

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT NO.		
6	TEXAS	HARRIS	C 389-13-39		
STATE DIST. NO.	HIGHWAY NO.	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
12	SH 146	0389	13	039	1

INDEX OF SHEETS
SEE SHEETS 2-3 FOR INDEX OF SHEETS

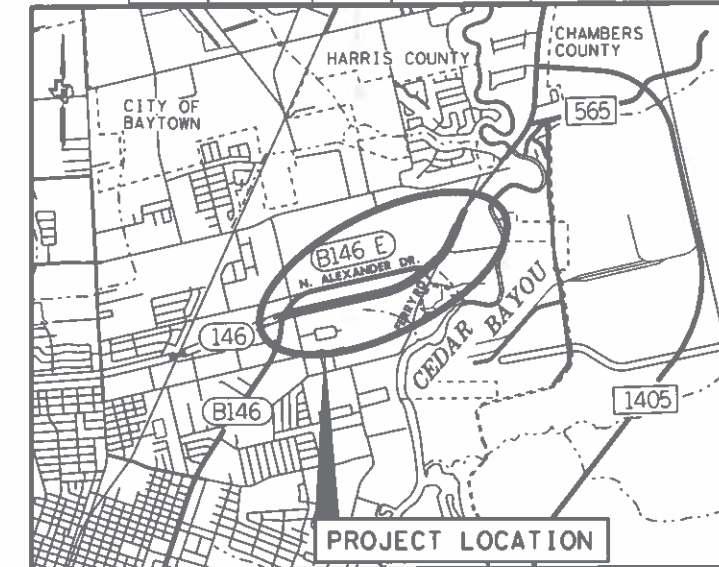
STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
SH 146

PROJECT ID #: C 389-13-39
CSJ: 0389-13-039
SH 146
HARRIS COUNTY
LIMITS: FROM FERRY RD TO BS 146E
FOR THE CONSTRUCTION OF SH 146

CONSISTING OF:
THE CONSTRUCTION OF THE GRADE SEPARATION (OVERPASS) AT N. ALEXANDER DR, AN URBAN FREEWAY FACILITY, COMPRISING OF GRADING, RETAINING WALLS, CONTINUOUSLY REINFORCED CONCRETE PAVEMENT, INLETS AND STORM SEWERS, MISCELLANEOUS DRAINAGE STRUCTURES, RECONFIGURE RAMP, AND TRAFFIC SIGNAL AT BAYTOWN LOOP INTERSECTION ON THE NORTH SIDE OF SH 146.

NET LENGTH OF PROJECT : 7,591 FT = 1.438 MILES
ROADWAY 7271 FT = 1.377 MILES
BRIDGES 320.00 FT = 0.061 MILES

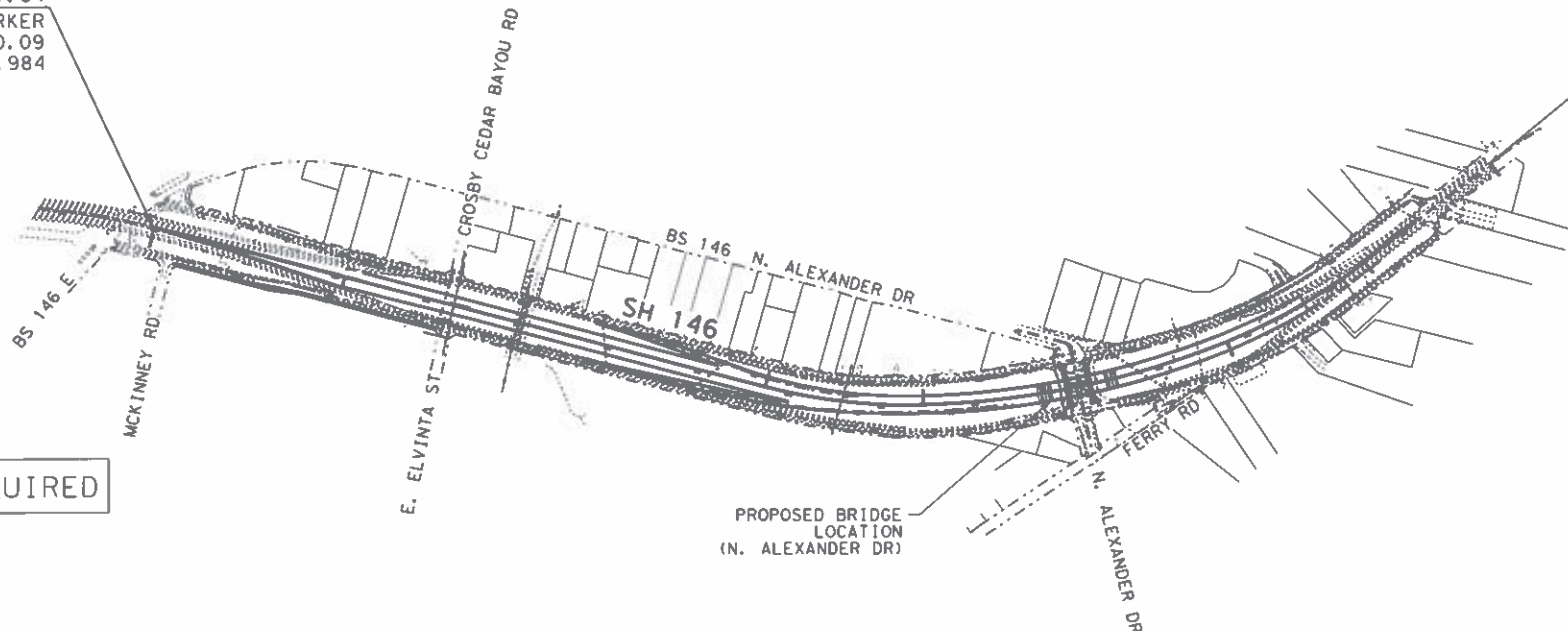


VICINITY MAP
NOT TO SCALE

BEGIN PROJECT
BEGIN CSJ: 0389-13-039
@ SH 146 STA 545+00.00
N=13,846,315.06
E=3,256,141.64
REFERENCE MARKER
484+0.09
MP: 10.984

END PROJECT
END CSJ: 0389-13-039
@ SH 146 STA 620+91.23
N=13,849,805.77
E=3,262,369.07
REFERENCE MARKER
482+0.997
MP: 10.010

DESIGN SPEED: MAINLANES (FREEWAY) = 60 MPH
FRONTAGE ROAD (URBAN COLLECTOR) = 45 MPH
RAMPS = 45 MPH
ADT: (2017): 42,000
ADT: (2022): 44,300
ADT: (2042): 54,800
ADT: (2052): 65,200



LAYOUT MAP

SCALE: 1"=1000'

EQUATIONS : NONE
EXCEPTIONS : NONE
RAILROAD CROSSINGS : NONE

TDLR NOT REQUIRED

NOTES:

SEE TRAFFIC CONTROL PLANS FOR BARRICADES AND WARNING SIGNS.

ALL CURVE DATA BASED UPON ARC DEFINITION.

ALL BEARINGS AND COORDINATES SHOWN HEREON ARE BASED ON THE TEXAS COORDINATE SYSTEM, SOUTH CENTRAL ZONE (4204), NORTH AMERICAN DATUM OF 1983, (NAD 83), 2011 ADJUSTMENT, EPOCH 2010.00. ALL DISTANCES AND COORDINATES SHOWN ARE SURFACE AND MAY BE CONVERTED TO GRID BY DIVIDING BY A COMBINED ADJUSTMENT FACTOR OF 1.00013. ALL ELEVATIONS ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) THE UNIT OF MEASURE IS US SURVEY FEET. ADD ALL HELD MONUMENTS USED WITH N, E AND ELEVATION.

ATTACHMENT NO. 01-20 TO SPECIAL AGREEMENT FOR CONSTRUCTION, MAINTENANCE AND OPERATION OF CONTINUOUS HIGHWAY ILLUMINATION SYSTEM WITHIN MUNICIPALITIES, DATED JULY 28, 1989. THE CITY-STATE CONSTRUCTION, MAINTENANCE, AND OPERATION RESPONSIBILITIES SHALL BE HERETOFORE AGREED TO, ACCEPTED, AND SPECIFIED IN THE AGREEMENT TO WHICH THESE PLANS ARE MADE APART.

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

PREPARED BY:

CivilTech
Engineering, Inc.

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



Prakash Shrestha, P.E.
3/7/2022



TEXAS DEPARTMENT OF TRANSPORTATION

SUBMITTED FOR LETTING 4/11/2022

Ng Quang, P.E.
PROJECT ENGINEER

APPROVED DocuSigned by: 4/20/2022

James Koch, P.E.
FOR 8A2ACFA465C24CC...

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SHEET NO. DESCRIPTION

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- 6 - 8 PROPOSED TYPICAL SECTIONS
- 9 PROPOSED RAMP TYPICAL SECTIONS
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- 11, 11A-11C ESTIMATE AND QUANTITY
- 12 SUMMARY OF TCP QUANTITIES
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- 14 SUMMARY OF ROADWAY & EARTHWORK QUANTITIES
- 15 SUMMARY OF RETAINING WALL & SOUND WALL QUANTITIES
- 16 SUMMARY OF DRAINAGE QUANTITIES
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- 19 SUMMARY OF PAVEMENT MARKING AND SIGNING QUANTITIES
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- * TCP(2-1)-18 TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK
- * TCP(2-6)-18 TRAFFIC CONTROL PLAN LANE CLOSURES FOR DIVIDED HIGHWAYS
- * TCP(3-1)-13 TRAFFIC CONTROL PLAN MOBILITY OPERATIONS UNDIVIDED HIGHWAYS
- * TCP(3-2)-13 TRAFFIC CONTROL PLAN MOBILITY OPERATIONS DIVIDED HIGHWAYS
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SHEET NO. DESCRIPTION

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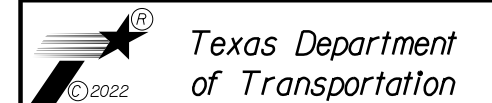
THE STANDARD SHEETS SPECIFICALLY IDENTIFIED WITH A SIGN (*) HAVE BEEN SELECTED BY ME, OR UNDER MY RESPONSIBLE SUPERVISION AS BEING APPLICABLE TO THIS PROJECT.

Prakash Shrestha, P.E.
 PRAKASH SHRESTHA 2/18/2022
 DATE



Prakash Shrestha, P.E.
 2/18/2022

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SH 146

INDEX OF SHEETS

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FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			2
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

CURVE 146WBRMP11
 P.I. STATION 12+30.64
 X = 3,258,529.8225
 Y = 13,846,953.5125
 DELTA = 4°47'31.13" (RT)
 DEGREE = 1°54'35.49"
 TANGENT = 125.5269
 LENGTH = 250.9075
 RADIUS = 3,000.0000
 EXTERNAL = 2.6250
 LONG CHORD = 250.8344
 MID. ORD. = 2.6227
 P.C. STATION 11+05.11
 P.T. STATION 13+56.05

CURVE 146WBRMP12
 P.I. STATION 22+83.91
 X = 3,259,638.2427
 Y = 13,847,083.0488
 DELTA = 14°11'09.13" (LT)
 DEGREE = 2°29'28.04"
 TANGENT = 286.1921
 LENGTH = 569.4573
 RADIUS = 2,300.0000
 EXTERNAL = 17.7372
 LONG CHORD = 568.0039
 MID. ORD. = 17.6015
 P.C. STATION 19+97.72
 P.T. STATION 25+67.18

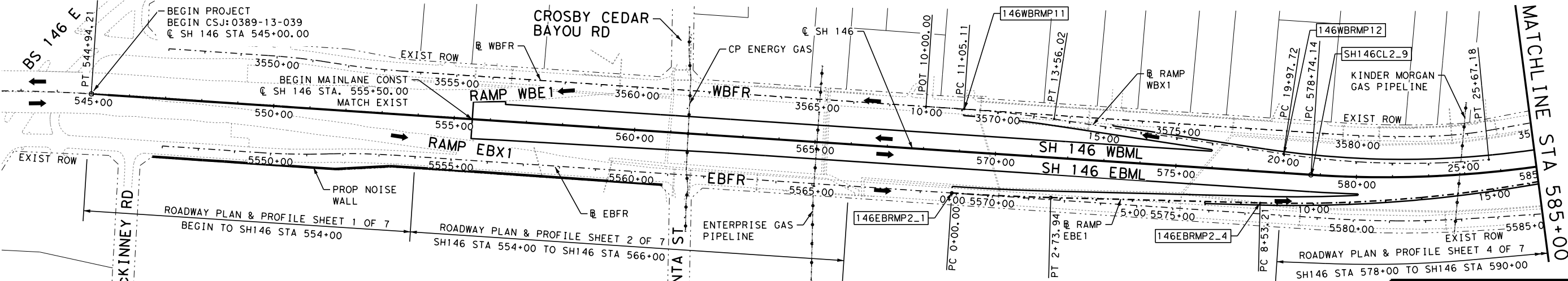
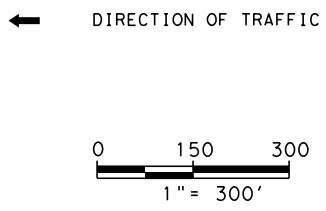
CURVE 146EBRMP2_1
 P.I. STATION 1+36.99
 X = 3,258,634.7825
 Y = 13,846,723.2206
 DELTA = 2°25'19.66" (LT)
 DEGREE = 0°53'03.10"
 TANGENT = 136.9885
 LENGTH = 273.9362
 RADIUS = 6,480.0000
 EXTERNAL = 1.4478
 LONG CHORD = 273.9158
 MID. ORD. = 1.4475
 P.C. STATION 0+00.00
 P.T. STATION 2+73.94

CURVE 146EBRMP2_4
 P.I. STATION 12+50.72
 X = 3,259,714.1498
 Y = 13,846,997.8972
 DELTA = 11°59'37.59" (LT)
 DEGREE = 1°30'50.97"
 TANGENT = 397.5066
 LENGTH = 792.1081
 RADIUS = 3,784.0000
 EXTERNAL = 20.8216
 LONG CHORD = 790.6626
 MID. ORD. = 20.7077
 P.C. STATION 8+53.21
 P.T. STATION 16+45.32

CURVE 146EBRMP2_7
 P.I. STATION 20+07.49
 X = 3,260,395.3626
 Y = 13,847,334.1492
 DELTA = 7°35'15.33" (LT)
 DEGREE = 1°09'39.63"
 TANGENT = 327.2456
 LENGTH = 653.5344
 RADIUS = 4,935.0000
 EXTERNAL = 10.8381
 LONG CHORD = 653.0569
 MID. ORD. = 10.8144
 P.C. STATION 16+80.25
 P.T. STATION 23+33.78

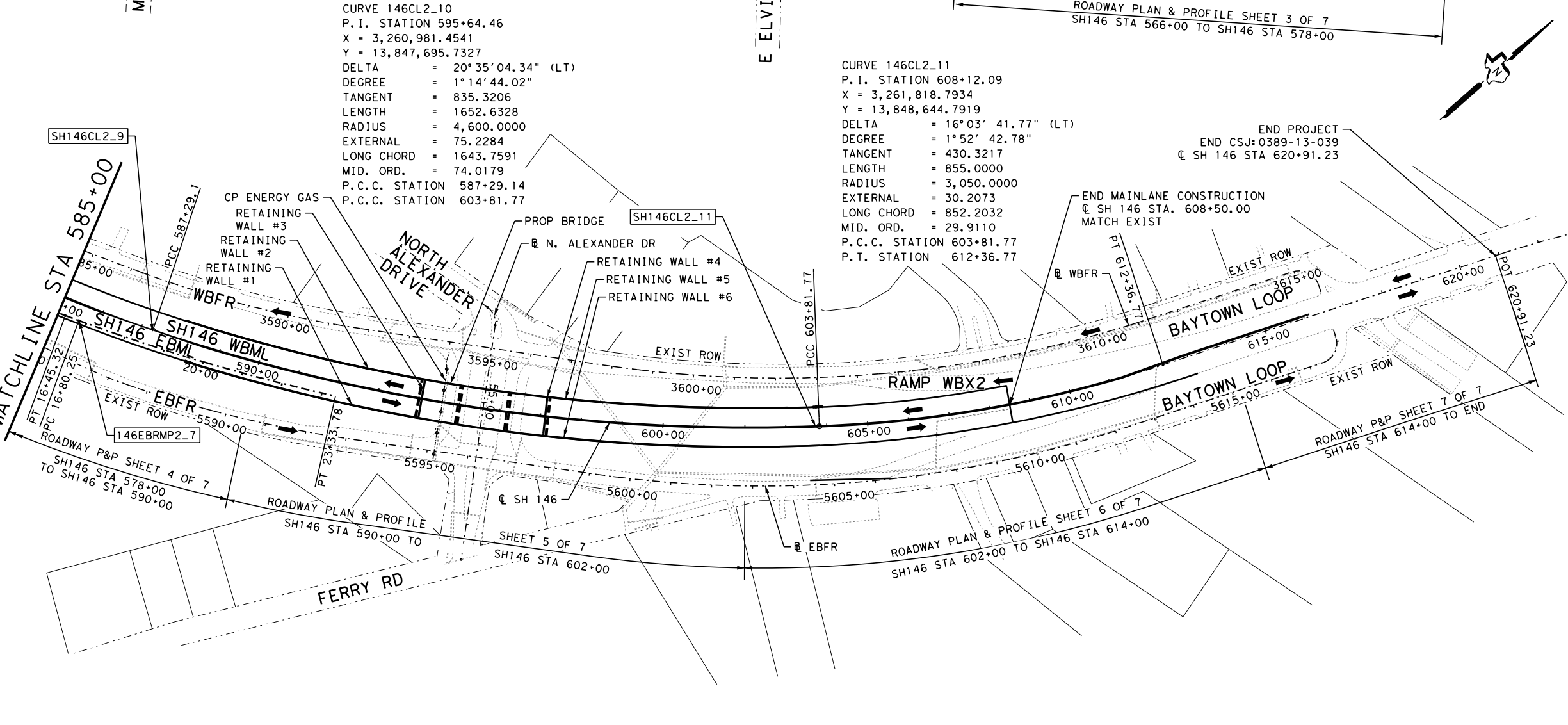
CURVE 146CL2_9
 P.I. STATION 583+04.46
 X = 3,259,863.8964
 Y = 13,847,101.6661
 DELTA = 16°03'41.77" (LT)
 DEGREE = 1°52'42.78"
 TANGENT = 430.3217
 LENGTH = 855.0000
 RADIUS = 3,050.0000
 EXTERNAL = 30.2073
 LONG CHORD = 852.2032
 MID. ORD. = 29.9110
 P.C. STATION 578+74.14
 P.C.C. STATION 587+29.14

LEGEND



CURVE 146CL2_10
 P.I. STATION 595+64.46
 X = 3,260,981.4541
 Y = 13,847,695.7327
 DELTA = 20°35'04.34" (LT)
 DEGREE = 1°14'44.02"
 TANGENT = 835.3206
 LENGTH = 1652.6328
 RADIUS = 4,600.0000
 EXTERNAL = 75.2284
 LONG CHORD = 1643.7591
 MID. ORD. = 74.0179
 P.C.C. STATION 587+29.14
 P.C.C. STATION 603+81.77

CURVE 146CL2_11
 P.I. STATION 608+12.09
 X = 3,261,818.7934
 Y = 13,848,644.7919
 DELTA = 16°03'41.77" (LT)
 DEGREE = 1°52'42.78"
 TANGENT = 430.3217
 LENGTH = 855.0000
 RADIUS = 3,050.0000
 EXTERNAL = 30.2073
 LONG CHORD = 852.2032
 MID. ORD. = 29.9110
 P.C.C. STATION 603+81.77
 P.T. STATION 612+36.77



REV. NO.	DATE	BY	REVISION

PRAKASH SHRESTHA
 95323
 LICENSED PROFESSIONAL ENGINEER

Prakash Shrestha, P.E.
 1/6/2022

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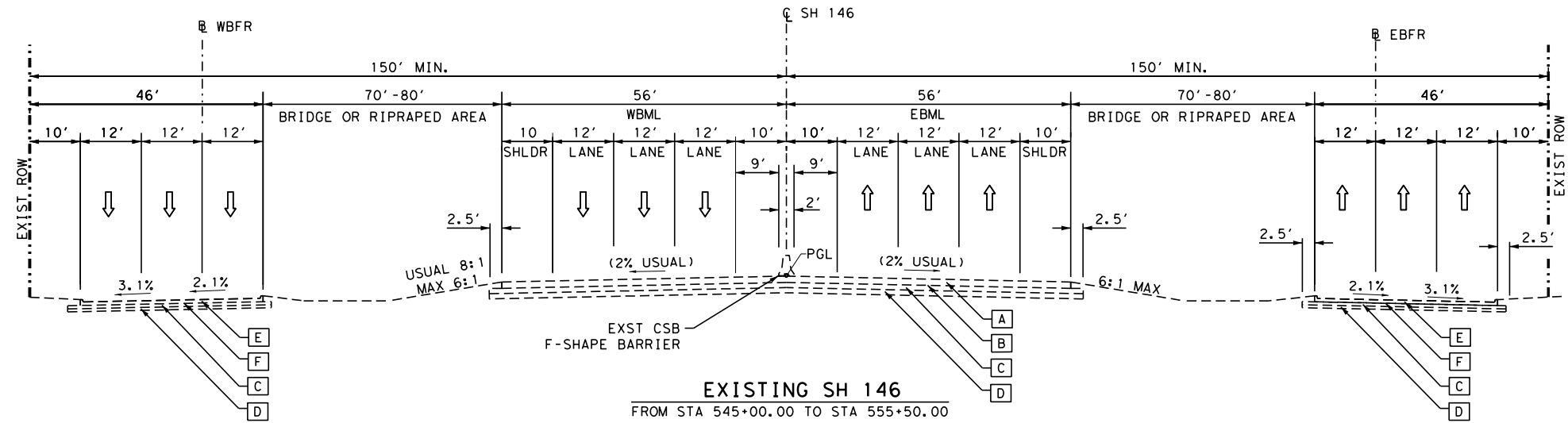


**SH 146
 PROJECT LAYOUT**

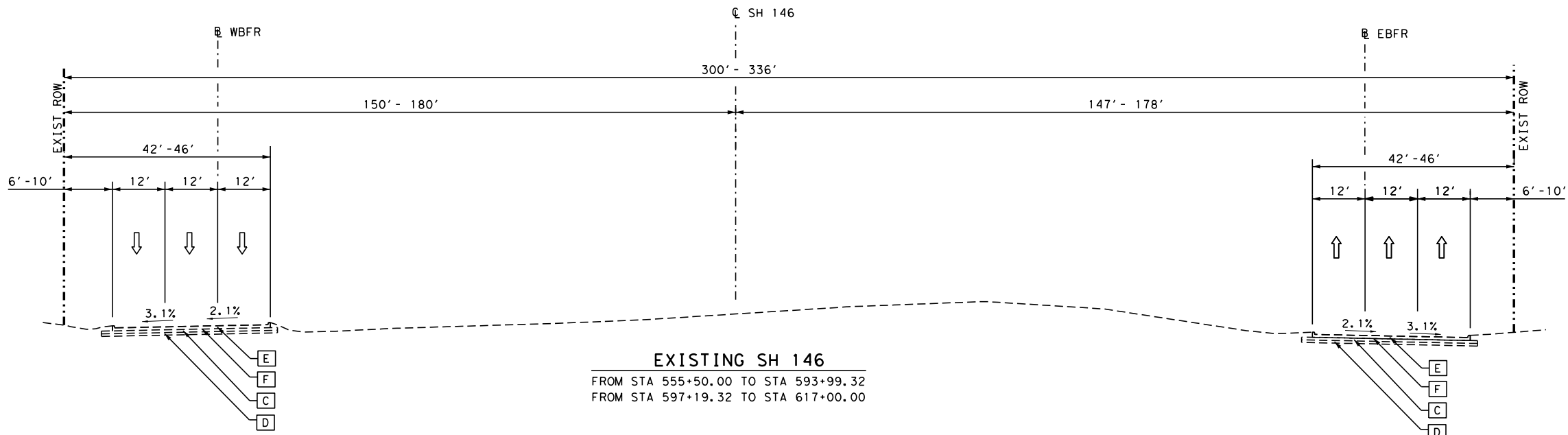
SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6	0389 13 039		4
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

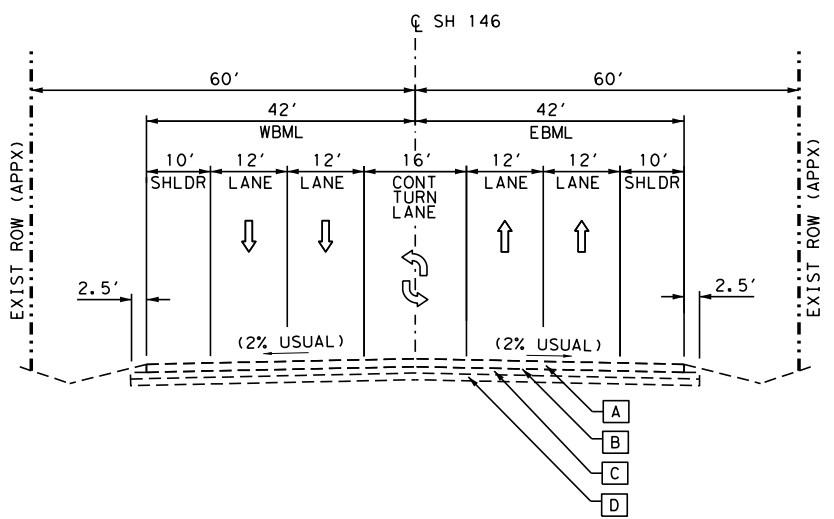
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EXISTING SH 146
FROM STA 545+00.00 TO STA 555+00.00



EXISTING SH 146
FROM STA 555+50.00 TO STA 593+99.32
FROM STA 597+19.32 TO STA 617+00.00



EXISTING SH 146
FROM STA 617+00.00 TO STA 620+91.23

LEGEND

- ← PROPOSED TRAFFIC
- ⇌ EXISTING TRAFFIC
- A 11" CONCRETE PAVEMENT (CRCP)
- B 1" ASPHALT STABILIZED BASE (ASB)
- C 6" CEMENT STABILIZED BASE (CSB)
- D 6" LIME TREATED SUBGRADE (LTS)
- E 8" CONCRETE PAVEMENT (CRCP)
- F 3/4" ASPHALT STABILIZED BASE (ASB)

NOTES:

1. THE CROSS SLOPES AND OTHER SLOPES SHOWN ON THE SECTIONS ARE TYPICAL AND VARY AT LOCATIONS.
2. FOR MORE INFORMATION ON PAVEMENTS, REFER TO 'ROADWAY MISCELLANEOUS DETAILS' SHEET 123

REV. NO.	DATE	BY	REVISION

PRAKASH SHRESTHA
95323
LICENSED PROFESSIONAL ENGINEER

Prakash Shrestha, P.E.
2/17/2022

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Texas Department of Transportation

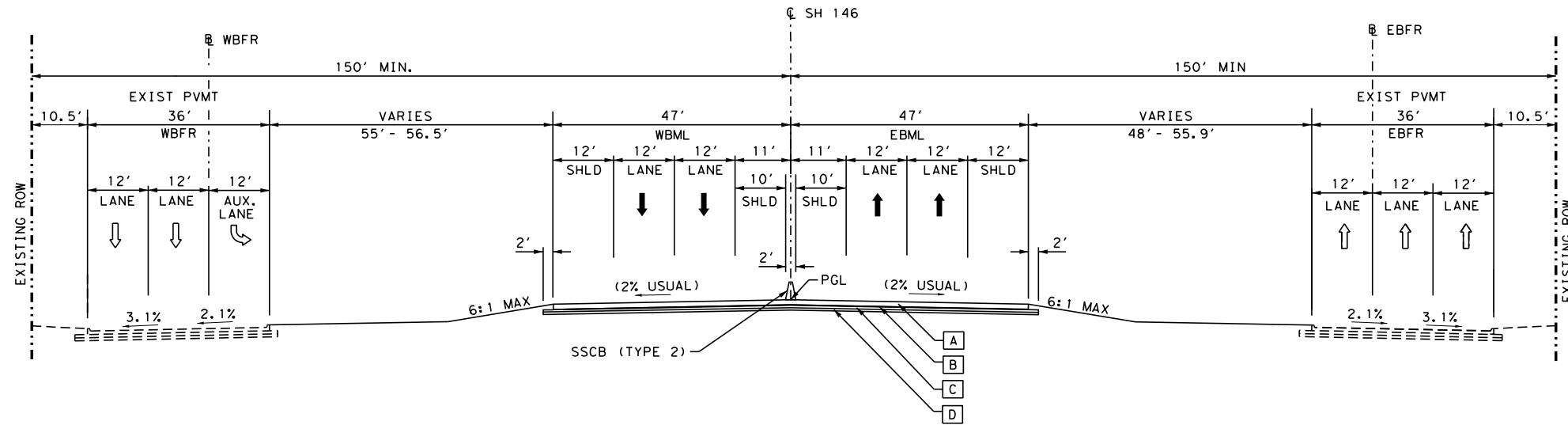
SH 146
EXISTING TYPICAL SECTIONS

N. T. S.		SHEET 1 OF 1	
FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.	SHEET NO. 5	
STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146

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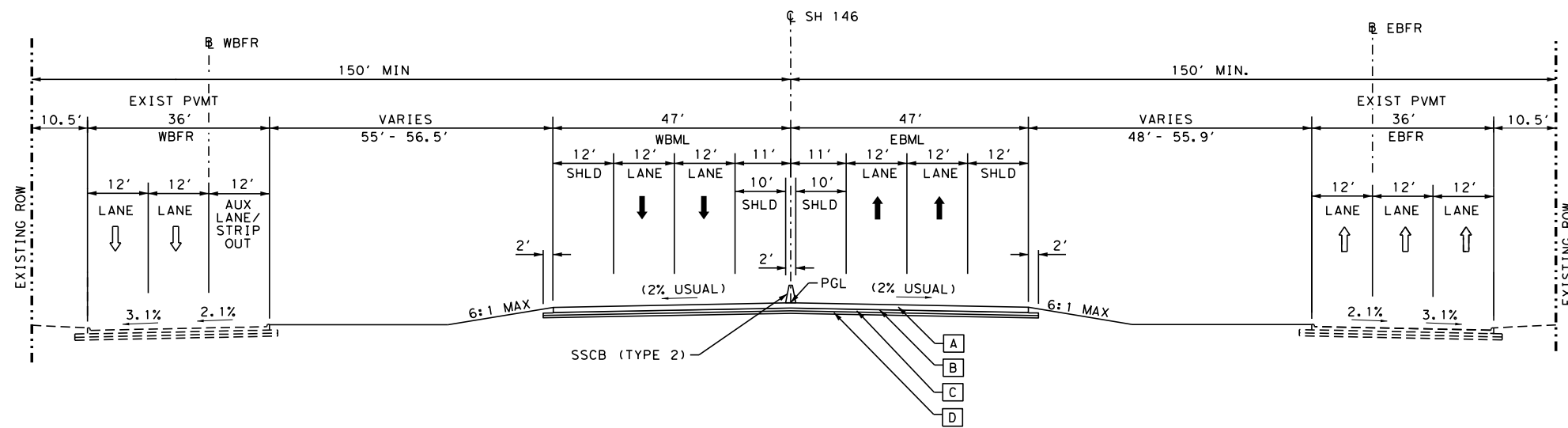
LEGEND

- ➔ PROPOSED TRAFFIC
- ⇐ EXISTING TRAFFIC
- [A] 11" CONCRETE PAVEMENT (CRCP)
- [B] 1" ASPHALT STABILIZED BASE (ASB)
- [C] 6" CEMENT STABILIZED BASE (CSB)
- [D] 6" LIME TREATED SUBGRADE (LTS)
- [E] 8" CONCRETE PAVEMENT (CRCP)



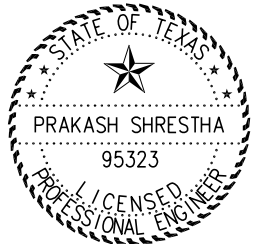
PROPOSED SH 146
FROM STA. 545+00.00 TO STA. 570+00.00

- NOTES:**
- USE PAY SCHEDULE 2 FOR CRCP RIDE QUALITY.



PROPOSED SH 146
FROM STA 570+00.00 TO STA 573+50.00

REV. NO.	DATE	BY	REVISION



Prakash Shrestha, P.E.
2/17/2022

CivilTech Engineering, Inc.
11821 Telge Road
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Firm Registration No. F-382



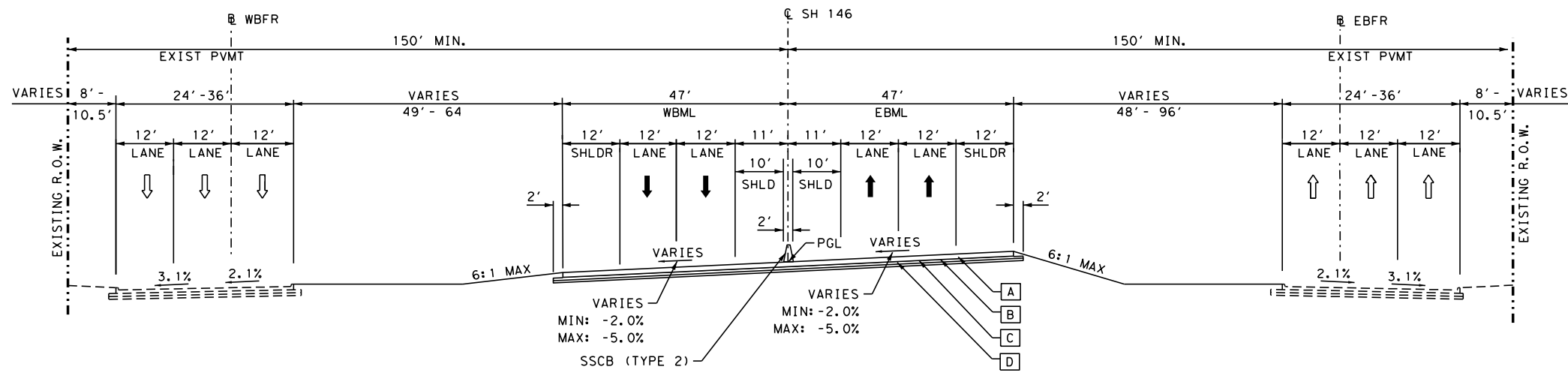
SH 146
PROPOSED TYPICAL SECTIONS

N. T. S.		SHEET 1 OF 3	
FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.	SHEET NO. 6	
STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146

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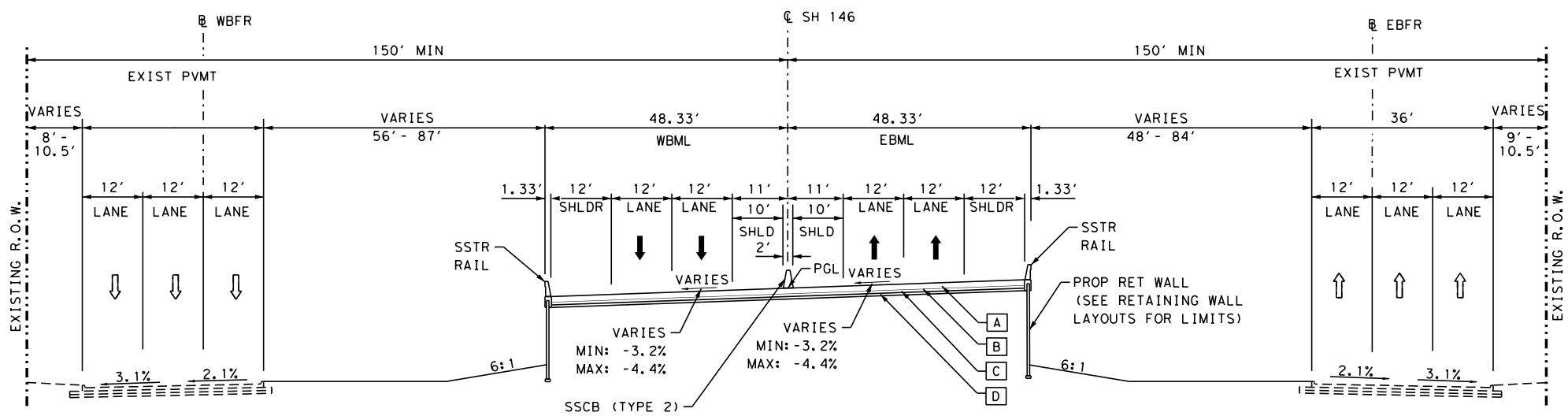
LEGEND

- ← PROPOSED TRAFFIC
- ⇌ EXISTING TRAFFIC
- A 11" CONCRETE PAVEMENT (CRCP)
- B 1" ASPHALT STABILIZED BASE (ASB)
- C 6" CEMENT STABILIZED BASE (CSB)
- D 6" LIME TREATED SUBGRADE (LTS)
- E 8" CONCRETE PAVEMENT (CRCP)



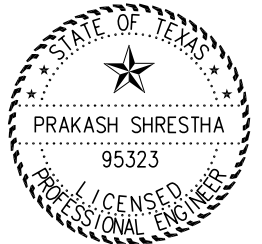
PROPOSED SH 146
 FROM STA. 573+50.00 TO STA. 588+52.00
 FROM STA. 602+84.11 TO STA. 608+50.00

- NOTES:**
- USE PAY SCHEDULE 2 FOR CRCP RIDE QUALITY.



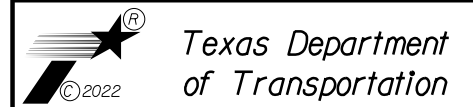
PROPOSED SH 146
 FROM STA 588+52.00 TO STA 593+99.32
 FROM STA 597+19.32 TO STA 602+84.11

REV NO.	DATE	BY	REVISION



Prakash Shrestha, P.E.
 4/21/2022

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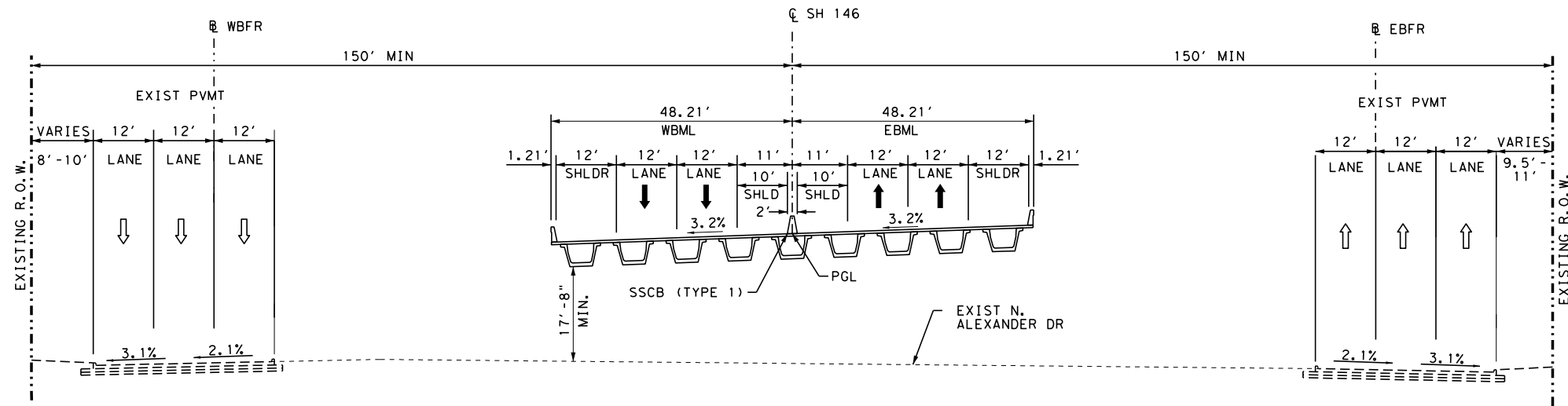
SH 146
PROPOSED
TYPICAL SECTIONS

N. T. S.		SHEET 2 OF 3	
FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.	SHEET NO. 7	
STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146

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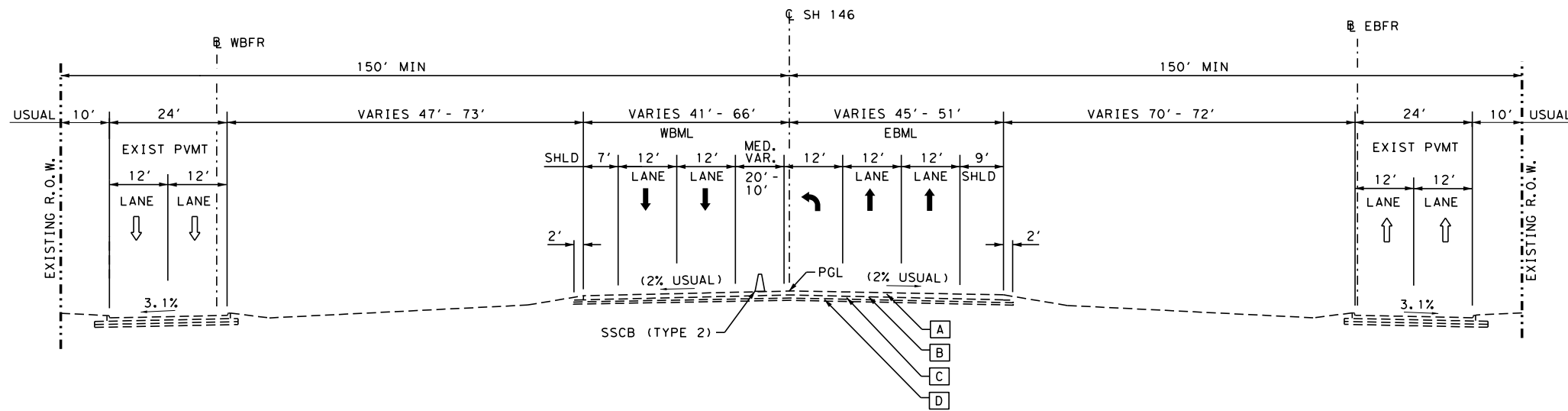
LEGEND

- ➡ PROPOSED TRAFFIC
- ↔ EXISTING TRAFFIC
- A 11" CONCRETE PAVEMENT (CRCP)
- B 1" ASPHALT STABILIZED BASE (ASB)
- C 6" CEMENT STABILIZED BASE (CSB)
- D 6" LIME TREATED SUBGRADE (LTS)
- E 8" CONCRETE PAVEMENT (CRCP)



PROPOSED SH 146
FROM STA 593+99.32 TO STA 597+19.32.00

- NOTES:**
- USE PAY SCHEDULE 2 FOR CRCP RIDE QUALITY.



PROPOSED SH 146
FROM STA 608+50.00 TO STA 620+91.23

REV. NO.	DATE	BY	REVISION

Prakash Shrestha, P.E.
2/17/2022

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

SH 146

PROPOSED TYPICAL SECTIONS

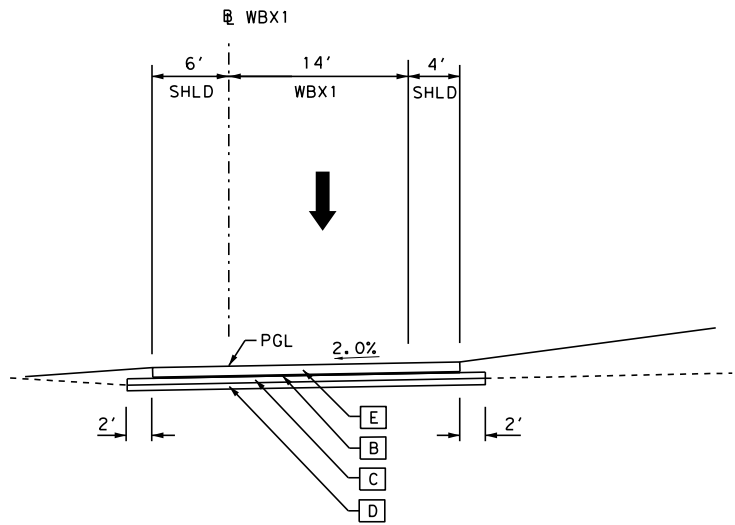
N. T. S.		SHEET 3 OF 3	
FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.	
6		8	
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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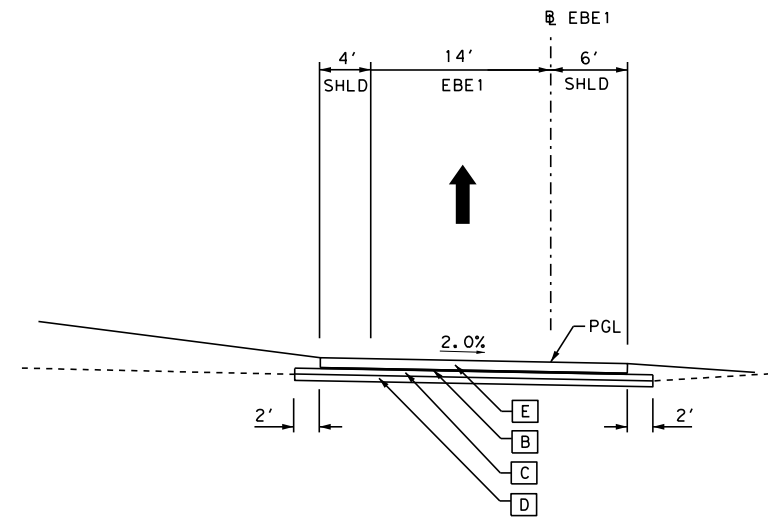
LEGEND

- ← PROPOSED TRAFFIC
- ⇌ EXISTING TRAFFIC
- A 11" CONCRETE PAVEMENT (CRCP)
- B 1" ASPHALT STABILIZED BASE (ASB)
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- E 8" CONCRETE PAVEMENT (CRCP)

- NOTES:**
1. USE PAY SCHEDULE 2 FOR CRCP RIDE QUALITY.

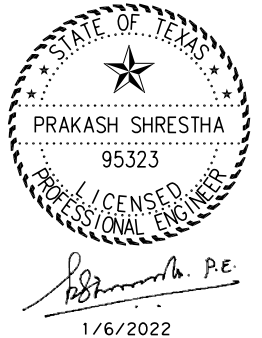


PROPOSED WB RAMP TYPICAL SECTION
FROM WBX1 STA 15+00.00 TO WBX1 STA 18+00.84

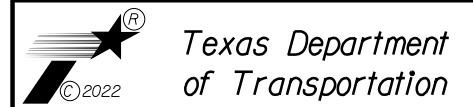


PROPOSED EB RAMP TYPICAL SECTION
FROM EBE1 STA 7+01.54 TO EBE1 STA 11+17.93

REV. NO.	DATE	BY	REVISION



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



SH 146

PROPOSED RAMP TYPICAL SECTIONS

N. T. S.		SHEET 1 OF 1	
FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.	
6		9	
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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County: Harris County

Control: 0389-13-039

Highway: SH 146

General Notes:

General:

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

Area Engineer Southeast Harris Area Engineer

Muhammad J. Elahi, P.E.

Jamal.Elahi@txdot.gov

Contractor questions will be accepted through email, phone, and in person by the above individuals. Contractor questions will be reviewed by the Area Engineer or Assistant Area 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/>

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, and CCSJ/Project Name.

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

Superelevate the curves to match the existing surface.

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

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

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

Grade street intersections and median openings for surface drainage.

If a foundation is to be placed where a riprap surface or an asphalt concrete surface presently exists, use caution in breaking out the existing surface for placement. Break out no greater area than is required to place the foundation. After placing the foundation, wrap the periphery with 0.5 in. pre-molded mastic expansion joint. Then replace the remaining portion of the broken out

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surface with Class A or Class C concrete or cold mix asphalt concrete to the exact slope, pattern, and thickness of the existing riprap or asphalt. Payment for breaking out the existing surface, wrapping the foundation, and replacing the surface is subsidiary to the various bid items.

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

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

Stencil the National Bridge Inventory (NBI) number on each existing bridge shown on these plans. The NBI number is shown above the title block for each bridge layout.

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

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

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

Unless otherwise shown on the plans or otherwise directed, commence work after sunrise and ensure construction equipment is off the road by sunset.

Tolls incurred by the Contractor are incidental to the various bid items.

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

Any groundwater elevation information provided is representative of conditions existing on the day when and for the specific location where this information was collected. The actual groundwater elevation may fluctuate with time, climatic conditions, and construction activity.

General: Roadway Illumination and Electrical

For roadway illumination and electrical items, use materials from pre-qualified producers as shown on the Construction Division (CST) of the Department's material producers list. Check the latest link on the Department's website for this list. The category/item is "Roadway Illumination and Electrical Supplies." No substitutions will be allowed for materials found on this list.

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

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The Contractor may make the electrical grounding connections and permissible splices using the thermal fusion process, Cadweld, ThermOweld, or approved equal, instead of bolted connections and splices.

The Area Engineer will arrange with the Contractor, an inspection of the completed electrical systems for the highway lighting systems before final acceptance for compliance with plans and specifications. The inspection will be made with personnel from the electrical section of the Department's District Transportation Operations Office. The city's electrical division personnel will also inspect lighting systems within the city limits. Portions of the work found to be deficient during this inspection will not be accepted.

General: Traffic Signals

For traffic signal items, use materials from the Pre-Qualified Producers List (located at <http://www.dot.state.tx.us/GSD/purchasing/supps.htm>) and the materials pre-qualified for illumination and electrical items (located at <http://ftp.dot.state.tx.us/pub/txdot-info/cmd/mp/riaes.pdf>) as shown on the Department's Material Producers List and the Roadway Illumination and Electrical Supplies List. Check the latest links on the Department's website for these lists. No substitutions will be allowed for materials found on these lists.

The existing controller cabinet and signal conduit will be in conflict with the proposed bridge foundations. Maintain continuous red/yellow/green signal operation prior to the new overpass bridge being opened to traffic. Prior to construction of the bridge foundation, install the new controller cabinet and foundation, conduit to avoid bridge foundations, cables, and electrical service. Provide peace officers for temporary all-way stop control of the intersection when downtime is required to move the controller and reconnect wiring prior to bridge construction. Limit downtime to off-peak hours.

The existing traffic signal located on N. Alexander Dr. intersection will no longer be required, after the newly constructed mainlanes with the overpass bridge are opened to traffic. The intersection will be converted to a multilane STOP controlled intersection for controlling traffic at the intersection. The signal poles, however, are proposed to be left in place with modifications as shown on the plans. The signals will be converted to flashing red light modes to aid the new STOP signs for additional safety. Coordinate with the City of Baytown prior to decommissioning the existing traffic signals.

General: Site Management

All the existing drainage systems (inlets, etc.) shall remain fully functional during the construction unless otherwise shown on the plans.

All the pavement marking and signings shall remain in place during the construction unless otherwise shown on the plans.

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

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

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

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

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

Tricycle Type

Wayne Series 900
Elgin White Wing
Elgin Pelican

Truck Type - 4 Wheel

M-B Cruiser II
Wayne Model 945
Mobile TE-3
Mobile TE-4
Murphy 4042

General: Traffic Control and Construction

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

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

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

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

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

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

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General: Utilities

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

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

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

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

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

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

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

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

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

A 12' high sound wall is proposed for the area along the SH 146 EB Frontage Road where the Chase Mobile Home Park is located. The wall will be located between McKinney Rd. and E. Elvinta St. in front of (street-side) of the CenterPoint Energy's overhead power poles. A minimum clearance of 18" between the wall and power poles shall be maintained.

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The contractor is required to coordinate with the CenterPoint Energy, at least 90 days prior to the construction of the sound wall. Contact details:

Carlton Porter - Service Area Manager - Power Delivery Solutions
333 Ward Road
Baytown, TX 77520
Phone: (281) 425-7334
Email: Carlton.Porter@centerpointenergy.com

Item 5: Control of Work

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

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

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

Submit shop drawings electronically for the fabrication of items as documented in Table 2 below. Information and requirements for electronic submittals can be viewed in the "Guide to Electronic Shop Drawing Submittal" which can be accessed through the following web link, ftp://ftp.dot.state.tx.us/pub/txdot-info/library/pubs/bus/bridge/e_submit_guide.pdf. References to 11 in. x 17 in. sheets in individual specifications for structural items imply electronic CAD sheets.

Table 2
2014 Construction Specification Required Shop/Working Drawing Submittals - Consultant Generated Plans

Spec Item No.'s	Product	Submittal Required	Approval Required (Y/N)	Contractor/Fabricator P.E. Seal Required	Reviewing Party	Shop or Working Drawing (Note 1)
7.16.1&2	Construction Load Analyses	Y	Y	Y	D	WD
400	Excavation and Backfill for Structures (cofferdams)	Y	N	Y	D	WD
403	Temporary Special Shoring	Y	N	Y	D	WD
420	Formwork/Falsework	Y	N	Y	D	WD
423	Retaining Walls, (calcs req'd.)	Y	Y	Y	D	SD
425	Optional Design Calculations (Prstrs Bms)	Y	Y	Y	D	SD
425	Prestr Concr Sheet Piling	Y	Y	N	D	SD
425	Prestr Concr Beams	Y	Y	N	D	SD
425	Prestr Concr Bent	Y	Y	N	D	SD
426	Post Tension Details	Y	Y	N	D	SD
434	Elastomeric Bearing Pads (All)	Y	Y	N	D	SD
441	Bridge Protective Assembly	Y	Y	N	D	SD

441	Misc Steel (various steel assemblies)	Y	Y	N	D	SD
441	Steel Pedestals (bridge raising)	Y	Y	N	D	SD
441	Steel Bearings	Y	Y	N	D	SD
441	Steel Bent	Y	Y	N	D	SD
441	Steel Diaphragms	Y	Y	N	D	SD
441	Steel Finger Joint	Y	Y	N	D	SD
441	Steel Plate Girder	Y	Y	N	D	SD
441	Steel Tub-Girders	Y	Y	N	D	SD
441	Erection Plans, including Falsework	Y	N	Y	D	WD
449	Sign Structure Anchor Bolts	Y	Y	N	D	SD
450	Railing	Y	Y	N	D	SD
462	Concrete Box Culvert	Y	Y	N	D	SD
462	Concrete Box Culvert (Alternate Designs Only, calcs req'd.)	Y	Y	Y	D	SD
464	Reinforced Concrete Pipe (Jack and Bore only; ONLY when requested)	Y	Y	Y	D	SD
465	Pre-cast Junction Boxes, Grates, and Inlets	Y	Y	N	D	SD
465	Pre-cast Junction Boxes, Grates, and Inlets (Alternate Designs Only, calcs req'd.)	Y	Y	Y	D	SD
466	Pre-cast Headwalls and Wingwalls	Y	Y	N	D	SD
467	Pre-cast Safety End Treatments	Y	Y	N	D	SD
495	Raising Existing Structure (calcs req'd.)	Y	Y	Y	D	SD
610	Roadway Illumination Supports (Non-Standard only, calcs req'd.)	Y	Y	Y	D	SD
613	High Mast Illumination Poles (Non-standard only, calcs req'd.)	Y	Y	Y	D	SD
627	Treated Timber Poles	Y	Y	N	D	SD
644	Special Non-Standard Supports (Bridge Mounts, Barrier Mounts, Etc.)	Y	Y	Y	D	SD
647	Large Roadside Sign Supports	Y	Y	Y	D	SD
650	Cantilever Sign Structure Supports - Alternate Design Calcs.	Y	Y	Y	D	SD
650	Sign Structures	Y	Y	N	D	SD
680	Installation of Highway Traffic Signals	Y	Y	N	D	SD
682	Vehicle and Pedestrian Signal Heads	Y	Y	N	D	SD
684	Traffic Signal Cables	Y	Y	N	D	SD
685	Roadside Flashing Beacon Assemblies	Y	Y	N	D	SD
686	Traffic Signal Pole Assemblies (Steel) (Non-Standard only)	Y	Y	Y	D	SD
687	Pedestal Pole Assemblies	Y	Y	N	D	SD
688	Detectors	Y	Y	N	D	SD
784	Repairing Steel Bridge Members	Y	Y	Y	D	WD
SS	Prestr Concr Crown Span	Y	Y	N	D	SD
SS	Sound Barrier Walls	Y	Y	Y	D	SD
SS	Camera Poles	Y	Y	Y	TMS	SD
SS	Pedestrian Bridge (Calcs req'd.)	Y	Y	Y	D	SD

SS	Screw-In Type Anchor Foundations	Y	Y	N	D	SD
SS	Fiber Optic/Communication Cable	Y	Y	N	TMS	SD
SS	Spread Spectrum Radios for Signals	Y	Y	N	D	SD
SS	VIVDS System for Signals	Y	Y	N	D	SD
SS	CTMS Equipment	Y	Y	N	TMS	SD

Notes:

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

Key to Reviewing Party

D – Consultant: Submit to Engineer of Record at prakash.shrestha@woolpert.com
TMS – Traffic Management System
Computerized Traffic Management Systems (CTMS) HOU-CTMSShpDrwgs@txdot.gov

“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

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

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

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

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1. Restricted Use of Materials for the Previously Evaluated Permit Areas.

Document both the Project Specific Locations (PSL) and their authorization. Maintain copies for review by the Department or any regulatory agency. When an area within the project limits has been evaluated by the USACE as part of the permit process for this project:

- a. Suitable excavation of required material in the areas shown on the plans and cross sections as specified in the Item, "Excavation" is used for permanent or temporary fill (under the Item, "Embankment") within a USACE permit area.
- b. Suitable embankment (under the Item, "Embankment") from within the USACE permit area is used as fill within a USACE evaluated area.
- c. Unsuitable excavation or excess excavation, "Waste" (under the Item, "Excavation"), that is disposed of at a location approved within a USACE evaluated area.

2. Contractor Materials from Areas Other than Previously Evaluated Areas.

Provide the Department with a copy of USACE coordination or approvals before initiating any activities for an area within the project limits that has not been evaluated by the USACE or for any off right of way locations used for the following, but not limited to, haul roads, equipment staging areas, borrow and disposal sites:

- a. The Item, "Embankment" used for temporary or permanent fill within a USACE permit area.
- b. Unsuitable excavation or excess excavation, "Waste" (under the Item, "Excavation"), that is disposed of outside a USACE evaluated area.

The total area disturbed for this project is 27.7 acres. The disturbed area in this project, the project locations in the Contract, and Contractor project specific locations (PSLs) within 1 mile of the project limits for the Contract, will further establish the authorization requirements for storm water discharges. The Department will obtain an authorization to discharge storm water from the Texas Commission on Environmental Quality (TCEQ) for the construction activities shown on the plans. The Contractor is to obtain required authorization from the TCEQ for Contractor PSLs for construction support activities on or off the ROW. When the total area disturbed in the Contract and PSLs within 1 mile of the project limits exceeds 5 acres, provide a copy of the Contractor NOI for PSLs on the ROW to the Engineer (to the appropriate MS4 operator when on an off-state system route) and to the local government that operates a separate storm drain system.

This project does not require a U.S. Army Corps of Engineers (USACE) Section 404 Permit before letting, but if a permit is needed during construction, assume responsibility for preparing the permit application. Submit the permit application to the Department's District Environmental Section for approval. Once the permit application is approved, the Department will submit it to the USACE. Assume responsibility for the requested revisions, in coordination with the Department's District Environmental Section.

Avoid encroaching into the wetland areas delineated in the plans. Place erosion control measures around the wetlands as shown on the plans. No construction work or construction

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equipment is permitted within this delineated area. If applicable for bridge construction, construct drilled shafts outside of this delineated area. Secure approval for the locations of field offices, material storage sites, material disposal sites, plants, borrow pits, etc. in writing before use to ensure that the proposed location is not within Jurisdictional Waters of the United States (wetlands).

Do not store any material in Waters of the United States inside the right of way without written approval.

Before construction operations begin, provide a drawing of the location of proposed temporary access roads, haul roads, or temporary fill used during construction operations to ensure that they are not within Jurisdictional Waters of the United States.

If the Contractor elects to use an area not permitted and determined to be within Jurisdictional Waters of the United States during the prosecution of the work, the Contractor will hold the Department harmless for delays caused by procuring the necessary permits from the United States Army Corps of Engineers.

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

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

Conduct any tree removal outside of the migratory bird nesting season. If this is not possible due to scheduling, then exercise caution to remove only those trees with no active nests. Do not destroy nests on structures or in trees within the project limits during the nesting / breeding season.

Take measures to prevent the building of nests on any structures or trees within the project limits throughout the duration of the construction if work / removal will be performed during the nesting / breeding season. This can be accomplished by application of bird repellent gel, netting by hand every 3 to 4 days, or any other non-threatening method approved by the Houston District Environmental Section. Obtain this approval well in advance of the planned use. Contact the Houston District Environmental Section at 713-802-5244. The cost of this work is subsidiary to the various bid items.

This project is on a hurricane evacuation route, the details of which can be accessed from the following website.

<https://www.txdot.gov/inside-txdot/division/traffic/safety/weather/hurricane.html>

Provide at the pre-construction meeting a written plan outlining procedures to suspend work, secure the job site, and safely handle traffic through and across the project in the event of a hurricane evacuation.

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During the hurricane season (June 1 through November 30), do not close any travel lanes except when the Contractor can demonstrate that he/she can provide labor, equipment, material, a work plan, and quality of work to satisfactorily return all lanes to an open, all-weather travel surface within 3 days of receiving written or verbal notice but no later than 3 days before the predicted hurricane landfall. Construction of temporary lanes to an all-weather surface will be paid for in accordance with Article 9.7, "Payment for Extra Work and Force Account Method."

In addition to lane closures, cease work 3 days before the predicted hurricane landfall on or near the roadway that adversely impacts the flow of traffic and reduces the capacity of the highway during an evacuation. Vehicles of the Contractor, subcontractors, or material suppliers will not be allowed to enter or exit the traffic stream, including those for the purpose of material hauling and delivery, and mobilization or demobilization of equipment. When directed, this prohibition will include a reasonable time period for the evacuees to return to their point of origin.

No significant traffic generator events have been identified.

Item 8: Prosecution and Progress

Create, maintain, and submit for approval, a Critical Path Method (CPM) project schedule using computer software that is fully compatible with the latest version of Primavera Systems, Inc. or Primavera Project Planner (P3 or P6).

The Department will supply bidders, upon written request, one electronic copy of the time determination schedule. The time determination schedule provided is for informational use only and is not intended for bidding or construction purposes. The Department will not adjust the number of days for the project and milestones, if any, due to differences in opinion regarding any assumptions made in the preparation of the schedule or for errors, omissions, or discrepancies found in the time determination schedule.

Working days will be computed and charged based on a Five-Day Workweek in accordance with Item 8, Section 3.1.1.

Provide a virus-free computer disk or other acceptable electronic media containing the Primavera construction schedule.

The maximum number of days the time charges on this contract may be suspended due to contractor mobilization, and material fabrication/accumulation or processing delays is 30 calendar days. The Engineer and the Contractor may mutually agree, in writing, to decrease this maximum number of days.

Item 100: Preparing Right of Way

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

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

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

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

Assume ownership of the existing ground mounted signs that have been removed within the limits of roadway construction unless otherwise noted or directed. This work is subsidiary to the Item, "Preparing Right of Way."

Item 104: Removing Concrete

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

Item 105: Removing Treated and Untreated Base and Asphalt Pavement

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

Obtain a secured site for the stockpile of the treated material to be salvaged from this project. Haul and stockpile the unused material as directed. This work is subsidiary to this bid Item.

Case 3 - ACP over concrete pavement

The removal of the Asphalt Concrete Pavement (ACP) material is paid under the Item, "Salvaging, Hauling, and Stockpiling Reclaimable Asphalt Pavement."

Removing the concrete pavement material is paid under the Item, "Removing Concrete."

Case 4 - ACP over concrete pavement over base

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

Removing the concrete pavement material is paid under the Item, "Removing Concrete."

Removing the base material is paid under the Item, "Removing Treated and Untreated Base and Asphalt Pavement."

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

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Case 5 - Concrete pavement over base
Removing the concrete pavement material is paid under the Item, "Removing Concrete."

Removing the base material and any asphalt bondbreaker material is paid under the Item, "Removing Treated and Untreated Base and Asphalt Pavement."

Item 110: Excavation

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

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

Excavate, strip, and stockpile the top 6 in. of existing topsoil only at locations shown in the plans or as directed by the engineer. The salvaged quantity is shown in the plans. Reuse the topsoil under the Item, "Topsoil" including measurement and payment.

Item 112: Subgrade Widening

Removing obstructions within the right of way, such as trees, brush, overhanging limbs, fences, foundations and other miscellaneous debris that may interfere with grading (subgrade widening) is subsidiary to the Item, "Subgrade Widening."

Item 132: Embankment

The cement stabilized backfill embankment as shown on the plans shall meet the requirements of Houston District Wide Special Provision 132-001 in addition to the requirements of the Standard Specification 132. This item will be measured and paid under item 132-6035: Emb (Final) (Dens Cont) (TY E) (CSBE).

The cement stabilized backfill for the foundation improvement as shown on the plans shall be in accordance with item 132 and Houston District Special Provision 132-001. This item will be measured and paid under item 132-6036: Emb (Final) (DC) (TY E) (CSBE) (Rwall Fnd Impr).

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

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

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

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For unpaved areas, provide a finished grade with the top 4 in. capable of sustaining vegetation. Use fertile soil that is easily cultivated, free from objectionable material and highly resistant to erosion. Topsoil work is paid under the Item, "Topsoil."

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

Item 134: Backfilling Pavement Edges

Quantity by station includes both sides of the roadway.

The Contractor has the option of selecting the type of backfill material consisting of Reclaimable Asphalt Pavement (RAP), Flex Base, or Crushed Concrete provided that it meets the requirements listed below.

For Permeable Friction Courses (PFC), the backfill material chosen must meet the requirements of Department Test Method Tex-246-F.

If using salvaged asphalt concrete pavement, size it so that all the material, passes the 2-in. sieve. Use RAP that does not contain deleterious material such as clay or organic material.

Flex Base must meet the requirements of Item 247, Type A, Grade 1-2. Department Test Method Tex-117-E will not be required.

Crushed concrete must meet the requirements of Item 247, Grade 1-2. Department Test Methods Tex-116-E and Tex-117-E will not be required.

Place emulsified asphalt (SS-1, CSS-1, or CSS-1H) at an application rate of 0.25 gal/sq. yard.

Item 150: Blading

Blade the shoulders in accordance with this Item and as directed.

Perform blading for ditch grading to ensure proper drainage between the existing and proposed ditches.

If using native soil for reshaping the shoulders, no separate payment for materials will be made.

Item 156: Bulldozer Work

Perform bulldozer work to grade or make repairs to slopes to control erosion if such work is not within the scope of other contract requirements.

Item 162: Sodding for Erosion Control

The sodding for erosion control in the areas as shown on the plans shall be Block Sodding conforming to the requirements of Specification Item 162 and the Houston District Standard Sheet 'Fertilizer, Seed, Sod, Straw, Compost, and Water' included in the plan set.

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Item 166: Fertilizer

Refer to the Specification Item 166 and the Houston District Standard Sheet 'Fertilizer, Seed, Sod, Straw, Compost, and Water' for the material specifications and for the rate of application.

Item 168: Vegetative Watering

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

Item 204: Sprinkling

Perform subsidiary sprinkling as required under various other items in accordance with the Item, "Sprinkling."

Sprinkling for dust control is subsidiary to the various bid items.

Item 210: Rolling

Use a medium pneumatic roller meeting the requirements of Item 210 as directed. This work is subsidiary to the various bid items. On every asphalt shot, use a minimum of 3 pneumatic rollers or as directed. Use approved rolling patterns. Successive asphalt shots will not be allowed until acceptable rolling has been accomplished on the preceding asphalt shot.

Item 247: Flexible Base

Place the flexible base in courses a maximum of 8 in. thick (loose measurement). Mix flexible base that requires 2 or more mixtures of material, in an approved stationary pugmill type mixer. Material passing the No. 40 sieve is known as soil binder.

Tolerances relating to a specified gradation and to a plasticity index under this specification are permitted.

Furnish one type of the base material unless otherwise authorized.

Compact the courses to a minimum density of 95 percent of the maximum density as determined using test method TEX-113-E.

Sandstone aggregate is not permitted.

Item 260: Lime Treatment (Road-Mixed)

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

The Engineer will observe the lime treatment that the Contractor elects to open to construction traffic immediately after compaction. If the construction traffic damages the subgrade, route the

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traffic off the damaged section in accordance with the standard specification. If the construction traffic does not damage the subgrade, cure the subgrade until other courses of material cover it. Apply these courses within 14 days with a maximum curing period of 7 days.

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

Use the type of lime at particular locations as directed.

Place the quicklime dry or as a slurry.

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

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

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

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

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

If using Type A aggregate in accordance with the Item, "Flexible Base," use only crushed stone, Grade 1.

Item 276: Cement Treatment (Plant-Mixed)

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

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

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

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

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For widening the existing pavement, the Engineer may waive the requirements for preparing the subgrade by scarifying and compacting if the as-cut subgrade can be maintained to the density of the natural ground and to a uniform consistency when placing the base course. Keep the subgrade wet.

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

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

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

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

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

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

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

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

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

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

If using salvaged existing base and asphalt concrete pavement as described above, size it so that all the material, except the existing individual aggregate, passes the 2-in. sieve and is of a

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gradation that allows satisfactory compaction. Provide salvaged material that does not contain deleterious material such as clay or organic material. Provide material passing the No. 40 sieve, defined as soil binder, with a maximum Plasticity Index of 10 and a maximum Liquid Limit of 35 when tested in accordance with test method TEX-106-E.

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

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

Item 3076: Dense-Graded Hot Mix Asphalt

Unless otherwise shown on the plans, RAP generated by this project will become the property of the Contractor for use in the current construction project or in future projects.

Item 310: Prime Coat

Use asphalt material (MC-30 or PCE) for new flexible base and for salvaged flexible base to be surfaced and place as directed.

Item 340: Dense-Graded Hot Mix Asphalt (Small Quantity)

Dilution of tack coat is not allowed.

Item 360: Concrete Pavement

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

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

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

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

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

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

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

Do not use limestone dust of fracture as fine aggregate.

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

Perform saw cutting as shown on the plans in accordance with Section 360.4.10, "Sawing Joints." This saw cutting is subsidiary to this bid Item.

The pay limits for concrete pavements with traffic rails extends to the outside edge or back of the traffic rail.

Items 360, 420, and 421: All Concrete Items

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

The approach pavement is paid for under the Item, "Concrete Pavement."

Item 361: Repair of Concrete Pavement

For full depth repair, remove only the quantity of pavement replaceable during the daily allowable work schedule.

Remove loose sub-base material and replace it with concrete. Use a bondbreaker, such as a polyethylene sheet, at the interface between the replaced sub-base material and the new concrete pavement.

Supply polyethylene fabric on the job site sufficient to cover the area of repair.

Do not place concrete if impending weather may result in rainfall or low temperatures that may impair the quality of the finished work.

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

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Ready mix concrete will be permitted if the equipment and construction methods can produce the desired results. Hand finishing will be permitted.

Perform saw cutting as shown on the plans in accordance with Section 360.4.10, "Sawing Joints." This saw cutting is subsidiary to this bid Item.

Item 400: Excavation and Backfill for Structures

The estimated total structural excavation quantity for the retaining walls foundation improvements as shown on the plans is 30,853 CY. The Contractor to conduct a detailed field survey and measurements of the site and obtain a written approval of the engineer prior to beginning of the excavation for the accurate measurement and payment of the excavation.

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

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

1. Use only approved sand, crushed concrete, or salvaged base free from deleterious matter, as aggregate for cement-stabilized backfill.
2. Provide crushed concrete or salvaged base backfill material in accordance with the Item, "Cement Treatment (Plant-Mixed)(Type D)" (base or crushed concrete), except the recycled Type D material must not contain Reclaimed Asphalt Pavement (RAP).
3. For backfill material below the spring line of pipes, use cement-stabilized sand rather than Recycled Type D backfill material.
4. For the cement-stabilized sand backfill, use a minimum of 7 percent of hydraulic cement based on the dry weight of backfill material. The cement content for the crushed concrete and salvaged base is specified in the Item, "Cement Treatment (Plant-Mixed) (Type D)."
5. Place and compact the stabilized backfill material using a gradation that provides a dense mass without segregating and is impervious to passing of water.

Item 407: Steel Piling

Assume ownership of removed temporary steel sheet piling.

Item 416: Drilled Shaft Foundations

Include the cost for furnishing and installing anchor bolts mounted in the drilled shafts in the unit bid price for the various diameter drilled shafts.

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The Department may test using ultrasonic methods the anchor bolts for overhead sign supports, light standards, and traffic signal poles after they are installed. Replace faulty anchor bolts as directed. Do not weld the anchor bolts.

Item 420: Concrete Substructures

Unless otherwise noted, use Class C concrete with an ordinary surface finish for signal, lighting, or sign structure foundations.

Mass concrete is a plans quantity item.

Item 421: Hydraulic Cement Concrete

Entrained air is required in all slip formed concrete (bridge rail, concrete traffic barrier, pavement, etc.), but is not required for other structural concrete. Adjust the dosage of air entraining agent for low air content as directed or allowed by the Engineer. If entrained air is provided where not required, do not exceed the manufacturer's recommended dosage.

Item 423: Retaining Walls

Surface finishes for the retaining walls and other applicable structures shall be in accordance with the standard detail 'Surface Finishes for Concrete Wave Scheme - SFC-WS, unless otherwise shown on the plans or as directed by the Engineer. Provide and maintain positive drainage away from the earth wall system, including the leveling pad, for the contract duration.

Place concrete riprap mow strips for retaining walls as shown on the plans and in accordance with the Item, "Riprap." Use Class B concrete reinforced with No. 4 bars spaced at 18 in. centers each direction and placed 2 in. below the surface. This work is paid for under the Item, "Riprap."

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

Approved Mechanically Stabilized Earth (MSE) Wall Systems are listed at the website below or from the Department's home page>Business>Bridge>Retaining Walls>Approved MSE Panel Systems:

<http://www.txdot.gov/business/resources/approved-systems/mse-wall.html>

Item 427: Surface Finishes for Concrete

Provide a Surface Area I finish for structures. Use concrete paint for the surface finish.

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Item 432: Riprap

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

Item 442: Metal for Structures

Use temperature zone 1 for Charpy V-Notch (CVN) testing.

Prestressed concrete panels will not be allowed on steel structures.

Item 449: Anchor Bolts

Pipe joint compound, as used in this Item, is an electrically conducting protective thread lubricant compound to be used on the foundation anchor bolts for illuminations poles (Crouse-Hinds TL-2, Oz/Gedney Stl, or Thomas & Betts Kopr-Shield).

Item 462: Concrete Box Culverts and Drains

Removal of the existing 7'x3' box culverts as shown on the plans includes demolition, hauling, disposal, and removal of other associated items, excavation, backfilling, etc. in accordance with Item 496-Removing Structures.

Installation of new box 7'x3' box culverts and making connections with the existing box culverts to remain as shown on the plans shall include all other items necessary to complete the work.

Item 464: Reinforced Concrete Pipe

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

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

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

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

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

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

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

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

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

Item 465: Junction Boxes, Manholes, and Inlets

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

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

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

Do not leave excavations or trenches open overnight.

Item 502: Barricades, Signs, and Traffic Handling

Use a traffic control plan for handling traffic through the various phases of construction. Follow the phasing sequence unless otherwise agreed upon by the Area Engineer and the Project Manager. Ensure this plan conforms to the latest "Texas Manual on Uniform Traffic Control Devices" and the latest Barricade and Construction (BC) Standard Sheets. The latest versions of Work Zone Standard Sheets WZ (BTS-1) and WZ (BTS-2) are the traffic control plan for the signal installations.

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

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

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

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

Erect temporary signs when exit ramps are closed or moved to new locations during construction.

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

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

Coordinate and schedule the work with the appropriate Metro representative if requiring access to the High Occupancy Vehicle lanes.

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

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

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

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

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

Do not reduce the existing number of lanes open to traffic at any times unless otherwise a written permission is obtained 3 days in advance of the closure.

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

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Provide full-time, off-duty, uniformed, certified peace officers, as part of traffic control operations. The peace officers must be able to show proof of certification by the Texas Commission on Law Enforcement Officers Standards. The cost of the officers will be a subsidiary item to Item 502-6000 (Barricades, Signs, and Traffic Handling).

A minimum of 7 days in advance of any total closure, notify the Houston District Public Information Office of which roadways, ramps, intersections, or lanes will be closed, the dates they will remain closed, and when they will be opened again to traffic.

A minimum of 7 days in advance of any total closure, place a portable changeable message (PCM) sign at the location of each total closure which informs the traveling public of the details of the closure. Alternately, if the Traffic Control Plan provides a positive barrier at the location, a non-trailer mounted static message board sign behind the positive barrier may be used in place of a PCM.

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

Before closing any City of Houston sidewalk, one or more city street lanes, or entire city streets during construction, obtain a permit to do so from the City. Obtain the required permit in person at the City of Houston Permit Office or apply online at <http://www.gims.houstontx.gov>.

During the various phases of construction, maintain and relocate Logo signs/Specific Service signs located within the project limits. Maintenance and relocation of these signs are subsidiary to the Item, "Barricades, Signs, and Traffic Handling." These signs are Department-owned and administered by LoneStar Logos, a Department signage contractor.

Relocate a logo sign to avoid interference with construction phases as necessary. Assure that relocated signs meet clearance requirements. If clearance requirements cannot be met using the existing sign, contact the logo sign contractor to manufacture and deliver to the jobsite a smaller logo sign within 3 weeks. If there is absolutely no room to display the relocated logo sign, 2 weeks before relocating, contact the logo sign contractor to remove the sign and place it in storage. The telephone number for LoneStar Logos is (512) 462-1310 and the email address for the regional manager, Tyler Starr, is tstarr@lonestarlogos.com.

When relocating a logo sign, provide wooden skid mounted sign supports for the sign that are crashworthy and in accordance with the latest edition of the "Texas Manual on Uniform Traffic Control Devices." Specific information on crash worthy skid mounted signs can be found at: <http://d2dtl5nnlpr0r.cloudfront.net/tti.tamu.edu/documents/0-6782-2.pdf>

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

Item 504: Field Office and Laboratory

Furnish one Type A structure for the laboratory. Ensure the windows for the structure have burglar bars.

Furnish a Type D structure for the asphalt mix control laboratory for the Engineer's exclusive use. In addition to the requirements of this Item, "Field Office and Laboratory," ensure this structure has a minimum height of 8 ft. Also ensure it has a minimum of 400 sq. ft. of gross floor area suitable for permanently located asphalt plants or 200 sq. ft. for temporarily located asphalt plants serving one project. Partition the floor area into a minimum of 2 interconnected rooms and provide each room with an exterior door and a minimum of 2 windows. Construct the floor of sufficient strength to support the testing equipment and with an impervious covering.

Adequately air condition the Type D structure and furnish it with a minimum of one desk, 3 chairs, one file cabinet, a telephone, and one built-in equipment-storage cabinet suitable for storing nuclear equipment. Ensure the cabinet is a minimum of 3 ft. wide by 2 ft. deep by 3 ft. high and has a secure lock. Provide the structure with a 240-volt electrical service entrance. Use a licensed electrician to determine the service size and service entrance conductors. Provide a minimum service of four 120-volt circuits with 20 amp breakers, and a maximum of 2 grounded convenience outlets per circuit and a minimum of two 220-volt ovens with vents to the outside. Provide a structure with a minimum of 2 convenience outlets per wall and a utility sink with an adequate, clean potable water supply for testing. Do not use space heaters to heat the structure. Use support blocks for the portable structures, tie them down, and securely attach them to the ground.

Furnish one Type E structure for the field office. Ensure the windows for the structure have burglar bars.

Provide a Type E field office meeting the requirements of a Type C structure. Provide this as a single structure with a minimum of 500 sq. ft. of floor space and 3 rooms. Provide the structure with the following facilities. The cost of providing these items is subsidiary to this bid Item:

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1. Three desks with 3 swivel chairs, two 5-drawer file cabinets and 3 straight back chairs.
2. Telephone service and equipment consisting of a minimum of one telephone with one extension. Include the call-waiting feature in the service.
3. Potable water with an electric water cooler, a cup dispenser, and cups.
4. Adequate heating, air conditioning, lighting, and a sufficient number of electrical outlets.
5. A commercially available toilet or equivalent facility for the field office and each laboratory.
6. A suitable printer/copier/fax machine for the field office as approved by the Engineer.

Provide a fenced enclosure approximately 100 ft. by 200 ft. Provide an appropriate parking area covered with a suitable base material and with a minimum of 2 security lights, one on each end of the lot. Cost of the work and materials to provide the enclosure are subsidiary to the various bid items.

Item 506: Temporary Erosion, Sedimentation and Environmental Controls

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

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

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

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

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

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

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

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Item 512: Portable Traffic Barrier

Transport Standard Height Portable Traffic Barriers (including J-J Hook and Safety Shape) used for traffic handling from the Department's stockpile located on the south side of IH 610 at Cedar Crest Blvd. (located across IH 610 from Long Drive).

Use only the J-J Hook type connection between barriers.

After completing the project, return Standard Height Portable Traffic Barriers (including J-J Hook and Single Slope) used for traffic handling, to the Department's stockpile located on the south side of at IH 610 at Cedar Crest Blvd. (located across IH 610 from Long Drive). After completing the project, return the associated Single Slope barrier connecting hardware to the area office or as directed.

After completing the project, Standard Height Safety Shape Portable Traffic Barriers used for traffic handling and the associated connecting hardware will become the property of the Contractor.

If placing the portable traffic barrier on pre-stressed concrete box beams with exposed reinforcing steel, protect the reinforcing steel by supporting the portable traffic barrier on 4 in. by 4 in. timbers. Place the timbers transversely and space them on 4 ft. centers. The cost of the labor and materials to perform this work are subsidiary to the Item, "Portable Traffic Barrier."

Item 514: Permanent Concrete Traffic Barrier

Add a 3/4-in. longitudinal chamfer to the Single Slope Concrete Barrier (SSCB) railing. Provide a continuous chamfer typically located 6 in. above the final grade. The cost of this is subsidiary to the Item, "Permanent Concrete Traffic Barrier."

Item 529: Concrete Curb, Gutter, and Combined Curb and Gutter

Item 530: Intersections, Driveways, and Turnouts

Item 531: Sidewalks

An air-entraining admixture is not required.

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

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

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

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Item 545: Crash Cushion Attenuators

After completing the project, return remaining unused crash cushion attenuators units to the Area Office Maintenance yard or as directed, at no cost to the Department.

A MASH compliant crash cushion attenuator is required for every temporary and permanent installation.

Item 556: Pipe Underdrains

Do not use crushed blast furnace slag.

Lay the underdrain pipe on a slope to insure proper drainage.

Tie the under drain pipe into the inlets as shown on the plans.

If filter material is processed gravel, use the following material requirements:

Square Sieve	Percent Retained
1/2 in.	0
No. 4	10 - 35
No. 40	55 - 85

If filter material is approved concrete sand, use the following material requirements:

Square Sieve	Percent Retained
5/8 in.	0
No. 4	0 - 40
No. 40	40 - 90
No. 100	90 - 100

Item 585: Ride Quality for Pavement Surfaces

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

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

For Continuously Reinforced Concrete Pavement (CRCP) mainlanes and direct connectors, use Surface Test Type B and Pay Adjustment Schedule 2. For ramps use Surface Test Type A.

For asphalt mainlanes and direct connectors, use Surface Test Type B and Pay Adjustment Schedule 1. For ramps use Surface Test Type A.

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

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

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

Item 610: Roadway Illumination Assemblies

The cost of providing the electrical conductor in the pole foundation or in the pole base to make connections is subsidiary to the roadway illumination assembly. The quantity for payment is the surface distance between locations.

Fabricate steel roadway illumination poles in accordance with the latest Department RIP (Roadway Illumination Poles) Standards. Poles manufactured according to the latest RIP Standards require no shop drawings. Alternate designs to the Department's RIP Standards or the use of aluminum to fabricate poles will require the submission of shop drawings electronically.

For poles to be installed in regions where the maximum basic wind speed exceeds 110 mph or to be mounted more than 25 ft. above the surrounding terrain, provide shop drawings (see ftp://ftp.dot.state.tx.us/pub/txdot-info/library/pubs/bus/bridge/e_submit_guide.pdf) and calculations that are sealed, signed, and dated by a professional engineer registered or licensed in Texas.

Supply anchor bolt assemblies as shown on the RIP standard sheets, unless a larger capacity bolt assembly is required for the 3-second gust wind speed and mounting elevation at the pole installation location.

Item 613: High Mast Illumination Poles

Place the metal beam guard fence before placing the high mast foundation.

Before erecting the high mast poles, notify the Engineer a minimum of 3 working days in advance for scheduling the inspection of each assembled high mast pole and high mast assembly.

Place high mast illumination poles in locations so that the light mounting, and support assembly can be lowered and maintained from ground level without interfering with bridges or retaining walls. Notify the Engineer of any such conflicts.

Provide anchor bolts for high mast illumination poles in accordance with the Item, "Anchor Bolts."

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Item 616: Performance Testing of Lighting Systems

The illumination plans provide for a complete illumination system installed, connected, tested, and ready for operation.

After satisfactory completion of tests, place the new lighting fixtures in operation. Final acceptance will be made after the fixtures operate satisfactorily for a minimum period of 14 days. The 14-day test period is included in the allowed working days.

Assume responsibility for the new lighting fixtures during the test period. Make adjustments or repairs as required and repair defects or damage at no expense to the Department.

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

Item 618: Conduit

When backfilling bore pits, ensure that the conduit is not damaged during installation or due to settling backfill material. Compact select backfill in 3 equal lifts to the bottom of the conduit; or if using sand, place it 2 in. above the conduit. Ensure backfill density is equal to that of the existing soil. Prevent material from entering the conduit.

Construct bore pits a minimum of 5 ft. from the edge of the base or pavement. Close the bore pit holes overnight.

Unless otherwise shown on the plans, install underground conduit a minimum of 24 in. deep. Install the conduit in accordance with the latest National Electrical Code (NEC) and applicable Department standard sheets. Place conduit under driveways or roadways a minimum of 24 in. below the pavement surface.

If using casing to place bored conduit, the casing is subsidiary to the conduit.

If placing the conduit under existing pavement to reach the service poles, bore the conduit in place and extend it a minimum distance of 5 ft. beyond the edge of shoulder or the back of curb.

Where PVC, duct cable, and HDPE conduit 1 in. and larger is allowed and installed per Department standards, provide a PVC elbow in place of the galvanized rigid metal elbow required by the Electrical Details standards. Ensure the PVC elbow is of the same schedule rating as the conduit to which it is connected. Use only a flat, high tensile strength polyester fiber pull tape to pull conductors through the PVC conduit system.

Remove conductor and conduit to be abandoned to 1 ft. below the ground level. This work is subsidiary to the various bid items.

Do not use cast iron junction boxes in concrete traffic barriers and single slope traffic barriers. Use polymer concrete junction boxes in place of the cast iron junction boxes shown on standard

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sheets CTBI (3), CTBI (4), and SSCB (4). Mount the junction boxes flush (+ 0 in., - 1/2 in.) with the concrete surface of the concrete barrier.

Use materials from pre-qualified producers as shown on the Department's Construction Division (CST) material producers list. Check the latest links on the Department's website for the list. The category is "Roadway Illumination and Electrical Supplies." The polymer concrete barrier box is subsidiary to Item 618, "Conduit."

Locate the underground utilities within the project limits. Provide the equipment necessary for locating these utilities, locate, and mark them before starting any excavation work in the area. This work is subsidiary to the various bid items. If the Contractor damages or cause damage to any existing underground utilities, repair such damage at no cost to the Department.

Ensure the interconnection of new equipment to the existing system does not interfere with the operation of the remaining system components. Ensure the system remains completely operational between the hours of 6:00 a.m. Monday and 12:00 a.m. (midnight) Saturday.

Do not interrupt system operation without coordinating with the Department's operations personnel at Houston Transtar at (713) 881-3285.

Perform work to be done on cables during weekends only.

Provide Liquid-Tight Flexible Metal (LTFM) conduit if the plans refer to flexible metal conduit. Do not use flexible metal conduit.

Unless otherwise shown on the plans, place conduit runs behind curbs at locations where curbs exist.

Use schedule 80 PVC conduit to house conductor runs under paved riprap, roadway, or driveways, unless otherwise shown on the plans.

Use Rigid Metal Conduit (RMC) for exposed conduit.

Before backfilling conduit trenches, place a detectable underground metalized mylar marking tape above the conduit and concrete encasement. Imprint the marking tape with, "TXDOT CONDUIT AND FIBER OPTIC CABLE SYSTEM. CALL (713) 802-5909 BEFORE PROCEEDING" every 18 in. Supplying and installing the marking tapes is subsidiary to the various bid items.

Conduit elbows and rigid metal extensions required when installing PVC conduit systems are subsidiary to the various bid items.

Install a continuous bare or green insulated copper wire No. 8 AWG or larger in every conduit throughout the electrical system in accordance with the Electrical Detail Standard Sheets, and the latest edition of the NEC.

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Item 620: Electrical Conductors

Test each wire of each cable or conductor after installation. Incomplete circuits or damage to the wire or the cable are cause for immediate rejection of the entire cable being tested. Remove and replace the entire cable at no expense to the Department. Also test the replacement cable after installation.

When pulling cables or conductors through the conduit, do not exceed the manufacturer's recommended pulling tensions. Lubricate the cables or conductors with a lubricant recommended by the cable manufacturer.

For both transformer and shoe-base type illumination poles, provide double-pole breakaway fuse holders as shown on the Department's Construction Division (CST) material producers list. Check the latest link on the Department's website for this list. The category is "Roadway Illumination and Electrical Supplies." The fuse holder is shown on the list under Items 610 and 620. Provide 10 Amp time delay fuses.

Ensure that circuits test clear of faults, grounds, and open circuits.

Split bolt connectors are allowed only for splices on the grounding conductors.

For Roadside Flashing Beacon Assemblies (Item 685) and Pedestal Pole Assemblies (Item 687) within the project, provide single-pole breakaway disconnects as shown on the Construction Division (CST) material producers list. Check the latest link on the Department's website for this list. The category is "Roadway Illumination and Electrical Supplies." The fuse holder is shown on the list under Item 685. For underground (hot) conductors, install a breakaway connector with a dummy fuse (slug). Provide dummy fuse (slug). For grounded (neutral) conductors, install a breakaway connector with a white colored marking and a permanently installed dummy fuse (slug).

For electrical licensing and electrical certification requirements for this project, see Item 7 of the Standard Specifications and any applicable special provisions to Item 7.

Item 624: Ground Boxes

The ground box locations are approximate. Alternate ground box locations may be used as directed, to avoid placing in sidewalks or driveways.

Ground metal ground box covers. Bond the ground box cover and ground conductors to a ground rod located in the ground box and to the system ground.

Ground the existing metal ground box covers as shown on the latest standard sheet ED (4)-14.

During construction and until project completion, provide personnel and equipment necessary to remove ground box lids for inspection. Provide this assistance within 24 hours of notification.

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Construct concrete aprons in accordance with the latest standard sheet ED (4)-14. Make the depth of the concrete apron the same as the depth of the ground box, except for Type 1 and Type 2 ground boxes. For Type 1 or Type 2 ground boxes, construct the concrete apron in accordance with details shown on the "Ground Box Details Installations" standard.

Item 628: Electrical Services

Verify and coordinate the electrical service location with the engineering section of the appropriate utility district or company.

Identify the electrical service pole with an address number assigned by the Utility Service Provider. Provide 2-in. numerals visible from the highway. Provide numbers cut out aluminum figures nailed to wood poles or painted figures on steel poles or service cabinets.

Item 636: Signs

Include aluminum route markers, exit only panels, routing signs, and other special panels attached to guide signs in the unit bid price for the parent guide sign material.

Furnish and install signs shown on the traffic signal "Summary of Traffic Signal Materials" sheet. Ensure that the legend on these sign panels is in accordance with the latest "Standard Highway Sign Designs for Texas" manual.

The locations of sign panels on overhead structures are approximate. Verify in the field before installing.

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

Item 644: Small Roadside Sign Assemblies

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

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

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

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

Assume ownership of the removed existing signs.

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

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

Item 647: Large Roadside Sign Supports and Assemblies

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

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

Assume ownership of the removed existing signs.

Item 656: Foundations for Traffic Control Devices

Excavating and disposing of surplus materials for lighting standard foundations are subsidiary to the roadway illumination assembly foundation. Dispose of surplus excavated material. Use rigid metal conduit (RMC) for stub-outs in foundation and concrete structures. These stub-outs are subsidiary to the drilled shaft foundations.

Using ready mix concrete for sign foundations is optional.

Item 662: Work Zone Pavement Markings

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

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

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

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

Item 662: Work Zone Pavement Markings

Item 666: Reflectorized Pavement Markings

Item 668: Prefabricated Pavement Markings

Item 6020: Multipolymer Pavement Markings (MPM) with Warranty

Item 6038: Multipolymer Pavement Markings (MPM)

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

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

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

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

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

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

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

Stripe all roadways before opening them to traffic.

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

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

Place the pedestrian crosswalk pavement markings only after the pedestrian signals and push buttons are installed and operating.

Item 672: Raised Pavement Markers

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

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

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

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Item 677: Eliminating Existing Pavement Markings and Markers

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

Item 678: Pavement Surface Preparation for Markings

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

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

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

Do not clean concrete pavement by grinding.

Item 680: Highway Traffic Signals

Clearly mark or highlight on the shop drawings the items being furnished for this project.

Furnish labor, tools, equipment, and materials as shown on the plans and specifications for a complete and operating signal installation.

Furnish the type of controller cabinet specified on the plans. Refer to the table shown in the Departmental Material Specifications (DMS-11170, Fully Actuated, Solid-State Traffic Signal Controller Assembly), Section 11170.6.A, Type 2 cabinet, page 4 of 39, regarding the size of the cabinet, back panel configuration, and the size of the load bay. Use the following website to view this specification: <http://www.txdot.gov/business/resources/dms.html>

Complete traffic signal construction work, including correcting discrepancies shown on the Department inspector's "Traffic Signal Installation Inspection Report" before the beginning of the test period.

Provide a full-time qualified traffic signal technician responsible for installing, maintaining, or replacing traffic signal devices.

Staking in the field is subject to approval.

Make adjustments in project construction, if needed, due to conflicts with underground utilities.

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Do not aim the luminaire arms mounted on traffic signal poles into the intersection. Aim each arm perpendicular to the centerline of the roadway it is intended to cover, to develop the proper illumination pattern for the intersection.

Allow the electrical work to be inspected by the City. Complying with the provisions and requirements of the City electrical ordinance is not required. Such inspection does not make the City a party to this contract.

Provide continuous conductors without splices from signal controller to signal heads. Route the conductors for luminaires to the service enclosure. Splices or attachments to the terminal block in the access compartment of the mast arm pole are not permitted except for the luminaire cable.

Abrasions to the conductor insulation caused while pulling cable for the traffic signal system are cause for immediate rejection. Remove and replace the entire damaged cable at no expense to the Department.

When pulling cables or conductors through conduit, do not exceed the manufacturer's recommended pulling tensions. Lubricate the cables or conductors with a lubricant as recommended by the cable manufacturer.

Bond the controller housing, signal poles, conduit, and spans to a minimum No. 6 AWG stranded copper conductor. An equipment grounding conductor is required in every conduit to form a continuous grounding system. Effectively connect the grounding system to ground rods or concrete encased grounding electrodes as indicated in the plans.

Wrap signal heads with dark plastic or suitable material to conceal the signal faces from the time of installation until placing into operation. Do not use burlap.

Furnish signal heads from the same manufacturer.

Use Type B (high intensity prismatic) or Type D (diamond grade) retroreflective sheeting for signs mounted under or adjacent to the signal heads.

Item 4002: Elastomeric Bearing Pads

Provide bridge jacking plans signed and sealed by a professional engineer to raise the bridge for bearing pad replacement.

Item 6004: Communication Cable

Seal each end of the communications cable that is exposed to elements during storage or after installing with a waterproof sealant, or as per manufacturer recommendations.

Ensure each communication cable run is continuous without splices from controller to controller.

Assume responsibility for the signal carrying capability and performance of the cable. Install each wire with a lightning protection device unless otherwise noted. Ground the cable in accordance with the manufacturer's recommendation.

Basis of Estimate

Item	Description	Limit and Rate	Unit
134	Backfilling Pavement Edges • Asphalt Emulsion	0.25 Gal. / Sq. Yd.	STA
150	Blading	1 Hr. / Station	HR
247	Flexible Base • Crushed Stone	138 Lb. / Cu. Ft.	TON
260	Lime Treatment (Road-Mixed) For materials used as subgrade * • Lime(HYD, COM, or QK)(SLRY) or QK(DRY)	6 % by weight based on 100 Lb. / Cu. Ft. subgrade	SY TON
263	Lime Treatment (Plant-Mixed) • Hydrated Lime	3 % by weight of flexible base	TON
275	Cement Treatment (Road-Mixed) For materials used as subgrade * • Cement	6 % by weight based on 100 Lb. / Cu. Ft. subgrade	SY TON
292	Asphalt Treatment (Plant-Mixed) • Asphalt • Aggregate	110 Lb. / Sq. Yd.-In. 5 % by weight 95 % by weight	TON
310	Prime Coat	0.25 Gal. / Sq. Yd.	GAL
316	Seal Coat • Asphalt • Aggregate (Gr 4) A-R Binder • Asphalt • Aggregate (Gr 4)	0.32 Gal. / Sq. Yd. 1/130 Cu. Yd. / Sq. Yd. 0.42 Gal. / Sq. Yd. 1/130 Cu. Yd. / Sq. Yd.	GAL CY GAL CY
3079	Permeable Friction Course (PG-Binder) • Asphalt • Aggregate Permeable Friction Course (A-R Binder) • Asphalt • Aggregate	95 Lb. / Sq. Yd.-In. 6.5 % by weight 93.5 % by weight 95 Lb. / Sq. Yd.-In. 8 % by weight 92 % by weight	TON TON
3000	Crack Attenuating Mixture • Asphalt • Aggregate	115 Lb. / Sq. Yd.-In. 7.5 % by weight 92.5 % by weight	TON

Item	Description	Limit and Rate	Unit
3076	Dense-Graded Hot Mix Asphalt • Asphalt • Aggregate Tack Coat • Applied on new HMA • Applied on Existing HMA • Applied on Milled HMA	110 Lb. / Sq. Yd.-In. 6 % by weight 94 % by weight 0.06 Gal. / Sq. Yd. 0.09 Gal. / Sq. Yd. 0.11 Gal. / Sq. Yd.	TON
3077	Superpave Mixtures • Asphalt • Aggregate	100 Lb. / Sq. Yd.-In. 8 % by weight 92 % by weight	TON

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



Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0389-13-039

DISTRICT Houston
HIGHWAY SH 146

COUNTY Harris

CONTROL SECTION JOB				0389-13-039		TOTAL EST.	TOTAL FINAL
PROJECT ID				A00087280			
COUNTY				Harris			
HIGHWAY				SH 146			
ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL		
	100-6002	PREPARING ROW	STA	58.000		58.000	
	104-6001	REMOVING CONC (PAV)	SY	9,523.000		9,523.000	
	104-6021	REMOVING CONC (CURB)	LF	1,708.000		1,708.000	
	104-6042	REMOVING CONC (MOVABLE BARRIER)	LF	2,120.000		2,120.000	
	110-6001	EXCAVATION (ROADWAY)	CY	20,982.000		20,982.000	
	132-6001	EMBANKMENT (FINAL)(ORD COMP)(TY A)	CY	69,640.000		69,640.000	
	132-6006	EMBANKMENT (FINAL)(DENS CONT)(TY C)	CY	84,494.000		84,494.000	
	132-6035	EMBANK(FINAL)(DC)(TY E)(CSBE)	CY	6,136.000		6,136.000	
	132-6036	EMB(FNL)(DC)(TYE)(CSBE)(RWALL FND IMPR	CY	16,857.000		16,857.000	
	162-6002	BLOCK SODDING	SY	60,785.000		60,785.000	
	166-6001	FERTILIZER	AC	12.000		12.000	
	168-6001	VEGETATIVE WATERING	MG	1,507.000		1,507.000	
	260-6006	LIME TRT (EXST MATL) (6")	SY	58,212.000		58,212.000	
	260-6012	LIME(HYD,COM OR QK)(SLRY)OR QK(DRY)	TON	930.000		930.000	
	276-6224	CEM TRT(PLNT MX) (CL N)(TY E)(GR 4)(6")	SY	58,212.000		58,212.000	
	292-6017	ASPHALT STAB BASE (GR 4)(PG 64)	TON	3,170.000		3,170.000	
	360-6002	CONC PVMT (CONT REINF - CRCP) (8")	SY	3,701.000		3,701.000	
	360-6005	CONC PVMT (CONT REINF - CRCP) (11")	SY	53,930.000		53,930.000	
	400-6001	STRUCT EXCAV	CY	30,853.000		30,853.000	
	400-6002	STRUCT EXCAV (BOX)	CY	917.000		917.000	
	400-6003	STRUCT EXCAV (PIPE)	CY	1,208.000		1,208.000	
	400-6005	CEM STABIL BKFL	CY	1,190.000		1,190.000	
	400-6009	CEMENT STAB BACKFILL (INLET OR MH)	CY	203.000		203.000	
	402-6001	TRENCH EXCAVATION PROTECTION	LF	2,182.000		2,182.000	
	403-6001	TEMPORARY SPL SHORING	SF	2,706.000		2,706.000	
	416-6003	DRILL SHAFT (30 IN)	LF	1,140.000		1,140.000	
	416-6004	DRILL SHAFT (36 IN)	LF	1,440.000		1,440.000	
	416-6007	DRILL SHAFT (54 IN)	LF	1,728.000		1,728.000	
	416-6018	DRILL SHAFT (SIGN MTS) (24 IN)	LF	108.000		108.000	
	416-6029	DRILL SHAFT (RDWY ILL POLE) (30 IN)	LF	152.000		152.000	
	420-6013	CL C CONC (ABUT)	CY	96.600		96.600	
	420-6037	CL C CONC (COLUMN)	CY	102.000		102.000	
	420-6043	CL C CONC (FOOTING)	CY	342.300		342.300	
	420-6082	CL F CONC (CAP)	CY	237.600		237.600	
	422-6001	REINF CONC SLAB	SF	30,853.000		30,853.000	
	422-6015	APPROACH SLAB	CY	255.000		255.000	
	423-6001	RETAINING WALL (MSE)	SF	46,990.000		46,990.000	

DISTRICT	COUNTY	CCSJ	SHEET
Houston	Harris	0389-13-039	11



CONTROLLING PROJECT ID 0389-13-039

DISTRICT Houston
HIGHWAY SH 146

COUNTY Harris

Estimate & Quantity Sheet

CONTROL SECTION JOB				0389-13-039		TOTAL EST.	TOTAL FINAL
PROJECT ID				A00087280			
COUNTY				Harris			
HIGHWAY				SH 146			
ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL		
	425-6028	PRESTR CONC U - BEAM (U54)	LF	2,803.470		2,803.470	
	432-6001	RIPRAP (CONC)(4 IN)	CY	31.000		31.000	
	432-6008	RIPRAP (CONC)(CL B)(RR8&RR9)	CY	11.000		11.000	
	432-6009	RIPRAP (CONC) (CL B) (4")	CY	220.000		220.000	
	442-6007	STR STEEL (MISC NON - BRIDGE)	LB	876.000		876.000	
	450-6023	RAIL (TY SSTR)	LF	3,027.000		3,027.000	
	454-6018	SEALED EXPANSION JOINT (4 IN) (SEJ - M)	LF	191.000		191.000	
	462-6014	CONC BOX CULV (7 FT X 3 FT)	LF	350.000		350.000	
	464-6003	RC PIPE (CL III)(18 IN)	LF	9.000		9.000	
	464-6005	RC PIPE (CL III)(24 IN)	LF	1,823.000		1,823.000	
	465-6167	INLET (COMPL)(TY AD)	EA	3.000		3.000	
	465-6172	INLET (COMPL)(TY AZR2G)	EA	6.000		6.000	
	465-6177	INLET (COMPL)(TY AZ2G)	EA	14.000		14.000	
	467-6358	SET (TY II) (18 IN) (RCP) (4: 1) (C)	EA	1.000		1.000	
	467-6390	SET (TY II) (24 IN) (RCP) (4: 1) (C)	EA	5.000		5.000	
	479-6006	ADJUSTING INLET (CAP)	EA	3.000		3.000	
	496-6008	REMOV STR (BOX CULVERT)	LF	692.000		692.000	
	500-6001	MOBILIZATION	LS	0.032		0.032	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	26.000		26.000	
	502-6024	FURNISH ADDITIONAL ARROW BOARD	HR	960.000		960.000	
	506-6020	CONSTRUCTION EXITS (INSTALL) (TY 1)	SY	350.000		350.000	
	506-6024	CONSTRUCTION EXITS (REMOVE)	SY	350.000		350.000	
	506-6041	BIODEG EROSN CONT LOGS (INSTL) (12")	LF	770.000		770.000	
	506-6043	BIODEG EROSN CONT LOGS (REMOVE)	LF	770.000		770.000	
	512-6013	PORT CTB (DES SOURCE)(SGL SLP)(TY 1)	LF	11,256.000		11,256.000	
	512-6025	PORT CTB (MOVE)(SGL SLP)(TY 1)	LF	830.000		830.000	
	512-6037	PORT CTB (STKPL)(SGL SLP)(TY 1)	LF	11,256.000		11,256.000	
	512-6080	PORT CTB CONNECT HARDWARE	EA	394.000		394.000	
	514-6001	PERM CTB (SGL SLOPE) (TY 1) (42)	LF	320.000		320.000	
	514-6002	PERM CTB (SGL SLOPE) (TY 2) (42)	LF	6,764.000		6,764.000	
	514-6035	PERM CTB (TRAN SSCB TO CTB) (MOD)	LF	40.000		40.000	
	529-6011	CONC CURB (DOWEL)	LF	950.000		950.000	
	533-6005	RUMBLE STRIPS (SHOULDER) CONCRETE	LF	27,669.000		27,669.000	
	545-6003	CRASH CUSH ATTEN (MOVE & RESET)	EA	2.000		2.000	
	545-6005	CRASH CUSH ATTEN (REMOVE)	EA	4.000		4.000	
	545-6007	CRASH CUSH ATTEN (INSTL)(L)(N)(TL3)	EA	6.000		6.000	
	556-6005	PIPE UNDERDRAINS (TY 5) (6")	LF	2,517.000		2,517.000	

DISTRICT	COUNTY	CCSJ	SHEET
Houston	Harris	0389-13-039	11A



CONTROLLING PROJECT ID 0389-13-039

DISTRICT Houston
HIGHWAY SH 146

COUNTY Harris

Estimate & Quantity Sheet

CONTROL SECTION JOB				0389-13-039		TOTAL EST.	TOTAL FINAL
PROJECT ID				A00087280			
COUNTY				Harris			
HIGHWAY				SH 146			
ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL		
	610-6009	REMOVE RD IL ASM (TRANS-BASE)	EA	1.000		1.000	
	610-6104	IN RD IL (U/P) (TY 1) (150W EQ) LED	EA	6.000		6.000	
	610-6106	IN RD IL (U/P) (TY 2) (150W EQ) LED	EA	6.000		6.000	
	610-6216	IN RD IL (TY SA) 40T-10 (250W EQ) LED	EA	19.000		19.000	
	618-6046	CONDT (PVC) (SCH 80) (2")	LF	5,296.000		5,296.000	
	618-6047	CONDT (PVC) (SCH 80) (2") (BORE)	LF	763.000		763.000	
	618-6053	CONDT (PVC) (SCH 80) (3")	LF	390.000		390.000	
	618-6054	CONDT (PVC) (SCH 80) (3") (BORE)	LF	390.000		390.000	
	618-6062	CONDT (RM) (3/4")	LF	444.000		444.000	
	618-6074	CONDT (RM) (3")	LF	35.000		35.000	
	620-6003	ELEC CONDR (NO.12) BARE	LF	6,767.000		6,767.000	
	620-6004	ELEC CONDR (NO.12) INSULATED	LF	13,534.000		13,534.000	
	620-6009	ELEC CONDR (NO.6) BARE	LF	625.000		625.000	
	620-6011	ELEC CONDR (NO.4) BARE	LF	185.000		185.000	
	620-6012	ELEC CONDR (NO.4) INSULATED	LF	365.000		365.000	
	621-6005	TRAY CABLE (4 CONDR) (12 AWG)	LF	675.000		675.000	
	624-6009	GROUND BOX TY D (162922)	EA	8.000		8.000	
	624-6010	GROUND BOX TY D (162922)W/APRON	EA	15.000		15.000	
	624-6028	REMOVE GROUND BOX	EA	1.000		1.000	
	628-6054	ELC SRV TY A 240/480 060(SS)SS(E)SP(O)	EA	3.000		3.000	
	628-6145	ELC SRV TY D 120/240 060(NS)SS(E)SP(O)	EA	1.000		1.000	
	636-6001	ALUMINUM SIGNS (TY A)	SF	616.000		616.000	
	636-6003	ALUMINUM SIGNS (TY O)	SF	56.000		56.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	54.000		54.000	
	644-6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	EA	4.000		4.000	
	644-6064	IN BRIDGE MNT CLEARANCE SGN ASSM(TY N)	EA	4.000		4.000	
	644-6068	RELOCATE SM RD SN SUP&AM TY 10BWG	EA	1.000		1.000	
	644-6070	RELOCATE SM RD SN SUP&AM TY S80	EA	1.000		1.000	
	644-6076	REMOVE SM RD SN SUP&AM	EA	29.000		29.000	
	644-6103	REPLACE SRS & S TY10BWG(1) (P)	EA	3.000		3.000	
	644-6104	REPLACE SRS & S TY10BWG(1) (T)	EA	3.000		3.000	
	647-6001	INSTALL LRSS (STRUCT STEEL)	LB	2,873.000		2,873.000	
	647-6003	REMOVE LRSA	EA	2.000		2.000	
	668-6054	PREFAB PAV MRK TY B (Y)(MED NOSE)	EA	3.000		3.000	
	672-6007	REFL PAV MRKR TY I-C	EA	80.000		80.000	
	672-6010	REFL PAV MRKR TY II-C-R	EA	1,000.000		1,000.000	
	680-6001	INSTALL HWY TRF SIG (FLASH BEACON)	EA	1.000		1.000	



DISTRICT	COUNTY	CCSJ	SHEET
Houston	Harris	0389-13-039	11B



CONTROLLING PROJECT ID 0389-13-039

DISTRICT Houston
HIGHWAY SH 146



COUNTY Harris

Estimate & Quantity Sheet

CONTROL SECTION JOB				0389-13-039		TOTAL EST.	TOTAL FINAL
PROJECT ID				A00087280			
COUNTY				Harris			
HIGHWAY				SH 146			
ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL		
	680-6004	REMOVING TRAFFIC SIGNALS	EA	1.000		1.000	
	682-6005	VEH SIG SEC (12")LED(RED)	EA	16.000		16.000	
	682-6021	BACK PLATE (12")(1 SEC)	EA	16.000		16.000	
	684-6012	TRF SIG CBL (TY A)(12 AWG)(7 CONDR)	LF	2,385.000		2,385.000	
	690-6009	REMOVAL OF CABLES	LF	600.000		600.000	
	3021-6001	WIDE FLANGE PAVEMENT TERMINALS	LF	188.000		188.000	
	4006-6003	SOUND WALL (WAVE SCHEME)(12 FT)	LF	1,413.000		1,413.000	
	6001-6002	PORTABLE CHANGEABLE MESSAGE SIGN	EA	2.000		2.000	
	6038-6004	MULTIPOLYMER PAV MRK (W)(6")(SLD)	LF	16,718.000		16,718.000	
	6038-6005	MULTIPOLYMER PAV MRK (W)(6")(BRK)	LF	32,966.000		32,966.000	
	6038-6007	MULTIPOLYMER PAV MRK (W)(8")(SLD)	LF	7,967.000		7,967.000	
	6038-6010	MULTIPOLYMER PAV MRK (W)(8")(LNDP)	LF	1,460.000		1,460.000	
	6038-6011	MULTIPOLYMER PAV MRK (W)(12")(SLD)	LF	1,584.000		1,584.000	
	6038-6012	MULTIPOLYMER PAV MRK (W)(12")(LNDP)	LF	1,442.000		1,442.000	
	6038-6013	MULTIPOLYMER PAV MRK (W)(24")(SLD)	LF	321.000		321.000	
	6038-6017	MULTIPOLYMER PAV MRK (Y)(6")(SLD)	LF	18,685.000		18,685.000	
	6038-6020	MULTIPOLYMER PAV MRK (Y)(8")(SLD)	LF	2,537.000		2,537.000	
	6038-6022	MULTIPOLYMER PAV MRK (Y)(24")(SLD)	LF	1,153.000		1,153.000	
	6038-6024	MULTIPOLYMER PAV MRK (BLK)(6")(BRK)	LF	32,966.000		32,966.000	
	6038-6025	MULTIYPOLYMER PAV MRK (W) (ARROW)	EA	13.000		13.000	
	6038-6026	MULTIPOLYMER PAV MRK (W) (DBL ARROW)	EA	4.000		4.000	
	6038-6027	MULTIPOLYMER PAV MRK (W) (WORD)	EA	15.000		15.000	
	6038-6028	MULTIPOLYMER PAV MRK (W) 36" YLD TRI	EA	19.000		19.000	
	6038-6029	MULTIPOLYMER PAV MRK (W)(U-TURN ARROW)	EA	4.000		4.000	
	6058-6001	BBU SYSTEM (EXTERNAL BATT CABINET)	EA	1.000		1.000	

- * CONTRACTOR SHALL COLLECT PORTABLE CTB FROM TXDOT'S STOCKPILE SOURCE LOCATED AT IH10 & CEDAR CREST ST, HOUSTON, TX AND RETURN BACK TO THE STOCKPILE AFTER COMPLETION.
- ** DES APPROVAL REQUIRED PRIOR TO USE
- *** FOR THE CONTRACTOR'S INFORMATION ONLY (SEE TCP LAYOUT SHEET #36, NOTE #5)

SUMMARY OF TRAFFIC CONTROL ITEMS											
LOCATION	502	502	512	512	512	512	545	545	545	6001	
	6001	6024	6013	6025	6037	6080	6007	6003	6005	6002	
	BARRICADES, SIGNS AND TRAFFIC HANDLING	FURNISH ADDITIONAL ARROW BOARD	* PORT CTB (DES SOURCE) (SGL SLP) (TY 1)	PORT CTB (MOVE) (SGL SLP) (TY 1)	PORT CTB (STKPL) (SGL SLP) (TY 1)	** PORT CTB CONNECT HARDWARE	CRASH CUSH ATTEN (INSTL)	CRASH CUSH ATTEN (MOVE & RESET)	CRASH CUSH ATTEN (REMOVE)	PORTABLE CHANGEABLE MESSAGE SIGN	*** HMAC (10") (TY-B)
	MO	HR	LF	LF	LF	EA	EA	EA	EA	EA	CY
PHASE 1 ST 1			11242			394	4				159
PHASE 1 ST 2				830	300					2	
PHASE 2 ST 1											29
PHASE 2 ST 2											
PHASE 2 ST 3		960			10,956		2				
PHASE 3 ST 1								4			
PROJECT TOTALS	26	960	11,242	830	11,256	394	4	2	4	2	188

REV. NO.	DATE	BY	REVISION
 11821 Telge Road Cypress, Texas 77429 PH: (281) 304-0200 - FX: (281) 304-0210 Firm Registration No. F-382			
 Texas Department of Transportation			
SH 146			
SUMMARY OF TCP QUANTITIES			
SHEET 1 OF 1			
FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			12
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

SUMMARY OF REMOVAL ITEMS					
LOCATION	104	104	104	104	496
	6001	6001	6021	6042	6008
	REMOVING CONC (PAV) 8"	REMOVING CONC (PAV) 12"	REMOVING CONC (CURB)	REMOVING CONC (MOVABLE BARRIER)	REMOV STR (BOX CULVERT)
	SY	SY	LF	LF	LF
SHEET 1 OF 4		4,861		2,120	
SHEET 2 OF 4			994		
SHEET 3 OF 4			589		346
SHEET 4 OF 4	2,165	2,497	125		
PROJECT TOTALS	2,165	7,358	1,708	2,120	346

REV NO.	DATE	BY	REVISION

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



SH 146
SUMMARY OF
REMOVAL
QUANTITIES

SHEET 1 OF 1



FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			13
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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SUMMARY OF ROADWAY ITEMS

LOCATION	100	110	132	260	260	276	292	360	360	422	432	450	514	514	529	545	3021
	6002	6001	6001	6006	6012	6224	6017	6002	6005	6015	6009	6023	6002	6035	6011	6007	6001
	PREPARING ROW	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL) (ORD COMP) (TY A)	LIME TRT (EXST MATL) (6")	LIME (HYD, COM OR QK) (SLRY) OR QK (DRY)	CEM TRT (PLNT MX) (CL N) (TY E) (GR 4) (6")	ASPHALT STAB BASE (GR 4) (PG 64)	CONC PVMT (CONT REINF - CRCP) (8")	CONC PVMT (CONT REINF - CRCP) (11")	APPROACH SLAB	RIPRAP (CONC) (CL B) (4")	RAIL (TY SSTR)	PERM CTB (SGL SLOPE) (TY 2) (42)	PERM CTB (TRAN SSCB TO CTB) (MOD)	CONC CURB (DOWEL)	CRASH CUSH ATTEN (INSTL) (L) (N) (TL3)	WIDE FLANGE PAVEMENT TERMINALS *
STA	CY	CY	SY	TON	SY	TON	SY	SY	CY	CY	LF	LF	LF	LF	EA	LF	
BEGIN TO STA 554+00	4												870	40			
STA 554+00 TO STA 566+00	12	3,662	1,399	11,433	183	11,433	623		10,967				1,200				
STA 566+00 TO STA 578+00	12	926	6,408	16,978	271	16,978	924	3,141	13,512		14		1,200				
STA 578+00 TO STA 590+00	12	3,074	12,341	14,589	233	14,589	794	559	13,471		4	348	1,200		1		
STA 590+00 TO STA 602+00	12	10,249	41,786	8,167	131	8,167	445		9,191	255	197	1,790	880		629		188
STA 602+00 TO STA 614+00	7	3,071	7,706	7,046	113	7,046	384		6,789		6	249	1,200		197	1	
STA 614+00 TO END													214		124		
PROJECT TOTALS	58	20,982	69,640	58,212	930	58,212	3,170	3,701	53,930	255	220	2387	6,764	40	950	2	188

* THIS MEASUREMENT INCLUDES FULL COMPENSATION FOR NECESSARY PREPARATION OF THE SUBGRADE CEMENT TREATED BASE AND LIME TREATED BASE AS SHOWN OF THE HOUSTON DISTRICT STANDARD 'WIDE FLANGE PAVEMENT TERMINAL - WFPT'. THE PAYMENT LIMITS SHALL BE AS SHOWN ON THE PLANS

REV NO.	DATE	BY	REVISION
 11821 Telge Road Cypress, Texas 77429 PH: (281) 304-0200 - FX: (281) 304-0210 Firm Registration No. F-382			
 Texas Department of Transportation			
SH 146 SUMMARY OF ROADWAY & EARTHWORK QUANTITIES			
SHEET 1 OF 1			
FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			14
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

SUMMARY OF RETAINING WALL ITEMS							SUMMARY OF SOUND WALL ITEMS		
LOCATION	132	132	132	400	423	556	LOCATION	416	4006
	6006	6035	6036	6001	6001	6005		6003	6003
	EMBANKMENT (FINAL) (DENS CONT) (TY C)	EMBANK (FINAL) (DC) (TY E) (CSBE)	EMB (FNL) (DC) (TYE) (CSBE) (RWALL FND IMPR)	STRUCT EXCAV	RETAINING WALL (MSE)	PIPE UNDERDRAINS (TY 5) (6")		DRILL SHAFT (30 IN)	SOUND WALL (WAVE SCHEME) (12 FT)
	CY	CY	CY	CY	SF	LF		LF	LF
SHEET 1 OF 6	21,053	1,335				11,412	SHEET 1 OF 3	527	396
SHEET 2 OF 6	3,299	1,335	8,066	15,020		9,506	SHEET 2 OF 3	511	396
SHEET 3 OF 6	16,671					1,753	SHEET 3 OF 3	434	336
SHEET 4 OF 6	16,571					1,869			
SHEET 5 OF 6	3,462	1,733	8,791	15,833		10,642			
SHEET 6 OF 6	23,438	1,733				11,808			
PROJECT TOTALS	84,494	6,136	16,857	30,853	46,990	2,517	PROJECT TOTALS	1,472	1,128

REV NO.	DATE	BY	REVISION
 11821 Telge Road Cypress, Texas 77429 PH: (281) 304-0200 - FX: (281) 304-0210 Firm Registration No. F-382			
 Texas Department of Transportation			
SH 146			
SUMMARY OF RETAINING WALL & SOUND WALL QUANTITIES			
SHEET 1 OF 1			
FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			15
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

* FOR CONTRACTOR'S INFORMATION ONLY

SUMMARY OF DRAINAGE ITEMS LOCATION	400 *	400 *	400	400	402	462	464	464	465	465	465	467	467	479
	6002	6003	6005	6009	6001	6014	6003	6005	6167	6172	6177	6358	6390	6006
	STRUCT EXCAV (BOX)	STRUCT EXCAV (PIPE)	CEM STABIL BKFL	CEMENT STAB BACKFILL (INLET OR MH)	TRENCH EXCAVATION PROTECTION	CONC BOX CULV (7 FT X 3 FT)	RC PIPE (CL III) (18 IN)	RC PIPE (CL III) (24 IN)	INLET (COMPL) (TY AD)	INLET (COMPL) (TY AZR2G)	INLET (COMPL) (TY AZ2G)	SET (TY II) (18 IN) (RCP) (4: 1) (C)	SET (TY II) (24 IN) (RCP) (4: 1) (C)	ADJUSTING INLET (CAP)
	CY	CY	CY	CY	LF	LF	LF	LF	EA	EA	EA	EA	EA	EA
BEGIN TO STA 577+00		11	8	25	17	-	-	17	3	-	-	-	-	3
STA 577+00 TO STA 587+00		579	420	64	878	-	-	878	-	-	5	-	1	-
STA 587+00 TO STA 599+00		235	171	51	359	-	9	365	-	4	4	1	4	-
STA 599+00 TO END	917	381	591	64	928	350		578	-	2	5	-	-	-
PROJECT TOTALS	917	1,208	1,190	203	2,182	350	9	1,838	3	6	14	1	5	3

REV NO.	DATE	BY	REVISION

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



SH 146

SUMMARY OF DRAINAGE QUANTITIES

SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			16
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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SUMMARY OF HIGH TRAFFIC SIGNAL QUANTITIES

ITEM	DESC CODE	DESCRIPTION	UNIT	QUANTITY	FINAL
618	6053	CONDT (PVC) (SCH 80) (3")	LF	390	
618	6054	CONDT (PVC) (SCH 80) (3") (BORE)	LF	390	
618	6074	CONDT (RM) (3")	LF	35	
620	6009	ELEC CONDR (NO.6) BARE	LF	625	
620	6011	ELEC CONDR (NO.4) BARE	LF	185	
620	6012	ELEC CONDR (NO.4) INSULATED	LF	365	
621	6005	TRAY CABLE (4 CONDR) (12 AWG)	LF	675	
624	6009	GROUND BOX TY D (162922)	EA	7	
624	6010	GROUND BOX TY D (162922)W/APRON	EA	1	
624	6028	REMOVE GROUND BOX	EA	1	
628	6145	ELC SRV TY D 120/240 060(NS)SS(E)SP(O)	EA	1	
680	6001	INSTALL HWY TRF SIG (FLASH BEACON)	EA	1	
		** CONTROLLER, FULL-ACTUATED	EA	1	
		** CABINET, BASE MOUNT LOCKABLE	EA	1	
		** TRAFFIC SIGNAL CONTROLLER FOUNDATION	EA	1	
		** ROD, 5/8 X 10' COPPER-CLAD GROUND (CONTROLLER)	EA	1	
		** DETECTOR CARD RACK (8 SLOT) AND (4 SLOT)	EA	1	
		** GPS COMMUNICATION UNIT	EA	1	
		** 18" CABINET EXTENSION	EA	1	
		** SIGN "SH 146" (72"x18")	EA	4	
		** SIGN "Ferry Rd" (96"x18")	EA	1	
		** SIGN "N Alexandar Dr" (120"x18")	EA	2	
		** SIGN "SIGNAL UNDER STUDY FOR REMOVAL" (30"x30")	EA	6	
		** SIGN "ONE WAY" LEFT (36"x12")	EA	2	
		** SIGN "ONE WAY" RIGHT (36"x12")	EA	2	
		** EXISTING SIGNAL CABLE RECONNECTIONS	EA	16	
		** RECONNECT VEHICLE DETECTION	EA	1	
680	6004	REMOVING TRAFFIC SIGNALS	EA	1	
		** SALVAGE EXISTING SIGNAL EQUIPMENT	EA	16	
		** REMOVE EXISTING OVERHEAD SIGNS	EA	10	
		** REMOVE EXISTING ELECTRICAL SERVICE	EA	1	
		** REMOVE EXISTING CONTROLLER CABINET AND FOUNDATION	EA	1	
682	6005	VEH SIG SEC (12")LED(RED)	EA	16	
682	6021	BACK PLATE (12") (1 SEC)	EA	16	
684	6012	TRF SIG CBL (TY A) (12 AWG) (7 CONDR)	LF	2385	
690	6009	REMOVAL OF CABLES	LF	600	
6058	6001	BBU SYSTEM (EXTERNAL BATT CABINET)	EA	1	

**MATERIALS SUBSIDIARY TO PERTINENT ITEMS.

REV. NO.	DATE	BY	REVISION
 AECOM 19219 KATY FREEWAY <small>AECOM Technical Services Inc. - 3580</small> SUITE 100 HOUSTON, TX 77094			
 CivilTech 11821 Telge Road Engineering, Inc. Cypress, Texas 77429 <small>Firm Registration No. F-382</small> PH: (281) 304-0200 - FX: (281) 304-0210			
 Texas Department of Transportation			
SH 146 SUMMARY OF SIGNAL QUANTITIES			
SHEET 1 OF 1			
FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			17
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

SUMMARY OF ILLUMINATION QUANTITIES													
SHEET	416 6029	610 6009	610 6104	610 6106	610 6216	618 6046	618 6047	618 6062	620 6003	620 6004	624 6009	624 6010	628 6054
	DRILL SHAFT (RDWY ILL POLE) (30 IN)	REMOVE RD IL ASM (TRANS-BASE)	IN RD IL (U/P) (TY 1) (150W EQ) LED	IN RD IL (U/P) (TY 2) (150W EQ) LED	IN RD IL (TY SA) 40T-10 (250W EQ) LED	CONDT (PVC) (SCH 80) (2")	CONDT (PVC) (SCH 80) (2") (BORE)	CONDT (RM) (3/4")	ELEC CONDR (NO. 12) BARE	ELEC CONDR (NO. 12) INSULATED	GROUND BOX TY D (162922)	GROUND BOX TY D (162922) w/ APRON	ELC SRV TY A 240/480 060 (SS)SS(E)SP(O)
	LF	EA	EA	EA	EA	LF	LF	LF	LF	LF	EA	EA	EA
SHEET 1 OF 7	-	-	-	-	-	-	-	-	-	-	-	-	-
SHEET 2 OF 7	24	-	-	-	3	1,199	102	-	1,349	2,698	-	6	2
SHEET 3 OF 7	48	-	-	-	6	1,192	-	-	1,222	2,444	-	-	-
SHEET 4 OF 7	64	-	-	-	8	1,893	-	-	1,953	3,906	-	3	-
SHEET 5 OF 7	8	-	-	-	1	789	528	-	1,353	2,706	-	5	1
SHEET 6 OF 7	8	1	-	-	1	223	-	-	229	458	-	-	-
SHEET 7 OF 7	-	-	-	-	-	-	-	-	-	-	-	-	-
UNDERPASS	-	-	6	6	-	-	133	444	661	1,322	1	-	-
TOTALS	152	1	6	6	19	5,296	763	444	6,767	13,534	1	14	3

REV NO.	DATE	BY	REVISION
 AECOM <small>AECOM Technical Services Inc. - 3580</small>			
19219 KATY FREEWAY SUITE 100 HOUSTON, TX 77094			
 CivilTech Engineering, Inc.			
11821 Telge Road Cypress, Texas 77429 PH: (281) 304-0200 - FX: (281) 304-0210 Firm Registration No. F-382			
 Texas Department of Transportation			
SH 146 SUMMARY OF ILLUMINATION QUANTITIES			
SHEET 1 OF 1			
FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			18
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

SUMMARY OF PAVEMENT MARKING ITEMS												
LOCATION	533	668	672	672	6038	6038	6038	6038	6038	6038	6038	6038
	6005	6054	6007	6010	6004	6005	6007	6010	6011	6012	6013	6017
	RUMBLE STRIPS (SHOULDER) CONCRETE	PREFAB PAV MRK TY B (Y) (MED NOSE)	REFL PAV MRKR TY I-C	REFL PAV MRKR TY II-C-R	MULTIPOLYMER PAV MRK (W) (6") (SLD)	MULTIPOLYMER PAV MRK (W) (6") (BRK)	MULTIPOLYMER PAV MRK (W) (8") (SLD)	MULTIPOLYMER PAV MRK (W) (8") (LNDP)	MULTIPOLYMER PAV MRK (W) (12") (SLD)	MULTIPOLYMER PAV MRK (W) (12") (LNDP)	MULTIPOLYMER PAV MRK (W) (24") (SLD)	MULTIPOLYMER PAV MRK (Y) (6") (SLD)
	LF	LF	EA	EA	EA	LF	LF	LF	LF	LF	LF	LF
BEGIN TO STA 554+00	3830			190	1,800	3,935	1,420		720	1,195		1,780
STA 554+00 TO STA 566+00	4799		56	155	1,610	5,080	2,363	990	406		30	3,522
STA 566+00 TO STA 578+00	4799		24	160	3,070	4,866	1,350	470	165			4,165
STA 578+00 TO STA 590+00	5010			118	2,600	7,112	732					2,600
STA 590+00 TO STA 602+00	4800			100	2,680	6,211	340				176	2,450
STA 602+00 TO STA 614+00	3559			95	2,812	4,000	1,218		293			3,001
STA 614+00 TO END	872	3		43	1,726	1,387	214				12	1,167
N. ALEXANDER DR				32	420	520	330			247	103	
PROJECT TOTALS	27,669	3	80	893	16,718	33,111	7,967	1,460	1,584	1,442	321	18,685

SUMMARY OF PAVEMENT MARKING ITEMS								
LOCATION	6038	6038	6038	6038	6038	6038	6038	6038
	6020	6022	6024	6025	6026	6027	6028	6029
	MULTIPOLYMER PAV MRK (Y) (8") (SLD)	MULTIPOLYMER PAV MRK (Y) (24") (SLD)	MULTIPOLYMER PAV MRK (BLK) (6") (BRK)	MULTIPOLYMER PAV MRK (W) (ARROW)	MULTIPOLYMER PAV MRK (W) (DBL ARROW)	MULTIPOLYMER PAV MRK (W) (WORD)	MULTIPOLYMER PAV MRK (W) 36" YLD TRI	MULTIPOLYMER PAV MRK (W) (U-TURN ARROW)
	LF	LF	LF	EA	EA	EA	EA	EA
BEGIN TO STA 554+00	557	216	3,935	3		3		
STA 554+00 TO STA 566+00	112	68	5,080	2		2		
STA 566+00 TO STA 578+00	487	278	4,866	2		2		
STA 578+00 TO STA 590+00	90	10	7,112					
STA 590+00 TO STA 602+00	430	113	6,211			4		4
STA 602+00 TO STA 614+00	851	467	4,000	1		1		
STA 614+00 TO END			1,387	1		1		
N. ALEXANDER DR			520	4	4	4	19	
PROJECT TOTALS	2,527	1,153	33,111	13	4	17	19	4

SUMMARY OF SIGNING ITEMS											
LOCATION	416	416	636	636	644	644	644	644	644	644	644
	6015	6018	6001	6003	6001	6004	6007	6027	6030	6064	6070
	DRILL SHAFT (NON - REINFORCED) (12 IN)	DRILL SHAFT (SIGN MTS) (24 IN)	ALUMINUM SIGNS (TY A)	ALUMINUM SIGNS (TY O)	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(P)	IN SM RD SN SUP&AM TYS80(1) SA(T)	IN BRIDGE MNT CLEARANCE SGN ASSM(TY N)	RELOCATE SM RD SN SUP&AM TY S80
	LF	LF	SF	SF	EA	EA	EA	EA	EA	EA	#REFL
BEGIN TO STA 554+00		62	63		1				2		
STA 554+00 TO STA 566+00	7		146		3	1			3		
STA 566+00 TO STA 578+00	7		125		5	1	2		2		
STA 578+00 TO STA 590+00			44		2	2					
STA 590+00 TO STA 602+00			34	56	2					4	1
STA 602+00 TO STA 614+00	7	26	141		3	3	2		2		
STA 614+00 TO END		48	158		2	6		2	1		
N. ALEXANDER DR.			201			3			10		
PROJECT TOTALS	21	136	912	56	15	16	4	12	10	4	1

SUMMARY OF SIGNING ITEMS					
LOCATION	644	644	644	647	647
	6076	6103	6104	6001	6003
	REMOVE SM RD SN SUP&AM	REPLACE SRS & S TY10BWG(1) (P)	REPLACE SRS & S TY10BWG(1) (T)	INSTALL LRSS (STRUCT STEEL)	REMOVE LRSA
	EA	EA	LB	EA	EA
BEGIN TO STA 554+00	8	1	1	1,294	1
STA 554+00 TO STA 566+00	3	2	2	325	
STA 566+00 TO STA 578+00	3			325	1
STA 578+00 TO STA 590+00	1				1
STA 590+00 TO STA 602+00	5				
STA 602+00 TO STA 614+00	3	1	1	998	
STA 614+00 TO END				953	
N. ALEXANDER DR.	4				
PROJECT TOTALS	27	4	4	3,894	3

REV. NO.	DATE	BY	REVISION

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



SH 146

SUMMARY OF PAVEMENT
MARKING AND SIGNING
QUANTITIES

SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			19
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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SUMMARY OF EROSION CONTROL ITEMS								
LOCATION	162 6002	164 6009	166 6001	168 6001	506 6020	506 6024	506 6041	506 6043
	BLOCK SODDING	BROADCAST SEED (TEMP) (WARM)	FERTILIZER	VEGETATIVE WATERING	CONSTRUCTION EXITS (INSTALL) (TY 1)	CONSTRUCTION EXITS (REMOVE)	BIODEG EROSN CONT LOGS (INSTL) (12")	BIODEG EROSN CONT LOGS (REMOVE)
	SY	SY	AC	MG	SY	SY	LF	LF
PHASE 1 STAGE 1					350		800	
PHASE 1 STAGE 2								
PHASE 2 STAGE 1								
PHASE 2 STAGE 2								
PHASE 2 STAGE 3								
PHASE 3 STAGE 1						350	70	870
PHASE 3 STAGE 2	60,785	30,000	12	1,507				
PROJECT TOTALS	60,785	30,000	12	1,507	350	350	870	870

REV NO.	DATE	BY	REVISION

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



SH 146
 SUMMARY OF
 SW3P
 QUANTITIES

SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			24
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

GENERAL

1. THE PROTECTION AND CONVENIENCE OF THE PUBLIC DURING CONSTRUCTION OF THIS PROJECT ARE OF THE PRIMARY IMPORTANCE. TRAFFIC MUST BE HANDLED THROUGHOUT THE PROJECT DURING CONSTRUCTION. THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING SAFE AND COMFORTABLE PASSAGE FOR VEHICULAR AND PEDESTRIAN TRAFFIC WITH MINIMAL INCONVENIENCE TO THE PUBLIC, AS SHOWN IN THE PLANS, OR AS DIRECTED/APPROVED BY THE ENGINEER. AT LOCATIONS WHERE IT IS NECESSARY, POLICE SHALL BE PROVIDED TO ADEQUATELY PROTECT AND GUIDE THE TRAVELING PUBLIC.
2. THE CONTRACTOR MAY PROPOSE/RECOMMEND MODIFICATIONS TO THE SEQUENCE OF WORK FOR CONSIDERATION BY THE ENGINEER. ANY PROPOSED CHANGES BY THE CONTRACTOR TO THE PLANS SHALL EVALUATE AND INCLUDE CHANGES TO THE VARIOUS BID ITEMS, IMPACTS TO TRAFFIC, AND THE OVERALL TIME AND COST IMPACT TO THE ENTIRE PROJECT. IF THE CONTRACTOR'S PROPOSAL IS IMPLEMENTED, THE CONTRACTOR WILL BE RESPONSIBLE FOR THE DEVELOPING DETAILED PLAN SHEETS TO BE SEALED AND SIGNED BY A LICENSED PROFESSIONAL ENGINEER FOR INCLUSION WITH THE CHANGE ORDER. THE CONTRACTOR CANNOT PROCEED WITH CONSTRUCTION OPERATIONS BASED ON A REVISED CONSTRUCTION PHASE/SEQUENCE UNTIL WRITTEN APPROVAL IS OBTAINED FROM THE ENGINEER. IF AT ANY TIME DURING CONSTRUCTION THE CONTRACTOR'S PROPOSED PLAN OF OPERATION FOR HANDLING TRAFFIC DOES NOT PROVIDE FOR SAFE AND COMFORTABLE MOVEMENT, THE CONTRACTOR WILL IMMEDIATELY CHANGE THEIR OPERATION TO CORRECT THE UNSATISFACTORY CONDITION.
3. DO NOT STORE ANY CONSTRUCTION MATERIAL OR EQUIPMENT AT ANY LOCATION THAT WILL CONSTITUTE A HAZARD AND WILL ENDANGER TRAFFIC.
4. CONTRACTOR SHALL NOT PLACE FIELD OFFICE OR CONDUCT CONSTRUCTION STAGING OPERATIONS WITHIN SURPLUS PROPERTY OF SH146.
5. ACCESS TO ADJOINING PROPERTY MUST BE MAINTAINED AT ALL TIMES.
6. CONTRACTOR IS RESPONSIBLE FOR CLEANING OUT TEMPORARY DRAINS TO MAINTAIN TEMPORARY/POSITIVE DRAINAGE AT ALL TIMES.
7. PORTABLE CHANGEABLE MESSAGE SIGNS (PCMS) PER TMUTCD, WHEN REQUIRED, MUST BE PLACED 7 DAYS IN ADVANCE (MINIMUM) OF THE CONTRACTOR BEGINNING THE PLANNED WORK AS SHOWN ON THE PLANS. ENGINEER SHALL APPROVE THE LOCATION OF THE PCMS PRIOR TO RELOCATING THE PCMS. THE WORDING OF THE PCMS SHALL BE APPROVED BY THE ENGINEER.
8. THE CONTRACTOR SHALL INSTALL AND MAINTAIN AN ADEQUATE NUMBER OF BARRICADES, WARNING AND DIRECTIONAL SIGNS TO DELINEATE TRAFFIC DURING ANY DETOURS OR CLOSURES. THE CONTRACTOR MAY, WITH THE APPROVAL AND/OR AS DIRECTED BY THE ENGINEER, BE ALLOWED TO VARY THE NUMBER AND LOCATION OF SIGNS AND BARRICADES FROM THAT INDICATED ON THE PLANS.
9. ALL SEQUENCE OF WORK SHALL BE COORDINATED TO COINCIDE WITH ANY PROJECT/PHASING WITHIN OR ADJACENT TO THIS PROJECT.
10. COORDINATE WITH CENTERPOINT ENERGY FOR THE CONSTRUCTION OF THE SOUND WALL AS SHOWN ON THE PLANS AT LEAST 3 MONTHS AHEAD OF THE CONSTRUCTION OF THE SOUND WALL.

CENTERPOINT CONTACT INFORMATION:
CARLTON PORTER - SERVICE AREA MANAGER
POWER DELIVERY SOLUTIONS
333 WARD RD BAYTOWN, TX 77520
TEL: (281) 425-7334 FAX: (281) 425-7370
11. NOTIFY THE ENGINEER IN WRITING 10 BUSINESS DAYS IN ADVANCE OF ANY TEMPORARY OR PERMANENT LANE OR RAMP CLOSURE, DETOURS, LANE WIDTH RESTRICTION, ALTERATION TO VERTICAL CLEARANCES, MODIFICATIONS TO RADII, OR ANY OTHER MODIFICATIONS TO THE ROADWAY THAT MAY ADVERSELY AFFECT THE MOBILITY OF AN OVERSIZED/OVERWEIGHT TRUCK.
12. PORTABLE CHANGEABLE MESSAGE SIGNS (PCMS) ARE INCLUDED IN THE CONTRACT AND PAYMENT IS BY EACH. TWO PCMS SHALL BE AVAILABLE AT ALL TIMES FOR PLACEMENT AS DIRECTED BY THE ENGINEER.
13. CONTRACTOR SHALL COVER SIGNS IN CONFLICT TO TRAFFIC CONTROL PHASING.
14. SHOULD ANY DAMAGE OCCUR ON THE EXISTING PAVEMENTS OR ANY INFRASTRUCTURE TO REMAIN, THE CONTRACTOR SHALL BE RESPONSIBLE TO RESTORE THE DAMAGED ITEM TO EXISTING OR BETTER CONDITION OR TO THE SATISFACTION OF THE ENGINEER WITHOUT ADDITIONAL COSTS TO THE PROJECT.

15. UNLESS OTHERWISE NOTED IN THE PLANS AND/OR AS DIRECTED BY THE ENGINEER, THE HOURS OF NIGHTTIME, WEEKENDS AND OFF-PEAK HOURS OF OPERATION SHALL BE LIMITED ACCORDING TO THE FOLLOWING RESTRICTIONS:
NIGHTTIME: SUNDAY THROUGH THURSDAY 9:00 PM TO 5:00 AM (WITH UNIFORMED OFF DUTY LAW ENFORCEMENT OFFICERS).
WEEKEND: FRIDAY FROM 9:00 PM TO MONDAY AT 5:00 AM.
OFF-PEAK HOURS: MONDAY THROUGH FRIDAY FROM 10:00 AM TO 3:00 PM.
16. MAINLANES CLOSURES ARE NOT ANTICIPATED FOR THIS PROJECT.

GENERAL SEQUENCE OF WORK

1. THIS PROJECT WILL BE CONSTRUCTED IN (3) PHASES. BEFORE THE COMMENCEMENT OF EACH PHASE, INSTALL ADVANCE WARNING SIGNS, TEMPORARY SIGNS AND BARRICADES AS SHOWN ON THE PLANS AND/OR AS DIRECTED/APPROVED BY THE ENGINEER. DROP-OFF CONDITIONS OF GREATER THAN 2" MUST HAVE A 3:1 SLOPE AT THE END OF EACH DAY, AS WELL AS THROUGHOUT THE PROJECT WHERE ACCESS IS ALLOWED TO ADJACENT PROPERTIES, DRIVEWAYS AND SIDE STREETS.
2. PREPARING ROW/REMOVAL OF EXISTING ITEMS TO BE DONE ONLY IN AREAS WHERE WORK IS OCCURRING, AS PER THE PHASES NOTED BELOW.

PHASE 1

PHASE 1-STAGE 1

CONSTRUCT MAINLANE FROM SH146 STA 555+50.00 TO SH146 STA 608+51.21 AS SHOWN ON THE PLANS. THE EXISTING TRAFFIC SHALL REMAIN IN CURRENT CONFIGURATIONS DURING THIS PHASE.

1. INSTALL BARRICADES AND SW3P ITEMS AS SHOWN ON THE TCP AND SW3P PLANS.
2. INSTALL ADVANCE WARNING SIGNS AS SHOWN ON THE TCP PLANS.
3. PREPARE RIGHT-OF-WAY ALONG PROJECT LIMITS WHERE THIS PHASE IS OCCURRING.
4. INSTALL PCTB ALONG SH146 INSIDE OF THE FRONTAGE ROADS AND ACROSS N. ALEXANDER DR. AS SHOWN ON THE PLANS. ENSURE THE GROUND BASE IS LEVELED AND STABILIZED, PRIOR TO INSTALLATION OF PCTB OVER THE NATURAL GROUND. PROVIDE ENTRANCES AND EXITS FOR THE CONSTRUCTION VEHICLES TO MOVE IN AND OUT FROM THE WORK ZONE AS INDICATED ON THE PLANS OR AS DIRECTED BY THE ENGINEER. THE EXISTING DRAINAGE INLETS MUST REMAIN FREE OF ANY OBSTRUCTIONS.
5. REMOVE EXISTING CURBS AND CONSTRUCT TEMPORARY PAVEMENTS FOR CONSTRUCTION ENTRANCES AND GRAVEL CONSTRUCTION PER SW3P STANDARD AS SHOWN ON THE PLANS.
6. REMOVE EXISTING CSB BARRIER ALONG RAMP EBX1 FROM SH146 STA 546+05.00 TO SH146 STA 549+68.00 AND FROM SH146 STA 554+00.00 TO SH146 STA 556+52.89 AS SHOWN ON THE PLANS.
7. NEATLY SAW-CUT THE EXISTING APPROXIMATELY 11" THICK CONCRETE PAVEMENTS AT THE LOCATIONS SHOWN ON THE PLANS. MAKE SURE THE EDGES ARE NOT SPALLED OR BROKEN WHILE SAWING AND BREAKING THE PAVEMENTS TO BE REMOVED. ANY ACCIDENTAL DAMAGE TO THE EXISTING PAVEMENTS TO REMAIN SHALL BE REPAIRED PRIOR TO PROCEEDING WITH THE PROPOSED PAVING OPERATIONS TO THE SATISFACTION OF THE ENGINEER WITH NO ADDITIONAL COST TO THE PROJECT.
8. CONSTRUCT PROPOSED NEW STORM WATER DRAIN SEWER LINES AND PROTECT AND MAINTAIN THE EXISTING TO REMAIN AS SHOWN ON THE STORM SEWER DRAINAGE LAYOUT PLANS.
9. CUT, REMOVE AND REPLACE PORTIONS OF EXISTING 7' X 3' RCBs LOCATED AT SH146 STA 598+93.03 AND STA 600+74.82 FOR THE LIMITS SHOWN ON THE DRAINAGE PLAN AND PROFILE SHEETS. BACKFILL THE TRENCH IN ACCORDANCE WITH SPECIFICATION ITEM 400.
10. FOUNDATION IMPROVEMENT - EXCAVATE AND REMOVE THE EXISTING GROUND AND BACKFILL WITH CEMENT STABILIZED BACKFILL MATERIAL (PAY ITEM 132 6046) IN VARYING DEPTHS (2' MIN TO 6' MAX) IN THE AREAS OF PROPOSED RETAINING WALL CONSTRUCTION ON BOTH SIDES OF THE N. ALEXANDER DR. INTERSECTION (FROM SH146 STA 588+00.00 TO SH146 STA 594+07.73 ON THE WEST SIDE AND FROM SH146 STA 597+10.88 TO SH146 STA 603+05.00 ON THE EAST SIDE). THE EXCAVATION SHALL BE CARRIED OUT FOR THE FULL WIDTH OF ROADWAY AS SHOWN ON THE RETAINING WALL PLAN AND PROFILE SHEETS.

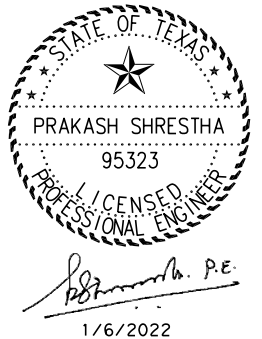
11. INSTALL BARRICADES AT THE N. ALEXANDER DR. INTERSECTION TO CLOSE EASTBOUND AND WESTBOUND TURNAROUNDS FOR THE CONSTRUCTION OF BRIDGE FOUNDATIONS (DRILL SHAFTS, ETC.) AS SHOWN ON THE PLANS.
12. CONSTRUCT AND COMPLETE BRIDGE DRILL SHAFTS/COLUMNS, BRIDGE ABUTMENTS AND BRIDGE BENTS/CAPS AS SHOWN ON THE BRIDGE LAYOUT PLANS. PLACE CONCRETE RIPRAP ON THE N. ALEXANDER DR MEDIANS AS SHOWN ON THE ROADWAY PLANS, AFTER THE COMPLETION OF THE DRILL SHAFTS CONSTRUCTION.
13. CONSTRUCT RETAINING WALLS RW-1, RW-2, RW-3, RW-4, RW-5 AND RW-6 AND OVERPASS EARTHWORKS AS SHOWN ON THE RETAINING WALL LAYOUTS.
14. PREPARE SUBGRADE AND CONSTRUCT 6" LIME TREATED SUBGRADE (LTS) AS SHOWN ON THE PLANS.
15. CONSTRUCT 6" CEMENT STABILIZED BASE (CSB) AND 1" ASPHALT STABILIZED BOND BREAKER (ASB) AS SHOWN ON THE PLANS.
16. CONSTRUCT PAVEMENT TIE-IN DETAILS (DOWEL BARS, TIE BARS, ETC.) TO TIE EXISTING PAVEMENT WITH PROPOSED NEW PAVEMENTS ON BOTH ENDS OF THE PROJECT AS SHOWN ON THE PLANS.
17. COMPLETE PHASE 1 STAGE 1 CONSTRUCTION.

PHASE 1-STAGE 2

DETOUR THE N. ALEXANDER DR TRAFFIC ON TO THE FRONTAGE ROADS FOR HANGING BRIDGE GIRDERS AND INSTALLATION OF PRECAST PANELS, AND CONSTRUCT THE BRIDGE DECK SLAB AND BRIDGE APPROACH SLABS AS SHOWN ON THE PLANS.


1. INSTALL BARRICADES AND SW3P ITEMS AS SHOWN ON THE TCP AND SW3P LAYOUTS.
2. INSTALL ADVANCE WARNING SIGNS AS SHOWN ON THE TCP LAYOUTS.
3. PREPARE RIGHT-OF-WAY ALONG PROJECT LIMITS WHERE WORK IN THIS PHASE IS OCCURRING.
4. TEMPORARILY CLOSE THE EXISTING N. ALEXANDER DR. INTERSECTION DETOURING THE TRAFFIC ONTO THE FRONTAGE ROADS UTILIZING THE INTERSECTIONS AT BS 146 E SH146 STA 543+00 AND FERRY ROAD AT SH146 STA 616+00 FOR HANGING BEAMS/GIRDERS THE INSTALLATION OF PRECAST SLAB PANELS AS SHOWN ON THE PLANS. THIS WORK SHALL BE DONE DURING THE WEEKEND OR NIGHTS OR AS DIRECTED BY THE ENGINEER. THE USE OF POLICE OFFICERS WILL BE REQUIRED TO ALLOW TRAFFIC TO FLOW CONTINUOUSLY ON THE FRONTAGE ROADS. UTILIZE PORTABLE CHANGEABLE MESSAGE (PCMS) BOARDS TO INFORM THE PUBLIC OF THE INTERSECTION/ROAD CLOSURE. DETOURS OF TRAFFIC DURING THE INTERSECTION CLOSURE SHALL BE HANDLED AS DIRECTED BY THE ENGINEER AND SHALL BE CONSIDERED SUBSIDIARY TO ITEM 502 - BARRICADE, SIGNS AND TRAFFIC HANDLING.
5. AFTER ALL TRAFFIC HAS BEEN DETOURED ONTO THE FRONTAGE ROADS, HANG BRIDGE BEAMS AND INSTALL PRECAST SLAB PANELS AS SHOWN ON THE PLANS. COMPLETE BEAM HANGING AND PRECAST SLAB PANEL INSTALLATION, REMOVE DETOURS AND RELATED TCP ITEMS (INCLUDING PCMS BOARDS) THAT ARE NO LONGER REQUIRED, AND RETURN THE TRAFFIC TO NORMAL CONDITION.
6. WHILE MAINTAINING THE TRAFFIC IN THE CURRENT CONFIGURATION, CONTINUE CONSTRUCTION OF BRIDGE DECK SLAB AND BRIDGE APPROACH SLABS AS SHOWN ON THE PLANS. INSTALL FORMS, JOINTS, ELECTRICAL CONDUITS, INLET STRUCTURES, REINFORCEMENT BARS, ETC. AS SHOWN ON THE PLANS. PREPARE THE DECK FOR POURING CONCRETE.
7. POUR CONCRETE AND FINISH SURFACE IN ACCORDANCE WITH THE SPECIFICATION AND/OR AS DIRECTED BY THE ENGINEER.
8. CURE THE BRIDGE DECK AND BRIDGE APPROACH SLABS.
9. CONSTRUCT BRIDGE RAILS (SSTR) AND MEDIAN CONCRETE BARRIER ON THE BRIDGE (TYPE-2) (SSCB(1)-16) AS SHOWN ON THE PLANS.
10. CONSTRUCT OTHER BRIDGE AND APPROACH SLABS FINISHING WORKS AS SHOWN ON THE PLANS.
11. INSTALL FORMS, JOINTS, REINFORCEMENT BARS, UTILITY CONDUITS, ETC. ON THE MAINLANES FROM SH146 STA 555+50.00 TO STA 593+79.32 AND STA 597+39.32 TO STA 608+50.00 FOR THE CONSTRUCTION OF CONCRETE PAVEMENT.
12. COMPLETE BRIDGE AND APPROACH SLAB CONSTRUCTION.
13. COMPLETE PHASE 1 STAGE 2 CONSTRUCTION.

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SH 146

TRAFFIC CONTROL PLAN NARRATIVE

SHEET 1 OF 2

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.	
6		25	
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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PHASE 2

CONSTRUCT CONCRETE PAVEMENTS AS SHOWN ON THE PLANS, ELIMINATE EXISTING PAVEMENT MARKINGS AND INSTALL PROPOSED PAVEMENT MARKINGS AS SHOWN ON THE PLANS.

PHASE 2-STAGE 1

CONSTRUCT HYDRAULIC CEMENT CONCRETE PAVEMENT ON PREVIOUSLY PREPARED SECTIONS IN PHASE 1 STAGE 1 AND PHASE 1 STAGE 2 IN ACCORDANCE WITH SPECIFICATION ITEM 360.

- 1. PLACE CONCRETE ON PREPARED SECTIONS FROM SH146 STA 555+50 TO SH146 STA 593+59.32 (SOUTH END) AND FROM SH146 STA 597+59.32 TO SH146 STA 608+50 (NORTH END).
- 2. CURE THE CONCRETE PAVEMENTS IN ACCORDANCE WITH THE PREVIOUSLY APPROVED METHODS AND EQUIPMENT, AND SPECIFICATION ITEM 360, AND/OR AS DIRECTED BY THE ENGINEER.
- 3. SAW JOINTS TO THE DEPTH AS SHOWN ON THE PLANS IN ACCORDANCE WITH THE SPECIFICATION ITEM 360 AND/OR AS DIRECTED BY THE ENGINEER.
- 4. COMPLETE CONSTRUCTION OF ALL PROPOSED INLETS.
- 5. INSTALL CONCRETE SAFETY BARRIERS (TYPE-2) ALONG THE MEDIAN BETWEEN SH146 STA 555+50 TO SH146 STA 608+50 AS SHOWN ON THE PLANS, AND SSTR RAILS ON RETAINING WALLS AS DIRECTED BY THE ENGINEER.
- 6. REMOVE EXISTING CURB TEMPORARILY AND INSTALL TEMPORARY HMAC PAVEMENT ON WBFR/BAYTOWN LOOP AS SHOWN ON THE PLANS TO ACCOMMODATE TWO 12 FT TRAVEL LANES FOR DETOURING MAINLANE TRAFFIC DURING PHASE 2, STAGE 3. INSTALL WORK ZONE PAVEMENT MARKINGS/MARKERS.
- 7. FINISH THE CONSTRUCTION OF CONCRETE PAVEMENT AND MISCELLANEOUS ITEMS.

PHASE 2-STAGE 2

COMPLETE INSTALLATION OF PERMANENT MEDIAN CONCRETE BARRIER, SSTR RAILS AND CRASH ATTENUATORS ON THE RETAINING WALLS.

- 1. INSTALL TCP ITEMS AS SHOWN ON THE PLANS.
- 2. REMOVE THE EXISTING CSB CONCRETE MEDIAN BARRIER FROM SH146 STA 545+00 TO SH146 STA 554+00 AS SHOWN ON THE PLANS.
- 3. INSTALL SSCB TO CSB TRANSITION UNIT. TIE-IN WITH THE EXISTING CSB TO REMAIN ON THE SOUTH END OF THE PROJECT AT SH146 STA 545+00.
- 4. CONSTRUCT PROPOSED SSCB TYPE 2 CONCRETE MEDIAN BARRIERS FROM SH146 STA 545+00 TO SH146 STA 555+50 AND FROM SH146 STA 608+50 TO THE TAPERED END TERMINAL AT SH146 STA 616+13.51. TIE-IN WITH PREVIOUSLY COMPLETED SECTIONS.
- 5. COMPLETE THE INSTALLATION OF ALL BARRIERS.
- 6. FINISH PHASE 2 STAGE 2 CONSTRUCTION.

PHASE 2-STAGE 3

ELIMINATE EXISTING PAVEMENT MARKINGS AND PERMANENT RESTRIPE, INSTALL NEW PAVEMENT MARKINGS AND SIGNS ON THE MAINLANES.

- 1. INSTALL BARRICADES ITEMS AS SHOWN ON THE TCP LAYOUT PLANS. TEMPORARILY CLOSE THE EXISTING WESTBOUND MAINLANE ENTRANCE RAMP WBE1 AT WBFR STA 3559+00 AND EASTBOUND MAINLANES AT SH146 STA 534+00, AND WESTBOUND MAINLANES AT SH146 STA 616+00 AND EASTBOUND ENTRANCE RAMP EBE2 AT EBFR STA 5605+00 AS SHOWN ON THE PLANS. DETOUR THE MAINLANE TRAFFIC ONTO THE EXISTING FRONTAGE ROADS AND BAYTOWN LOOP RD AS SHOWN ON THE PLANS. THIS WORK SHALL BE DONE DURING THE WEEKEND OR NIGHTS. THE USE OF POLICE OFFICERS WILL BE REQUIRED TO ALLOW TRAFFIC TO FLOW CONTINUOUSLY ON THE FRONTAGE ROADS. DETOURS OF TRAFFIC DURING THIS CLOSURE SHALL BE HANDLED AS DIRECTED BY THE ENGINEER AND SHALL BE CONSIDERED SUBSIDIARY TO ITEM 502-BARRICADE, SIGNS AND TRAFFIC HANDLING.

- 2. ELIMINATE THE EXISTING PAVEMENT MARKINGS AND INSTALL NEW PAVEMENT MARKINGS ON THE MAINLANES AS SHOWN ON THE PAVEMENT MARKING AND SIGNING LAYOUT SHEETS
- 3. INSTALL NEW SIGNS INCLUDING THE GUIDE SIGNS AND TRAFFIC SIGNS, AS SHOWN ON THE PLANS FOR THE MAINLANES.
- 4. REMOVE TEMPORARY PAVEMENTS AND RECONSTRUCT CURBS AT THE CONSTRUCTION ENTRANCES/EXITS, ALONG THE FRONTAGE ROADS, AS SHOWN ON THE PLANS.
- 5. FINISH ALL THE PAVEMENT MARKINGS AND SIGN INSTALLATION WORKS FOR THE MAINLANES AS SHOWN ON THIS PHASE AND PREPARE THE MAINLANES FOR OPENING TO TRAFFIC AS DIRECTED BY THE ENGINEER.

PHASE 3

SHIFT MAINLANE TRAFFIC ONTO THE NEWLY CONSTRUCTED MAINLANE PAVEMENT, ELIMINATE THE REMAINING EXISTING PAVEMENT MARKINGS AND RESTRIPE AS SHOWN ON THE PLANS, INSTALL NEW PAVEMENT MARKINGS AND SIGNS ON THE FRONTAGE ROADS. TEMPORARILY CLOSE THE EXISTING EASTBOUND MAINLANE EXIT RAMP EBX1 AT SH146 STA 548+00 AND WESTBOUND EXIT RAMP WBX1 AT SH146 STA 578+00 ALLOWING ONLY THE LOCAL TRAFFIC ON THE FRONTAGE ROADS. THIS WORK TO BE DONE USING MOBILE OPERATIONS DURING THE OFF-PEAK HOURS. ONE TRAVEL LANE (OUTER LANE) MUST REMAIN OPEN AT ALL THE TIMES OR AS DIRECTED BY THE ENGINEER.

PHASE 3-STAGE 1

- 1. INSTALL BARRICADES AND SW3P ITEMS AS SHOWN ON THE TCP LAYOUT PLANS.
- 2. INSTALL ADVANCE WARNING SIGNS AS SHOWN ON THE TCP LAYOUT PLANS.
- 3. SHIFT EASTBOUND AND WESTBOUND MAINLANE TRAFFIC ON TO THE NEWLY CONSTRUCTED MAINLANES FROM SH146 STA 549+00 ON THE SOUTH END AND FROM SH146 STA 615+00 ON THE NORTH END.
- 4. CLOSE WB ENTRANCE RAMP WBE1 AT WBFR STA 3560+00, AND WB EXIT RAMP WBX2 AT SH146 STA 615+00, AND EB EXIT RAMP EBX1 AT SH146 STA 548+00, AND EB ENTRANCE RAMP EBE2 AT EBFR STA 5604+00. THE LOCAL TRAFFIC SHALL BE DETOURED VIA BS146 E. INTERSECTION, N. ALEXANDER DR. INTERSECTION AND BAYTOWN LOOP INTERSECTION AS SHOWN ON THE PLANS.
- 5. COMPLETE THE CONSTRUCTION OF THE REMAINING PROPOSED EXIT RAMP: WBX1 FROM WBFR STA 3570+25.26 TO WBX1 STA 17+00.00 AND EBE1 FROM EBFR STA 5568+87.43 TO EBE1 STA 9+50.00 CLOSING ONE INSIDE FRONTAGE ROAD LANE ON EACH FRONTAGE ROAD.
- 6. SAW CUT, DEMOLISH AND REMOVE THE EXISTING EB ENTRANCE RAMP EBE2 AT EBFR STA 5604+40.85 AS SHOWN ON THE PLANS OR AS DIRECTED BY THE ENGINEER. GRADE THE AREA AS SHOWN ON THE PLANS.
- 7. ELIMINATE AND RESTRIPE THE EXISTING RAMPS TO REMAIN, NEW RAMPS, FRONTAGE ROADS AND INTERSECTION UTILIZING CHANNELIZING DEVICES AS SHOWN ON THE PLANS OR AS DIRECTED BY THE ENGINEER.
- 8. COMPLETE TRAFFIC SIGNAL WORKS, INSTALL REMAINING SIGNS ON FRONTAGE ROADS, RAMPS, INTERSECTIONS AND ON MAINLANES.
- 9. REMOVE TEMPORARY PAVEMENT INSTALLED IN PHASE 2, STAGE 1 AND RECONSTRUCT CURB AT THE NORTH END OF WBFR AND WB MAINLANES AS SHOWN ON THE PLANS.
- 10. CONSTRUCT SOUND WALL LOCATED BETWEEN MCKINNEY RD AND E. ELVINTA ST. AT THE SOUTH END OF THE PROJECT ALONG THE EB FRONTAGE ROAD.
- 11. COMPLETE PHASE 3-STAGE 1 CONSTRUCTION.

PHASE 3-STAGE 2

- 1. INSTALL BARRICADES AND SW3P ITEMS AS SHOWN ON THE TCP LAYOUT PLANS.
- 2. CONSTRUCT AND GRADE DITCHES AND INSTALL PERMANENT EROSION CONTROL ITEMS AS SHOWN ON THE PLANS.
- 3. COMPLETE BRIDGE CONSTRUCTION INCLUDING REMAINING FINISHING WORK.
- 4. COMPLETE PHASE 3-STAGE 2 CONSTRUCTION.

FINAL CLEAN-UP AND FINISH PROJECT

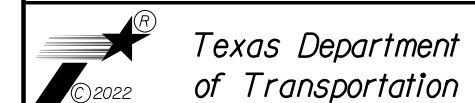
- 1. UPON COMPLETION OF THE WORK AND BEFORE FINAL ACCEPTANCE AND FINAL PAYMENT IS MADE, THE CONTRACTOR SHALL CLEAR AND REMOVE FROM THE SITE ALL SURPLUS AND DISCARDED MATERIALS AND DEBRIS OF EVERY KIND AND LEAVE THE ENTIRE PROJECT IN A SMOOTH NEAT AND CLEAN CONDITION.

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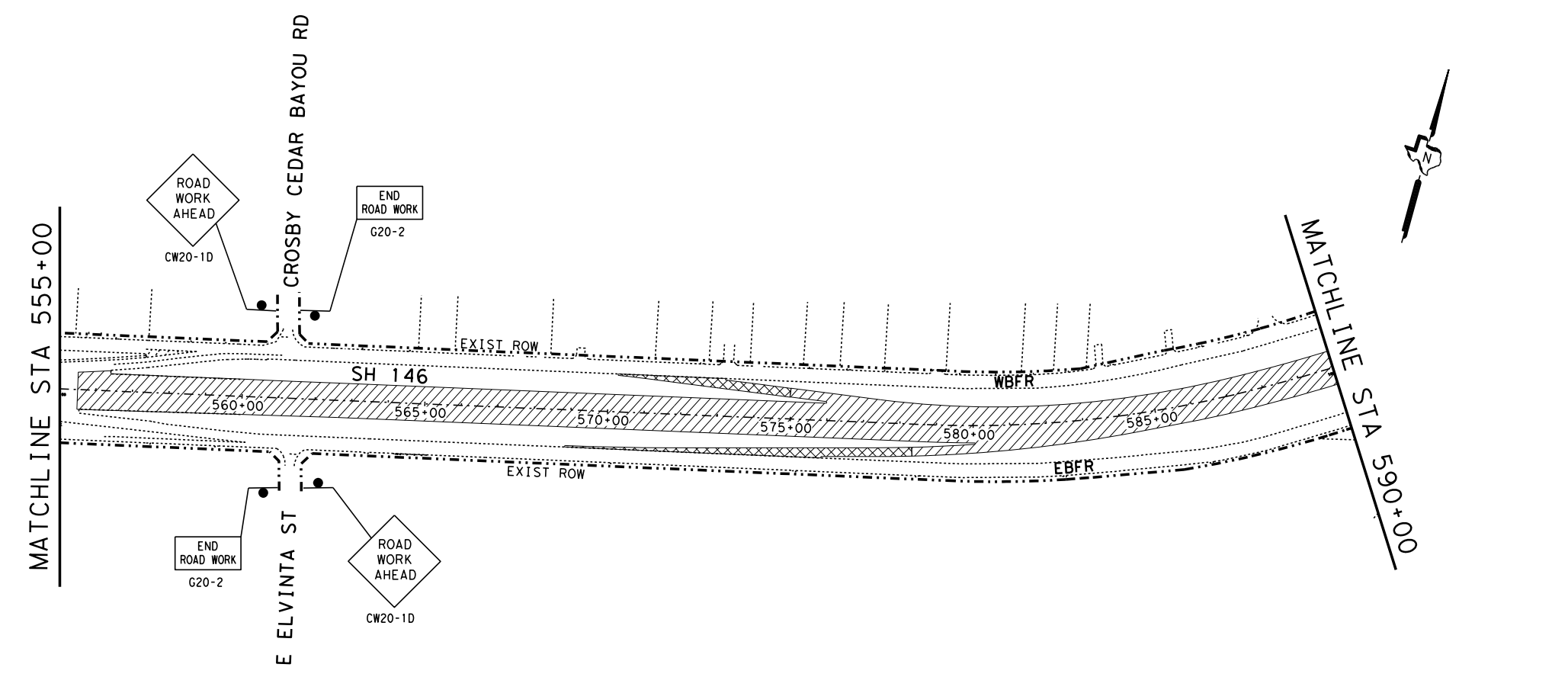
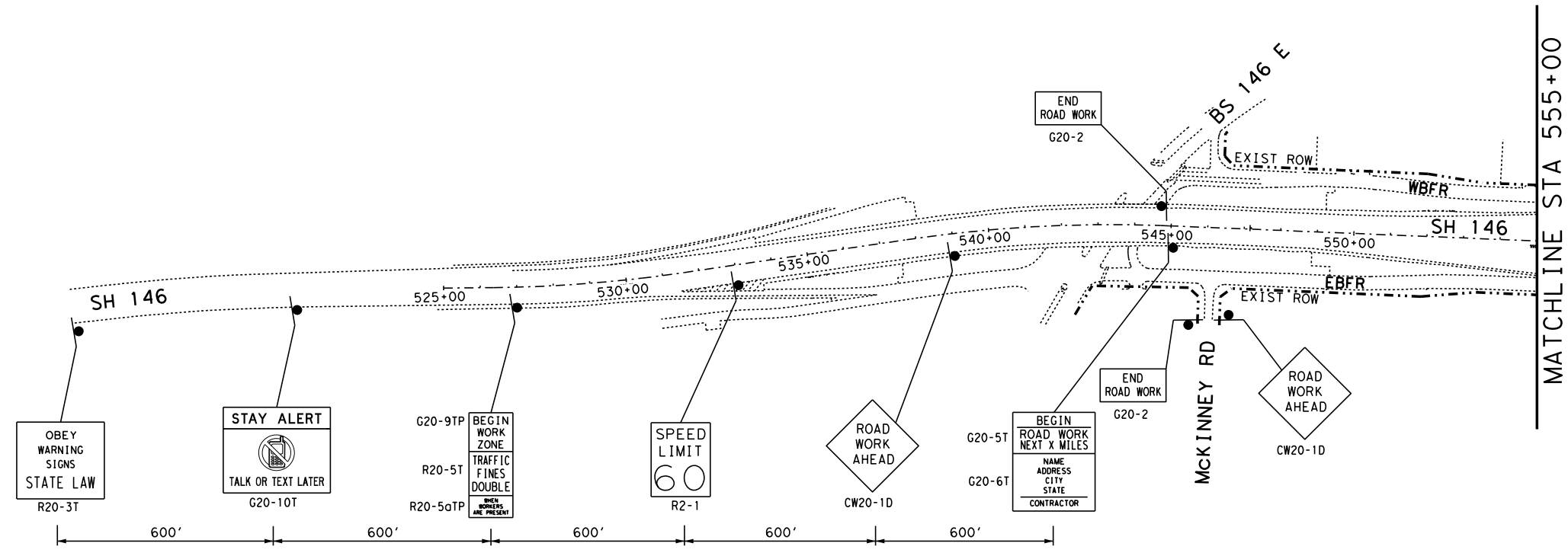
SH 146

TRAFFIC CONTROL PLAN NARRATIVE

SHEET 2 OF 2

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			26
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

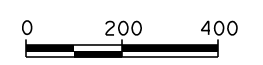
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LEGEND

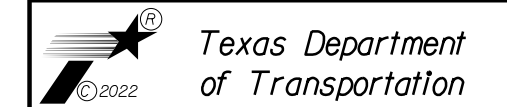
- PHASE 1 & PHASE 2 CONSTRUCTION
- PHASE 3 CONSTRUCTION

NOTES:
 1. REFER TO INDIVIDUAL PHASE LAYOUTS FOR ADDITIONAL INFORMATION



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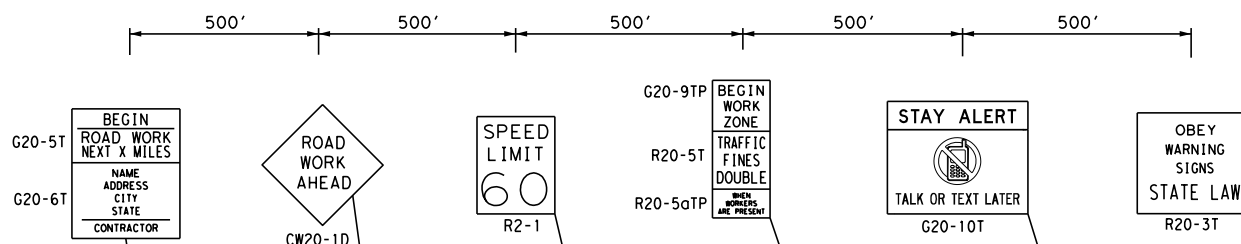
SH 146

**TRAFFIC CONTROL PLAN
 PHASING OVERVIEW
 AND ADVANCE WARNING
 BEGIN TO STA 590+00**

SHEET 1 OF 2

FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.	SHEET NO. 27
STATE TEXAS	DIST. HOU	COUNTY HARRIS
CONT. 0389	SECT. 13	JOB 039
		HIGHWAY NO. SH 146

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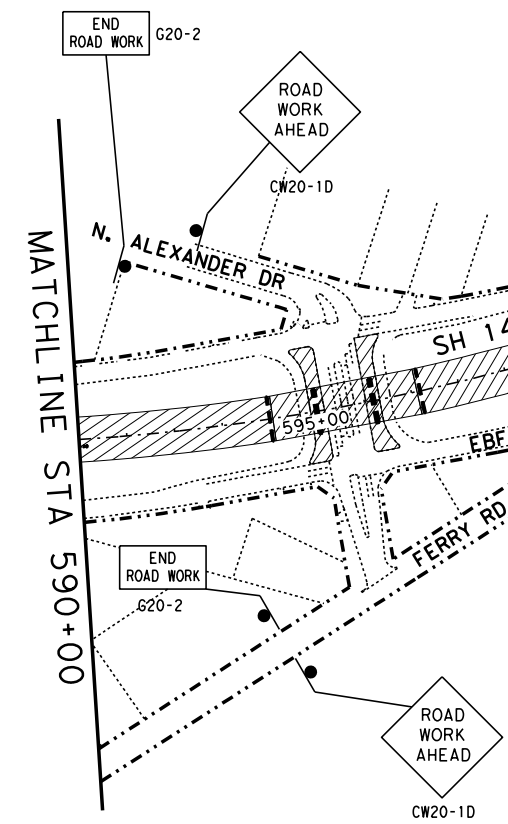
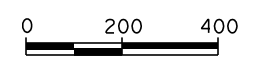
LEGEND

- PHASE 1 & PHASE 2 CONSTRUCTION
- PHASE 3 CONSTRUCTION

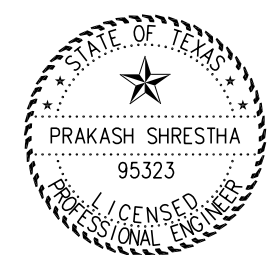


NOTES:

1. REFER TO INDIVIDUAL PHASE LAYOUTS FOR ADDITIONAL INFORMATION

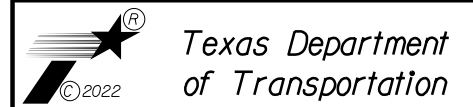


END PROJECT
 END CSJ: 0389-13-039
 @ SH 146 STA 620+91.23



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 Firm Registration No. F-382



SH 146

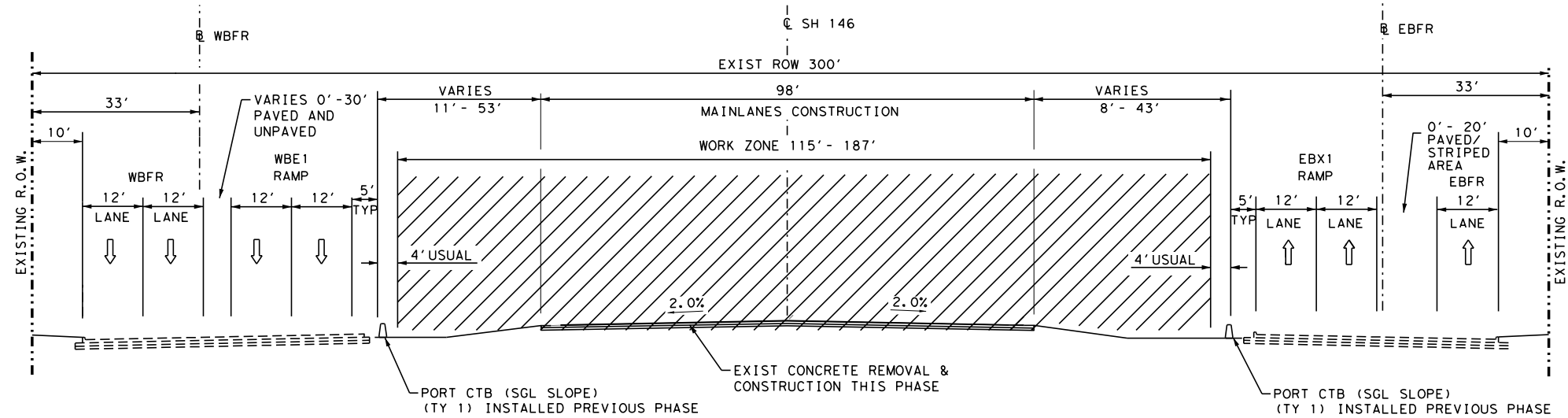
**TRAFFIC CONTROL PLAN
 PHASING OVERVIEW
 AND ADVANCE WARNING
 590+00 TO END**

SHEET 2 OF 2

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			28
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

TCP LEGEND

- A WRK ZN PAV MRK REMOV (W) 4" (BRK)
- B WRK ZN PAV MRK REMOV (W) 4" (SLD)
- C WRK ZN PAV MRK REMOV (Y) 4" (SLD)
- PERMANENT CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTION COMPLETED IN PREVIOUS PHASE
- EXISTING TRAFFIC
- PROPOSED TRAFFIC
- PORTABLE CTB (TYPE 1)
- PLASTIC DRUM
- TRAFFIC CONE

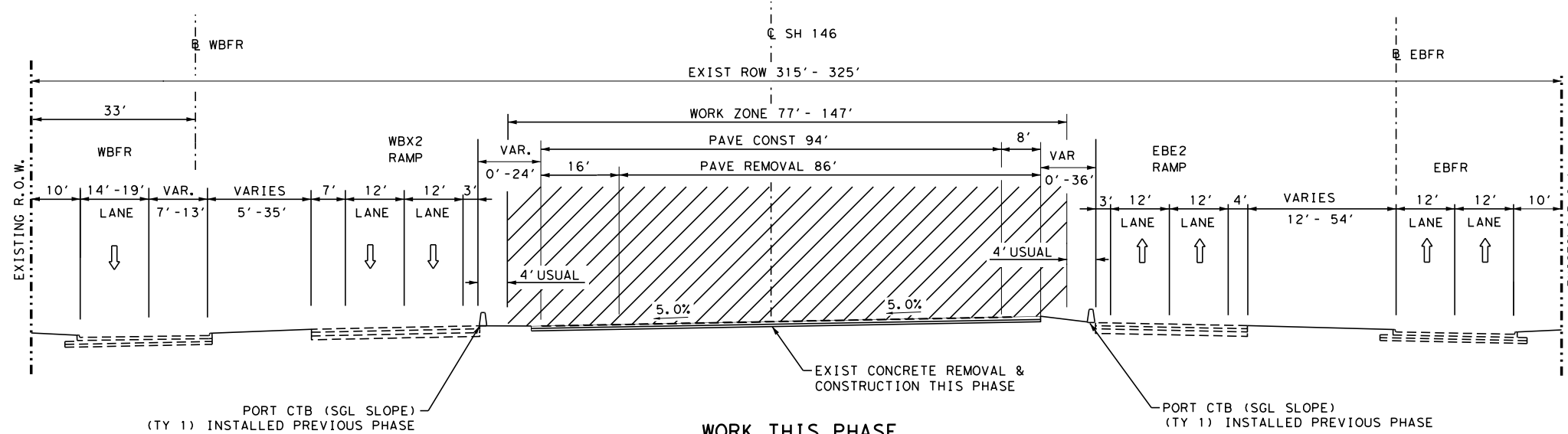


WORK THIS PHASE

- * SAWCUT & REMOVE EXISTING PAVEMENT
- * CONSTRUCT 6" LIME TREATED SUBGRADE (LTS)
- * CONSTRUCT 6" CEMENT STABILIZED BASE (CSB)
- * CONSTRUCT 1" ASPHALT STABILIZED BASE (ASB)

PHASE 1 STAGE 1 TCP TYPICAL SECTION

FROM STA 555+50.00 TO STA 560+00.00



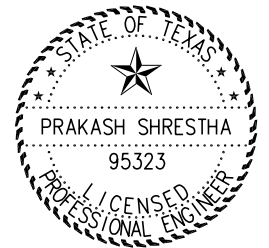
WORK THIS PHASE

- * SAWCUT & REMOVE EXISTING PAVEMENT
- * CONSTRUCT 6" LIME TREATED SUBGRADE (LTS)
- * CONSTRUCT 6" CEMENT STABILIZED BASE (CSB)
- * CONSTRUCT 1" ASPHALT STABILIZED BASE (ASB)

PHASE 1 STAGE 1 TCP TYPICAL SECTION

FROM STA 605+91.20 TO STA 608+50.00

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SH 146

TRAFFIC CONTROL
TYPICAL SECTIONS

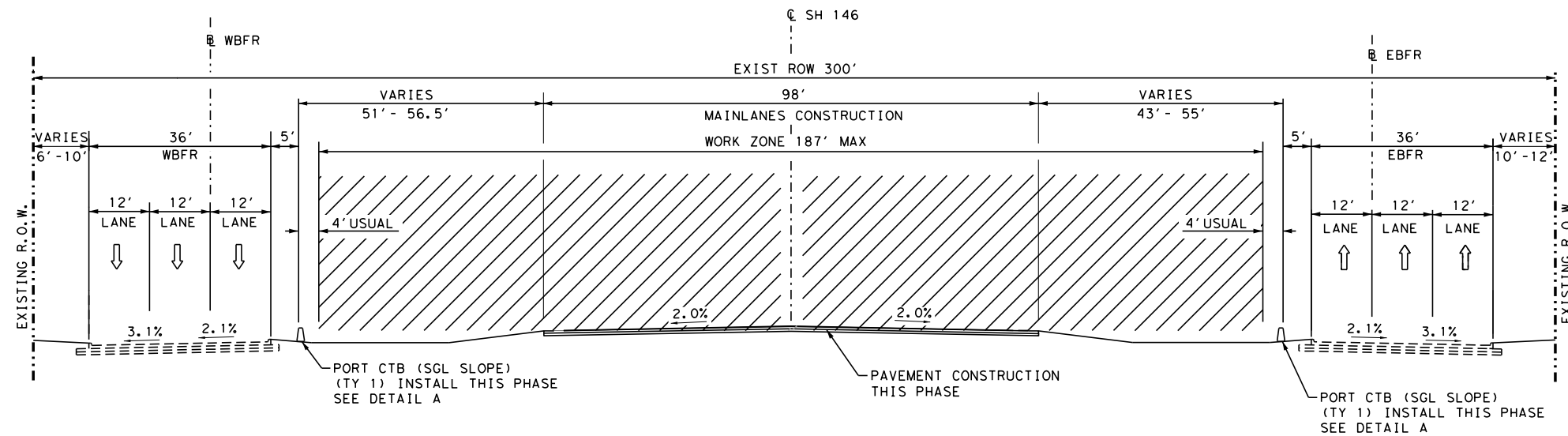
PHASE 1 STAGE 1

N. T. S.		SHEET 1 OF 3	
FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.	
6		29	
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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TCP LEGEND

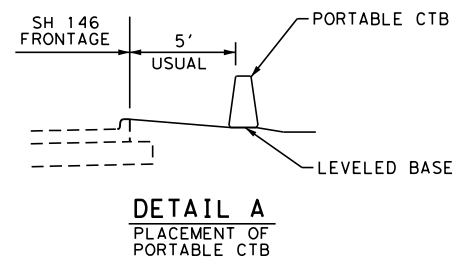
- A WRK ZN PAV MRK REMOV (W) 4" (BRK)
- B WRK ZN PAV MRK REMOV (W) 4" (SLD)
- C WRK ZN PAV MRK REMOV (Y) 4" (SLD)
- PERMANENT CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTION COMPLETED IN PREVIOUS PHASE
- EXISTING TRAFFIC
- PROPOSED TRAFFIC
- PORTABLE CTB (TYPE 1)
- PLASTIC DRUM
- TRAFFIC CONE



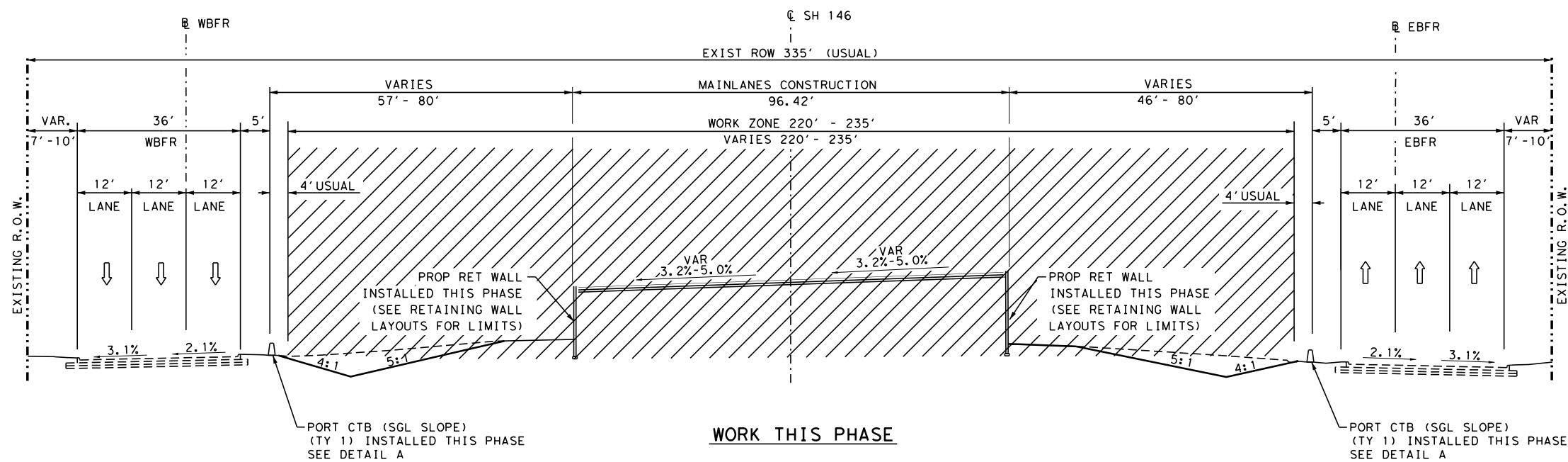
WORK THIS PHASE

- * CONSTRUCT 6" LIME TREATED SUBGRADE (LTS)
- * CONSTRUCT 6" CEMENT STABILIZED BASE (CSB)
- * CONSTRUCT 1" ASPHALT STABILIZED BASE (ASB)

PHASE 1 STAGE 1 TCP TYPICAL SECTION
FROM STA 560+00.00 TO STA 583+00.00



DETAIL A
PLACEMENT OF PORTABLE CTB



WORK THIS PHASE

- * CONSTRUCT RETAINING WALLS

PHASE 1 STAGE 1 TCP TYPICAL SECTION
FROM STA 588+00.00 TO STA 594+00.00 (DITCH/POND)
STA 597+50.00 TO STA 603+00.00

REV. NO.	DATE	BY	REVISION

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Texas Department of Transportation

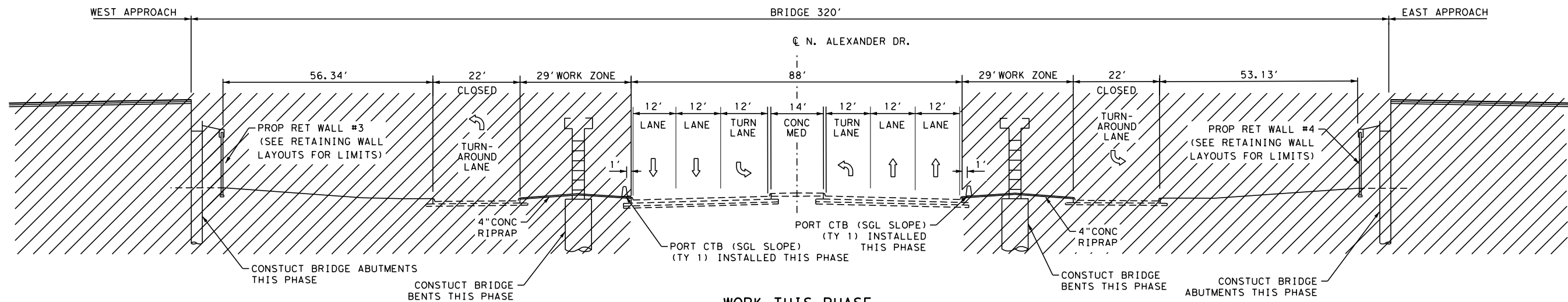
SH 146

TRAFFIC CONTROL TYPICAL SECTIONS

PHASE 1 STAGE 1

N. T. S.		SHEET 2 OF 3	
FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.	
6		30	
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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WORK THIS PHASE

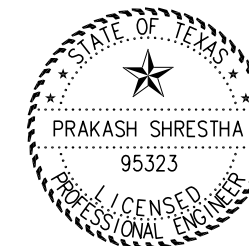
- * CONSTRUCT BRIDGE DRILL SHAFTS, COLUMNS & BENT CAPS, ABUTMENTS
- * CONSTRUCT 4" CONCRETE RIPRAP

PHASE 1 STAGE 1 TCP TYPICAL SECTION (ACROSS BRIDGE - FACING NORTH)
 N. ALEXANDER DR STA 55+14.90
 NTS

TCP LEGEND

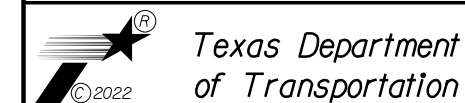
- [A] WRK ZN PAV MRK REMOV (W) 4" (BRK)
- [B] WRK ZN PAV MRK REMOV (W) 4" (SLD)
- [C] WRK ZN PAV MRK REMOV (Y) 4" (SLD)
- [Hatched Box] PERMANENT CONSTRUCTION THIS PHASE
- [Cross-hatched Box] WORK PERFORMED PREVIOUS PHASE
- [Solid Grey Box] PERMANENT CONSTRUCTION COMPLETED IN PREVIOUS PHASE
- [Arrow] EXISTING TRAFFIC
- [Thick Arrow] PROPOSED TRAFFIC
- [Cone] PORTABLE CTB (TYPE 1)
- [Drum] PLASTIC DRUM
- [Cone] TRAFFIC CONE

REV NO.	DATE	BY	REVISION



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SH 146

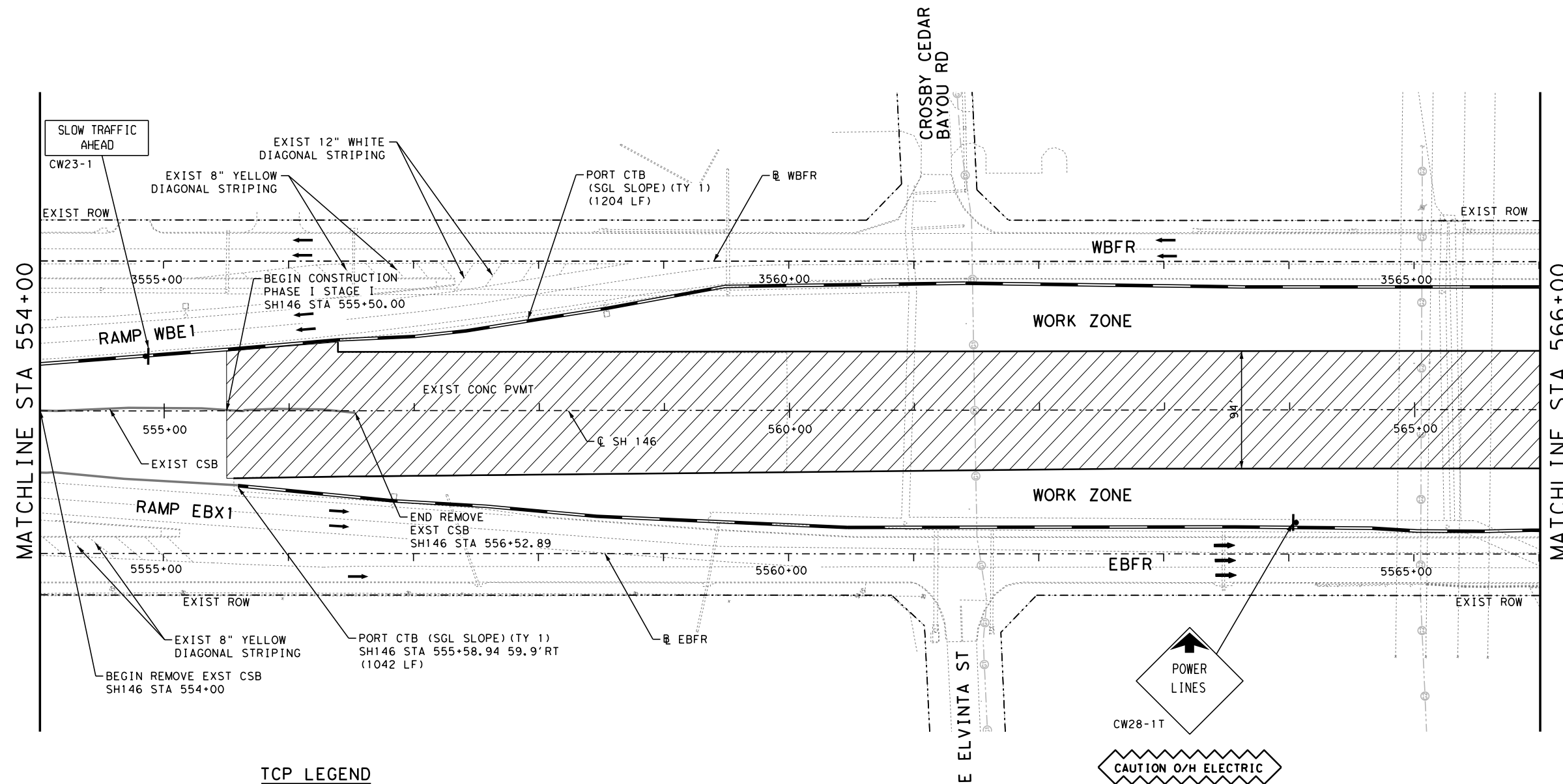
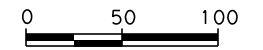
TRAFFIC CONTROL
 TYPICAL SECTIONS

PHASE 1 STAGE 1

N. T. S.			SHEET 3 OF 3
FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.	
6		31	
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146



- NOTES:
1. REFER TO DETOUR LAYOUT SHEET FOR DETOURS.
 2. ALL PCTB SHALL HAVE REFLECTORS MOUNTED ON THE TOP AND ROAD SIDE NEAR THE MIDSECTION OF EACH PCTB SECTION ALONG THE FRONTAGE ROADS (SEE STANDARD DETAIL SHEET BC(7)-14 FOR MORE INFORMATION).
 3. ALL EXISTING DRAINAGE INLETS MUST REMAIN FREE OF ANY OBSTRUCTIONS AND SHALL REMAIN OPERATIONAL DURING THE CONSTRUCTION.
 4. ALL THE TCP AND SW3P ITEMS INSTALLED IN PREVIOUS PHASES SHALL REMAIN IN PLACE UNLESS OTHERWISE SHOWN ON THE PLANS OR AS DIRECTED.
 5. REFER TO SHEET #27 FOR ADVANCE WARNING SIGN LAYOUT



TCP LEGEND

	WRK ZN PAV MRK REMOV (W) 4" (BRK)		PERMANENT CONSTRUCTION COMPLETED IN PREVIOUS PHASE
	WRK ZN PAV MRK REMOV (W) 4" (LNDR)		TEMPORARY PAVEMENT
	WRK ZN PAV MRK REMOV (W) 4" (SLD)		DIRECTION OF TRAFFIC
	WRK ZN PAV MRK REMOV (W) 8" (SLD)		CONSTRUCTION SIGN
	WRK ZN PAV MRK REMOV (Y) 4" (BRK)		CHANNELLIZING DEVICE
	WRK ZN PAV MRK REMOV (Y) 4" (SLD)		TYPE III BARRICADE
	WRK ZN PAV MRK REMOV (Y) 8" (SLD)		FLAGGER
	PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)		PORT CTB (SGL SLOPE) (TY 1)
	CONSTRUCTION AREA THIS PHASE		CURB REMOVAL
	CONSTRUCTION EXIT		

REV NO.	DATE	BY	REVISION

PRAKASH SHRESTHA
95323
LICENSED PROFESSIONAL ENGINEER

Prakash Shrestha, P.E.
1/6/2022

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

Texas Department of Transportation

SH 146

**TRAFFIC CONTROL PLAN
PHASE 1 STAGE 1**

STA 554+00 TO STA 566+00

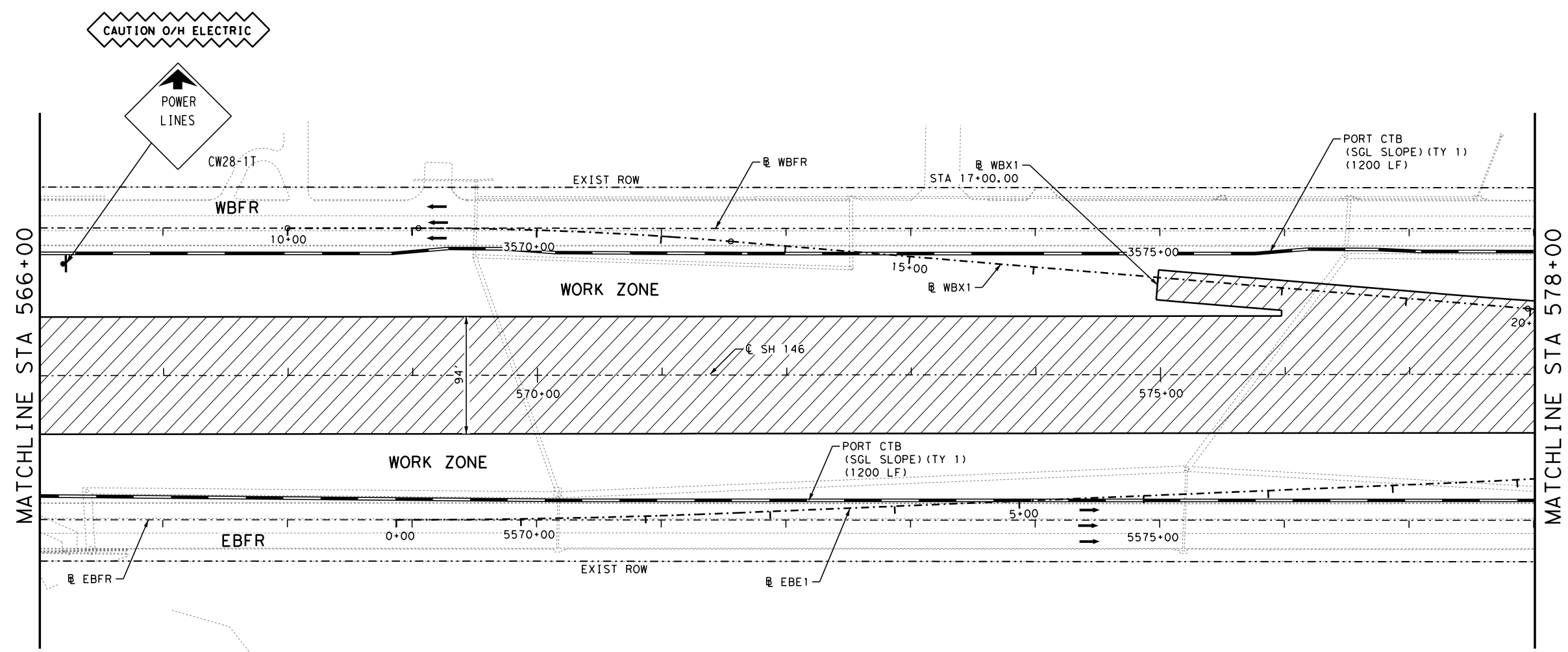
SHEET 2 OF 7

FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.	SHEET NO. 33
STATE TEXAS	DIST. HOU	COUNTY HARRIS
CONT. 0389	SECT. 13	JOB 039
		HIGHWAY NO. SH 146

1/6/2022 10:39:39 AM c:\pwworking\civiltecheng.com\dms0621\SH146_TCP_PH1_ST1_02.dgn



- NOTES:
1. REFER TO DETOUR LAYOUT SHEET FOR DETOURS.
 2. ALL PCTB SHALL HAVE REFLECTORS MOUNTED ON THE TOP AND ROAD SIDE NEAR THE MIDSECTION OF EACH PCTB SECTION ALONG THE FRONTAGE ROADS (SEE STANDARD DETAIL SHEET BC(7)-14 FOR MORE INFORMATION).
 3. ALL EXISTING DRAINAGE INLETS MUST REMAIN FREE OF ANY OBSTRUCTIONS AND SHALL REMAIN OPERATIONAL DURING THE CONSTRUCTION.
 4. ALL THE TCP AND SW3P ITEMS INSTALLED IN PREVIOUS PHASES SHALL REMAIN IN PLACE UNLESS OTHERWISE SHOWN ON THE PLANS OR AS DIRECTED.



REV NO.	DATE	BY	REVISION

PRAKASH SHRESTHA
 95323
 LICENSED PROFESSIONAL ENGINEER

 1/6/2022

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 Firm Registration No. F-382

Texas Department of Transportation

SH 146
TRAFFIC CONTROL PLAN
PHASE 1 STAGE 1
STA 566+00 TO STA 578+00
 SHEET 3 OF 7

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			34
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

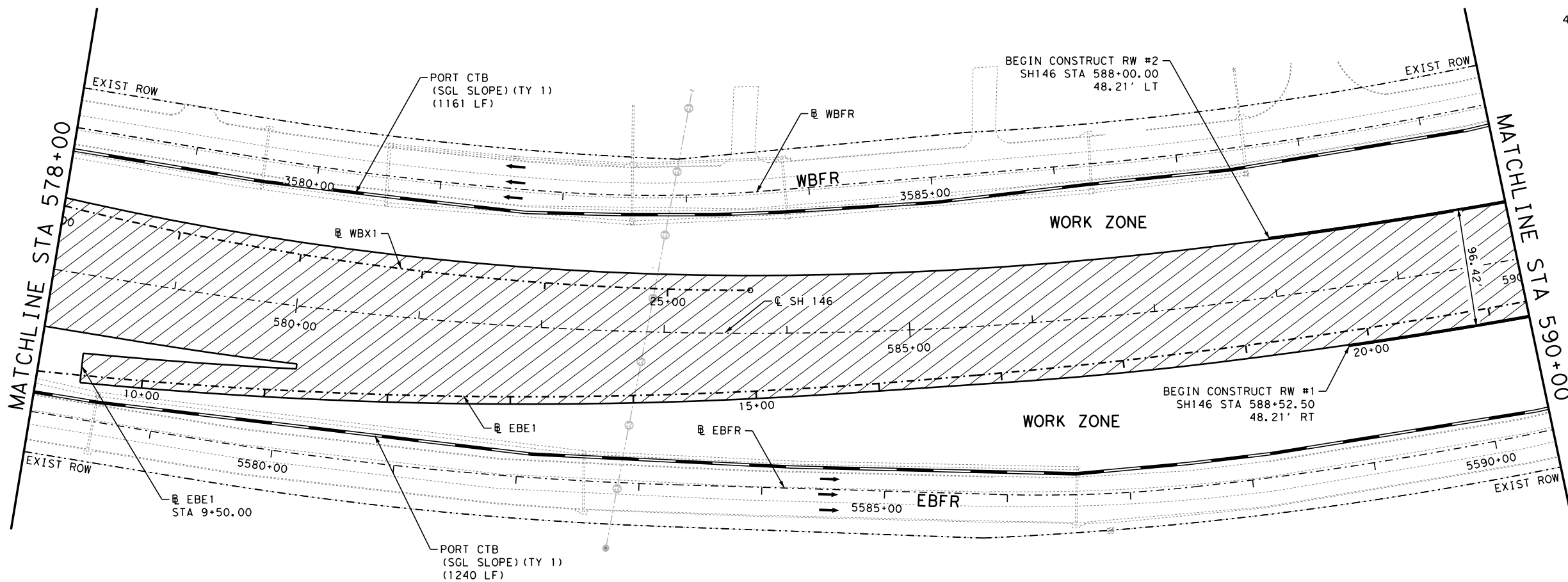
TCP LEGEND

- | | | | |
|--|---|--|--|
| | WRK ZN PAV MRK REMOV (W) 4" (BRK) | | PERMANENT CONSTRUCTION COMPLETED IN PREVIOUS PHASE |
| | WRK ZN PAV MRK REMOV (W) 4" (LNDR) | | TEMPORARY PAVEMENT |
| | WRK ZN PAV MRK REMOV (W) 4" (SLD) | | DIRECTION OF TRAFFIC |
| | WRK ZN PAV MRK REMOV (W) 8" (SLD) | | CONSTRUCTION SIGN |
| | WRK ZN PAV MRK REMOV (Y) 4" (BRK) | | CHANNELLIZING DEVICE |
| | WRK ZN PAV MRK REMOV (Y) 4" (SLD) | | TYPE III BARRICADE |
| | WRK ZN PAV MRK REMOV (Y) 8" (SLD) | | FLAGGER |
| | PORTABLE CHANGEABLE MESSAGE SIGN (PCMS) | | PORT CTB (SGL SLOPE) (TY 1) |
| | CONSTRUCTION AREA THIS PHASE | | CURB REMOVAL |
| | CONSTRUCTION EXIT | | |

1/6/2022 10:39:42 AM
 c:\pwworking\civiltecheng.com\dms0621\SH146_TCP_PHI_ST1_03.dgn



- NOTES:
- REFER TO DETOUR LAYOUT SHEET FOR DETOURS.
 - ALL PCTB SHALL HAVE REFLECTORS MOUNTED ON THE TOP AND ROAD SIDE NEAR THE MIDSECTION OF EACH PCTB SECTION ALONG THE FRONTAGE ROADS (SEE STANDARD DETAIL SHEET BC(7)-14 FOR MORE INFORMATION).
 - ALL EXISTING DRAINAGE INLETS MUST REMAIN FREE OF ANY OBSTRUCTIONS AND SHALL REMAIN OPERATIONAL DURING THE CONSTRUCTION.
 - ALL THE TCP AND SW3P ITEMS INSTALLED IN PREVIOUS PHASES SHALL REMAIN IN PLACE UNLESS OTHERWISE SHOWN ON THE PLANS OR AS DIRECTED.



REV. NO.	DATE	BY	REVISION

PRAKASH SHRESTHA
95323
LICENSED PROFESSIONAL ENGINEER

Prakash Shrestha, P.E.
1/6/2022

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Firm Registration No. F-382



SH 146

**TRAFFIC CONTROL PLAN
PHASE 1 STAGE 1**

STA 578+00 TO STA 590+00

SHEET 4 OF 7

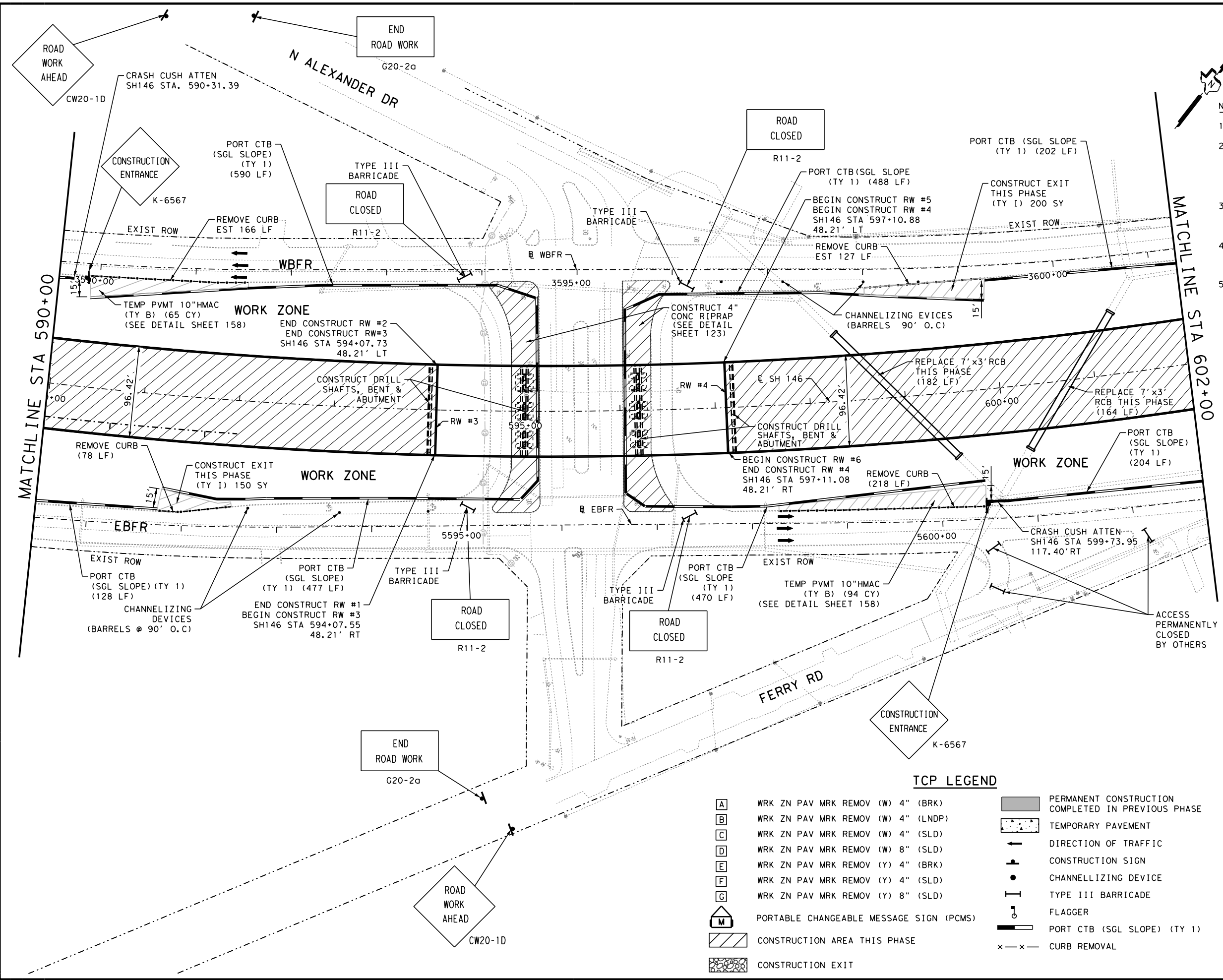
FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.		SHEET NO. 35
STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146

TCP LEGEND

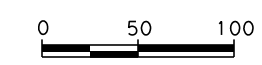
- | | | | |
|--|---|--|--|
| | WRK ZN PAV MRK REMOV (W) 4" (BRK) | | PERMANENT CONSTRUCTION COMPLETED IN PREVIOUS PHASE |
| | WRK ZN PAV MRK REMOV (W) 4" (LNDR) | | TEMPORARY PAVEMENT |
| | WRK ZN PAV MRK REMOV (W) 4" (SLD) | | DIRECTION OF TRAFFIC |
| | WRK ZN PAV MRK REMOV (W) 8" (SLD) | | CONSTRUCTION SIGN |
| | WRK ZN PAV MRK REMOV (Y) 4" (BRK) | | CHANNELLIZING DEVICE |
| | WRK ZN PAV MRK REMOV (Y) 4" (SLD) | | TYPE III BARRICADE |
| | WRK ZN PAV MRK REMOV (Y) 8" (SLD) | | FLAGGER |
| | PORTABLE CHANGEABLE MESSAGE SIGN (PCMS) | | PORT CTB (SGL SLOPE) (TY 1) |
| | CONSTRUCTION AREA THIS PHASE | | CURB REMOVAL |
| | CONSTRUCTION EXIT | | |

1/6/2022 10:39:45 AM c:\pwworking\civiltecheng.com\dms0621\SH146_TCP_PHI_ST1_04.dgn

2/28/2022 2:49:13 PM
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- NOTES:**
- REFER TO DETOUR LAYOUT SHEET FOR DETOURS.
 - ALL PCTB SHALL HAVE REFLECTORS MOUNTED ON THE TOP AND ROAD SIDE NEAR THE MIDSECTION OF EACH PCTB SECTION ALONG THE FRONTAGE ROADS (SEE STANDARD DETAIL SHEET BC(7)-14 FOR MORE INFORMATION).
 - ALL EXISTING DRAINAGE INLETS MUST REMAIN FREE OF ANY OBSTRUCTIONS AND SHALL REMAIN OPERATIONAL DURING THE CONSTRUCTION.
 - ALL THE TCP AND SW3P ITEMS INSTALLED IN PREVIOUS PHASES SHALL REMAIN IN PLACE UNLESS OTHERWISE SHOWN ON THE PLANS OR AS DIRECTED.
 - TEMPORARY PAVEMENTS SHOWN ON THE TCP PLANS ARE A SUBSIDIARY ITEM TO 'BARRICADES, SIGNS AND TRAFFIC HANDLING' (ITEM 502 6001) AND SHALL NOT BE PAID FOR SEPARATELY.



REV. NO.	DATE	BY	REVISION

PRAKASH SHRESTHA
95323
PROFESSIONAL ENGINEER

Prakash Shrestha, P.E.
2/28/2022

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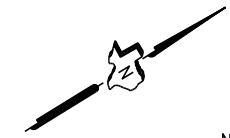
SH 146
TRAFFIC CONTROL PLAN
PHASE 1 STAGE 1
STA 590+00 TO STA 602+00

SHEET 5 OF 7

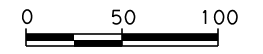
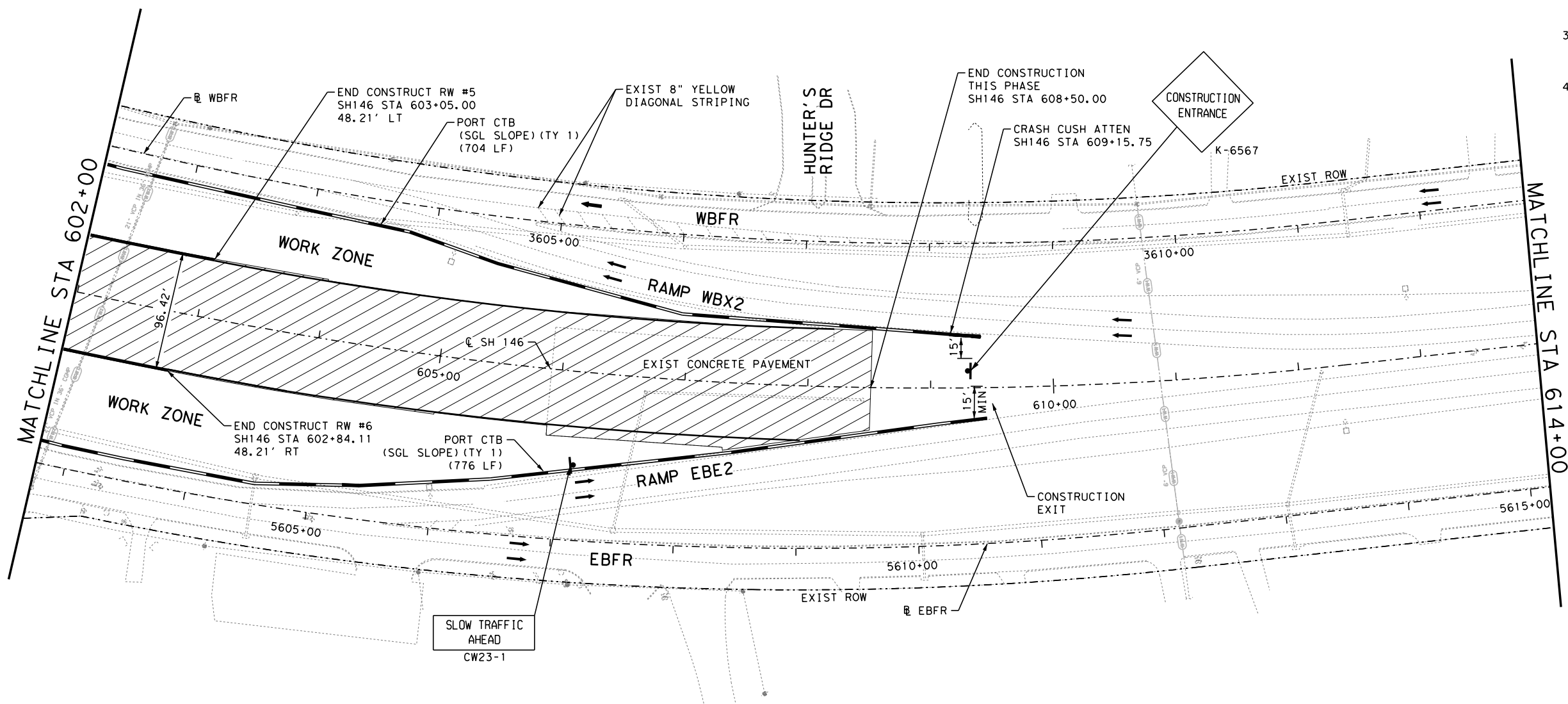
FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			36
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

TCP LEGEND

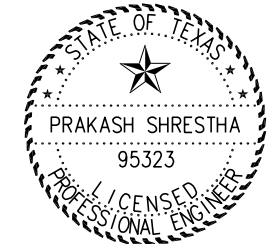
<p>A WRK ZN PAV MRK REMOV (W) 4" (BRK)</p> <p>B WRK ZN PAV MRK REMOV (W) 4" (LNDP)</p> <p>C WRK ZN PAV MRK REMOV (W) 4" (SLD)</p> <p>D WRK ZN PAV MRK REMOV (W) 8" (SLD)</p> <p>E WRK ZN PAV MRK REMOV (Y) 4" (BRK)</p> <p>F WRK ZN PAV MRK REMOV (Y) 4" (SLD)</p> <p>G WRK ZN PAV MRK REMOV (Y) 8" (SLD)</p> <p>M PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)</p> <p>CONSTRUCTION AREA THIS PHASE</p> <p>CONSTRUCTION EXIT</p>	<p>PERMANENT CONSTRUCTION COMPLETED IN PREVIOUS PHASE</p> <p>TEMPORARY PAVEMENT</p> <p>DIRECTION OF TRAFFIC</p> <p>CONSTRUCTION SIGN</p> <p>CHANNELLIZING DEVICE</p> <p>TYPE III BARRICADE</p> <p>FLAGGER</p> <p>PORT CTB (SGL SLOPE) (TY 1)</p> <p>CURB REMOVAL</p>
---	--



- NOTES:
1. REFER TO DETOUR LAYOUT SHEET FOR DETOURS.
 2. ALL PCTB SHALL HAVE REFLECTORS MOUNTED ON THE TOP AND ROAD SIDE NEAR THE MIDSECTION OF EACH PCTB SECTION ALONG THE FRONTAGE ROADS (SEE STANDARD DETAIL SHEET BC(7)-14 FOR MORE INFORMATION).
 3. ALL EXISTING DRAINAGE INLETS MUST REMAIN FREE OF ANY OBSTRUCTIONS AND SHALL REMAIN OPERATIONAL DURING THE CONSTRUCTION.
 4. ALL THE TCP AND SW3P ITEMS INSTALLED IN PREVIOUS PHASES SHALL REMAIN IN PLACE UNLESS OTHERWISE SHOWN ON THE PLANS OR AS DIRECTED.



REV NO.	DATE	BY	REVISION



Prakash Shrestha, P.E.
2/25/2022

CivilTech Engineering, Inc.
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Firm Registration No. F-382



SH 146

TRAFFIC CONTROL PLAN
PHASE 1 STAGE 1

STA 602+00 TO STA 614+00

SHEET 6 OF 7

FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.	SHEET NO. 37
STATE TEXAS	DIST. HOU	COUNTY HARRIS
CONT. 0389	SECT. 13	JOB 039
		HIGHWAY NO. SH 146

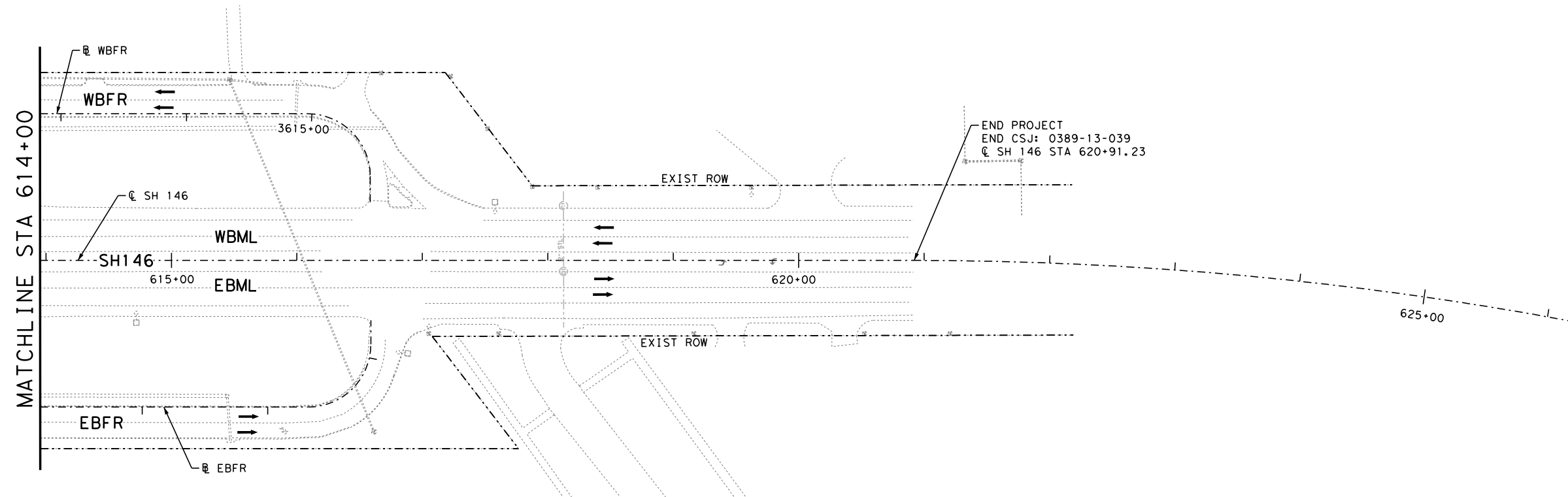
TCP LEGEND

- | | |
|---|--|
| WRK ZN PAV MRK REMOV (W) 4" (BRK) | PERMANENT CONSTRUCTION COMPLETED IN PREVIOUS PHASE |
| WRK ZN PAV MRK REMOV (W) 4" (LNDP) | TEMPORARY PAVEMENT |
| WRK ZN PAV MRK REMOV (W) 4" (SLD) | DIRECTION OF TRAFFIC |
| WRK ZN PAV MRK REMOV (W) 8" (SLD) | CONSTRUCTION SIGN |
| WRK ZN PAV MRK REMOV (Y) 4" (BRK) | CHANNELLIZING DEVICE |
| WRK ZN PAV MRK REMOV (Y) 4" (SLD) | TYPE III BARRICADE |
| WRK ZN PAV MRK REMOV (Y) 8" (SLD) | FLAGGER |
| PORTABLE CHANGEABLE MESSAGE SIGN (PCMS) | PORT CTB (SGL SLOPE) (TY 1) |
| CONSTRUCTION AREA THIS PHASE | CURB REMOVAL |
| CONSTRUCTION EXIT | |

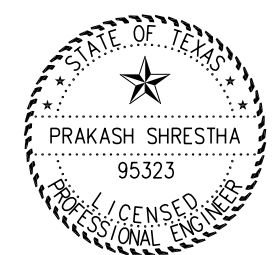
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- NOTES:
1. REFER TO DETOUR LAYOUT SHEET FOR DETOURS.
 2. ALL PCTB SHALL HAVE REFLECTORS MOUNTED ON THE TOP AND ROAD SIDE NEAR THE MIDSECTION OF EACH PCTB SECTION ALONG THE FRONTAGE ROADS (SEE STANDARD DETAIL SHEET BC(7)-14 FOR MORE INFORMATION).
 3. ALL EXISTING DRAINAGE INLETS MUST REMAIN FREE OF ANY OBSTRUCTIONS AND SHALL REMAIN OPERATIONAL DURING THE CONSTRUCTION.
 4. ALL THE TCP AND SW3P ITEMS INSTALLED IN PREVIOUS PHASES SHALL REMAIN IN PLACE UNLESS OTHERWISE SHOWN ON THE PLANS OR AS DIRECTED.
 5. REFER TO SHEET #28 FOR ADVANCE WARNING SIGN LAYOUT



REV NO.	DATE	BY	REVISION



Prakash Shrestha, P.E.
1/6/2022

CivilTech Engineering, Inc.
11821 Telge Road
Cypress, Texas 77429
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Firm Registration No. F-382



SH 146

TRAFFIC CONTROL PLAN
PHASE 1 STAGE 1

STA 614+00 TO END

SHEET 7 OF 7

FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.	SHEET NO. 38
STATE TEXAS	DIST. HOU	COUNTY HARRIS
CONT. 0389	SECT. 13	JOB 039
		HIGHWAY NO. SH 146

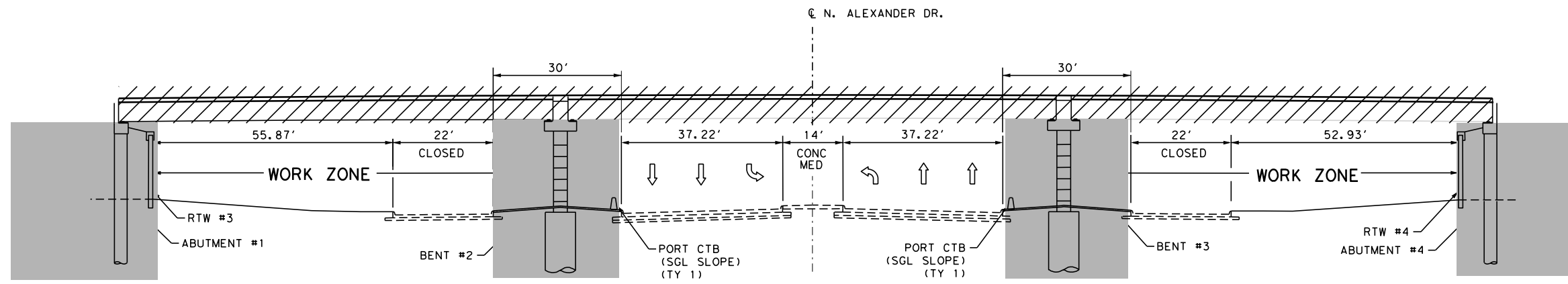
TCP LEGEND

- | | |
|---|--|
| WRK ZN PAV MRK REMOV (W) 4" (BRK) | PERMANENT CONSTRUCTION COMPLETED IN PREVIOUS PHASE |
| WRK ZN PAV MRK REMOV (W) 4" (LNDP) | TEMPORARY PAVEMENT |
| WRK ZN PAV MRK REMOV (W) 4" (SLD) | DIRECTION OF TRAFFIC |
| WRK ZN PAV MRK REMOV (W) 8" (SLD) | CONSTRUCTION SIGN |
| WRK ZN PAV MRK REMOV (Y) 4" (BRK) | CHANNELLIZING DEVICE |
| WRK ZN PAV MRK REMOV (Y) 4" (SLD) | TYPE III BARRICADE |
| WRK ZN PAV MRK REMOV (Y) 8" (SLD) | FLAGGER |
| PORTABLE CHANGEABLE MESSAGE SIGN (PCMS) | PORT CTB (SGL SLOPE) (TY 1) |
| CONSTRUCTION AREA THIS PHASE | CURB REMOVAL |
| CONSTRUCTION EXIT | |

1/6/2022 10:39:56 AM c:\pwworking\civiltecheng.com\dms0621\SH146_TCP_PHI_ST1_07.dgn

TCP LEGEND

- A WRK ZN PAV MRK REMOV (W) 4" (BRK)
- B WRK ZN PAV MRK REMOV (W) 4" (SLD)
- C WRK ZN PAV MRK REMOV (Y) 4" (SLD)
- PERMANENT CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTION COMPLETED IN PREVIOUS PHASE
- EXISTING TRAFFIC
- PROPOSED TRAFFIC
- PORTABLE CTB (TYPE 1)
- PLASTIC DRUM
- TRAFFIC CONE



WORK THIS PHASE

- * HANG BRIDGE BEAMS
- * INSTALL PRECAST SLAB PANELS
- * CONSTRUCT BRIDGE DECK SLAB
- * POUR CONCRETE & FINISH SURFACE (BRIDGE)
- * INSTALL BRIDGE RAILS
- * INSTALL REBARS, FORMS, JOINTS, ETC. (MAINLANE PAVEMENT)

PHASE 1 STAGE 2 TCP TYPICAL SECTION
N. ALEXANDER DR STA 55+14.90

REV. NO.	DATE	BY	REVISION



CivilTech Engineering, Inc.
11821 Telge Road
Cypress, Texas 77429
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Firm Registration No. F-382



SH 146

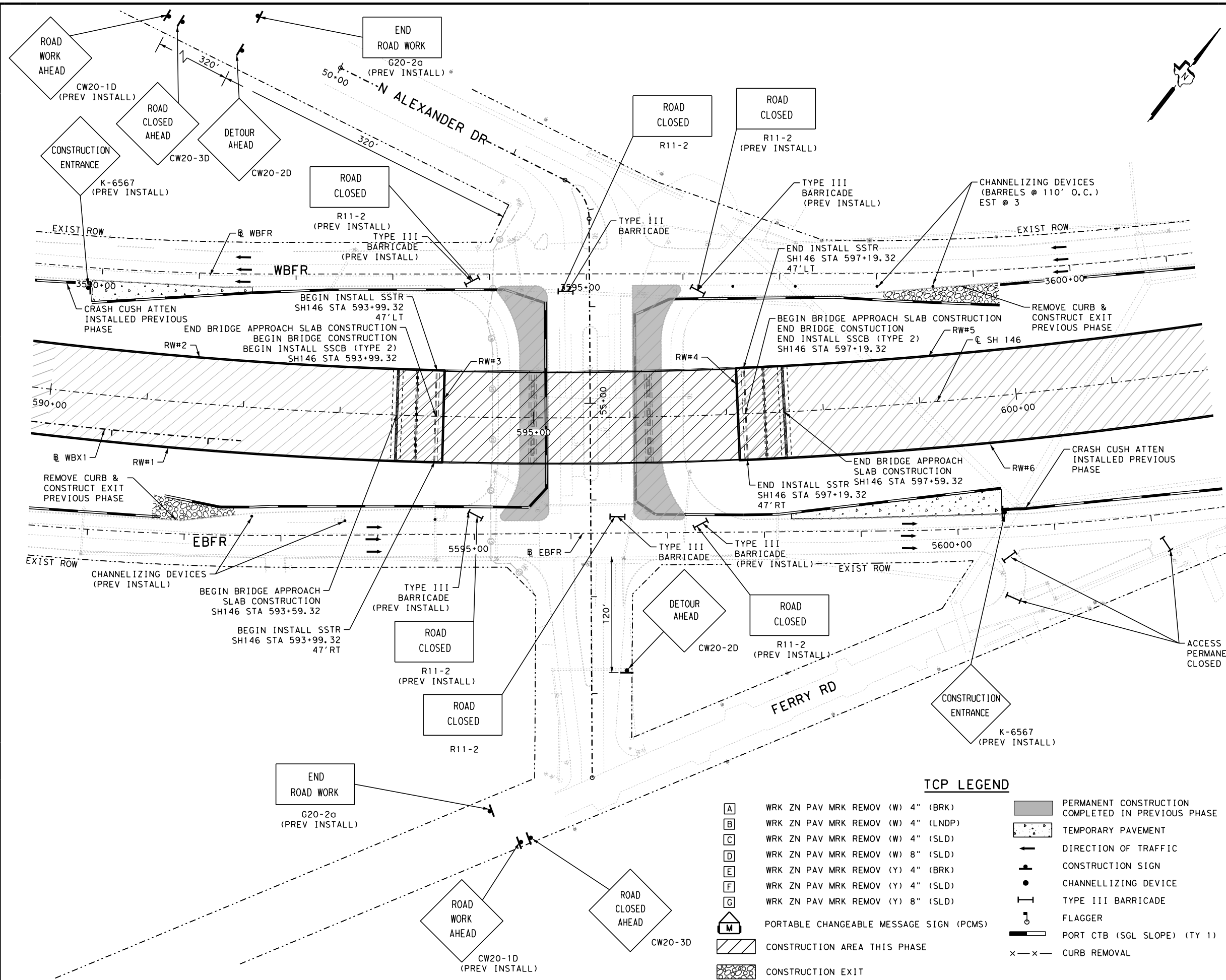
TRAFFIC CONTROL
TYPICAL SECTIONS

PHASE 1 STAGE 2

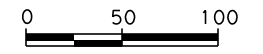
N. T. S		SHEET 1 OF 1	
FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.	
6		39	
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

1/6/2022 10:40:00 AM
c:\pwworking\dw\combe\civil\techeng.com\dms08801\SH146_TCP_TYP_PH1_ST2.dgn

1/6/2022 10:40:04 AM
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- NOTES:**
1. REFER TO DETOUR LAYOUT SHEET FOR DETOURS.
 2. ALL PCTB SHALL HAVE REFLECTORS MOUNTED ON THE TOP AND ROAD SIDE NEAR THE MIDSECTION OF EACH PCTB SECTION ALONG THE FRONTAGE ROADS (SEE STANDARD DETAIL SHEET BC(7)-14 FOR MORE INFORMATION).
 3. ALL EXISTING DRAINAGE INLETS MUST REMAIN FREE OF ANY OBSTRUCTIONS AND SHALL REMAIN OPERATIONAL DURING THE CONSTRUCTION.
 4. ALL THE TCP AND SW3P ITEMS INSTALLED IN PREVIOUS PHASES SHALL REMAIN IN PLACE UNLESS OTHERWISE SHOWN ON THE PLANS OR AS DIRECTED.
 5. THE N. ALEXANDER INTERSECTION SHALL BE CLOSED ONLY DURING THE WEEKENDS OR NIGHTS (AS DESCRIBED IN TCP NARRATIVE) FOR HANGING BEAMS AND INSTALLING PRECAST SLAB PANELS ONLY. THE INTERSECTION MUST OPEN IMMEDIATELY AFTER THE COMPLETION OF THESE WORKS AND ALL RELATED TCP ITEMS HAVE BEEN REMOVED.
 6. THE PCMS BOARD SIGNS ON EACH END OF SH 146 MUST DISPLAY INFORMATION OF INTERSECTION CLOSURE AT LEAST 3 DAYS IN ADVANCE OF THE INTERSECTION CLOSURE. THE WORDING ON THE PCMS SHALL BE APPROVED BY THE ENGINEER.



REV. NO.	DATE	BY	REVISION

1/6/2022

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



SH 146

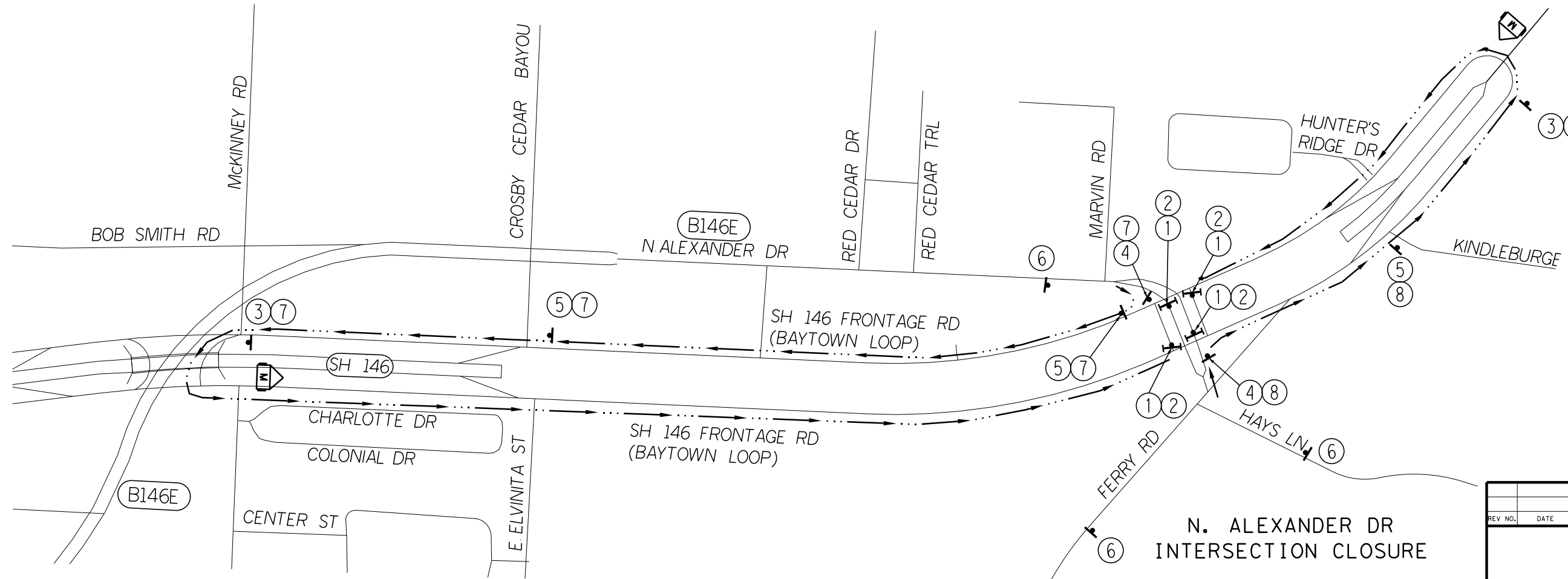
**TRAFFIC CONTROL PLAN
 PHASE 1 STAGE 2**

SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			40
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

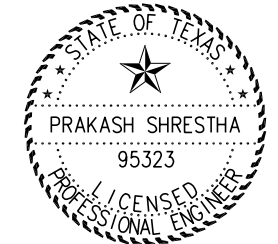
TCP LEGEND

[A]	WRK ZN PAV MRK REMOV (W) 4" (BRK)	[Grey Box]	PERMANENT CONSTRUCTION COMPLETED IN PREVIOUS PHASE
[B]	WRK ZN PAV MRK REMOV (W) 4" (LNDP)	[Dotted Box]	TEMPORARY PAVEMENT
[C]	WRK ZN PAV MRK REMOV (W) 4" (SLD)	[Arrow]	DIRECTION OF TRAFFIC
[D]	WRK ZN PAV MRK REMOV (W) 8" (SLD)	[Sign]	CONSTRUCTION SIGN
[E]	WRK ZN PAV MRK REMOV (Y) 4" (BRK)	[Dot]	CHANNELLIZING DEVICE
[F]	WRK ZN PAV MRK REMOV (Y) 4" (SLD)	[Barricade]	TYPE III BARRICADE
[G]	WRK ZN PAV MRK REMOV (Y) 8" (SLD)	[Flagger]	FLAGGER
[M]	PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)	[Port CTB]	PORT CTB (SGL SLOPE) (TY 1)
[Hatched Box]	CONSTRUCTION AREA THIS PHASE	[Curb Removal]	CURB REMOVAL
[Stippled Box]	CONSTRUCTION EXIT		



N. ALEXANDER DR INTERSECTION CLOSURE

REV. NO.	DATE	BY	REVISION



Prakash Shrestha, P.E.
1/6/2022

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

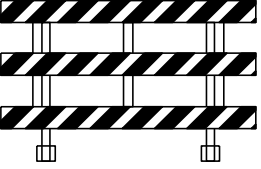

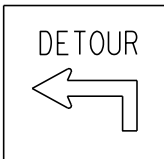
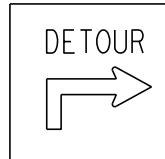
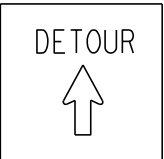
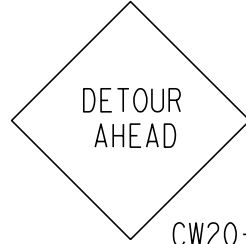











SH 146

TRAFFIC CONTROL PLAN
PHASE 1 STAGE 2
DETOUR PLAN

N. T. S. SHEET 1 OF 1

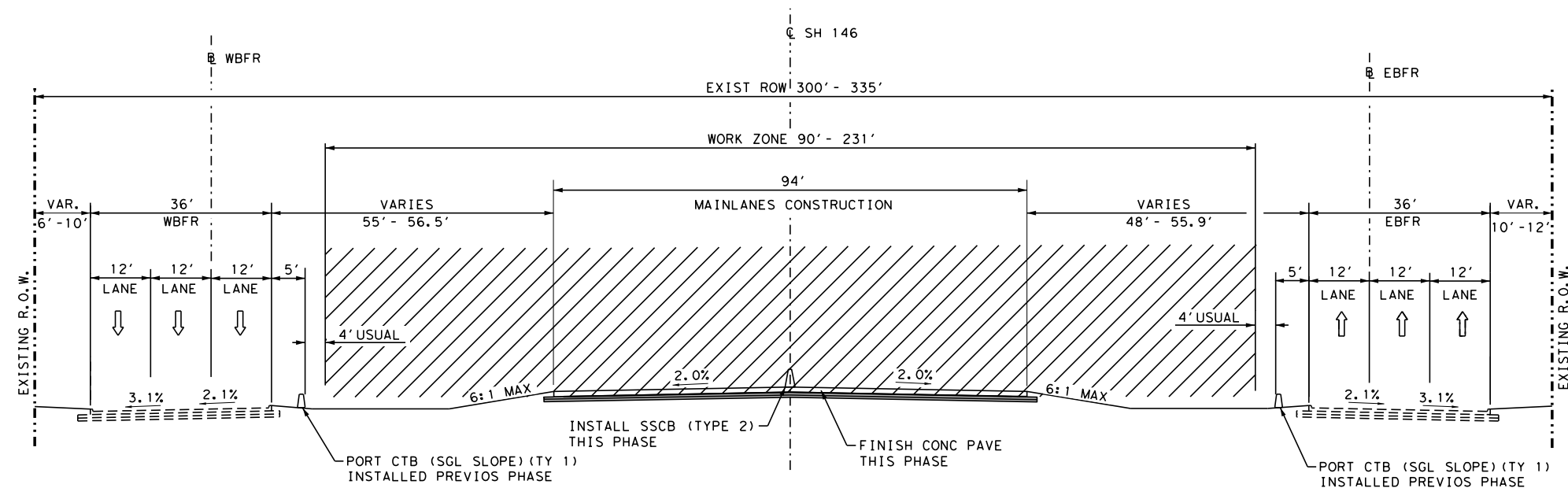
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6			41
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

 TYPE III BARRICADE ①	 ROAD CLOSED R11-2 ②	 DETOUR M4-9AL ③	 DETOUR M4-9AR ④	 DETOUR M4-9S ⑤	 DETOUR AHEAD CW20-2D ⑥
 NORTH M3-1  146 TEXAS M1-6T ⑦	 SOUTH M3-3  146 TEXAS M1-6T ⑧	<p style="text-align: center;">LEGEND</p>  PORTABLE CHANGEABLE MESSAGE SIGN  DETOUR ROUTE  CONSTRUCTION SIGN  CHANNELLIZING DEVICE  TYPE III BARRICADE			

1/6/2022 10:40:07 AM c:\pwworking\civiltecheng.com\dms0621\SH146_ICP_PHI_ST2-DETOUR.dgn

TCP LEGEND

- A WRK ZN PAV MRK REMOV (W) 4" (BRK)
- B WRK ZN PAV MRK REMOV (W) 4" (SLD)
- C WRK ZN PAV MRK REMOV (Y) 4" (SLD)
- PERMANENT CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTION COMPLETED IN PREVIOUS PHASE
- EXISTING TRAFFIC
- PROPOSED TRAFFIC
- PORTABLE CTB (TYPE 1)
- PLASTIC DRUM
- TRAFFIC CONE

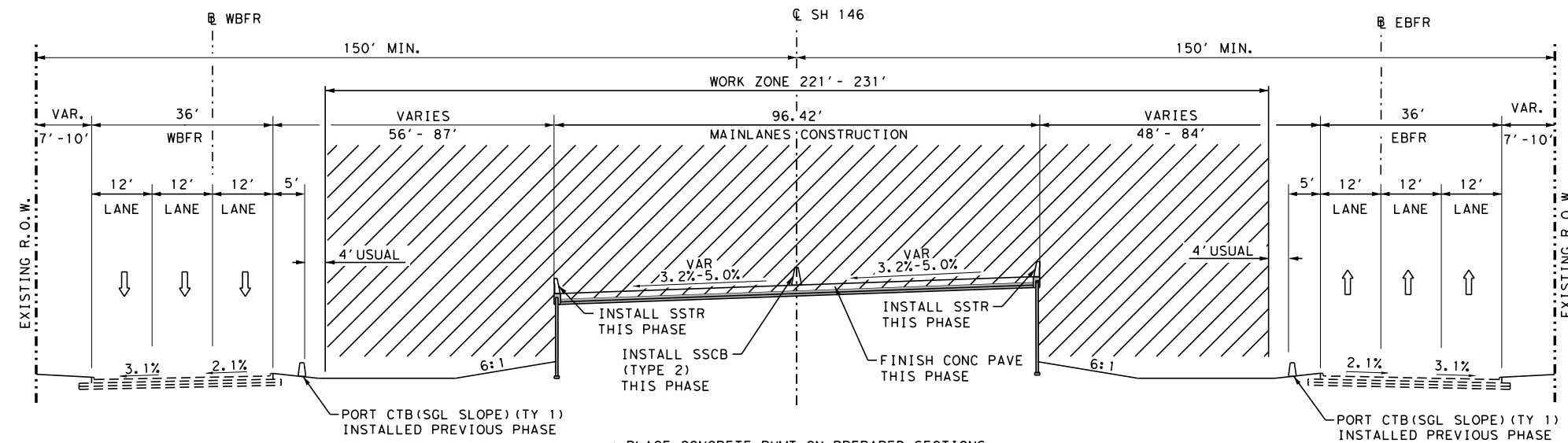


WORK THIS PHASE

- * PLACE CONCRETE PVMT ON PREPARED SECTIONS
- * FINISHING OF CONCRETE PVMT
- * CURE CONCRETE PAVEMENT
- * INSTALL CONCRETE SAFETY BARRIERS

PHASE 2 STAGE 1 TCP TYPICAL SECTION

FROM STA 555+50.00 TO STA 583+00+00

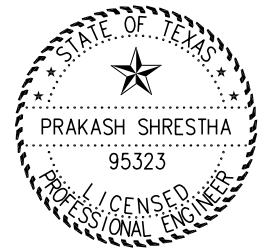


- * PLACE CONCRETE PVMT ON PREPARED SECTIONS
- * FINISHING OF CONCRETE PVMT
- * CURE CONCRETE PAVEMENT
- * INSTALL CONCRETE SAFETY BARRIERS, AND RAILS

PHASE 2 STAGE 1 TCP TYPICAL SECTION

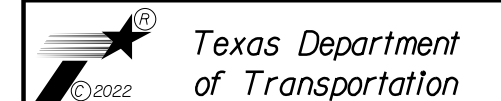
FROM STA 588+00.00 TO STA 594+00.00
FROM STA 597+20.00 TO STA 603+00.00

REV. NO.	DATE	BY	REVISION



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1/6/2022

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Firm Registration No. F-382



SH 146

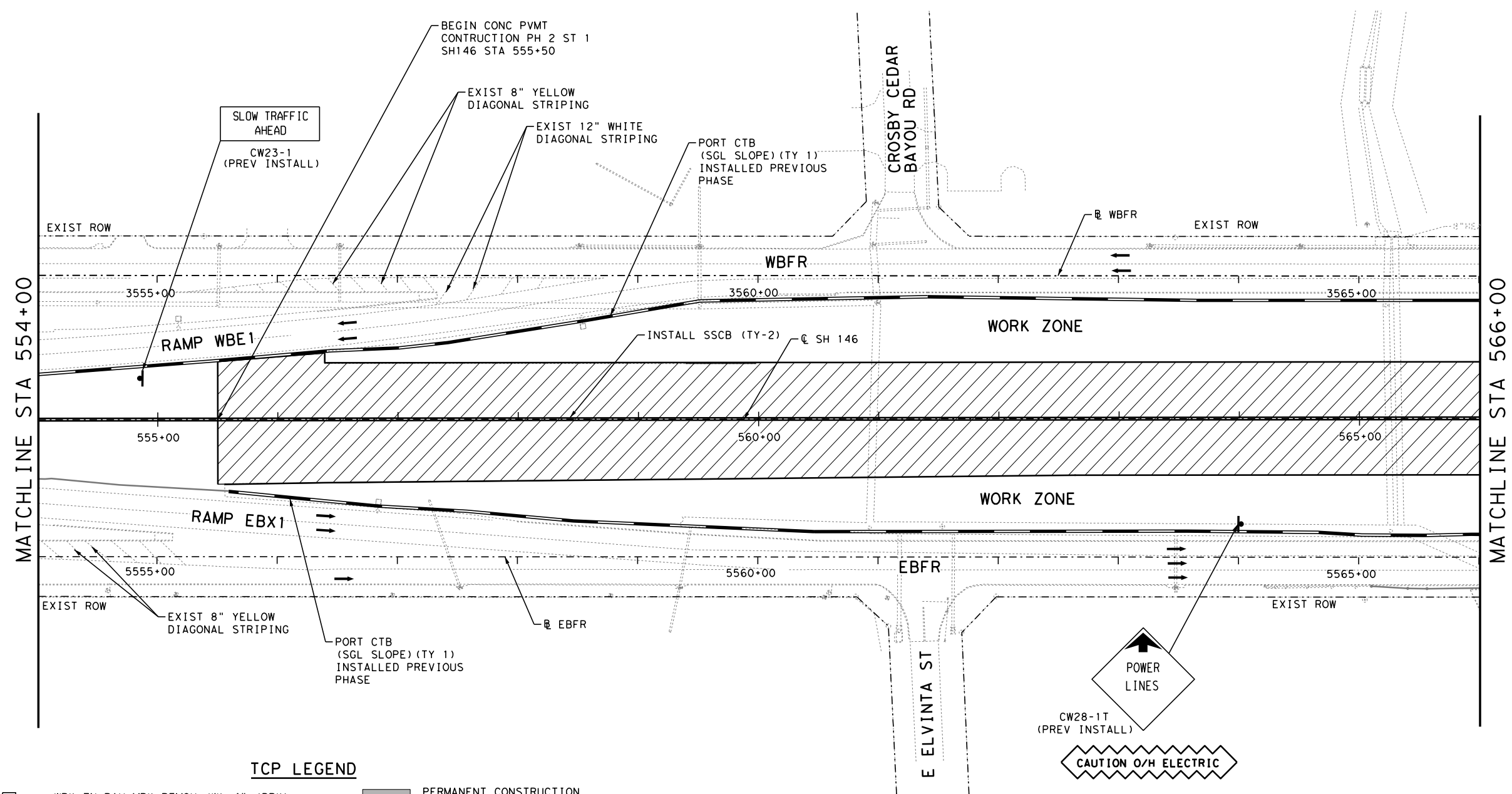
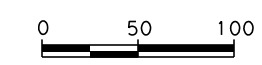
TRAFFIC CONTROL
TYPICAL SECTIONS

PHASE 2 STAGE 1

N. T. S.		SHEET 1 OF 1	
FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.	SHEET NO. 42	
STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146



- NOTES:
1. REFER TO DETOUR LAYOUT SHEET FOR DETOURS.
 2. ALL PCTB SHALL HAVE REFLECTORS MOUNTED ON THE TOP AND ROAD SIDE NEAR THE MIDSECTION OF EACH PCTB SECTION ALONG THE FRONTAGE ROADS (SEE STANDARD DETAIL SHEET BC(7)-14 FOR MORE INFORMATION).
 3. ALL EXISTING DRAINAGE INLETS MUST REMAIN FREE OF ANY OBSTRUCTIONS AND SHALL REMAIN OPERATIONAL DURING THE CONSTRUCTION.
 4. ALL THE TCP AND SW3P ITEMS INSTALLED IN PREVIOUS PHASES SHALL REMAIN IN PLACE UNLESS OTHERWISE SHOWN ON THE PLANS OR AS DIRECTED.
 5. REFER TO SHEET #27 FOR ADVANCE WARNING SIGN LAYOUT



MATCHLINE STA 554+00

MATCHLINE STA 566+00

TCP LEGEND

	WRK ZN PAV MRK REMOV (W) 4" (BRK)		PERMANENT CONSTRUCTION COMPLETED IN PREVIOUS PHASE
	WRK ZN PAV MRK REMOV (W) 4" (LNDP)		TEMPORARY PAVEMENT
	WRK ZN PAV MRK REMOV (W) 4" (SLD)		DIRECTION OF TRAFFIC
	WRK ZN PAV MRK REMOV (W) 8" (SLD)		CONSTRUCTION SIGN
	WRK ZN PAV MRK REMOV (Y) 4" (BRK)		CHANNELLIZING DEVICE
	WRK ZN PAV MRK REMOV (Y) 4" (SLD)		TYPE III BARRICADE
	WRK ZN PAV MRK REMOV (Y) 8" (SLD)		FLAGGER
	PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)		PORT CTB (SGL SLOPE) (TY 1)
	CONSTRUCTION AREA THIS PHASE		CURB REMOVAL
	CONSTRUCTION EXIT		

REV NO.	DATE	BY	REVISION

1/6/2022

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 Firm Registration No. F-382



SH 146

**TRAFFIC CONTROL PLAN
 PHASE 2 STAGE 1**

STA 554+00 TO STA 566+00

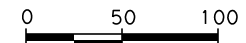
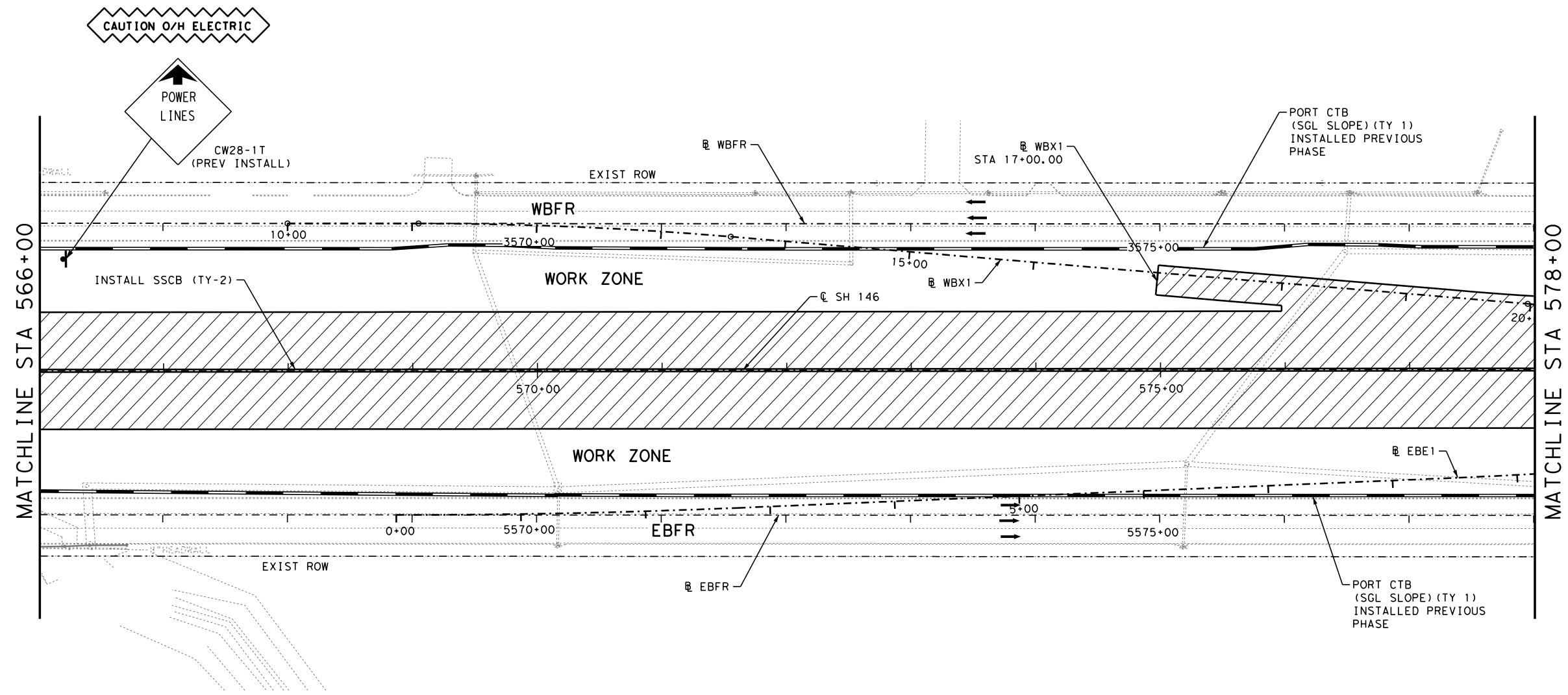
SHEET 2 OF 7

FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.		SHEET NO. 44
STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146

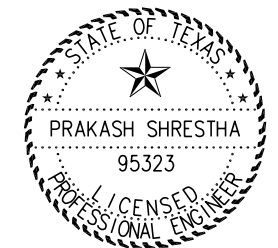
1/6/2022 10:40:17 AM c:\pwworking\civiltecheng.com\dms0621\SH146_TCP_PH2_ST1-02.dgn



- NOTES:
1. REFER TO DETOUR LAYOUT SHEET FOR DETOURS.
 2. ALL PCTB SHALL HAVE REFLECTORS MOUNTED ON THE TOP AND ROAD SIDE NEAR THE MIDSECTION OF EACH PCTB SECTION ALONG THE FRONTAGE ROADS (SEE STANDARD DETAIL SHEET BC(7)-14 FOR MORE INFORMATION).
 3. ALL EXISTING DRAINAGE INLETS MUST REMAIN FREE OF ANY OBSTRUCTIONS AND SHALL REMAIN OPERATIONAL DURING THE CONSTRUCTION.
 4. ALL THE TCP AND SW3P ITEMS INSTALLED IN PREVIOUS PHASES SHALL REMAIN IN PLACE UNLESS OTHERWISE SHOWN ON THE PLANS OR AS DIRECTED.

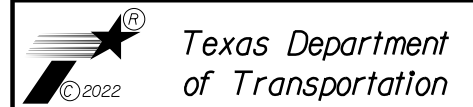


REV NO.	DATE	BY	REVISION



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1/6/2022

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SH 146

TRAFFIC CONTROL PLAN
PHASE 2 STAGE 1

STA 566+00 TO STA 578+00

SHEET 3 OF 7

FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.		SHEET NO. 45
STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146

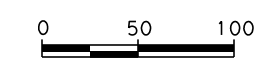
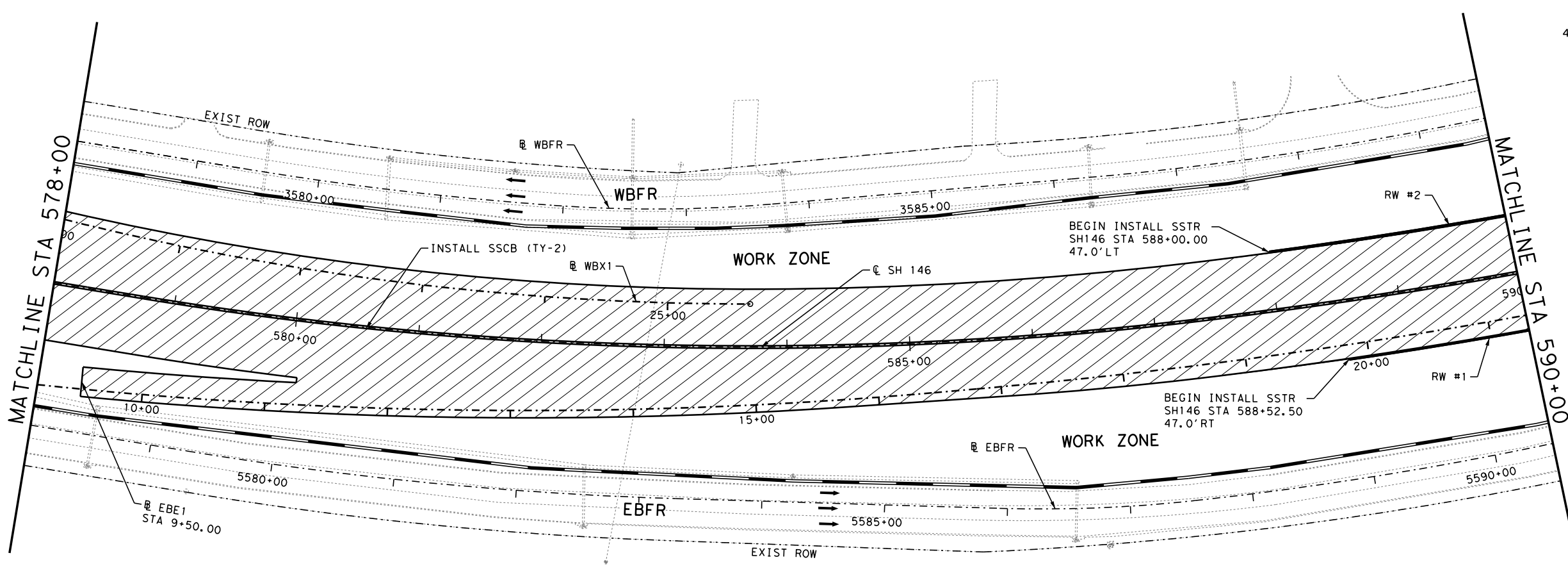
TCP LEGEND

- | | | | |
|--|---|--|--|
| | WRK ZN PAV MRK REMOV (W) 4" (BRK) | | PERMANENT CONSTRUCTION COMPLETED IN PREVIOUS PHASE |
| | WRK ZN PAV MRK REMOV (W) 4" (LNDR) | | TEMPORARY PAVEMENT |
| | WRK ZN PAV MRK REMOV (W) 4" (SLD) | | DIRECTION OF TRAFFIC |
| | WRK ZN PAV MRK REMOV (W) 8" (SLD) | | CONSTRUCTION SIGN |
| | WRK ZN PAV MRK REMOV (Y) 4" (BRK) | | CHANNELLIZING DEVICE |
| | WRK ZN PAV MRK REMOV (Y) 4" (SLD) | | TYPE III BARRICADE |
| | WRK ZN PAV MRK REMOV (Y) 8" (SLD) | | FLAGGER |
| | PORTABLE CHANGEABLE MESSAGE SIGN (PCMS) | | PORT CTB (SGL SLOPE) (TY 1) |
| | CONSTRUCTION AREA THIS PHASE | | CURB REMOVAL |
| | CONSTRUCTION EXIT | | |

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- NOTES:
1. REFER TO DETOUR LAYOUT SHEET FOR DETOURS.
 2. ALL PCTB SHALL HAVE REFLECTORS MOUNTED ON THE TOP AND ROAD SIDE NEAR THE MIDSECTION OF EACH PCTB SECTION ALONG THE FRONTAGE ROADS (SEE STANDARD DETAIL SHEET BC(7)-14 FOR MORE INFORMATION).
 3. ALL EXISTING DRAINAGE INLETS MUST REMAIN FREE OF ANY OBSTRUCTIONS AND SHALL REMAIN OPERATIONAL DURING THE CONSTRUCTION.
 4. ALL THE TCP AND SW3P ITEMS INSTALLED IN PREVIOUS PHASES SHALL REMAIN IN PLACE UNLESS OTHERWISE SHOWN ON THE PLANS OR AS DIRECTED.



REV. NO.	DATE	BY	REVISION

PRAKASH SHRESTHA
95323
LICENSED PROFESSIONAL ENGINEER

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1/6/2022

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Firm Registration No. F-382

Texas Department of Transportation

SH 146

TRAFFIC CONTROL PLAN
PHASE 2 STAGE 1

STA 578+00 TO STA 590+00

SHEET 4 OF 7

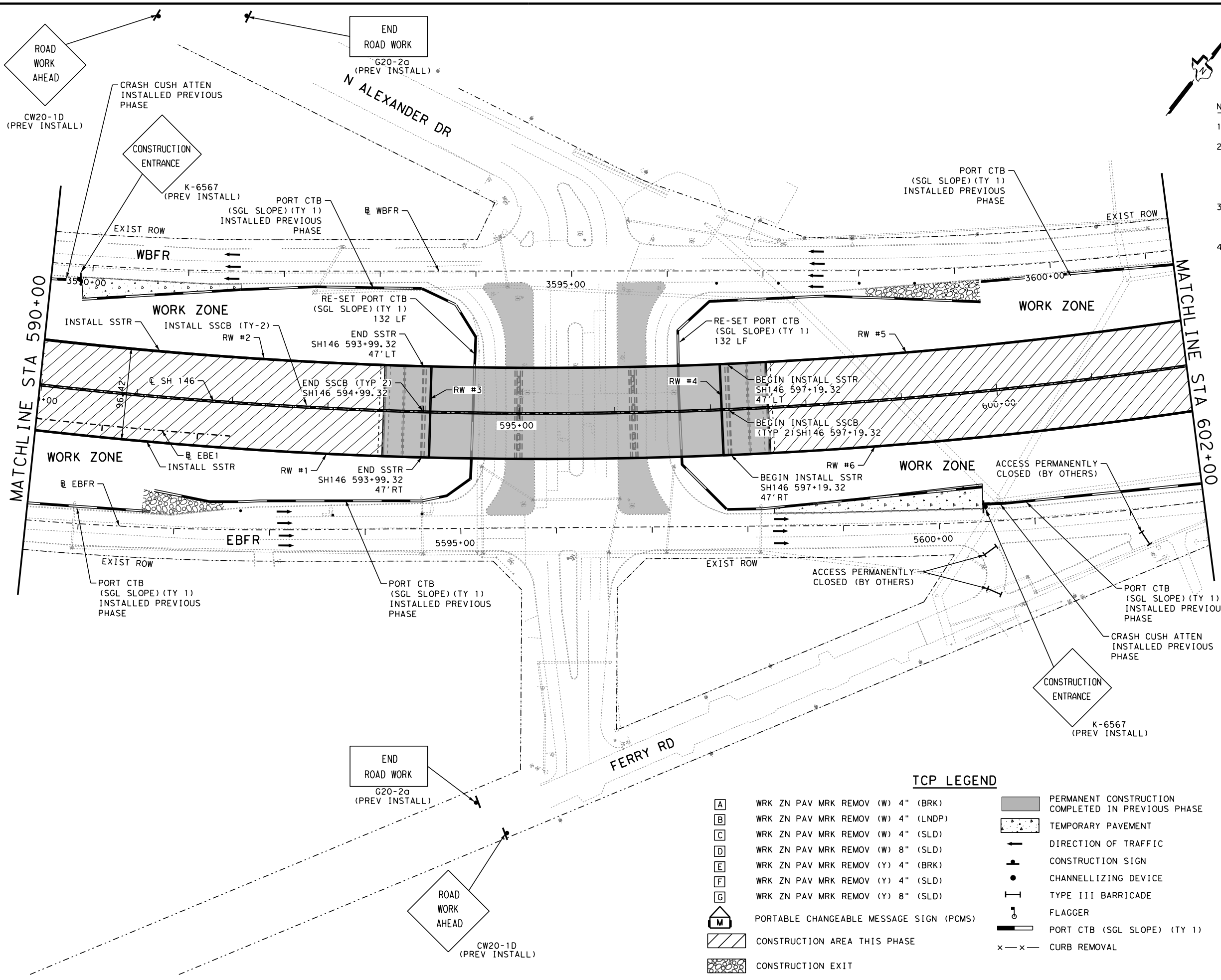
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STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146

TCP LEGEND

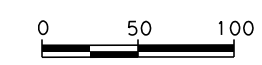
- | | | | |
|--|---|--|--|
| | WRK ZN PAV MRK REMOV (W) 4" (BRK) | | PERMANENT CONSTRUCTION COMPLETED IN PREVIOUS PHASE |
| | WRK ZN PAV MRK REMOV (W) 4" (LNDR) | | TEMPORARY PAVEMENT |
| | WRK ZN PAV MRK REMOV (W) 4" (SLD) | | DIRECTION OF TRAFFIC |
| | WRK ZN PAV MRK REMOV (W) 8" (SLD) | | CONSTRUCTION SIGN |
| | WRK ZN PAV MRK REMOV (Y) 4" (BRK) | | CHANNELLIZING DEVICE |
| | WRK ZN PAV MRK REMOV (Y) 4" (SLD) | | TYPE III BARRICADE |
| | WRK ZN PAV MRK REMOV (Y) 8" (SLD) | | FLAGGER |
| | PORTABLE CHANGEABLE MESSAGE SIGN (PCMS) | | PORT CTB (SGL SLOPE) (TY 1) |
| | CONSTRUCTION AREA THIS PHASE | | CURB REMOVAL |
| | CONSTRUCTION EXIT | | |

1/6/2022 10:40:24 AM c:\pwworking\civiltecheng.com\dms0621\SH146_TCP_PH2_ST1-04.dgn

1/6/2022 10:40:27 AM c:\pwworking\dwg\1\sh146\sh146\TCP_Ph2_ST1-05.dgn



- NOTES:**
1. REFER TO DETOUR LAYOUT SHEET FOR DETOURS.
 2. ALL PCTB SHALL HAVE REFLECTORS MOUNTED ON THE TOP AND ROAD SIDE NEAR THE MIDSECTION OF EACH PCTB SECTION ALONG THE FRONTAGE ROADS (SEE STANDARD DETAIL SHEET BC(7)-14 FOR MORE INFORMATION).
 3. ALL EXISTING DRAINAGE INLETS MUST REMAIN FREE OF ANY OBSTRUCTIONS AND SHALL REMAIN OPERATIONAL DURING THE CONSTRUCTION.
 4. ALL THE TCP AND SW3P ITEMS INSTALLED IN PREVIOUS PHASES SHALL REMAIN IN PLACE UNLESS OTHERWISE SHOWN ON THE PLANS OR AS DIRECTED.



REV NO.	DATE	BY	REVISION

Prakash Shrestha, P.E.
1/6/2022

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SH 146

TRAFFIC CONTROL PLAN
PHASE 2 STAGE 1

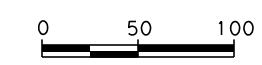
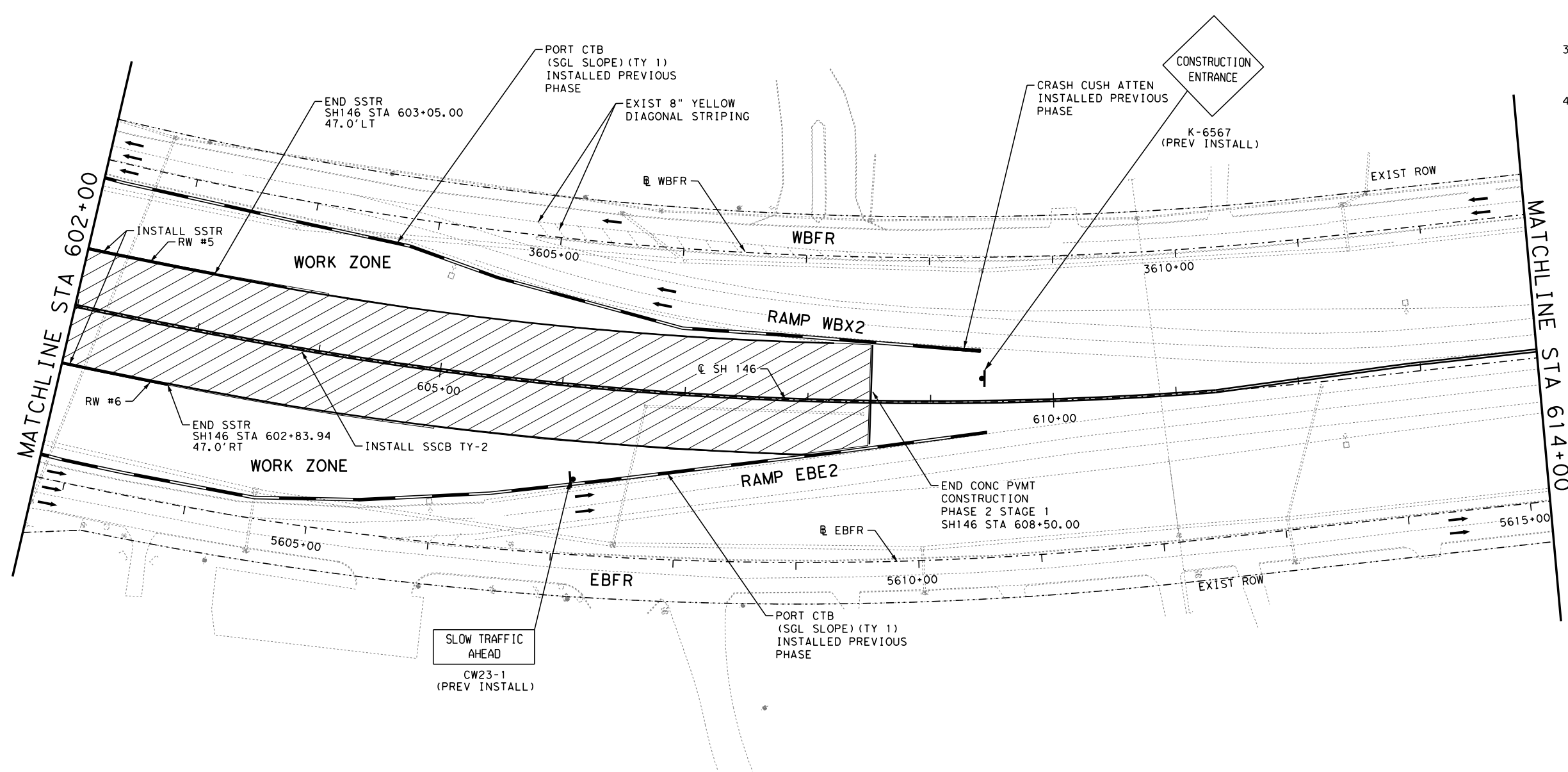
STA 590+00 TO STA 602+00

SHEET 5 OF 7

FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.		SHEET NO. 47
STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146



- NOTES:
1. REFER TO DETOUR LAYOUT SHEET FOR DETOURS.
 2. ALL PCTB SHALL HAVE REFLECTORS MOUNTED ON THE TOP AND ROAD SIDE NEAR THE MIDSECTION OF EACH PCTB SECTION ALONG THE FRONTAGE ROADS (SEE STANDARD DETAIL SHEET BC(7)-14 FOR MORE INFORMATION).
 3. ALL EXISTING DRAINAGE INLETS MUST REMAIN FREE OF ANY OBSTRUCTIONS AND SHALL REMAIN OPERATIONAL DURING THE CONSTRUCTION.
 4. ALL THE TCP AND SW3P ITEMS INSTALLED IN PREVIOUS PHASES SHALL REMAIN IN PLACE UNLESS OTHERWISE SHOWN ON THE PLANS OR AS DIRECTED.



REV. NO.	DATE	BY	REVISION

1/6/2022

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 Firm Registration No. F-382



SH 146

**TRAFFIC CONTROL PLAN
 PHASE 2 STAGE 1**

STA 602+00 TO STA 614+00

SHEET 6 OF 7

FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.		SHEET NO. 48
STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146

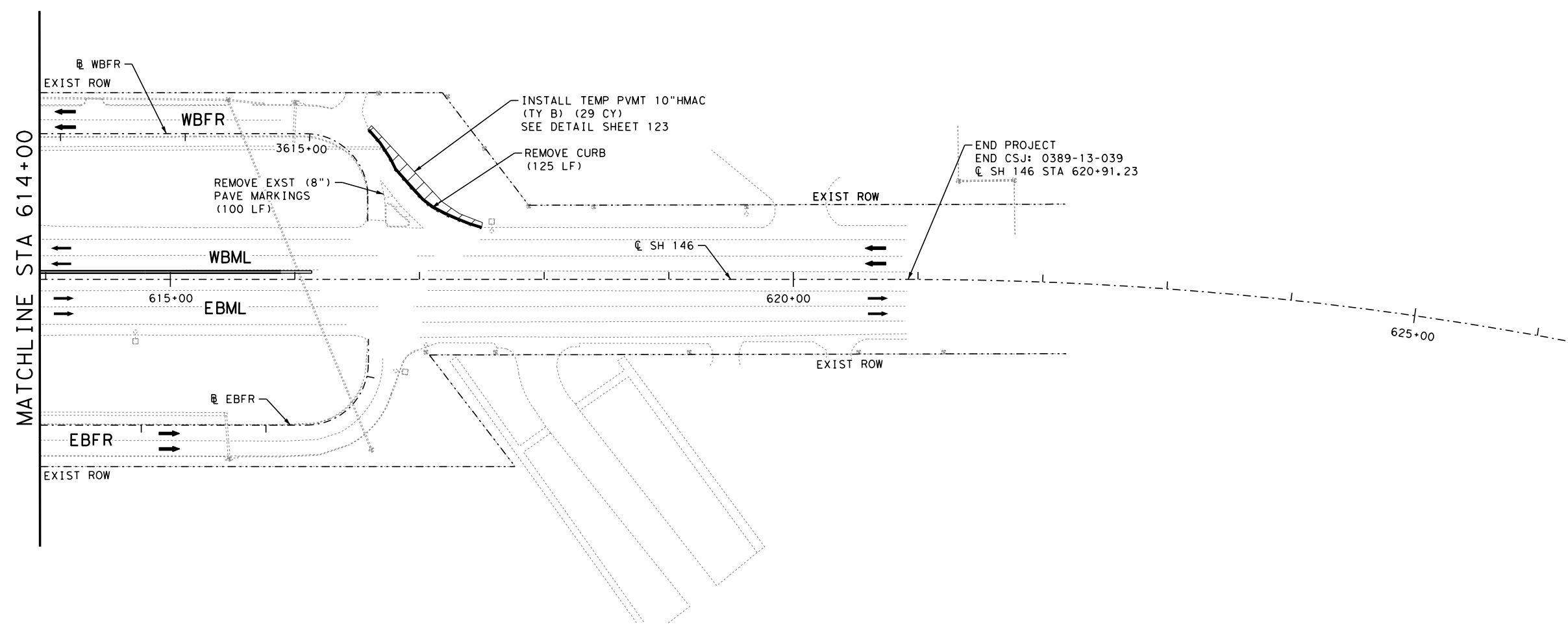
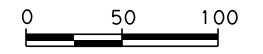
TCP LEGEND

- | | | | |
|--|---|--|--|
| | WRK ZN PAV MRK REMOV (W) 4" (BRK) | | PERMANENT CONSTRUCTION COMPLETED IN PREVIOUS PHASE |
| | WRK ZN PAV MRK REMOV (W) 4" (LNDR) | | TEMPORARY PAVEMENT |
| | WRK ZN PAV MRK REMOV (W) 4" (SLD) | | DIRECTION OF TRAFFIC |
| | WRK ZN PAV MRK REMOV (W) 8" (SLD) | | CONSTRUCTION SIGN |
| | WRK ZN PAV MRK REMOV (Y) 4" (BRK) | | CHANNELLIZING DEVICE |
| | WRK ZN PAV MRK REMOV (Y) 4" (SLD) | | TYPE III BARRICADE |
| | WRK ZN PAV MRK REMOV (Y) 8" (SLD) | | FLAGGER |
| | PORTABLE CHANGEABLE MESSAGE SIGN (PCMS) | | PORT CTB (SGL SLOPE) (TY 1) |
| | CONSTRUCTION AREA THIS PHASE | | CURB REMOVAL |
| | CONSTRUCTION EXIT | | |

1/6/2022 10:40:31 AM
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- NOTES:
1. REFER TO DETOUR LAYOUT SHEET FOR DETOURS.
 2. ALL PCTB SHALL HAVE REFLECTORS MOUNTED ON THE TOP AND ROAD SIDE NEAR THE MIDSECTION OF EACH PCTB SECTION ALONG THE FRONTAGE ROADS (SEE STANDARD DETAIL SHEET BC(7)-14 FOR MORE INFORMATION).
 3. ALL EXISTING DRAINAGE INLETS MUST REMAIN FREE OF ANY OBSTRUCTIONS AND SHALL REMAIN OPERATIONAL DURING THE CONSTRUCTION.
 4. ALL THE TCP AND SW3P ITEMS INSTALLED IN PREVIOUS PHASES SHALL REMAIN IN PLACE UNLESS OTHERWISE SHOWN ON THE PLANS OR AS DIRECTED.
 5. REFER TO SHEET #28 FOR ADVANCE WARNING SIGN LAYOUT
 6. TEMPORARY PAVEMENTS SHOWN ON THE TCP PLANS ARE A SUBSIDIARY ITEM TO 'BARRICADES, SIGNS AND TRAFFIC HANDLING' (ITEM 502 6001) AND SHALL NOT BE PAID FOR SEPARATELY.



1/6/2022 10:40:34 AM
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TCP LEGEND

- | | | | |
|----------|---|--|--|
| A | WRK ZN PAV MRK REMOV (W) 4" (BRK) | | PERMANENT CONSTRUCTION COMPLETED IN PREVIOUS PHASE |
| B | WRK ZN PAV MRK REMOV (W) 4" (LNDP) | | TEMPORARY PAVEMENT |
| C | WRK ZN PAV MRK REMOV (W) 4" (SLD) | | DIRECTION OF TRAFFIC |
| D | WRK ZN PAV MRK REMOV (W) 8" (SLD) | | CONSTRUCTION SIGN |
| E | WRK ZN PAV MRK REMOV (Y) 4" (BRK) | | CHANNELLIZING DEVICE |
| F | WRK ZN PAV MRK REMOV (Y) 4" (SLD) | | TYPE III BARRICADE |
| G | WRK ZN PAV MRK REMOV (Y) 8" (SLD) | | FLAGGER |
| | PORTABLE CHANGEABLE MESSAGE SIGN (PCMS) | | PORT CTB (SGL SLOPE) (TY 1) |
| | CONSTRUCTION AREA THIS PHASE | | CURB REMOVAL |
| | CONSTRUCTION EXIT | | |

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95323
LICENSED PROFESSIONAL ENGINEER

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1/6/2022

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Firm Registration No. F-382

Texas Department of Transportation

SH 146

**TRAFFIC CONTROL PLAN
PHASE 2 STAGE 1**

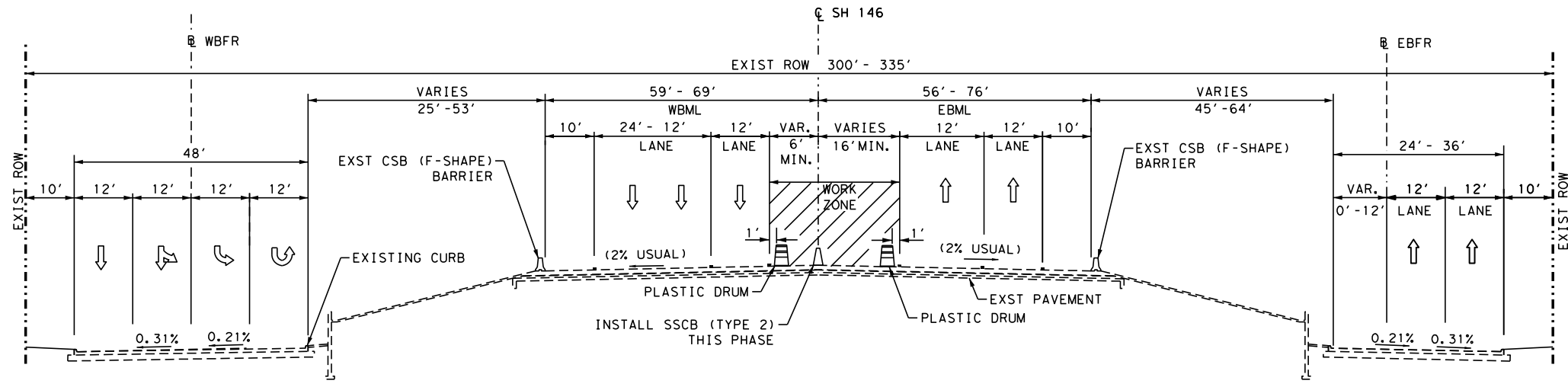
STA 614+00 TO END

SHEET 7 OF 7

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			49
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

TCP LEGEND

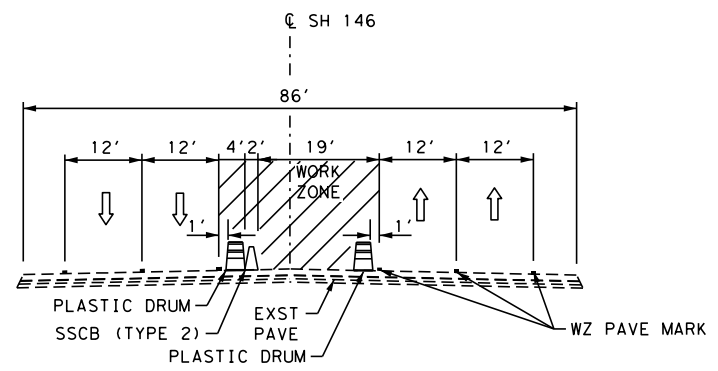
- A WRK ZN PAV MRK REMOV (W) 4" (BRK)
- B WRK ZN PAV MRK REMOV (W) 4" (SLD)
- C WRK ZN PAV MRK REMOV (Y) 4" (SLD)
- PERMANENT CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTION COMPLETED IN PREVIOUS PHASE
- EXISTING TRAFFIC
- PROPOSED TRAFFIC
- PORTABLE CTB (TYPE 1)
- PLASTIC DRUM
- TRAFFIC CONE



WORK THIS PHASE

* INSTALL CONCRETE SAFETY BARRIERS

PHASE 2 STAGE 2 TCP TYPICAL SECTION
FROM STA 545+00.00 TO STA 555+50.00



WORK THIS PHASE

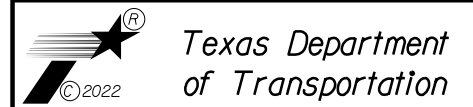
* INSTALL CONCRETE SAFETY BARRIERS

PHASE 2 STAGE 2 TCP TYPICAL SECTION
FROM STA 608+50.00 TO STA 616+13.51

REV. NO.	DATE	BY	REVISION



CivilTech Engineering, Inc.
11821 Telge Road
Cypress, Texas 77429
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Firm Registration No. F-382



SH 146

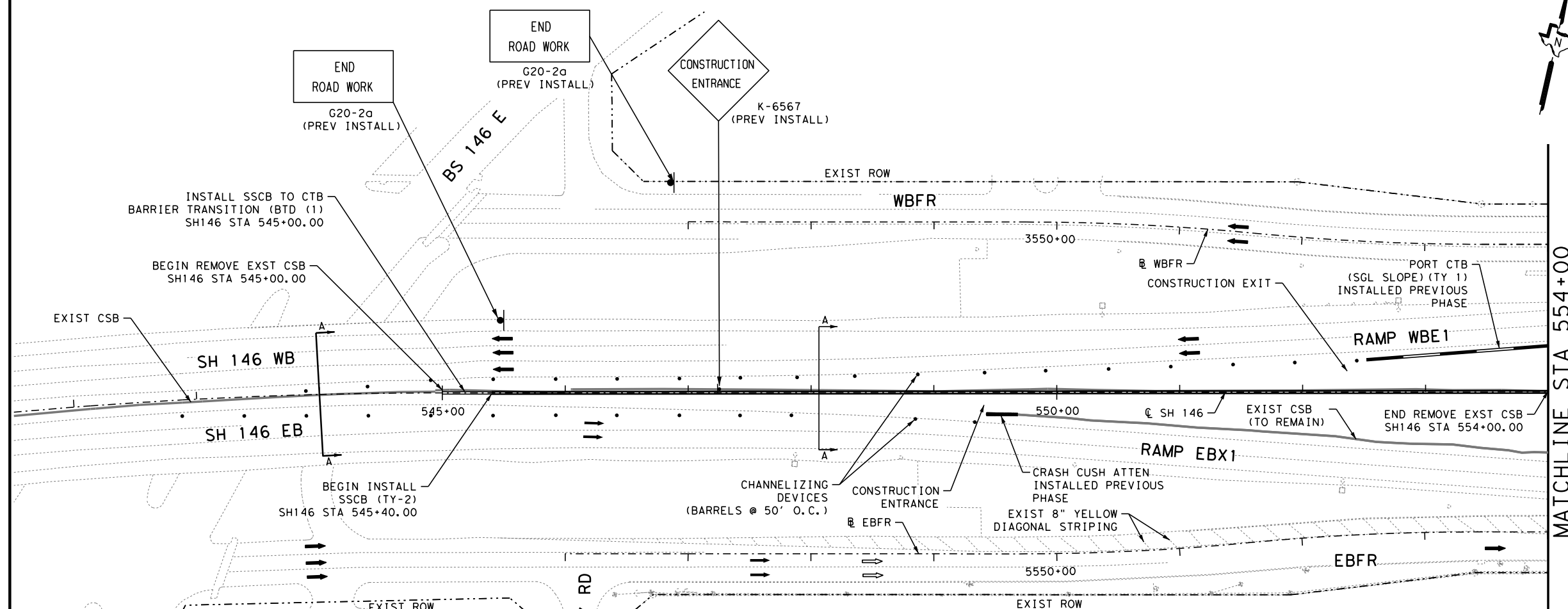
TRAFFIC CONTROL TYPICAL SECTIONS

PHASE 2 STAGE 2

N. T. S.			SHEET 1 OF 1
FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.	
6		50	
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

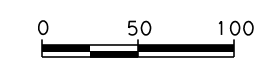
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1/6/2022 10:40:40 AM
 c:\pwworking\dwg\11\techeng.com\dms0621\SH146_TCP_Ph2_ST2-01.dgn



MATCHLINE STA 554+00

- NOTES:
1. REFER TO DETOUR LAYOUT SHEET FOR DETOURS.
 2. ALL PCTB SHALL HAVE REFLECTORS MOUNTED ON THE TOP AND ROAD SIDE NEAR THE MIDSECTION OF EACH PCTB SECTION ALONG THE FRONTAGE ROADS (SEE STANDARD DETAIL SHEET BC(7)-14 FOR MORE INFORMATION).
 3. ALL EXISTING DRAINAGE INLETS MUST REMAIN FREE OF ANY OBSTRUCTIONS AND SHALL REMAIN OPERATIONAL DURING THE CONSTRUCTION.
 4. ALL THE TCP AND SW3P ITEMS INSTALLED IN PREVIOUS PHASES SHALL REMAIN IN PLACE UNLESS OTHERWISE SHOWN ON THE PLANS OR AS DIRECTED.
 5. REFER TO SHEET #27 FOR ADVANCE WARNING SIGN LAYOUT



REV. NO.	DATE	BY	REVISION

PRAKASH SHRESTHA
95323
LICENSED PROFESSIONAL ENGINEER

Prakash Shrestha, P.E.
1/6/2022

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 Cypress, Texas 77429
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Texas Department of Transportation

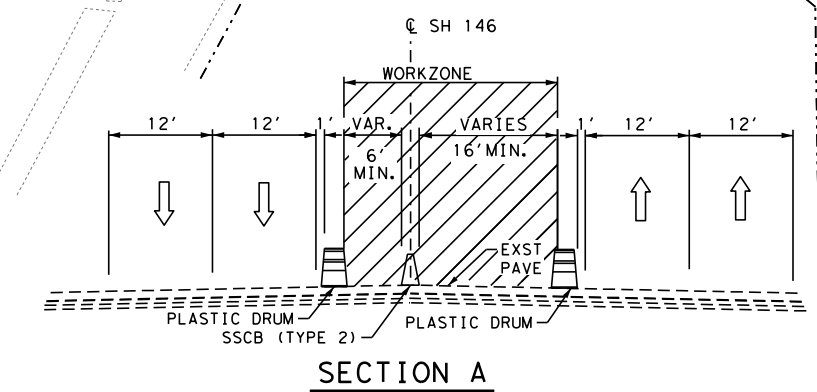
SH 146

**TRAFFIC CONTROL PLAN
 PHASE 2 STAGE 2**

BEGIN TO STA 554+00

SHEET 1 OF 4

FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.		SHEET NO. 51
STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146

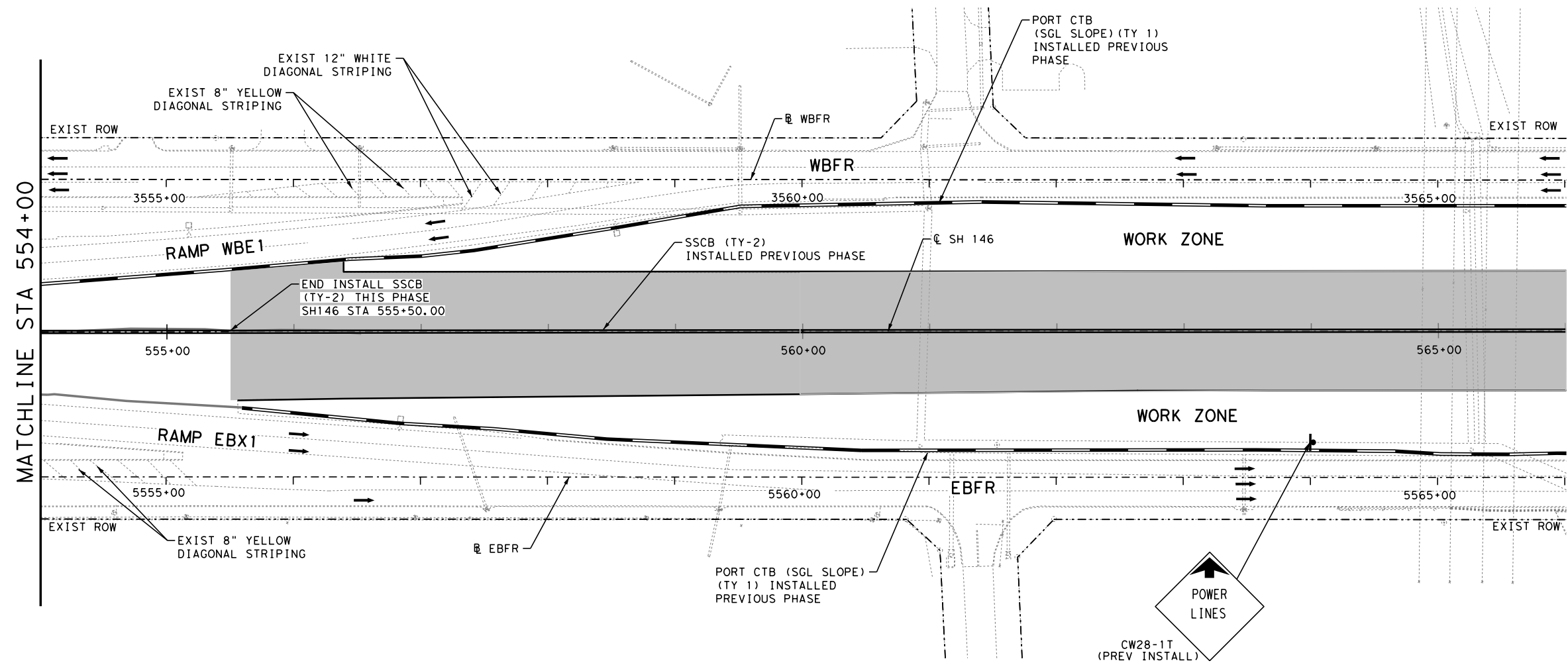
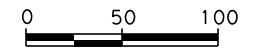


TCP LEGEND

- | | | | |
|--|---|--|--|
| | WRK ZN PAV MRK REMOV (W) 4" (BRK) | | PERMANENT CONSTRUCTION COMPLETED IN PREVIOUS PHASE |
| | WRK ZN PAV MRK REMOV (W) 4" (LNDR) | | TEMPORARY PAVEMENT |
| | WRK ZN PAV MRK REMOV (W) 4" (SLD) | | DIRECTION OF TRAFFIC |
| | WRK ZN PAV MRK REMOV (W) 8" (SLD) | | CONSTRUCTION SIGN |
| | WRK ZN PAV MRK REMOV (Y) 4" (BRK) | | CHANNELLIZING DEVICE |
| | WRK ZN PAV MRK REMOV (Y) 4" (SLD) | | TYPE III BARRICADE |
| | WRK ZN PAV MRK REMOV (Y) 8" (SLD) | | FLAGGER |
| | PORTABLE CHANGEABLE MESSAGE SIGN (PCMS) | | PORT CTB (SGL SLOPE) (TY 1) |
| | CONSTRUCTION AREA THIS PHASE | | CURB REMOVAL |
| | CONSTRUCTION EXIT | | |



- NOTES:
1. REFER TO DETOUR LAYOUT SHEET FOR DETOURS.
 2. ALL PCTB SHALL HAVE REFLECTORS MOUNTED ON THE TOP AND ROAD SIDE NEAR THE MIDSECTION OF EACH PCTB SECTION ALONG THE FRONTAGE ROADS (SEE STANDARD DETAIL SHEET BC(7)-14 FOR MORE INFORMATION).
 3. ALL EXISTING DRAINAGE INLETS MUST REMAIN FREE OF ANY OBSTRUCTIONS AND SHALL REMAIN OPERATIONAL DURING THE CONSTRUCTION.
 4. ALL THE TCP AND SW3P ITEMS INSTALLED IN PREVIOUS PHASES SHALL REMAIN IN PLACE UNLESS OTHERWISE SHOWN ON THE PLANS OR AS DIRECTED.
 5. REFER TO SHEET #27 FOR ADVANCE WARNING SIGN LAYOUT



MATCHLINE STA 554+00

REV. NO.	DATE	BY	REVISION

PRAKASH SHRESTHA
95323
LICENSED PROFESSIONAL ENGINEER

Prakash Shrestha, P.E.
1/6/2022

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Cypress, Texas 77429
PH: (281) 304-0200 - FX: (281) 304-0210
Firm Registration No. F-382



SH 146

**TRAFFIC CONTROL PLAN
PHASE 2 STAGE 2**

STA 554+00 TO STA 555+50

SHEET 2 OF 4

FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.		SHEET NO. 52
STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146

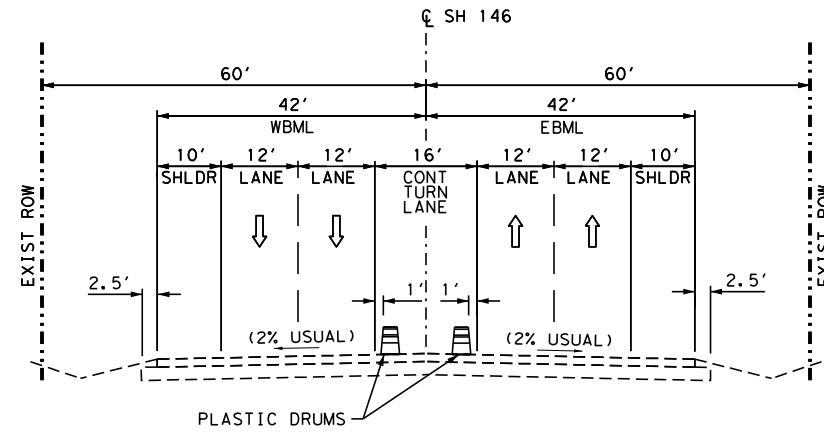
TCP LEGEND

- | | | | |
|--|---|--|--|
| | WRK ZN PAV MRK REMOV (W) 4" (BRK) | | PERMANENT CONSTRUCTION COMPLETED IN PREVIOUS PHASE |
| | WRK ZN PAV MRK REMOV (W) 4" (LNDP) | | TEMPORARY PAVEMENT |
| | WRK ZN PAV MRK REMOV (W) 4" (SLD) | | DIRECTION OF TRAFFIC |
| | WRK ZN PAV MRK REMOV (W) 8" (SLD) | | CONSTRUCTION SIGN |
| | WRK ZN PAV MRK REMOV (Y) 4" (BRK) | | CHANNELLIZING DEVICE |
| | WRK ZN PAV MRK REMOV (Y) 4" (SLD) | | TYPE III BARRICADE |
| | WRK ZN PAV MRK REMOV (Y) 8" (SLD) | | FLAGGER |
| | PORTABLE CHANGEABLE MESSAGE SIGN (PCMS) | | PORT CTB (SGL SLOPE) (TY 1) |
| | CONSTRUCTION AREA THIS PHASE | | CURB REMOVAL |
| | CONSTRUCTION EXIT | | |

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TCP LEGEND

- A WRK ZN PAV MRK REMOV (W) 4" (BRK)
- B WRK ZN PAV MRK REMOV (W) 4" (SLD)
- C WRK ZN PAV MRK REMOV (Y) 4" (SLD)
- PERMANENT CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTION COMPLETED IN PREVIOUS PHASE
- EXISTING TRAFFIC
- PROPOSED TRAFFIC
- PORTABLE CTB (TYPE 1)
- PLASTIC DRUM
- TRAFFIC CONE

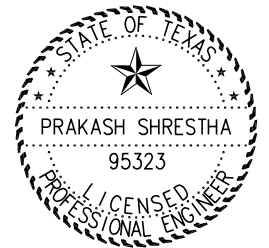


WORK THIS PHASE

- * ELIMINATE EXST PVMT MARKINGS & INSTALL NEW PVMT MARKINGS
- * INSTALL NEW SIGNS

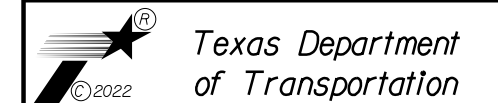
PHASE 2 STAGE 3 TCP TYPICAL SECTION
FROM STA 619+25.00 TO STA 620+91.23

REV. NO.	DATE	BY	REVISION



Prakash Shrestha, P.E.
1/6/2022

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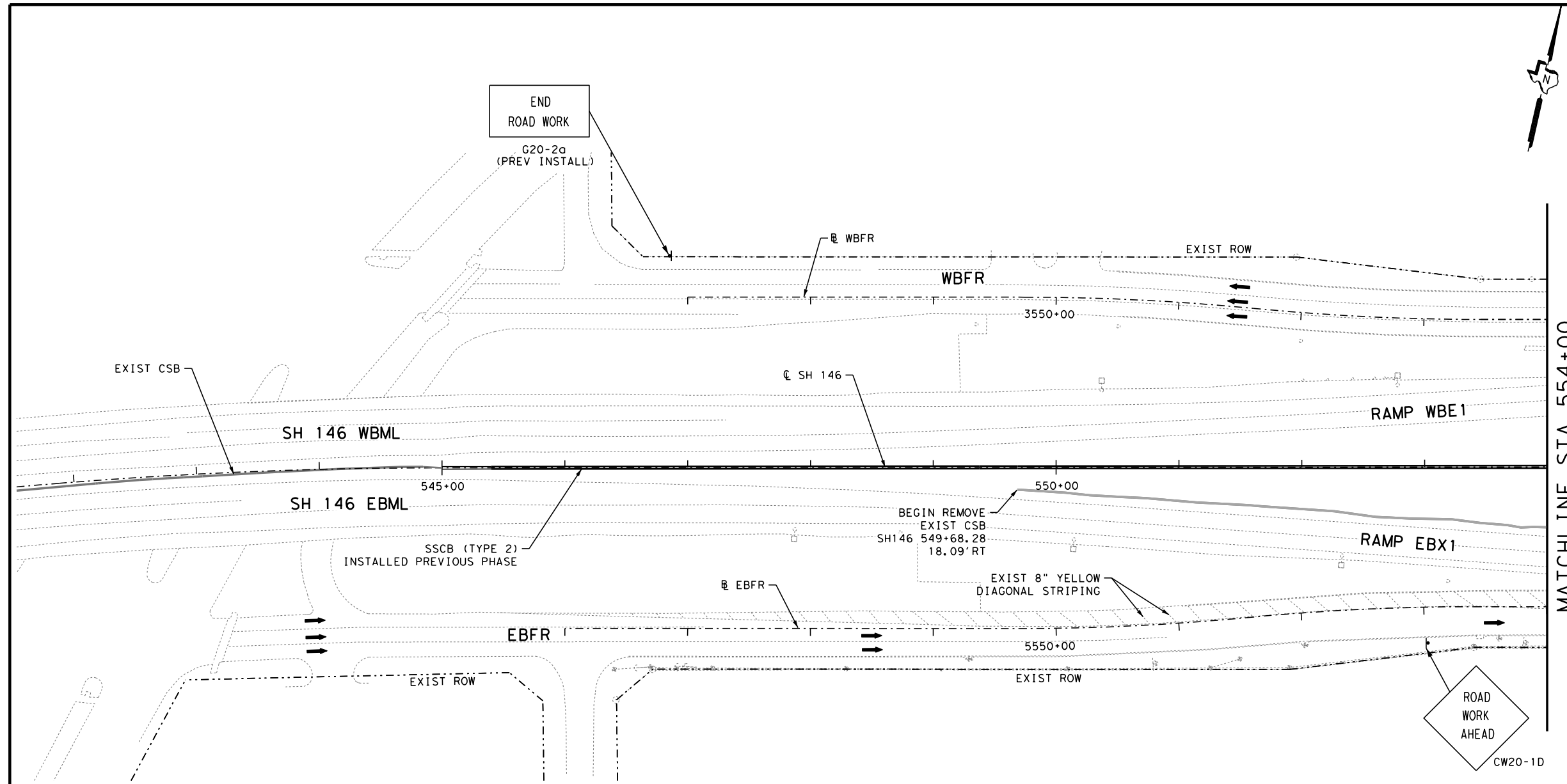


SH 146

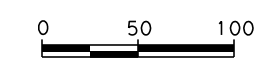
TRAFFIC CONTROL
TYPICAL SECTIONS

PHASE 2 STAGE 3

N. T. S.			SHEET 1 OF 1
FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.	
6		55	
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

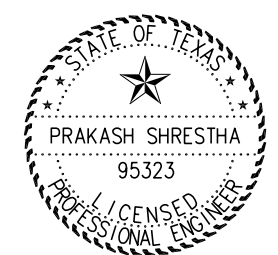


- NOTES:
1. REFER TO DETOUR LAYOUT SHEET FOR DETOURS.
 2. ALL PCTB SHALL HAVE REFLECTORS MOUNTED ON THE TOP AND ROAD SIDE NEAR THE MIDSECTION OF EACH PCTB SECTION ALONG THE FRONTAGE ROADS (SEE STANDARD DETAIL SHEET BC(7)-14 FOR MORE INFORMATION).
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 5. REFER TO SHEET #27 FOR ADVANCE WARNING SIGN LAYOUT



MATCHLINE STA 554+00

REV NO.	DATE	BY	REVISION



Prakash Shrestha, P.E.
1/6/2022

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SH 146

TRAFFIC CONTROL PLAN
PHASE 2 STAGE 3

BEGIN TO STA 554+00

SHEET 1 OF 7

FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.		SHEET NO. 56
STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146

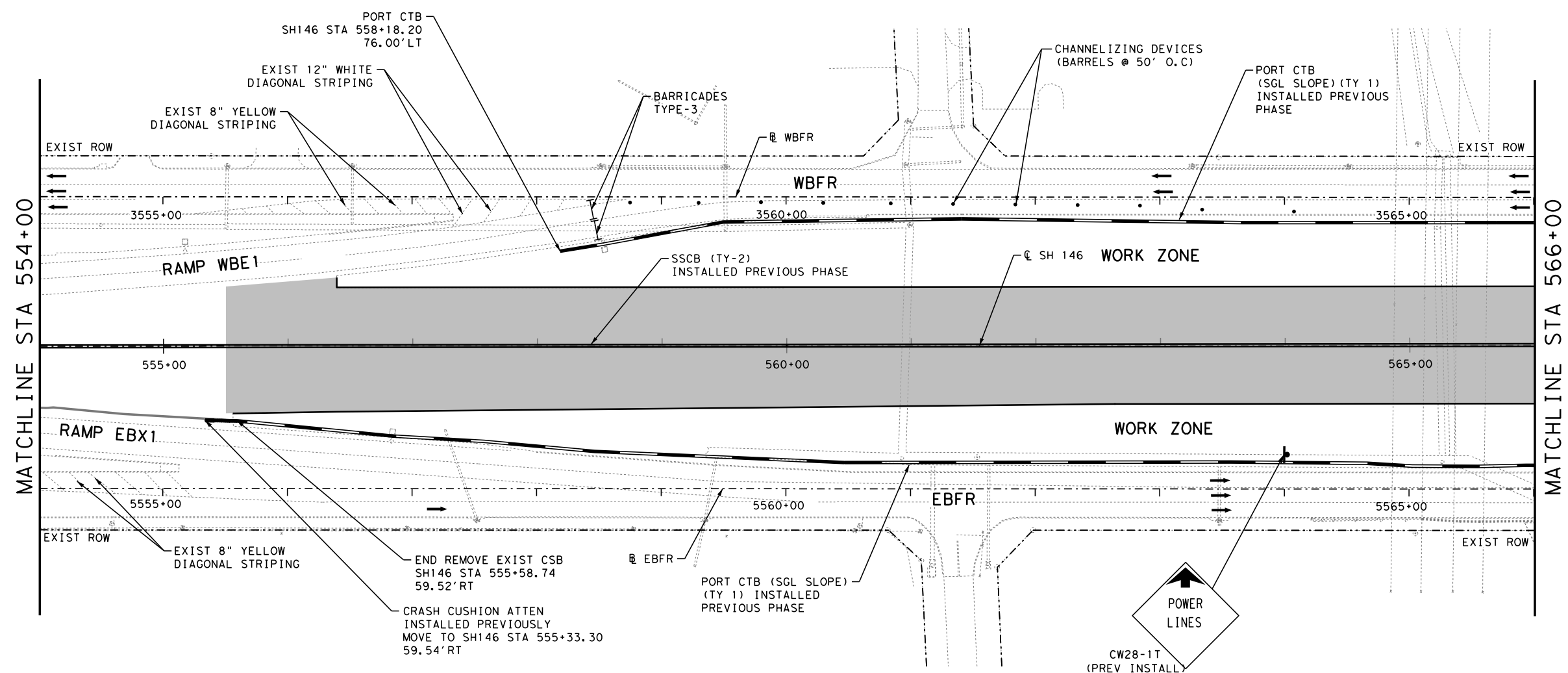
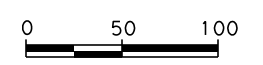
TCP LEGEND

- | | | | |
|--|---|--|--|
| | WRK ZN PAV MRK REMOV (W) 4" (BRK) | | PERMANENT CONSTRUCTION COMPLETED IN PREVIOUS PHASE |
| | WRK ZN PAV MRK REMOV (W) 4" (LNDR) | | TEMPORARY PAVEMENT |
| | WRK ZN PAV MRK REMOV (W) 4" (SLD) | | DIRECTION OF TRAFFIC |
| | WRK ZN PAV MRK REMOV (W) 8" (SLD) | | CONSTRUCTION SIGN |
| | WRK ZN PAV MRK REMOV (Y) 4" (BRK) | | CHANNELLIZING DEVICE |
| | WRK ZN PAV MRK REMOV (Y) 4" (SLD) | | TYPE III BARRICADE |
| | WRK ZN PAV MRK REMOV (Y) 8" (SLD) | | FLAGGER |
| | PORTABLE CHANGEABLE MESSAGE SIGN (PCMS) | | PORT CTB (SGL SLOPE) (TY 1) |
| | CONSTRUCTION AREA THIS PHASE | | CURB REMOVAL |
| | CONSTRUCTION EXIT | | |

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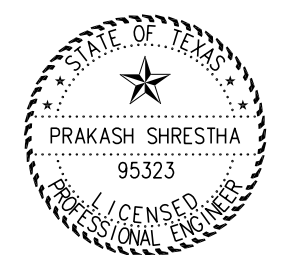
- NOTES:
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 - ALL PCTB SHALL HAVE REFLECTORS MOUNTED ON THE TOP AND ROAD SIDE NEAR THE MIDSECTION OF EACH PCTB SECTION ALONG THE FRONTAGE ROADS (SEE STANDARD DETAIL SHEET BC(7)-14 FOR MORE INFORMATION).
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 - REFER TO SHEET #27 FOR ADVANCE WARNING SIGN LAYOUT



MATCHLINE STA 554+00

MATCHLINE STA 566+00

REV NO.	DATE	BY	REVISION



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1/6/2022

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SH 146

TRAFFIC CONTROL PLAN
PHASE 2 STAGE 3

STA 554+00 TO STA 566+00

SHEET 2 OF 7

FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.		SHEET NO. 57
STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146

TCP LEGEND

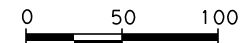
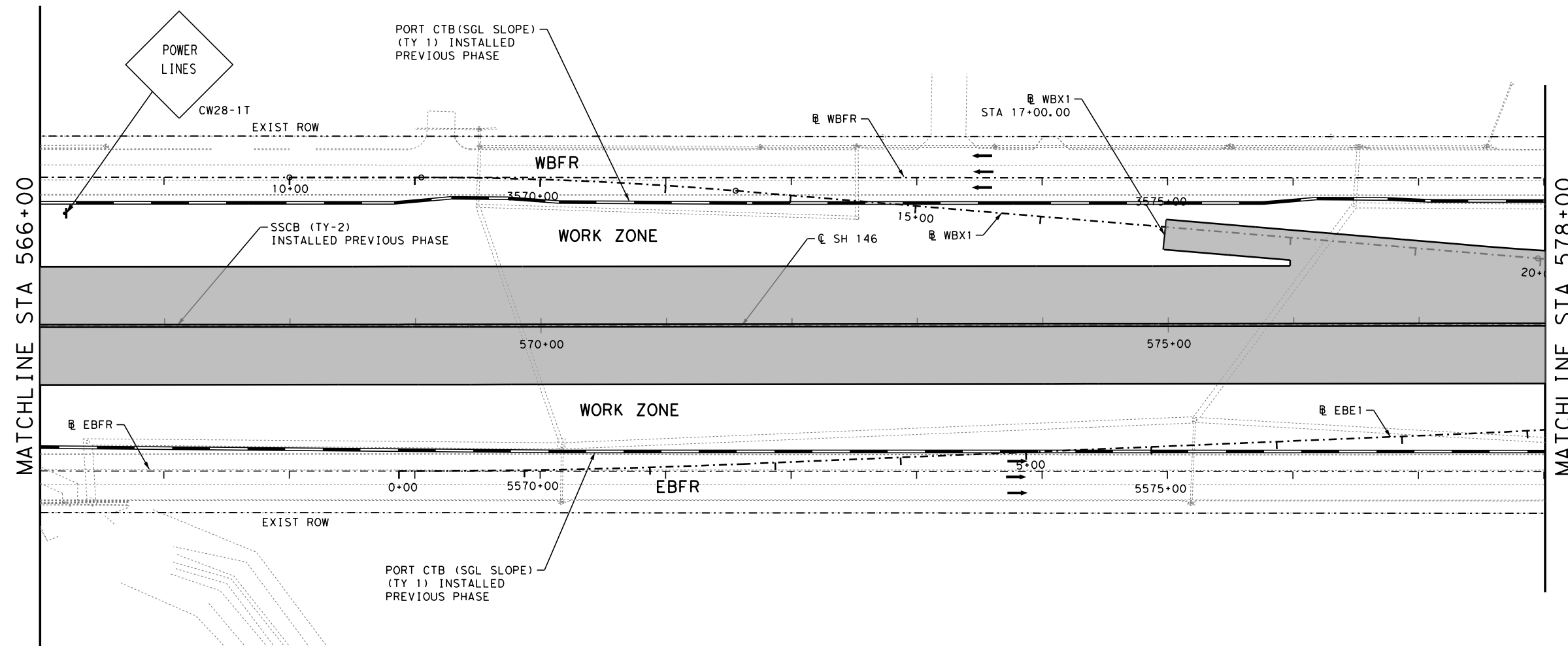
- | | | | |
|--|---|--|--|
| | WRK ZN PAV MRK REMOV (W) 4" (BRK) | | PERMANENT CONSTRUCTION COMPLETED IN PREVIOUS PHASE |
| | WRK ZN PAV MRK REMOV (W) 4" (LNDP) | | TEMPORARY PAVEMENT |
| | WRK ZN PAV MRK REMOV (W) 4" (SLD) | | DIRECTION OF TRAFFIC |
| | WRK ZN PAV MRK REMOV (W) 8" (SLD) | | CONSTRUCTION SIGN |
| | WRK ZN PAV MRK REMOV (Y) 4" (BRK) | | CHANNELIZING DEVICE |
| | WRK ZN PAV MRK REMOV (Y) 4" (SLD) | | TYPE III BARRICADE |
| | WRK ZN PAV MRK REMOV (Y) 8" (SLD) | | FLAGGER |
| | PORTABLE CHANGEABLE MESSAGE SIGN (PCMS) | | PORT CTB (SGL SLOPE) (TY 1) |
| | CONSTRUCTION AREA THIS PHASE | | CURB REMOVAL |
| | CONSTRUCTION EXIT | | |

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NOTES:

1. REFER TO DETOUR LAYOUT SHEET FOR DETOURS.
2. ALL PCTB SHALL HAVE REFLECTORS MOUNTED ON THE TOP AND ROAD SIDE NEAR THE MIDSECTION OF EACH PCTB SECTION ALONG THE FRONTAGE ROADS (SEE STANDARD DETAIL SHEET BC(7)-14 FOR MORE INFORMATION).
3. ALL EXISTING DRAINAGE INLETS MUST REMAIN FREE OF ANY OBSTRUCTIONS AND SHALL REMAIN OPERATIONAL DURING THE CONSTRUCTION.
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REV NO.	DATE	BY	REVISION

PRAKASH SHRESTHA
95323
LICENSED PROFESSIONAL ENGINEER

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1/6/2022

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SH 146

**TRAFFIC CONTROL PLAN
PHASE 2 STAGE 3**

STA 566+00 TO STA 578+00

SHEET 3 OF 7

FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.		SHEET NO. 58
STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146

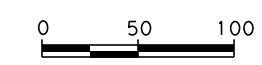
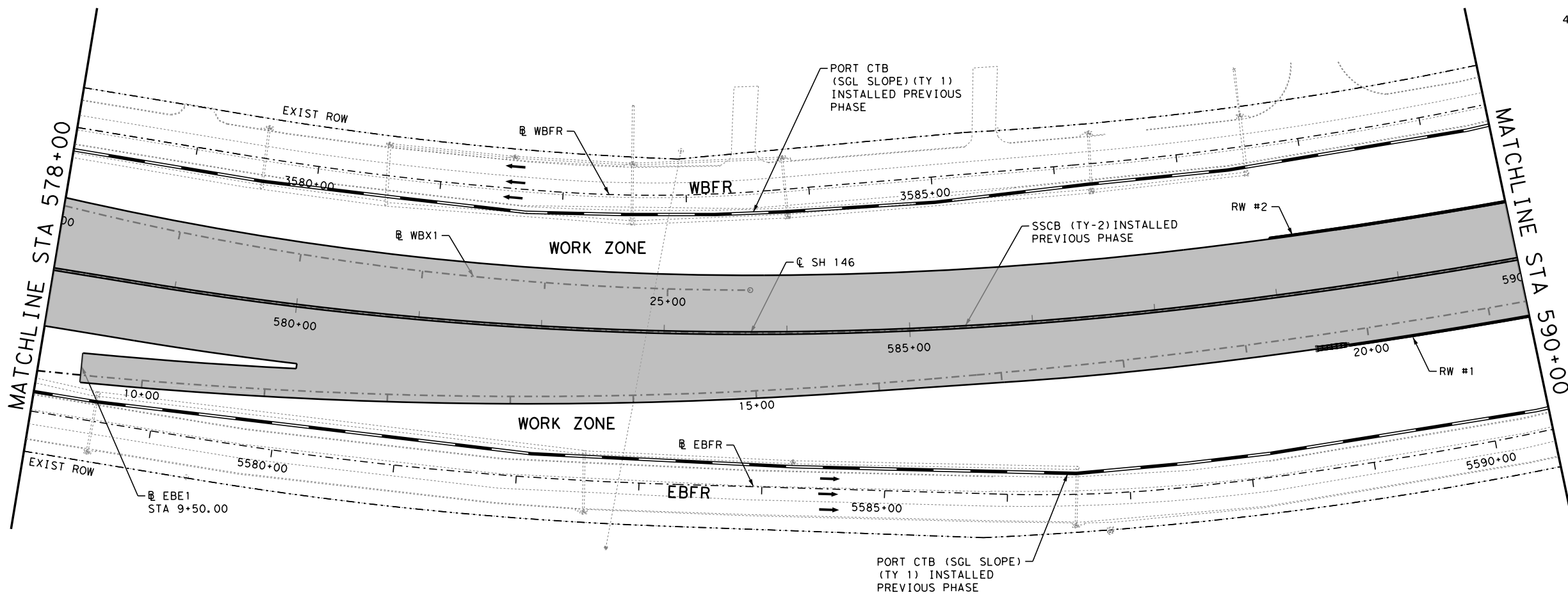
TCP LEGEND

- | | | | |
|--|---|--|--|
| | WRK ZN PAV MRK REMOV (W) 4" (BRK) | | PERMANENT CONSTRUCTION COMPLETED IN PREVIOUS PHASE |
| | WRK ZN PAV MRK REMOV (W) 4" (LNDR) | | TEMPORARY PAVEMENT |
| | WRK ZN PAV MRK REMOV (W) 4" (SLD) | | DIRECTION OF TRAFFIC |
| | WRK ZN PAV MRK REMOV (W) 8" (SLD) | | CONSTRUCTION SIGN |
| | WRK ZN PAV MRK REMOV (Y) 4" (BRK) | | CHANNELLIZING DEVICE |
| | WRK ZN PAV MRK REMOV (Y) 4" (SLD) | | TYPE III BARRICADE |
| | WRK ZN PAV MRK REMOV (Y) 8" (SLD) | | FLAGGER |
| | PORTABLE CHANGEABLE MESSAGE SIGN (PCMS) | | PORT CTB (SGL SLOPE) (TY 1) |
| | CONSTRUCTION AREA THIS PHASE | | CURB REMOVAL |
| | CONSTRUCTION EXIT | | |

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- NOTES:
1. REFER TO DETOUR LAYOUT SHEET FOR DETOURS.
 2. ALL PCTB SHALL HAVE REFLECTORS MOUNTED ON THE TOP AND ROAD SIDE NEAR THE MIDSECTION OF EACH PCTB SECTION ALONG THE FRONTAGE ROADS (SEE STANDARD DETAIL SHEET BC(7)-14 FOR MORE INFORMATION).
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REV NO.	DATE	BY	REVISION

PRAKASH SHRESTHA
95323
LICENSED PROFESSIONAL ENGINEER

Prakash Shrestha, P.E.
1/6/2022

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Firm Registration No. F-382



SH 146

**TRAFFIC CONTROL PLAN
PHASE 2 STAGE 3**

STA 578+00 TO STA 590+00

SHEET 4 OF 7

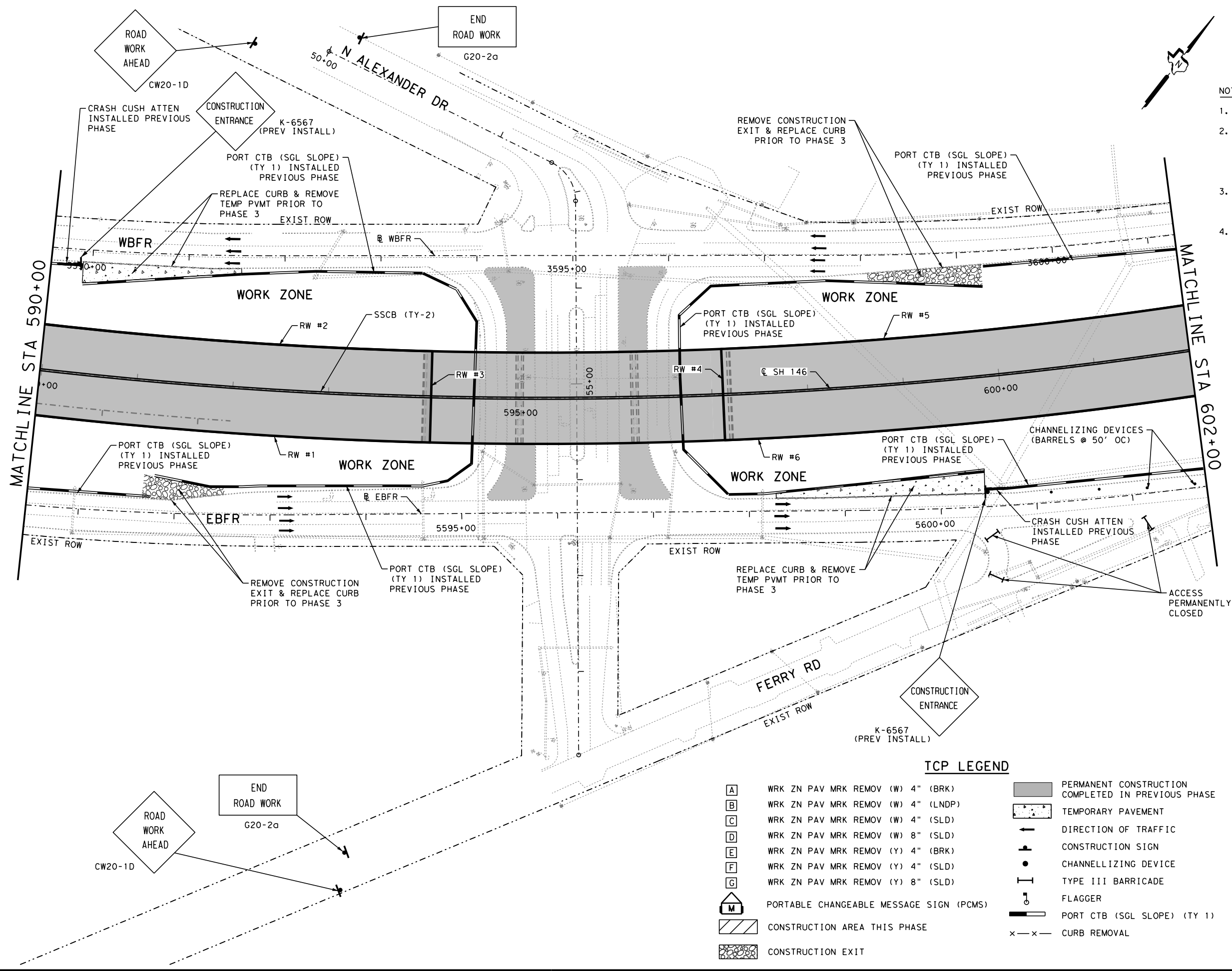
FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.		SHEET NO. 59
STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146

TCP LEGEND

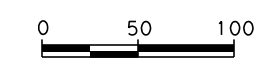
- | | | | |
|--|---|--|--|
| | WRK ZN PAV MRK REMOV (W) 4" (BRK) | | PERMANENT CONSTRUCTION COMPLETED IN PREVIOUS PHASE |
| | WRK ZN PAV MRK REMOV (W) 4" (LNDR) | | TEMPORARY PAVEMENT |
| | WRK ZN PAV MRK REMOV (W) 4" (SLD) | | DIRECTION OF TRAFFIC |
| | WRK ZN PAV MRK REMOV (W) 8" (SLD) | | CONSTRUCTION SIGN |
| | WRK ZN PAV MRK REMOV (Y) 4" (BRK) | | CHANNELLIZING DEVICE |
| | WRK ZN PAV MRK REMOV (Y) 4" (SLD) | | TYPE III BARRICADE |
| | WRK ZN PAV MRK REMOV (Y) 8" (SLD) | | FLAGGER |
| | PORTABLE CHANGEABLE MESSAGE SIGN (PCMS) | | PORT CTB (SGL SLOPE) (TY 1) |
| | CONSTRUCTION AREA THIS PHASE | | CURB REMOVAL |
| | CONSTRUCTION EXIT | | |

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- NOTES:
1. REFER TO DETOUR LAYOUT SHEET FOR DETOURS.
 2. ALL PCTB SHALL HAVE REFLECTORS MOUNTED ON THE TOP AND ROAD SIDE NEAR THE MIDSECTION OF EACH PCTB SECTION ALONG THE FRONTAGE ROADS (SEE STANDARD DETAIL SHEET BC(7)-14 FOR MORE INFORMATION).
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REV NO.	DATE	BY	REVISION

Prakash Shrestha, P.E.
 1/6/2022

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 Cypress, Texas 77429
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 Firm Registration No. F-382



SH 146

**TRAFFIC CONTROL PLAN
 PHASE 2 STAGE 3**

STA 590+00 TO STA 602+00

SHEET 5 OF 7

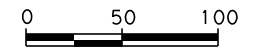
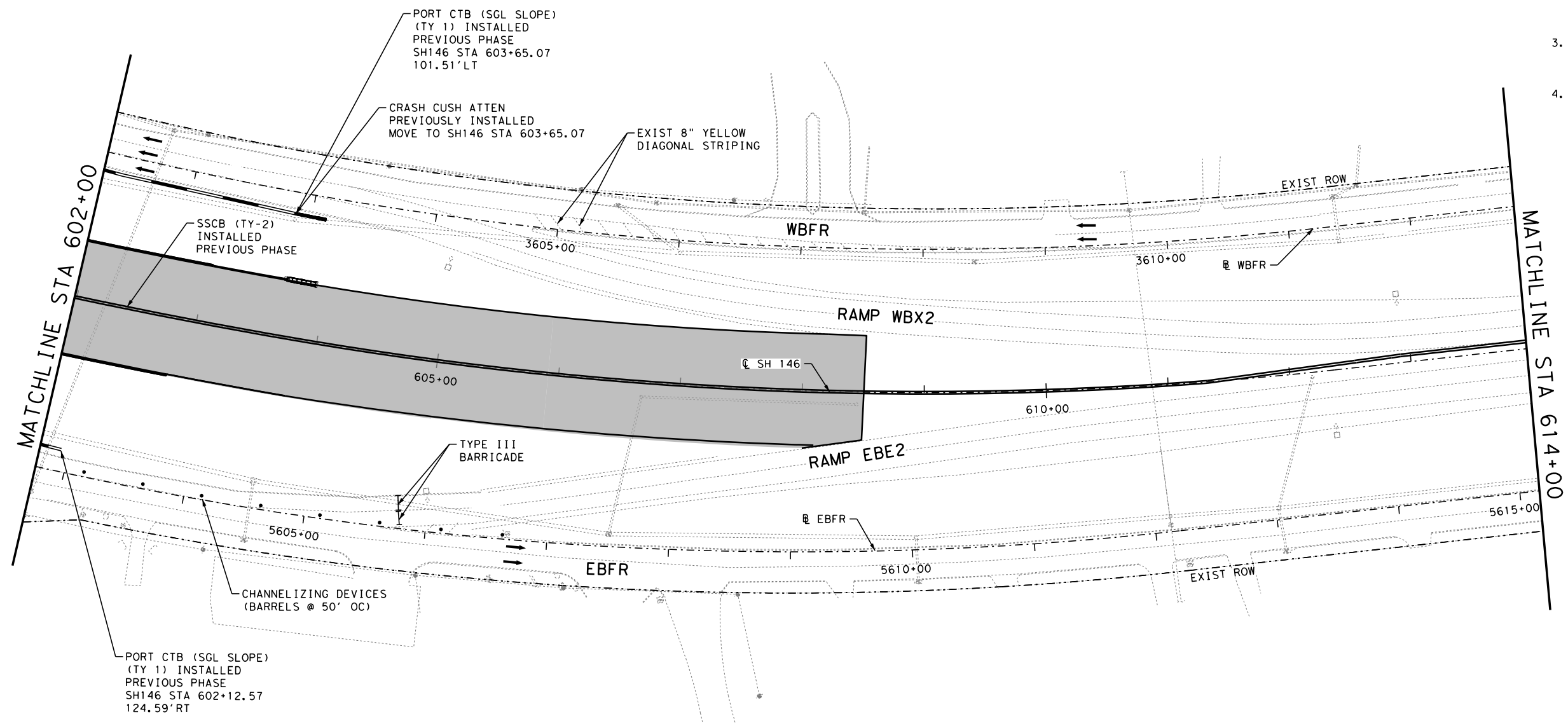
FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.	SHEET NO. 60
STATE TEXAS	DIST. HOU	COUNTY HARRIS
CONT. 0389	SECT. 13	JOB 039
		HIGHWAY NO. SH 146

TCP LEGEND

[A] WRK ZN PAV MRK REMOV (W) 4" (BRK)	[Grey Box] PERMANENT CONSTRUCTION COMPLETED IN PREVIOUS PHASE
[B] WRK ZN PAV MRK REMOV (W) 4" (LNDP)	[Dotted Box] TEMPORARY PAVEMENT
[C] WRK ZN PAV MRK REMOV (W) 4" (SLD)	[Arrow] DIRECTION OF TRAFFIC
[D] WRK ZN PAV MRK REMOV (W) 8" (SLD)	[Sign Symbol] CONSTRUCTION SIGN
[E] WRK ZN PAV MRK REMOV (Y) 4" (BRK)	[Dot Symbol] CHANNELLIZING DEVICE
[F] WRK ZN PAV MRK REMOV (Y) 4" (SLD)	[Barricade Symbol] TYPE III BARRICADE
[G] WRK ZN PAV MRK REMOV (Y) 8" (SLD)	[Flagger Symbol] FLAGGER
[M] PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)	[Port CTB Symbol] PORT CTB (SGL SLOPE) (TY 1)
[Hatched Box] CONSTRUCTION AREA THIS PHASE	[X-X Symbol] CURB REMOVAL
[Dotted Box] CONSTRUCTION EXIT	



- NOTES:
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1/6/2022

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 11821 Telge Road
 Cypress, Texas 77429
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 Firm Registration No. F-382



SH 146

**TRAFFIC CONTROL PLAN
 PHASE 2 STAGE 3**

STA 602+00 TO STA 614+00

SHEET 6 OF 7

FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.		SHEET NO. 61
STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146

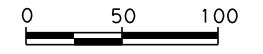
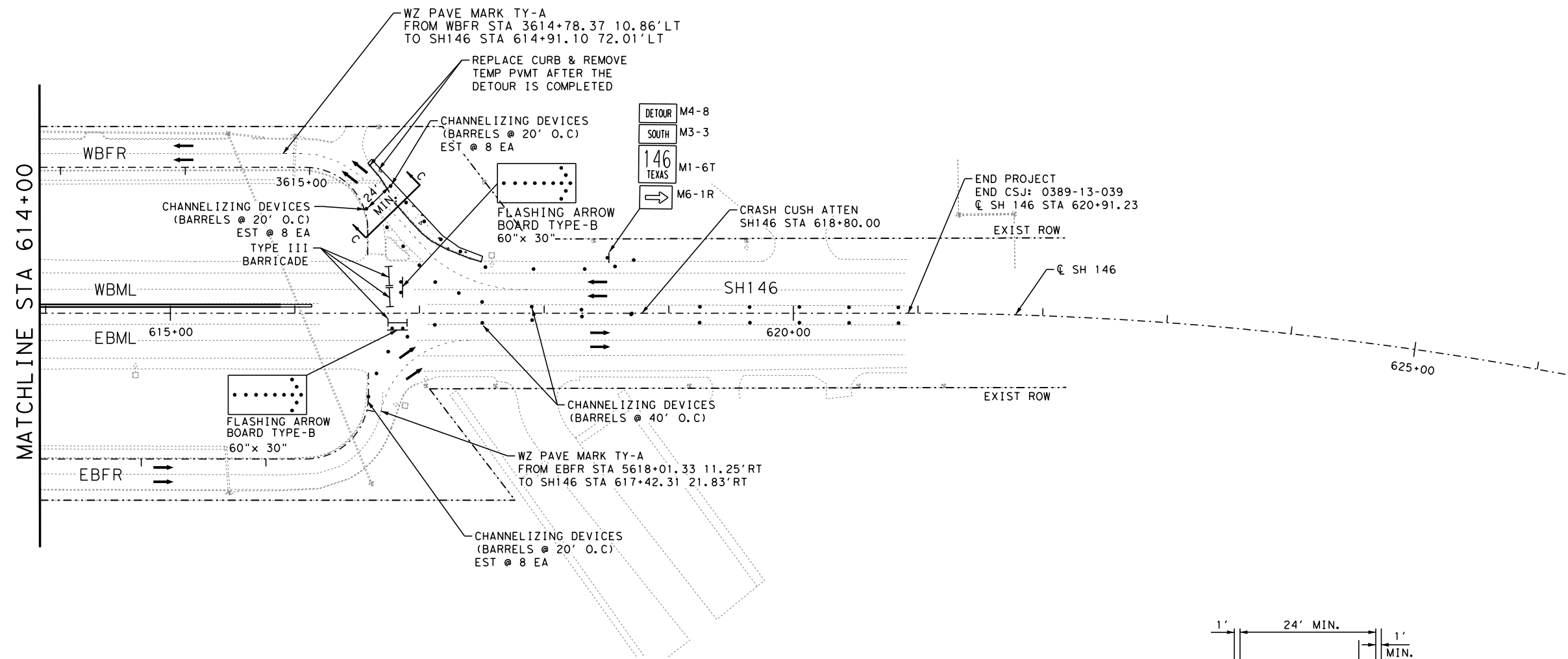
TCP LEGEND

- | | | | |
|--|---|--|--|
| | WRK ZN PAV MRK REMOV (W) 4" (BRK) | | PERMANENT CONSTRUCTION COMPLETED IN PREVIOUS PHASE |
| | WRK ZN PAV MRK REMOV (W) 4" (LNDP) | | TEMPORARY PAVEMENT |
| | WRK ZN PAV MRK REMOV (W) 4" (SLD) | | DIRECTION OF TRAFFIC |
| | WRK ZN PAV MRK REMOV (W) 8" (SLD) | | CONSTRUCTION SIGN |
| | WRK ZN PAV MRK REMOV (Y) 4" (BRK) | | CHANNELLIZING DEVICE |
| | WRK ZN PAV MRK REMOV (Y) 4" (SLD) | | TYPE III BARRICADE |
| | WRK ZN PAV MRK REMOV (Y) 8" (SLD) | | FLAGGER |
| | PORTABLE CHANGEABLE MESSAGE SIGN (PCMS) | | PORT CTB (SGL SLOPE) (TY 1) |
| | CONSTRUCTION AREA THIS PHASE | | CURB REMOVAL |
| | CONSTRUCTION EXIT | | |

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REV NO.	DATE	BY	REVISION

1/6/2022

CivilTech Engineering, Inc.
 11821 Telge Road
 Cypress, Texas 77429
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 Firm Registration No. F-382



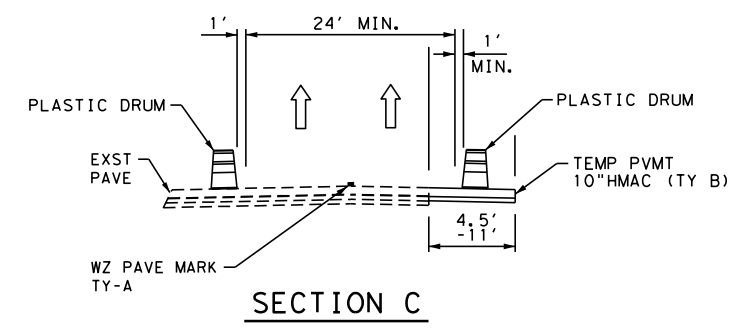
SH 146

TRAFFIC CONTROL PLAN
PHASE 2 STAGE 3

STA 614+00 TO END

SHEET 7 OF 7

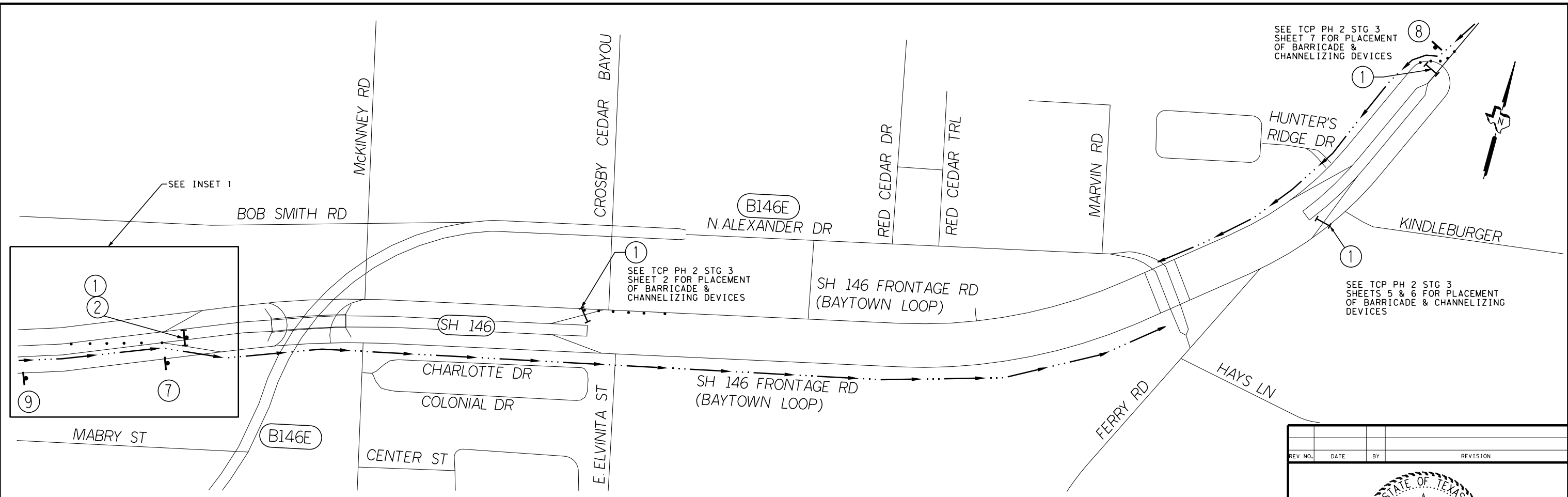
FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.		SHEET NO. 62
STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146



TCP LEGEND

	WRK ZN PAV MRK REMOV (W) 4" (BRK)		PERMANENT CONSTRUCTION COMPLETED IN PREVIOUS PHASE
	WRK ZN PAV MRK REMOV (W) 4" (LNDP)		TEMPORARY PAVEMENT
	WRK ZN PAV MRK REMOV (W) 4" (SLD)		DIRECTION OF TRAFFIC
	WRK ZN PAV MRK REMOV (W) 8" (SLD)		CONSTRUCTION SIGN
	WRK ZN PAV MRK REMOV (Y) 4" (BRK)		CHANNELLIZING DEVICE
	WRK ZN PAV MRK REMOV (Y) 4" (SLD)		TYPE III BARRICADE
	WRK ZN PAV MRK REMOV (Y) 8" (SLD)		FLAGGER
	PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)		PORT CTB (SGL SLOPE) (TY 1)
	CONSTRUCTION AREA THIS PHASE		CURB REMOVAL
	CONSTRUCTION EXIT		

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Cypress, Texas 77429
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Firm Registration No. F-382

Texas Department of Transportation

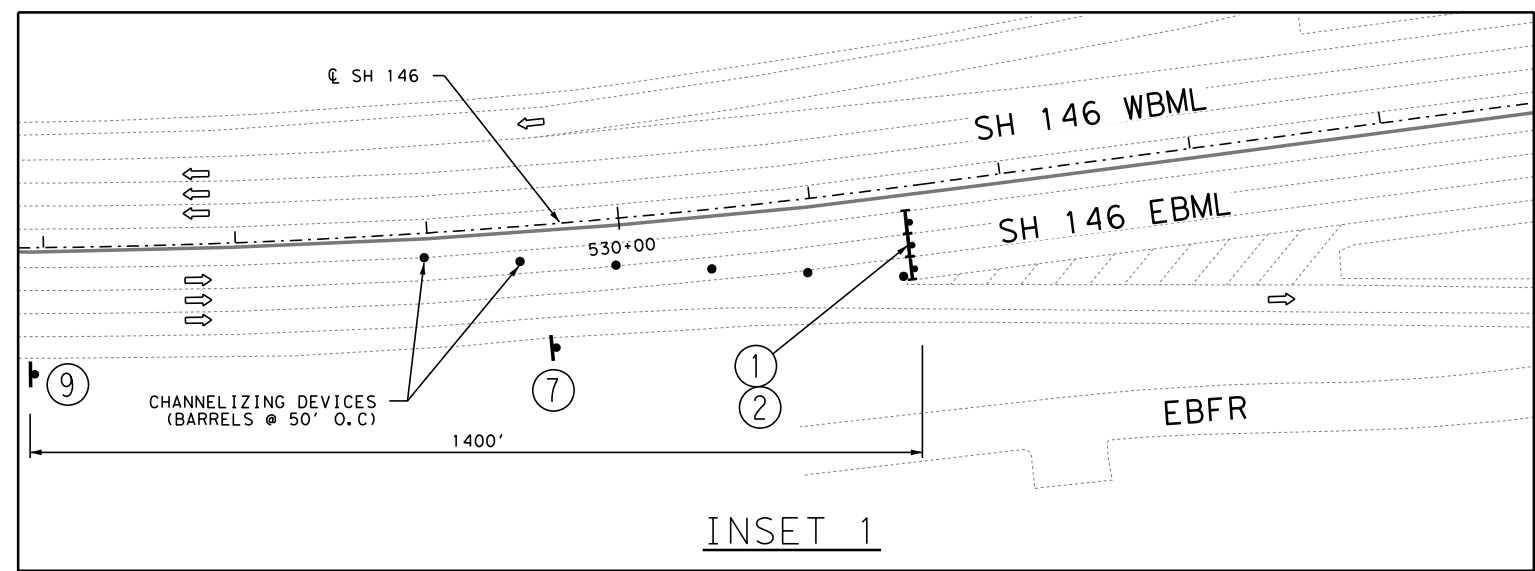
SH 146

TRAFFIC CONTROL PLAN
PHASE 2 STAGE 3

DETOUR PLAN

N. T. S. SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.	
6		63	
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146



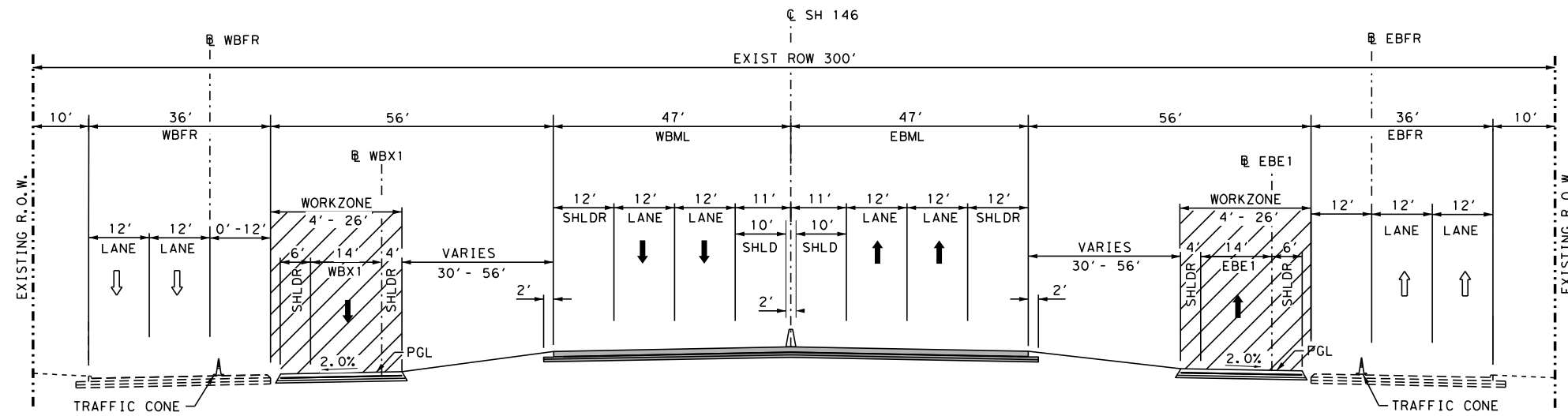
- LEGEND**
- PORTABLE CHANGEABLE MESSAGE SIGN
 - DETOUR ROUTE
 - CONSTRUCTION SIGN
 - CHANNELIZING DEVICE
 - TYPE III BARRICADE

- TYPE III BARRICADE
 ①
- ROAD CLOSED
 R11-2
 ②
- DETOUR
 M4-9AL
 ③
- DETOUR
 M4-9AR
 ④
- DETOUR AHEAD
 M4-9S
 ⑤
- DETOUR AHEAD
 CW20-2D
 ⑥
- NORTH
 146 TEXAS
 M3-1
 M1-6T
 ⑦
- SOUTH
 146 TEXAS
 M3-3
 M1-6T
 ⑧
- ROAD CLOSED AHEAD
 CW20-3D
 ⑨

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TCP LEGEND

- A WRK ZN PAV MRK REMOV (W) 4" (BRK)
- B WRK ZN PAV MRK REMOV (W) 4" (SLD)
- C WRK ZN PAV MRK REMOV (Y) 4" (SLD)
- PERMANENT CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTION COMPLETED IN PREVIOUS PHASE
- EXISTING TRAFFIC
- PROPOSED TRAFFIC
- PORTABLE CTB (TYPE 1)
- PLASTIC DRUM
- TRAFFIC CONE



WORK THIS PHASE

- * COMPLETE CONSTRUCTION OF PROPOSED RAMPS
- * ELIMINATE AND RESTRIPE RAMPS, FRONTAGE ROADS & INTERSECTION
- * COMPLETE TRAFFIC SIGNAL WORK
- * CONSTRUCT NOISE WALL

PHASE 3 STAGE 1 TCP TYPICAL SECTION
FROM STA 568+86.72 TO STA 574+36.38

REV. NO.	DATE	BY	REVISION

Prakash Shrestha, P.E.
1/6/2022

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Firm Registration No. F-382

Texas Department of Transportation

SH 146

TRAFFIC CONTROL TYPICAL SECTIONS

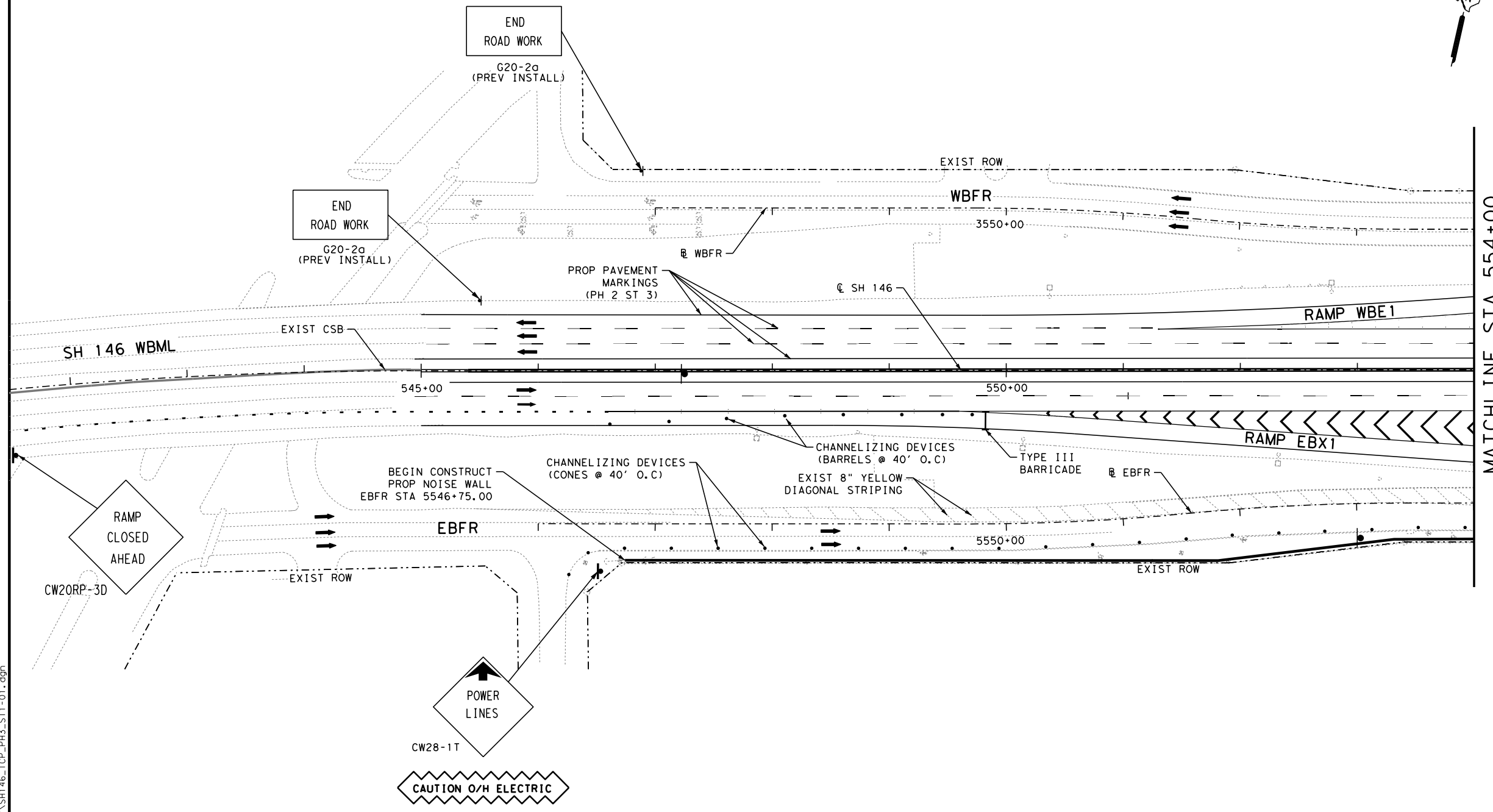
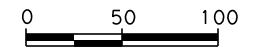
PHASE 3 STAGE 1

N. T. S.			SHEET 1 OF 1
FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.	
6		64	
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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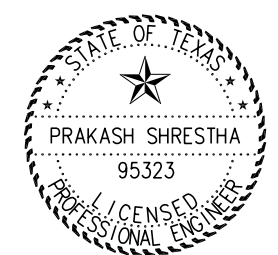


- NOTES:
1. REFER TO DETOUR LAYOUT SHEET FOR DETOURS.
 2. ALL PCTB SHALL HAVE REFLECTORS MOUNTED ON THE TOP AND ROAD SIDE NEAR THE MIDSECTION OF EACH PCTB SECTION ALONG THE FRONTAGE ROADS (SEE STANDARD DETAIL SHEET BC(7)-14 FOR MORE INFORMATION).
 3. ALL EXISTING DRAINAGE INLETS MUST REMAIN FREE OF ANY OBSTRUCTIONS AND SHALL REMAIN OPERATIONAL DURING THE CONSTRUCTION.
 4. ALL THE TCP AND SW3P ITEMS INSTALLED IN PREVIOUS PHASES SHALL REMAIN IN PLACE UNLESS OTHERWISE SHOWN ON THE PLANS OR AS DIRECTED.
 5. THE EXISTING ELECTRICAL POWER POLES AND OVERHEAD LINES ARE IN CONFLICT WITH THE PROPOSED CONSTRUCTION. THE CONTRACTOR MUST COORDINATE WITH CENTERPOINT ENERGY (THE OWNER OF THE ELECTRICAL LINE) FOR THE RE-LOCATION OF THE POWER POLES, AHEAD OF THE CONSTRUCTION OF THE NOISE WALL.
 6. REFER TO SHEET #27 FOR ADVANCE WARNING SIGN LAYOUT



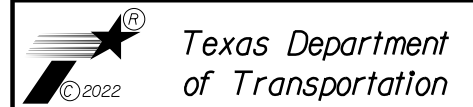
MATCHLINE STA 554+00

REV. NO.	DATE	BY	REVISION



Prakash Shrestha, P.E.
1/6/2022

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Cypress, Texas 77429
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Firm Registration No. F-382



SH 146

TRAFFIC CONTROL PLAN
PHASE 3 STAGE 1

BEGIN TO STA 554+00

SHEET 1 OF 7

FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.		SHEET NO. 65
STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146

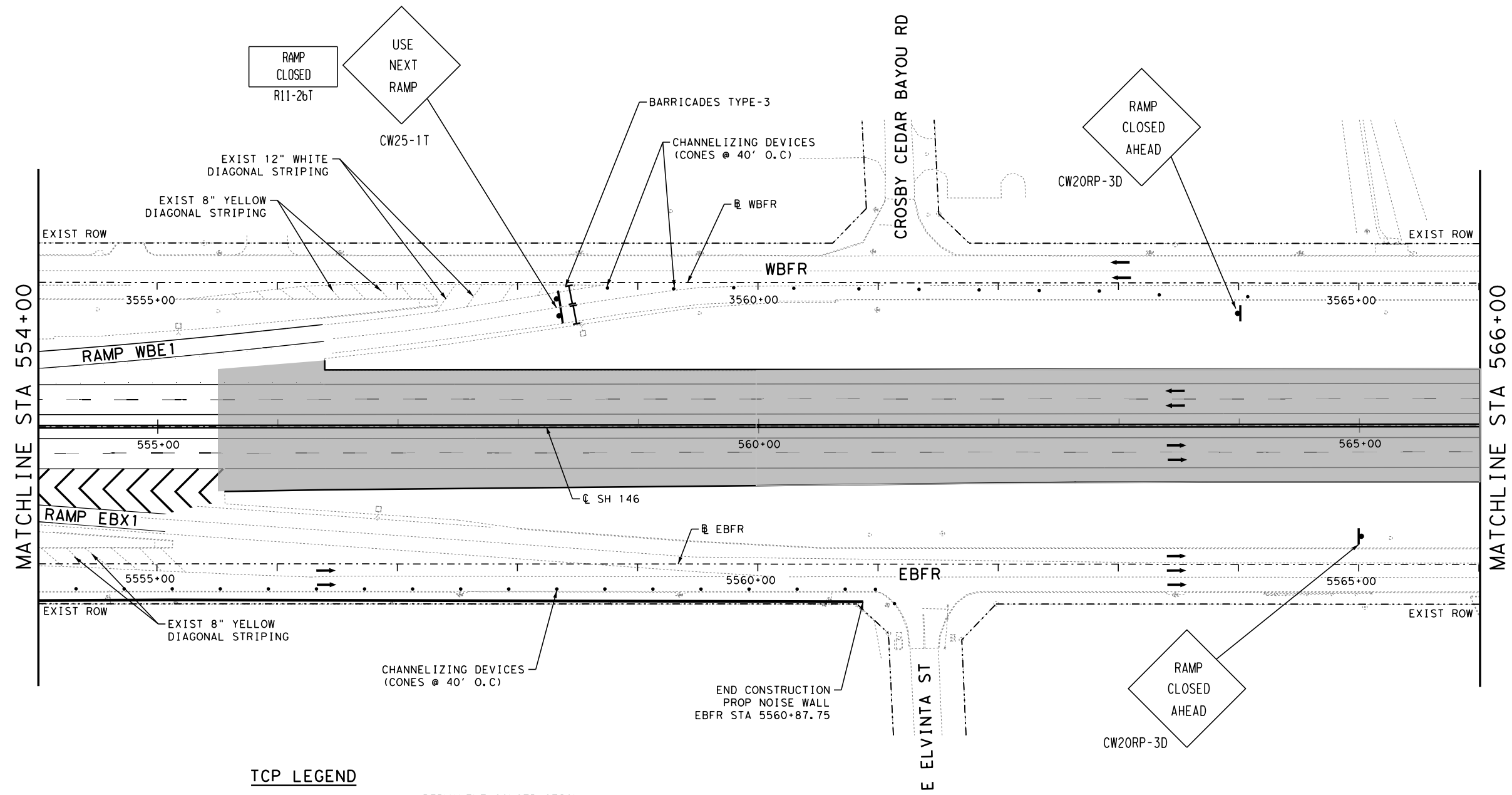
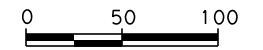
TCP LEGEND

- | | |
|---|--|
| WRK ZN PAV MRK REMOV (W) 4" (BRK) | PERMANENT CONSTRUCTION COMPLETED IN PREVIOUS PHASE |
| WRK ZN PAV MRK REMOV (W) 4" (LNDP) | TEMPORARY PAVEMENT |
| WRK ZN PAV MRK REMOV (W) 4" (SLD) | DIRECTION OF TRAFFIC |
| WRK ZN PAV MRK REMOV (W) 8" (SLD) | CONSTRUCTION SIGN |
| WRK ZN PAV MRK REMOV (Y) 4" (BRK) | CHANNELLIZING DEVICE |
| WRK ZN PAV MRK REMOV (Y) 4" (SLD) | TYPE III BARRICADE |
| WRK ZN PAV MRK REMOV (Y) 8" (SLD) | FLAGGER |
| PORTABLE CHANGEABLE MESSAGE SIGN (PCMS) | PORT CTB (SGL SLOPE) (TY 1) |
| CONSTRUCTION AREA THIS PHASE | CURB REMOVAL |
| CONSTRUCTION EXIT | |

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- NOTES:
1. REFER TO DETOUR LAYOUT SHEET FOR DETOURS.
 2. ALL PCTB SHALL HAVE REFLECTORS MOUNTED ON THE TOP AND ROAD SIDE NEAR THE MIDSECTION OF EACH PCTB SECTION ALONG THE FRONTAGE ROADS (SEE STANDARD DETAIL SHEET BC(7)-14 FOR MORE INFORMATION).
 3. ALL EXISTING DRAINAGE INLETS MUST REMAIN FREE OF ANY OBSTRUCTIONS AND SHALL REMAIN OPERATIONAL DURING THE CONSTRUCTION.
 4. ALL THE TCP AND SW3P ITEMS INSTALLED IN PREVIOUS PHASES SHALL REMAIN IN PLACE UNLESS OTHERWISE SHOWN ON THE PLANS OR AS DIRECTED.
 5. REFER TO SHEET #27 FOR ADVANCE WARNING SIGN LAYOUT



MATCHLINE STA 554+00

MATCHLINE STA 566+00

TCP LEGEND

- | | | | |
|--|---|--|--|
| | WRK ZN PAV MRK REMOV (W) 4" (BRK) | | PERMANENT CONSTRUCTION COMPLETED IN PREVIOUS PHASE |
| | WRK ZN PAV MRK REMOV (W) 4" (LNDP) | | TEMPORARY PAVEMENT |
| | WRK ZN PAV MRK REMOV (W) 4" (SLD) | | DIRECTION OF TRAFFIC |
| | WRK ZN PAV MRK REMOV (W) 8" (SLD) | | CONSTRUCTION SIGN |
| | WRK ZN PAV MRK REMOV (Y) 4" (BRK) | | CHANNELIZING DEVICE |
| | WRK ZN PAV MRK REMOV (Y) 4" (SLD) | | TYPE III BARRICADE |
| | WRK ZN PAV MRK REMOV (Y) 8" (SLD) | | FLAGGER |
| | PORTABLE CHANGEABLE MESSAGE SIGN (PCMS) | | PORT CTB (SGL SLOPE) (TY 1) |
| | CONSTRUCTION AREA THIS PHASE | | CURB REMOVAL |
| | CONSTRUCTION EXIT | | |

REV NO.	DATE	BY	REVISION

1/6/2022

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SH 146

**TRAFFIC CONTROL PLAN
 PHASE 3 STAGE 1**

STA 554+00 TO STA 566+00

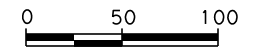
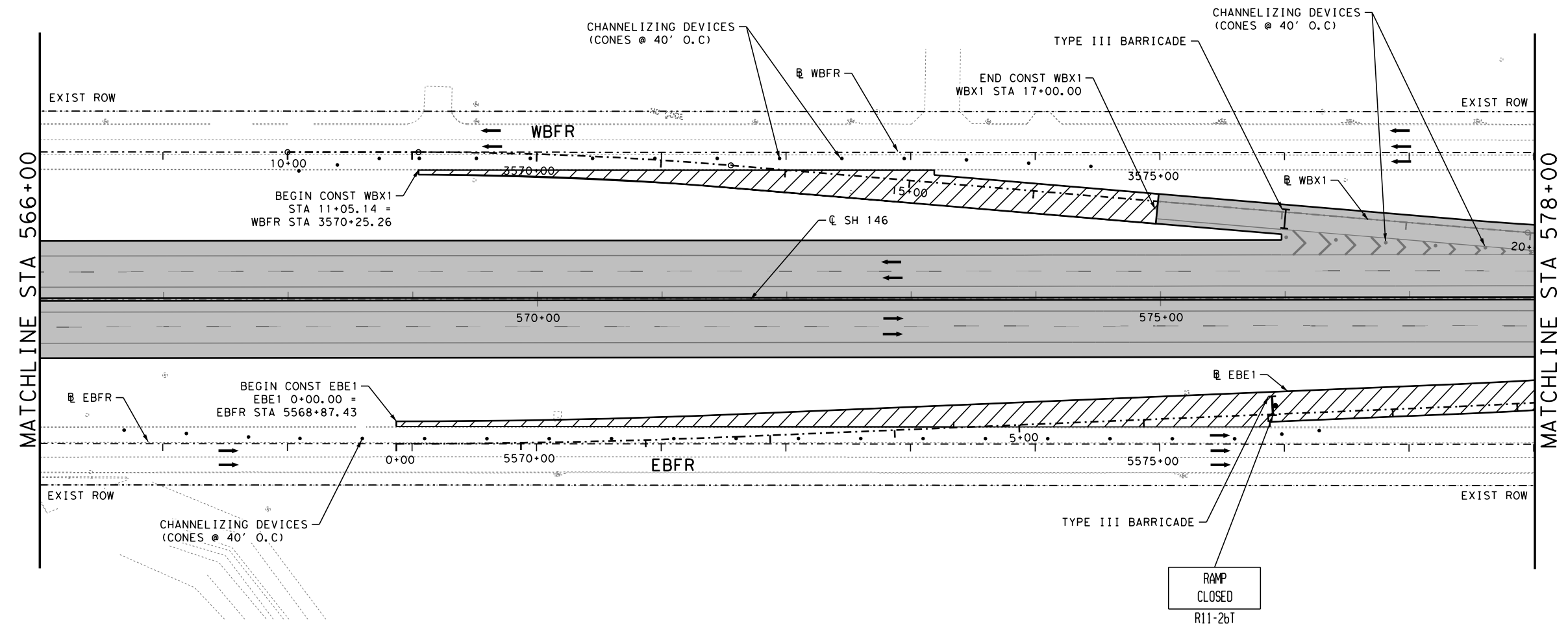
SHEET 2 OF 7

FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.		SHEET NO. 66
STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146

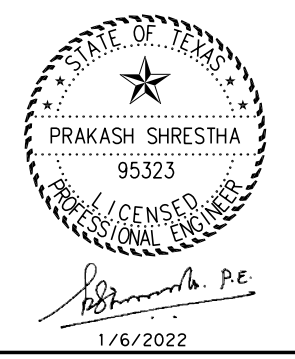
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- NOTES:
1. REFER TO DETOUR LAYOUT SHEET FOR DETOURS.
 2. ALL PCTB SHALL HAVE REFLECTORS MOUNTED ON THE TOP AND ROAD SIDE NEAR THE MIDSECTION OF EACH PCTB SECTION ALONG THE FRONTAGE ROADS (SEE STANDARD DETAIL SHEET BC(7)-14 FOR MORE INFORMATION).
 3. ALL EXISTING DRAINAGE INLETS MUST REMAIN FREE OF ANY OBSTRUCTIONS AND SHALL REMAIN OPERATIONAL DURING THE CONSTRUCTION.
 4. ALL THE TCP AND SW3P ITEMS INSTALLED IN PREVIOUS PHASES SHALL REMAIN IN PLACE UNLESS OTHERWISE SHOWN ON THE PLANS OR AS DIRECTED.



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 Firm Registration No. F-382



SH 146

TRAFFIC CONTROL PLAN
 PHASE 3 STAGE 1

STA 566+00 TO STA 578+00

SHEET 3 OF 7

FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.	SHEET NO. 67
STATE TEXAS	DIST. HOU	COUNTY HARRIS
CONT. 0389	SECT. 13	JOB 039
		HIGHWAY NO. SH 146

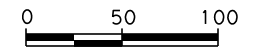
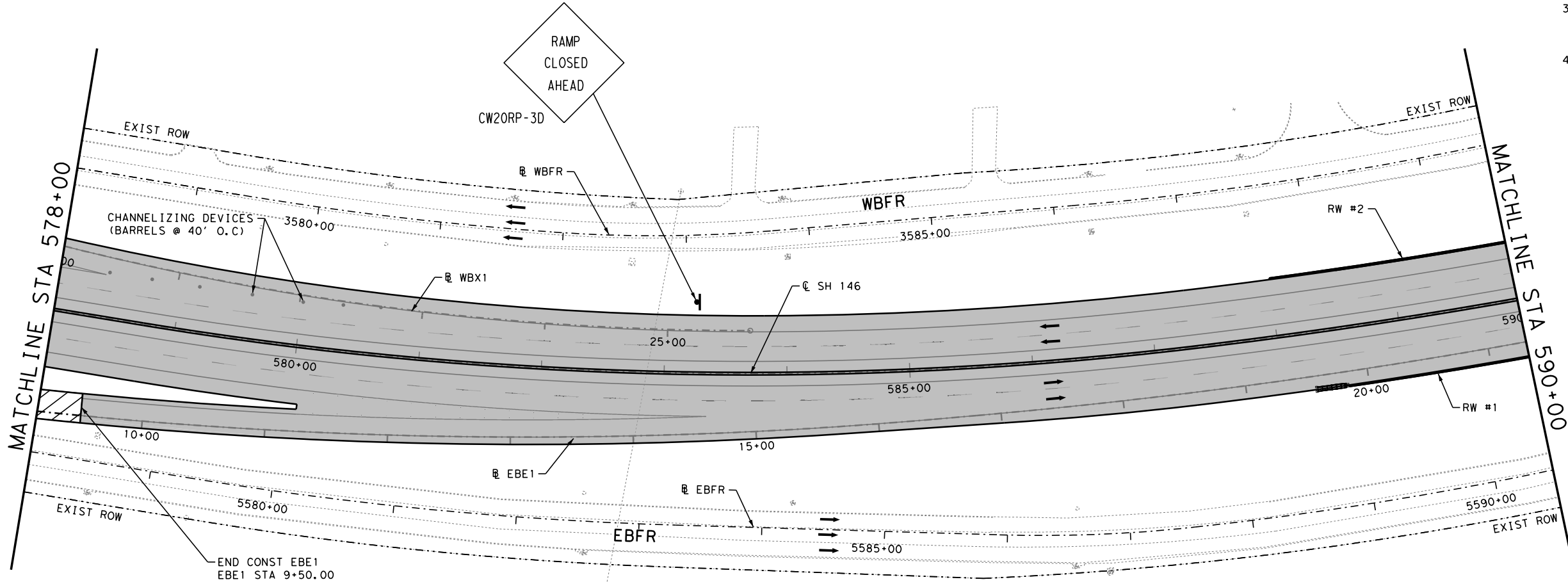
TCP LEGEND

- | | | | |
|--|---|--|--|
| | WRK ZN PAV MRK REMOV (W) 4" (BRK) | | PERMANENT CONSTRUCTION COMPLETED IN PREVIOUS PHASE |
| | WRK ZN PAV MRK REMOV (W) 4" (LNDP) | | TEMPORARY PAVEMENT |
| | WRK ZN PAV MRK REMOV (W) 4" (SLD) | | DIRECTION OF TRAFFIC |
| | WRK ZN PAV MRK REMOV (W) 8" (SLD) | | CONSTRUCTION SIGN |
| | WRK ZN PAV MRK REMOV (Y) 4" (BRK) | | CHANNELIZING DEVICE |
| | WRK ZN PAV MRK REMOV (Y) 4" (SLD) | | TYPE III BARRICADE |
| | WRK ZN PAV MRK REMOV (Y) 8" (SLD) | | FLAGGER |
| | PORTABLE CHANGEABLE MESSAGE SIGN (PCMS) | | PORT CTB (SGL SLOPE) (TY 1) |
| | CONSTRUCTION AREA THIS PHASE | | CURB REMOVAL |
| | CONSTRUCTION EXIT | | |

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- NOTES:
1. REFER TO DETOUR LAYOUT SHEET FOR DETOURS.
 2. ALL PCTB SHALL HAVE REFLECTORS MOUNTED ON THE TOP AND ROAD SIDE NEAR THE MIDSECTION OF EACH PCTB SECTION ALONG THE FRONTAGE ROADS (SEE STANDARD DETAIL SHEET BC(7)-14 FOR MORE INFORMATION).
 3. ALL EXISTING DRAINAGE INLETS MUST REMAIN FREE OF ANY OBSTRUCTIONS AND SHALL REMAIN OPERATIONAL DURING THE CONSTRUCTION.
 4. ALL THE TCP AND SW3P ITEMS INSTALLED IN PREVIOUS PHASES SHALL REMAIN IN PLACE UNLESS OTHERWISE SHOWN ON THE PLANS OR AS DIRECTED.



