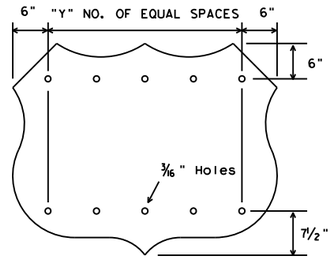


INTERSTATE ROUTE MARKERS

A	C	D	E
36	21	15	1 1/2
48	28	20	1 3/4

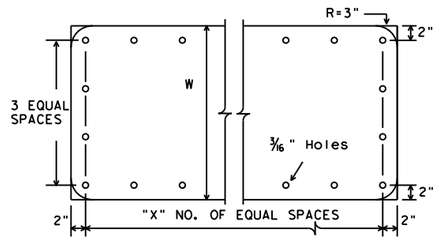


EXIT ONLY PANEL



U.S. ROUTE MARKERS

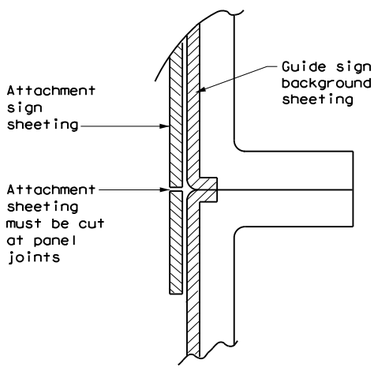
Sign Size	"Y"
24x24	2
30x24	3
36x36	3
45x36	4
48x48	4
60x48	5



STATE ROUTE MARKERS

No. of Digits	W	X
4	24	4
4	36	5
4	48	6
3	24	3
3	36	4
3	48	5

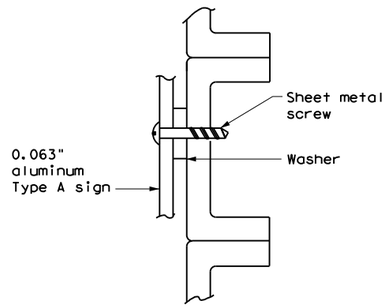
MOUNTING DETAILS OF ATTACHMENTS TO GUIDE SIGN FACE ("EXIT ONLY" AND "LEFT EXIT" PANELS, ROUTE MARKERS AND OTHER ATTACHMENTS)



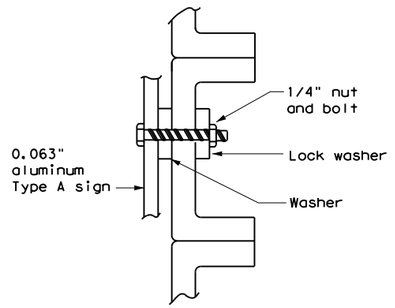
DIRECT APPLIED ATTACHMENT

NOTE:

1. Sheeting for legend, symbols, and borders must be cut at panel joints.
2. Direct applied attachment signs will be subsidiary to "Aluminum Signs" or "Fiberglass Signs".



SCREW ATTACHMENT



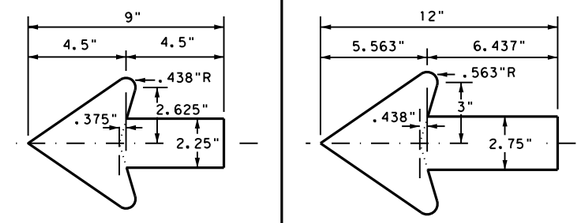
NUT/BOLT ATTACHMENT

NOTE:

Furnish Type A aluminum sign attachments only when specified in the plans. These signs will be paid for under "Aluminum Signs".

ARROW DETAILS

for Destination Signs (Type D)



Standard arrow to be used with 6 inch letters.

Standard arrow to be used with 8 inch letters.

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(5)-13

FILE: tsr5-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	2707	01	011, ETC.	FM 2781
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	LFK	HOUSTON, ETC.		130

NOTES:
(1) THE PURPOSE OF THIS SHEET IS TO POINT THE USER TO THE APPROPRIATE LOCATIONS TO FIND THE REQUIRED CONTENT OF THE SWP3.
(2) THE PROJECT LIMITS SHOWN ON THE TITLE SHEET AND LIMITS OF TXDOT RIGHT OF WAY SHALL ALSO BE THE LIMITS OF COVERAGE OF THE SWP3.

PROJECT DESCRIPTION

A. NATURE OF ACTIVITY: FOR THE CONSTRUCTION OF REHABILITATION AND WIDENING OF EXISTING PAVEMENT AND SAFETY TREAT FIXED OBJECTS.

B. POTENTIAL POLLUTANTS AND THEIR SOURCES:
POLLUTANT: SEDIMENT; SOURCE: DISTURBED SOIL.
POLUUTANT: OIL AND GREASE; SOURCE: EQUIPMENT AND VEHICLES.
POLLUTANT: GARBAGE AND CONSTRUCTION DEBRIS; SOURCE: CONSTRUCTION ACTIVITIES AND WORKERS.

C. INTENDED SEQUENCE OF ACTIVITIES: SEE CONSTRUCTION SCHEDULE FOR ESTIMATED START DATES AND DURATION OF SOIL-DISTURBING ACTIVITIES

D. TOTAL AREA OF SITE: 167.76 ACRES AREA TO BE DISTURBED: 56.23 ACRES

E. DATA DESCRIBING THE SOIL OR QUALITY OF ANY DISCHARGE FROM THE SITE: 27% FULLER FINE SANDY LOAM 1-3% SLOPES; 28% KELTYS FINE SANDY LOAM 1-3% SLOPES; 14% KURTH FINE SANDY LOAM 1-3% SLOPES; 13% PENNING VERY FINE SANDY LOAM 0-4% SLOPES; 11% HERTY LOAM 1-3% SLOPES; 7% KOURY SILT LOAM FREQUENTLY FLOODED.

F. GENERAL LOCATION MAP: SEE TITLE SHEET OF THE PROJECT PLANS

G. DETAILED SITE MAP/MAPS INDICATING THE FOLLOWING:
- i. DRAINAGE PATTERNS: SEE SWP3 LAYOUTS
- ii. ANTICIPATED SLOPES AFTER MAJOR GRADING ACTIVITIES: SEE TYPICAL SECTIONS
- iii. AREAS WHERE SOIL DISTURBANCE WILL OCCUR: SEE SWP3 LAYOUTS
- iv. LOCATIONS OF ALL CONTROLS OR BUFFERS (PLANNED/IN PLACE): SEE SWP3 LAYOUTS
- v. LOCATIONS WHERE TEMPORARY OR PERMANENT STABILIZATION PRACTICES ARE EXPECTED TO BE USED: SEE SWP3 LAYOUTS
- vi. LOCATION OF CONSTRUCTION SUPPORT ACTIVITIES: SEE SWP3 LAYOUTS
- vii. SURFACE WATERS, INCLUDING WETLANDS, AT, ADJACENT, OR IN CLOSE PROXIMITY TO THE SITE (* INDICATES IMPAIRED WATERS): SEE SWP3 LAYOUTS
- viii. LOCATIONS WHERE STORMWATER DISCHARGES DIRECTLY TO A SURFACE WATER BODY OR MS4: SEE SWP3 LAYOUTS
- ix. VEHICLE WASH AREAS: N/A
- x. DESIGNATED POINTS ON THE SITE WHERE VEHICLES WILL EXIT FROM UNSTABLE DIRT TO PAVED ROAD: SEE SWP3 LAYOUTS.

H. LOCATION AND DESCRIPTION OF CONSTRUCTION SUPPORT ACTIVITIES AUTHORIZED UNDER THE PERMITTEE'S NOI: CONSTRUCTION SUPPORT ACTIVITIES ARE NOT COVERED UNDER THIS SWP3 AS IT IS NOT AUTHORIZED UNDER THIS PERMITTEE'S CGP. THE PERMITTEE WILL MAKE REFERENCE TO CONSTRUCTION SUPPORT ACTIVITIES THAT ARE COVERED UNDER THE CONTRACTOR'S SWP3 AND CGP ON SWP3 LAYOUTS

I. NAME OF RECEIVING WATER(S) AT OR NEAR SITE:
(AN ASTERISK (*) INDICATES AND IMPAIRED WATER)
WOOD SPRING BRANCH, BRICE SPRING BRANCH, *PINEY CREEK, LYNCH CREEK, AND UNNAMED TRIBUTARIES TO NEAT SITE ELM, WALLACE, PINEY, AND BROWNLEE CREEKS.

NEAREST CLASSIFIED SEGMENT NUMBER: 0604

CLASSIFIED SEGMENT NAME: NECHES RIVER BELOW LAKE PALESTINE.

J. COPY OF TPDES GENERAL PERMIT: SEE SWP3 FILE

K. NOI AND ACKNOWLEDGEMENT CERTIFICATE OR SITE NOTICE: SEE SWP3 FILE

L. STORMWATER AND ALLOWABLE NON-STORMWATER DISCHARGE LOCATIONS: SEE SWP3 LAYOUTS

M. LOCATIONS OF POLLUTANT GENERATING ACTIVITIES: ACTIVITIES AUTHORIZED UNDER THIS PERMITTEE'S CGP CAN BE FOUND ON SWP3 LAYOUTS. THIS SHEET WILL ALSO REFERENCE THE LOCATION OF POLLUTANT GENERATING ACTIVITIES THAT ARE COVERED BY THE CONTRACTOR'S CGP AND SWP3.

DESCRIPTION OF BMPS

A. GENERAL REQUIREMENTS: EROSION AND SEDIMENT CONTROLS SHOWN ON SWP3 LAYOUTS WERE DESIGNED TO RETAIN SEDIMENT ON-SITE TO THE EXTENT PRACTICABLE WITH CONSIDERATION OF LOCAL TOPOGRAPHY, SOIL TYPE, AND RAINFALL. THE EROSION AND SEDIMENT CONTROLS WILL BE INSTALLED AND MAINTAINED ACCORDING TO MANUFACTURER AND TXDOT STORM WATER MANAGEMENT GUIDELINES. CONTROLS TO MINIMIZE THE OFF-SITE TRANSPORT OF LITTER, CONSTRUCTION DEBRIS, AND CONSTRUCTION MATERIALS INCLUDE: CONSTRUCTION MATERIALS TO BE STORED IN LOCATIONS THAT MINIMIZE THEIR EXPOSURE TO PRECIPITATION & STORM WATER RUNOFF; COLLECTION OF CONSTRUCTION DEBRIS IN RECEPTACLES WITH A SECURE COVER MEETING STATE AND LOCAL SOLID WASTE MANAGEMENT REGULATIONS; HAULING AND EMPTYING RECEPTACLES AT APPROVED LANDFILL SITES; PROHIBITING THE BURIAL OF CONSTRUCTION DEBRIS; COLLECTION OF SANITARY WASTE FROM PORTABLE UNITS AS NECESSARY OR AS REQUIRED BY LOCAL REGULATIONS BY A LICENSED SANITARY WASTE MANAGEMENT CONTRACTOR.

B. EROSION CONTROL AND STABILIZATION PRACTICES

T/P	TEMP/PERM SEEDING		PROTECTION OF TREES AND VEGETATION
	MULCHING (HAY OR STRAW)		GEOTEXTILES
	VEGETATIVE BUFFER STRIPS		SLOPE TEXTURING
	SOD STABILIZATION		TEMP VELOCITY DISSIPATION DEVICES
P	BLOCK SOD		FLOW DIVERSION MECHANISMS
P	OTHER		

T = TEMPORARY; P = PERMANENT

DATES:
1. MAJOR GRADING ACTIVITIES: PAVEMENT WIDENING AND REHAB.
2. WHEN CONSTRUCTION ACTIVITIES TEMPORARILY OR PERMANENTLY CEASE ON A PORTION OF THE SITE: SEE CONSTRUCTION SCHEDULE FOR THESE DATES.
3. WHEN STABILIZATION MEASURES ARE INITIATED: SEE CONSTRUCTION SCHEDULE FOR THESE DATES.

INITIATE EROSION CONTROL AND STABILIZATION MEASURES IMMEDIATELY IN THAT PORTION OF THE SITE WHERE CONSTRUCTION ACTIVITIES HAVE TEMPORARILY CEASED AND WILL NOT RESUME FOR A PERIOD EXCEEDING 14 CALENDAR DAYS. INITIATE STABILIZATION MEASURES THAT PROVIDE A PROTECTIVE COVER IMMEDIATELY IN THAT PORTION OF THE SITE WHERE CONSTRUCTION ACTIVITIES HAVE PERMANENTLY CEASED. "IMMEDIATELY" MEANS NO LATER THAN THE NEXT WORK DAY FOLLOWING THE DAY WHEN THE SOIL-DISTURBING ACTIVITIES HAVE TEMPORARILY OR PERMANENTLY CEASED. STABILIZATION MEASURES MUST BE COMPLETED NO MORE THAN 14 CALENDAR DAYS AFTER INITIATION BEGINS.

THE SCHEDULE OF IMPLEMENTATION OF THESE PRACTICES WILL BE BASED ON THE INTENDED SEQUENCE OF MAJOR SOIL-DISTURBING ACTIVITIES. SEE CONSTRUCTION SCHEDULE

C. SEDIMENT CONTROL PRACTICES

X	SILT FENCE		VEGETATIVE BUFFER STRIPS
X	OTHER		

IF SITE WILL DISTURB 10 OR MORE ACRES WITHIN A COMMON DRAINAGE LOCATION AND A SEDIMENTATION BASIN IS NOT FEASIBLE, PROVIDE REASON: NOT ENOUGH SPACE WITH THE ROW FOR A SEDIMENT BASIN.

THE SCHEDULE OF IMPLEMENTATION OF THESE PRACTICES WILL BE BASED ON THE INTENDED SEQUENCE OF MAJOR SOIL-DISTURBING ACTIVITIES. SEE CONSTRUCTION SCHEDULE

DESCRIPTION OF PERMANENT STORM WATER CONTROLS

PROVIDE A DESCRIPTION OF ANY MEASURES THAT WILL BE INSTALLED DURING THE CONSTRUCTION PROCESS TO CONTROL POLLUTANTS IN STORM WATER DISCHARGES THAT MAY OCCUR AFTER CONSTRUCTION OPERATIONS HAVE BEEN COMPLETED: N/A

OTHER REQUIRED CONTROLS AND BMPS

TXDOT WILL UTILIZE ROCK AT CONSTRUCTION ENTRANCES AND SPRINKLING, AS NEEDED, TO MINIMIZE OFF-SITE VEHICLE TRACKING OF SEDIMENTS AND THE GENERATION OF DUST.

SEE SECTION A ABOVE FOR DESCRIPTION OF CONSTRUCTION AND WASTE MATERIALS AND CONTROLS USED FOR THOSE THAT MAY BE STORED ON-SITE.

AT A MINIMUM, ANY PRODUCTS IN THE FOLLOWING CATEGORIES ARE CONSIDERED TO BE HAZARDOUS: PAINTS, ACIDS FOR CLEANING MASONRY SURFACES, CLEANING SOLVENTS, FUELS, MOTOR OIL, ASPHALT PRODUCTS, CHEMICAL ADDITIVES FOR SOIL STABILIZATION, OR CONCRETE CURING COMPOUNDS AND ADDITIVES. STORE MATERIAL IN ACCORDANCE WITH APPLICABLE REGULATIONS. CONTACT THE SPILL COORDINATOR IMMEDIATELY IN THE EVENT OF A SPILL WHICH MAY BE HAZARDOUS.

MAINTENANCE REQUIREMENTS

EFFECTIVELY MAINTAIN THE OPERATING CONDITIONS OF ALL EROSION AND SEDIMENT CONTROL AND OTHER PROTECTIVE MEASURES IDENTIFIED IN THE SWP3. IF SITE INSPECTIONS REQUIRED BY THIS PERMIT IDENTIFY BMP'S THAT ARE NOT OPERATING EFFECTIVELY, MAINTENANCE SHALL BE PERFORMED BEFORE THE NEXT ANTICIPATED STORM EVENT, OR AS NECESSARY TO MAINTAIN THE CONTINUED EFFECTIVENESS OF STORM WATER CONTROLS. IF MAINTENANCE PRIOR TO THE NEXT ANTICIPATED STORM EVENT IS UNPRACTICABLE, SCHEDULE AND ACCOMPLISH MAINTENANCE AS SOON AS PRACTICAL. CONTROLS THAT HAVE BEEN INTENTIONALLY DISABLED, RUN-OVER, REMOVED OR OTHERWISE RENDERED INEFFECTIVE MUST BE REPLACED OR CORRECTED IMMEDIATELY UPON DISCOVERY. IF A CONTROL HAS BEEN USED INCORRECTLY, IS PERFORMING INADEQUATELY OR IS DAMAGED, THE OPERATOR SHALL REPLACE OR MODIFY THE CONTROL AS SOON AS PRACTICABLE AFTER THE DISCOVERY.

INSPECTION OF CONTROLS

A) QUALIFIED PERSONNEL SHALL INSPECT DISTURBED AREAS OF THE CONSTRUCTION SITE THAT HAVE NOT BEEN FINALLY STABILIZED, AREAS USED FOR STORAGE OF MATERIALS THAT ARE EXPOSED TO PRECIPITATION, STRUCTURAL CONTROL MEASURES, AND LOCATIONS WHERE VEHICLES ENTER OR EXIT THE SITE, ONCE EVERY 7 CALENDAR DAYS. DISTURBED AREAS THAT ARE EXPOSED TO PRECIPITATION SHALL BE INSPECTED FOR EVIDENCE OF, OR THE POTENTIAL FOR, POLLUTANTS ENTERING THE DRAINAGE SYSTEM. SEDIMENT AND EROSION CONTROL MEASURES IDENTIFIED ON THE SWP3 SHALL BE OBSERVED TO ENSURE THAT THEY ARE OPERATING CORRECTLY. LOCATIONS WHERE VEHICLES ENTER OR EXIT THE SITE SHALL BE INSPECTED FOR EVIDENCE OF OFF-SITE SEDIMENT TRACKING.

D) THE SWP3 MUST BE MODIFIED BASED ON THE RESULTS OF INSPECTION TO BETTER CONTROL POLLUTANTS IN RUNOFF. REVISIONS TO THE SWP3 MUST BE COMPLETED WITHIN 7 CALENDAR DAYS FOLLOWING THE INSPECTION. IF EXISTING BMPS ARE MODIFIED OR ADDITIONAL BMPS ARE NECESSARY, AN IMPLEMENTATION SCHEDULE MUST BE DESCRIBED IN THE SWP3. IMPLEMENTATION OF CHANGES SHOULD BE DONE PRIOR TO THE NEXT STORM EVENT IF POSSIBLE, OTHERWISE, THEY SHOULD BE DONE AS SOON AS PRACTICABLE.

E) A REPORT SUMMARIZING THE SCOPE, DATE, NAME AND QUALIFICATIONS OF INSPECTOR, AND MAJOR OBSERVATIONS RELATING TO THE IMPLEMENTATION OF THE SWP3 SHALL BE PRODUCED AND RETAINED AS PART OF THE SWP3. MAJOR OBSERVATIONS INCLUDE: LOCATIONS OF DISCHARGES OF SEDIMENT OR OTHER POLLUTANTS FROM THE SITE, LOCATIONS OF BMPS THAT NEED TO BE MAINTAINED, LOCATIONS OF BMPS THAT FAILED TO OPERATE AS DESIGNED OR PROVED INADEQUATE FOR A PARTICULAR LOCATION AND LOCATIONS WHERE BMPS ARE NEEDED. ACTIONS TAKEN AS A RESULT OF INSPECTIONS MUST BE DESCRIBED WITHIN AND RETAINED AS PART OF THE SWP3. REPORTS MUST IDENTIFY ANY INCIDENTS OF NON-COMPLIANCE. WHERE THE REPORT DOES NOT IDENTIFY ANY INCIDENTS OF NON-COMPLIANCE, THE REPORT MUST CONTAIN A CERTIFICATION THAT THE SITE IS IN COMPLIANCE WITH THE SWP3 AND PERMIT.

OTHER SWP3 CONTENT

TXDOT WILL ENSURE THE APPROPRIATE POLLUTION PREVENTION MEASURES (I.E. VEGETATED BUFFER STRIPS, SILT FENCE, ETC.) ARE IDENTIFIED AND IMPLEMENTED FOR ALL ELIGIBLE NON-STORMWATER WATER COMPONENTS OF DISCHARGE SUCH AS WASHING OF VEHICLES, STRUCTURES, AND PAVEMENT WHERE SOAPS AND DETERGENTS ARE NOT USED AND THE PURPOSE IS TO REMOVE DIRT, MUD OR DUST; UNCONTAMINATED WATER USED FOR DUST CONTROL; AND LAWN WATERING AND SIMILAR IRRIGATION DRAINAGE.

CHECKLIST FOR CONTENTS OF AREA OFFICE SWP3 FILE:

- ☐ CONTACT FORM *
- ☐ NOI AND ACKNOWLEDGEMENT CERTIFICATE (IF EQUAL OR GREATER THAN 5 ACRES)
- ☐ APPLICABLE CONSTRUCTION SITE NOTICE *
- ☐ SWP3 CERTIFICATION STATEMENT (SIGNED BY AE)
- ☐ TPDES GENERAL PERMIT
- ☐ SWP3 PLAN
- ☐ INSPECTION AND MAINTENANCE REPORT
- ☐ INSPECTOR QUALIFICATION FORM
- ☐ DELEGATION OF SIGNATURE AUTHORITY (ALL INSPECTORS SIGNING REPORTS)
- ☐ NOTICE OF TERMINATION

* SYMBOL INDICATES THAT THE INFORMATION SHOULD BE DISPLAYED ON THE PROJECT BULLETIN BOARD

ANY REPORTABLE QUANTITY OF HAZARDOUS MATERIAL RELEASE MUST BE REPORTED TO NATIONAL RESPONSE CENTER AT 1-800-424-8802 AND TO STATE OF TEXAS SPILL-REPORTING HOTLINE AT 1-800-832-8224

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED
PROFESSIONAL ENGINEER

DocuSigned by:
P.E.
AF8... 9/2/2022

TXDOT SWP3 INDEX (SWP3I)

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST		COUNTY	SHEET NO.
LFK		HOUSTON, ETC.	131

(REVISED OCTOBER 30, 2013)

9/2/2022 6:01:52 PM
c:\txdot\pw*online\txdot3\sergio.zapata\d0361229\SWP3Index*large disturbance.dgn

DATE: 9/1/2022 11:36:02 AM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0361229\2707-01-011,etc_ EPIC.dgn

I. STORMWATER POLLUTION PREVENTION-CLEAN WATER ACT SECTION 402

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

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

1. N/A

☐ No Action Required ☒ Required Action

Action No.

This project disturbs more then 5 acres ; therefore, the following actions are required:

1. Prevent Stormwater Pollution by controlling erosion and sedimentation in accordance to TPDES CGP Permit TXR150000.

2. Comply with SWP3 site plan and revise when necessary to control pollution or required by Engineer.

3. Posting of Large Construction Site Notice with Cosntruction and SWP3 info on or near site accessible to the public and TCEQ, EPA, or other insptectors. Notice of Intent (NOI) is required to be file with TCEQ and Notice of Termination (NOT) is required to be filed with TCEQ when final stabilization has been achieved.

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

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

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

☐ No Permit Required

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

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

☐ Individual 404 Permit Required

☐ Other Nationwide Permit Required: _____

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

1. STA 235+10 Piney Creek and STA 302+05 Lynch Creek.

2. Named and Unnamed tributary streams assocaited to cross culverts at the following stations: STA 16+14, STA 34+86, STA 50+03, STA 55+00, STA 82+08, STA 259+74, STA 354+48, STA 385+40, STA 430+92, STA 458+03, STA 148+30, STA 19+22, STA 77+00, STA 15+75.

3. Adhere to and utilize Section 404 / 401 Water Quality Permit BMPs.

4. Refer to EPIC sheet 2 of 2 for Nationwide Permit (NWP) #14 non-PCN requirements in regard to work activities, access, and general conditions.

5. All work activities MUST be conducted within the existing ROW.

Best Management Practices:

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

III. CULTURAL RESOURCES

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

☒ No Action Required ☐ Required Action

Action No.

1. N/A

IV. VEGETATION RESOURCES

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

☐ No Action Required ☒ Required Action

Conditions and Parameters for Prep ROW activities within Davy Crockett National Forest boundaries:

Action No.

1. See section VII for Prep ROW restrictions in National Forest.

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

☐ No Action Required ☒ Required Action

In order to maintain compliance with Chapter 64 of the Texas Parks and Wildlife Code and Migratory Bird Treaty Act (MBTA), construction activities that may affect nests(i.e. tree removal, tree limbing, bridg work) shall be conducted outside of the nesting season (March 15 to Septemeber 15). In the event birds or active nests(eggs and/or nestlings present) are encountered, contact the engineer prior to conducting work.

Action No.

1. Southern crawfish frog, Strecker's chorus frog, Blackbelted crayfish, Neches Crayfish, Blackspot shiner, Mississippi silvery minnow, Eastern spotted skunk, Long-tailed weasel, Swamp rabbit, Eastern box turtle, Pygmy rattlesnake, Slender glass lizard, and Timber rattlesnake may occur in the project area. Avoid harming species if encountered and allow them to safely leave the project area.

2. Inspect excavation areas prior to backfill for trapped wildlife. Examine heavy equipment stored on site before use, particularly after rain events, to ensure use will not harm wildlife that may be seeking refuge.

3. Avoid or minimize disturbing burrows or debris, where feasible. Project specific locations (PSLs) proposed within the state-owned ROW should be located in uplands away from aquatic features.

4. Install and maintain Water Quality BMPs associated with Section 404 & 401 permits (i.e. silt fence, rock filter dams, avoid/minimize impacts to WOTUS, etc.) around creeks and streams that cross the project area to avoid impacts to aquatic wildlife.

LIST OF ABBREVIATIONS

BMP:	Best Management Practice	SPCC:	Spill Prevention Control and Countermeasure
CGP:	Construction General Permit	SWP3:	Storm Water Pollution Prevention Plan
DSHS:	Texas Department of State Health Services	PCN:	Pre-Construction Notification
FHWA:	Federal Highway Administration	PSL:	Project Specific Location
MOA:	Memorandum of Agreement	TCEQ:	Texas Commission on Environmental Quality
MOU:	Memorandum of Understanding	TPDES:	Texas Pollutant Discharge Elimination System
MS4:	Municipal Separate Stormwater Sewer System	TPWD:	Texas Parks and Wildlife Department
MBTA:	Migratory Bird Treaty Act	TxDOT:	Texas Department of Transportation
NOT:	Notice of Termination	T&E:	Threatened and Endangered Species
NWP:	Nationwide Permit	USACE:	U.S. Army Corps of Engineers
NOI:	Notice of Intent	USFWS:	U.S. Fish and Wildlife Service

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

General (applies to all projects):

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

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

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

Contact the Engineer if any of the following are detected:

* Dead or distressed vegetation (not identified as normal)
* Trash piles, drums, canister, barrels, etc.
* Undesirable smells or odors
* Evidence of leaching or seepage of substances

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

☐ Yes ☒ No

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

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

☐ Yes ☐ No

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

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

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

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

☒ No Action Required ☐ Required Action

Action No.

1. N/A

VII. OTHER ENVIRONMENTAL ISSUES

Sections of FM 2781 traverse through the Davy Crockett National Forest boundaries. The following actions are required:

Davy Crockett National Forest Boundary Limits:
Right side of FM 2781: STA 77+00-STA 128+50; STA 137+00-STA 146+50; STA 156+80-STA 163+20; STA 177+90-STA 202+30; STA 231+50-STA 242+40; STA 280+80-STA 334+00; STA 392+70-STA 167+50 (reversal)
Left side of FM 2781: STA 79+00-STA 150+00; STA 156+60-STA 163+20; STA 180+20-STA 202+30; STA 238+50-STA 242+30; STA 299+80-STA 334+00; STA 392+70-STA 469+10

☐ No Action Required ☒ Required Action

Action No.

1. No Tree Removal in the National Forest. Limbing is allowed. Refer to the Tree Removal and Trimming Detail.

2. NO stockpiling or storage of materials and equipment within the Davy Crockett National Forest.

3. Area Engineer shall notify United States Forest Service prior to starting work within the Davy Crockett National Forest.

Texas Department of Transportation

Design Division Standard

EPIC

(ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS)

SHEET 1 OF 2

FILE: epic.dgn	DN: TxDOT	CK: RG	DW: VP	CK: AR
©TxDOT: February 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	2707	01	011, ETC.	FM 2781
12-12-2011 (DS)	DIST	COUNTY		SHEET NO.
05-07-14 ADDED NOTE SECTION IV.	LFK	HOUSTON, ETC.		132
01-23-2015 SECTION 1 (CHANGED ITEM 1122 TO ITEM 506, ADDED GRASSY SWALES.				

NWP GENERAL CONDITIONS

AS APPLICABLE TO
THIS PROJECT

2. AQUATIC LIFE MOVEMENTS. NO ACTIVITY MAY SUBSTANTIALLY DISRUPT THE NECESSARY LIFE CYCLE MOVEMENTS OF THOSE SPECIES OF AQUATIC LIFE INDIGENOUS TO THE WATERBODY, INCLUDING THOSE SPECIES THAT NORMALLY MIGRATE THROUGH THE AREA, UNLESS THE ACTIVITY'S PRIMARY PURPOSE IS TO IMPOUND WATER.

3. SPAWNING AREAS. ACTIVITIES IN SPAWNING AREAS DURING SPAWNING SEASONS MUST BE AVOIDED TO THE MAXIMUM EXTENT PRACTICABLE. ACTIVITIES THAT RESULT IN THE PHYSICAL DESTRUCTION (E.G., THROUGH EXCAVATION, FILL, OR DOWNSTREAM SMOTHERING BY SUBSTANTIAL TURBIDITY) OF AN IMPORTANT SPAWNING AREA ARE NOT AUTHORIZED.

6. SUITABLE MATERIAL. NO ACTIVITY MAY USE UNSUITABLE MATERIAL (E.G., TRASH, DEBRIS, CAR BODIES, ASPHALT, ETC.). MATERIAL USED FOR CONSTRUCTION OR DISCHARGED MUST BE FREE FROM TOXIC POLLUTANTS IN TOXIC AMOUNTS (SEE SECTION 307 OF THE CLEAN WATER ACT).

8. ADVERSE EFFECTS FROM IMPOUNDMENTS. IF THE ACTIVITY CREATES AN IMPOUNDMENT OF WATER, ADVERSE EFFECTS TO THE AQUATIC SYSTEM DUE TO ACCELERATING THE PASSAGE OF WATER, AND/OR RESTRICTING ITS FLOW MUST BE MINIMIZED TO THE MAXIMUM EXTENT PRACTICABLE.

9. MANAGEMENT OF WATER FLOWS. TO THE MAXIMUM EXTENT PRACTICABLE, THE PRE-CONSTRUCTION COURSE, CONDITION, CAPACITY, AND LOCATION OF OPEN WATERS MUST BE MAINTAINED FOR EACH ACTIVITY, INCLUDING STREAM CHANNELIZATION AND STORM WATER MANAGEMENT ACTIVITIES, EXCEPT AS PROVIDED BELOW. THE ACTIVITY MUST BE CONSTRUCTED TO WITHSTAND EXPECTED HIGH FLOWS. THE ACTIVITY MUST NOT RESTRICT OR IMPEDE THE PASSAGE OF NORMAL OR HIGH FLOWS, UNLESS THE PRIMARY PURPOSE OF THE ACTIVITY IS TO IMPOUND WATER OR MANAGE HIGH FLOWS. THE ACTIVITY MAY ALTER THE PRE-CONSTRUCTION COURSE, CONDITION, CAPACITY, AND LOCATION OF OPEN WATERS IF IT BENEFITS THE AQUATIC ENVIRONMENT (E.G., STREAM RESTORATION OR RELOCATION ACTIVITIES).

11. EQUIPMENT. HEAVY EQUIPMENT WORKING IN WETLANDS OR MUD FLATS MUST BE PLACED ON MATS, OR OTHER MEASURES MUST BE TAKEN TO MINIMIZE SOIL DISTURBANCE.

12. SOIL EROSION AND SEDIMENT CONTROLS. APPROPRIATE SOIL EROSION AND SEDIMENT CONTROLS MUST BE USED AND MAINTAINED IN EFFECTIVE OPERATING CONDITION DURING CONSTRUCTION, AND ALL EXPOSED SOIL AND OTHER FILLS, AS WELL AS ANY WORK BELOW THE ORDINARY HIGH WATER MARK OR HIGH TIDE LINE, MUST BE PERMANENTLY STABILIZED AT THE EARLIEST PRACTICABLE DATE. PERMITTEES ARE ENCOURAGED TO PERFORM WORK WITHIN WATERS OF THE UNITED STATES DURING PERIODS OF LOW-FLOW OR NO-FLOW.

13. REMOVAL OF TEMPORARY FILLS. TEMPORARY FILLS MUST BE REMOVED IN THEIR ENTIRETY AND THE AFFECTED AREAS RETURNED TO PRE-CONSTRUCTION ELEVATIONS. THE AFFECTED AREAS MUST BE REVEGETATED, AS APPROPRIATE.

14. PROPER MAINTENANCE. ANY AUTHORIZED STRUCTURE OR FILL SHALL BE PROPERLY MAINTAINED, INCLUDING MAINTENANCE TO ENSURE PUBLIC SAFETY AND COMPLIANCE WITH APPLICABLE NWP GENERAL CONDITIONS, AS WELL AS ANY ACTIVITY-SPECIFIC CONDITIONS ADDED BY THE DISTRICT ENGINEER TO AN NWP AUTHORIZATION.

23. MITIGATION. THE DISTRICT ENGINEER WILL CONSIDER SEVERAL FACTORS WHEN DETERMINING APPROPRIATE AND PRACTICABLE MITIGATION NECESSARY TO ENSURE THAT ADVERSE EFFECTS ON THE AQUATIC ENVIRONMENT ARE MINIMAL.

25. WATER QUALITY. WHERE STATES AND AUTHORIZED TRIBES, OR EPA WHERE APPLICABLE, HAVE NOT PREVIOUSLY CERTIFIED COMPLIANCE OF AN NWP WITH CWA SECTION 401, INDIVIDUAL 401 WATER QUALITY CERTIFICATION MUST BE OBTAINED OR WAIVED (SEE 33 CFR 330.4(C)). THE DISTRICT ENGINEER OR STATE OR TRIBE MAY REQUIRE ADDITIONAL WATER QUALITY MANAGEMENT MEASURES TO ENSURE THAT THE AUTHORIZED ACTIVITY DOES NOT RESULT IN MORE THAN MINIMAL DEGRADATION OR WATER QUALITY.

27. REGIONAL AND CASE-BY-CASE CONDITIONS. THE ACTIVITY MUST COMPLY WITH ANY REGIONAL CONDITIONS THAT MAY HAVE BEEN ADDED BY THE DIVISION ENGINEER (SEE 33 CFR 330.4(E)) AND WITH ANY CASE SPECIFIC CONDITIONS ADDED BY THE CORPS OR BY THE STATE, INDIAN TRIBE, OR U.S. EPA IN ITS SECTION 401 WATER QUALITY CERTIFICATION, OR BY THE STATE IN ITS COASTAL ZONE MANAGEMENT ACT CONSISTENCY DETERMINATION.

FOR A COMPLETE LIST OF GENERAL CONDITIONS GO TO:

http://www.swf.usace.army.mil/Missions/Regulatory/Permitting/NationwideGeneralPermits.aspx

USACE - PERMIT #14

AS APPLICABLE TO
THIS PROJECT

ACTIVITIES REQUIRED FOR CROSSINGS OF WATERS OF THE UNITED STATES ASSOCIATED WITH THE CONSTRUCTION, EXPANSION, MODIFICATION, OR IMPROVEMENT OF LINEAR TRANSPORTATION PROJECTS (E.G., ROADS, HIGHWAYS, RAILWAYS, TRAILS, AIRPORT RUNWAYS, AND TAXIWAYS) IN WATERS OF THE U.S. FOR LINEAR TRANSPORTATION PROJECTS IN NON-TIDAL WATERS, THE DISCHARGE CANNOT CAUSE THE LOSS OF GREATER THAN 1/2-ACRE OF WATERS OF THE U.S. ANY STREAM CHANNEL MODIFICATION, INCLUDING BANK STABILIZATION, IS LIMITED TO THE MINIMUM NECESSARY TO CONSTRUCT OR PROTECT THE LINEAR TRANSPORTATION PROJECT; SUCH MODIFICATIONS MUST BE IN THE IMMEDIATE VICINITY OF THE PROJECT.

THIS NWP ALSO AUTHORIZES TEMPORARY STRUCTURES, FILLS, AND WORK NECESSARY TO CONSTRUCT THE LINEAR TRANSPORTATION PROJECT. APPROPRIATE MEASURES MUST BE TAKEN TO MAINTAIN DOWNSTREAM FLOWS AND MINIMIZE FLOODING TO THE MAXIMUM EXTENT PRACTICABLE, WHEN TEMPORARY STRUCTURES, WORK, AND DISCHARGES, INCLUDING COFFERDAMS, ARE NECESSARY FOR CONSTRUCTION ACTIVITIES, ACCESS FILLS, OR DEWATERING OF CONSTRUCTION SITES. TEMPORARY FILLS MUST CONSIST OF MATERIALS, AND BE PLACED IN A MANNER THAT WILL NOT BE ERODED BY EXPECTED HIGH FLOWS. TEMPORARY FILLS MUST BE REMOVED IN THEIR ENTIRETY AND THE AFFECTED AREAS RETURNED TO PRE-CONSTRUCTION ELEVATIONS. THE AREAS AFFECTED BY TEMPORARY FILLS MUST BE REVEGETATED, AS APPROPRIATE.

THIS NWP CANNOT BE USED TO AUTHORIZE NON-LINEAR FEATURES COMMONLY ASSOCIATED WITH TRANSPORTATION PROJECTS, SUCH AS VEHICLE MAINTENANCE OR STORAGE BUILDINGS, PARKING LOTS, TRAIN STATIONS, OR AIRCRAFT HANGARS.

NOTIFICATION: THE PERMITTEE MUST SUBMIT A PRE-CONSTRUCTION NOTIFICATION (PCN) TO THE DISTRICT ENGINEER PRIOR TO COMMENCING THE ACTIVITY IF: (1) THE LOSS OF WATERS OF THE U.S. EXCEEDS 1/10-ACRE; OR (2) THERE IS A DISCHARGE IN A SPECIAL AQUATIC SITE, INCLUDING WETLANDS.

NOTE:

THE PROJECT CROSSES JURISDICTIONAL WATERS OF THE U.S. AND A NWP #14 WITH NO PCN HAS BEEN UTILIZED. THIS PERMIT AUTHORIZES THE ACTIVITIES WHICH WILL IMPACT WATERS OF THE U.S. THE NWP GENERAL CONDITIONS AND THE NWP #14 LIMITS MUST BE FOLLOWED IN ORDER TO MAINTAIN COMPLIANCE WITH THE NWP. NO COORDINATION HAS TAKEN PLACE WITH THE USACE BECAUSE IMPACTS WILL NOT EXCEED THE ABOVE CRITERIA. IF COORDINATION MAY BE NEEDED, CONTACT THE TXDOT LUFKIN DISTRICT ENVIRONMENTAL SECTION AT 1-800-687-8087.

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS (EPIC):

USACE

Texas Department of Transportation

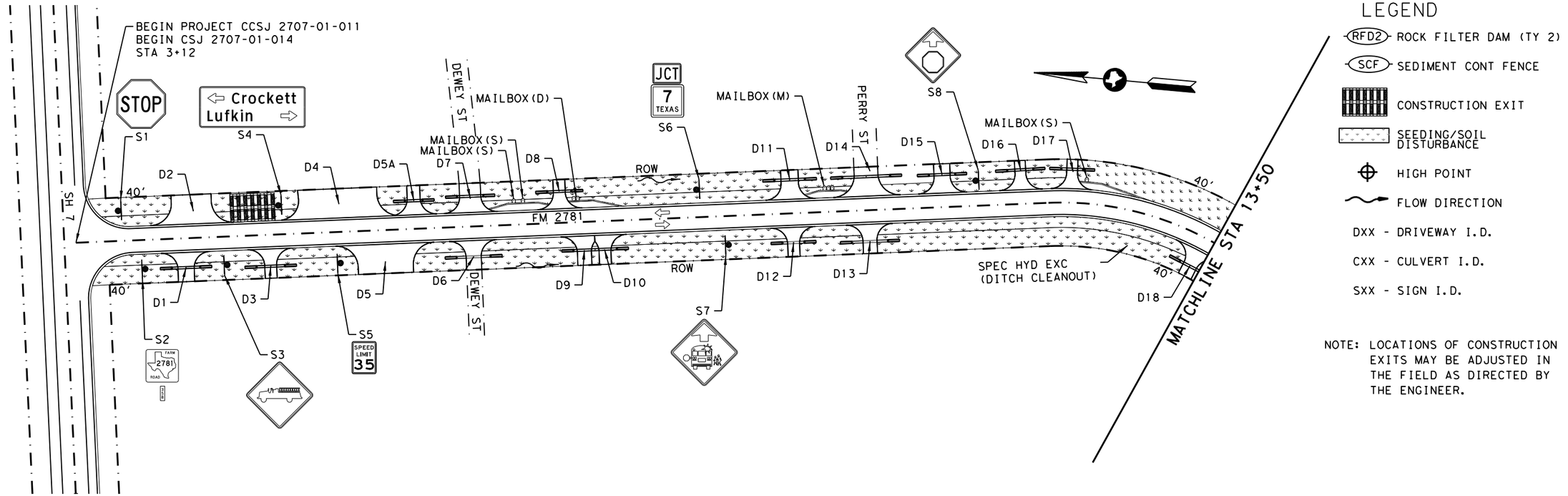
EPIC

(ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS)

SHEET 2 OF 2

FILE: epic.dgn	DN: TxDOT	CK: RG	DW: VP	CK: AR			
©TxDOT: February 2015	CONT	SECT	JOB		HIGHWAY		
REVISIONS	2707	01	011, ETC.		FM 2781		
12-12-2011 (DS)	DIST	COUNTY			SHEET NO.		
05-07-14 ADDED NOTE SECTION IV.	LFK	HOUSTON, ETC.			133		
01-23-2015 SECTION I (CHANGED ITEM 1122 TO ITEM 506, ADDED GRASSY SWALES.							

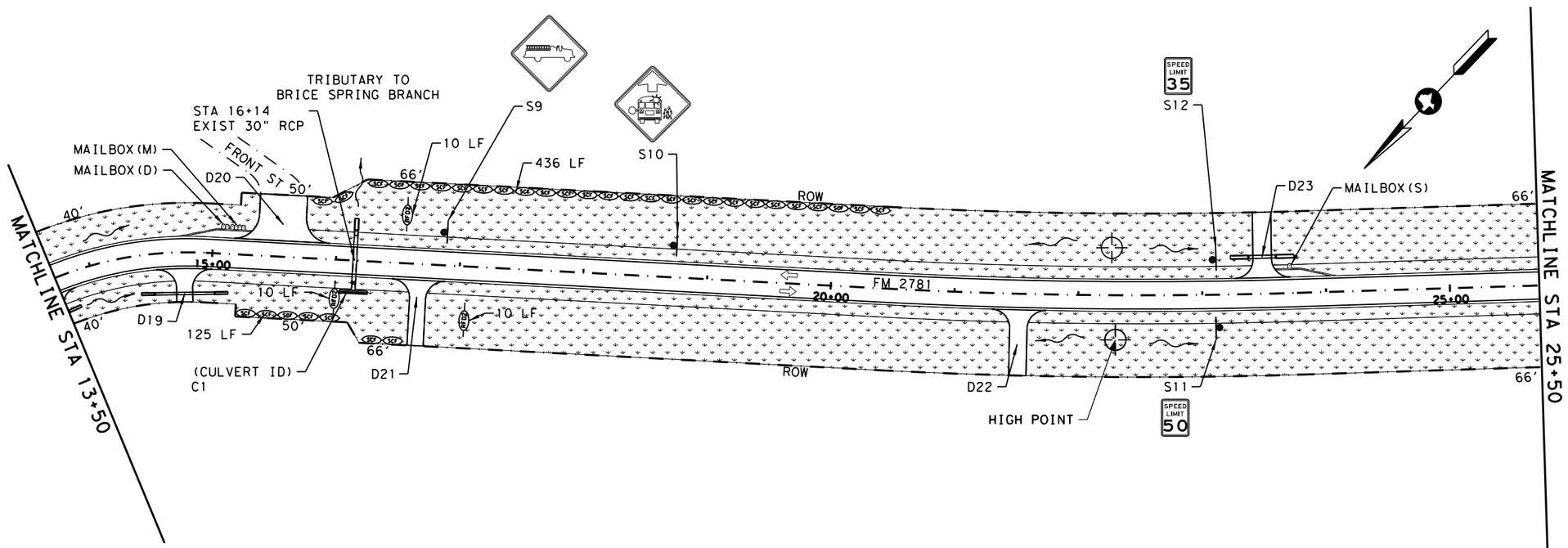
DATE: 8/31/2022 5:22:57 PM
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0361229\2707-01-011,etc_EPIC 2of2_ NWP14 non-PCN.dgn



LEGEND

- RFD2 — ROCK FILTER DAM (TY 2)
- SCF — SEDIMENT CONT FENCE
- CONSTRUCTION EXIT
- SEEDING/SOIL DISTURBANCE
- HIGH POINT
- FLOW DIRECTION
- DXX - DRIVEWAY I.D.
- CXX - CULVERT I.D.
- SXX - SIGN I.D.

NOTE: LOCATIONS OF CONSTRUCTION EXITS MAY BE ADJUSTED IN THE FIELD AS DIRECTED BY THE ENGINEER.



SCALE 1" = 100'

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED
PROFESSIONAL ENGINEER

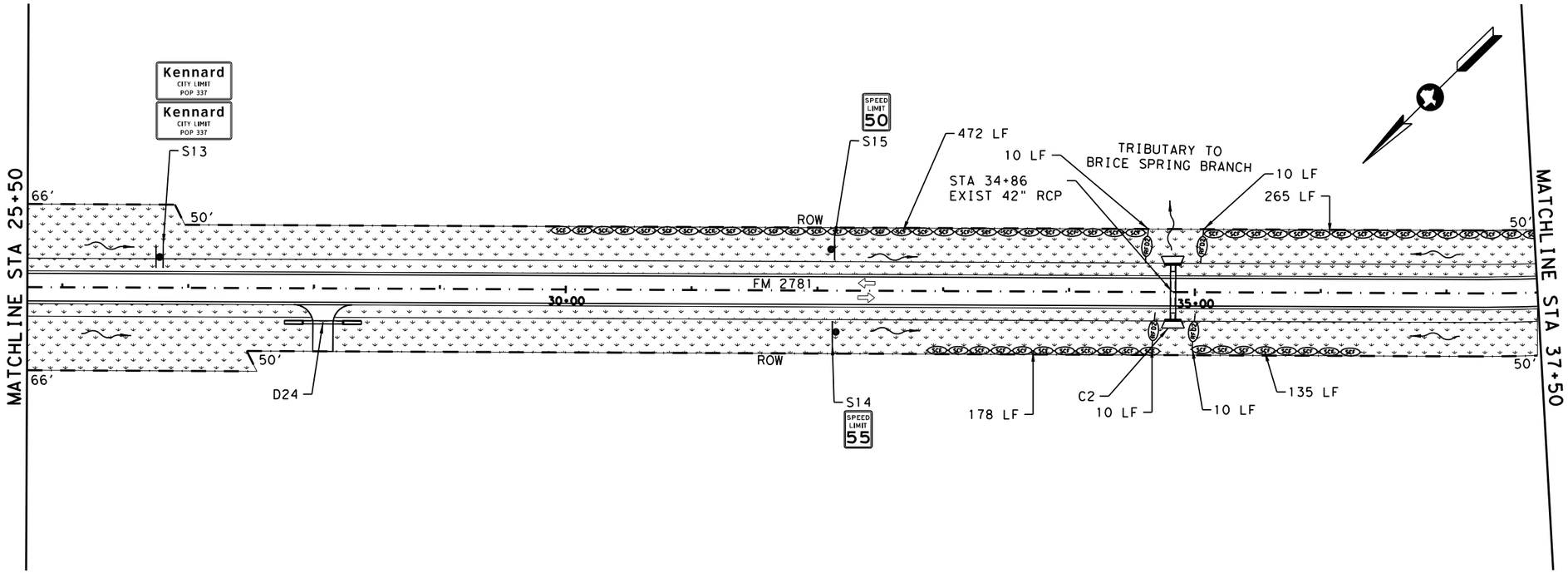
DocuSigned by:
AF852E728A5C4C9...
9/22/2022

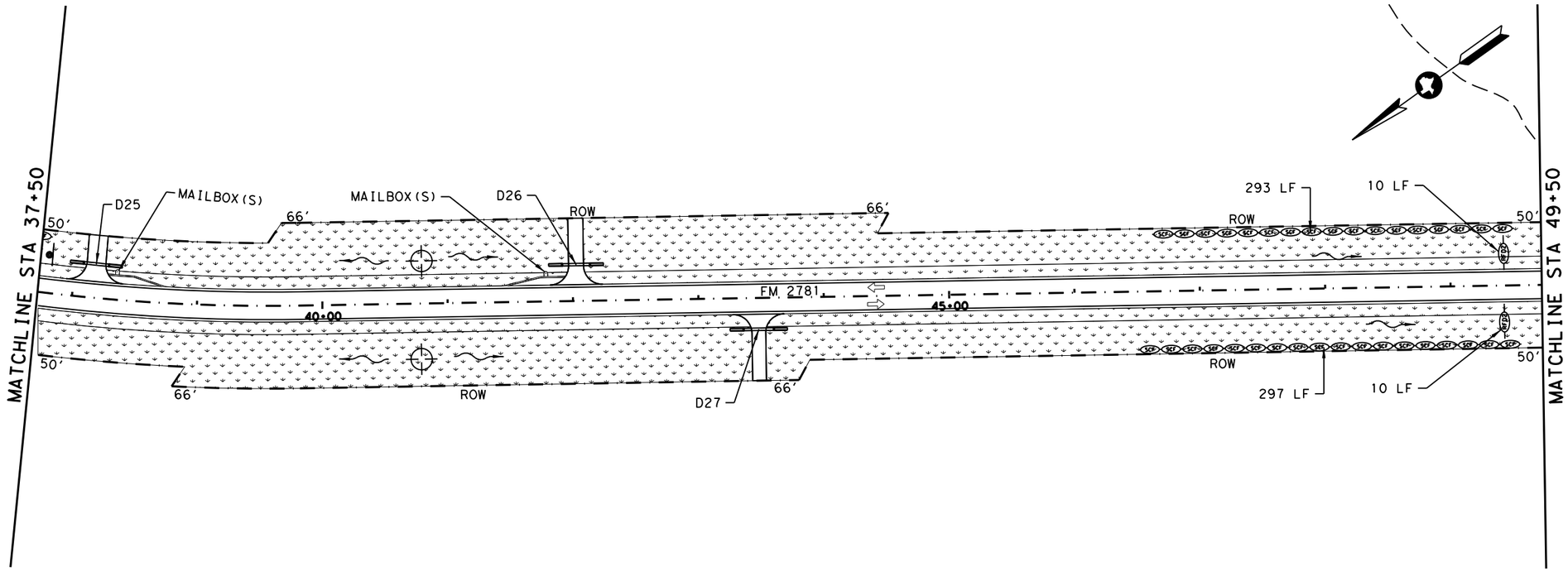
SWP3 LAYOUTS

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 1 OF 28

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		134





LEGEND

- RFD2 — ROCK FILTER DAM (TY 2)
- SCF — SEDIMENT CONT FENCE
- CONSTRUCTION EXIT
- SEEDING/SOIL DISTURBANCE
- HIGH POINT
- FLOW DIRECTION
- DXX - DRIVEWAY I.D.
- CXX - CULVERT I.D.
- SXX - SIGN I.D.

NOTE: LOCATIONS OF CONSTRUCTION EXITS MAY BE ADJUSTED IN THE FIELD AS DIRECTED BY THE ENGINEER.

SCALE 1" = 100'

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED
PROFESSIONAL ENGINEER

DocuSigned by:
cmb, P.E.
AF852E728A5C4C9...
9/22/2022

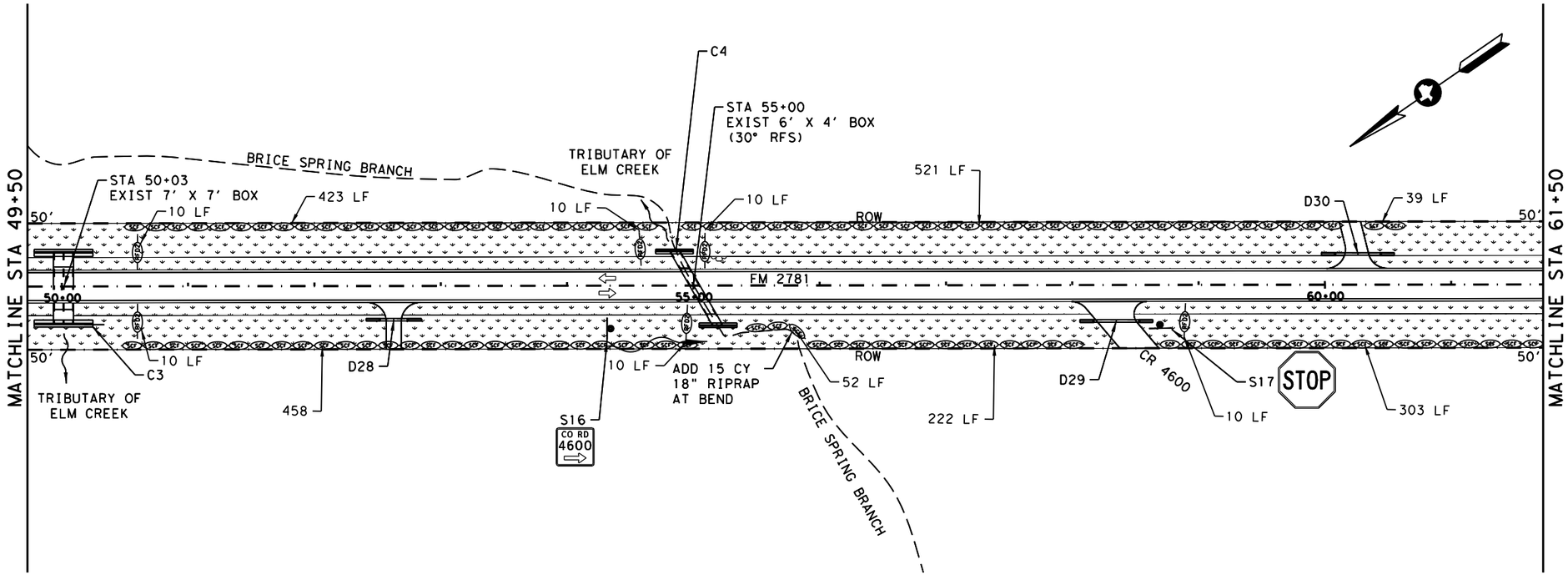
SWP3 LAYOUTS

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 2 OF 28

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		135

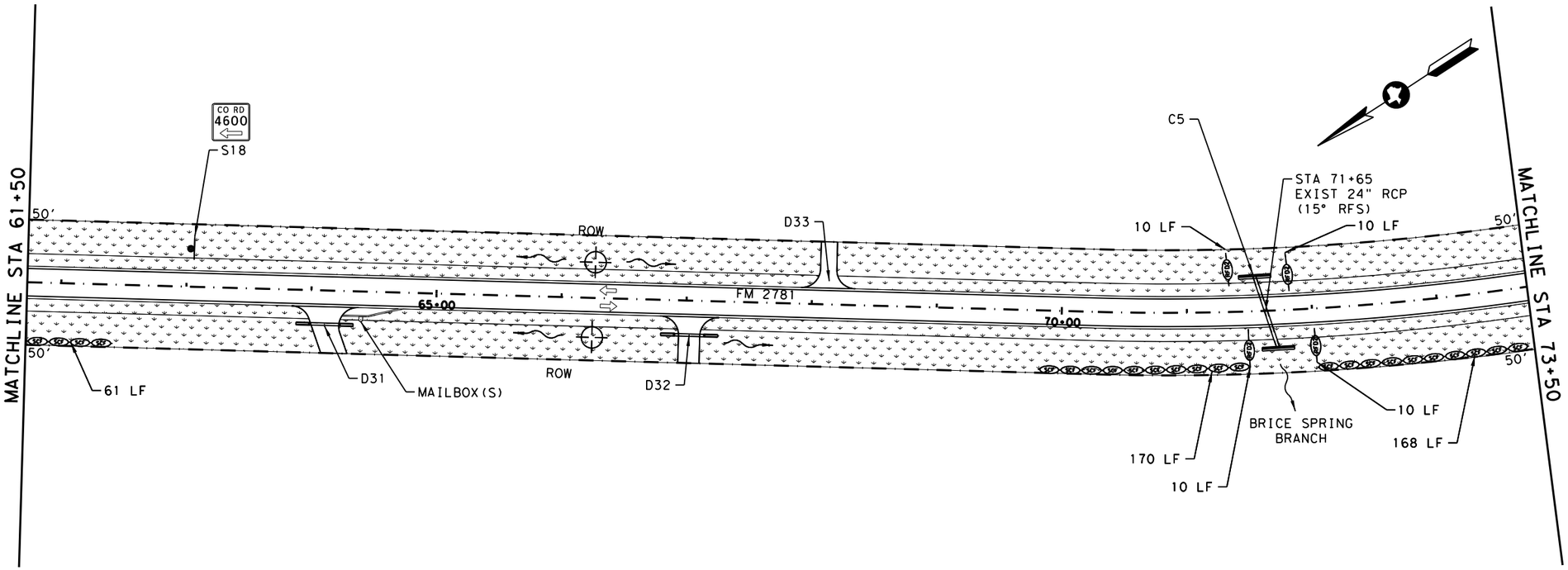
9/20/2022 12:55:06 PM
c:\txdot\pw*online\txdot3\sergio.zapata\d0361223\Plan Layout-2.dgn



LEGEND

- RFD2 — ROCK FILTER DAM (TY 2)
- SCF — SEDIMENT CONT FENCE
- CONSTRUCTION EXIT
- SEEDING/SOIL DISTURBANCE
- HIGH POINT
- FLOW DIRECTION
- DXX - DRIVEWAY I.D.
- CXX - CULVERT I.D.
- SXX - SIGN I.D.

NOTE: LOCATIONS OF CONSTRUCTION EXITS MAY BE ADJUSTED IN THE FIELD AS DIRECTED BY THE ENGINEER.



SCALE 1" = 100'

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED
PROFESSIONAL ENGINEER

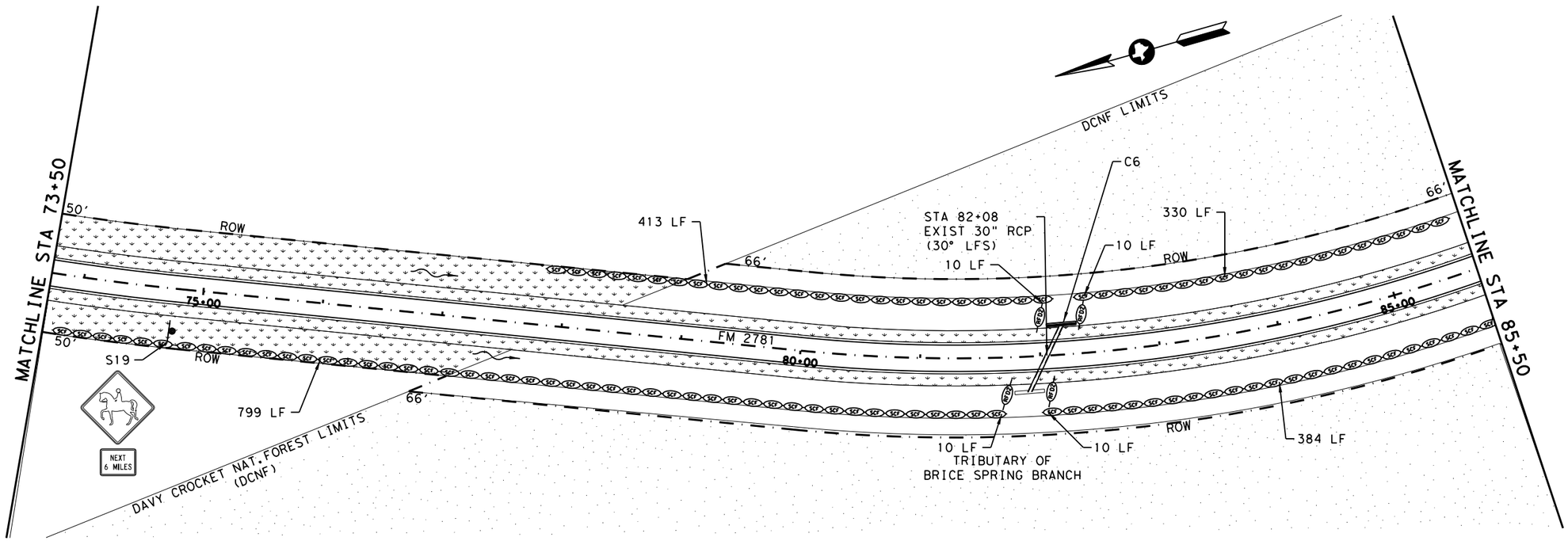
DocuSigned by:
cmb, P.E.
AF852E728AF04C9...
9/22/2022

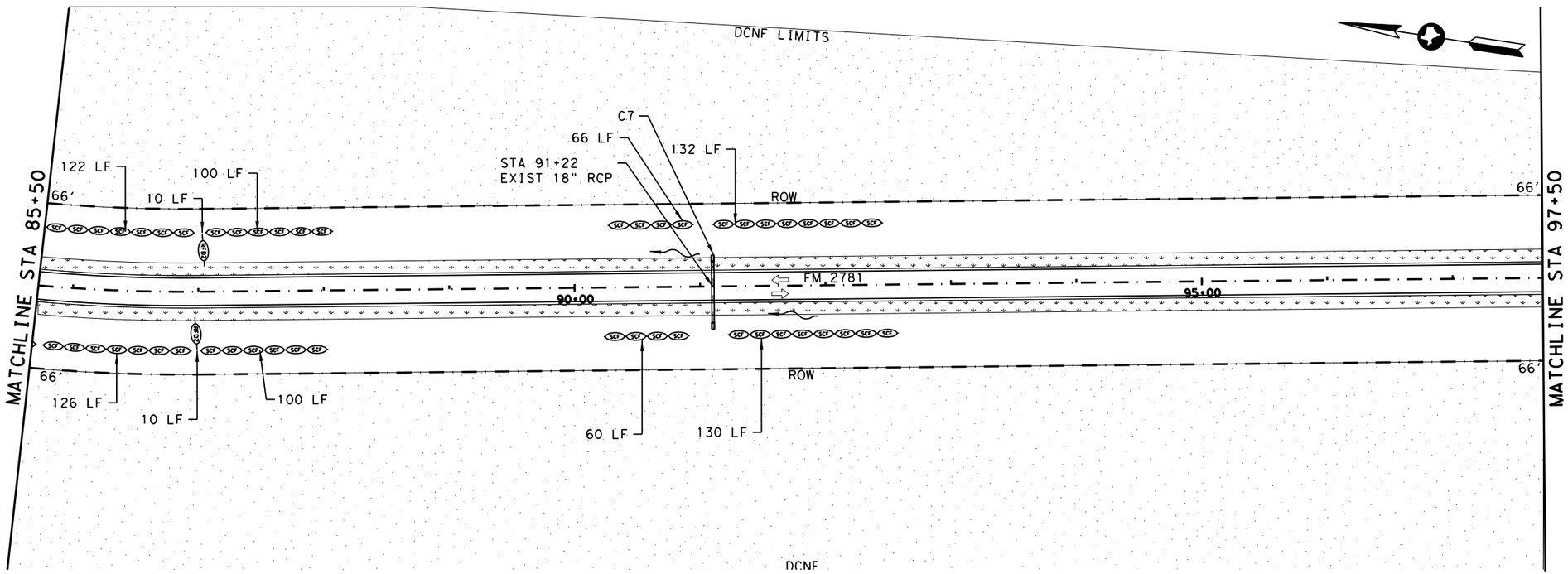
SWP3 LAYOUTS

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 3 OF 28

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		136





LEGEND

- RFD2 — ROCK FILTER DAM (TY 2)
- SCF — SEDIMENT CONT FENCE
- CONSTRUCTION EXIT
- SEEDING/SOIL DISTURBANCE
- HIGH POINT
- FLOW DIRECTION
- DXX - DRIVEWAY I.D.
- CXX - CULVERT I.D.
- SXX - SIGN I.D.