REV. NO.	DATE	BY	REVISION

PRAKASH SHRESTHA
95323
LICENSED PROFESSIONAL ENGINEER

Prakash Shrestha P.E.
1/6/2022

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 Firm Registration No. F-382



SH 146

**TRAFFIC CONTROL PLAN
PHASE 3 STAGE 1**

STA 578+00 TO STA 590+00

SHEET 4 OF 7

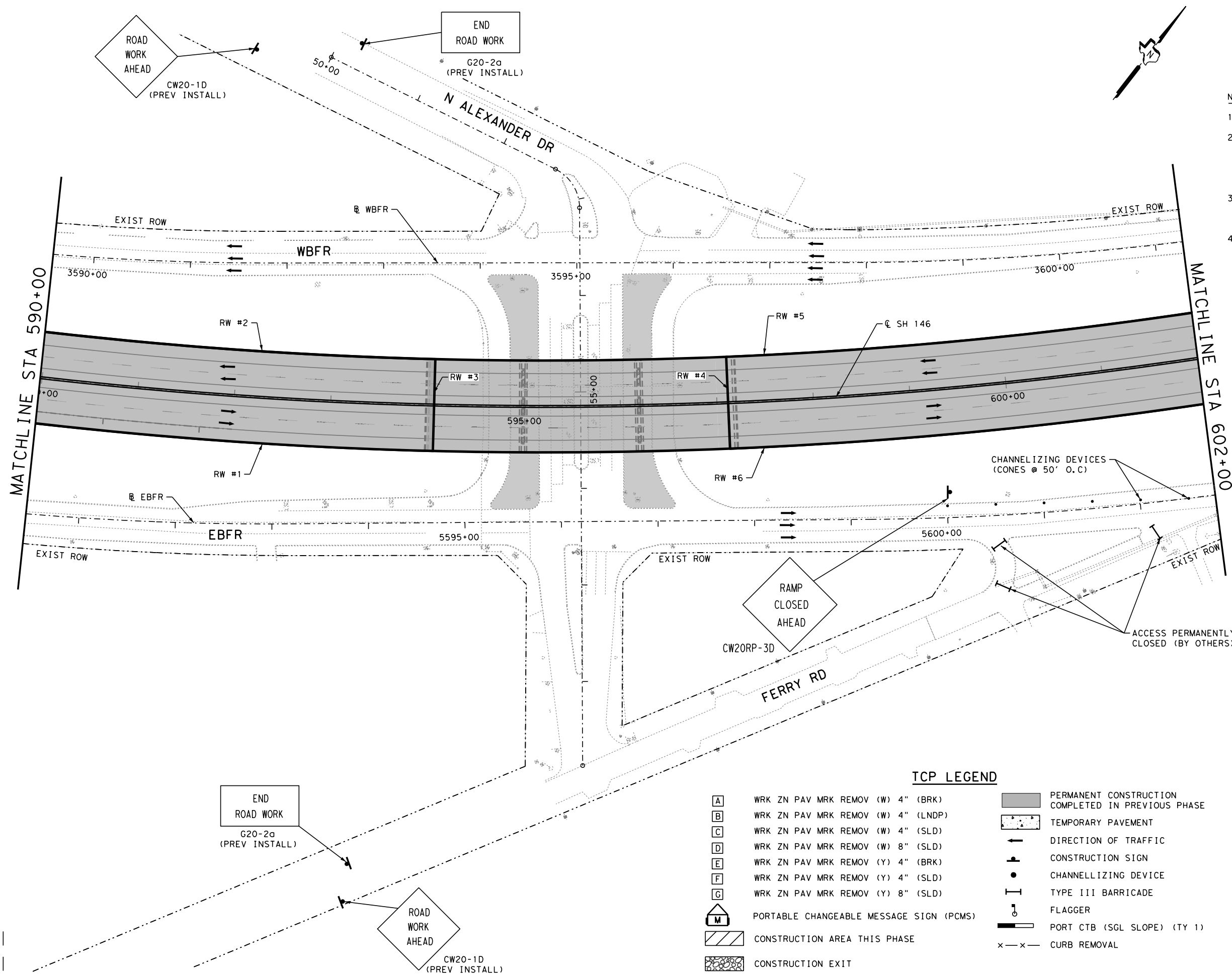
FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.		SHEET NO. 68
STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146

TCP LEGEND

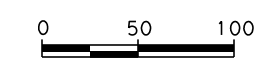
- | | | | |
|--|---|--|--|
| | WRK ZN PAV MRK REMOV (W) 4" (BRK) | | PERMANENT CONSTRUCTION COMPLETED IN PREVIOUS PHASE |
| | WRK ZN PAV MRK REMOV (W) 4" (LNDR) | | TEMPORARY PAVEMENT |
| | WRK ZN PAV MRK REMOV (W) 4" (SLD) | | DIRECTION OF TRAFFIC |
| | WRK ZN PAV MRK REMOV (W) 8" (SLD) | | CONSTRUCTION SIGN |
| | WRK ZN PAV MRK REMOV (Y) 4" (BRK) | | CHANNELLIZING DEVICE |
| | WRK ZN PAV MRK REMOV (Y) 4" (SLD) | | TYPE III BARRICADE |
| | WRK ZN PAV MRK REMOV (Y) 8" (SLD) | | FLAGGER |
| | PORTABLE CHANGEABLE MESSAGE SIGN (PCMS) | | PORT CTB (SGL SLOPE) (TY 1) |
| | CONSTRUCTION AREA THIS PHASE | | CURB REMOVAL |
| | CONSTRUCTION EXIT | | |

1/6/2022 10:41:25 AM
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1/6/2022 10:41:27 AM



- NOTES:
1. REFER TO DETOUR LAYOUT SHEET FOR DETOURS.
 2. ALL PCTB SHALL HAVE REFLECTORS MOUNTED ON THE TOP AND ROAD SIDE NEAR THE MIDSECTION OF EACH PCTB SECTION ALONG THE FRONTAGE ROADS (SEE STANDARD DETAIL SHEET BC(7)-14 FOR MORE INFORMATION).
 3. ALL EXISTING DRAINAGE INLETS MUST REMAIN FREE OF ANY OBSTRUCTIONS AND SHALL REMAIN OPERATIONAL DURING THE CONSTRUCTION.
 4. ALL THE TCP AND SW3P ITEMS INSTALLED IN PREVIOUS PHASES SHALL REMAIN IN PLACE UNLESS OTHERWISE SHOWN ON THE PLANS OR AS DIRECTED.



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1/6/2022

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



SH 146

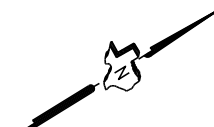
**TRAFFIC CONTROL PLAN
PHASE 3 STAGE 1**

STA 590+00 TO STA 602+00

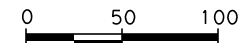
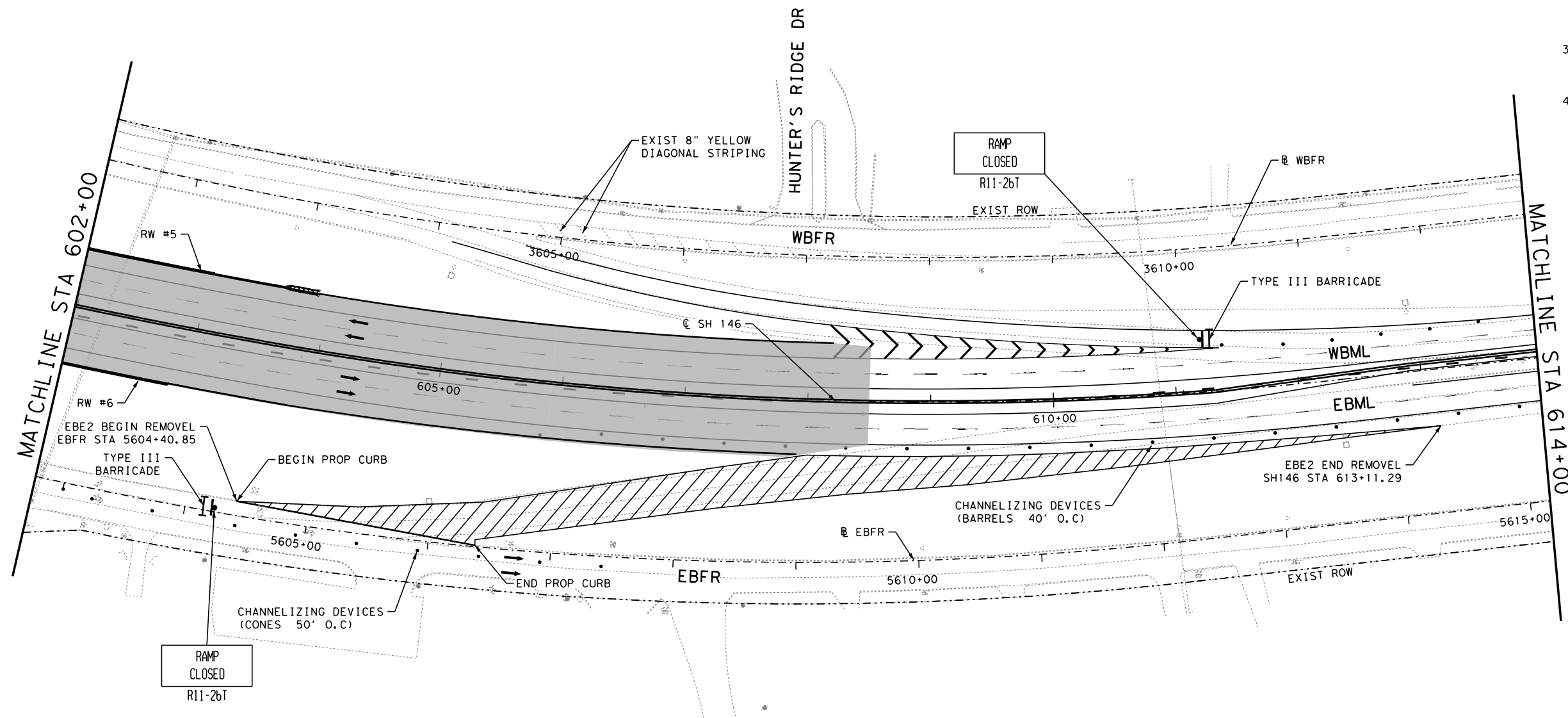
SHEET 5 OF 7

TCP LEGEND

<p>A WRK ZN PAV MRK REMOV (W) 4" (BRK)</p> <p>B WRK ZN PAV MRK REMOV (W) 4" (LNDR)</p> <p>C WRK ZN PAV MRK REMOV (W) 4" (SLD)</p> <p>D WRK ZN PAV MRK REMOV (W) 8" (SLD)</p> <p>E WRK ZN PAV MRK REMOV (Y) 4" (BRK)</p> <p>F WRK ZN PAV MRK REMOV (Y) 4" (SLD)</p> <p>G WRK ZN PAV MRK REMOV (Y) 8" (SLD)</p> <p>M PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)</p> <p> CONSTRUCTION AREA THIS PHASE</p> <p> CONSTRUCTION EXIT</p>	<p> PERMANENT CONSTRUCTION COMPLETED IN PREVIOUS PHASE</p> <p> TEMPORARY PAVEMENT</p> <p> DIRECTION OF TRAFFIC</p> <p> CONSTRUCTION SIGN</p> <p> CHANNELLIZING DEVICE</p> <p> TYPE III BARRICADE</p> <p> FLAGGER</p> <p> PORT CTB (SGL SLOPE) (TY 1)</p> <p> CURB REMOVAL</p>
---	---



- NOTES:
1. REFER TO DETOUR LAYOUT SHEET FOR DETOURS.
 2. ALL PCTB SHALL HAVE REFLECTORS MOUNTED ON THE TOP AND ROAD SIDE NEAR THE MIDSECTION OF EACH PCTB SECTION ALONG THE FRONTAGE ROADS (SEE STANDARD DETAIL SHEET BC(7)-14 FOR MORE INFORMATION).
 3. ALL EXISTING DRAINAGE INLETS MUST REMAIN FREE OF ANY OBSTRUCTIONS AND SHALL REMAIN OPERATIONAL DURING THE CONSTRUCTION.
 4. ALL THE TCP AND SW3P ITEMS INSTALLED IN PREVIOUS PHASES SHALL REMAIN IN PLACE UNLESS OTHERWISE SHOWN ON THE PLANS OR AS DIRECTED.



REV. NO.	DATE	BY	REVISION

PRAKASH SHRESTHA
95323
LICENSED PROFESSIONAL ENGINEER

Prakash Shrestha, P.E.
1/6/2022

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Cypress, Texas 77429
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Firm Registration No. F-382



SH 146

**TRAFFIC CONTROL PLAN
PHASE 3 STAGE 1**

STA 602+00 TO STA 614+00

SHEET 6 OF 7

FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.		SHEET NO. 70
STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146

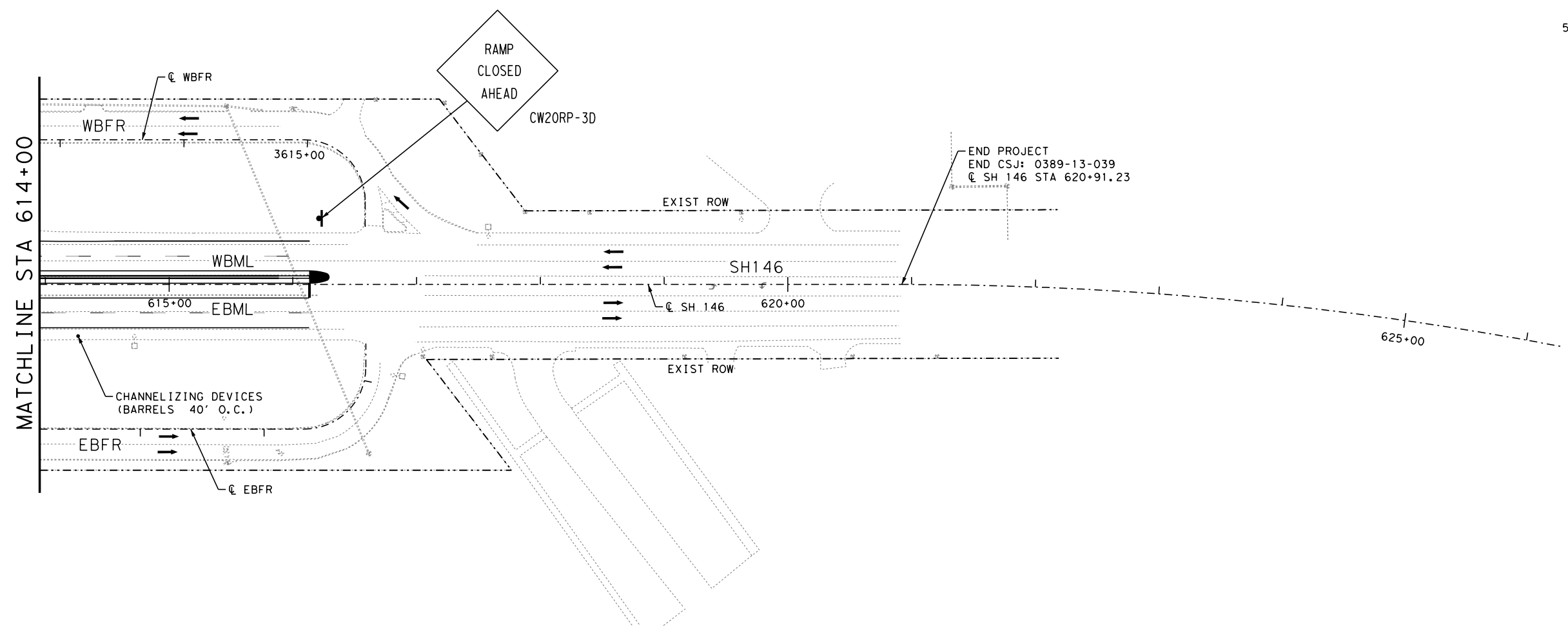
TCP LEGEND

- | | | | |
|--|---|--|--|
| | WRK ZN PAV MRK REMOV (W) 4" (BRK) | | PERMANENT CONSTRUCTION COMPLETED IN PREVIOUS PHASE |
| | WRK ZN PAV MRK REMOV (W) 4" (LNDR) | | TEMPORARY PAVEMENT |
| | WRK ZN PAV MRK REMOV (W) 4" (SLD) | | DIRECTION OF TRAFFIC |
| | WRK ZN PAV MRK REMOV (W) 8" (SLD) | | CONSTRUCTION SIGN |
| | WRK ZN PAV MRK REMOV (Y) 4" (BRK) | | CHANNELLIZING DEVICE |
| | WRK ZN PAV MRK REMOV (Y) 4" (SLD) | | TYPE III BARRICADE |
| | WRK ZN PAV MRK REMOV (Y) 8" (SLD) | | FLAGGER |
| | PORTABLE CHANGEABLE MESSAGE SIGN (PCMS) | | PORT CTB (SGL SLOPE) (TY 1) |
| | CONSTRUCTION AREA THIS PHASE | | CURB REMOVAL |
| | CONSTRUCTION EXIT | | |

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- NOTES:
1. REFER TO DETOUR LAYOUT SHEET FOR DETOURS.
 2. ALL PCTB SHALL HAVE REFLECTORS MOUNTED ON THE TOP AND ROAD SIDE NEAR THE MIDSECTION OF EACH PCTB SECTION ALONG THE FRONTAGE ROADS (SEE STANDARD DETAIL SHEET BC(7)-14 FOR MORE INFORMATION).
 3. ALL EXISTING DRAINAGE INLETS MUST REMAIN FREE OF ANY OBSTRUCTIONS AND SHALL REMAIN OPERATIONAL DURING THE CONSTRUCTION.
 4. ALL THE TCP AND SW3P ITEMS INSTALLED IN PREVIOUS PHASES SHALL REMAIN IN PLACE UNLESS OTHERWISE SHOWN ON THE PLANS OR AS DIRECTED.
 5. REFER TO SHEET #28 FOR ADVANCE WARNING SIGN LAYOUT



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1/6/2022

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 Cypress, Texas 77429
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 Firm Registration No. F-382



SH 146

TRAFFIC CONTROL PLAN
PHASE 3 STAGE 1

STA 614+00 TO END

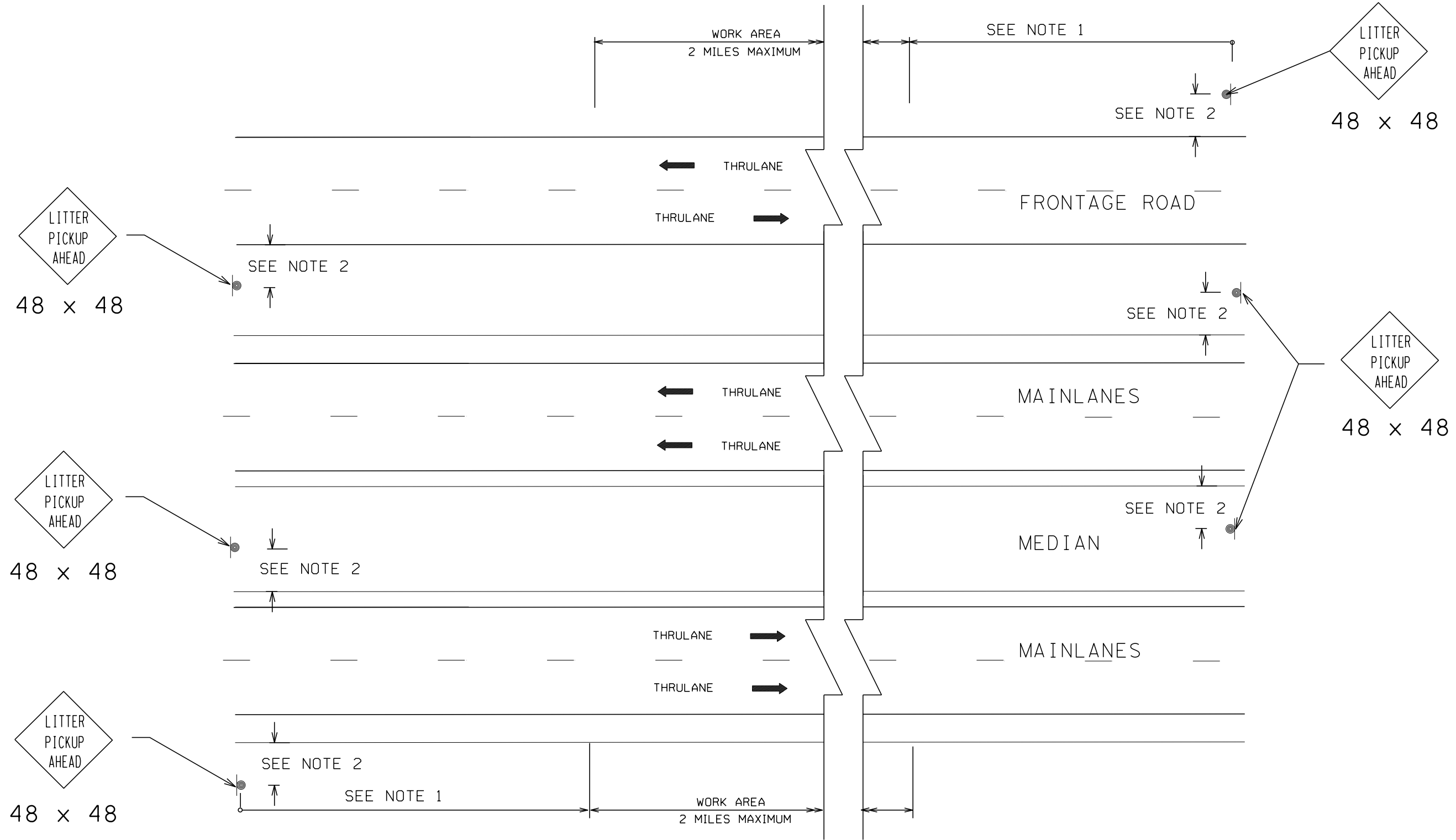
SHEET 7 OF 7

FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.	SHEET NO. 71
STATE TEXAS	DIST. HOU	COUNTY HARRIS
CONT. 0389	SECT. 13	JOB 039
		HIGHWAY NO. SH 146

TCP LEGEND

	WRK ZN PAV MRK REMOV (W) 4" (BRK)		PERMANENT CONSTRUCTION COMPLETED IN PREVIOUS PHASE
	WRK ZN PAV MRK REMOV (W) 4" (LNDP)		TEMPORARY PAVEMENT
	WRK ZN PAV MRK REMOV (W) 4" (SLD)		DIRECTION OF TRAFFIC
	WRK ZN PAV MRK REMOV (W) 8" (SLD)		CONSTRUCTION SIGN
	WRK ZN PAV MRK REMOV (Y) 4" (BRK)		CHANNELLIZING DEVICE
	WRK ZN PAV MRK REMOV (Y) 4" (SLD)		TYPE III BARRICADE
	WRK ZN PAV MRK REMOV (Y) 8" (SLD)		FLAGGER
	PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)		PORT CTB (SGL SLOPE) (TY 1)
	CONSTRUCTION AREA THIS PHASE		CURB REMOVAL
	CONSTRUCTION EXIT		

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NOTES:

- 1) SEE BC(2), PROJECT LIMIT "TYPICAL CONSTRUCTION WARNING SIGN SIZE AND SPACING", FOR SIGN SPACING.
- 2) SEE BC(4), TEMPORARY SIGN NOTES, FOR MINIMUM CLEARANCES.

N.T.S.

SHEET 2 OF 2

Texas Department of Transportation
Houston District

**TRAFFIC CONTROL PLAN
SIGNING ARRANGEMENT
LITTER PICKUP**

(TC)LP (2)

FILE#	DN#	CK#	DW#	CK#
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	COUNTY	CONTROL	SECT	JOB
	HARRIS	0389	13	039 SH 146

STD H-31B

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BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

1. The Barricade and Construction Standard Sheets (BC sheets) are intended to show typical examples for placement of temporary traffic control devices, construction pavement markings, and typical work zone signs. The information contained in these sheets meet or exceed the requirements shown in the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
2. The development and design of the Traffic Control Plan (TCP) is the responsibility of the Engineer.
3. The Contractor may propose changes to the TCP that are signed and sealed by a licensed professional engineer for approval. The Engineer may develop, sign and seal Contractor proposed changes.
4. The Contractor is responsible for installing and maintaining the traffic control devices as shown in the plans. The Contractor may not move or change the approximate location of any device without the approval of the Engineer.
5. Geometric design of lane shifts and detours should, when possible, meet the applicable design criteria contained in manuals such as the American Association of State Highway and Transportation Officials (AASHTO), "A Policy on Geometric Design of Highways and Streets," the TxDOT "Roadway Design Manual" or engineering judgment.
6. When projects abut, the Engineer(s) may omit the END ROAD WORK, TRAFFIC FINES DOUBLE, and other advance warning signs if the signing would be redundant and the work areas appear continuous to the motorists. If the adjacent project is completed first, the Contractor shall erect the necessary warning signs as shown on these sheets, the TCP sheets or as directed by the Engineer. The BEGIN ROAD WORK NEXT X MILES sign shall be revised to show appropriate work zone distance.
7. The Engineer may require duplicate warning signs on the median side of divided highways where median width will permit and traffic volumes justify the signing.
8. All signs shall be constructed in accordance with the details found in the "Standard Highway Sign Designs for Texas," latest edition. Sign details not shown in this manual shall be shown in the plans or the Engineer shall provide a detail to the Contractor before the sign is manufactured.
9. The temporary traffic control devices shown in the illustrations of the BC sheets are examples. As necessary, the Engineer will determine the most appropriate traffic control devices to be used.
10. Where highway construction or maintenance work is being undertaken, other than mobile operations as defined by the Texas Manual on Uniform Traffic Control Devices, CSJ limit signs are required. CSJ limit signs are shown on BC(2). The OBEY WARNING SIGNS STATE LAW sign, STAY ALERT TALK OR TEXT LATER and the WORK ZONE TRAFFIC FINES DOUBLE sign with plaque shall be erected in advance of the CSJ limits. The BEGIN ROAD WORK NEXT X MILES, CONTRACTOR and END ROAD WORK signs shall be erected at or near the CSJ limits. For mobile operations, CSJ limit signs are not required.
11. Traffic control devices should be in place only while work is actually in progress or a definite need exists.
12. The Engineer has the final decision on the location of all traffic control devices.
13. Inactive equipment and work vehicles, including workers' private vehicles must be parked away from travel lanes. They should be as close to the right-of-way line as possible, or located behind a barrier or guardrail, or as approved by the Engineer.

WORKER SAFETY NOTES:

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

COMPLIANT WORKZONE TRAFFIC CONTROL DEVICES

1. Only pre-qualified products shall be used. The "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources.
2. Work zone traffic control devices shall be compliant with the Manual for Assessing safety Hardware (MASH).

<p>THE DOCUMENTS BELOW CAN BE FOUND ON-LINE AT http://www.txdot.gov</p>
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



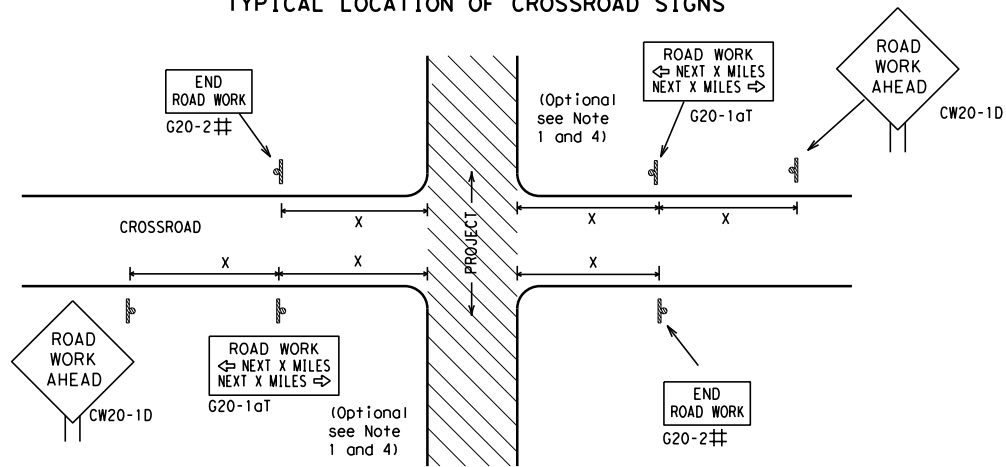
**BARRICADE AND CONSTRUCTION
 GENERAL NOTES
 AND REQUIREMENTS**

BC (1) - 21

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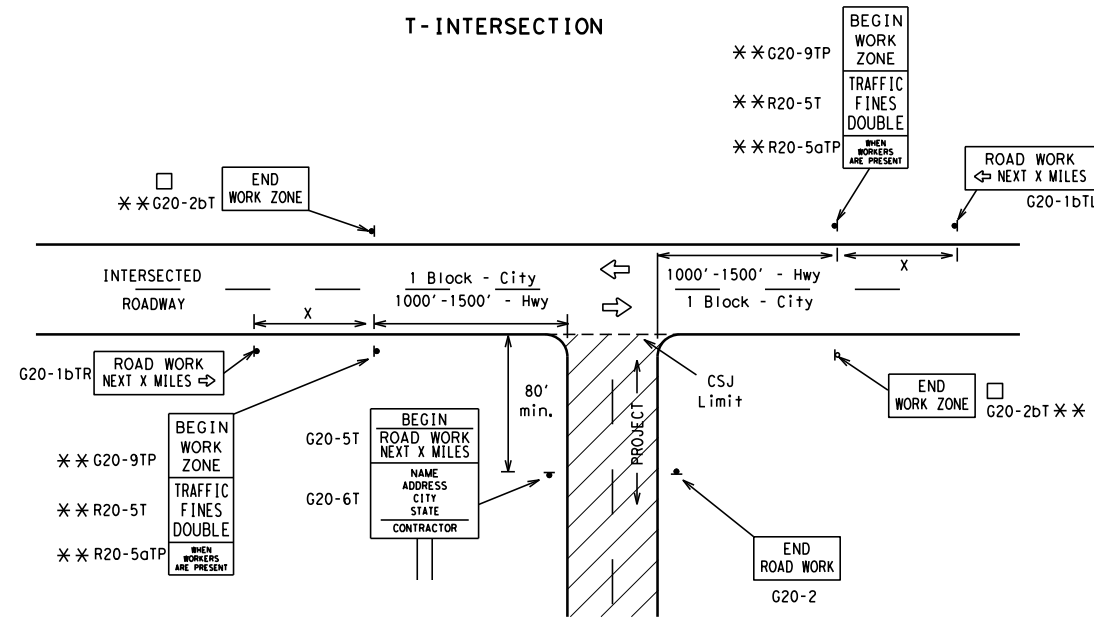
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TYPICAL LOCATION OF CROSSROAD SIGNS



- ## May be mounted on back of "ROAD WORK AHEAD" (CW20-1D) sign with approval of Engineer. (See note 2 below)
- 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.
 - 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.
 - 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.
 - 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.
 - Additional traffic control devices may be shown elsewhere in the plans for higher volume crossroads.
 - 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

- 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.
- 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}

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

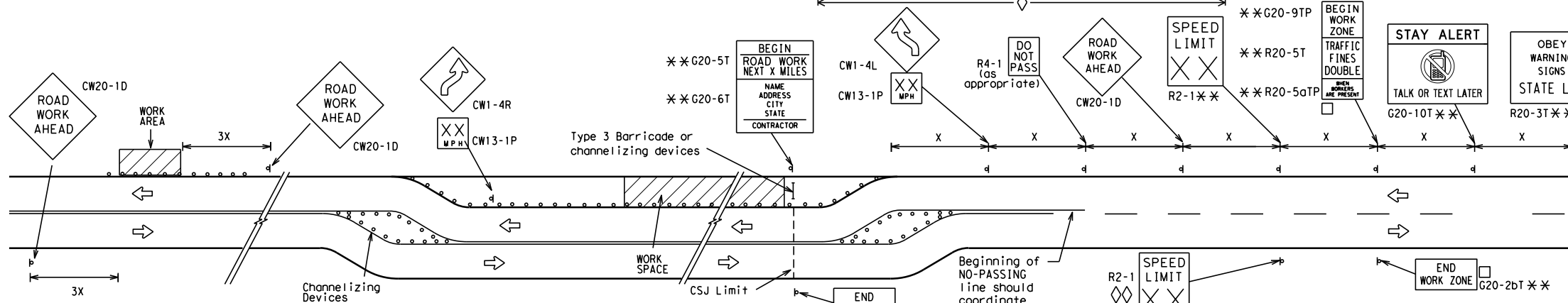
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

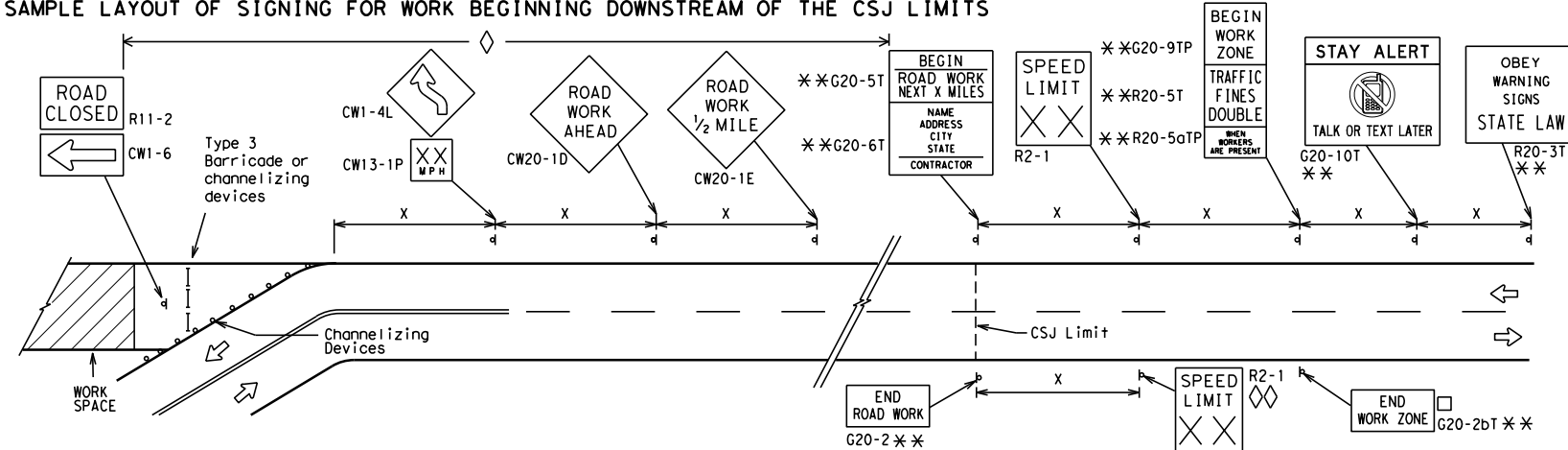
- Special or larger size signs may be used as necessary.
- Distance between signs should be increased as required to have 1500 feet advance warning.
- Distance between signs should be increased as required to have 1/2 mile or more advance warning.
- 36" x 36" "ROAD WORK AHEAD" (CW20-1D) signs may be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



BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

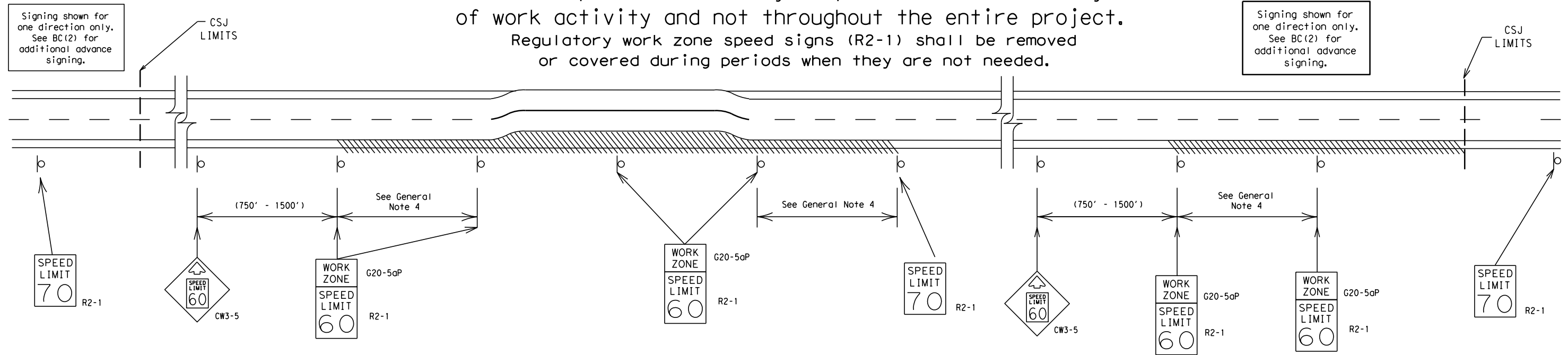
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TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

Reduced speeds should only be posted in the vicinity of work activity and not throughout the entire project. Regulatory work zone speed signs (R2-1) shall be removed or covered during periods when they are not needed.



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

- rough road or damaged pavement surface
- substantial alteration of roadway geometrics (diversions)
- construction detours
- grade
- width
- 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

- Regulatory work zone speed limits should be used only for sections of construction projects where speed control is of major importance.
- Regulatory work zone speed limit signs shall be placed on supports at a 7 foot minimum mounting height.
- Speed zone signs are illustrated for one direction of travel and are normally posted for each direction of travel.
- 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
- Regulatory speed limit signs shall have black legend and border on a white reflective background (See "Reflective Sheeting" on BC(4)).
- 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.
- Turning signs from view, laying signs over or down will not be allowed, unless as otherwise noted under "REMOVING OR COVERING" on BC(4).
- Techniques that may help reduce traffic speeds include but are not limited to:
 - Law enforcement.
 - Flagger stationed next to sign.
 - Portable changeable message sign (PCMS).
 - Low-power (drone) radar transmitter.
 - Speed monitor trailers or signs.
- Speeds shown on details above are for illustration only. Work Zone Speed Limits should only be posted as approved for each project.
- For more specific guidance concerning the type of work, work zone conditions and factors impacting allowable regulatory construction speed zone reduction see TxDOT form #1204 in the TxDOT e-form system.

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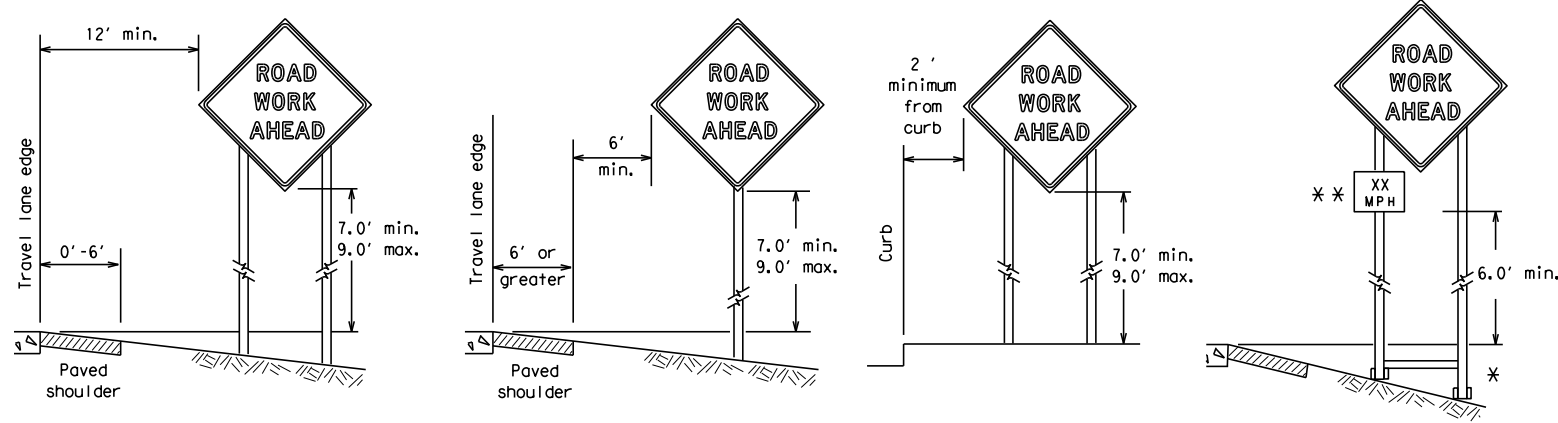
BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC (3) - 21

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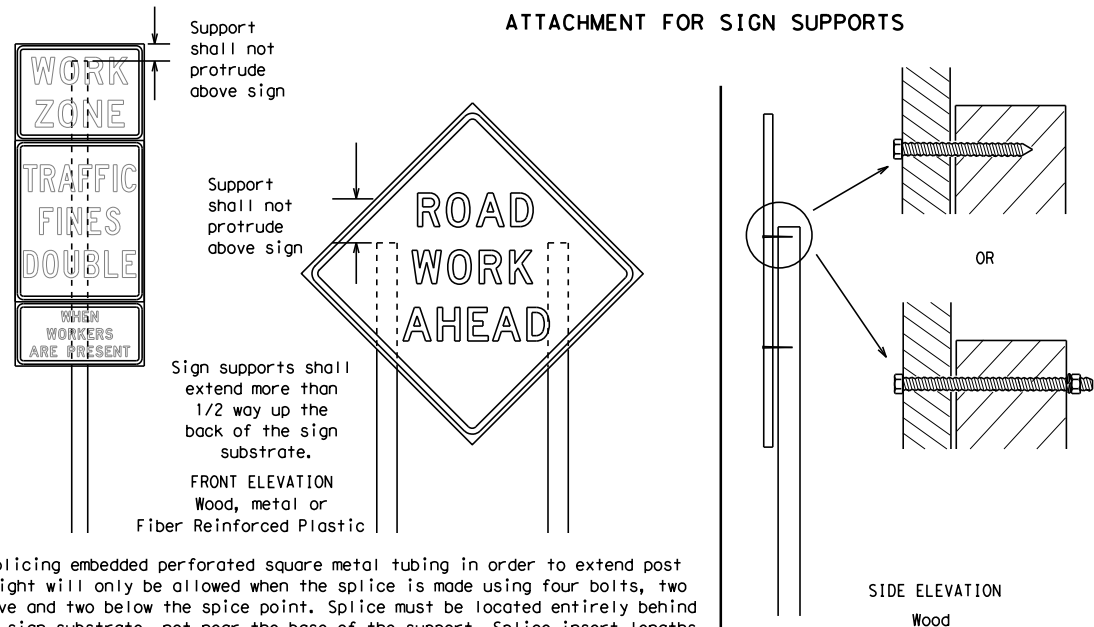
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



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

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

ATTACHMENT FOR SIGN SUPPORTS



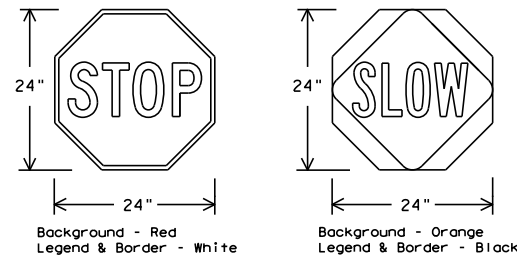
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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 splice 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.

SHEET 4 OF 12



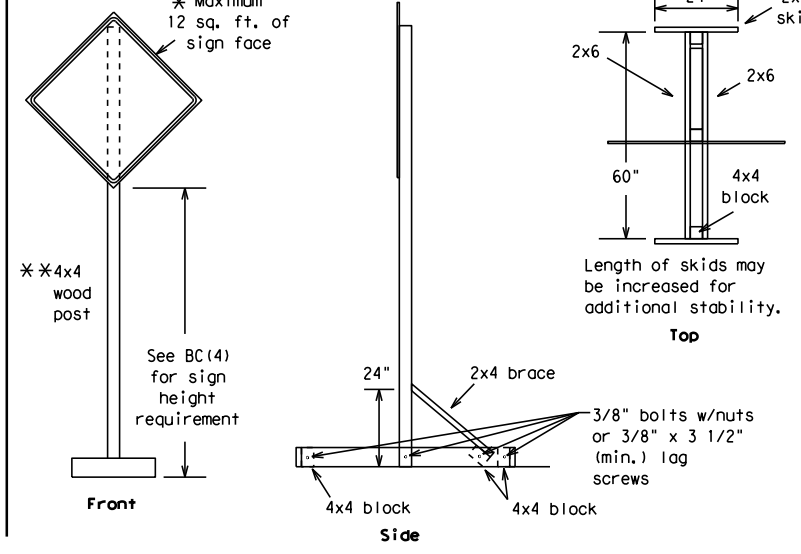
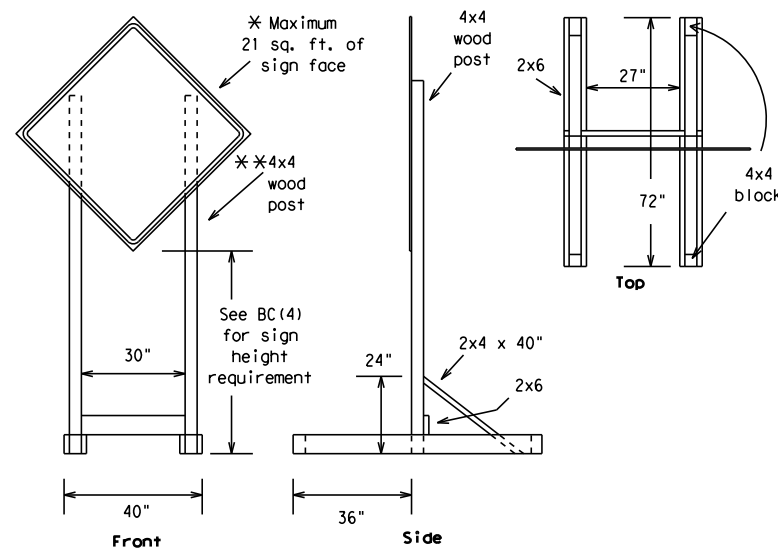
BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC (4) - 21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0389	13	039	SH 146
9-07 8-14	DIST	COUNTY	SHEET NO.	
7-13 5-21	HOU	HARRIS	76	

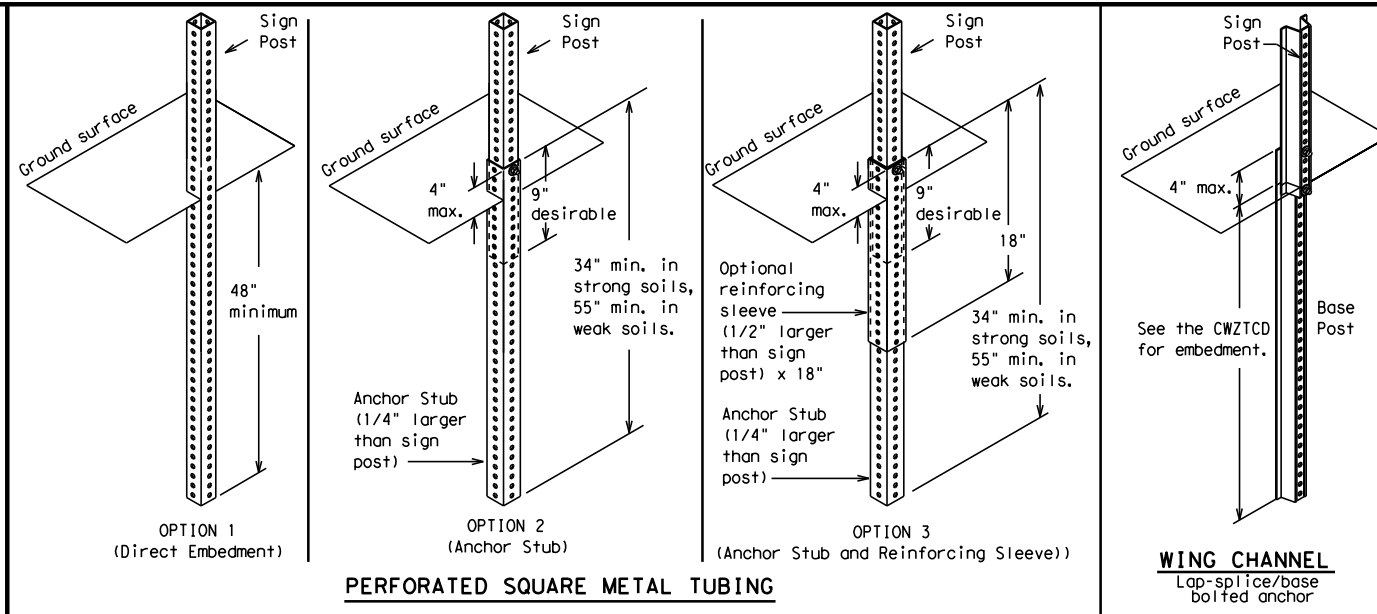
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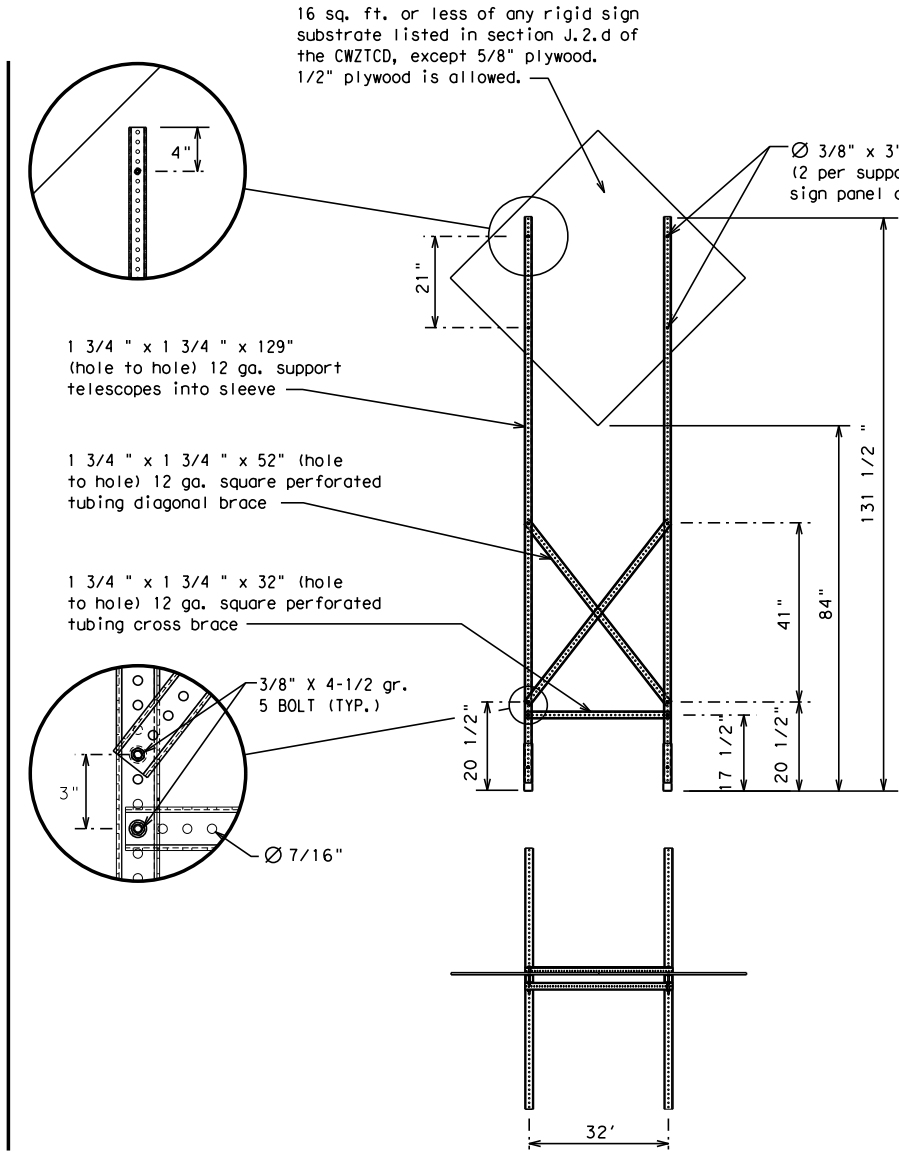
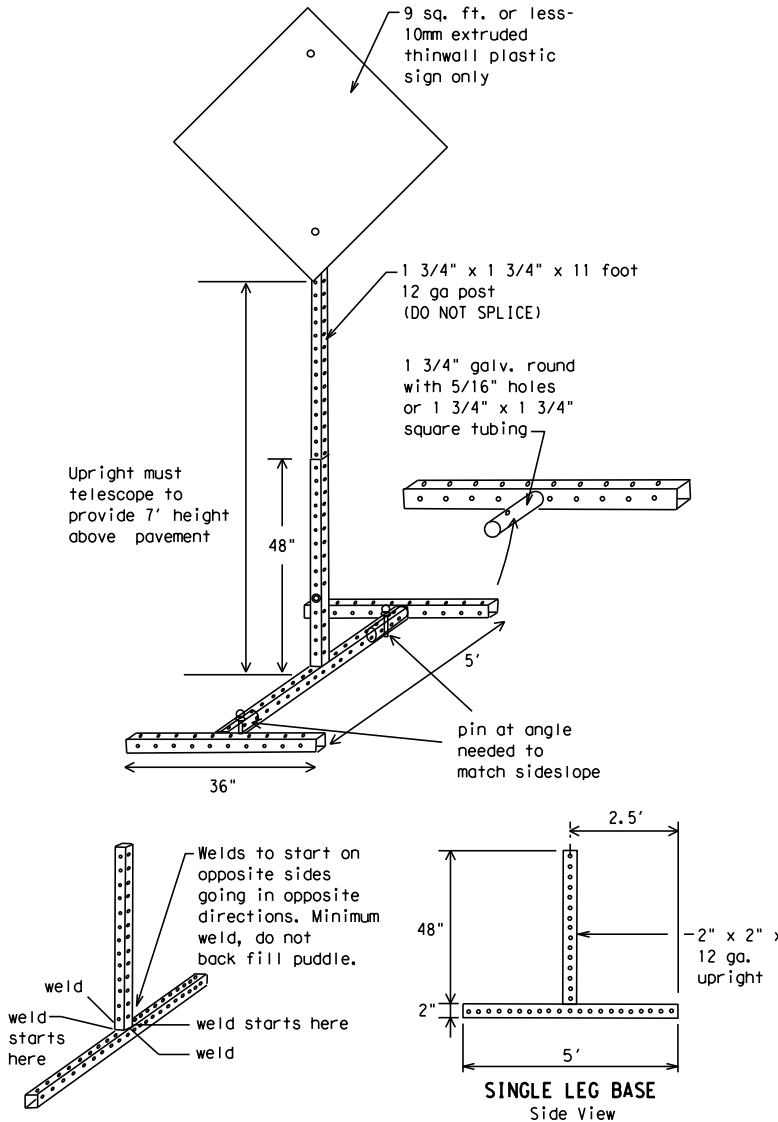
SKID MOUNTED WOOD SIGN SUPPORTS

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



GROUND MOUNTED SIGN SUPPORTS

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



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.

SHEET 5 OF 12



BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5) - 21

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9-07 8-14	DIST	COUNTY	SHEET NO.	
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DATE: FILE:

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

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

(The Engineer may approve other messages not specifically covered here.)

PORTABLE CHANGEABLE MESSAGE SIGNS

- The Engineer/Inspector shall approve all messages used on portable changeable message signs (PCMS).
- 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.
- 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.
- Use the word "EXIT" to refer to an exit ramp on a freeway; i.e., "EXIT CLOSED." Do not use the term "RAMP."
- Always use the route or interstate designation (IH, US, SH, FM) along with the number when referring to a roadway.
- When in use, the bottom of a stationary PCMS message panel should be a minimum 7 feet above the roadway, where possible.
- 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.
- 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.
- Do not "flash" messages or words included in a message. The message should be steady burn or continuous while displayed.
- 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.
- Do not use the word "Danger" in message.
- Do not display the message "LANES SHIFT LEFT" or "LANES SHIFT RIGHT" on a PCMS. Drivers do not understand the message.
- Do not display messages that scroll horizontally or vertically across the face of the sign.
- 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.
- 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.
- Each line of text should be centered on the message board rather than left or right justified.
- 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.

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

FREEWAY CLOSED X MILE
ROAD CLOSED AT SH XXX
ROAD CLSD AT FM XXXX
RIGHT X LANES CLOSED
CENTER LANE CLOSED
NIGHT LANE CLOSURES
VARIOUS LANES CLOSED
EXIT CLOSED
MALL DRIVEWAY CLOSED
XXXXXXXX BLVD CLOSED

Other Condition List

FRONTAGE ROAD CLOSED
SHOULDER CLOSED XXX FT
RIGHT LN CLOSED XXX FT
RIGHT X LANES OPEN
DAYTIME LANE CLOSURES
I-XX SOUTH EXIT CLOSED
EXIT XXX CLOSED X MILE
RIGHT LN TO BE CLOSED
X LANES CLOSED TUE - FRI
ROADWORK XXX FT
FLAGGER XXXX FT
RIGHT LN NARROWS XXXX FT
MERGING TRAFFIC XXXX FT
LOOSE GRAVEL XXXX FT
DETOUR X MILE
ROADWORK PAST SH XXXX
BUMP XXXX FT
TRAFFIC SIGNAL XXXX FT
ROAD REPAIRS XXXX FT
LANE NARROWS XXXX FT
TWO-WAY TRAFFIC XX MILE
CONST TRAFFIC XXX FT
UNEVEN LANES XXXX FT
ROUGH ROAD XXXX FT
ROADWORK NEXT FRI-SUN
US XXX EXIT X MILES
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
DETOUR NEXT X EXITS
USE EXIT XXX
STAY ON US XXX SOUTH
TRUCKS USE US XXX N
WATCH FOR TRUCKS
EXPECT DELAYS
REDUCE SPEED XXX FT
USE OTHER ROUTES
STAY IN LANE *

Location List

AT FM XXXX
BEFORE RAILROAD CROSSING
NEXT X MILES
PAST US XXX EXIT
XXXXXXXX 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

- Only 1 or 2 phases are to be used on a PCMS.
- The 1st phase (or both) should be selected from the "Road/Lane/Ramp Closure List" and the "Other Condition List".
- A 2nd phase can be selected from the "Action to Take/Effect on Travel, Location, General Warning, or Advance Notice Phase Lists".
- A Location Phase is necessary only if a distance or location is not included in the first phase selected.
- 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.
- 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

- The words RIGHT, LEFT and ALL can be interchanged as appropriate.
- Roadway designations IH, US, SH, FM and LP can be interchanged as appropriate.
- EAST, WEST, NORTH and SOUTH (or abbreviations E, W, N and S) can be interchanged as appropriate.
- Highway names and numbers replaced as appropriate.
- ROAD, HIGHWAY and FREEWAY can be interchanged as needed.
- AHEAD may be used instead of distances if necessary.
- FT and MI, MILE and MILES interchanged as appropriate.
- AT, BEFORE and PAST interchanged as needed.
- 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

- 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.
- 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.
- 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.
- 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.

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WORD OR PHRASE	ABBREVIATION	WORD OR PHRASE	ABBREVIATION
Access Road	ACCS RD	Major	MAJ
Alternate	ALT	Miles	MI
Avenue	AVE	Miles Per Hour	MPH
Best Route	BEST RTE	Minor	MNR
Boulevard	BLVD	Monday	MON
Bridge	BRDG	Normal	NORM
Canot	CANT	North	N
Center	CTR	Northbound	(route) N
Construction Ahead	CONST AHD	Parking	PKING
CROSSING	XING	Road	RD
Detour Route	DETOUR RTE	Right Lane	RT LN
Do Not	DONT	Saturday	SAT
East	E	Service Road	SERV RD
Eastbound	(route) E	Shoulder	SHLDR
Emergency	EMER	Slippery	SLIP
Emergency Vehicle	EMER VEH	South	S
Entrance, Enter	ENT	Southbound	(route) S
Express Lane	EXP LN	Speed	SPD
Expressway	EXPWY	Street	ST
XXXX Feet	XXXX FT	Sunday	SUN
Fog Ahead	FOG AHD	Telephone	PHONE
Freeway	FRWY, FWY	Temporary	TEMP
Freeway Blocked	FWY BLKD	Thursday	THURS
Friday	FRI	To Downtown	TO DWNTN
Hazardous Driving	HAZ DRIVING	Traffic	TRAF
Hazardous Material	HAZMAT	Travelers	TRVLR
High-Occupancy Vehicle	HOV	Tuesday	TUES
Highway	HWY	Time Minutes	TIME MIN
Hour(s)	HR, HRS	Upper Level	UPR LEVEL
Information	INFO	Vehicles (s)	VEH, VEHS
It Is	ITS	Warning	WARN
Junction	JCT	Wednesday	WED
Left	LFT	Weight Limit	WT LIMIT
Left Lane	LFT LN	West	W
Lane Closed	LN CLOSED	Westbound	(route) W
Lower Level	LWR LEVEL	Wet Pavement	WET PVMT
Maintenance	MAINT	Will Not	WONT

Roadway designation # IH-number, US-number, SH-number, FM-number

DATE: FILE:



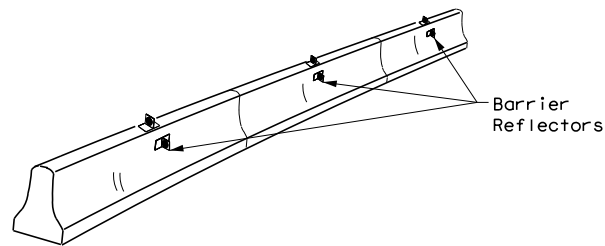
BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC (6) - 21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	0389	13	039	SH 146
9-07 8-14	DIST	COUNTY	SHEET NO.	
7-13 5-21	HOU	HARRIS	78	

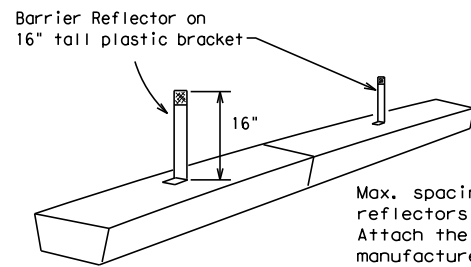
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- Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
- Color of Barrier Reflectors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



CONCRETE TRAFFIC BARRIER (CTB)

- 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.
- 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.
- When CTB separates traffic traveling in the same direction, no barrier reflectors will be required on top of the CTB.
- Barrier Reflector units shall be yellow or white in color to match the edgeline being supplemented.
- Maximum spacing of Barrier Reflectors is forty (40) feet.
- Pavement markers or temporary flexible-reflective roadway marker tabs shall NOT be used as CTB delineation.
- Attachment of Barrier Reflectors to CTB shall be per manufacturer's recommendations.
- Missing or damaged Barrier Reflectors shall be replaced as directed by the Engineer.
- Single slope barriers shall be delineated as shown on the above detail.

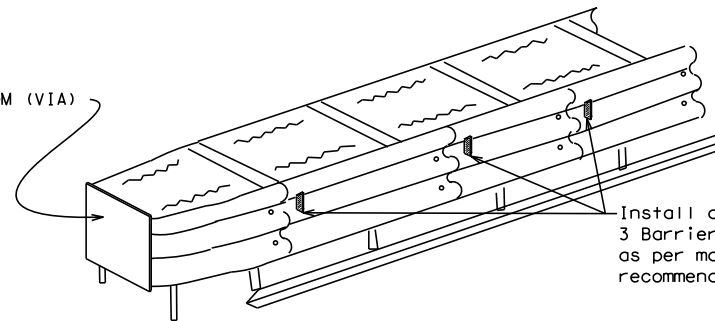


LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES

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

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

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 appropriate 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

WARNING LIGHTS

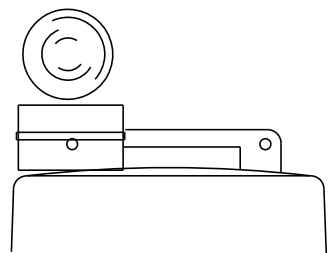
- Warning lights shall meet the requirements of the TMUTCD.
- Warning lights shall NOT be installed on barricades.
- Type A-Low Intensity Flashing Warning Lights are commonly used with drums. They are intended to warn of or mark a potentially hazardous area. Their use shall be as indicated on this sheet 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.
- 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".
- The Engineer/Inspector or the plans shall specify the location and type of warning lights to be installed on the traffic control devices.
- 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.
- 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.
- The location of warning lights and warning reflectors on drums shall be as shown elsewhere in the plans.

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

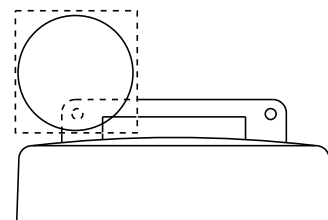
- Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
- Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
- A series of sequential flashing warning lights placed on channelizing 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.
- 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.
- Type A, Type C and Type D warning lights shall be installed at locations as detailed on other sheets in the plans.
- Warning lights shall not be installed on a drum that has a sign, chevron or vertical panel.
- 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

- 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.
- 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.
- The warning reflector shall have a minimum retroreflective surface area (one-side) of 30 square inches.
- Round reflectors shall be fully reflectorized, including the area where attached to the drum.
- 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.
- 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.
- When used near two-way traffic, both sides of the warning reflector shall be reflectorized.
- The warning reflector should be mounted on the side of the handle nearest approaching traffic.
- The maximum spacing for warning reflectors should be identical to the channelizing device spacing requirements.



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

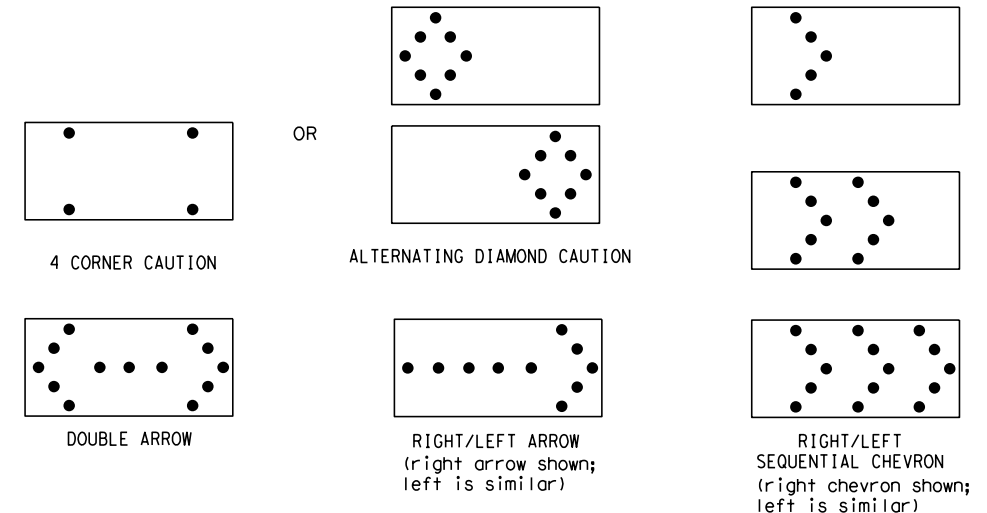


Warning reflector may be round or square. Must have a yellow reflective surface area of at least 30 square inches

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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.

- 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.
- 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.
- 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.
- The Flashing Arrow Board should be able to display the following symbols:



- The "CAUTION" display consists of four corner lamps flashing simultaneously, or the Alternating Diamond Caution mode as shown.
- The straight line caution display is NOT ALLOWED.
- 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.
- 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.
- The sequential arrow display is NOT ALLOWED.
- The flashing arrow display is the TxDOT standard; however, the sequential chevron display may be used during daylight operations.
- The Flashing Arrow Board shall be mounted on a vehicle, trailer or other suitable support.
- A Flashing Arrow Board SHALL NOT BE USED to laterally shift traffic.
- 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.
- 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

- Truck-mounted attenuators (TMA) used on TxDOT facilities must meet the requirements outlined in the Manual for Assessing Safety Hardware (MASH).
- Refer to the CWZTCD for the requirements of Level 2 or Level 3 TMAs.
- Refer to the CWZTCD for a list of approved TMAs.
- TMAs are required on freeways unless otherwise noted in the plans.
- 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.
- 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.



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

BC (7) - 21

FILE:	bc-21.dgn	DN:	TxDOT	CK:	TxDOT	DW:	TxDOT	CK:	TxDOT
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REVISIONS		0389	13	039	SH 146				
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7-13	5-21	HOU	HARRIS		79				

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GENERAL NOTES

- For long term stationary work zones on freeways, drums shall be used as the primary channelizing device.
- 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.
- 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.
- 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).
- 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.
- 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:

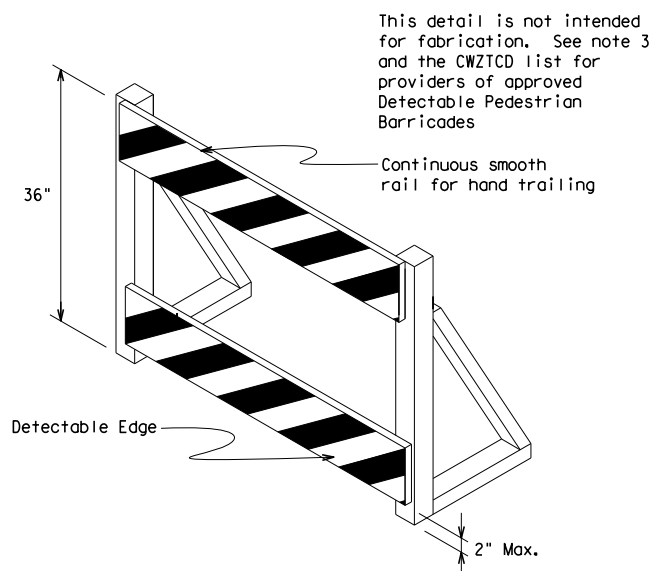
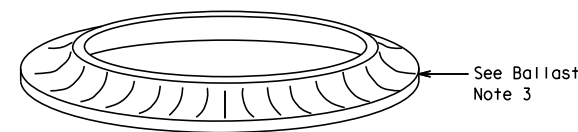
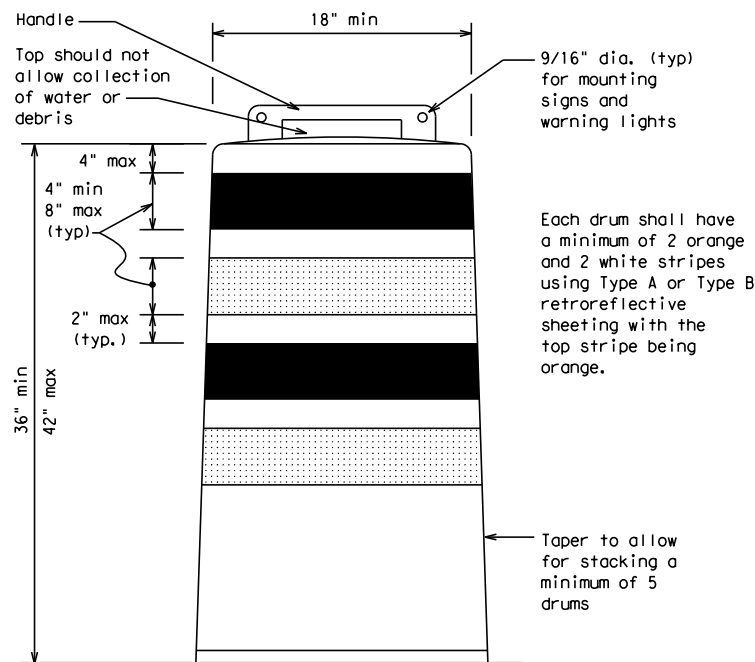
- Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
- The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents accidental separation due to normal handling and/or air turbulence created by passing vehicles.
- 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.
- 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.
- 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.
- 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.
- 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.
- Plastic drums shall be constructed of ultra-violet stabilized, orange, high-density polyethylene (HDPE) or other approved material.
- Drum body shall have a maximum unballasted weight of 11 lbs.
- Drum and base shall be marked with manufacturer's name and model number.

RETROREFLECTIVE SHEETING

- 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.
- 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.

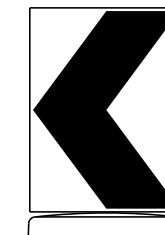
BALLAST

- 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.
- 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.
- Recycled truck tire sidewalls may be used for ballast on drums approved for this type of ballast on the CWZTCD list.
- 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.
- 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.
- Ballast shall not be placed on top of drums.
- Adhesives may be used to secure base of drums to pavement.

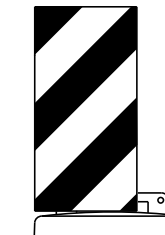


DETECTABLE PEDESTRIAN BARRICADES

- 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.
- 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.
- 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.
- 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.
- Warning lights shall not be attached to detectable pedestrian barricades.
- 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

- Signs used on plastic drums shall be manufactured using substrates listed on the CWZTCD.
- 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.
- 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.
- 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.
- Signs shall be installed using a 1/2 inch bolt (nominal) and nut, two washers, and one locking washer for each connection.
- Mounting bolts and nuts shall be fully engaged and adequately torqued. Bolts should not extend more than 1/2 inch beyond nuts.
- 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.
- 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.

SHEET 8 OF 12

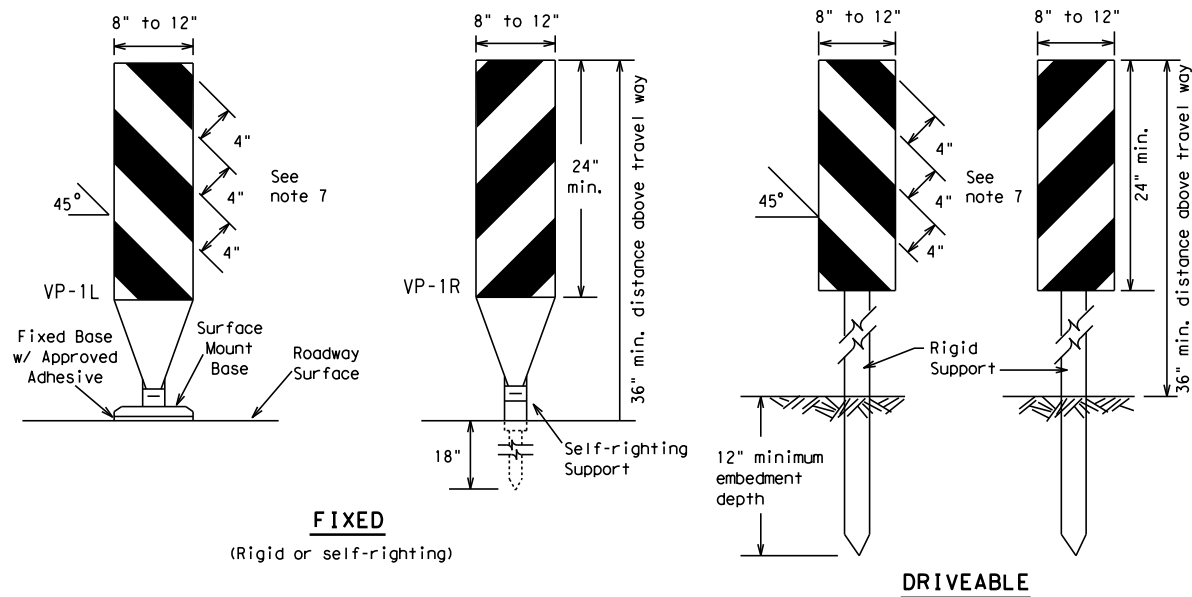


BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC (8) - 21

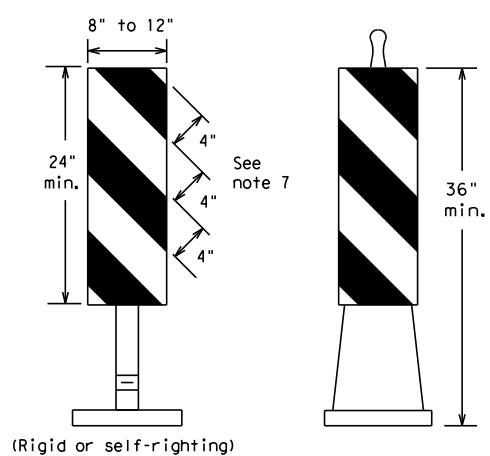
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© TxDOT	November 2002	CONT	SECT	JOB	HIGHWAY				
REVISIONS		0389	13	039	SH 146				
4-03	8-14	DIST	COUNTY		SHEET NO.				
9-07	5-21	HOU	HARRIS		80				
7-13									

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FIXED
(Rigid or self-righting)

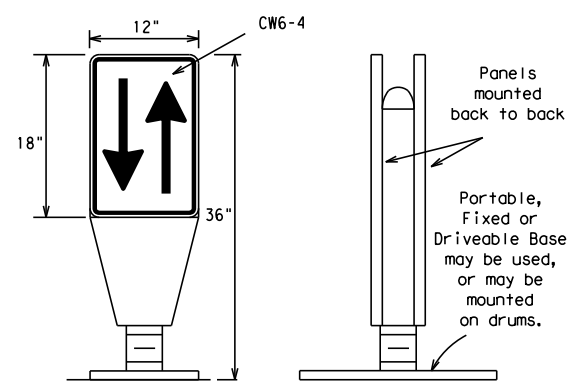
DRIVEABLE



PORTABLE

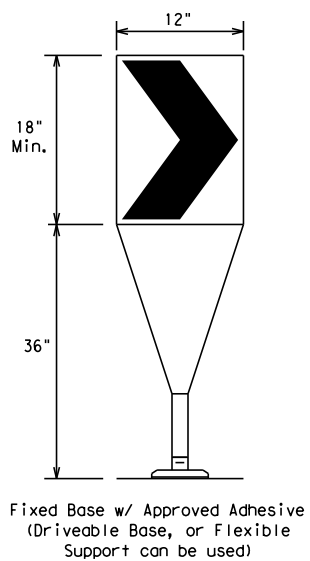
VERTICAL PANELS (VPs)

- Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
- 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.
- 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.
- VP's used on expressways and freeways or other high speed roadways, may have more than 270 square inches of retroreflective area facing traffic.
- Self-righting supports are available with portable base. See "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
- Sheeting for the VP's shall be retroreflective Type A or Type B conforming to Departmental Material Specification DMS-8300, unless noted otherwise.
- Where the height of reflective material on the vertical panel is 36 inches or greater, a panel stripe of 6 inches shall be used.



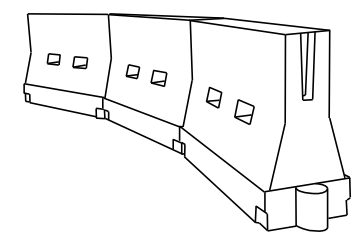
OPPOSING TRAFFIC LANE DIVIDERS (OTLD)

- 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.
- The OTLD may be used in combination with 42" cones or VPs.
- Spacing between the OTLD shall not exceed 500 feet. 42" cones or VPs placed between the OTLD's should not exceed 100 foot spacing.
- 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.



- The chevron shall be a vertical rectangle with a minimum size of 12 by 18 inches.
- 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.
- 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.
- To be effective, the chevron should be visible for at least 500 feet.
- 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.
- 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)

- 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.
- LCDs may be used instead of a line of cones or drums.
- LCDs shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
- LCDs should not be used to provide positive protection for obstacles, pedestrians or workers.
- LCDs shall be supplemented with retroreflective delineation as required for temporary barriers on BC(7) when placed roughly parallel to the travel lanes.
- 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

- 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.
- 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.
- 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.
- 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.
- 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

- 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).
- 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.
- 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).
- 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.
- Portable bases shall be fabricated from virgin and/or recycled rubber. The portable bases shall weigh a minimum of 30 lbs.
- 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.
- 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 * *			Suggested Maximum Spacing of Channelizing Devices	
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60'
35		205'	225'	245'	35'	70'
40		265'	295'	320'	40'	80'
45	L = WS	450'	495'	540'	45'	90'
50		500'	550'	600'	50'	100'
55		550'	605'	660'	55'	110'
60		600'	660'	720'	60'	120'
65		650'	715'	780'	65'	130'
70	700'	770'	840'	70'	140'	
75	750'	825'	900'	75'	150'	
80	800'	880'	960'	80'	160'	

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

SHEET 9 OF 12



BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC (9) - 21

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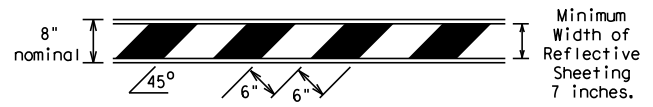
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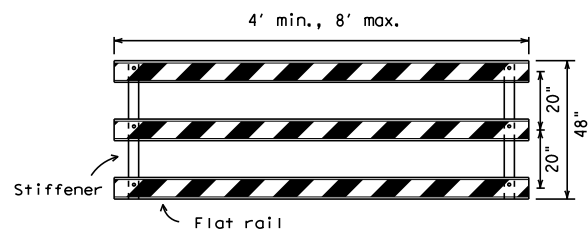
TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



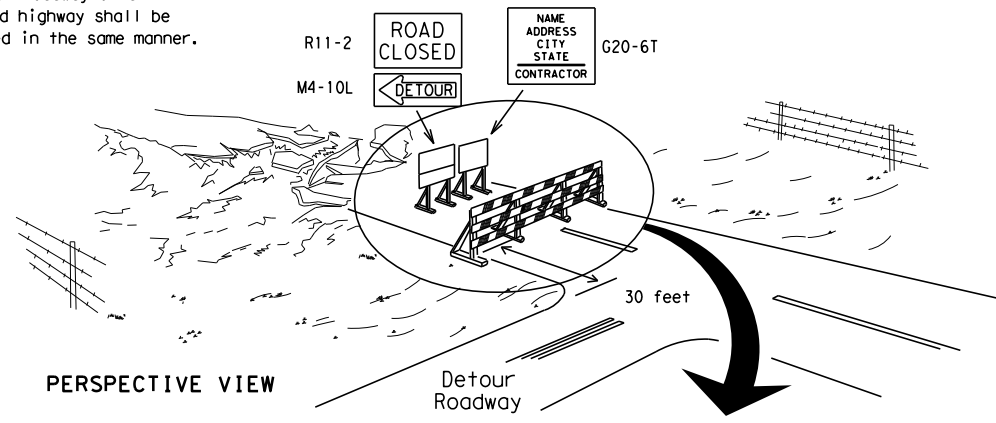
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

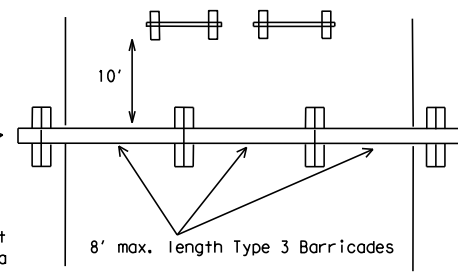
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

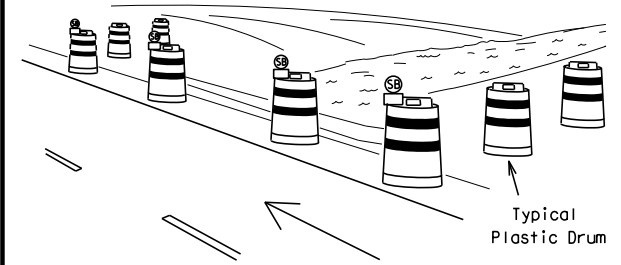
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic. Barricade striping should slant downward in the direction of detour.



PLAN VIEW

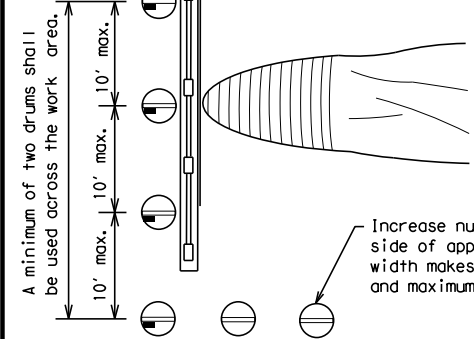
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

These drums are not required on one-way roadway



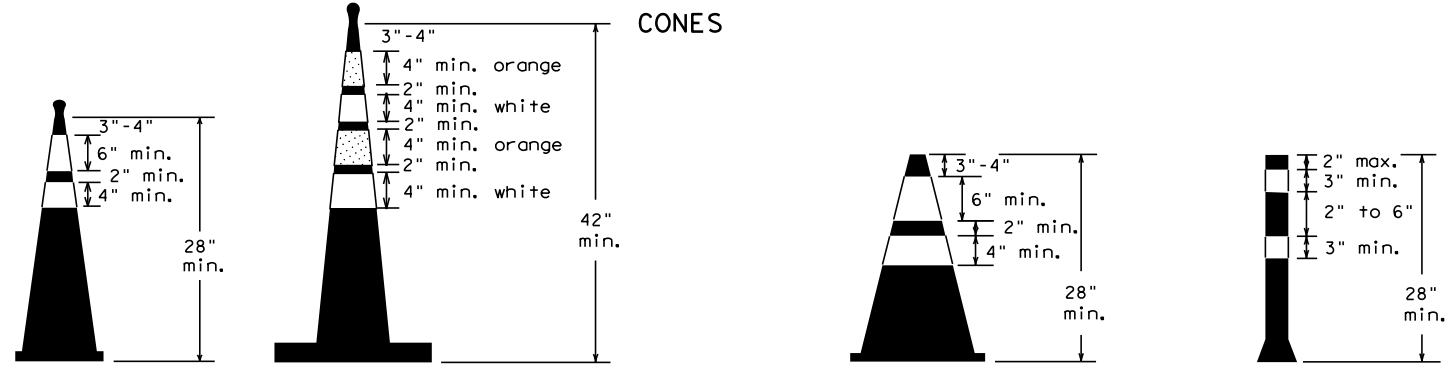
PLAN VIEW

Increase number of plastic drums on the side of approaching traffic if the crown width makes it necessary. (minimum of 2 and maximum of 4 drums)

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

1. Where positive redirection 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.

CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



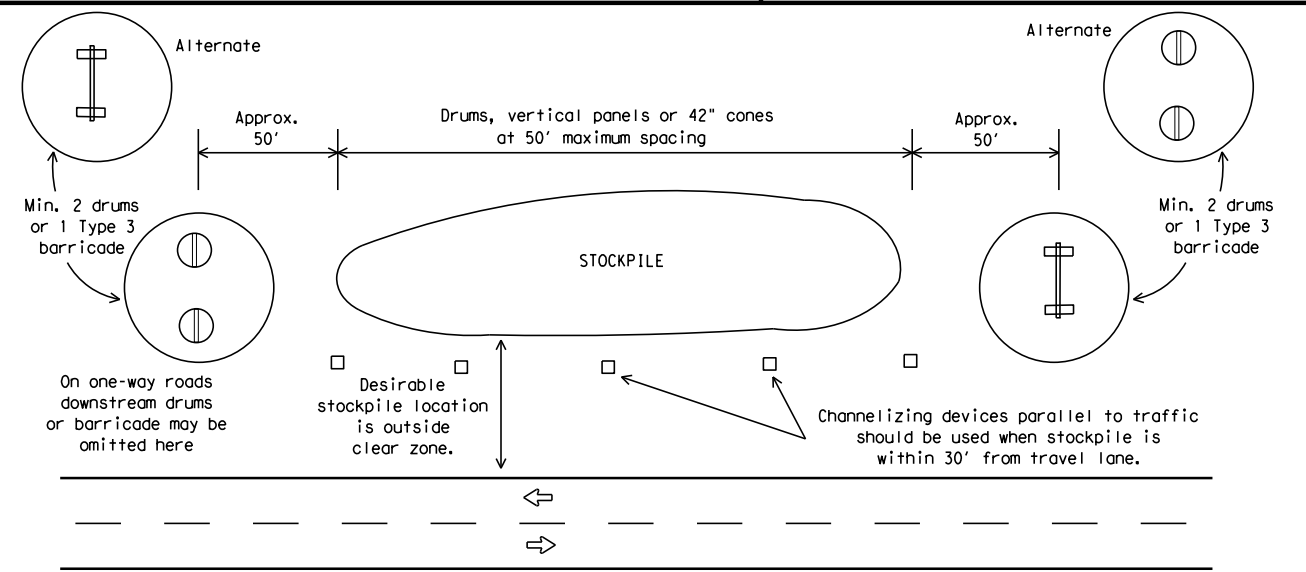
Two-Piece cones

One-Piece cones

Tubular Marker

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



BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC (10) - 21

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WORK ZONE PAVEMENT MARKINGS

GENERAL

- 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.
- Color, patterns and dimensions shall be in conformance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
- Additional supplemental pavement marking details may be found in the plans or specifications.
- Pavement markings shall be installed in accordance with the TMUTCD and as shown on the plans.
- 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).
- 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.
- All work zone pavement markings shall be installed in accordance with Item 662, "Work Zone Pavement Markings."

RAISED PAVEMENT MARKERS

- Raised pavement markers are to be placed according to the patterns on BC(12).
- 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

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

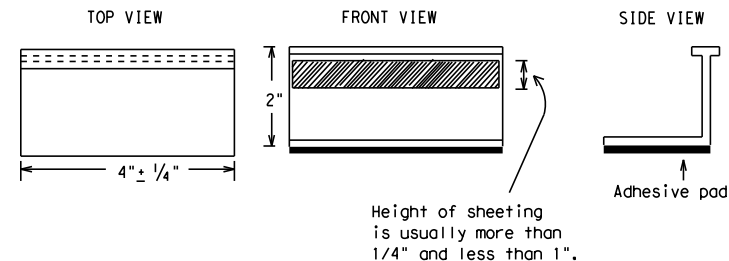
MAINTAINING WORK ZONE PAVEMENT MARKINGS

- The Contractor will be responsible for maintaining work zone pavement markings within the work limits.
- 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.
- 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.
- 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

- 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.
- 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.
- 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".
- The removal of pavement markings may require resurfacing or seal coating portions of the roadway as described in Item 677.
- Subject to the approval of the Engineer, any method that proves to be successful on a particular type pavement may be used.
- Blast cleaning may be used but will not be required unless specifically shown in the plans.
- Over-painting of the markings SHALL NOT BE permitted.
- Removal of raised pavement markers shall be as directed by the Engineer.
- 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.
- 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**

- Temporary flexible-reflective roadway marker tabs used as guidemarks shall meet the requirements of DMS-8242.
- 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.
 - 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.
 - 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.
- Small design variances may be noted between tab manufacturers.
- 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

- Raised pavement markers used as guidemarks shall be from the approved product list, and meet the requirements of DMS-4200.
- All temporary construction raised pavement markers provided on a project shall be of the same manufacturer.
- 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).

SHEET 11 OF 12



BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

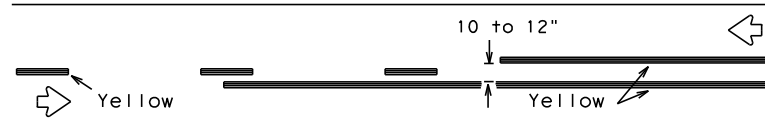
BC(11)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	0389	13	039	SH 146
2-98 9-07 5-21	DIST	COUNTY	SHEET NO.	
1-02 7-13	HOU	HARRIS	83	
11-02 8-14				

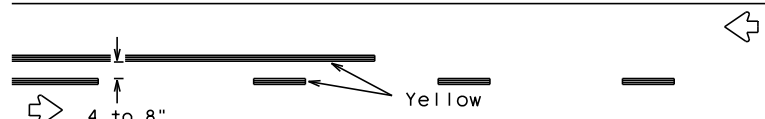
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE:
FILE:

PAVEMENT MARKING PATTERNS

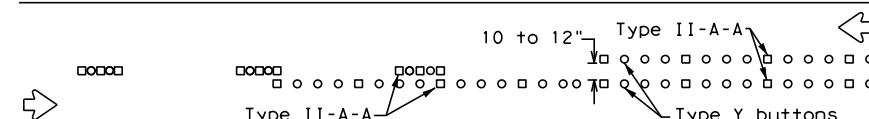


REFLECTORIZED PAVEMENT MARKINGS - PATTERN A

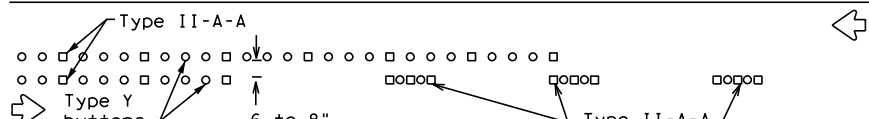


REFLECTORIZED PAVEMENT MARKINGS - PATTERN B

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.

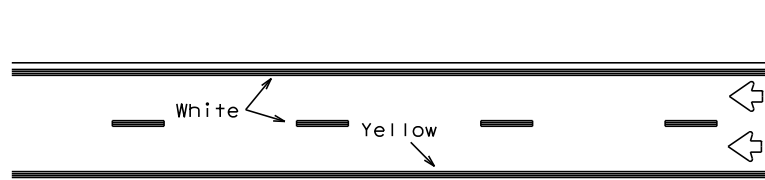


RAISED PAVEMENT MARKERS - PATTERN A



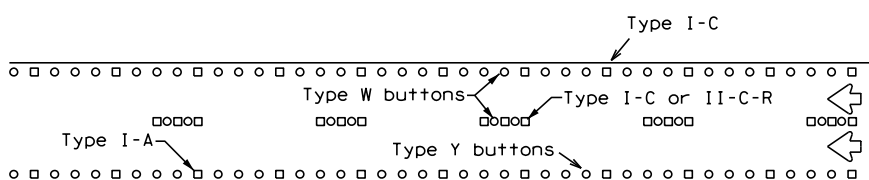
RAISED PAVEMENT MARKERS - PATTERN B

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



REFLECTORIZED PAVEMENT MARKINGS

Prefabricated markings may be substituted for reflectORIZED pavement markings.



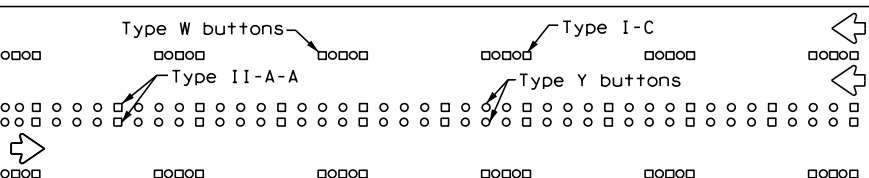
RAISED PAVEMENT MARKERS

EDGE & LANE LINES FOR DIVIDED HIGHWAY



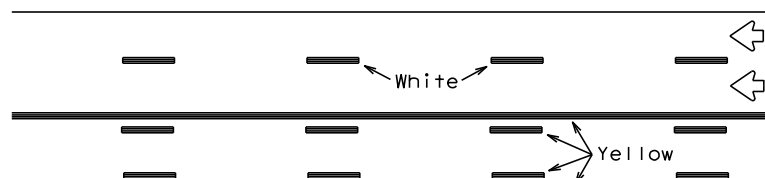
REFLECTORIZED PAVEMENT MARKINGS

Prefabricated markings may be substituted for reflectORIZED pavement markings.



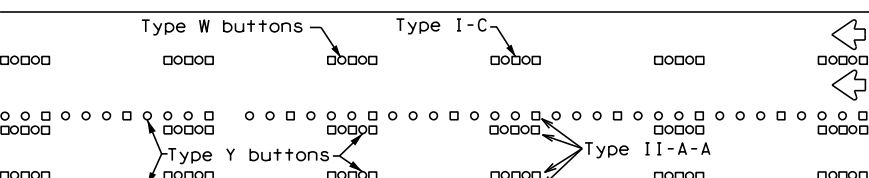
RAISED PAVEMENT MARKERS

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS

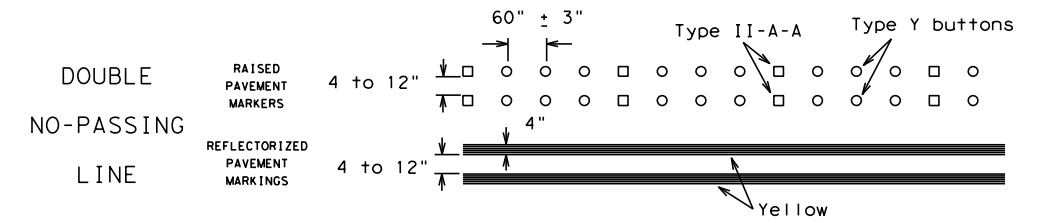
Prefabricated markings may be substituted for reflectORIZED pavement markings.



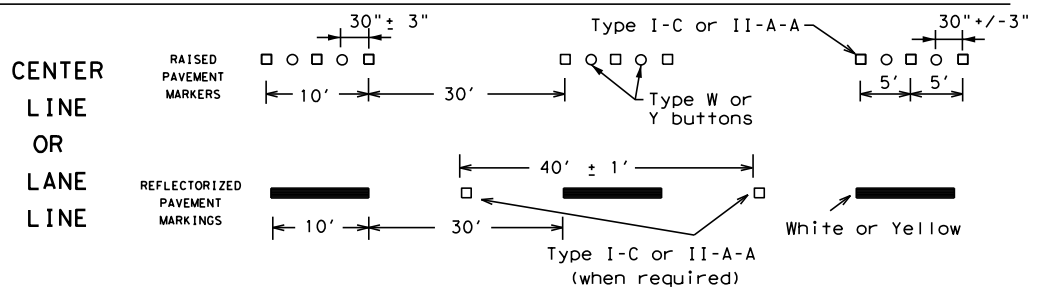
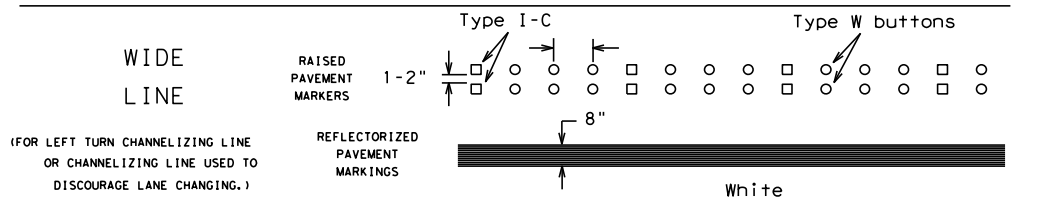
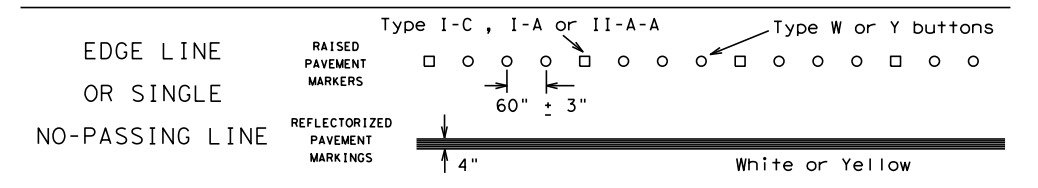
RAISED PAVEMENT MARKERS

TWO-WAY LEFT TURN LANE

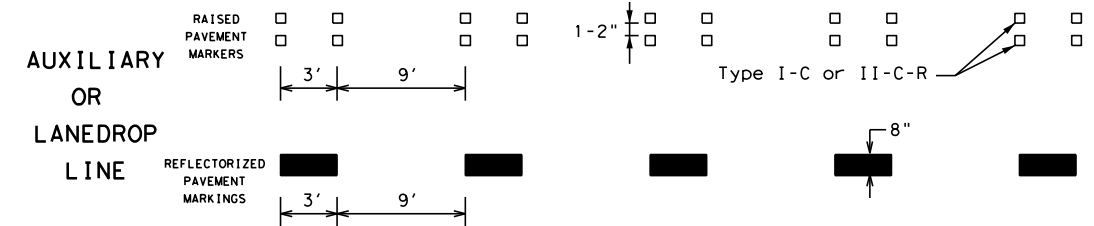
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS



SOLID LINES

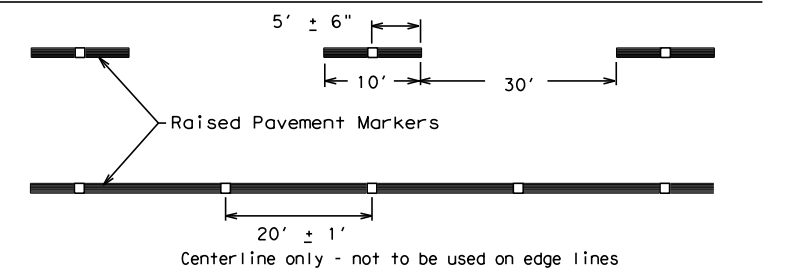


BROKEN LINES



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.



SHEET 12 OF 12



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	0389	13	039	SH 146
1-97 9-07 5-21				
2-98 7-13				
11-02 8-14	DIST	COUNTY	SHEET NO.	
	HOU	HARRIS	84	

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."

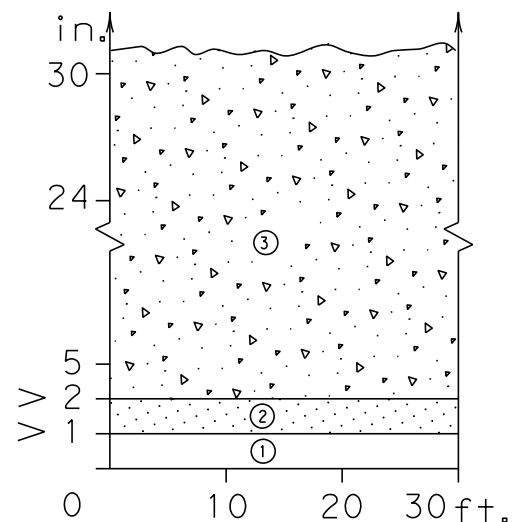
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DATE:
FILE:

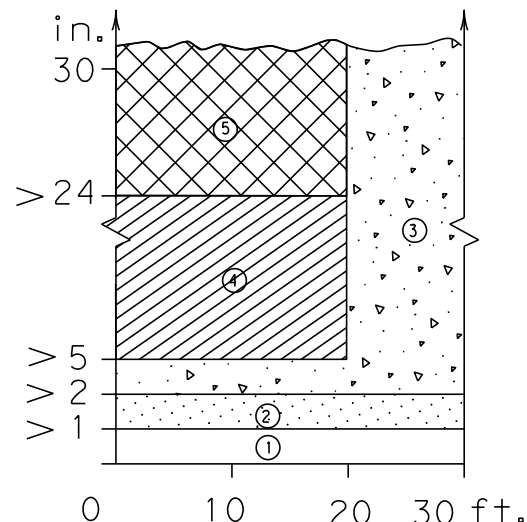
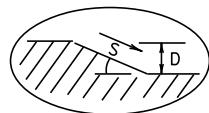
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DEFINITION OF TREATMENT ZONES FOR VARIOUS EDGE CONDITIONS

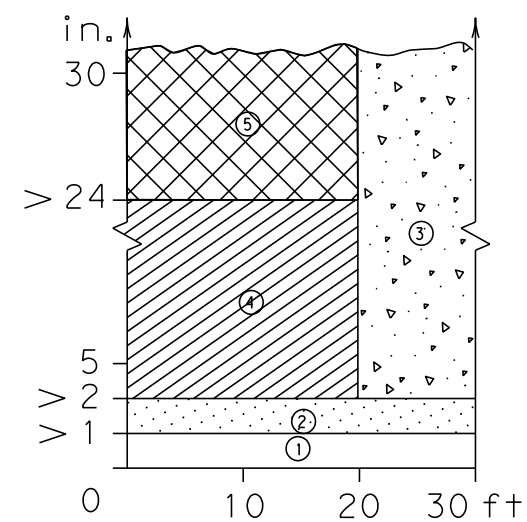
Edge Height (D) in Inches versus Lateral Clearance (Y) in Feet



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



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



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

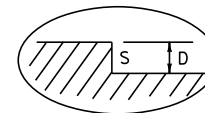
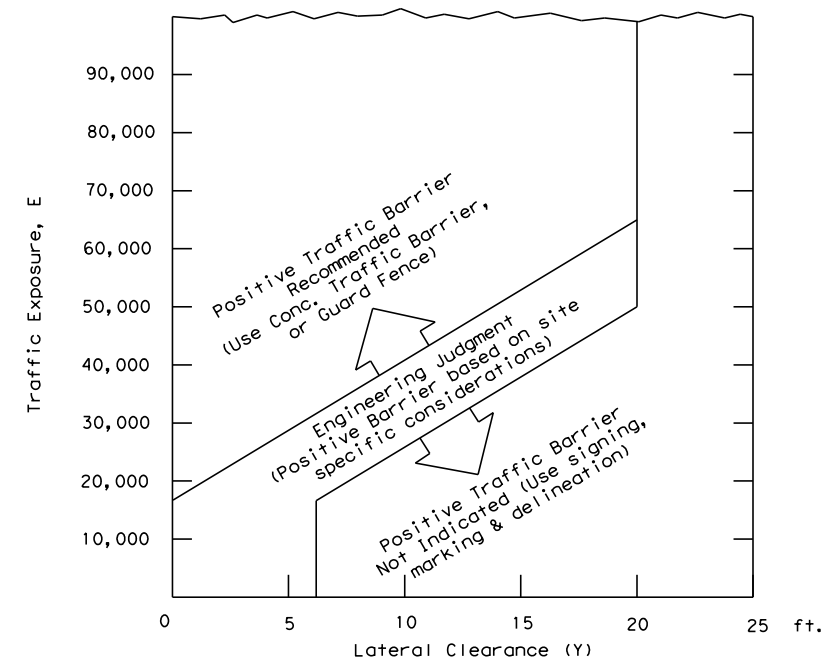


FIGURE-1: CONDITIONS INDICATING USE OF POSITIVE BARRIER FOR ZONE 5 ([Cross-hatched])

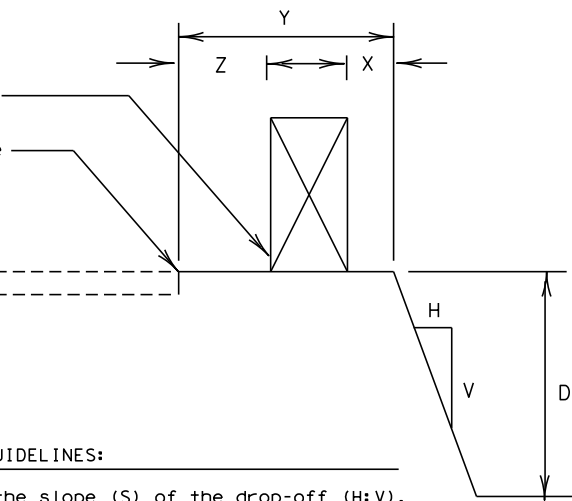


- E = ADT x T
Where ADT is that portion of the average daily traffic volume traveling within 20 feet (generally two adjacent lanes) of the edge dropoff condition; and, T is the duration time in years of the dropoff condition.
- Figure-1 provides a practical approach to the use of positive barriers for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

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

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

Warning Device or Traffic Barrier
4" White Edge Line or Edge of Lanes being used for maintenance of traffic.



FACTORS CONSIDERED IN THE GUIDELINES:

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

Edge Condition Notes:

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

Engineer's Seal

Date _____

Texas Department of Transportation
Traffic Operations Division

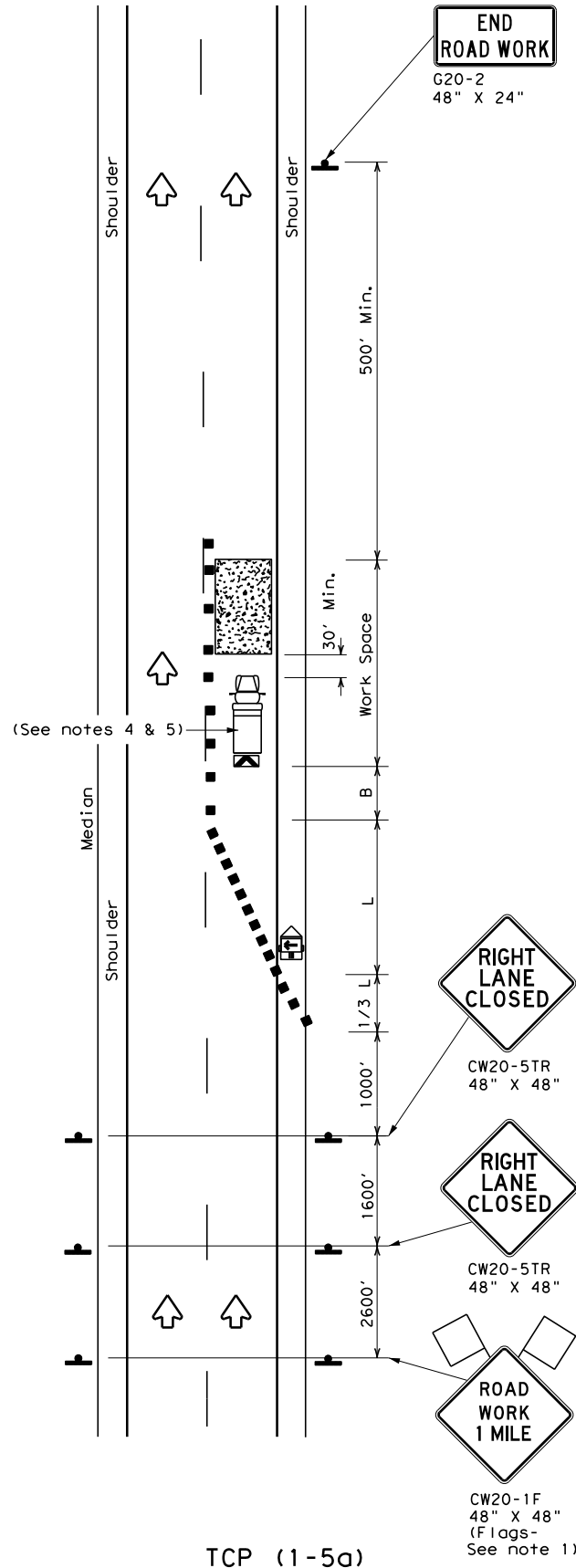
TREATMENT FOR VARIOUS EDGE CONDITIONS

© TxDOT August 2000		DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
REVISIONS					
CONT	SECT	JOB	HIGHWAY		
0389	13	039	SH 146		
DIST		COUNTY	SHEET NO.		
HOU		HARRIS	85		

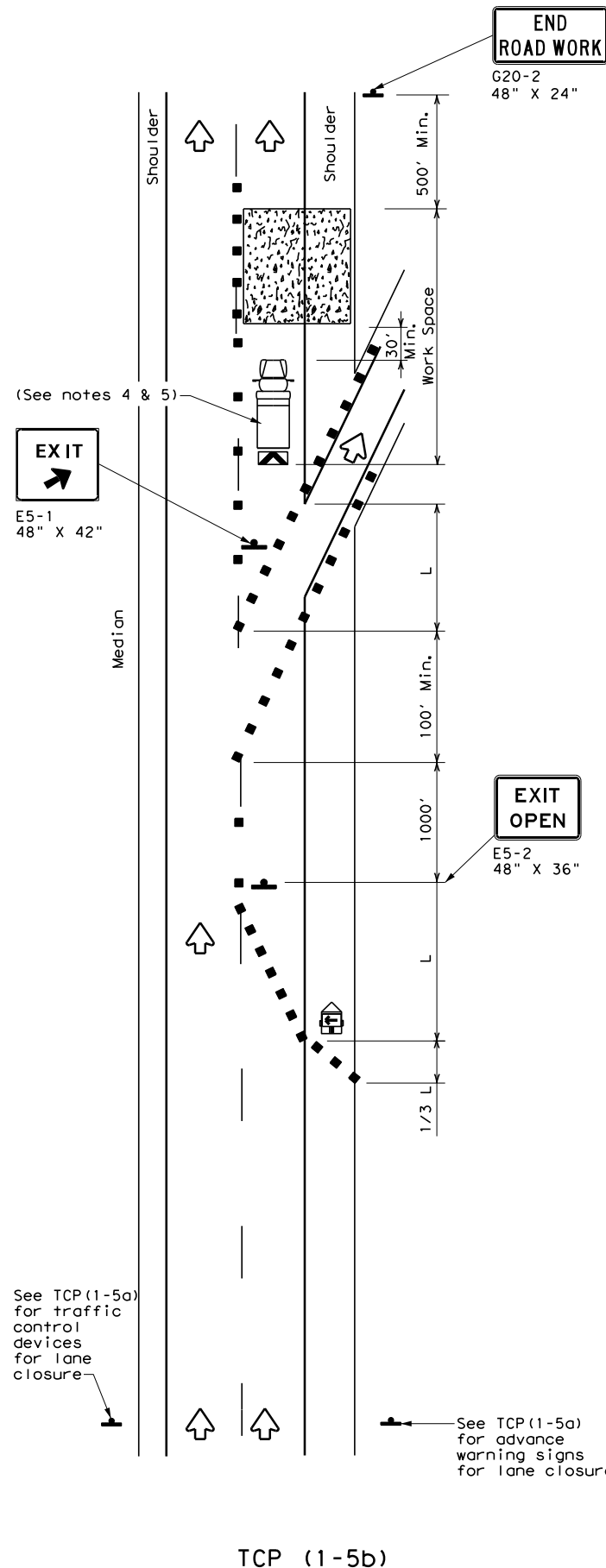
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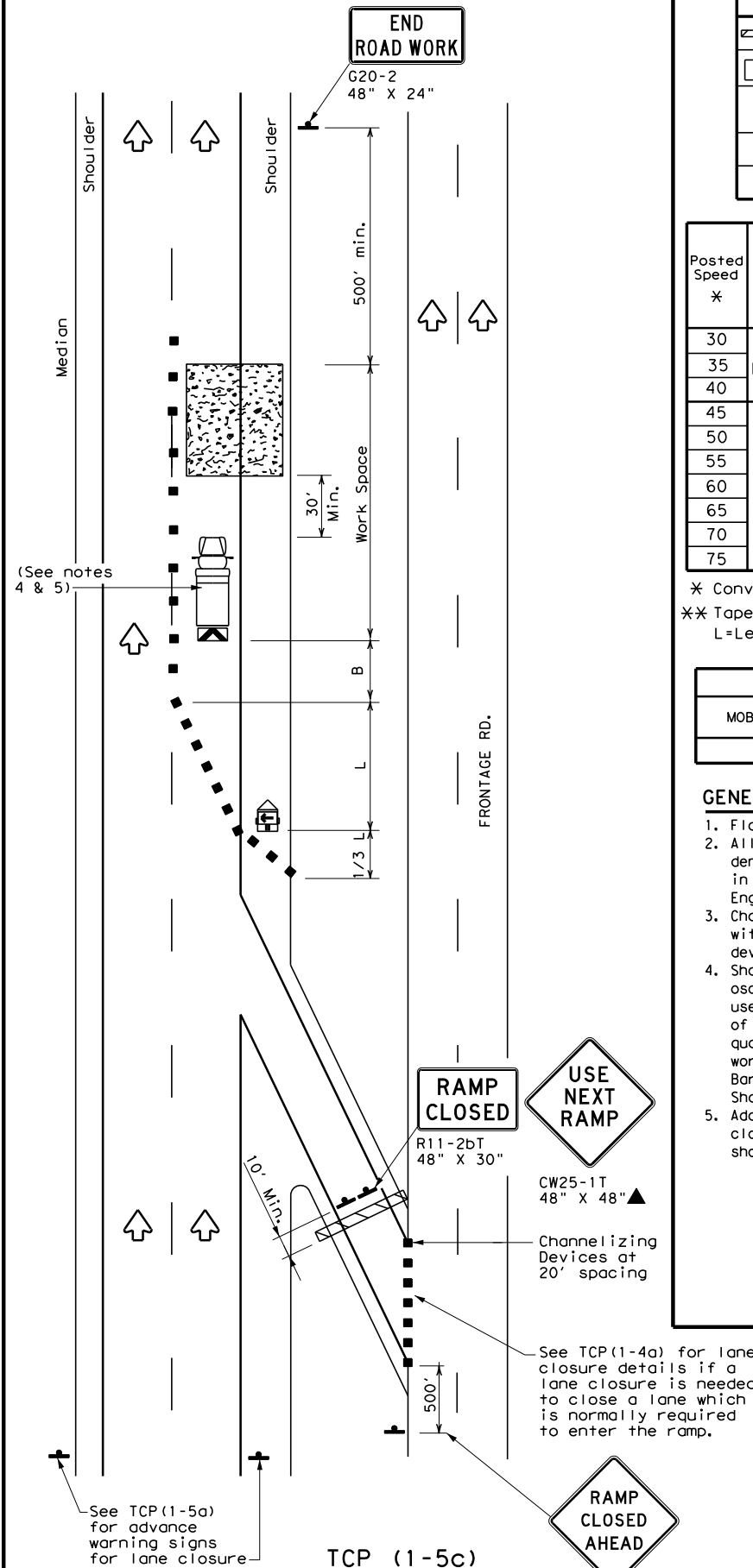
DATE:
FILE:



TCP (1-5a)
ONE LANE CLOSURE



TCP (1-5b)
LANE CLOSURE NEAR EXIT RAMP



TCP (1-5c)
LANE CLOSURE NEAR ENTRANCE RAMP

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

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

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

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

- GENERAL NOTES**
- Flags attached to signs where shown, are REQUIRED.
 - 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.
 - Channelizing devices used to close lanes may be supplemented with the Chevron Alignment Sign placed on every other channelizing device. Chevrons may be attached to plastic drums as per BC Standards.
 - 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.
 - Additional Shadow Vehicles with TMAs may be positioned in each closed lane, on the shoulder or off the paved surface, next to those shown in order to protect a wider work space.

Texas Department of Transportation
 Traffic Operations Division Standard

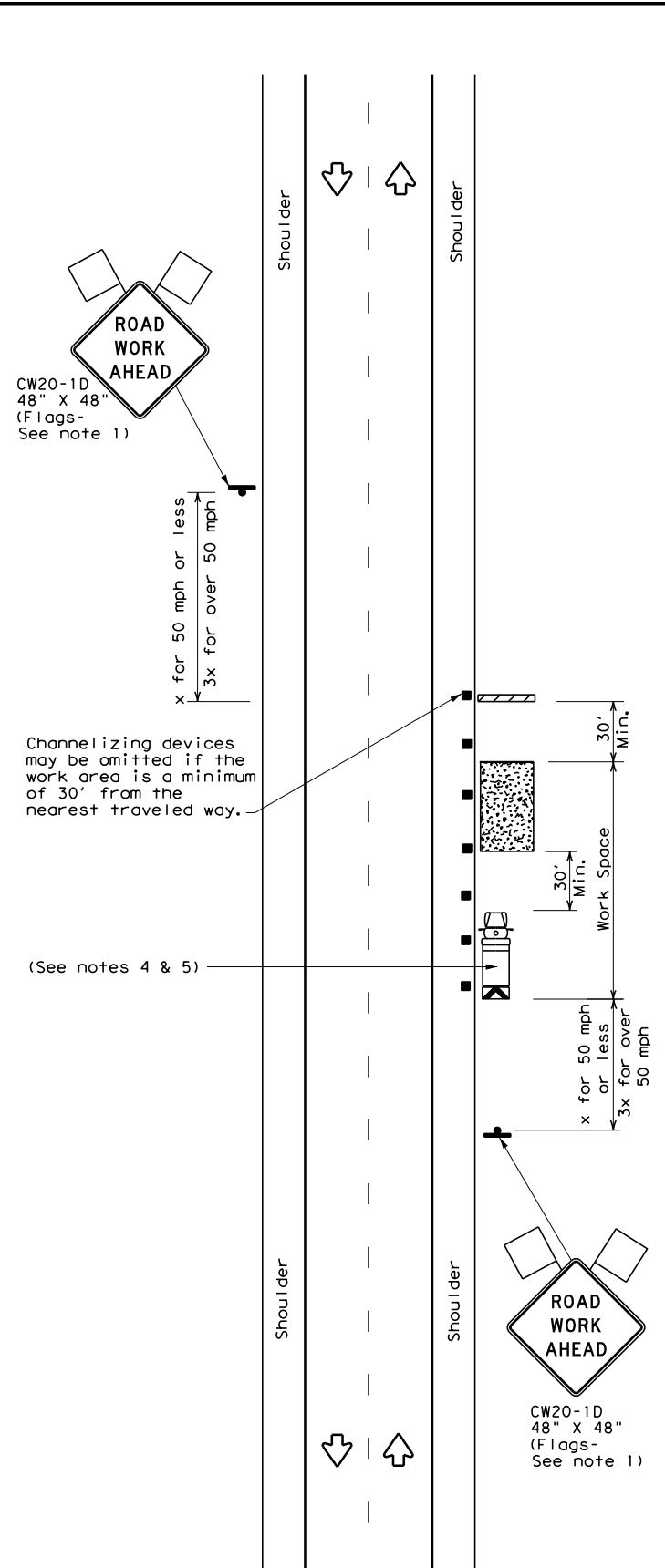
**TRAFFIC CONTROL PLAN
 LANE CLOSURES FOR
 DIVIDED HIGHWAYS**

TCP (1-5) - 18

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© TxDOT February 2012	CON:	SECT:	JOB:	HIGHWAY:
2-18	0389	13	039	SH 146
	DIST:	COUNTY:	SHEET NO.	
	HOU	HARRIS	86	

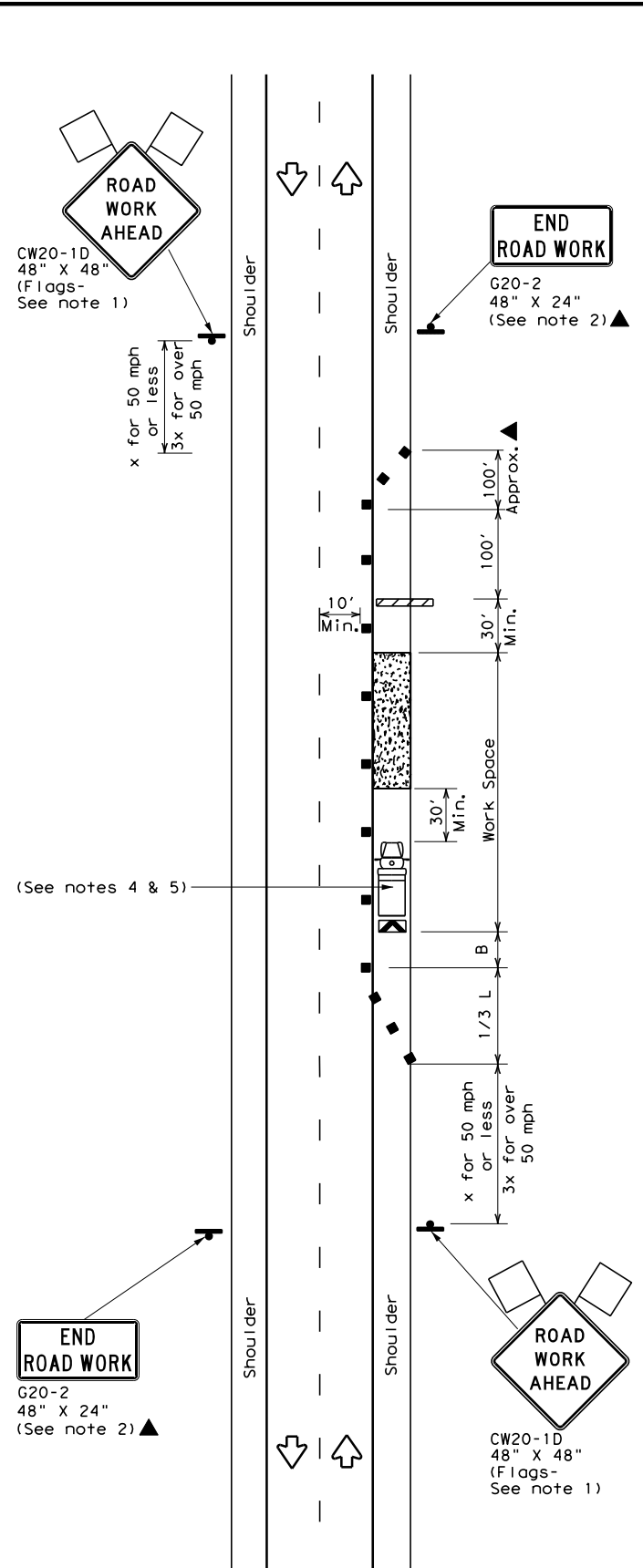
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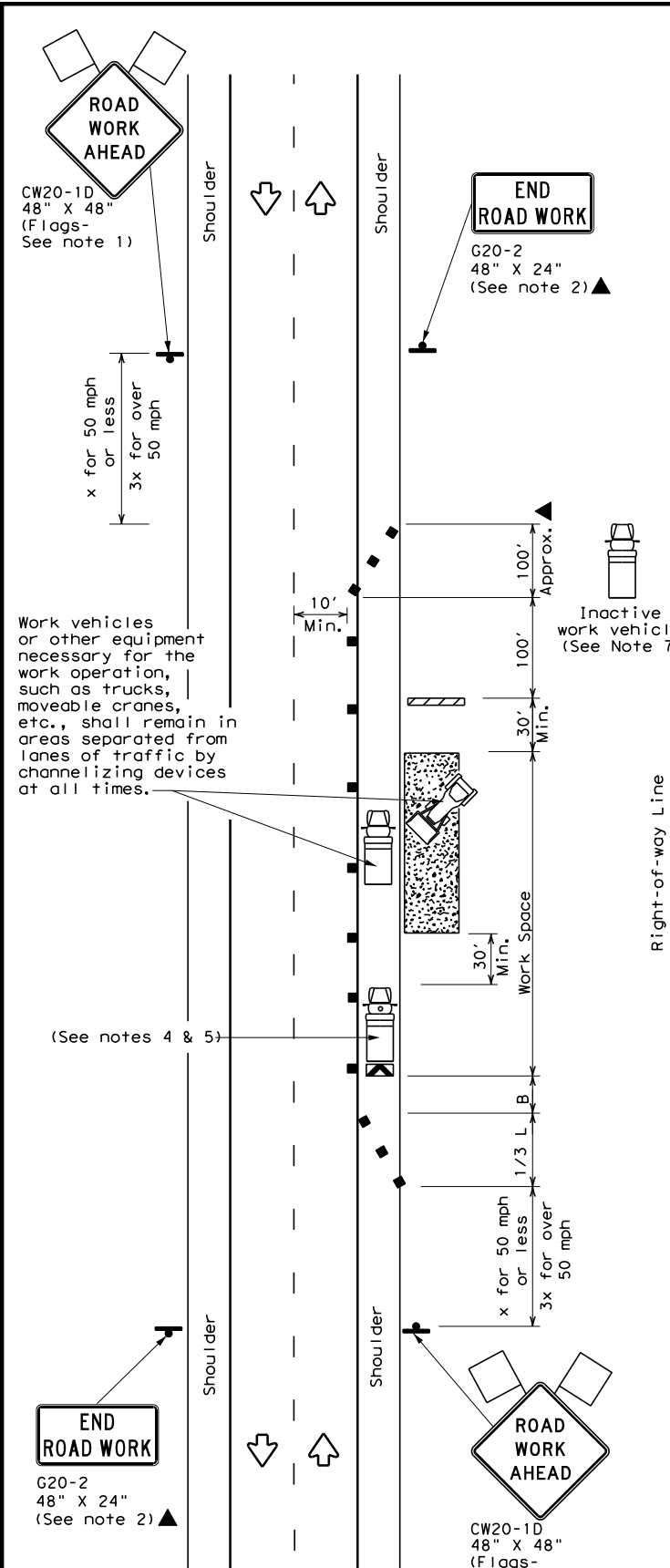
TCP (2-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (2-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (2-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

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

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

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

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

- GENERAL NOTES**
- Flags attached to signs where shown, are REQUIRED.
 - 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.
 - Stockpiled material should be placed a minimum of 30 feet from nearest traveled way.
 - 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.
 - Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect a wider work space.
 - See TCP(5-1) for shoulder work on divided highways, expressways and freeways.
 - Inactive work vehicles or other equipment should be parked near the right-of-way line and not parked on the paved shoulder.
 - CW21-5 "SHOULDER WORK" signs may be used in place of CW20-1D "ROAD WORK AHEAD" signs for shoulder work on conventional roadways.



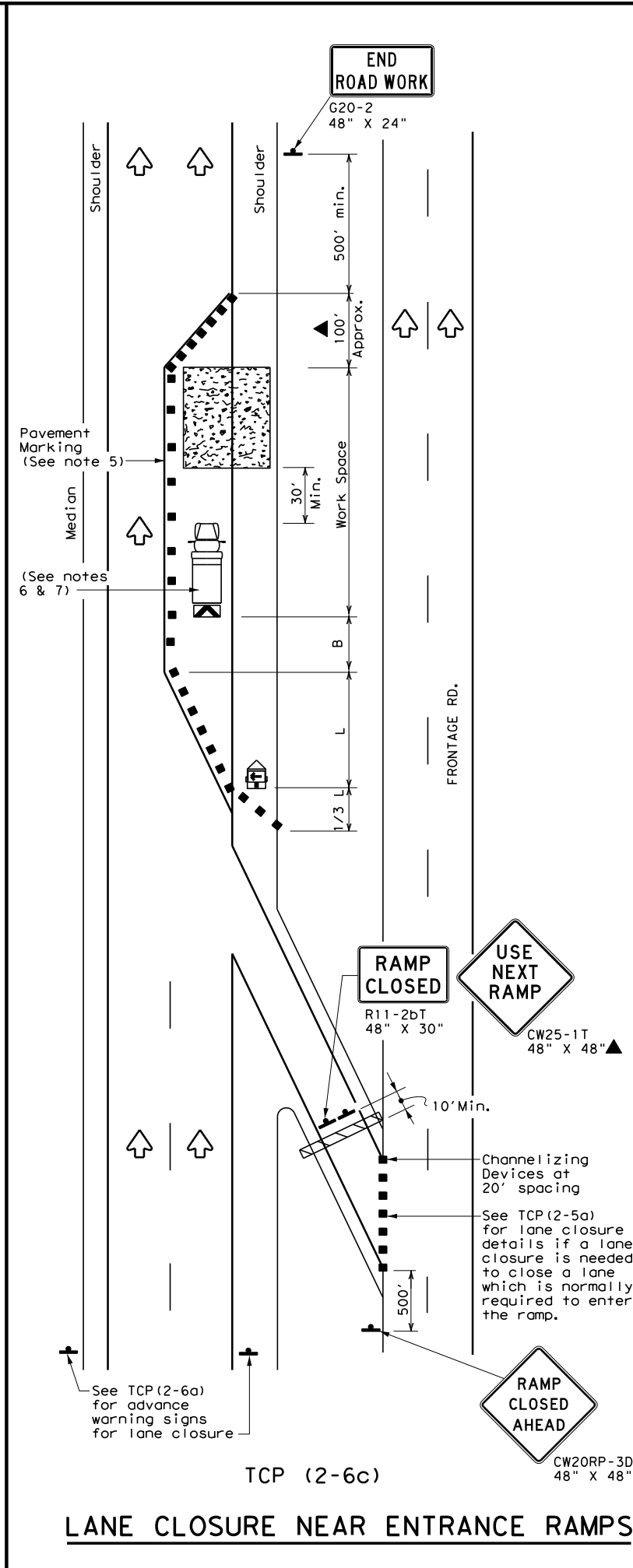
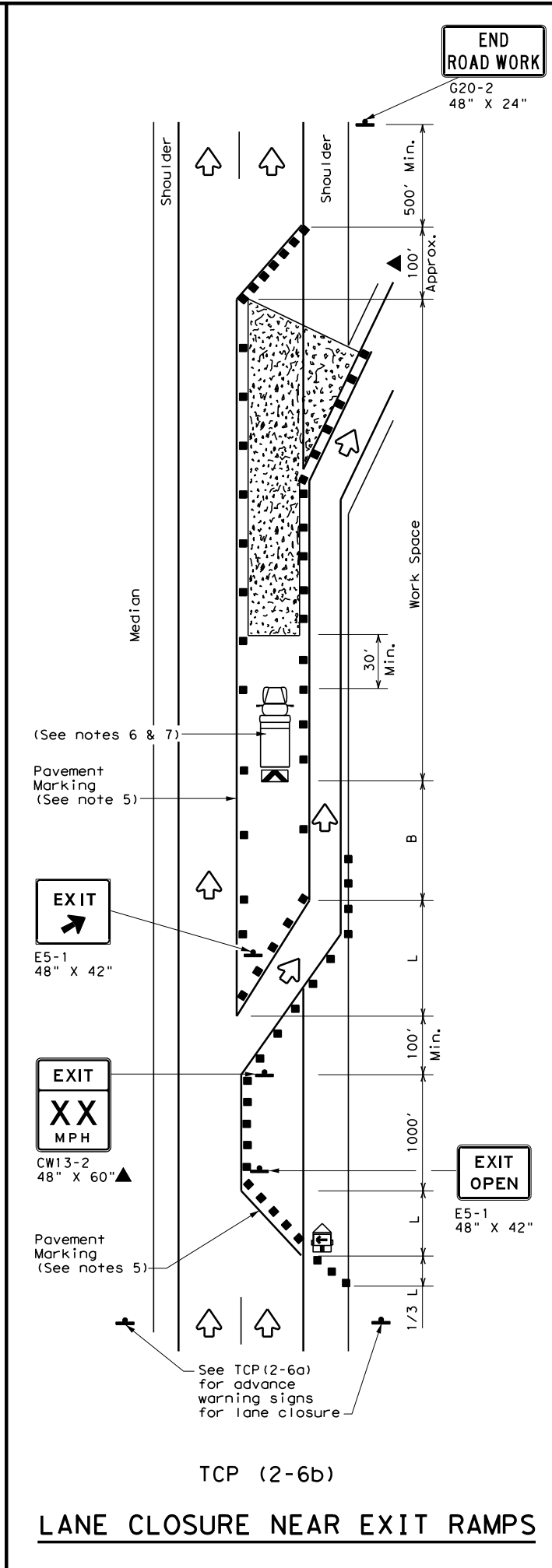
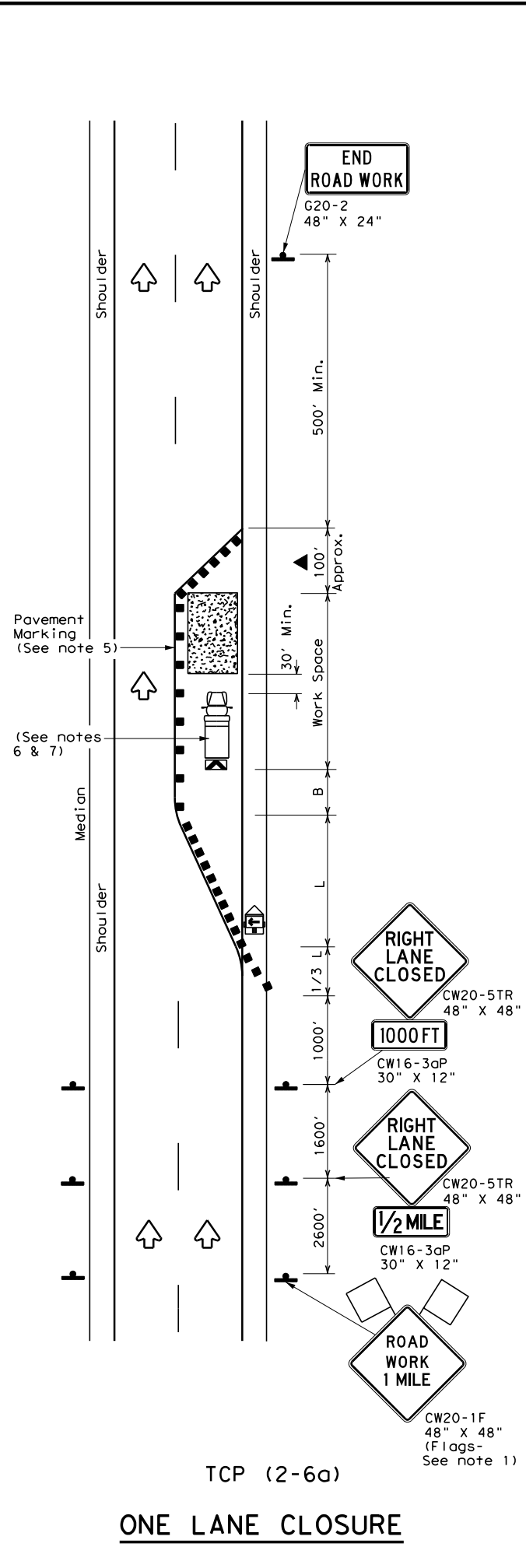
TRAFFIC CONTROL PLAN
CONVENTIONAL ROAD
SHOULDER WORK

TCP (2-1) - 18

FILE: tcp2-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CON:	SECT:	JOB:	HIGHWAY:
REVISIONS	0389	13	039	SH 146
2-94 4-98	DIST:	COUNTY:	SHEET NO.:	
8-95 2-12	HOU:	HARRIS	87	
1-97 2-18				

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DATE: FILE:



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

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

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

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

- GENERAL NOTES**
- Flags attached to signs where shown, are REQUIRED.
 - 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.
 - Channelizing devices used to close lanes may be supplemented with the Chevron Alignment Sign placed on every other channelizing device. Chevrons may be attached to plastic drums as per BC Standards.
 - Channelizing devices used along the work space or along tangent sections may be supplemented with vertical panels (VP) placed on every other channelizing device. If night time conditions make it difficult to see at least two VPs, the VPs may be placed on each channelizing device.
 - The placement of pavement markings may be omitted on intermediate-term stationary work zones with the approval of the Engineer.
 - 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.
 - Additional Shadow Vehicles with TMAs may be positioned in each closed lane, on the shoulder or off the paved surface, next to those shown in order to protect a wider work space.

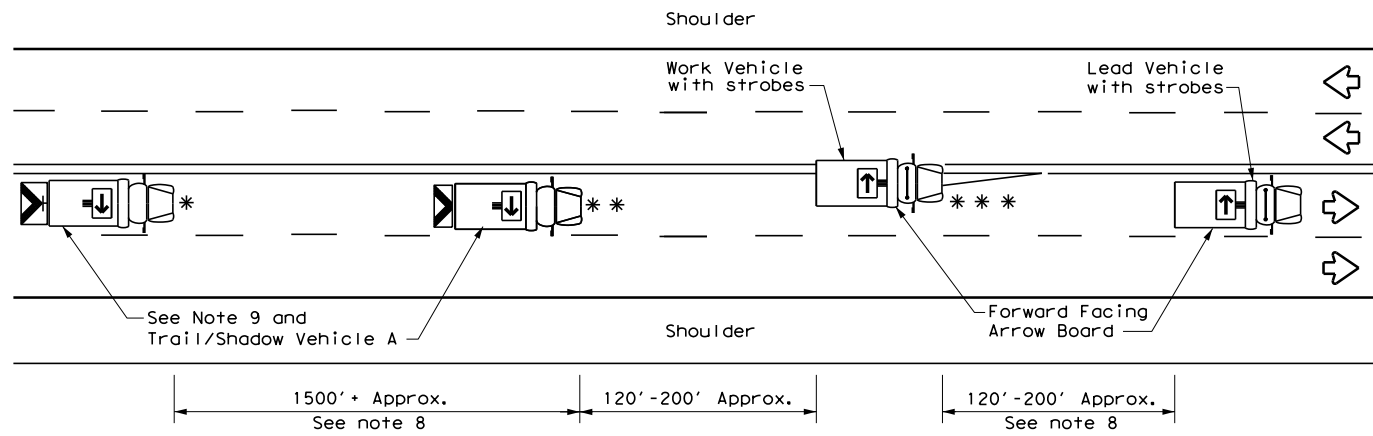
Texas Department of Transportation
 Traffic Operations Division Standard

**TRAFFIC CONTROL PLAN
LANE CLOSURES ON
DIVIDED HIGHWAYS**

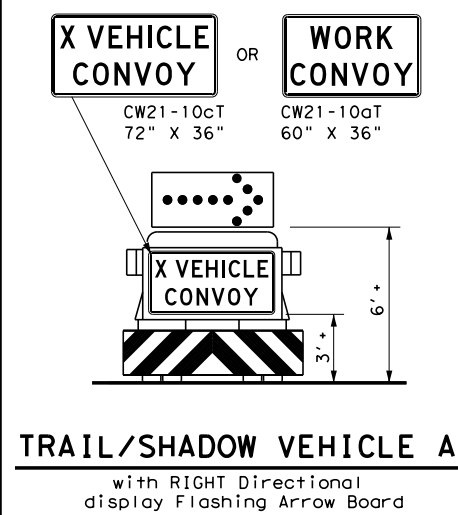
TCP (2-6) - 18

FILE: tcp2-6-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CON:	SECT:	JOB:	HIGHWAY:
REVISIONS	0389	13	039	SH 146
2-94 4-98	DIST:	COUNTY:	SHEET NO.	
8-95 2-12	HOU	HARRIS	88	
1-97 2-18				

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TCP (3-1a)
UNDIVIDED MULTILANE ROADWAY



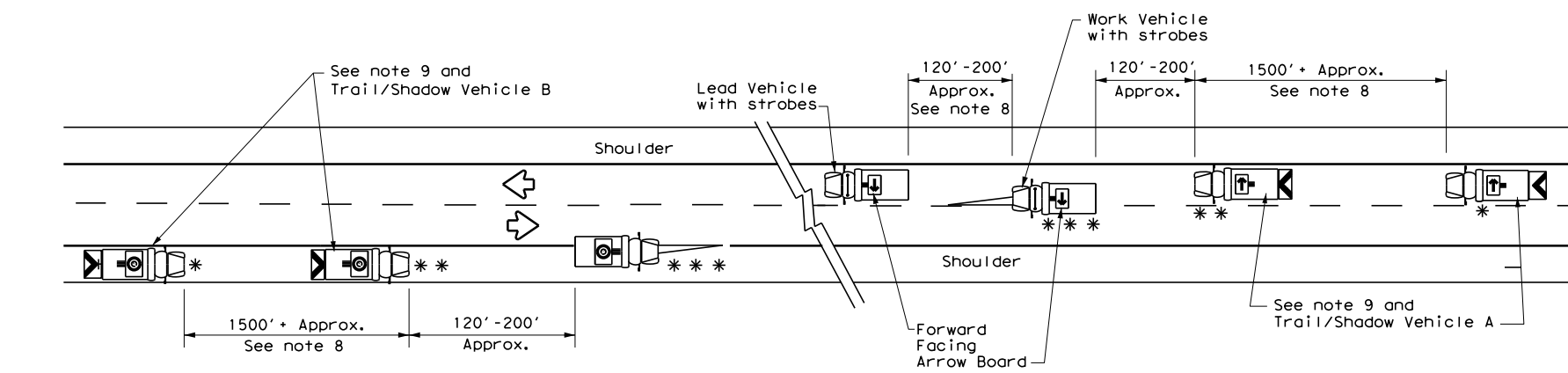
TRAIL/SHADOW VEHICLE A
with RIGHT Directional display Flashing Arrow Board

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)

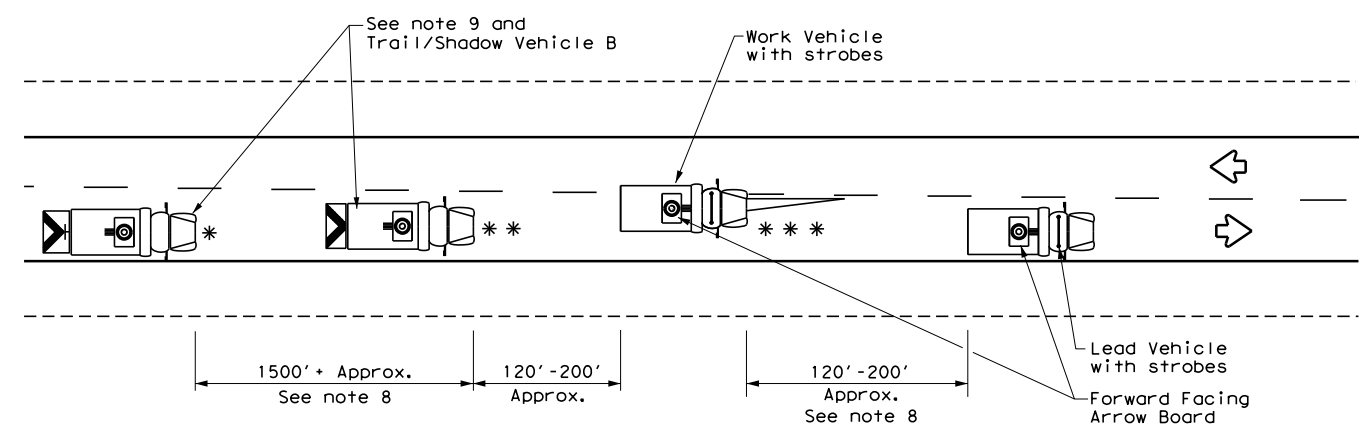
TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
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GENERAL NOTES

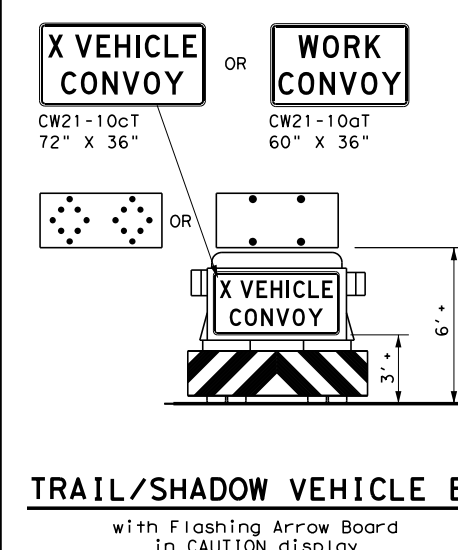
- TRAIL, SHADOW, and LEAD vehicles shall be equipped with arrow boards as illustrated. When a LEAD vehicle is not used the WORK vehicle must be equipped with an arrow board. The Engineer will determine if the LEAD VEHICLE and/or TRAIL VEHICLE are required based on prevailing roadway conditions, traffic volume, and sight distance restrictions.
- 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.
- The use of truck mounted attenuators (TMA) on the SHADOW VEHICLE and TRAIL VEHICLE are required.
- 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.
- 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.
- Each vehicle shall have two-way radio communication capability.
- When work convoys must change lanes, the TRAIL VEHICLE should change lanes first to shadow the other convoy vehicles.
- 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.
- "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.
- 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.



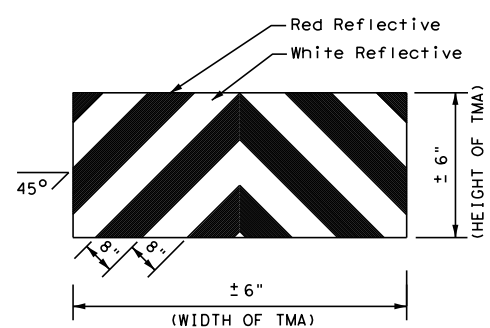
TCP (3-1b)
TWO-WAY ROADWAY WITH PAVED SHOULDERS



TCP (3-1c)
TWO-WAY ROADWAY WITHOUT PAVED SHOULDERS



TRAIL/SHADOW VEHICLE B
with Flashing Arrow Board in CAUTION display



STRIPING FOR TMA



TRAFFIC CONTROL PLAN
MOBILE OPERATIONS
UNDIVIDED HIGHWAYS

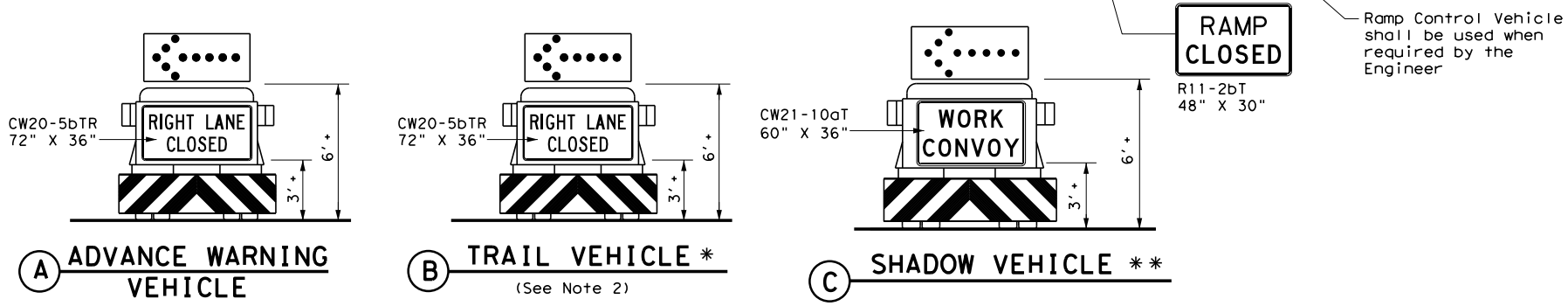
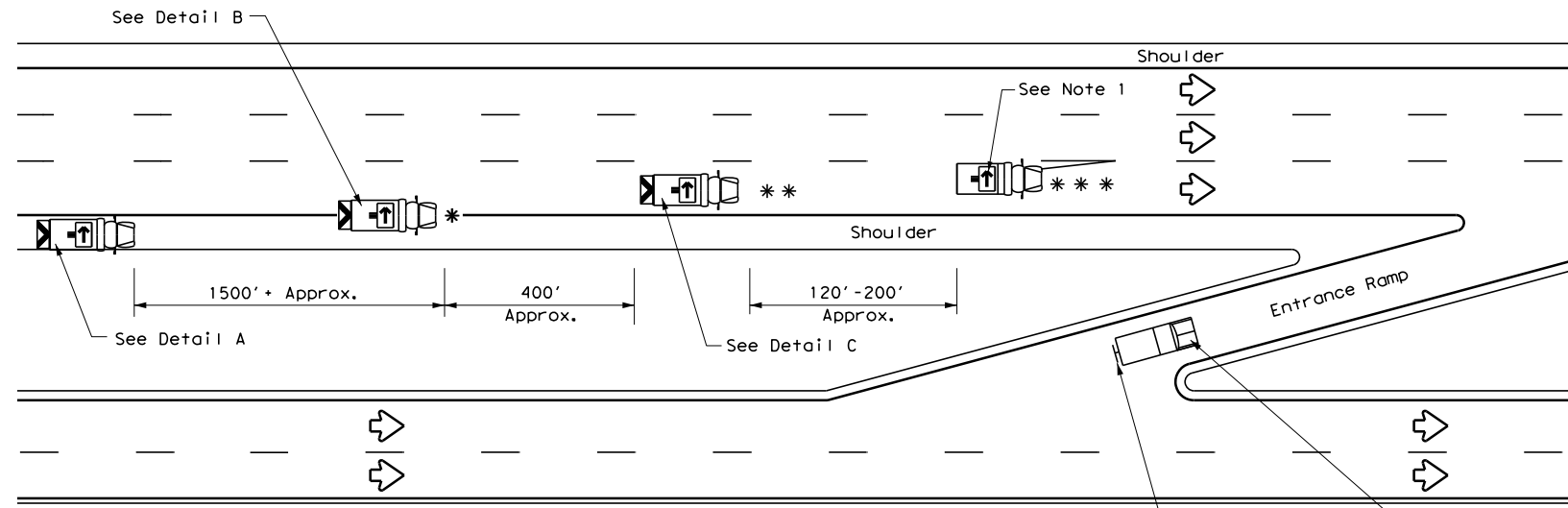
TCP (3-1) - 13

FILE:	tcp3-1.dgn	DN:	TxDOT	CK:	TxDOT	DW:	TxDOT	CK:	TxDOT
© TxDOT	December 1985	CONT	SECT	JOB	HIGHWAY				
REVISIONS		0389	13	039	SH 146				
2-94	4-98	DIST	COUNTY		SHEET NO.				
8-95	7-13	HOU	HARRIS		89				
1-97									

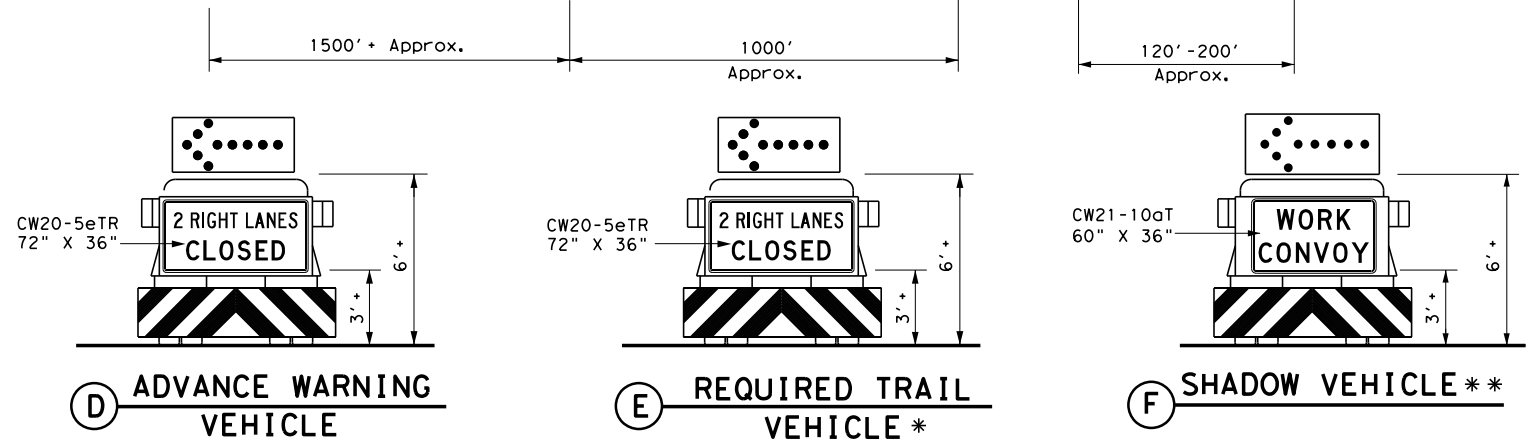
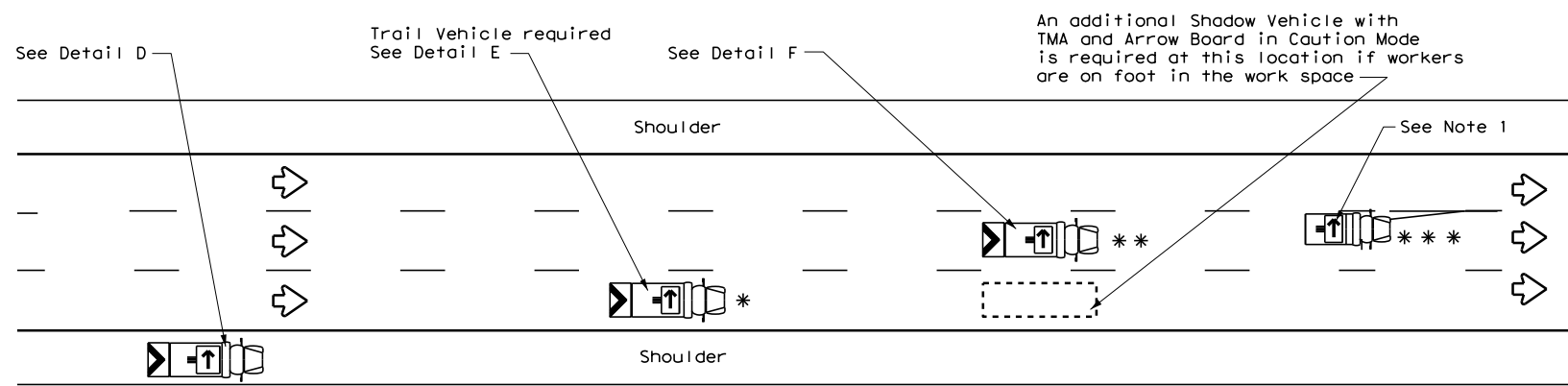
DATE: FILE:

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DATE: FILE:



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



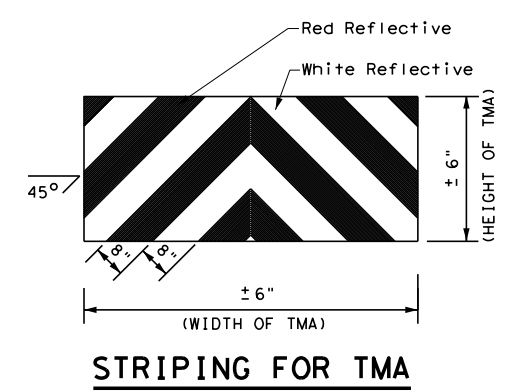
INTERIOR LANE CLOSURE ON MULTI-LANE DIVIDED HIGHWAY - TCP(3-2b)

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

- ADVANCE WARNING, TRAIL and SHADOW vehicles shall be equipped with Type B or Type C flashing arrow boards as per the Barricade and Construction (BC) standards. Arrow boards on WORK vehicles will be optional based on the type of work being performed. The arrow boards shall be operated from inside the vehicle.
- For TCP(3-2a) the Engineer will determine if the TRAIL VEHICLE is required based on prevailing roadway conditions, traffic volume, and sight distance restrictions. All other vehicles shown for both TCP(3-2a) and TCP(3-2b) are required.
- 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.
- The use of truck mounted attenuators (TMA) on the ADVANCE WARNING, SHADOW, and TRAIL vehicles are required.
- Reflective sheeting on the rear of the TMA shall meet or exceed the reflectivity and color requirements of DMS 8300, Type A.
- Each vehicle shall have two-way radio communication capability.
- When work convoys must change lanes, the TRAIL VEHICLE should change lanes first to shadow the other convoy vehicles.
- Vehicle spacing between the TRAIL VEHICLE and the SHADOW VEHICLE will vary depending on sight distance restrictions. Motorists approaching the work convoy should be able to see the TRAIL VEHICLE in time to slow down and/or change lanes as they approach the TRAIL VEHICLE. Vehicle spacing between the WORK VEHICLE and SHADOW VEHICLE may vary according to terrain, work activity and other factors.
- Standard 48" X 48" diamond shaped warning signs with the same message as those shown may be used where adequate mounting space exists.
- The signs shown should be used on the Advance Warning Vehicle. As an option, a portable changeable message sign (PCMS) or a truck mounted changeable message sign (TMCMS) with a minimum character height of 12", and displaying the same legend may be substituted for these signs. An appropriate directional arrow display, simulating the size and legibility of the flashing arrow board, must be used in the second phase of the PCMS/TMCMS message. When this is done, the arrow board will not be required on the Advance Warning Vehicle.
- Standard diamond shape versions of the CW20-5 series signs may be used as an option if the rectangular signs shown are not available.
- The principles on this sheet may be used to close lanes from the left side of the roadway considering the number of lanes, shoulder width, sight distance, and ramp frequency.
- Signs and flashing arrow board modes shall be appropriately altered when implementing left lane closures or interior closures which close the left lanes.
- The Advance Warning Vehicle may straddle the edgeline when shoulder width makes it necessary.

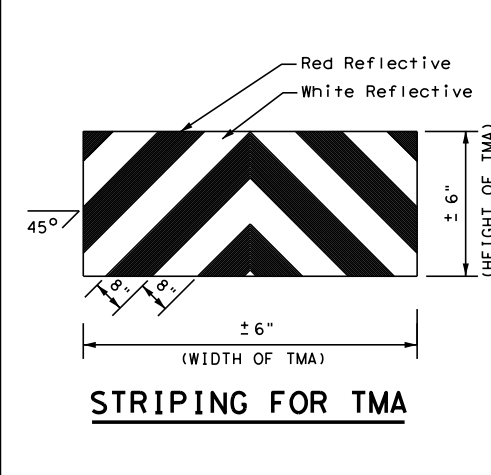
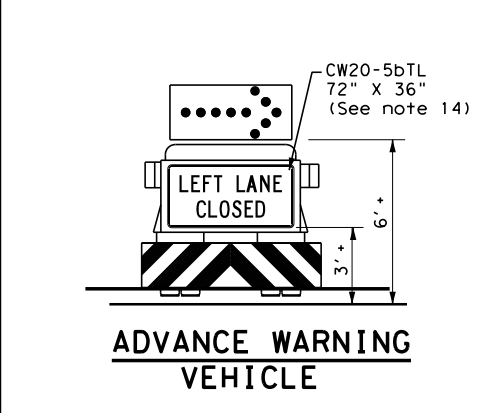
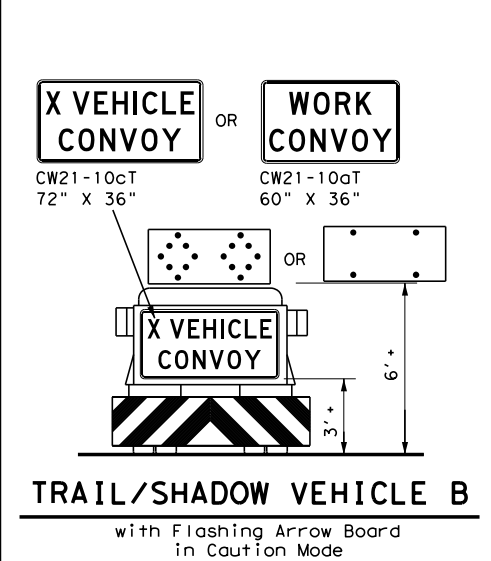
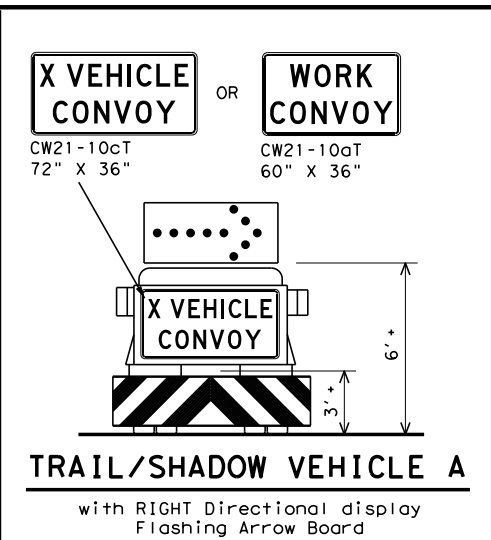
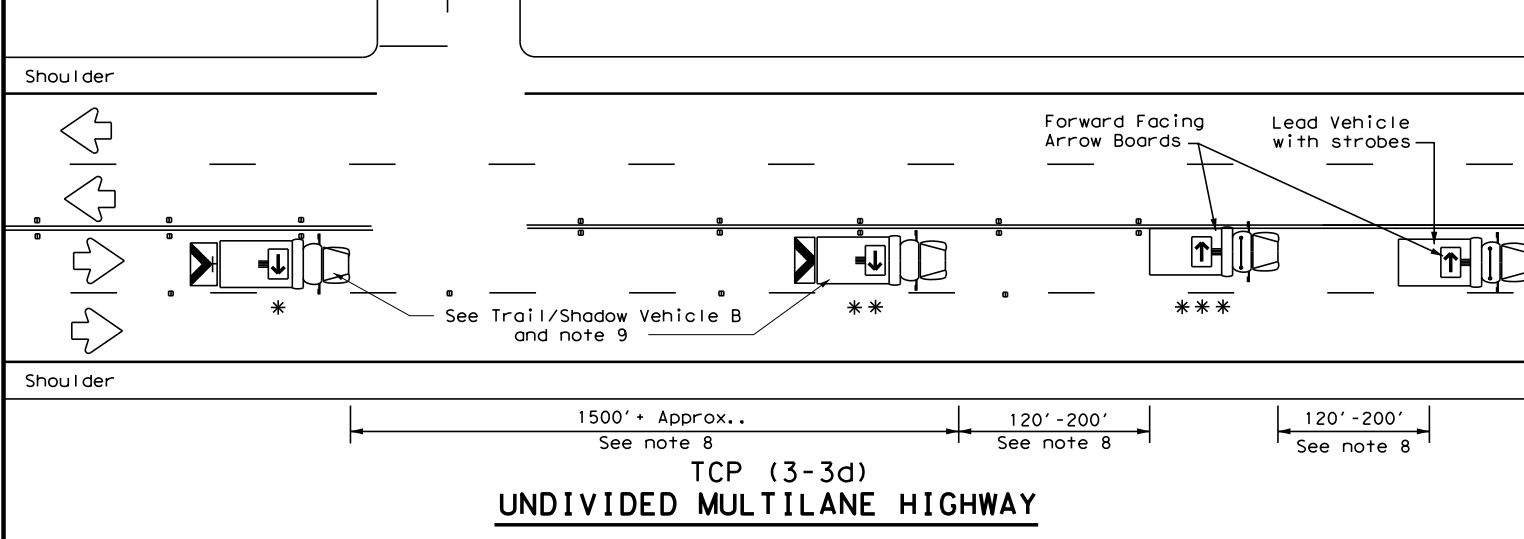
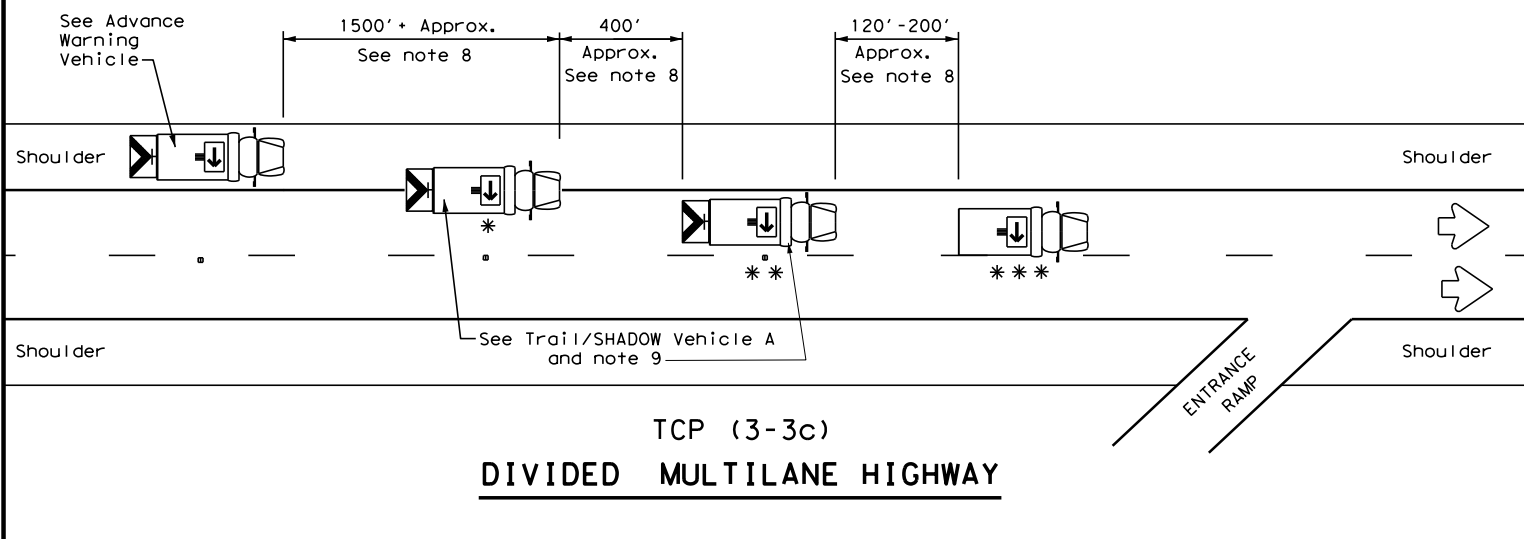
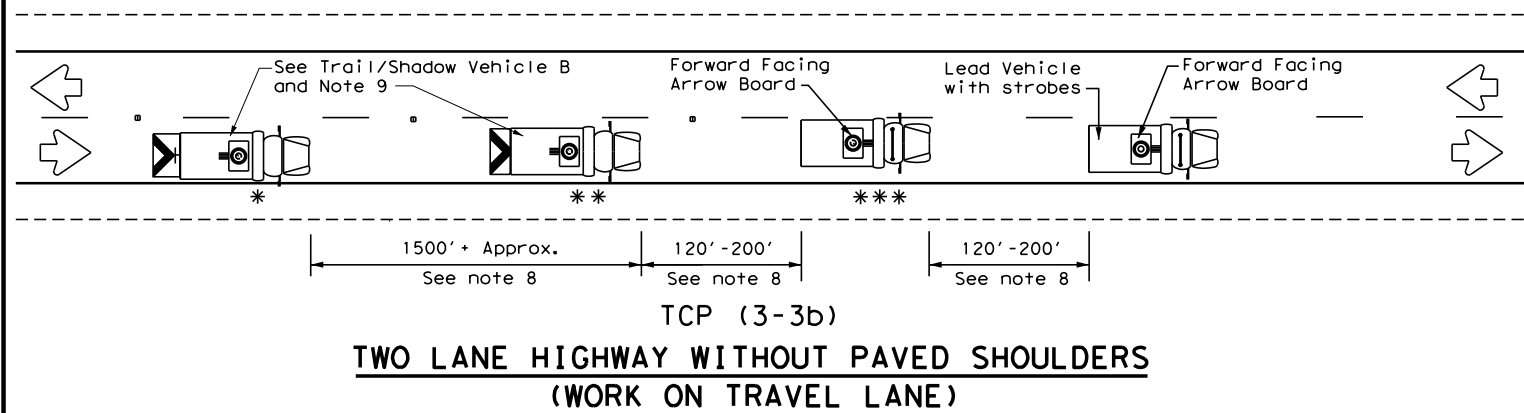
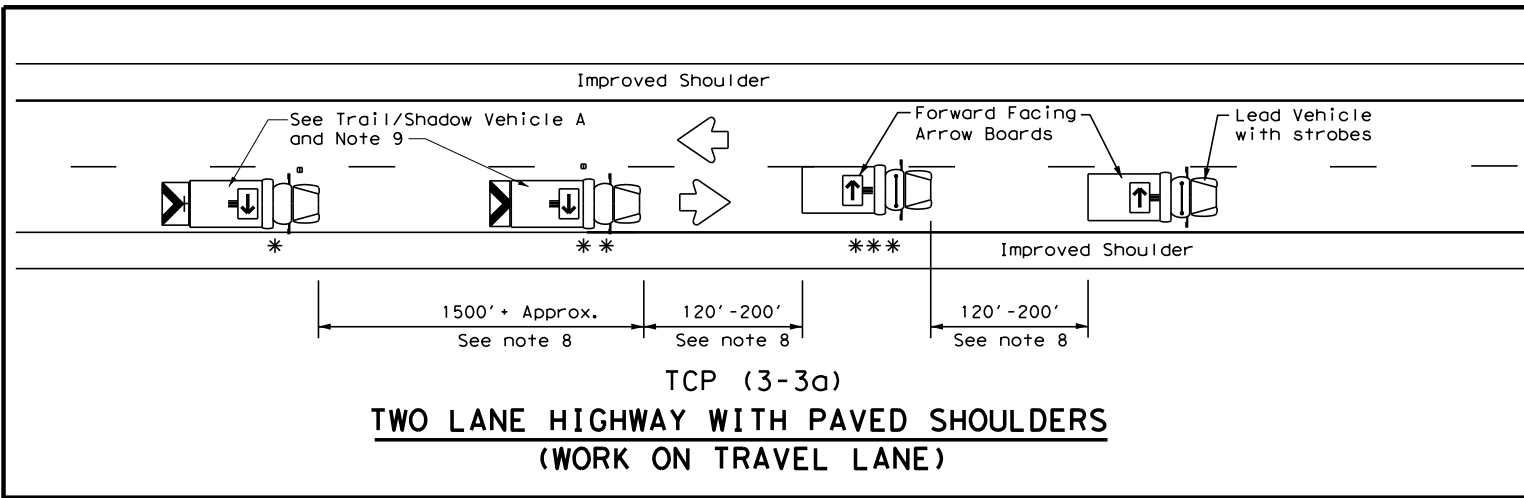


STRIPING FOR TMA

		Traffic Operations Division Standard	
TRAFFIC CONTROL PLAN MOBILE OPERATIONS DIVIDED HIGHWAYS			
TCP(3-2)-13			
FILE: tcp3-2.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
© TxDOT December 1985	CONT	SECT	JOB
REVISIONS	0389	13	039
2-94 4-98			
8-95 7-13			
1-97			
	DIST	COUNTY	SHEET NO.
	HOU	HARRIS	90

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DATE: FILE:



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
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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.

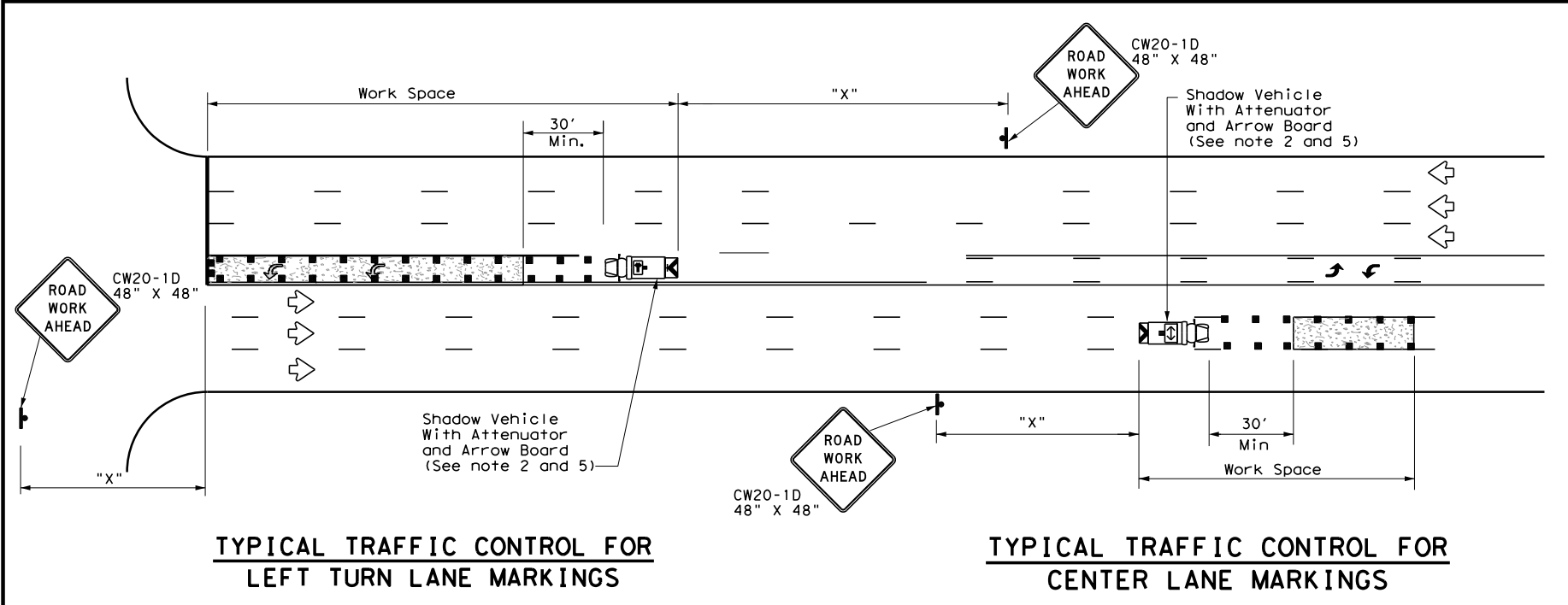
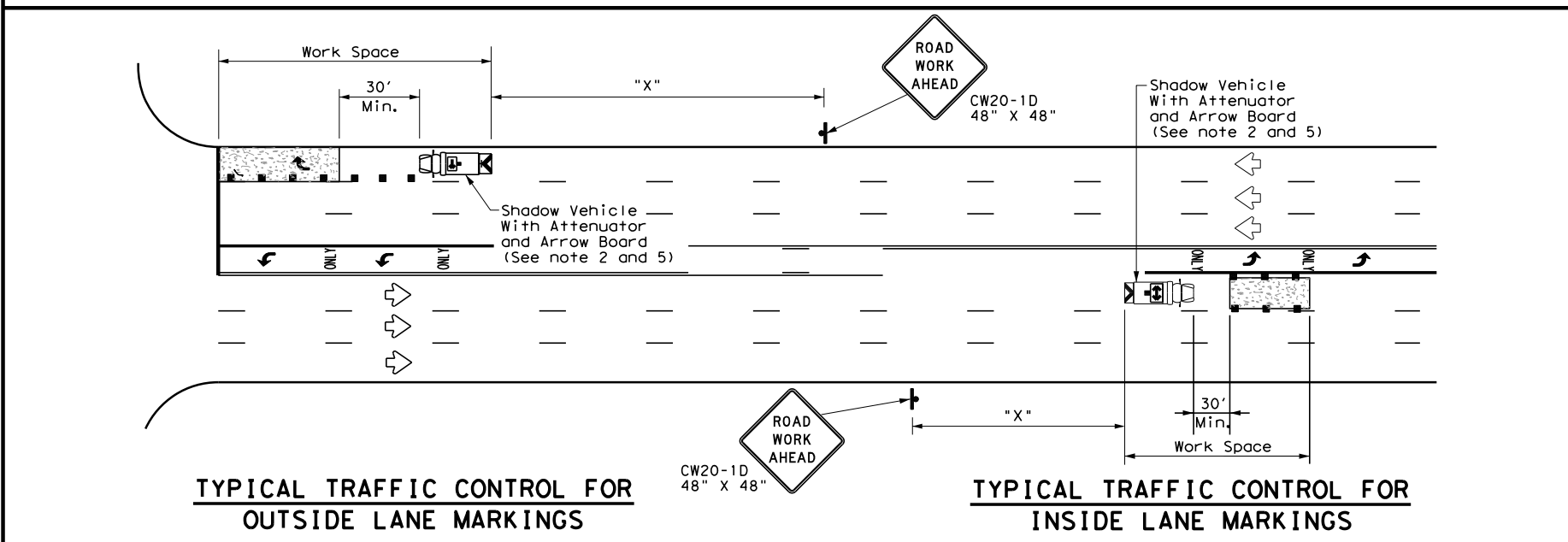
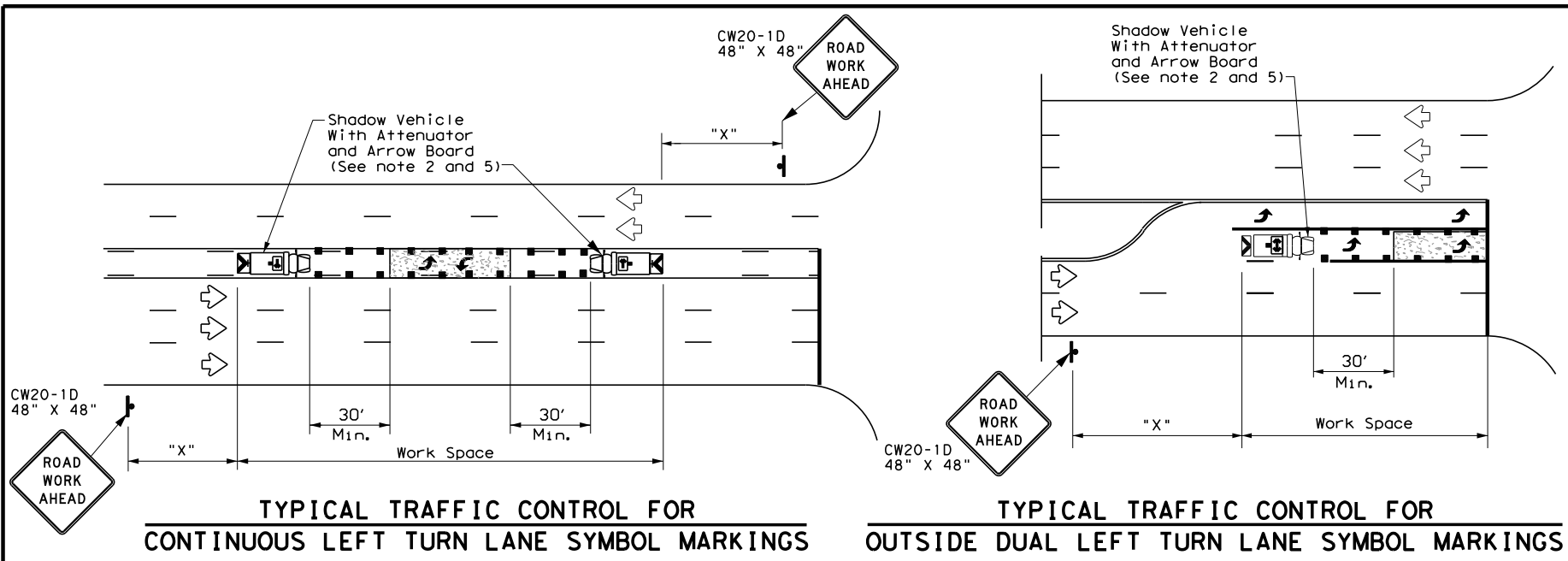
Texas Department of Transportation

**TRAFFIC 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	0389	13	039	SH 146
2-94 4-98	DIST	COUNTY	SHEET NO.	
8-95 7-13	HOU	HARRIS	91	
1-97 7-14				

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DATE: FILE:



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	Channelizing Devices

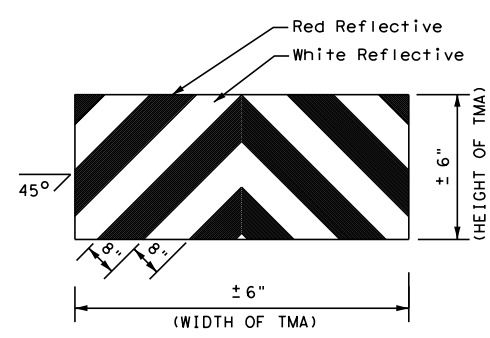
Posted Speed *	Formula	Minimum Desirable Taper Lengths **			Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent		
30	L = WS ² / 60	150'	165'	180'	30'	60'	120'	90'
35		205'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

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

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

GENERAL NOTES

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



Texas Department of Transportation
 Traffic Operations Division Standard

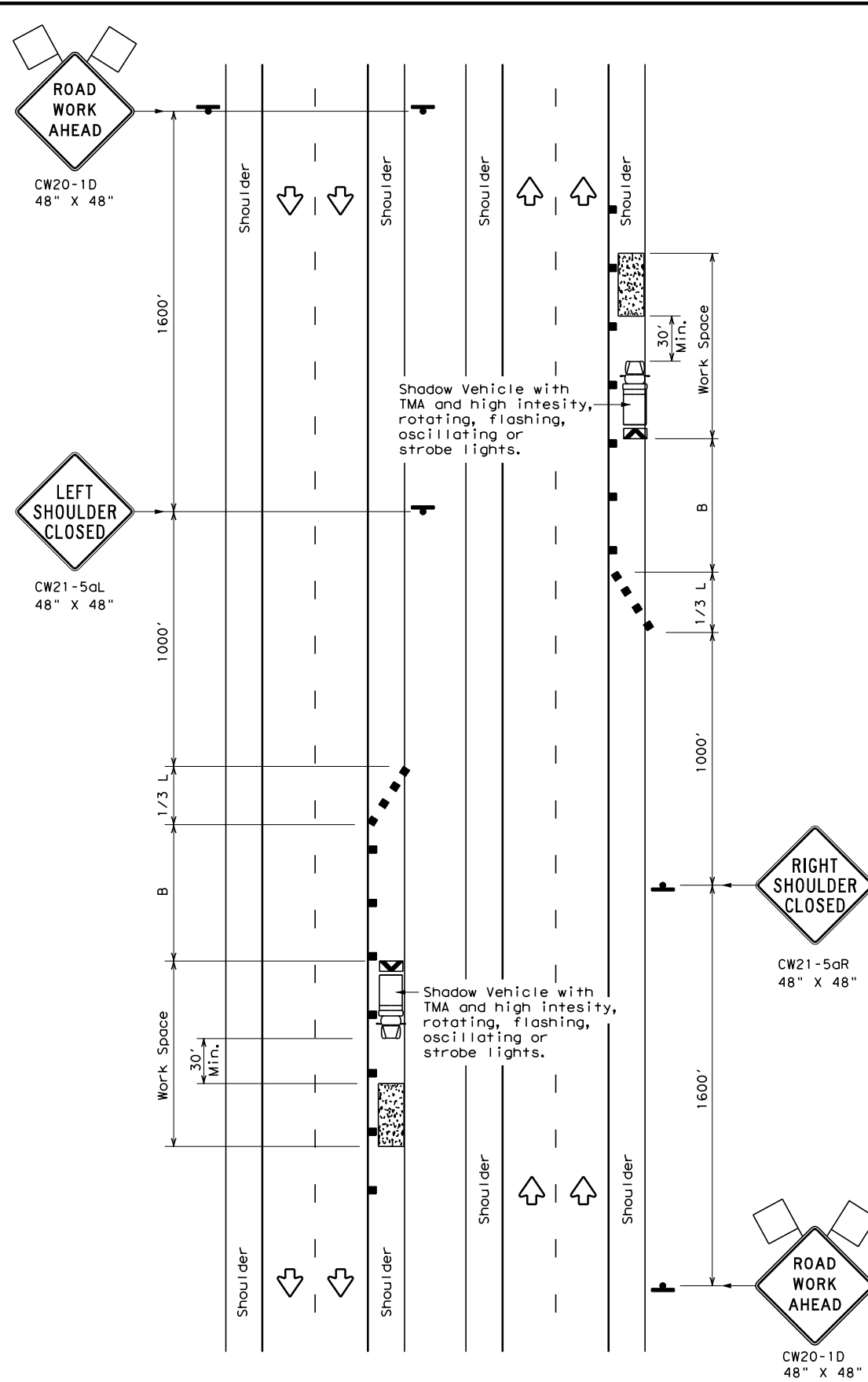
**TRAFFIC CONTROL PLAN
 MOBILE OPERATIONS FOR
 ISOLATED WORK AREAS
 UNDIVIDED HIGHWAYS**

TCP (3-4) - 13

FILE: tcp3-4.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT July, 2013	CONT: 0389	SECT: 13	JOB: 039	HIGHWAY: SH 146
REVISIONS	DIST: HOU	COUNTY: HARRIS	SHEET NO.: 92	

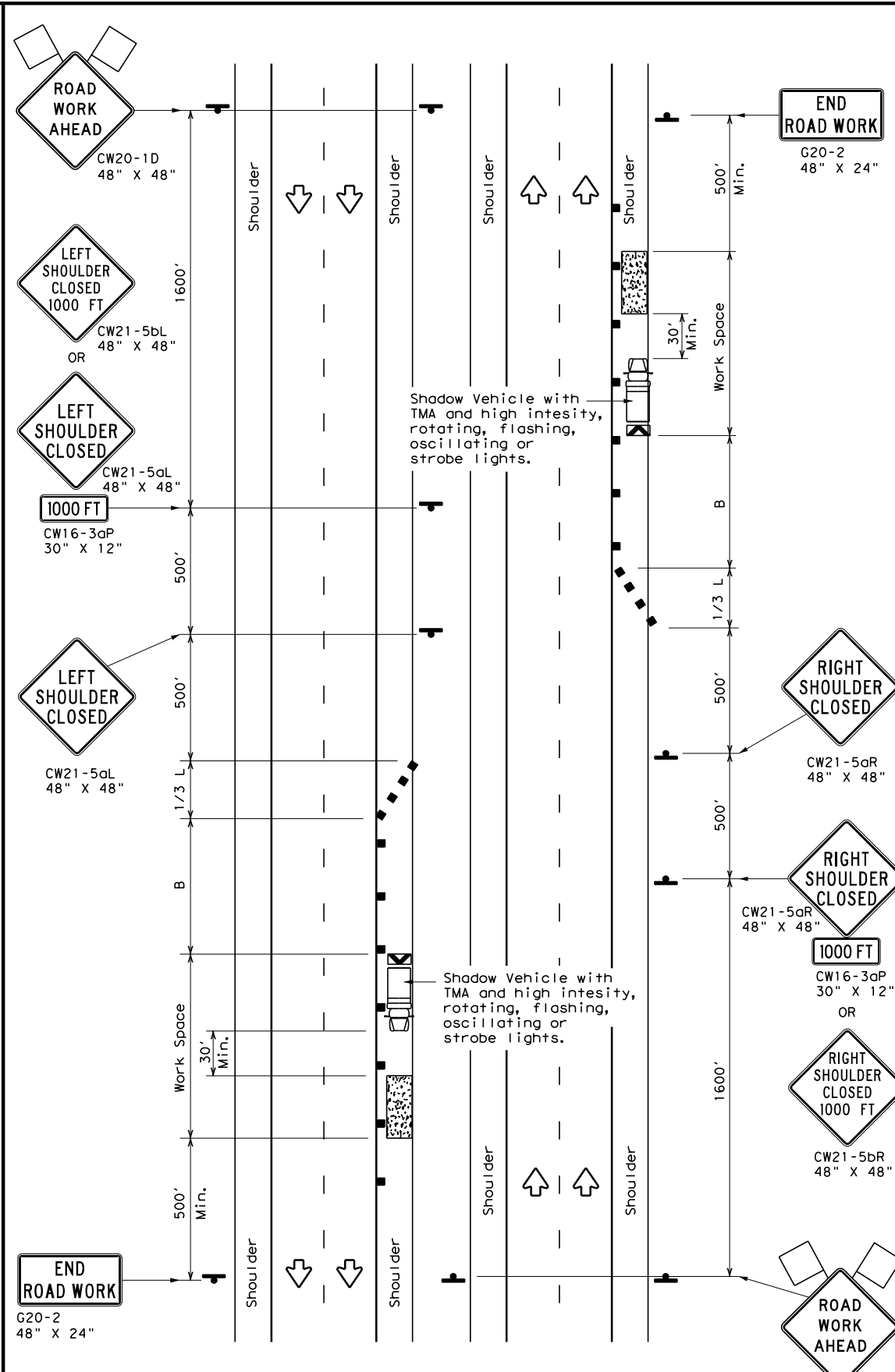
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DATE:
FILE:



TCP (5-1a)

WORK AREA ON SHOULDER



TCP (5-1b)

WORK AREA ON SHOULDER

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

Posted Speed *	Formula	Minimum Desirable Taper Lengths **			Suggested Maximum Spacing of Channelizing Devices		Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent	
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60'	90'
35		205'	225'	245'	35'	70'	120'
40		265'	295'	320'	40'	80'	155'
45	L = WS	450'	495'	540'	45'	90'	195'
50		500'	550'	600'	50'	100'	240'
55		550'	605'	660'	55'	110'	295'
60		600'	660'	720'	60'	120'	350'
65		650'	715'	780'	65'	130'	410'
70		700'	770'	840'	70'	140'	475'
75		750'	825'	900'	75'	150'	540'
80		800'	880'	960'	80'	160'	615'

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

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	TCP (5-1a)	TCP (5-1b)	TCP (5-1b)	

GENERAL NOTES

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



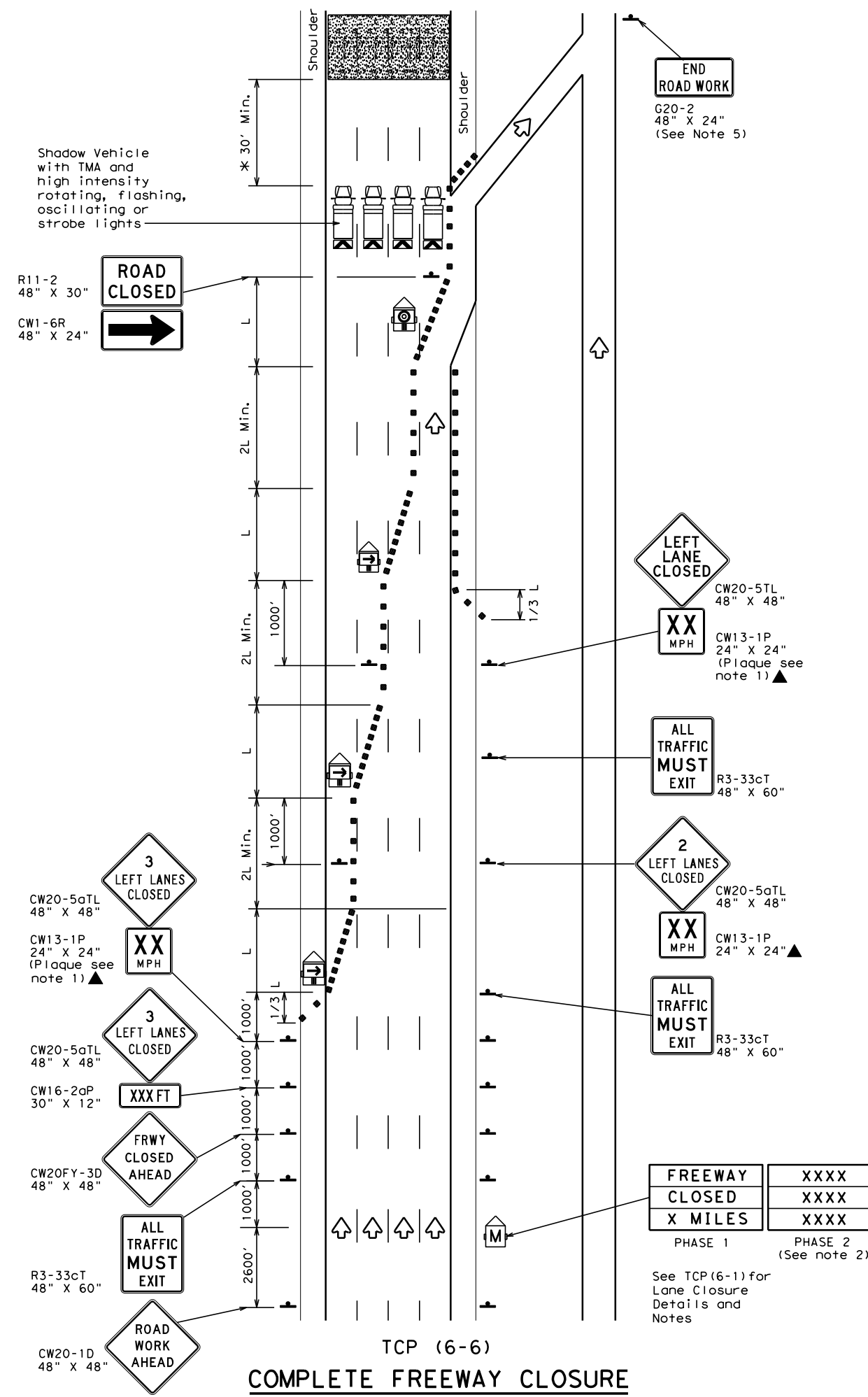
**TRAFFIC CONTROL PLAN
 SHOULDER WORK FOR
 FREEWAYS / EXPRESSWAYS**

TCP (5-1) - 18

FILE: tcp5-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT February 2012	CONT	SECT	JOB	HIGHWAY
2-18	REVISIONS	0389	13	039
	DIST	COUNTY	SHEET NO.	
	HOU	HARRIS	93	

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

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

XX 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**
- All traffic control devices illustrated are REQUIRED. Devices denoted with the triangle symbol may be omitted when stated elsewhere in the plans.
 - Phase 2 of the PCMS message should include appropriate information formatted as shown on BC(6), such as "MERGE RIGHT," recommended speed, delay, exit information, or other specific warnings.
 - Where queuing is anticipated beyond signing shown, additional PCMS signs, other warning signs, devices or Law Enforcement Officers should be available to warn approaching high speed traffic of the end of the queue, as directed by the Engineer.
 - Entrance ramps located from the advance warning area to the exit ramp should be closed whenever possible.
 - The END ROAD WORK (G20-2) sign may be omitted when it conflicts with G20-2 signs already in place on the project.

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

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

Texas Department of Transportation
Traffic Operations Division Standard

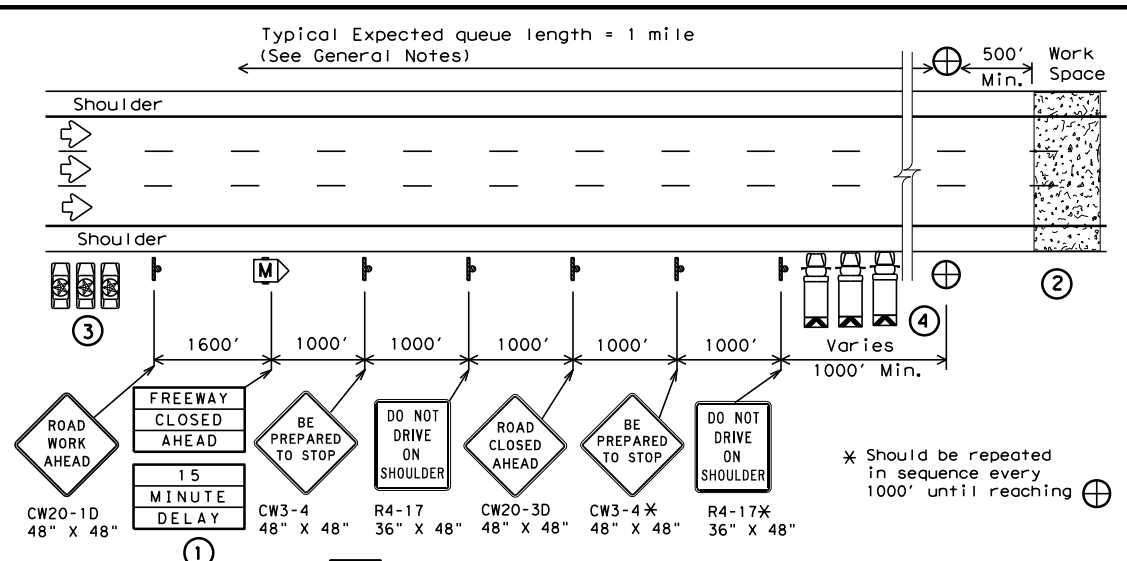
TRAFFIC CONTROL PLAN FREEWAY CLOSURE

TCP (6-6) - 12

FILE: tcp6-6.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1994	CONT	SECT	JOB	HIGHWAY
REVISIONS	0389	13	039	SH 146
1-97 8-98	DIST	COUNTY	SHEET NO.	
4-98 8-12	HOU	HARRIS	94	

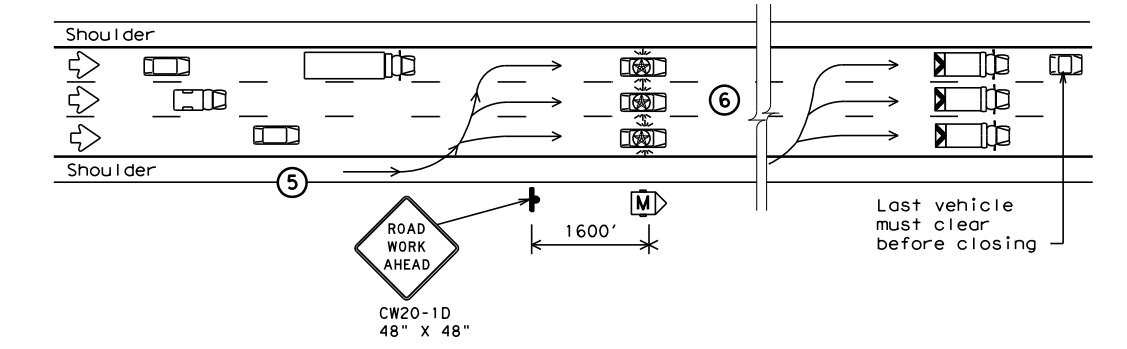
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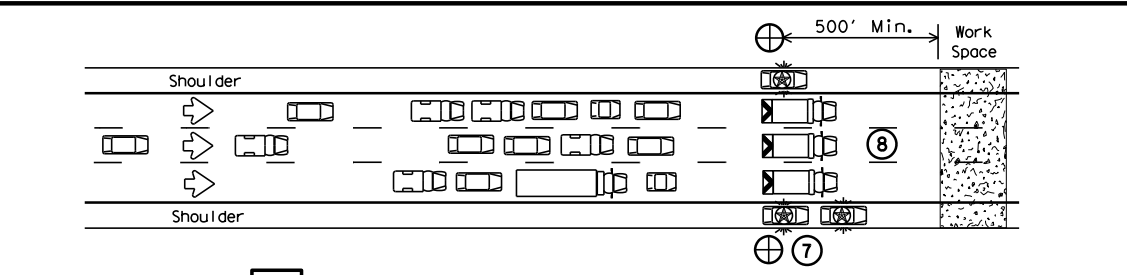
1 STARTING POSITION

- ① Traffic control devices should be installed or located near their intended position prior to beginning temporary roadway closure sequence. Duplicate signs should be erected on the median side of the roadway when median width permits. Warning signs should not be placed on the paved shoulders that will be used by the WARNING LEOV, or where movement of the LEOVs or barrier vehicles will be impeded.
- ② Prior to beginning the roadway closure sequence, all equipment, materials, personnel, and other items necessary to complete the work should be gathered near the work area. Entrance ramps located in the area where a queue is expected to build should be closed.
- ③ There should be one LEOV for every lane to be controlled, plus a minimum of one to warn traffic approaching a queue. An additional lead law enforcement officer is desirable to remain with the Engineer's or Contractor's point of contact (POC) during the operation in order to improve communication with all LEOVs involved.
- ④ One barrier vehicle with a Truck Mounted Attenuator and amber or blue and amber high intensity flashing/oscillating/strobe lighting shall be used for each lane to be closed.



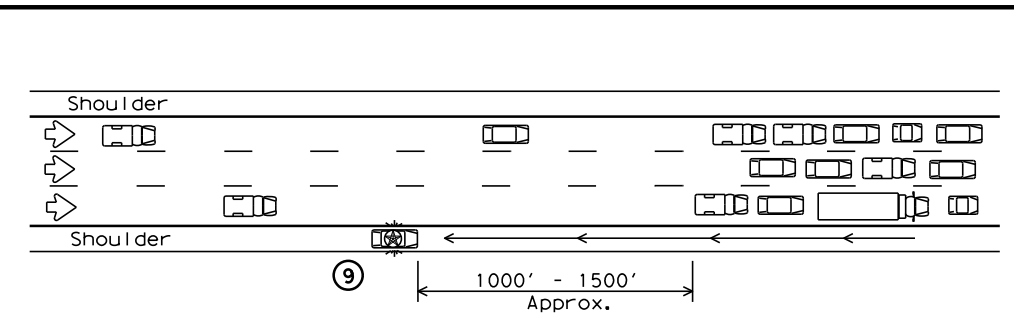
2 REDUCING SPEED OPERATION

- ⑤ Starting position of the LEOVs should be in advance of the most distant warning signs.
- ⑥ Once the LEOVs have achieved an abreast blocking formation while traveling toward the CP, emergency lights and headlights should be turned "ON". The LEOVs should maintain formation, not allow traffic to pass, and begin to decelerate. The LEOVs should continue to decelerate, giving the barrier vehicles opportunity to be staged upstream of the work space after traffic has cleared. The LEOVs should then continue to decelerate slowly until bringing traffic to a stop near the barrier vehicles.



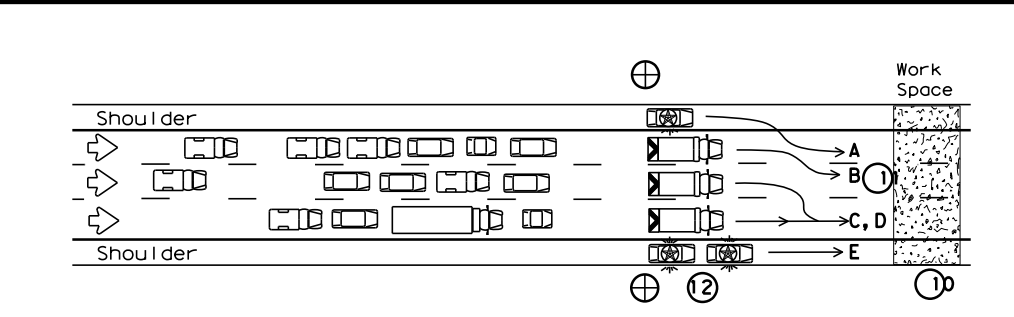
3 ALL TRAFFIC STOPPED AT CP

- ⑦ Once traffic is stopped the LEOVs should park on the shoulders with emergency lighting "ON" in order to provide law enforcement presence at the closure and keep shoulders blocked ahead of the work space. They should stay in radio contact with the WARNING LEOV.
- ⑧ The barrier vehicles should be parked, one in each lane, the parking brake set, with the high visibility flashing/oscillating/strobe lighting "ON," and the transmission in gear.



4 WARNING THE TRAFFIC QUEUE

- ⑨ The WARNING LEOV should proceed to the right shoulder of the roadway, with emergency lights on approximately 1000' in advance of the traffic queue (stopped traffic) as the queue develops. When determined that limited sight distance situations (crest of hills, sharp roadway curvature, etc.) may occur to motorists approaching the queue, the WARNING LEOV may proceed 1/4 mile or more in advance of the queue.



5 RELEASING STOPPED TRAFFIC

- ⑩ All equipment, materials, personnel, and other items should be removed from the roadway and maintain an adequate clear zone.
- ⑪ When the roadway is clear for traffic, the LEOV should proceed forward from the left shoulder followed by the barrier vehicles, from left to right, as shown alphabetically in the plan view.
- ⑫ The LEOV or LEOVs on the right shoulder may remain on the shoulder until satisfied that traffic is moving satisfactorily before merging or proceeding.
- ⑬ LEOVs and barrier vehicles should re-group at their respective starting positions if necessary.

LEGEND			
■ ■	Channelizing Devices	⊕	Control Position (CP)
M	Portable Changeable Message Sign (PCMS)	⊠	Barrier Vehicle with Truck Mounted Attenuator
Ⓜ	Law Enforcement Officer's Vehicle (LEOV)	←	Traffic Flow

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

GENERAL NOTES

1. All traffic control devices shall conform with the latest edition of the Texas Manual on Uniform Traffic Control Devices (TMUTCD). Additional guidelines for traffic control devices may be found in the TMUTCD. Signs conflicting with the roadway closure sequence should be completely removed or covered. Additional traffic control devices may be required for closure of access roads, cross streets, exit and entrance ramps as directed by the Engineer.
2. Law enforcement officers and all workers involved should review and understand all procedures before the roadway closure sequence begins. Pre-work meetings may be held for this purpose. Local emergency services and media should have advance notification of roadway closure, expected dates and approximate times of closures.
3. Law enforcement officers shall be in uniform and have jurisdiction in the locale of the work area. An additional WARNING Law Enforcement Officer's Vehicle (LEOV) may be used on the median side of the roadway where median shoulder width permits (See sequence #9).
4. The roadway closure should be during off-peak hours, as shown in the plans, or as directed by the Engineer.
5. Work should be limited to approximately 15 minutes maximum duration unless otherwise directed by the Engineer based on existing roadway conditions. If the work is not complete within 15 minutes, or if the end of the traffic queue extends past the most distant advance warning signs, the work area should be cleared of all equipment, materials, personnel, and other items, and the roadway reopened. When the queue has dissipated and the traffic flow appears normal the roadway closure sequence may be repeated.
6. For traffic volumes greater than 1000 Passenger Cars Per Hour Per Lane (PCPHPL), or for roadway closures that exceed 15 minutes, see details elsewhere in the plan.
7. If traffic queues beyond the advance warning signs during one road closure sequence, the advance warning should be extended prior to repeating the road closure sequence. When possible, PCMS signs should be located in advance of the last available exit prior to the closure to allow motorists the choice of an alternate route.

THIS PLAN IS INTENDED TO BE USED AT LOCATIONS/TIMES WHEN TRAFFIC VOLUMES ARE LESS THAN 1000 PASSENGER CARS PER HOUR PER LANE.

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN

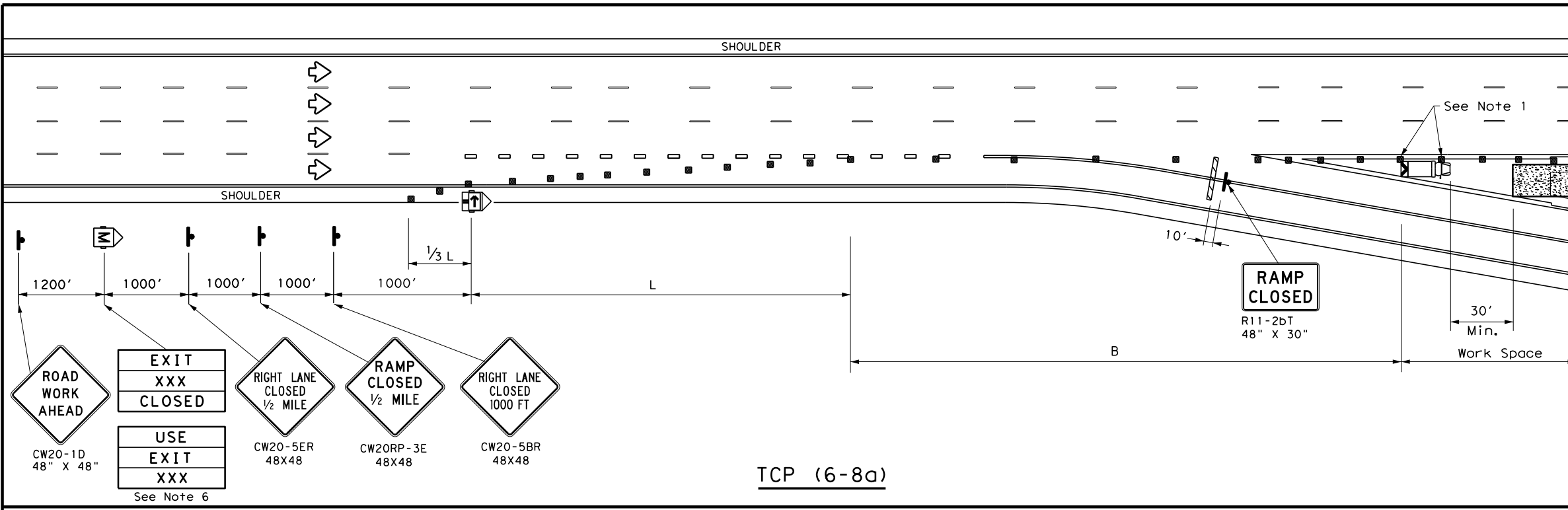
SHORT DURATION FREEWAY CLOSURE SEQUENCE

TCP (6-7) - 12

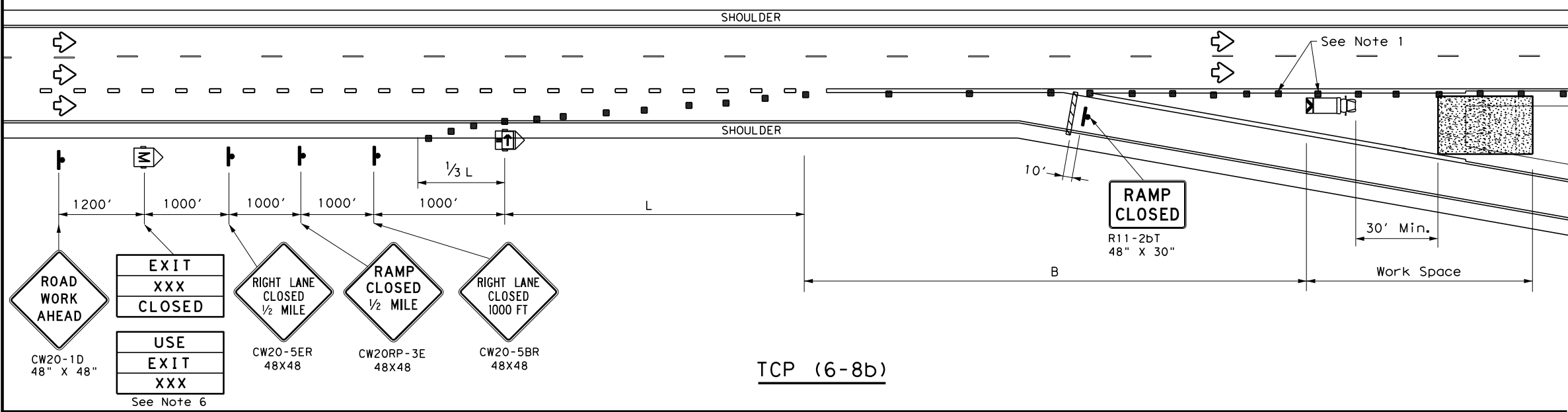
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©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	0389	13	039	SH 146
1-97 8-12	DIST	COUNTY	SHEET NO.	
4-98	HOU	HARRIS	95	

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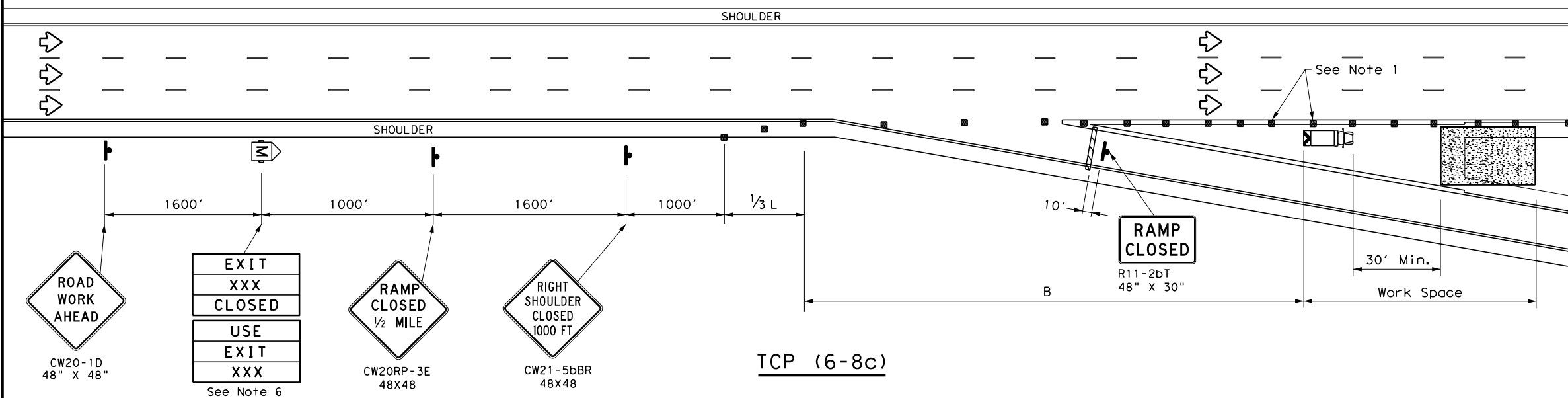
DATE:
FILE:



TCP (6-8a)



TCP (6-8b)



TCP (6-8c)

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

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

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

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

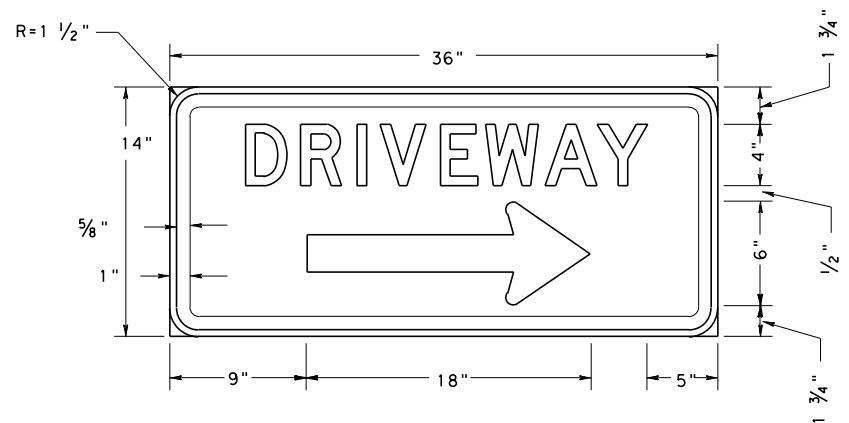
- GENERAL NOTES**
- Place channelizing devices in the gore at 20' spacing.
 - See the Standard Highway Sign Design for Texas (SHSD) for sign details.
 - The PCMS may be omitted when a permanent DMS sign is available in an appropriate location to display a similar message as called for on the PCMS.
 -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



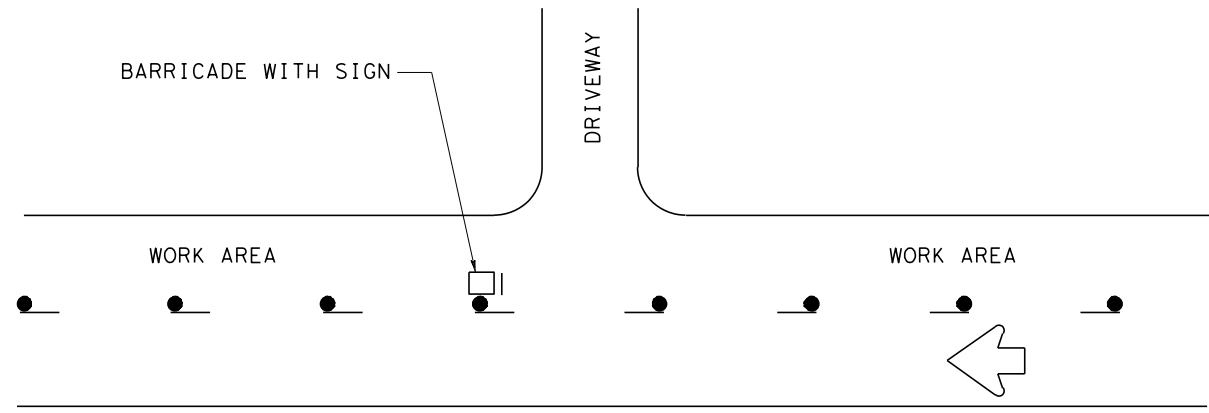
WORK IN EXIT GORE FOR ADT GREATER THAN 10,000

TCP (6-8) - 14

FILE: tcp6-8.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT February 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0389	13	039	SH 146
	DIST	COUNTY	SHEET NO.	
	HOU	HARRIS	96	



LETTERS: WHITE
 BORDER: WHITE
 BACKGROUND: BLUE



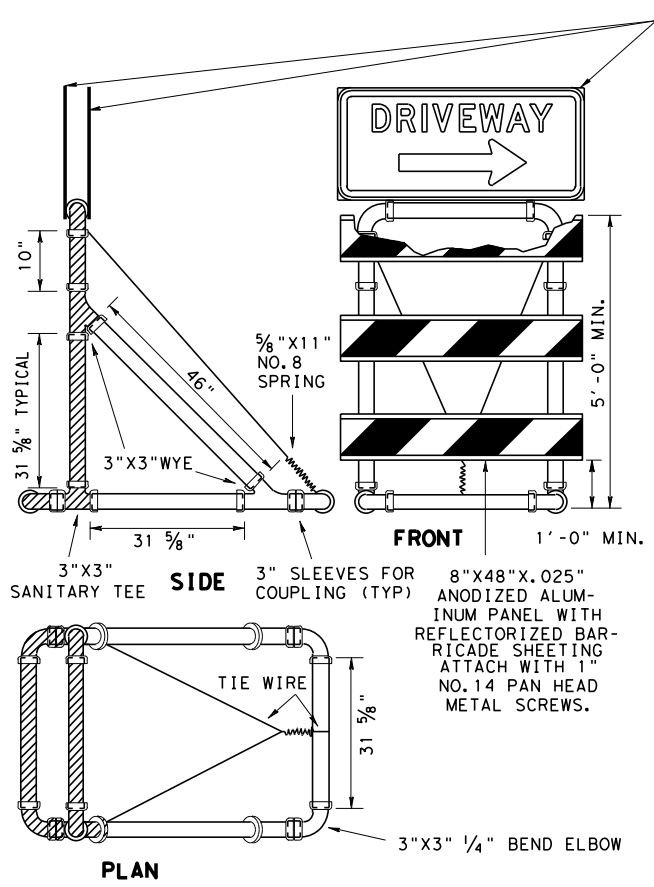
TYPICAL LOCATION OF DRIVEWAY SIGN

**TYPE III PVC BARRICADES
 TYPICAL DESIGN DETAILS**

MAY BE USED AT THE OPTION OF THE CONTRACTOR.

NOTES:

1. ALL PIPE SHALL BE POLYVINYL CHLORIDE (PVC) PRESSURE RATED PIPE SDR 21 OR SDR 26 ASTM D2241.
2. JOINT FITTINGS MAY BE PVC-ASTM D2665 OR ACRYLONITRILE BUTADIENE STYRENE (ABS) ASTM D2661 (DRAINAGE WASTE AND VENT).
3. ALL PIPE AND FITTINGS SHALL BE WHITE.
4. ALL JOINTS SHALL BE FREE TO SEPARATE UPON VEHICLE IMPACT.
5. CROSS HATCHED CONDUIT TO BE TIED TOGETHER WITH ROPE THREADED INTO PIPE INTERIOR. USE 3/16" NO. 6 SOLID BRAIDED NYLON OR EQUIVALENT.
6. A FIXED FRANGIBLE PAVEMENT CONNECTION IS PREFERRED. SAND BAGS MAY BE SUBSTITUTED.



CONSTRUCTION SIGN NOTES

MATERIALS

CONSTRUCTION SIGNS SHALL BE MADE FROM APPROVED FIBERGLASS OR HIGH IMPACT PLASTIC AS PRIMARY MATERIALS.

SIGN SHEETING

REFLECTORIZED SIGN SHALL BE CONSTRUCTED OF RETRO REFLECTIVE SHEETING MEETING THE COLOR AND REFLECTIVITY REQUIREMENTS OF MATERIAL SPECIFICATIONS, DMS-8300.

TYPE C SHEETING SHALL BE USED FOR THIS APPLICATION.

SIGN LETTERS

ALL SIGNS LETTERING SHALL BE CLEAR, OPEN ROUNDED TYPE CAPITAL LETTERS AS APPROVED BY AND AS PUBLISHED BY THE FEDERAL HIGHWAY ADMINISTRATION. SIGNS AND LETTERING SHALL BE OF FIRST CLASS WORKMANSHIP EQUIVALENT TO THAT OF THE DEPARTMENT'S STANDARD SIGNS.



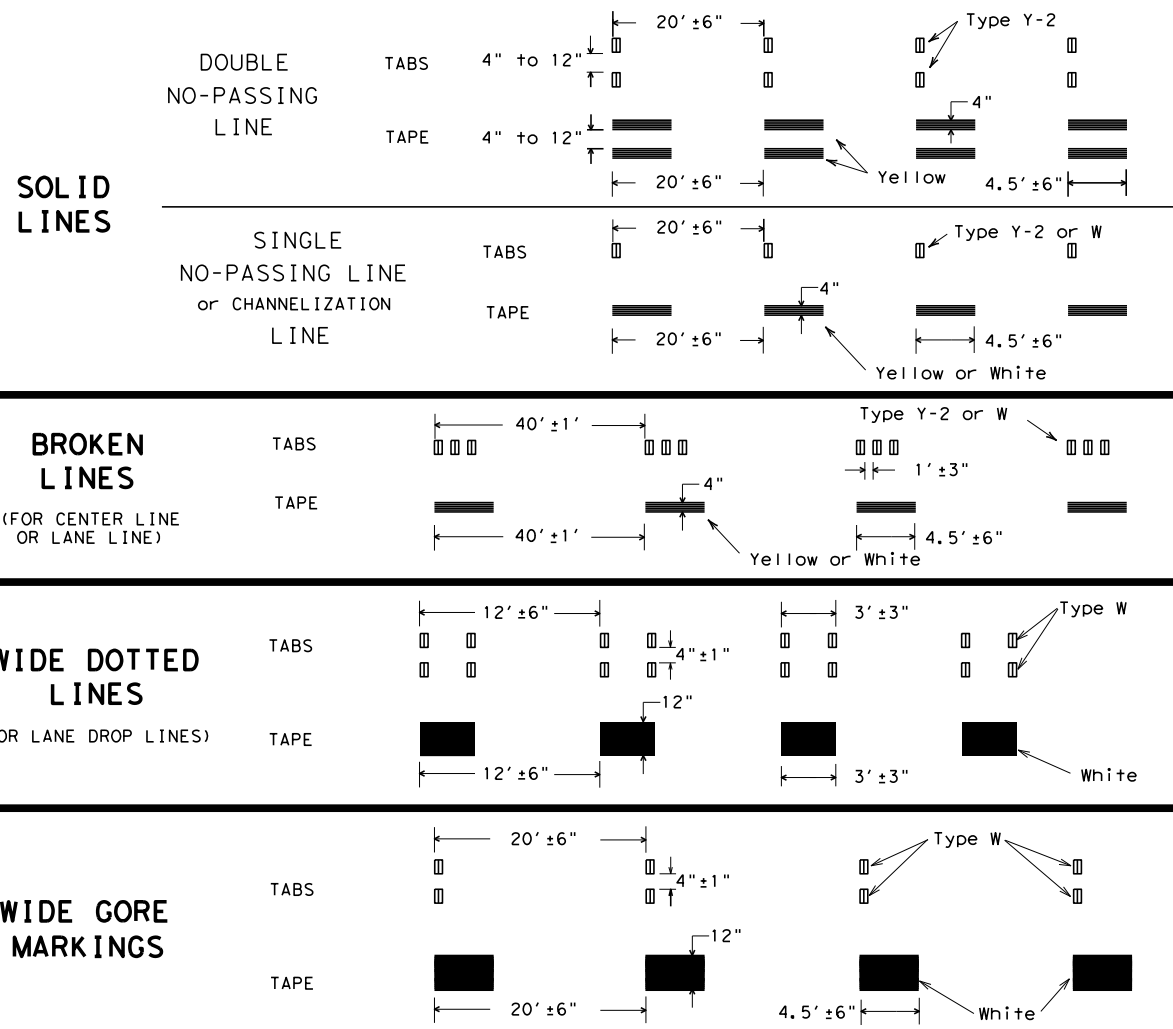
DRIVEWAY SIGNING

DS TC8020-04

FILE:	DN:	CK:	DW:	CK:
© TxDOT 2004	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS	HOU	6		97
	COUNTY	CONTROL	SECT	JOB
	HARRIS	0389	13	039
				HIGHWAY
				SH 146

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WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS



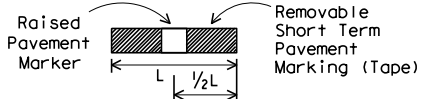
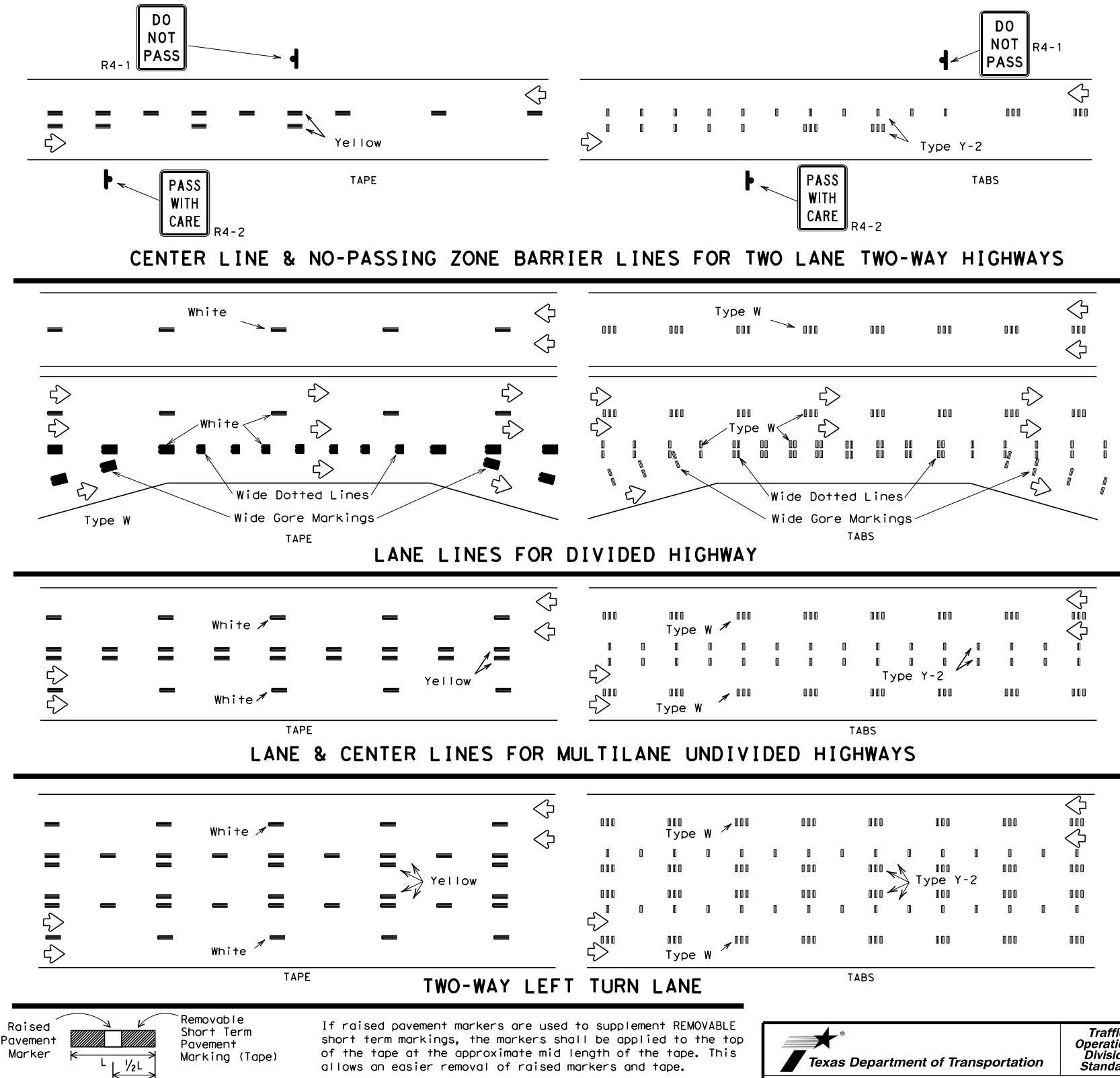
NOTES:

- Short term pavement markings may be prefabricated markings (stick down tape) or temporary flexible-reflective roadway marker tabs unless otherwise specified elsewhere in plans.
- Short term pavement markings shall NOT be used to simulate edge lines.
- 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.
- 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.
- 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.
- 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.
- 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).
- 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)

- 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).
- Tabs shall meet requirements of Departmental Material Specification DMS-8242.
- 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.
- 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



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

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

RAISED PAVEMENT MARKERS

- 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)

- 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



WORK ZONE SHORT TERM PAVEMENT MARKINGS

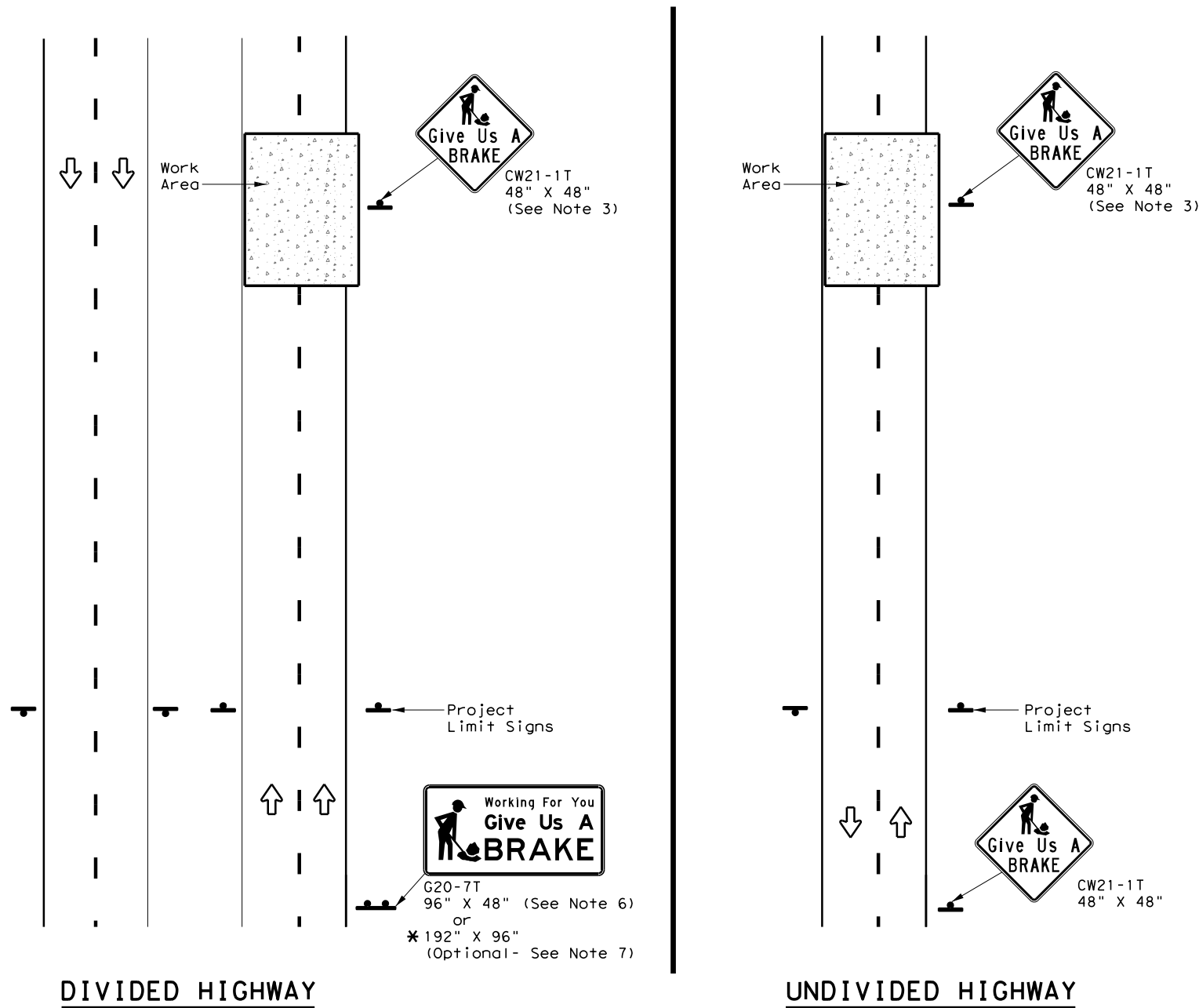
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© TxDOT	April 1992	CONT	0389	SECT	13	JOB	039	SH	146
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SIGNS ARE SHOWN FOR ONE DIRECTION OF TRAVEL

* 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
						Size	(LF)	
							① ②	24" DIA. (LF)
Orange	G20-7T		96" X 48"	Type B _{FL} or C _{FL}	32	▲	▲ ▲	▲
Orange	G20-7T		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

- See BC and SMD sheets for additional sign support details.
- Sign locations shall be approved by the Engineer.
- 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.
- 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.
- Give Us a Brake (CW21-1T) signs and supports shall be considered subsidiary to Item 502, "Barricades, Signs and Traffic Handling."
- 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.
- 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
- 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.



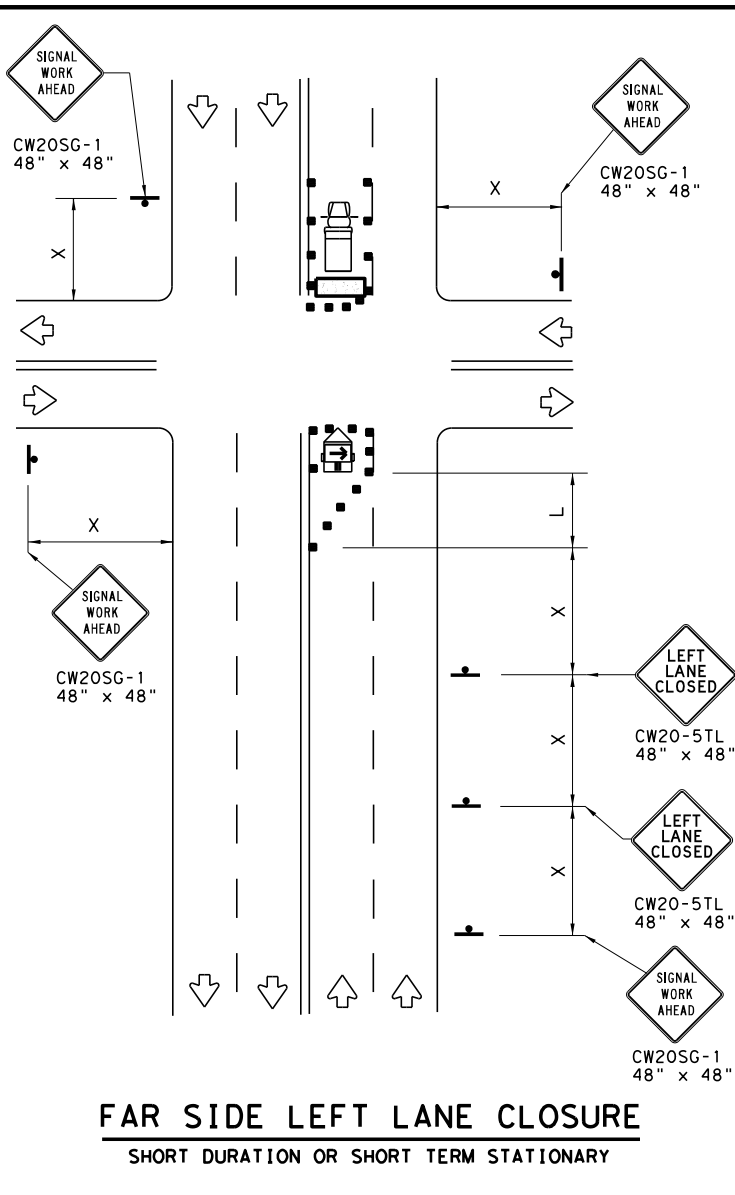
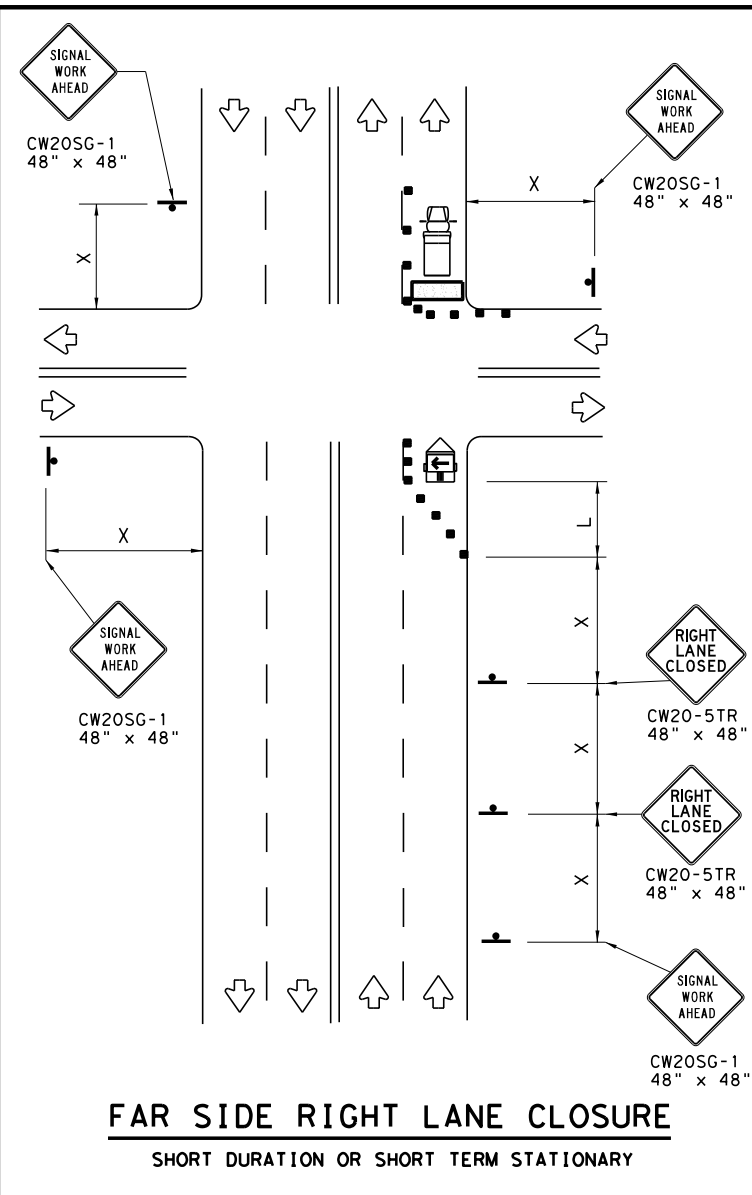
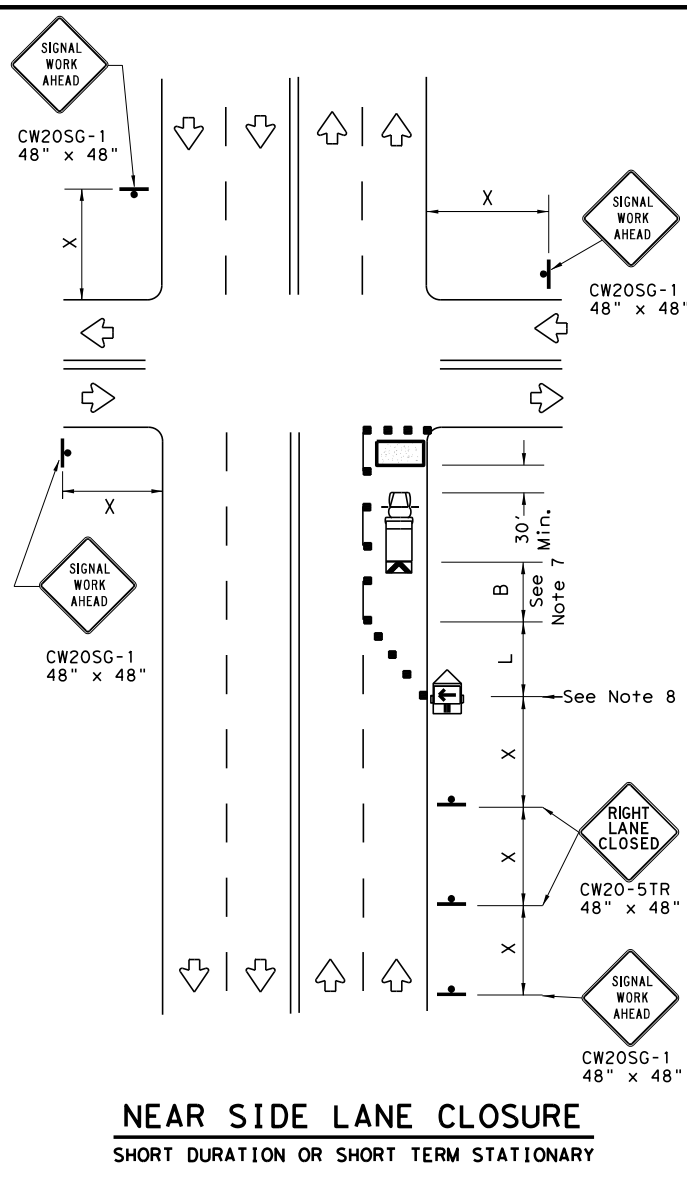
WORK ZONE
"GIVE US A BRAKE"
SIGNS

WZ (BRK) - 13

FILE: wzbrk-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	0389	13	039	SH 146
6-96 5-98 7-13	DIST	COUNTY	SHEET NO.	
8-96 3-03	HOU	HARRIS	99	

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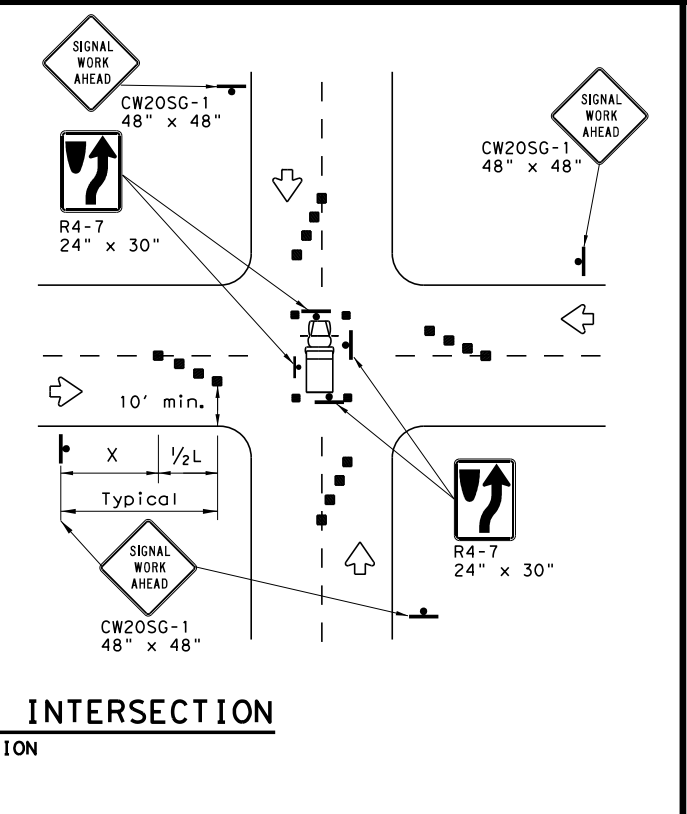
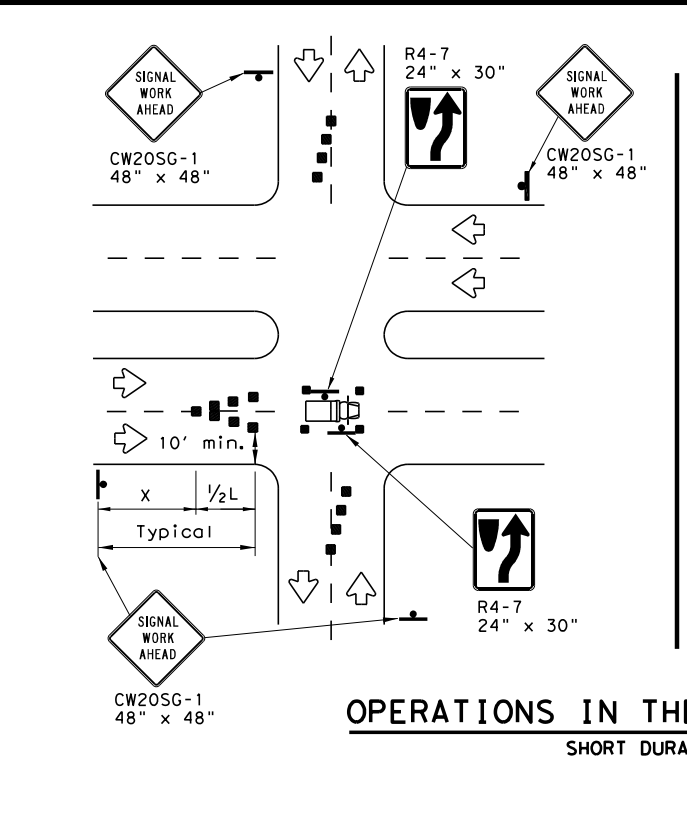


LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board		Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

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

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

WORKERS IN BUCKET TRUCKS SHALL NOT WORK ABOVE OPEN LANES OF TRAFFIC.



GENERAL NOTES

- The minimum size channelizing device is the 28" cone. 42" Two-piece cones, drums, vertical panels or barricades will be required when the device must be left unattended at night.
- Obstructions or hazards at the work area shall be clearly marked and delineated at all times.
- Flaggers and Flagger Symbol (CW20-7) signs may be required according to field conditions.
- Vehicles parked in roadway shall be equipped with at least two high intensity rotating, flashing, oscillating or strobe type lights.
- High level warning devices (flag trees) may be used at corners of the vehicle.
- When work operations are performed on existing signals, the signals may be placed in flashing red mode when approved by the engineer. If existing signals do not have power, All-Way Stop (R1-1 and R1-3P) signs may be implemented when approved by the engineer.
- For Short-Term Stationary work the buffer space "B" from the above table should be used if field conditions permit. For Short Duration (less than 1 hour) any buffer space provided will enhance the safety of the setup.
- The arrow board at this location may be omitted for Short Duration work if the work vehicle has an arrow board in operation. As an option, the arrow board may be placed at the end of the taper in the closed lane if space is not available at the beginning of the taper.
- Signs and devices for the NEAR SIDE LANE CLOSURE may be altered for a left lane closure by using a LEFT LANE CLOSED (CW20-5TL) and adding channelizing devices on the centerline to protect the work space from opposing traffic.

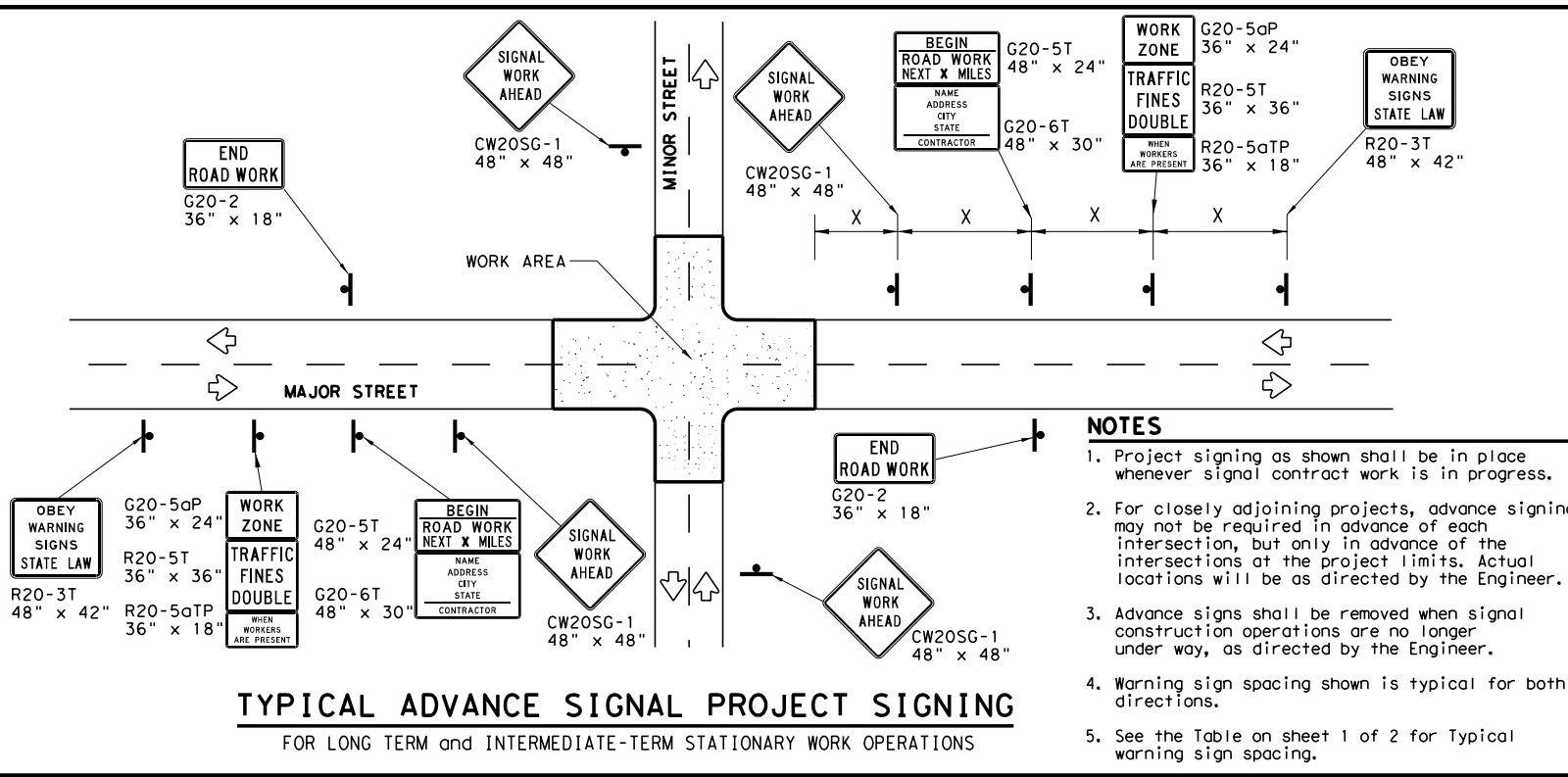
TRAFFIC SIGNAL WORK TYPICAL DETAILS

WZ (BTS-1) - 13

FILE: wzbt13-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS	0389	13	039	SH 146
2-98 10-99 7-13	DIST	COUNTY	SHEET NO.	
4-98 3-03	HOU	HARRIS	100	

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 resulting from its use.

DATE: FILE:



- NOTES**
1. Project signing as shown shall be in place whenever signal contract work is in progress.
 2. For closely adjoining projects, advance signing may not be required in advance of each intersection, but only in advance of the intersections at the project limits. Actual locations will be as directed by the Engineer.
 3. Advance signs shall be removed when signal construction operations are no longer under way, as directed by the Engineer.
 4. Warning sign spacing shown is typical for both directions.
 5. See the Table on sheet 1 of 2 for Typical warning sign spacing.

GENERAL NOTES FOR WORK ZONE SIGNS

1. Signs shall be installed and maintained in a straight and plumb condition.
2. Wooden sign posts shall be painted white.
3. Barricades shall NOT be used as sign supports.
4. Nails shall NOT be used to attach signs to any support.
5. All signs shall be installed in accordance with the plans or as directed by the Engineer.
6. The Contractor shall furnish the sign design shown in the plans or in the "Standard Highway Sign Designs for Texas" (SHSD).
7. The Contractor shall furnish sign supports and substrates listed in the "Compliant Work Zone Traffic Control Device List" (CWZTCD), installed as per the manufacturer's recommendations.
8. Temporary signs that have damaged or cracked substrates and/or damaged or marred reflective sheeting shall be replaced as directed by the Engineer.
9. 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".
10. Damaged wood posts shall be replaced. Splicing wood posts will not be allowed.

DURATION OF WORK

1. Work zone durations are defined in Part 6, Section 66.02 of the Texas Manual on Uniform Traffic Control Devices (TMUTCD).

SIGN MOUNTING HEIGHT

1. Sign height of Long-term/Intermediate-term warning signs shall be as shown on Figure 6F-1 of the TMUTCD.
2. Sign height of Short-term/Short Duration warning signs shall be as shown on Figure 6F-2 of the TMUTCD.
3. Regulatory signs shall be mounted at least 7 feet, but not more than 9 feet, above the paved surface regardless of work duration.

REMOVING OR COVERING

1. When sign messages may be confusing or do not apply, the signs shall be removed or completely covered, unless otherwise approved by the Engineer.
2. 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. Burlap, or heavy materials such as plywood or aluminum shall not be used to cover signs.
3. Duct tape or other adhesive material shall NOT be affixed to a sign face.
4. Signs and anchor stubs shall be removed and holes back filled upon completion of the work.

REFLECTIVE SHEETING

1. All signs shall be retroreflective and constructed of sheeting meeting the requirements of the DMS and color usage table shown on this sheet.

SIGN SUPPORT WEIGHTS

1. Weights used to keep signs from turning over should be sandbags filled with dry, cohesionless material.
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 will 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.

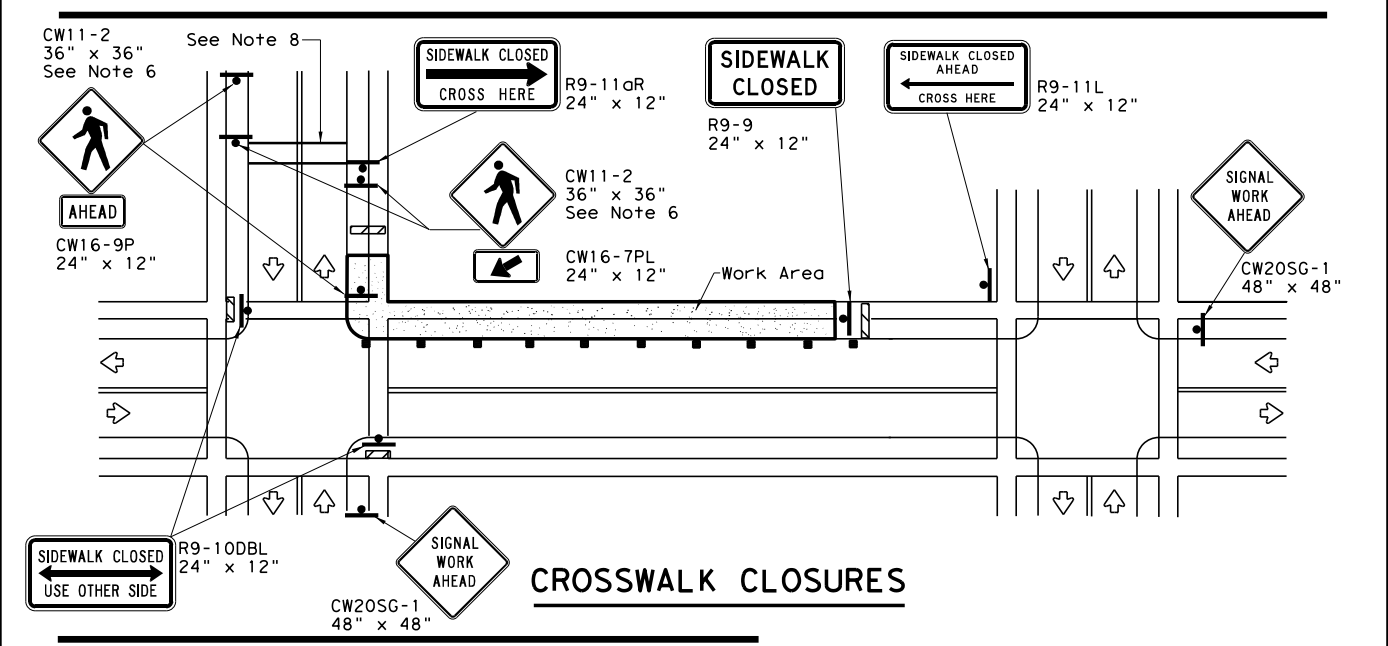
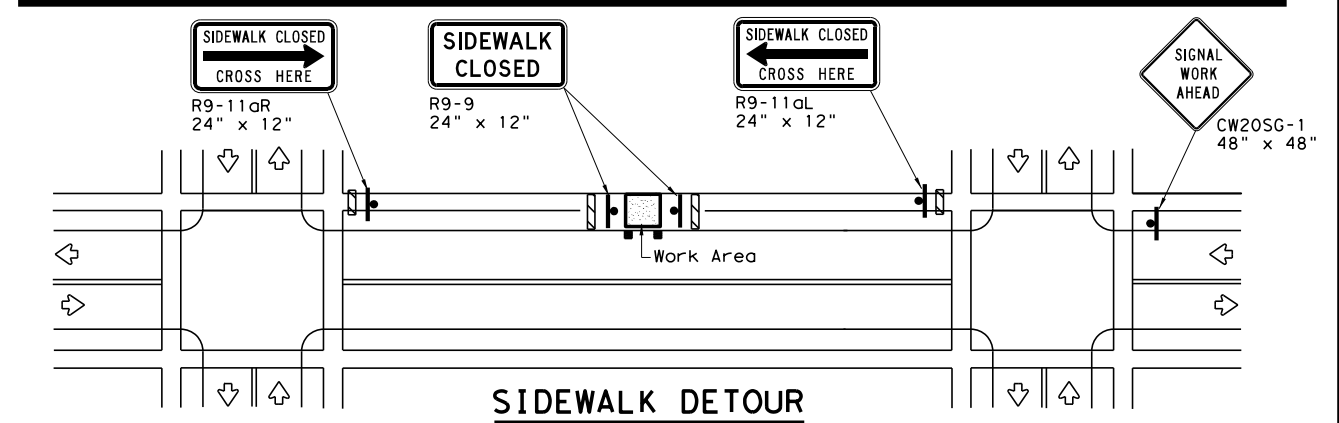
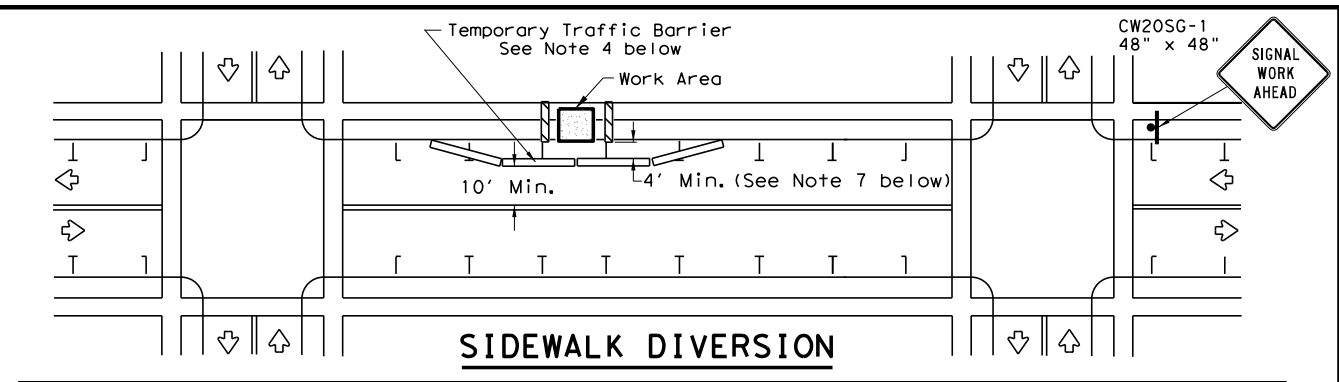
LEGEND	
	Sign
	Channelizing Devices
	Type 3 Barricade

DEPARTMENTAL MATERIAL SPECIFICATIONS

SIGN FACE MATERIALS	DMS-8300
FLEXIBLE ROLL-UP REFLECTIVE SIGNS	DMS-8310

COLOR	USAGE	SHEETING MATERIAL
ORANGE	BACKGROUND	TYPE B _{FL} OR TYPE C _{FL} SHEETING
WHITE	BACKGROUND	TYPE A SHEETING
BLACK	LEGEND & BORDERS	ACRYLIC NON-REFLECTIVE SHEETING

Only pre-qualified products shall be used. A copy of the "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources and may be found at the following web address:
http://www.txdot.gov/txdot_library/publications/construction.htm



PEDESTRIAN CONTROL

1. Holes, trenches or other hazards shall be adequately protected by covering, delineating or surrounding the hazard with orange plastic pedestrian fencing or longitudinal channelizing devices, or as directed by the Engineer.
2. "CROSSWALK CLOSURES" as detailed above will require the Engineer's approval prior to installation.
3. R9 series signs shown may be placed on supports detailed on the BC standards or CWZTCD list, or when fabricated from approved lightweight plastic substrates, they may be mounted on top of a plastic drum at or near the location shown.
4. For speeds less than 45 mph longitudinal channelizing devices may be used instead of traffic barriers when approved by the Engineer. Attenuation of blunt ends and installation of water filled devices shall be as per BC(9) and manufacturer's recommendations.
5. Location of devices are for general guidance. Actual device spacing and location must be field adjusted to meet actual conditions.
6. Where pedestrians with visual disabilities normally use the closed sidewalk Detectable Pedestrian Barricades should be used instead of the Type 3 Barricades shown.
7. The width of existing sidewalk should be maintained if practical.
8. Pavement markings for mid-block crosswalks shall be paid for under the appropriate bid items.
9. When crosswalks or other pedestrian facilities are closed or relocated, temporary facilities shall be detectable and shall include accessibility features consistent with the features present in the existing pedestrian facility.

SHEET 2 OF 2



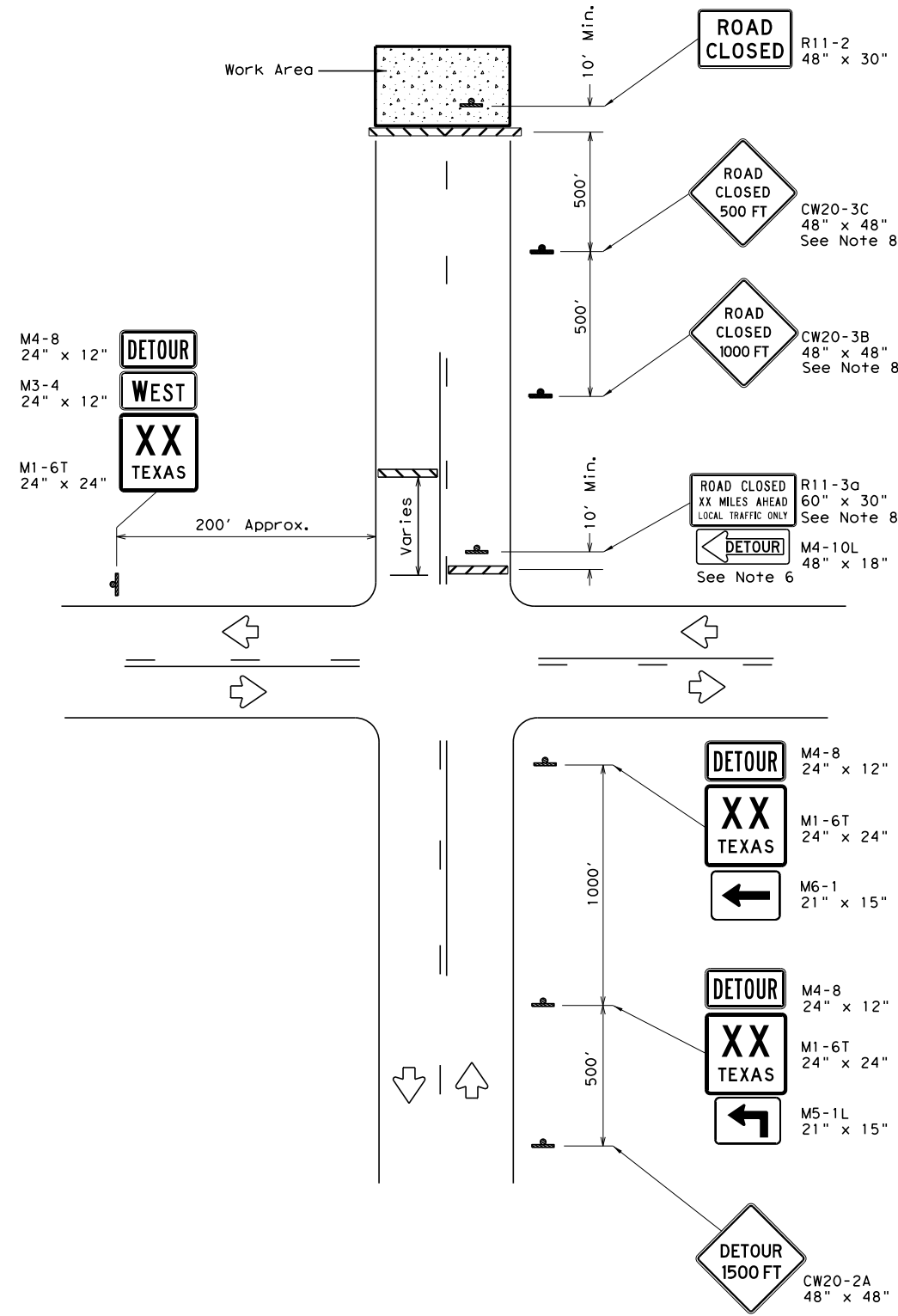
TRAFFIC SIGNAL WORK BARRICADES AND SIGNS

WZ (BTS-2) - 13

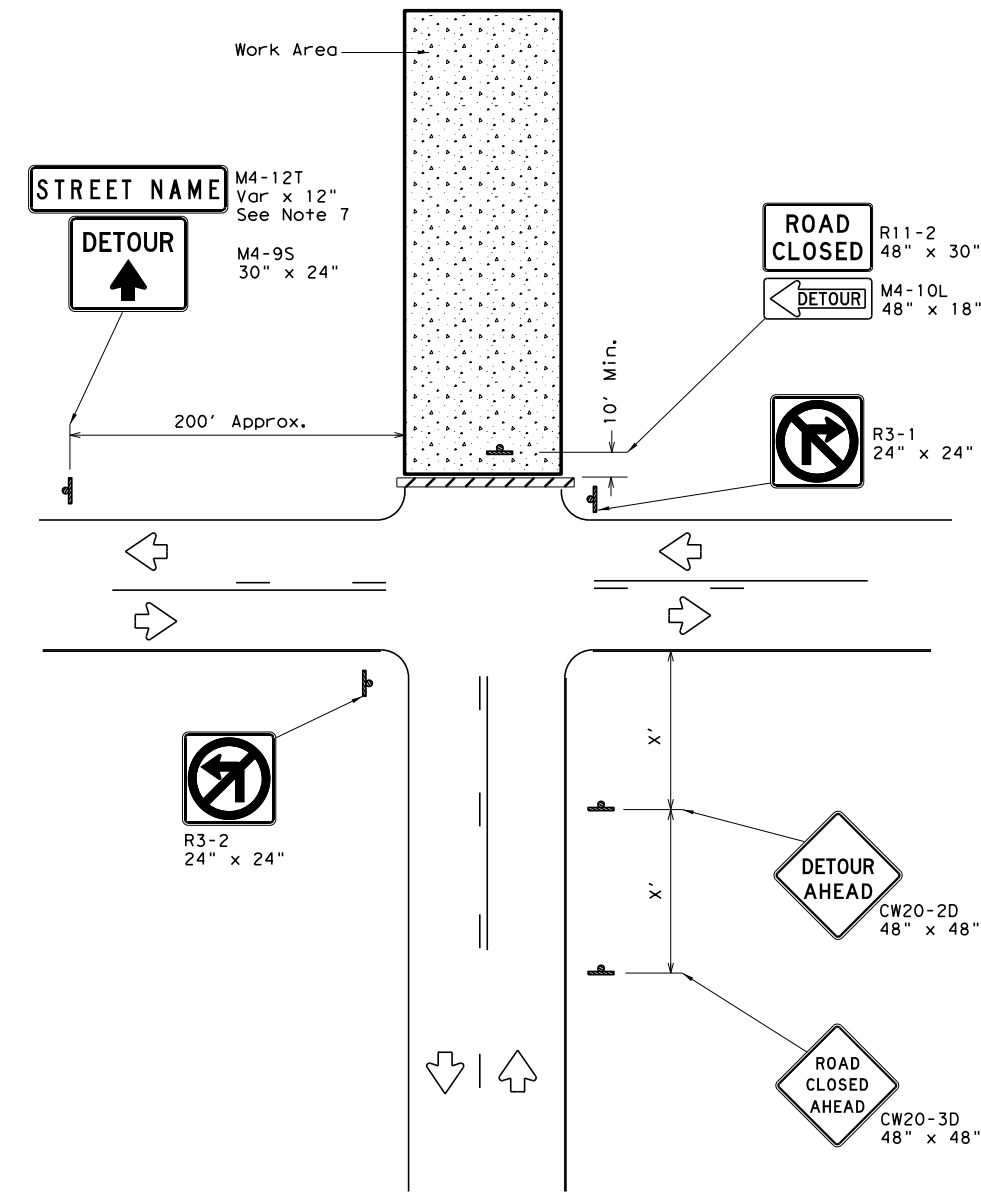
FILE: wzbts-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS	0389	13	039	SH 146
2-98 10-99 7-13	DIST	COUNTY	SHEET NO.	
4-98 3-03	HOU	HARRIS	101	

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DATE: FILE:



ROAD CLOSURE BEYOND THE INTERSECTION
 Signing for a Numbered Route with an Off-Site Detour



ROAD CLOSURE AT THE INTERSECTION
 Signing for an Un-numbered Route with an Off-Site Detour

LEGEND	
	Type 3 Barricade
	Sign

Posted Speed *	Minimum Sign Spacing "X" Distance
30	120'
35	160'
40	240'
45	320'
50	400'
55	500'
60	600'
65	700'
70	800'
75	900'

* Conventional Roads Only

GENERAL NOTES

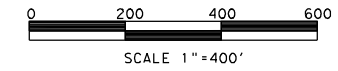
1. This sheet is intended to provide details for temporary work zone road closures. For permanent road closure details see the D&OM standards.
2. Barricades used shall meet the requirements shown on Barricade and Construction Standard BC(10) and listed on the Compliant Work Zone Traffic Control Devices List (CWZTCD).
3. Stockpiled materials shall not be placed on the traffic side of barricades.
4. Barricades at the road closure should extend from pavement edge to pavement edge.
5. Detour signing shown is intended to illustrate the type of signing that is appropriate for numbered routes or un-numbered routes as labeled. It does not indicate the full extent of detour signing required. Detour routes should be signed as shown elsewhere in the plans.
6. If the road is open for a significant distance beyond the intersection or there are significant origin/destination points beyond the intersection, the signs and barricades at this location should be located at the edge of the traveled way.
7. The Street Name (M4-12T) sign is to be placed above the DETOUR (M4-9S) sign.
8. For urban areas where there is a shorter distance between the intersection and the actual closure location, the ROAD CLOSED XX MILES AHEAD (R11-3a) sign may be replaced with a ROAD CLOSED TO THRU TRAFFIC (R11-4) sign. If adequate space does not exist between the intersection and the closure a single ROAD CLOSED AHEAD (CW20-3D) sign spaced as per the table above may replace the ROAD CLOSED 1000 FT (CW20-3B) and ROAD CLOSED 500 FT (CW20-3C) signs.
9. Signs and barricades shown shall be subsidiary to Item 502. Locations where these details will be required shall be as shown elsewhere in the plans.



WORK ZONE ROAD CLOSURE DETAILS

WZ (RCD) - 13

FILE: w2rcd-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT August 1995	CONT	SECT	JOB	HIGHWAY
REVISIONS	0389	13	039	SH 146
1-97 4-98 7-13	DIST	COUNTY	SHEET NO.	
2-98 3-03	HOU	HARRIS	102	



- NOTES:
1. ALL BEARINGS AND COORDINATES SHOWN HEREON ARE BASED ON THE TEXAS COORDINATE SYSTEM, SOUTH CENTRAL ZONE (4204), NORTH AMERICAN DATUM OF 1983 (2011 ADJ.).
 2. ALL ELEVATIONS SHOWN HEREON ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (GEOID MODEL 12B).
 3. COORDINATES AND DISTANCES ARE U.S. SURVEY FEET, DISPLAYED IN SURFACE VALUES, AND MAY BE CONVERTED TO NAD83 (GRID) VALUES BY APPLYING THE TXDOT COMBINED ADJUSTMENT FACTOR (CAF) FOR HARRIS COUNTY, CAF = 1.00013, USING THE FORMULA: SURFACE / CAF = GRID
 4. HORIZONTAL COORDINATE SOLUTIONS ARE BASED ON REDUNDANT GPS RTN OBSERVATIONS, MEASURED FROM TXDOT CORS TXAC & TXLI DURING MAY-JUNE, 2019.
 5. ELEVATIONS HAVE BEEN ESTABLISHED VIA DIGITAL LEVELING, HOLDING FIXED THE GPS DERIVED ELEVATION FOR CP-50, N1020101 & N1020099.

THE CONTROL POINTS SHOWN HEREIN WERE DETERMINED BY A SURVEY MADE ON THE GROUND UNDER MY SUPERVISION.



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

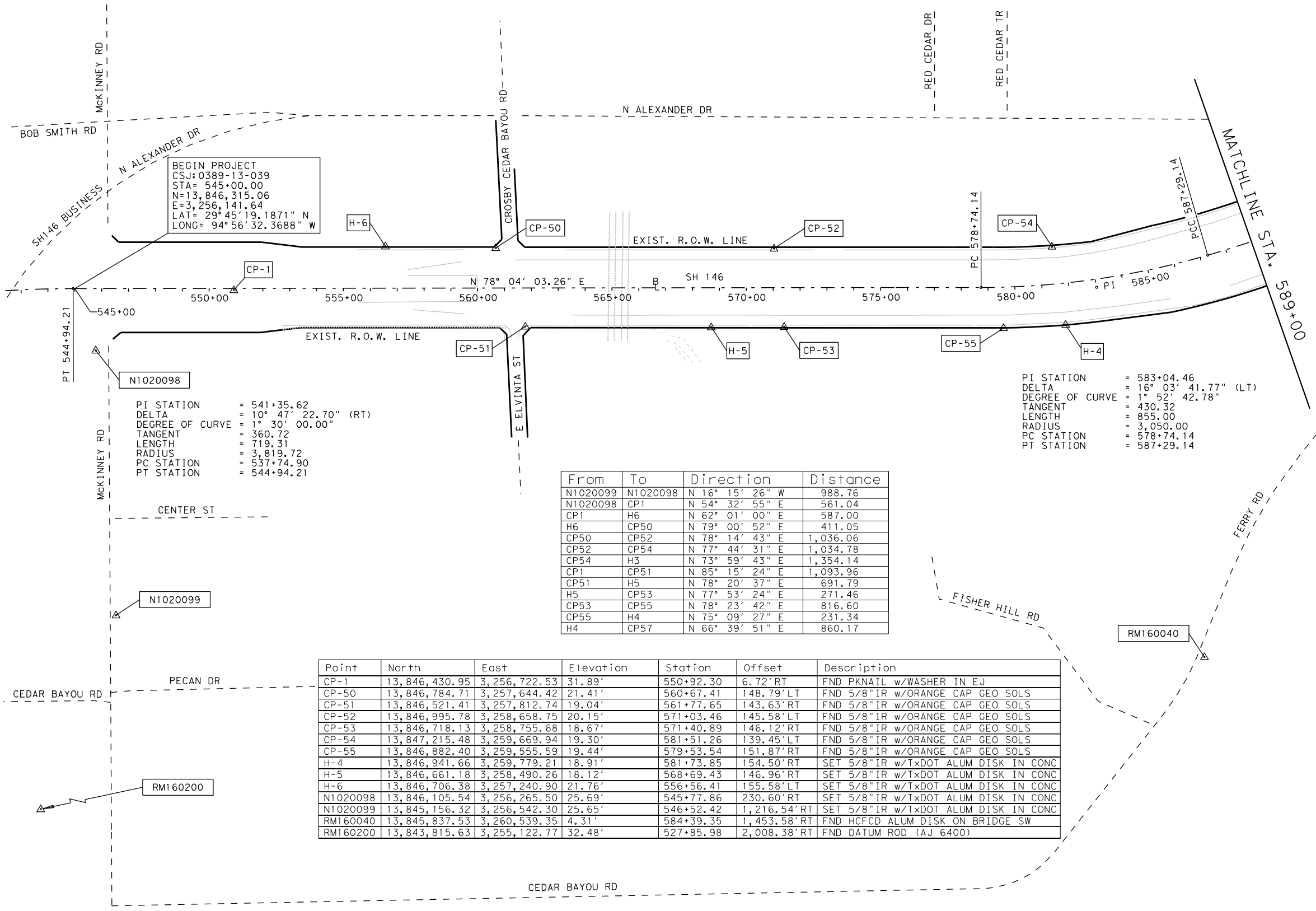
RODS
Surveying, Inc.
6810 LEE ROAD, STE. 100
SPRING, TEXAS 77379
TEL (281) 257-4020
FAX (281) 257-4021
TBPELS SURVEYING FIRM REG. No. 10030700

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

Texas Department of Transportation
© 2022

SH 146
SURVEY CONTROL
INDEX SHEET

FED. RD. DIV. NO.		FEDERAL AID PROJECT NO.		SHEET NO.
6				103
STATE	DIST.	COUNTY		
TEXAS	HOU	HARRIS		
CONT.	SECT.	JOB	HIGHWAY NO.	
0389	13	039	SH 146	



BEGIN PROJECT
CSJ: 0389-13-039
STA= 545+00.00
N=13,846,315.06
E=3,256,141.64
LAT= 29° 45' 19.1871" N
LONG= 94° 56' 32.3688" W

PI STATION = 541+35.62
DELTA = 10° 47' 22.70" (RT)
DEGREE OF CURVE = 1° 30' 00.00"
TANGENT = 360.72
LENGTH = 719.31
RADIUS = 3,819.72
PC STATION = 537+74.90
PT STATION = 544+94.21

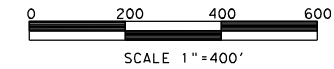
PI STATION = 583+04.46
DELTA = 16° 03' 41.77" (LT)
DEGREE OF CURVE = 1° 52' 42.78"
TANGENT = 430.32
LENGTH = 855.00
RADIUS = 3,050.00
PC STATION = 578+74.14
PT STATION = 587+29.14

From	To	Direction	Distance
N1020099	N1020098	N 16° 15' 26" W	988.76
N1020098	CP1	N 54° 32' 55" E	561.04
CP1	H6	N 62° 01' 00" E	587.00
H6	CP50	N 79° 00' 52" E	411.05
CP50	CP52	N 78° 14' 43" E	1,036.06
CP52	CP54	N 77° 44' 31" E	1,034.78
CP54	H3	N 73° 59' 43" E	1,354.14
CP1	CP51	N 85° 15' 24" E	1,093.96
CP51	H5	N 78° 20' 37" E	691.79
H5	CP53	N 77° 53' 24" E	271.46
CP53	CP55	N 78° 23' 42" E	816.60
CP55	H4	N 75° 09' 27" E	231.34
H4	CP57	N 66° 39' 51" E	860.17

Point	North	East	Elevation	Station	Offset	Description
CP-1	13,846,430.95	3,256,722.53	31.89'	550+92.30	6.72' RT	FND PKNAIL w/WASHER IN EJ
CP-50	13,846,784.71	3,257,644.42	21.41'	560+67.41	148.79' LT	FND 5/8" IR w/ORANGE CAP GEO SOLS
CP-51	13,846,521.41	3,257,812.74	19.04'	561+77.65	143.63' RT	FND 5/8" IR w/ORANGE CAP GEO SOLS
CP-52	13,846,995.78	3,258,658.75	20.15'	571+03.46	145.58' LT	FND 5/8" IR w/ORANGE CAP GEO SOLS
CP-53	13,846,718.13	3,258,755.68	18.67'	571+40.89	146.12' RT	FND 5/8" IR w/ORANGE CAP GEO SOLS
CP-54	13,847,215.48	3,259,669.94	19.30'	581+51.26	139.45' LT	FND 5/8" IR w/ORANGE CAP GEO SOLS
CP-55	13,846,882.40	3,259,555.59	19.44'	579+53.54	151.87' RT	FND 5/8" IR w/ORANGE CAP GEO SOLS
H-4	13,846,941.66	3,259,779.21	18.91'	581+73.85	154.50' RT	SET 5/8" IR w/TxDOT ALUM DISK IN CONC
H-5	13,846,661.18	3,258,490.26	18.12'	568+69.43	146.96' RT	SET 5/8" IR w/TxDOT ALUM DISK IN CONC
H-6	13,846,706.38	3,257,240.90	21.76'	556+56.41	155.58' LT	SET 5/8" IR w/TxDOT ALUM DISK IN CONC
N1020098	13,846,105.54	3,256,265.50	25.69'	545+77.86	230.60' RT	SET 5/8" IR w/TxDOT ALUM DISK IN CONC
N1020099	13,845,156.32	3,256,542.30	25.65'	546+52.42	1,216.54' RT	SET 5/8" IR w/TxDOT ALUM DISK IN CONC
RM160040	13,845,837.53	3,260,539.35	4.31'	584+39.35	1,453.58' RT	FND HCFCD ALUM DISK ON BRIDGE SW
RM160200	13,843,815.63	3,255,122.77	32.48'	527+85.98	2,008.38' RT	FND DATUM ROD (AJ 6400)

1/5/2022 7:54:15 AM N:\CivilTech\287\21701\004\CAD\H&V Control\H&V Index Sheet 1.dgn

Point	North	East	Elevation	Station	Offset	Description
CP-57	13,847,282.39	3,260,569.02	17.39'	589+96.01	179.43'RT	FND 5/8" IR w/ORANGE CAP GEO SOLS
CP-58	13,848,181.65	3,261,174.02	17.83'	600+25.18	163.76'LT	FND 5/8" IR w/ORANGE CAP GEO SOLS
CP-59	13,847,921.83	3,261,382.64	17.19'	599+95.07	168.09'RT	FND "X" IN CONC
CP-60	13,848,936.01	3,261,789.82	21.26'	610+48.09	145.35'LT	FND 5/8" IR w/ORANGE CAP GEO SOLS
CP-61	13,848,797.21	3,262,052.35	20.83'	610+53.22	151.57'RT	FND 5/8" IR w/ORANGE CAP GEO SOLS
CP-8	13,849,454.30	3,262,147.39	23.14'	616+78.69	49.78'LT	FND "X" IN CONC
H-1	13,849,918.87	3,262,347.53	24.44'	621+82.03	69.38'LT	SET 5/8" IR w/TxDOT ALUM DISK IN CONC
H-2	13,848,459.70	3,261,869.65	20.34'	606+89.63	177.02'RT	SET 5/8" IR w/TxDOT ALUM DISK IN CONC
H-3	13,847,588.84	3,260,971.59	16.29'	594+83.87	153.59'RT	SET 5/8" IR w/TxDOT ALUM DISK IN CONC
N1020100	13,851,181.92	3,263,067.32	19.33'	635+99.85	263.55'LT	SET 5/8" IR w/TxDOT ALUM DISK IN CONC
N1020101	13,850,936.75	3,261,735.40	21.43'	626+32.97	1,128.19'LT	SET 5/8" IR w/TxDOT ALUM DISK IN CONC
RM160045	13,847,379.79	3,263,027.03	16.54'	605+60.45	1,751.16'RT	FND BRASS DISK ON CATWALK OF TANK 71



- NOTES:
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THIS SURVEY CONTROL INFORMATION HAS BEEN ACCEPTED AND ACCEPTED AND INCORPORATED INTO THIS PS&E

PI STATION = 624+72.35
 DELTA = 15° 09' 20.99" (RT)
 DEGREE OF CURVE = 2° 00' 00.00"
 TANGENT = 381.12
 LENGTH = 757.79
 RADIUS = 2,864.79
 PC STATION = 620+91.23
 PT STATION = 628+49.02

PI STATION = 608+12.09
 DELTA = 16° 03' 41.77" (LT)
 DEGREE OF CURVE = 1° 52' 42.78"
 TANGENT = 430.32
 LENGTH = 855.00
 RADIUS = 3,050.00
 PC STATION = 603+81.77
 PT STATION = 612+36.77

END PROJECT
 CSJ: 0389-13-039
 STA = 620+91.23
 N = 13,849,805.77
 E = 3,262,369.07
 LAT = 29° 45' 51.5762" N
 LONG = 94° 55' 20.3845" W

From	To	Direction	Distance
CP54	H3	N 73° 59' 43" E	1,354.14
H3	CP58	N 18° 51' 14" E	626.42
CP58	CP60	N 39° 13' 32" E	973.79
CP60	CP8	N 34° 36' 07" E	629.67
CP8	H1	N 23° 18' 24" E	505.85
H1	N1020100	N 29° 40' 41" E	1,453.75
N1020100	N1020101	N 79° 34' 13" W	1,354.30
H4	CP57	N 66° 39' 51" E	860.17
CP57	H3	N 52° 43' 13" E	505.94
H3	CP59	N 50° 59' 21" E	529.00
CP59	H2	N 42° 09' 32" E	725.59
H2	CP61	N 28° 25' 39" E	383.79
CP61	CP8	N 08° 13' 48" E	663.93

PI STATION = 595+64.46
 DELTA = 20° 35' 04.34" (LT)
 DEGREE OF CURVE = 1° 14' 44.02"
 TANGENT = 835.32
 LENGTH = 1,652.63
 RADIUS = 4,600.00
 PC STATION = 587+29.14
 PT STATION = 603+81.77

Control Name	Published: NAD83 Coordinate Information			Measured: NAD83(2011) Coordinate Information			Deferent (Published - Measured)		
	N. Coord.	E. Coord.	Elev.	N. Coord.	E. Coord.	Elev.	N. Coord.	E. Coord.	Elev.
RM160040	13,844,037.68	3,260,115.38	4.31	13,844,037.80	3,260,115.53	4.34	-0.12	-0.15	-0.03
RM160045	13,845,579.83	3,262,602.72	16.54	13,845,579.87	3,262,602.89	16.56	-0.04	-0.17	-0.02
RM160200*	13,842,016.10	3,254,699.50	32.48	13,842,016.17	3,254,699.65	32.41	-0.07	-0.15	0.07
AJ6400*	13,842,016.21	3,254,699.62	32.4	13,842,016.17	3,254,699.65	32.41	0.04	-0.03	-0.01

- Notes:
1. Harris County Floodplain Reference Markers published data based on NAD83(2001 Adj.), NAVD88 (2001 TSARP Adj.).
 2. To convert project elevations to TSARP elevations, subtract 0.06'.
 3. AJ6400 is an NGS Height Modernization Survey Station; published data based on NAD83(2011 Adj.), NAVD88; *AJ6400 and RM160200 are the same monument.

RODS
 Surveying, Inc.
 6810 LEE ROAD, STE. 100
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 TBPELS SURVEYING FIRM REG. No. 10030700

CivilTech Engineering, Inc.
 11821 Teige Road
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 PH: (281) 304-0200
 FX: (281) 304-0210
 Firm Reg. No. F-382



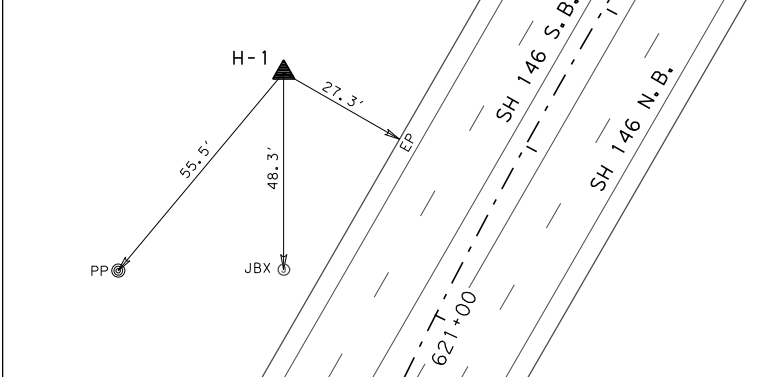
SH 146

SURVEY CONTROL INDEX SHEET

SHEET 2 of 2

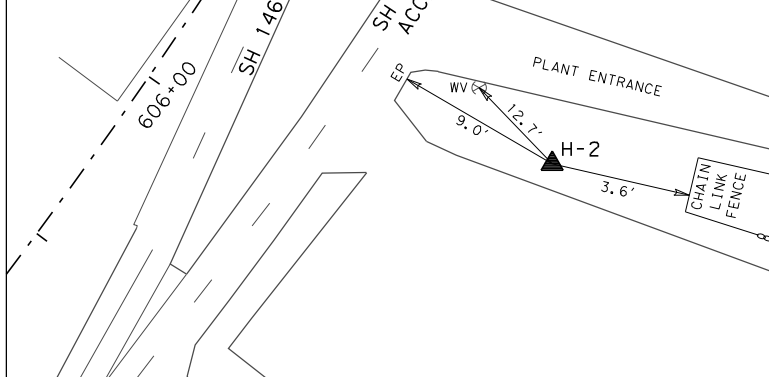
FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			104
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

H-1
 N=13,849,918.87
 E= 3,262,347.53
 ELEV= 24.44'
 STA= 621+82.03
 OFF= 69.38' LT
 SET 5/8" IR w/
 TxDOT ALUM DISK
 IN CONC



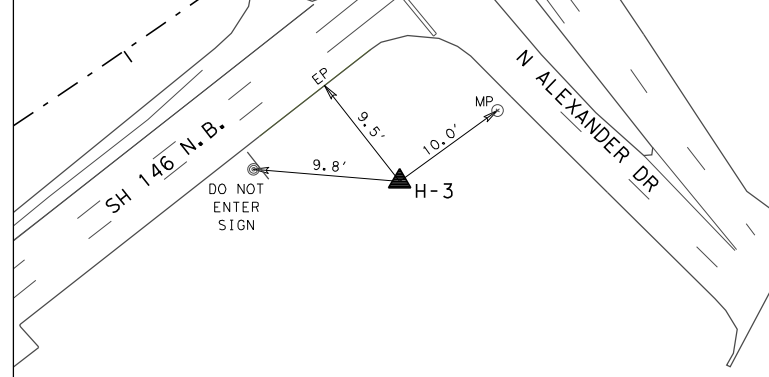
STATION IS LOCATED ON THE THE WEST SIDE OF SH 146, LYING 0.10 MILE SOUTH OF FERRY ROAD.

H-2
 N=13,848,459.70
 E= 3,261,869.65
 ELEV= 20.34'
 STA= 606+89.63
 OFF= 177.02' RT
 SET 5/8" IR w/
 TxDOT ALUM DISK
 IN CONC



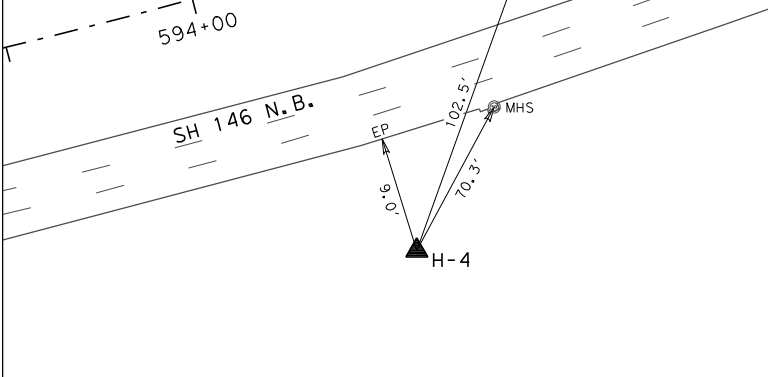
STATION IS LOCATED ON THE SOUTH SIDE OF SH 146 NORTH BOUND, LYING 0.61 MILE SOUTH OF MASSEY TOMPKINS ROAD.

H-3
 N=13,847,588.84
 E= 3,260,971.59
 ELEV= 16.29'
 STA= 594+83.87
 OFF= 153.59' RT
 SET 5/8" IR w/
 TxDOT ALUM DISK
 IN CONC



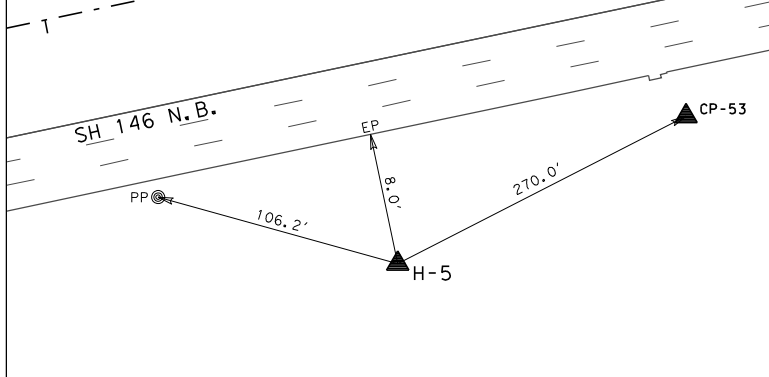
STATION IS LOCATED ON THE SOUTHWEST SIDE OF THE INTERSECTION OF NORTH ALEXANDER DRIVE AND SH 146 NORTH BOUND.

H-4
 N=13,846,941.66
 E= 3,259,779.21
 ELEV= 18.91'
 STA= 594+83.87
 OFF= 153.59' RT
 SET 5/8" IR w/
 TxDOT ALUM DISK
 IN CONC



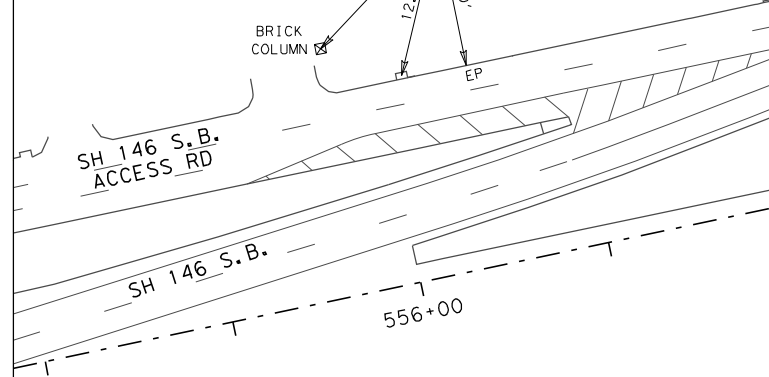
STATION IS LOCATED ON THE SOUTH SIDE OF SH 146 NORTH BOUND, LYING 0.27 MILE SOUTH OF NORTH ALEXANDER DRIVE.

H-5
 N=13,846,661.18
 E= 3,258,490.26
 ELEV= 18.12'
 STA= 568+69.43
 OFF= 146.96' RT
 SET 5/8" IR w/
 TxDOT ALUM DISK
 IN CONC



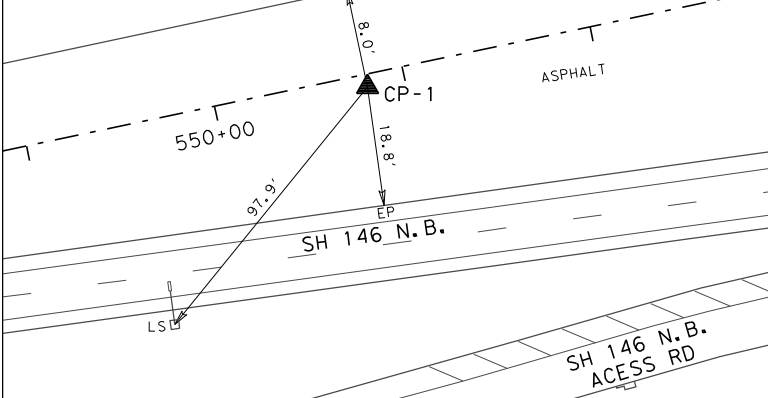
STATION IS LOCATED ON THE SOUTH SIDE OF SH 146 NORTH BOUND, LYING 0.14 MILE EAST OF EAST ELVINTA STREET.

H-6
 N=13,846,706.38
 E= 3,257,240.90
 ELEV= 21.76'
 STA= 556+56.41
 OFF= 155.58' LT
 SET 5/8" IR w/
 TxDOT ALUM DISK
 IN CONC



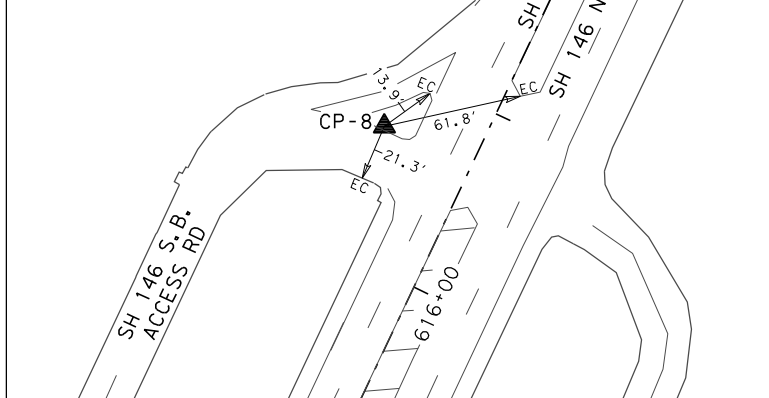
STATION IS LOCATED ON THE NORTH SIDE OF SH 146 SOUTH BOUND, LYING 0.10 MILE WEST OF CROSBY CEDAR BAYOU ROAD.

CP-1
 N=13,846,430.95
 E= 3,256,722.53
 ELEV= 31.89'
 STA= 550+92.30
 OFF= 6.72' RT
 FND PK NAIL w/
 WASHER IN EJ



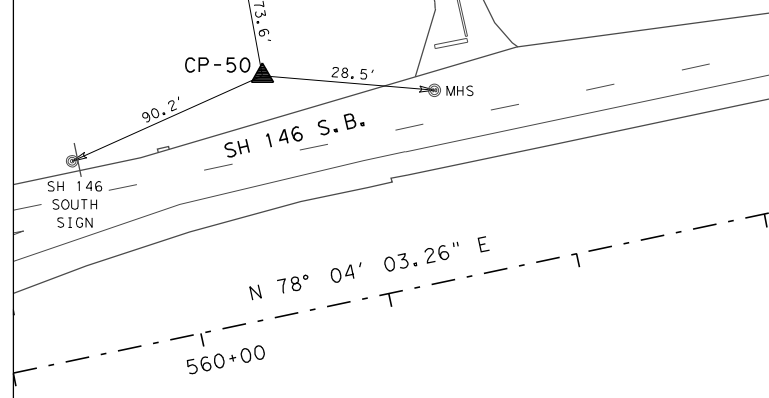
STATION IS LOCATED ON THE SOUTH SIDE OF SH 146 SOUTH BOUND, LYING 0.20 MILE WEST OF CROSBY CEDAR BAYOU ROAD.

CP-8
 N=13,849,454.30
 E= 3,262,147.39
 ELEV= 23.14'
 STA= 616+78.69
 OFF= 49.78' LT
 FND "X" IN CONC



STATION IS LOCATED IN A CONCRETE MEDIAN ON SH 146 SOUTH BOUND, LYING 0.41 MILE SOUTH OF MASSEY TOMPKINS ROAD.

CP-50
 N=13,846,784.71
 E= 3,257,644.42
 ELEV= 21.41'
 STA= 560+67.41
 OFF= 148.79' LT
 FND 5/8" IR
 w/ ORANGE CAP
 GEO SOLS



STATION IS LOCATED ON THE NORTHWEST SIDE OF THE INTERSECTION OF CROSBY CEDAR BAYOU ROAD AND SH 146 SOUTH BOUND.

- NOTES:
1. ALL BEARINGS AND COORDINATES SHOWN HEREON ARE BASED ON THE TEXAS COORDINATE SYSTEM, SOUTH CENTRAL ZONE (4204), NORTH AMERICAN DATUM OF 1983 (2011 ADJ.).
 2. ALL ELEVATIONS SHOWN HEREON ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (GEOID MODEL 12B).
 3. COORDINATES AND DISTANCES ARE U.S. SURVEY FEET, DISPLAYED IN SURFACE VALUES, AND MAY BE CONVERTED TO NAD83 (GRID) VALUES BY APPLYING THE TxDOT COMBINED ADJUSTMENT FACTOR (CAF) FOR HARRIS COUNTY, CAF = 1.00013, USING THE FORMULA: SURFACE / CAF = GRID
 4. HORIZONTAL COORDINATE SOLUTIONS ARE BASED ON REDUNDANT GPS RTN OBSERVATIONS, MEASURED FROM TxDOT CORS TXAC & TXLI DURING MAY-JUNE, 2019.
 5. ELEVATIONS HAVE BEEN ESTABLISHED VIA DIGITAL LEVELING, HOLDING FIXED THE GPS DERIVED ELEVATION FOR CP-50, N1020101 & N1020099.

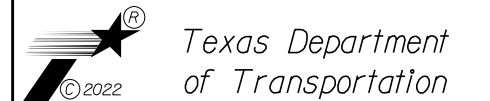
THE CONTROL POINTS SHOWN HEREIN WERE DETERMINED BY A SURVEY MADE ON THE GROUND UNDER MY SUPERVISION.



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

RODS
 Surveying, Inc.
 6810 LEE ROAD, STE. 100
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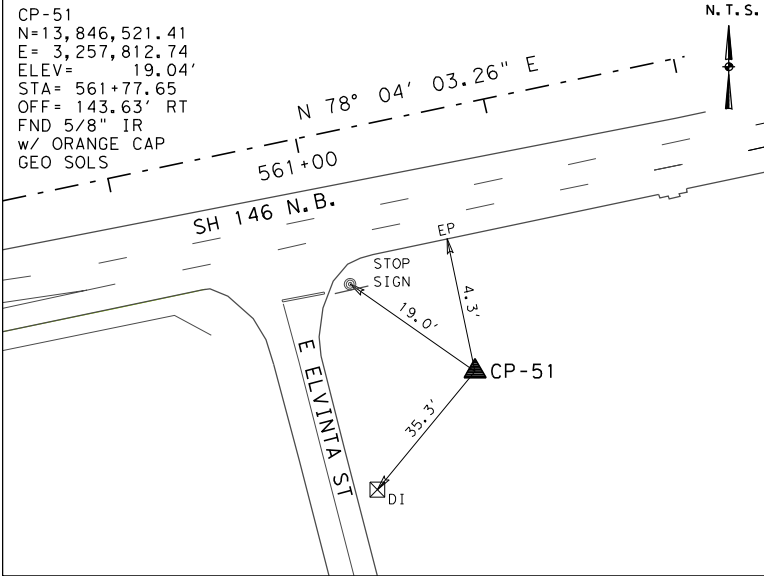
SH 146

HORIZONTAL & VERTICAL CONTROL SHEET

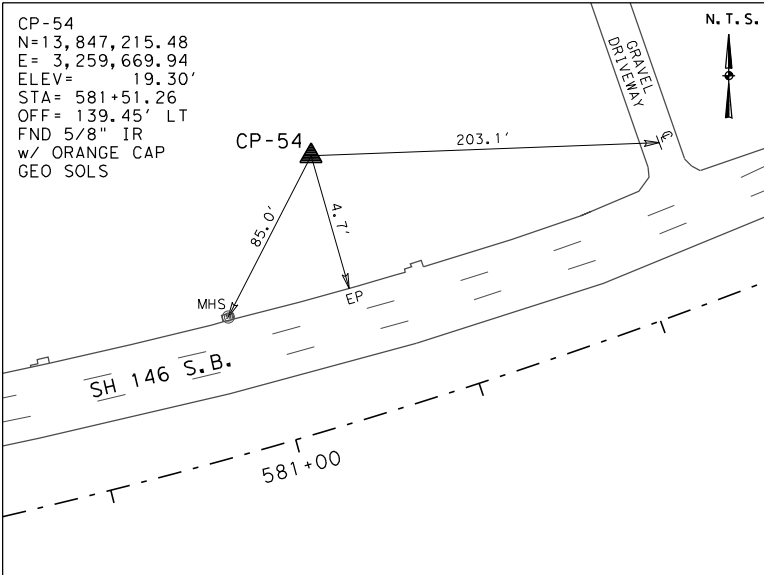
SHEET 1 of 3

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			105
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

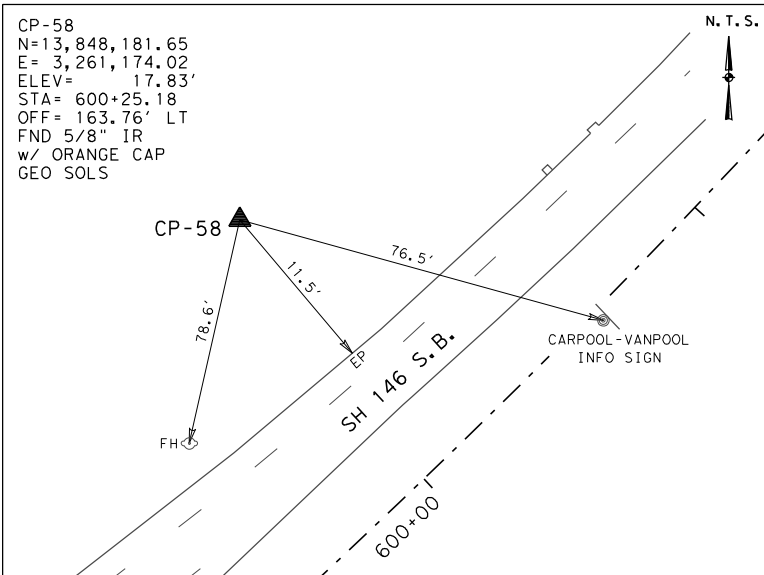
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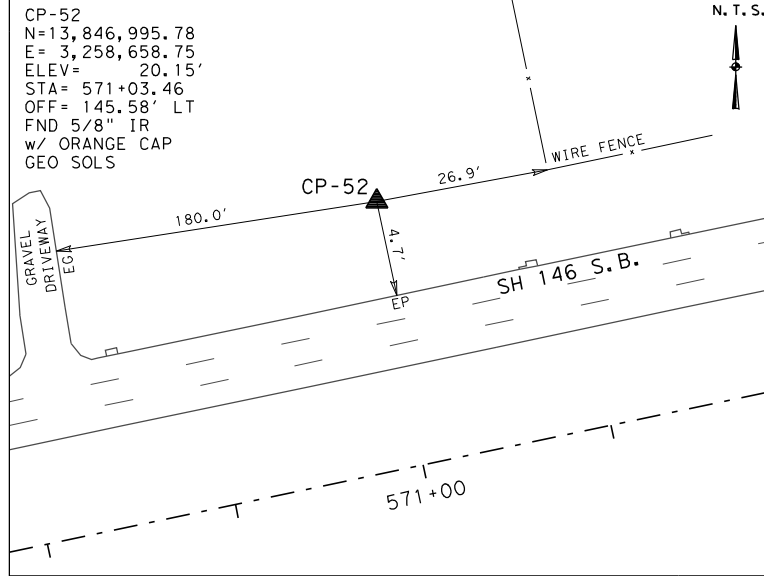
STATION IS LOCATED ON THE SOUTHEAST SIDE OF THE INTERSECTION OF SH 146 NORTH BOUND AND EAST ELVINTA STREET.



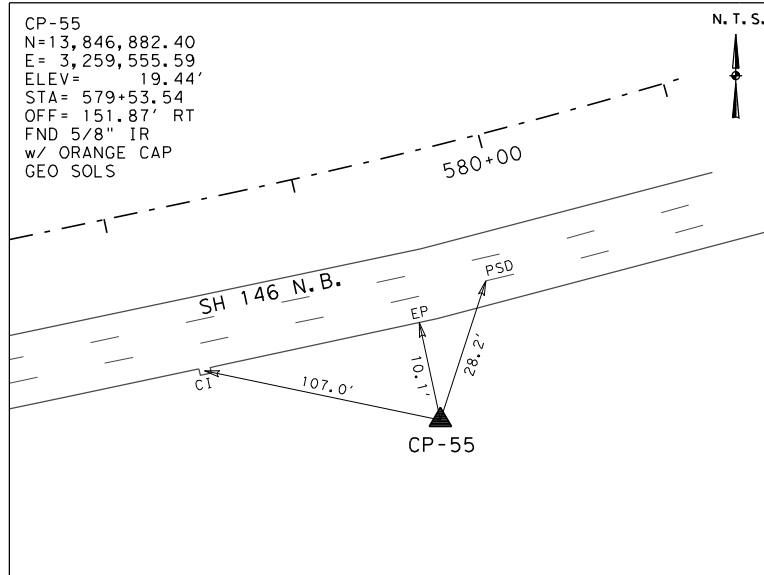
STATION IS LOCATED ON THE NORTH SIDE OF SH 146 SOUTH BOUND, LYING 0.38 MILE EAST OF CROSBY CEDAR BAYOU ROAD.



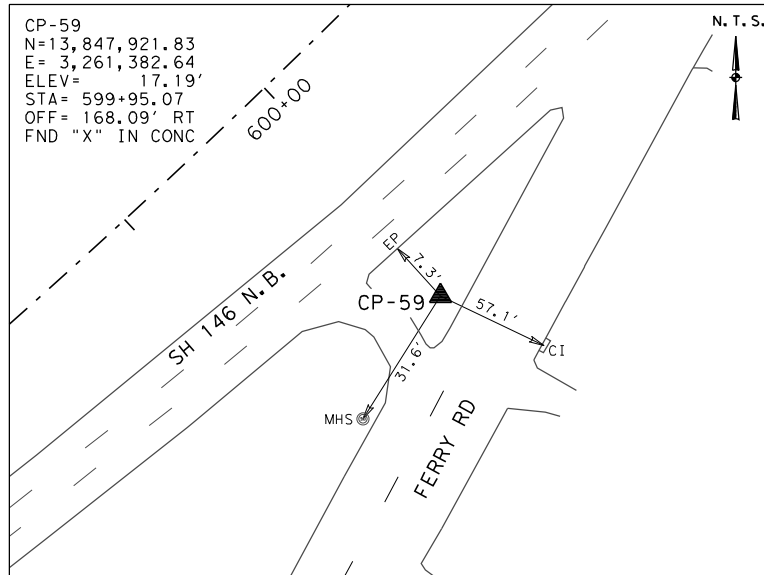
STATION IS LOCATED ON THE NORTH SIDE OF SH 146 SOUTH BOUND, LYING 0.10 MILE NORTH OF NORTH ALEXANDER DRIVE.



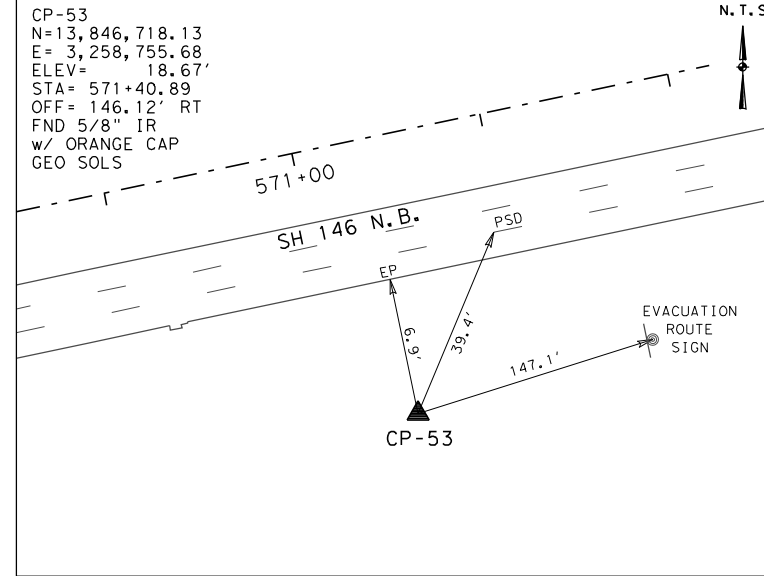
STATION IS LOCATED ON THE NORTH SIDE OF SH 146 SOUTH BOUND, LYING 0.20 MILE EAST OF CROSBY CEDAR BAYOU ROAD.



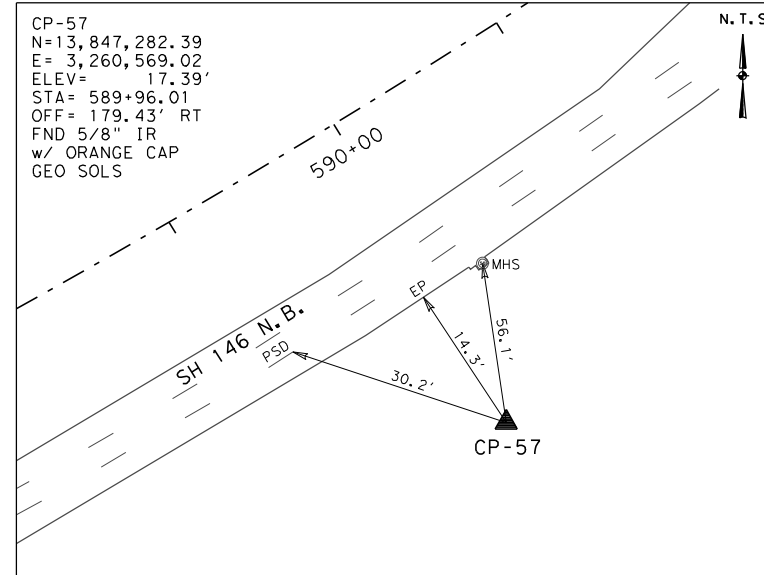
STATION IS LOCATED ON THE SOUTH SIDE OF SH 146 NORTH BOUND, LYING 0.32 MILE SOUTH OF NORTH ALEXANDER DRIVE.



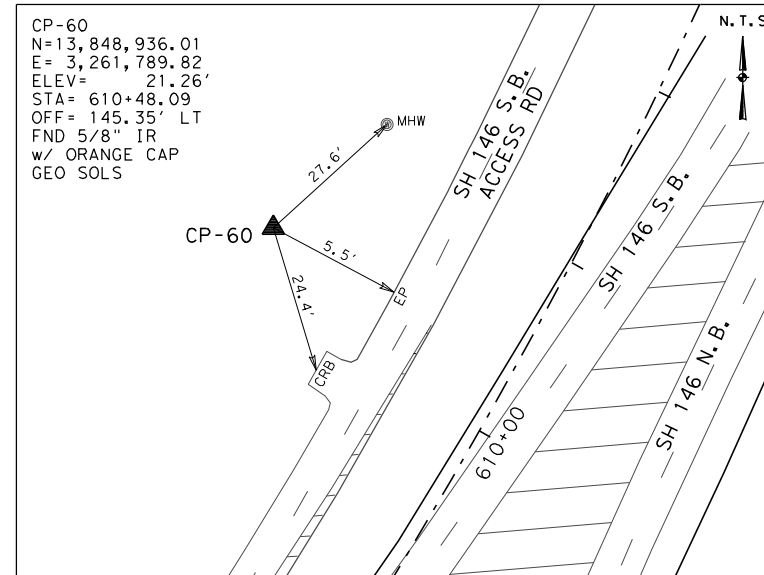
STATION IS LOCATED ON THE SOUTH SIDE OF SH 146 NORTH BOUND, LYING 0.10 MILE NORTH OF NORTH ALEXANDER DRIVE.



STATION IS LOCATED ON THE SOUTH SIDE OF SH 146 NORTH BOUND, LYING 0.19 MILE EAST OF EAST ELVINTA STREET.



STATION IS LOCATED ON THE SOUTH SIDE OF SH 146 NORTH BOUND, LYING 0.11 MILE SOUTH OF NORTH ALEXANDER DRIVE.



STATION IS LOCATED ON THE NORTHWEST SIDE OF SH 146 SOUTH BOUND ACCESS ROAD, LYING 210.00 FEET NORTH OF HUNTERS RIDGE DRIVE.

- NOTES:
1. ALL BEARINGS AND COORDINATES SHOWN HEREON ARE BASED ON THE TEXAS COORDINATE SYSTEM, SOUTH CENTRAL ZONE (4204), NORTH AMERICAN DATUM OF 1983 (2011 ADJ.).
 2. ALL ELEVATIONS SHOWN HEREON ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (GEOID MODEL 12B).
 3. COORDINATES AND DISTANCES ARE U.S. SURVEY FEET, DISPLAYED IN SURFACE VALUES, AND MAY BE CONVERTED TO NAD83 (GRID) VALUES BY APPLYING THE TXDOT COMBINED ADJUSTMENT FACTOR (CAF) FOR HARRIS COUNTY, CAF = 1.00013, USING THE FORMULA: SURFACE / CAF = GRID
 4. HORIZONTAL COORDINATE SOLUTIONS ARE BASED ON REDUNDANT GPS RTN OBSERVATIONS, MEASURED FROM TXDOT CORS TXAC & TXLI DURING MAY-JUNE, 2019.
 5. ELEVATIONS HAVE BEEN ESTABLISHED VIA DIGITAL LEVELING, HOLDING FIXED THE GPS DERIVED ELEVATION FOR CP-50, N1020101 & N1020099.

THE CONTROL POINTS SHOWN HEREIN WERE DETERMINED BY A SURVEY MADE ON THE GROUND UNDER MY SUPERVISION.



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

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 Surveying, Inc.
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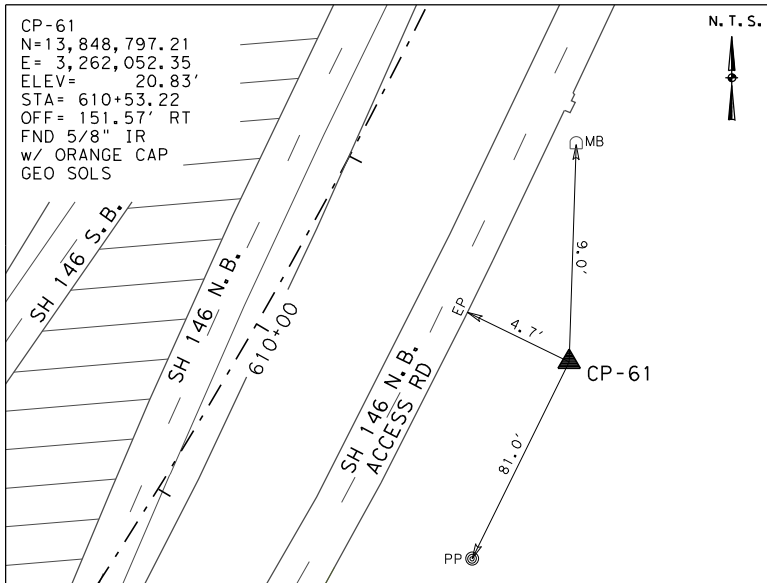


SH 146
 HORIZONTAL & VERTICAL CONTROL SHEET

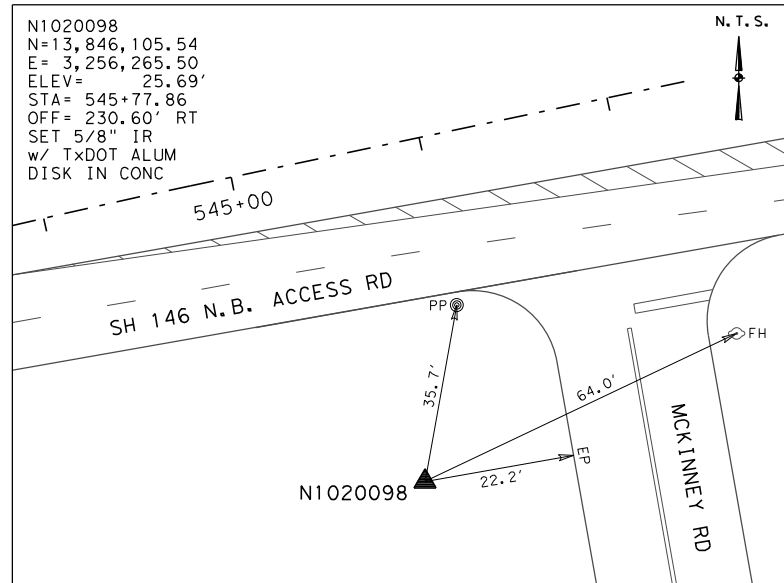
SHEET 2 of 3

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			106
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

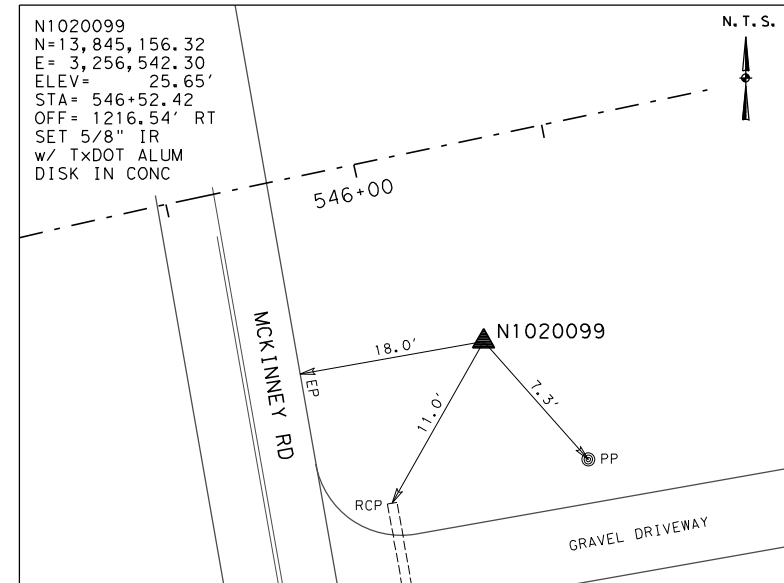
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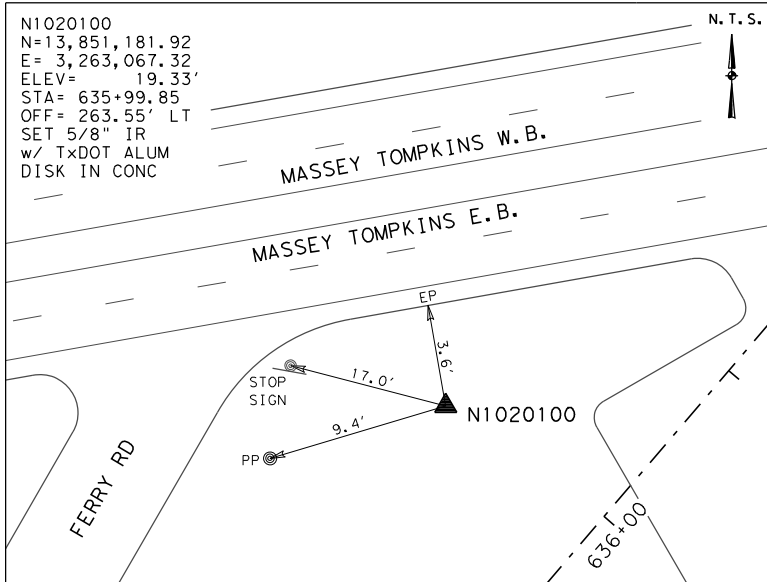
STATION IS LOCATED ON THE SOUTH SIDE OF SH 146 NORTH BOUND, LYING 0.30 MILE NORTH OF NORTH ALEXANDER DRIVE.



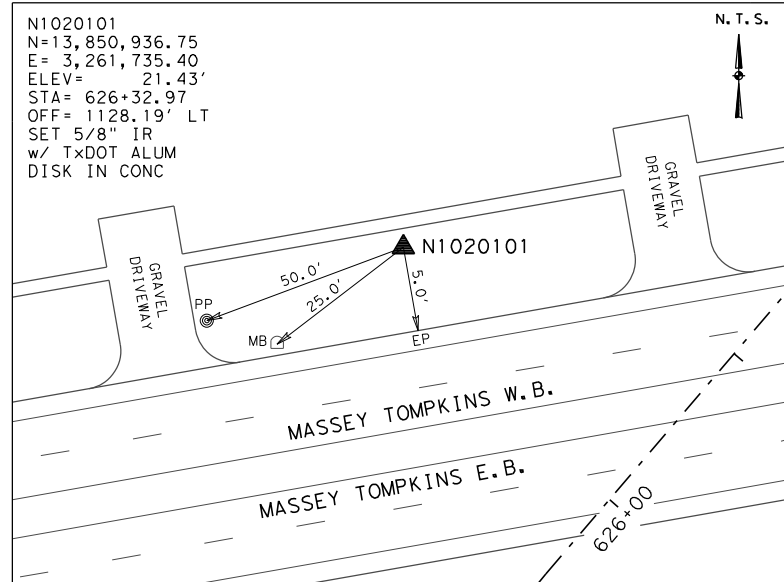
STATION IS LOCATED ON THE SOUTHWEST SIDE OF THE INTERSECTION OF MCKINNEY ROAD AND NORTH LANIER DRIVE/SH 146 NORTH BOUND ACCESS ROAD.



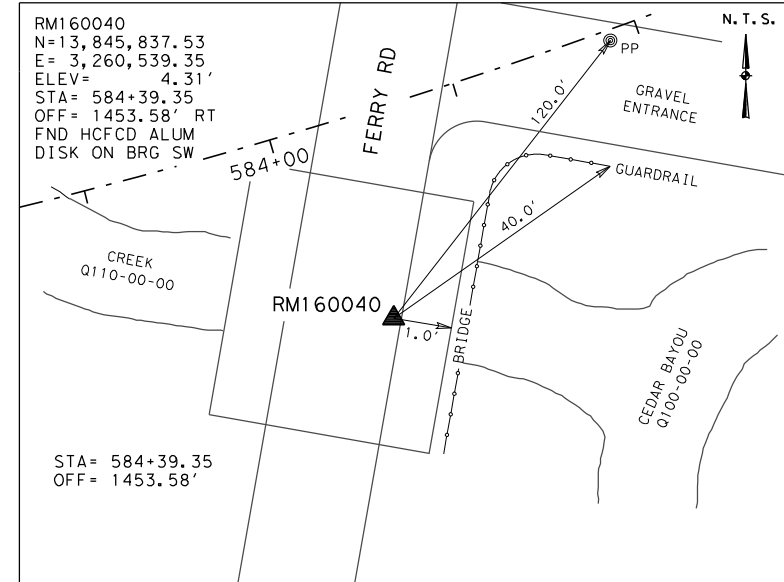
STATION IS LOCATED ON THE EAST SIDE OF MCKINNEY ROAD, LYING 0.21 MILE SOUTH OF NORTH LANIER DRIVE/SH 146 NORTH BOUND ACCESS ROAD.



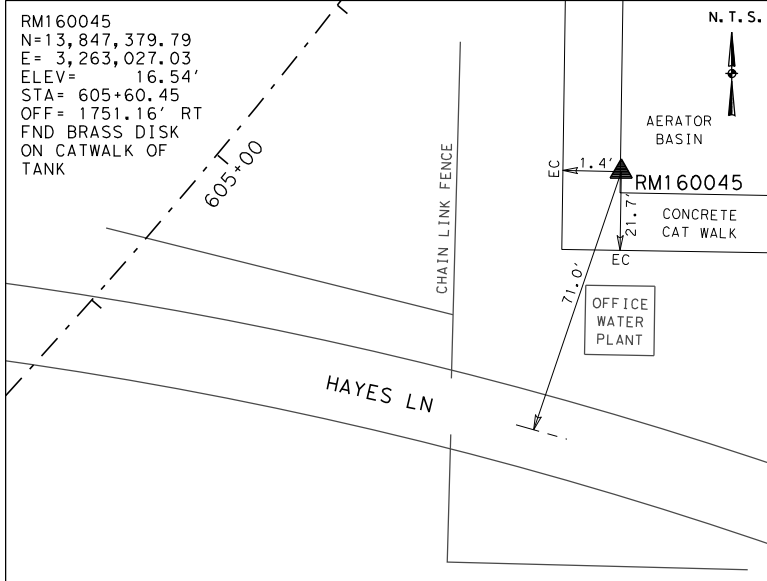
STATION IS LOCATED ON THE SOUTHEAST SIDE OF THE INTERSECTION OF MASSEY TOMPKINS ROAD AND FERRY ROAD.



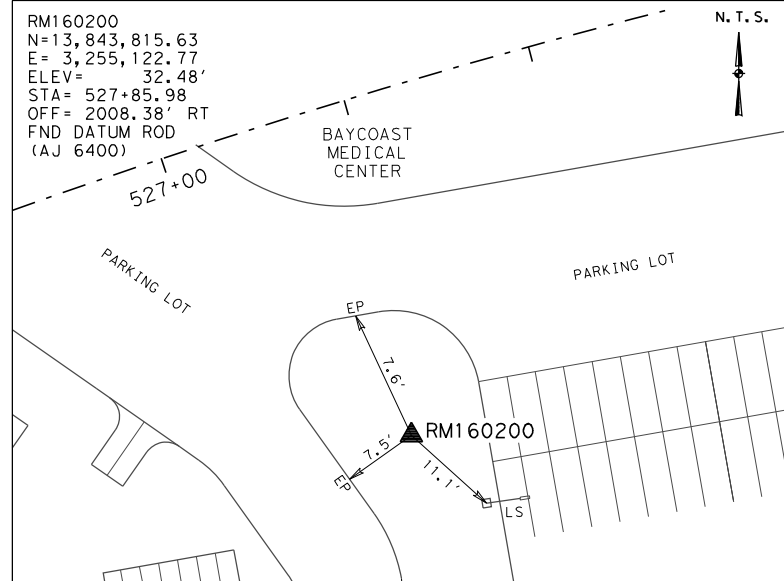
STATION IS LOCATED ON THE NORTH SIDE OF MASSEY TOMPKINS ROAD, LYING 0.26 MILE SOUTHWEST OF FERRY ROAD.



STATION IS LOCATED ON THE EAST SIDE OF BRIDGE ON FERRY ROAD, LYING 0.33 MILE SOUTH OF NORTH ALEXANDER DRIVE.



STATION IS LOCATED ON THE NORTH SIDE OF HAYES LANE, LYING 0.36 MILE EAST OF FERRY ROAD, AND ON A CATWALK OF AN AERATOR TANK.



STATION IS LOCATED ON THE SOUTHEAST SIDE OF SH 146 NORTH BOUND/NORTH LANIER DRIVE, LYING 0.21 MILE NORTHEAST OF JAMES BOWIE DRIVE, AND WITHIN THE PARKING LOT OF BAYCOAST MEDICAL CENTER.

- NOTES:
1. ALL BEARINGS AND COORDINATES SHOWN HEREON ARE BASED ON THE TEXAS COORDINATE SYSTEM, SOUTH CENTRAL ZONE (4204), NORTH AMERICAN DATUM OF 1983 (2011 ADJ.).
 2. ALL ELEVATIONS SHOWN HEREON ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (GEOID MODEL 12B).
 3. COORDINATES AND DISTANCES ARE U.S. SURVEY FEET, DISPLAYED IN SURFACE VALUES, AND MAY BE CONVERTED TO NAD83 (GRID) VALUES BY APPLYING THE TXDOT COMBINED ADJUSTMENT FACTOR (CAF) FOR HARRIS COUNTY, CAF = 1.00013, USING THE FORMULA: SURFACE / CAF = GRID
 4. HORIZONTAL COORDINATE SOLUTIONS ARE BASED ON REDUNDANT GPS RTN OBSERVATIONS, MEASURED FROM TXDOT CORS TXAC & TXLI DURING MAY-JUNE, 2019.
 5. ELEVATIONS HAVE BEEN ESTABLISHED VIA DIGITAL LEVELING, HOLDING FIXED THE GPS DERIVED ELEVATION FOR CP-50, N1020101 & N1020099.

THE CONTROL POINTS SHOWN HEREIN WERE DETERMINED BY A SURVEY MADE ON THE GROUND UNDER MY SUPERVISION.