NOTE: LOCATIONS OF CONSTRUCTION EXITS MAY BE ADJUSTED IN THE FIELD AS DIRECTED BY THE ENGINEER.

SCALE 1" = 100'

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED PROFESSIONAL ENGINEER

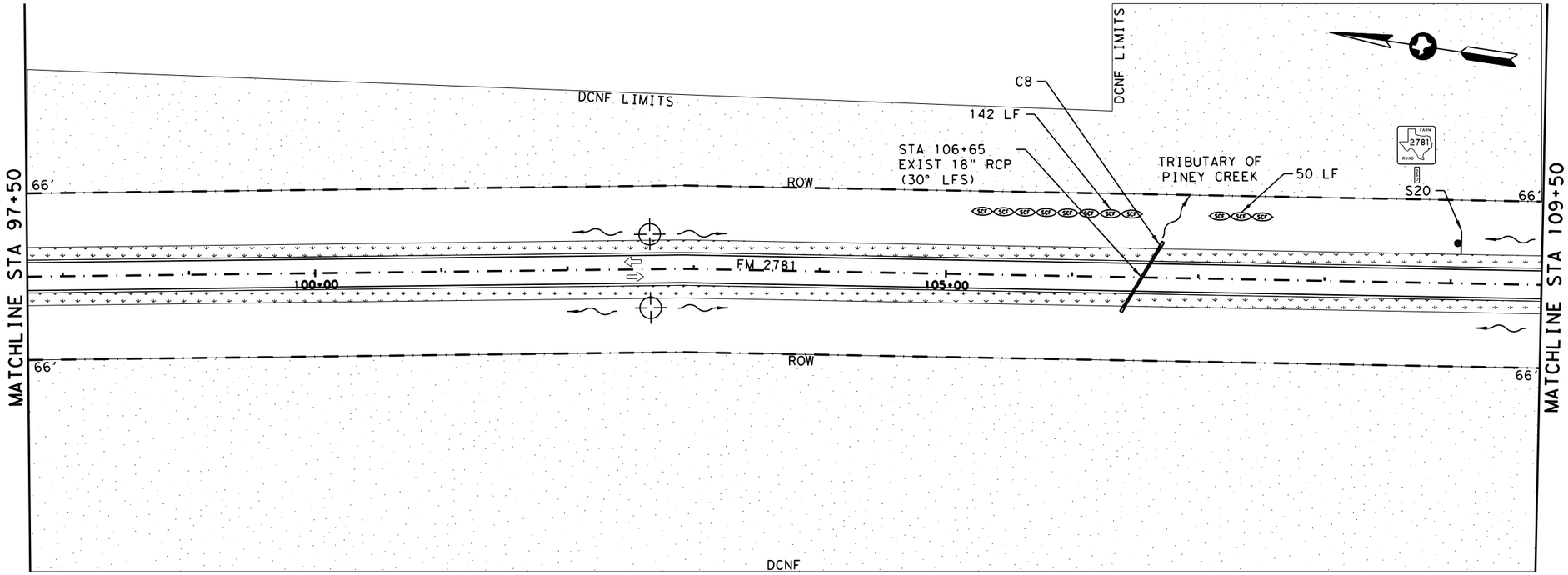
DocuSigned by:
cmb P.E.
AF852E728AFC4C9...
9/22/2022

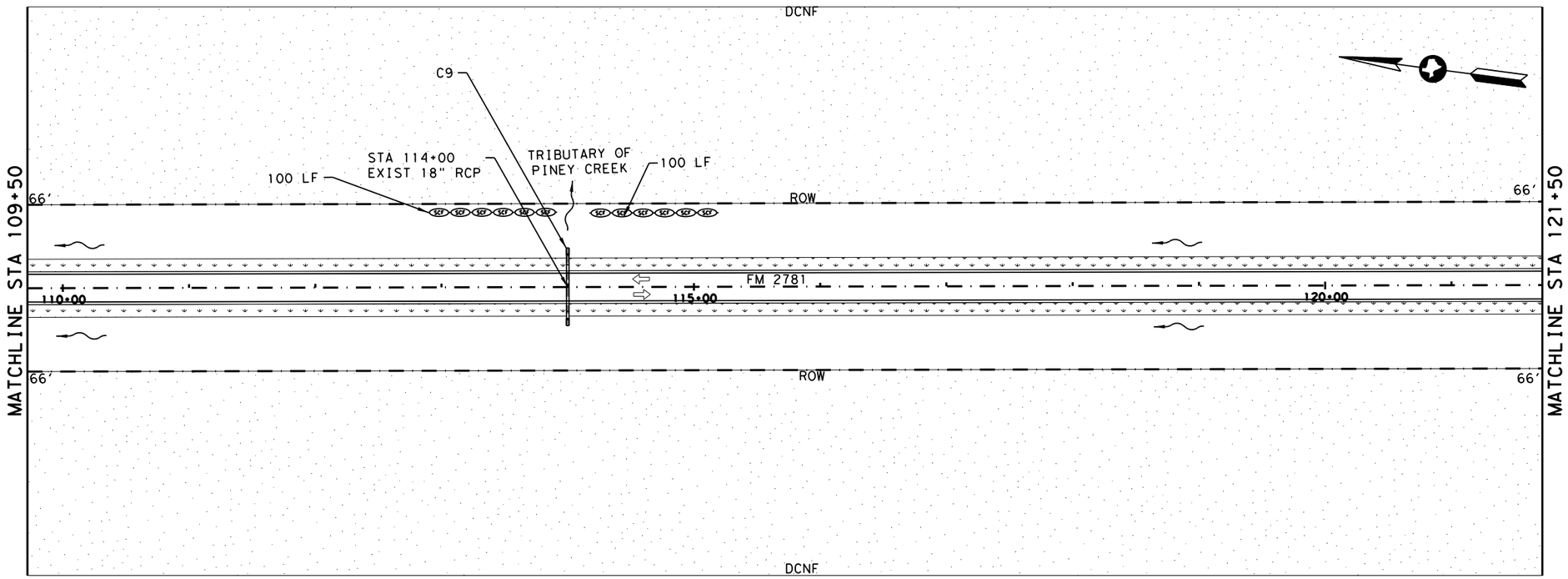
SWP3 LAYOUTS

TEXAS DEPARTMENT OF TRANSPORTATION
©2022 SHEET 4 OF 28

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		137

9/20/2022 7:23:44 AM
c:\txdot\pw*online\txdot3\sergio.zapata\d0361223\Plan Layout-4.dgn





LEGEND

- RFD2 — ROCK FILTER DAM (TY 2)
- SCF — SEDIMENT CONT FENCE
- CONSTRUCTION EXIT
- SEEDING/SOIL DISTURBANCE
- HIGH POINT
- FLOW DIRECTION
- DXX - DRIVEWAY I.D.
- CXX - CULVERT I.D.
- SXX - SIGN I.D.

NOTE: LOCATIONS OF CONSTRUCTION EXITS MAY BE ADJUSTED IN THE FIELD AS DIRECTED BY THE ENGINEER.

SCALE 1" = 100'

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED
PROFESSIONAL ENGINEER

DocuSigned by:
cmb, P.E.
AF852E728AFC4C9...
9/22/2022

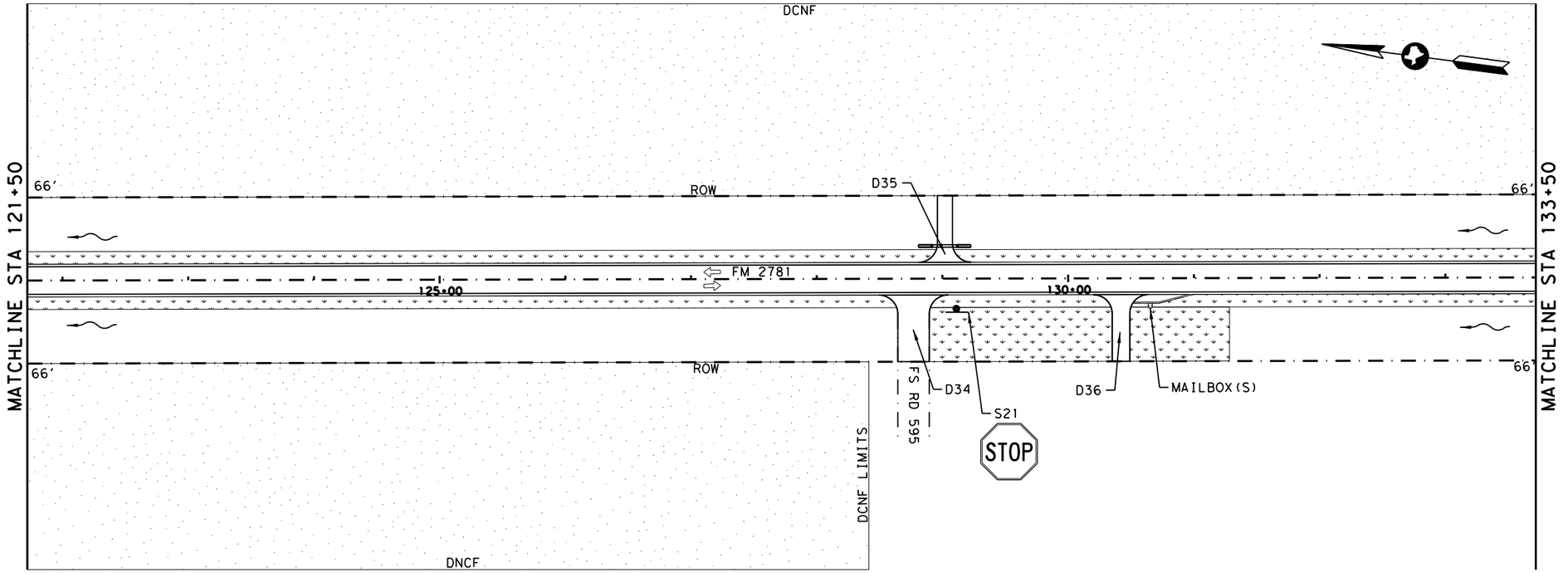
SWP3 LAYOUTS

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 5 OF 28

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		138

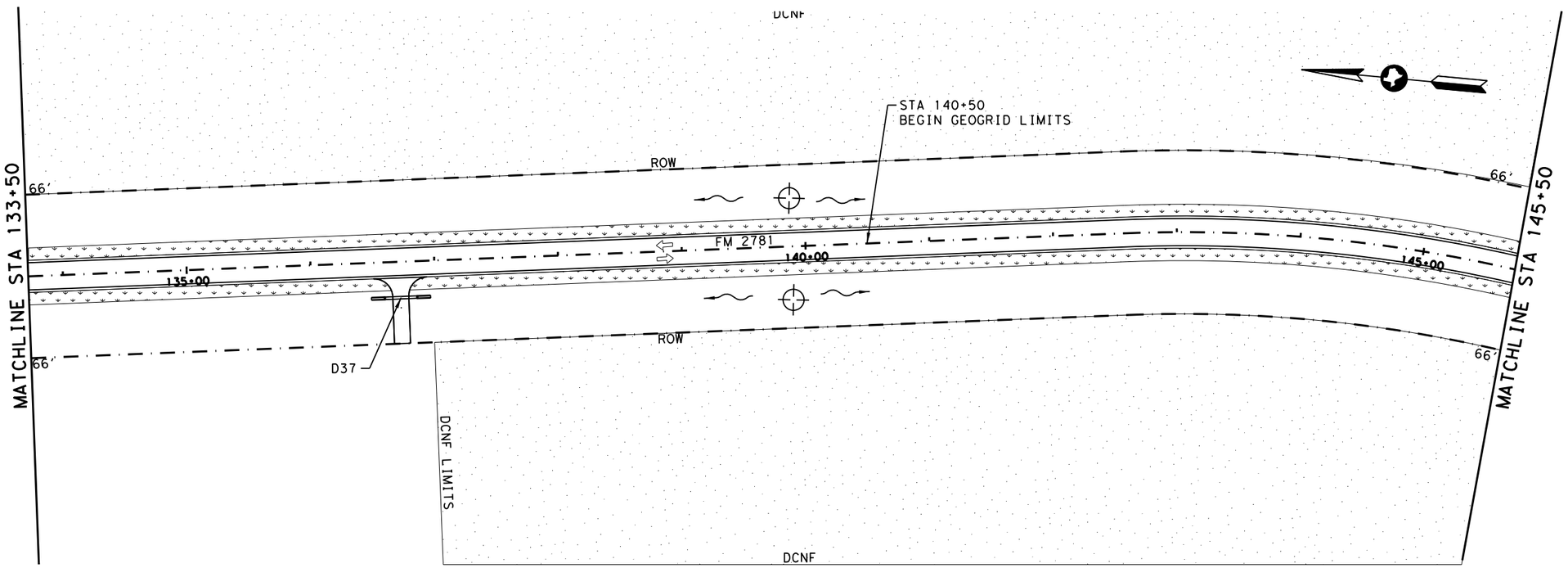
9/20/2022 7:29:22 AM
c:\txdot\pw*online\txdot3\sergio.zapata\d0361223\Plan Layout-5.dgn



LEGEND

- RFD2 — ROCK FILTER DAM (TY 2)
- SCF — SEDIMENT CONT FENCE
- CONSTRUCTION EXIT
- SEEDING/SOIL DISTURBANCE
- HIGH POINT
- FLOW DIRECTION
- DXX - DRIVEWAY I.D.
- CXX - CULVERT I.D.
- SXX - SIGN I.D.

NOTE: LOCATIONS OF CONSTRUCTION EXITS MAY BE ADJUSTED IN THE FIELD AS DIRECTED BY THE ENGINEER.



SCALE 1" = 100'

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED
PROFESSIONAL ENGINEER

DocuSigned by:
AF852E728AEC4C0...
9/2/2022

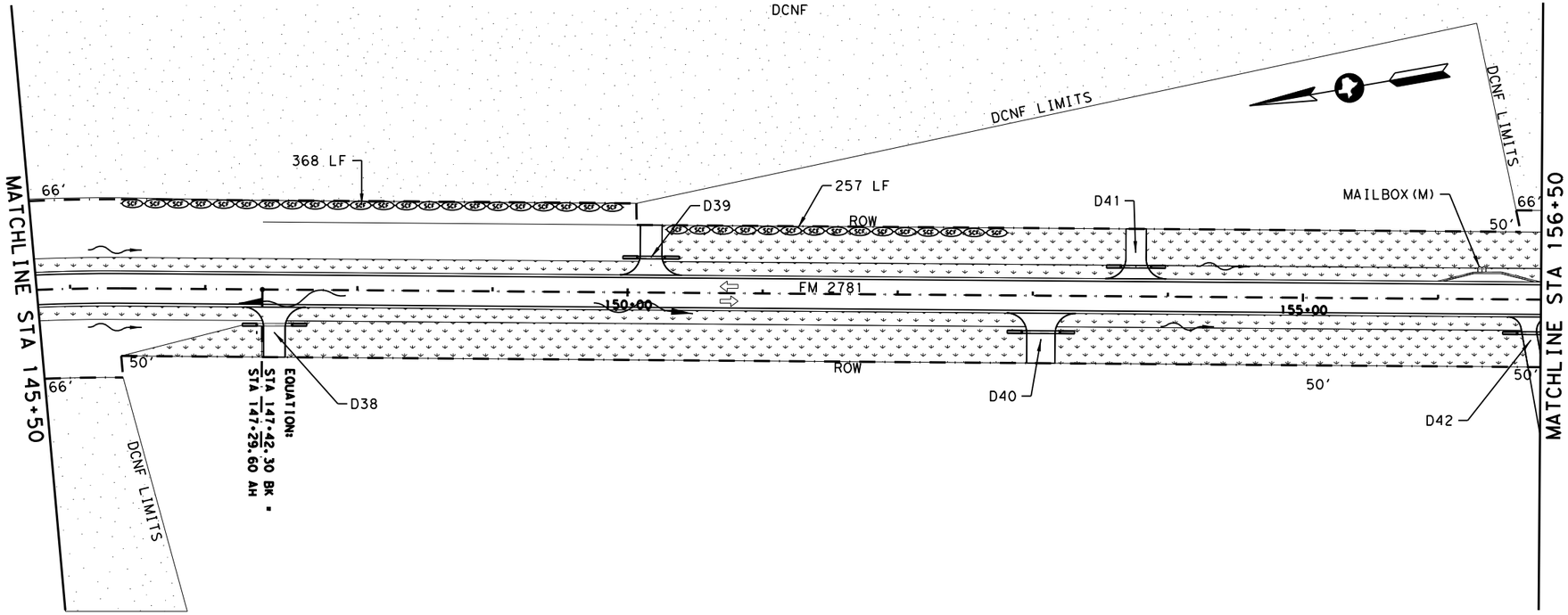
SWP3 LAYOUTS

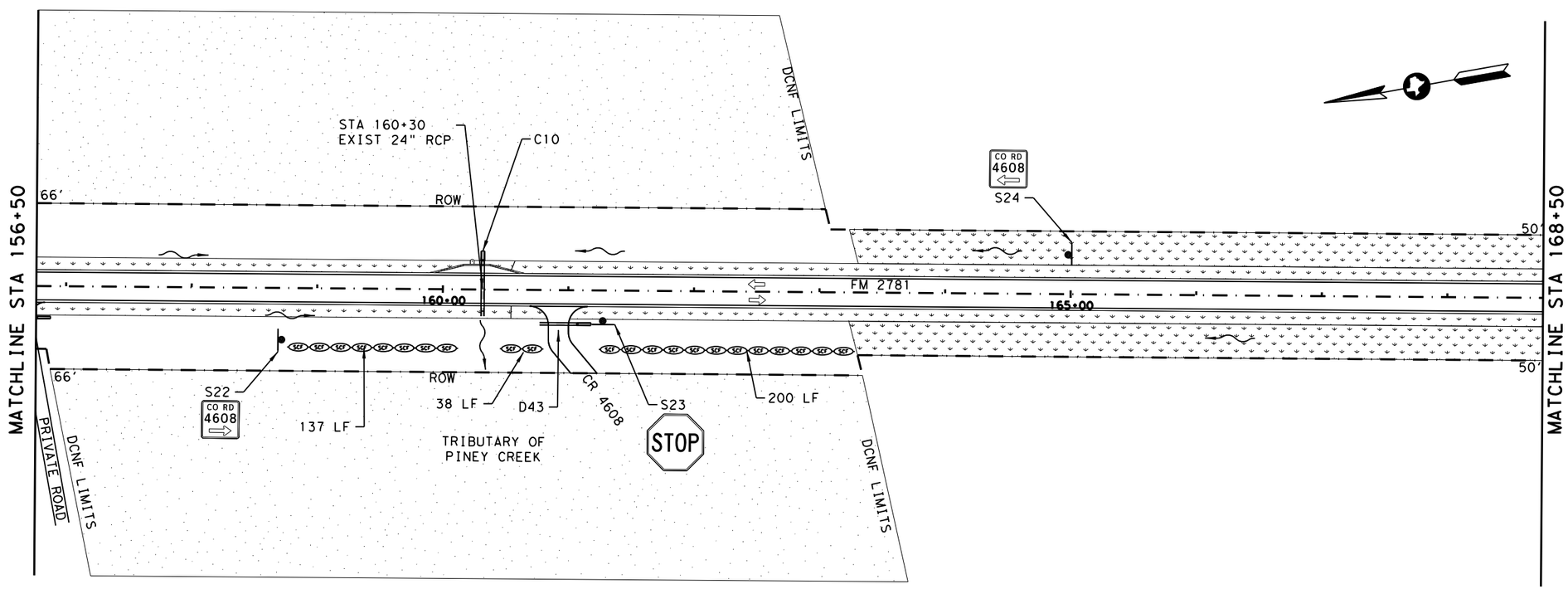
TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 6 OF 28

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		139

9/2/2022 3:13:06 PM
c:\txdot\pw*online\txdot3\cathy.laerch\d0361223\Plan Layout-6.dgn





LEGEND

- RFD2 — ROCK FILTER DAM (TY 2)
- SCF — SEDIMENT CONT FENCE
- CONSTRUCTION EXIT
- SEEDING/SOIL DISTURBANCE
- HIGH POINT
- FLOW DIRECTION
- DXX - DRIVEWAY I.D.
- CXX - CULVERT I.D.
- SXX - SIGN I.D.

NOTE: LOCATIONS OF CONSTRUCTION EXITS MAY BE ADJUSTED IN THE FIELD AS DIRECTED BY THE ENGINEER.

SCALE 1" = 100'

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED
PROFESSIONAL ENGINEER

DocuSigned by:
AF852E728AFC4C9...
9/22/2022

SWP3 LAYOUTS

TEXAS DEPARTMENT OF TRANSPORTATION
©2022 SHEET 7 OF 28

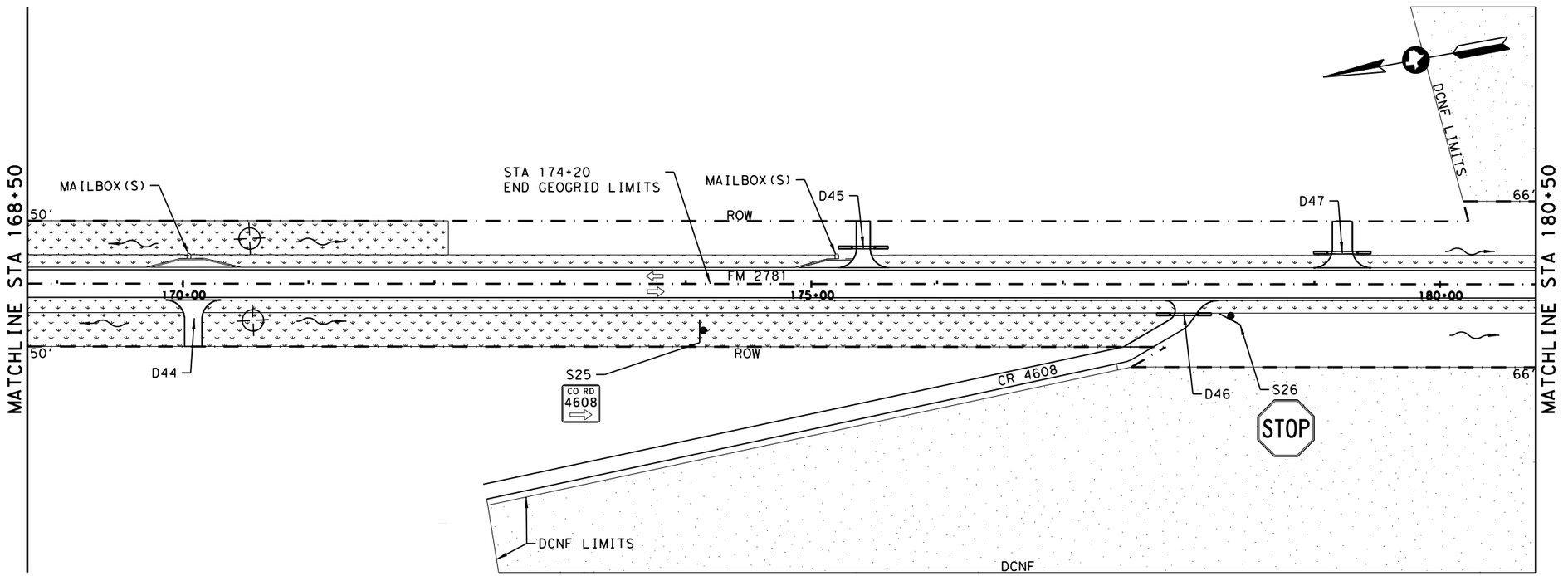
CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		140

THIS VIEW INTENTIONALLY LEFT BLANK

LEGEND

- (RFD2) ROCK FILTER DAM (TY 2)
- (SCF) SEDIMENT CONT FENCE
- CONSTRUCTION EXIT
- SEEDING/SOIL DISTURBANCE
- HIGH POINT
- FLOW DIRECTION
- DXX - DRIVEWAY I.D.
- CXX - CULVERT I.D.
- SXX - SIGN I.D.

NOTE: LOCATIONS OF CONSTRUCTION EXITS MAY BE ADJUSTED IN THE FIELD AS DIRECTED BY THE ENGINEER.



SCALE 1" = 100'

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED
PROFESSIONAL ENGINEER

DocuSigned by:
9/2/2022
2F8227728AEC4C0...

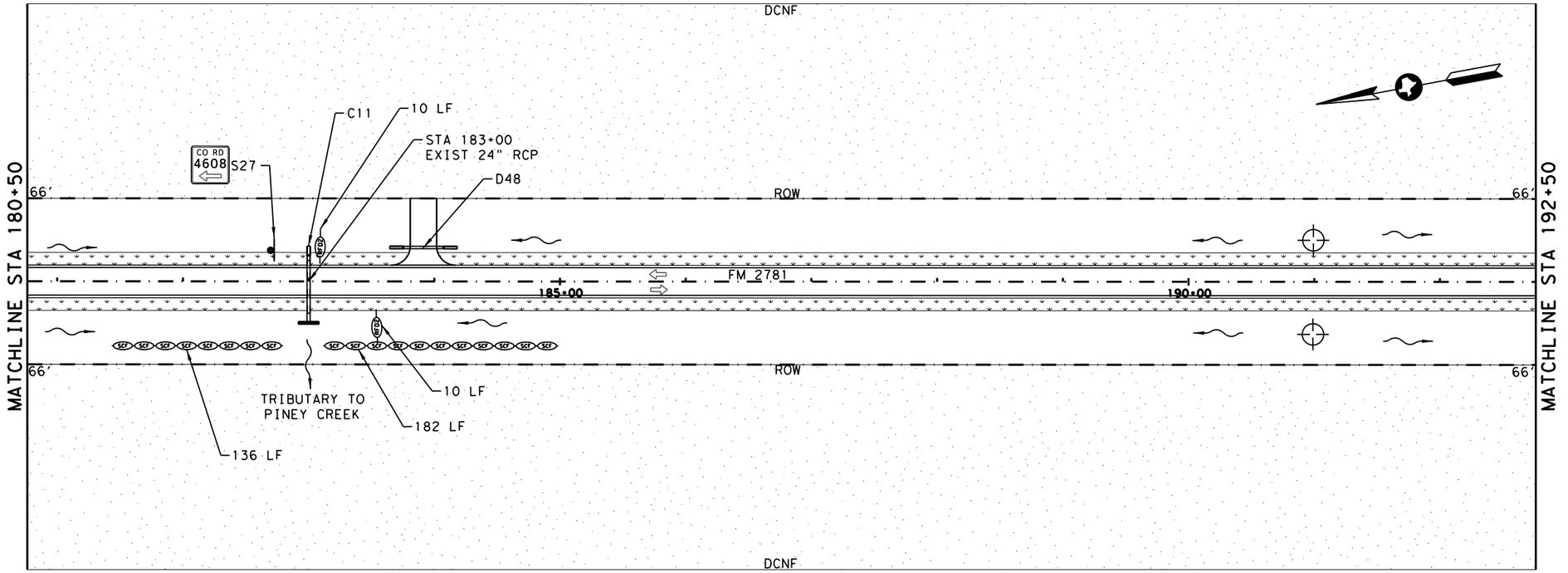
SWP3 LAYOUTS

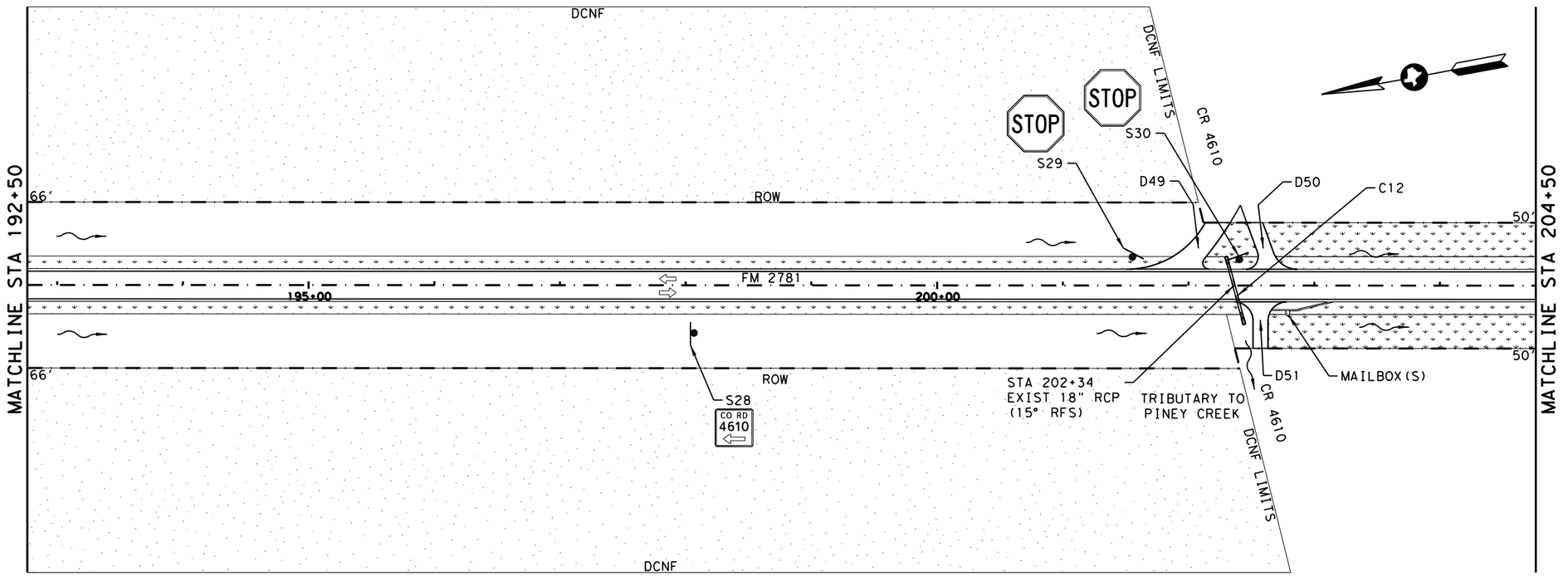
TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 8 OF 28

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		141

9/2/2022 5:01:43 PM
c:\txdot\pw*online\txdot3\sergio.zapata\d0361223\Plan Layout-8.dgn





LEGEND

- RFD2 — ROCK FILTER DAM (TY 2)
- SCF — SEDIMENT CONT FENCE
- CONSTRUCTION EXIT
- SEEDING/SOIL DISTURBANCE
- HIGH POINT
- FLOW DIRECTION
- DXX - DRIVEWAY I.D.
- CXX - CULVERT I.D.
- SXX - SIGN I.D.

NOTE: LOCATIONS OF CONSTRUCTION EXITS MAY BE ADJUSTED IN THE FIELD AS DIRECTED BY THE ENGINEER.

SCALE 1" = 100'

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED
PROFESSIONAL ENGINEER

DocuSigned by:
AF852E728AFC4C9...
9/22/2022

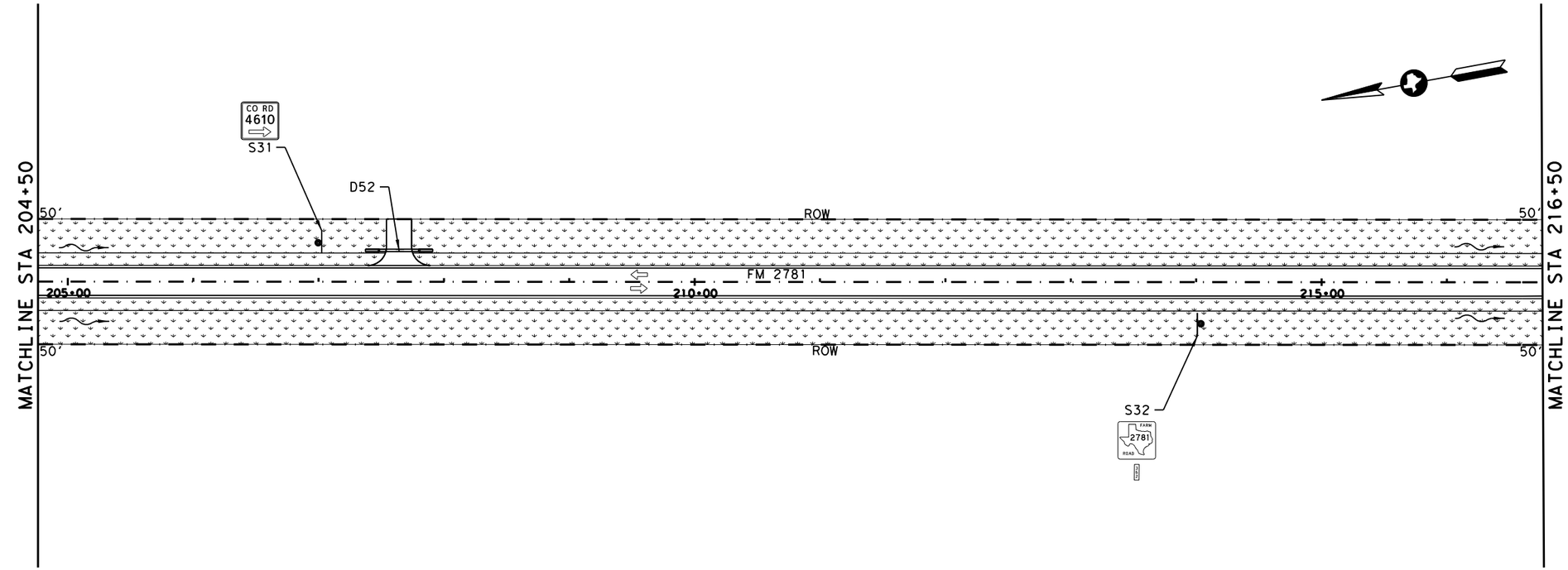
SWP3 LAYOUTS

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 9 OF 28

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		142

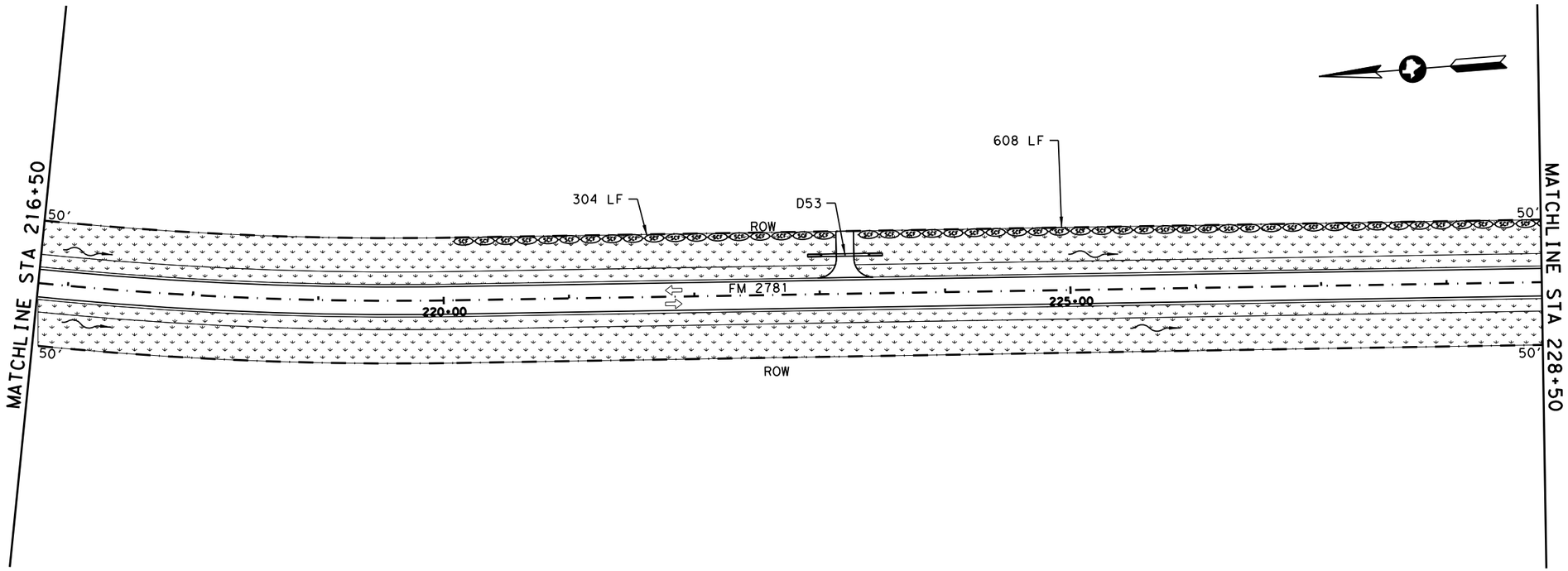
9/20/2022 7:38:35 AM
c:\txdot\pw*online\txdot3\sergio.zapata\d0361223\Plan Layout-9.dgn



LEGEND

- RFD2 — ROCK FILTER DAM (TY 2)
- SCF — SEDIMENT CONT FENCE
- CONSTRUCTION EXIT
- SEEDING/SOIL DISTURBANCE
- HIGH POINT
- FLOW DIRECTION
- DXX - DRIVEWAY I.D.
- CXX - CULVERT I.D.
- SXX - SIGN I.D.

NOTE: LOCATIONS OF CONSTRUCTION EXITS MAY BE ADJUSTED IN THE FIELD AS DIRECTED BY THE ENGINEER.



SCALE 1" = 100'

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED
PROFESSIONAL ENGINEER

DocuSigned by:
cmb, P.E.
AF852E728AFC4C9...
9/22/2022

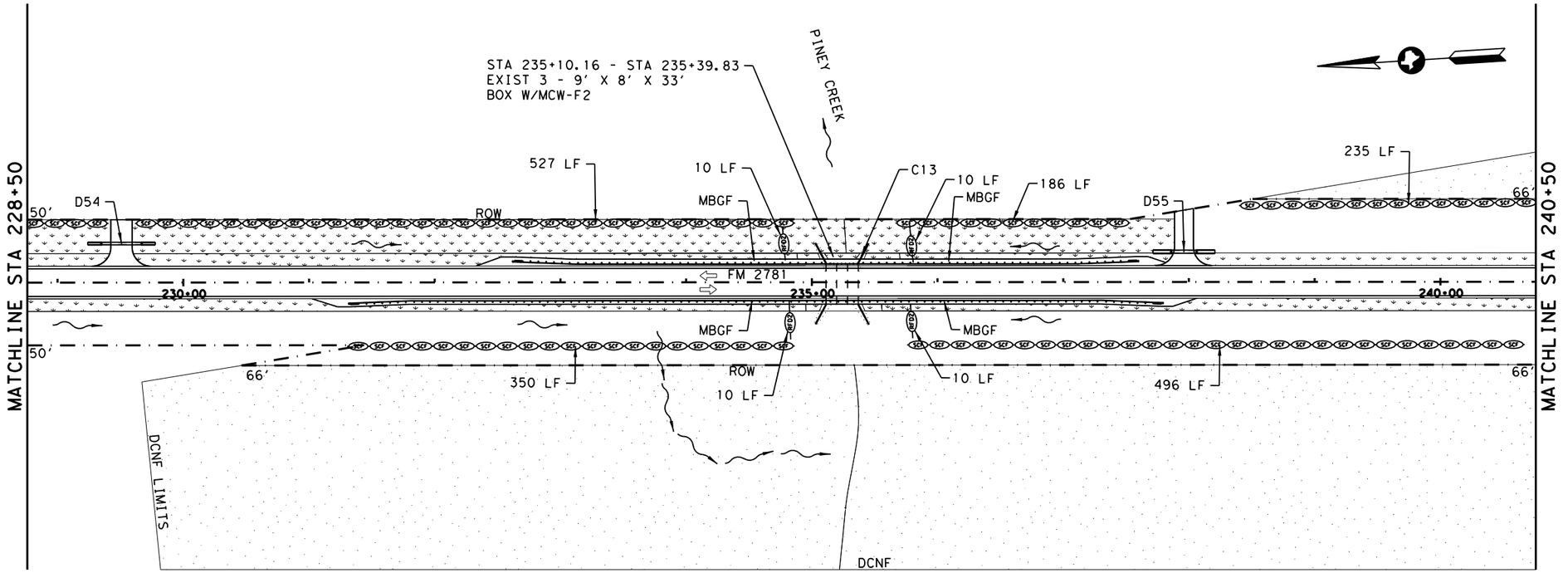
SWP3 LAYOUTS

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 10 OF 28

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		143

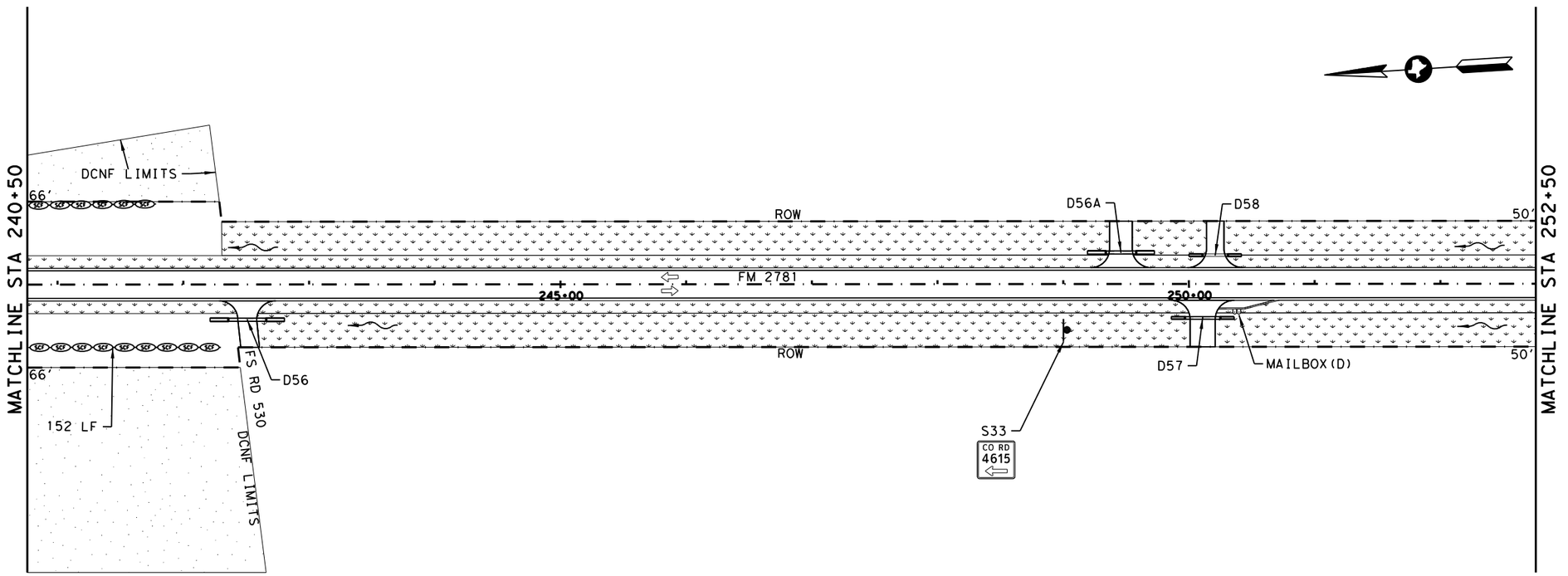
9/20/2022 8:17:32 AM
c:\txdot\pw*online\txdot3\sergio.zapata\d0361223\Plan Layout-10.dgn



LEGEND

- RFD2 — ROCK FILTER DAM (TY 2)
- SCF — SEDIMENT CONT FENCE
- CONSTRUCTION EXIT
- SEEDING/SOIL DISTURBANCE
- HIGH POINT
- FLOW DIRECTION
- DXX - DRIVEWAY I.D.
- CXX - CULVERT I.D.
- SXX - SIGN I.D.

NOTE: LOCATIONS OF CONSTRUCTION EXITS MAY BE ADJUSTED IN THE FIELD AS DIRECTED BY THE ENGINEER.



SCALE 1" = 100'

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED
PROFESSIONAL ENGINEER

DocuSigned by:
AF852E728A5C4C9...
9/22/2022

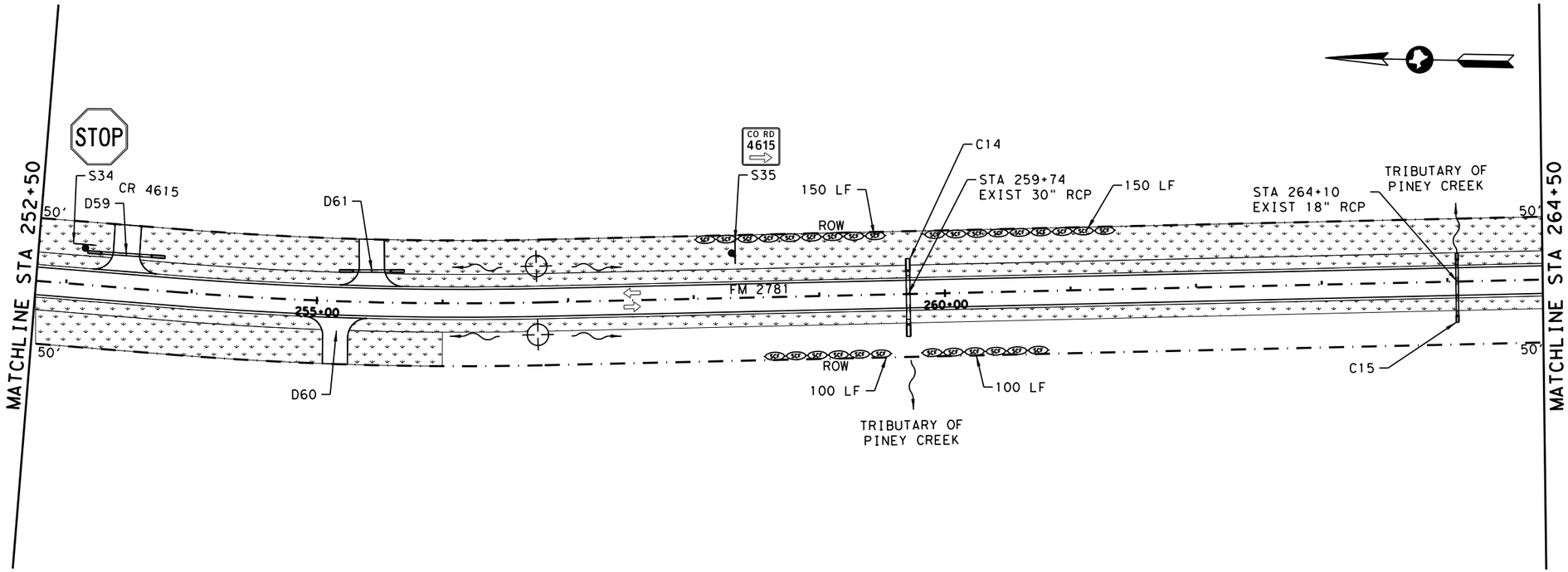
SWP3 LAYOUTS

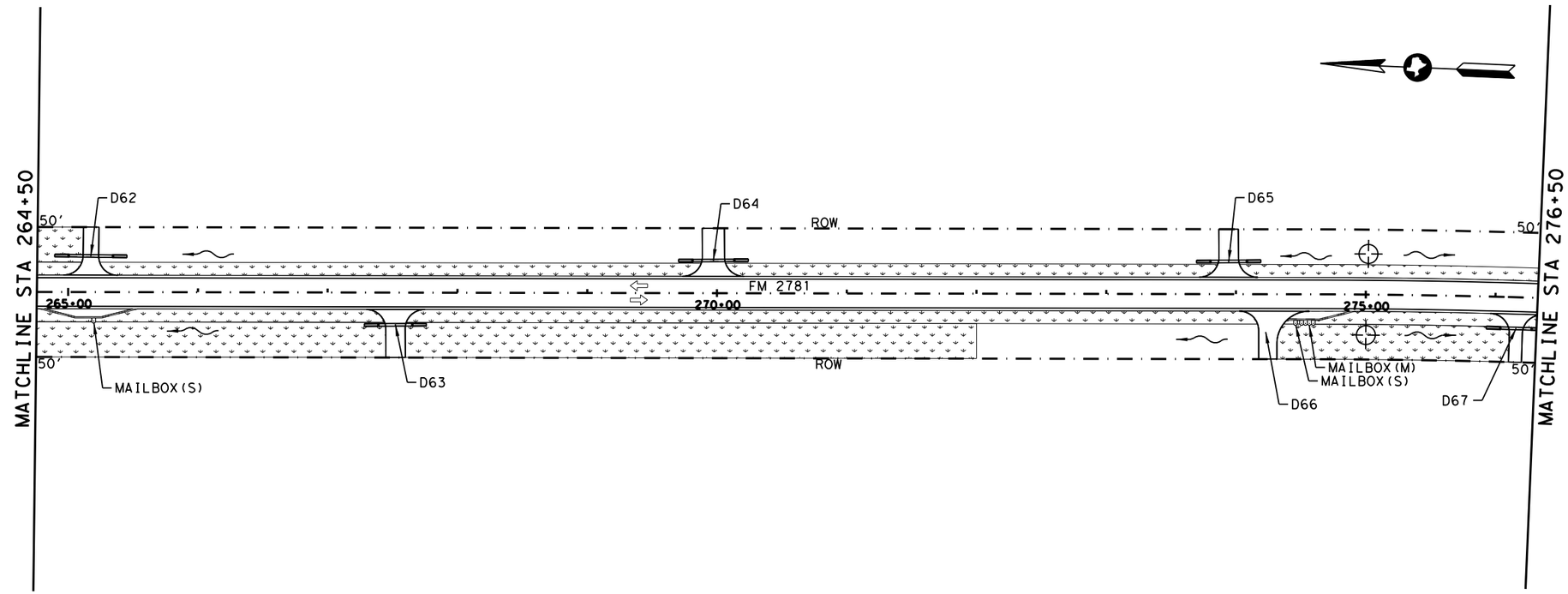
TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 11 OF 28

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		144

9/20/2022 7:43:22 AM
c:\txdot\pw*online\txdot3\sergio.zapata\d0361223\Plan Layout-11.dgn





LEGEND

- RFD2 — ROCK FILTER DAM (TY 2)
- SCF — SEDIMENT CONT FENCE
- CONSTRUCTION EXIT
- SEEDING/SOIL DISTURBANCE
- HIGH POINT
- FLOW DIRECTION
- DXX - DRIVEWAY I.D.
- CXX - CULVERT I.D.
- SXX - SIGN I.D.

NOTE: LOCATIONS OF CONSTRUCTION EXITS MAY BE ADJUSTED IN THE FIELD AS DIRECTED BY THE ENGINEER.

SCALE 1" = 100'

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED
PROFESSIONAL ENGINEER

DocuSigned by:
9/2/2022 | 2:02:27 PM | 28AEC4C0...

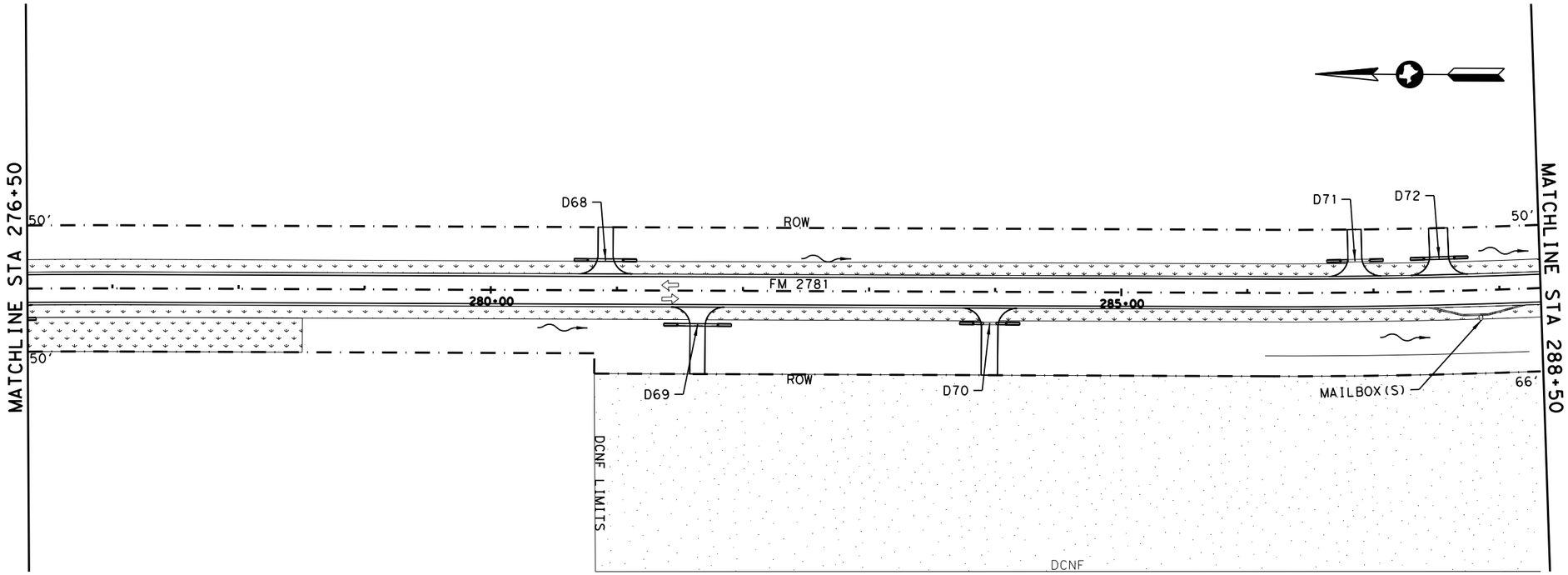
SWP3 LAYOUTS

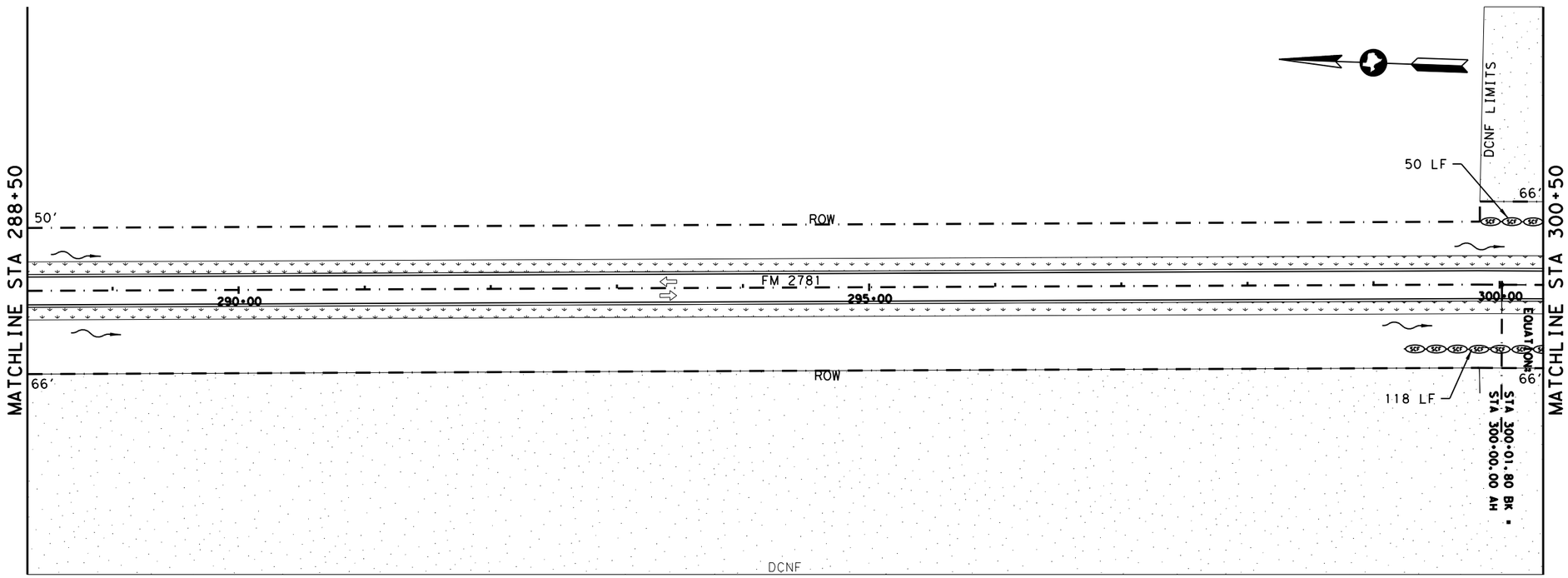
TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 12 OF 28

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		145

9/2/2022 3:13:56 PM
c:\txdot\pw*online\txdot3\cathy.loerch\d0361223\Plan Layout-12.dgn





LEGEND

- RFD2 — ROCK FILTER DAM (TY 2)
- SCF — SEDIMENT CONT FENCE
- CONSTRUCTION EXIT
- SEEDING/SOIL DISTURBANCE
- HIGH POINT
- FLOW DIRECTION
- DXX - DRIVEWAY I.D.
- CXX - CULVERT I.D.
- SXX - SIGN I.D.

NOTE: LOCATIONS OF CONSTRUCTION EXITS MAY BE ADJUSTED IN THE FIELD AS DIRECTED BY THE ENGINEER.

SCALE 1" = 100'

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED
PROFESSIONAL ENGINEER

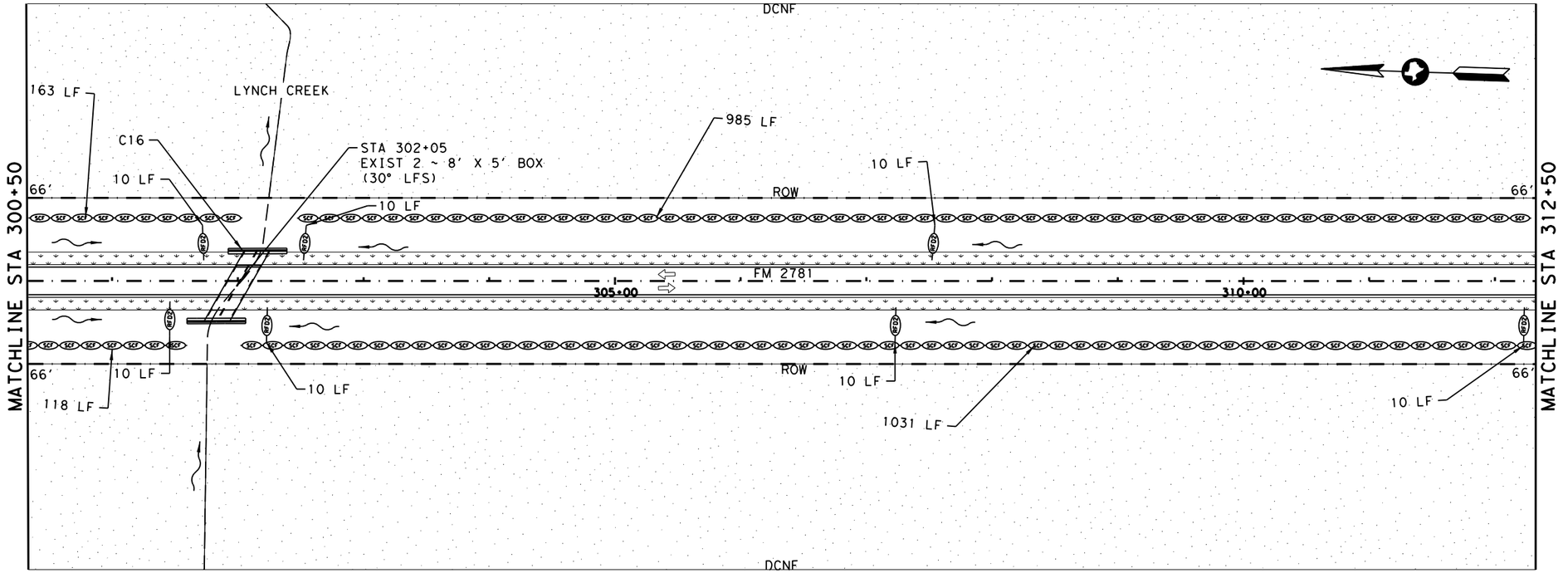
DocuSigned by:
cmb, P.E.
AF852E728AFC4C9...
9/22/2022

SWP3 LAYOUTS

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 13 OF 28

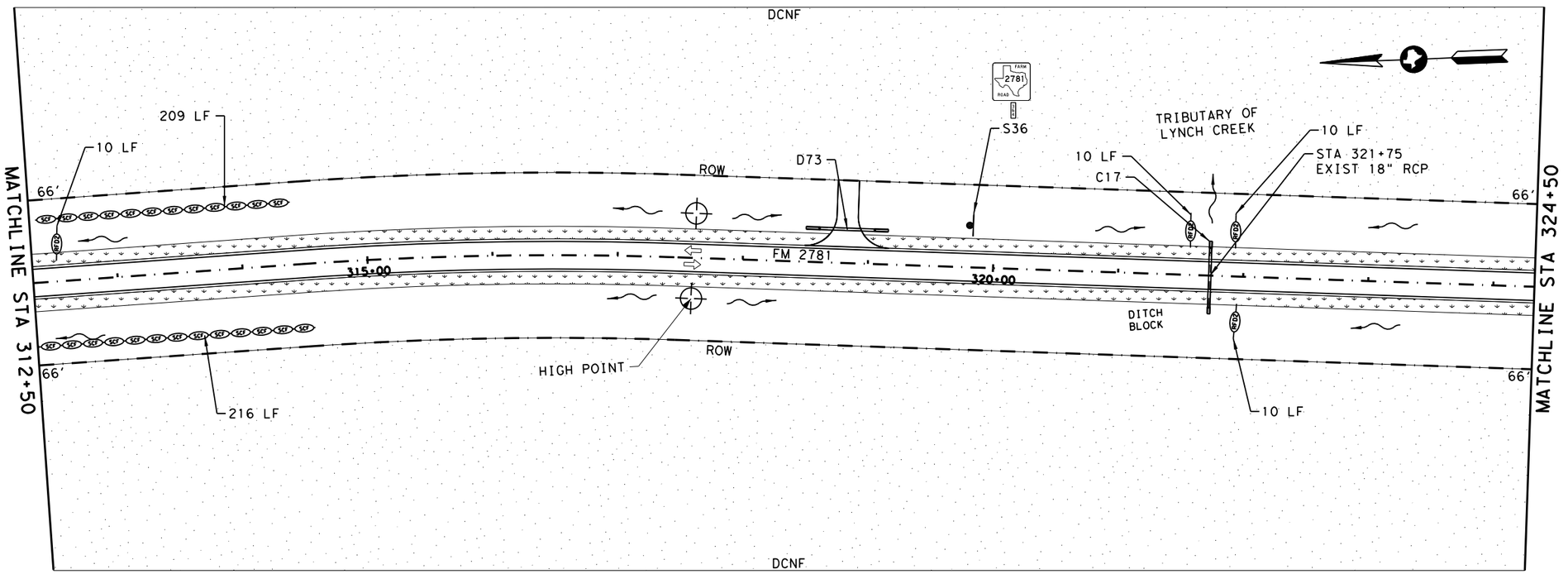
CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		146



LEGEND

- RFD2 — ROCK FILTER DAM (TY 2)
- SCF — SEDIMENT CONT FENCE
- CONSTRUCTION EXIT
- SEEDING/SOIL DISTURBANCE
- HIGH POINT
- FLOW DIRECTION
- DXX - DRIVEWAY I.D.
- CXX - CULVERT I.D.
- SXX - SIGN I.D.