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

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SH 146

HORIZONTAL & VERTICAL CONTROL SHEET

SHEET 3 of 3

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			107
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

1/5/2022 7:58:34 AM N:\CivilTech\287\21701004\CAD\H&V Control\H&V Sketches.dgn

CL SH 146

Beginning chain CL SH 146 description

P.T. Station 544+94.21 N 13,846,313.8659 E 3,256,135.9741
N 78° 04' 03.26" E

Curve Data

Curve 146CL2_9
P.I. Station 583+04.46 N 13,847,101.6661 E 3,259,863.8964
Delta = 16° 03' 41.77" (LT)
Degree = 1° 52' 42.78"
Tangent = 430.3217
Length = 855.0000
Radius = 3,050.0000
External = 30.2073
Long Chord = 852.2032
Mid. Ord. = 29.9110
P.C. Station 578+74.14 N 13,847,012.6937 E 3,259,442.8730
P.T. Station 587+29.14 N 13,847,303.6503 E 3,260,243.8690
C.C. N 13,849,996.7897 E 3,258,812.2613
Back = N 78° 04' 03.26" E
Ahead = N 62° 00' 21.49" E
Chord Bear = N 70° 02' 12.38" E

Curve Data

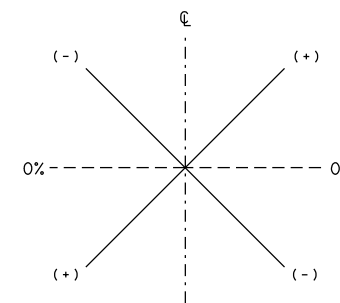
Curve 146CL2_10
P.I. Station 595+64.46 N 13,847,695.7327 E 3,260,981.4541
Delta = 20° 35' 04.34" (LT)
Degree = 1° 14' 44.02"
Tangent = 835.3206
Length = 1,652.6328
Radius = 4,600.0000
External = 75.2284
Long Chord = 1,643.7591
Mid. Ord. = 74.0179
P.C. Station 587+29.14 N 13,847,303.6503 E 3,260,243.8690
P.T. Station 603+81.77 N 13,848,322.1093 E 3,261,534.0959
C.C. N 13,851,365.4342 E 3,258,084.7230
Back = N 62° 00' 21.49" E
Ahead = N 41° 25' 17.15" E
Chord Bear = N 51° 42' 49.32" E

Curve Data

Curve 146CL2_11
P.I. Station 608+12.09 N 13,848,644.7919 E 3,261,818.7934
Delta = 16° 03' 41.77" (LT)
Degree = 1° 52' 42.78"
Tangent = 430.3217
Length = 855.0000
Radius = 3,050.0000
External = 30.2073
Long Chord = 852.2032
Mid. Ord. = 29.9110
P.C. Station 603+81.77 N 13,848,322.1093 E 3,261,534.0959
P.T. Station 612+36.77 N 13,849,033.6461 E 3,262,003.1009
C.C. N 13,850,339.9661 E 3,259,247.0116
Back = N 41° 25' 17.15" E
Ahead = N 25° 21' 35.37" E
Chord Bear = N 33° 23' 26.26" E

TABLE OF SUPERELEVATION TRANSITIONS						
SUPERELEVATION	NAME	STATION	CROSS SLOPE	TRANSITION TYPE	PIVOT EDGE	POINT TYPE
RT	RT - 573+39	573+39.38 R1	-2.0%	REVERSE PARABOLIC	LEFT EDGE	NORMAL CROWN OUT
RT	RT - 580+08	580+07.83 R1	-4.40%	REVERSE PARABOLIC	LEFT EDGE	UNDEFINED TYPE
RT	RT - 586+28	586+28.87 R1	-4.40%	REVERSE PARABOLIC	LEFT EDGE	FULL SUPER OUT
RT	RT - 587+53	587+54.20 R1	-3.2%	REVERSE PARABOLIC	LEFT EDGE	NORMAL CROWN OUT
RT	RT - 602+46	602+44.74 R1	-3.2%	REVERSE PARABOLIC	LEFT EDGE	FULL SUPER OUT
RT	RT - 604+16	604+16.03 R1	-5.04%	REVERSE PARABOLIC	LEFT EDGE	NORMAL CROWN OUT
RT	RT - 610+00	610+00.87 R1	-5.04%	REVERSE PARABOLIC	LEFT EDGE	FULL SUPER OUT
LT	LT - 576+73	576+73.60 R1	-2.0%	REVERSE PARABOLIC	RIGHT EDGE	NORMAL CROWN OUT
LT	LT - 579+23	579+24.27 R1	-4.40%	REVERSE PARABOLIC	RIGHT EDGE	FULL SUPER OUT
LT	LT - 586+28	586+28.87 R1	-4.40%	REVERSE PARABOLIC	RIGHT EDGE	FULL SUPER OUT
LT	LT - 587+53	587+54.20 R1	-3.2%	REVERSE PARABOLIC	RIGHT EDGE	NORMAL CROWN OUT
LT	LT - 602+46	602+44.74 R1	-3.2%	REVERSE PARABOLIC	RIGHT EDGE	FULL SUPER OUT
LT	LT - 604+16	604+16.03 R1	-5.04%	REVERSE PARABOLIC	RIGHT EDGE	FULL SUPER OUT
LT	LT - 610+00	610+00.33 R1	-5.04%	REVERSE PARABOLIC	RIGHT EDGE	FULL SUPER OUT

SUPERELEVATION TRANSITION SUMMARY



CROSS SLOPE SIGN CONVENTION

REV. NO.	DATE	BY	REVISION

1/6/2022

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

Texas Department of Transportation

SH 146

MAINLANE HORIZONTAL ALIGNMENT DATA & SUPERELEVATION TRANSITION TABLE

SHEET 1 OF 2

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.	
6		108	
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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RAMP EBE1

Beginning chain RAMP EBE1 description
Feature: Road_Centerline

Curve Data

Curve 146EBRMP2_1
 P.I. Station 1+36.99 N 13,846,723.2206 E 3,258,634.7825
 Delta = 2° 25' 19.66" (LT)
 Degree = 0° 53' 03.10"
 Tangent = 136.9885
 Length = 273.9362
 Radius = 6,480.0000
 External = 1.4478
 Long Chord = 273.9158
 Mid. Ord. = 1.4475
 P.C. Station = 0+00.00 N 13,846,695.0773 E 3,258,500.7161
 P.T. Station = 2+73.94 N 13,846,757.0046 E 3,258,767.5398
 C.C. = N 13,853,036.8536 E 3,257,169.4485
 Back = N 78° 08' 40.54" E
 Ahead = N 75° 43' 20.88" E
 Chord Bear = N 76° 56' 00.71" E

Course from PT 146EBRMP2_1 to PC 146EBRMP2_4 N 75° 43' 20.88" E Dist 579.2737

Curve Data

Curve 146EBRMP2_4
 P.I. Station 12+50.72 N 13,846,997.8972 E 3,259,714.1498
 Delta = 11° 59' 37.59" (LT)
 Degree = 1° 30' 50.97"
 Tangent = 397.5066
 Length = 792.1081
 Radius = 3,784.0000
 External = 20.8216
 Long Chord = 790.6626
 Mid. Ord. = 20.7077
 P.C. Station = 8+53.21 N 13,846,899.8645 E 3,259,328.9212
 P.T. Station = 16+45.32 N 13,847,173.8425 E 3,260,070.5973
 C.C. = N 13,850,566.9862 E 3,258,395.7147
 Back = N 75° 43' 20.88" E
 Ahead = N 63° 43' 43.28" E
 Chord Bear = N 69° 43' 32.08" E

Course from PT 146EBRMP2_4 to PC 146EBRMP2_7 N 63° 43' 43.28" E Dist 34.9294

Curve Data

Curve 146EBRMP2_7
 P.I. Station 20+07.49 N 13,847,334.1492 E 3,260,395.3626
 Delta = 7° 35' 15.33" (LT)
 Degree = 1° 09' 39.63"
 Tangent = 327.2456
 Length = 653.5344
 Radius = 4,935.0000
 External = 10.8381
 Long Chord = 653.0569
 Mid. Ord. = 10.8144
 P.C. Station = 16+80.25 N 13,847,189.3030 E 3,260,101.9188
 P.T. Station = 23+33.78 N 13,847,516.4739 E 3,260,667.1113
 C.C. = N 13,851,614.5579 E 3,257,917.5780
 Back = N 63° 43' 43.28" E
 Ahead = N 56° 08' 27.96" E
 Chord Bear = N 59° 56' 05.62" E

Ending chain 146EBRMP2 description

RAMP WBX1

Beginning chain RAMP WBX1 description

Point 50 N 13,846,906.1290 E 3,258,367.1008 Sta 10+00.00
 Course from 50 to PC 146WBRMP11 N 78° 08' 40.55" E Dist 105.1146

Curve Data

Curve 146WBRMP11
 P.I. Station 12+30.64 N 13,846,953.5125 E 3,258,592.8225
 Delta = 4° 47' 31.13" (RT)
 Degree = 1° 54' 35.49"
 Tangent = 125.5269
 Length = 250.9075
 Radius = 3,000.0000
 External = 2.6250
 Long Chord = 250.8344
 Mid. Ord. = 2.6227
 P.C. Station = 11+05.11 N 13,846,927.7240 E 3,258,469.9732
 P.T. Station = 13+56.02 N 13,846,968.9483 E 3,258,717.3968
 C.C. = N 13,843,991.7164 E 3,259,086.3007
 Back = N 78° 08' 40.55" E
 Ahead = N 82° 56' 11.67" E
 Chord Bear = N 80° 32' 26.11" E

Course from PT 146WBRMP11 to PC 146WBRMP12 N 82° 56' 11.67" E Dist 641.6959

Curve Data

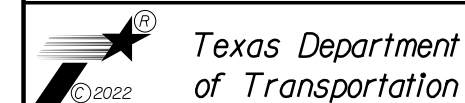
Curve 146WBRMP12
 P.I. Station 22+83.91 N 13,847,083.0488 E 3,259,638.2427
 Delta = 14° 11' 09.13" (LT)
 Degree = 2° 29' 28.04"
 Tangent = 286.1921
 Length = 569.4573
 Radius = 2,300.0000
 External = 17.7372
 Long Chord = 568.0039
 Mid. Ord. = 17.6015
 P.C. Station = 19+97.72 N 13,847,047.8564 E 3,259,354.2226
 P.T. Station = 25+67.18 N 13,847,186.7725 E 3,259,904.9773
 C.C. = N 13,849,330.4008 E 3,259,071.3963
 Back = N 82° 56' 11.67" E
 Ahead = N 68° 45' 02.54" E
 Chord Bear = N 75° 50' 37.11" E

Ending chain 146WBRMP1 description

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 Cypress, Texas 77429
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 Firm Registration No. F-382



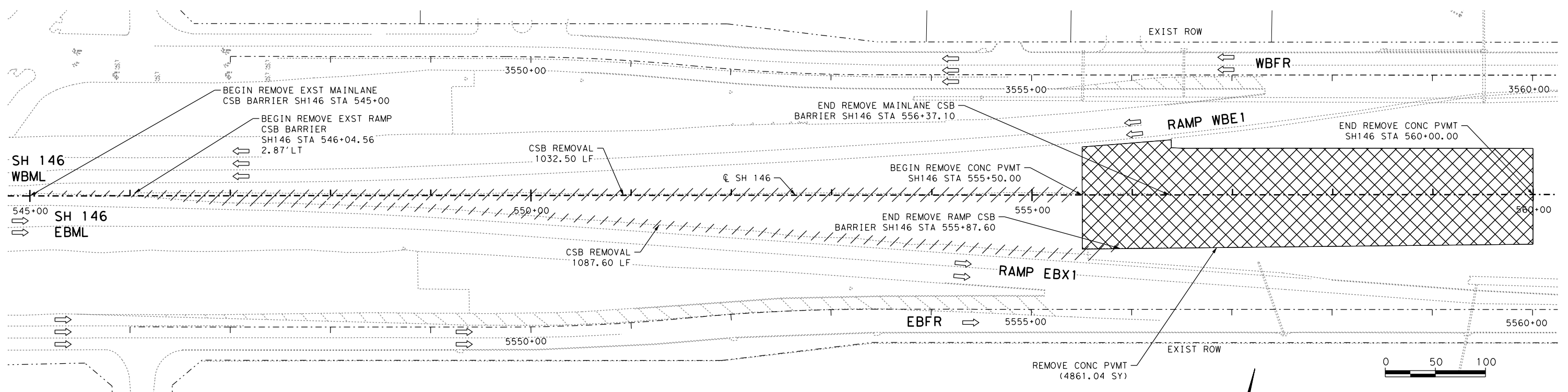
SH 146

RAMP HORIZONTAL
ALIGNMENT DATA

SHEET 2 OF 2




FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.	SHEET NO. 109
STATE TEXAS	DIST. HOU	COUNTY HARRIS
CONT. 0389	SECT. 13	JOB 039 HIGHWAY NO. SH 146

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MCKINNEY RD

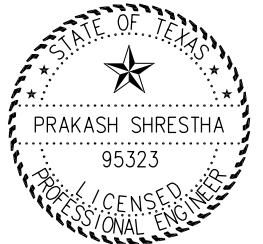
LEGEND

-  REMOVE CONC PVMT
-  REMOVE CURB
-  REMOVE CONC BARRIER

NOTES:


1. FOR ADDITIONAL INFORMATION OF REMOVAL, REFER TO TRAFFIC CONTROL PLAN SHEETS.
2. THE UTILITIES SHOWN ON THE PLANS ARE APPROXIMATE ONLY, UNLESS SUE LEVEL A INFORMATION PRESENTED.
3. SAW-CUT, WHERE SHOWN ON THE PLANS, ITEM SHALL BE SUBSIDIARY TO PAY ITEM 104-6001 REMOVING CONC (PAV)

REV. NO.	DATE	BY	REVISION



Prakash Shrestha, P.E.
1/6/2022

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Cypress, Texas 77429
PH: (281) 304-0200 - FX: (281) 304-0210
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Texas Department of Transportation

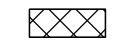

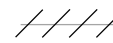
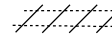
SH 146

REMOVAL LAYOUT

SHEET 1 OF 4

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.	
6		110	
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

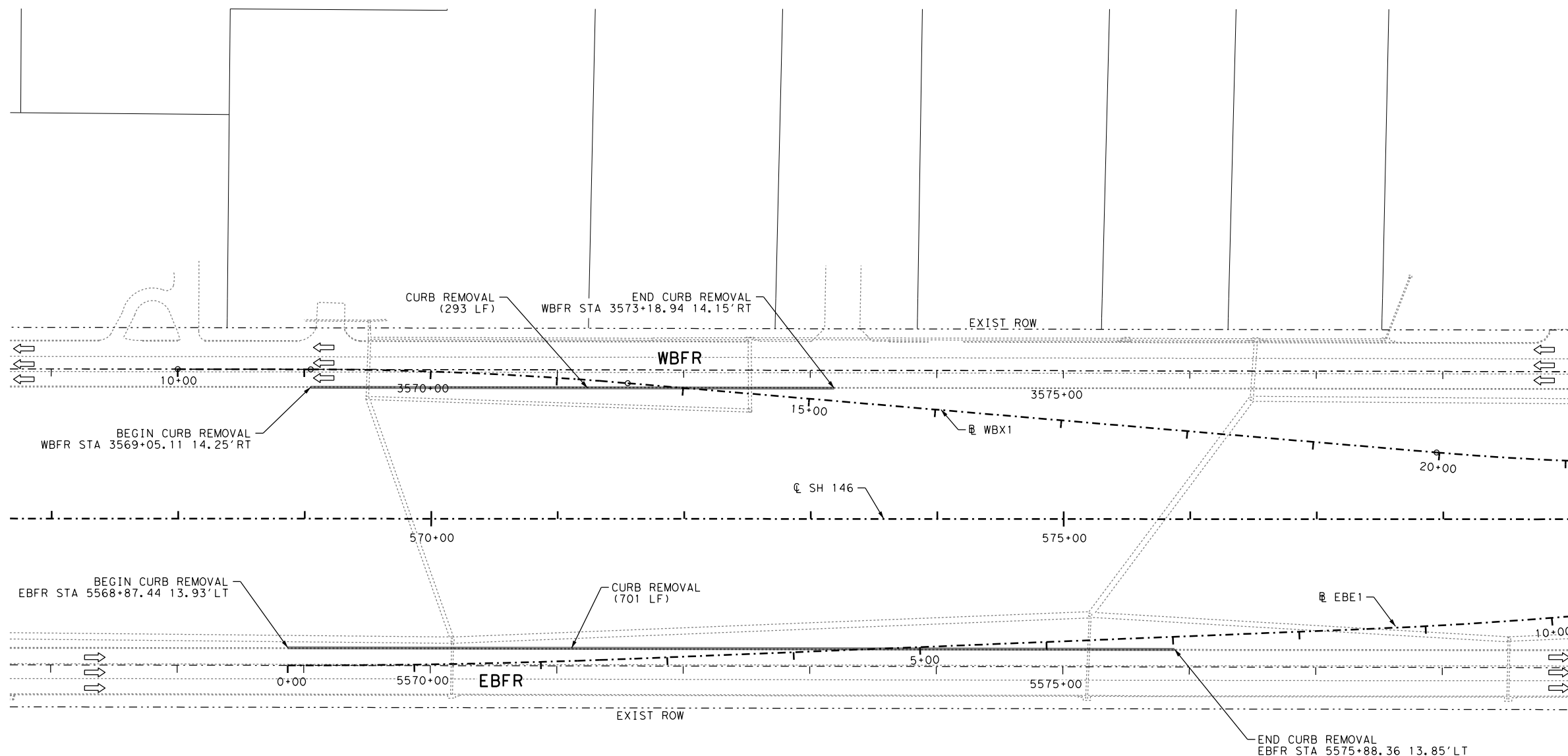
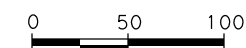
LEGEND

-  REMOVE CONC PVMT
-  REMOVE CURB
-  REMOVE CONC BARRIER
-  REMOVE CONC BOX CULVERT

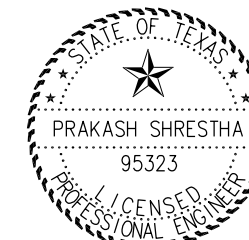


NOTES:

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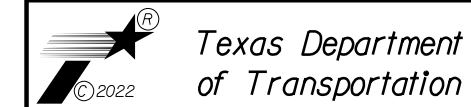


REV NO.	DATE	BY	REVISION



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1/6/2022

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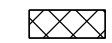

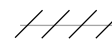
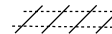
**SH 146
REMOVAL LAYOUT**

SHEET 2 OF 4

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			111
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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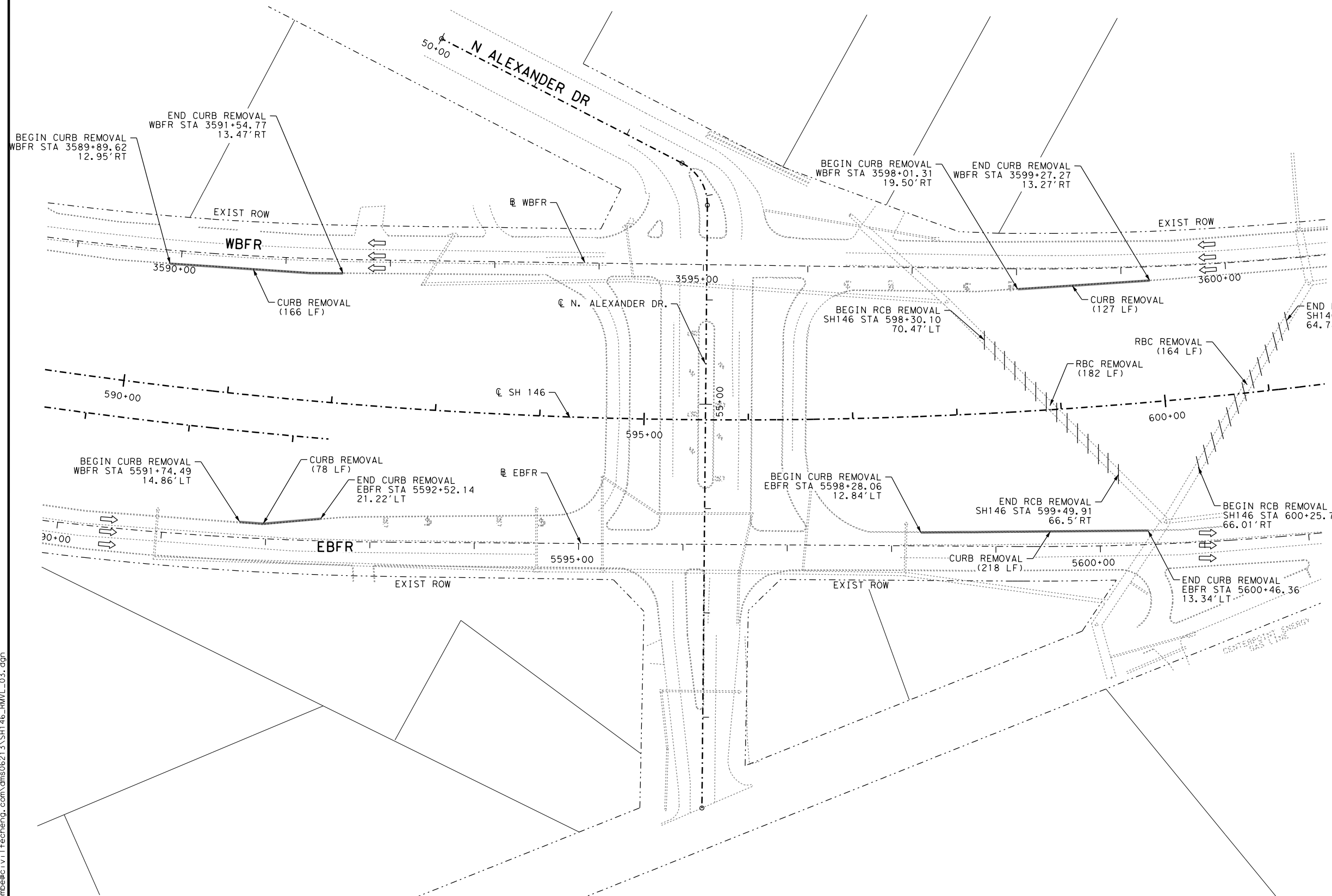
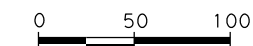
LEGEND

-  REMOVE CONC PVMT
-  REMOVE CURB
-  REMOVE CONC BARRIER
-  REMOVE CONC BOX CULVERT

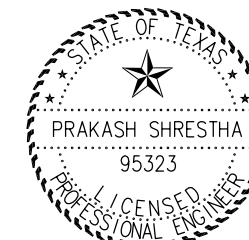


NOTES:

1. FOR ADDITIONAL INFORMATION OF REMOVAL, REFER TO TRAFFIC CONTROL PLAN SHEETS.
2. THE UTILITIES SHOWN ON THE PLANS ARE APPROXIMATE ONLY, UNLESS SUE LEVEL A INFORMATION PRESENTED.
3. SAW-CUT, WHERE SHOWN ON THE PLANS, ITEM SHALL BE SUBSIDIARY TO PAY ITEM 104-6001 REMOVING CONC (PAV)

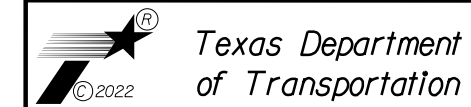


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1/6/2022

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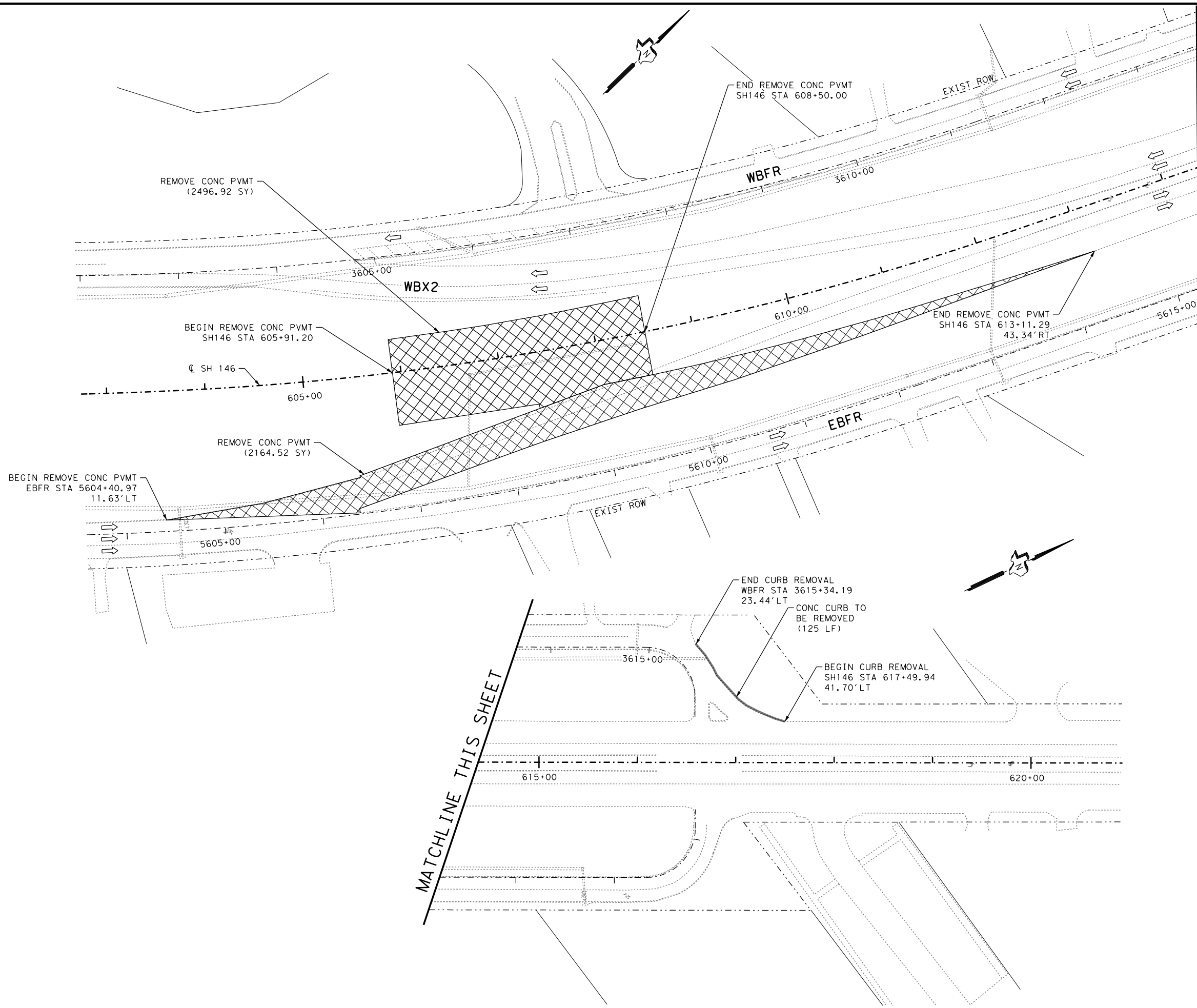
**SH 146
REMOVAL LAYOUT**

SHEET 3 OF 4

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			112
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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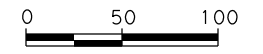
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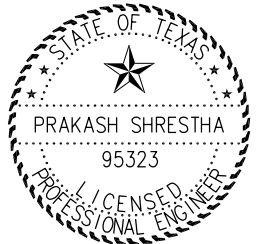
LEGEND

- REMOVE CONC PVMT
- REMOVE CURB
- REMOVE CONC BARRIER
- REMOVE CONC BOX CULVERT

- NOTES:**
- FOR ADDITIONAL INFORMATION OF REMOVAL, REFER TO TRAFFIC CONTROL PLAN SHEETS.
 - THE UTILITIES SHOWN ON THE PLANS ARE APPROXIMATE ONLY, UNLESS SUE LEVEL A INFORMATION PRESENTED.
 - SAW-CUT, WHERE SHOWN ON THE PLANS, ITEM SHALL BE SUBSIDIARY TO PAY ITEM 104-6001 REMOVING CONC (PAV)



REV. NO.	DATE	BY	REVISION



Prakash Shrestha, P.E.
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 11821 Telge Road
 Cypress, Texas 77429
 PH: (281) 304-0200 - FX: (281) 304-0210
 Firm Registration No. F-382



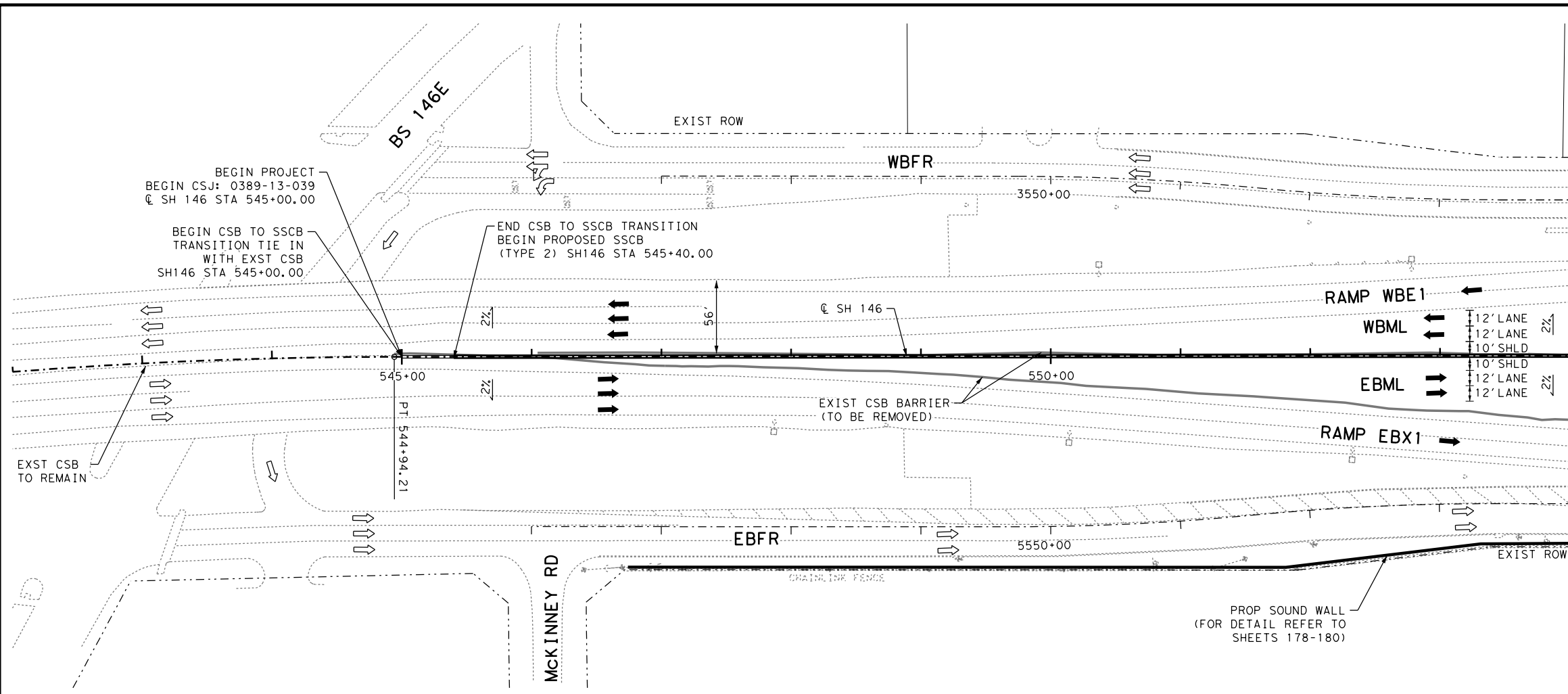
SH 146

REMOVAL LAYOUT

SHEET 4 OF 4

FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.		SHEET NO. 113
STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146

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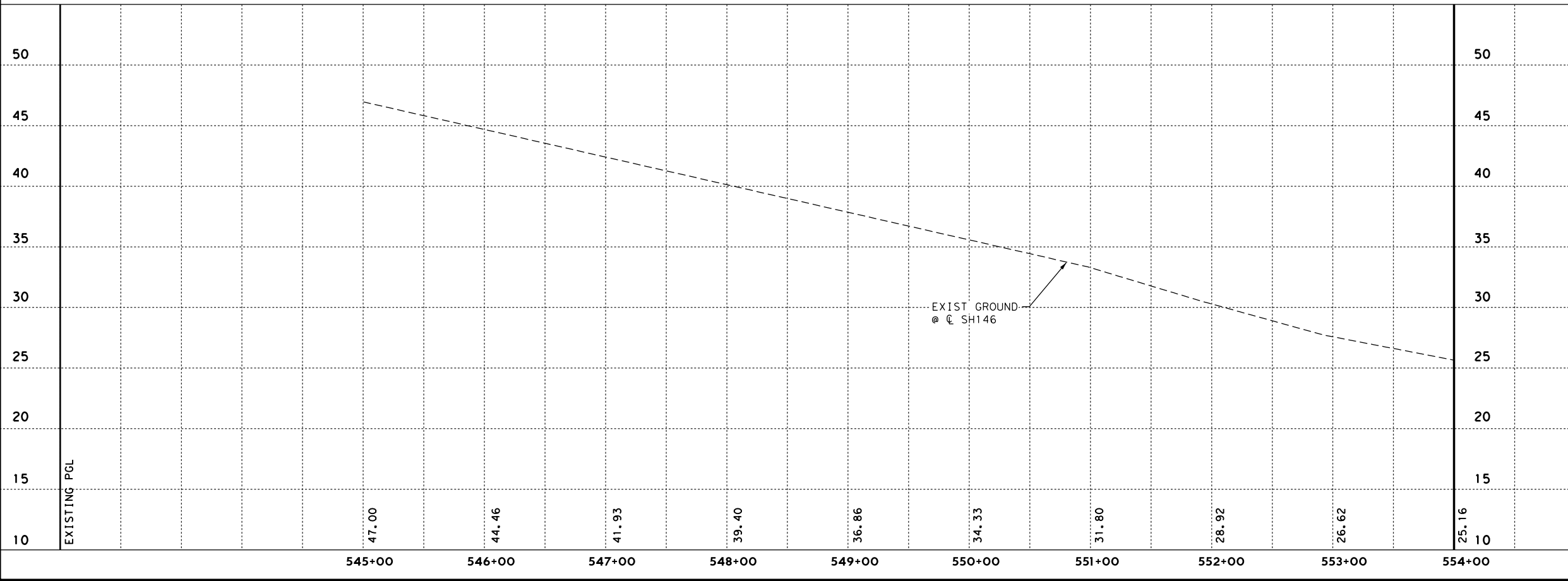
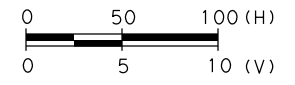
MATCHLINE STA 554+00

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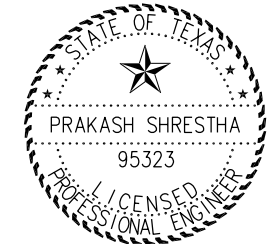
- ➔ PROP DIRECTION OF TRAFFIC
- ↔ EXIST DIRECTION OF TRAFFIC
- ▭ 4" PROPOSED CONCRETE RIP RAP
- - - SAW CUT LINE
- ▬ SINGLE SLOPE CONC BARRIER (SSCB)

NOTES:

1. FOR HORIZONTAL ALIGNMENT INFORMATION SEE HORIZONTAL ALIGNMENT DATA SHEETS
2. FOR RAMP INFORMATION SEE RAMP PLAN AND PROFILE SHEETS
3. FOR INTERSECTION INFORMATION SEE INTERSECTION LAYOUT SHEETS
4. FOR BRIDGE INFORMATION SEE BRIDGE LAYOUT SHEETS
5. FOR RETAINING WALL INFORMATION SEE RETAINING WALL LAYOUT SHEETS
6. SAWCUT IS SUBSIDIARY TO PERTAINING BID ITEMS



REV NO.	DATE	BY	REVISION



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 Firm Registration No. F-382



SH 146
ROADWAY (MAINLANES)
PLAN AND PROFILE
BEGIN TO STA 554+00

SHEET 1 OF 7

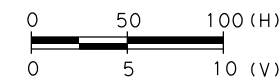
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STATE TEXAS	DIST. HOU	COUNTY HARRIS		
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146	

LEGEND

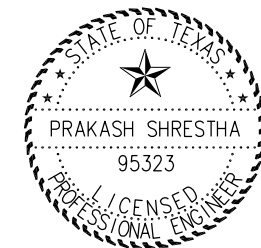
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- ↔ EXIST DIRECTION OF TRAFFIC
- ▭ 4" PROPOSED CONCRETE RIP RAP
- - - SAW CUT LINE
- SINGLE SLOPE CONC BARRIER (SSCB)

NOTES:

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2. FOR RAMP INFORMATION SEE RAMP PLAN AND PROFILE SHEETS
3. FOR INTERSECTION INFORMATION SEE INTERSECTION LAYOUT SHEETS
4. FOR BRIDGE INFORMATION SEE BRIDGE LAYOUT SHEETS
5. FOR RETAINING WALL INFORMATION SEE RETAINING WALL LAYOUT SHEETS
6. SAWCUT IS SUBSIDIARY TO PERTAINING BID ITEMS



REV. NO.	DATE	BY	REVISION



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1/6/2022

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Cypress, Texas 77429
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Firm Registration No. F-382



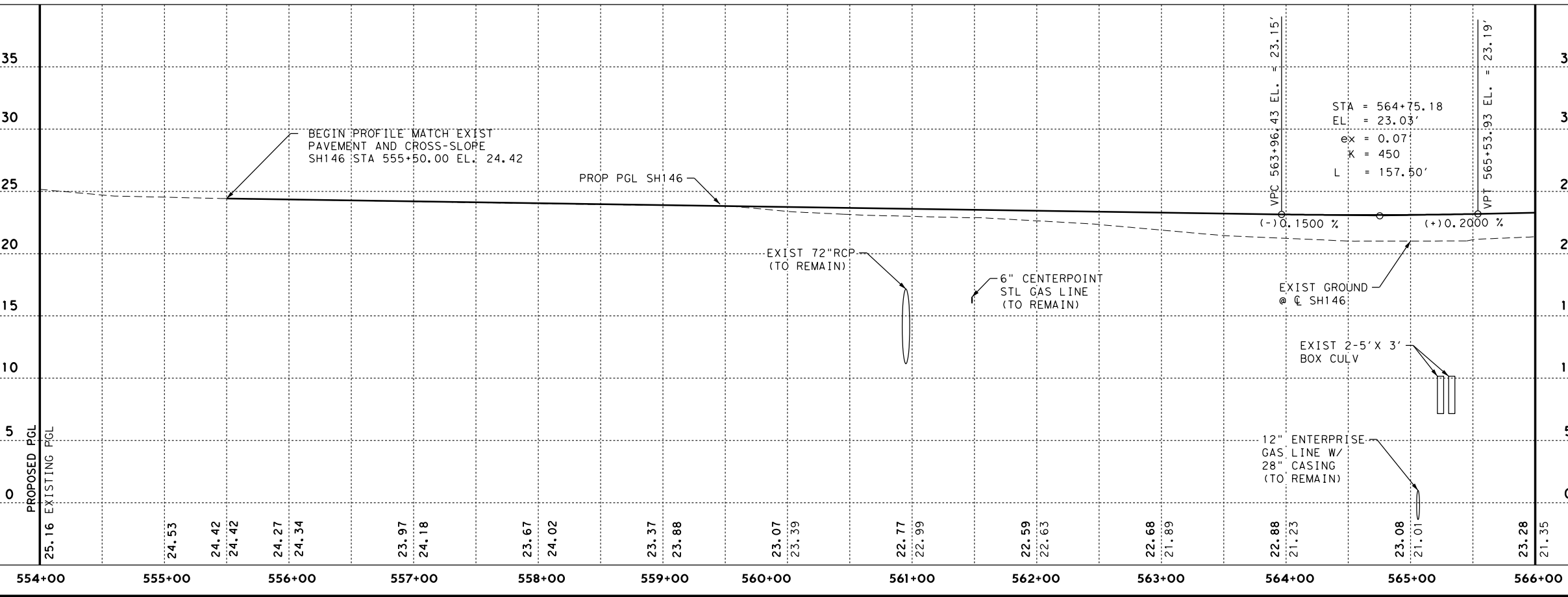
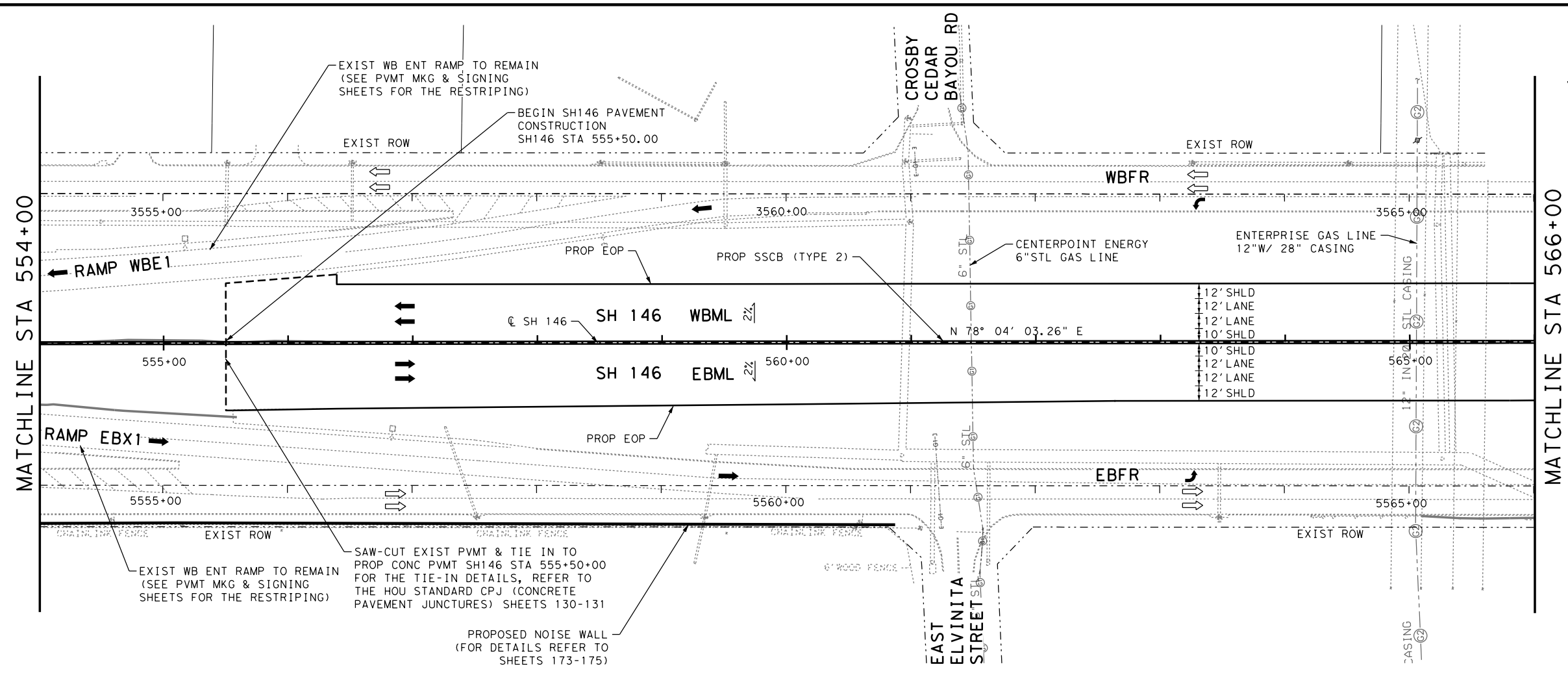
SH 146

**ROADWAY (MAINLANES)
PLAN AND PROFILE**

STA 554+00 TO STA 566+00

SHEET 2 OF 7

FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.		SHEET NO. 115
STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146



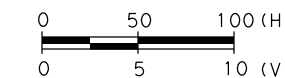
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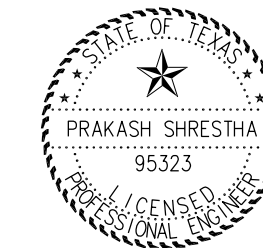
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- ↔ EXIST DIRECTION OF TRAFFIC
- ▭ 4" PROPOSED CONCRETE RIP RAP
- SAW CUT LINE
- SINGLE SLOPE CONC BARRIER (SSCB)

NOTES:

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2. FOR RAMP INFORMATION SEE RAMP PLAN AND PROFILE SHEETS
3. FOR INTERSECTION INFORMATION SEE INTERSECTION LAYOUT SHEETS
4. FOR BRIDGE INFORMATION SEE BRIDGE LAYOUT SHEETS
5. FOR RETAINING WALL INFORMATION SEE RETAINING WALL LAYOUT SHEETS
6. SAWCUT IS SUBSIDIARY TO PERTAINING BID ITEMS



REV NO.	DATE	BY	REVISION



Prakash Shrestha, P.E.
1/6/2022

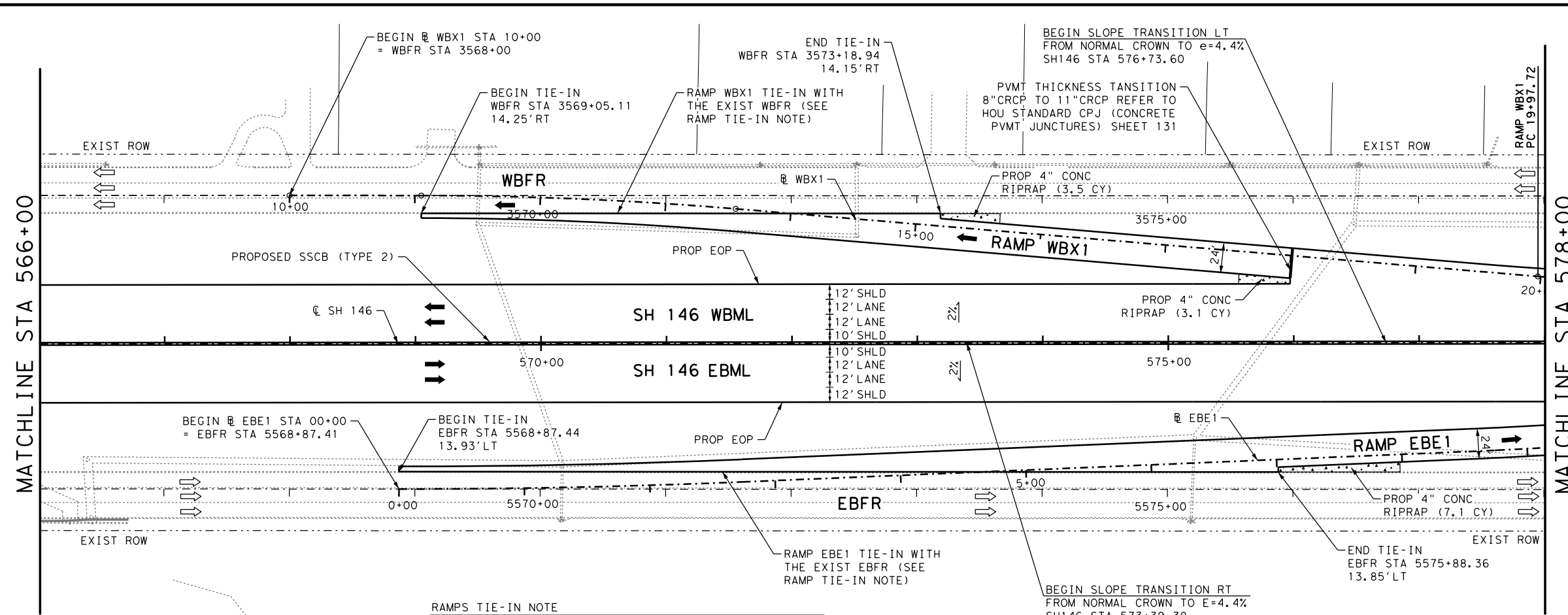
CivilTech Engineering, Inc. 11821 Telge Road
Cypress, Texas 77429
PH: (281) 304-0200 - FX: (281) 304-0210
Firm Registration No. F-382



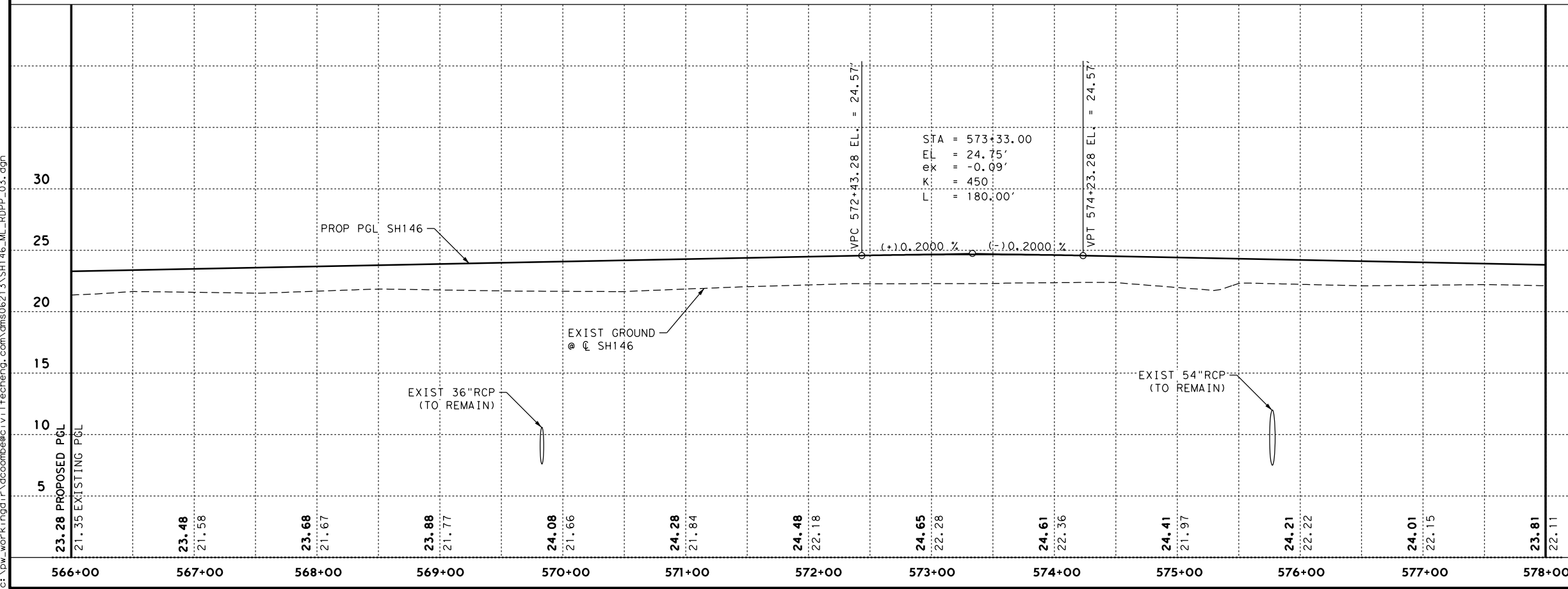
SH 146
ROADWAY (MAINLANES)
PLAN AND PROFILE
STA 566+00 TO STA 578+00

SHEET 3 OF 7

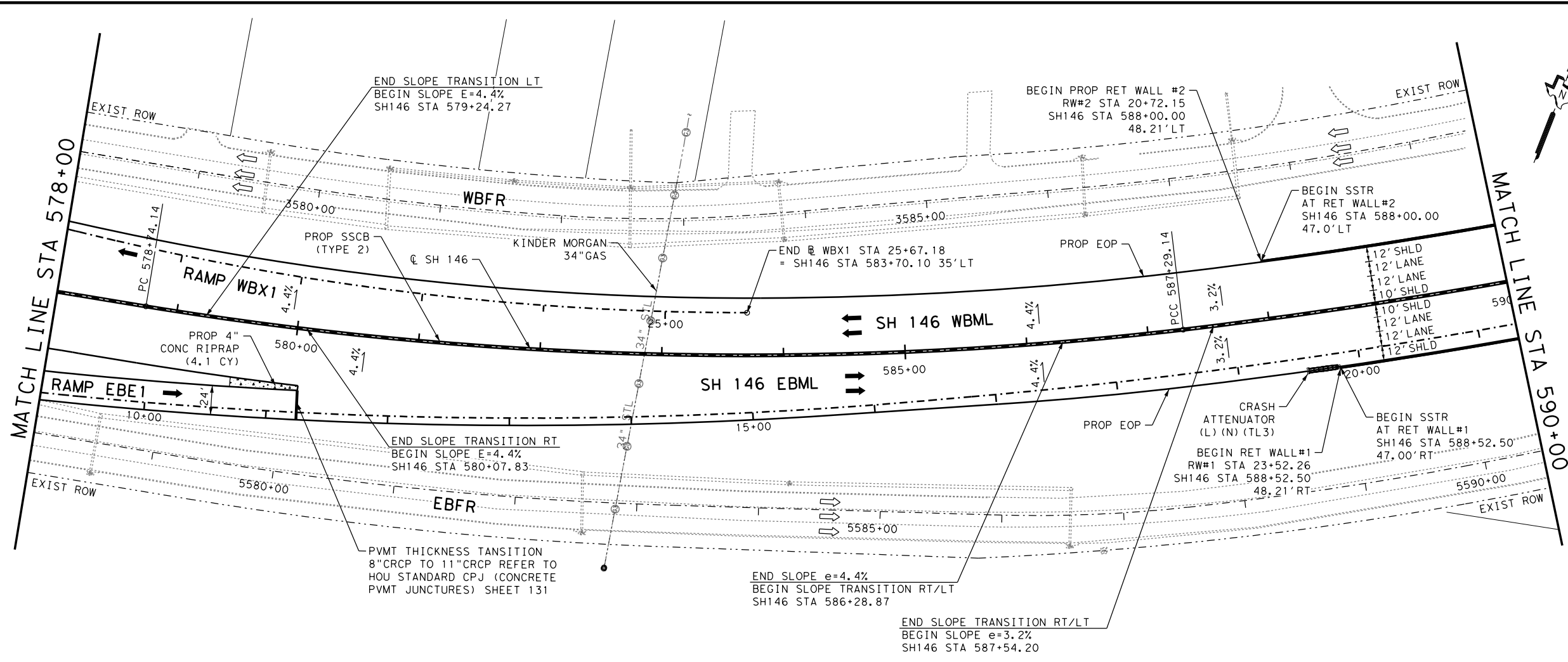
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STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146



RAMPS TIE-IN NOTE
FOR RAMP TIE IN TO THE EXIST CRCP PAVEMENTS, REFER TO DETAIL 'JUNCTURE D-TYPICAL CONNECTIONS TO EXISTING CONCRETE' ON THE STANDARD DETAIL 'CONCRETE PAVEMENT STRUCTURES' (CPJ) SHEETS 130 & 131



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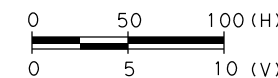


LEGEND

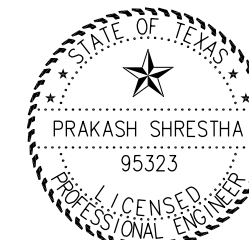
- ➔ PROP DIRECTION OF TRAFFIC
- ➞ EXIST DIRECTION OF TRAFFIC
- ▭ 4" PROPOSED CONCRETE RIP RAP
- SAW CUT LINE
- SINGLE SLOPE CONC BARRIER (SSCB)

NOTES:

1. FOR HORIZONTAL ALIGNMENT INFORMATION SEE HORIZONTAL ALIGNMENT DATA SHEETS
2. FOR RAMP INFORMATION SEE RAMP PLAN AND PROFILE SHEETS
3. FOR INTERSECTION INFORMATION SEE INTERSECTION LAYOUT SHEETS
4. FOR BRIDGE INFORMATION SEE BRIDGE LAYOUT SHEETS
5. FOR RETAINING WALL INFORMATION SEE RETAINING WALL LAYOUT SHEETS
6. SAWCUT IS SUBSIDIARY TO PERTAINING BID ITEMS

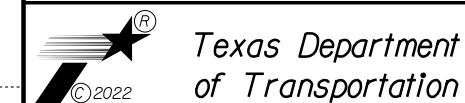


REV. NO.	DATE	BY	REVISION



Prakash Shrestha, P.E.
1/6/2022

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Cypress, Texas 77429
PH: (281) 304-0200 - FX: (281) 304-0210
Firm Registration No. F-382



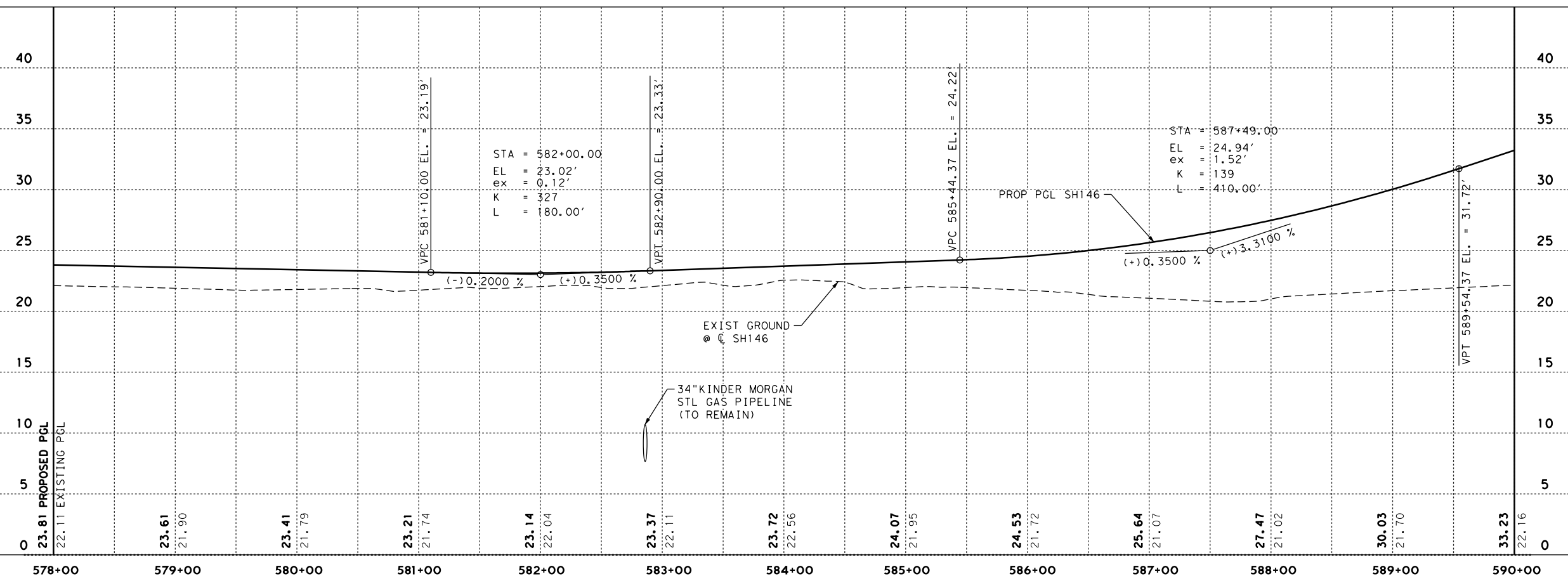
SH 146

ROADWAY (MAINLANES)
PLAN AND PROFILE

STA 578+00 TO STA 590+00

SHEET 4 OF 7

FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.		SHEET NO. 117
STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146



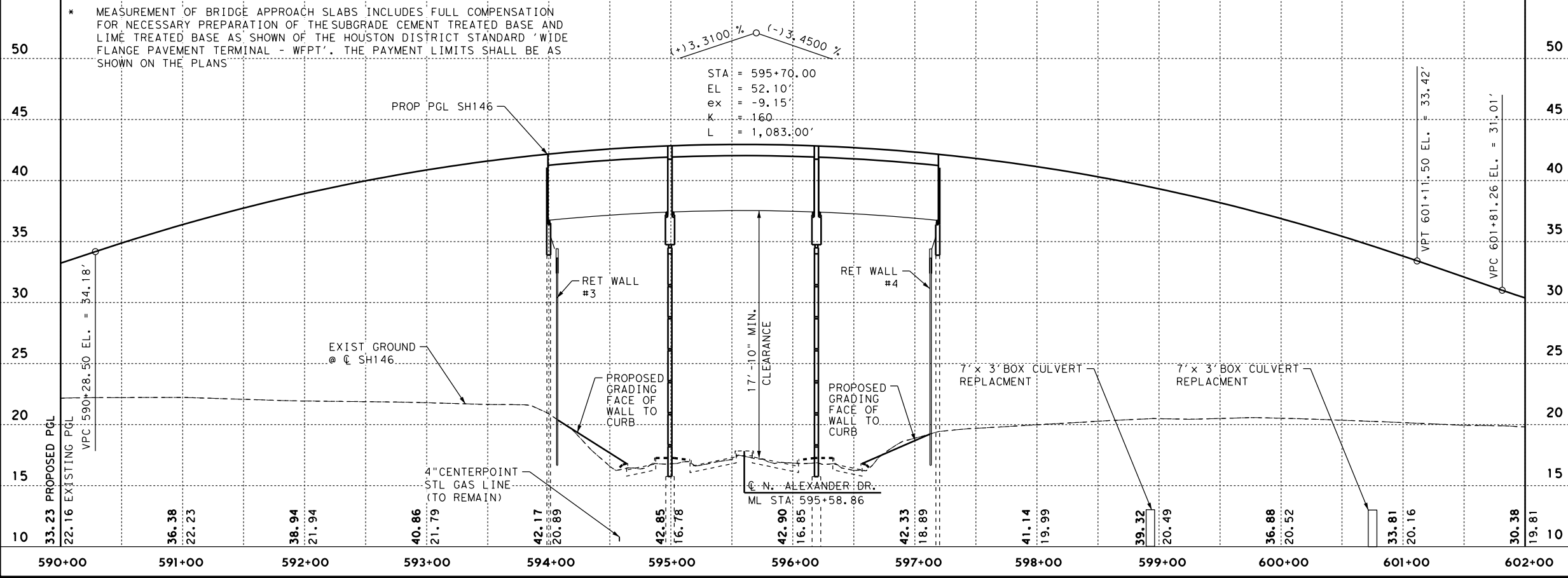
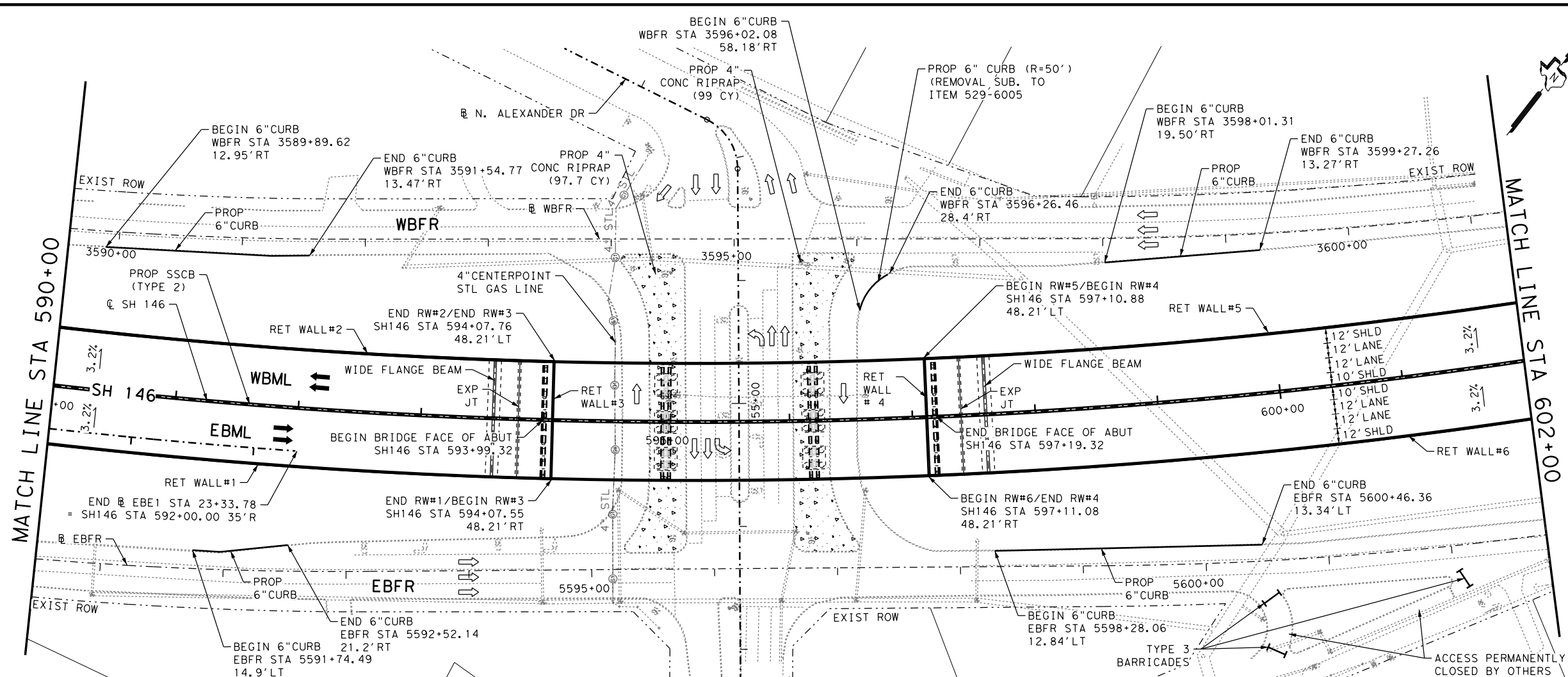
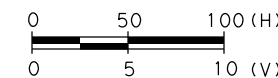
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LEGEND

- ➔ PROP DIRECTION OF TRAFFIC
- ➞ EXIST DIRECTION OF TRAFFIC
- ▭ 4" PROPOSED CONCRETE RIP RAP
- SAW CUT LINE
- ▬ SINGLE SLOPE CONC BARRIER (SSCB)

NOTES:

1. FOR HORIZONTAL ALIGNMENT INFORMATION SEE HORIZONTAL ALIGNMENT DATA SHEETS
2. FOR RAMP INFORMATION SEE RAMP PLAN AND PROFILE SHEETS
3. FOR INTERSECTION INFORMATION SEE INTERSECTION LAYOUT SHEETS
4. FOR BRIDGE INFORMATION SEE BRIDGE LAYOUT SHEETS
5. FOR RETAINING WALL INFORMATION SEE RETAINING WALL LAYOUT SHEETS
6. SAWCUT IS SUBSIDIARY TO PERTAINING BID ITEMS



REV NO.	DATE	BY	REVISION

PRAKASH SHRESTHA
95323
PROFESSIONAL ENGINEER

P. Shrestha, P.E.
1/6/2022

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

Texas Department of Transportation

SH 146

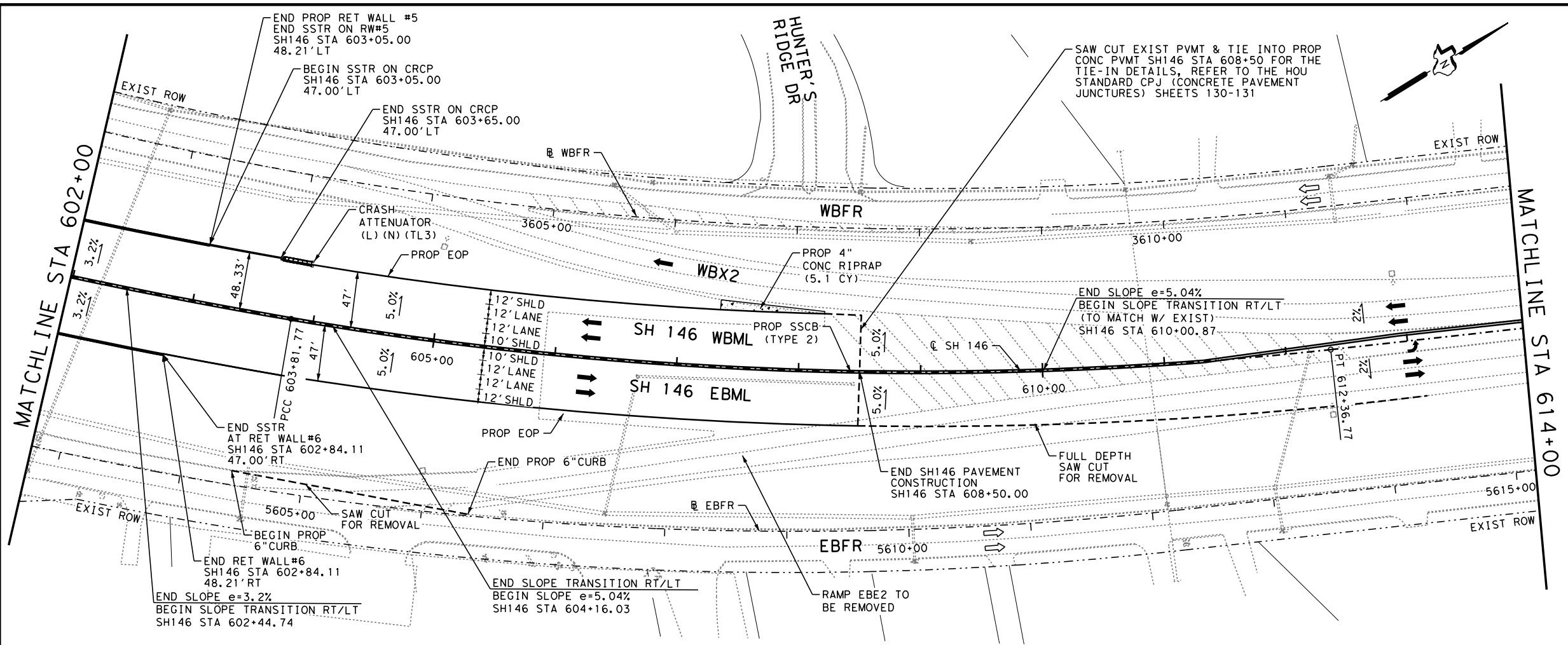
**ROADWAY (MAINLANES)
PLAN AND PROFILE**

STA 590+00 TO STA 602+00

SHEET 5 OF 7

FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.	SHEET NO. 118
STATE TEXAS	DIST. HOU.	COUNTY HARRIS
CONT. 0389	SECT. 13	JOB 039
		HIGHWAY NO. SH 146

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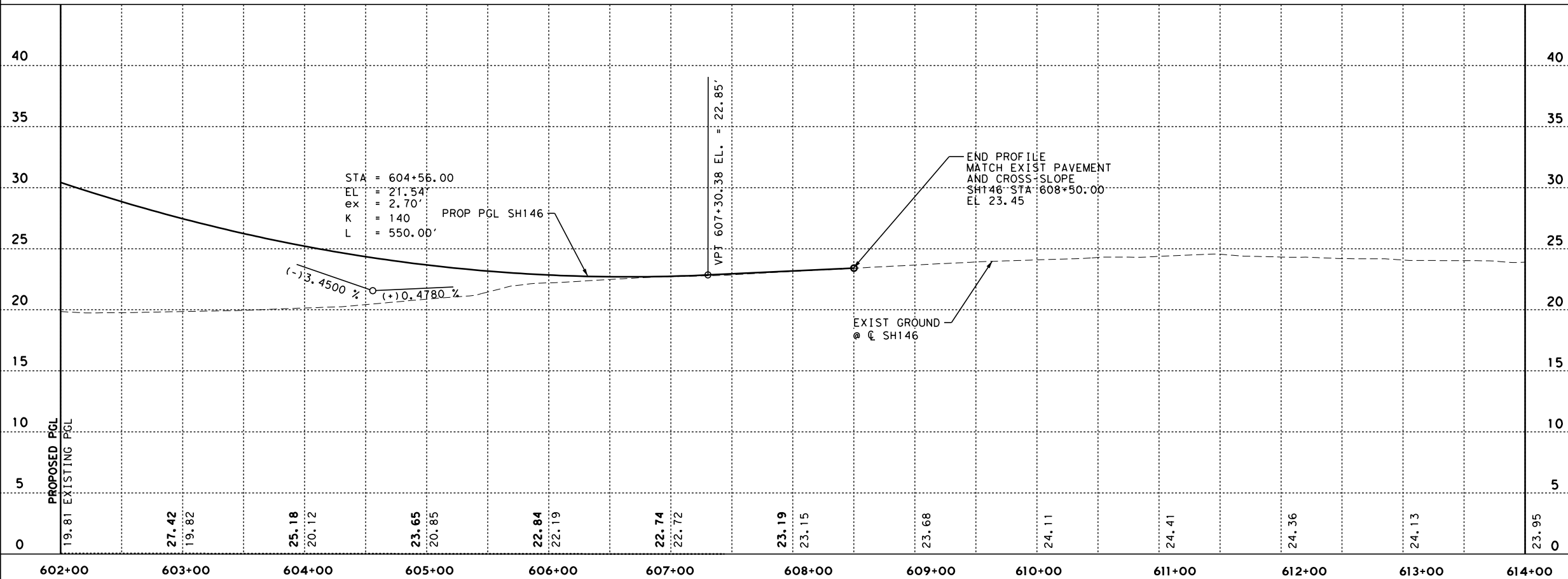
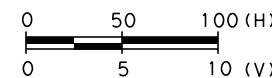


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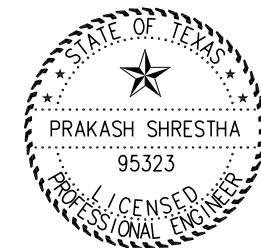
- ➔ PROP DIRECTION OF TRAFFIC
- ↔ EXIST DIRECTION OF TRAFFIC
- ▭ 4" PROPOSED CONCRETE RIP RAP
- SAW CUT LINE
- SINGLE SLOPE CONC BARRIER (SSCB)

NOTES:

1. FOR HORIZONTAL ALIGNMENT INFORMATION SEE HORIZONTAL ALIGNMENT DATA SHEETS
2. FOR RAMP INFORMATION SEE RAMP PLAN AND PROFILE SHEETS
3. FOR INTERSECTION INFORMATION SEE INTERSECTION LAYOUT SHEETS
4. FOR BRIDGE INFORMATION SEE BRIDGE LAYOUT SHEETS
5. FOR RETAINING WALL INFORMATION SEE RETAINING WALL LAYOUT SHEETS
6. SAWCUT IS SUBSIDIARY TO PERTAINING BID ITEMS

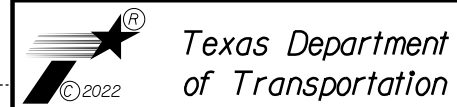


REV. NO.	DATE	BY	REVISION



Prakash Shrestha, P.E.
1/6/2022

CivilTech Engineering, Inc. 11821 Telge Road
Cypress, Texas 77429
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SH 146

ROADWAY (MAINLANES)
PLAN AND PROFILE

STA 602+00 TO STA 614+00

SHEET 6 OF 7

FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.		SHEET NO. 119
STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146

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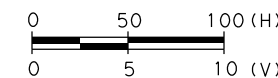


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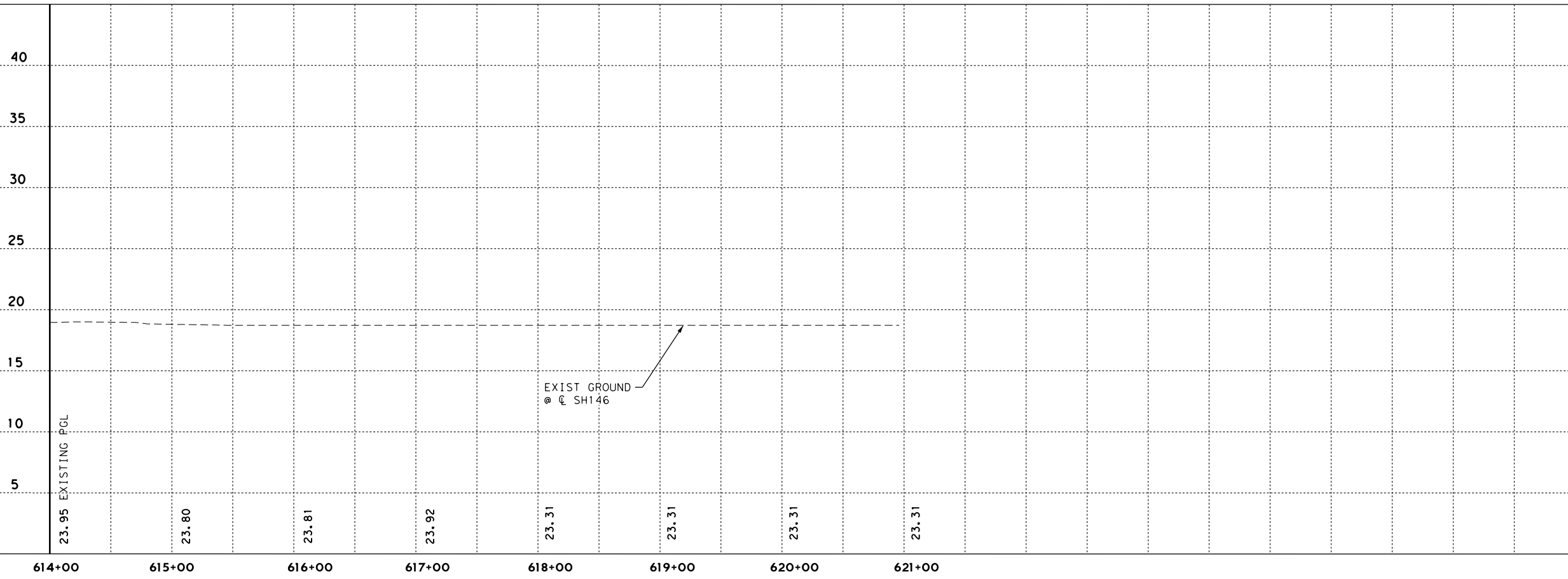
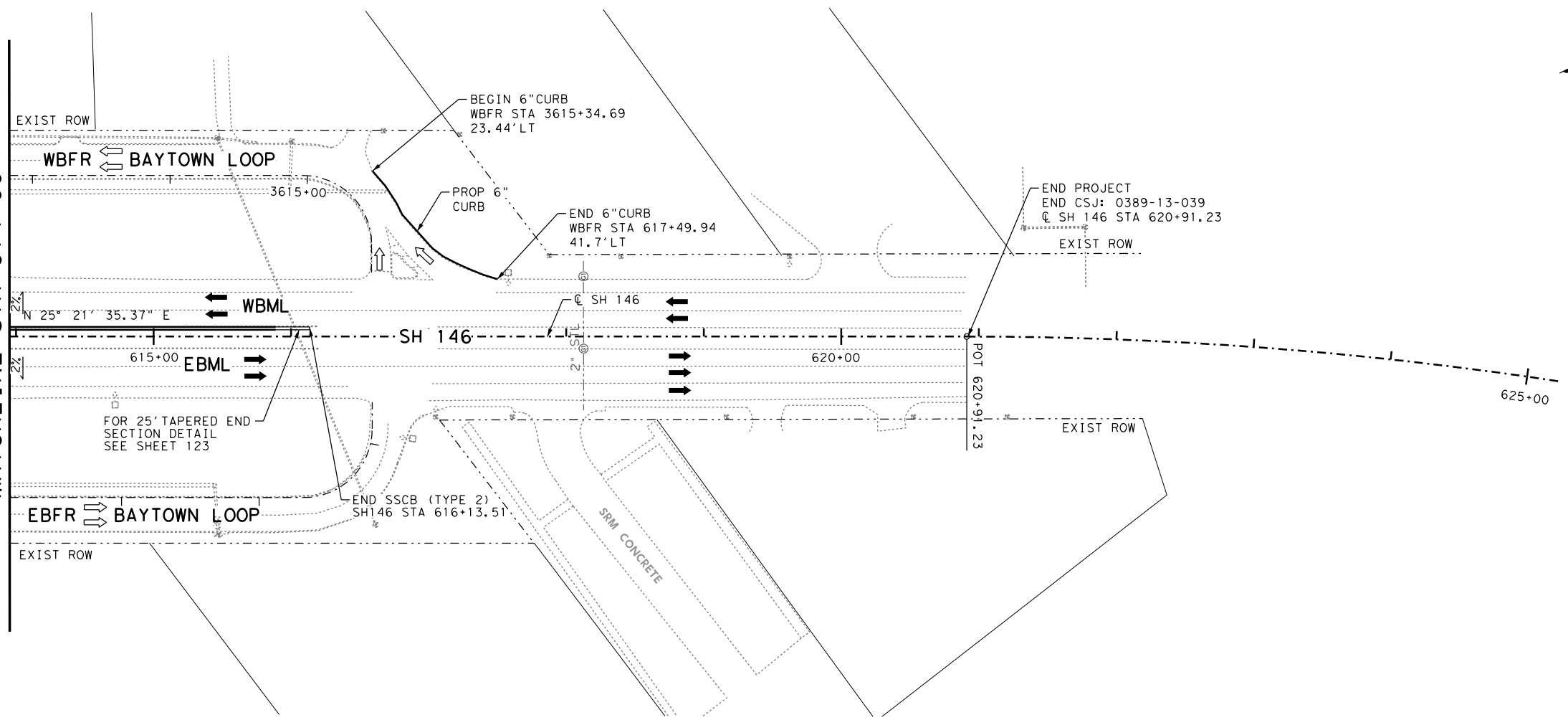
- ← PROP DIRECTION OF TRAFFIC
- ⇐ EXIST DIRECTION OF TRAFFIC
- ▭ 4" PROPOSED CONCRETE RIP RAP
- - - SAW CUT LINE
- ▬ SINGLE SLOPE CONC BARRIER (SSCB)

NOTES:

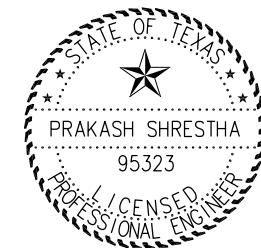
1. FOR HORIZONTAL ALIGNMENT INFORMATION SEE HORIZONTAL ALIGNMENT DATA SHEETS
2. FOR RAMP INFORMATION SEE RAMP PLAN AND PROFILE SHEETS
3. FOR INTERSECTION INFORMATION SEE INTERSECTION LAYOUT SHEETS
4. FOR BRIDGE INFORMATION SEE BRIDGE LAYOUT SHEETS
5. FOR RETAINING WALL INFORMATION SEE RETAINING WALL LAYOUT SHEETS
6. SAWCUT IS SUBSIDIARY TO PERTAINING BID ITEMS



MATCHLINE STA 614+00



REV NO.	DATE	BY	REVISION



Prakash Shrestha, P.E.
1/6/2022

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



SH 146
ROADWAY (MAINLANES)
PLAN AND PROFILE
STA 614+00 TO END

SHEET 7 OF 7

FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.		SHEET NO. 120
STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146

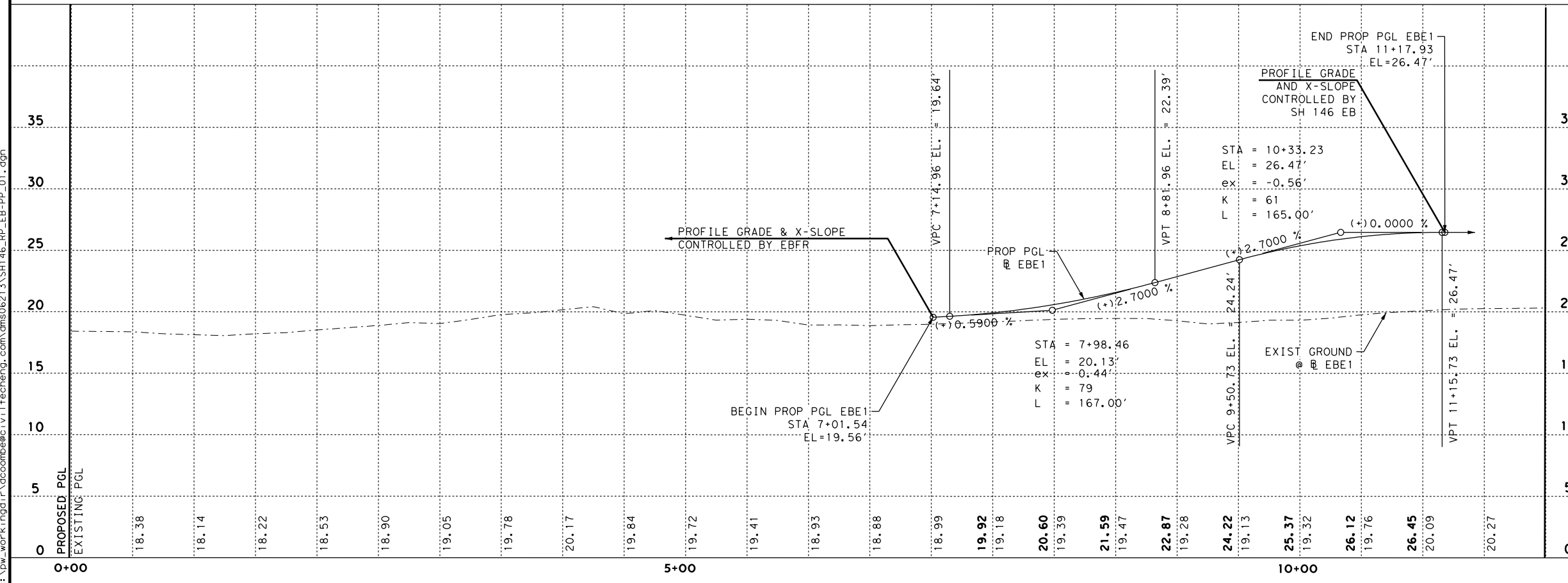
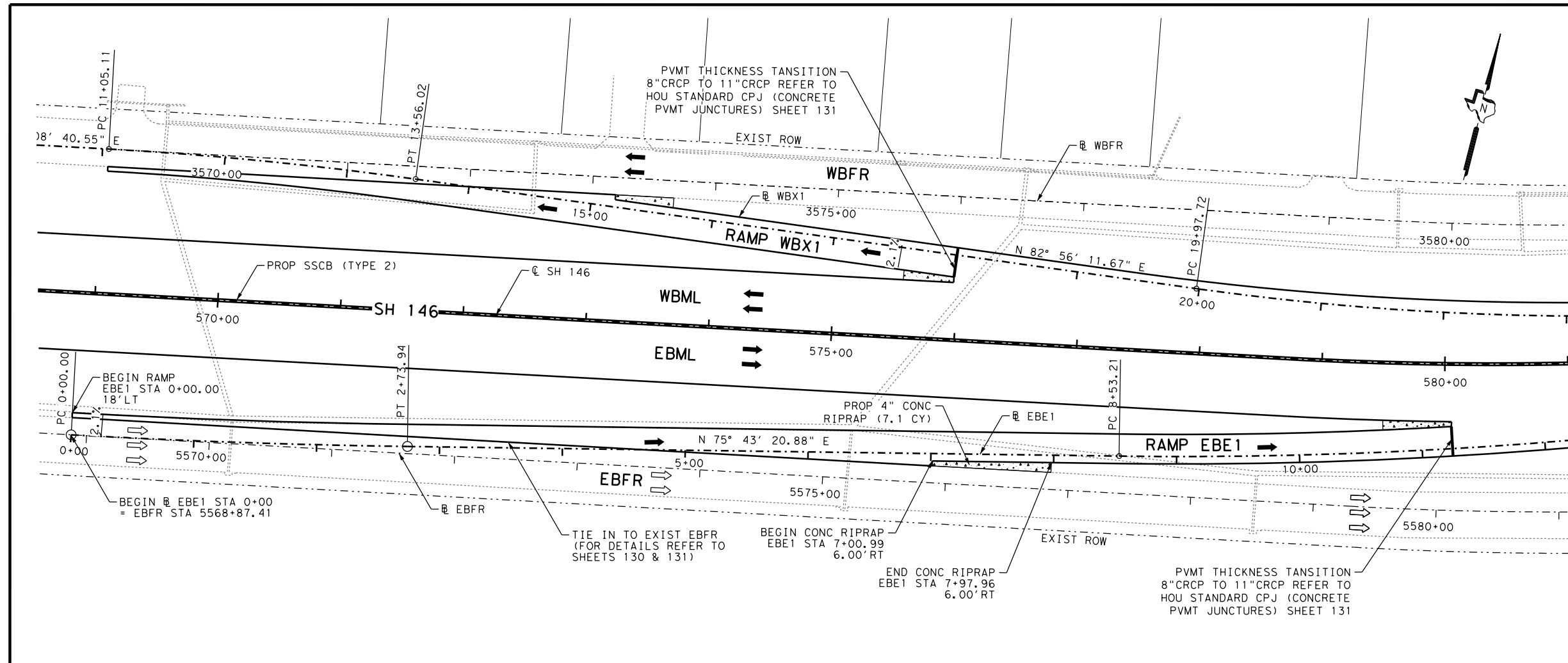
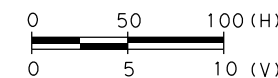
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LEGEND

- ← PROP DIRECTION OF TRAFFIC
- ⇐ EXIST DIRECTION OF TRAFFIC
- ▭ 4" PROPOSED CONCRETE RIP RAP
- SAW CUT LINE
- SINGLE SLOPE CONC BARRIER (SSCB)

NOTES:

1. FOR HORIZONTAL ALIGNMENT INFORMATION SEE HORIZONTAL ALIGNMENT DATA SHEETS
2. FOR RAMP INFORMATION SEE RAMP PLAN AND PROFILE SHEETS
3. FOR INTERSECTION INFORMATION SEE INTERSECTION LAYOUT SHEETS
4. FOR BRIDGE INFORMATION SEE BRIDGE LAYOUT SHEETS
5. FOR RETAINING WALL INFORMATION SEE RETAINING WALL LAYOUT SHEETS
6. SAWCUT IS SUBSIDIARY TO PERTAINING BID ITEMS



REV. NO.	DATE	BY	REVISION

Prakash Shrestha, P.E.
1/6/2022

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

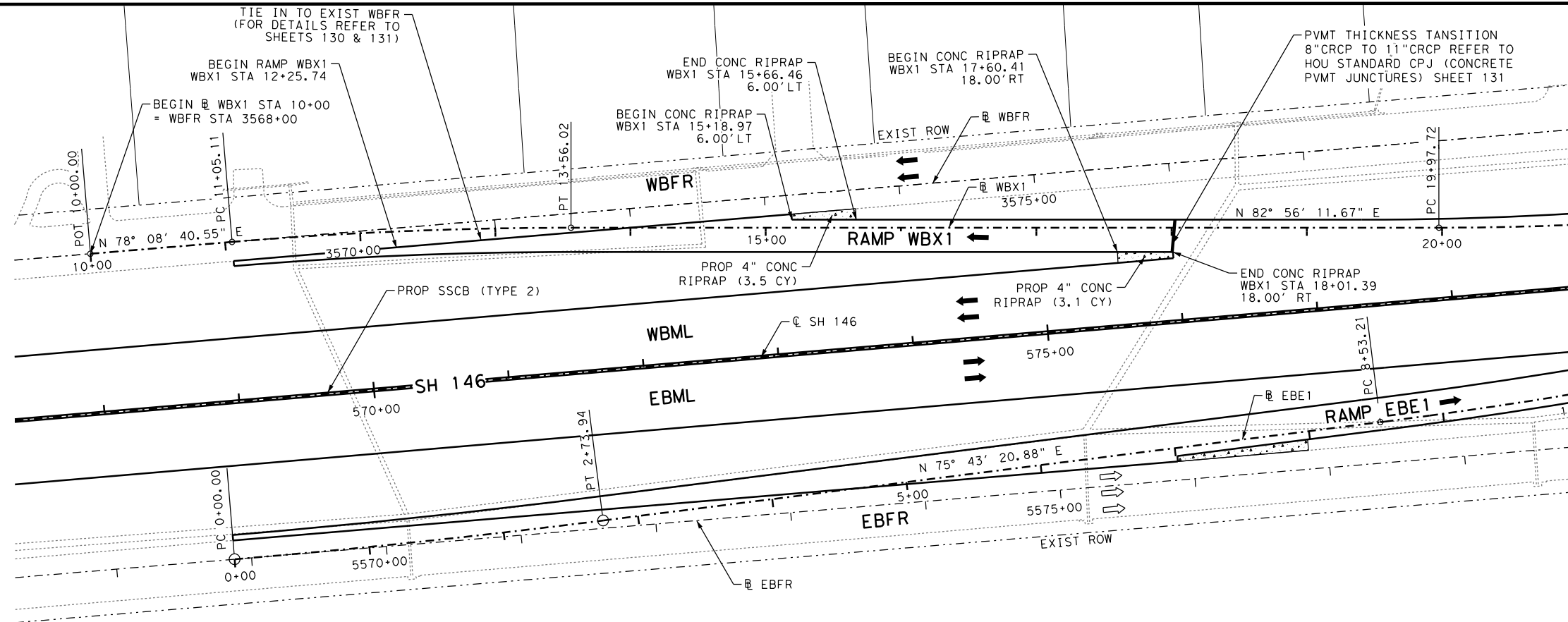


SH 146
RAMP EBE1
PLAN AND PROFILE

SHEET 1 OF 1

FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.		SHEET NO. 121
STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146

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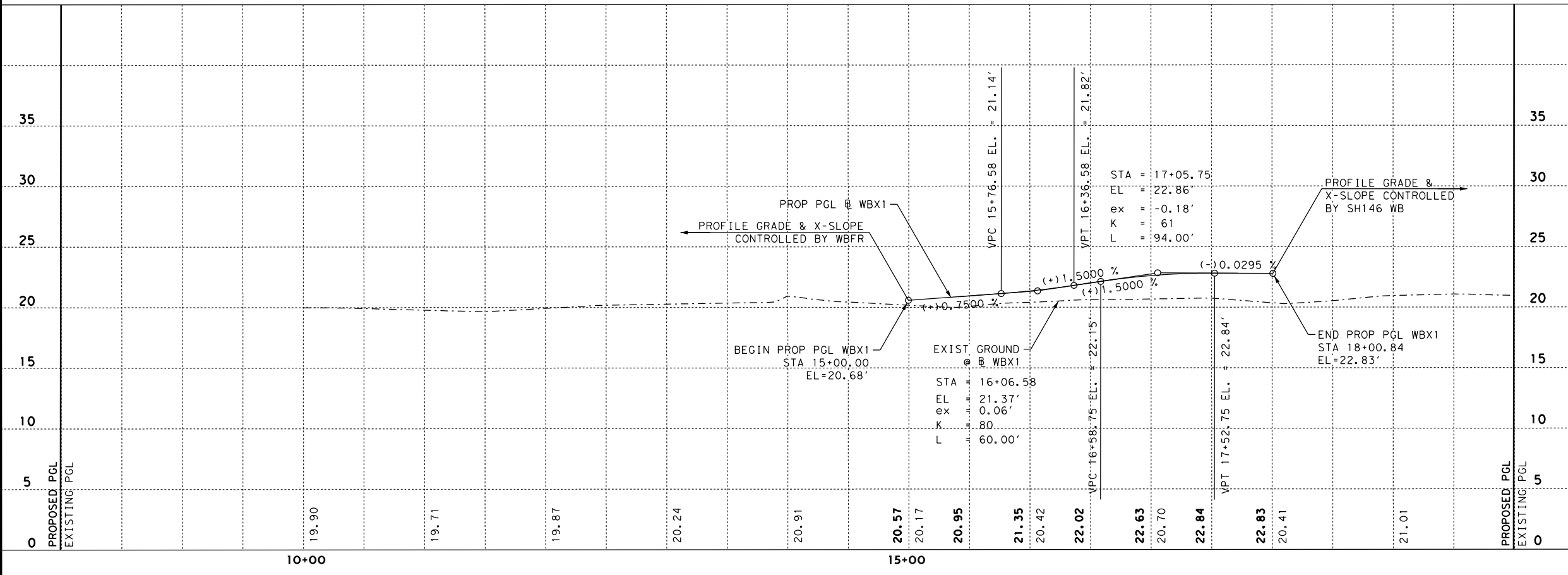
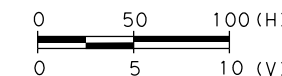


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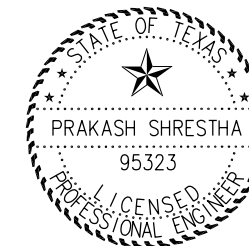
- ← PROP DIRECTION OF TRAFFIC
- ⇐ EXIST DIRECTION OF TRAFFIC
- 4" PROPOSED CONCRETE RIP RAP
- SAW CUT LINE
- SINGLE SLOPE CONC BARRIER (SSCB)

NOTES:

1. FOR HORIZONTAL ALIGNMENT INFORMATION SEE HORIZONTAL ALIGNMENT DATA SHEETS
2. FOR RAMP INFORMATION SEE RAMP PLAN AND PROFILE SHEETS
3. FOR INTERSECTION INFORMATION SEE INTERSECTION LAYOUT SHEETS
4. FOR BRIDGE INFORMATION SEE BRIDGE LAYOUT SHEETS
5. FOR RETAINING WALL INFORMATION SEE RETAINING WALL LAYOUT SHEETS
6. SAWCUT IS SUBSIDIARY TO PERTAINING BID ITEMS

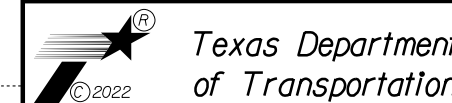


REV. NO.	DATE	BY	REVISION



Prakash Shrestha, P.E.
1/6/2022

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



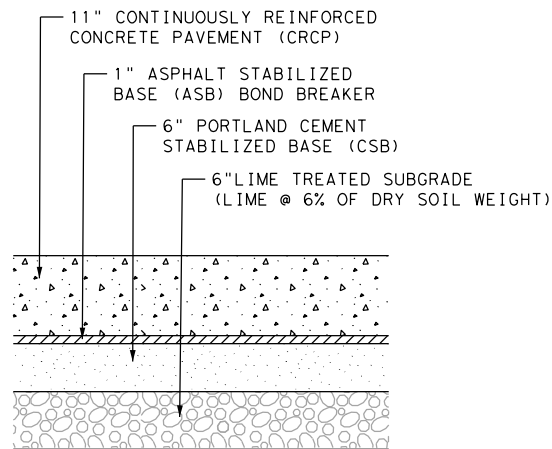
SH 146

**RAMP WBX1
PLAN AND PROFILE**

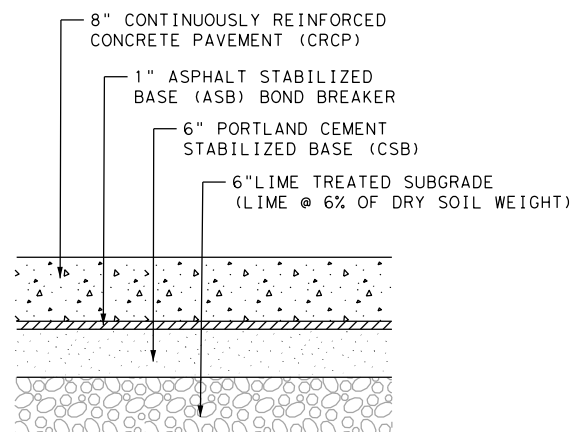
SHEET 1 OF 1

FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.			SHEET NO. 122
STATE TEXAS	DIST. HOU	COUNTY HARRIS		
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146	

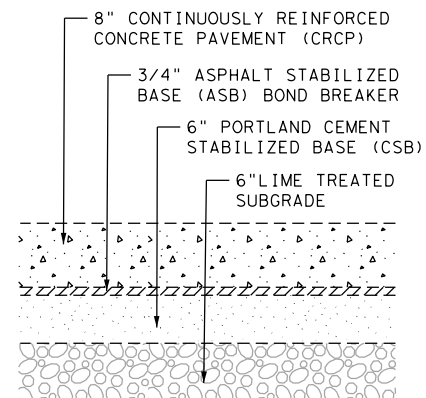
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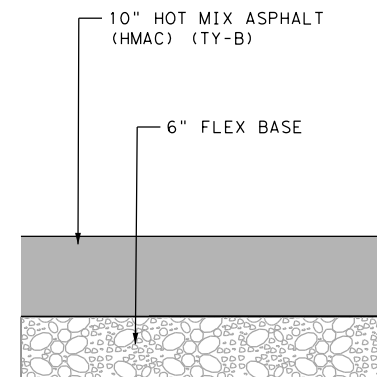
PROPOSED MAINLANE PAVEMENT
SH146 STA 555+50 TO 608+50



PROPOSED RAMP PAVEMENT
EBE1 STA 0+00.00 TO EBE1 STA 5+50.00
WBX1 STA 12+25.82 TO WBX1 STA 16+00.00

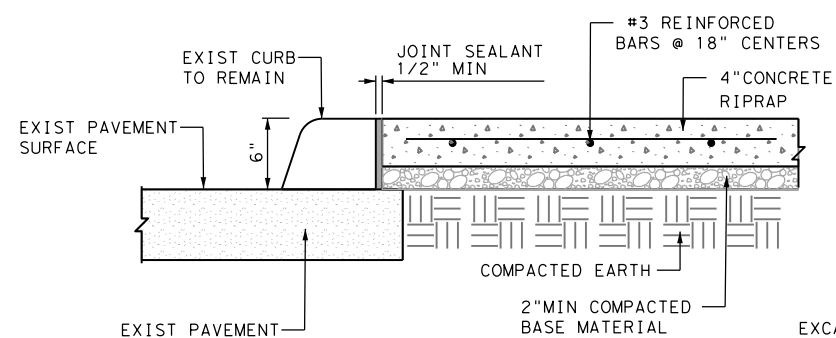


EXIST FRONTAGE ROAD PAVEMENT
EBFR STA 5549+00 TO 5618+20
WBFR STA 3551+00 TO 3615+75



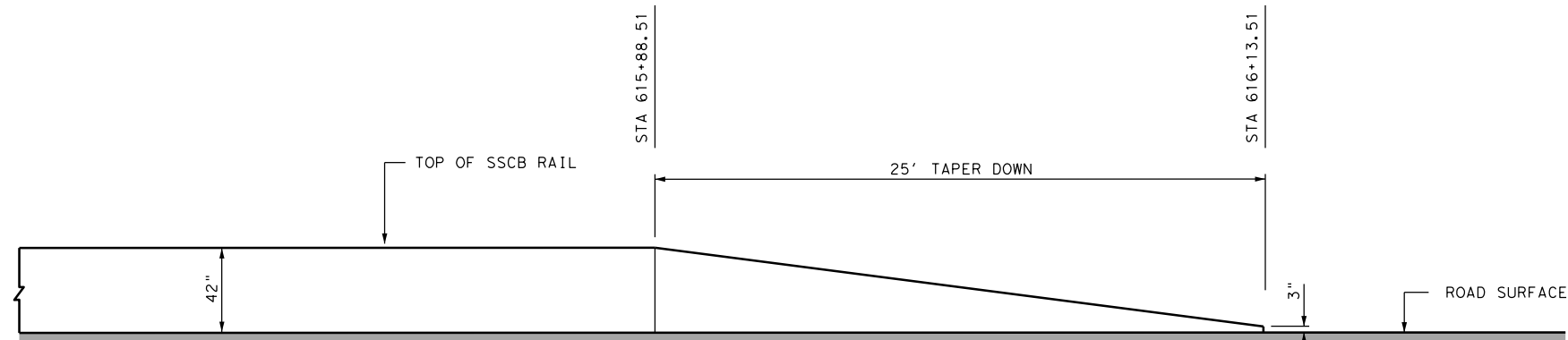
TEMPORARY PAVEMENTS

TEMPORARY PAVEMENTS SHOWN ON THE TCP PLANS ARE A SUBSIDIARY ITEM TO 'BARRICADES, SIGNS AND TRAFFIC HANDLING' (ITEM 502 6001) AND SHALL NOT BE PAID FOR SEPARATELY.



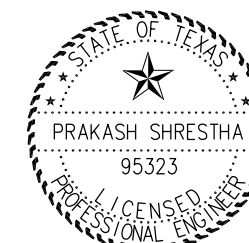
CONCRETE RIPRAP AT MEDIAN

EXCAVATION AND REMOVAL OF EXISTING MATERIALS FROM THE MEDIAN IS A SUBSIDIARY ITEM TO MEDIAN CONCRETE RIPRAP CONSTRUCTION.



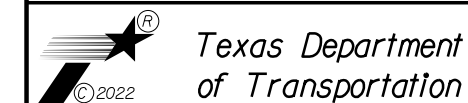
SSCB RAIL TOP PROFILE (TAPERED END SECTION DETAIL)
N. T. S.

REV NO.	DATE	BY	REVISION



Prakash Shrestha, P.E.
1/6/2022

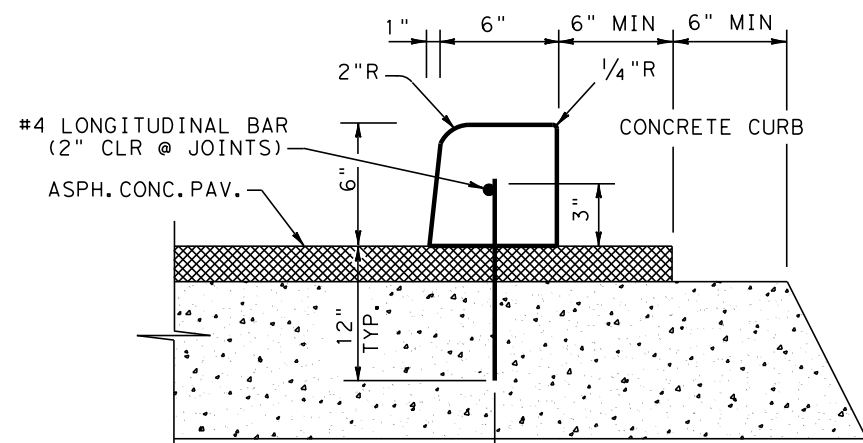
CivilTech Engineering, Inc.
11821 Telge Road
Cypress, Texas 77429
PH: (281) 304-0200 - FX: (281) 304-0210
Firm Registration No. F-382



SH 146

MISCELLANEOUS
ROADWAY
DETAILS

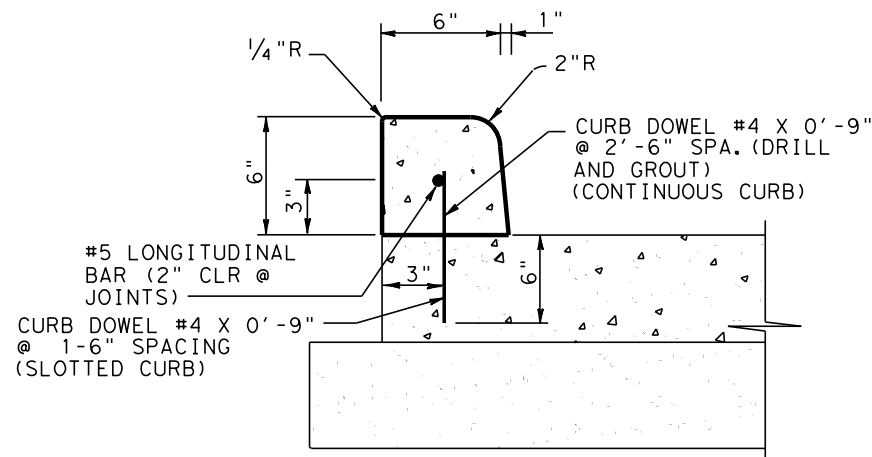
N. T. S.			SHEET 1 OF 1	
FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.	
6			123	
STATE	DIST.	COUNTY		
TEXAS	HOU	HARRIS		
CONT.	SECT.	JOB	HIGHWAY NO.	
0389	13	039	SH 146	



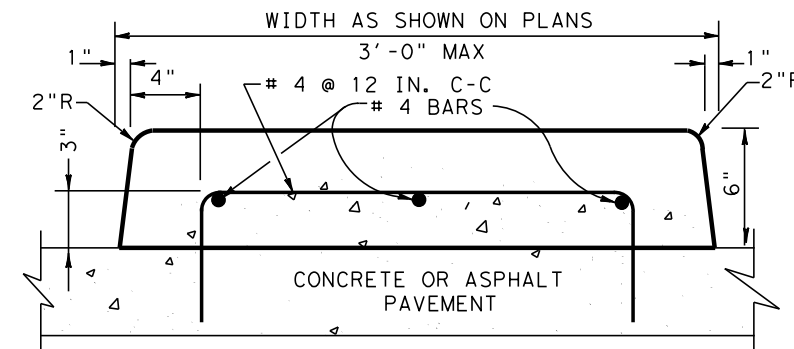
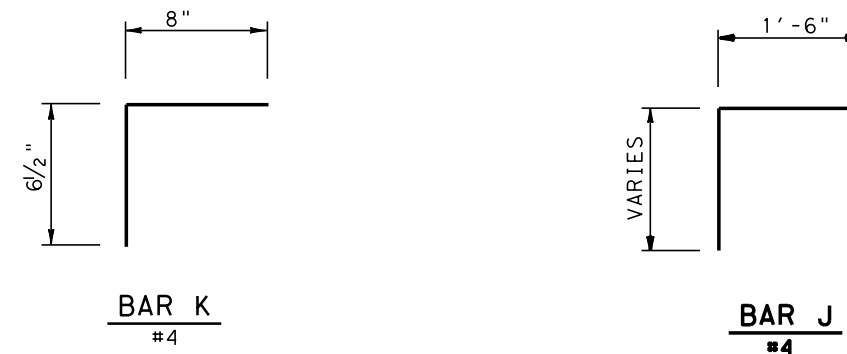
CONTINUOUS CURB; DOWEL #5 X 1'-3"
@ 2'-6" SPA. (DRILL & GROUT)
SLOTTED CURB; DOWEL #5 X 1'-3"
@ 1'-6" SPA. (DRILL & GROUT)

SHOWN ON EXISTING OR PROPOSED ACP PAVEMENT
(PAY ITEM 529-6011) - FOR CONTINUOUS

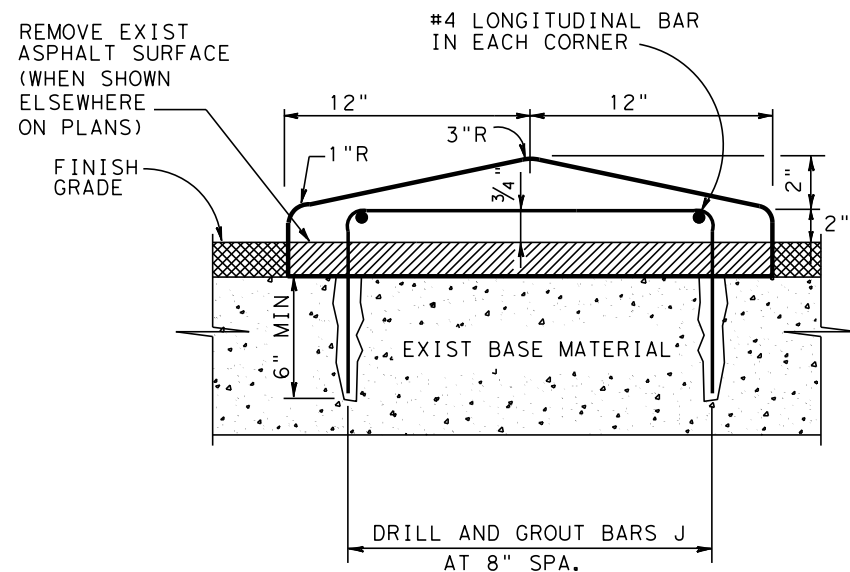
CONCRETE CURB (DOWEL) (6 IN.)



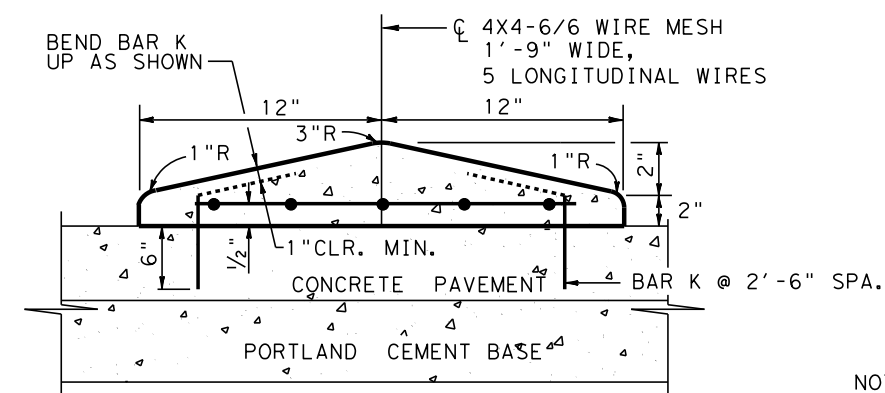
SHOWN ON EXISTING OR PROPOSED CONCRETE PAVEMENT
(PAY ITEM 529-6011) - FOR CONTINUOUS



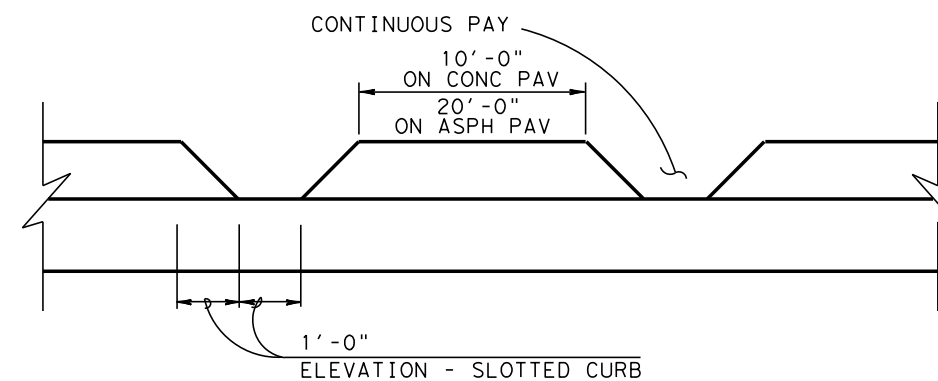
ITEM 536-6001 CONCRETE MEDIAN
SEE NOTE 2



SHOWN ON EXISTING ACP PAVEMENT
SEE NOTE 2 - ITEM 536-6003 CONC DIRECTIONAL ISLAND



SHOWN ON EXISTING OR PROPOSED CONCRETE PAVEMENT
SEE NOTE 2 - ITEM 536-6003 CONC DIRECTIONAL ISLAND



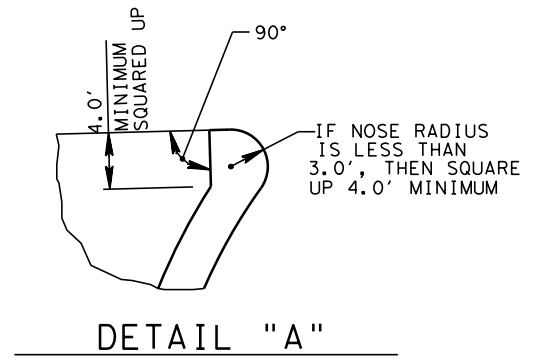
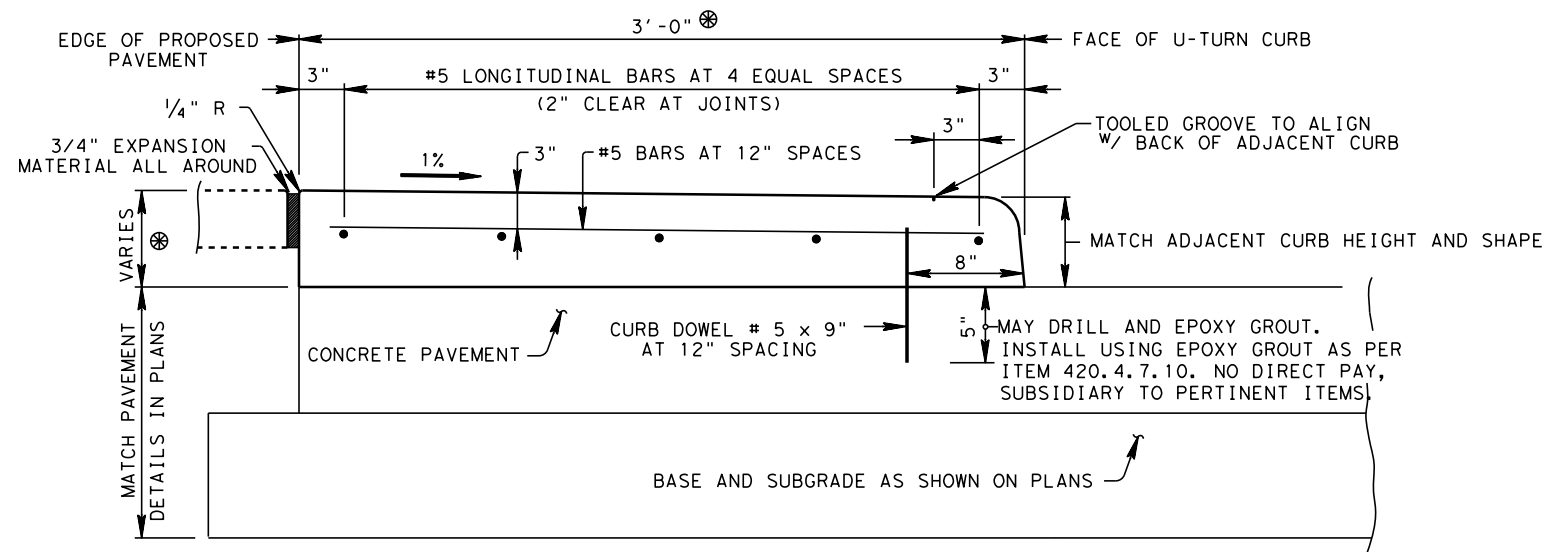
ITEM 529-6012 CONCRETE CURB (SLOTTED) - ON CONC.
ITEM 529-6009 CONC CURB (DOWEL) (SLOTTED) - ON ASPH.

NOTES:

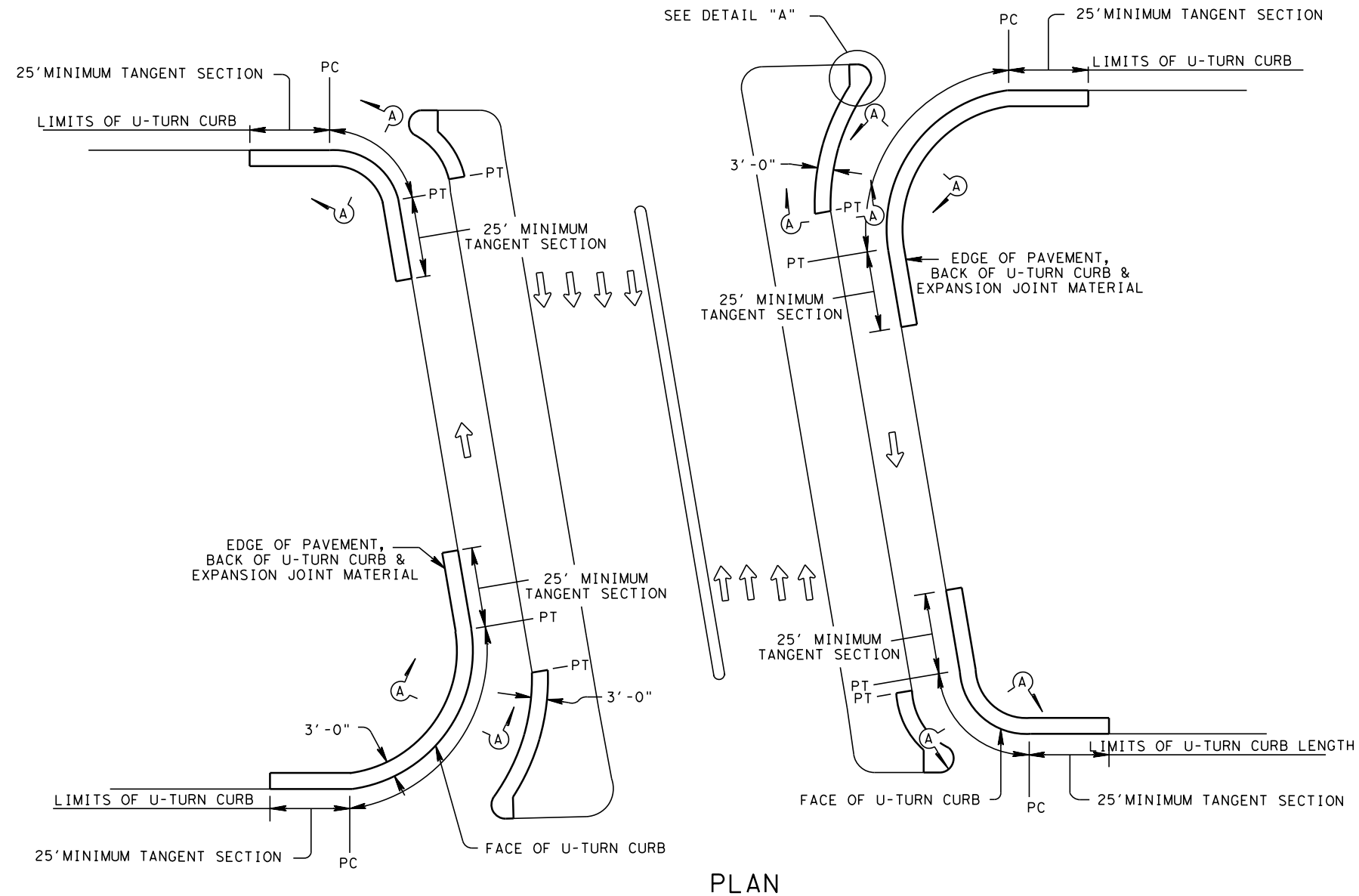
1. DRILL AND GROUT BARS SHOWN AS PER ITEM 420.4.7.10, 6" EMBEDMENT, MINIMUM ON CONC.
2. INSTALL A 2 INCH DRAINAGE OPENING AT 10 FT C-C WHEN CURB/ISLAND IS NOT ON TOP OF CROSS SECTION. (LOCATED ON A 2 OR 3 PERCENT TRANSVERSE GRADE, OR SUPERELEVATION.)

CONCRETE DIRECTIONAL ISLAND

CONCRETE CURB AND DIRECTIONAL ISLAND DETAILS CC & DID									
FILE# STDB-9.dgn	DN#	CK#	DW#	CK#					
© TXDOT 2014	DIST	FED REG	PROJECT NO.		SHEET				
REVISIONS		HOU	6				124		
		COUNTY	CONTROL	SECT	JOB	HIGHWAY			
		HARRIS	0389	13	039	SH 146			



SECTION A-A
NEW CONSTRUCTION
ITEM 529 - CONC CURB (U-TURN)



PLAN

NOTE:

1. U-TURN CURB MEASURED BY THE FOOT ALONG THE FACE OF THE CURB.

LEGEND:

- R = RADIUS
- ⊗ = LIMITS OF PAY FOR U-TURN CURB WIDTH



U-TURN CURB DETAIL
NEW CONSTRUCTION

HOU-U-CURB

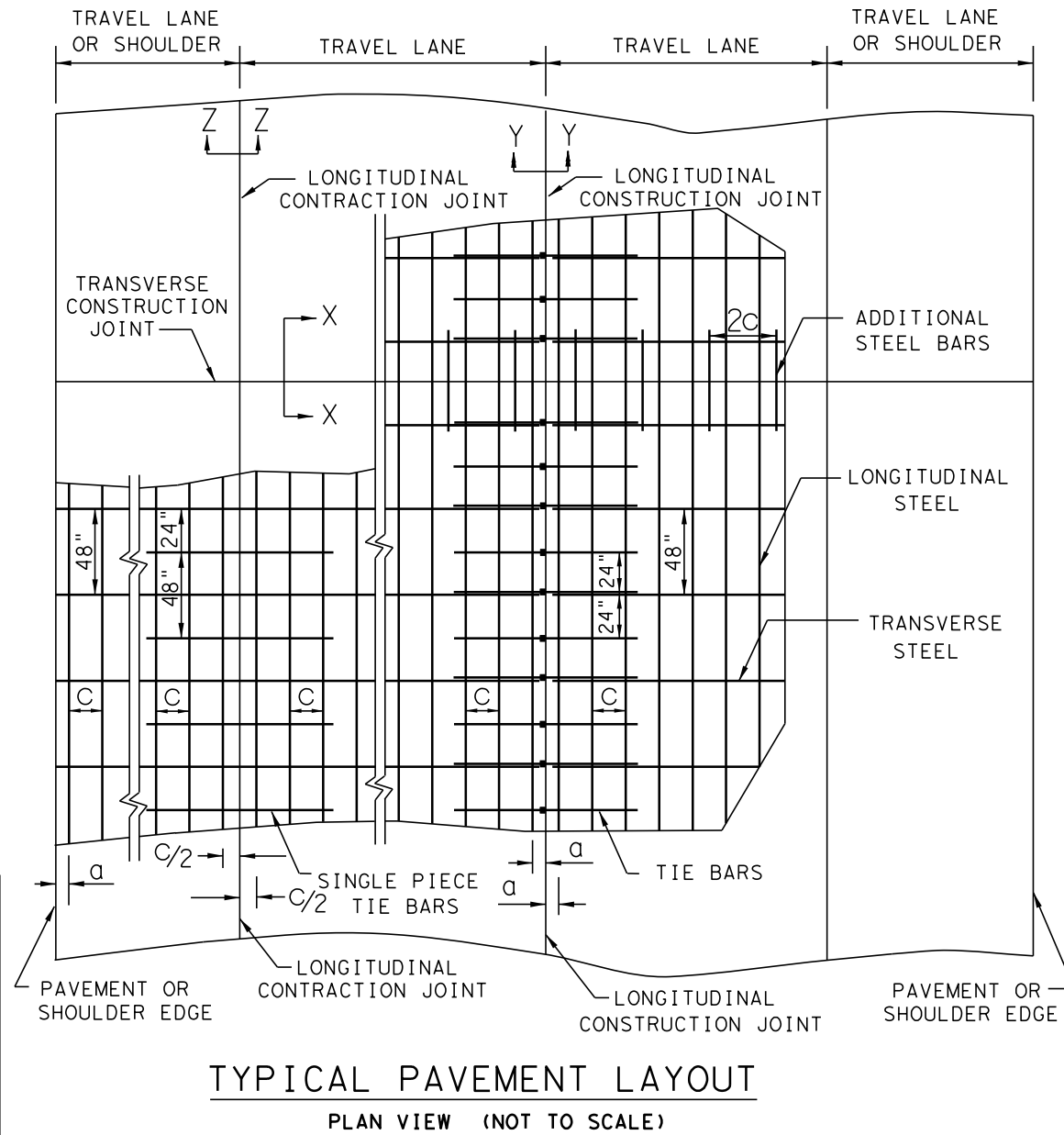
FILE: UCURBNW.DGN	DN:TXDOT	CK:TXDOT	DW:TXDOT	CK:TXDOT
© TXDOT 2014	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS	HOU	6		125
	COUNTY	CONTROL	SECT	JOB
	HARRIS	0389	13	039
				HIGHWAY
				SH 146

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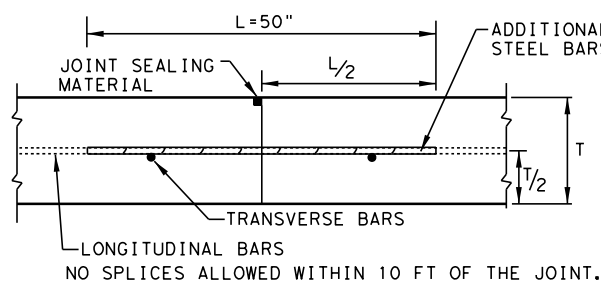
DATE:
FILE:

SLAB THICKNESS AND BAR SIZE		REGULAR STEEL BARS	FIRST SPACING AT EDGE OR JOINT	ADDITIONAL STEEL BARS AT TRANSVERSE CONSTRUCTION JOINT (SECTION X-X)	
T (IN.)	BAR SIZE	SPACING C (IN.)	SPACING a (IN.)	SPACING 2 X C (IN.)	LENGTH L (IN.)
7.0	#5	6.5	3 TO 4	13	50
7.5	#5	6.0	3 TO 4	12	50
8.0	#6	9.0	3 TO 4	18	50
8.5	#6	8.5	3 TO 4	17	50
9.0	#6	8.0	3 TO 4	16	50
9.5	#6	7.5	3 TO 4	15	50
10.0	#6	7.0	3 TO 4	14	50
10.5	#6	6.75	3 TO 4	13.5	50
11.0	#6	6.5	3 TO 4	13	50
11.5	#6	6.25	3 TO 4	12.5	50
12.0	#6	6.0	3 TO 4	12	50
12.5	#6	5.75	3 TO 4	11.5	50
13.0	#6	5.5	3 TO 4	11	50

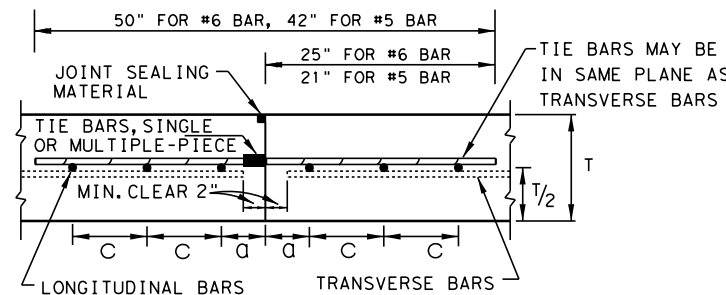
SLAB THICKNESS (IN.)	TRANSVERSE STEEL		TIE BARS AT LONGITUDINAL CONSTRUCTION JOINT (SECTION Z-Z)		TIE BARS AT LONGITUDINAL CONSTRUCTION JOINT (SECTION Y-Y)	
	BAR SIZE	SPACING (IN.)	BAR SIZE	SPACING (IN.)	BAR SIZE	SPACING (IN.)
7.0 - 7.5	#5	48	#5	48	#5	24
8.0 - 13.0	#5	48	#6	48	#6	24



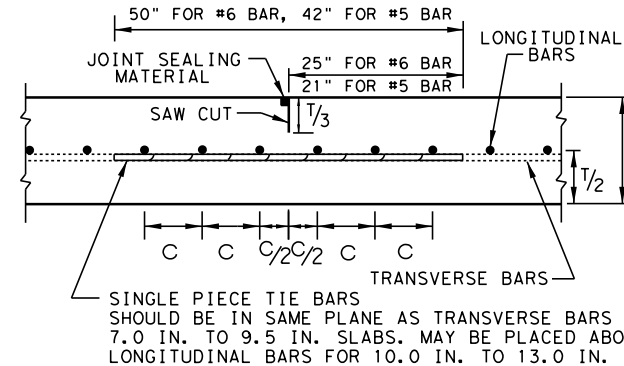
1. DETAILS FOR PAVEMENT WIDTH, PAVEMENT THICKNESS AND THE CROWN CROSS-SLOPE SHALL BE SHOWN ELSEWHERE IN THE PLANS. PAVEMENTS WIDER THAN 100 FT. WITHOUT A FREE LONGITUDINAL JOINT ARE NOT COVERED BY THIS STANDARD.
2. USE COARSE AGGREGATES WITH A RATED COEFFICIENT OF THERMAL EXPANSION (COTE) OF NOT MORE THAN 5.5×10^{-6} IN/IN/°F AS LISTED IN THE CONCRETE RATED SOURCE QUALITY CATALOG (CRSQC).
3. ALL THE REINFORCING STEEL AND TIE BARS SHALL BE DEFORMED STEEL BARS CONFORMING TO ASTM A 615 (GRADE 60) OR ASTM A 996 (GRADE 60) OR ABOVE. STEEL BAR SIZES AND SPACINGS SHALL CONFORM TO TABLE NO.1 AND TABLE NO.2.
4. STEEL BAR PLACEMENT TOLERANCE SHALL BE +/- 1 IN. HORIZONTALLY AND +/- 0.5 IN. VERTICALLY. CALCULATED AVERAGE BAR SPACING (CONCRETE PLACEMENT WIDTH / NUMBER OF LONGITUDINAL BARS) SHALL CONFORM TO TABLE NO.1
5. PAVEMENT WIDTHS OF MORE THAN 15 FT. SHALL HAVE A LONGITUDINAL JOINT (SECTION Z-Z OR SECTION Y-Y). THESE JOINTS SHALL BE LOCATED WITHIN 6 IN. OF THE LANE LINE UNLESS THE JOINT LOCATION IS SHOWN ELSEWHERE ON THE PLANS.
6. THE SAW CUT DEPTH FOR THE LONGITUDINAL CONTRACTION JOINT (SECTION Z-Z) SHALL BE ONE THIRD OF THE SLAB THICKNESS (T/3).
7. WHEN TYING CONCRETE GUTTER AT A LONGITUDINAL JOINT, THE TIE BAR LENGTH OR POSITION MAY BE ADJUSTED. PROVIDE 3 IN. OF CONCRETE COVER FROM THE BACK OF GUTTER TO THE END OF TIE BAR.
8. REPLACE MISSING OR DAMAGED TIE BARS WITHOUT ADDITIONAL COMPENSATION BY DRILLING MIN. 10 IN. DEEP AND GROUTING TIE BARS WITH TYPE III, CLASS C EPOXY. MEET THE PULL-OUT TEST REQUIREMENTS IN ITEM 361.
9. OMIT TIE BARS LOCATED WITHIN 18-IN. OF THE TRANSVERSE CONSTRUCTION JOINTS (SECTION X-X). USE HAND-OPERATED IMMERSION VIBRATORS TO CONSOLIDATE THE CONCRETE ADJACENT TO ALL FORMED JOINTS.
10. LONGITUDINAL REINFORCING STEEL SPLICES SHALL BE A MINIMUM OF 25 IN. STAGGER THE LAP LOCATIONS SO THAT NO MORE THAN 1/3 OF THE LONGITUDINAL STEEL IS SPLICED IN ANY GIVEN 12-FT. WIDTH AND 2-FT. LENGTH OF THE PAVEMENT.
11. THE DETAIL FOR THE JOINT SEALANT AND RESERVOIR IS SHOWN ON STANDARD SHEET "CONCRETE PAVING DETAILS, JOINT SEALS."



TRANSVERSE CONSTRUCTION JOINT
SECTION X - X



LONGITUDINAL CONSTRUCTION JOINT
SECTION Y - Y



LONGITUDINAL CONTRACTION JOINT
SECTION Z - Z

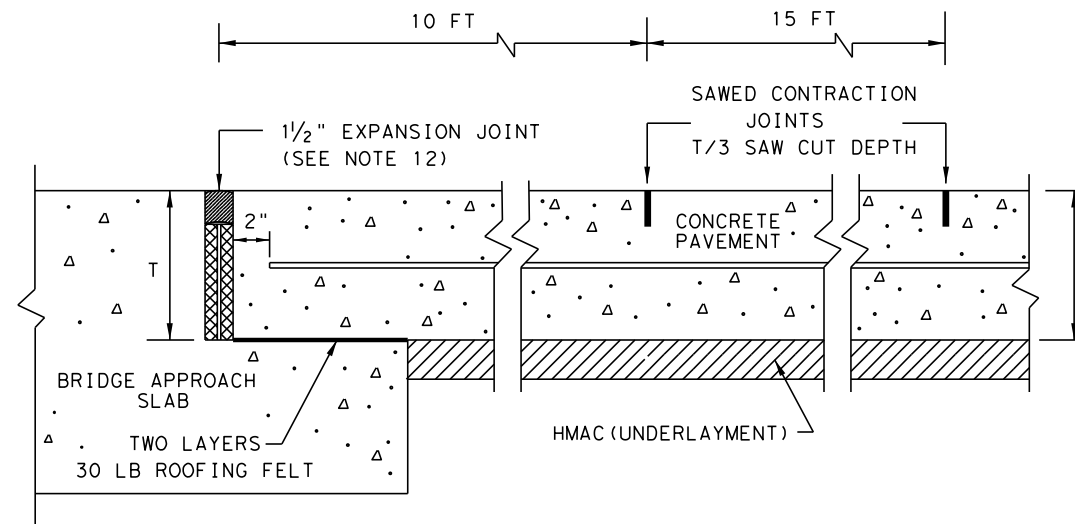
GENERAL NOTES

SHEET 1 OF 2

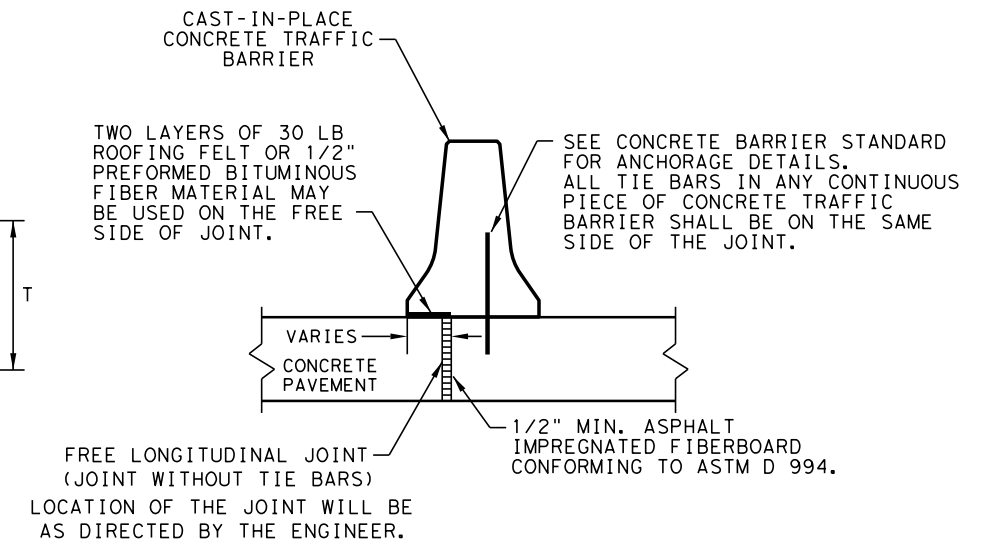
		Design Division Standard	
CONTINUOUSLY REINFORCED CONCRETE PAVEMENT ONE LAYER STEEL BAR PLACEMENT T - 7 to 13 INCHES CRCP (1) - 20			
FILE: crcp120.dgn	DN: TxDOT	CK: KM	DW: AN
© TxDOT: APRIL 2020	CONT: 0389	SECT: 13	JOB: 039
10/10/2011 ADD GN #12			HIGHWAY: SH 146
04/09/2013 REMOVE 6" AND 6.5" ADD CTE REQUIREMENTS	DIST: HOU	COUNTY: HARRIS	SHEET NO: 126
05/05/2017 COTE AS RATED 4.3			

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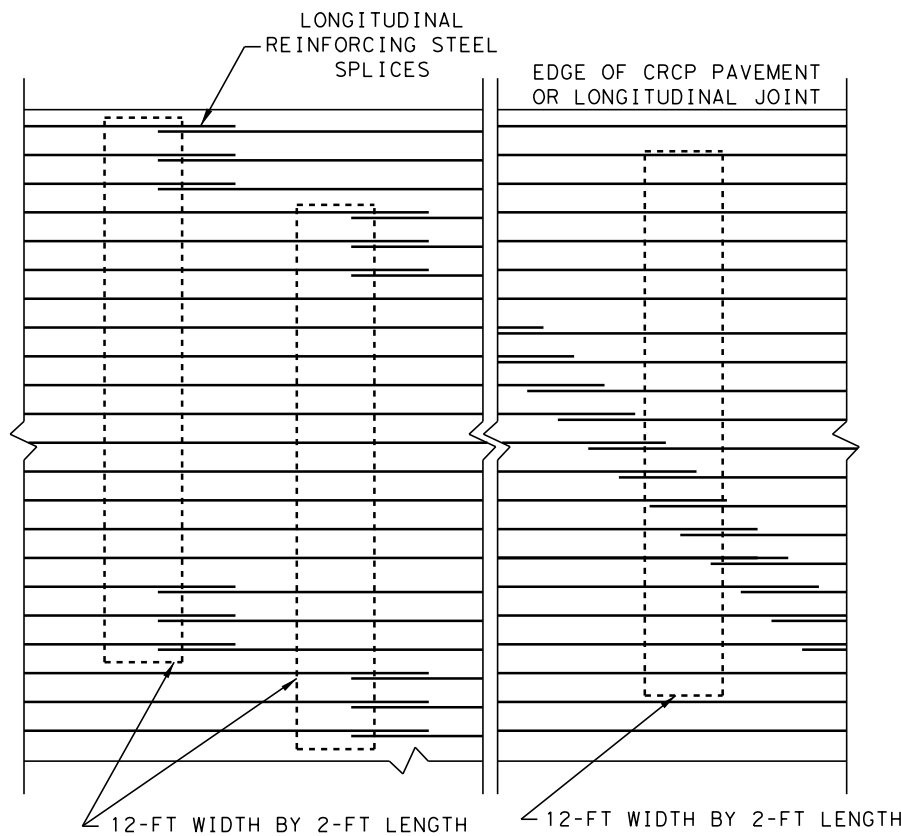
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FILE:



**TRANSVERSE EXPANSION JOINT DETAIL
AT BRIDGE APPROACH**

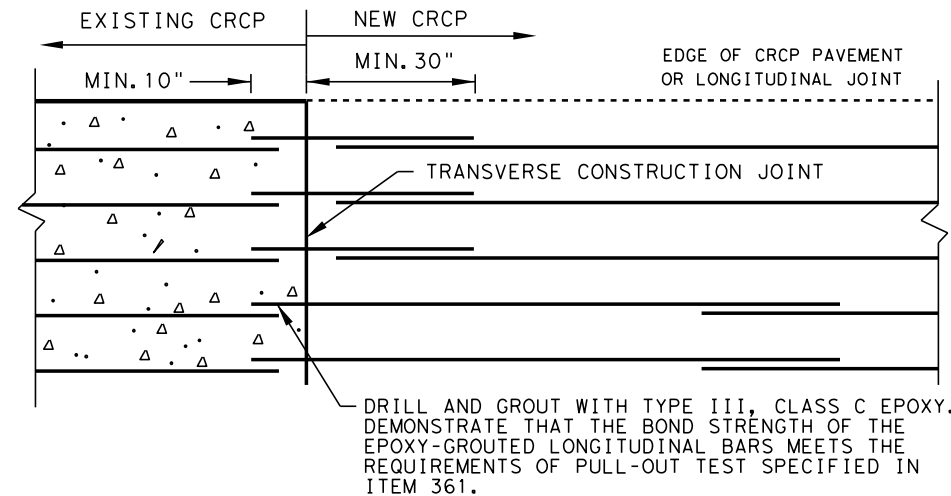


FREE LONGITUDINAL JOINT DETAIL

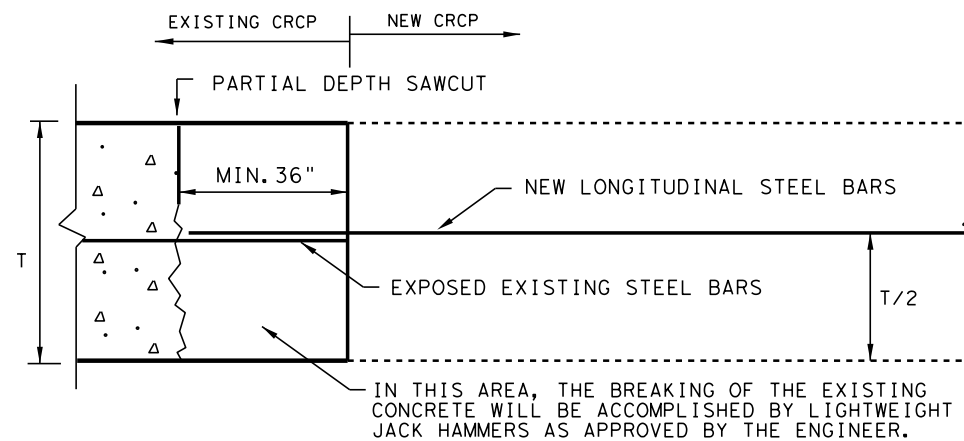


STAGGER THE LAP LOCATIONS SO THAT NO MORE THAN 1/3 OF THE LONGITUDINAL STEEL IS SPLICED IN ANY GIVEN 12-FT. WIDTH AND 2-FT. LENGTH OF THE PAVEMENT. ANY OTHER LAP CONFIGURATION MEETING THIS REQUIREMENT WILL BE ALLOWED.

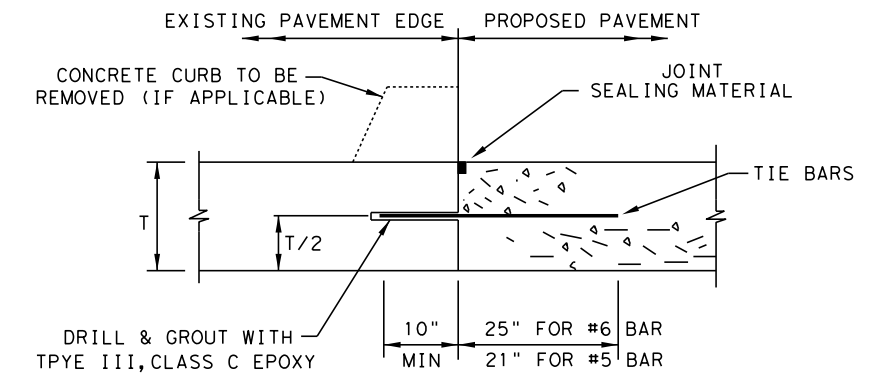
**EXAMPLES OF LAP CONFIGURATION
PLAN VIEW (NOT TO SCALE)**



**OPTION A: DRILL AND EPOXY
PLAN VIEW (NOT TO SCALE)**



**OPTION B: BREAKBACK AND LAP
TRANSVERSE TIE JOINT DETAIL
EXISTING CRCP TO NEW CRCP**



1. BEFORE WIDENING WORK, DEMONSTRATE THAT THE BOND STRENGTH OF THE EPOXY-GROUTED TIE BARS MEETS THE REQUIREMENTS OF PULL-OUT TEST SPECIFIED IN ITEM 361.
2. SPACE TIE BARS AT 24" SPACING. USE #6 TIE BARS FOR 8" AND THICKER SLABS, USE #5 TIE BARS FOR LESS THAN 8" THICK SLABS.

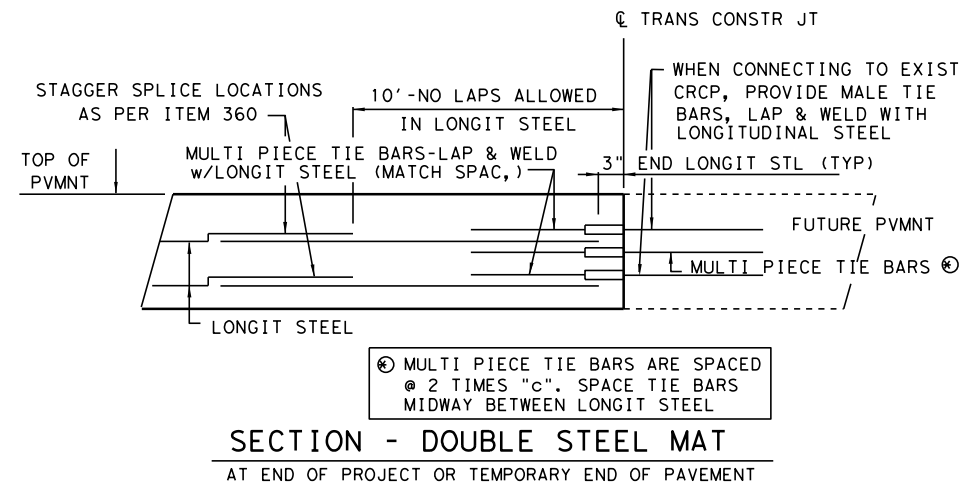
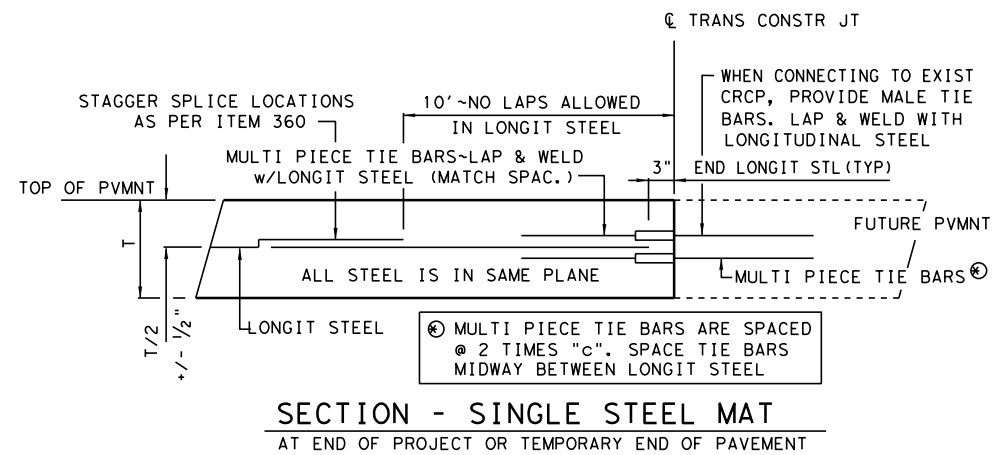
LONGITUDINAL WIDENING JOINT DETAIL

SHEET 2 OF 2



**CONTINUOUSLY REINFORCED
CONCRETE PAVEMENT
ONE LAYER STEEL BAR PLACEMENT
T - 7 to 13 INCHES
CRCP (1) - 20**

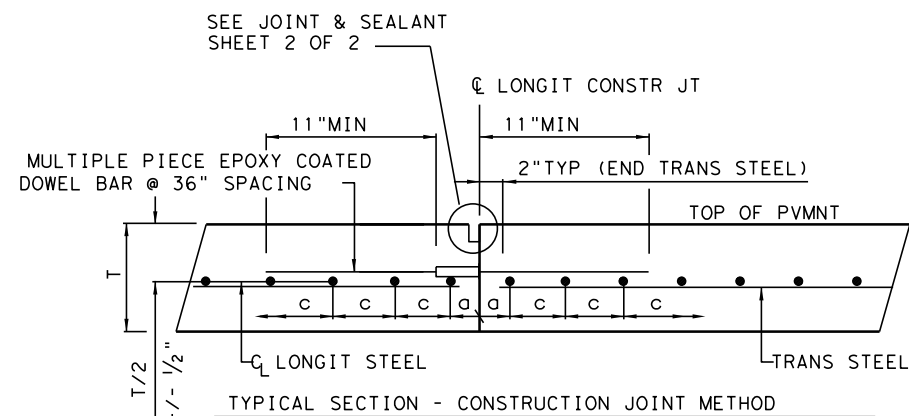
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© TxDOT: APRIL 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0389	13	039	SH 146
03/16/2020 REMOVED TABLE 1A	DIST	COUNTY	SHEET NO.	
	HOU	HARRIS	127	



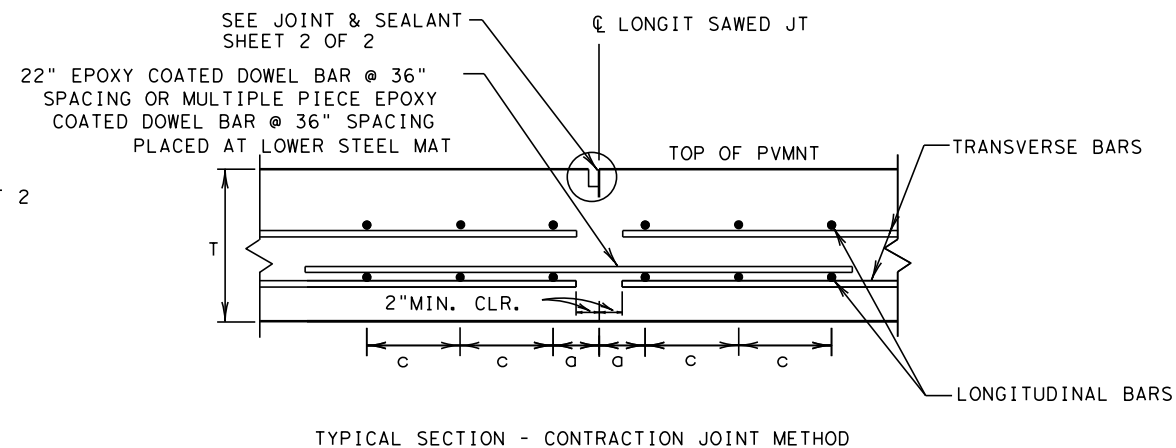
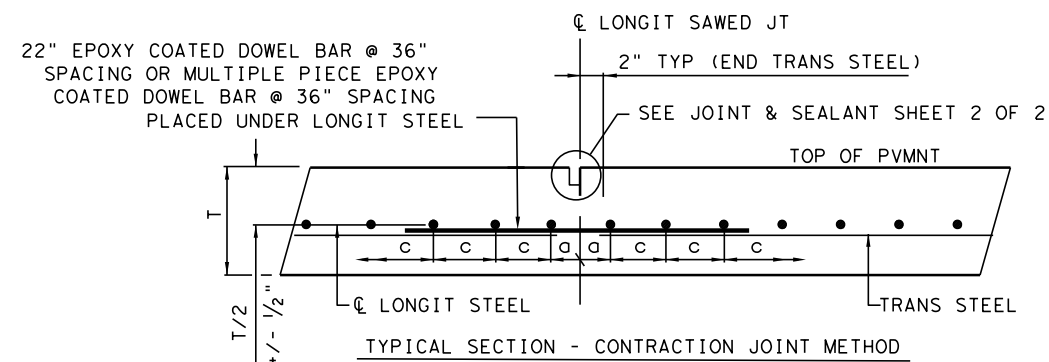
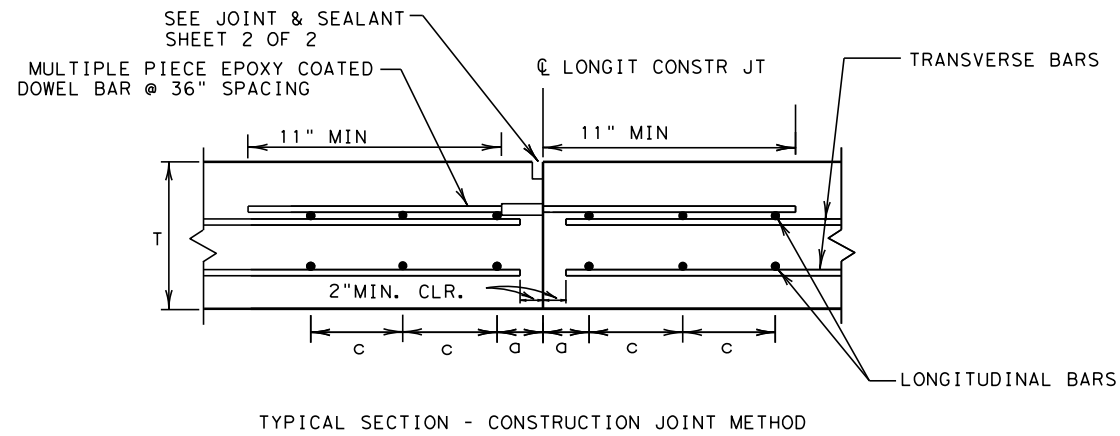
LONGITUDINAL DOWEL JOINT DETAILS

LOCATE WHERE SHOWN IN THE PLANS OR AS APPROVED. CONTRACTOR MAY USE EITHER METHOD

SINGLE STEEL MAT




DOUBLE STEEL MAT



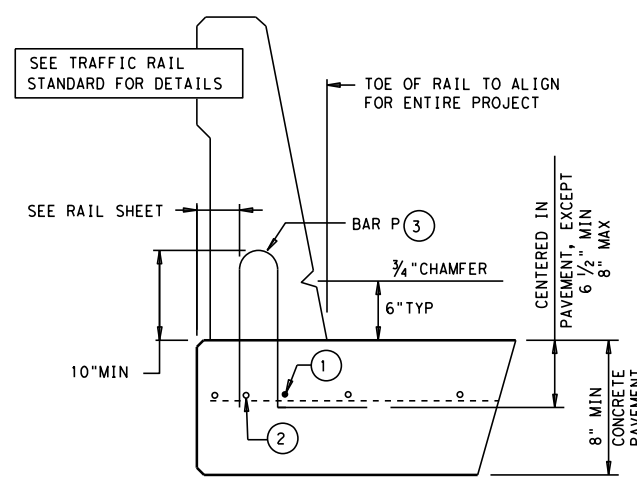
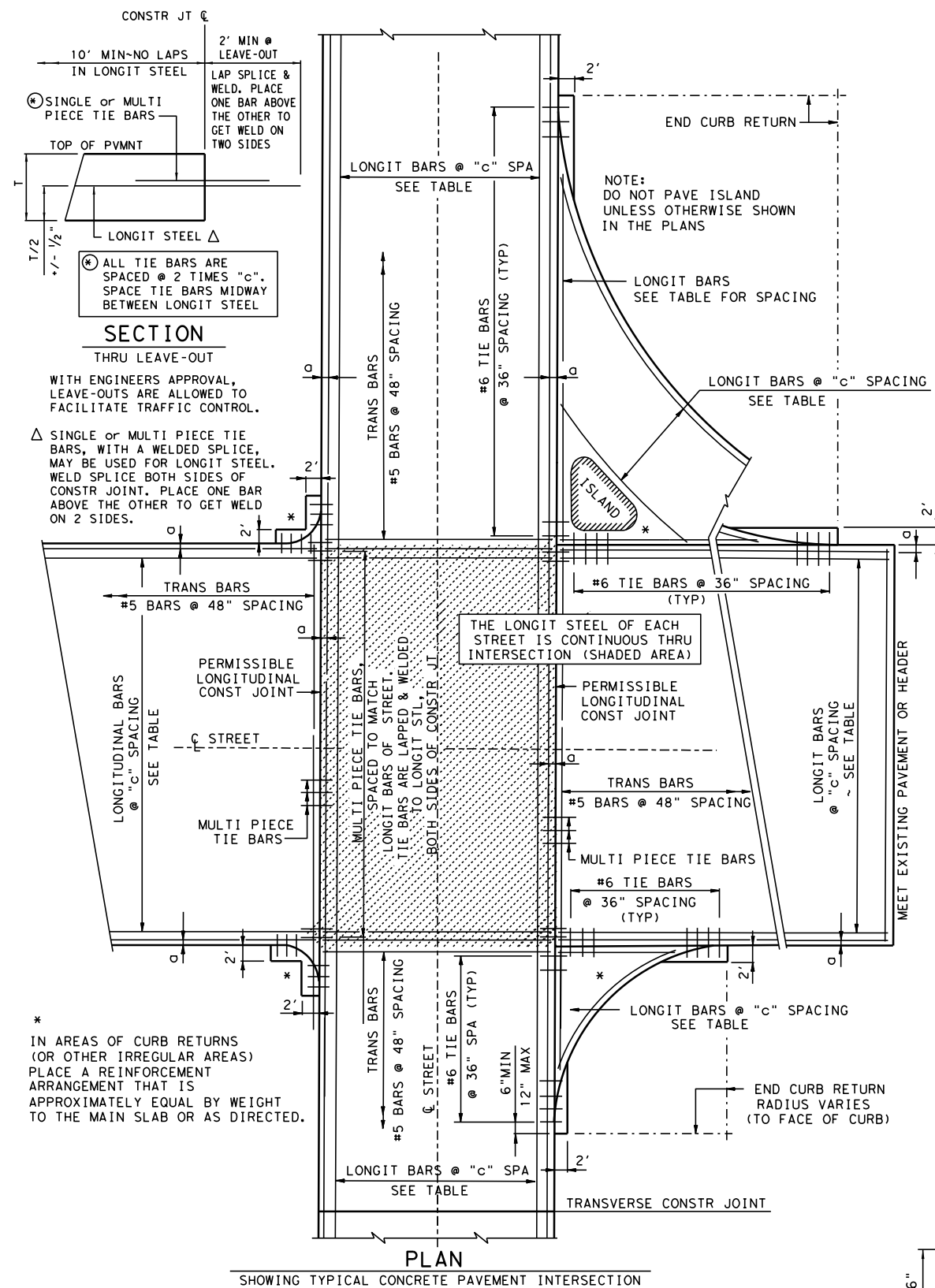
GENERAL NOTES

1. DETAILS FOR 7.0 IN. TO 13.0 IN. THICK CONCRETE PAVEMENT ARE SHOWN ON STANDARD CRCP(1)-17. DETAILS FOR 14 IN. TO 15 IN. THICK CONCRETE PAVEMENT ARE SHOWN ON STANDARD CRCP(2)-17.
2. DOWELS AND TIE BARS - DOWELS ARE ONE INCH MINIMUM DIAMETER. ENSURE DOWELS ARE FREE OF GREASE AND ARE EPOXY COATED. DO NOT SHEAR CUT DOWELS DURING FABRICATION. PROVIDE TIE BARS PER ITEM 360. FURNISH MULTI PIECE TIE BARS AND DOWELS WITH STOP COUPLINGS AND WITH THREADS ON THE BARS.
3. USE CHAIRS OF SUFFICIENT STRUCTURAL QUALITY AND NUMBER TO SUPPORT THE MAT TO THE VERTICAL TOLERANCES. CHAIRS WILL BE APPROVED BY THE ENGINEER AND DO NOT REQUIRE GALVANIZING.
4. MECHANICALLY PLACING REINFORCING STEEL IS NOT ALLOWED. NO BARS, DOWELS OR TIE BARS MAY BE VIBRATED INTO POSITION.
5. WHERE DIFFERENT THICKNESS PAVEMENTS MEET, TRANSITION THE THINNER SECTION TO THE THICKER SECTION OVER A DISTANCE OF 20 FT. PLACE REINFORCING STEEL WITHIN THE TRANSITION THE SAME AS IN THE THICKER PAVEMENT.
6. PERFORM WELDING PER ITEM 448. FURNISH WELDABLE REBAR PER ITEM 440.

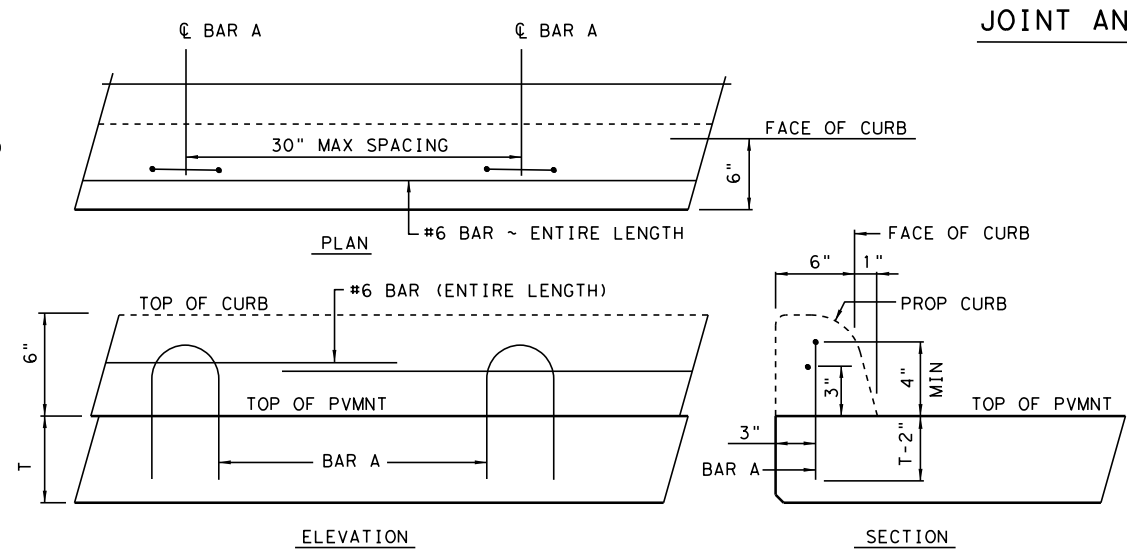
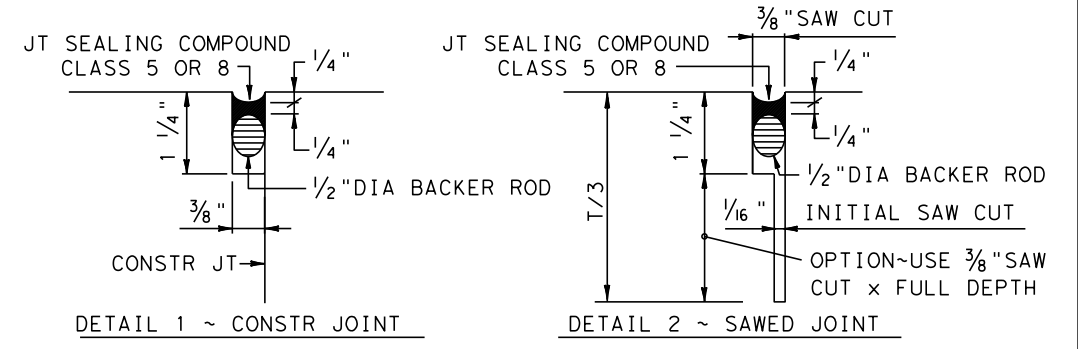
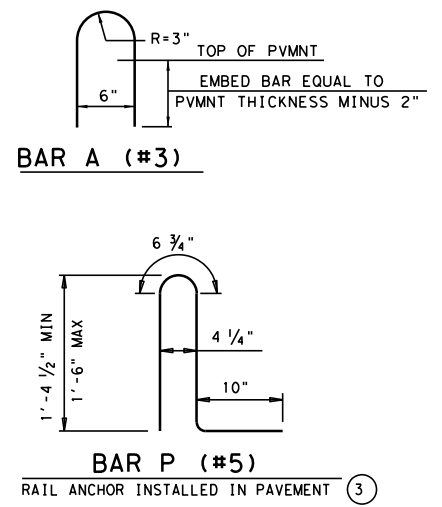

 Texas Department of Transportation
 Houston District

**CONTINUOUSLY REINFORCED
 CONCRETE PAVEMENT
 HOUSTON SUPPLEMENT
 CRCP-HS**

© TxDOT APR. 2012		Dist-	City-	Div-	Off-
REVISIONS 4/12 CHANGED CTE FROM 6.0 TO 5.0 8/14 UPDATE TO REFERENCE CRCP-13 STD. 2/15 REVISED GENERAL NOTES, MINOR CORRECTIONS. 4/17 REVISED NOTE #3 OF GENERAL NOTES, MINOR CORRECTIONS.		PROJECT NO.		SHEET	
HOUSTON		HARRIS		128	
COUNTY		CONTROL	SECTION	JOB	HIGHWAY
HARRIS		0389	13	039	SH 146



- ① AS AN AID IN SUPPORTING REINFORCEMENT, ADDITIONAL LONGITUDINAL BARS MAY BE USED IN THE SLAB WITH THE APPROVAL OF THE ENGINEER. FURNISH SUCH BARS AT NO EXPENSE TO THE DEPARTMENT.
- ② LONGITUDINAL SLAB BAR MAY BE ADJUSTED LATERALLY 3" +/- TO TIE REINFORCING.
- ③ ANCHORAGE BAR SHOWN IS FOR AN SSTR OR T551 RAIL. SEE RAILING DETAIL SHEET FOR SPACING OF BAR P. FOR OTHER RAIL TYPES SEE RAILING DETAIL SHEET.



SHEET 2 OF 2

Texas Department of Transportation
Houston District

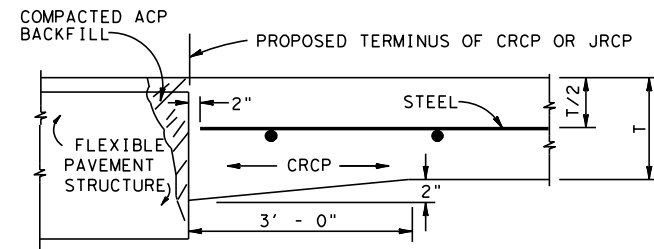
**CONTINUOUSLY REINFORCED
CONCRETE PAVEMENT
HOUSTON SUPPLEMENT
CRCP-HS**

© TxDOT APR. 2012		Dist-1	Dist-2	Dist-3	Dist-4
REVISIONS	DISTRICT	PROJECT NO.		SHEET	
4/12 CHANGED CTE FROM 6.0 TO 5.0 (ON SHEET 1)	HOU			129	
2/15 MINOR CORRECTIONS.	COUNTY	CONTROL	SECTION	JOB	HIGHWAY
	HARRIS	0389	13	039	SH 146

STD-B1B

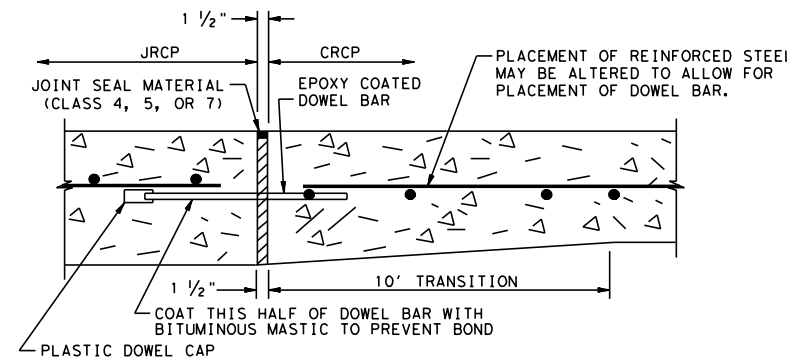
GENERAL NOTES

- FOR FURTHER INFORMATION REGARDING PLACING CONCRETE AND REINFORCEMENT, REFER TO THE GOVERNING SPECIFICATION FOR CONCRETE PAVEMENT.
- THE DESIGN REQUIREMENTS FOR THE PAVEMENT STRUCTURE, I.E. BAR SPACING, BAR SIZE LAP REQUIREMENTS, ETC., ARE SHOWN ON THE APPROPRIATE PAVEMENT DESIGN DETAIL.
- SLEEPER SLAB AND ADDITIONAL REINFORCING REQUIRED ON THIS DRAWING ARE INCIDENTAL TO THE VARIOUS BID ITEMS.
- USE THE SIZE, SPACING, AND LENGTH OF DOWEL BARS SHOWN IN TABLE "A".
- WHERE THERE WILL BE A JUNCTURE AND ADDITIONAL JRCP PAVING WILL BE PLACED AT A FUTURE DATE, MULTIPLE PIECE DOWEL BARS WILL BE PERMITTED AT THE JUNCTURE. PROVIDE MULTIPLE PIECE DOWEL BAR ASSEMBLIES WITH A MINIMUM ULTIMATE TENSILE STRENGTH OF 60.0 KIPS AND THAT HAVE SMOOTH EPOXY COATED BARS. ENSURE THE MULTIPLE PIECE DOWEL BAR ASSEMBLIES HAVE STOP TYPE COUPLINGS AND HAVE ROLLED THREADS ON THE BARS. DISMANTLE THE BAR AND FIT THE COUPLING PORTION USED IN CONSTRUCTION, WITH A PLASTIC CAP. FURNISH THE REMAINING PORTION OF THE BAR TO THE ENGINEER.
- WHERE THE PAVING IS CRCP AND A RAMP COMPOSED OF A FLEXIBLE PAVEMENT WILL BE USED AT THE JUNCTURE UNTIL FUTURE PAVING IS CONSTRUCTED, MULTIPLE PIECE TIE BARS MAY BE USED IF PERMITTED BY THE ENGINEER. IF USED, ENSURE THE MULTIPLE PIECE TIE BAR ASSEMBLIES HAVE STOP TYPE COUPLINGS AND ROLLED THREADS ON THE BARS. FURNISH MULTIPLE PIECE TIE BAR ASSEMBLIES THAT DEVELOP A MINIMUM ULTIMATE TENSILE STRENGTH EQUAL TO 1.25 TIMES THE YIELD STRENGTH OF THE TRANSVERSE BARS BEING JOINED. FOR TIE BARS, USE DEFORMED REINFORCING BARS. TIE BAR ASSEMBLIES MADE FROM STEELS OTHER THAN ASTM GRADE 60 AND WITH DEFORMATIONS OTHER THAN ASTM STD. MAY BE USED PROVIDED THEY PROVE SATISFACTORY TO THE ENGINEER AND ARE IN EVERY RESPECT THE EQUAL TO THE ASSEMBLIES SPECIFIED. LABORATORY TESTING OF THE PROPOSED ASSEMBLIES, AT THE CONTRACTOR'S EXPENSE, MAY BE REQUIRED. LAP AND WELD ONE PORTION OF THE TIE BAR ASSEMBLY TO EACH LONGITUDINAL BAR IN ACCORDANCE WITH THE ITEM "STRUCTURAL FIELD WELDING" AND THE OTHER PORTION INTO THE COUPLING PRIOR TO PAVING. ENSURE MULTIPLE PIECE TIE BAR LENGTHS CONFORM TO THE TIE BAR LENGTHS SHOWN ELSEWHERE IN THE PLANS. ADDITIONAL "SHEAR STEEL" WILL ALSO BE REQUIRED AND MAY BE USED WITH MULTIPLE PIECE ASSEMBLIES AS PREVIOUSLY DESCRIBED. USE ADDITIONAL STEEL BARS OF EQUAL DIAMETER AT A SPACING DOUBLE THAT OF THE LONGITUDINAL STEEL AND ENSURE THE LENGTH IS 66 TIMES THE TIE BAR DIAMETER.
- DO NOT SHEAR CUT DOWEL BARS.
- ENSURE DOWEL BAR EPOXY COATING CONFORMS TO ARTICLE 440.2.7., "EPOXY COATING".
- REPLACE ANY BENT LONGITUDINAL REINFORCING. IF THERE IS NOT SUFFICIENT EXPOSED REINFORCING TO PROVIDE A MINIMUM OF A 33 TIMES BAR DIAMETER LAP, REMOVE THE EXISTING PAVEMENT AND SUFFICIENTLY EXPOSE THE EXISTING REINFORCING TO PROVIDE A 33 TIMES BAR DIAMETER LAP. REPLACE ANY SHEAR BARS THAT ARE DISTURBED, BY DRILLING AND GROUTING AS REQUIRED BY NOTE 12 BELOW. PERFORM THIS CORRECTIVE ACTION AT NO EXPENSE TO THE DEPARTMENT.
- TIE BARS AND DOWEL BARS OMITTED, LOST, OR DAMAGED SHALL BE REPAIRED BY DRILLING AND EPOXY GROUTING AT NO EXPENSE TO THE DEPARTMENT.
- JUNCTURES A & B ARE ONLY SUITABLE FOR MINOR STREETS WITH LOW TRAFFIC VOLUMES.
- FURNISH ADDITIONAL SHEAR BARS (DIAMETER "D") OF THE SAME SIZE AS LONGITUDINAL BARS AND SPACE THEM MIDWAY BETWEEN ALTERNATE LONGITUDINAL BARS ALONG THE TRANSVERSE CONSTRUCTION JOINT FORMED AT THE LEAVE-OUT.



NOTE:
ADDITIONAL CONCRETE FOR THICKENED EDGE IS SUBSIDIARY TO VARIOUS BID ITEMS. BACKFILL DISTURBED MATERIAL IN THE FLEXIBLE PAVEMENT WITH ACP. THIS ACP IS SUBSIDIARY TO VARIOUS BID ITEMS.

JUNCTURE A & B - CRCP OR JRCP WITH FLEXIBLE TYPE PAVEMENT STRUCTURE

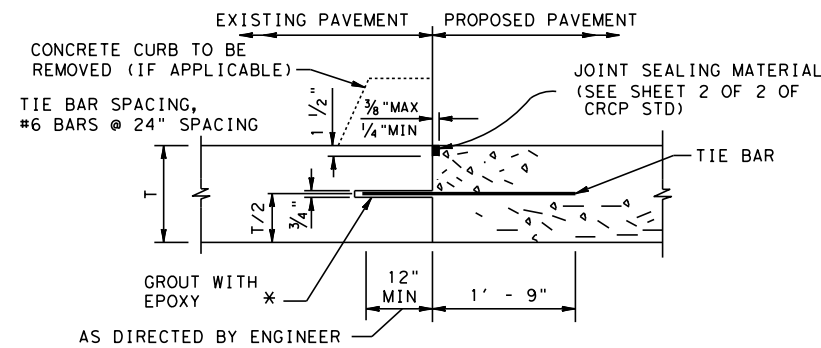


FOR DETAILS NOT SHOWN, SEE TRANSVERSE EXPANSION JOINT DETAILS ELSEWHERE IN PLANS.

DETAIL "B" - DOWEL ASSEMBLY AT EXPANSION JOINT

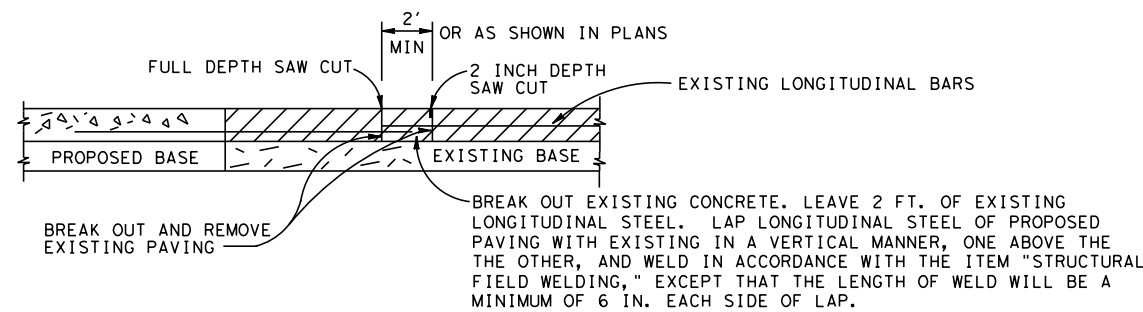
DOWEL BAR DATA			
SLAB THICKNESS (T)	6"-7.5"	8"-10"	10.5"-15"
DOWEL SIZE	1"	1 1/4"	1 1/2"
DOWEL LENGTH	18"	20"	22"
DOWEL BAR SPACING	12"	12"	12"

TABLE A - DOWEL BAR DATA



JUNCTURE D - TYPICAL CONNECTION TO EXISTING CONCRETE

*FOR EPOXY TYPE SEE ITEM 361.



JUNCTURE F - "BREAK BACK" CONCRETE CRCP WITH CRCP OR JRCP WITH JRCP

LEGEND

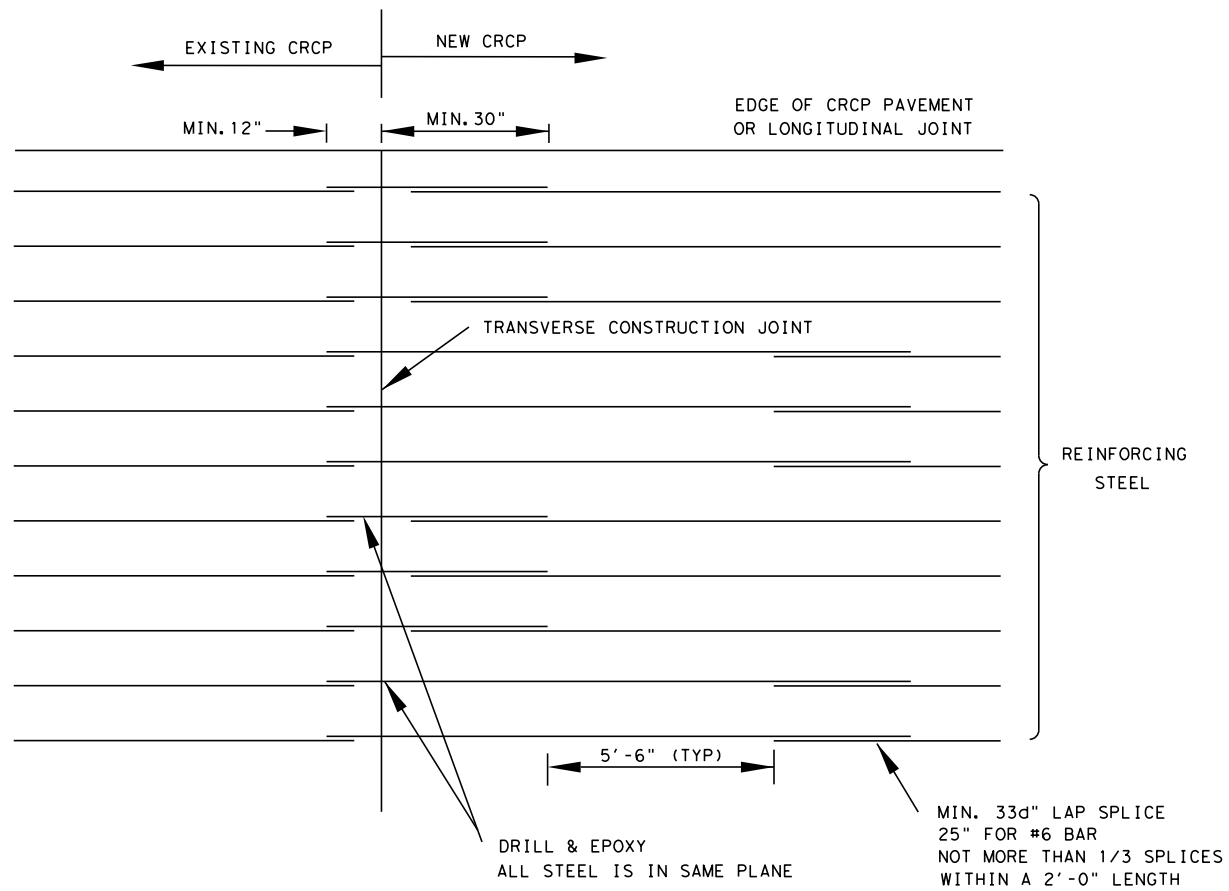
- ACP - ASPHALT CONCRETE PAVEMENT
- CRCP - CONTINUOUSLY REINFORCED CONCRETE PAVEMENT
- JRCP - JOINTED REINFORCED CONCRETE PAVEMENT
- T - THICKNESS

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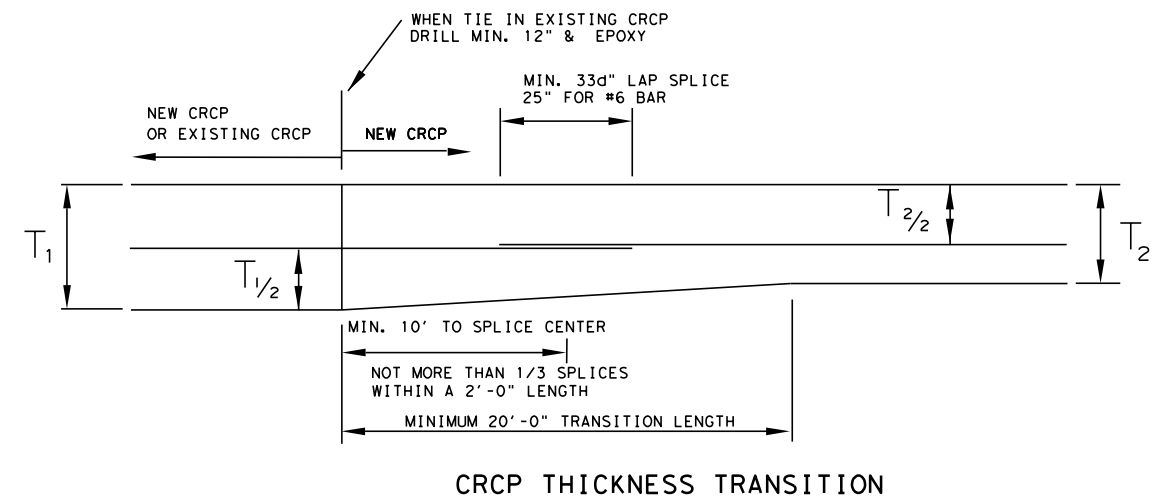
CONCRETE PAVEMENT JUNCTURES

CPJ

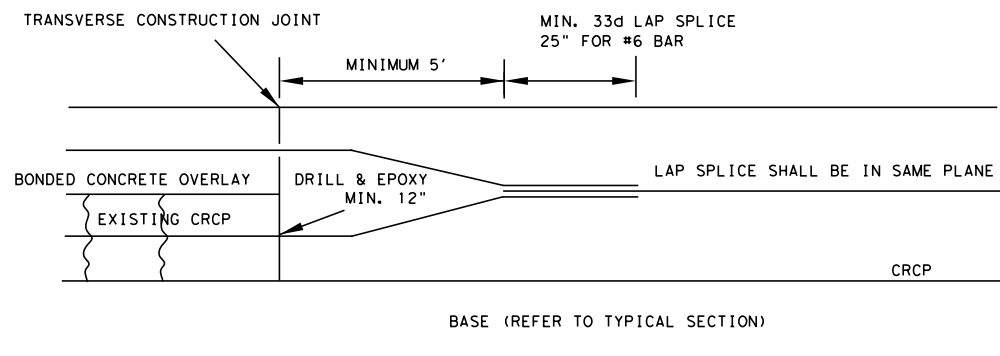
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© TxDOT DEC. 2009	DIST	FED REG	PROJECT NO.	SHEET
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	COUNTY	CONTROL	SECT	JOB
	HARRIS	0389	13	039 SH 146



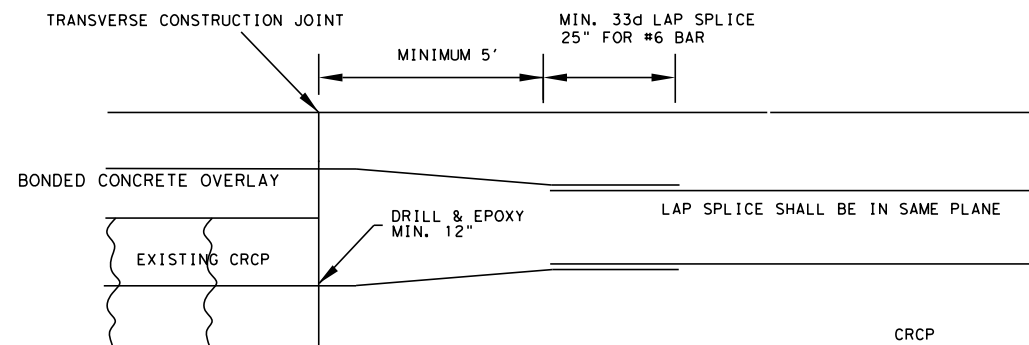
EXISTING CRCP TO NEW CRCP



CRCP THICKNESS TRANSITION



CRCP BONDED OVERLAY TO CRCP TRANSITION
(ONE LAYER STEEL)



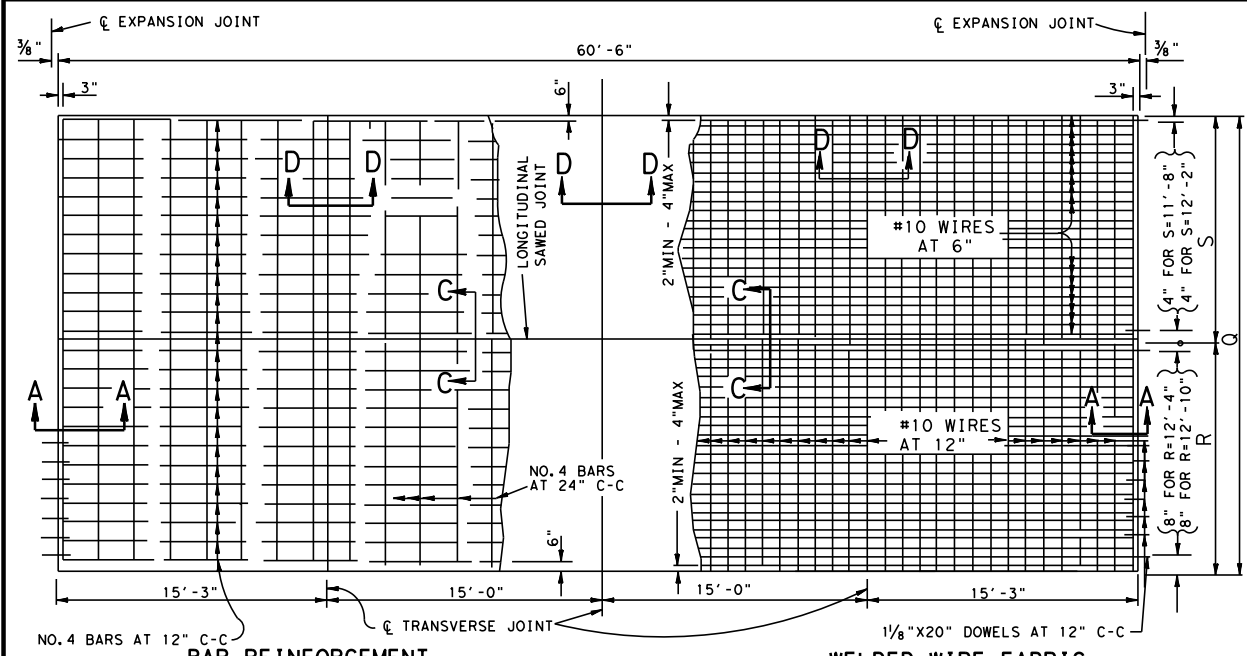
CRCP BONDED OVERLAY TO CRCP TRANSITION
(TWO LAYER STEEL)

Texas Department of Transportation
Houston District

CONCRETE PAVEMENT JUNCTURES

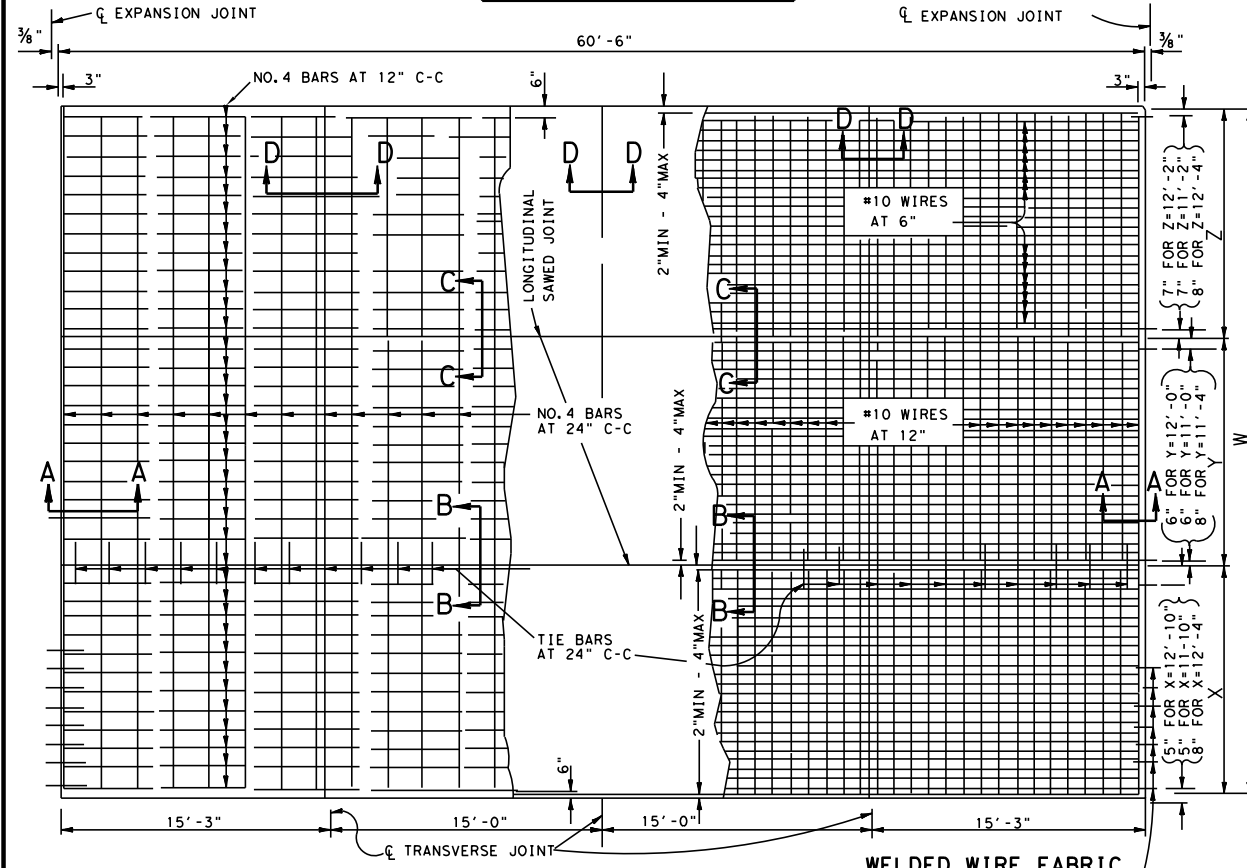
CPJ

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© TXDOT DEC. 2009	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS 5/05 2004 SPECS REVISED 4/2008 2/15 2014 SPECS	HOU	6		131
	COUNTY	CONTROL	SECT	JOB
	HARRIS	0389	13	039
				SH 146



TWO LANE PAVEMENT PLAN

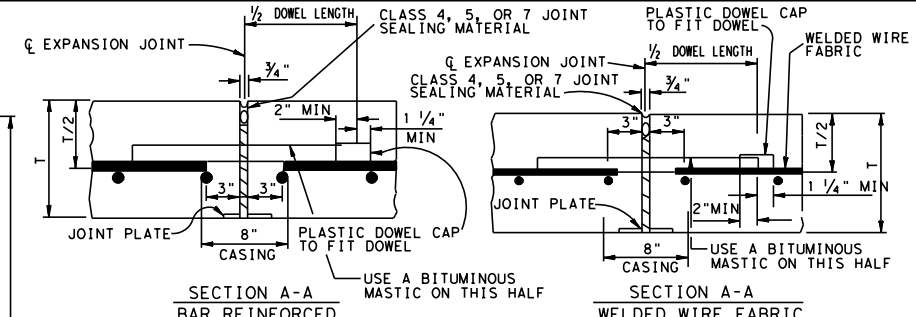
	WIDTH - Q		
	24'-0"	24'-6"	25'-0"
R	12'-4"	12'-4"	12'-10"
S	11'-8"	12'-2"	12'-2"



THREE LANE PAVEMENT PLAN

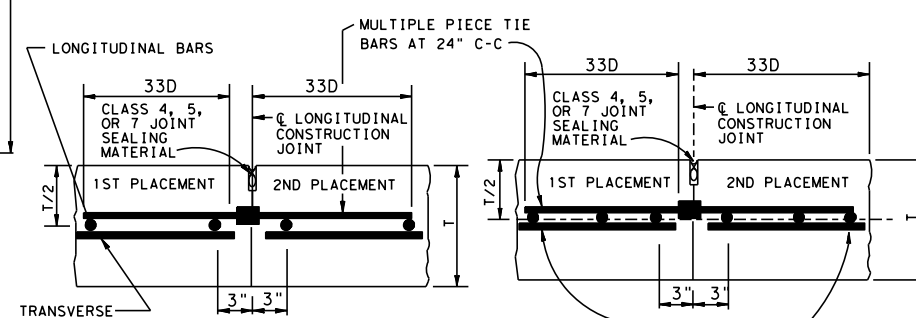
	WIDTH - W		
	37'-0"	36'-0"	34'-0"
X	12'-10"	12'-4"	11'-10"
Y	12'-0"	11'-4"	11'-0"
Z	12'-2"	12'-4"	11'-2"

D = DIAMETER
R = RADIUS
T = THICKNESS

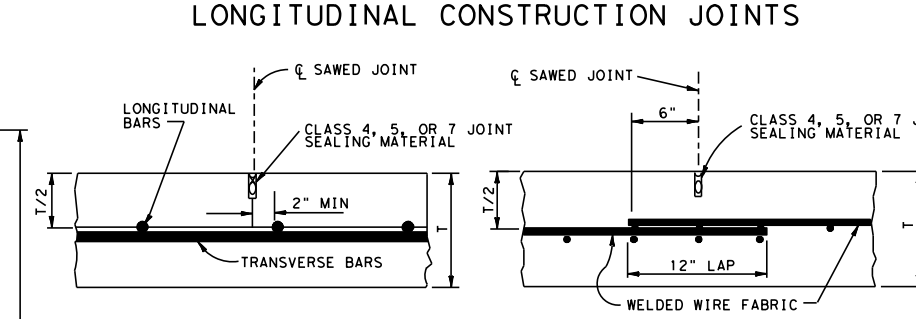


TRANSVERSE EXPANSION JOINTS

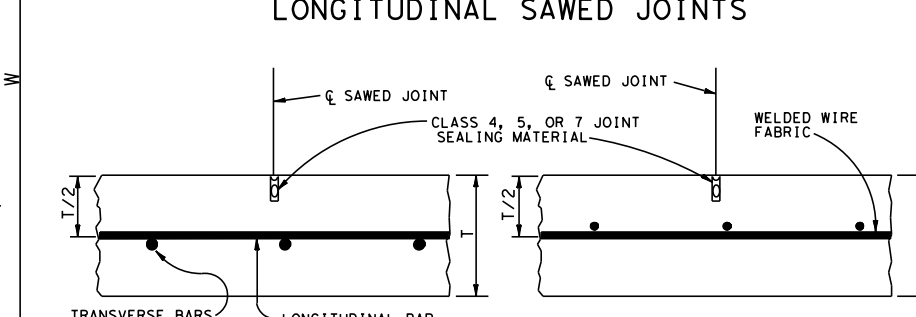
NOTE: DOWEL BARS CONFORMING TO ASTM A615 OR A616 GRADE 60 ARE ACCEPTABLE



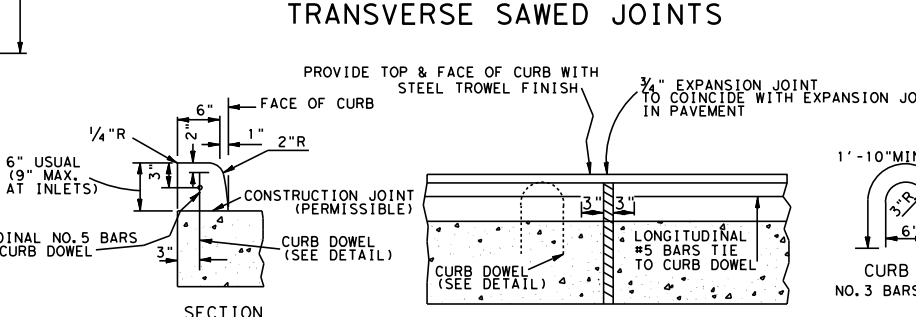
LONGITUDINAL CONSTRUCTION JOINTS



LONGITUDINAL SAWED JOINTS



TRANSVERSE SAWED JOINTS



TYPICAL 6" CURB (DETAIL)

- GENERAL NOTES**
- MULTIPLE PIECE TIE BARS ARE REQUIRED AT LONGITUDINAL CONSTRUCTION JOINTS. USE MULTIPLE PIECE TIE BAR ASSEMBLIES WITH STOP TYPE COUPLINGS AND WITH THREADS ON THE BARS. ENSURE THE MULTIPLE PIECE TIE BAR ASSEMBLIES DEVELOP A MINIMUM ULTIMATE TENSILE STRENGTH EQUAL TO 1.25 TIMES THE YIELD STRENGTH OF THE TRANSVERSE BARS BEING JOINED. USE DEFORMED REINFORCING BARS FOR TIE BARS. TIE BAR ASSEMBLIES MADE FROM STEELS OTHER THAN ASTM GRADE 60 AND WITH DEFORMATIONS OTHER THAN ASTM STANDARD MAY BE USED IF IT CAN BE PROVEN TO THE ENGINEER THAT THEY ARE IN EVERY RESPECT THE EQUAL OF THE ASSEMBLIES SPECIFIED. LABORATORY TESTING OF THE PROPOSED ASSEMBLIES, AT THE CONTRACTOR'S EXPENSE, MAY BE REQUIRED.
 - FORM CONSTRUCTION JOINTS WITH METAL OR WOOD FORMS EQUAL IN DEPTH TO THE NOMINAL DEPTH OF THE PAVEMENT OR BY OTHER MEANS APPROVED PRIOR TO THEIR USE.
 - SAW LONGITUDINAL AND TRANSVERSE JOINTS AS SOON AS SAWING CAN BE ACCOMPLISHED WITHOUT DAMAGE TO THE PAVEMENT AND BEFORE 24 HOURS AFTER PLACING THE CONCRETE, THE EXACT TIME WILL BE APPROVED BY THE ENGINEER. PREFORMED JOINT WITH ASPHALT STRIP IS NOT ACCEPTABLE.
 - LONGITUDINAL JOINTS ARE SHOWN OFFSET FOUR INCHES FROM THE THEORETICAL LANE LINE AND MAY BE OFFSET TO EITHER SIDE IF THE WIDTH OF THE WIRE FABRIC IS PROPERLY ADJUSTED.
 - ONE OF THE LONGITUDINAL JOINTS OF PAVEMENT SLABS WIDER THAN TWO LANES MAY BE A CONSTRUCTION JOINT. FOR PAVEMENT SLABS WIDER THAN 15 FT. PROVIDE A LOGITUDINAL SAWED JOINT UNLESS OTHERWISE DIRECTED.
 - FORM THE JOINT SEAL SPACE AT TRANSVERSE EXPANSION JOINTS BY USING A STRAIGHT FORM PLACED BEHIND THE LONGITUDINAL FLOAT. LOOSEN THE FORM AS SOON AS THE CONCRETE WILL RETAIN ITS SHAPE AND EDGE WITH AN APPROVED EDGING TOOL. TOOL BOTH EDGES OF LONGITUDINAL CONSTRUCTION JOINTS TO A 1/8 IN. RADIUS AT THE PAVEMENT SURFACE.
 - DO NOT DISCHARGE CONCRETE FROM THE MIXER DIRECTLY ON TOP OF OR ON THE SIDES OF THE EXPANSION JOINT ASSEMBLIES.
 - LAP TRANSVERSE EDGES OF SHEETS OF WELDED WIRE FABRIC 12 INCHES EXCEPT AT TRANSVERSE EXPANSION JOINTS. LAP LONGITUDINAL EDGES 6 INCHES EXCEPT AT LONGITUDINAL CONSTRUCTION JOINTS.
 - DOWEL BARS MAY BE COATED WITH STAINLESS STEEL, MONEL METAL, OR IN ACCORDANCE WITH THE ITEM "REINFORCING STEEL" SECTION ON EPOXY COATING; WITH A WELDED DOWEL ASSEMBLY SUPPORT, AS APPROVED. ENSURE THE CASING CONFORMS TO THE REQUIREMENTS OF ONE OF THE GRADES OF ASTM A167-70 OR A176-71 AND IS NOT LESS THAN 0.010 INCH THICK. PROVIDE A CASING AT LEAST 8 INCHES LONG AND THAT COVERS THE MIDDLE 8 INCHES OF THE DOWEL.
 - SECURE DOWELS PARALLEL TO THE PAVEMENT SURFACE AND PERPENDICULAR TO THE JOINT WITH THE AID OF APPROVED WELDED WIRE BASKET ARRANGEMENTS. ENSURE WELDED WIRE BASKET ARRANGEMENTS DO NOT CROSS THE EXPANSION JOINT. UNIFORMLY COAT DOWELS WITH A BITUMINOUS MASTIC ON THE END WITH THE DOWEL CAP.
 - DO NOT BEND TIE BARS AND DOWEL BARS. TO PREVENT DISPLACEMENT OF WIRE FABRIC BY CONCRETE PLACEMENT, TIE THE FABRIC PANEL TOGETHER AND TIE THE INITIAL FABRIC PANELS OF EACH SLAB TO THE DOWEL BASKET OR AS DIRECTED.
 - TOOL PAVEMENT EDGES TO A RADIUS OF 1/8 IN. WITH AN APPROVED EDGING TOOL.
 - DETAILS FOR PAVEMENT WIDTH, PAVEMENT THICKNESS, AND CROWN-SLOPE ARE ELSEWHERE SHOWN ON THE PLANS.
 - THE CONTRACTOR HAS THE OPTION OF USING WELDED WIRE FABRIC OR BAR REINFORCEMENT. LOCATE THE LONGITUDINAL STEEL AT THE CENTER OF THE SLAB. TAKE NECESSARY PRECAUTIONS TO INSURE THAT THE FINAL POSITION OF STEEL IS WITHIN 1/2 IN. OF THE SLAB CENTER. ENSURE THE LONGITUDINAL AND TRANSVERSE STEEL SPACING DOES NOT VARY MORE THAN ONE-TWELFTH OF SPACING SHOWN.
 - LONGITUDINAL STEEL MAY BE SPLICED WITH 33 TIMES BAR DIAMETER LAPS.
 - FOR LANE WIDTHS NOT SHOWN OR FOR VARIABLE PANEL LENGTHS AND WIDTHS, SPACE REINFORCING STEEL AND DOWELS AS DIRECTED.
 - USE APPROVED BAR MAT CHAIRS. DO NOT EXCEED CHAIR SPACING OF 30 IN. C-C (TRANSVERSE) AND 48 IN. C-C (LONGITUDINAL). GALVANIZING THE CHAIRS IS NOT REQUIRED.
 - OBTAIN BOARDS FOR EXPANSION JOINT FILLER FROM REDWOOD TIMBER.
 - PROVIDE AND CONSTRUCT THE JOINT PLATE AS APPROVED.
 - WHEN CURB IS PLACED SEPARATELY FROM THE CONCRETE PAVEMENT, PROVIDE THE REINFORCING STEEL AS SHOWN IN THE CURB DETAIL. THE CURB REINFORCING STEEL MAY BE OMITTED WHEN THE CURB IS PLACED MONOLITHICALLY.

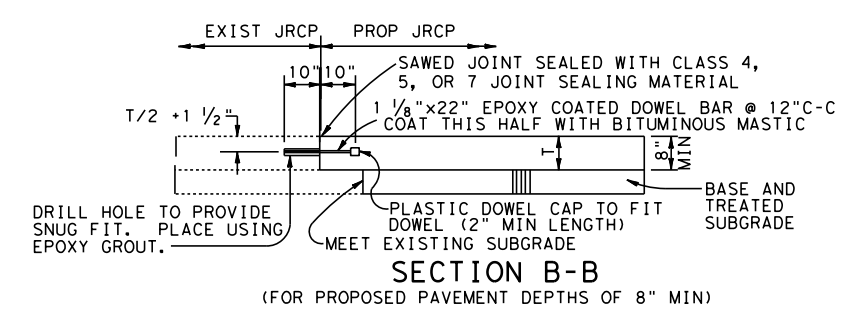
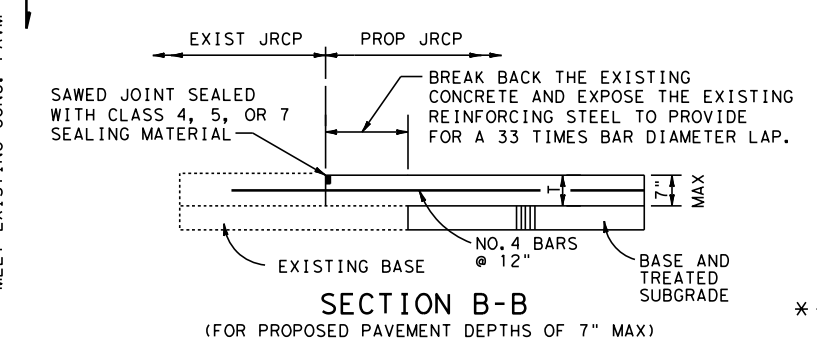
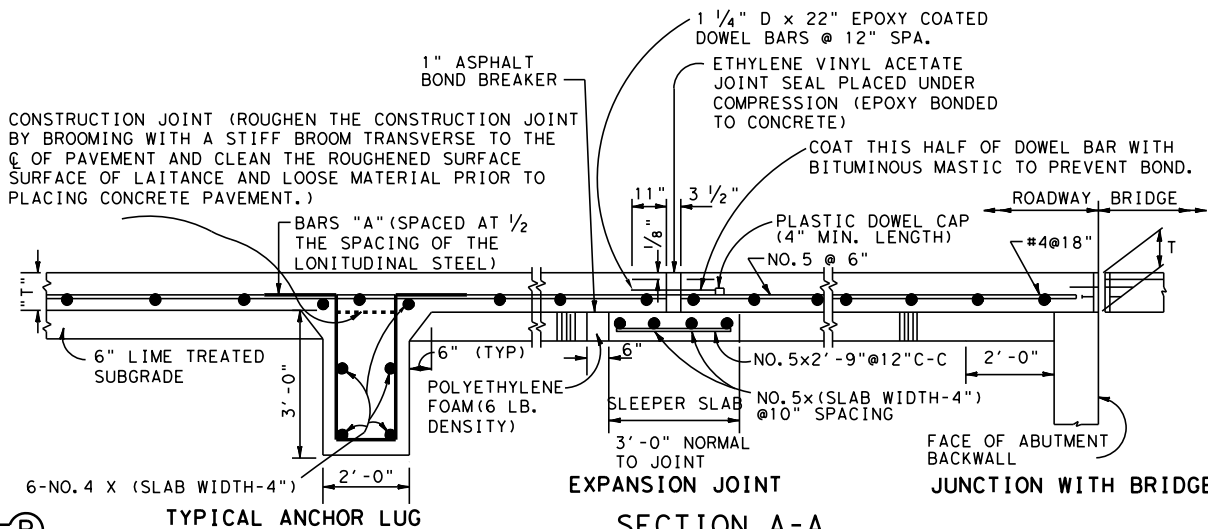
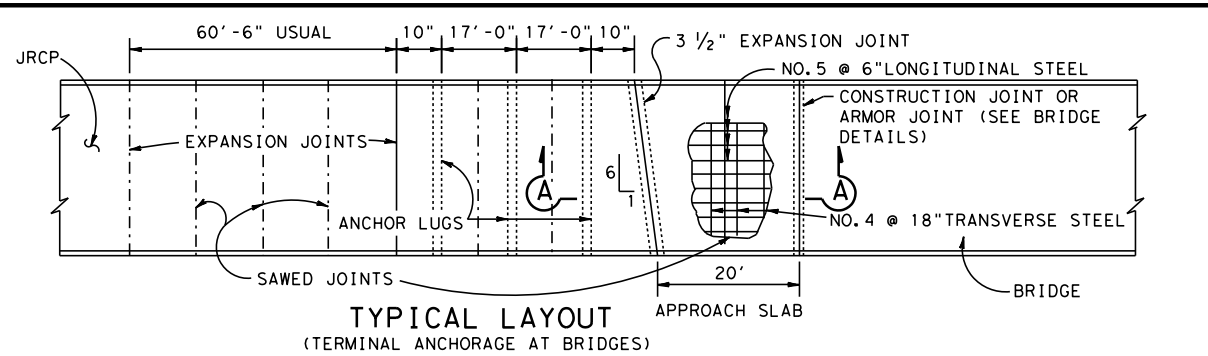
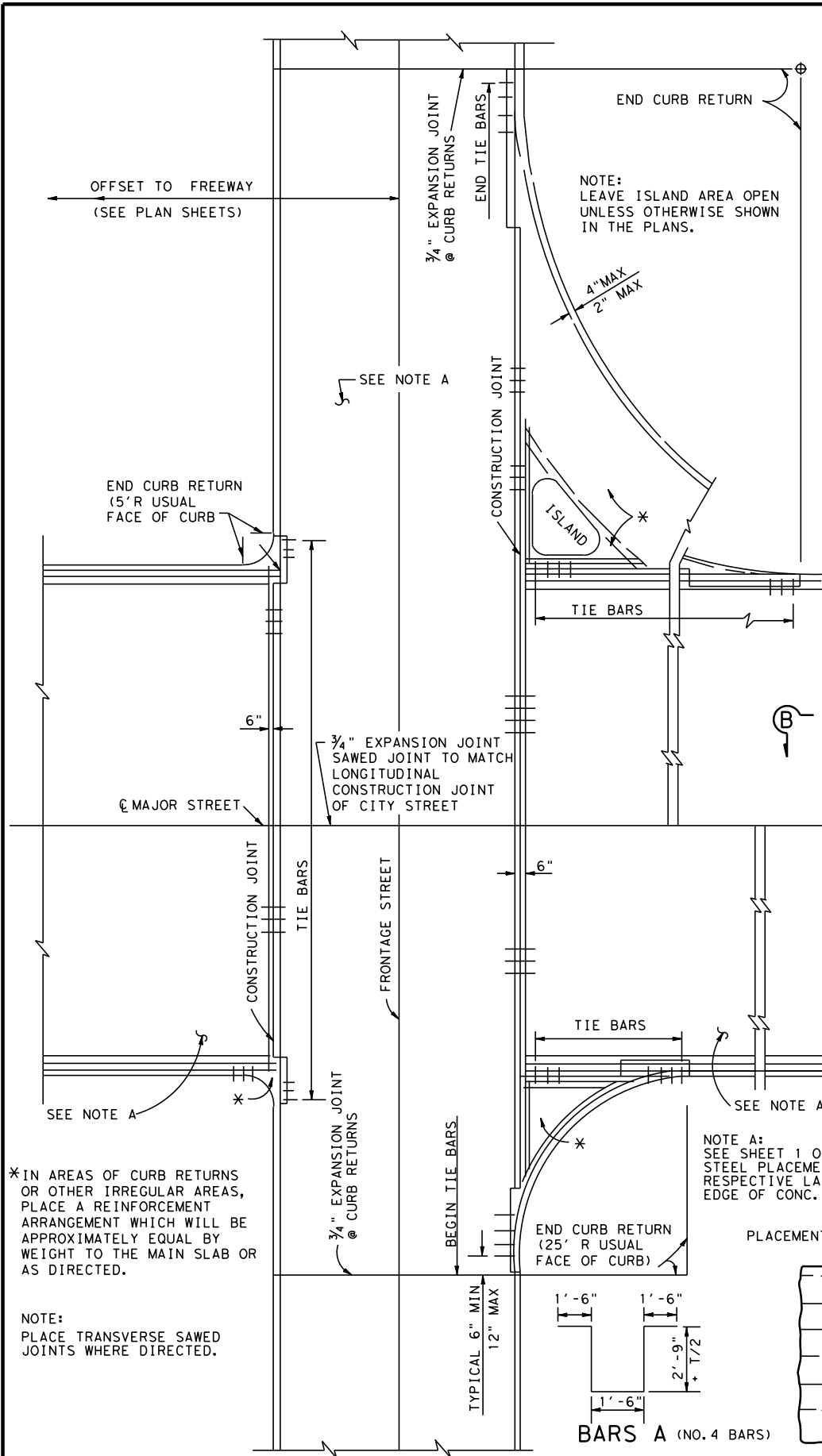
(GENERAL NOTES CONTINUED ON SHEET 2 OF 2)

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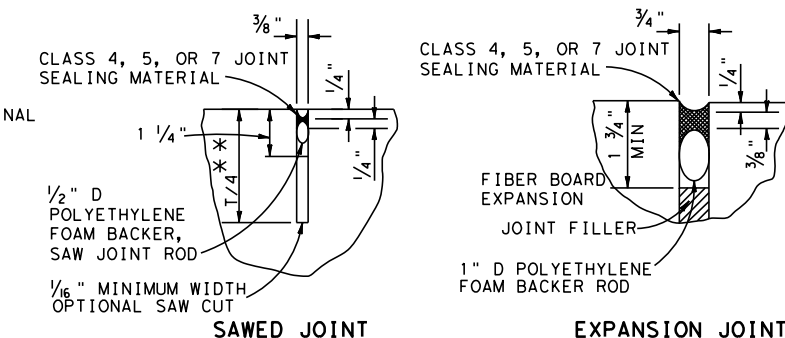
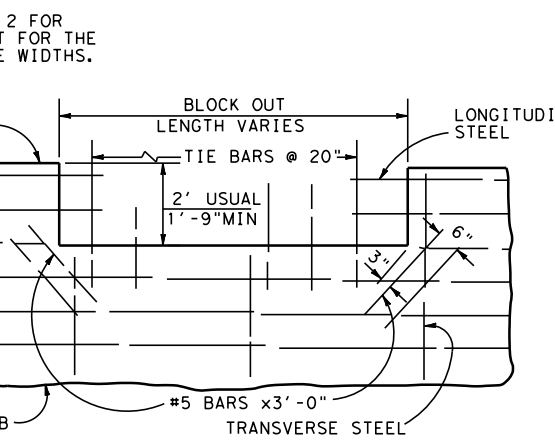
JOINTED REINFORCED CONCRETE PAVEMENT DETAILS
(FOR PAVEMENT THICKNESS 10 INCHES OR LESS)

JRPC SHEET 1 OF 2

FILE: STDB-2.dgn	DN:	CK:	DW:	CK:
© TxDOT MAR. 2004	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS	HOU	6		132
5/05 2004 SPECS	COUNTY	CONTROL	SECT	JOB
7/2010 ADDED NOTE	HARRIS	0389	13	039
8/2015 MODIFIED NOTES				SH 146



REPLACE ANY BENT LONGITUDINAL REINFORCING. IF THERE IS NOT SUFFICIENT EXPOSED REINFORCING TO PROVIDE A MINIMUM OF A 33 TIMES BAR DIAMETER LAP, REMOVE THE EXISTING PAVEMENT AND SUFFICIENTLY EXPOSE THE EXISTING REINFORCING TO PROVIDE A 33 TIMES BAR DIAMETER LAP. REPLACE ANY SHEAR BARS THAT ARE DISTURBED, BY DRILLING AND GROUTING AS REQUIRED BY NOTE #29. PERFORM THIS CORRECTIVE ACTION AT NO EXPENSE TO THE DEPARTMENT.



INTERSECTION OF MAJOR STREET WITH FRONTAGE STREET
TYPICAL REINFORCING PLAN

DETAIL OF BLOCKOUT
*OMIT TIE BARS
* INLET BLOCK-OUT

JOINT SEALING DETAILS
** IF SILICEOUS RIVER GRAVEL IS USED AS THE COARSE AGGREGATE, THIS DEPTH IS T/3.

- GENERAL NOTES (CONTINUED FROM SHEET 1 OF 2)
- CONSTRUCT ANCHOR LUGS, EXPANSION JOINTS, AND SLEEPER SLABS AS DETAILED IN SECTION A-A. THESE WILL BE PAID FOR IN ACCORDANCE WITH ITEM, "CONCRETE PAVEMENT TERMINALS."
 - REINFORCING STEEL FOR TERMINAL ANCHOR SYSTEMS MAY BE GRADE 40 OR GRADE 60.
 - PLACE CONCRETE FOR ANCHOR LUGS AS SOON AS POSSIBLE AFTER COMPLETING EXCAVATION, TO PRESERVE THE INHERENT SOIL CHARACTERISTICS. EXCAVATING FOR AND PLACING CONCRETE FOR ANCHOR SYSTEM MAY BE IN PREFORMED SECTIONS CORRESPONDING TO THE WIDTH OF PAVING PLACEMENT.
 - APPLY A STEEL TROWEL FINISH TO SLEEPER SLABS AND COAT WITH AN ASPHALT BOND BREAKER.
 - THE DETAILS FOR ANCHORS, LUGS, EXPANSION JOINTS, AND SLEEPER SLABS ARE NOT APPLICABLE UNLESS SHOWN ELSEWHERE IN THE PLANS.
 - APPROACH SLAB WILL BE PAID FOR IN ACCORDANCE WITH THE ITEM "CONCRETE STRUCTURES."
 - WITHIN 5 MINUTES OF SAWING, COMPLETELY REMOVE THE RESULTING SLURRY FROM THE JOINT BY FLUSHING WITH HIGH PRESSURE WATER. THEN ALLOW THE JOINT TO DRY FOR A MINIMUM OF 48 HOURS BEFORE SANDBLASTING THE JOINT.
 - DO NOT SHEAR CUT DOWEL BARS.
 - SIZE ADDITIONAL SHEAR BARS AS LONGITUDINAL BARS AND SPACE THEM MIDWAY BETWEEN ALTERNATE LONGITUDINAL BARS ALONG THE TRANSVERSE CONSTRUCTION JOINT FORMED AT THE LEAVE-OUT.
 - IF THE CONCRETE DESIGN REQUIRES GREATER THAN 5.5 SACKS OF CEMENTITIOUS MATERIAL PER CUBIC YARD, WRITTEN APPROVAL BY THE AREA ENGINEER WILL BE REQUIRED. ENSURE CONCRETE PAVEMENT MIXES PLACED FROM APRIL 1 TO OCTOBER 31 CONTAIN A MINIMUM OF 25 PERCENT BY WEIGHT OF CLASS "F" FLY ASH.
 - IN LOCATIONS WHERE THE PLANS CALL FOR FAST TRACK CONCRETE PAVEMENT IN LIEU OF JRCP (LAID ON COMPACTED OR STABILIZED SUBGRADE), USE DETAILS IN THIS STANDARD IN CONJUNCTION WITH THE APPROPRIATE FAST TRACK CONCRETE SPECIFICATION. IF THE JRCP IS LAID UPON A BASE STRUCTURE, ADD 3" TO THE FAST TRACK PAVEMENT THICKNESS TO COMPENSATE FOR THE BASE.

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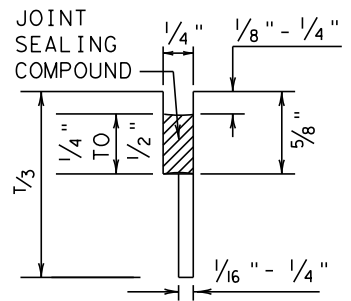
JOINTED REINFORCED CONCRETE PAVEMENT DETAILS
EXPANSION JOINT DESIGN
(FOR PAVEMENT THICKNESS 10 INCHES OR LESS)

JRCP SHEET 2 OF 2

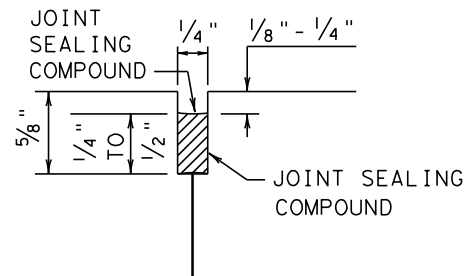
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5/05 2004 SPECS	COUNTY	CONTROL	SECT	JOB
7/2010 ADDED NOTE	HARRIS	0389	13	039
9/2013 ADDED NOTE				SH 146
8/2015 MODIFIED NOTES				

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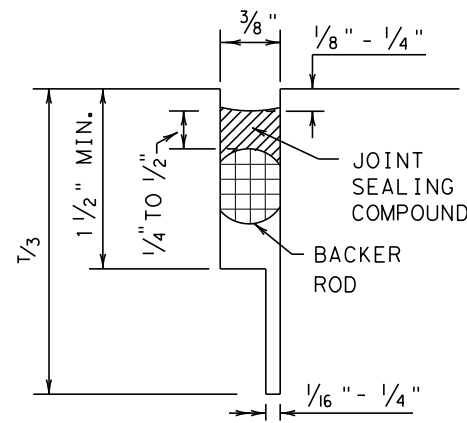
METHOD B: JOINT SEALING COMPOUND



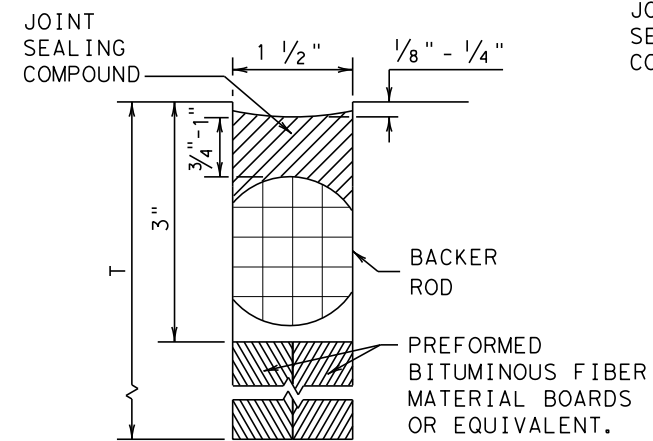
LONGITUDINAL SAWED CONTRACTION JOINT



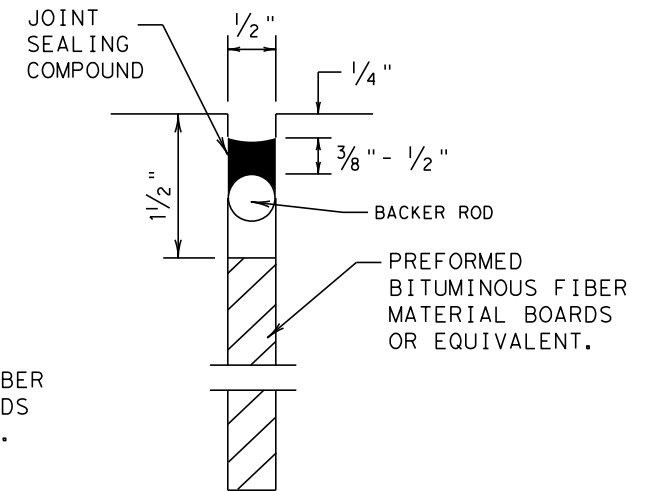
LONGITUDINAL OR TRANSVERSE CONSTRUCTION JOINT



TRANSVERSE SAWED CONTRACTION JOINT

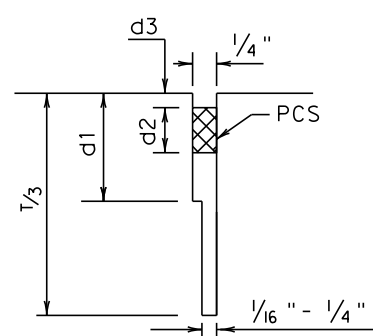


TRANSVERSE FORMED EXPANSION JOINT

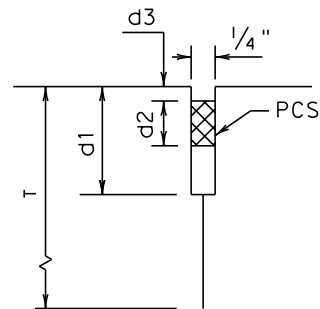


FORMED ISOLATION JOINT

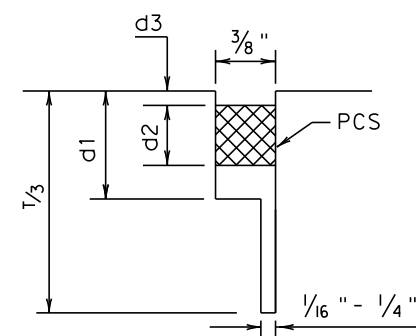
METHOD A: PREFORMED COMPRESSION SEALS (PCS) (DMS-6310 CLASS 6)



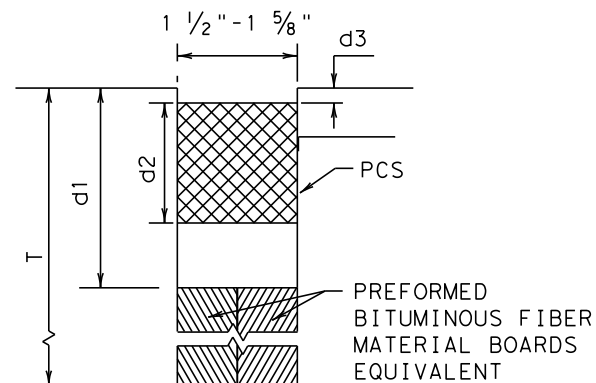
LONGITUDINAL SAWED CONTRACTION JOINT



LONGITUDINAL CONSTRUCTION JOINT



TRANSVERSE SAWED CONTRACTION JOINT



TRANSVERSE FORMED EXPANSION JOINT

GENERAL NOTES

- UNLESS OTHERWISE SHOWN IN THE PLANS, EITHER METHOD "A" OR METHOD "B" MAY BE USED.
- THE LOCATION OF JOINTS SHALL BE AS SHOWN ELSEWHERE IN THE PLANS.
- THE JOINT RESERVOIR FOR SEALANT OR PCS SHALL BE SAWED UNLESS OTHERWISE SHOWN ON THE PLANS FOR THE LONGITUDINAL AND TRANSVERSE CONSTRUCTION JOINTS AND THE SAWED JOINTS.
- DIMENSIONS d1, d2, AND d3 SHOWN IN METHOD A SHALL BE IN ACCORDANCE WITH THE PREFORMED COMPRESSION SEAL MANUFACTURER'S RECOMMENDATION.
- REFER TO DMS-6310 "JOINT SEALANTS AND FILLERS" FOR THE CLASSIFICATIONS.
- FOR SAWED LONGITUDINAL JOINT, LONGITUDINAL OR TRANSVERSE CONSTRUCTION JOINT, USE JOINT SEALANT CLASS 5 OR 8 UNLESS OTHERWISE SHOWN ON THE PLAN OR APPROVED.
- FOR TRANSVERSE SAWED CONTRACTION, TRANSVERSE FORMED EXPANSION JOINT, AND ISOLATION JOINT USE JOINT SEALANT CLASS 5 OR 8 AT NEW JOINTS. USE JOINT SEALANT CLASS 4, 5, 7, OR 8 FOR MAINTAINING EXISTING JOINTS.
- THE JOINTS SHALL BE CLEANED IN ACCORDANCE WITH THE ITEM 438 "CLEANING AND SEALING JOINTS" OR ITEM 713 "CLEANING AND SEALING JOINTS AND CRACKS (CONCRETE PAVEMENT)".
- ISOLATION JOINTS ACCOMMODATE HORIZONTAL AND VERTICAL MOVEMENTS THAT OCCUR BETWEEN A PAVEMENT AND A STRUCTURE. ISOLATION JOINTS MAY BE USED FOR BRIDGE ABUTMENTS, INTERSECTIONS, CURB AND GUTTER, OLD AND NEW PAVEMENTS, OR AROUND DRAINAGE INLETS, MANHOLES, FOOTINGS AND LIGHTING STRUCTURES.

DATE:
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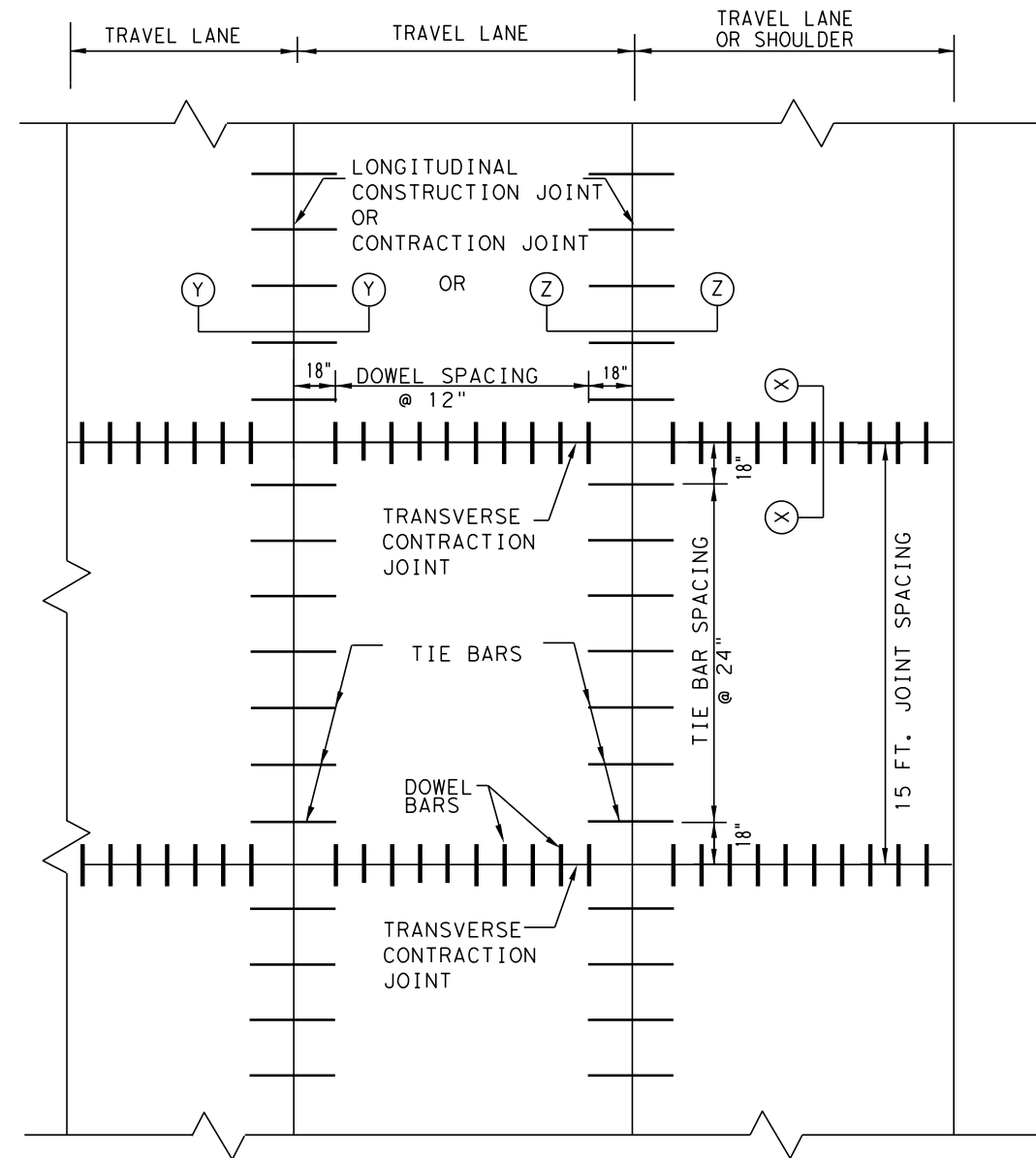
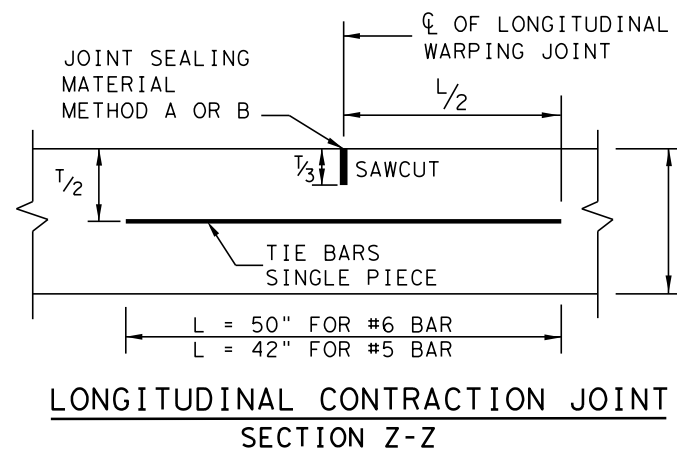
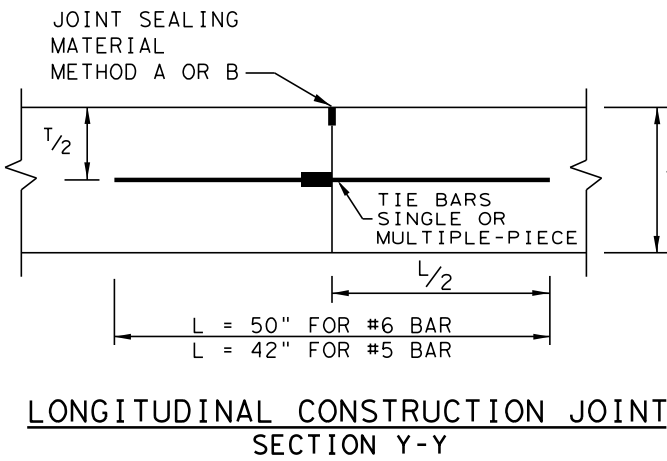
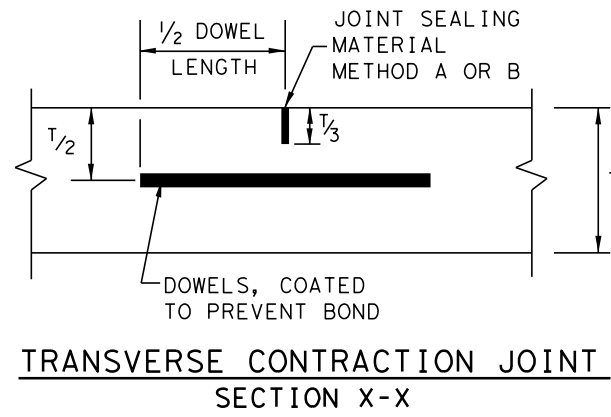
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CONCRETE PAVING DETAILS JOINT SEALS JS-14			
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© TxDOT: DECEMBER 2014	CONT	SECT	HIGHWAY
REVISIONS	0389	13	039 SH 146
	DIST	COUNTY	SHEET NO.
	HOU	HARRIS	134

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GENERAL NOTES

1. DETAILS FOR PAVEMENT WIDTH, PAVEMENT THICKNESS AND THE CROWN CROSS-SLOPE SHALL BE SHOWN ELSEWHERE IN THE PLANS. PAVEMENTS WIDER THAN 100 FT. WITHOUT A FREE LONGITUDINAL JOINT ARE NOT COVERED BY THIS STANDARD.
2. FOR FURTHER INFORMATION REGARDING THE PLACEMENT OF CONCRETE AND LOAD TRANSFER DEVICES REFER TO THE GOVERNING SPECIFICATION FOR "CONCRETE PAVEMENT".
3. THE SPACING BETWEEN TRANSVERSE CONTRACTION JOINTS SHALL BE 15 FT. UNLESS OTHERWISE SHOWN IN THE PLANS.
4. TRANSVERSE CONSTRUCTION JOINTS MAY BE FORMED BY USE OF METAL OR WOOD FORMS EQUAL IN DEPTH TO THE DEPTH OF PAVEMENT, OR BY METHODS APPROVED BY THE ENGINEER.
5. USE HAND-OPERATED IMMERSION VIBRATORS TO CONSOLIDATE THE CONCRETE ADJACENT TO ALL THE FORMED JOINTS.
6. PAVEMENT WIDTHS OF MORE THAN 15 FT. SHALL HAVE A LONGITUDINAL JOINT (SECTION Z-Z OR SECTION Y-Y). THESE JOINTS SHALL BE LOCATED WITHIN 6 IN. OF THE LANE LINE UNLESS THE JOINT LOCATION IS SHOWN ELSEWHERE ON THE PLANS.
7. THE JOINT BETWEEN OUTSIDE LANE AND SHOULDER SHALL BE A LONGITUDINAL CONTRACTION JOINT (SECTION Z-Z) UNLESS OTHERWISE SHOWN IN THE PLANS. THE SAW CUT DEPTH FOR THE LONGITUDINAL CONTRACTION JOINT (SECTION Z-Z) SHALL BE ONE THIRD OF THE SLAB THICKNESS (T/3).
8. WHEN TYING CONCRETE GUTTER AT A LONGITUDINAL JOINT, THE TIE BAR LENGTH OR POSITION MAY BE ADJUSTED. PROVIDE 3 IN. OF CONCRETE COVER FROM THE BACK OF GUTTER TO THE END OF TIE BAR.
9. REPLACE MISSING OR DAMAGED TIE BARS WITHOUT ADDITIONAL COMPENSATION BY DRILLING MIN. 10 IN. DEEP AND GROUTING TIE BARS WITH TYPE III, CLASS C EPOXY. MEET THE PULL-OUT TEST REQUIREMENTS IN ITEM 361.
10. WHEN AN MONOLITHIC CURB IS SPECIFIED, THE JOINT IN THE CURB SHALL COINCIDE WITH PAVEMENT JOINTS AND MAY BE FORMED BY ANY MEANS APPROVED BY THE ENGINEER.
11. DOWEL BAR PLACEMENT TOLERANCE SHALL BE +/- 1/4 IN. HORIZONTALLY AND VERTICALLY UNLESS OTHERWISE SPECIFIED. WHERE DOWEL BAR BASKETS ARE USED, REMOVE THE SHIPPING WIRES.
12. THE DETAIL FOR JOINT SEALANT AND RESERVOIR IS SHOWN ON STANDARD SHEET "CONCRETE PAVING DETAILS, JOINT SEALS."



TYPICAL PAVEMENT LAYOUT
PLAN VIEW (NOT TO SCALE)

SLAB THICKNESS T (IN.)	BAR DIA. AND LENGTH	AVERAGE SPACING (IN.)
6 to 7.5	1" X 18"	12
8 to 10	1 1/4" X 18"	12
>= 10.5	1 1/2" X 18"	12

SLAB THICKNESS T (IN.)	BAR SIZE	AVERAGE SPACING (IN.)
6 to 7.5	#5	24
>= 8	#6	24

SHEET 1 OF 2

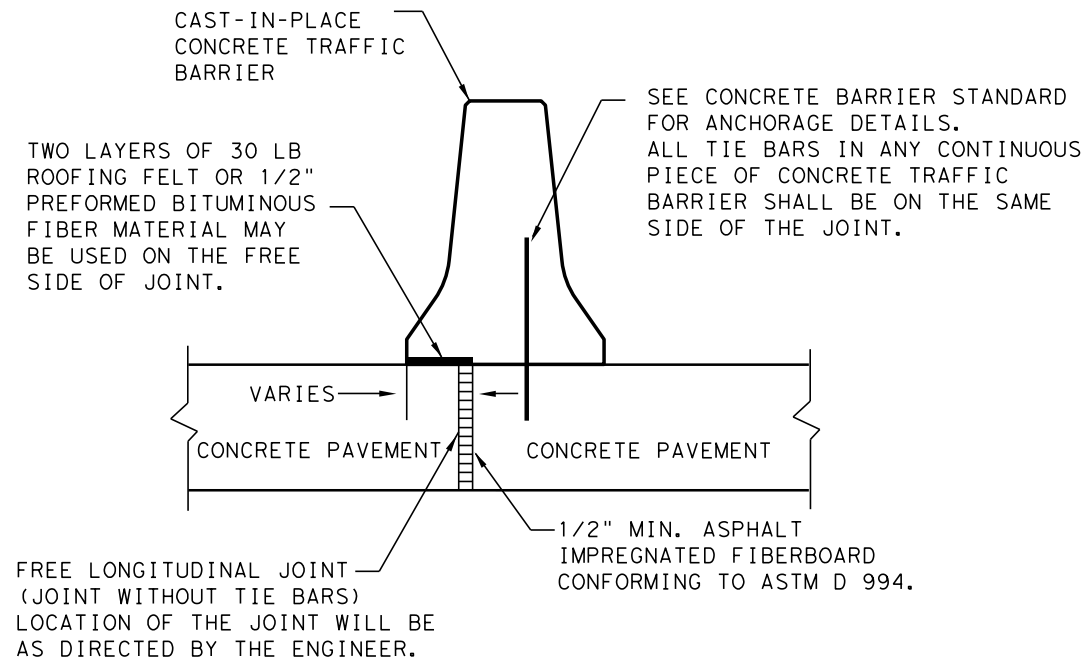


**CONCRETE PAVEMENT DETAILS
CONTRACTION DESIGN
T-6 to 12 INCHES**

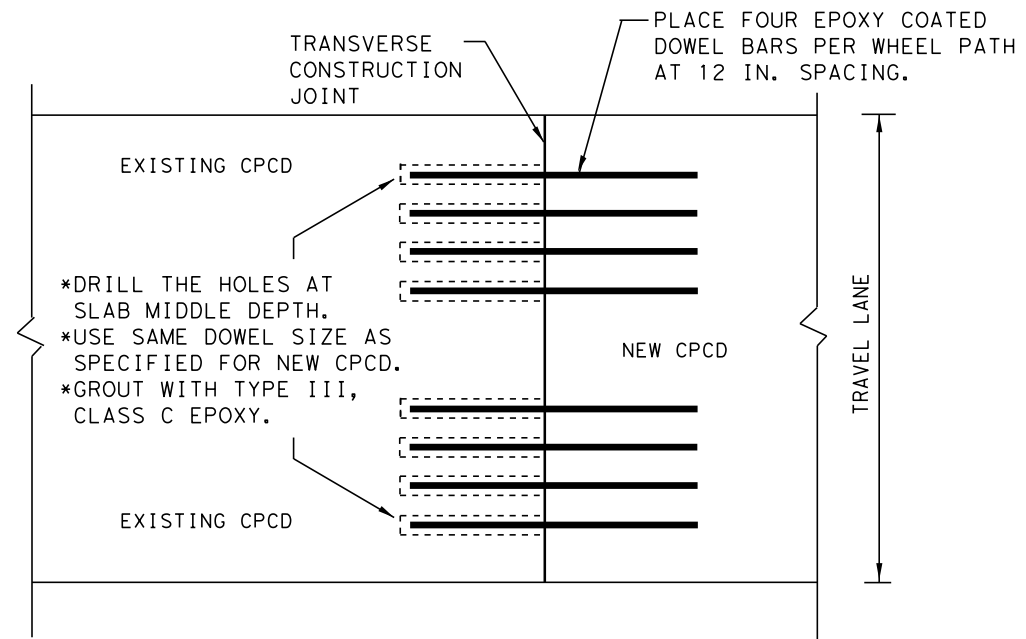
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FILE: cpcd14.dgn	DN: TxDOT	DN: HC	DN: HC	CK: AN
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REVISIONS	0389	13	039	SH 146
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	HOU	HARRIS	135	

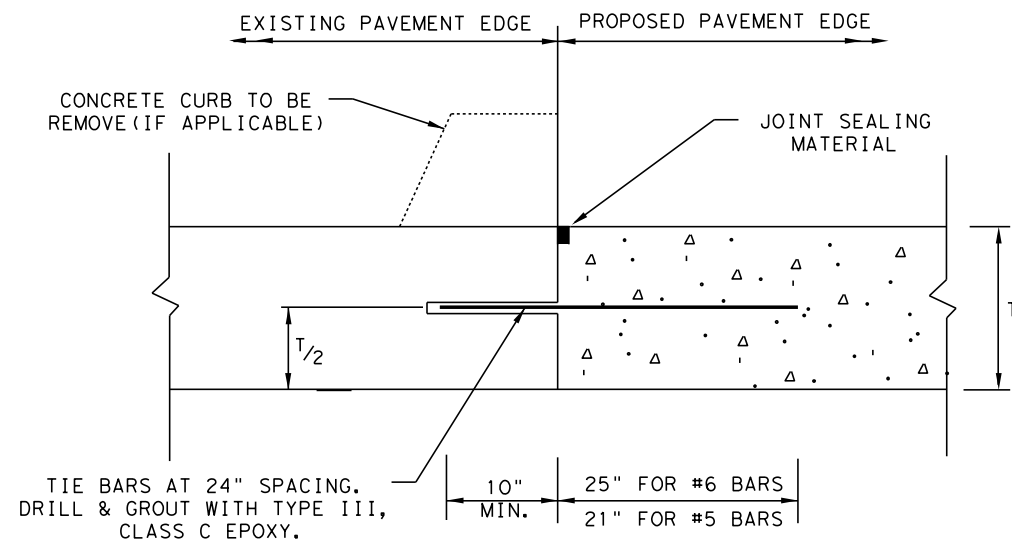
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FREE LONGITUDINAL JOINT DETAIL

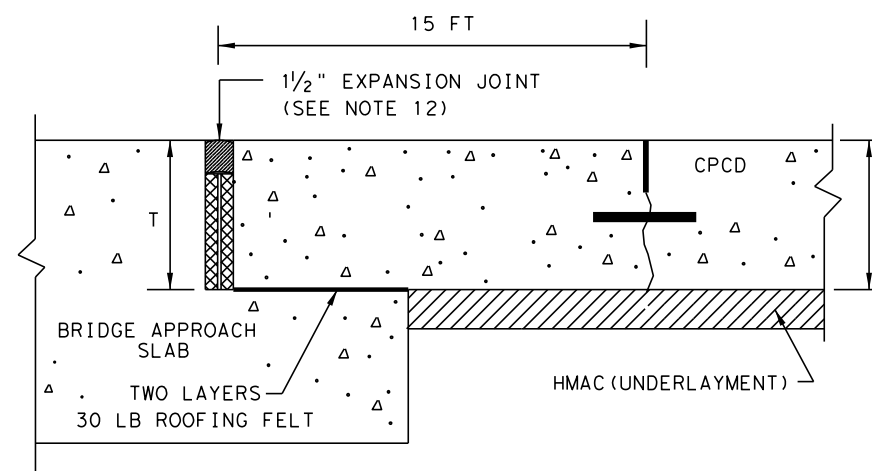


**TRANSVERSE JOINT DETAIL
EXISTING CPCD TO NEW CPCD
PLAN VIEW (NOT TO SCALE)**



1. BEFORE WIDENING WORK, DEMONSTRATE THAT THE BOND STRENGTH OF THE EPOXY-GROUTED TIE BARS MEETS THE REQUIREMENTS OF PULL-OUT TEST SPECIFIED IN ITEM 361.
2. SPACE TIE BARS AT 24" SPACING. USE #6 BARS FOR 8" AND THICKER SLABS, USE #5 BARS FOR LESS THAN 8" THICK SLABS.
3. THE TRANSVERSE JOINTS OF PROPOSED PAVEMENT SHALL COINCIDE WITH EXISTING PAVEMENT JOINTS UNLESS OTHERWISE SHOWN ON THE PLANS.

LONGITUDINAL WIDENING JOINT DETAIL



**TRANSVERSE EXPANSION JOINT DETAIL
AT BRIDGE APPROACH**

SHEET 2 OF 2



**CONCRETE PAVEMENT DETAILS
CONTRACTION DESIGN
T-6 to 12 INCHES**

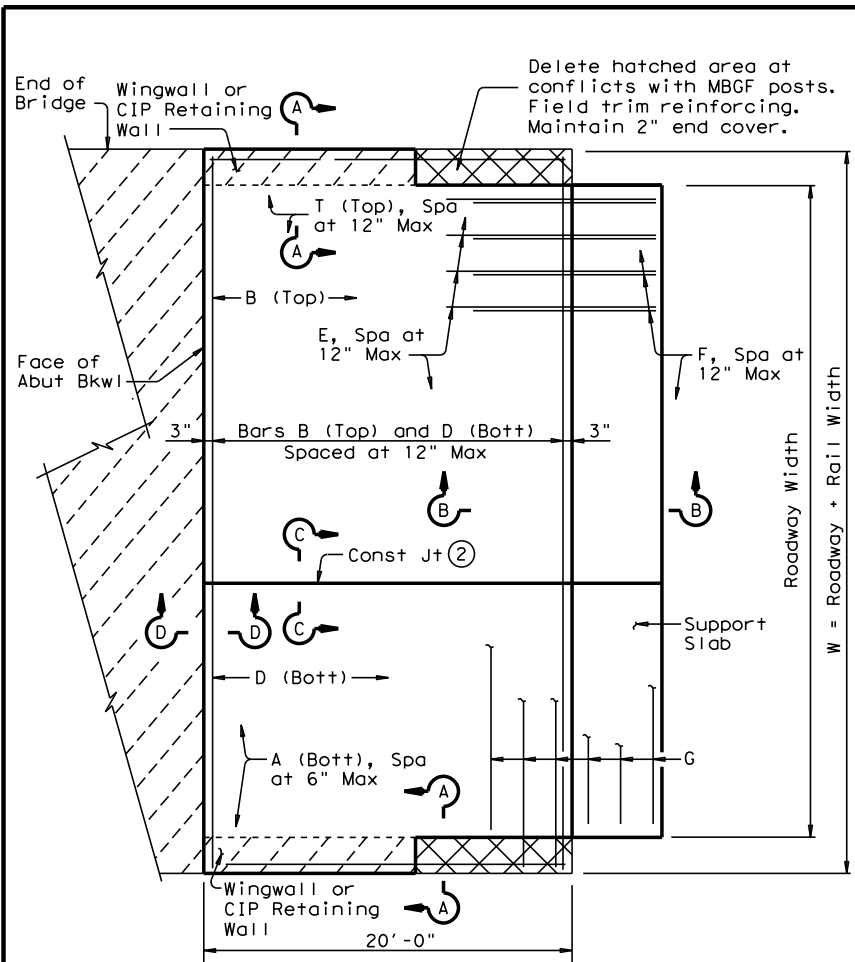
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REVISIONS	0389	13	039	SH 146
	DIST	COUNTY	SHEET NO.	
	HOU	HARRIS	136	

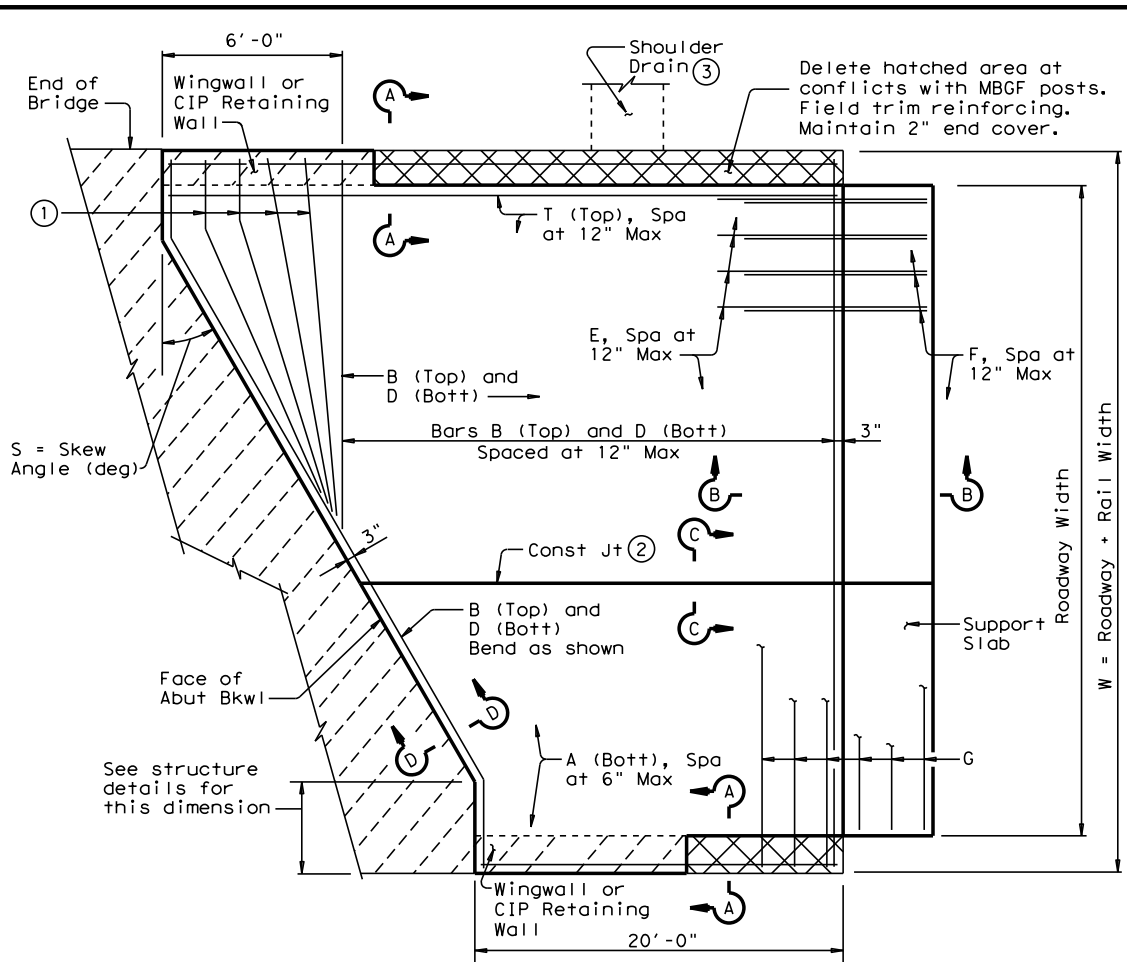
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LEVELS DISPLAYED



PLAN (Showing Non-Skewed Approach Slab)



PLAN (Showing Skewed Approach Slab)

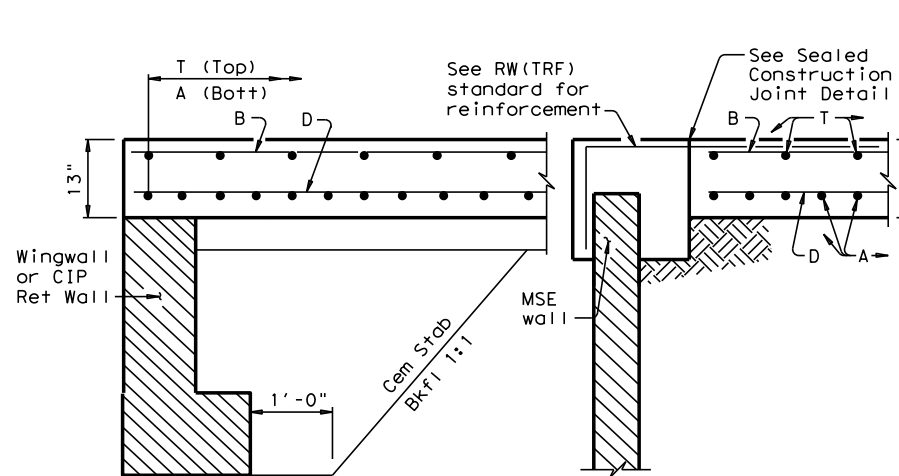
BAR TABLE	
BAR	SIZE
A	#8
B	#5
D	#5
E	#5
F	#5
G	#5
T	#5

APPROXIMATE QUANTITIES ④	
Reinf steel weight =	8.5 Lbs/SF of Approach Slab
	= 18.4 Lbs/LF of Support Slab
Area of Appr Slab =	$20W + 0.5W^2 \tan S$ (SF)
	(Support Slab not included)
W =	Width of Approach Slab (ft)
S =	Skew Angle (deg)

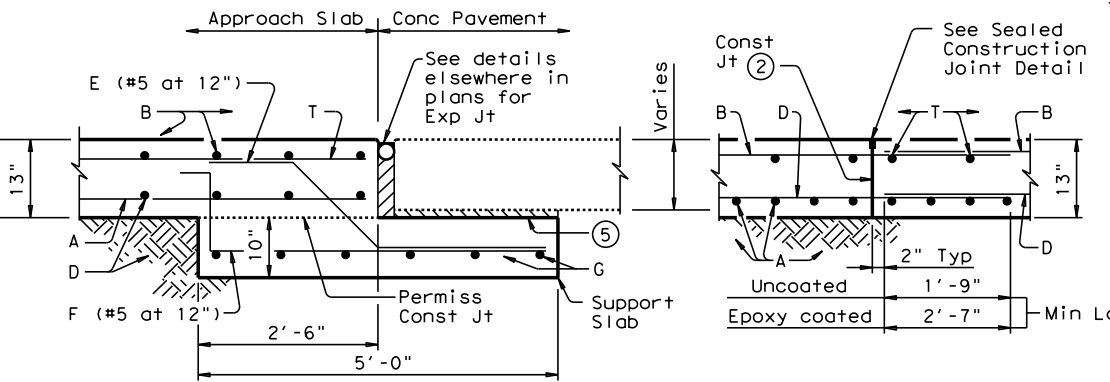
- ① Flare Bars B and D in this region (1'-6" Max Spa, 3" Min Spa). Minimum flared bar length = 2'-6". Bend bars as necessary.
- ② Provide longitudinal construction joints that align with longitudinal construction joints in the bridge slab with bridges built in stages. Other longitudinal construction joints must receive approval of the Engineer.
- ③ See details elsewhere in plans for shoulder drain location and details.
- ④ For Contractor's information only.
- ⑤ On portion of support slab that supports the concrete pavement, adjust top surface elevation, if required, to accommodate concrete pavement thickness. Smooth trowel finish. Oil top of support slab with 60 grade oil and apply heavy coat of powdered graphite. Press down one layer of 30# roofing felt.
- ⑥ Multiple piece tie bars are acceptable at longitudinal construction joints provided minimum laps shown are achieved.
- ⑦ See details elsewhere in plans for required cross-slope.
- ⑧ Place in accordance with Item 438.
- ⑨ Backer rod shall be 25% larger than joint opening and shall be compatible with the sealant.

GENERAL NOTES:

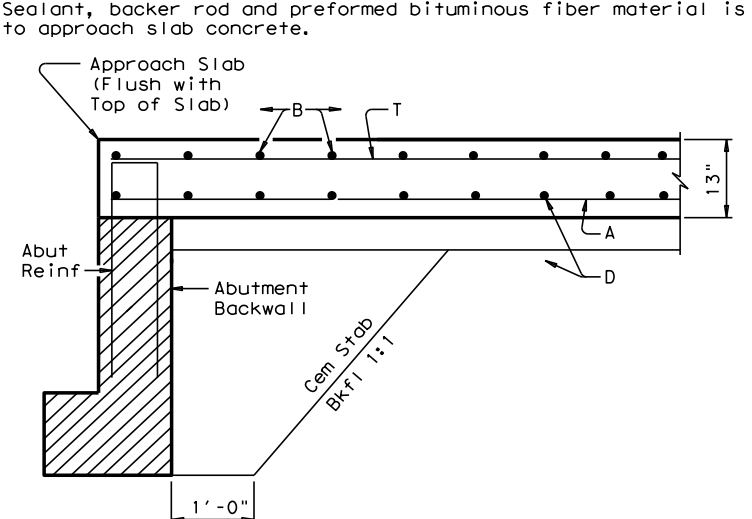
- 1. Construct approach slab in accordance with Item 422.
- 2. Concrete shall be Class "S" with a minimum compressive strength of 4,000 psi.
- 3. All reinforcing steel shall be Grade 60.
- 4. Construct the subgrade or subbase from the bridge for a minimum distance of 100 feet prior to the approach slab, unless otherwise indicated on the plans.
- 5. Compact and finish the subgrade or foundation for the approach slab to the typical cross-section and to the lines and grades shown on the plans.
- 6. Cure for 4 days using water or membrane curing per Item 422.
- 7. Sealant, backer rod and preformed bituminous fiber material is subsidiary to approach slab concrete.



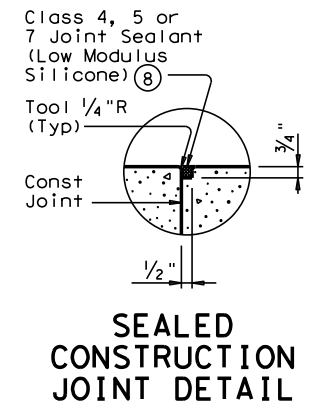
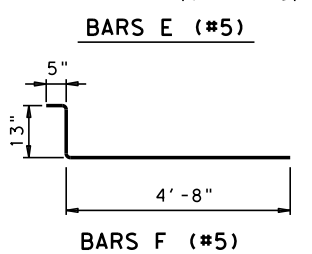
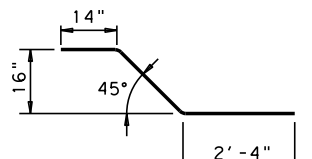
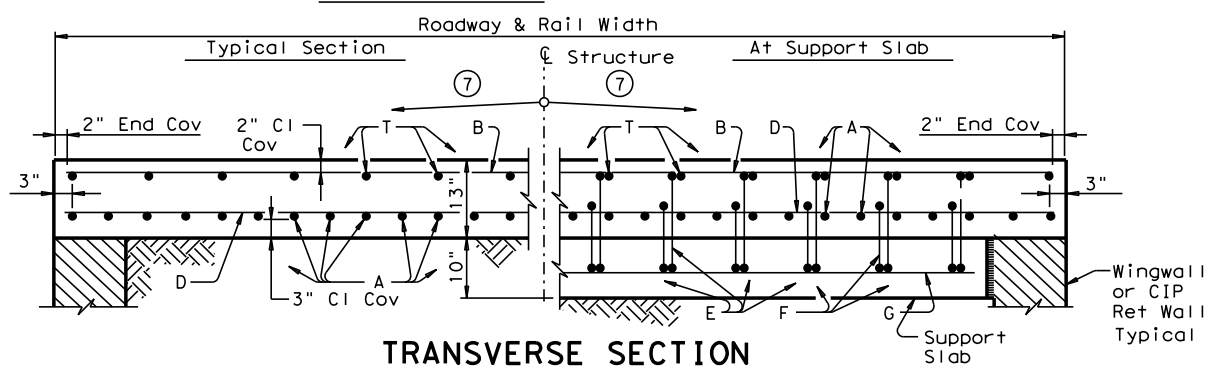
SECTION A-A



SECTION B-B and SECTION C-C ⑥



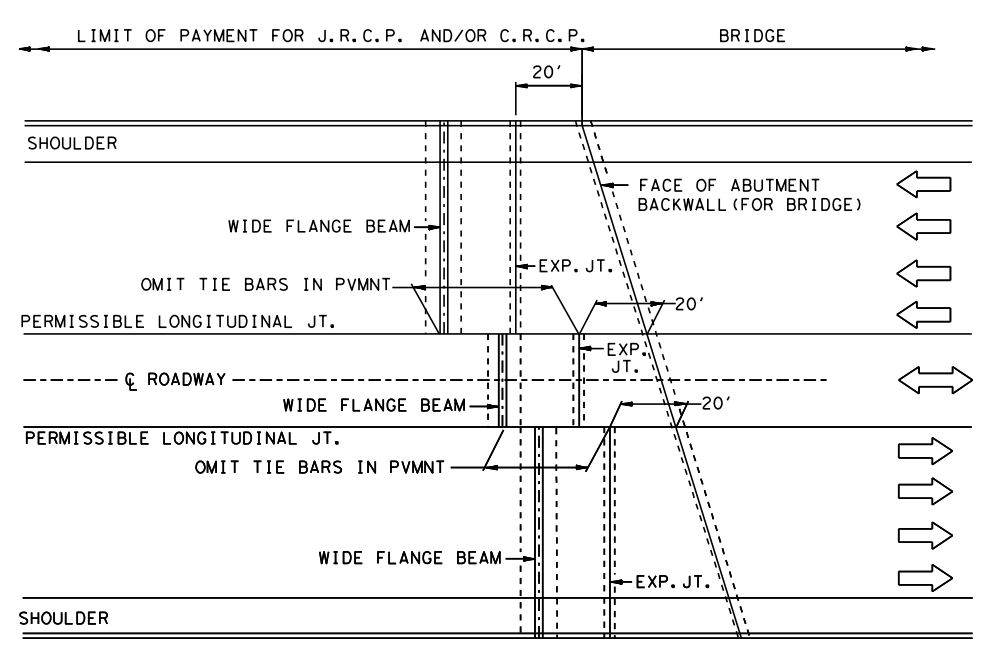
SECTION D-D



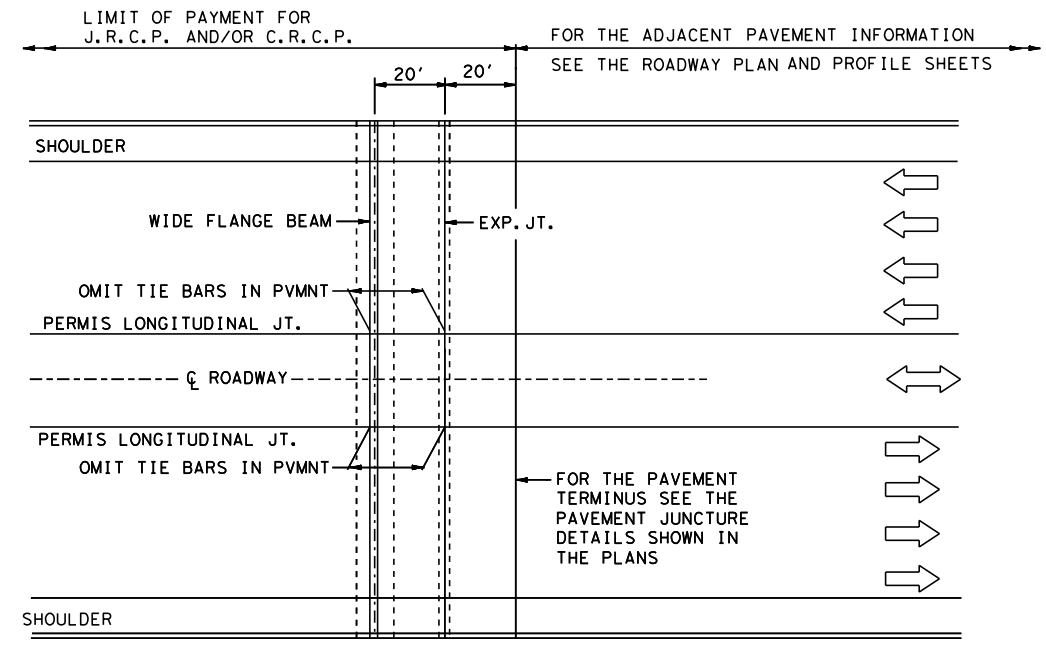
Texas Department of Transportation
Houston District

BRIDGE APPROACH SLAB
CONCRETE PAVEMENT
BAS-C

FILE: STDB10B.dgn	DN: TxDOT	CR: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT March 2009	DISTRICT	PROJECT NO.		SHEET
4/20/2015 updated to 2014 standard	HOU	137		
	COUNTY	CONTROL	SECT	JOB HIGHWAY
	HARRIS	0389	13	039 SH 146

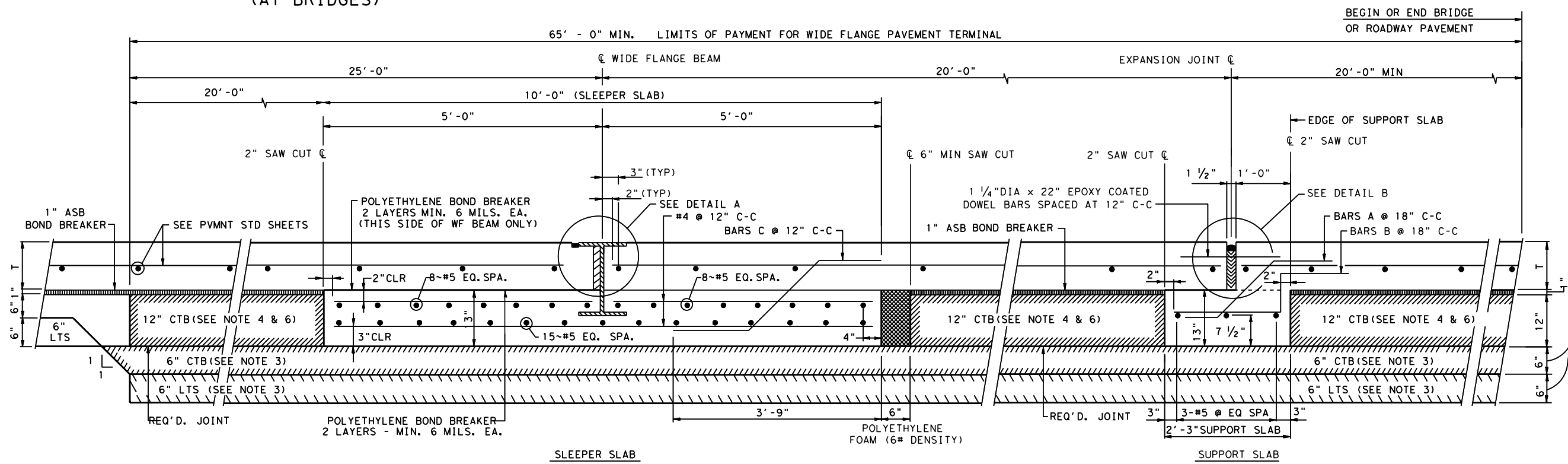


TYPICAL ROADWAY LAYOUT
CONCRETE MEDIAN AND SHOULDERS
(AT BRIDGES)



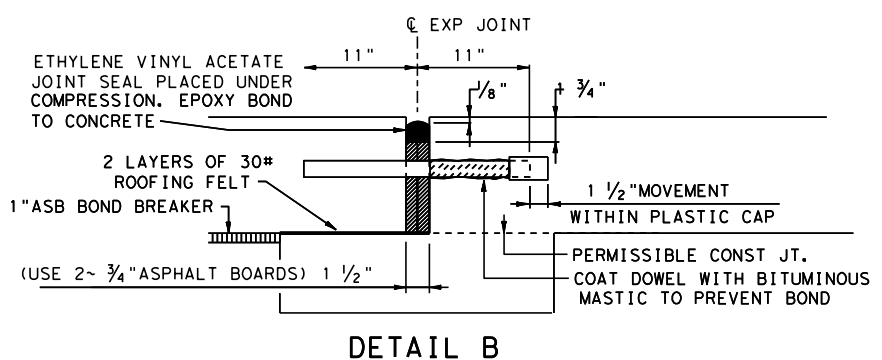
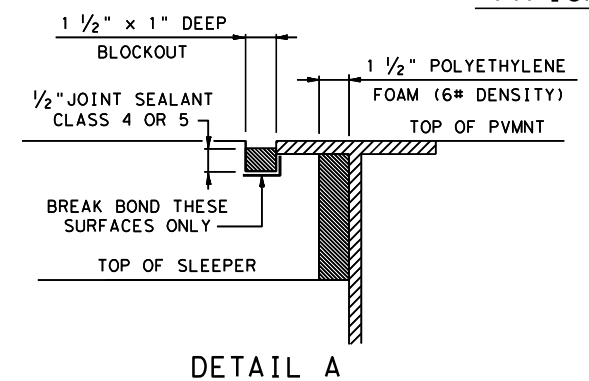
TYPICAL ROADWAY LAYOUT
CONCRETE MEDIAN AND SHOULDERS

- NOTES
- BLOCK-OUT REQUIRED AT EACH END OF WIDE FLANGE BEAM ADJACENT TO 3/8 INCH END PLATE WHERE BLOCK-OUT IS PLACED ABUTTING CONCRETE PAVEMENT, RIPRAP OR STABILIZED BASE. THE BLOCKED OUT AREA WILL BE FILLED WITH POLYETHYLENE FOAM (6 POUND DENSITY). SEE SHEET 3 OF 3 FOR BLOCK-OUT DETAIL.
 - FOR ADDITIONAL DETAILS ON REINFORCEMENT MEMBER QUANTITIES AND THE WIDE FLANGE BEAM SEE SHEET 2 OF 3.
 - REPLACE 6 INCH LIME TREATMENT AND 6 INCH CEMENT TREATMENT WITH CEMENT STABILIZED BACK-FILL AT STRUCTURES WITH CEMENT STABILIZED BACKFILL EMBANKMENT. SEE "CEMENT STABILIZED BACKFILL EMBANKMENT" STANDARD SHEET FOR DETAILS.
 - 12 INCH CEMENT STABILIZED BACKFILL MAY BE SUBSTITUTED FOR 12 INCH CTB, AT CONTRACTOR'S OPTION, ON APPLICABLE STRUCTURES WITH CEMENT STABILIZED BACKFILL EMBANKMENT.
- CTB - CEMENT TREATED BASE
LTS - LIME TREATED SUBGRADE
CRCP - CONTINUOUSLY REINFORCED CONCRETE PAVEMENT
JRCP - JOINTED REINFORCED CONCRETE PAVEMENT
ASB - ASPHALT STABILIZED BASE
T - PAVEMENT THICKNESS



TYPICAL SECTION THRU TERMINAL ANCHORAGE @ SLEEPER SLAB & SUPPORT SLAB

FOR MORE DETAILS AND LIMITS OF PAY FOR CTB & LTS SEE ABUTMENT BACKFILL DIAGRAM DETAIL ON SHEET 2 OF 3 OR THE PAVEMENT JUNCTURE DETAILS AS SHOWN IN PLANS.



SHEET 1 OF 3

Texas Department of Transportation
Houston District

WIDE FLANGE PAVEMENT TERMINALS

FOR CONTINUOUSLY & JOINTED REINFORCED CONCRETE PAVEMENT DETAILS (FOR USE AT BRIDGE END OR PAVEMENT TERMINUS)

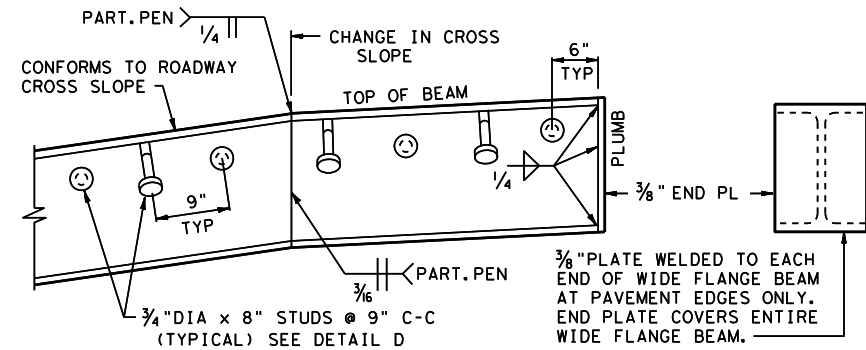
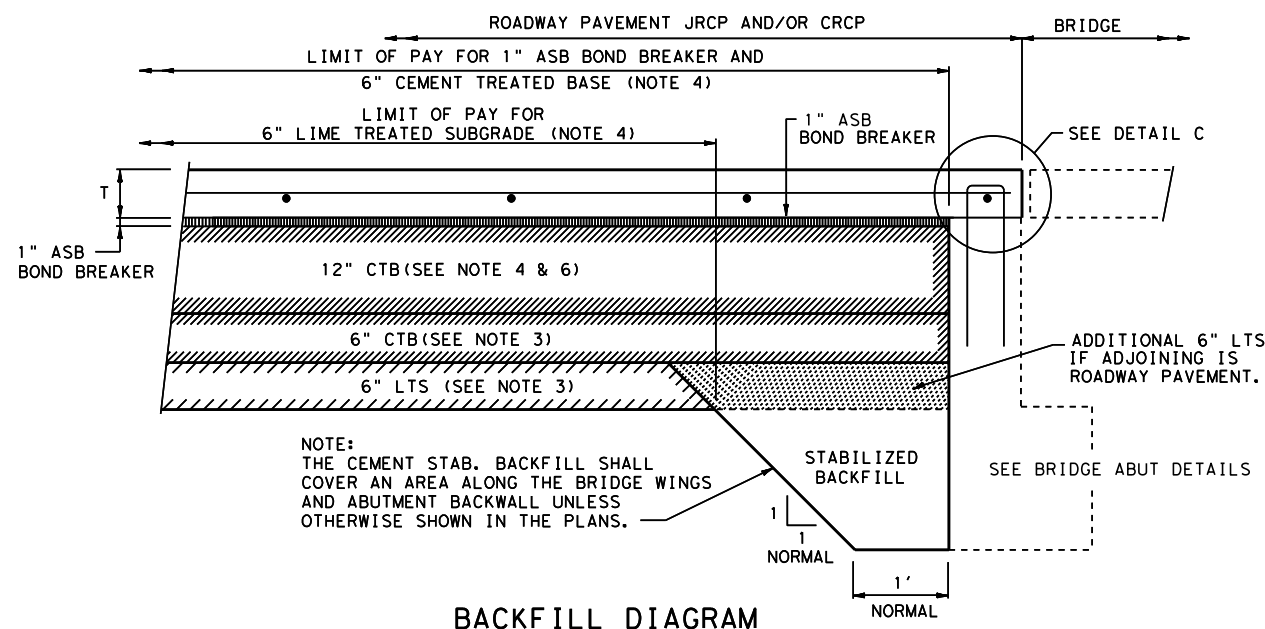
WFPT

FILE#	STDB-3.DGN	DISTRICT	HOU	CRK1	TxDOT	DISTRICT	FED REG	PROJECT NO.	SHEET
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REVISIONS	02/15 2014 SPECS								
		COUNTY	HARRIS	CONTROL	0389	SECT	13	JOB	039 SH 146

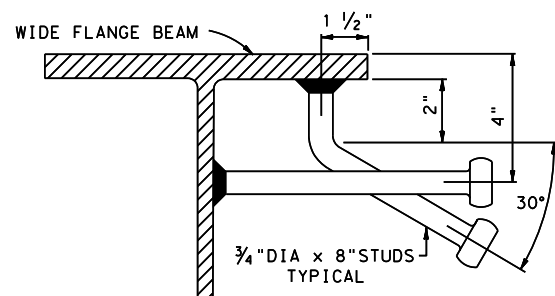
STDB-3

NOTES: (CONT)

- THIS STANDARD WILL BE USED WITH SPECIAL SPECIFICATION "CONCRETE PAVEMENT TERMINALS" THIS ITEM WILL BE MEASURED BY THE LINEAR FOOT OF WIDE FLANGE BEAM COMPLETE IN PLACE.
 - WIDE FLANGE BEAM, SUPPORT SLAB, SLEEPER SLAB, 12 INCHES OF CEMENT TREATED BASE, POLYETHYLENE BONDBREAKER AND ANY EXCAVATION NECESSARY WILL NOT BE PAID FOR DIRECTLY, BUT WILL BE CONSIDERED SUBSIDIARY TO SPECIAL SPECIFICATION ITEM, "CONCRETE PAVEMENT WIDE FLANGE TERMINALS".
 - POLYETHYLENE FOAM (6 POUND DENSITY), SAW CUTS, EXPANSION JOINTS, EPOXY COATED DOWEL AND EXPANSION JOINT MATERIALS WILL NOT BE PAID FOR DIRECTLY BUT SHALL BE CONSIDERED INCIDENTAL TO THE ITEM 360.
 - THE CONCRETE PAVEMENT, 1 INCH ASB BONDBREAKER, 6 INCH PORTLAND CEMENT TREATED BASE AND 6 INCH LIME TREATED SUBGRADE WILL BE PAID FOR UNDER THE APPROPRIATE BID ITEMS.
 - SHEAR CUTTING OF DOWEL BARS IS PROHIBITED.
 - EPOXY COATING OF DOWEL BARS PER SPECIFICATION ITEM 440.
 - CEMENT STABILIZED BACKFILL IS REQUIRED AT ALL ABUTMENTS.
- CTB - CEMENT TREATED BASE
LTS - LIME TREATED SUBGRADE
CRCP - CONTINUOUSLY REINFORCED CONCRETE PAVEMENT
JRCP - JOINTED REINFORCED CONCRETE PAVEMENT
ASB - ASPHALT STABILIZED BASE
T - PAVEMENT THICKNESS

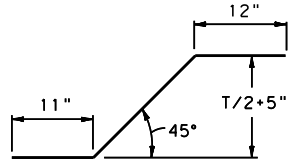


WIDE FLANGE DETAIL

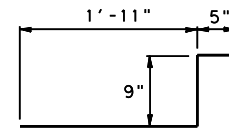


NOTE: STUDS SHALL BE ELECTRIC ARC END WELDED WITH COMPLETE FUSION. ANY STUD WHICH IS DISLODGED IN SHIPPING OR CAN BE DISLODGED BY HAMMER SHALL BE REPLACED.

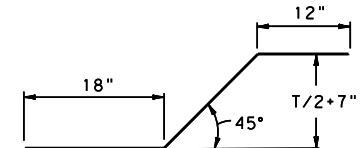
DETAIL D



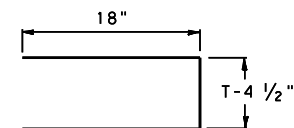
BARS A (#4)



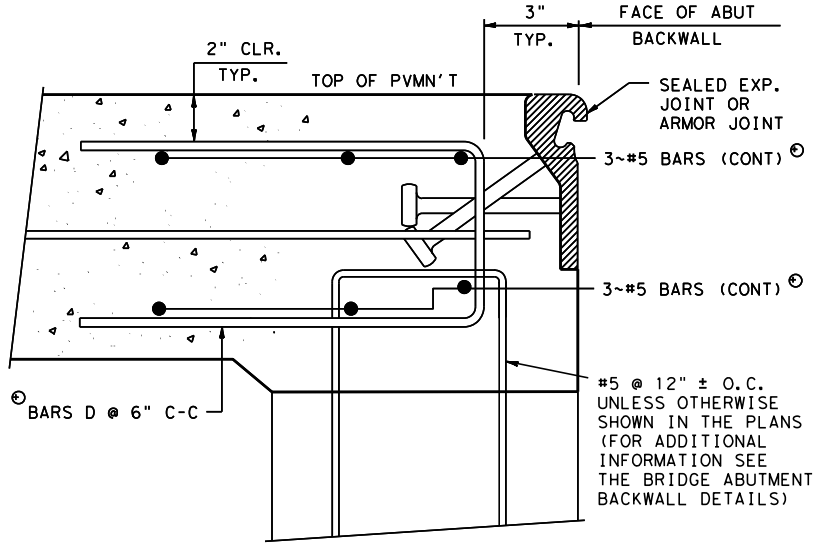
BARS B (#4)



BARS C (#4)



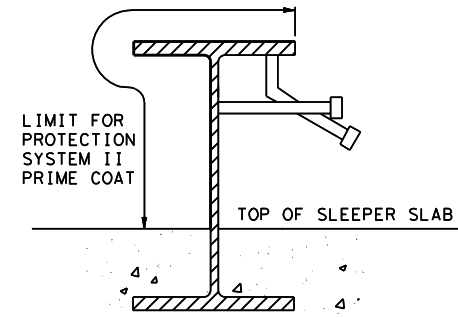
BARS D (#5)



(SHOWING ADDITIONAL REINFORCEMENT FOR ROADWAY PAVEMENT WITH SEALED EXPANSION JOINTS OR ARMOR JOINTS AT ABUTMENTS.)

⊙ THE ADDITIONAL STEEL REQUIRED BY THE ABOVE DETAIL "C" SHALL NOT BE PAID FOR DIRECTLY, BUT SHALL BE CONSIDERED INCIDENTAL TO THE ITEM, "CONCRETE PAVEMENT".

PAVEMENT THICKNESS	WIDE FLANGE BEAM DESIGNATION
8"-9 1/2"	W14 X 68
10"-11 1/2"	W16 X 89
12"-13"	W18 X 97
14" & 15"	W21 X111



SEE "TABLE OF BEAM SIZES"

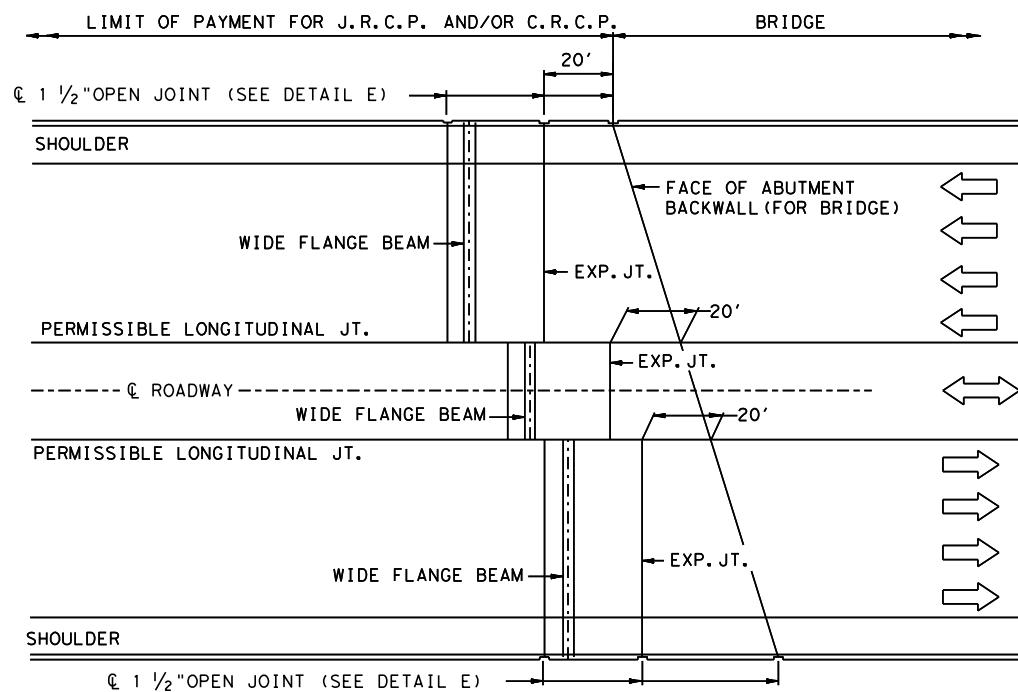
ITEM		PAVEMENT THICKNESS				
		8" THRU 10"	10 1/2" THRU 12"	12 1/2" THRU 13"	14"	15"
SLEEPER	CONCRETE	0.40 CY/LF	0.40 CY/LF	0.40 CY/LF	0.40 CY/LF	0.40 CY/LF
	REINFORCING STEEL	49.1 LBS/LF	49.3 LBS/LF	49.6 LBS/LF	49.7 LBS/LF	49.8 LBS/LF
SLAB	CONCRETE	0.09 CY/LF	0.09 CY/LF	0.09 CY/LF	0.09 CY/LF	0.09 CY/LF
	REINFORCING STEEL	6.3 LBS/LF	6.4 LBS/LF	6.5 LBS/LF	6.6 LBS/LF	6.6 LBS/LF
12" CEMENT TREATED BASE		1.95 CY/LF (BASED ON JOINTS BEING NORMAL TO THE PAVEMENT CENTERLINE)				

WIDE FLANGE PAVEMENT TERMINALS

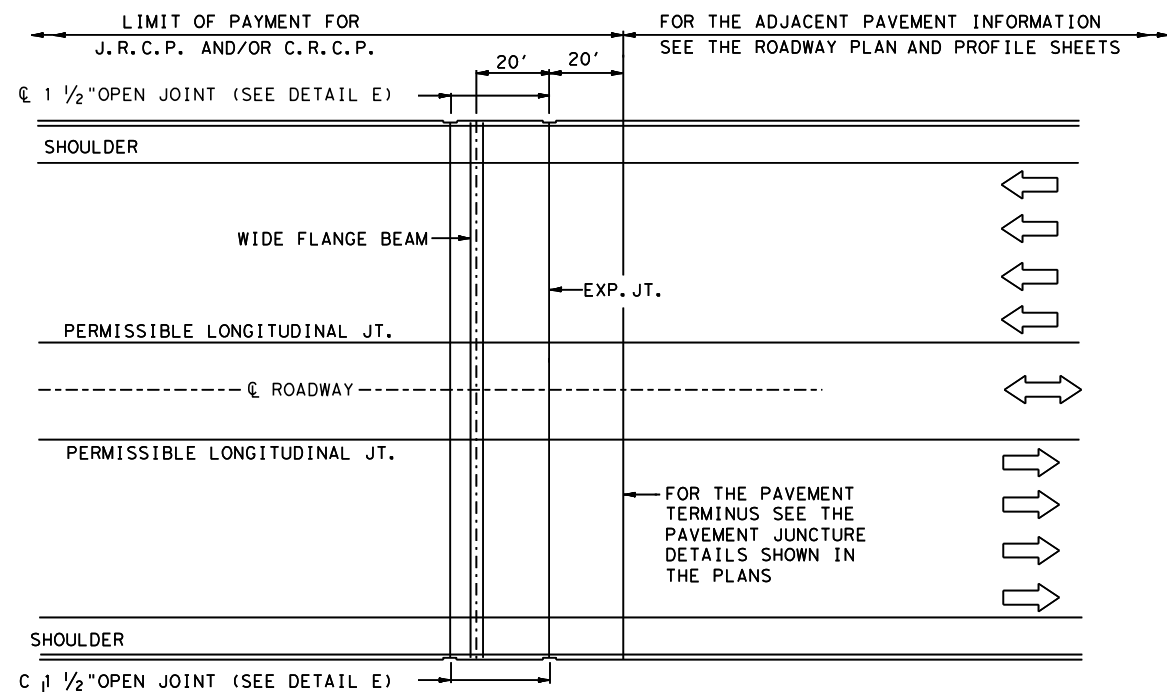
FOR CONTINUOUSLY & JOINTED REINFORCED CONCRETE PAVEMENT DETAILS (FOR USE AT BRIDGE END OR PAVEMENT TERMINUS)

WFPT

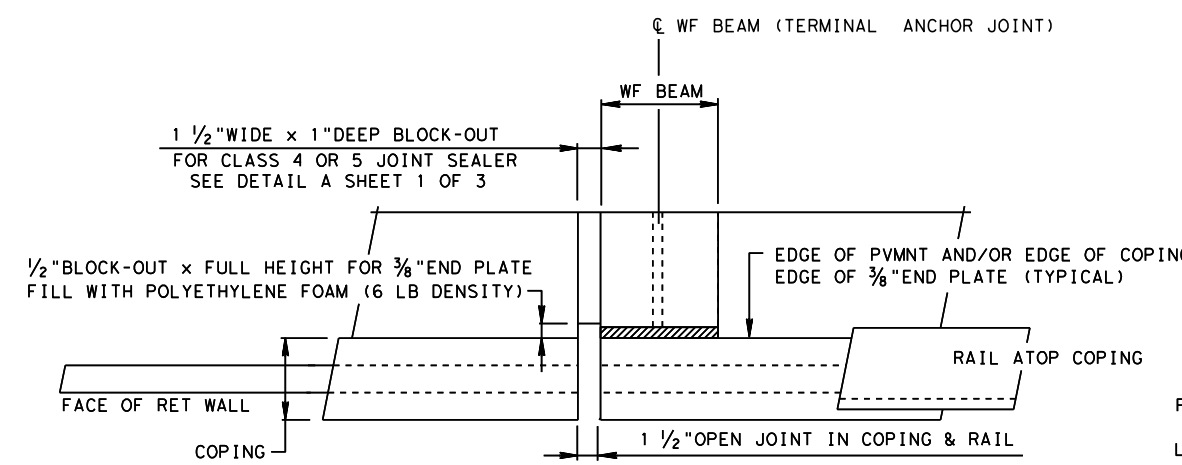
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© TxDOT	2014	DISTRICT	FED REG	PROJECT NO.	SHEET
REVISIONS	HOU	6		139	
02/15 2014 SPECS	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	HARRIS	0389	13	039	SH 146



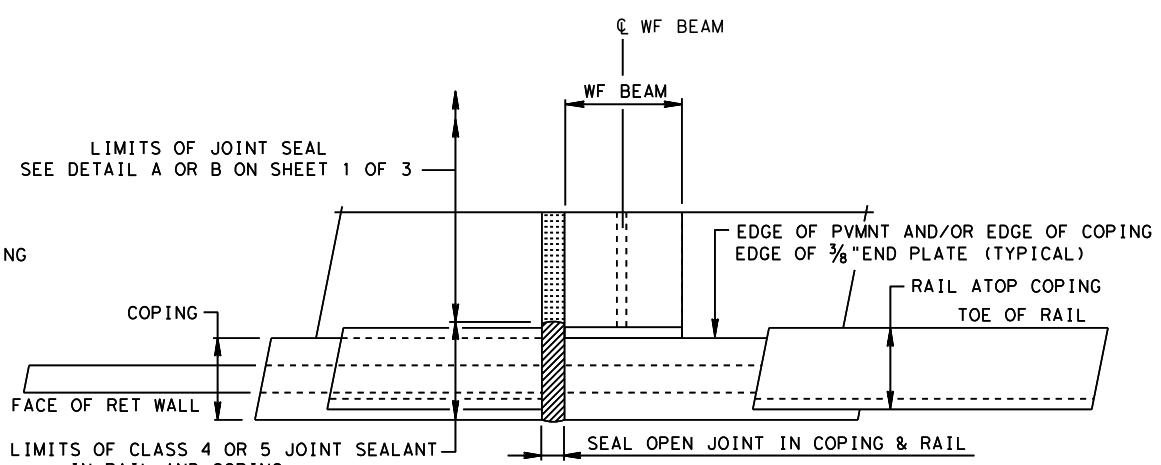
PLAN
SHOWING OPEN JOINT LAYOUT



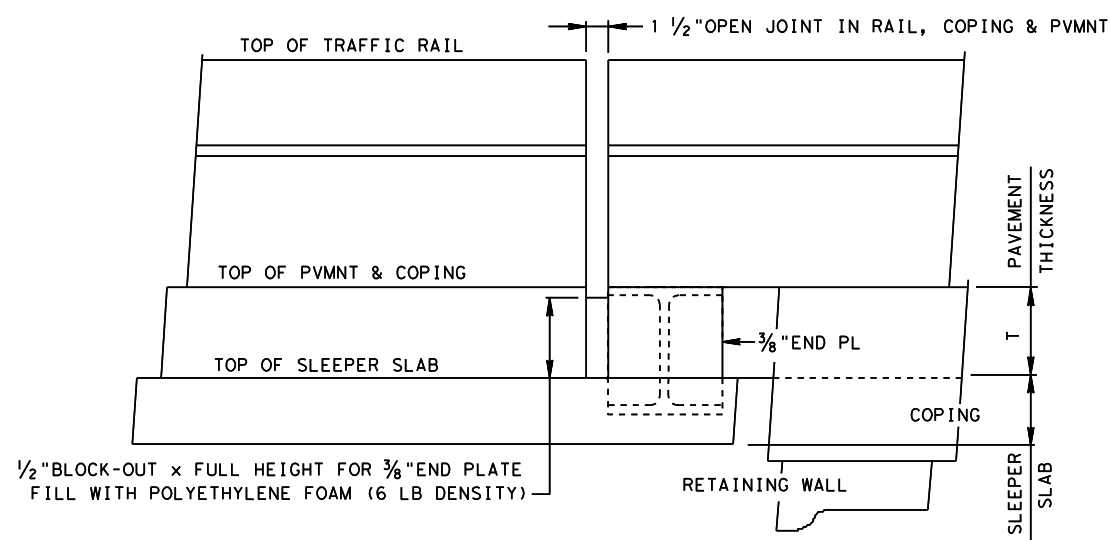
PLAN
SHOWING OPEN JOINT LAYOUT



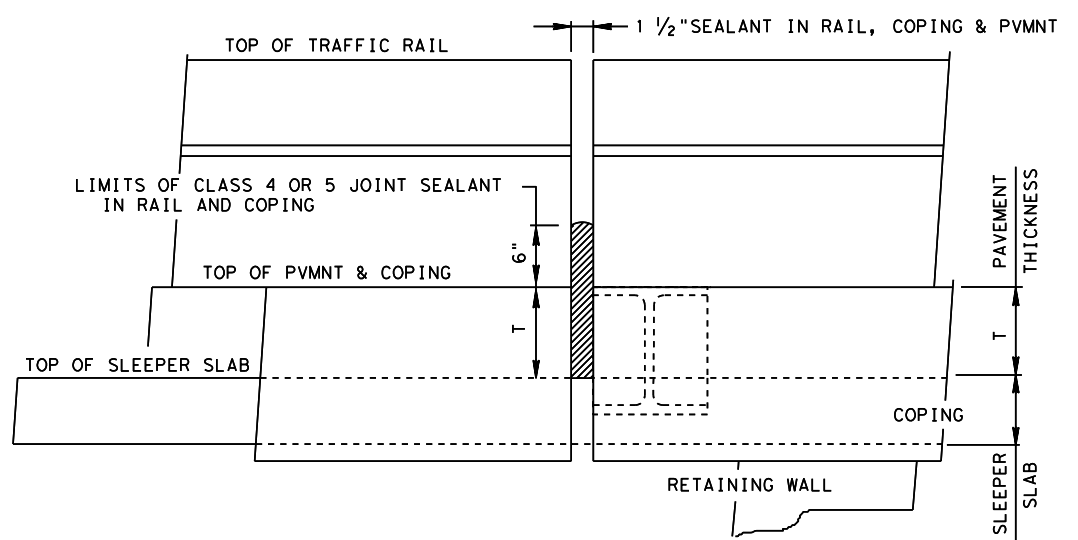
PLAN SHOWING OPEN JOINTS & BLOCK-OUT



PLAN SHOWING JOINT SEALANT



ELEVATION SHOWING OPEN JOINTS & BLOCK-OUT



ELEVATION SHOWING JOINT SEALANT

DETAIL E

SHOWN @ WIDE FLANGE ~ ALL OTHER JOINTS SIMILAR



WIDE FLANGE PAVEMENT TERMINALS

FOR CONTINUOUSLY & JOINTED REINFORCED CONCRETE PAVEMENT DETAILS (FOR USE AT RETAINING WALLS)

WFPT

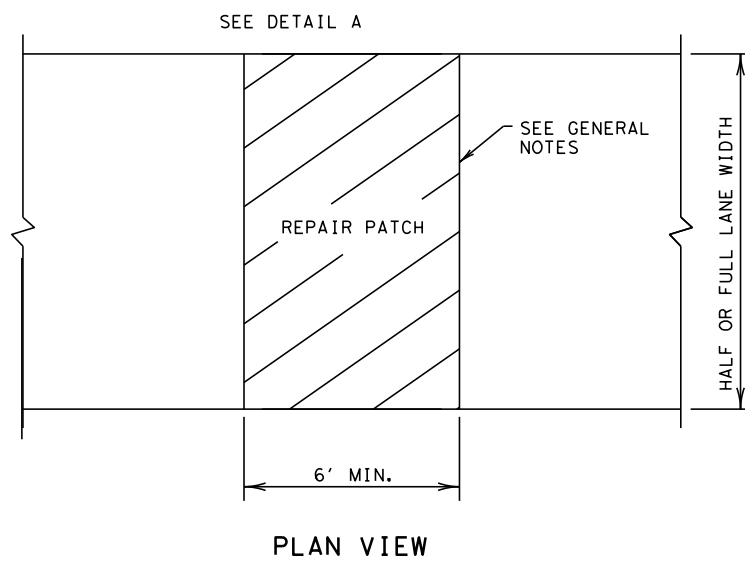
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©	TXDOT	2014	DISTRICT	FED REG	PROJECT NO.	SHEET			
REVISIONS	HOU	6	COUNTY		CONTROL	SECT	JOB	HIGHWAY	
02/15 2014 SPECS	HARRIS		0389	13	039	SH 146			

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DATE: FILE:

TABLE NO.1 STEEL BAR SIZE AND SPACING						
TYPE PAVEMENT	SLAB THICKNESS AND BAR SIZE		LONGITUDINAL*		TRANSVERSE*	
			REGULAR BARS	TIEBARS	BARS	TIEBARS
	T (IN.)	BAR SIZE	SPACING (IN.)	SPACING (IN.)	SPACING (IN.)	SPACING (IN.)
CRCP	6.0	#5	7.5	7.5	24	24
	6.5		7.0	7.0		
	7.0		6.5	6.5		
	7.5		6.0	6.0		
	8.0	#6	9.0	9.0	24	24
	8.5		8.5	8.5		
	9.0		8.0	8.0		
	9.5		7.5	7.5		
	10.0		7.0	7.0		
	10.5		6.75	6.75		
	11.0	6.5	6.5			
	11.5	6.25	6.25			
	≥12.0	6.0	6.0			
JRCP	<8.0	#5	24.0	12.0	24	24
	≥8.0	#6	24.0	12.0	24	24
CPCD	<8.0	#5	NONE	12.0	NONE	24
	≥8.0	#6	NONE	12.0	NONE	24

* USE 12" SPACING AS FIRST AND LAST SPACING AT END OR SIDE FOR ALL BARS.

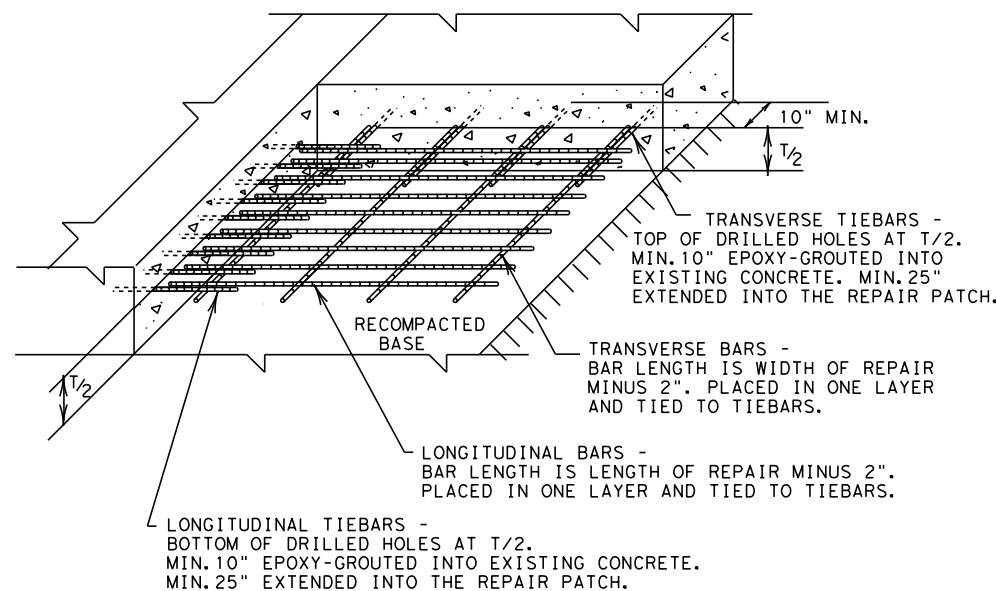


PLAN VIEW

FULL-DEPTH REPAIR OF CRCP, JRCP, AND CPCD

GENERAL NOTES

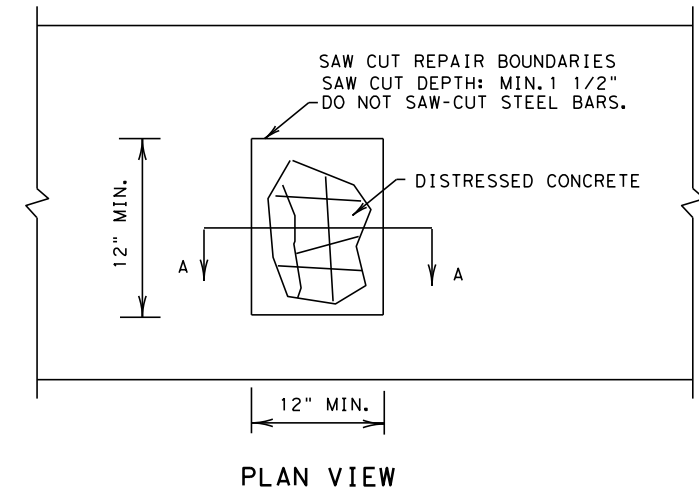
- ITEM 361, "REPAIR OF CONCRETE PAVEMENT" SHALL GOVERN FOR THIS WORK.
- MULTIPLE PIECE TIEBARS SHALL BE USED WHEN THE REPAIR AREA MUST BE PLACED IN TWO STAGES DUE TO SEQUENCE OF CONSTRUCTION.
- FULL DEPTH SAW CUTS SHALL BE MADE AROUND THE PERIMETER OF THE AREA TO BE REPAIRED. THE CUT SHALL BE MADE AT A RIGHT ANGLE TO THE PAVEMENT EDGE AND TO THE CENTER LINE OF THE PAVEMENT.
- AT LEAST ONE LONGITUDINAL FULL DEPTH SAW CUT SHALL BE AT AN EXISTING LONGITUDINAL JOINT.
- 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.
- THE SAW CUTS WHICH EXTEND OUTSIDE THE AREA OF THE REPAIR WILL BE CLEANED AND FILLED WITH A CEMENTITIOUS GROUT APPROVED BY THE ENGINEER.
- EXISTING LONGITUDINAL AND TRANSVERSE JOINTS REMOVED DUE TO REPAIR OPERATION SHOULD BE RESTORED IN ACCORDANCE WITH STANDARD SHEET "CONCRETE PAVING DETAILS, JOINT SEALS."



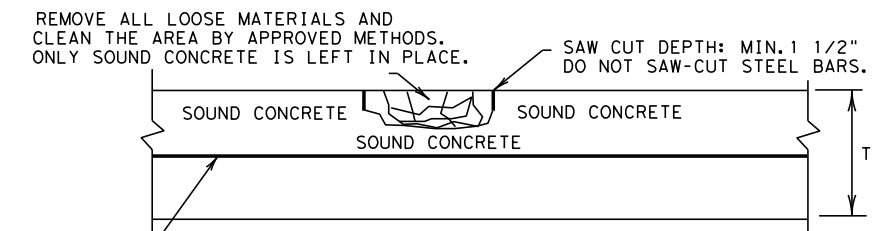
DETAIL A
GROUTED TIEBARS & REINFORCEMENT

GENERAL NOTES

- ITEM 361, "REPAIR OF CONCRETE PAVEMENT" SHALL GOVERN FOR THIS WORK.
- THE SAW CUTS WHICH EXTEND OUTSIDE THE AREA OF THE REPAIR WILL BE CLEANED AND FILLED WITH A CEMENTITIOUS GROUT APPROVED BY THE ENGINEER.
- EXISTING LONGITUDINAL AND TRANSVERSE JOINTS REMOVED DUE TO REPAIR OPERATION SHOULD BE RESTORED IN ACCORDANCE WITH STANDARD SHEET "CONCRETE PAVING DETAILS, JOINT SEALS."



PLAN VIEW



LONGITUDINAL STEEL BARS:

*REPAIR AREAS MAY BE ADJUSTED AFTER REMOVING DISTRESSED CONCRETE. SWITCH THE HALF-DEPTH REPAIR TO FULL-DEPTH REPAIR IF EXPOSED EXISTING LONGITUDINAL BARS ARE DEFICIENT, AS APPROVED. COMPENSATION WILL BE MADE FOR UNEXPECTED VOLUMES OF REPAIR AREAS OR CHANGES IN SCOPE OF WORK.

*INCREASE THE REPAIR AREA AND PERFORM A FULL-DEPTH REPAIR AS DIRECTED IF LONGITUDINAL STEEL BARS WERE DAMAGED BY THE REMOVAL OPERATIONS. NO ADDITIONAL COMPENSATION WILL BE MADE.

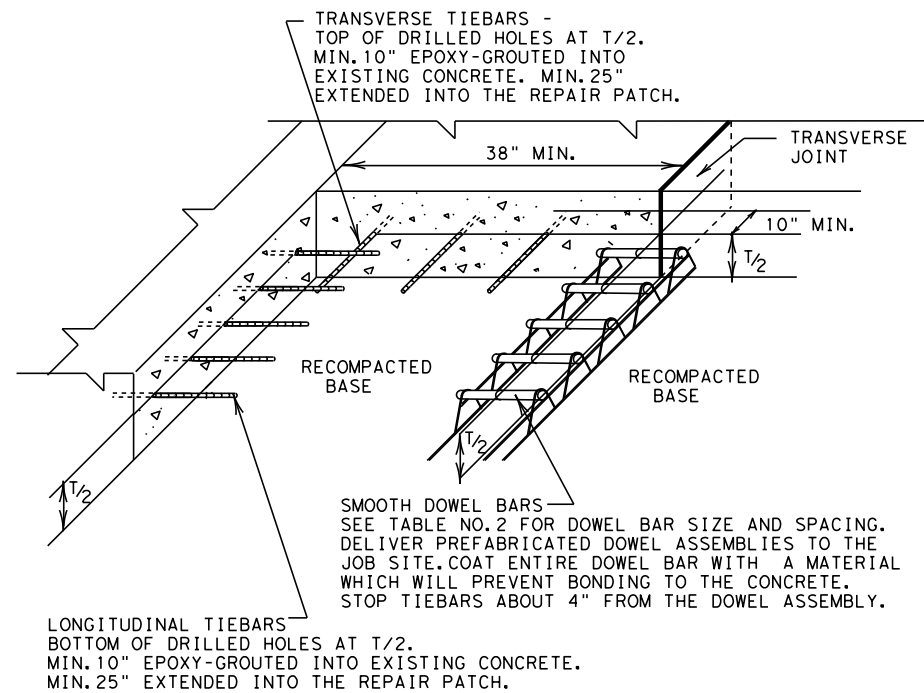
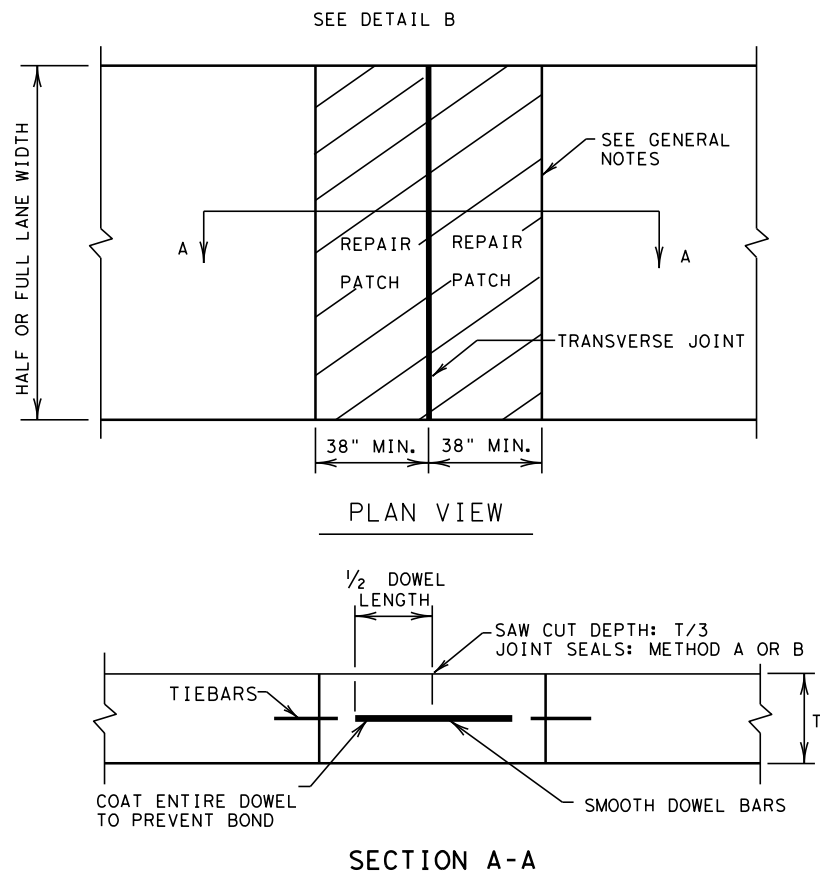
SECTION A-A
HALF-DEPTH REPAIR

SHEET 1 OF 2

				Design Division Standard	
REPAIR OF CONCRETE PAVEMENT					
REPCP-14					
FILE: repcp14.dgn	DN: TxDOT	DN: HC	DN: HC	CK: AN	
© TxDOT: DECEMBER 2014	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0389	13	039	SH 146	
	DIST	COUNTY	SHEET NO.		
	HOU	HARRIS	141		

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DETAIL B
GROUTED TIEBARS & DOWELS

REPAIR OF TRANSVERSE JOINT OF CPCD

GENERAL NOTES

1. ITEM 361, "REPAIR OF CONCRETE PAVEMENT" SHALL GOVERN FOR THIS WORK.
2. MULTIPLE PIECE TIEBARS SHALL BE USED WHEN THE REPAIR AREA MUST BE PLACED IN TWO STAGES DUE TO SEQUENCE OF CONSTRUCTION.
3. FULL DEPTH SAW CUTS SHALL BE MADE AROUND THE PERIMETER OF THE AREA TO BE REPAIRED. THE CUT SHALL BE MADE AT A RIGHT ANGLE TO THE PAVEMENT EDGE AND TO THE CENTER LINE OF THE PAVEMENT.
4. AT LEAST ONE LONGITUDINAL FULL DEPTH SAW CUT SHALL BE AT AN EXISTING LONGITUDINAL JOINT.
5. 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.
6. THE SAW CUTS WHICH EXTEND OUTSIDE THE AREA OF THE REPAIR WILL BE CLEANED AND FILLED WITH A CEMENTITIOUS GROUT APPROVED BY THE ENGINEER.
7. EXISTING LONGITUDINAL AND TRANSVERSE JOINTS REMOVED DUE TO REPAIR OPERATION SHOULD BE RESTORED IN ACCORDANCE WITH STANDARD SHEET "CONCRETE PAVING DETAILS, JOINT SEALS."
8. DOWEL BAR PLACEMENT TOLERANCE SHALL BE +/- 1/4 IN. HORIZONTALLY AND VERTICALLY UNLESS OTHERWISE SPECIFIED. WHERE DOWEL BAR BASKETS ARE USED, REMOVE THE SHIPPING WIRES.

PAVEMENT THICKNESS (INCHES)	SIZE AND DIA.	LENGTH (IN.)	SPACING (IN.)
<10	#8 (1 IN.)	18.0	12.0
≥10	#10 (1 1/4 IN.)		

SHEET 2 OF 2



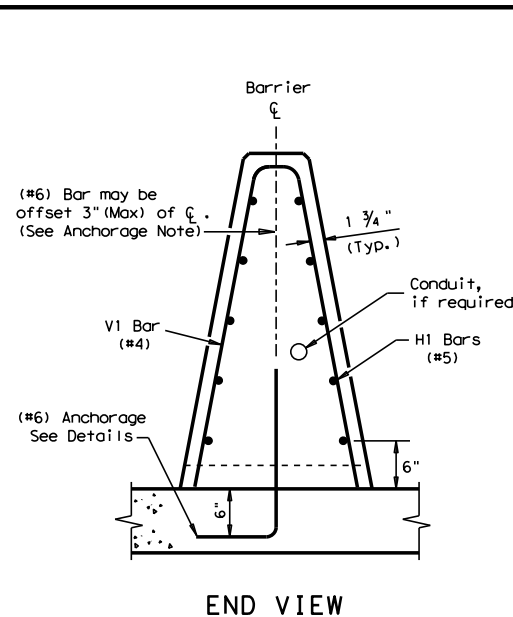
REPAIR OF CONCRETE PAVEMENT

REPCP-14

FILE: repcp14.dgn	DN: TxDOT	DN: HC	DN: HC	CK: AN
© TxDOT: DECEMBER 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0389	13	039	SH 146
	DIST	COUNTY	SHEET NO.	
	HOU	HARRIS	142	

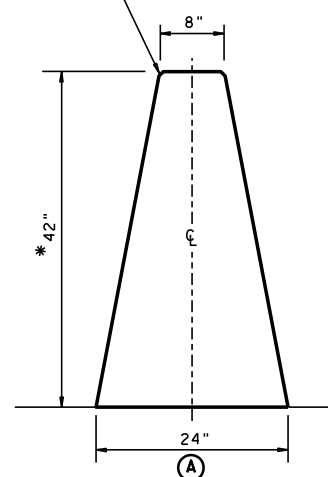
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END VIEW
CAST-IN-PLACE (CIP) BARRIER
Barrier is Symmetrical About the Center Line

Top edges of CIP barrier shall have a 3/4" chamfer or tooling radius.

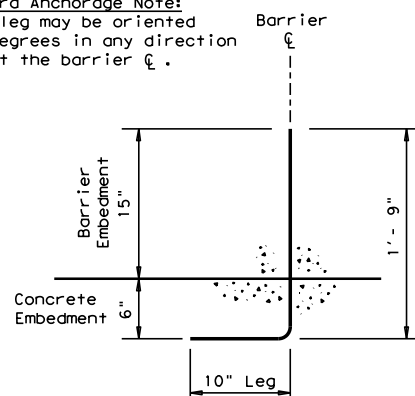


SINGLE SLOPE CONCRETE BARRIER
(SSCB) (42")

* Barrier height (IN.)	Dimensions (IN.)		
	(A)	(B)	(C)
42	24	40 1/4	20 1/2
48	26 1/4	46 1/4	22 3/4
54	28 1/2	52 1/4	25 1/6

* (SSCB) (42") Barrier height may be increased to 48" or 54". This would increase the barrier and reinforcement dimensions accordingly.

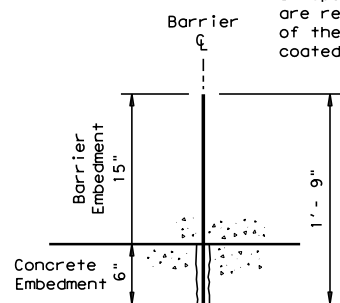
Standard Anchorage Note:
10" leg may be oriented 90 degrees in any direction about the barrier centerline.



STANDARD ANCHORAGE

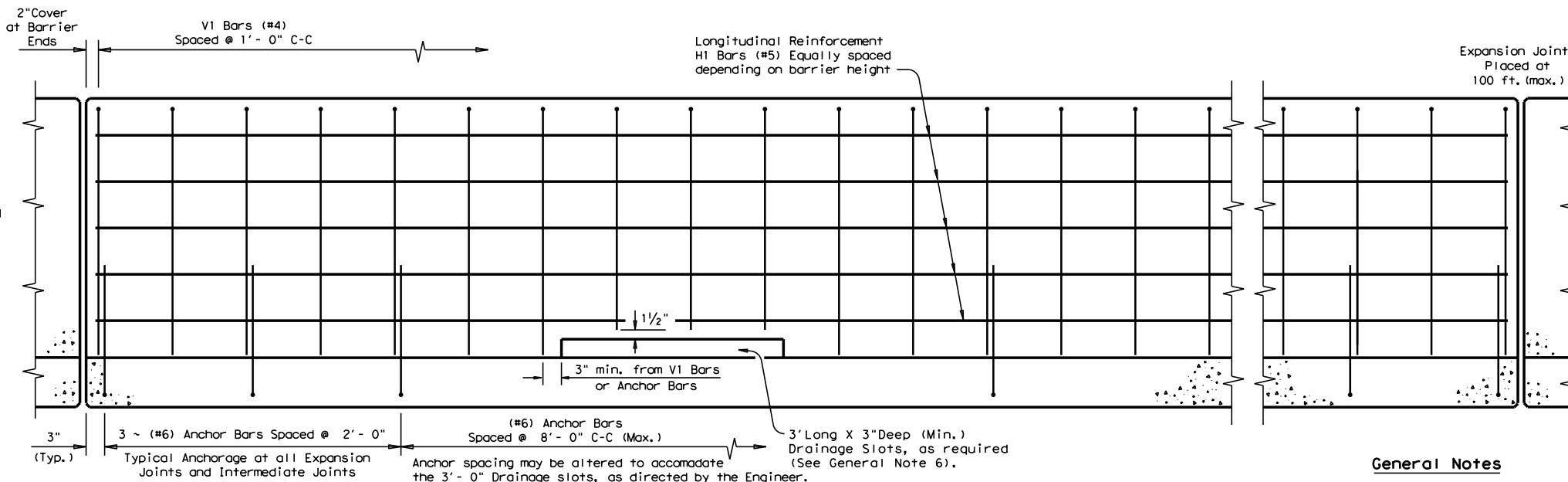
(#6) Bar
Concrete Pavement / Bridge Deck Anchorage:
Cast-in-Place or Slip-Formed Barrier
(See General Notes 2)

Epoxy Note:
If epoxy coated anchor bars are required, the lower 6" of the bars must not be epoxy coated.



"OPTIONAL" ANCHORAGE

(#6) Bar
Fresh insertion method or Type III, Class C Epoxy Method
Concrete Pavement / Bridge Deck Anchorage:
Cast-in-Place or Slip-Formed Barrier
(See General Notes 2 & 4)



ELEVATION VIEW

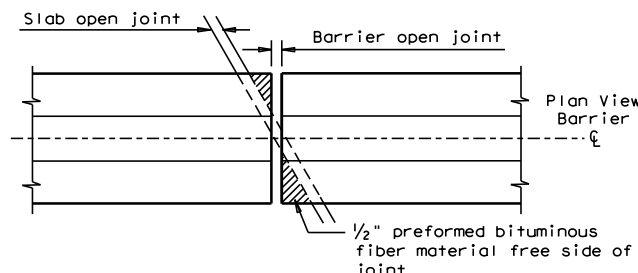
Cast-in-Place (SSCB) on Bridge Decks or Continuously Reinforced Concrete Pavement (CRCP)
(Showing Reinforcement and Anchor Placement)

BARRIER PLACEMENT OVER (CRCP) JOINTS

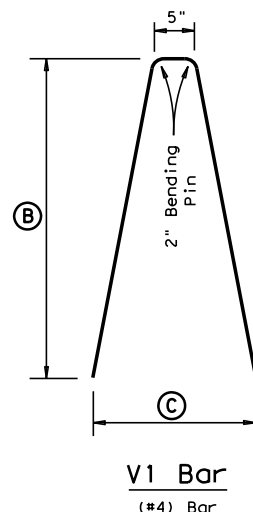
Barrier may be cast over a "Longitudinal" CRCP joint.

CRCP Joints (with or without tiebars): Two layers of 30 lb roofing felt or 1/2" preformed bituminous fiber material.

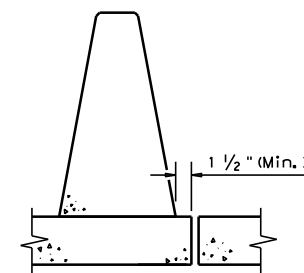
Barrier Anchorage Note: Anchorage must be located at least 3" from a longitudinal joint.



BARRIER OVER TRANSVERSE OPEN JOINT

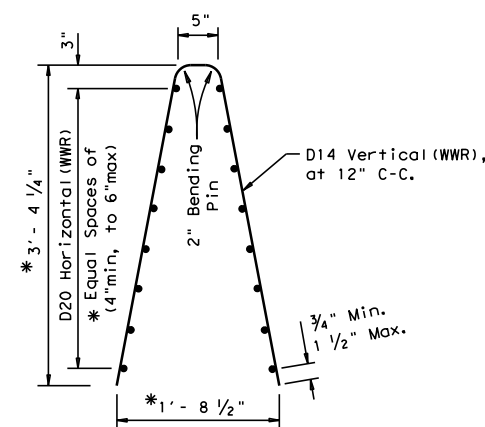


V1 Bar
(#4) Bar



MINIMUM EDGE DISTANCE FROM LONGITUDINAL JOINT

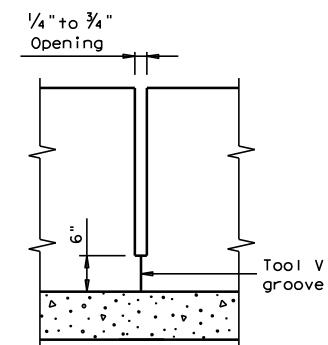
Barrier placement over a longitudinal bridge joint is not recommended.



Welded Wire Reinforcement (WWR) Option for Bars V1 and H1

(WWR) General Notes

- Deformed Welded Wire Reinforcement (WWR) shall conform to ASTM A497.
- Welded wire cage may be cut and bent to accommodate the drainage slots, as directed by the Engineer.
- Welded wire splice locations shall have a "minimum" splice lap length of 12".
- Combinations of reinforcing steel and WWR will be permitted, as directed by the Engineer. The dimension from the end of the barrier section to the first wire shall not exceed 3".



INTERMEDIATE JOINT DETAIL

Place at all Bent C's, without expansion joints and spaced at 33 ft. (max.), 10 ft. (min).

EXPANSION JOINT PLACEMENT

Place at all transverse joints or 100 ft. (max.), 10 ft. (min).

General Notes

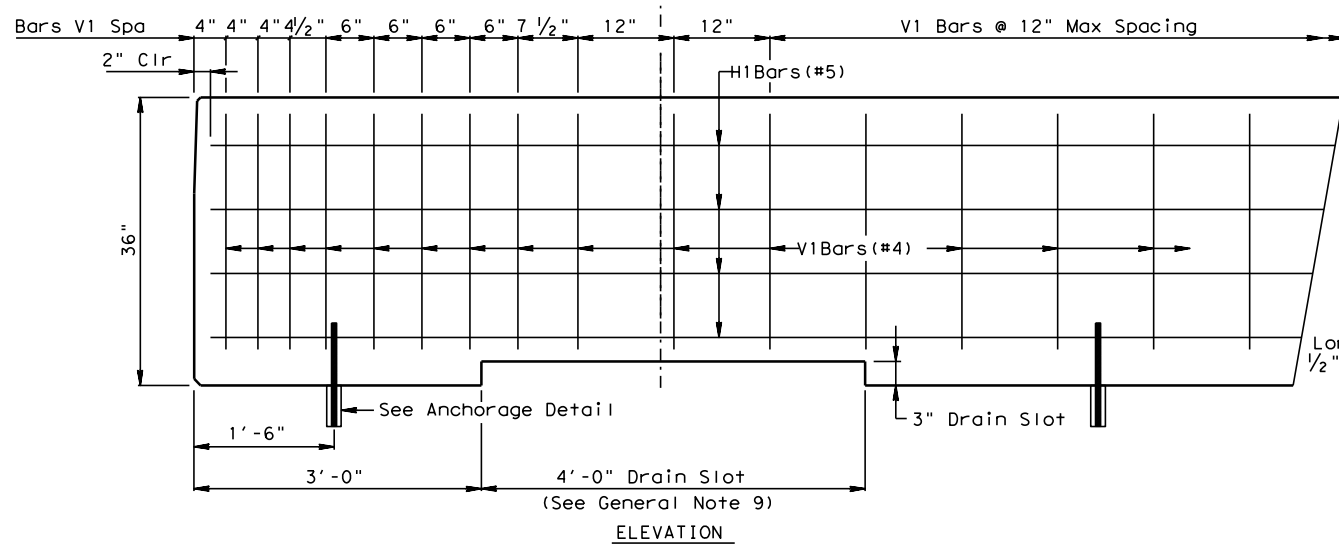
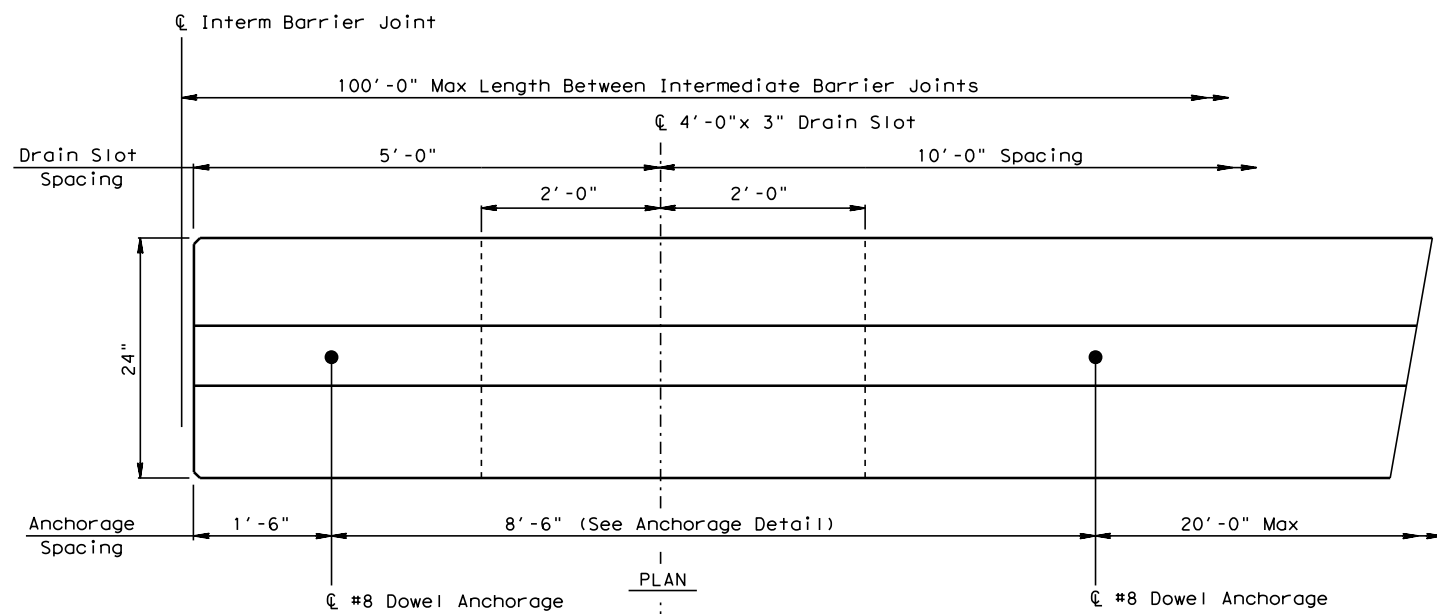
- Concrete shall be Class C. Unless otherwise specified in the plans.
- Where used, rebar reinforcement shall be Grade 60 and conform to ASTM A615. If the bridge slab requires epoxy "coated" reinforcement, the barrier and/or anchorage may require the same, if shown elsewhere in the plans.
- These details cover barrier per Item 514, "Permanent Concrete Traffic Barrier".
- Anchorage: The "Optional" Anchor system shall be embedded 6" into fresh concrete or using a Type III, Class C Epoxy anchorage system. Follow the manufacturer's directions for installing the expoxied anchor bars. All anchorage shown is the minimum required, and considered subsidiary to the bid item.
- Top edges of CIP barrier shall have a 3/4" chamfer or tooling radius.
- Drainage slot locations (12'-0", C-C Min. Spacing) are shown elsewhere, or as directed by the Engineer. Drainage slot heights on the SSCB may be increased to a maximum of 5 inches, without geometric changes to the barrier face.
- Cast-in-place barrier may be slip formed. Bracing may be tied or tack welded to the reinforcement cage to provide cage stability. Do not weld to anchor bars. The reinforcement cage may rest on the top of the finished grade.
- For locations where lighting is required, see the SSCB(4) sheet for the proper reinforcement and anchorage.

Cast-In-Place (CIP) or Slip-Formed (SSCB)

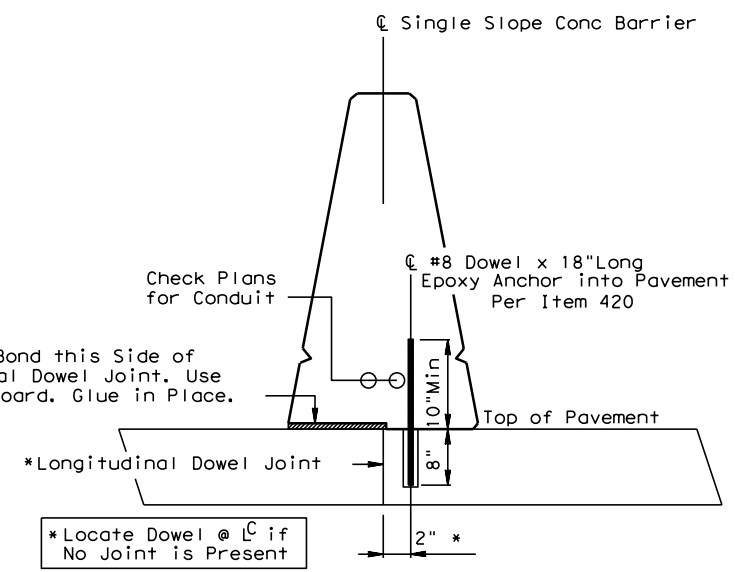
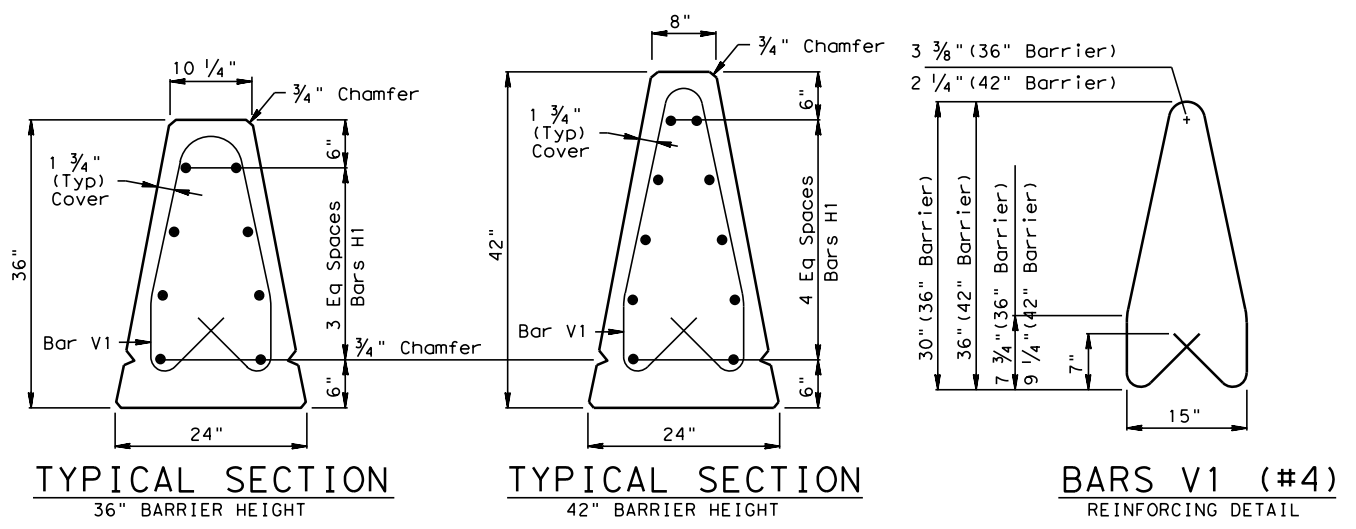
Cast-in-Place barrier may be connected to precast SSCB. Joint connection "Types" may be used in Cast-in-Place barrier, to match the precast barrier connection. (See required connection "Type" elsewhere in the plans)

The weight of Cast-in-Place (SSCB)42" is approx. 717 lbs per ft.

				Design Division Standard	
SINGLE SLOPE CONCRETE BARRIER CAST-IN-PLACE (TYPE 1) (BRIDGE DECK OR CRCP) SSCB(1)-16					
FILE:	sscb116.dgn	DN:	TxDOT	CK:	HC/AN
©TxDOT	January 2016	CON:	0389	SECT:	13
REVISIONS		JOB	039	SH	146
CST 01-2016		DIST:	HARRIS	COUNTY	
				SHEET NO.	143



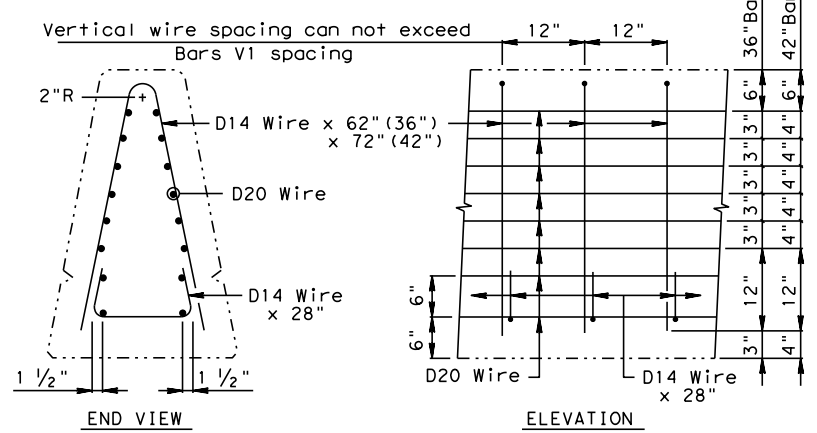
CAST-IN-PLACE SINGLE SLOPE CONCRETE BARRIER
36" Barrier Shown ~ 42" Barrier Similar



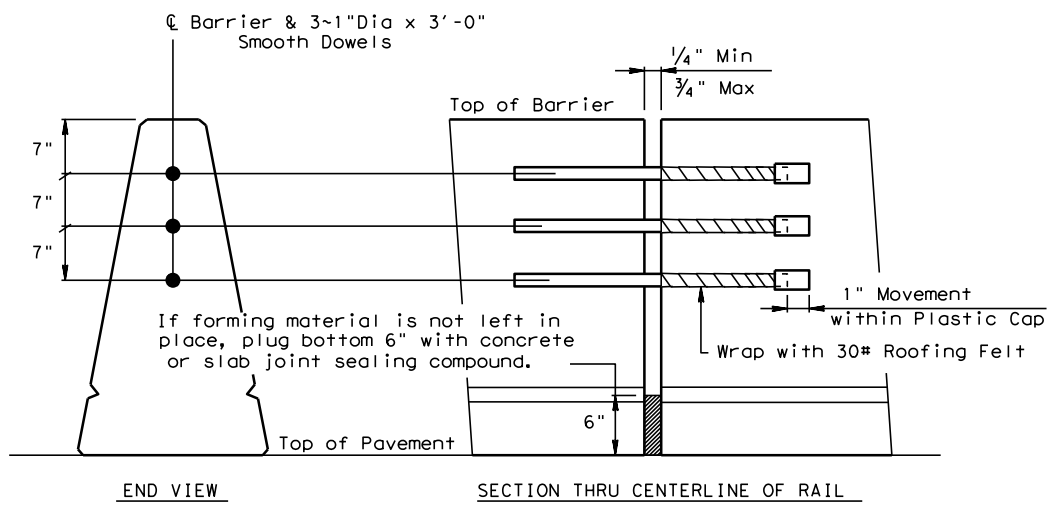
ANCHORAGE AND JOINT DETAIL

- GENERAL NOTES:**
- 1) Precast barrier is not allowed. Cast-in place barrier may be slip formed. Additional reinforcement may be tack welded to the upper two-thirds of the reinforcing cage to provide bracing.
 - 2) All concrete will be Class C.
 - 3) All reinforcing steel will be Grade 60, unless otherwise specified. All welded rebar is ASTM A706.
 - 4) Chamfer all edges 3/4 inch.
 - 5) The minimum bar splice length is 24 times the bar diameter.
 - 6) Welded wire fabric may be used as an option to conventional reinforcement. All wire is 60 ksi yield strength.
 - 7) Transitions to barrier height, as needed, will be determined by the Engineer. Changes in barrier height should not normally exceed 2 inches per 30 feet. Vertical steel will be uniformly transitioned throughout the variation in barrier height as directed by the Engineer.
 - 8) Installation of anchorage dowels are not paid for directly. Installation is incidental to barrier bid items.
 - 9) Drain slots may be used where shown elsewhere on the plans or as directed by the Engineer.

WELDED WIRE FABRIC	
36" BARRIER	42" BARRIER
3x12-D20xD14	4x12-D20xD14



WELDED WIRE FABRIC (OPTIONAL REINFORCING)



INTERMEDIATE BARRIER JOINT DETAIL

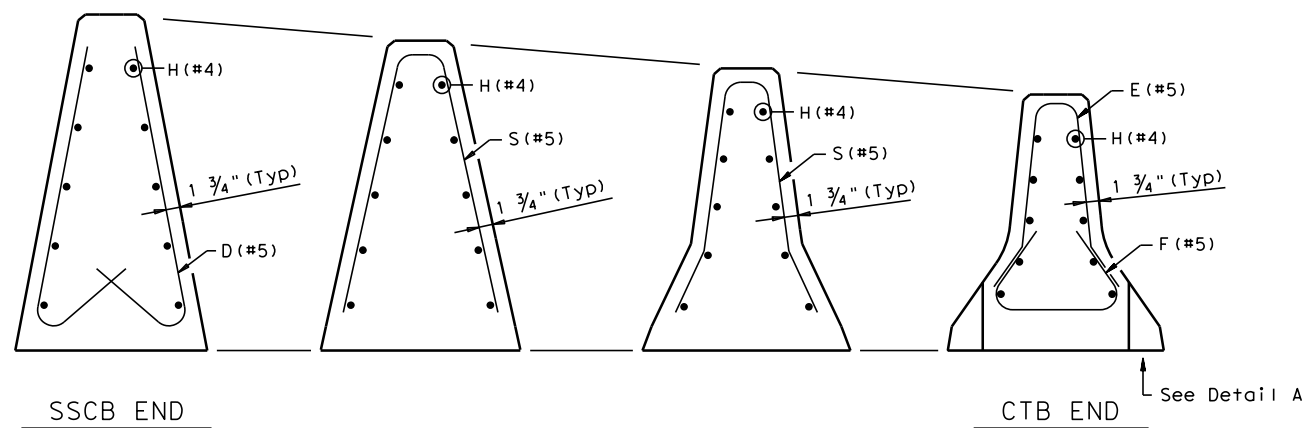
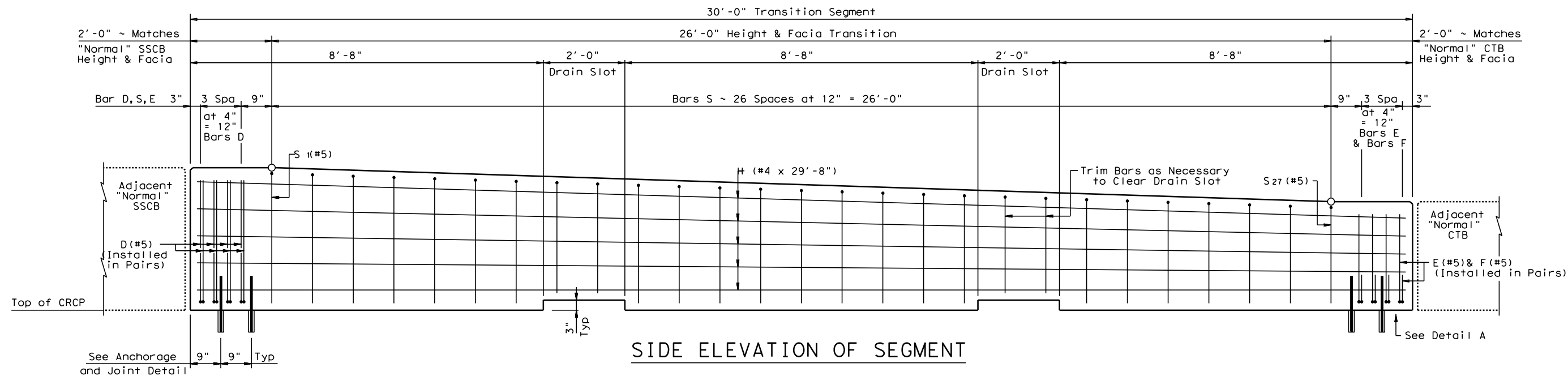
Texas Department of Transportation
Houston District (Roadway)

SINGLE SLOPE CONCRETE BARRIER
TYPE 2
(CAST-IN-PLACE)

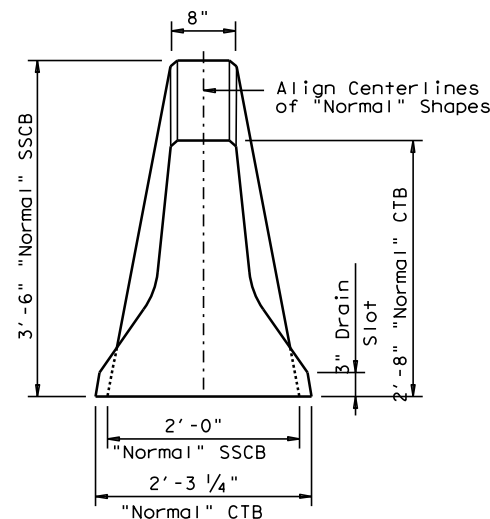
SSCB (2) - HOU

FILE: STDC4.DGN	DW: TxDot	CK: TxDot	DW: TxDot	CK: TxDot
©TXDOT AUG. 2005	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS	HOU	6		144
3/2015 2014 SPECS	COUNTY	CONTROL	SECT	JOB
	HARRIS	0389	13	039 SH 146

R = Radius
Dia = Diameter



TYPICAL SECTIONS THRU TRANSITION SEGMENT
Showing Reinforcing and Shape Transitions Only



END ELEVATION OF SEGMENT
Showing Geometry Only

General Notes:

This Concrete Safety Barrier Transition Segment has been evaluated and approved to be of equal strength to barriers with similar geometry, which have been crash tested to meet NCHRP Report 350 TL-3 criteria. This Transition may be used for design speeds of 50 mph and greater.

Reinforcing for the Transition Segment shall be Grade 60. All concrete shall be Class "C". Chamfer all exposed corners $\frac{3}{4}$ " x $\frac{3}{4}$ ".

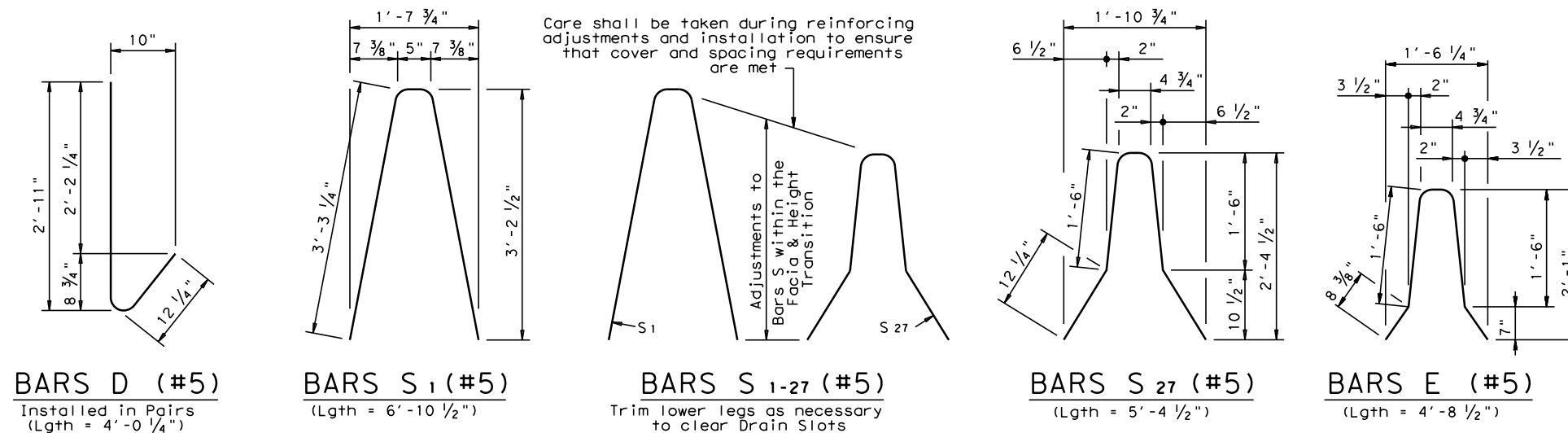
This Transition Segment is cast-in-place. The Transition Segment shall have end faces that are parallel to the adjacent "normal" Barriers.

Height and face profile of the Transition Segment shall be gradually changed, within the limits detailed, so as to match the height and profile of the adjacent "normal" Barriers. Adjust (bend and relocate) the reinforcing within the transition portion of the segment as necessary to conform to the altered barrier shape. Cover and minimum spacing requirements of the reinforcing shall not be violated.

See elsewhere in the plans for barrier dimensions and joint connection details not included herein.

THIS SHEET MUST BE SIGNED,
SEALED AND DATED FOR USE

SHEET 1 OF 2



Texas Department of Transportation
Houston District

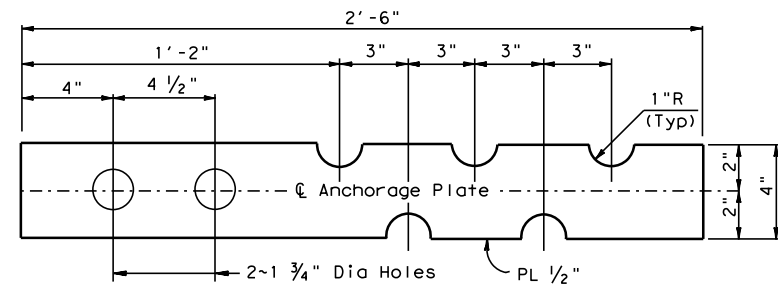
BARRIER TRANSITION
DETAILS
(SSCB to CTB)

BTD (1)

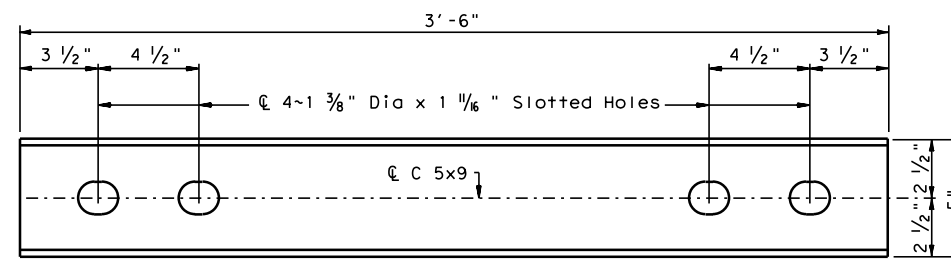
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© TxDOT MAY 2010	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS	HOU	6		145
3/2015 2014 SPECS	COUNTY	CONTROL	SECT	JOB
	HARRIS	0389	13	039
				HIGHWAY
				SH 146

APPROXIMATE QUANTITIES FOR A 30 FT. SECTION		
CONCRETE	CY	3.27
REINFORCING STEEL	LBS	390

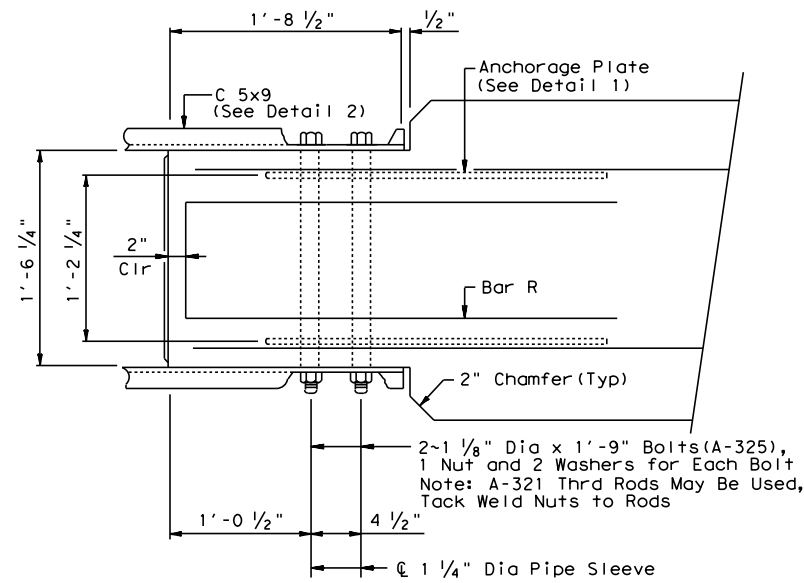
Approximate Weight Per Foot is 442 Lbs.
For Contractor's Information Only.
R = Radius
Dia = Diameter



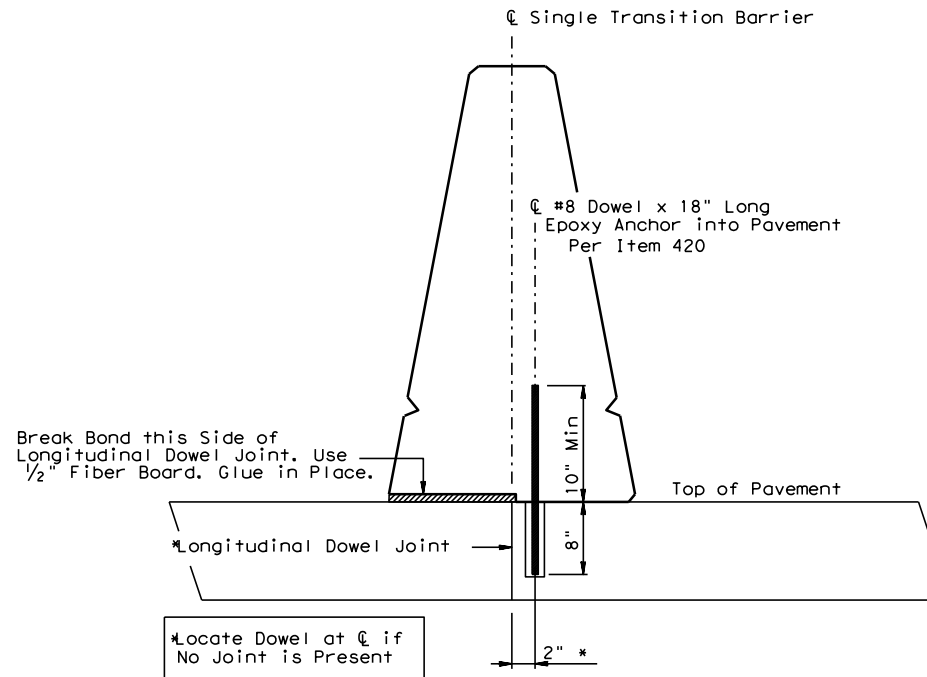
DETAIL 1



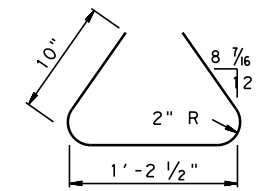
DETAIL 2



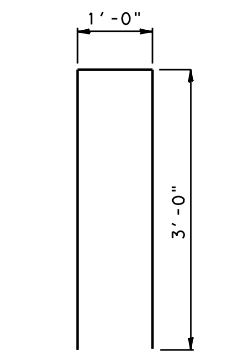
PLAN
CTB END
Showing Bolt Anchorage, Rebar & Block-out



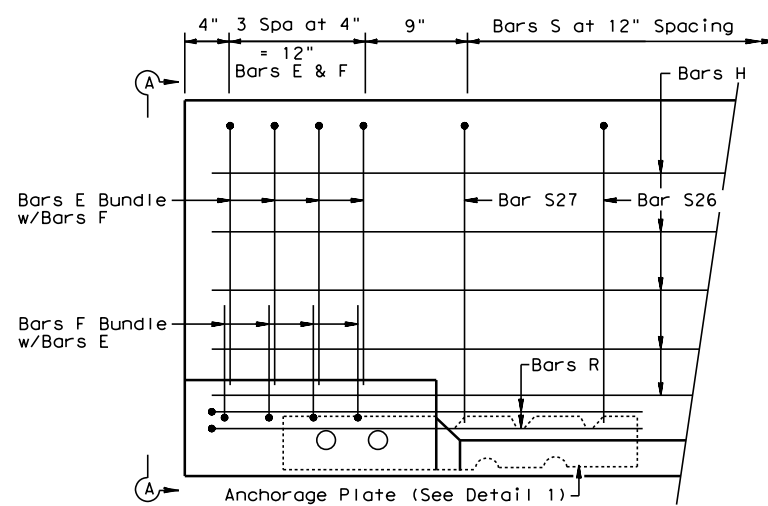
ANCHORAGE AND JOINT DETAIL



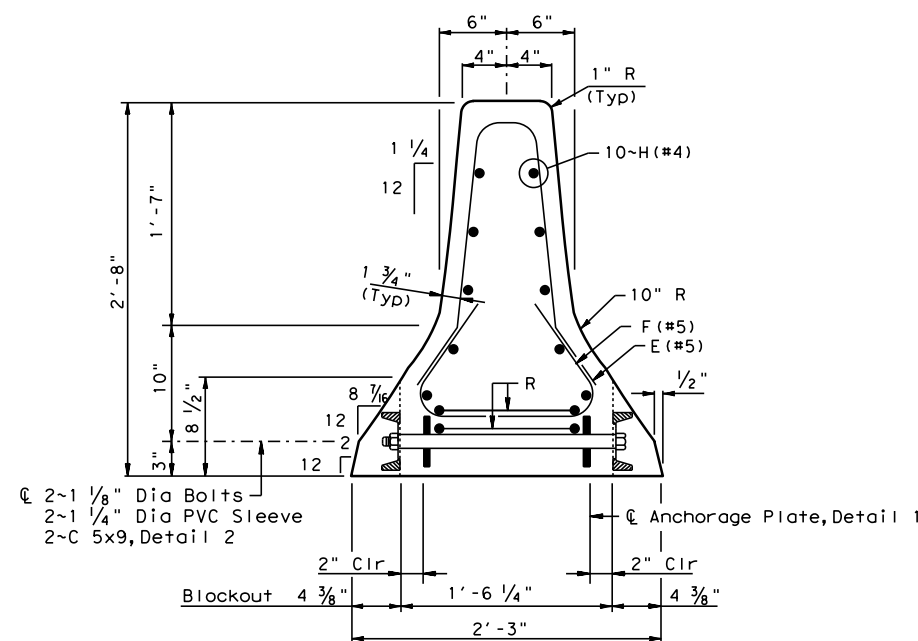
BAR F
(#5)



BAR R
(#6)



ELEVATION
CTB END



SECTION A-A

THIS SHEET MUST BE SIGNED,
SEALED AND DATED FOR USE

SHEET 2 OF 2

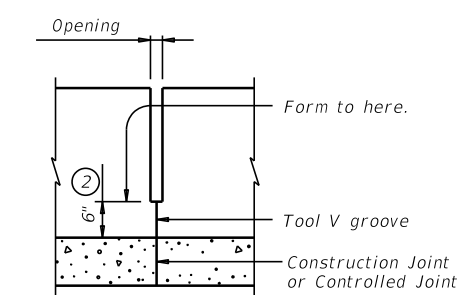
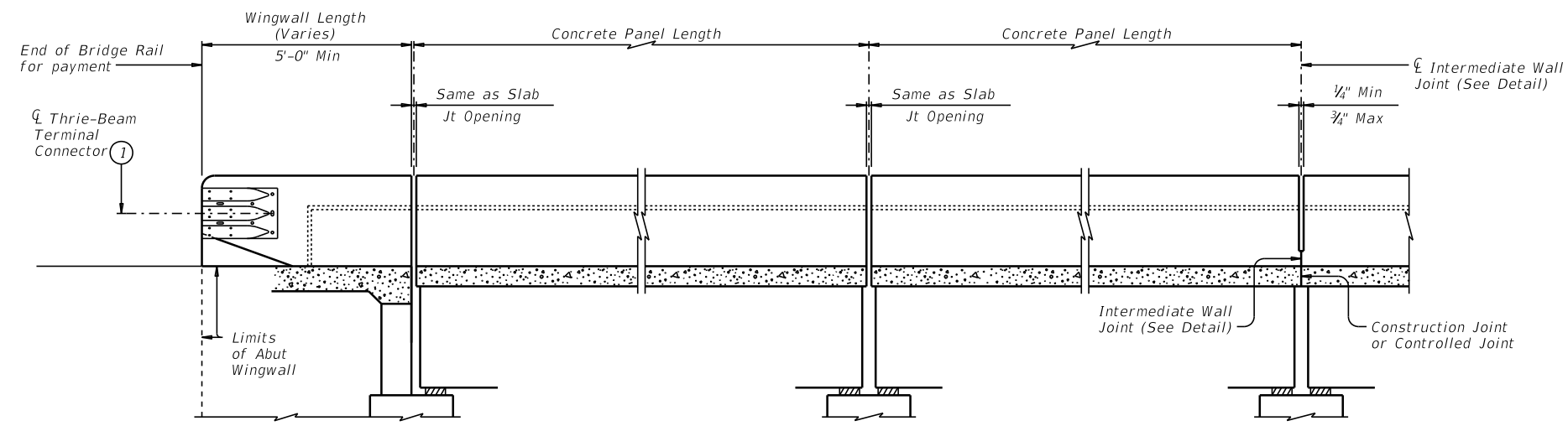


BARRIER TRANSITION
DETAILS
(SSCB to CTB)

BTD (2)

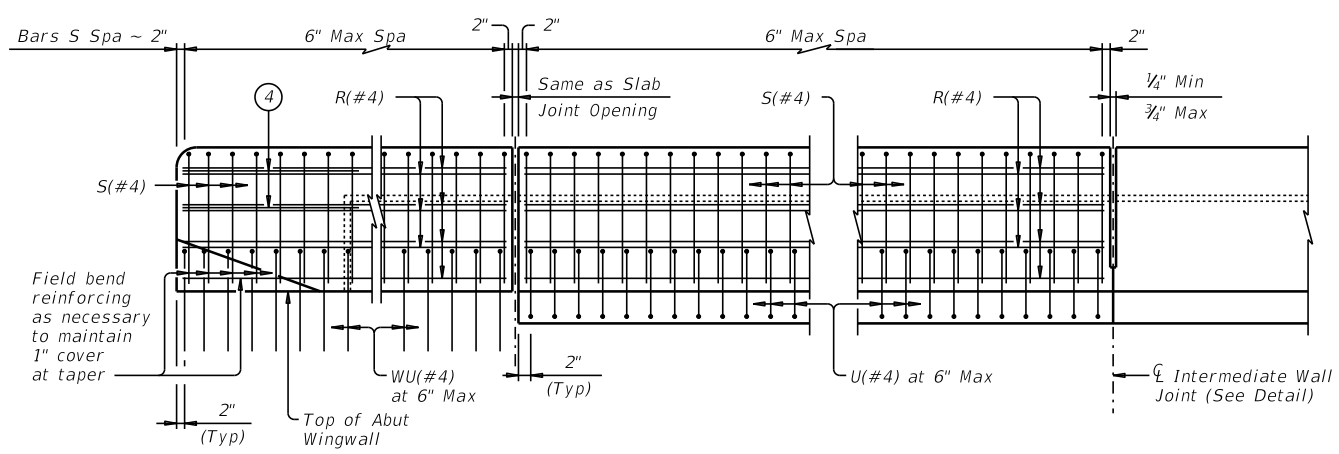
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© TxDOT MAY 2010	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS	HOU	6		146
3/2015 2014 SPECS	COUNTY	CONTROL	SECT	JOB
	HARRIS	0389	13	039
				HIGHWAY
				SH 146

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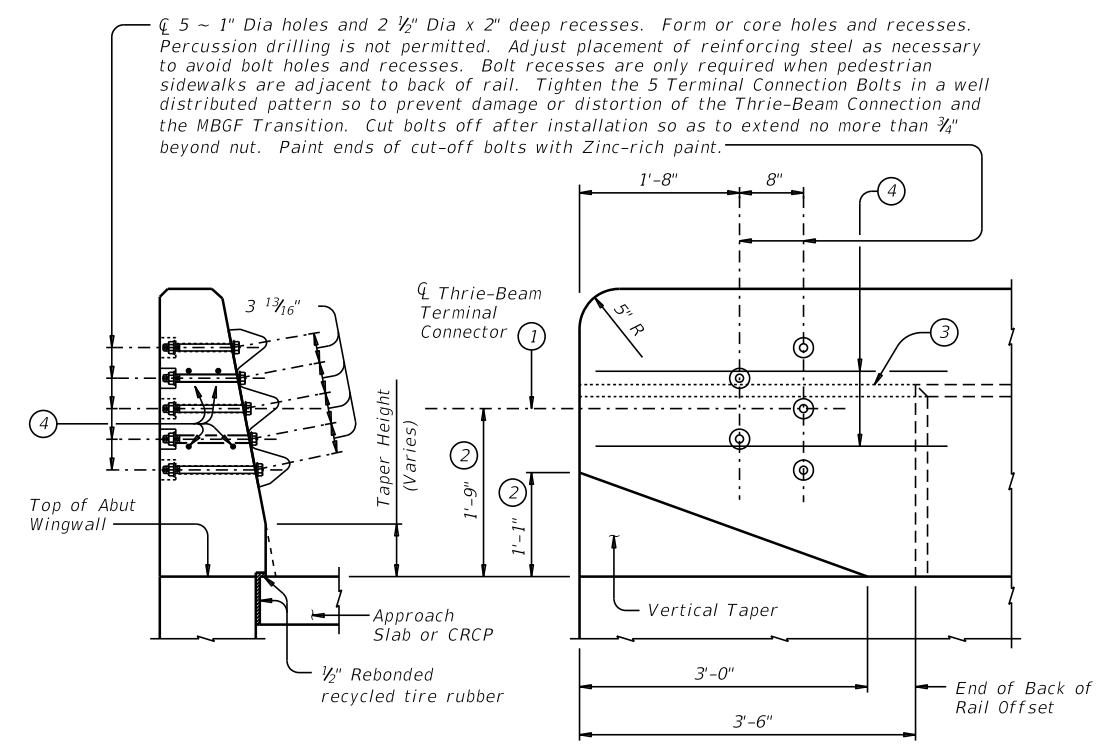


INTERMEDIATE WALL JOINT DETAIL
Provide at all interior bents without slab expansion joints.

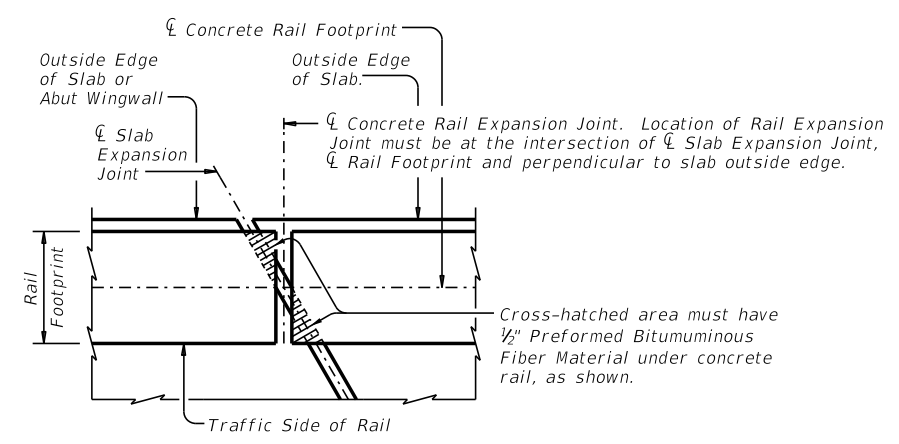
ROADWAY ELEVATION OF RAIL



ELEVATION SHOWING TYPICAL REINFORCING PLACEMENT



TERMINAL CONNECTION DETAILS



PLAN OF RAIL AT EXPANSION JOINTS

Example showing Slab Expansion Joints without breakbacks.

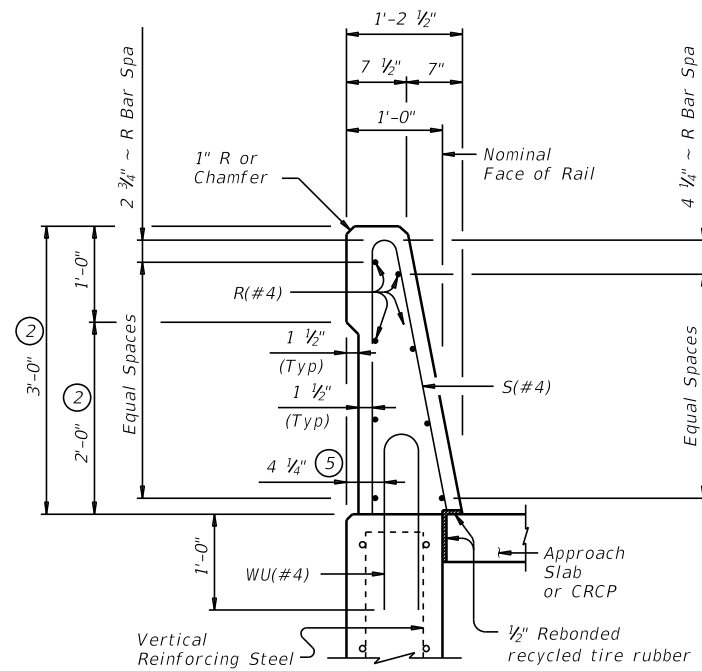
- 1 Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence". Attach Metal Beam Guard Fence Transitions to the bridge rail and extend along the embankment unless otherwise shown in the plans.
- 2 Increase 2" for structures with Overlay.
- 3 Back of rail offset may, with Engineer's approval, be continued to the end of the railing.
- 4 Place 4 additional Bars R(#4) 3'-8" in length inside Bars S(#4) and centered 2'-0" from end of rail when Terminal Connections are required.

		Bridge Division Standard	
<p>TRAFFIC RAIL SINGLE SLOPE</p>			
<p>TYPE SSTR</p>			
FILE: r1std014-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR
038913	CONTRACT	SECTION	JOB
038913	039	SH 146	HIGHWAY
HOU	COUNTY	HARRIS	SHEET NO.
			147

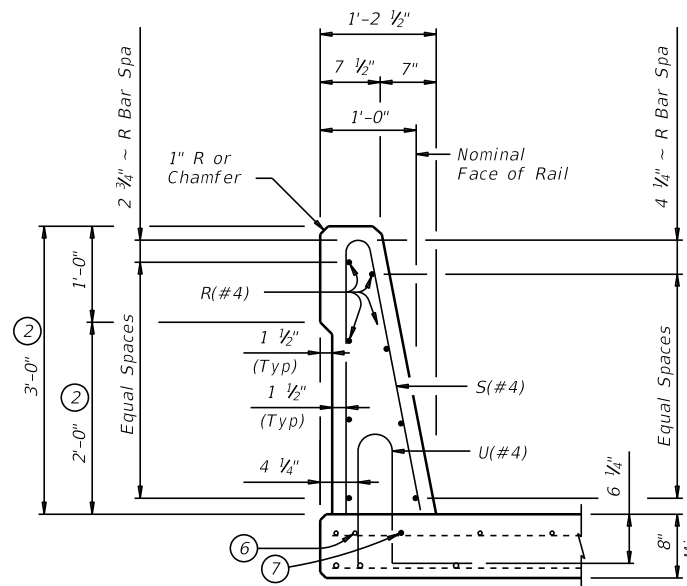
DATE: FILE:

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DATE: FILE:

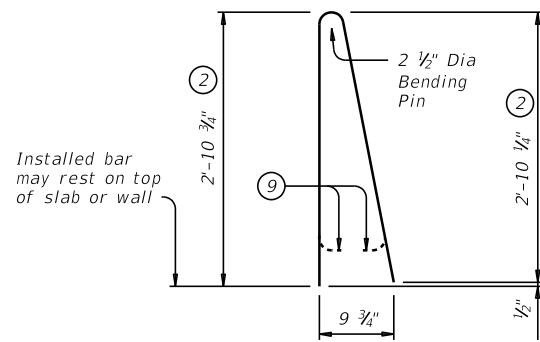


ON ABUTMENT WINGWALLS OR CIP RETAINING WALLS

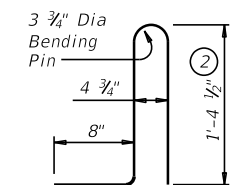


ON BRIDGE SLAB

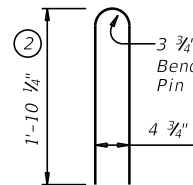
SECTIONS THRU RAIL



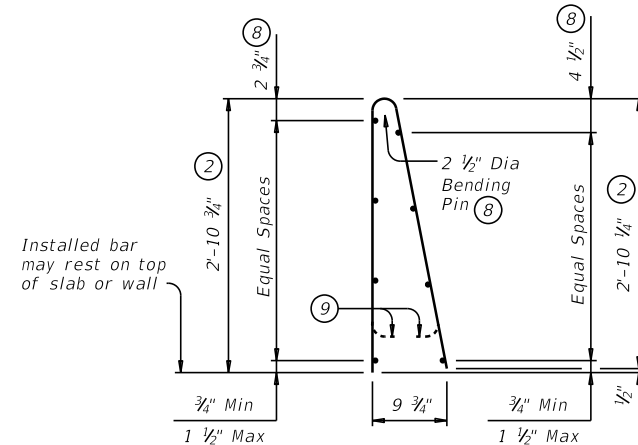
BARS S (#4)



BARS U (#4)



BARS WU (#4)



OPTIONAL WELDED WIRE REINFORCEMENT (WWR)

- ② Increase 2" for structures with Overlay.
- ⑤ 5/8" when vertical reinforcing has closer clear cover over horizontal reinforcing in abutment wingwalls or retaining walls on traffic side of wall.
- ⑥ As an aid in supporting reinforcement, additional longitudinal bars may be used in the slab with the approval of the Engineer. Such bars must be furnished at the Contractor's expense.
- ⑦ Top longitudinal slab bar may be adjusted laterally 3" plus or minus to tie reinforcing.
- ⑧ No longitudinal wires may be within upper bend.
- ⑨ Bend or cut as required to clear drain slots.
- ⑩ Space U(#4) bars at 4" Max when end region of panel length is less than 6'-0" to side slot drain. Space U(#4) bars at 6" Max when end region of panel length is 6'-0" and greater to side slot drain.

CONSTRUCTION NOTES:

This railing may be constructed by the slipform process when approved by the Engineer, with equipment approved by the Engineer. Provide sensor control for both line and grade. Tack welding to provide bracing for slipform operations is acceptable. Welding may be performed at a minimum spacing of 3 ft between the cage and the anchorage. It is permissible to weld to bars U, WU and S at any location on the cage. If increased bracing is needed, provide additional anchorage devices and weld in the upper two thirds of the cage. Paint welded areas on epoxy coated and/or galvanized reinforcing with an organic zinc rich paint in accordance with Item 445 "Galvanizing".
If rail is slipformed, apply a heavy epoxy bead 1" behind toe of traffic side of rail to concrete deck just prior to slip forming. Provide a 3/8" width x 1/4" tall heavy epoxy bead with Type III, Class C or a Type V epoxy.
The back of railing must be vertical unless otherwise shown in the plans or approved by the Engineer.

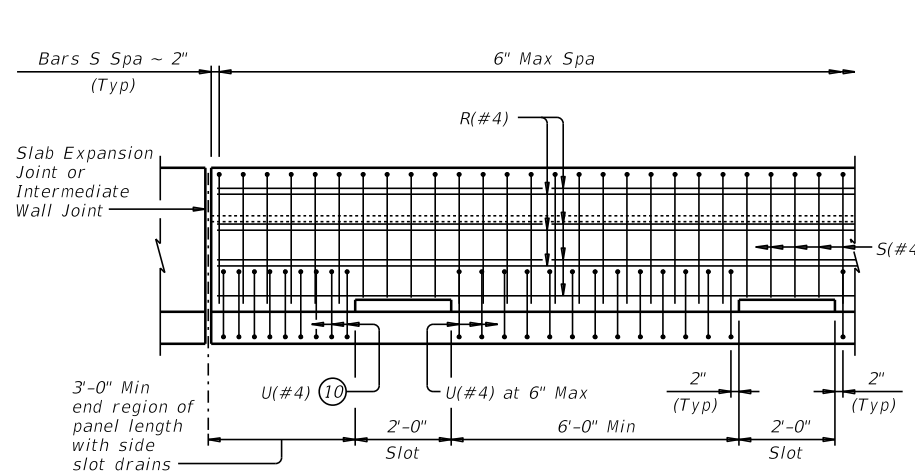
MATERIAL NOTES:

Provide Class "C" concrete. Provide Class "C" (HPC) if required elsewhere.
Provide Grade 60 reinforcing steel.
Epoxy coat or galvanize all reinforcing steel if slab bars are epoxy coated or galvanized.
Deformed Welded Wire Reinforcement (WWR) (ASTM A1064) of equal size and spacing may be substituted for Bars U and WU unless noted otherwise. Deformed WWR (ASTM A1064) may be substituted for Bars R and S, as shown. Combinations of reinforcing steel and WWR or configurations of WWR other than shown are permitted if conditions in the table are satisfied. Provide the same laps as required for reinforcing bars.
Provide bar laps, where required, as follows:
Uncoated or galvanized ~ #4 = 1'-7"
Epoxy coated ~ #4 = 2'-5"

GENERAL NOTES:

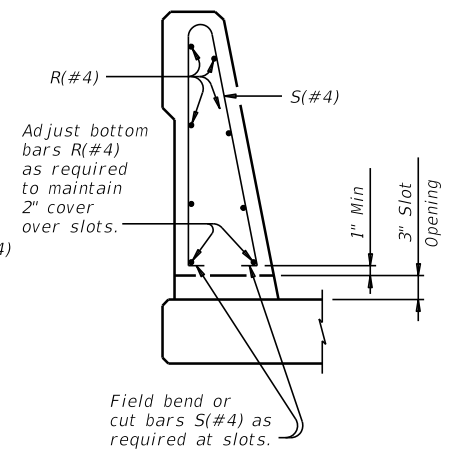
This rail has been successfully evaluated by full-scale crash test to meet MASH TL-4 criteria. This rail can be used for speeds of 50 mph and greater when a TL-3 rated guard fence transition is used. When a TL-2 rated guard fence transition is used, this rail can only be used for speeds of 45 mph and less.
Do not use this railing on bridges with expansion joints providing more than 5" movement.
Rail anchorage details shown on this standard may require modification for select structure types. See appropriate details elsewhere in plans for these modifications.
Shop drawings will not be required for this rail.
Average weight of railing with no overlay is 376 pcf.

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



OPTIONAL SIDE SLOT DRAIN DETAIL

Note: Side Slot Drains may be used where shown elsewhere on the plans or as directed by the Engineer. Drains should not be placed over railroad tracks, lower roadways, or sidewalks. When this rail is used as a separator between a roadway surface and a sidewalk surface, side drain slots will not be permitted.



SECTION THRU OPTIONAL SIDE SLOT DRAIN

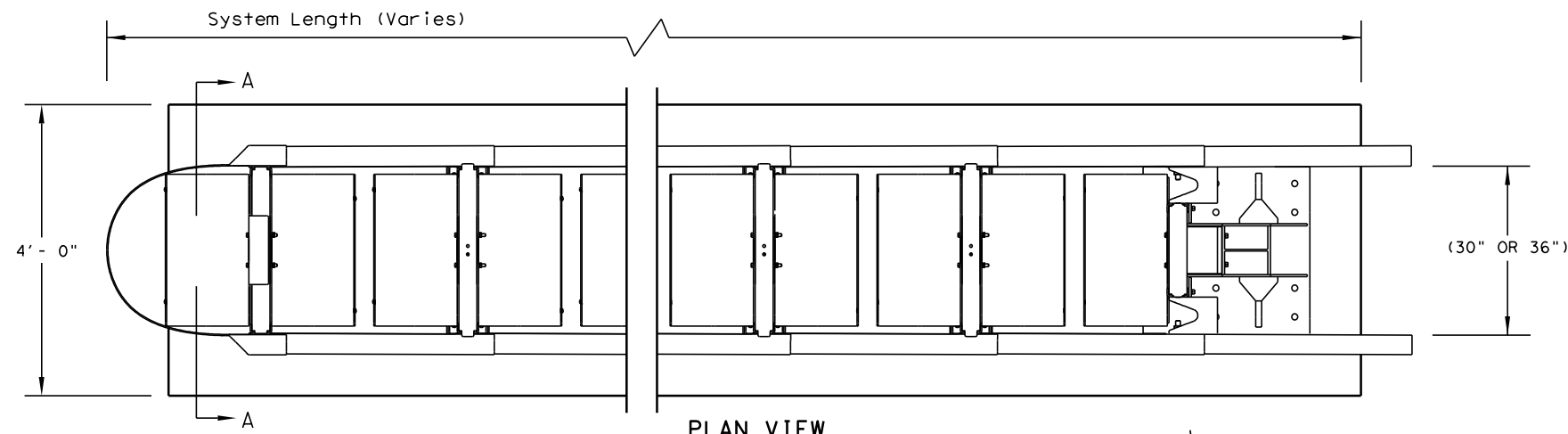
DESCRIPTION	LONGITUDINAL WIRES	VERTICAL WIRES
Minimum (Cumulative Total) Wire Area	1.067 Sq In.	0.267 Sq In. per Ft
Minimum	No. of Wires	Spacing
Maximum	8	4"
Maximum Wire Size Differential	10	8"
	The smaller wire must have an area of 40% or more of the larger wire.	

Texas Department of Transportation
TRAFFIC RAIL SINGLE SLOPE
TYPE SSTR

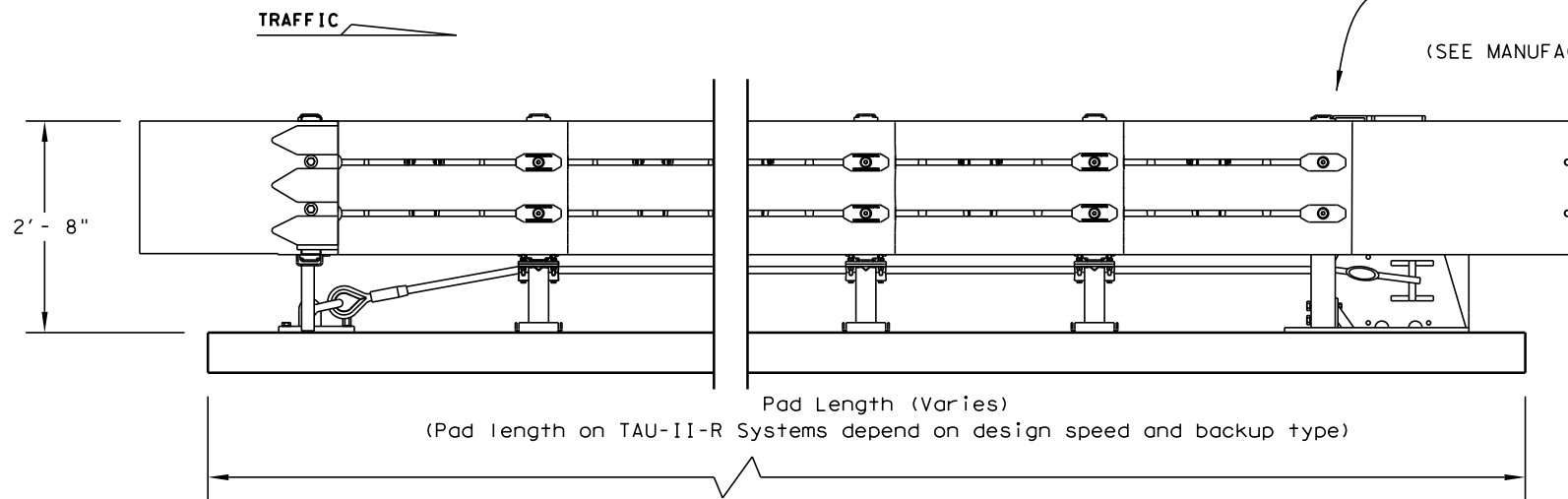
FILE: r1std014-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TxDOT
0389	13	039	SH	146
HOU	HARRIS			148

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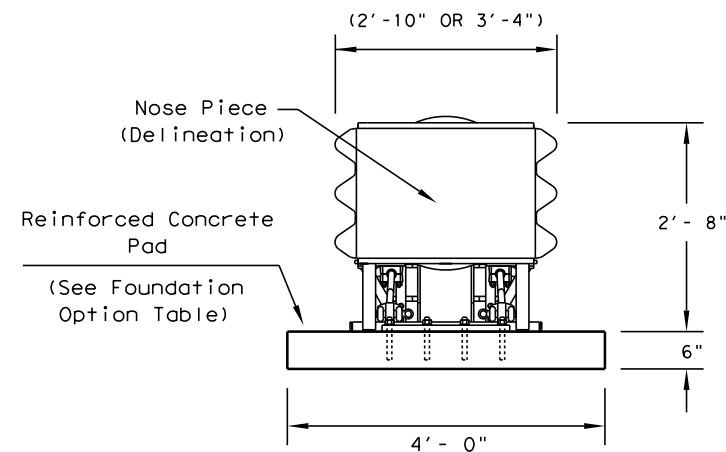
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PLAN VIEW



ELEVATION VIEW



SECTION A-A

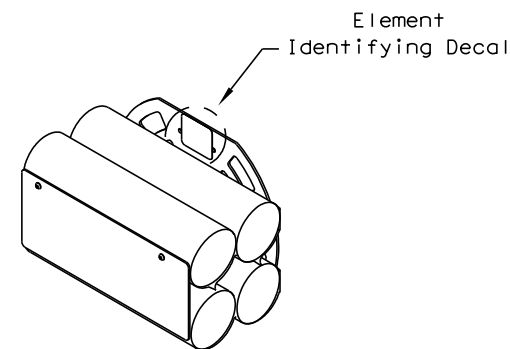
Nose Piece delineation orientation, is shown elsewhere on the plans.

TRANSITION OPTIONS
Vertical Wall
Concrete Traffic Barriers
W-Beam Guardrail
Thrie Beam Guardrail

For bi-directional transition panel and end shoe details. (See manufacturer's product manual.)

FOUNDATION OPTIONS
6" Reinforced Concrete
8" Unreinforced Concrete
Asphalt over Concrete with Minimum 6" Embedment in Concrete
6" Asphalt over 6" Compact Subbase
8" Minimum Asphalt

For steel placement in concrete foundations. (See manufacturer's product manual)



ENERGY ABSORBING ELEMENTS (EAE)

BACKUP SUPPORT OPTIONS
Compact (Stand Alone)
Flush Mount
PCB (Concrete Barrier)

TAU-II-R (NARROW) SYSTEM LENGTHS			
BACKSTOP	TL-2	TL-3	70 mph
PCB	13'-7"	27'-10"	30'-7"
Flush Mount	14'-0"	28'-3"	31'-0"
Compact	15'-3"	29'-6"	32'-3"

Backup and Transition types are shown elsewhere on the plans, (i.e. Attenuator location details or in the general notes).

Note: System lengths are ± 2"

GENERAL NOTES

1. For specific information regarding installation and technical guidance of the system, contact: Lindsay Transportation Solutions - Barrier Systems, Inc. at (707) 374-6800. 180 River Road, Rio Vista, CA 94571
2. For bi-directional traffic, appropriate transition panels will be required.
3. Additional details for the backup support option, transition options and foundation option will be shown on the manufacturer's shop drawings furnished to the Engineer.
4. Concrete shall be class "S" with a minimum compressive strength of 4,000 psi.
5. Maximum permissible cross-slope is 8%.
6. The installation area should be free from curbs, elevated objects, or depressions.
7. The TAU-II-R system should be approximately parallel with the barrier or center of merging barriers.
8. Refer to Universal TAU-II-R configuration chart for specific systems configuration number and location of each type of energy absorbing element.
9. 30-inch (30") model shown, also available in 36-inch (36") configuration.

BILL OF MATERIAL

PRODUCT CODE	QTY	DESCRIPTION
B030704	1	Front Support
B030703	TBD	Mid Support
TBD	1	Backstop Assembly (See Table)
TBD	1	Front Cable Anchor
TBD	1	Nose Assembly
B010202	TBD	Sliding Panel
B010659	2	End Panel
K001003	1	Slider Assembly Kit
BSI-1202006-KT	TBD	TAU-II-R Slider Kit
BSI-1107131-KT	TBD	TAU-II-R EAE Mounting Hw Kit
BSI-1012069-00	TBD	Energy Absorbing Element, Type 1
BSI-1012070-00	TBD	Energy Absorbing Element, Type 2
BSI-1012071-00	TBD	Energy Absorbing Element, Type 3
BSI-1110009-00	TBD	Energy Absorbing Element, Type 3N
TBD	TBD	Cable Assembly
K001004	TBD	Cable Guide Kit
K001005	2	Front Support Leg Kit
B010651	4	Pipe Panel Mount
TBD	1	Anchoring Package

(TBD) = To Be Determined, depending on Backup Type and System Length.

(See manufacturer's product manual for details)



**LTS-BARRIER SYSTEMS
CRASH CUSHION
(R-NARROW)**

TAU-II-R(N)-16

LOW MAINTENANCE

FILE: tauirn16.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL
©TxDOT: January 2013	CONT	SECT	JOB	HIGHWAY
REVISIONS	0389	13	039	SH 146
REVISED 06, 2013 (VP)	DIST	COUNTY	SHEET NO.	
REVISED 03, 2016 (VP)	HOU	HARRIS	149	

RETAINING WALL #1

Chain RW 1 contains:
6 CUR RW 1 3

Beginning chain RW 1 description
Feature: Struc Wall

Point 6 N 13,847,159.2083 E 3,260,062.9873 Sta 20+00.00
Course from 6 to PC RW 1 3 N 64° 46' 21.66" E Dist 3.1534

Curve Data

Curve RW 1 3
P.I. Station 24+55.27 N 13,847,353.2513 E 3,260,474.8396
Delta = 11° 06' 40.02" (LT)
Degree = 1° 13' 57.51"
Tangent = 452.1212
Length = 901.4067
Radius = 4,648.2100
External = 21.9367
Long Chord = 899.9949
Mid. Ord. = 21.8336
P.C. Station 20+03.15 N 13,847,160.5524 E 3,260,065.8400
P.T. Station 29+04.56 N 13,847,621.1574 E 3,260,839.0372
C.C. N 13,851,365.4342 E 3,258,084.7230
Back = N 64° 46' 21.64" E
Ahead = N 53° 39' 41.62" E
Chord Bear = N 59° 13' 01.63" E

Ending chain RW 1 description

RETAINING WALL #2

Chain RW 2 contains:
7 CUR RW 2 3

Beginning chain RW 2 description
Feature: Struc Wall

Point 7 N 13,847,345.2669 E 3,260,219.4481 Sta 20+00.00
Course from 7 to PC RW 2 3 N 62° 00' 21.47" E Dist 2.0296

Curve Data

Curve RW 2 3
P.I. Station 23+34.07 N 13,847,502.0736 E 3,260,514.4326
Delta = 8° 20' 39.87" (LT)
Degree = 1° 15' 31.51"
Tangent = 332.0426
Length = 662.9109
Radius = 4,551.7900
External = 12.0948
Long Chord = 662.3252
Mid. Ord. = 12.0627
P.C. Station 20+02.03 N 13,847,346.2196 E 3,260,221.2402
P.T. Station 26+64.94 N 13,847,698.8267 E 3,260,781.9032
C.C. N 13,851,365.4342 E 3,258,084.7230
Back = N 62° 00' 21.49" E
Ahead = N 53° 39' 41.62" E
Chord Bear = N 57° 50' 01.55" E

Ending chain RW 2 description

RETAINING WALL #5

Chain RTW5 contains:
CUR RTW51 151

Beginning chain RTW5 description

Curve Data

Curve RTW51
P.I. Station 22+94.35 N 13,848,080.0174 E 3,261,248.8140
Delta = 7° 24' 00.14" (LT)
Degree = 1° 15' 31.51"
Tangent = 294.3526
Length = 587.8866
Radius = 4,551.7900
External = 9.5076
Long Chord = 587.4781
Mid. Ord. = 9.4878
P.C. Station 20+00.00 N 13,847,889.9379 E 3,261,024.0626
P.T. Station 25+87.89 N 13,848,297.4610 E 3,261,447.2120
C.C. N 13,851,365.4342 E 3,258,084.7230
Back = N 49° 46' 39.79" E
Ahead = N 42° 22' 39.65" E
Chord Bear = N 46° 04' 39.72" E

Course from PT RTW51 to 151 S 65° 55' 07.25" W Dist 4,694.1021

Equation: Sta 72+81.99 (BK) = Sta 32+50.12 (AH) End Region 1
Begin Region 2

Point 151 N 13,846,382.1133 E 3,257,161.6504 Sta 32+50.12

Ending chain RTW5 description

RETAINING WALL #6

Chain RTW6 contains:
CUR RTW61 251

Beginning chain RTW6 description

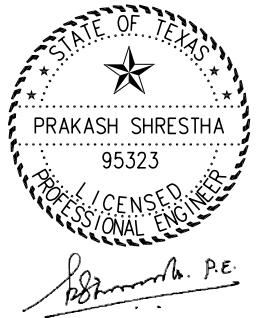

Curve Data

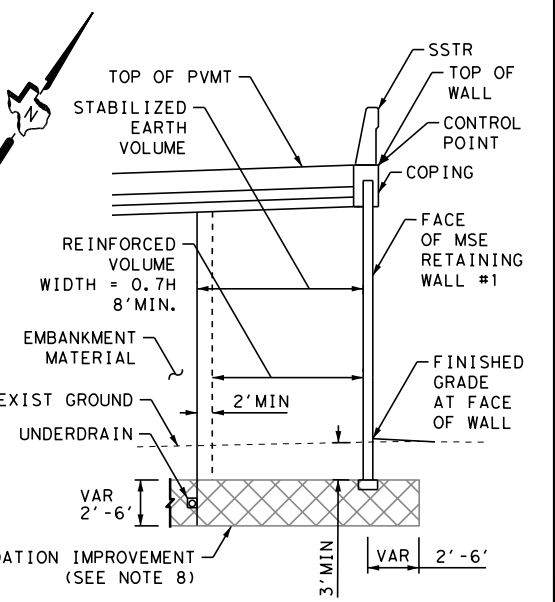
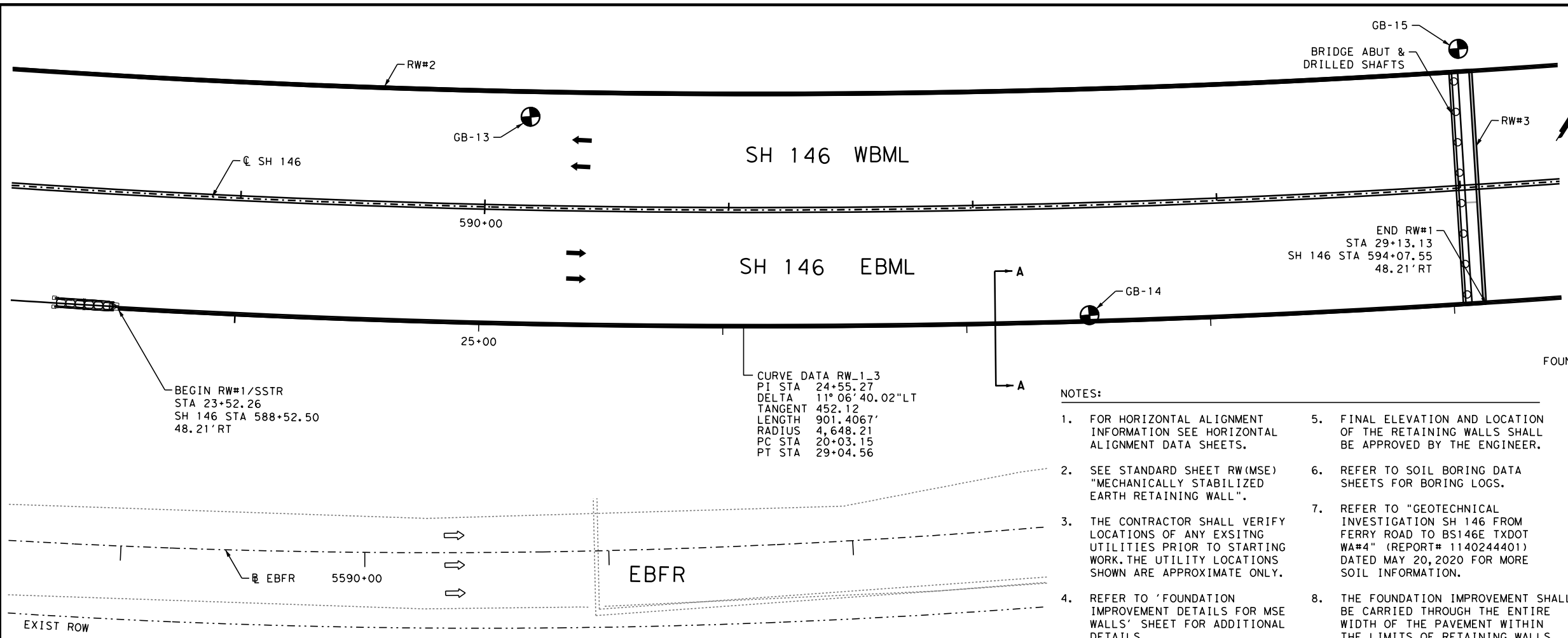
Curve RTW61
P.I. Station 22+89.89 N 13,848,003.6555 E 3,261,307.8175
Delta = 7° 08' 14.80" (LT)
Degree = 1° 13' 57.51"
Tangent = 289.8931
Length = 579.0363
Radius = 4,648.2100
External = 9.0311
Long Chord = 578.6619
Mid. Ord. = 9.0135
P.C. Station 20+00.00 N 13,847,816.4462 E 3,261,086.4791
P.T. Station 25+79.04 N 13,848,216.9155 E 3,261,504.1799
C.C. N 13,851,365.4342 E 3,258,084.7230
Back = N 49° 46' 30.90" E
Ahead = N 42° 38' 16.11" E
Chord Bear = N 46° 12' 23.51" E

Course from PT RTW61 to 251 N 42° 03' 37.66" E Dist 0.0299

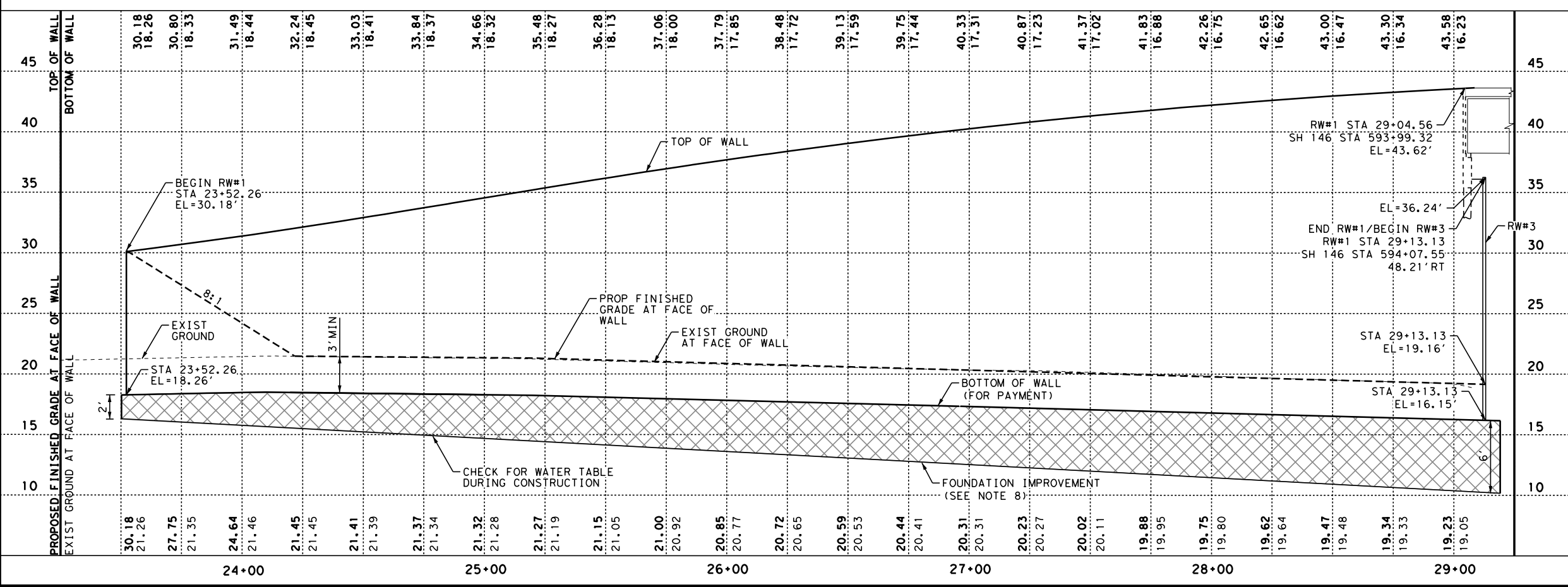
Point 251 N 13,848,216.9376 E 3,261,504.1999 Sta 25+79.07

Ending chain RTW6 description

REV NO.	DATE	BY	REVISION
			
CivilTech Engineering, Inc.		11821 Telge Road Cypress, Texas 77429 PH: (281) 304-0200 - FX: (281) 304-0210 Firm Registration No. F-382	
		Texas Department of Transportation	
SH 146 RETAINING WALLS HORIZONTAL ALIGNMENT DATA			
SHEET 1 OF 1			
FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.		SHEET NO. 150
STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146



- NOTES:
- FOR HORIZONTAL ALIGNMENT INFORMATION SEE HORIZONTAL ALIGNMENT DATA SHEETS.
 - SEE STANDARD SHEET RW(MSE) "MECHANICALLY STABILIZED EARTH RETAINING WALL".
 - THE CONTRACTOR SHALL VERIFY LOCATIONS OF ANY EXISTING UTILITIES PRIOR TO STARTING WORK. THE UTILITY LOCATIONS SHOWN ARE APPROXIMATE ONLY.
 - REFER TO 'FOUNDATION IMPROVEMENT DETAILS FOR MSE WALLS' SHEET FOR ADDITIONAL DETAILS.
 - FINAL ELEVATION AND LOCATION OF THE RETAINING WALLS SHALL BE APPROVED BY THE ENGINEER.
 - REFER TO SOIL BORING DATA SHEETS FOR BORING LOGS.
 - REFER TO "GEOTECHNICAL INVESTIGATION SH 146 FROM FERRY ROAD TO BS146E TXDOT WA#4" (REPORT# 1140244401) DATED MAY 20, 2020 FOR MORE SOIL INFORMATION.
 - THE FOUNDATION IMPROVEMENT SHALL BE CARRIED THROUGH THE ENTIRE WIDTH OF THE PAVEMENT WITHIN THE LIMITS OF RETAINING WALLS.



REV. NO.	DATE	BY	REVISION

STATE OF TEXAS
PRAKASH SHRESTHA
95323
PROFESSIONAL ENGINEER

P. Shrestha, P.E.
1/6/2022

CivilTech Engineering, Inc. 11821 Telge Road
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Firm Registration No. F-382

Texas Department of Transportation

SH 146

RETAINING WALL
PLAN & PROFILE
(WALL #1)

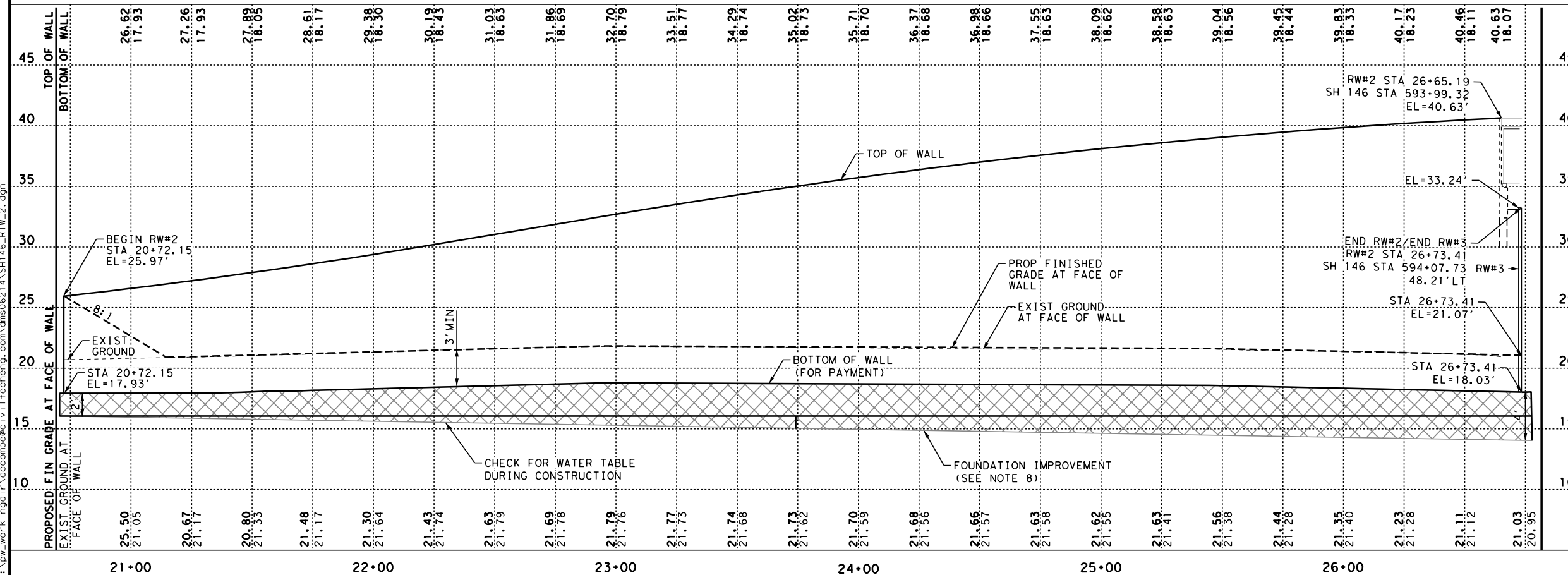
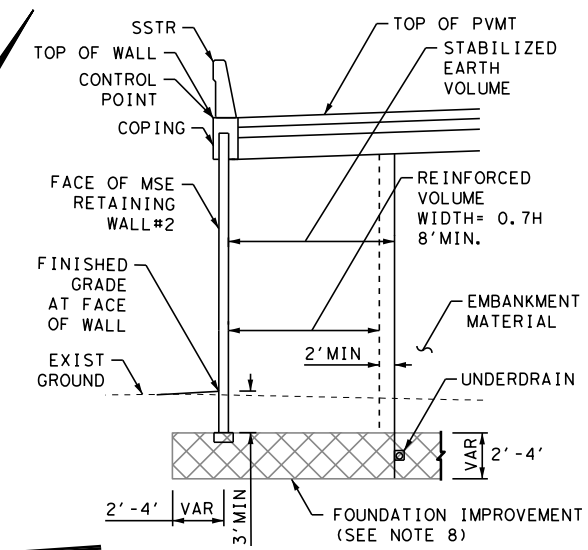
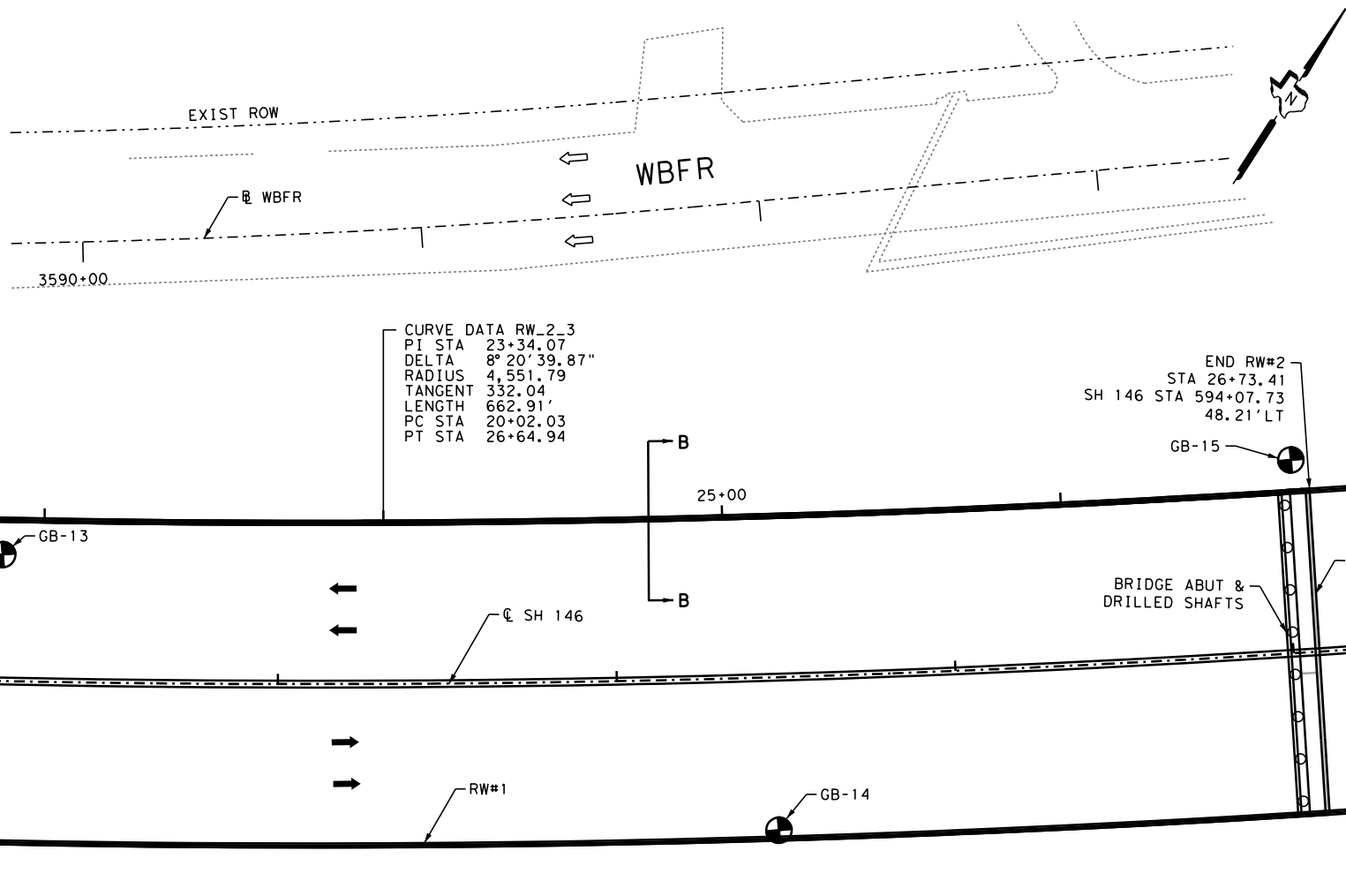
SHEET 1 OF 6

FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.	SHEET NO. 151
STATE TEXAS	DIST. HOU	COUNTY HARRIS
CONT. 0389	SECT. 13	JOB 039
		HIGHWAY NO. SH 146

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NOTES:

- FOR HORIZONTAL ALIGNMENT INFORMATION SEE HORIZONTAL ALIGNMENT DATA SHEETS.
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REV. NO.	DATE	BY	REVISION

STATE OF TEXAS
PRAKASH SHRESTHA
95323
LICENSED PROFESSIONAL ENGINEER

1/6/2022

CivilTech Engineering, Inc.

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Firm Registration No. F-382

Texas Department of Transportation

SH 146

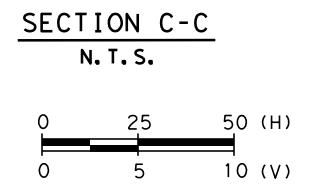
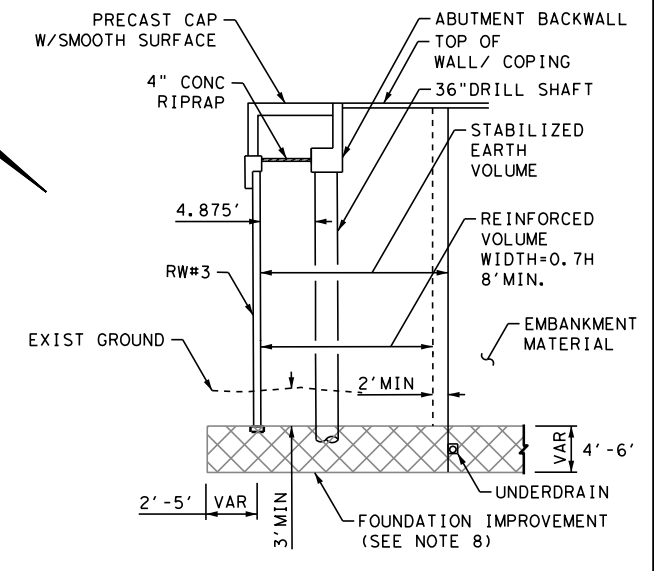
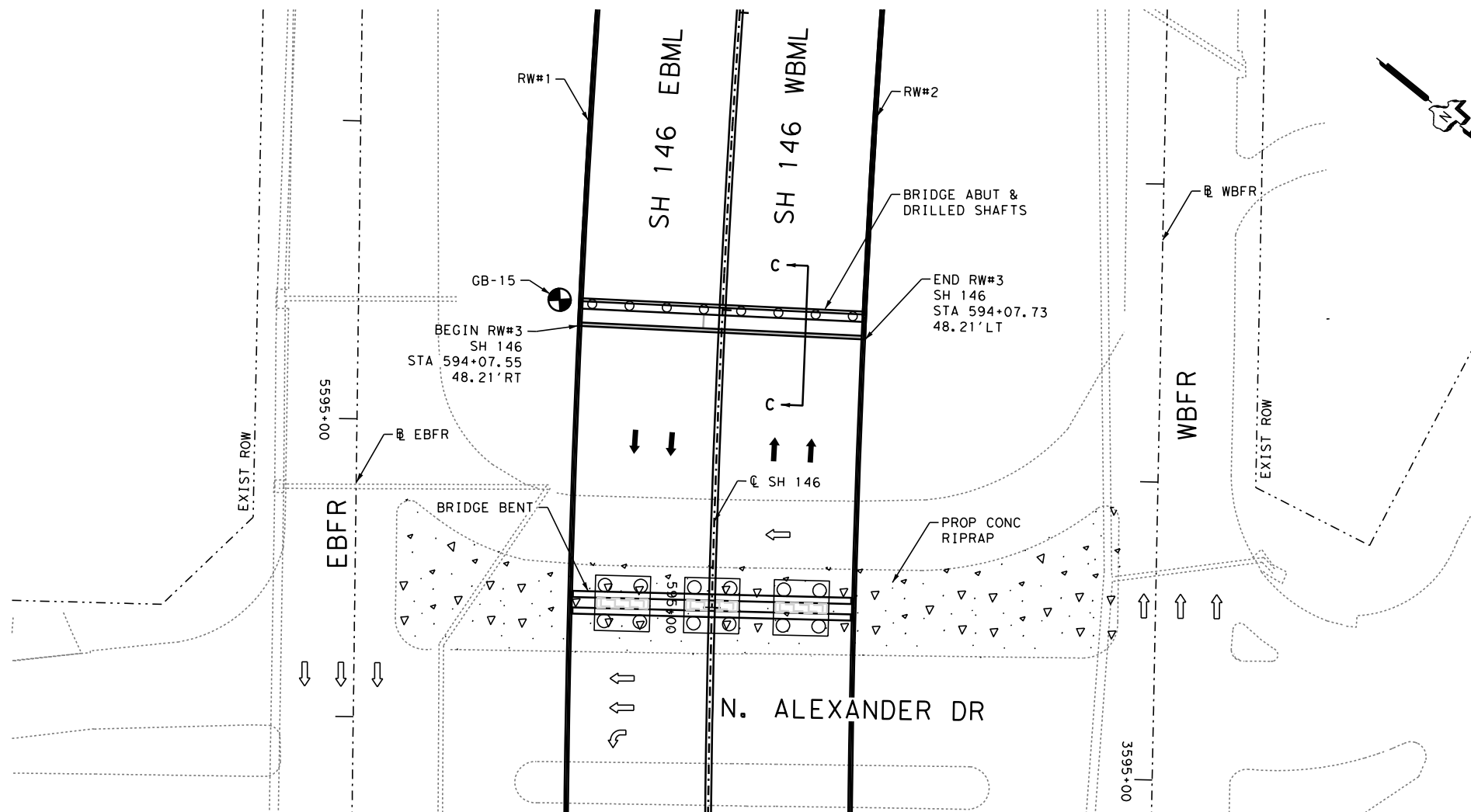
RETAINING WALL
PLAN & PROFILE
(WALL #2)

SHEET 2 OF 6

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.	
6		152	
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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- NOTES:
- FOR HORIZONTAL ALIGNMENT INFORMATION SEE HORIZONTAL ALIGNMENT DATA SHEETS.
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 - REFER TO "GEOTECHNICAL INVESTIGATION SH 146 FROM FERRY ROAD TO BS146E TXDOT WA#4" (REPORT# 114024401) DATED MAY 20, 20 FOR MORE SOIL INFORMATION.
 - THE FOUNDATION IMPROVEMENT SHALL BE CARRIED THROUGH THE ENTIRE WIDTH OF THE PAVEMENT WITHIN THE LIMITS OF RETAINING WALLS.



REV. NO.	DATE	BY	REVISION

STATE OF TEXAS
 PRAKASH SHRESTHA
 95323
 LICENSED PROFESSIONAL ENGINEER
 1/6/2022

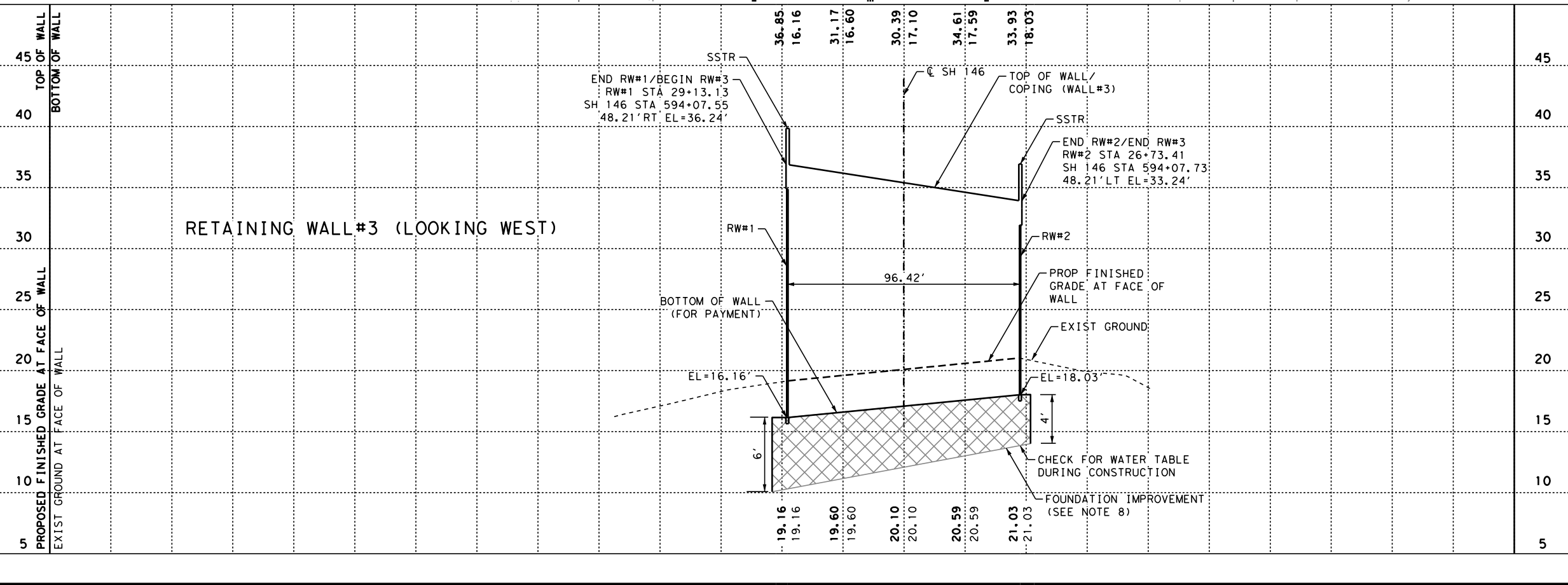
CivilTech Engineering, Inc. 11821 Telge Road
 Cypress, Texas 77429
 PH: (281) 304-0200 - FX: (281) 304-0210
 Firm Registration No. F-382

Texas Department of Transportation

SH 146
 RETAINING WALL
 PLAN & PROFILE
 (WALL #3)

SHEET 3 OF 6

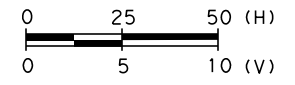
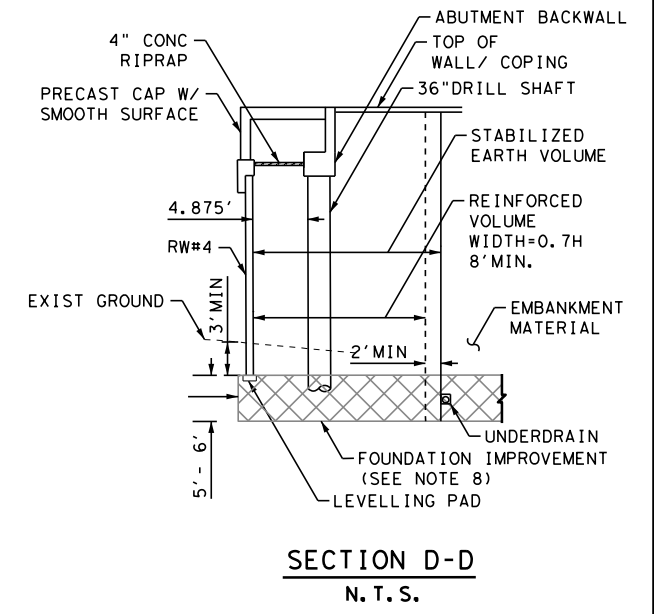
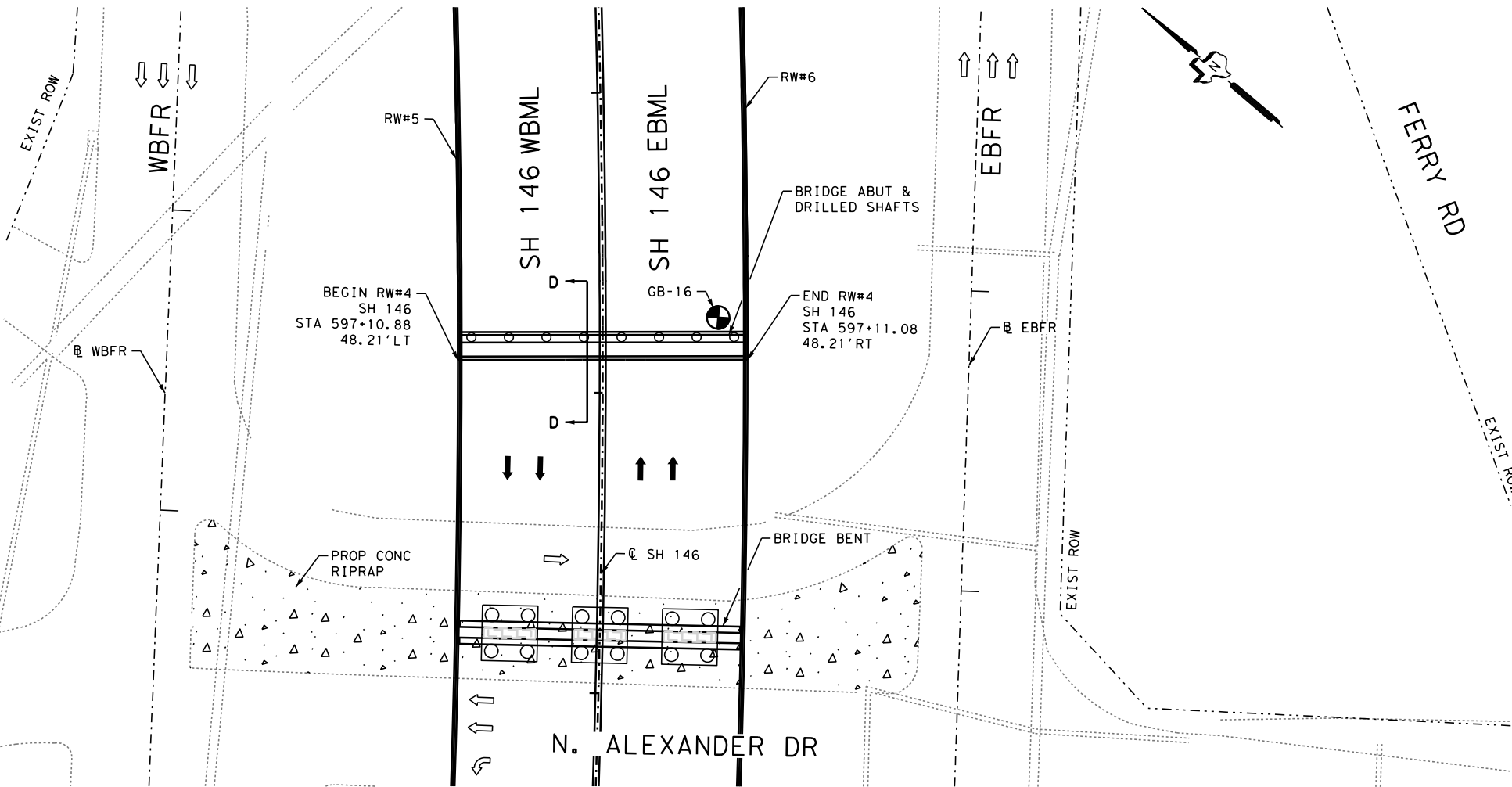
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6		153	
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146



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NOTES:

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- REFER TO "GEOTECHNICAL INVESTIGATION SH 146 FROM FERRY ROAD TO BS146 TXDOT WA#4" (REPORT# 1140244401) DATED MAY 20, 2020 FOR MORE SOIL INFORMATION.
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REV. NO.	DATE	BY	REVISION



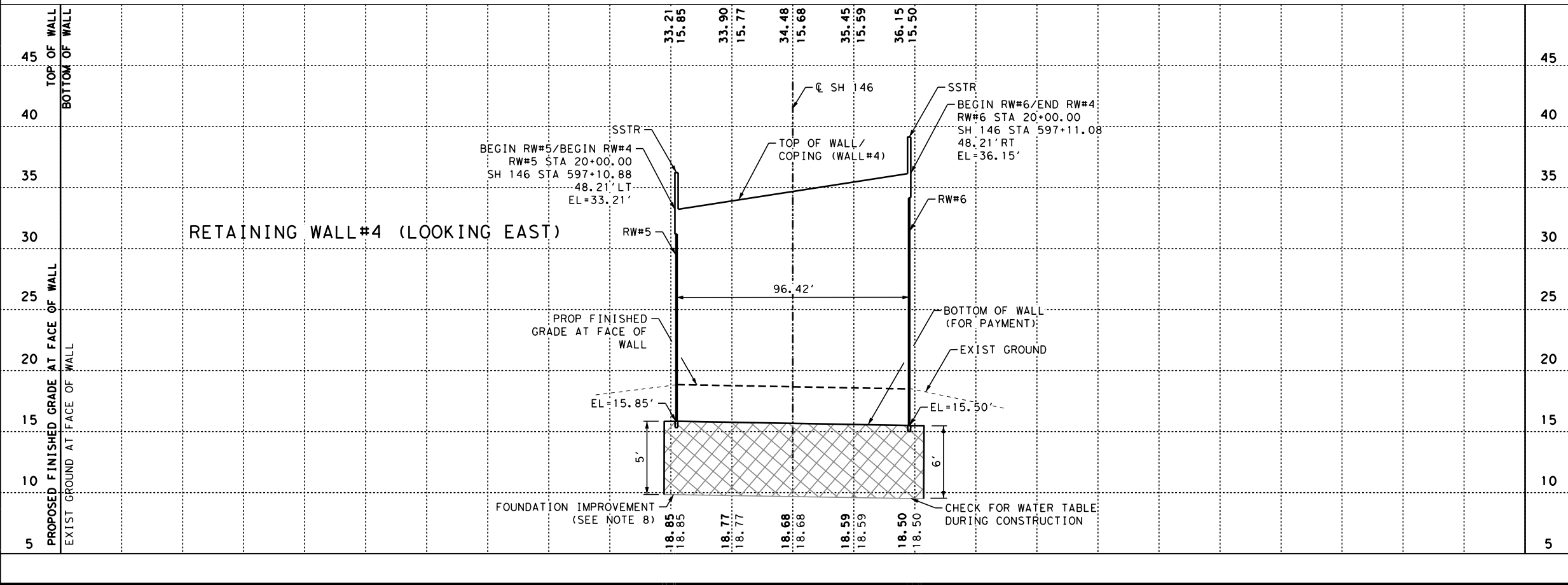
CivilTech Engineering, Inc.
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Firm Registration No. F-382



SH 146
RETAINING WALL
PLAN & PROFILE
(WALL #4)

SHEET 4 OF 6

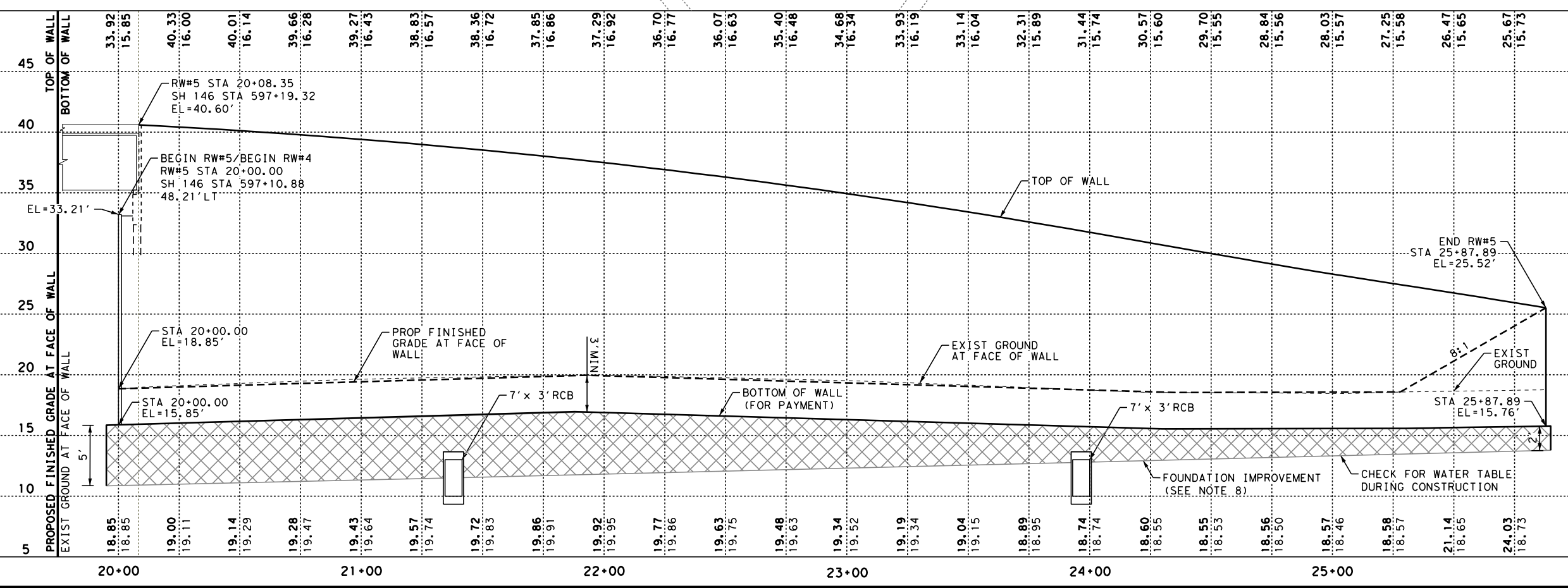
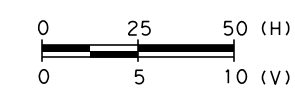
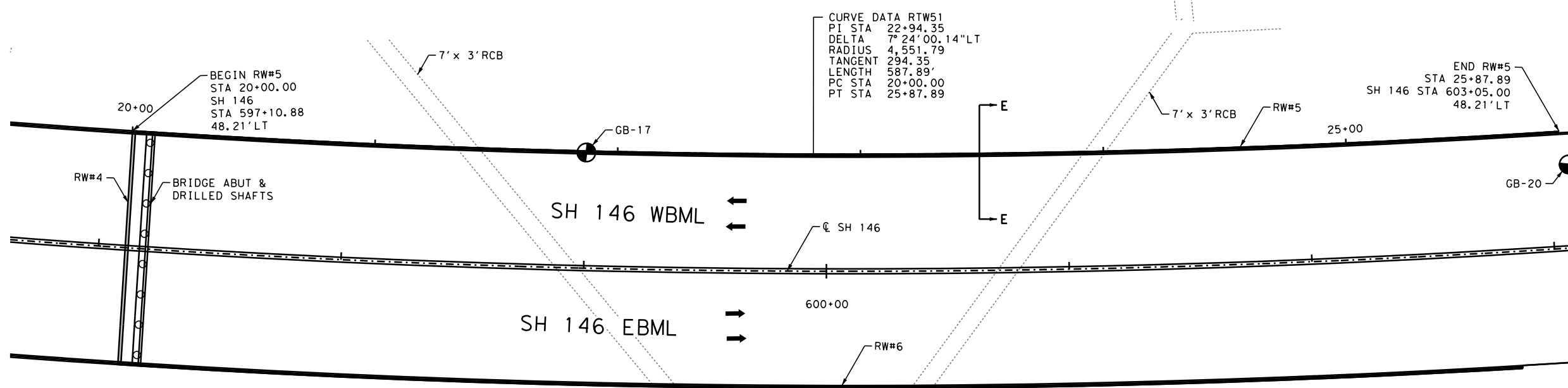
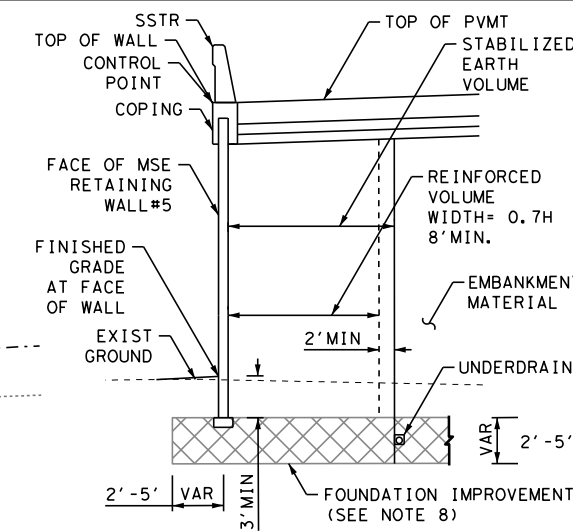
FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.	SHEET NO. 154
STATE TEXAS	DIST. HOU	COUNTY HARRIS
CONT. 0389	SECT. 13	JOB 039
		HIGHWAY NO. SH 146



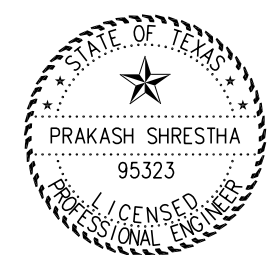
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NOTES:

- FOR HORIZONTAL ALIGNMENT INFORMATION SEE HORIZONTAL ALIGNMENT DATA SHEETS.
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- REFER TO "GEOTECHNICAL INVESTIGATION SH 146 FROM FERRY ROAD TO BS146E TXDOT WA#4" (REPORT# 1140244401) DATED MAY 20, 20 FOR MORE SOIL INFORMATION.
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REV. NO.	DATE	BY	REVISION



Prakash Shrestha, P.E.
1/6/2022

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

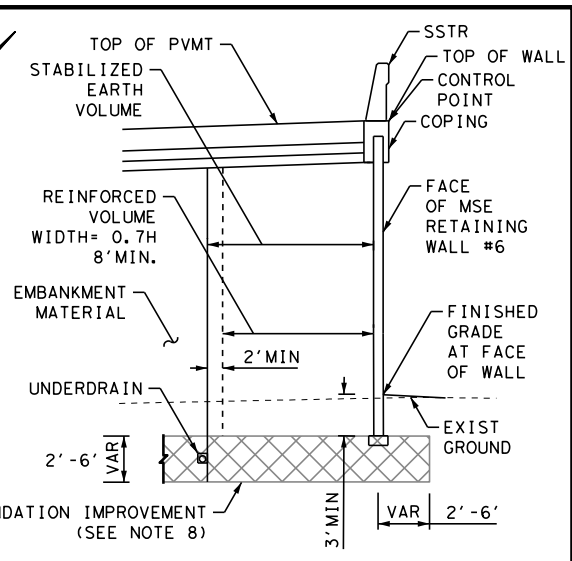
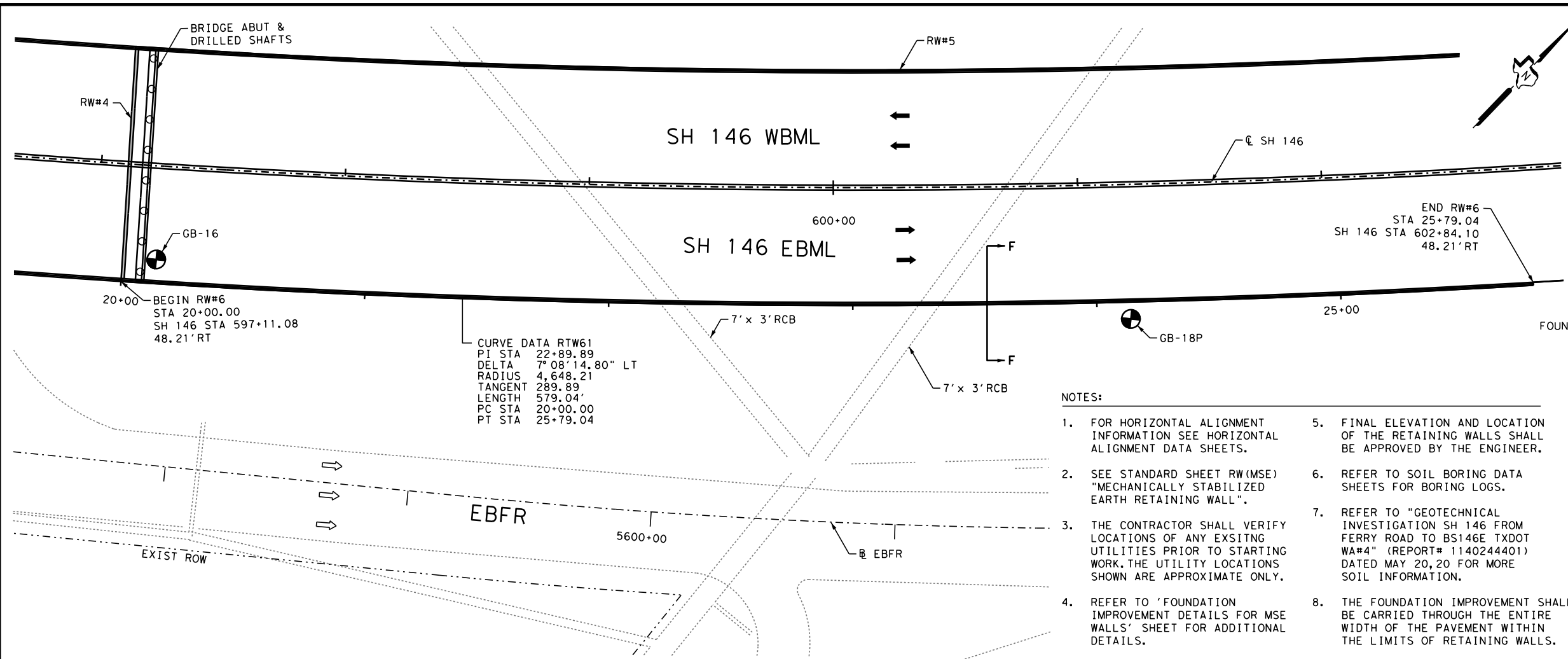


SH 146
RETAINING WALL
PLAN & PROFILE
(WALL #5)

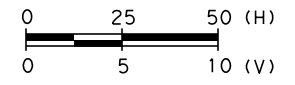
SHEET 5 OF 6

FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.		SHEET NO. 155
STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146

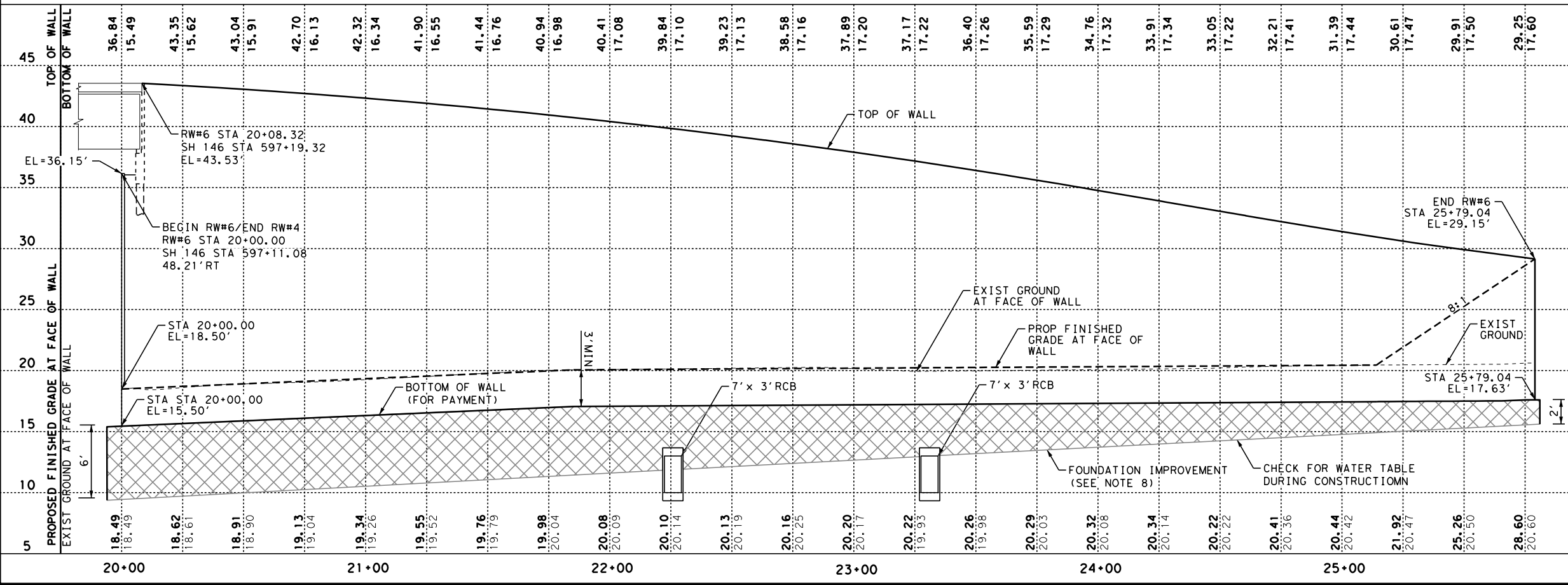
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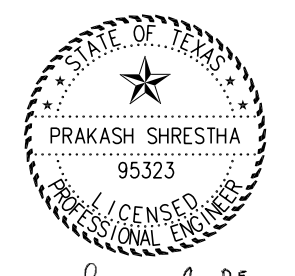
SECTION F-F
N. T. S.



- NOTES:
- FOR HORIZONTAL ALIGNMENT INFORMATION SEE HORIZONTAL ALIGNMENT DATA SHEETS.
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REV. NO.	DATE	BY	REVISION



1/6/2022

CivilTech Engineering, Inc.
11821 Telge Road
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PH: (281) 304-0200 - FX: (281) 304-0210
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SH 146
RETAINING WALL
PLAN & PROFILE
(WALL #6)

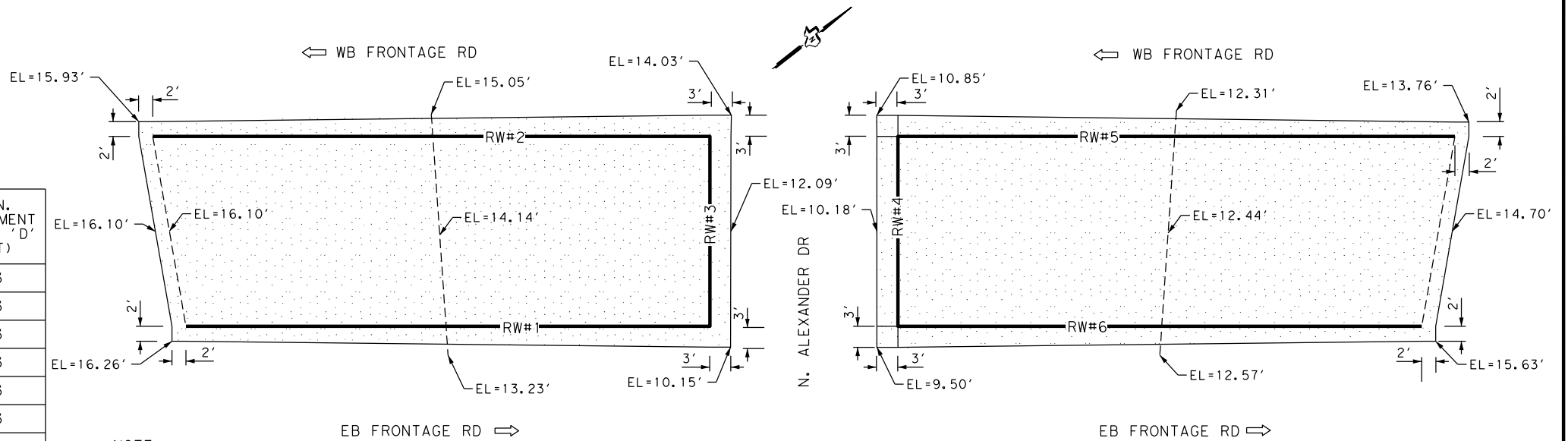
SHEET 6 OF 6

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.	
6		156	
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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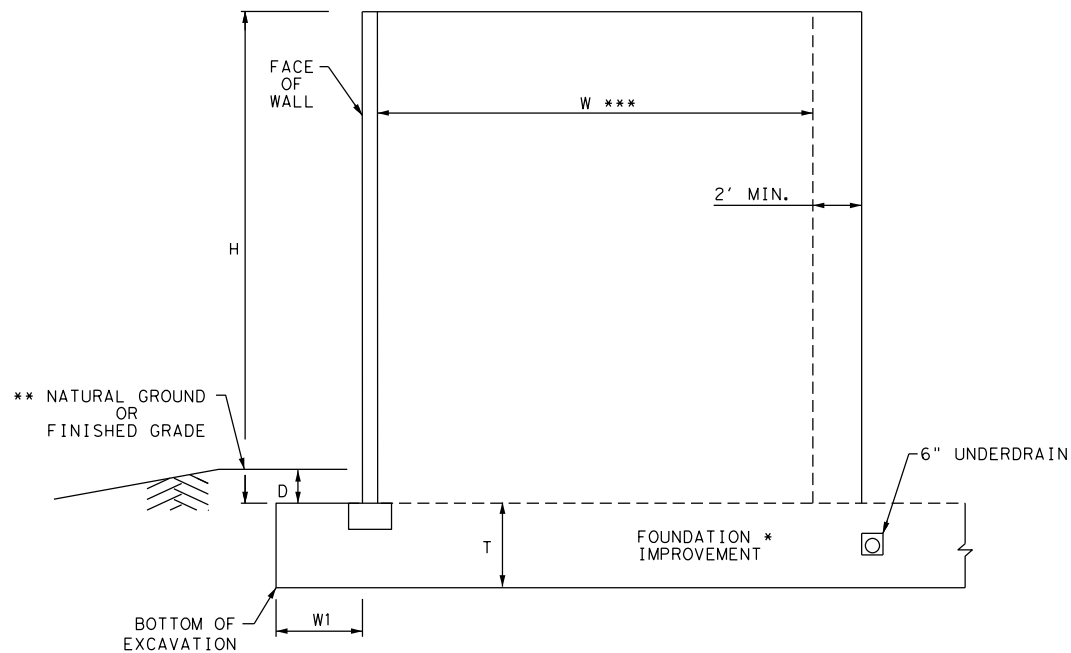
SH146 FROM BS146E TO FERRY RD

MSE WALL	SOIL BORINGS USED	WALL HEIGHT 'H' (FT)	WIDTH OF REINFORCED VOLUME 'W' (FT)	REQUIRED TOE WIDTH 'W1' (FT)	REQUIRED TOE THICKNESS 'T' (FT)	MIN. EMBEDMENT DEPTH 'D' (FT)
MSE WALL # 1 Sta: 588+52.50 to 594+.07.55	GB-12 THROUGH GB-15	26.5<H<=29.5	0.7H	3	6	3
		22<H<=26.5	0.7H	3	5	3
		19.5<H<=23	0.7H	3	4	3
		16<H<=19.5	0.7H	3	3	3
		8<H<=16	0.7H>=8	2	2	3
H<=8	8	0	0	3		
MSE WALL # 2 Sta: 588+54.81 to 594+.07.73	GB-12 THROUGH GB-15	20.5<H<=24.0	0.7H	3	4	3
		17.0<H<=20.5	0.7H	3	3	3
		8.0<H<=17.0	0.7H>=8	2	2	3
		H<=8	8	0	0	3
MSE WALL # 3	GB-14 & GB-15	23.0<H<=26.5	0.7H	3	4	3
		19.5<H<=23.0	0.7H	3	3	3
		16.0<H<=19.5	0.7H	3	2	3
		8<H<=16	0.7H>=8	2	2	3
H<=8	8	0	0	3		
MSE WALL # 4	GB-15 THROUGH GB-17	19.0<H<=22.5	0.7H	3	4	3
		15.0<H<=19.0	0.7H	3	3	3
		8<H<=15	0.7H>=8	2	2	3
		H<=8	8	0	0	3
MSE WALL # 5 Sta: 597+10.88 to 599+00	GB-16 & GB-17	22.5<H<=26.0	0.7H	3	4	3
		19.0<H<=22.5	0.7H	3	4	3
		17.0<H<=21.5	0.7H	3	4	3
		13.5<H<=17.0	0.7H>=8	3	3	3
		8<H<=13.50	0.7H>=8	2	2	3
H<=8	8	0	0	3		
MSE WALL # 6 Sta: 597+11.08 to 599+00	GB-16 & GB-17	26.0<H<=29.5	0.7H	3	6	3
		23.5<H<=26.0	0.7H	3	5	3
MSE WALL # 6 Sta: 599+00 to 602+87.11	GB-18 & GB-20	20.5<H<=23.5	0.7H	3	4	3
		18.0<H<=20.5	0.7H	3	3	3
		15.0<H<=18.0	0.7H	3	2	3
		8<H<=15	0.7H>=8	2	2	3
H<=8	8	0	0	3		



NOTE
ALL ELEVATIONS SHOWN ARE
BOTTOM OF THE EXCAVATION

LIMITS OF FOUNDATION IMPROVEMENT
N. T. S.



FOUNDATION IMPROVEMENT DETAIL
N. T. S.

WHERE:

- H - HEIGHT OF WALL, AS MEASURED FROM TOP OF WALL TO LEVELING PAD.
- W - WIDTH OF REINFORCED VOLUME.
- T - THICKNESS OF SOIL IMPROVEMENT, AS MEASURED FROM BOTTOM OF LEVELLING PAD.
- W1 - WIDTH OF SOIL IMPROVEMENT EXTENSION, AS MEASURED FROM FACE OF WALL.
- D - EMBEDMENT DEPTH

* FOUNDATION IMPROVEMENT SHOULD CONSIST OF CEMENT-STABILIZED BACKFILL (WITH MIN. 5% CEMENT) OR CRUSHED RECYCLED CONCRETE. THE IMPROVEMENT SHALL BE CARRIED OUT ALL ACROSS (FULL WIDTH) THE ROADWAY.

** WHICHEVER IS LOWER.

*** MINIMUM WIDTH OF REINFORCED VOLUME SHALL NOT BE LESS THAN 8 FT.

NOTES:

1. THE WALL HEIGHTS ARE MEASURED FROM TOP OF WALL TO TOP OF LEVELLING PAD.
2. MINIMUM WIDTH OF REINFORCED VOLUME SHOULD BE 8 FT.

REV. NO.	DATE	BY	REVISION

PRAKASH SHRESTHA
95323
LICENSED PROFESSIONAL ENGINEER

Prakash Shrestha, P.E.
2/28/2022

CivilTech Engineering, Inc. 11821 Telge Road
Cypress, Texas 77429
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Firm Registration No. F-382

Texas Department of Transportation

SH 146

FOUNDATION IMPROVEMENT DETAILS FOR MSE WALLS

SHEET 1 OF 1

FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.	SHEET NO. 157
STATE TEXAS	DIST. HOU	COUNTY HARRIS
CONT. 0389	SECT. 13	JOB 039
		HIGHWAY NO. SH 146

SH 146 SOUND WALL

Chain NW4 contains:
1010 1011 1012 1013

Beginning chain NW4 description

Point 1010 N 13,846,192.9703 E 3,256,342.5847 Sta 10+00.00

Course from 1010 to 1011 N 78° 03' 19.54" E Dist 528.0205

Point 1011 N 13,846,302.2523 E 3,256,859.1727 Sta 15+28.02

Course from 1011 to 1012 N 71° 06' 04.03" E Dist 150.0522

Point 1012 N 13,846,350.8540 E 3,257,001.1358 Sta 16+78.07

Course from 1012 to 1013 N 78° 10' 55.29" E Dist 738.0002

Point 1013 N 13,846,501.9988 E 3,257,723.4927 Sta 24+16.07

Ending chain NW4 description

REV. NO.	DATE	BY	REVISION



Prakash Shrestha, P.E.
1/6/2022

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Cypress, Texas 77429
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Firm Registration No. F-382



SH 146
SOUND WALL

HORIZONTAL
ALIGNMENT
DATA

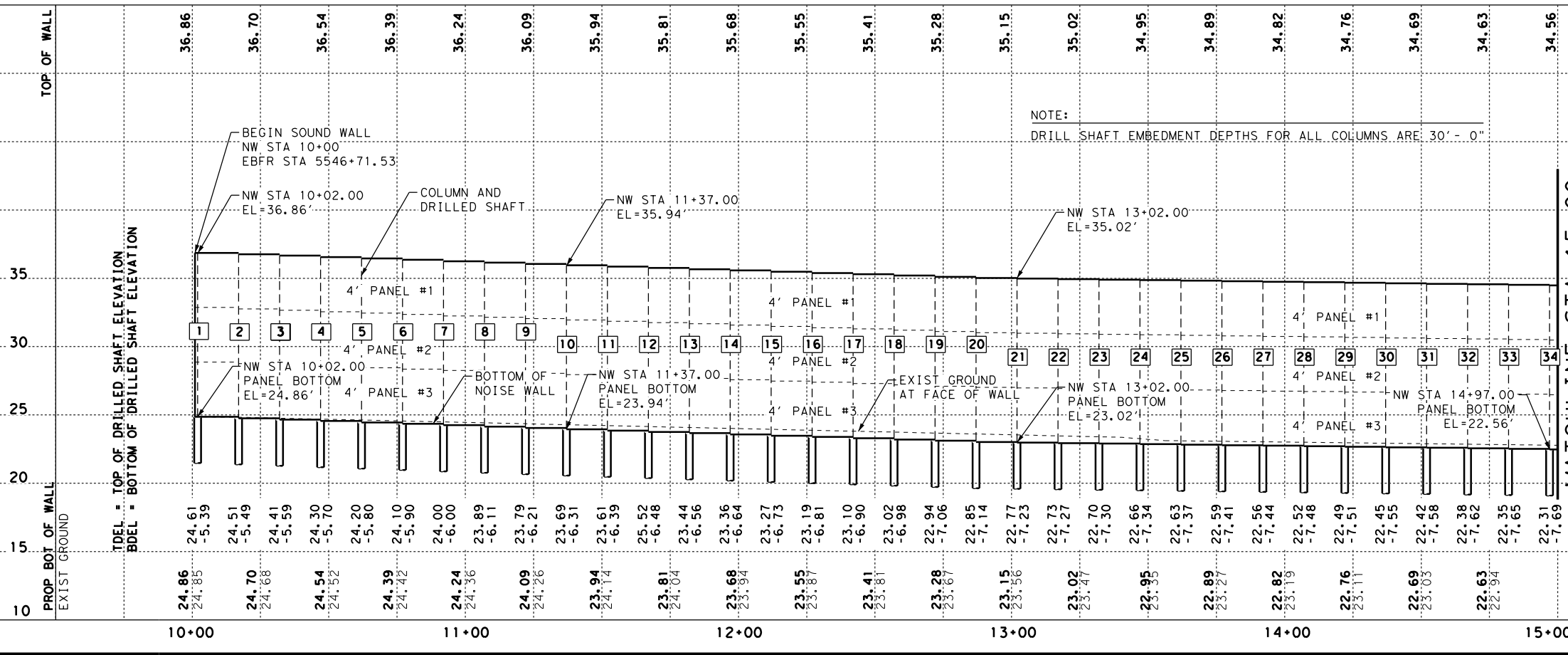
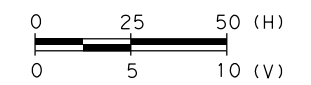
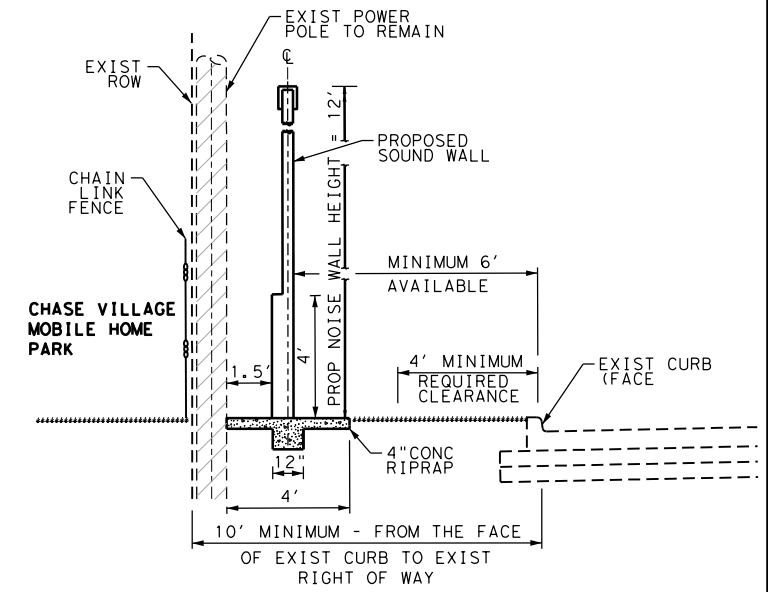
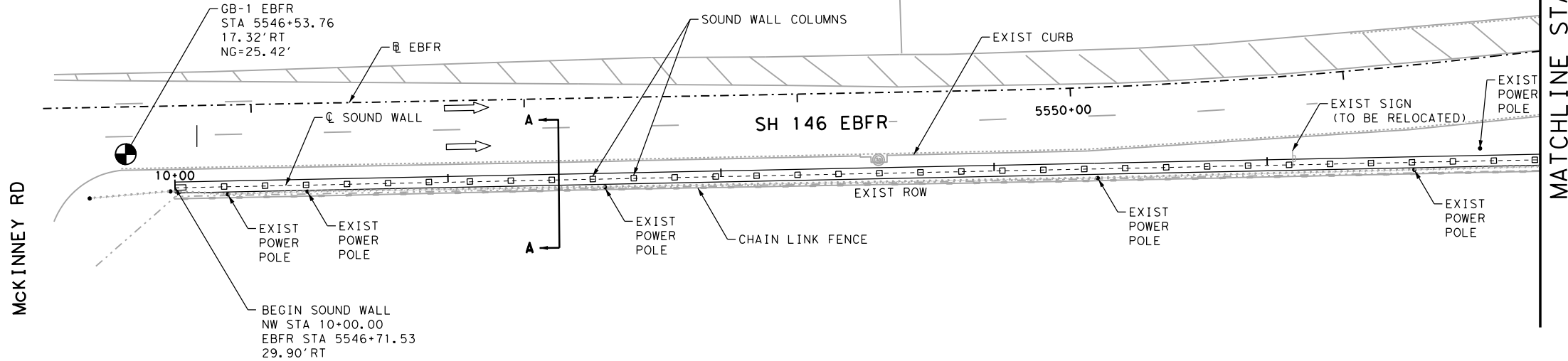
SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			158
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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NOTES:

- FOR SOUND WALL COLUMN AND PANEL DETAILS SEE SOUND WALL STANDARD DETAILS "SWD=WS".
- SEE GEOTECH REPORT FOR ADDITIONAL BORING INFORMATION.
- SHOP DRAWINGS SHALL LAYOUT INDIVIDUAL PANELS.
- CONTRACTOR SHALL LOCATE ALL EXISTING UTILITIES IN CLOSE PROXIMITY TO THE SOUND WALL AND INFORM ENGINEER IN WRITING OF ANY CONFLICTS PRIOR TO FABRICATION OF PANELS AND BEGINNING CONSTRUCTION ON SOUND WALL.
- UNLESS OTHERWISE DIRECTED BY THE ENGINEER IN WRITING, THE WALL TEXTURE SHALL BE 'ASHLAR STONE' FINISH
- UNLESS OTHERWISE DIRECTED BY THE ENGINEER IN WRITING, THE BARRIER SHALL RECEIVE ANTI-GRAFFITI 'SOFTER TAN' SHERWIN WILLIAMS PAINT. THE COST OF PAINTING IS SUBSIDIARY TO THE WALL CONSTRUCTION. THE CONTRACTOR IS REQUIRED TO SUBMIT A PAINTED SAMPLE ON A SIMILAR SURFACE, AT LEAST TWO WEEKS PRIOR TO THE COMMENCEMENT OF THE WORK, FOR APPROVAL BY THE ENGINEER.



NOTE:
DRILL SHAFT EMBEDMENT DEPTHS FOR ALL COLUMNS ARE 30' - 0"

REV NO.	DATE	BY	REVISION

Prakash Shrestha, P.E.
4/5/2022

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Firm Registration No. F-382

Texas Department of Transportation
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SH 146
SOUND WALL
PLAN & PROFILE

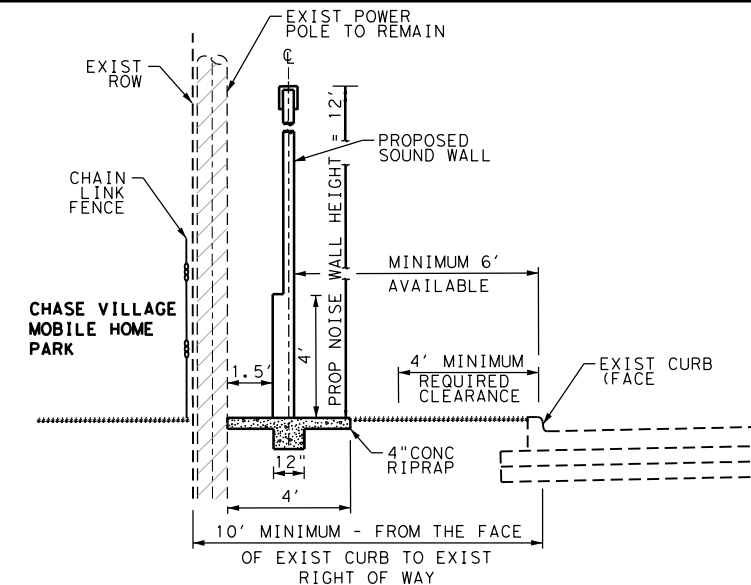
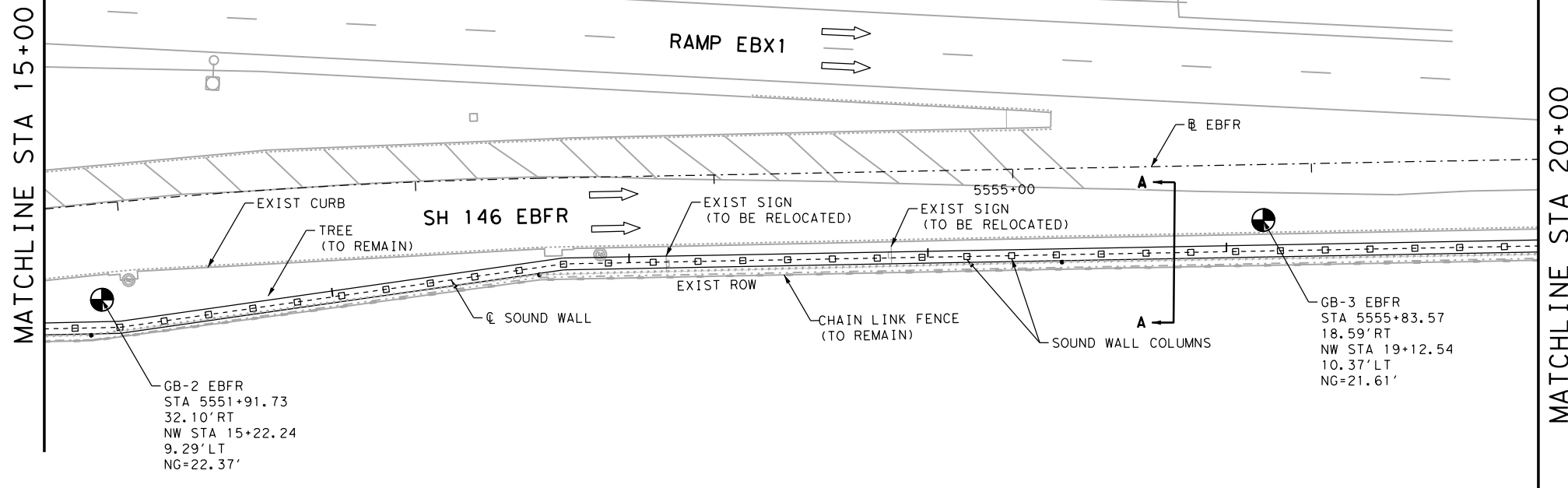
SHEET 1 OF 3

FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.		SHEET NO. 159
STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146

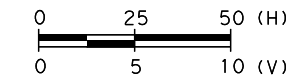
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NOTES:

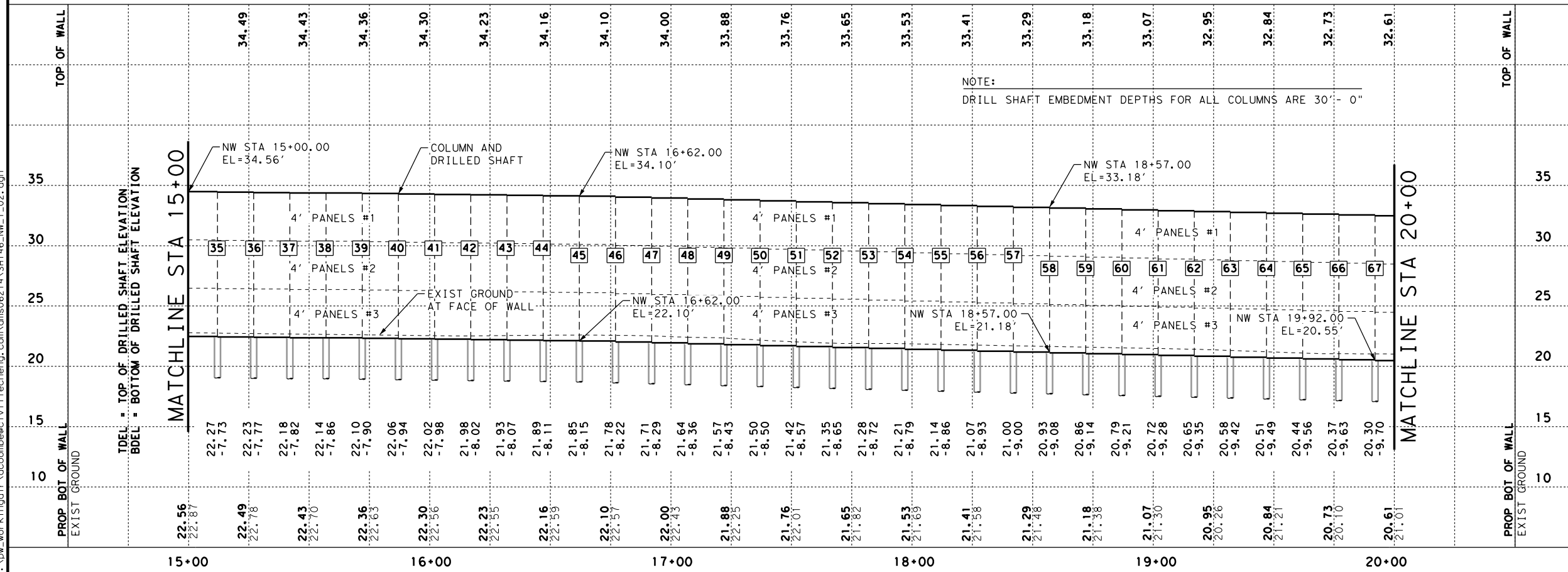
- FOR SOUND WALL COLUMN AND PANEL DETAILS SEE SOUND WALL STANDARD DETAILS "SWD=WS".
- SEE GEOTECH REPORT FOR ADDITIONAL BORING INFORMATION.
- SHOP DRAWINGS SHALL LAYOUT INDIVIDUAL PANELS.
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- UNLESS OTHERWISE DIRECTED BY THE ENGINEER IN WRITING, THE WALL TEXTURE SHALL BE 'ASHLAR STONE' FINISH
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A-A SECTION
N. T. S.



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NOTE:
DRILL SHAFT EMBEDMENT DEPTHS FOR ALL COLUMNS ARE 30'-0"

REV. NO.	DATE	BY	REVISION

PRAKASH SHRESTHA
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4/5/2022

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Firm Registration No. F-382

Texas Department of Transportation

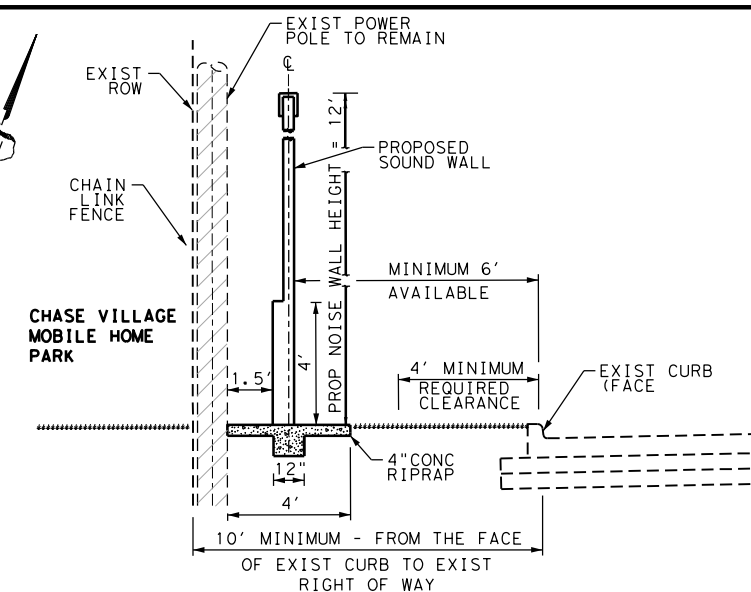
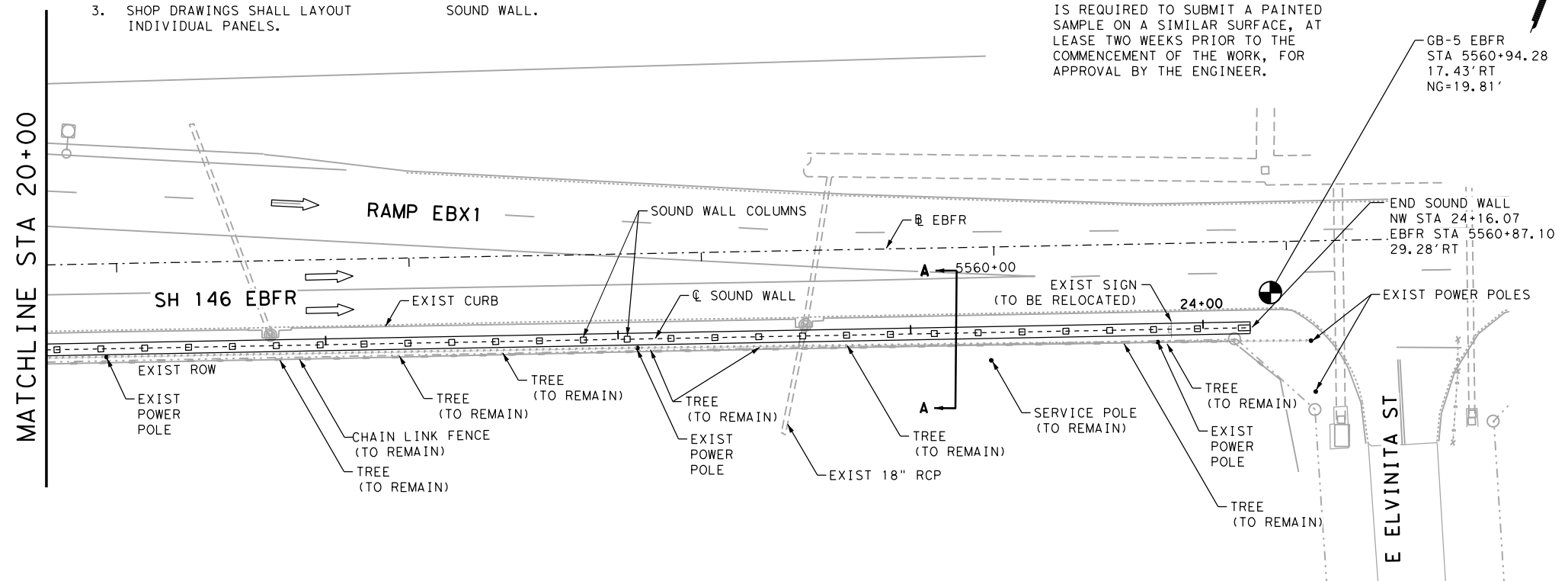
SH 146
SOUND WALL
PLAN & PROFILE

SHEET 2 OF 3

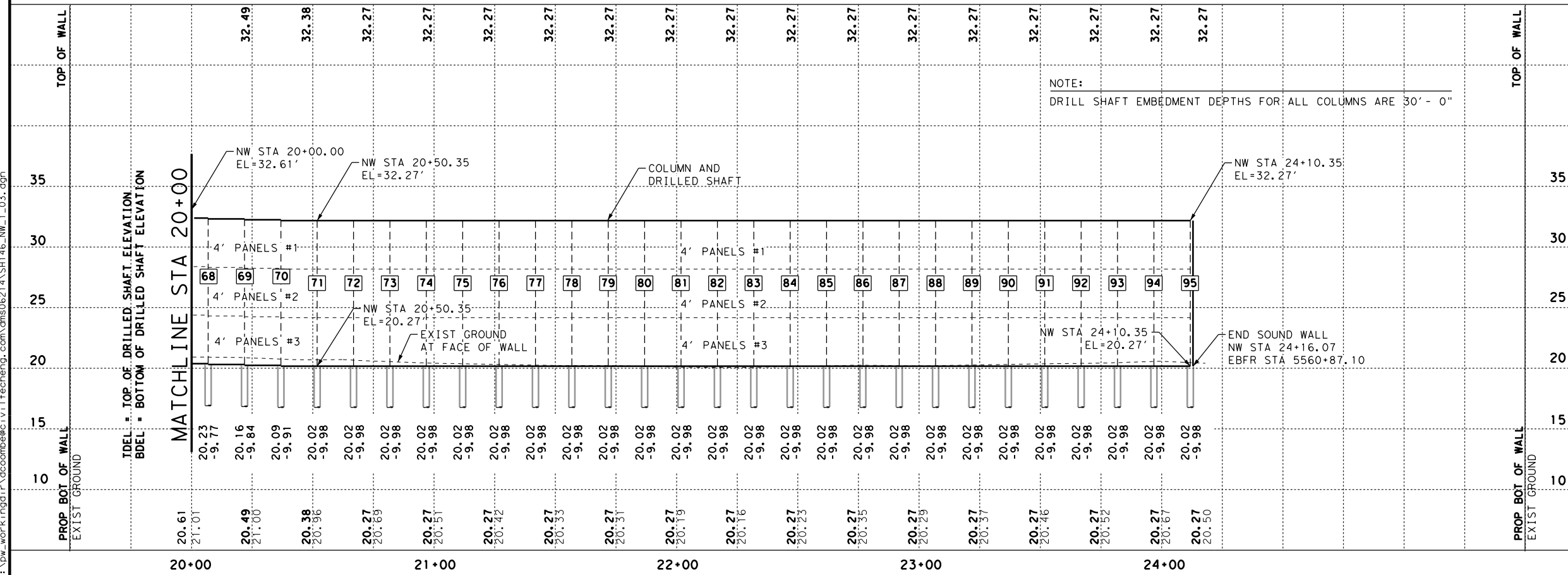
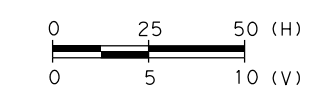
FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.		SHEET NO. 160
STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146

NOTES:

- FOR SOUND WALL COLUMN AND PANEL DETAILS SEE SOUND WALL STANDARD DETAILS "SWD=WS".
- SEE GEOTECH REPORT FOR ADDITIONAL BORING INFORMATION.
- SHOP DRAWINGS SHALL LAYOUT INDIVIDUAL PANELS.
- CONTRACTOR SHALL LOCATE ALL EXISTING UTILITIES IN CLOSE PROXIMITY TO THE SOUND WALL AND INFORM ENGINEER IN WRITING OF ANY CONFLICTS PRIOR TO FABRICATION OF PANELS AND BEGINNING CONSTRUCTION ON SOUND WALL.
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- UNLESS OTHERWISE DIRECTED BY THE ENGINEER IN WRITING, THE BARRIER SHALL RECEIVE ANTI-GRAFFITI 'SOFTER TAN' SHERWIN WILLIAMS PAINT. THE COST OF PAINTING IS SUBSIDIARY TO THE WALL CONSTRUCTION. THE CONTRACTOR IS REQUIRED TO SUBMIT A PAINTED SAMPLE ON A SIMILAR SURFACE, AT LEAST TWO WEEKS PRIOR TO THE COMMENCEMENT OF THE WORK, FOR APPROVAL BY THE ENGINEER.



A-A SECTION
N. T. S.



REV. NO.	DATE	BY	REVISION

PRAKASH SHRESTHA
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4/5/2022

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Firm Registration No. F-382

Texas Department of Transportation

SH 146

SOUND WALL
PLAN & PROFILE

SHEET 3 OF 3

FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.		SHEET NO. 161
STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146

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DRILLING LOG

1 of 1

WinCore
Version 3.3

County Harris
Highway SH 146
CSJ 0389-13-039

Hole GB-12
Structure Retaining Wall
Station 587+90.3
Offset 67.94' RT

District Houston
Date 06-11-19
Grnd. Elev. 21.06 ft
GW Elev. N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties			Additional Remarks	
				Lateral Press. (psi)	Deviator Stress (psi)	MC	LL	PI		Wet Den. (pcf)
19.1			FILL, clay, dark gray and gray			27.3			w/grass roots, gravel and oyster shell 0'-2'	
			CLAY, soft to stiff, dark gray w/ferrous nodules (CH)			27.9			w/roots 2'-4'	
5		3 (6) 4 (6)		5	22	24.9	65	43	128.4	gray 4'-8' very soft 5'-6.5' gray and yellow 6'-15' w/ferrous stains 6'-20' w/calcareous nodules 7'-10'
				8	20	25.6	69	44	124.6	
10		5 (6) 6 (6)				23.9				
				13	16	26.9	62	40	126.7	
15		5 (6) 6 (6)				29.2				brown and gray 15'-21'
				18	16	31.3	84	55	122.1	
20		9 (6) 25 (6)				31.4				
.1			CLAY, silty, sandy, brown and gray (CL-ML)			22.7	22	5		w/silty sand 21.5'-22' % passing #200 sieve = 81% w/sand partings 23'-25'
-1.9		5 (6) 6 (6)	CLAY, soft to stiff, brown and gray w/ferrous nodules and ferrous stains (CH)			30.2				
				0	20	32.0	88	55	121.1	
25		5 (6) 6 (6)				35.2				
				0	17	32.4	91	61	122.4	
30		5 (6) 7 (6)				31.9				
-13.9		7 (6) 8 (6)								
35										
40										
45										
50										
55										
60										

Remarks: 1) Dry auger to 21.0 ft., wet rotary from 21.0 to 35.0 ft. 2) Free water first encountered at 21.0 ft. during drilling; after 20 min. at 12.6 ft.

The ground water elevation was not determined during the course of this boring.

Driller: Dempsey Gearen

Logger: John A. Gentry

Organization: Geotest Engineering, Inc.

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FIGURE A-12



DRILLING LOG

1 of 1

WinCore
Version 3.3

County Harris
Highway SH 146
CSJ 0389-13-039

Hole GB-13
Structure Retaining Wall
Station 590+17.25
Offset 37.25' LT

District Houston
Date 06-04-19
Grnd. Elev. 21.93 ft
GW Elev. N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties			Additional Remarks		
				Lateral Press. (psi)	Deviator Stress (psi)	MC	LL	PI		Wet Den. (pcf)	
16.9			FILL, clay, very stiff, brown and gray			19.7			w/grass roots 0'-2' w/gravel 0'-2.5'		
				3	34	20.7	58	35	128.4		
5		2 (6) 3 (6)				23.5					
			CLAY, very soft to stiff, yellowish brown and gray w/ferrous nodules and ferrous stains (CH)			8	22	23.5	69	44	127.3
11.9		6 (6) 7 (6)				24.0				w/calcareous nodules 9'-10'	
			CLAY, silty, soft to stiff, gray and yellowish brown w/sand and silt seams, calcareous and ferrous nodules and ferrous stains (CL)			15	21	21.4	47	26	130
6.9		6 (6) 8 (6)				26.6				w/ferrous nodules and ferrous stains 15'-23'	
			CLAY, soft to stiff, yellowish brown and gray (CH)			0	23	26.5	85	55	127
20		4 (6) 7 (6)				25.4				w/calcareous nodules 19'-25'	
				25	26	23.6	53	31	127.2	w/sand and silt seams at 25'	
25		6 (6) 6 (6)				29.6				w/ferrous stains 28'-33'	
				0	14	32.1	89	57	121.1		
30		6 (6) 9 (6)				32.7					
				35	24	35.5	87	56	120.8		
35		8 (6) 9 (6)				35.9					
				0	25	38.8	103	67	118		
40		9 (6) 10 (6)				38.2					
				45	20	39.6	105	68	117.4		
-23.1		11 (6) 14 (6)									
45											
50											
55											
60											

Remarks: 1) Dry auger to 25.0 ft., wet rotary from 25.0 to 45.0 ft. 2) Free water first encountered at 25.0 ft. during drilling; after 20 min. at 14.0 ft.

The ground water elevation was not determined during the course of this boring.

Driller: Dempsey Gearen

Logger: John A. Gentry

Organization: Geotest Engineering, Inc.

C:\Jobs\1140244401\1140244401_Retaining Wall_GB-12,13,14,17,18,20,21.CLG

FIGURE A-13

NOTES:

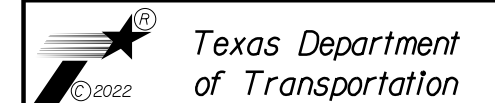
- CONTRACTOR SHALL REFER TO GEOTECHNICAL REPORT PREPARED BY GEOTEST ENGINEERING, INC., DATED MAY 29, 2020 (GEOTECH REPORT# 140244401) FOR ADDITIONAL INFORMATION.
- BORING LOGS PROVIDED HERE WERE TAKEN DIRECTLY FROM THE GEOTECHNICAL REPORT IDENTIFIED IN NOTE #1.

REV. NO.	DATE	BY	REVISION



Prakash Shrestha, P.E.
1/12/2022

CivilTech Engineering, Inc.
11821 Telge Road
Cypress, Texas 77429
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Firm Registration No. F-382



SH 146

RETAINING WALL
BORING LOGS

SHEET 1 OF 5

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			162
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146



DRILLING LOG

1 of 1

WinCore
Version 3.3

County Harris
Highway SH 146
CSJ 0389-13-039

Hole GB-14P
Structure Retaining Wall
Station 592+46.6
Offset 45.12' RT

District Houston
Date 06-11-19
Grnd. Elev. 20.18 ft
GW Elev. N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties				Additional Remarks
				Lateral Press. (psi)	Deviator Stress (psi)	MC	LL	PI	Wet Den. (pcf)	
16.2			FILL, clay, dark gray and brown w/ oyster shell and gravel			20.2				w/grass roots 0'-2' dark gray and gray 2'-5'
		3 (6) 4 (6)				22.9				
5			CLAY, very soft to very stiff, dark gray and brown w/ferrous nodules (CH)	5	26	21.7	53	31	126.8	
		4 (6) 4 (6)				22.8				w/ferrous stains 8'-10' gray and yellow 8'-11' w/calcareous nodules 8'-13' dark gray, gray and yellow 11'-13' w/sand seams 11.75'-12' % passing #200 sieve = 33%
10				10	29	22.8	67	41	131.8	
7.2			SAND, clayey, loose, yellow and gray (SC)			28.2				
		3 (6) 4 (6)		15	5	24.3	27	9	129.4	% passing #200 sieve = 17%
3.7			SAND, silty, dense, dark gray and gray (SM)			27.2				% passing #200 sieve = 12%
		50 (5) 50 (3)				22.5				
20						23.5				
4.8			CLAY, soft to stiff, yellowish brown and gray w/ferrous nodules (CH)	30	25	34.3	95	61	121.6	
		8 (6) 9 (6)				32.9				
30				0	24	38.0	104	69	119.1	
		5 (6) 7 (6)				35.5				brown and gray 36.5'-50'
35				0	26	39.6	107	70	117.4	
		5 (6) 8 (6)				44.1				very stiff 43'-45'
40				45	28	44.6	108	72	114.7	
		6 (6) 7 (6)				40.2				
45				0	25	40.4	102	86	116.5	
		9 (6) 10 (6)								
50										
		8 (6) 11 (6)								
55										
60										

Remarks: 1) Dry auger to 15.0 ft., wet rotary from 15.0 to 50.0 ft. 2) Free water first encountered at 15.0 ft. during drilling; after 20 min. at 8.08 ft. 3) Water depth at 8.6 ft.; hole open to 50.0 ft. on 7-16-19.

The ground water elevation was not determined during the course of this boring.

Driller: Dempsey Gearen Logger: John A. Gentry Organization: Geotest Engineering, Inc.

C:\Jobs\1140244401\1140244401_Retaining Wall_GB-12,13,14,17,18,20,21 CLG

FIGURE A-14



DRILLING LOG

1 of 2

WinCore
Version 3.3

County Harris
Highway SH 146
CSJ 0389-13-039

Hole GB-15
Structure Bridge
Station 594+02.75
Offset 57.0' LT

District Houston
Date 06-04-19
Grnd. Elev. 20.64 ft
GW Elev. N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties				Additional Remarks
				Lateral Press. (psi)	Deviator Stress (psi)	MC	LL	PI	Wet Den. (pcf)	
15.6			FILL, clay, stiff, yellowish brown and gray			22.2				w/gravel, roots and sand seams 0'-2' dark gray w/shell 2'-3' w/calcareous and ferrous nodules 3'-5'
		3 (6) 3 (6)		3	22	19.8	50	29	129.2	
5			CLAY, very soft to stiff, gray and brown w/ferrous nodules (CH)			23.9				gray & yellowish brown 8'-15'
		3 (6) 4 (6)		8	15	30.6	76	48	120.9	
10						28.2				w/ferrous stains 11'-21' w/calcareous nodules 13'-15' brown and gray 15'-45'
		3 (6) 4 (6)		13	16	29.0	74	46	123.7	
15						28.7				
		3 (6) 4 (6)				23.1				
20				20	12	31.9	91	58	123.2	
		5 (6) 6 (6)				24.7				w/calcareous nodules 22'-25'
25				25	19	26.4	74	47	129.6	
		4 (6) 7 (6)				32.4				w/ferrous stains 28'-42'
30				30	19	35.5	102	67	121.6	
		4 (6) 6 (6)				35.6				very stiff 33'-35'
35				0	30	36.1	103	67	120.3	
		3 (6) 6 (6)				38.2				
40				0	21	39.9	103	68	115.3	
		5 (6) 7 (6)				43.5				
45				0	27	41.4	113	75	114.5	
		7 (6) 9 (6)				40.8				gray and brown 45'-48'
50				50	24	41.8	109	72	115.01	
		4 (6) 6 (6)				44.8				gray 48'-50'
55				0	23	35.6	90	57	119.7	
		6 (6) 10 (6)				41.2				
60				60	26	41.0	96	62	116.2	
		5 (6) 8 (6)								

Remarks: 1) Dry auger to 36.0 ft., wet rotary from 36.0 to 80.0 ft.

The ground water elevation was not determined during the course of this boring.

Driller: Dempsey Gearen Logger: John A. Gentry Organization: Geotest Engineering, Inc.

C:\Jobs\1140244401\1140244401_Bridge_GB-15,16 CLG

FIGURE A-15

NOTES:

- CONTRACTOR SHALL REFER TO GEOTECHNICAL REPORT PREPARED BY GEOTEST ENGINEERING, INC., DATED MAY 29, 2020 (GEOTECH REPORT# 140244401) FOR ADDITIONAL INFORMATION.
- BORING LOGS PROVIDED HERE WERE TAKEN DIRECTLY FROM THE GEOTECHNICAL REPORT IDENTIFIED IN NOTE #1.

REV. NO.	DATE	BY	REVISION

PRAKASH SHRESTHA
95323
PROFESSIONAL ENGINEER
1/12/2022

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

Texas Department of Transportation

SH 146

RETAINING WALL BORING LOGS

SHEET 2 OF 5

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			163
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146



DRILLING LOG

2 of 2

WinCore
Version 3.3

County Harris
Highway SH 146
CSJ 0389-13-039

Hole GB-15
Structure Bridge
Station 594+02.75
Offset 57.0' LT

District Houston
Date 06-04-19
Grnd. Elev. 20.64 ft
GW Elev. N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties				Additional Remarks	
				Lateral Press. (psi)	Deviator Stress (psi)	MC	LL	PI	Wet Den. (pcf)		
65		6 (6) 8 (6)	CLAY, very soft to stiff, gray and brown w/ferrous nodules (CH)	0	30	32.7	30.6	73	45	125.9	very stiff 63'-65' w/calcareous nodules 63'-68' w/roots 64'-65'
-47.4		50 (5) 50 (3)	CLAY, sandy, stiff, gray and brown (CL)	70	17	26.2	21.8	38	20	128.1	w/sand pockets at 68' w/sand seams and ferrous stains 68'-70'
-49.4		19 (6) 22 (6)	SAND, POORLY GRADED WITH SILT, slightly compact to dense, gray (SP-SM)			16.0					% passing #200 sieve = 9%
75		9 (6) 13 (6)				15.7					w/pea gravel at 76'

Remarks: 1) Dry auger to 36.0 ft., wet rotary from 36.0 to 80.0 ft.

The ground water elevation was not determined during the course of this boring.

Driller: Dempsey Gearen

Logger: John A. Gentry

Organization: Geotest Engineering, Inc.

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FIGURE A-15a



DRILLING LOG

1 of 2

WinCore
Version 3.3

County Harris
Highway SH 146
CSJ 0389-13-039

Hole GB-16
Structure Bridge
Station 597+24.9
Offset 38.2' RT

District Houston
Date 06-03-19
Grnd. Elev. 19.04 ft
GW Elev. N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties				Additional Remarks		
				Lateral Press. (psi)	Deviator Stress (psi)	MC	LL	PI	Wet Den. (pcf)			
17		2 (6) 3 (6)	FILL, clay, gray w/gravel and ferrous stains	4	17	22.0	32.0	82	51	118.9		
5		3 (6) 4 (6)	CLAY, very soft to stiff, dark gray, w/ferrous nodules (CH)			31.3					w/calcareous nodules 6.5'-20'	
10		3 (6) 4 (6)				27.6					yellowish gray 11.5'-15'	
15		3 (6) 4 (6)				25.2					w/ferrous stains 13'-18'	
15		3 (6) 4 (6)				15	16	26.1	82	51	126.4	gray 15'-25'
20		5 (6) 6 (6)				34.9						
20		5 (6) 6 (6)				0	6	33.1	87	55	124.4	w/ferrous stains 23'-25'
25		6 (6) 7 (6)				29.4						
25		6 (6) 7 (6)				34.4						
28		6 (6) 7 (6)				28	13	36.8	96	63	119.7	gray and brown 25'-41.5'
30		6 (6) 7 (6)				35.5						
35		6 (6) 8 (6)				0	13	38.9	101	66	119	w/ferrous stains 41.5'-43'
35		6 (6) 8 (6)				38.9						
38		6 (6) 10 (6)				38	25	39.8	111	73	116.3	gray 41.5'-60'
40		6 (6) 10 (6)				41.8						
43		5 (6) 7 (6)				43	23	46.2	120	80	112.9	
45		4 (6) 7 (6)				41.2						
45		4 (6) 7 (6)				48	17	46.2	106	69	111.9	
50		6 (6) 6 (6)				36.7						
55		6 (6) 6 (6)				38.6						
55		6 (6) 6 (6)				55	24	39.6	95	61	115.7	
60		5 (6) 7 (6)				38.7						
60		5 (6) 7 (6)				0	32	28.4	60	35	126	

Remarks: 1) Dry auger to 40.0 ft., wet rotary from 40.0 to 80.0 ft.

The ground water elevation was not determined during the course of this boring.

Driller: Dempsey Gearen

Logger: Gazi Saif Uddin

Organization: Geotest Engineering, Inc.

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FIGURE A-16

NOTES:

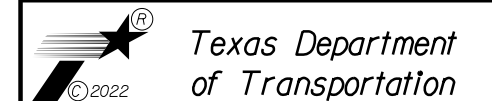
- CONTRACTOR SHALL REFER TO GEOTECHNICAL REPORT PREPARED BY GEOTEST ENGINEERING, INC., DATED MAY 29, 2020 (GEOTECH REPORT# 140244401) FOR ADDITIONAL INFORMATION.
- BORING LOGS PROVIDED HERE WERE TAKEN DIRECTLY FROM THE GEOTECHNICAL REPORT IDENTIFIED IN NOTE #1.

REV. NO.	DATE	BY	REVISION



Prakash Shrestha, P.E.
1/12/2022

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



SH 146

RETAINING WALL BORING LOGS

SHEET 3 OF 5

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			164
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146



DRILLING LOG

2 of 2

WinCore
Version 3.3

County Harris
Highway SH 146
CSJ 0389-13-039

Hole GB-16
Structure Bridge
Station 597+24.9
Offset 38.2' RT

District Houston
Date 06-03-19
Grnd. Elev. 19.04 ft
GW Elev. N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties				Additional Remarks
				Lateral Press. (psi)	Deviator Stress (psi)	MC	LL	PI	Wet Den. (pcf)	
-44.0			CLAY, sandy, soft to very stiff (CL)	63	29	23.1	37	19	130.2	dark gray w/ferrous nodules 60'-61.5'
65.0		7 (6) 13 (6)	SAND, silty, slightly compact to compact, gray (SM)			25.0				gray w/ferrous nodules and ferrous stains 61.5'-63'
70.0		12 (6) 20 (6)				20.1				% passing #200 sieve = 18%
75.0		16 (6) 26 (6)				21.2				
-59.0			SAND, POORLY GRADED WITH SILT, dense, gray (SP-SM)			15.1				w/pea gravel 78.5'-80'
-61.0		33 (6) 49 (6)								% passing #200 sieve = 9%

Remarks: 1) Dry auger to 40.0 ft., wet rotary from 40.0 to 80.0 ft.

The ground water elevation was not determined during the course of this boring.

Driller: Dempsey Gearen

Logger: Gazi Saif Uddin

Organization: Geotest Engineering, Inc.

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FIGURE A-16a



DRILLING LOG

1 of 1

WinCore
Version 3.3

County Harris
Highway SH 146
CSJ 0389-13-039

Hole GB-17
Structure Retaining Wall
Station 598+99.3
Offset 48.3' LT

District Houston
Date 06-12-19
Grnd. Elev. 20.00 ft
GW Elev. N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties				Additional Remarks	
				Lateral Press. (psi)	Deviator Stress (psi)	MC	LL	PI	Wet Den. (pcf)		
18.0			FILL, clay, dark gray w/roots (CH)			18.4				w/oyster shell & gravel 0'-2'	
5.0		3 (6) 3 (6)	CLAY, very soft to stiff, dark gray w/ferrous nodules and ferrous stains (CH)	4	19	25.5	60	36	123.9	gray and yellow w/calcareous nodules 5'-10'	
10.0		3 (6) 3 (6)				28.0					
15.0		4 (6) 5 (6)				25.7				yellowish brown and gray 10'-15'	
20.0		5 (6) 6 (6)				13	11	35.5	86	55	118.4
25.0		6 (6) 6 (6)				34.4					
30.0		6 (6) 7 (6)				18	16	32.9	85	55	120.4
35.0		5 (6) 6 (6)				32.4					
40.0		6 (6) 8 (6)				0	17	30.6	91	59	121.6
45.0		7 (6) 8 (6)				28.7					
50.0		7 (6) 8 (6)				28	17	34.0	90	57	120.4
55.0						34.8					
60.0						0	28	33.5	107	71	119.3
						36.8					
						0	22	38.2	108	71	120.5
						40.5					
						0	26	43.4	119	80	113.5
						36.3					
						39.1					
						50	24	41.6	118	79	114.4

Remarks: 1) Dry auger to 20.0 ft., wet rotary from 20.0 to 50.0 ft.

The ground water elevation was not determined during the course of this boring.

Driller: Dempsey Gearen

Logger: John A. Gentry

Organization: Geotest Engineering, Inc.

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FIGURE A-17

NOTES:

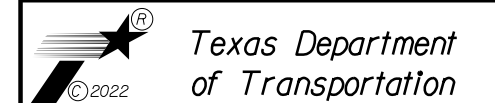
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- BORING LOGS PROVIDED HERE WERE TAKEN DIRECTLY FROM THE GEOTECHNICAL REPORT IDENTIFIED IN NOTE #1.

REV. NO.	DATE	BY	REVISION



1/12/2022

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



SH 146

RETAINING WALL
BORING LOGS

SHEET 4 OF 5

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			165
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146



DRILLING LOG

1 of 1

WinCore
Version 3.3

County Harris
Highway SH 146
CSJ 0389-13-039

Hole GB-18P
Structure Retaining Wall
Station 601+20.6
Offset 55.1' RT

District Houston
Date 06-12-19
Grnd. Elev. 20.12 ft
GW Elev. N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties				Additional Remarks
				Lateral Press. (psi)	Deviator Stress (psi)	MC	LL	PI	Wet Den. (pcf)	
17.1			FILL, clay, sandy, dark gray and brown			13.6				w/roots, oyster shell and gravel 0'-1' w/asphalt 1'-3'
5		2 (6) 2 (6)	CLAY, very soft to stiff, gray w/ferrrous nodules (CH)	5	22	28.5	72	45	122.6	
				8	15	26.8	65	40	124.6	gray and yellow 8'-11.5' w/ferrrous stains 9'-11.5'
10		3 (6) 3 (6)				32.9				
8.6			CLAY, sandy, stiff, gray and yellow	13	14	20.8	35	17	127.8	w/ferrrous nodules and ferrous stains 11.5'-13'
7.1			CLAY, soft to very stiff, gray and yellow w/ferrrous nodules and ferrous stains (CH)			29.2				w/sand seams at 13'
15		4 (6) 4 (6)								brown and gray 16'-45'
				18	12	33.4	91	59	119.2	
20		6 (6) 7 (6)				32.0				
				0	21	31.4	94	61	123	
25		5 (6) 6 (6)				36.1				
						35.1				
30		7 (6) 9 (6)		0	13	33.8	97	64	121.2	
						34.4				
35		6 (6) 6 (6)		0	30	37.1	107.70		119.7	
						36.6				
40		6 (6) 7 (6)		0	28	40.0	101.65		116.7	
						44.9				
45		8 (6) 9 (6)		0	32	42.8	112.74		114.1	

Remarks: 1) Dry auger to 45.0 ft. 2) Water depth at 3.7 ft.; hole open to 45.0 ft. on 7-16-19.

The ground water elevation was not determined during the course of this boring.

Driller: Dempsey Gearan

Logger: John A. Gentry

Organization: Geotest Engineering, Inc.

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FIGURE A-18



DRILLING LOG

1 of 1

WinCore
Version 3.3

County Harris
Highway SH 146
CSJ 0389-13-039

Hole GB-20
Structure Retaining Wall
Station 603+08.1
Offset 34.4' LT

District Houston
Date 06-13-19
Grnd. Elev. 18.68 ft
GW Elev. N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties				Additional Remarks	
				Lateral Press. (psi)	Deviator Stress (psi)	MC	LL	PI	Wet Den. (pcf)		
13.7			FILL, clay, stiff, dark gray	3	27	16.5	22.9	64	39	128.5	w/grass roots, oyster shell and gravel 0'-1' dark gray and gray 1.5'-3' dark gray, gray & brown 3'-5' very soft 5'-6.5' w/ferrrous nodules and ferrous stains 5'-10'
5		2 (6) 3 (6)				26.1					
10		4 (6) 5 (6)	CLAY, soft to stiff, gray and yellow w/ferrrous nodules and ferrous stains (CH)	8	23	21.7	73	46	127.1	gray & yellowish brown 10'-13'	
						25.9					
15		5 (6) 5 (6)				33.8					brown and gray 13'-35'
						33.8					w/calcareous nodules 15'-20'
20		6 (6) 7 (6)				31.3					
						33.4					very stiff 21.5'-23'
25		7 (6) 7 (6)				33.4					
				0	18	35.1	100.66		116.5		w/calcareous nodules 28'-31'
30		6 (6) 8 (6)				35.2					
						39.2					
35		8 (6) 9 (6)		0	27	35.9	98	63	115.5		

Remarks: 1) Dry auger to 35.0 ft.

The ground water elevation was not determined during the course of this boring.

Driller: Dempsey Gearan

Logger: John A. Gentry

Organization: Geotest Engineering, Inc.

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FIGURE A-20

NOTES:

- CONTRACTOR SHALL REFER TO GEOTECHNICAL REPORT PREPARED BY GEOTEST ENGINEERING, INC., DATED MAY 29, 2020 (GEOTECH REPORT# 140244401) FOR ADDITIONAL INFORMATION.
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REV. NO.	DATE	BY	REVISION



Prakash Shrestha, P.E.
1/12/2022

CivilTech Engineering, Inc.

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



Texas Department of Transportation

SH 146

RETAINING WALL BORING LOGS

SHEET 5 OF 5

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			166
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146



DRILLING LOG

1 of 1

WinCore
Version 3.3

County Harris
Highway SH 146
CSJ 0389-13-039

Hole GB-1
Structure Sound Barrier Wall
Station 546+53.6
Offset 148.3' RT

District Houston
Date 06-06-19
Grnd. Elev. 25.42 ft
GW Elev. N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties				Additional Remarks
				Lateral Press. (psi)	Deviator Stress (psi)	MC	LL	PI	Wet Den. (pcf)	
23.3			PAVEMENT							8.5" Concrete over 1.5" Asphalt over 6.5" Cement Treated Base w/hard rock over 8.5" Stabilized Clay
21.4		5 (6) 6 (6)	FILL, clay, sandy, stiff	4	17	20.4	43	24	133.7	dark gray and gray w/sand seams 25"-4' w/sand seams and calcareous nodules 6'-10'
15.4		8 (6) 7 (6)	CLAY, sandy, soft to stiff, gray and yellowish brown w/ferrous nodules and ferrous stains (CL)			17.4				
12.4		7 (6) 9 (6)	SAND, silty, loose, yellowish brown (SM)			17.3				% passing #200 sieve = 32%
8.9		7 (6) 9 (6)	CLAY, sandy, soft to medium stiff, brown (CL)	10	23	17.0	27	11	134	w/sand seams 16'-21'
3.9		6 (6) 7 (6)	CLAY, silty, soft, yellowish brown and gray w/sand seams and ferrous nodules (CL)	15	11	23.0	32	12	126.6	% passing #200 sieve = 97%
		4 (6) 6 (6)	CLAY, soft to stiff, gray and brown (CH)	23	24	23.5	54	32	128.2	w/ferrous nodules and ferrous stains 21.5'-23' w/vertical sand seams 23'-24' w/calcareous nodules 23'-25'
		7 (6) 8 (6)	CLAY, soft to stiff, gray and brown (CH)			23.6				
		7 (6) 9 (6)	CLAY, silty, soft to medium stiff, brown and gray w/sand seams (CL)	28	15	21.5	69	35	124.6	w/silt and clay seams 33'-36'
		7 (6) 9 (6)	CLAY, soft to stiff, brown and gray w/ferrous nodules and silt seams (CH)	35	11	28.7	43	20	122.7	
		7 (6) 10 (6)	CLAY, soft to stiff, brown and gray w/ferrous nodules and silt seams (CH)	0	19	31.1	75	47	134.3	

Remarks: 1) Dry auger to 10.0 ft., wet rotary from 10.0 to 40.0 ft. 2) Free water first encountered at 10.0 ft. during drilling; after 15 min. at 9.83 ft.

The ground water elevation was not determined during the course of this boring.

Driller: Dempsey Gearen

Logger: John A. Gentry

Organization: Geotest Engineering, Inc.

FIGURE A-1

C:\Jobs\114024401\1140244401_Sound Barrier Wall_GB-1,2,3,5.CLG



DRILLING LOG

1 of 1

WinCore
Version 3.3

County Harris
Highway SH 146
CSJ 0389-13-039

Hole GB-2
Structure Sound Barrier Wall
Station 551+93.6
Offset 151.5' RT

District Houston
Date 06-07-19
Grnd. Elev. 22.37 ft
GW Elev. N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties				Additional Remarks
				Lateral Press. (psi)	Deviator Stress (psi)	MC	LL	PI	Wet Den. (pcf)	
15.9		4 (6) 5 (6)	CLAY, soft to stiff, dark gray (CH)			22.9				w/grass roots 0'-3' w/ferrous nodules and ferrous stains 2'-5' gray and yellowish brown w/calcareous nodules 3'-5'
10.9		4 (6) 4 (6)	CLAY, sandy, soft to stiff, gray and yellowish brown w/calcareous and ferrous nodules and ferrous stains (CL)	5	17	22.6	57	34	137.6	
		6 (6) 7 (6)	CLAY, soft to very stiff, gray and yellowish brown w/ferrous nodules and ferrous stains (CH)			17.5				w/silt partings at 13'
		6 (6) 7 (6)	CLAY, soft to very stiff, gray and yellowish brown w/ferrous nodules and ferrous stains (CH)	10	14	19.1	34	15	135.9	
		6 (6) 7 (6)	CLAY, soft to very stiff, gray and yellowish brown w/ferrous nodules and ferrous stains (CH)	13	28	27.4	77	49	123.7	
		6 (6) 7 (6)	CLAY, soft to stiff, brown and gray w/ferrous nodules and ferrous stains (CH)			25.9				
		7 (6) 7 (6)	CLAY, soft to stiff, brown and gray w/ferrous nodules and ferrous stains (CH)	20	25	26.2	68	42	127.2	
		4 (6) 5 (6)	CLAY, silty, soft to medium stiff (CL)			19.5				w/ferrous nodules and ferrous stains 21.5'-23' w/vertical sand seams 23'-24' w/calcareous nodules 23'-25'
		7 (6) 7 (6)	CLAY, soft to stiff, brown and gray w/ferrous nodules and ferrous stains (CH)	25	7	22.4	37	15	125.4	
		8 (6) 9 (6)	CLAY, soft to stiff, brown and gray w/ferrous nodules and ferrous stains (CH)			25.5				w/ferrous nodules and ferrous stains 21.5'-23' w/vertical sand seams 23'-24' w/calcareous nodules 23'-25'
		4 (6) 5 (6)	CLAY, silty, soft to medium stiff (CL)	0	17	27.5	66	41	124.8	w/ferrous nodules and ferrous stains 21.5'-23' w/vertical sand seams 23'-24' w/calcareous nodules 23'-25'
		8 (6) 9 (6)	CLAY, soft to very stiff, yellowish brown and gray (CH)	33	12	27.6	41	17	126	w/ferrous nodules and ferrous stains 21.5'-23' w/vertical sand seams 23'-24' w/calcareous nodules 23'-25'
		5 (6) 6 (6)	CLAY, soft to very stiff, yellowish brown and gray (CH)			29.2				w/ferrous nodules 36.5'-38'
		5 (6) 6 (6)	CLAY, soft to very stiff, yellowish brown and gray (CH)	0	31	33.6	92	59	120.3	
		5 (6) 6 (6)	CLAY, soft to very stiff, yellowish brown and gray (CH)			39.5				

Remarks: 1) Dry auger to 12.0 ft., wet rotary from 12.0 to 40.0 ft. 2) Free water first encountered at 12.0 ft. during drilling; after 15 min. at 8.66 ft.

The ground water elevation was not determined during the course of this boring.

Driller: Dempsey Gearen

Logger: John A. Gentry

Organization: Geotest Engineering, Inc.

FIGURE A-2

C:\Jobs\114024401\1140244401_Sound Barrier Wall_GB-1,2,3,5.CLG

NOTES:

- CONTRACTOR SHALL REFER TO GEOTECHNICAL REPORT PREPARED BY GEOTEST ENGINEERING, INC., DATED MAY 29, 2020 (GEOTECH REPORT# 140244401) FOR ADDITIONAL INFORMATION.
- BORING LOGS PROVIDED HERE WERE TAKEN DIRECTLY FROM THE GEOTECHNICAL REPORT IDENTIFIED IN NOTE #1.

REV. NO.	DATE	BY	REVISION

1/12/2022

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



SH 146
 SOUND WALL
 BORING LOGS

SHEET 1 OF 2

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			167
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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WinCore
Version 3.3

DRILLING LOG

1 of 1

County Harris
Highway SH 146
CSJ 0389-13-039

Hole GB-3
Structure Sound Barrier Wall
Station 555+82.8
Offset 132.8' RT

District Houston
Date 06-07-19
Grnd. Elev. 21.81 ft
GW Elev. N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties				Additional Remarks
				Lateral Press. (psi)	Deviator Stress (psi)	MC	LL	PI	Wet Den. (pcf)	
19.7			PAVEMENT							8.75" Concrete over 2" Asphalt over 5" Cement Treated Base w/hard rock over 6.75" Stabilized Clay
		4 (6) 5 (6)	CLAY, soft to stiff, dark gray w/calcareous and ferrous nodules and ferrous stains (CH)	3.5	26	23.7	60	36	127.3	
						23.0				gray and yellow w/sand seams 6'-8' w/calcareous and ferrous nodules and ferrous stains 8'-10' w/ferrous stains 11.5'-20'
13.6		4 (6) 4 (6)	CLAY, sandy, gray and yellow (CL)	8	27	18.9	53	31	137.1	
11.6			CLAY, soft to stiff, yellowish brown and gray (CH)							w/silt partings 13'-15'
		4 (6) 5 (6)				27.3				
				18	24	26.6	68	43	127.5	w/ferrous nodules 16.5'-18' w/calcareous nodules 18'-20'
		5 (6) 13 (6)				24.1				
				0	13	24.6	64	38	126.1	w/sand partings 23'-25' brown and gray 23'-40'
		8 (6) 11 (6)				24.6				
						28.7				
		8 (6) 9 (6)		0	33	27.4	61	37	125.1	w/silty sand 27'-10"-28' very stiff 28'-30'
						31.5				
		9 (6) 10 (6)		0	25	33.8	96	62	119.3	
						35.8				w/ferrous nodules 36.5'-38'
-18.4		10 (6) 12 (6)		0	25	36.0	93	59	117.1	

Remarks: 1) Dry auger to 21.5 ft., wet rotary from 21.5 to 40.0 ft. 2) Free water first encountered at 20.5 ft. during drilling; after 20 min. at 7.17 ft.

The ground water elevation was not determined during the course of this boring.

Driller: Dempsey Gearen

Logger: John A. Gentry

Organization: Geotest Engineering, Inc.

FIGURE A-3

C:\Jobs\1140244401\1140244401_Sound Barrier Wall_GB-1,2,3,5.CLG



WinCore
Version 3.3

DRILLING LOG

1 of 1

County Harris
Highway SH 146
CSJ 0389-13-039

Hole GB-5
Structure Sound Barrier Wall
Station 560+93.5
Offset 132.3' RT

District Houston
Date 06-06-19
Grnd. Elev. 19.81 ft
GW Elev. N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties				Additional Remarks
				Lateral Press. (psi)	Deviator Stress (psi)	MC	LL	PI	Wet Den. (pcf)	
18.2			PAVEMENT							7.5" Concrete over 2" Asphalt over 4.5" Cement Treated Base w/hard rock over 5" Stabilized Clay
		5 (6) 5 (6)	CLAY, soft to very stiff, gray w/ferrous nodules and ferrous stains (CH)	5	22	25.3	60	36	130.9	gray & yellowish brown 4'-11' w/calcareous nodules 7'-10'
						21.2				
		5 (6) 6 (6)		10	30	18.4	64	39	136.1	brown and gray 11'-40' slickensided 11.5'-18'
						29.1				
		4 (6) 4 (6)		0	12	31.0	96	62	126.5	w/calcareous nodules 16'-22'
						28.1				
		7 (6) 8 (6)		20	16	23.7	50	29	136	w/silt seams at 20'
						30.3				
		6 (6) 7 (6)		0	30	32.1	62	37	131.3	
						31.2				
		8 (6) 12 (6)		0	30	30.7	79	50	128	slickensided 33'-40'
						34.9				
		9 (6) 13 (6)		35	24	35.9	87	56	122.2	
						39.4				
		8 (6) 12 (6)		0	23	39.0	106	71	120.6	
-20.2						39.4				

Remarks: 1) Dry auger to 20.0 ft., wet rotary from 20.0 to 40.0 ft. 2) Free water first encountered at 20.0 ft. during drilling; after 20 min. at 6.33 ft.

The ground water elevation was not determined during the course of this boring.

Driller: Dempsey Gearen

Logger: John A. Gentry

Organization: Geotest Engineering, Inc.

FIGURE A-5

C:\Jobs\1140244401\1140244401_Sound Barrier Wall_GB-1,2,3,5.CLG

NOTES:

- CONTRACTOR SHALL REFER TO GEOTECHNICAL REPORT PREPARED BY GEOTEST ENGINEERING, INC., DATED MAY 29, 2020 (GEOTECH REPORT# 140244401) FOR ADDITIONAL INFORMATION.
- BORING LOGS PROVIDED HERE WERE TAKEN DIRECTLY FROM THE GEOTECHNICAL REPORT IDENTIFIED IN NOTE #1.

REV. NO.	DATE	BY	REVISION

1/12/2022

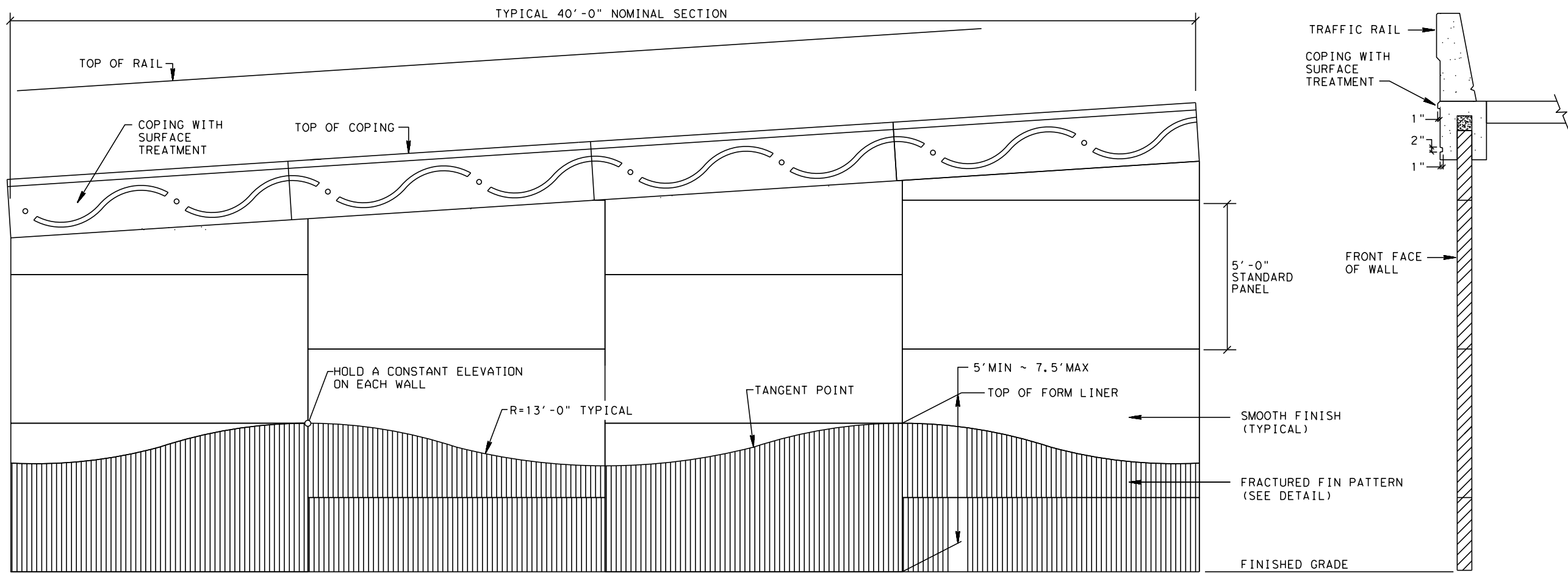
CivilTech Engineering, Inc. 11821 Telge Road
Cypress, Texas 77429
PH: (281) 304-0200 - FX: (281) 304-0210
Firm Registration No. F-382



SH 146
SOUND WALL
BORING LOGS

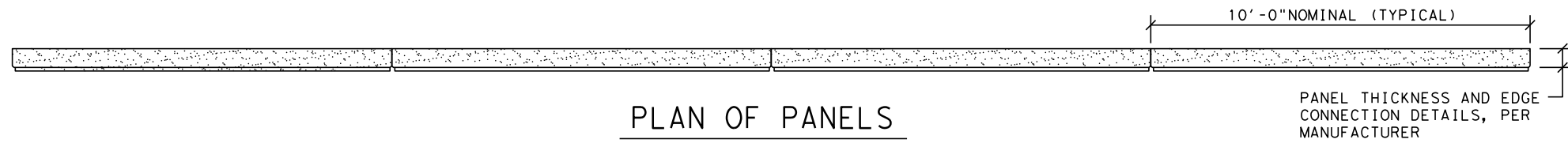
SHEET 2 OF 2

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			168
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146



ELEVATION

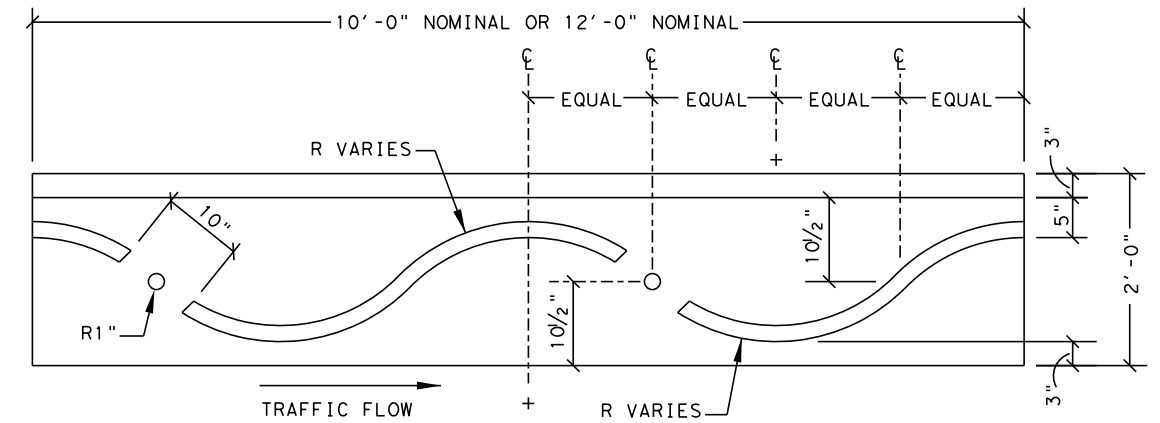
SECTION



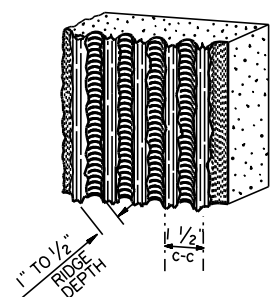
PLAN OF PANELS

NOTES:

1. DETAILS FOR CONSTRUCTION OF RETAINING WALLS ARE SHOWN IN THE STANDARD DRAWING "MECHANICALLY STABILIZED EARTH RETAINING WALL"
2. ITEM 427 "SURFACE FINISHES FOR CONCRETE" ARE CONSIDERED INCIDENTAL TO ITEM 423 "RETAINING WALL". SEE SHEET TITLED "SURFACE FINISHES FOR CONCRETE".
3. FORM LINER USED TO PROVIDE TEXTURE SHALL BE OF ONE PIECE CONSTRUCTION. JOINTS SHALL NOT BE PERMITTED IN FORM LINERS.
4. THE CONTRACTOR SHALL PROVIDE THE ENGINEER AND DISTRICT LANDSCAPE ARCHITECT WITH AN 18" SQUARE OR LARGER SAMPLE OF THE FORM LINER FOR APPROVAL PRIOR TO MANUFACTURING RETAINING WALL PANELS.



ELEVATION OF COPING



FRACTURED FIN PATTERN
PRECAST CONCRETE PANEL
(FREEWAY SIDE)

FRACTURED FIN PATTERN	
FORM LINER NO	MFG
#109	SCOTTSYSTEM, INC.
#373	GREENSTREAK
#16950	FITZGERALD FORMLINERS
OR EQUAL - SUBJECT TO APPROVAL	

NOT TO SCALE

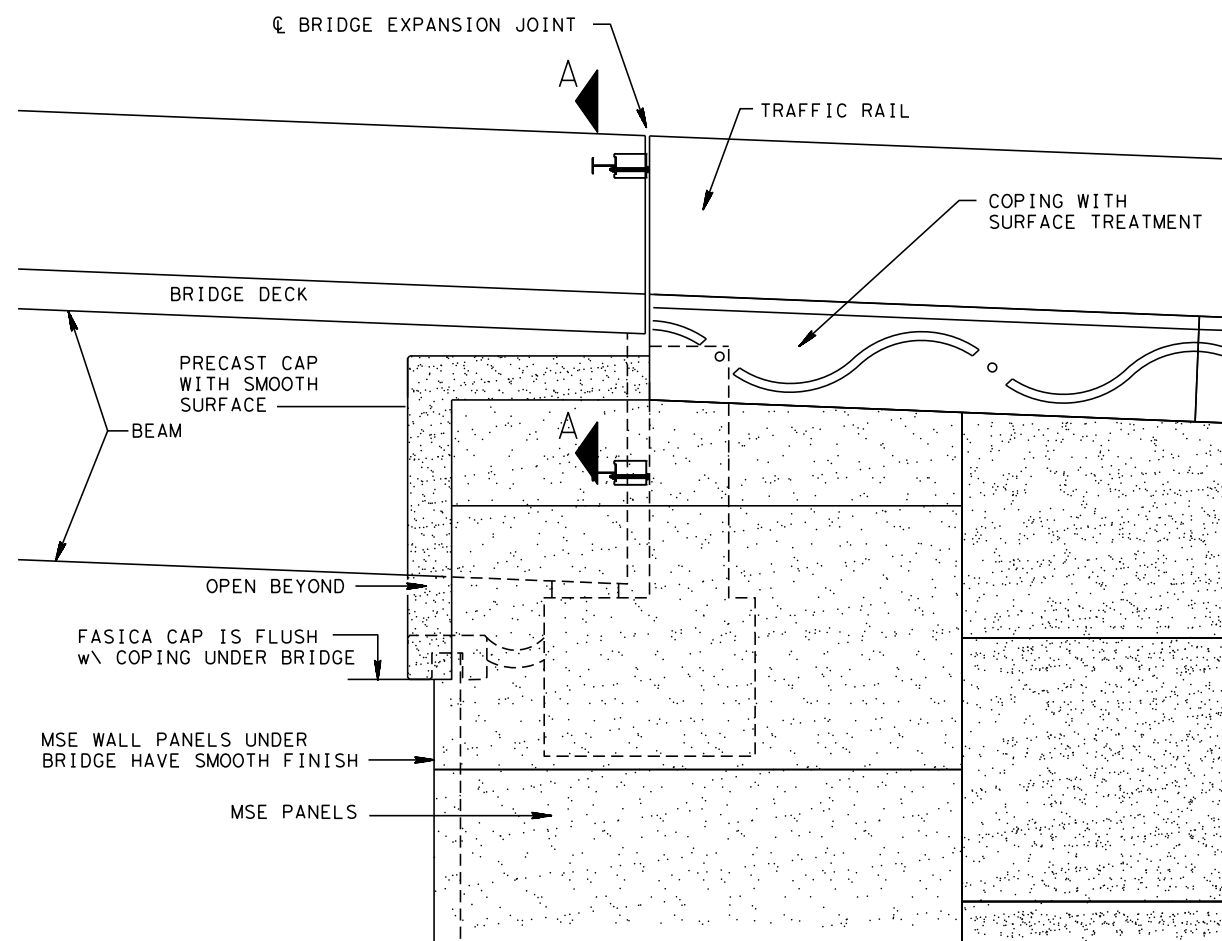
Texas Department of Transportation
 Houston District Bridge
 Green Ribbon Project

RETAINING WALL DETAILS

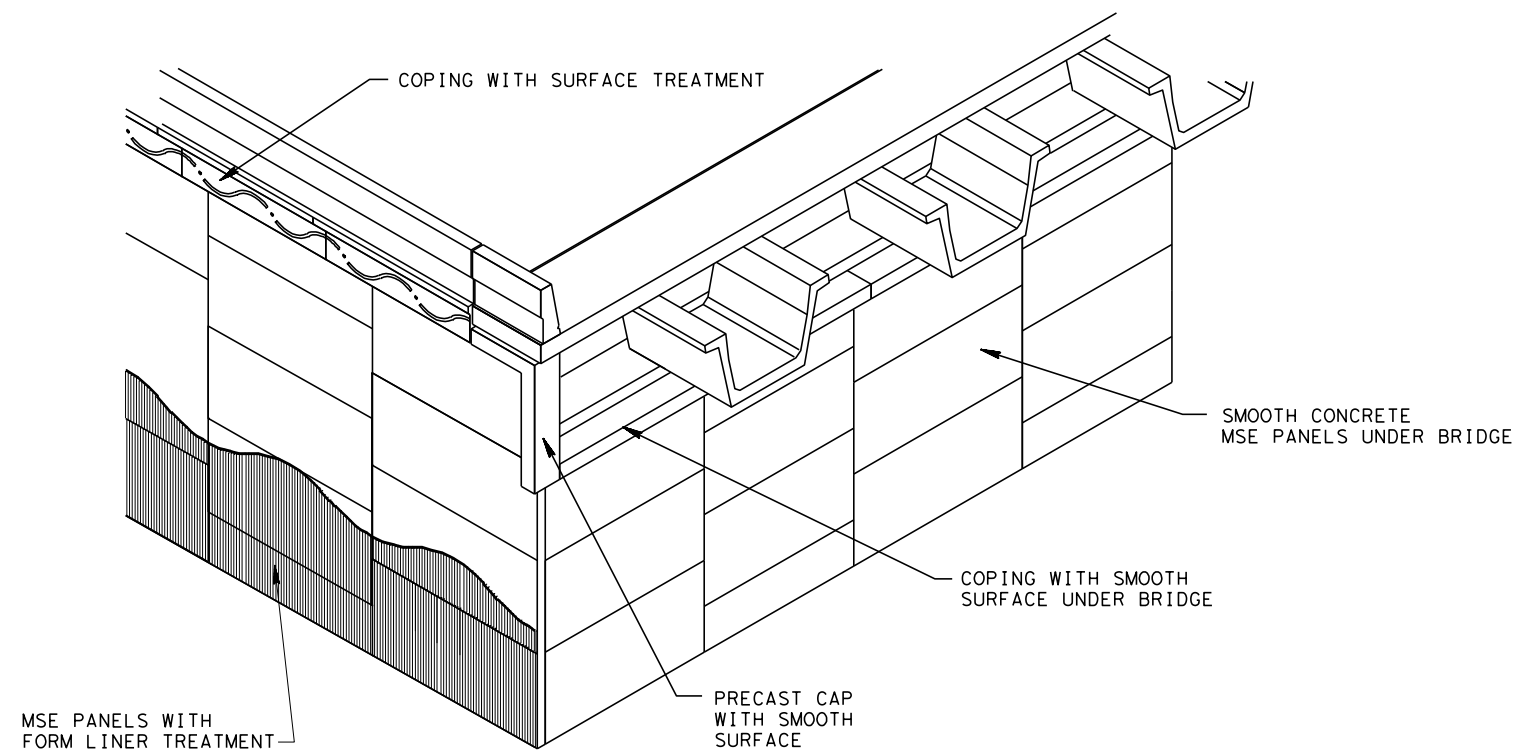
WAVE SCHEME

RWD-WS

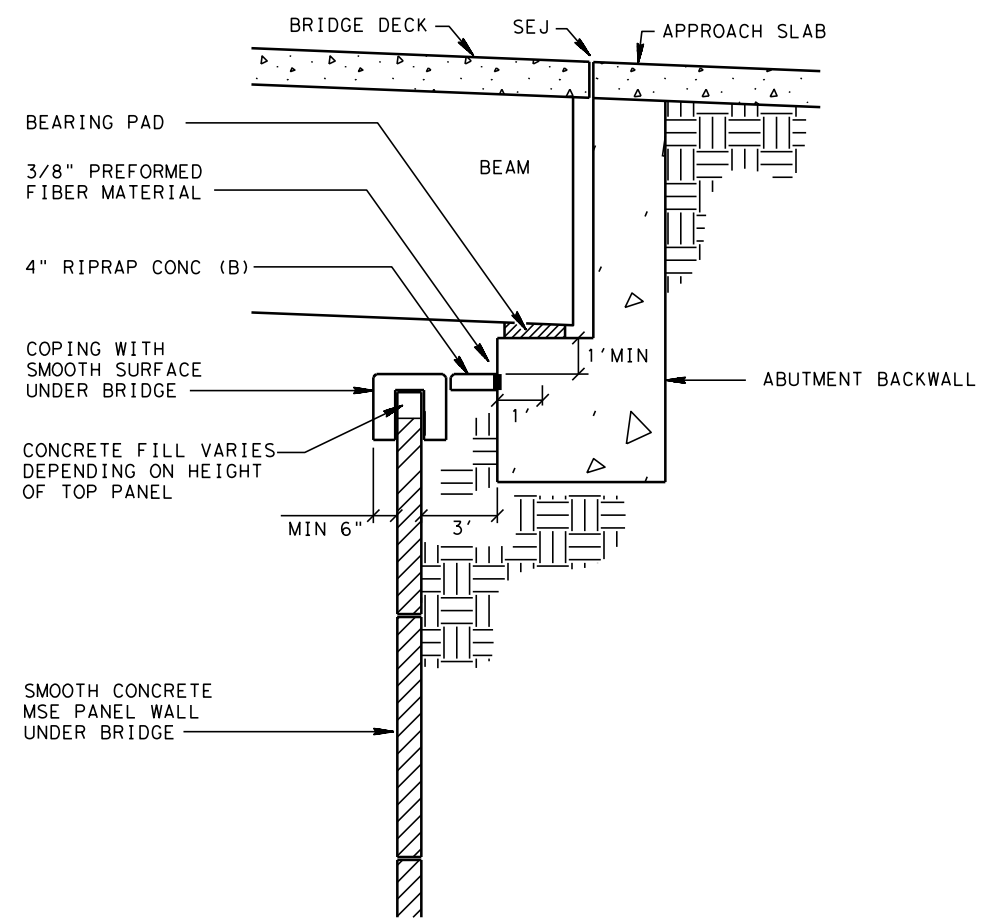
FILE#	STDJ3.DGN	DW:	CK:	DW:	CK:
©	TxDOT	APRIL 2006	DISTRICT	FED REG	PROJECT NO.
REVISIONS		HOUSTON	6	SHEET	
		COUNTY	CONTROL	SECT	JOB
		HARRIS	0389	13	039 SH 146



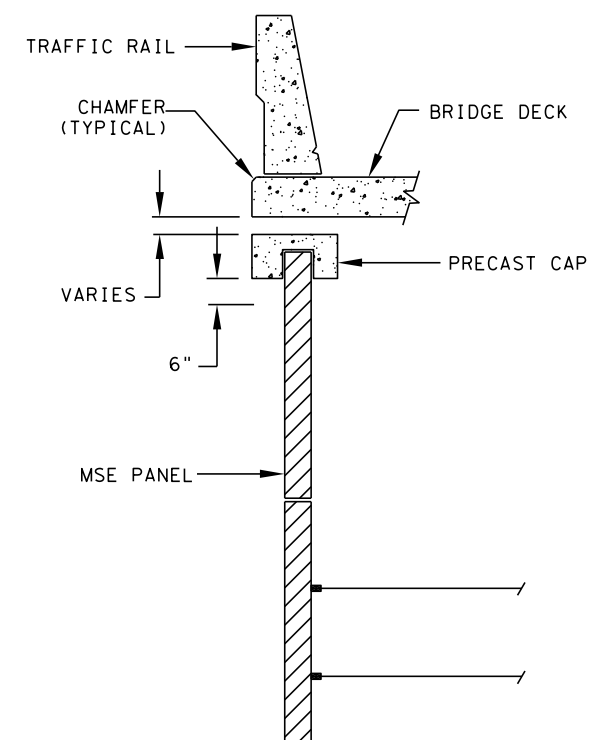
ELEVATION



Wave Scheme: MSE Retaining Wall w/ Vertical Front Face



TYPICAL WALL SECTION @ ABUTMENT



SECTION A-A

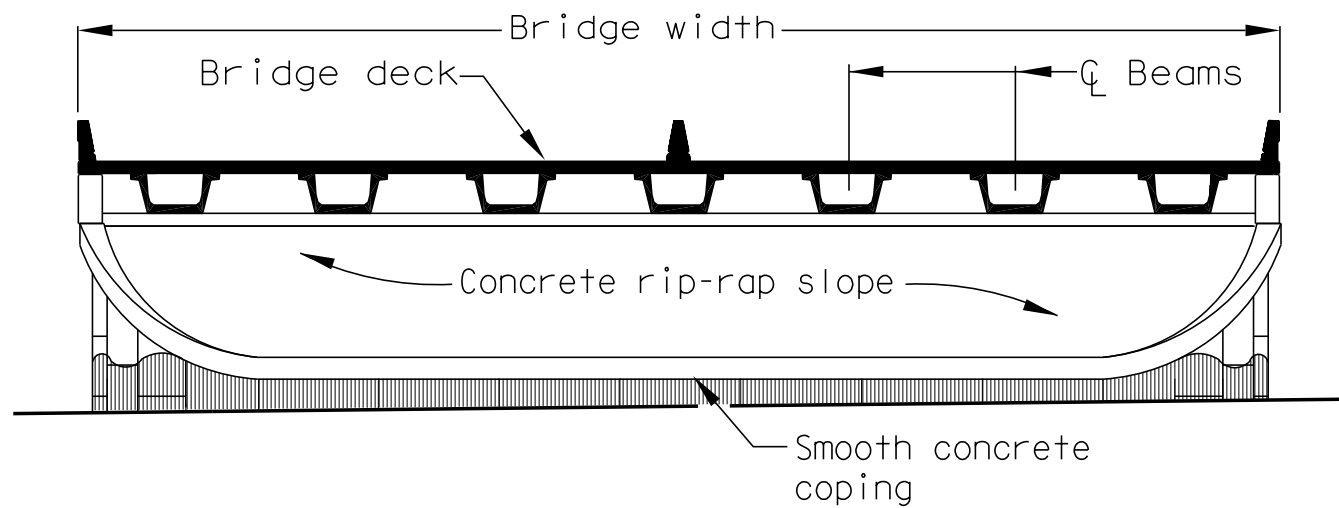
NOT TO SCALE

Texas Department of Transportation
 Houston District Bridge
 Green Ribbon Project

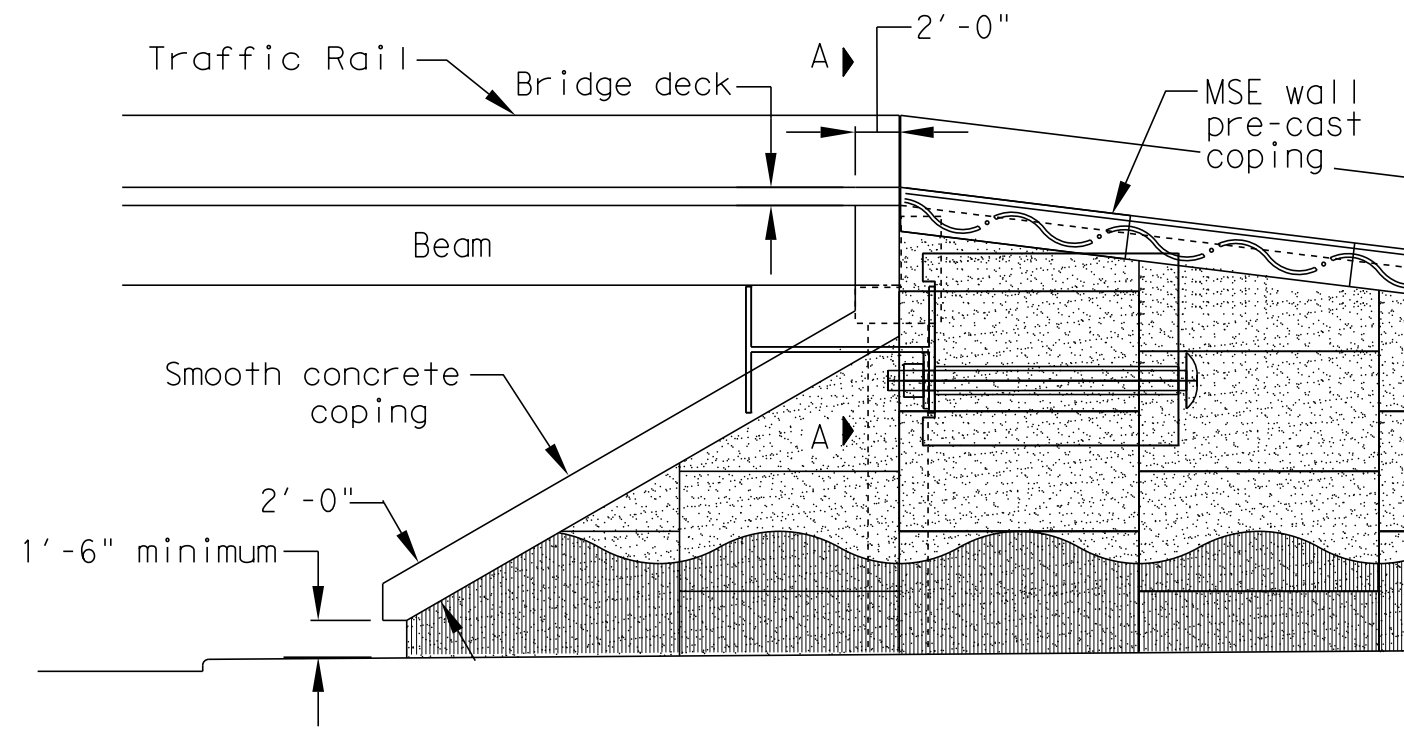
RETAINING WALL DETAILS
WAVE SCHEME

RWD-WS

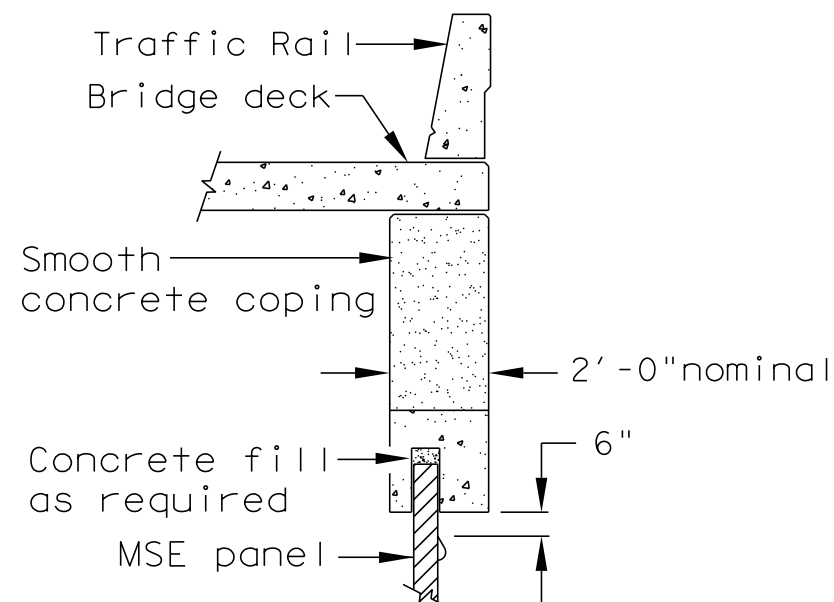
FILE#	STDJ3.DGN	DN#	CK#	DW#	CK#
© TxDOT	APRIL 2006	DISTRICT	FED REG	PROJECT NO.	SHEET
REVISIONS		HOUSTON	6		170
		COUNTY	CONTROL	SECT	JOB
		HARRIS	0389	13	039 SH 146



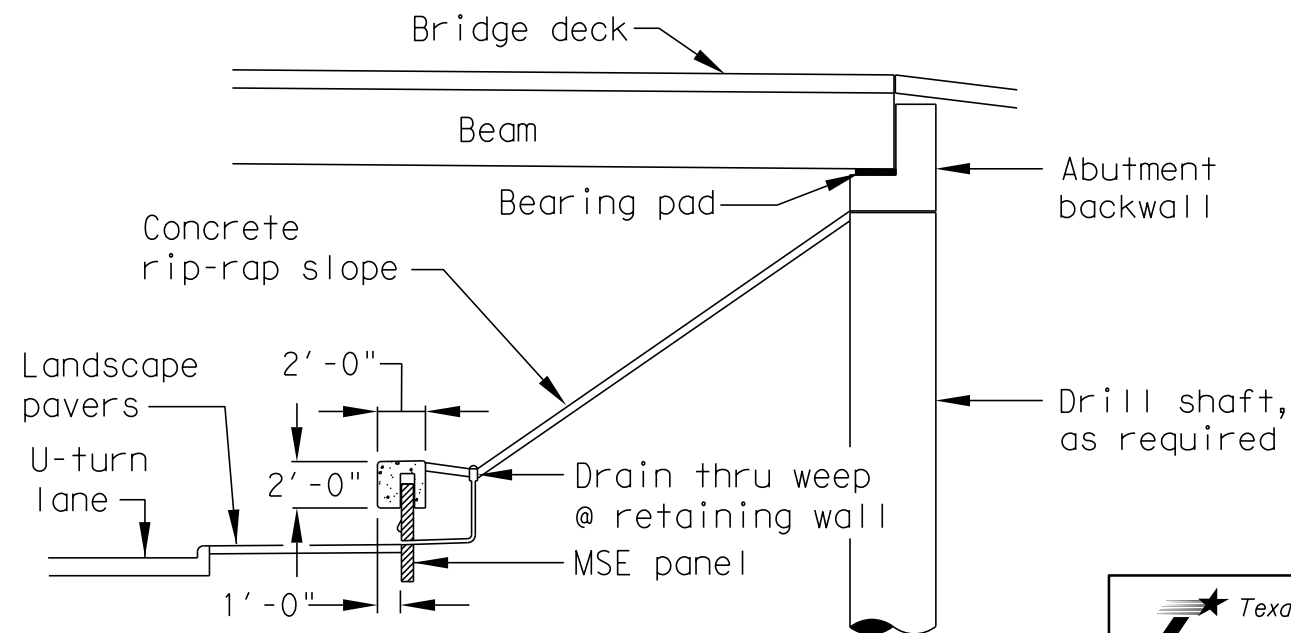
ELEVATION 1/16" = 1'-0"



ELEVATION 1/8" = 1'-0"



SECTION A-A 1/4" = 1'-0"



SECTION 1/8" = 1'-0"

WAVE SCHEME: MSE Retaining Wall w/ Sloped Rip Rap

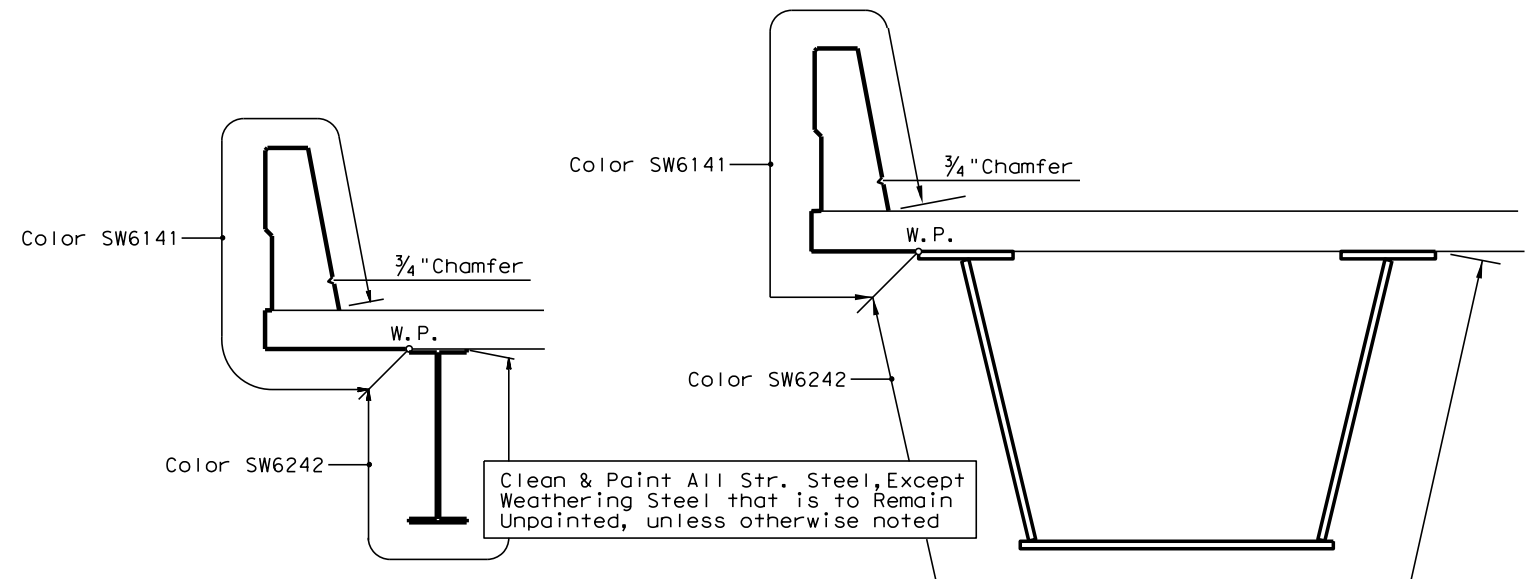
Texas Department of Transportation
Houston District Bridge
Green Ribbon Project

RETAINING WALL DETAILS
WAVE SCHEME

RWD-WS

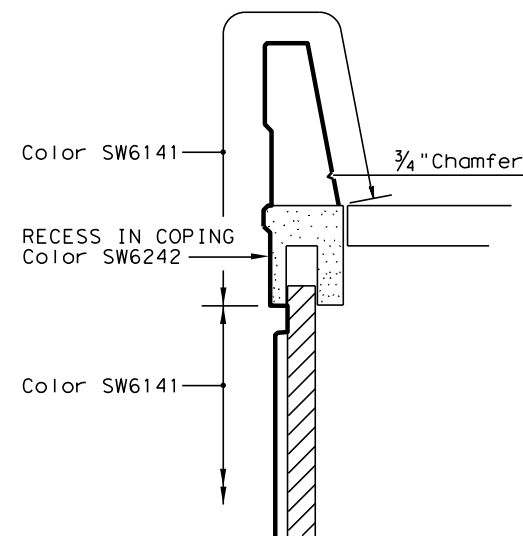
FILE#	STDJ3.DGN	DN#	CK#	DW#	CK#
©	TxDOT	APRIL 2006	DISTRICT	FED REG	PROJECT NO.
REVISIONS		HOUSTON	6	SHEET 171	
		COUNTY	CONTROL	SECT	JOB
		HARRIS	0389	13	039 SH 146

WAVE SCHEME		SHERWIN WILLIAMS (SW) COLOR # 6141 OR EQUAL	SHERWIN WILLIAMS (SW) COLOR # 6242 OR EQUAL
MSE WALL	PANEL / COPING	X	
	COPING ACCENT		X
STRUCTURES	COLUMN	X	
	BENT CAP	X	
	BEAM		X
RAIL	MEDIAN LOCATION	X	
	EDGE LOCATION	X	
SOUND WALL	PANEL / COLUMN	X	
	COPING / COLUMN CAP / RECESSED CIRCLE OF END COLUMN		X
OTHER STRUCTURES	SIGN COLUMNS	X	
	NEW RIP RAP	X	

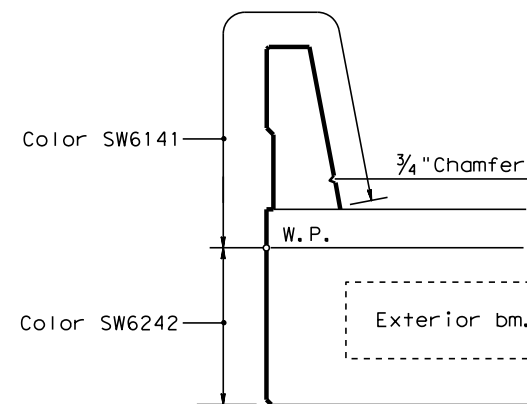


SECTION THRU BRIDGE STEEL I-BEAM
TYPICAL ALL GIRDERS, U.N.O.

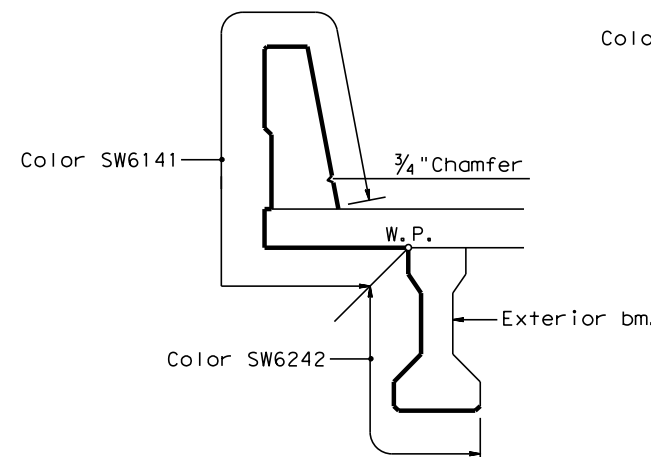
SECTION THRU BRIDGE STEEL TUB-GIRDER
TYPICAL ALL GIRDERS, U.N.O.



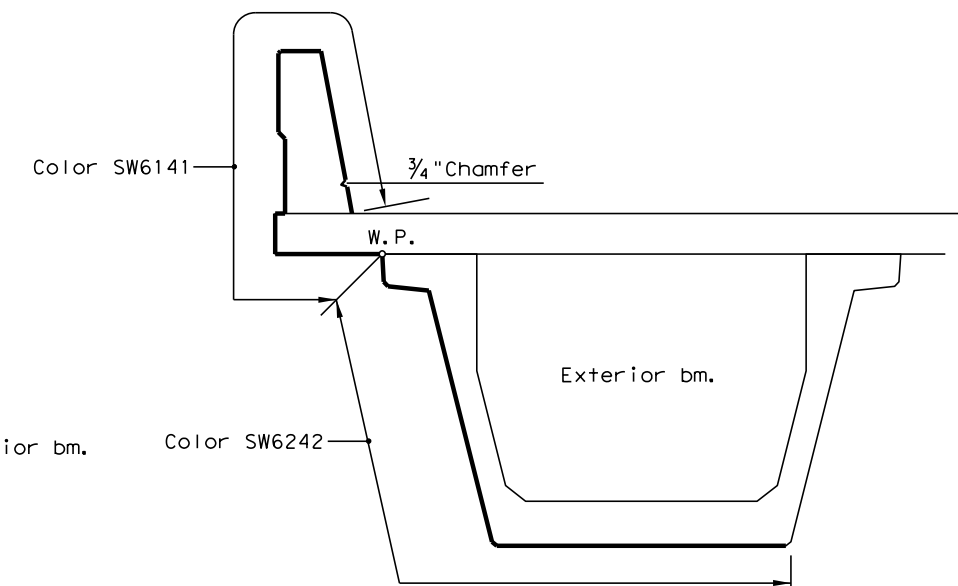
SECTION THRU RETAINING WALL



SECTION THRU BRIDGE CONC BOX BEAM



SECTION THRU BRIDGE CONC I-BEAM



SECTION THRU BRIDGE CONC U-BEAM

TYPICAL SECTIONS

Showing dual color. All other bridge components are color SW6141 Or equal.

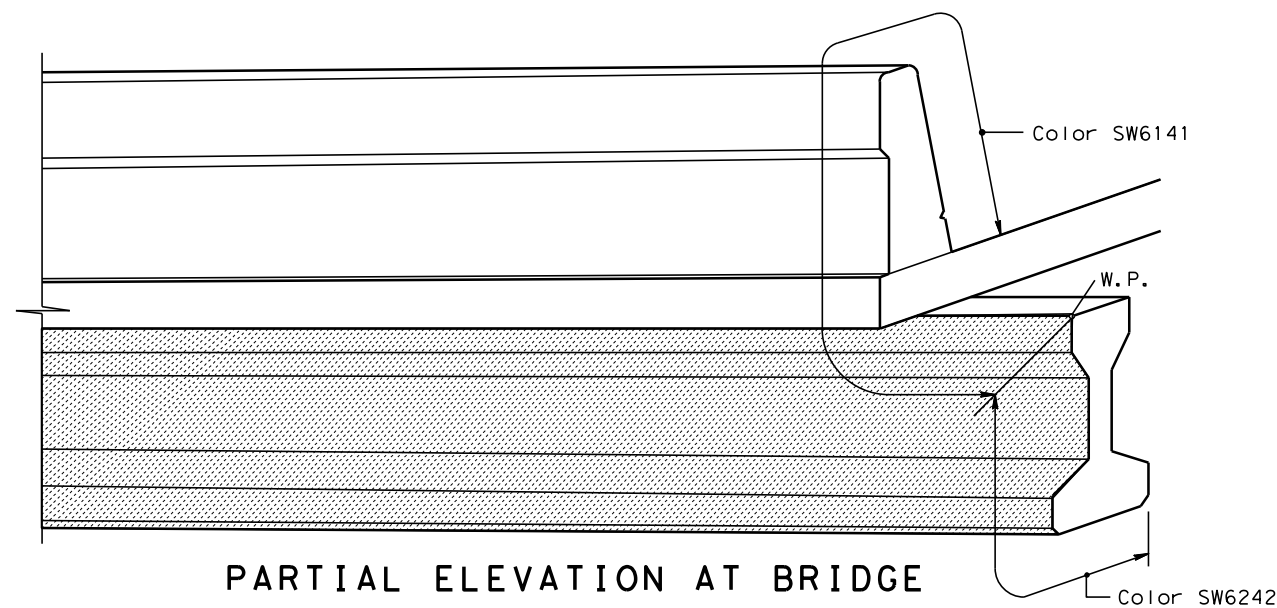
NOTES: Provide a Surface Area I, Concrete Paint Finish, as per the Standard Specifications and these Details

NEW CONCRETE SURFACES

Item 427 "Surface Finishes For Concrete" will NOT be Measured or Paid for on New Concrete Surfaces: Item 427 will be incidental to various bid items on New Concrete Surfaces.

EXISTING CONCRETE SURFACES

Item 427 "Surface Finishes For Concrete" will be Measured and Paid for on Existing Concrete Surfaces.



PARTIAL ELEVATION AT BRIDGE

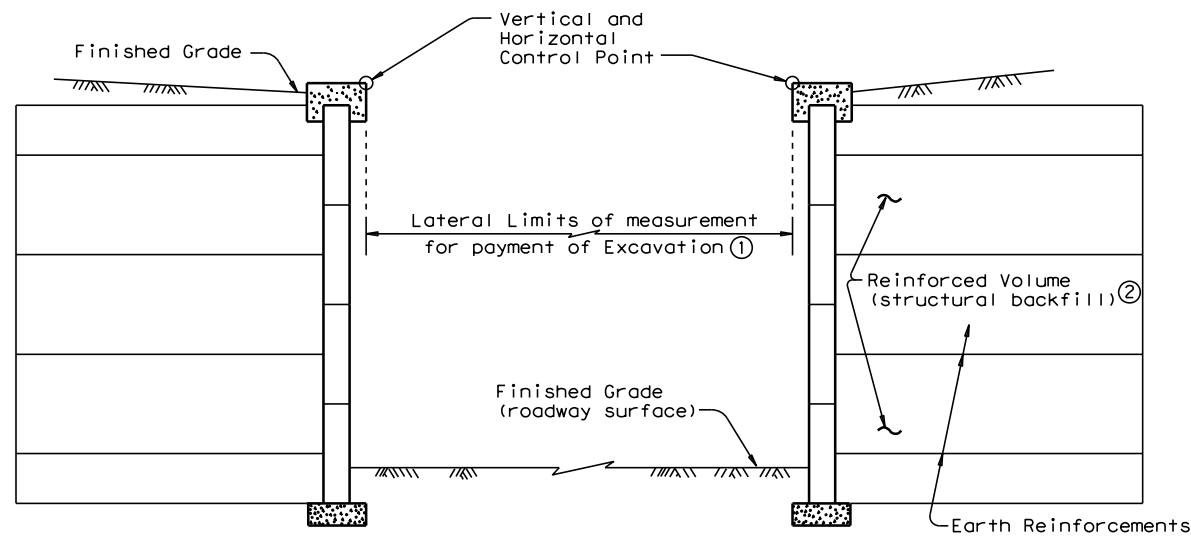


SURFACE FINISHES FOR CONCRETE WAVE SCHEME

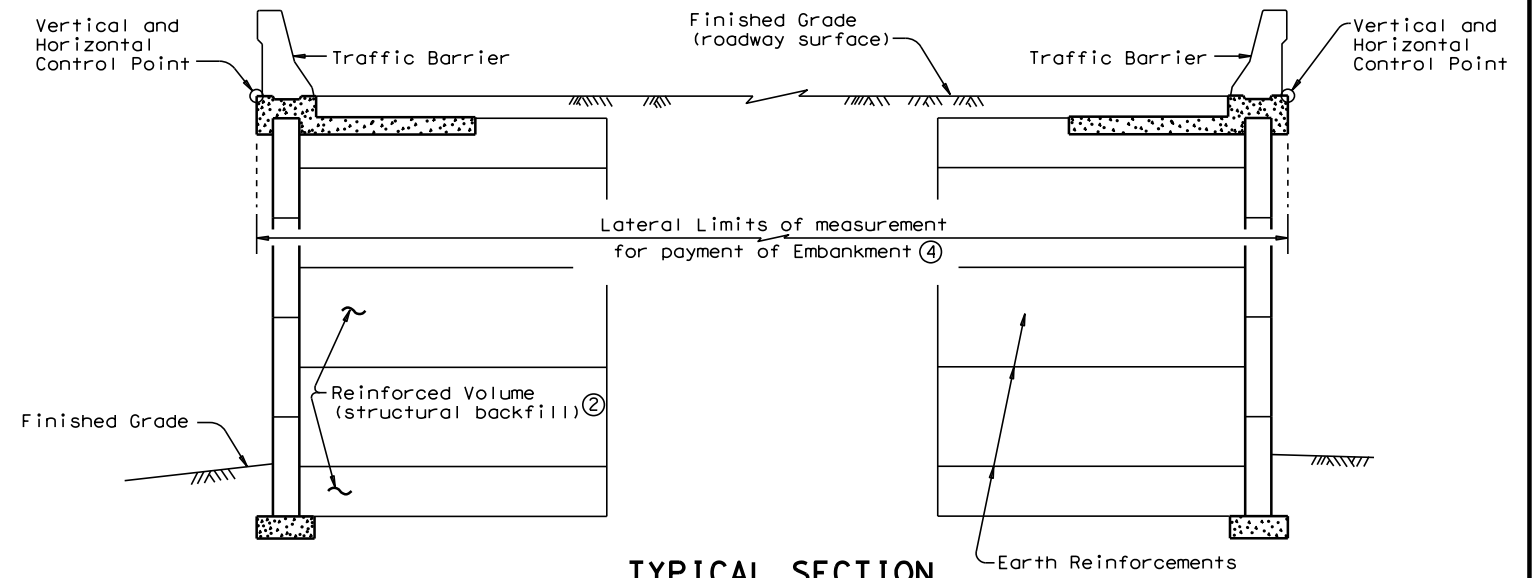
SFC-WS

FILE: STDJ11.DGN	DN:	CK:	DW:	CK:
©TxDOT APRIL 2010	DISTRICT	FED REG	PROJECT NO.	SHEET
REVISIONS	HOUSTON	6		172
6/2017 Removed rail patterns.	COUNTY	CONTROL	SECT	JOB
	HARRIS	0389	13	039SH 146

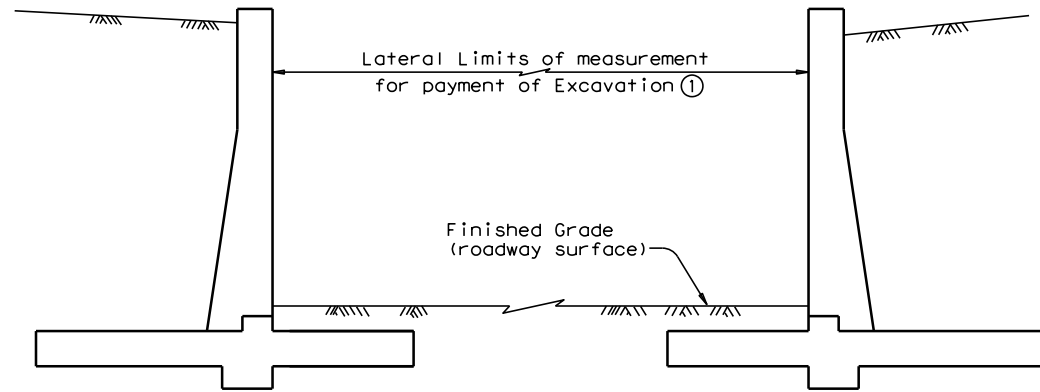
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.



TYPICAL SECTION
Excavation Between MSE Retaining Walls (3)

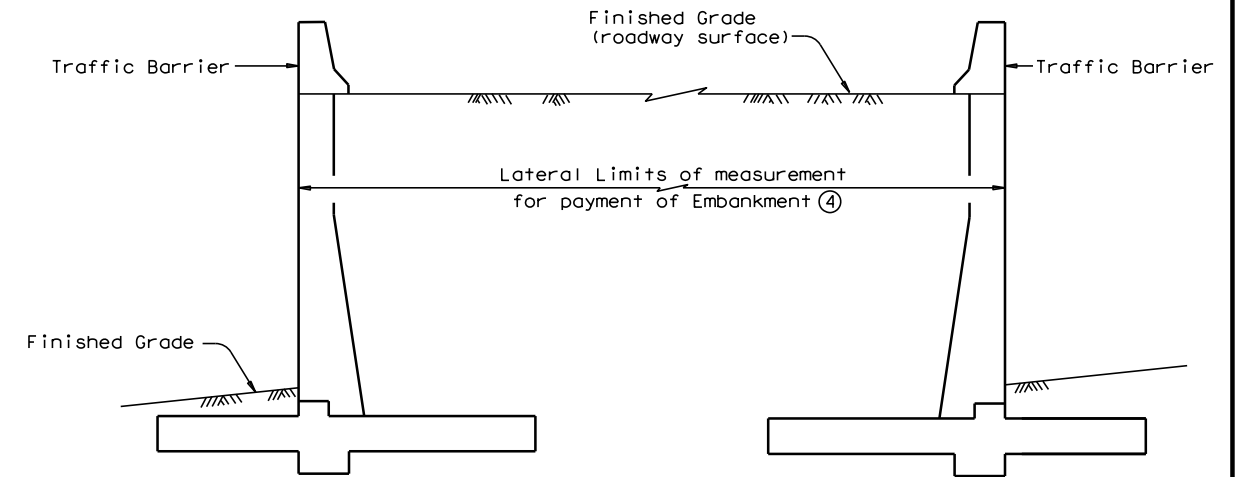


TYPICAL SECTION
Embankment Between MSE Retaining Walls (3)

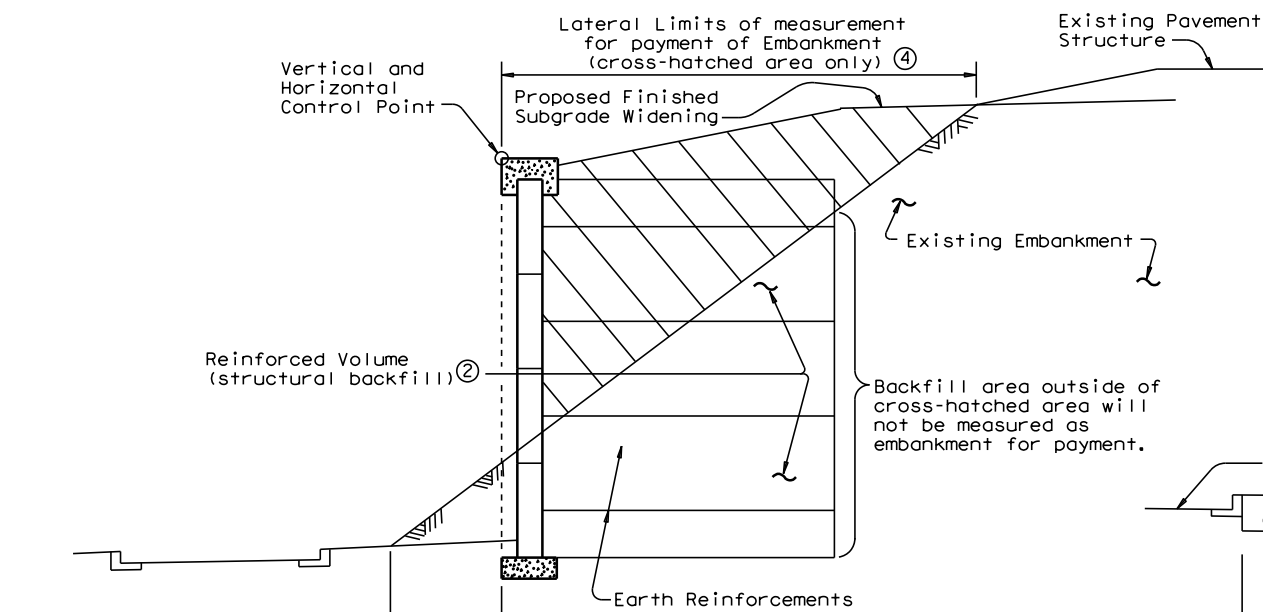


TYPICAL SECTION
Excavation Between Conventional Retaining Walls

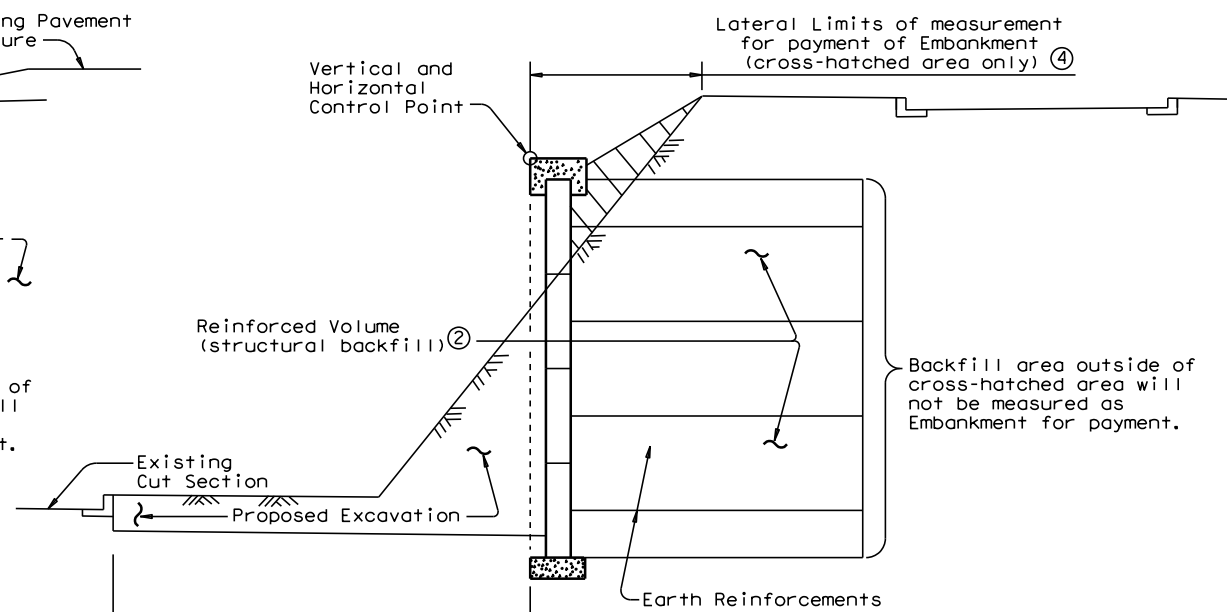
- ① Only the Excavation above the proposed subgrade elevation will be measured for payment.
- ② Meeting requirements of Retaining-Wall Item.
- ③ Earthwork measurement with other designs of retaining walls will be made to the outside finished face in the same manner.
- ④ Only the Embankment above the existing ground line will be measured for payment.



TYPICAL SECTION
Embankment Between Conventional Retaining Walls



TYPICAL SECTION
Widening Embankment with MSE Retaining Walls (3)



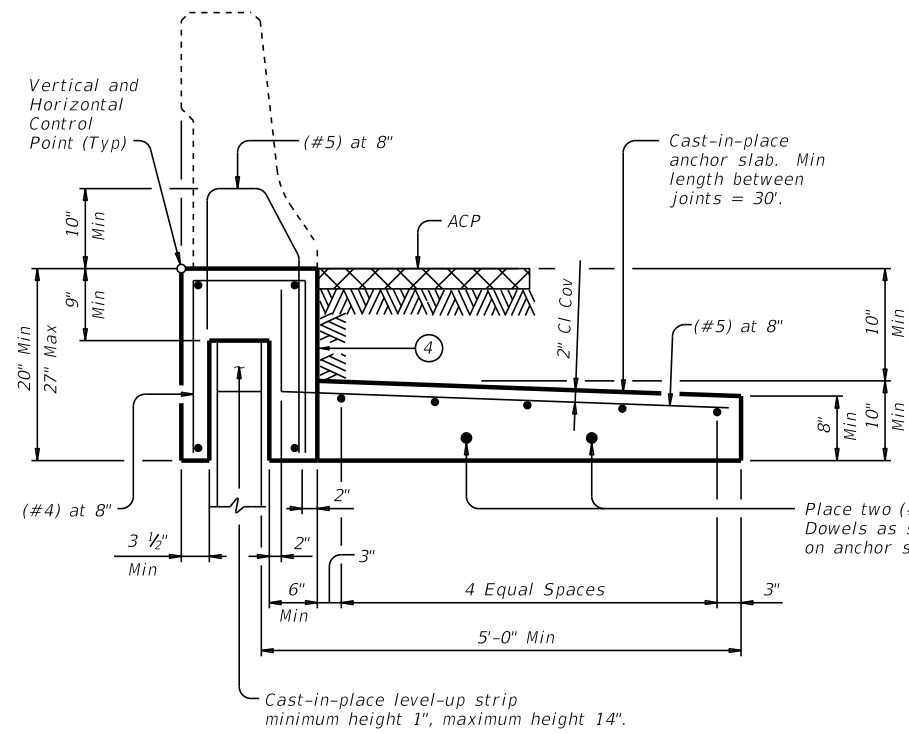
TYPICAL SECTION
Widening Cut Section with MSE Retaining Walls (3)

Backfill area outside of cross-hatched area will not be measured as Embankment for payment.

		Bridge Division Standard	
<h2>EARTHWORK MEASUREMENT AT RETAINING WALLS</h2>			
<h3>RW(EM)</h3>			
FILE: rwstde12.dgn	DN: TxDOT	CK: TxDOT	DW: BWH
©TxDOT March 2010	CONTRACT: 0389	SECTION: 13	JOB: 039
REVISIONS	DIST: HOU		COUNTY: HARRIS
	SHEET NO.:		173

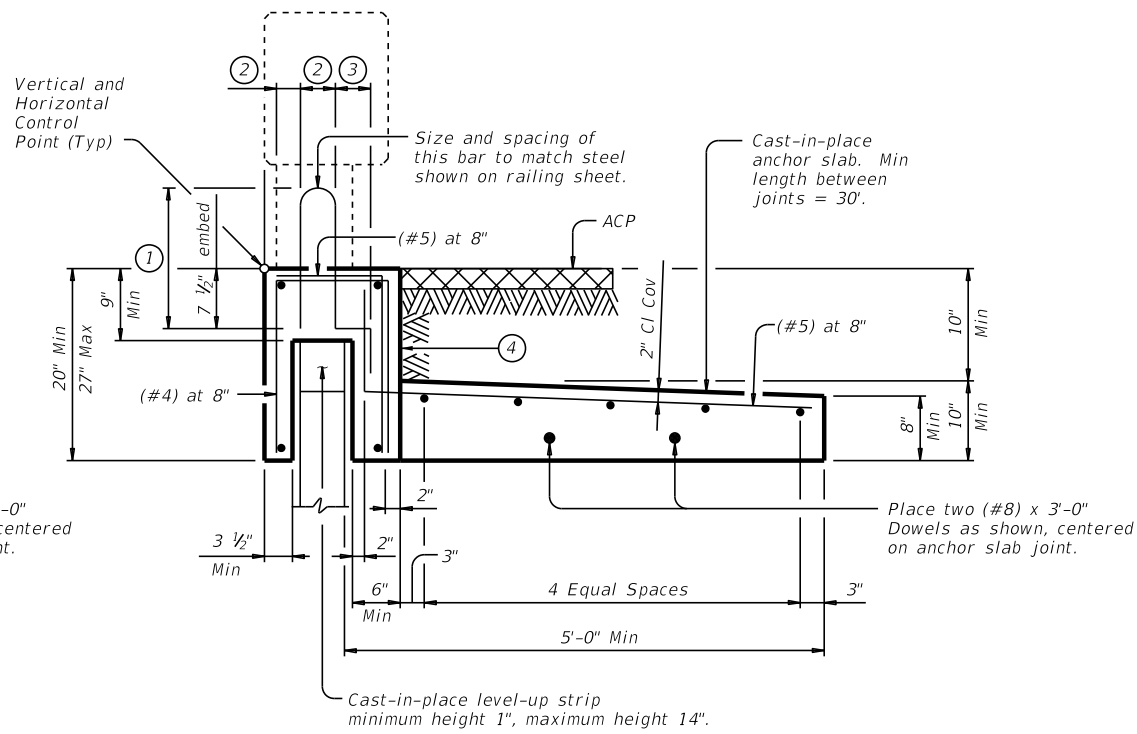
DATE: FILE:

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.



"WIDE BASED" ADJACENT TO ACP

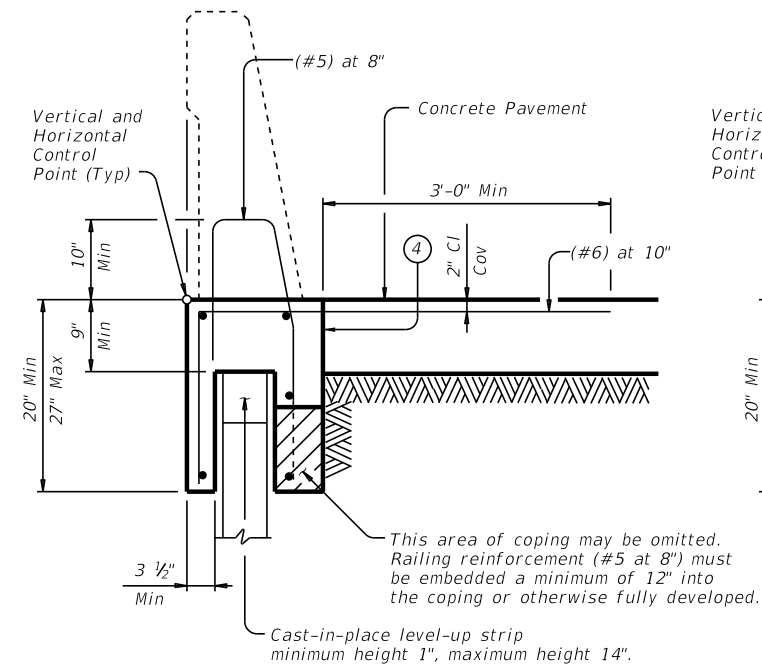
(Showing T551 Rail, other rails listed similar)



"NARROW BASED" ADJACENT TO ACP

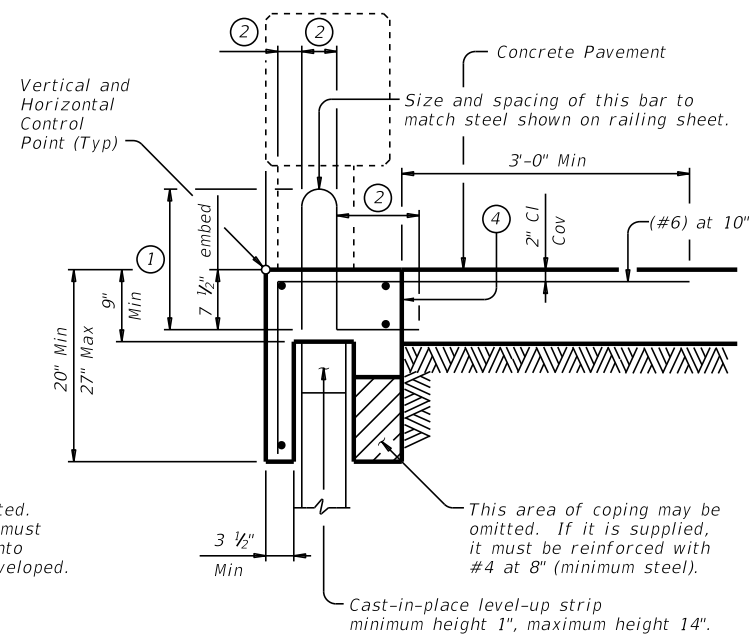
(Showing T223 Rail, other rails listed similar)

- ① Reinforcement length equal to length shown on the appropriate Rail standard plus 1".
- ② Match dimension on the appropriate Rail standard.
- ③ Match dimension on the appropriate Rail standard. Bend end of rail anchorage reinforcing as shown as required to maintain clear cover.
- ④ See "Coping Joint Sealer Details".
- ⑤ Use of these rails will result in a railing acceptable for MASH Test Level 3 (TL-3) regardless of the higher ratings that may be indicated on the rail standard.



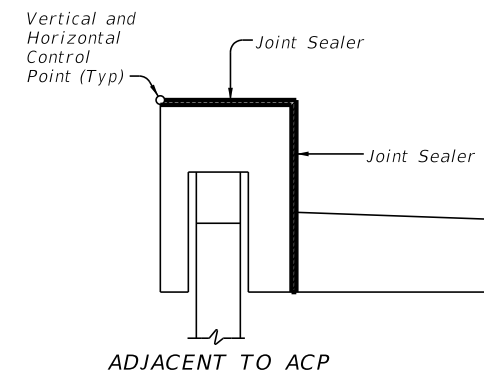
"WIDE BASED" ADJACENT TO CONCRETE PAVEMENT

(Showing SSTR Rail, other rails listed similar)

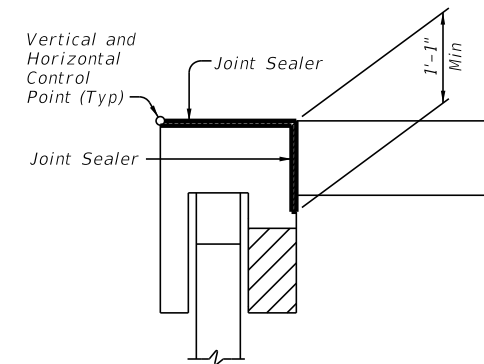


"NARROW BASED" ADJACENT TO CONCRETE PAVEMENT

(Showing T223 Rail, other rails listed similar)



ADJACENT TO ACP



ADJACENT TO CONCRETE PAVEMENT

COPING JOINT SEALER DETAILS

(Reinforcing steel not shown for clarity)

Rail Type ⑤	Detail	Precasting Rail with Coping Allowed
T1F/T1W/C1W/T2P/C2P	NARROW	NO
T221/C221/T222	NARROW	YES
T223/C223	NARROW	NO
T401/T402/C402	NARROW	NO
T411/C411	NARROW	NO
T551/T552	WIDE	YES
T66	NARROW	NO
SSTR	WIDE	YES

CAST-IN-PLACE COPINGS:

Provide compressible material to isolate precast panel from cast-in-place coping to prevent cracking. Attach compressible material to both sides of precast panel prior to casting concrete for coping. When cast-in-place coping is anchored to reinforced concrete pavement, a smooth level-up strip must be provided on the top of the precast panels. The purpose of the level-up is to allow the pavement and coping to move longitudinally relative to the wall without causing damage. Align coping and railing joints with precast panel joints. Optional rail joints are allowed as approved by Engineer. Provide railing construction joints or expansion joints at no greater than 100' spacing.

PRECAST COPINGS:

Provide a smooth level-up strip on top of the precast panels prior to installation of the coping. Shims may be used on top of the level-up strip to facilitate alignment. Total shim thickness not to exceed 1". Provide precast coping in 10' minimum lengths.

JOINED CONCRETE PAVEMENT:

When coping is adjacent to and anchored into jointed concrete pavement, the coping joints must coincide with the pavement joints.

JOINT SEALER:

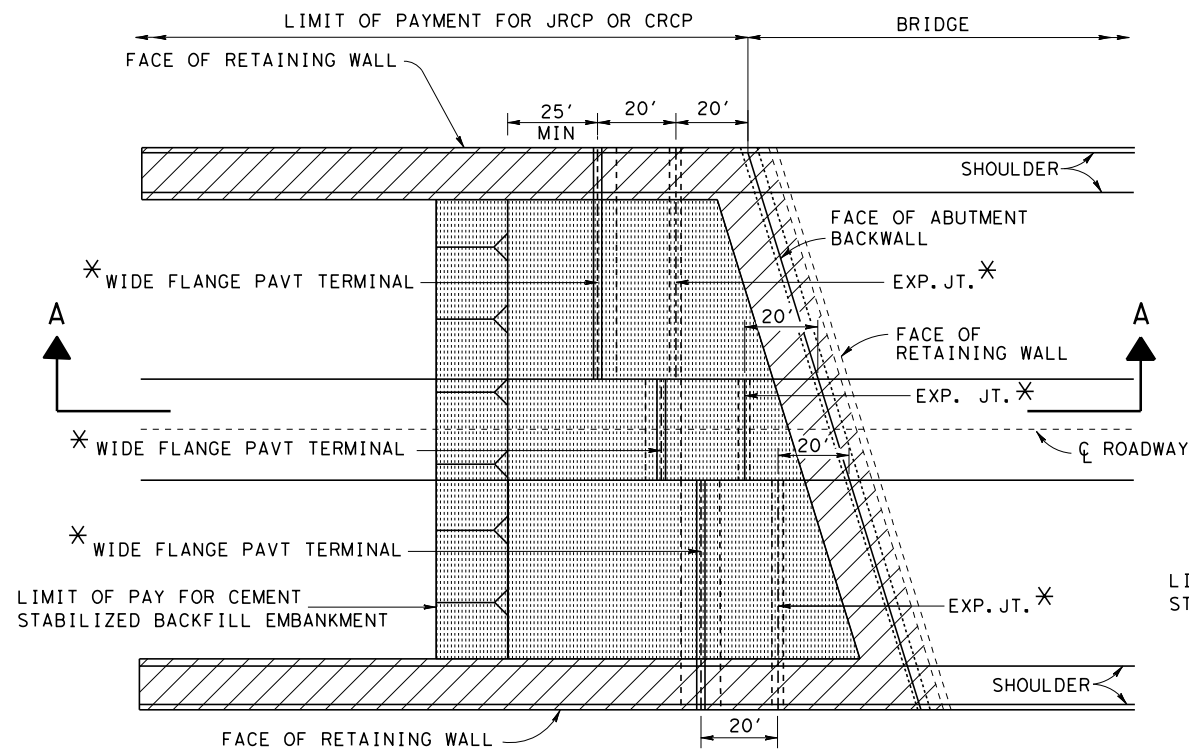
Seal joints between coping segments in accordance with Item 438, "Cleaning and Sealing Joints". Provide Class 4 joint seal. Place sealant flush with coping surface. The purpose of the joint sealing is to reduce surface drainage infiltration into the retaining wall backfill. Sealing coping joint is considered subsidiary to other items.

GENERAL NOTES:

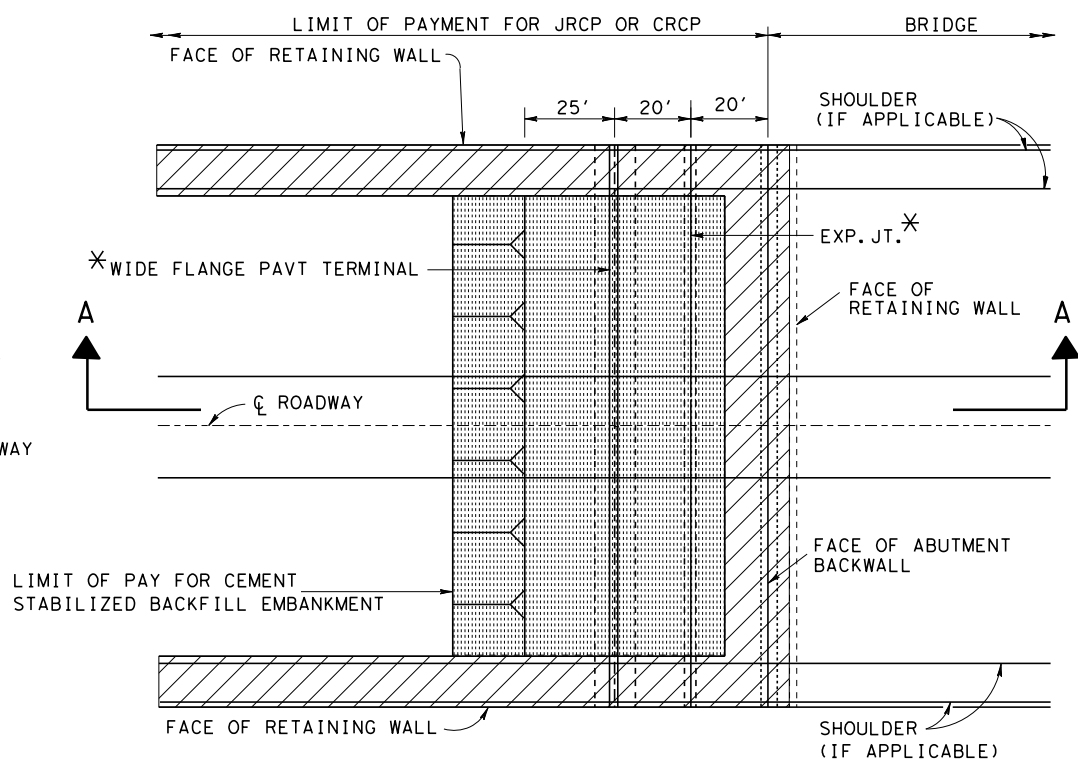
Details on this sheet are to be used in development of specific details for mounting traffic railing on mechanically stabilized earth (MSE) walls. The specific details proposed must have strengths equivalent to those shown on this sheet. Areas of particular importance are the connection of the coping to the railing, the strength of the vertical coping leg connecting the railing to the anchor slab, and the connection of the coping to the anchor slab or concrete pavement. Submit shop drawings for the traffic railing foundations to the Engineer in accordance with Item 423 "Retaining Wall". The shop drawings must include bar bending details. Precasting of railing with the coping will be allowed as noted in the table on this sheet. The Contractor's attention is directed to the fact that various configurations of precast coping/railing combinations are covered by patent. The contractor must provide for use of these systems in accordance with Article 7.3. Provide Class C concrete (f'c=3,600 psi). Provide Grade 60 reinforcing steel. Provide (#4) longitudinal bars, unless otherwise shown. Coping and anchor slabs are considered subsidiary to Item 423 "Retaining Wall". Payment for traffic railing is per the linear foot for the appropriate railing type.

		Bridge Division Standard	
<h2>RETAINING WALL TRAFFIC RAILING FOUNDATIONS</h2>			
<h3>RW(TRF)</h3>			
FILE: rwstd03-20.dgn	DN: TxDOT	CK: TxDOT	DW: JTR
CONTRACT: 0389	SECTION: 13	JOB: 039	HIGHWAY: SH 146
<small>01-13: Precast option with Rails. 03-18: Cast-In-Place Copings, railing construction and expansion joints. 02-20: Note 5 added for precast rail option.</small>		DIST: HOU	COUNTY: HARRIS
		SHEET NO. 174	

DATE: FILE:



TYPICAL ROADWAY LAYOUT
CONCRETE MEDIAN AND SHOULDERS
(AT SKEWED BRIDGES)

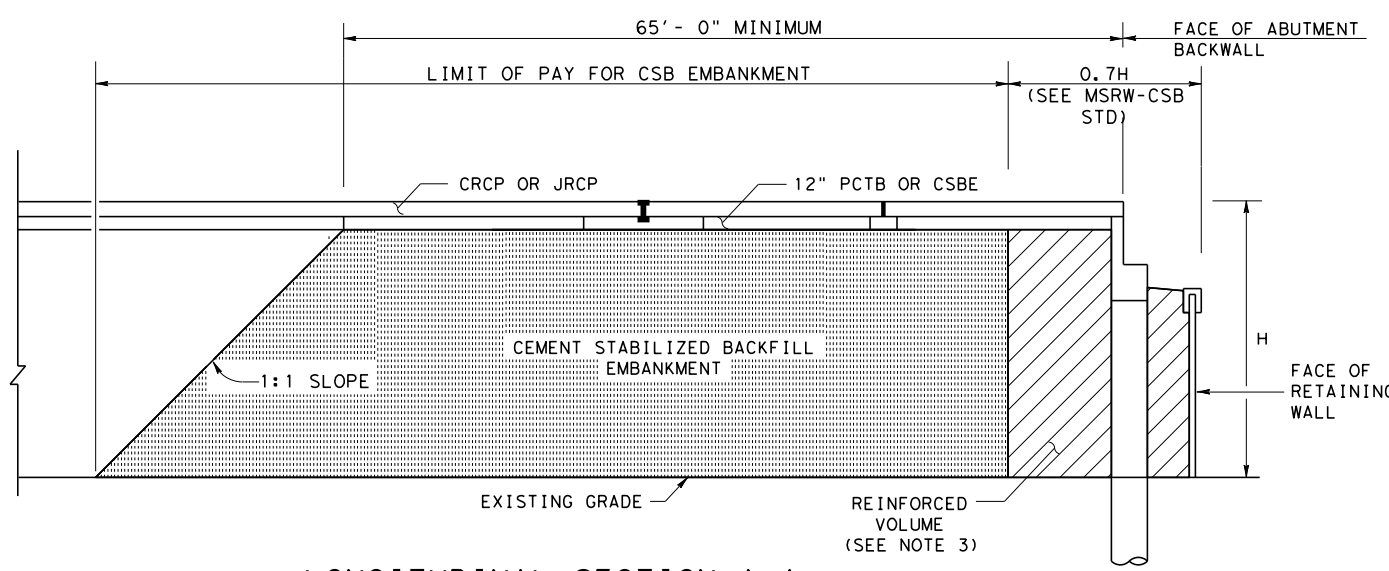


TYPICAL ROADWAY LAYOUT
CONCRETE MEDIAN AND SHOULDERS
(AT NON-SKEWED BRIDGES)

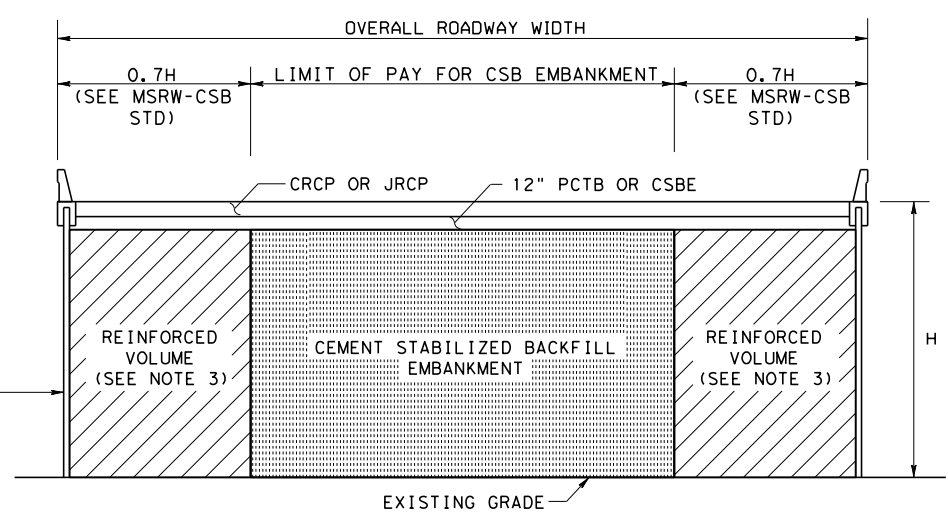
- NOTES**
- USE CEMENT STABILIZED BACKFILL EMBANKMENT IN ACCORDANCE WITH ITEM 132 AND HOUSTON DISTRICT-WIDE SPECIAL PROVISION (132-001).
 - FOR ADDITIONAL DETAILS ON WIDE FLANGE PAVEMENT TERMINALS SEE "WIDE FLANGE PAVEMENT TERMINALS" STANDARD SHEET.
 - FOR ADDITIONAL DETAILS ON RETAINING WALLS SEE "MECHANICALLY STABILIZED RETAINING WALL - CEMENT STABILIZED BACKFILL" MSRW-CSB STANDARD SHEET.
- CRCP - CONTINUOUSLY REINFORCED CONCRETE PAVEMENT
 CSBE - CEMENT STABILIZED BACKFILL EMBANKMENT
 EXP JT - EXPANSION JOINT
 H - HEIGHT OF RETAINING WALL
 JRCP - JOINTED REINFORCED CONCRETE PAVEMENT
 MSRW - MECHANICALLY STABILIZED RETAINING WALL
 PCTB - PORTLAND CEMENT TREATED BASE
- LIMITS OF REINFORCED VOLUME (CEMENT STABILIZED BACKFILL). THIS VOLUME IS PAID UNDER ITEM 132-6006, EMBANKMENT (FINAL) (DC) (TY C).
- LIMITS OF CEMENT STABILIZED BACKFILL EMBANKMENT. THIS QUANTITY IS PAID UNDER ITEM 132-6035, EMBANKMENT (FINAL) (DENS CONT) (TY E) (CSBE).

LEGEND

* THIS APPLIES ONLY WHEN WIDE FLANGE TERMINALS ARE USED ON APPROACHES TO BRIDGES. IF NOT USING THIS SYSTEM, SEE APPROACH SLAB DETAILS ELSEWHERE IN THE PLANS.



LONGITUDINAL SECTION A-A

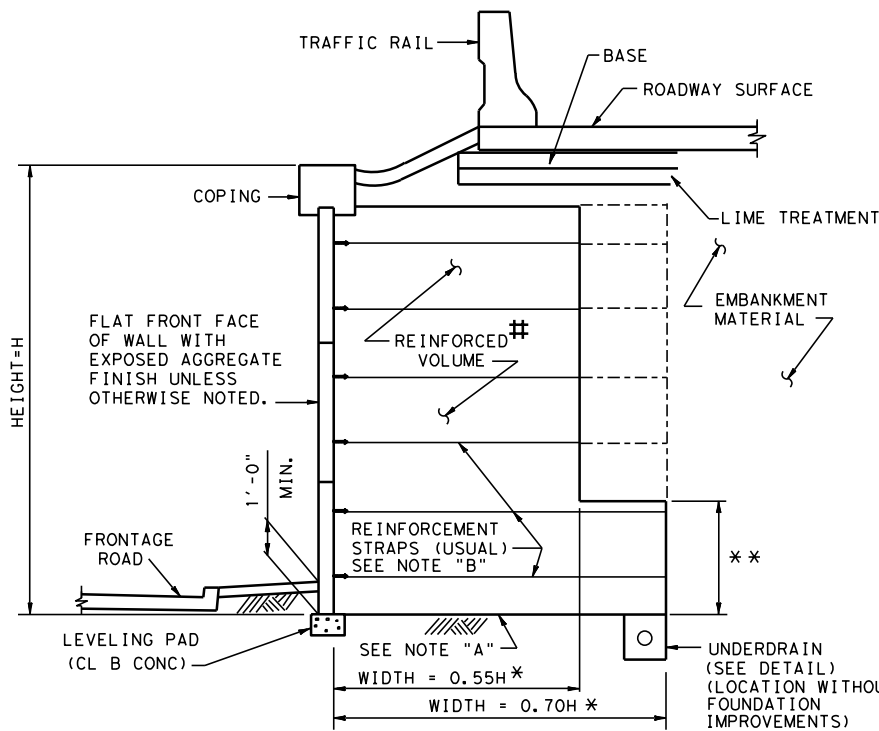


TRANSVERSE SECTION

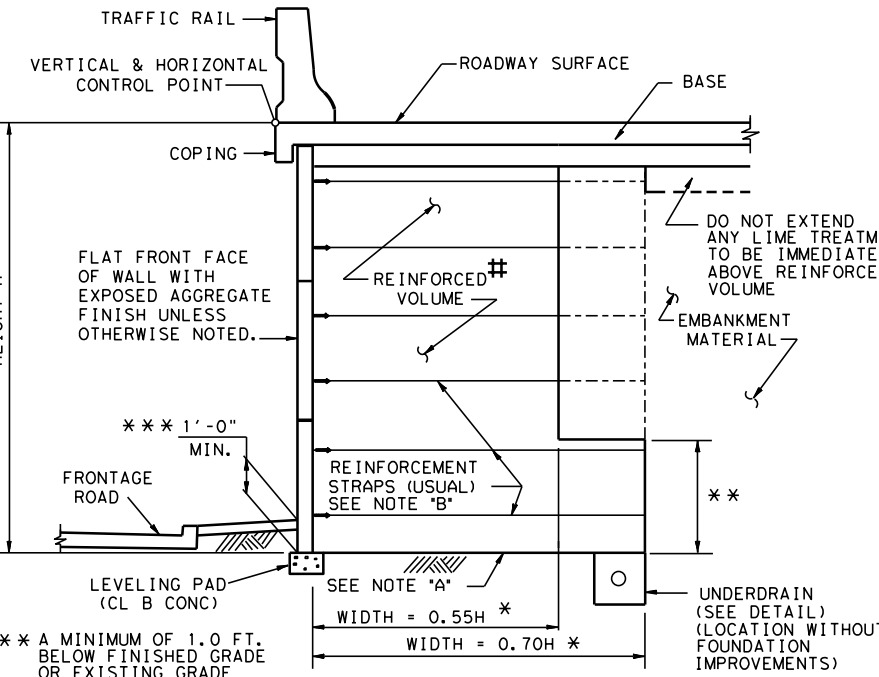
Texas Department of Transportation
Houston District

CEMENT STABILIZED BACKFILL EMBANKMENT
(FOR USE WITH RETAINING WALLS AT BRIDGE ABUTMENTS)
CSBE-RW

FILE: STDB-6.dgn	DN:	CK:	DW:	CK:
© TxDOT 2014	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS	HOU	6		175
	COUNTY	CONTROL	SECT	JOB
	HARRIS	0389	13	039 SH 146

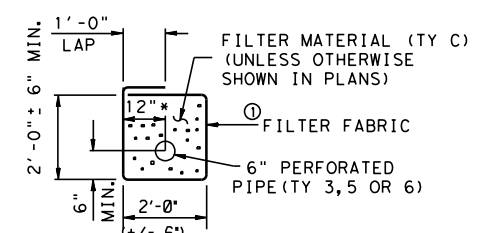


TYPICAL SECTION
(WALL AT BOTTOM OF SLOPE)

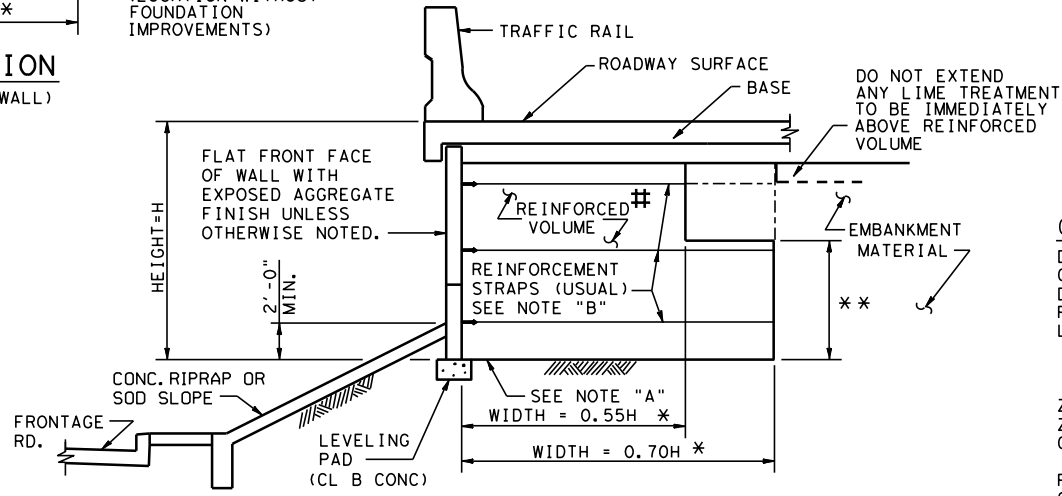


TYPICAL SECTION
(SHOWING ROADWAY ON WALL)

① FILTER FABRIC MEETING THE REQUIREMENTS OF DMS-6200 TYPE 1.

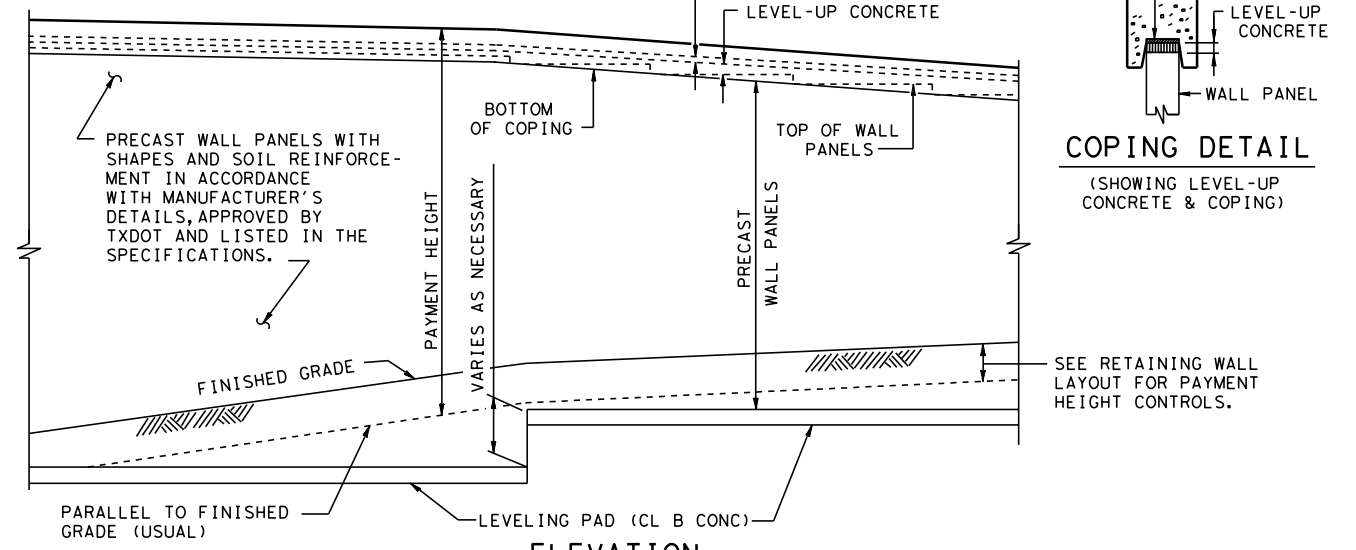


UNDERDRAIN DETAIL



TYPICAL SECTION
(WALL AT TOP OF SLOPE)

NOTE: LEVEL-UP CONCRETE AND EXPANSION JOINT MATERIAL SHALL BE INCLUDED IN THE COST OF THE RETAINING WALL



ELEVATION

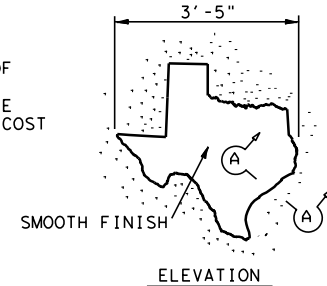
NOTE "A": COMPACT THE SOIL UNDER THE LEVELING PAD AND THE REINFORCED VOLUME INCLUDING A MINIMUM OF TWO (2) FEET IN FRONT OF THE LEVELING PAD TO A MINIMUM OF 98% OF THE MAXIMUM DRY DENSITY, AS PRESENTED IN TEST METHOD TEX-114-E. THE DENSITY TESTING OF THE SOIL WILL BE OUTLINED IN TEST METHOD TEX-115-E. COST OF THIS COMPACTION WILL NOT BE PAID FOR DIRECTLY BUT IS INCIDENTAL TO THE UNIT PRICE BID FOR "RETAINING WALL."

NOTE "B": WHEN BACKFILL DOES NOT COMPLY WITH pH AND RESISTIVITY REQUIREMENTS, USE EPOXY COATED METALLIC REINFORCEMENTS. ALSO EPOXY COAT CONNECTION HARDWARE USED WITH EPOXY COATED REINFORCEMENTS. USE EPOXY CONFORMING TO THE REQUIREMENTS OF THE ITEM, "EPOXY." THIS WORK WILL NOT BE PAID FOR DIRECTLY, BUT IS CONSIDERED INCIDENTAL TO THE UNIT PRICE BID FOR "RETAINING WALL."

* THE CONTRACTOR HAS THE OPTION OF PROVIDING A REINFORCED VOLUME WITH TWO DIFFERENT WIDTHS (0.55H BUT NOT LESS THAN SIX FEET AND 0.70H BUT NOT LESS THAN EIGHT FEET), OR WITH A CONSTANT WIDTH EQUAL TO 0.70H BUT NOT LESS THAN EIGHT FEET AS SHOWN.

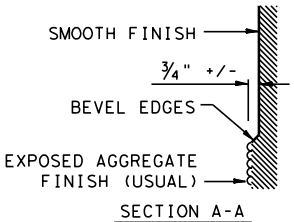
** 3 IN. MINIMUM ABOVE THE SECOND COURSE OF SOIL REINFORCEMENTS, BUT NO LESS THAN 4 FEET.

CEMENT STABILIZED BACKFILL REINFORCED VOLUME TO BE PAID AS ITEM 132-6006 EMBANKMENT (FINAL) (DENS CONT) (TY C)

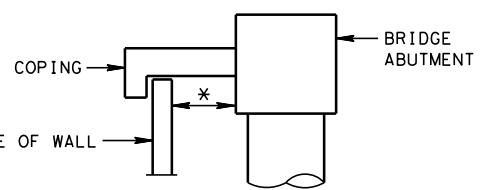


MAP OF TEXAS EMBLEM

(FOR NON - GREEN RIBBON PROJECTS ONLY)
FORM MAP OF TEXAS EMBLEM INTO A WALL PANEL NEXT TO EACH BRIDGE ABUTMENT. PLACE THE EXACT LOCATION OF EACH EMBLEM AS APPROVED BY THE ENGINEER. THE COST OF FORMING THE EMBLEMS WILL NOT BE PAID FOR DIRECTLY, BUT IS CONSIDERED INCIDENTAL TO THE UNIT PRICE BID FOR "RETAINING WALL."



SECTION A-A



TYPICAL SECTION
(WALL AT ABUTMENT)

* 2' MINIMUM AND 3' DESIRABLE EDGE DISTANCE FROM BACK OF PANEL TO FRONT OF ABUTMENT.

CORROSION CRITERIA

DESIGN THE EARTH REINFORCEMENT ELEMENTS TO HAVE A CORROSION RESISTANCE DURABILITY TO ENSURE A MINIMUM DESIGN LIFE OF 75 YEARS. COMPUTE THE MAXIMUM LOSS PER SIDE DUE TO CORROSION BY ASSUMING A UNIFORM LOSS MODEL BASED ON THE FOLLOWING:

ZINC CORROSION RATE (FIRST 2 YEARS) - 15 UM/YR.
ZINC CORROSION RATE (SUBSEQUENT YEARS) - 4 UM/YR.
CARBON STEEL CORROSION RATE - 12 UM/YR.

PERFORM STRESS AND PULLOUT CALCULATIONS ON THE CALCULATED EARTH REINFORCEMENT SECTION REMAINING AFTER 75 YEARS.

NOTES

RAILING AND ROADWAY SLAB ARE PAID FOR UNDER THE APPROPRIATE ROADWAY ITEMS. MODIFICATIONS TO THE RAIL OR ROADWAY SLAB TO FORM COPING ARE CONSIDERED INCIDENTAL TO THE SQUARE FOOT COST OF THE BID ITEM, "RETAINING WALL".
PLACE THE UPPERMOST REINFORCEMENT STRAPS NO MORE THAN 3.5' BELOW THE TOP OF THE WALL. PLACE THE LOWEST LEVEL OF REINFORCEMENT STRAPS NO MORE THAN 2.0' ABOVE THE TOP OF THE LEVELING PAD.
PROVIDE UNDERDRAINS ONLY AT LOCATIONS SHOWN ON THE PLANS. INCLUDE THE COST OF FURNISHING AND INSTALLING UNDERDRAINS IN THE UNIT PRICE BID FOR "RETAINING WALL."

THE REINFORCED VOLUME CONSISTS OF CEMENT STABILIZED BACKFILL IN ACCORDANCE WITH ITEM 132 AND HOUSTON DISTRICT SPECIAL PROVISION (132-001).

PAYMENT HEIGHT SHOWN IN RETAINING WALL LAYOUTS IS CONSIDERED THE MINIMUM HEIGHT TO BE FURNISHED. ADDITIONAL WALL FURNISHED BELOW PAYMENT LINE DUE TO DETAILING OR FABRICATOR DESIGN REQUIREMENTS WILL NOT BE PAID FOR DIRECTLY BUT SHALL BE CONSIDERED INCIDENTAL.

THE CONTRACTOR MAY USE A DIFFERENT TYPE OF TRAFFIC RAIL AND COPING ON RETAINING WALLS IF THE DESIGN AND DETAILS ARE APPROVED BY THE ENGINEER.

WHEN OBSTRUCTIONS (INLETS, DRILLED SHAFTS, PILING, ETC.) PREVENT PLACEMENT OF SOIL REINFORCEMENTS IN THEIR NORMAL LOCATIONS, PROVIDE DETAILS AND CALCULATIONS THAT ESTABLISH SUPPORT FOR THE AFFECTED PANELS. FURNISH THE SAME STEEL AREA OF SOIL REINFORCEMENTS AS THAT REQUIRED IN THE ABSENCE OF THE OBSTRUCTION. PROVIDE CALCULATIONS THAT JUSTIFY ANY ALTERATIONS MADE TO THE SOIL REINFORCEMENTS OR MODIFICATIONS TO THEIR NORMAL PLACEMENT. DO NOT USE PANELS WITHOUT ANY SOIL REINFORCEMENTS CONNECTED TO THEM UNLESS THEY ARE CONNECTED WITH GALVANIZED HARDWARE TO ADJACENT PANELS WHICH DO HAVE SUPPORTING SOIL REINFORCEMENTS ATTACHED TO THEM AND AS APPROVED BY THE ENGINEER.

DESIGN PARAMETERS

BASE RETAINING WALL DESIGN ON THE FOLLOWING DESIGN PATTERNS:

EMBANKMENT MATERIAL (BEHIND CEMENT STABILIZED BACKFILL)
UNIT WEIGHT - 125 PCF
 $\phi = 30^\circ C = 0$ PSF
KA = 0.333

CEMENT STABILIZED BACKFILL
UNIT WEIGHT = 125 PCF
 $\phi = 45^\circ C = 0$ PSF

ALLOWABLE STRESSES IN STEEL AND CONCRETE ARE IN ACCORDANCE WITH CURRENT A.A.S.H.T.O. AND INTERIM SPECIFICATIONS.

THE MINIMUM LENGTH OF REINFORCEMENT STRAPS FOR A 0.55H STEP WALL IS SIX FEET AND FOR A 0.70H WALL IS EIGHT FEET.

EXTERNAL STABILITY CRITERIA

PROVIDE A FACTOR OF SAFETY IN SLIDING ALONG THE BASE OF THE STRUCTURE OF GREATER THAN OR EQUAL TO 1.5.

PROVIDE A FACTOR OF SAFETY IN OVERTURNING OF GREATER THAN OR EQUAL TO 2.0.

THE MAXIMUM ALLOWABLE BEARING PRESSURE IS 1/2 THE ULTIMATE BEARING CAPACITY OF THE FOUNDATION.

THE WIDTHS SHOWN HEREIN ARE CONSIDERED MINIMUM UNLESS A LARGER WIDTH IS SPECIFIED ON THE WALL PLANS OR REQUIRED BY THE FABRICATOR'S DETAILS.

ENSURE THE BASE PRESSURE RESULTANT FALLS WITHIN THE MIDDLE THIRD OF THE RETAINING WALL.

PROVIDE A FACTOR OF SAFETY AGAINST PULLOUT OF THE EARTH REINFORCEMENTS OF GREATER THAN OR EQUAL TO 1.5 AT EACH LEVEL. DETERMINE PULLOUT RESISTANCE FROM TEST DATA EVALUATED AT 1/4 INCH STRAIN.

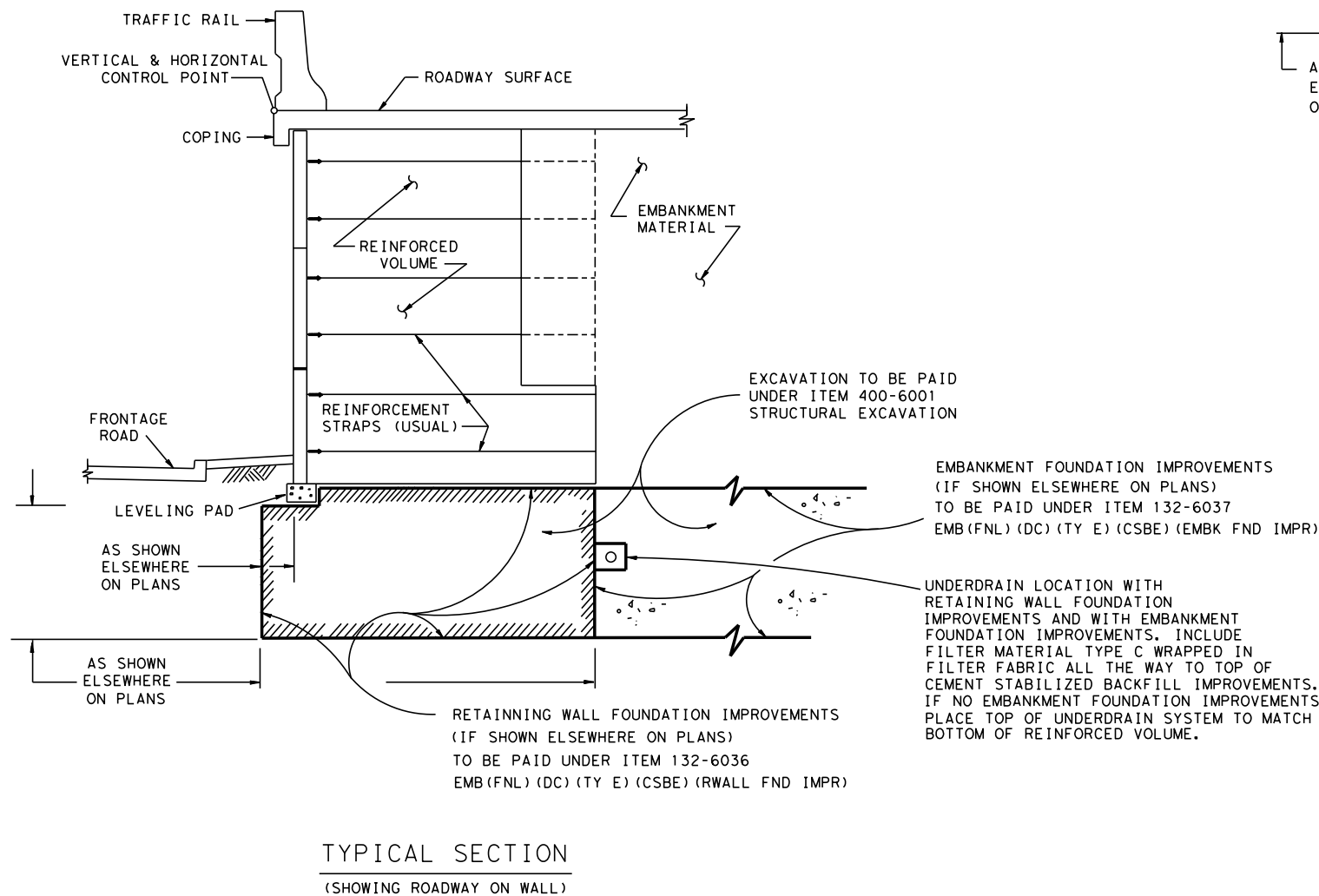
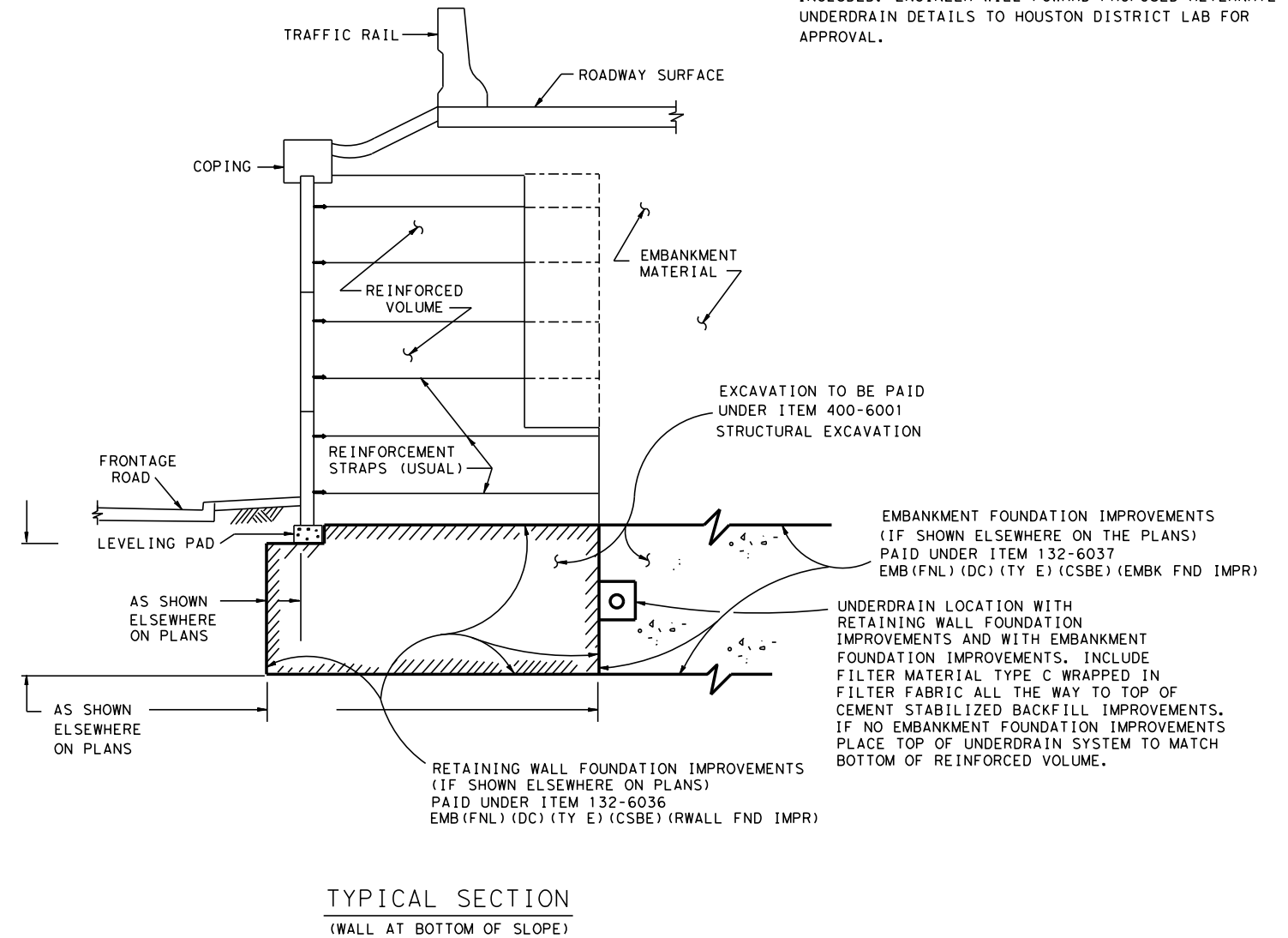
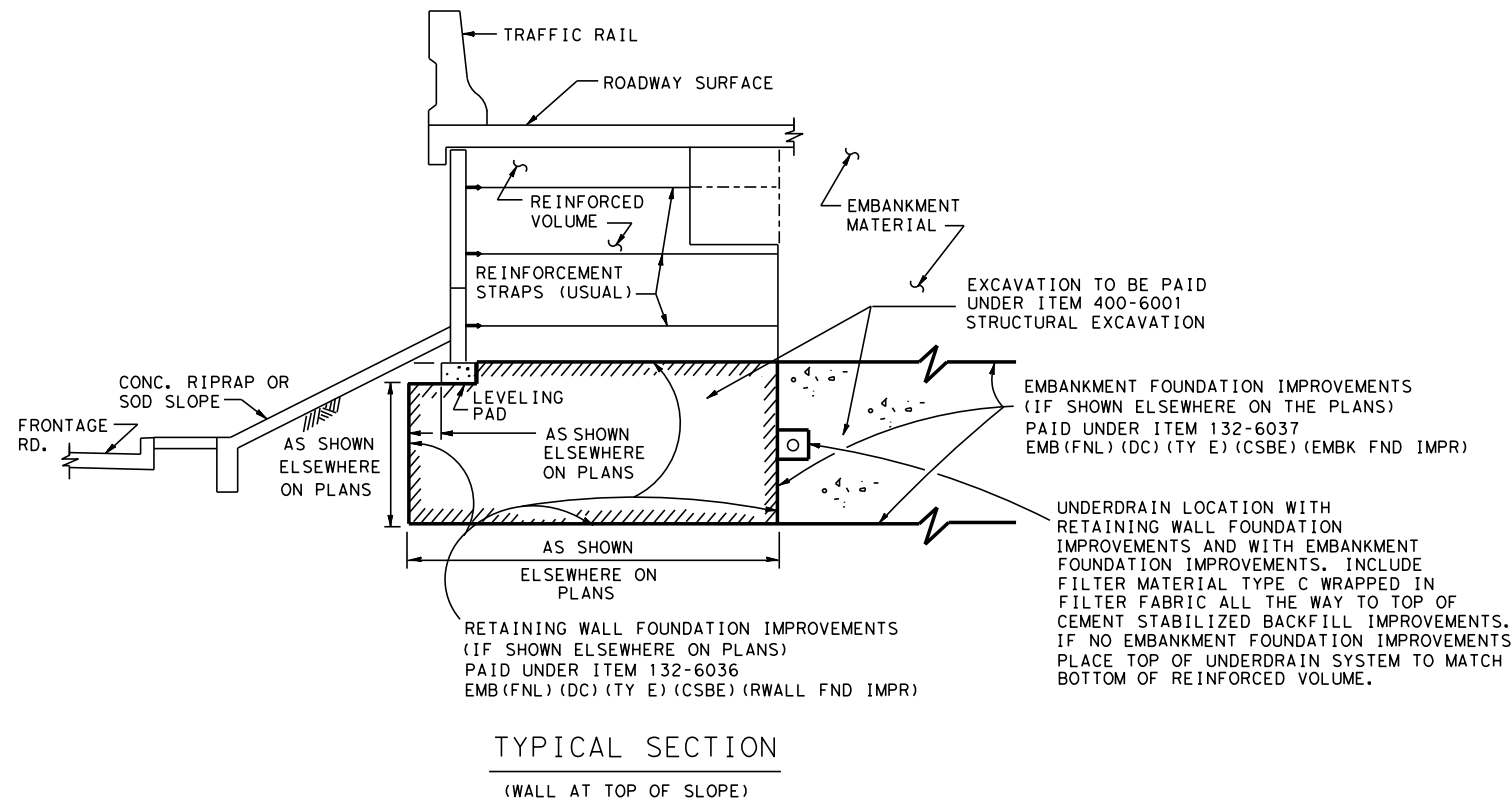


MECHANICALLY STABILIZED RETAINING WALL
CEMENT STABILIZED BACKFILL

MSRW-CSB

FILE: STDJ4.DGN	DN:	CK:	DW:	CK:
© TxDOT 2014	DIST	FED REG	PROJECT NO.	SHEET
MAR 2015 - 2014 SPECS	HOU	6		176
	COUNTY	CONTROL	SECT	JOB
	HARRIS	0389	13	039
				SH 146

NOTE:
 CONTRACTOR MAY SUBMIT FOR APPROVAL AN ALTERNATE UNDERDRAIN LOCATION. UNDERDRAIN SLOPE SHOULD BE INCLUDED. ENGINEER WILL FORWARD PROPOSED ALTERNATE UNDERDRAIN DETAILS TO HOUSTON DISTRICT LAB FOR APPROVAL.



WHEN USING BOTH RETAINING WALL AND EMBANKMENT FOUNDATION IMPROVEMENTS, DESIGNER TO SPECIFY UNDERDRAIN FLOW LINES AS HIGH AS POSSIBLE BUT NOT TO EXTEND TOP OF UNDERDRAIN SYSTEM ABOVE BOTTOM OF REINFORCED VOLUME.

- NOTES:
1. PROVIDE CEMENT STABILIZED BACKFILL IN ACCORDANCE WITH ITEM 132 AND HOUSTON DISTRICT SPECIAL PROVISION (132-001).
 2. FOR ADDITIONAL DETAILS ON RETAINING WALLS SEE "MECHANICALLY STABILIZED EARTH RETAINING WALL CEMENT STABILIZED BACKFILL" MSRW-CSB STANDARD SHEET.

Texas Department of Transportation
 Houston District

RETAINING WALL AND EMBANKMENT FOUNDATION IMPROVEMENTS

RW & EFI

FILE: STDJ-12.dgn	DN:	CK:	DW:	CK:
© TxDOT SEPT. 2009	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS	HOU	6		177
	COUNTY	CONTROL	SECT	JOB
	HARRIS	0389	13	039 SH 146

DRILLED SHAFT DESIGN

WALL HEIGHT	DRILLED SHAFT	
	DIAMETER	LENGTH
12'	30"	15'- 6"

PLAN NOTES:

GENERAL

DESIGN THE SOUND WALL IN ACCORDANCE WITH CURRENT AASHTO GUIDE SPECIFICATIONS FOR STRUCTURAL DESIGN OF SOUND BARRIERS.

SURFACE FINISH

UNLESS OTHERWISE SHOWN IN PLANS, PROVIDE BRUSH CONCRETE OR ASHLAR STONE #12020 TEXTURE FOR THE RESIDENTIAL SIDE OF THE SOUND WALL. PATTERN THE FREEWAY SIDE USING A "FRACTURED FIN" FORMLINER. PROVIDE FORMLINERS USED FOR TEXTURING MADE OF ONE PIECE CONSTRUCTION. JOINTS ARE NOT PERMITTED IN FORMLINERS.

SEE SHEET 3 OF 3, SOUND WALL DETAILS, OR AS DIRECTED, FOR PAINT COLOR ON RESIDENTIAL AND FREEWAY SIDES.

PRECAST CONCRETE SEGMENTS

PRECAST SEGMENTS MAY BE CAST FULL HEIGHT. THE WALL MAY BE CAST MONOLITHICALLY WITH THE COLUMN. GROUT SEGMENTALLY PRECAST COLUMN JOINTS SMOOTH.

STRUCTURAL STEEL

GALVANIZE EXPOSED STEEL PARTS IN ACCORDANCE WITH THE ITEM "GALVANIZING". PAINT GALVANIZED STEEL PER ITEM 446. GALVANIZED ANCHOR BOLTS MAY REMAIN UNPAINTED.

LOADING

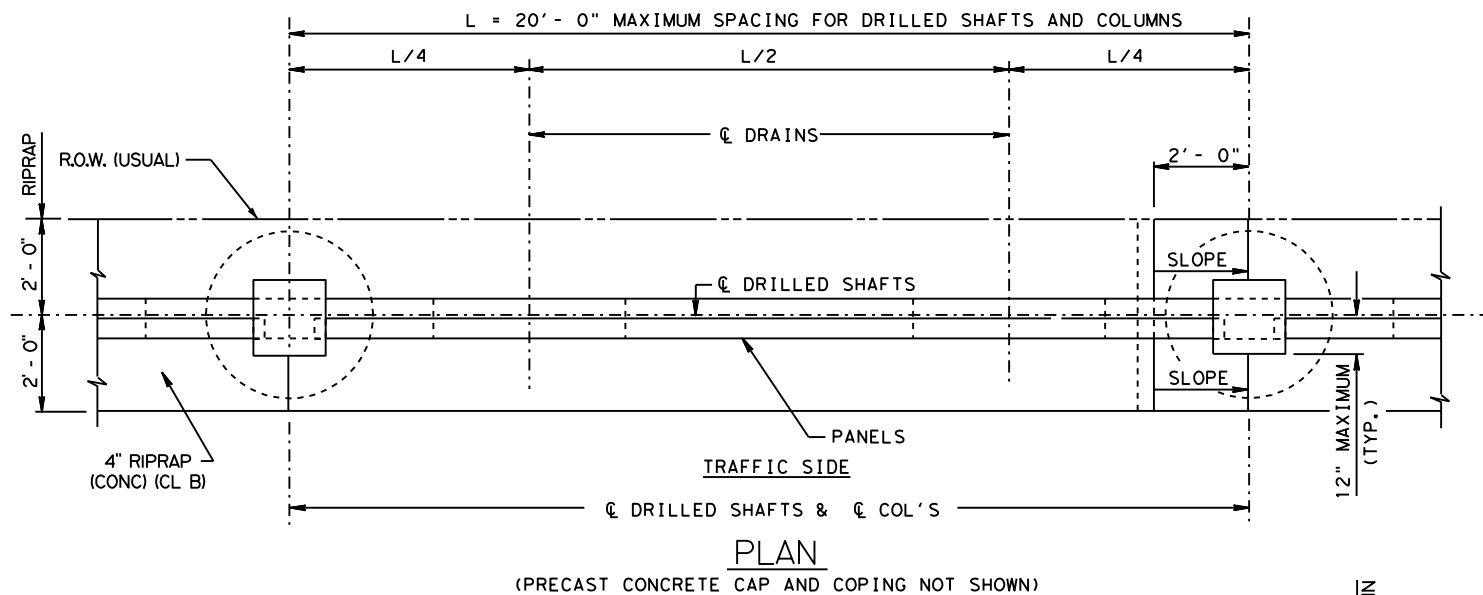
DESIGN THE SOUND WALL TO WITHSTAND A MINIMUM WIND SPEED OF 100 MILES PER HOUR AND FOR EXPOSURE B2.

CONNECTIONS

DESIGN CONNECTIONS OF THE SOUND WALL TO THE FOUNDATIONS USING A FACTOR OF SAFETY OF TWO (2) AGAINST WIND LOAD ALONE, IN ADDITION TO OTHER LOAD COMBINATIONS SPECIFIED. ENSURE CONNECTIONS UTILIZING THREADED RODS OR ANCHOR BOLTS CONFORM TO THE REQUIREMENTS OF THE ITEM "ANCHOR BOLTS". ENSURE CONNECTIONS UTILIZING POST TENSIONING CONFORM TO THE REQUIREMENTS OF THE ITEM "PRESTRESSING". NO UNGROUTED TENDONS ARE ALLOWED, EXCEPT PRESTRESSING USED TO TEMPORARILY SECURE THE WALL.

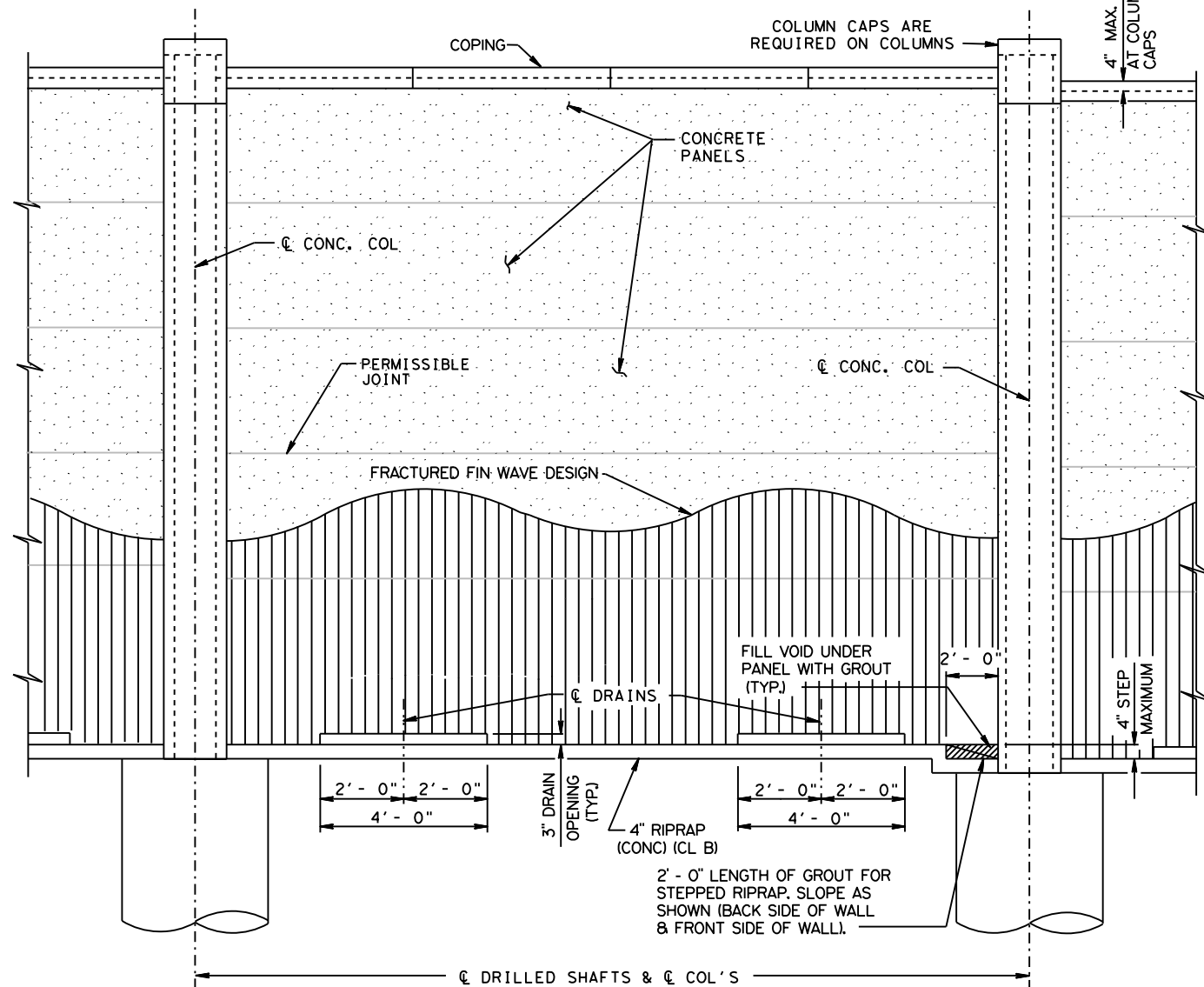
REINFORCEMENT

WIRE MESH MAY BE USED IN LIEU OF DEFORMED BARS IN PANELS.



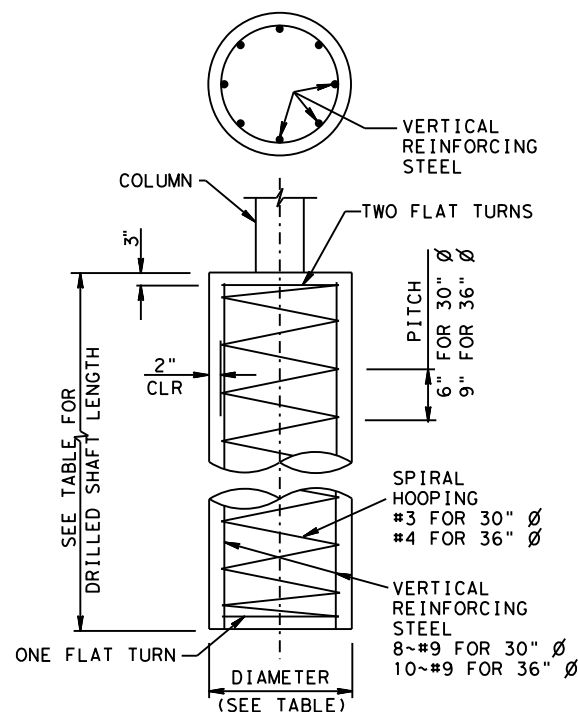
PLAN

(PRECAST CONCRETE CAP AND COPING NOT SHOWN)

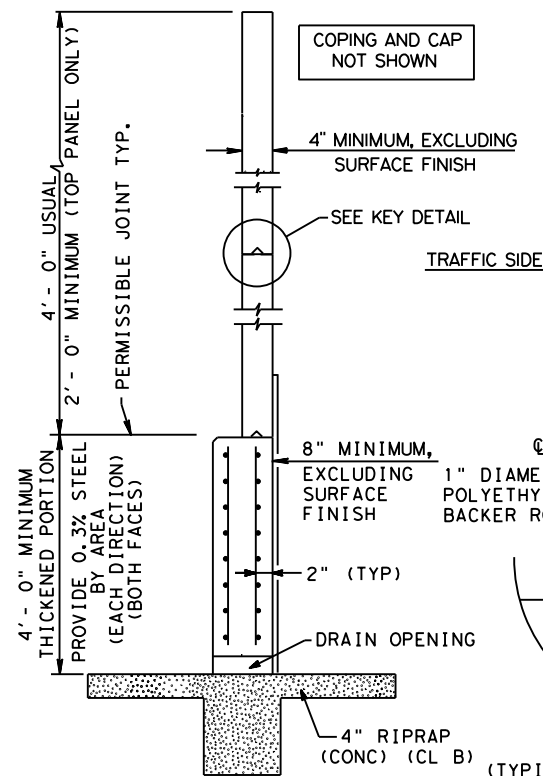


ELEVATION

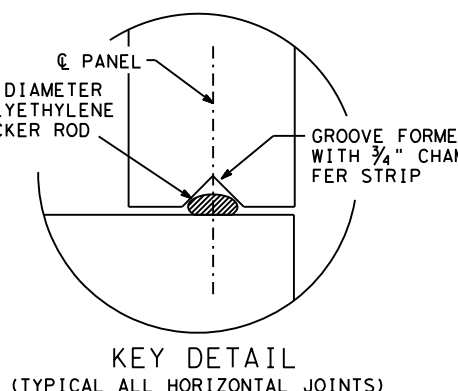
(SHOWN FOR SLOPING OR UNEVEN TERRAIN)



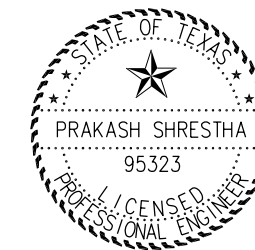
DRILLED SHAFT DETAIL



TYPICAL SECTION



KEY DETAIL
(TYPICAL ALL HORIZONTAL JOINTS)



3/3/2022

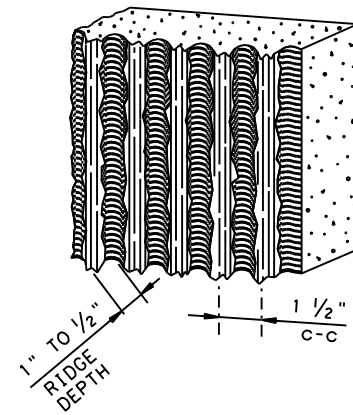
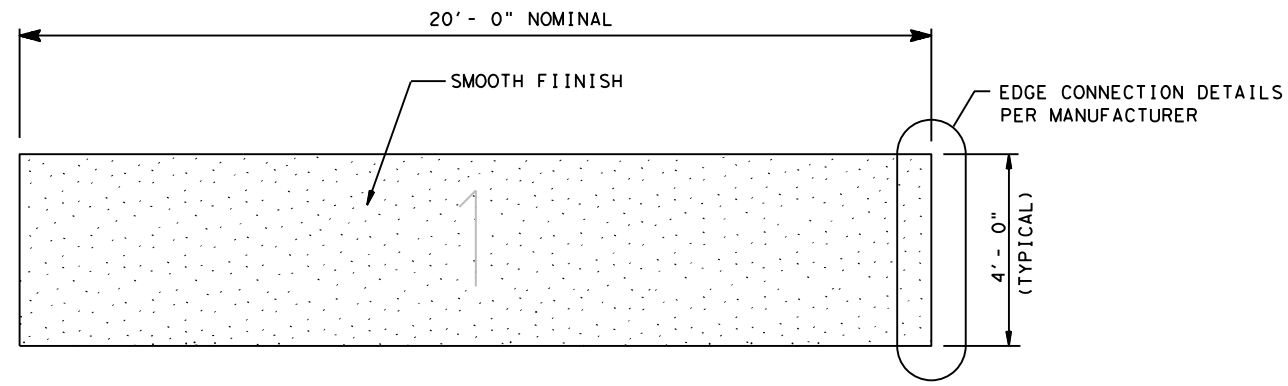
SHEET 1 OF 3

Texas Department of Transportation
Houston District Bridge
Green Ribbon Project

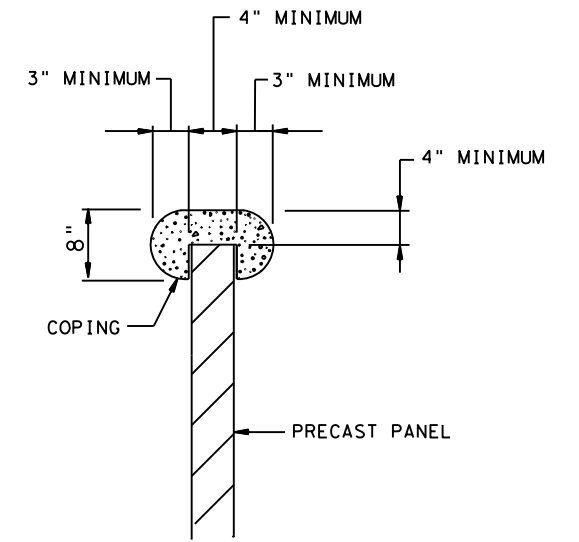
**SOUND WALL DETAILS
WAVE SCHEME**

SWD-WS

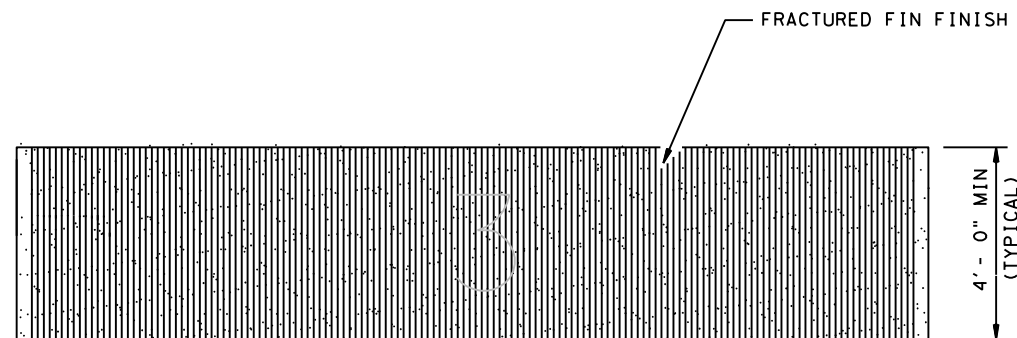
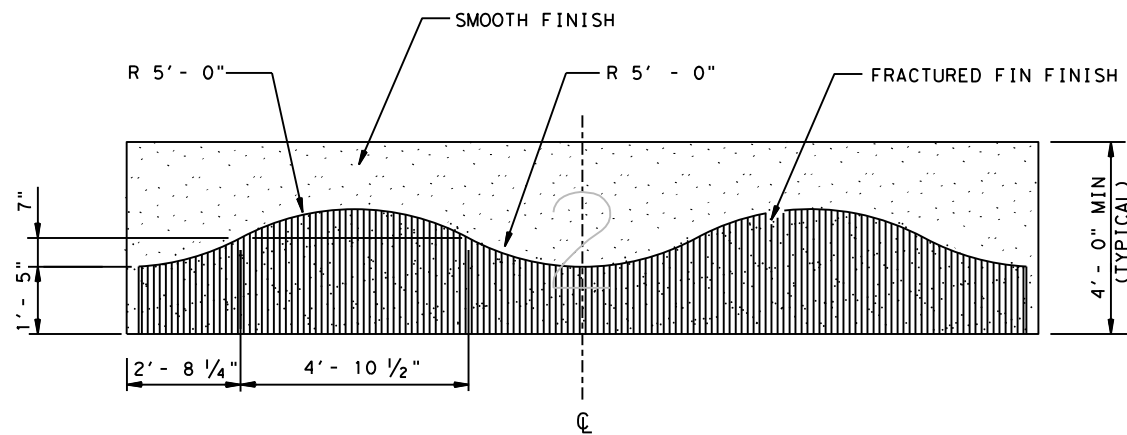
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© TxDOT DEC 2010	DISTRICT	FED REG	PROJECT NO.	SHEET
REVISIONS	HOUSTON	6		178
12/2010 Update system panel steel requirements.	COUNTY	CONTROL	SECT	JOB
9/2014 Usual added to ROW.	HARRIS	0389	13	039
6/2017 Removed Mini Mono Blend.				SH 146



FRACTURED FIN PATTERN
PRECAST CONCRETE PANEL
(FREEWAY SIDE)

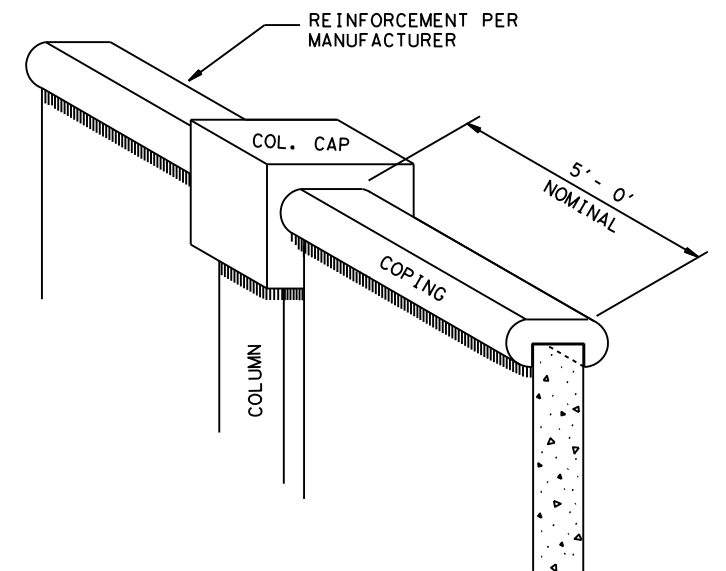


SECTION

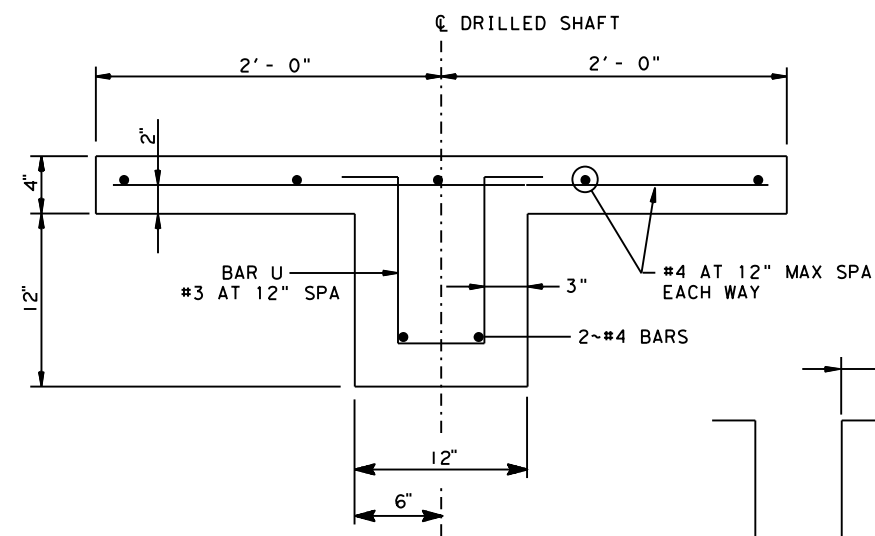


PANEL ELEVATIONS FREEWAY SIDE
(RESIDENTIAL SIDE TO BE
BRUSH CONCRETE
or
ASHLAR STONE #12020)

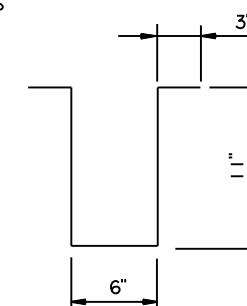
FRACTURED FIN PATTERN	
FORM LINER NO	MFG
#109	SCOTTSYSTEM, INC.
#373	GREENSTREAK
#16950	FITZGERALD FORMLINERS
OR EQUAL ~ SUBJECT TO APPROVAL	



PRECAST CONCRETE COPING
N. T. S.

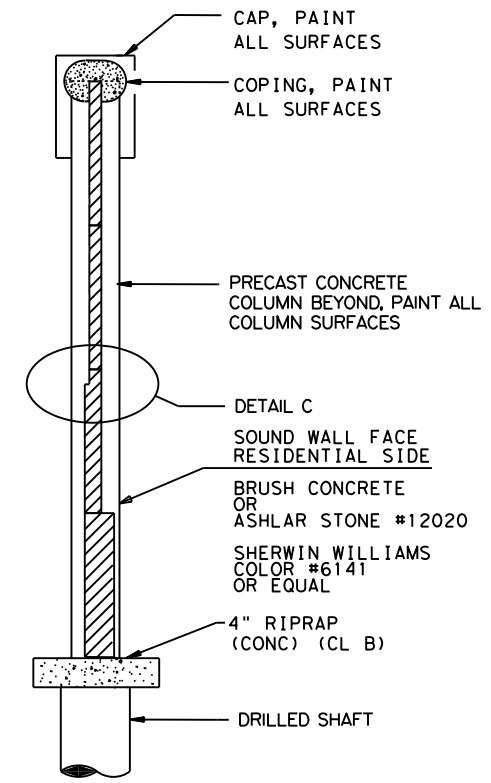
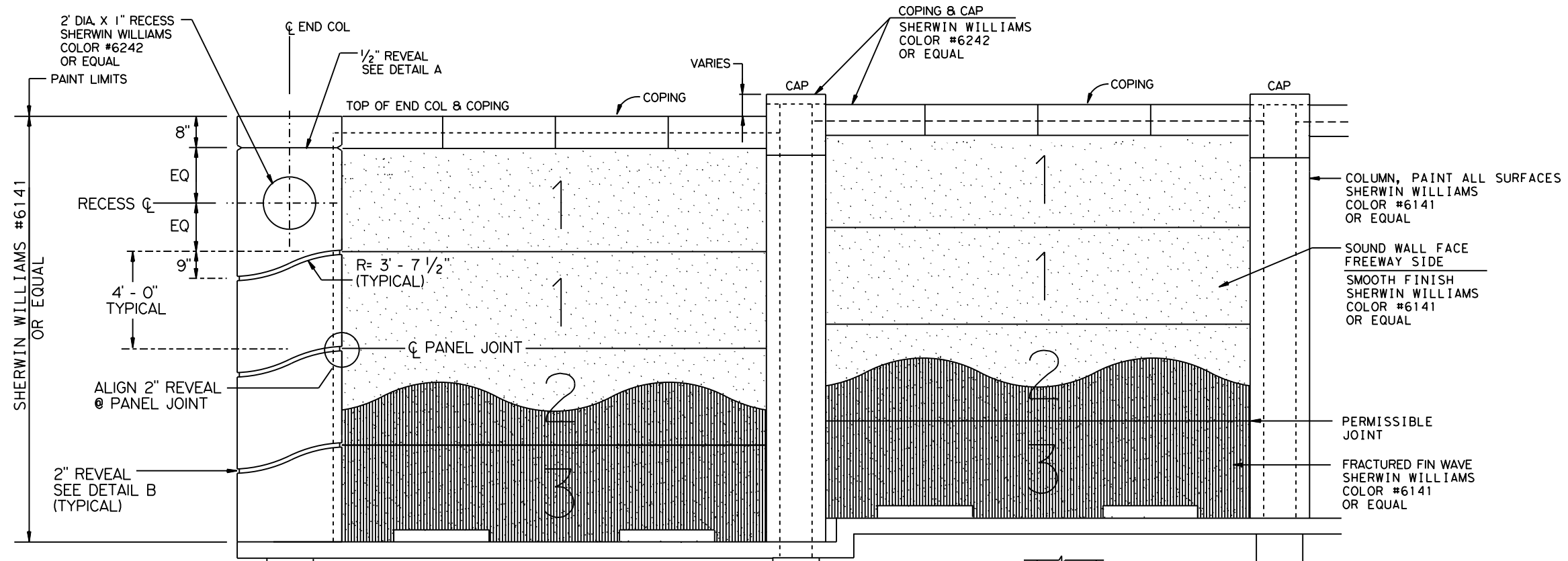


RIPRAP DETAIL



BAR U

FILE: STDJ7.DGN	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT DEC 2010	DISTRICT	FED REG	PROJECT NO.	SHEET
12/2010 Update bottom panel steel requirements. 6/2017 Removed Mini Hoop Br end.	HOUSTON	6		179
	COUNTY	CONTROL	SECT	JOB
	HARRIS	0389	13	039 SH 146



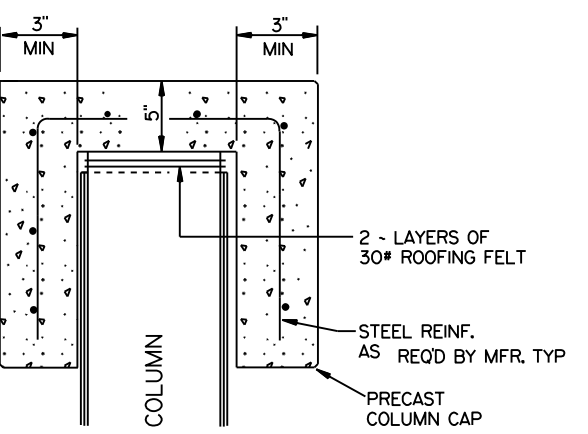
ELEVATION

END COLUMN PLAN
REQD AT ALL ENDS

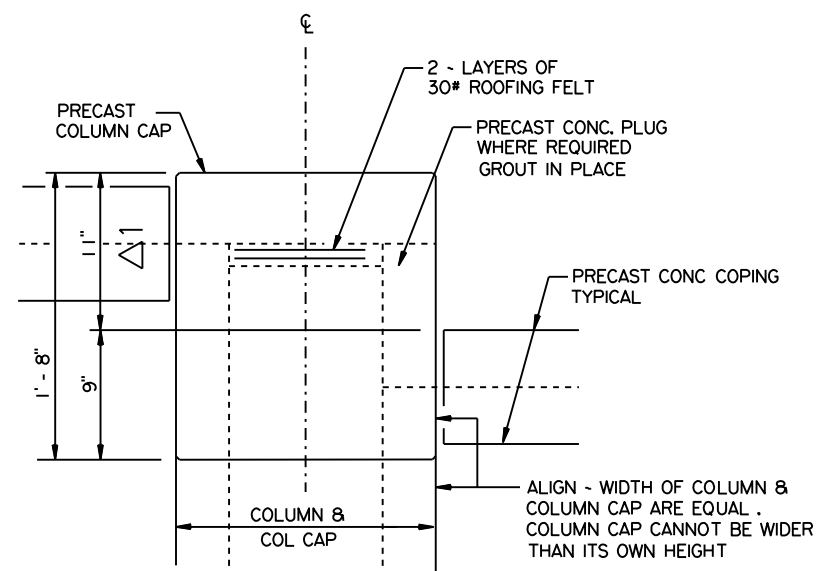
DETAIL A
NTS

DETAIL B
NTS

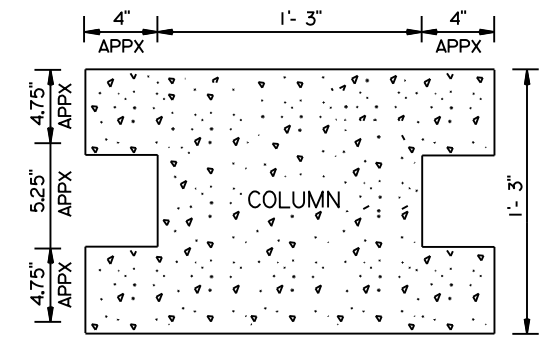
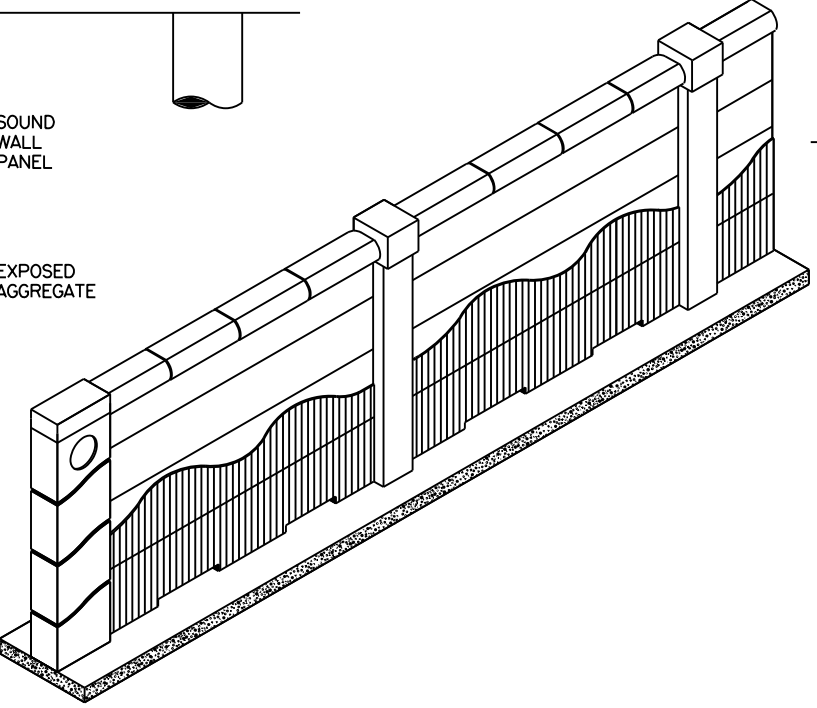
DETAIL C
NTS



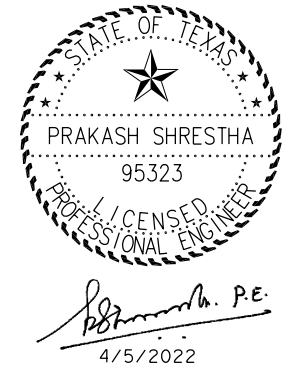
SECTION
PRECAST CONCRETE COLUMN CAP



ELEVATION
PRECAST CONCRETE COLUMN CAP



PLAN
PRECAST CONCRETE COLUMN



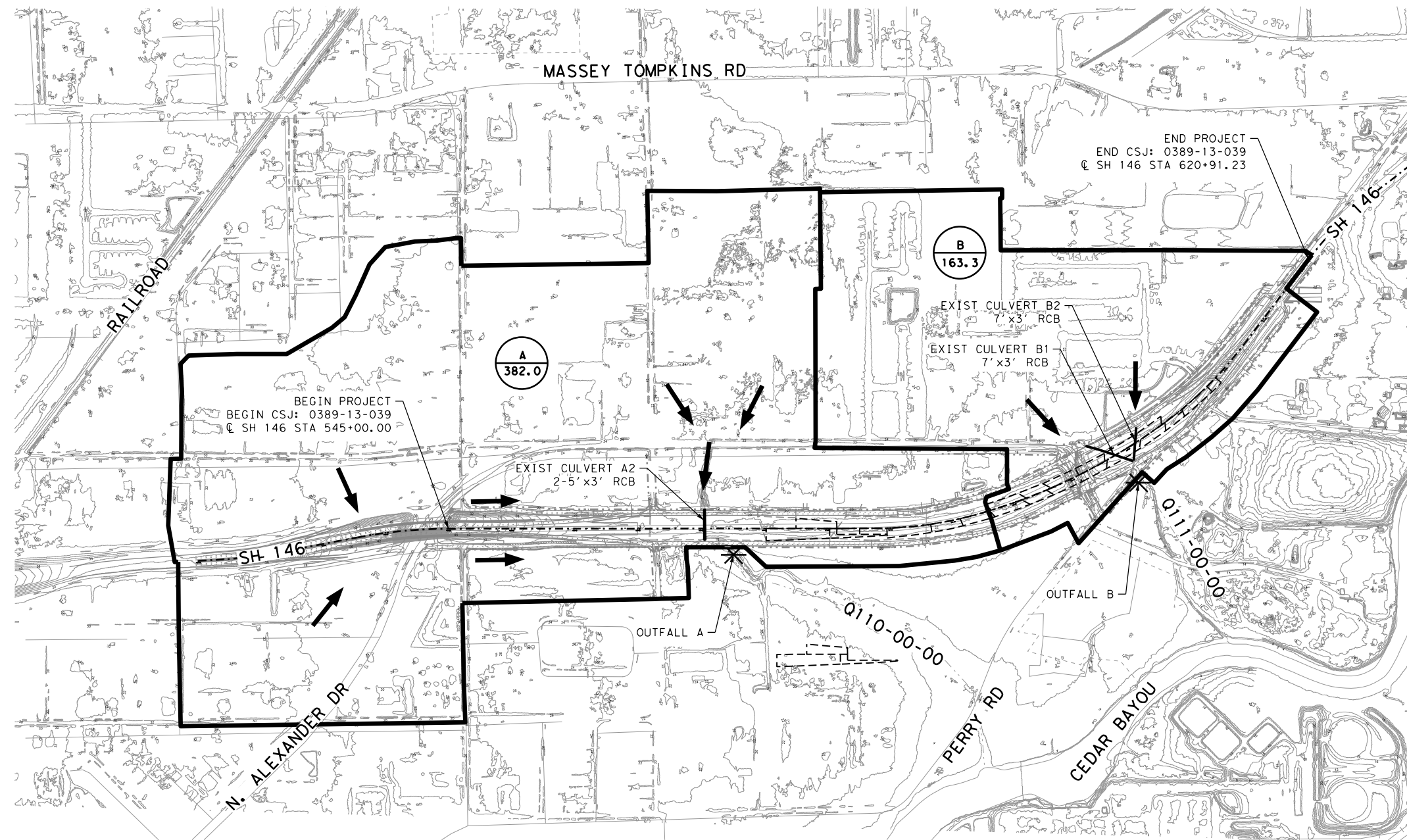
Texas Department of Transportation
Houston District Bridge
Green Ribbon Project

SOUND WALL DETAILS
WAVE SCHEME

SWD-WS

FILE#	STDJ7.DGN	DN#	TxDOT	CK#	TxDOT	DR#	TxDOT	CK#	TxDOT
©	TxDOT	DEC	2010	DISTRICT	FED REG	PROJECT NO.	SHEET		
REVISIONS	12/2010 Update bottom panel steel requirements.								
9/2014	Usual added to ROW.								
6/2017	Removed Wyma Haha Blend.								
	HOUSTON	6		COUNTY	CONTROL	SECT	JOB	HIGHWAY	
	HARRIS	0389	13	039	SH 146				

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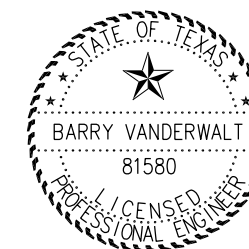
LEGEND

- DIRECTION OF FLOW
- ONSITE DRAINAGE AREA BOUNDARY
- OVERALL DRAINAGE AREA BOUNDARY
- OUTFALL LOCATION
- DRAINAGE AREA ID
DRAINAGE AREA ACREAGE

NOTES:

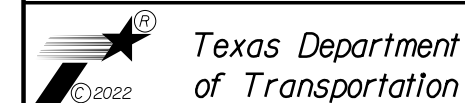
1. THE OVERALL DRAINAGE AREAS BOUNDARIES ARE SHOWN AS PROVIDED IN THE DRAINAGE STUDY REPORT PREPARED BY AECOM TITLED, "DRAINAGE STUDY FOR ROADWAY IMPROVEMENT TO SH146 FROM BS 146E TO FERRY ROAD", DATED MAY 2020.
2. THE DRAINAGE AREA A AND B OUTFALL TO CEDAR BAYOU TRIBUTARY Q110-00-00 AND Q111-00-00 THROUGH CROSS CULVERTS.

REV NO.	DATE	BY	REVISION



Barry Vanderwalt
1/5/2022

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



SH 146
OVERALL DRAINAGE AREA MAP






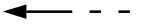
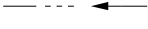




SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			181
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

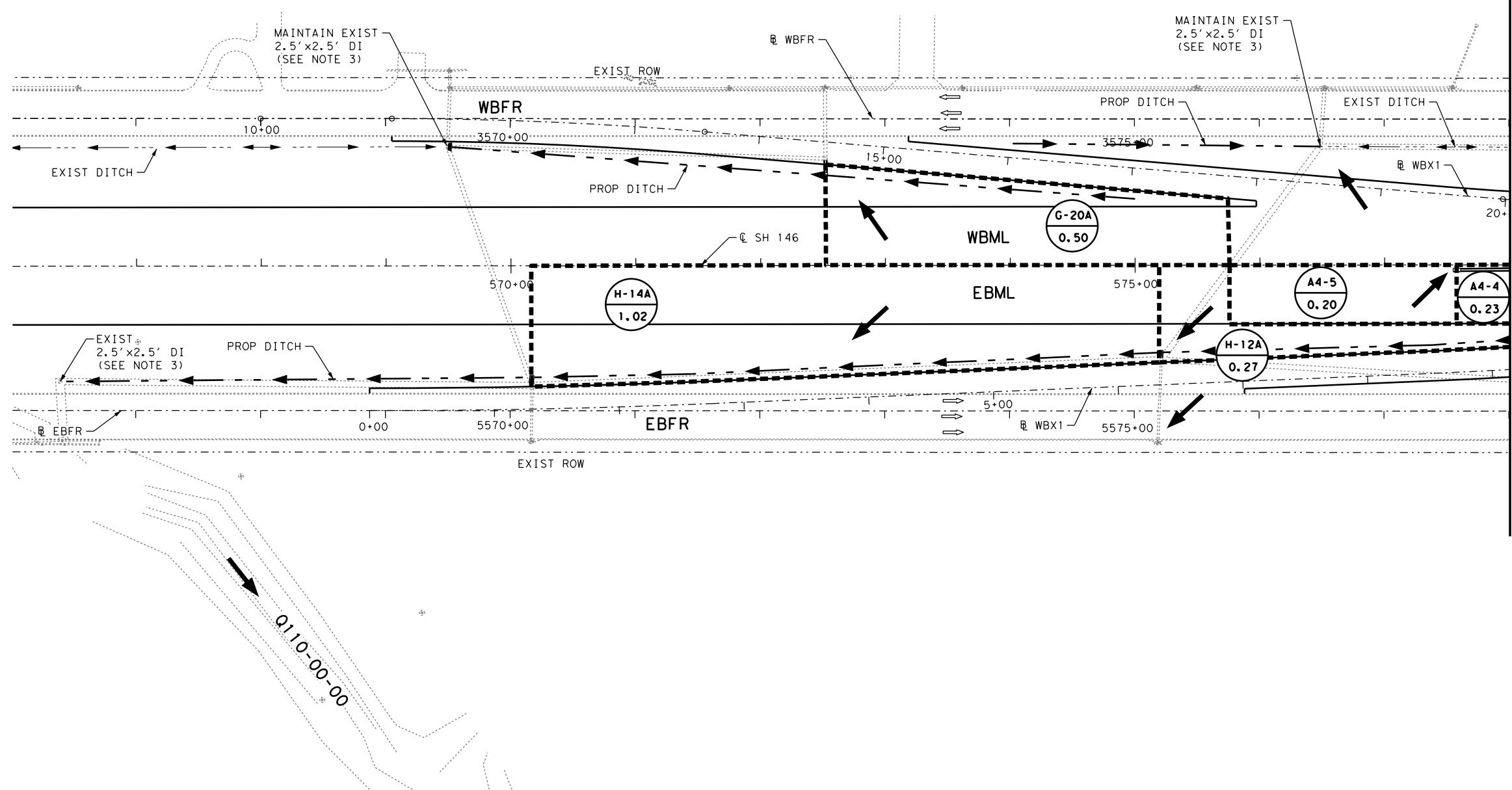
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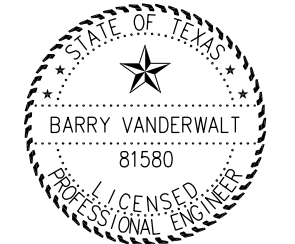
LEGEND

-  MANHOLE
-  GRATE INLET
-  CURB INLET
-  CURB INLET WITH EXTENSION
-  EXISTING STORM SEWER
-  PROPOSED DITCH
-  EXISTING DITCH
-  DIRECTION OF FLOW
-  DRAINAGE AREA BOUNDARY
-  DRAINAGE AREA ID
-  DRAINAGE AREA ACREAGE

- NOTES:
1. SEE RUNOFF COMPUTATIONS SHEET FOR ALL DRAINAGE AREA CALCULATIONS.
 2. SEE OVERALL DRAINAGE AREA MAP SHEETS FOR FULL EXTENTS OF DRAINAGE AREA BOUNDARIES.
 3. EXISTING DRAINAGE SYSTEMS ARE DESIGNED TO ACCOMMODATE ULTIMATE PAVEMENT WIDTH OF MAINLANES AND ARE NOT ANALYSED HERE. MODIFICATIONS ARE ANALYSED AND SHOWN IN COMPUTATION SHEETS.



REV. NO.	DATE	BY	REVISION



Barry Vanderwalt
 1/5/2022

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



SH 146

DRAINAGE AREA MAP












STA 566+00 TO STA 578+00

SHEET 1 OF 4

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			182
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

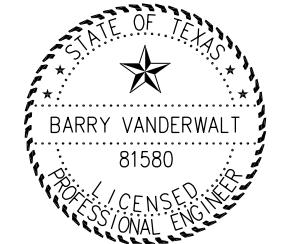


LEGEND

-  MANHOLE
-  GRATE INLET
-  CURB INLET
-  CURB INLET WITH EXTENSION
-  EXISTING STORM SEWER
-  PROPOSED DITCH
-  EXISTING DITCH
-  DIRECTION OF FLOW
-  DRAINAGE AREA BOUNDARY
-  DRAINAGE AREA ID
-  DRAINAGE AREA ACREAGE

- NOTES:
1. SEE RUNOFF COMPUTATIONS SHEET FOR ALL DRAINAGE AREA CALCULATIONS.
 2. SEE OVERALL DRAINAGE AREA MAP SHEETS FOR FULL EXTENTS OF DRAINAGE AREA BOUNDARIES.
 3. EXISTING DRAINAGE SYSTEMS ARE DESIGNED TO ACCOMMODATE ULTIMATE PAVEMENT WIDTH OF MAINLANES AND ARE NOT ANALYSED HERE. MODIFICATIONS ARE ANALYSED AND SHOWN IN COMPUTATION SHEETS.

REV. NO.	DATE	BY	REVISION



Barry Vanderwalt
1/5/2022

CivilTech Engineering, Inc.
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Firm Registration No. F-382



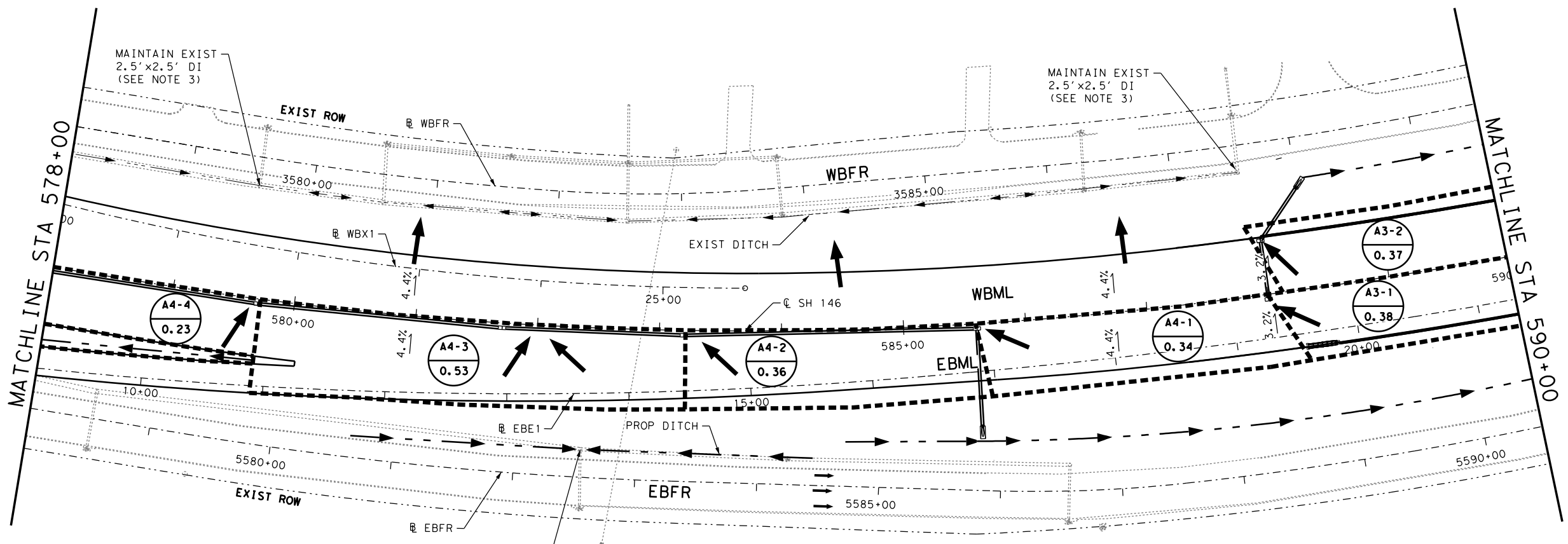
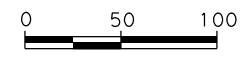
SH 146

DRAINAGE AREA MAP

STA 578+00 TO STA 590+00

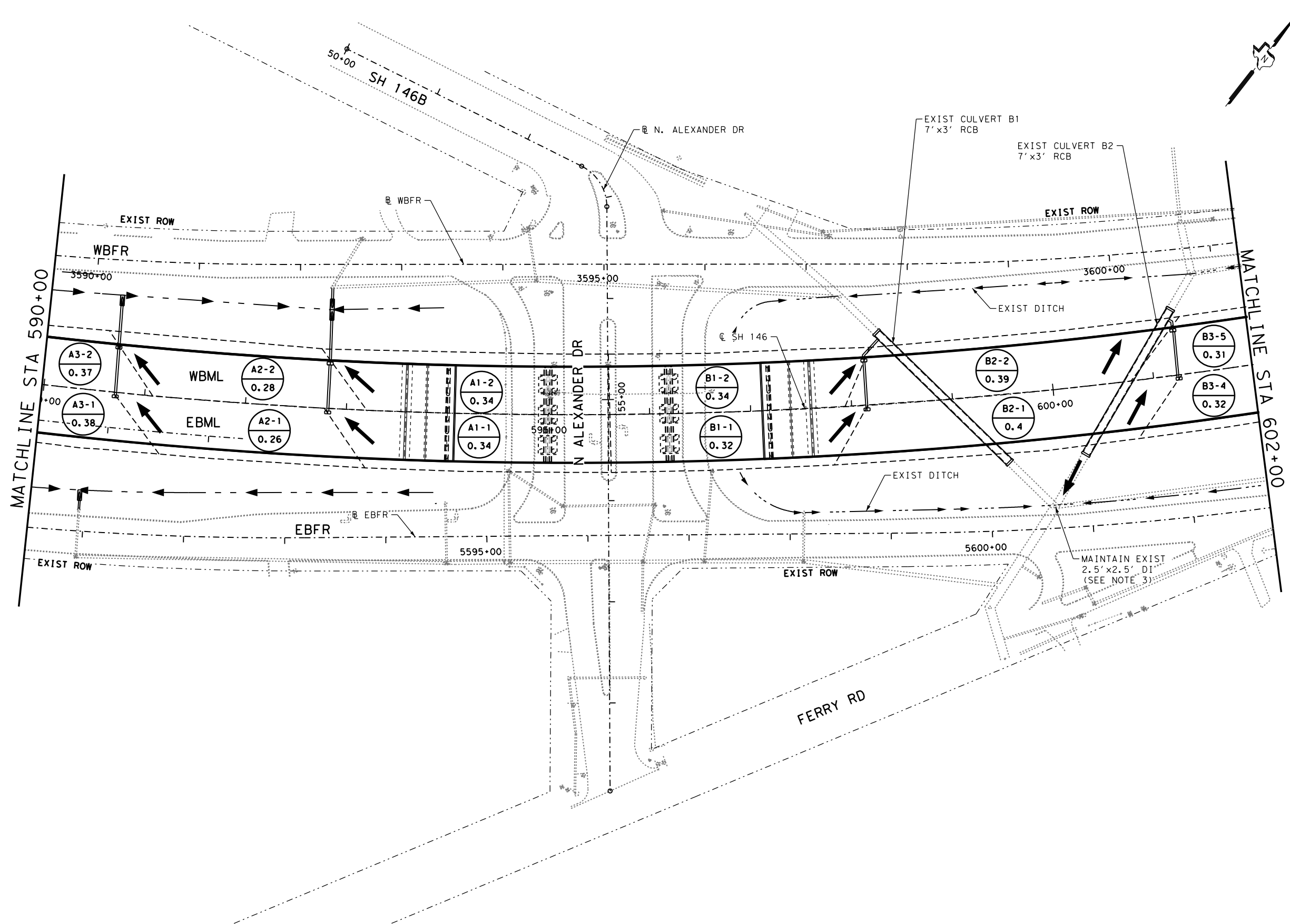
SHEET 2 OF 4

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.	
6		183	
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146



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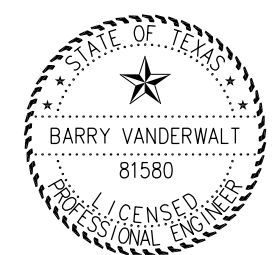


LEGEND

- MANHOLE
- GRATE INLET
- CURB INLET
- CURB INLET WITH EXTENSION
- EXISTING STORM SEWER
- PROPOSED DITCH
- EXISTING DITCH
- DIRECTION OF FLOW
- DRAINAGE AREA BOUNDARY
- DRAINAGE AREA ID
- DRAINAGE AREA ACREAGE

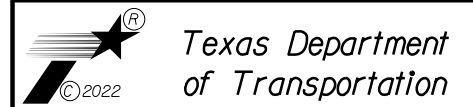
- NOTES:
- SEE RUNOFF COMPUTATIONS SHEET FOR ALL DRAINAGE AREA CALCULATIONS.
 - SEE OVERALL DRAINAGE AREA MAP SHEETS FOR FULL EXTENTS OF DRAINAGE AREA BOUNDARIES.
 - EXISTING DRAINAGE SYSTEMS ARE DESIGNED TO ACCOMMODATE ULTIMATE PAVEMENT WIDTH OF MAINLANES AND ARE NOT ANALYSED HERE. MODIFICATIONS ARE ANALYSED AND SHOWN IN COMPUTATION SHEETS.

REV. NO.	DATE	BY	REVISION



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 1/5/2022

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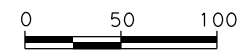
SH 146

DRAINAGE AREA MAP












STA 590+00 TO STA 602+00

SHEET 3 OF 4

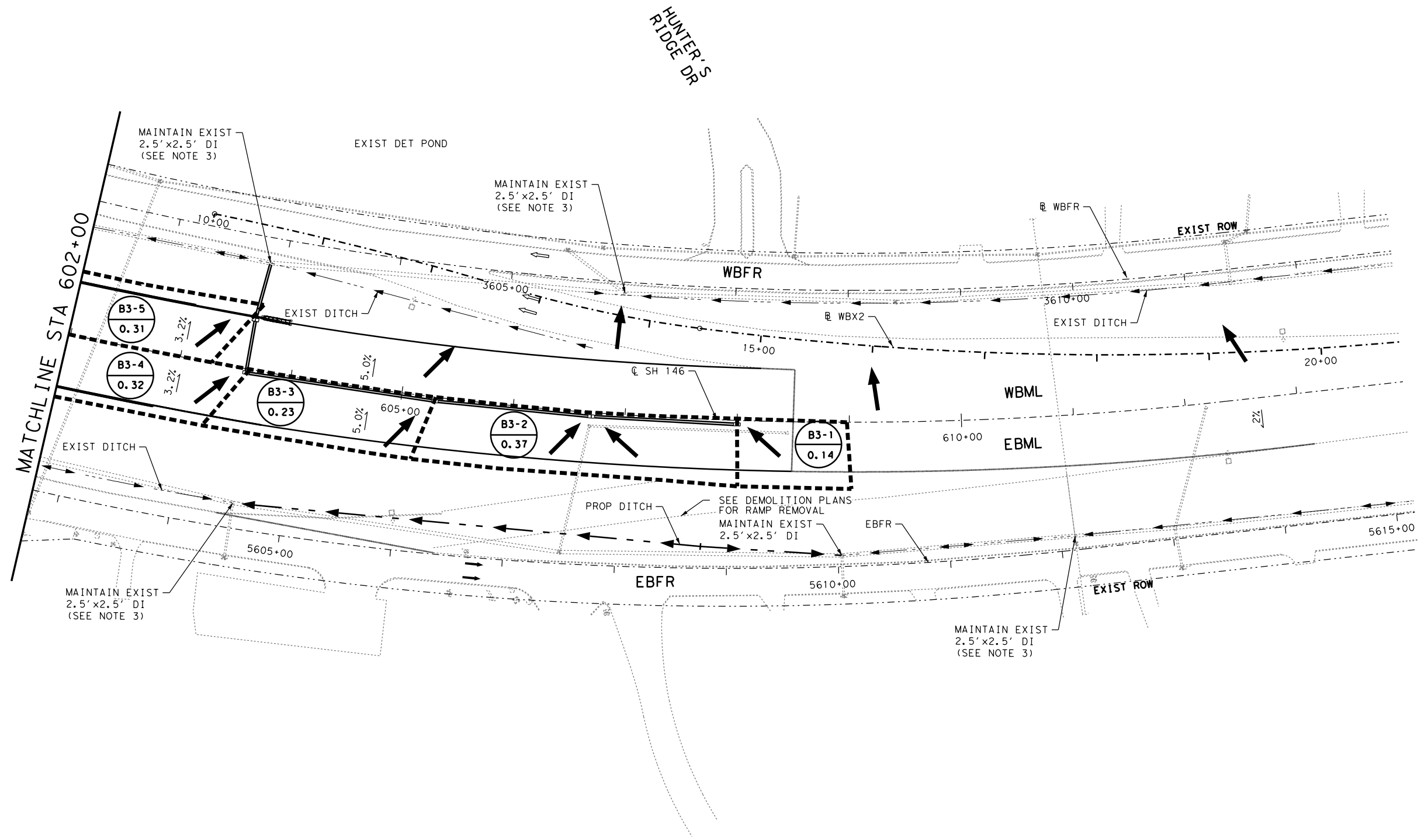
FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			184
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146



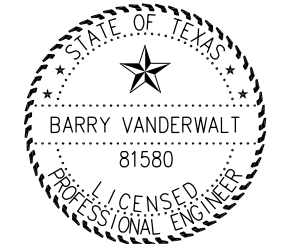
LEGEND

-  MANHOLE
-  GRATE INLET
-  CURB INLET
-  CURB INLET WITH EXTENSION
-  EXISTING STORM SEWER
-  PROPOSED DITCH
-  EXISTING DITCH
-  DIRECTION OF FLOW
-  DRAINAGE AREA BOUNDARY
-  DRAINAGE AREA ID
-  DRAINAGE AREA ACREAGE

- NOTES:
1. SEE RUNOFF COMPUTATIONS SHEET FOR ALL DRAINAGE AREA CALCULATIONS.
 2. SEE OVERALL DRAINAGE AREA MAP SHEETS FOR FULL EXTENTS OF DRAINAGE AREA BOUNDARIES.
 3. EXISTING DRAINAGE SYSTEMS ARE DESIGNED TO ACCOMMODATE ULTIMATE PAVEMENT WIDTH OF MAINLANES AND ARE NOT ANALYSED HERE. MODIFICATIONS ARE ANALYSED AND SHOWN IN COMPUTATION SHEETS.



REV. NO.	DATE	BY	REVISION



Barry Vanderwalt
1/5/2022

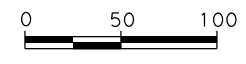
CivilTech Engineering, Inc.
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Firm Registration No. F-382



SH 146
DRAINAGE AREA MAP
STA 602+00 TO STA 614+00

SHEET 4 OF 4

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			185
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146



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GEOPAK 2013 Drainage (STORM DRAIN DESIGN)
 Project Name: SH 146
 Job Number: 375024
 Project Description: Storm Sewer
 Design Frequency: 10 Year
 Tailwater: Top of Pipe
 Measurement Unit: English
 County: Harris County
 Runoff Computations for Design Frequency

NOTES:
 1. INTENSITY TAKEN FROM EBDLKUP-2019-vc6.2.10.XLSM FOR HARRIS COUNTY PARTIAL DURATION SERIES.

SYSTEM A1						
ID	Weighted C	Drainage Area (acres)	TC Computed (min)	TC Used (min)	Intensity (in/hr)	Runoff (cfs)
A1-2	0.90	0.34	5.36	10.00	8.39	2.54
A1-1	0.90	0.34	5.35	10.00	8.39	2.54

SYSTEM B1						
ID	Weighted C	Drainage Area (acres)	TC Computed (min)	TC Used (min)	Intensity (in/hr)	Runoff (cfs)
B1-2	0.90	0.34	5.00	10.00	8.39	2.53
B1-1	0.90	0.32	5.05	10.00	8.39	2.41

SYSTEM A2						
ID	Weighted C	Drainage Area (acres)	TC Computed (min)	TC Used (min)	Intensity (in/hr)	Runoff (cfs)
A2-2	0.90	0.28	4.35	10.00	8.39	2.14
A2-1	0.90	0.26	4.42	10.00	8.39	1.99

SYSTEM B2						
ID	Weighted C	Drainage Area (acres)	TC Computed (min)	TC Used (min)	Intensity (in/hr)	Runoff (cfs)
B2-2	0.90	0.39	5.80	10.00	8.39	2.92
B2-1	0.90	0.40	6.00	10.00	8.39	3.03

SYSTEM A3						
ID	Weighted C	Drainage Area (acres)	TC Computed (min)	TC Used (min)	Intensity (in/hr)	Runoff (cfs)
A3-2	0.90	0.37	5.20	10.00	8.39	2.80
A3-1	0.90	0.38	5.50	10.00	8.39	2.84

SYSTEM B3						
ID	Weighted C	Drainage Area (acres)	TC Computed (min)	TC Used (min)	Intensity (in/hr)	Runoff (cfs)
B3-5	0.90	0.31	3.00	10.00	8.39	2.37
B3-4	0.90	0.32	4.88	10.00	8.39	2.42
B3-3	0.90	0.23	3.63	10.00	8.39	1.75
B3-2	0.90	0.37	3.21	10.00	8.39	2.82
B3-1	0.90	0.14	3.00	10.00	8.39	1.02

SYSTEM A4						
ID	Weighted C	Drainage Area (acres)	TC Computed (min)	TC Used (min)	Intensity (in/hr)	Runoff (cfs)
A4-1	0.90	0.34	4.80	10.00	8.39	2.54
A4-2	0.90	0.36	4.70	10.00	8.39	2.68
A4-3	0.90	0.56	4.80	10.00	8.39	4.25
A4-4	0.90	0.23	4.60	10.00	8.39	1.73
A4-5	0.90	0.20	2.00	10.00	8.39	1.49

EXIST SYSTEM H&G						
ID	Weighted C	Drainage Area (acres)	TC Computed (min)	TC Used (min)	Intensity (in/hr)	Runoff (cfs)
H-12A	0.47	0.27	5.01	10.00	8.39	1.09
H-14A	0.64	1.02	5.50	10.00	8.39	5.49
G-20A	0.74	0.50	3.44	10.00	8.39	3.06

REV. NO.	DATE	BY	REVISION



Barry Vanderwalt
 1/5/2022

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 Firm Registration No. F-382



SH 146
 HYDRAULIC DATA SHEET
 RUNOFF COMPUTATIONS

SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.	
6		186	
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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GEOPAK 2013 Drainage (STORM DRAIN DESIGN)
 Project Name: SH 146
 Job Number: 375024
 Project Description: Storm Sewer
 Design Frequency: 10 Year
 Tailwater: Top of Pipe
 Measurement Unit: English
 County: Harris County

NOTES:
 1. SEE SHEET 2 OF 2 FOR SAG INLET COMPUTATIONS

On Grade Inlet Computations Data

SYSTEM A1																
ID	Station	Offset	Inlet Type	Inlet Profile	Discharge (cfs)	Ponded Width	Ponded Depth	Max Allow Pond (ft)	Trans. Slope (%)	Longitud. Slope (%)	Inlet Length	Inlet Width	Depr.	Capacity (cfs)	By Pass (cfs)	To Node
A1-2	592+81.00	44.50' LT	Grate	On Grade	2.54	6.09	0.21	10.00	3.20	1.73	5.96	2.75	n/a	2.28	0.27	A2-2
A1-1	592+81.00	4.00' RT	Grate	On Grade	2.54	6.09	0.21	10.00	3.20	1.73	5.96	2.75	n/a	2.28	0.27	A2-1

SYSTEM A2																
ID	Station	Offset	Inlet Type	Inlet Profile	Discharge (cfs)	Ponded Width	Ponded Depth	Max Allow Pond (ft)	Trans. Slope (%)	Longitud. Slope (%)	Inlet Length	Inlet Width	Depr.	Capacity (cfs)	By Pass (cfs)	To Node
A2-2	590+70.00	44.50' LT	Grate	On Grade	2.36	5.73	0.18	10.00	3.20	3.05	5.96	2.75	n/a	2.14	0.22	A3-2
A2-1	590+70.00	4.00' RT	Grate	On Grade	2.21	5.59	0.18	10.00	3.20	3.05	5.96	2.75	n/a	2.02	0.19	A3-1

SYSTEM A3																
ID	Station	Offset	Inlet Type	Inlet Profile	Discharge (cfs)	Ponded Width	Ponded Depth	Max Allow Pond (ft)	Trans. Slope (%)	Longitud. Slope (%)	Inlet Length	Inlet Width	Depr.	Capacity (cfs)	By Pass (cfs)	To Node
A3-2	588+00.00	44.50' LT	Grate	On Grade	3.03	6.69	0.21	10.00	3.20	2.20	5.96	2.75	n/a	2.65	0.37	G-2
A3-1	588+00.00	4.00' RT	Grate	On Grade	3.04	6.71	0.21	10.00	3.20	2.20	5.96	2.75	n/a	2.66	0.80	A4-1

SYSTEM A4																
ID	Station	Offset	Inlet Type	Inlet Profile	Discharge (cfs)	Ponded Width	Ponded Depth	Max Allow Pond (ft)	Trans. Slope (%)	Longitud. Slope (%)	Inlet Length	Inlet Width	Depr.	Capacity (cfs)	By Pass (cfs)	To Node
A4-1	585+60.00	4.00' RT	Grate	On Grade	2.87	8.16	0.29	10.00	4.40	0.46	5.96	2.75	n/a	2.63	0.24	A4-2
A4-2	583+20.00	4.00' RT	Grate	On Grade	2.92	8.65	0.31	10.00	4.40	0.35	5.96	2.75	n/a	2.69	0.23	A4-3
A4-4	579+70.00	4.00' RT	Grate	On Grade	1.81	8.04	0.29	10.00	4.34	0.20	5.96	2.75	n/a	1.73	0.08	A4-3
A4-5	577+57.77	4.00' RT	Grate	On Grade	1.49	9.15	0.24	10.00	2.50	0.20	5.96	2.75	n/a	1.41	0.08	A4-4

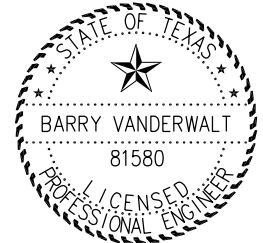
SYSTEM B1																
ID	Station	Offset	Inlet Type	Inlet Profile	Discharge (cfs)	Ponded Width	Ponded Depth	Max Allow Pond (ft)	Trans. Slope (%)	Longitud. Slope (%)	Inlet Length	Inlet Width	Depr.	Capacity (cfs)	By Pass (cfs)	To Node
B1-2	598+14.92	44.50' LT	Grate	On Grade	2.53	6.64	0.21	10.00	3.20	1.60	5.96	2.75	n/a	2.27	0.26	B2-2
B1-1	598+15.00	4.00' RT	Grate	On Grade	2.41	6.52	0.21	10.00	3.20	1.60	5.96	2.75	n/a	2.17	0.24	B2-1

SYSTEM B2																
ID	Station	Offset	Inlet Type	Inlet Profile	Discharge (cfs)	Ponded Width	Ponded Depth	Max Allow Pond (ft)	Trans. Slope (%)	Longitud. Slope (%)	Inlet Length	Inlet Width	Depr.	Capacity (cfs)	By Pass (cfs)	To Node
B2-2	601+25.00	44.50' LT	Grate	On Grade	3.19	6.27	0.20	10.00	3.20	3.45	5.96	2.75	n/a	2.78	0.40	B3-5
B2-1	601+25.00	4.00' RT	Grate	On Grade	3.27	6.33	0.20	10.00	3.20	3.45	5.96	2.75	n/a	2.85	0.42	B3-4

SYSTEM B3																
ID	Station	Offset	Inlet Type	Inlet Profile	Discharge (cfs)	Ponded Width	Ponded Depth	Max Allow Pond (ft)	Trans. Slope (%)	Longitud. Slope (%)	Inlet Length	Inlet Width	Depr.	Capacity (cfs)	By Pass (cfs)	To Node
B3-5	603+60.00	44.50' LT	Grate	On Grade	2.77	6.03	0.22	10.00	3.60	2.17	5.96	2.75	n/a	2.51	0.26	B3-OUT
B3-4	603+60.00	4.00' RT	Grate	On Grade	2.84	5.22	0.24	10.00	4.60	2.17	5.96	2.75	n/a	2.67	0.17	B3-3
B3-3	605+30.00	4.00' RT	Grate	On Grade	1.92	4.99	0.25	10.00	5.00	0.96	5.96	2.75	n/a	1.86	0.06	B3-2
B3-1	608+00.00	4.00' RT	Grate	On Grade	1.02	6.01	0.30	10.00	5.00	0.10	5.96	2.75	n/a	1.01	1.01	B3-2

EXIST SYSTEM G&H																
ID	Station	Offset	Inlet Type	Inlet Profile	Discharge (cfs)	Ponded Width	Ponded Depth	Max Allow Pond (ft)	Trans. Slope (%)	Longitud. Slope (%)	Inlet Length	Inlet Width	Depr.	Capacity (cfs)	By Pass (cfs)	To Node
H-12A	575+20.00	70.00' RT	Grate	On Grade	1.09	6.20	1.55	20.00	25.00	0.28	2.48	2.48	n/a	1.09	0.01	H-14A
H-14A	570+15.00	90.00' RT	Grate	On Grade	5.49	11.35	2.84	20.00	25.00	0.28	2.48	2.48	n/a	5.46	0.03	EXIST IL
G-20A	572+52.23	73.00' LT	Grate	On Grade	3.06	3.18	0.80	30.00	25.00	0.78	2.48	2.48	n/a	3.05	0.01	EXIST IL


REV NO.	DATE	BY	REVISION



BARRY VANDERWALT
81580
LICENSED PROFESSIONAL ENGINEER

Barry Vanderwalt
2/28/2022

CivilTech Engineering, Inc. 11821 Telge Road
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Firm Registration No. F-382



Texas Department of Transportation

SH 146

**HYDRAULIC DATA SHEET
INLET COMPUTATIONS**

SHEET 1 OF 2

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			187
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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GEOPAK 2013 Drainage (STORM DRAIN DESIGN)
 Project Name: SH 146
 Job Number: 375024
 Project Description: Storm Sewer
 Design Frequency: 10 Year
 Tailwater: Top of Pipe
 Measurement Unit: English
 County: Harris County
 Sag Inlet Computations Data

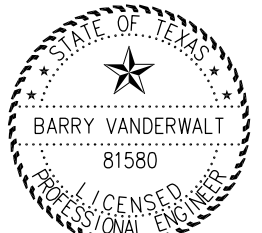
NOTES:

1. ALL SAG INLET CAPACITIES CALCULATED WITH AREA AND PERIMETER REDUCTION FACTOR OF 0.5. TO ACCOUNT FOR CLOGGING

SYSTEM A4																				
ID	Station	Offset	Inlet Type	Inlet Profile	Discharge (cfs)	Discharge (cfs)		Ponded Width (ft)		Max Allow Pond Width (ft)	Slope (%)		Grate Length (ft)	Grate Width (ft)	Depr.	Grate Area (sq ft)	Perimeter (ft)	Capacity (cfs)	Ponded Depth (ft)	Trans. Slope (%)
						Left	Right	Left	Right		Left	Right								
A4-3	581+71.00	4.00' RT	Grate	Sag	4.48	2.24	2.24	7.68	7.68	10.00	0.20	0.20	5.96	2.75	n/a	9.08	17.42	9.50	0.30	3.60


SYSTEM B3																				
ID	Station	Offset	Inlet Type	Inlet Profile	Discharge (cfs)	Discharge (cfs)		Ponded Width (ft)		Max Allow Pond Width (ft)	Slope (%)		Grate Length (ft)	Grate Width (ft)	Depr.	Grate Area (sq ft)	Perimeter (ft)	Capacity (cfs)	Ponded Depth (ft)	Trans. Slope (%)
						Left	Right	Left	Right		Left	Right								
B3-2	606+70.00	4.00' RT	Grate	Sag	2.89	1.45	1.45	6.84	5.57	10.00	0.10	0.30	5.96	2.75	n/a	9.08	17.42	9.50	0.23	5.00

REV NO.	DATE	BY	REVISION



Barry Vanderwalt
2/28/2022

CivilTech Engineering, Inc.
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 Firm Registration No. F-382



Texas Department of Transportation

SH 146

HYDRAULIC DATA SHEET
INLET COMPUTATIONS

SHEET 2 OF 2

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			188
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

GEOPAK 2013 Drainage (STORM DRAIN DESIGN)
 Project Name: SH 146
 Job Number: 375024
 Project Description: Storm Sewer
 Design Frequency: 10 Year
 Tailwater: Top of Pipe
 Measurement Unit: English
 County: Harris County
 Conveyance Configuration Data

NOTES:

- PIPE LENGTH SHOWN IS ACTUAL LENGTH FROM INSIDE FACE TO INSIDE FACE OF STRUCTURE

SYSTEM A1											
ID	US ID	DS ID	Length (ft)	Shape	Barrels	Rise (ft)	Span (ft)	N	Slope (%)	US Invert (ft)	DS Invert (ft)
A1-2	A1-2	A1-OUT	41.70	Circular	1	2	n/a	0.012	1.06	13.44	13.00
A1-1	A1-1	A1-2	45.67	Circular	1	2	n/a	0.012	1.01	13.90	13.44

SYSTEM A2											
ID	US ID	DS ID	Length (ft)	Shape	Barrels	Rise (ft)	Span (ft)	N	Slope (%)	US Invert (ft)	DS Invert (ft)
A2-2	A2-2	A2-OUT	42.5	Circular	1	2	n/a	0.012	0.99	15.62	15.20
A2-1	A2-1	A2-2	45.2	Circular	1	2	n/a	0.012	1.00	16.08	15.63

SYSTEM A3											
ID	US ID	DS ID	Length (ft)	Shape	Barrels	Rise (ft)	Span (ft)	N	Slope (%)	US Invert (ft)	DS Invert (ft)
A3-2	A3-2	A3-OUT	52.67	Circular	1	2	n/a	0.012	1.00	15.03	14.50
A3-1	A3-1	A3-2	45.67	Circular	1	2	n/a	0.012	1.27	15.61	15.03

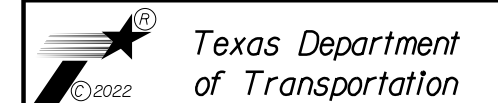
SYSTEM A4											
ID	US ID	DS ID	Length (ft)	Shape	Barrels	Rise (ft)	Span (ft)	N	Slope (%)	US Invert (ft)	DS Invert (ft)
A4-1	A4-1	A4-OUT	78.78	Circular	1	2	n/a	0.012	0.31	15.54	15.30
A4-2	A4-2	A4-1	234.30	Circular	1	2	n/a	0.012	0.50	16.71	15.54
A4-3	A4-3	A4-2	138.77	Circular	1	2	n/a	0.012	0.31	17.14	16.71
A4-4	A4-4	A4-3	205.68	Circular	1	2	n/a	0.012	0.28	17.72	17.14
A4-5	A4-5	A4-4	218.31	Circular	1	2	n/a	0.012	0.28	18.34	17.72

REV NO.	DATE	BY	REVISION



Barry Vanderwalt
 1/5/2022

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



SH 146

HYDRAULIC DATA SHEET
 STORM SEWER
 COMPUTATIONS

SHEET 1 OF 4

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			189
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

GEOPAK 2013 Drainage (STORM DRAIN DESIGN)
 Project Name: SH 146
 Job Number: 375024
 Project Description: Storm Sewer
 Design Frequency: 10 Year
 Tailwater: Top of Pipe
 Measurement Unit: English
 County: Harris County
 Conveyance Configuration Data

NOTES:

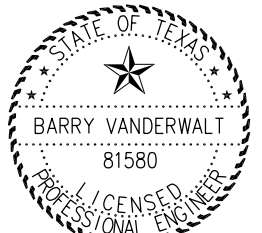
- PIPE LENGTH SHOWN IS ACTUAL LENGTH FROM INSIDE FACE TO INSIDE FACE OF STRUCTURE

SYSTEM B1											
ID	US ID	DS ID	Length (ft)	Shape	Barrels	Rise (ft)	Span (ft)	N	Slope (%)	US Invert (ft)	DS Invert (ft)
B1-2	B1-2	B1-OUT	27.91	Circular	1	2	n/a	0.012	1.00	11.58	11.30
B1-1	B1-1	B1-2	45.67	Circular	1	2	n/a	0.012	1.01	12.04	11.58

SYSTEM B1											
ID	US ID	DS ID	Length (ft)	Shape	Barrels	Rise (ft)	Span (ft)	N	Slope (%)	US Invert (ft)	DS Invert (ft)
B2-2	B2-2	B2-OUT	9.91	Circular	1	2	n/a	0.012	0.71	11.27	11.20
B2-1	B2-1	B2-2	45.67	Circular	1	2	n/a	0.012	0.95	11.70	11.27


SYSTEM B3											
ID	US ID	DS ID	Length (ft)	Shape	Barrels	Rise (ft)	Span (ft)	N	Slope (%)	US Invert (ft)	DS Invert (ft)
B3-5	B3-5	B3-OUT	51.08	Circular	1	2	n/a	0.012	1.00	13.51	13.00
B3-4	B3-4	B3-5	45.67	Circular	1	2	n/a	0.012	0.95	13.94	13.51
B3-3	B3-3	B3-4	164.24	Circular	1	2	n/a	0.012	0.51	14.77	13.94
B3-2	B3-2	B3-3	134.22	Circular	1	2	n/a	0.012	0.51	15.45	14.77
B3-1	B3-1	B3-2	124.20	Circular	1	2	n/a	0.012	0.49	16.06	15.45

REV NO.	DATE	BY	REVISION



Barry Vanderwalt
1/5/2022

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Texas Department of Transportation

SH 146

HYDRAULIC DATA SHEET
STORM SEWER
COMPUTATIONS

SHEET 2 OF 4

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			190
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

NOTES:

- PIPE LENGTH SHOWN IS ACTUAL LENGTH FROM INSIDE FACE TO INSIDE FACE OF STRUCTURE

GEOPAK 2013 Drainage (STORM DRAIN DESIGN)
 Project Name: SH 146
 Job Number: 375024
 Project Description: Storm Sewer
 Design Frequency: 10 Year
 Tailwater: Top of Pipe
 Measurement Unit: English
 County: Harris County
 Conveyance Hydraulic Computation

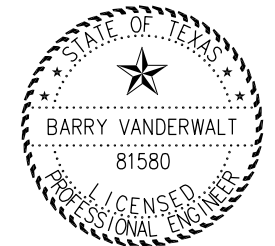
SYSTEM A1												
ID	US ID	DS ID	US HGL (ft)	DS HGL (ft)	Discharge (cfs)	Capacity (cfs)	Slope (%)	Loss (ft)	Uniform Vel. (ft/s)	Uniform Depth (ft)	Actual Vel. (ft/s)	Actual Depth (ft)
A1-2	A1-2	A1-OUT	15.00	15.00	4.55	27.10	1.06	0.00	6.08	0.58	1.45	2.00
A1-1	A1-1	A1-2	14.99	15.00	2.28	26.46	1.01	0.00	4.94	0.41	0.87	1.56

SYSTEM A2												
ID	US ID	DS ID	US HGL (ft)	DS HGL (ft)	Discharge (cfs)	Capacity (cfs)	Slope (%)	Loss (ft)	Uniform Vel. (ft/s)	Uniform Depth (ft)	Actual Vel. (ft/s)	Actual Depth (ft)
A2-2	A2-2	A2-OUT	17.20	17.20	4.23	26.21	0.99	0.00	5.80	0.56	1.35	2.00
A2-1	A2-1	A2-2	17.20	17.20	2.05	26.37	1.00	0.00	4.75	0.39	0.77	1.58

SYSTEM A3												
ID	DS ID	US ID	US HGL (ft)	DS HGL (ft)	Discharge (cfs)	Capacity (cfs)	Slope (%)	Loss (ft)	Uniform Vel. (ft/s)	Uniform Depth (ft)	Actual Vel. (ft/s)	Actual Depth (ft)
A3-2	A3-2	A3-OUT	16.50	16.50	5.32	26.36	1.00	0.00	6.21	0.63	1.69	2.00
A3-1	A3-1	A3-2	16.50	16.50	2.66	29.73	1.27	0.00	5.60	0.42	1.08	1.47

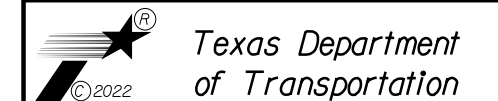
SYSTEM A4												
ID	DS ID	US ID	US HGL (ft)	DS HGL (ft)	Discharge (cfs)	Capacity (cfs)	Slope (%)	Loss (ft)	Uniform Vel. (ft/s)	Uniform Depth (ft)	Actual Vel. (ft/s)	Actual Depth (ft)
A4-1	A4-1	A4-OUT	17.51	17.30	13.09	14.55	0.30	0.00	4.91	1.58	4.17	2.00
A4-2	A4-2	A4-1	17.89	16.65	10.34	18.63	0.50	0.00	5.75	1.11	5.75	1.11
A4-3	A4-3	A4-2	18.23	17.89	7.64	14.68	0.31	0.00	4.46	1.07	3.95	1.18
A4-4	A4-4	A4-3	18.41	18.23	3.16	14.00	0.28	0.00	3.39	0.67	1.80	1.09
A4-5	A4-5	A4-4	18.84	18.41	1.40	14.05	0.28	0.00	2.74	0.44	1.45	0.69

REV NO.	DATE	BY	REVISION



Barry Vanderwalt
1/5/2022

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SH 146

HYDRAULIC DATA SHEET
 STORM SEWER
 COMPUTATIONS

SHEET 3 OF 4

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			191
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

NOTES:

- PIPE LENGTH SHOWN IS ACTUAL LENGTH FROM INSIDE FACE TO INSIDE FACE OF STRUCTURE

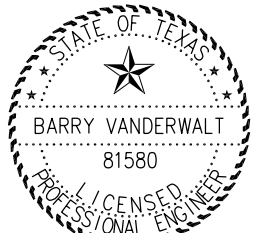
GEOPAK 2013 Drainage (STORM DRAIN DESIGN)
 Project Name: SH 146
 Job Number: 375024
 Project Description: Storm Sewer
 Design Frequency: 10 Year
 Tailwater: Top of Pipe
 Measurement Unit: English
 County: Harris County
 Conveyance Hydraulic Computation

SYSTEM B1												
ID	DS ID	US ID	US HGL (ft)	DS HGL (ft)	Discharge (cfs)	Capacity (cfs)	Slope (%)	Loss (ft)	Uniform Vel. (ft/s)	Uniform Depth (ft)	Actual Vel. (ft/s)	Actual Depth (ft)
B1-2	B1-2	B1-OUT	13.30	13.30	4.43	26.41	1.00	0.00	5.92	0.58	1.41	2.00
B1-1	B1-1	B1-2	13.30	13.30	2.17	26.46	1.01	0.00	4.82	0.40	0.75	1.72

SYSTEM B2												
ID	DS ID	US ID	US HGL (ft)	DS HGL (ft)	Discharge (cfs)	Capacity (cfs)	Slope (%)	Loss (ft)	Uniform Vel. (ft/s)	Uniform Depth (ft)	Actual Vel. (ft/s)	Actual Depth (ft)
B2-2	B2-2	B2-OUT	13.20	13.20	5.63	22.16	0.71	0.00	5.59	0.72	1.79	2.00
B2-1	B2-1	B2-2	13.20	13.20	2.85	25.63	0.94	0.00	5.10	0.47	0.92	1.93


SYSTEM B3												
ID	DS ID	US ID	US HGL (ft)	DS HGL (ft)	Discharge (cfs)	Capacity (cfs)	Slope (%)	Loss (ft)	Uniform Vel. (ft/s)	Uniform Depth (ft)	Actual Vel. (ft/s)	Actual Depth (ft)
B3-5	B3-5	B3-OUT	14.98	15.00	10.94	26.34	1.00	0.00	7.55	0.94	3.48	2.00
B3-4	B3-4	B3-5	15.00	14.35	8.43	25.58	0.95	0.00	6.93	0.82	6.70	0.84
B3-3	B3-3	B3-4	15.65	14.74	5.76	18.74	0.51	0.00	4.97	0.79	4.97	0.80
B3-2	B3-2	B3-3	16.17	15.42	3.91	18.76	0.51	0.00	4.45	0.65	4.45	0.65
B3-1	B3-1	B3-2	16.47	15.78	1.01	18.48	0.49	0.00	2.97	0.33	2.97	0.33

REV NO.	DATE	BY	REVISION



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1/5/2022

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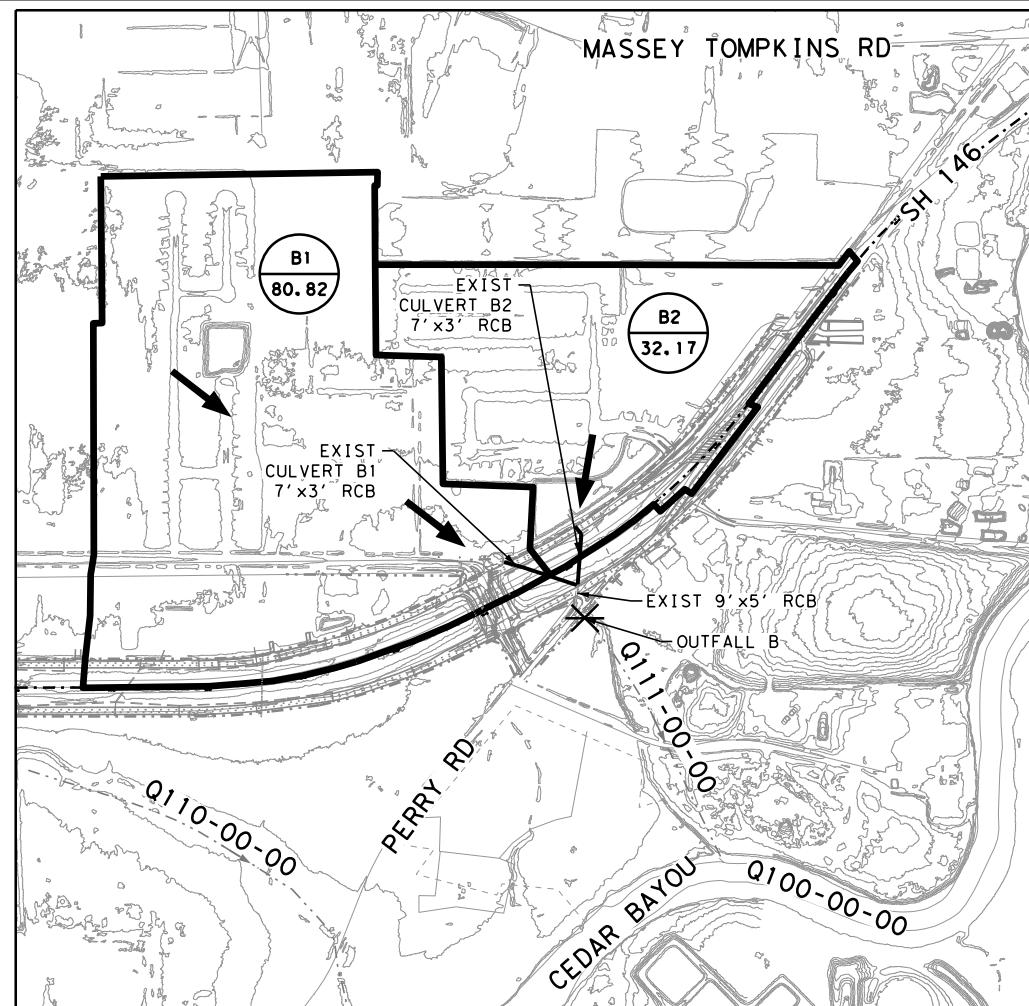
SH 146

HYDRAULIC DATA SHEET
STORM SEWER
COMPUTATIONS

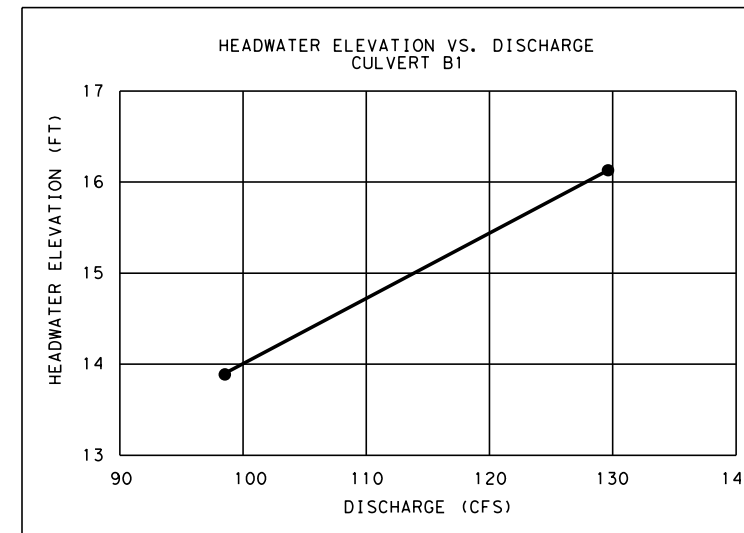
SHEET 4 OF 4

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			192
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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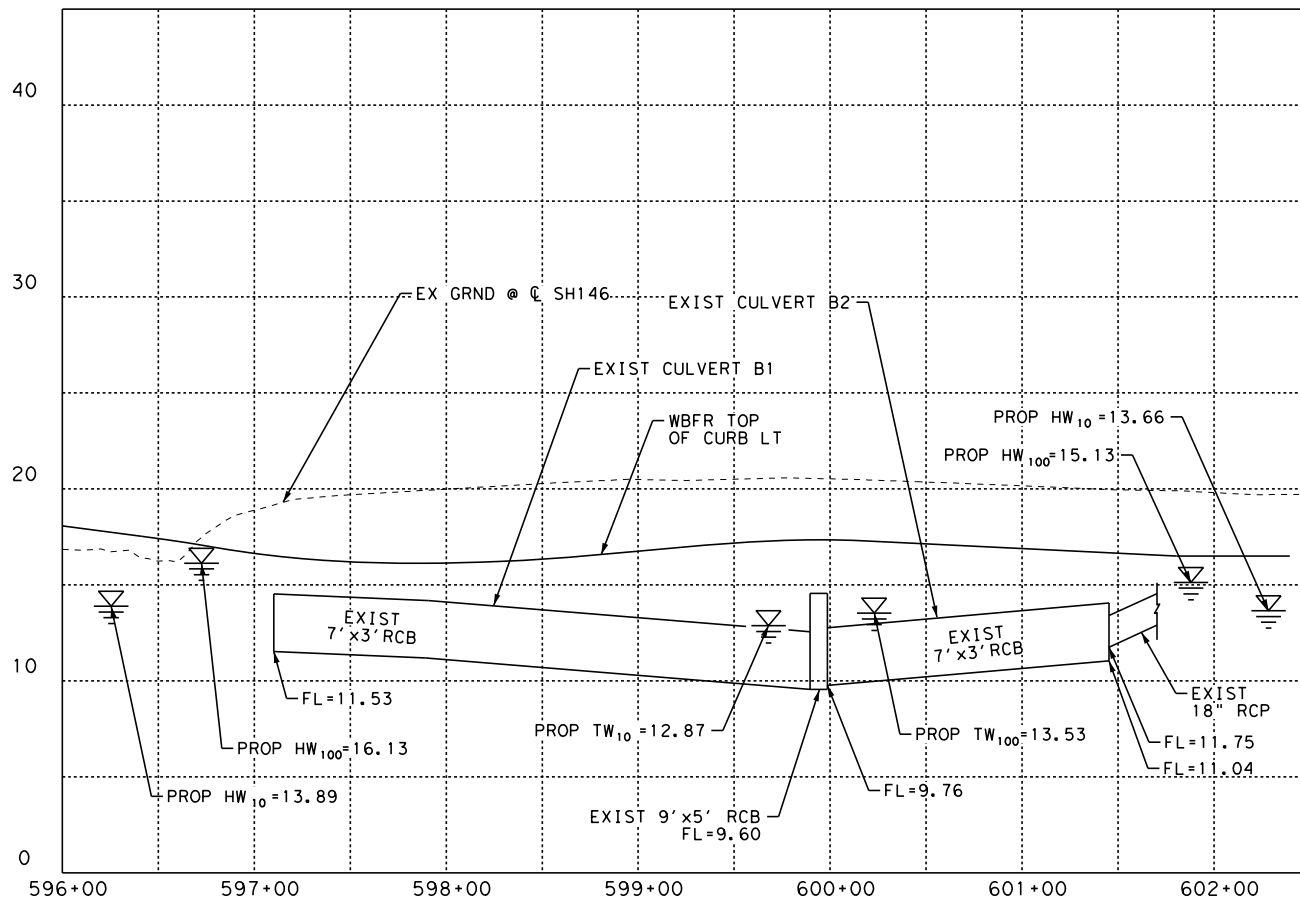
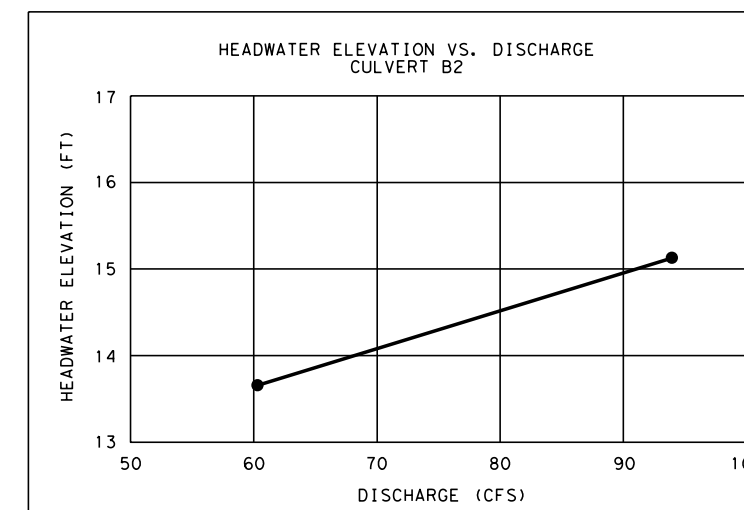


CULVERT ID	FREQUENCY	TOTAL DISCHARGE (CFS)	COMPUTED WSE (FT)		FRONTAGE ROAD EL		AVG. VELOCITY (FT/S)
			US WSE	DS WSE	US EOP (FT)	DS EOP (FT)	
CULVERT B1 STA 600+00 7'x3' RCB	10-YEAR	98.50	13.89	12.87	16.20	16.80	5.10
	100-YEAR	129.60	16.13	13.53	16.20	16.80	5.40
CULVERT B2 STA 601+00 7'x3' RCB	10-YEAR	60.20	13.66	12.87	17.30	16.80	5.10
	100-YEAR	93.80	15.13	13.53	17.30	16.80	5.50

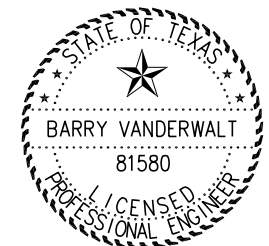


NOTES:

- THE DRAINAGE AREAS BOUNDARIES AND HYDRAULIC DATA ARE SHOWN AS PROVIDED IN THE DRAINAGE STUDY REPORT PREPARED BY AECOM TITLED, "DRAINAGE STUDY FOR ROADWAY IMPROVEMENT TO SH146 FROM BS 146E TO FERRY ROAD", DATED MAY 2020.

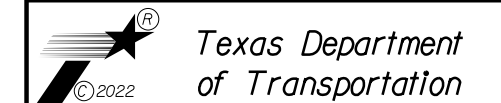


REV NO.	DATE	BY	REVISION



Barry Vanderwalt
2/28/2022

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SH 146

HYDRAULIC DATA SHEET
CROSS CULVERT B1 & B2

STA 600+00 & STA 601+00

SHEET 1 OF 1

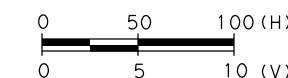
FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.		SHEET NO. 193
STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146

LEGEND

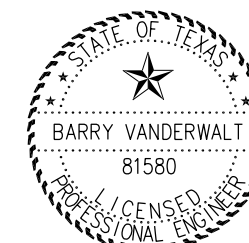
- MANHOLE
- GRATE INLET
- CURB INLET
- CURB INLET WITH EXTENSION
- ☉ EXISTING DITCH
- ☉ PROPOSED DITCH
- EXISTING STORM SEWER
- PROPOSED STORM SEWER
- [Dotted pattern] PROPOSED CONCRETE RIPRAP

NOTES:

1. ALL REINFORCED CONCRETE PIPE IS CL III
2. PIPE LENGTH SHOWN IN PROFILE IS PAY LENGTH
3. MAINTAIN EXISTING INLET FOR DETENTION DITCH OVERFLOW
4. EXISTING INLETS ARE DESIGNED FOR ULTIMATE PROJECT CONDITIONS

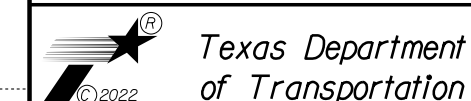


REV. NO.	DATE	BY	REVISION



Barry Vanderwalt
1/5/2022

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



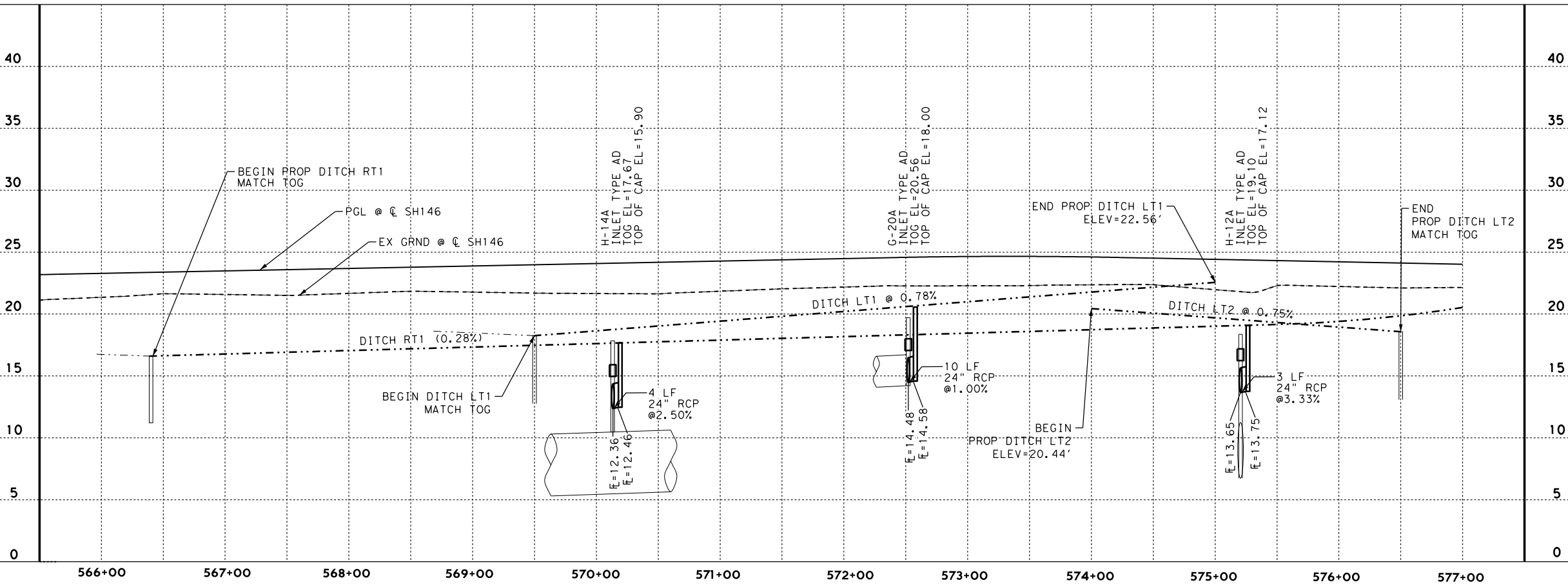
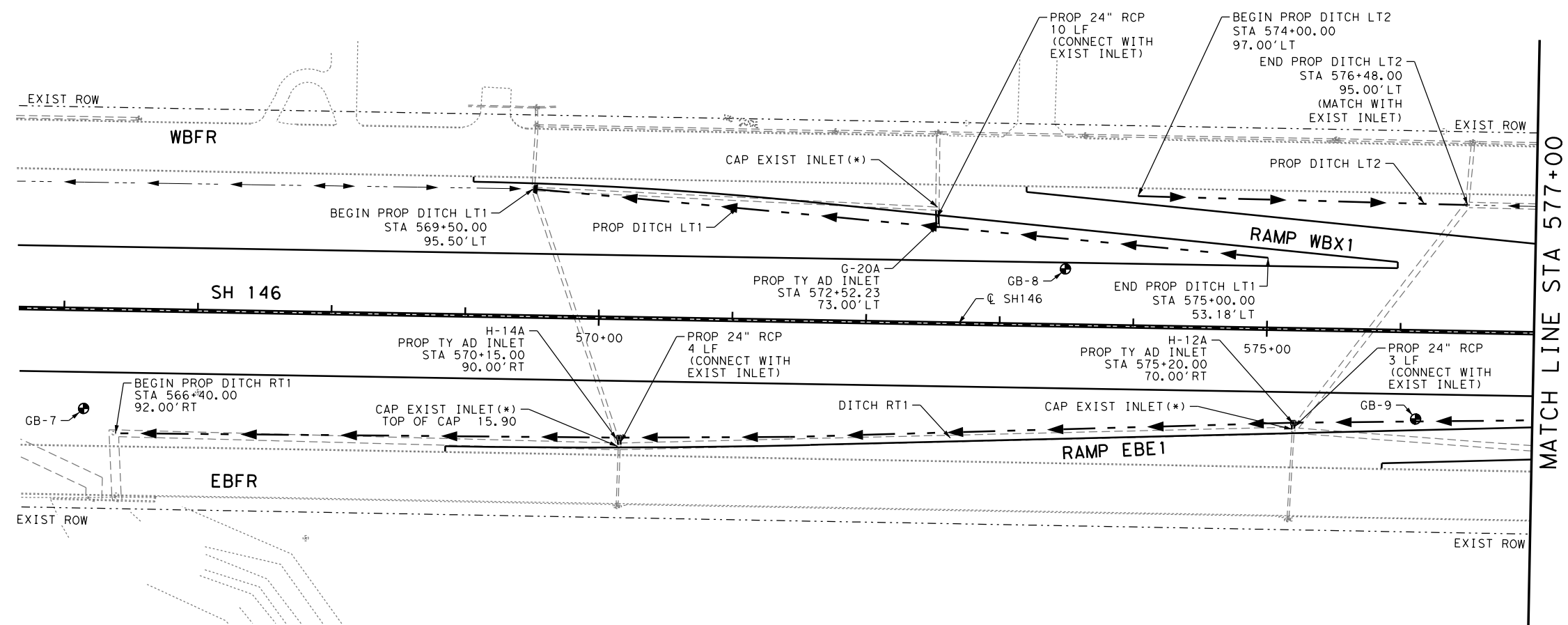
SH 146

MAINLANE DRAINAGE PLAN AND PROFILE

BEGIN TO STA 577+00

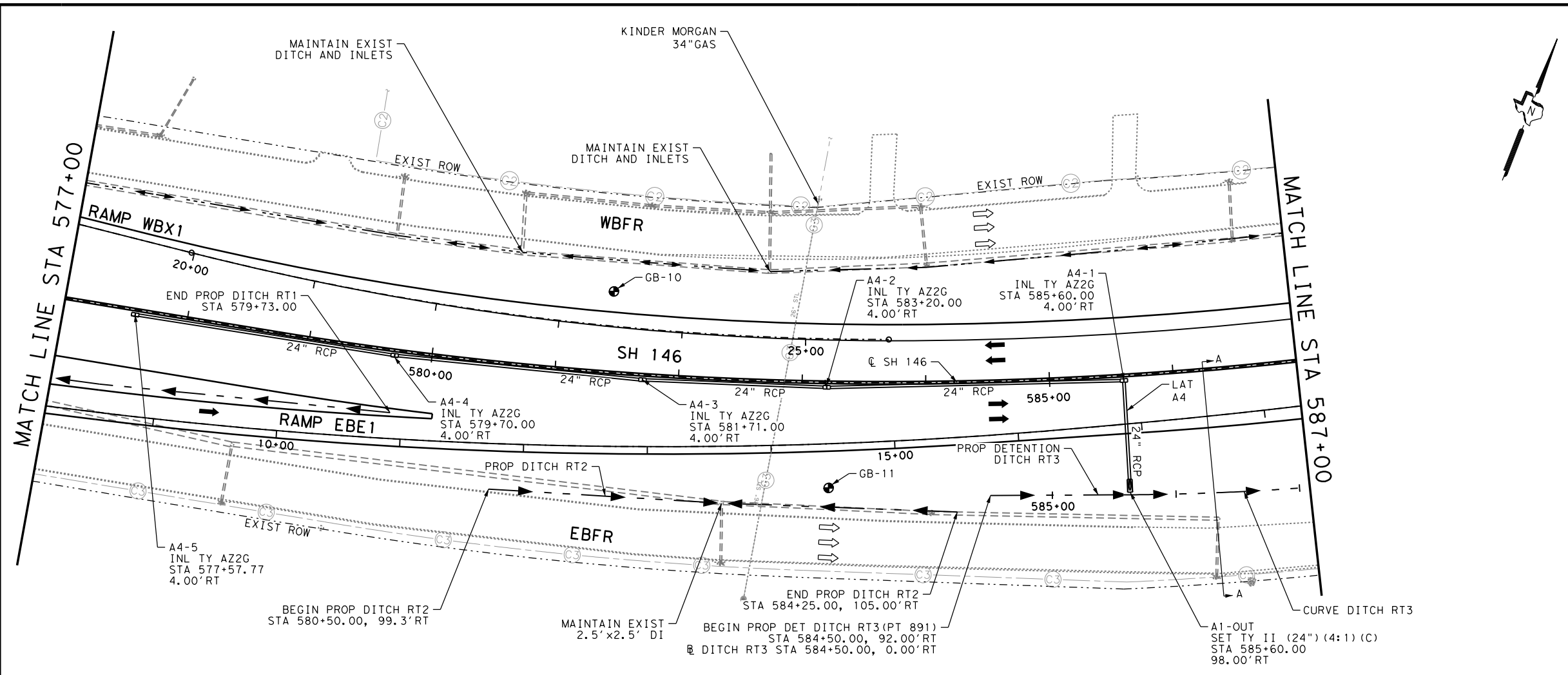
SHEET 1 OF 4

FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.		SHEET NO. 194
STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146



* SEE INLET CAP DETAIL SHEET

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LEGEND

- MANHOLE
- GRATE INLET
- CURB INLET
- CURB INLET WITH EXTENSION
- EXISTING DITCH
- PROPOSED DITCH
- EXISTING STORM SEWER
- PROPOSED STORM SEWER
- PROPOSED CONCRETE RIPRAP

NOTES:

- ALL REINFORCED CONCRETE PIPE IS CL III
- PIPE LENGTH SHOWN IN PROFILE IS PAY LENGTH
- MAINTAIN EXISTING INLET FOR DETENTION DITCH OVERFLOW
- EXISTING INLETS ARE DESIGNED FOR ULTIMATE PROJECT CONDITIONS

REV. NO.	DATE	BY	REVISION

Barry Vanderwalt
1/5/2022

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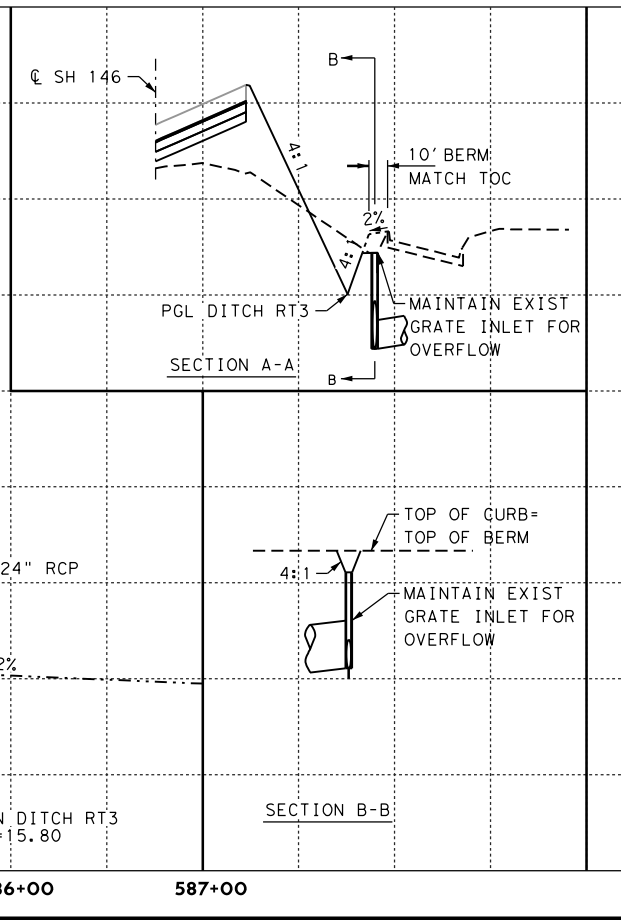
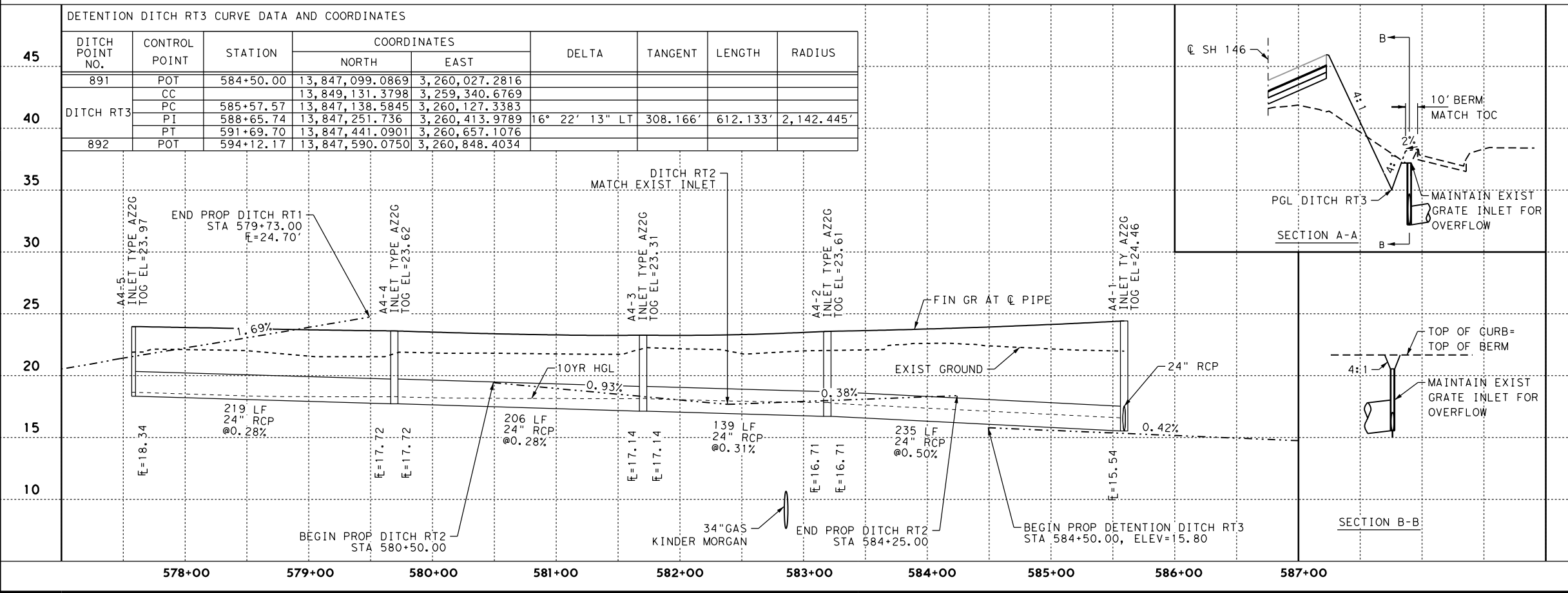
SH 146

MAINLANE DRAINAGE PLAN AND PROFILE

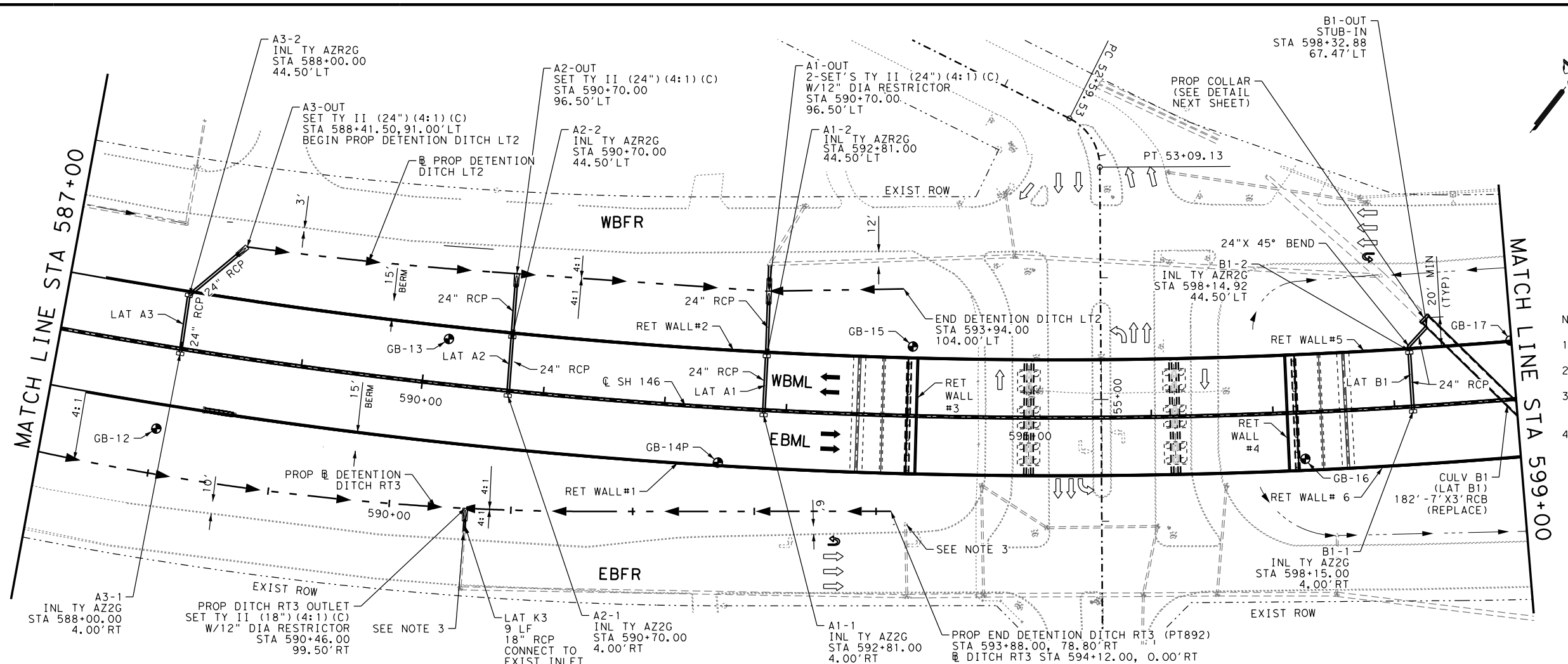
STA 577+00 TO STA 587+00

SHEET 2 OF 4

FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.		SHEET NO. 195
STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146



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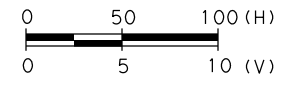


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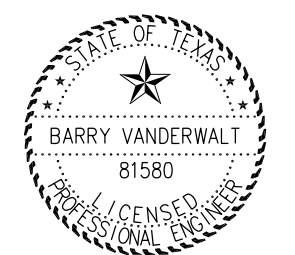
- MANHOLE
- GRATE INLET
- CURB INLET
- CURB INLET WITH EXTENSION
- EXISTING DITCH
- PROPOSED DITCH
- EXISTING STORM SEWER
- PROPOSED STORM SEWER
- PROPOSED CONCRETE RIPRAP

NOTES:

- ALL REINFORCED CONCRETE PIPE IS CL III
- PIPE LENGTH SHOWN IN PROFILE IS PAY LENGTH
- MAINTAIN EXISTING INLET FOR DETENTION DITCH OVERFLOW
- EXISTING INLETS ARE DESIGNED FOR ULTIMATE PROJECT CONDITIONS



REV NO.	DATE	BY	REVISION



1/5/2022

CivilTech Engineering, Inc. 11821 Telge Road
Cypress, Texas 77429
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Firm Registration No. F-382

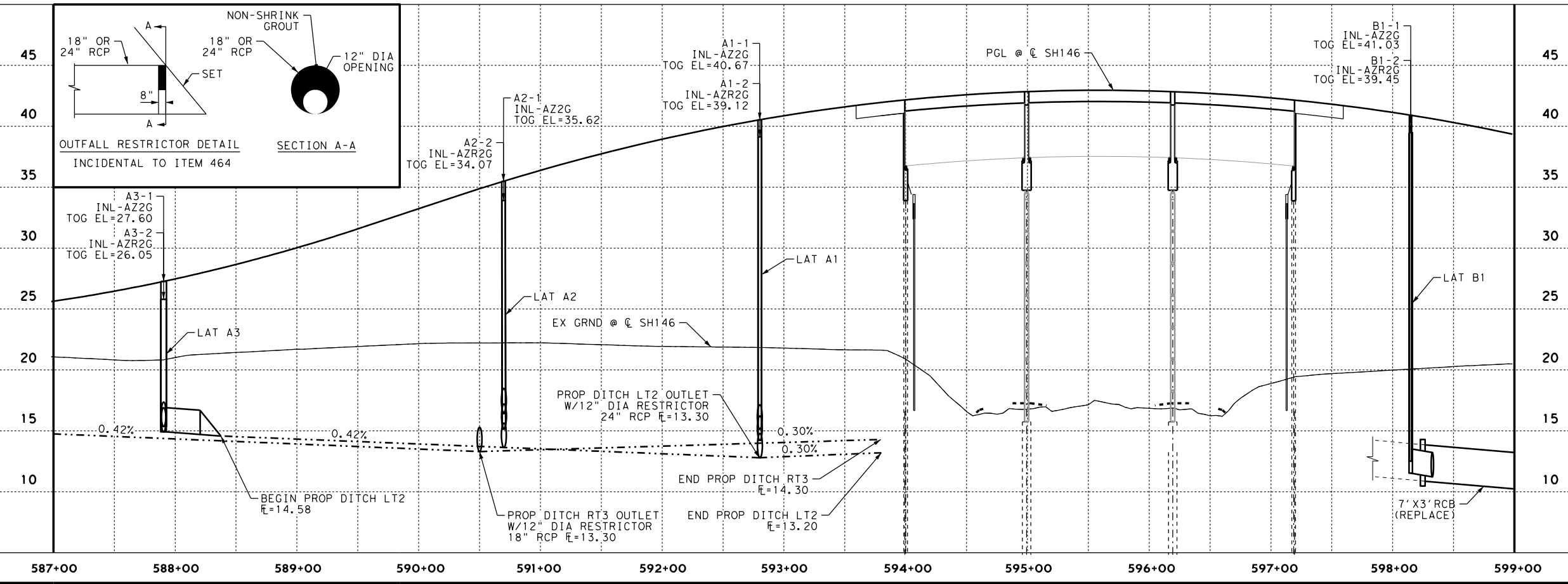


SH 146

MAINLANE DRAINAGE PLAN AND PROFILE

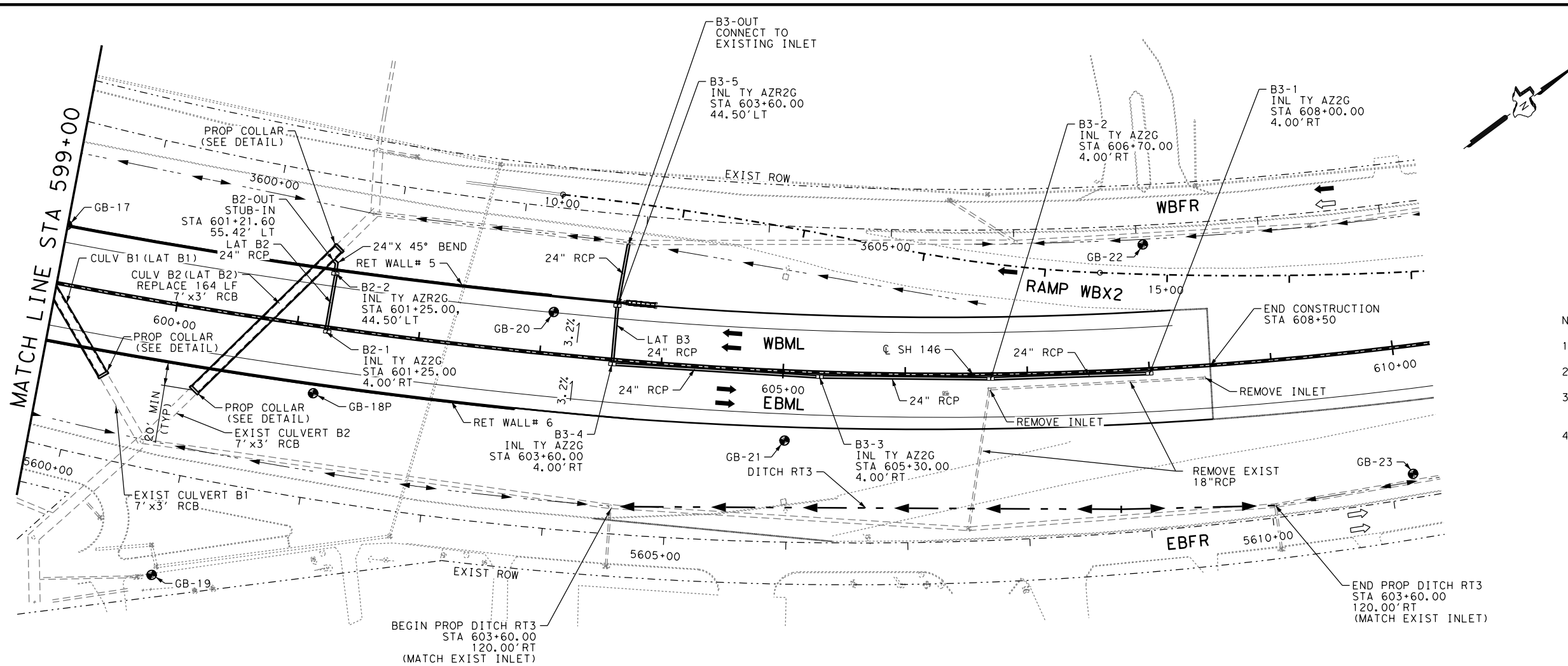
STA 587+00 TO STA 599+00

SHEET 3 OF 4



FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.	
6		196	
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

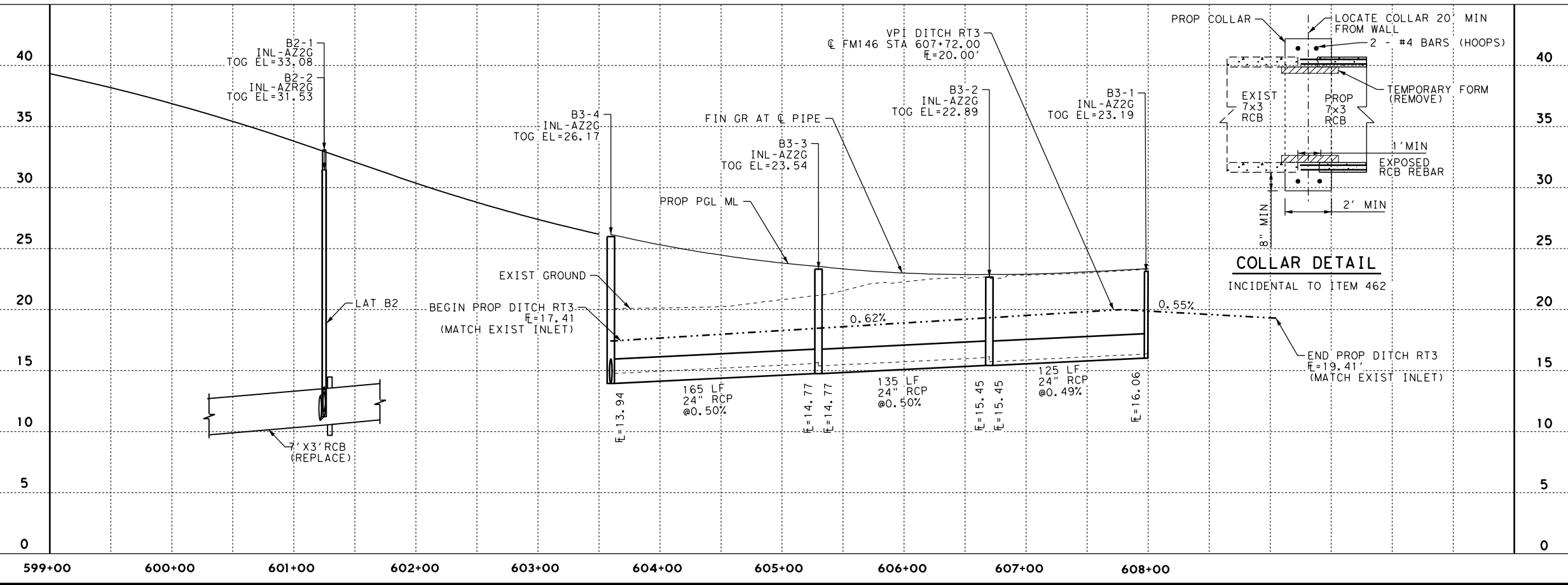
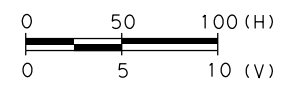
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LEGEND

- MANHOLE
- GRATE INLET
- CURB INLET
- CURB INLET WITH EXTENSION
- @ EXISTING DITCH
- @ PROPOSED DITCH
- EXISTING STORM SEWER
- PROPOSED STORM SEWER
- PROPOSED CONCRETE RIPRAP

- NOTES:
- ALL REINFORCED CONCRETE PIPE IS CL III
 - PIPE LENGTH SHOWN IN PROFILE IS PAY LENGTH
 - MAINTAIN EXISTING INLET FOR DETENTION DITCH OVERFLOW
 - EXISTING INLETS ARE DESIGNED FOR ULTIMATE PROJECT CONDITIONS



REV. NO.	DATE	BY	REVISION

BARRY VANDERWALT
81580
PROFESSIONAL ENGINEER

Barry Vanderwalt
1/5/2022

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Firm Registration No. F-382

Texas Department of Transportation

SH 146

MAINLANE DRAINAGE PLAN AND PROFILE

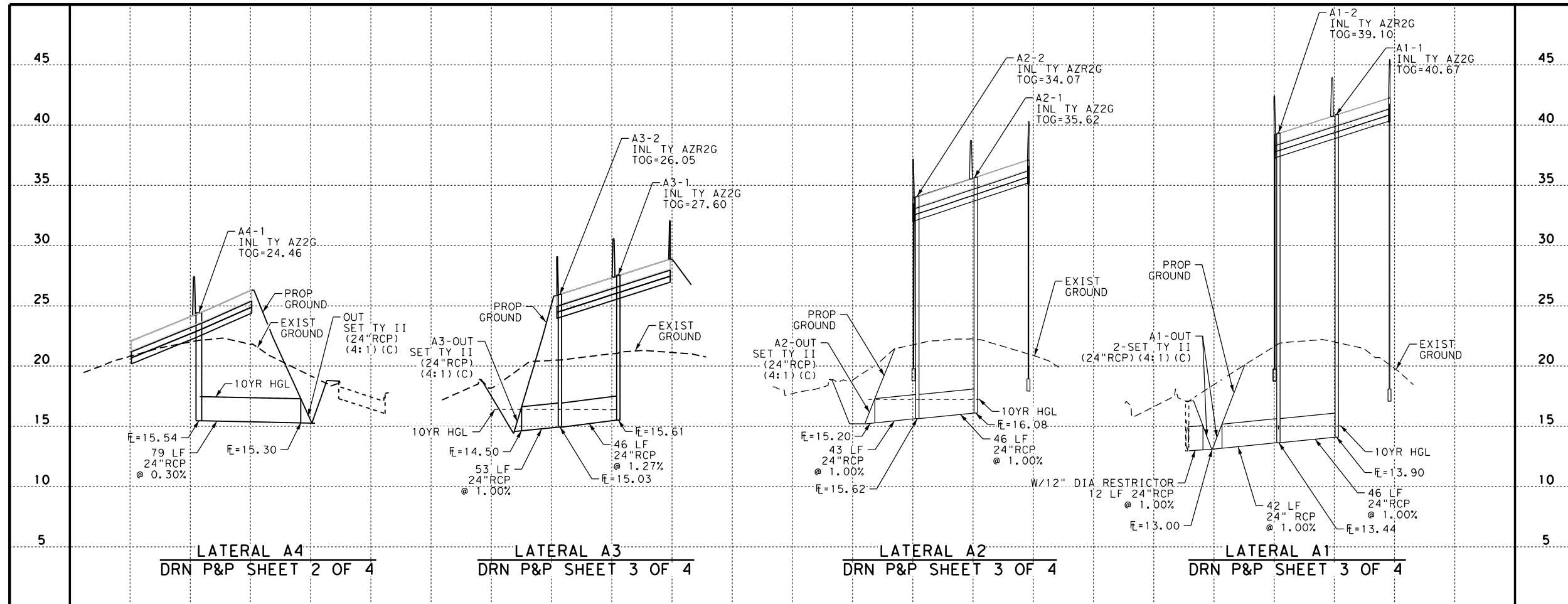
STA 599+00 TO STA END

SHEET 4 OF 4

FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.		SHEET NO. 197
STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146

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1/5/2022 10:56:37 AM
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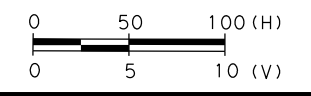
LATERAL A4
 DRN P&P SHEET 2 OF 4

LATERAL A3
 DRN P&P SHEET 3 OF 4

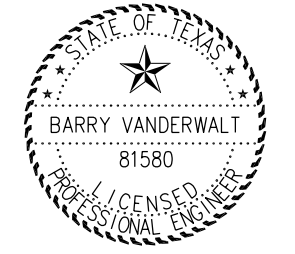
LATERAL A2
 DRN P&P SHEET 3 OF 4

LATERAL A1
 DRN P&P SHEET 3 OF 4

- NOTES:
- PIPE LENGTH SHOWN IN PROFILE IS PAY LENGTH.
 - ALL PIPES ARE CLASS III REINFORCED CONCRETE PIPES UNLESS OTHERWISE NOTED.



REV. NO.	DATE	BY	REVISION



Barry Vanderwalt
 1/5/2022

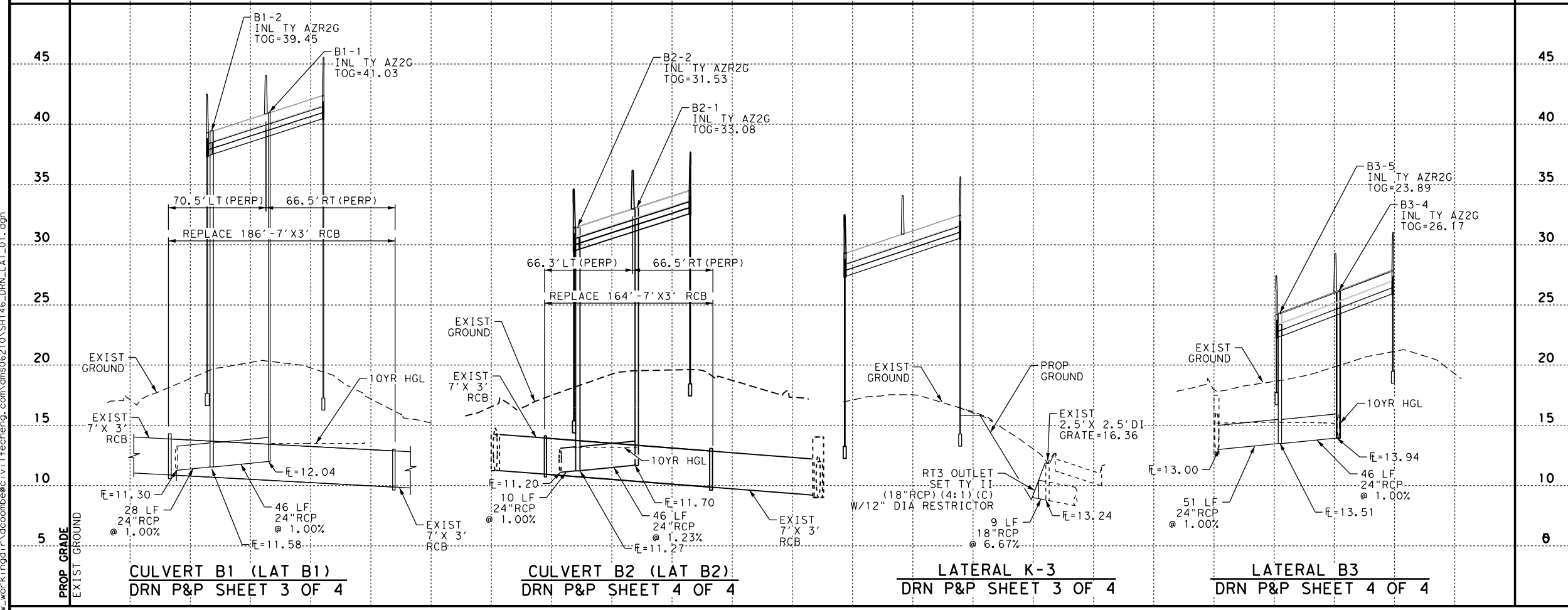
CivilTech Engineering, Inc.
 11821 Telge Road
 Cypress, Texas 77429
 PH: (281) 304-0200 - FX: (281) 304-0210
 Firm Registration No. F-382



SH 146

DRAINAGE
 LATERALS

SHEET 1 OF 1



CULVERT B1 (LAT B1)
 DRN P&P SHEET 3 OF 4

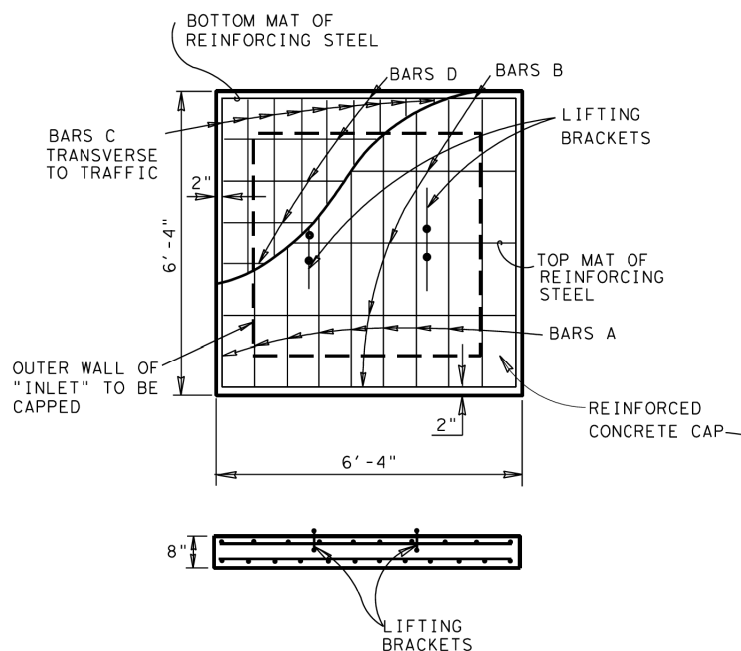
CULVERT B2 (LAT B2)
 DRN P&P SHEET 4 OF 4

LATERAL K-3
 DRN P&P SHEET 3 OF 4

LATERAL B3
 DRN P&P SHEET 4 OF 4

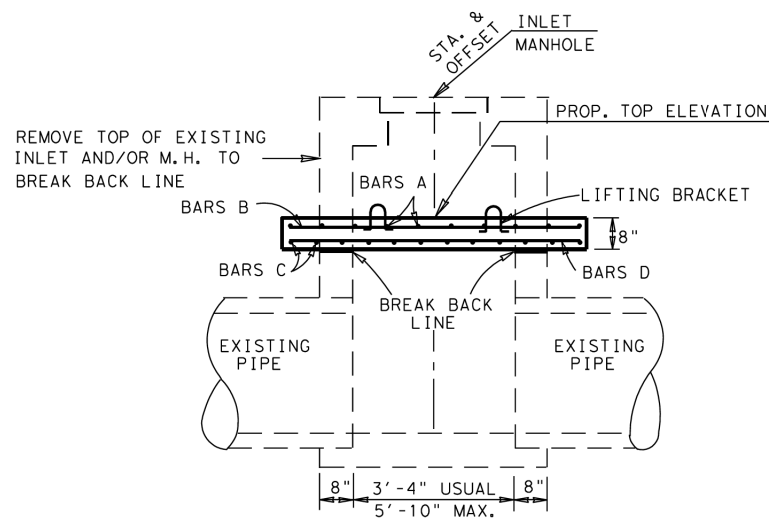
FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			198
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

6'-4" SQUARE CAP



REINFORCING STEEL					6'-4" CAP
BAR	NO.	SIZE	SPAC.	LEN.	WGT.
A	10	4	8"	6'-0"	40
B	5	4	18"	6'-0"	20
C	12	6	6"	6'-0"	108
D	8	4	10"	6'-0"	32
REINFORCING STEEL =					200 LBS. *
CL "A" CONCRETE =					0.99 C.Y. *

* FOR CONTRACTORS INFORMATION ONLY

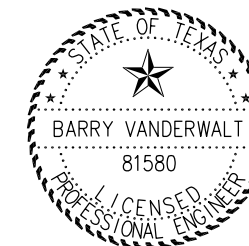


CAP FOR A DROP INLET OR MANHOLE

NOTES:

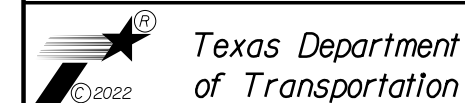
1. REMOVAL OF THE TOP PORTION OF THE INLET AND/OR MANHOLE WHERE REQUIRED PLUS FURNISHING & INSTALLING THE CONC. CAP WILL BE PAID FOR UNDER ITEM 479 "ADJUSTING MANHOLES AND INLETS"
2. ALL CONCRETE SHALL BE CLASS "A" AND SHALL MEET THE REQUIREMENTS OF ITEMS 420 & 421
3. ALL REINFORCING STEEL SHALL BE GRADE 60 AND SHALL MEET THE REQUIREMENTS OF ITEM 440
4. THE BREAK-BACK LINE SHALL BE CUT SMOOTH TO ENSURE UNIFORM BEARING OF THE CAP ON THE INLET/M.H. WALLS.

REV. NO.	DATE	BY	REVISION



Barry Vanderwalt
1/5/2022

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



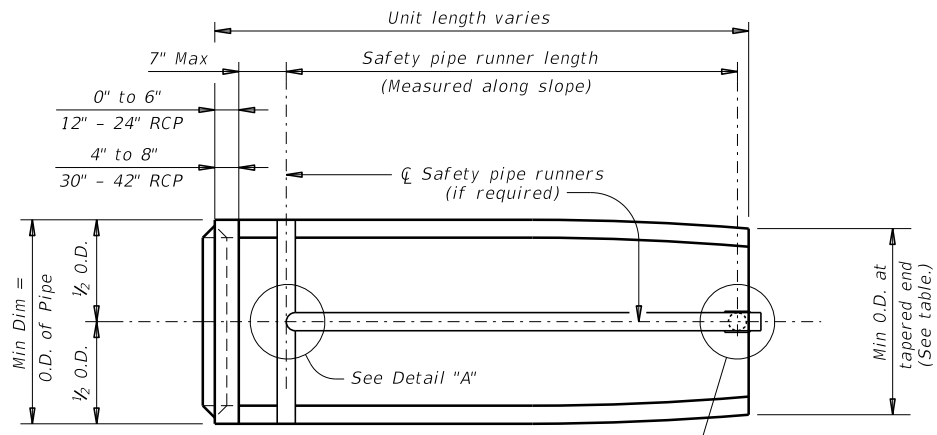
SH 146

INLET CAP
DETAIL

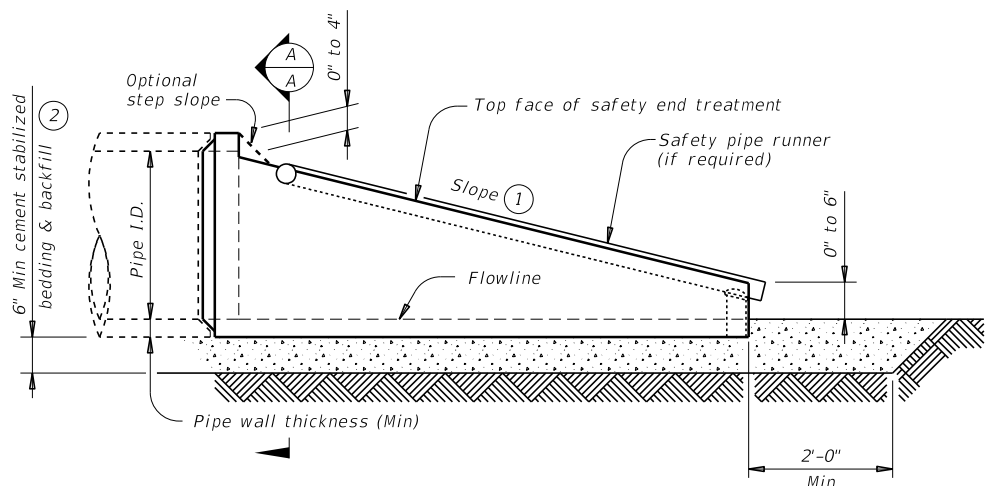
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6			199
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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: FILE:



PLAN VIEW
(Showing spigot end connection.)



LONGITUDINAL ELEVATION
(Showing spigot end connection.)

- ① Slope as shown elsewhere in the plans. Slope of 3:1 or flatter is required for vehicle safety.
- ② Provide cement stabilized bedding and backfill in accordance with the Item, "Excavation and Backfill for Structures". Bedding and backfill is considered subsidiary to the Item "Safety End Treatment". When concrete riprap is specified around the safety end treatment, backfill as directed by Engineer.
- ③ Fill the top 4" of void between precast end treatments with concrete riprap. Concrete riprap be considered subsidiary to the Item "Safety End Treatment".
- ④ Adjust clear distance between pipes to provide for the minimum distance between safety end treatments.

MAX SAFETY PIPE RUNNER LENGTHS AND REQUIRED SAFETY PIPE RUNNER SIZES

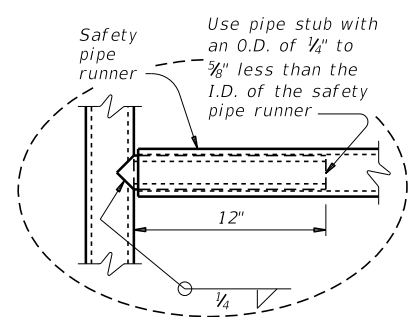
Max Safety Pipe Runner Length	Required Pipe Runner Size		
	Pipe Size	Pipe O.D.	Pipe I.D.
11' - 2"	3" STD	3.500"	3.068"
15' - 6"	3 1/2" STD	4.000"	3.548"
20' - 10"	4" STD	4.500"	4.026"
35' - 4"	5" STD	5.563"	5.047"

REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

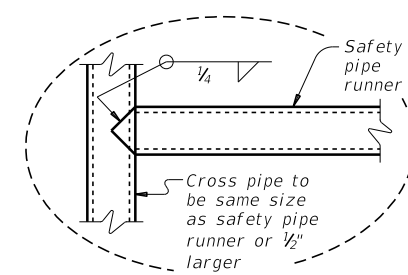
Pipe I.D.	Min Wall Thickness	Min O.D.	Min O.D. at Tapered End	Min Reinf Requirements (sq. in. / ft. of pipe)	Slope	Minimum Length of Unit	Single Pipe		Multiple Pipe			
							Skew	Pipe Runners Required	Skew	Pipe Runners Required		
12"	2"	16"	16"	0.07 Circ.	3:1	2' - 0"	≤ 45°	No	≤ 45°	No		
											4:1	2' - 8"
											6:1	4' - 0"
15"	2 1/4"	19 1/2"	19"	0.07 Circ.	3:1	2' - 10"	≤ 45°	No	≤ 45°	No		
											4:1	3' - 9"
											6:1	5' - 8"
18"	2 1/2"	23"	21 1/2"	0.07 Circ.	3:1	3' - 8"	≤ 45°	No	≤ 45°	No		
											4:1	4' - 10"
											6:1	7' - 3"
24"	3"	30"	27"	0.07 Circ.	3:1	5' - 3"	≤ 45°	No	≤ 30°	No		
									4:1	7' - 0"	> 30°	Yes
									6:1	10' - 6"		
30"	3 1/2"	37"	31"	0.18 Circ.	3:1	6' - 3"	≤ 15°	No	≤ 15°	No		
									4:1	8' - 2"	> 15°	Yes
									6:1	12' - 1"		
36"	4"	44"	36"	0.19 Ellip.	3:1	7' - 10"	= 0°	No	≥ 0°	Yes		
									4:1	10' - 4"	> 0°	Yes
									6:1	15' - 4"		
42"	4 1/2"	51"	41 1/2"	0.23 Ellip.	3:1	9' - 6"	≥ 0°	Yes	≥ 0°	Yes		
									4:1	12' - 6"		
									6:1	18' - 7"		

MATERIAL NOTES:
 Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.
 Provide safety pipe runners, cross pipes, pipe support posts, and pipe stubs meeting the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr 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.

GENERAL NOTES:
 Precast safety end treatment for reinforced concrete pipe (CRP) may be used for TYPE II end treatment as specified in Item 467, "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.
 Manufacture precast concrete end sections in accordance with Item 464, "Reinforced Concrete Pipe" and in accordance with ASTM Specification C-76, Class III, Wall B for circular pipe.
 Provide precast concrete end sections with a spigot or bell end for compatibility to upstream or downstream end conditions with sufficient annular space to allow for grout, mortar, cold applied asphalt joint compound or pre-formed plastic gasket material.
 Methods of lifting shall be provided by the manufacturer for ease of loading, unloading, and installation.
 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.

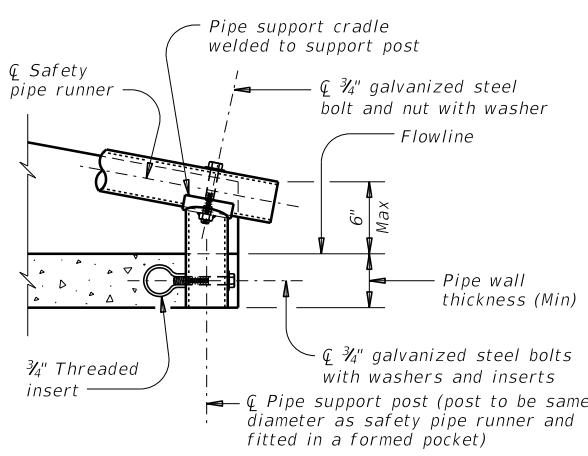


OPTION A

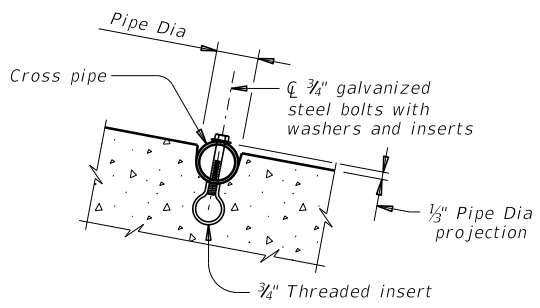


OPTION B

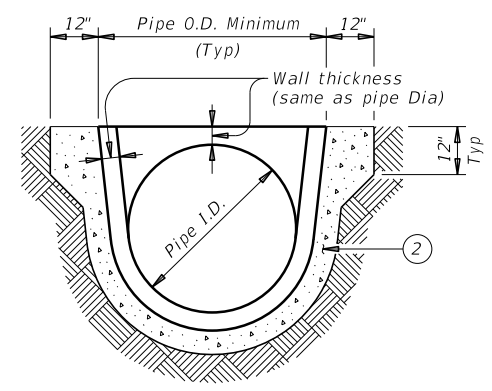
DETAIL A



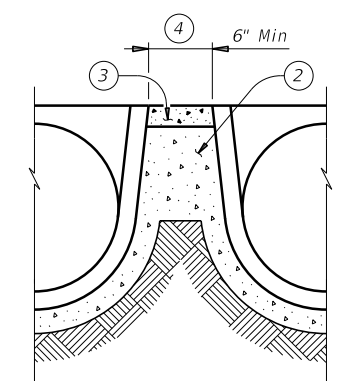
END DETAIL FOR INSTALLATION OF SAFETY PIPE RUNNERS
(If required)



INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS
(If required)



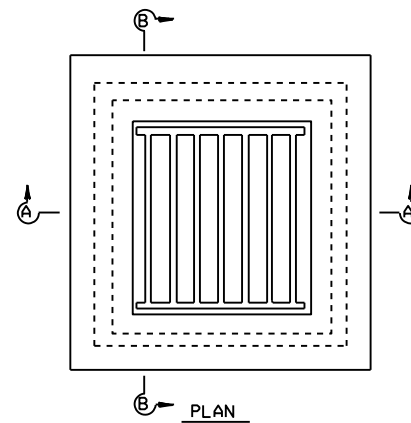
SECTION A-A



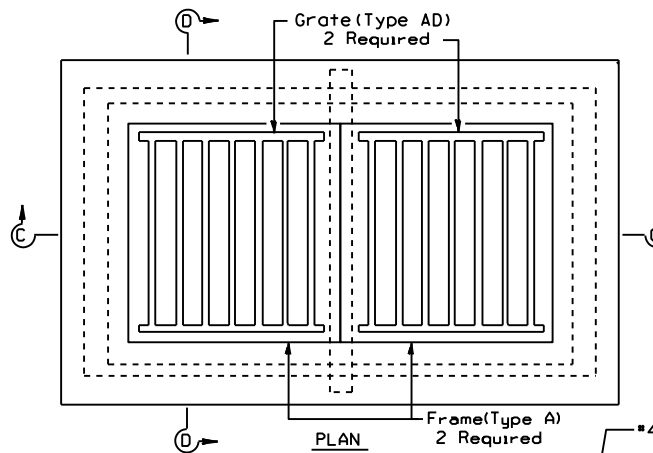
MULTIPLE PIPE INSTALLATION

Texas Department of Transportation
PRECAST SAFETY END TREATMENT TYPE II ~ CROSS DRAINAGE
PSET-RC

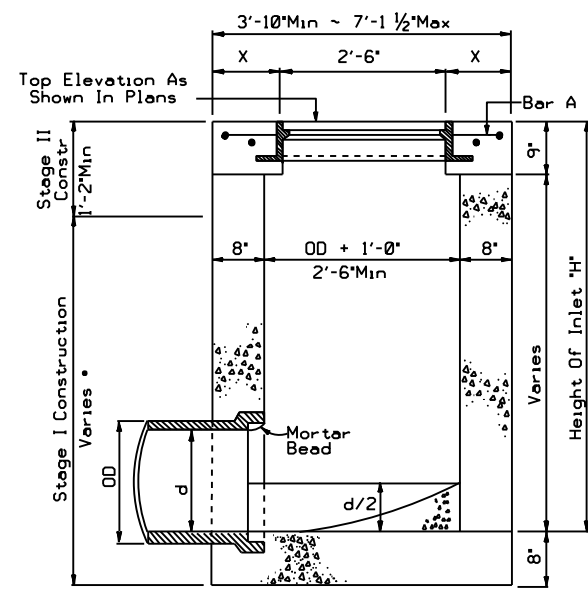
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0389 13	REVISIONS	039	SH 146	
DIST: HOU	COUNTY: HARRIS	SHEET NO: 200		



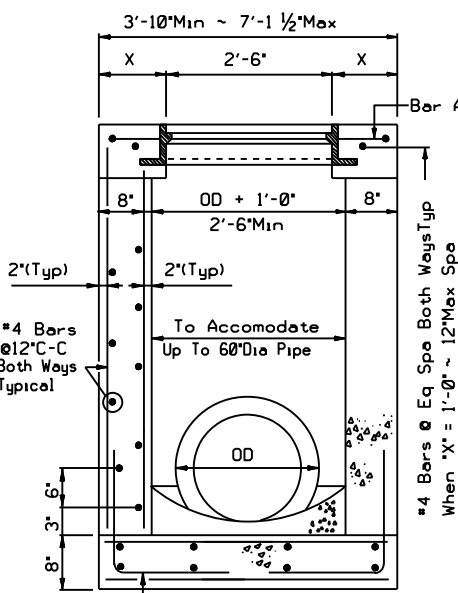
• But Not Less Than Six Inches Over Highest Entering Pipe.
X = 8" Min to 3'-9" Max



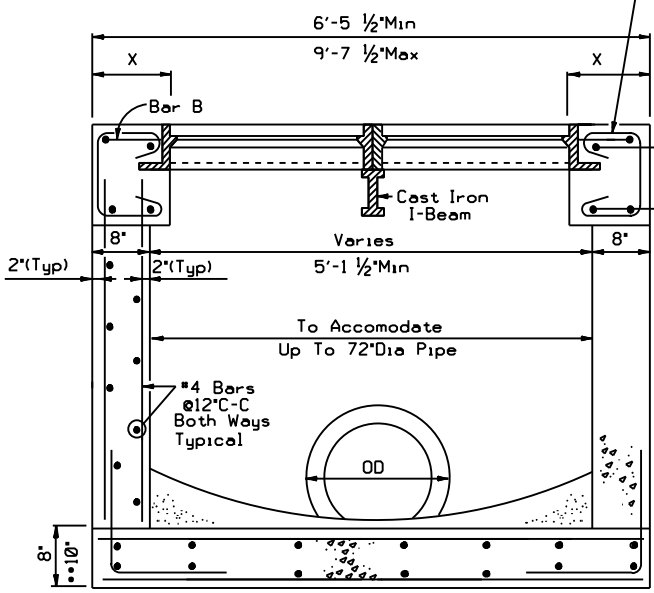
• But Not Less Than Six Inches Over Highest Entering Pipe.
•• For Pipe Diameters 66" And Greater



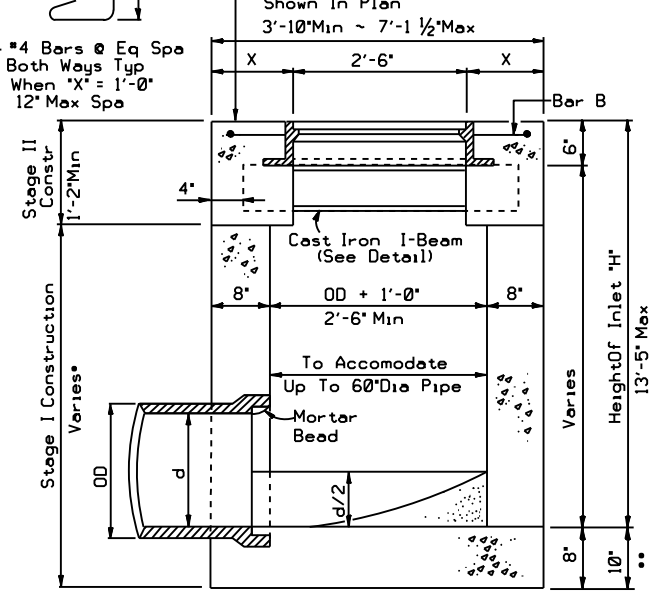
SECTION A-A



SECTION B-B



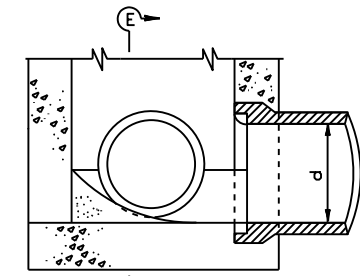
SECTION C-C



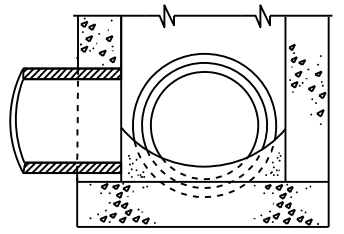
SECTION D-D

INLET TYPE AD

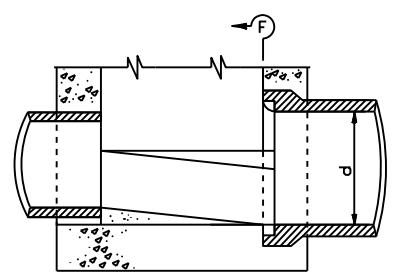
INLET TYPE AAD



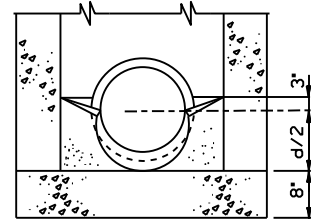
PART SECTION AT INVERT Showing Shaping Of Invert, Pipe Entering From Adjacent Sides



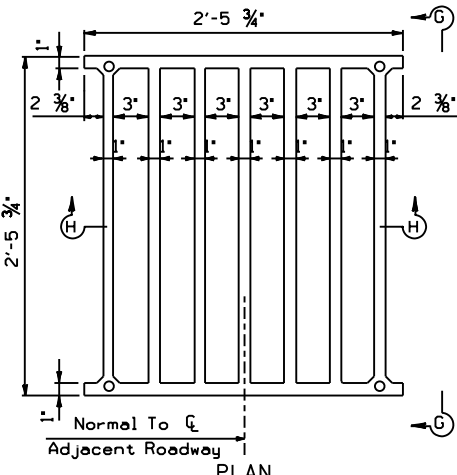
SECTION E-E



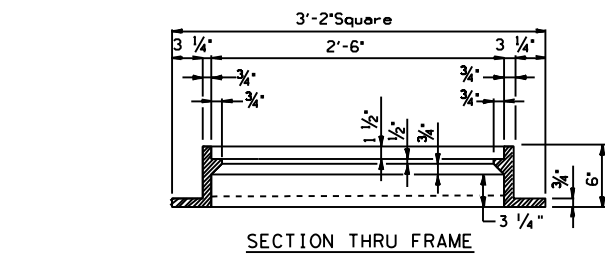
PART SECTION AT INVERT Showing Shaping Of Invert, Pipe Entering From Opposite Sides



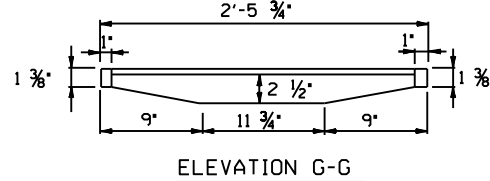
SECTION F-F



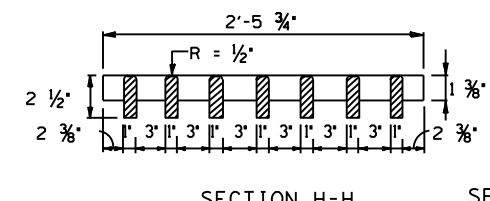
PLAN Provide 4 ~ Stainless Steel Hex Head Bolts per Grate



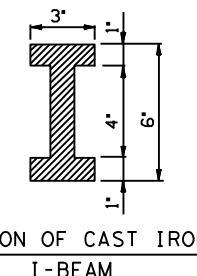
SECTION THRU FRAME



ELEVATION G-G



SECTION H-H



SECTION OF CAST IRON I-BEAM

FRAME AND GRATE

Type AD ~ Neenah No.3418 or EJIW No.V-4880-2
Type AAD ~ Neenah No.3418-2 or EJIW No.V-4881-2

d = Diameter
R = Radius

GENERAL NOTES:
Type AD Inlet contains a single frame with grate.
Type AAD Inlet contains a double frame and double grate with an I-beam.
Frame and Grates may be gray cast iron.
The Furnishing And Installation Of Cast Iron I-Beams Shall Be Considered Incidental To Inlet (Comp) (Ty AAD) Or Inlet (Stage II) (Ty AAD) As The Case May Be.

Where Size Of Pipes Passing Thru Inlet Exceeds 30", Increase Inside Width To Diameter Of Pipe Plus 1'-0" (OD + 1'-0")
Cast Iron Manhole Steps (See Manhole Details) Spaced At 16" Centers And Located On Wall Specified By The Engineer Shall Be Provided And Installed Where "D" Exceeds 5'-0".