NOTE: LOCATIONS OF CONSTRUCTION EXITS MAY BE ADJUSTED IN THE FIELD AS DIRECTED BY THE ENGINEER.



SCALE 1" = 100'

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED
PROFESSIONAL ENGINEER

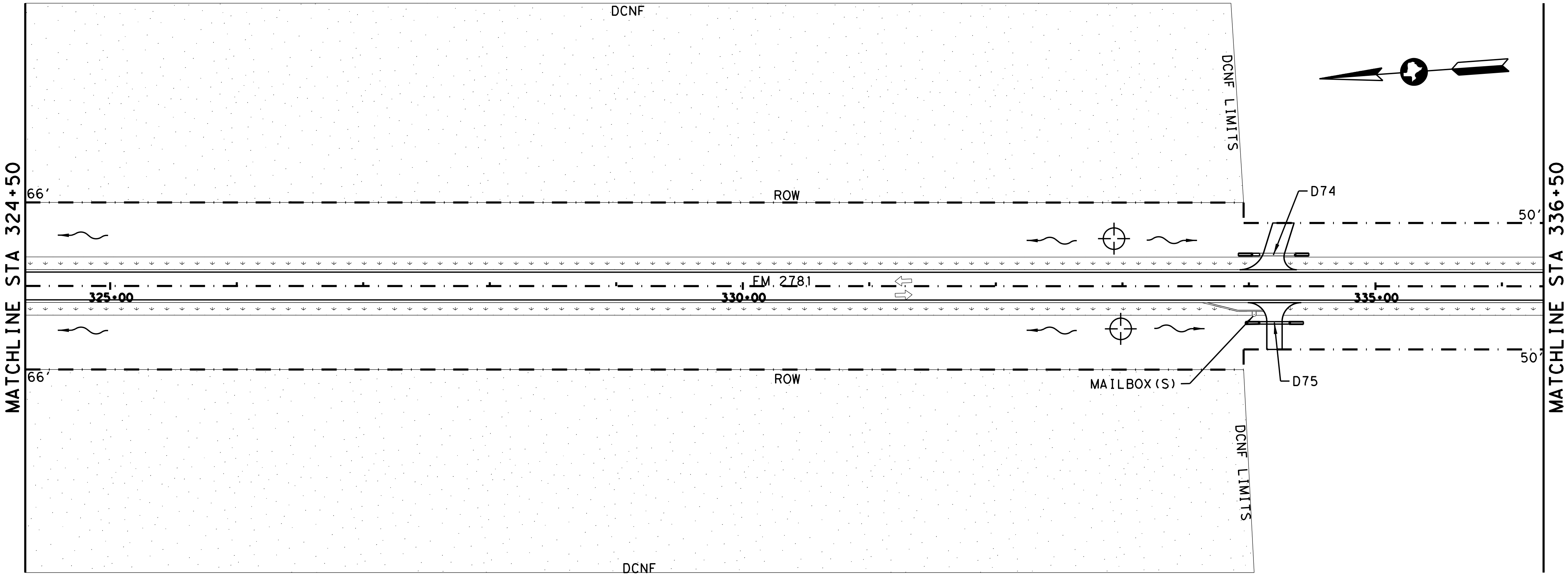
DocuSigned by:
P.E.
AF852E728A5C4C9...
9/22/2022

SWP3 LAYOUTS

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 14 OF 28

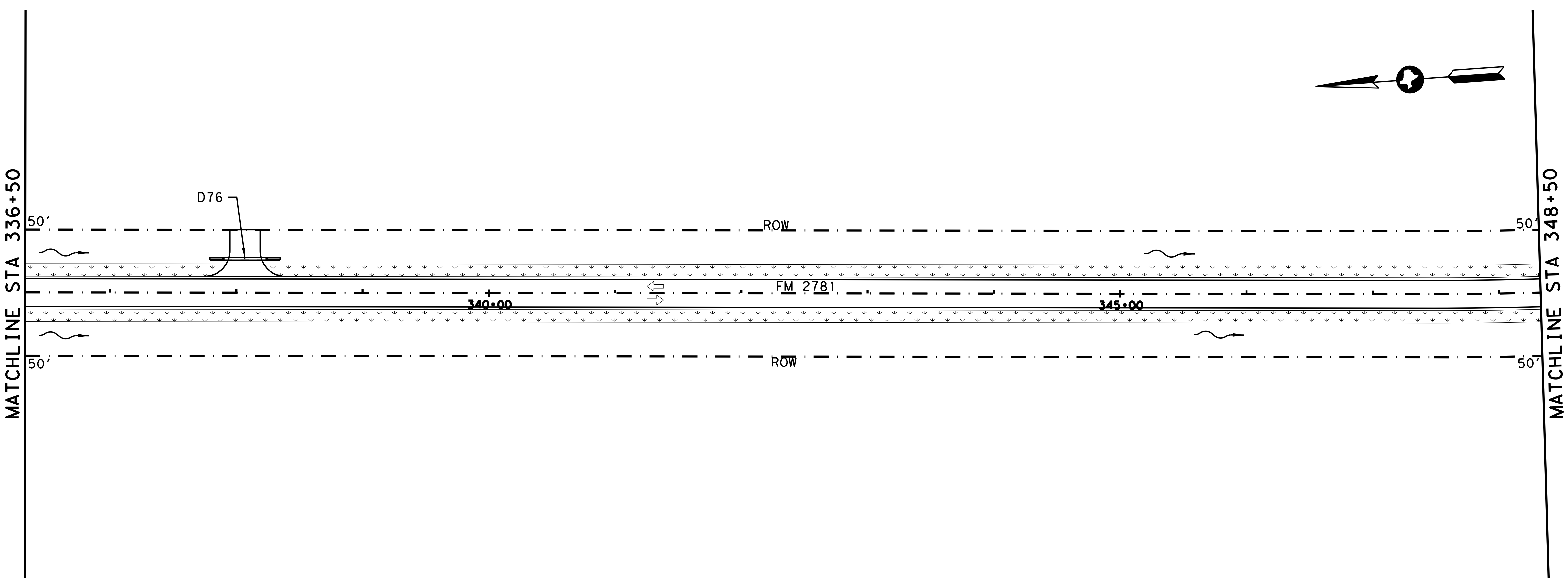
CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		147



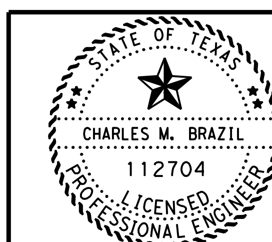
LEGEND

- RFD2 — ROCK FILTER DAM (TY 2)
- SCF — SEDIMENT CONT FENCE
- CONSTRUCTION EXIT
- SEEDING/SOIL DISTURBANCE
- HIGH POINT
- FLOW DIRECTION
- DXX - DRIVEWAY I.D.
- CXX - CULVERT I.D.
- SXX - SIGN I.D.

NOTE: LOCATIONS OF CONSTRUCTION EXITS MAY BE ADJUSTED IN THE FIELD AS DIRECTED BY THE ENGINEER.



SCALE 1" = 100'



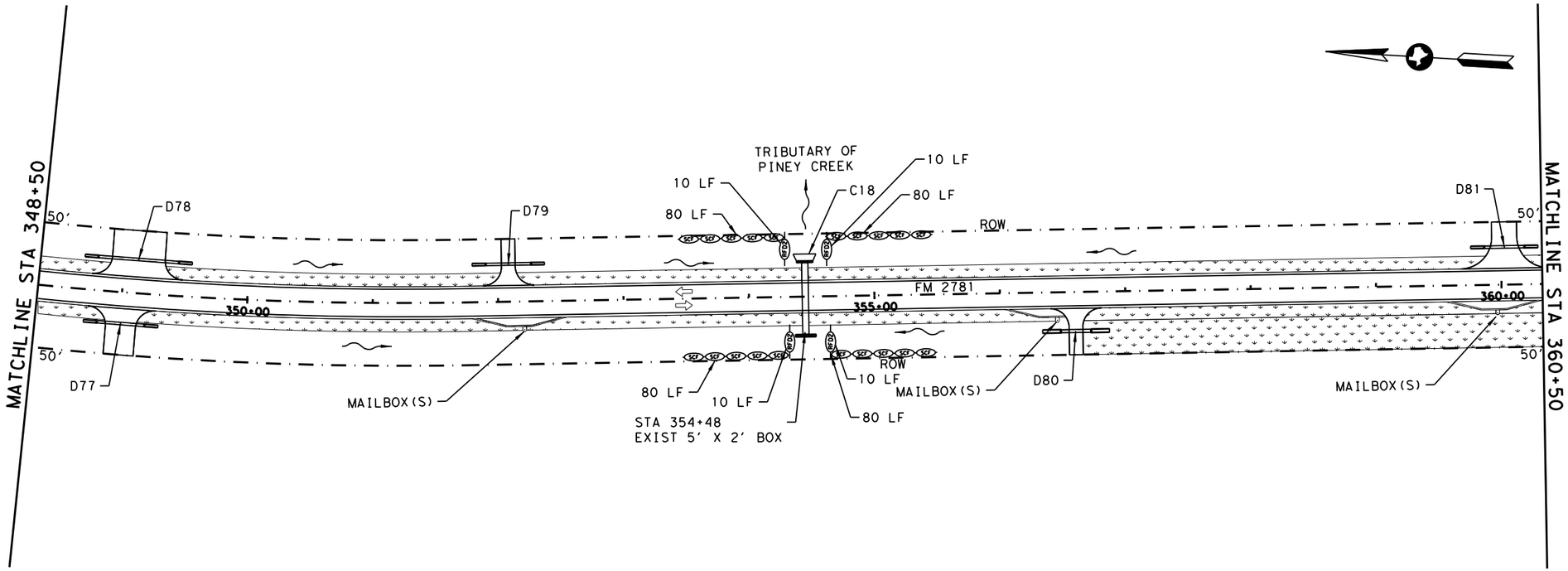
DocuSigned by:
9/2/2022

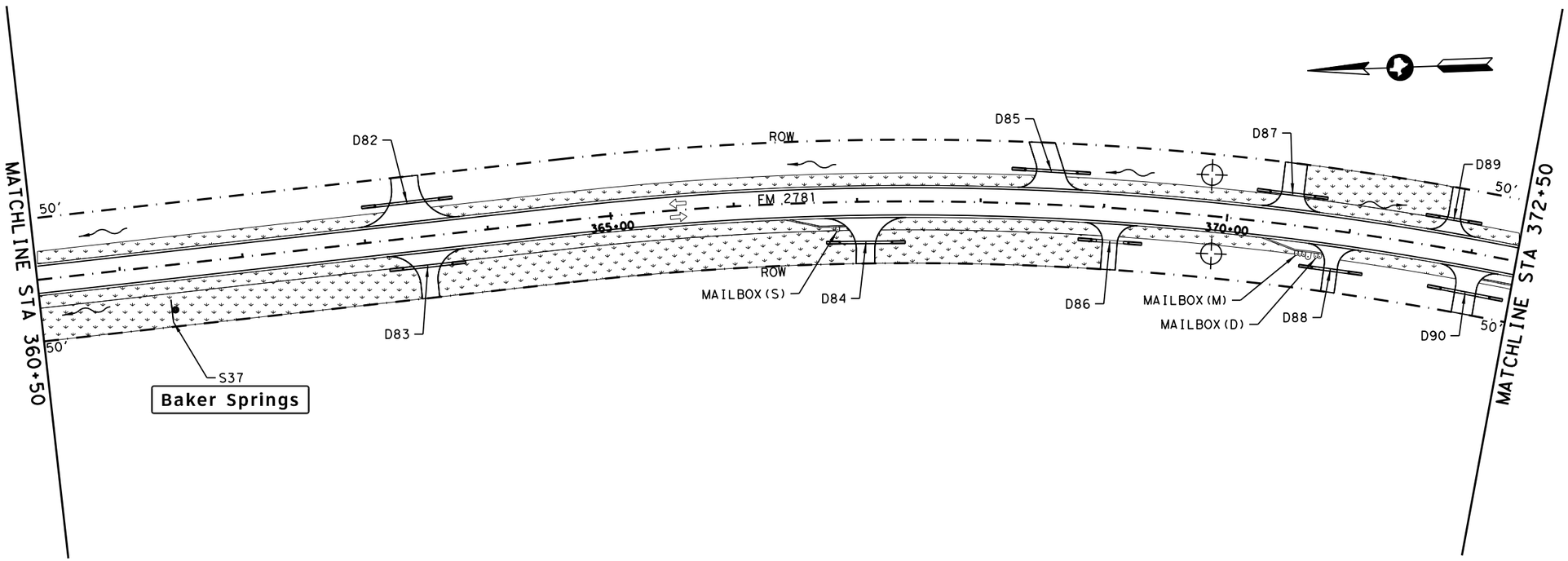
SWP3 LAYOUTS

TEXAS DEPARTMENT OF TRANSPORTATION
©2022 SHEET 15 OF 28

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		148

9/2/2022 3:14:13 PM
c:\txdot\pw*online\txdot3\cathy.loerch\d0361223\Plan Layout-15.dgn





LEGEND

- RFD2 — ROCK FILTER DAM (TY 2)
- SCF — SEDIMENT CONT FENCE
- CONSTRUCTION EXIT
- SEEDING/SOIL DISTURBANCE
- HIGH POINT
- FLOW DIRECTION
- DXX - DRIVEWAY I.D.
- CXX - CULVERT I.D.
- SXX - SIGN I.D.

NOTE: LOCATIONS OF CONSTRUCTION EXITS MAY BE ADJUSTED IN THE FIELD AS DIRECTED BY THE ENGINEER.

SCALE 1" = 100'

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED
PROFESSIONAL ENGINEER

DocuSigned by:
AF852E728AFC4C9...
9/22/2022

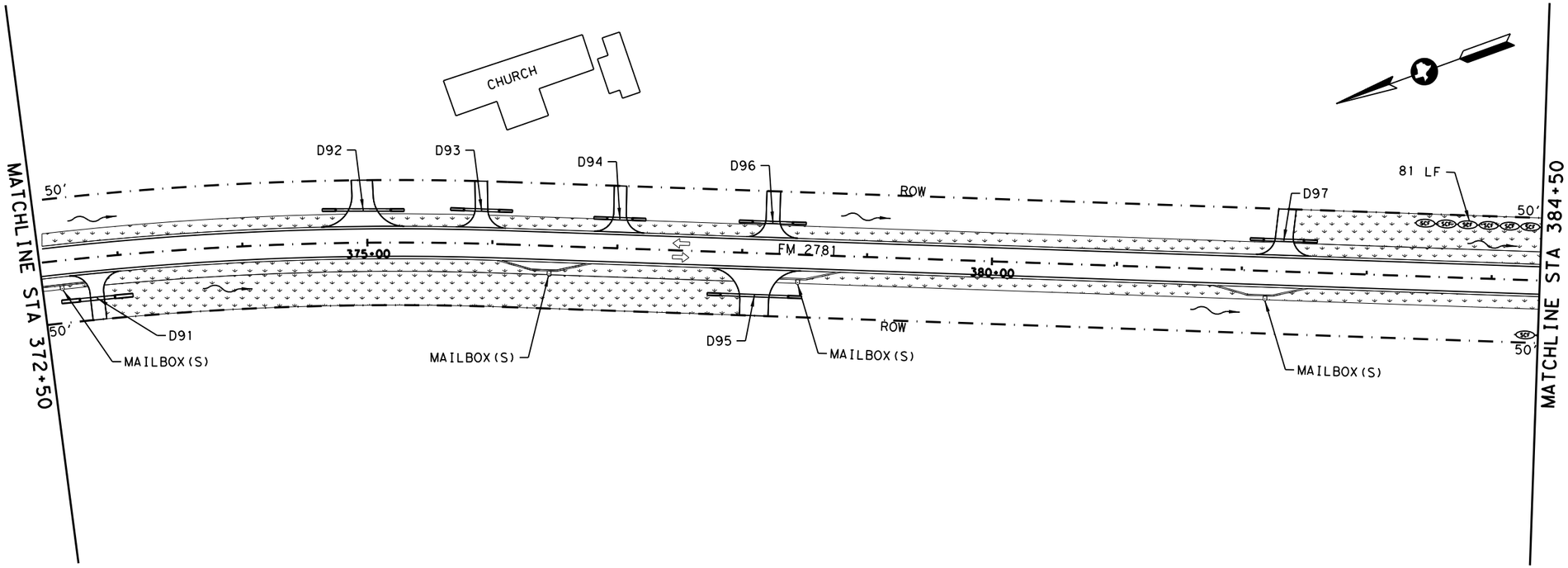
SWP3 LAYOUTS

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 16 OF 28

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		149

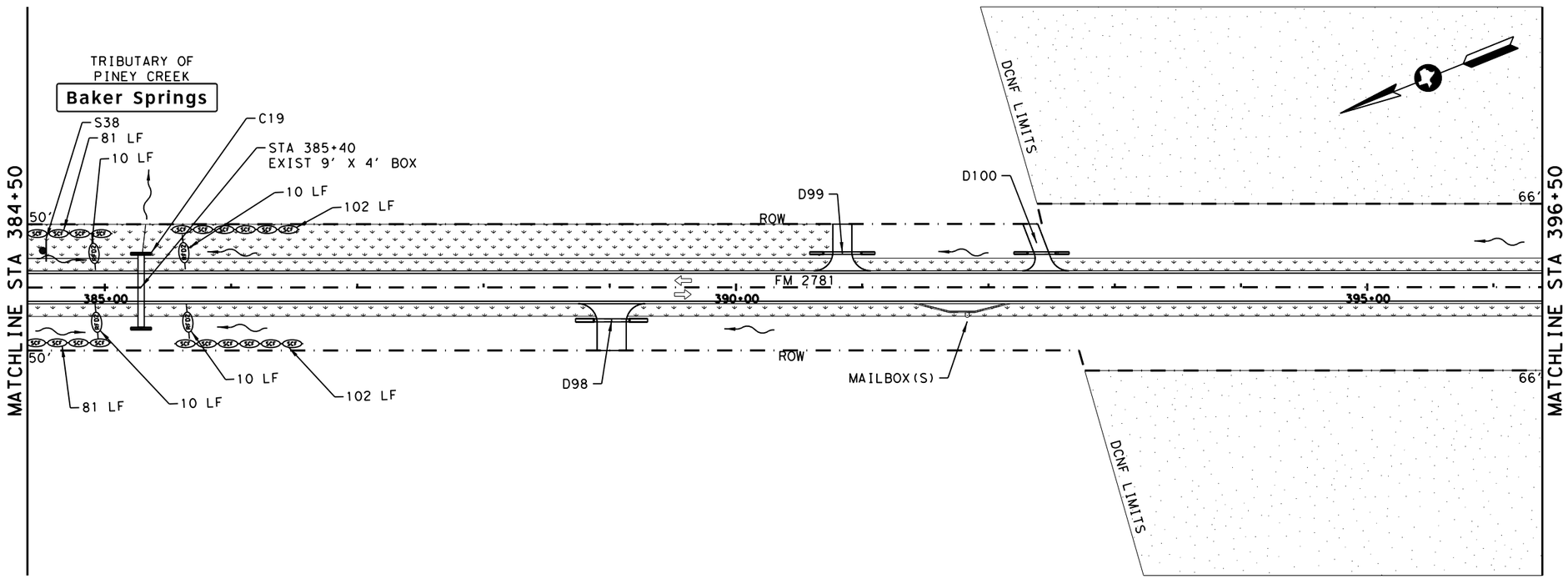
9/19/2022 11:31:36 AM
c:\txdot\pw*online\txdot3\sergio.zapata\d0361223\Plan Layout-16.dgn



LEGEND

- RFD2 — ROCK FILTER DAM (TY 2)
- SCF — SEDIMENT CONT FENCE
- CONSTRUCTION EXIT
- SEEDING/SOIL DISTURBANCE
- HIGH POINT
- FLOW DIRECTION
- DXX - DRIVEWAY I.D.
- CXX - CULVERT I.D.
- SXX - SIGN I.D.

NOTE: LOCATIONS OF CONSTRUCTION EXITS MAY BE ADJUSTED IN THE FIELD AS DIRECTED BY THE ENGINEER.



SCALE 1" = 100'

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED
PROFESSIONAL ENGINEER

DocuSigned by:
cmb, P.E.
AF852E728A5C4C9...
9/22/2022

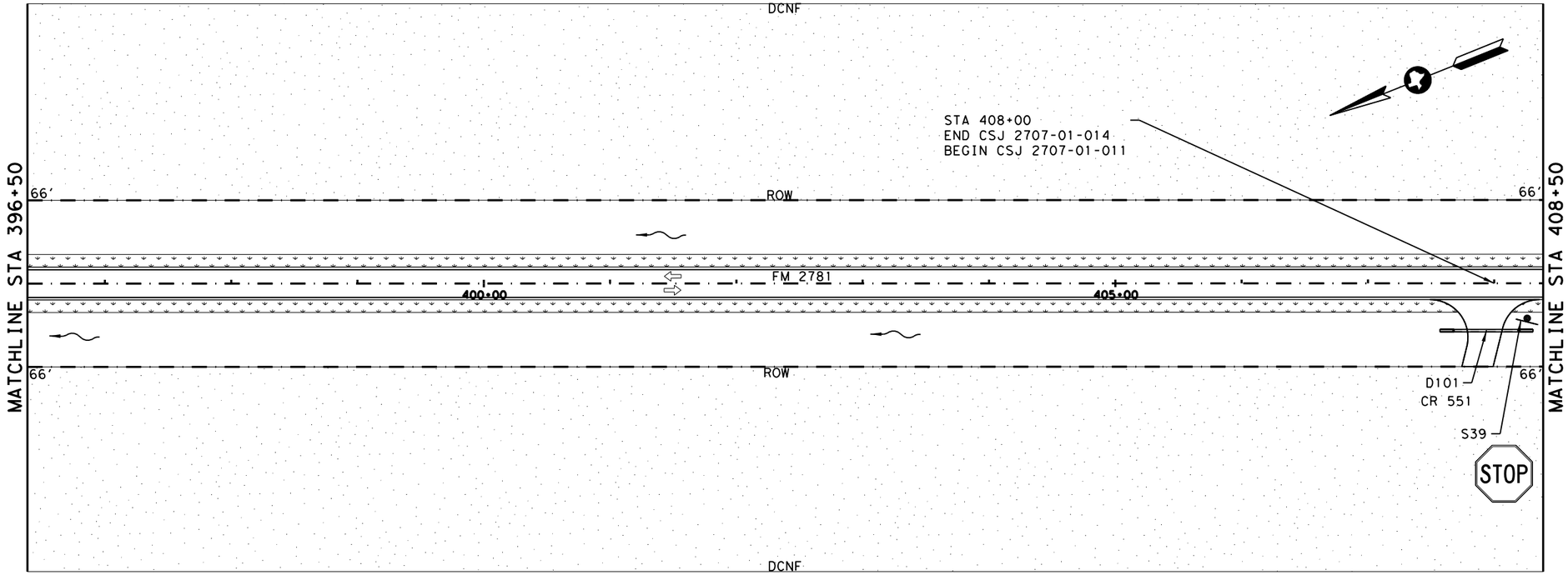
SWP3 LAYOUTS

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 17 OF 28

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		150

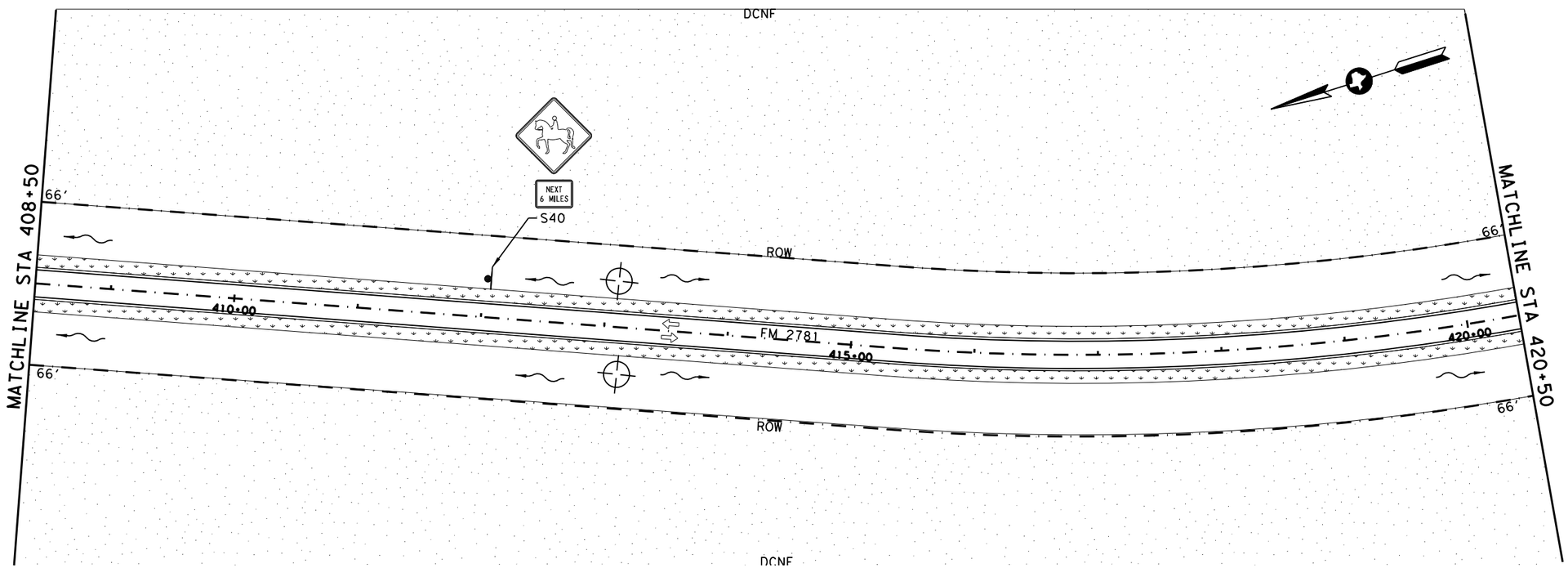
9/20/2022 11:18:05 AM
c:\txdot\pw*online\txdot3\sergio.zapata\d0361223\Plan Layout-17.dgn



LEGEND

- RFD2 — ROCK FILTER DAM (TY 2)
- SCF — SEDIMENT CONT FENCE
- CONSTRUCTION EXIT
- SEEDING/SOIL DISTURBANCE
- HIGH POINT
- FLOW DIRECTION
- DXX - DRIVEWAY I.D.
- CXX - CULVERT I.D.
- SXX - SIGN I.D.

NOTE: LOCATIONS OF CONSTRUCTION EXITS MAY BE ADJUSTED IN THE FIELD AS DIRECTED BY THE ENGINEER.



SCALE 1" = 100'

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED
PROFESSIONAL ENGINEER

DocuSigned by:
[signature] P.E.
9/2/2022
...2728AEC4C0...