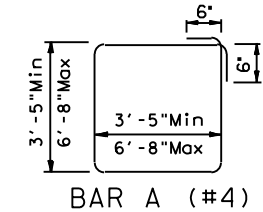
See Standard or Detail Sheet For Excavation and Backfill Diagrams.

Type AD & AAD Inlets Shall Be Built To Stage I And Finished After All Grading Operations Are Substantially Completed.

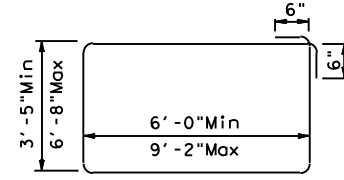
Shop Drawings Will Be Required For Precast Construction Of Inlets.

Upon installation of the grates the threads of the bolts shall be coated with thread lock type adhesive (Lockite or equal). Reapply thread lock adhesive each time grates are removed.

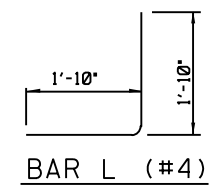
Bolted grates and frames are a matched set, do not unbolt without "Match Marking" so that grates and frames are re-installed as originally built.



BAR A (#4)



BAR B (#4)



BAR L (#4)

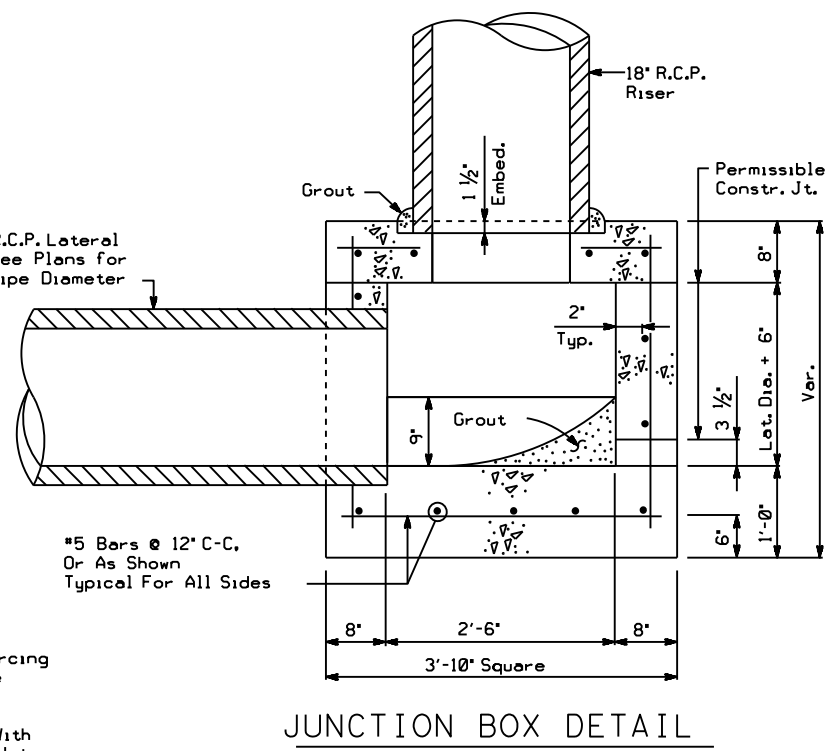
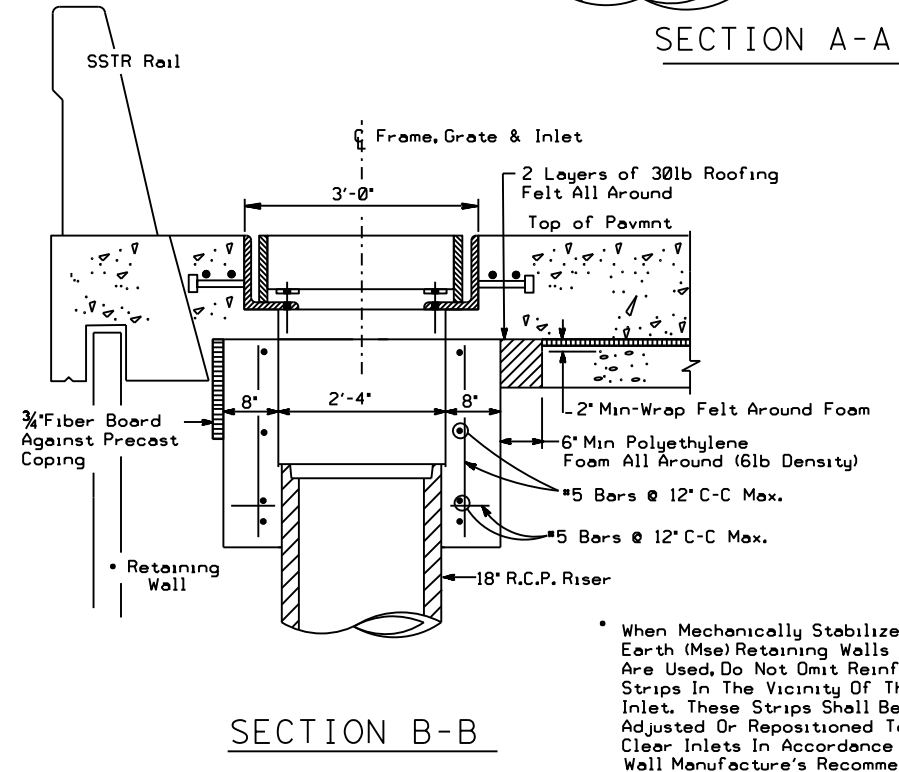
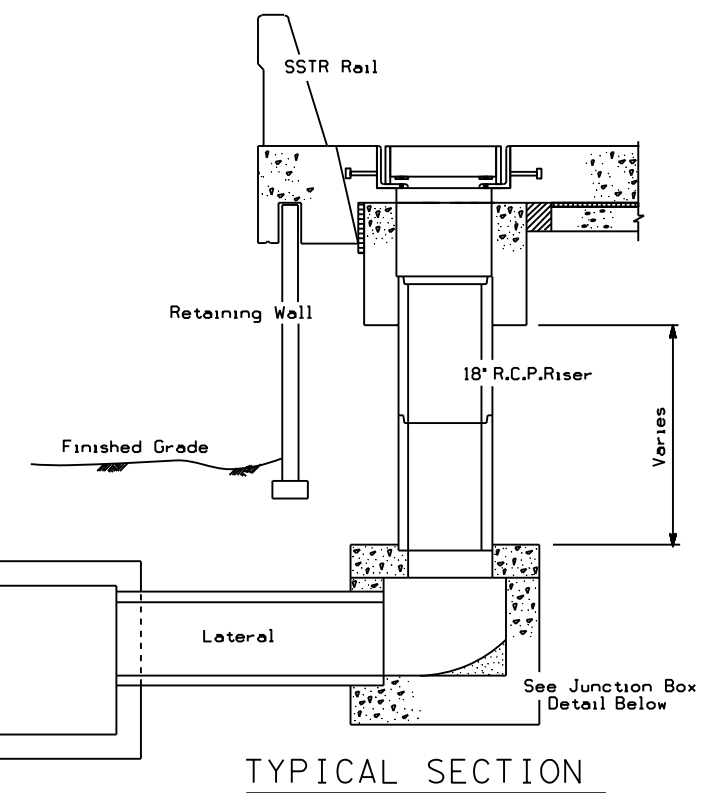
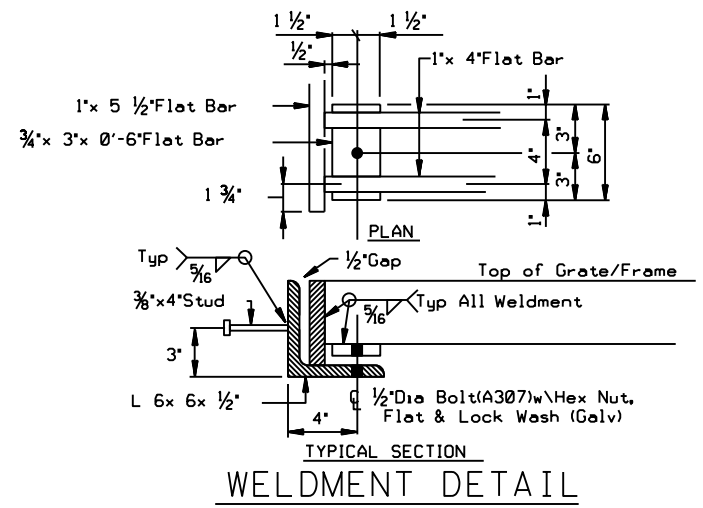
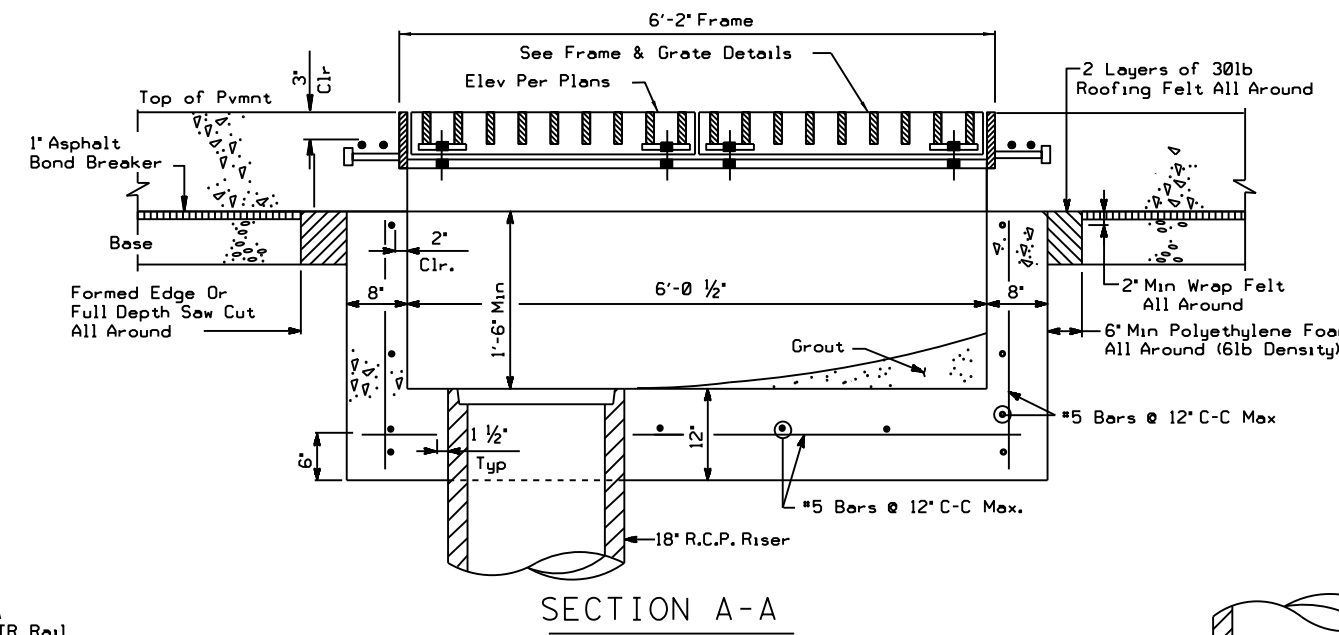
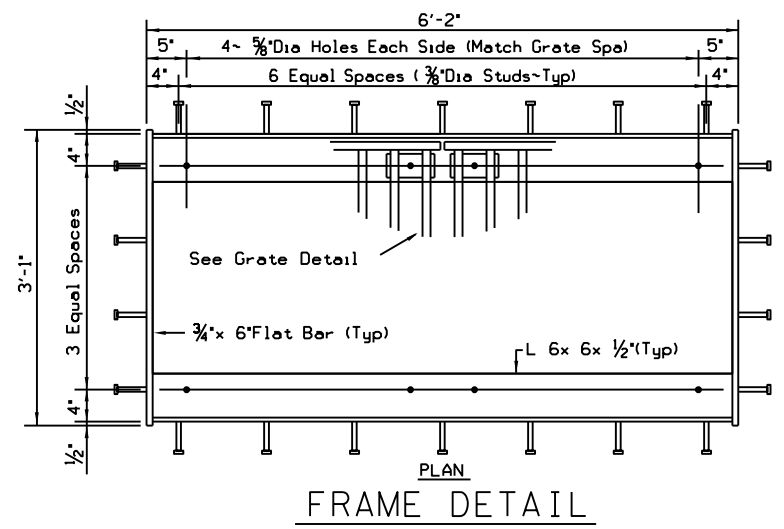
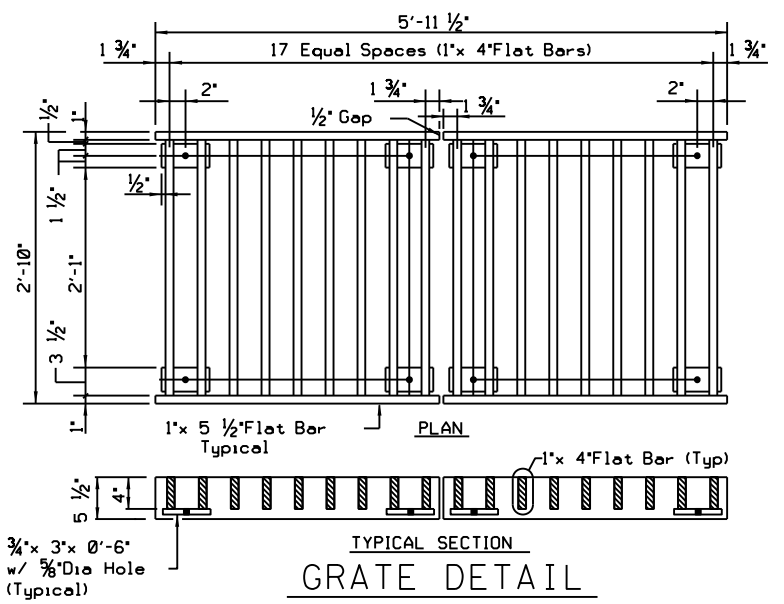
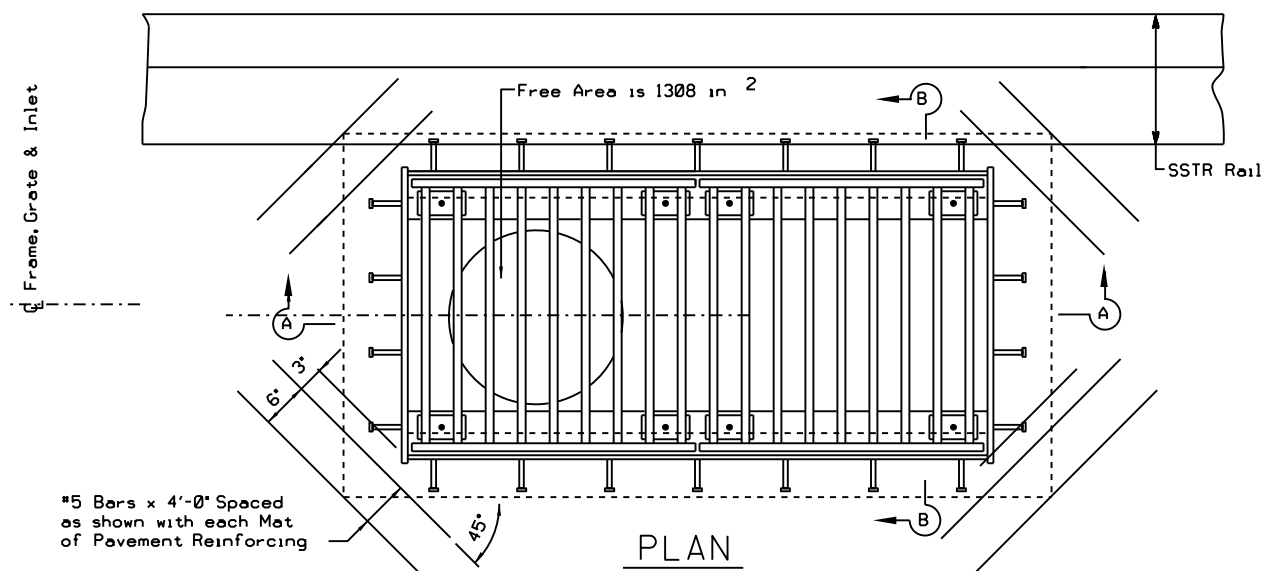
NOT FOR TRAFFIC LOADS



INLETS TYPE AD & AAD
HIL-AD/AAD

FILE#	STDD5.DGN	DW:TXDOT	CK:TXDOT	DW:TXDOT	CK:TXDOT	STD:
© TXDOT	2014	DIST	FED REG	PROJECT NO.	SHEET	
REVISIONS		HOUS	6	201		
		COUNTY	CONTROL	SECT	JOB	HIGHWAY
		HARRIS	0389	13	039	SH 146

STDD5.DGN



GENERAL NOTES:

All steel is ASTM-A36 and shall be galvanized after fabrication. Cost Of Furnishing And Installing Frames, Grates, Additional Pavement Reinforcing, Roofing Felt, Polyethylene Foam, Vertical Riser and Junction Box Shall Be Included In The Unit Price Bid For The Type Of Inlet Selected.

All Concrete Shall Be Class C.

Shop Drawings Will Be Required For Precast Construction Of Inlets.

FOR TRAFFIC LOADS

Texas Department of Transportation
Houston District

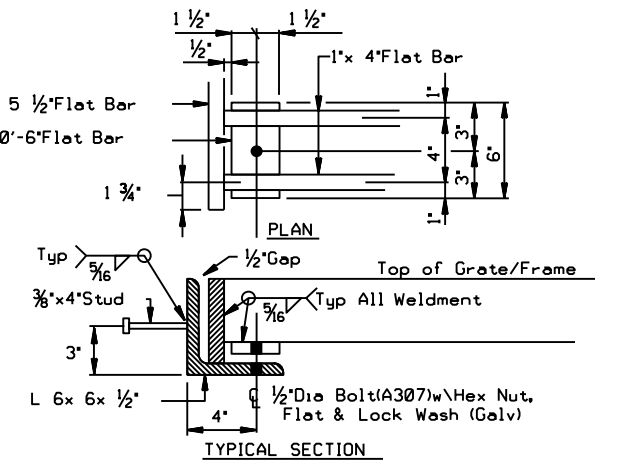
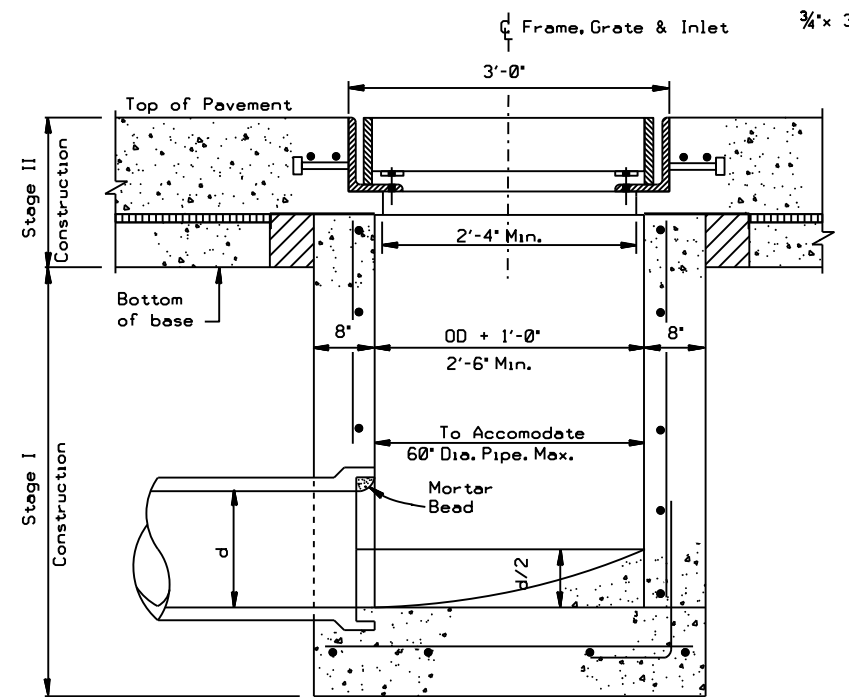
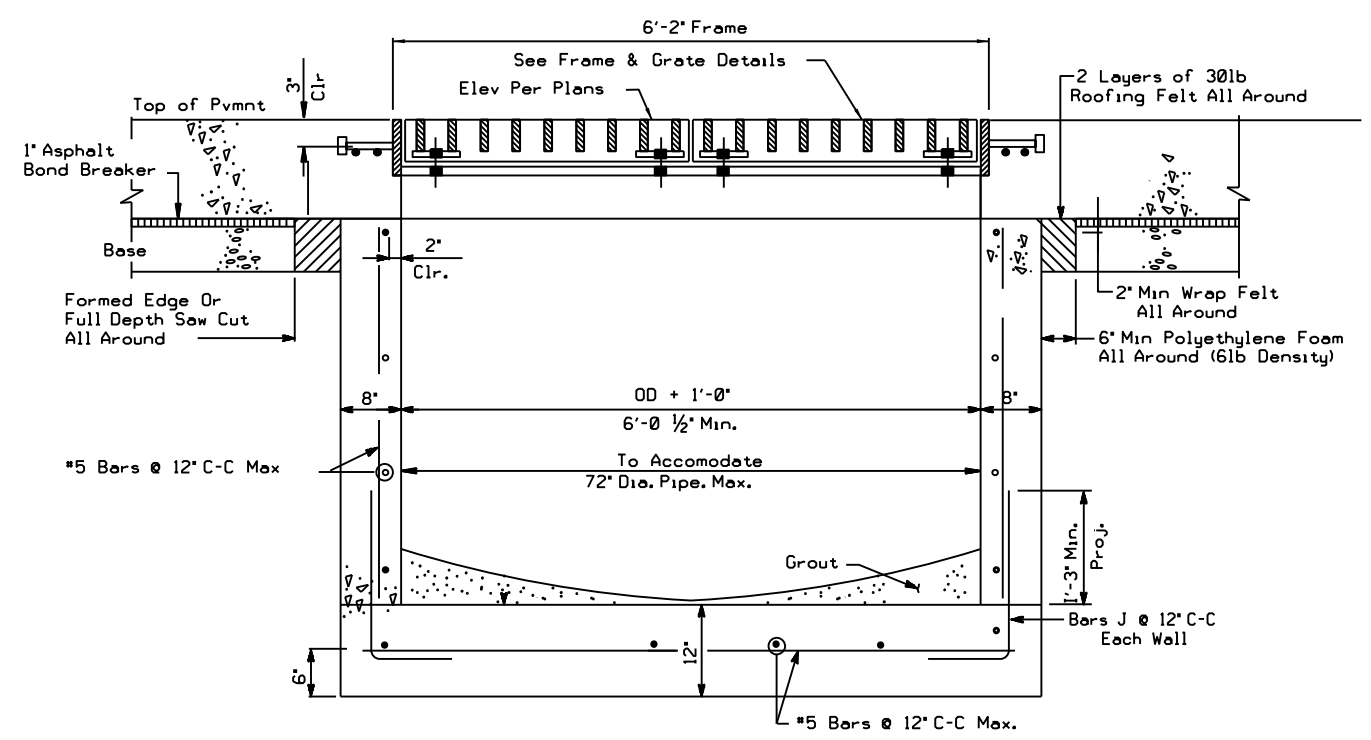
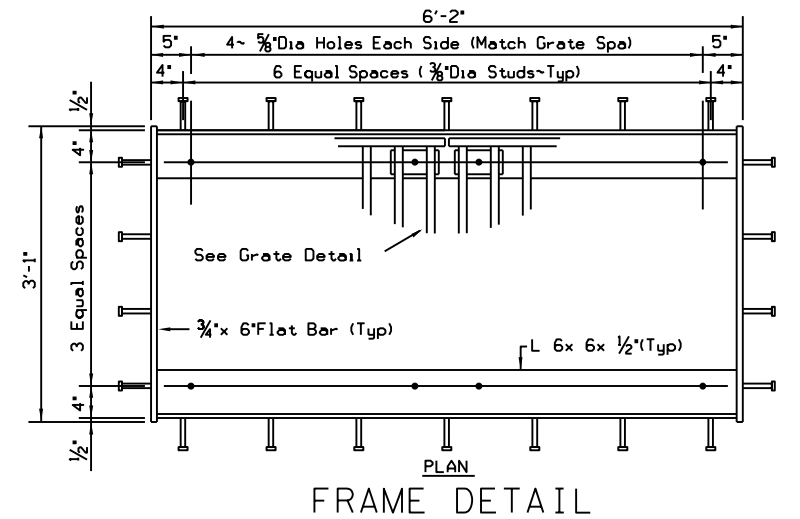
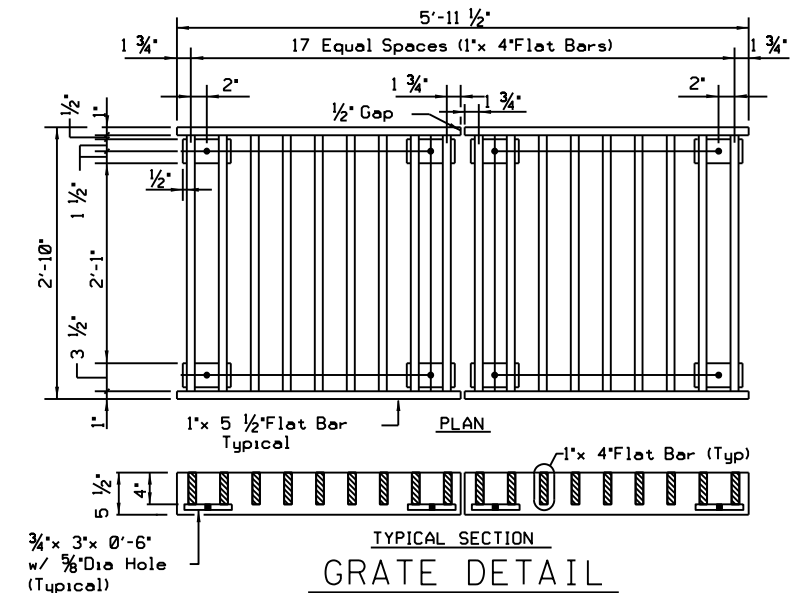
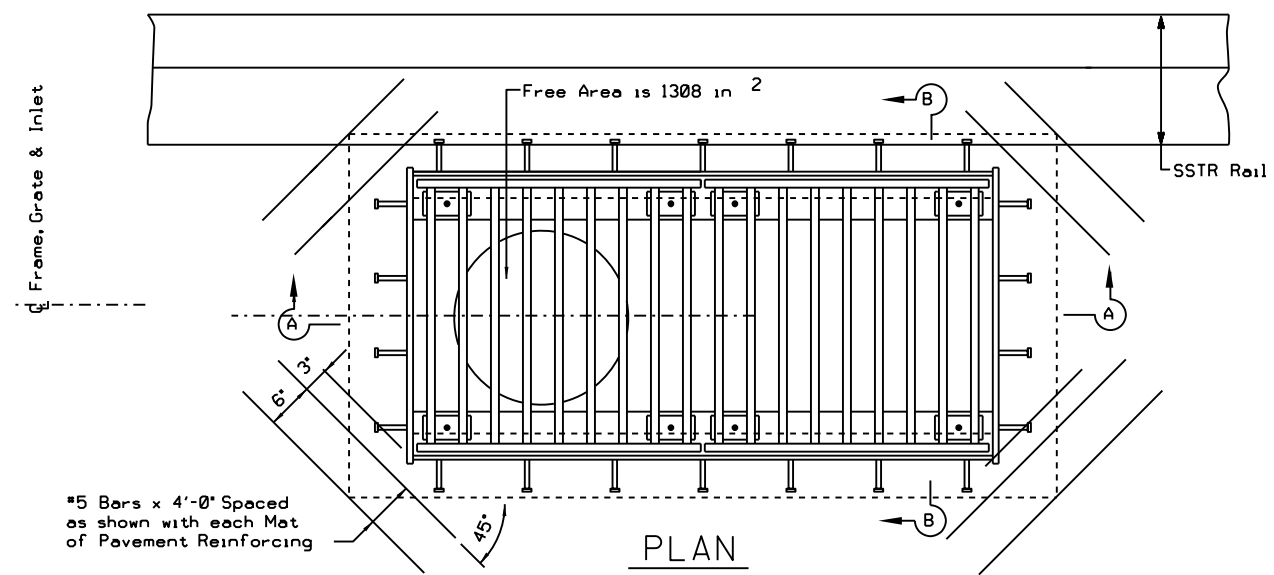
INLET TYPE AZR2G

HIL-AZR2G

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© TXDOT	FEB 2010	DIST	FED REG	PROJECT NO.	SHEET	
REVISIONS		HOUS	6			202
		COUNTY	CONTROL	SECT	JOB	HIGHWAY
		HARRIS	0389	13	039	SH146

d = Diameter

STDD9.DGN

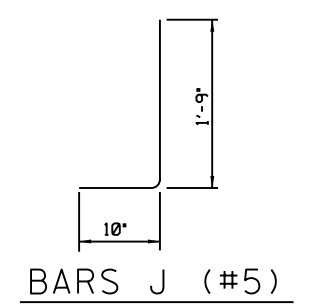
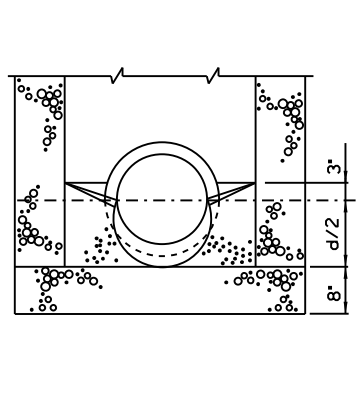
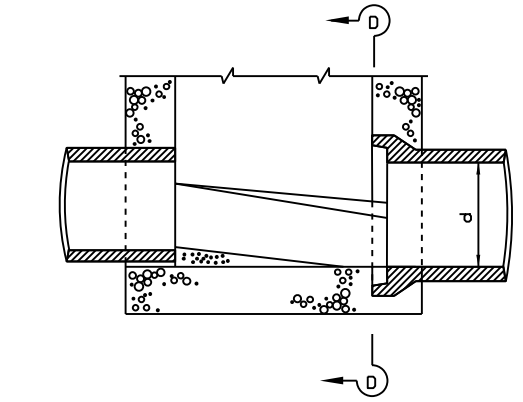
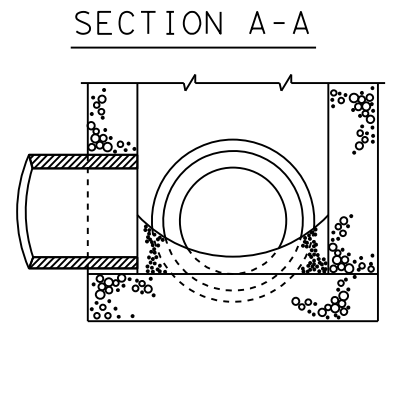
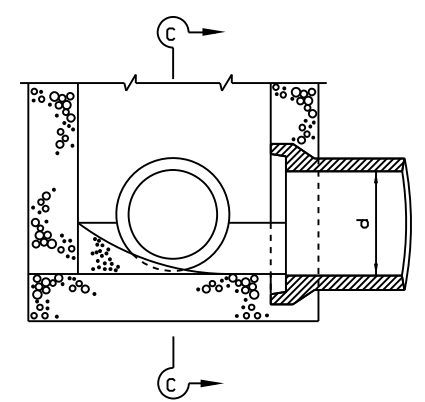


GENERAL NOTES:

All steel is ASTM-A36 and shall be galvanized after fabrication. Cost Of Furnishing And Installing Frames, Grates, Additional Pavement Reinforcing, Roofing Felt And Polyethylene Foam Shall Be Included In The Unit Price Bid For The Type Of Inlet Selected.

All Concrete Shall Be Class C.

Shop Drawings Will Be Required For Precast Construction Of Inlets.



d = Diameter

FOR TRAFFIC LOADS

Texas Department of Transportation
Houston District

INLET TYPE AZ2G

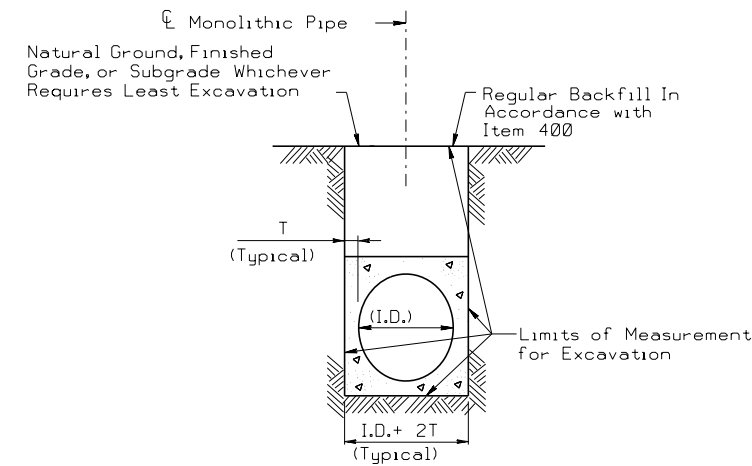
HIL-AZ2G

FILE#	STDD7.DGN	DN# TxDOT	CK# TxDOT	DN# TxDOT	CK# TxDOT	STD#
© TxDOT	Feb 2010	DIST	FED REG	PROJECT NO.		SHEET
REVISIONS		HOUS	6			203
	COUNTY	CONTROL	SECT	JOB	HIGHWAY	
	HARRIS	0389	13	039	SH 146	

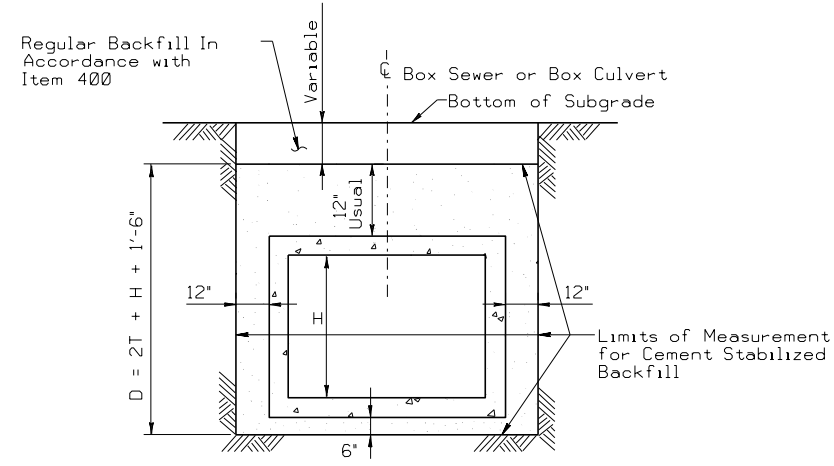
STDD7.DGN

REINFORCED CONCRETE PIPE			
EXCAVATION AND BACKFILL QUANTITIES			
PIPE DIA. IN.	T FT.	CULVERT OR SEWER EXCAVATION IN A PAVED OR GRADED AREA	CEMENT STABILIZED BACKFILL IN A PAVED OR GRADED AREA
		C.Y.PER L.F.PER FT.OF DEPTH	C.Y.PER L.F. OF PIPE
18	0.19	0.144	0.383
24	0.23	0.165	0.478
30	0.29	0.188	0.586
36	0.33	0.210	0.692
42	0.38	0.231	0.808
48	0.42	0.327	1.394
54	0.46	0.349	1.560
60	0.50	0.370	1.731
66	0.54	0.392	1.907
72	0.58	0.414	2.088
78	0.62	0.435	2.275
84	0.67	0.457	2.474

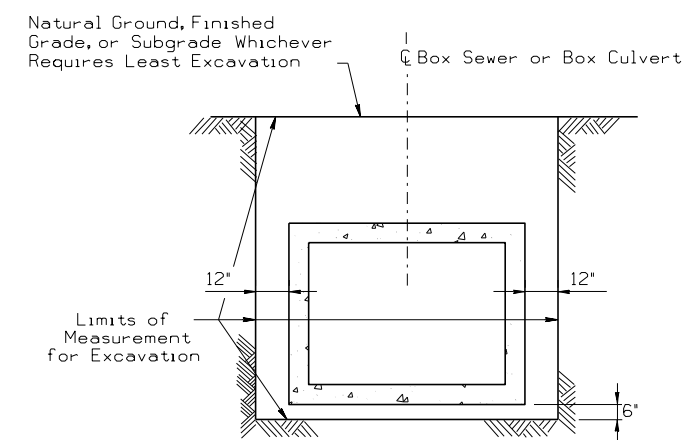
MONOLITHIC PIPE		
EXCAVATION QUANTITIES		
PIPE DIA. IN.	T FT.	EXCAVATION
		C.Y.PER L.F.PER FT.OF DEPTH
36	0.417	0.142
42	0.458	0.164
48	0.458	0.182
54	0.500	0.204
60	0.583	0.228
66	0.583	0.247
72	0.625	0.269
78	0.625	0.287
84	0.625	0.306



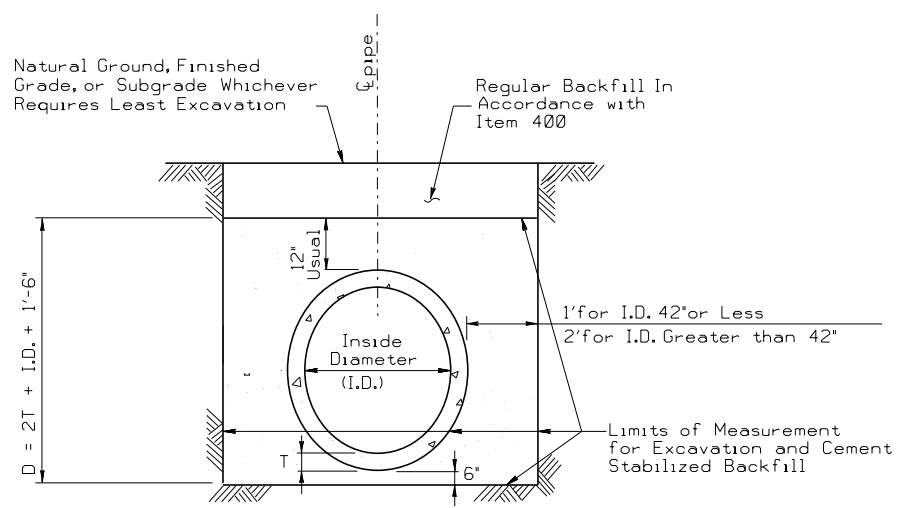
EXCAVATION DETAIL
MONOLITHIC PIPE
IN A PAVED OR GRADED AREA



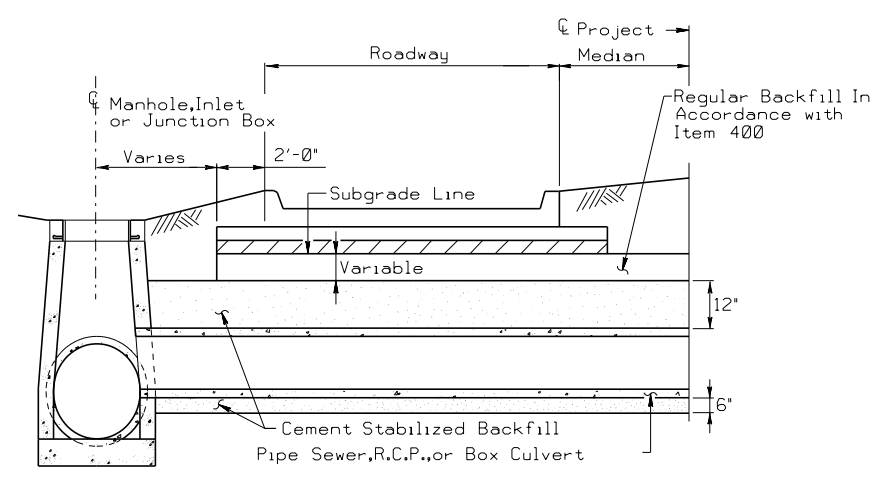
BACKFILL DETAIL
BOX CULVERTS
IN A GRADED OR PAVED AREA
INCLUDING DETOURS *



EXCAVATION DETAIL
BOX CULVERTS
IN A GRADED AREA



EXCAVATION & BACKFILL DETAIL
REINFORCED CONCRETE PIPE
IN A GRADED OR PAVED AREA
INCLUDING DETOURS



BACKFILL DETAIL
AT MANHOLE, INLET OR JUNCTION BOX

NOTE:
Cement stabilized backfill may be omitted in private driveways as indicated elsewhere in the plans.

Rubber gaskets shall be required for all joints on proposed cross drainage, pipe culverts and proposed storm sewer systems, unless otherwise shown in the plans.

Backfill with cement stabilized material will be required for all structures under detours unless noted otherwise in the General Notes.

SHEET 1 OF 2

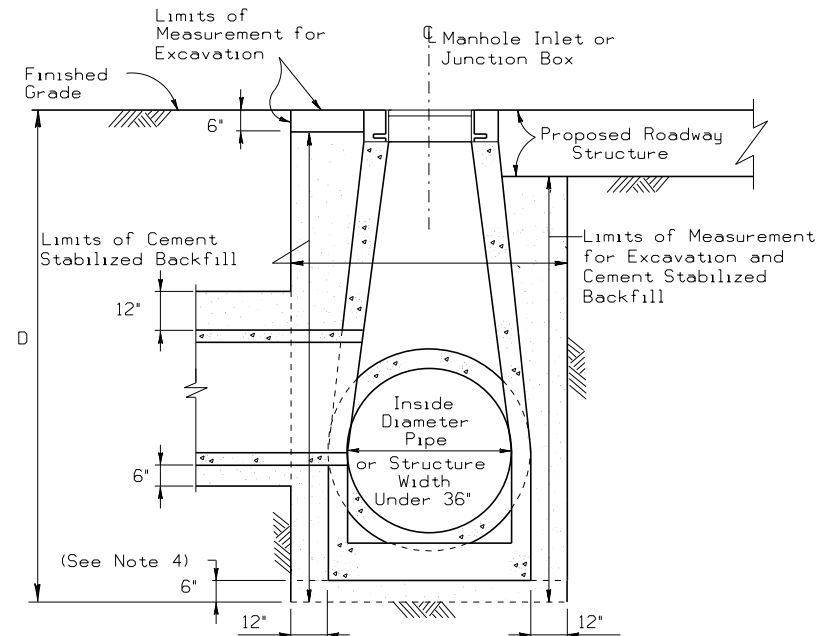


EXCAVATION AND BACKFILL DIAGRAMS

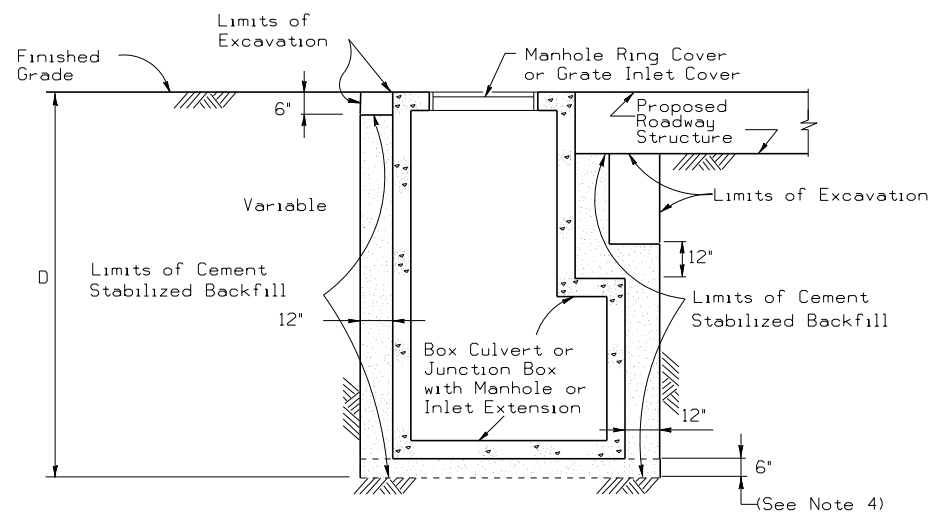
E&BD

D = Depth
H = Height
T = Thickness
R = Radius
Dia = Diameter

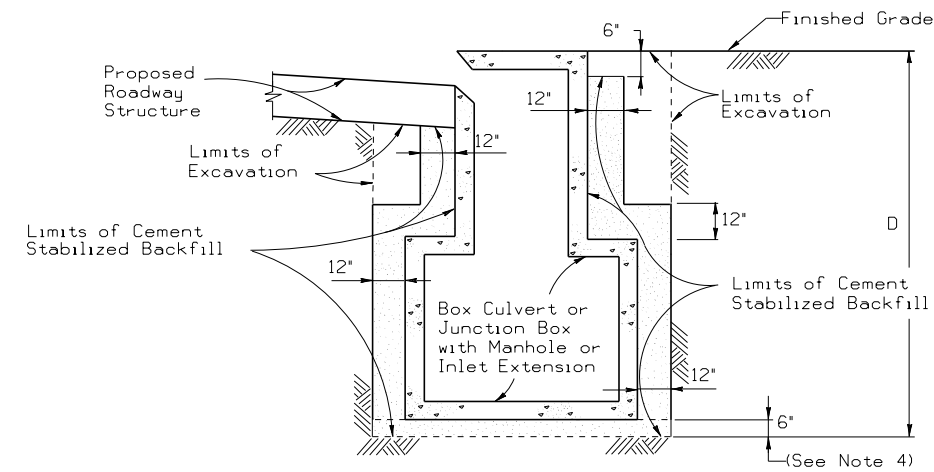
FILE: STDE1.DGN	DN: TxDot	CK: TxDot	DW: TxDot	CK: TxDot
© TxDOT FEB 2010	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS	HOUSTON	6		204
REVIS 2/2010 Added note to Table 1, Sht 2 of 2.	COUNTY	CONTROL	SECT	JOB
REVIS 6/12	HARRIS	0389	13	039 SH 146
REVIS 9/14				



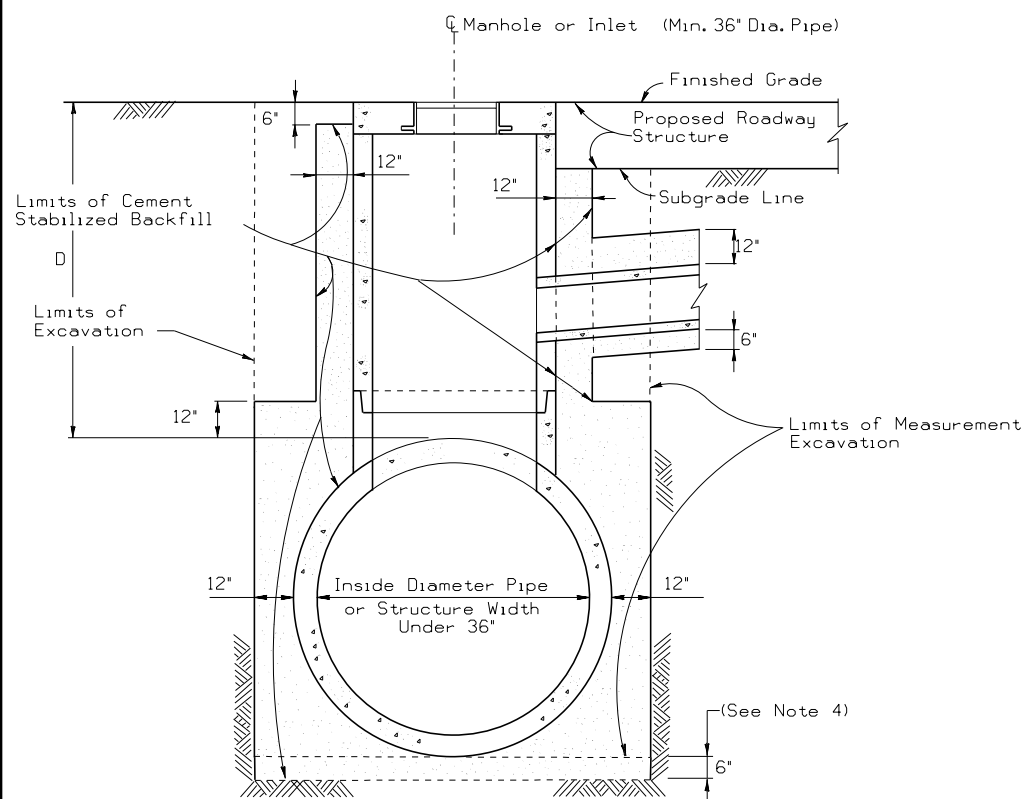
EXCAVATION AND BACKFILL DETAIL
MANHOLES SMALLER THAN 36 IN.
IN A PAVED OR GRADED AREAS
 N.T.S.



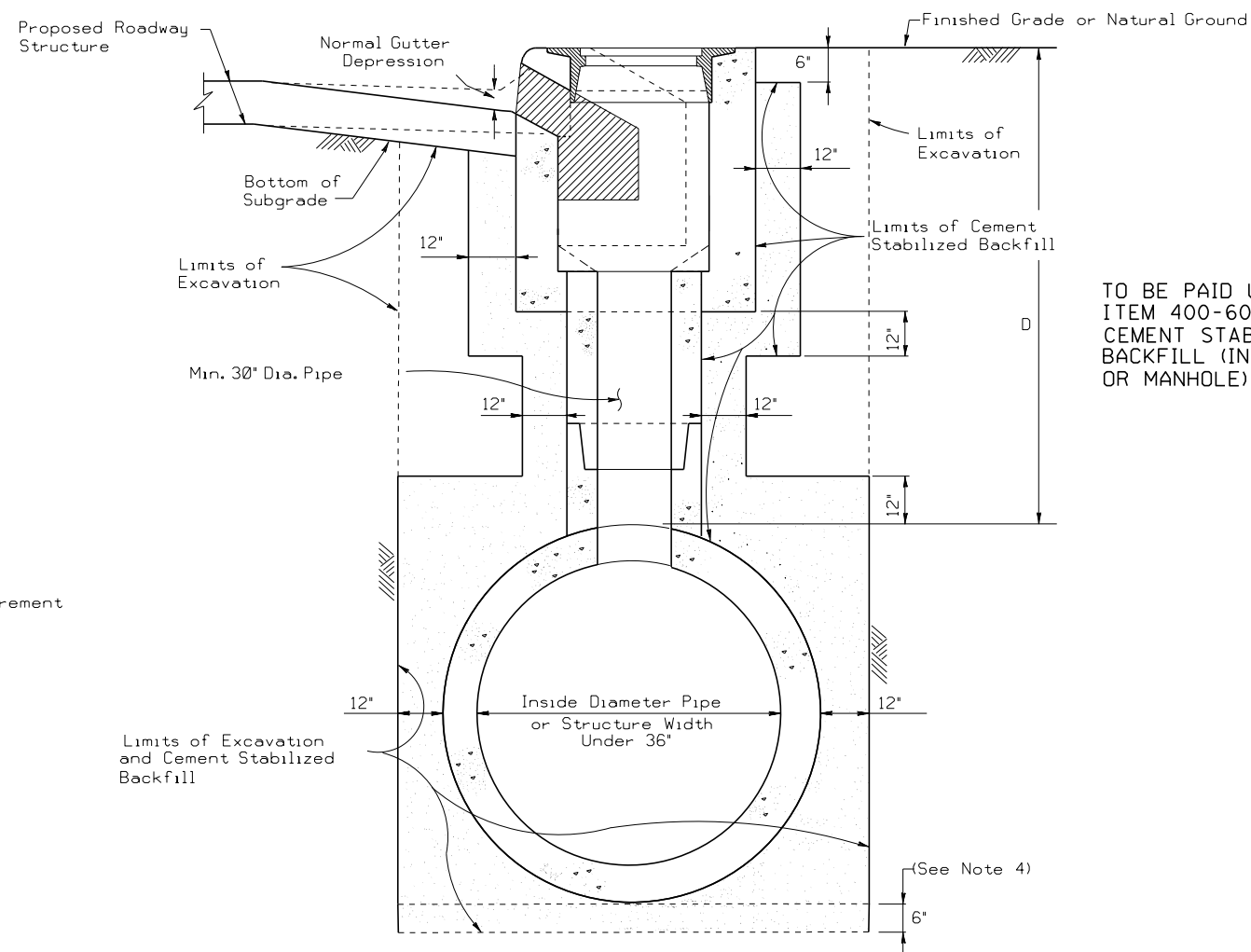
EXCAVATION AND BACKFILL DETAIL
JUNCTION BOXES IN A
PAVED OR GRADED AREA
 N.T.S.



EXCAVATION AND BACKFILL DETAIL
INLET EXTENSIONS ON A BOX CULVERT
IN A PAVED OR GRADED AREA
 N.T.S.



EXCAVATION AND BACKFILL DETAIL
MANHOLES 36 IN. AND GREATER
IN A PAVED OR GRADED AREA
 N.T.S.



EXCAVATION AND BACKFILL DETAIL
CURB INLETS IN A PAVED OR GRADED AREA
 N.T.S.

TO BE PAID UNDER
 ITEM 400-6009
 CEMENT STABILIZED
 BACKFILL (INLET
 OR MANHOLE)

TABLE I	
SCHEDULE FOR PAY QUANTITIES OF CEMENT STABILIZED BACKFILL (SEE NOTE 1)	
MANHOLE OR INLET DEPTH (D) IN FEET	CEMENT STABILIZED BACKFILL IN CUBIC YARDS
0 through 5	5.75
> 5 through 10	8.25
greater than 10	12.75

NOTES:

1. The Contractor is paid a fixed estimated amount for cement stabilized backfill based on depth (D) and Table 1.
2. Proposed roadway structure includes pavement, base and any subgrade.
3. For backfill of intersecting pipes and box culverts, see "Excavation and Backfill Diagram for Pipes and Box Culverts."
4. 6" cement stabilized backfill will be required only for precast units.

EXCAVATION AND BACKFILL DIAGRAMS

E&BD

D = Depth
 H = Height
 T = Thickness
 R = Radius
 Dia = Diameter

FILE: STDE1.DGN	DN: TxDot	CK: TxDot	DW: TxDot	CK: TxDot
© TxDOT FEB 2010	DIST	FED REG	PROJECT NO.	SHEET
REVISED 2/2010	HOUSTON	6		205
REVISED 6/12	COUNTY	CONTROL	SECT	JOB
REVISED 3/15	HARRIS	0389	13	039 SH 146

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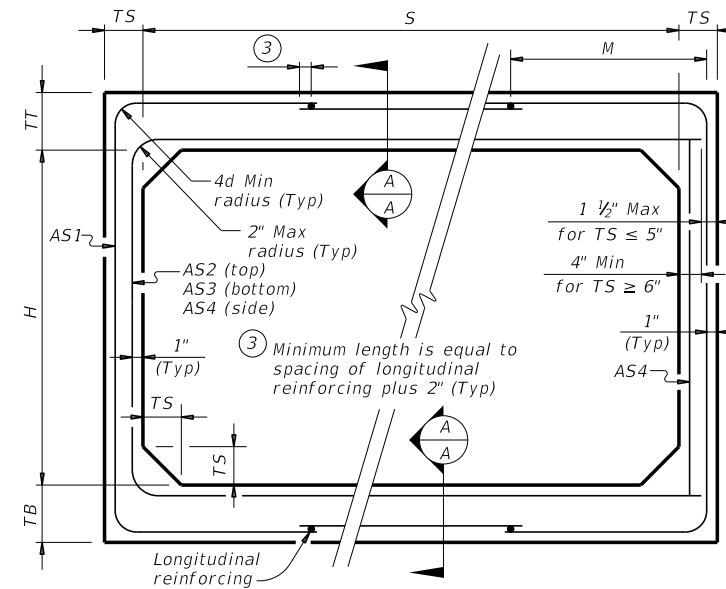
DATE:
FILE:

BOX DATA

SECTION DIMENSIONS					Fill Height (ft.)	M (Min) (in.)	REINFORCING (sq. in. / ft.) ^②							① Lift Weight (tons)
S (ft.)	H (ft.)	TT (in.)	TB (in.)	TS (in.)			AS1	AS2	AS3	AS4	AS5	AS7	AS8	
7	3	8	8	8	< 2	-	0.23	0.31	0.22	0.19	0.19	0.19	0.19	9.6
7	3	8	8	8	2 < 3	47	0.27	0.25	0.24	0.19	-	-	-	9.6
7	3	8	8	8	3 - 5	43	0.19	0.19	0.19	0.19	-	-	-	9.6
7	3	8	8	8	10	43	0.21	0.20	0.21	0.19	-	-	-	9.6
7	3	8	8	8	15	43	0.28	0.26	0.27	0.19	-	-	-	9.6
7	3	8	8	8	20	43	0.36	0.34	0.35	0.19	-	-	-	9.6
7	3	8	8	8	25	43	0.45	0.42	0.43	0.19	-	-	-	9.6
7	3	8	8	8	30	43	0.54	0.50	0.51	0.19	-	-	-	9.6
7	4	8	8	8	< 2	-	0.21	0.34	0.25	0.19	0.19	0.19	0.19	10.4
7	4	8	8	8	2 < 3	43	0.23	0.28	0.28	0.19	-	-	-	10.4
7	4	8	8	8	3 - 5	43	0.19	0.22	0.19	0.19	-	-	-	10.4
7	4	8	8	8	10	43	0.19	0.23	0.23	0.19	-	-	-	10.4
7	4	8	8	8	15	41	0.24	0.30	0.30	0.19	-	-	-	10.4
7	4	8	8	8	20	41	0.31	0.38	0.39	0.19	-	-	-	10.4
7	4	8	8	8	25	41	0.38	0.47	0.48	0.19	-	-	-	10.4
7	4	8	8	8	30	41	0.46	0.57	0.57	0.19	-	-	-	10.4
7	5	8	8	8	< 2	-	0.19	0.36	0.27	0.19	0.19	0.19	0.19	11.2
7	5	8	8	8	2 < 3	47	0.21	0.31	0.31	0.19	-	-	-	11.2
7	5	8	8	8	3 - 5	43	0.19	0.24	0.21	0.19	-	-	-	11.2
7	5	8	8	8	10	43	0.19	0.25	0.26	0.19	-	-	-	11.2
7	5	8	8	8	15	41	0.21	0.32	0.33	0.19	-	-	-	11.2
7	5	8	8	8	20	41	0.27	0.41	0.42	0.19	-	-	-	11.2
7	5	8	8	8	25	41	0.33	0.51	0.52	0.19	-	-	-	11.2
7	5	8	8	8	30	41	0.40	0.61	0.62	0.19	-	-	-	11.2
7	6	8	8	8	< 2	-	0.19	0.38	0.30	0.19	0.19	0.19	0.19	12.0
7	6	8	8	8	2 < 3	59	0.19	0.33	0.34	0.19	-	-	-	12.0
7	6	8	8	8	3 - 5	47	0.19	0.25	0.23	0.19	-	-	-	12.0
7	6	8	8	8	10	43	0.19	0.26	0.27	0.19	-	-	-	12.0
7	6	8	8	8	15	41	0.19	0.34	0.35	0.19	-	-	-	12.0
7	6	8	8	8	20	41	0.24	0.43	0.45	0.19	-	-	-	12.0
7	6	8	8	8	25	41	0.29	0.53	0.55	0.19	-	-	-	12.0
7	6	8	8	8	30	41	0.35	0.64	0.65	0.19	-	-	-	12.0
7	7	8	8	8	< 2	-	0.19	0.40	0.33	0.19	0.19	0.19	0.19	12.8
7	7	8	8	8	2 < 3	59	0.19	0.36	0.37	0.19	-	-	-	12.8
7	7	8	8	8	3 - 5	59	0.19	0.27	0.25	0.19	-	-	-	12.8
7	7	8	8	8	10	47	0.19	0.27	0.29	0.19	-	-	-	12.8
7	7	8	8	8	15	43	0.19	0.35	0.37	0.19	-	-	-	12.8
7	7	8	8	8	20	43	0.22	0.44	0.46	0.19	-	-	-	12.8
7	7	8	8	8	25	43	0.27	0.54	0.57	0.19	-	-	-	12.8
7	7	8	8	8	30	41	0.32	0.65	0.67	0.19	-	-	-	12.8

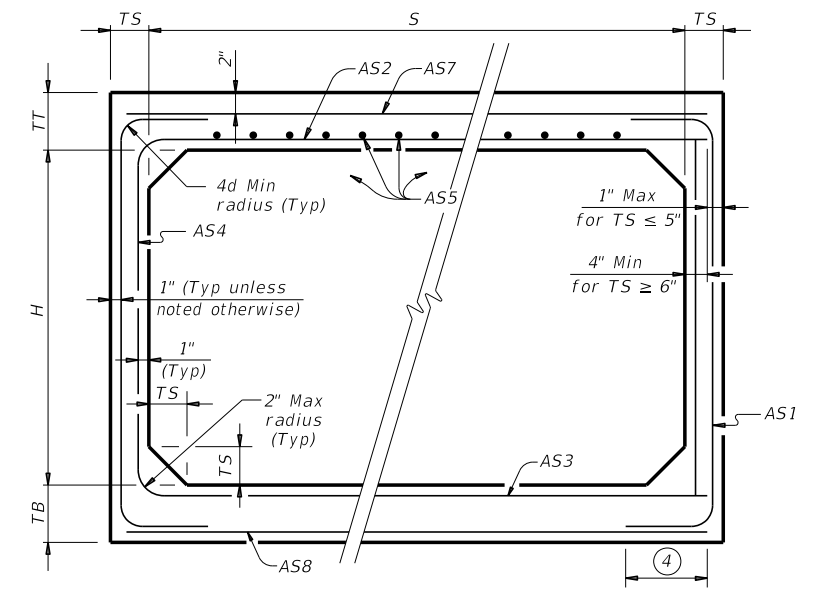
① For box length = 8'-0"

② AS1 thru AS4, AS7 and AS8 are minimum required areas of reinforcement per linear foot of box length. AS5 is minimum required area of reinforcement per linear foot of box width.



CORNER OPTION "A" CORNER OPTION "B"

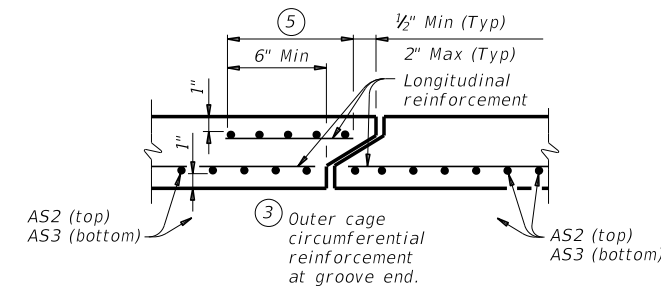
FILL HEIGHT 2 FT AND GREATER



CORNER OPTION "A" CORNER OPTION "B"

FILL HEIGHT LESS THAN 2 FT

④ Length is equal to spacing of longitudinal reinforcing plus 2". (10" Min) (Typ)



SECTION A-A

(Showing top and bottom slab joint reinforcement.)

MATERIAL NOTES:

Provide 0.03 sq. in./ft. minimum longitudinal reinforcement at each face in slabs and walls. This minimum requirement may be met by the transverse wires when wire mesh reinforcement is used.
Provide Class H concrete (f'c = 5,000 psi).

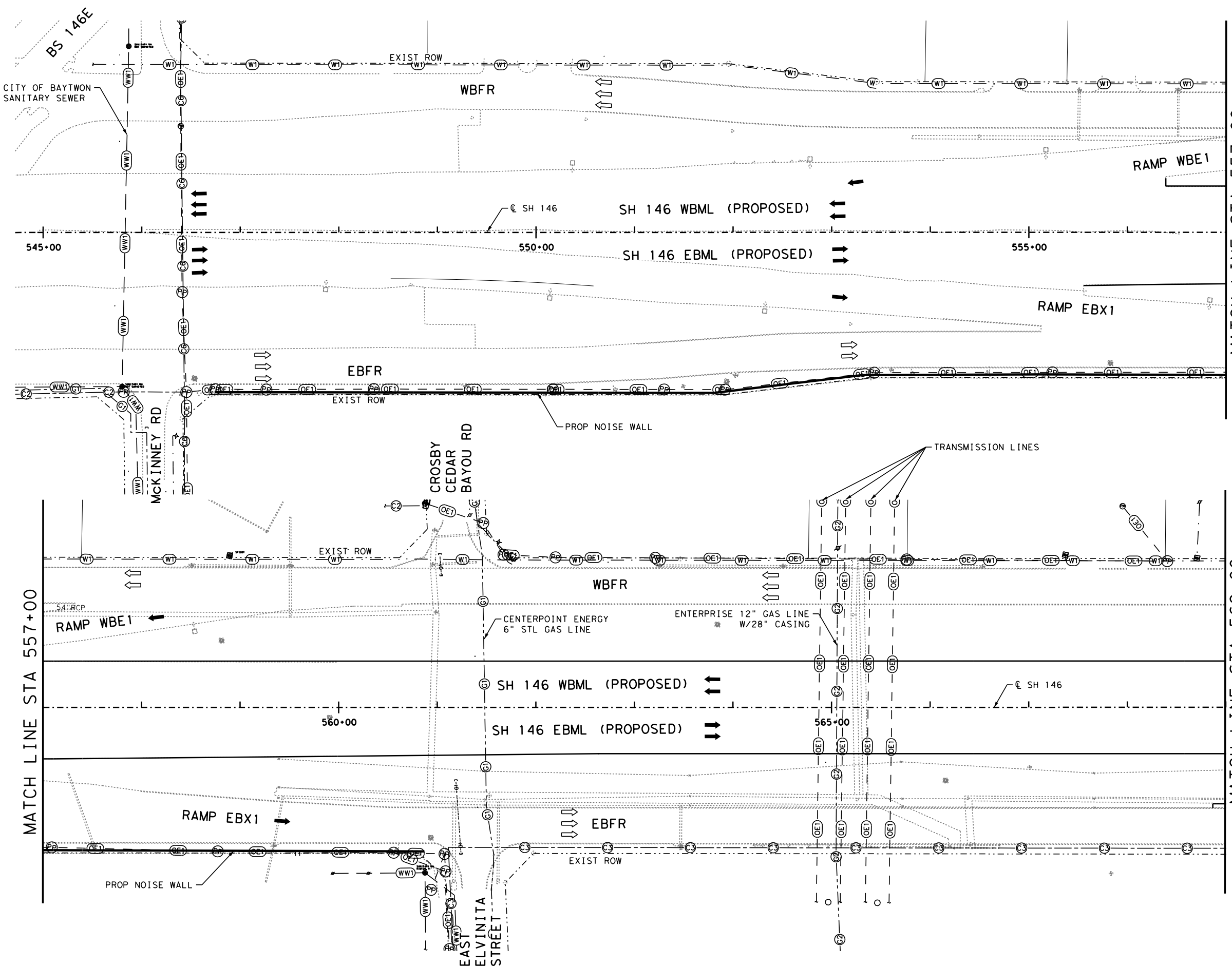
GENERAL NOTES:

Designs shown conform to ASTM C1577. Refer to ASTM C1577 for information or details not shown.
See Box Culverts Precast Miscellaneous Details (SCP-MD) standard sheet for details and notes not shown.
In lieu of furnishing the designs shown on this sheet, the contractor may furnish an alternate design that is equal to or exceeds the box design for the design fill height in the table. Submit shop plans for alternate designs in accordance with Item "Precast Concrete Structural Members (Fabrication)".

HL93 LOADING

		Bridge Division Standard	
<h2>SINGLE BOX CULVERTS PRECAST 7'-0" SPAN</h2>			
<h3>SCP-7</h3>			
FILE: scp07sts-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
©TxDOT February 2020	CONT: 0389	SECT: 13	JOB: 039
REVISIONS	COUNTY: HARRIS		HIGHWAY: SH 146
	DIST: HOU	COUNTY: HARRIS	SHEET NO.: 206

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COMMUNICATIONS QL "C"/QL "D"

VERIZON (TELE)	C1	C2	C3
FRONTIER (TELE)	C4	C5	C6
AT&T (TELE)	C7	C8	C9
COMCAST (FOC)	C10	C11	C12
COMCAST (CTV)	C13	C14	C15
UNKNOWN (TELE)	C16	C17	C18

ELECTRIC / POWER QL "C"/QL "D"

UNKNOWN	E1	E2	E3
CITY	E4	E5	E6
TxDOT (ELEC)	E7	E8	E9
TxDOT (TRAFFIC SIGNAL)	TS1	TS2	TS3

GAS / PETROLEUM QL "C"/QL "D"

CENTERPOINT ENERGY	G1	G2	G3
ENTERPRISE-TEPPCO	G4	G5	G6
KINDER MORGAN	G7	G8	G9

SANITARY SEWER QL "C"/QL "D"

CITY	WW1	WW2	WW3
------	-----	-----	-----

POTABLE WATER QL "C"/QL "D"

CITY	WT1	WT2	WT3
------	-----	-----	-----

OVERHEAD ELECTRIC QL "C"/QL "D"

UNKNOWN	OE1	OE2	OE3
---------	-----	-----	-----



CivilTech Engineering, Inc.
 4630 N. Loop 1604 W., suite 307
 San Antonio, Texas 78249
 PH: (210) 598-0710 - FX: (210) 598-0715
 Firm Registration No. F-382

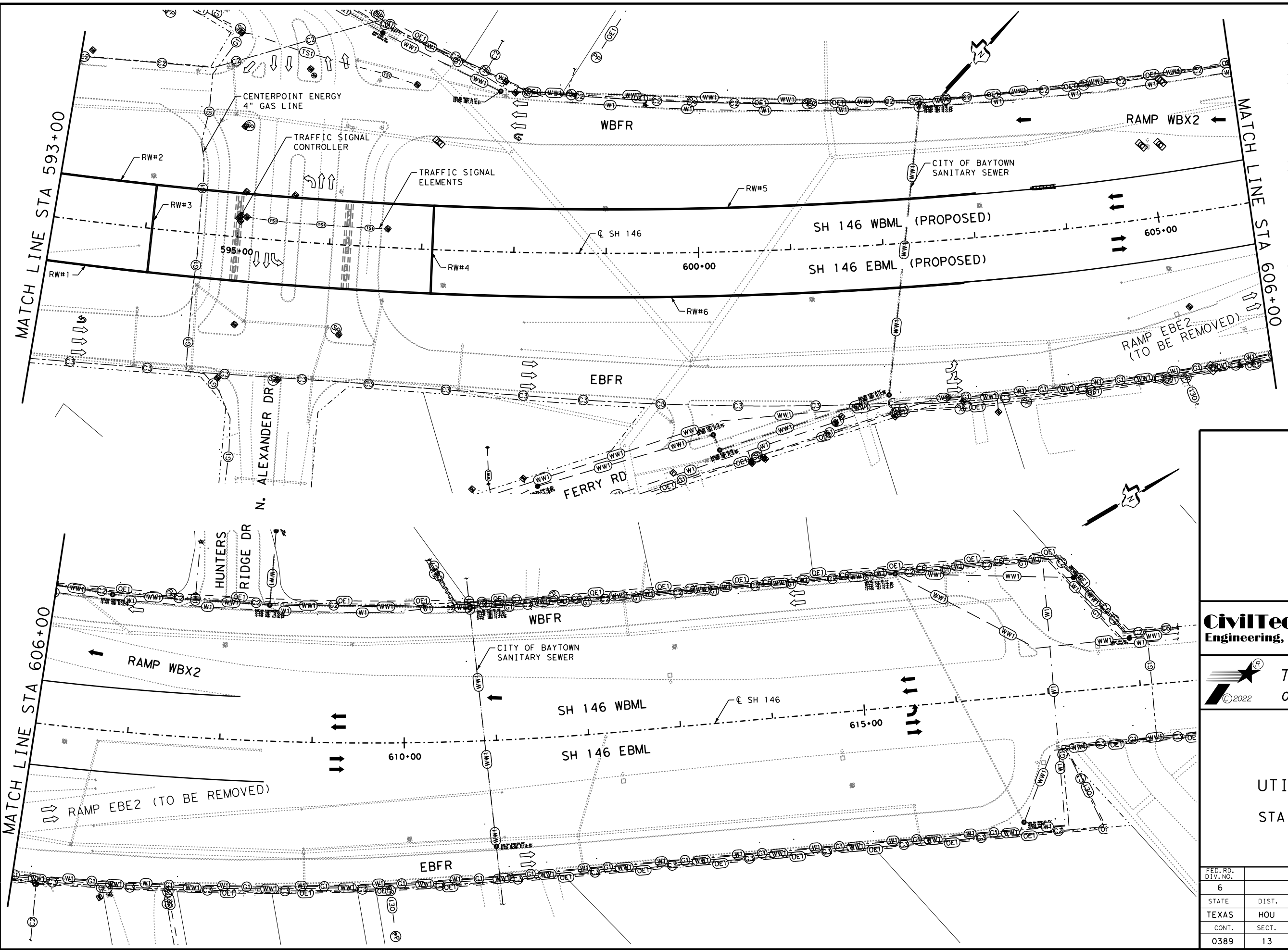
Texas Department of Transportation

SH 146
EXISTING UTILITY LAYOUT
 BEGIN TO STA 569+00

SHEET 1 OF 3

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			207
STATE	DIST.	COUNTY	
TEXAS	HOU.	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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COMMUNICATIONS QL "C"/QL "D"

VERIZON (TELE)	C1	C2	C3
FRONTIER (TELE)	C4	C5	C6
FRONTIER (FOC)	C7	C8	C9
AT&T (TELE)	C10	C11	C12
AT&T (FOC)	C13	C14	C15
COMCAST (FOC)	C16	C17	C18
COMCAST (CTV)	C19	C20	C21
UNKNOWN (TELE)	C22	C23	C24

ELECTRIC / POWER QL "C"/QL "D"

UNKNOWN	E1	E2	E3
CITY	E4	E5	E6
TxDOT (ELEC)	E7	E8	E9
TxDOT (TRAFFIC SIGNAL)	E10	E11	E12

GAS / PETROLEUM QL "C"/QL "D"

CENTERPOINT ENERGY	G1	G2	G3
ENTERPRISE-TEPCO	G4	G5	G6
KINDER MORGAN	G7	G8	G9

SANITARY SEWER QL "C"/QL "D"

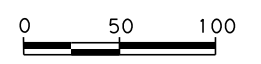
CITY	W1	W2	W3
------	----	----	----

POTABLE WATER QL "C"/QL "D"

CITY	W4	W5	W6
------	----	----	----

OVERHEAD ELECTRIC QL "C"/QL "D"

UNKNOWN	OE1	OE2	OE3
---------	-----	-----	-----



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 4630 N. Loop 1604 W., suite 307
 San Antonio, Texas 78249
 PH: (210) 598-0710 - FX: (210) 598-0715
 Firm Registration No. F-382



SH 146
EXISTING UTILITY LAYOUT
STA 593+00 TO END

SHEET 3 OF 3

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			209
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146



DRILLING LOG

1 of 2

WinCore
Version 3.3

County Harris
Highway SH 146
CSJ 0389-13-039

Hole GB-15
Structure Bridge
Station 594+02.75
Offset 57.0' LT

District Houston
Date 06-04-19
Grnd. Elev. 20.64 ft
GW Elev. N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties				Additional Remarks
				Lateral Press. (psi)	Deviator Stress (psi)	MC	LL	PI	Wet Den. (pcf)	
15.6	5	3 (6) 3 (6)	FILL, clay, stiff, yellowish brown and gray	3	22	22.2				w/gravel, roots and sand seams 0'-2'
						19.8	50	29	129.2	dark gray w/shell 2'-3'
						23.9				w/calcareous and ferrous nodules 3'-5'
			CLAY, very soft to stiff, gray and brown w/ferrous nodules (CH)	8	15	30.6	76	48	120.9	gray & yellowish brown 8'-15'
10		3 (6) 4 (6)				28.2				w/ferrous stains 11'-21'
				13	16	29.0	74	46	123.7	w/calcareous nodules 13'-15'
						28.7				brown and gray 15'-45'
15		3 (6) 4 (6)				23.1				
				20	12	31.9	91	58	123.2	
20		5 (6) 6 (6)				24.7				w/calcareous nodules 22'-25'
				25	19	26.4	74	47	129.6	
25		4 (6) 7 (6)				32.4				w/ferrous stains 28'-42'
				30	19	35.5	102	67	121.6	
30		4 (6) 6 (6)				35.6				very stiff 33'-35'
				0	30	36.1	103	67	120.3	
35		3 (6) 6 (6)				38.2				
				0	21	39.9	103	68	115.3	
40		5 (6) 7 (6)				43.5				
				0	27	41.4	113	75	114.5	gray and brown 45'-48'
45		7 (6) 9 (6)				40.8				gray 48'-50'
				50	24	41.8	109	72	115.01	
50		4 (6) 5 (6)				44.8				
				0	23	35.6	90	57	119.7	
55		6 (6) 10 (6)				41.2				
				60	26	41.0	96	62	116.2	

Remarks: 1) Dry auger to 36.0 ft., wet rotary from 36.0 to 80.0 ft.

The ground water elevation was not determined during the course of this boring.

Driller: Dempsey Gearen

Logger: John A. Gentry

Organization: Geotest Engineering, Inc.

C:\Jobs\1140244401\1140244401_Bridge_GB-15.16.CLG

FIGURE A-15



DRILLING LOG

2 of 2

WinCore
Version 3.3

County Harris
Highway SH 146
CSJ 0389-13-039

Hole GB-15
Structure Bridge
Station 594+02.75
Offset 57.0' LT

District Houston
Date 06-04-19
Grnd. Elev. 20.64 ft
GW Elev. N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties				Additional Remarks		
				Lateral Press. (psi)	Deviator Stress (psi)	MC	LL	PI	Wet Den. (pcf)			
			CLAY, very soft to stiff, gray and brown w/ferrous nodules (CH)			32.7				very stiff 63'-65'		
65		6 (6) 8 (6)				0	30	30.6	73	45	125.9	w/calcareous nodules 63'-68'
						26.2						w/sand pockets at 68'
-47.4			CLAY, sandy, stiff, gray and brown (CL)	70	17	21.8	38	20	128.1			w/sand seams and ferrous stains 68'-70'
-49.4		50 (5) 50 (3)	SAND, POORLY GRADED WITH SILT, slightly compact to dense, gray (SP-SM)			16.0						% passing #200 sieve = 9%
						15.7						w/pea gravel at 76'
75		19 (6) 22 (6)										
-59.4		9 (6) 13 (6)										

Remarks: 1) Dry auger to 36.0 ft., wet rotary from 36.0 to 80.0 ft.

The ground water elevation was not determined during the course of this boring.

Driller: Dempsey Gearen

Logger: John A. Gentry

Organization: Geotest Engineering, Inc.

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FIGURE A-15a

REV NO.	DATE	BY	REVISION

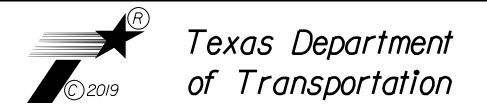


Mahsa Arastoo

3/7/2022



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



SH 146

BORING LOG SH 146 OVERPASS AT N. ALEXANDER DR

SHEET 1 OF 2

FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.		SHEET NO. 210
STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146

\$FILEABBREV\$



DRILLING LOG

1 of 2

WinCore Version 3.3
 County Harris
 Highway SH 146
 CSJ 0389-13-039

Hole GB-16
 Structure Bridge
 Station 597+24.9
 Offset 38.2' RT

District Houston
 Date 06-03-19
 Grnd. Elev. 19.04 ft
 GW Elev. N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties				Additional Remarks	
				Lateral Press. (psi)	Deviator Stress (psi)	MC	LL	PI	Wet Den. (pcf)		
17.			FILL, clay, gray w/gravel and ferrous stains								
			CLAY, very soft to stiff, dark gray, w/ferrous nodules (CH)	4	17	32.0	82	51	118.9		
5		2 (6) 3 (6)				31.3					w/calcareous nodules 6.5'-20'
				8	20	27.1	78	49	125.2		
						27.6					yellowish gray 11.5'-15'
10		3 (6) 4 (6)									w/ferrous stains 13'-18'
						25.2					gray 15'-25'
15		3 (6) 4 (6)		15	16	26.1	82	51	126.4		
						34.9					
20		5 (6) 6 (6)		0	6	33.1	87	55	124.4		
						29.4					w/ferrous stains 23'-25'
25		6 (6) 7 (6)				34.4					gray and brown 25'-41.5'
				28	13	36.8	96	63	119.7		
						35.5					
30		6 (6) 7 (6)		0	13	38.9	101	66	119		
						38.9					
35		6 (6) 8 (6)		38	25	39.8	111	73	116.3		
						41.8					w/ferrous stains 41.5'-43'
40		8 (6) 10 (6)		43	23	46.2	120	80	112.9		gray 41.5'-60'
						41.2					
45		5 (6) 7 (6)		48	17	46.2	106	69	111.9		
						36.7					
50		4 (6) 7 (6)				38.6					
				55	24	39.6	95	61	115.7		
55		6 (6) 6 (6)				38.7					
				0	32	28.4	60	35	126		
60		5 (6) 7 (6)									

Remarks: 1) Dry auger to 40.0 ft., wet rotary from 40.0 to 80.0 ft.

The ground water elevation was not determined during the course of this boring.

Driller: Dempsey Gearen Logger: Gazi Saif Uddin Organization: Geotest Engineering, Inc.

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FIGURE A-16



DRILLING LOG

2 of 2

WinCore Version 3.3
 County Harris
 Highway SH 146
 CSJ 0389-13-039

Hole GB-16
 Structure Bridge
 Station 597+24.9
 Offset 38.2' RT

District Houston
 Date 06-03-19
 Grnd. Elev. 19.04 ft
 GW Elev. N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties				Additional Remarks	
				Lateral Press. (psi)	Deviator Stress (psi)	MC	LL	PI	Wet Den. (pcf)		
-44.			CLAY, sandy, soft to very stiff (CL)	63	29	23.1	37	19	130.2		dark gray w/ferrous nodules 60'-61.5'
65		7 (6) 13 (6)				25.0					gray w/ferrous nodules and ferrous stains 61.5'-63'
			SAND, silty, slightly compact to compact, gray (SM)								% passing #200 sieve = 18%
70		12 (6) 20 (6)				20.1					
						21.2					
75		16 (6) 26 (6)				15.1					w/pea gravel 78.5'-80'
-59.			SAND, POORLY GRADED WITH SILT, dense, gray (SP-SM)								% passing #200 sieve = 9%
-61.		33 (6) 49 (6)									
80											
85											
90											
95											
100											
105											
110											
115											
120											

Remarks: 1) Dry auger to 40.0 ft., wet rotary from 40.0 to 80.0 ft.

The ground water elevation was not determined during the course of this boring.

Driller: Dempsey Gearen Logger: Gazi Saif Uddin Organization: Geotest Engineering, Inc.

C:\Jobs\1140244401\1140244401_Bridge_GB-15,16.CLG

FIGURE A-16a

REV. NO.	DATE	BY	REVISION

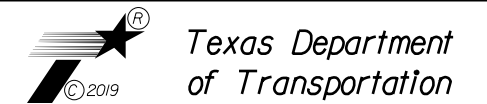


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 Cypress, Texas 77429
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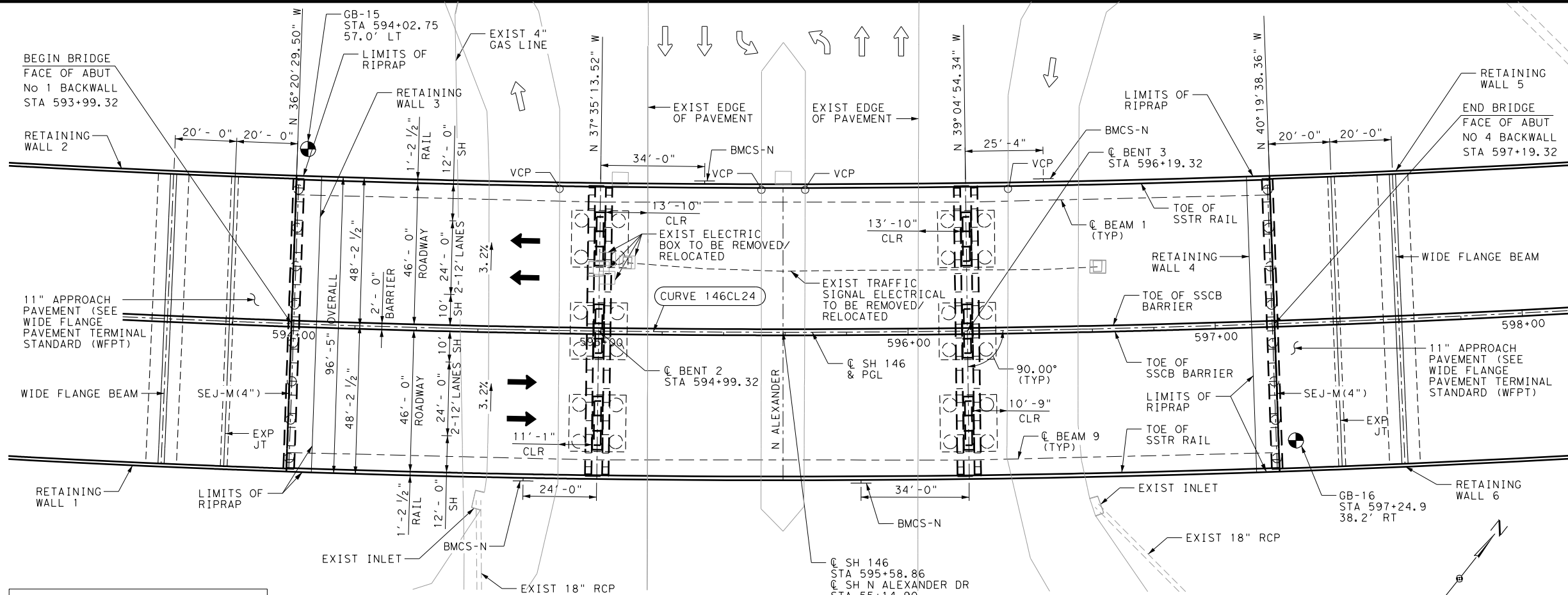


SH 146

BORING LOG SH 146 OVERPASS AT N. ALEXANDER DR

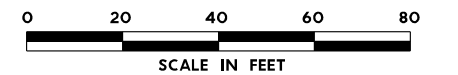
SHEET 2 OF 2

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			211
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146



THE "H" VALUES SHOWN ARE ESTIMATED COLUMN HEIGHTS. THE CONTRACTOR IS RESPONSIBLE FOR CALCULATING THE ACTUAL COLUMN HEIGHTS BASED ON FIELD CONDITIONS.

PLAN



- GENERAL NOTES:**
- DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATION 8TH EDITION (2017).
 - FOR TYPICAL SECTIONS, SEE "TYPICAL SECTIONS" SHEET.
 - "D" DENOTES BENTS SLAB EXPANSION DOWELS IN INVERTED TEE BENT CAP STEM. SEE BENT SHEETS FOR DOWEL LOCATION.
 - SEE "BORING LOG" SHEETS FOR GEOTECHNICAL INFORMATION.
 - ROW IS OUTSIDE OF THE LIMITS OF THIS PAGE.

DESIGN SPEED = 60 MPH
 ADT (2017): 42,100
 ADT (2025): 48,000
 NBI NO.: 12-102-0-0389-03-087

CURVE INFORMATION CURVE 146CL24

PI STATION	= 595+64.46
DELTA	= 20° 35' 04.34" (LT)
DEGREE OF CURVE	= 1° 14' 44.02"
TANGENT	= 835.32
LENGTH	= 1,652.63
RADIUS	= 4,600.00
PC STATION	= 587+29.14
PT STATION	= 603+81.77

HL 93 LOADING

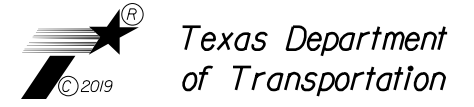
REV. NO.	DATE	BY	REVISION



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 5/11/2022

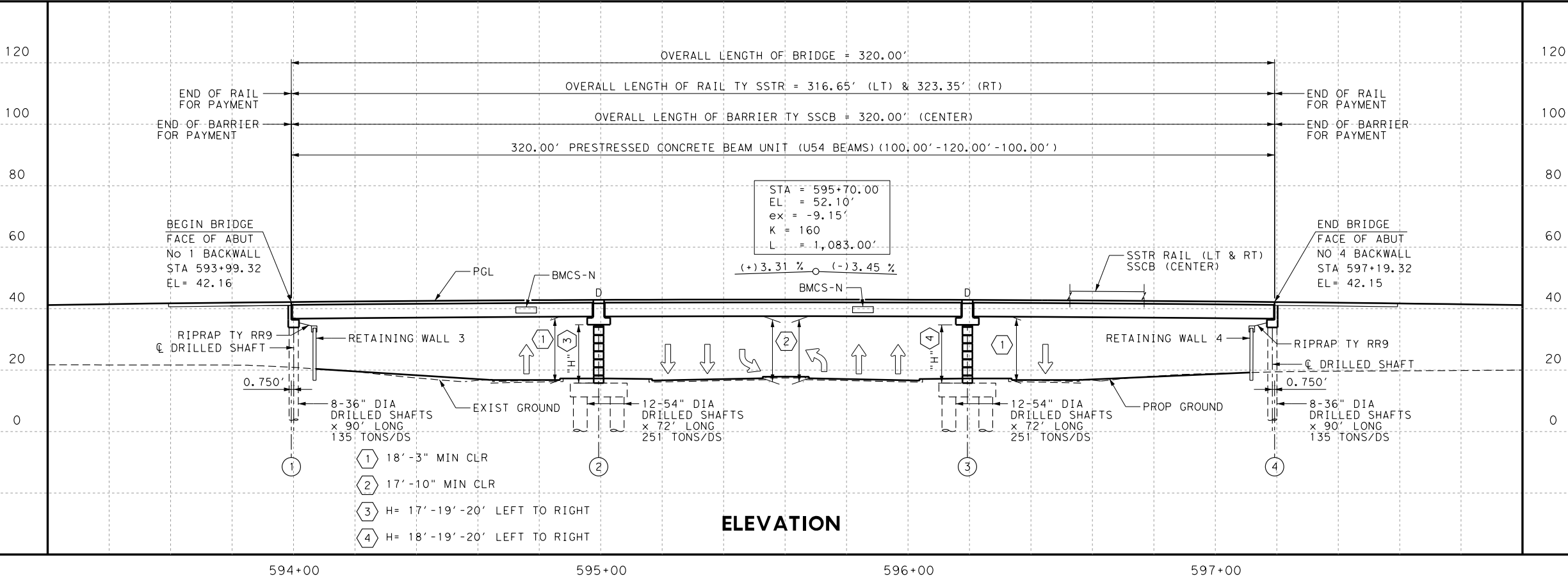


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SH 146

BRIDGE LAYOUT
SH 146 OVERPASS AT
N. ALEXANDER DR

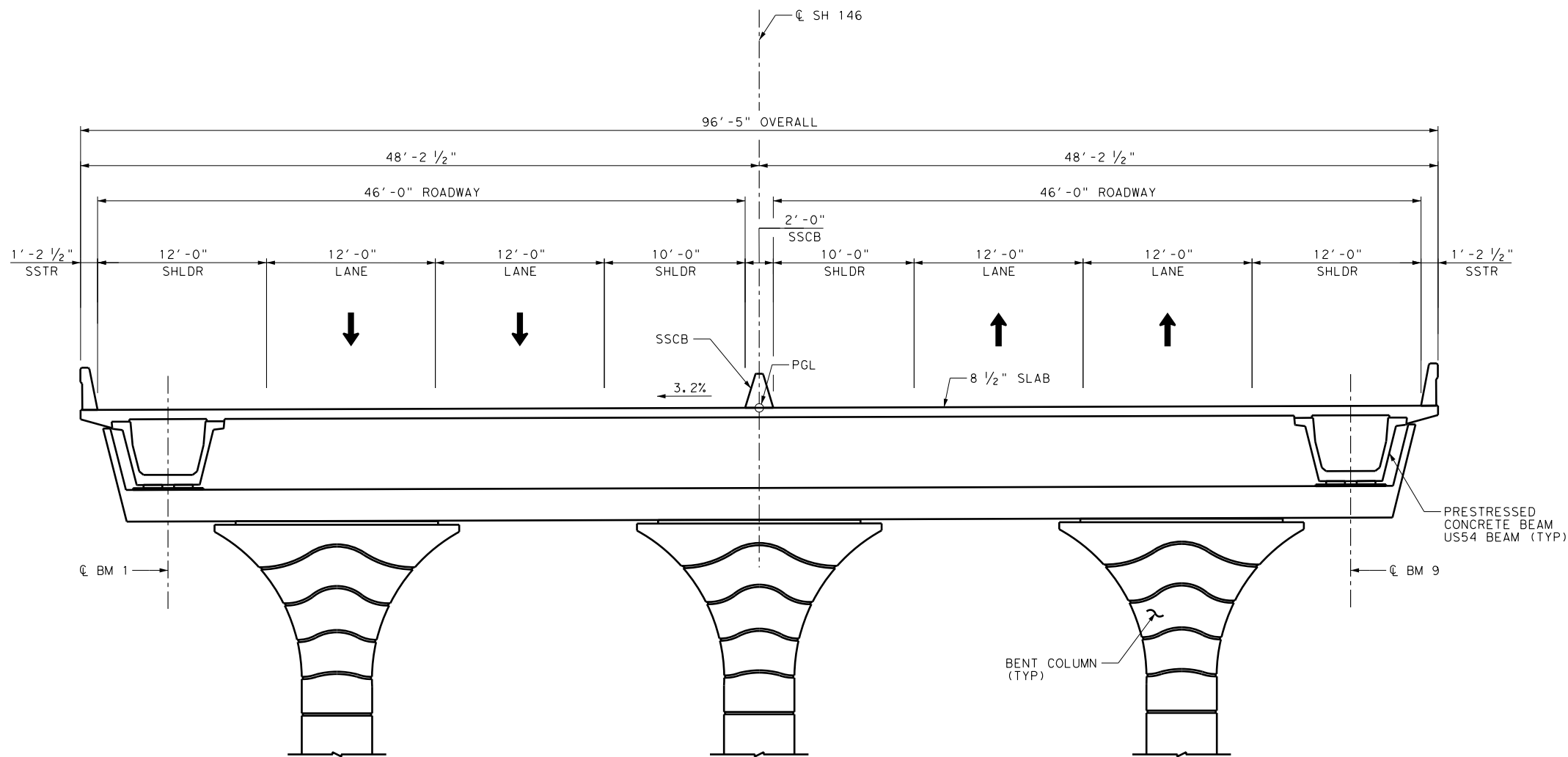


ELEVATION

- 1 18'-3" MIN CLR
- 2 17'-10" MIN CLR
- 3 H= 17'-19'-20' LEFT TO RIGHT
- 4 H= 18'-19'-20' LEFT TO RIGHT

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			212
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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TYPICAL SECTION
NOT TO SCALE

HL 93 LOADING

REV. NO.	DATE	BY	REVISION

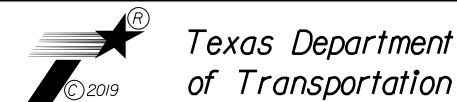


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SH 146

**BRIDGE TYPICAL SECTION
SH 146 OVERPASS AT
N. ALEXANDER DR**


FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			213
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

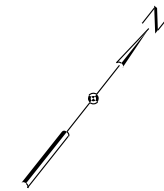
SUMMARY OF ESTIMATED BRIDGE QUANTITIES

ITEM	403	416	416	420	420	420	420	422	425	432	432	442	450	454	514
BID CODE	6001	6004	6007	6013	6037	6043	6082	6001	6028	6001	6008	6007	6023	6018	6001
DESCRIPTION	TEMPORARY SPL SHORING	DRILL SHAFT (36 IN)	DRILL SHAFT (54 IN)	CL C CONC (ABUT)	CL C CONC (COLUMN)	CL C CONC (FOOTING)	CL F CONC (CAP)	REINF CONC SLAB	PRESTR CONC U - BEAM (U54)	RIPRAP (CONC) (4 IN)	RIPRAP (CONC) (CL B) (RR8&RR9)	STR STEEL (MISC NON - BRIDGE)	RAIL (TY SSTR)	SEALED EXPANSION JOINT (4IN) (SEJ-M)	PERM CTB (SGL SLOPE) (TY 1) (42)
UNIT	SF	LF	LF	CY	CY	CY	CY	SF	LF	CY	CY	LB	LF	LF	LF
ABUTMENTS 1 & 4		1,440		96.6							11			191	
BENTS 2 & 3	2706		1,728		102.0	342.3	237.6			31					
320.00' PRESTRESSED CONCRETE U-BEAM UNIT								30,853	2,803.47			876	640.0		320.0
TOTAL	2,706	1,440	1,728	96.6	102.0	342.3	237.6	30,853	2,803.47	31	11	876	640.0	191	320.0

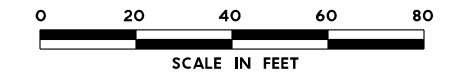
HL 93 LOADING

	BEARING ELEVATIONS (FT)				DIST BETWN BRNG ELEV ALONG CL BRNG (FT)		
	BEAM 1		BEAM 2		BEAM 3		
	LEFT	RIGHT	LEFT	RIGHT	LEFT	RIGHT	
BENT 1 (FWD)	35.149	35.293	35.485	35.629	35.821	35.965	4.5000
	BEAM 4		BEAM 5		BEAM 6		
	LEFT	RIGHT	LEFT	RIGHT	LEFT	RIGHT	
	36.157	36.301	36.493	36.637	36.829	36.973	
	BEAM 7		BEAM 8		BEAM 9		
	LEFT	RIGHT	LEFT	RIGHT	LEFT	RIGHT	
	37.165	37.309	37.501	37.645	37.837	37.981	
BENT 2 (BK)	BEAM 1		BEAM 2		BEAM 3		4.5000
	LEFT	RIGHT	LEFT	RIGHT	LEFT	RIGHT	
	35.811	35.955	36.147	36.291	36.483	36.627	
	BEAM 4		BEAM 5		BEAM 6		
	LEFT	RIGHT	LEFT	RIGHT	LEFT	RIGHT	
	36.819	36.963	37.155	37.299	37.491	37.635	
	BEAM 7		BEAM 8		BEAM 9		
	LEFT	RIGHT	LEFT	RIGHT	LEFT	RIGHT	
	37.827	37.971	38.163	38.307	38.499	38.643	
BENT 2 (FWD)	BEAM 1		BEAM 2		BEAM 3		4.5000
	LEFT	RIGHT	LEFT	RIGHT	LEFT	RIGHT	
	35.832	35.976	36.168	36.312	36.504	36.648	
	BEAM 4		BEAM 5		BEAM 6		
	LEFT	RIGHT	LEFT	RIGHT	LEFT	RIGHT	
	36.840	36.984	37.176	37.320	37.512	37.656	
	BEAM 7		BEAM 8		BEAM 9		
	LEFT	RIGHT	LEFT	RIGHT	LEFT	RIGHT	
	37.848	37.992	38.183	38.327	38.519	38.663	
BENT 3 (BK)	BEAM 1		BEAM 2		BEAM 3		4.5000
	LEFT	RIGHT	LEFT	RIGHT	LEFT	RIGHT	
	35.828	35.972	36.164	36.308	36.500	36.644	
	BEAM 4		BEAM 5		BEAM 6		
	LEFT	RIGHT	LEFT	RIGHT	LEFT	RIGHT	
	36.836	36.980	37.172	37.316	37.508	37.652	
	BEAM 7		BEAM 8		BEAM 9		
	LEFT	RIGHT	LEFT	RIGHT	LEFT	RIGHT	
	37.844	37.988	38.180	38.324	38.516	38.659	
BENT 3 (FWD)	BEAM 1		BEAM 2		BEAM 3		4.5000
	LEFT	RIGHT	LEFT	RIGHT	LEFT	RIGHT	
	35.807	35.951	36.143	36.287	36.479	36.623	
	BEAM 4		BEAM 5		BEAM 6		
	LEFT	RIGHT	LEFT	RIGHT	LEFT	RIGHT	
	36.815	36.959	37.151	37.295	37.487	37.631	
	BEAM 7		BEAM 8		BEAM 9		
	LEFT	RIGHT	LEFT	RIGHT	LEFT	RIGHT	
	37.823	37.967	38.159	38.303	38.495	38.639	
BENT 4 (BK)	BEAM 1		BEAM 2		BEAM 3		4.5000
	LEFT	RIGHT	LEFT	RIGHT	LEFT	RIGHT	
	35.138	35.282	35.474	35.618	35.810	35.954	
	BEAM 4		BEAM 5		BEAM 6		
	LEFT	RIGHT	LEFT	RIGHT	LEFT	RIGHT	
	36.146	36.290	36.482	36.626	36.818	36.962	
	BEAM 7		BEAM 8		BEAM 9		
	LEFT	RIGHT	LEFT	RIGHT	LEFT	RIGHT	
	37.154	37.298	37.490	37.634	37.826	37.970	

REV NO.	DATE	BY	REVISION
 Mahsa Arastoo 3/7/2022			
 AGUIRRE & FIELDS ENGINEERING INNOVATORS TBPE FIRM REGISTRATION #739			
 11821 Telge Road Cypress, Texas 77429 PH: (281) 304-0200 - FX: (281) 304-0210 Firm Registration No. F-382			
 Texas Department of Transportation			
SH 146			
ESTIMATED QUANTITIES AND BEARING SEAT ELEVATIONS SH 146 OVERPASS AT N. ALEXANDER DR			
FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			214
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146



- NOTES:
1. SEE ABUTMENT AND COLUMN DETAILS SHEETS FOR TOP OF DRILLED SHAFT ELEVATIONS.
 2. SEE "SOIL BORING DATA" SHEETS FOR GEOTECHNICAL INFORMATION.
 3. SEE "BRIDGE LAYOUT" SHEETS FOR DRILLED SHAFT LENGTHS.
 4. ABUTMENT SHAFT LOCATIONS ARE OFFSET FROM FACE OF BACKWALL.
 5. SEE "BRIDGE LAYOUT" SHEET FOR ALIGNMENT INFORMATION.



HL 93 LOADING

REV NO.	DATE	BY	REVISION

Mahsa Arastoo
3/7/2022

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TBPE FIRM REGISTRATION #739

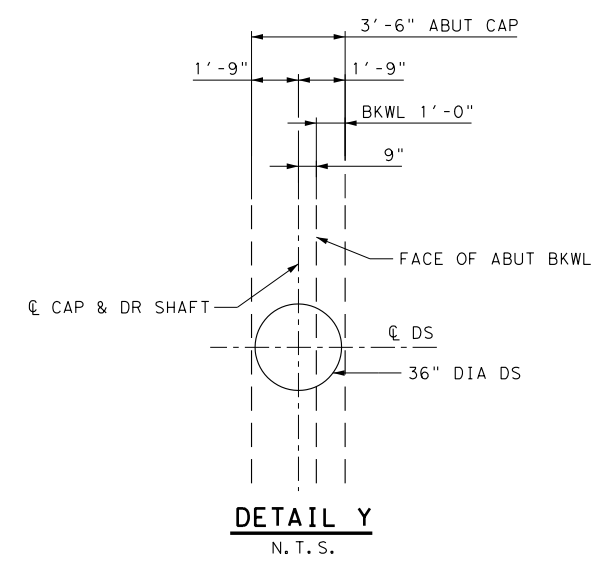
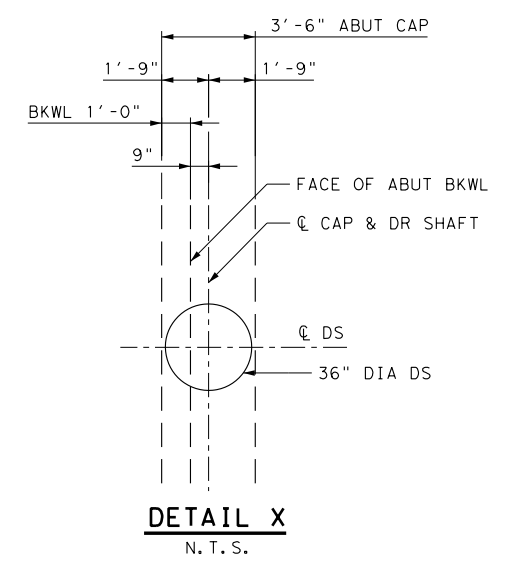
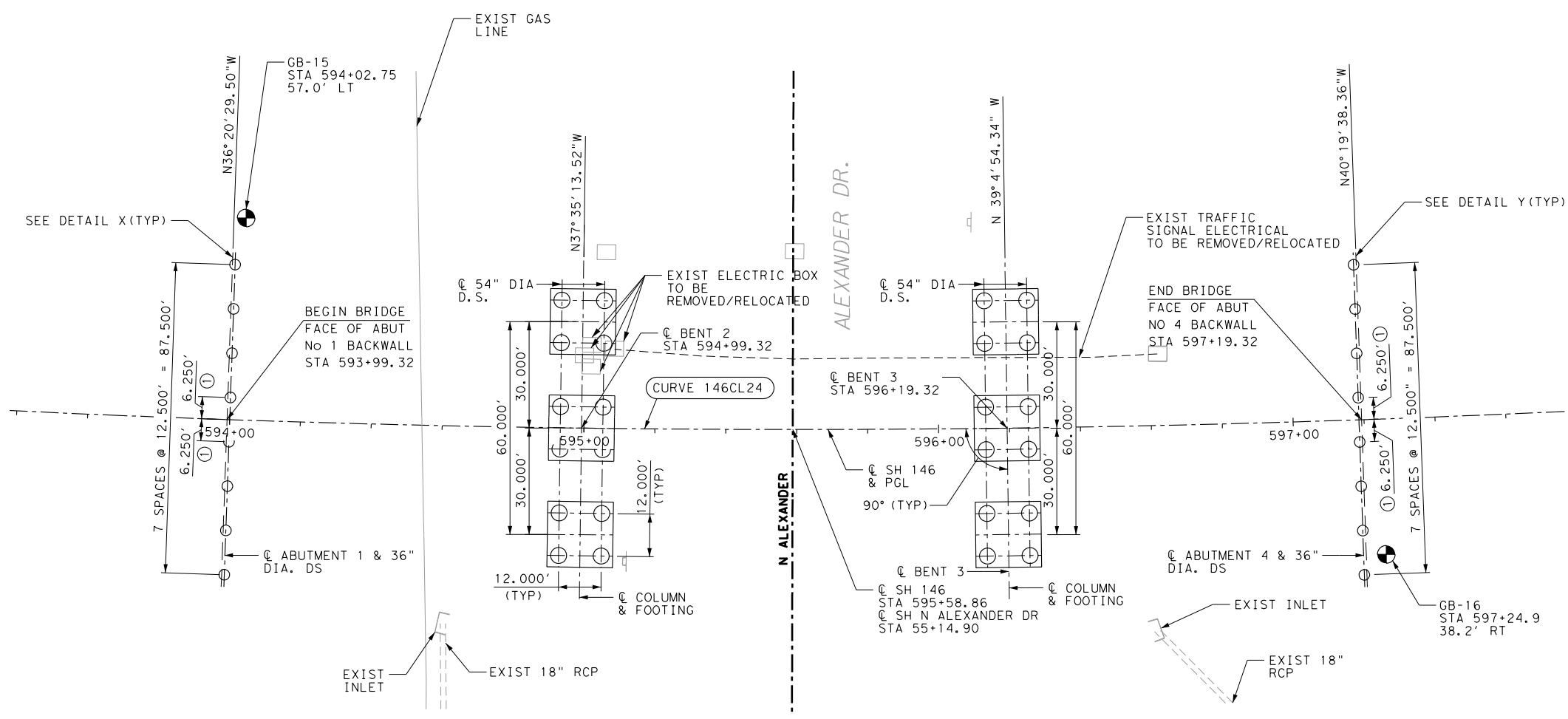
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PH: (281) 304-0200 - FX: (281) 304-0210
Firm Registration No. F-382

Texas Department
of Transportation

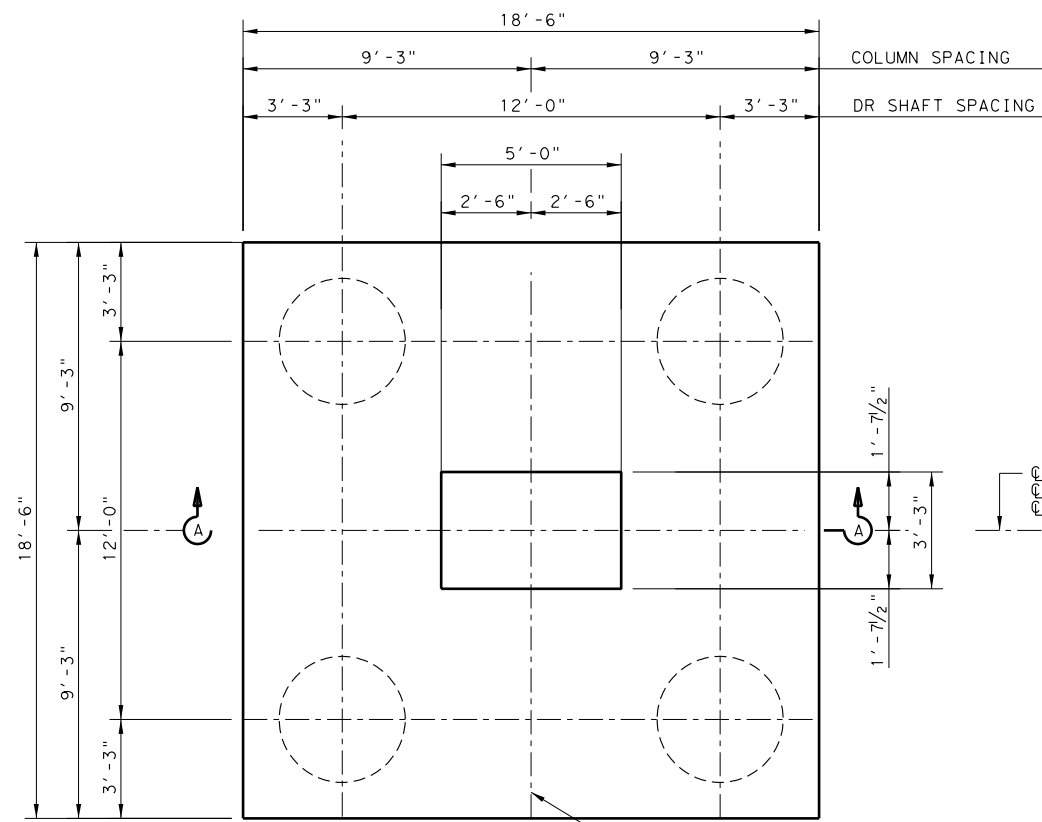
SH 146

**FOUNDATION LAYOUT
SH 146 OVERPASS AT
N. ALEXANDER DR**

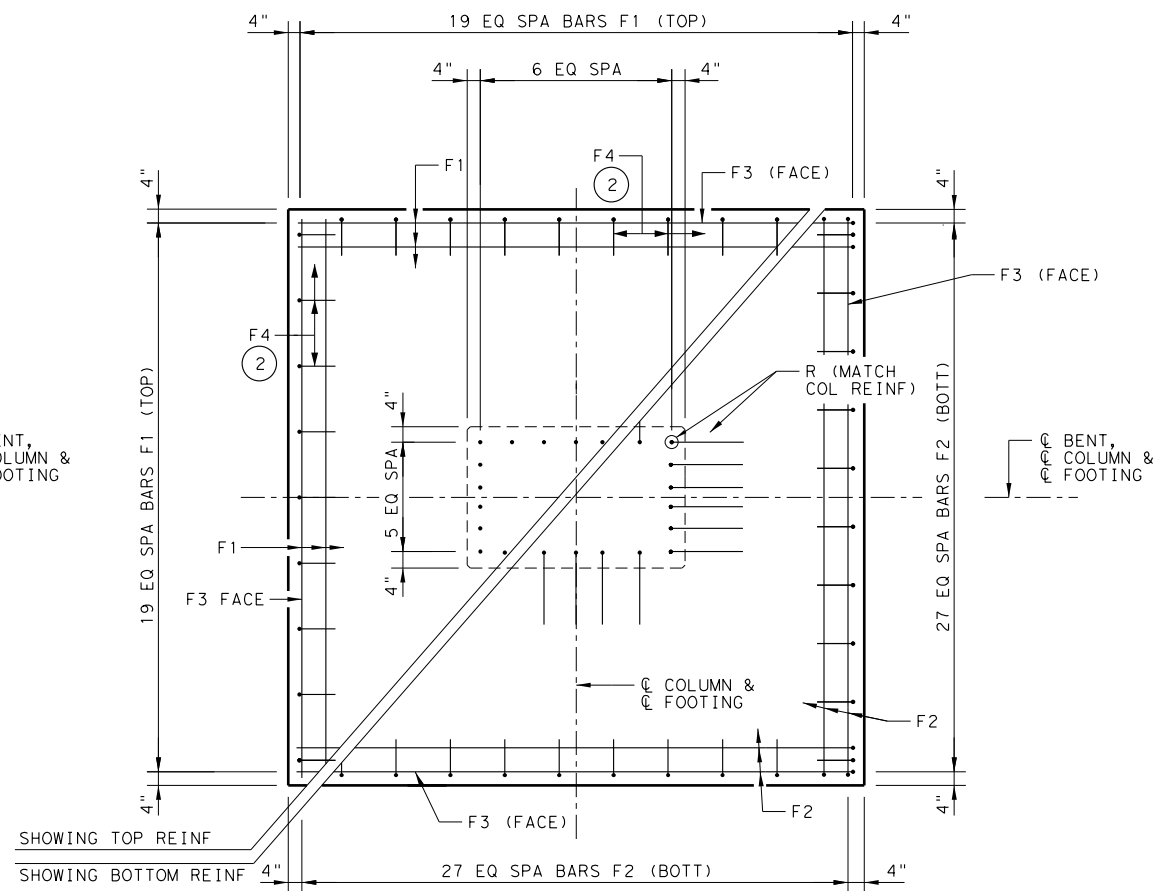
FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			215
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146



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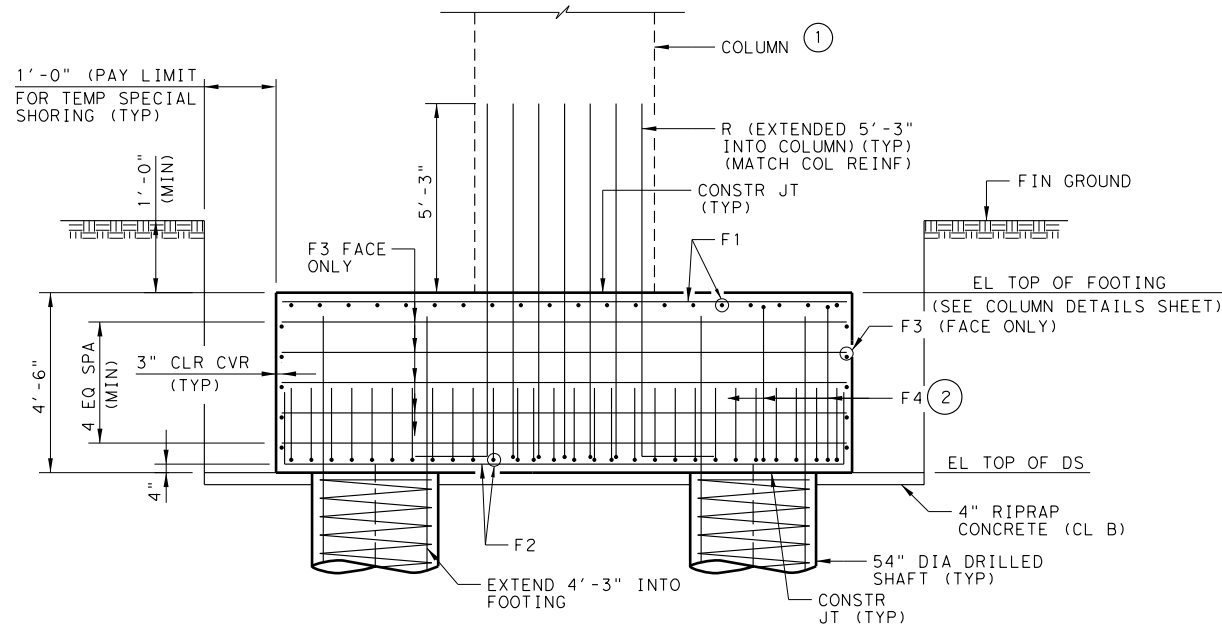


PLAN

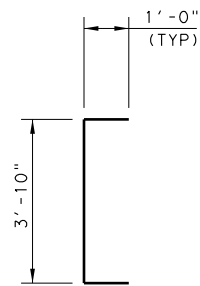


PLAN

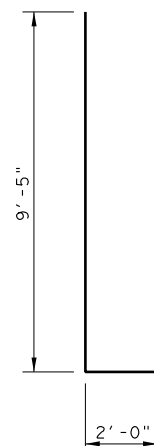
(SHOWING FOOTING REINFORCEMENT)



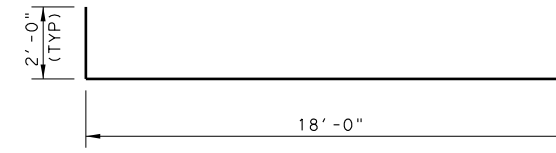
SECTION A-A



BARS F4



BARS R



BARS F2

GENERAL NOTES:

- DESIGNED IN ACCORDANCE WITH AASHTO LRFD SPECIFICATIONS.
- CONCRETE STRENGTH SHALL BE CLASS "C" CONCRETE F'C = 5,000 PSI.
- ALL REINFORCING STEEL SHALL BE GRADE 60.
- SEE COLUMN DETAILS SHEET 5 FOR TOP OF FOOTING ELEVATION.
- DUE TO THE PRESENCE OF WATER BEARING COHESIONLESS SOILS ENCOUNTERED AT THE SITE, IT IS ANTICIPATED THAT SHAFT INSTALLATION WILL REQUIRE THE USE OF SLURRY DISPLACEMENT METHODS, AND POSSIBLE SURFACE CASING. THE SURFACE CASING IS TEMPORARY AND SHALL BE RETRIEVED AS OUTLINED IN TXDOT STANDARD SPECIFICATIONS.

- ① SEE COLUMN DETAILS SHEETS FOR DETAILS, REINFORCEMENT AND NOTES NOT SHOWN.
- ② SPACE BARS F4 ON 2'-0" (MAX) GRID.

REINFORCING TABLE ①

BAR	NO	SIZE	LENGTH	WEIGHT
F1	40	#11	18'-0"	3,826
F2	56	#11	22'-0"	6,546
F3	20	#6	18'-0"	541
F4	36	#6	5'-10"	316
R	22	#11	11'-5"	1,335
REINFORCING STEEL			LB	12,564
CLASS "C" CONC (FTG)			CY	57
TEMPORARY SPL SHORING			SF	451
RIPRAP (CONC) (CL B)			CY	5.2

① QUANTITY FOR SINGLE FOOTING

HL 93 LOADING

REV NO.	DATE	BY	REVISION

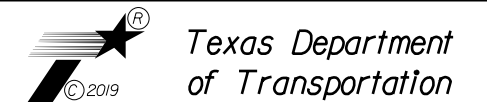


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3/7/2022



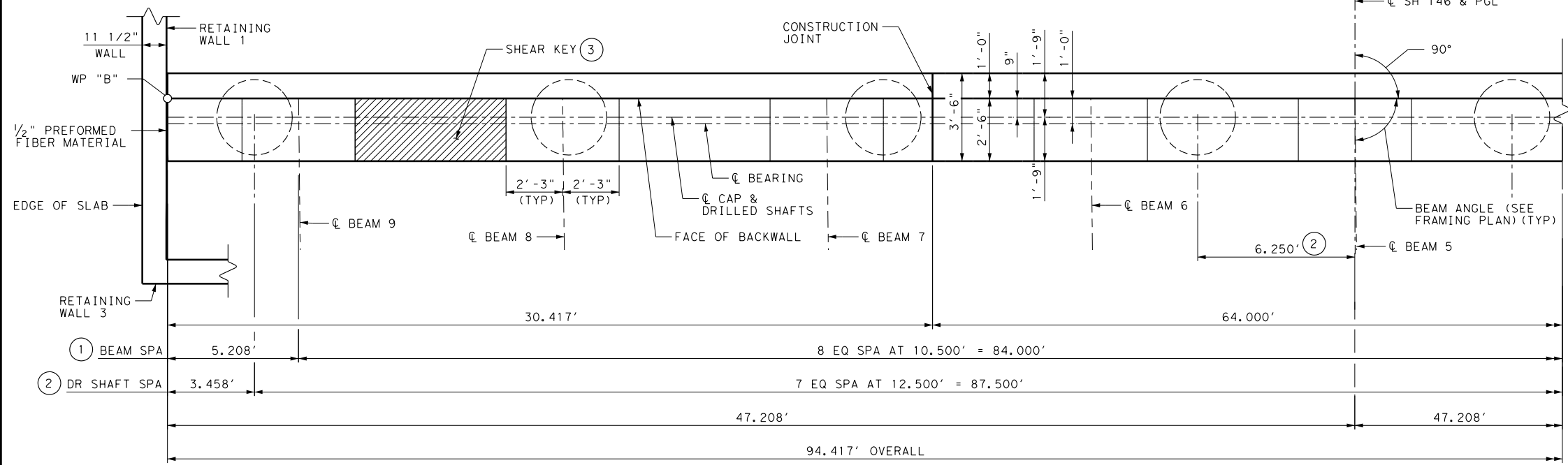
CivilTech
Engineering, Inc.
11821 Telge Road
Cypress, Texas 77429
PH: (281) 304-0200 - FX: (281) 304-0210
Firm Registration No. F-382



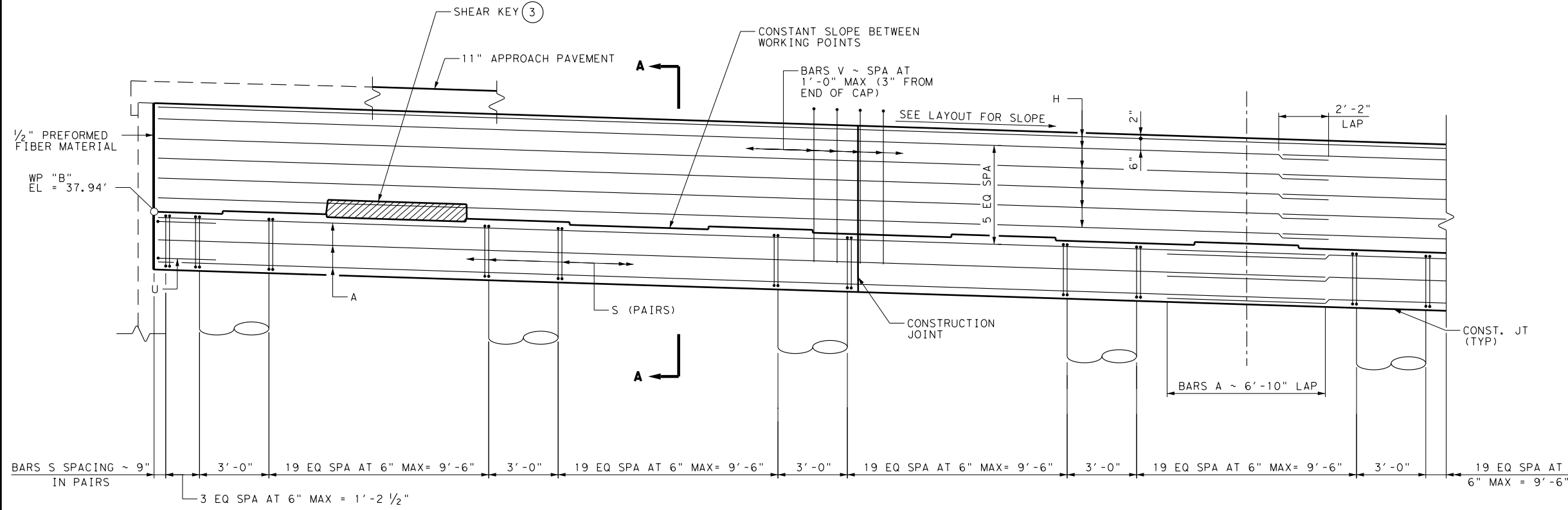
SH 146

FOUNDATION DETAILS
SH 146 OVERPASS AT
N. ALEXANDER DR

FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.		SHEET NO. 216
STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146



PLAN



ELEVATION
LOOKING BACK STATION

- GENERAL NOTES:**
- DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS 8TH EDITION (2017).
 - SEE CONCRETE RIPRAP (CRR) STANDARD SHEET FOR RIPRAP ATTACHMENT DETAILS.

COVER DIMENSIONS ARE CLEAR DIMENSIONS UNLESS NOTED OTHERWISE. REINFORCING BAR DIMENSION SHOWN ARE OUT TO OUT OF BARS.

- MATERIAL NOTES:**
- PROVIDE CLASS C CONCRETE (F'C = 3,600 PSI).
 - PROVIDE GRADE 60 REINFORCING STEEL.
- ① MEASURED ALONG FRONT FACE OF ABUTMENT BACKWALL.
 ② MEASURED ALONG C OF DRILLED SHAFTS.
 ③ SEE ABUTMENT DETAILS FOR SHEAR KEY.

HL 93 LOADING

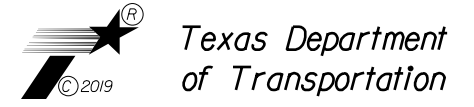
REV NO.	DATE	BY	REVISION



Mahsa Arastoo
3/7/2022



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



SH 146

**ABUTMENT 1
SH 146 OVERPASS AT
N. ALEXANDER DR**

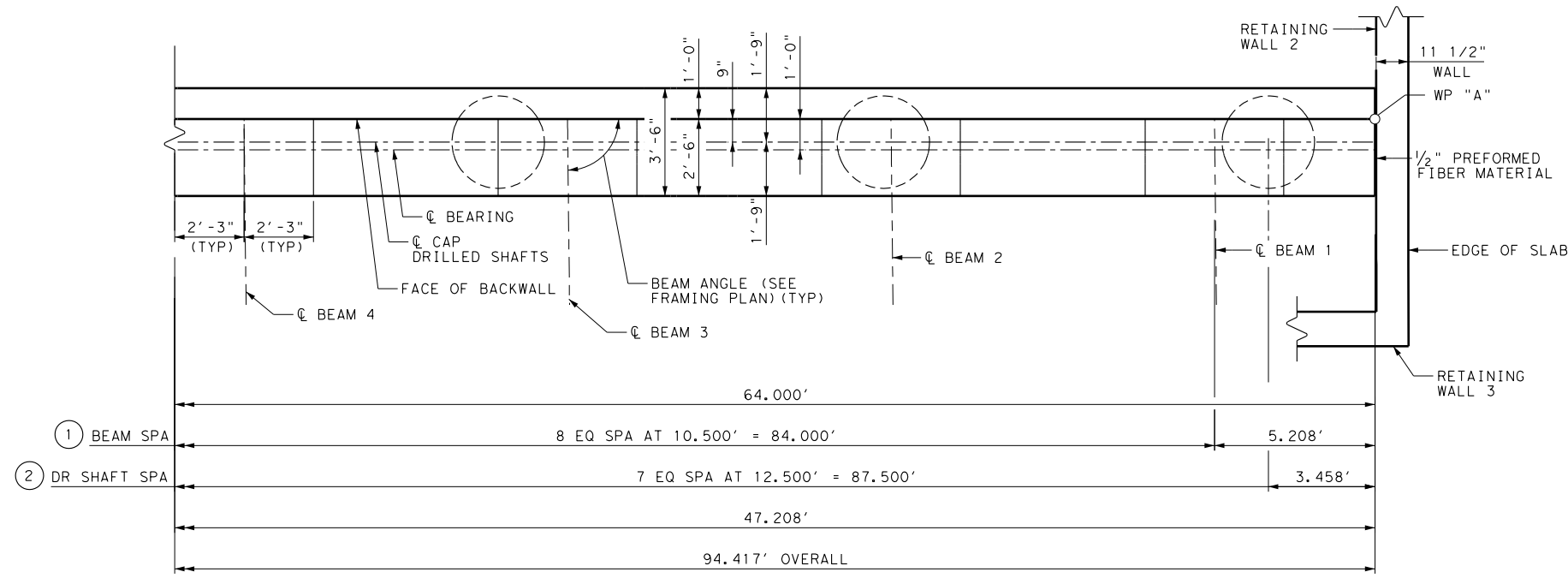
SHEET 1 OF 2

FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.		SHEET NO. 217
STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146

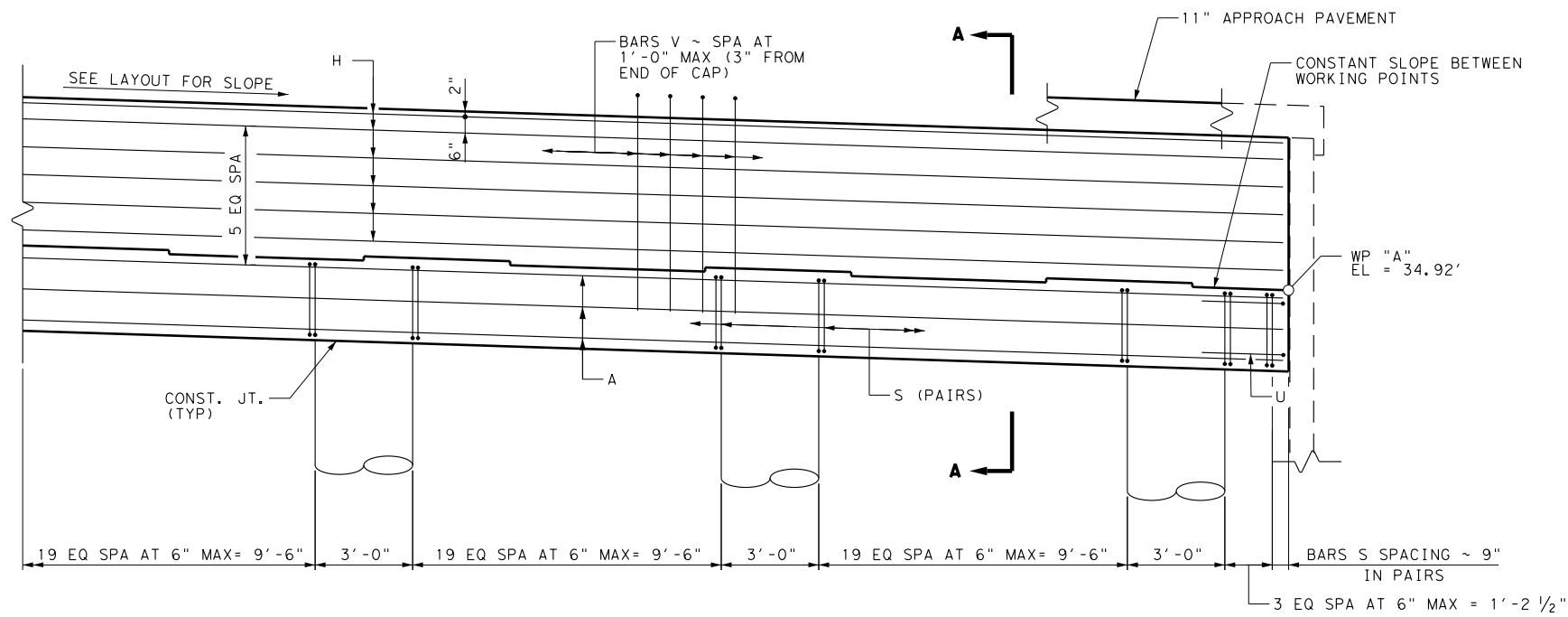
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NOTE:
SEE SHEET 1 OF 2 FOR GENERAL NOTES

- ① MEASURED ALONG FRONT FACE OF ABUTMENT BACKWALL.
- ② MEASURED ALONG ϕ OF DRILLED SHAFTS.



PLAN



ELEVATION
LOOKING BACK STATION

HL 93 LOADING

REV NO.	DATE	BY	REVISION



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3/7/2022



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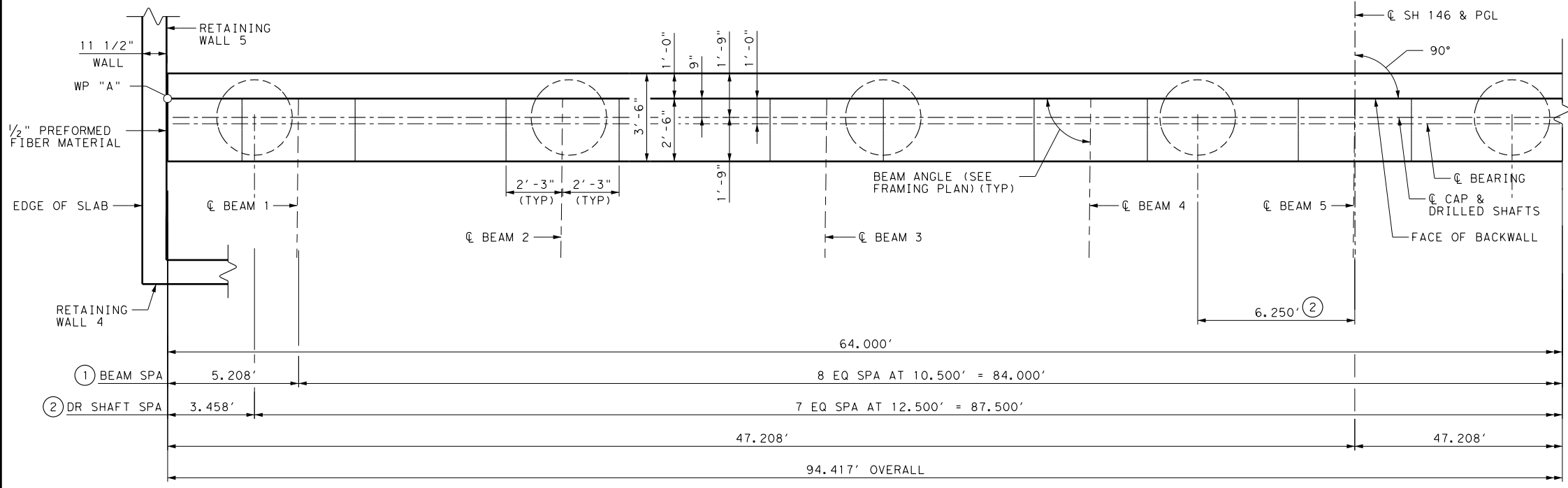
SH 146

**ABUTMENT 1
SH 146 OVERPASS AT
N. ALEXANDER DR**

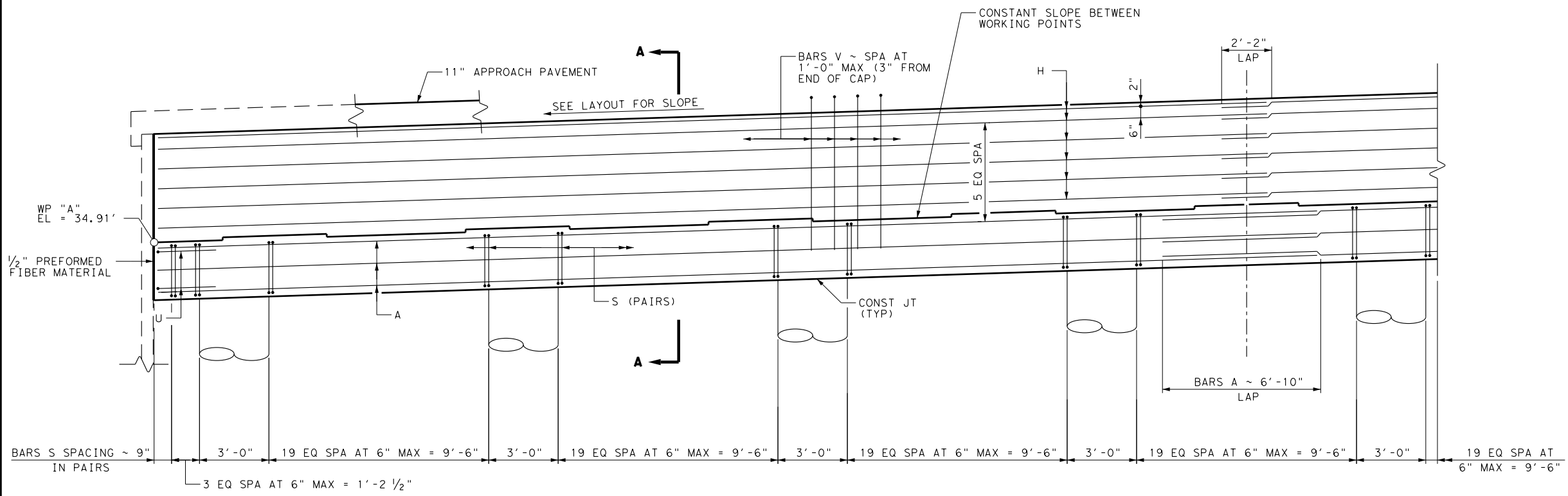
SHEET 2 OF 2

FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.		SHEET NO. 218
STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146

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PLAN



ELEVATION

- GENERAL NOTES:
- DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS 8TH EDITION (2017).
 - SEE CONCRETE RIPRAP (CRR) STANDARD SHEET FOR RIPRAP ATTACHMENT DETAILS.

COVER DIMENSIONS ARE CLEAR DIMENSIONS UNLESS NOTED OTHERWISE. REINFORCING BAR DIMENSION SHOWN ARE OUT TO OUT OF BARS.

- MATERIAL NOTES:
- PROVIDE CLASS C CONCRETE (F'C = 3,600 PSI).
 - PROVIDE GRADE 60 REINFORCING STEEL.
- ① MEASURED ALONG FRONT FACE OF ABUTMENT BACKWALL.
 ② MEASURED ALONG C OF DRILLED SHAFTS.

HL 93 LOADING

REV NO.	DATE	BY	REVISION

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 3/7/2022

AGUIRRE & FIELDS
 ENGINEERING INNOVATORS
 TBPE FIRM REGISTRATION #739

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

Texas Department of Transportation
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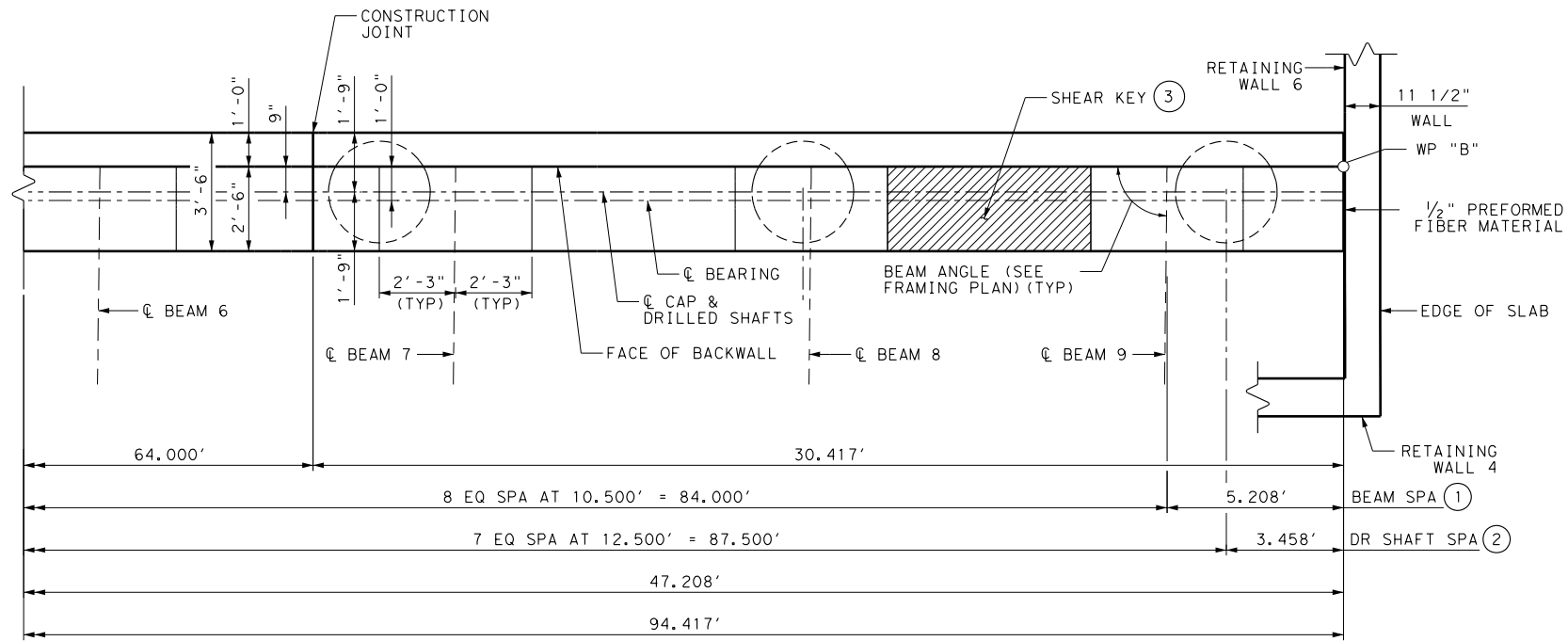
SH 146

**ABUTMENT 4
 SH 146 OVERPASS AT
 N. ALEXANDER DR**

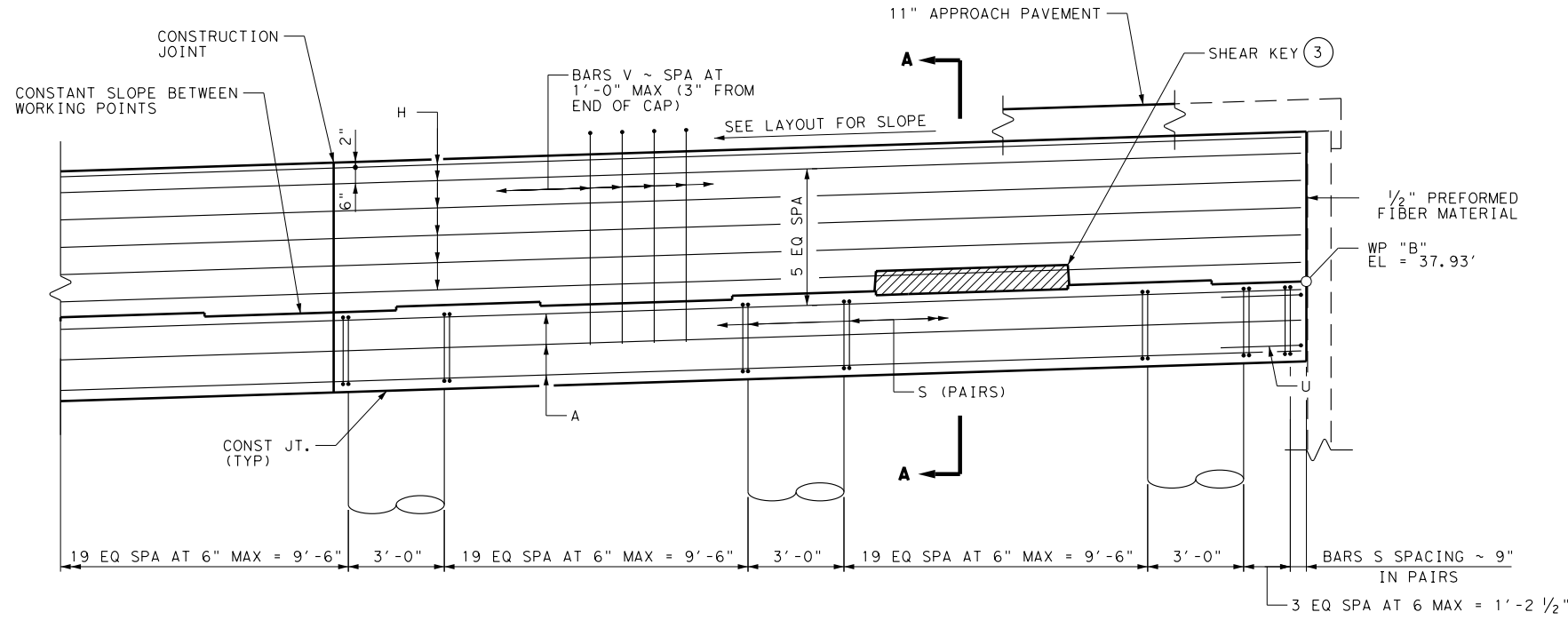
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FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.		SHEET NO. 219
STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146

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PLAN



ELEVATION

- ① MEASURED ALONG FRONT FACE OF ABUTMENT BACKWALL.
- ② MEASURED ALONG CL OF DRILLED SHAFTS.
- ③ SEE ABUTMENT DETAILS FOR SHEAR KEY.

HL 93 LOADING

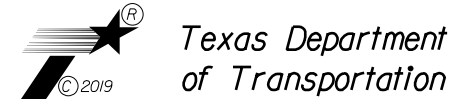
REV NO.	DATE	BY	REVISION



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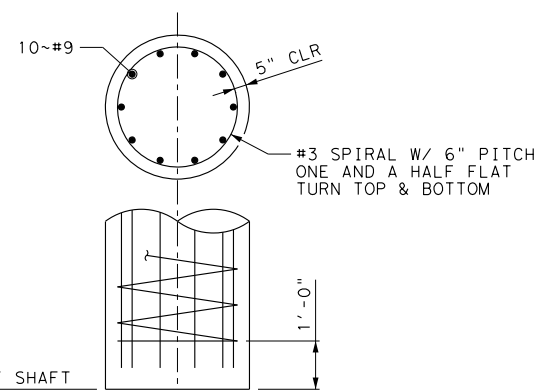
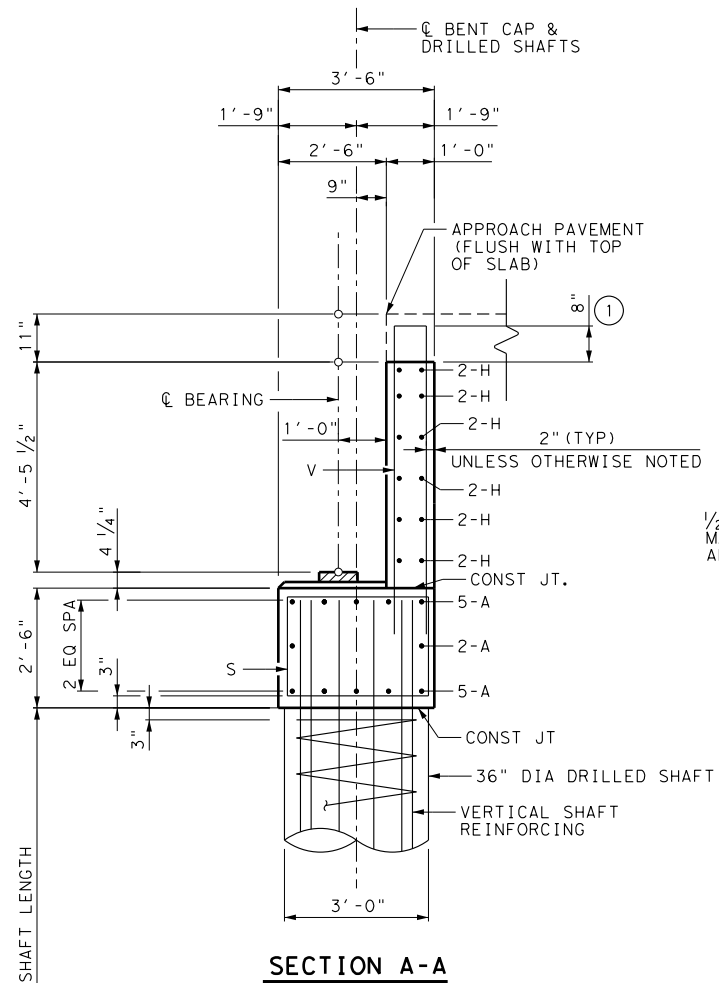
SH 146

**ABUTMENT 4
SH 146 OVERPASS AT
N. ALEXANDER DR**

SHEET 2 OF 2

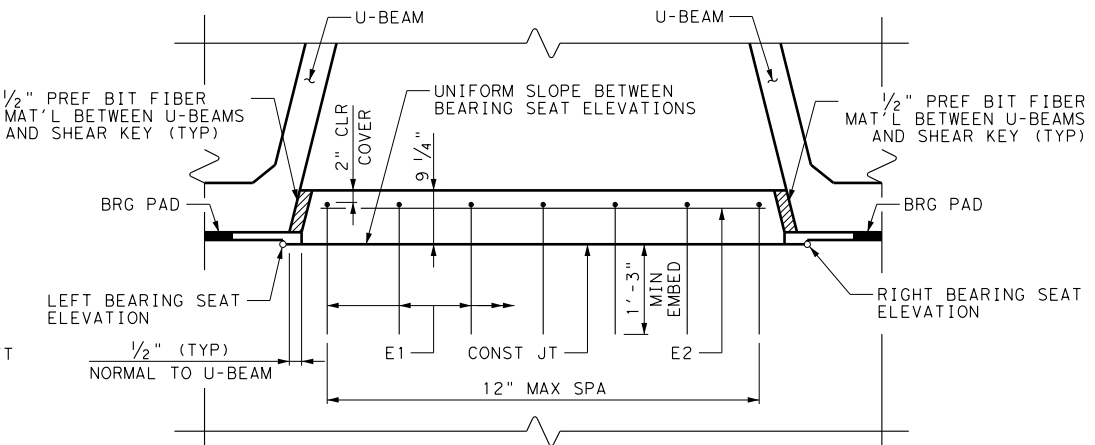
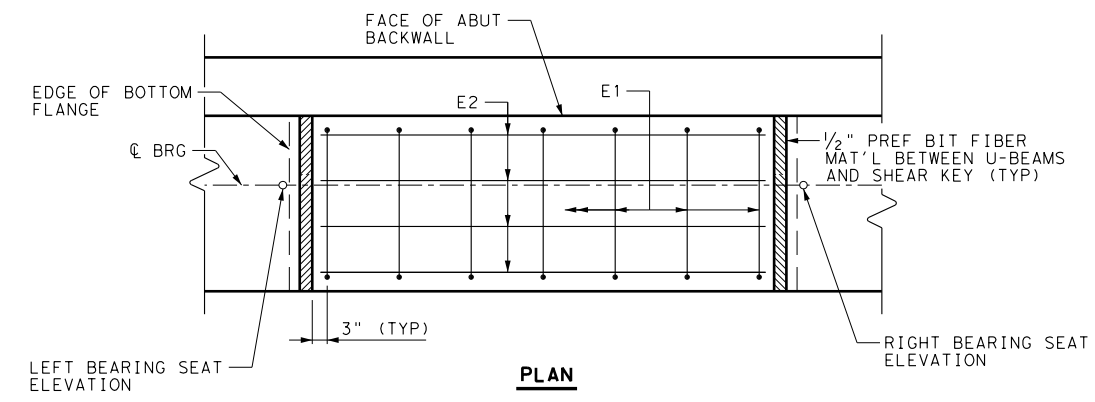
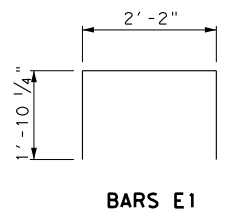
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STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146

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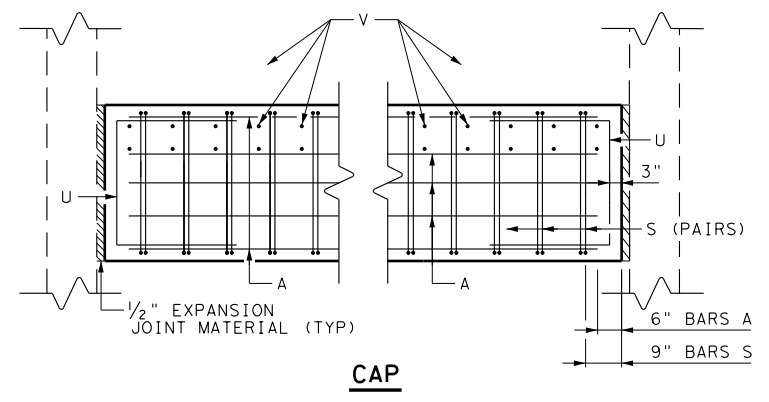
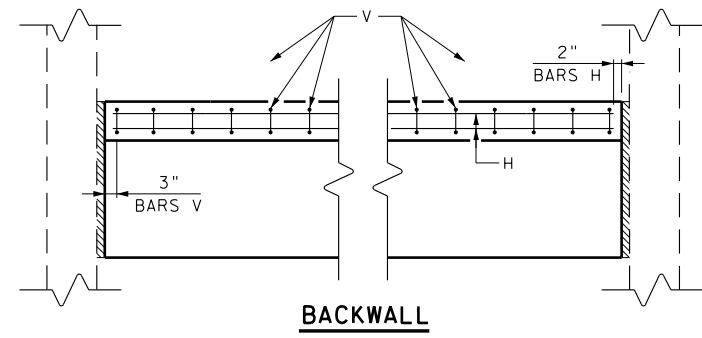


36" DIAMETER DRILLED SHAFT

1 INCREASE AS REQUIRED TO MAINTAIN 3" FROM FINISH GRADE.



SHEAR KEY DETAIL



END DETAILS

COVER DIMENSIONS ARE CLEAR DIMENSIONS, UNLESS NOTED OTHERWISE.

REINFORCING BAR DIMENSIONS SHOWN ARE OUT-TO-OUT OF BAR.

- 1 QUANTITIES ARE FOR ONE ABUTMENT ONLY
- 2 INCLUDE ONE 6'-10" LAP SPLICE
- 3 INCLUDE ONE 2'-2" LAP SPLICE
- 4 ALTERNATE LAP LOCATION BETWEEN ADJACENT BARS
- 5 POUR SHEAR KEY AFTER U-BEAMS HAVE BEEN SET IN PLACE. TAKE SUFFICIENT MEASURES TO PREVENT CONCRETE FROM FLOWING UNDER U-BEAMS WHEN POURING SHEAR KEY CONCRETE.

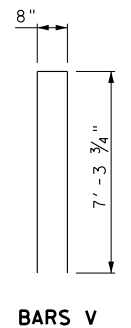
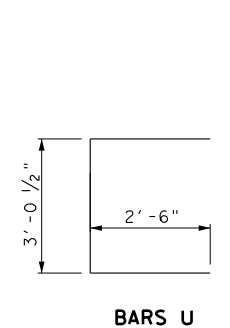
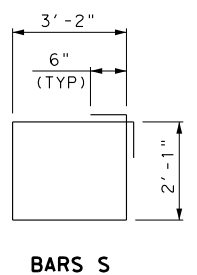
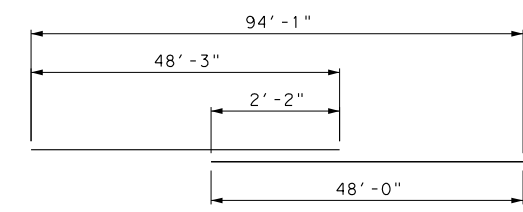
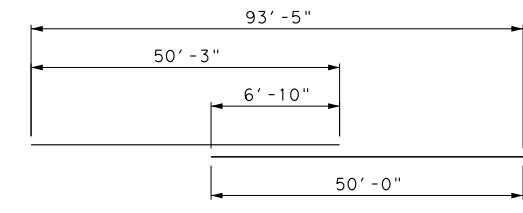
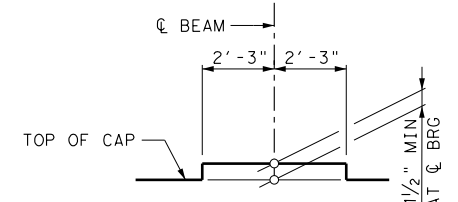


TABLE OF ESTIMATED QUANTITIES

BAR	NO	SIZE	LENGTH	WEIGHT
A	12	#11	100'-3"	6,392
H	12	#6	96'-3"	1,735
S	296	#5	11'-6"	3,551
U	4	#6	8'-1"	49
V	95	#5	15'-4"	1,516
E1	7	#5	5'-11"	43
E2	4	#5	5'-7"	24
REINFORCING STEEL			LB	13,310
CLASS "C" CONC (ABUT)			CY	48.3

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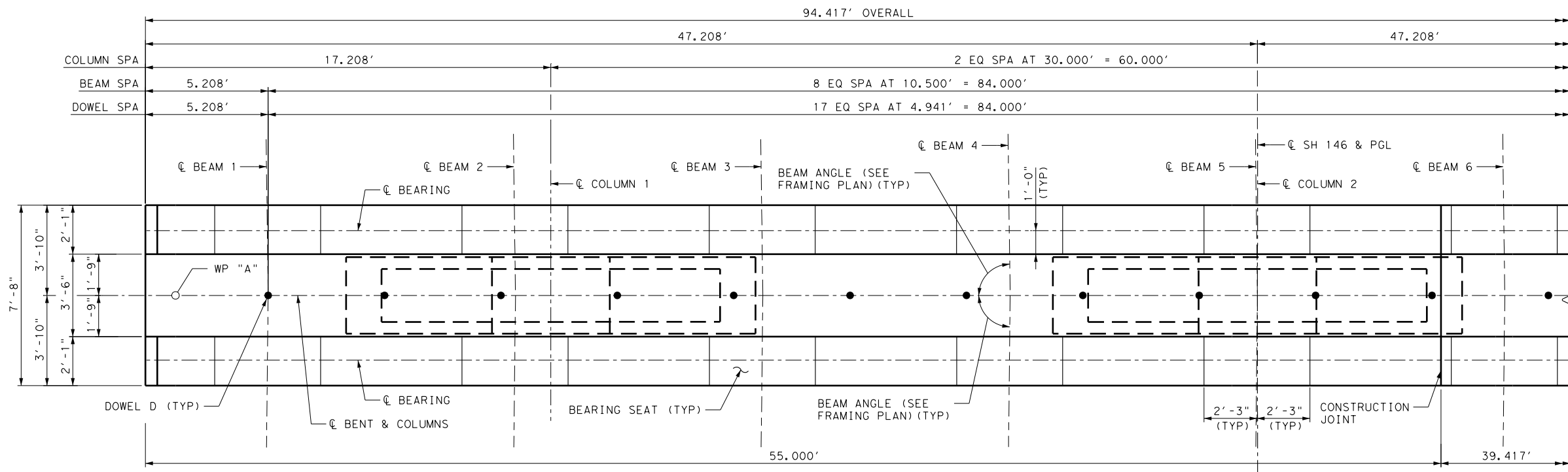
SH 146

**ABUTMENT DETAILS
SH 146 OVERPASS AT
N. ALEXANDER DR**

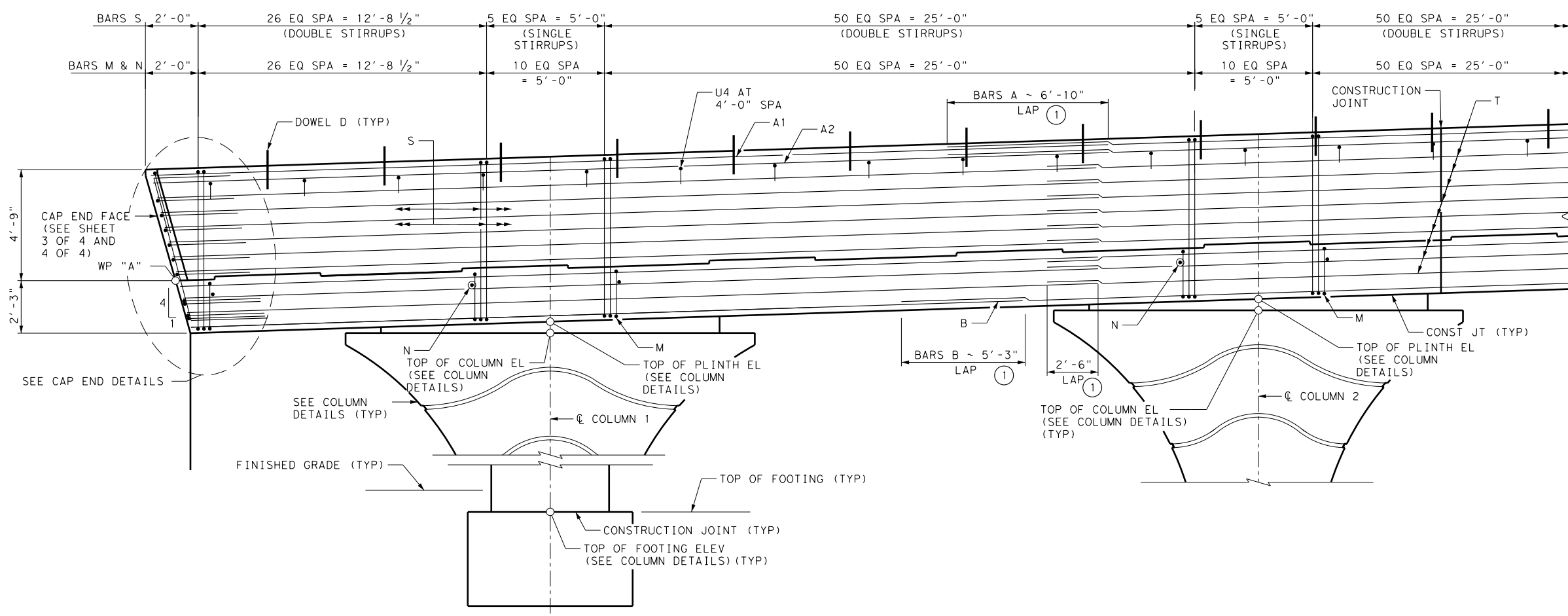
SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.	
6		221	
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

\$F ILE ABBREV\$



PLAN



ELEVATION

① ALTERNATE LAP LOCATION BETWEEN ADJACENT BARS.

- GENERAL NOTES:
- DESIGNED IN ACCORDANCE WITH AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS 8TH EDITION (2017).
 - SEE COLUMN DETAILS FOR INFORMATION NOT SHOWN.
- MATERIAL NOTES:
- PROVIDE CLASS F CONCRETE (F'C = 5,000 PSI).
 - PROVIDE GRADE 60 REINFORCING STEEL.

COVER DIMENSIONS ARE CLEAR DIMENSIONS UNLESS NOTED OTHERWISE. REINFORCING BAR DIMENSION SHOWN ARE OUT TO OUT OF BARS.

FORM STRAIGHT LINES BETWEEN ELEVATIONS SHOWN. BOTTOM OF CAP SHALL BE PARALLEL TO TOP OF CAP.

HL 93 LOADING

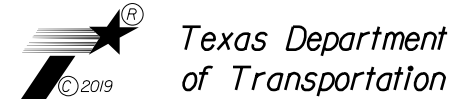
REV NO.	DATE	BY	REVISION



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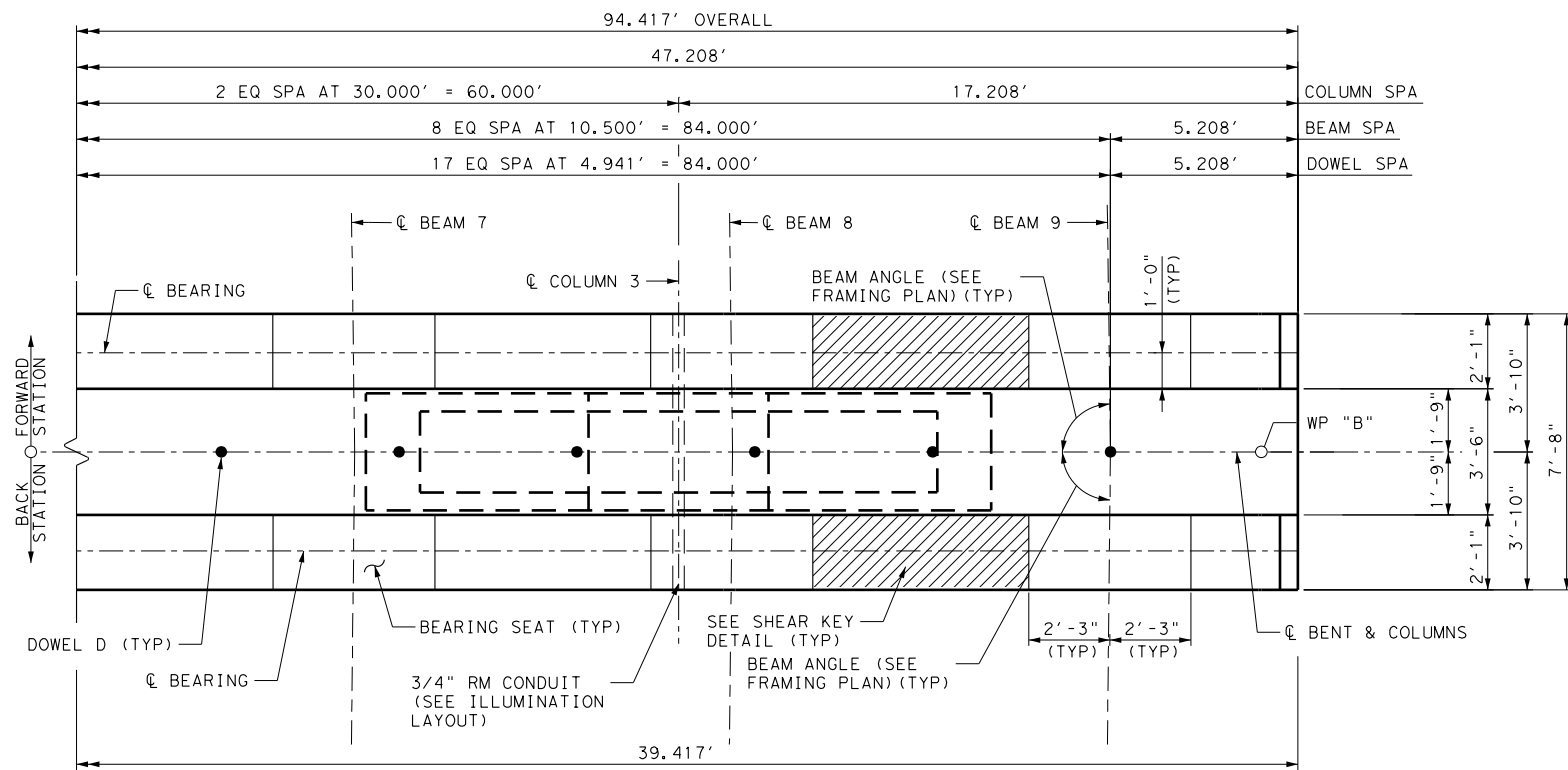
SH 146

**BENTS 2 & 3
SH 146 OVERPASS AT
N. ALEXANDER DR**

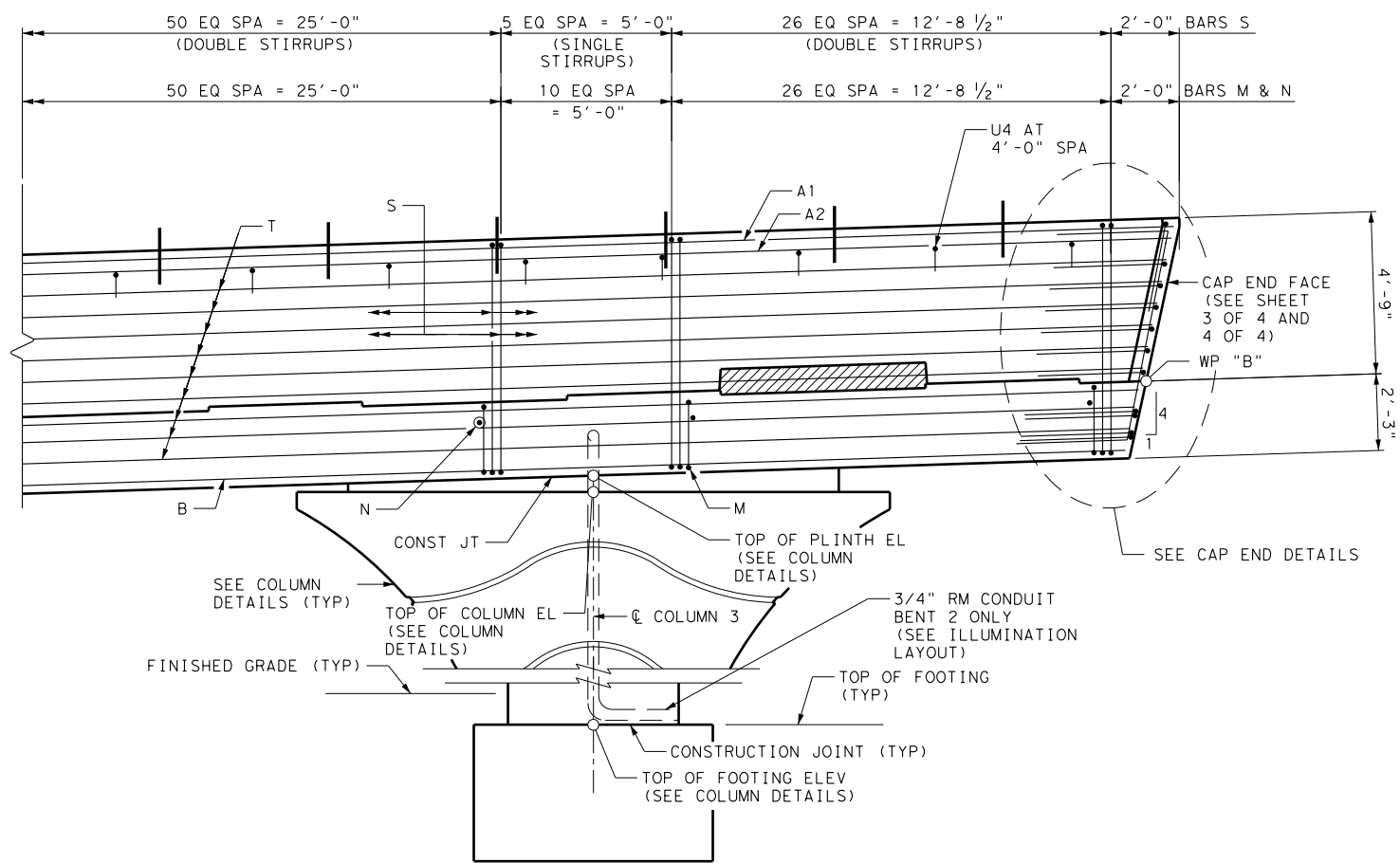
SHEET 1 OF 4

FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.		SHEET NO. 222
STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146

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PLAN



ELEVATION

NOTES:
 SEE SHEET 1 OF 4 FOR GENERAL NOTES.

FORM STRAIGHT LINES BETWEEN ELEVATIONS SHOWN. BOTTOM OF CAP SHALL BE PARALLEL TO TOP OF CAP.

HL 93 LOADING

REV NO.	DATE	BY	REVISION

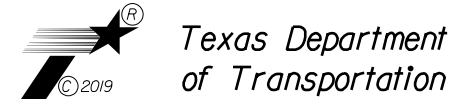


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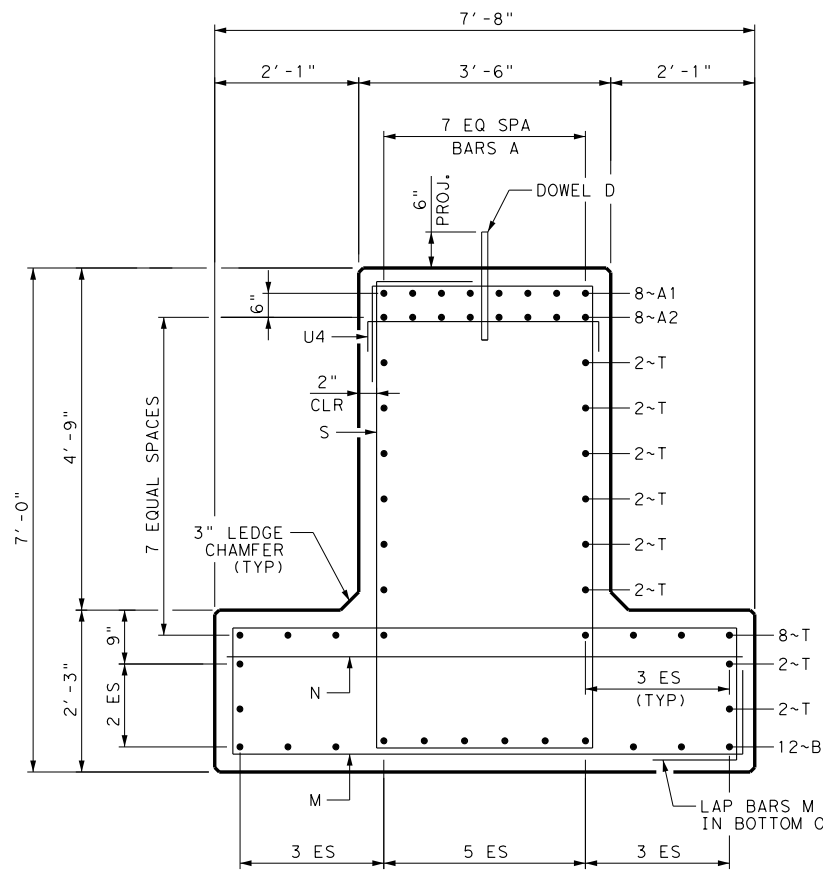
SH 146

**BENTS 2 & 3
 SH 146 OVERPASS AT
 N. ALEXANDER DR**

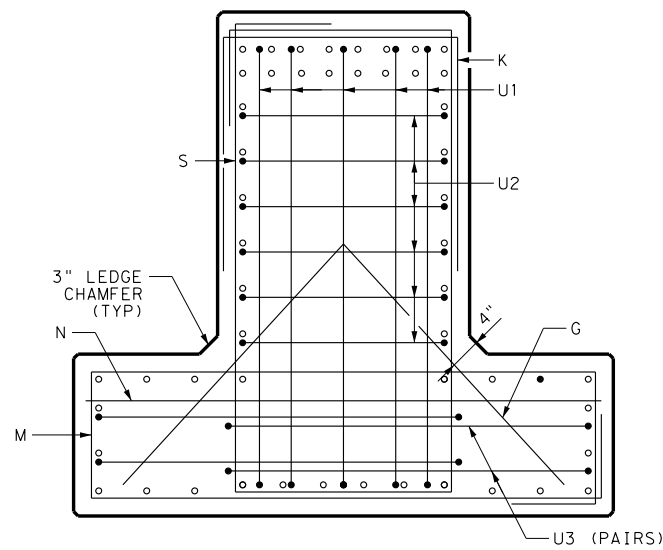
SHEET 2 OF 4

WORKING POINT ELEVATION		
BENT	WP "A"	WP "B"
BENT 2	35.62	38.56
BENT 3	35.62	38.56

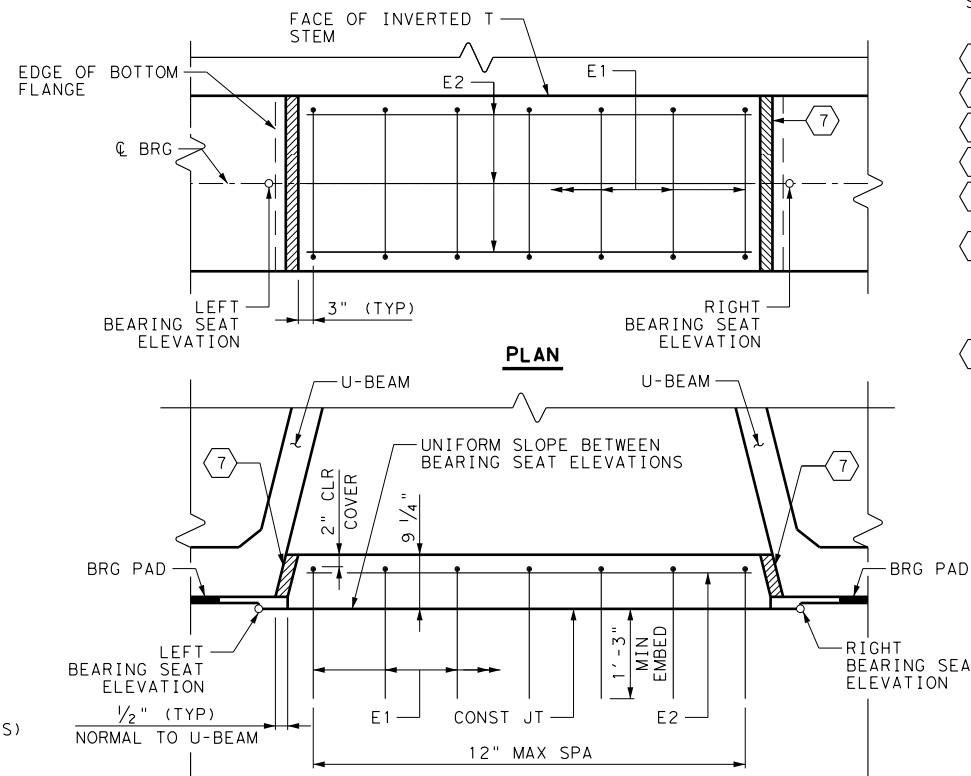
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TYPICAL CAP SECTION

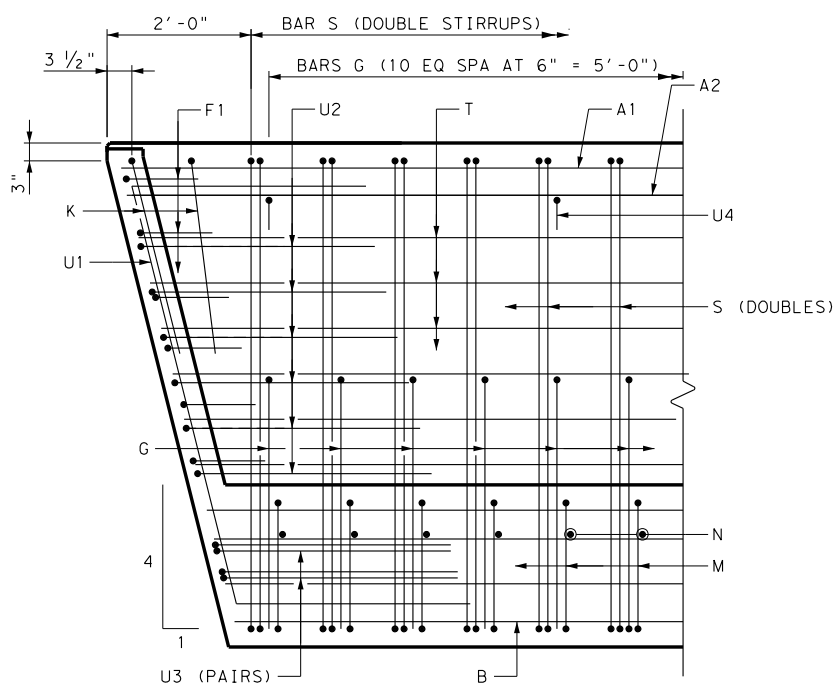


TYPICAL CAP END SECTION



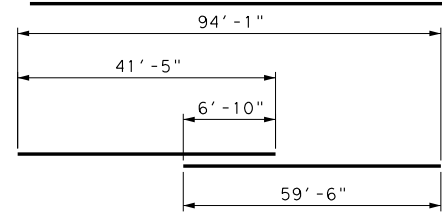
SECTION THRU SHEAR KEY
SHEAR KEY DETAIL

- NOTES:
SEE SHEET 1 OF 4 FOR GENERAL NOTES.
- ① QUANTITIES ARE FOR ONE BENT CAP ONLY
 - ② INCLUDE ONE 6'-10" LAP SPLICE
 - ③ INCLUDE ONE 5'-3" LAP SPLICE
 - ④ INCLUDE ONE 2'-2" LAP SPLICE
 - ⑤ ALTERNATE LAP LOCATION BETWEEN ADJACENT BARS
 - ⑥ POUR SHEAR KEY AFTER U-BEAMS HAVE BEEN SET IN PLACE. TAKE SUFFICIENT MEASURES TO PREVENT CONCRETE FROM FLOWING UNDER U-BEAMS WHEN POURING SHEAR KEY CONCRETE.
 - ⑦ 1/2" PREF BIT FIBER MAT'L BETWEEN U-BEAMS AND SHEAR KEY (TYP)

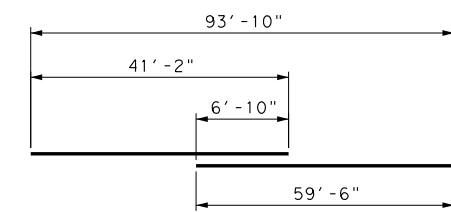


CAP END DETAILS

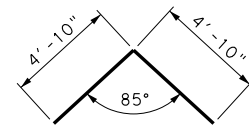
BARS F2 NOT SHOWN FOR CLARITY. SEE SHEET 4 OF 4.



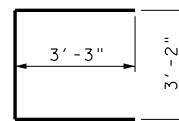
BARS A1



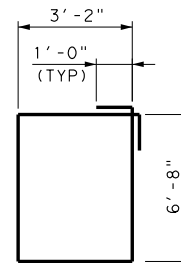
BARS A2



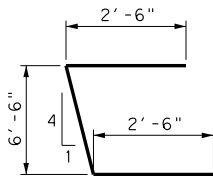
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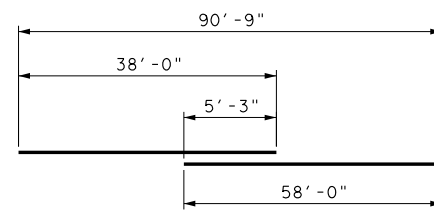
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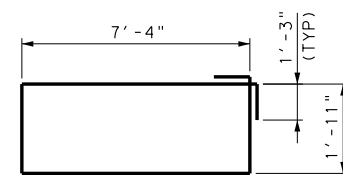
BARS S



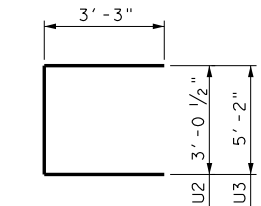
BARS U1



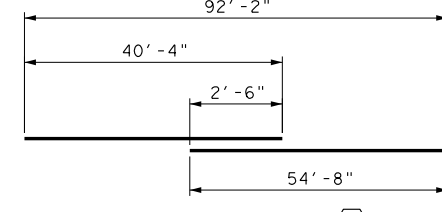
BARS B



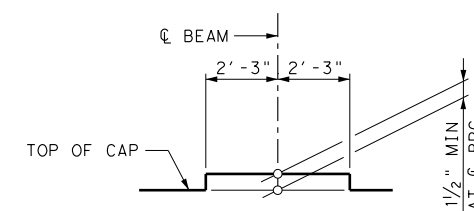
BARS M



BARS U2 & U3

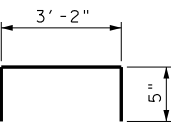


BARS T (AVG)

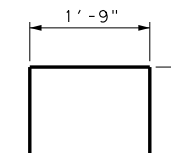


BEARING SEAT DETAIL

(BEARING SURFACE MUST BE CLEAN AND FREE OF ALL LOOSE MATERIAL BEFORE PLACING BEARING PAD.)



BARS U4



BARS E1

HL 93 LOADING

REV NO.	DATE	BY	REVISION

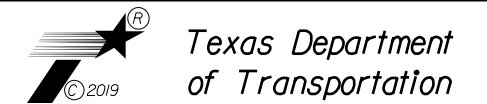


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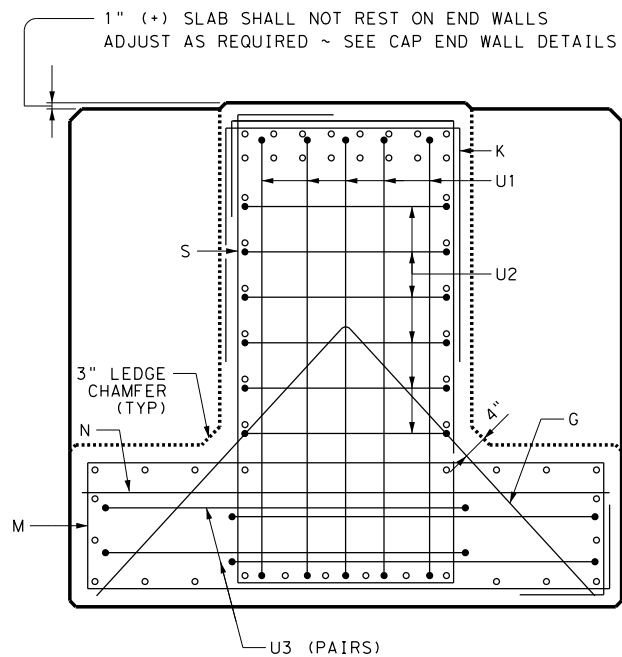
SH 146

BENTS 2 & 3
SH 146 OVERPASS AT
N. ALEXANDER DR

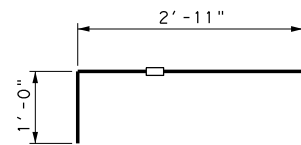
SHEET 3 OF 4

FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.		SHEET NO. 224
STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146

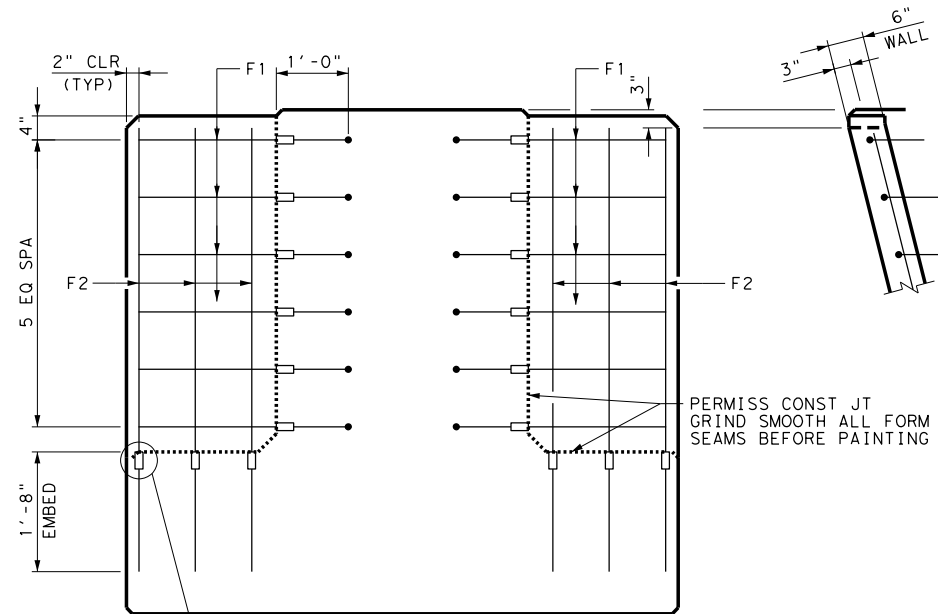
FILEABBREV



END VIEW



BARS F1



CAP END WALL DETAILS

NOTES:
SEE SHEET 1 OF 4 FOR GENERAL NOTES.

- ② INCLUDE ONE 6'-10" LAP SPLICE
- ③ INCLUDE ONE 5'-3" LAP SPLICE
- ④ INCLUDE ONE 2'-2" LAP SPLICE

NOTE: USE MECHANICAL COUPLERS AS PER STANDARD SPEC ITEM 440.2.8.

PERMISS CONST JT
GRIND SMOOTH ALL FORM
SEAMS BEFORE PAINTING

TABLE OF ESTIMATED QUANTITIES

BAR	NO	SIZE	LENGTH	WEIGHT
A1	8	#11	100' - 11"	4,290
A2	8	#11	100' - 8"	4,279
B	12	#11	96' - 0"	6,121
D	18	#11	1' - 8"	160
E1	14	#5	5' - 6"	80
E2	6	#5	5' - 7"	35
F1	24	#4	3' - 11"	63
F2	12	#4	6' - 2"	50
G	22	#6	9' - 8"	320
K	4	#6	9' - 8"	59
M	183	#7	21' - 0"	7,856
N	183	#6	7' - 4"	2,016
S	324	#6	21' - 8"	10,545
T (AVG)	24	#6	95' - 0"	3,425
U1	10	#6	11' - 8"	176
U2	12	#6	9' - 7"	172
U3	8	#6	11' - 8"	141
U4	23	#4	4' - 0"	62
REINFORCING STEEL			LB	39,850
CLASS "F" CONC (CAP)			CY	118.8

REV NO.	DATE	BY	REVISION

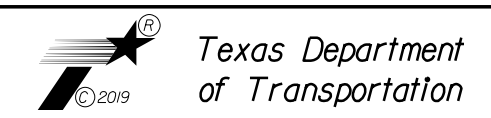


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SH 146

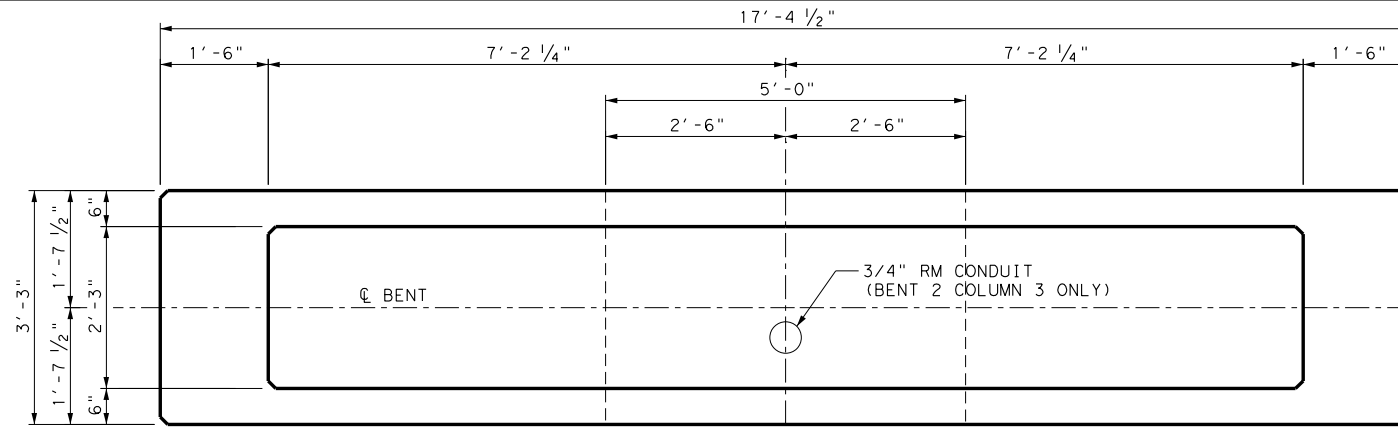
**BENTS 2 & 3
SH 146 OVERPASS AT
N. ALEXANDER DR**

SHEET 4 OF 4

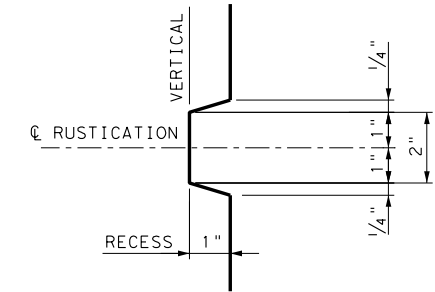
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STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146

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- NOTES:
1. ALL RUSTICATION STRIP DIMENSIONS ARE AS SHOWN.
 2. USE HIGH DENSITY POLYETHYLENE AND/OR ELASTOMERIC URETHANE FOR RUSTICATION.
 3. SEE COLOR SELECTION DETAILS ON THE "SURFACE FINISHES FOR NEW STRUCTURES" SHEET.
 4. SEE "UNDERPASS ILLUMINATION LAYOUT" SHEETS FOR LOCATIONS AND SIZE OF CONDUIT.
 5. SEE BENT SHEETS FOR CROSS-SLOPE.



TYPICAL RUSTICATION SECTION

HL 93 LOADING

REV NO.	DATE	BY	REVISION



Mahsa Arastoo

3/7/2022



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Cypress, Texas 77429
PH: (281) 304-0200 - FX: (281) 304-0210
Firm Registration No. F-382

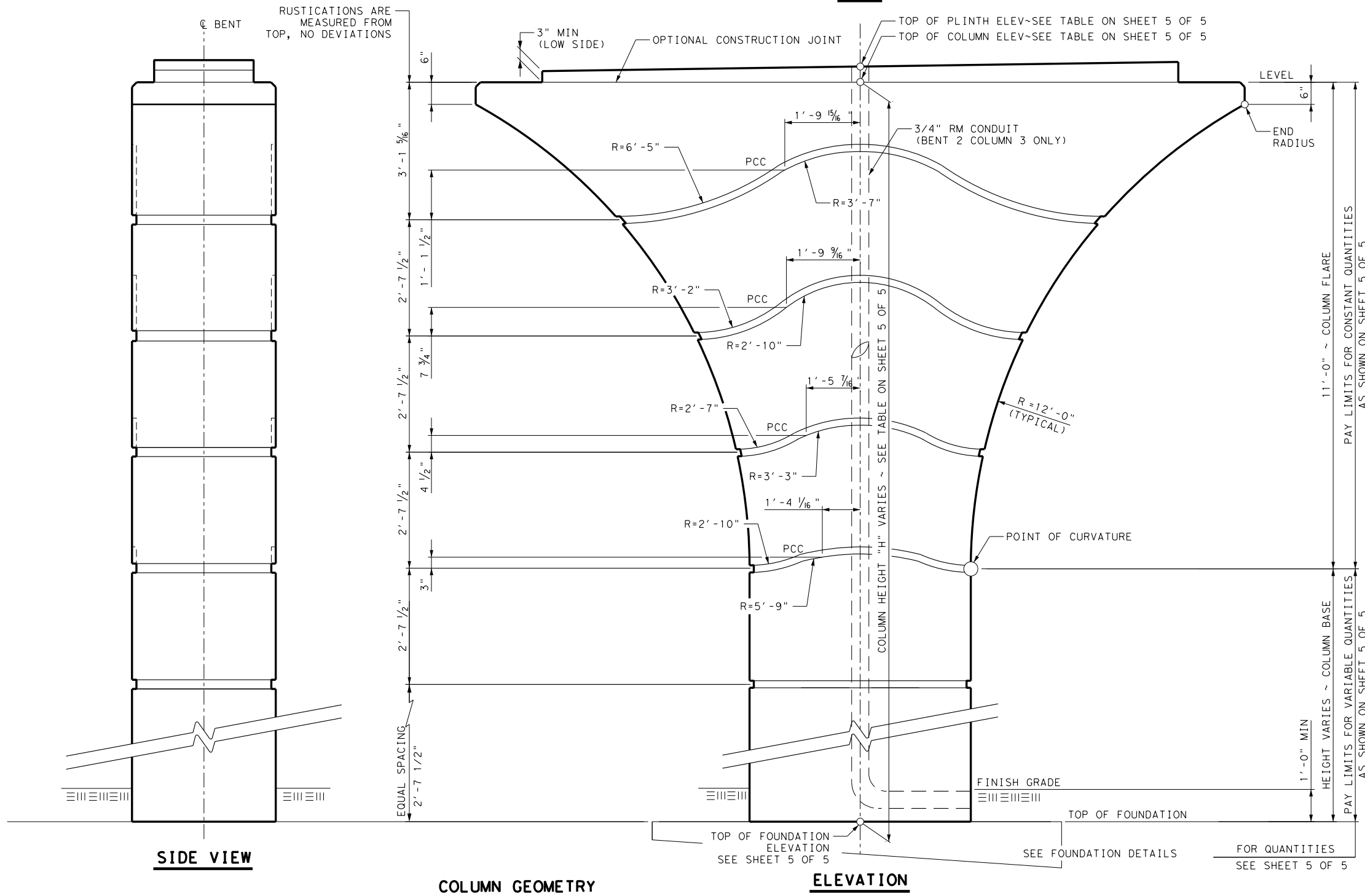


SH 146

**COLUMN DETAILS
SH 146 OVERPASS AT
N. ALEXANDER DR**

SHEET 1 OF 5

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.			SHEET NO.
6				226
STATE	DIST.	COUNTY		
TEXAS	HOU	HARRIS		
CONT.	SECT.	JOB	HIGHWAY NO.	
0389	13	039	SH 146	

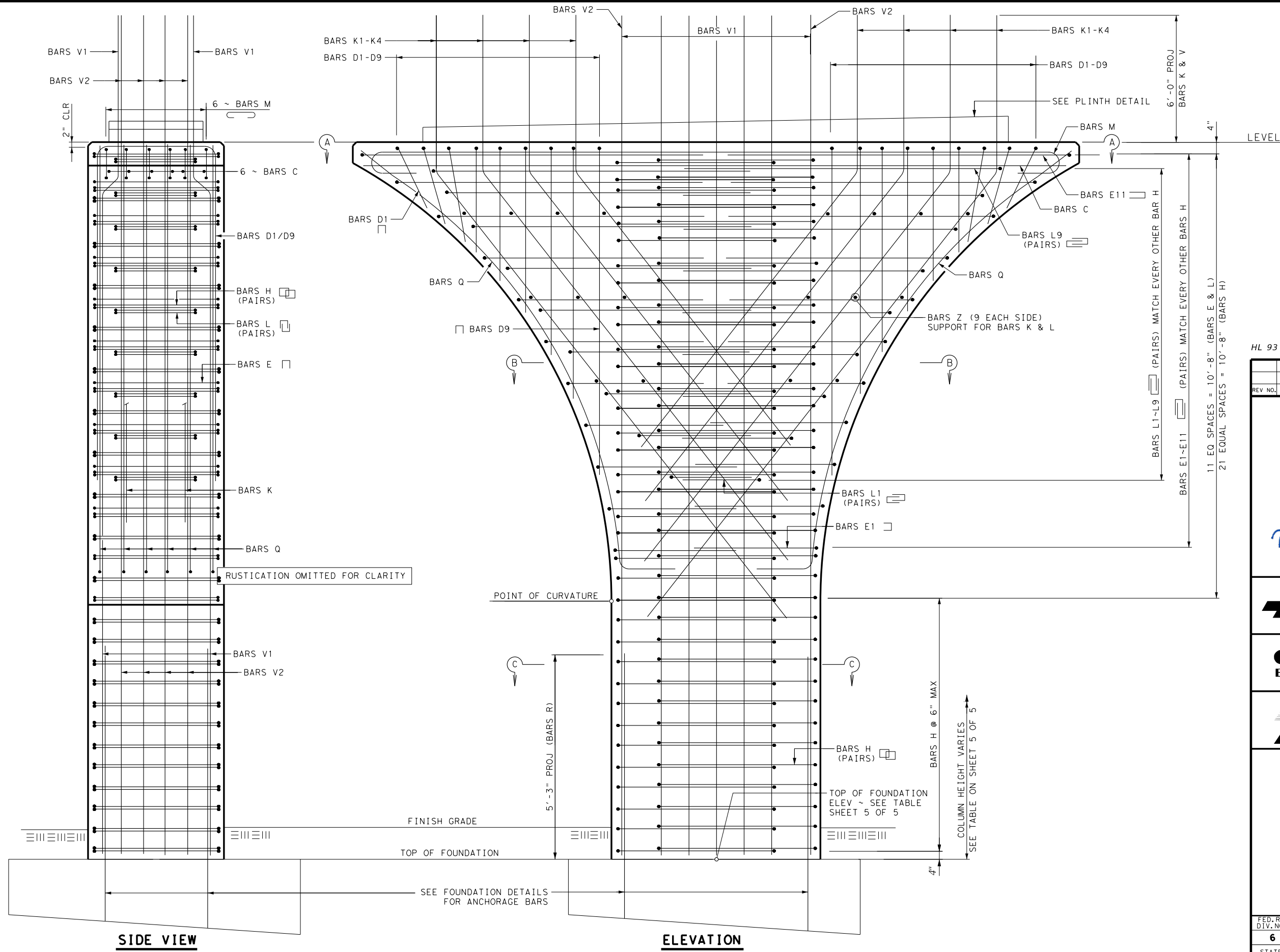


SIDE VIEW

COLUMN GEOMETRY

ELEVATION

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COLUMN REINFORCEMENT DETAILS

HL 93 LOADING

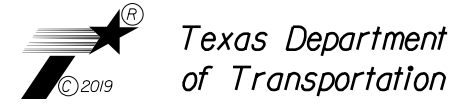
REV. NO.	DATE	BY	REVISION



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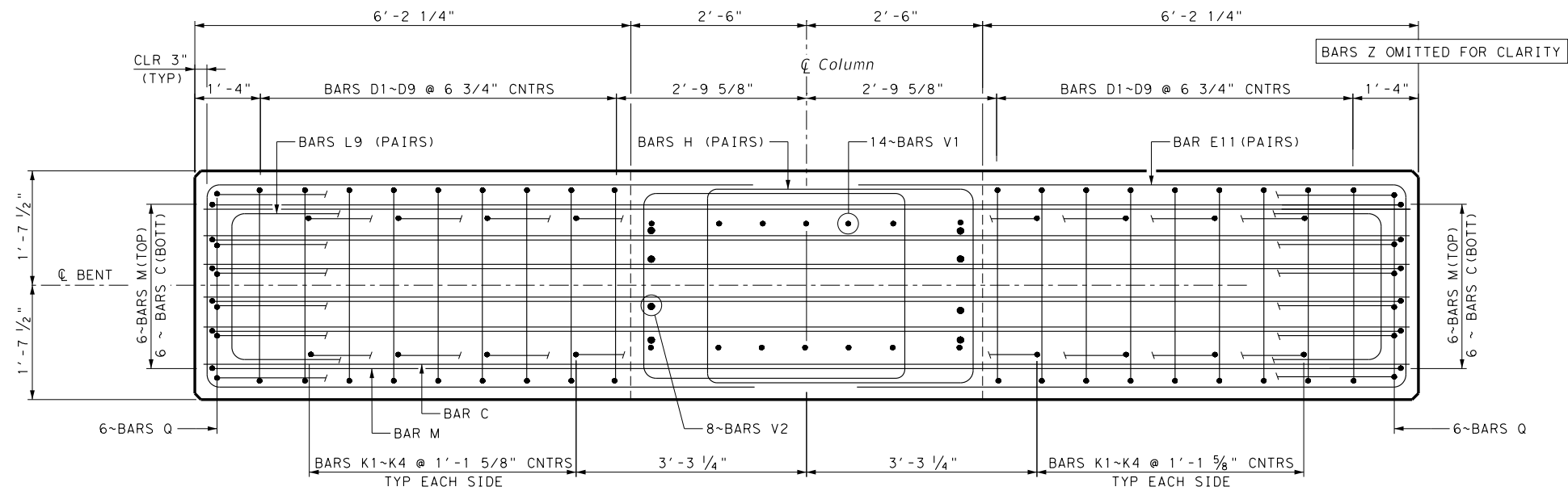
SH 146

**COLUMN DETAILS
SH 146 OVERPASS AT
N. ALEXANDER DR**

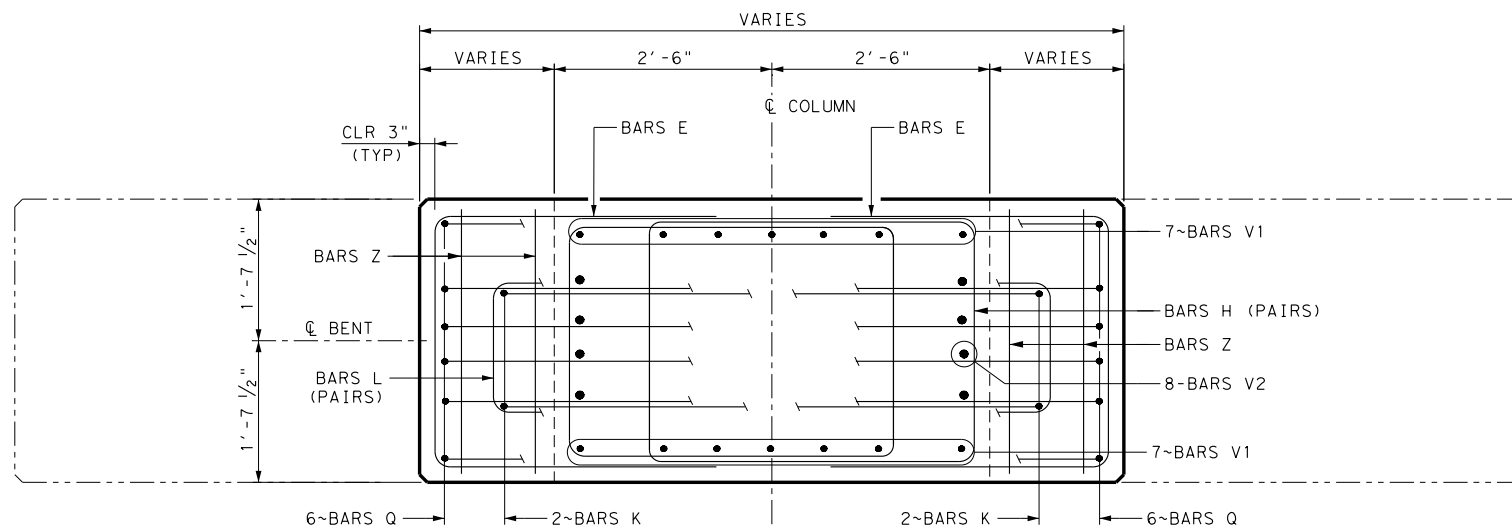
SHEET 2 OF 5

FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.		SHEET NO. 227
STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146

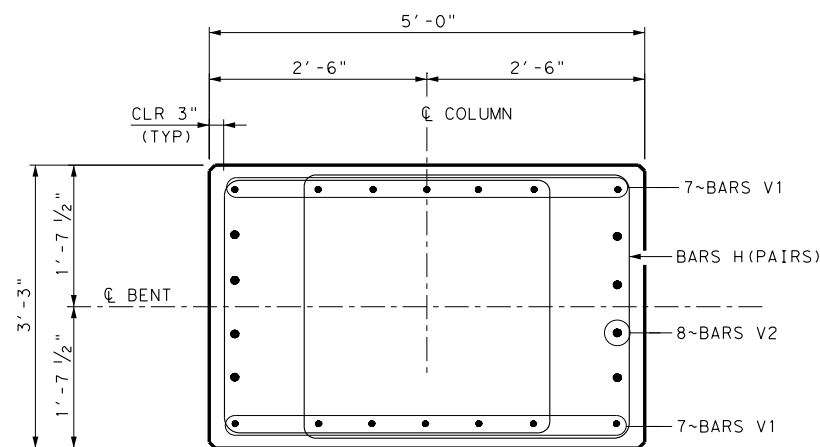
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SECTION A-A



SECTION B-B



SECTION C-C

HL 93 LOADING

REV. NO.	DATE	BY	REVISION

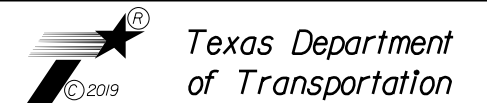


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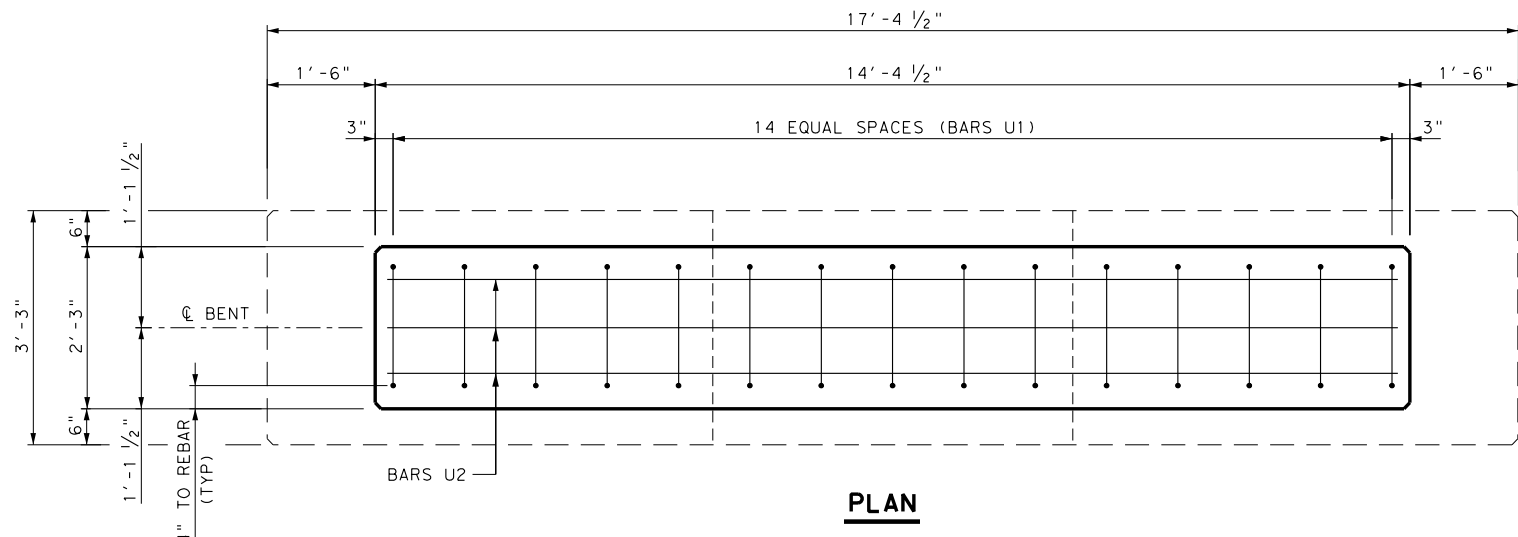


SH 146

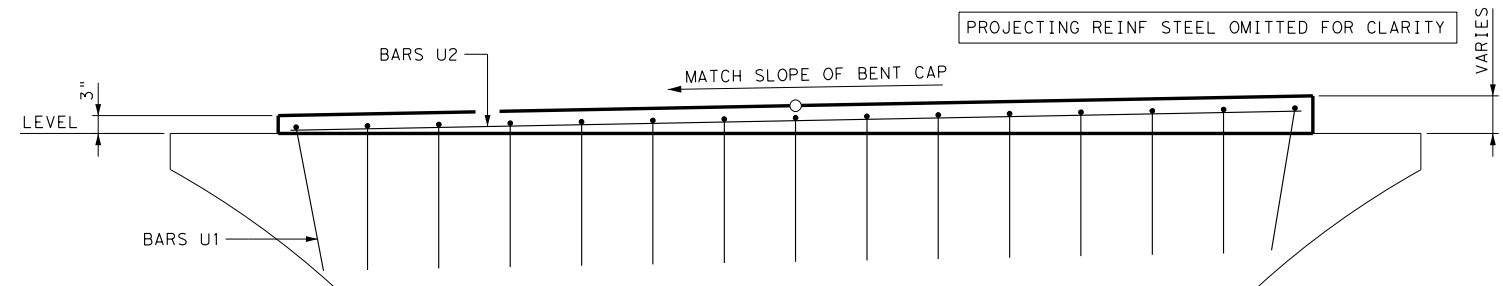
**COLUMN DETAILS
 SH 146 OVERPASS AT
 N. ALEXANDER DR**

SHEET 3 OF 5

FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.		SHEET NO. 228
STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146

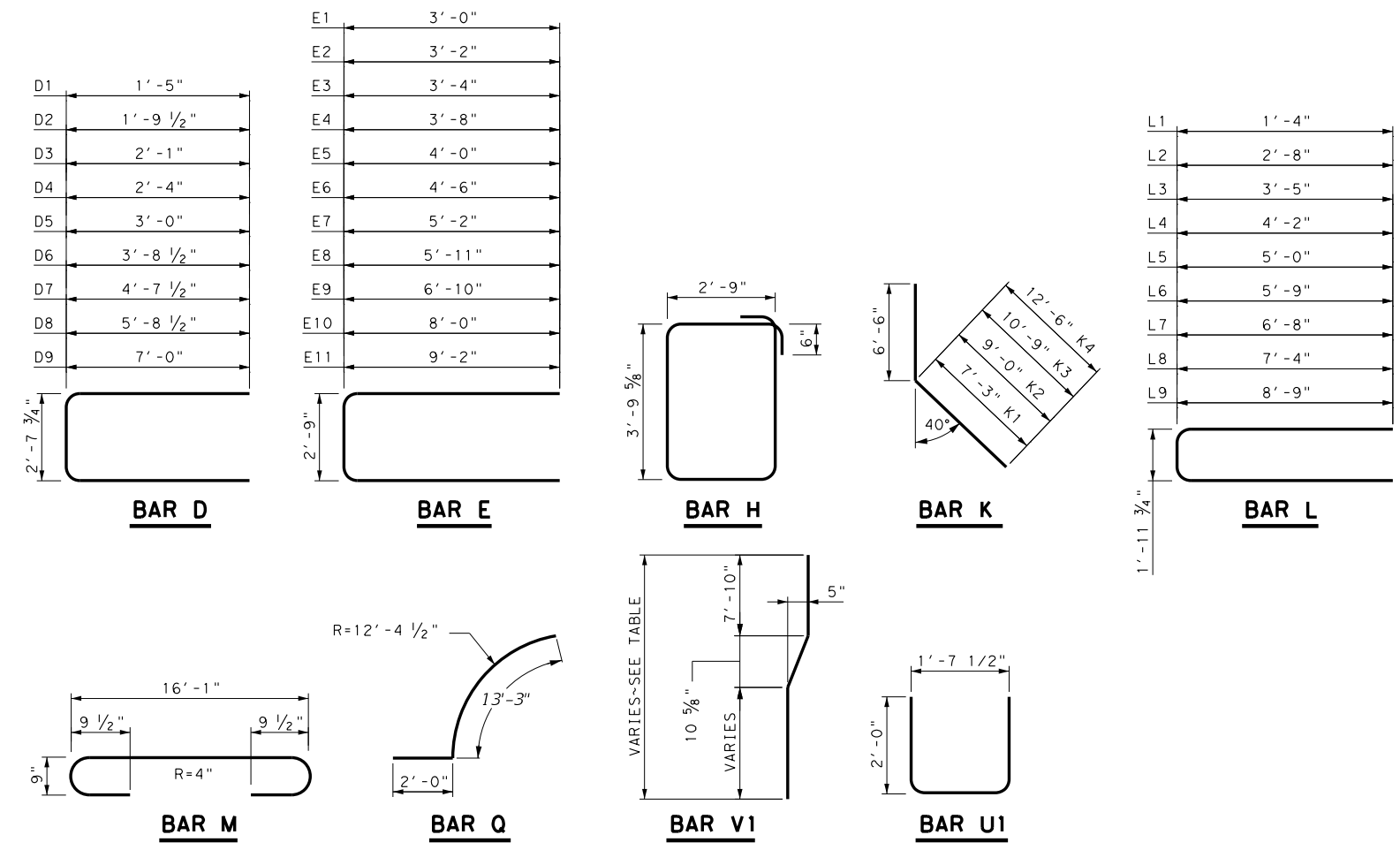


PLAN



ELEVATION

PLINTH DETAIL



HL 93 LOADING

REV NO.	DATE	BY	REVISION

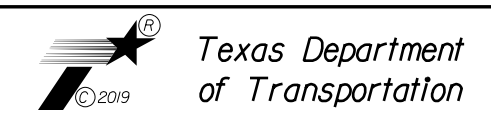


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SH 146

**COLUMN DETAILS
 SH 146 OVERPASS AT
 N. ALEXANDER DR**

SHEET 4 OF 5

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			229
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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TABLE OF CONSTANT COLUMN QUANTITIES (ALL BENTS) ①

BAR	NO	SIZE	LENGTH	WEIGHT
C	6	#6	17'-1 1/2"	155
D1	2	#6	5'-5"	17
D2	2	#6	6'-2"	19
D3	2	#6	6'-9"	21
D4	2	#6	7'-3"	22
D5	2	#6	8'-7"	26
D6	2	#6	10'-0"	31
D7	2	#6	11'-10"	36
D8	2	#6	14'-0"	43
D9	2	#6	16'-7"	50
E1	2	#6	8'-8 1/4"	27
E2	2	#6	9'-1/4"	28
E3	2	#6	9'-4 1/4"	29
E4	2	#6	10'-1/4"	31
E5	2	#6	10'-8 1/4"	33
E6	2	#6	11'-8 1/4"	36
E7	2	#6	13'-1/4"	40
E8	2	#6	14'-6 1/4"	44
E9	2	#6	16'-4 1/4"	50
E10	2	#6	18'-8 1/4"	57
E11	2	#6	21'-1/4"	64
H	44	#5	13'-11"	639
K1	4	#11	13'-9"	293
K2	4	#11	15'-6"	330
K3	4	#11	17'-3"	367
K4	4	#11	19'-0"	404
L1	2	#6	4'-7"	14
L2	2	#6	7'-2"	22
L3	2	#6	8'-9"	27
L4	2	#6	10'-3"	31
L5	2	#6	11'-11"	36
L6	2	#6	13'-5"	41
L7	2	#6	15'-3"	46
L8	2	#6	16'-7"	50
L9	2	#6	19'-5"	59
M	6	#8	18'-3"	293
Q	12	#6	15'-3"	275
U1	15	#4	5'-7"	56
U2	3	#6	14'-0"	64
Z	18	#6	3'-0"	82
* REINFORCING STEEL			LB	3,988
** CLASS "C" CONC (COL)			CY	12.3

* ALL REINFORCING STEEL SHALL BE GRADE 60.
 REINFORCING STEEL QUANTITIES ARE FOR CONTRACTOR'S INFORMATION ONLY.
 ** INCLUDES PLINTH QUANTITY CALCULATED USING 3.2% CROSS-SLOPE.

TABLE OF VARIABLE COLUMN QUANTITIES (ALL BENTS)

BENT	COLUMN NO	TOP OF FOOTING (ELEV)	TOP OF COLUMN (ELEV)	TOP OF PLINTH (ELEV)	COLUMN HEIGHT "H" (FT)	CLASS C CONC (COL) (CY)	BAR V1 (#11)			BAR V2 (#11)			BARS H (#5) LENGTH = 14'-1 1/2" (EA)		CLASS C CONC (COL) (MASS) (CY)	REINFORCING STEEL (LB)
							NO	LENGTH	WEIGHT	NO	LENGTH	WEIGHT	NO	WEIGHT		
															NO	WEIGHT
2	1	16.40	33.40	33.88	17.00	3.6	14	23'-0"	1,711	8	23'-0"	978	24	354	15.9	7,043
	2	15.36	34.36	34.84	19.00	4.8	14	25'-0"	1,860	8	25'-0"	1,063	32	471	17.1	7,394
	3	15.32	35.32	35.80	20.00	5.4	14	26'-0"	1,934	8	26'-0"	1,106	36	530	17.7	7,570
3	1	15.40	33.40	33.88	18.00	4.2	14	24'-0"	1,786	8	24'-0"	1,021	28	412	16.5	7,219
	2	15.36	34.36	34.84	19.00	4.8	14	25'-0"	1,860	8	25'-0"	1,063	32	471	17.1	7,394
	3	15.32	35.32	35.80	20.00	5.4	14	26'-0"	1,934	8	26'-0"	1,106	36	530	17.7	7,570

GENERAL NOTES:

- DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATION 8TH EDITION (2017).
- REINFORCING BAR DIMENSION SHOWN ARE OUT TO OUT OF BARS.
- COVER DIMENSIONS ARE CLEAR DIMENSIONS, UNLESS NOTED OTHERWISE.

MATERIAL NOTES:

- ALL REINFORCING SHALL BE GRADE 60.
- CONCRETE STRENGTH SHALL BE CLASS "C" F'C = 3,600 PSI.

① QUANTITIES FOR ONE COLUMN ONLY

TOTAL ESTIMATED QUANTITIES

HL 93 LOADING

REV NO.	DATE	BY	REVISION



Mahsa Arastoo

3/7/2022



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 Cypress, Texas 77429
 PH: (281) 304-0200 - FX: (281) 304-0210
 Firm Registration No. F-382



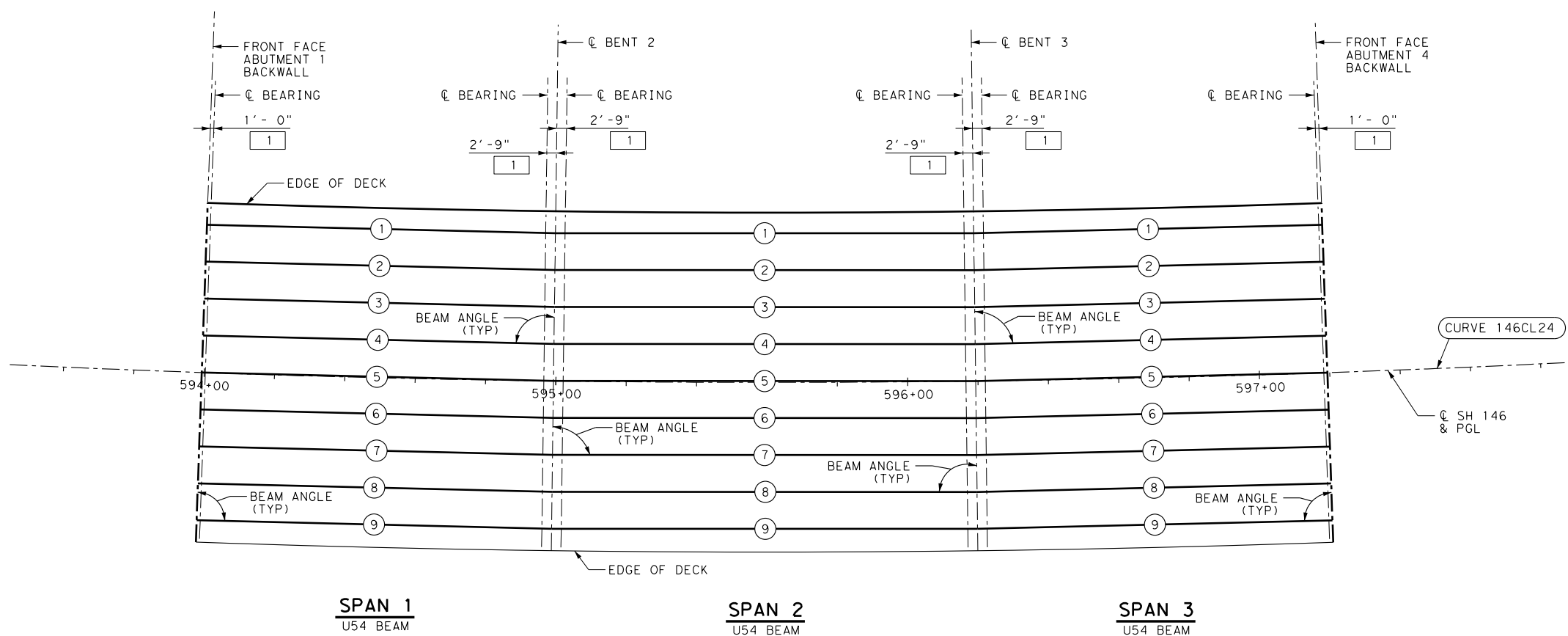
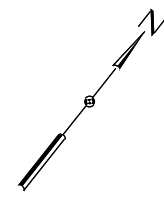
SH 146

**COLUMN DETAILS
 SH 146 OVERPASS AT
 N. ALEXANDER DR**

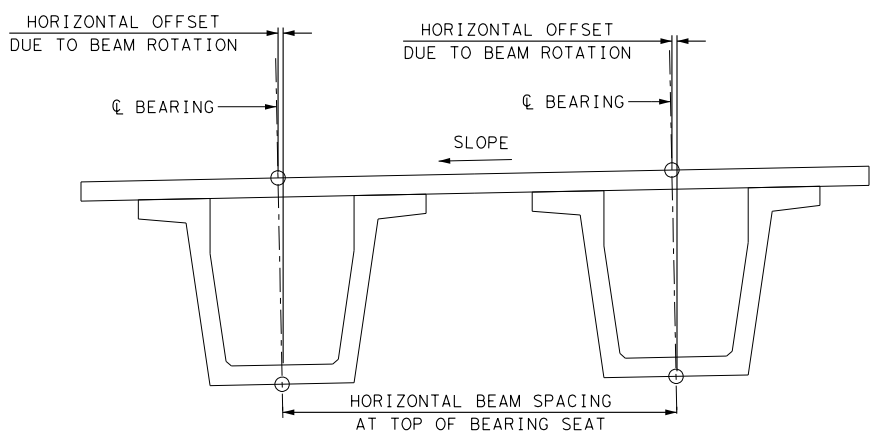
SHEET 5 OF 5

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			230
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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FRAMING PLAN



AT CONSTANT CROSS-SLOPE

BEAM SPACING DETAILS
ALONG CENTERLINE OF BENT CAP

- ⊕ BEAM NUMBER
- 1 SEE STANDARD UBEB FOR ORIENTATION OF DIMENSIONS.

HL 93 LOADING

REV. NO.	DATE	BY	REVISION

MAHSA ARASTOO
125062
LICENSED PROFESSIONAL ENGINEER
3/7/2022

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TBPE FIRM REGISTRATION #739

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

Texas Department of Transportation

SH 146

FRAMING PLAN
SH 146 OVERPASS AT
N. ALEXANDER DR

SHEET 1 OF 2

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.			SHEET NO.
6				231
STATE	DIST.	COUNTY		
TEXAS	HOU	HARRIS		
CONT.	SECT.	JOB	HIGHWAY NO.	
0389	13	039	SH 146	

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BENT REPORT

ABUT NO. 4 (N 40 19 38.36 W)

DISTANCE BETWEEN STATION LINE AND BEAM LINE 1, 42.0000 L

ABUT NO. 1 (N 36 20 29.50 W)

DISTANCE BETWEEN STATION LINE AND BEAM LINE 1, 42.0000 L

Table with columns: BEAM SPAC. ALONG CL BENT, BEAM ANGLE D M S, DISTANCE CL PERP TO CL BENT, BENT TO CL ALONG CL BENT, BEARING ALONG CL BEAM, DIST CL PERP TO CL BENT, BENT TO END OF BM ALONG CL BEAM. Rows include SPAN 1, BEAM 1-9, and TOTAL.

BENT NO. 2 (N 37 35 13.52 W)

DISTANCE BETWEEN STATION LINE AND BEAM LINE 1, 42.0000 L

Table with columns: BEAM SPAC. ALONG CL BENT, BEAM ANGLE D M S, DISTANCE CL PERP TO CL BENT, BENT TO CL ALONG CL BENT, BEARING ALONG CL BEAM, DIST CL PERP TO CL BENT, BENT TO END OF BM ALONG CL BEAM. Rows include SPAN 1, BEAM 1-9, and TOTAL.

BENT NO. 2 (N 37 35 13.52 W)

DISTANCE BETWEEN STATION LINE AND BEAM LINE 1, 42.0000 L

Table with columns: BEAM SPAC. ALONG CL BENT, BEAM ANGLE D M S, DISTANCE CL PERP TO CL BENT, BENT TO CL ALONG CL BENT, BEARING ALONG CL BEAM, DIST CL PERP TO CL BENT, BENT TO END OF BM ALONG CL BEAM. Rows include SPAN 2, BEAM 1-9, and TOTAL.

BENT NO. 3 (N 39 4 54.34 W)

DISTANCE BETWEEN STATION LINE AND BEAM LINE 1, 42.0000 L

Table with columns: BEAM SPAC. ALONG CL BENT, BEAM ANGLE D M S, DISTANCE CL PERP TO CL BENT, BENT TO CL ALONG CL BENT, BEARING ALONG CL BEAM, DIST CL PERP TO CL BENT, BENT TO END OF BM ALONG CL BEAM. Rows include SPAN 2, BEAM 1-9, and TOTAL.

BENT NO. 3 (N 39 4 54.34 W)

DISTANCE BETWEEN STATION LINE AND BEAM LINE 1, 42.0000 L

Table with columns: BEAM SPAC. ALONG CL BENT, BEAM ANGLE D M S, DISTANCE CL PERP TO CL BENT, BENT TO CL ALONG CL BENT, BEARING ALONG CL BEAM, DIST CL PERP TO CL BENT, BENT TO END OF BM ALONG CL BEAM. Rows include SPAN 3, BEAM 1-9, and TOTAL.

Table with columns: BEAM SPAC. ALONG CL BENT, BEAM ANGLE D M S, DISTANCE CL PERP TO CL BENT, BENT TO CL ALONG CL BENT, BEARING ALONG CL BEAM, DIST CL PERP TO CL BENT, BENT TO END OF BM ALONG CL BEAM. Rows include SPAN 3, BEAM 1-9, and TOTAL.

BEAM REPORT

BEAM REPORT AT CENTER OF BEAM, SPAN 1

Table with columns: BEAM, HORIZONTAL C-C BENT, DISTANCE C-C BRG., TRUE DISTANCE BOT. BM. FLG., BEAM SLOPE, BEAM BEARING. Rows include BEAM 1-9.

BEAM REPORT AT CENTER OF BEAM, SPAN 2

Table with columns: BEAM, HORIZONTAL C-C BENT, DISTANCE C-C BRG., TRUE DISTANCE BOT. BM. FLG., BEAM SLOPE, BEAM BEARING. Rows include BEAM 1-9.

BEAM REPORT AT CENTER OF BEAM, SPAN 3

Table with columns: BEAM, HORIZONTAL C-C BENT, DISTANCE C-C BRG., TRUE DISTANCE BOT. BM. FLG., BEAM SLOPE, BEAM BEARING. Rows include BEAM 1-9.

BEAM REPORT

BEARING PAD TAPER -- FABRICATOR'S REPORT PERPENDICULAR TO THE CENTERLINE OF BEARING. SUMMATION OF BEARING PAD TAPER DUE TO CROSS-SLOPE, GRADE, AND SKEW, MEASURED IN IN/IN. A POSITIVE TAPER INDICATES INCREASING PAD THICKNESS IN DIRECTION OF INCREASING STATIONS. A NEGATIVE TAPER INDICATES DECREASING PAD THICKNESS IN DIRECTION OF INCREASING STATIONS.

Table with columns: BENT, BEAM 1-9. Rows include BENT 1 (FWD), BENT 2 (BK), BENT 2 (FWD), BENT 3 (BK), BENT 3 (FWD), BENT 4 (BK).

BEAM LENGTHS SHOWN ARE BOTTOM BEAM FLANGE LENGTHS WITH ADJUSTMENTS MADE FOR BEAM SLOPE.

HL 93 LOADING

Professional Engineer Seal for MAHSA ARASTOO, State of Texas, License No. 125062, dated 3/7/2022.

AGUIRRE & FIELDS ENGINEERING INNOVATORS TBPE FIRM REGISTRATION #739

CivilTech Engineering, Inc. 11821 Telge Road Cypress, Texas 77429

Texas Department of Transportation logo

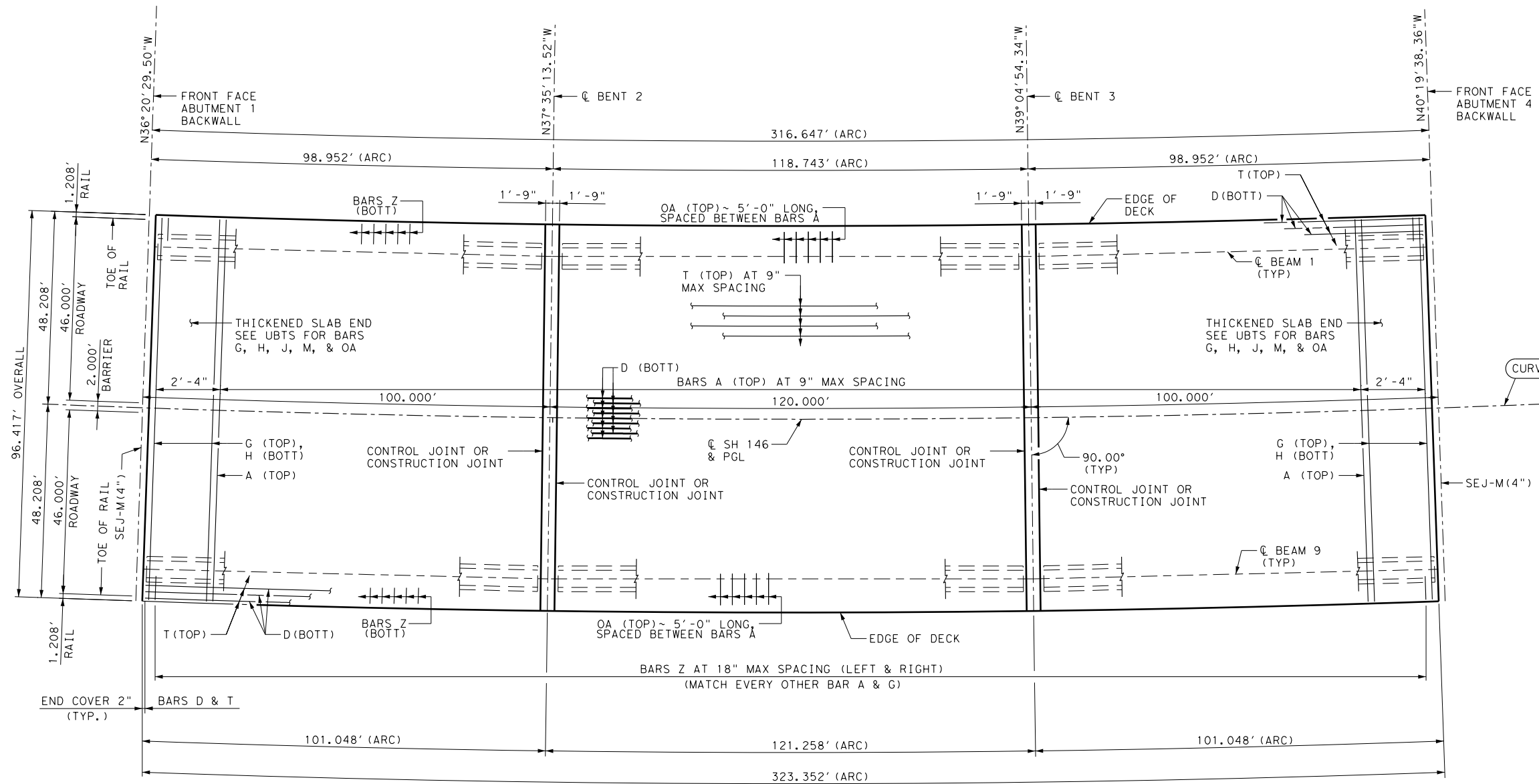
SH 146

FRAMING PLAN SH 146 OVERPASS AT N. ALEXANDER DR

SHEET 2 OF 2

Table with columns: FED. RD. DIV. NO., FEDERAL AID PROJECT NO., SHEET NO., STATE, DIST., COUNTY, CONT., SECT., JOB, HIGHWAY NO. Values: 6, 232, TEXAS, HOU, HARRIS, 0389, 13, 039, SH 146

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HL 93 LOADING

REV. NO.	DATE	BY	REVISION

MAHSA ARASTOO
125062
LICENSED PROFESSIONAL ENGINEER
3/7/2022

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TBPE FIRM REGISTRATION #739

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

Texas Department of Transportation

SH 146

320.00' PRESTRESSED CONCRETE BEAM UNIT SH 146 OVERPASS AT N. ALEXANDER DR

SHEET 1 OF 3

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			233
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

BAR	SIZE
A	#4
B	#5
D	#4
E	#4
G	#4
H	#6
J	#4
M	#4
T	#4
X	#4
W	#4
Y	#4
Z	#4
OA	#5

SPAN 1

SPAN 2

SPAN 3

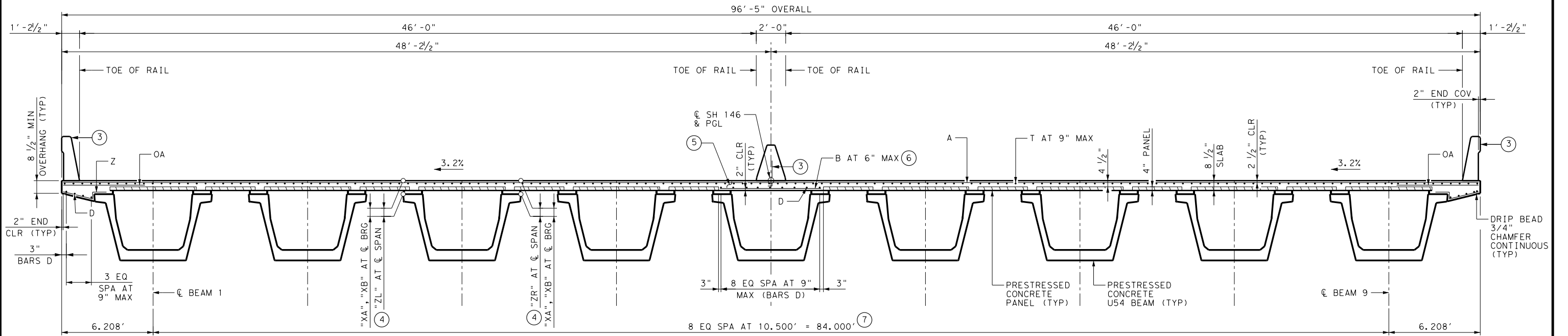
PLAN

SPAN	REINF CONCRETE SLAB	PRESTR CONC BEAMS (U54)	CLASS "S" CONCRETE	TOTAL REINF STEEL
	SF	LF	CY	LB
1	9,642	879.75	270.4	35,674
2	11,570	1,043.97	321.9	42,809
3	9,642	879.75	270.4	35,674
TOTAL	30,853	2,803.47	862.7	114,157

① REINFORCING STEEL QUANTITY IS CALCULATED USING AN APPROXIMATE FACTOR OF 3.7 LB/SF.

② QUANTITIES ARE FOR CONTRACTOR'S INFORMATION ONLY.

- GENERAL NOTES:
- DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATION 8TH EDITION (2017).
 - SEE PCP AND PCP-FAB STANDARDS FOR PANEL DETAILS NOT SHOWN.
 - SEE UBMS STANDARD FOR MISCELLANEOUS DETAILS.
 - SEE UBTS STANDARD FOR THICKENED SLAB END DETAILS.
 - SEE SHEET 3 OF 3 FOR LONGITUDINAL SECTION OF SLAB OVER INVERTED-TEE BENT FOR REINFORCING DETAILS NOT SHOWN.
 - ALL REINFORCING STEEL SHALL BE GRADE 60.
 - CONCRETE STRENGTH SHALL BE CLASS "S" CONCRETE $f'c = 4,000$ PSI.
 - BAR LAPS, WHERE REQUIRED, SHALL BE AS FOLLOWS:
#4 = 1'-7"
#5 = 2'-0"
 - SEE RAILING STANDARDS FOR ANCHORAGE IN SLAB.
 - FOR SEALED EXPANSION JOINT DETAILS NOT SHOWN SEE SEJ-M STANDARD.



TYPICAL TRANSVERSE SECTION

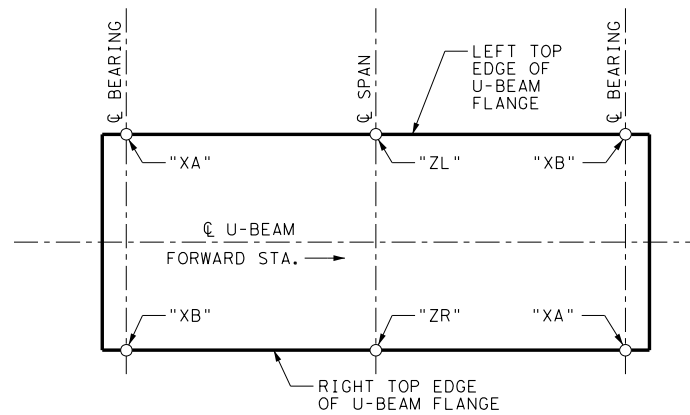
NOT TO SCALE

TABLE OF DEAD LOAD DEFLECTIONS

SPAN NO.	BEAM NO.	"A" FT	"B" FT
1 & 3	1	0.073	0.102
	2	0.065	0.091
	3	0.066	0.092
	4	0.066	0.093
	5	0.067	0.094
	6	0.068	0.095
	7	0.068	0.096
	8	0.069	0.097
	9	0.083	0.116
2	1	0.145	0.204
	2	0.131	0.184
	3	0.132	0.186
	4	0.133	0.187
	5	0.135	0.189
	6	0.136	0.191
	7	0.138	0.194
	8	0.139	0.195
	9	0.169	0.237

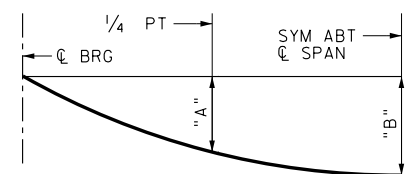
TABLE OF SECTION DEPTHS

SPAN NO.	GIRDER NO.	"XA" AT CL BRG	"XB" AT CL BRG	"ZR" AT CL SPAN	"ZL" AT CL SPAN
1 & 3	1-8	10 1/2"	10 1/2"	10 1/2"	10 1/2"
	9	10 1/2"	10 1/2"	10 3/4"	10 3/4"
2	1-8	10 1/2"	10 1/2"	10 3/4"	10 3/4"
	9	10 1/2"	10 1/2"	11 1/4"	11 1/4"



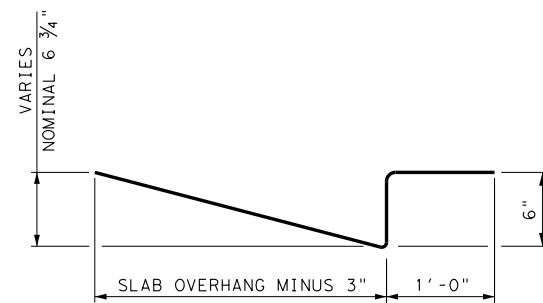
LOCATION OF SECTION DEPTHS

(SHOWING PLAN VIEW OF TOP OF BEAM)



DEAD LOAD DEFLECTION DIAGRAM

CALCULATED DEFLECTIONS SHOWN ARE DUE TO THE CAST-IN-PLACE SLAB ONLY (EC = 5000 KSI). ADJUST DEFLECTIONS BASED ON FIELD OBSERVATIONS AS NEEDED.



BARS Z (#4)

- ③ SEE SSTR RAIL STANDARD AND SINGLE SLOPE CONCRETE BARRIER STANDARDS FOR ADDITIONAL REINFORCING STEEL REQUIREMENTS.
- ④ THEORETICAL DIMENSION
- ⑤ PRESTRESSED CONCRETE PANELS (PCP) NOT PERMITTED DIRECTLY BELOW THE SINGLE SLOPE CONCRETE BARRIER
- ⑥ FIELD TRIM BARS B AS NECESSARY TO MAINTAIN 1" END CLEAR TO EDGE OF PANEL.
- ⑦ BEAM SPACING SHOWN IS MEASURED AT BOTTOM OF BEAM. BEAM SPACING AT TOP OF BEAM MAY VARY DUE TO CROSS SLOPE OF U-BEAMS.

REV NO.	DATE	BY	REVISION



Mahsa Arastoo
3/7/2022



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



SH 146

320.00' PRESTRESSED CONCRETE BEAM UNIT SH 146 OVERPASS AT N. ALEXANDER DR

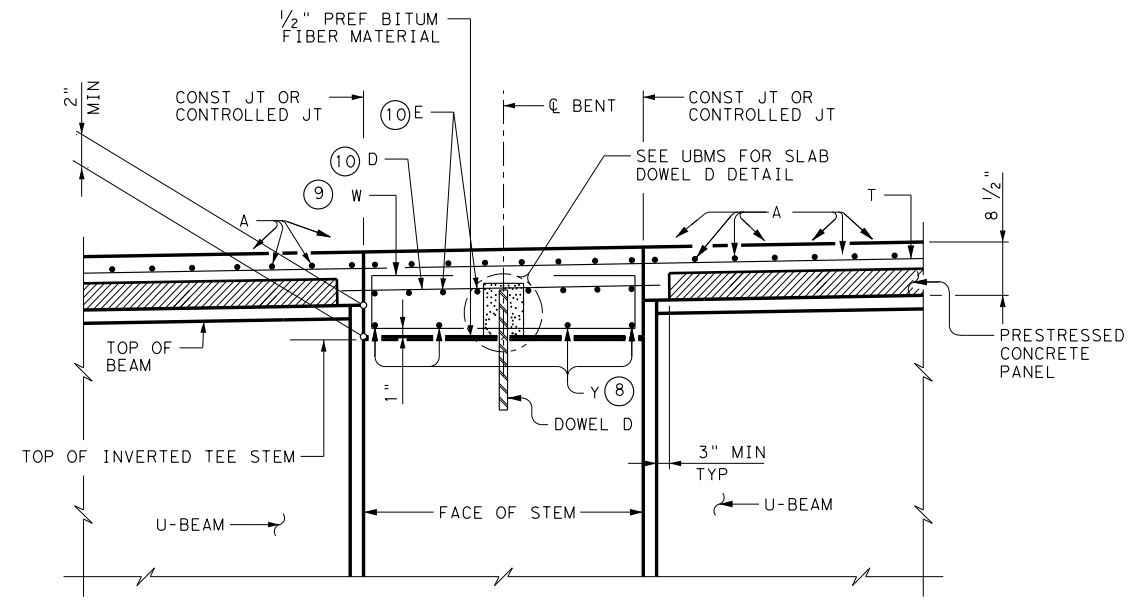
SHEET 2 OF 3

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.	
6		234	
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

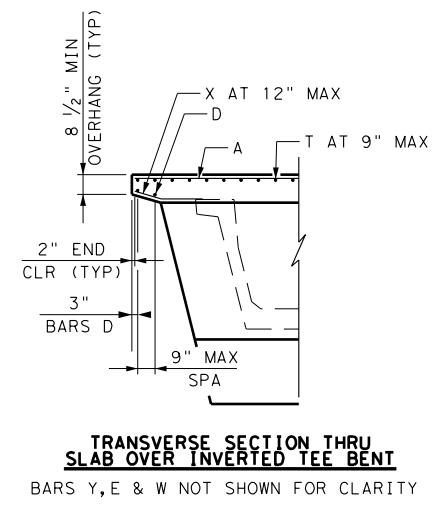
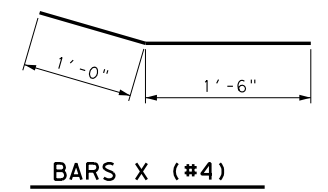
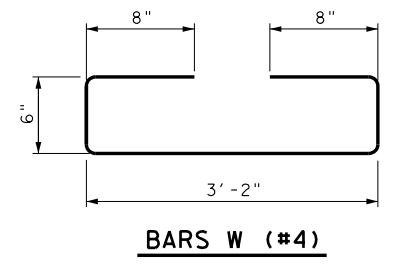
HL 93 LOADING

\$FILEABBREV\$

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LONGITUDINAL SECTION OF SLAB OVER INVERTED TEE BENT
SEE SPAN DETAILS FOR BARS A AND T.



TRANSVERSE SECTION THRU SLAB OVER INVERTED TEE BENT
BARS Y, E & W NOT SHOWN FOR CLARITY

- NOTES:
- SEE UBMS STANDARD FOR ADDITIONAL DETAILS.
 - SEE PCP STANDARD FOR ADDITIONAL DETAILS.
- ⑧ SPACE BARS Y (#4) AT 12" MAX. USE 2" END COVER. PLACE PARALLEL TO BENT.
- ⑨ SPACE BARS W (#4) AT 12" MAX (3" FROM END OF CAP). PLACE PARALLEL TO LONGITUDINAL SLAB REINFORCEMENT.
- ⑩ SEE STANDARD PCP FOR BARS D & E.

REV NO.	DATE	BY	REVISION

Mahsa Arastoo
3/7/2022

AGUIRRE & FIELDS
ENGINEERING INNOVATORS
TBPE FIRM REGISTRATION #739

CivilTech Engineering, Inc. 11821 Telge Road
Cypress, Texas 77429
PH: (281) 304-0200 - FX: (281) 304-0210
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Texas Department of Transportation

SH 146

320.00' PRESTRESSED CONCRETE BEAM UNIT SH 146 OVERPASS AT N. ALEXANDER DR

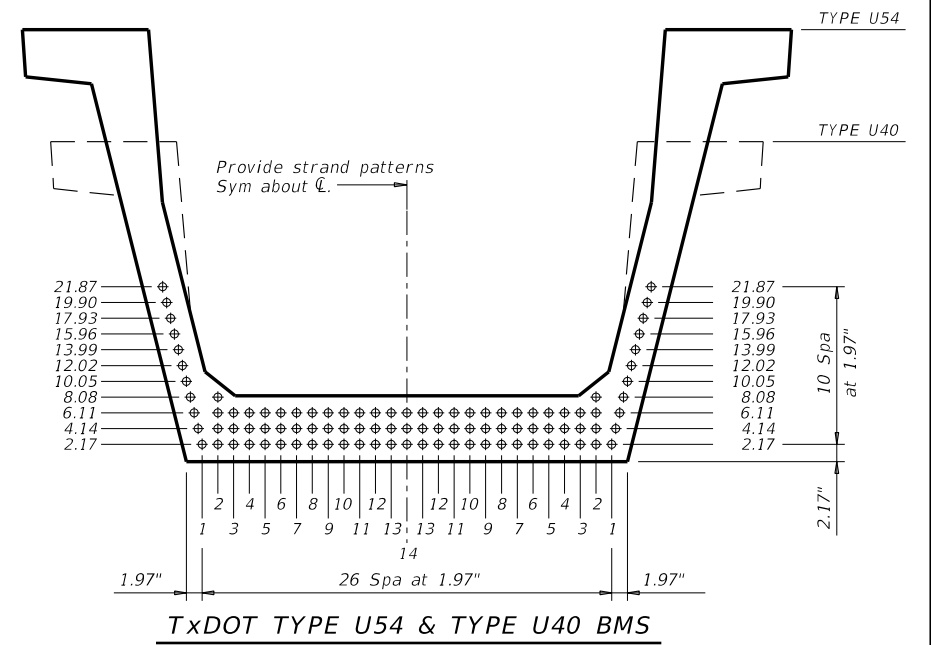
SHEET 3 OF 3

FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.	SHEET NO. 235
STATE TEXAS	DIST. HOU	COUNTY HARRIS
CONT. 0389	SECT. 13	JOB 039
		HIGHWAY NO. SH 146

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DATE: FILE:

STRUCTURE	DESIGNED BEAMS (STRAIGHT STRANDS)																	OPTIONAL DESIGN							
	SPAN NO.	BEAM NO.	BEAM TYPE	PRESTRESSING STRANDS							DEBONDED STRAND PATTERN PER ROW							CONCRETE		DESIGN LOAD COMP STRESS (TOP $\bar{\epsilon}$) (SERVICE I)	DESIGN LOAD TENSILE STRESS (BOT $\bar{\epsilon}$) (SERVICE III)	REQUIRED MINIMUM ULTIMATE MOMENT CAPACITY (STRENGTH I)	LIVE LOAD DISTRIBUTION FACTOR		
				NON-STD STRAND PATTERN	TOTAL NO.	SIZE (in)	STRGTH (ksi)	"e" $\bar{\epsilon}$ (in)	"e" END (in)	TOT NO. DEB	DIST FROM BOT (in)	NO. OF STRANDS		NUMBER OF STRANDS DEBONDED TO (ft from end)					RELEASE STRGTH f'_{ci} (ksi)				MINIMUM 28 DAY COMP STRGTH f'_c (ksi)	②	
												TOTAL	DE-BONDED	3	6	9	12	15						Moment	Shear
SH 146	1&3 2	ALL ALL	U54 U54		37 51	0.6 0.6	270 270	19.75 19.36	19.50 19.24	12 21	2.17 2.17 4.14	27 27 24	12 13 8	2 0 4	8 5 4	2 6 0	0 0 0	4.000 5.200	5.200 7.100	3.289 4.622	-2.931 -4.035	7848 10483	0.740 0.711	1.016 1.010	



DESIGN NOTES:
 Designed in accordance with AASHTO LRFD Bridge Design Specifications. Optional designs must have a calculated residual camber equal to or greater than that of the designed beam.
 Prestress losses for the designed beams have been calculated for a relative humidity of 75 percent. Optional designs must likewise conform.
 The grid pattern for the strands is based on exact conversions from a metric grid spacing of 50mm.

FABRICATION NOTES:
 Provide Class H concrete.
 Provide Grade 60 reinforcing steel bars.
 Use low relaxation strands, each pretensioned to 75 percent of f_{pu} .
 When shown on this sheet, the Fabricator has the option of furnishing either the designed beam or an approved optional beam design. All optional design submittals and shop drawings must be signed, sealed and dated by a Professional Engineer registered in the State of Texas.
 Locate strands for the designed beam as low as possible on the 1.97" grid system unless a non-standard stand pattern is indicated. Fill row "2.17", then row "4.14", then row "6.11", etc., beginning each row in the "1" position and, distributing uniformly as practical, working inward until the required number of strands is reached.
 Strand debonding must comply with Item 424.4.2.2.4.
 Do not debond strands in position "1". Distribute debonded strands equally about the vertical centerline. Decrease debonded lengths working inward, with debonding staggered in each row.
 Full-length debonded strands are not permitted in positions "1" and "2".

① Based on the following allowable stresses (ksi):
 Compression = $0.65 f'_{ci}$
 Tension = $0.24 \sqrt{f'_{ci}}$
 Optional designs must likewise conform.
 ② Portion of full HL93.



HL93 LOADING

Texas Department of Transportation
 Bridge Division Standard

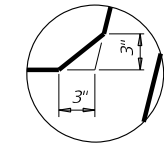
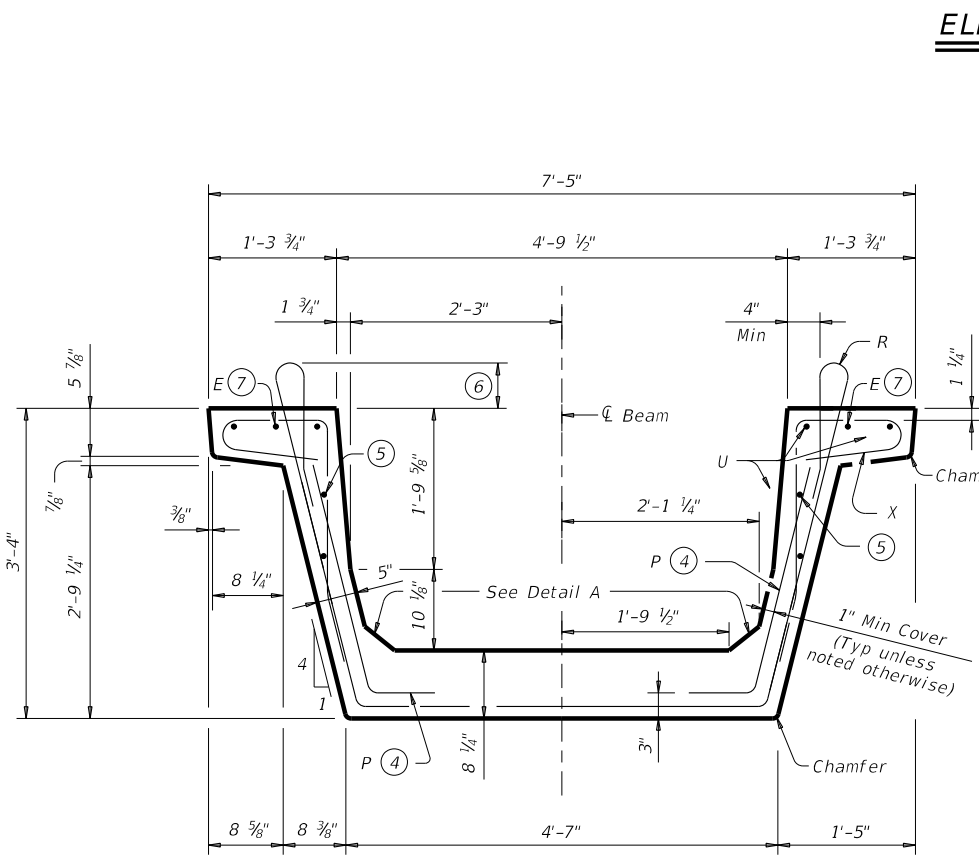
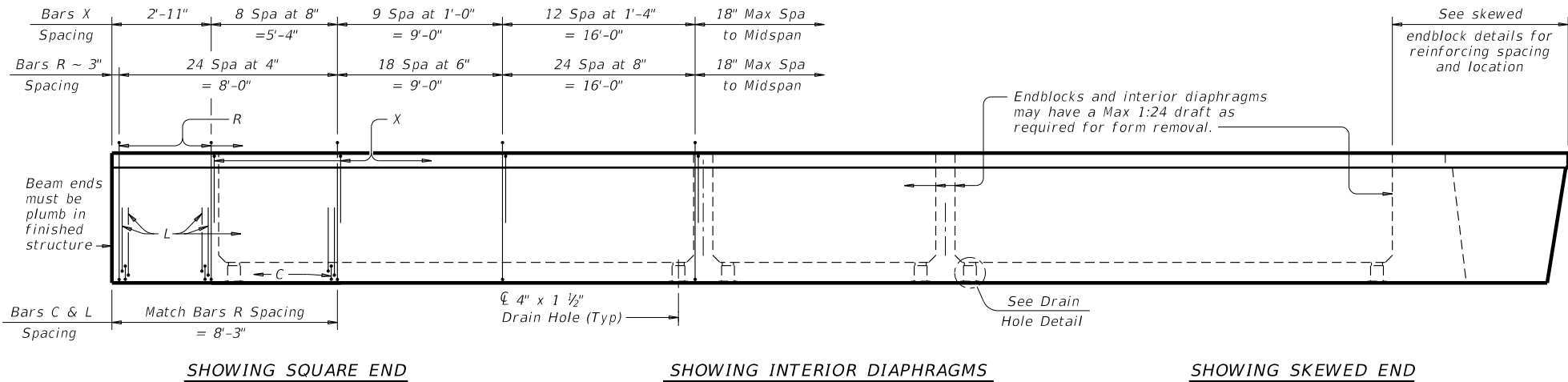
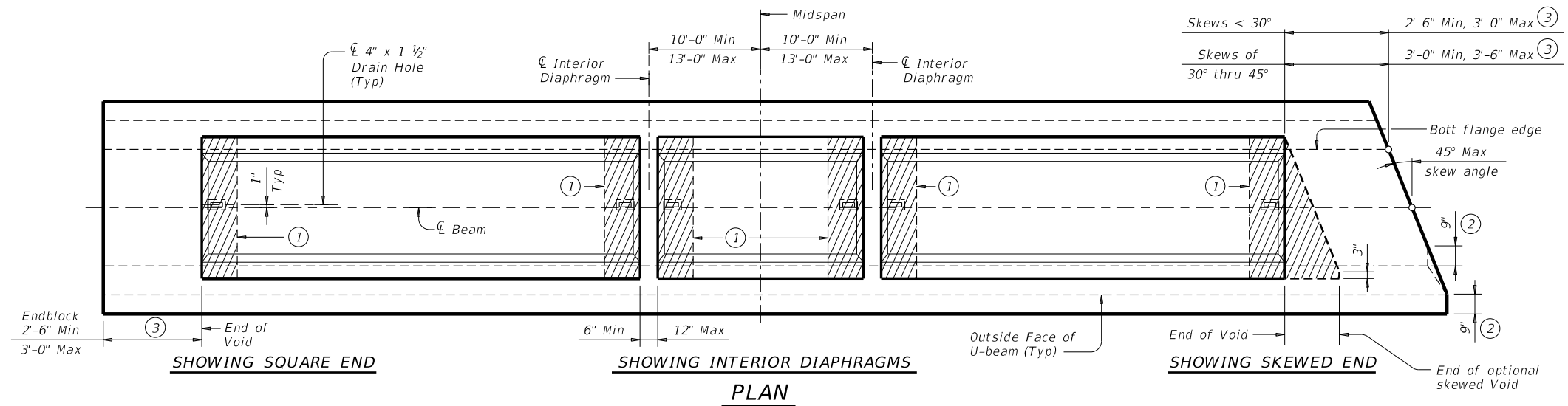
PRESTRESSED CONCRETE U-BEAMS (DESIGN DATA)

UBND

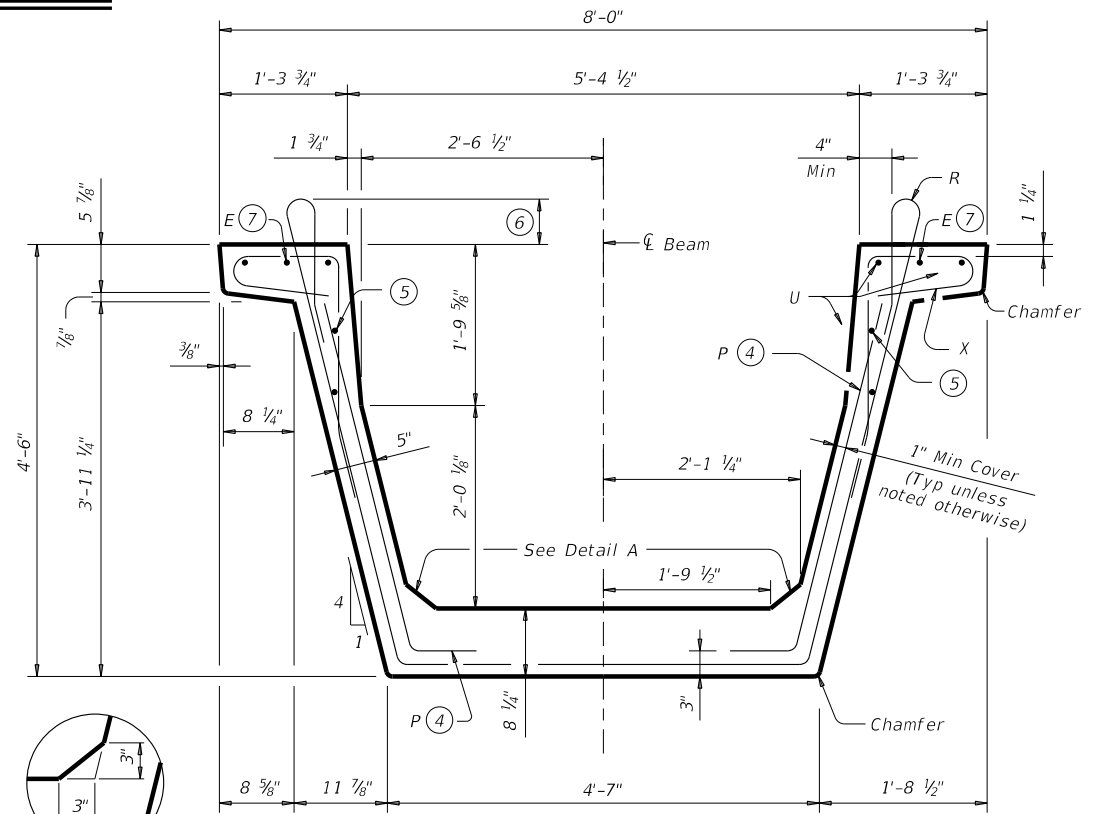
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REVISIONS	0389	13	039	SH 146
01-16: Notes.	DIST	COUNTY	SHEET NO.	
	HOU	HARRIS	236	

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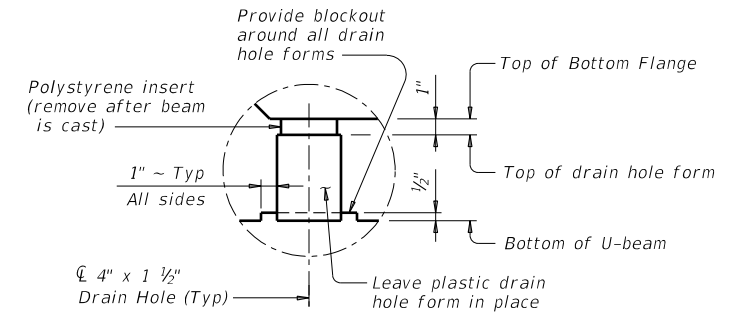
DATE: FILE:



DETAIL A



- ① Polystyrene may be used at ends of inside forms (12" maximum in length except at optional skewed ends) and left in place. Offset drain holes if not removing polystyrene.
- ② For skews greater than 15 degrees, breakback both top and bottom flanges 9" as shown. Provide a smooth transition between top and bottom flange breakbacks. Adjust reinforcement as necessary to maintain minimum clear cover.
- ③ Minimum and maximum endblock dimensions apply throughout the endblock depth. This dimension control applies to the narrowest portion of endblocks at skewed beam ends.
- ④ Required for beams that will support cantilevered slab overhang formwork and exterior beams only.
- ⑤ Optional Bar U for beams requiring Bars P.
- ⑥ 5 1/2" for normal Bars R.
5 1/2" - 6 1/2" Max for Bars R at skewed beam ends.
- ⑦ Provide Bars E (#5 x 15'-0") at beam ends.



Provide 1/4" clear between strands and drain hole form.

Beam Type	Y _t (in.)	Y _b (in.)	Area (in. ²)	I (in. ⁴)	Weight (plf) ⑧
U40	23.66	16.30	979.9	183,108	1021
U54	31.58	22.36	1120.0	403,020	1167

⑧ Weights shown assume a concrete density of 150 pcf and are for the typical section only. These weights do not include weight of diaphragms or endblocks.

HL93 LOADING SHEET 1 OF 3

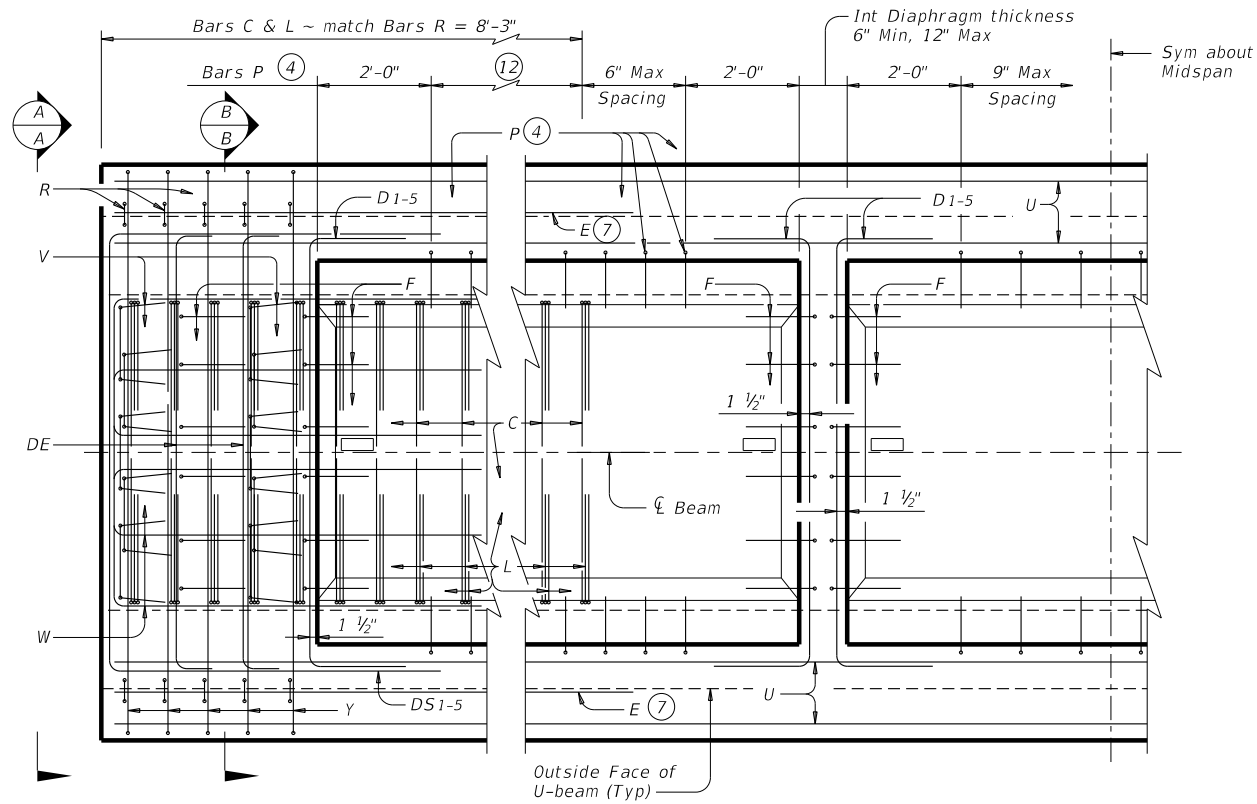
Texas Department of Transportation Bridge Division Standard

PRESTRESSED CONCRETE U-BEAM DETAILS

UBD

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REVISIONS	0389 13	039	SH 146	
DIST	COUNTY	SHEET NO.		
HOU	HARRIS	237		

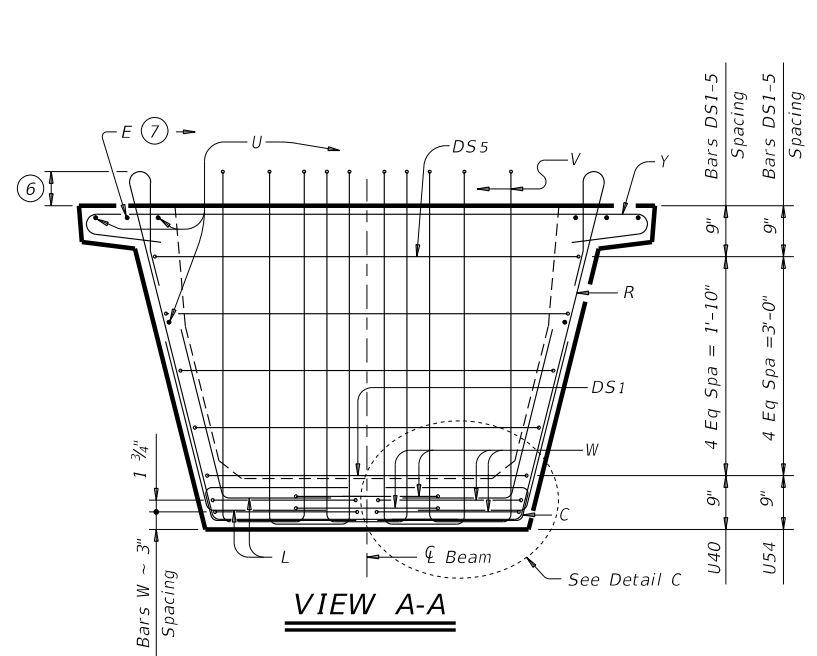
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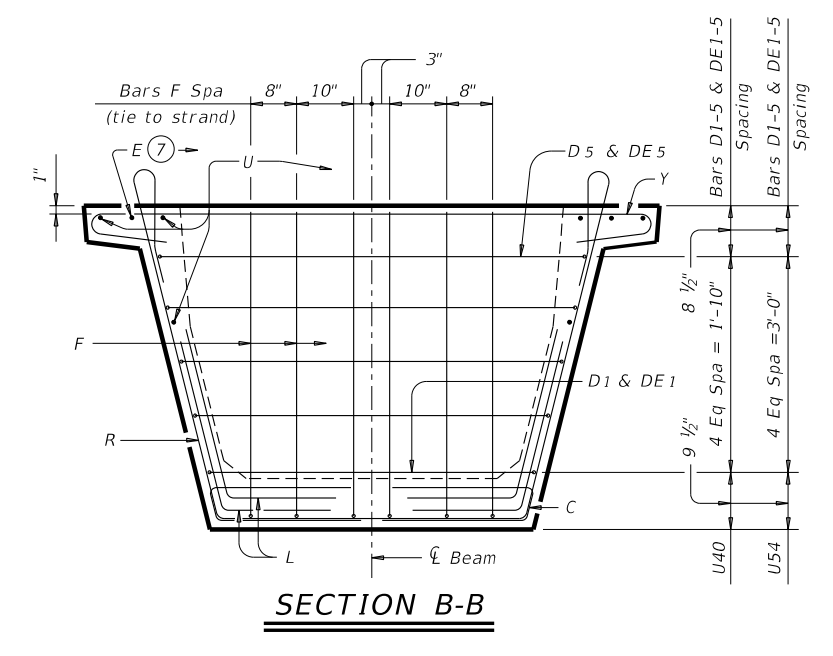
SHOWING SQUARE END

SHOWING INTERIOR DIAPHRAGM

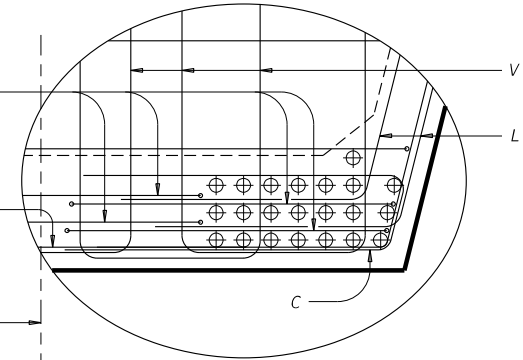
PLAN



VIEW A-A

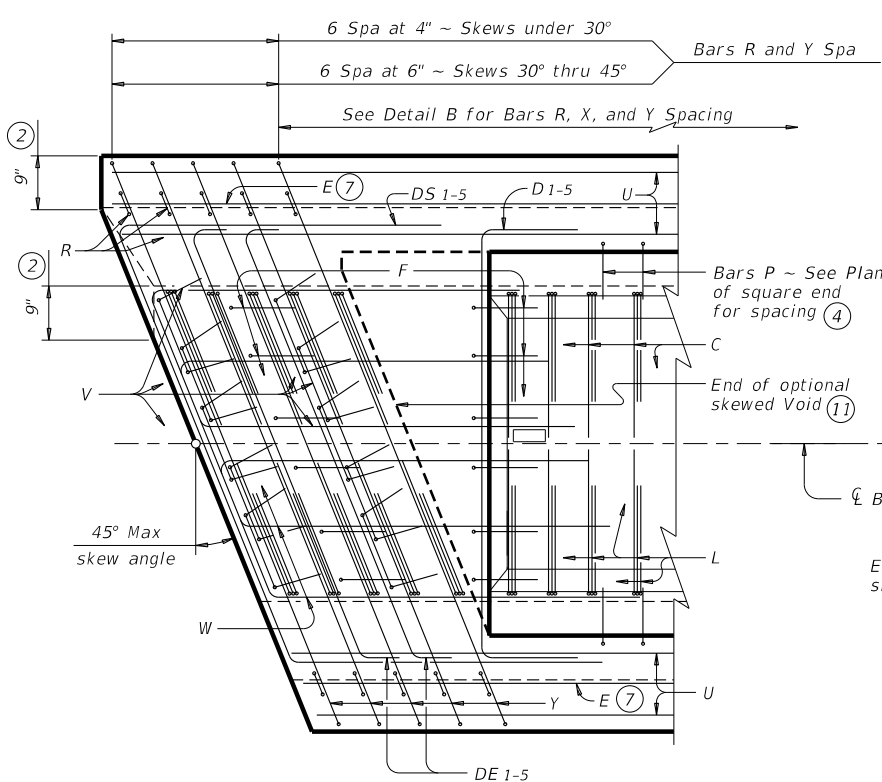


SECTION B-B



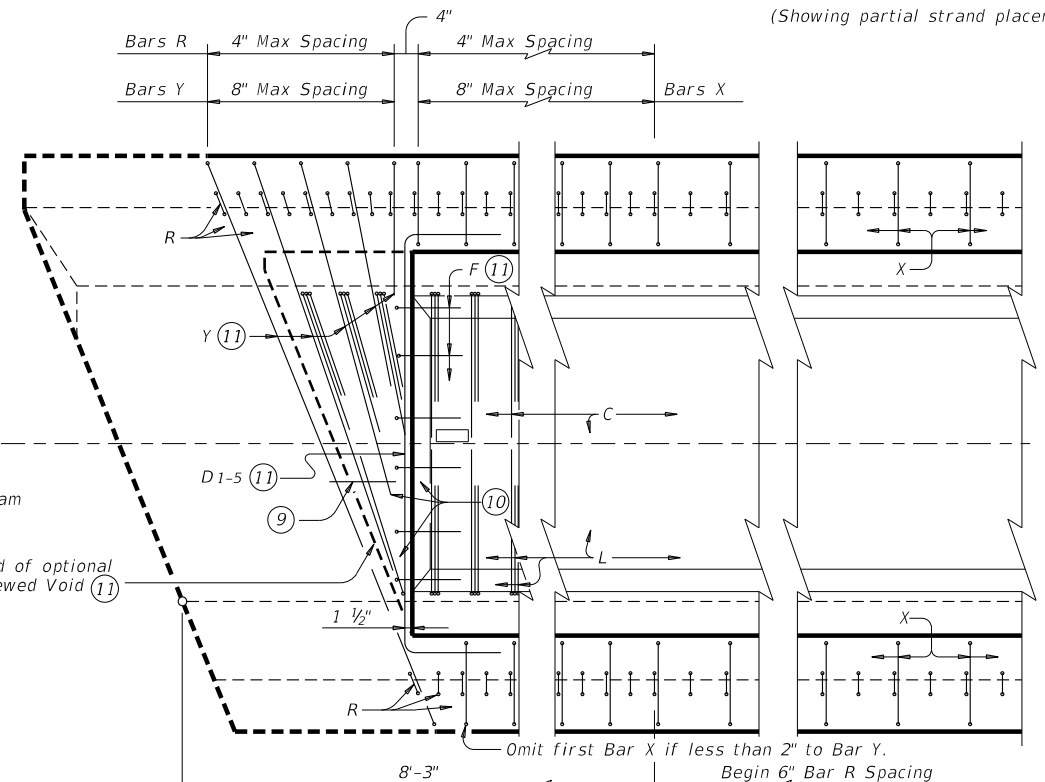
DETAIL C

(Showing partial strand placement)



PLAN ~ SKEWED END

(Skews thru 45°)



DETAIL B

(Bars DE, DS, E, P, U, V and W not shown for clarity)

- ② For skews greater than 15 degrees, breakback both top and bottom flanges 9" as shown. Provide a smooth transition between top and bottom flange breakbacks. Adjust reinforcement as necessary to maintain minimum clear cover.
- ④ Required for beams that will support cantilevered slab overhang formwork and exterior beams only.
- ⑥ 5 1/2" for normal Bars R.
5 1/2" - 6 1/2" Max for Bars R at skewed beam ends.
- ⑦ Provide Bars E (#5 x 15'-0") at beam ends.
- ⑨ Add support bars for Bars Y as necessary.
- ⑩ Cut Bars Y and Bars R as necessary to provide 2" clear between adjacent bars.
- ⑪ When fabricating beams using the optional skewed end, replace Bars Y that are shown to be cut with Bars X, adjust location of Bars F, and adjust Bars D1-5 in shape and location. Shop drawings must show details used.
- ⑫ Where Bars P and L overlap, omit one Bar L and place Bar P instead.

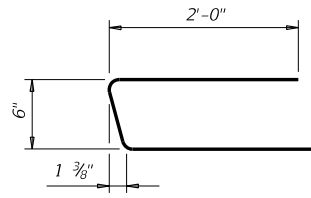
PRESTRESSED CONCRETE U-BEAM DETAILS

UBD

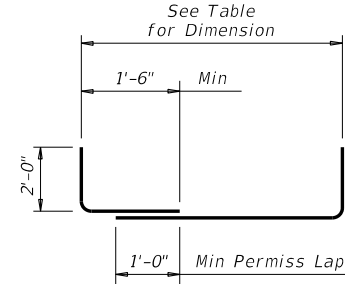
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REVISIONS	0389 13		039	SH 146
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	HOU	HARRIS	238	

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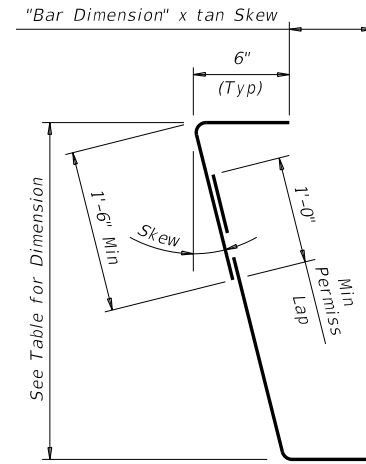


BARS C (#4)



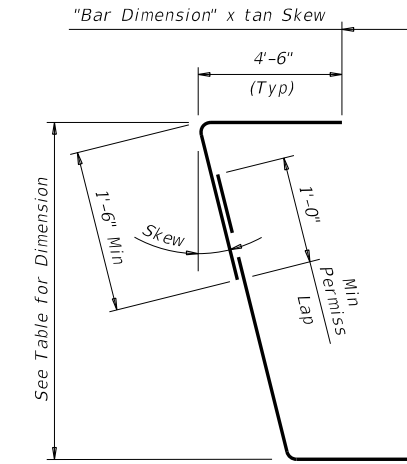
BARS D 1-5 (#4)

BAR D DIMENSION		
Bar	Beam Type	
	U40	U54
D 1	4'-7 1/2"	4'-7 1/2"
D 2	4'-10 1/2"	5'-0"
D 3	5'-1 1/2"	5'-4 1/2"
D 4	5'-3 1/2"	5'-9"
D 5	5'-5"	6'-0 1/2"



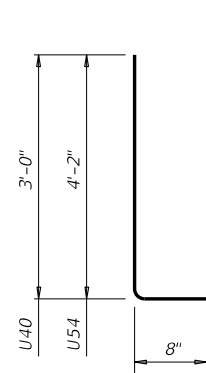
BARS DE 1-5 (#4)

BAR DE DIMENSION		
Bar	Beam Type	
	U40	U54
DE 1	4'-7 1/2"	4'-7 1/2"
DE 2	4'-10 1/2"	5'-0"
DE 3	5'-1 1/2"	5'-4 1/2"
DE 4	5'-3 1/2"	5'-9"
DE 5	5'-5"	6'-0 1/2"

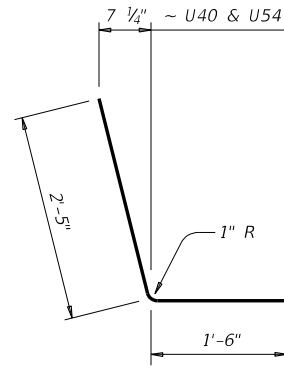


BARS DS 1-5 (#4)

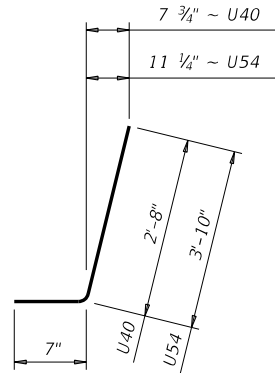
BAR DS DIMENSION		
Bar	Beam Type	
	U40	U54
DS 1	4'-7 1/2"	4'-7 1/2"
DS 2	4'-10 1/2"	5'-0"
DS 3	5'-1"	5'-4"
DS 4	5'-3"	5'-8 1/2"
DS 5	5'-4 1/2"	6'-0"



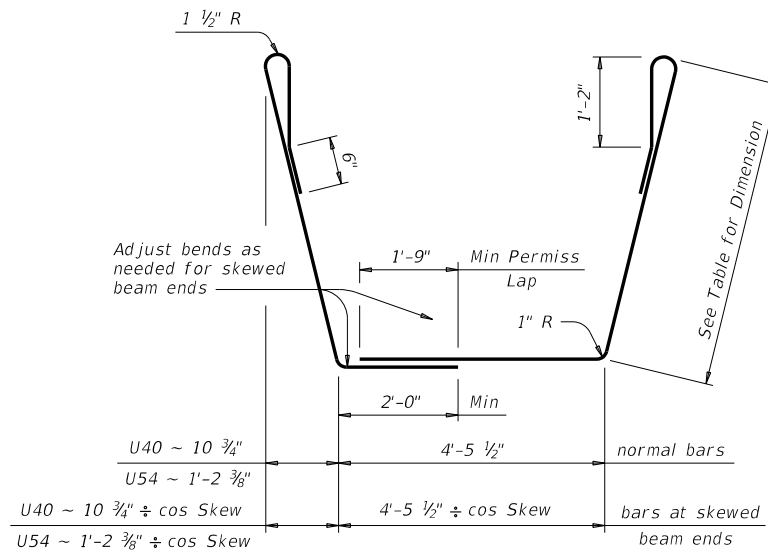
BARS F (#4)



BARS L (#5)

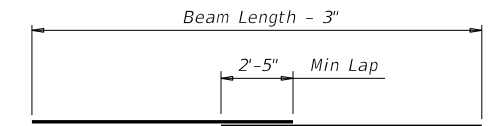


BARS P (#4)



BARS R (#4)

BAR R DIMENSION		
Skew Angle	Beam Type	
	U40	U54
0° thru 15°	3'-9 3/4"	5'-0"
15° thru 30°	3'-10"	5'-0 1/2"
30° thru 45°	3'-10 3/4"	5'-1 1/2"



BARS U (#5)

Bars U may be placed with multiple segments, provided no segment is less than 10 ft in length and 40 ft Min C-C splices.

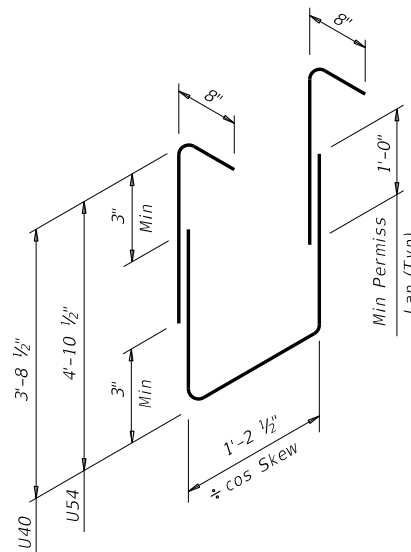
GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications. Details are provided for skew angles up to 45 degrees. Shop drawings can be prepared with horizontal skews rounded to nearest 1/4 degree and beam end vertical batter rounded to the nearest 1/4". These shop drawing tolerances are in addition to the fabrication tolerances listed in Item 424, "Precast Concrete Structural Members (Fabrication)".

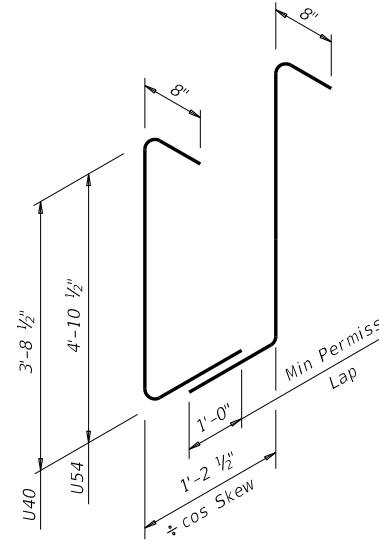
Cover dimensions are clear dimensions, unless noted otherwise. Reinforcing bar dimensions shown are out-to-out of bar.

FABRICATION NOTES:

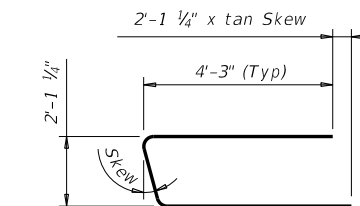
Provide Class H concrete. Provide Grade 60 reinforcing steel. An equal area of deformed welded wire reinforcement, (WWR) (ASTM A1064), may be substituted for Bars L, P, R, X and Y. Chamfer all acute corners for skews over 20 degrees. Provide 1/4" chamfer or 1 3/8" radius at all corners noted to require a chamfer. Horizontal form joints on exterior forms are not permitted. Refer to standard UBEB for embedded plate cast in beam end when bearing pad taper exceeds 5 percent, roadway cross-slope exceeds 5 percent, or otherwise required in plans.



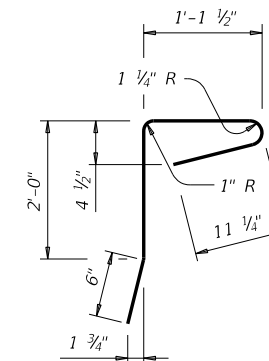
BARS V (#4) ~ Option 1 (ISOMETRIC VIEW)



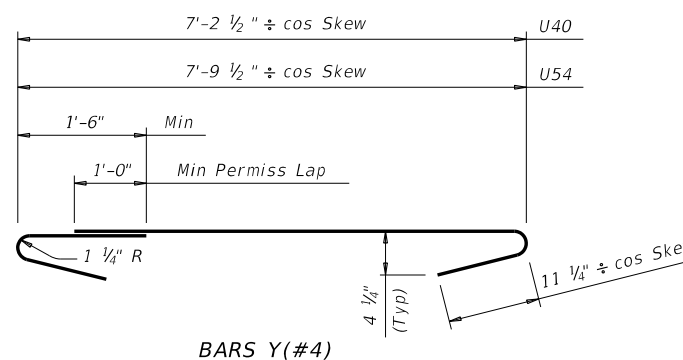
BARS V (#4) ~ Option 2 (ISOMETRIC VIEW)



BARS W (#4)



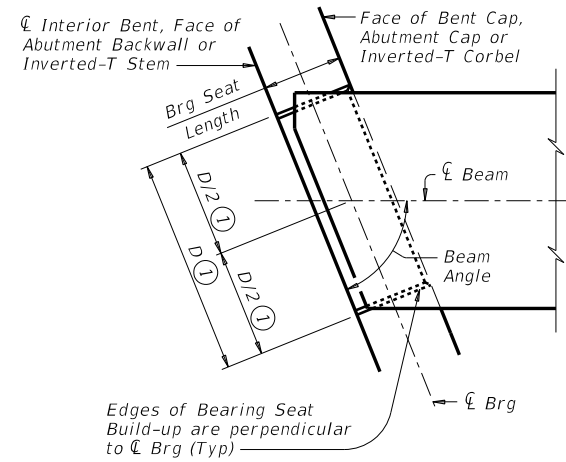
BARS X (#4)



BARS Y (#4)

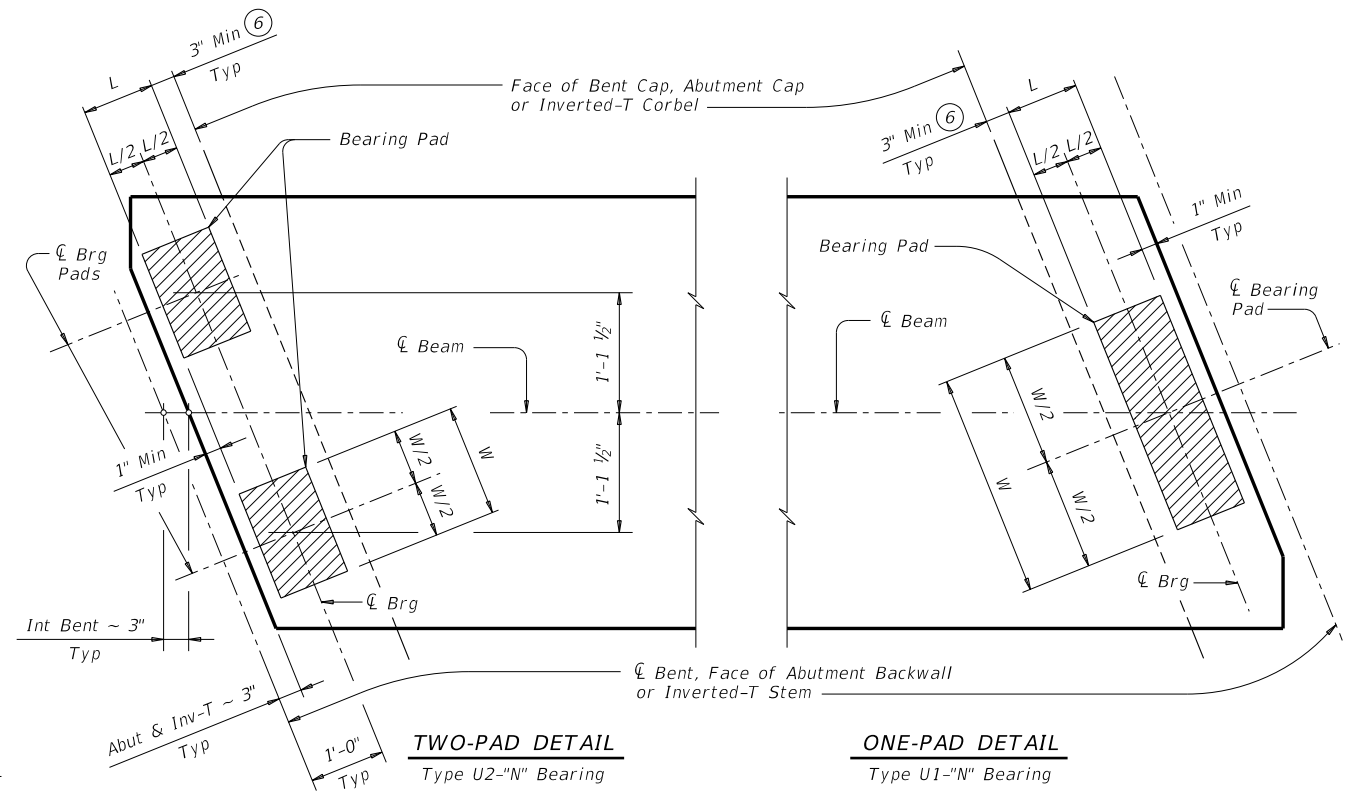
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<h2>PRESTRESSED CONCRETE U-BEAM DETAILS</h2>			
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FILE: ubstds01.dgn	DN: TxDOT	CK: TxDOT	OW: TxDOT
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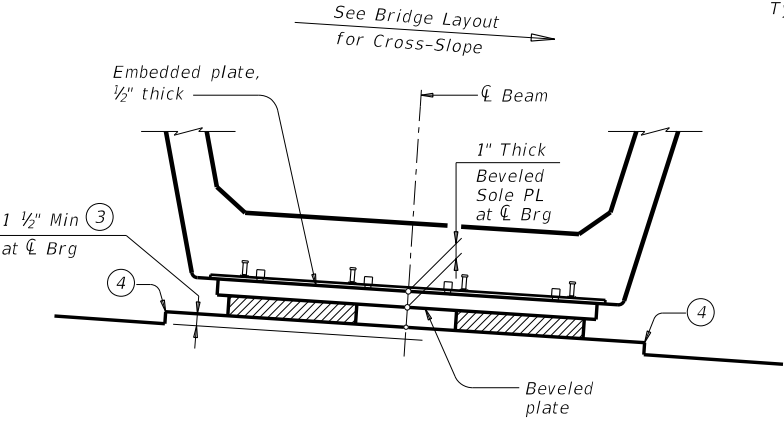
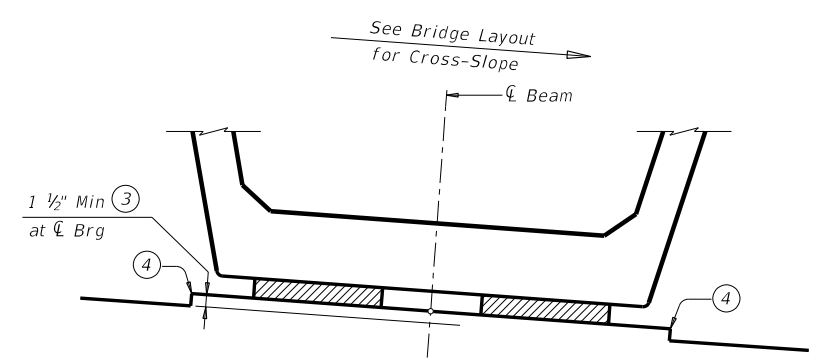
BEARING SEAT DIMENSION "D" ②	
BEAM ANGLE	"D"
75° + thru 90°	4'-6"
60° + thru 75°	5'-0"
45° thru 60°	5'-6"

BEARING SEAT DIMENSIONS



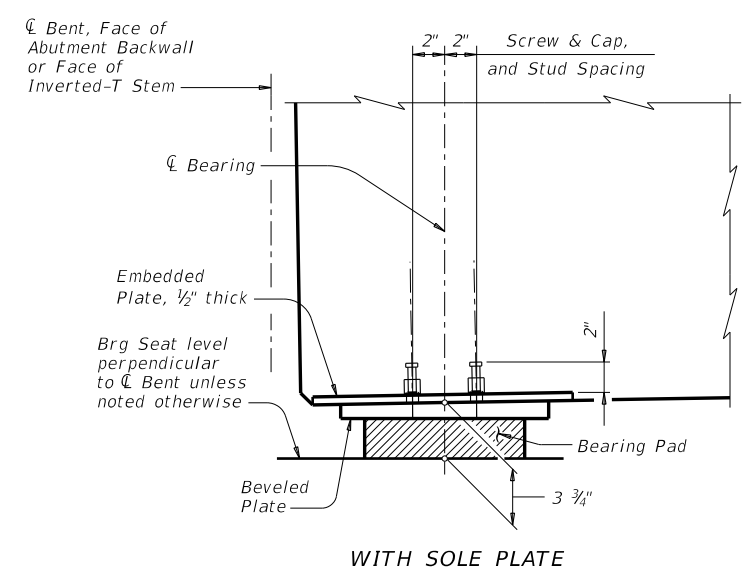
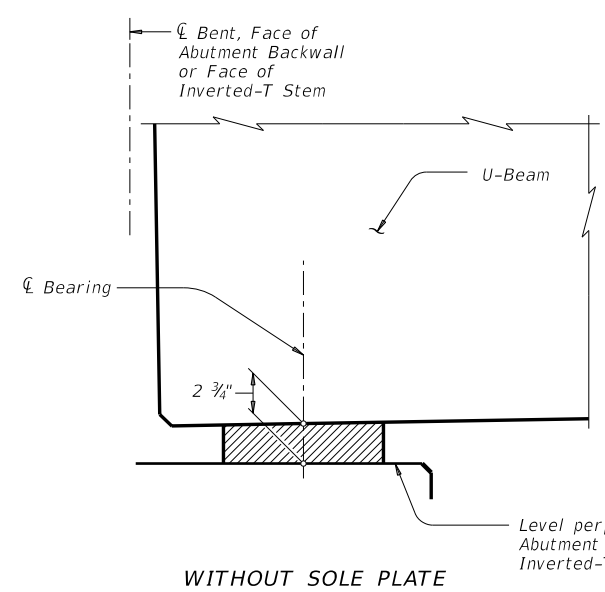
BEARING PAD PLACEMENT AND BEAM END DIAGRAMS

Place one bearing pad at forward station beam end.
Place two bearing pads at back station beam end.



TYPICAL SECTIONS

Showing two pad end, one pad end similar



SHOWING SIDE ELEVATION AT BEAM END

- ① Measured along ̄ of Bearing.
- ② Unless noted otherwise in the plans.
- ③ Reinforce bearing seat build-ups greater than 3" high with #4 bars at 12" Max Spa as per Item 420, "Concrete Substructures".
- ④ See elsewhere in plans for right and left elevations and locations.
- ⑤ Longitudinal slope is defined as bearing pad taper as shown in Bearing Pad Taper Report.
- ⑥ With or without sole plate.

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation Bridge Division Standard

ELASTOMERIC BEARING AND BEAM END DETAILS PRESTR CONC U-BEAMS

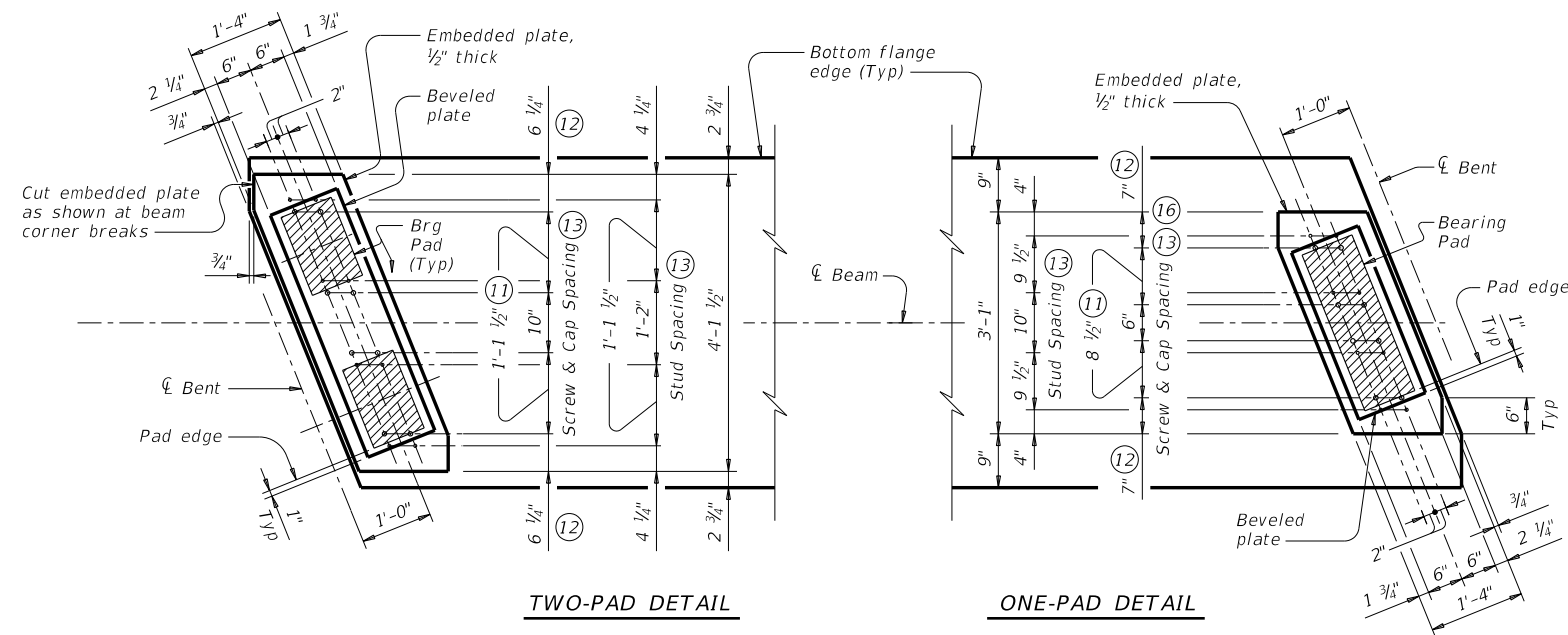
UBEB

FILE: ubstds02.dgn	DN: TxDOT	CK: TxDOT	OW: TxDOT	CK: TxDOT
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REVISIONS	0389 13		039	SH 146
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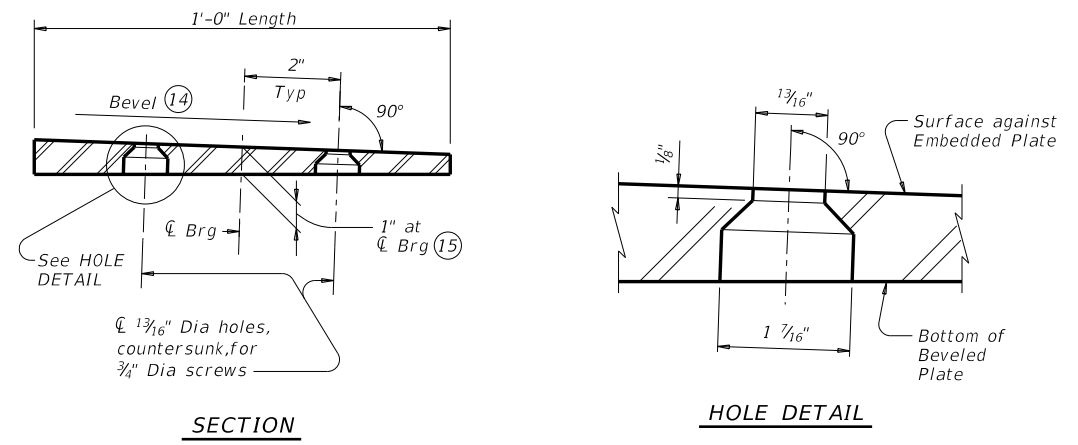
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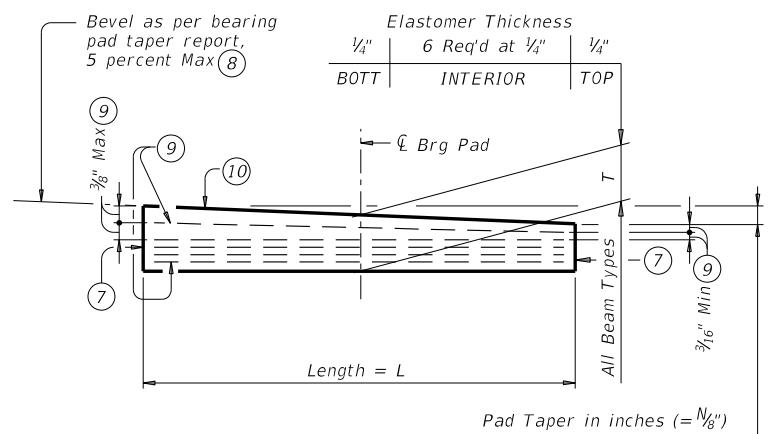
PLAN VIEW OF SOLE PLATE DETAILS

Provide 1/2" Dia x 2" headed studs and 3/4" Dia screws. Electric-arc end weld studs to embedded plate with complete fusion.

- 7) Locate permanent mark here.
- 8) Use beveled sole plate if required bearing pad taper exceeds 5 percent or if cross-slope on span exceeds 5 percent.
- 9) Place 0.105" thick steel laminates parallel to the bottom surface of the pad, except the top laminate(s) may be sloped to satisfy maximum and minimum thickness criteria for tapered elastomeric layers.
- 10) Indicate BEARING TYPE on all pads. For tapered pads, locate BEARING TYPE on the high side. The Fabricator must include the value of "N" (amount of taper in 1/8" increments) in this mark. Examples: N=0, (for 0" taper) N=1, (for 1/8" taper) N=2, (for 1/4" taper) (etc.) Fabricated pad top surface slope must not vary from plan bearing pad taper by more than (0.0625" / Length) (IN/IN).
- 11) Decrease by 2" for skews 30° and over.
- 12) Increase by 2" for skews 30° and over.
- 13) Stud and screw locations may be adjusted slightly to locate them between strand positions.
- 14) Bevel to the slope listed in the Bearing Pad Taper Report.
- 15) Accommodates bevels up to 0.085 ft per foot.
- 16) Omit screws within 1" of beveled plate edge.



BEVELED PLATE DETAILS



LAMINATED ELASTOMERIC BEARING PAD

GENERAL NOTES:

Shop drawings for approval are required and must include a bearing pad layout which identifies location and orientation of all bearing pads. Permanently mark each bearing pad in accordance with the bearing pad layout. Provide a copy of the bearing pad layout to the Engineer. Finish Bearing Surface with a wood float finish. Bearing Surface must be clean and free of all loose material before placing Bearing Pads. For Transition Bents with backwall, the beams and bearing pads must receive the same treatment as shown for Abutments. See Bearing Pad Taper Report sheet for Fabricator's Report of bearing pad taper. Cost of furnishing and installing bearing pads, including beveled and embedded steel plates, is included in unit price bid for "Prestressed Concrete U-Beams".

SOLE PLATE NOTES:

Provide constant thickness bearing pads with beveled and embedded steel sole plates in accordance with these details if the required bearing pad taper exceeds 5 percent, if the roadway cross-slope exceeds 5 percent or if otherwise required in the plans. Provide for all beams in the span.

On the shop drawings, dimension sole plates to the nearest 1/16" based on required thickness at centerline of bearing and required bevel. Thickness tolerance variation from the approved shop drawings is 1/16" +/-, except variation from a plane parallel to the theoretical top surface can not exceed 1/16" total. Bearing surface tolerances listed in Item 424 apply to embedded and beveled plates.

Steel plate must conform to ASTM A 36, A 572 Gr 50, or A 709 Gr 36 or Gr 50. Hot dip galvanize both the embedded plate and beveled sole plate after fabrication. Seal weld caps to embedded plate before galvanizing.

Tap threads in the embedded plate only. Drill and tap prior to galvanizing.

3/4" Dia screws must be electroplated, socket flat head countersunk cap screws conforming to ASTM F 835. Electroplating must conform to ASTM B 633, SC 2, Type I. Provide screws long enough to maintain a 3/4" minimum embedment into the embedded plate and galvanized cap. Provide galvanized steel caps (16 ga Min) with a nominal 1" inside diameter and deep enough to accommodate the screws, but not less than 1/2" deep or deeper than 1".

Install beveled sole plates prior to shipping beams. Installed screw heads must not protrude below the bottom of the beveled plate.

TABLE OF BEARING PAD DIMENSIONS						
Beam Type	One-Pad (Ty U1-"N") (10)			Two-Pad (Ty U2-"N") (10)		
	W	L	T	W	L	T
U40	24"	9"	2 3/4"	12"	9"	2 3/4"
U54	32"	9"	2 3/4"	16"	9"	2 3/4"



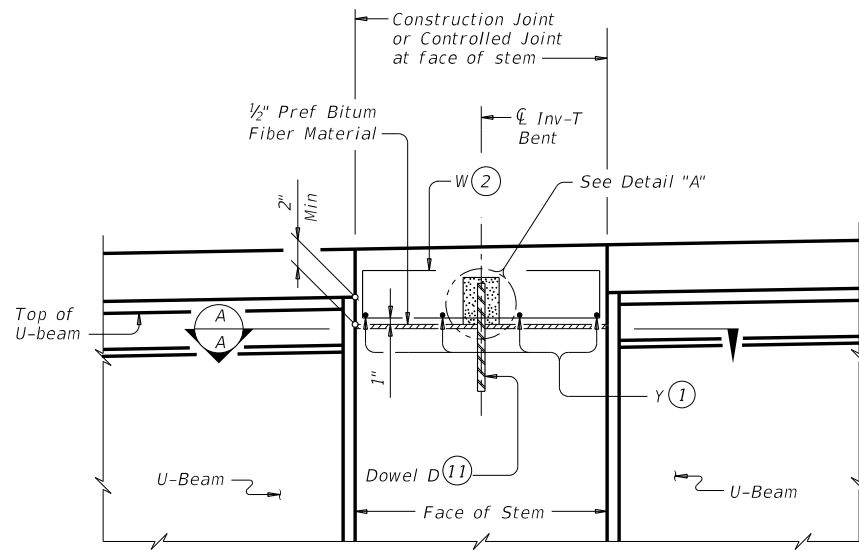
ELASTOMERIC BEARING AND BEAM END DETAILS PRESTR CONC U-BEAMS

UBEB

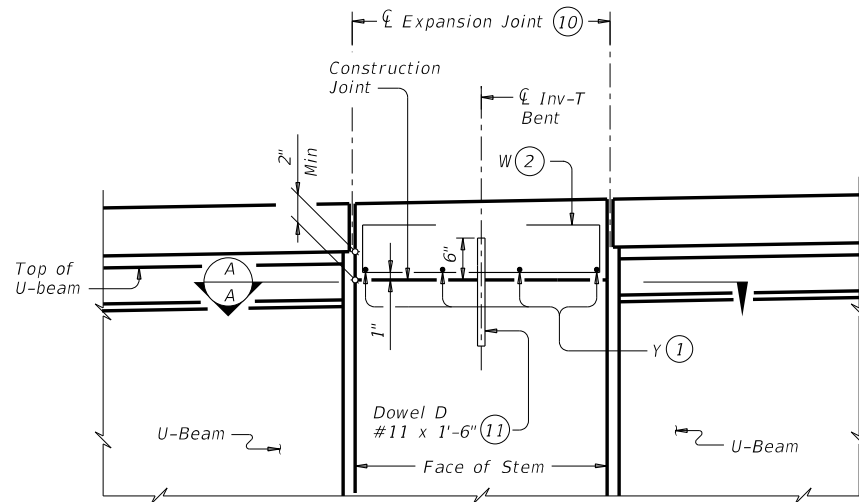
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©TxDOT July 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0389 13	039	SH 146	
DIST	COUNTY	SHEET NO.		
HOU	HARRIS	241		

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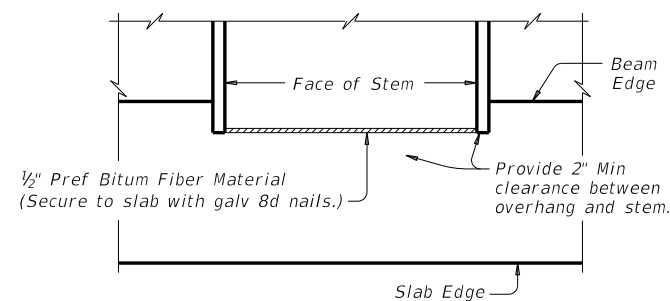
SHOWING CONST JTS OR CONTROLLED JTS



SHOWING EXPANSION JOINTS

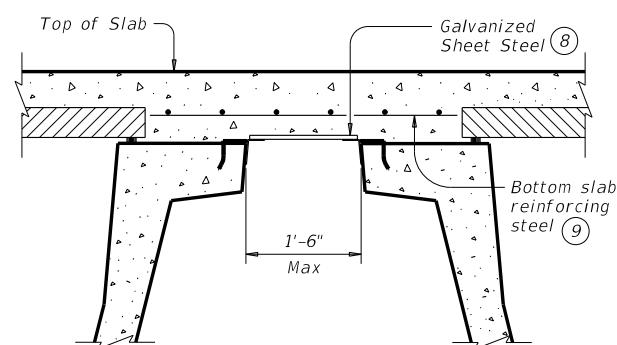
REINFORCEMENT OVER INVERTED-T BENT

Slab reinforcement not shown for clarity.



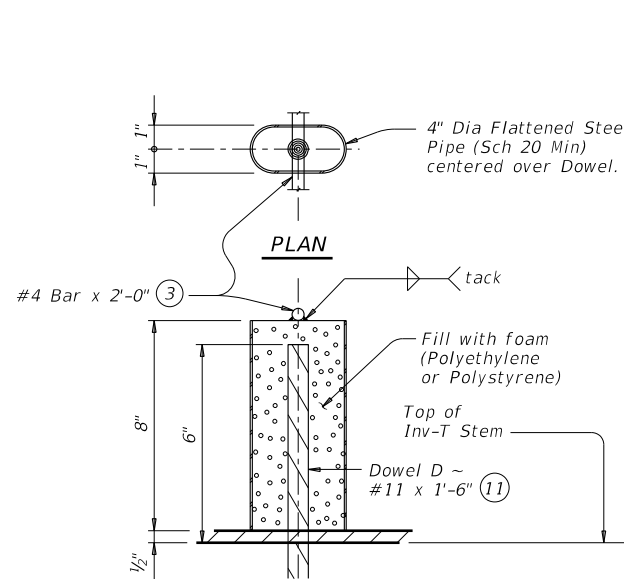
SECTION A-A

Applies to sloped overhang only



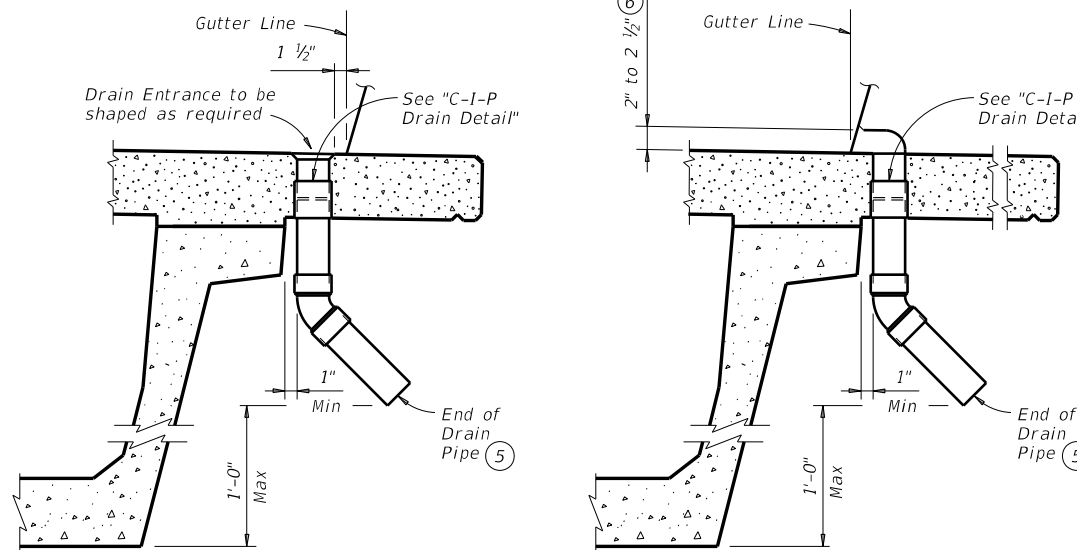
PERMISSIBLE SLAB FORMING DETAIL

See standard PMDF for connection details

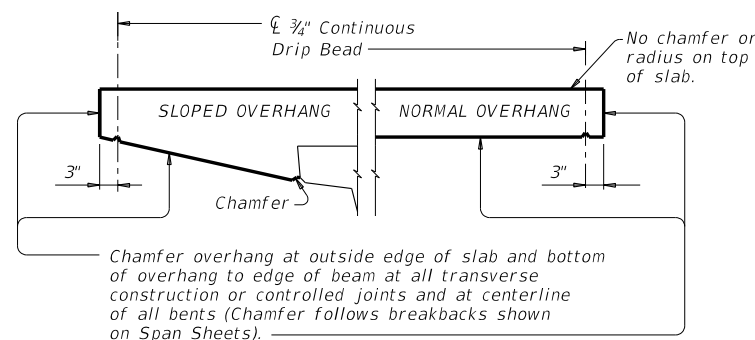


ELEVATION

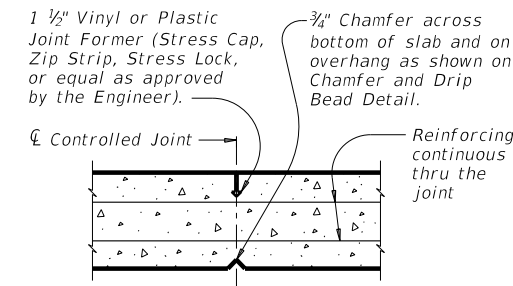
DETAIL "A"



DRAIN DETAILS (7)

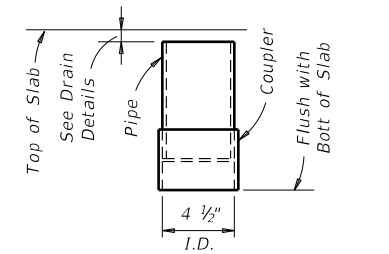


CHAMFER AND DRIP BEAD DETAIL

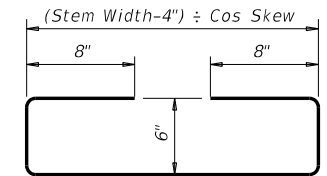


CONTROLLED JOINT DETAIL

(Saw-cutting is not allowed)



C-I-P DRAIN DETAIL (4)



BARS W (#4)

- ① Space Bars Y (#4) at 12" Max. Use 2" end cover. Number of Bars Y must satisfy spacing limit. Place parallel to bent.
- ② Space Bars W at 12" Max (3" from end of cap). Tilt if necessary to maintain cover requirements. Place parallel to longitudinal slab reinforcement.
- ③ Field bend #4 Bars and tie securely to slab steel.
- ④ Roughen outside of PVC with coarse rasp or equal to ensure bond with cast-in-place concrete.
- ⑤ Water must not be discharged onto beams.
- ⑥ Form Drain Entrance in Rail or Sidewalk.
- ⑦ Provide 4" diameter (Sch 40) PVC for all drain pipe and fittings. See Item 481 "Pipe for Drains" for pipe, connections and solvent welding. Bend reinforcing steel to clear PVC 1". Drain length and location will be as directed by the Engineer. No drains will be permitted over roadways or railways, or within 10'-0" of Bent Caps. Degrease outside of exposed PVC, apply acrylic water base primer, then coat with same surface finishing material as used for outside beam face. Variations of the above designs, as required for the type of rail used and its location on the structure, may be installed with the approval and direction of the Engineer.
- ⑧ Galvanized sheet steel can be used to form the slab when clear distance between beams is 1'-6" and less. All requirements for permanent metal deck forms shown on standard PMDF apply.
- ⑨ Bottom slab reinforcing for Permissible Slab Forming Detail must match the size and spacing of the top mat of steel as shown on the span details unless otherwise noted, except bottom reinforcing steel must be #5 bars. Transverse bottom slab reinforcing must have 1" end clear to edge of panel when used with PCP option.
- ⑩ See Layout for Joint Type.
- ⑪ Dowel D (#11) spaced at 5 ft Max. See Inverted-T Bents for quantity and location.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

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

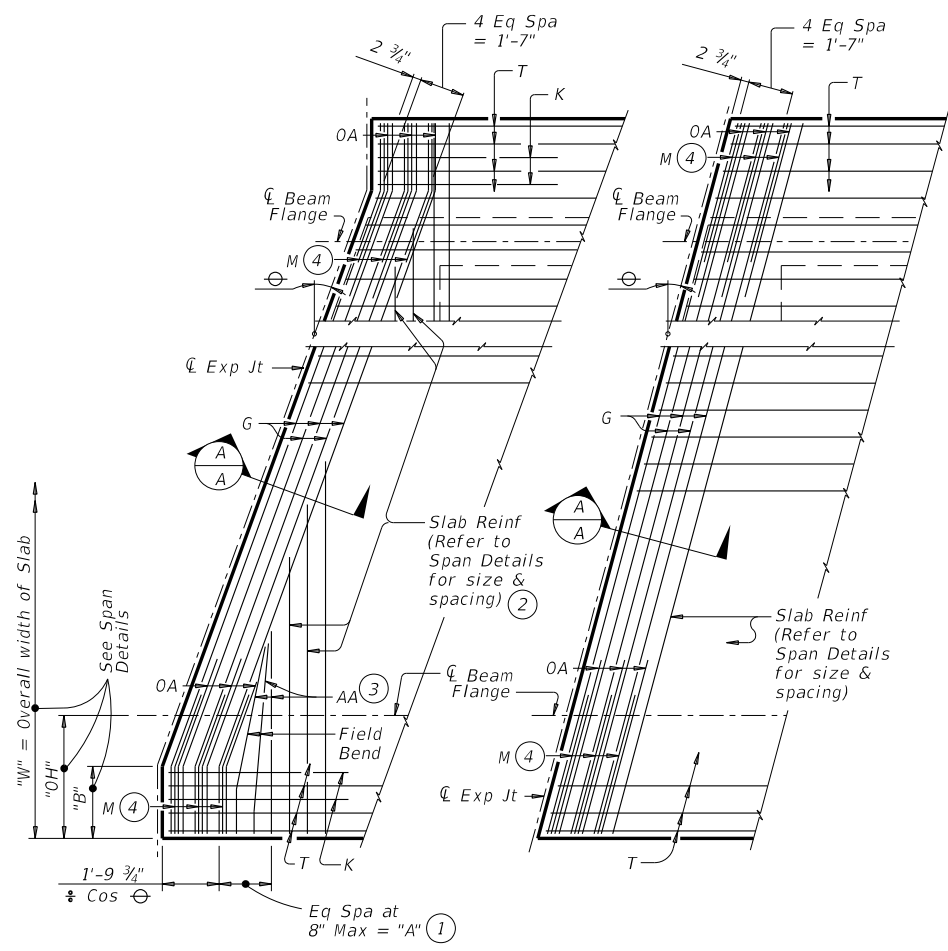
CONSTRUCTION NOTES:

All items (reinforcing steel, drains, joint formers, etc.) shown on this sheet are subsidiary to other bid items.

				Bridge Division Standard	
MISCELLANEOUS SLAB DETAILS PRESTR CONC U-BEAM SPANS					
UBMS					
FILE: ubstas03.dgn	DN: TxDOT	CK: TxDOT	OW: TxDOT	CK: TxDOT	
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	REVISIONS	0389 13		039	SH 146
		DIST	COUNTY	SHEET NO.	
		HOU	HARRIS	242	

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DATE: FILE:

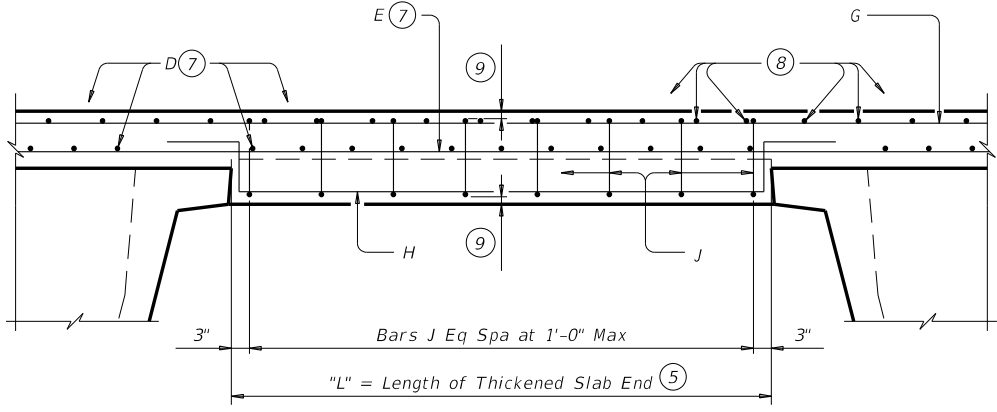


WITH BREAKBACK

WITHOUT BREAKBACK

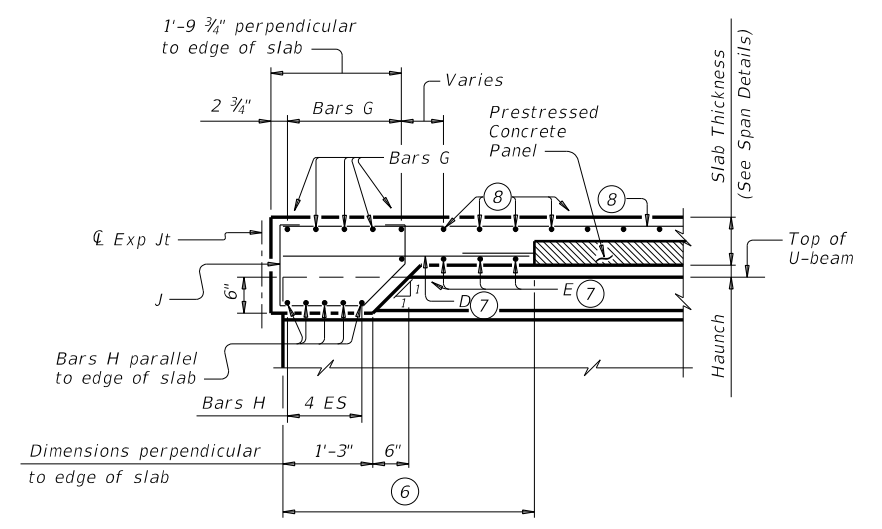
PARTIAL PLAN

(Showing top reinforcing steel only unless noted otherwise)



TYPICAL TRANSVERSE SECTION

- 1 "A" = $(\text{"OH"} + 2.125' + \frac{0.052'}{\sin \theta} - \text{"B"}) \times \tan \theta$
- 2 End the top transverse reinforcement steel at inside Bar G. End the bottom transverse reinforcement steel 1'-0" beyond inside Bar G.
- 3 Bars AA (Top & Bott)
- 4 Place 3 Bars M (Bott) at 10" Max. Field bend as necessary. Substitute Bars Z1 for Bars M when sloped overhangs are required. Bars Z1 are shown on standard PCP.
- 5 Thickened slab end not required for lengths less than 1'-6".
- 6 See standard PCP for panel placement.
- 7 See standard PCP for Bars D and E.
- 8 See Span Details for reinforcement size and spacing.
- 9 Provide clear cover as shown on Span Details.

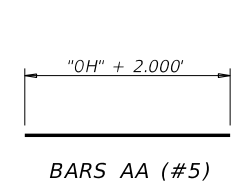


SECTION A-A

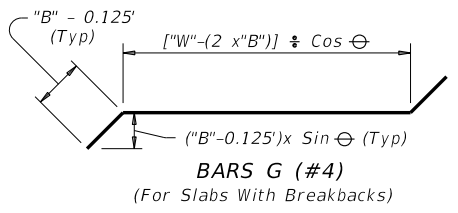
GENERAL NOTES:
 Designed according to AASHTO LRFD Bridge Design Specifications. Use these details in conjunction with the Span Details and standard PCP (if prestressed concrete panels are used). When Option 2 from standard PCP is used, provide Bars AA, G, K and OA in the slab.

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

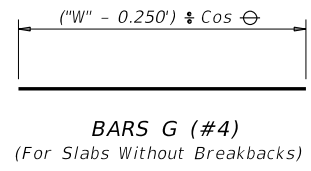
CONSTRUCTION NOTES:
 Provide Grade 60 reinforcing steel. If slab reinforcing steel is shown on the Span Details to be epoxy coated, then Bars AA, G, K, H, J and M must be epoxy coated. Provide bar laps, where required, as follows:
 Uncoated ~ #4 = 1'-5"
 Epoxy Coated ~ #4 = 2'-1"



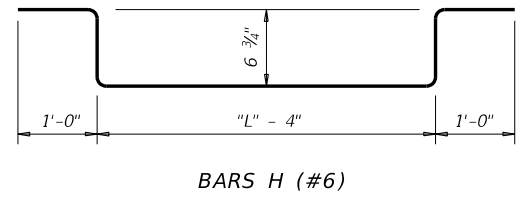
BARS AA (#5)



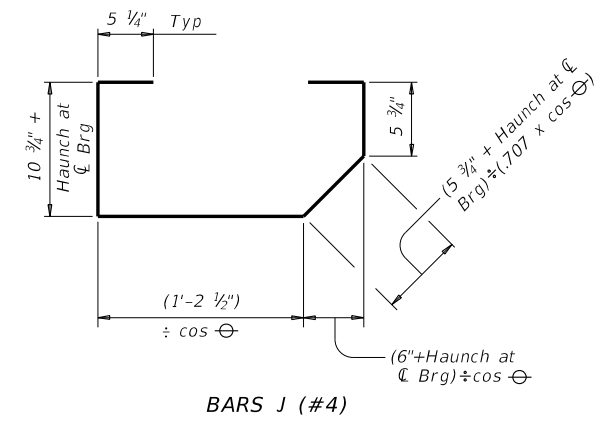
BARS G (#4)
(For Slabs With Breakbacks)



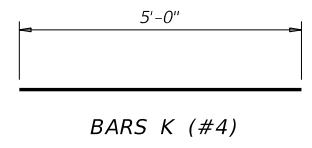
BARS G (#4)
(For Slabs Without Breakbacks)



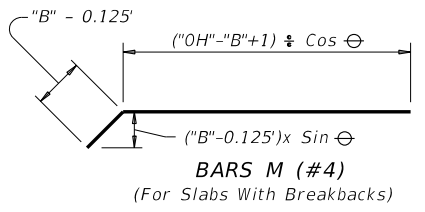
BARS H (#6)



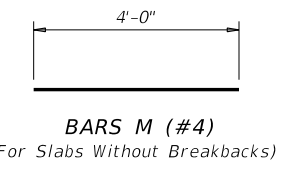
BARS J (#4)



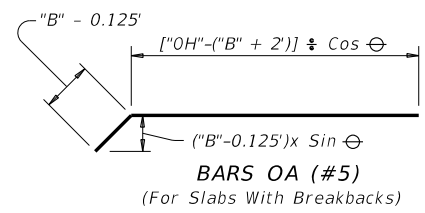
BARS K (#4)



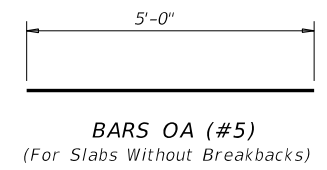
BARS M (#4)
(For Slabs With Breakbacks)



BARS M (#4)
(For Slabs Without Breakbacks)



BARS OA (#5)
(For Slabs With Breakbacks)



BARS OA (#5)
(For Slabs Without Breakbacks)

HL93 LOADING

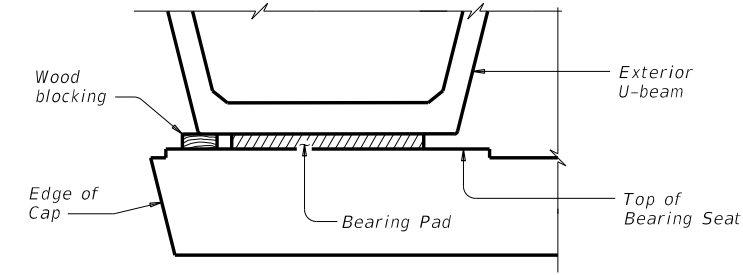


**THICKENED SLAB END DETAILS
 PRESTR CONC U-BEAM SPANS**

UBTS

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DIST	COUNTY	SHEET NO.		
HOU	HARRIS	243		

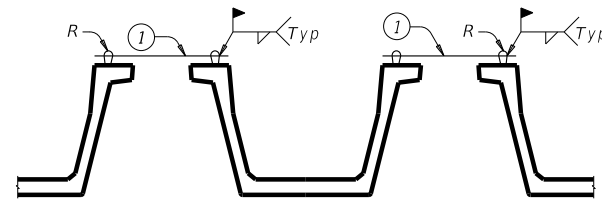
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MINIMUM BLOCKING OF EXTERIOR U-BEAM

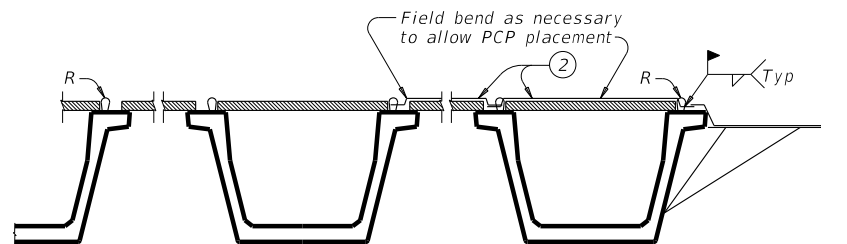
Required minimum blocking of exterior U-beam must be in place before pouring slab concrete. Leave blocking in place for at least 4 days after slab is cast and afterwards remove at the Contractor's convenience.

- ① Weld two #5 bars at each end of each beam to Bars R between all U-Beams immediately after erection. This reinforcement is in addition to that shown for the thickened slab end. This must be in place prior to placing any precast deck panels.
- ② Weld #5 bars at 15' Max spacing along exterior beam and exterior bay after precast deck panels have been placed and prior to placing overhang formwork. This reinforcement is in addition to that shown for the concrete slab.



ERECTION BRACING

(Reinforcement placement after U-Beam erection)



SLAB PLACEMENT BRACING

(Reinforcement placement after PCP placement)

MINIMUM BEAM BRACING

CONSTRUCTION NOTES:

Systems equal to or better than those shown may be used provided details of such systems are submitted and approved prior to erection.

GENERAL NOTES:

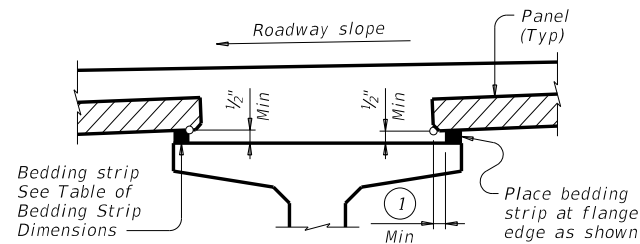
Use of these systems or details does not relieve the Contractor of the responsibility for the adequacy of the bracing and the safety of the structure.

DATE:
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				Bridge Division Standard	
MINIMUM ERECTION AND BRACING REQUIREMENTS PRESTR CONC U-BEAM SPANS					
MEBR(U)					
FILE: ubstae06.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT	
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REVISIONS	0389	13	039	SH 146	
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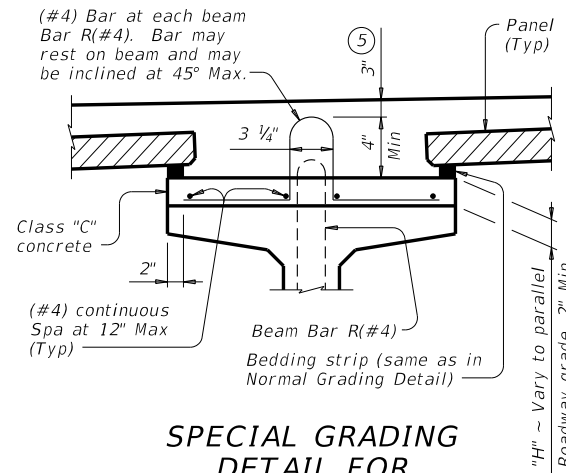
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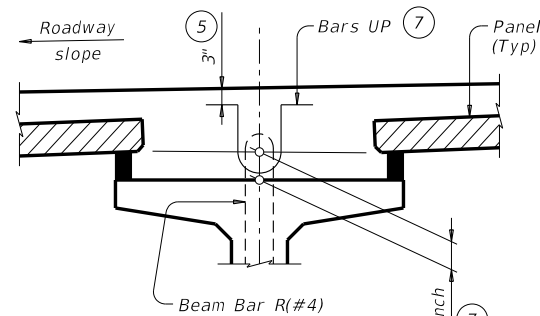
NORMAL GRADING DETAIL ③

Showing prestressed concrete I-girders. (Other beam types similar)



SPECIAL GRADING DETAIL FOR CONCRETE BEAMS

Showing prestressed concrete I-girders. (Other beam types similar)

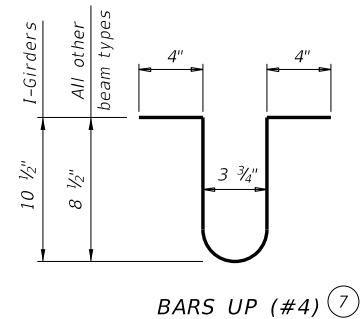


HAUNCH REINFORCING DETAIL

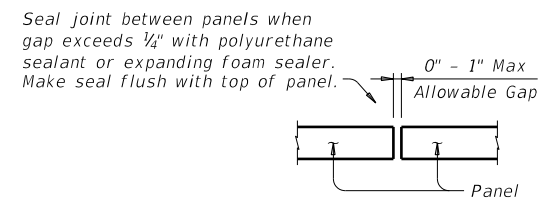
Showing prestressed concrete I-girders. (Other beam types similar)

WIDTH	HEIGHT ④	
	Min	Max
1" (Min)	1/2"	2"
1 1/4"	1/2"	2 1/2"
1 1/2"	1/2"	3"
1 3/4"	1/2"	3 1/2"
2"	1/2"	4"
2 1/4"	1/2"	4 1/2" ②
2 1/2"	1/2"	5" ②
2 3/4"	1/2"	5 1/2" ②
3" (Max)	1/2"	6" ②

- ① 2" Min for I-girders, 1 1/2" Min for all other beam types.
- ② Allowed for I-girders, not allowed on other beam types.
- ③ To reduce the quantity of cast-in-place concrete, bedding strip thickness may be increased in 1/4" increments. Bedding strips must be comprised of one layer. Bond bedding strips to the beams with an adhesive compatible with bedding strips. Bedding strips over 2.5" high may need to be bonded to panels. The same thickness strip must be used under any one panel edge and the maximum change in thickness between adjacent panels is 1/4". Alternatively, bedding strips may be cut to grade. Panels may be supported by an alternate method, using a commercial product, if approved by the Engineer of Bridge Design, Bridge Division. If bedding strips exceed 6" high for I-Girders, 4" high for all other beam types, use Special Grading Detail for Concrete Beams or submit an alternate method to the Bridge Division for approval.
- ④ Height must not exceed twice the width.
- ⑤ Provide clear cover as indicated unless otherwise shown on Span Details.
- ⑥ See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.
- ⑦ Space Bars UP(#4) with Beam Bars R(#4) in all areas where measured haunch exceeds 3 1/2" with I-girders, and 3" for all other beam types. Epoxy coating for Bars UP is not required.
- ⑧ Do not locate construction joints on top of a panel.
- ⑨ Butt adjacent bedding strips together with adhesive. Cut v-notches, approx 1/4" deep, in the top of the bedding strips at 8" o.c..

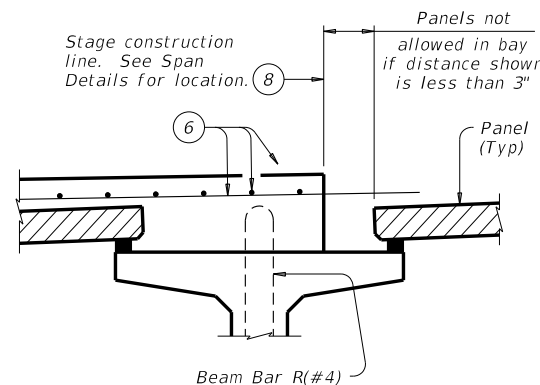


BARS UP (#4) ⑦

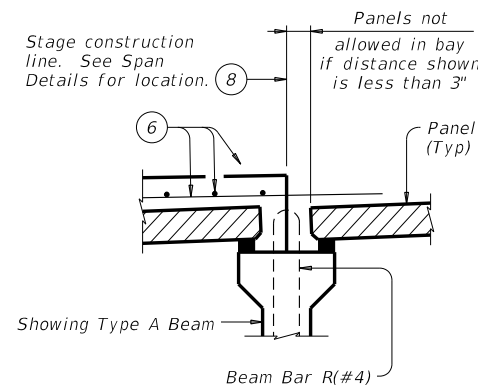


PANEL JOINTS

(Panel reinforcing not shown for clarity. The gap cannot be considered as a panel fabrication tolerance. Adjust panel placement to minimize joint openings.)



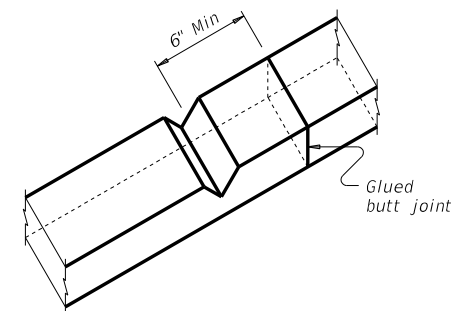
PRESTR CONC I-GIRDERS



PRESTR CONC I-BEAMS

STAGE CONSTRUCTION LIMITATIONS

(Other beam types similar)



BEDDING STRIP DETAIL ⑨

CONSTRUCTION NOTES:
 Erected panels must bear uniformly on bedding strips of extruded polystyrene placed along top flange edges. Placing panels to minimize joint openings is recommended. If additional blocking is needed, special grading details for supporting the panels and extra reinforcing between beam and slab will be considered subsidiary to deck construction. Bars U, shown on PCP-FAB, may be bent over or cut off if necessary. Care must be taken to ensure proper cleaning of construction debris and consolidation of concrete material under the edges of the panels. Bedding strips must be placed at beam flange edges so that adequate space is provided for the mortar to flow a minimum of 1 1/2" under the panels as the slab concrete is placed. To allow the proper amount of mortar to flow between beam and panel, the minimum vertical opening must be at least 1/2". Roadway cross-slope reduces the opening available for entry of the mortar. Bedding strips varying in thickness across the beam are therefore required. For clear span between U-beams less than or equal to 18", see Permissible Slab Forming Detail on Miscellaneous Slab Detail sheets, UBMS.

MATERIAL NOTES:
 Provide Grade 60 reinforcing steel in the cast-in-place slab. See Table of Reinforcing Steel for size and spacing of reinforcement. If the top and bottom layer of reinforcing steel is shown on the Span Details to be epoxy coated, then the D, E, P, & Z bars must be epoxy coated. Provide bar Laps, where required, as follows:
 Uncoated ~ #4 = 1'-7"
 Epoxy Coated ~ #4 = 2'-5"

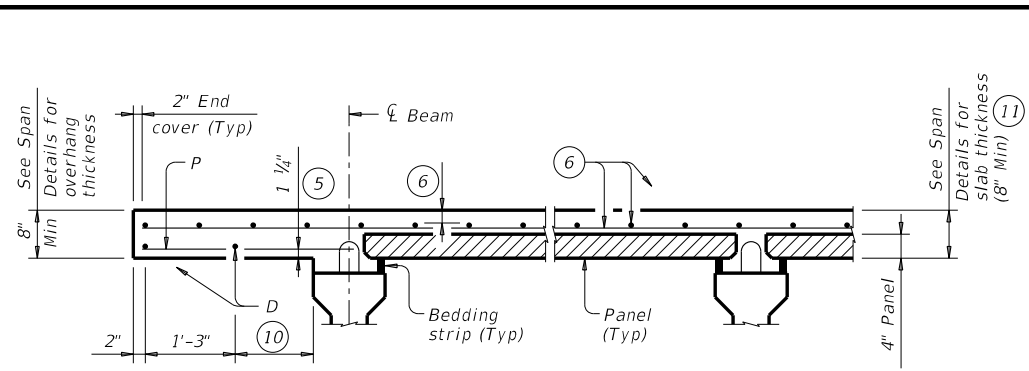
GENERAL NOTES:
 Designed according to AASHTO LRFD Bridge Design Specifications. Panel placement may follow either Option 1 or Option 2 except Option 1 must be used if the skew exceeds 45 degrees. Use of Prestressed Concrete Panels is not permitted for horizontally curved steel plate or tub girders. See Span Details for other possible restrictions on their use. These details are to be used in conjunction with the Span Details, PCP-FAB and other applicable standard drawings. When panel support (bedding strips) deviates from what is shown herein, provide details signed and sealed by a professional Engineer. Any additional reinforcing or concrete required on this standard is considered subsidiary to the bid item "Reinforced Concrete Slab".

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

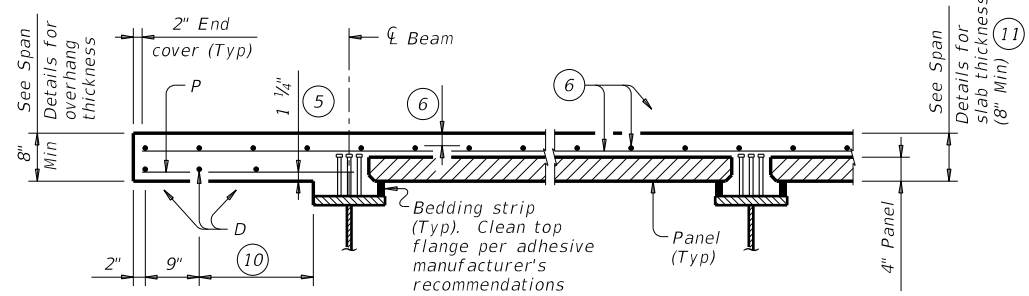
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PRESTRESSED CONCRETE PANELS DECK DETAILS			
PCP			
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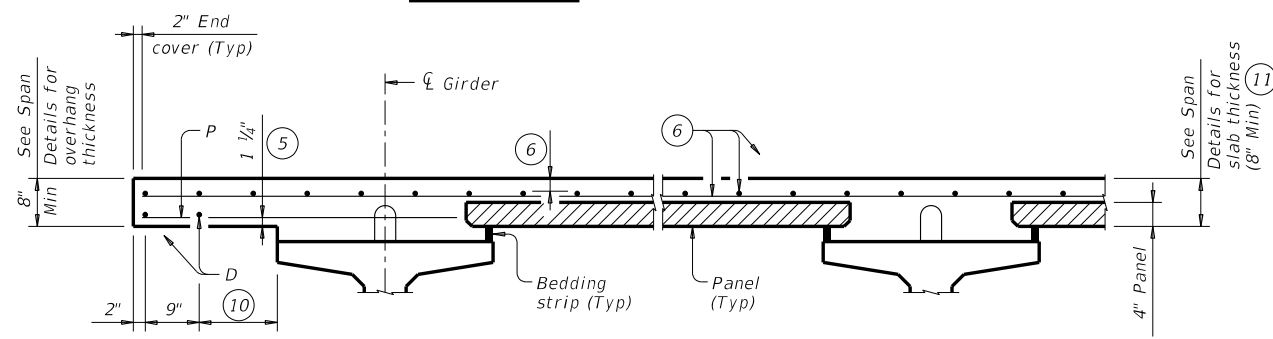
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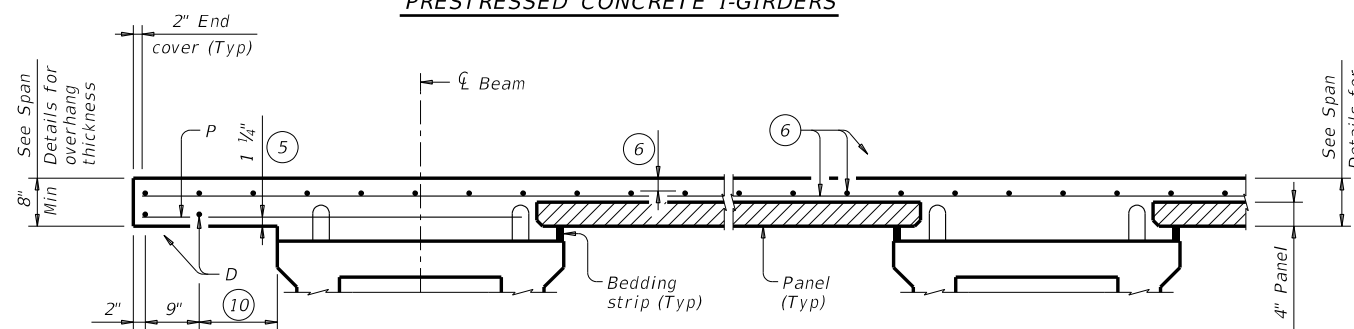
PRESTRESSED CONCRETE I-BEAMS



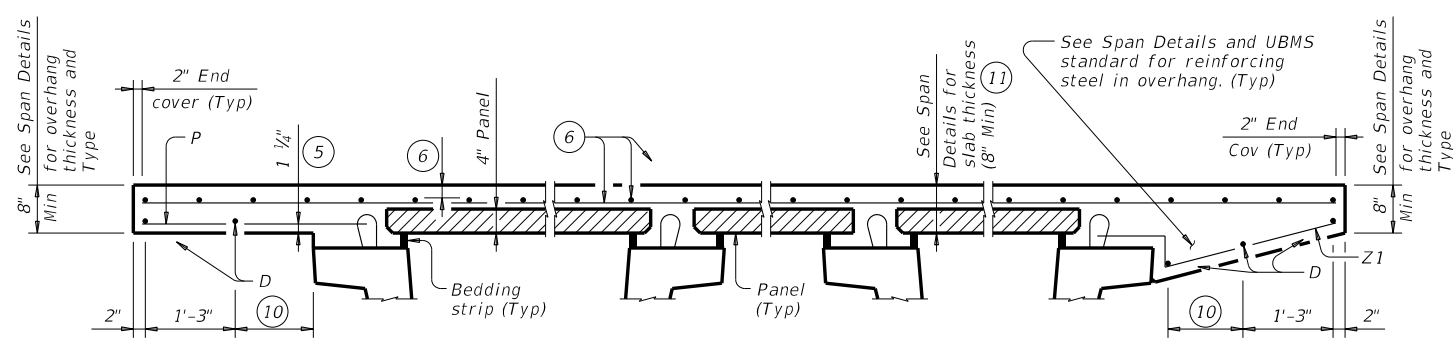
STEEL BEAMS



PRESTRESSED CONCRETE I-GIRDERS



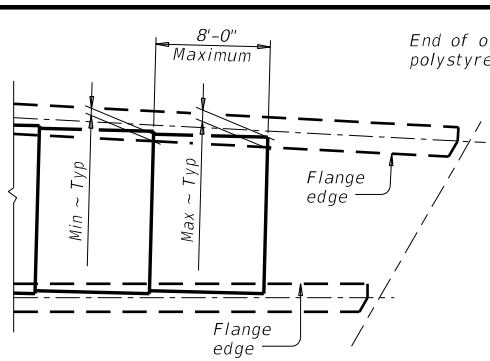
PRESTRESSED CONCRETE X-BEAMS



NORMAL OVERHANG WITH PRESTR CONC U-BEAMS

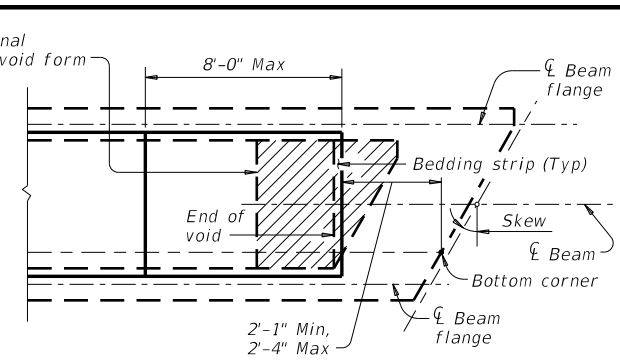
TYPICAL PART TRANSVERSE SECTIONS

SLOPED OVERHANG WITH PRESTR CONC U-BEAMS



AT FLARED BEAMS OR GIRDERS

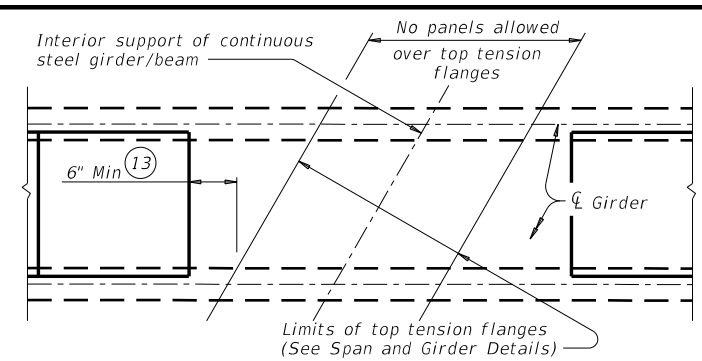
See PCP-FAB standard for Min and Max dimensions based on beam/girder type.



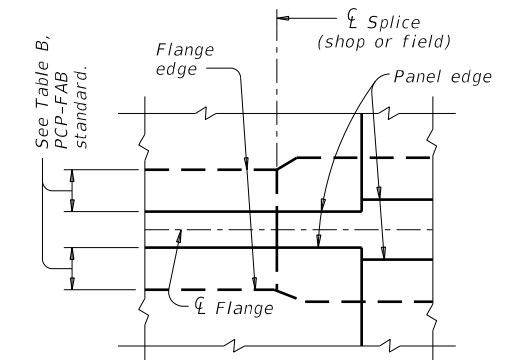
OVER CONC U-BEAMS

PART PLANS OF PANEL PLACEMENT

- 5 Provide clear cover as indicated unless otherwise shown on Span Details.
- 6 See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.
- 9 Butt adjacent bedding strips together with adhesive. Cut v-notches, approx 1/4" deep, in the top of the bedding strips at 8' o.c..
- 10 Equally space additional bar if more than 1'-3" Max.
- 11 The actual thickness constructed may exceed the slab thickness shown on the Span Details but the extra thickness may be no more than 2" (1" for prestressed concrete U-beams and steel beams). Bearing seat elevations or finished grade may be adjusted.
- 12 Field adjust Bars Z1(#4) to match actual slope of slab overhangs. Width of slab overhang will vary along span with curved slab edges. Adjust Bar Z1(#4) dimensions to maintain proper cover. Bars Z2(#4) are located at Inverted-Tee stems only.
- 13 Location of concrete placement sequence boundaries and bolted field splices should be considered by the contractor in determining panel limits.



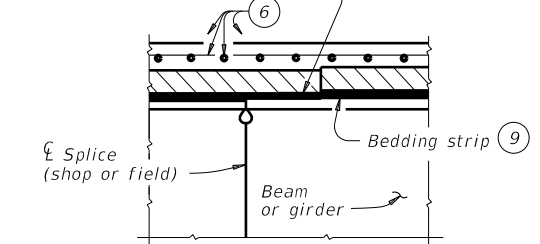
AT INT SUPPORTS OF CONTINUOUS STEEL GIRDERS



PLAN AT SPLICE

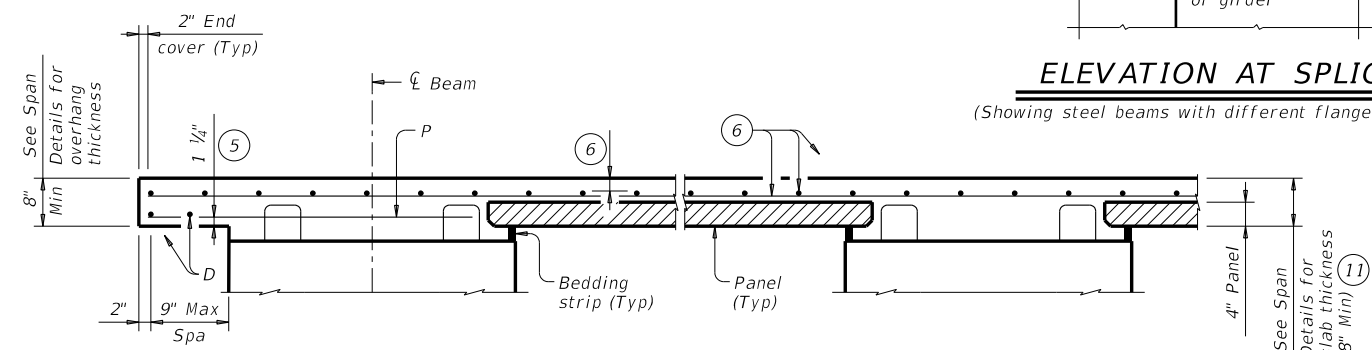
(Showing steel beams with flange width transition)

Cut bedding strip to adjust for difference in flange thickness.



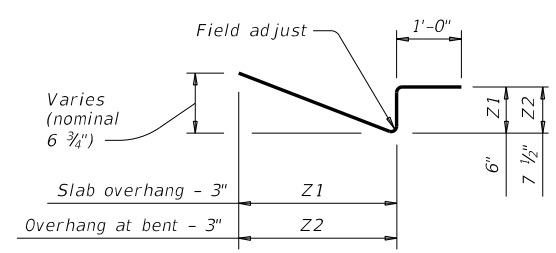
ELEVATION AT SPLICE

(Showing steel beams with different flange thickness)



PRESTRESSED CONCRETE SPREAD SLAB BEAMS

Bars P over exterior beams are still required when no overhang is used. In this case, only one Bar D, 2" from slab edge, is required.



BARS Z (#4)

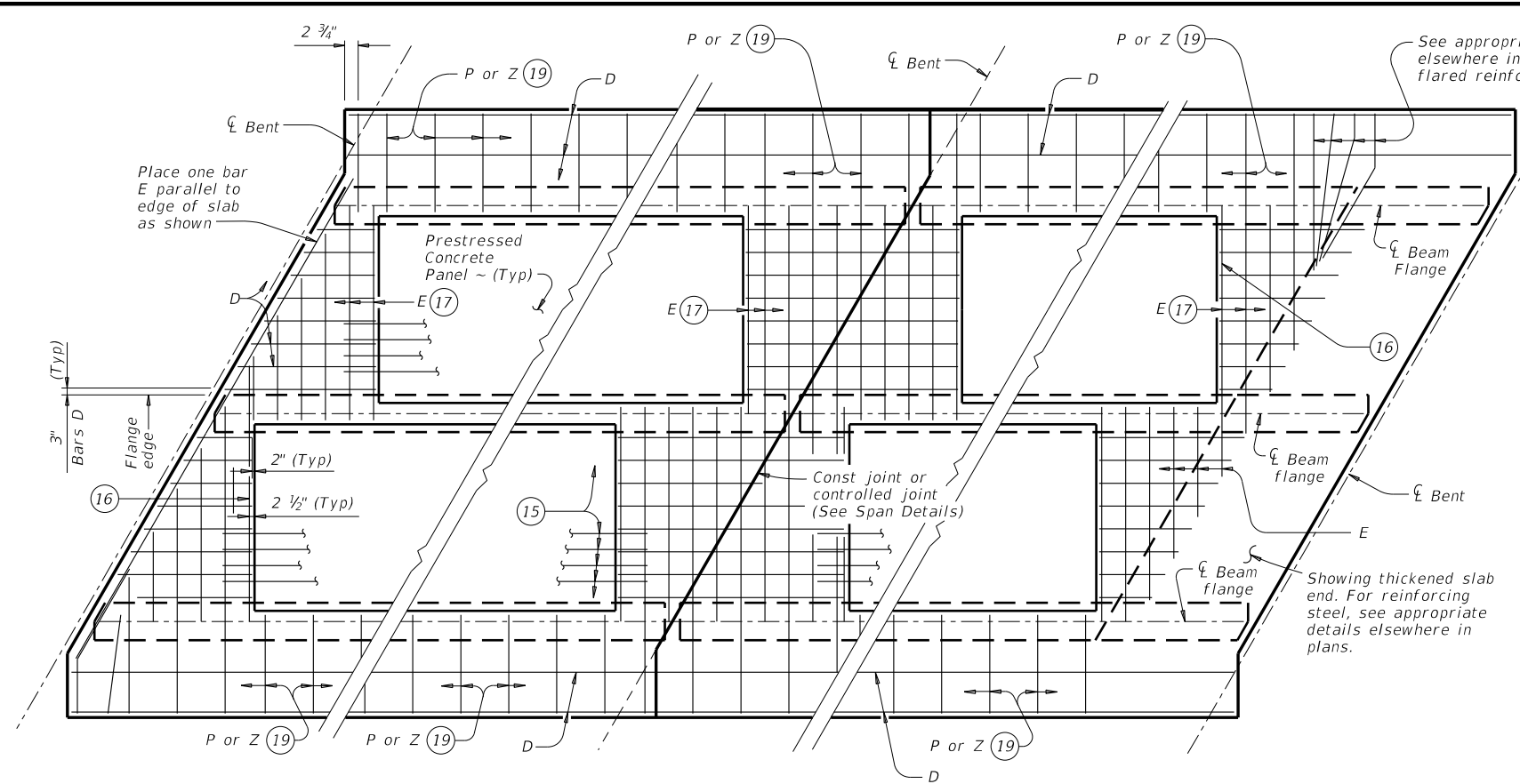
PRESTRESSED CONCRETE PANELS DECK DETAILS

PCP

FILE: pcpstde1-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: JMH
REV: 0389 13	CON: 0389	SECT: 13	JOB: 039	HIGHWAY: SH 146
DIST: HOU	COUNTY: HARRIS	SHEET NO: 246		

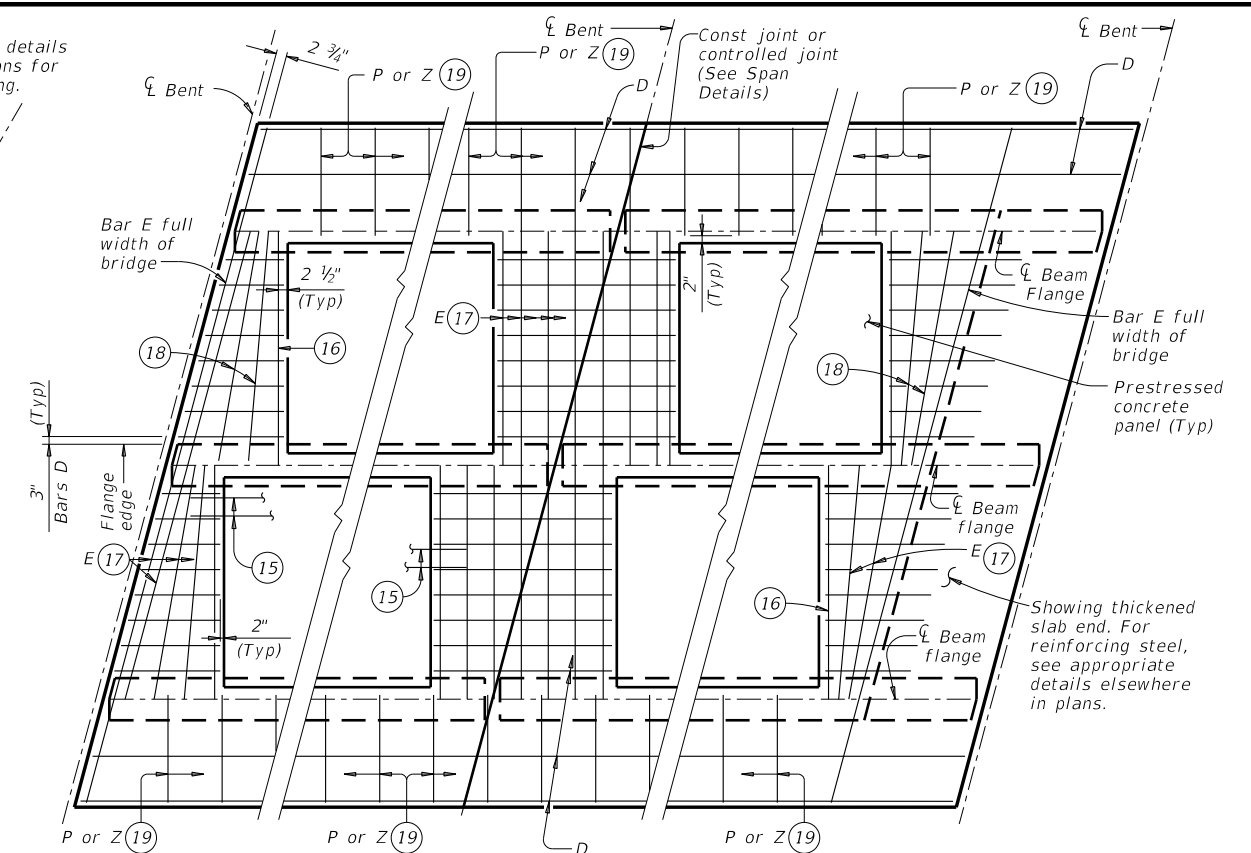
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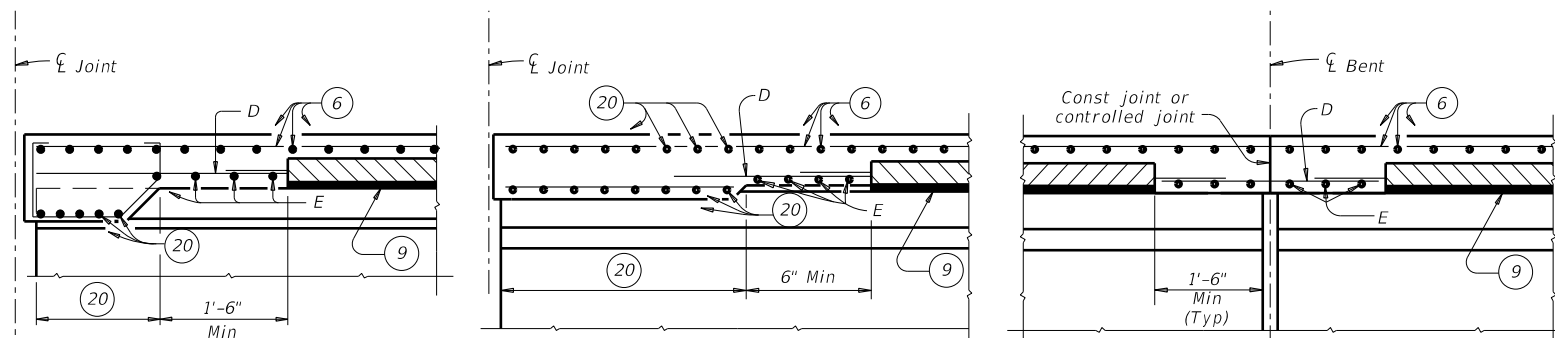
AT ALL SPAN ENDS UNLESS NOTED OTHERWISE
 AT INTERIOR BENTS
 AT THICKENED END SLABS

OPTION 1 ~ PLAN OF SLABS WITH NORMAL REINFORCEMENT

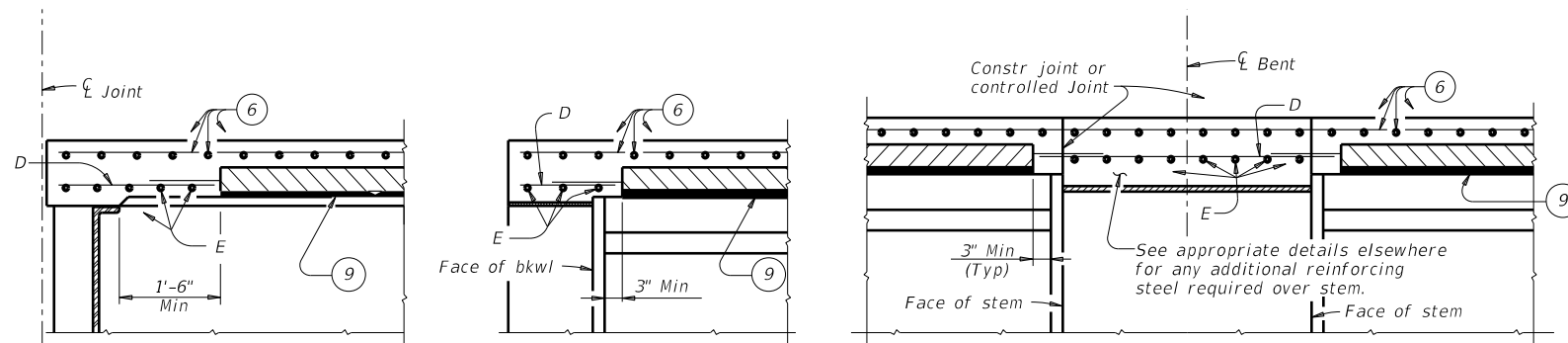


AT ALL SPAN ENDS UNLESS NOTED OTHERWISE
 AT INTERIOR BENTS
 AT THICKENED END SLABS

OPTION 1 ~ PLAN OF SLABS WITH SKEWED REINFORCEMENT



AT THICKENED SLAB ENDS FOR PRESTR CONC U-BMS
 AT THICKENED SLAB ENDS FOR PRESTR CONC I-BMS AND STEEL BMS
 AT SLAB CONTINUOUS OVER CONVENTIONAL INTERIOR BENTS FOR ALL SIMPLE SPAN BMS



AT CONVENTIONAL END DIAPHRAGMS FOR STEEL BMS
 AT SLAB OVER ABUTMENT BACKWALL FOR ALL BMS
 AT SLAB CONTINUOUS OVER INVERTED-T BENTS FOR ALL BMS

OPTION 1 ~ ELEVATIONS AT BEAM ENDS

- 6 See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.
- 9 Butt adjacent bedding strips together with adhesive. Cut v-notches, approx 1/4" deep, in the top of the bedding strips at 8' o.c.
- 14 Max Spacing as listed unless otherwise shown.
- 15 At connection with cast-in-place slab, extend longitudinal panel reinforcement. See PCP-FAB for details.
- 16 Maintain one Bar E(#4) parallel to panel ends (Typ).
- 17 Bars E(#4) not continuous over beam flanges must overlap beam flange 6" Min.
- 18 Add flared Bars E(#4) (Min Spa = 6", Max Spa = 12") as required at panel ends.
- 19 Where possible, Bars E(#4) may be extended into overhangs to replace Bars P(#4). Bars Z(#4) are required for sloped overhangs with U-Beams.
- 20 See appropriate thickened slab end details for reinforcing and limits of thickened slab end.

TABLE OF REINFORCING STEEL (14)		
BAR	SIZE	Max Spa (in.)
D	#4	9
E	#4	9
P	#4	18
UP	#4	~
Z	#4	18



PRESTRESSED CONCRETE PANELS DECK DETAILS

PCP

FILE: pcpstde1-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: JMH
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0389 13	039	SH 146	
DIST	COUNTY	SHEET NO.		
HOU	HARRIS	247		

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DATE: FILE:

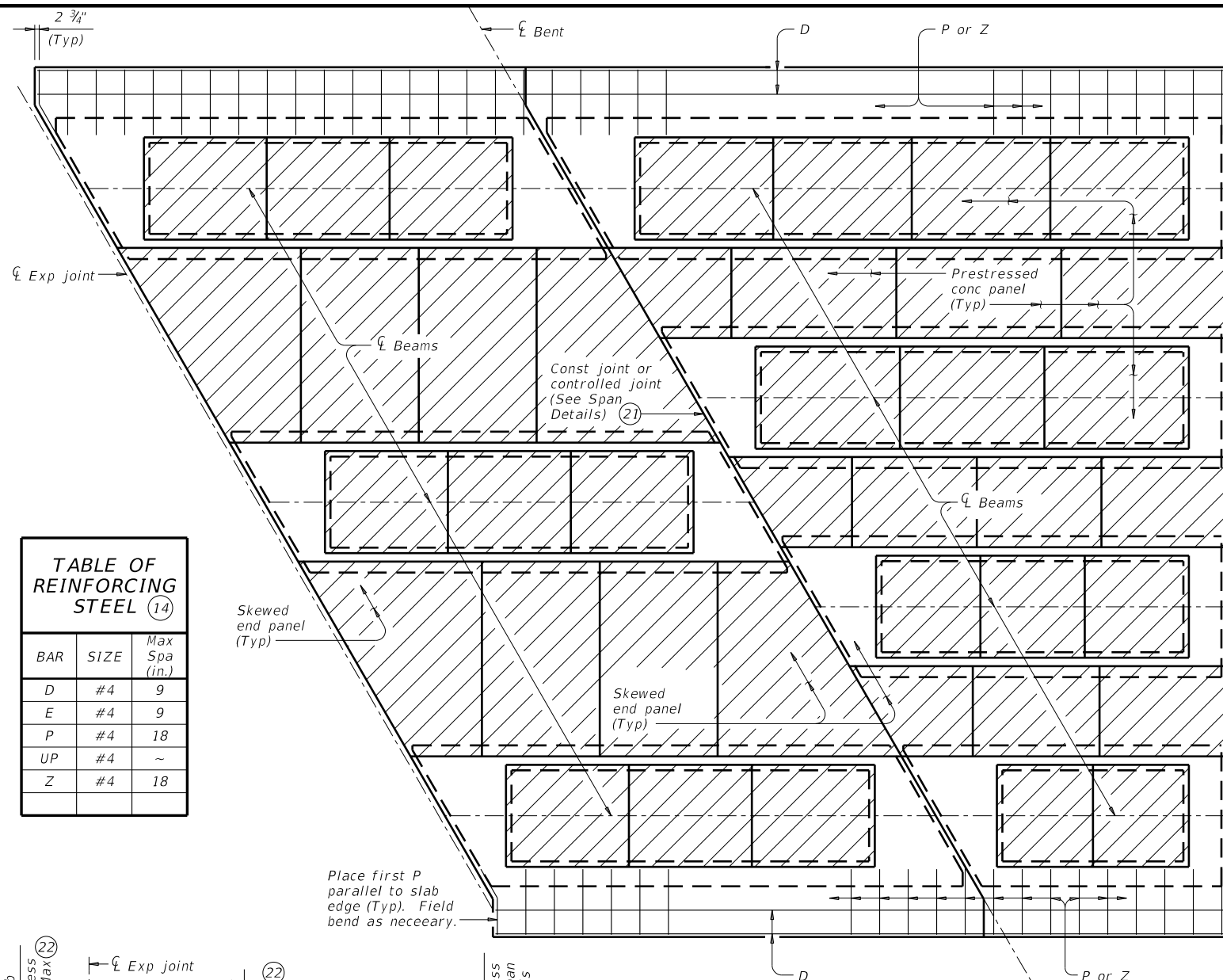
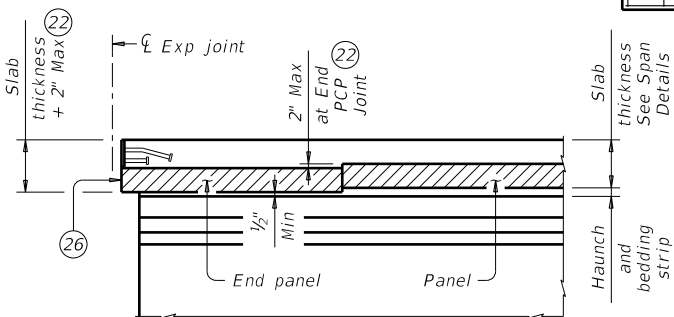
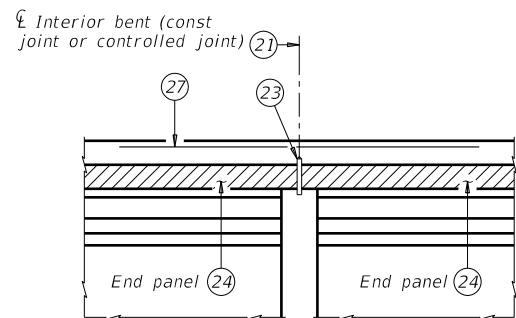


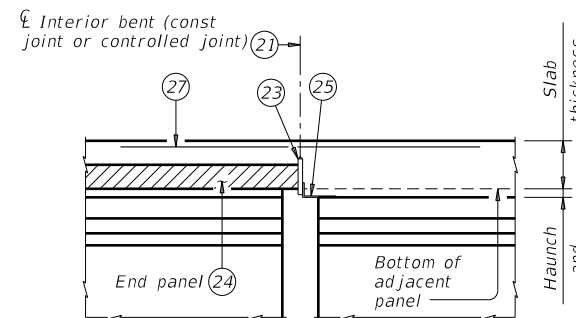
TABLE OF REINFORCING STEEL (14)		
BAR	SIZE	Max Spa (in.)
D	#4	9
E	#4	9
P	#4	18
UP	#4	~
Z	#4	18



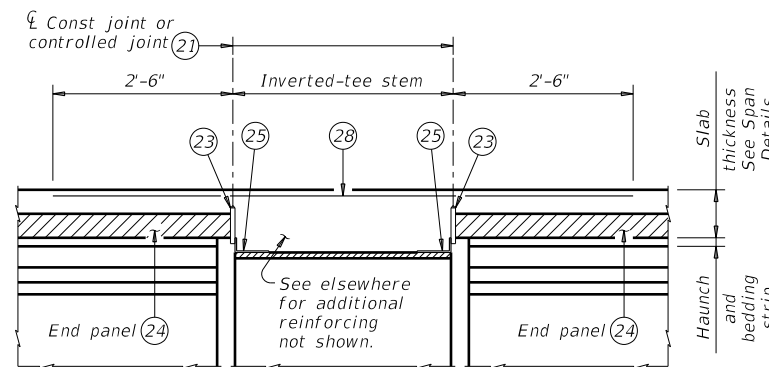
JOINTS (BETWEEN BEAMS/GIRDERS OR AT INV-T STEM)
For SEJ-A, SEJ-S(0), AJ, and Type A expansion joints only.



CONVENTIONAL INTERIOR BENT
Panel against panel between beams/girders.



CONVENTIONAL INTERIOR BENT
Panel against beam/girder end in adjacent span.



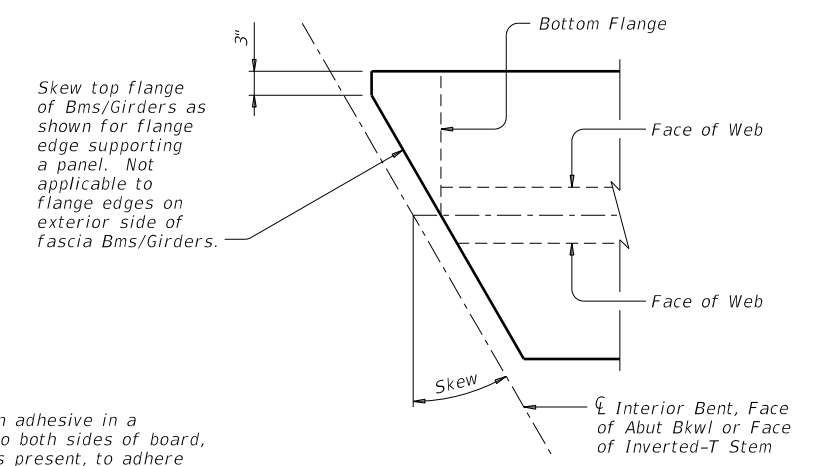
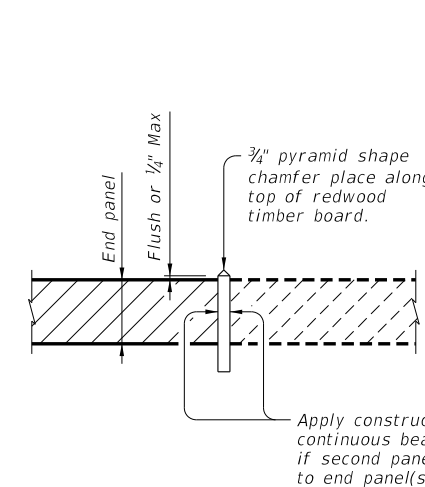
INVERTED-T BENT
Panels against inverted-tee stem

OPTION 2 ~ PLAN OF SLAB
(Showing U-Beams; other beams similar)

ELEVATION EXAMPLE OF END PANEL AND TIMBER BOARD (23)

See "Option 2 ~ Elevation At Beam Ends".

- (6) See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.
- (14) Max Spacing as listed unless otherwise shown.
- (21) 1 1/2" Vinyl or plastic joint former at controlled joints (Stress Cap, Zip Strip, Stress Lock, or equal as approved by the Engineer.)
- (22) End panel may be set up to 2" lower to accommodate expansion joint hardware, provided bedding strip is not less than 1/2" thick.
- (23) 3/4" thick redwood timber board, leave in place. Redwood timber board placed flush with top of panel or within 1/4" Max above panel. Place 3/4" pyramid shape chamfer along top of timber board. See "Elevation Example of End Panel and Timber Board". Place straight, within 1/4" of centerline of bent or face of inverted-tee, across bridge width and end board at exterior flange edge of fascia beams/girders. Do not extend into overhang.
- (24) Place panel within 1/2" of 3/4" thick board.
- (25) Permanent galvanized steel sheet form. Removable formwork is acceptable.
- (26) Place end panel within 1/2" of expansion joint opening. End panel cannot encroach on required expansion joint opening.
- (27) Place additional (#4) bar 5'-0" in length between every slab bars T. Center (#4) bar on Joint.
- (28) Place additional (#4) bar continuous 2'-6" beyond each side of Inverted-T Stem between every slab bars T.



OPTION 2 ~ SHOWING MODIFICATION TO BEAM/GIRDER TOP FLANGE FOR SKEWS OVER 5°

Showing I-Bm/I-Girder, U-Bms and Steel Bms similar.

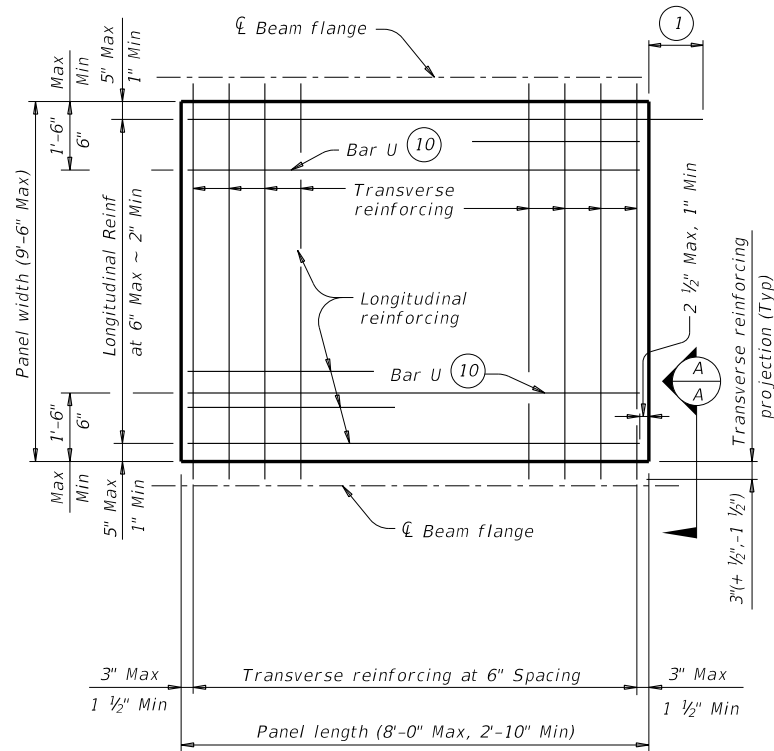
SPECIAL OPTION 2 CONSTRUCTION NOTES:

When Option 2 is chosen bottom mat of thickened end slab reinforcing is not required. Use the same top mat as shown on the Thickened Slab End Details sheet.
 Placing panels adjacent to expansion joints and bent centerlines prior to completing interior panel placement is recommended. Saw cutting panels to fit is acceptable when approved by the Engineer. Minimum distance from a saw cut edge to a panel strand is 1 1/2".
 Do not extend the longitudinal panel reinforcement into the cast-in-place slab.
 Top flanges of beams and girders on skewed bridges must be modified as shown on this drawing. The Contractor is responsible for coordinating this modification with the beam fabricator prior to submitting shop drawings for approval.
 Fabricator may optionally skew the whole end. When electing to skew whole end, girder end details and bearing type at conventional interior bent must be changed to use condition at abutment. Fabricator must coordinate change in bearing type, bearing centerline location, and dowel location with Engineer and Contractor. Show appropriate changes on girder and bearing shop drawings.
 Bending of anchor studs of expansion joints shown on standards AJ, SEJ-A and SEJ-S(0) is permissible if necessary to clear top of end panels. The Contractor is responsible for coordinating modifications with the joint fabricator. Submit shop drawings for approval when modifications to expansion joint hardware are made.
 Bedding strips under skewed end panels must conform to the requirements of Item 422 except their minimum compressive strength must be 60 psi.
 Provide Bars AA, G, K and OA from standard IGTS in the slab.

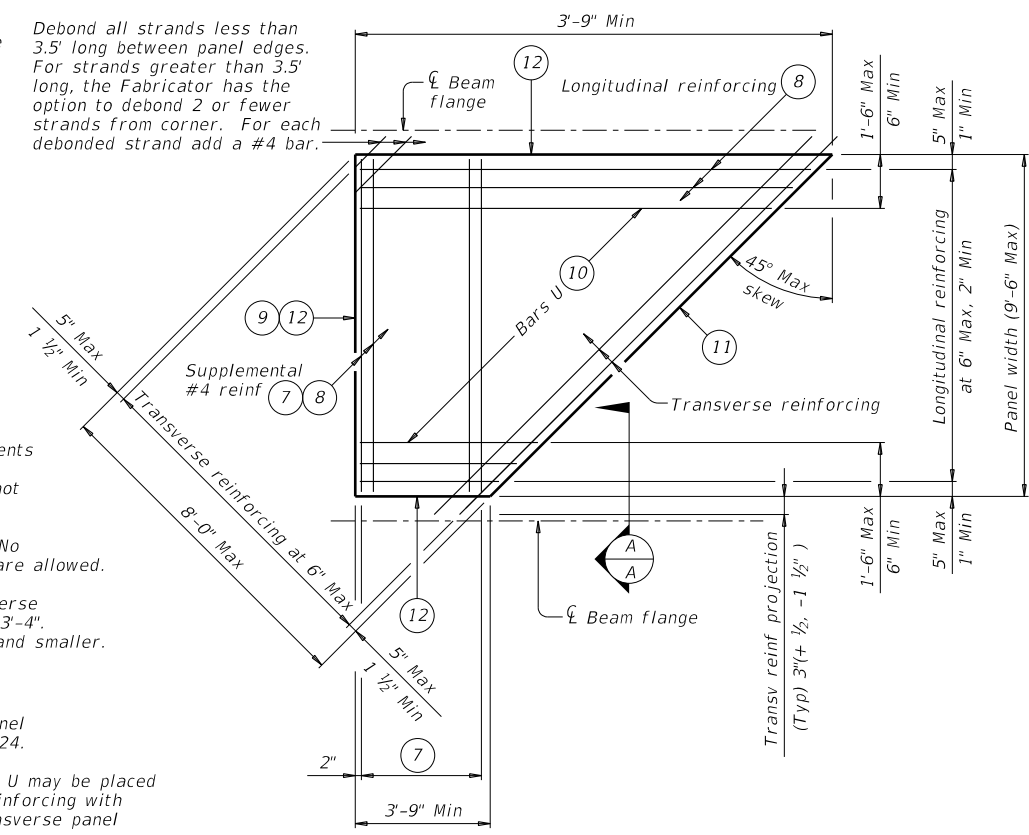
		Bridge Division Standard	
PRESTRESSED CONCRETE PANELS DECK DETAILS			
PCP			
FILE: pcpstde1-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR
REV: 0389 13	CON: 039	SECT: SH 146	CK: JMH
DIST: HOU	COUNTY: HARRIS	SHEET NO: 248	

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DATE: FILE:



TYPICAL NON-SKEWED PANEL PLAN



TYPICAL SKEWED END PANEL PLAN

(Only to be used with details shown elsewhere in the plans.)

- 1 At connection with cast-in-place slab, extend longitudinal panel reinforcement 1'-0" (+2", -0") past panel end. Alternatively, provide (#3) x 2'-0" dowels at 6" Max Spacing and extend dowels 1'-0" past panel end.
- 2 Four loops required per panel.
- 3 Four loops required per panel. 3/8" or 1/2" strands may be used.
- 4 Normal dimensions must be used on spans with parallel beams. Maximum and Minimum dimensions apply only to spans with flared beams.
- 5 See Normal Grading Detail on PCP standard for lap requirements and bedding strip dimensions. Some laps shown in tables cannot utilize all bedding strip widths.
- 6 One Splice allowed per panel. No more than two sheets of WWR are allowed.
- 7 Provide (#4) bars under transverse reinforcing, 10 Spaces at 4" = 3'-4". Omit for 5 degree (1:12) skew and smaller.
- 8 End Cover 2 1/2" Max, 1" Min.
- 9 Recess strands on indicated panel edge in accordance with Item 424.
- 10 At the fabricator's option, Bars U may be placed parallel to transverse panel reinforcing with horizontal legs in plane of transverse panel reinforcing.
- 11 Use length of indicated panel edge as panel width for purpose of determining type of transverse reinforcing.
- 12 Timber form work permissible this edge.

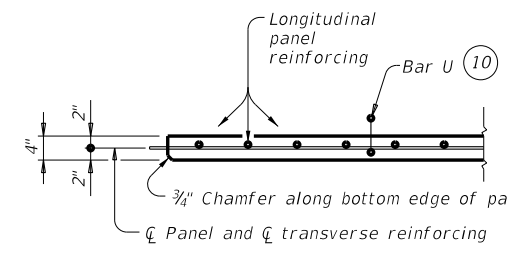
TABLE A (4) (5)			
Beam Type	Normal (In.)	Min (In.)	Max (In.)
A	3	2 1/2	3 1/2
B	3	2 1/2	3 1/2
C	4	3	4 1/2
IV	6	4	7 1/2
VI	6 1/2	4 1/2	8 1/2
U40 - 54	5 1/2	5 1/2	7
Tx28-70	6	5	7 1/2
XB20 - 40	4	3	4 1/2
XSB12 - 15	4	3	4 1/2

TABLE B (4) (5)			
Top Flange Width	Normal (In.)	Min (In.)	Max (In.)
11" to 12"	2 3/4	2 1/2	2 3/4
Over 12" to 15"	3 1/4	3	3 1/4
Over 15" to 18"	4	3	4 3/4
Over 18"	5	3 1/2	6 1/4

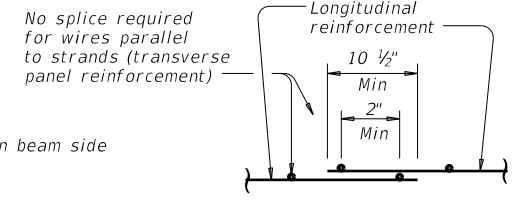
GENERAL NOTES:
 Provide Class H concrete for panels. Release strength $f'c=3,500$ psi. Minimum 28 day strength $f'c=5,000$ psi.
 Provide 3/4" chamfer along bottom edge of panel on beam side. Do not use epoxy-coated reinforcing steel bar or strand in panels. Remove laitance from top panel surface.
 Finish top of panel to a roughness between a No. 6 and No. 9 concrete surface profile, inclusive, as specified by the International Concrete Repair Institute (ICRI).
 Shop drawings for the fabrication of panels will not require the Engineer's approval if fabrication is in accordance with the details shown on this standard.
 A panel layout which identifies location of each panel must be developed by the Fabricator. Permanently mark each panel in accordance with the panel layout. A copy of the layout is to be provided to the Engineer.

TRANSVERSE PANEL REINFORCEMENT:
 For panel widths over 5', use 3/8" or 1/2" Dia (270k) prestressing strands with a tension of 14.4 kips per strand.
 For panel widths over 3'-6" up to and including 5', use 3/8" or 1/2" Dia (270k) prestressing strands with a tension of 14.4 kip per strand. Optionally, (#4) Grade 60 reinforcing bars may be used in lieu of prestressed strands.
 For panel widths up to 3'-6", use (#4) Grade 60 reinforcing bars (prestressed strands alone are not allowed).
 Place transverse panel reinforcement at panel centroid and space at 6" Max.

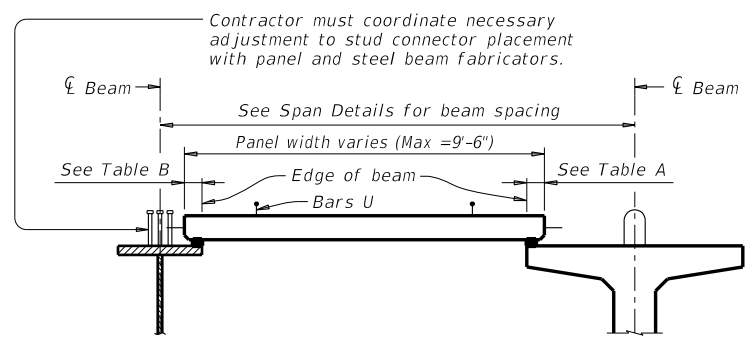
LONGITUDINAL PANEL REINFORCEMENT:
 Any of the following options may be used for longitudinal panel reinforcement:
 1. (#3) Grade 60 reinforcing steel at 6" Max Spacing. No splices allowed.
 2. 3/8" Dia prestressing strands at 4 1/2" Max Spacing (unstressed). No splices allowed.
 3. 1/2" Dia prestressing strands at 6" Max Spacing (unstressed). No splices allowed.
 4. Deformed Welded Wire Reinforcement (WWR) (ASTM A1064) providing 0.22 sq in per foot of panel width. Wires larger than D11 not permitted. Provide transverse wires to ensure proper handling of reinforcing. One splice per panel is allowed. See WWR Splice Detail.
 No combination of longitudinal reinforcement options in a panel is allowed. Place longitudinal panel reinforcement above or below transverse panel reinforcement. Must be placed above transverse panel reinforcement for skewed end panels with supplemental (#4) reinforcement.



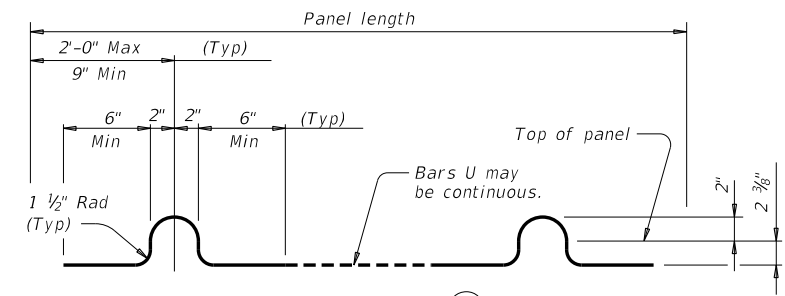
SECTION A-A
(Not showing supplemental #4 bars for skewed end panels.)



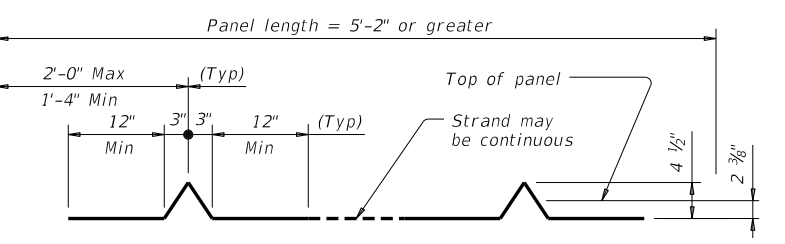
WELDED WIRE REINFORCEMENT (WWR) SPLICE DETAIL (6)



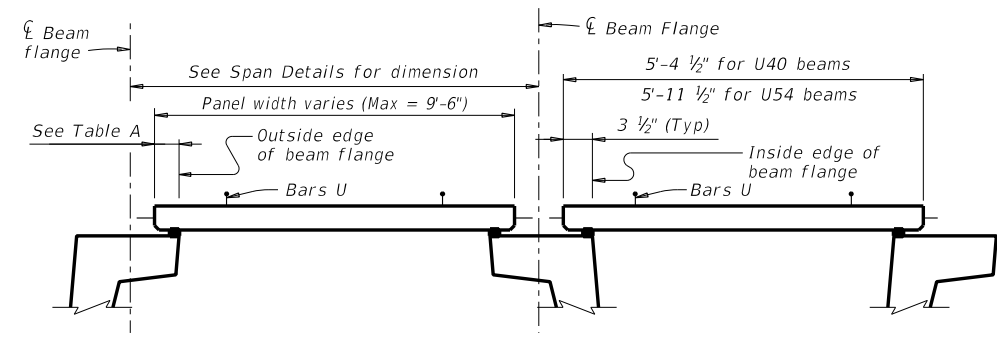
STEEL BEAMS
PRESTRESSED CONCRETE BEAMS OR GIRDERS
Typ unless noted otherwise



BARS U (#3) (2)



OPTIONAL STRAND FOR BARS U (3)



PRESTRESSED CONCRETE U-BEAMS

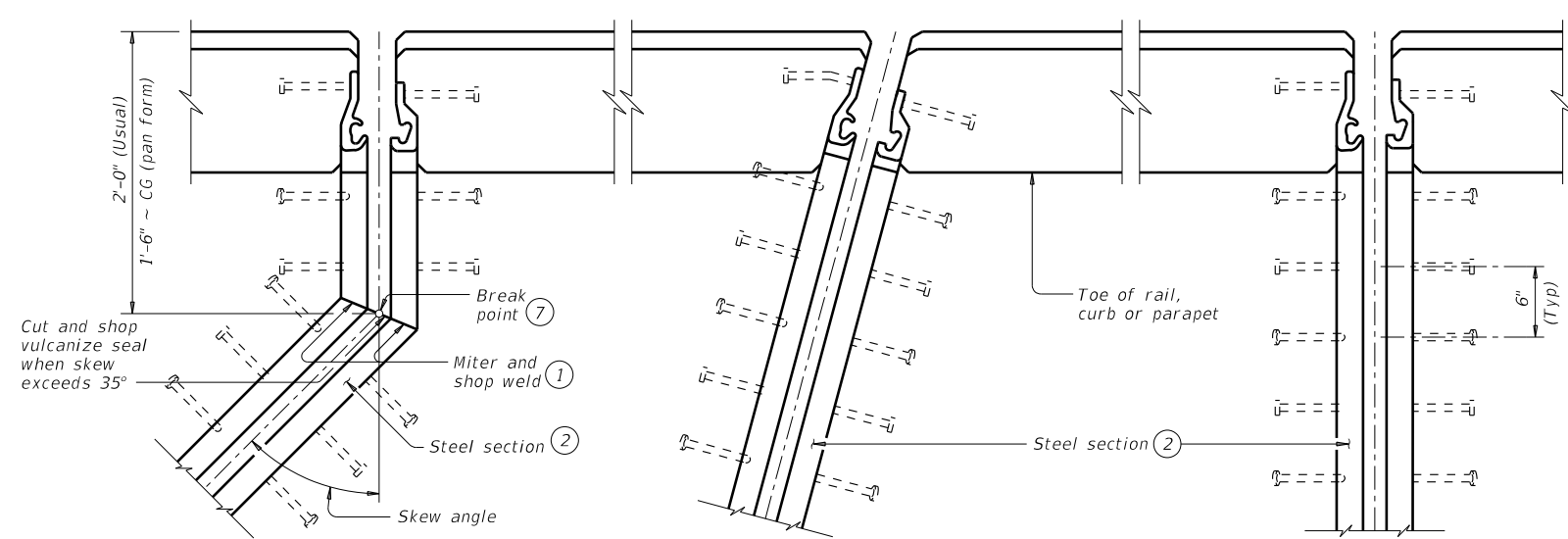
TYPICAL SECTIONS FOR DETERMINING PANEL WIDTH

HL93 LOADING

		Bridge Division Standard	
PRESTRESSED CONCRETE PANEL FABRICATION DETAILS			
PCP-FAB			
FILE: pcpstde2-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR
©TxDOT April 2019	CONT	SECT	JOB
REVISIONS	0389 13	039	SH 146
DIST	COUNTY	SHEET NO.	
HOU	HARRIS	249	

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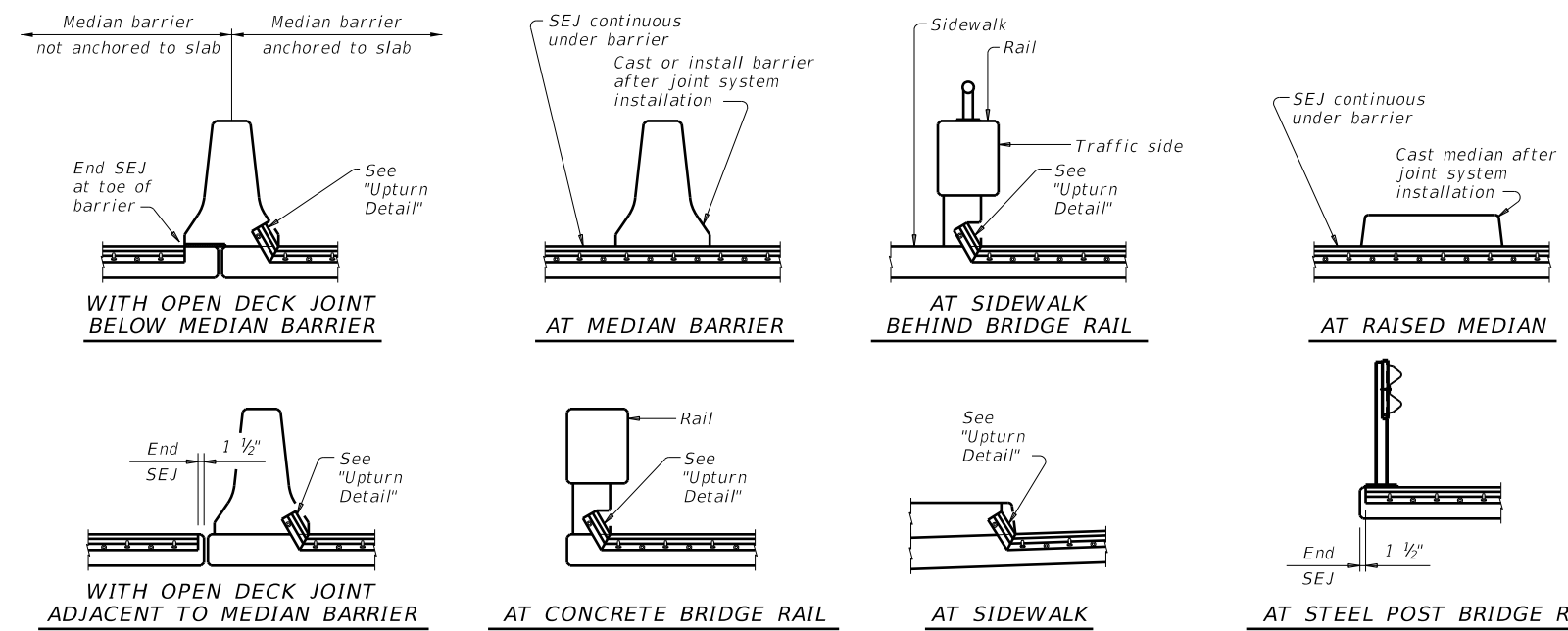


SHOWING SKEWS WITH SLAB BREAKBACKS

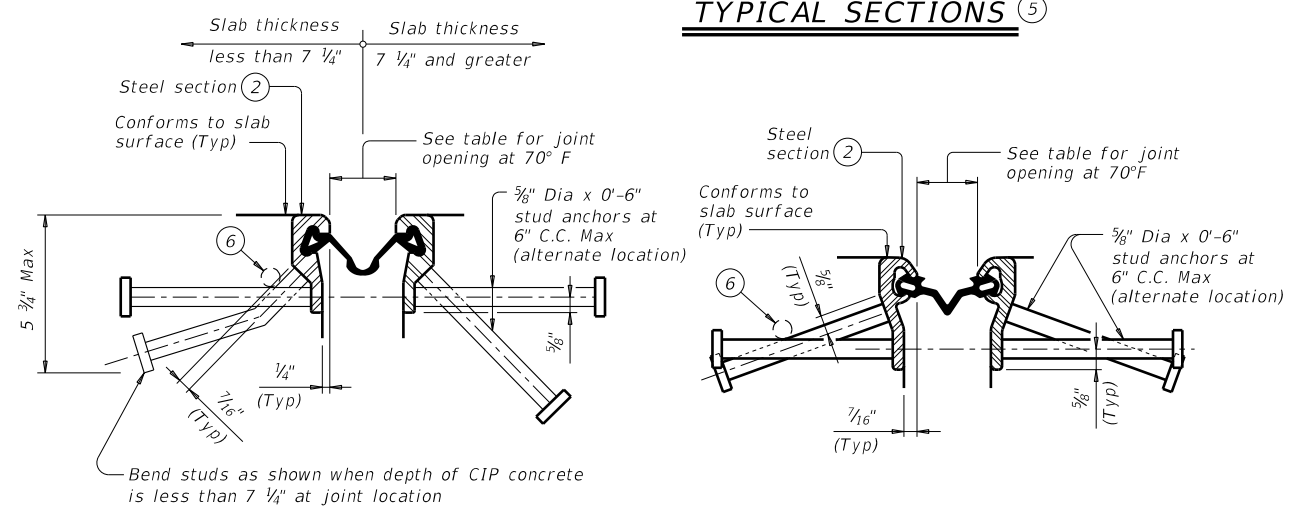
SHOWING SKEWS WITHOUT SLAB BREAKBACKS

SHOWING WITHOUT SKEWS AND SLAB BREAKBACKS

PLANS OF END CONDITIONS

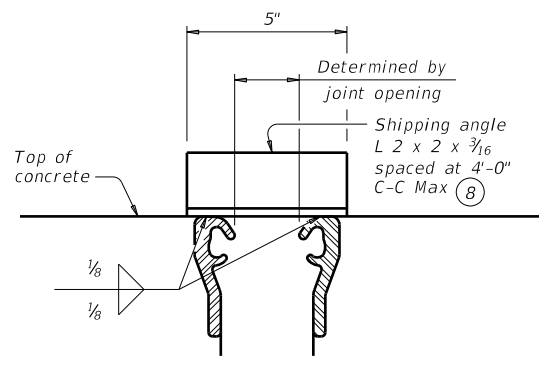


TYPICAL SECTIONS



SECTION THRU WATSON BOWMAN ACME (SE-400 OR SE-500) JOINTS

SECTION THRU D.S. BROWN (A2R-400 OR A2R-XTRA) JOINTS



SHOWING D.S. BROWN (Type SSCM2) (All joints are similar.) (Studs are not shown for clarity.)

SHIPPING ANGLE

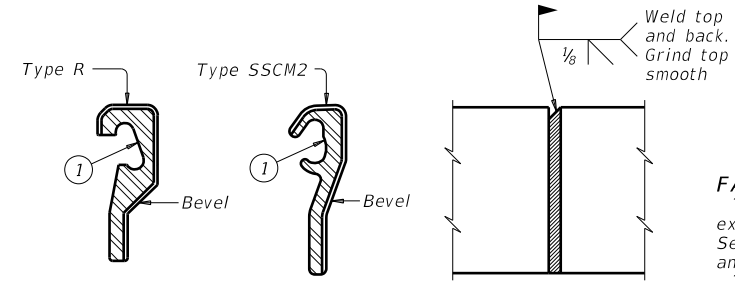
An alternate method of securing joint sections may be used if approved by the Bridge Division. Erection bolts are not allowed.

TABLE OF SEALED EXPANSION JOINT INFORMATION					
MANUFACTURER	STEEL SECTION ②	STRIP SEAL			
		4" JOINT		5" JOINT	
		Seal Type	Joint Opening ③	Seal Type	Joint Opening ③
D.S. Brown	Type SSCM2	A2R-400	1 3/4"	A2R-XTRA	2"
Watson Bowman Acme	Type R	SE-400	1 3/4"	SE-500	2"

SKEW (deg)	JOINT SIZE	
	4"	5"
0	4.0"	5.0"
15	4.0"	5.0"
30	3.5"	4.3"
45	2.8"	3.5"

DESIGN NOTES:
 Joints installed on a skew have reduced ability to accommodate longitudinal movement. Use table values to determine the correct joint size for skewed installations. For other skews over 25 degrees, calculate reduced movement range by multiplying joint size by cosine (skew).

- Remove all burrs which will be in contact with seal prior to making splice.
- Shape of steel section shown is typical. Variations in sections must be approved by the Engineer.
- These openings are also the recommended minimum installation openings.
- Reduce for sidewalk or parapet heights less than 6".
- Other conditions affecting the joint profile should be noted elsewhere.
- Move transverse bars that are in conflict with SEJ studs, in either the bridge slab or approach slab, to rest at the junction of the studs.
- See Span details for location of break point.
- Align shipping angle perpendicular to joint.



FIELD SPLICE DETAIL

FABRICATION NOTES:

Temporarily shop assemble corresponding sections of sealed expansion joints (SEJ), check for fit, and match mark for shipment. Secure corresponding sections together for shipment with shipping angle. Do not use erection bolts. The seal must be continuous and included in the price bid for sealed expansion joint. Ship steel sections in convenient lengths of 10'-0" Min and 24'-0" Max unless necessary for staged construction or widenings. One shop splice is permitted in each shipping length provided no piece is less than 2'-0" long and sufficient studs are added to limit the stud to shop splice distance to 2" Min and 4" Max. Weld studs in accordance with AWS D1.1. Butt weld all shop and field splices and grind smooth areas in contact with seal. Make all necessary field splice joint preparations in the shop. Paint the entire steel section with System II or IV primer in accordance with Item 446, "Feild Cleaning and Painting Steel", unless required to galvanize when shown in the plans. Provide galvanizing in accordance with Item 445, "Galvanizing". Provide paints in accordance with Item 446.2. Prepare steel and apply paint in accordance with Item 446.7.3 and 446.7.4. Shop drawings for the fabrication of sealed expansion joints will not require the Engineer's approval if fabrication is in accordance with the details shown on this standard.

CONSTRUCTION NOTES:

Secure the sealed expansion joint in position and place to the proper grade and alignment by welding braces to adjacent reinforcing steel, to prestressed beam stirrups, or to anchors cast in concrete diaphragms. Include cost of temporary bracing in the price bid for sealed expansion joint. Remove shipping angle immediately after each joint half is secured in place. Grind smooth, and touch up with organic zinc-rich paint. Clean and prepare seal cavity for seal installation as per the Manufacturer's installation procedures.

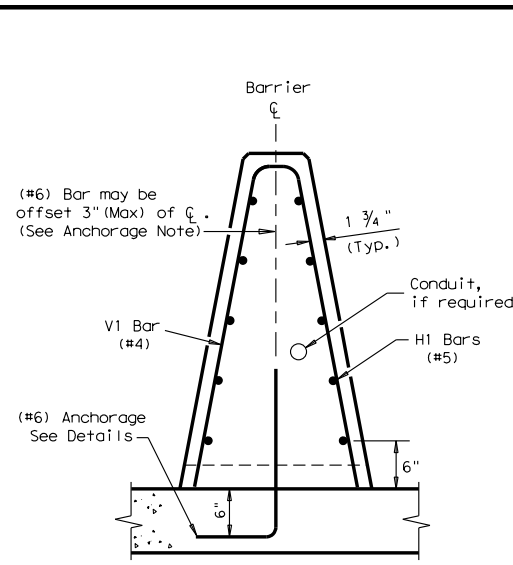
GENERAL NOTES:

Provide sealed expansion joints in the size and at locations shown on the plans. Minimum slab and overhang thickness required for the use of SEJ-M is 6 1/2".

		Bridge Division Standard	
SEALED EXPANSION JOINT TYPE M WITHOUT OVERLAY			
SEJ-M			
FILE: sejmste1-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR
REV: 0389 13	SECT: 039	JOB: SH 146	HIGHWAY: 250
DIST: HOU	COUNTY: HARRIS	SHEET NO. 250	

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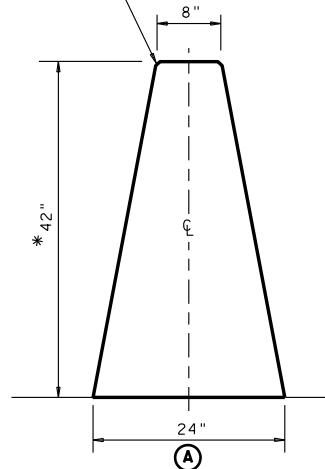
DATE: FILE:



END VIEW

CAST-IN-PLACE (CIP) BARRIER
Barrier is Symmetrical About the Center Line

Top edges of CIP barrier shall have a 3/4" chamfer or tooling radius.



SINGLE SLOPE CONCRETE BARRIER (SSCB) (42")

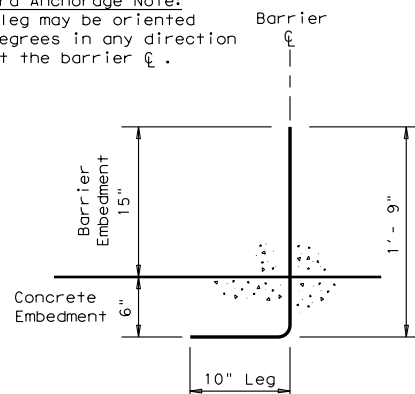
* Barrier height (IN.)	Dimensions (IN.)		
	(A)	(B)	(C)
42	24	40 1/4	20 1/2
48	26 1/4	46 1/4	22 3/4
54	28 1/2	52 1/4	25 1/6

* (SSCB) (42") Barrier height may be increased to 48" or 54". This would increase the barrier and reinforcement dimensions accordingly.

Epoxy Note:

If epoxy coated anchor bars are required, the lower 6" of the bars must not be epoxy coated.

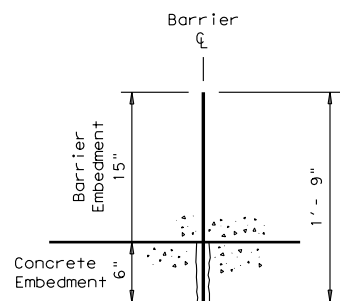
Standard Anchorage Note:
10" leg may be oriented 90 degrees in any direction about the barrier centerline.



STANDARD ANCHORAGE

(#6) Bar

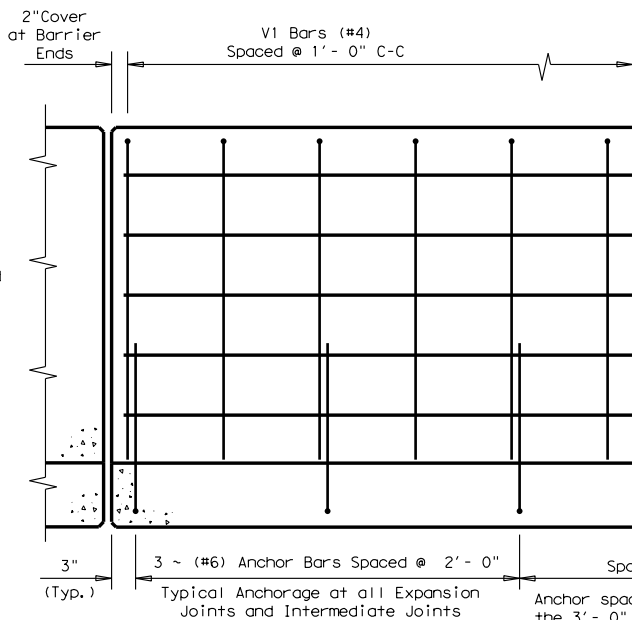
Concrete Pavement / Bridge Deck Anchorage:
Cast-in-Place or Slip-Formed Barrier
(See General Notes 2)



"OPTIONAL" ANCHORAGE

(#6) Bar

Fresh insertion method or Type III, Class C Epoxy Method
Concrete Pavement / Bridge Deck Anchorage:
Cast-in-Place or Slip-Formed Barrier
(See General Notes 2 & 4)



ELEVATION VIEW

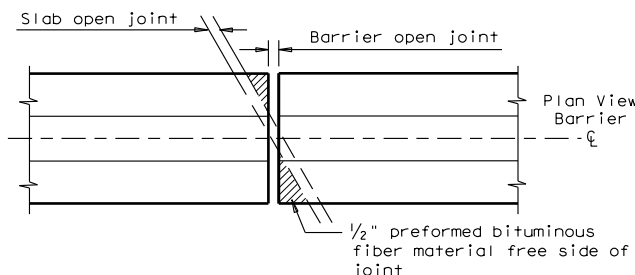
Cast-in-Place (SSCB) on Bridge Decks or Continuously Reinforced Concrete Pavement (CRCP) (Showing Reinforcement and Anchor Placement)

BARRIER PLACEMENT OVER (CRCP) JOINTS

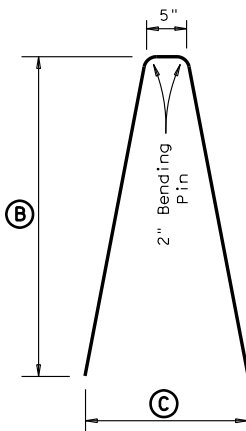
Barrier may be cast over a "Longitudinal" CRCP joint.

CRCP Joints (with or without tiebars): Two layers of 30 lb roofing felt or 1/2" preformed bituminous fiber material.

Barrier Anchorage Note: Anchorage must be located at least 3" from a longitudinal joint.



BARRIER OVER TRANSVERSE OPEN JOINT

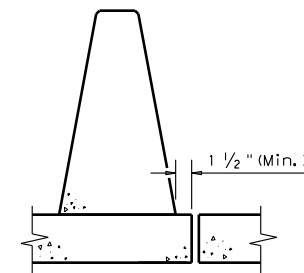


V1 Bar (#4) Bar

Welded Wire Reinforcement (WWR) Option for Bars V1 and H1

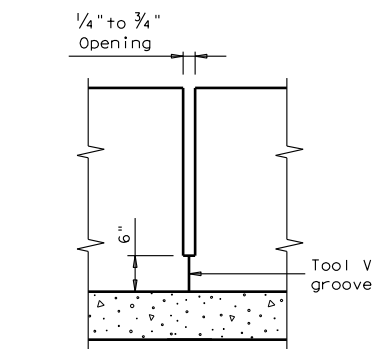
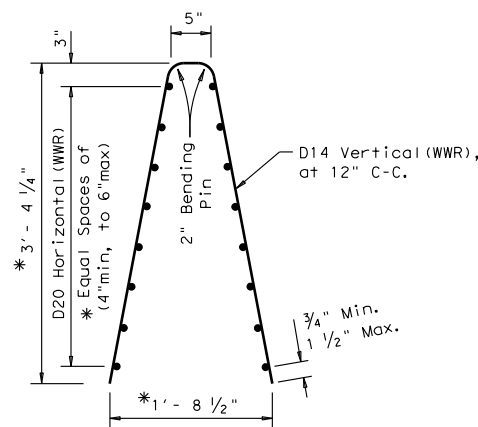
(WWR) General Notes

- Deformed Welded Wire Reinforcement (WWR) shall conform to ASTM A497.
- Welded wire cage may be cut and bent to accommodate the drainage slots, as directed by the Engineer.
- Welded wire splice locations shall have a "minimum" splice lap length of 12".
- Combinations of reinforcing steel and WWR will be permitted, as directed by the Engineer. The dimension from the end of the barrier section to the first wire shall not exceed 3".



MINIMUM EDGE DISTANCE FROM LONGITUDINAL JOINT

Barrier placement over a longitudinal bridge joint is not recommended.



INTERMEDIATE JOINT DETAIL

Place at all Bent C's, without expansion joints and spaced at 33 ft. (max.), 10 ft. (min).

EXPANSION JOINT PLACEMENT

Place at all transverse joints or 100 ft. (max.), 10 ft. (min).

General Notes

- Concrete shall be Class C. Unless otherwise specified in the plans.
- Where used, rebar reinforcement shall be Grade 60 and conform to ASTM A615. If the bridge slab requires epoxy "coated" reinforcement, the barrier and/or anchorage may require the same, if shown elsewhere in the plans.
- These details cover barrier per Item 514, "Permanent Concrete Traffic Barrier".
- Anchorage: The "Optional" Anchor system shall be embedded 6" into fresh concrete or using a Type III, Class C Epoxy anchorage system. Follow the manufacturer's directions for installing the epoxied anchor bars. All anchorage shown is the minimum required, and considered subsidiary to the bid item.
- Top edges of CIP barrier shall have a 3/4" chamfer or tooling radius.
- Drainage slot locations (12'-0", C-C Min. Spacing) are shown elsewhere, or as directed by the Engineer. Drainage slot heights on the SSCB may be increased to a maximum of 5 inches, without geometric changes to the barrier face.
- Cast-in-place barrier may be slip formed. Bracing may be tied or tack welded to the reinforcement cage to provide cage stability. Do not weld to anchor bars. The reinforcement cage may rest on the top of the finished grade.
- For locations where lighting is required, see the SSCB(4) sheet for the proper reinforcement and anchorage.

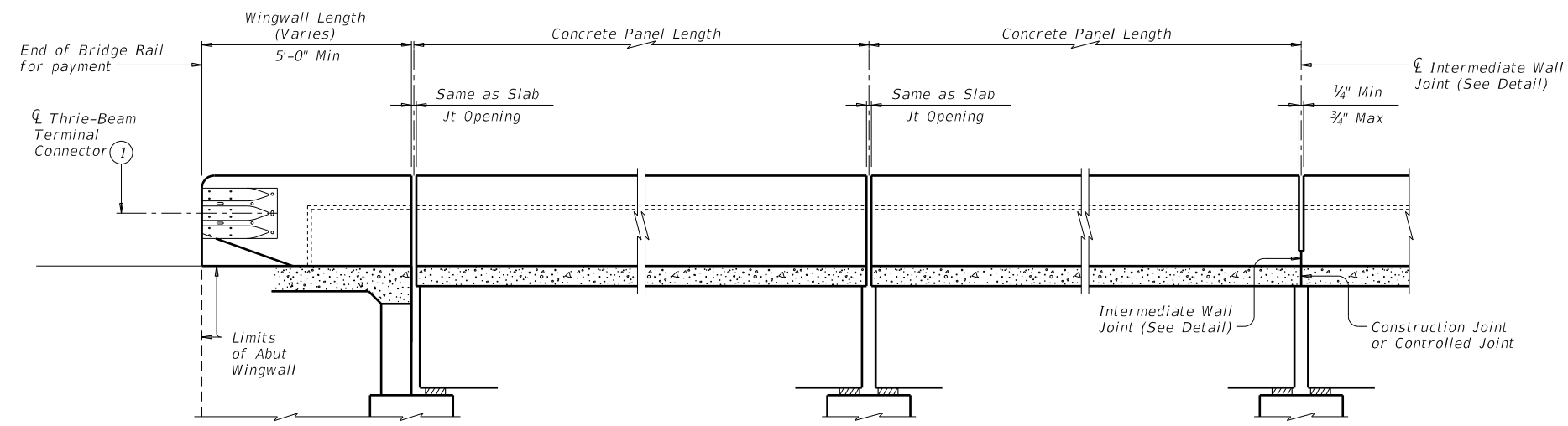
Cast-In-Place (CIP) or Slip-Formed (SSCB)

Cast-in-Place barrier may be connected to precast SSCB. Joint connection "Types" may be used in Cast-in-Place barrier, to match the precast barrier connection. (See required connection "Type" elsewhere in the plans)

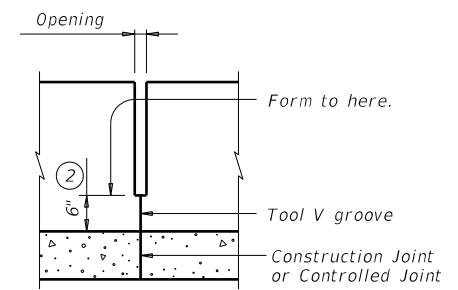
The weight of Cast-in-Place (SSCB)42" is approx. 717 lbs per ft.

				Design Division Standard	
SINGLE SLOPE CONCRETE BARRIER CAST-IN-PLACE (TYPE 1) (BRIDGE DECK OR CRCP) SSCB(1)-16					
FILE: sscb116.dgn	DN: TxDOT	CK: HC/AN	DN: BD/VP	CK: KM	
© TxDOT January 2016	CONT	SECT	JOB	HIGHWAY	
REVISONS	0389 13		039	SH 146	
CST 01-2016	DIST	COUNTY		SHEET NO.	
	HOU	HARRIS		251	

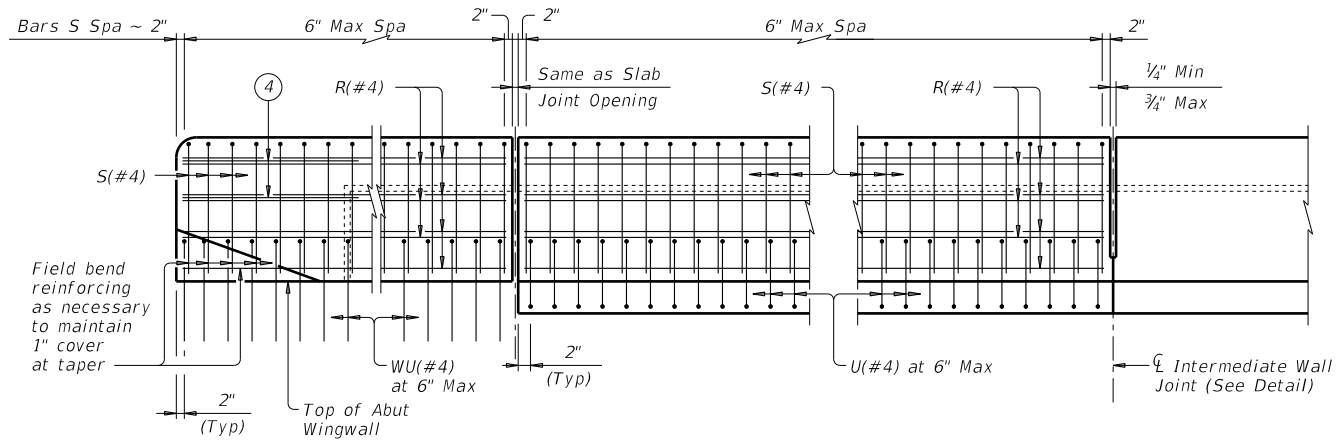
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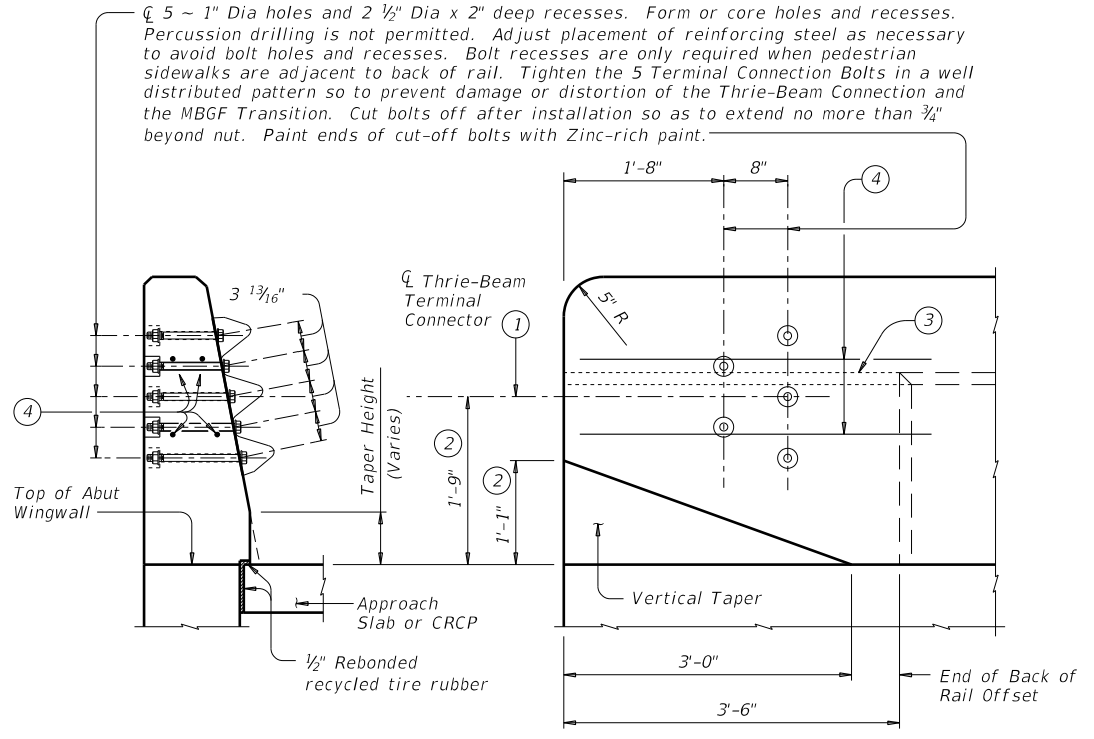
ROADWAY ELEVATION OF RAIL
 AT ABUTMENTS AT BENTS WITH SLAB EXP JOINTS AT BENTS WITHOUT SLAB EXP JOINTS



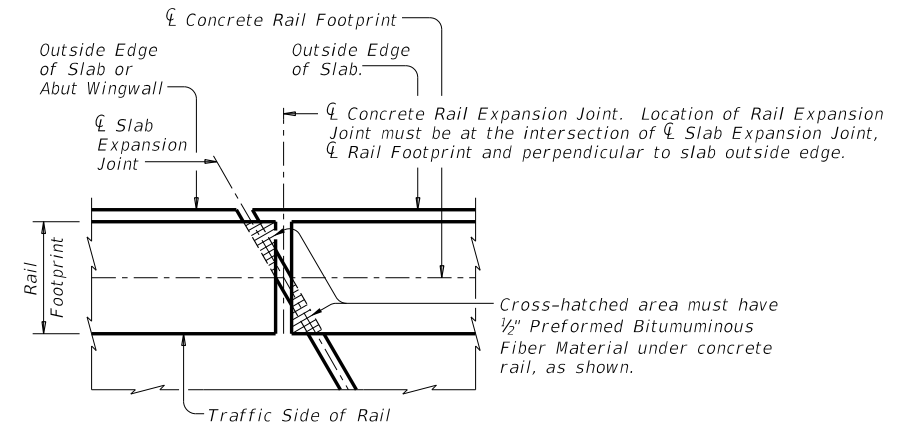
INTERMEDIATE WALL JOINT DETAIL
 Provide at all interior bents without slab expansion joints.



ELEVATION SHOWING TYPICAL REINFORCING PLACEMENT



SECTION **ELEVATION**
TERMINAL CONNECTION DETAILS



PLAN OF RAIL AT EXPANSION JOINTS
 Example showing Slab Expansion Joints without breakbacks.

- ① Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence". Attach Metal Beam Guard Fence Transitions to the bridge rail and extend along the embankment unless otherwise shown in the plans.
- ② Increase 2" for structures with Overlay.
- ③ Back of rail offset may, with Engineer's approval, be continued to the end of the railing.
- ④ Place 4 additional Bars R(#4) 3'-8" in length inside Bars S(#4) and centered 2'-0" from end of rail when Terminal Connections are required.

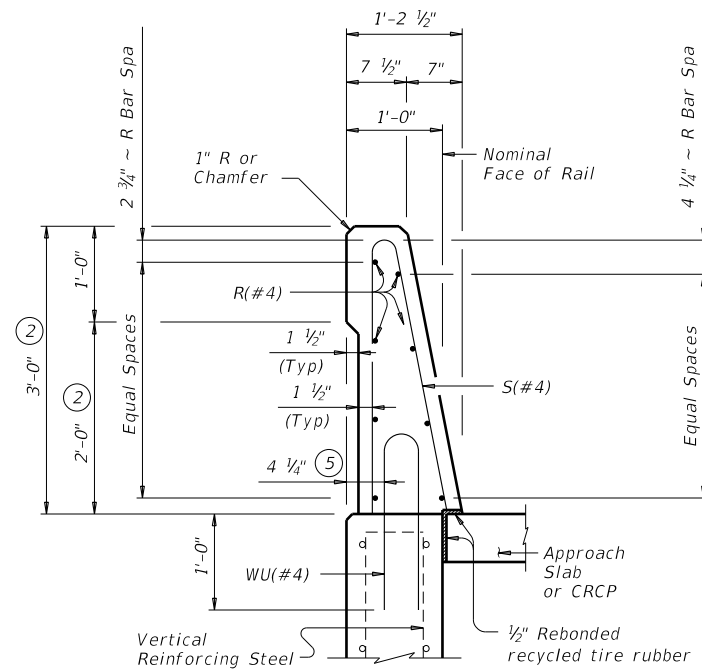
SHEET 1 OF 2

		Bridge Division Standard	
TRAFFIC RAIL SINGLE SLOPE			
TYPE SSTR			
FILE: r1std014-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR
©TxDOT September 2019	CONT	SECT	JOB
REVISIONS	0389 13	039	SH 146
DIST	COUNTY	SHEET NO.	
HOU	HARRIS	252	

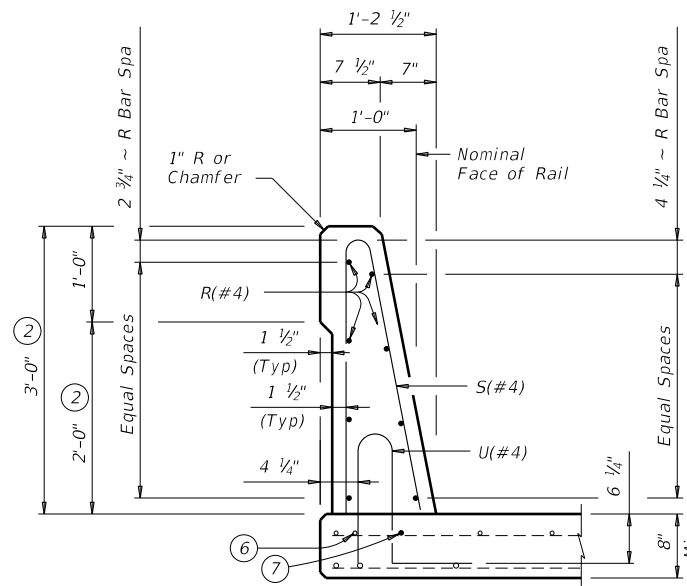
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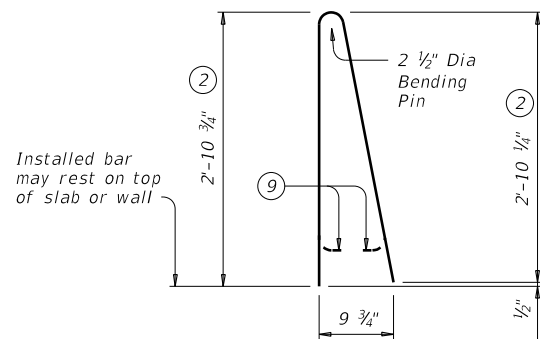


ON ABUTMENT WINGWALLS OR CIP RETAINING WALLS

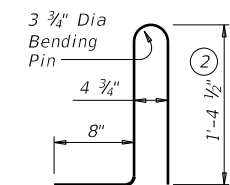


ON BRIDGE SLAB

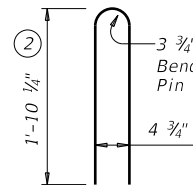
SECTIONS THRU RAIL



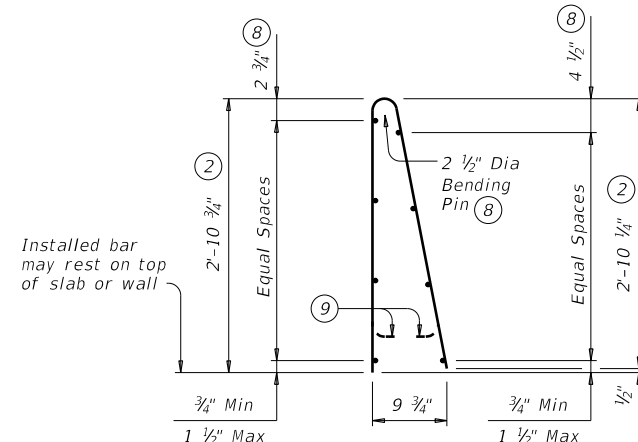
BARS S (#4)



BARS U (#4)



BARS WU (#4)



OPTIONAL WELDED WIRE REINFORCEMENT (WWR)

- ② Increase 2" for structures with Overlay.
- ⑤ 5 1/4" when vertical reinforcing has closer clear cover over horizontal reinforcing in abutment wingwalls or retaining walls on traffic side of wall.
- ⑥ As an aid in supporting reinforcement, additional longitudinal bars may be used in the slab with the approval of the Engineer. Such bars must be furnished at the Contractor's expense.
- ⑦ Top longitudinal slab bar may be adjusted laterally 3" plus or minus to tie reinforcing.
- ⑧ No longitudinal wires may be within upper bend.
- ⑨ Bend or cut as required to clear drain slots.
- ⑩ Space U(#4) bars at 4" Max when end region of panel length is less than 6'-0" to side slot drain. Space U(#4) bars at 6" Max when end region of panel length is 6'-0" and greater to side slot drain.

CONSTRUCTION NOTES:

This railing may be constructed by the slipform process when approved by the Engineer, with equipment approved by the Engineer. Provide sensor control for both line and grade. Tack welding to provide bracing for slipform operations is acceptable. Welding may be performed at a minimum spacing of 3 ft between the cage and the anchorage. It is permissible to weld to bars U, WU and S at any location on the cage. If increased bracing is needed, provide additional anchorage devices and weld in the upper two thirds of the cage. Paint welded areas on epoxy coated and/or galvanized reinforcing with an organic zinc rich paint in accordance with Item 445 "Galvanizing".
If rail is slipformed, apply a heavy epoxy bead 1" behind toe of traffic side of rail to concrete deck just prior to slip forming. Provide a 3/8" width x 1/4" tall heavy epoxy bead with Type III, Class C or a Type V epoxy.
The back of railing must be vertical unless otherwise shown in the plans or approved by the Engineer.

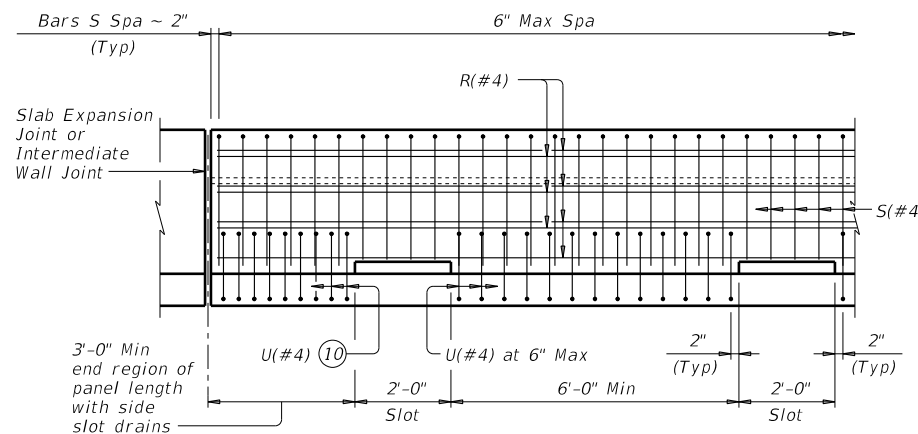
MATERIAL NOTES:

Provide Class "C" concrete. Provide Class "C" (HPC) if required elsewhere.
Provide Grade 60 reinforcing steel.
Epoxy coat or galvanize all reinforcing steel if slab bars are epoxy coated or galvanized.
Deformed Welded Wire Reinforcement (WWR) (ASTM A1064) of equal size and spacing may be substituted for Bars U and WU unless noted otherwise. Deformed WWR (ASTM A1064) may be substituted for Bars R and S, as shown. Combinations of reinforcing steel and WWR or configurations of WWR other than shown are permitted if conditions in the table are satisfied. Provide the same laps as required for reinforcing bars.
Provide bar laps, where required, as follows:
Uncoated or galvanized ~ #4 = 1'-7"
Epoxy coated ~ #4 = 2'-5"

GENERAL NOTES:

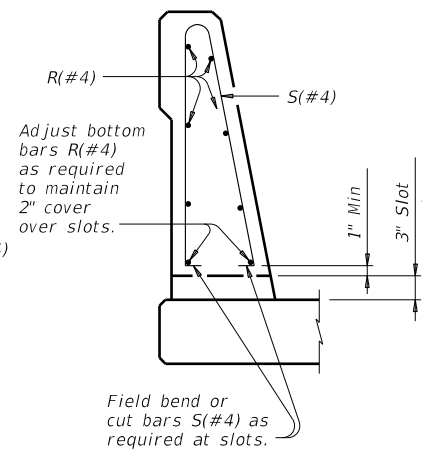
This rail has been successfully evaluated by full-scale crash test to meet MASH TL-4 criteria. This rail can be used for speeds of 50 mph and greater when a TL-3 rated guard fence transition is used. When a TL-2 rated guard fence transition is used, this rail can only be used for speeds of 45 mph and less.
Do not use this railing on bridges with expansion joints providing more than 5" movement.
Rail anchorage details shown on this standard may require modification for select structure types. See appropriate details elsewhere in plans for these modifications.
Shop drawings will not be required for this rail.
Average weight of railing with no overlay is 376 plf.

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



OPTIONAL SIDE SLOT DRAIN DETAIL

Note: Side Slot Drains may be used where shown elsewhere on the plans or as directed by the Engineer. Drains should not be placed over railroad tracks, lower roadways, or sidewalks. When this rail is used as a separator between a roadway surface and a sidewalk surface, side drain slots will not be permitted.



SECTION THRU OPTIONAL SIDE SLOT DRAIN

DESCRIPTION	LONGITUDINAL WIRES	VERTICAL WIRES
Minimum (Cumulative Total) Wire Area	1.067 Sq In.	0.267 Sq In. per Ft
Minimum	No. of Wires	Spacing
Maximum	8	4"
Maximum Wire Size Differential	10	8"
	The smaller wire must have an area of 40% or more of the larger wire.	

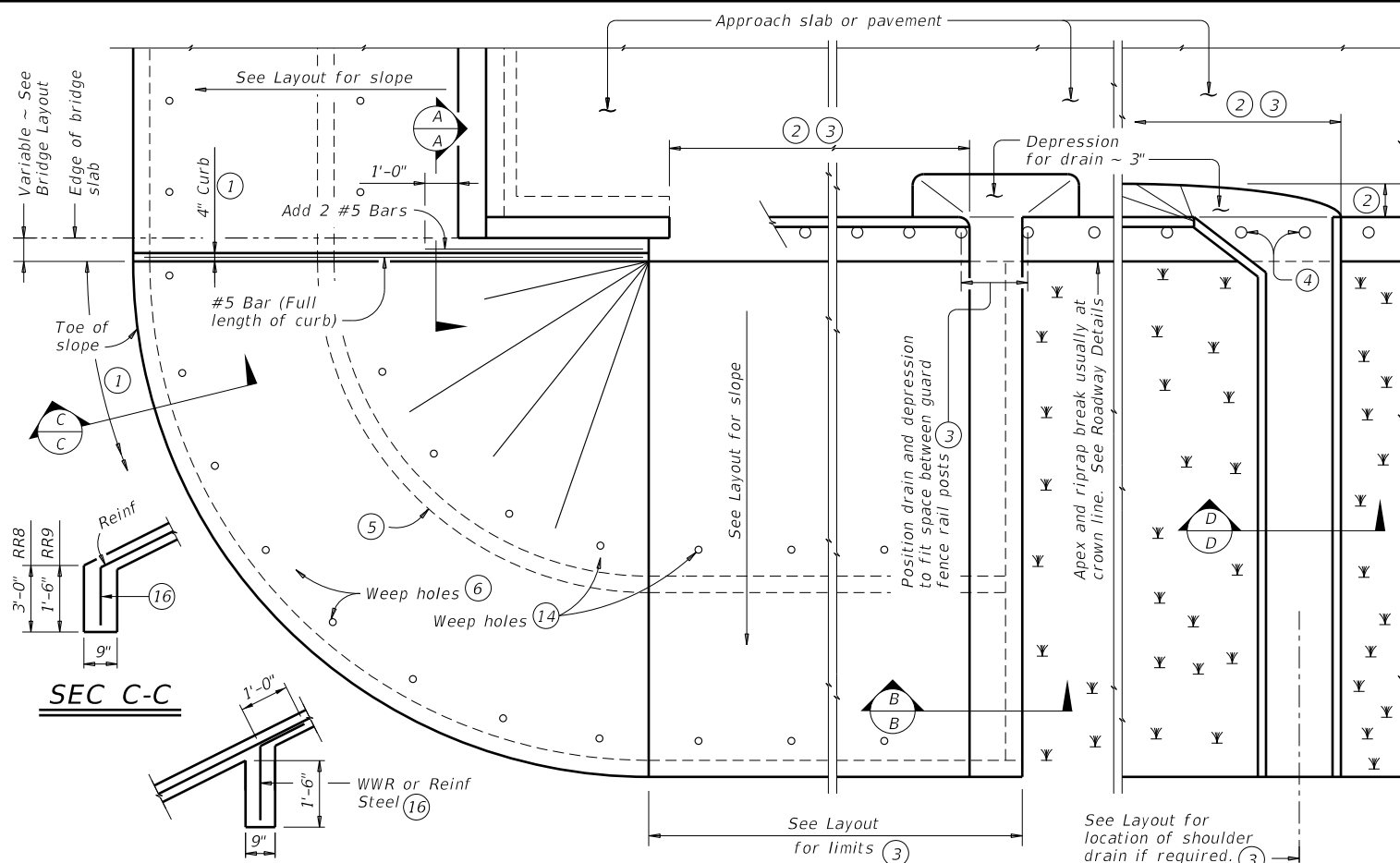
Texas Department of Transportation
TRAFFIC RAIL SINGLE SLOPE
TYPE SSTR

FILE: r1std014-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TxDOT
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0389 13	039	SH 146	
DIST	COUNTY	SHEET NO.		
HOU	HARRIS	253		

Bridge Division Standard

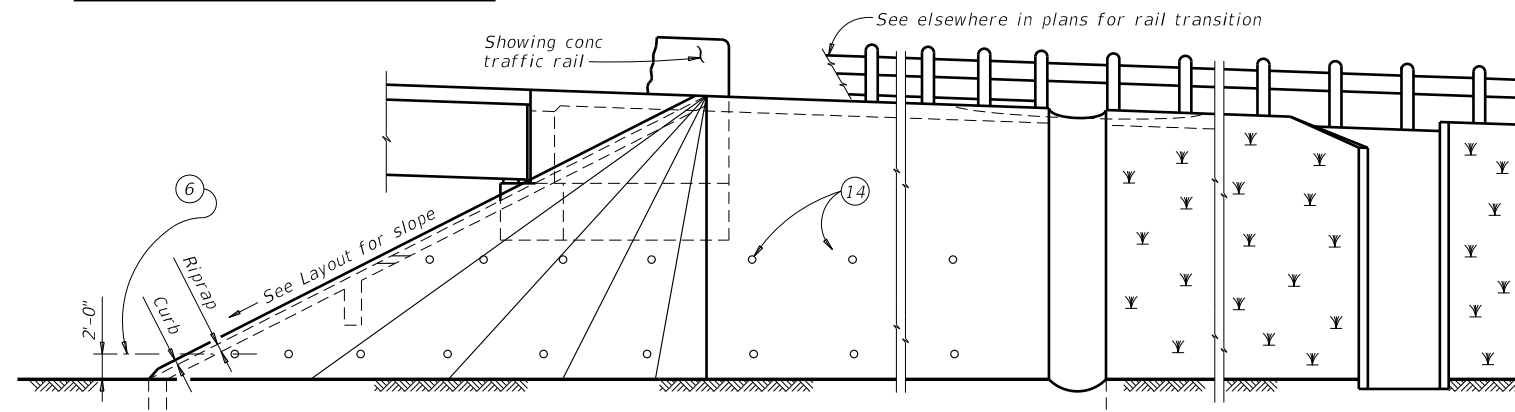
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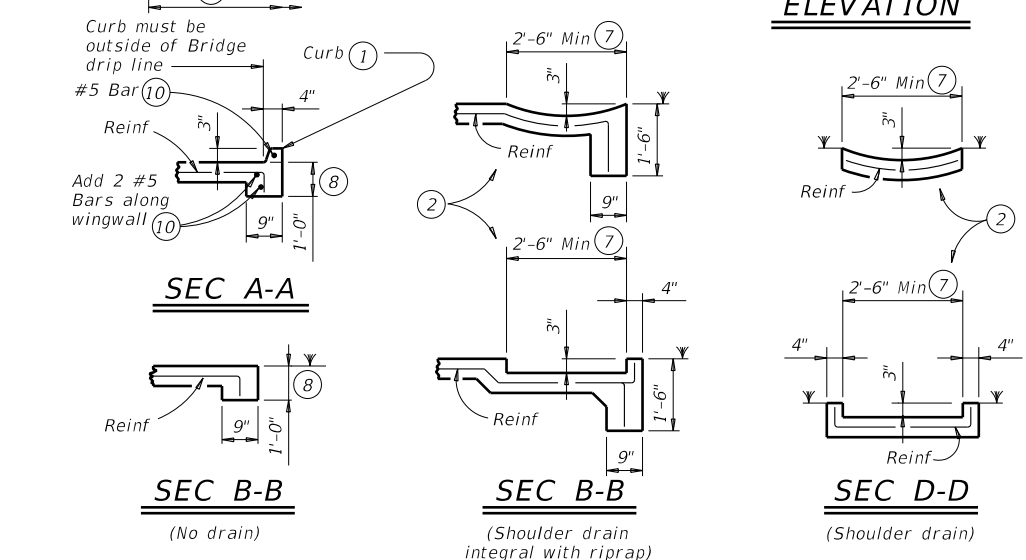


INTERMEDIATE TOEWALL

PLAN

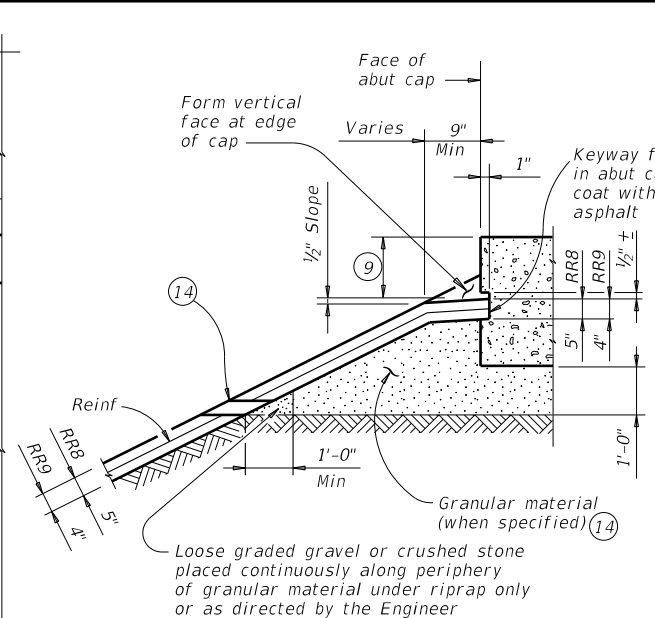


ELEVATION



RIPRAP DETAIL AT COLUMNS

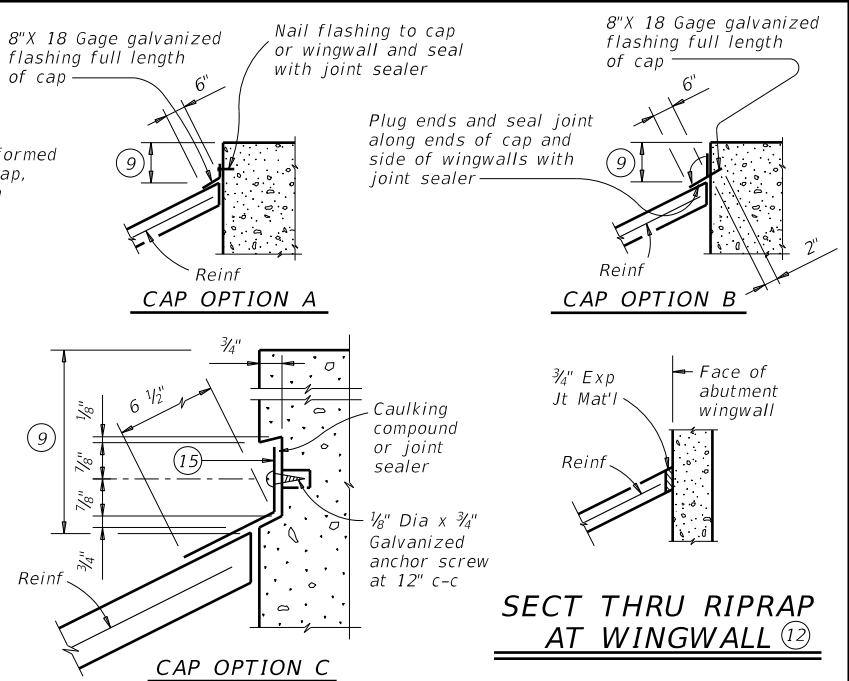
(As directed by the Engineer)



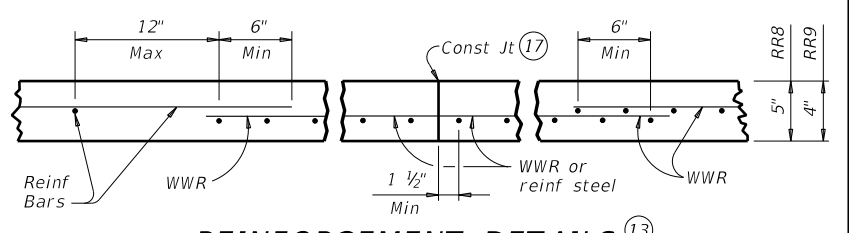
SHOWING KEYWAY OPTION

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

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



SECTIONS THRU RIPRAP AT CAP



REINFORCEMENT DETAILS

See General Notes for optional synthetic fiber reinforcement.

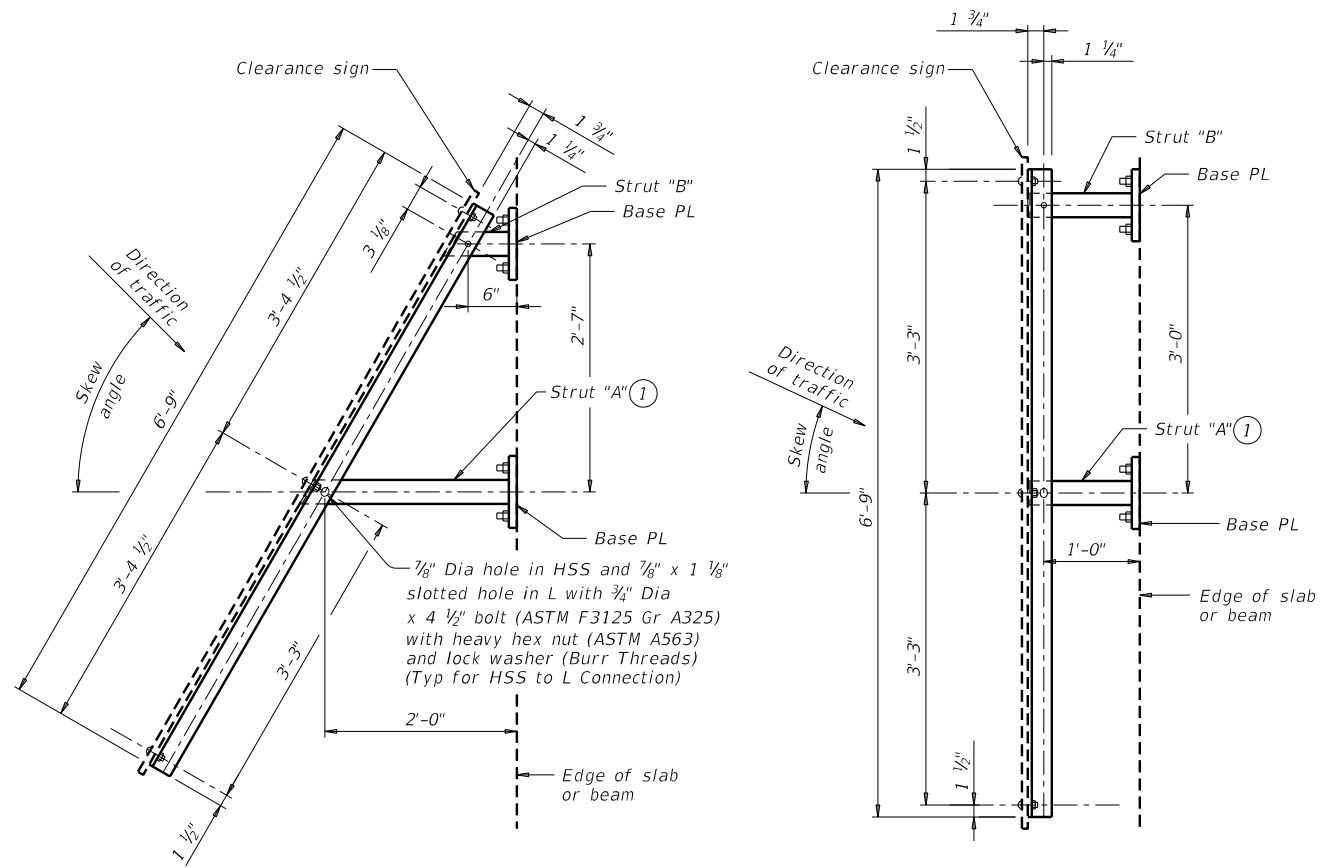
GENERAL NOTES:

- Provide Class "B" concrete (f'c = 2,000 psi) unless noted elsewhere in plans.
- Provide Grade 60 reinforcing steel.
- Provide deformed welded wire reinforcement (WWR) meeting ASTM A1064, unless otherwise shown.
- Provide reinforcing bars, deformed WWR, or any suitable combination of both types for riprap reinforcing, unless specified elsewhere in the plans.
- Optionally synthetic fibers may be used if approved by the Engineer. Provide synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) in lieu of steel reinforcing in riprap concrete.
- Install construction joints or grooved joints extending the full slant slope height at intervals of approximately 20 feet unless otherwise directed by the Engineer.
- Hardware cloth, loose grade stone behind weep holes, flashing, or other sealing material are subsidiary to the bid item "Riprap". See Layout for limits of riprap.
- RR8 is to be used on stream crossings.
- RR9 is to be used on other embankments.

		Bridge Division Standard	
CONCRETE RIPRAP AND SHOULDER DRAINS EMBANKMENTS AT BRIDGE ENDS (TYPES RR8 & RR9)			
CRR			
FILE: crrstde1-19.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
©TxDOT April 2019	CONT	SECT	JOB
REVISIONS	0389 13	039	SH 146
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HOU	HARRIS	254	

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PLAN OF TYPE S MOUNT
(Used for skews over 30°)

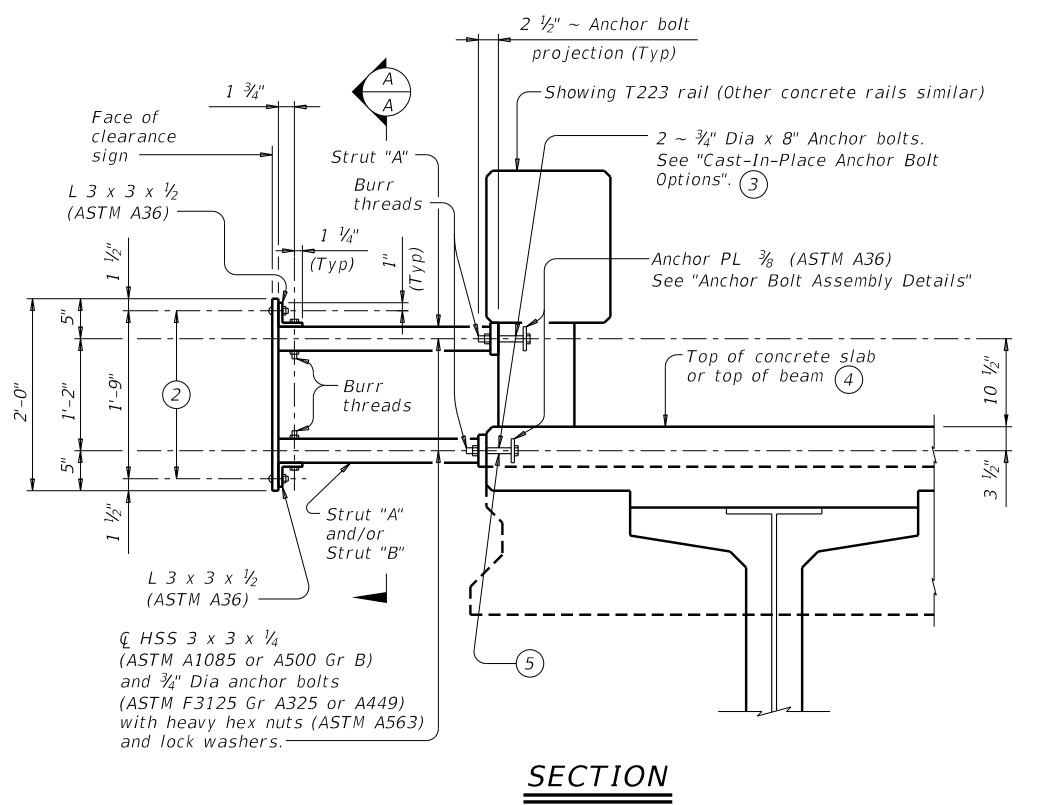
PLAN OF TYPE N MOUNT
(Used for 0° to 30° skews)

- ① Locate centerline of Strut A no closer than 12" from a vertical concrete edge.
- ② 1/8" Dia x 2" Hexagon socket button head cap screws (ASTM A574) with hex nuts. Attach hex nuts to L 3 x 3 x 1/2 by tack welding in two places. Threads must have Class 3A fit tolerance in accordance ASME B1.1. Six screws required.
- ③ At the Contractor's option fully threaded adhesive anchors may be used instead of cast-in-place anchor bolts. Expansion anchors are not allowed. Provide adhesive anchors that are 3/4" 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 heavy hex nut (ASTM A563). Embed fully threaded rods using a Type III, Class C, D, E, or F anchor adhesive. Adhesive anchor embedment depth is 8". Anchor adhesive chosen must be able to achieve a factored bond strength in tension of 2.2 kips per anchor (edge distance and spacing 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".
- ④ For decked slab beams topped with a 2 course surface treatment and ACP overlay.
- ⑤ Anchor bolts to be cast into decked slab beams topped with a 2 course surface treatment or ACP overlay. Anchor bolts with heavy hex nuts, regular lock washers, hardened washers and anchor plate that is embedded in the beam will be provided by the beam fabricator.

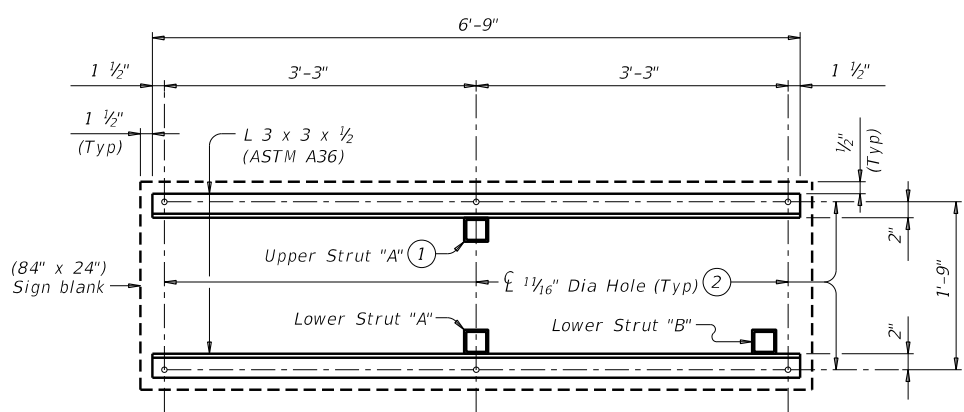
CONSTRUCTION NOTES:
Install the vertical face of clearance sign plumb unless otherwise approved by the Engineer.
Test adhesive anchors in accordance with Item 450.3.3, "Tests". Test 1 anchor per bridge mounted clearance sign installed. Perform corrective measures to provide adequate capacity if any of the tests do not meet the required test load. Repair damage from testing as directed.

MATERIAL NOTES:
Galvanize all steel components after fabrication unless otherwise noted.

GENERAL NOTES:
This standard provides details to mount a vertical clearance sign (84" x 24") to bridges. Rail Types T631, T631LS, PR11, PR22 and PR3 are not accommodated. The Engineer will furnish the clearance to be shown on the sign.
See Bridge Layout for sign location and mounting type (Type N or S).
Cost of furnishing, installing, relocating or removing a clearance sign, including structural steel for sign mount, is included in unit price bid for Item 644, "Small Roadside Sign Assemblies".
One Sign Blank (84" x 24") is 14 SF.
Average steel weight for one complete Type N Mount is 219 Lb.
Average steel weight for one complete Type S Mount is 233 Lb.



SECTION



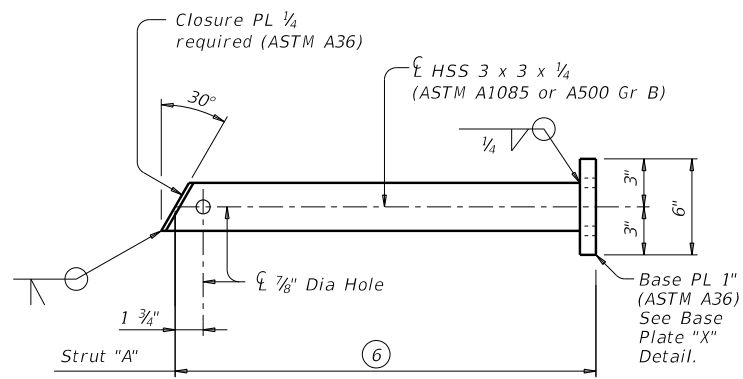
SECTION A-A

SHEET 1 OF 3

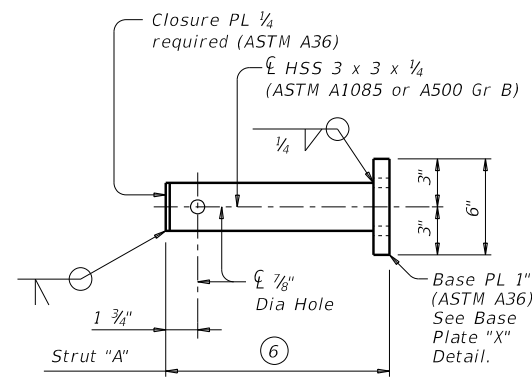
		Bridge Division Standard	
BRIDGE MOUNTED CLEARANCE SIGN ASSEMBLY			
BMCS			
FILE: bmcste1-19.dgn	DN: TxDOT	CK: TxDOT	OW: TxDOT
©TxDOT April 2019	CONT	SECT	JOB
REVISIONS	0389 13	039	SH 146
DIST	COUNTY	SHEET NO.	
HOU	HARRIS	255	

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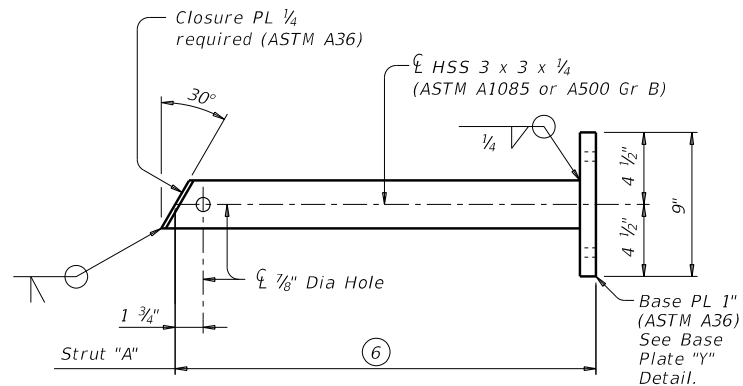
DATE: FILE:



FOR T411 AND C411 RAIL TYPES



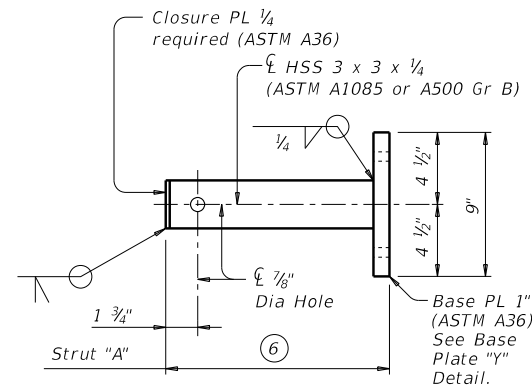
FOR T411 AND C411 RAIL TYPES



FOR T221, C221, T222, T223, C223, T401, T402, C402, T551, T552, T80HT, T80SS AND SSTR RAIL TYPES

UPPER STRUT DETAIL FOR (TYPE S MOUNT)

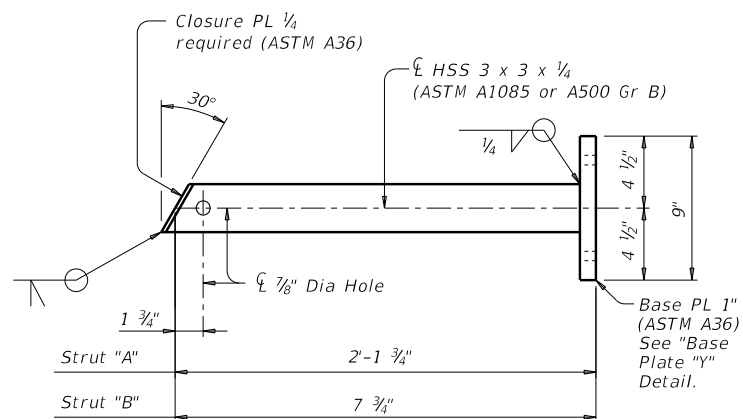
(Used for skews over 30°)



FOR T221, C221, T222, T223, C223, T401, T402, C402, T551, T552, T80HT, T80SS AND SSTR RAIL TYPES

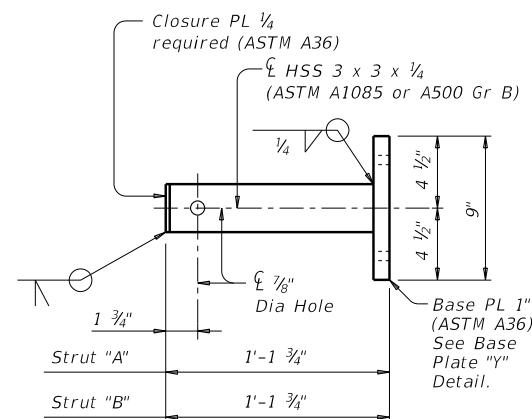
UPPER STRUT DETAIL FOR (TYPE N MOUNT)

(Used for 0° to 30° skews)



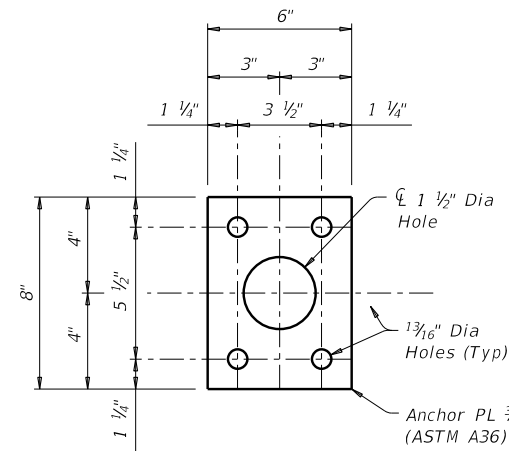
LOWER STRUT DETAILS FOR (TYPE S MOUNT)

(Used for skews over 30°)

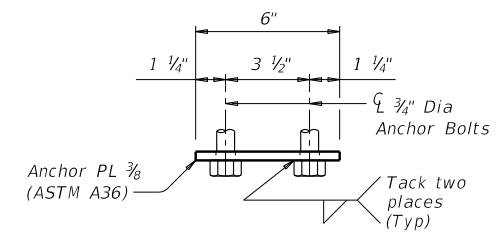


LOWER STRUT DETAILS FOR (TYPE N MOUNT)

(Used for 0° to 30° skews)



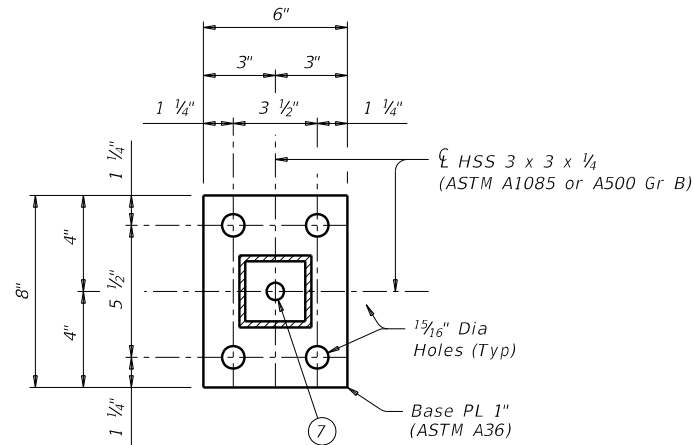
PLAN OF ANCHOR PLATE



ELEVATION

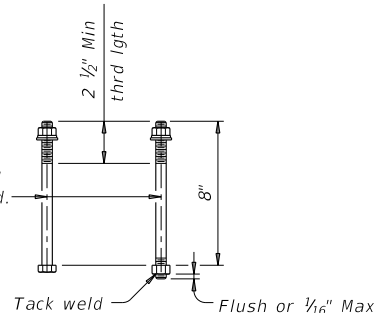
ANCHOR BOLT ASSEMBLY DETAILS ③

(Used on Base Plate "X" with T411 and C411 rail types.)



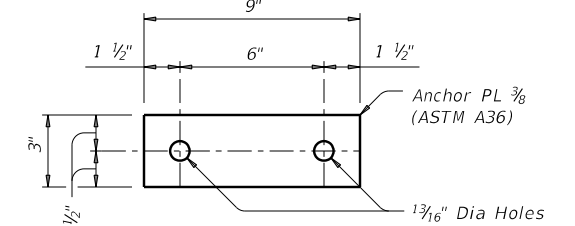
BASE PLATE "X" DETAIL

③ 3/4" Dia heavy hex head anchor bolt (ASTM F3125 Gr A325 or A449) or threaded rod (ASTM A193 Gr B7 or F1554 Gr 105) with one hardened washer and one regular lock washer placed under heavy hex nut (ASTM A563). Furnish one additional heavy hex nut for each threaded rod.

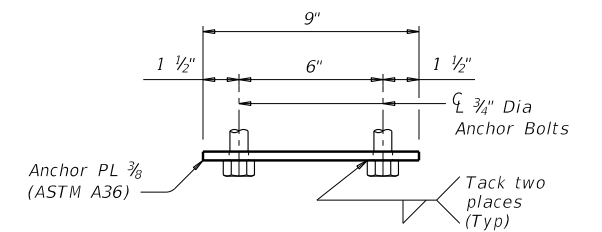


CAST-IN-PLACE ANCHOR BOLT OPTIONS ③

- ③ At the Contractor's option fully threaded adhesive anchors may be used instead of cast-in-place anchor bolts. Expansion anchors are not allowed. Provide adhesive anchors that are 3/4" 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 heavy hex nut (ASTM A563). Embed fully threaded rods using a Type III, Class C, D, E, or F anchor adhesive. Adhesive anchor embedment depth is 8". Anchor adhesive chosen must be able to achieve a factored bond strength in tension of 2.2 kips per anchor (edge distance and spacing 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".
- ⑥ Adjust length to accommodate edge of slab to back of rail for specific project conditions and to help plumb the vertical face of clearance sign.
- ⑦ Hole required to drain zinc from base plate during galvanizing.



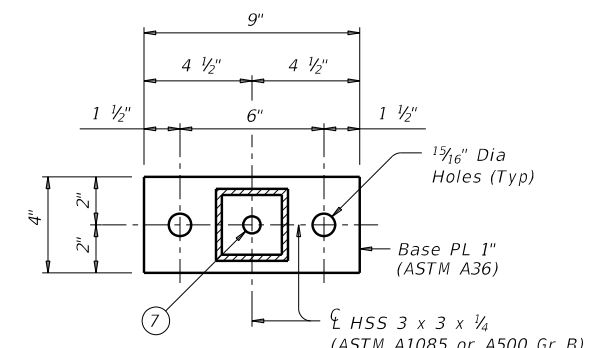
PLAN OF ANCHOR PLATE



ELEVATION

ANCHOR BOLT ASSEMBLY DETAILS ③

(Used on Base Plate "Y" and with T1F, T2P, C2P, T1W, C1W, T66 and C66 rail types.)



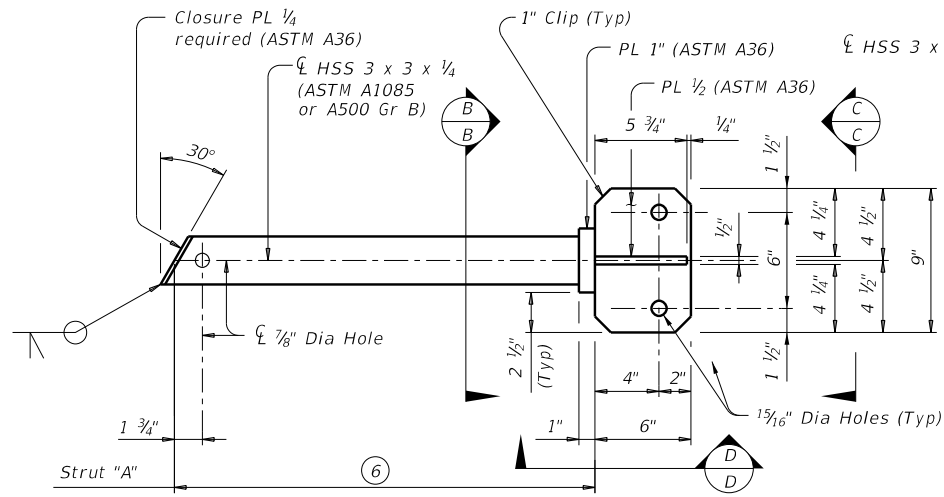
BASE PLATE "Y" DETAIL

SHEET 2 OF 3

				Bridge Division Standard	
<h2>BRIDGE MOUNTED CLEARANCE SIGN ASSEMBLY</h2>					
<h3>BMCS</h3>					
FILE: bmcste1-19.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT	
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0389	13	039	SH 146	
	DIST	COUNTY		SHEET NO.	
	HOU	HARRIS		256	

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DATE: FILE:

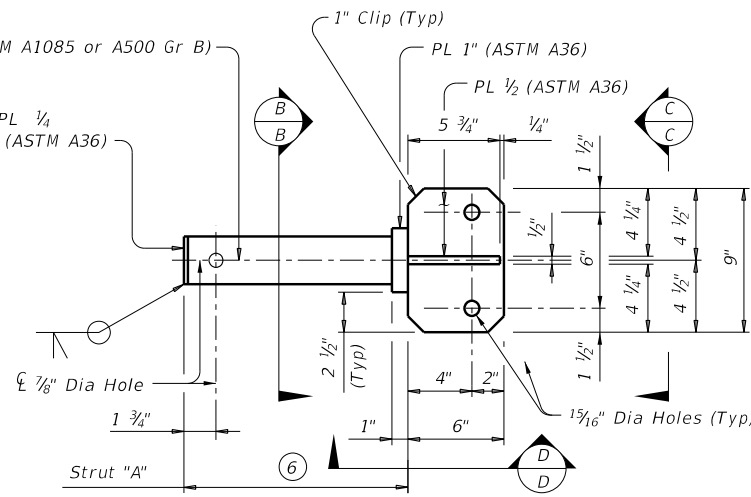


FOR T1F, T2P, C2P, T1W, C1W, T66 AND C66 RAIL TYPES

UPPER STRUT DETAIL FOR (TYPE S MOUNT)

(Used for skews over 30°)

- 2) 3/8" Dia x 2" Hexagon socket button head cap screws (ASTM A574) with hex nuts. Attach hex nuts to L 3 x 3 x 1/2 by tack welding in two places. Threads must have Class 3A fit tolerance in accordance ASME B1.1. Six screws required.
- 3) At the Contractor's option fully threaded adhesive anchors may be used instead of cast-in-place anchor bolts. Expansion anchors are not allowed. Provide adhesive anchors that are 3/4" 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 heavy hex nut (ASTM A563). Embed fully threaded rods using a Type III, Class C, D, E, or F anchor adhesive. Adhesive anchor embedment depth is 8". Anchor adhesive chosen must be able to achieve a factored bond strength in tension of 2.2 kips per anchor (edge distance and spacing 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".

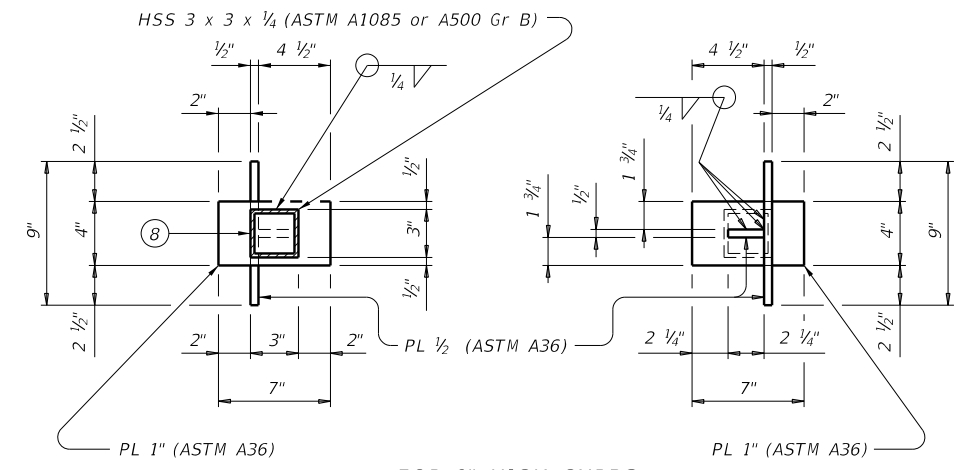


FOR T1F, T2P, C2P, T1W, C1W, T66 AND C66 RAIL TYPES

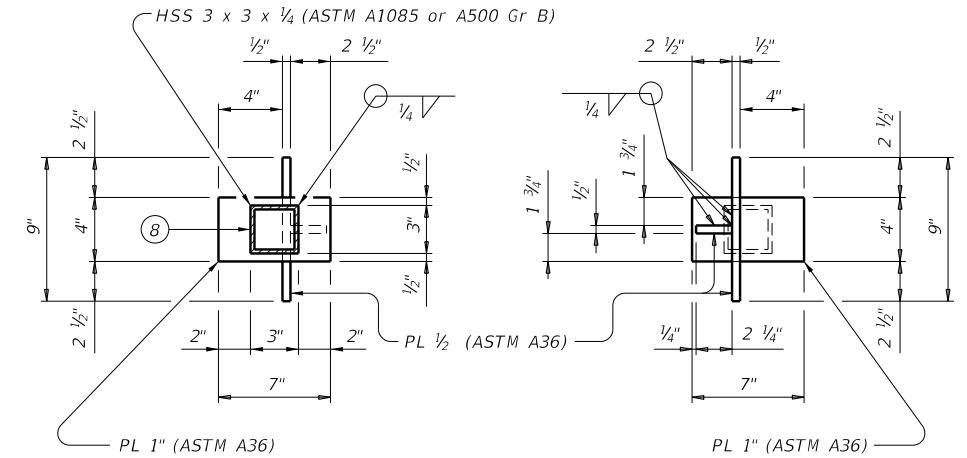
UPPER STRUT DETAIL FOR (TYPE N MOUNT)

(Used for 0° to 30° skews)

- 4) For decked slab beams topped with a 2 course surface treatment and ACP overlay.
- 6) Adjust length to accommodate edge of slab to back of rail for specific project conditions and to help plumb the vertical face of clearance sign.
- 8) Hole required in bottom of HSS to drain zinc during galvanizing.
- 9) 11" curb is for structures with 2" ACP overlay.



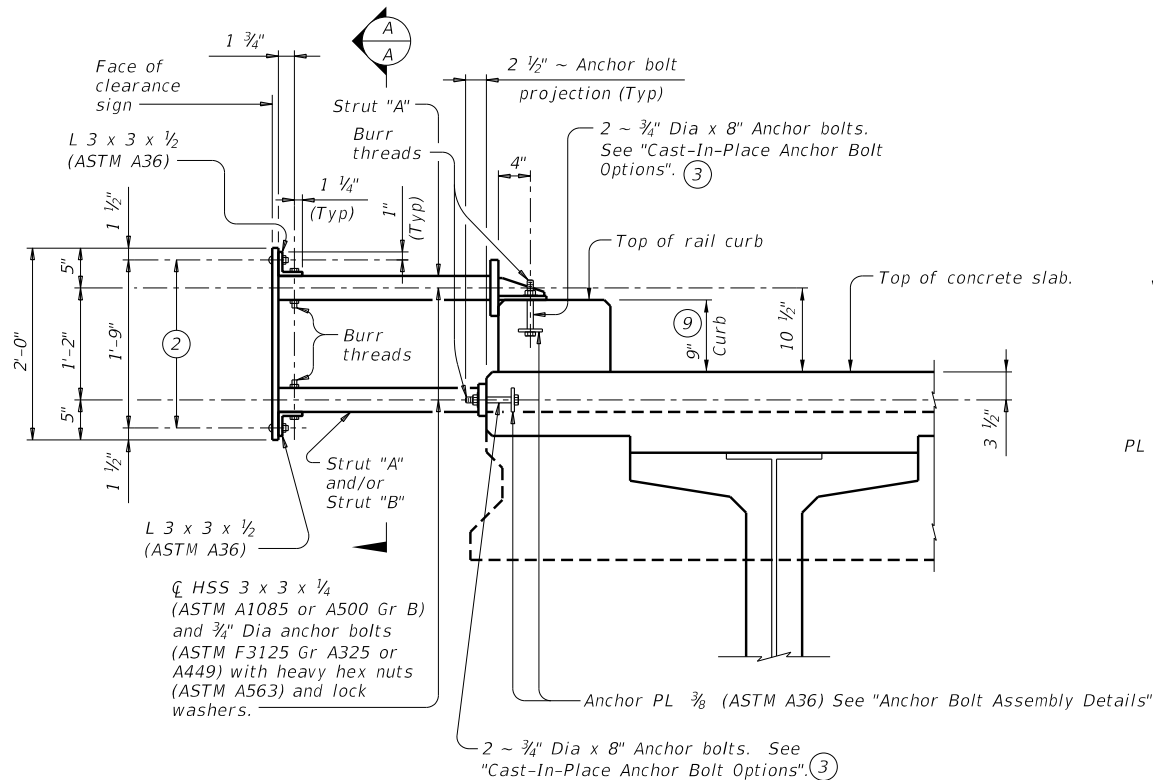
FOR 9" HIGH CURBS



FOR 11" HIGH CURBS

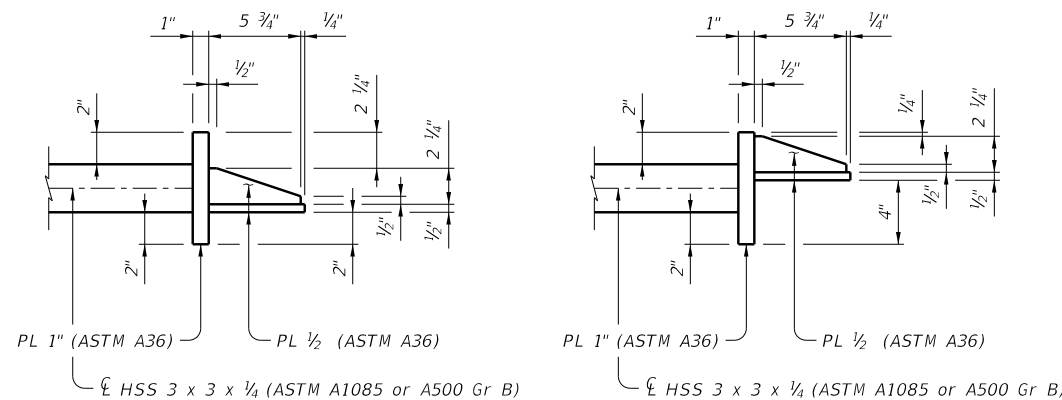
SECTION B-B

VIEW C-C



SECTION THRU T1F, T2P, C2P, T1W, C1W, T66 AND C66 RAIL CURB

Showing sign mount on a 9" high curb, 11" high curb similar.



FOR 9" HIGH CURBS

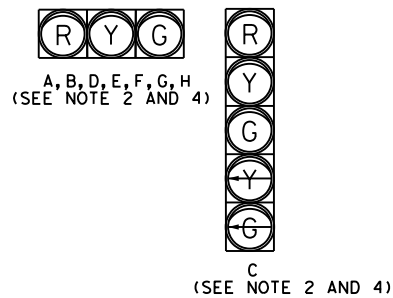
FOR 11" HIGH CURBS

VIEW D-D

SHEET 3 OF 3

		Bridge Division Standard	
BRIDGE MOUNTED CLEARANCE SIGN ASSEMBLY			
BMCS			
FILE: bmcste1-19.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
REV: 0389 13	SECT: 039	JOB: SH 146	HIGHWAY:
DIST: HOU	COUNTY: HARRIS	SHEET NO. 257	

EXISTING SIGNAL HEADS TO BE REMOVED



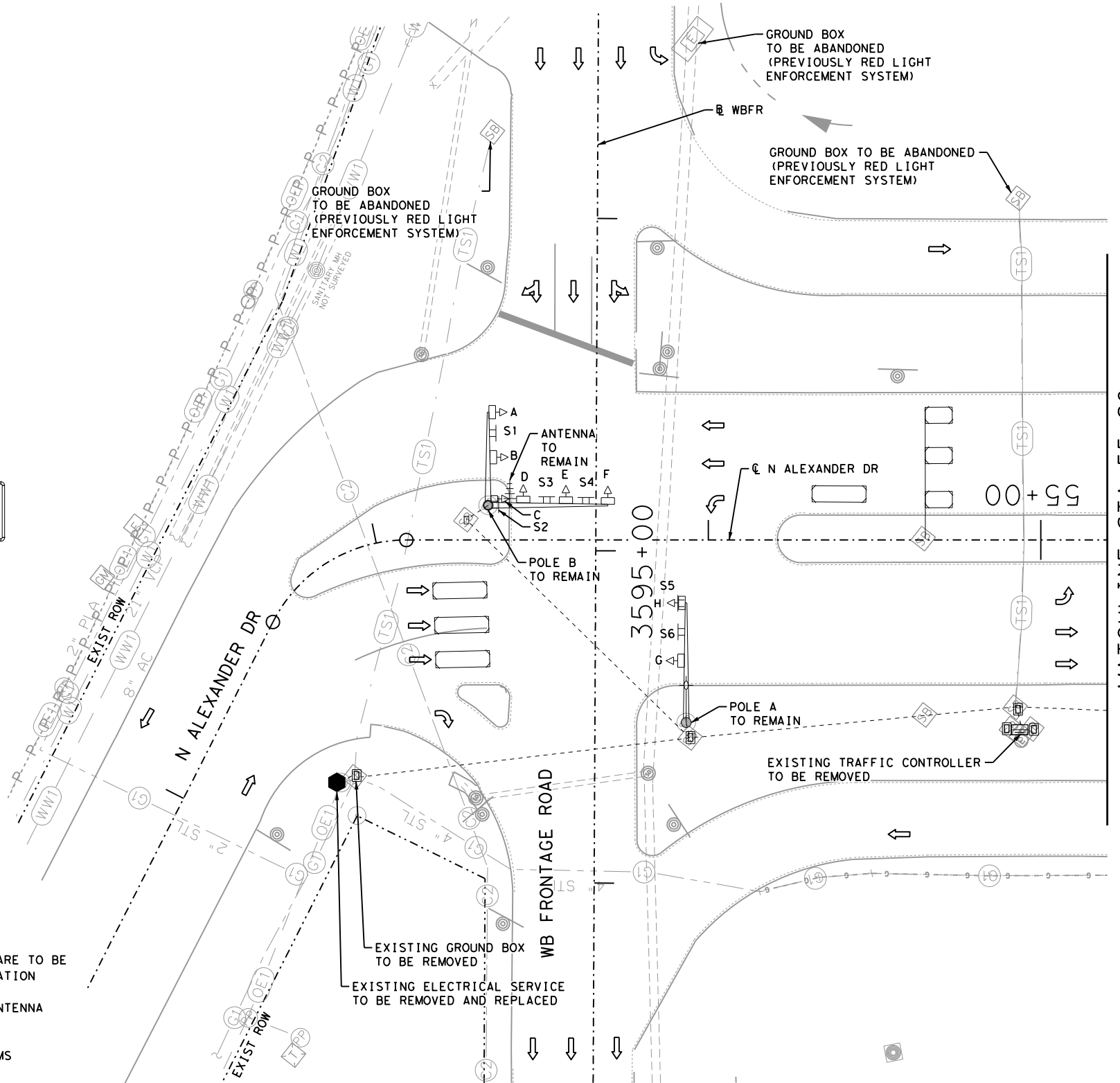
EXISTING SIGNS TO BE REMOVED



POLE ID	DESCRIPTION
POLE A	EXISTING MAST ARM W/LUM
POLE B	EXISTING DUAL MAST ARM

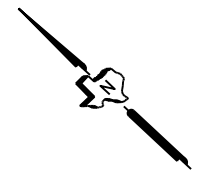
NOTES:

- LOCATION OF UNDERGROUND AND ABOVEGROUND INSTALLATIONS IS APPROXIMATE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY ALL UTILITY LOCATIONS PRIOR TO ANY CONSTRUCTION.
- EXISTING SIGNAL HEADS A, B, C, D, E, F, G AND H ARE TO BE REMOVED DURING CONVERSION TO FLASHING OPERATION
- RECONNECT EXISTING VEHICLE DETECTION AND ANTENNA EQUIPMENT AS NEEDED BY CITY OF BAYTOWN.
- SALVAGE ANY EQUIPMENT REMOVED FROM MAST ARMS AND RETURN TO STATE.
- EXISTING POLES TO REMAIN. EXISTING CONDUIT AND GROUND BOXES TO BE ABANDONED. REMOVE EXISTING SIGNAL HEAD CABLE AND POWER CABLE. SALVAGE EXISTING VEHICLE DETECTION AND ANTENNA CABLE.

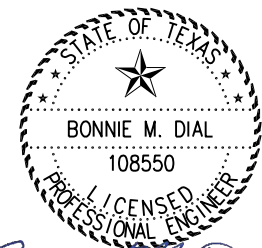


LEGEND:

- TRAFFIC FLOW
- EXIST CONTROLLER W/ CABINET
- EXIST CONDUIT
- EXIST GROUND BOX TYPE D W/ APRON
- EXIST GROUND BOX
- EXIST HORIZONTAL TRAFFIC SIGNAL HEAD
- EXIST MAST ARM AND POLE
- EXIST ELECTRICAL SERVICE
- EXIST LED LUMINAIRE W/ 10' ARM
- EXIST SMALL SIGN
- EXIST LOOP DETECTION ZONE
- EXIST ANTENNA



REV. NO.	DATE	BY	REVISION



Bonnie M. Dial

12/8/2021

AECOM 19219 KATY FREEWAY
SUITE 100 HOUSTON, TX 77094

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



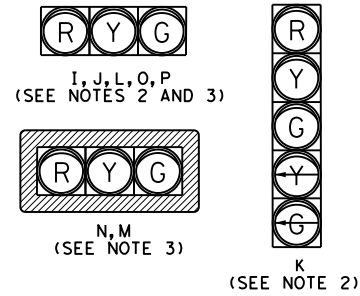
SH 146
EXISTING
TRAFFIC SIGNAL
LAYOUT
SH146 AT N ALEXANDER DR

SHEET 1 OF 2

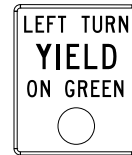
FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.			SHEET NO.
6				258
STATE	DIST.	COUNTY		
TEXAS	HOU	HARRIS		
CONT.	SECT.	JOB	HIGHWAY NO.	
0389	13	039	SH 146	

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EXISTING SIGNAL HEADS TO BE REMOVED



EXISTING SIGNS TO BE REMOVED



S8

ST. HWY 146

S7, S10

N Alexander Dr

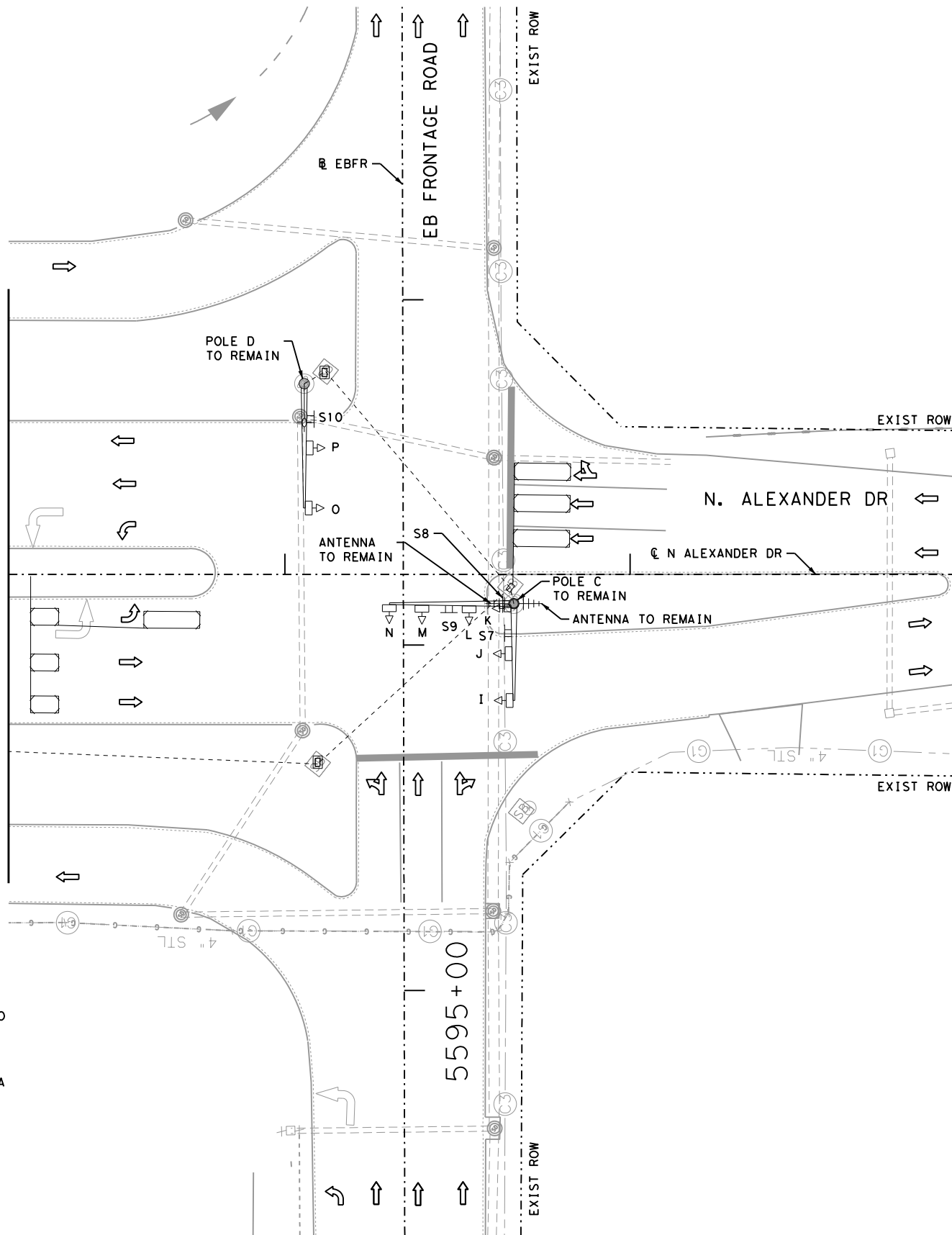
S9

POLE ID	DESCRIPTION
POLE C	EXISTING DUAL MAST ARM
POLE D	EXISTING MAST ARM W/LUM

NOTES:

1. LOCATION OF UNDERGROUND AND ABOVEGROUND INSTALLATIONS IS APPROXIMATE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY ALL UTILITY LOCATIONS PRIOR TO ANY CONSTRUCTION.
2. EXISTING SIGNAL HEADS I, J, K, L, M, N, O AND P ARE TO BE REMOVED DURING CONVERSION TO FLASHING OPERATION.
3. RECONNECT EXISTING VEHICLE DETECTION AND ANTENNA EQUIPMENT AS NEEDED BY CITY OF BAYTOWN.
4. SALVAGE ANY EQUIPMENT REMOVED FROM MAST ARMS AND RETURN TO THE STATE.
5. EXISTING POLES TO REMAIN. EXISTING CONDUIT AND GROUND BOXES TO BE ABANDONED. REMOVE EXISTING SIGNAL HEAD CABLE AND POWER CABLE. SALVAGE EXISTING VEHICLE DETECTION AND ANTENNA CABLE.

MATCHLINE STA 55+20

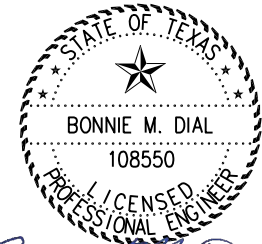


LEGEND:

- TRAFFIC FLOW
- EXIST CONTROLLER W/ CABINET
- EXIST CONDUIT
- EXIST GROUND BOX TYPE D W/ APRON
- EXIST GROUND BOX
- EXIST HORIZONTAL TRAFFIC SIGNAL HEAD
- EXIST MAST ARM AND POLE
- EXIST ELECTRICAL SERVICE
- EXIST LED LUMINAIRE W/ 10' ARM
- EXIST SMALL SIGN
- EXIST LOOP DETECTION ZONE
- EXIST ANTENNA



REV. NO.	DATE	BY	REVISION

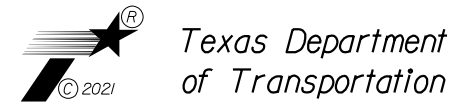


Bonnie M. Dial

12/8/2021

AECOM 19219 KATY FREEWAY
SUITE 100 HOUSTON, TX 77094

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



SH 146
EXISTING
TRAFFIC SIGNAL
LAYOUT
SH146 AT N ALEXANDER DR

SHEET 2 OF 2

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			259
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

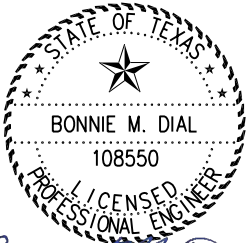



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NOTES FOR PERMANENT TRAFFIC SIGNAL(S):

1. CONTACT AND COORDINATE WITH THE OWNER OF THE OPTICOM EQUIPMENT PRIOR TO CONSTRUCTION. THE OWNER IS TO REMOVE OPTICOM EQUIPMENT. ONCE THE CONSTRUCTION IS COMPLETED IT'S THE OWNER RESPONSIBILITY TO REINSTALL OPTICOM COMPONENTS.
2. THE CONTRACTOR TO FURNISH AND INSTALL ALL EQUIPMENT CALLED FOR AND REQUIRED AS NEEDED FOR A FULLY OPERATIONAL TRAFFIC SIGNAL.
3. INSTALL SIGNALS HORIZONTALLY ON MAST ARM, 17 FT. - 6 IN. ABOVE THE ROADWAY.
4. INSTALL SIGNALS WITH ALTERNATELY FLASHING RED 12 IN. LENS.
5. FURNISH BLACK HOUSING FOR VEHICLE SIGNALS. FURNISH BLACK VEHICLE SIGNAL HEAD BACK PLATES WITH TWO-INCH RETROREFLECTIVE YELLOW BORDERS.
6. FURNISH VEHICLE SIGNAL HEADS WITH LIGHT EMITTING DIODE (LED) SIGNAL LAMP UNITS.
7. USE TYPE B (HIGH INTENSITY PRISMATIC) OR TYPE D (DIAMOND GRADE) RETROREFLECTIVE SHEETING FOR SIGNS MOUNTED UNDER OR ADJACENT TO THE SIGNAL HEADS.
8. ROUTE CABLE FOR LUMINAIRES (#12/4C - TRAY CABLE) TO THE SERVICE ENCLOSURE. SEE ELECTRICAL DETAIL SHEETS. DO NOT PASS LUMINAIRE CONDUCTORS THROUGH THE SIGNAL CONTROLLER CABINET.
9. FURNISH AND INSTALL FULL-ACTUATED CONTROLLER WITH INTERNAL TIME BASE COORDINATION UNIT IN A BASE MOUNTED CABINET.
10. FURNISH ALL MATERIALS. SUPPLY THE CONTROLLER WITH PHASE SEQUENCE, DETECTOR UNITS, DETECTOR CARD RACK, AND POWER SUPPLY, TO THE DEPARTMENT'S SIGNAL SHOP, 6810 KATY ROAD, HOUSTON, TEXAS FORTY-FIVE (45) DAYS IN ADVANCE FOR INSPECTION, SET UP, AND TESTING. CONTACT MR. MICHAEL AWA, P. E., IN WRITING, AT LEAST FIFTEEN (15) WORKING DAYS PRIOR TO PICKING UP THE MATERIALS.

ADDRESS: TEXAS DEPARTMENT OF TRANSPORTATION
 P. O. BOX 1386
 HOUSTON, TEXAS 77251-1386
 TEL. NO. (713) 802-5661

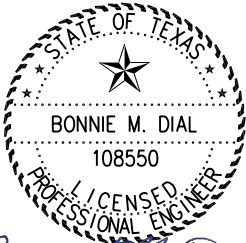
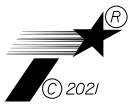
11. LOCATE CONTROLLER, ELECTRICAL SERVICE, ETC., AS APPROVED.
12. REPAIR OR REPLACE PAVEMENT AND SIDEWALKS DAMAGED BY THE CONTRACTOR'S FORCES DURING CONSTRUCTION AT NO COST TO THE DEPARTMENT.
13. CONTACT MR. MICHAEL AWA, P. E., AT TEXAS DEPARTMENT OF TRANSPORTATION, P. O. BOX 1386, HOUSTON, TEXAS 77251-1386, TEL. NO. (713) 802-5661. WHEN REMOVING EXISTING SIGNAL SYSTEMS; HIS EMPLOYEES WILL DETERMINE WHICH ITEMS WILL BE SALAVGED. ITEMS DEEMED SALVAGEABLE WILL BE DELIVERED TO THE DEPARTMENT'S SIGNAL SHOP AT 6810 KATY ROAD, HOUSTON, TEXAS, BETWEEN 9:00 AM AND 3:00 PM, MONDAY THROUGH FRIDAY. CAREFULLY REMOVE THE MATERIALS SO THAT THEY WILL NOT BE MARRED OR DAMAGED. REPLACE MATERIALS THAT ARE SCARRED, BATTERED OR BROKEN BY THE CONTRACTOR AT NO EXPENSE TO THE DEPARTMENT. DISPOSE OF OTHER ITEMS REMOVED BY THE CONTRACTOR AT NO EXPENSE TO THE DEPARTMENT.
14. REMOVE THE EXISTING STOP SIGN(S) AND THOSE ITEMS DEEMED SALVAGEABLE BY THE ENGINEER. STOCKPILE THOSE ITEMS ON THE RIGHT OF WAY. REMOVE AND DISPOSE OF OTHER ITEMS AT NO EXPENSE TO THE DEPARTMENT.
15. FURNISH AND INSTALL URETHANE FOAM TO ENCLOSE THE ENDS OF ALL CONDUITS CONTAINING SIGNAL CABLES AND ELECTRICAL CONDUCTORS.
16. CAP SPARE CONDUITS INSTALLED IN POLE FOUNDATIONS AND GROUND BOXES USING APPROVED CAPPING DEVICES.
17. DO NOT PLACE SIGNAL HEADS OVER THE ROADWAY UNTIL ALL NECESSARY MATERIALS ARE ON HAND AS APPROVED.
18. INSTALL TWO SET SCREWS ON ALL VEHICLE SIGNAL HEAD MOUNTING HARDWARE FITTINGS.
19. PROVIDE CONTINUED OPERATION OF THE EXISTING SIGNAL(S) DURING CONSTRUCTION AND UNTIL THE PROPOSED OPERATION IS COMPLETED.

REV. NO.	DATE	BY	REVISION
 <i>Bonnie M. Dial</i> 12/8/2021			
 AECOM Technical Services Inc. - 3580		19219 KATY FREEWAY SUITE 100 HOUSTON, TX 77094	
		11821 Telge Road Cypress, Texas 77429 PH: (281) 304-0200 - FX: (281) 304-0210 Firm Registration No. F-382	
		<i>Texas Department of Transportation</i>	
SH 146 TRAFFIC SIGNAL NOTES			
SH146 AT N ALEXANDER DR SHEET 1 OF 2			
FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			260
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

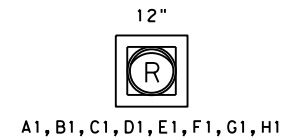
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- 20. ONCE THE INTEGRITY AND/OR FUNCTION OF THE EXISTING TRAFFIC SIGNAL(S) IS ALTERED BY THE CONTRACTOR, MAINTAIN AND OPERATE THE EXISTING TRAFFIC SIGNAL(S) UNTIL THE TRAFFIC SIGNAL WORK IS ACCEPTED BY THE DEPARTMENT. DURING THE CONSTRUCTION OF THE PROPOSED TRAFFIC SIGNAL WORK, MAINTAIN THE EXISTING TRAFFIC SIGNAL(S) AND/OR TEMPORARY CONSTRUCTION TRAFFIC SIGNAL(S) IN CONFORMANCE WITH THE LATEST TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.
- 21. DURING CONSTRUCTION OF THE PROPOSED SIGNAL WORK, IF THE EXISTING TRAFFIC SIGNAL EQUIPMENT REQUIRES REPLACEMENT DUE TO WEAR, DETERIORATION, OR ANY CIRCUMSTANCE OVER WHICH THE CONTRACTOR HAS NO CONTROL, THE EQUIPMENT WILL BE FURNISHED BY THE DEPARTMENT AT NO COST TO THE CONTRACTOR. INSTALL THIS EQUIPMENT AT NO COST TO THE DEPARTMENT. SUCH MATERIALS WILL BE PROVIDED AT THE DEPARTMENT'S SIGNAL SHOP LOCATED AT 6810 KATY ROAD, HOUSTON, TEXAS. CONTACT MR. MICHAEL AWA, P.E., AT TELEPHONE NUMBER (713) 802-5661.
- 22. MAINTAIN THE INTEGRITY AND FUNCTION OF EACH EXISTING SIGNALIZED INTERSECTION. ONCE THE INTEGRITY OR FUNCTION OF THE SIGNAL HAS BEEN ALTERED, PURSUE THE WORK AT THAT LOCATION WITHOUT DELAY OR INTERRUPTION TO RESTORE OPERATION TO ITS ORIGINAL OR FINAL OPERATIONAL DESIGN.
- 23. INSTALL A 5/8-IN. (MINIMUM) EYE BOLT FOR THE POINT OF ATTACHMENT BELOW THE SERVICE ENTRANCE WEATHERHEAD FOR THE SERVICE DROP TO STEEL OR WOOD POLE.
- 24. WRAP SIGNAL HEADS WITH DARK PLASTIC OR SUITABLE MATERIAL TO CONCEAL THE SIGNAL FACES FROM THE TIME OF INSTALLATION UNTIL PLACING INTO OPERATION.
- 25. GROUND STEEL MAST ARM POLE ASSEMBLIES IN ACCORDANCE WITH REQUIREMENTS SHOWN ON THE LATEST TRAFFIC SIGNAL POLE FOUNDATION STANDARD. USE THE GROUNDING LUG ON THE POLE TO GROUND THE POLE TO THE GROUND CONDUCTORS FROM THE CONDUITS.
- 26. INSTALL A CLOSE NIPPLE WITH LOCK NUT AND BUSHING (SIZE AS REQUIRED) WHERE THE CABLE ENTERS THE UPPER PORTION OF THE SIGNAL POLE.

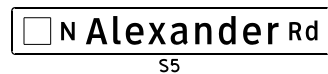
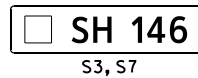
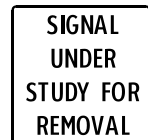
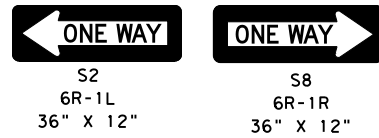
- 27. REFER TO TXDOT'S WEBSITE FOR PREQUALIFIED PRODUCTS LIST REGARDING VEHICLE LED TRAFFIC SIGNAL LAMP UNIT, CONDUIT, CONDUCTORS, GROUND BOXES, AND ELECTRIC SERVICE. CHECK WEBSITE PERIODICALLY FOR CURRENT UPDATES.
- 28. GROUND ALL EXISTING METAL GROUND BOX COVERS AS OUTLINED ON LATEST STANDARD SHEET ED (4)-14. REPLACEMENTS FOR THESE GROUND BOXES MUST BE MADE OF POLYMER CONCRETE AS DETAILED ON THE LATEST STANDARD SHEET ED (4)-14. THE MATERIALS AND LABOR ASSOCIATED WITH THIS WORK IS SUBSIDIARY TO VARIOUS BID ITEMS IN THE PROJECT.
- 29. IF EXISTING GROUND BOXES ARE FOUND TO BE INSUFFICIENT IN SIZE TO ACCOMMODATE THE PROPOSED CONDUITS AND CABLES AS SHOWN ON THE PLANS OR IF THEY HAVE BEEN DAMAGED TO THE EXTENT THEY WILL NOT ACCOMMODATE THE ADDITIONAL CONDUITS AND CABLES, REPLACE THE GROUND BOX WITH A NEW GROUND BOX (SIZE AS REQUIRED) OR INSTALL A NEW GROUND BOX ADJACENT TO THE EXISTING GROUND BOX AS APPROVED BY THE ENGINEER. SUCH REPAIR OR REPLACEMENT IS INCIDENTAL TO ITEM 624, "GROUND BOX".
- 30. IF THE ENGINEER IN THE FIELD FINDS THE EXISTING CONDUITS IN THE SIGNAL POLE FOUNDATION INADEQUATE TO ACCOMMODATE THE PROPOSED CABLES, ATTACH A NEW CONDUIT (SIZE AS REQUIRED) TO THE SIGNAL POLE FOUNDATION. IF ADEQUATE ROOM EXISTS BETWEEN THE SIGNAL POLE AND THE FOUNDATION, INSTALL THE CONDUIT UNDER THE SIGNAL POLE. IF ADEQUATE ROOM DOES NOT EXIST BETWEEN THE SIGNAL POLE AND THE FOUNDATION, ATTACH THE CONDUIT TO THE SIGNAL POLE FOR THE PROPOSED CABLES. SUCH WORK IS CONSIDERED INCIDENTAL TO THE BID ITEM 618, "CONDUIT".
- 31. REMOVE THE EXISTING LUMINAIRES AND INSTALL 250 WATT SODIUM VAPOR LUMINAIRES. REUSE EXISTING MAST ARMS AT THIS LOCATION. SUCH WORK IS INCIDENTAL TO THE ITEM 680, "INSTALLATION OF HIGHWAY TRAFFIC SIGNALS".

REV. NO.	DATE	BY	REVISION
 <i>Bonnie M. Dial</i> 12/8/2021			
AECOM <small>AECOM Technical Services Inc. - 3580</small>		19219 KATY FREEWAY SUITE 100 HOUSTON, TX 77094	
CivilTech Engineering, Inc.		11821 Telge Road Cypress, Texas 77429 PH: (281) 304-0200 - FX: (281) 304-0210 Firm Registration No. F-382	
		<i>Texas Department of Transportation</i>	
SH 146 TRAFFIC SIGNAL NOTES			
SH146 AT N ALEXANDER DR SHEET 2 OF 2			
FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			261
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

PROPOSED LED FLASHING SIGNALS

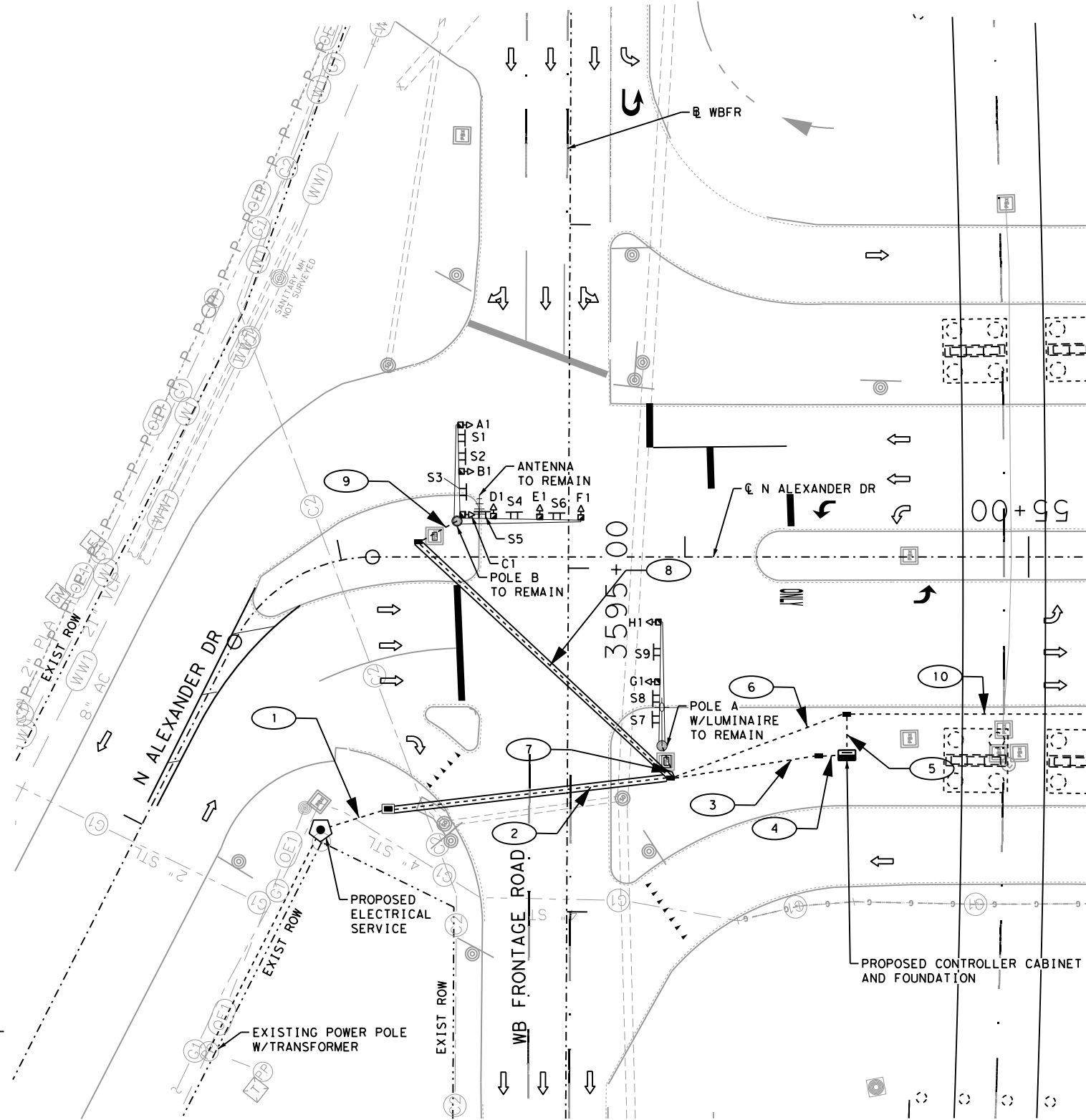


PROPOSED SIGNS



NOTES:

1. LOCATION OF UNDERGROUND AND ABOVEGROUND INSTALLATIONS IS APPROXIMATE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY ALL UTILITY LOCATIONS PRIOR TO ANY CONSTRUCTION.
2. MAINTAIN CONTINUOUS SIGNAL OPERATION DURING CONSTRUCTION. WHEN DOWNTIME IS REQUIRED, PROVIDE PEACE OFFICER OPERATION OF SIGNAL WITH ALL-WAY STOP CONTROL. INCLUDE STOP SIGNS (R1-1 36"x36") AND STOP AHEAD SIGNS (CW3-1 36"x36") DURING PEACE OFFICER OPERATION. LIMIT SIGNAL INTERRUPTION TO OFF-PEAK HOURS.
3. CONSTRUCT NEW SIGNAL CABINET/CONTROLLER WITH RED/YELLOW/GREEN OPERATION BEFORE BRIDGE WORK. PLACE RUN 10 TO AVOID BRIDGE WORK. ONCE TRAFFIC IS OPENED ON NEW BRIDGE, INSTALL FLASHING BEACON SIGNAL HEADS AND PROGRAM CONTROLLER FOR FLASHING OPERATIONS. SEE SIGNING AND PAVEMENT MARKING PLANS FOR CHANGE TO ALL-WAY STOP CONDITION.
4. MAINTAIN AND TIE INTO EXISTING CONDUIT EMBEDDED IN EXISTING TRAFFIC SIGNAL FOUNDATIONS FOR PERMANENT CONDITION FOR RUNS 7 AND 9.
5. RECONNECT EXISTING VEHICLE DETECTION EQUIPMENT AS DIRECTED BY STATE OR CITY OF BAYTOWN. WORK SUBSIDIARY TO ITEM 680.
6. GROUND BOXES AND CONDUIT LOCATIONS ARE DIAGRAMMATIC. ACTUAL LOCATIONS TO BE DETERMINED IN FIELD.

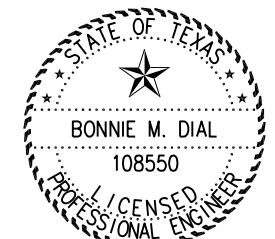


LEGEND:

- ← TRAFFIC FLOW
- ▣ PROP CONTROLLER CABINET W/ BBU
- PROP CONDUIT (TRENCH)
- === PROP CONDUIT (BORE)
- ▣ PROP GROUND BOX TYPE D W/O APRON
- ▣ PROP GROUND BOX TYPE D W/ APRON
- ▶ PROP FLASHING SIGNAL HEAD
- ⊥ EXIST MAST ARM AND POLE
- ⊕ PROP ELECTRICAL SERVICE
- ⊥ EXIST LUMINAIRE ARM
- ⊥ PROP SMALL SIGN
- ⊗ PROP RUN NUMBER
- ⊕ EXIST ANTENNA



REV. NO.	DATE	BY	REVISION

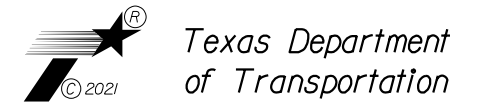


Bonnie M. Dial

12/8/2021

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Cypress, Texas 77429
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Firm Registration No. F-382

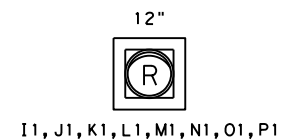


SH 146
TRAFFIC SIGNAL
CONVERSION TO
FLASH OPERATION PLAN
SH146 AT N ALEXANDER DR

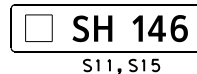
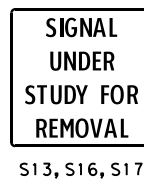
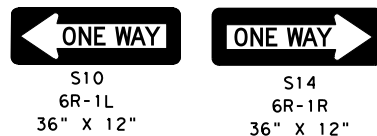
SHEET 1 OF 2

FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.		SHEET NO. 262
STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146

PROPOSED LED FLASHING SIGNALS

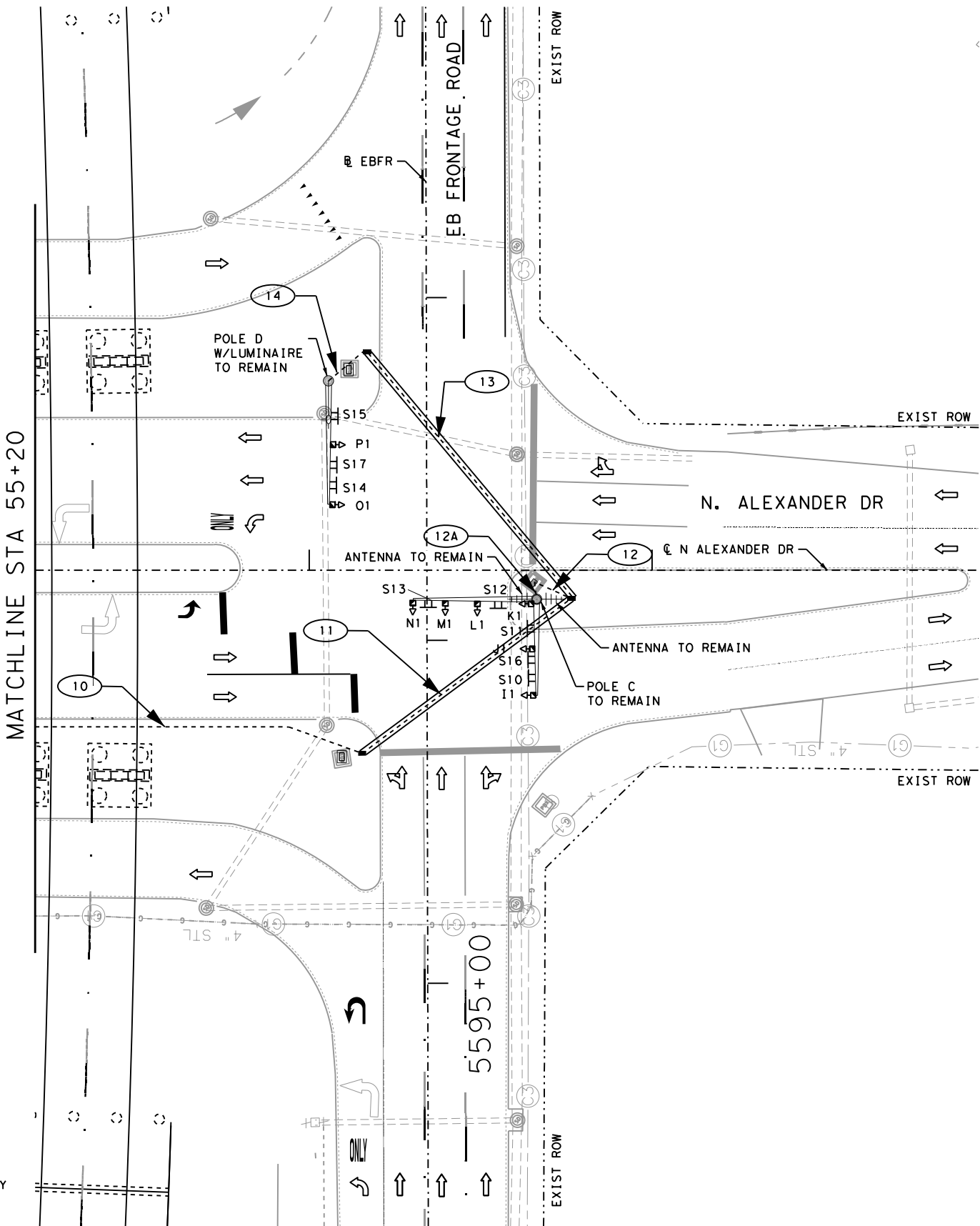


PROPOSED SIGNS



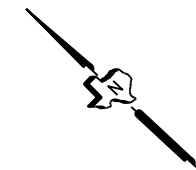
NOTES:

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3. CONSTRUCT NEW SIGNAL CABINET/CONTROLLER WITH RED/YELLOW/GREEN OPERATION BEFORE BRIDGE WORK. PLACE RUN 10 TO AVOID BRIDGE WORK. ONCE TRAFFIC IS OPENED ON NEW BRIDGE, INSTALL FLASHING BEACON SIGNAL HEADS AND PROGRAM CONTROLLER FOR FLASHING OPERATIONS. SEE SIGNING AND PAVEMENT MARKING PLANS FOR CHANGE TO ALL-WAY STOP CONDITION.
4. MAINTAIN AND TIE INTO EXISTING CONDUIT EMBEDDED IN EXISTING TRAFFIC SIGNAL FOUNDATIONS FOR PERMANENT CONDITION FOR RUNS 12A AND 14.
5. RECONNECT EXISTING VEHICLE DETECTION EQUIPMENT AS DIRECTED BY STATE OR CITY OF BAYTOWN. WORK SUBSIDIARY TO ITEM 680.
6. GROUND BOXES AND CONDUIT LOCATIONS ARE DIAGRAMMATIC. ACTUAL LOCATIONS TO BE DETERMINED IN FIELD.

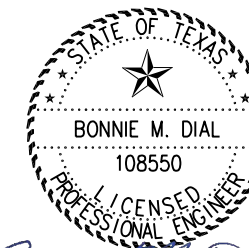


LEGEND:

- ← TRAFFIC FLOW
- ▣ PROP CONTROLLER CABINET W/ BBU
- PROP CONDUIT (TRENCH)
- ===== PROP CONDUIT (BORE)
- PROP GROUND BOX TYPE D W/O APRON
- ▣ PROP GROUND BOX TYPE D W/ APRON
- ▶ PROP FLASHING SIGNAL HEAD
- ⊥ EXIST MAST ARM AND POLE
- ⬠ PROP ELECTRICAL SERVICE
- ⊥ EXIST LUMINAIRE ARM
- ⊥ PROP SMALL SIGN
- X PROP RUN NUMBER
- +++ EXIST ANTENNA



REV. NO.	DATE	BY	REVISION

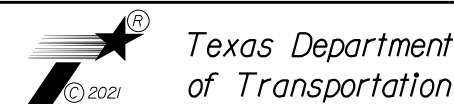


Bonnie M. Dial

12/8/2021

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PH: (281) 304-0200 - FX: (281) 304-0210
Firm Registration No. F-382



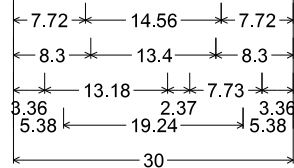
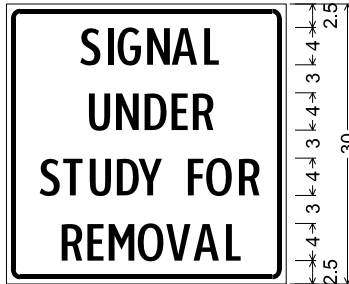
SH 146
TRAFFIC SIGNAL
CONVERSION TO
FLASH OPERATION PLAN
SH146 AT N ALEXANDER DR

SHEET 2 OF 2

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			263
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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ELECTRICAL SERVICE DATA												
ELECTRICAL SERVICE ID	SHEET NO.	ELECTRICAL SERVICE DESCRIPTION (SEE ED (5)-14 THRU ED (8)-14)	SERVICE CONDUIT SIZE (RM)	SERVICE CONDUCTORS NO. / SIZE	SAFETY SWITCH AMPS	MAIN DISCONNECT CKT. BRK. POLE/AMP	TWO-POLE CONTACTOR AMPS	PANEL BD. / LOADCENTER AMP RATING (MIN)	BRANCH CIRCUIT ID	BRANCH CKT. BRK. POLE/AMPS	BRANCH CIRCUIT AMPS	KVA LOAD
ES-1	262	TY D (120/240)060(NS)SS(E)SP(0)	1 1/4"	3/#6	N/A	2P/60	30	100	SIGNAL CONTROLLER	1P/50	40	5.52
									LUMINAIRES	2P/20	3	



D12-6-DE;
 1.50" Radius, 0.50" Border, 0.50" Indent, Black on Yellow;
 [SIGNAL UNDER STUDY FOR REMOVAL] ClearviewHwy-2-W 50% spacing;

OVERHEAD STREET NAME SIGNS TO BE PROVIDED AND MAINTAINED BY CITY OF BAYTOWN

CONTACT CITY OF BAYTOWN
 TRAFFIC ENGINEERING:
 MATTHEW JOHNSON
 281-420-7119

REV. NO.	DATE	BY	REVISION
 <i>Bonnie M. Dial</i> 12/8/2021			
AECOM		19219 KATY FREEWAY SUITE 100 HOUSTON, TX 77094	
CivilTech Engineering, Inc.		11821 Telge Road Cypress, Texas 77429 PH: (281) 304-0200 - FX: (281) 304-0210 Firm Registration No. F-382	
		<i>Texas Department of Transportation</i>	
SH 146 TRAFFIC SIGNAL CONVERSION TO FLASH OPERATION DETAILS SH146 AT N ALEXANDER DR SHEET 1 OF 2			
FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			264
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

CONDUIT AND CONDUCTOR RUNS

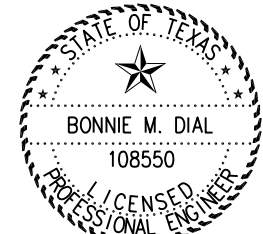



RUN NO.	CONDUIT (618)				CONDUCTORS (620)				TRAY CABLE (621)		CABLES (684)					
	PVC		RM		POWER		GROUND		LUMINAIRE		SIGNAL					
	3" (SCHD 80)		3"		#4 INSULATED		#4 BARE		#6 BARE		#12/4C Tray Cable		#12/7C			
	(6053)		(6054)		(6074)		(6012)		(6011)		(6009)		(6005)		(6012)	
	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF
1				1	28	2	28	1	28			1	28			
2			1	82			2	82	1	82			1	82		
3	1	45					2	45	1	45						
4	1	10					2	10	1	10						
5	1	11									1	11			8	11
6	1	55									1	55	1	55	4	55
7	1	15									1	15	2	15	1	15
8			1	100							1	100			3	100
9	1	13									1	13			3	13
10	1	170									1	170	1	170	4	170
11			1	76							1	76	1	76	4	76
12 12A	1	17									1	17			3	17
13			1	95							1	95	1	95	1	95
14	1	15									1	15	1	15	1	15
A													1	30	1	20
MA															1	36
B															3	20
MB1															1	36
MB2															1	28
C															3	20
MC1															1	36
MC2															1	28
D													1	30	1	20
MD															1	36
TOTAL (LF)		351		353		28		330		165		567		611		2167

EST. TOTAL	390	390	35	365	185	625	675	2385
-------------------	------------	------------	-----------	------------	------------	------------	------------	-------------

NOTES:

- A = POLE RUN
MA1/MA2 = DUAL MAST ARM POLE RUN
- ADDITIONAL SIGNAL CABLE INCLUDED FOR POLE B AND POLE C FOR POSSIBLE FUTURE LEFT TURN SIGNAL.

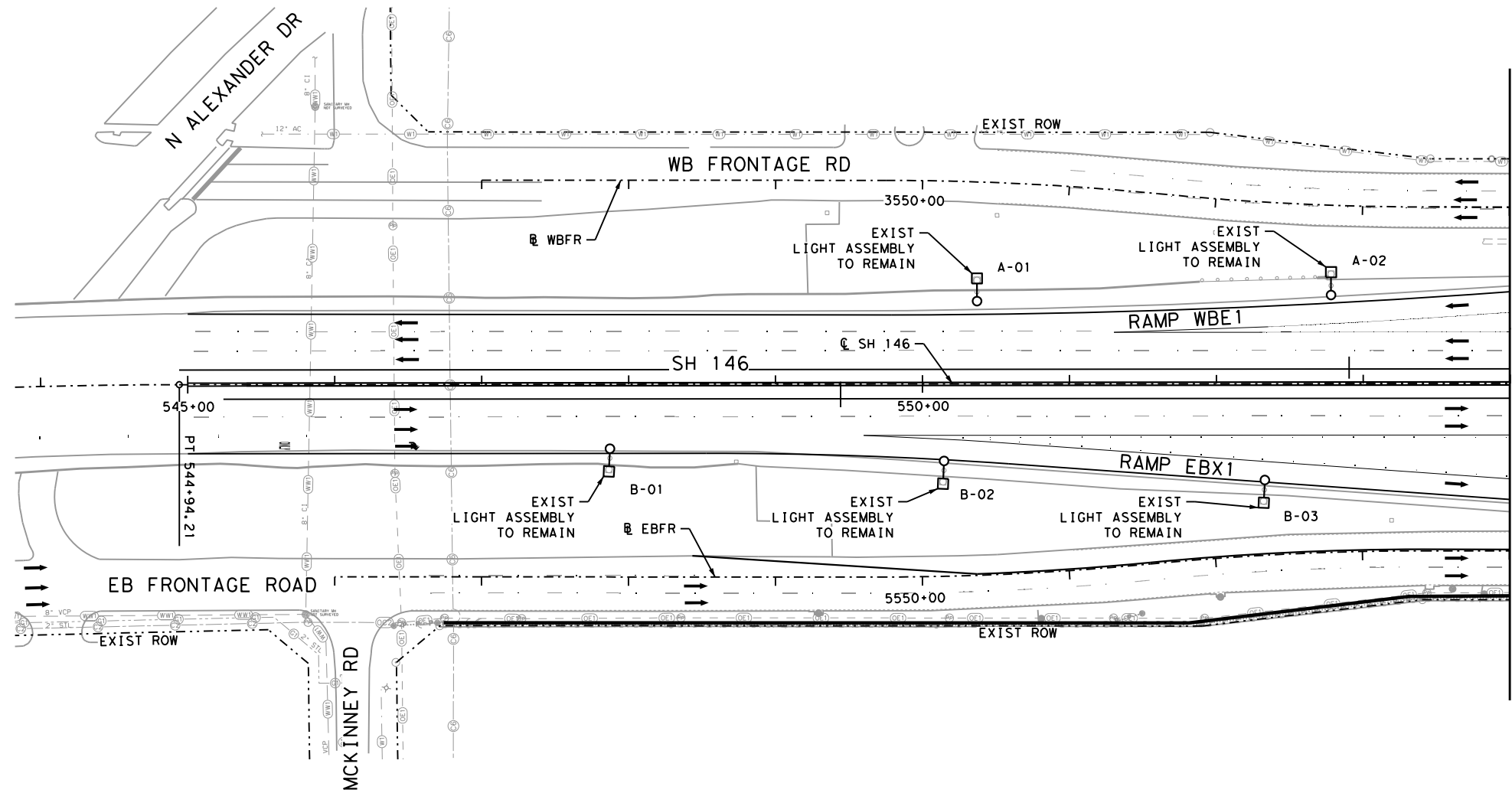
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REV. NO.	DATE	BY	REVISION
 Bonnie M. Dial 12/8/2021			
 19219 KATY FREEWAY SUITE 100 HOUSTON, TX 77094 <small>AECOM Technical Services Inc. - 3580</small>			
 11821 Telge Road Cypress, Texas 77429 PH: (281) 304-0200 - FX: (281) 304-0210 Firm Registration No. F-382			
 Texas Department of Transportation			
SH 146 TRAFFIC SIGNAL CONVERSION TO FLASH OPERATION DETAILS SH146 AT N ALEXANDER DR SHEET 2 OF 2			
FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			265
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

ROADWAY ILLUMINATION ASSEMBLY SHEET SHUMMARY				
LUMINAIRE	ML STATION	OFFSET	STANDARD TYPE	DRILL SHAFT LENGTH 30 IN DIA (LF)
A-01	550+40	N/A	EXISTING RDWY ILL ASSEMBLY - TO REMAIN	N/A
A-02	552+80	N/A	EXISTING RDWY ILL ASSEMBLY - TO REMAIN	N/A
B-01	548+85	N/A	EXISTING RDWY ILL ASSEMBLY - TO REMAIN	N/A
B-02	550+15	N/A	EXISTING RDWY ILL ASSEMBLY - TO REMAIN	N/A
B-03	552+30	N/A	EXISTING RDWY ILL ASSEMBLY - TO REMAIN	N/A

LEGEND

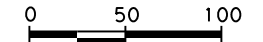
- RDWY ILL ASSEMBLY (TY SA 40T-10) (250W EQ)LED
- EXISTING RDWY ILL ASSEMBLY (TY SA 40T-10) (250W EQ)LED
- ▲ RDWY ILL AM (U/P)
- ◆ ELECTRICAL SERVICE
- ◇ EXISTING ELECTRICAL SERVICE
- CONDUIT & CONDUCTOR (TRENCHED)
- ==== CONDUIT & CONDUCTOR (BORED)
- RIGID METAL CONDUIT
- GROUND BOX TY D WITH APRON
- GROUND BOX TY D WITHOUT APRON
- ⊠ JUNCTION BOX
- ⊞ DISCONNECT SWITCH
- X-X-X
└─ RUN NUMBER
└─ CIRCLET LETTER
└─ SERVICE NUMBER



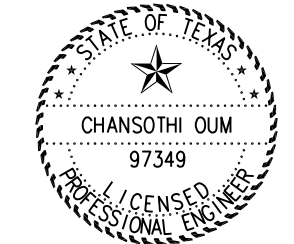
MATCHLINE STA 554+00

NOTES:

- INSTALL MOW STRIP AT ALL PROP ROADWAY ILLUMINATION ASSEMBLIES PER TXDOT RID STANDARD 2 OF 3.



REV. NO.	DATE	BY	REVISION



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1/10/2022

AECOM 19219 KATY FREEWAY
AECOM Technical Services Inc.-3580 SUITE 100
HOUSTON, TX 77094

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



SH 146
ILLUMINATION
LAYOUT
BEGIN TO STA 554+00

SHEET 1 OF 7

FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.		SHEET NO. 266
STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146

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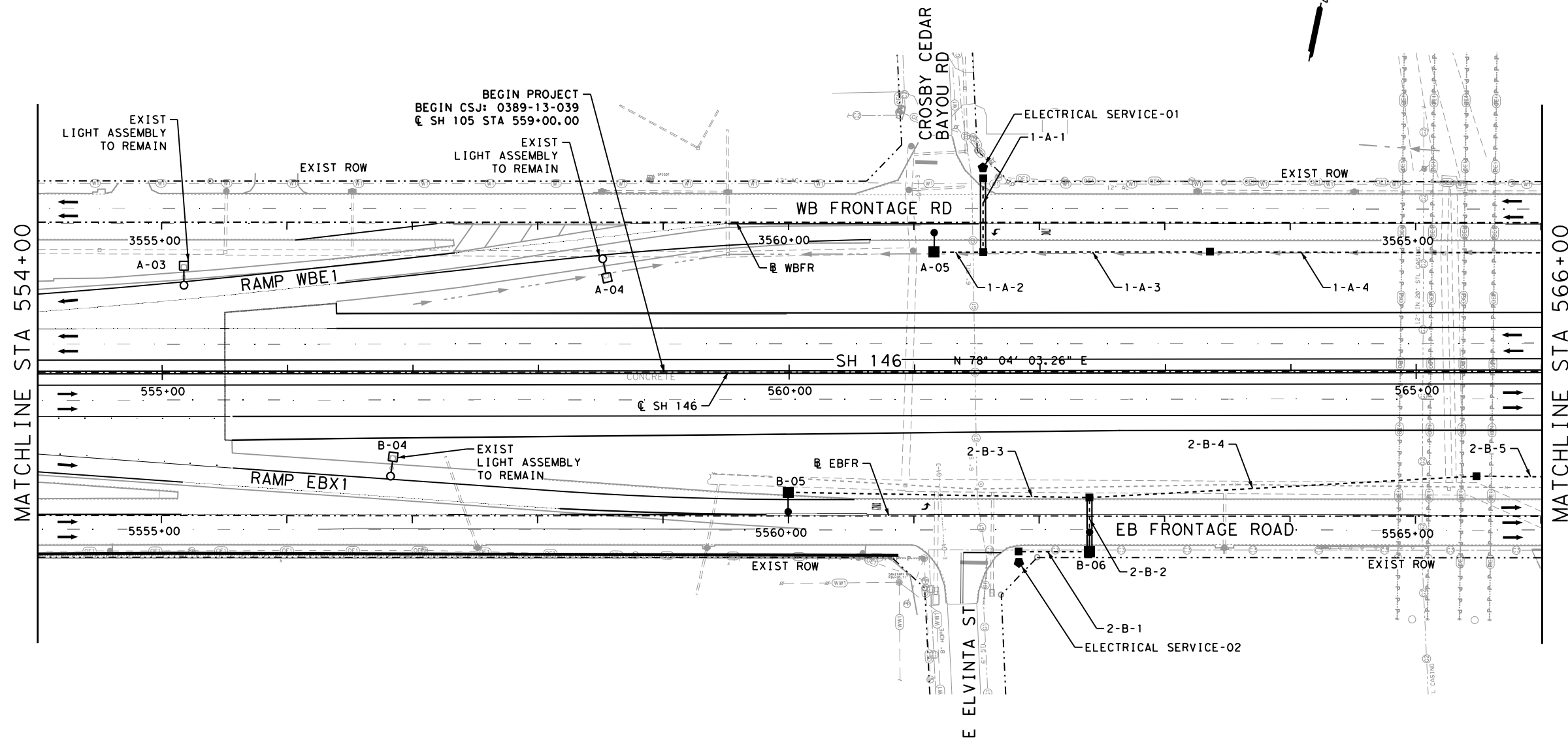
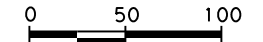
ROADWAY ILLUMINATION ASSEMBLY SHEET SUMMARY				
LUMINAIRE	ML STATION	OFFSET	STANDARD TYPE	DRILL SHAFT LENGTH 30 IN DIA (LF)
A-03	555+20	N/A	EXISTING RDWY ILL ASSEMBLY - TO REMAIN	N/A
A-04	558+55	N/A	EXISTING RDWY ILL ASSEMBLY - TO REMAIN	N/A
A-05	561+15	95.5' LT	RDWY ILL ASSEMBLY (TY SA 40T-10) (250W EQ) LED	8
B-04	556+80	N/A	EXISTING RDWY ILL ASSEMBLY - TO REMAIN	N/A
B-05	560+15	96.0' RT	RDWY ILL ASSEMBLY (TY SA 40T-10) (250W EQ) LED	8
B-06	562+35	143.4' RT	RDWY ILL ASSEMBLY (TY SA 40T-10) (250W EQ) LED	8

LEGEND

- RDWY ILL ASSEMBLY (TY SA 40T-10) (250W EQ) LED
- EXISTING RDWY ILL ASSEMBLY (TY SA 40T-10) (250W EQ) LED
- ◀ RDWY ILL AM (U/P)
- ◆ ELECTRICAL SERVICE
- ◇ EXISTING ELECTRICAL SERVICE
- CONDUIT & CONDUCTOR (TRENCHED)
- === CONDUIT & CONDUCTOR (BORED)
- RIGID METAL CONDUIT
- GROUND BOX TY D WITH APRON
- GROUND BOX TY D WITHOUT APRON
- ⊠ JUNCTION BOX
- DISCONNECT SWITCH
- X-X-X
└─ RUN NUMBER
└─ CIRCLET LETTER
└─ SERVICE NUMBER

NOTES:

- INSTALL MOW STRIP AT ALL PROP ROADWAY ILLUMINATION ASSEMBLIES PER TXDOT RID STANDARD 2 OF 3.

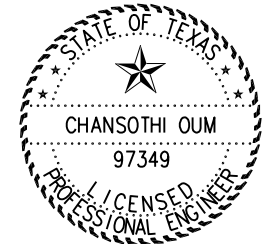


MATCHLINE STA 554+00

MATCHLINE STA 566+00

CONDUIT AND CONDUCTOR RUNS					
CONDUIT RUN	RUN LENGTH (FEET)	ELEC CONDOR SIZE & LENGTH (FEET)		CONDUIT PVC SIZE & LENGTH (FEET)	
		1 - #12 BARE	2 - #12 INSULATED	(SCHD 80) (2")	(SCHD 80) (2") (BORE)
1-A-1	59	65	130		59
1-A-2	39	45	90	39	
1-A-3	181	187	374	181	
1-A-4	374	380	760	374	
2-B-1	56	62	124	56	
2-B-2	43	49	98		43
2-B-3	240	246	492	240	
2-B-4	309	315	630	309	
TOTAL	1,301	1,349	2,698	1,199	102

REV NO.	DATE	BY	REVISION

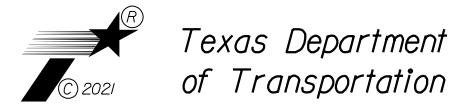


Chansothi

1/10/2022

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SH 146
ILLUMINATION
LAYOUT

STA 554+00 TO STA 566+00

SHEET 2 OF 7

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6	039		267
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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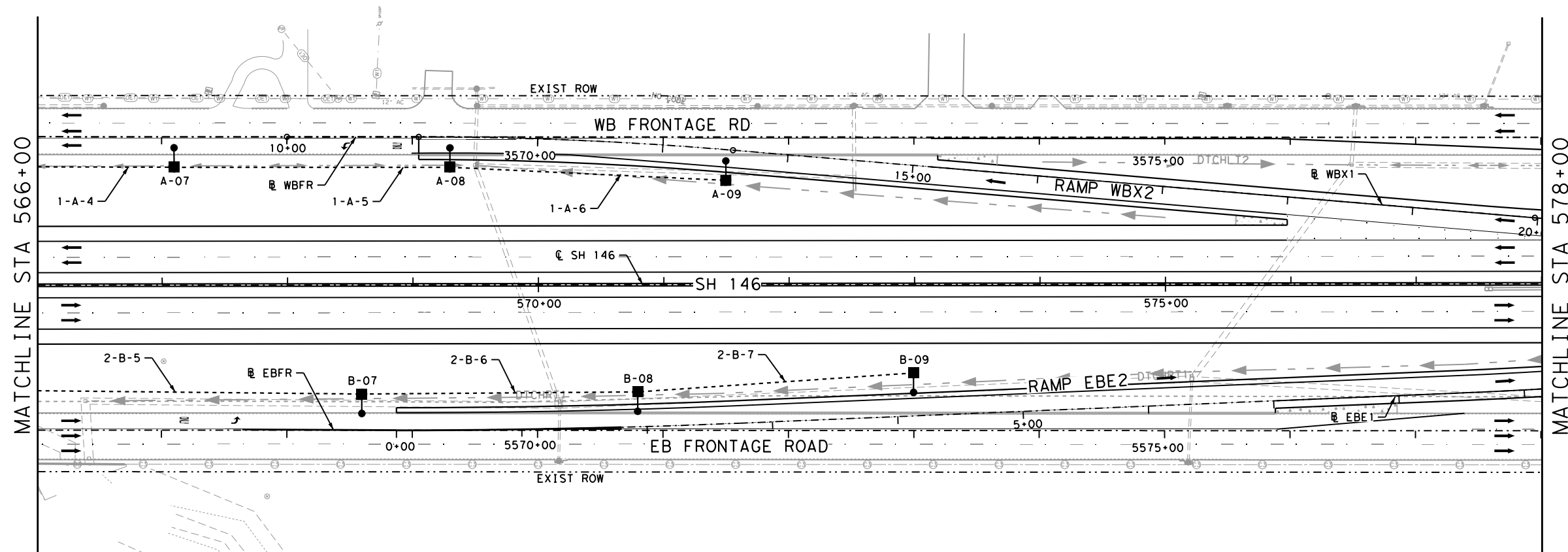
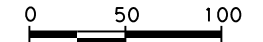
ROADWAY ILLUMINATION ASSEMBLY SHEET SHUMMARY				
LUMINAIRE	ML STATION	OFFSET	STANDARD TYPE	DRILL SHAFT LENGTH 30 IN DIA (LF)
A-07	567+10	94.0' LT	RDWY ILL ASSEMBLY (TY SA 40T-10) (250W EQ) LED	8
A-08	569+30	93.8' LT	RDWY ILL ASSEMBLY (TY SA 40T-10) (250W EQ) LED	8
A-09	571+50	83.1' LT	RDWY ILL ASSEMBLY (TY SA 40T-10) (250W EQ) LED	8
B-07	568+60	87.0' RT	RDWY ILL ASSEMBLY (TY SA 40T-10) (250W EQ) LED	8
B-08	570+80	85.5' RT	RDWY ILL ASSEMBLY (TY SA 40T-10) (250W EQ) LED	8
B-09	573+00	70.6' RT	RDWY ILL ASSEMBLY (TY SA 40T-10) (250W EQ) LED	8

LEGEND

- RDWY ILL ASSEMBLY (TY SA 40T-10) (250W EQ) LED
- EXISTING RDWY ILL ASSEMBLY (TY SA 40T-10) (250W EQ) LED
- ◀ RDWY ILL AM (U/P)
- ⬤ ELECTRICAL SERVICE
- ⬡ EXISTING ELECTRICAL SERVICE
- - - - CONDUIT & CONDUCTOR (TRENCHED)
- ≡≡≡ CONDUIT & CONDUCTOR (BORED)
- RIGID METAL CONDUIT
- GROUND BOX TY D WITH APRON
- GROUND BOX TY D WITHOUT APRON
- ⊠ JUNCTION BOX
- DISCONNECT SWITCH
- X-X-X
└─ RUN NUMBER
└─ CIRCLET LETTER
└─ SERVICE NUMBER

NOTES:

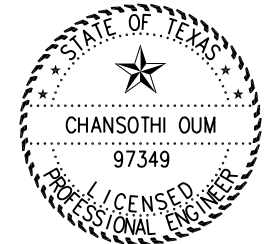
- INSTALL MOW STRIP AT ALL PROP ROADWAY ILLUMINATION ASSEMBLIES PER TXDOT RID STANDARD 2 OF 3.



MATCHLINE STA 566+00

MATCHLINE STA 578+00

REV. NO.	DATE	BY	REVISION



Chansothi

1/10/2022

AECOM 19219 KATY FREEWAY
AECOM Technical Services Inc.-3580 SUITE 100
HOUSTON, TX 77094

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



SH 146
ILLUMINATION
LAYOUT

STA 566+00 TO STA 578+00

SHEET 3 OF 7

CONDUIT AND CONDUCTOR RUNS					
CONDUIT RUN	RUN LENGTH (FEET)	ELEC CONDR SIZE & LENGTH (FEET)		CONDUIT PVC SIZE & LENGTH (FEET)	
		1 - #12 BARE	2 - #12 INSULATED	(SCHD 80) (2")	(SCHD 80) (2") (BORE)
1-A-5	220	226	452	220	
1-A-6	220	226	452	220	
2-B-5	311	317	634	311	
2-B-6	220	226	452	220	
2-B-7	221	227	454	221	
TOTAL	1,192	1,222	2,444	1,192	0

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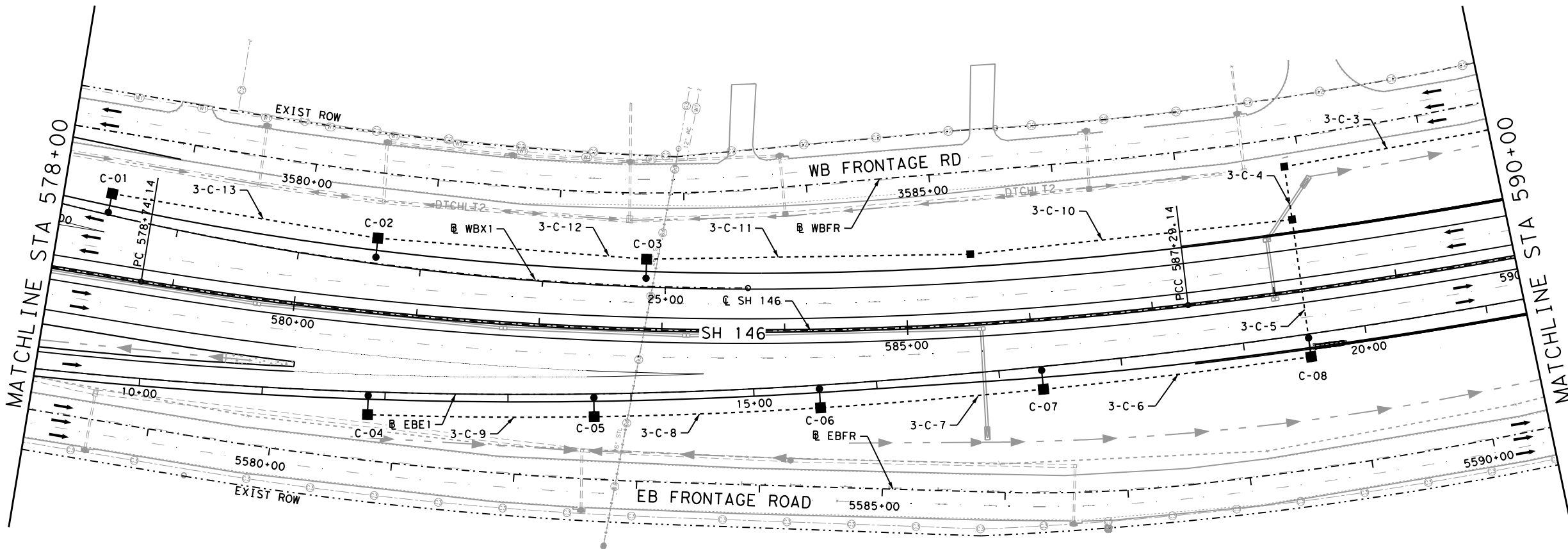
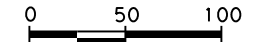
ROADWAY ILLUMINATION ASSEMBLY SHEET SHUMMARY				
LUMINAIRE	ML STATION	OFFSET	STANDARD TYPE	DRILL SHAFT LENGTH 30 IN DIA (LF)
C-01	578+35	66.7' LT	RDWY ILL ASSEMBLY (TY SA 40T-10) (250W EQ) LED	8
C-02	580+65	60.3' LT	RDWY ILL ASSEMBLY (TY SA 40T-10) (250W EQ) LED	8
C-03	582+85	57.3' LT	RDWY ILL ASSEMBLY (TY SA 40T-10) (250W EQ) LED	8
C-04	580+70	83.3' RT	RDWY ILL ASSEMBLY (TY SA 40T-10) (250W EQ) LED	8
C-05	582+50	72.2' RT	RDWY ILL ASSEMBLY (TY SA 40T-10) (250W EQ) LED	8
C-06	584+30	63.0' RT	RDWY ILL ASSEMBLY (TY SA 40T-10) (250W EQ) LED	8
C-07	586+05	56.7' RT	RDWY ILL ASSEMBLY (TY SA 40T-10) (250W EQ) LED	8
C-08	588+20	58.2' RT	RDWY ILL ASSEMBLY (TY SA 40T-10) (250W EQ) LED	8

LEGEND

- RDWY ILL ASSEMBLY (TY SA 40T-10) (250W EQ) LED
- EXISTING RDWY ILL ASSEMBLY (TY SA 40T-10) (250W EQ) LED
- ◀ RDWY ILL AM (U/P)
- ◆ ELECTRICAL SERVICE
- ◇ EXISTING ELECTRICAL SERVICE
- - - CONDUIT & CONDUCTOR (TRENCHED)
- ≡≡≡ CONDUIT & CONDUCTOR (BORED)
- RIGID METAL CONDUIT
- GROUND BOX TY D WITH APRON
- GROUND BOX TY D WITHOUT APRON
- ⊠ JUNCTION BOX
- DISCONNECT SWITCH
- X-X-X
└─ RUN NUMBER
└─ CIRCUIT LETTER
└─ SERVICE NUMBER

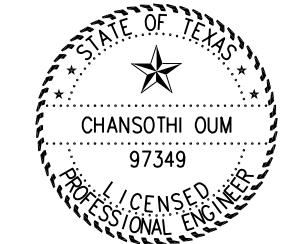
NOTES:

- INSTALL MOW STRIP AT ALL PROP ROADWAY ILLUMINATION ASSEMBLIES PER TXDOT RID STANDARD 2 OF 3.



CONDUIT AND CONDUCTOR RUNS					
CONDUIT RUN	RUN LENGTH (FEET)	ELEC CONDR SIZE & LENGTH (FEET)		CONDUIT PVC SIZE & LENGTH (FEET)	
		1 - #12 BARE	2 - #12 INSULATED	(SCHD 80) (2")	(SCHD 80) (2") (BORE)
3-C-4	44	50	100	44	
3-C-5	116	122	244	116	
3-C-6	219	225	450	219	
3-C-7	182	188	376	182	
3-C-8	184	190	380	184	
3-C-9	184	190	380	184	
3-C-10	263	269	538	263	
3-C-11	263	269	538	263	
3-C-12	219	225	450	219	
3-C-13	219	225	450	219	
TOTAL	1,893	1,953	3,906	1,893	0

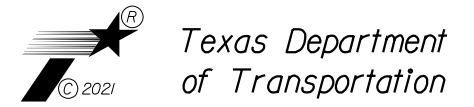
REV NO.	DATE	BY	REVISION



Chansothi
1/10/2022

AECOM 19219 KATY FREEWAY
AECOM Technical Services Inc.-3580 SUITE 100
HOUSTON, TX 77094

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Firm Registration No. F-382



SH 146
ILLUMINATION
LAYOUT

STA 578+00 TO STA 590+00

SHEET 4 OF 7

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			269
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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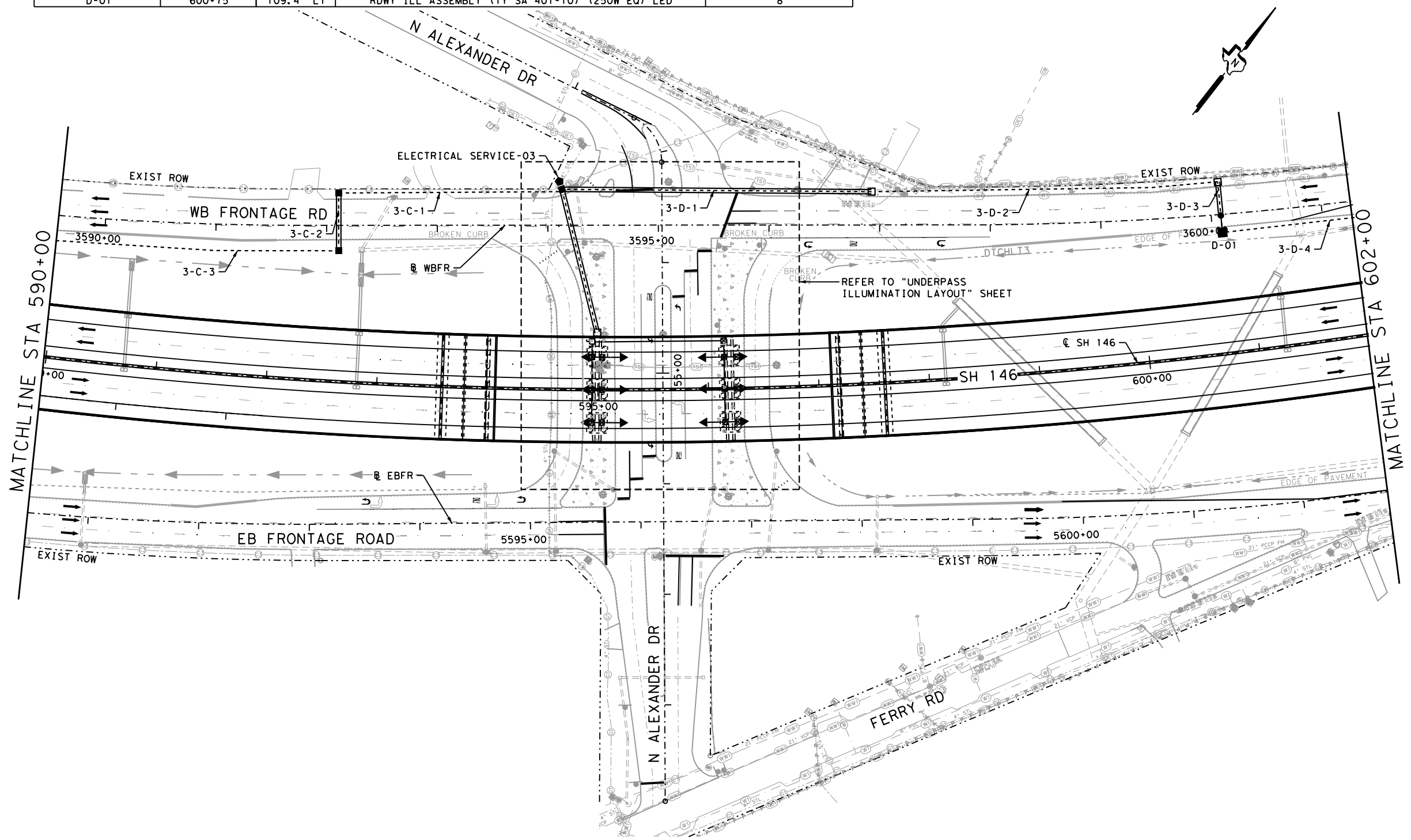
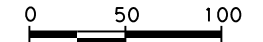
ROADWAY ILLUMINATION ASSEMBLY SHEET SUMMARY				
LUMINAIRE	ML STATION	OFFSET	STANDARD TYPE	DRILL SHAFT LENGTH 30 IN DIA (LF)
D-01	600+75	109.4' LT	RDWY ILL ASSEMBLY (TY SA 40T-10) (250W EQ) LED	8

LEGEND

- RDWY ILL ASSEMBLY (TY SA 40T-10) (250W EQ) LED
- EXISTING RDWY ILL ASSEMBLY (TY SA 40T-10) (250W EQ) LED
- ▲ RDWY ILL AM (U/P)
- ◆ ELECTRICAL SERVICE
- ◇ EXISTING ELECTRICAL SERVICE
- - - CONDUIT & CONDUCTOR (TRENCHED)
- ≡≡≡ CONDUIT & CONDUCTOR (BORED)
- RIGID METAL CONDUIT
- GROUND BOX TY D WITH APRON
- GROUND BOX TY D WITHOUT APRON
- ⊠ JUNCTION BOX
- ⊞ DISCONNECT SWITCH
- X-X-X RUN NUMBER
CIRCUIT LETTER
SERVICE NUMBER

NOTES:

- INSTALL MOW STRIP AT ALL PROP ROADWAY ILLUMINATION ASSEMBLIES PER TXDOT RID STANDARD 2 OF 3.



CONDUIT AND CONDUCTOR RUNS					
CONDUIT RUN	RUN LENGTH (FEET)	ELEC CONDR SIZE & LENGTH (FEET)		CONDUIT PVC SIZE & LENGTH (FEET)	
		1 - #12 BARE	2 - #12 INSULATED	(SCHD 80) (2")	(SCHD 80) (2") (BORE)
3-C-1	202	208	416		202
3-C-2	52	58	116	52	
3-C-3	424	430	860	424	
3-D-1	280	286	572		280
3-D-2	313	319	638	313	
3-D-3	46	52	104		46
TOTAL	1,317	1,353	2,706	789	528

REV NO.	DATE	BY	REVISION
1/10/2022			
AECOM		19219 KATY FREEWAY SUITE 100 HOUSTON, TX 77094	
CivilTech Engineering, Inc.		11821 Telge Road Cypress, Texas 77429 PH: (281) 304-0200 - FX: (281) 304-0210 Firm Registration No. F-382	
SH 146 ILLUMINATION LAYOUT			
STA 590+00 TO STA 602+00			
SHEET 5 OF 7			
FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			270
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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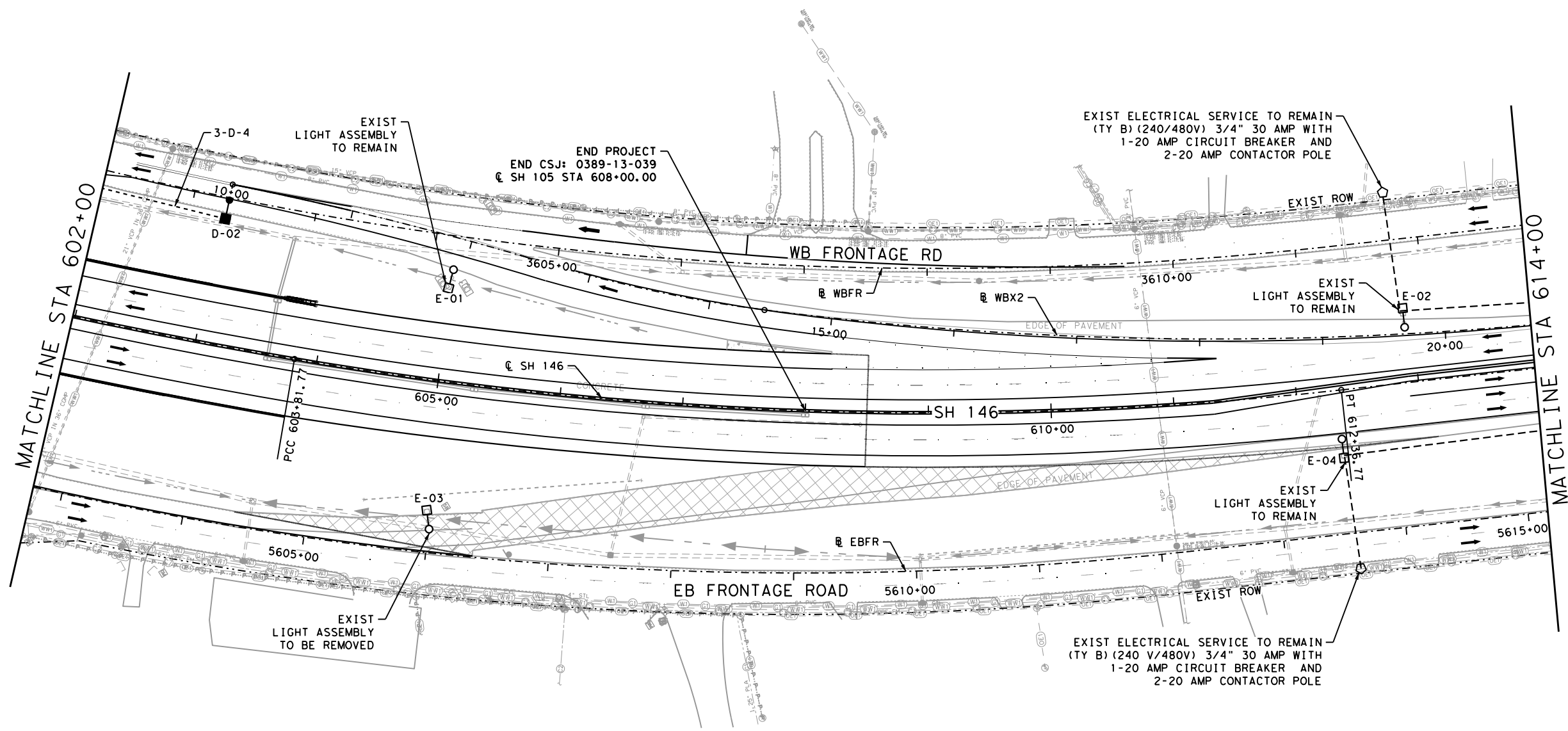
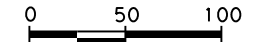
ROADWAY ILLUMINATION ASSEMBLY SHEET SUMMARY				
LUMINAIRE	ML STATION	OFFSET	STANDARD TYPE	DRILL SHAFT LENGTH 30 IN DIA (LF)
D-02	603+00	102.4' LT	RDWY ILL ASSEMBLY (TY SA 40T-10) (250W EQ) LED	8
E-01	605+00	N/A	EXISTING RDWY ILL ASSEMBLY - TO REMAIN	N/A
E-02	611+90	N/A	EXISTING RDWY ILL ASSEMBLY - TO REMAIN	N/A
E-03	605+10	N/A	EXISTING RDWY ILL ASSEMBLY - TO BE REMOVED	N/A
E-04	612+35	N/A	EXISTING RDWY ILL ASSEMBLY - TO REMAIN	N/A

LEGEND

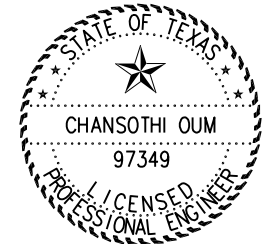
- RDWY ILL ASSEMBLY (TY SA 40T-10) (250W EQ) LED
- EXISTING RDWY ILL ASSEMBLY (TY SA 40T-10) (250W EQ) LED
- ▲ RDWY ILL AM (U/P)
- ◆ ELECTRICAL SERVICE
- ◇ EXISTING ELECTRICAL SERVICE
- CONDUIT & CONDUCTOR (TRENCHED)
- ==== CONDUIT & CONDUCTOR (BORED)
- RIGID METAL CONDUIT
- GROUND BOX TY D WITH APRON
- GROUND BOX TY D WITHOUT APRON
- ⊠ JUNCTION BOX
- DISCONNECT SWITCH
- X-X-X
— RUN NUMBER
— CIRCLET LETTER
— SERVICE NUMBER

NOTES:

- INSTALL MOW STRIP AT ALL PROP ROADWAY ILLUMINATION ASSEMBLIES PER TXDOT RID STANDARD 2 OF 3.



REV NO.	DATE	BY	REVISION

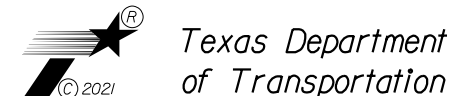


Chansothi

1/10/2022

AECOM 19219 KATY FREEWAY
AECOM Technical Services Inc.-3580 SUITE 100
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Firm Registration No. F-382



SH 146
ILLUMINATION
LAYOUT

STA 602+00 TO STA 614+00

SHEET 6 OF 7

CONDUIT AND CONDUCTOR RUNS					
CONDUIT RUN	RUN LENGTH (FEET)	ELEC CONDR SIZE & LENGTH (FEET)		CONDUIT PVC SIZE & LENGTH (FEET)	
		1 - #12 BARE	2 - #12 INSULATED	(SCHD 80) (2")	(SCHD 80) (2") (BORE)
3-D-4	223	229	458	223	0
TOTAL	223	229	458	223	0

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			271
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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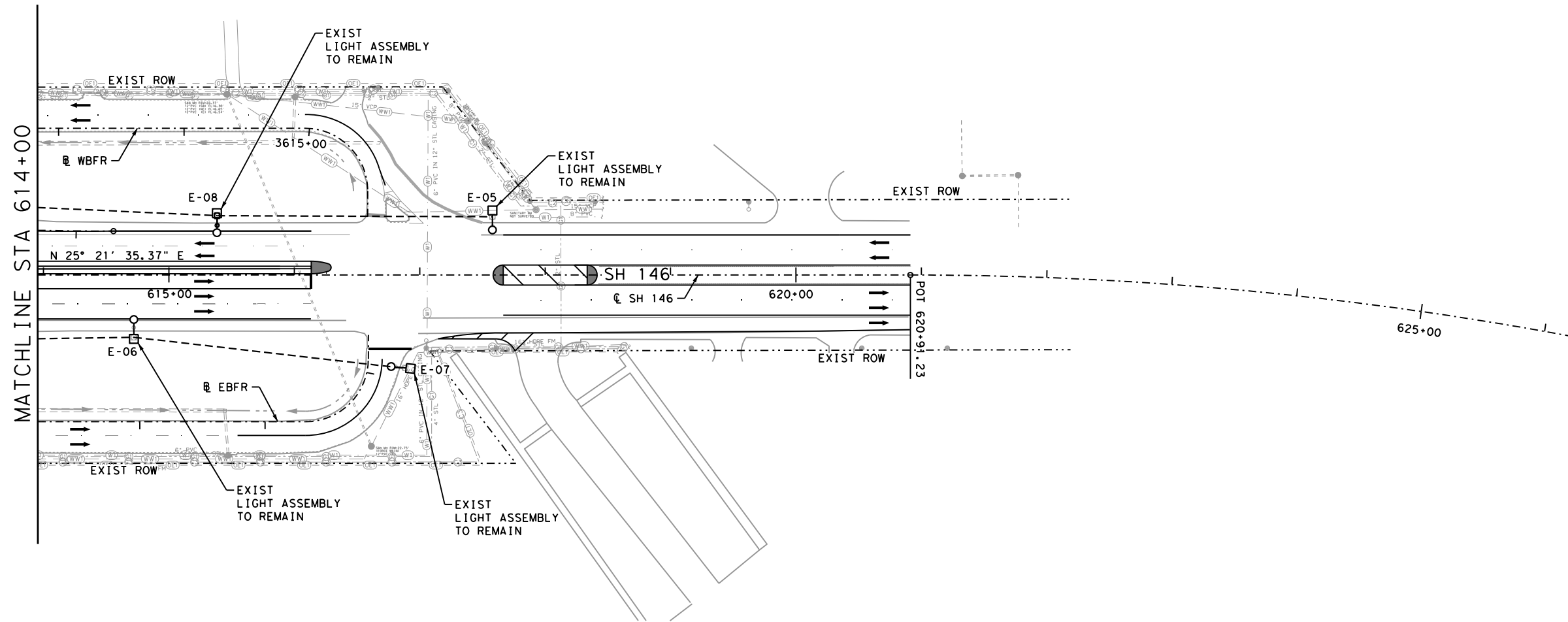
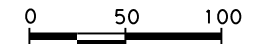
ROADWAY ILLUMINATION ASSEMBLY SHEET SHUMMARY				
LUMINAIRE	ML STATION	OFFSET	STANDARD TYPE	DRILL SHAFT LENGTH 30 IN DIA (LF)
E-05	617+60	N/A	EXISTING RDWY ILL ASSEMBLY - TO REMAIN	N/A
E-06	614+75	N/A	EXISTING RDWY ILL ASSEMBLY - TO REMAIN	N/A
E-07	616+90	N/A	EXISTING RDWY ILL ASSEMBLY - TO REMAIN	N/A
E-08	615+40	N/A	EXISTING RDWY ILL ASSEMBLY - TO REMAIN	N/A

LEGEND

- RDWY ILL ASSEMBLY (TY SA 40T-10) (250W EQ)LED
- EXISTING RDWY ILL ASSEMBLY (TY SA 40T-10) (250W EQ)LED
- ◀ RDWY ILL AM (U/P)
- ◆ ELECTRICAL SERVICE
- ◇ EXISTING ELECTRICAL SERVICE
- CONDUIT & CONDUCTOR (TRENCHED)
- ==== CONDUIT & CONDUCTOR (BORED)
- RIGID METAL CONDUIT
- GROUND BOX TY D WITH APRON
- GROUND BOX TY D WITHOUT APRON
- ⊠ JUNCTION BOX
- ⊞ DISCONNECT SWITCH
- X-X-X
├── RUN NUMBER
├── CIRCUIT LETTER
└── SERVICE NUMBER

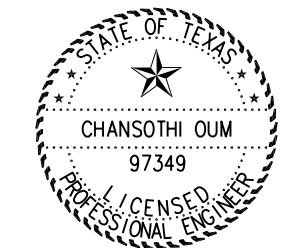
NOTES:

- INSTALL MOW STRIP AT ALL PROP ROADWAY ILLUMINATION ASSEMBLIES PER TXDOT RID STANDARD 2 OF 3.



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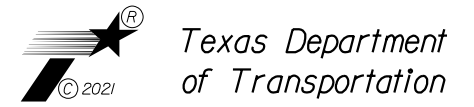
REV NO.	DATE	BY	REVISION



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1/10/2022

AECOM 19219 KATY FREEWAY
AECOM Technical Services Inc.-3580 SUITE 100
HOUSTON, TX 77094

CivilTech Engineering, Inc. 11821 Telge Road
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Firm Registration No. F-382



SH 146
ILLUMINATION
LAYOUT

STA 614+00 TO END

SHEET 7 OF 7

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			272
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

ROADWAY ILLUMINATION ASSEMBLY SHEET SHUMMARY

LUMINAIRE	ML STATION	OFFSET	STANDARD TYPE
F-01	54+58	BENT	UNDERPASS TY 1 (150W EQ) LED
F-02	55+14	BENT	UNDERPASS TY 1 (150W EQ) LED
F-03	55+42	BENT	UNDERPASS TY 1 (150W EQ) LED
F-04	54+58	GIRDER	UNDERPASS TY 2 (150W EQ) LED
F-05	55+14	GIRDER	UNDERPASS TY 2 (150W EQ) LED
F-06	55+42	GIRDER	UNDERPASS TY 2 (150W EQ) LED
F-07	54+58	GIRDER	UNDERPASS TY 2 (150W EQ) LED
F-08	55+14	GIRDER	UNDERPASS TY 2 (150W EQ) LED
F-09	55+42	GIRDER	UNDERPASS TY 2 (150W EQ) LED
F-10	54+58	BENT	UNDERPASS TY 1 (150W EQ) LED
F-11	55+14	BENT	UNDERPASS TY 1 (150W EQ) LED
F-12	55+42	BENT	UNDERPASS TY 1 (150W EQ) LED

CONDUIT AND CONDUCTOR RUNS

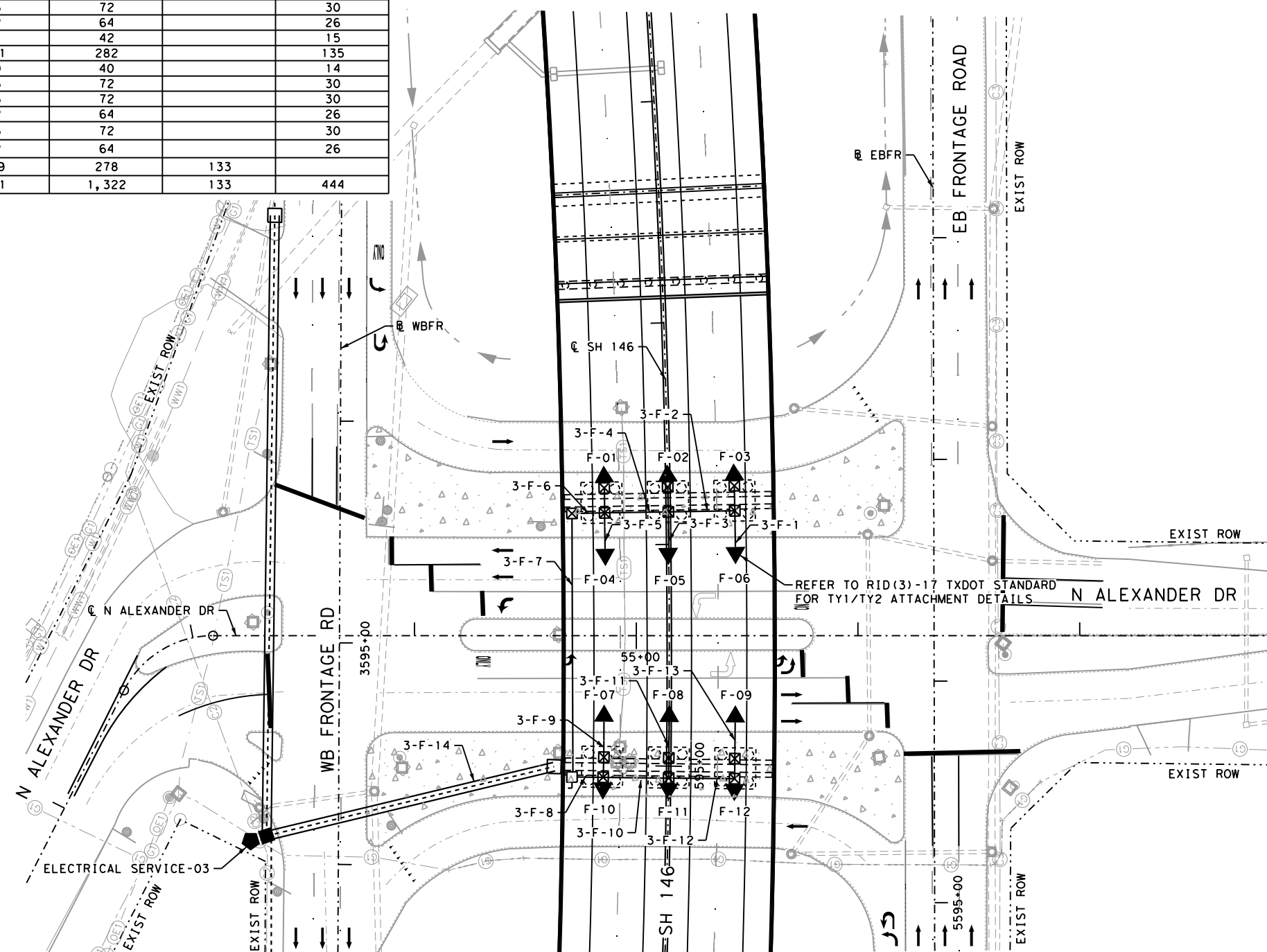
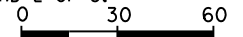
CONDUIT RUN	RUN LENGTH (FEET)	ELEC CONDR SIZE & LENGTH (FEET)		CONDUIT PVC SIZE & LENGTH (FEET)	
		1 - #12 BARE	2 - #12 INSULATED	(SCHD 80) (2") (BORE)	(RM) 3/4"
3-F-1	26	32	64		26
3-F-2	30	36	72		30
3-F-3	26	32	64		26
3-F-4	30	36	72		30
3-F-5	26	32	64		26
3-F-6	15	21	42		15
3-F-7	135	141	282		135
3-F-8	14	20	40		14
3-F-9	30	36	72		30
3-F-10	30	36	72		30
3-F-11	26	32	64		26
3-F-12	30	36	72		30
3-F-13	26	32	64		26
3-F-14	133	139	278	133	
TOTAL	577	661	1,322	133	444

LEGEND

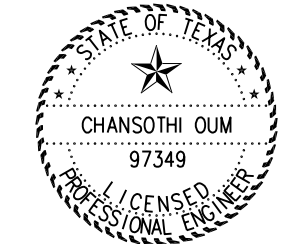
- RDWY ILL ASSEMBLY (TY SA 40T-10) (250W EQ) LED
- EXISTING RDWY ILL ASSEMBLY (TY SA 40T-10) (250W EQ) LED
- ▲ RDWY ILL AM (U/P)
- ◆ ELECTRICAL SERVICE
- ◇ EXISTING ELECTRICAL SERVICE
- - - CONDUIT & CONDUCTOR (TRENCHED)
- ≡≡≡ CONDUIT & CONDUCTOR (BORED)
- RIGID METAL CONDUIT
- GROUND BOX TY D WITH APRON
- GROUND BOX TY D WITHOUT APRON
- ⊠ JUNCTION BOX
- ⊞ DISCONNECT SWITCH
- X-X-X
└─ RUN NUMBER
└─ CIRCUIT LETTER
└─ SERVICE NUMBER

NOTES:

- INSTALL MOW STRIP AT ALL PROP ROADWAY ILLUMINATION ASSEMBLIES PER TXDOT RID STANDARD 2 OF 3.



REV. NO.	DATE	BY	REVISION



Chansothi

1/10/2022

AECOM 19219 KATY FREEWAY
SUITE 100 HOUSTON, TX 77094
AECOM Technical Services Inc.-3580

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Firm Registration No. F-382

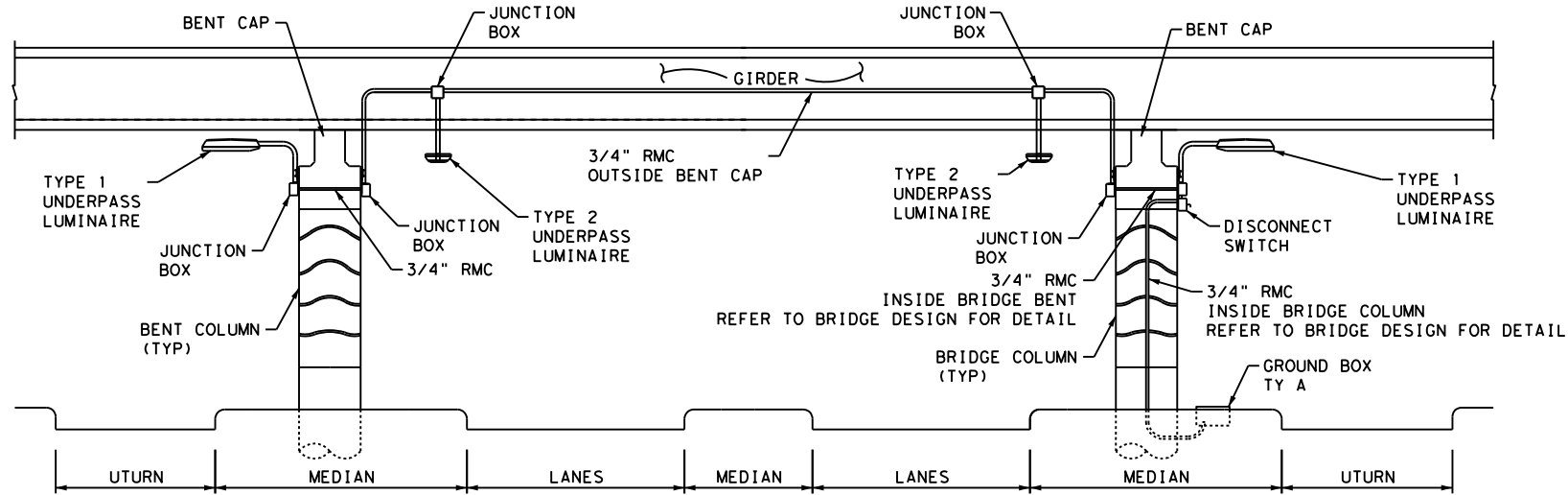


SH 146
UNDERPASS
ILLUMINATION
LAYOUT
N ALEXANDER DR

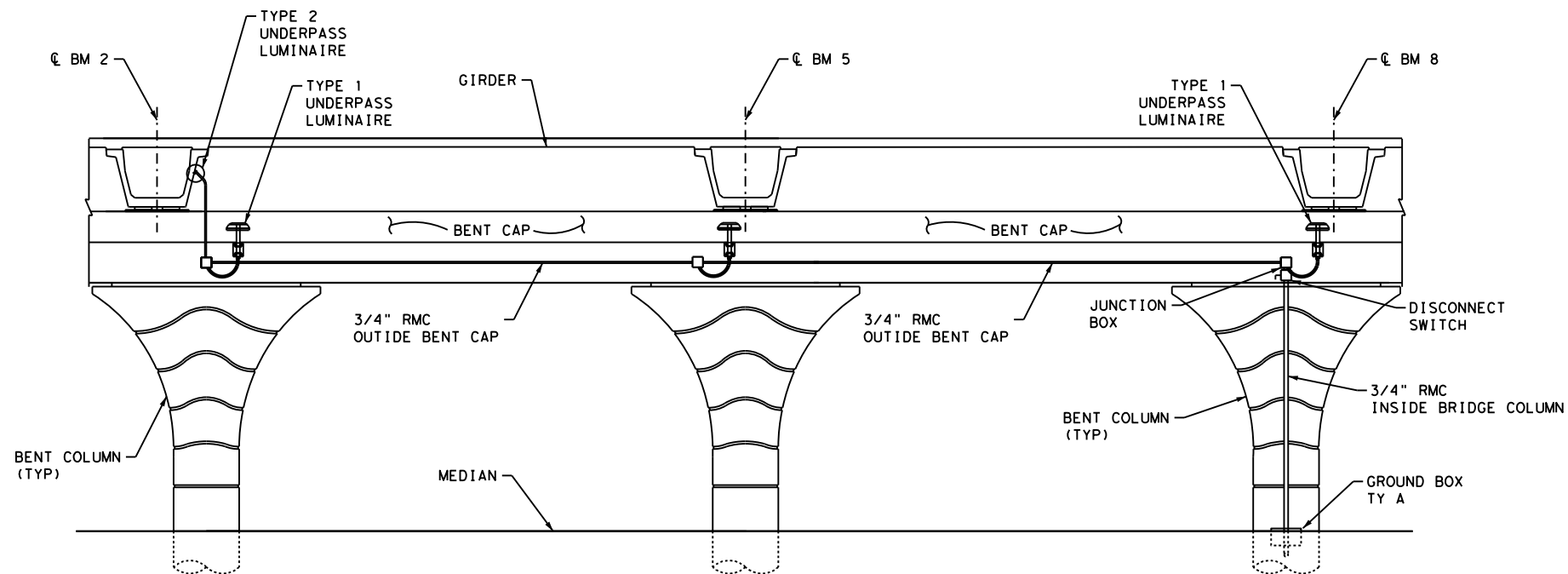
SHEET 1 OF 2

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			273
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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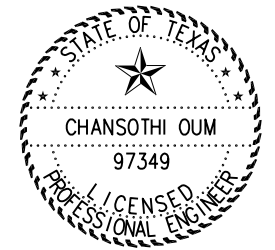
ELEVATION
LOOKING EAST



ELEVATION
LOOKING NORTH

N. T. S.

REV. NO.	DATE	BY	REVISION

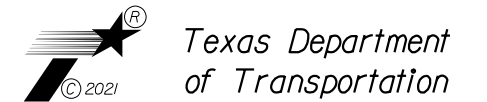


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1/10/2022

AECOM 19219 KATY FREEWAY
AECOM Technical Services Inc.-3580 SUITE 100
HOUSTON, TX 77094

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



SH 146
UNDERPASS:
ILLUMINATION LAYOUT

N ALEXANDER DR

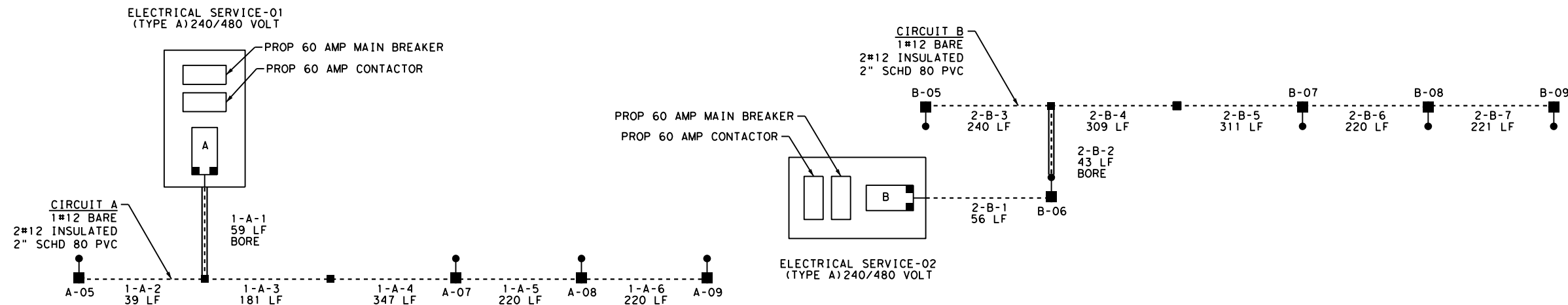
SHEET 2 OF 2

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.			SHEET NO.
6				274
STATE	DIST.	COUNTY		
TEXAS	HOU	HARRIS		
CONT.	SECT.	JOB	HIGHWAY NO.	
0389	13	039	SH 146	

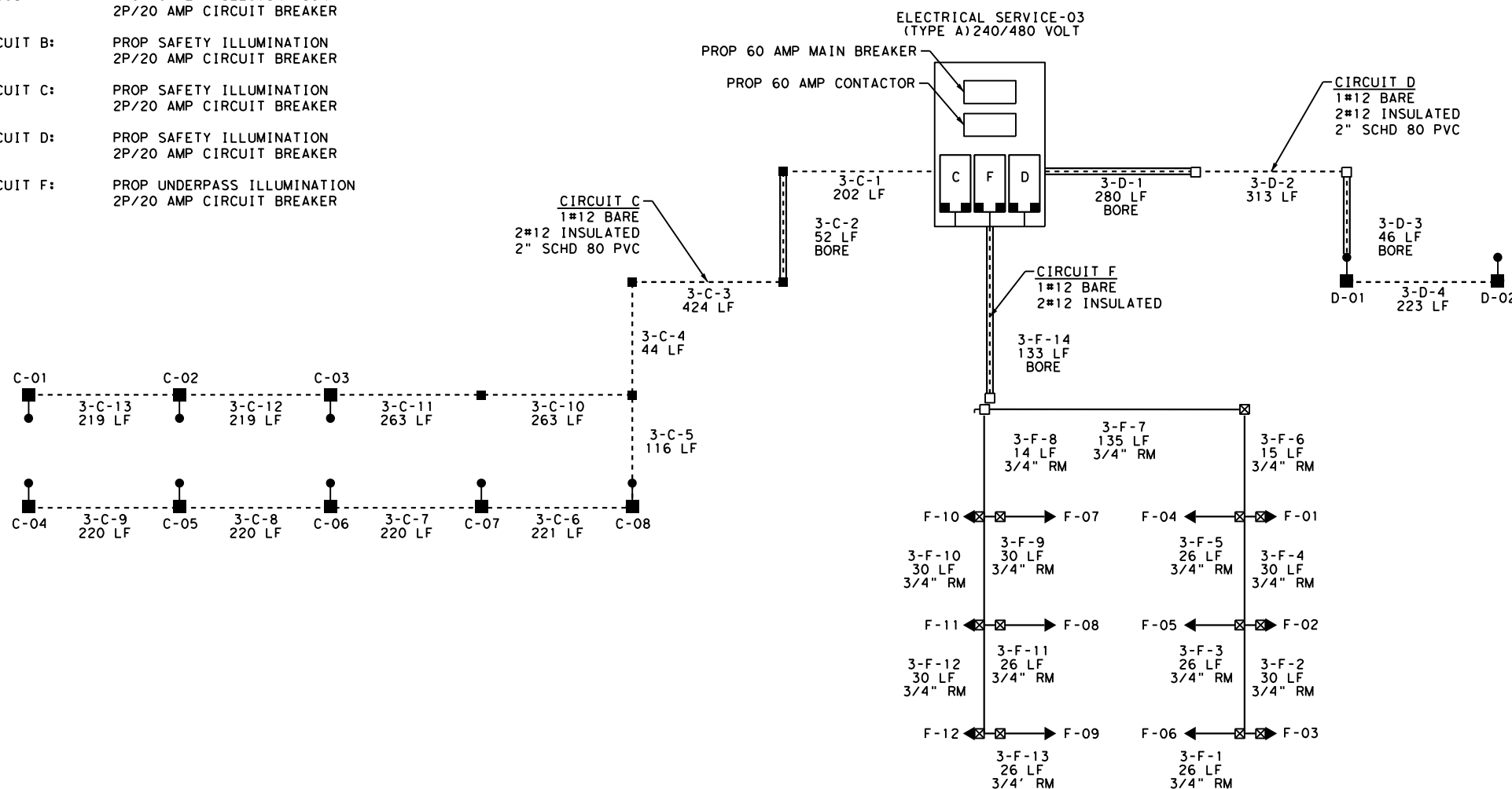
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LEGEND

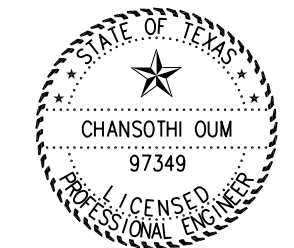
- RDWY ILL ASSEMBLY (TY SA 40T-10) (250W EQ)LED
- EXISTING RDWY ILL ASSEMBLY (TY SA 40T-10) (250W EQ)LED
- ◀ RDWY ILL AM (U/P)
- ◆ ELECTRICAL SERVICE
- ◇ EXISTING ELECTRICAL SERVICE
- - - CONDUIT & CONDUCTOR (TRENCHED)
- ≡≡≡ CONDUIT & CONDUCTOR (BORED)
- RIGID METAL CONDUIT
- GROUND BOX TY D WITH APRON
- GROUND BOX TY D WITHOUT APRON
- ⊠ JUNCTION BOX
- DISCONNECT SWITCH
- X-X-X RUN NUMBER
- CIRCUIT LETTER
- SERVICE NUMBER



- CIRCUIT A: PROP SAFETY ILLUMINATION 2P/20 AMP CIRCUIT BREAKER
- CIRCUIT B: PROP SAFETY ILLUMINATION 2P/20 AMP CIRCUIT BREAKER
- CIRCUIT C: PROP SAFETY ILLUMINATION 2P/20 AMP CIRCUIT BREAKER
- CIRCUIT D: PROP SAFETY ILLUMINATION 2P/20 AMP CIRCUIT BREAKER
- CIRCUIT F: PROP UNDERPASS ILLUMINATION 2P/20 AMP CIRCUIT BREAKER



REV. NO.	DATE	BY	REVISION



Chansothi
1/10/2022

AECOM 19219 KATY FREEWAY
SUITE 100 HOUSTON, TX 77094
AECOM Technical Services Inc.-3580

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



SH 146
ILLUMINATION
ELECTRICAL CIRCUIT
DIAGRAM

SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			275
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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1/10/2022 12:52:35 PM c:\pw_workingdir\acourtney_chance@aecom.com\dms06172\SH146-ILLUM-ELEC-SERVICE-DATA-SUMMARY.dgn DGN

ELEC. SERVICE NO.	SHEET NO.	ELECTRICAL SERVICE DESCRIPTION (SEE ED (4) - 00)	SERVICE CONDUIT SIZE	SERVICE CONDUCTORS NO./SIZE	SAFETY SWITCH AMPS	MAIN CKT. BKR. POLE/AMPS	TWO-POLE CONTACTOR AMPS	PANELBD/LOADCENTER AMP RATING	CIRCUIT NO.	BRANCH CKT. BKR. POLE/AMPS	BRANCH CIRCUIT AMPS	KVA LOAD
1	ILLUMINATION LAYOUT 2 OF 7	ELEC SERV TY A (240/480)060 (SS)SS(E)SP(O)	1 1/2"	3/#6	N/A	2P/60	60	N/A	A	2P/20	1	0.5
2	ILLUMINATION LAYOUT 2 OF 7	ELEC SERV TY A (240/480)060 (SS)SS(E)SP(O)	1 1/2"	3/#6	N/A	2P/60	60	N/A	B	2P/20	2	1.0
3	ILLUMINATION LAYOUT 5 OF 7	ELEC SERV TY A (240/480)060 (SS)SS(E)SP(O)	1 1/2"	3/#6	N/A	2P/60	60	N/A	C	2P/20	3	3.4
									D	2P/20	1	
									F	2P/20	3	

REV. NO.	DATE	BY	REVISION



Chansothi

1/10/2022

AECOM 19219 KATY FREEWAY
AECOM Technical Services Inc. - 3580 SUITE 100
 HOUSTON, TX 77094

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



Texas Department of Transportation

SH 146
 ILLUMINATION
 ELECTRICAL SERVICE
 DATA SUMMARY

SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			276
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

NOTES:

1. THE REMOVAL OF EXISTING PAVEMENT MARKINGS AND MARKERS ON THE PLANS IS A SUBSIDIARY ITEM TO 'PREP ROW' (ITEM 100 6002). THE REMOVAL QUANTITIES SHOWN ON THE PLANS ARE FOR THE CONTRACTOR'S INFORMATION ONLY.
2. ALL PROPOSED REGULATORY SIGNS SHALL CONFORM TO 'STANDARD HIGHWAY SIGN DESIGNS FOR TEXAS' (REV. MAY 2021).
3. ALL EXISTING GUIDE SIGNS, LOCATED OUTSIDE OF THE PROJECT LIMITS THAT ARE NO LONGER APPLICABLE MUST BE REMOVED, PRIOR TO OPENING THE ROAD TO TRAFFIC.

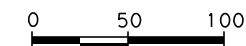
* LANE DROP TRANSITION:
 BEGIN LANE TAPER EBFR STA 5548+43.49 14.37'LT
 END LANE TAPER EBFR STA 5550+37.31 1.0'LT

** BEGIN RUMBLE STRIPS REFER TO STD SHEET
 RS(1)-13 OPTION 4

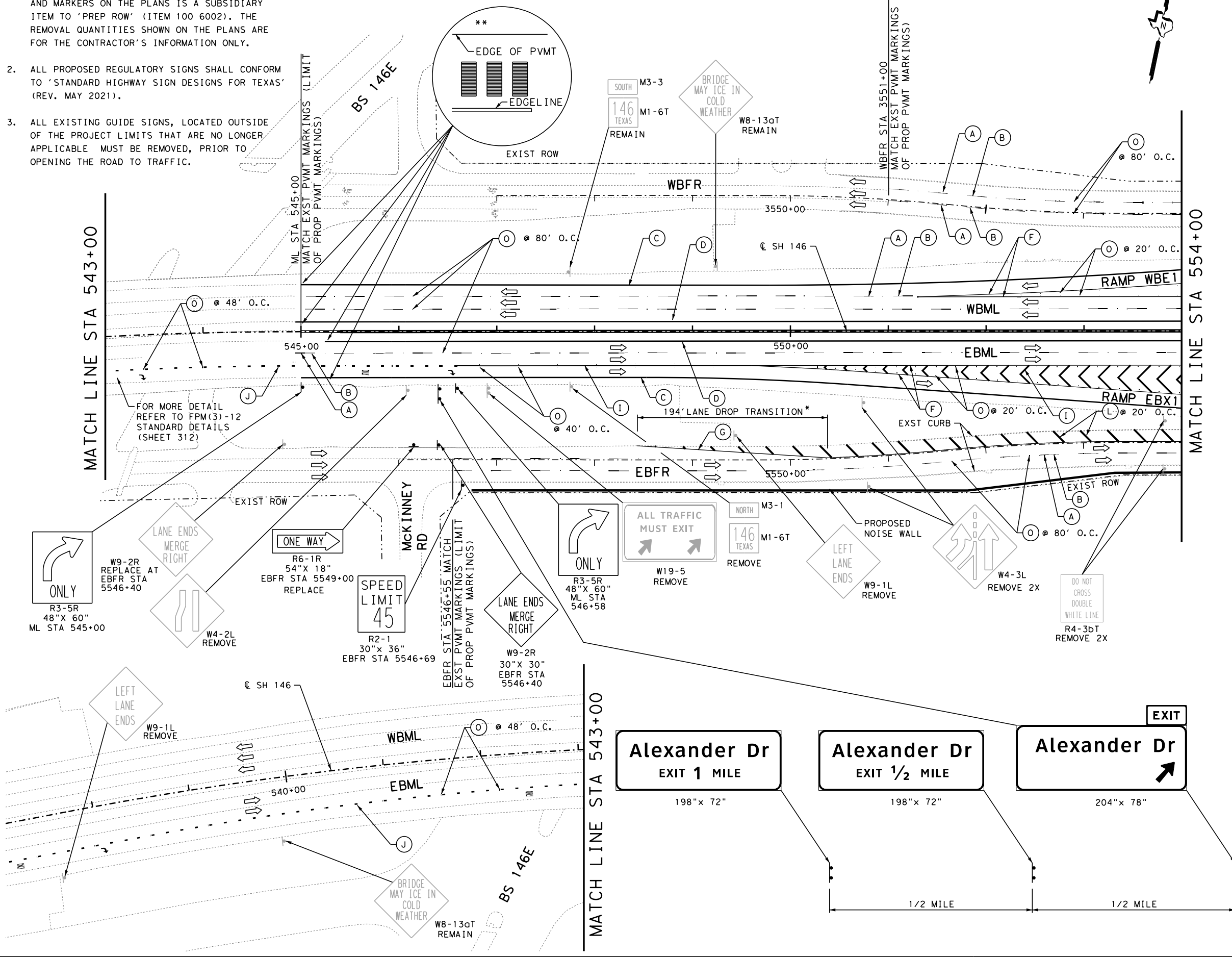


LEGEND

- (A) MULTIPOLYMER PAV MRK (W) (6") (BRK)
- (B) MULTIPOLYMER PAV MRK (BLK) (6") (BRK)
- (C) MULTIPOLYMER PAV MRK (W) (6") (SLD)
- (D) MULTIPOLYMER PAV MRK (Y) (6") (SLD)
- (E) MULTIPOLYMER PAV MRK (Y) (6") (BRK)
- (F) MULTIPOLYMER PAV MRK TY B (W) (8") (SLD)
- (G) MULTIPOLYMER PAV MRK TY B (Y) (8") (SLD)
- (H) MULTIPOLYMER PAV MRK TY B (W) (8") (LNDP)
- (I) MULTIPOLYMER PAV MRK TY B (W) (12") (SLD)
- (J) MULTIPOLYMER PAV MRK TY B (W) (12") (LNDP)
- (K) MULTIPOLYMER PAV MRK TY B (W) (24") (SLD)
- (L) MULTIPOLYMER MRK TY B (Y) (24") (SLD)
- (M) PREFAB PAV MRK TY B (Y) (MED NOSE)
- (N) REFL PAV MRKR TY II (W) (18") (YLD TRI)
- (O) REFL PAV MRKR TY II-C-R
- (P) REFL PAV MRKR TY I-C
- MULTIPOLYMER PAV MRK TY B (W) (ARROW)
- ⇄ MULTIPOLYMER PAV MRK TY B (W) (DBL ARROW)
- ↻ MULTIPOLYMER PAV MRK TY C (W) (TURN ARROW)
- ≡ MULTIPOLYMER PAV MRK TY C (W) (WORD)
- ↑ DIRECTION OF TRAFFIC
- ⊕ PROPOSED SIGN
- ⊖ EXISTING SIGN
- ⊞ BACK TO BACK SIGN
- ⊞ 2 POST SIGN



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REV. NO.	DATE	BY	REVISION

2/25/2022

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

SH 146

SIGNING & PAVEMENT MARKINGS LAYOUT

BEGIN TO STA 554+00

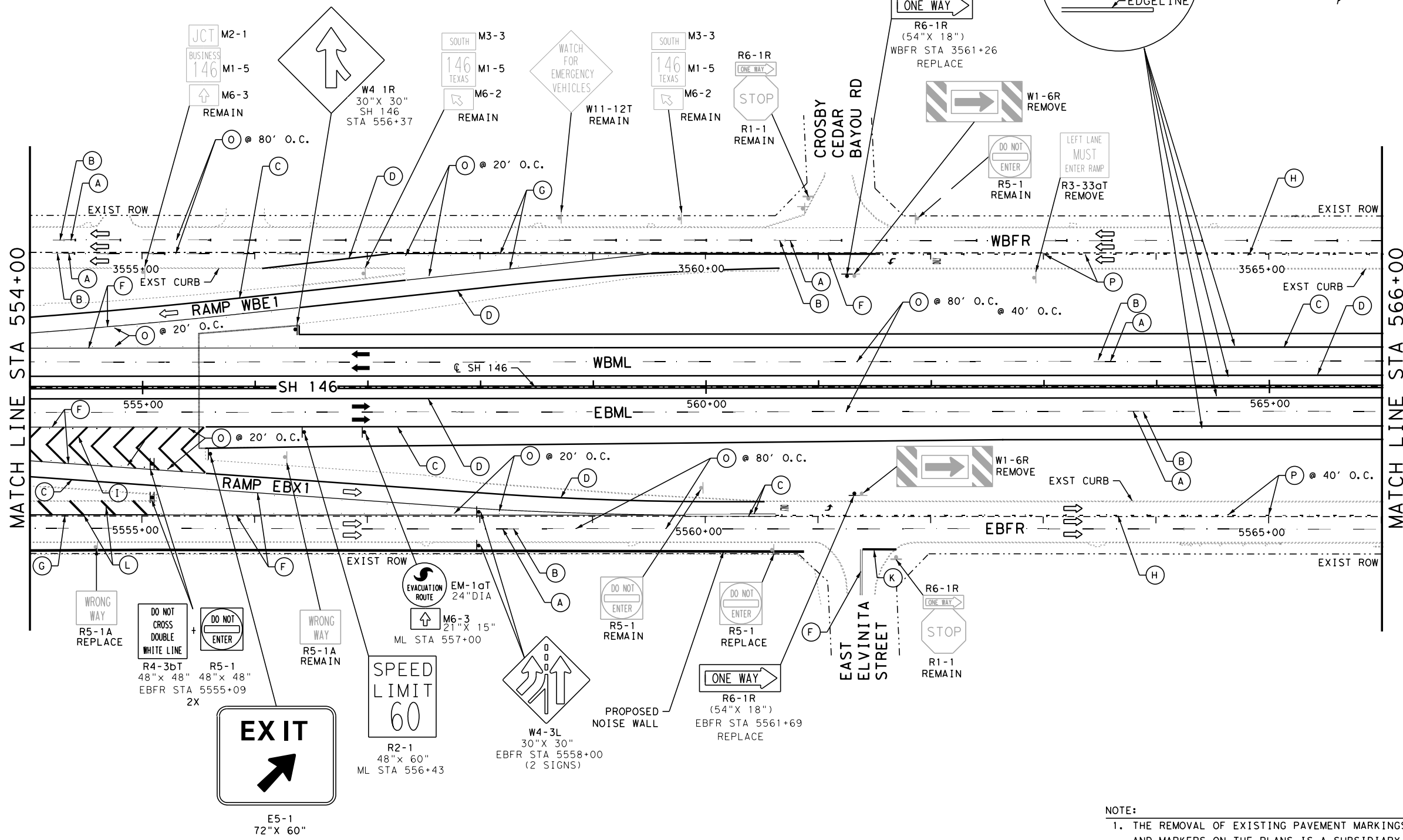
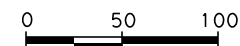
SHEET 1 OF 7

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.
6		277
STATE	DIST.	COUNTY
TEXAS	HOU	HARRIS
CONT.	SECT.	JOB
0389	13	039
		HIGHWAY NO.
		SH 146

* RUMBLE STRIPS REFER TO STD SHEET RS(1)-13 OPTION 4

LEGEND

- (A) MULTIPOLYMER PAV MRK (W) (6") (BRK)
- (B) MULTIPOLYMER PAV MRK (BLK) (6") (BRK)
- (C) MULTIPOLYMER PAV MRK (W) (6") (SLD)
- (D) MULTIPOLYMER PAV MRK (Y) (6") (SLD)
- (E) MULTIPOLYMER PAV MRK (Y) (6") (BRK)
- (F) MULTIPOLYMER PAV MRK TY B (W) (8") (SLD)
- (G) MULTIPOLYMER PAV MRK TY B (Y) (8") (SLD)
- (H) MULTIPOLYMER PAV MRK TY B (W) (8") (LNDR)
- (I) MULTIPOLYMER PAV MRK TY B (W) (12") (SLD)
- (J) MULTIPOLYMER PAV MRK TY B (W) (12") (LNDR)
- (K) MULTIPOLYMER PAV MRK TY B (W) (24") (SLD)
- (L) MULTIPOLYMER MRK TY B (Y) (24") (SLD)
- (M) PREFAB PAV MRK TY B (Y) (MED NOSE)
- (N) REFL PAV MRKR TY II (W) (18") (YLD TRI)
- (O) REFL PAV MRKR TY II-C-R
- (P) REFL PAV MRKR TY I-C
- (↑) MULTIPOLYMER PAV MRK TY B (W) (ARROW)
- (⇄) MULTIPOLYMER PAV MRK TY B (W) (DBL ARROW)
- (↩) MULTIPOLYMER PAV MRK TY C (W) (TURN ARROW)
- (W) MULTIPOLYMER PAV MRK TY C (W) (WORD)
- (⇄) DIRECTION OF TRAFFIC
- (↑) PROPOSED SIGN
- (↓) EXISTING SIGN
- (H) BACK TO BACK SIGN
- (P) 2 POST SIGN



NOTE:
 1. THE REMOVAL OF EXISTING PAVEMENT MARKINGS AND MARKERS ON THE PLANS IS A SUBSIDIARY ITEM TO 'PREP ROW' (ITEM 100 6002). THE REMOVAL QUANTITIES SHOWN ON THE PLANS ARE FOR THE CONTRACTOR'S INFORMATION ONLY.

REV. NO.	DATE	BY	REVISION

Prakash Shrestha, P.E.
 2/25/2022

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



SH 146

SIGNING & PAVEMENT MARKINGS LAYOUT

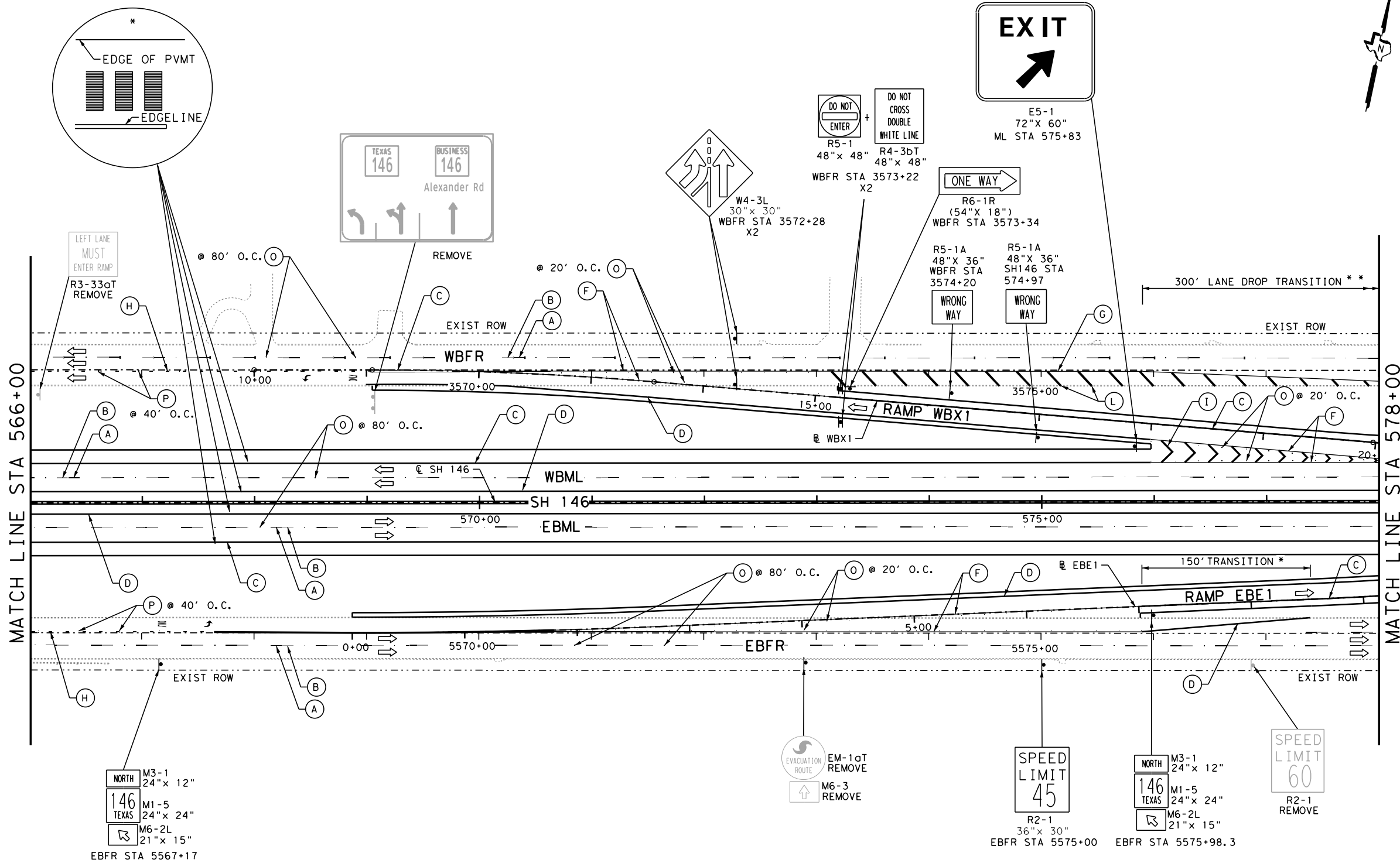
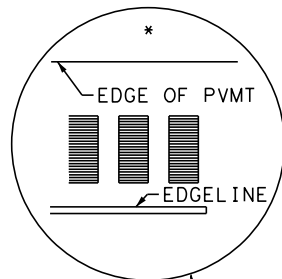
STA 554+00 TO STA 566+00

SHEET 2 OF 7

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			278
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

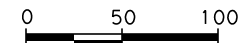
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* RUMBLE STRIPS REFER TO STD SHEET
RS(1)-13 OPTION 4

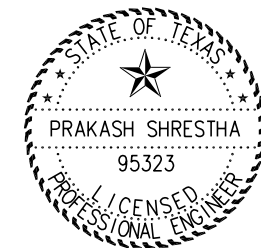


LEGEND

- (A) MULTIPOLYMER PAV MRK (W) (6") (BRK)
- (B) MULTIPOLYMER PAV MRK (BLK) (6") (BRK)
- (C) MULTIPOLYMER PAV MRK (W) (6") (SLD)
- (D) MULTIPOLYMER PAV MRK (Y) (6") (SLD)
- (E) MULTIPOLYMER PAV MRK (Y) (6") (BRK)
- (F) MULTIPOLYMER PAV MRK TY B (W) (8") (SLD)
- (G) MULTIPOLYMER PAV MRK TY B (Y) (8") (SLD)
- (H) MULTIPOLYMER PAV MRK TY B (W) (8") (LNDR)
- (I) MULTIPOLYMER PAV MRK TY B (W) (12") (SLD)
- (J) MULTIPOLYMER PAV MRK TY B (W) (12") (LNDR)
- (K) MULTIPOLYMER PAV MRK TY B (W) (24") (SLD)
- (L) MULTIPOLYMER MRK TY B (Y) (24") (SLD)
- (M) PREFAB PAV MRK TY B (Y) (MED NOSE)
- (N) REFL PAV MRKR TY II (W) (18") (YLD TRI)
- (O) REFL PAV MRKR TY II-C-R
- (P) REFL PAV MRKR TY I-C
- ↑ MULTIPOLYMER PAV MRK TY B (W) (ARROW)
- ↕ MULTIPOLYMER PAV MRK TY B (W) (DBL ARROW)
- ↻ MULTIPOLYMER PAV MRK TY C (W) (TURN ARROW)
- ⊞ MULTIPOLYMER PAV MRK TY C (W) (WORD)
- ← DIRECTION OF TRAFFIC
- ⊞ PROPOSED SIGN
- ⊞ EXISTING SIGN
- ⊞ BACK TO BACK SIGN
- ⊞ 2 POST SIGN



REV. NO.	DATE	BY	REVISION



Prakash Shrestha, P.E.
2/25/2022

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



SH 146

SIGNING & PAVEMENT MARKINGS LAYOUT

STA 566+00 TO STA 578+00

SHEET 3 OF 7

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			279
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

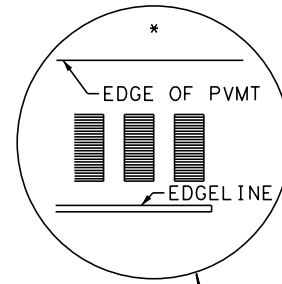
** LANE DROP TRANSITION:
BEGIN LANE TAPER WBFR STA 3575+90.06 1.0' RT
END LANE TAPER WBFR STA 3578+90.27 13.4' RT

* LANE TRANSITION:
BEGIN LANE TAPER EBFR STA 5575+89.64 1.3' LT
END LANE TAPER EBFR STA 5575+39.11 14.0' LT

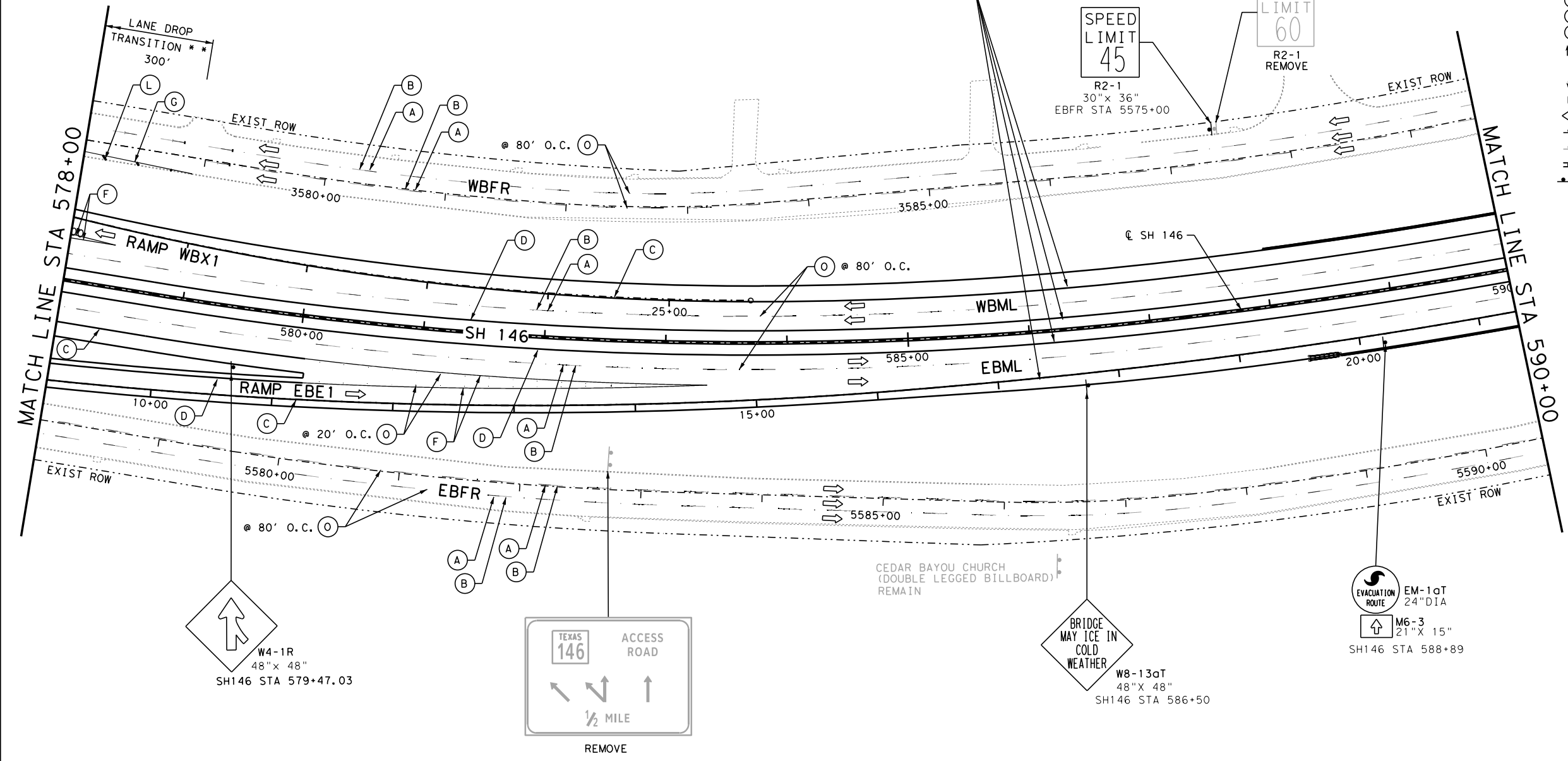
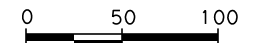
NOTE:
1. THE REMOVAL OF EXISTING PAVEMENT MARKINGS AND MARKERS ON THE PLANS IS A SUBSIDIARY ITEM TO 'PREP ROW' (ITEM 100 6002). THE REMOVAL QUANTITIES SHOWN ON THE PLANS ARE FOR THE CONTRACTOR'S INFORMATION ONLY.

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* RUMBLE STRIPS REFER TO STD SHEET RS(1)-13 OPTION 4



- LEGEND**
- (A) MULTIPOLYMER PAV MRK (W) (6") (BRK)
 - (B) MULTIPOLYMER PAV MRK (BLK) (6") (BRK)
 - (C) MULTIPOLYMER PAV MRK (W) (6") (SLD)
 - (D) MULTIPOLYMER PAV MRK (Y) (6") (SLD)
 - (E) MULTIPOLYMER PAV MRK (Y) (6") (BRK)
 - (F) MULTIPOLYMER PAV MRK TY B (W) (8") (SLD)
 - (G) MULTIPOLYMER PAV MRK TY B (Y) (8") (SLD)
 - (H) MULTIPOLYMER PAV MRK TY B (W) (8") (LNDP)
 - (I) MULTIPOLYMER PAV MRK TY B (W) (12") (SLD)
 - (J) MULTIPOLYMER PAV MRK TY B (W) (12") (LNDP)
 - (K) MULTIPOLYMER PAV MRK TY B (W) (24") (SLD)
 - (L) MULTIPOLYMER MRK TY B (Y) (24") (SLD)
 - (M) PREFAB PAV MRK TY B (Y) (MED NOSE)
 - (N) REFL PAV MRKR TY II (W) (18") (YLD TRI)
 - (O) REFL PAV MRKR TY II-C-R
 - (P) REFL PAV MRKR TY I-C
 - ↑ MULTIPOLYMER PAV MRK TY B (W) (ARROW)
 - ↑ MULTIPOLYMER PAV MRK TY B (W) (DBL ARROW)
 - ↪ MULTIPOLYMER PAV MRK TY C (W) (UTURN ARROW)
 - ↪ MULTIPOLYMER PAV MRK TY C (W) (WORD)
 - ↔ DIRECTION OF TRAFFIC
 - ↑ PROPOSED SIGN
 - ↓ EXISTING SIGN
 - ↔ BACK TO BACK SIGN
 - ↔ 2 POST SIGN



** LANE DROP TRANSITION:
 BEGIN LANE TAPER WBFR STA 3575+90.06 1.0' RT
 END LANE TAPER WBFR STA 3578+90.27 13.4' RT

NOTE:
 1. THE REMOVAL OF EXISTING PAVEMENT MARKINGS AND MARKERS ON THE PLANS IS A SUBSIDIARY ITEM TO 'PREP ROW' (ITEM 100 6002). THE REMOVAL QUANTITIES SHOWN ON THE PLANS ARE FOR THE CONTRACTOR'S INFORMATION ONLY.

REV. NO.	DATE	BY	REVISION

PRAKASH SHRESTHA
95323
LICENSED PROFESSIONAL ENGINEER

Prakash Shrestha, P.E.

2/25/2022

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

Texas Department of Transportation

SH 146

SIGNING & PAVEMENT MARKINGS LAYOUT

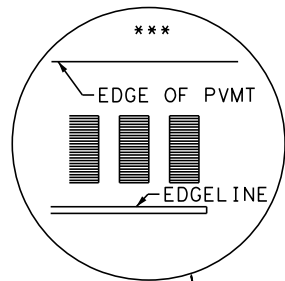
STA 578+00 TO STA 590+00

SHEET 4 OF 7

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			280
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

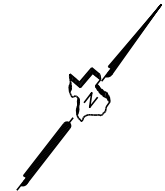
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*** RUMBLE STRIPS REFER TO STD SHEET
RS(1)-13 OPTION 4



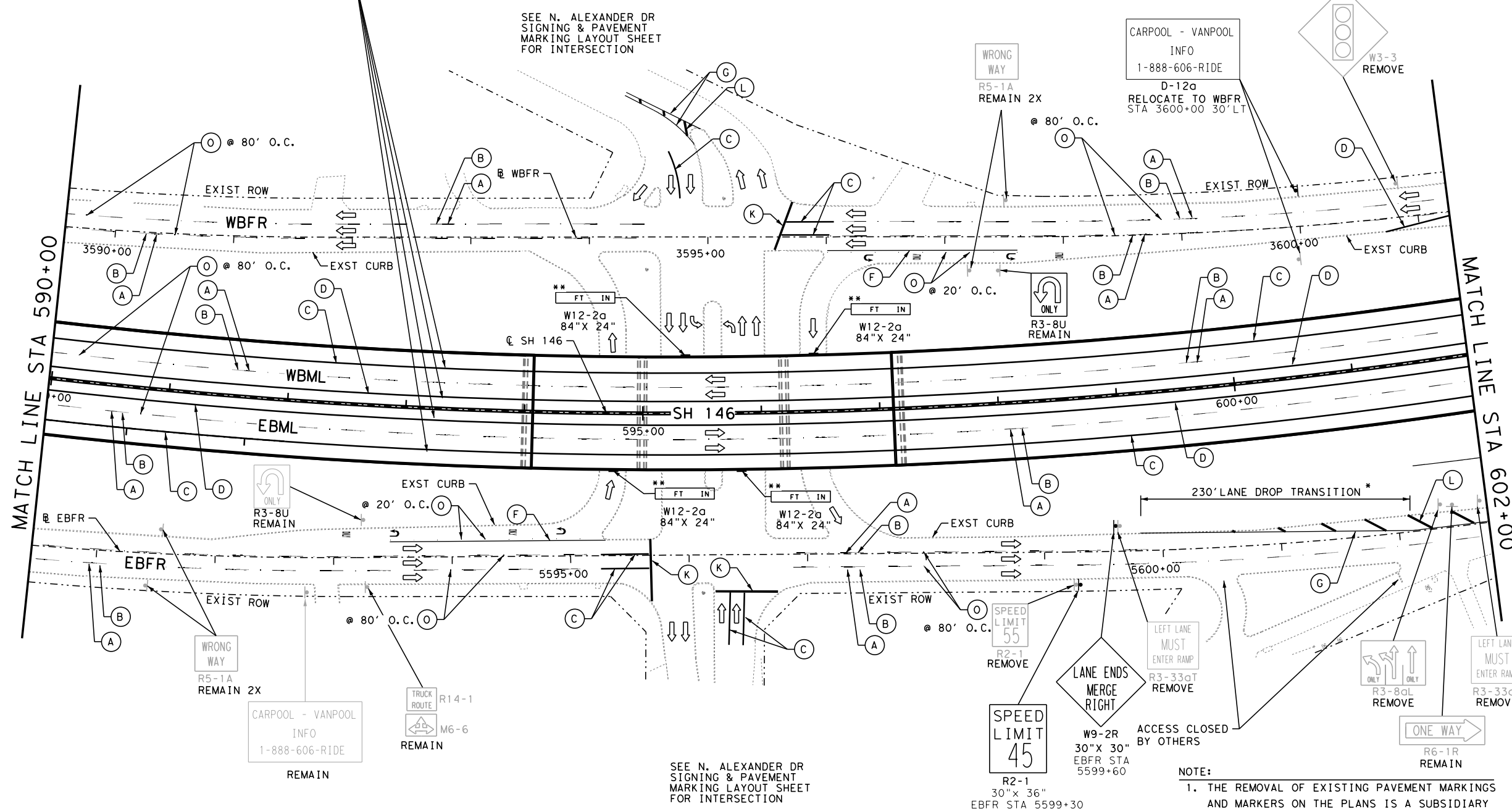
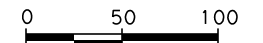
* LANE DROP TRANSITION:
BEGIN LANE TAPER EBFR STA 5599+81.12 14.84'LT
END LANE TAPER EBFR STA 5602+11.22 1.0'LT

** ACTUAL CLEARANCE SHOWN WILL BE VERIFIED IN THE FIELD
BY THE CONTRACTOR AND APPROVES BY THE ENGINEER PRIOR
TO FABRICATION OF THE SIGN. REFER TO BRIDGE LAYOUT
SHEET FOR CLEARANCES.



LEGEND

- (A) MULTIPOLYMER PAV MRK (W) (6") (BRK)
- (B) MULTIPOLYMER PAV MRK (BLK) (6") (BRK)
- (C) MULTIPOLYMER PAV MRK (W) (6") (SLD)
- (D) MULTIPOLYMER PAV MRK (Y) (6") (SLD)
- (E) MULTIPOLYMER PAV MRK (Y) (6") (BRK)
- (F) MULTIPOLYMER PAV MRK TY B (W) (8") (SLD)
- (G) MULTIPOLYMER PAV MRK TY B (Y) (8") (SLD)
- (H) MULTIPOLYMER PAV MRK TY B (W) (8") (LNDP)
- (I) MULTIPOLYMER PAV MRK TY B (W) (12") (SLD)
- (J) MULTIPOLYMER PAV MRK TY B (W) (12") (LNDP)
- (K) MULTIPOLYMER PAV MRK TY B (W) (24") (SLD)
- (L) MULTIPOLYMER MRK TY B (Y) (24") (SLD)
- (M) PREFAB PAV MRK TY B (Y) (MED NOSE)
- (N) REFL PAV MRKR TY II (W) (18") (YLD TRI)
- (O) REFL PAV MRKR TY II-C-R
- (P) REFL PAV MRKR TY I-C
- ↑ MULTIPOLYMER PAV MRK TY B (W) (ARROW)
- ↑ MULTIPOLYMER PAV MRK TY B (W) (DBL ARROW)
- ↪ MULTIPOLYMER PAV MRK TY C (W) (TURN ARROW)
- ↪ MULTIPOLYMER PAV MRK TY C (W) (WORD)
- ↔ DIRECTION OF TRAFFIC
- ⊕ PROPOSED SIGN
- ⊖ EXISTING SIGN
- ⊕ ⊖ BACK TO BACK SIGN
- ⊕ ⊖ 2 POST SIGN



REV. NO.	DATE	BY	REVISION

STATE OF TEXAS
PRAKASH SHRESTHA
95323
LICENSED PROFESSIONAL ENGINEER
2/25/2022

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

Texas Department of Transportation
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SH 146

SIGNING & PAVEMENT MARKINGS LAYOUT

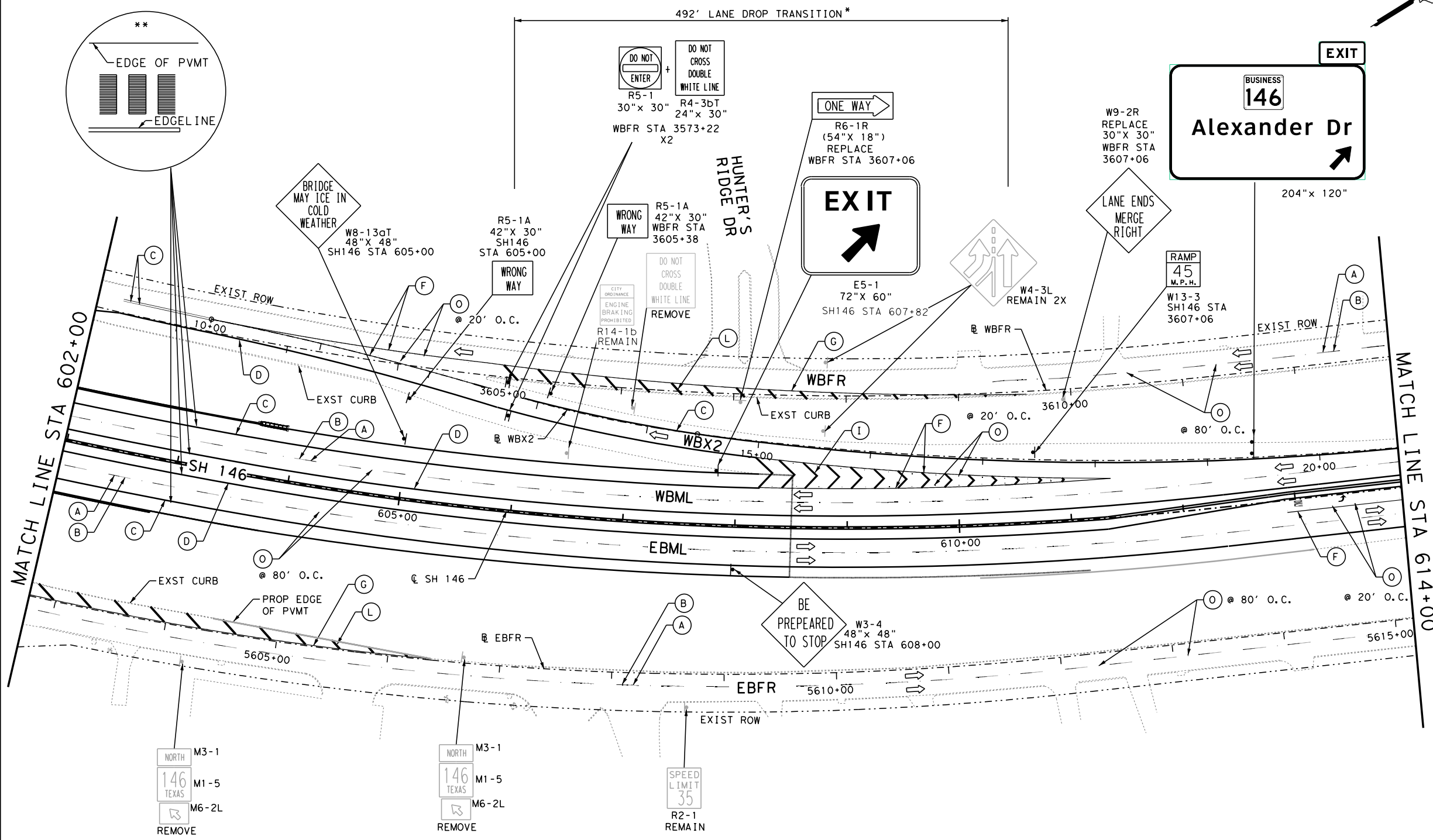
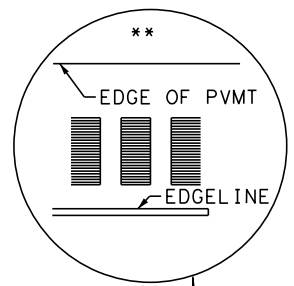
STA 590+00 TO STA 602+00

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.	
6		281	
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

NOTE:
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** RUMBLE STRIPS REFER TO STD SHEET RS(1)-13 OPTION 4



LEGEND

- (A) MULTIPOLYMER PAV MRK (W) (6") (BRK)
- (B) MULTIPOLYMER PAV MRK (BLK) (6") (BLK)
- (C) MULTIPOLYMER PAV MRK (W) (6") (SLD)
- (D) MULTIPOLYMER PAV MRK (Y) (6") (SLD)
- (E) MULTIPOLYMER PAV MRK (Y) (6") (BRK)
- (F) MULTIPOLYMER PAV MRK TY B (W) (8") (SLD)
- (G) MULTIPOLYMER PAV MRK TY B (Y) (8") (SLD)
- (H) MULTIPOLYMER PAV MRK TY B (W) (8") (LNDP)
- (I) MULTIPOLYMER PAV MRK TY B (W) (12") (SLD)
- (J) MULTIPOLYMER PAV MRK TY B (W) (12") (LNDP)
- (K) MULTIPOLYMER PAV MRK TY B (W) (24") (SLD)
- (L) MULTIPOLYMER MRK TY B (Y) (24") (SLD)
- (M) PREFAB PAV MRK TY B (Y) (MED NOSE)
- (N) REFL PAV MRKR TY II (W) (18") (YLD TRI)
- (O) REFL PAV MRKR TY II-C-R
- (P) REFL PAV MRKR TY I-C
- ↑ MULTIPOLYMER PAV MRK TY B (W) (ARROW)
- ↔ MULTIPOLYMER PAV MRK TY B (W) (DBL ARROW)
- ↻ MULTIPOLYMER PAV MRK TY C (W) (TURN ARROW)
- ▭ MULTIPOLYMER PAV MRK TY C (W) (WORD)
- ⇄ DIRECTION OF TRAFFIC
- ▬ PROPOSED SIGN
- ▬ EXISTING SIGN
- ▬ BACK TO BACK SIGN
- ▬ 2 POST SIGN

0 50 100

REV. NO.	DATE	BY	REVISION

PRAKASH SHRESTHA
95323
LICENSED PROFESSIONAL ENGINEER

Prakash Shrestha, P.E.

2/25/2022

CivilTech Engineering, Inc.

11821 Telge Road
Cypress, Texas 77429
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Firm Registration No. F-382

Texas Department of Transportation

SH 146

SIGNING & PAVEMENT MARKINGS LAYOUT

STA 602+00 TO STA 614+00

SHEET 6 OF 7

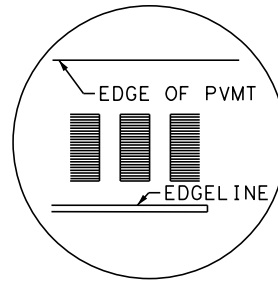
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6			282
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

* LANE DROP TRANSITION:
BEGIN LANE TAPER WBFR STA 3604+68.53 11.0' LT
END LANE TAPER WBFR STA 3609+60.41 3.4' LT

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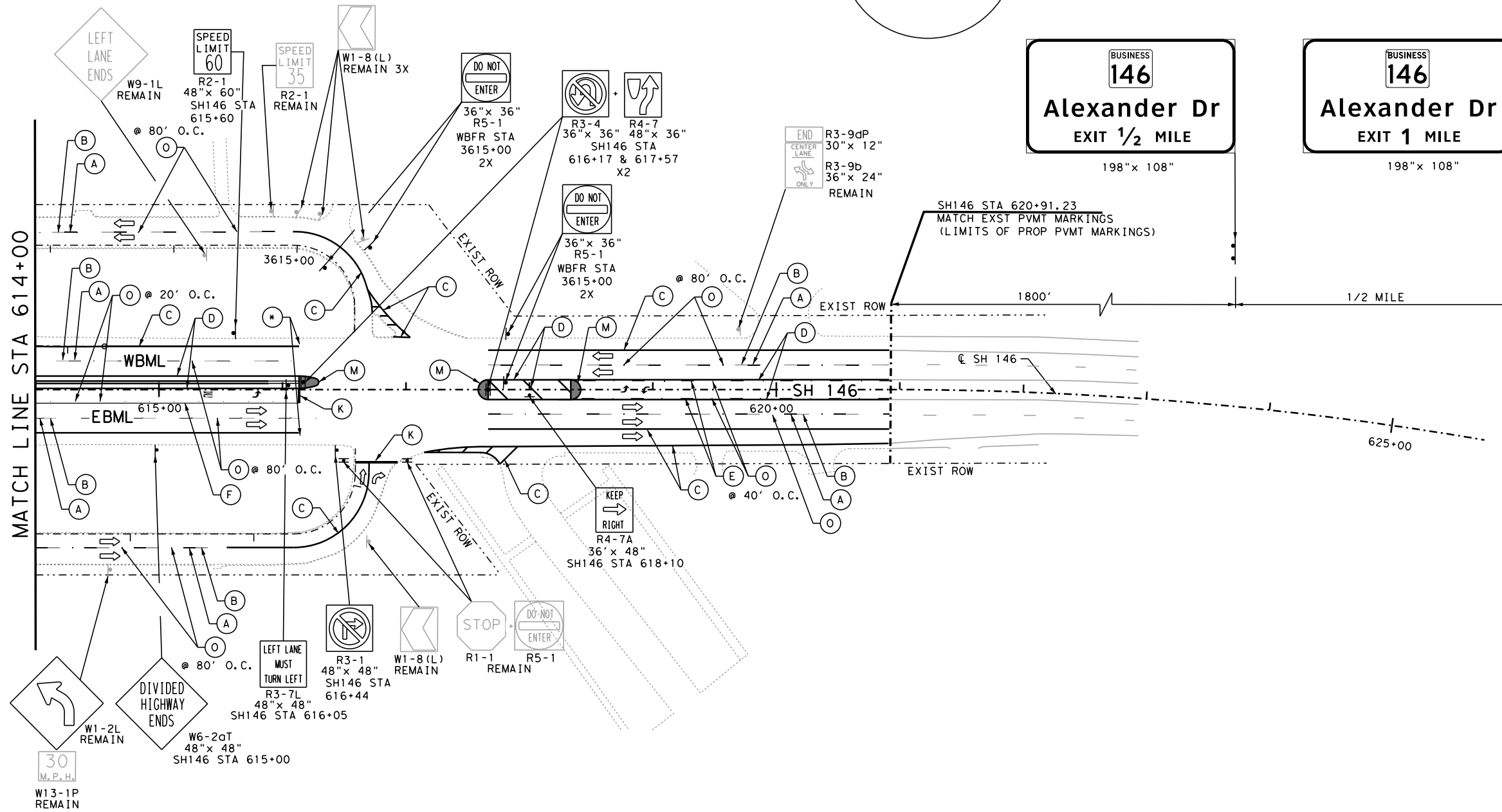
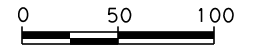
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* END RUMBLE STRIPS REFER TO STD SHEET
RS(1)-13 OPTION 4



LEGEND

- (A) MULTIPOLYMER PAV MRK (W) (6") (BRK)
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- ↑ MULTIPOLYMER PAV MRK TY B (W) (ARROW)
- ↔ MULTIPOLYMER PAV MRK TY B (W) (DBL ARROW)
- ↻ MULTIPOLYMER PAV MRK TY C (W) (TURN ARROW)
- ⊞ MULTIPOLYMER PAV MRK TY C (W) (WORD)
- ⇐ DIRECTION OF TRAFFIC
- ⊕ PROPOSED SIGN
- ⊖ EXISTING SIGN
- ⇄ BACK TO BACK SIGN
- ⊞ 2 POST SIGN



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Prakash Shrestha, P.E.
2/25/2022

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

SH 146

SIGNING & PAVEMENT MARKINGS LAYOUT

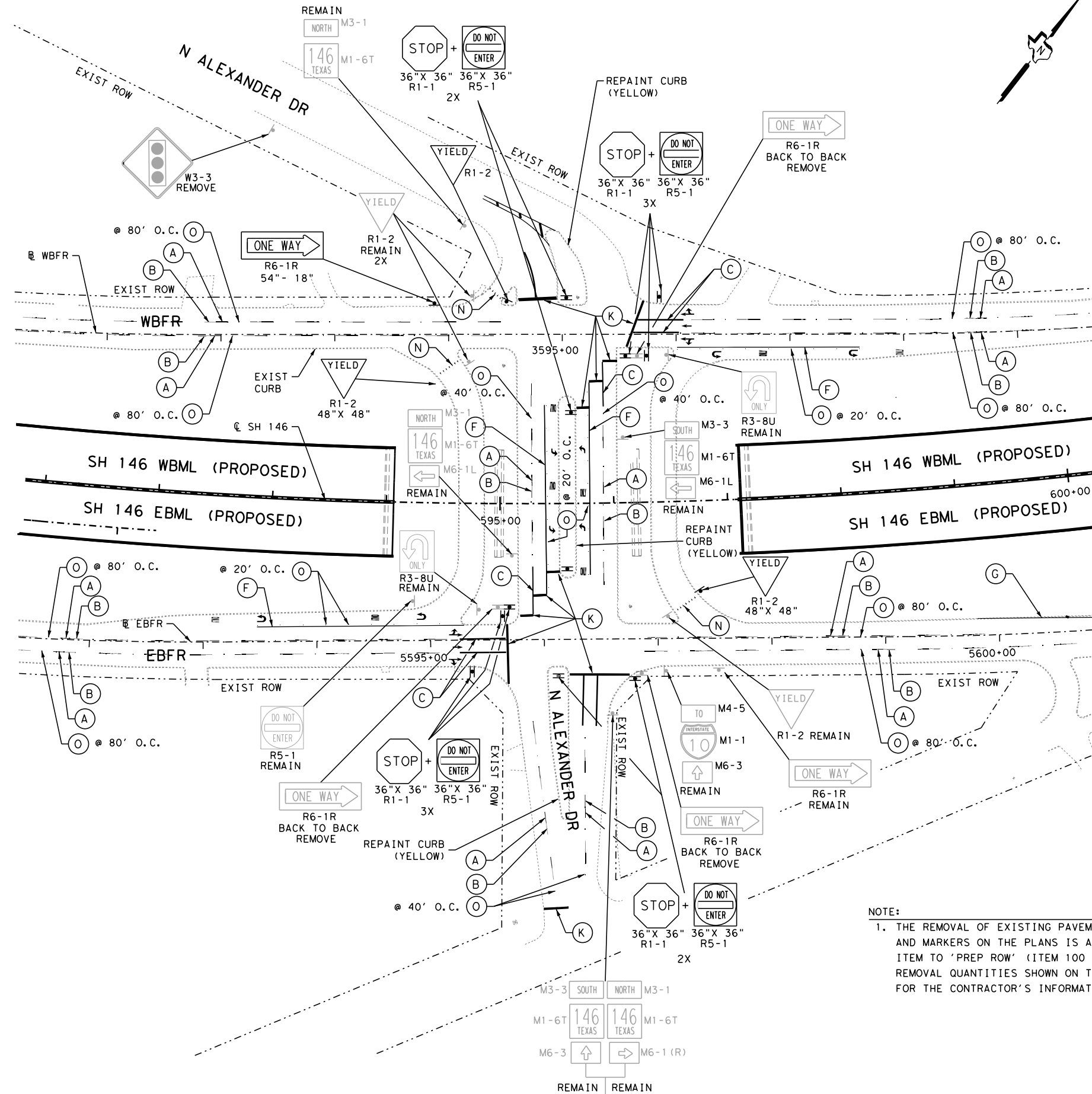
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SHEET 7 OF 7

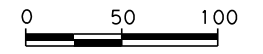
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6		283	
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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- LEGEND**
- (A) MULTIPOLYMER PAV MRK (W) (6") (BRK)
 - (B) MULTIPOLYMER PAV MRK (BLK) (6") (BRK)
 - (C) MULTIPOLYMER PAV MRK (W) (6") (SLD)
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 - (↑) MULTIPOLYMER PAV MRK TY B (W) (ARROW)
 - (↔) MULTIPOLYMER PAV MRK TY B (W) (DBL ARROW)
 - (↶) MULTIPOLYMER PAV MRK TY C (W) (TURN ARROW)
 - (W) MULTIPOLYMER PAV MRK TY C (W) (WORD)
 - (←) DIRECTION OF TRAFFIC
 - (+/-) PROPOSED SIGN
 - (=) EXISTING SIGN
 - (↔) BACK TO BACK SIGN
 - (-/-) 2 POST SIGN



REV. NO.	DATE	BY	REVISION

PRAKASH SHRESTHA
 95323
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Texas Department of Transportation

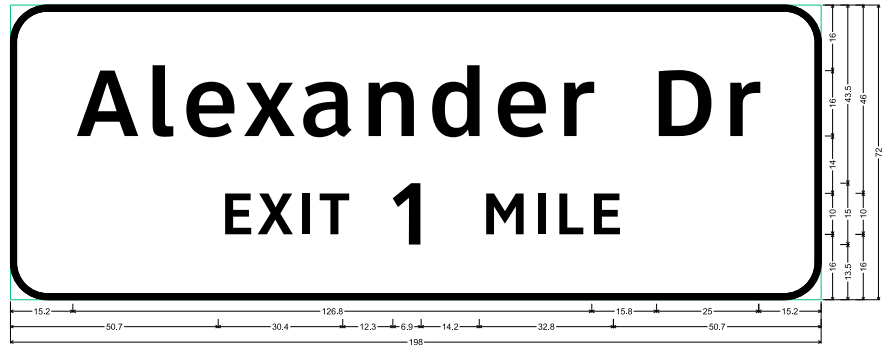
SH 146

**N ALEXANDER DR
 SIGNING & PAVEMENT
 MARKING LAYOUT**

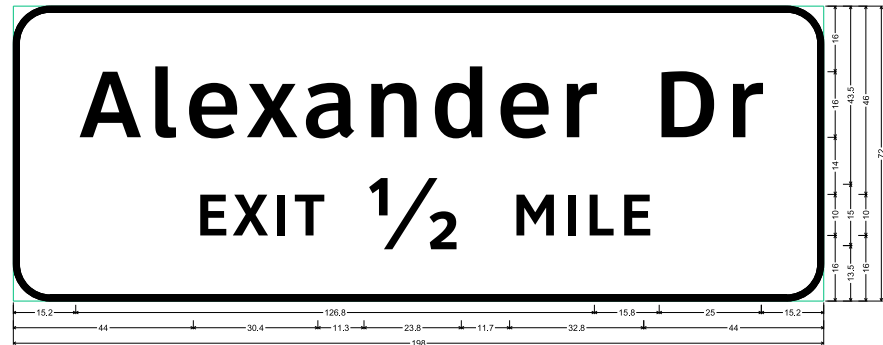
SHEET 1 OF 1

FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.		SHEET NO. 284
STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146

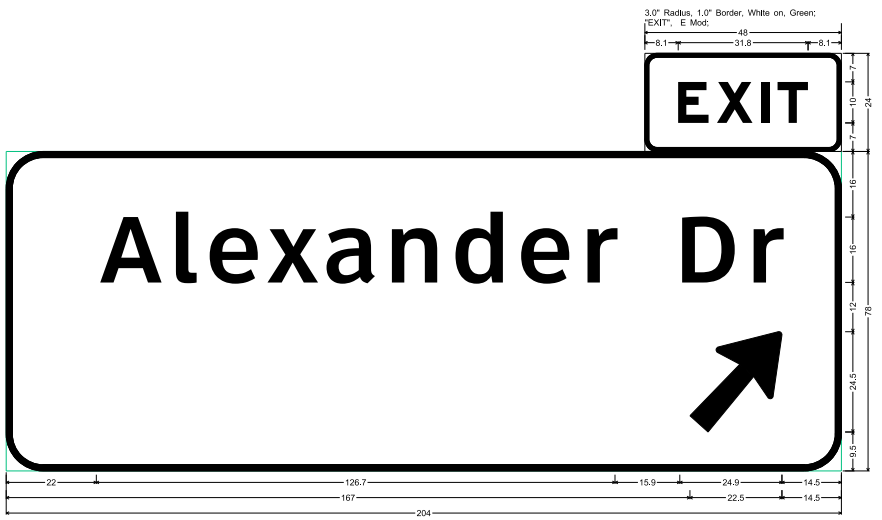
NOTE:
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9.0" Radius, 1.5" Border, White on, Green:
 Alexander Dr, ClearviewHwy-S-W-R; "EXIT", ClearviewHwy-S-W-R; "1", ClearviewHwy-S-W-R; "MILE", ClearviewHwy-S-W-R;



9.0" Radius, 1.5" Border, White on, Green:
 Alexander Dr, ClearviewHwy-S-W-R; "EXIT", ClearviewHwy-S-W-R; "1/2", ClearviewHwy-S-W-R; "MILE", ClearviewHwy-S-W-R;

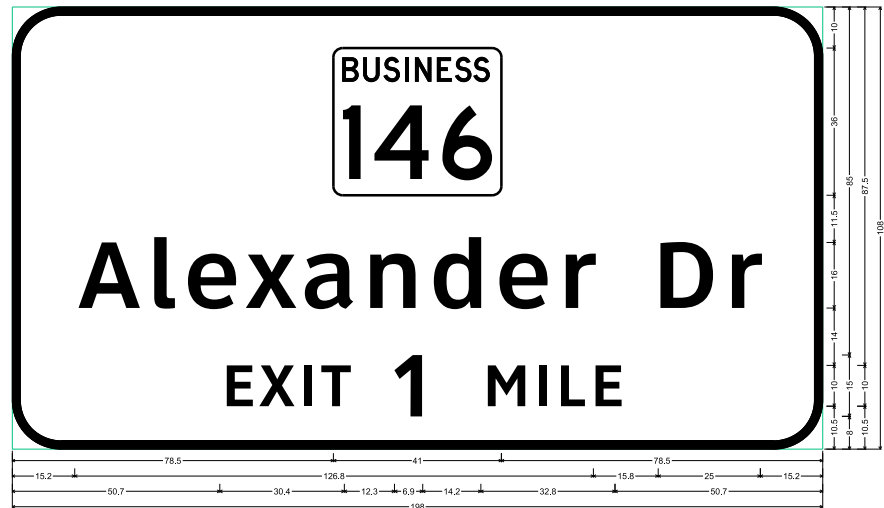


9.0" Radius, 1.5" Border, White on, Green:
 Alexander Dr, ClearviewHwy-S-W-R; Arrow 133 - 30.0" 48";

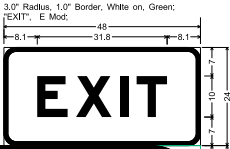


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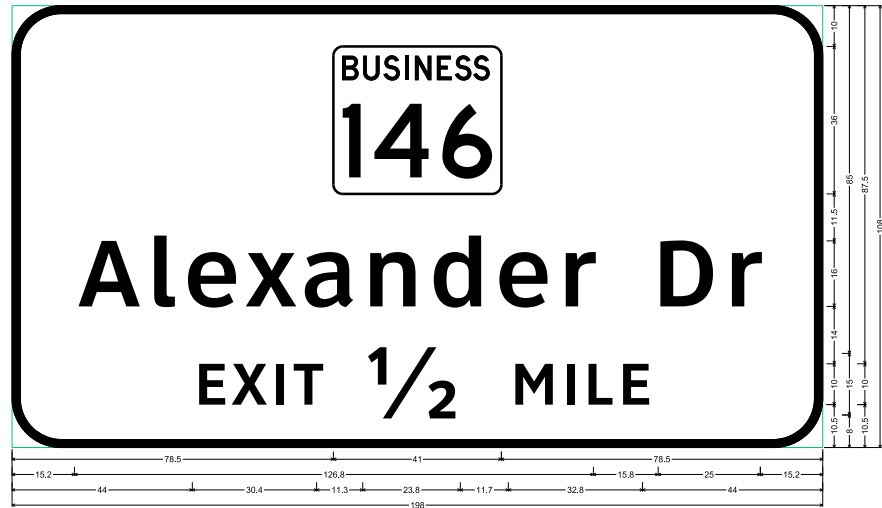
E5-1
 LAYOUT SHEET 2 OF 7 SH146 STA 555+50 (EB)
 LAYOUT SHEET 3 OF 7 SH146 STA 575+83 (WB)
 LAYOUT SHEET 6 OF 7 SH146 STA 607+82 (WB)



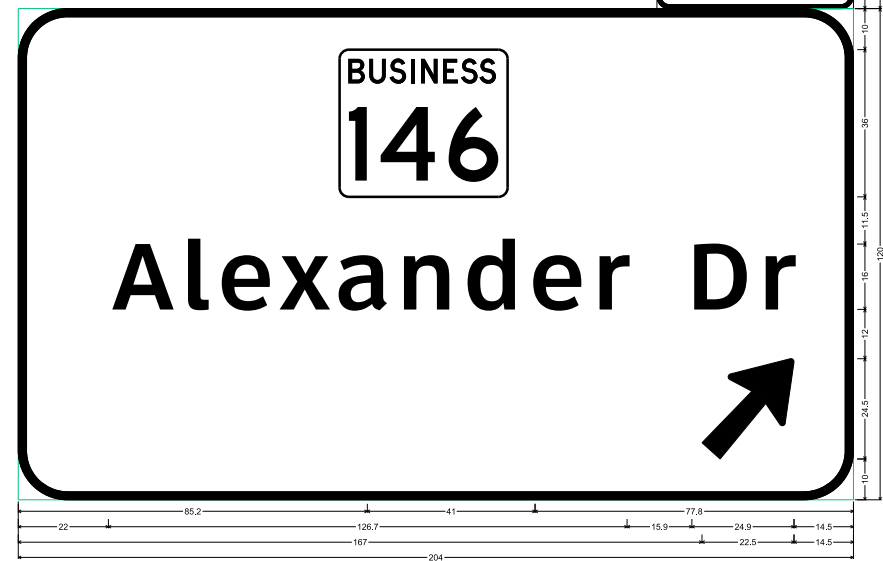
12.0" Radius, 2.0" Border, White on, Green:
 State Highway 146 M1-6B3; *Alexander Dr*, ClearviewHwy-S-W-R; "EXIT", ClearviewHwy-S-W-R; "1", ClearviewHwy-S-W-R; "MILE", ClearviewHwy-S-W-R;



3.0" Radius, 1.0" Border, White on, Green:
 "EXIT", E Mod;



12.0" Radius, 2.0" Border, White on, Green:
 State Highway 146 M1-6B3; *Alexander Dr*, ClearviewHwy-S-W-R; "EXIT", ClearviewHwy-S-W-R; "1/2", ClearviewHwy-S-W-R; "MILE", ClearviewHwy-S-W-R;



12.0" Radius, 2.0" Border, White on, Green:
 State Highway 146 M1-6B3; *Alexander Dr*, ClearviewHwy-S-W-R; Arrow 133 - 30.0" 48";

REV. NO.	DATE	BY	REVISION

1/10/2022

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 Cypress, Texas 77429
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 Firm Registration No. F-382

Texas Department of Transportation

SH 146

GUIDE SIGN DETAILS

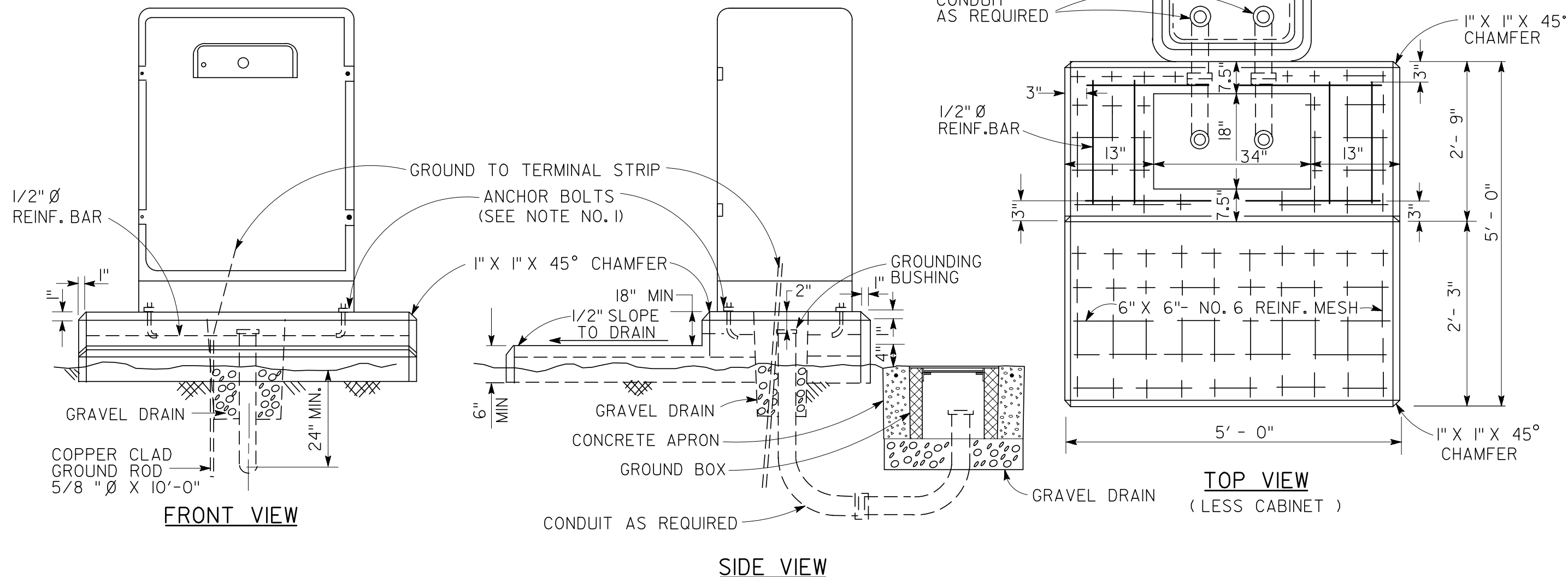
N. T. S. SHEET 1 OF 1

FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.	SHEET NO. 285
STATE TEXAS	DIST. HOU	COUNTY HARRIS
CONT. 0389	SECT. 13	JOB 039
		HIGHWAY NO. SH 146

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CABINET AS PER CONTROLLER MANUFACTURER

NOTE: SEE PLAN LAYOUT FOR CONDUIT ENTRANCES AND SIZES



NOTES:

1. CABINET MANUFACTURER TO PROVIDE DETAILS OF ANCHOR BOLT LOCATION.
2. MODIFY DIMENSIONS FOR CONCRETE BASE TO FIT EQUIPMENT FURNISHED, IF NECESSARY.
3. PROVIDE GRAVEL DRAIN FOR CONTROLLER AND ALL GROUND BOXES.
4. FURNISH CLASS "B" OR CLASS "C" CONCRETE.
5. SET CONTROLLER FOUNDATION LEVEL WITH THE PAVEMENT SURFACE OR AS APPROVED BY THE ENGINEER.
6. FURNISH AT NO COST TO THE DEPARTMENT ANY ADDITIONAL CONCRETE WHICH MAY BE NECESSARY TO STABILIZE THE FOUNDATION AT UNUSUAL LOCATIONS.
7. PLACE REINFORCING BARS AS DIRECTED.
8. UPON INSTALLING THE CONTROLLER CABINET, APPLY A SILICON-BASED CAULKING COMPOUND AROUND THE BASE OF THE CONTROLLER CABINET.

Texas Department of Transportation
Houston District

SIGNAL DETAILS/STANDARDS
CONTROLLER FOUNDATION
DETAIL
SD/SCFD

FILE#	DN#	CK#	DW#	CK#
© TxDOT 2007	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS	HOU	6		286
08-04	COUNTY	CONTROL	SECT	JOB
03-07	HARRIS	0389	13	039
				SH 146

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DATE: FILE:

GENERAL NOTES FOR ALL ELECTRICAL WORK

- The location of all conduits, junction boxes, ground boxes, and electrical services is diagrammatic and may be shifted to accommodate field conditions.
- Provide new and unused materials. Ensure that all materials and installations comply with the applicable articles of the National Electrical Code (NEC), TxDOT standards and specifications, National Electrical Manufacturers Association (NEMA), and are listed by Underwriters Laboratories (UL) or a Nationally Recognized Testing Lab (NRTL). NRTLs such as Canadian Standard Association (CSA), Intertek Testing Services NA Inc., or FM Approvals LLC can be considered equivalent to UL. Where reference is made to NEMA listed devices, International Electrotechnical Commission (IEC) listed devices will not be considered an acceptable equal to a NEMA listed device. Acceptable devices may have both a NEMA and IEC listing. Faulty fabrication or poor workmanship in any material, equipment, or installation is justification for rejection. Replace or reinstall rejected material or equipment at no additional cost to the Department.
- Miscellaneous nuts, bolts and hardware, except for high strength bolts, may be stainless steel when plans specify galvanized, provided the bolt size is 1/2 in. or less in diameter.
- Provide the following test equipment as required by the Engineer to confirm compliance with the contract and the NEC: voltmeter, ammeter, megohm meter (1000 volt DC), ground resistance tester, torque wrenches, and torque screwdrivers. Ensure all equipment has been properly calibrated within the last year. Provide calibration certification to the Engineer upon request. Operate test equipment during inspection as requested by the Engineer.
- Install grounding as shown on the plans and in accordance with the NEC. Ensure all metallic conduits; metal poles; luminaires; and metal enclosures are bonded to the equipment grounding conductor. Provide stranded bare copper or green insulated grounding conductors. Ground rods, connectors, and bonding jumpers are subsidiary to the various bid items.
- When required by the Engineer, notify the Department in writing of materials from the Material Producers List (MPL) intended for use on each project. Prequalified materials are listed on the MPL on TxDOT's website under "Roadway Illumination and Electrical Supplies." No substitutions will be allowed for materials on this list.

CONDUIT

A. MATERIALS

- Provide conduit, junction boxes, fittings, and hardware as per TxDOT Departmental Material Specification (DMS) 11030 "Conduit" and Item 618 "Conduit" of TxDOT's "Standard Specifications For Construction And Maintenance Of Highways, Streets, And Bridges," latest edition. Provide conduits listed under Item 618 on the MPL under "Roadway Illumination and Electrical Supplies." Provide conduit types according to the descriptive code or as shown on the plans. Do not substitute other types of conduits for those shown. Provide liquidtight flexible metal conduit (LFMC) when flexible conduit is called for on galvanized steel rigid metallic conduit (RMC) systems. Provide liquidtight flexible nonmetallic conduit (LFNC) when flexible conduit is called for on polyvinyl chloride (PVC) systems.
- Provide galvanized steel RMC for all exposed conduits, unless otherwise shown on the plans. Properly bond all metal conduits.
- Unless otherwise shown on the plans, provide junction boxes with a minimum size as shown in the following table, which applies to the greatest number of conductors entering the box through one conduit with no more than four conduits per box. When a mixture of conductor sizes is present, count the conductors as if all are of the larger size. For situations not applicable to the table, size junction boxes in accordance with NEC.


AWG	3 CONDUCTORS	5 CONDUCTORS	7 CONDUCTORS
#1	10" x 10" x 4"	12" x 12" x 4"	16" x 16" x 4"
#2	8" x 8" x 4"	10" x 10" x 4"	12" x 12" x 4"
#4	8" x 8" x 4"	10" x 10" x 4"	10" x 10" x 4"
#6	8" x 8" x 4"	8" x 8" x 4"	10" x 10" x 4"
#8	8" x 8" x 4"	8" x 8" x 4"	8" x 8" x 4"

- Junction boxes with an internal volume of less than 100 cu. in. and supported by entering raceways must have threaded entries or hubs identified for the intended purpose and supported by connection of two or more rigid metal conduits. Secure conduit within 3 ft. of the enclosure or within 18 in. of the enclosure if all conduit entries are on the same side. Mechanically secure all junction boxes with an internal volume greater than 100 cu. inches.
- Provide hot dipped galvanized cast iron or sand cast aluminum outlet boxes for junction boxes containing only 10 AWG or 12 AWG conductors. Do not use die cast aluminum boxes. Size outlet boxes according to the NEC.
- Do not use intermediate metal conduit (IMC) or electrical metallic tubing (EMT) unless specifically required by the plan sheets. When EMT is called for, provide junction boxes made from galvanized steel sheeting, listed and approved for outdoor use, unless otherwise noted on the plans. Size all galvanized steel junction boxes in accordance with the NEC. Provide junction boxes for IMC conduit systems that meet the same requirements for junction boxes used with RMC systems.
- Provide PVC junction boxes intended for outdoor use on PVC conduit systems, unless otherwise noted on the plans.

- Provide PVC elbows in PVC conduit systems, unless otherwise shown on the plans. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the PVC conduit system. When galvanized steel RMC elbows are specifically called for in the plans and any portion of the RMC elbow is buried less than 18 in., ground the RMC elbow by means of a grounding bushing on a rigid metal extension. Grounding of the rigid metal elbow is not required if the entire RMC elbow is encased in a minimum of 2 in. of concrete. PVC extensions are allowed on these concrete encased rigid metal elbows. RMC or PVC elbows are subsidiary to various bid items.
- When required, provide High-Density Polyethylene (HDPE) conduit with factory installed internal conductors according to Item 622 "Duct Cable." At the Contractor's request and with approval by the Engineer, substitute HDPE conduit with no conductors for bored schedule 40 or schedule 80 PVC conduit bid under Item 618. Ensure bored HDPE substituted for PVC is schedule 40 and of the same size PVC called for in the plans. Ensure the substituted HDPE meets the requirements of Item 622, except that the conduit is supplied without factory-installed conductors. Make the transition of the HDPE conduit to PVC (or RMC elbow when required) at the bore pit. Provide conduit of the size and schedule as shown on the plans. Do not extend substituted conduit into ground boxes or foundations. Provide PVC or galvanized steel RMC elbows as called for at all ground boxes and foundations.
- Use two-hole straps when supporting 2 in. and larger conduits. On electrical service poles, properly sized stainless steel or hot dipped galvanized one-hole standoff straps are allowed on the service riser conduit.

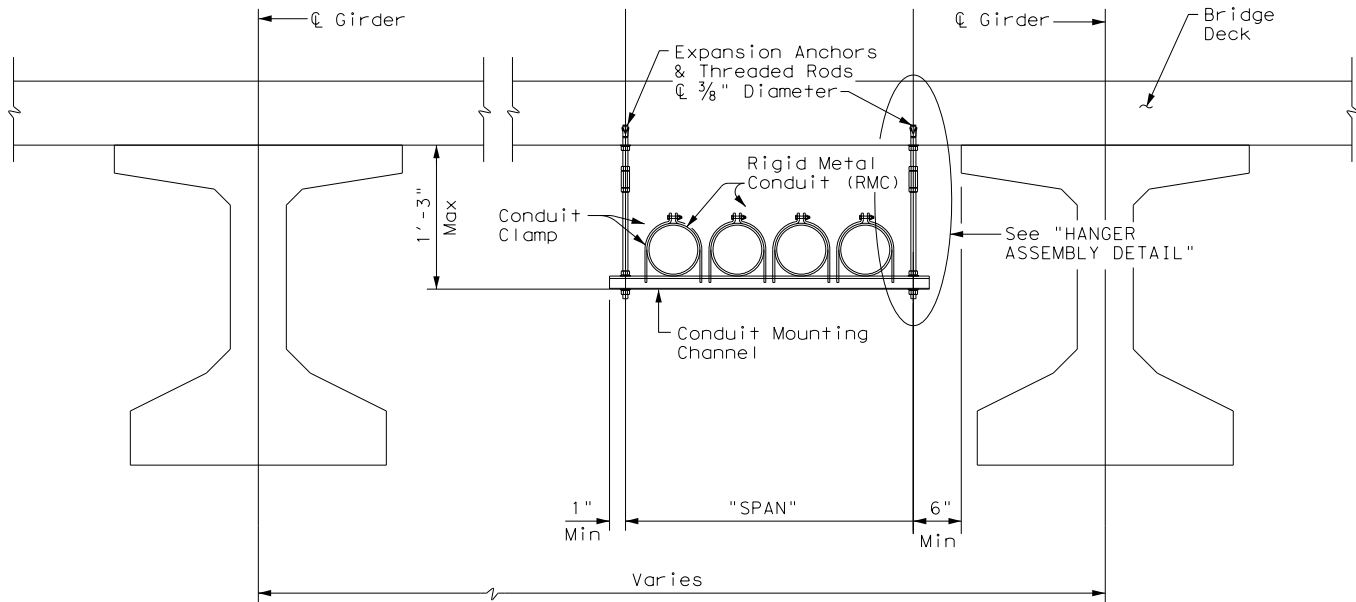
B. CONSTRUCTION METHODS

- Provide and install expansion joint conduit fittings on all structure-mounted conduits at the structure's expansion joints to allow for movement of the conduit. In addition, provide and install expansion joint fittings on all continuous runs of galvanized steel RMC conduit externally exposed on structures such as bridges at maximum intervals of 150 ft. When requested by the project Engineer, supply manufacturer's specification sheet for expansion joint conduit fittings. Repair or replace expansion joint fittings that do not allow for movement at no additional cost to the Department. Provide the method of determining the amount of expansion to the Engineer upon request. Do not use LFMC or LFNC as a substitute for the required expansion conduit fittings.
- Space all conduit supports at maximum intervals of 5 ft. Install conduit spacers when attaching metal conduit to surface of concrete structures. See "Conduit Mounting Options" on ED(2). Install conduit support within 3 ft. of all enclosures and conduit terminations.
- Do not attach conduit supports directly to pre-stressed concrete beams except as shown specifically in the plans or as approved by the Engineer.
- Unless otherwise shown on the plans, jack or bore conduit placed beneath existing roadways, driveways, sidewalks, or after the base or surfacing operation has begun. Backfill and compact the bore pits below the conduit per Item 476 "Jacking, Boring, or Tunneling Pipe or Box" prior to installing conduit or duct cable to prevent bending of the connections.
- When placing conduit in the sub-grade of new roadways, backfill all trenches with excavated material unless otherwise noted on the plans. When placing conduit in the sub-base of new roadways, backfill all trenches with cement-stabilized base as per requirements of Items 110 "Excavation", 400 "Excavation and Backfill for Structures", 401 "Flowable Backfill", 402 "Trench Excavation Protection", and 403 "Temporary Special Shoring."
- Provide and place warning tape approximately 10 in. above all trenched conduit as per Item 618.
- During construction, temporarily cap or plug open ends of all conduit and raceways immediately after installation to prevent entry of dirt, debris and animals. Temporary caps constructed of durable duct tape are allowed. Tightly fix the tape to the conduit opening. Clean out the conduit and prove it clear in accordance with Item 618 prior to installing any conductors.
- Ensure conduit entry into the top of any enclosure is waterproof by installing conduit sealing hubs or using boxes with threaded bosses. This includes surface mounted safety switches, meter cans, service enclosures, auxiliary enclosures and junction boxes. Grounding bushings on water tight sealing hubs are not required.
- Fit the ends of all PVC conduit terminations with bushings or bell end fittings. Provide and install a grounding type bushing on all metal conduit terminations.
- Install a bonding jumper from each grounding bushing to the nearest ground rod, grounding lug, or equipment grounding conductor. Ensure all bonding jumpers are the same size as the equipment grounding conductor. Bonding of conduit used as a casing under roadways for duct cable is not required, if the duct extends the full length through the casing.
- At all electrical services, install a 6 AWG solid copper grounding electrode conductor.
- Place conduits entering ground boxes so that the conduit openings are between 3 in. and 6 in. from the bottom of the box. See the ground box detail on sheet ED(4).
- Seal ends of all conduits with duct seal, expandable foam, or by other methods approved by the Engineer. Seal conduit immediately after completion of conductor installation and pull tests. Do not use duct tape as a permanent conduit sealant. Do not use silicone caulk as a conduit sealant.
- File smooth the cut ends of all mounting strut and conduit. Before installing, paint the field cut ends of all mounting strut and RMC (threaded or non-threaded) with zinc rich paint (94% or more zinc content) to alleviate overspray. Use zinc rich paint to touch up galvanized material as allowed under Item 445 "Galvanizing." Do not paint non-galvanized material with a zinc rich paint as an alternative for materials required to be galvanized.

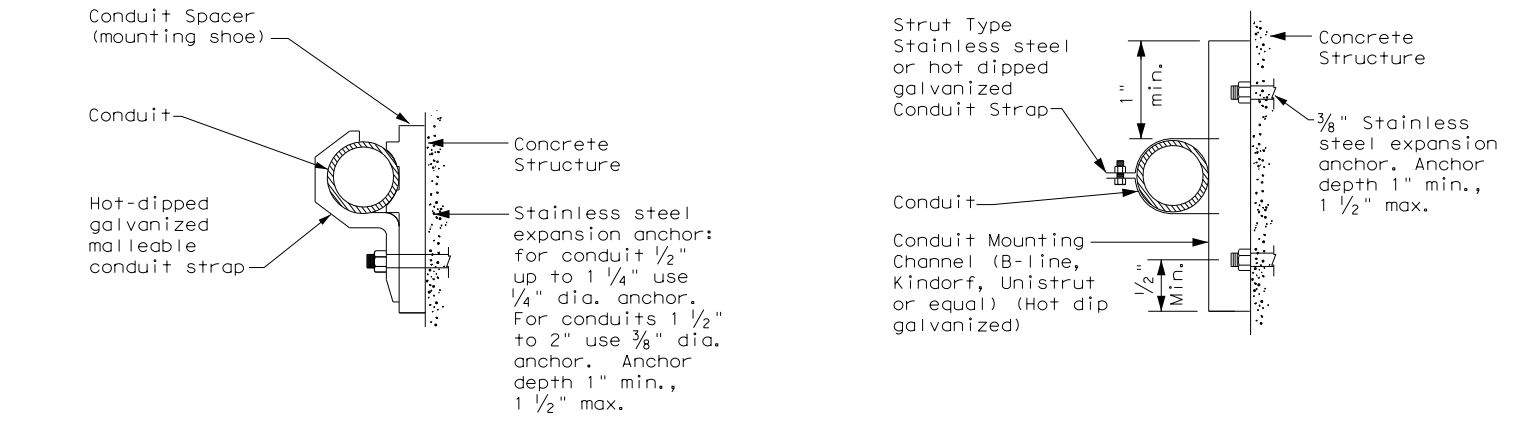
		Traffic Operations Division Standard	
<h1>ELECTRICAL DETAILS CONDUITS & NOTES</h1>			
<h2>ED(1) - 14</h2>			
FILE:	ed1-14.dgn	DN:	CK:
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REVISIONS		13	146
DIST:	COUNTY:	SHEET NO.	
HOU	HARRIS	287	

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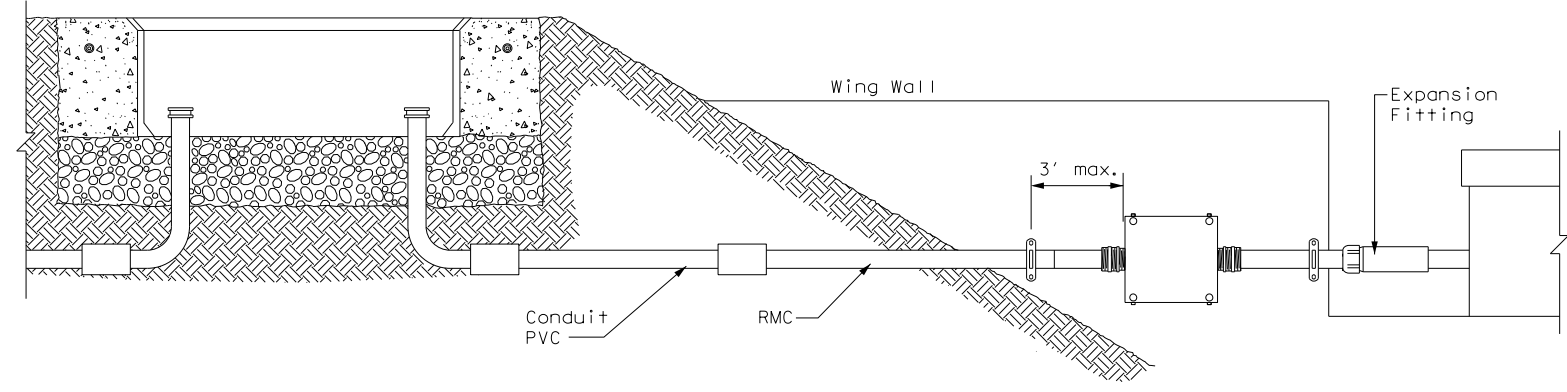
DATE: FILE:



CONDUIT HANGING DETAIL



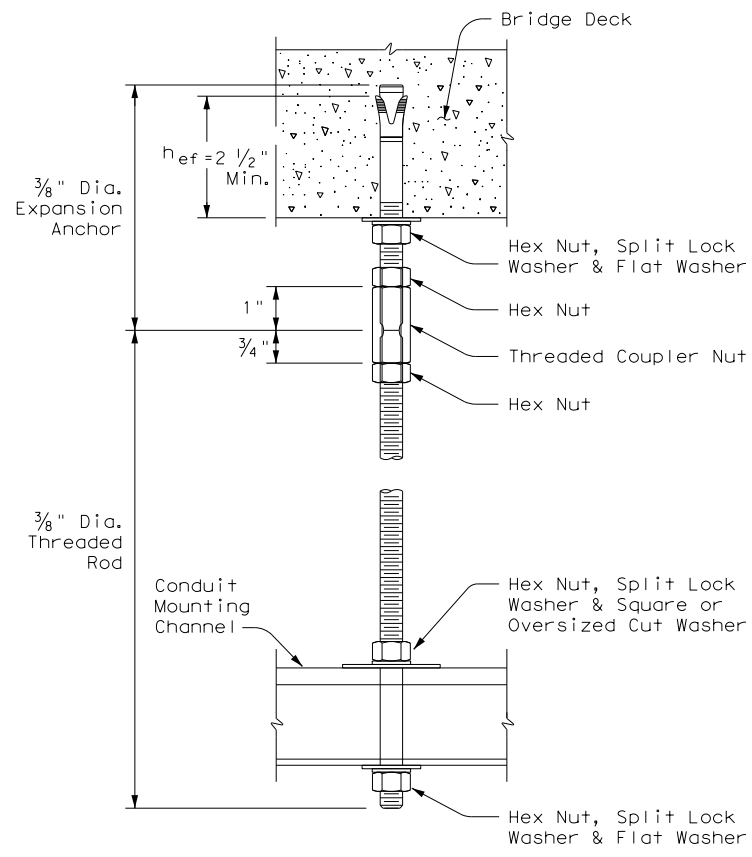
CONDUIT MOUNTING OPTIONS
Attachment to concrete surfaces
See ED(1)B.2



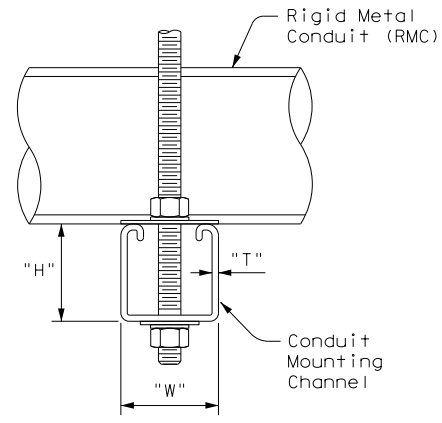
TYPICAL CONDUIT ENTRY TO BRIDGE STRUCTURE DETAIL

CONDUIT MOUNTING CHANNEL		
"SPAN"	"W" x "H"	"T"
less than 2'	1 5/8" x 1 3/8"	12 Ga.
2'-0" to 2'-6"	1 5/8" x 1 5/8"	12 Ga.
>2'-6" to 3'-0"	1 5/8" x 2 7/16"	12 Ga.

Channels with round or short slotted hole patterns are allowed, if the load carrying capacity is not reduced by more than 15%.



HANGER ASSEMBLY DETAIL



ELECTRIC CONDUIT TO BRIDGE DECK ATTACHMENT

EXPANSION ANCHOR NOTES FOR BRIDGE DECK ATTACHMENT

1. Use torque controlled mechanical expansion anchors that are approved for use in cracked concrete by the International Code Council, Evaluation Service (ICC-ES). The chosen anchor product shall have a designated ICC-ES Evaluation Report number, and its approval status shall be maintained on the ICC-ES website under Division 031600 for Concrete Anchors.
2. Unless otherwise approved by the Engineer: do not use adhesive anchors; do not use expansion anchors that are not included in the ICC-ES approval list; and do not use expansion anchors that are only approved for use in uncracked concrete.
3. Use anchors manufactured with stainless steel expansion wedges. Anchors manufactured with carbon steel expansion wedges are not allowed. Anchor bodies can be either zinc-plated carbon steel or stainless steel. For application in marine environment, both the anchor body and expansion wedge shall be stainless steel.
4. Install anchors as shown on the plans and in accordance with the anchor manufacturer's published installation instructions. Arrange a field demonstration test to evaluate the procedures and tools. The test shall be witnessed and approved by the Engineer prior to furnishing anchors on the structure.
5. Prior to hole drilling, use rebar locator to ensure clearing of existing deck strands or reinforcement. Install anchors to ensure a minimum effective embedment depth, (h_{ef}), as shown. Increase (h_{ef}) as needed to ensure sufficient thread length for proper torqueing and tightening of anchors.
6. Use anchors of minimum 1600 Lbs tensile capacity (minimum of steel, concrete breakout, and concrete pullout strengths as determined by ACI 318 Appendix D) at the required minimum embedment depth (h_{ef}). No lateral loads shall be introduced after conduit installation.

		Traffic Operations Division Standard	
<h2>ELECTRICAL DETAILS CONDUIT SUPPORTS</h2>			
<h3>ED(2) - 14</h3>			
FILE: ed2-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
© TxDOT October 2014	CONT SECT	JOB	HIGHWAY
REVISIONS	0389 13	039	SH 146
DIST	COUNTY	SHEET NO.	
HOU	HARRIS	288	

ELECTRICAL CONDUCTORS

A. MATERIAL INFORMATION

1. Provide Type XHHW insulated conductors in accordance with Departmental Material Specification (DMS)11040 "Conductors" and Item 620 "Electrical Conductors." Provide conductors as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies" Item 620. Color code insulated conductors in conformance with the NEC. Identify grounded (neutral) conductors with white insulation. Identify grounding conductors (ground wires) with green insulation or bare conductors. Identify ungrounded (hot) conductors with any color insulation except green, white, or gray. Keep color scheme consistent throughout the wiring system. Identify conductors 6 American Wire Gauge (AWG) and smaller by continuous color jacket. Identify electrical conductors 4 AWG and larger by continuous color jacket or by colored tape. When identifying conductors with colored tape, mark at least 6 in. of the conductor's insulation with half laps of tape.
2. Provide a solid copper 6 AWG grounding electrode conductor to bond the electrical service equipment to the concrete encased grounding electrode or the ground rod at the service location. Connect the grounding electrode conductor to the ground rod with a UL listed connector in accordance with DMS 11040. Connect the grounding electrode conductor to the concrete encased grounding electrode as shown in the plans.
3. Where two or more circuits are present in one conduit or enclosure, permanently identify the conductors of each branch circuit by attaching a non-metallic tag around both circuit conductors at each accessible location. Provide tags with two straps, large enough to indicate circuit number, letter, or other identification as shown in the plans. Print circuit identification on the tag with a permanent marker.
4. Use listed compression or screw type pressure connectors, terminal blocks, or split bolt connectors for splicing as specified in DMS 11040. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Provide UL listed gel-filled insulating splice covers. Splicing materials, insulating materials, breakaway disconnects, splice covers, and fuse holders are subsidiary to various bid items.

B. CONSTRUCTION METHODS

1. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the conduit system. After installing conductors in conduit, perform conductor pull test. If a conductor cannot be freely pulled, make any needed alterations or repairs at no additional cost to the department. Perform insulation resistance tests in accordance with Item 620. Coordinate with the Engineer to witness the tests.
2. Leave 2 ft. minimum, 3 ft. maximum length for each conductor up to the splice in ground boxes. Leave 3 ft. minimum, 4 ft. maximum length of conductor in ground boxes when pulled through with no splice. Leave 1 ft. minimum, 1.5 ft. maximum length of conductor at enclosures, weatherheads and pole bases.
3. Make splices only in junction boxes, ground boxes, pole bases, or electrical enclosures and use only listed compression or screw type pressure connectors, terminal blocks, or split bolt connectors. Insulate splices with heavy wall heat shrink tubing or gel-filled insulating splice covers to provide a watertight splice. Overlap conductor insulation with heat shrink tubing a minimum of 2 in. past both sides of the splice. Where heat shrink tubing may not shrink sufficiently to provide a watertight seal around the individual conductors, prior to heating the tubing, increase the diameter of the conductor insulation using hot melt adhesive tape to provide a watertight seal between the individual conductors and the heat shrink tubing. Ensure the tape extends past the heat shrink tubing. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Heat shrink tubing that appears to have been burned, or overheated, is considered defective and must be replaced.
4. Size and install gel-filled insulating splice covers according to manufacturer's specifications when used in place of heat shrink tubing.
5. Wire nuts with factory applied waterproof sealant may be used for 8 AWG or smaller conductors in above ground junction boxes, but not in pole bases or ground boxes. Install wire nuts in an upright position to prevent the accumulation of water.
6. Support conductors in illumination poles with a J-hook at the top of the pole.
7. When terminating conductors, remove the insulation and jacketing material without nicking the individual strands of the conductor. Conductors with nicked individual conductor strands or removed strands will be considered damaged.
8. Replace conductors and cables that are damaged beyond repair or that fail an insulation resistance test at no additional cost to the department.
9. Do not repair damaged conductors with duct tape, electrical tape, or wire nuts. Use only approved splicing methods.
10. Do not terminate more than one conductor under a single connector, unless the connector is rated for multiple conductors. Do not exceed the pressure connector's listing for maximum number and size of conductors allowed.
11. Install breakaway connectors on conductors bid under Item 620 whenever those conductors pass through a breakaway support device. Follow manufacturer's instructions when terminating conductors to breakaway connectors. Properly torque threaded connections. Proper terminations are critical to the safe operation of breakaway devices. Trim waterproofing boots on breakaway connectors to fit snugly around the conductor to ensure waterproof connection. Only one conductor may enter a single opening in a boot. Provide waterproof boots with the correct number of openings. Leave unused openings factory sealed. Use prequalified breakaway connectors as shown on the MPL.

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12. Provide and install a separate stranded equipment grounding conductor (EGC) in all conduits that contain circuit wiring of 50 volts or more. Unless shown elsewhere, size the EGC to be the same size as the largest current carrying conductor contained in the conduit. Ensure all EGCs are bonded together at every accessible location. For traffic signal installations, provide a minimum size 8 AWG EGC. The EGC is paid for under Item 620.

C. TEMPORARY WIRING

1. Install temporary conductors and electrical equipment in accordance with the NEC article "Temporary Installations" and Department standard sheets.
2. Provide a ground fault circuit interrupter (GFCI) for power outlets for portable electrical equipment, power tools, ice machines, ice storage bins and refrigerators located outdoors at grade. GFCI may be any one of the following: molded cord and plug set, receptacle, or circuit breaker type.
3. Use listed wire nuts with factory applied sealant for temporary wiring where approved.
4. Enclose conductor splices within a listed enclosure or ground box, or ensure the splices are more than 10 ft. above grade vertically and more than 5 ft. horizontally from any metal structure. Where installing temporary conductors in areas subject to vehicle traffic or mobile construction equipment, ensure the vertical clearance to ground is at least 18 ft. when measured at the lowest point. Ground messenger wires that support power conductors in conformance with the NEC.
5. Protect and when necessary repair any existing electrical conduits uncovered during the construction process in a timely manner and in conformance with the NEC.

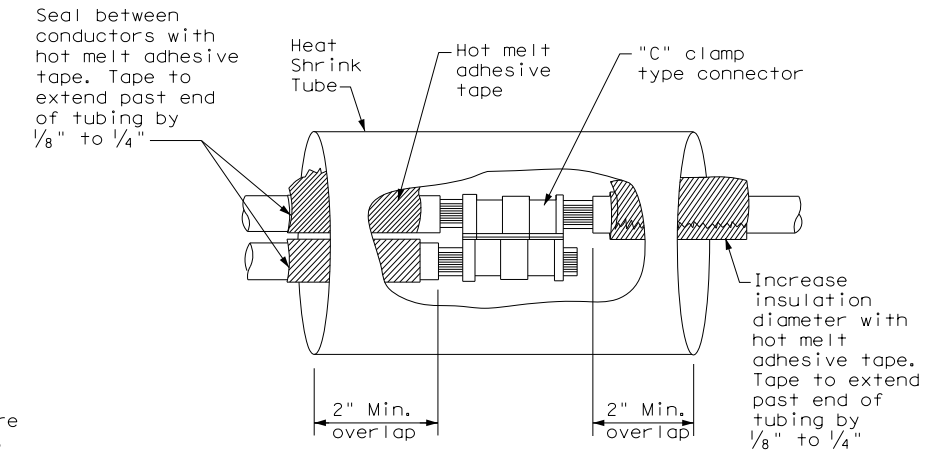
GROUND RODS & GROUNDING ELECTRODES

A. MATERIAL INFORMATION

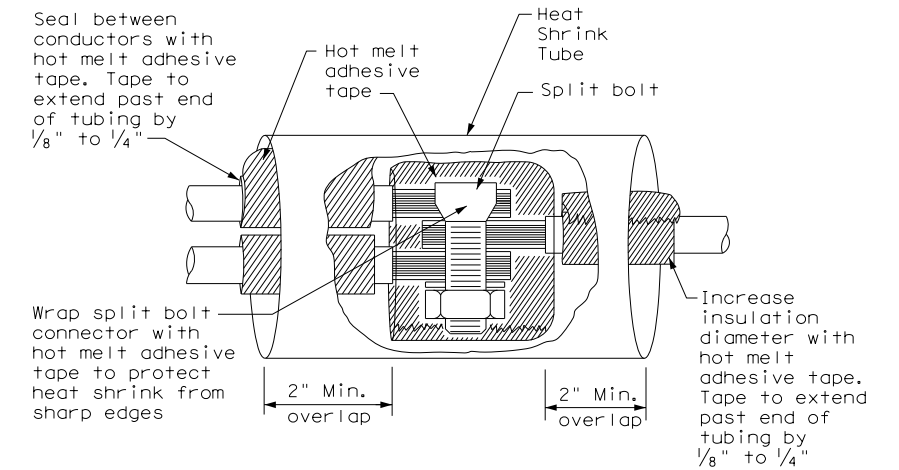
1. Provide and install a grounding electrode at electrical services. Provide ground rods according to DMS 11040 and the plans. Larger diameter or longer length rods may be called for in some specific locations, see the individual plans sheets. Concrete encased grounding electrodes may be called for in specific locations including electrical service, see individual plan sheets.

B. CONSTRUCTION METHODS

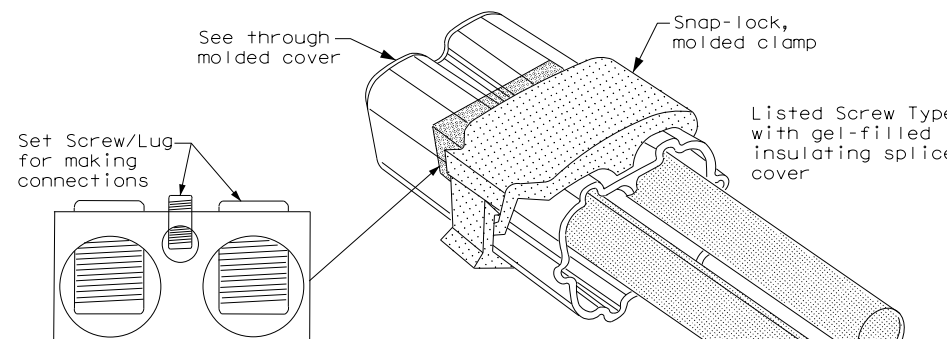
1. Furnish auxiliary ground rods for lightning protection and install in soil, concrete, or both, as called for in the plans. For ground rods installed in concrete, ensure the connection of the conductor to the ground rod is readily accessible for inspection or repairs. For ground rods installed in soil, ensure that the upper end is between 2 to 4 in. below finished grade.
2. Do not place ground rods in the same drilled hole as a timber pole.
3. Install ground rods so the imprinted part number is at the upper end of the rod.
4. Remove all non-conductive coatings such as concrete splatter from the rod at the clamp location.
5. Route all conductors as short and straight as possible for connection to lightning protection ground rods. When a bend is required, ensure a minimum radius bend of four inches for these conductors.
6. Unless otherwise called for in the plans, protect grounding electrode conductors with non-metallic conduit. When protecting grounding electrode conductors with metal conduit, provide and install a grounding type bushing and properly sized bonding jumper on each end of the metal conduit.
7. Written authorization is required before installing a ground rod in a horizontal trench for rocky soil or a solid rock bottom.



SPLICE OPTION 1
Compression Type



SPLICE OPTION 2
Split Bolt Type

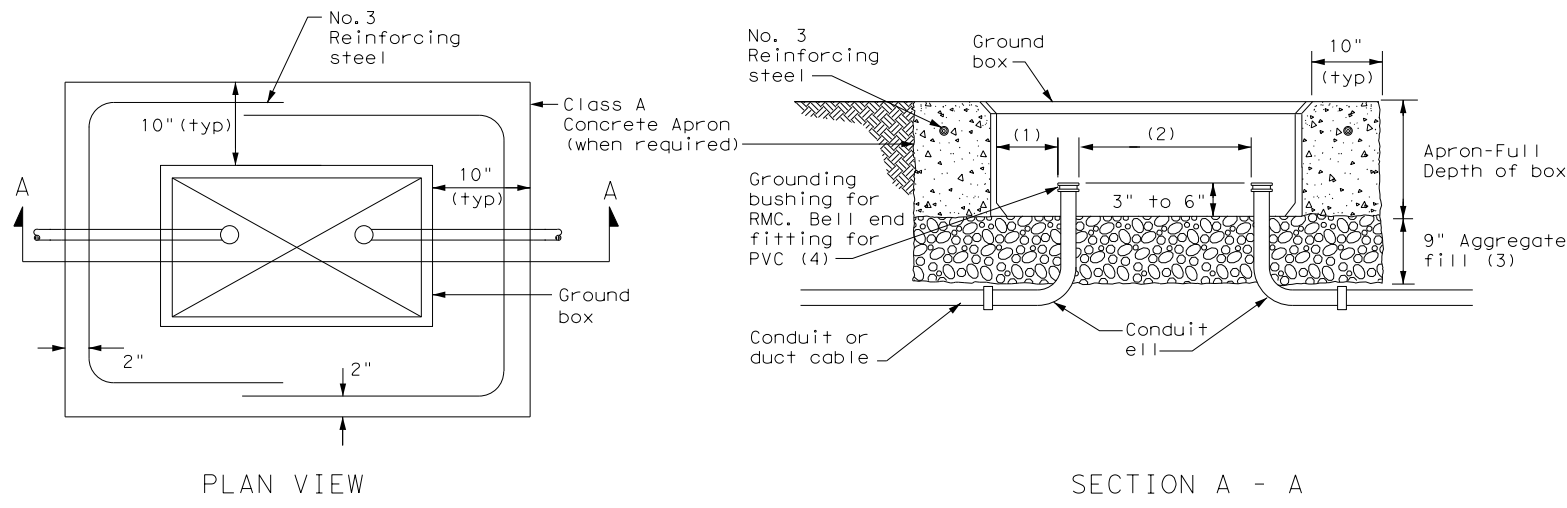


SPLICE OPTION 3
Listed Screw Type

		Texas Department of Transportation		Traffic Operations Division Standard	
<h2>ELECTRICAL DETAILS CONDUCTORS</h2>					
<h3>ED(3) - 14</h3>					
FILE:	ed3-14.dgn	DN:	TxDOT	CK:	TxDOT
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REVISIONS		JOB:	039	HIGHWAY:	SH 146
		DIST:	HOU	COUNTY:	HARRIS
				SHEET NO.:	289

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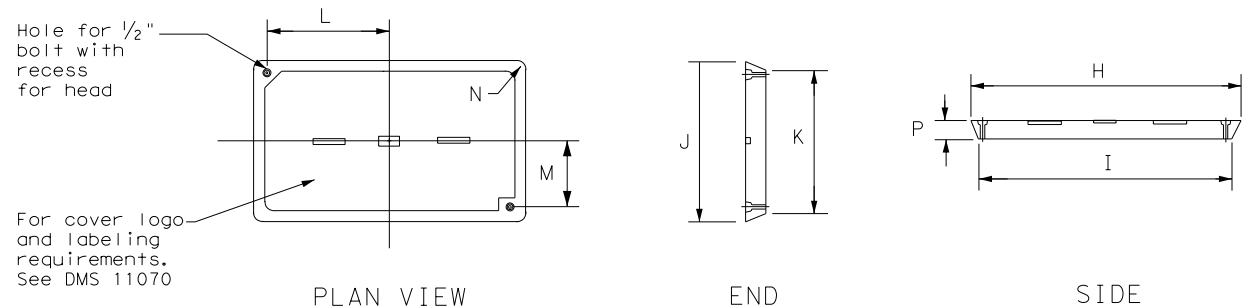


APRON FOR GROUND BOX

- (1) Uniformly space ends of conduits within the ground box. Position ends of conduits so that ground box walls do not interfere with the installation of grounding bushings or bell end fittings.
- (2) Maintain sufficient space between conduits to allow for proper installation of bushing.
- (3) Place aggregate under the box, not in the box. Aggregate should not encroach on the interior volume of the box.
- (4) Install a grounding bushing on the upper end of all RMC terminating in a ground box. Ground RMC elbows when any part of the elbow is less than 18 in. below the bottom of the ground box. Install a PVC bushing or bell end fitting on the upper end of all PVC conduits terminating in a ground box.

GROUND BOX DIMENSIONS	
TYPE	OUTSIDE DIMENSIONS (INCHES) (Width x Length X Depth)
A	12 X 23 X 11
B	12 X 23 X 22
C	16 X 29 X 11
D	16 X 29 X 22
E	12 X 23 X 17

GROUND BOX COVER DIMENSIONS								
TYPE	DIMENSIONS (INCHES)							
	H	I	J	K	L	M	N	P
A, B & E	23 1/4	23	13 3/4	13 1/2	9 7/8	5 1/8	1 3/8	2
C & D	30 1/2	30 1/4	17 1/2	17 1/4	13 1/4	6 3/4	1 3/8	2



GROUND BOX COVER

GROUND BOXES

A. MATERIALS

1. Provide polymer concrete ground boxes measuring 16x30x24 in. (WxLxD) or smaller in accordance with Departmental Material Specification (DMS) 11070 "Ground Boxes" and Item 624 "Ground Boxes."
2. Provide Type A, B, C, D, and E ground boxes as shown in the plans, and as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies," Item 624.

3. Ensure ground box cover is correctly labeled in accordance with DMS 11070.

4. Provide larger ground boxes in accordance with Item 624 and as shown in the plans.

B. CONSTRUCTION METHODS

1. Remove all gravel and dirt from conduit. Cap all conduits prior to placing aggregate and setting ground box. Provide Grade 3 or 4 coarse aggregate as shown on Table 2 of Item 302 "Aggregates for Surface Treatments." Ensure aggregate bed is in place and at least 9 inches deep, prior to setting the ground box. Install ground box on top of aggregate.
2. Cast ground box aprons in place. Reinforcing steel may be field bent. Ensure the depth of concrete for the apron extends from finished grade to the top of the aggregate bed under the box. Ground box aprons, including concrete and reinforcing steel, are subsidiary to ground boxes when called for by descriptive code.
3. Keep bolt holes in the box clear of dirt. Bolt covers down when not working in ground boxes.
4. Install all conduits and ells in a neat and workmanlike manner. Uniformly space conduits so grounding bushings and bell end fittings can easily be installed.
5. Temporarily seal all conduits in the ground box until conductors are installed.
6. Permanently seal conduits immediately after the completion of conductor installation and pull tests. Permanently seal the ends of all conduits with duct seal, expandable foam, or other method as approved. Do not use duct tape as a permanent conduit sealant. Do not use silicone caulk as a sealant.
7. When a ground rod is present in a ground box, bond all equipment grounding conductors together and to the ground rod with listed connectors.
8. When a type B or D ground box is stacked to meet volume requirements, it is allowable to cut an appropriately sized hole for conduit entry in the side wall at least 18 inches below grade.
9. If an existing ground box in the contract has a metal cover, bond the cover to the equipment grounding conductor with a 3 ft. long stranded bonding jumper the same size as the grounding conductor. The bonding jumper is subsidiary to various bid items. Verify existing ground boxes with metal covers are shown on the plans, with notes fully describing the work required.
10. If other ground boxes with metal covers are within the project limits but are not part of the contract, the Engineer may direct the Contractor to bond the metal covers, identifying the specific boxes in writing. This work will be paid for separately.
11. Bond metal ground box covers to the grounding conductor with a tank ground type lug.

				Traffic Operations Division Standard	
<h2>ELECTRICAL DETAILS</h2> <h3>GROUND BOXES</h3>					
<h3>ED(4) - 14</h3>					
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ELECTRICAL SERVICES NOTES

- Provide new materials. Ensure installation and materials comply with the applicable provisions of the National Electrical Code (NEC) and National Electrical Manufacturers Association (NEMA) standards. Ensure material is Underwriters Laboratories (UL) listed. Provide and install electrical service conduits, conductors, disconnects, contactors, circuit breaker panels, and branch circuit breakers as shown on the Electrical Service Data chart in the plans. Faulty fabrication or poor workmanship in material, equipment, or installation is justification for rejection. Where manufacturers provide warranties and guarantees as a customary trade practice, furnish these to the State.
- Provide electrical services in accordance with Electrical Details standard sheets, Departmental Material Specification (DMS) 11080 "Electrical Services," DMS 11081 "Electrical Services-Type A," DMS 11082 "Electrical Services-Type C," DMS 11083 "Electrical Services-Type D," DMS 11084 "Electrical Services-Type T," DMS 11085 "Electrical Services-Pedestal (PS)", and Item 628 "Electrical Services" of the Standard Specifications. Provide electrical service types A, C, and D, as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies," Item 628. Provide other service types as detailed on the plans.
- Provide all work, materials, services, and any incidentals needed to install a complete electrical service as specified in the plans.
- Coordinate with the Engineer and the utility provider for metering and compliance with utility requirements. Primary line extensions, connection charges, meter charges, and other charges by the utility company to provide power to the location are paid for in accordance with Item 628. Get approval for the costs associated with these charges prior to engaging the utility company to do the work. Consult with the utility provider to determine costs and requirements, and coordinate the work as approved.
- The enclosure manufacturer will provide Master Lock Type 2 with brass tumblers keyed #2195 for all custom electrical enclosures. Installing Contractor is to provide Master Lock #2195 Type 2 with brass tumblers for "off the shelf" enclosures. Master Lock #2195 keys and locks become property of the State. Unless otherwise approved, do not energize electrical service equipment until locks are installed.
- Enclosures with external disconnects that de-energize all equipment inside the enclosure do not need a dead front trim. Protect incoming line terminations from incidental contact as required by the NEC.
- When galvanized is specified for nuts, screws, bolts or miscellaneous hardware, stainless steel may be used.
- Provide wiring and electrical components rated for 75°C. Provide red, black, and white colored XHHW service entrance conductors of minimum size 6 American Wire Gauge (AWG). Identify size 6 AWG conductors by continuous color jacket. Identify electrical conductors sized 4 AWG and larger by continuous color jacket or by colored tape. Mark at least 6 inches of the conductor's insulation with half laps of colored tape, when identifying conductors. Ensure each service entrance conductor exits through a separately bushed non-metallic opening in the weatherhead. The lengths of the conductors outside the weatherhead are to be 12 inches minimum, 18 inches maximum, or as required by utility.
- All electrical service conduit and conductors attached to the electrical service including the riser or the elbow below ground are subsidiary to the electrical service. For an underground utility feed, all service conduit and conductors after the elbow, including service conduit and conductors for the utility pole riser when furnished by the Contractor, will be paid for separately.
- Provide rigid metal conduit (RMC) for all conduits on service, except for the 1/2 in. PVC conduit containing the electrical service grounding electrode conductor. Size the service entrance conduit as shown in the plans. Ensure conduit for branch circuit entry to enclosure is the same size as that shown on the layout sheets for branch circuit conduit. Extend all rigid metal conduits a minimum of 6 inches underground and then couple to the type and schedule of the conduit shown on the layout for that particular branch circuit. Install a grounding bushing on the RMC where it terminates in the service enclosure.
- Use of liquidtight flexible metal conduit (LFMC) is allowed between the meter and service enclosure when they are mounted 90 to 180 degrees to each other. Size the LFMC the same size as service entrance conduit. LFMC must not exceed 3 feet in length. Strap LFMC within 1 foot of each end. LFMC less than 12 inches in length need not be strapped. Each end of LFMC must have a grounding bushing or be terminated with a grounding fitting. The LFMC must contain a grounded (neutral) conductor. Ensure any bend in LFMC never exceeds 180 degrees. A pull test is required on all installed conductors, with at least six inches of free conductor movement demonstrated to the satisfaction of the Engineer.
- Ensure all mounting hardware and installation details of services conform to utility company specifications.
- For all electrical service enclosures listed under Item 628 on the MPL, the UL 508 enclosure manufacturers will prepare and submit a schematic drawing unique to each service. Before shipment to the job site, place the applicable laminated schematic drawings and the laminated plan sheet showing the electrical service data chart used to build the enclosure in the enclosure's data pocket. The installing contractor will copy and laminate the actual project plan sheets detailing all equipment and branch circuits supplied by that service. The laminated plan sheets are to be placed in the service enclosure's document pocket. Reduce 11 in. x 17 in. plan sheets to 8 1/2 in. x 11 in. before laminating. If the installation differs from the plan sheets, the installing contractor is to redline plan sheets before laminating.
- When providing an "Off The Shelf" Type D or Type T service, provide laminated plan sheets detailing equipment and branch circuits supplied by that service. Reduce 11 in. x 17 in. plan sheets to 8 1/2 in. x 11 in before laminating. Deliver these drawings before completion of the work to the Engineer, instead of placing in enclosure that has no door pocket.
- Do not install conduit in the back wall of a service enclosure where it would penetrate the equipment mounting panel inside the enclosure. Provide grounding bushings on all metal conduits, and terminate bonding jumpers to grounding bus. Grounding bushings are not required when the end of the metal conduit is fitted with a conduit sealing hub or threaded boss, such as a meter base hub.

SERVICE ASSEMBLY ENCLOSURE

- Provide threaded hub for all conduit entries into the top of enclosure.
- Type galvanized steel (GS) enclosures may be used for Type C panelboards and for Type D and T services that do not use an enclosure mounted photocell or lighting contactor. Provide GS enclosures in accordance with DMS 11080, 11082, 11083, and 11084.
- Provide aluminum (AL) and stainless steel (SS) enclosures for Types A, C, and D in accordance with DMS 11080, 11081, 11082, 11083, and 11084. Do not paint stainless steel.
- Provide pedestal service (PS) enclosures in accordance with ED(9) and DMS 11080 and 11085. Do not provide GS pedestal services. If GS is shown in the PS descriptive code, provide an AL enclosure.

MAIN DISCONNECT & BRANCH CIRCUIT BREAKERS

- Field drill flange-mounted remote operator handle if needed, to ensure handle is lockable in both the "On" and "Off" positions.
- When the utility company provides a transformer larger than 50 KVA, verify that the available fault current is less than the circuit breaker's ampere interrupting capacity (AIC) rating and provide documentation from the electric utility provider to the Engineer.

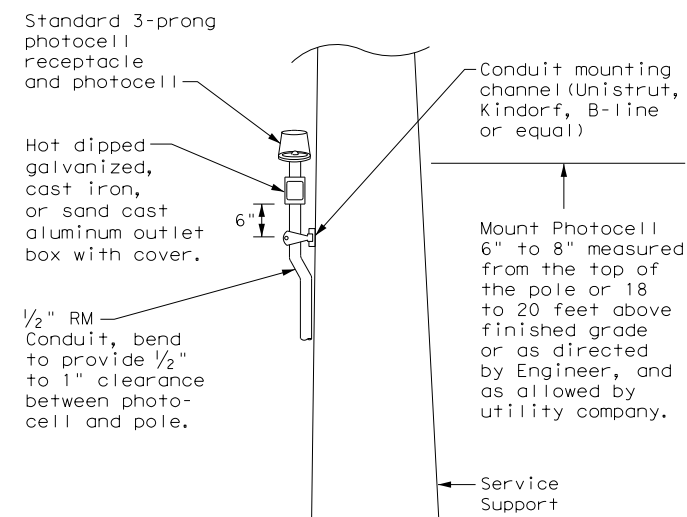
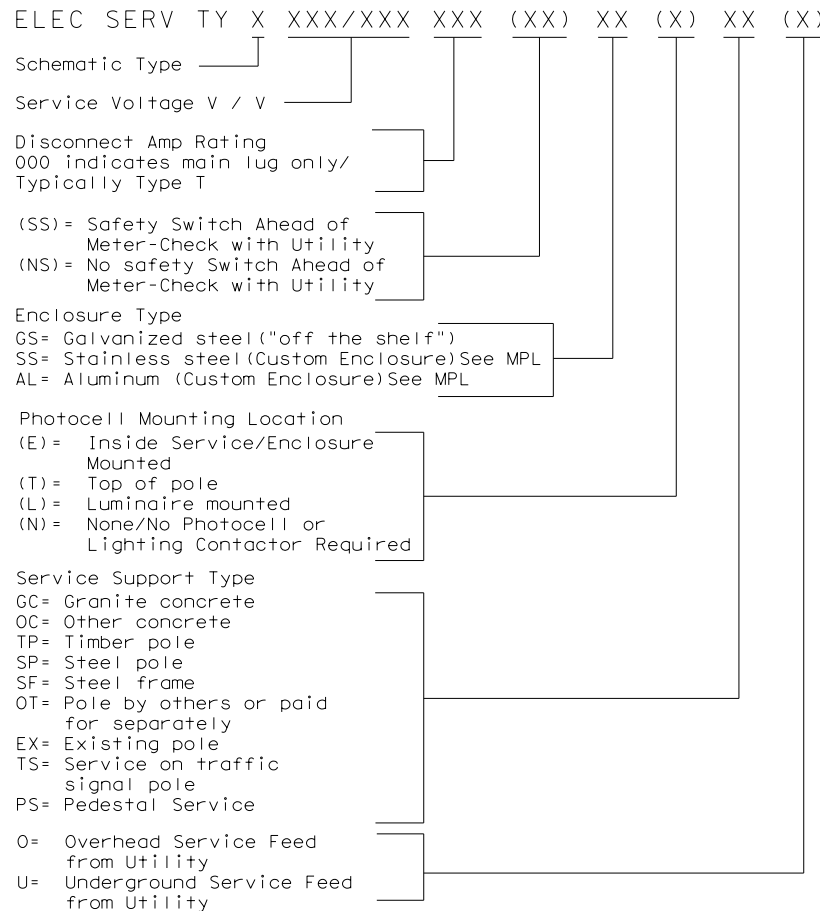
PHOTOELECTRIC CONTROL

- Provide photocell as listed on the MPL. Move, adjust, or shield the photocell from stray or ambient night time light to ensure proper operation. Mount photocell facing north when practical. Mount top of pole photocells as shown on Top Mounted Photocell Detail.

* ELECTRICAL SERVICE DATA												
Elec. Service ID	Plan Sheet Number	Electrical Service Description	Service Conduit *xS Size	Service Conductors No./Size	Safety Switch Amps	Main Ckt. Bkr. Pole/Amps	Two-Pole Contractor Amps	Panelbd/ Loadcenter Amp Rating	Branch Circuit ID	Branch Ckt. Bkr. Pole/Amps	Branch Circuit Amps	KVA Load
SB 183	289	ELC SRV TY A 240/480 100(SS)AL(E)SF(U)	2"	3/#2	100	2P/100	100	N/A	Lighting NB	2P/40	26	28.1
									Lighting SB	2P/40	25	
									Underpass	1P/20	15	
NB Access	30	ELC SRV TY D 120/240 060(NS)SS(E)TS(O)	1 1/4"	3/#6	N/A	2P/60		100	Sig. Controller	1P/30	23	5.3
							30		Luminaires	2P/20	9	
									CCTV	1P/20	3	
2nd & Main	58	ELC SRV TY T 120/240 000(NS)GS(N)SP(O)	1 1/4"	3/#6	N/A	N/A	N/A	70	Flashing Beacon 1	1P/20	4	1.0
									Flashing Beacon 2	1P/20	4	

* Example only, not for construction. All new electrical services must have electrical service data chart specific to that service as shown in the plans.
 ** Verify service conduit size with utility. Size may change due to utility meter requirements. Ensure conduit size meets the National Electrical Code.

EXPLANATION OF ELECTRICAL SERVICE DESCRIPTIVE CODE



TOP MOUNTED PHOTOCELL

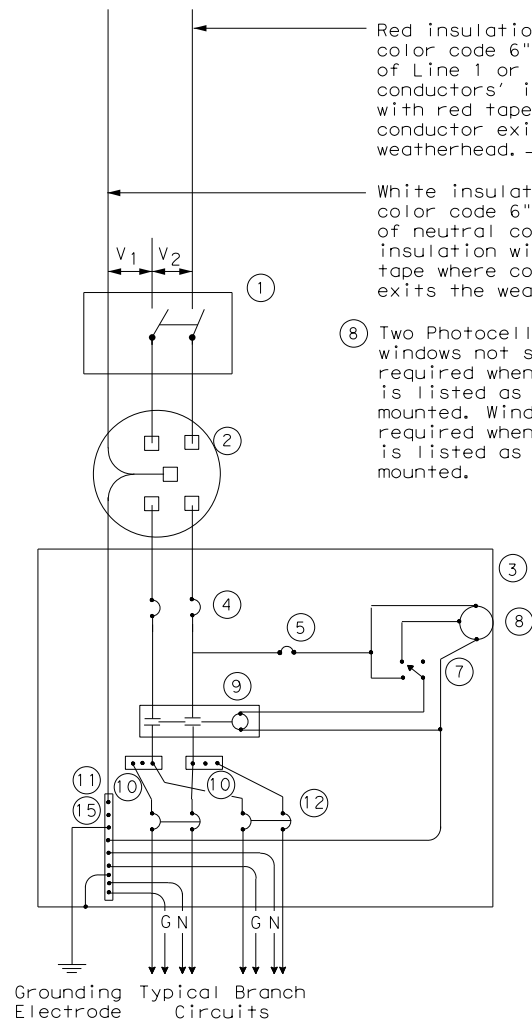
Install conduit strap maximum 3 feet from box. 5 foot maximum spacing between straps supporting conduit.

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<h2>ELECTRICAL DETAILS SERVICE NOTES & DATA</h2>			
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FILE: ed5-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
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DIST	COUNTY		SHEET NO.
HOU	HARRIS		291

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SCHEMATIC TYPE A
THREE WIRE

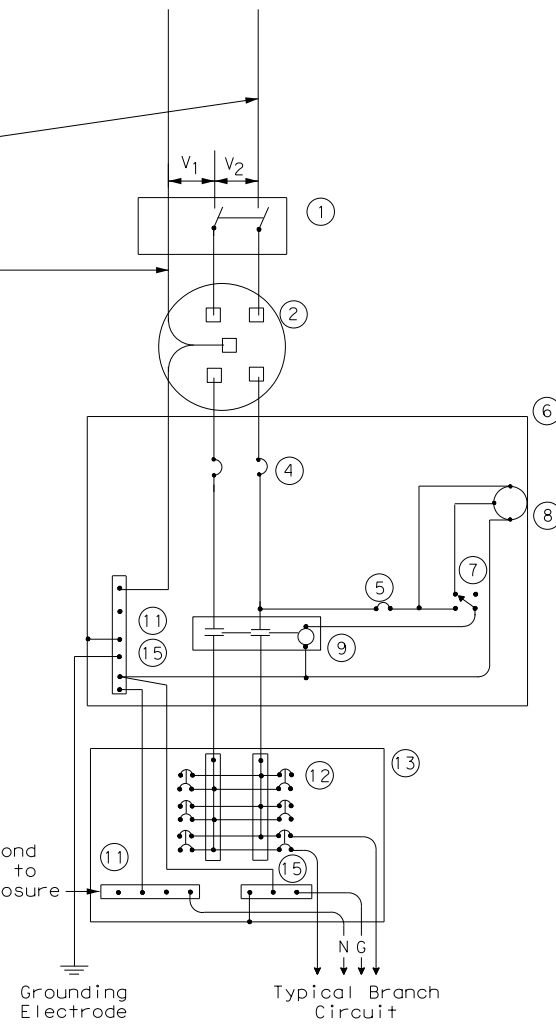
Red insulation or color code 6" length of Line 1 or Line 2 conductors' insulation with red tape where conductor exits the weatherhead.

White insulation or color code 6" length of neutral conductors' insulation with white tape where conductor exits the weatherhead.

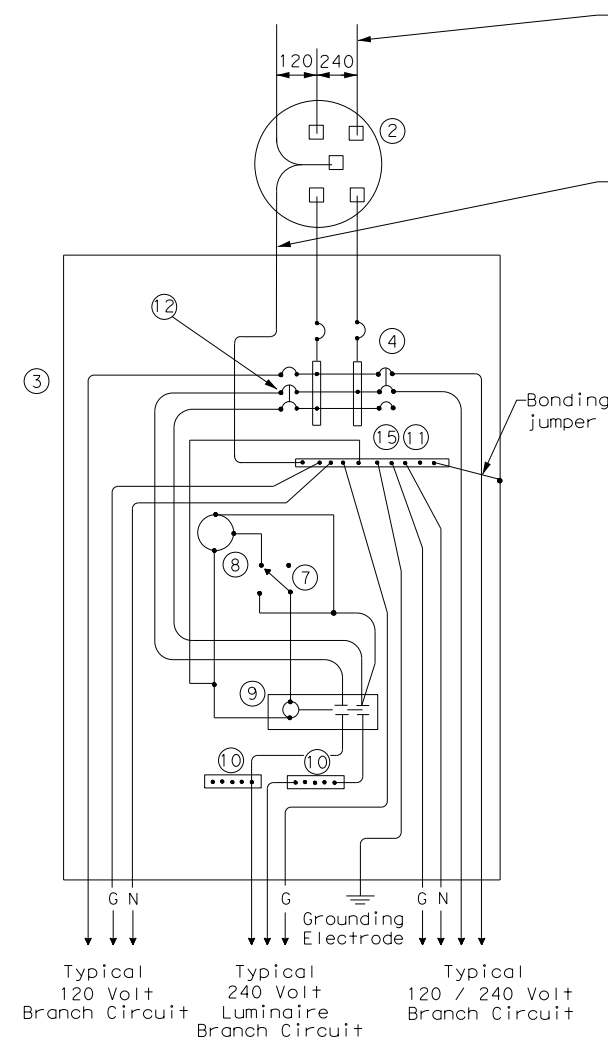
8 Two Photocell viewing windows not shown but required when photocell is listed as enclosure mounted. Windows not required when photocell is listed as pole top mounted.

Do not bond this bus to the enclosure

WIRING LEGEND	
—	Power Wiring
- - -	Control Wiring
—N—	Neutral Conductor
—G—	Equipment grounding conductor-always required



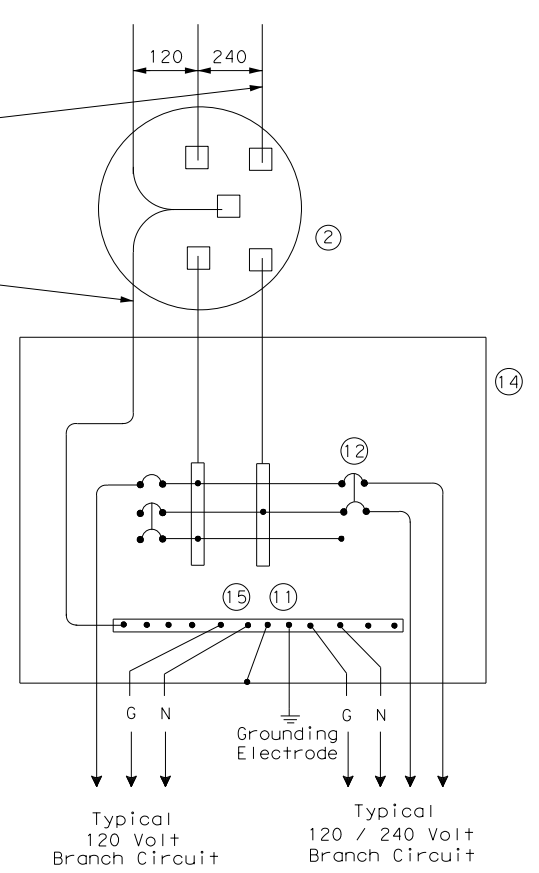
SCHEMATIC TYPE C
THREE WIRE



SCHEMATIC TYPE D - CUSTOM
120/240 VOLTS - THREE WIRE

Red insulation or color code 6" length of Line 1 or Line 2 conductors' insulation with red tape where conductor exits the weatherhead.

White insulation or color code 6" length of neutral conductors' insulation with white tape where conductor exits the weatherhead.



SCHEMATIC TYPE T
120/240 VOLTS - THREE WIRE
Galvanized steel-"Buy Off The Shelf" only. When required install photocell top of the pole or on luminaire only, no lighting contractor will be installed.

SCHEMATIC LEGEND	
1	Safety Switch (when required)
2	Meter (when required-verify with electric utility provider)
3	Service Assembly Enclosure
4	Main Disconnect Breaker (See Electrical Service Data)
5	Circuit Breaker, 15 Amp (Control Circuit)
6	Auxiliary Enclosure
7	Control Station ("H-O-A" Switch)
8	Photo Electric Control (enclosure-mounted shown)
9	Lighting Contactor
10	Power Distribution Terminal Blocks
11	Neutral Bus
12	Branch Circuit Breaker (See Electrical Service Data)
13	Separate Circuit Breaker Panelboard
14	Load Center
15	Ground Bus

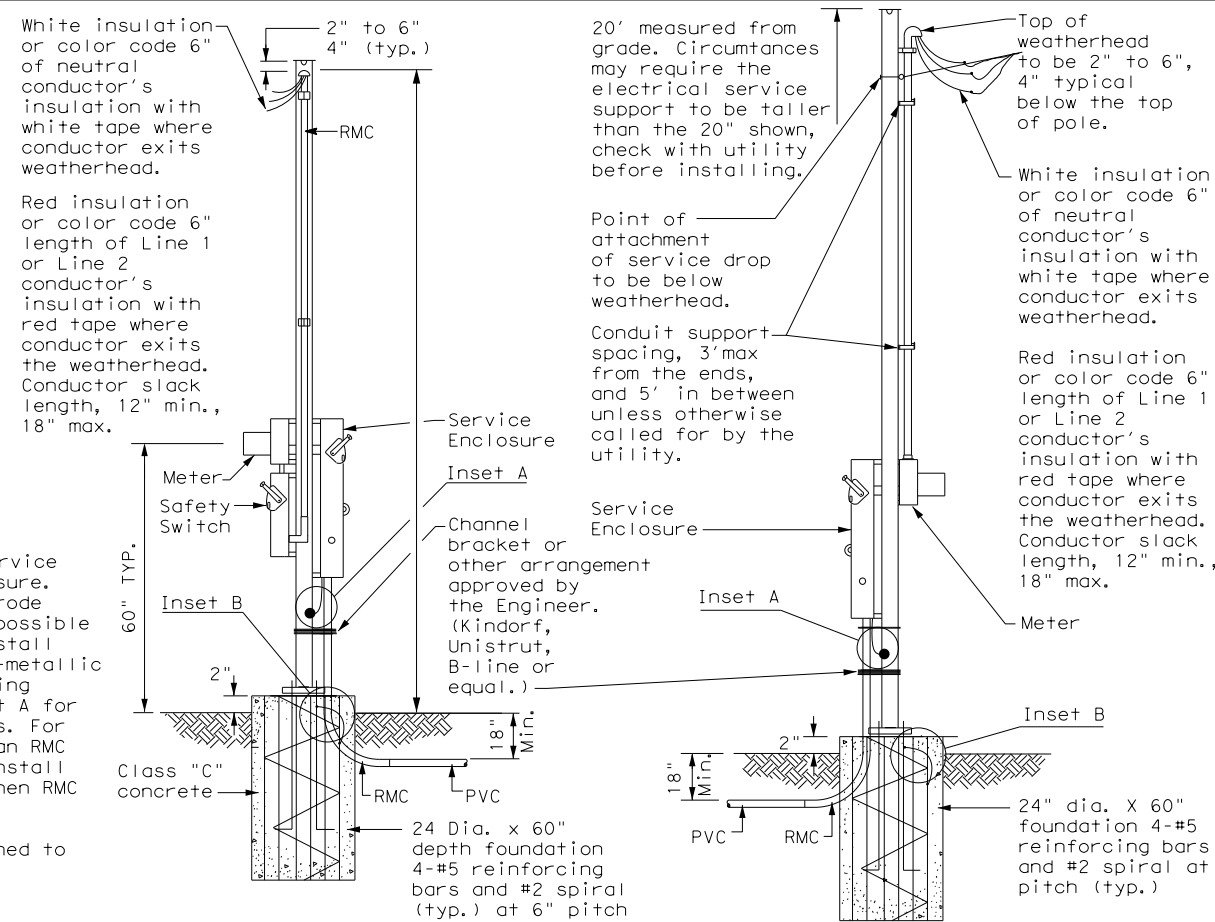
				Traffic Operations Division Standard	
ELECTRICAL DETAILS SERVICE ENCLOSURE AND NOTES ED(6) - 14					
FILE:	ed6-14.dgn	DN:	TxDOT	CK:	TxDOT
© TxDOT	October 2014	CON:	SECT	JOB	HIGHWAY
REVISIONS		0389	13	039	SH 146
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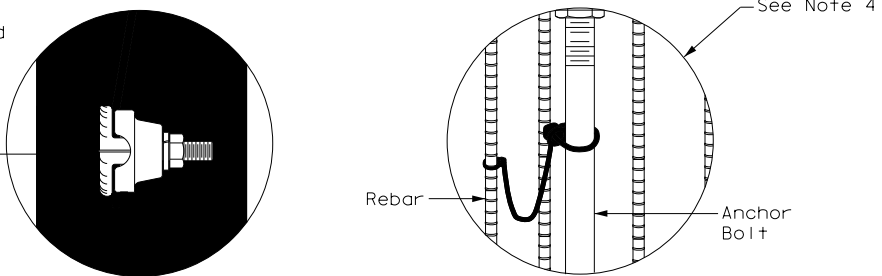
SUPPORT TYPE STEEL POLE (SP) AND STEEL FRAME (SF)

1. Provide steel pole and steel frame supports as per TxDOT Departmental Material Specification (DMS)11080 "Electrical Services." Mount all equipment and conduit on 12 gauge galvanized steel or stainless steel channel strut, 1 1/2 in. or 1 3/8 in. wide by 1 in. up to 3 3/4 in. deep Unistrut, Kindorf, B-line or equal. Bolt or weld all channel and hardware to vertical members as approved. Do not stack channel. File smooth and paint field cut ends of all channel with zinc-rich paint before installing.
2. Provide poles for overhead service with an eyebolt or similar fitting for attachment of the service drop to the pole in conformance with the electric utility provider's specifications.
3. Provide and install galvanized 3/4 in. x 18 in. x 4 in. (dia. x length x hook length) anchor bolts for underground service supports. Provide and install galvanized 3/4 in. x 56 in. x 4 in. anchor bolts for overhead service supports. Ensure anchor bolts have 3 in of thread, with 3 1/4 in. to 3 1/2 in. of the exposed anchor bolt projecting above finished foundation. Provide and install leveling nuts for all anchor bolts.
4. Bond one of the anchor bolts to the rebar cage with 6 AWG bare stranded copper conductor. Use listed mechanical connectors rated for embedment in concrete. See Inset B.
5. Furnish and install rigid metallic ells in all steel pole and steel frame foundations for all conduits entering the service from underground.
6. Use class C concrete for foundations. Ensure reinforcing steel is Grade 60 with 3" of unobstructed concrete cover.
7. Drill and tap steel poles and frames for 1/2 in. X 13 UNC tank ground fitting. For steel pole service supports, provide and install tank ground fitting 4 in. to 6 in. below electrical service enclosure. Provide properly sized hole through the bottom of the enclosure for the service grounding electrode conductor. Ensure electrical service grounding electrode conductor is as short and straight as possible from the enclosure to the tank ground fitting. For steel frame service supports, provide and install tank ground fitting on steel frame post. Install service grounding electrode conductor in a non-metallic conduit or tubing from the enclosure to the steel frame post. Connect electrical service grounding electrode conductor to the tank ground fitting. See steel frame and steel pole details and Inset A for more information. Size service entrance conduit and branch circuit conduit as shown in the plans. For underground conduit runs from the electrical service, extend RMC from the service enclosure to an RMC elbow, and then connect the schedule type and size of conduit shown in the plans. Provide and install grounding bushings where RMC terminates in the enclosure. Grounding bushings are not required when RMC is fitted into a sealing hub or threaded boss.
8. If Steel pole or frame is painted, bond each separate painted piece with a bonding jumper attached to a tapped hole.
9. Provide 1/4" - 20 machine screws for bonding. Do not use sheet metal screws. Remove all non-conductive material at contact points. Terminate bonding jumpers with listed devices. Install minimum size 6 AWG stranded copper bonding jumpers. Make up all threaded bonding connections wrench tight.
10. Avoid contact of the service drop and service entrance conductors with the metal pole to prevent abrasion of the insulated conductors.
11. Shop drawings are not required for service support structure unless specifically stated elsewhere or directed by the Engineer.

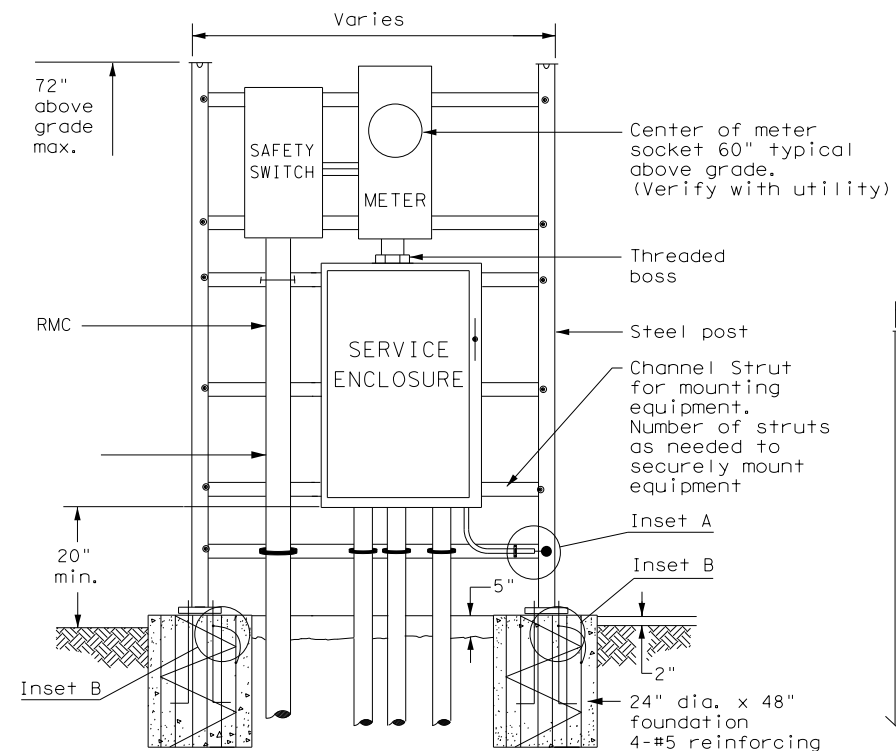


WITH SAFETY SWITCH WITHOUT SAFETY SWITCH
 SERVICE SUPPORT TYPE SP (O) - OVERHEAD SERVICE

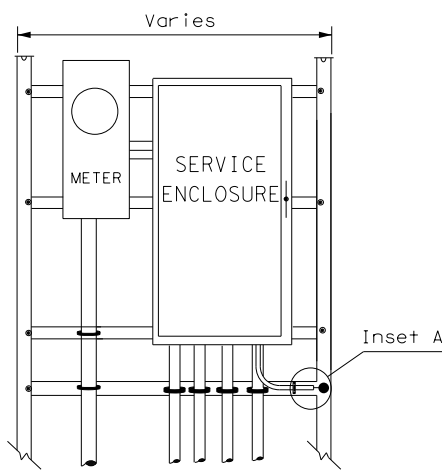
Drill, top, and thread 1/2" X 13 UNC. Install tank ground fitting, connect electrical service grounding electrode conductor. See Note 7.



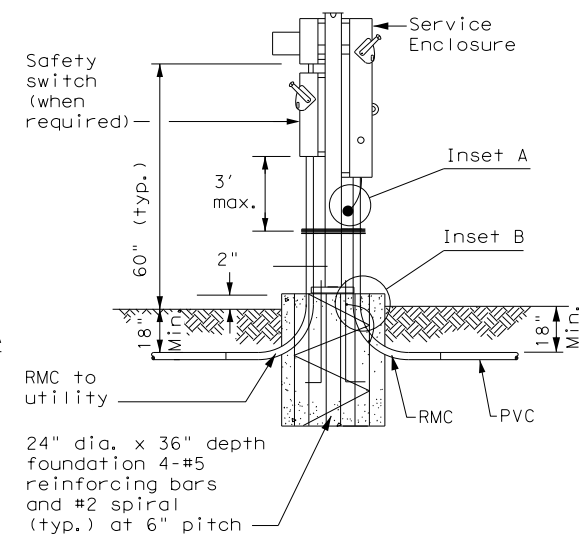
FRONT VIEW INSET A INSET B



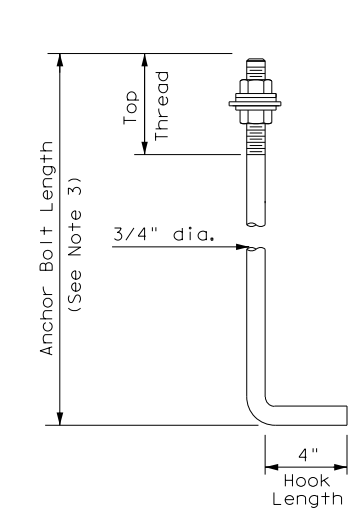
WITH SAFETY SWITCH FRONT VIEW
 SERVICE SUPPORT TYPE SF (U) - UNDERGROUND SERVICE



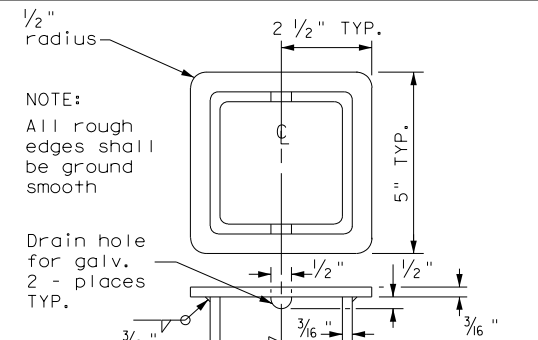
WITHOUT SAFETY SWITCH



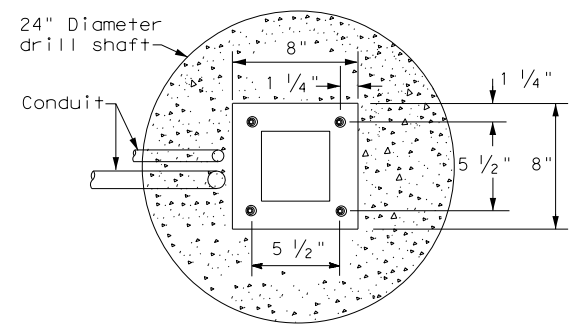
WITH SAFETY SWITCH
 SERVICE SUPPORT TYPE SP (U) - UNDERGROUND SERVICE



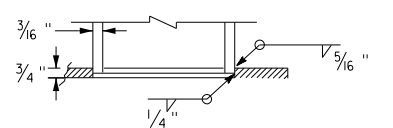
HOOKED ANCHOR DETAIL



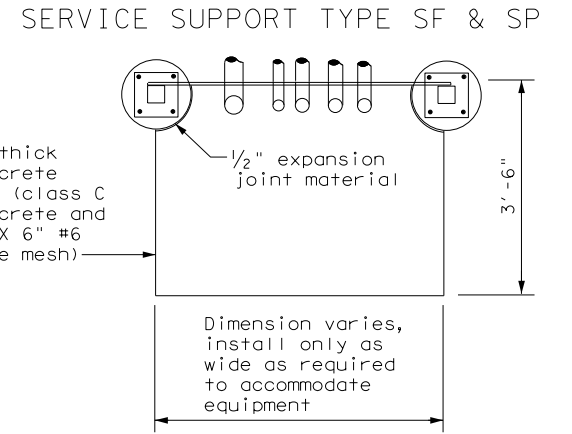
POLE TOP PLATE



BASE PLATE DETAIL



BOTTOM OF POLE



TOP VIEW
 SERVICE SUPPORT TY SF (O) & SF (U)

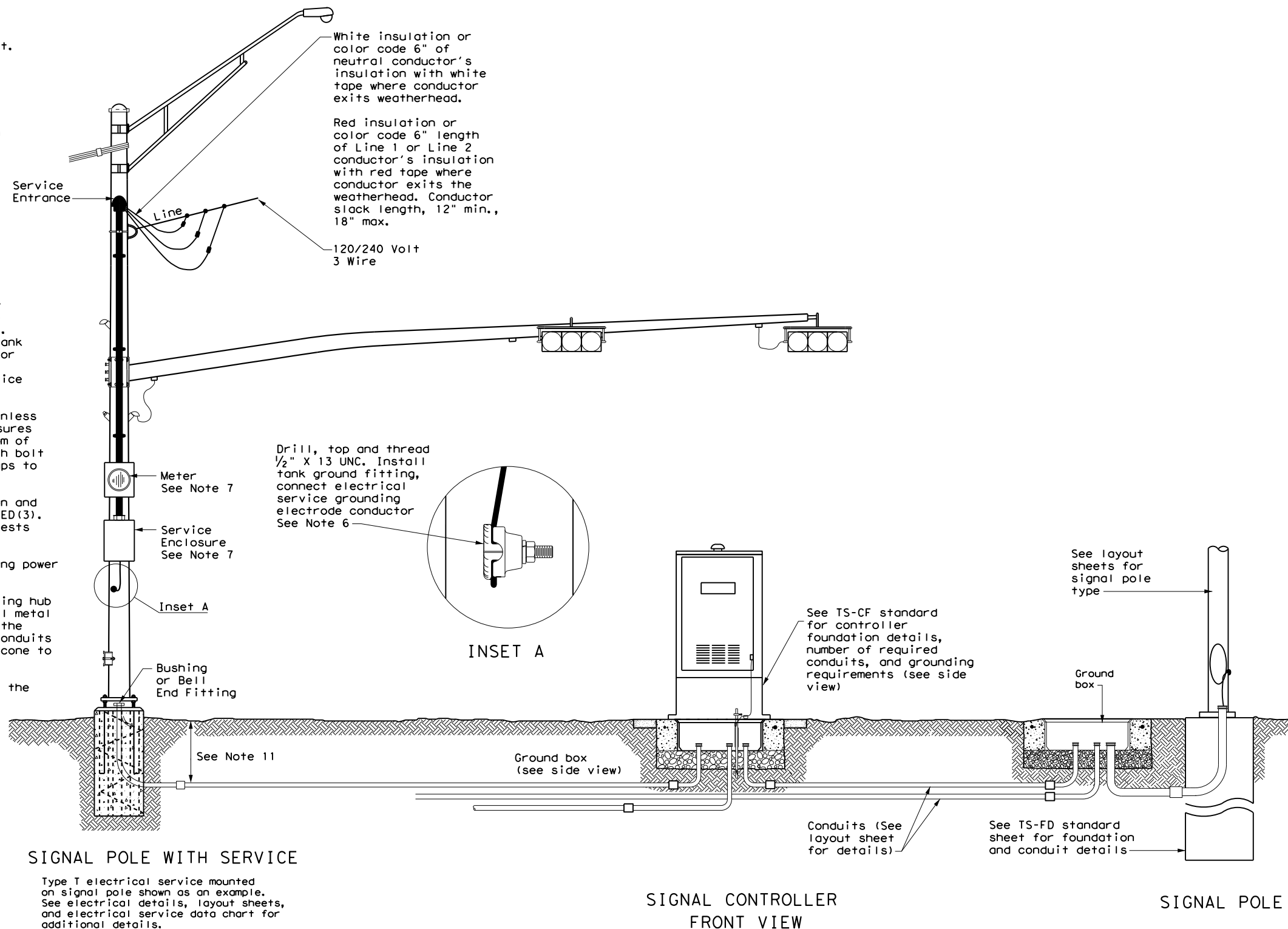


**ELECTRICAL DETAILS
 SERVICE SUPPORT
 TYPES SF & SP
 ED(7)-14**

FILE: ed7-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	0389	13	039	SH 146
	DIST	COUNTY	SHEET NO.	
	HOU	HARRIS	293	

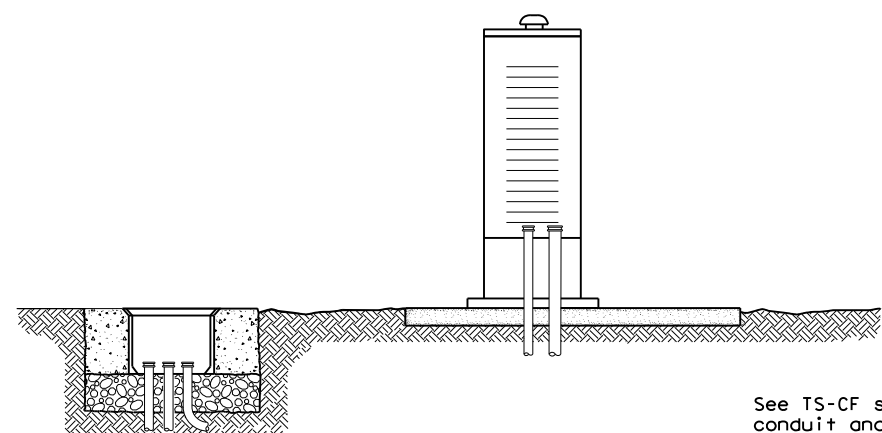
TRAFFIC SIGNAL NOTES

1. Do not pass luminaire conductors through the signal controller cabinet.
2. Include an equipment grounding conductor in all conduits throughout the electrical system. Bond all exposed metal parts to the grounding conductor.
3. Provide roadway luminaires, when required, in accordance with the material and construction sections of Item 610, "Roadway Illumination Assemblies," except for performance testing of luminaires. Test installed roadway luminaires for proper operation as a part of the associated traffic signal system test.
4. If internally illuminated street name signs are approved for use, ground the fixture to the pole with a 12 AWG green XHHW conductor.
5. Bond anchor bolts to rebar cage in two locations using #3 bars or 6 AWG stranded copper conductors. Use listed mechanical connectors rated for embedment in concrete. See TXDOT standard TS-FD for further details.
6. Drill and tap signal poles for 1/2 in. X 13 UNC tank ground fitting. Provide and install tank ground fitting 4 in. to 6 in. directly below electrical service enclosure. Provide properly sized hole through the bottom of the enclosure for the service grounding electrode conductor. Connect the electrical service grounding electrode conductor to the tank ground fitting. Ensure electrical service grounding electrode conductor is as short and straight as possible from the enclosure to the tank ground fitting. See Inset A detail for further information. Size service entrance conduit and branch circuit conduit as shown in the plans.
7. Mount electrical service enclosure and meter to signal pole with stainless steel bands. Ensure bands are a minimum width of 3/4 in. Secure enclosures to bands using two-bolt brackets. Install brackets near top and bottom of each enclosure. Install properly sized stainless steel washers on each bolt in the enclosure. Band or drill and tap properly sized stand-off straps to signal pole for attaching conduit.
8. Conduct pull tests and insulation resistance tests on all illumination and power conductors as required in Item 620 "Electrical Conductors" and ED(3). To prevent electronics damage, do not conduct insulation resistance tests on traffic signal cables after termination.
9. Lock all enclosures and bolt down all ground box covers before applying power to the signal installation.
10. Terminate conduits entering the top of enclosures with a conduit-sealing hub or threaded boss such as meter hub. Install a grounding bushing on all metal conduits not connected to conduit-sealing hub or threaded boss. Bond the grounding bushing to the ground bus with a bonding jumper. Seal all conduits entering enclosures with duct seal or expanding foam. Do not use silicone to seal conduit ends.
11. For all conduits, ensure the burial depth is a minimum of 18". Ensure the minimum burial depth for conduit placed under a roadway is 24".