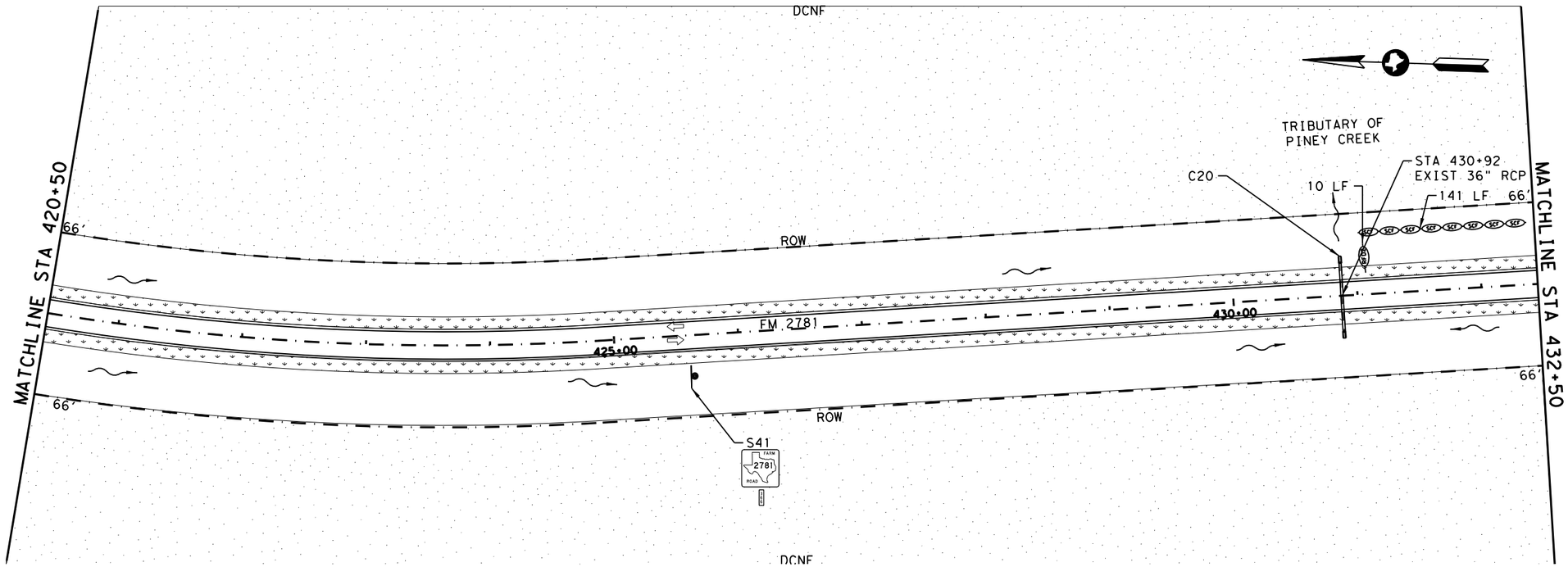
SWP3 LAYOUTS

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 18 OF 28

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		151

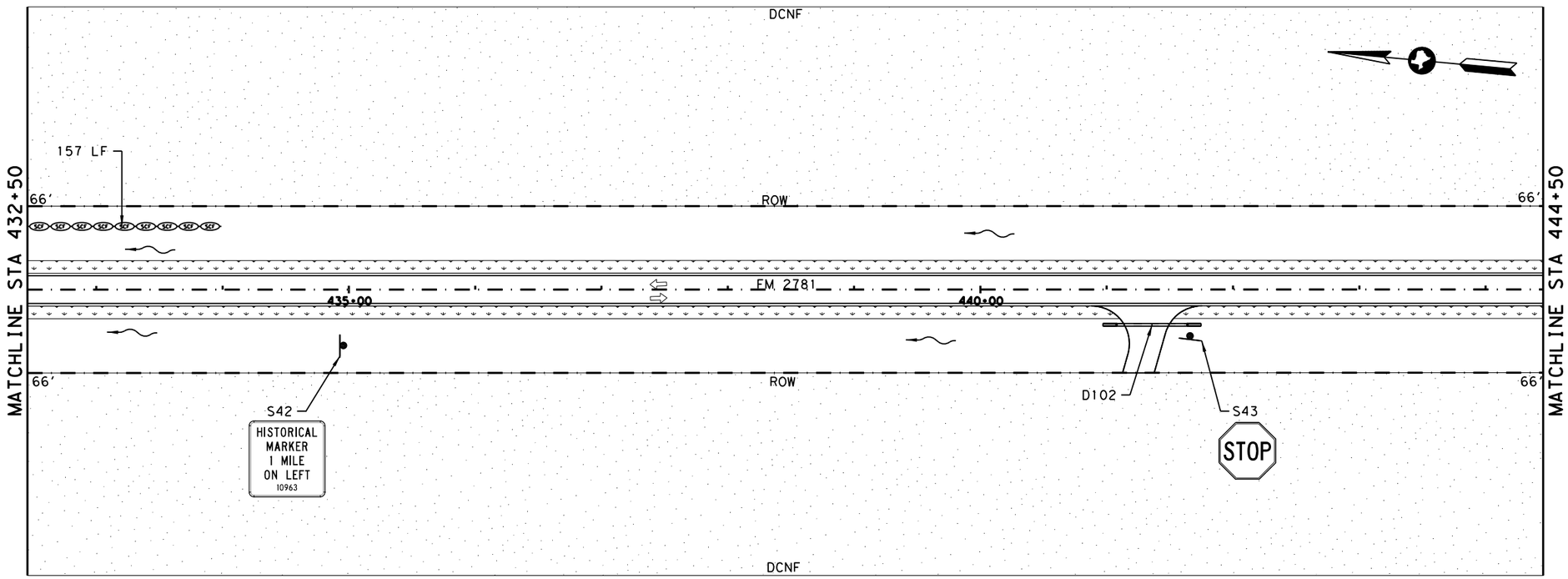
9/2/2022 3:14:29 PM
c:\txdot\pw*online\txdot3\cathy.loerch\d0361223\Plan Layout-18.dgn



LEGEND

- RFD2 — ROCK FILTER DAM (TY 2)
- SCF — SEDIMENT CONT FENCE
- CONSTRUCTION EXIT
- SEEDING/SOIL DISTURBANCE
- HIGH POINT
- FLOW DIRECTION
- DXX - DRIVEWAY I.D.
- CXX - CULVERT I.D.
- SXX - SIGN I.D.

NOTE: LOCATIONS OF CONSTRUCTION EXITS MAY BE ADJUSTED IN THE FIELD AS DIRECTED BY THE ENGINEER.



SCALE 1" = 100'

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED
PROFESSIONAL ENGINEER

DocuSigned by:
cmb, P.E.
A5A025728AEC4C0...
9/2/2022

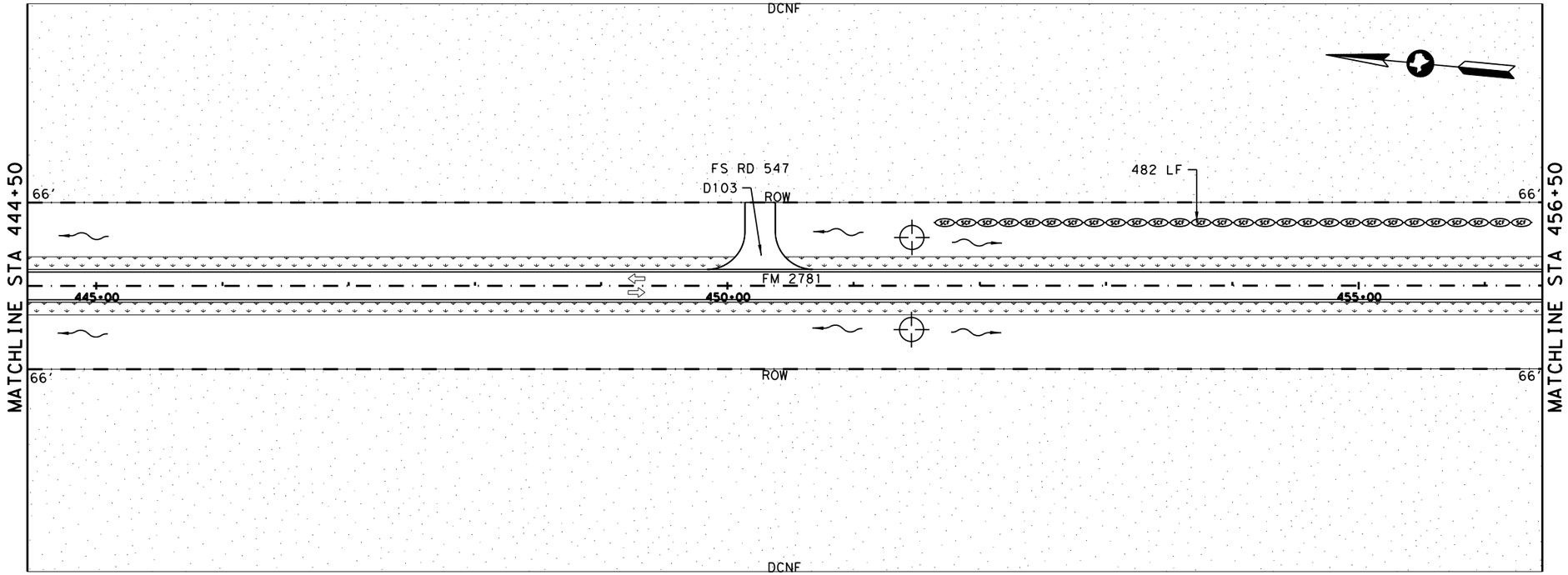
SWP3 LAYOUTS

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 19 OF 28

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		152

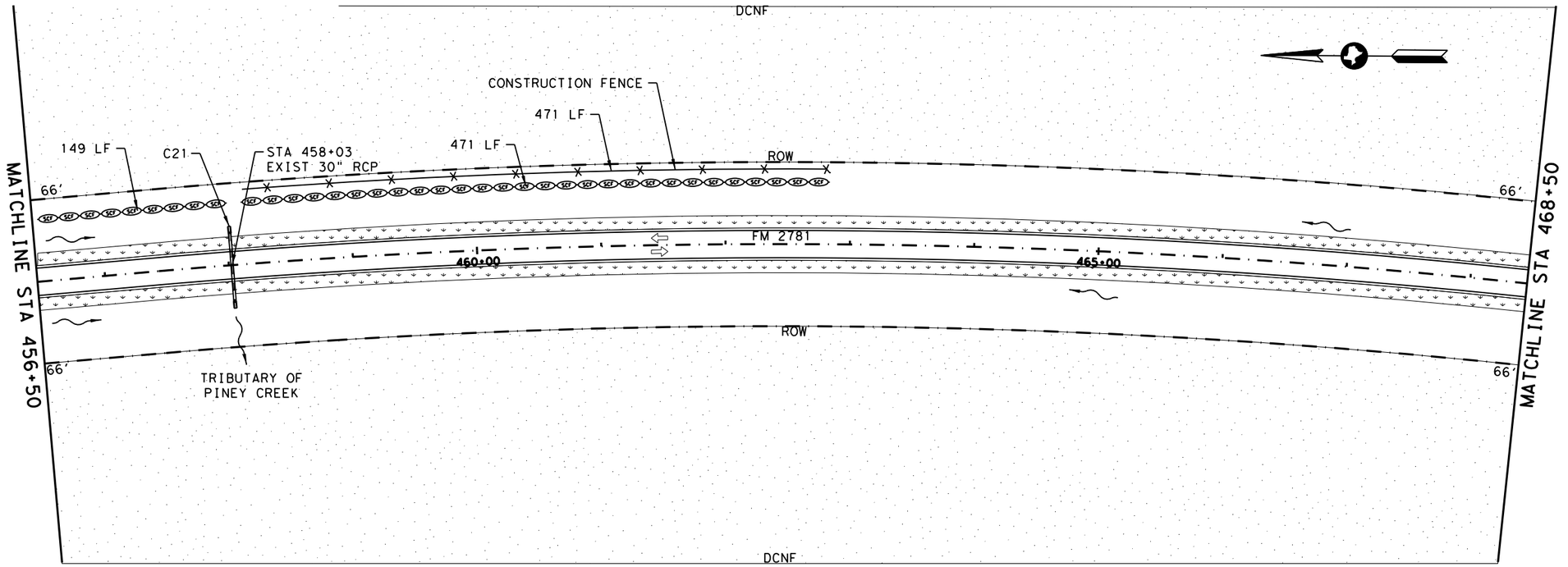
9/2/2022 3:14:34 PM
c:\txdot\pw\online\txdot3\cathy.loerch\d0361223\Plan Layout-19.dgn



LEGEND

- RFD2 — ROCK FILTER DAM (TY 2)
- SCF — SEDIMENT CONT FENCE
- CONSTRUCTION EXIT
- SEEDING/SOIL DISTURBANCE
- HIGH POINT
- FLOW DIRECTION
- DXX - DRIVEWAY I.D.
- CXX - CULVERT I.D.
- SXX - SIGN I.D.

NOTE: LOCATIONS OF CONSTRUCTION EXITS MAY BE ADJUSTED IN THE FIELD AS DIRECTED BY THE ENGINEER.



SCALE 1" = 100'

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED
PROFESSIONAL ENGINEER

DocuSigned by:
cmb, P.E.
AF852E728AF04C9...
9/22/2022

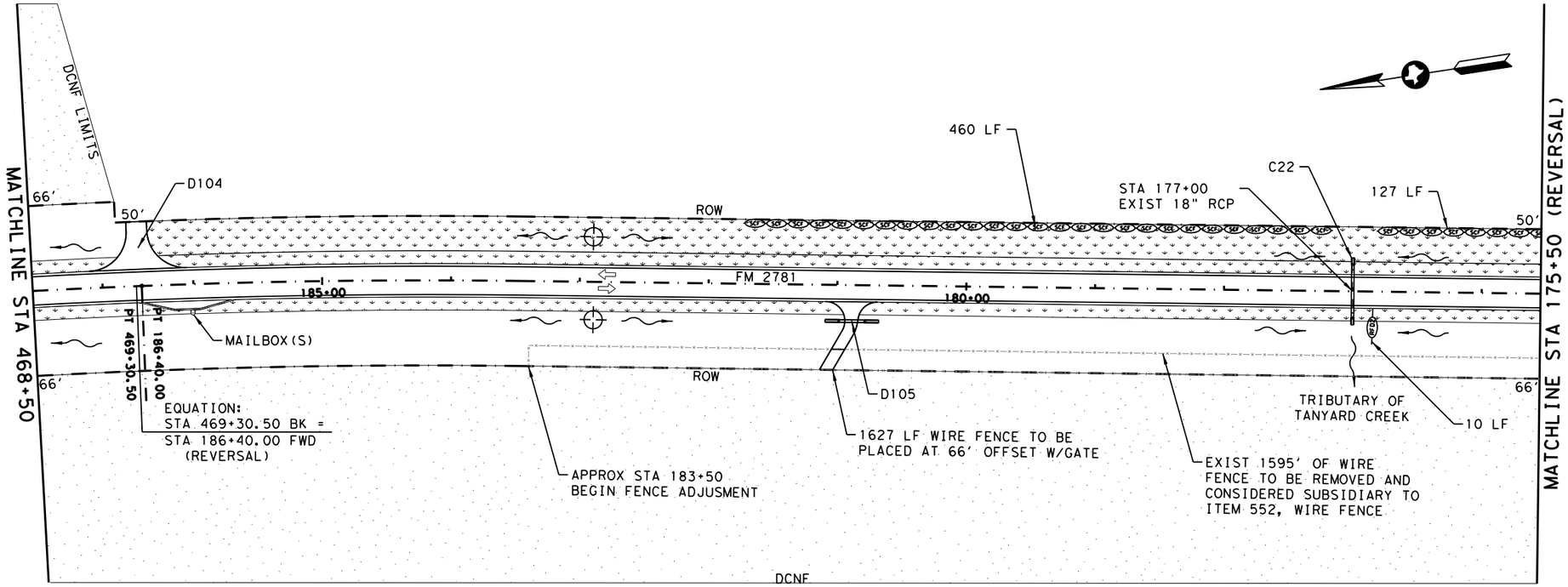
SWP3 LAYOUTS

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 20 OF 28

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		153

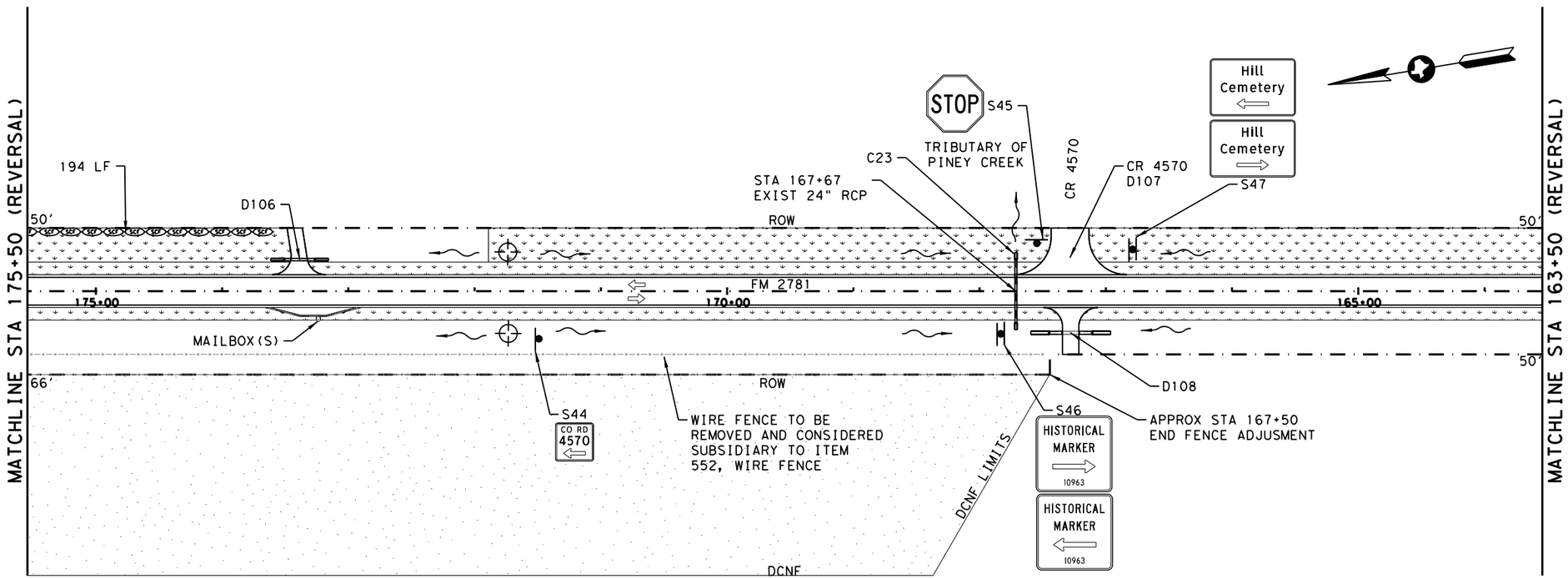
9/20/2022 11:27:18 AM
c:\txdot\pw*online\txdot3\sergio.zapata\d0361223\Plan Layout-20.dgn



LEGEND

- RFD2 — ROCK FILTER DAM (TY 2)
- SCF — SEDIMENT CONT FENCE
- CONSTRUCTION EXIT
- SEEDING/SOIL DISTURBANCE
- HIGH POINT
- FLOW DIRECTION
- DXX - DRIVEWAY I.D.
- CXX - CULVERT I.D.
- SXX - SIGN I.D.

NOTE: LOCATIONS OF CONSTRUCTION EXITS MAY BE ADJUSTED IN THE FIELD AS DIRECTED BY THE ENGINEER.



SCALE 1" = 100'

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED
PROFESSIONAL ENGINEER

DocuSigned by:
cmb, P.E.
AF852E728A5C4C9...
9/22/2022

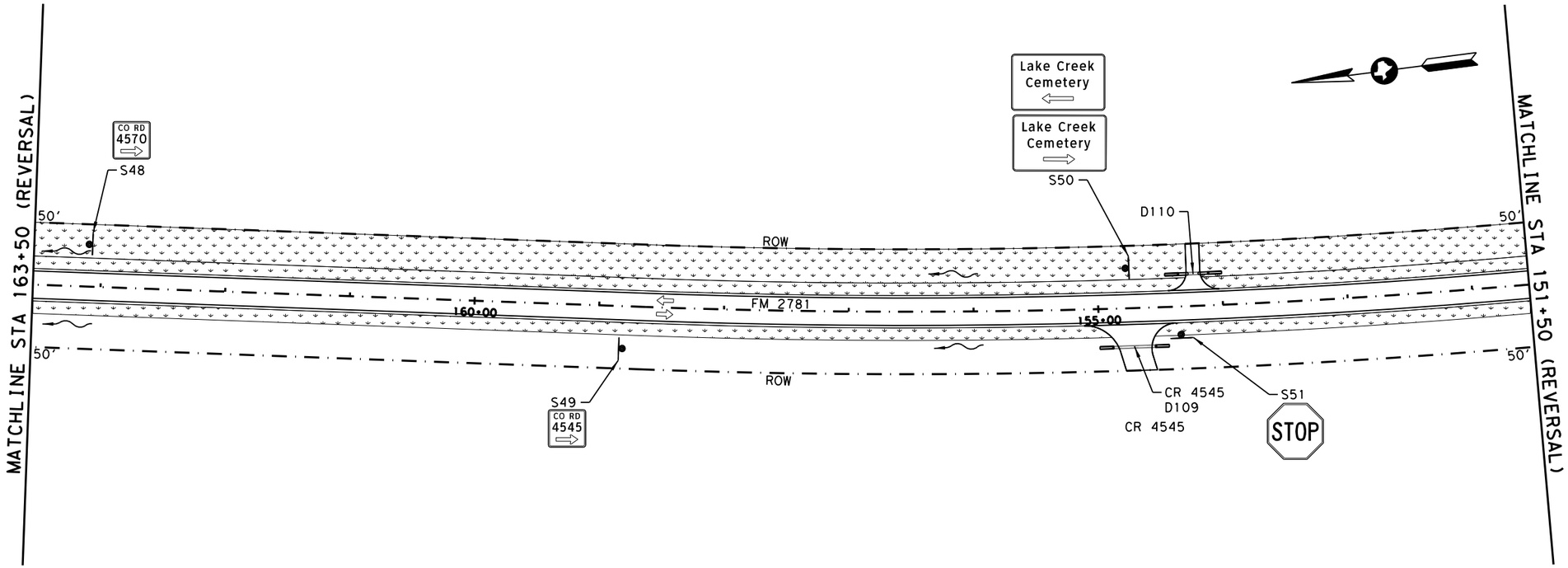
SWP3 LAYOUTS

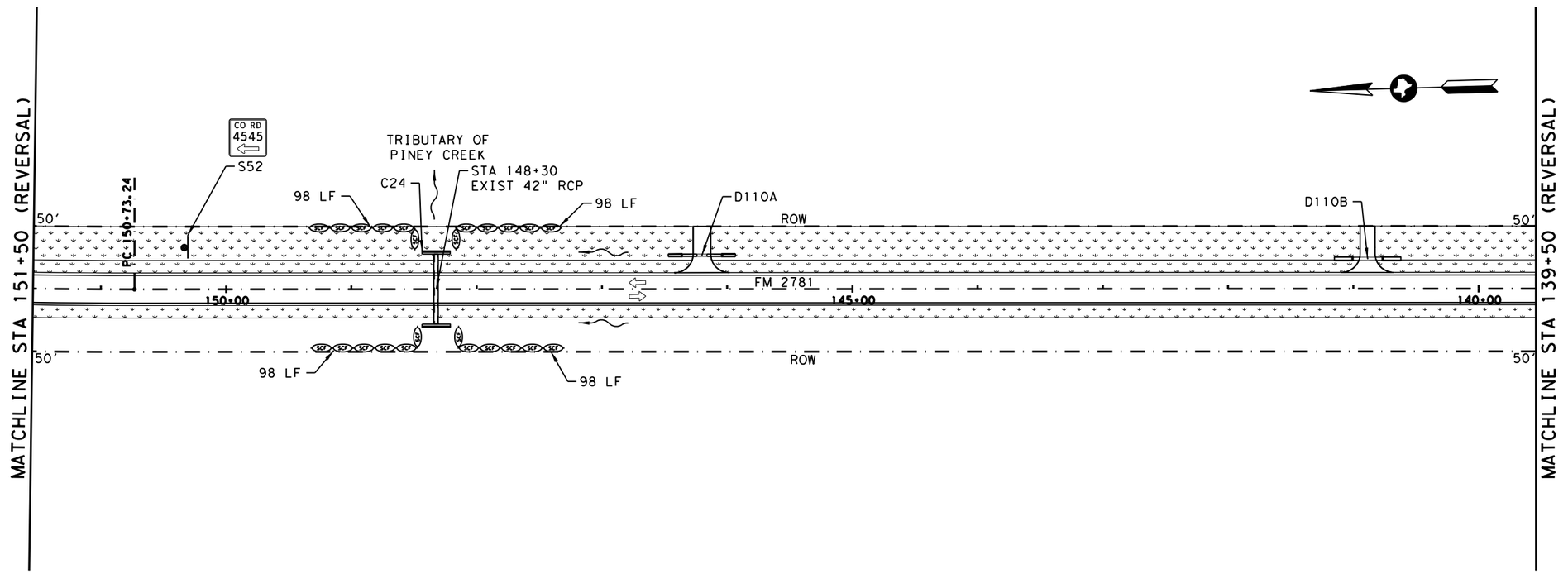
TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 21 OF 28

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		154

9/20/2022 11:34:11 AM
c:\txdot\pw*online\txdot3\sergio.zapata\d0361223\Plan Layout-21.dgn





LEGEND

- RFD2 — ROCK FILTER DAM (TY 2)
- SCF — SEDIMENT CONT FENCE
- CONSTRUCTION EXIT
- SEEDING/SOIL DISTURBANCE
- HIGH POINT
- FLOW DIRECTION
- DXX - DRIVEWAY I.D.
- CXX - CULVERT I.D.
- SXX - SIGN I.D.

NOTE: LOCATIONS OF CONSTRUCTION EXITS MAY BE ADJUSTED IN THE FIELD AS DIRECTED BY THE ENGINEER.

SCALE 1" = 100'

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED PROFESSIONAL ENGINEER

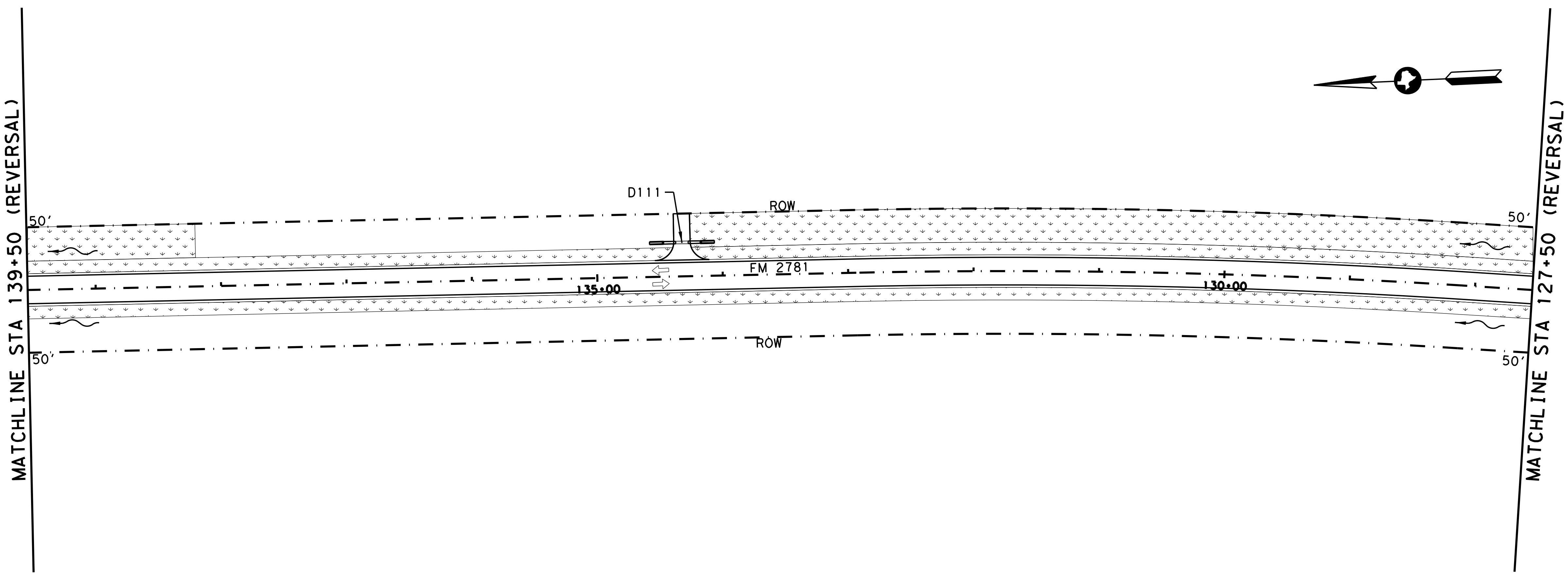
DocuSigned by:
cmb, P.E.
AF852E728AFC4C9...
9/22/2022

SWP3 LAYOUTS

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 22 OF 28

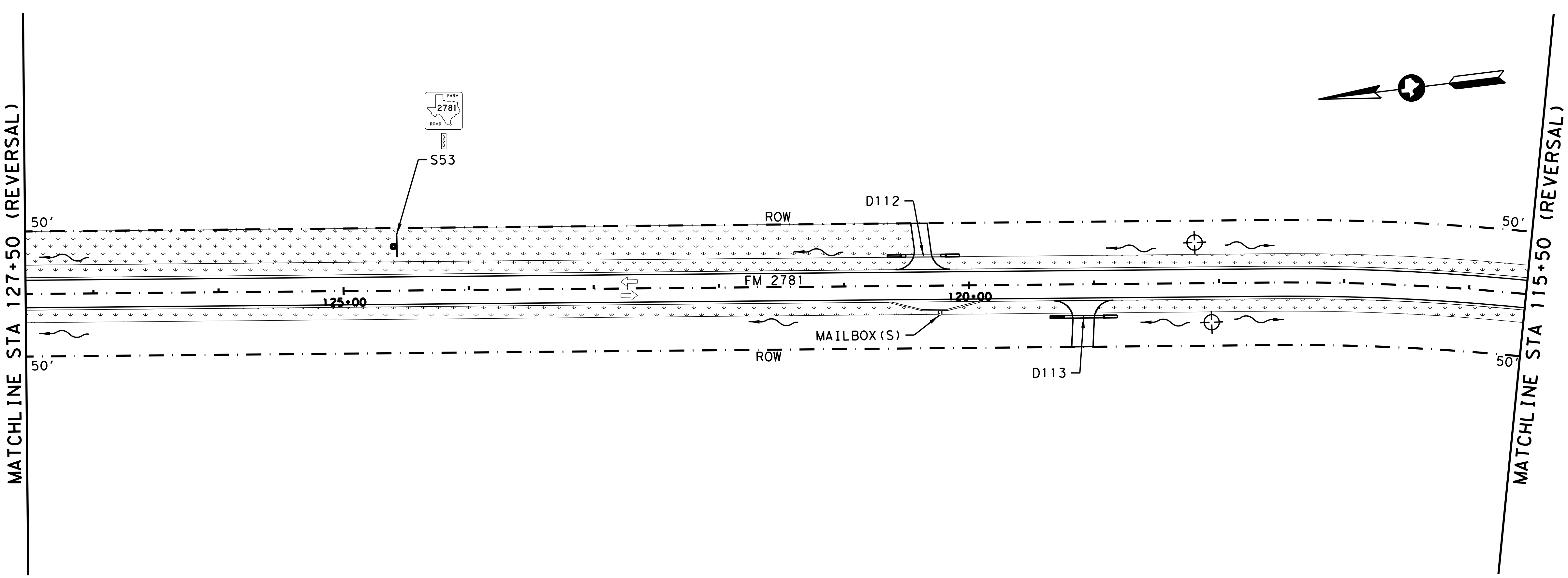
CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		155



LEGEND

- RFD2 — ROCK FILTER DAM (TY 2)
- SCF — SEDIMENT CONT FENCE
- CONSTRUCTION EXIT
- SEEDING/SOIL DISTURBANCE
- HIGH POINT
- FLOW DIRECTION
- DXX - DRIVEWAY I.D.
- CXX - CULVERT I.D.
- SXX - SIGN I.D.

NOTE: LOCATIONS OF CONSTRUCTION EXITS MAY BE ADJUSTED IN THE FIELD AS DIRECTED BY THE ENGINEER.