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SIGNAL CONTROLLER SIDE VIEW

See TS-CF standard for conduit and grounding requirements. See layout sheets for ground box locations and any additional conduits that are required.

**ELECTRICAL DETAILS
 TYPICAL TRAFFIC SIGNAL
 SYSTEM DETAILS**
ED(8) - 14

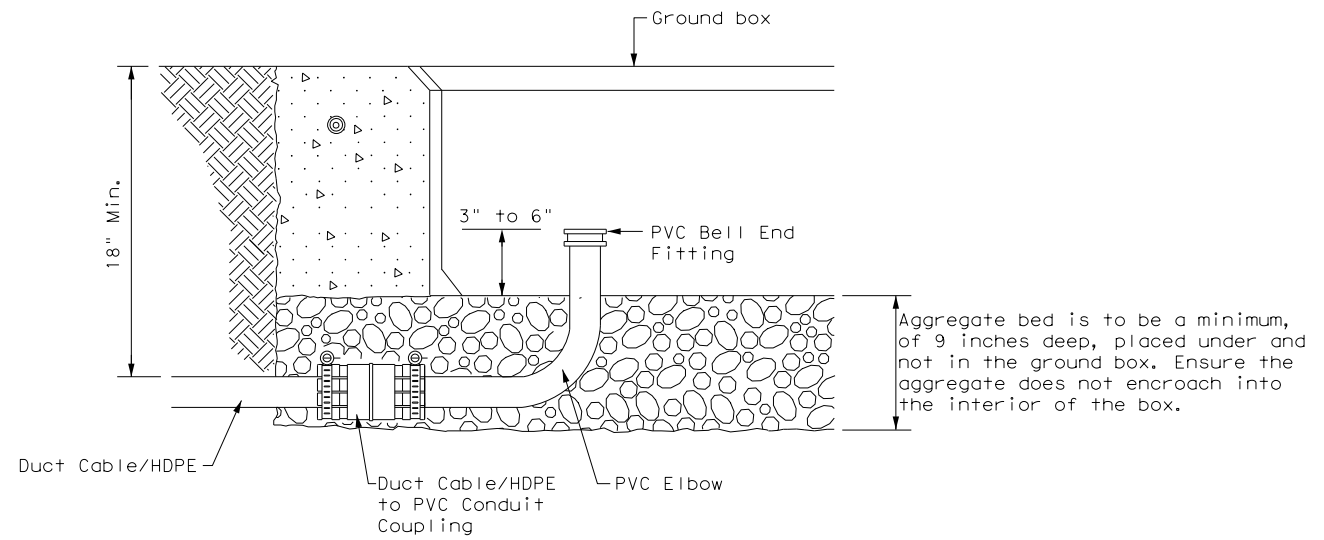
FILE: ed8-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	0389	13	039	SH 146
	DIST	COUNTY	SHEET NO.	
	HOU	HARRIS	294	

DUCT CABLE & HDPE CONDUIT NOTES

1. Provide duct cable in accordance with Departmental Material Specification (DMS) 11060 "Duct Cable" and Item 622 "Duct Cable." Provide duct cable as listed on the Material Producer List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies" Item 622.
2. Provide High-Density Polyethylene (HDPE) conduit in accordance with DMS 11060 and Item 618, "Conduit." Provide HDPE as listed on the MPL on the Department web site under "Roadway Illumination and Electrical Supplies," Item 618.
3. Supply duct cable with a minimum 2 in. diameter, unless otherwise shown in the plans. Provide duct cable and HDPE conduit as shown by descriptive code or on the plans. Bend duct cable and HDPE conduit as recommended by the manufacturer, with a minimum bending radius of 26 in. for 2 in. duct. Follow manufacturers' recommendations when handling duct cable and HDPE conduit reels and during installation of duct cable and HDPE conduit.
4. Do not splice conductors within duct cable or HDPE conduit. Couple duct cable and HDPE entering a ground box or foundation to a PVC elbow. When galvanized steel RMC elbows are called for in the plans and any portion of the RMC elbow is buried less than 18" from possible contact, ground the RMC elbow.
5. Furnish and install duct cable with factory installed conductors, sized as shown in the plans and as required by the National Electrical Code (NEC). The NEC contains specific requirements for duct cable in Article, "Nonmetallic Underground Conduit with Conductors: Type NUCC."
6. When conduit casing is called for in the plans, extend duct cable or HDPE conduit through the conduit casing in one continuous length without connection to the casing.
7. Seal the ends of duct cable or HDPE conduit with duct seal, expandable foam, or other approved method after completing the pull tests required by Item 622.
8. Provide minimum cover of 24 in. under roadways, 18 in. in other locations, or as shown on the plans.
9. Furnish and install listed fittings to couple duct cable or HDPE conduit to other types of conduit. Duct cable and HDPE conduit may be field-threaded and spliced with PVC or RMC threaded couplings; connected with listed tie-wrap fittings; connected using listed coupling made of HDPE with stainless steel external banding clamps and locking rings; connected with approved electrofusion conduit couplings; or connected using an approved chemical fusion method using an epoxy or adhesive specifically designed for HDPE couplings and connectors all installed in accordance with their manufacturer's instructions. Do not use PVC glue on HDPE. Do not use water pipe fittings, or connect conduit with heat shrink tubing.

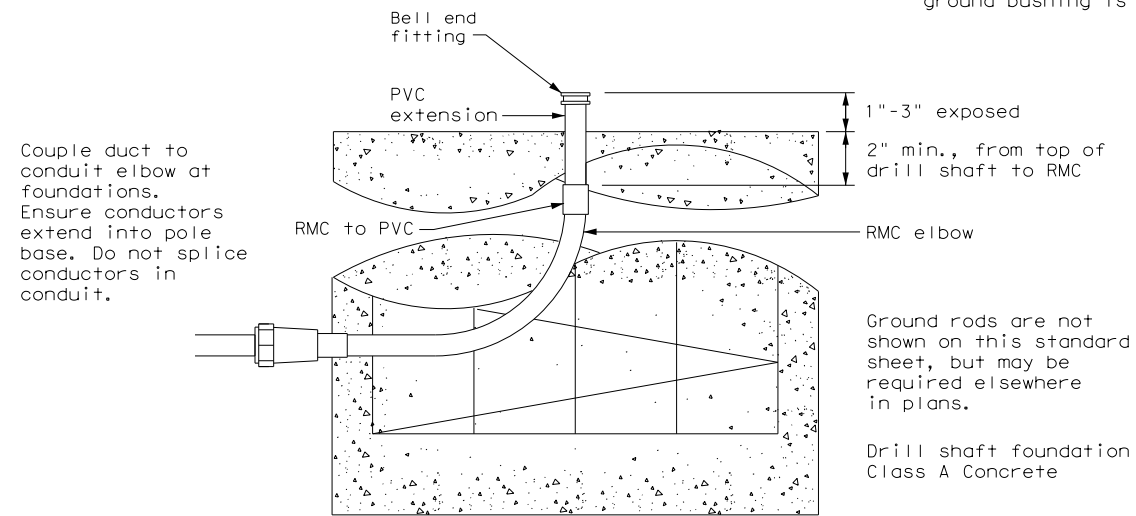
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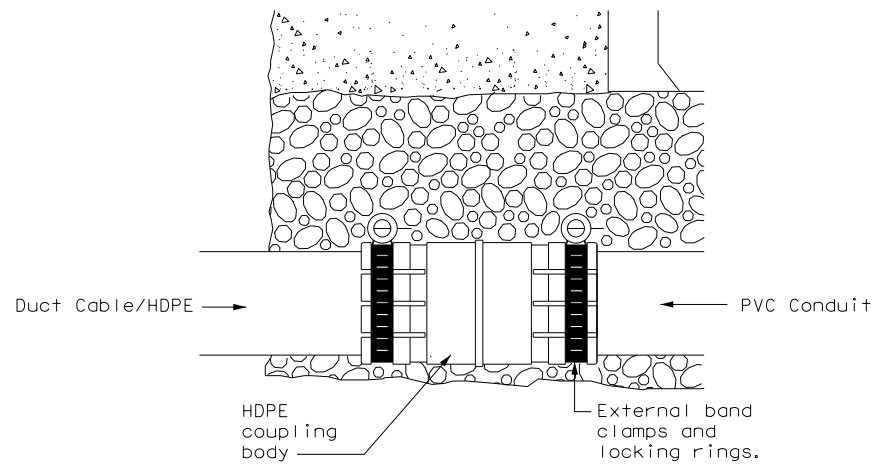


DUCT CABLE/HDPE AT GROUND BOX

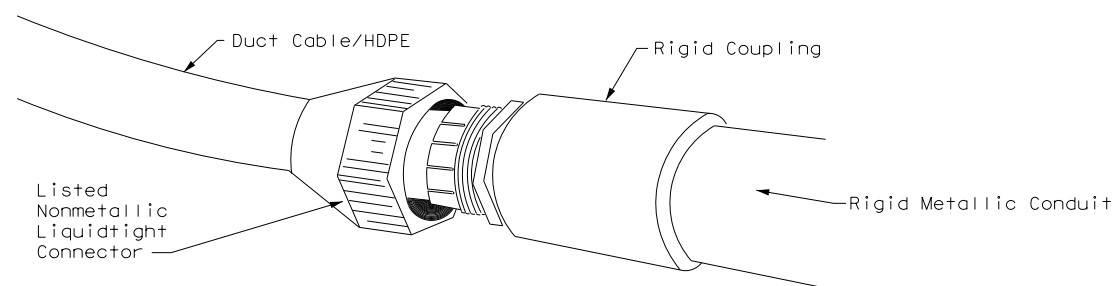
When the upper end of an RMC EII does not enter the ground box, it may be extended with a SCH-40 PVC conduit nipple and bell end, provided there is a minimum of 18" of cover over all parts of the elbow. If not, a rigid extension and ground bushing is required.



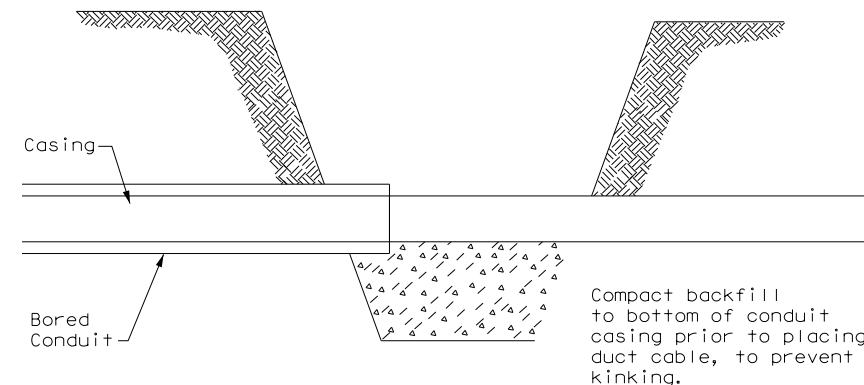
DUCT CABLE / HDPE AT FOUNDATION



DUCT CABLE/HDPE TO PVC



DUCT CABLE/HDPE TO RMC



BORE PIT DETAIL

		Traffic Operations Division Standard	
<h2>ELECTRICAL DETAILS</h2> <h3>DUCT CABLE / HDPE CONDUIT</h3> <h4>ED(11)-14</h4>			
FILE: ed11-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
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REVISIONS		HIGHWAY: SH 146	
DIST: HOU	COUNTY: HARRIS	SHEET NO.: 295	

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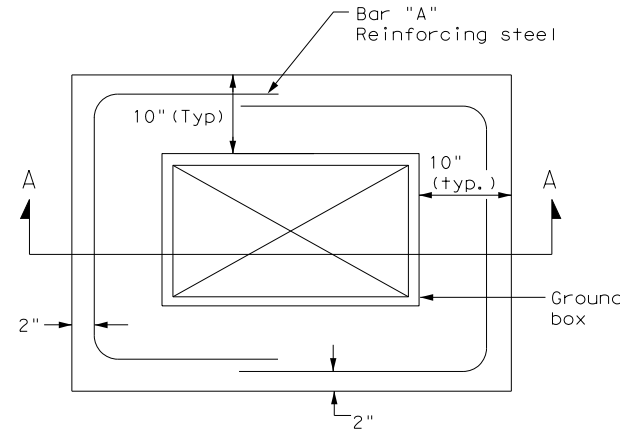
BATTERY BOX GROUND BOXES NOTES

A. MATERIALS

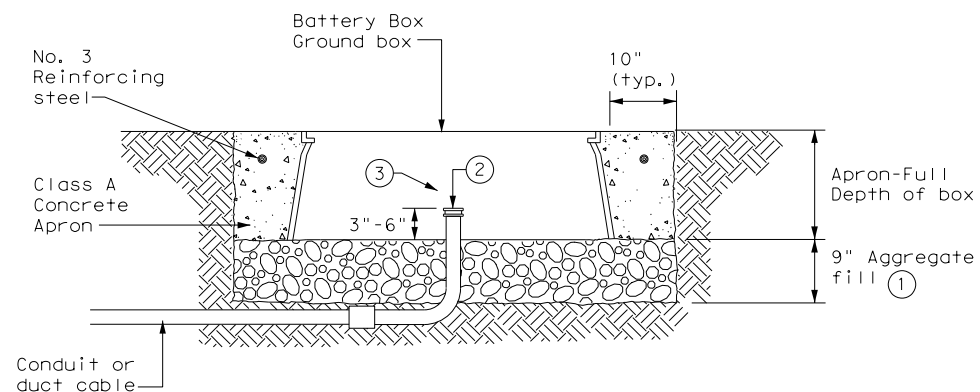
1. Provide polymer concrete or fiberglass reinforced plastic (FRP) battery box ground box and cover in accordance with Departmental Material Specification (DMS) 11071 "Battery Box Ground Boxes." Battery box will accommodate up to 4 batteries, each measuring 8 in. x 13.5 in. x 10 in. (W x L x D). Label battery box ground box cover in accordance with DMS 11071.
2. Supply a marine grade batteries with covers. Secure the marine grade batteries with covers to the stainless steel rack in the bottom of the ground box with tie down straps.

B. CONSTRUCTION METHODS

1. Ensure conduit entry will not interfere with placement of the batteries in the battery box ground box.
2. Remove all gravel and dirt from conduit. Cap all conduits prior to placing aggregate and setting battery box ground box. Provide Grade 3 or 4 coarse aggregate as shown on Table 2 of Item 302 "Aggregates for Surface Treatments." Ensure the aggregate bed is in place and is a minimum of 9 in. deep prior to setting the box. Install battery box ground box on top of aggregate.
3. Cast battery box aprons in place. Reinforcing steel may be field bent. Ensure the depth of concrete for the apron extends from finished grade to the top of the aggregate bed under the box. Battery box ground box aprons, including concrete and reinforcing steel, are subsidiary to battery box ground boxes when called for by descriptive code.
4. Bolt covers down when not working in battery box ground boxes. Keep bolt holes in the box clear of dirt.



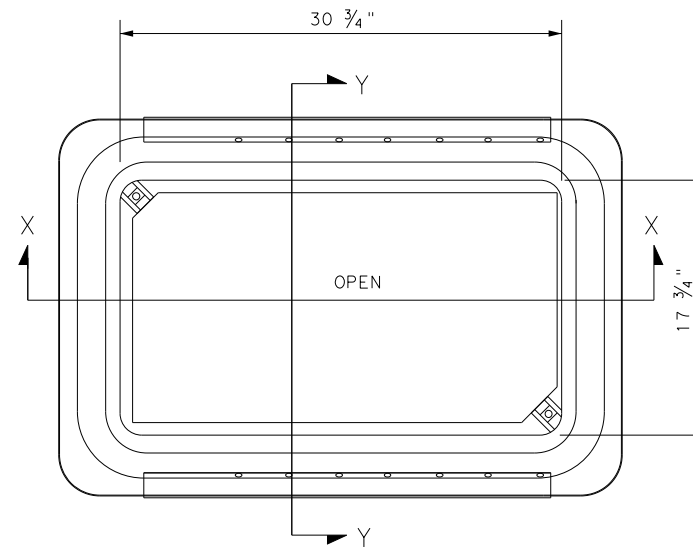
PLAN VIEW



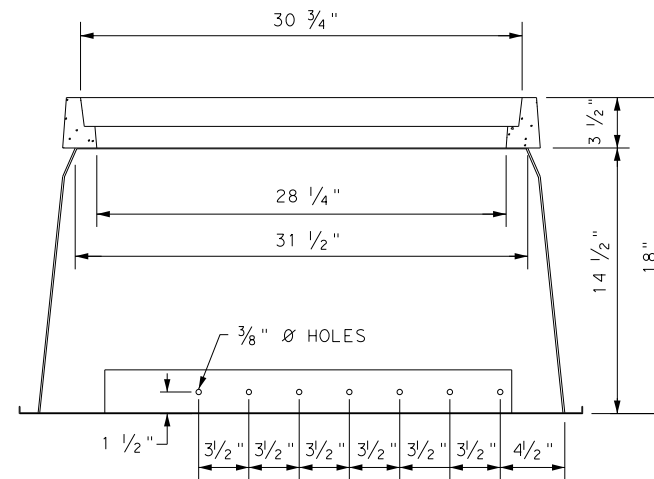
SECTION A - A

APRON FOR BATTERY BOX GROUND BOXES

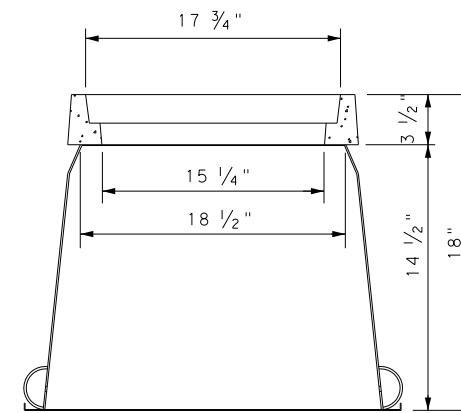
- ① Place aggregate under the box and not in the box. Aggregate should not encroach on the interior volume of the box.
- ② Install bushing or bell end fitting on the upper end of all ellis.
- ③ Install all conduits in a neat and workmanlike manner.



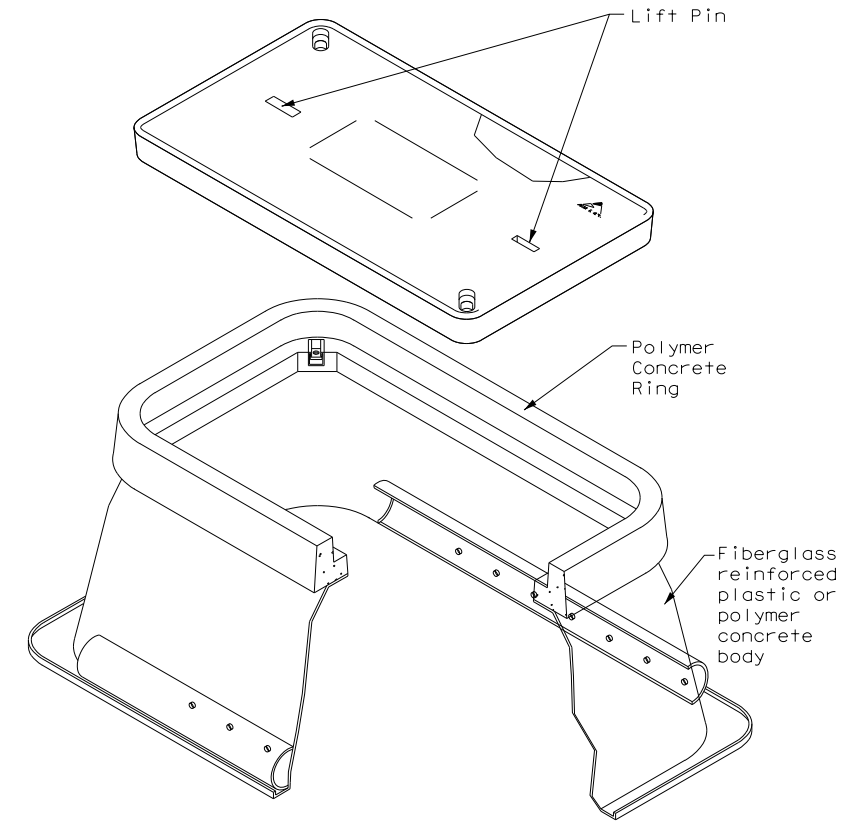
BATTERY BOX TOP VIEW



SECTION X-X



SECTION Y-Y



		Traffic Operations Division Standard	
ELECTRICAL DETAILS BATTERY BOX GROUND BOXES			
ED(12)-14			
FILE: ed12-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
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ROADWAY ILLUMINATION ASSEMBLY NOTES

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1. Details apply to roadway lighting installations bid or referenced under Item 610, "Roadway Illumination Assemblies." Provide, furnish, and install all other materials not shown on the plans which may be necessary for complete and proper construction. Where manufacturers provide warranties or guarantees as a customary trade practice, furnish to the State such warranties or guarantees.
2. The locations of poles and fixtures may be shifted by the Engineer to accommodate local conditions. Install or remove poles and luminaires located near overhead electrical lines using established industry and utility safety practices and in accordance with laws governing such work. Consult with the appropriate utility company prior to beginning such work.
3. Provide new and unused materials. Ensure that all materials and installations comply with the applicable articles of the National Electrical Code (NEC), TxDOT standards and specifications, National Electrical Manufacturers Association (NEMA), and are listed by Underwriters Laboratories (UL) or a Nationally Recognized Testing Lab (NRTL). NRTLs such as Canadian Standard Association, Intertek Testing Services NA Inc., or FM Approvals LLC can be considered equivalent to UL. Faulty fabrication or poor workmanship in any material, equipment, or installation is justification for rejection.
4. Provide Roadway Illumination Light Fixtures as per TxDOT Departmental Material Specification (DMS) 11010, Item 610, and as shown on the Material Producers List (MPL) for Roadway Illumination and Electrical Supplies.
5. Fabricate steel roadway illumination poles in accordance with Roadway Illumination Poles (RIP) standards and Item 610. Poles fabricated according to RIP standards do not require shop drawing submittals.
 - a. Alternate designs to RIP standards or the use of aluminum to fabricate poles will require the submission of shop drawings electronically. For instructions on submitting shop drawings electronically see "Guide to Electronic Shop Drawing Submittal" on the TxDOT web site.
 - b. Limitations on use of the RIP standard: The RIP standard details were developed for installations in locations where the 3-second gust basic maximum wind speed is 110 mph, and where the elevation of the base of the pole is less than (i.e. not more than) 25' above the elevation of the surrounding terrain, in accordance with the "AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals," 6th Edition (2013) of the AASHTO Design Specifications. For poles to be installed in regions where the maximum basic wind speed exceeds 110 mph or to be mounted more than 25' above the surrounding terrain, provide poles meeting the following requirements:
 - i. Submittals. Following the electronic shop drawing submittal process (see Guide to Electronic Shop Drawing Submittal on the TxDOT web site), submit to the Engineer for approval fabrication drawings and calculations for the poles, sealed by a Texas licensed professional engineer (P.E.).
 - ii. Luminaire Structural Support Requirements. Provide light poles, arms, and anchor bolt assemblies with a 25 year design life to safely resist dead loads, ice loads and the required basic wind speeds at the location of installation in accordance with the 6th edition (2013) of the AASHTO Design Specifications. For transformer base poles, include transformer base and connecting hardware in calculations and shop drawing submittals. Structurally test all transformer bases to resist the theoretical plastic moment capacity of the pole. Submit certification of the plastic moment load test and FHWA breakaway requirement test of the model of base being furnished with the shop drawings. Show breakaway base model number, manufacturer's name, and logo on shop drawings. Include on manufacturer's shop drawings the ASTM designations for all materials to be used.
6. For both transformer and shoe-base type illumination poles, provide and install double-pole breakaway fuse holders as specified by DMS-11040. Breakaway fuse holders are listed on the MPL for Roadway Illumination and Electrical Supplies under Items 610 & 620. Provide 10 amp time delay fuses for breakaway connectors in light poles, or inside the light fixture for underpass luminaires. In each pole, connect luminaires to the breakaway connector with continuous stranded 12 AWG copper conductors as listed on the MPL. Bond all equipment grounding conductors together and to the ground lug in the transformer base or hand hole.
7. Tighten anchor bolts for shoe base, concrete traffic barrier base, and bridge mount roadway illumination poles, in accordance with Item 449.
8. Install T-Base with following procedure:
 - a. Anchor Bolt Tightening.
 - i. Coat the threads of the anchor bolts with electrically conductive lubricant.
 - ii. Place the T-base over the anchor bolts. Foundation must be level and flat. The maximum permissible gap under any one corner of the T-base is 1/8" before nuts are tightened.
 - iii. Coat the bearing surfaces of the nuts and washers with electrically conductive lubricant. Install (1) 1/2" hold down washer, (1) lock washer, and (1) nut on each anchor bolt. Turn the nuts onto the bolts so that each is hand-tight against the washer.
 - iv. Using a torque wrench, tighten each nut to 150 ft-lb. Uniform contact is required between the foundation and the T-base in the corner regions of the T-base, and all corner gaps must be closed after applying torque. If a gap still exists after torquing to 150 ft-lbs, continue torquing each bolt incrementally until gap is closed or maximum allowable torque of 250 ft. pound is reached, whichever comes first. If 250 ft-lbs is not enough to close the gap the foundation must be leveled. Gaps along the straight sides of the T-bases and the foundation are permissible. Ensure that no high point of contact occurs between the straight sides of the T-base and the foundation.
 - v. Check top of T-base for level. If not level then foundation must be leveled.
 - b. Top Bolt Procedure
 - i. Erect pole over T-base with crane. Coat bolts, nuts, washers, and lock washers with electrically conductive lubricant.

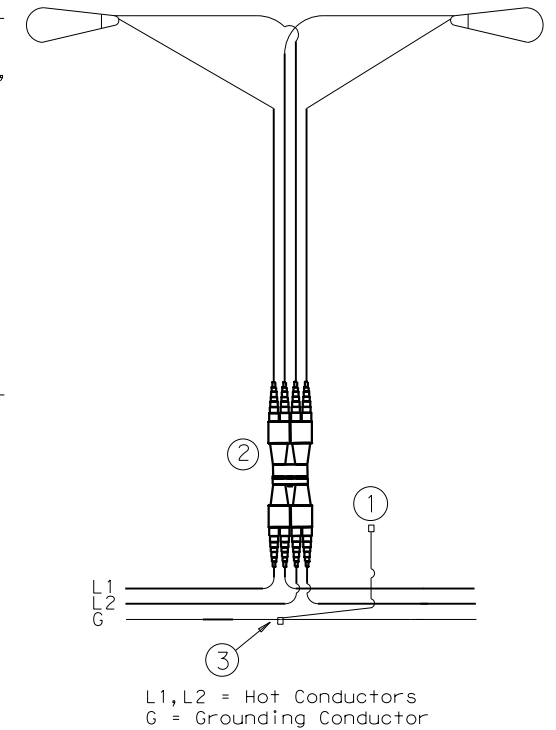
- ii. Install bolts and 1/2" connecting washers from the inside of the T-base, thread up through the pole base. Install flat washers, lock washers and nuts snug tight according to Item 447, "Structural Bolting."
- iii. Tighten each nut to 150 ft-lb. using a torque wrench.
- c. Level and Plumb
 - i. Ensure pole is plumb and mast arm is perpendicular to the roadway according to plans to within 5 degrees.
9. Construct luminaire pole foundations in accordance with Item 416, "Drilled Shaft Foundations," and TxDOT standard sheet RID(2).
10. Provide and install underpass luminaires in accordance with Item 610, DMS-11010, and TxDOT standard sheet RID(3). Typical luminaire size for underpass luminaires is 150W HPS or 150W EQ LED.
11. Mount luminaires on arms level as shown by the luminaire level indicator.
12. Orient luminaires perpendicular to the roadway intended to be lit unless otherwise shown on the plans.

Wiring Diagram Notes:

- ① Use 1/2 in.-13 UNC threaded, copper or tin-plated copper, pole bonding connector, sized appropriately for conductors, bonded to T-base, or use ground lug in handhole as available.
- ② Use pre-qualified two-pole breakaway connectors for all luminaire pole installations. For luminaires fed by a circuit with a neutral conductor, use double pole breakaway connectors with the neutral side unfused and marked white.
- ③ Split Bolt or other connector.

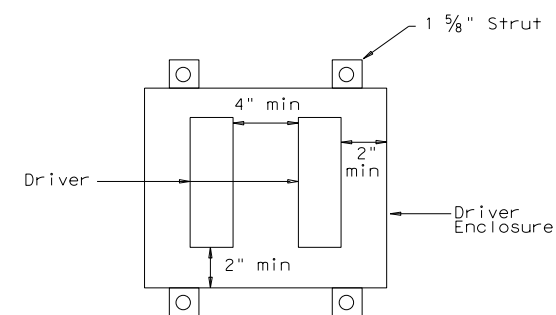
Decorative LED Lighting Notes:

1. LED Drivers in Remote Outdoor enclosures (for drivers that do not include an enclosure as part of a factory assembly):
 - a. Provide NEMA 3R outdoor enclosure or as approved.
 - b. Install enclosure at least 12" above ground or other horizontal surface. Mount vertically or on ceiling, and avoid direct sun where possible.
 - c. Install drivers with at least 2 inches of space from enclosure walls.
 - d. For multiple drivers in an enclosure, provide at least 4 inches side to side and 1 inch end to end from other drivers or electronic equipment
 - e. For drivers mounted on back wall of enclosure, mount enclosure on 1 5/8" strut or other standoff to dissipate heat, or mount driver to side of the enclosure or to the metal cover.
 - f. Provide remote drivers with a maximum of 100 watts
 - g. Provide drivers with documentation of 100,000 hr lifetime at Tcase of 65C or higher.



TYPICAL WIRING DIAGRAM

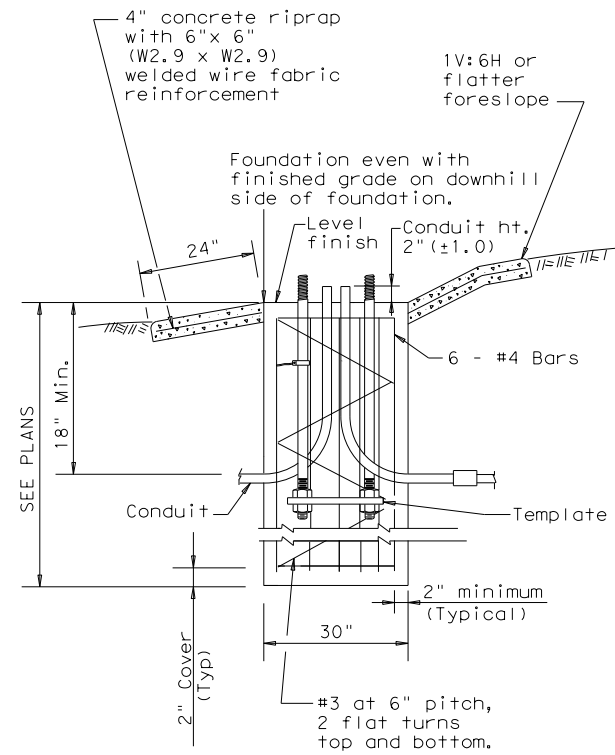
LUMINAIRES SERVED AT 480V ON 240/480 VOLT SERVICE OR LUMINAIRES SERVED AT 240V FOR 120/240 VOLT SERVICE.



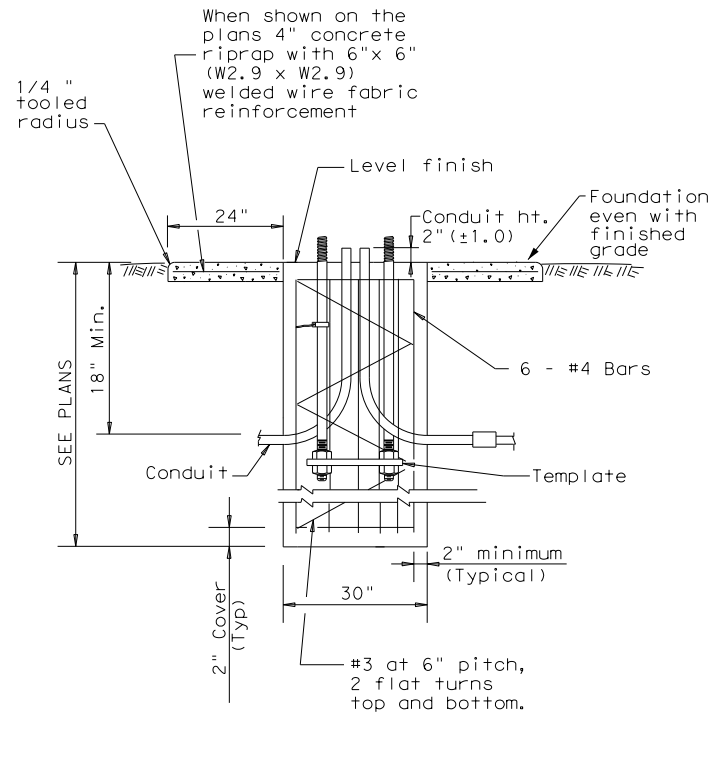
Driver Spacing In Remote Enclosure

Texas Department of Transportation				Traffic Safety Division Standard	
<h2 style="margin: 0;">ROADWAY ILLUMINATION DETAILS</h2> <h3 style="margin: 0;">RID(1)-20</h3>					
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© TxDOT	January 2007	CONT	SECT	JOB	HIGHWAY
REVISIONS		0389	13	039	SH 146
7-17	12-20	DIST	COUNTY	SHEET NO.	
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SECTION A-A
SHOWING SLOPED GRADE



SECTION A-A
SHOWING CONSTANT GRADE

TABLE 1

ANCHOR BOLTS

POLE MOUNTING HEIGHT	BOLT CIRCLE		ANCHOR BOLT SIZE
	Shoe Base	T-Base	
<40 ft.	13 in.	14 in.	1 in. x 30 in.
40-50 ft.	15 in.	17 1/4 in.	1 1/4 in. x 30 in.

TABLE 2

RECOMMENDED FOUNDATION LENGTHS (See note 1)

MOUNTING HEIGHT	TEXAS CONE PENETROMETER N Blows/ft		
	10	15	40
≤20 ft.	6'	6'	6'
>20 ft. to 30 ft.	8'	6'	6'
>30 ft. to 40 ft.	8'	8'	6'
>40 ft. to 50 ft.	10'	8'	6'

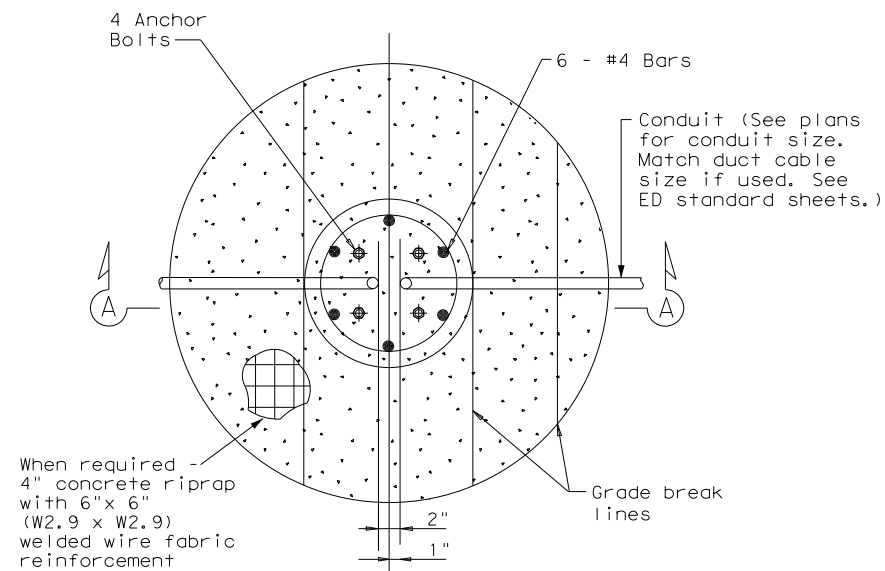
TABLE 3

PAY QUANTITY OF RIPRAP PER FOUNDATION (Install only when shown on the plans)

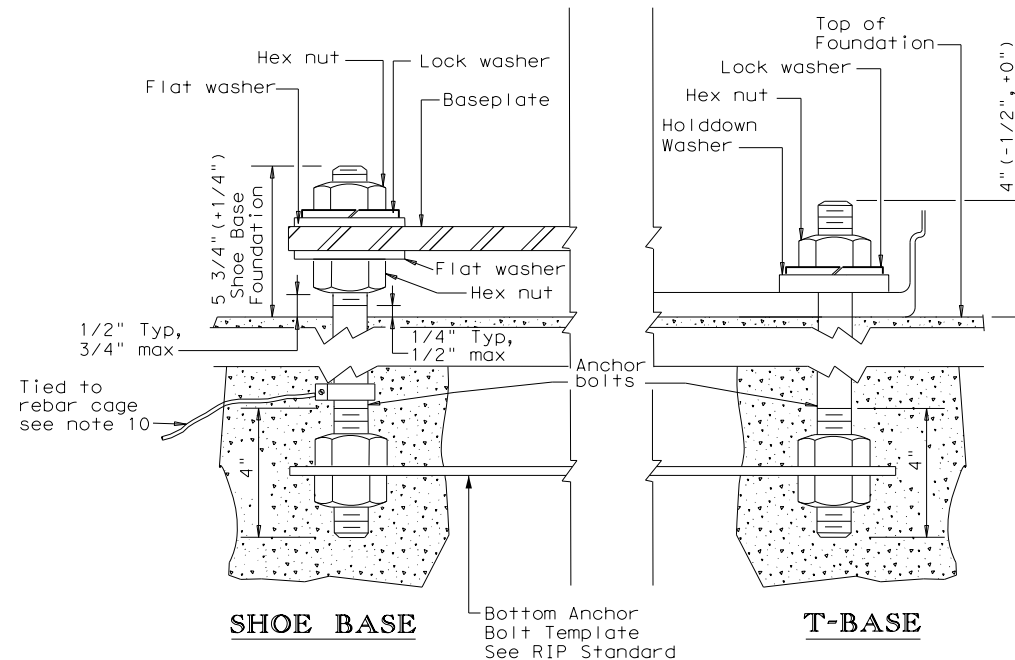
Foundation Diameter	RIPRAP DIAMETER	RIPRAP (CONC) (CL B)
30 in.	78 in.	0.35 CY

GENERAL NOTES:

- "Recommended Foundation Lengths" table is for information purposes only. Foundation lengths shall be as shown on the plans, or as directed by the Engineer. Foundations will be paid for under Item 416, "Drilled Shaft Foundations," unless otherwise shown on the plans.
- Erect roadway illumination assembly poles plumb and true. Form and level the top 6" of the foundation so the pole will be plumb. Use leveling nuts to plumb shoe base poles. Do not use shims or leveling nuts under transformer bases. Do not grout between baseplate and the foundation.
- Ensure Class 2A and 2B fit for anchor bolts and nuts. Tap and chase nuts after galvanizing. Anchor bolt body with rolled threads need not be full size.
- Use appropriate class of concrete as specified in Items 416 and 432. Concrete for riprap may be upgraded to Class C at no extra cost to the Department.
- Place riprap around the foundation when called for elsewhere in the plans. Riprap will be paid for under Item 432.
- Locate breakaway roadway illumination assemblies as shown in the placement table, unless otherwise dimensioned on the plans. Protect non-breakaway illumination assemblies from vehicular impact (i.e. 2.5 ft. behind guard rail or mounted on traffic barrier), or located outside the clear zone, except that 2.5 ft. from curb face is minimum desired for light poles on city streets, 45 mph or less. See Roadway Design Manual for further information.
- Use 4 hold down and 4 connecting washers on transformer base poles as recommended by the manufacturer and supplied with base.
- Install a minimum of 2 conduits in each foundation. See lighting layout sheets for locations of foundations with more than 2 conduits. Cap unused conduits in foundations on both ends.
- Conduit location in foundations is critical for breakaway devices. Place conduits 2 in. apart on centerline as shown.
- Bond anchor bolt to rebar cage with #6 bare stranded copper conductor. Use listed mechanical connectors rated for embedment in concrete. The bonded steel in the foundation creates a concrete encased grounding electrode which replaces the ground rod.
- Grade earthwork around T-base foundations even with the finished grade as shown in Section A-A to ensure proper function of the breakaway device. Use riprap on T-base foundations that are located on sloped grades, and as shown on the plans for level grades.



FOUNDATION DETAIL



ANCHOR BOLT DETAIL

TABLE 4

BREAKAWAY POLE PLACEMENT (See note 6)

ROADWAY FUNCTIONAL CLASSIFICATION	** POLE OFFSET (DISTANCE TO FACE OF TRANSFORMER BASE)
Freeway Mainlanes (roadway with full control of access)	15 ft. (minimum and typical) from lane edge
All curbed, 45 mph or less design speed	2.5 ft. minimum (15 ft. desirable) from curb face
All others	10 ft. minimum*(15 ft. desirable) from lane edge

* or as close to ROW line as is practical

** provide 2/5 of the luminaire mounting height behind the pole for "falling area" to prevent encroachment on the other travel lanes. See design guidelines.

Texas Department of Transportation
Traffic Safety Division Standard

ROADWAY ILLUMINATION DETAILS (RDWY ILLUM FOUNDATIONS)

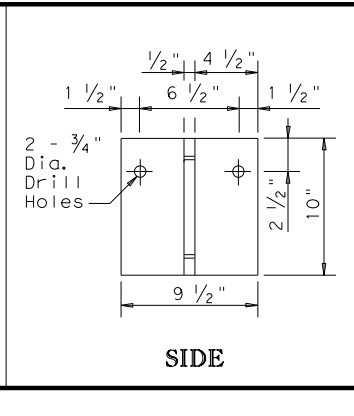
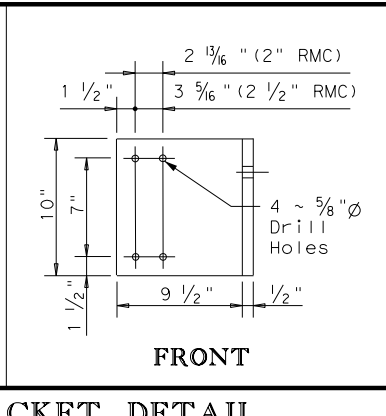
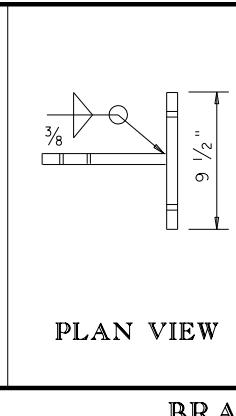
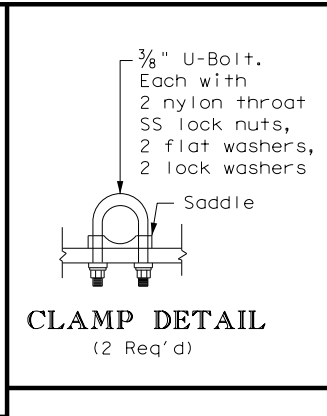
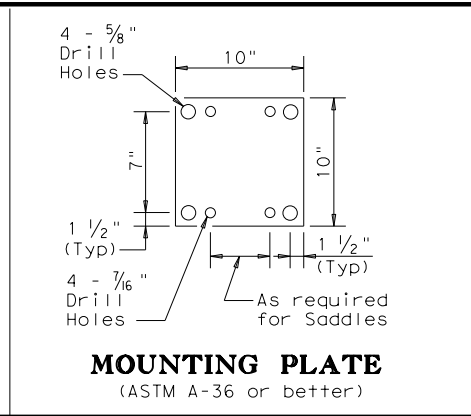
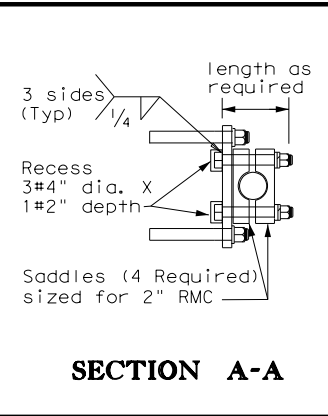
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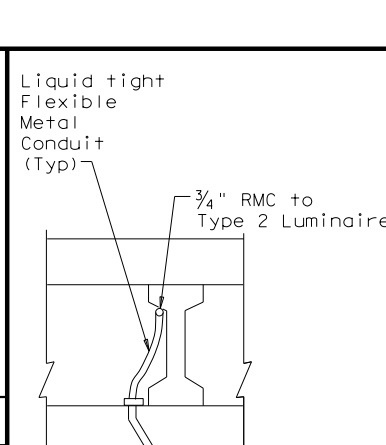
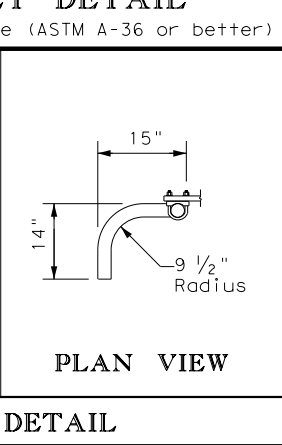
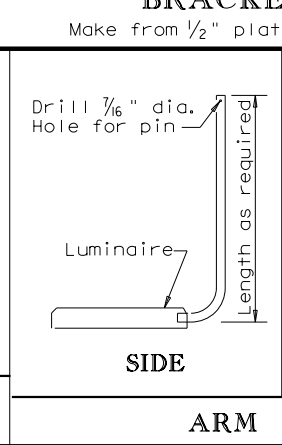
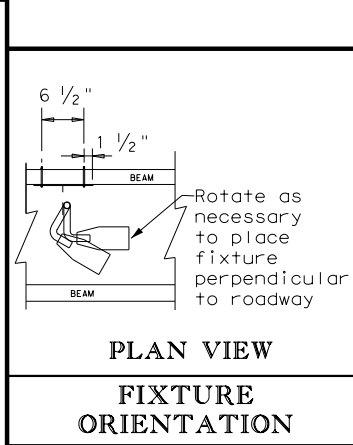
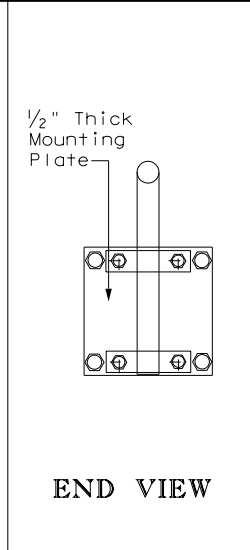
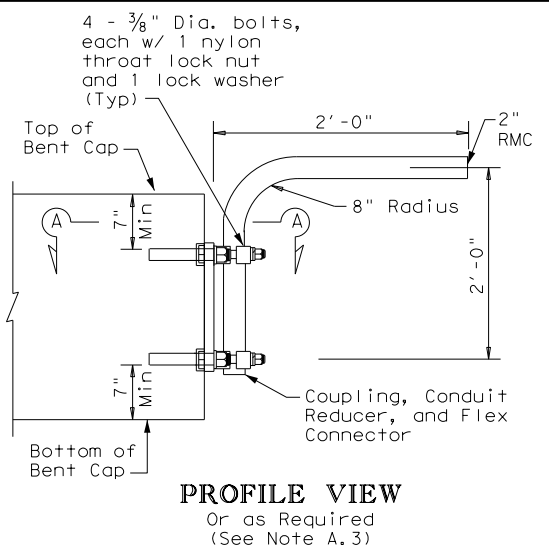
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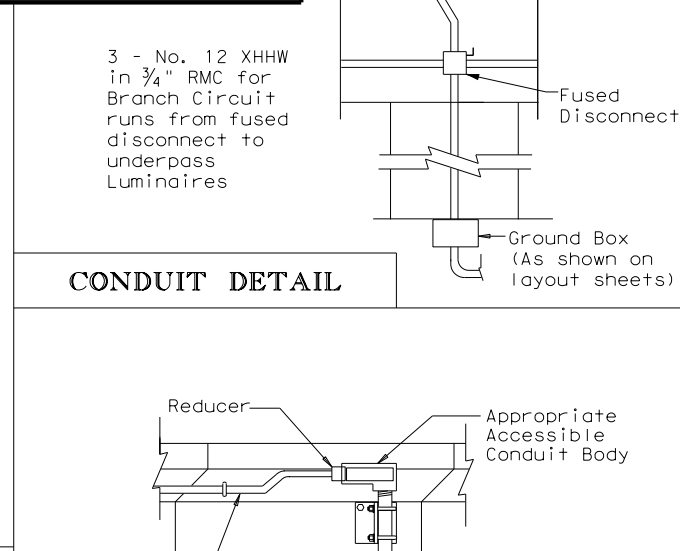
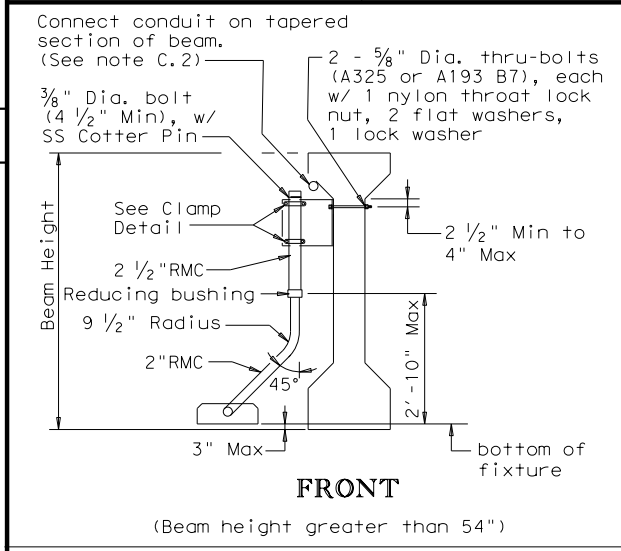
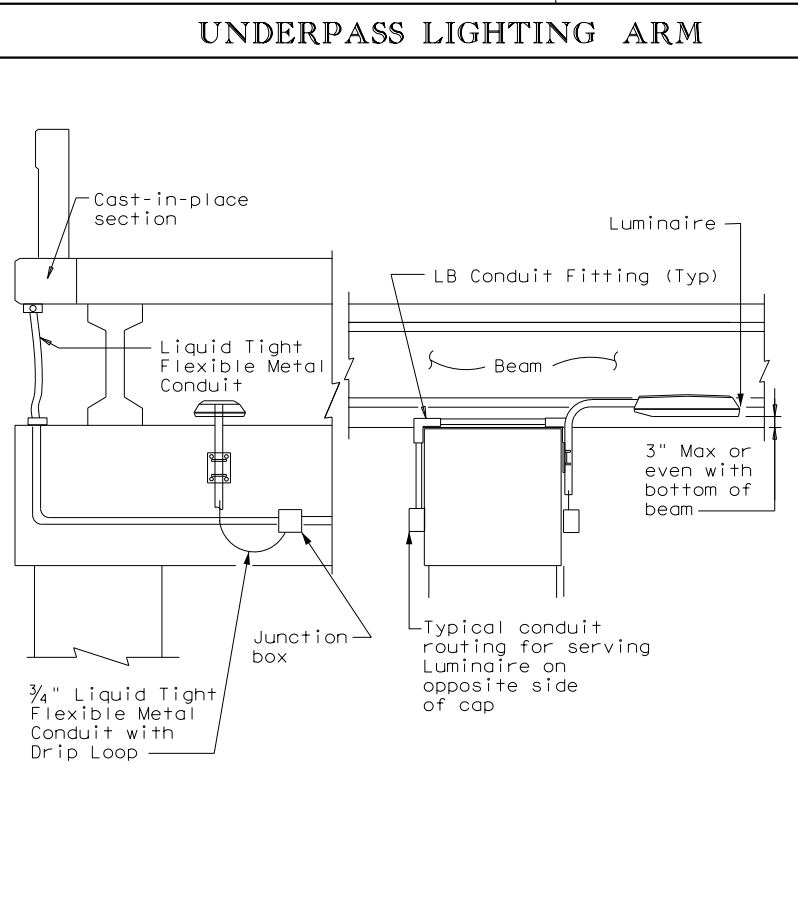
A. ALL 150 watt HPS and 150 watt equivalent LED Luminaires

- Luminaire locations, conduit and conductor sizes and routing are typical and diagrammatic only. See project layout sheets for specific details.
- Conduit will be paid for under Item 618, "Conduit" and conductors will be paid for under Item 620, "Electrical Conductors," unless otherwise shown on the plans.
- Adjust conduit in saddles to place fixture height and orientation as required. See fixture orientation detail and plans. Where practicable, place luminaires so the bottom of luminaire is above the bottom of the beam, maximum of 3 in. (See detail UNDERPASS LIGHTING ARM TYPE 2)
- Except as noted, galvanize all structural steel and exposed bolts, nuts, and washers in accordance with Item 445 "Galvanizing".
- Fabrication of brackets and support arms will not be paid for directly but is subsidiary to Item 610, "Roadway Illumination Assemblies."
- Install a heavy duty NEMA 3R fused disconnect or breaker enclosure rated at 30 amps and 480 volts to switch underpass luminaires as shown on plans, with at least one per bridge circuit. Install 20 amp time-delay fuses or inverse-time circuit breakers. Mount disconnect or breaker enclosure 10 ft. (min) above grade on columns or bent caps as approved by the Department. Modify disconnect to allow padlocking in the "ON" and "OFF" positions. Padlocks and disconnect switches or circuit breakers for underpass fixtures will not be paid for directly but are subsidiary to the various bid items of the contract.
- Conduit on columns, caps, and slab is shown surface mounted. For new columns and caps, embed PVC conduit in concrete. Bond and ground metal junction boxes and conduit.



B. TYPE 1

- Provide 2 in. rigid metal conduit (2.375" O.D., 0.146" wall) for Type 1 arm shaft.
- Use 3/8 in. stainless steel bolt or stud non-epoxy type expansion anchors for concrete for Type 1 mounting. Except as noted, provide an allowable 2650 lbs minimum pull-out force (after consideration of adjustment factors for edge distance and bolt spacing) for each anchor. Install each anchor to the embedment depth recommended by the manufacturer.
- Attach conduit to plate with 4 saddles, four - 3/8 in. diameter bolts, nylon throat lock nuts, and lock washers.



C. TYPE 2

- Provide 2 in. rigid metal conduit (2.375" O.D., 0.146" wall) or provide a combination of 2 1/2 in. (2.875" O.D., 0.193" wall) and 2 in. (2.375" O.D., 0.146" wall) rigid metal conduits with a reducing bushing as beam height stipulated for Type 2 arm shaft. Field cutting and threading will be permitted. Paint cut and threaded areas with zinc rich paint after conduit is connected to adjacent fitting.
- Connecting conduit may be strapped to tapered section only of precast beams as shown. Anchor as approved by the Engineer. Maximum anchor depth is 1 in.
- Indiscriminate drilling into precast concrete beams may result in reduced beam strength. Use drilling location and method as directed by the Engineer. See Location of Underpass Lighting Mounting Bracket detail. The locations shown in the table are such that reinforcing strands will not be damaged.

IN RD IL AM (U/P) (TY 1)
 If bridge has pre-cast panels under deck, run circuit under deck edge.
UNDERPASS LIGHTING TYPE 1

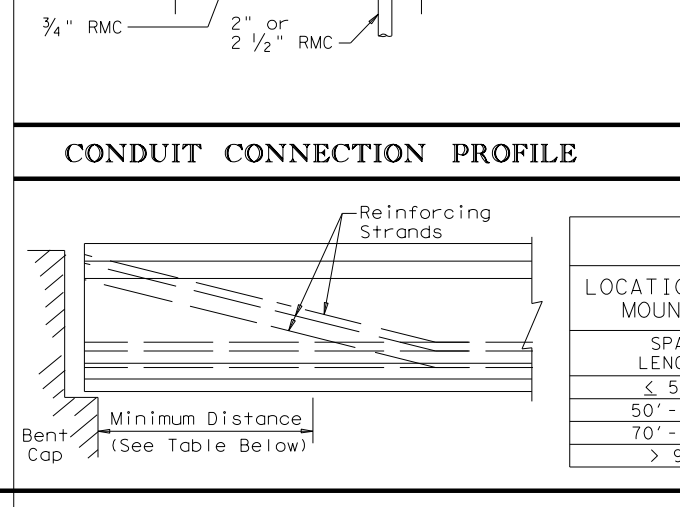
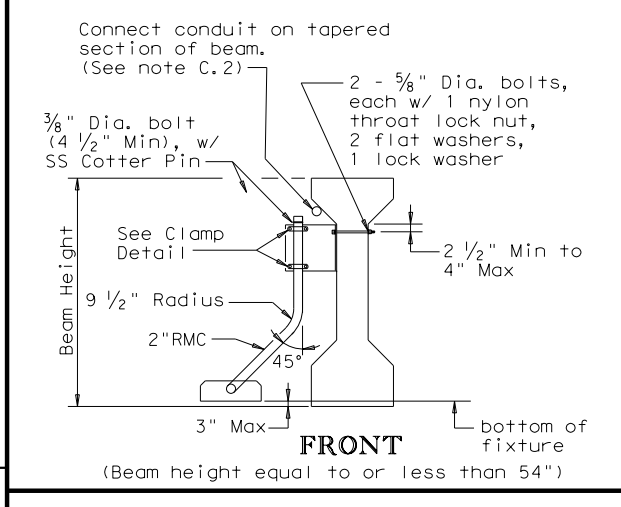


TABLE 5
 LOCATION OF UNDERPASS LIGHT MOUNTING BRACKET TABLE

SPAN LENGTH	MINIMUM DISTANCE
≤ 50'	10'-0"
50' - 70'	15'-0"
70' - 90'	20'-0"
> 90'	25'-0"

TABLE 5
 LOCATION OF UNDERPASS LIGHT MOUNTING BRACKET TABLE

Minimum Distance (See Table Below)

IN RD IL AM (U/P) (TY 2)
UNDERPASS LIGHTING TYPE 2

LOCATION OF UNDERPASS LIGHT MOUNTING BRACKET

Texas Department of Transportation
 Traffic Safety Division Standard

ROADWAY ILLUMINATION DETAILS (UNDERPASS LIGHT FIXTURES)

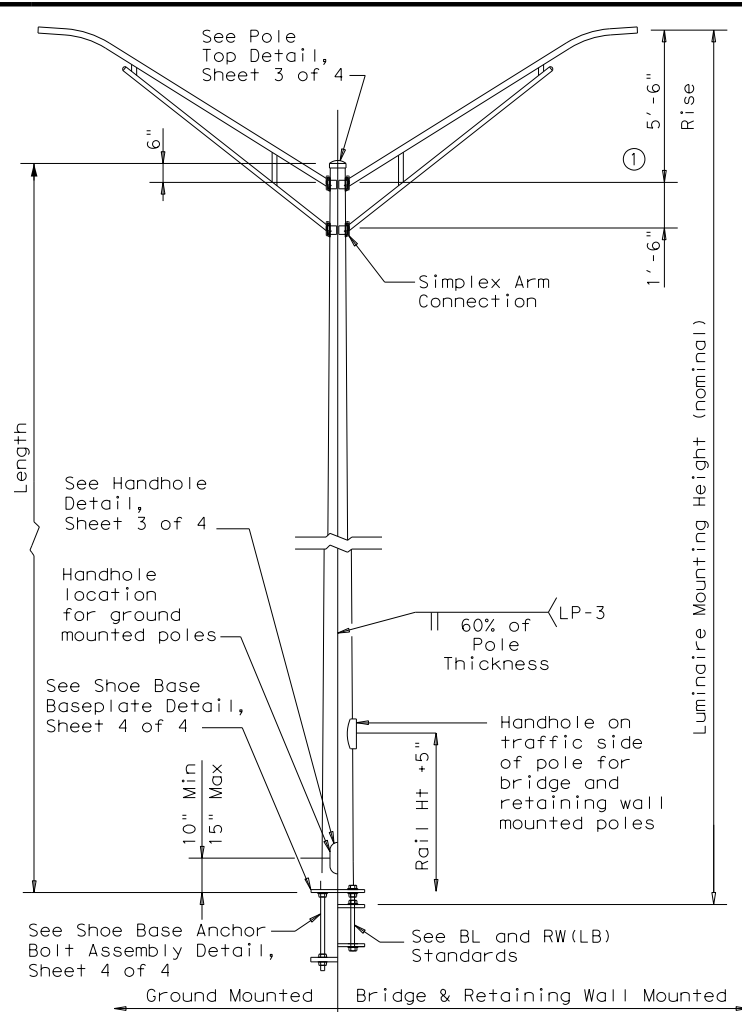
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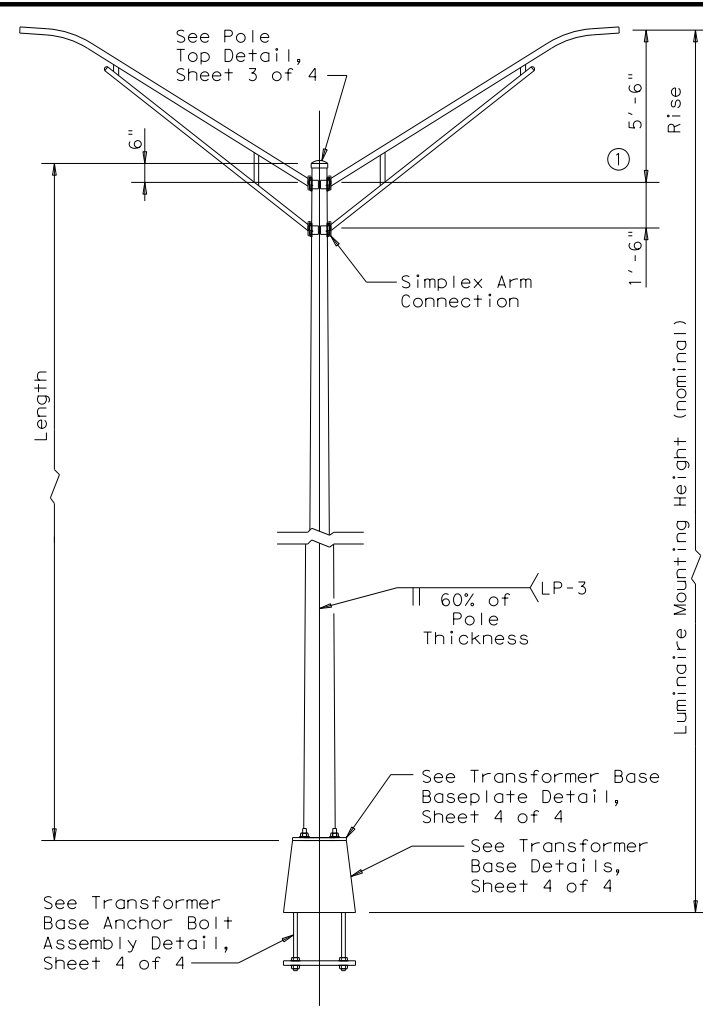
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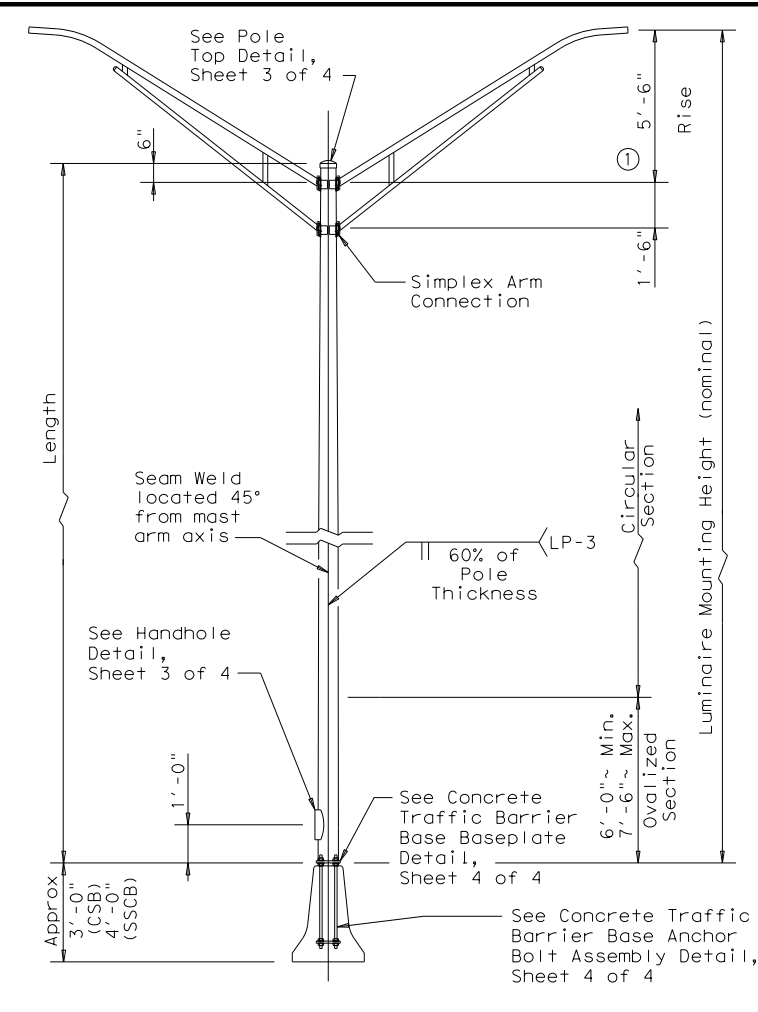
SHOE BASE POLE

SHOE BASE POLE					
Luminaire Mounting Height (Nominal) (ft)	Base Diameter (in)	Top Diameter (in)	Length (ft)	Pole Thickness (in)	Design Moment (K-ft)
20.00	7.00	4.90	15.00	0.1196	7.1
30.00	7.50	4.00	25.00	0.1196	13.2
31.00-39.00	8.00	4.36-3.24	26.00-34.00	0.1196	20.7
40.00	8.50	3.60	35.00	0.1196	20.7
50.00	10.50	4.20	45.00	0.1196	30.3



TRANSFORMER BASE POLE

TRANSFORMER BASE POLE					
Luminaire Mounting Height (Nominal) (ft)	Base Diameter (in)	Top Diameter (in)	Length (ft)	Pole Thickness (in)	Design Moment (K-ft)
20.00	7.00	5.11	13.50	0.1196	7.1
30.00	7.50	4.21	23.50	0.1196	13.2
31.00-39.00	8.00	4.57-3.45	24.50-32.50	0.1196	20.7
40.00	8.50	3.81	33.50	0.1196	20.7
50.00	10.00	3.91	43.50	0.1196	30.3



CONCRETE TRAFFIC BARRIER BASE POLE

CONCRETE TRAFFIC BARRIER BASE POLE (CSB/SSCB)						
Luminaire Mounting Height (Nominal) (ft)	Base Diameter (in)	Top Diameter (in)	Length (ft)	Pole Thickness (in)	Design Moment (K-ft)	
					About C of Rail	Perp. to Rail
28.00	9.00	5.78	23.00	0.1196	10.3	13.2
38.00	9.00	4.38	33.00	0.1196	16.6	20.8
48.00	10.50	4.48	43.00	0.1345	25.1	30.5

GENERAL NOTES:

- Designs conform to AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, 6th Edition (2013) and Interim Revisions thereto. Design 3-Second Gust Wind Speed equals 110 mph with a 1.14 gust factor. A wind importance factor of 0.80 is applied to adjust the wind speed to a 25 year recurrence interval. Design moments listed in tables assume base of pole is 25' above natural ground level.
- Structures are designed to support two 12' luminaire mast arms and luminaires. Mast arms are designed to support a 60-pound luminaire having an effective projected area of 1.6 square feet.
- Fabrication shall be in accordance with the Specifications and with the details, dimensions, and weld procedures shown herein. Do not submit shop drawings for roadway illumination pole assemblies fabricated in accordance with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. Materials, fabrication tolerances, and shipping practices shall meet the requirements of these sheets and the Specifications. In the absence of specified fabrication tolerances, dimensions shall be within the tolerances generally obtainable in normal fabrication practice.
- For mounting heights between values shown in the tables, use base diameter and thickness values for the larger height.
- Unless otherwise noted, all steel parts shall be galvanized in accordance with Item 445, "Galvanizing."
- Steel poles shall be fabricated in accordance with Item 441, "Steel Structures." Longitudinal seam welds for pole sections shall have 60% minimum penetration. All welding shall be in accordance with AWS D1.1, Structural Welding Code-Steel.
- Two-section poles joined by circumferential welds will not be permitted, unless otherwise shown on the plans. Poles may be fabricated in two sections and field-assembled by the lap-joint method. The two sections shall telescope together with a lap length of not less than 1-1/2 times the shaft diameter at the lap joint.
- Alternate material equal to or better than material specified may be substituted with the approval of the Engineer.
- Lubricate and tighten anchor bolts, when erecting shoe base poles and concrete traffic barrier base poles, in accordance with Item 449, "Anchor Bolts."
- All poles, except Transformer Base Poles, shall have hand holes with reinforcing frames and covers. For ground mounted shoe base poles, hand holes shall be placed 90 degrees to mast arm unless otherwise noted on the plans. For poles mounted on a concrete traffic barrier with one luminaire arm, hand holes shall be located 180 degrees from luminaire arm. For poles mounted on a concrete traffic barrier with two luminaire arms, all hand holes shall be on the same side of the barrier. For poles mounted on a bridge lighting bracket or a retaining wall lighting bracket, hand hole shall be on traffic side of the pole, at a height that will clear the barrier.
- The finished pole shall have a smooth, uniform finish free of pits, blisters, or other defects. Scratched, chipped, and other damaged galvanized areas on poles and mast arms shall be repaired in accordance with Item 445, "Galvanizing."
- Pole length is based on a 5'-6" luminaire arm rise. 4 ft. luminaire arms have a 2'-6" rise. A pole with 4 ft. luminaire arms will have an actual mounting height 3'-0" less than the nominal mounting height. Increasing the pole length to meet the nominal mounting height is allowed, but unnecessary unless otherwise directed by the engineer.
- Erect transformer base poles in accordance with sheet RID(1).

MATERIAL DATA

COMPONENT	ASTM DESIGNATION	MIN. YIELD (ksi)
Pole Shaft (0.14"/ft. Taper)	A572 Gr 50, A595 Gr A, A1011 HSLAS Gr 50 Cl 2 ③, or A1008 HSLAS Gr 50 Cl 2	50
Base Plate and Handhole Frame	A572 Gr.50, or A36	36
T-Base Connecting Bolts	F3125 Gr A325	92
Anchor Bolts		
Anchor Bolt Templates	A36	36
Heavy Hex (H.H.) Nuts	A194 Gr 2H, or A563 Gr DH	
Flat Washers	F436	

NOTES:

- 2'-6" rise for 4 ft. luminaire arms.
- Before ovalized as shown on Concrete Traffic Barrier Base Baseplate details, Sheet 4 of 4.
- A1011 SS Gr 50 may be used instead of HSLAS, provided the material meets the elongation requirements for HSLAS.

POLE ASSEMBLY FABRICATION TOLERANCES TABLE

DIMENSION	TOLERANCE
Shaft length	+1"
I.D. of outside piece of slip fitting pieces	+1/8", -1/16"
O.D. of inside piece of slip fitting pieces	+1/32", -1/8"
Shaft diameter: other	+3/16"
Out of "round"	1/4"
Straightness of shaft	±1/4" in 10 ft
Twist in multi-sided shaft	4° in 50 ft
Perpendicular to baseplate	1/8" in 24"
Pole centered on baseplate	±1/4"
Location of Attachments	±1/4"
Bolt hole spacing	±1/16"

SHEET 2 OF 4



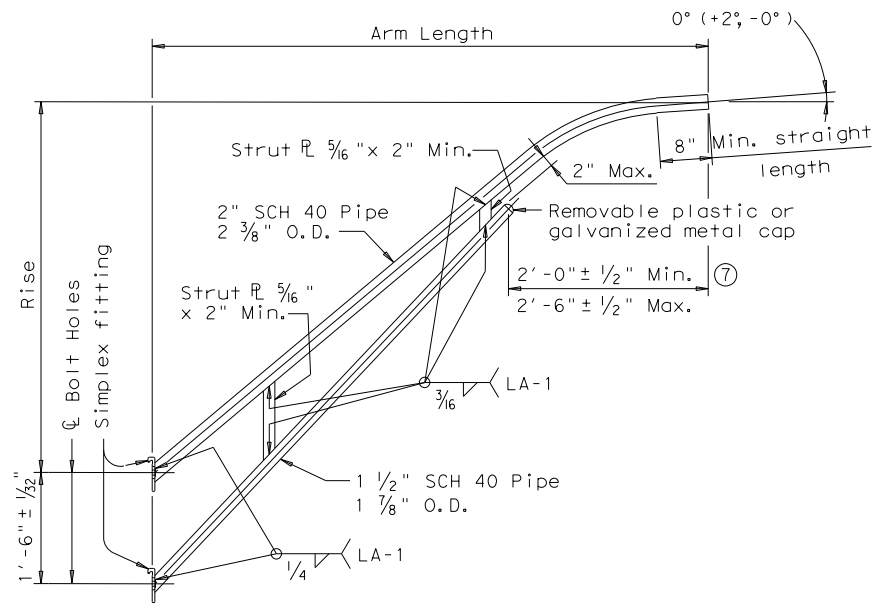
ROADWAY ILLUMINATION POLES

RIP(2) - 19

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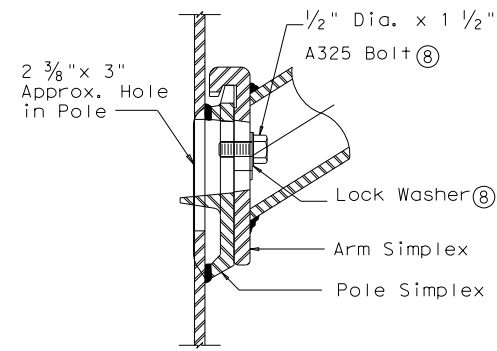
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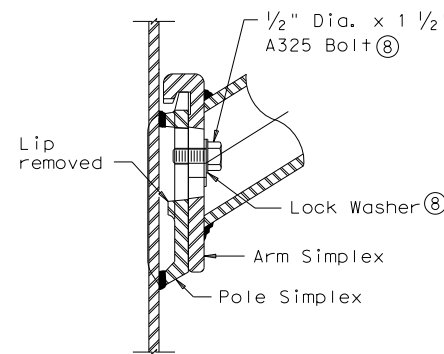
LUMINAIRE ARM

LUMINAIRE ARM DIMENSIONS		
Nominal Arm Length	Arm Length	Rise
4'-0"	3'-6"	2'-6"
6'-0"	5'-6"	5'-6"
8'-0"	7'-6"	5'-6"
10'-0"	9'-6"	5'-6"
12'-0"	11'-6"	5'-6"

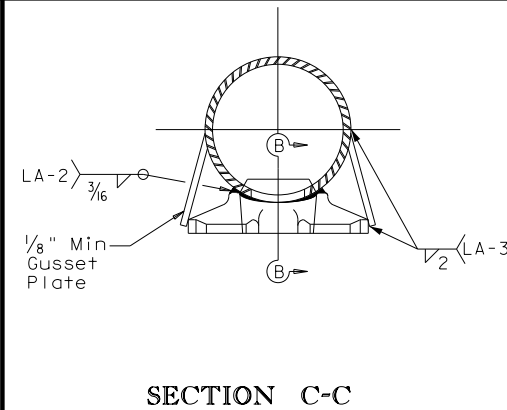
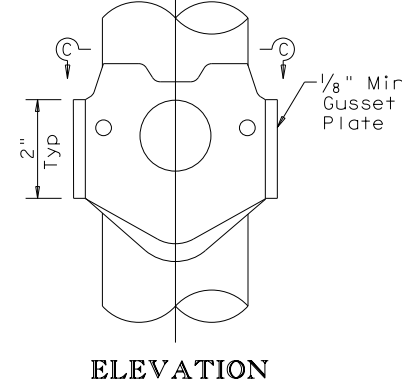
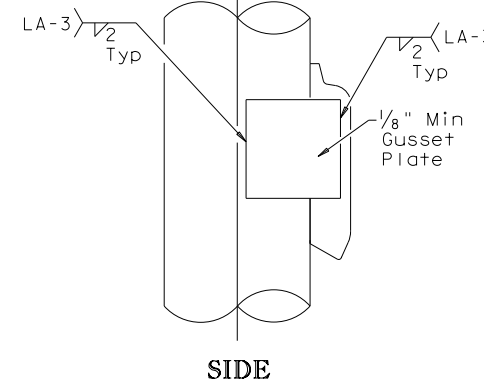
ARM ASSEMBLY FABRICATION TOLERANCES TABLE	
DIMENSION	TOLERANCE
Arm Length	±1"
Arm Rise	±1"
Deviation from flat	1/8" in 12"
Spacing between holes	±1/32"



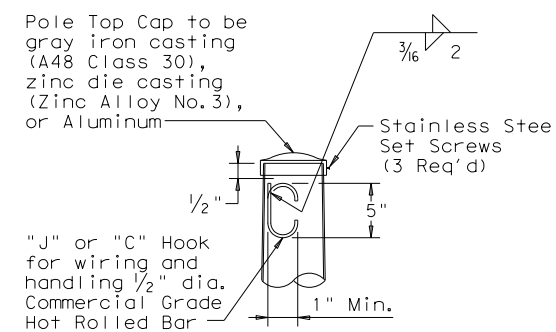
UPPER SIMPLEX FITTING
(Gusset not shown for clarity)



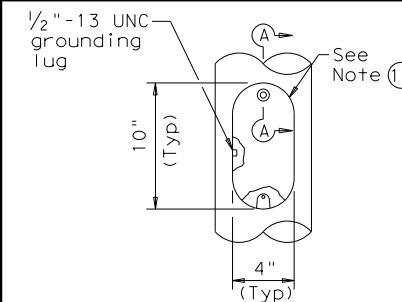
LOWER SIMPLEX FITTING
(Gusset not shown for clarity)



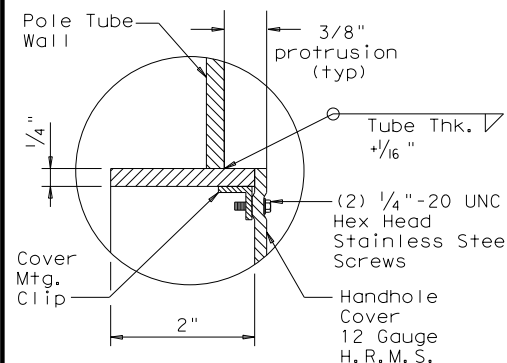
SIMPLEX ATTACHMENT DETAIL



POLE TOP

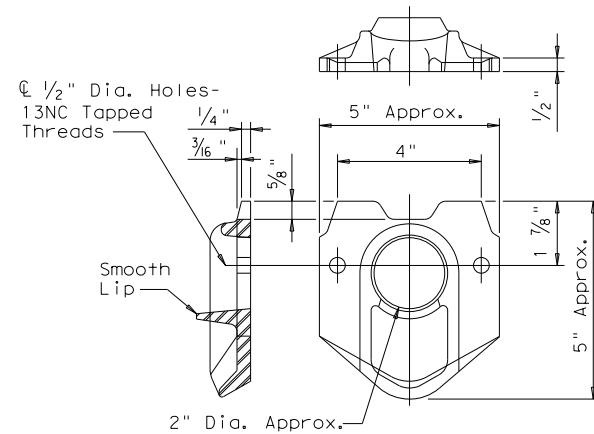


ELEVATION

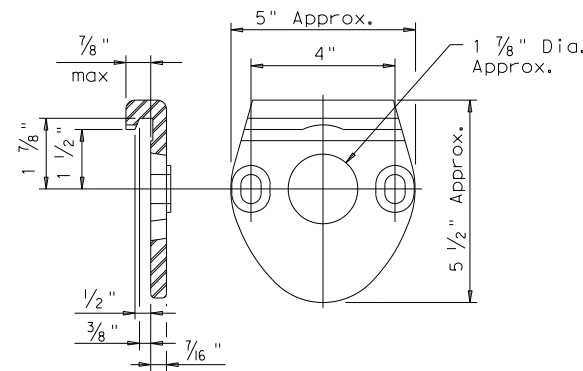


SECTION A-A

HANDHOLE



POLE SIMPLEX DETAIL 9



ARM SIMPLEX DETAIL 9

NOTES:

- ④ Any of the materials listed for plates may be used where the drawings do not specify a particular ASTM designation.
- ⑤ A576 must be suitable for forging and also meet minimum tensile strength of 65 ksi, minimum yield of 35 ksi, and elongation in 2 inches of 22 percent.
- ⑥ A572, A1008 HSLAS-F, and A1011 HSLAS-F materials may have higher yield strengths but shall not have less elongation than the grade indicated.
- ⑦ Dimensional limits are given to show acceptable variation in design. All of a Fabricator's production of a particular arm length shall have the same dimensions within specified tolerances.
- ⑧ Each pole simplex fitting shall be supplied with 2 bolts and 2 lock washers of the size specified. The bolts and lock washers shall be secured to the pole with the other hardware items called for in the plans.
- ⑨ Proposed deviations in arm simplex dimensions or materials must be submitted to the Department for approval.
- ⑩ A welded handhole frame is permissible. Maximum of two (2) CJP weld splices is allowed.

MATERIALS

Pole or Arm Simplex	ASTM A27 Gr 65-35 or Gr 70-36, A148 Gr 80-50, A576 Gr 1021 ⑤, or A36 (Arm only)
Arm Pipes	ASTM A53 Gr A or B, A500 Gr B, A501, A 1008 HSLAS-F Gr 50 ⑥, or A1011 HSLAS-F Gr 50 ⑥
Arm Struts and Gusset Plates ④	ASTM A36, A572 Gr 50 ⑥, or A588
Misc.	ASTM designations as noted

SHEET 3 OF 4

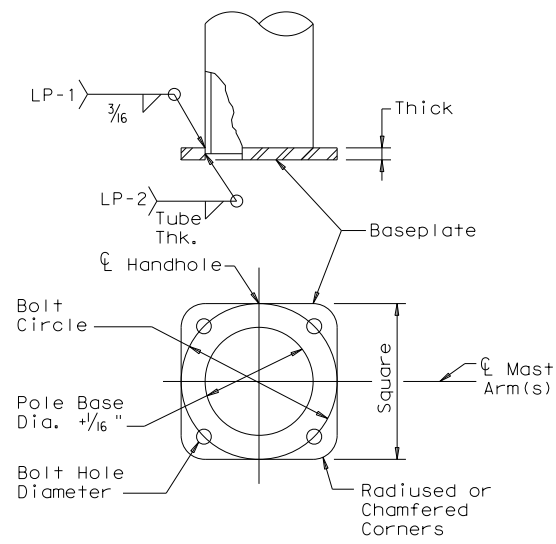


ROADWAY ILLUMINATION POLES

RIP(3) - 19

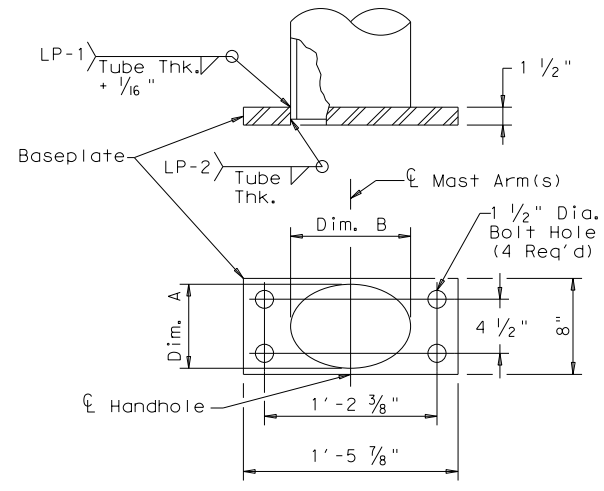
FILE: rip-19.dgn	DN:	CK:	DW:	CK:
©TxDOT January 2007	CONT	SECT	JOB	HIGHWAY
REVISIONS	0389	13	039	SH 146
7-17	DIST	COUNTY	SHEET NO.	
12-19	HOU	HARRIS	302	

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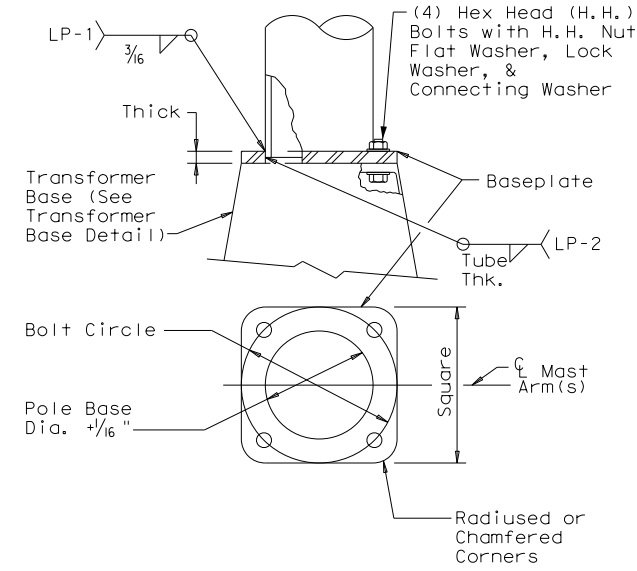
**SHOE BASE
BASEPLATE**

SHOE BASE BASEPLATE TABLE				
MOUNTING HEIGHTS (nominal)	BOLT CIRCLE	SQUARE	THICK	BOLT HOLE DIAMETER
20' - 39'	13"	13"	1 1/4"	1 1/4"
40'	15"	15"	1 1/4"	1 1/2"
50'	15"	15"	1 1/2"	1 1/2"



**CONCRETE TRAFFIC
BARRIER BASE BASEPLATE**

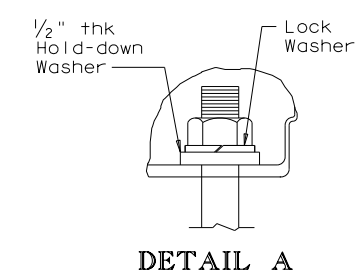
CONCRETE TRAFFIC BARRIER BASE BASEPLATE TABLE			
MOUNTING HEIGHTS (nominal)	POLE DIA. (12)	DIM. A	DIM. B
28' - 38'	9"	7" ± 1/4"	10" ± 1/4"
48'	10 1/2"	7" ± 1/4"	13" ± 1/4"



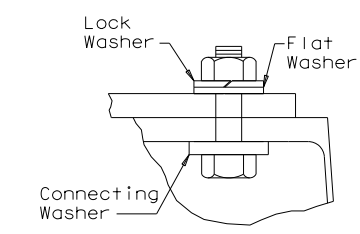
**TRANSFORMER
BASE BASEPLATE**

TRANSFORMER BASE BASEPLATE TABLE						
MOUNTING HEIGHTS (nominal)	BOLT CIRCLE	SQUARE	THICK	CONNECTING BOLT DIA.	BOLT HOLE DIAMETER	TRANSFORMER BASE TYPE
20' - 39'	13"	13"	1 1/4"	1"	1 1/4"	A
40'	15"	15"	1 1/4"	1 1/4"	1 1/2"	B
50'	15"	15"	1 1/2"	1 1/4"	1 1/2"	B

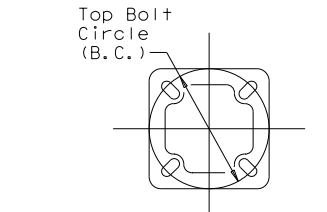
TRANSFORMER BASE TABLE		
TYPE	TOP B.C.	BTM. B.C.
A	13"	14"
B	15"	17 1/4"



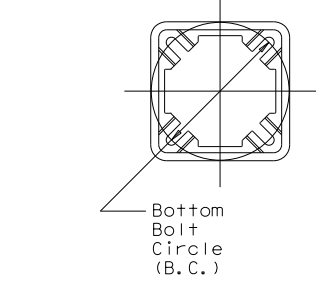
DETAIL A



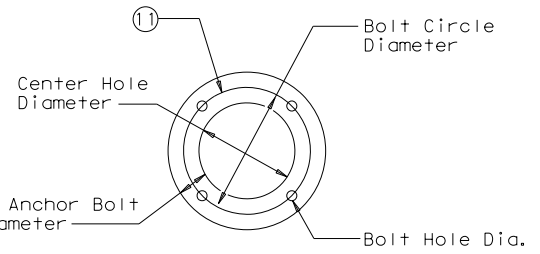
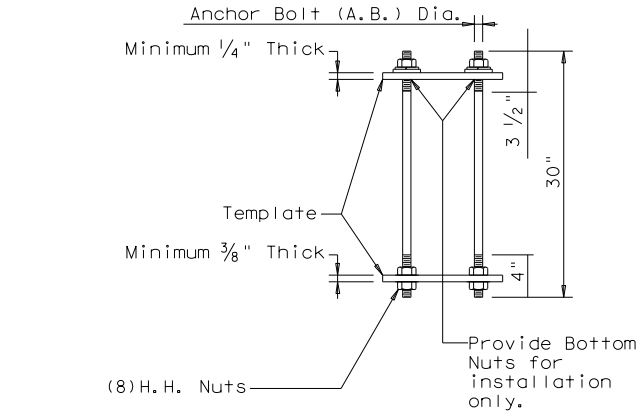
DETAIL B



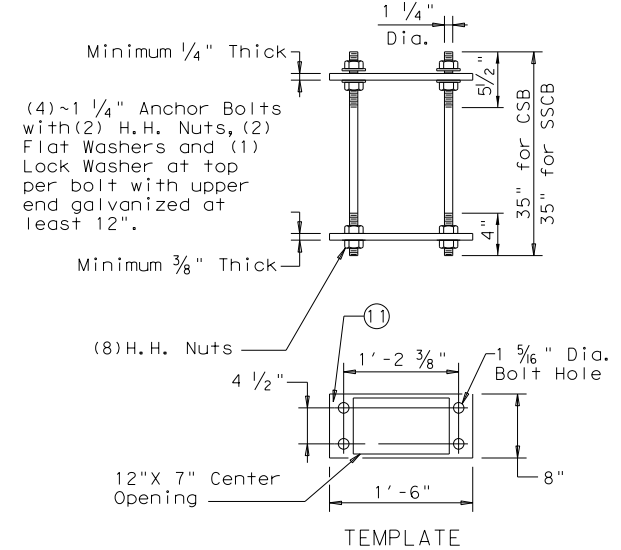
TOP PLAN



BOTTOM PLAN

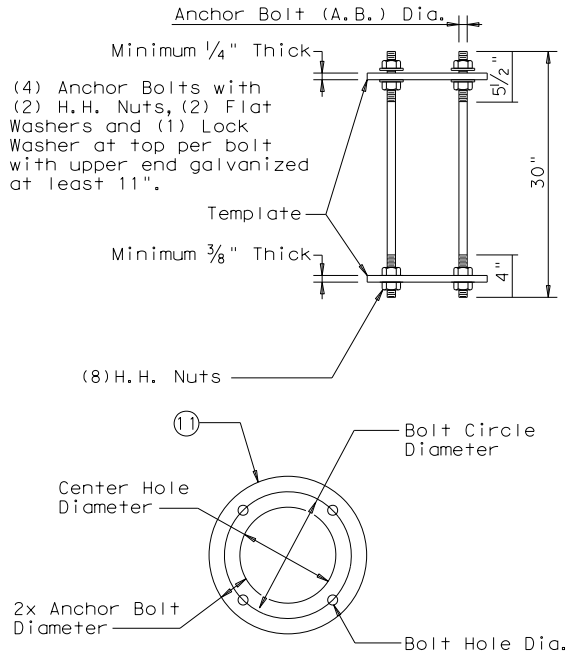


**TRANSFORMER BASE
ANCHOR BOLT ASSEMBLY**



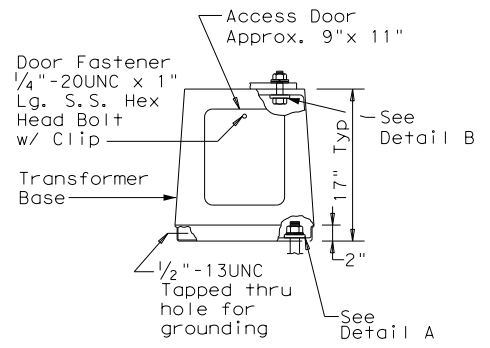
**CONCRETE TRAFFIC BARRIER
BASE ANCHOR BOLT ASSEMBLY**

TRANSFORMER BASE ANCHOR BOLT ASSEMBLY TABLE				
MOUNTING HEIGHTS (nominal)	A.B. Dia.	BOLT CIRCLE DIAMETER	CTR. HOLE DIAMETER	BOLT HOLE DIAMETER
20' - 39'	1"	14"	12"	1 1/16"
40' - 50'	1 1/4"	17 1/4"	14 3/4"	1 5/16"



**SHOE BASE
ANCHOR BOLT ASSEMBLY**

SHOE BASE ANCHOR BOLT ASSEMBLY TABLE				
MOUNTING HEIGHTS (nominal)	A.B. Dia.	BOLT CIRCLE DIAMETER	CTR. HOLE DIAMETER	BOLT HOLE DIAMETER
20' - 39'	1"	13"	11"	1 1/16"
40' - 50'	1 1/4"	15"	12 1/2"	1 5/16"



**TRANSFORMER BASE
DETAILS**

GENERAL NOTES:

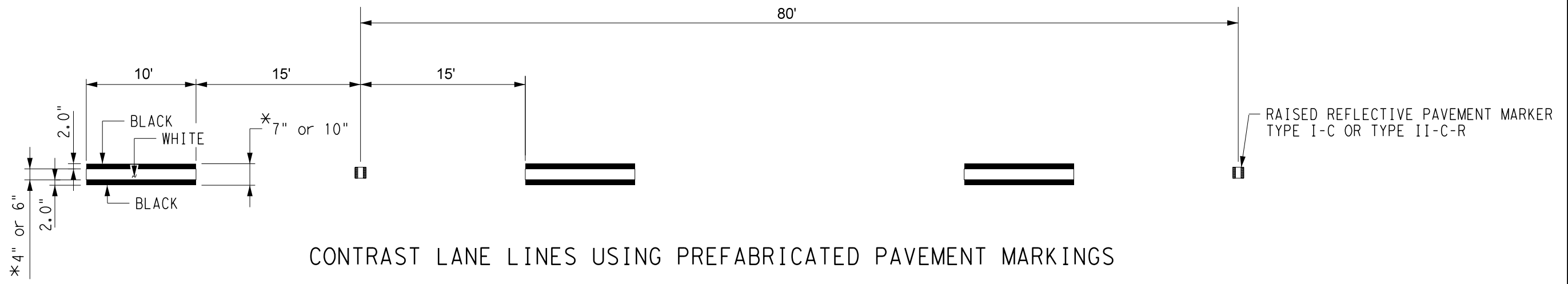
- For mounting heights between those shown in the table, use the values in the table for the larger mounting height.
- All breakaway bases shall meet the breakaway requirements of the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 6th Edition (2013) and Interim Revisions thereto, and shall have been tested by FHWA-approved methods. All bases shall have been structurally tested to resist 150% of the design moment.
- Transformer bases shall be cast from aluminum, ASTM B108 or B26 Alloy 356.0-T6, or other material approved by the Engineer. Four Hex Head (H.H.) bolts with four H.H. nuts, four lock washers, four flat washers, and connecting and hold-down washers as recommended by the manufacturer, galvanized to ASTM A153 Class C or D, or B695 Class 50, shall be provided with each transformer base for connecting the pole. Bolts shall be ASTM A325 or approved equal. Nuts shall be ASTM A563 grade DH galvanized.
- Bases shall be stamped, incised or by other approved permanent means, marked to show fabricator's name or logo, and model number. Such information shall be placed in a readily seen location, inside or outside the base, but shall not be placed on the door.
- Doors for transformer bases shall be made of plastic, fiberglass or other non-metallic material approved by the Engineer and shall be attached with stainless steel screws or bolts. Transformer bases shall be cleaned by grit blast cleaning after heat treatment. Certification by the manufacturer of heat treatment shall be furnished with transformer bases. The certification shall show the material alloy and temper and that the base meets those requirements, chemical and physical. The certification shall also show the material ASTM specification. Transformer bases shall be cast with a removable tab bar for material testing. Some bars may have been removed by the manufacturer for testing.

NOTES:

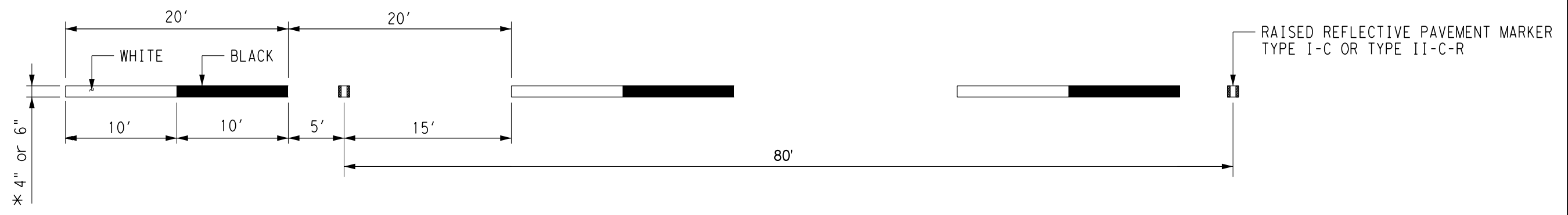
- Anchor Bolt Templates do not need to be galvanized.
- Pole diameter before ovalized.

ANCHOR BOLT FABRICATION TOLERANCES TABLE	
DIMENSION	TOLERANCE
Length	± 1/2"
Threaded length	± 1/2"
Galvanized length (if required)	- 1/4"

ROADWAY ILLUMINATION POLES RIP(4) - 19			
FILE: rip-19.dgn	DN:	CK:	DW:
©TxDOT January 2007	CON:	SECT:	HIGHWAY:
REVISIONS	0389 13	039	SH 146
7-17 12-19	DIST:	COUNTY:	SHEET NO.:
	HOU	HARRIS	303



➔ DIRECTION OF TRAFFIC

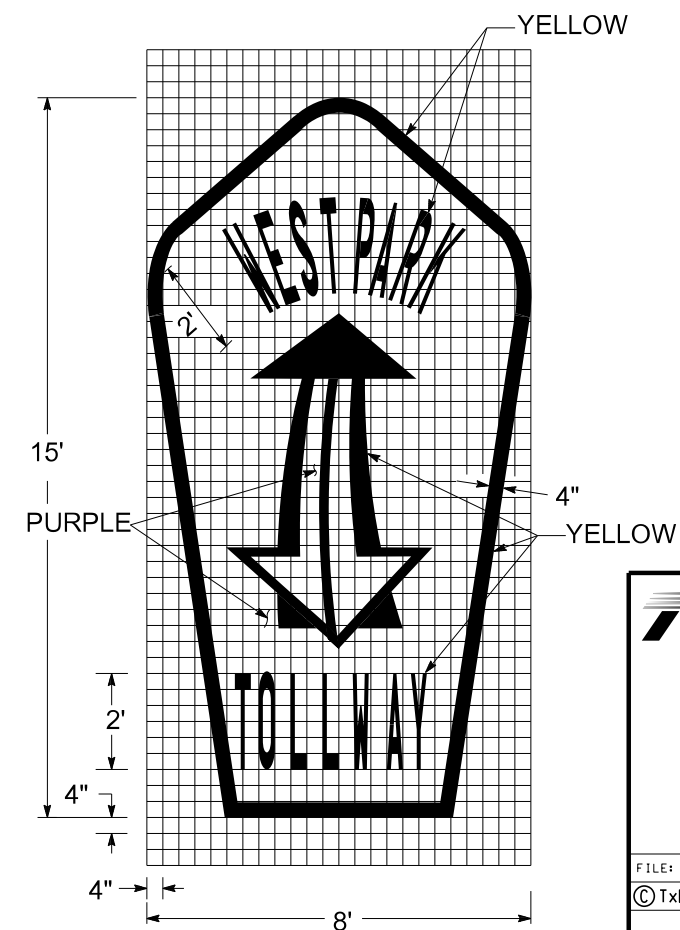
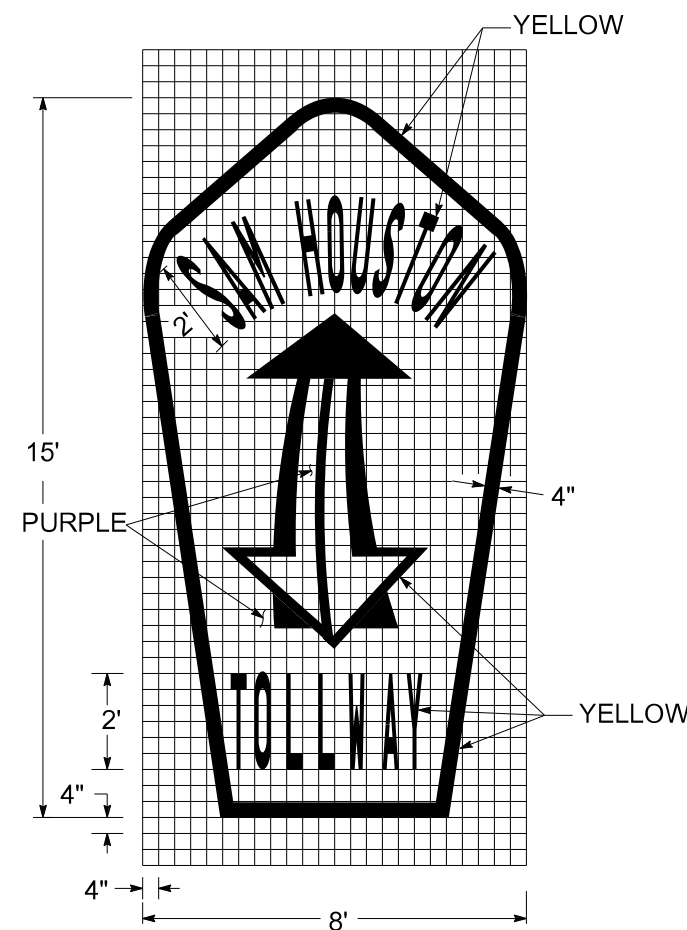
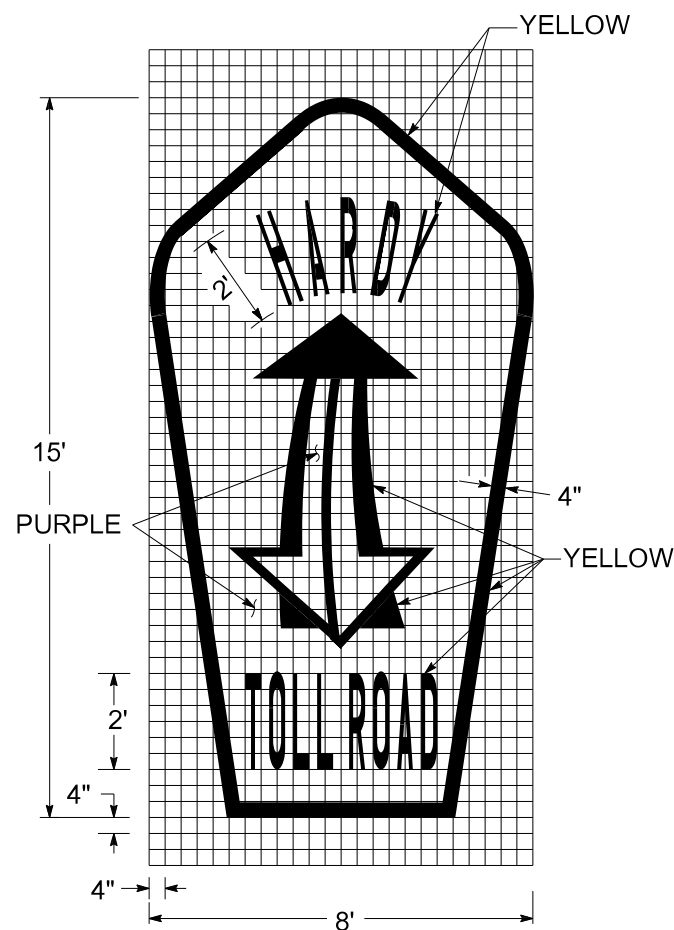
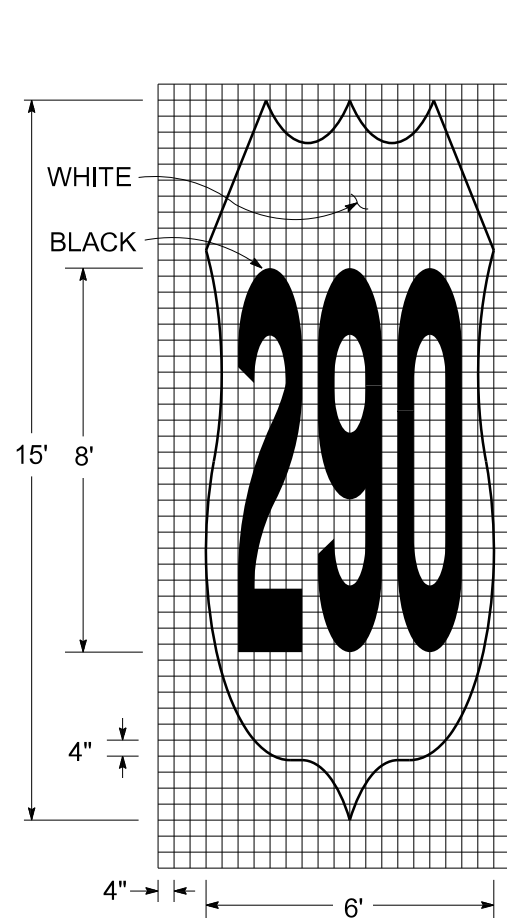
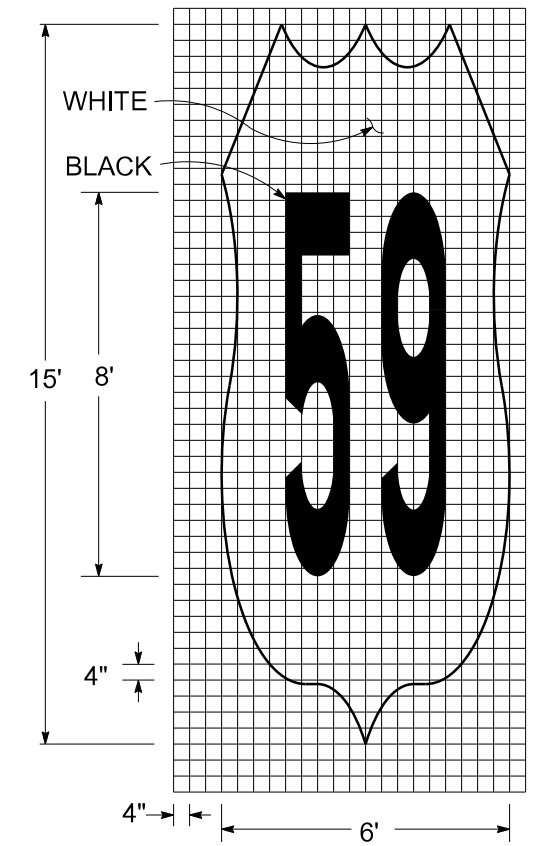
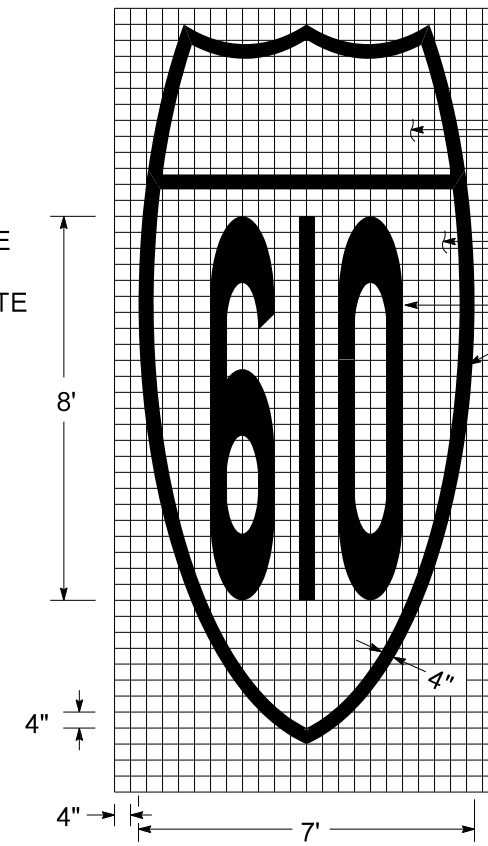
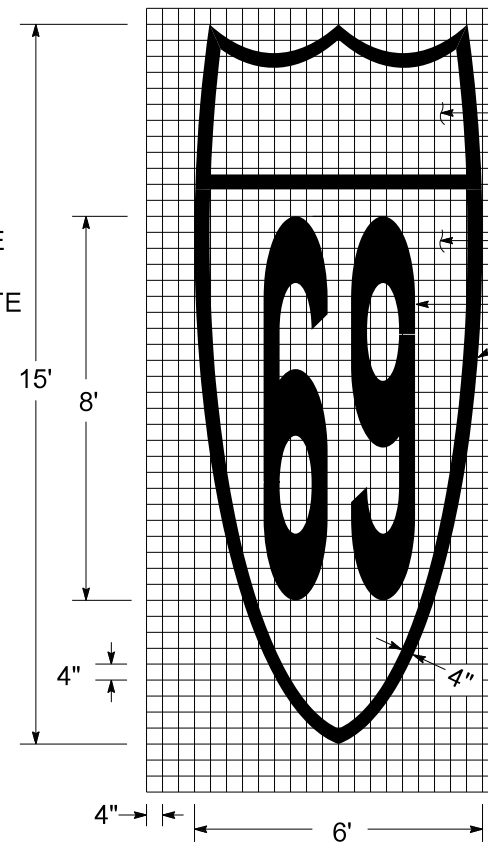
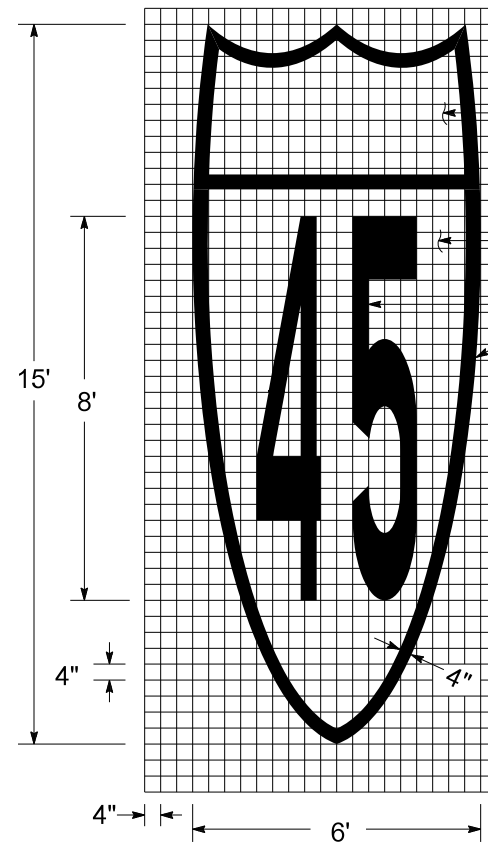
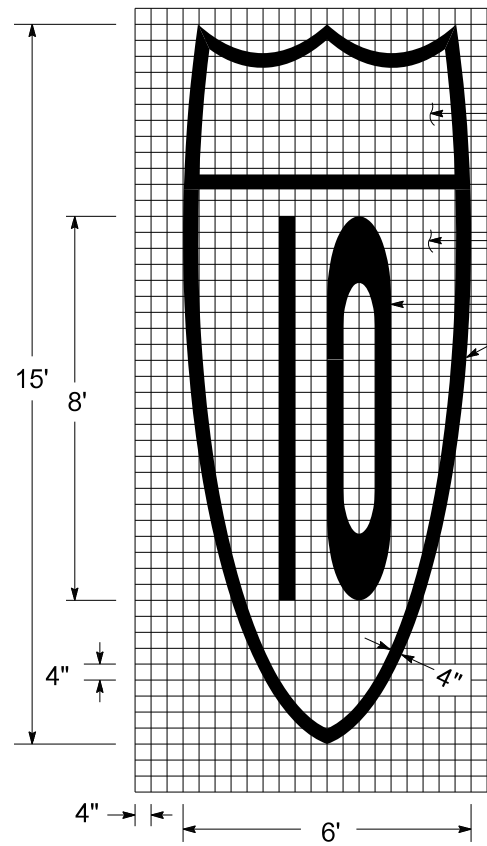


* AS SHOWN ON THE PLANS.

PAVEMENT MARKINGS
(CONTRAST LANE LINES)

PM (CLL) - 14

FILE:	DN:	CK:	DW:	CK:
© TxDOT 2003	DIST	FED REG	PROJECT NO.	SHEET
01-19-08 02-19-08 10-2019	HOU	6		304
REVISIONS 9" to 10"	COUNTY	CONTROL	SECT	JOB
	HARRIS	0389	13	039
				HIGHWAY
				SH 146



Texas Department of Transportation
Houston District

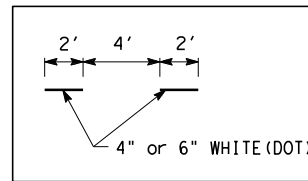
PAVEMENT MARKING
(SHIELD)

PM(SHIELD-1)-17

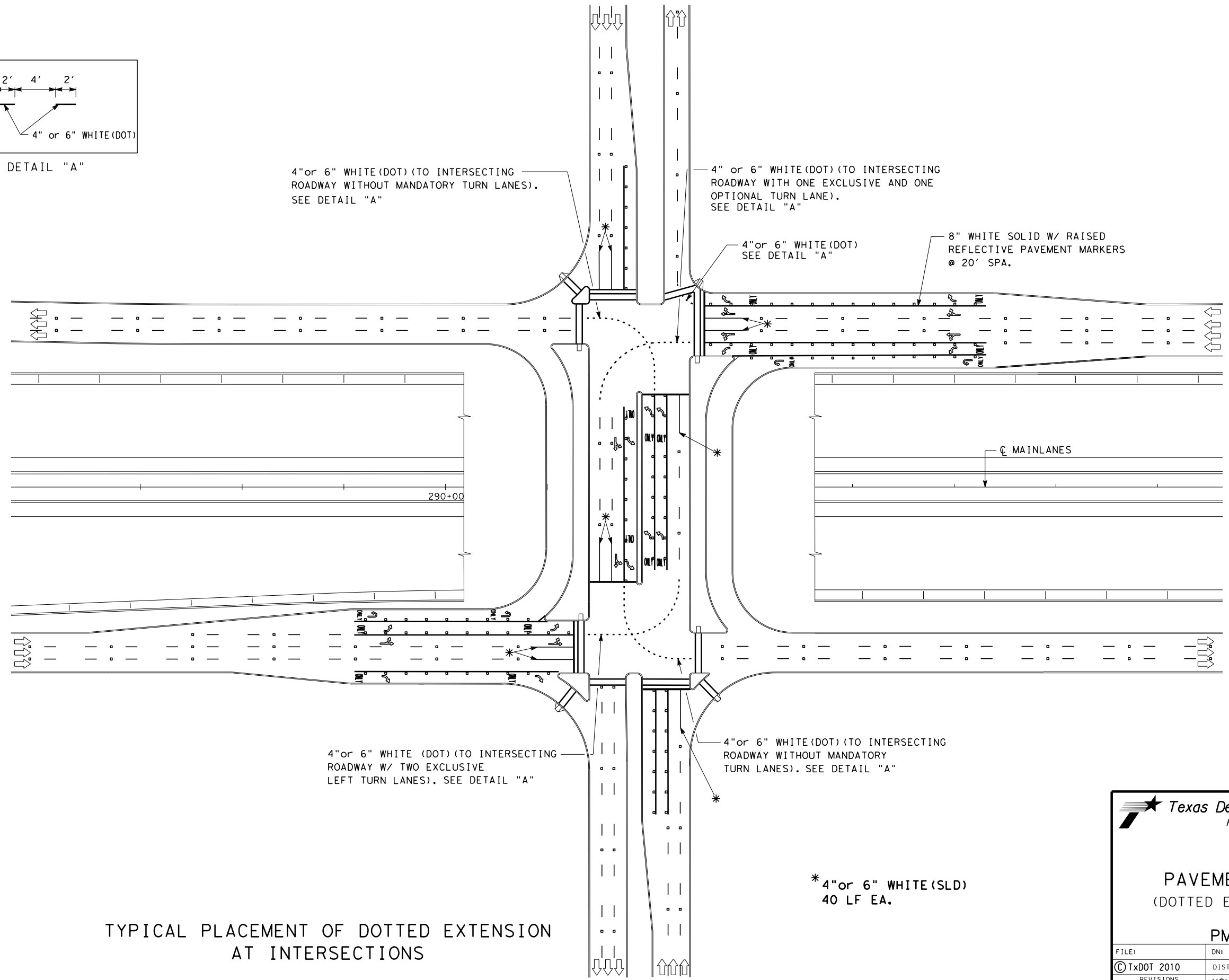
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© TxDOT 2004	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS 07-12-17 07-30-17	HOU	6		305
	COUNTY	CONTROL	SECT	JOB
	HARRIS	0389	13	039
				SH 146

SCALE 1/4" = 1'

STD-N32



DETAIL "A"



TYPICAL PLACEMENT OF DOTTED EXTENSION AT INTERSECTIONS

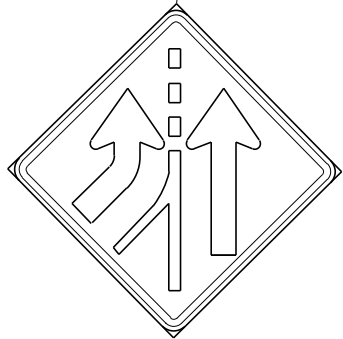
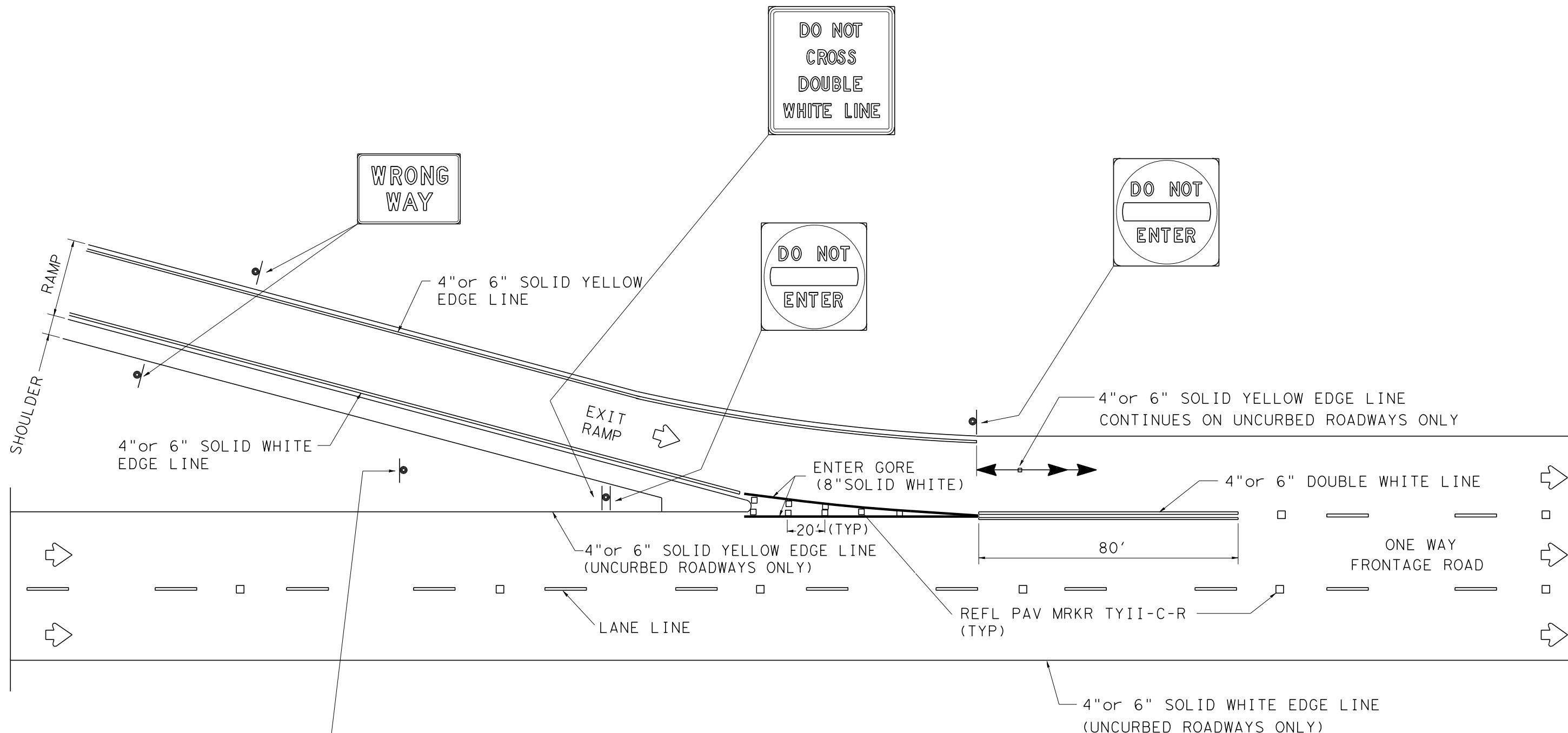


PAVEMENT MARKINGS
(DOTTED EXTENSION DETAILS)

PM(DOT) - 11

FILE:	DN:	CK:	DW:	CK:
© TxDOT 2010	DIST	FED REG	PROJECT NO.	SHEET
4/2010	HOU	6		306
4/2011	COUNTY	CONTROL	SECT	JOB
	HARRIS	0389	13	039
				HIGHWAY
				SH 146

* 4" or 6" WHITE (SLD)
40 LF EA.



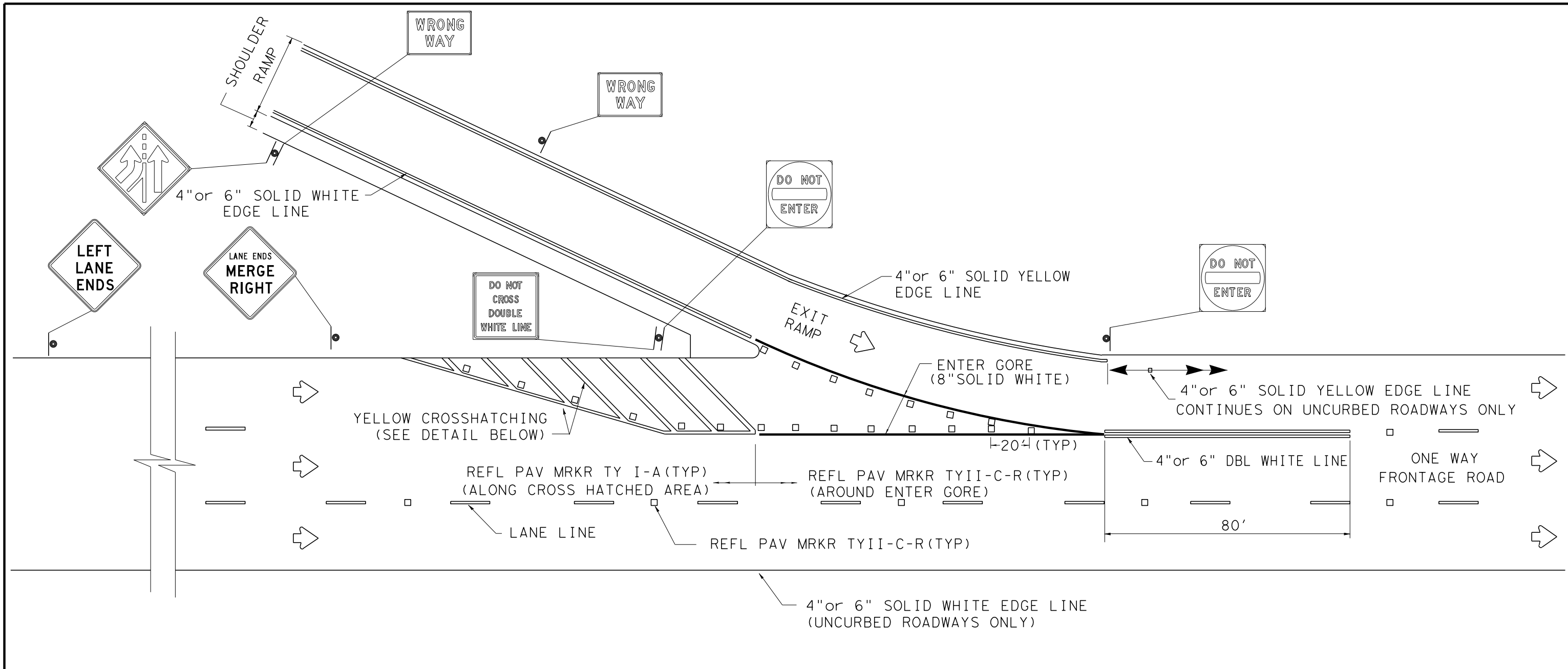
DRAWING SCALE: NONE

Texas Department of Transportation
Houston District

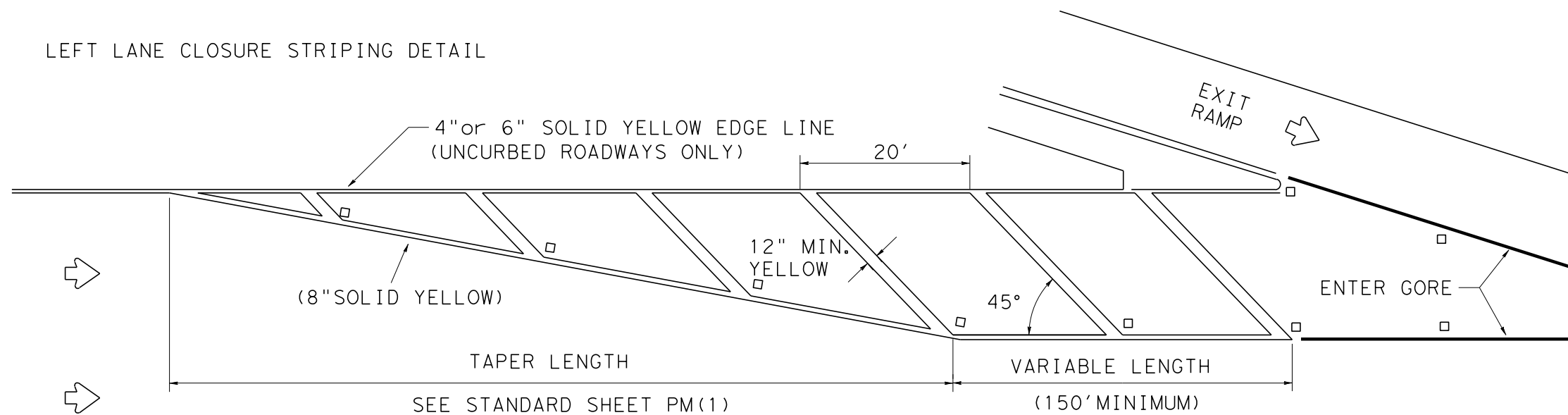
SIGNING AND PAVEMENT MARKING DETAILS
EXIT RAMPS-FRONTAGE ROAD

ER-FR(1)-09

FILE:	DN:	CK:	DW:	CK:
© TxDOT 1998	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS FEB., 2008 DEC., 2009	HOU	6		307
COUNTY	CONTROL	SECT	JOB	HIGHWAY
HARRIS	0389	13	039	SH 146



LEFT LANE CLOSURE STRIPING DETAIL



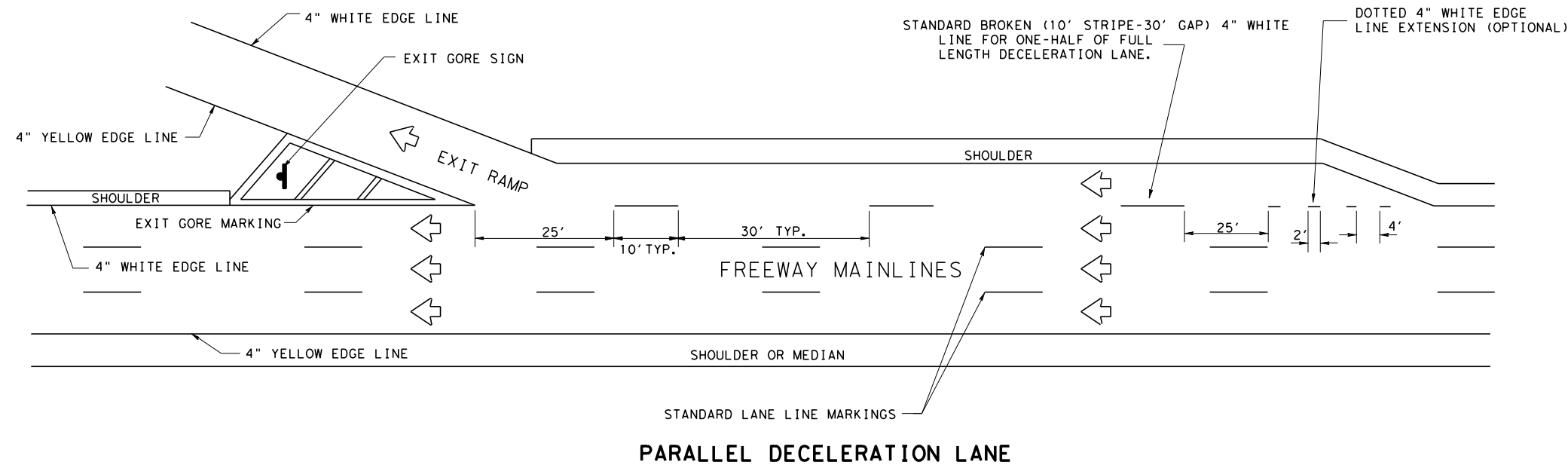
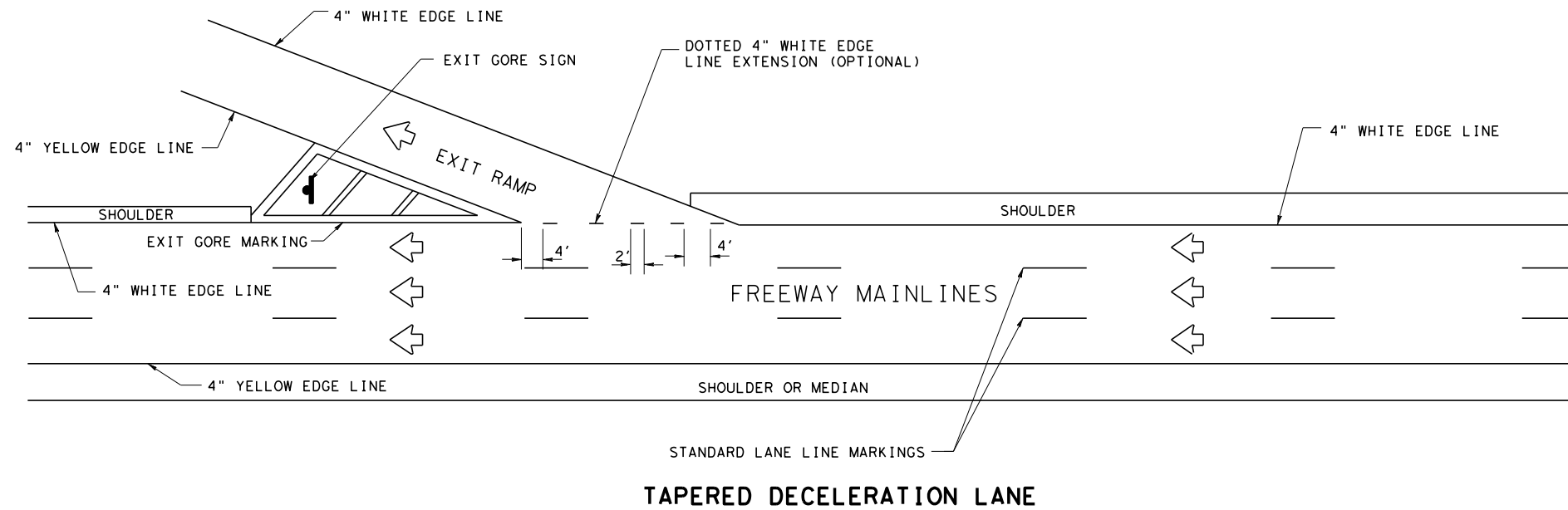
DRAWING SCALE: NONE



SIGNING AND PAVEMENT MARKING DETAILS
EXIT RAMPS-FRONTAGE ROAD

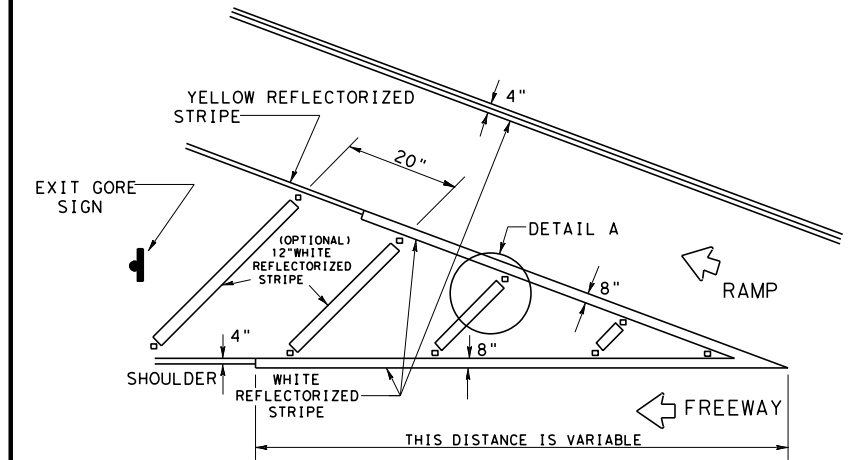
ER-FR(2)-09

FILE:	DN:	CK:	DW:	CK:
© TxDOT 1998	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS FEB., 2008 DEC., 2009	HOU	6		308
	COUNTY	CONTROL	SECT	JOB
	HARRIS	0389	13	039
				HIGHWAY
				SH 146



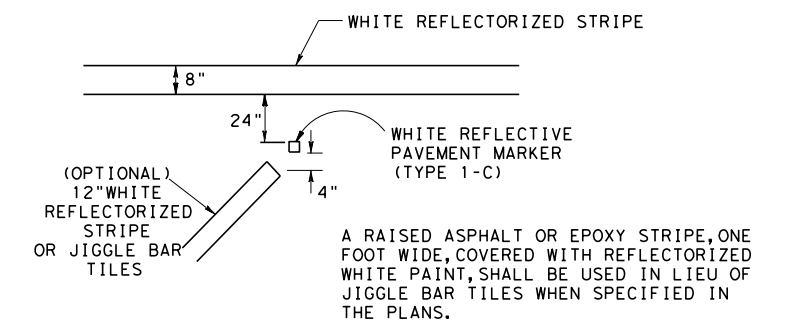
TYPICAL EXIT RAMP MARKINGS

THE ABOVE EXIT RAMP MARKINGS SHALL BE APPLIED ONLY ON ONE LANE EXIT RAMPS TO FRONTAGE ROAD OR TO CROSSING ROADS UNLESS OTHERWISE DIRECTED BY THE PLANS OR BY THE ENGINEER.



THE SHAPE OF THE GORE MARKING WILL VARY DEPENDING ON THE RAMP DESIGN AND WILL BE AS SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER.

TYPICAL EXIT RAMP GORE MARKING



DETAIL A



EXIT GORE PAVEMENT MARKINGS

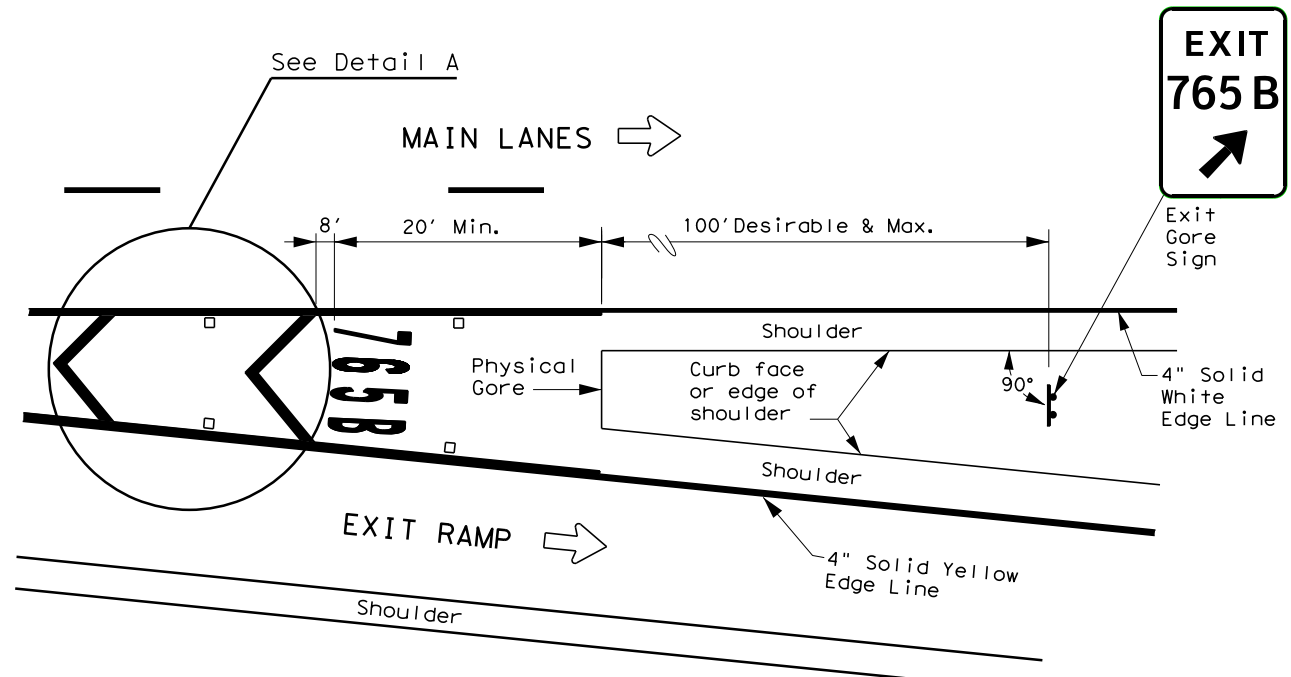
EGPM TC6001-04

FILE:	DN:	CK:	DW:	CK:
© TxDOT	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS	HOU	6		309
	COUNTY	CONTROL	SECT	JOB
	HARRIS	0389	13	039
			SH	146

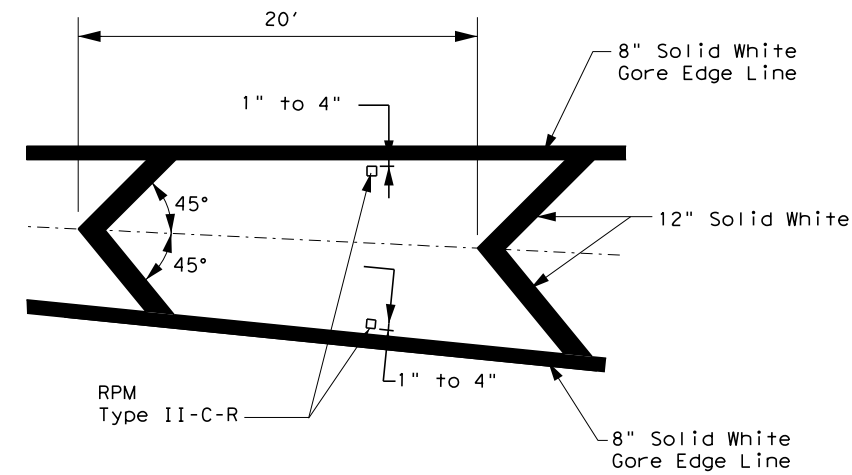
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EXIT NUMBER PAVEMENT MARKING NOTES

1. Minimum 8 foot white markings should be used, unless otherwise noted.
2. Spacing between letters and numbers should be approximately 4 inches.
3. Pavement markings are to be located as specified elsewhere in the plans.
4. All pavement marking materials shall meet the required Departmental Material Specifications or as specified in these plans.
5. Numbers and Letters details can be found in the Standard Highway Design for Texas (SHSD) Chapter 12 at <http://www.txdot.gov>



MARKINGS WITH EXIT NUMBER



NOTES

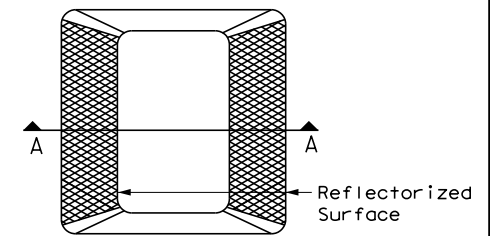
1. Raised pavement markers shall be centered between chevron or gore lines.
2. For more information, see ReflectORIZED Raised Pavement Marker Detail.

DETAIL A

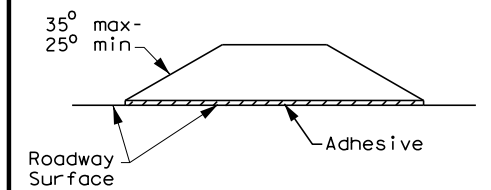
MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

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

LEGEND	
←	Traffic flow
□	ReflectORIZED Raised Markers (RPM) Type II-C-R



Type II (Top View)



SECTION A

REFLECTORIZED RAISED PAVEMENT MARKER (RPM)

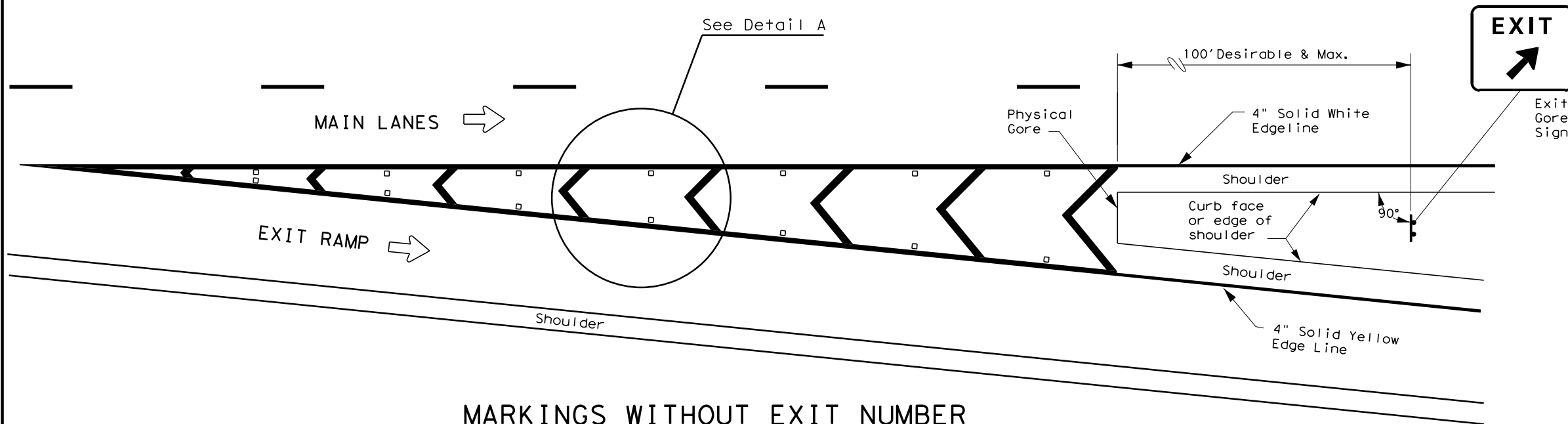


EXIT GORE PAVEMENT MARKINGS

FPM(5) - 19

FILE: fpm(5)-19.dgn	DN:	CK:	DW:	CK:
© TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0389	13	039	SH 146
	DIST	COUNTY	SHEET NO.	
	HOU	HARRIS	310	

MARKINGS WITHOUT EXIT NUMBER



DATE:
FILE:

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DATE: FILE:

REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS				DELINEATORS				D & OM DESCRIPTIVE CODES	
DEVICE	SIZE 1	SIZE 2	SIZE 3	SIZE 4	SINGLE		DOUBLE		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
						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 (fix). 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.			
				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	

OBJECT MARKERS								D & OM DESCRIPTIVE CODES	
DEVICE	Type 1 (OM-1)	Type 2 (OM-2)			Type 3 (OM-3)			Type 4 (OM-4)	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 unit (Type 2 only) Y = 1-Size 3 reflector unit (Type 2 only) Z = 3-Size 1 or 1-Size 4 reflector unit (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
		OM-1	OM-2X	OM-2Y	OM-2Z	OM-3L	OM-3R	OM-3C	
SHEETING Yellow-Type B _{FL} or C _{FL} Sheeting		SHEETING Yellow - Type B or C Sheeting			SHEETING Alternating acrylic black and retroreflective yellow - Type B _{FL} or C _{FL} Sheeting			SHEETING Red -Type B _{FL} or C _{FL} Sheeting	
POST TYPE TWT		POST TYPE WC WC WFLX			POST TYPE TWT			POST TYPE TWT	
MOUNT TYPE WAS, WAP		MOUNT TYPE GND GND GND, SRF			MOUNT TYPE WAS, WAP			MOUNT TYPE WAS, WAP	

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

BARRIER REFLECTORS (BRF)			CHEVRONS				ONE DIRECTION LARGE ARROW		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.
DEVICE 	SIZE (W x L) 18" x 24" (Conventional) 24" x 30" (Conventional Oversize) 30" x 36" (Expressway) 36" x 48" (Freeway)	MOUNTING HEIGHT 4'-0" or 7'-0"	DEVICE 		SIZE (W x L) 48" x 24" (Conventional) 60" x 30" (Expressway & Freeway)	MOUNTING HEIGHT 7'-0"	DEVICE 	Texas Department of Transportation Traffic Safety Division Standard	
SHEETING Yellow, White, Red 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.			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).		DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION D & OM(1)-20		FILE: dom1-20.dgn DN: TxDOT CK: TxDOT DW: TxDOT CK: TxDOT © TxDOT August 2004 REVISIONS 0389 13 039 SH 146 10-09 3-15 4-10 7-20 DIST COUNTY SHEET NO. HOU HARRIS 311		

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POST TYPE AND SUPPORT FOUNDATION DETAILS				TYPE OF BARRIER MOUNTS		
WING CHANNEL (WC)	FLEXIBLE POSTS (YFLX, WFLX)		WEDGE ANCHOR SYSTEMS		GUARD FENCE ATTACHMENT	
GND	GND	SRF	WAS	WAP	GF 1	
	EMBEDDED	SURFACE MOUNT	STEEL	PLASTIC	GF 2	
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.		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.		NOTE 1. Install per manufacturer's recommendations.		

TYPE OF BARRIER MOUNTS	
GUARD FENCE ATTACHMENT	
GF 1	GF 2
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	0389	13	039	SH 146
10-09 3-15	DIST	COUNTY	SHEET NO.	
4-10 7-20	HOU	HARRIS	312	

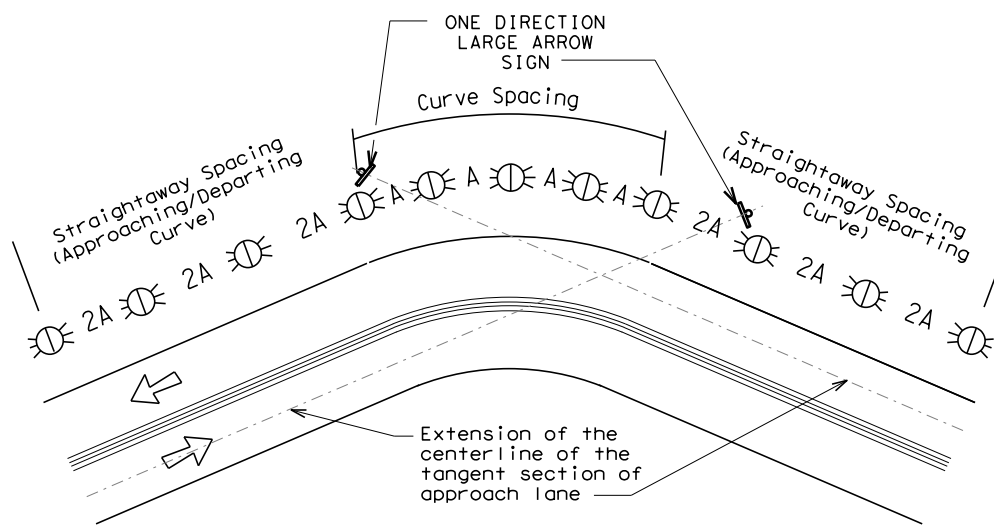
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MINIMUM WARNING DEVICES AT CURVES WITH ADVISORY SPEEDS

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

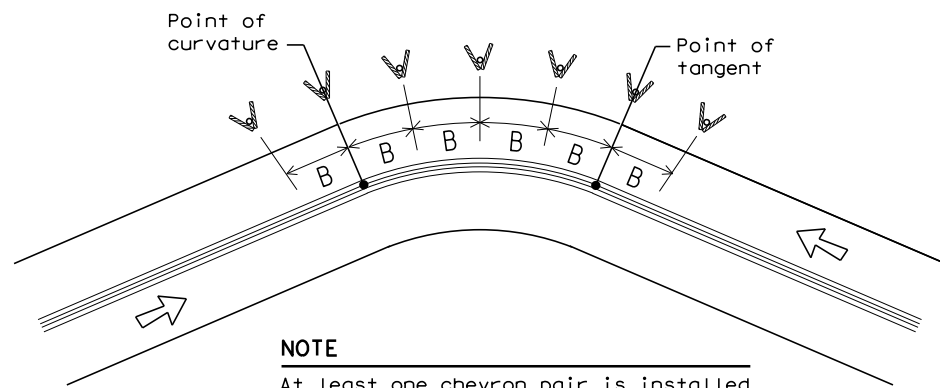
SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



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

- 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.
- Barrier reflectors may be used to replace required delineators.
- Single red delineators may be mounted on the back side of delineator posts for wrong way driver applications

LEGEND	
	Bi-directional Delineator
	Delineator
	Sign



DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(3)-20

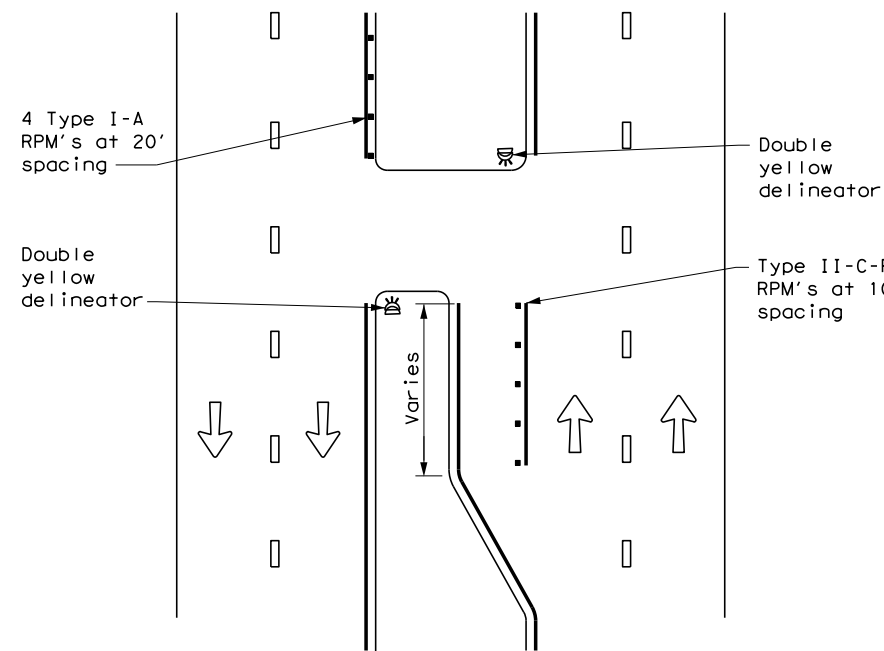
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© TXDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0389	13	039	SH 146
3-15 8-15	DIST	COUNTY	SHEET NO.	
8-15 7-20	HOU	HARRIS	313	

DATE:
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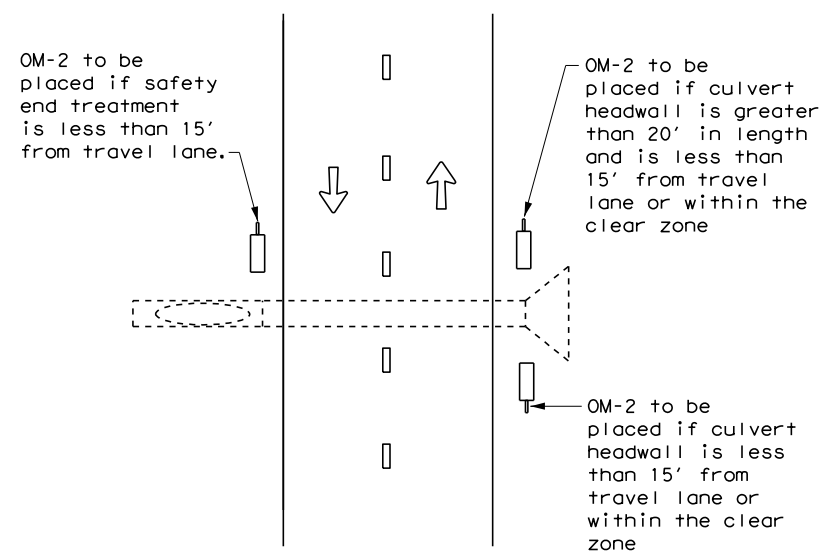
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FILE:

CROSSOVERS



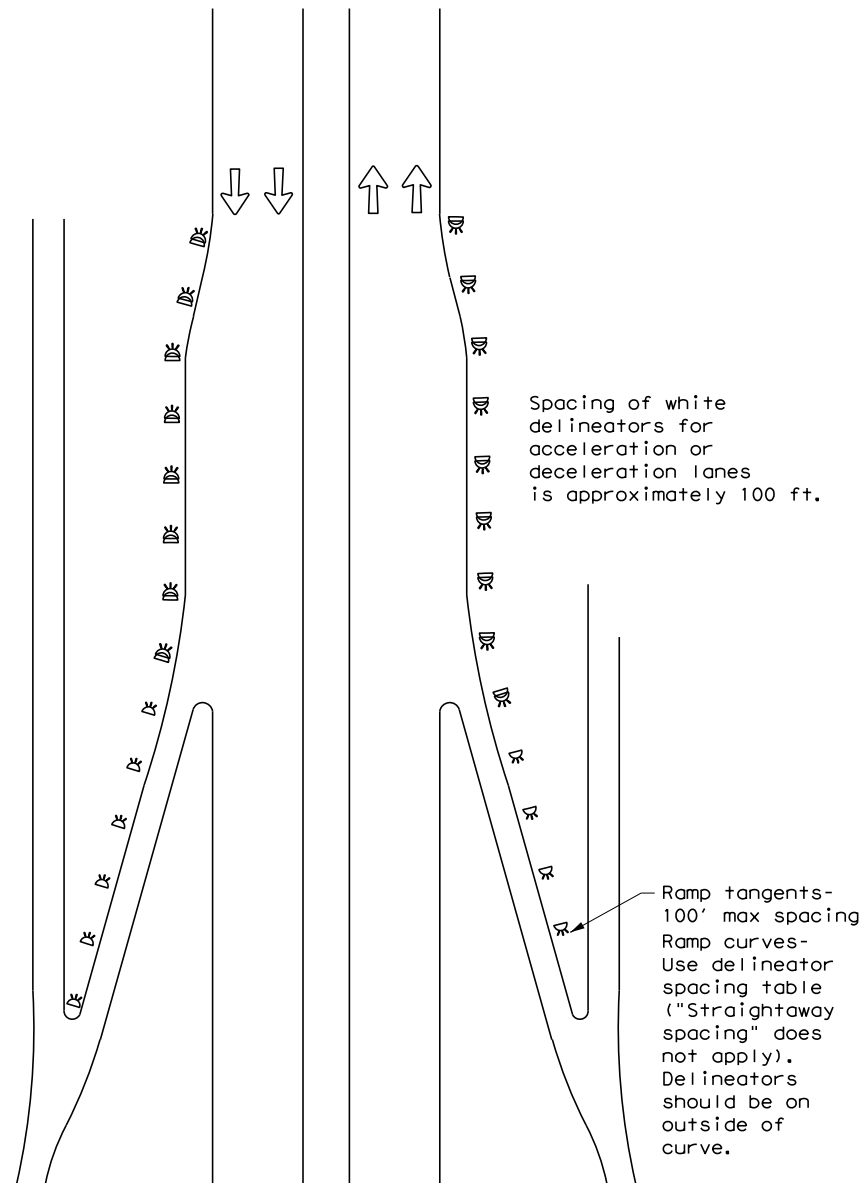
DETAIL 1

FOR CULVERTS WITHOUT MBGF



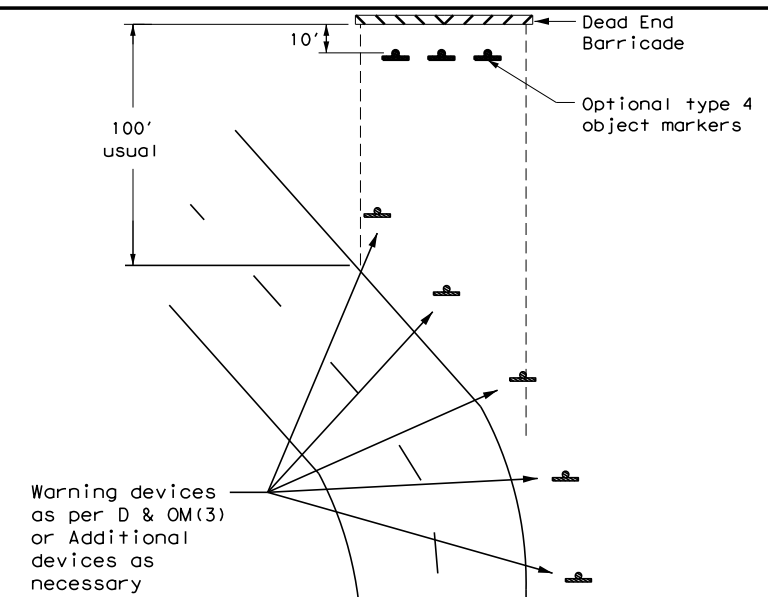
DETAIL 2

FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES



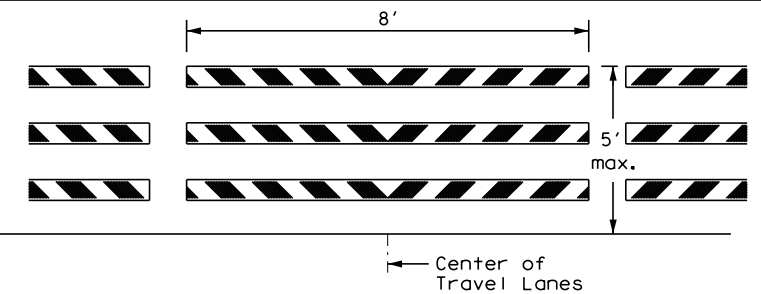
DETAIL 3

TYPICAL APPLICATION OF DEAD END BARRICADE



DETAIL 4

TYPICAL DEAD END BARRICADE INSTALLATION



NOTES

- Barricade striping shall be red and white reflective sheeting for all permanent road closures.
- Barricade striping is red and white sloping toward the center of the roadway.
- 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

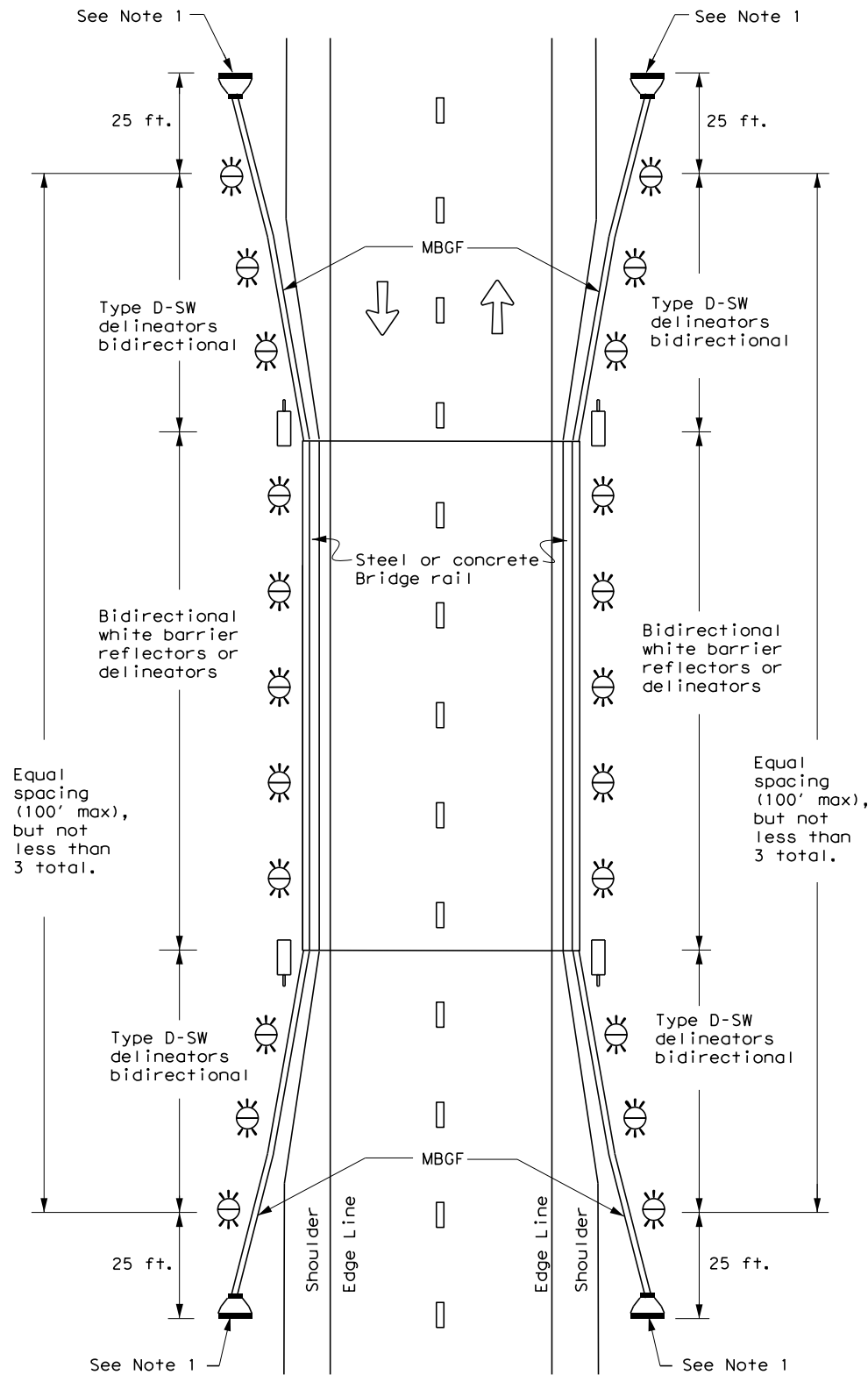


DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(4) -20

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REVISIONS	0389	13	039	SH 146
3-15	DIST	COUNTY	SHEET NO.	
7-20	HOU	HARRIS	314	

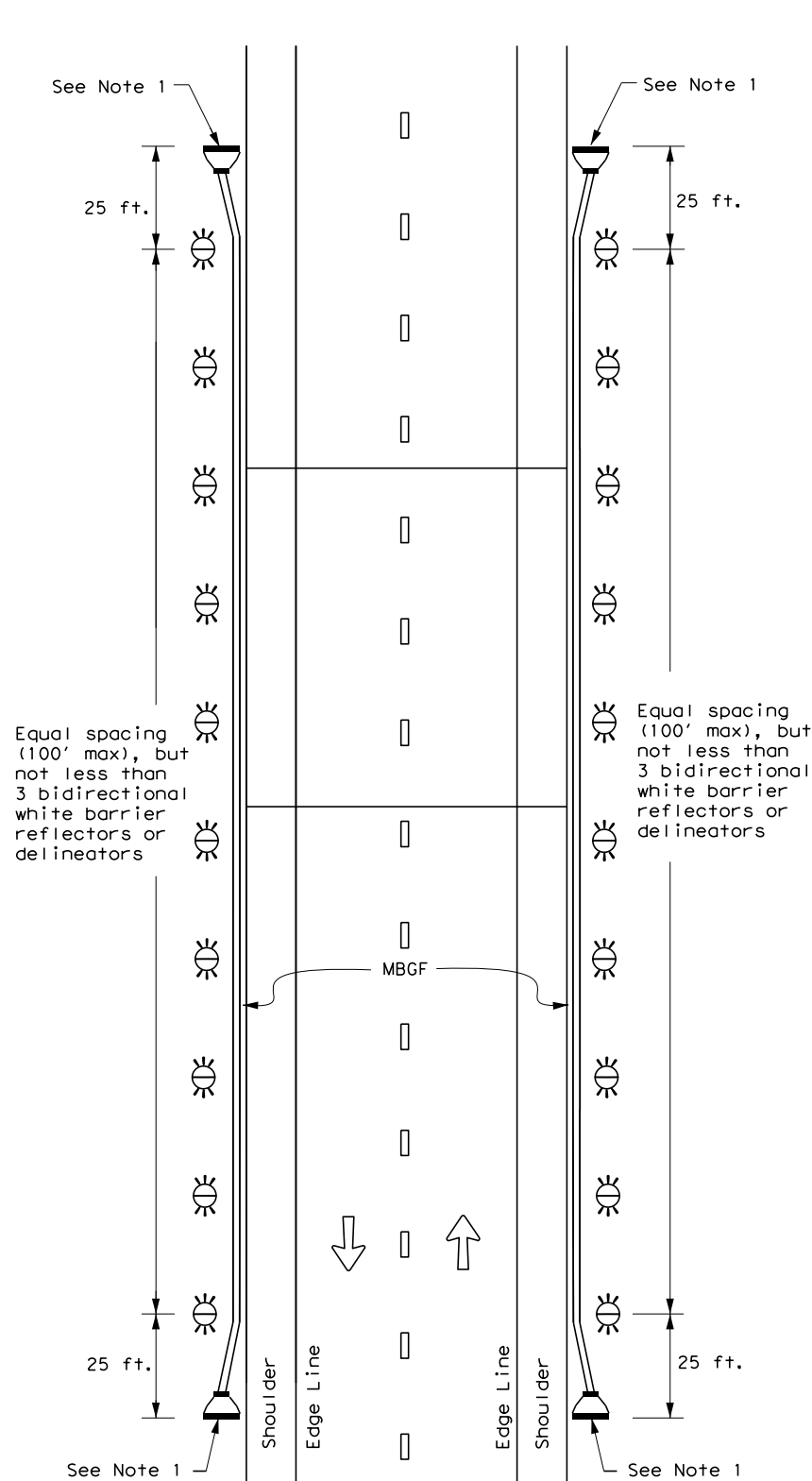
**TWO-WAY, TWO LANE ROADWAY
WITH REDUCED WIDTH APPROACH RAIL**



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.

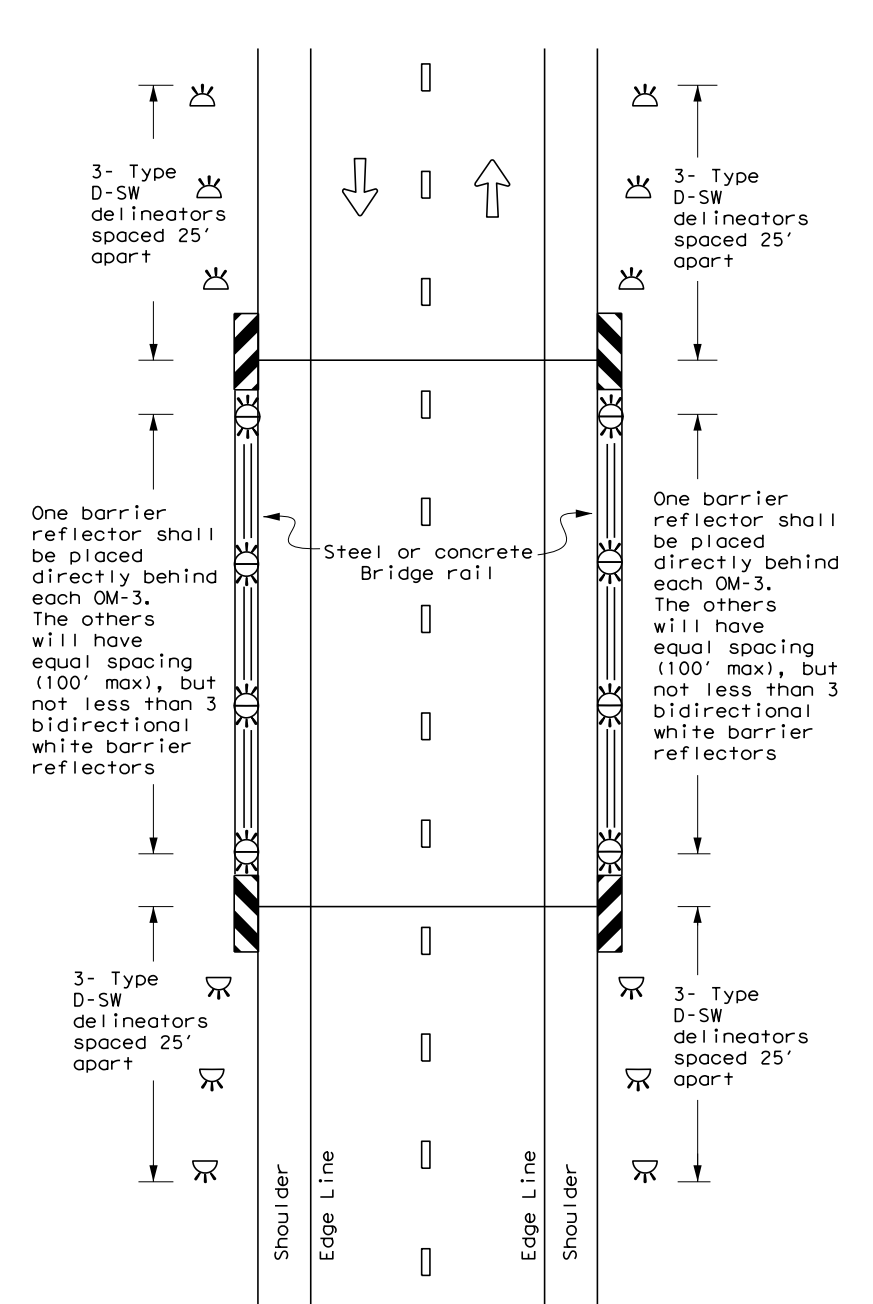
**TWO-WAY, TWO LANE ROADWAY
WITH METAL BEAM GUARD FENCE (MBGF)**



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



**DELINEATOR &
OBJECT MARKER
PLACEMENT DETAILS**

D & OM(5) - 20

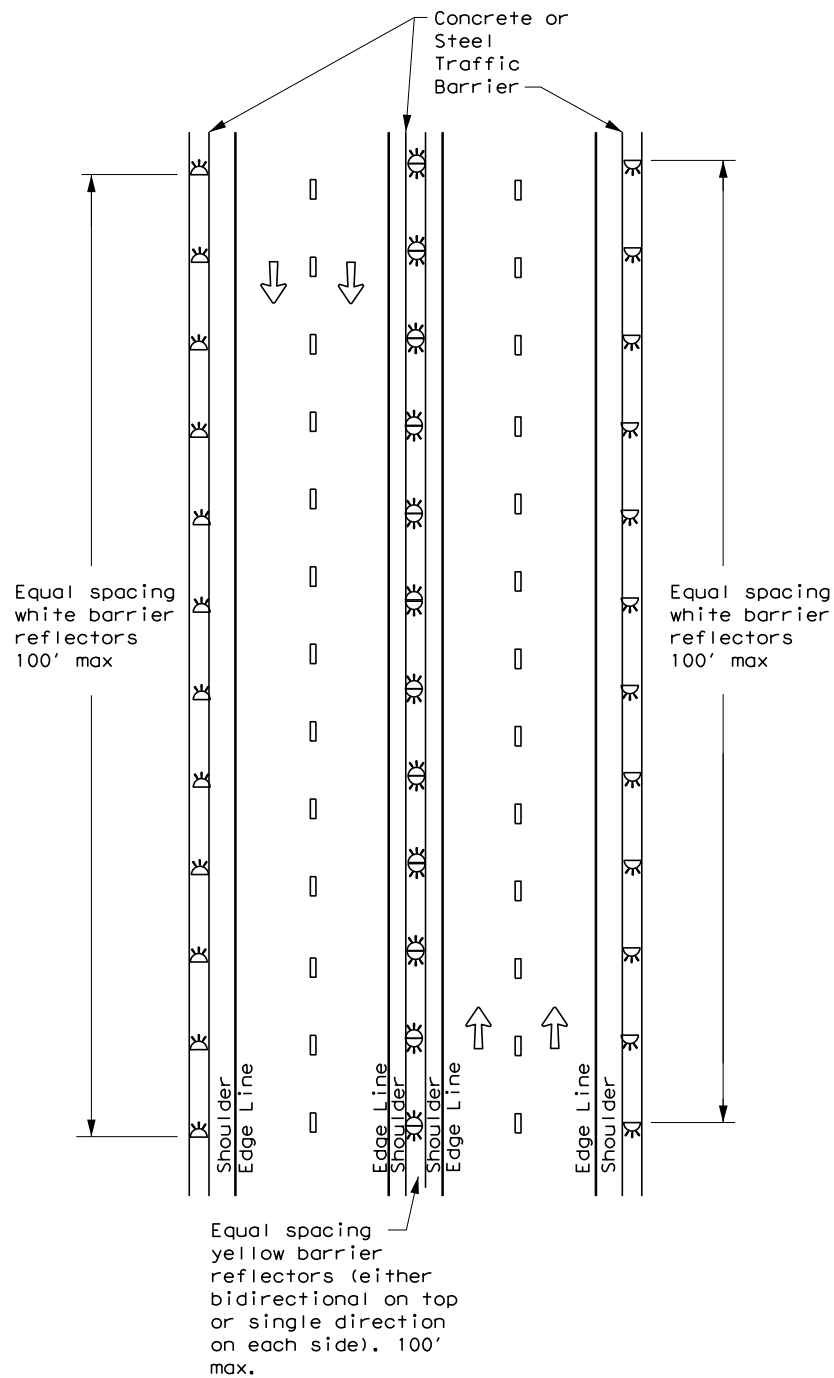
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REVISIONS	0389	13	039	SH 146
7-20	DIST	COUNTY	SHEET NO.	
	HOU	HARRIS	315	

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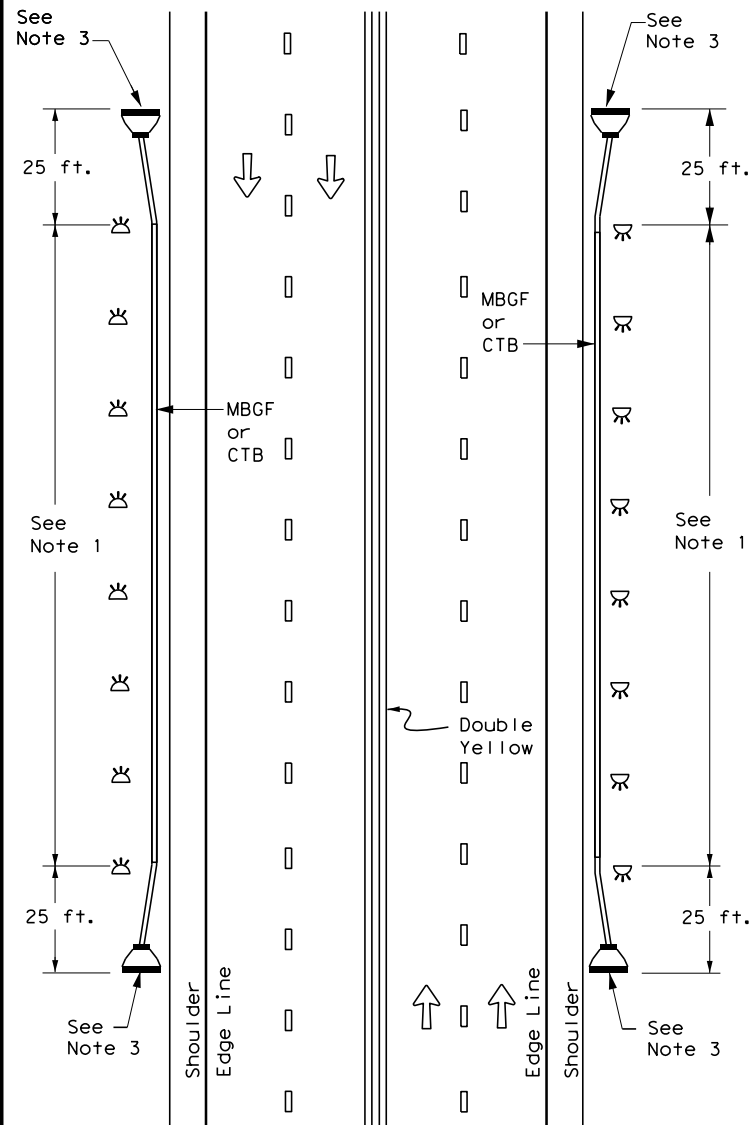
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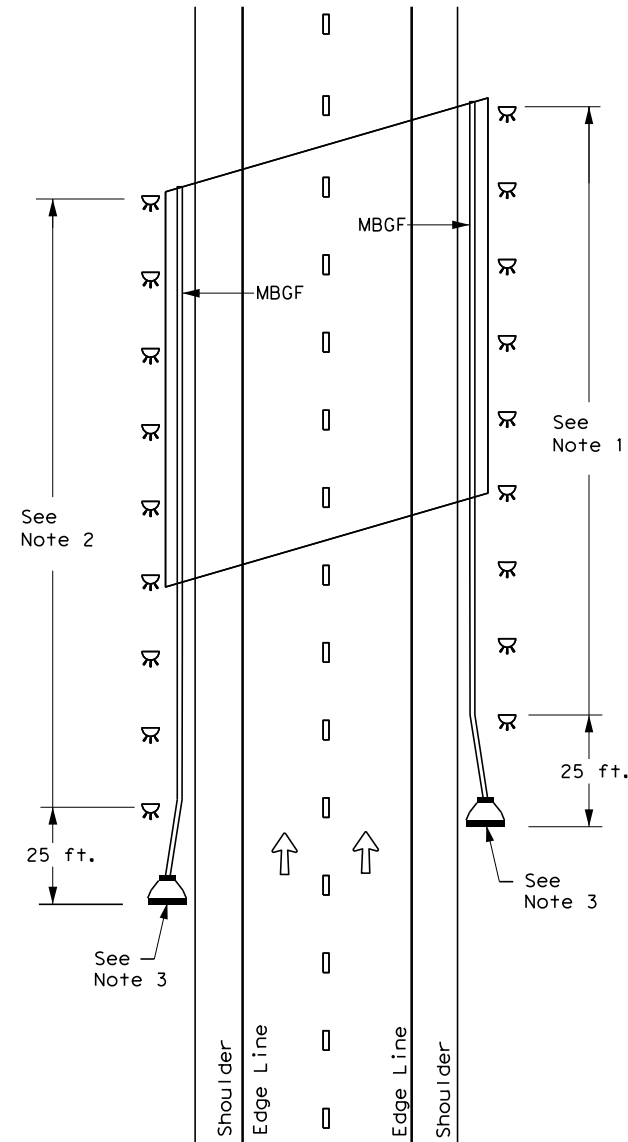
CONTINUOUS CONCRETE OR STEEL BARRIER



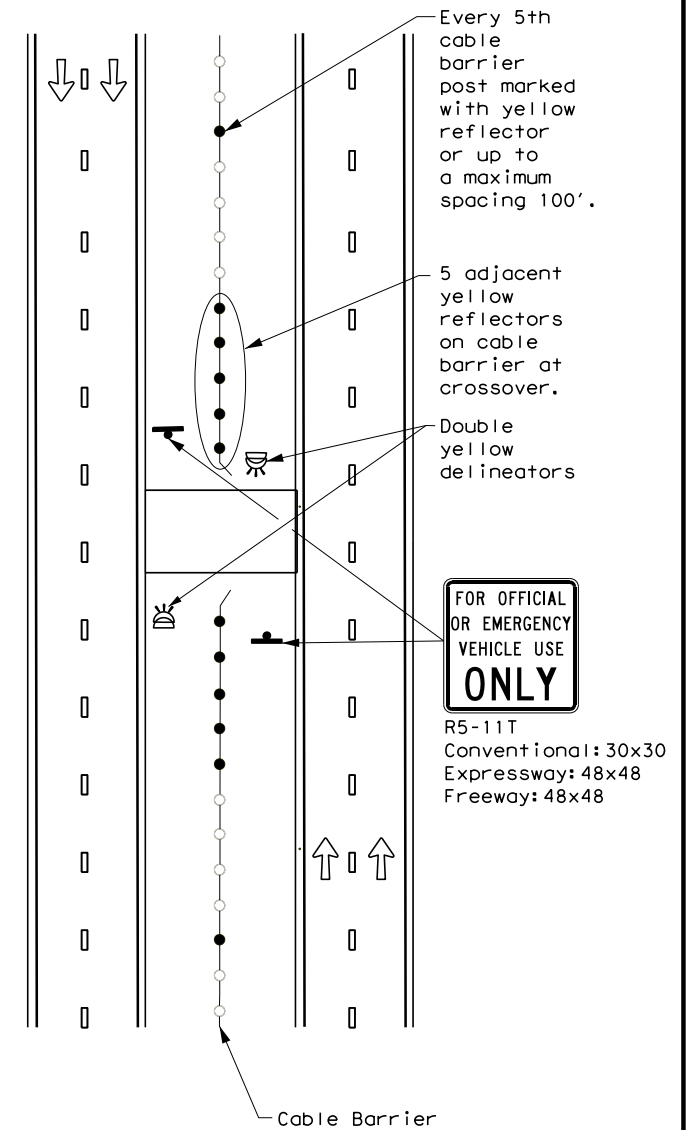
MULTI-LANE UNDIVIDED, TWO-WAY ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



DIVIDED ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



EMERGENCY CROSSOVER



NOTES

1. Equal spacing (100' max), but not less than 3 single directional white barrier reflectors or delineators. On Continuous Barrier, equal spacing (100' max.)
2. Equal spacing (100' max), but not less than 3 single directional yellow barrier reflectors or delineators.
3. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

LEGEND

	Bidirectional Delineator
	Delineator
	OM-3
	OM-2
	Terminal End
	Traffic Flow



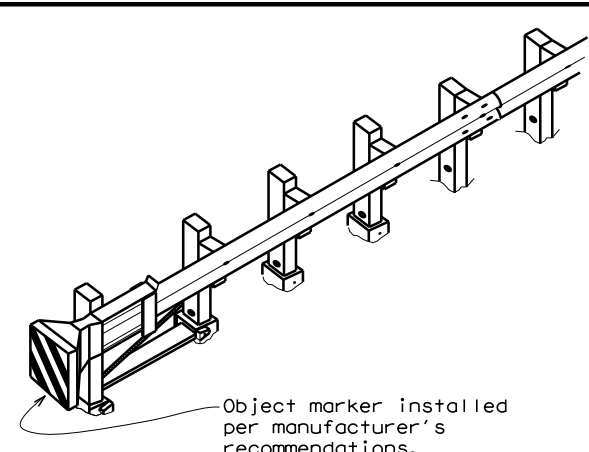
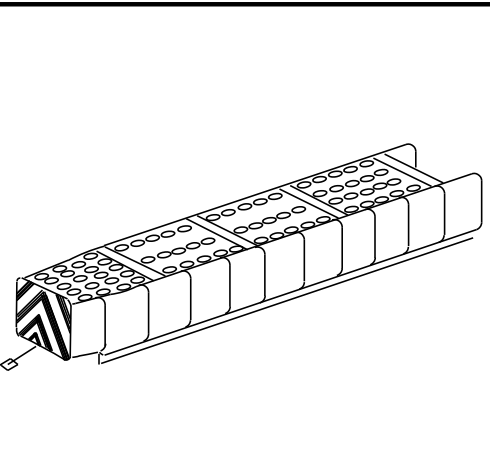
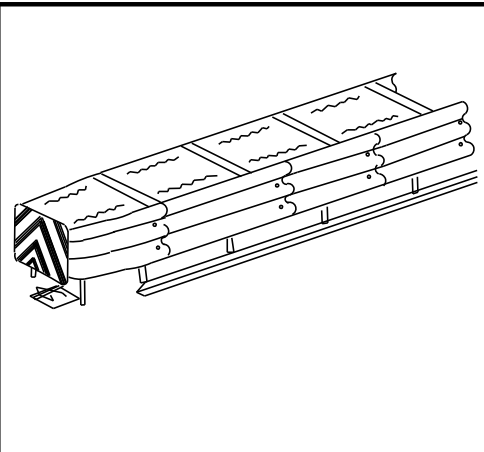
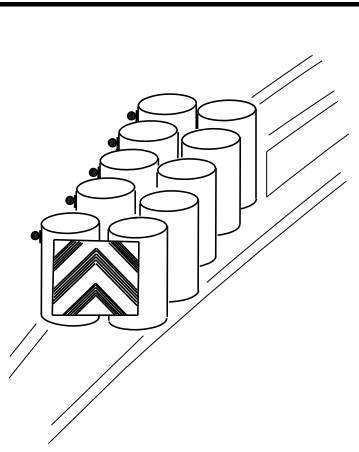
DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(6) - 20

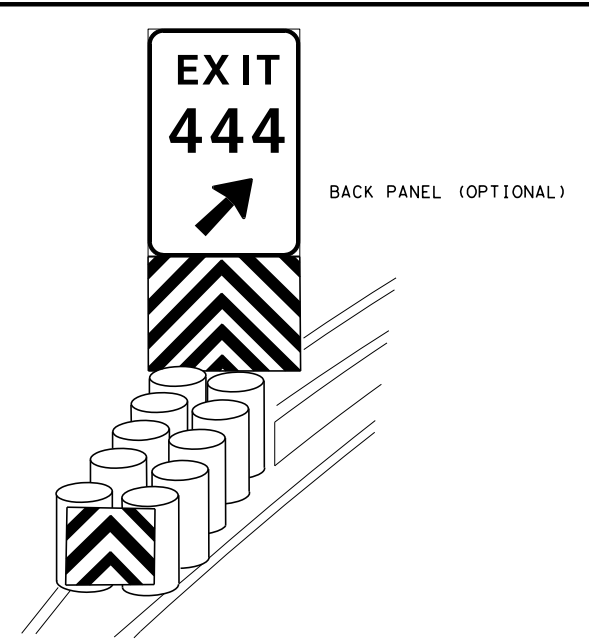
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REVISIONS	0389	13	039	SH 146
7-20	DIST	COUNTY	SHEET NO.	
	HOU	HARRIS	316	

DATE:
FILE:

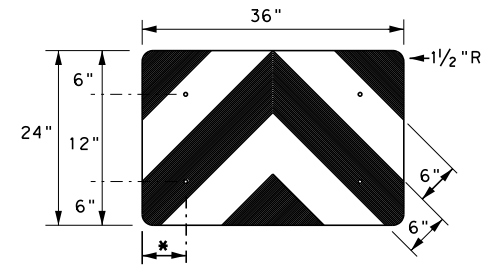
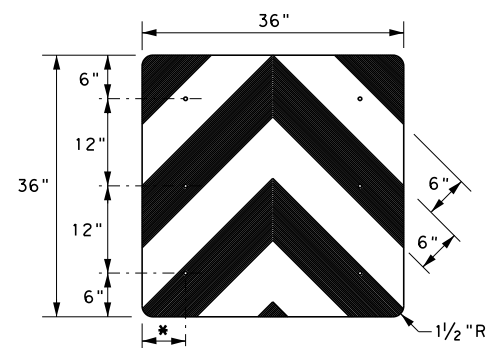
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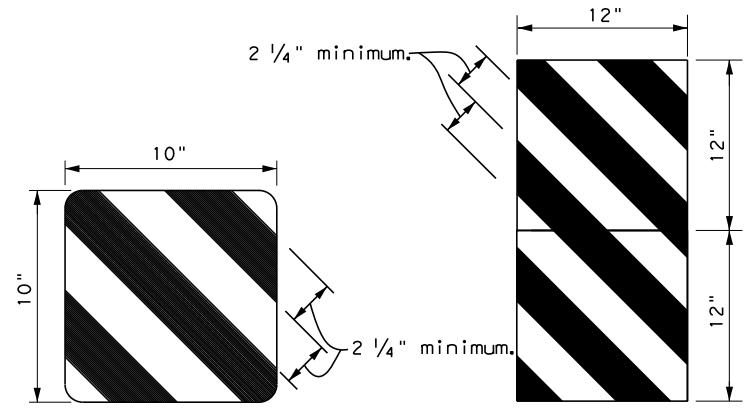
Object marker installed per manufacturer's recommendations.



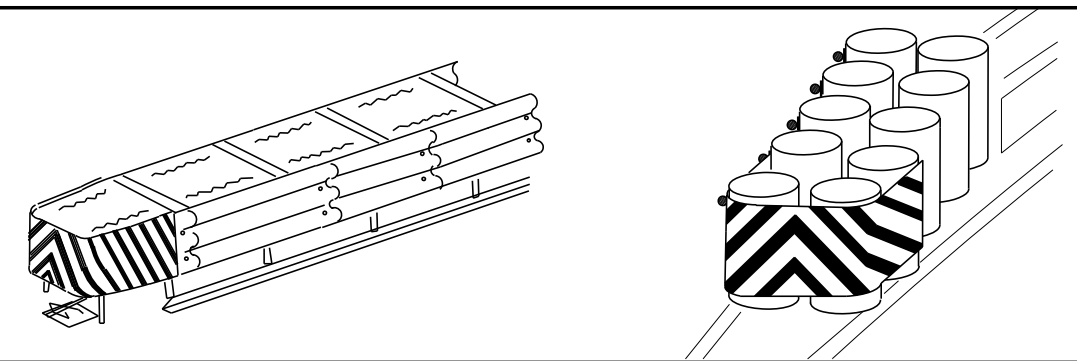
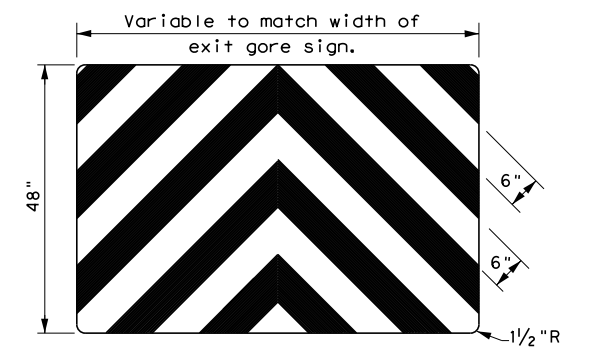
BACK PANEL (OPTIONAL)



* Adjust to fit attenuator per manufacturer's recommendation, or as directed by the Engineer

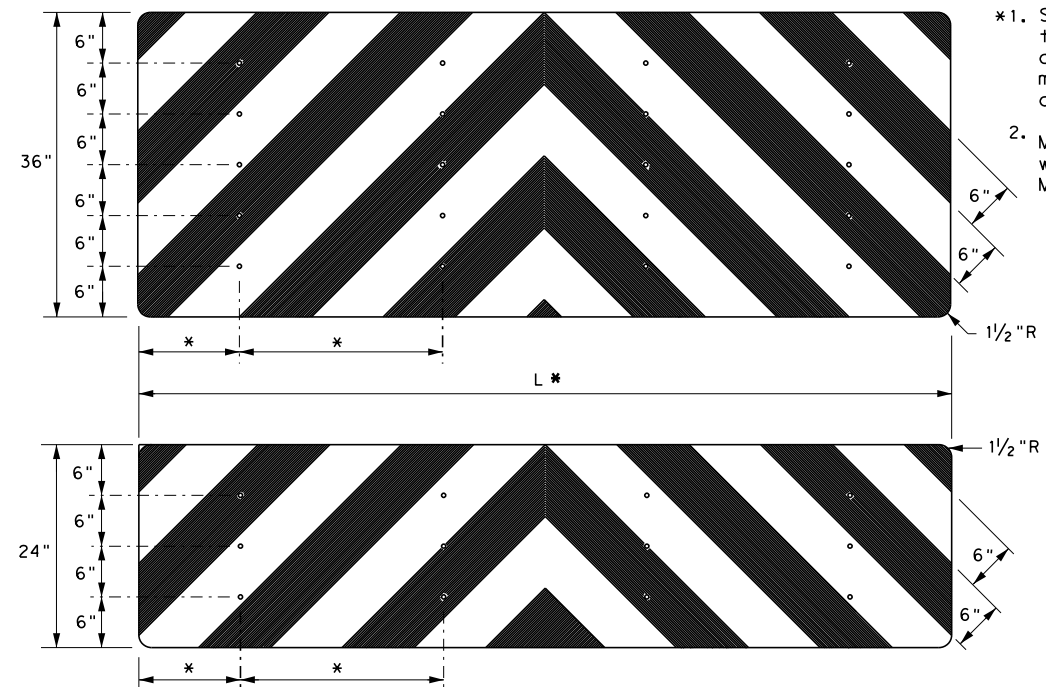


OBJECT MARKERS SMALLER THAN 3 FT²



NOTES

- *1. Spacing should be adjusted to attach through centerline of drum, per attenuator manufacturer's recommendation, or as directed by the Engineer.
- 2. Mounting should be flush with top of attenuator. Minimum size 96" x 24".



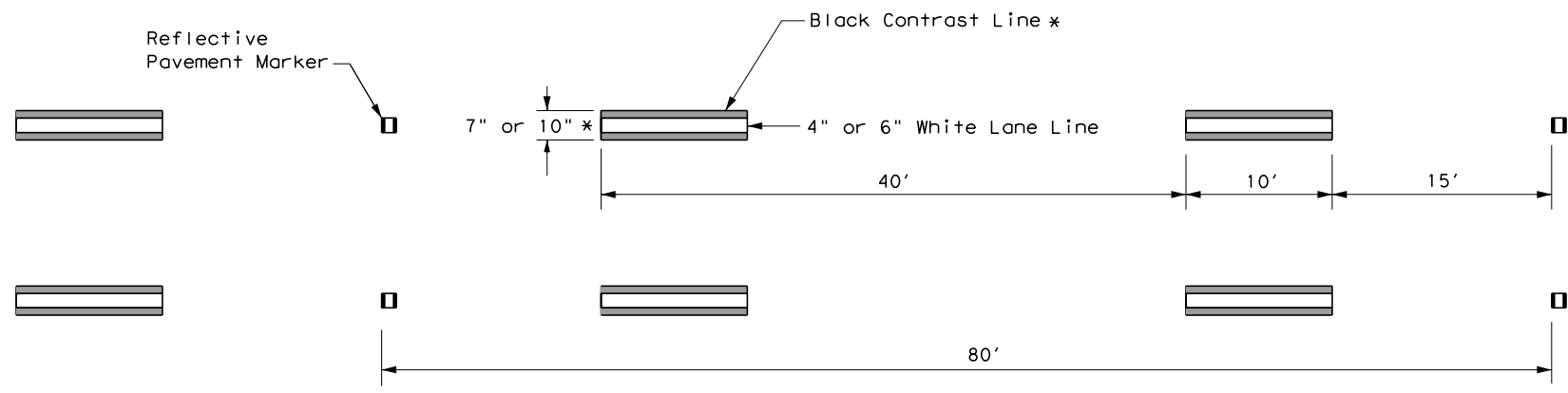
NOTES

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 1/4".
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.

		Traffic Safety Division Standard	
DELINEATOR & OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS D & OM(VIA) -20			
FILE: domvia20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
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REVISIONS		0389 13	039 SH 146
4-92 8-04	DIST	COUNTY	SHEET NO.
8-95 3-15	HOU	HARRIS	317
4-98 7-20			
20G			

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CONTRAST LANE LINE DESIGN

* See contrast line dimensions table for width of black line.

CONTRAST LINE DIMENSIONS		
White	Black (per side)	Total Width
4"	1.5"	7"
6"	2"	10"

GENERAL NOTES

1. Contrast and Shadow markings may only be used on concrete pavements.
2. Contrast and Shadow markings shall not be used on edge lines.
3. Contrast lane lines shall be permanent prefabricated pavement markings meeting DMS 8240.
4. Shadow lane line designs shall be a liquid markings system approved by TxDOT.
5. All raised reflective pavement markers placed in broken lines shall be placed in line with and midway between the white stripes.
6. See PM(2) for raised reflective pavement markings installation details.

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

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

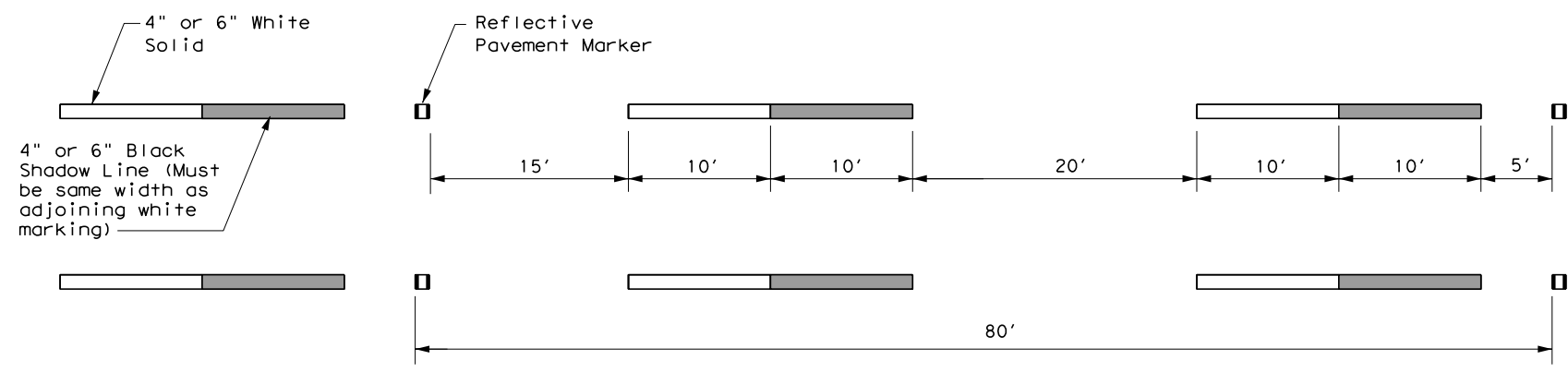


CONTRAST AND SHADOW PAVEMENT MARKINGS

CPM(1) - 14

FILE: CPM(1)14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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	DIST	COUNTY	SHEET NO.	
	HOU	HARRIS	318	

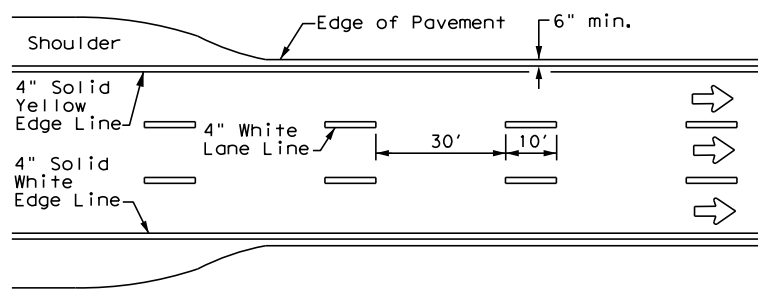
DATE:
FILE:



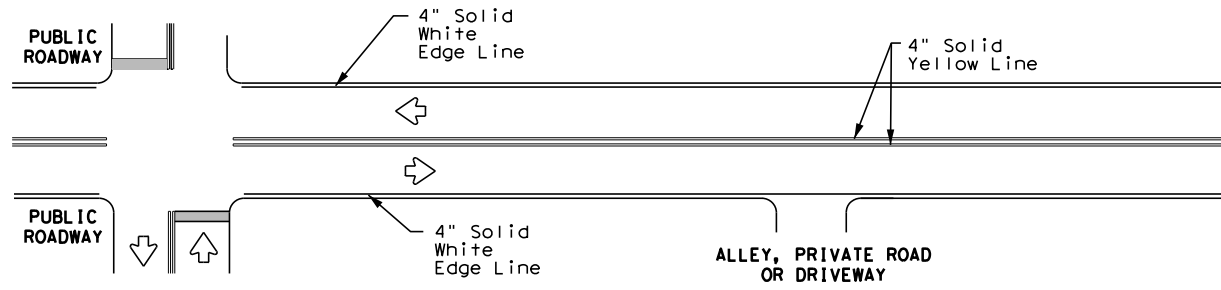
SHADOW LANE LINE DESIGN

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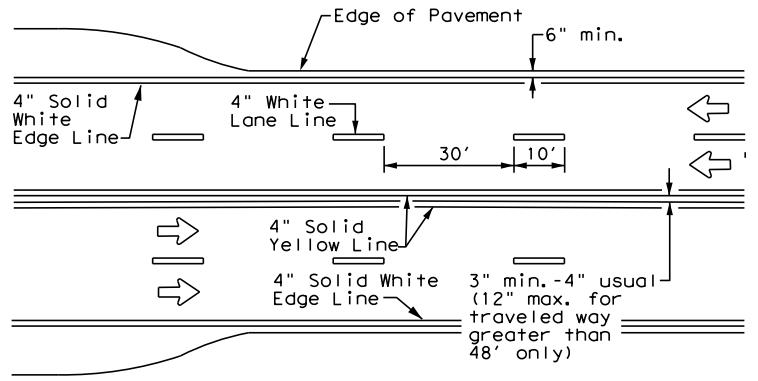
DATE: FILE:



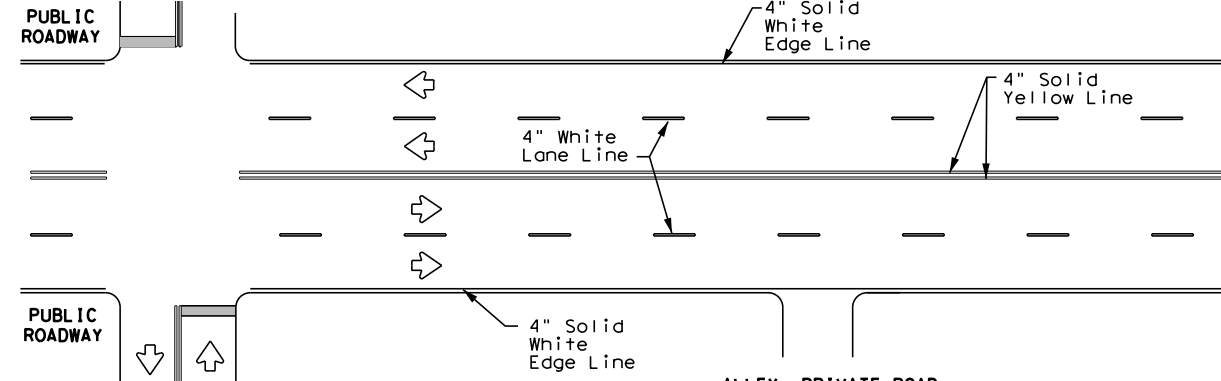
**EDGE LINE AND LANE LINES
ONE-WAY ROADWAY
WITH OR WITHOUT SHOULDERS**



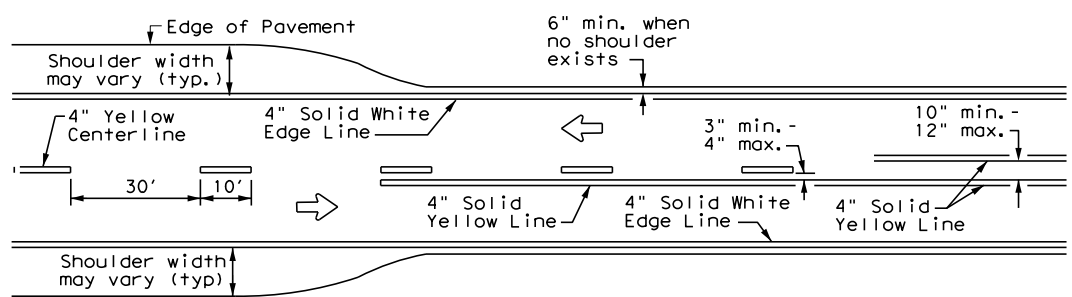
**TYPICAL TWO-LANE, TWO-WAY PAVEMENT
MARKINGS THROUGH INTERSECTIONS**



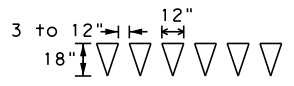
**CENTERLINE AND LANE LINES
FOUR LANE TWO-WAY ROADWAY
WITH OR WITHOUT SHOULDERS**



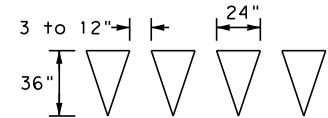
**TYPICAL MULTI-LANE, TWO-WAY PAVEMENT
MARKINGS THROUGH INTERSECTIONS**



**TWO LANE TWO-WAY ROADWAY
WITH OR WITHOUT SHOULDERS**

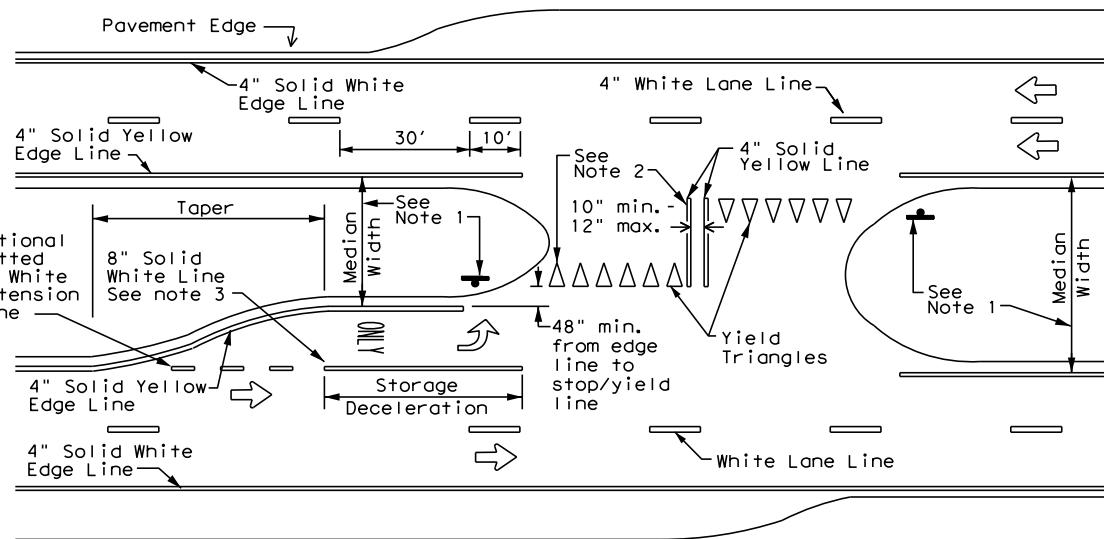


For posted speed on road being marked equal to or less than 40 MPH.



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

YIELD LINES



FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTES

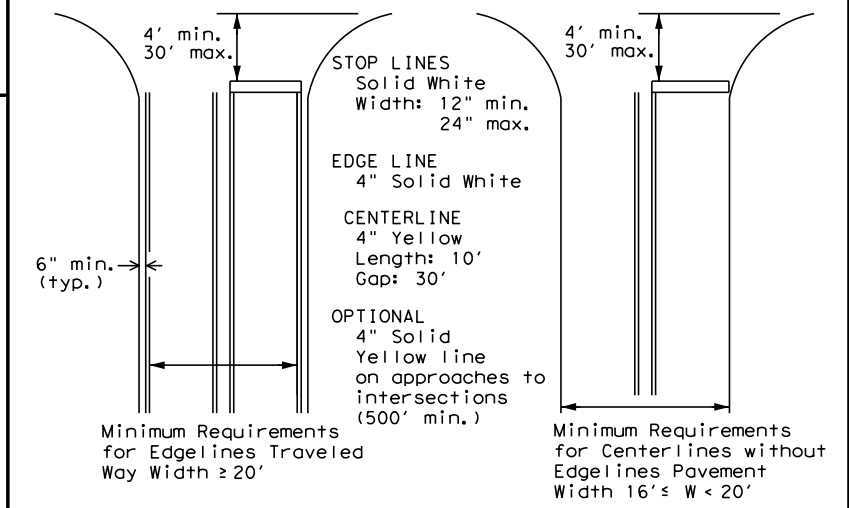
- Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections. Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling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

- Edgeline striping shall be as shown in the plans or as directed by the Engineer. The edgeline should not be placed 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.
- 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



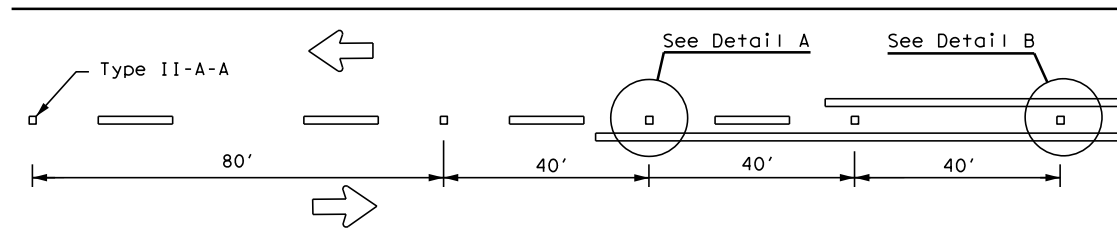
**TYPICAL STANDARD
PAVEMENT MARKINGS**

PM(1) - 20

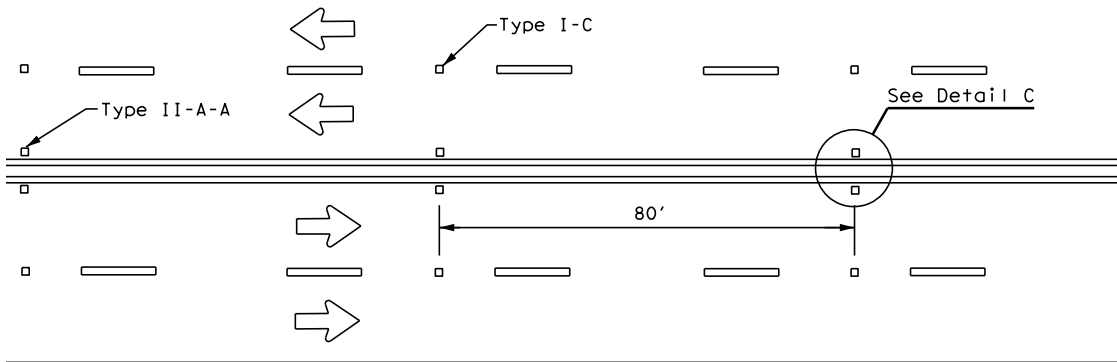
FILE: pm1-20.dgn	DN:	CK:	DW:	CK:
© TxDOT November 1978	CONT	SECT	JOB	HIGHWAY
8-95 3-03 REVISIONS	0389	13	039	SH 146
5-00 2-12	DIST	COUNTY	SHEET NO.	
8-00 6-20	HOU	HARRIS	319	

REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE

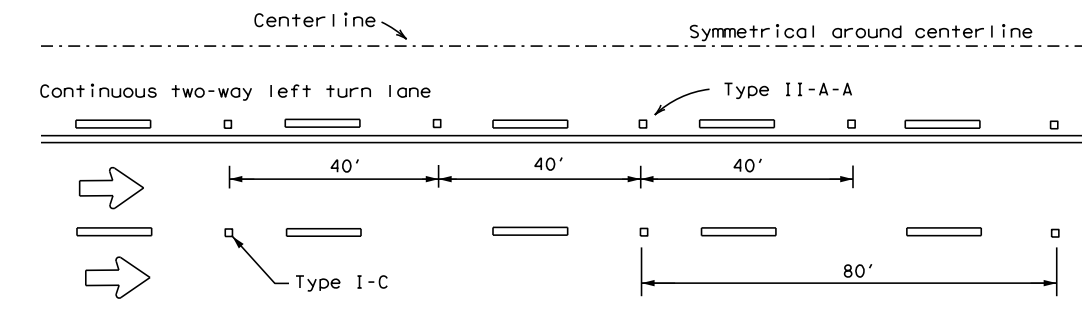
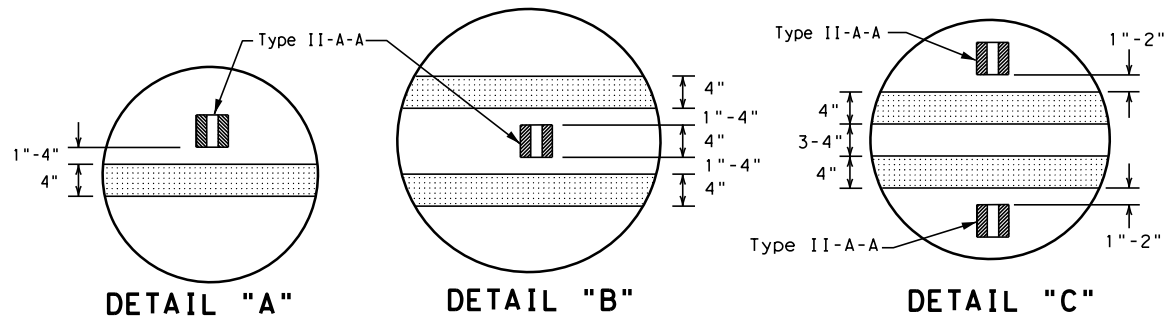
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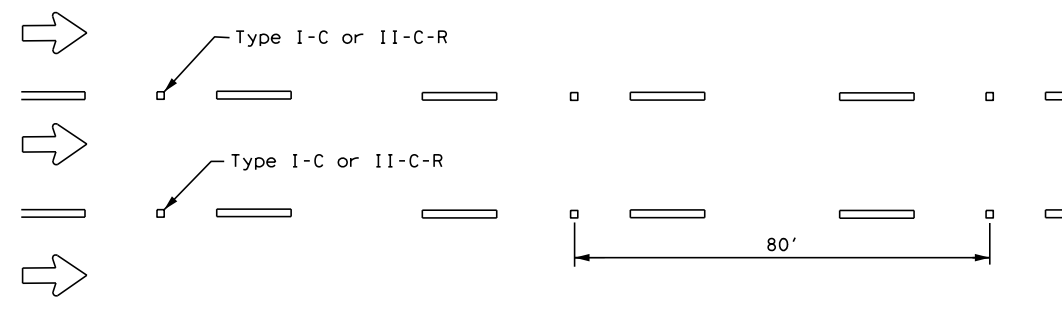
CENTERLINE FOR ALL TWO LANE ROADWAYS



**CENTERLINE & LANE LINES
FOR FOUR LANE TWO-WAY HIGHWAYS**



CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE

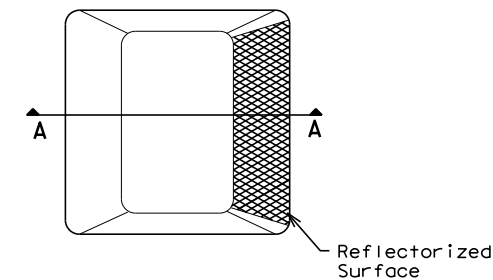


LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

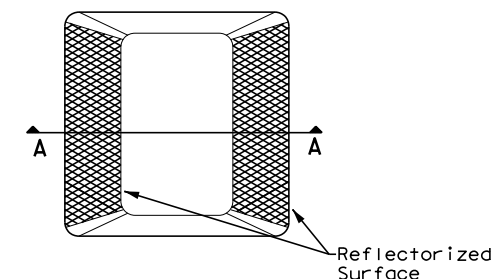
Raised pavement markers Type II-C-R shall have clear face toward normal traffic and red face toward wrong-way traffic.

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

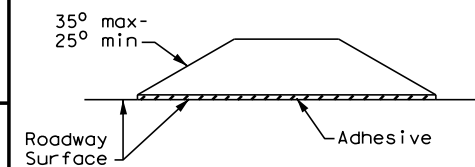
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)



Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS

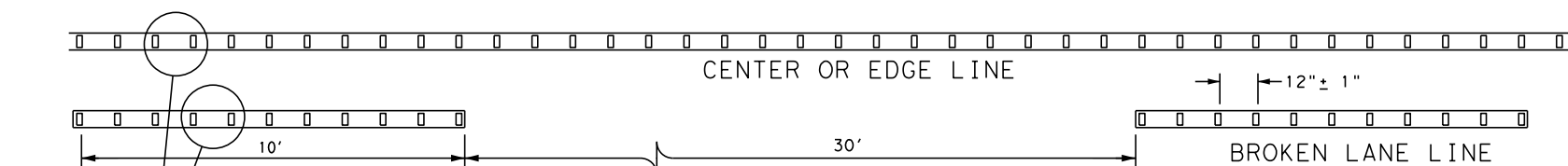


POSITION GUIDANCE USING RAISED MARKERS REFLECTORIZED PROFILE MARKINGS PM(2) - 20

FILE: pm2-20.dgn	DN:	CK:	DW:	CK:
© TxDOT April 1977	CONT	SECT	JOB	HIGHWAY
4-92 2-10 REVISIONS	0389	13	039	SH 146
5-00 2-12	DIST	COUNTY	SHEET NO.	
8-00 6-20	HOU	HARRIS	320	

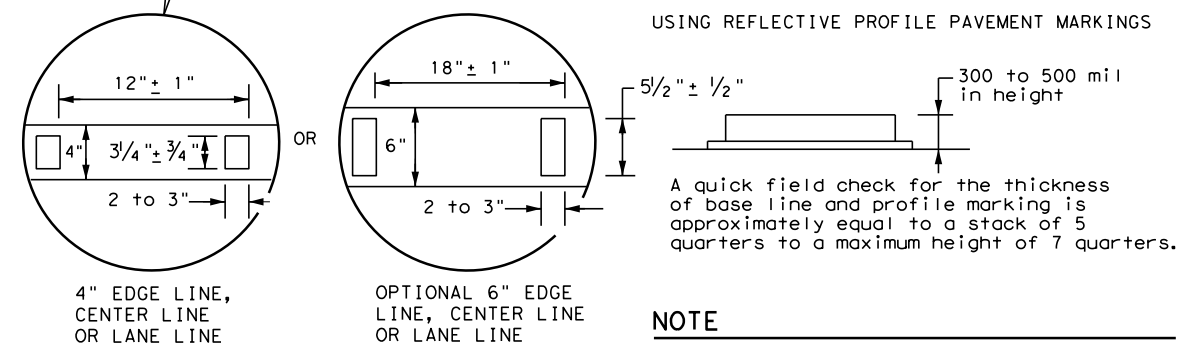
GENERAL NOTES

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



REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS

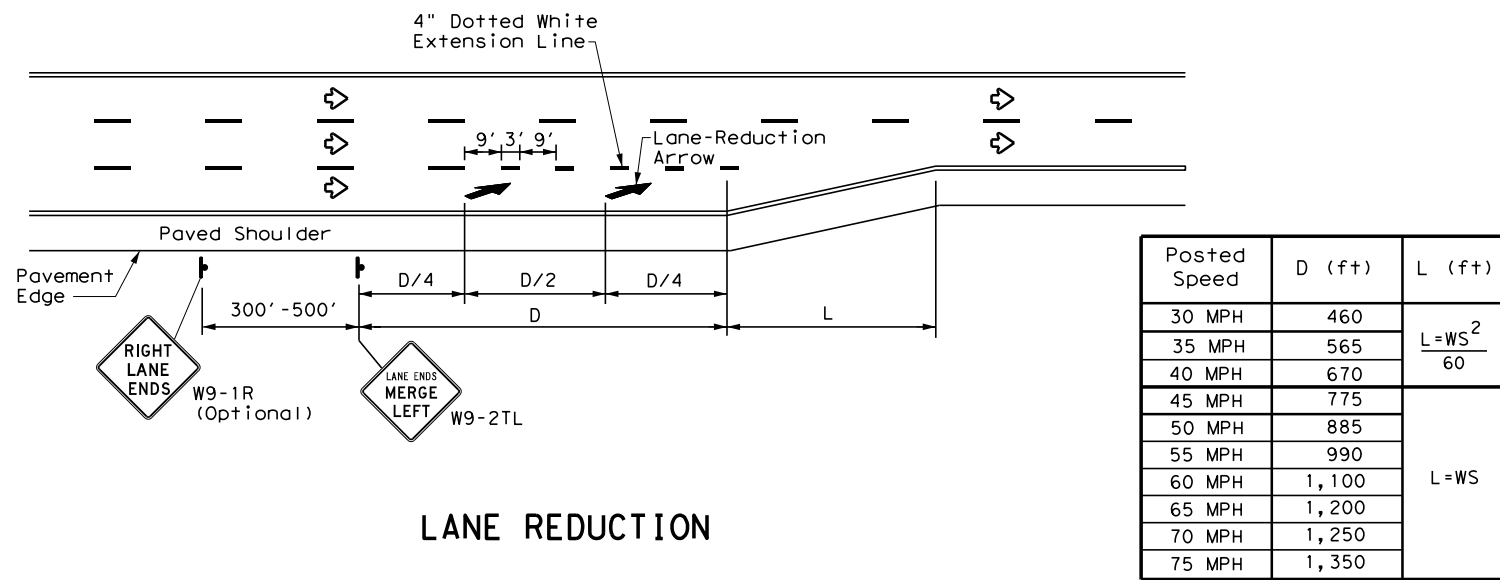


NOTE

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

DATE:
FILE:

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

LANE REDUCTION

NOTES

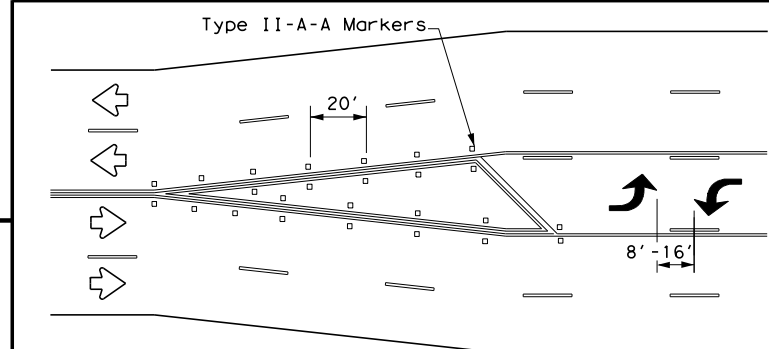
- Lane reduction pavement markings are used where the number of through lanes is reduced because of narrowing of the roadway or because of a section of on-street parking in what would otherwise be a through lane. For Texas Super 2 Passing Lanes, see TS2(PL) standard sheets.
- On divided highways, an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

GENERAL NOTES

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

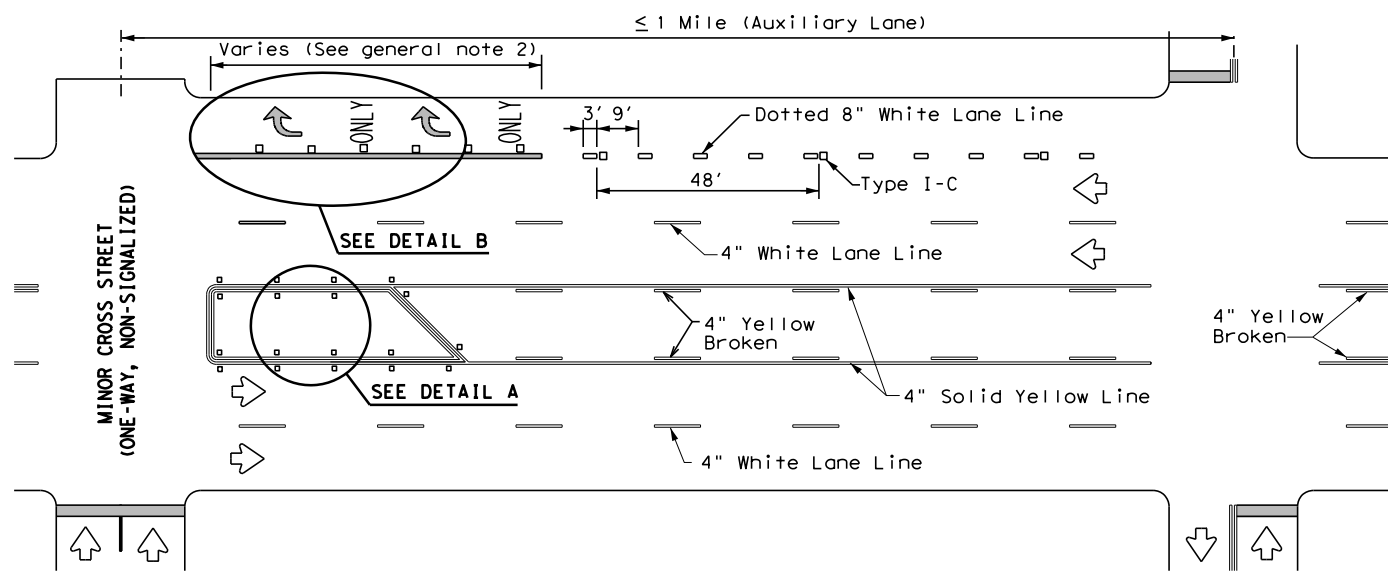
MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

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

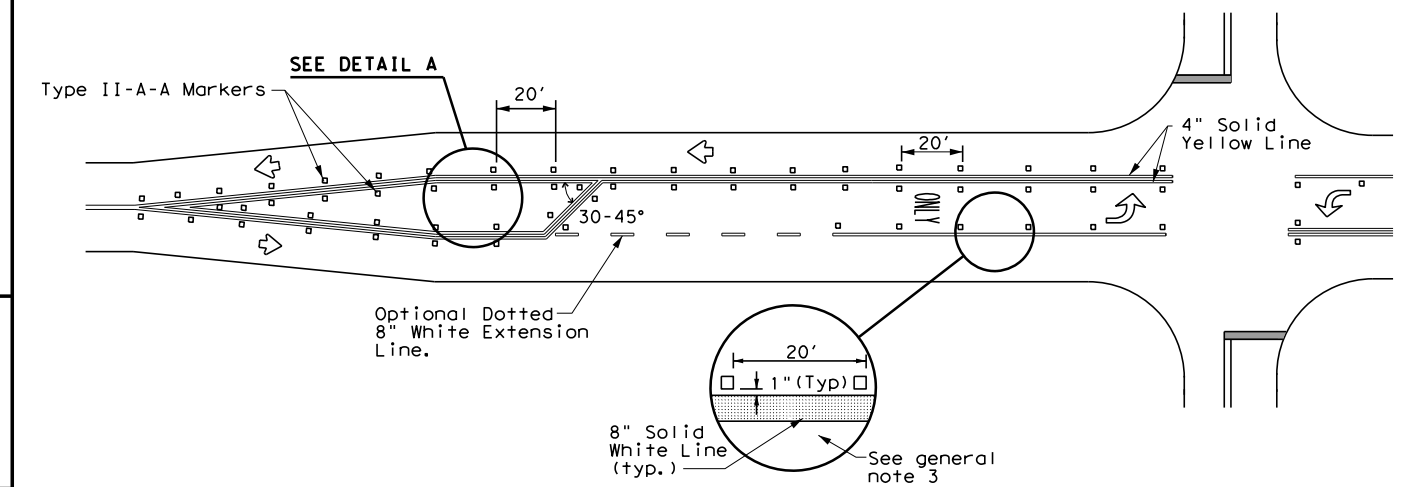


A two-way left-turn (TWLTL) lane-use arrow pavement marking should be used at or just downstream from the beginning of a two-way left-turn lane within a corridor. Repeating the marking after each intersection or dedicated turn bay is not required unless stated elsewhere in the plans.

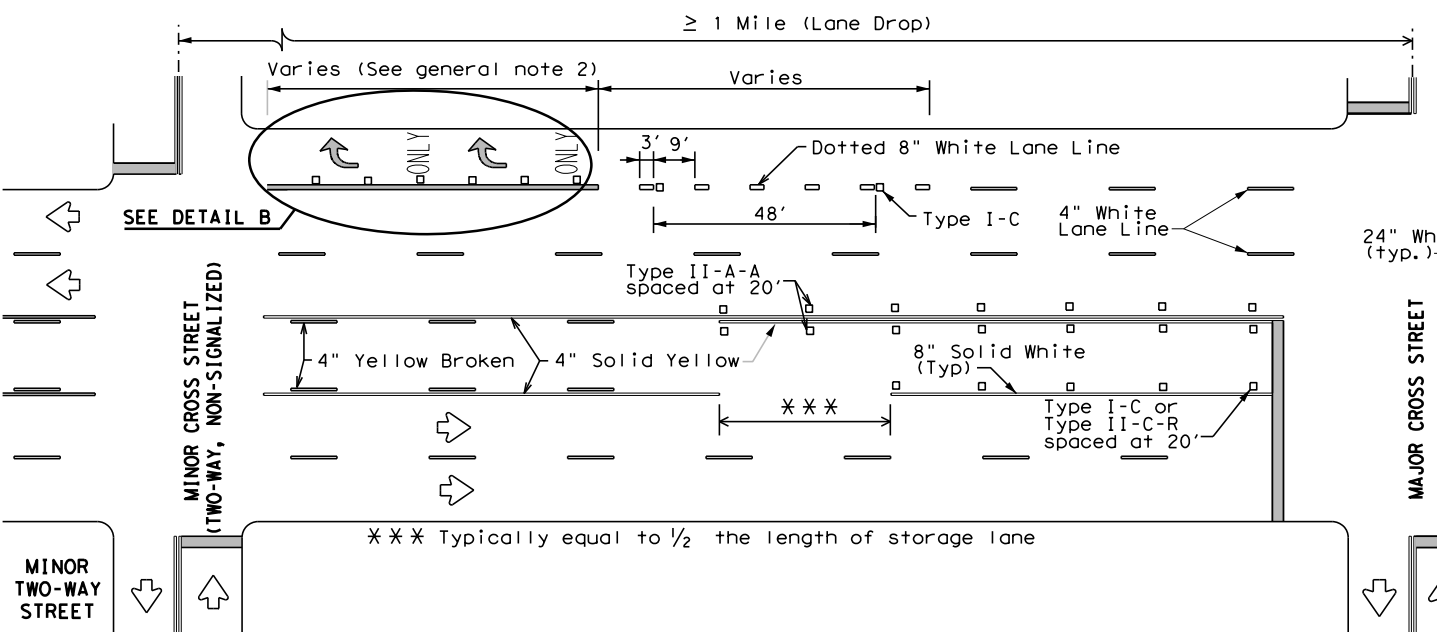
TYPICAL TRANSITION FOR TWLTL AND DIVIDED HIGHWAY



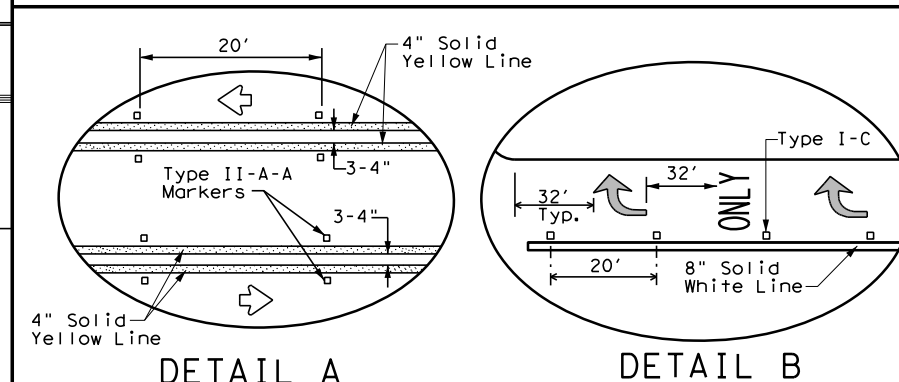
TYPICAL TWLTL AT ONE-WAY STREET AND RIGHT TURN AUXILIARY LANE



TYPICAL TWO-LANE HIGHWAY INTERSECTION WITH LEFT TURN BAYS



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



DETAIL A

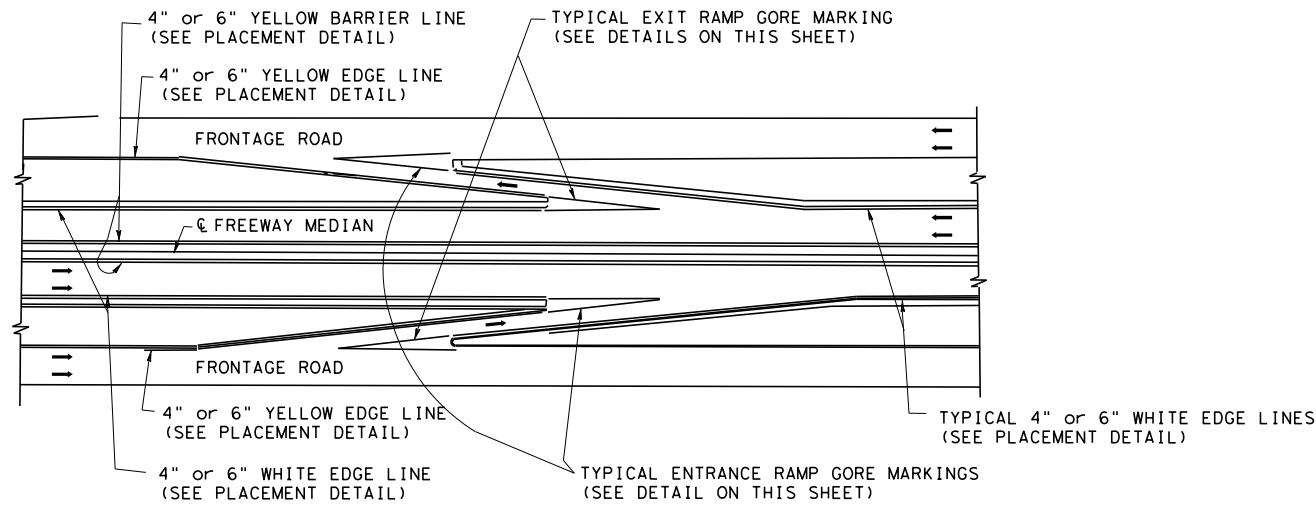
DETAIL B

Texas Department of Transportation
Traffic Safety Division Standard

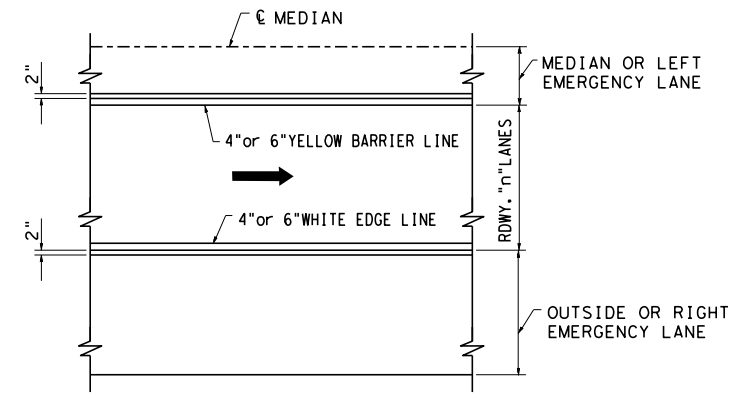
TWO-WAY LEFT TURN LANES, RURAL LEFT TURN BAYS, AND LANE REDUCTION PAVEMENT MARKINGS PM(3) - 20

FILE: pm3-20.dgn	DN:	CK:	DW:	CK:
© TxDOT April 1998	CONTRACT	SECTION	JOB	HIGHWAY
REVISIONS	038913	039	SH 146	
5-00 2-10	DIST	COUNTY	SHEET NO.	
8-00 2-12	HOU	HARRIS	321	
3-03 6-20				

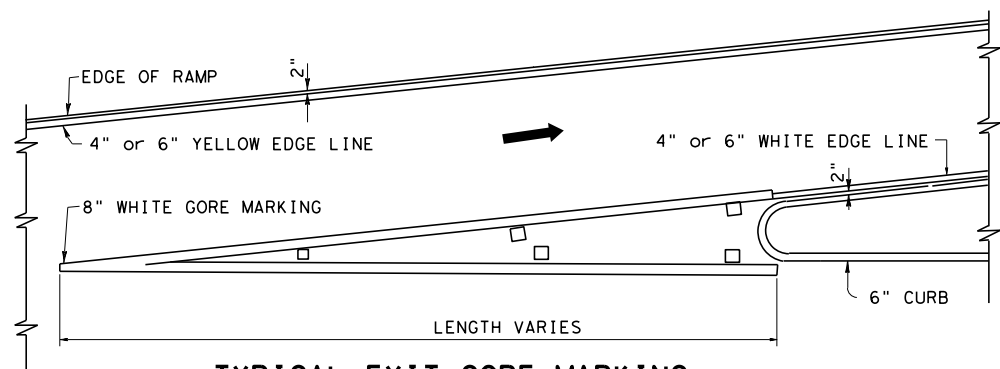
DATE: FILE:



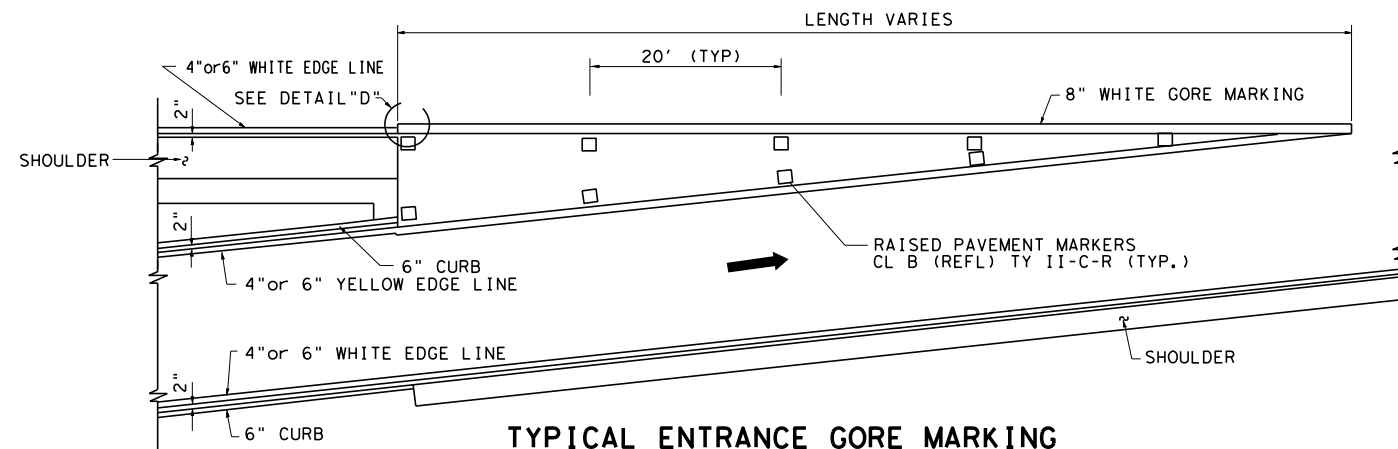
TYPICAL LAYOUT



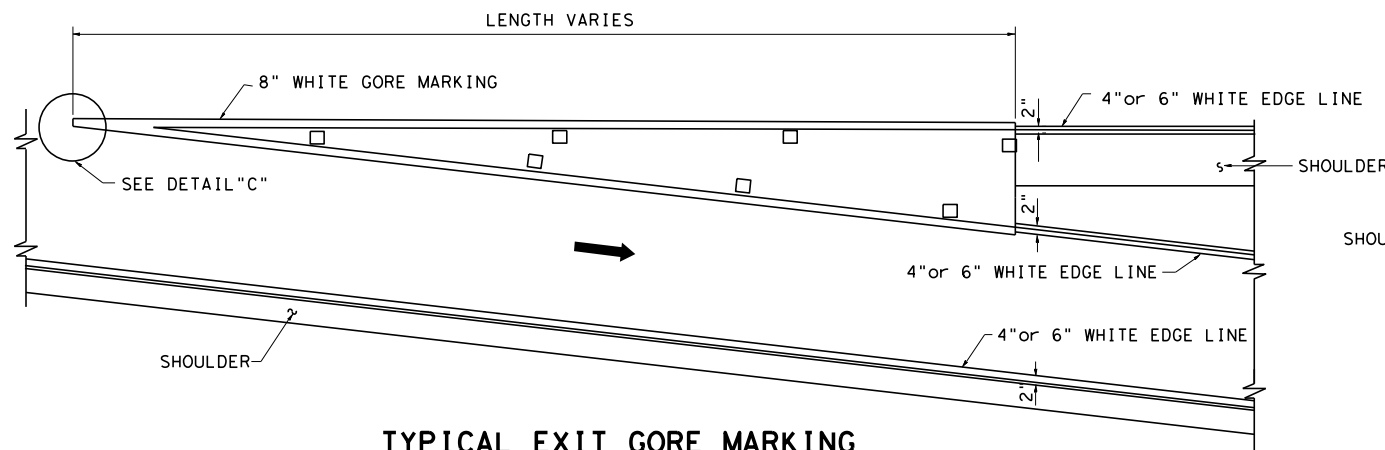
TYPICAL PLACEMENT FOR BARRIER AND EDGE LINES



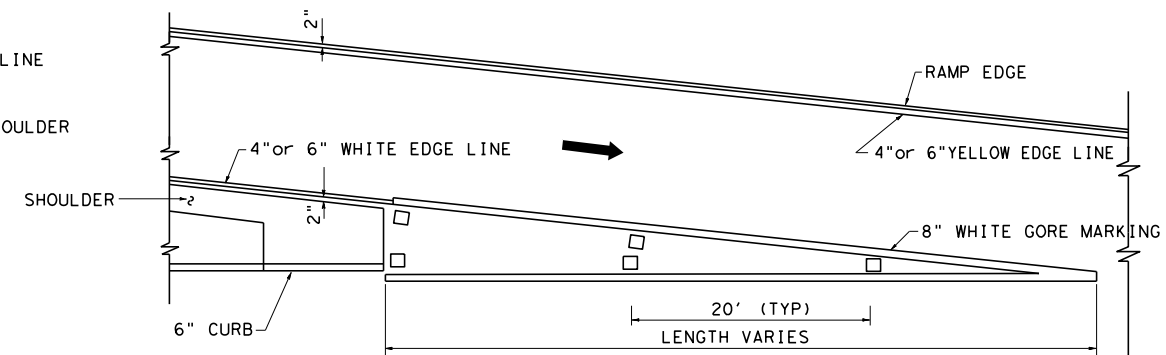
TYPICAL EXIT GORE MARKING AT FRONTAGE ROAD



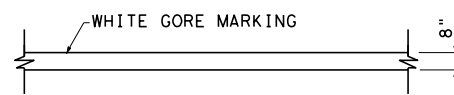
TYPICAL ENTRANCE GORE MARKING AT MAIN TRAFFIC LANES



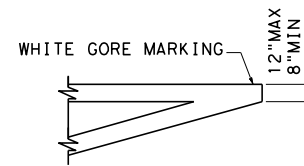
TYPICAL EXIT GORE MARKING AT MAIN TRAFFIC LANES



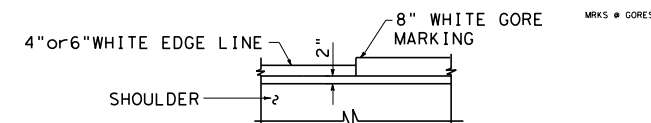
TYPICAL ENTRANCE GORE MARKING AT FRONTAGE ROAD



DETAIL "A"



DETAIL "C"



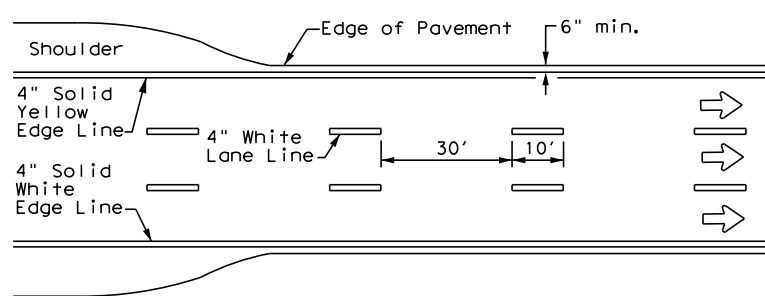
DETAIL "D"

PAVEMENT MARKINGS
(RAMP AND GORE DETAILS)

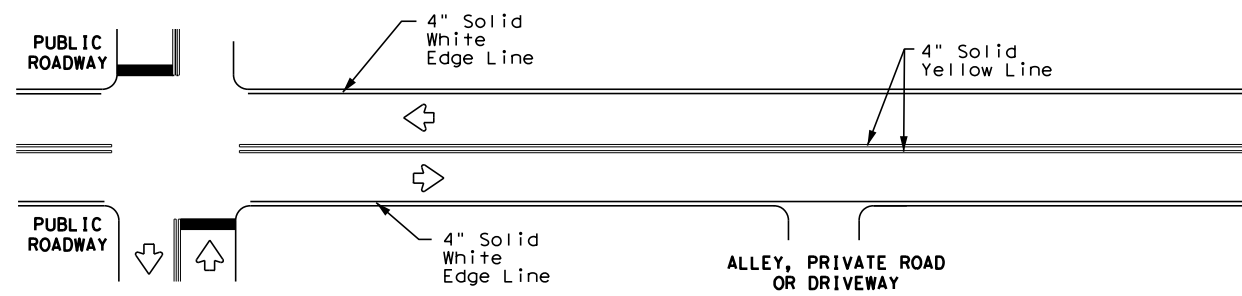
PM(R&G) - 10

FILE:	DN:	CK:	DW:	CK:
© TxDOT 2010	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS	HOU	6		SH 146
4/2010	COUNTY	CONTROL	SECT	JOB
	HARRIS	0389	13	039
				322

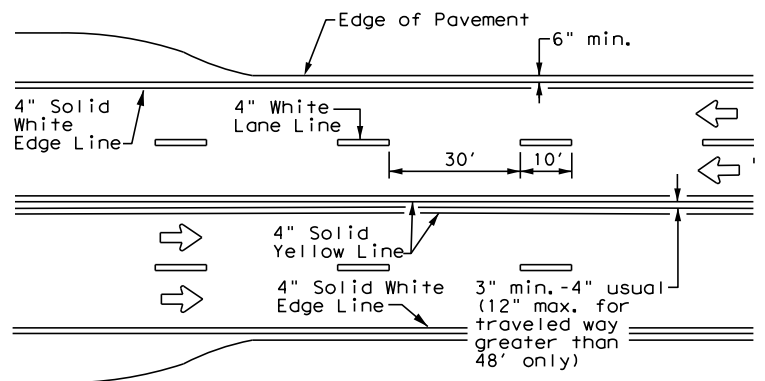
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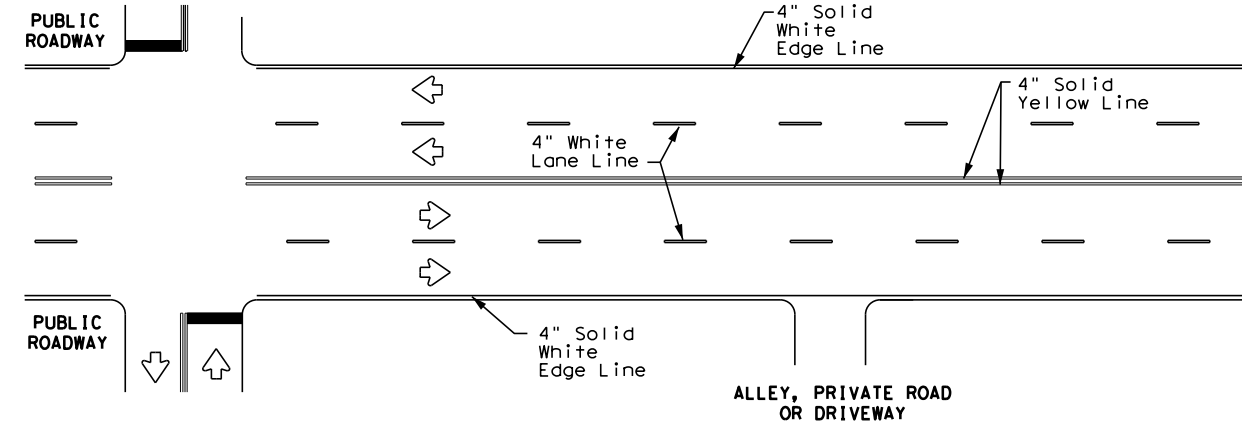
**EDGE LINE AND LANE LINES
ONE-WAY ROADWAY
WITH OR WITHOUT SHOULDERS**



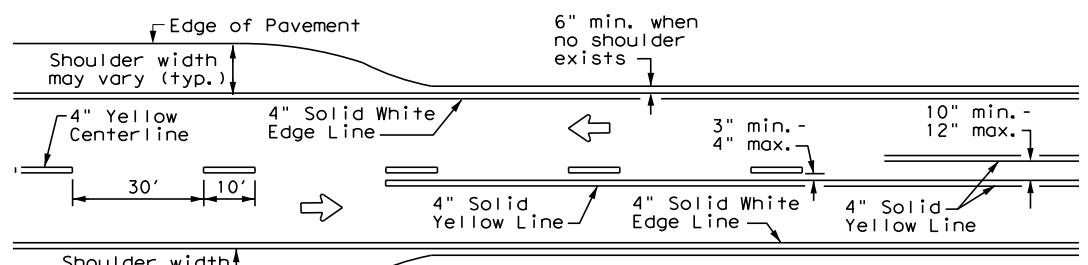
**TYPICAL TWO-LANE, TWO-WAY PAVEMENT
MARKINGS THROUGH INTERSECTIONS**



**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**

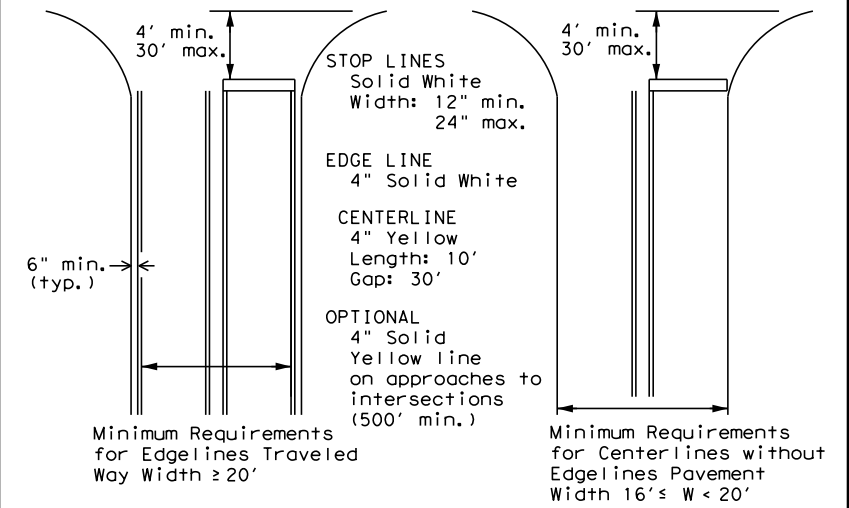


YIELD LINES

- 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 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

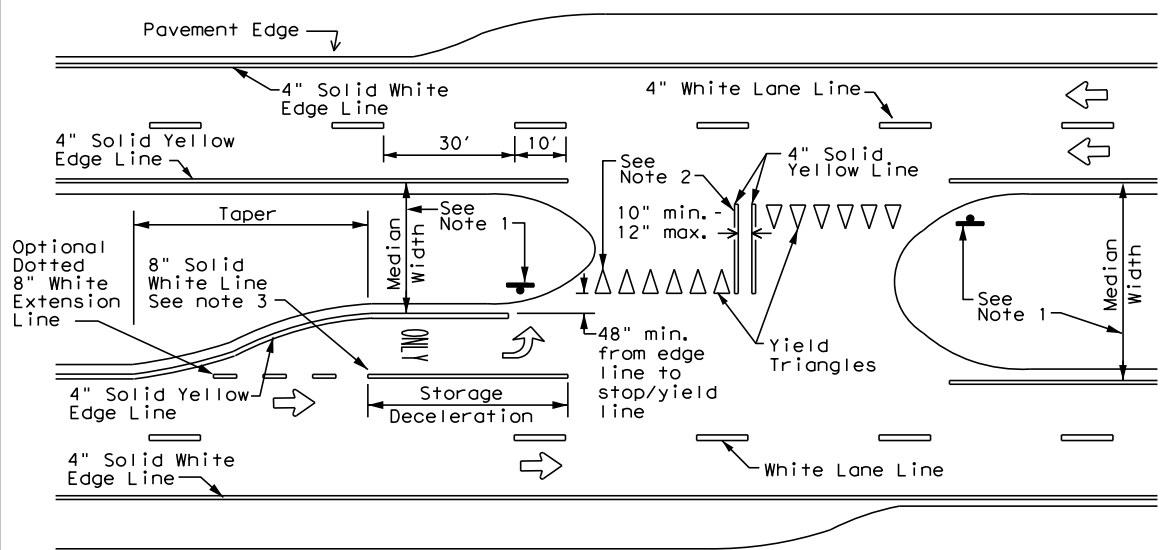
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



**GUIDE FOR PLACEMENT OF STOP LINES,
EDGE LINE & CENTERLINE**
Based on Traveled Way and Pavement Widths
for Undivided Highways

- NOTE:**
1. Irrespective of shoulder, use 6 in width lines (edge lines).
 2. Use 4 in. width lines (edge and lane lines) when lane width is 10 ft. or less; and 6 in. width lines when lane width is greater than 10 ft.

- 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 triangles 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.



FOUR LANE DIVIDED ROADWAY CROSSOVERS

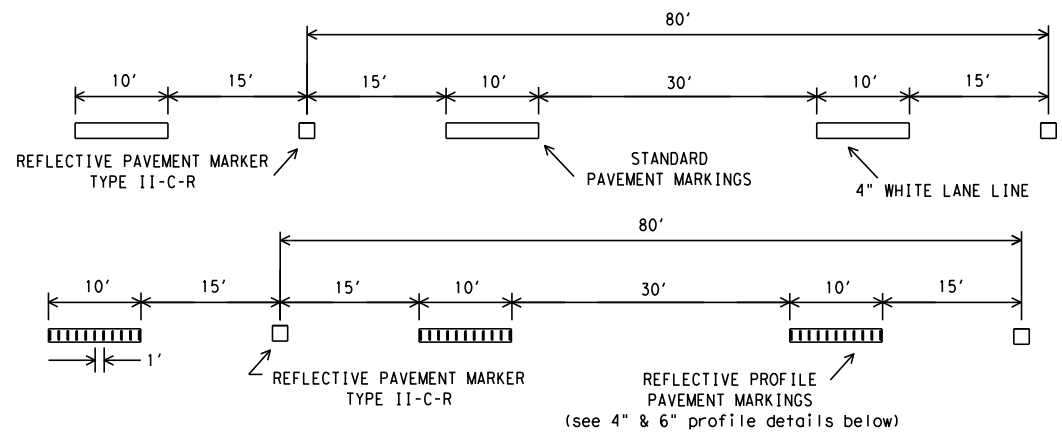
**TYPICAL STANDARD
PAVEMENT MARKINGS**

PM-20

© TxDOT NOVEMBER 1978		DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
REVISIONS		CONT	SECT	JOB	HIGHWAY
8-95	2-12	0389	13	039	SH 146
5-00	8-16				
8-00	7-20	DIST	COUNTY		SHEET NO.
3-03		HOU	HARRIS		323

DATE:
FILE:

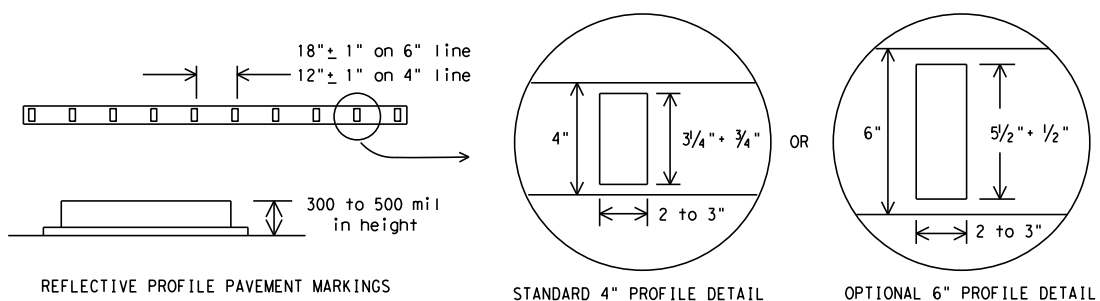
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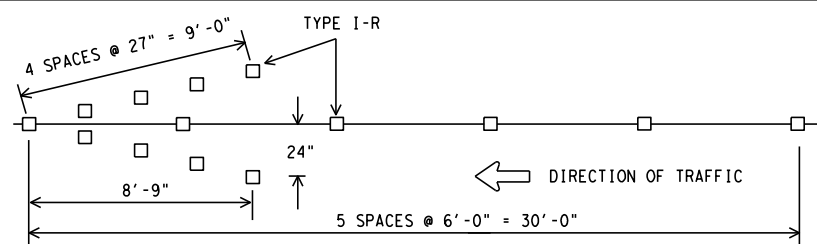
PAVEMENT MARKERS (REFL) TYPE II-C-R SHALL BE SPACED ON 80' CENTERS WITH THE CLEAR FACE TOWARD NORMAL TRAFFIC AND THE RED FACE TOWARD WRONG WAY TRAFFIC.

TRAFFIC LANE LINES PAVEMENT MARKING DETAILS

EDGE LINES SHOULD TYPICALLY BE 4" WIDE AND THE MATERIALS SHALL BE AS SPECIFIED IN THE PLANS. IF RAISED PROFILE PAVEMENT MARKINGS ARE USED SEE DETAILS BELOW.

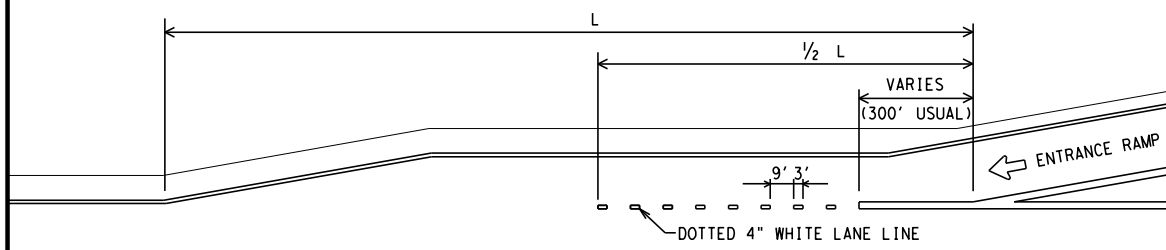


EDGE LINE PAVEMENT MARKINGS

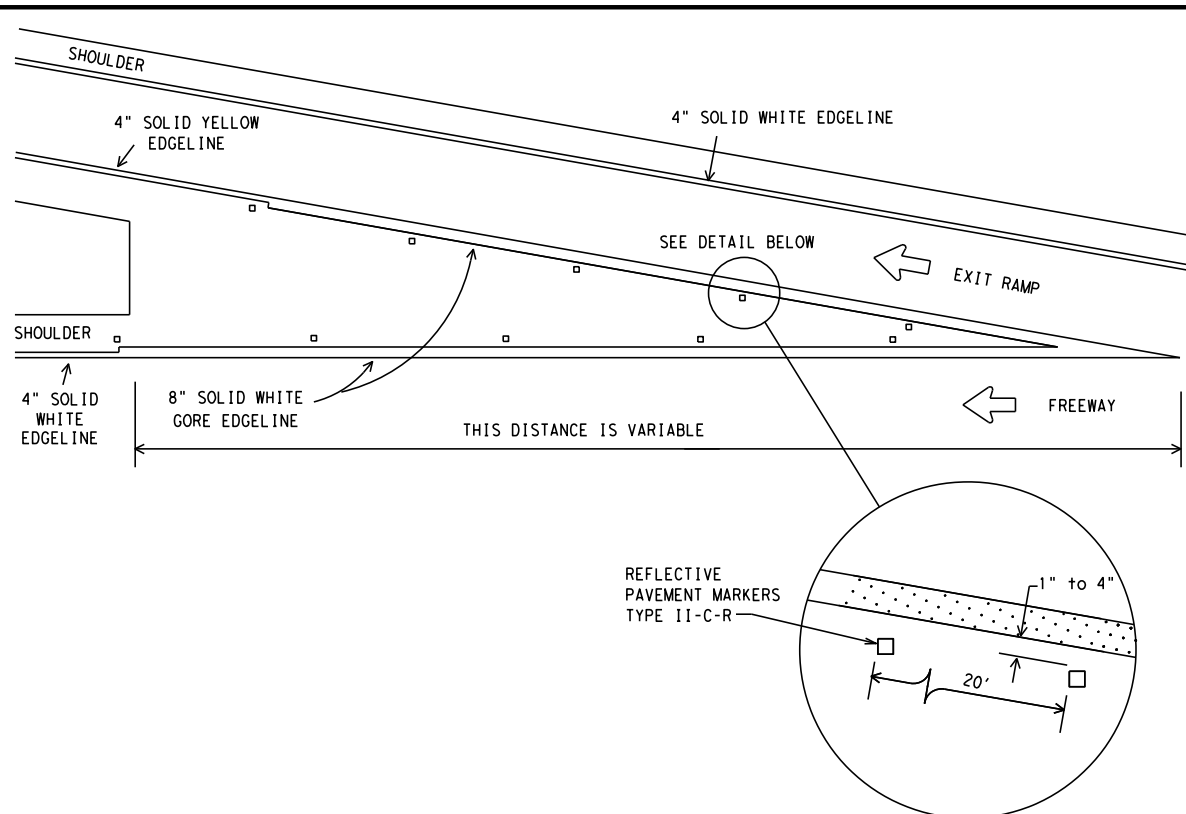


ALL RAISED MARKERS IN THE WRONG WAY ARROW SHALL BE TYPE I-R REFLECTORIZED PAVEMENT MARKERS WITH THE REFLECTORIZED SURFACE FACING THE WRONG WAY TRAFFIC. TYPE II-C-R SHALL NOT BE USED. REFLECTORIZED WRONG WAY ARROWS, NOT TO EXCEED TWO, MAY BE PLACED ON EXIT RAMP. LOCATION OF THE ARROWS SHALL BE AS SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER.

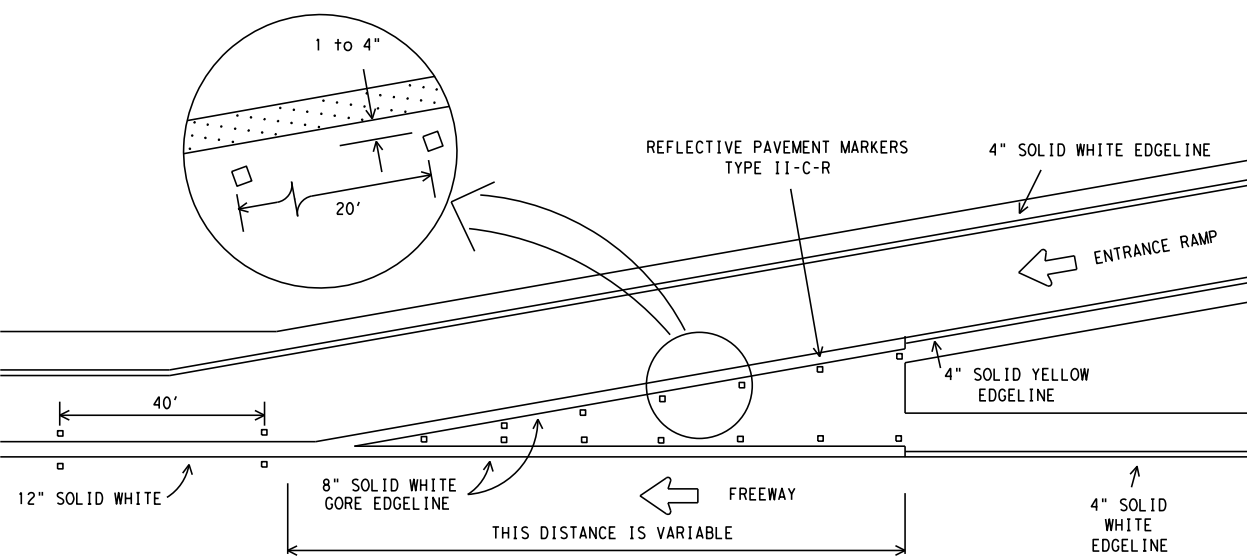
WRONG WAY ARROW DETAIL



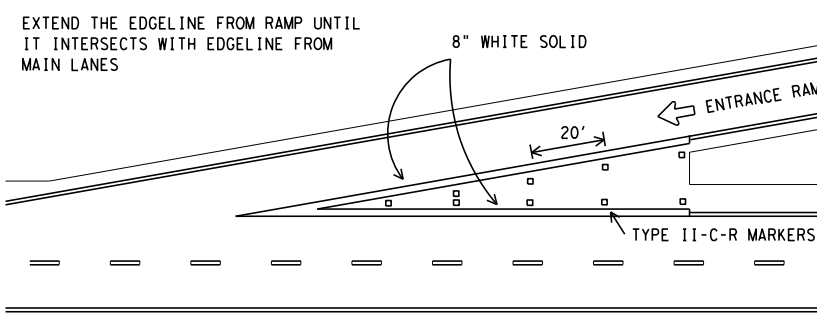
PARALLEL ACCELERATION LANE



TYPICAL EXIT RAMP GORE MARKING



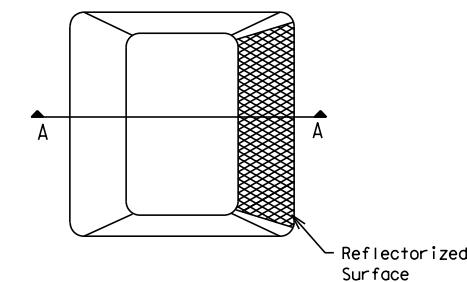
TYPICAL ENTRANCE RAMP GORE MARKING



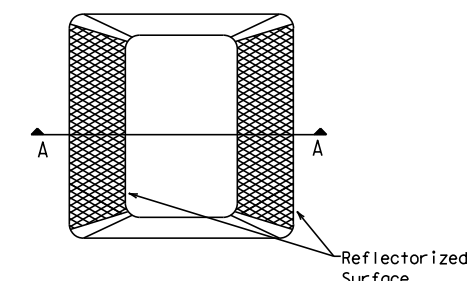
TAPERED ACCELERATION LANE

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

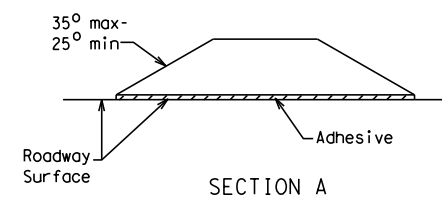
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)



Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS

Texas Department of Transportation
Traffic Operations Division

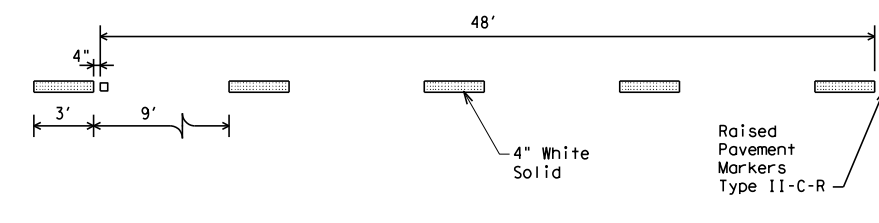
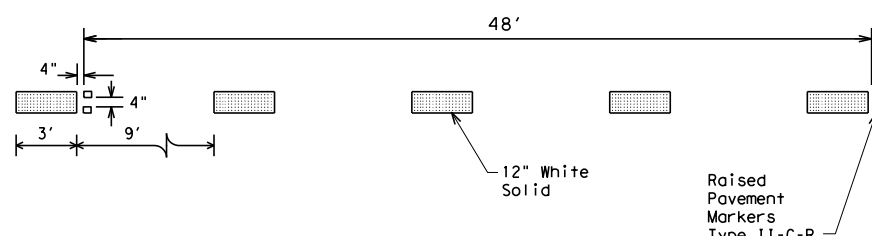
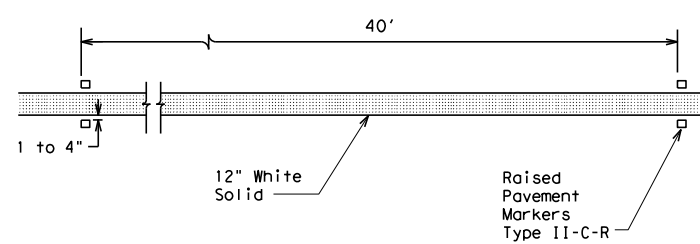
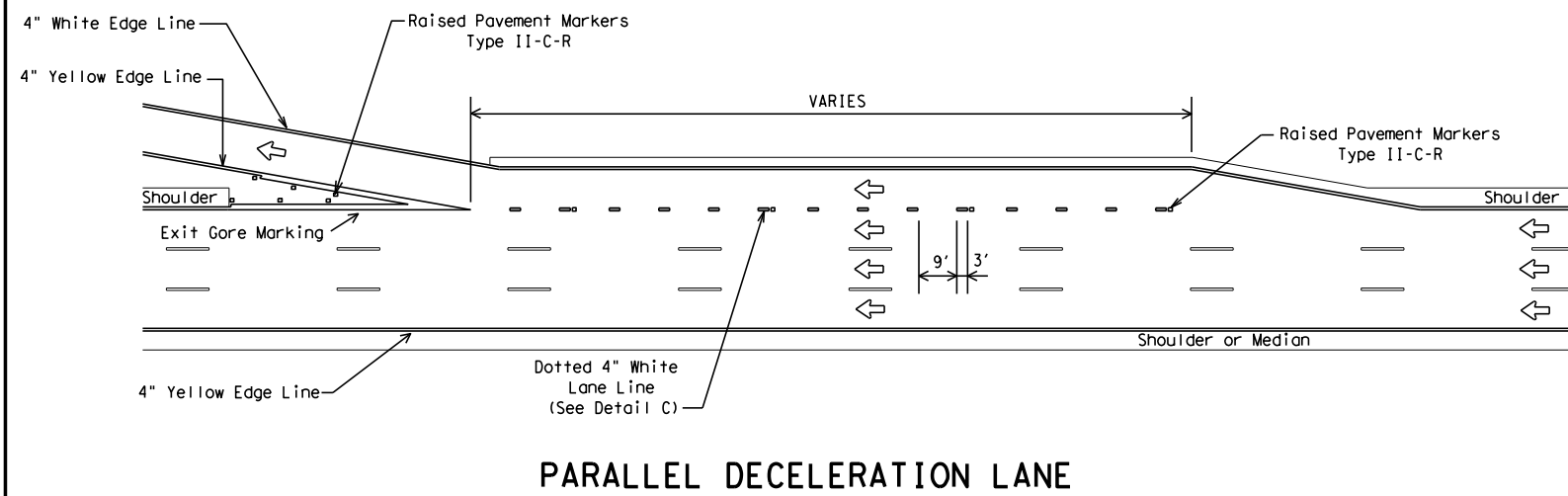
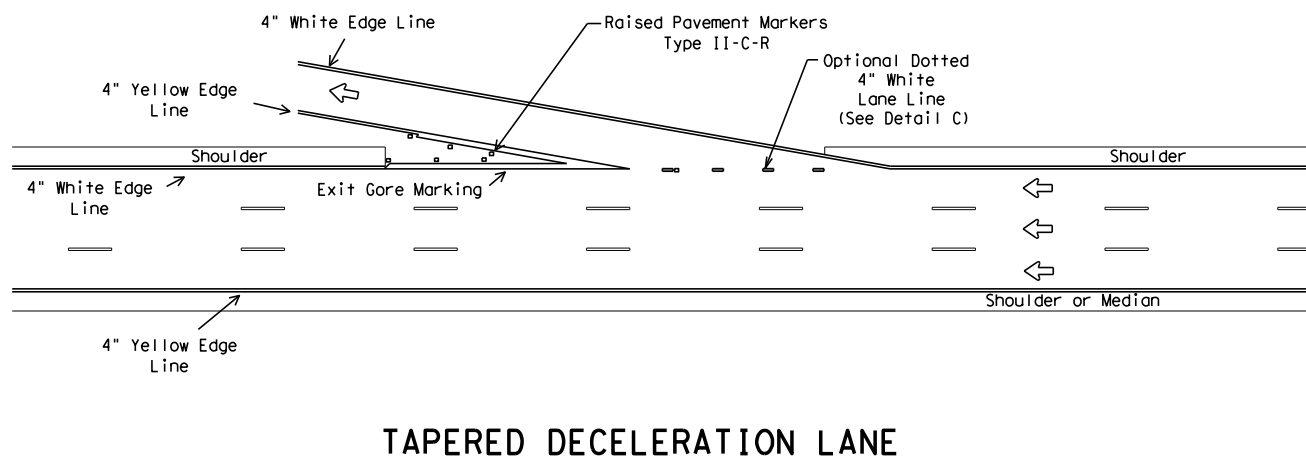
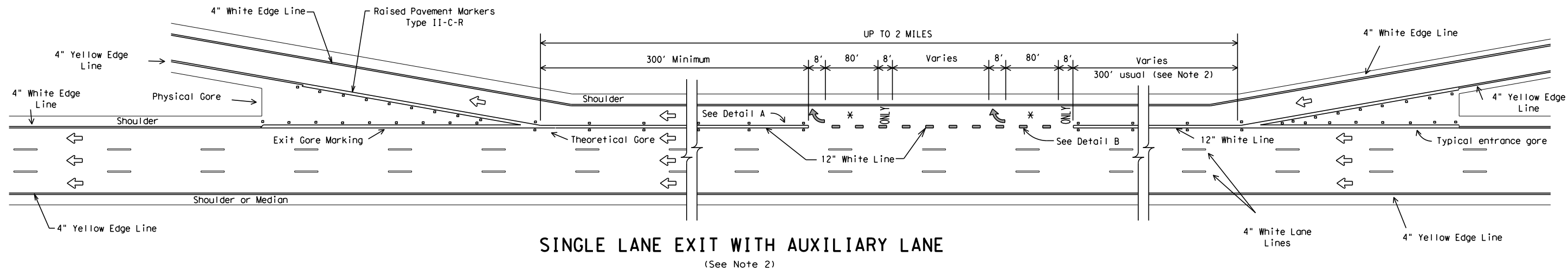
TYPICAL STANDARD FREEWAY PAVEMENT MARKINGS WITH RAISED PAVEMENT MARKERS

FPM(1)-12

© TxDOT May 1974		DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
REVISONS		CONT	SECT	JOB	HIGHWAY
4-92	2-10	0389	13	039	SH 146
5-00	2-12				
8-00		DIST	COUNTY		SHEET NO.
2-08		HOU	HARRIS		324

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DATE:
FILE:



GENERAL NOTES

1. Pavement markings shall be white except as otherwise noted.
2. Length of 12" white line may vary depending on location.
3. Wide (12") Dotted Lane Line (See Detail B) is used to separate a through lane from a lane drop at normal exit ramp and from an auxiliary lane between an entrance and exit ramp.
4. Normal (4") Dotted Lane Line (See Detail C) is used at parallel acceleration and deceleration lanes.

LEGEND	
←	Denotes direction of traffic.
↪	Pavement marking arrows (white)
*	Arrow markings are optional, however "ONLY" is required if arrow is used

MATERIAL SPECIFICATIONS

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

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

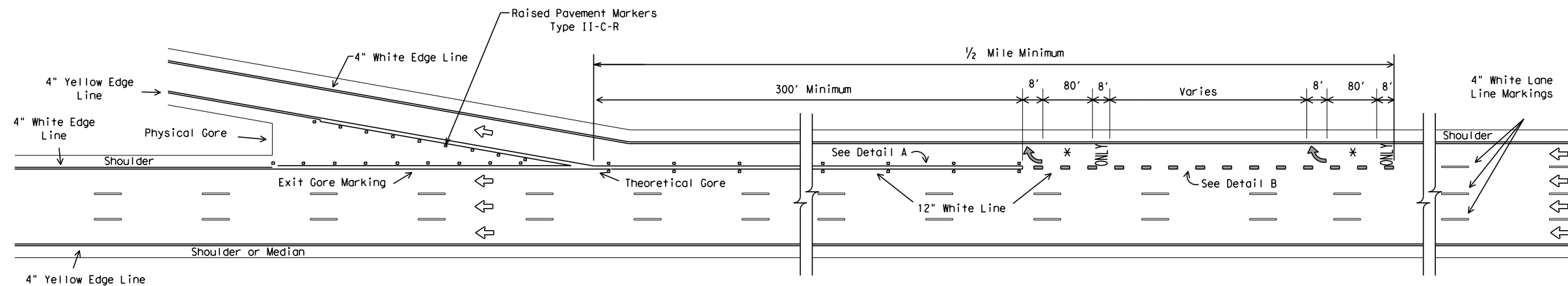


**TYPICAL STANDARD
FREEWAY PAVEMENT MARKINGS
ENTRANCE AND EXIT RAMP
FPM(2)-12**

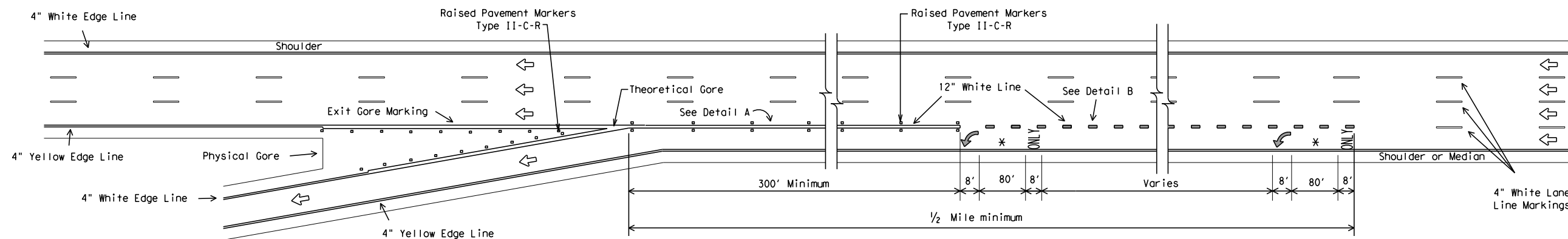
© TxDOT February 1977		DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
REVISIONS		CONT	SECT	JOB	HIGHWAY
4-92	2-10	0389	13	039	SH 146
8-95	2-12				
5-00		DIST	COUNTY		SHEET NO.
8-00		HOU	HARRIS		325

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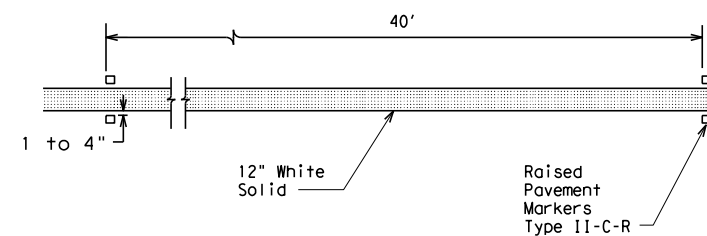


SINGLE LANE EXIT - LANE DROP OR EXIT ONLY

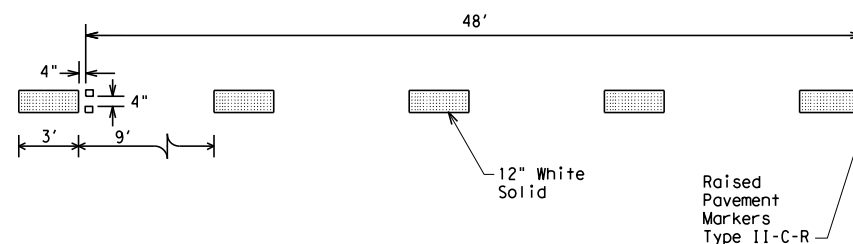


SINGLE LANE EXIT - LANE DROP OR EXIT ONLY (LEFTHAND)

LEGEND	
←	Denotes direction of traffic.
↶	Pavement marking arrows (white)
✱	Arrow markings are optional, however "ONLY" is required if arrow is used



DETAIL A



DETAIL B

Wide (12") Dotted Lane Line (See Note 3)

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

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

GENERAL NOTES

1. Pavement markings shall be white except as otherwise noted.
2. Length of 12" white line may vary depending on location.
3. Wide (12") Dotted Lane Line (See Detail B) is used to separate a through lane from a lane drop at normal exit ramp and from an auxiliary lane between an entrance and exit ramp.

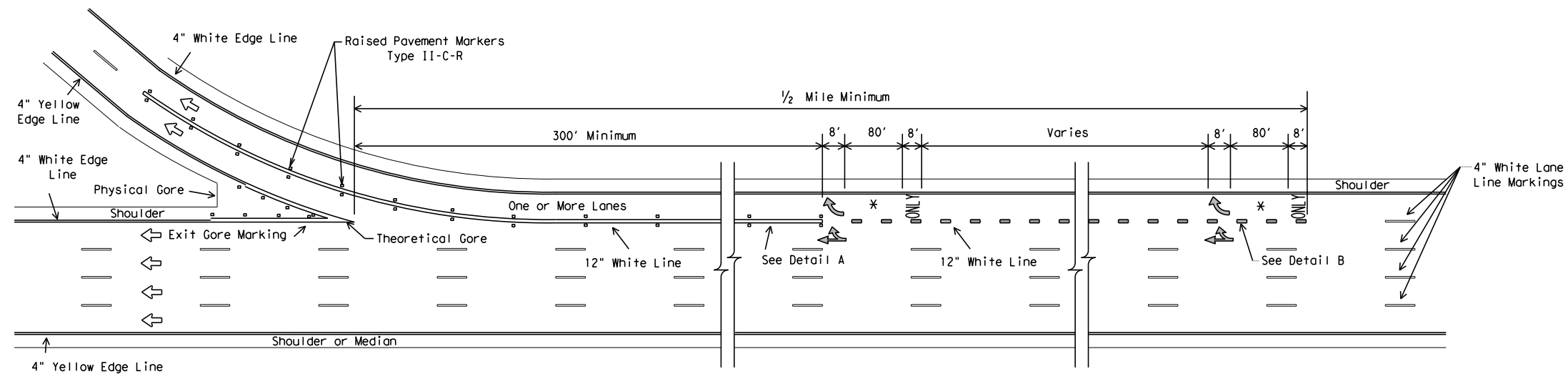
Texas Department of Transportation
Traffic Operations Division

**TYPICAL STANDARD
FREEWAY PAVEMENT MARKINGS
LANE DROP (EXIT ONLY) EXIT RAMPS
FPM(3) - 12**

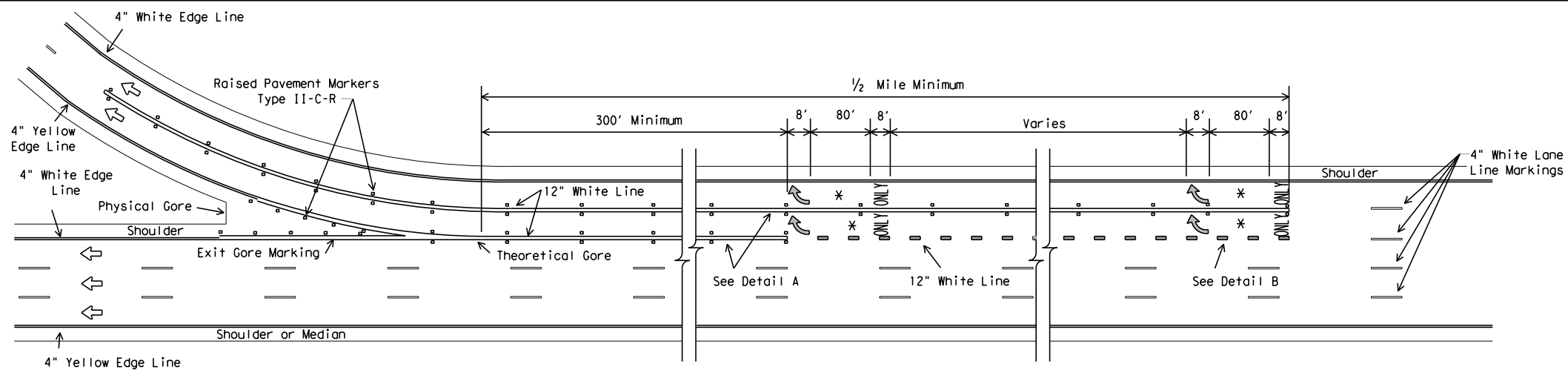
© TxDOT April 1992		DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
REVISIONS		CONT	SECT	JOB	HIGHWAY
5-00		0389	13	039	SH 146
8-00					
2-10					
2-12					
		DIST	COUNTY		SHEET NO.
		HOU	HARRIS		326

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DATE:
FILE:



MULTIPLE LANE EXIT - EXIT ONLY WITH OPTION LANE

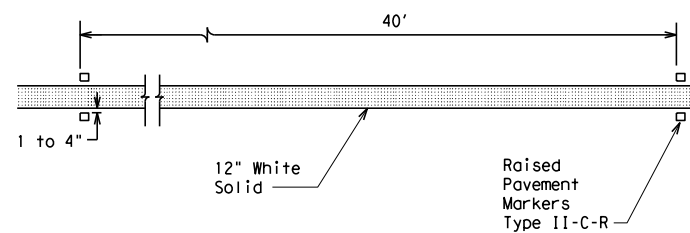


MULTIPLE LANE EXIT ONLY

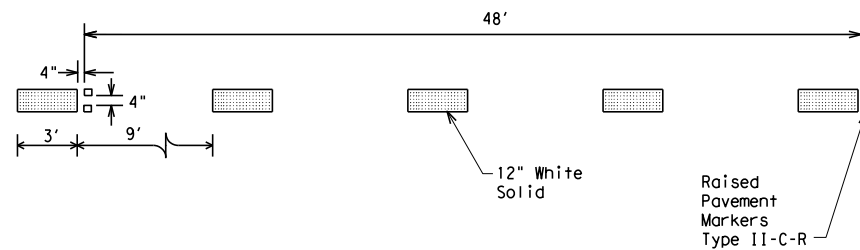
LEGEND	
	Denotes direction of traffic
	Pavement marking arrow (white)
	Optional Pavement Marking Arrows (white)
	Arrow markings are optional, however "ONLY" is required if arrow is used

GENERAL NOTES

1. Pavement markings shall be white except as otherwise noted.
2. Length of 12" white line may vary depending on location.
3. Wide (12") Dotted Lane Line (See Detail B) is used to separate a through lane from a lane drop at normal exit ramp and from an auxiliary lane between an entrance and exit ramp.



DETAIL A



DETAIL B

Wide (12") Dotted Lane Line (See Note 3)

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

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

Texas Department of Transportation
Traffic Operations Division

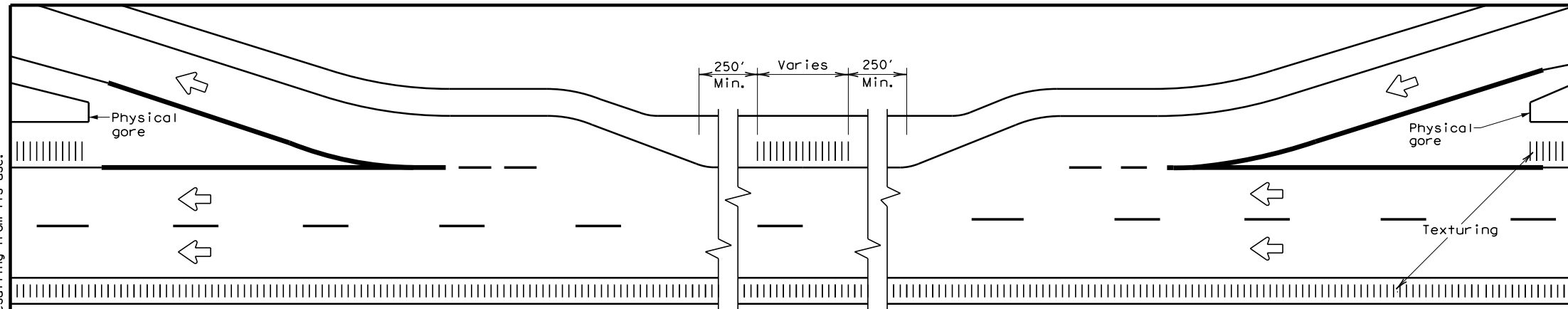
**TYPICAL STANDARD
FREEWAY PAVEMENT MARKINGS
LANE DROP (EXIT ONLY) DETAILS**

FPM(4) - 12

REVISIONS	© TxDOT April 1992			
	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
5-00	0389	13	039	SH 146
8-00				
2-10	DIST	COUNTY		SHEET NO.
2-12	HOU	HARRIS		327

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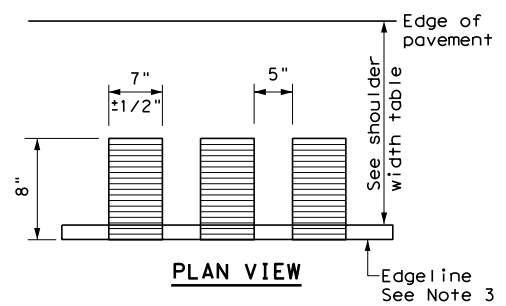
TYPICAL RUMBLE STRIP PLACEMENT AT EXIT AND ENTRANCE RAMP

GENERAL NOTES

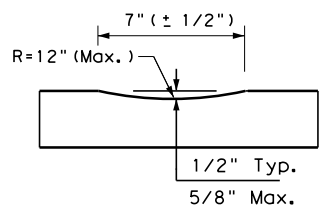
- Rumble strips and profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
 - Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
 - Use Standard Sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, pavement markings, and profile markings.
 - See the table below for determining what options may be used for edgeline rumble strips.
- WHEN INSTALLING MILLED DEPRESSION EDGELINE RUMBLE STRIPS:**
- See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Operations Division.
 - Pavement markings can be applied over milled shoulder rumble strips to create an edgeline rumble stripe.
 - 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.
 - Rumble strips shall not be placed across exit or entrance ramps, acceleration and deceleration lanes, crossovers, gore areas or intersections with other roadways.
 - 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.
 - 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:

- 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.
- 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.
- 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.
- 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.
- The minimum distance between the edgeline and the buttons should be used if the shoulder is less than 8 feet in width.
- Raised profile thermoplastic markings used as edgelines may substitute for buttons.

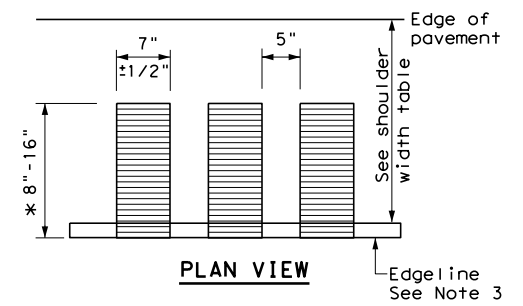


PLAN VIEW

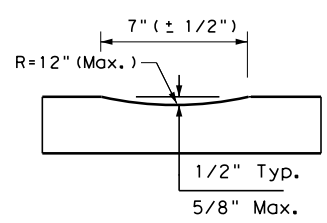


PROFILE VIEW
OPTION 1

CONTINUOUS MILLED DEPRESSIONS (Rumble Strips)



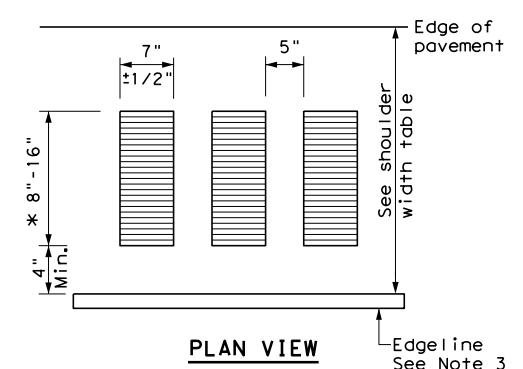
PLAN VIEW



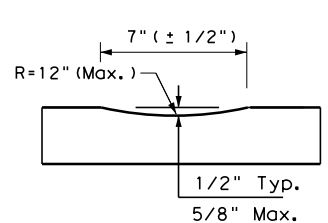
PROFILE VIEW
OPTION 2

CONTINUOUS MILLED DEPRESSIONS (Rumble Strips)

* This distance may vary based on width of shoulder



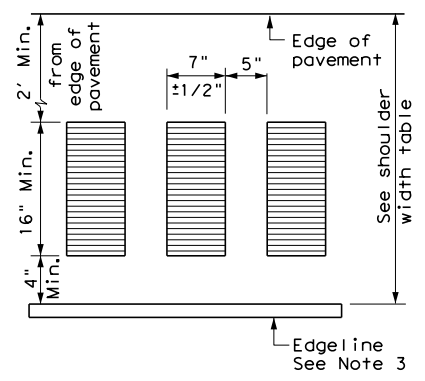
PLAN VIEW



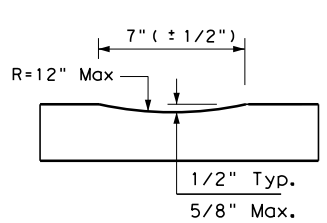
PROFILE VIEW
OPTION 3

CONTINUOUS MILLED DEPRESSIONS (Rumble Strips)

* This distance may vary based on width of shoulder

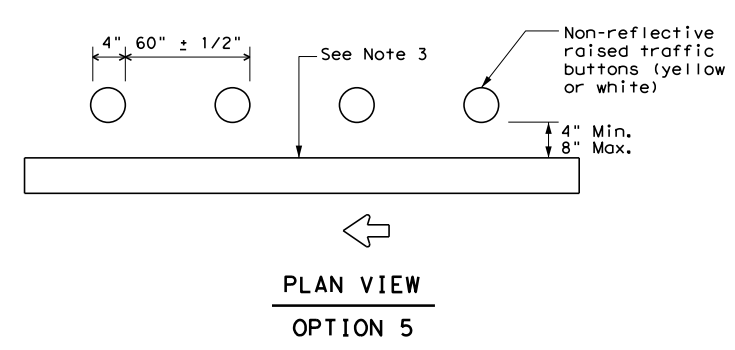


PLAN VIEW



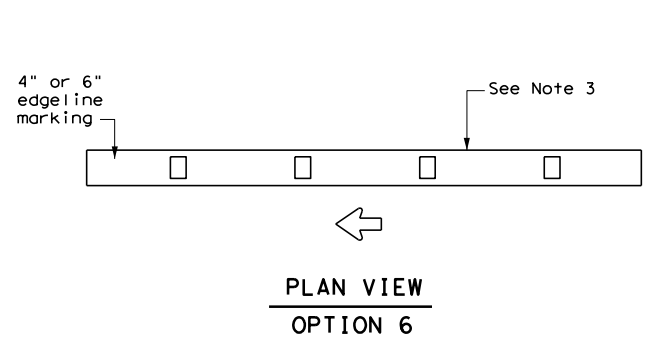
PROFILE VIEW
OPTION 4

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

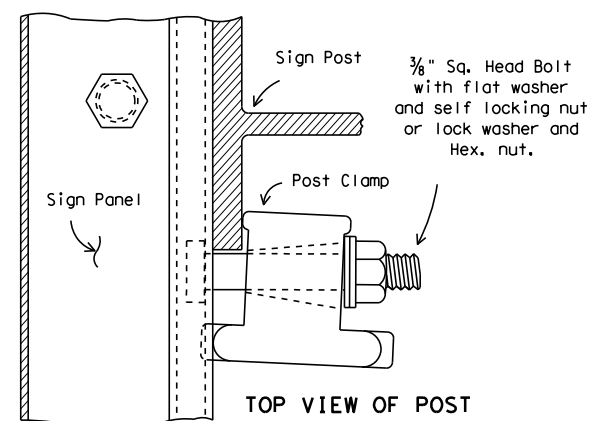
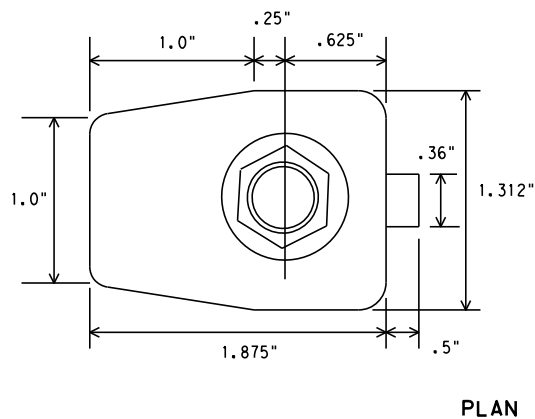
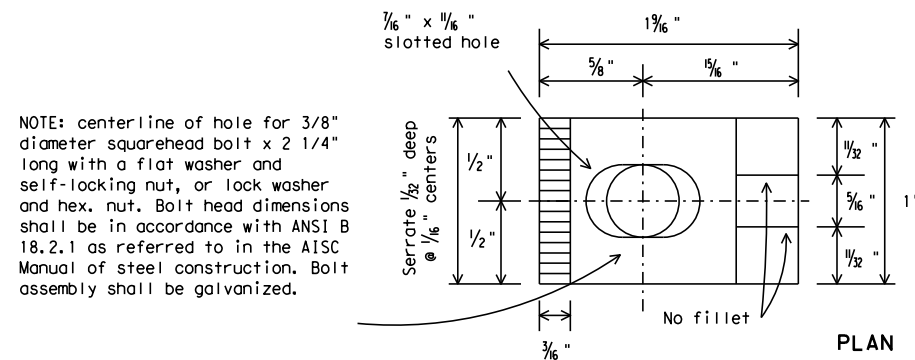


EDGELINE RUMBLE STRIPS ON FREEWAYS AND DIVIDED HIGHWAYS RS(1)-13

FILE: rs(1)-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2006	CONT	SECT	JOB	HIGHWAY
2-10	REVISIONS	0389	13	039
10-13		DIST	COUNTY	SHEET NO.
		HOU	HARRIS	328

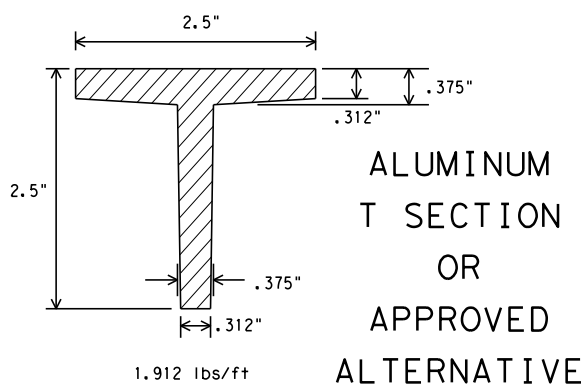
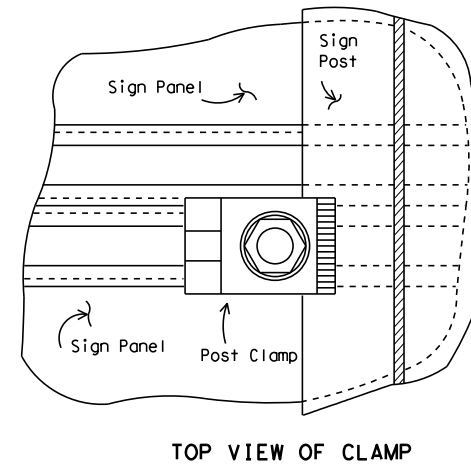
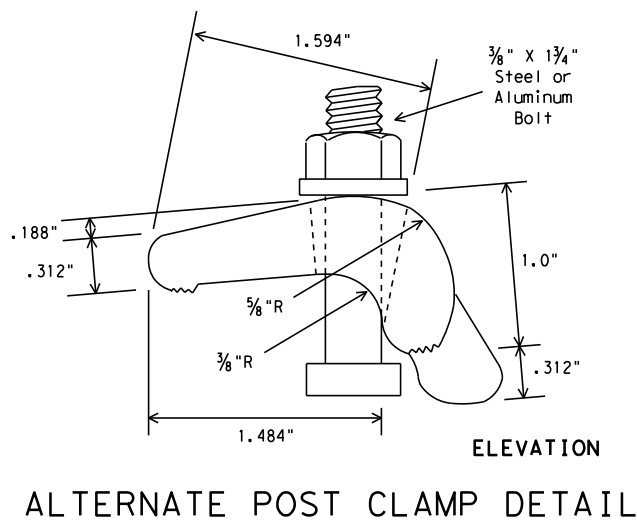
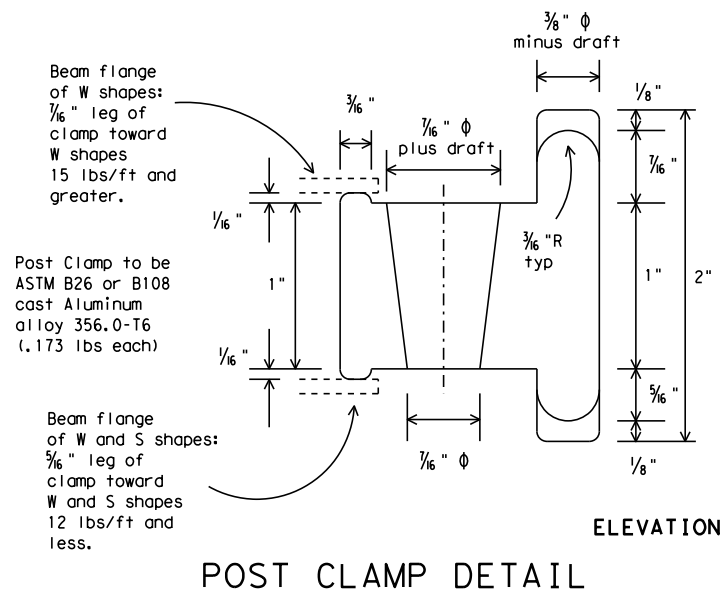
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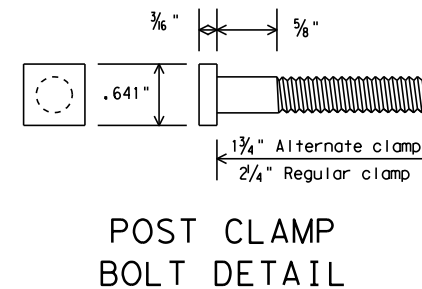
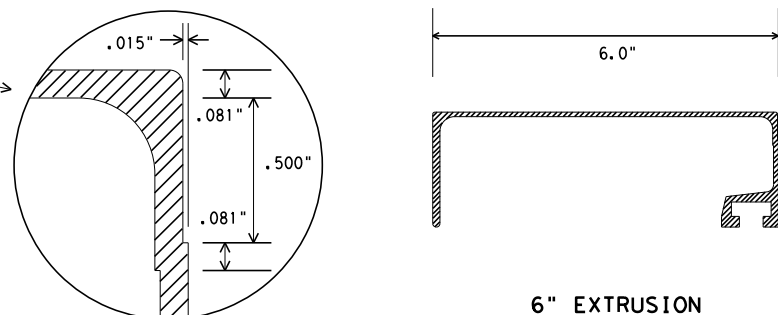
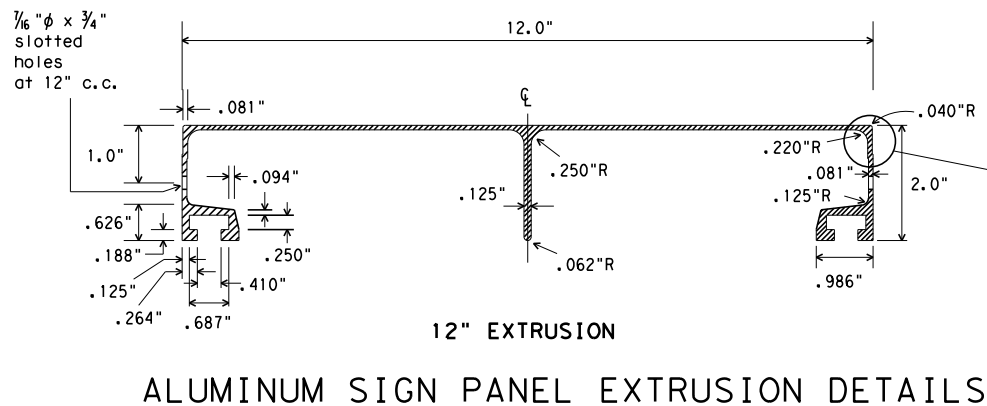
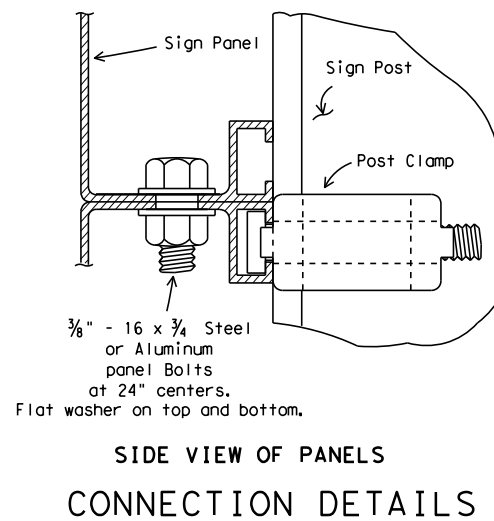
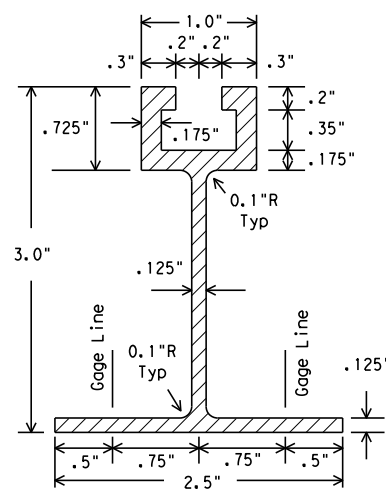
DEPARTMENTAL MATERIAL SPECIFICATIONS	
SIGN HARDWARE	DMS-7120

- GENERAL NOTES:
1. Design conforms with AASHTO Specifications for the design and construction of structural supports for highway signs.
 2. Materials and fabrication shall conform to the requirements of the Department material specifications.
 3. Structural steel shall be "low-alloy steel" for non-bridge structures per Item 442, "Metal For Structures."
 4. For fiberglass substrate connection details, see manufacturer's recommendations.



WINDBEAM CROSS SECTION

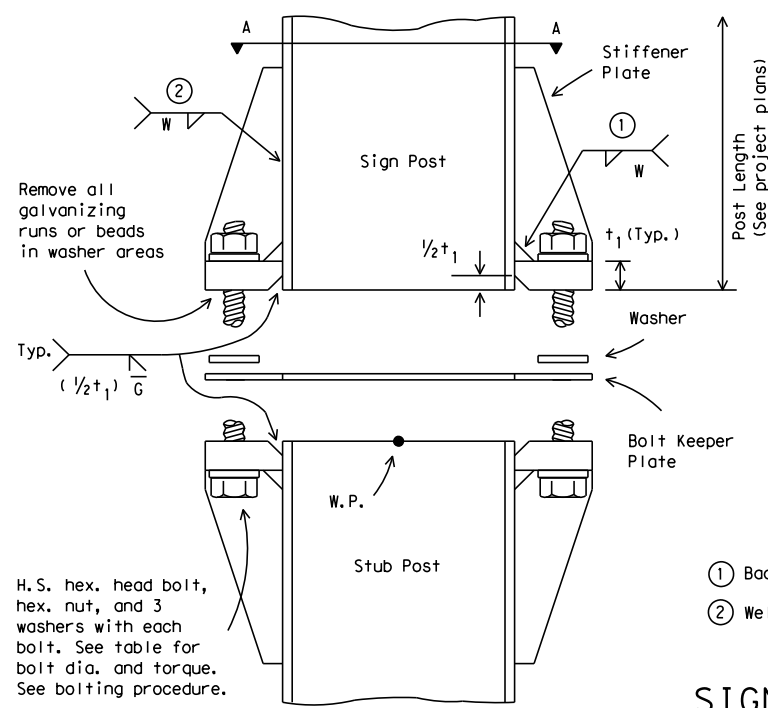
Windbeam to be extruded aluminum (1.175 lbs/ft) or approved alternative



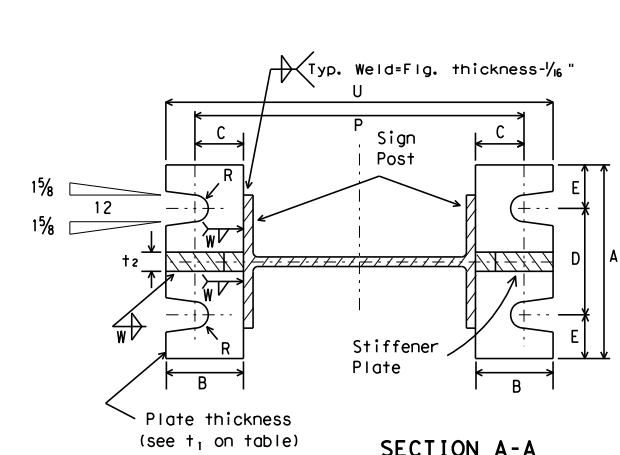
**SIGN MOUNTING DETAILS-
EXTRUDED ALUMINUM
SIGN PANELS & HARDWARE**
SMD(2-1)-08

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9-08	REVISIONS	CON: 0389	SECT: 13	JOB: 039	HIGHWAY: SH 146
		DIST: HOU	COUNTY: HARRIS	SHEET NO.: 329	

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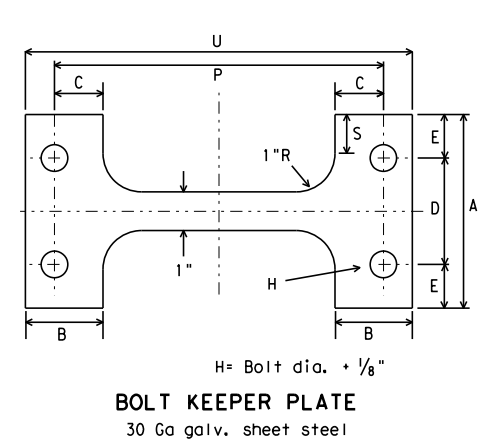
ELEVATION



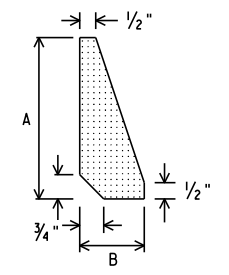
SECTION A-A

- ① Back up weld to be made before installing stiffener plate
- ② Weld W may be continued across clips to seal joint

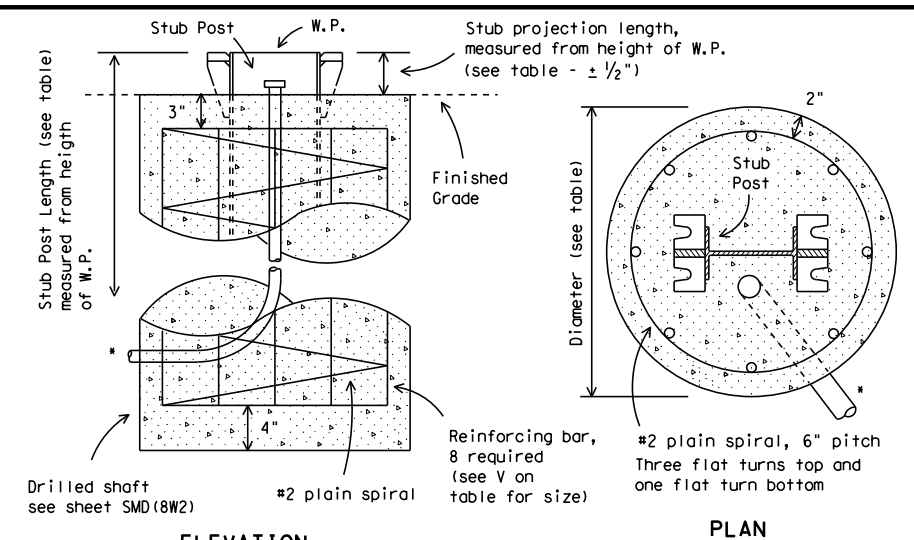
SIGN POST AND STUB POST
(For W Shapes)



BOLT KEEPER PLATE
30 Ga galv. sheet steel

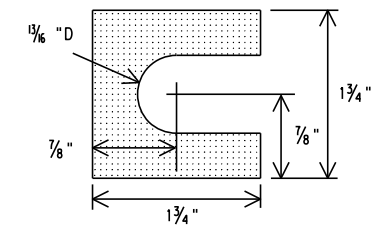


STIFFENER PLATE
DETAIL



FOUNDATION DETAIL

*Note: For signs with electrical apparatus, see ED(10) for conduit required in foundation.

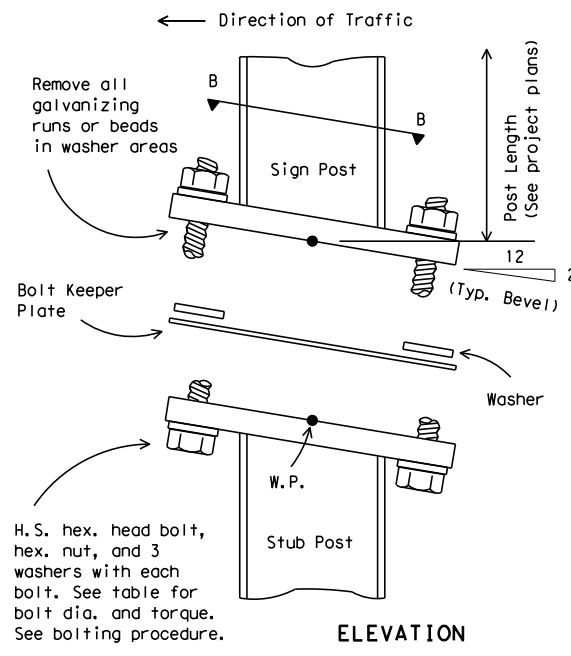


SHIM DETAIL

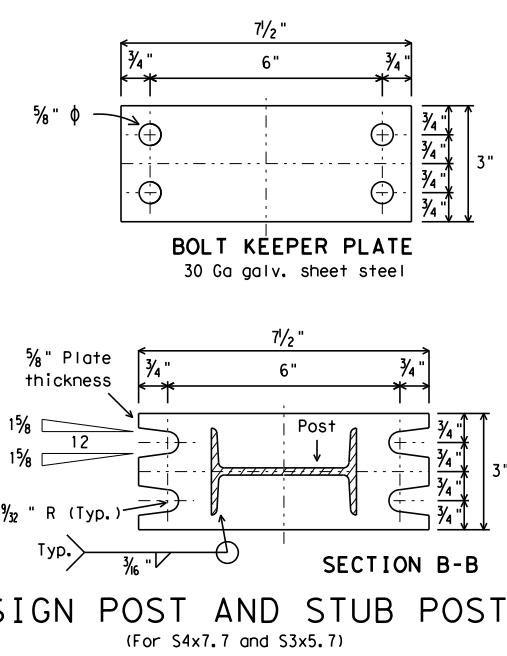
- BOLTING PROCEDURE FOR ASSEMBLY OF BASE CONNECTION:**
- Assemble sign post, BOLT KEEPER PLATE and stub post with bolts and three flat washers per bolt as shown.
 - Shim as required to plumb post.
 - Tighten all bolts the maximum possible with a 12 to 15 inch wrench to clean bolt threads and to bed washers and shims.
 - Loosen each bolt in sequence and retighten bolts in a systematic order to the prescribed torque. Do not over-tighten.
 - To prevent nut loosening, burr threads of bolt at junction with nut using a center punch.

Dimensions Post Size	Base Connection Data Table										Perforated Fuse Plate Data Table							Bolt Keeper Data			Foundation Data								
	Bolt Size & Torque	A	B	C	D	E	t ₁	t ₂	W	R	F	G	J	K	M	d ₁	d ₂	t ₃	Bolt Dia.	Wt. (ea.) (lbs.)	Bolt length	P	S	U	Stub length	Stub projection	Dr. Shaft diameter	Bar V Size	
W6x9	5/8" φ × 2 3/4"										4 1/4"	2"	4"	2 1/4"	1"	9/16"	3/4"	1/4"	1/2"	1.01	1 1/2"	8 3/8"		9 7/8"	2'-0"	3"		#5	
W6x12	440-450 inch pounds	5"	2"	1 1/4"	2 3/4"	1 1/8"	3/4"	1/2"	1/4"	11/32"	5"	2 1/2"	6"	3 1/2"	1 1/2"	11/16"	1 1/4"	3/8"	5/8"	2.51	2 1/4"	8 1/2"	1"	10"	2'-0"	3"		#5	
W6x15	36-38 foot pounds										5"	2 1/2"	5 1/4"	2 3/4"	1 1/4"	11/16"	1 1/16"	3/8"	5/8"	2.26	2 1/4"	10 5/8"		10"	2'-6"	3"		#6	
W8x18											5 1/2"	2 1/2"	5 1/4"	2 3/4"	1 1/4"	13/16"	1"	1/2"	3/4"	3.35	2 1/4"	11"		12 1/8"	2'-6"	3"		#7	
W8x21	3/4" φ × 3 1/2"										5 1/2"	2 1/2"	5 1/4"	2 3/4"	1 1/4"	13/16"	1"	1/2"	3/4"	3.35	2 1/4"	11"		12 3/4"	3'-0"	2 1/2"		#8	
W10x22	740-750 inch pounds	6"	2 1/4"	1 3/8"	3 1/2"	1 1/4"	1"	3/4"	5/16"	13/32"	6"	3"	5 3/4"	2 3/4"	1 3/8"	13/16"	1 1/8"	1/2"	3/4"	4.03	2 1/4"	12 7/8"	1 1/2"	14 5/8"	3'-0"	2 1/2"		#9	
W10x26	62-63 foot pounds										6"	3"	6 1/2"	3 1/2"	1 5/8"	13/16"	1 5/16"	1/2"	3/4"	4.47	2 1/4"	13 3/8"	1 1/2"	14 7/8"	3'-0"	2 1/2"		#10	
W12x26											6"	3"	6 1/2"	3 1/2"	1 5/8"	13/16"	1 5/16"	1/2"	3/4"	4.47	2 1/4"	15"		16 3/4"	3'-0"	2 1/2"		#11	
S3x5.7	1/2" φ × 2 1/2"	See Detail Below										3 3/4"	1 1/2"	2 5/8"	1 1/2"	5/8"	9/16"	3/8"	1/4"	1/2"	0.60	1 1/2"	See Detail Below			3'-3 1/2"	3 1/2"	12"	Non-reinforced
S4x7.7	440-450 inch pounds	See Detail Below										3 3/4"	1 1/2"	2 5/8"	1 1/2"	5/8"	9/16"	3/8"	1/4"	1/2"	0.60	1 1/2"	See Detail Below			3'-3 1/2"	3 1/2"	12"	Non-reinforced

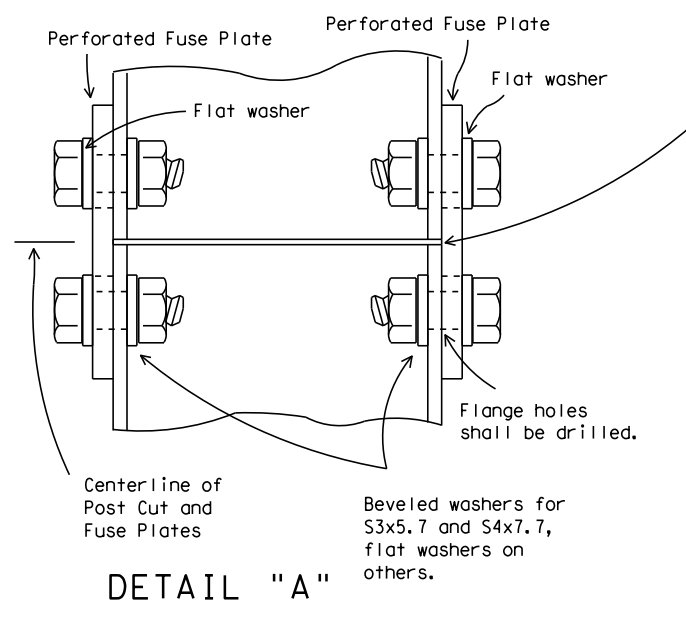
③ Foundation design shall be Type G Mount, see SMD (TY G).



ELEVATION



SIGN POST AND STUB POST
(For S4x7.7 and S3x5.7)



DETAIL "A"

PERFORATED FUSE PLATE DETAIL

Use H.S. hex head bolts, hex head nut and bevel or flat washer (where req'd) under nut. All holes shall be drilled, sub-punched and reamed. All plate cuts shall preferably be saw cuts. However, flame cutting will be permitted provided all edges are ground. Metal projecting beyond the plane of the plate face will not be permitted. Steel fuse plates shall conform to the requirements of ASTM A36. ASTM A572 Grade 50 or ASTM A588 may be substituted for A36 at the option of the fabricator. Mill test reports shall be submitted for Fuse Plates. Steel used shall have an ultimate tensile strength not to exceed 80 KSI. For alternative Fuse Plate contact Traffic Operations Division.

Texas Department of Transportation
Traffic Operations Division

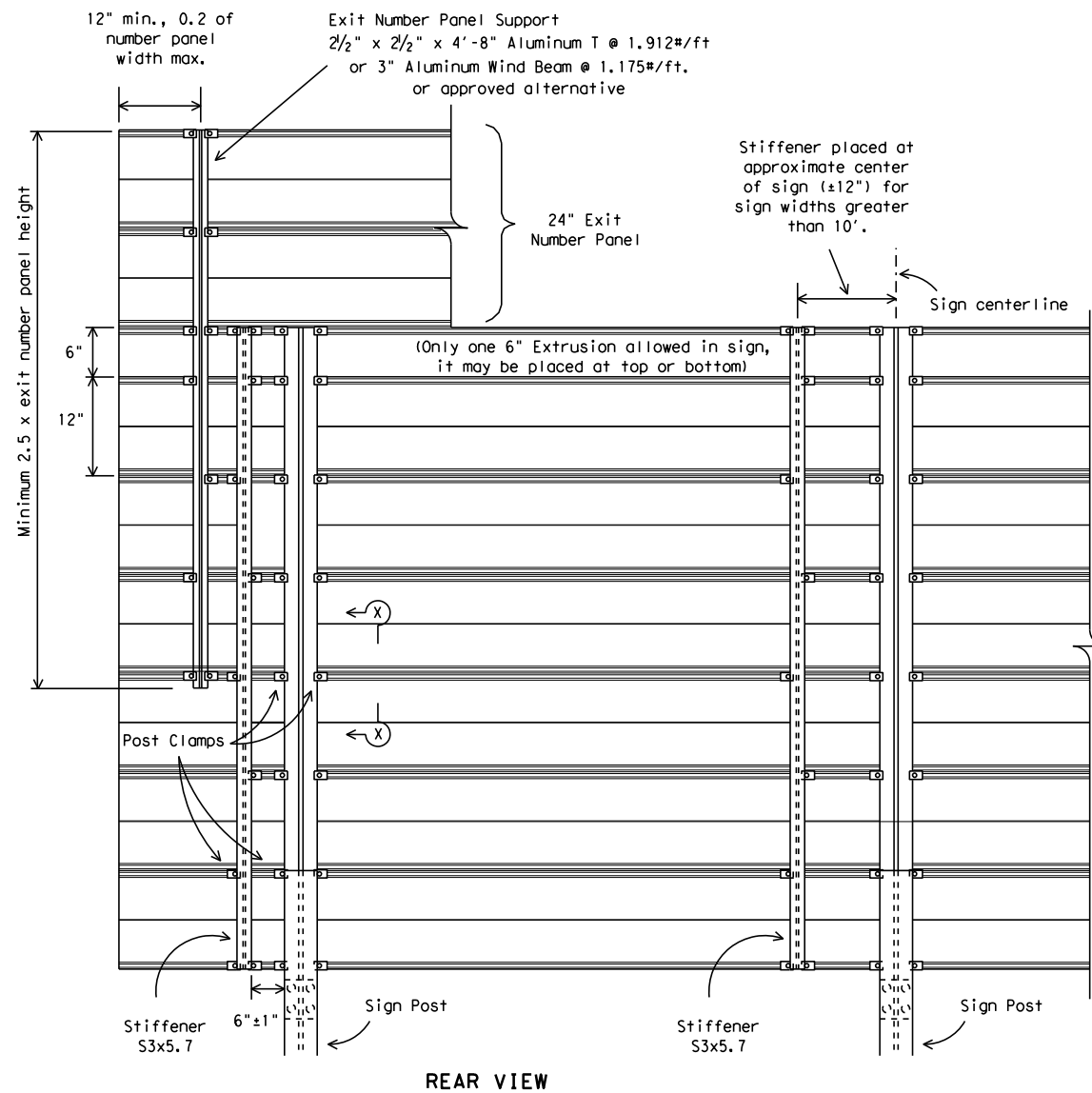
SIGN MOUNTING DETAILS-
LARGE ROADSIDE SIGNS
FOUNDATION & STUB

SMD(2-2)-08

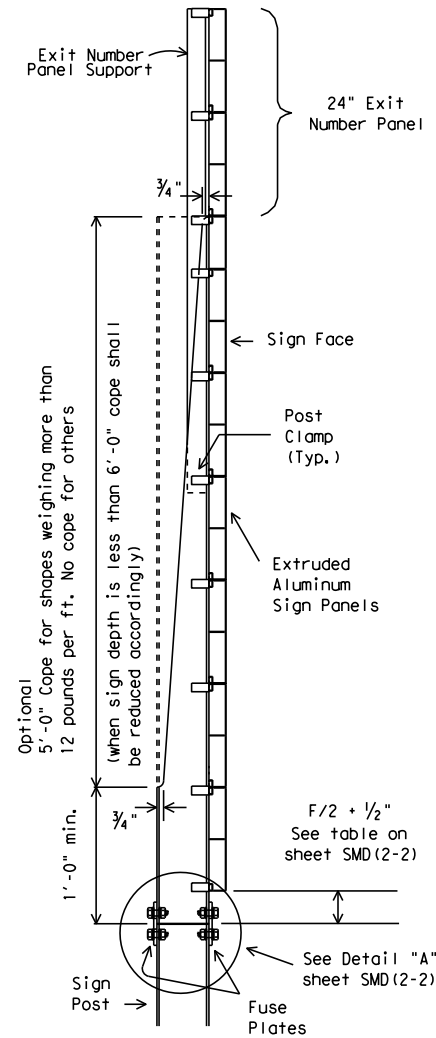
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4-98 REVISIONS	CONT	SECT	JOB	HIGHWAY
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	HOU	HARRIS		330

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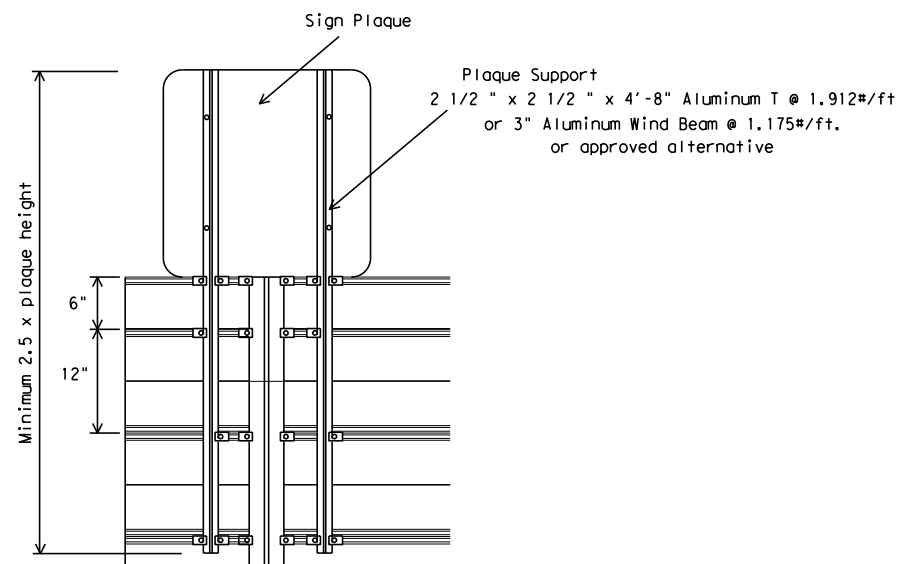
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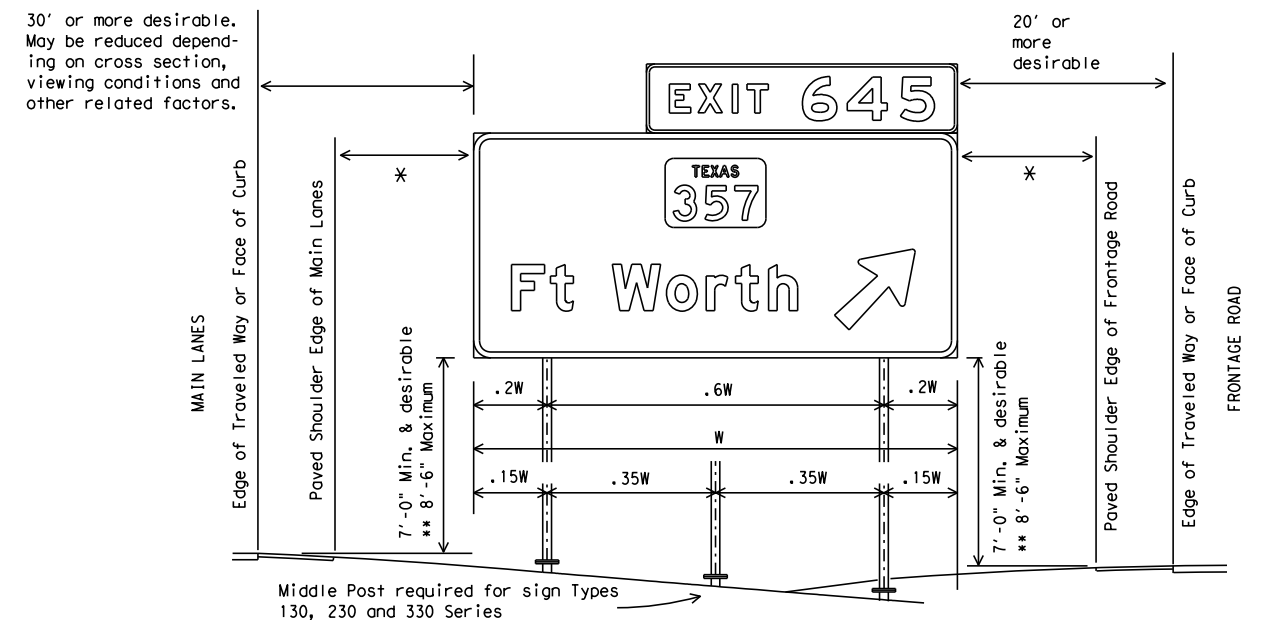
REAR VIEW
ALUMINUM PARENT SIGN & EXIT NUMBER PANEL MOUNTING DETAILS



SIDE VIEW



SIGN PLAQUE MOUNTING DETAIL TO ALUMINUM PARENT SIGN



TYPICAL SIGN INSTALLATION AND LOCATION

LATERAL CLEARANCE NOTES:

Lateral clearances of signs mounted on median side of main lanes are the same as shown above where space will permit.

Where a sign is to be located behind guardrail, an allowable minimum clearance of five feet may be used, measured from the face of the guardrail to the near edge of sign.

* - 6' minimum and desirable may be used only in areas of limited lateral clearance and when approved by the Engineer.

POST SPACING NOTES:

Post spacing on a two post sign may vary a maximum of plus or minus 10% of total sign width to fit field conditions.

Post spacing on a three post sign may vary a maximum of plus or minus 5% of total sign width to fit field conditions.

SIGN HEIGHT NOTES:

** The 8' 6" maximum may be exceeded when placing signs on extreme slopes. In these conditions, a 7' minimum from natural ground to bottom of sign must be maintained.

DEPARTMENTAL MATERIAL SPECIFICATIONS

ALUMINUM SIGN BLANKS	DMS-7110
SIGN HARDWARE	DMS-7120

GENERAL NOTES:

- Exit number panel shall be mounted to the right hand side of the parent sign for right exits and to the left hand side for left exits. The number panel shall be mounted with two uprights so its right edge is even with the right edge of the parent sign or vice-versa for left hand exits.
- Exit number panel support shall be symmetrical about number panel centerline.
- Exit number panel support shall be ASTM A36 structural steel galvanized after fabrication, or ASTM B221 aluminum alloy 6061-T6 or approved alternative.
- All bolts, nuts and washers shall be galvanized per ASTM Designation: B695 Class 50, or A153 Class C or D.
- Posts, parent sign panels, and exit number panels shall comply with notes on sheets SMD(2-1) and SMD(2-2).
- Signs (such as exit number panels) attached above a parent sign shall be made of the same type material as the parent sign. General Service and Routing signs may be fabricated from flat sheet aluminum.
- Exit number panel support and other connection hardware required to fasten exit number panel to parent sign shall be subsidiary to "Aluminum Signs" or "Fiberglass Signs."
- For fiberglass sign installation details, see manufacturer's recommendations.



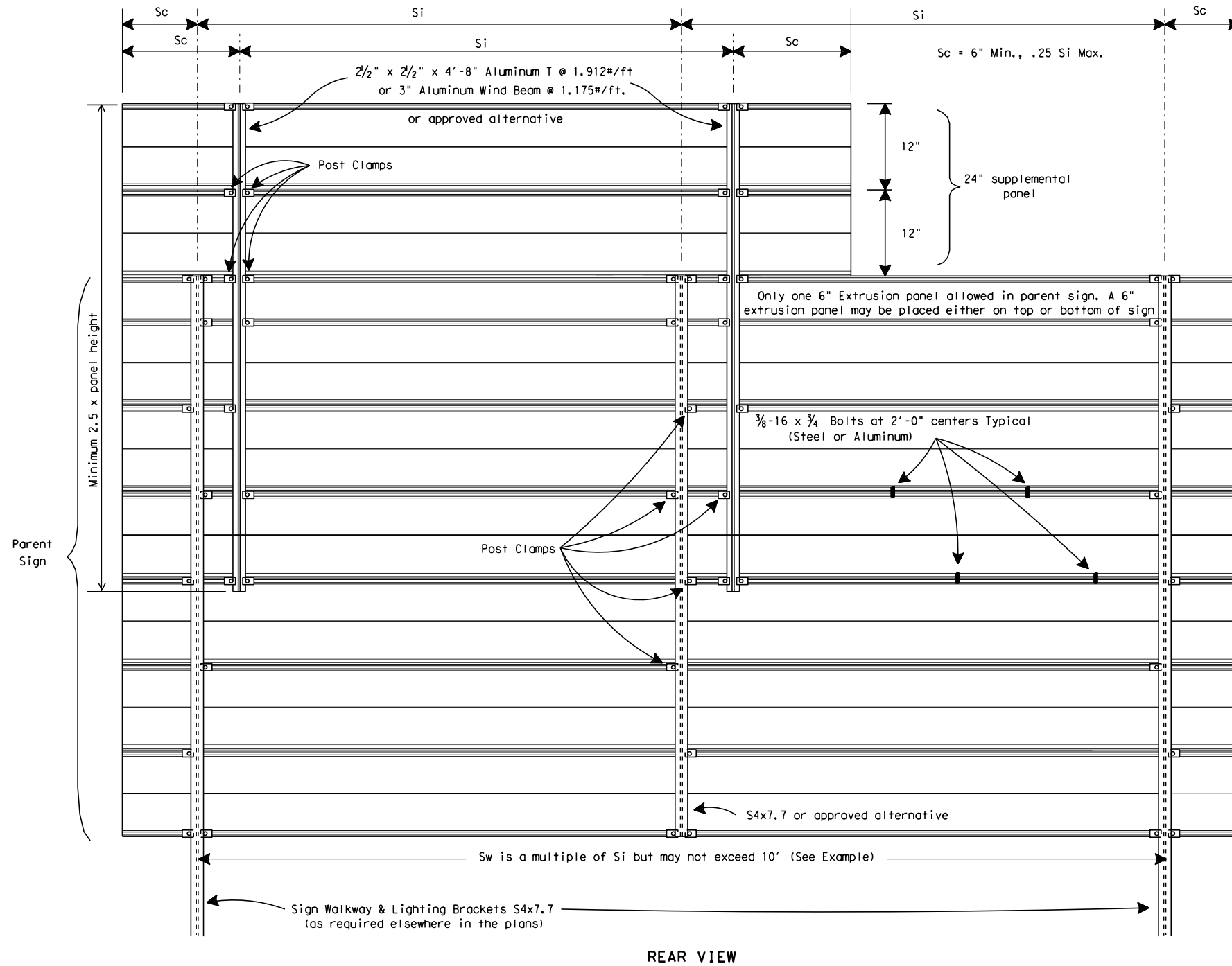
SIGN MOUNTING DETAILS-
LARGE ROADSIDE SIGNS

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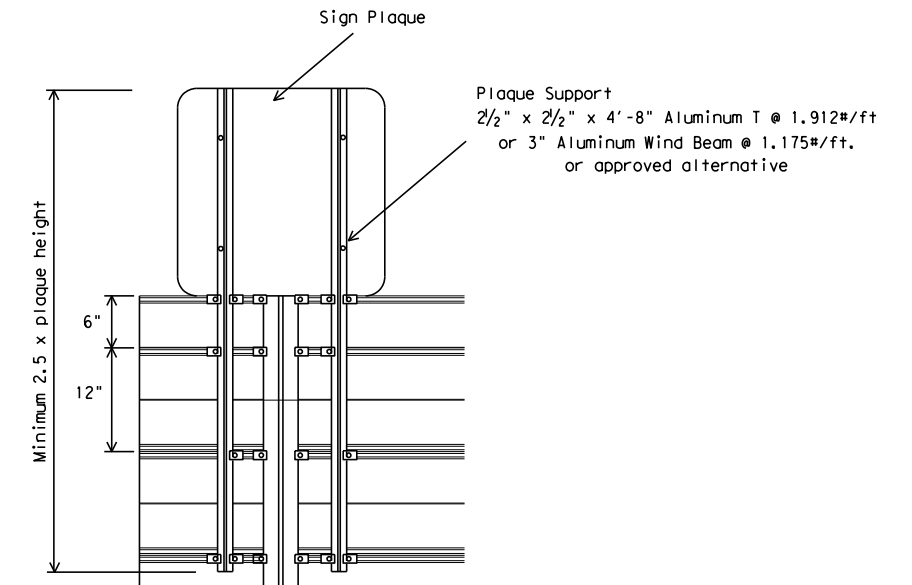
DATE:
FILE:



EXAMPLES (FOR DETERMINING Si and Sw)

NO.	ZONE	"d"	EXIT PANEL	WALKWAY	Si	Sw	COMMENT
1	1	15.0	YES	YES	4.5	9.0	Sw=2x(Si)
2	2	14.0	YES	NO	7.5	7.5	Sw = Si
3	1	15.0	NO	NO	8.5	8.5	Sw = Si
4	3	14.0	NO	YES	10.0	10.0	Sw = Si

Values shown for Si are maximum values. Si may be varied for different sign lengths and Truss mounting conditions. Sw should not exceed two times Si (Max.) or 10 feet.



SIGN PLAQUE MOUNTING DETAIL

"d"	MAXIMUM SIGN SUPPORT SPACING "Si" (FEET)															
	EXTRUDED ALUMINUM SIGN PANELS															
	WITH EXIT NUMBER PANELS								WITHOUT EXIT NUMBER PANELS							
	WITH WALKWAYS				WITHOUT WALKWAYS				WITH WALKWAYS				WITHOUT WALKWAYS			
Deepest Sign in Group (Ft.)	WIND ZONE				WIND ZONE				WIND ZONE				WIND ZONE			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
15	4.5	7	8	10	5	7	8	10	7	8	9	10	8.5	10	10	10
14	6	7.5	9.5	10	6	7.5	9.5	10	8	9	10	10	10	10	10	10
13	7.5	9	10	10	7.5	9	10	10	9	10	10	10	10	10	10	10
12	8.5	10	10	10	8.5	10	10	10	10	10	10	10	10	10	10	10
11 or less	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10

For fiberglass sign installations, see manufacturer's recommendations.

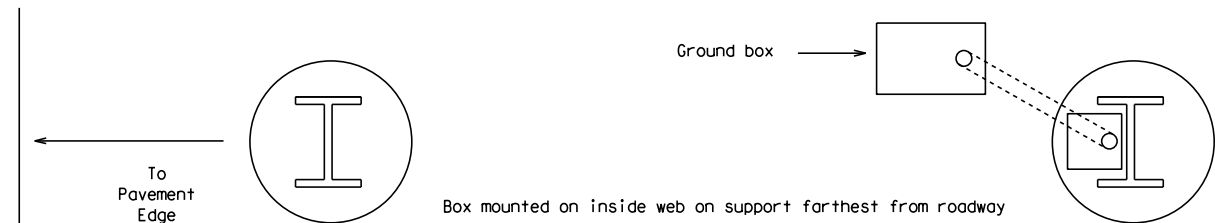


**SIGN MOUNTING DETAILS-
OVERHEAD SIGNS
EXTRUDED ALUMINUM
SMD (2-4) -08**

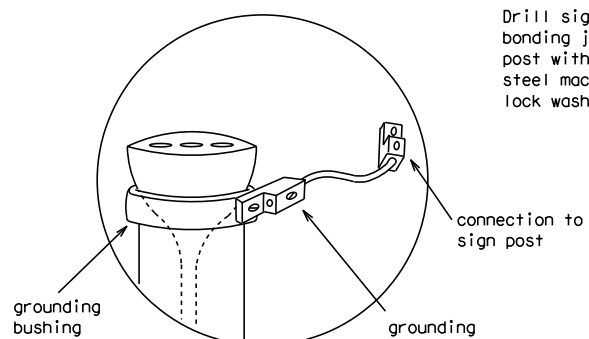
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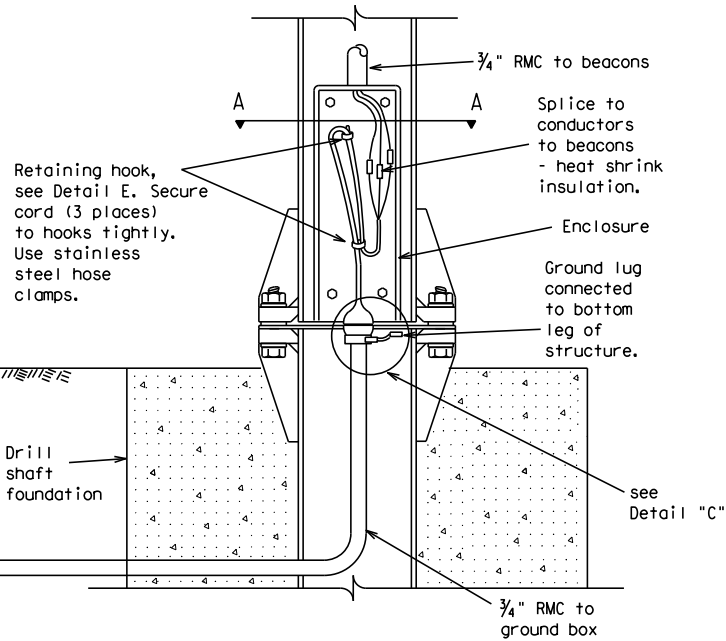
PLAN VIEW



DETAIL C

⚠ Pull connector down tight against conduit then clamp in ground box. See Detail "D"

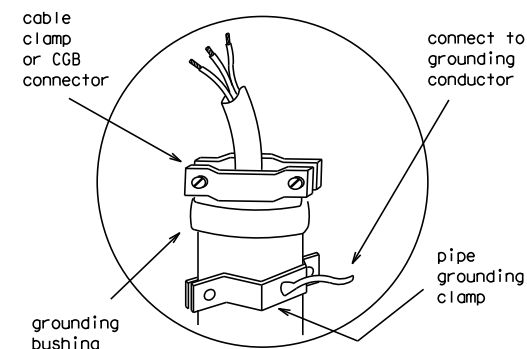
Drill sign post - structure leg, terminate bonding jumper with listed connector to post with a 10-24 (3/16") min. stainless steel machine screw, nut, flat washer and lock washer made wrench tight.



ELECTRICAL CONNECTION DETAIL

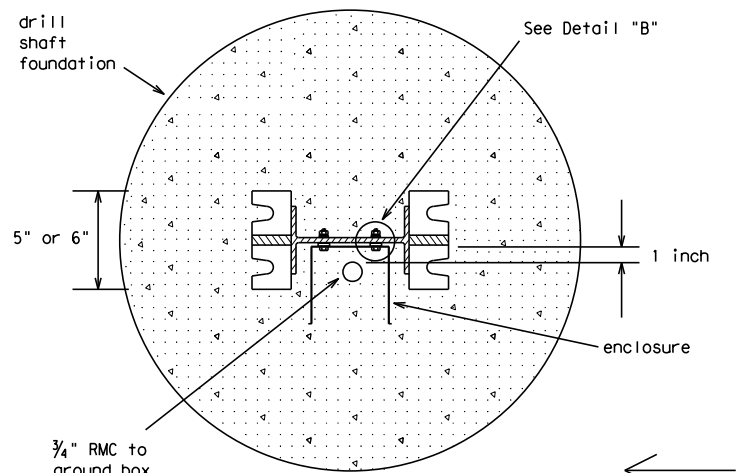
Enclosure cover not shown for clarity
Detail shows channel greater than 4 inches.
Less than 4 inches similar, see Detail A.

Use RMC E11s, provide grounding bushings. Terminate bonding jumper to ground rod and equipment grounding conductors.



DETAIL D

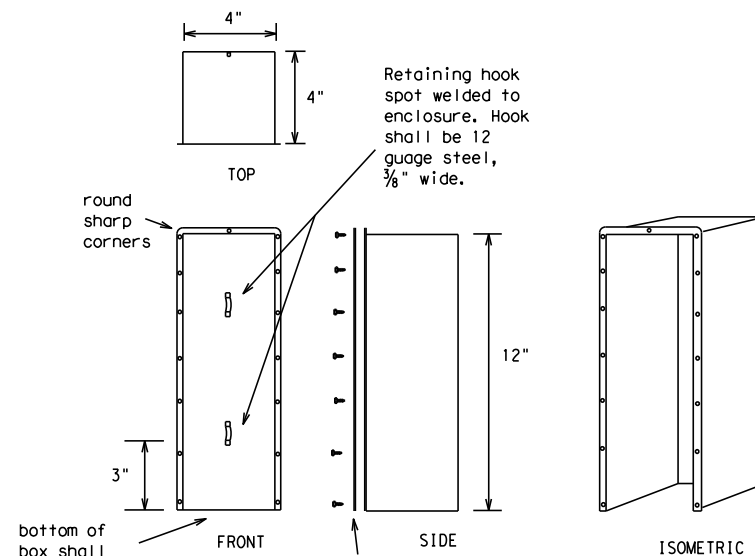
Pull cable so opposite end connector is tight against conduit end, clamp cable at top of conduit as shown.



SECTION A-A

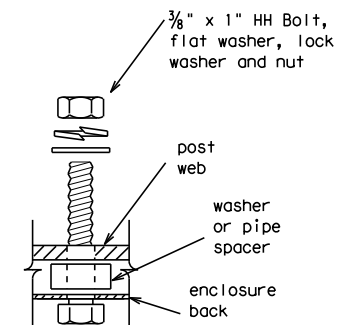
Stub-post connection
conduit, bolts and enclosure
(cover not shown)

direction of traffic



ENCLOSURE

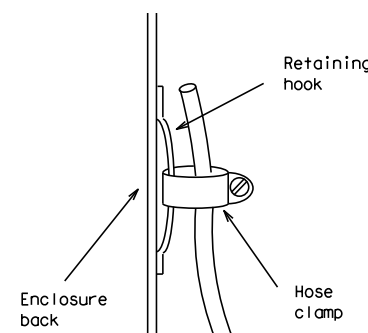
make from 12 gauge galvanized sheet metal



DETAIL B

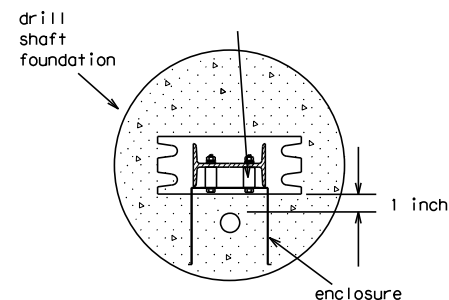
enclosure connection
(4 places)

(use 2 inch bolt for 3 and 4 inch channels)



DETAIL E

steel pipe spacer
(1" for 3" channel,
1 1/4" for 4" channel)
See detail B



DETAIL A

Stub-post connection
conduit, bolts and enclosure
for 3 and 4 inch channel
(cover not shown)

direction of traffic

NOTES:

- Breakaway connector shall be rated for 300 VAC, 30 amps and shall be waterproof. Connector shall be a three pole (two line conductors and neutral) polarized elastomer connector made from thermosetting synthetic polymer which remains flexible over the temperature range of -40 degrees C to 90 degrees C. The pins on the connector shall be overmolded 1/4" from the face of the connector toward the tips of the pins with the same material used in the construction of the connector body. This overmolding of the pins shall provide a non-conductive double taper which prevents the intrusion of water into the connection when the connectors are fully engaged. The pin receptors shall have current carrying barrels recessed 1/2" from the face of the connector and surrounded by beryllium copper spring sleeves. The plug/receptacle combination shall be listed by an approved testing facility (UL or Factory Mutual) as suitable for outdoor use and shall have passed a rain test and a watertight (immersion) test as approved by the Engineer.
- The female connector shall be integrally molded to a 13' length of type 50 cord containing three number 10 or number 8 AWG conductors. The male connector shall be integrally molded to a 20' length of Type 50 cord containing three number 10 or number 8 AWG conductors. Cord conductors shall have colored insulation, two black and one white, or shall be taped or painted to be two black and one white. Tape or paint marking shall cover entire exposed length. The contractor shall make a brochure submittal on cord connectors. Breakaway connector and cord shall not be paid for separately, but shall be subsidiary to the various items.
- The contractor shall install in-line waterproof fuseholders for each line conductor in the ground box. Fuses shall be fast-acting 5 amp (Bussman KTK5, Gould ATM5, Littlefuse KLK5 or equal).
- ⚠ Conduit shall convert to 3/4" liquidtight flexible metallic conduit below the fuse plate or knee joint and shall revert to 3/4" RMC above the fuse plate or knee joint. The length of liquidtight flexible metal conduit shall not exceed 6".
- Ground rod clamp shall be Blackburn GG 5/8H, Weaver W5.8 or equal.
- Ground rod to be driven to a depth to leave between 2 to 4 inches of rod above the gravel placed under the ground box. See ED(2) standard sheet for ground box details.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS-
LARGE ROADSIDE SIGNS
ELECTRICAL CONNECTION

SMD(2-6)-01

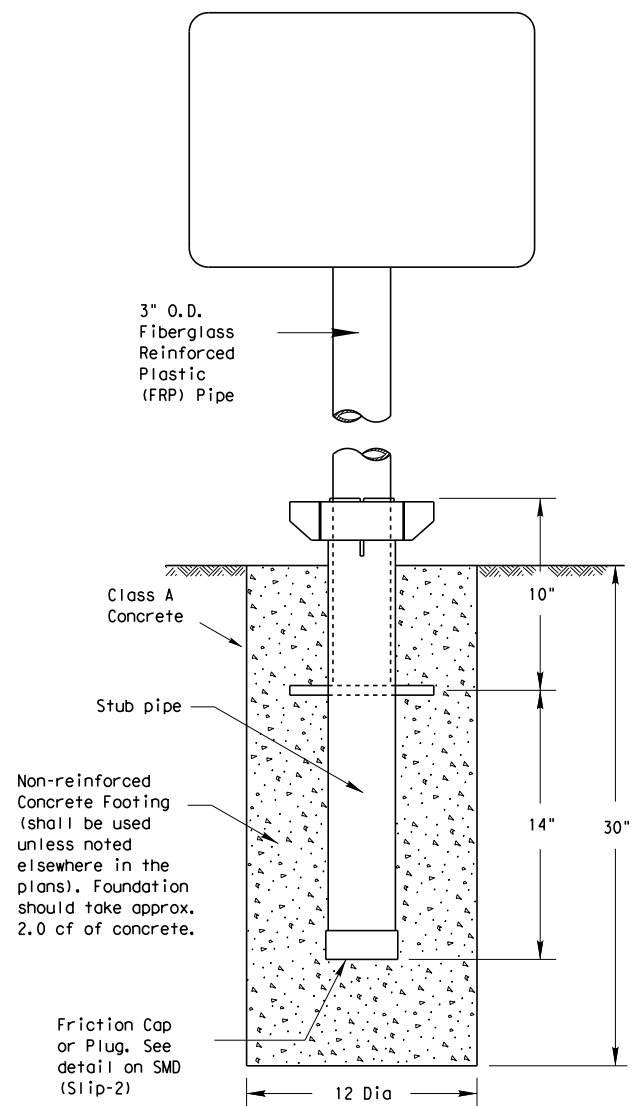
11-01 Revision

- ⚠ Liquidtight conduit size corrected.
- ⚠ Editing of minor notes.

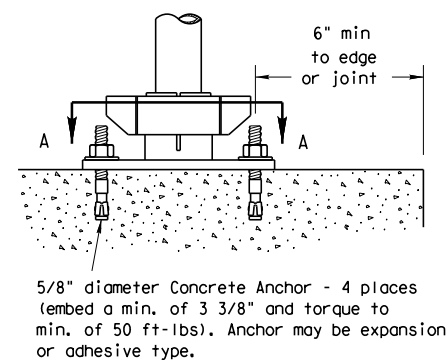
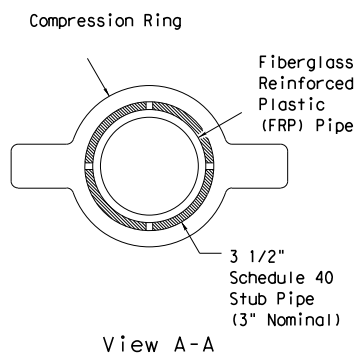
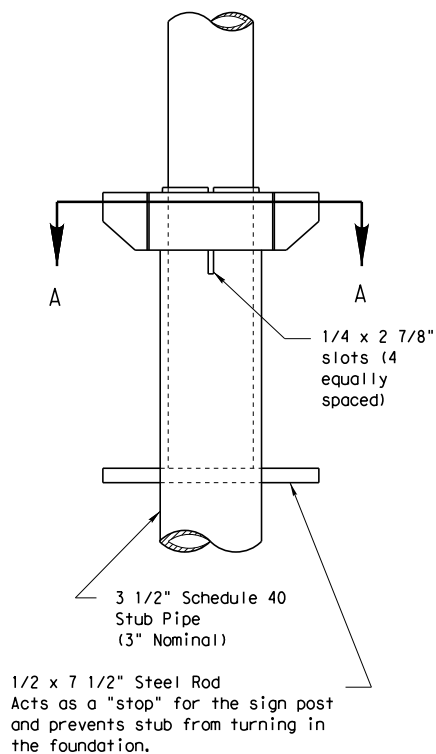
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Universal Anchor System with Fiberglass Reinforced Plastic (FRP) Post

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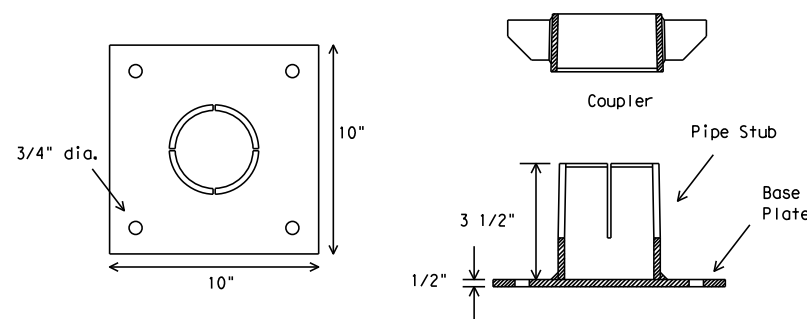


SM RD SGN ASSM TY FRP(X)UA(P)



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, "Epoxy and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations.

BOLT-DOWN DETAILS



SM RD SGN ASSM TY FRP(X)UB(P)

GENERAL NOTES:

- FRP sign supports for a single type sign support may be used for signs up to and including 16 square feet. Dual post installation may be used for signs up to and including 32 square feet.
- All nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing."
- See the Traffic Operations Division website for detailed drawings of sign clamps. The website address is: <http://www.txdot.gov/publications/traffic.htm>

FRP POST REQUIREMENTS

- Materials shall conform to the requirements of Departmental Material Specification DMS-4410 and will be furnished in a yellow or gray color as specified elsewhere in the plans.
- Thickness of FRP sign support is 0.125" + 0.031", - 0.0".
- FRP sign supports are prequalified by the Traffic Operations Division. Prequalification procedures are obtained by writing:
Texas Department of Transportation
Traffic Operations Division
125 East 11th Street
Austin, Texas 78701-2483

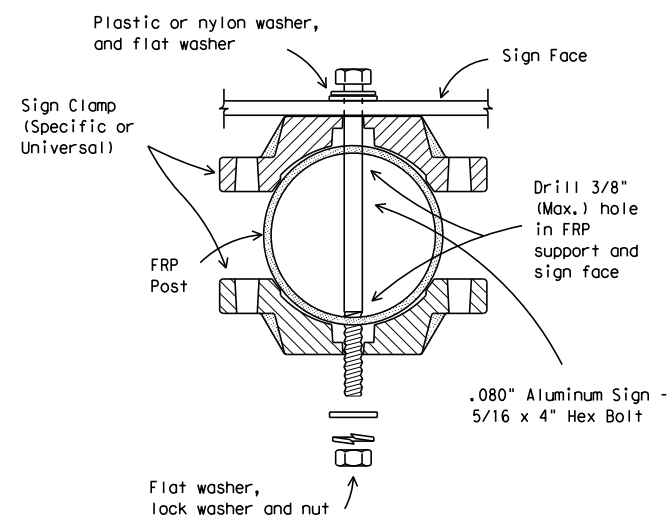
UNIVERSAL ANCHOR SYSTEM INSTALLATION PROCEDURES

- 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.
- 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.
- Insert base post in foundation hole to depths shown and fill hole with concrete. Cut base post from bottom and ensure a minimum of 18" embedment if installed in solid rock.
- Level and plumb the base post with coupler using a torpedo level and let concrete set a minimum of 4 days, unless otherwise directed by Engineer. Bottom of base post slots shall be above the concrete footing.
- Attach sign to FRP post.
- Insert sign post into base post. Lower until the post comes to rest on the steel rod.
- Use hammer to ensure the coupler is firmly seated. Top of coupler should be level with top of base post in most instances.
- Check sign to ensure there is no twist. If loose, increase the tightening of coupler.

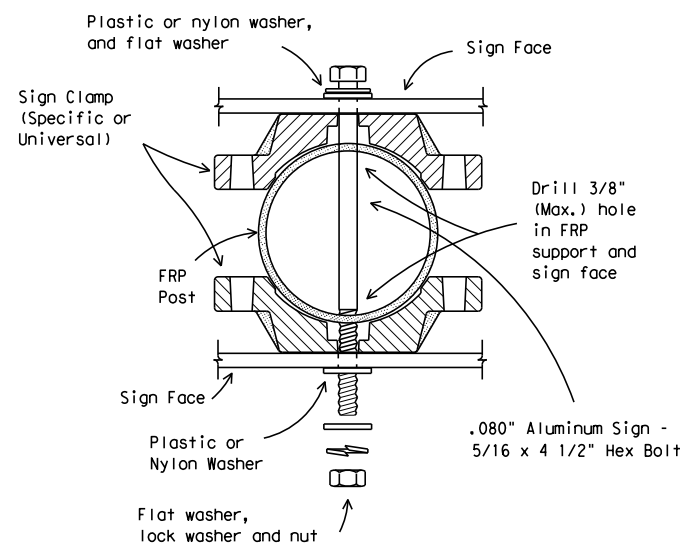
BOLT DOWN SIGN SUPPORT

- Position base plate with coupler on existing concrete.
- Drill holes into concrete and insert the 5/8" diameter bolts with wedge anchors, and tighten nuts.
- Attach sign to FRP post.
- Insert bottom of sign post into pipe stub.
- Use hammer to ensure the coupler is firmly seated. Top of coupler should be level with top of base post in most instances.
- Check sign to ensure there is no twist. If loose, increase the tightening of coupler.

Typical Sign Mounting Detail for FRP Support with Single Sign



Typical Sign Mounting Detail for FRP Support with Back-to-Back Signs



Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS UNIVERSAL ANCHOR SYSTEM WITH FRP POST

SMD (FRP) -08

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SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

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

Post Type

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

Number of Posts (1 or 2)

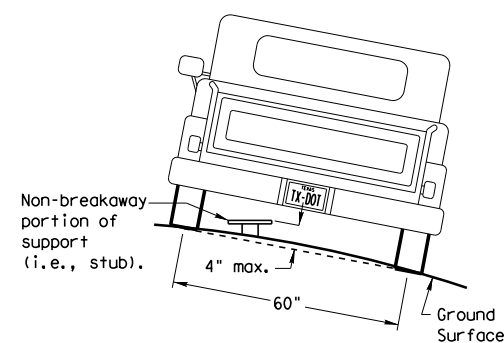
Anchor Type

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

Sign Mounting Designation

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

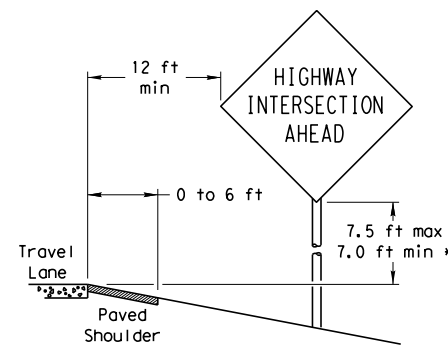
REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



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).

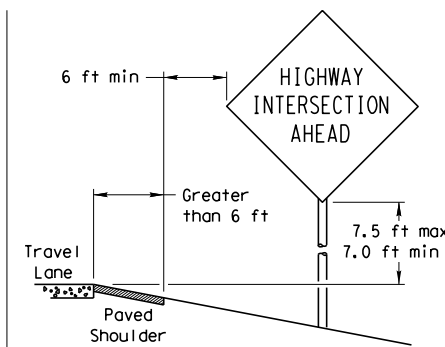
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

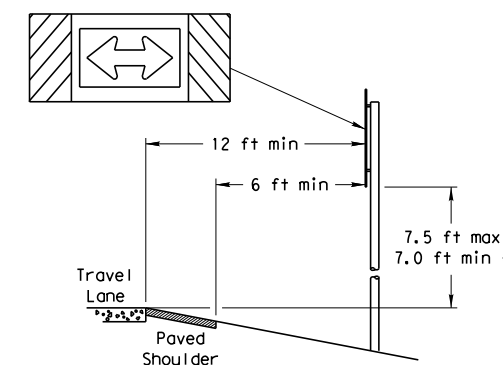
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



GREATER THAN 6 FT. WIDE

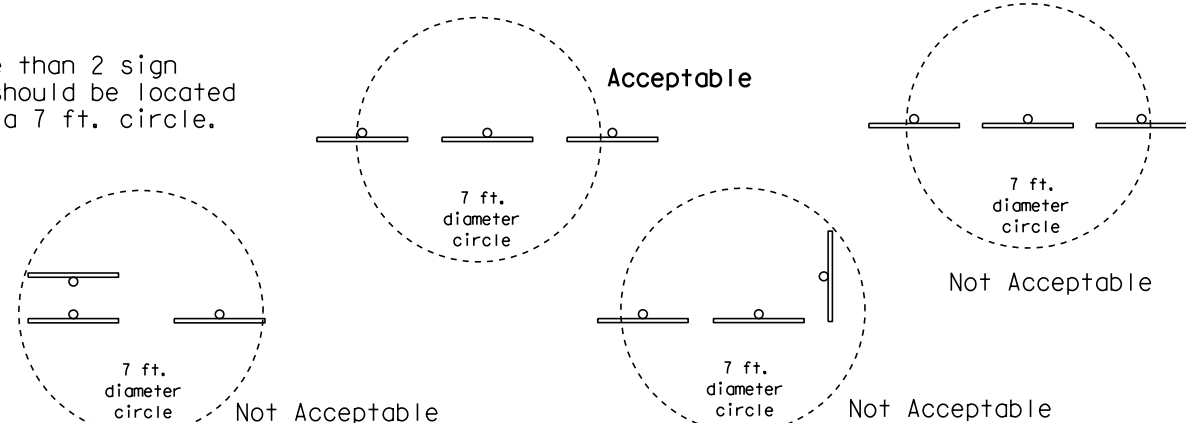
When the shoulder is greater than 6 ft in width, the sign must be placed at least 6 ft. from the edge of the shoulder.

T-INTERSECTION

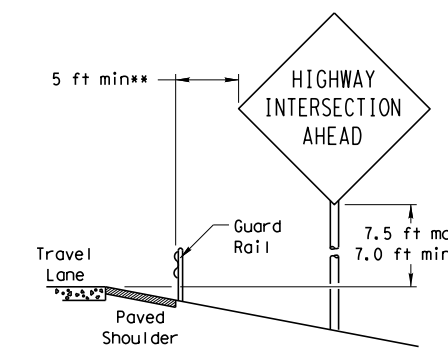


When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.

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

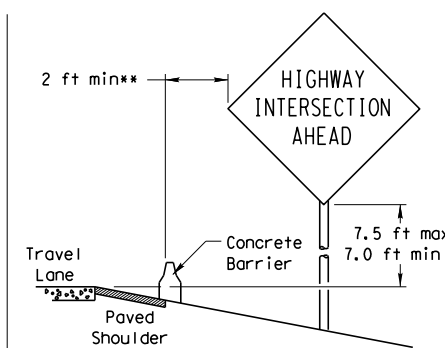


BEHIND BARRIER

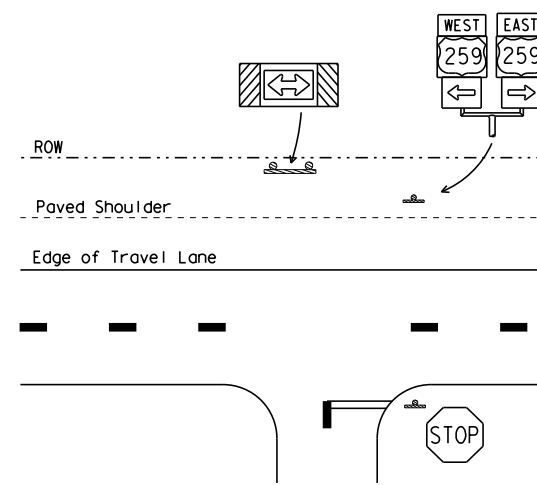


BEHIND GUARDRAIL

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



BEHIND CONCRETE BARRIER



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

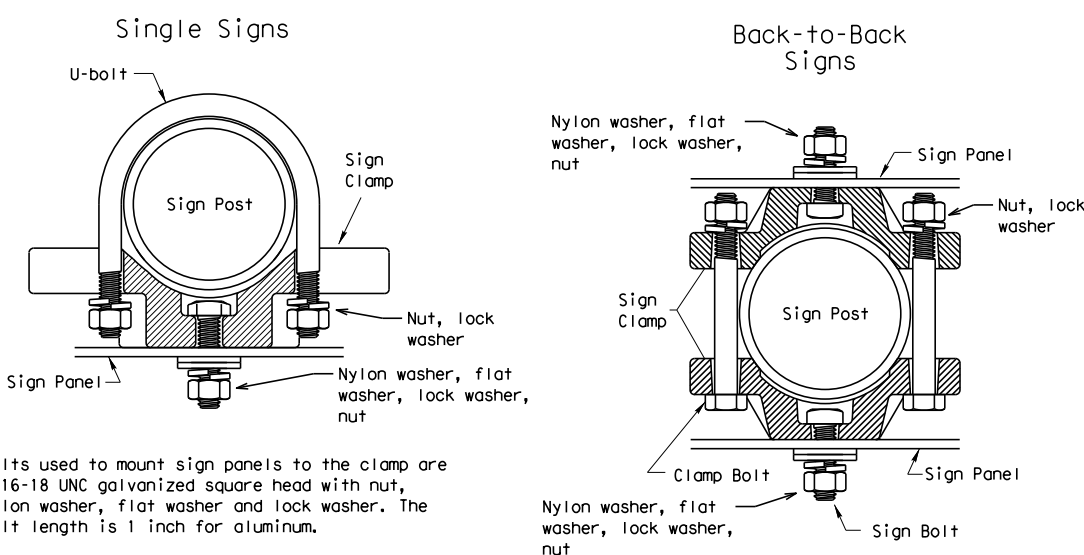
- (1) a minimum of 7 to a maximum of 7.5 feet above the edge of the travel lane or
- (2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.