SCALE 1" = 100'

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED
PROFESSIONAL ENGINEER

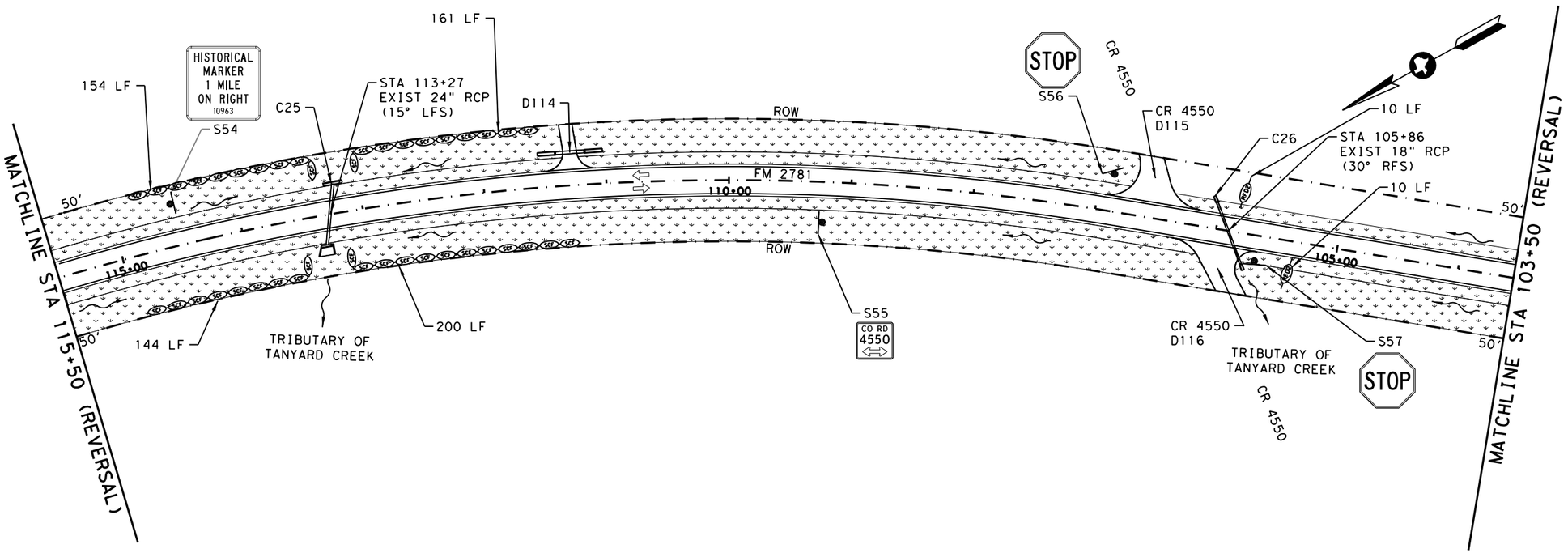
DocuSigned by:
9/2/2022

SWP3 LAYOUTS

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 23 OF 28

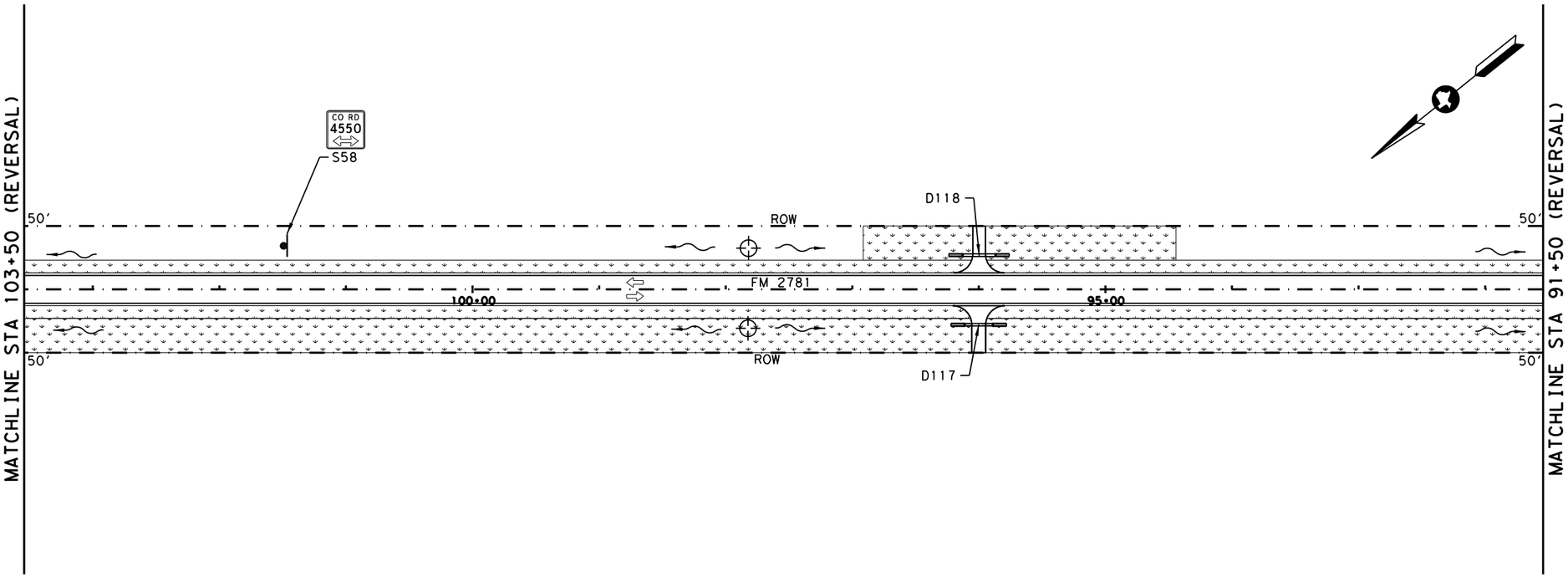
CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		156



LEGEND

- RFD2 — ROCK FILTER DAM (TY 2)
- SCF — SEDIMENT CONT FENCE
- CONSTRUCTION EXIT
- SEEDING/SOIL DISTURBANCE
- HIGH POINT
- FLOW DIRECTION
- DXX - DRIVEWAY I.D.
- CXX - CULVERT I.D.
- SXX - SIGN I.D.

NOTE: LOCATIONS OF CONSTRUCTION EXITS MAY BE ADJUSTED IN THE FIELD AS DIRECTED BY THE ENGINEER.



SCALE 1" = 100'

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED PROFESSIONAL ENGINEER

DocuSigned by:
AF852E728AFC4C9...
9/22/2022

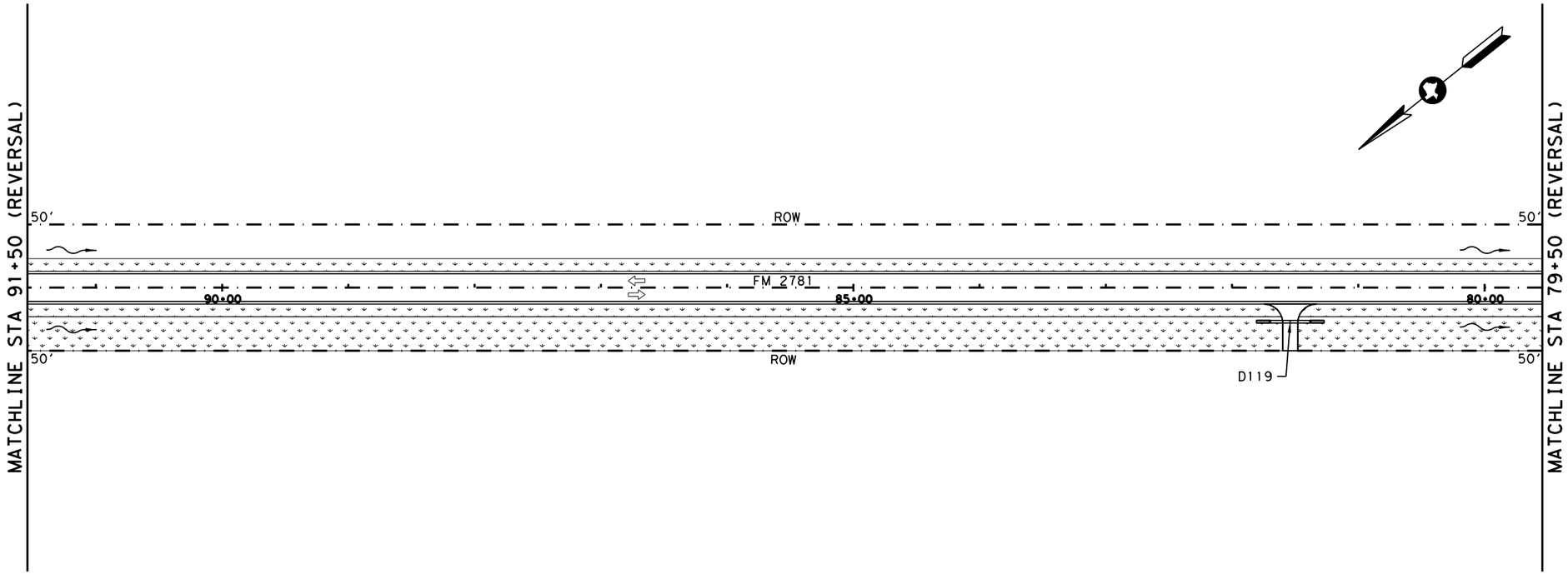
SWP3 LAYOUTS

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 24 OF 28

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		157

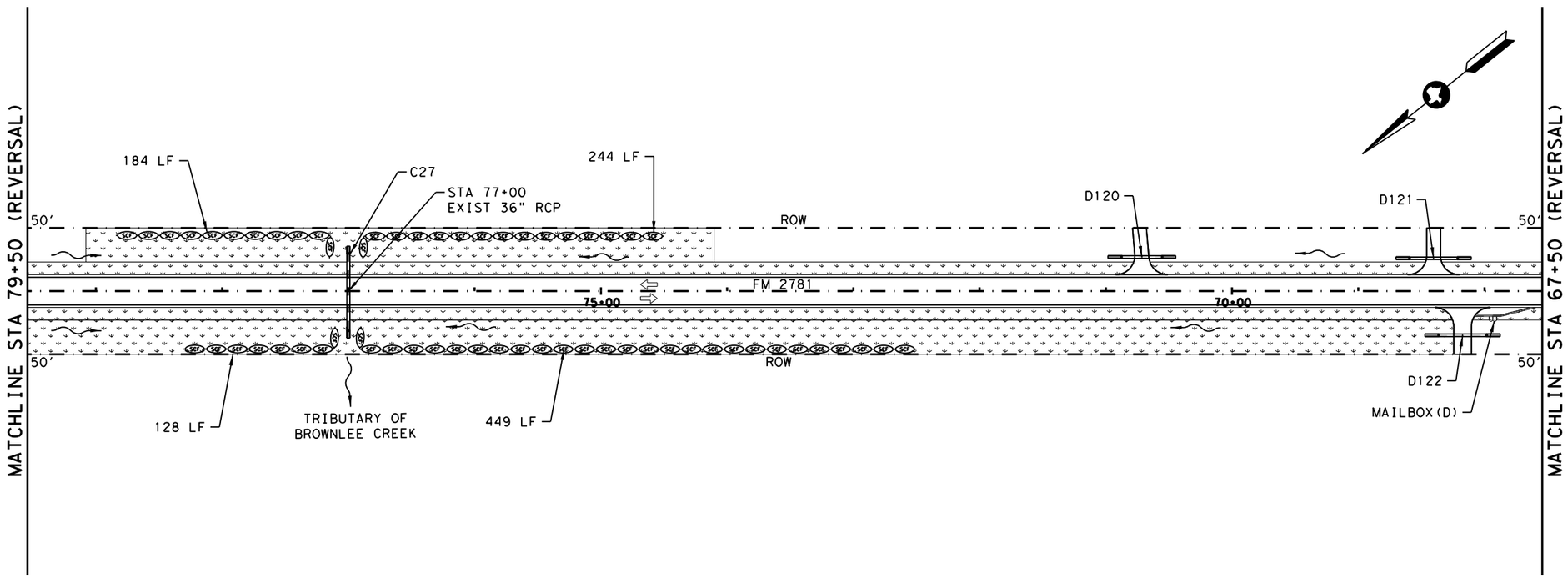
9/20/2022 11:52:21 AM
c:\txdot\pw*online\txdot3\sergio.zapata\d0361223\Plan Layout-24.dgn



LEGEND

- RFD2 — ROCK FILTER DAM (TY 2)
- SCF — SEDIMENT CONT FENCE
- CONSTRUCTION EXIT
- SEEDING/SOIL DISTURBANCE
- HIGH POINT
- FLOW DIRECTION
- DXX - DRIVEWAY I.D.
- CXX - CULVERT I.D.
- SXX - SIGN I.D.

NOTE: LOCATIONS OF CONSTRUCTION EXITS MAY BE ADJUSTED IN THE FIELD AS DIRECTED BY THE ENGINEER.



SCALE 1" = 100'

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED
PROFESSIONAL ENGINEER

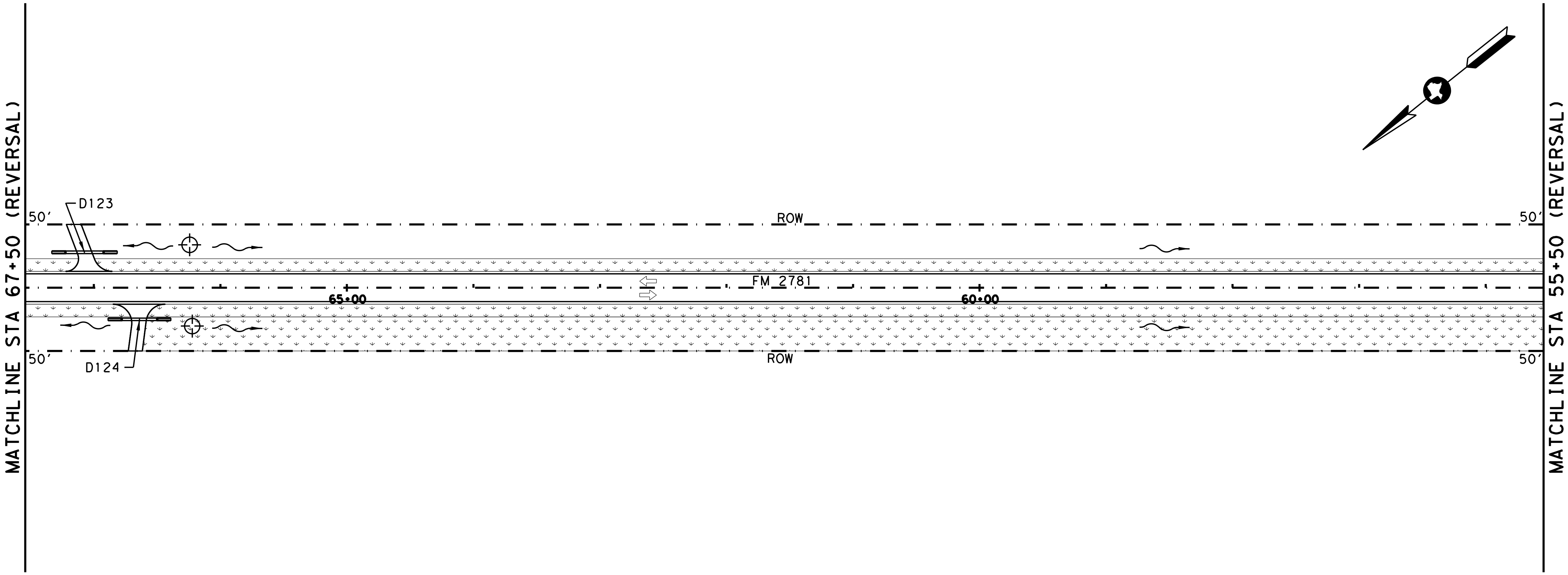
DocuSigned by:
AF852E728A5C4C9...
9/22/2022

SWP3 LAYOUTS

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 25 OF 28

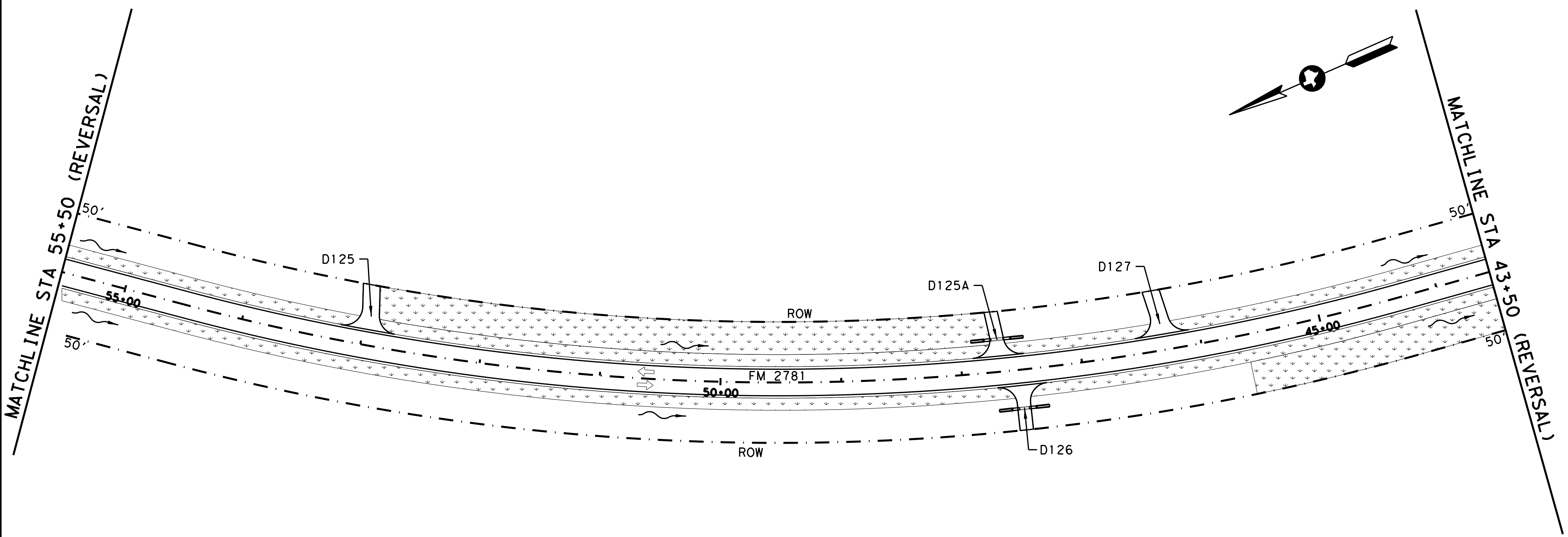
CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		158



LEGEND

- RFD2 — ROCK FILTER DAM (TY 2)
- SCF — SEDIMENT CONT FENCE
- CONSTRUCTION EXIT
- SEEDING/SOIL DISTURBANCE
- HIGH POINT
- FLOW DIRECTION
- DXX - DRIVEWAY I.D.
- CXX - CULVERT I.D.
- SXX - SIGN I.D.

NOTE: LOCATIONS OF CONSTRUCTION EXITS MAY BE ADJUSTED IN THE FIELD AS DIRECTED BY THE ENGINEER.



SCALE 1" = 100'

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED PROFESSIONAL ENGINEER

DocuSigned by:
CMB, P.E.
A8B2E728AEC4C0...
9/2/2022

SWP3 LAYOUTS

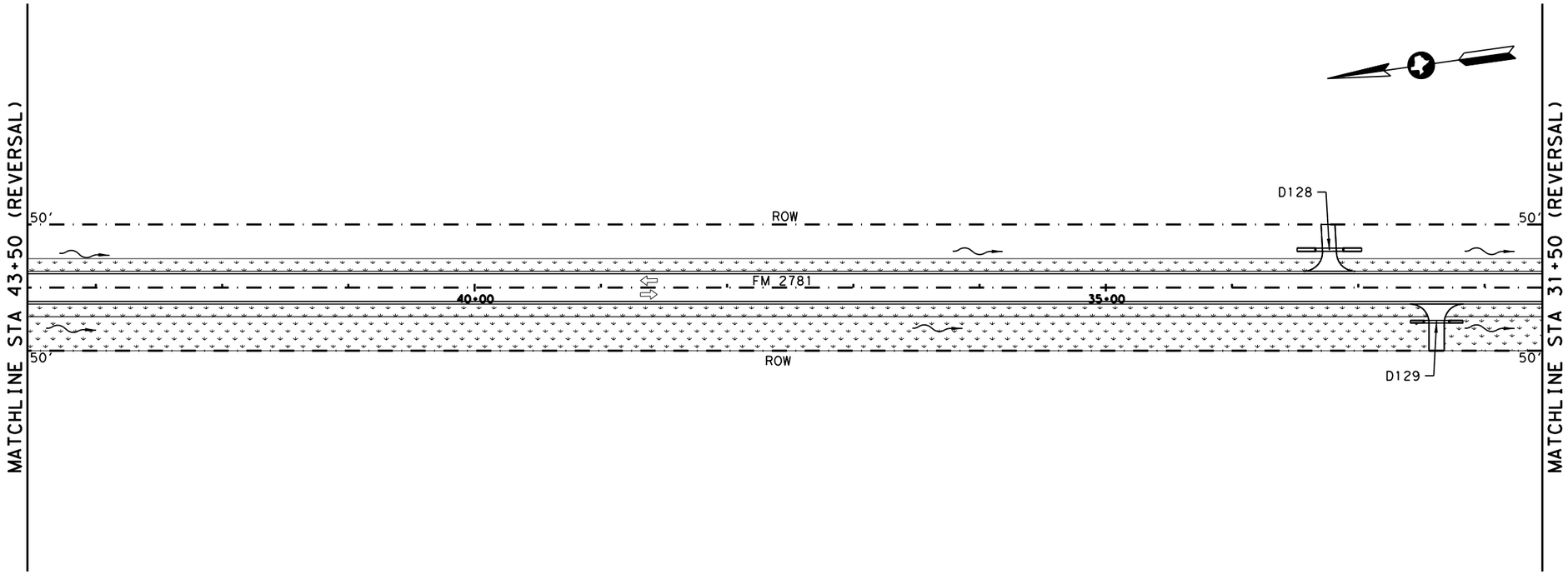
TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 26 OF 28

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781

DIST	COUNTY	SHEET NO.
LFK	HOUSTON, ETC.	159

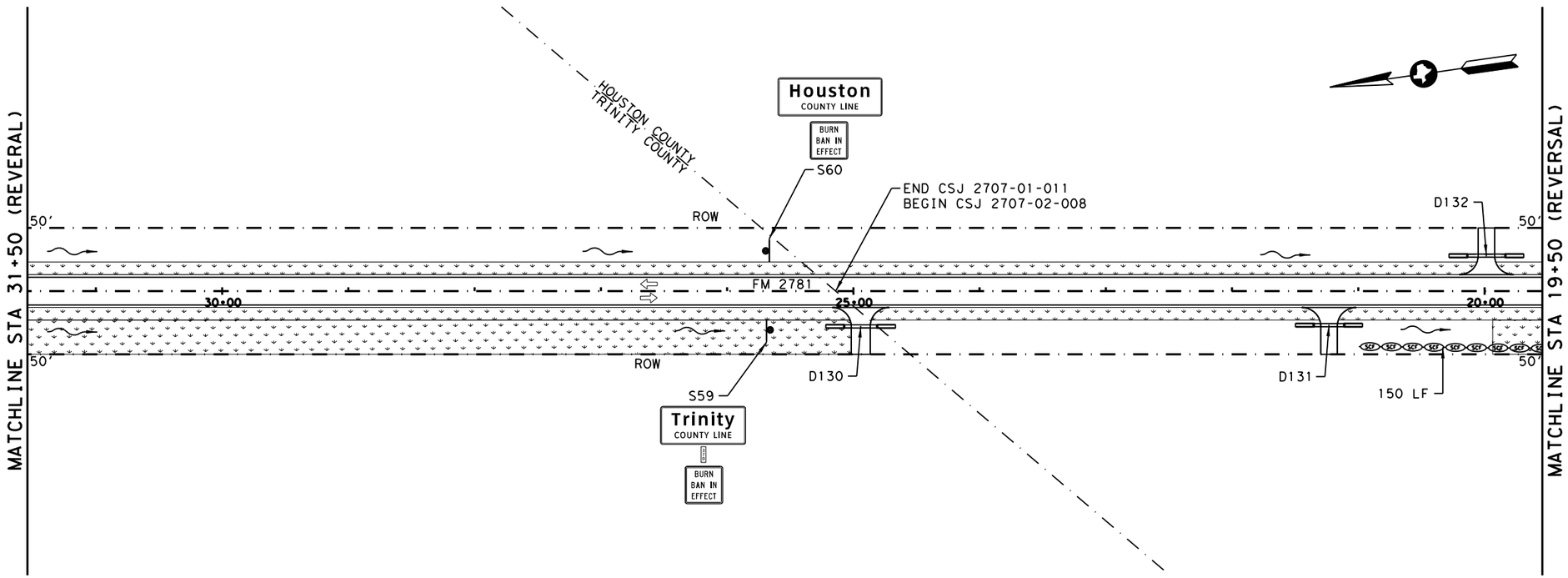
9/2/2022 3:15:13 PM
c:\txdot\pw+online\txdot3\cathy.loerch\d0361223\Plan Layout-26.dgn



LEGEND

- RFD2 — ROCK FILTER DAM (TY 2)
- SCF — SEDIMENT CONT FENCE
- CONSTRUCTION EXIT
- SEEDING/SOIL DISTURBANCE
- HIGH POINT
- FLOW DIRECTION
- DXX - DRIVEWAY I.D.
- CXX - CULVERT I.D.
- SXX - SIGN I.D.

NOTE: LOCATIONS OF CONSTRUCTION EXITS MAY BE ADJUSTED IN THE FIELD AS DIRECTED BY THE ENGINEER.



SCALE 1" = 100'

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED
PROFESSIONAL ENGINEER

DocuSigned by:
AF852E728A5C4C9...
9/22/2022

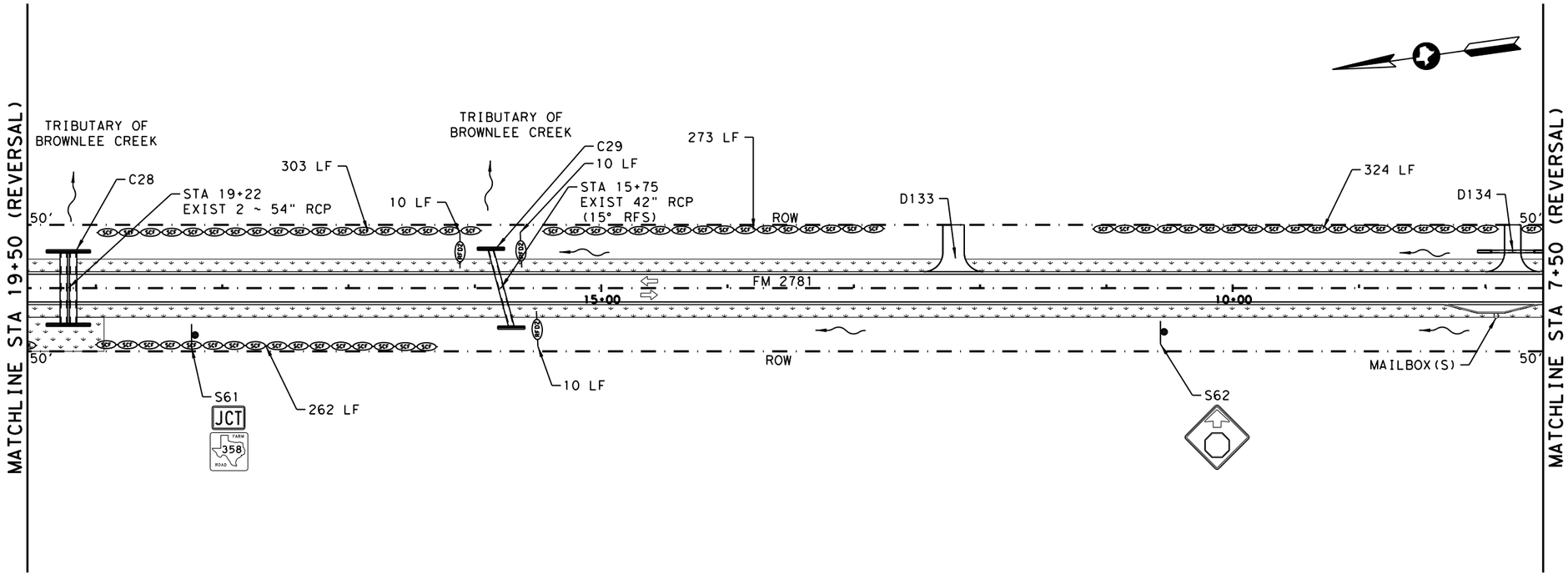
SWP3 LAYOUTS

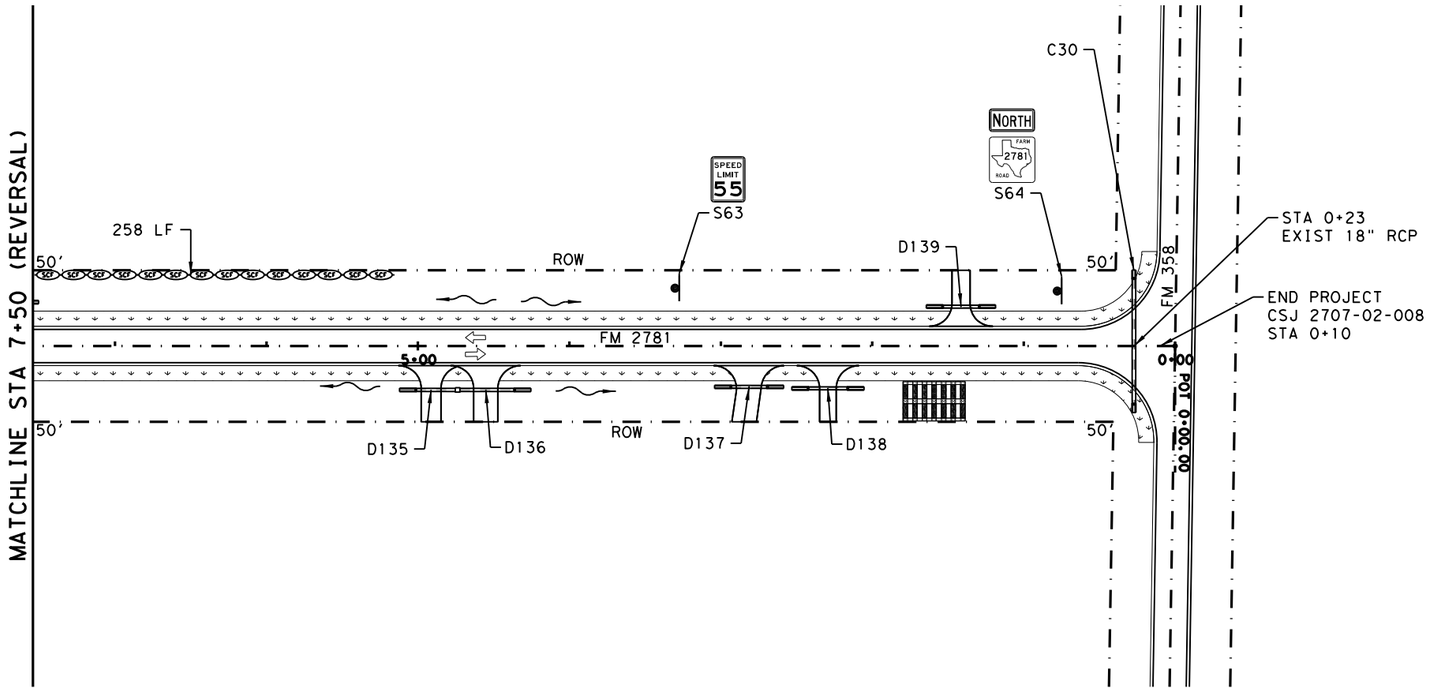
TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 27 OF 28

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		160

9/20/2022 11:56:00 AM
c:\txdot\pw*online\txdot3\sergio.zapata\d0361223\Plan Layout-27.dgn





LEGEND

- RFD2 — ROCK FILTER DAM (TY 2)
- SCF — SEDIMENT CONT FENCE
- CONSTRUCTION EXIT
- SEEDING/SOIL DISTURBANCE
- HIGH POINT
- FLOW DIRECTION
- DXX - DRIVEWAY I.D.
- CXX - CULVERT I.D.
- SXX - SIGN I.D.

NOTE: LOCATIONS OF CONSTRUCTION EXITS MAY BE ADJUSTED IN THE FIELD AS DIRECTED BY THE ENGINEER.

SCALE 1" = 100'

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED PROFESSIONAL ENGINEER

DocuSigned by:
AF852E728AFC4C9...
9/22/2022

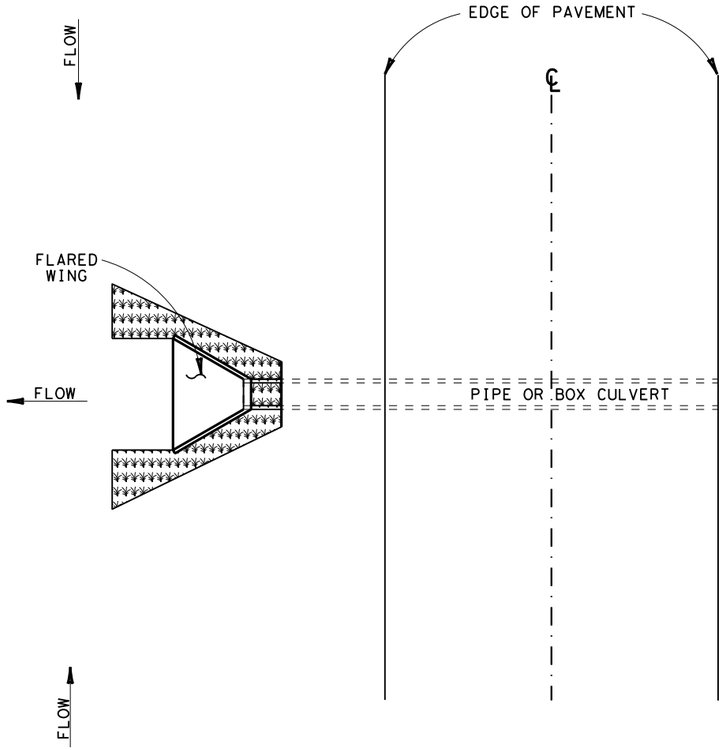
SWP3 LAYOUTS

TEXAS DEPARTMENT OF TRANSPORTATION

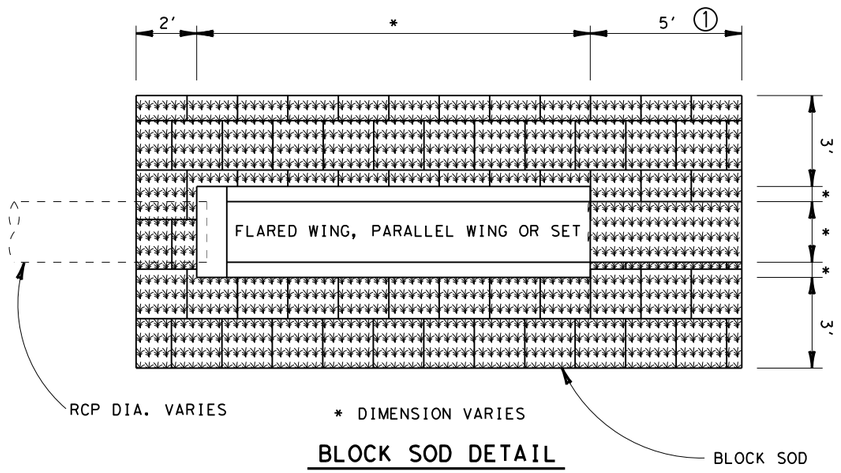
SHEET 28 OF 28

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		161

9/20/2022 12:07:01 PM
c:\txdot\pw*online\txdot3\sergio.zapata\d0361223\Plan Layout-28.dgn

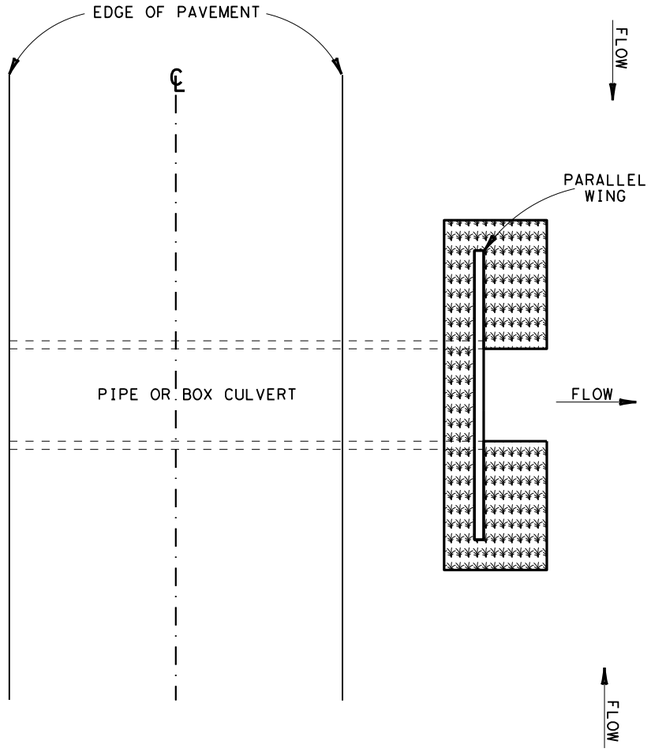


FLARED WING CROSS DRAINAGE DETAIL ①

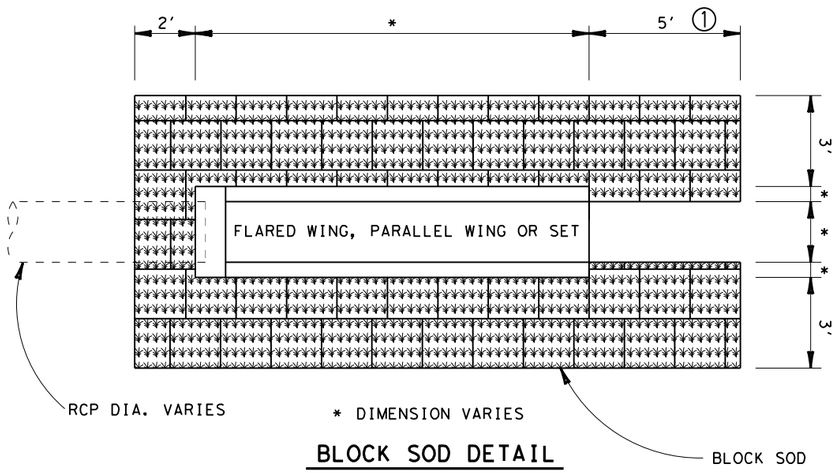


BLOCK SOD DETAIL

PLACE AT ALL PARALLEL CULVERTS WHERE WORK IS PROPOSED.



PARALLEL WING CROSS DRAINAGE DETAIL ①



BLOCK SOD DETAIL

PLACE AT ALL CROSSROAD CULVERTS WHERE WORK IS PROPOSED.
DO NOT PLACE SOD DIRECTLY IN THE CHANNEL.

SYMBOL	DESCRIPTION
	BLOCK SODDING

① DO NOT PLACE BLOCK SOD WHERE RIPRAP (STONE COMMON) IS INSTALLED.

N. T. S.

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED PROFESSIONAL ENGINEER

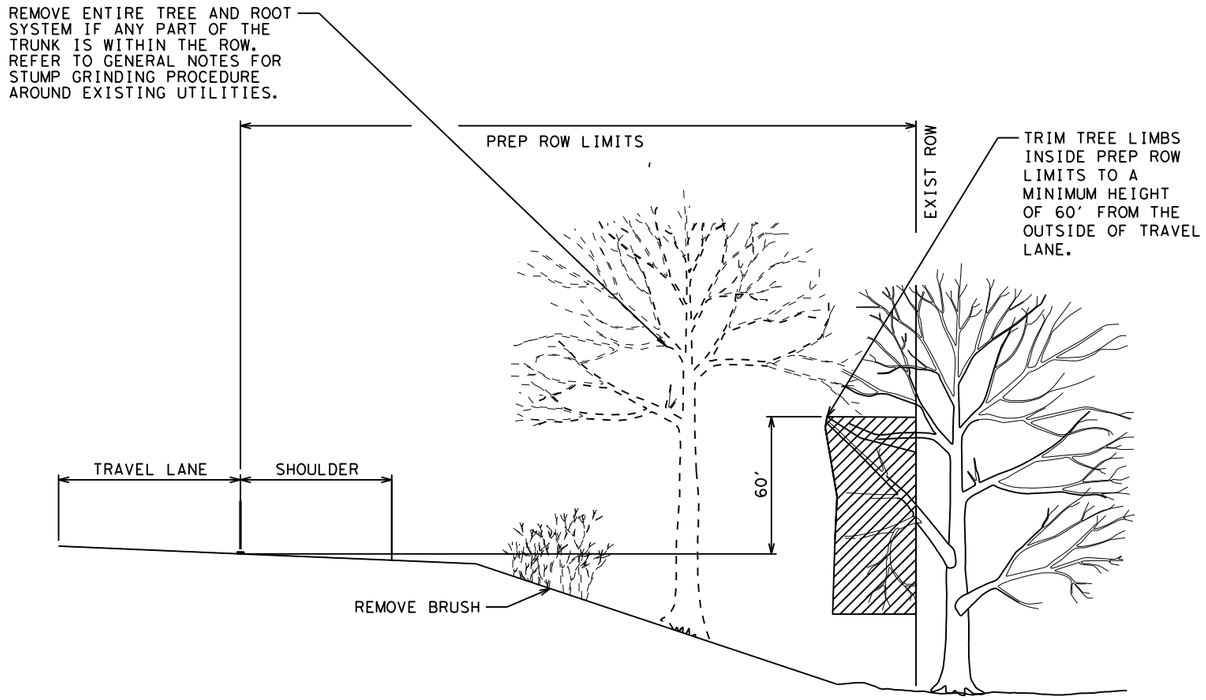
DocuSigned by:
cmb, P.E.
AF852E728A5C46C...
8/5/2022

BLOCK SOD DETAILS

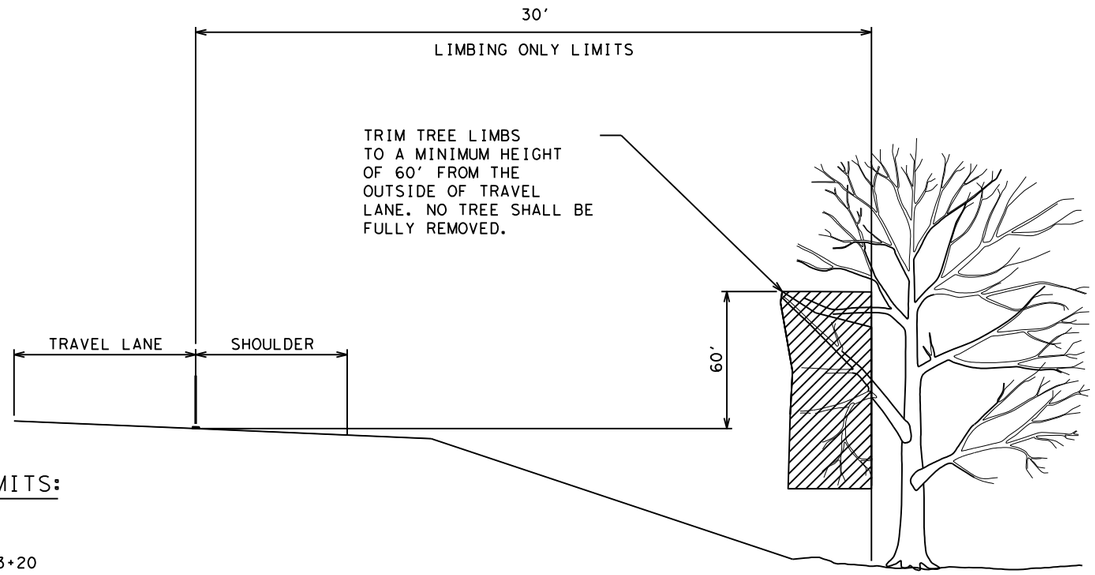
TEXAS DEPARTMENT OF TRANSPORTATION

CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		162

8/5/2022 1:20:00 PM
c:\txdot\pw\online\txdot3\sergio.zapata\d0361229\BLOCK SOD DETAILS.dgn



TYPICAL REMOVAL AND TRIM DETAIL



DAVY CROCKETT NATIONAL FOREST LIMITS:

LEFT SIDE OF FM 2781

STA 79+00 TO STA 150+00; STA 156+60 TO STA 163+20
STA 180+20 TO STA 202+30; STA 238+50 TO STA 242+30
STA 299+80 TO STA 334+00; STA 392+70 TO STA 469+10

RIGHT SIDE OF FM 2781

STA 77+00 TO STA 128+50; STA 137+00 TO STA 146+50
STA 156+80 TO STA 163+20; STA 177+90 TO STA 202+30
STA 231+50 TO STA 242+40; STA 280+80 TO STA 334+00
STA 392+70 TO STA 167+50 (REVERSAL)

TYPICAL REMOVAL AND TRIM DETAIL INSIDE DAVY CROCKETT NATIONAL FOREST

SCALE 1" = 100'

STATE OF TEXAS
CHARLES M. BRAZIL
112704
LICENSED PROFESSIONAL ENGINEER

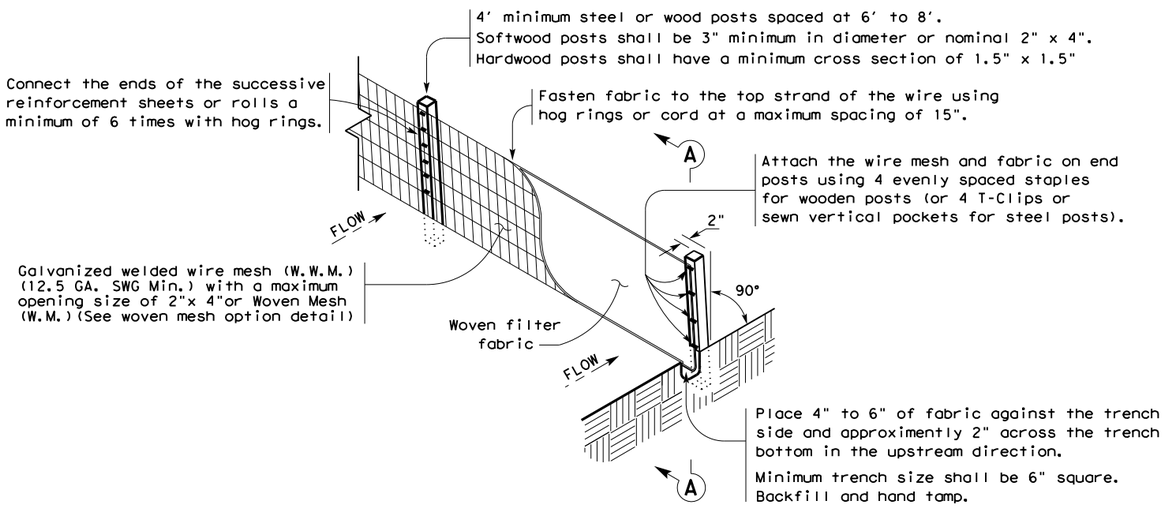
DocuSigned by:
AF852E728AEC4C8...
9/2/2022

TREE REMOVAL AND TRIMMING DETAILS

TEXAS DEPARTMENT OF TRANSPORTATION

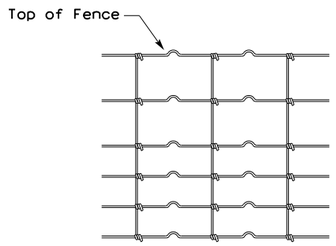
CONT	SECT	JOB	HIGHWAY
2707	01	011, ETC.	FM 2781
DIST	COUNTY		SHEET NO.
LFK	HOUSTON, ETC.		163

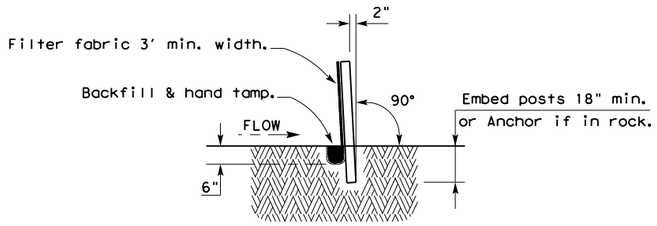
9/1/2022 11:32:38 AM
c:\txdot\pw*online\txdot3\sergio.zapata\d0361229\TREE REMOVAL AND TRIMMING DETAILS.DGN



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.

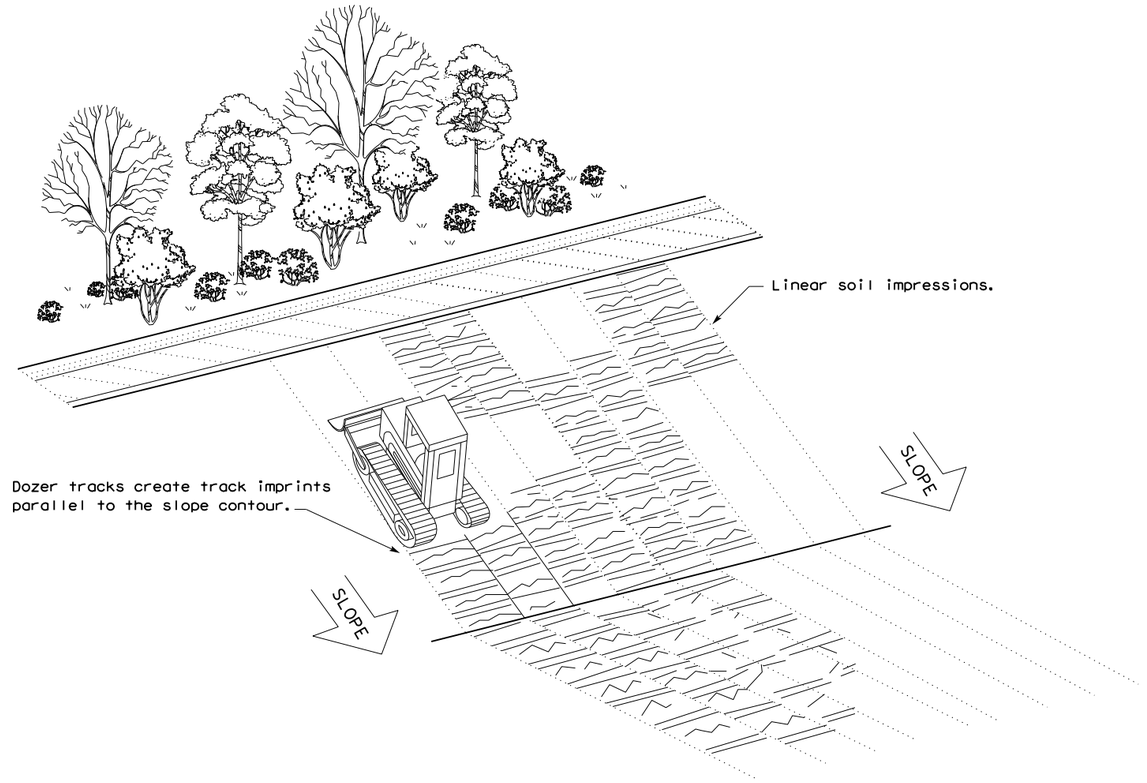
LEGEND

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

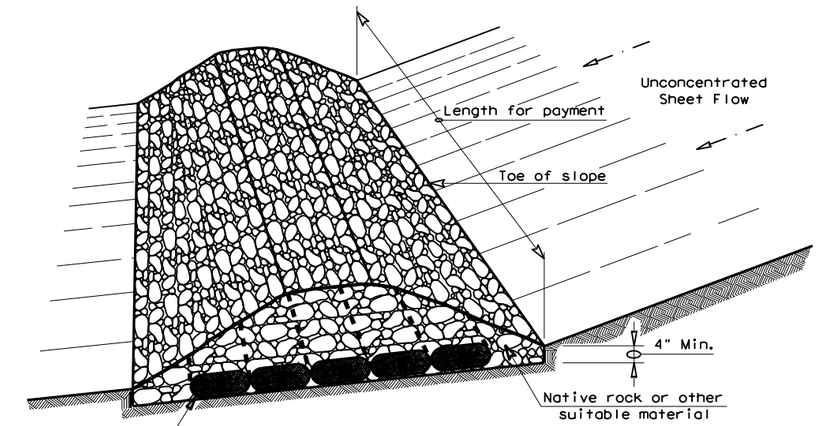
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

FENCE & VERTICAL TRACKING

EC(1)-16

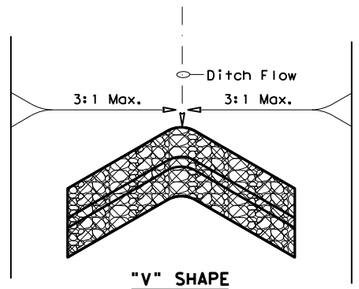
FILE: ec116	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	2707	01	011, ETC.	FM 2781
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON, ETC.		164

DATE: 8/5/2022
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0361229\ec216.dgn

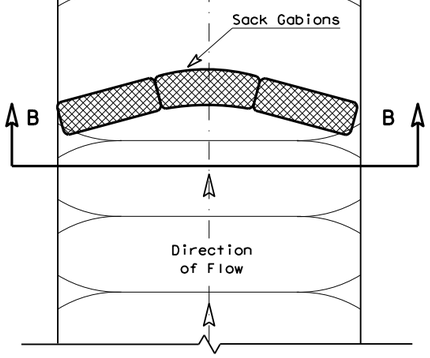


FILTER DAM AT TOE OF SLOPE

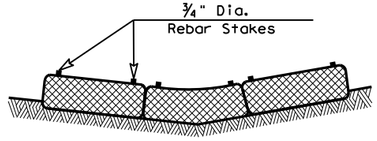
RFD1



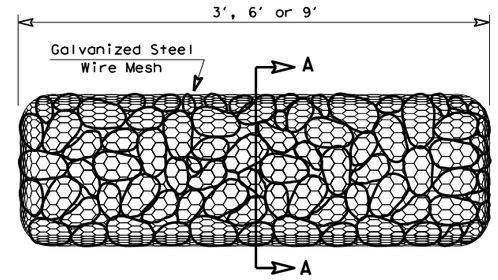
"V" SHAPE
PLAN VIEW



PLAN VIEW

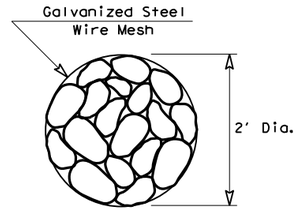


SECTION B-B

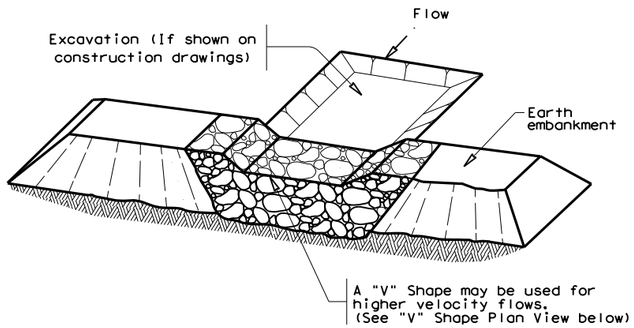


TYPE 4 (SACK GABIONS)

RFD4

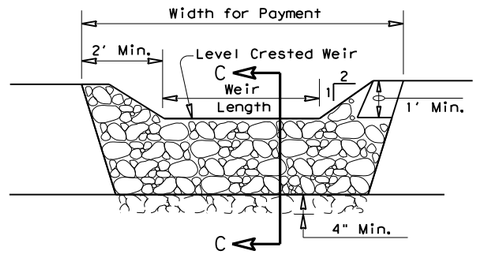


SECTION A-A

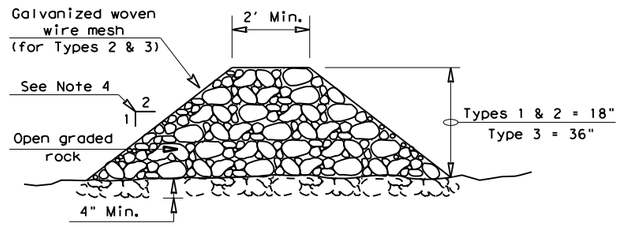


FILTER DAM AT SEDIMENT TRAP

RFD1 OR RFD2



PROFILE



SECTION C-C

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.

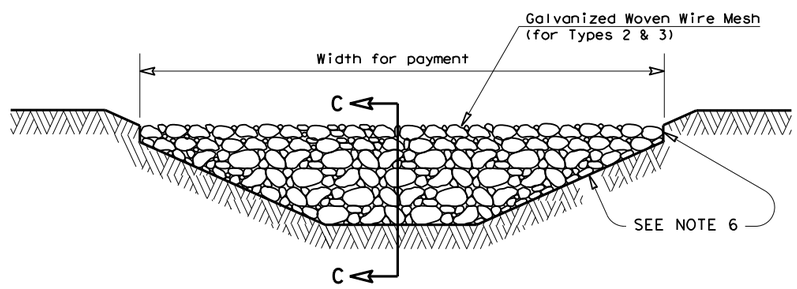
Type 1 (18" high with no wire mesh) (3" to 6" aggregate): Type 1 may be used at the toe of slopes, around inlets, in small ditches, and at dike or swale outlets. This type of dam is recommended to control erosion from a drainage area of 5 acres or less. Type 1 may not be used in concentrated high velocity 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.



FILTER DAM AT CHANNEL SECTIONS

RFD1 OR RFD2 OR RFD3

GENERAL NOTES

1. If shown on the plans or directed by the Engineer, filter dams should be placed near the toe of slopes where erosion is anticipated, upstream and/or downstream at drainage structures, and in roadway ditches and channels to collect sediment.
2. Materials (aggregate, wire mesh, sandbags, etc.) shall be as indicated by the specification for "Rock Filter Dams for Erosion and Sedimentation Control".
3. The rock filter dam dimensions shall be as indicated on the SW3P plans.
4. Side slopes should be 2:1 or flatter. Dams within the safety zone shall have sideslopes of 6:1 or flatter.
5. Maintain a minimum of 1' between top of rock filter dam weir and top of embankment for filter dams at sediment traps.
6. Filter dams should be embedded a minimum of 4" into existing ground.
7. The sediment trap for ponding of sediment laden runoff shall be of the dimensions shown on the plans.
8. Rock filter dam types 2 & 3 shall be secured with 20 gauge galvanized woven wire mesh with 1" diameter hexagonal openings. The aggregate shall be placed on the mesh to the height & slopes specified. The mesh shall be folded at the upstream side over the aggregate and tightly secured to itself on the downstream side using wire ties or hog rings. For in stream use, the mesh should be secured or staked to the stream bed prior to aggregate placement.
9. Sack Gabions should be staked down with ¾" dia. rebar stakes, and have a double-twisted hexagonal weave with a nominal mesh opening of 2 ½" x 3 ¼"
10. Flow outlet should be onto a stabilized area (vegetation, rock, etc.).
11. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

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

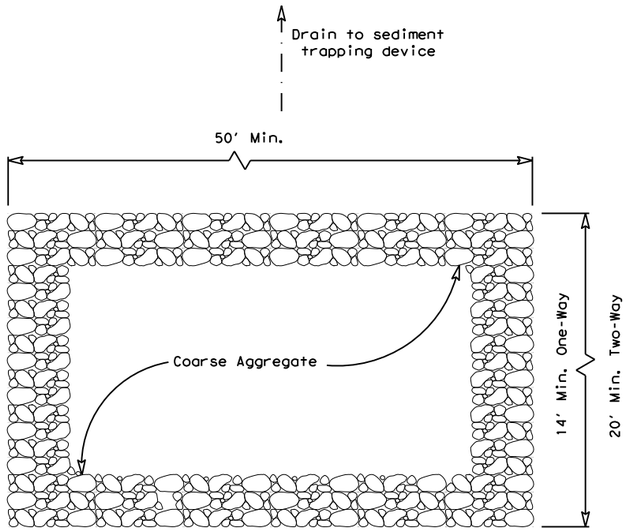
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

ROCK FILTER DAMS

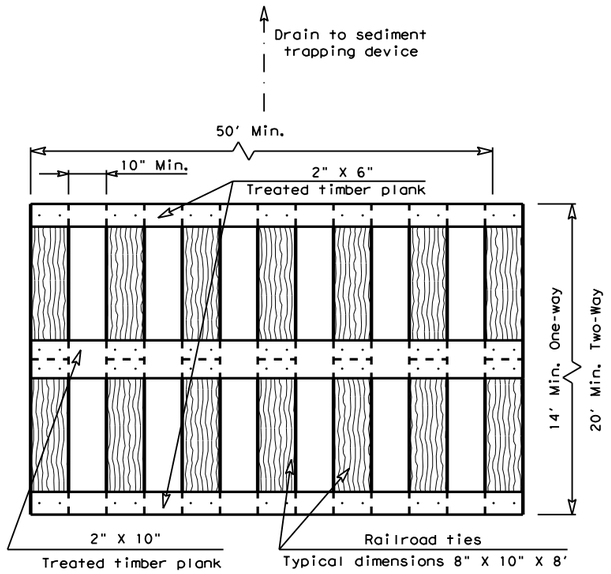
EC(2)-16

FILE: ec216	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	2707	01	011, ETC.	FM 2781
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON, ETC.		165

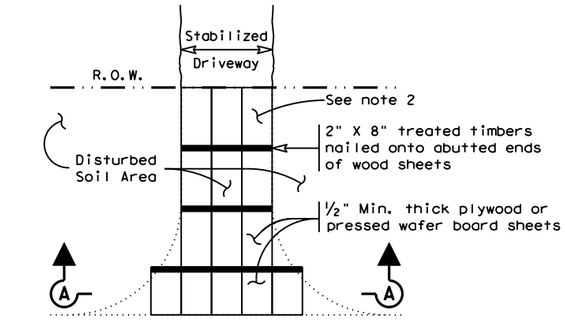
DATE: 8/5/2022
FILE: c:\txdot\pw_online\txdot3\sergio.zapata\d0361229\ec316.dgn



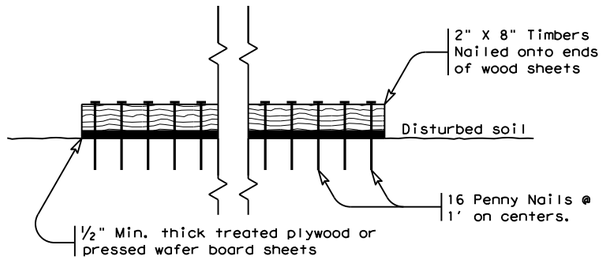
PLAN VIEW



PLAN VIEW



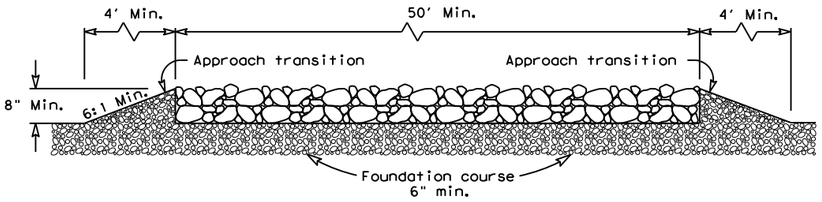
PLAN VIEW



SECTION A-A

CONSTRUCTION EXIT (TYPE 3)

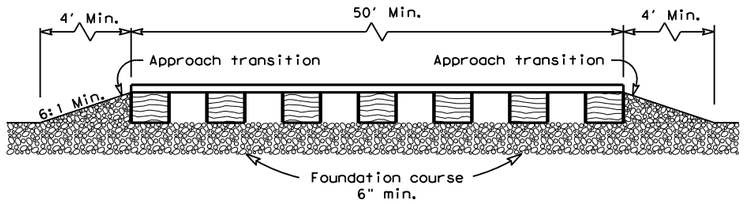
SHORT TERM



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
©TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	2707	01	011, ETC.	FM 2781
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON, ETC.		166