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>

TYPICAL SIGN ATTACHMENT DETAIL



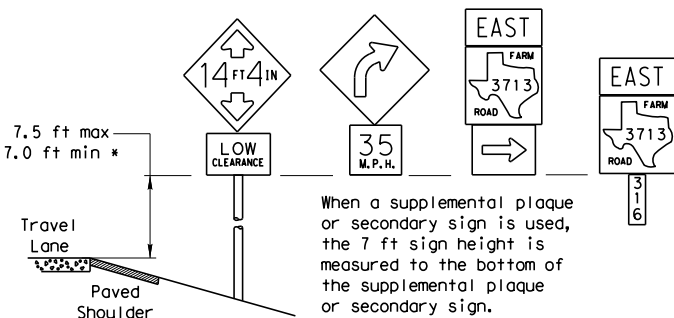
Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

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.

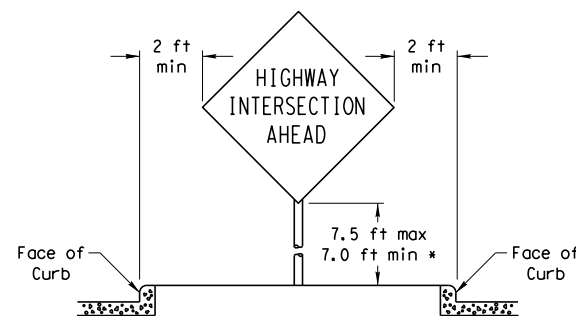
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES

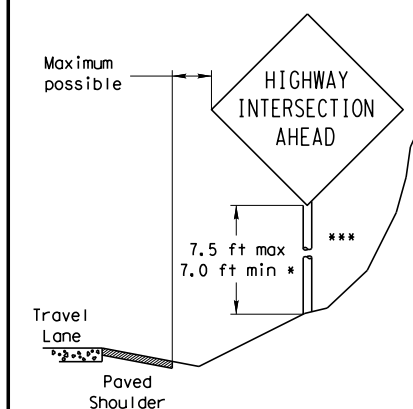


When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

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.



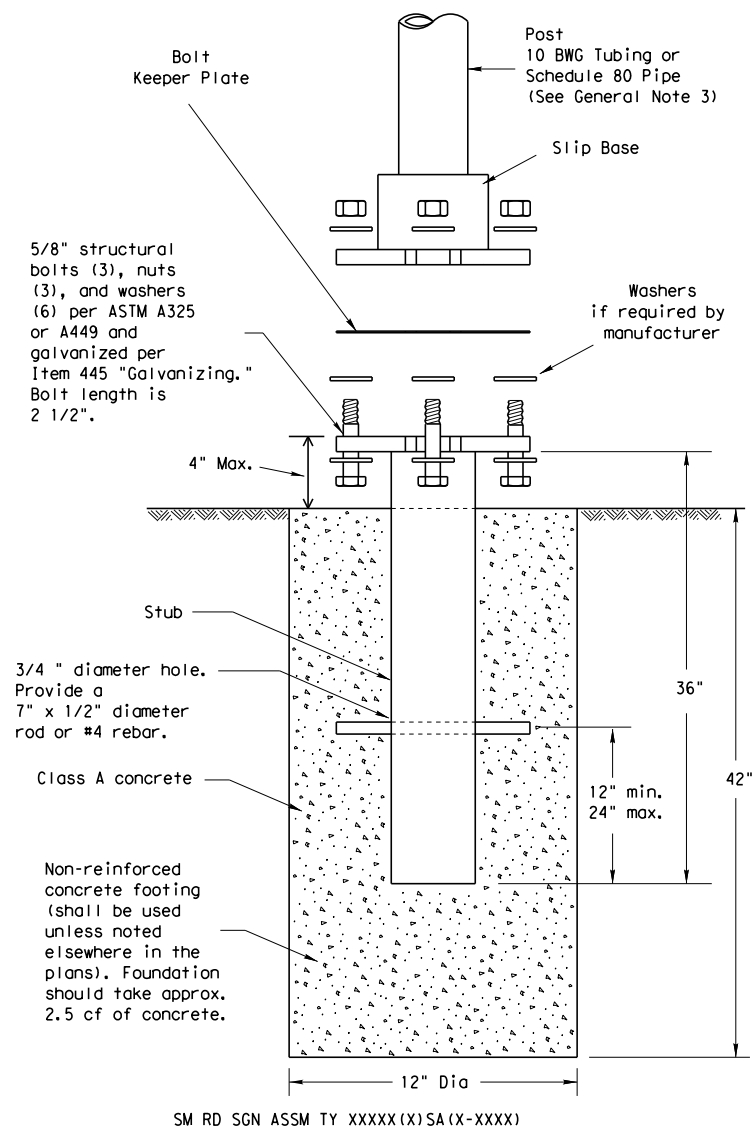
SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD(GEN)-08

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TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS



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:

- 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.
- 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
- 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>
- Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.

ASSEMBLY PROCEDURE

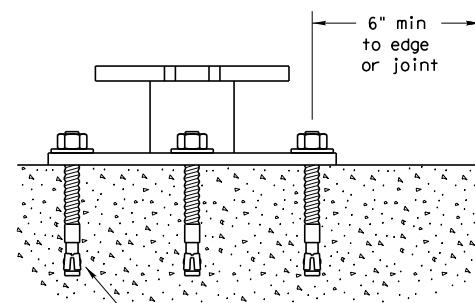
Foundation

- 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.
- 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.
- 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.
- Plumb the stub. Allow a minimum of 4 days to set, unless otherwise directed by the Engineer.
- The triangular slipbase system is multidirectional and is designed to release when struck from any direction.

Support

- 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.
- 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, "Epoxyes 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

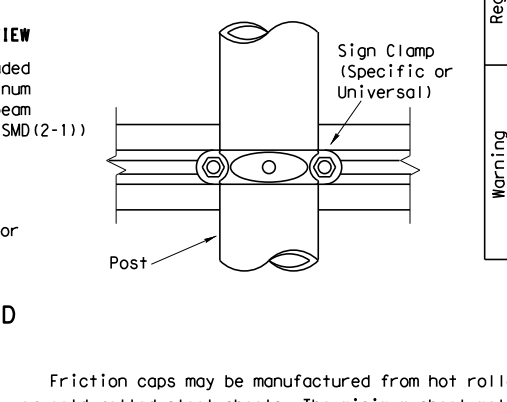
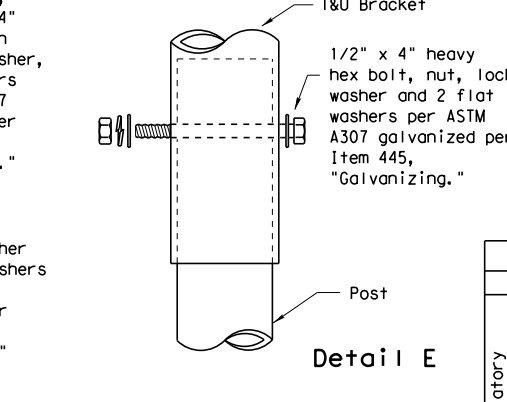
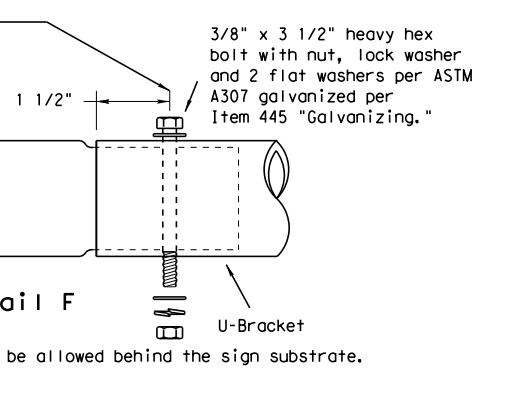
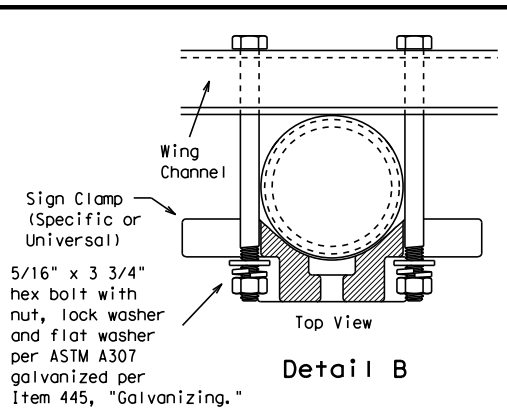
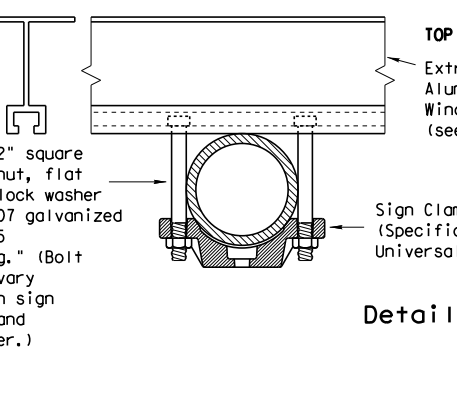
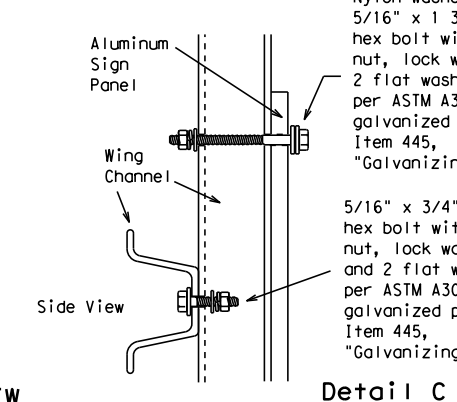
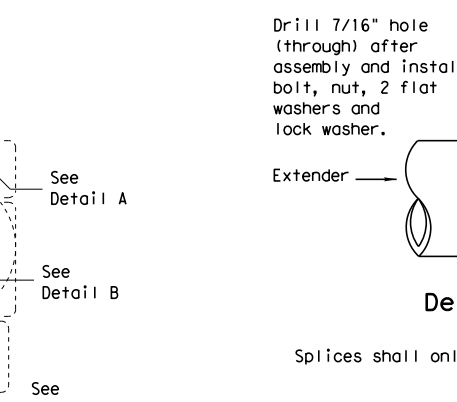
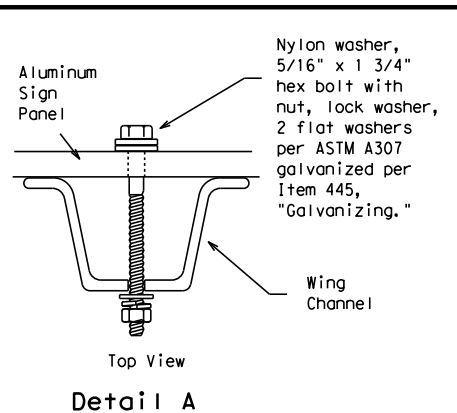
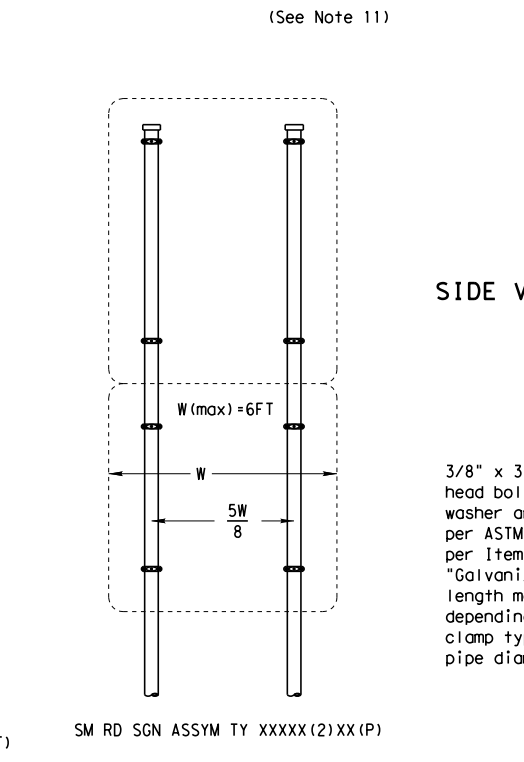
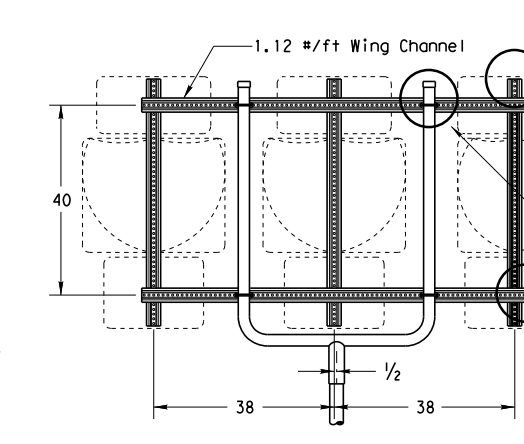
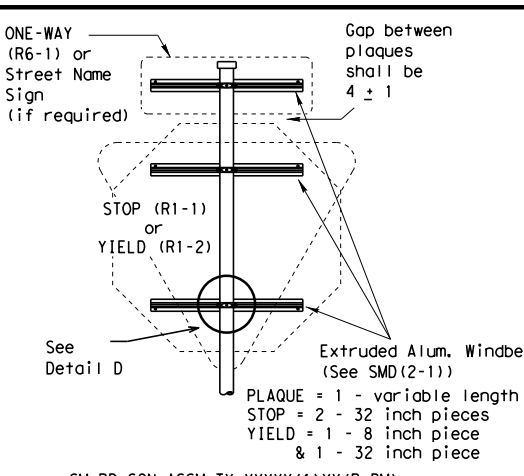
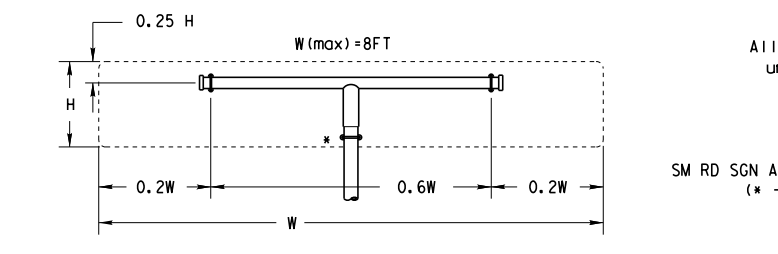
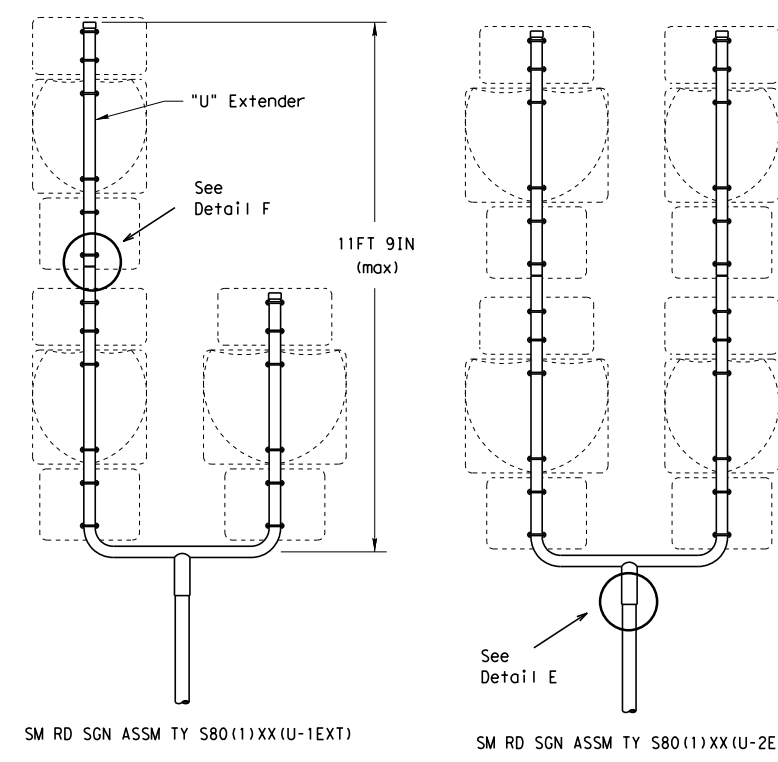
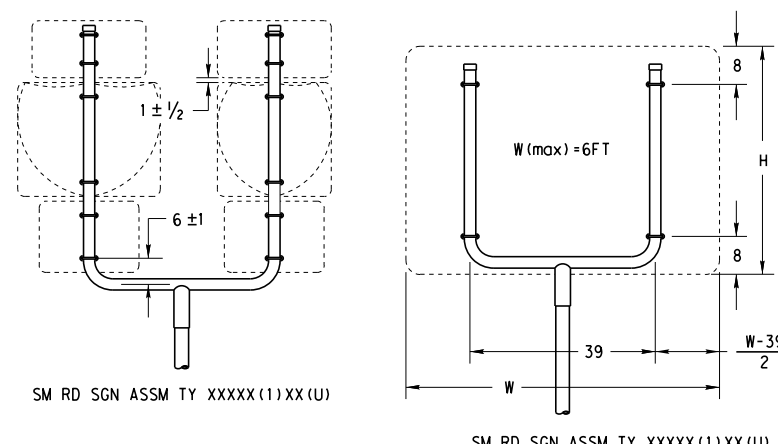
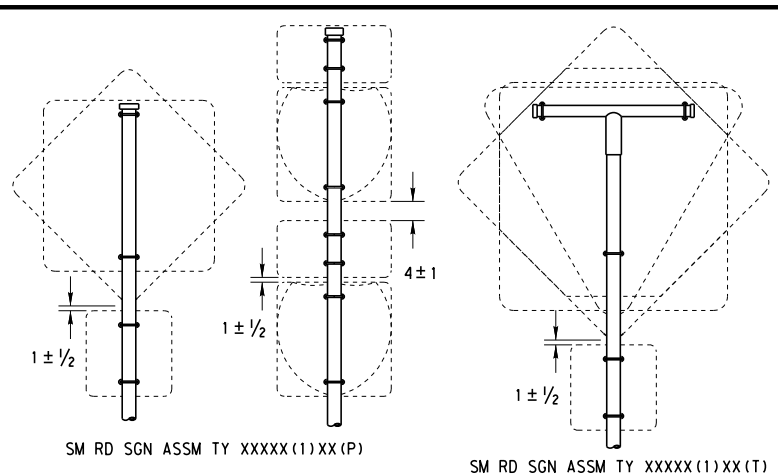
Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-1)-08

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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 |
- 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.
- Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
- 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.
- Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
- 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.
- 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.
- Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
- 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."
- Additional route markers may be added vertically, provided the total sign area does not exceed the maximum allowable amount per Note 1.
- 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.
- Post open ends shall be fitted with Friction Caps.
- Sign blanks shall be the sizes and shapes shown on the plans.

REQUIRED SUPPORT		
SIGN DESCRIPTION	SUPPORT	
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
Warning	48x60-inch signs	TY S80(1)XX(T)
	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)	



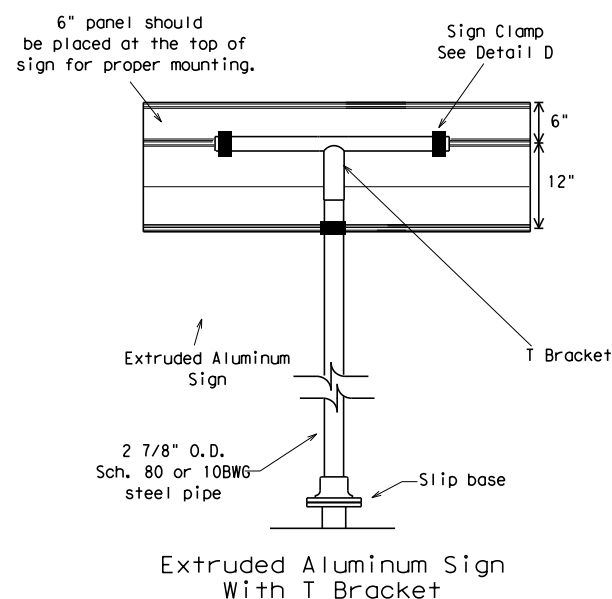
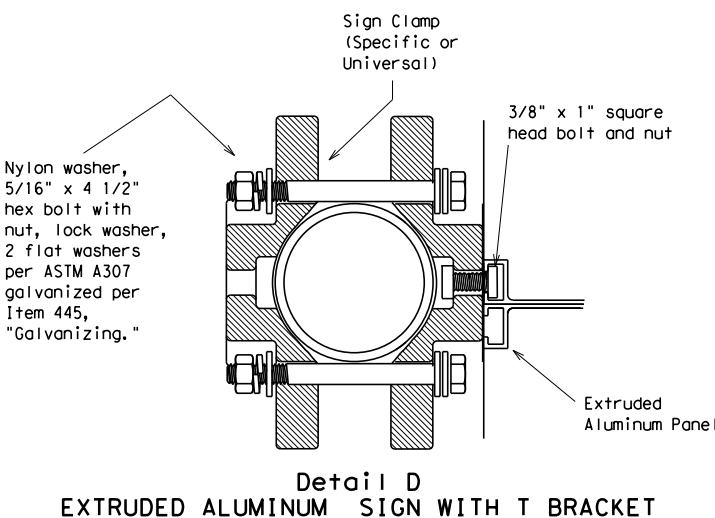
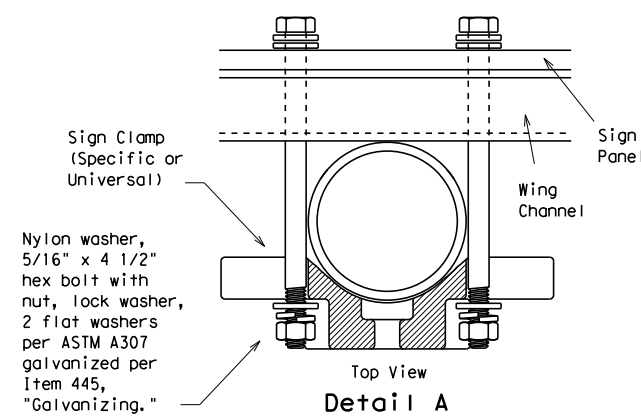
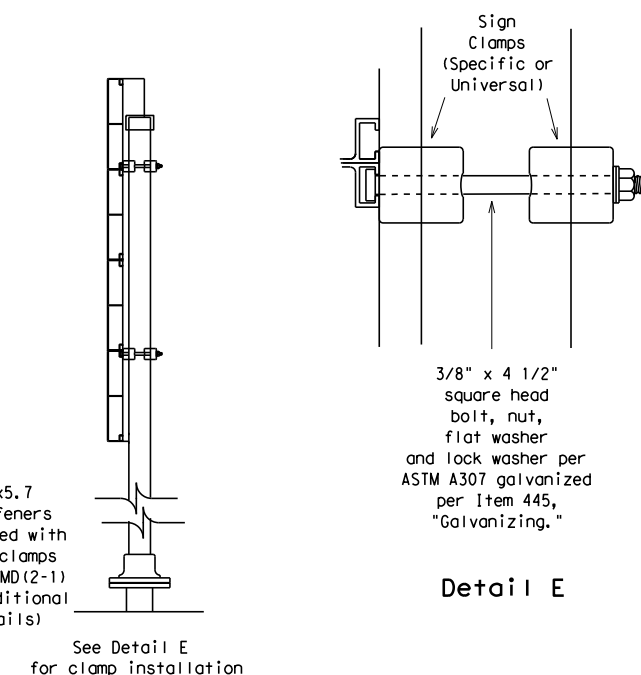
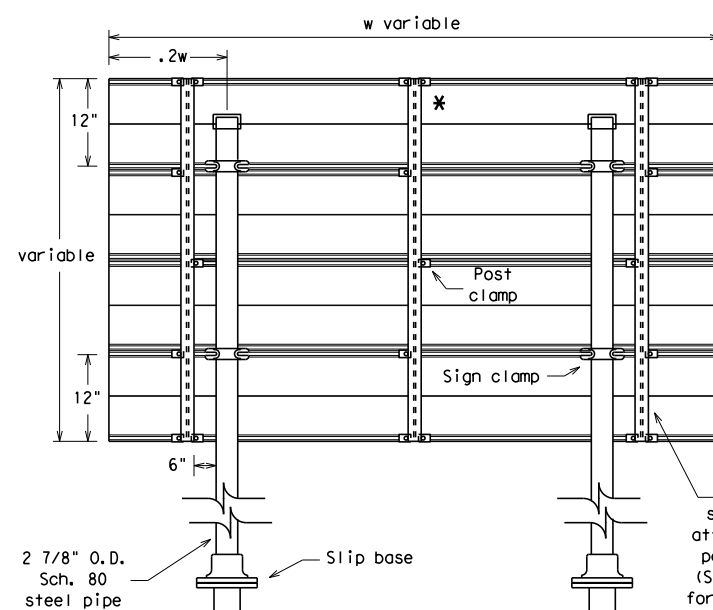
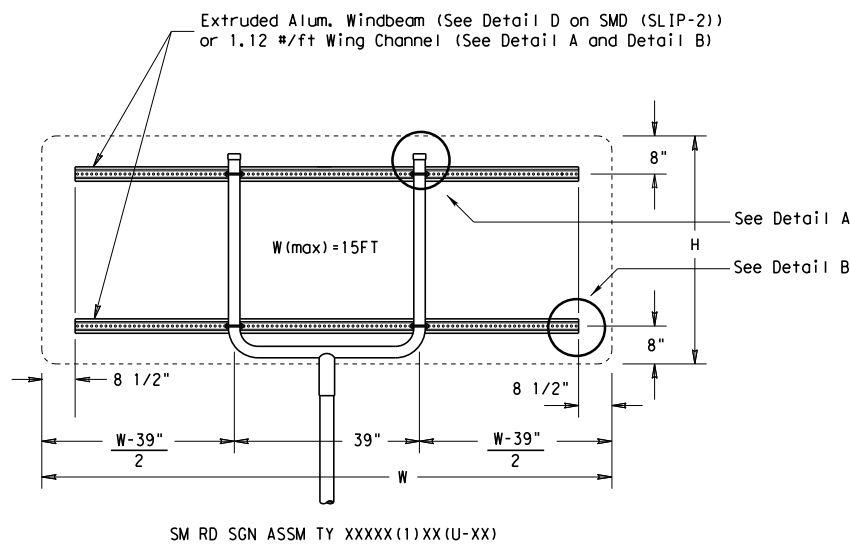
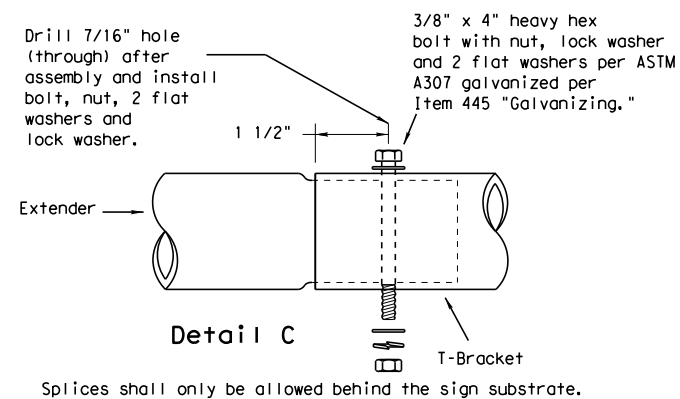
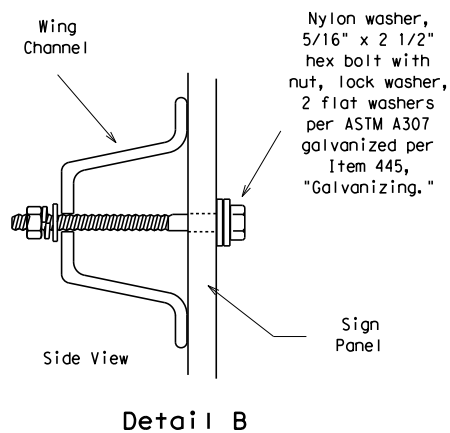
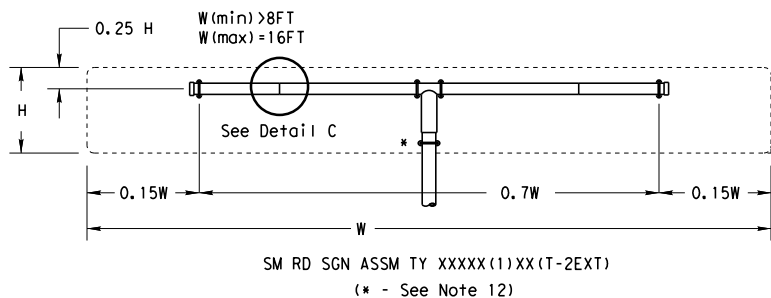
SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
TRIANGULAR SLIPBASE SYSTEM
SMD(SLIP-2)-08

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.

DATE:
FILE:

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DATE:
FILE:



GENERAL NOTES:

- | SIGN SUPPORT | # OF POSTS | MAX. SIGN AREA |
|--------------|------------|----------------|
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| 10 BWG | 2 | 32 SF |
| Sch 80 | 1 | 32 SF |
| Sch 80 | 2 | 64 SF |
- 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.
- Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
- 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.
- Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
- 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.
- 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.
- Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
- 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."
- Sign blanks shall be the sizes and shapes shown on the plans.
- 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.
- 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)	
Warning	48x60-inch signs	TY S80(1)XX(T)	
	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)	

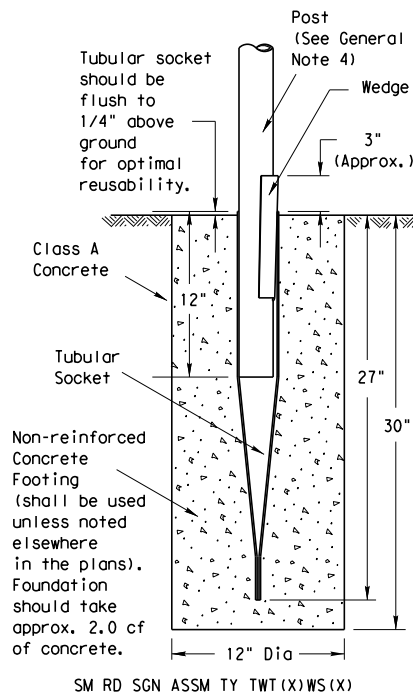
Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
TRIANGULAR SLIPBASE SYSTEM
SMD(SLIP-3)-08

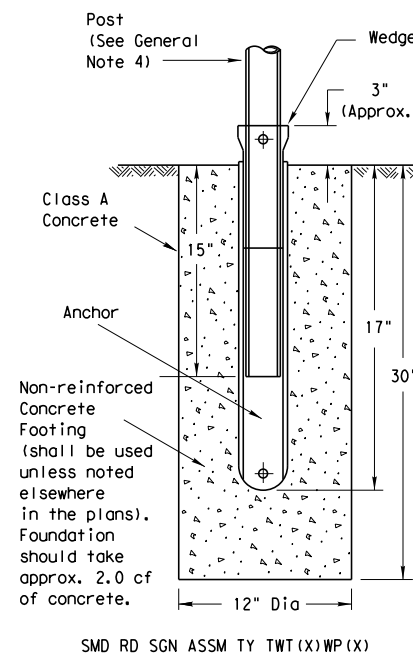
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		0389	13	039	SH 146
		DIST	COUNTY		SHEET NO.
		HOU	HARRIS		338

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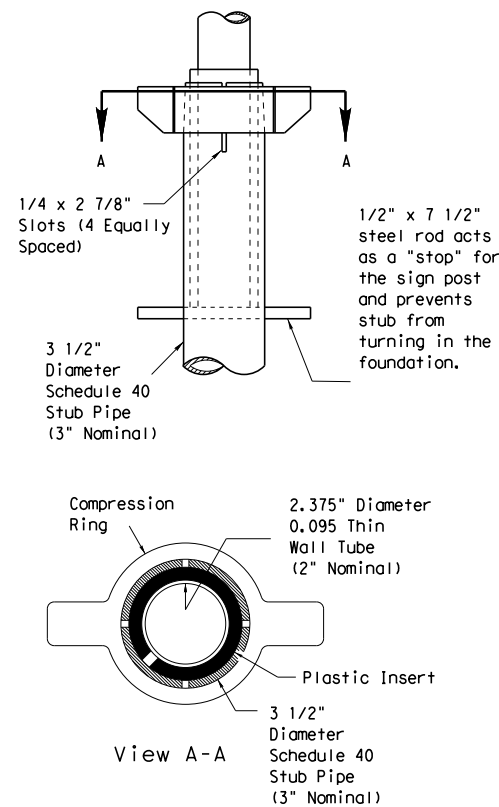
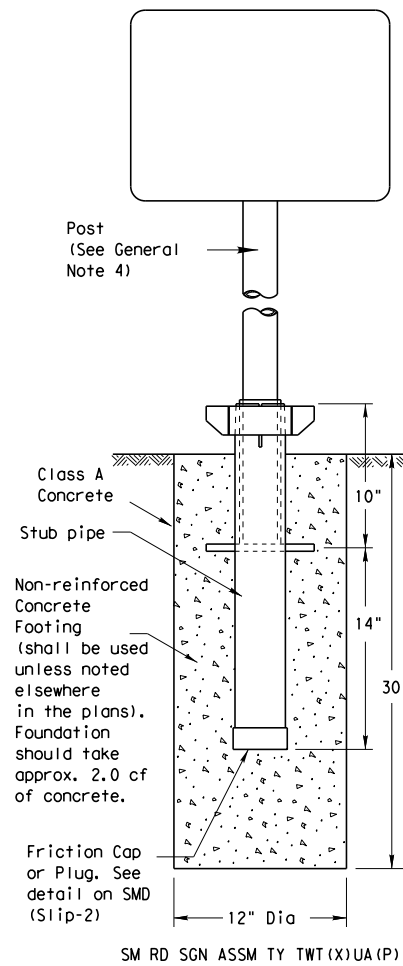
Wedge Anchor Steel System



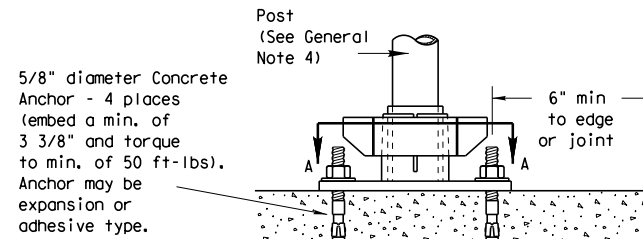
Wedge Anchor High Density Polyethylene (HDPE) System



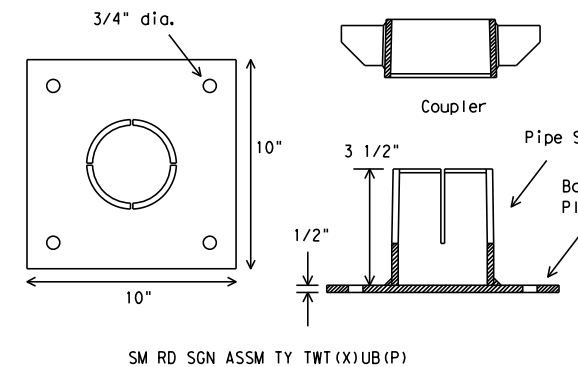
Universal Anchor System with Thin-Walled Tubing Post



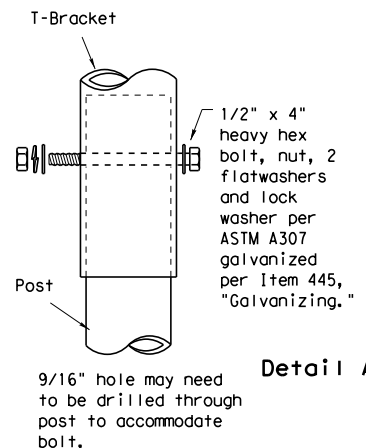
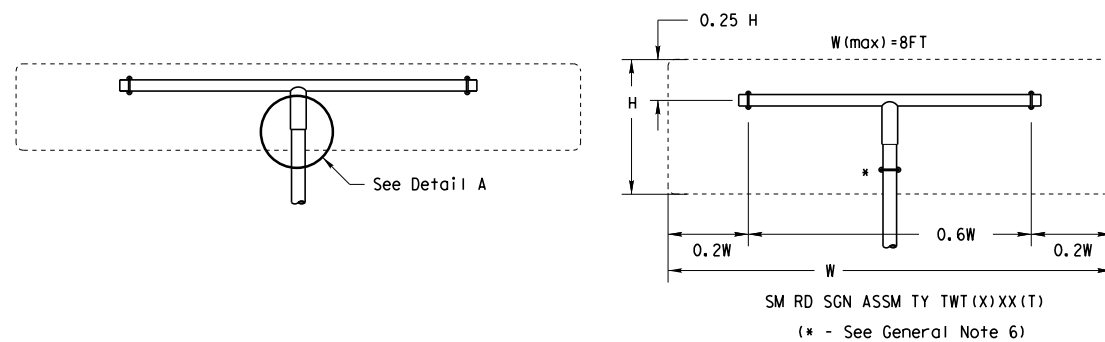
Plastic insert must be used when using the TWT with either the Universal Anchor System or the Bolt Down Universal Anchor System. The insert should be approx. 10" long and cover the tubing from just above the top of the stub pipe to the bottom of the sign post when using the Universal Anchor System. The 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, "Epoxyes and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations.



Sign Installation Using a Prefabricated T-Bracket for Thin-Wall Tubing Post



NOTE

The devices shall be installed per manufacturer's recommendations. Installation procedures shall be provided to the Engineer by Contractor.

GENERAL NOTES:

- 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.
- 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.
- 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
- 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.
- Sign blanks shall be the sizes and shapes shown on the plans.
- Additional sign clamp required on the "T-bracket" post for 24" high signs. Place clamp at least 3" above bottom of sign when possible.
- Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
- 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

- 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.
- 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.
- Insert tubular socket into concrete until top of socket is approximately 1/4" above the concrete footing.
- Plumb the socket. Allow a minimum 4 days for concrete to set, unless otherwise directed by Engineer.
- Attach the sign to the sign post.
- Insert the sign post into socket and align sign face with roadway.
- Drive the wedge into the socket to secure post. This will leave approximately 3 inches of the wedge exposed.

UNIVERSAL ANCHOR SYSTEM INSTALLATION PROCEDURE

- 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.
- Insert base post in hole to depths shown and backfill hole with concrete.
- 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.
- Attach the sign to the sign post.
- Install plastic insert around bottom of post.
- Insert sign post into base post. Lower until the post comes to rest on steel rod.
- Seat compression ring using a hammer. Typically, the top of compression ring will be approximately level with top of stub post when optimally installed.
- Check sign post by hand to ensure it is unable to turn. If loose, increase the tightening of the compression ring.

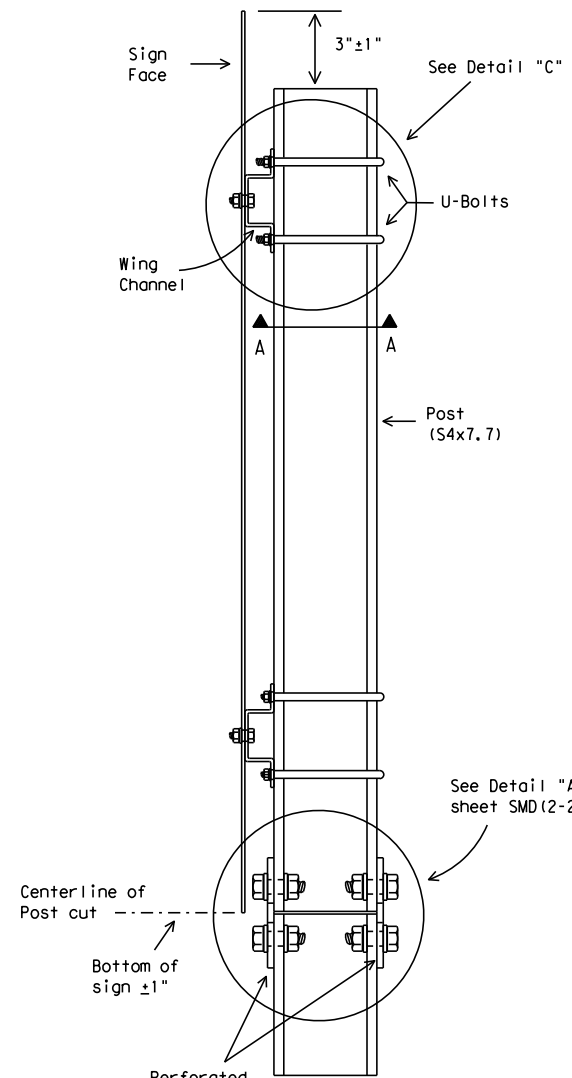
Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS WEDGE & UNIVERSAL ANCHOR WITH THIN WALL TUBING POST SMD(TWT) - 08

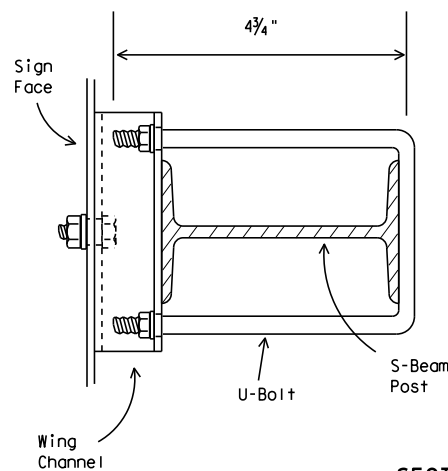
© TxDOT July 2002	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT	
9-08	REVISIONS	CONT	SECT	JOB	HIGHWAY
		0389	13	039	SH 146
		DIST	COUNTY	SHEET NO.	
		HOU	HARRIS	339	

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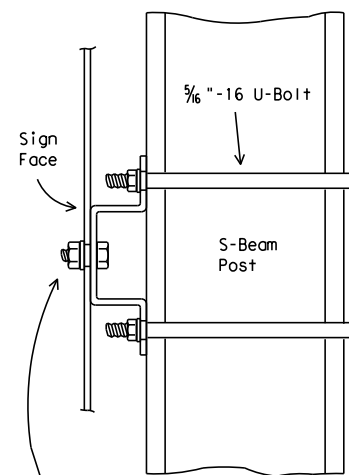
WING CHANNEL CLAMP DETAIL FOR TYPE G MOUNT



SIDE VIEW

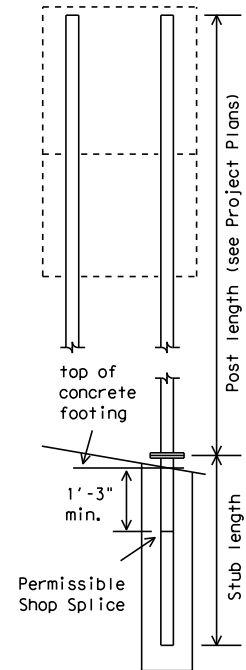


SECTION A-A

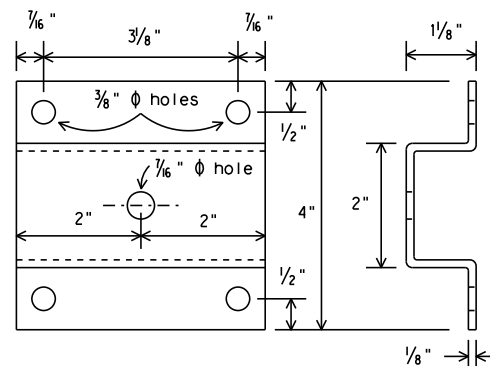


DETAIL "C"

Galvanized steel or aluminum self-locking hex. head nut. 3/8" - 16 x 3/4" hex. head bolt for sheet metal. 3/8" - 16 x 1 1/4" hex. head bolt for plywood. 3/8" galvanized medium washer.



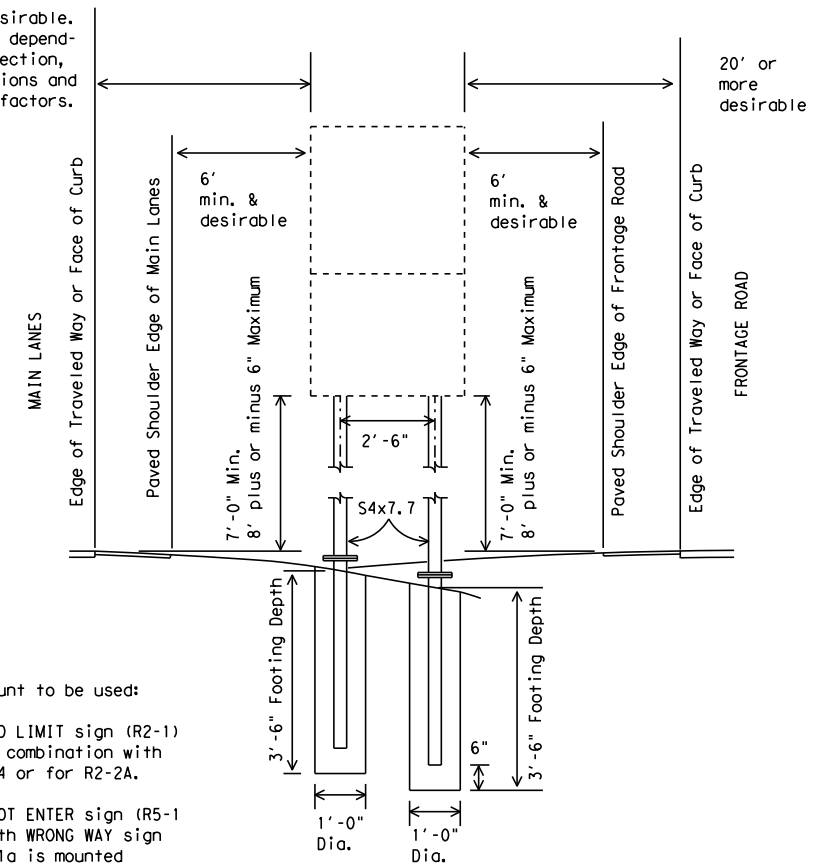
The weight of one S4x7.7 post is equal to 112.2 lbs. plus 7.7 lbs./ft x (post length in feet minus 10 ft). The weight of 112.2 lbs. includes 10 feet of post length, post foundation stub, related connection plates, friction fuse plate, and all high strength bolts, nuts and washers.



WING CHANNEL

Wing channel, 4" width x 1/8" depth x 1/8" thickness, shall be aluminum (ASTM B221 6061-T6 or B308 6061-T6), galvanized steel (ASTM A36) or stainless steel (ASTM A167 type 304, No. 2B finish).

30' or more desirable. May be reduced depending on cross section, viewing conditions and other related factors.



This type mount to be used:

- (1) For SPEED LIMIT sign (R2-1) when used in combination with R2-2 and R2-4 or for R2-2A.
- (2) For DO NOT ENTER sign (R5-1) when used with WRONG WAY sign (R5-1a). R5-1a is mounted above R5-1.

DEPARTMENTAL MATERIAL SPECIFICATIONS
SIGN HARDWARE
DMS-7120

GENERAL NOTES:

1. Design conforms with AASHTO Specifications for the design and construction of structural supports for highway signs.
2. Materials and fabrication shall conform to the requirements of the Department material specifications.
3. Structural steel shall be "Low-Alloy Steel" for non-bridge structures per Item 442, "Metal For Structures."
4. Parts shall be saw cut either before galvanizing and the galvanized cut cleaned of zinc build-up, or saw cut after galvanizing and the cut surface repaired per Item 445, "Galvanizing." (Cut surface will not be treated until plate is installed and all bolts fully tightened.)



SIGN MOUNTING DETAILS, TYPE G SUPPORT

SMD(TY G)-08

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1-97	CONT	SECT	JOB	HIGHWAY
9-08	0389	13	039	SH 146
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		340

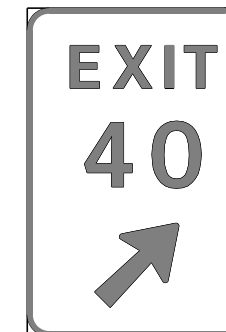
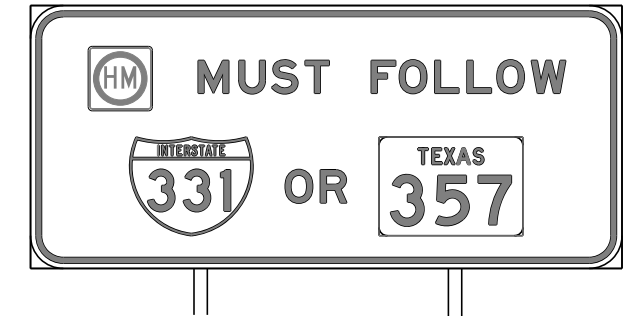
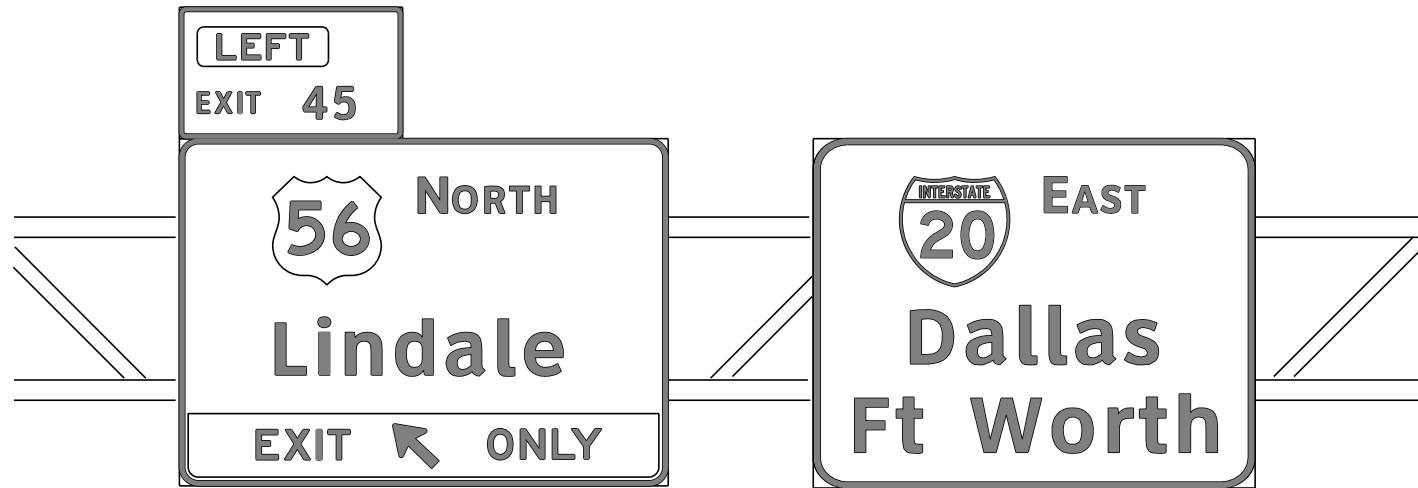
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REQUIREMENTS FOR OVERHEAD AND LARGE GROUND-MOUNTED SIGNS

TYPICAL EXAMPLES

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DATE:
FILE:



GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign summary sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).
2. Black legend shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets (B, C, D, E, Emod, or F). White legend shall use the Clearview Alphabet. The following Clearview fonts shall be used to replace the existing white FHWA lettering, 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. 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 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 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 need not be trimmed or rounded if fabricated from an extruded material.
7. Sign substrate for ground-mounted signs shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative. Sign substrate for overhead signs shall be any material that meets DMS-7110. Exit Number Panels attached above the parent sign shall be made with the same substrate and sheeting as the parent sign.
8. Mounting details of attachments to parent sign face are shown on Standard Plan Sheet TSR(5). Mounting details of exit number panels above parent sign are shown in the "SMD series" Standard Plan Sheets.
9. Background sheeting shall be applied to the substrate per sheeting manufacturer's recommendations. Sheeting will not be allowed to bridge the horizontal gap between panels.
10. Cut all legend, symbols, borders, and direct applied sign attachments at panel joints.

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/>

SHEETING REQUIREMENTS

USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE B OR C SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE D SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM



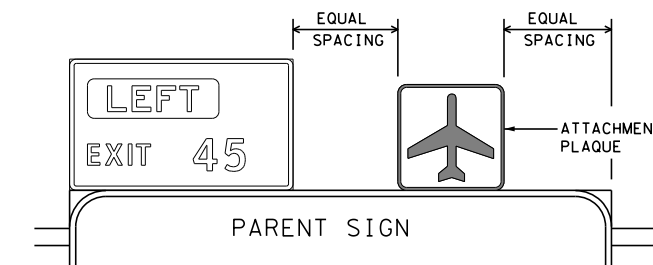
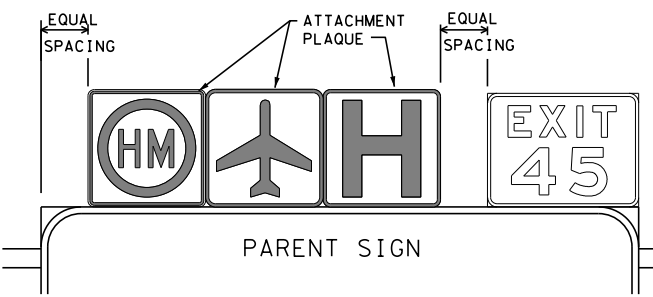
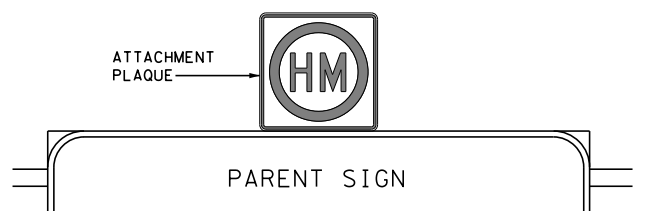
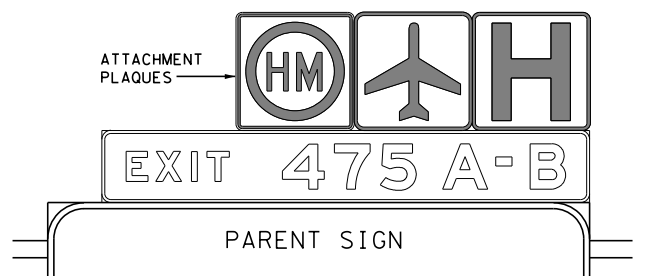
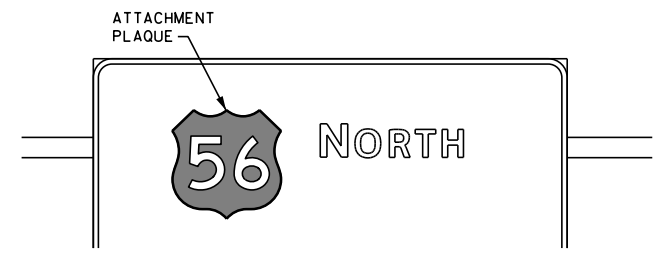
TYPICAL SIGN REQUIREMENTS

TSR(1) - 13

FILE:	fsl-13.dgn	DN:	TxDOT	CK:	TxDOT	DW:	TxDOT	CK:	TxDOT
©TxDOT	October 2003	CONT	SECT	JOB	HIGHWAY				
REVISIONS		0389	13	039	SH 146				
12-03	7-13	DIST	COUNTY	SHEET NO.					
9-08		HOU	HARRIS	341					

REQUIREMENTS FOR ATTACHMENTS TO OVERHEAD AND LARGE GROUND MOUNTED SIGNS

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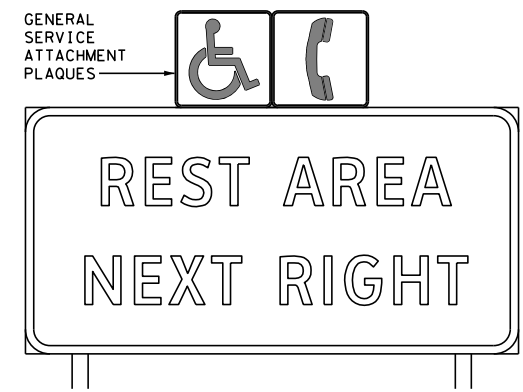


DEPARTMENTAL MATERIAL SPECIFICATIONS	
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	ALL	TYPE B OR C SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & BORDERS	ALL OTHERS	TYPE B OR C SHEETING

GENERAL NOTES

- 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).
- Route Marker legends (ie. IH, US, SH and FM shields) shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets (B, C, D, E, Emod, or F).
- 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.
- Black legend and borders shall be applied by screening process or cut-out acrylic non-reflective black film to background sheeting, or combination thereof.
- 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.
- Colored legend and borders shall be applied by screening process with transparent colored ink, transparent colored overlay film or colored sheeting to white background sheeting, or combination thereof.
- Route markers and other attachments within the parent sign face shall be direct applied unless otherwise specified in the plans. Attachments not direct applied shall use 0.063 inch thick one piece sheet aluminum signs (Type A).
- General Service Plaques shall be 0.080 inch thick and Routing Plaques shall be 0.100 inch thick.
- The priority for Routing Plaques shall be (left to right) Hazardous Material, Airport then Hospital. See examples for mounting location.
- Mounting details of attachments to parent signs face are shown on Standard Plan Sheet TSR(5). Mounting details of sign plaque attachments above and below parent sign are shown in the "SMD series" Standard Plan Sheets.
- Plaques shall be horizontally centered at the top of the parent sign. If an exit number panel exists, the plaque shall be centered between the edge of the parent sign and the edge of the exit number panel. The plaque may be placed above the exit number panel when there is insufficient space.



TYPICAL EXAMPLES

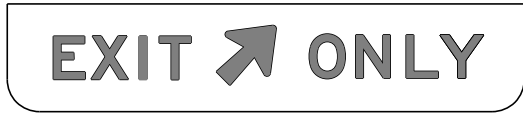
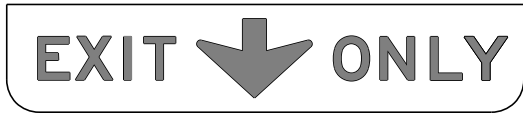
REQUIREMENTS FOR EXIT ONLY AND LEFT EXIT PANELS

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

SHEETING REQUIREMENTS FOR OVERHEAD EXIT PANELS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	FLUORESCENT YELLOW	TYPE B _{FL} OR C _{FL} SHEETING
LEGEND	BLACK	ACRYLIC NON-REFLECTIVE FILM

GENERAL NOTES

- 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). Individual panel sizes shown in the plans may be adjusted to fit actual parent sign sizes if necessary.
- Exit Panel legend shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets E Series.
- 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.
- Black legend shall be applied by screening process or cut-out acrylic non-reflective black film to yellow background sheeting, or combination thereof.
- Exit Only and Left Exit panels within the parent sign face shall be direct applied unless otherwise specified in the plans. Panels not direct applied shall use 0.063 inch thick one piece sheet aluminum signs (Type A).
- Mounting details of Exit Only and Left Exit panel attachments to parent signs face are shown on Standard Plan Sheet TSR(5).



TYPICAL EXAMPLES

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.
<http://www.txdot.gov/>



TYPICAL SIGN REQUIREMENTS

TSR(2) - 13

FILE: tsr2-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0389	13	039	SH 146
12-03 7-13	DIST	COUNTY	SHEET NO.	
9-08	HOU	HARRIS	342	

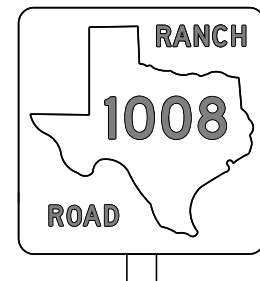
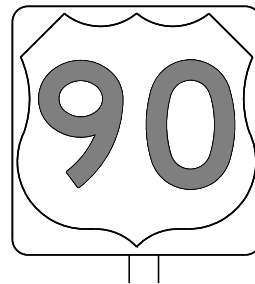
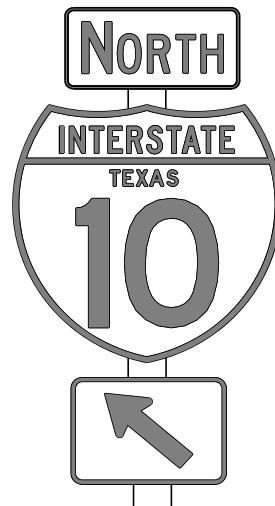
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REQUIREMENTS FOR INDEPENDENT MOUNTED ROUTE SIGNS

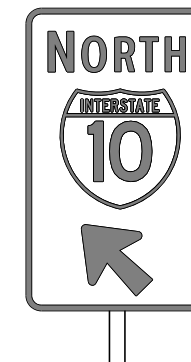
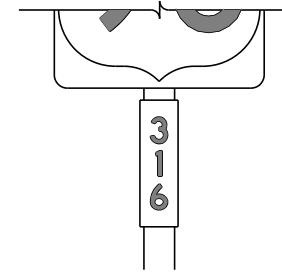
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE A SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & BORDERS	ALL OTHERS	TYPE B or C SHEETING



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

- 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).
- 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

- 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).
- 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.
- 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.
- 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.
- Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.
- 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/>



TYPICAL SIGN REQUIREMENTS

TSR(3) - 13

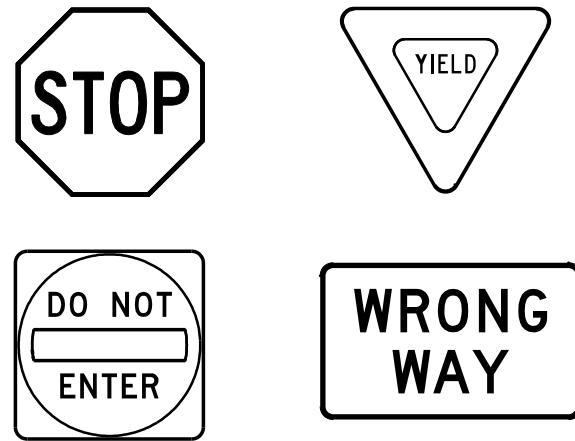
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© TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
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12-03 7-13	DIST	COUNTY	SHEET NO.	
9-08	HOU	HARRIS	343	

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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

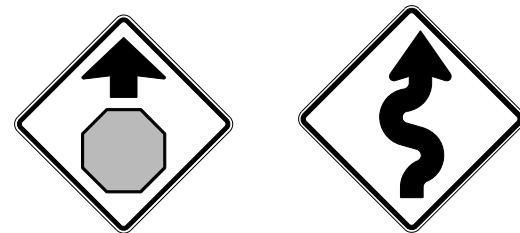
(EXCLUDING STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)



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

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

GENERAL NOTES

- 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).
- Sign legend shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets (B, C, D, E, Emod or F).
- 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.
- Black legend and borders shall be applied by screening process or cut-out acrylic non-reflective black film to background sheeting, or combination thereof.
- 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.
- 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.
- Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.
- 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

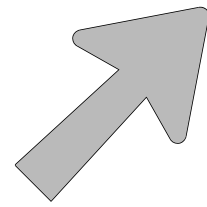
The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website:
<http://www.txdot.gov/>

				<i>Traffic Operations Division Standard</i>	
<h2>TYPICAL SIGN REQUIREMENTS</h2>					
<h3>TSR(4) - 13</h3>					
FILE:	tsr4-13.dgn	DN:	TxDOT	CK:	TxDOT
© TxDOT	October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS		0389	13	039	SH 146
12-03	7-13	DIST	COUNTY	SHEET NO.	
9-08		HOU	HARRIS	344	

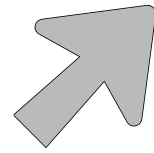
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

ARROW DETAILS

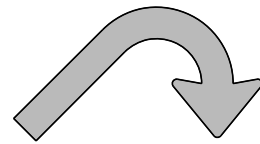
for Large Ground-Mounted and Overhead Guide Signs



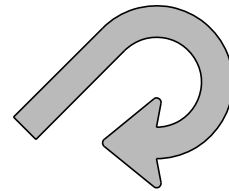
Type A



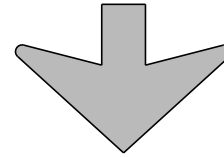
Type B



E-3



E-4



Down Arrow

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

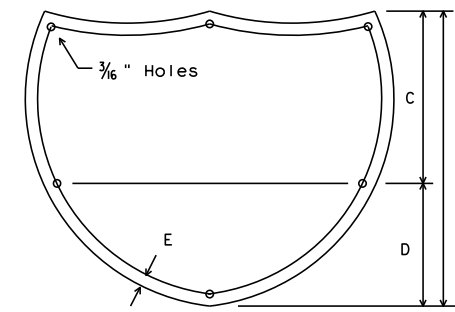
NOTE

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.

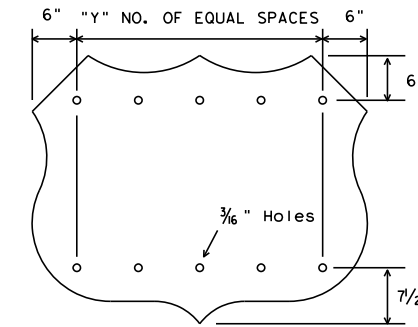
<http://www.txdot.gov/>

SIGN BLANK PUNCHING DETAILS FOR ATTACHMENTS WHEN SPECIFIED TO BE TYPE A ALUMINUM SIGNS (FOR MOUNTING TO GUIDE SIGN FACE)



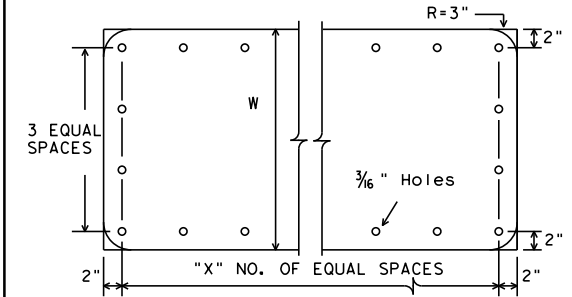
INTERSTATE ROUTE MARKERS

A	C	D	E
36	21	15	1 1/2
48	28	20	1 3/4



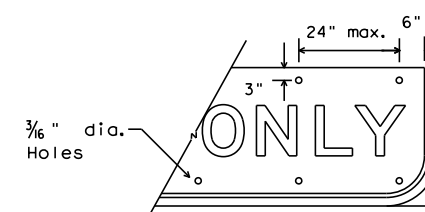
U.S. ROUTE MARKERS

Sign Size	"Y"
24x24	2
30x24	3
36x36	3
45x36	4
48x48	4
60x48	5



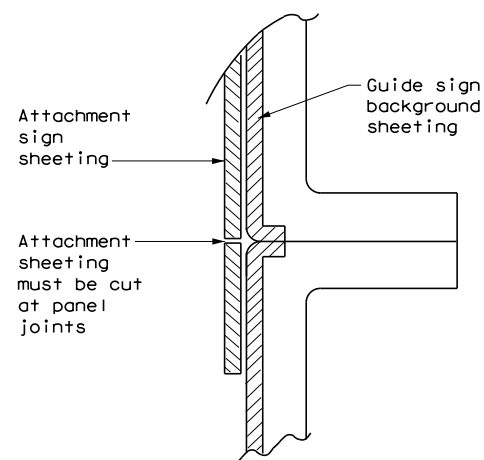
STATE ROUTE MARKERS

No. of Digits	W	X
4	24	4
4	36	5
4	48	6
3	24	3
3	36	4
3	48	5



EXIT ONLY PANEL

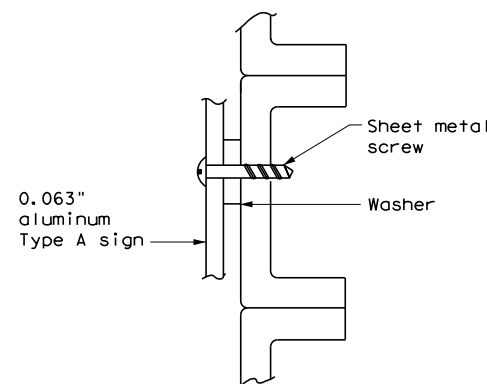
MOUNTING DETAILS OF ATTACHMENTS TO GUIDE SIGN FACE ("EXIT ONLY" AND "LEFT EXIT" PANELS, ROUTE MARKERS AND OTHER ATTACHMENTS)



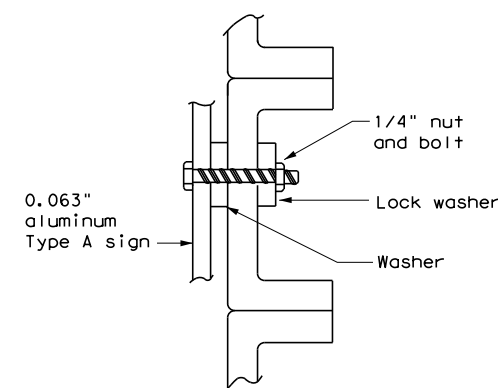
DIRECT APPLIED ATTACHMENT

NOTE:

- Sheeting for legend, symbols, and borders must be cut at panel joints.
- Direct applied attachment signs will be subsidiary to "Aluminum Signs" or "Fiberglass Signs".



SCREW ATTACHMENT

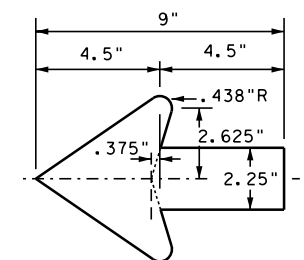


NUT/BOLT ATTACHMENT

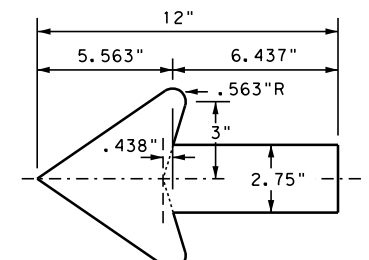
NOTE:

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.



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	0389	13	039	SH 146
12-03 7-13	DIST	COUNTY	SHEET NO.	
9-08	HOU	HARRIS	345	

DATE:
FILE:

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: FILE:

APPLICABLE STANDARDS SHEETS

OVERHEAD SIGN BRIDGE STANDARDS:

- OSB-SE
- OSB-Z#
- OSB-Z#1
- HOSB-Z#
- HOSB-Z1L
- HOSB-Z#1
- OSBT
- OSBC
- OSBC-SC-Z#
- OSBS-SC
- OSB-FD
- OSB-FD-SC

CANTILEVER OVERHEAD SIGN SUPPORT STANDARDS:

- COSS-SE
- COSS-Z#-10
- HCOSS-Z#-10
- COSS-Z21-10
- COSS-Z#&Z#1-10
- COSSD
- COSSF
- COSS-FD

Note: # = Wind Zone number 1, 2, 3 or 4

HIGH MAST ILLUMINATION POLE STANDARDS:

- HMIP-98
- HMIF-98

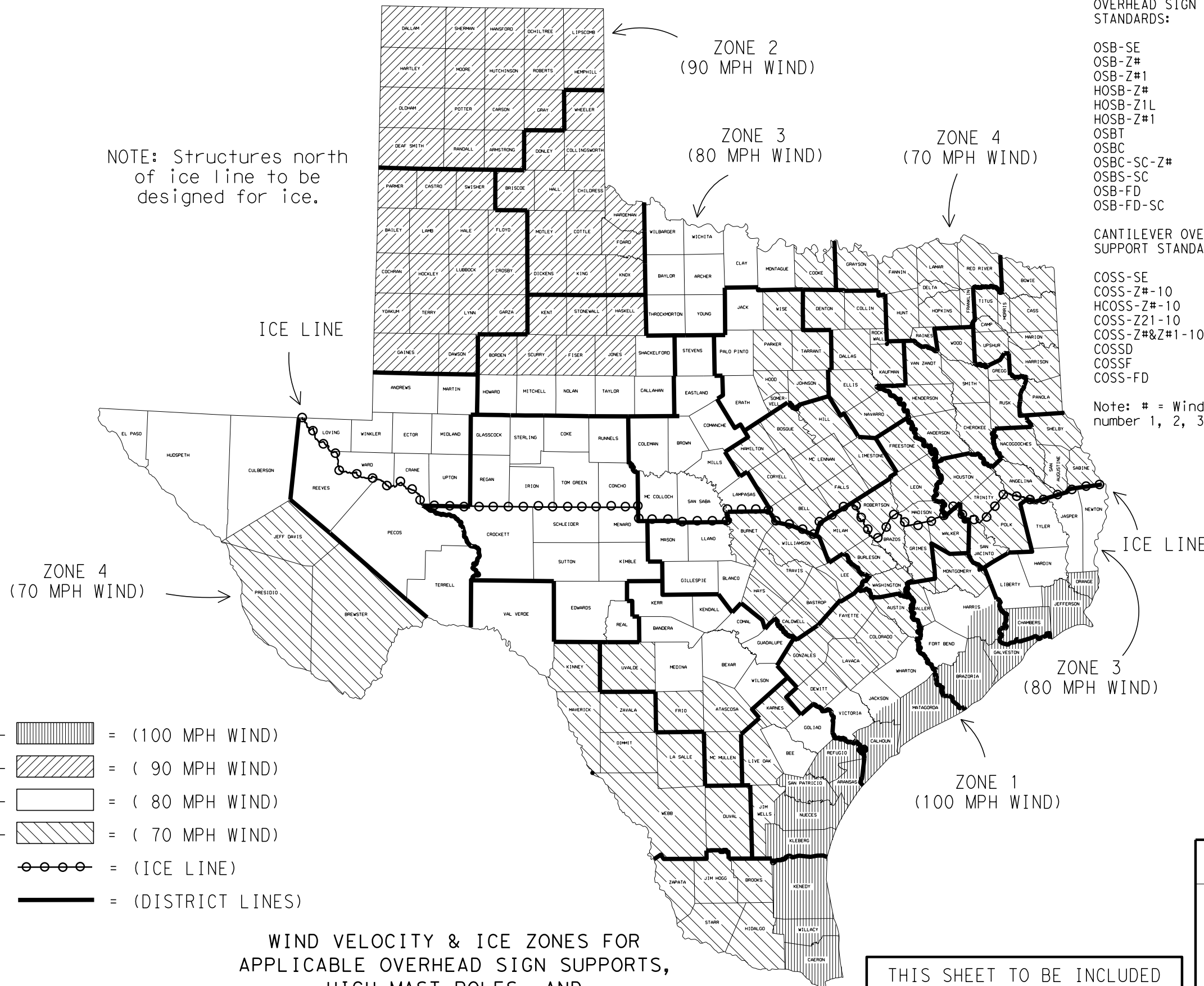
WALKWAYS AND BRACKETS STANDARDS:

- SWW
- SB(SWL-1)

TRAFFIC SIGNAL POLE STANDARDS:

- SP-80
- SP-100
- SMA-80
- SMA-100
- DMA-80
- DMA-100
- MA-C
- MAC (ILSN)
- MAD-D
- TS-FD
- LUM-A
- CFA
- LMA
- TS-C
- MA-DPD

NOTE: Structures north of ice line to be designed for ice.



LEGEND

- ZONE 1 - [Hatching] = (100 MPH WIND)
- ZONE 2 - [Hatching] = (90 MPH WIND)
- ZONE 3 - [Hatching] = (80 MPH WIND)
- ZONE 4 - [Hatching] = (70 MPH WIND)
- [Dashed line with circles] = (ICE LINE)
- [Solid black line] = (DISTRICT LINES)

WIND VELOCITY & ICE ZONES FOR APPLICABLE OVERHEAD SIGN SUPPORTS, HIGH MAST POLES, AND TRAFFIC SIGNAL POLES

Based on 50 Year Mean Recurrence Interval of Fastest Mile Wind Velocity at 33 feet height.


THIS SHEET TO BE INCLUDED IN ALL P.S.&E. PACKAGES CONTAINING ONE OR MORE OF THE APPLICABLE STANDARD SHEETS LISTED HEREON

FOR HARRIS CO. ONLY
Zone line is just North of US 90, around on the North, West and South sides of IH 610 and down the West side of SH 288.

FOR JACKSON CO. ONLY
Zone line is just North of SH 616.

		Traffic Operations Division Standard	
<h2>WIND VELOCITY AND ICE ZONES</h2> <h3>WV & IZ-14</h3>			
FILE: windice.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
© TxDOT April 1996	CON: 0389	SECT: 13	JOB: 039
REVISIONS 8-14-Added list of applicable standards, restricting use to structures designed for Fastest Mile wind speeds.		HIGHWAY: SH 146	SHEET NO.: 346

<p>I. STORMWATER POLLUTION PREVENTION</p> <p>Texas Pollutant Discharge Elimination System (TPDES) TXR 150000: Stormwater Discharge Permit or Construction General Permit is required for projects with 1 or more acres disturbed soil. Projects with any disturbed soil must protect for erosion and sedimentation in accordance with Item 506. Refer to Storm Water Pollution Prevention Plan (SWP3) Houston District standard plan.</p> <p style="text-align: center;">Additional Comments</p> <p>The proposed project is located within Phase II Baytown Urbanized Area Municipal Separate Storm Sewer System (MS4). A Notice of Intent (NOI) would also need to be filed with the city of Baytown stating that TxDOT would have a Storm Water Pollution Prevention Plan (SW3P) in place during construction of the proposed project.</p>	<p>III. CULTURAL RESOURCES</p> <p>Refer to TxDOT Standard Specifications in the event historical issues or archeological artifacts are found during construction. Upon discovery of archeological artifacts (bones, burnt rock, flint, pottery, etc.) cease work in the area and contact the Engineer immediately.</p> <p style="text-align: center;">Additional Comments</p> <p>In the event that unanticipated archeological deposits are encountered during construction, work in the immediate area would cease and TxDOT archeological staff would be contacted to initiate post-review discovery procedures.</p>	<p>VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES</p> <p>Refer to TxDOT Standard Specifications in the event potentially contaminated materials are observed, such as dead or distressed vegetation, trash disposal areas, drums, canisters, barrels, leaching or seepage of substances, unusual smells or odors, or stained soil, cease work in the area and contact the Engineer immediately.</p> <p style="text-align: center;">Additional Comments</p> <p>Provisions will be included in the plans and specifications that require the contractor to make every reasonable effort to minimize construction noise through abatement measures such as work-hour controls and proper maintenance of muffler systems.</p> <p>A noise barrier would be reasonable and feasible at one location: Chase Village Mobile Home Park.</p>
<p>II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS</p> <p>United States Army Corps of Engineers (USACE) Permit is required for filling, dredging, excavating or other work in water bodies, rivers, creeks, streams, wetlands or wet areas. The Contractor must adhere to all of the terms and general conditions associated with the following permit(s). If additional work not represented in the plans is required, contact the Engineer immediately.</p> <p><input checked="" type="checkbox"/> No United States Army Corps (USACE) Permit Required</p> <p><input type="checkbox"/> Work is authorized by the United States Army Corps of Engineers (USACE) under a Nationwide Permit (NWP) without a Pre-Construction Notification (PCN). Project specific permit was not issued by USACE, therefore is not in the plan set. The USACE general conditions are in the "General Notes."</p> <p><input type="checkbox"/> Work is authorized by the United States Army Corps of Engineers (USACE) under a Nationwide Permit (NWP) with a Pre-Construction Notification (PCN). The project specific permit issued by the United States Army Corps of Engineers (USACE) is included in the plan set. The USACE general conditions are in the "General Notes."</p> <p><input type="checkbox"/> Work is authorized by the United States Army Corps of Engineers (USACE) under a Individual Permit (IP). The project specific permit issued by the United States Army Corps of Engineers (USACE) is included in the plan set.</p> <p><input type="checkbox"/> Work would be authorized by the United States Army Corps of Engineers (USACE) permit. The project specific permit issued by the USACE will be provided to the contractor.</p> <p>United States Coast Guard (USCG) Permit is required for projects that involve the construction or modification (including changes to lighting) of a bridge or causeway across a water body determined to be navigable by the United States Coast Guard (USCG) under Section 9 of the Rivers and Harbors Act. If additional work not represented in the plans is required, contact the Engineer immediately.</p> <p><input checked="" type="checkbox"/> No United States Coast Guard (USCG) Coordination Required</p> <p><input type="checkbox"/> United States Coast Guard (USCG) Permit</p> <p><input type="checkbox"/> United States Coast Guard (USCG) Exemption</p> <p style="text-align: center;">No Additional Comments</p>	<p>IV. VEGETATION RESOURCES</p> <p>Preserve native vegetation to the extent practical. Refer to TxDOT Standard Specifications in order to comply with requirements for invasive species, beneficial landscaping and tree/brush removal.</p> <p style="text-align: center;">No Additional Comments</p>	<p>V. FEDERAL LISTED, PROPOSED THREATENED, ENDANGERED SPECIES, CRITICAL HABITAT, STATE LISTED SPECIES, CANDIDATE SPECIES AND MIGRATORY BIRDS</p> <p>If any of the listed species below are observed, cease work in the area, do not disturb species or habitat and contact the Engineer immediately.</p> <p>The work may not remove active nests (from bridges, structures, or vegetation adjacent to the roadway, etc.) during nesting season (February 15 to October 1). If removal of structures or vegetation is necessary during the nesting season, the Contractor shall conduct a bird survey no more than 3 days in advance of the clearing/demolish start date. All bird surveys shall be conducted by a Field Biologist and adhere to the guidance document "Avoiding Migratory Birds and Handling Potential Violations" found in the TxDOT Environmental Compliance Toolkits at the time of the survey. (See below for Field Biologist and Ornithologist qualifications)</p> <p style="text-align: center;">Additional Comments</p> <p>The following Bird BMPs will be incorporated into the proposed project:</p> <ul style="list-style-type: none"> - Construction shall not disturb, destroy, or remove active nests, including those of ground nesting birds, during the nesting season. - Avoid the removal of unoccupied, inactive nest, as practicable. - Prevent the establishment of active nests during the nesting season on TxDOT owned and operated facilities and structures for replacement or repair. - No collecting, capturing, relocating, or transporting adult birds, eggs, young, or active nest without a permit. <p>Field Biologist, Ornithologist – a field biologist is defined as an individual qualified to perform field investigations, presence/absence surveys and habitat surveys for protected avian species or species of concern. A mandatory bachelor's degree in biology or a related science is required. At a minimum, the Field Biologist, Ornithologist, shall have completed and reported a minimum of three presence/absence and habitat surveys for protected avian species in the past five years. A minimum of three projects must have been conducted in Texas. Surveys shall have been performed for documentation of species in accordance with a protocol approved by USFWS or TPWD, or following generally accepted methodologies.</p>
<p style="text-align: right;">Version 2.1</p>		

		TxDOT Houston District		
<p>ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS</p> <p>EPIC</p>				
FILE: EPIC Sheet.dgn	DN:	CK:	DW:	CK:
© TxDOT: March 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0389	13	039	SH 146
UPDATED section V, text and added definition (10/17) ADDED USCG and USACE notes in Section VII (04/18)	DIST	COUNTY		SHEET NO.
	12	HARRIS		347

SITE DESCRIPTION

PROJECT LIMITS: The proposed SH 146 project is located between BS 146 E and Ferry Rd in the City of Baytown, Harris County, Texas.

PROJECT DESCRIPTION: SH 146 in the project limits is currently a six-lane divided roadway with a grassy median. Upon the construction of proposed mainlanes with an overpass on N. Alexander Dr. intersection, the existing roadways will be converted to frontage roads. The proposed improvement includes the construction of divided mainlanes, a bridge over the N. Alexander Dr. intersection, drainage improvements, a noise wall construction between the McKinney Rd and E. Elvinta St. on the southside of the road.

MAJOR SOIL DISTURBING ACTIVITIES: The major soil disturbing activities are the excavation of existing grassy median between the frontage roads and the stubbed out mainlane pavement sections for the construction of mainlanes and bridge.

TOTAL PROJECT AREA: 52.28 ACRES

TOTAL AREA TO BE DISTURBED: 27.7 ACRES

WEIGHTED RUNOFF COEFFICIENT: 0.7 - 0.9
(AFTER CONSTRUCTION):

EXISTING CONDITION OF SOIL & VEGETATIVE COVER AND % OF EXISTING VEGETATIVE COVER: CLAYEY SANDY SOIL WITH GRASS COVER EXISING VEGETATIVE COVER = 52%

NAME OF RECEIVING WATERS: THE TRIBUTARIES (Q110-00-00 & Q111-00-00) OF CEDAR BAYOU

EROSION AND SEDIMENT CONTROLS

SOIL STABILIZATION PRACTICES:

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

OTHER: The disturbed areas that are outside the permanent mainlanes construction, shall be permanently stabilized using sodding after the gradings for proposed ditches as shown on the plans.

STRUCTURAL PRACTICES:

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

OTHER: _____

NARRATIVE - SEQUENCE OF CONSTRUCTION (STORM WATER MANAGEMENT) ACTIVITIES: 3 Phases

The project is proposed to be constructed in 3 phases as described below:

Phase 1, Stage 1: Construct drainage elements and mainlane earthwork. Saw-cut and remove the existing stubbed-out concrete pavement, and reconstruct the pavement as on Phase 1, Stage 1. Construct retaining walls, pavement elements (except the concrete pavement), drill shafts, bridge columns and bents, etc.

Phase 1, Stage 2: Hang beams and construct bridge deck.

Phase 2, Stage 1: Construct concrete pavement on the mainlanes.

Phase 2, Stage 2: Complete median barrier and traffic rail installations.

Phase 2, Stage 3: Eliminate existing pavement markings and install new pavement markings and signings.

Phase 3, Stage 1: Shift mainlane traffic on the newly constructed mainlanes, complete the construction of remaining ramps and finish all pavement markings and signings installations.

Phase 3, Stage 2: Grade ditches and install permanent erosion control items.

STORM WATER MANAGEMENT: The existing stormwater systems will remain unaffected during the construction. Therefore, no impacts on the existing stormwater systems is anticipated during the construction.

OTHER EROSION AND SEDIMENT CONTROLS:

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

INSPECTION: All inspections will be performed by a TxDOT inspector per one of the options below as directed by the Area Engineer
 1. At least every 7 calendar days
 2. At least every 14 days or after 0.5 inches or more of rainfall
An inspection and maintenance report should be made for each inspection. Based on the inspection results, the controls shall be revised according to the inspection report.

WASTE MATERIALS: The dumpster used to store all waste material will meet all state and local city solid waste management regulations. All trash and construction debris will be deposited in the dumpster. The dumpster will be emptied as necessary or as required by local regulation and the trash will be hauled to a local dump. No construction waste material will be buried on site.

HAZARDOUS WASTE (INCLUDING SPILL REPORTING): In the event of a spill which may be considered hazardous, the Houston District Safety Office shall be contacted immediately at 713-802-5962.

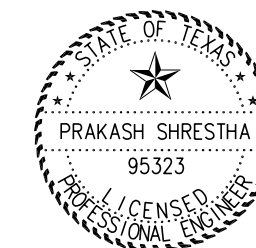
SANITARY WASTE: All Sanitary Waste will be collected from the portable units as necessary or as required by local regulations by a licensed sanitary waste management contractor.

OFFSITE VEHICLE TRACKING:

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

OTHER: _____

REMARKS: Disposal areas, stockpiles, and haul roads shall be constructed in a manner that will minimize and control the sediment that may enter receiving waterways. Disposal areas shall not be located in any waterway, waterbody or streambed. Construction staging areas and vehicle maintenance areas shall be constructed by the contractor in a manner which minimizes the runoff of all pollutants. All waterways shall be cleared as soon as practical of temporary embankments, temporary bridges, matting, falsework, piling, debris, and other obstructions placed during construction operations that are not part of the finished work.



1/7/2022

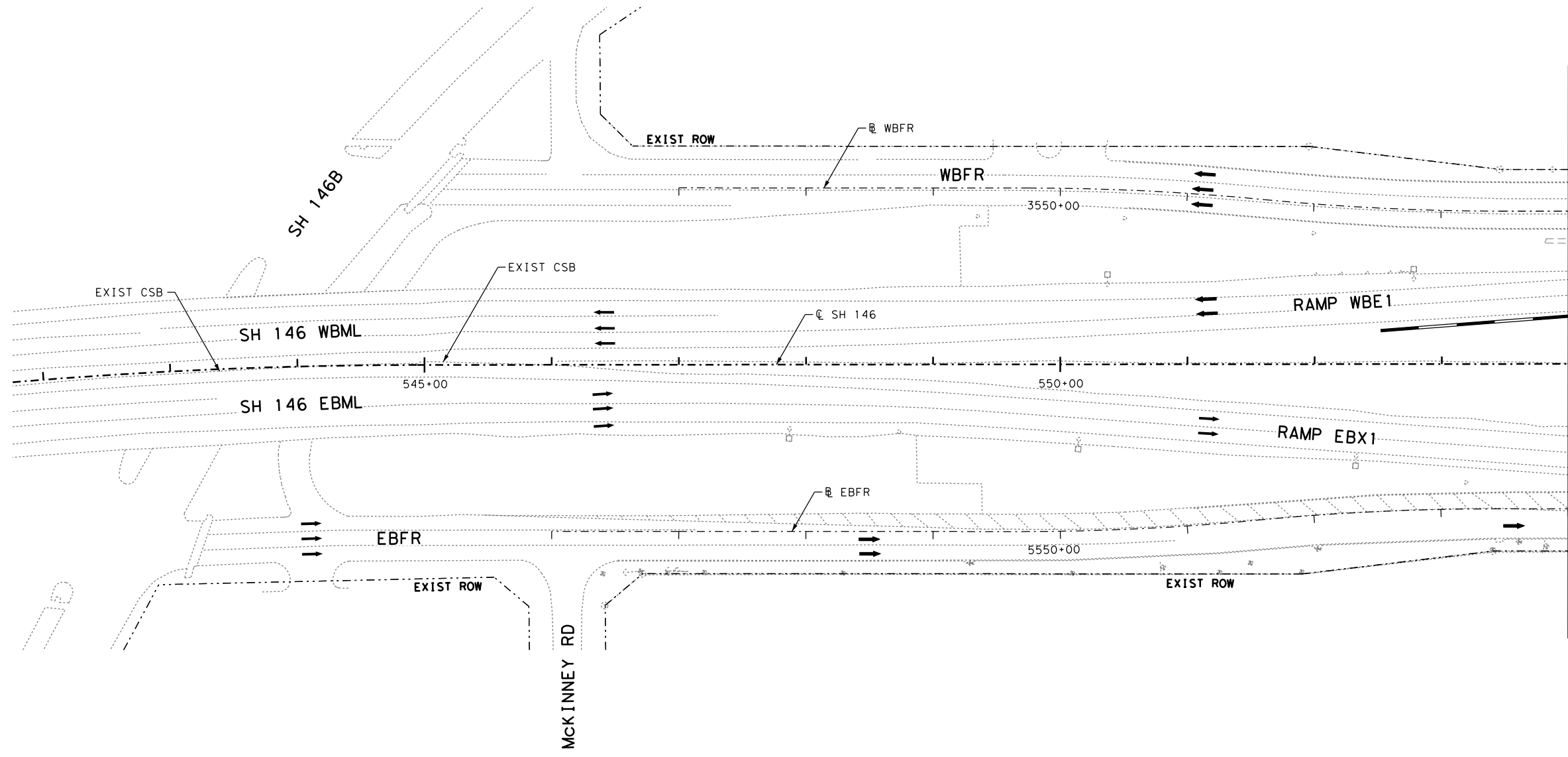
Texas Department of Transportation
Houston District

TxDOT STORM WATER POLLUTION PREVENTION PLAN

SWP3














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© TxDOT JANUARY 2007	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS	HOU	6		348
9/2010 INSPECTION NOTE	COUNTY	CONTROL	SECT	JOB
9/2013 INSPECTION NOTE	HARRIS	0389	13	039
11/2013 SW3P TO SWP3				SH 146
03/2015 2014 SPECS				

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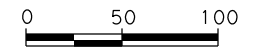


MATCHLINE STA 554+00

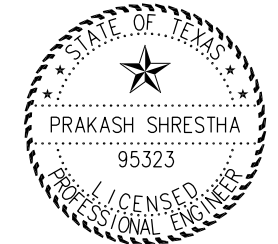
LEGEND

-  CL-DI DROP INLET
-  CL-CI CURB INLET
-  EROSION CONTROL LOG
-  FLOW DIRECTION
-  DITCH FLOW DIRECTION
-  DIRECTION OF TRAFFIC
-  CHANNELLIZING DEVICE
-  PORT CTB (SGL SLOPE) (TY 1)
-  CURB REMOVAL
-  CONSTRUCTION THIS PHASE
-  CONSTRUCTION PREVIOUS PHASE
-  BLOCK SODDING (PERM)
-  CONSTRUCTION EXIT (TYPE 1)

- NOTES:
1. SEE SW3P STANDARD SHEETS FOR DETAILS.
 2. REFER TO TCP LAYOUTS FOR MORE INFORMATION ON PHASING LAYOUTS.



REV. NO.	DATE	BY	REVISION



Prakash Shrestha, P.E.
 1/7/2022

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

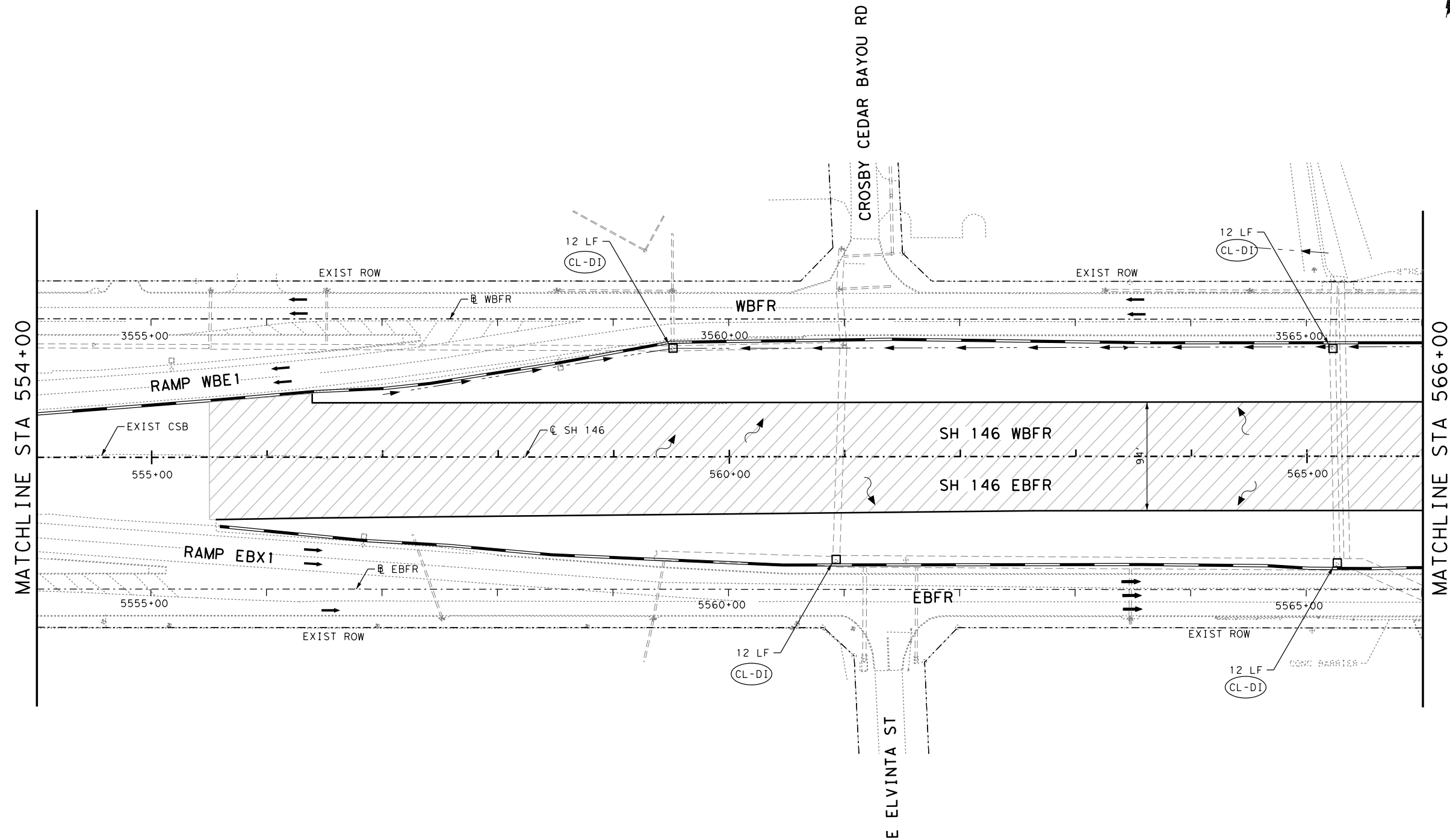


SH 146
SW3P
PHASE 1 STAGE 1
BEGIN TO STA 554+00

SHEET 1 OF 7

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			349
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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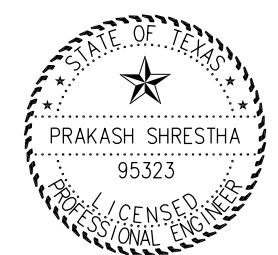
- CL-DI DROP INLET
- CL-CI CURB INLET
- EROSION CONTROL LOG
- FLOW DIRECTION
- DITCH FLOW DIRECTION
- DIRECTION OF TRAFFIC
- CHANNELLIZING DEVICE
- PORT CTB (SGL SLOPE) (TY 1)
- CURB REMOVAL
- CONSTRUCTION THIS PHASE
- CONSTRUCTION PREVIOUS PHASE
- BLOCK SODDING (PERM)
- CONSTRUCTION EXIT (TYPE 1)

NOTES:

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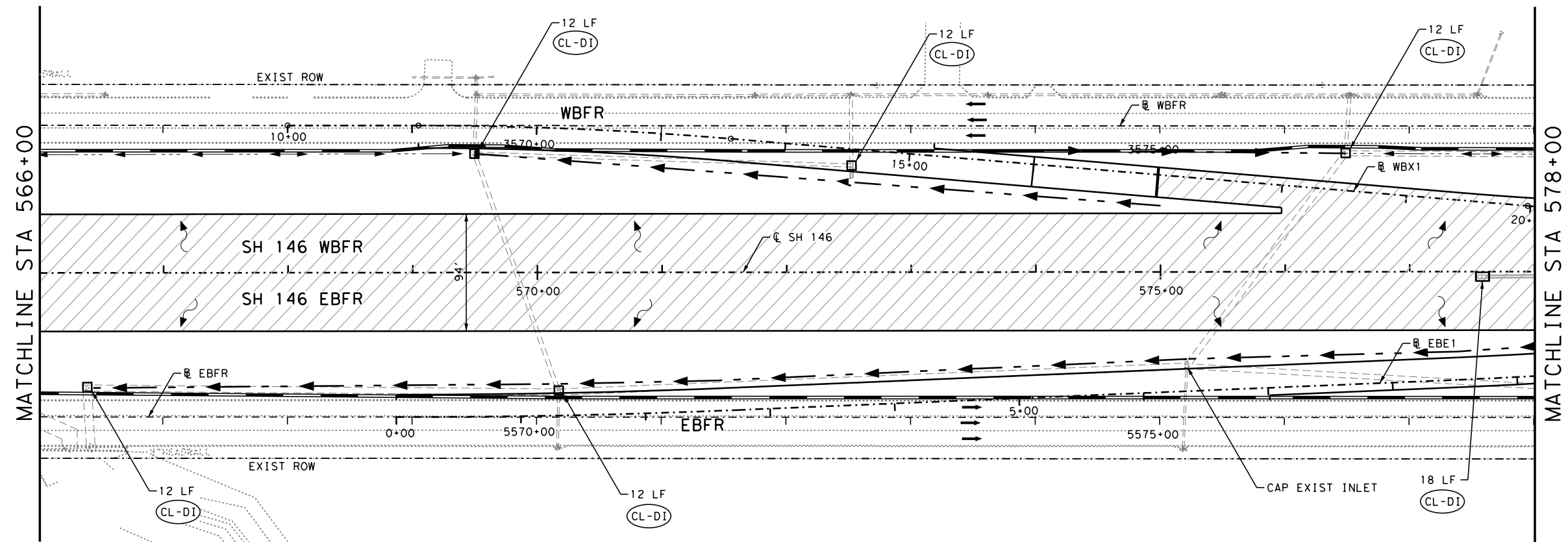


SH 146
SW3P
PHASE 1 STAGE 1
STA 554+00 TO STA 566+00

SHEET 2 OF 7

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			350
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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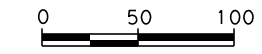


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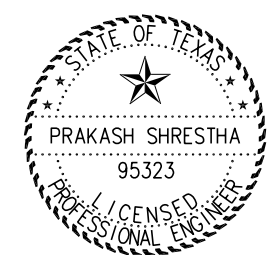
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- CL-CI CURB INLET
- EROSION CONTROL LOG
- FLOW DIRECTION
- DITCH FLOW DIRECTION
- DIRECTION OF TRAFFIC
- CHANNELLIZING DEVICE
- PORT CTB (SGL SLOPE) (TY 1)
- CURB REMOVAL
- CONSTRUCTION THIS PHASE
- CONSTRUCTION PREVIOUS PHASE
- BLOCK SODDING (PERM)
- CONSTRUCTION EXIT (TYPE 1)

NOTES:

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REV. NO.	DATE	BY	REVISION



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SH 146

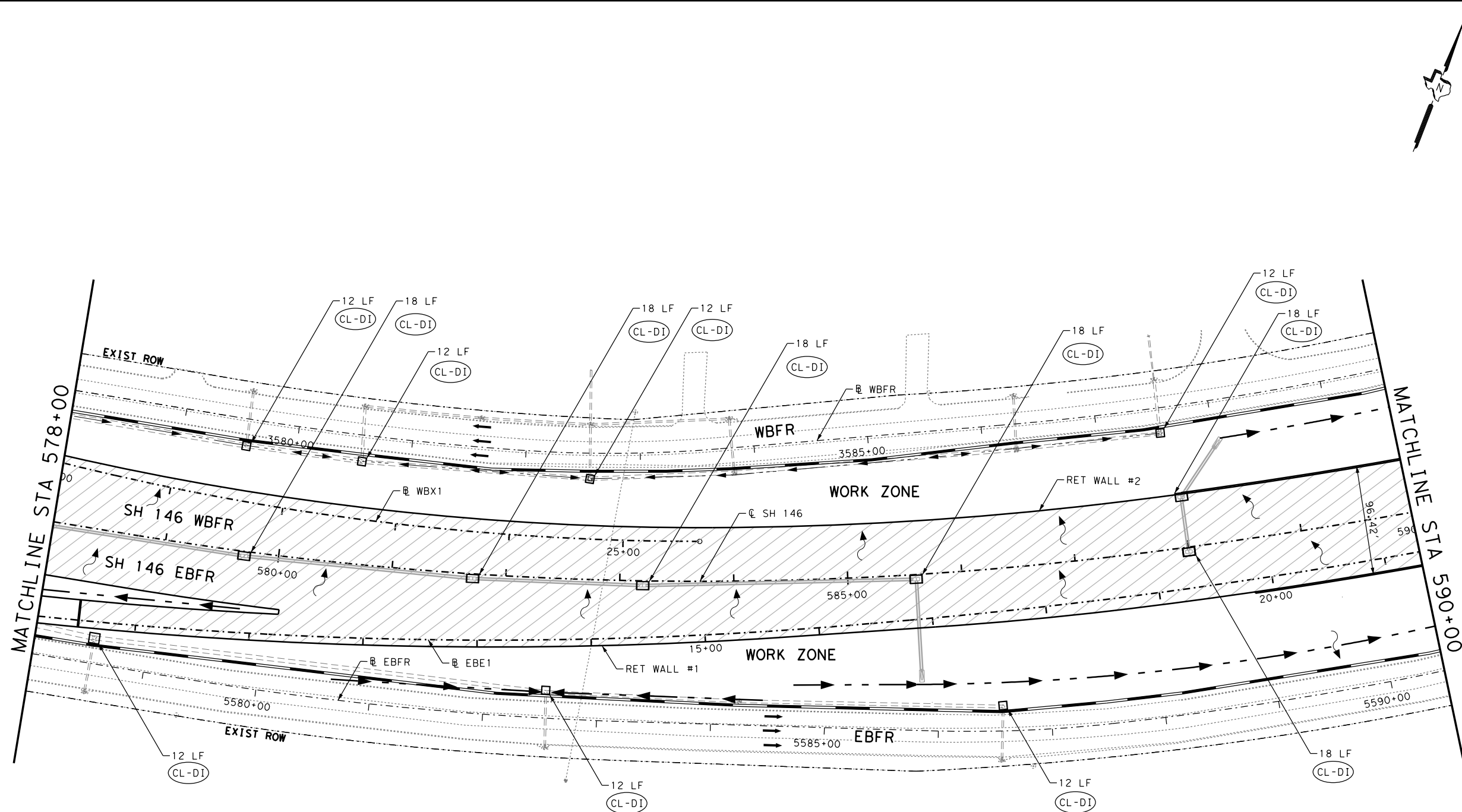
**SW3P
 PHASE 1 STAGE 1**

STA 566+00 TO STA 578+00

SHEET 3 OF 7

FED. RD. DIV. NO.	6	FEDERAL AID PROJECT NO.	
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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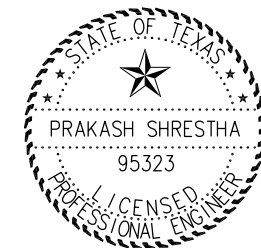
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- CL-CI CURB INLET
- EROSION CONTROL LOG
- FLOW DIRECTION
- DITCH FLOW DIRECTION
- DIRECTION OF TRAFFIC
- CHANNELLIZING DEVICE
- PORT CTB (SGL SLOPE) (TY 1)
- CURB REMOVAL
- CONSTRUCTION THIS PHASE
- CONSTRUCTION PREVIOUS PHASE
- BLOCK SODDING (PERM)
- CONSTRUCTION EXIT (TYPE 1)

NOTES:

1. SEE SW3P STANDARD SHEETS FOR DETAILS.
2. REFER TO TCP LAYOUTS FOR MORE INFORMATION ON PHASING LAYOUTS.

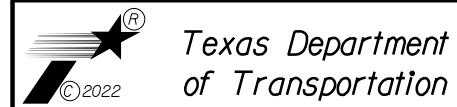


REV. NO.	DATE	BY	REVISION



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Firm Registration No. F-382

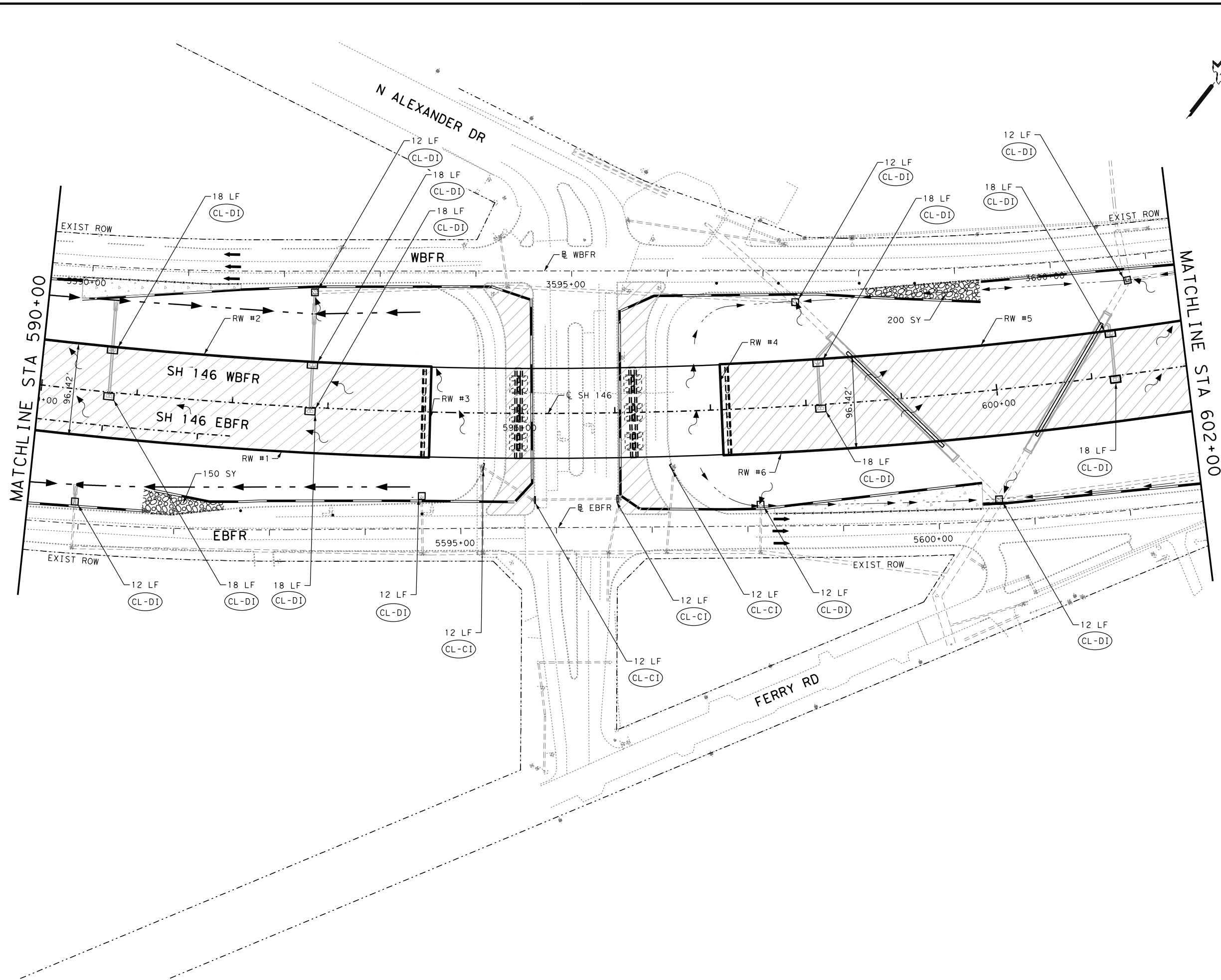


SH 146
SW3P
PHASE 1 STAGE 1
STA 578+00 TO STA 590+00

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			352
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

SHEET 4 OF 7

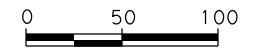
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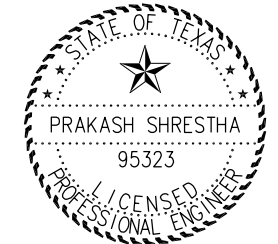
LEGEND

- CL-DI DROP INLET
- CL-CI CURB INLET
- EROSION CONTROL LOG
- FLOW DIRECTION
- DITCH FLOW DIRECTION
- DIRECTION OF TRAFFIC
- CHANNELIZING DEVICE
- PORT CTB (SGL SLOPE) (TY 1)
- CURB REMOVAL
- CONSTRUCTION THIS PHASE
- CONSTRUCTION PREVIOUS PHASE
- BLOCK SODDING (PERM)
- CONSTRUCTION EXIT (TYPE 1)

- NOTES:**
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SH 146

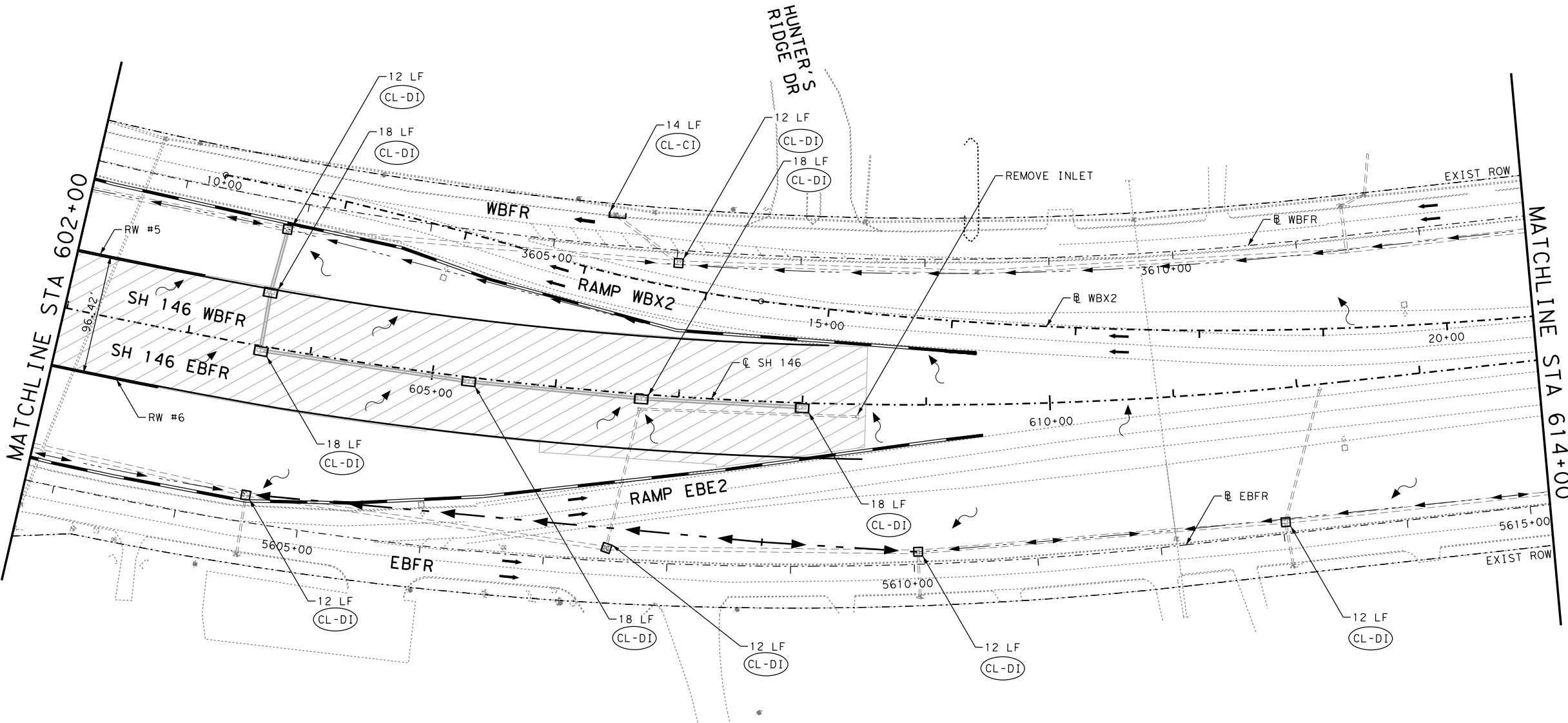
SW3P
PHASE 1 STAGE 1

STA 590+00 TO STA 602+00

SHEET 5 OF 7

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			353
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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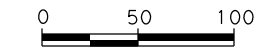


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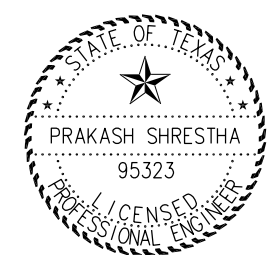
- (CL-DI) DROP INLET
- (CL-CI) CURB INLET
- EROSION CONTROL LOG
- ~ FLOW DIRECTION
- ← DITCH FLOW DIRECTION
- DIRECTION OF TRAFFIC
- CHANNELLIZING DEVICE
- ▬ PORT CTB (SGL SLOPE) (TY 1)
- x-x-x CURB REMOVAL
- ▨ CONSTRUCTION THIS PHASE
- CONSTRUCTION PREVIOUS PHASE
- ▤ BLOCK SODDING (PERM)
- ▩ CONSTRUCTION EXIT (TYPE 1)

NOTES:

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2. REFER TO TCP LAYOUTS FOR MORE INFORMATION ON PHASING LAYOUTS.



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SH 146

SW3P

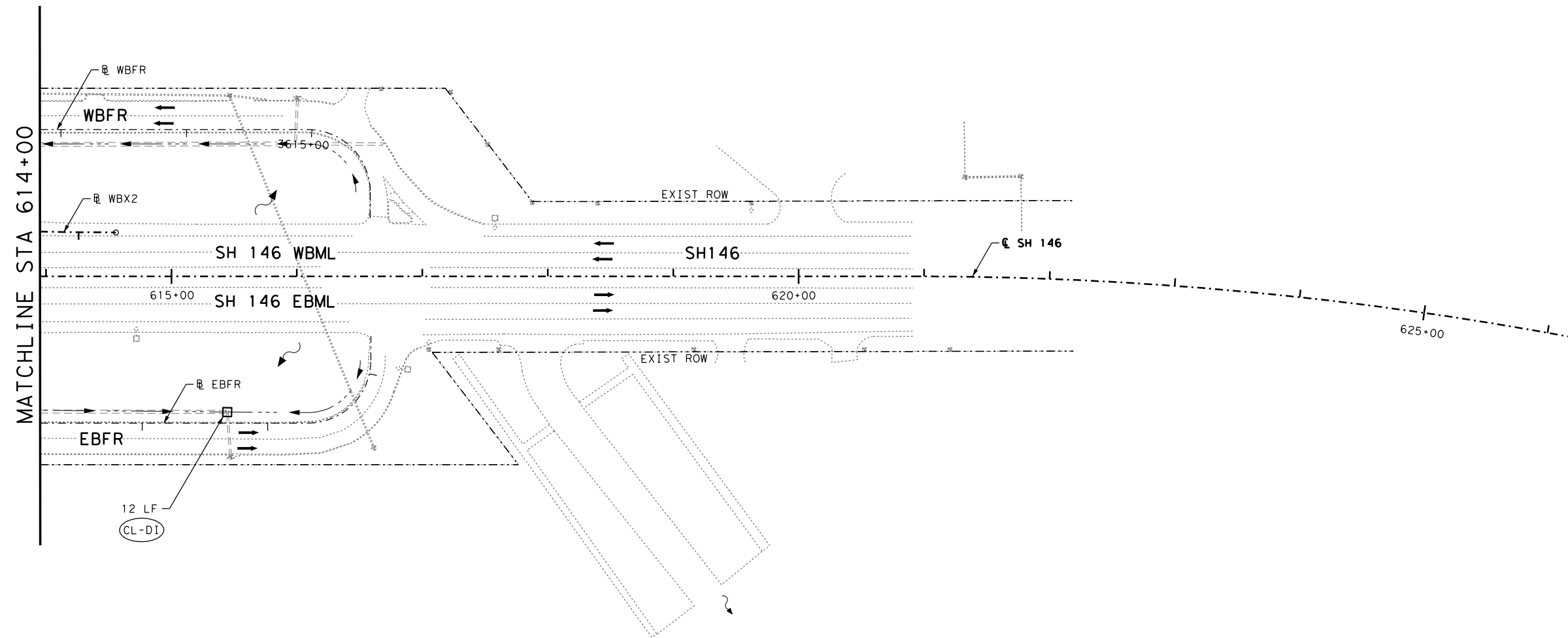
PHASE 1 STAGE 1

STA 602+00 TO STA 614+00

SHEET 6 OF 7

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			354
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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LEGEND

- CL-DI DROP INLET
- CL-CI CURB INLET
- EROSION CONTROL LOG
- FLOW DIRECTION
- DITCH FLOW DIRECTION
- DIRECTION OF TRAFFIC
- CHANNELLIZING DEVICE
- PORT CTB (SGL SLOPE) (TY 1)
- CURB REMOVAL
- CONSTRUCTION THIS PHASE
- CONSTRUCTION PREVIOUS PHASE
- BLOCK SODDING (PERM)
- CONSTRUCTION EXIT (TYPE 1)

NOTES:

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2. REFER TO TCP LAYOUTS FOR MORE INFORMATION ON PHASING LAYOUTS.



REV NO.	DATE	BY	REVISION

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SH 146

SW3P

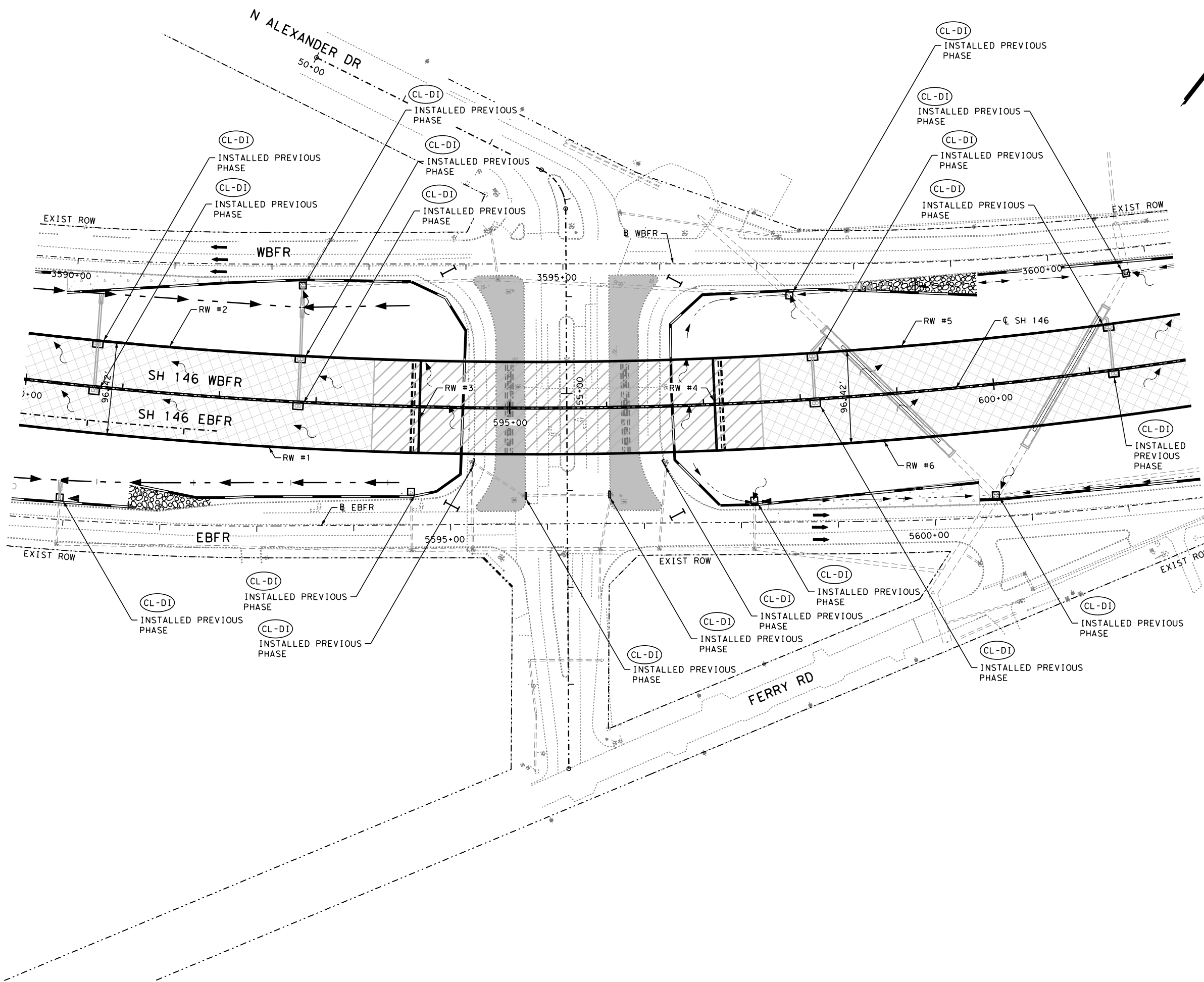
PHASE 1 STAGE 1

STA 614+00 TO END

SHEET 7 OF 7

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			355
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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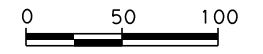


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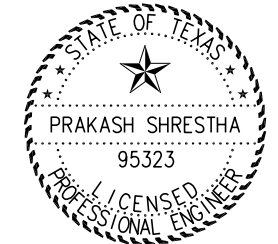
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- (CL-CI) CURB INLET
- EROSION CONTROL LOG
- ~ FLOW DIRECTION
- ← DITCH FLOW DIRECTION
- DIRECTION OF TRAFFIC
- CHANNELLIZING DEVICE
- ▬ PORT CTB (SGL SLOPE) (TY 1)
- x-x-x CURB REMOVAL
- ▨ CONSTRUCTION THIS PHASE
- ▩ CONSTRUCTION PREVIOUS PHASE
- ▧ BLOCK SODDING (PERM)
- ▩ CONSTRUCTION EXIT (TYPE 1)

NOTES:

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SH 146

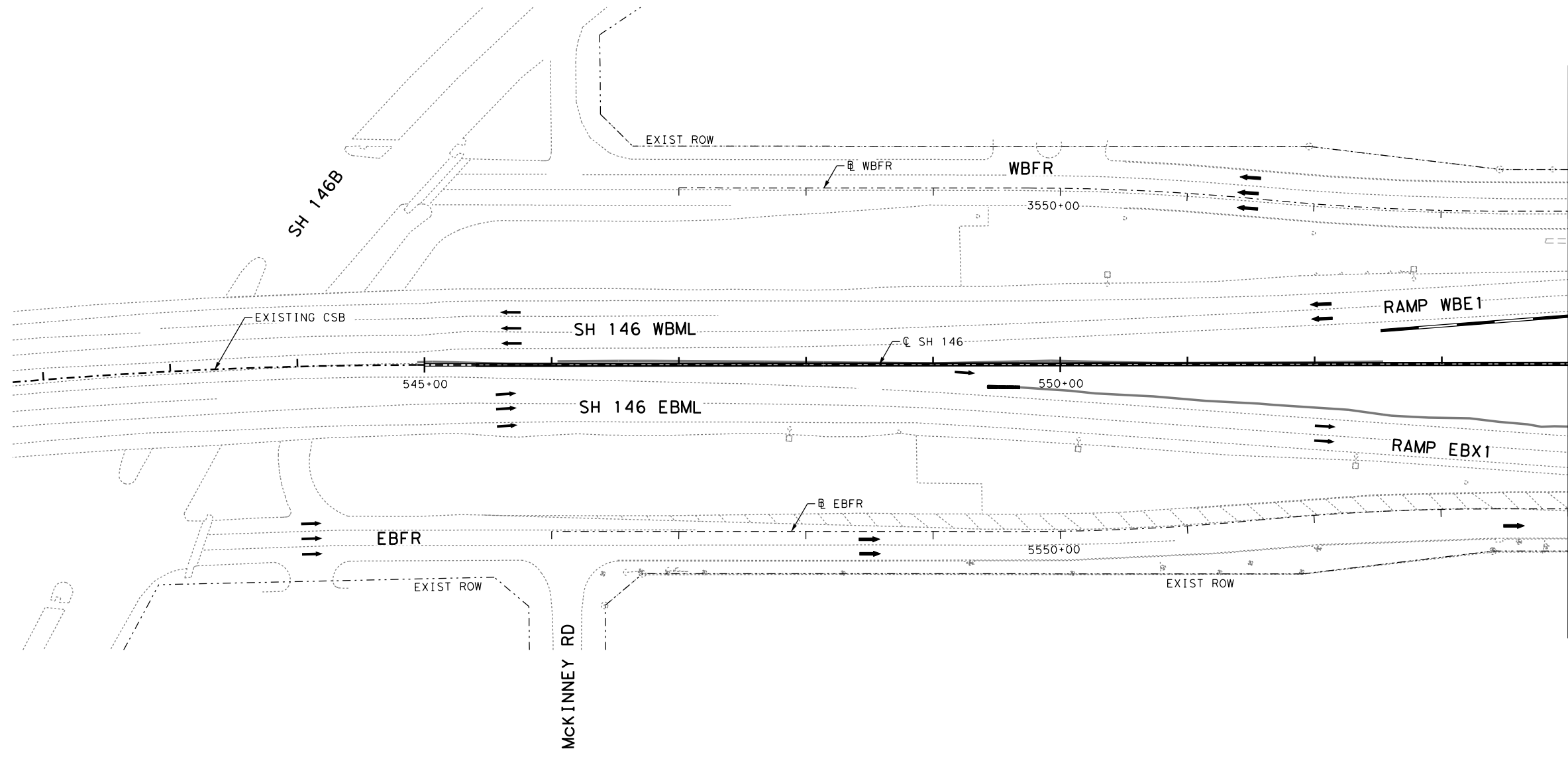
SW3P
 PHASE 1 STAGE 2

STA 590+00 TO STA 602+00

SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			356
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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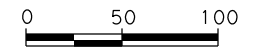


MATCHLINE STA 554+00

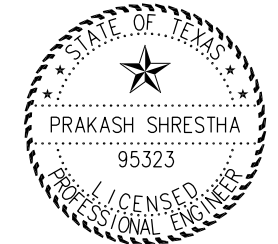
LEGEND

- CL-DI DROP INLET
- CL-CI CURB INLET
- EROSION CONTROL LOG
- FLOW DIRECTION
- DITCH FLOW DIRECTION
- DIRECTION OF TRAFFIC
- CHANNELLIZING DEVICE
- PORT CTB (SGL SLOPE) (TY 1)
- CURB REMOVAL
- CONSTRUCTION THIS PHASE
- CONSTRUCTION PREVIOUS PHASE
- BLOCK SODDING (PERM)
- CONSTRUCTION EXIT (TYPE 1)

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SH 146

SW3P

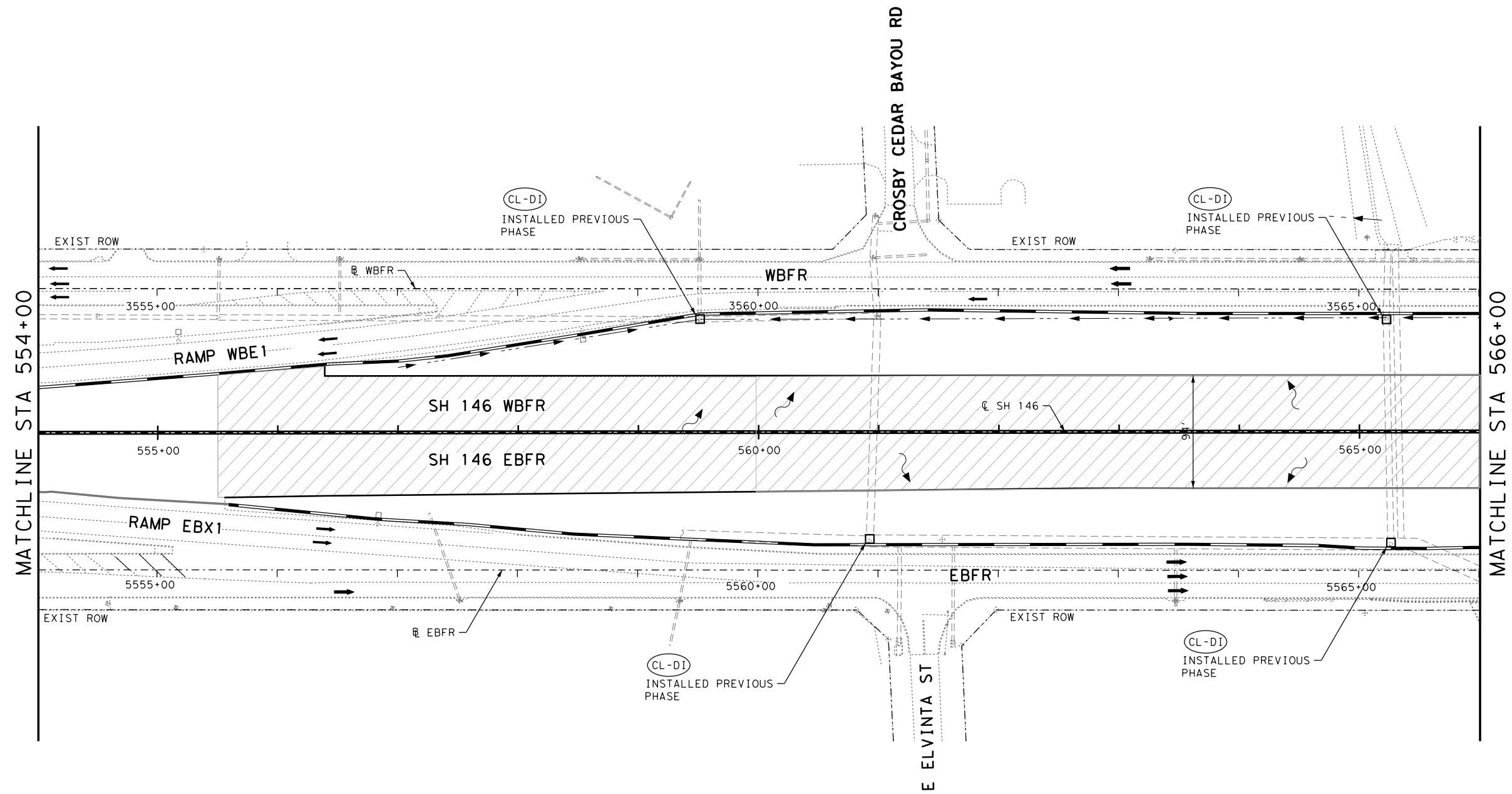
PHASE 2 STAGE 1

BEGIN TO STA 554+00

SHEET 1 OF 7

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			357
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

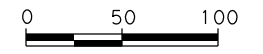
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LEGEND

- (CL-DI) DROP INLET
- (CL-CI) CURB INLET
- EROSION CONTROL LOG
- ~ FLOW DIRECTION
- ← DITCH FLOW DIRECTION
- DIRECTION OF TRAFFIC
- CHANNELLIZING DEVICE
- ▬ PORT CTB (SGL SLOPE) (TY 1)
- x-x-x CURB REMOVAL
- ▨ CONSTRUCTION THIS PHASE
- ▩ CONSTRUCTION PREVIOUS PHASE
- ⬮ BLOCK SODDING (PERM)
- ⬮ CONSTRUCTION EXIT (TYPE 1)

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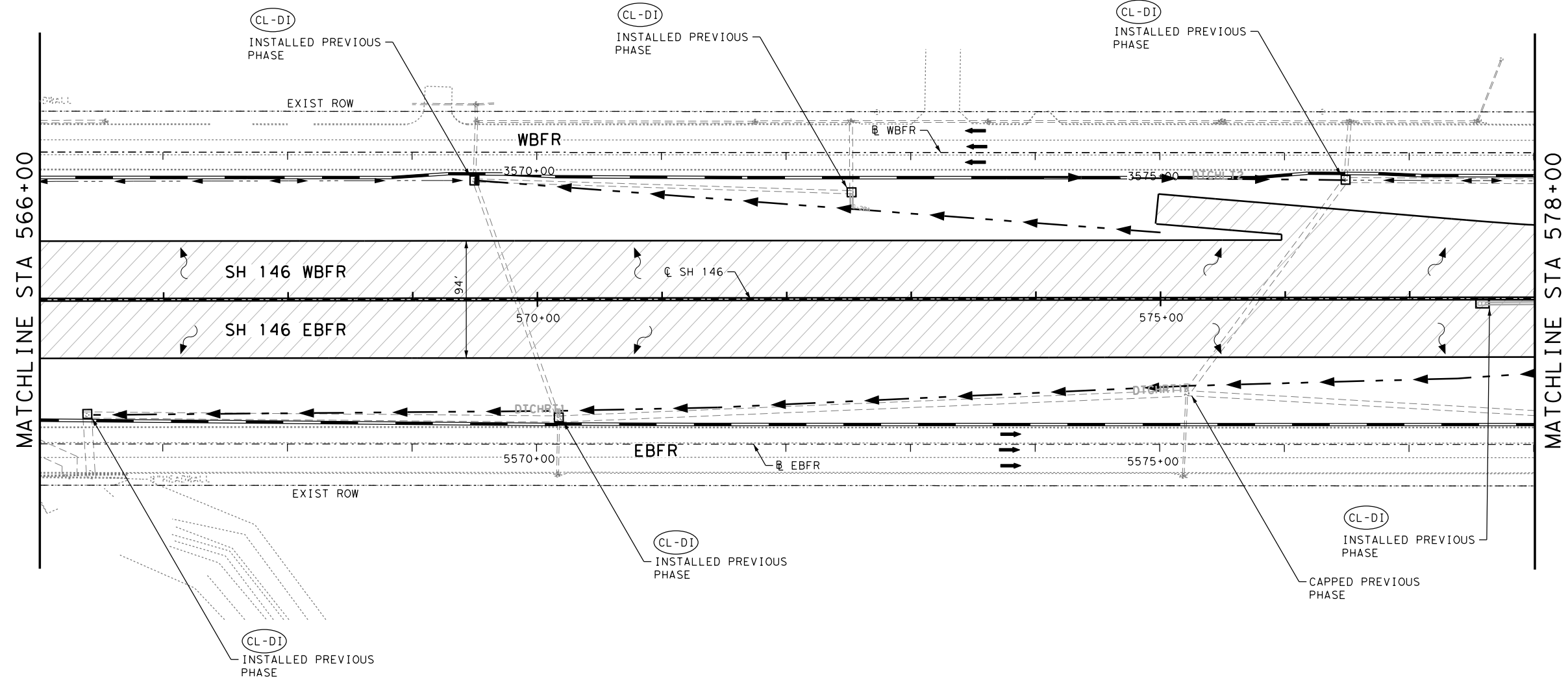


SH 146
 SW3P
 PHASE 2 STAGE 1
 STA 554+00 TO STA 566+00

SHEET 2 OF 7

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			358
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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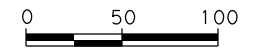


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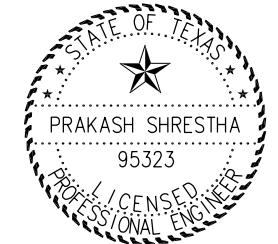
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- (CL-CI) CURB INLET
- EROSION CONTROL LOG
- ~ FLOW DIRECTION
- ← DITCH FLOW DIRECTION
- DIRECTION OF TRAFFIC
- CHANNELLIZING DEVICE
- ▬ PORT CTB (SGL SLOPE) (TY 1)
- x-x-x CURB REMOVAL
- ▨ CONSTRUCTION THIS PHASE
- CONSTRUCTION PREVIOUS PHASE
- ▧ BLOCK SODDING (PERM)
- ▩ CONSTRUCTION EXIT (TYPE 1)

NOTES:

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2. REFER TO TCP LAYOUTS FOR MORE INFORMATION ON PHASING LAYOUTS.



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 1/7/2022

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 Firm Registration No. F-382



SH 146
SW3P
PHASE 2 STAGE 1
STA 566+00 TO STA 578+00

SHEET 3 OF 7

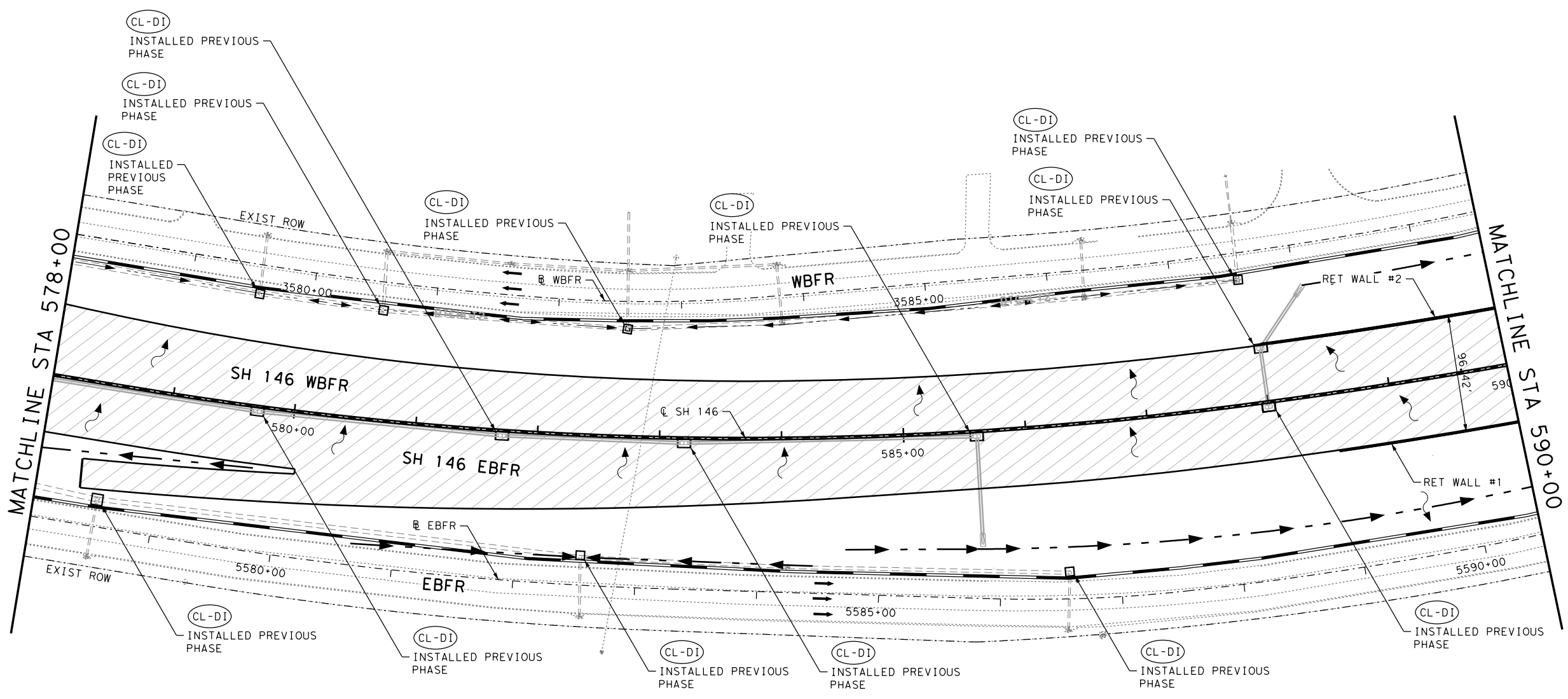
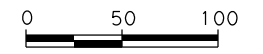
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6			359
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

LEGEND

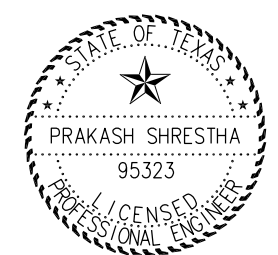
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- (CL-CI) CURB INLET
- EROSION CONTROL LOG
- ↻ FLOW DIRECTION
- ← DITCH FLOW DIRECTION
- DIRECTION OF TRAFFIC
- CHANNELLIZING DEVICE
- ▬ PORT CTB (SGL SLOPE) (TY 1)
- x-x CURB REMOVAL
- ▨ CONSTRUCTION THIS PHASE
- ▩ CONSTRUCTION PREVIOUS PHASE
- ⊞ BLOCK SODDING (PERM)
- ⊞ CONSTRUCTION EXIT (TYPE 1)

NOTES:

1. SEE SW3P STANDARD SHEETS FOR DETAILS.
2. REFER TO TCP LAYOUTS FOR MORE INFORMATION ON PHASING LAYOUTS.



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Firm Registration No. F-382



SH 146

**SW3P
PHASE 2 STAGE 1**

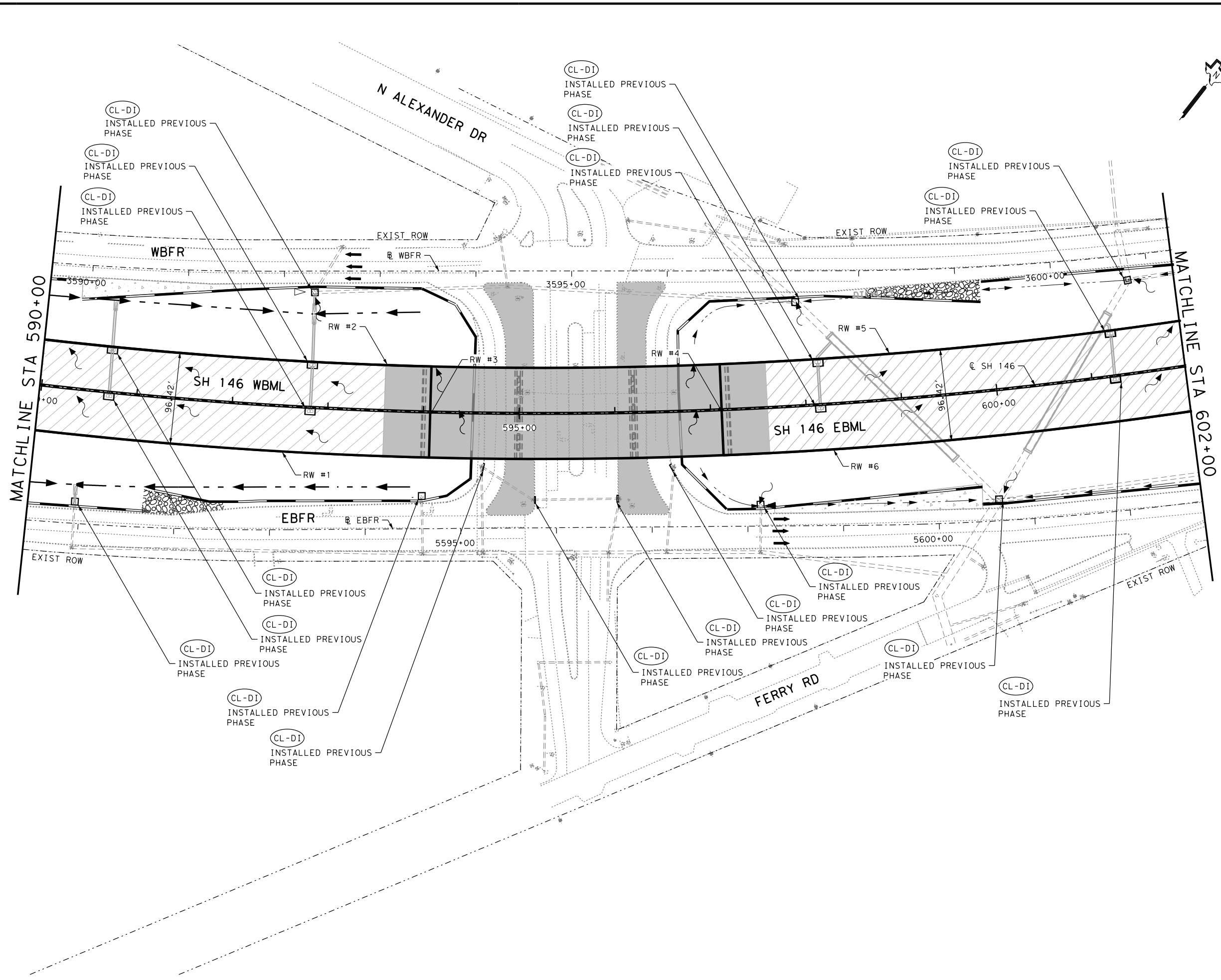
STA 578+00 TO STA 590+00

SHEET 4 OF 7

FED. RD. DIV. NO. 6		FEDERAL AID PROJECT NO.		SHEET NO. 360
STATE TEXAS	DIST. HOU	COUNTY HARRIS		
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146	

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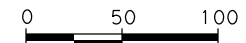


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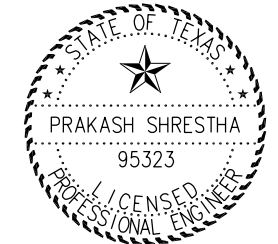
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- (CL-CI) CURB INLET
- EROSION CONTROL LOG
- ~ FLOW DIRECTION
- ← DITCH FLOW DIRECTION
- DIRECTION OF TRAFFIC
- CHANNELLIZING DEVICE
- ▬ PORT CTB (SGL SLOPE) (TY 1)
- x-x-x CURB REMOVAL
- ▨ CONSTRUCTION THIS PHASE
- CONSTRUCTION PREVIOUS PHASE
- ▤ BLOCK SODDING (PERM)
- ▧ CONSTRUCTION EXIT (TYPE 1)

NOTES:

1. SEE SW3P STANDARD SHEETS FOR DETAILS.
2. REFER TO TCP LAYOUTS FOR MORE INFORMATION ON PHASING LAYOUTS.

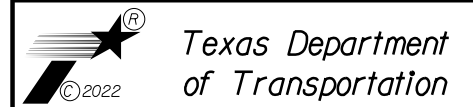


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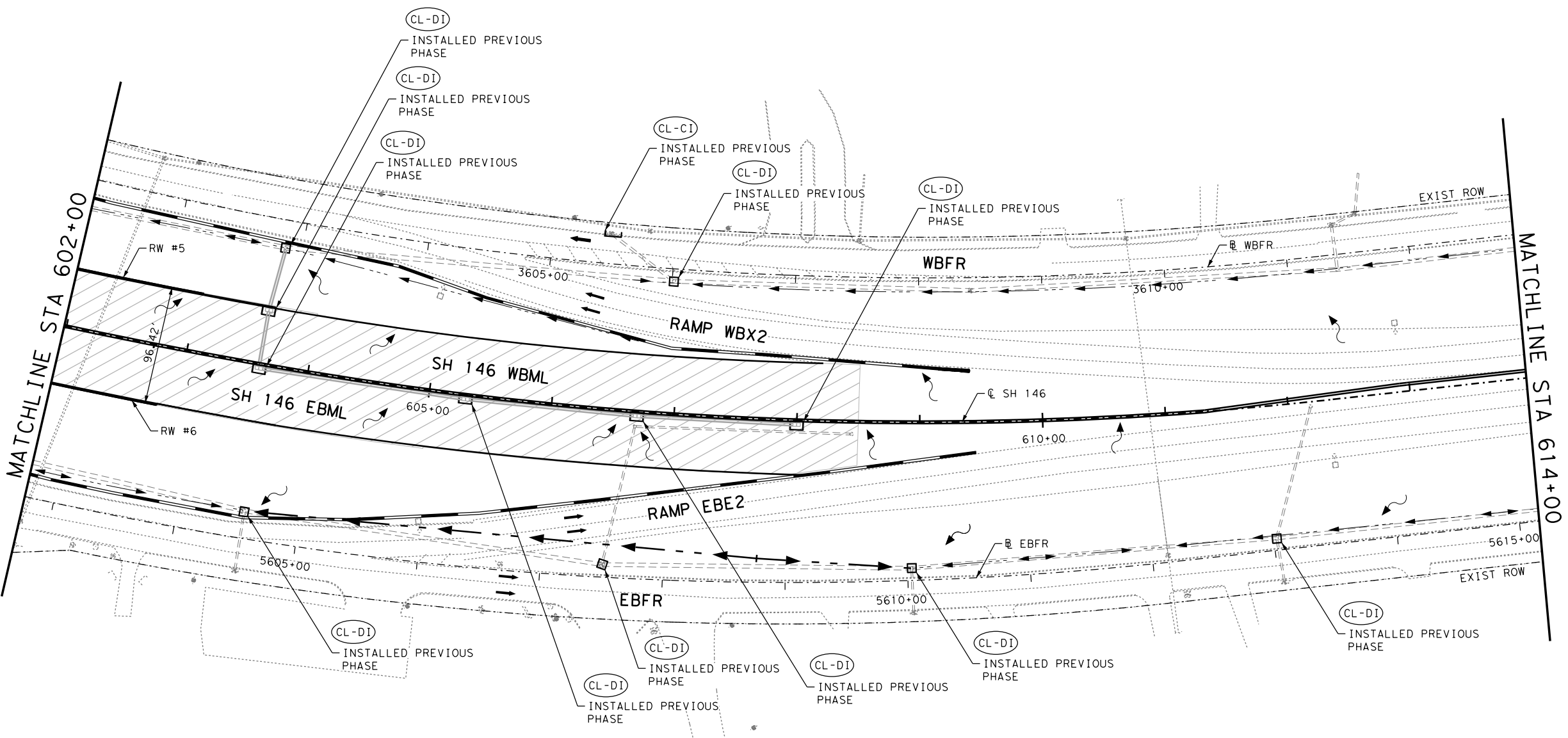


SH 146
SW3P
PHASE 2 STAGE 1
STA 590+00 TO STA 602+00

SHEET 5 OF 7

FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.	SHEET NO. 361
STATE TEXAS	DIST. HOU	COUNTY HARRIS
CONT. 0389	SECT. 13	JOB 039
		HIGHWAY NO. SH 146

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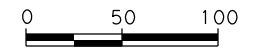


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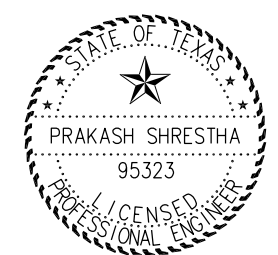
- (CL-DI) DROP INLET
- (CL-CI) CURB INLET
- EROSION CONTROL LOG
- ↷ FLOW DIRECTION
- ← DITCH FLOW DIRECTION
- DIRECTION OF TRAFFIC
- CHANNELLIZING DEVICE
- ▬ PORT CTB (SGL SLOPE) (TY 1)
- x-x-x CURB REMOVAL
- ▨ CONSTRUCTION THIS PHASE
- ▩ CONSTRUCTION PREVIOUS PHASE
- ▧ BLOCK SODDING (PERM)
- ▩ CONSTRUCTION EXIT (TYPE 1)

NOTES:

1. SEE SW3P STANDARD SHEETS FOR DETAILS.
2. REFER TO TCP LAYOUTS FOR MORE INFORMATION ON PHASING LAYOUTS.



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SH 146

SW3P
PHASE 2 STAGE 1

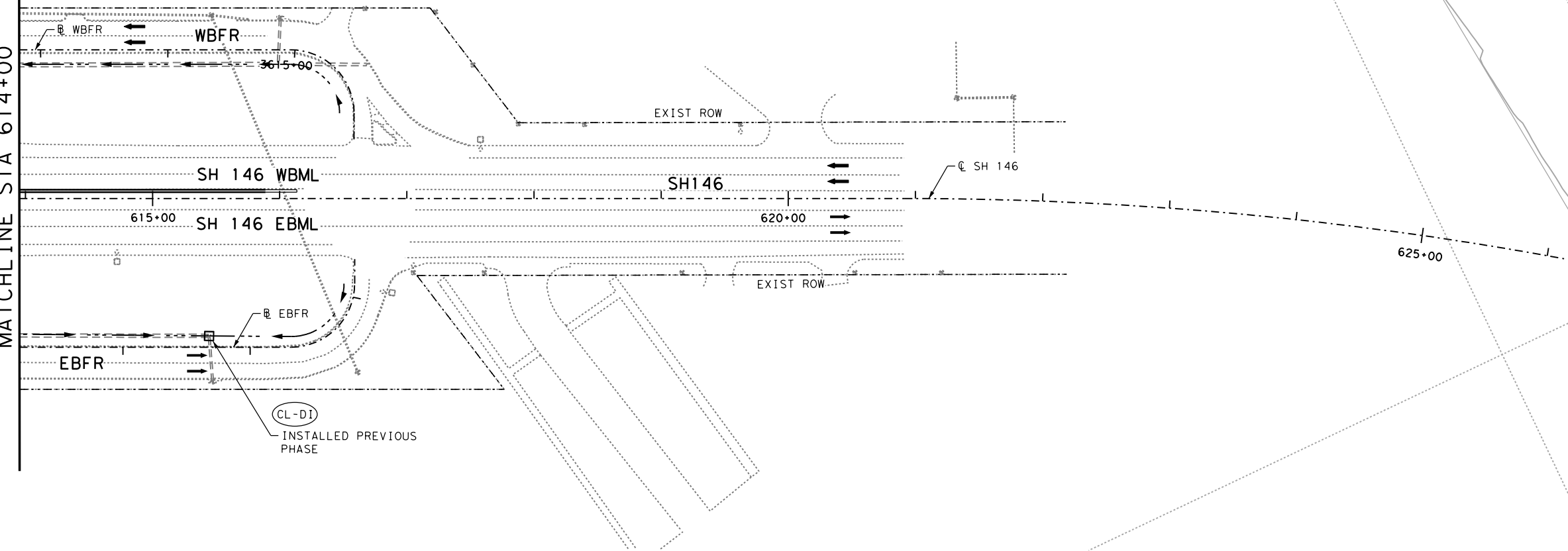
STA 602+00 TO STA 614+00

SHEET 6 OF 7

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			362
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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MATCHLINE STA 614+00

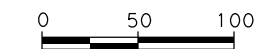


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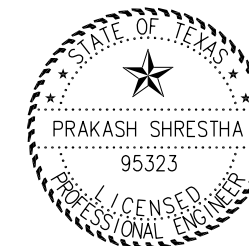
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- CL-CI CURB INLET
- EROSION CONTROL LOG
- FLOW DIRECTION
- DITCH FLOW DIRECTION
- DIRECTION OF TRAFFIC
- CHANNELIZING DEVICE
- PORT CTB (SGL SLOPE) (TY 1)
- CURB REMOVAL
- CONSTRUCTION THIS PHASE
- CONSTRUCTION PREVIOUS PHASE
- BLOCK SODDING (PERM)
- CONSTRUCTION EXIT (TYPE 1)

NOTES:

1. SEE SW3P STANDARD SHEETS FOR DETAILS.
2. REFER TO TCP LAYOUTS FOR MORE INFORMATION ON PHASING LAYOUTS.

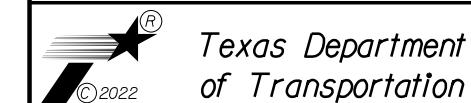


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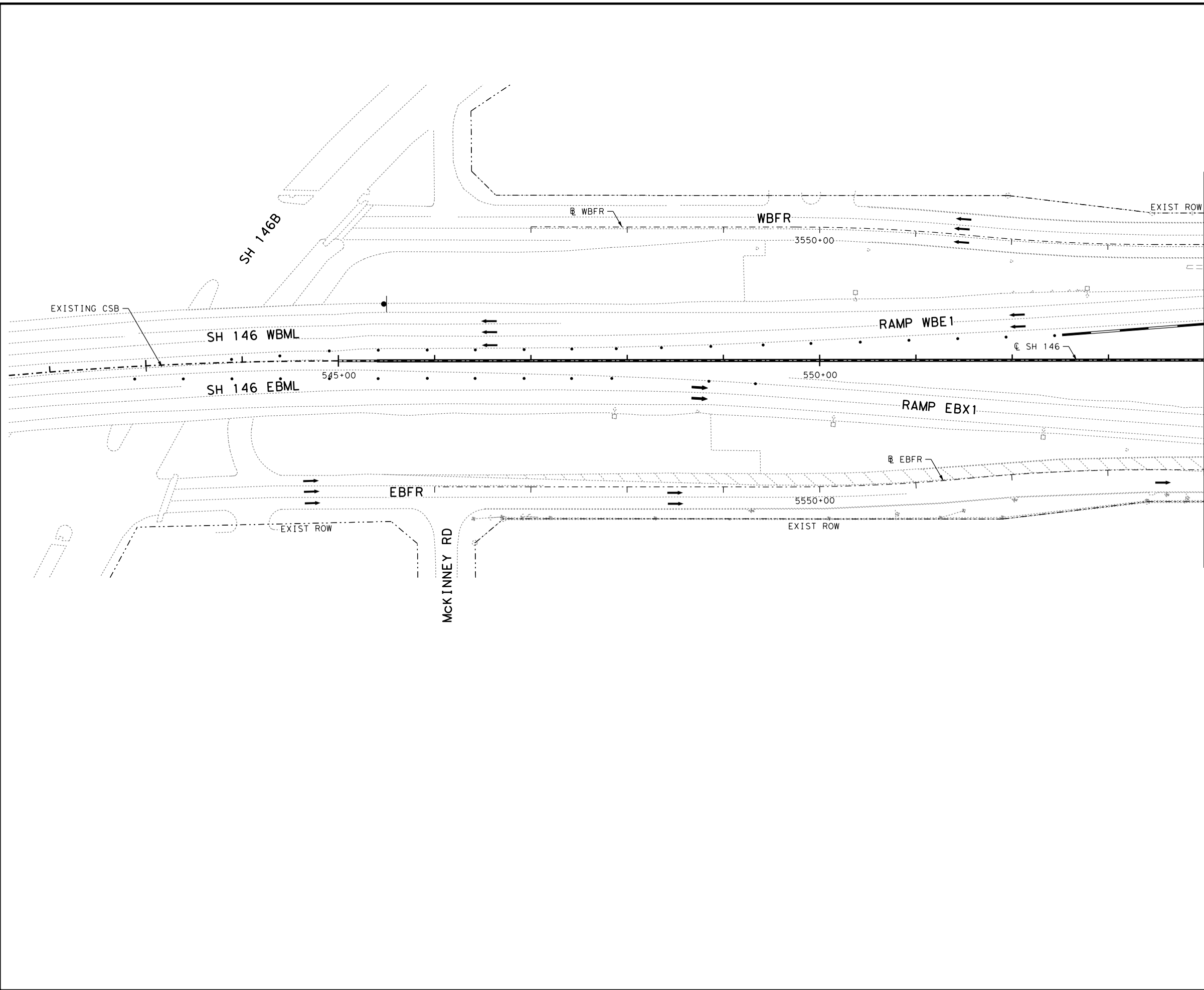
SW3P
 PHASE 2 STAGE 1

STA 614+00 TO END

SHEET 7 OF 7

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			363
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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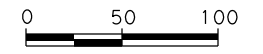
MATCHLINE STA 554+00

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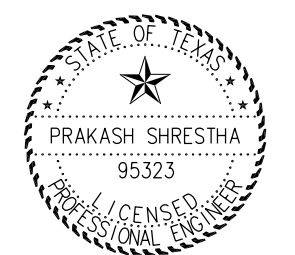
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- FLOW DIRECTION
- DITCH FLOW DIRECTION
- DIRECTION OF TRAFFIC
- CHANNELLIZING DEVICE
- PORT CTB (SGL SLOPE) (TY 1)
- CURB REMOVAL
- CONSTRUCTION THIS PHASE
- CONSTRUCTION PREVIOUS PHASE
- BLOCK SODDING (PERM)
- CONSTRUCTION EXIT (TYPE 1)

NOTES:

1. SEE SW3P STANDARD SHEETS FOR DETAILS.
2. REFER TO TCP LAYOUTS FOR MORE INFORMATION ON PHASING LAYOUTS.



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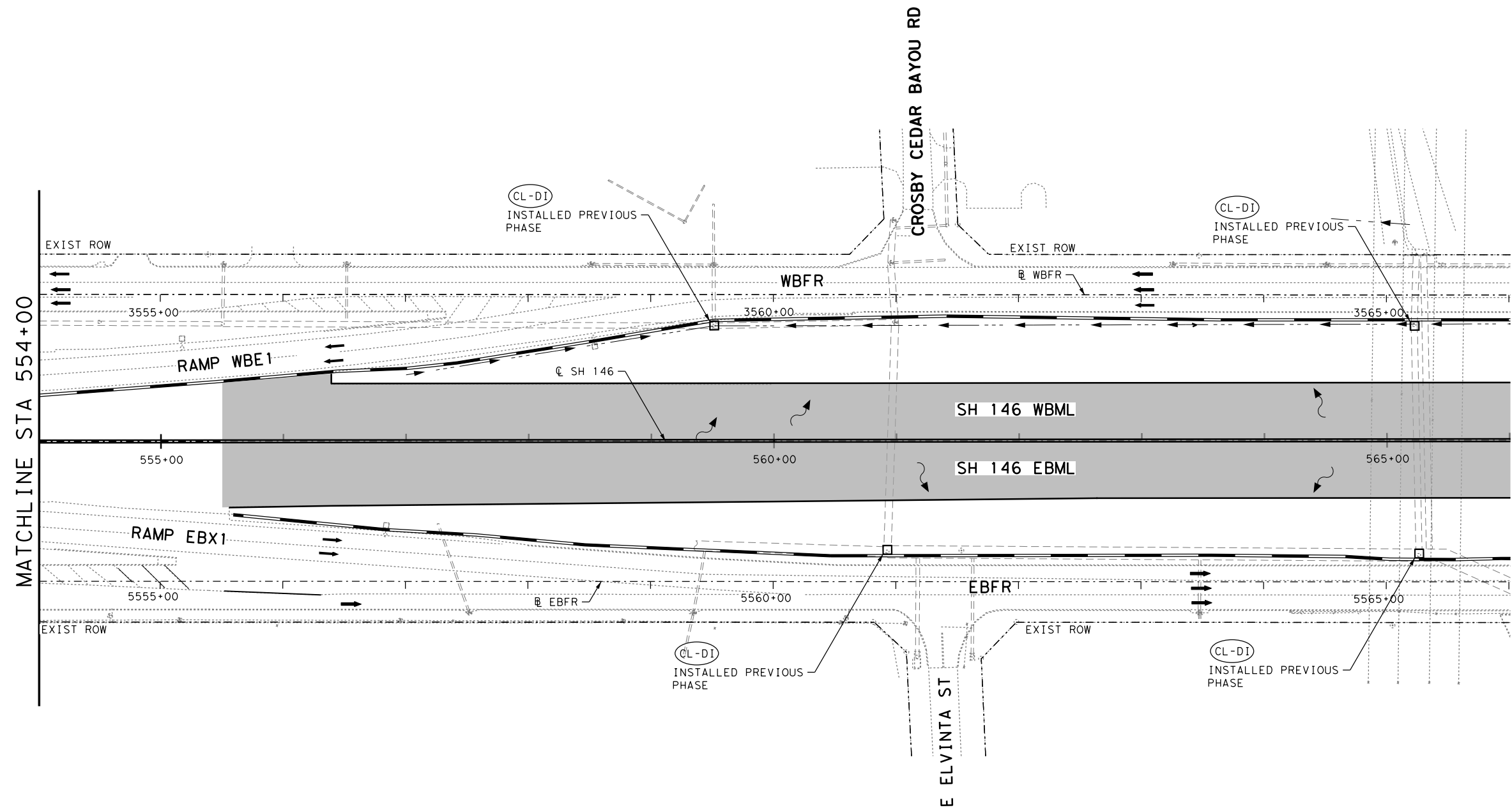
SW3P
 PHASE 2 STAGE 2

BEGIN TO STA 554+00

SHEET 1 OF 4

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			364
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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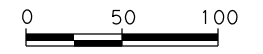


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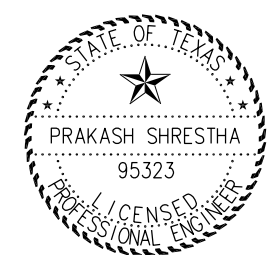
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- CL-CI CURB INLET
- EROSION CONTROL LOG
- FLOW DIRECTION
- DITCH FLOW DIRECTION
- DIRECTION OF TRAFFIC
- CHANNELLIZING DEVICE
- PORT CTB (SGL SLOPE) (TY 1)
- CURB REMOVAL
- CONSTRUCTION THIS PHASE
- CONSTRUCTION PREVIOUS PHASE
- BLOCK SODDING (PERM)
- CONSTRUCTION EXIT (TYPE 1)

NOTES:

1. SEE SW3P STANDARD SHEETS FOR DETAILS.
2. REFER TO TCP LAYOUTS FOR MORE INFORMATION ON PHASING LAYOUTS.

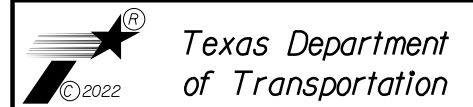


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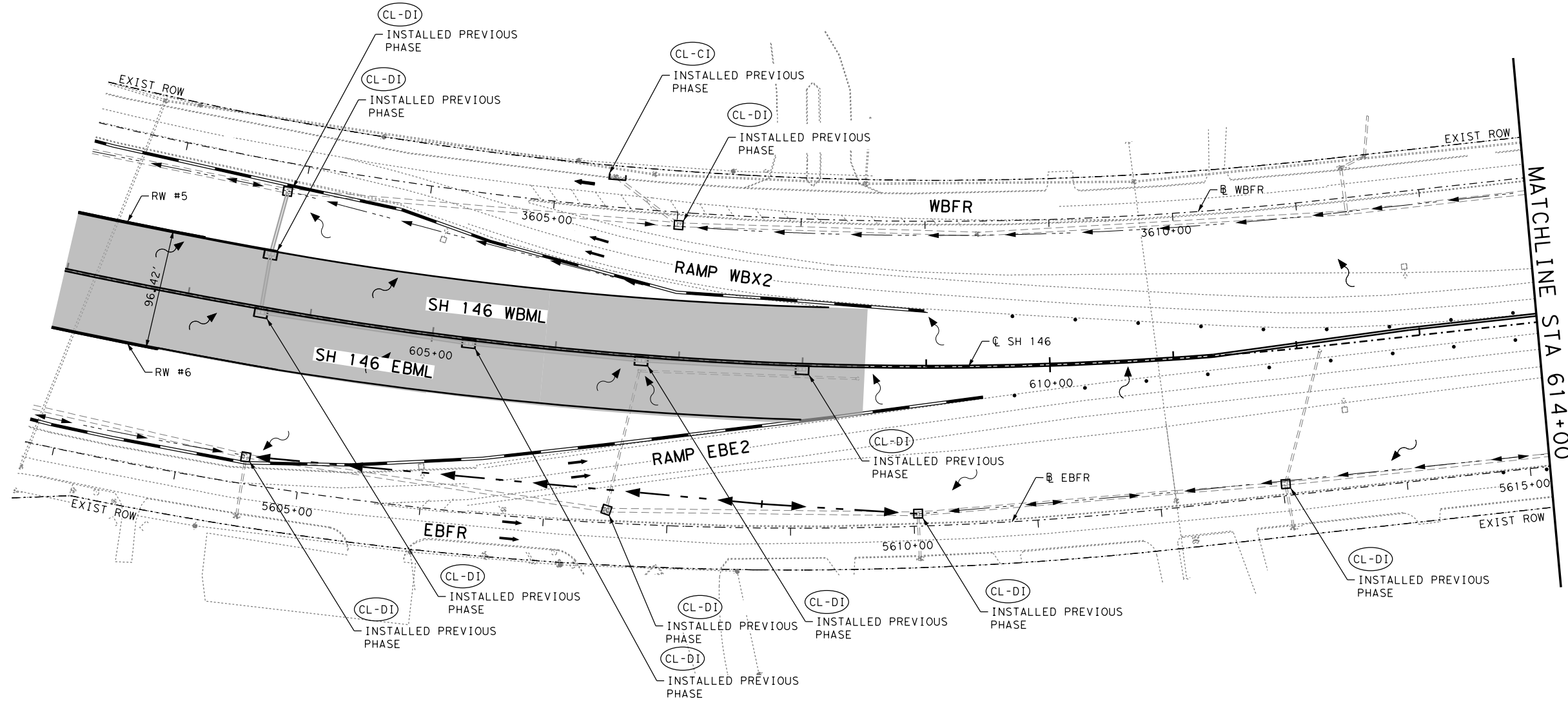
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 PHASE 2 STAGE 2

STA 554+00 TO STA 566+00

SHEET 2 OF 4

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			365
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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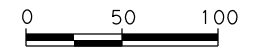


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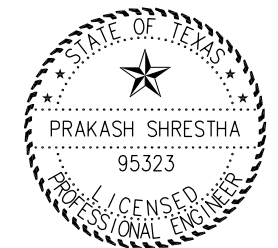
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- CL-CI CURB INLET
- EROSION CONTROL LOG
- FLOW DIRECTION
- DITCH FLOW DIRECTION
- DIRECTION OF TRAFFIC
- CHANNELLIZING DEVICE
- PORT CTB (SGL SLOPE) (TY 1)
- CURB REMOVAL
- CONSTRUCTION THIS PHASE
- CONSTRUCTION PREVIOUS PHASE
- BLOCK SODDING (PERM)
- CONSTRUCTION EXIT (TYPE 1)

NOTES:

1. SEE SW3P STANDARD SHEETS FOR DETAILS.
2. REFER TO TCP LAYOUTS FOR MORE INFORMATION ON PHASING LAYOUTS.

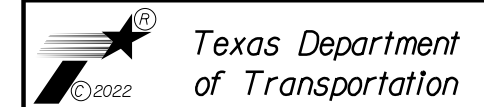


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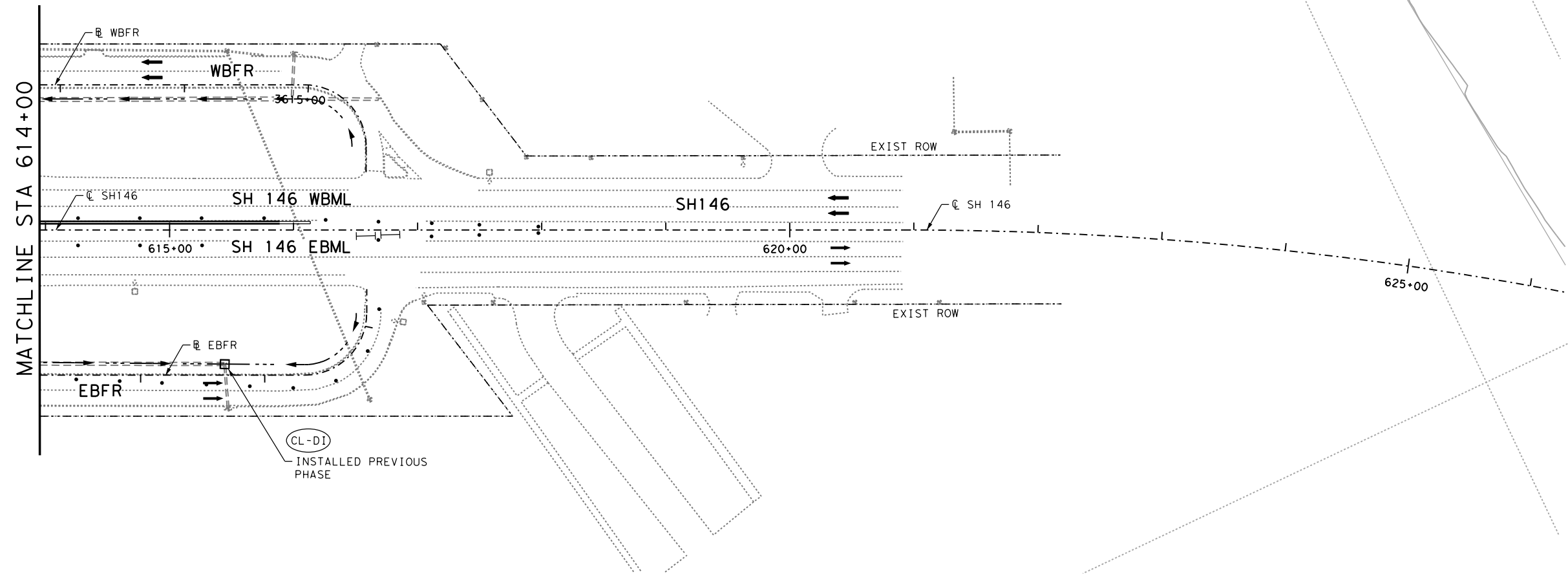
SW3P
 PHASE 2 STAGE 2

STA 602+00 TO STA 614+00

SHEET 3 OF 4

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			366
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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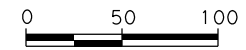


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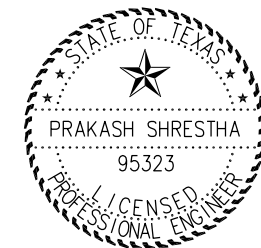
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- DITCH FLOW DIRECTION
- DIRECTION OF TRAFFIC
- CHANNELLIZING DEVICE
- PORT CTB (SGL SLOPE) (TY 1)
- CURB REMOVAL
- CONSTRUCTION THIS PHASE
- CONSTRUCTION PREVIOUS PHASE
- BLOCK SODDING (PERM)
- CONSTRUCTION EXIT (TYPE 1)

NOTES:

1. SEE SW3P STANDARD SHEETS FOR DETAILS.
2. REFER TO TCP LAYOUTS FOR MORE INFORMATION ON PHASING LAYOUTS.

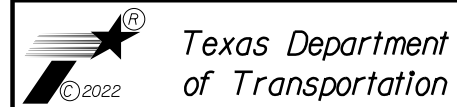


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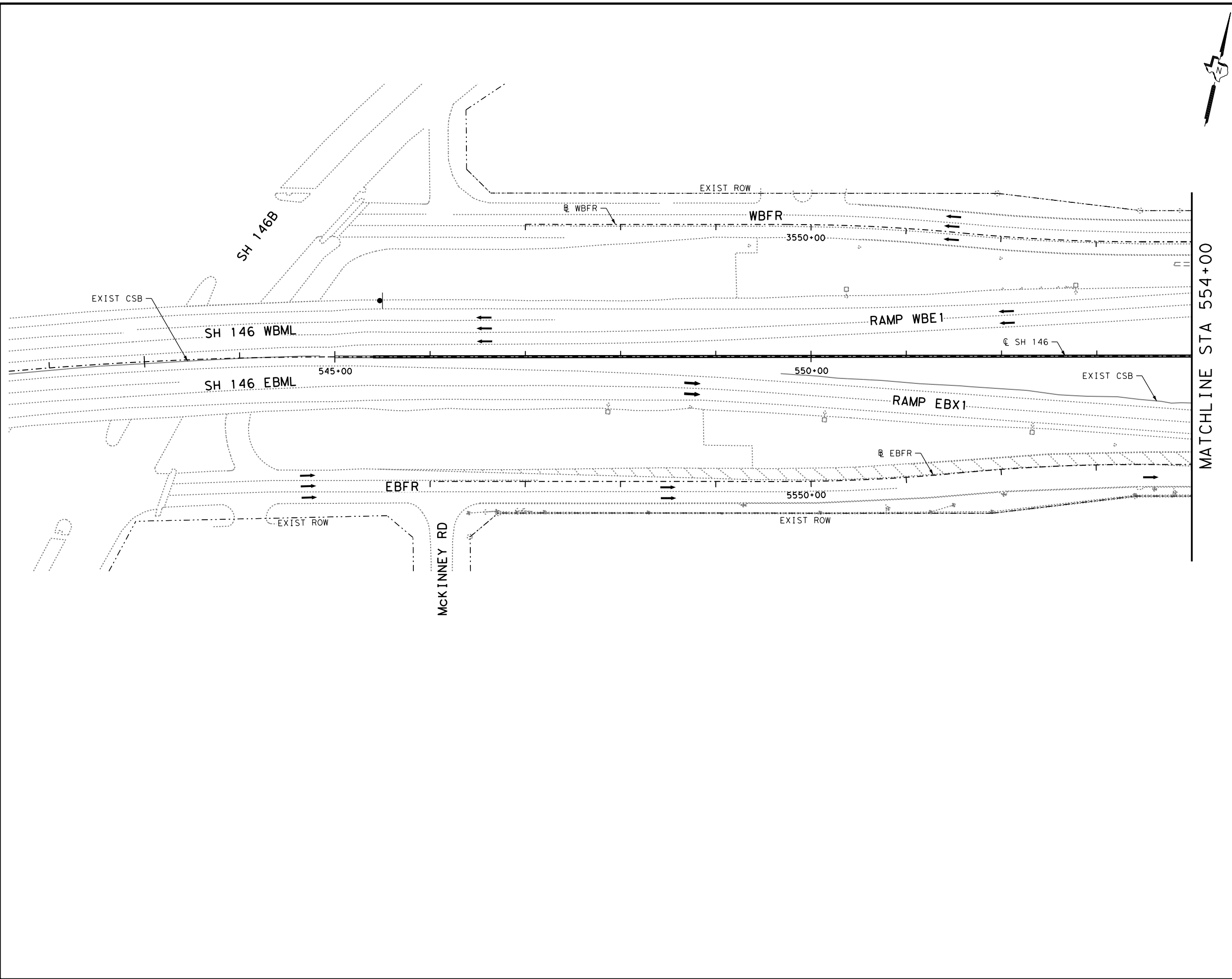


SH 146
 SW3P
 PHASE 2 STAGE 2
 STA 614+00 TO END

SHEET 4 OF 4

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			367
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

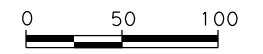
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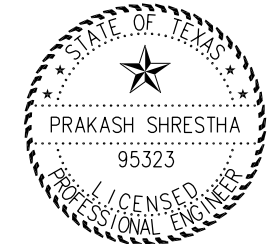
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- (CL-CI) CURB INLET
- EROSION CONTROL LOG
- ~ FLOW DIRECTION
- ← DITCH FLOW DIRECTION
- DIRECTION OF TRAFFIC
- CHANNELLIZING DEVICE
- ▬ PORT CTB (SGL SLOPE) (TY 1)
- x-x CURB REMOVAL
- ▨ CONSTRUCTION THIS PHASE
- ▩ CONSTRUCTION PREVIOUS PHASE
- ⬇ BLOCK SODDING (PERM)
- ⬆ CONSTRUCTION EXIT (TYPE 1)

- NOTES:
1. SEE SW3P STANDARD SHEETS FOR DETAILS.
 2. REFER TO TCP LAYOUTS FOR MORE INFORMATION ON PHASING LAYOUTS.



MATCHLINE STA 554+00

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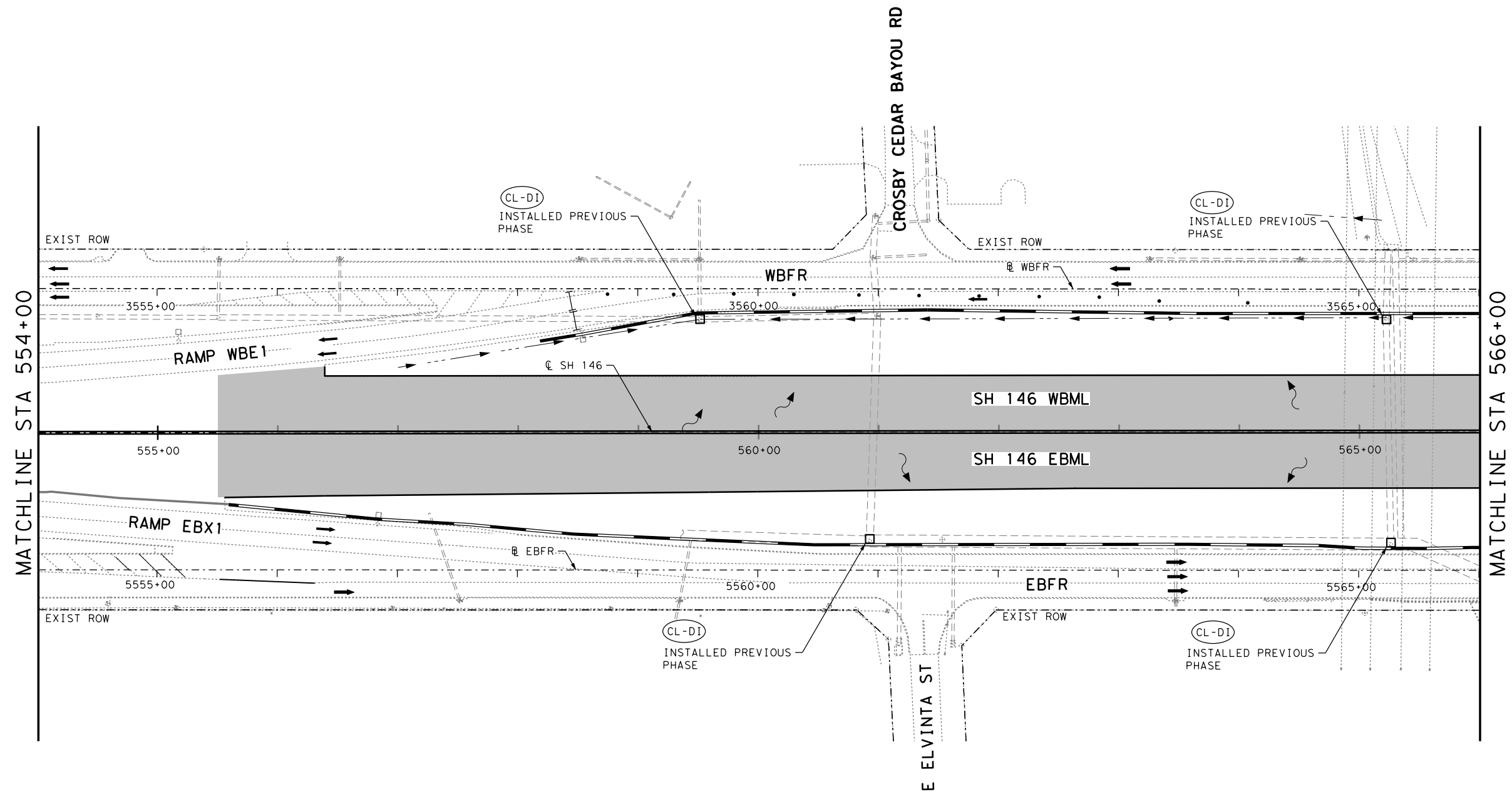


SH 146
 SW3P
 PHASE 2 STAGE 3
 BEGIN TO STA 554+00

SHEET 1 OF 7

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			368
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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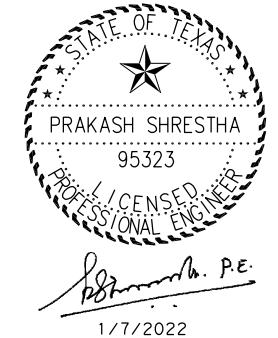
LEGEND

- (CL-DI) DROP INLET
- (CL-CI) CURB INLET
- EROSION CONTROL LOG
- ~ FLOW DIRECTION
- ← DITCH FLOW DIRECTION
- DIRECTION OF TRAFFIC
- CHANNELLIZING DEVICE
- ▬ PORT CTB (SGL SLOPE) (TY 1)
- x-x-x CURB REMOVAL
- ▨ CONSTRUCTION THIS PHASE
- ▩ CONSTRUCTION PREVIOUS PHASE
- ⬆ BLOCK SODDING (PERM)
- ⬇ CONSTRUCTION EXIT (TYPE 1)

NOTES:
 1. SEE SW3P STANDARD SHEETS FOR DETAILS.
 2. REFER TO TCP LAYOUTS FOR MORE INFORMATION ON PHASING LAYOUTS.

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REV NO.	DATE	BY	REVISION



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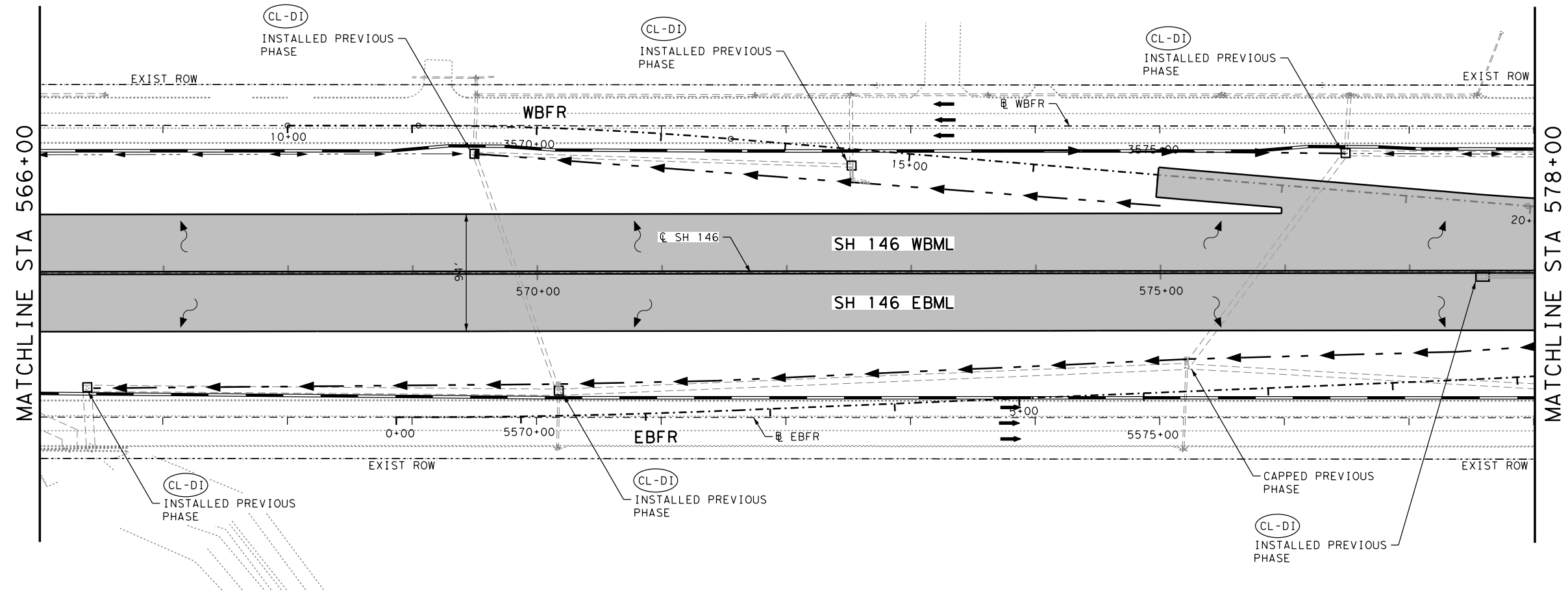


SH 146
 SW3P
 PHASE 2 STAGE 3
 STA 554+00 TO STA 566+00

SHEET 2 OF 7

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			369
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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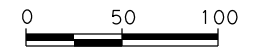


LEGEND

- (CL-DI) DROP INLET
- (CL-CI) CURB INLET
- EROSION CONTROL LOG
- ~ FLOW DIRECTION
- ← DITCH FLOW DIRECTION
- DIRECTION OF TRAFFIC
- CHANNELLIZING DEVICE
- ▬ PORT CTB (SGL SLOPE) (TY 1)
- x-x-x CURB REMOVAL
- ▨ CONSTRUCTION THIS PHASE
- ▩ CONSTRUCTION PREVIOUS PHASE
- ▧ BLOCK SODDING (PERM)
- ▩ CONSTRUCTION EXIT (TYPE 1)

NOTES:

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SH 146














SW3P
PHASE 2 STAGE 3

STA 566+00 TO STA 578+00

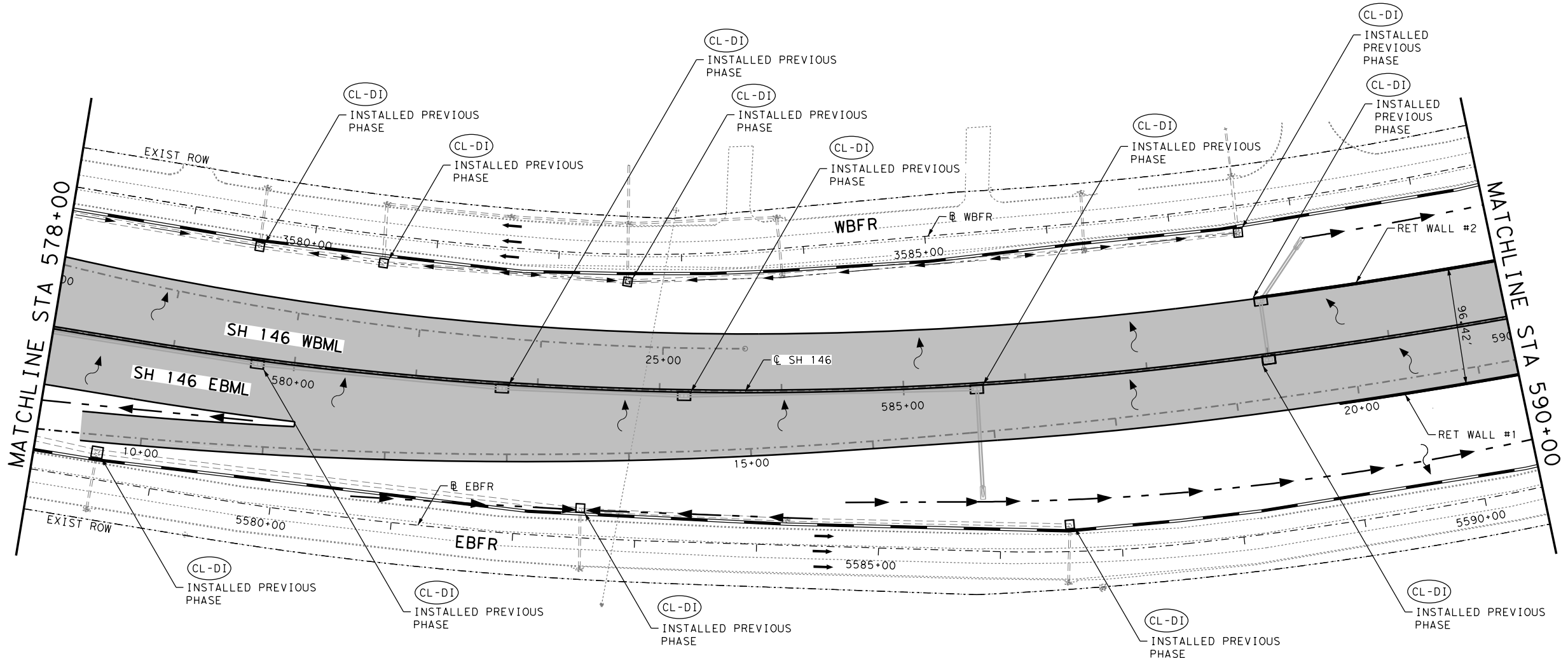
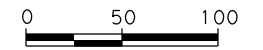
SHEET 3 OF 7

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			370
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

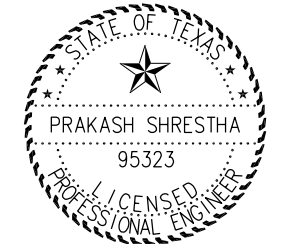
LEGEND

-  DROP INLET
-  CURB INLET
-  EROSION CONTROL LOG
-  FLOW DIRECTION
-  DITCH FLOW DIRECTION
-  DIRECTION OF TRAFFIC
-  CHANNELLIZING DEVICE
-  PORT CTB (SGL SLOPE) (TY 1)
-  CURB REMOVAL
-  CONSTRUCTION THIS PHASE
-  CONSTRUCTION PREVIOUS PHASE
-  BLOCK SODDING (PERM)
-  CONSTRUCTION EXIT (TYPE 1)

- NOTES:
1. SEE SW3P STANDARD SHEETS FOR DETAILS.
 2. REFER TO TCP LAYOUTS FOR MORE INFORMATION ON PHASING LAYOUTS.



REV. NO.	DATE	BY	REVISION



Prakash Shrestha, P.E.
1/7/2022

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



SH 146

SW3P
PHASE 2 STAGE 3

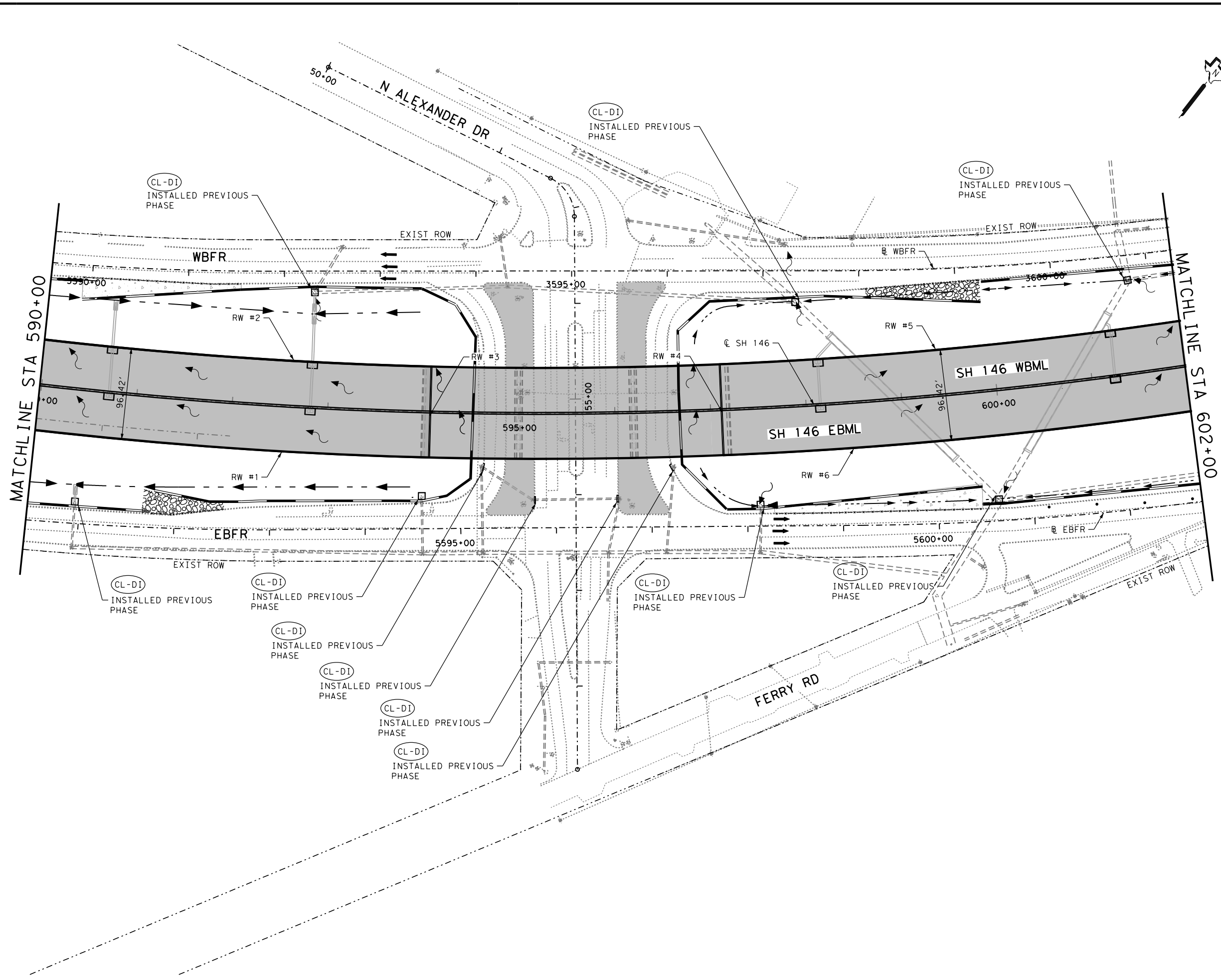
STA 578+00 TO STA 590+00

SHEET 4 OF 7

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			371
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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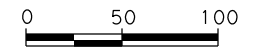
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LEGEND

- CL-DI DROP INLET
- CL-CI CURB INLET
- EROSION CONTROL LOG
- FLOW DIRECTION
- DITCH FLOW DIRECTION
- DIRECTION OF TRAFFIC
- CHANNELLIZING DEVICE
- PORT CTB (SGL SLOPE) (TY 1)
- CURB REMOVAL
- CONSTRUCTION THIS PHASE
- CONSTRUCTION PREVIOUS PHASE
- BLOCK SODDING (PERM)
- CONSTRUCTION EXIT (TYPE 1)

- NOTES:
- SEE SW3P STANDARD SHEETS FOR DETAILS.
 - REFER TO TCP LAYOUTS FOR MORE INFORMATION ON PHASING LAYOUTS.



REV. NO.	DATE	BY	REVISION

PRAKASH SHRESTHA
 95323
 LICENSED PROFESSIONAL ENGINEER
Prakash Shrestha, P.E.
 1/7/2022

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

Texas Department of Transportation

SH 146

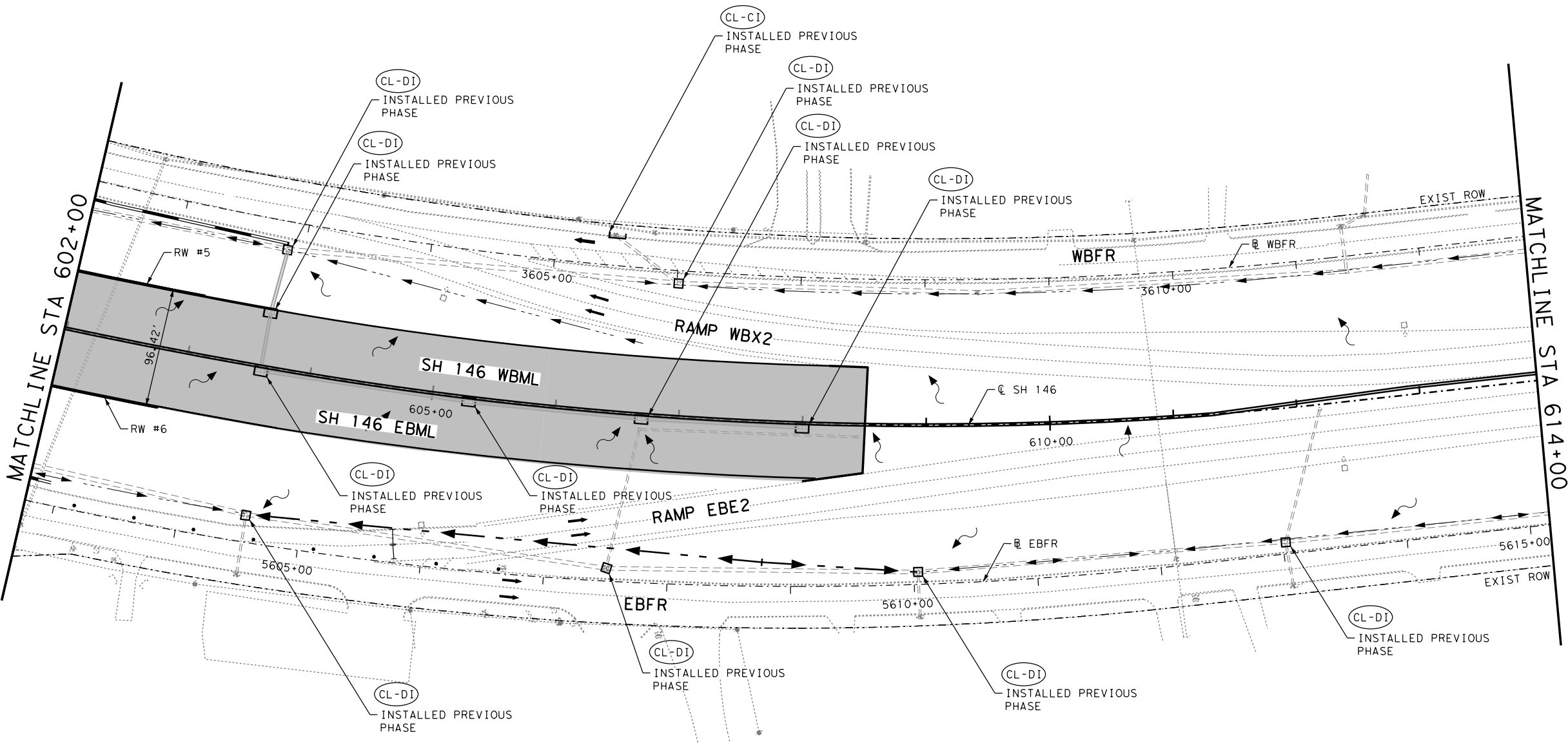
SW3P
PHASE 2 STAGE 3

STA 590+00 TO STA 602+00

SHEET 5 OF 7

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			372
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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LEGEND

- (CL-DI) DROP INLET
- (CL-CI) CURB INLET
- EROSION CONTROL LOG
- ↷ FLOW DIRECTION
- ← DITCH FLOW DIRECTION
- DIRECTION OF TRAFFIC
- CHANNELLIZING DEVICE
- ▬ PORT CTB (SGL SLOPE) (TY 1)
- x-x-x CURB REMOVAL
- ▨ CONSTRUCTION THIS PHASE
- ▩ CONSTRUCTION PREVIOUS PHASE
- ▧ BLOCK SODDING (PERM)
- ▩ CONSTRUCTION EXIT (TYPE 1)

NOTES:

- SEE SW3P STANDARD SHEETS FOR DETAILS.
- REFER TO TCP LAYOUTS FOR MORE INFORMATION ON PHASING LAYOUTS.

0 50 100

REV. NO.	DATE	BY	REVISION

STATE OF TEXAS
 PRAKASH SHRESTHA
 95323
 LICENSED PROFESSIONAL ENGINEER
 P. Shrestha, P.E.
 1/7/2022

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



SH 146

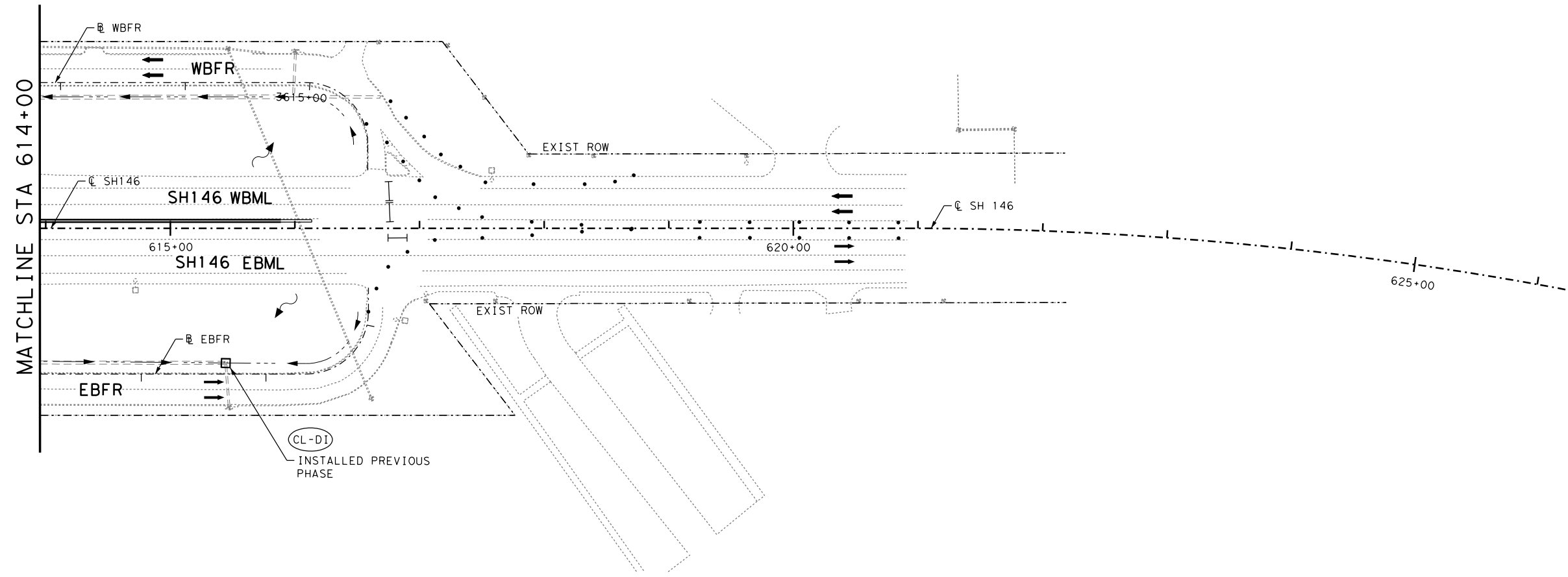
SW3P
 PHASE 2 STAGE 3

STA 602+00 TO STA 614+00

SHEET 6 OF 7

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			373
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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LEGEND

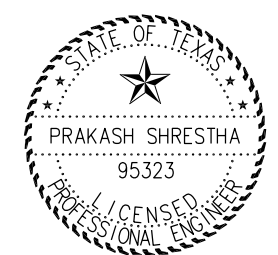
- CL-DI DROP INLET
- CL-CI CURB INLET
- EROSION CONTROL LOG
- FLOW DIRECTION
- DITCH FLOW DIRECTION
- DIRECTION OF TRAFFIC
- CHANNELLIZING DEVICE
- PORT CTB (SGL SLOPE) (TY 1)
- CURB REMOVAL
- CONSTRUCTION THIS PHASE
- CONSTRUCTION PREVIOUS PHASE
- BLOCK SODDING (PERM)
- CONSTRUCTION EXIT (TYPE 1)

NOTES:

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 1/7/2022

CivilTech Engineering, Inc.
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 PH: (281) 304-0200 - FX: (281) 304-0210
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SH 146

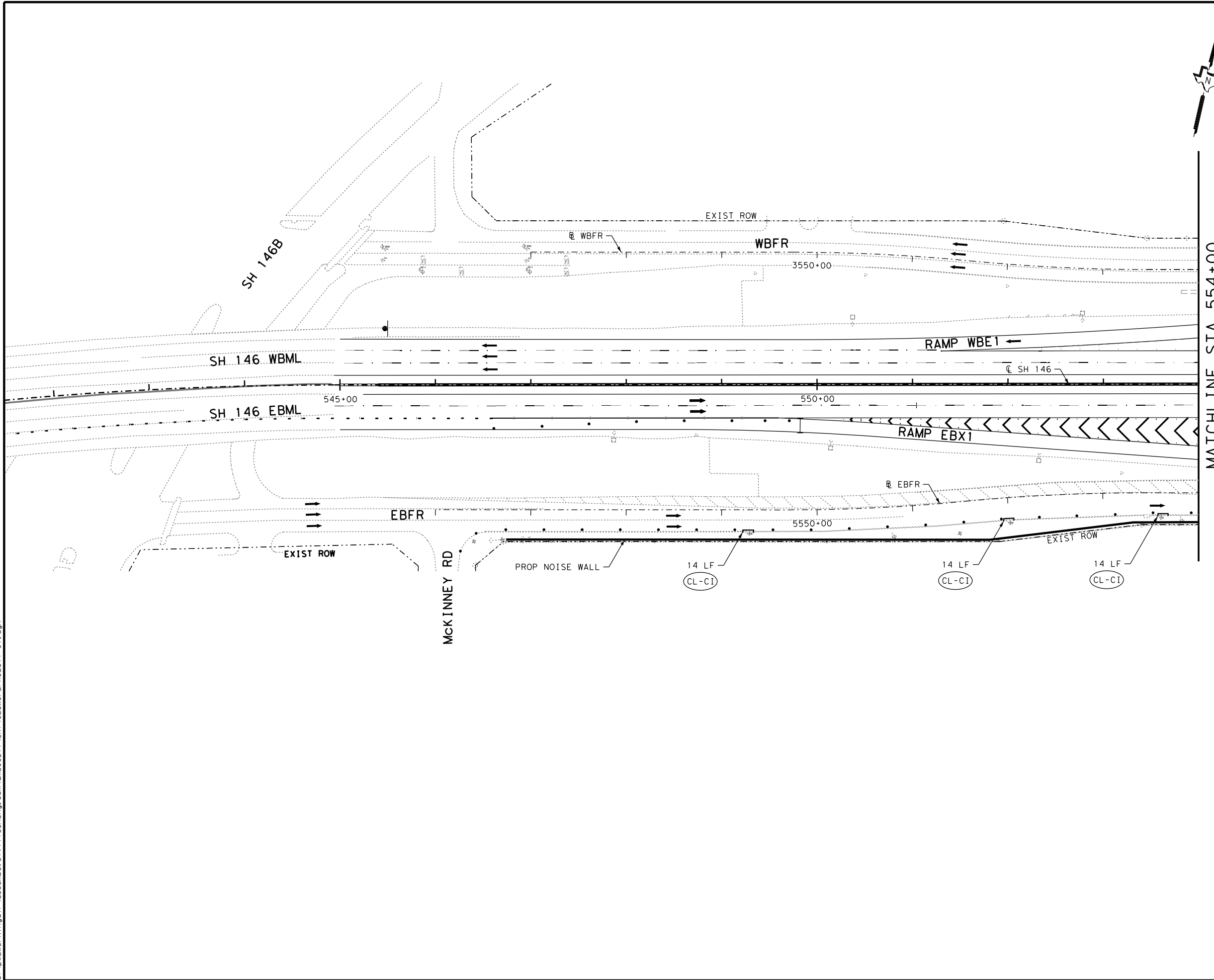
SW3P
 PHASE 2 STAGE 3

STA 614+00 TO END

SHEET 7 OF 7

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			374
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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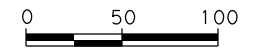


MATCHLINE STA 554+00

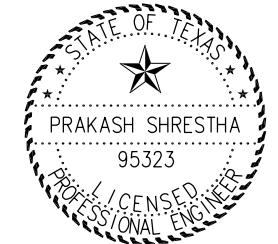
LEGEND

- CL-DI DROP INLET
- CL-CI CURB INLET
- EROSION CONTROL LOG
- FLOW DIRECTION
- DITCH FLOW DIRECTION
- DIRECTION OF TRAFFIC
- CHANNELLIZING DEVICE
- PORT CTB (SGL SLOPE) (TY 1)
- CURB REMOVAL
- CONSTRUCTION THIS PHASE
- CONSTRUCTION PREVIOUS PHASE
- BLOCK SODDING (PERM)
- CONSTRUCTION EXIT (TYPE 1)

- NOTES:**
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SH 146

SW3P

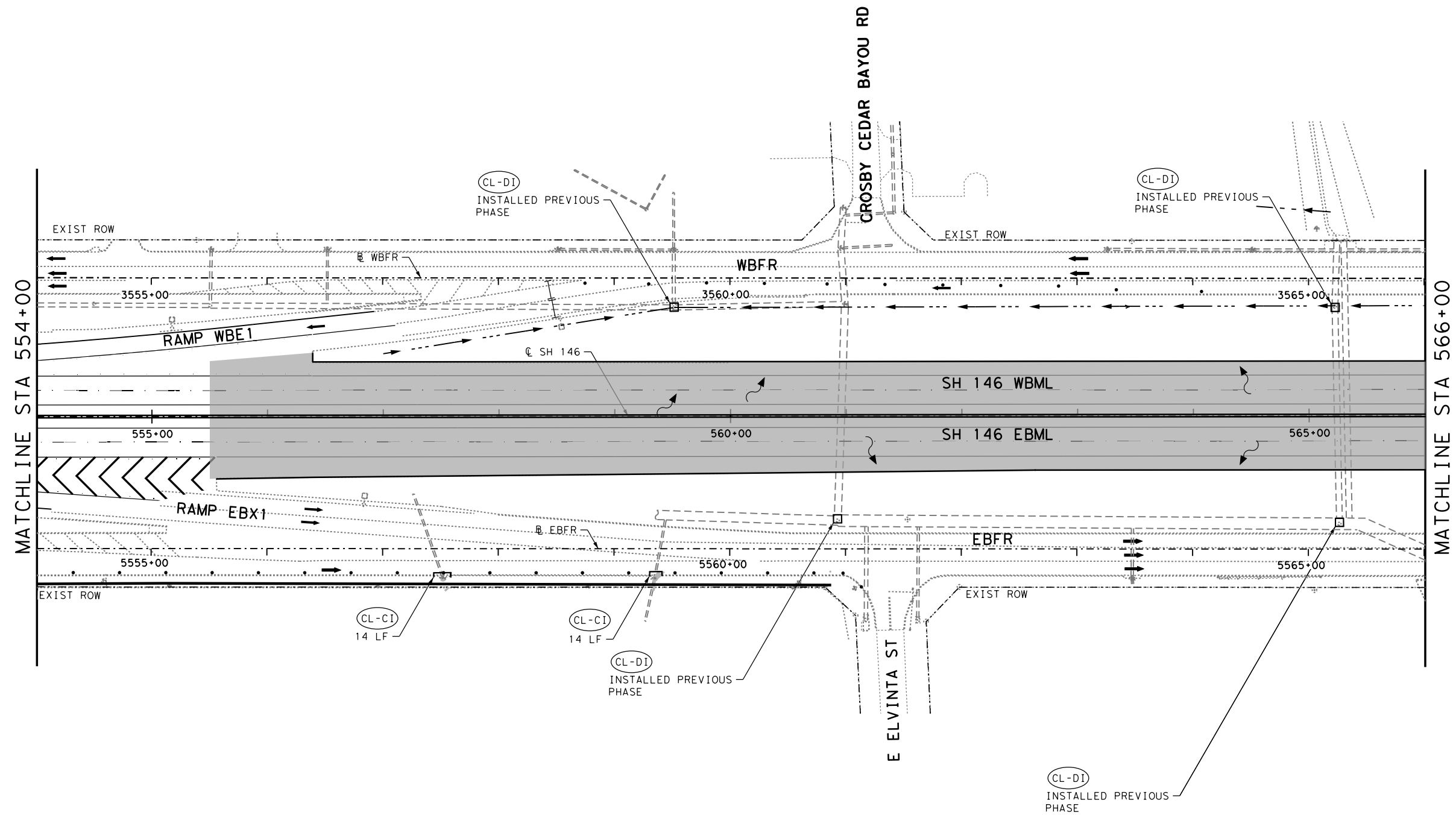
PHASE 3 STAGE 1

BEGIN TO STA 554+00

SHEET 1 OF 7

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			375
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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LEGEND

- CL-DI DROP INLET
- CL-CI CURB INLET
- EROSION CONTROL LOG
- FLOW DIRECTION
- DITCH FLOW DIRECTION
- DIRECTION OF TRAFFIC
- CHANNELLIZING DEVICE
- PORT CTB (SGL SLOPE) (TY 1)
- CURB REMOVAL
- CONSTRUCTION THIS PHASE
- CONSTRUCTION PREVIOUS PHASE
- BLOCK SODDING (PERM)
- CONSTRUCTION EXIT (TYPE 1)

NOTES:

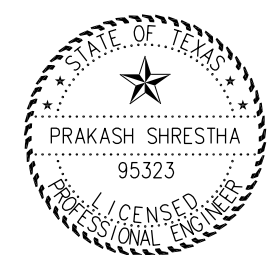
1. SEE SW3P STANDARD SHEETS FOR DETAILS.
2. REFER TO TCP LAYOUTS FOR MORE INFORMATION ON PHASING LAYOUTS.



MATCHLINE STA 554+00

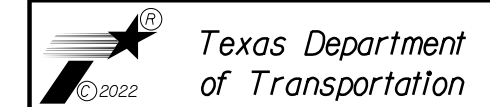
MATCHLINE STA 566+00

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SH 146

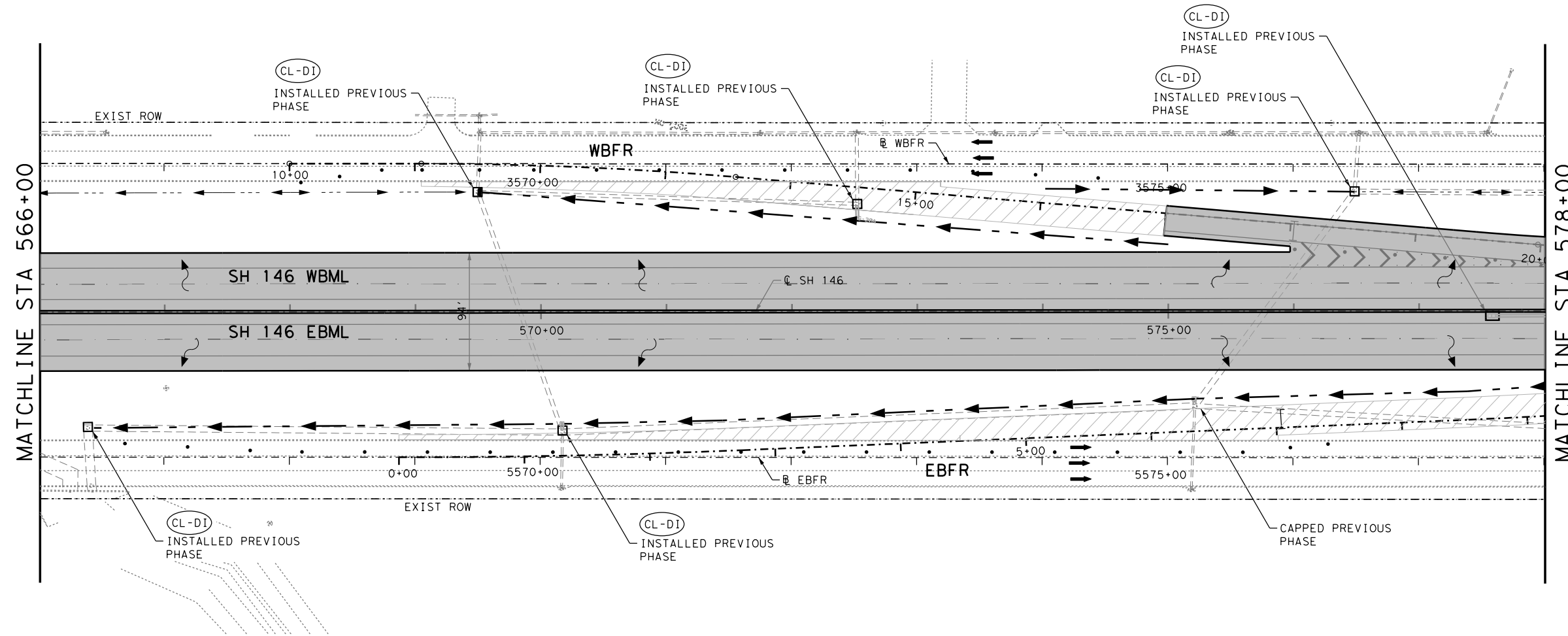
SW3P
 PHASE 3 STAGE 1

STA 554+00 TO STA 566+00

SHEET 2 OF 7

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			376
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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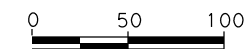


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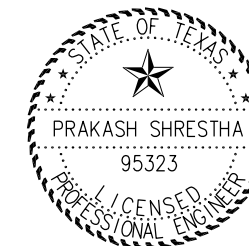
- (CL-DI) DROP INLET
- (CL-CI) CURB INLET
- EROSION CONTROL LOG
- ~ FLOW DIRECTION
- ← DITCH FLOW DIRECTION
- DIRECTION OF TRAFFIC
- CHANNELLIZING DEVICE
- ▬ PORT CTB (SGL SLOPE) (TY 1)
- x-x-x CURB REMOVAL
- ▨ CONSTRUCTION THIS PHASE
- ▩ CONSTRUCTION PREVIOUS PHASE
- ▧ BLOCK SODDING (PERM)
- ▩ CONSTRUCTION EXIT (TYPE 1)

NOTES:

1. SEE SW3P STANDARD SHEETS FOR DETAILS.
2. REFER TO TCP LAYOUTS FOR MORE INFORMATION ON PHASING LAYOUTS.

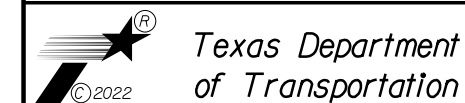


REV NO.	DATE	BY	REVISION



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CivilTech Engineering, Inc.
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 Cypress, Texas 77429
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 Firm Registration No. F-382



SH 146














SW3P
 PHASE 3 STAGE 1

STA 566+00 TO STA 578+00

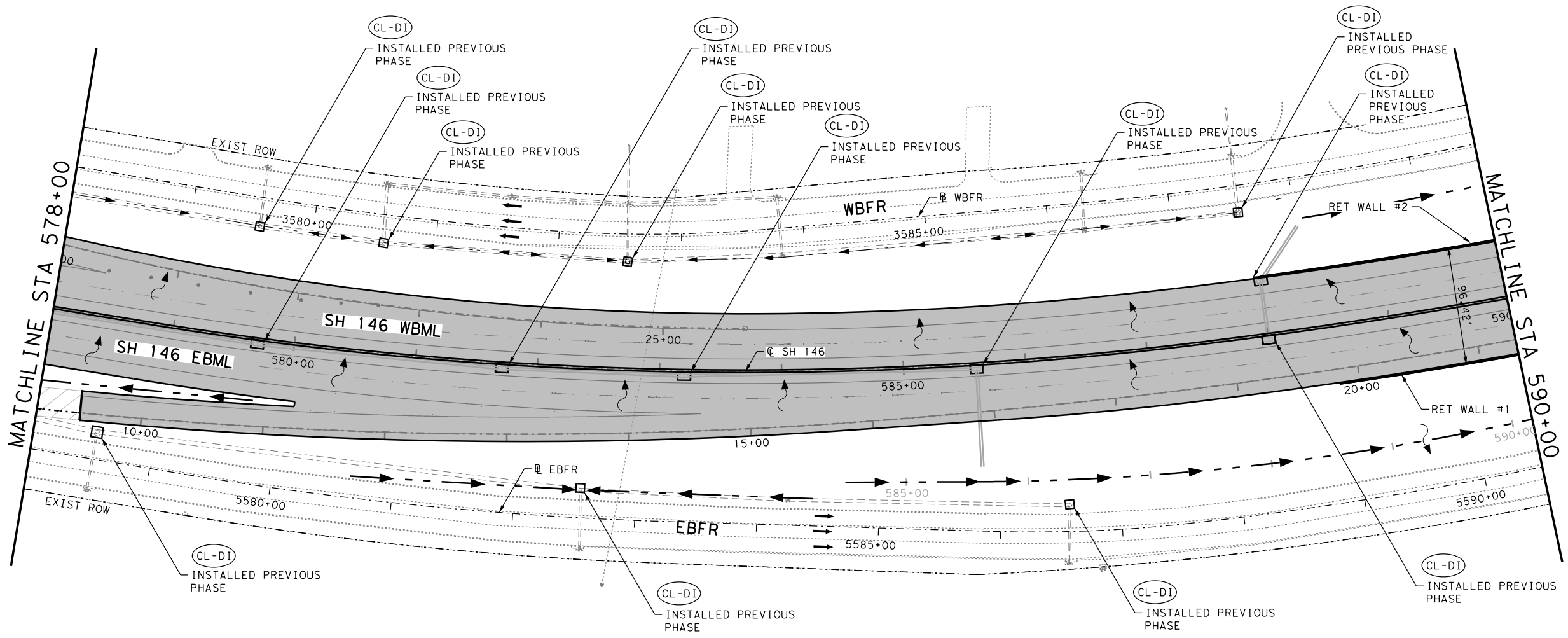
SHEET 3 OF 7

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			377
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

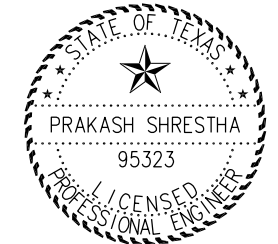
LEGEND

-  CL-DI DROP INLET
-  CL-CI CURB INLET
-  EROSION CONTROL LOG
-  FLOW DIRECTION
-  DITCH FLOW DIRECTION
-  DIRECTION OF TRAFFIC
-  CHANNELLIZING DEVICE
-  PORT CTB (SGL SLOPE) (TY 1)
-  CURB REMOVAL
-  CONSTRUCTION THIS PHASE
-  CONSTRUCTION PREVIOUS PHASE
-  BLOCK SODDING (PERM)
-  CONSTRUCTION EXIT (TYPE 1)

- NOTES:
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REV. NO.	DATE	BY	REVISION



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1/7/2022

CivilTech Engineering, Inc.
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Cypress, Texas 77429
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Firm Registration No. F-382



SH 146

SW3P
PHASE 3 STAGE 1

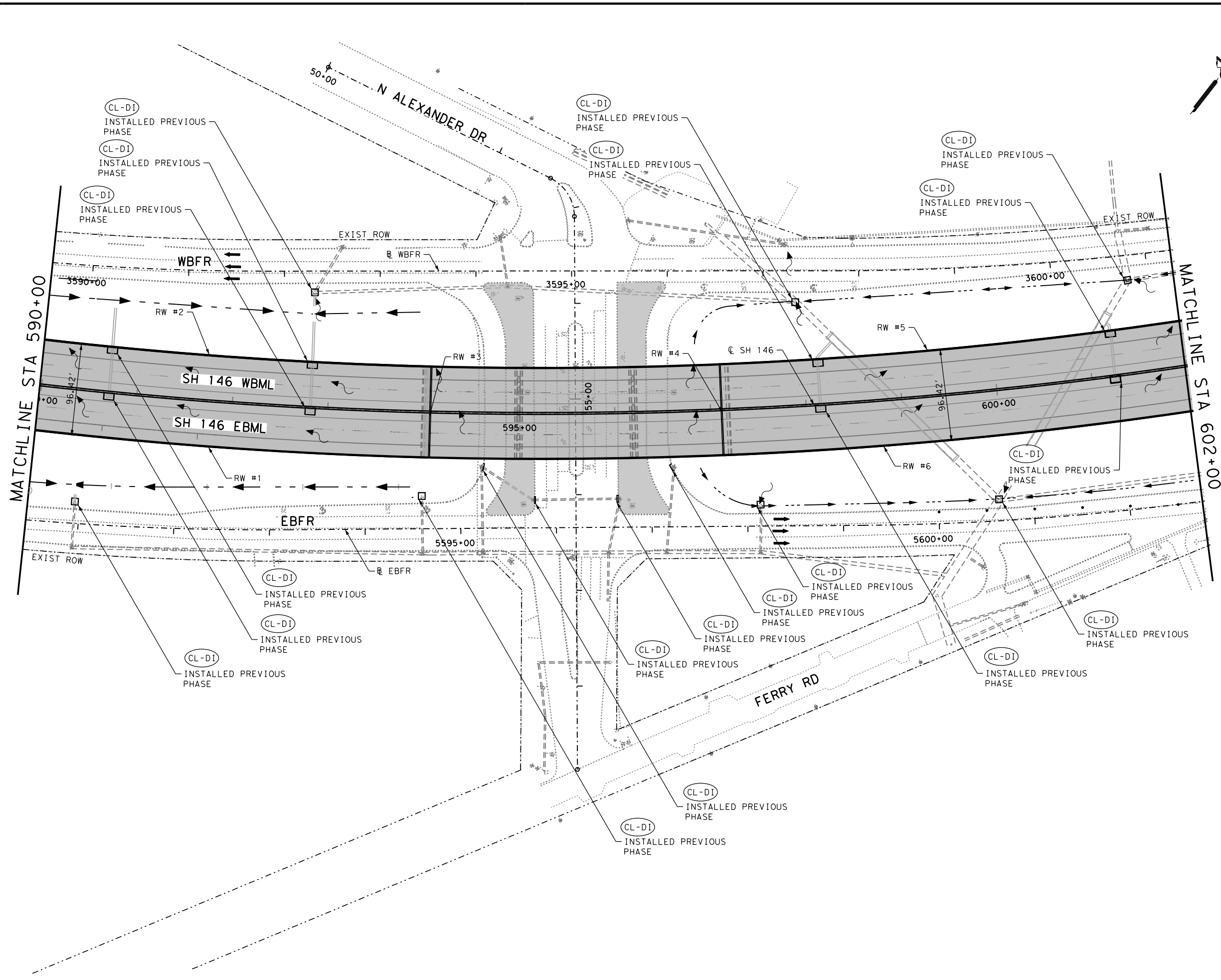
STA 578+00 TO STA 590+00

SHEET 4 OF 7

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			378
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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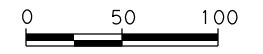


LEGEND

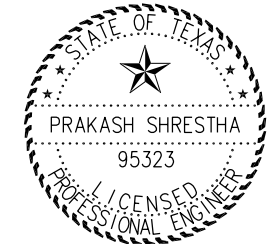
- (CL-DI) DROP INLET
- (CL-CI) CURB INLET
- EROSION CONTROL LOG
- ~ FLOW DIRECTION
- ← DITCH FLOW DIRECTION
- DIRECTION OF TRAFFIC
- CHANNELLIZING DEVICE
- ▬ PORT CTB (SGL SLOPE) (TY 1)
- x-x-x CURB REMOVAL
- ▨ CONSTRUCTION THIS PHASE
- ▩ CONSTRUCTION PREVIOUS PHASE
- ▤ BLOCK SODDING (PERM)
- ▧ CONSTRUCTION EXIT (TYPE 1)

NOTES:

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REV. NO.	DATE	BY	REVISION



Prakash Shrestha, P.E.
 1/7/2022

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



SH 146

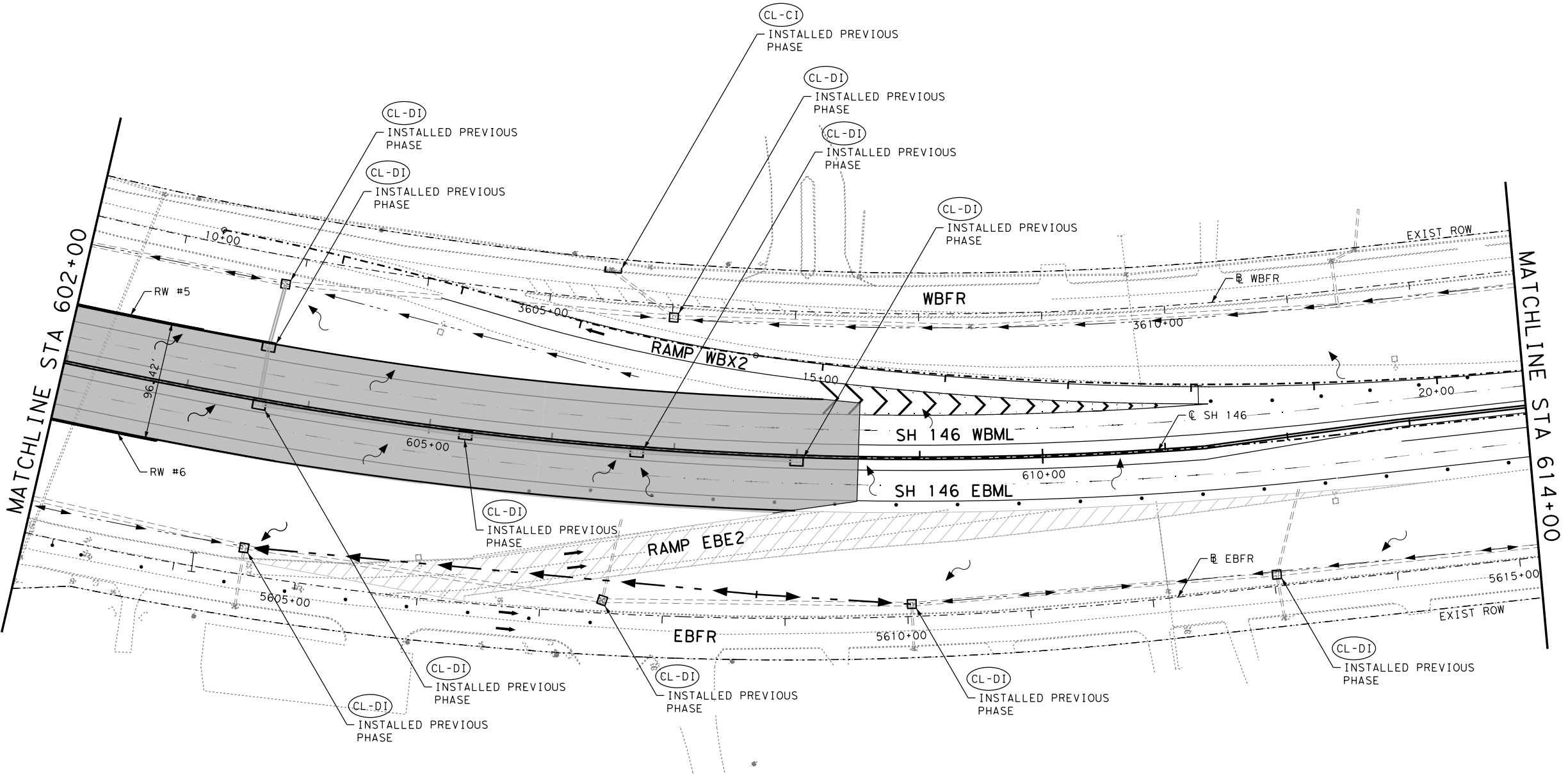
SW3P
 PHASE 3 STAGE 1

STA 590+00 TO STA 602+00

SHEET 5 OF 7

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			379
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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LEGEND

- (CL-DI) DROP INLET
- (CL-CI) CURB INLET
- EROSION CONTROL LOG
- ↷ FLOW DIRECTION
- ← DITCH FLOW DIRECTION
- DIRECTION OF TRAFFIC
- CHANNELLIZING DEVICE
- ▬ PORT CTB (SGL SLOPE) (TY 1)
- x-x-x CURB REMOVAL
- ▨ CONSTRUCTION THIS PHASE
- ▩ CONSTRUCTION PREVIOUS PHASE
- ⊞ BLOCK SODDING (PERM)
- ⊞ CONSTRUCTION EXIT (TYPE 1)

NOTES:
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0 50 100

REV. NO.	DATE	BY	REVISION



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



SH 146

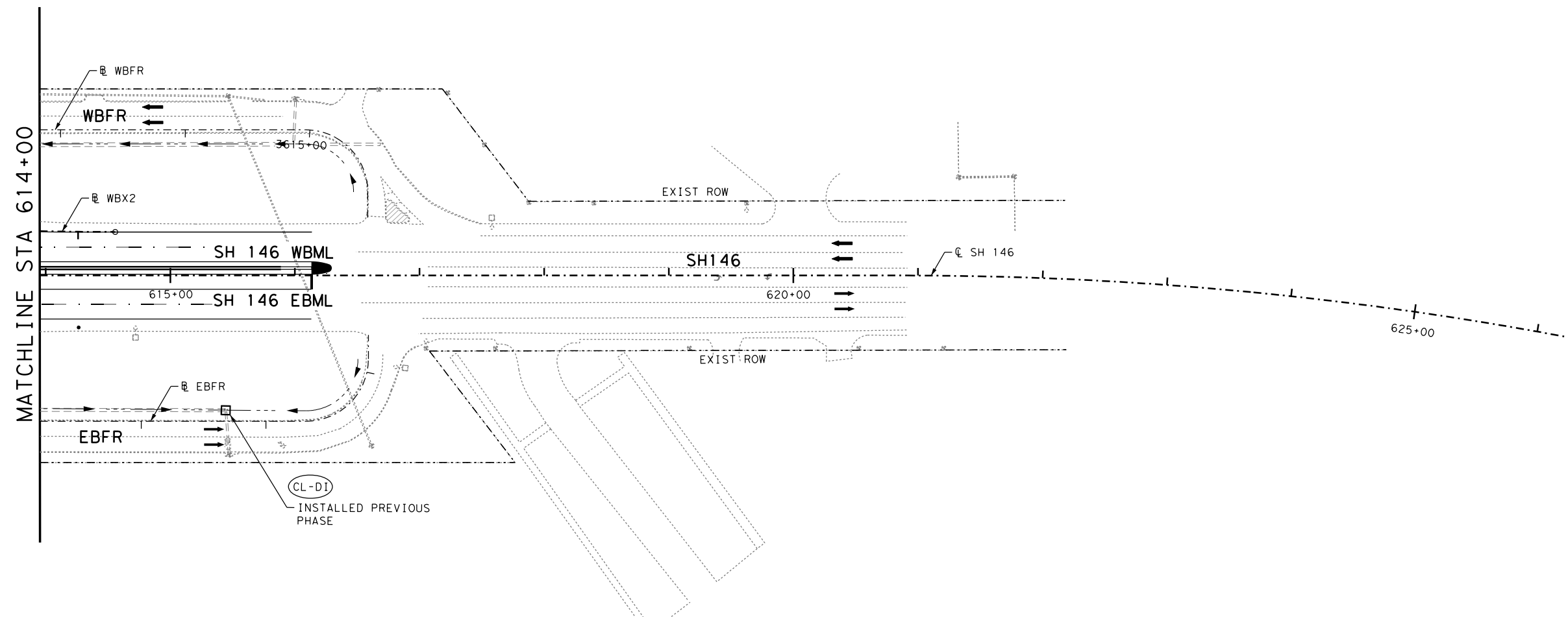
SW3P
PHASE 3 STAGE 1

STA 602+00 TO STA 614+00

SHEET 6 OF 7

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			380
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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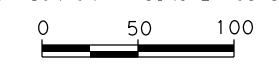


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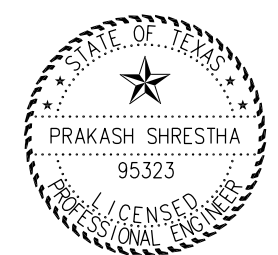
- (CL-DI) DROP INLET
- (CL-CI) CURB INLET
- EROSION CONTROL LOG
- ~ FLOW DIRECTION
- ← DITCH FLOW DIRECTION
- DIRECTION OF TRAFFIC
- CHANNELLIZING DEVICE
- ▬ PORT CTB (SGL SLOPE) (TY 1)
- x-x-x CURB REMOVAL
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- CONSTRUCTION PREVIOUS PHASE
- ▤ BLOCK SODDING (PERM)
- ▩ CONSTRUCTION EXIT (TYPE 1)

NOTES:

1. SEE SW3P STANDARD SHEETS FOR DETAILS.
2. REFER TO TCP LAYOUTS FOR MORE INFORMATION ON PHASING LAYOUTS.



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 1/7/2022

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



SH 146

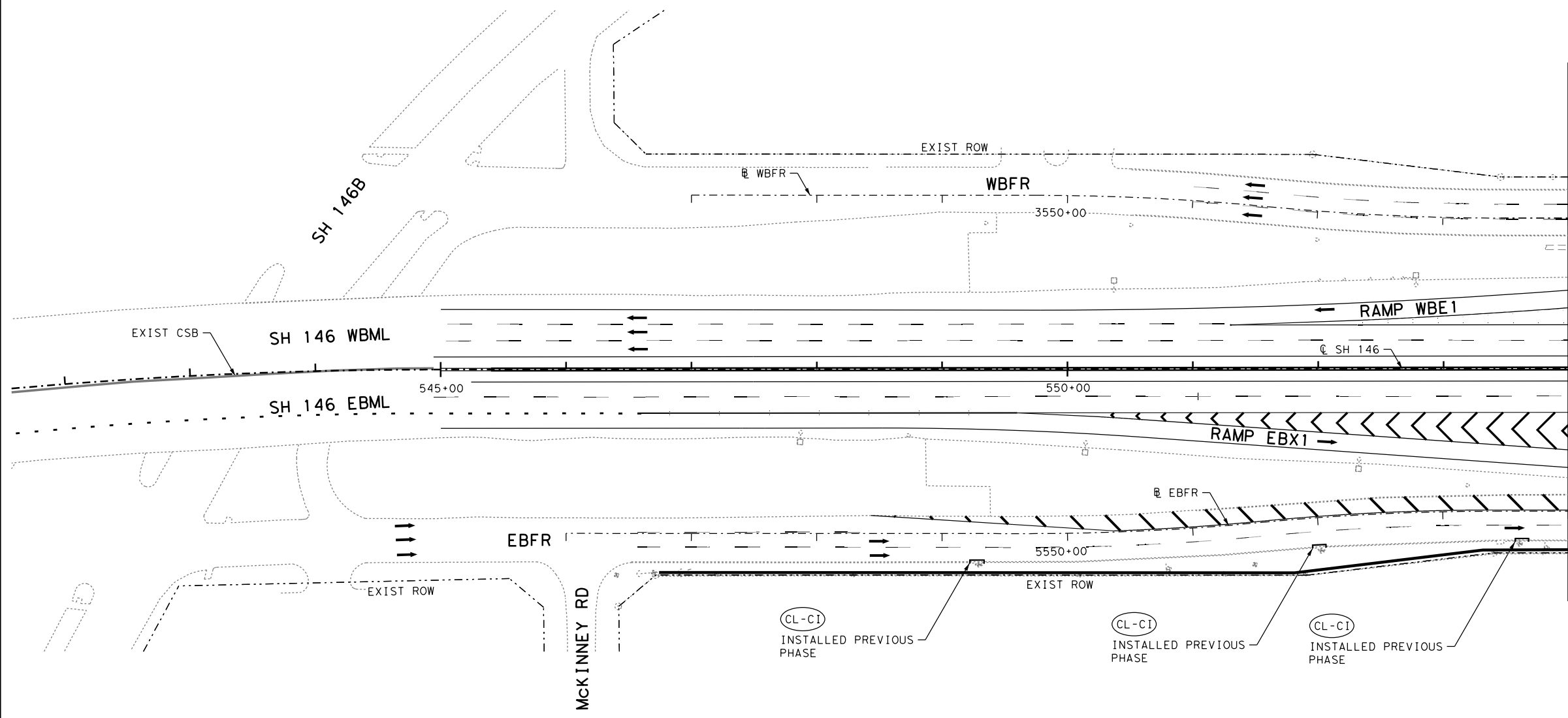
SW3P
 PHASE 3 STAGE 1

STA 614+00 TO END

SHEET 7 OF 7

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			381
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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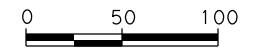
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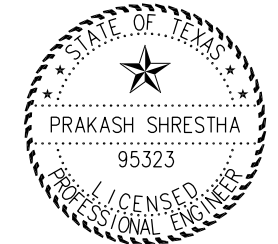
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- CL-CI CURB INLET
- EROSION CONTROL LOG
- FLOW DIRECTION
- DITCH FLOW DIRECTION
- DIRECTION OF TRAFFIC
- CHANNELLIZING DEVICE
- PORT CTB (SGL SLOPE) (TY 1)
- CURB REMOVAL
- CONSTRUCTION THIS PHASE
- CONSTRUCTION PREVIOUS PHASE
- BLOCK SODDING (PERM)
- CONSTRUCTION EXIT (TYPE 1)

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SH 146

SW3P

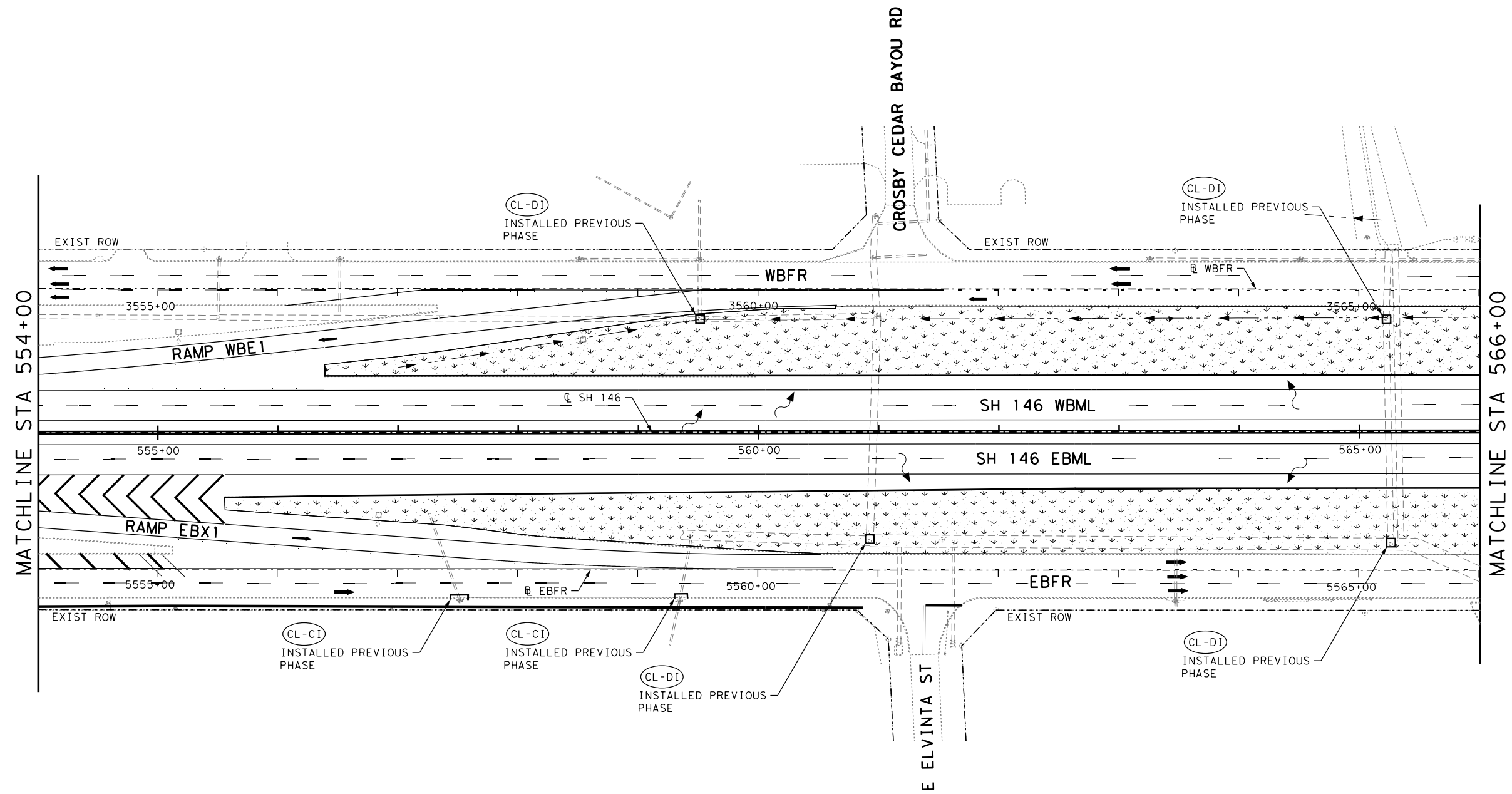
PHASE 3 STAGE 2

BEGIN TO STA 554+00

SHEET 1 OF 7

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			382
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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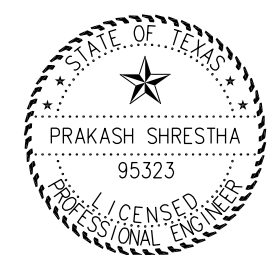
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- (CL-CI) CURB INLET
- EROSION CONTROL LOG
- ~ FLOW DIRECTION
- ← DITCH FLOW DIRECTION
- DIRECTION OF TRAFFIC
- CHANNELLIZING DEVICE
- ▬ PORT CTB (SGL SLOPE) (TY 1)
- x-x-x CURB REMOVAL
- ▨ CONSTRUCTION THIS PHASE
- ▩ CONSTRUCTION PREVIOUS PHASE
- ▧ TEMP SEEDING AND BLOCK SODDING (PERM)
- ▩ CONSTRUCTION EXIT (TYPE 1)

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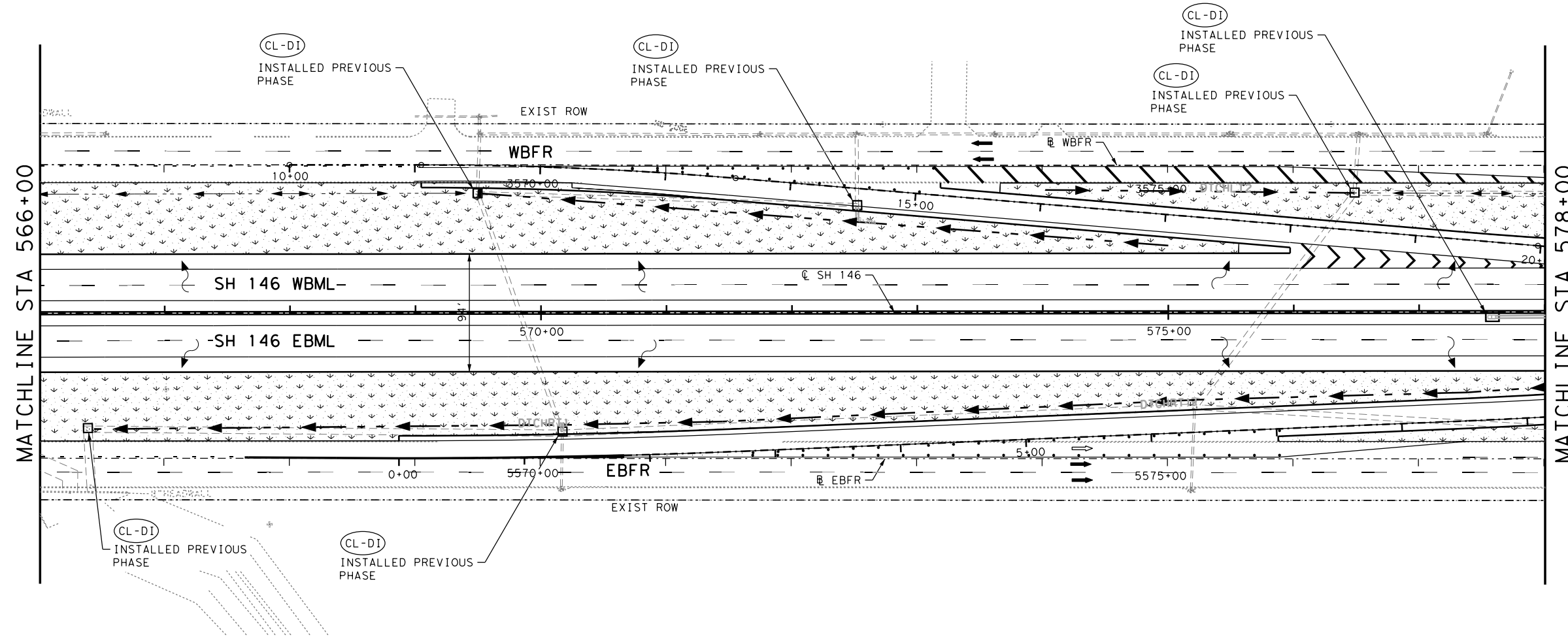
SH 146
SW3P
PHASE 3 STAGE 2
STA 554+00 TO STA 566+00

SHEET 2 OF 7

NOTE:
TEMPORARY SEEDING IS FOR MANAGING TEMPORARY CONSTRUCTION ACTIVITIES TO MINIMIZE EROSION AND STORMWATER QUALITY PER TCEQ PERMIT REQUIREMENTS.

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			383
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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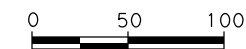


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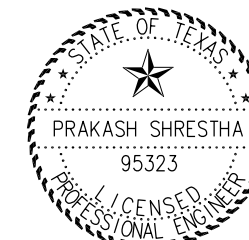
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- (CL-CI) CURB INLET
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- ← DITCH FLOW DIRECTION
- DIRECTION OF TRAFFIC
- CHANNELLIZING DEVICE
- ▬ PORT CTB (SGL SLOPE) (TY 1)
- x-x-x CURB REMOVAL
- ▨ CONSTRUCTION THIS PHASE
- CONSTRUCTION PREVIOUS PHASE
- ▨ TEMP SEEDING AND BLOCK SODDING (PERM)
- ▨ CONSTRUCTION EXIT (TYPE 1)

NOTES:

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2. REFER TO TCP LAYOUTS FOR MORE INFORMATION ON PHASING LAYOUTS.

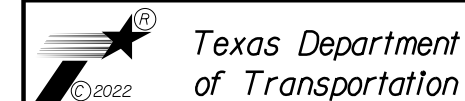


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SH 146

SW3P
 PHASE 3 STAGE 2














STA 566+00 TO STA 578+00

SHEET 3 OF 7

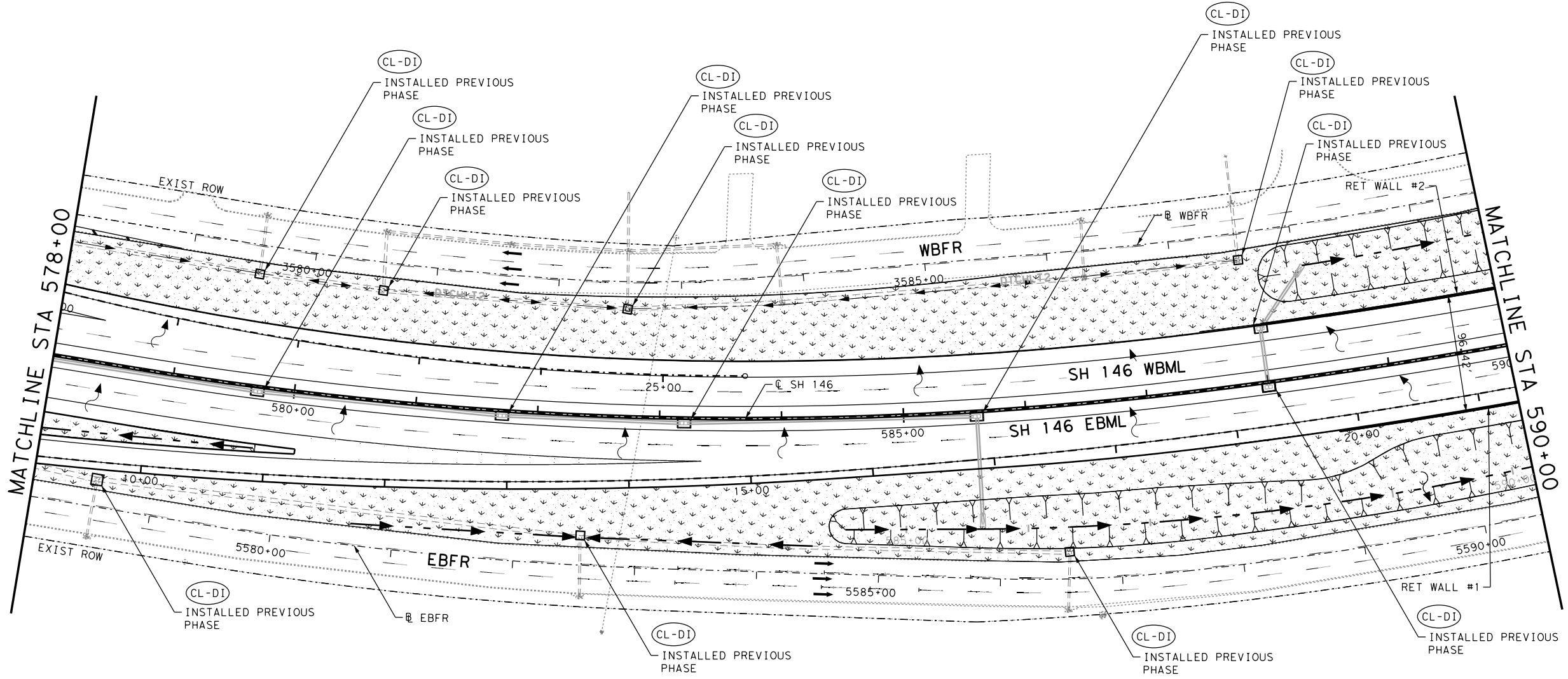
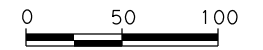
NOTE:

TEMPORARY SEEDING IS FOR MANAGING TEMPORARY CONSTRUCTION ACTIVITIES TO MINIMIZE EROSION AND STORMWATER QUALITY PER TCEQ PERMIT REQUIREMENTS.

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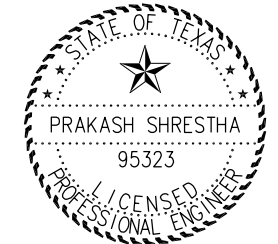
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-  CURB INLET
-  EROSION CONTROL LOG
-  FLOW DIRECTION
-  DITCH FLOW DIRECTION
-  DIRECTION OF TRAFFIC
-  CHANNELLIZING DEVICE
-  PORT CTB (SGL SLOPE) (TY 1)
-  CURB REMOVAL
-  CONSTRUCTION THIS PHASE
-  CONSTRUCTION PREVIOUS PHASE
-  TEMP SEEDING AND BLOCK SODDING (PERM)
-  CONSTRUCTION EXIT (TYPE 1)

- NOTES:
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 2. REFER TO TCP LAYOUTS FOR MORE INFORMATION ON PHASING LAYOUTS.



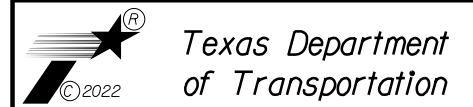
NOTE:
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SH 146

SW3P
 PHASE 3 STAGE 2

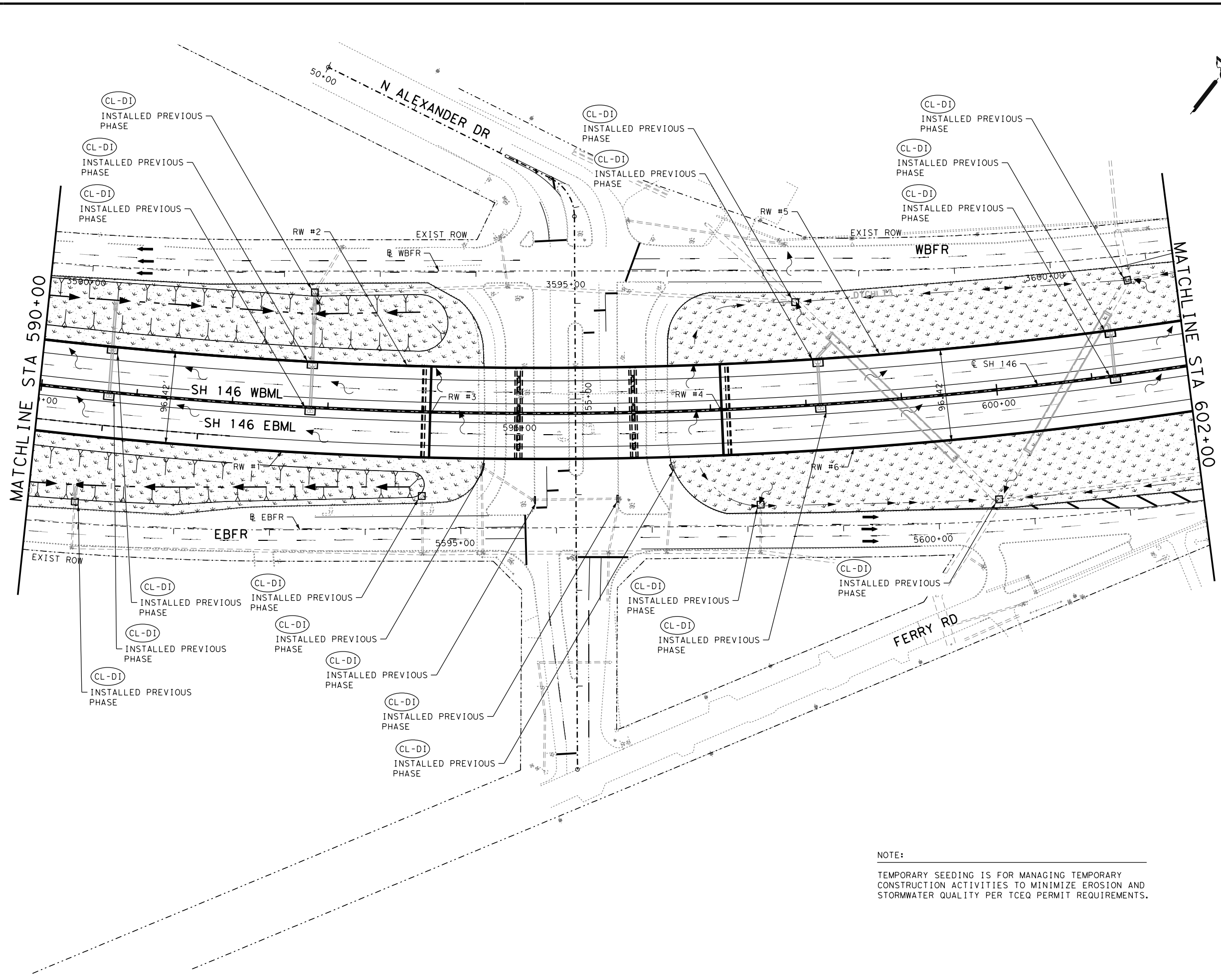
STA 578+00 TO STA 590+00

SHEET 4 OF 7

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			385
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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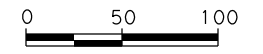
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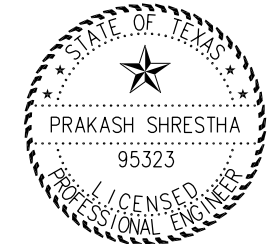
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- (CL-DI) DROP INLET
- (CL-CI) CURB INLET
- EROSION CONTROL LOG
- ~ FLOW DIRECTION
- ← DITCH FLOW DIRECTION
- DIRECTION OF TRAFFIC
- CHANNELLIZING DEVICE
- ▬ PORT CTB (SGL SLOPE) (TY 1)
- x-x-x CURB REMOVAL
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- ▤ CONSTRUCTION EXIT (TYPE 1)

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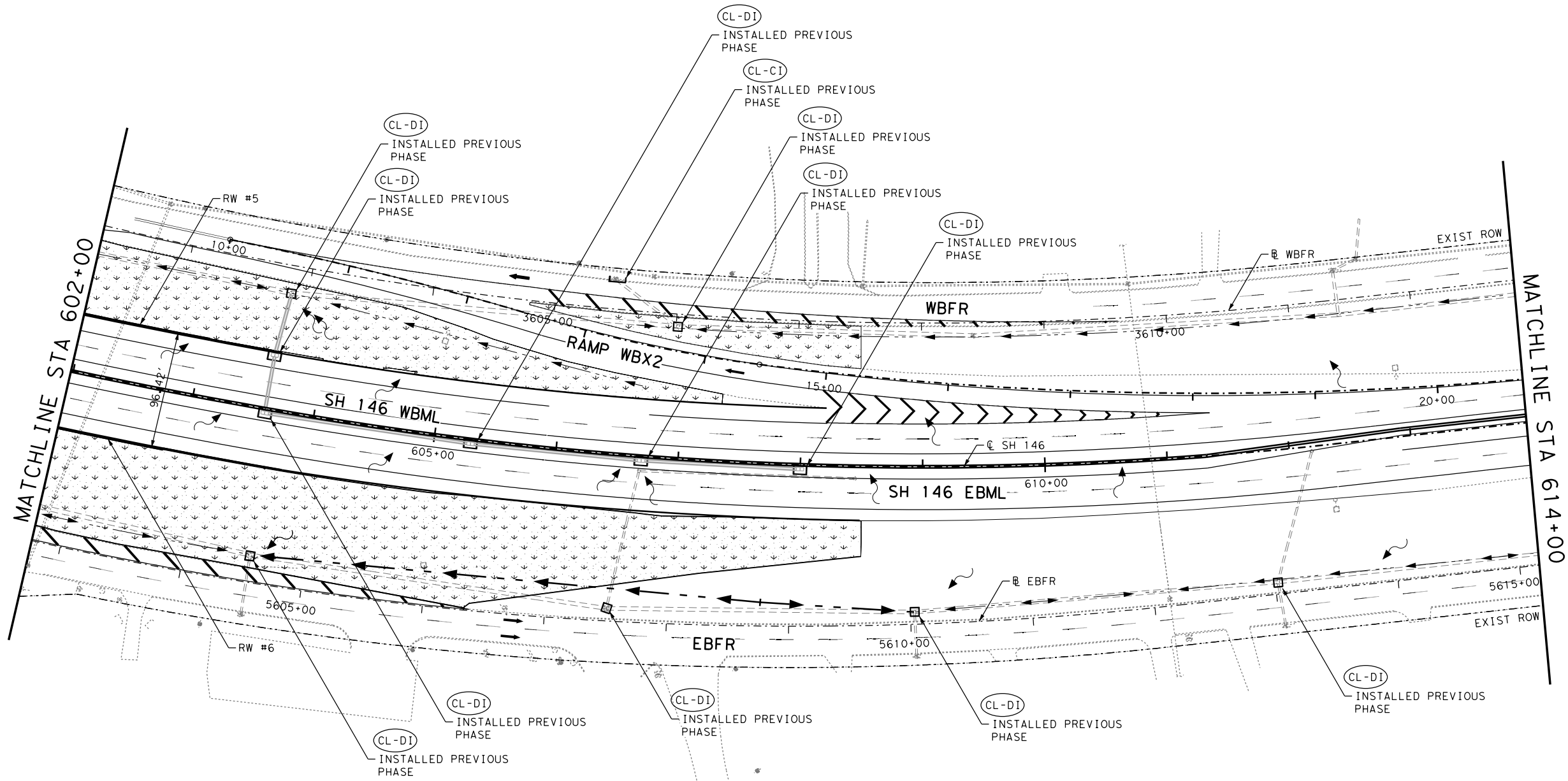
SH 146
SW3P
PHASE 3 STAGE 2
STA 590+00 TO STA 602+00

SHEET 5 OF 7

NOTE:
 TEMPORARY SEEDING IS FOR MANAGING TEMPORARY CONSTRUCTION ACTIVITIES TO MINIMIZE EROSION AND STORMWATER QUALITY PER TCEQ PERMIT REQUIREMENTS.

FED. RD. DIV. NO. 6	FEDERAL AID PROJECT NO.		SHEET NO. 386
STATE TEXAS	DIST. HOU	COUNTY HARRIS	
CONT. 0389	SECT. 13	JOB 039	HIGHWAY NO. SH 146

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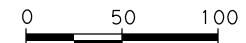


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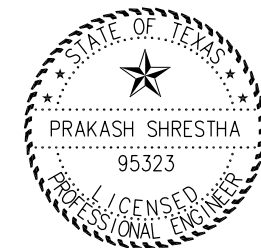
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- (CL-CI) CURB INLET
- EROSION CONTROL LOG
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- ← DITCH FLOW DIRECTION
- DIRECTION OF TRAFFIC
- CHANNELLIZING DEVICE
- ▬ PORT CTB (SGL SLOPE) (TY 1)
- x-x-x CURB REMOVAL
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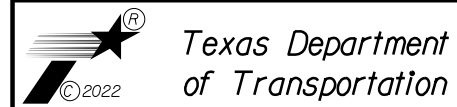


REV. NO.	DATE	BY	REVISION



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 3/8/2022

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SH 146

SW3P
 PHASE 3 STAGE 2

STA 602+00 TO STA 614+00

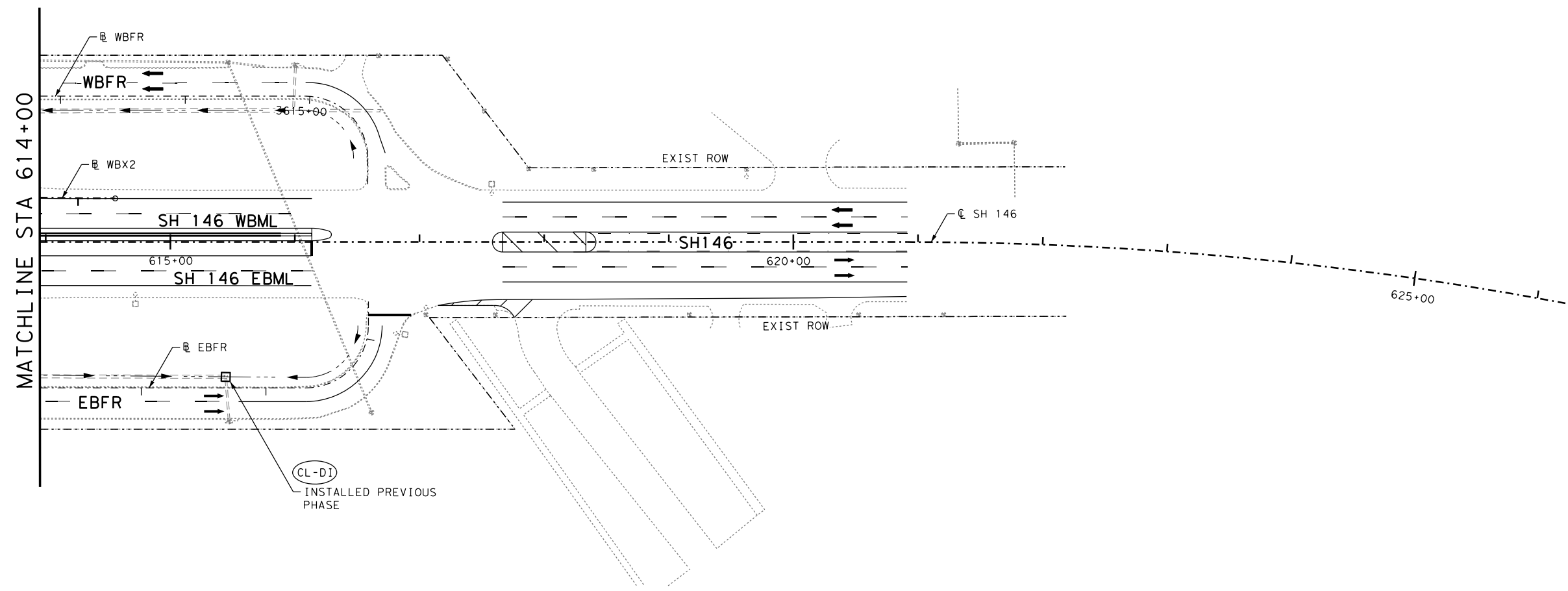
SHEET 6 OF 7

NOTE:

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FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			387
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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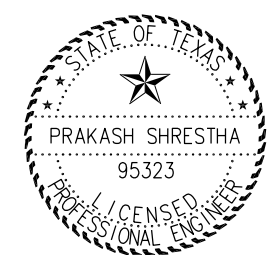
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- EROSION CONTROL LOG
- FLOW DIRECTION
- DITCH FLOW DIRECTION
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SH 146

SW3P
 PHASE 3 STAGE 2

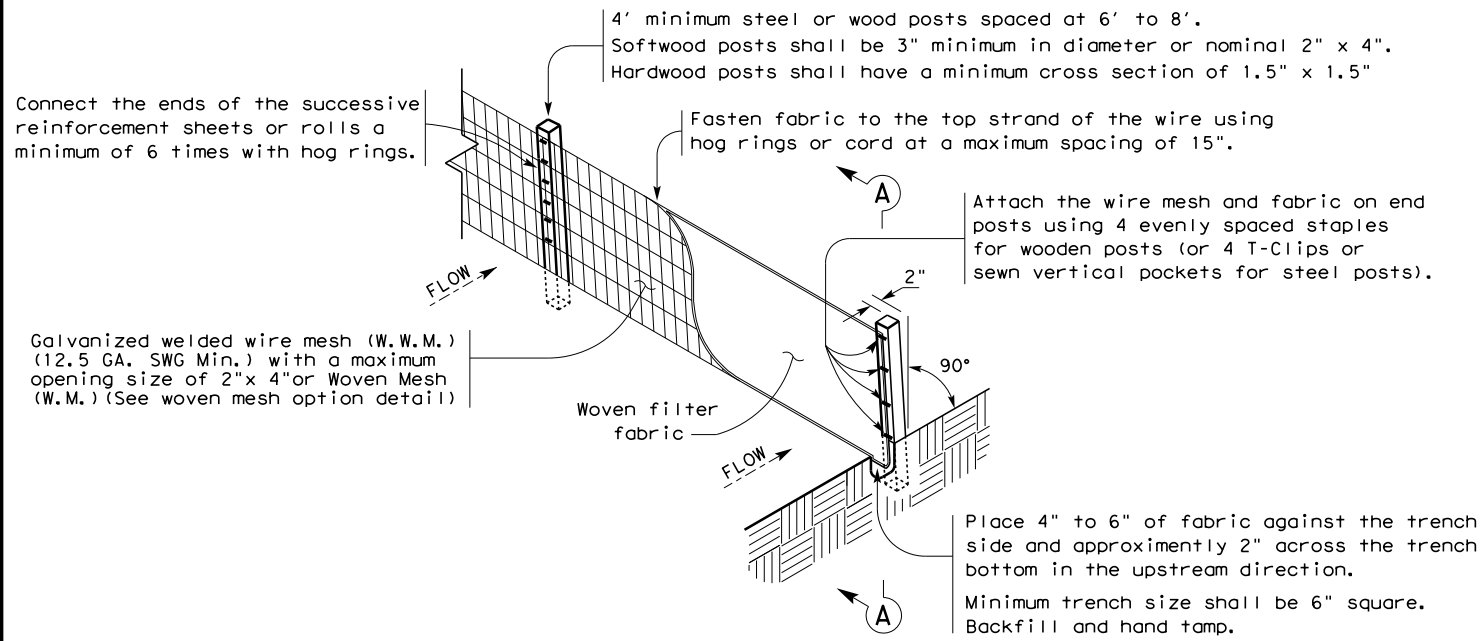
STA 614+00 TO END

SHEET 7 OF 7

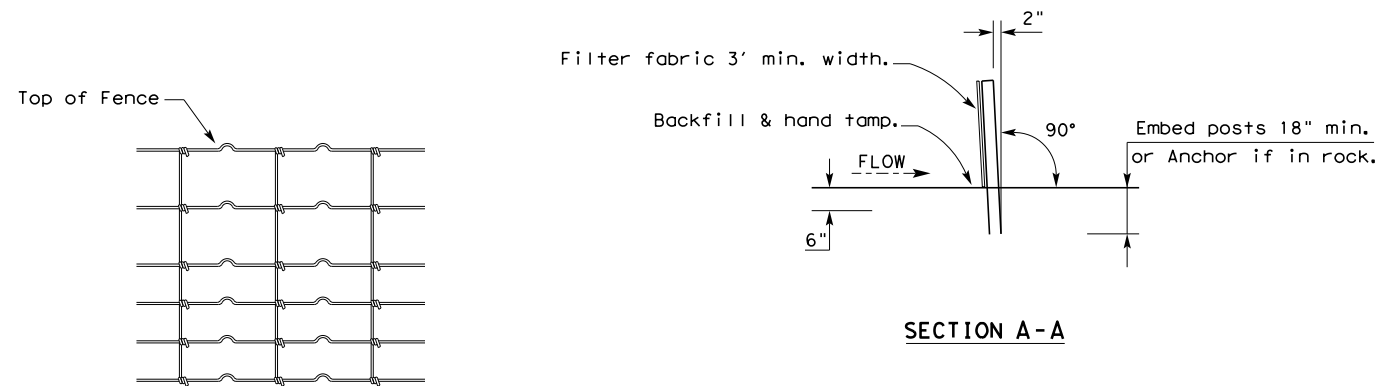
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6			388
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0389	13	039	SH 146

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DATE
FILE



TEMPORARY SEDIMENT CONTROL FENCE



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/FT². Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.

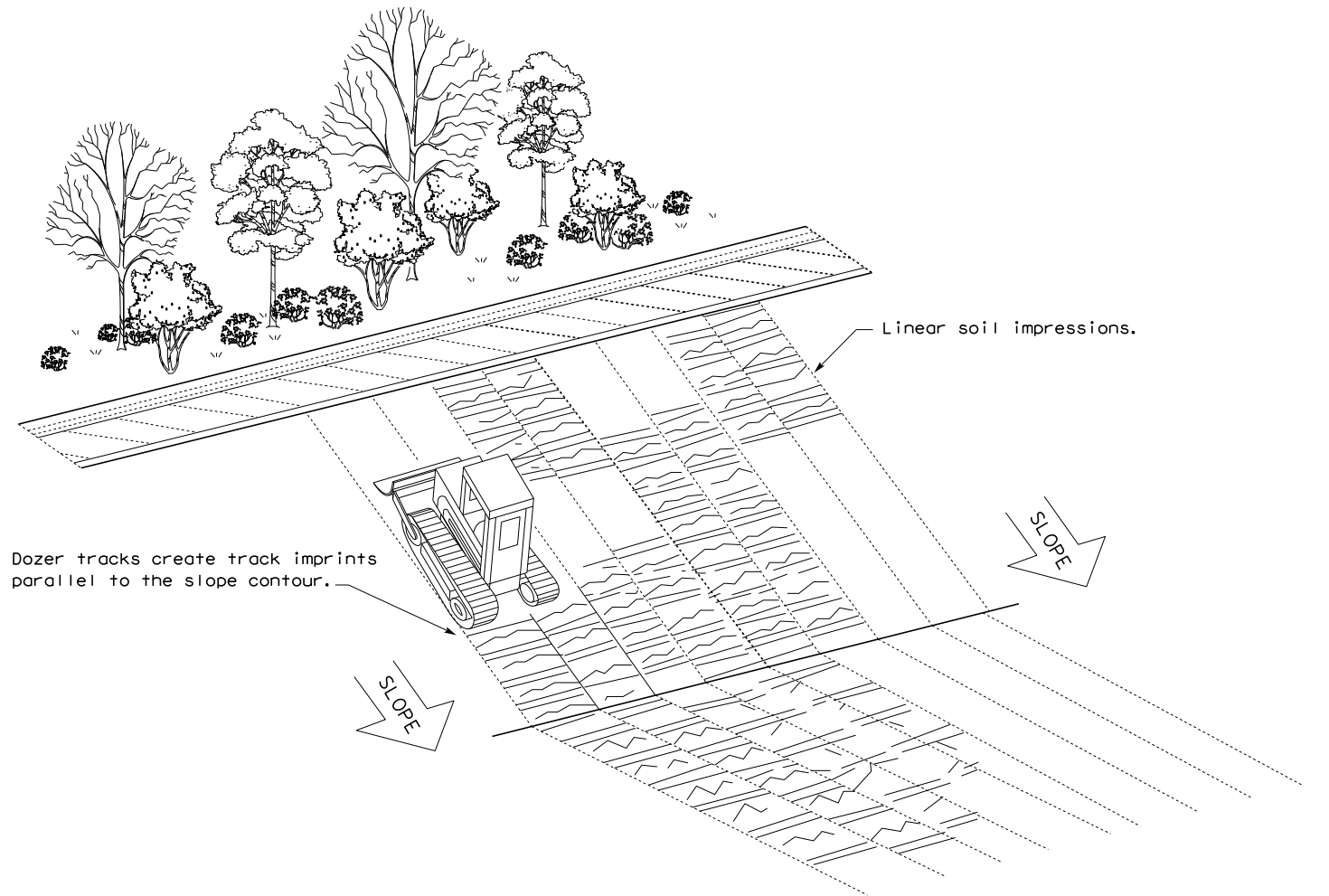
LEGEND

Sediment Control Fence



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 continuous linear track impressions where the minimum 12" length impressions are perpendicular to the slope or direction of water flow.

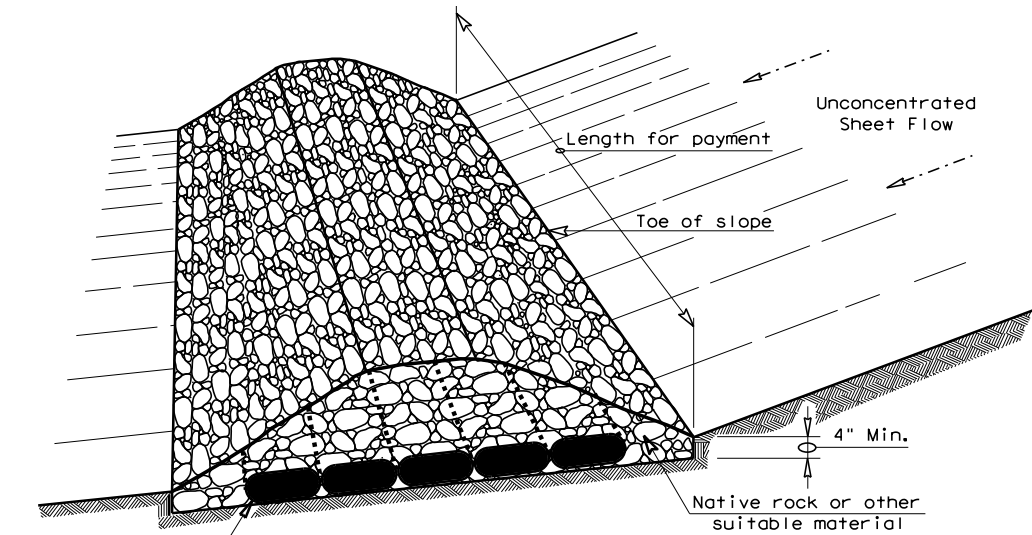


VERTICAL TRACKING

				Design Division Standard	
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES FENCE & VERTICAL TRACKING					
EC(1) - 16					
FILE: ec116	DN: TxDOT	CK:	DW:	DN/CK:	
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0389	13	039	SH 146	
	DIST	COUNTY	SHEET NO.		
	HOU	HARRIS	389		

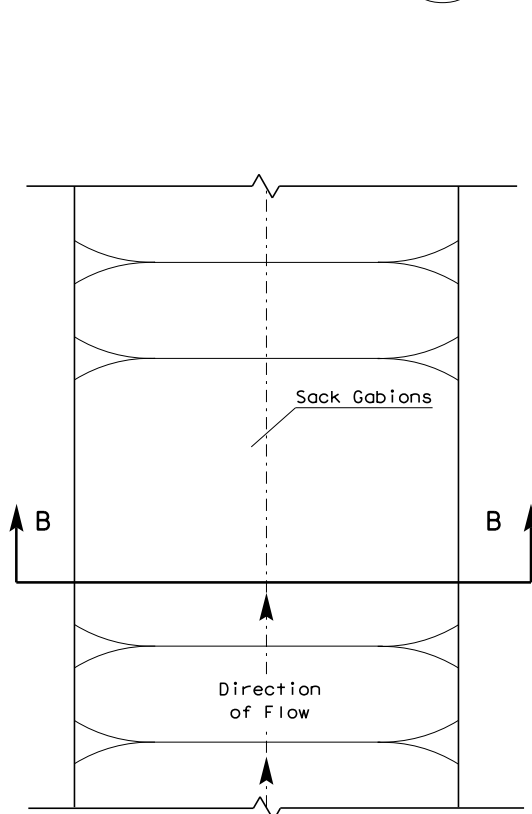
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DATE: FILE:

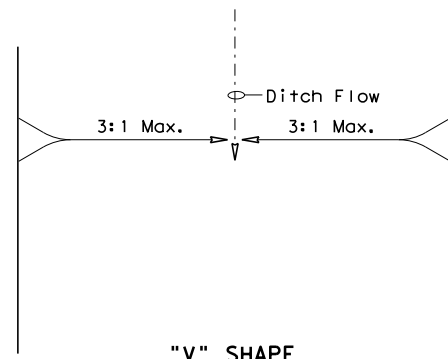


FILTER DAM AT TOE OF SLOPE

— (RFD1) —



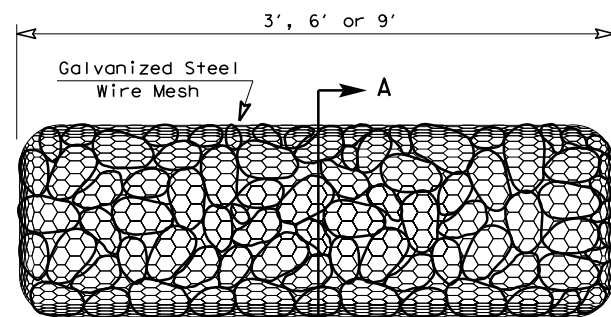
PLAN VIEW



"V" SHAPE PLAN VIEW

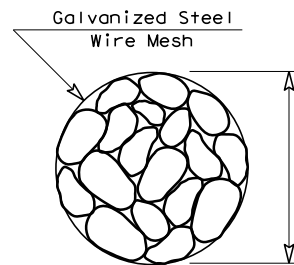
3/4" Dia. Rebar Stakes

SECTION B-B

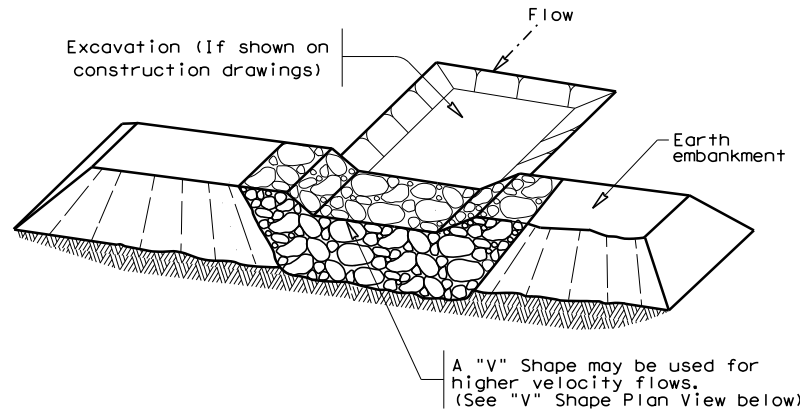


TYPE 4 (SACK GABIONS)

— (RFD4) —

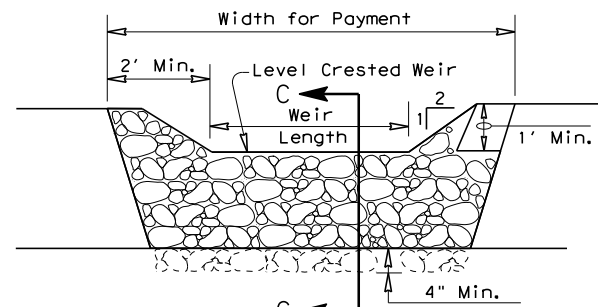


SECTION A-A

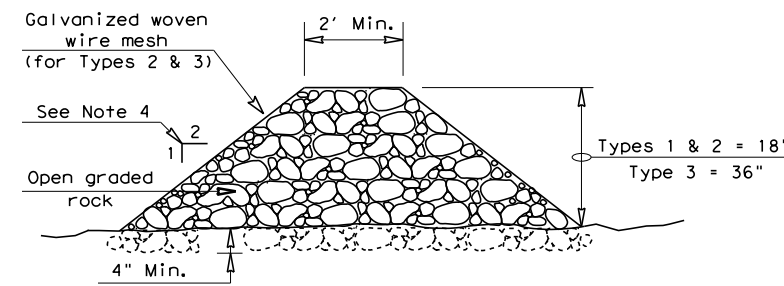


FILTER DAM AT SEDIMENT TRAP

— (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/FT² of cross sectional area. A 2 year storm frequency may be used to calculate the flow rate.

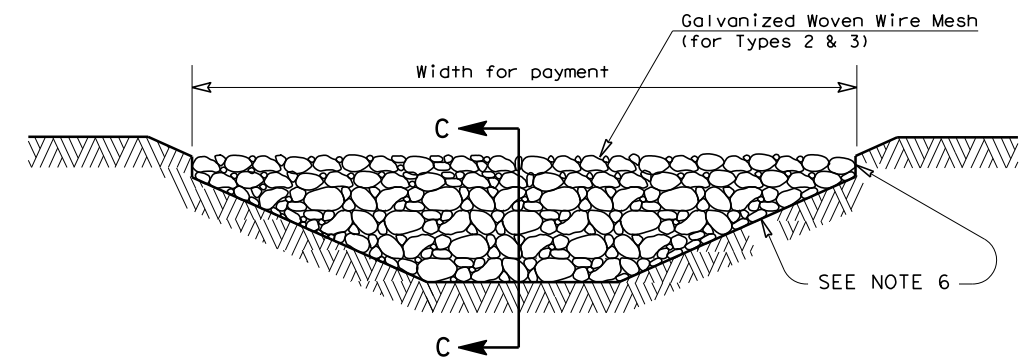
Type 1 (18" high with no wire mesh) (3" to 6" aggregate): Type 1 may be used at the toe of slopes, around inlets, in small ditches, and at dike or swale outlets. This type of dam is recommended to control erosion from a drainage area of 5 acres or less. Type 1 may not be used in concentrated high velocity flows (approximately 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 3/4" dia. rebar stakes, and have a double-twisted hexagonal weave with a nominal mesh opening of 2 1/2" x 3 1/4".
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.

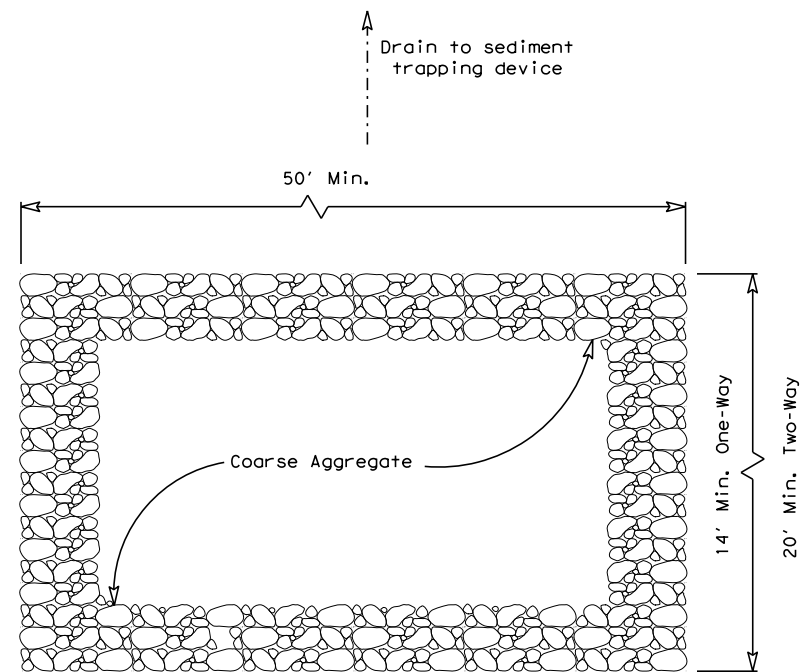
PLAN SHEET LEGEND

- Type 1 Rock Filter Dam — (RFD1) —
- Type 2 Rock Filter Dam — (RFD2) —
- Type 3 Rock Filter Dam — (RFD3) —
- Type 4 Rock Filter Dam — (RFD4) —

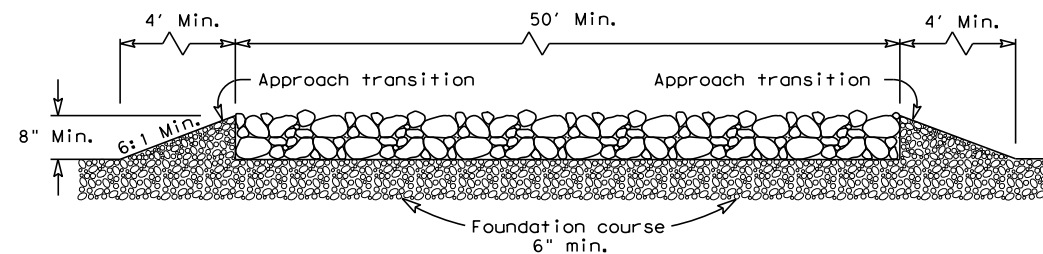
		Design Division Standard	
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES ROCK FILTER DAMS EC (2) - 16			
FILE: ec216	DN: TxDOT	CK: KM	DW: VP
© TxDOT: JULY 2016	CONT	SECT	JOB
REVISIONS	0389	13	039
	DIST	COUNTY	SH 146
	HOU	HARRIS	SHEET NO. 390

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DATE:
FILE:



PLAN VIEW

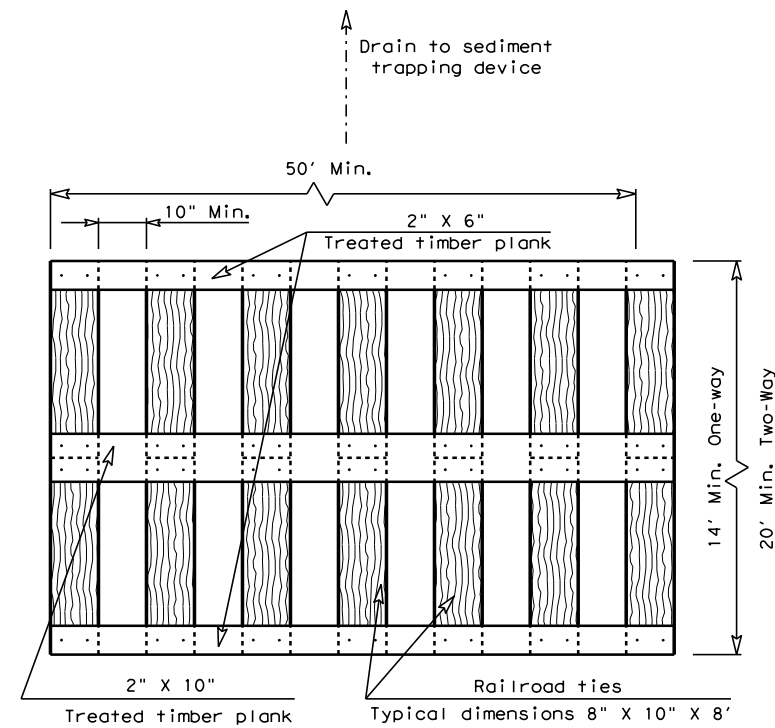


ELEVATION VIEW

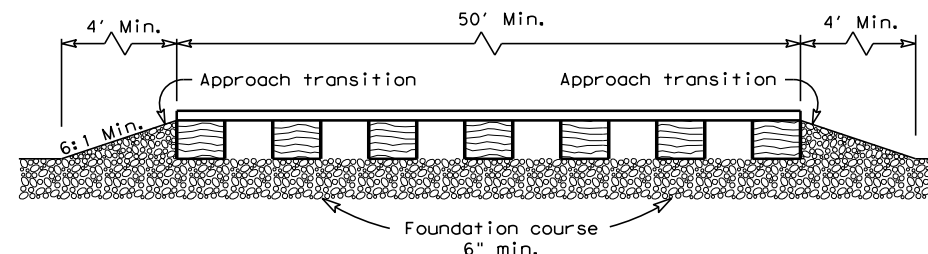
CONSTRUCTION EXIT (TYPE 1)
ROCK CONSTRUCTION (LONG TERM)

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 materials 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.



PLAN VIEW

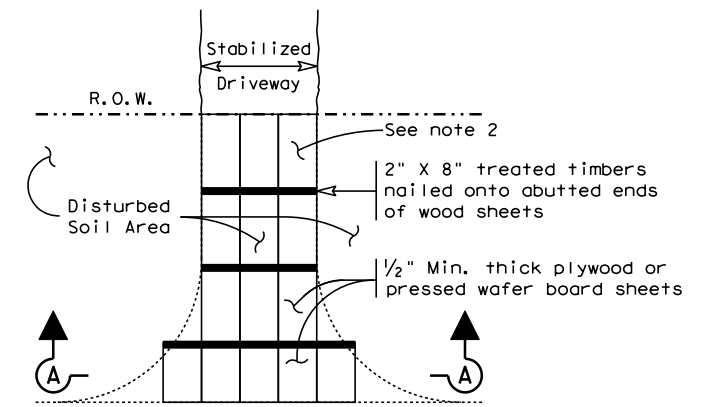


ELEVATION VIEW

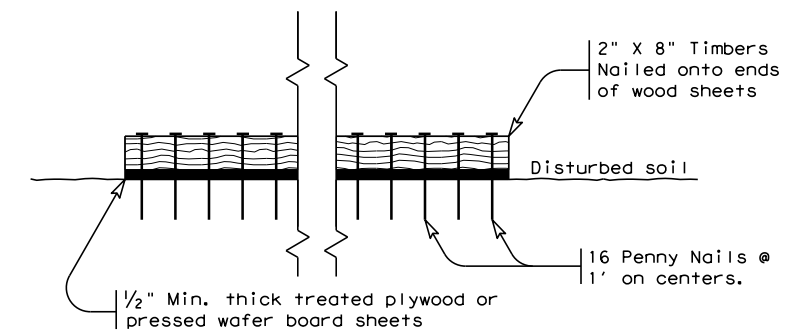
CONSTRUCTION EXIT (TYPE 2)
TIMBER CONSTRUCTION (LONG TERM)

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 1/2" 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.



PLAN VIEW



SECTION A-A

CONSTRUCTION EXIT (TYPE 3)
SHORT TERM

GENERAL NOTES (TYPE 3)

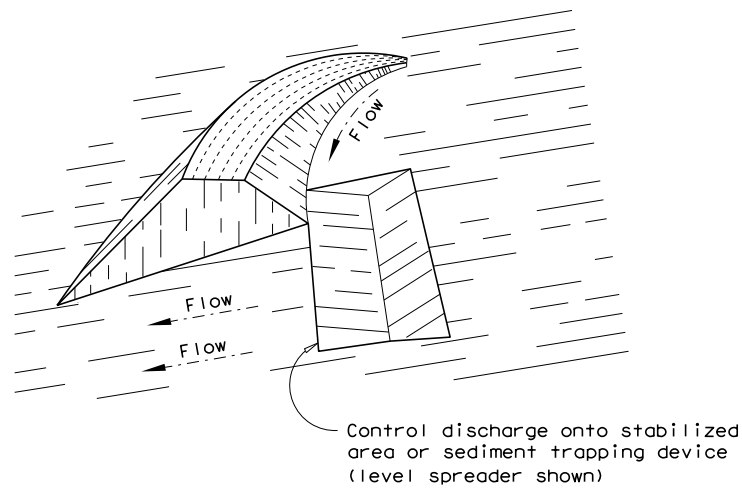
1. The length of the type 3 construction exit shall be as shown on the plans, or as directed by the Engineer.
2. The type 3 construction exit may be constructed from open graded crushed stone with a size of two to four inches spread a min. of 4" thick to the limits shown on the plans.
3. The treated 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.



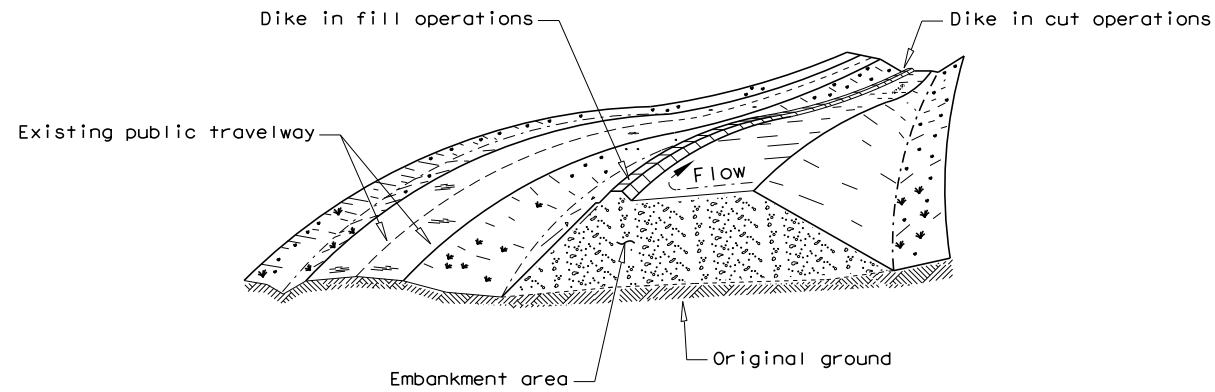
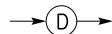
**TEMPORARY EROSION,
SEDIMENT AND WATER
POLLUTION CONTROL MEASURES
CONSTRUCTION EXITS
EC (3) - 16**

FILE: ec316	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0389	13	039	SH 146
	DIST	COUNTY	SHEET NO.	
	HOU	HARRIS	391	

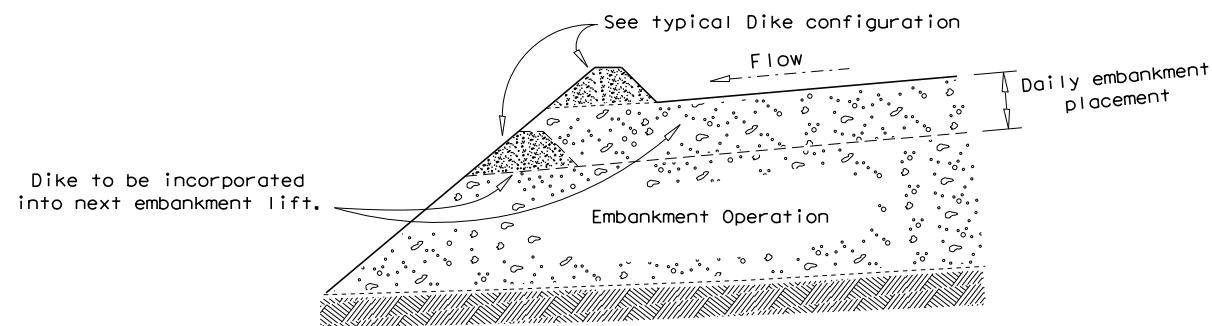
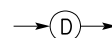
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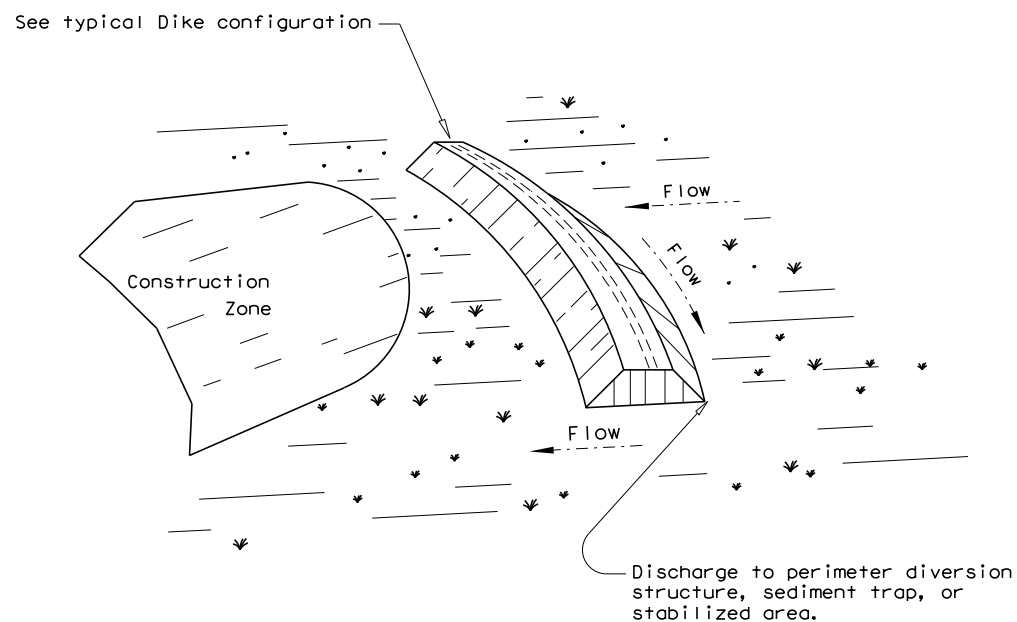
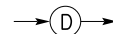
PERIMETER DIKE



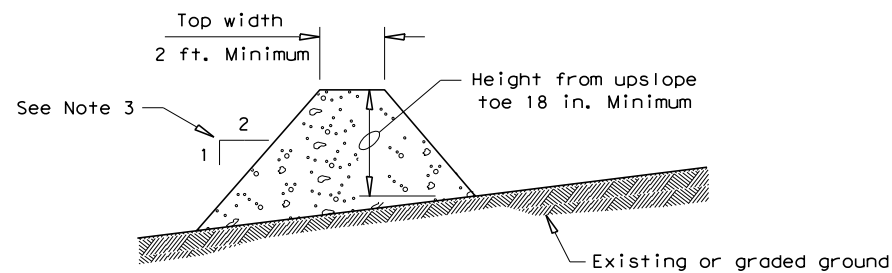
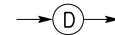
DIVERSION DIKE



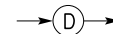
EMBANKMENT SECTION - DIVERSION DIKE



INTERCEPTOR DIKE



TYPICAL DIKE CONFIGURATION



GENERAL NOTE

1. Soil used in dike construction shall be machine compacted.
2. Top width and height of dike may be modified with prior approval of the Engineer.
3. Side slopes within the safety clear zone of a roadway shall be 6:1 or flatter.
4. Grading shall be shown elsewhere in the plans or as directed by the Engineer.
5. The Engineer reserves the right to modify the dimensions shown for the dike dependent on runoff volume characteristics.
6. Dikes that are in place for more than 14 calendar days should be stabilized to prevent sediment runoff.
7. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
8. Remove sediment and debris when accumulation affects the performance of the devices, after a rain and when directed by the engineer.

DIKE USAGE GUIDELINES

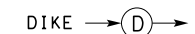
A Dike may be used to intercept runoff and divert it around unstabilized areas or to divert sediment laden runoff to an erosion control device (sediment basin or trap, rock filter dam, etc.).

The drainage area contributing runoff to a dike should not exceed 5 acres. The spacing of dikes should be as follows:

Slope of disturbed areas above dike	greater than 10%	5 - 10%	less than 5%
Maximum distance between dikes	100'	200'	300'

Intercepted runoff flowing along a dike should outlet to a stabilized area (vegetation, rock, etc.).

PLANS SHEET LEGEND

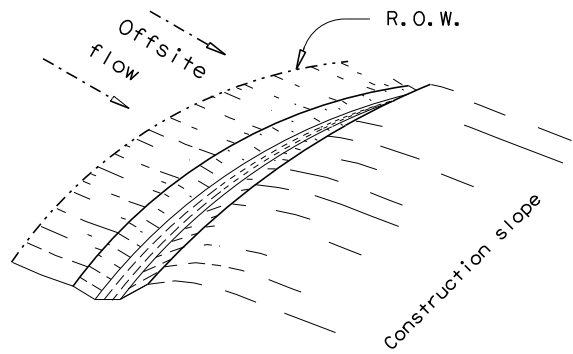


				Design Division Standard	
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES DIKES (EARTHWORK FOR EROSION CONTROL) EC (4) - 16					
FILE: ec416	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS	
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0389	13	039	SH 146	
	DIST	COUNTY	SHEET NO.		
	HOU	HARRIS	392		

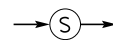
DATE:
FILE:

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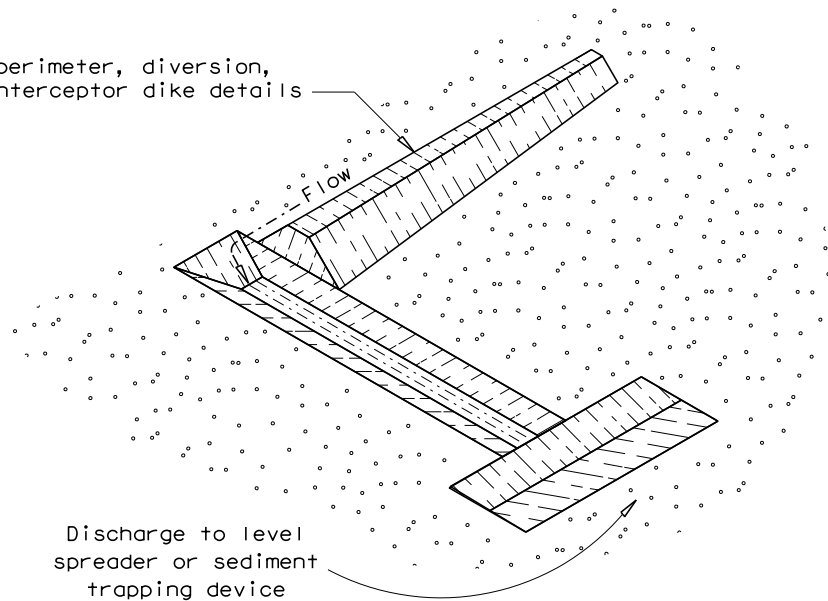
DATE:
FILE:



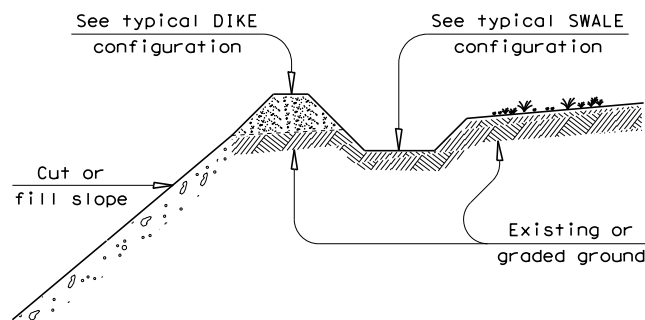
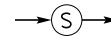
PERIMETER SWALE



See perimeter, diversion, or interceptor dike details



DIVERSION SWALE



DIVERSION DIKE WITH SWALE

SWALE AND DIKE/SWALE USAGE GUIDELINES

A swale or dike/swale may be used to intercept runoff and divert it around unstabilized areas or to divert sediment laden runoff to an erosion control device (sediment basin or trap, rock filter dam, etc.).

The drainage area contributing runoff to a swale or dike/swale should not exceed 5 acres. The spacing of swales and dike/swales should be as follows:

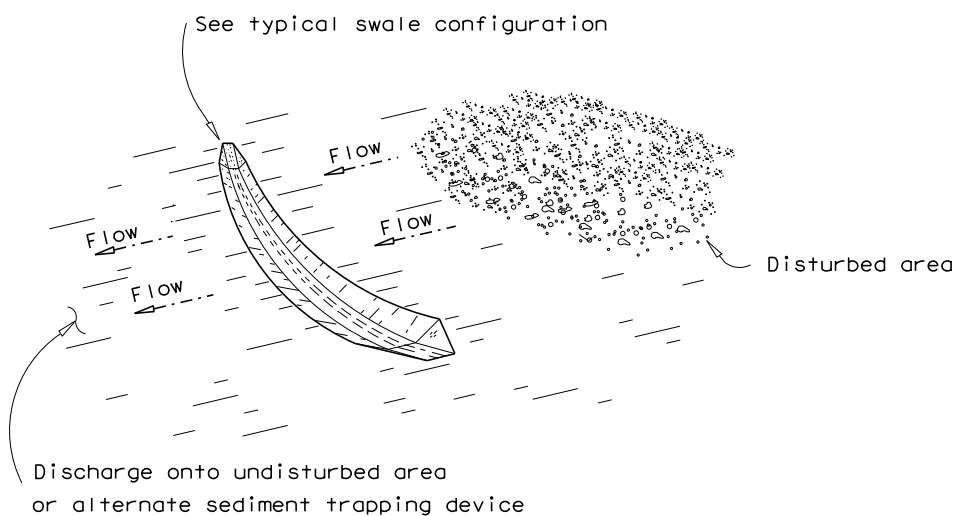
Slope of disturbed areas above dike	greater than 10%	5 - 10%	less than 5%
Maximum distance between dikes	100'	200'	300'

Intercepted runoff flowing in a swale or dike/swale should outlet to a stabilized area (vegetation, rock, etc.).

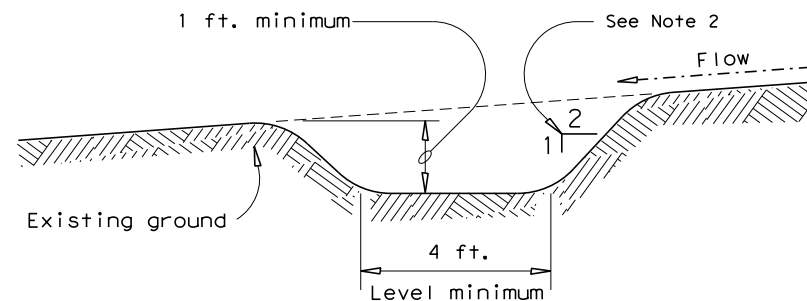
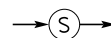
PLAN SHEET LEGEND

SWALE → (S) →

DIKE → (D) →



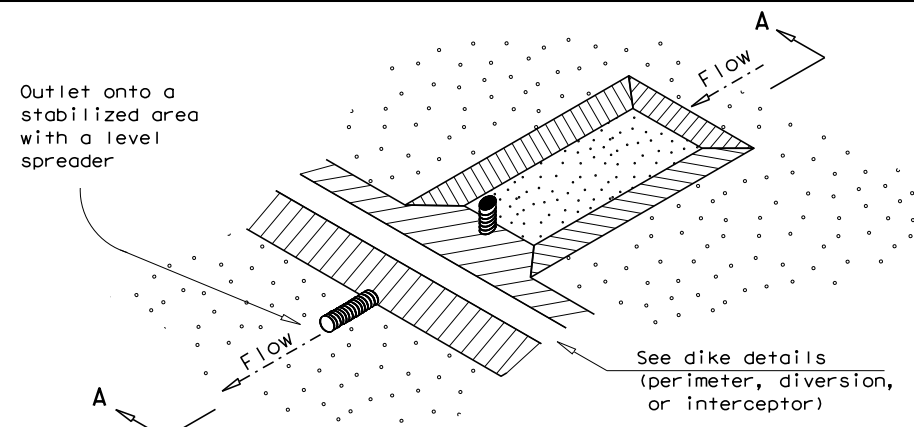
INTERCEPTOR SWALE



TYPICAL SWALE CONFIGURATION

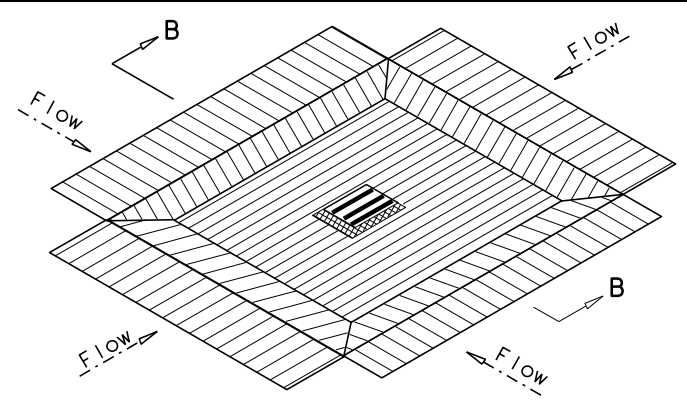
		Design Division Standard	
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES SWALES (EARTHWORK FOR EROSION CONTROL) EC (5) - 16			
FILE: ec516	DN: TxDOT	CK: KM	DW: VP
© TxDOT: JULY 2016	CONT: 0389	SECT: 13	JOB: SH 146
REVISIONS		039	SH 146
DIST: HOU	COUNTY: HARRIS	SHEET NO. 393	

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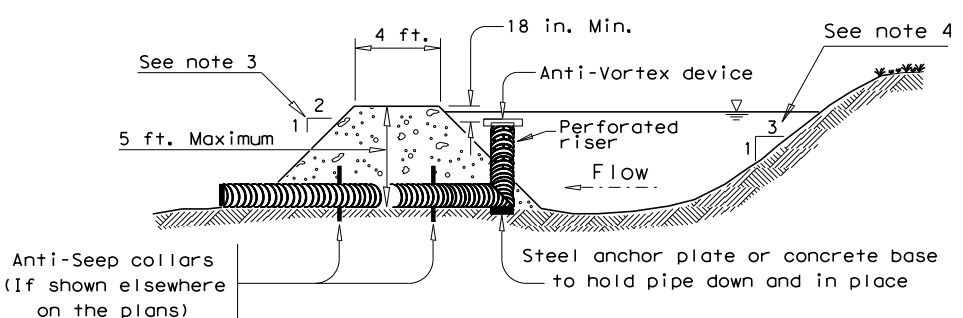
SEDIMENT BASIN AND/OR TRAP WITH PIPE OUTLET

ST/PO

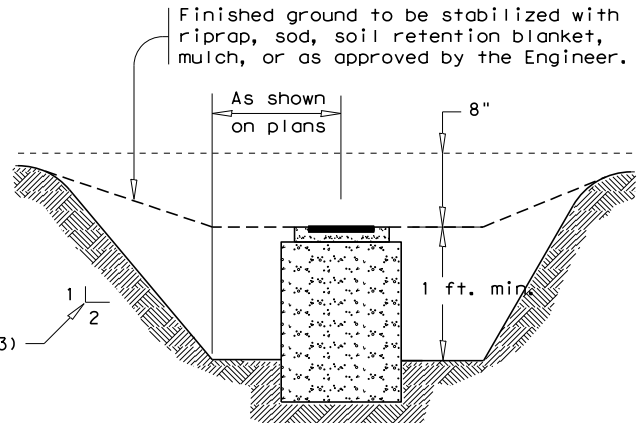


DROP INLET SEDIMENT TRAP

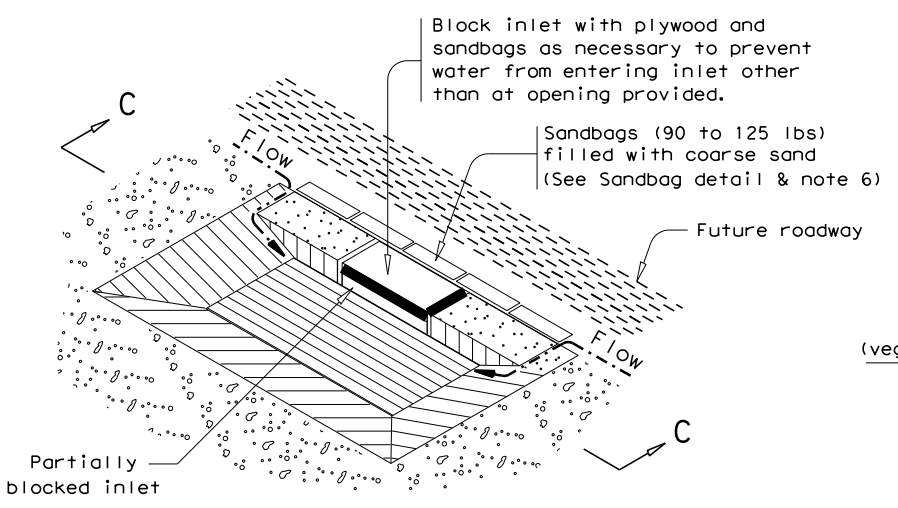
ST-DI



SECTION A-A

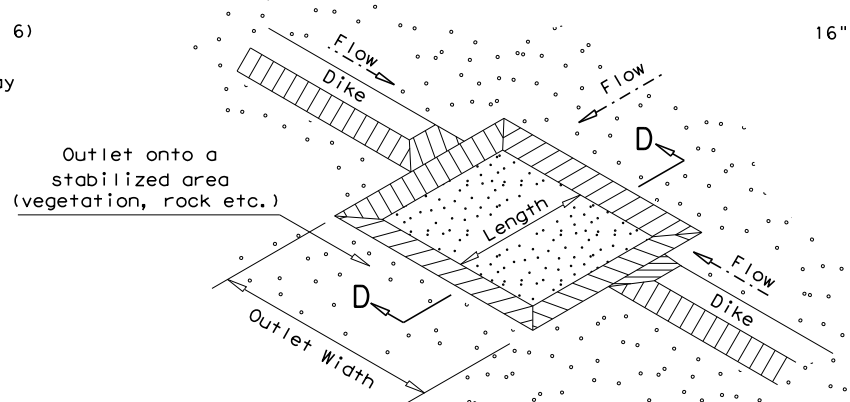


SECTION B-B



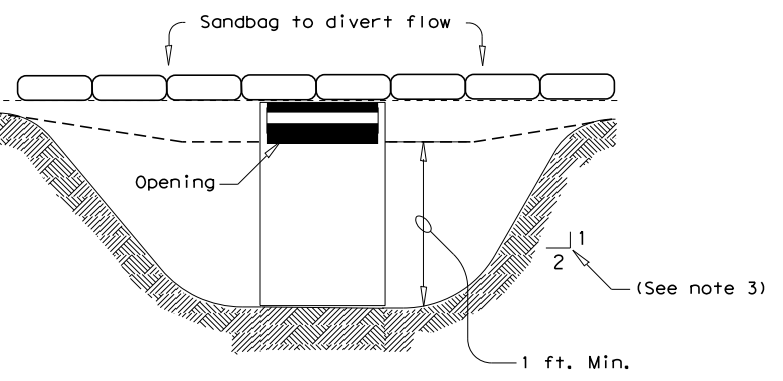
CURB INLET SEDIMENT TRAP

ST-CI

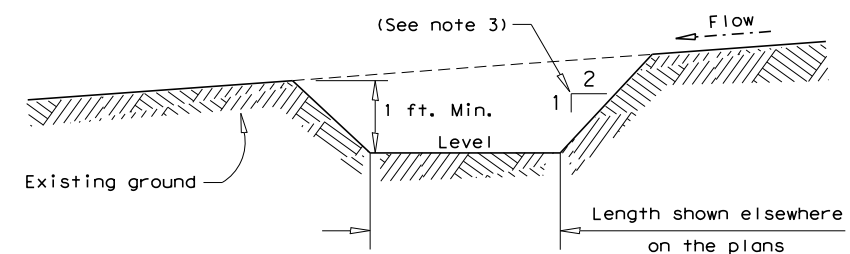


SEDIMENT TRAP WITH LEVEL STABILIZED OUTLET

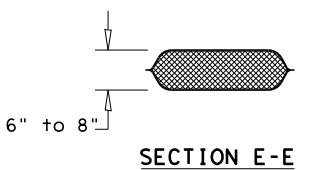
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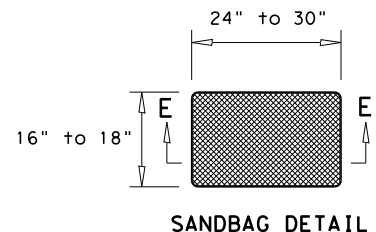
SECTION C-C



SECTION D-D



SECTION E-E



SANDBAG DETAIL

GENERAL NOTES

1. Pipe outlet material shall conform to the Item "Pipe Underdrains" or as accepted by the Engineer.
2. All pipe connections shall be watertight.
3. Side slopes within the safety clear zone of a roadway shall be 6:1 or flatter. Protect the traveling public from inlet stacks within the clear zone.
4. Sediment basins shall have side slopes of 3:1 or flatter.
5. The dimensions and limits of excavation for sediment basins and traps will be as shown elsewhere on the plans.
6. The sandbag material shall be made of polypropylene, polyethylene or polyamide woven fabric, min. unit weight 4 ounces /SY, Mullen burst strength exceeding 300 psi and ultraviolet stability exceeding 70%.
7. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

SEDIMENT BASIN & TRAP USAGE GUIDELINES

A sediment basin and/or trap may be used to precipitate sediment out of runoff draining from an unstabilized area.

Basins: The drainage area for a sediment basin should not exceed 100 acres. The basin capacity shall be at least 1800 CF/Acre of drainage area (0.5" over the drainage area). If the disturbed area draining to the basin is larger than 10 acres, the basin capacity should be 3600 CF/Acre (1.0" over the drainage area).

The basin should have a 40 hour draw-down time with an emergency spillway. The spillway may be designed to pass the peak rate of runoff from a 25 year frequency storm. The 100 year storm should be investigated to consider possible flooding impacts.

The entrance into the basin should be protected from erosion. The basin should be cleaned when the capacity has been reduced by 1/3.

Traps: The drainage area for a sediment trap should not exceed 5 acres. The trap capacity should be 1800 CF/Acre (0.5" over the drainage area).

Sediment traps should be placed in the following locations:

1. Within drainage ditches spaced @ 500' ± on center
2. Immediately preceding ditch inlets
3. Just before the drainage enters a water course
4. Just before the drainage leaves the right of way

The trap outlet may either be through a perforated riser and pipe assembly designed to achieve a 40 hour draw-down time or over a level stabilized area (vegetation, rock, etc.).

The trap should be cleaned when the capacity has been reduced by 1/2 or the sediment has accumulated to a depth of 1', whichever is less.

PLANS SHEET LEGEND

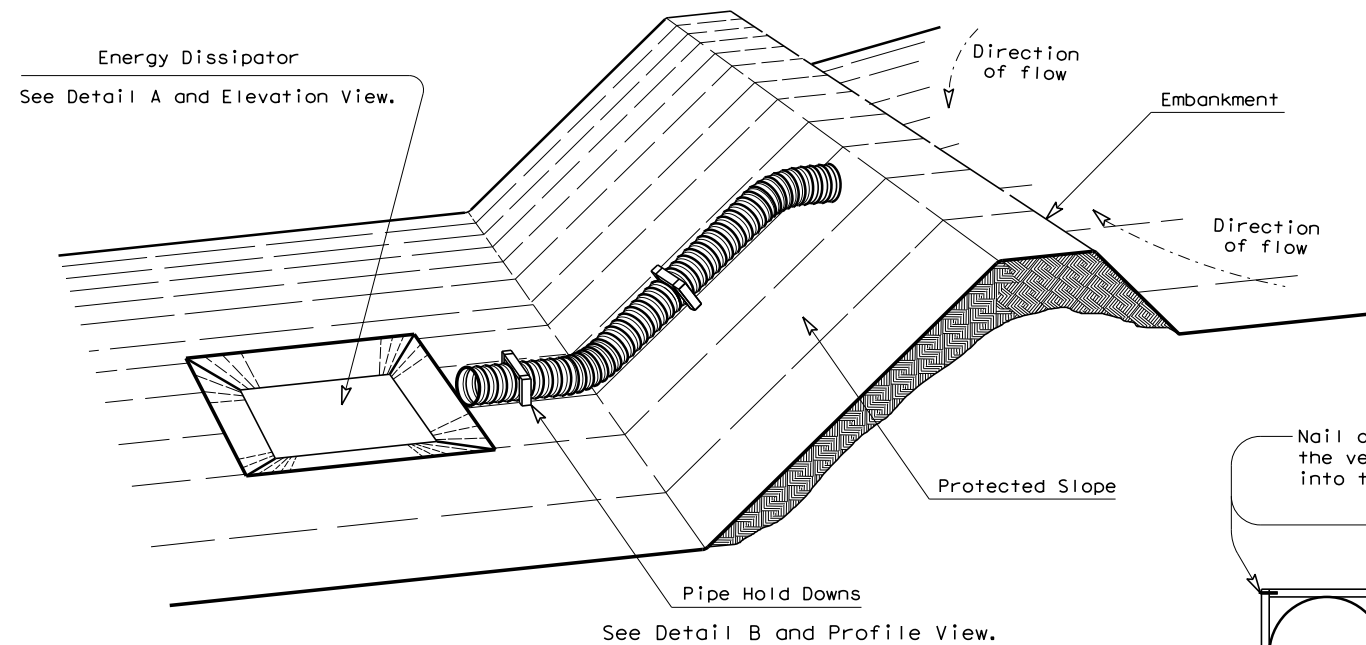
- (ST/PO) —
Sediment Basin and / or Trap with Pipe Outlet
- (ST-DI) —
Drop Inlet Sediment Trap
- (ST-CI) —
Curb Inlet Sediment Trap
- (ST) —
Sediment Trap with Level Stabilized Outlet

		Design Division Standard	
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES SEDIMENT BASINS AND TRAPS (EARTHWORK FOR EROSION CONTROL) EC (6) - 16			
FILE: ec616	DN: TxDOT	CK: KM	DW: VP
© TxDOT: JULY 2016	CONT SECT	JOB	HIGHWAY
REVISIONS	0389 13	039	SH 146
	DIST	COUNTY	SHEET NO.
	HOU	HARRIS	394

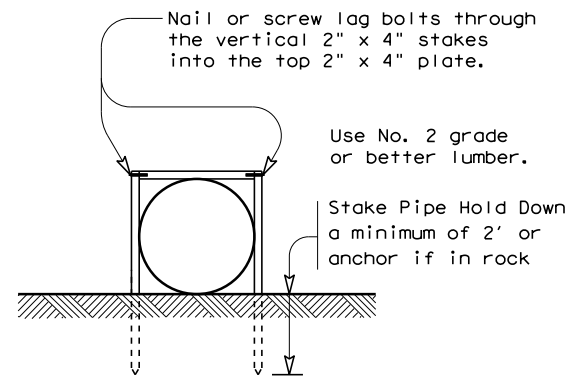
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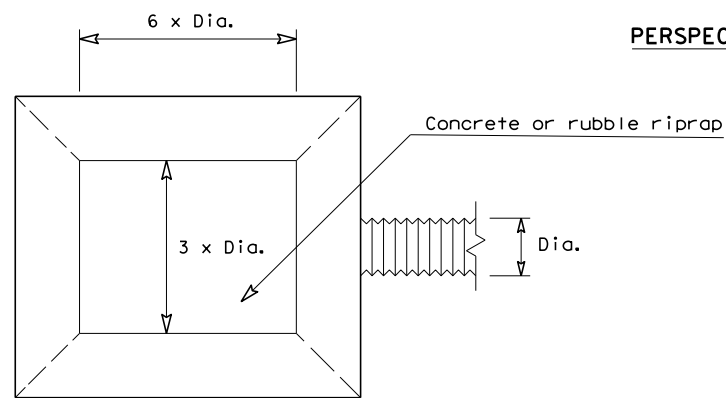
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PERSPECTIVE VIEW

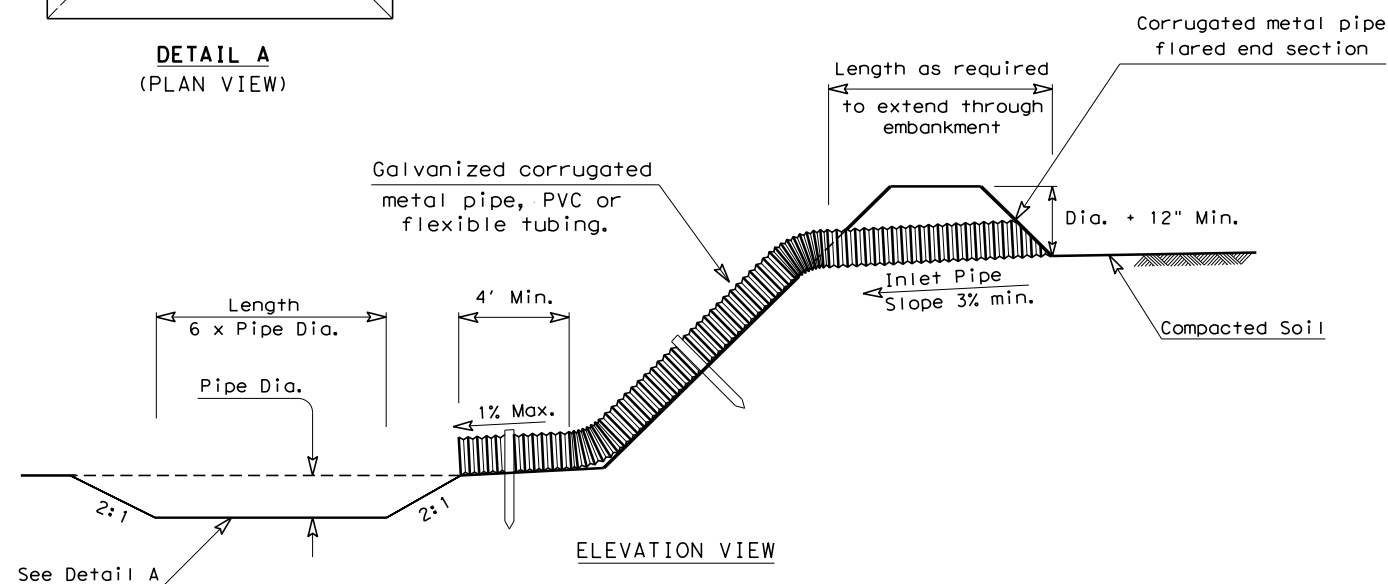


DETAIL B
(ELEVATION VIEW)



DETAIL A
(PLAN VIEW)

PIPE SLOPE DRAIN DESIGN CRITERIA		
PIPE/TUBING SIZE	DIAMETER	MAXIMUM DRAINAGE AREA
PSD 12	12"	0.5 Acre
PSD 18	18"	1.5 Acres
PSD 21	21"	2.5 Acres
PSD 24	24"	3.5 Acres
PSD 30	30"	5.0 Acres



ELEVATION VIEW

PIPE SLOPE DRAIN WITH ENERGY DISSIPATOR

PSD

GENERAL NOTES

1. The inlet pipe shall have a slope of 3 percent or greater. Pipe diameter shall be as indicated on the construction drawings.
2. The top of embankment shall be at least 12" higher than the top of the inlet pipe at all points.
3. The pipe shall be galvanized corrugated metal pipe, PVC, or flexible tubing with watertight connection bands.
4. Pipe shall be secured with hold-down grommets spaced a maximum of 10' on centers or with pipe hold downs as shown in Detail B.
5. Construct embankment for the drainage system in 8" lifts to the required elevations. Hand tamp the soil around and under the entrance section to the top of the embankment as shown on the plans or as directed by the engineer.
6. The sediment trap shall be constructed to the dimensions as shown and in accordance with Special Specification, "Earthwork for Erosion Control". As otherwise detailed on the plans, the sediment trap may be stabilized using concrete or rubble riprap as per Item, "Riprap".
7. A standard corrugated metal pipe flared end section shall be used at the entrance of the pipe slope drain.
8. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

PIPE SLOPE DRAIN USAGE GUIDELINES

A Pipe Slope Drain (PSD) should be constructed to drain concentrated surface runoff safely down slopes without causing erosion. The drainage area contributing runoff to a PSD should not exceed 5 acres. The PSD should be sized to drain the peak rate of runoff without overtopping at the earth dike entrance. A 25 year storm frequency may be used to calculate the flow rate.

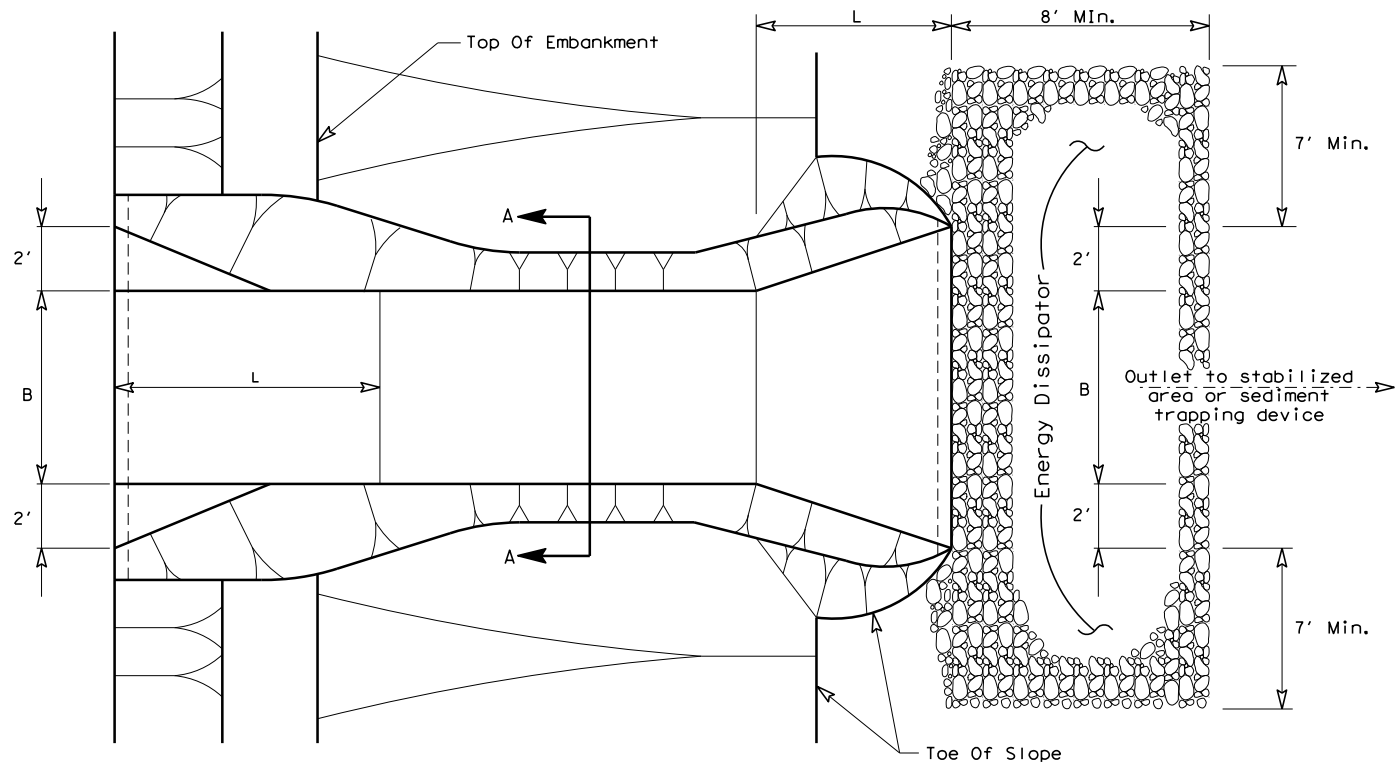
PLAN SHEET LEGEND

Pipe Slope Drain — PSD —

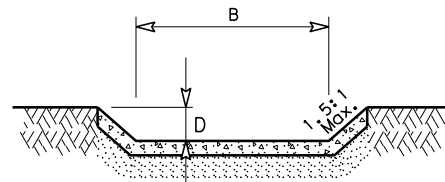
				Design Division Standard	
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES TEMPORARY PIPE SLOPE DRAINS EC (7) - 16					
FILE: ec716.dgn	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS	
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0389	13	039	SH 146	
	DIST	COUNTY	SHEET NO.		
	HOU	HARRIS	395		

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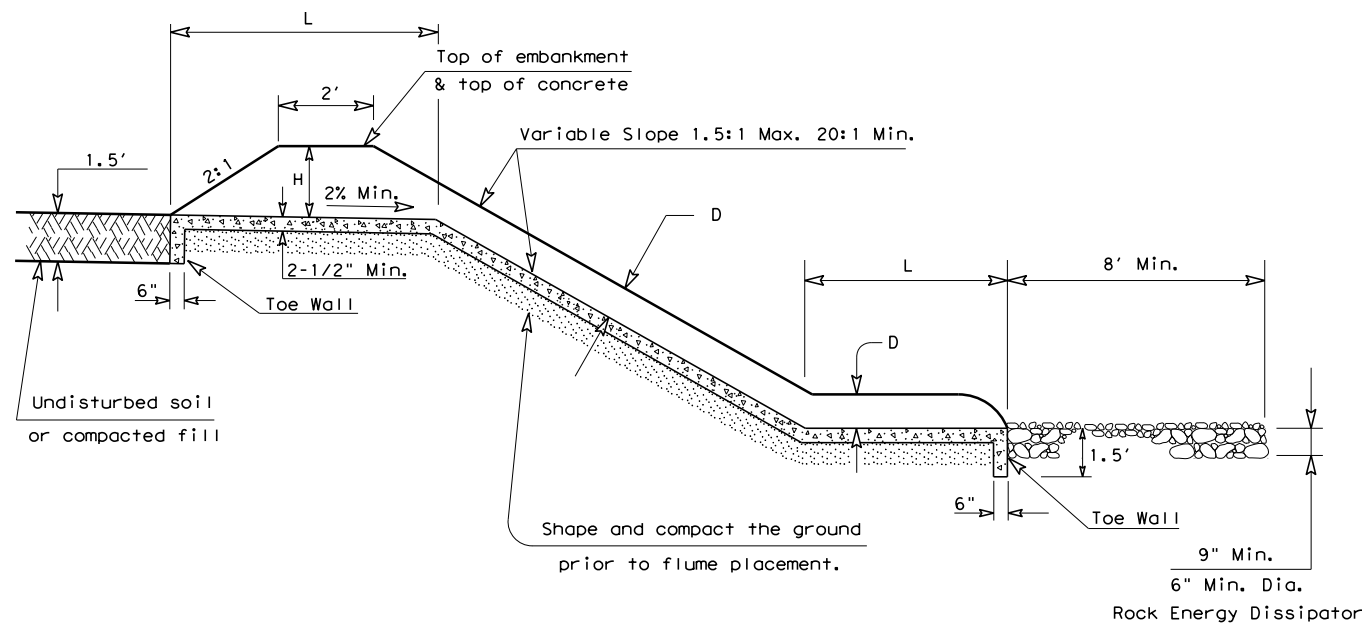
DATE:
FILE:



PLAN VIEW



SECTION A-A



ELEVATION VIEW

PAVED FLUME



GENERAL NOTES

1. The group / size is a designator for the dimensions of the paved flume. The group / size is designated by a letter (A or B) and the bottom (B) dimension. The appropriate size shall be indicated on the construction plans.
2. Provide rock or rubble with a minimum diameter of 6" and a maximum volume of 1/2 cubic feet for construction of energy dissipaters.
3. For high velocity flows, the aggregate of the energy dissipator should be secured with 20-gauge galvanized woven wire mesh with 1" diameter hexagonal openings. The aggregate should be placed on the mesh to the dimensions 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.
4. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

PAVED FLUME USAGE GUIDELINES

A Paved Flume should be constructed to drain concentrated surface runoff safely down slopes without causing erosion. The drainage area contributing runoff to a paved flume should not exceed that given in the Design Criteria above. The paved flume should be sized to drain the peak rate of runoff without overtopping the embankment at the earth dike entrance. A 25 year storm frequency may be used to calculate the flow rate.

DESIGN CRITERIA

Group/Size	B Bottom Width	H Min.	D Min.	L Min.	Maximum Drainage Area
A-2	2'	1.5'	8"	5'	5 Acres
A-4	4'	1.5'	8"	5'	8 Acres
A-6	6'	1.5'	8"	5'	11 Acres
A-8	8'	1.5'	8"	5'	14 Acres
A-10	10'	1.5'	8"	5'	18 Acres
B-4	4'	2'	10"	6'	14 Acres
B-6	6'	2'	10"	6'	20 Acres
B-8	8'	2'	10"	6'	25 Acres
B-10	10'	2'	10"	6'	31 Acres
B-12	12'	2'	10"	6'	36 Acres

PLANS SHEET LEGEND

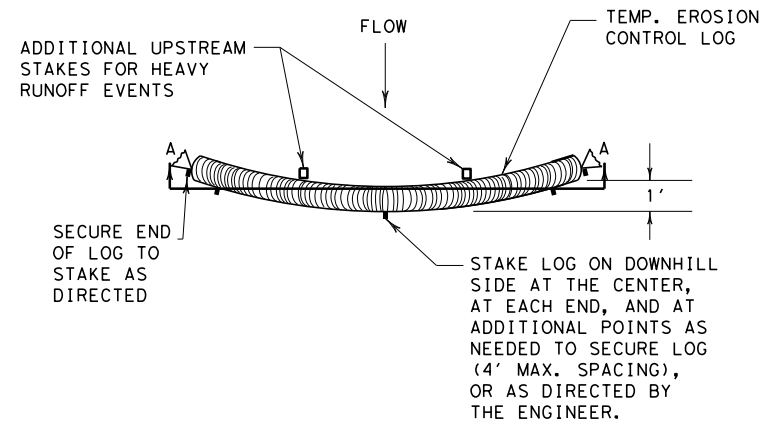
Paved Flume — (PF) —



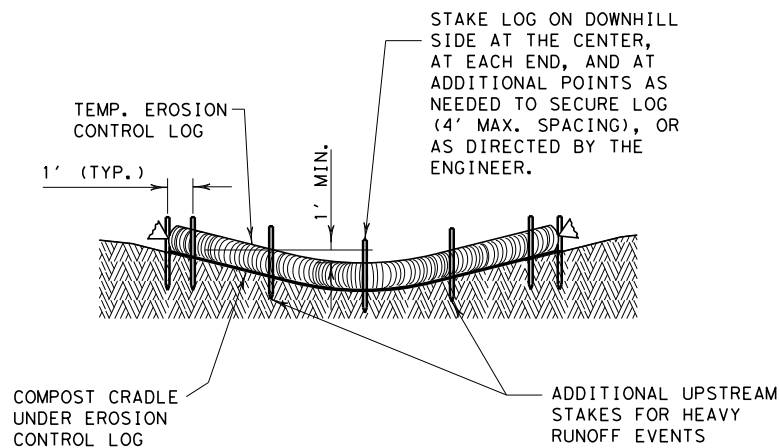
**TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES
TEMPORARY PAVED FLUMES
EC(8) - 16**

FILE: ec816	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0389	13	039	SH 146
	DIST	COUNTY	SHEET NO.	
	HOU	HARRIS	396	

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PLAN VIEW



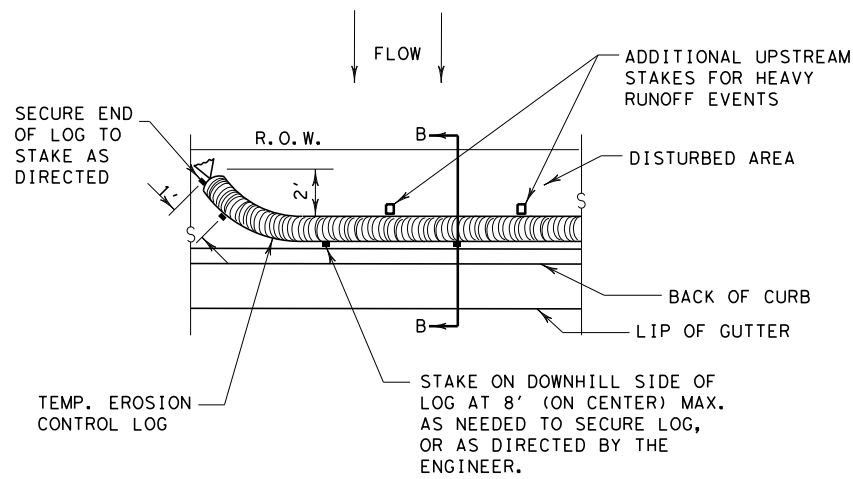
SECTION A-A

EROSION CONTROL LOG DAM

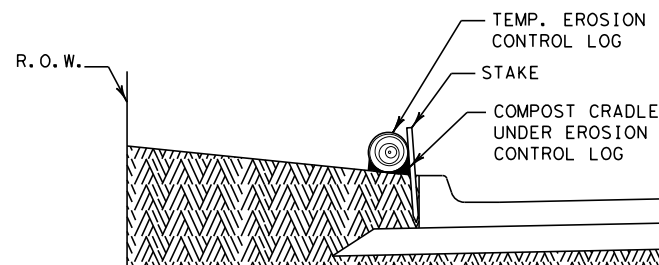
CL-D

LEGEND

- CL-D EROSION CONTROL LOG DAM
- CL-BOC EROSION CONTROL LOG AT BACK OF CURB
- CL-ROW EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY
- CL-SST EROSION CONTROL LOGS ON SLOPES STAKE AND TRENCHING ANCHORING
- CL-SSL EROSION CONTROL LOGS ON SLOPES STAKE AND LASHING ANCHORING
- CL-DI EROSION CONTROL LOG AT DROP INLET
- CL-CI EROSION CONTROL LOG AT CURB INLET
- CL-GI EROSION CONTROL LOG AT CURB & GRATE INLET



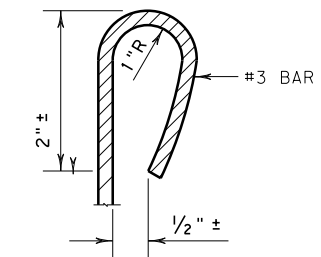
PLAN VIEW



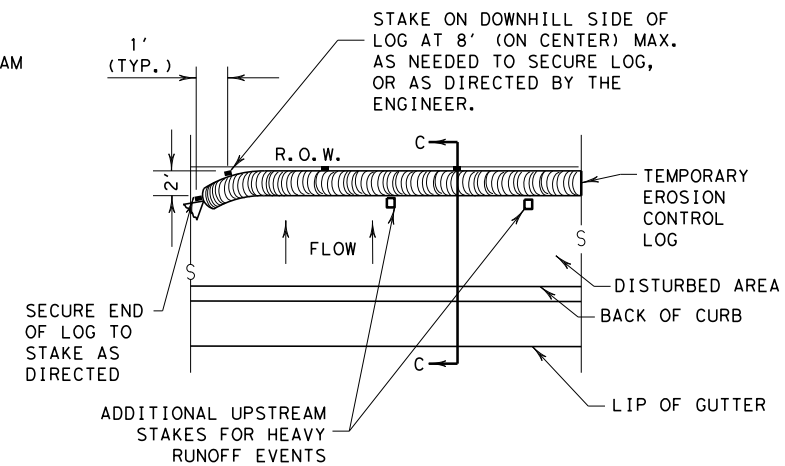
SECTION B-B

EROSION CONTROL LOG AT BACK OF CURB

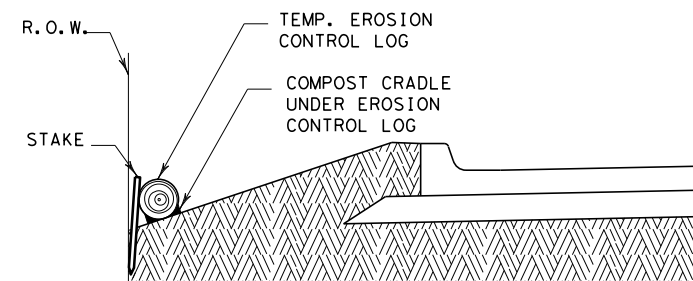
CL-BOC



REBAR STAKE DETAIL



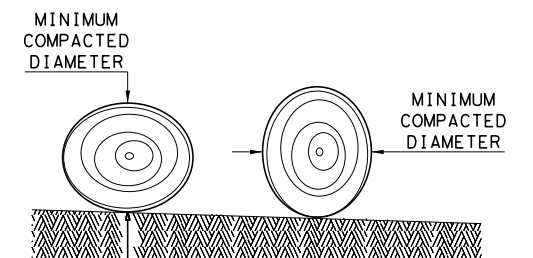
PLAN VIEW



SECTION C-C

EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY

CL-ROW



DIAMETER MEASUREMENTS OF EROSION CONTROL LOGS SPECIFIED IN PLANS

SEDIMENT BASIN & TRAP USAGE GUIDELINES

An erosion control log sediment trap may be used to filter sediment out of runoff draining from an unstabilized area.

Log Traps: The drainage area for a sediment trap should not exceed 5 acres. The trap capacity should be 1800 CF/Acre (0.5" over the drainage area).

Control logs should be placed in the following locations:

1. Within drainage ditches spaced as needed or min. 500' on center
2. Immediately preceding ditch inlets or drain inlets
3. Just before the drainage enters a water course
4. Just before the drainage leaves the right of way
5. Just before the drainage leaves the construction limits where drainage flows away from the project.

The logs should be cleaned when the sediment has accumulated to a depth of 1/2 the log diameter.

Cleaning and removal of accumulated sediment deposits is incidental and will not be paid for separately.

GENERAL NOTES:

1. EROSION CONTROL LOGS SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS, OR AS DIRECTED BY THE ENGINEER.
2. LENGTHS OF EROSION CONTROL LOGS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND AS REQUIRED FOR THE PURPOSE INTENDED.
3. UNLESS OTHERWISE DIRECTED, USE BIODEGRADABLE OR PHOTODEGRADABLE CONTAINMENT MESH ONLY WHERE LOG WILL REMAIN IN PLACE AS PART OF A VEGETATIVE SYSTEM. FOR TEMPORARY INSTALLATIONS, USE RECYCLABLE CONTAINMENT MESH.
4. FILL LOGS WITH SUFFICIENT FILTER MATERIAL TO ACHIEVE THE MINIMUM COMPACTED DIAMETER SPECIFIED IN THE PLANS WITHOUT EXCESSIVE DEFORMATION.
5. STAKES SHALL BE 2" X 2" WOOD OR #3 REBAR, 2'-4' LONG, EMBEDDED SUCH THAT 2" PROTRUDES ABOVE LOG, OR AS DIRECTED BY THE ENGINEER.
6. DO NOT PLACE STAKES THROUGH CONTAINMENT MESH.
7. COMPOST CRADLE MATERIAL IS INCIDENTAL & WILL NOT BE PAID FOR SEPARATELY.
8. SANDBAGS USED AS ANCHORS SHALL BE PLACED ON TOP OF LOGS & SHALL BE OF SUFFICIENT SIZE TO HOLD LOGS IN PLACE.
9. TURN THE ENDS OF EACH ROW OF LOGS UPSLOPE TO PREVENT RUNOFF FROM FLOWING AROUND THE LOG.
10. FOR HEAVY RUNOFF EVENTS, ADDITIONAL UPSTREAM STAKES MAY BE NECESSARY TO KEEP LOG FROM FOLDING IN ON ITSELF.

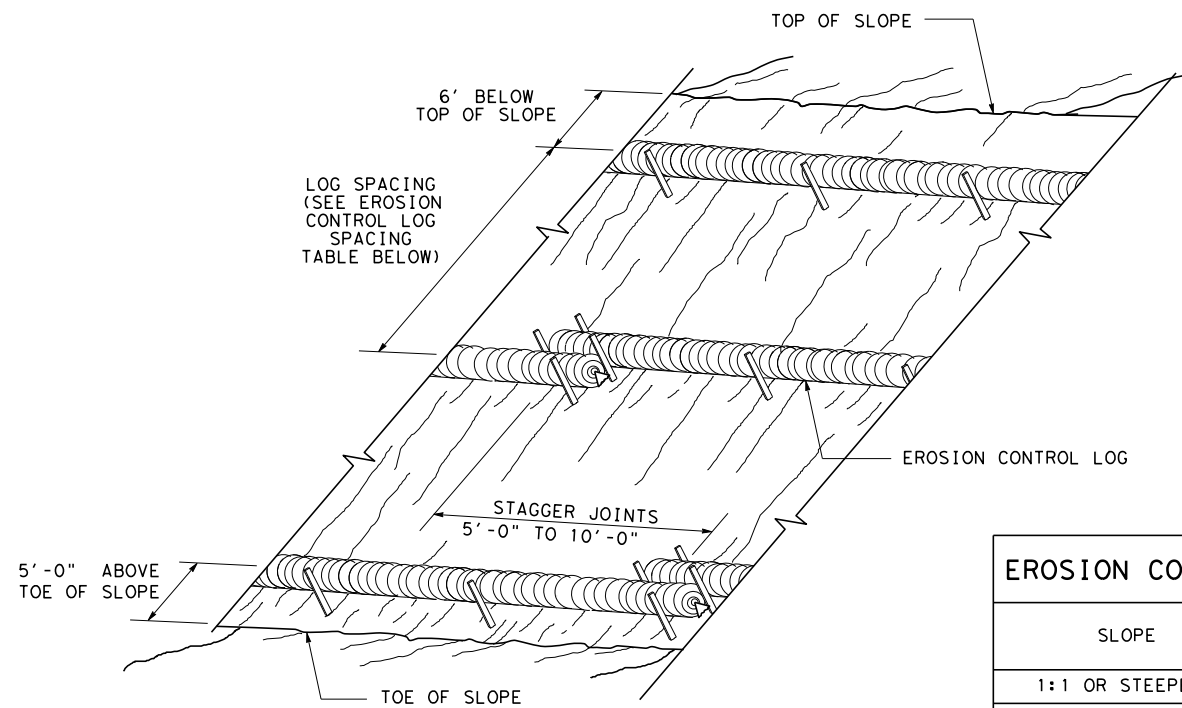
SHEET 1 OF 3

		Design Division Standard	
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES			
EROSION CONTROL LOG			
EC (9) - 16			
FILE: ec916	DN: TxDOT	CK: KM	DW: LS/PT
© TxDOT: JULY 2016	CONT	SECT	JOB
REVISIONS	0389	13	039
	DIST	COUNTY	SH 146
	HOU	HARRIS	397

DATE: FILE:

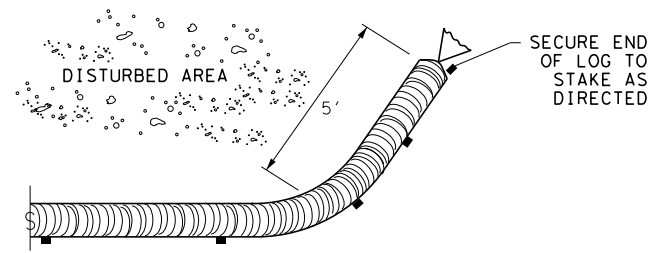
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DATE:
FILE:



**EROSION CONTROL LOGS ON SLOPES
STAKE AND TRENCHING ANCHORING**

CL-SST

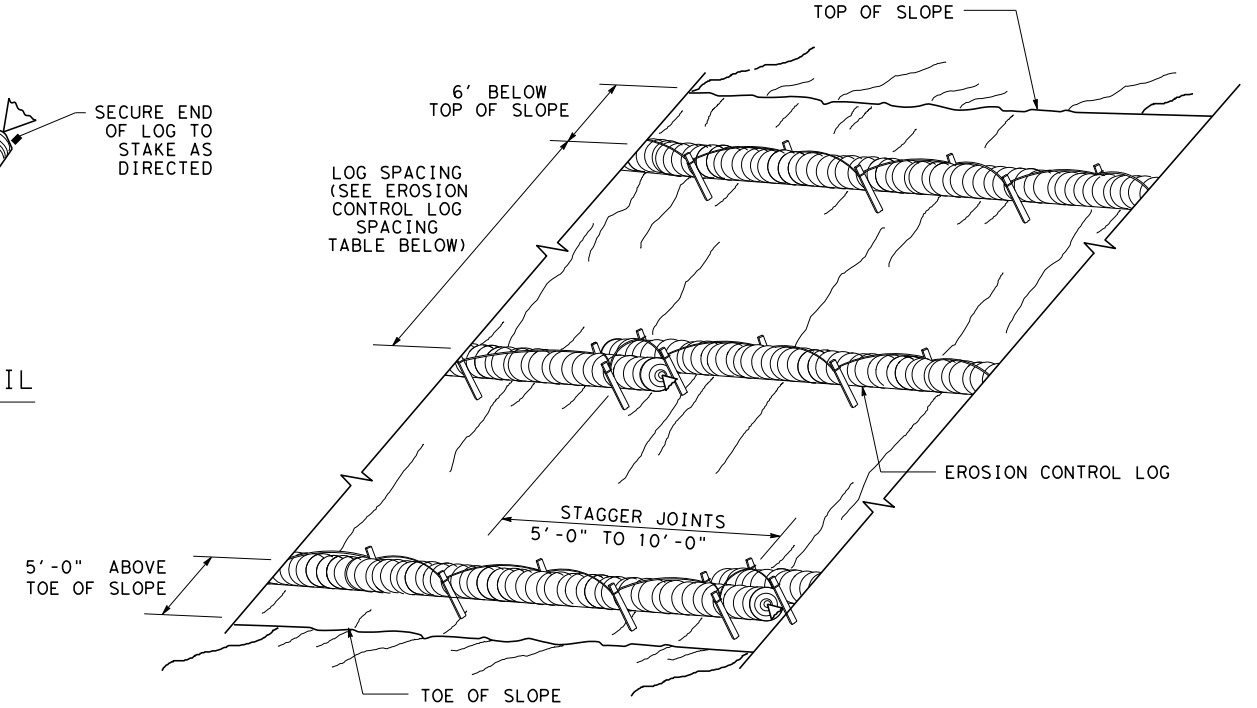


END SECTION RAP DETAIL

EROSION CONTROL LOG SPACING TABLE

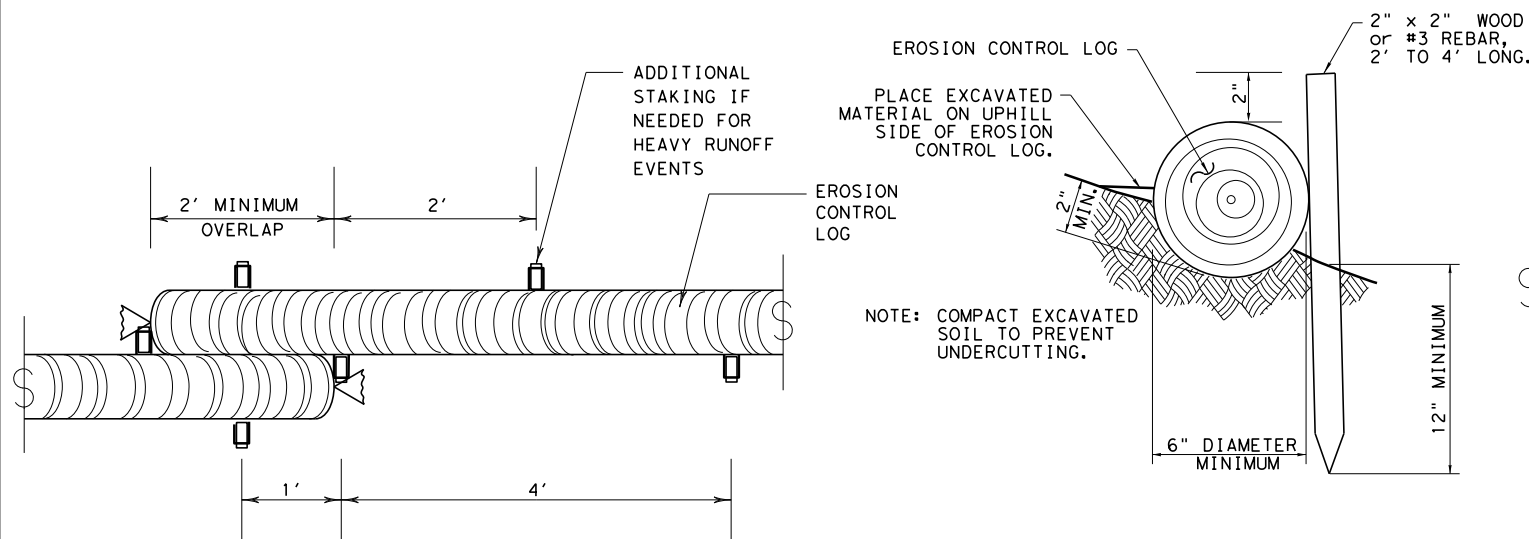
SLOPE	LOG DIAMETER			
	6"	8"	12"	18"
1:1 OR STEEPER	5'	10'	15'	20'
2:1	10'	20'	30'	40'
3:1	15'	30'	45'	60'
4:1 OR FLATTER	20'	40'	60'	80'

* ADJUSTMENTS CAN BE MADE FOR SOIL TYPE:
SOFT, LOAMY SOILS-ADJUST ROWS CLOSER TOGETHER;
HARD, ROCKY SOILS- ADJUST ROWS FARTHER APART



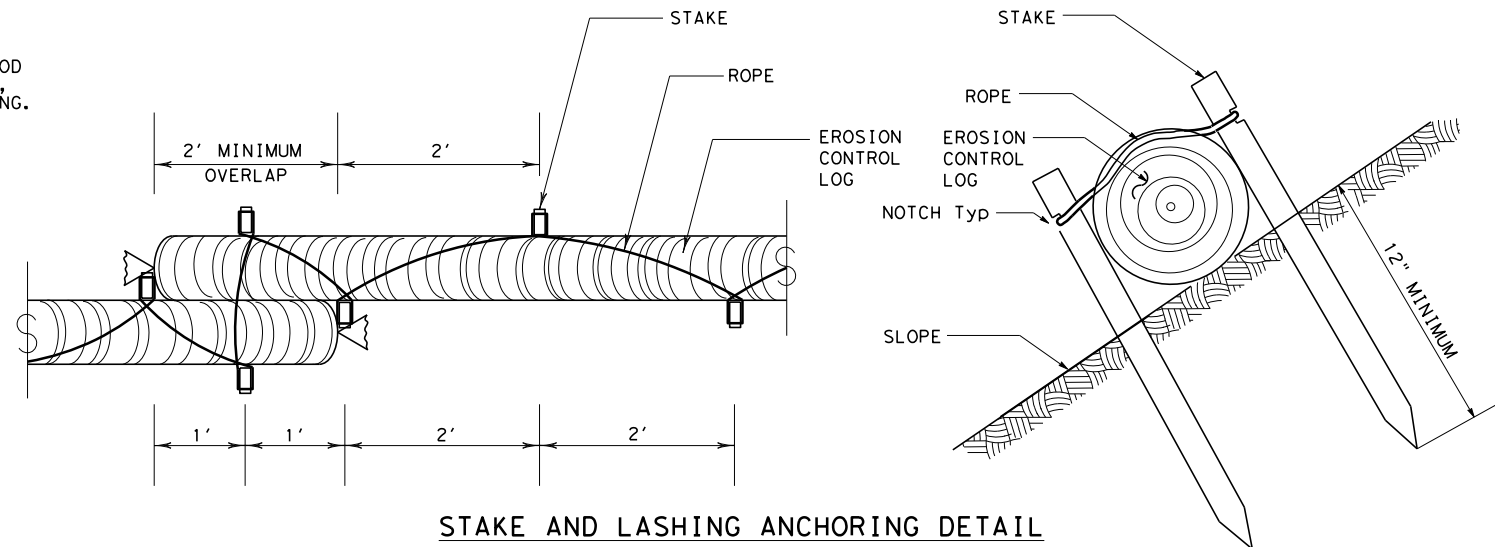
**EROSION CONTROL LOGS ON SLOPES
STAKE AND LASHING ANCHORING**

CL-SSL



STAKE AND TRENCHING ANCHORING DETAIL

CL-SST

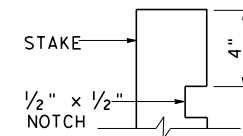


STAKE AND LASHING ANCHORING DETAIL

CL-SSL

TRENCH DEPTH TABLE

LOG DIAMETER	DEPTH
6"	2"
8"	3"
12"	4"
18"	5"

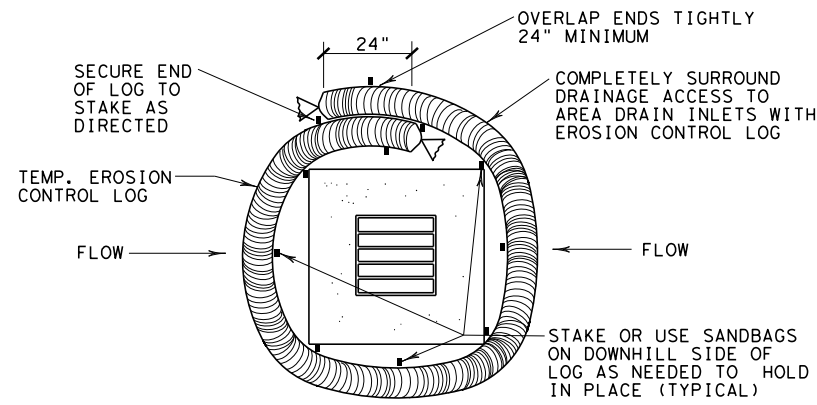


STAKE NOTCH DETAIL

SHEET 2 OF 3

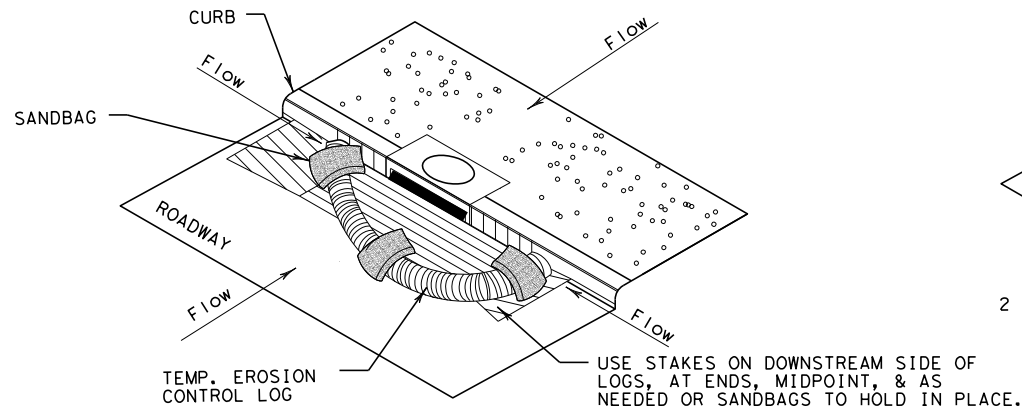
		Design Division Standard	
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES EROSION CONTROL LOG EC(9)-16			
FILE: ec116	DN: TxDOT	CK: KM	DW: LS/PT
© TxDOT: JULY 2016	CONT	SECT	JOB
REVISIONS	0389	13	039
	DIST	COUNTY	SH 146
	HOU	HARRIS	SHEET NO. 398

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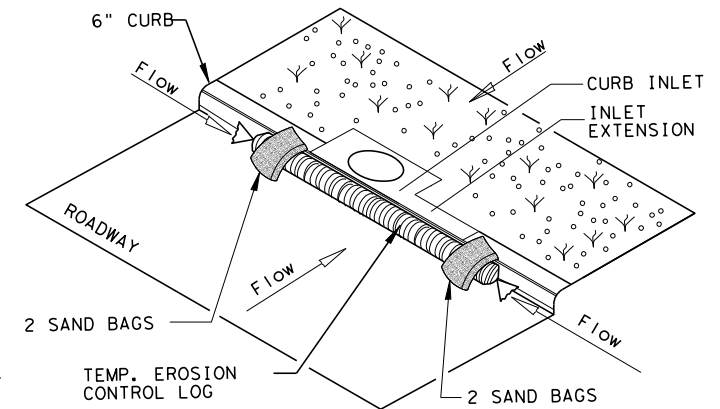
EROSION CONTROL LOG AT DROP INLET

CL-DI



EROSION CONTROL LOG AT CURB INLET

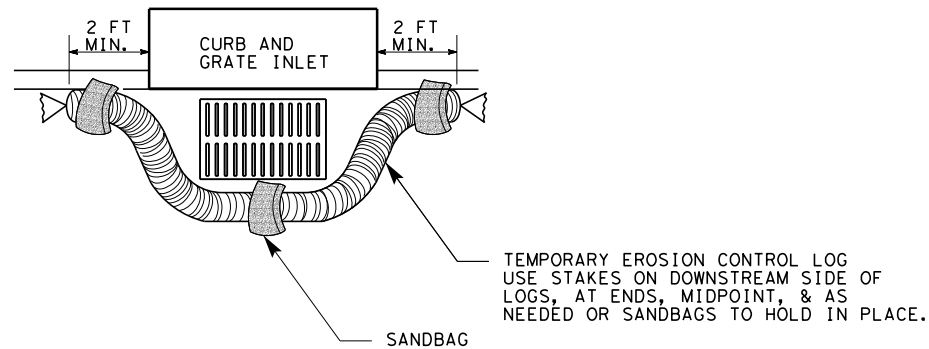
CL-CI



EROSION CONTROL LOG AT CURB INLET

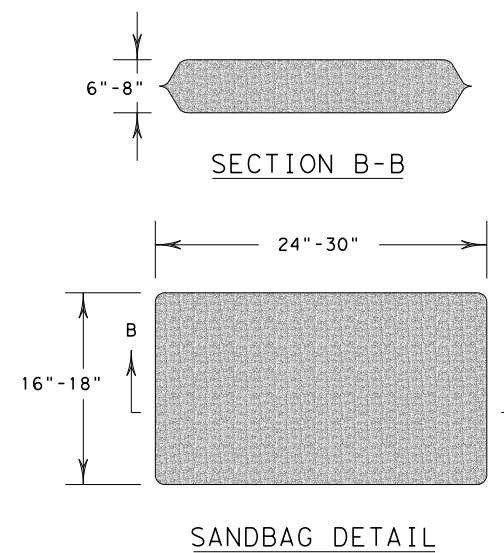
CL-CI

NOTE:
EROSION CONTROL LOGS USED AT CURB INLETS SHOULD ONLY BE USED IF THEY WILL NOT IMPEDE TRAFFIC OR FLOOD THE ROADWAY OR WHEN THE STORM SEWER SYSTEM IS NOT FULLY FUNCTIONAL.



EROSION CONTROL LOG AT CURB & GRADE INLET

CL-GI



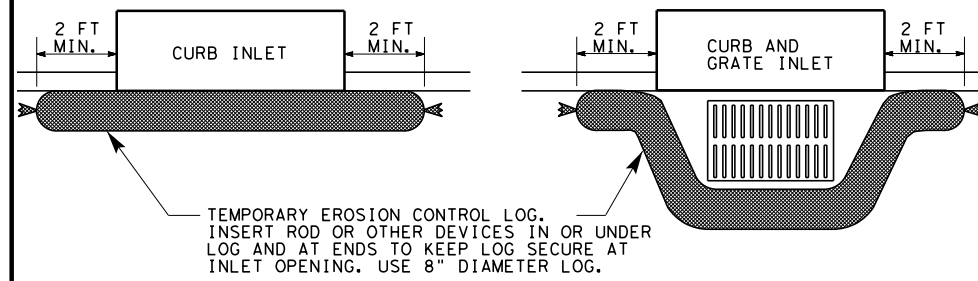
SHEET 3 OF 3

		Design Division Standard		
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES EROSION CONTROL LOG EC (9) - 16				
FILE: ec916	DN: TxDOT	CK: KM	DW: LS/PT	CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0389	13	039	SH 146
	DIST	COUNTY	SHEET NO.	
	HOU	HARRIS	399	

DATE:
FILE:

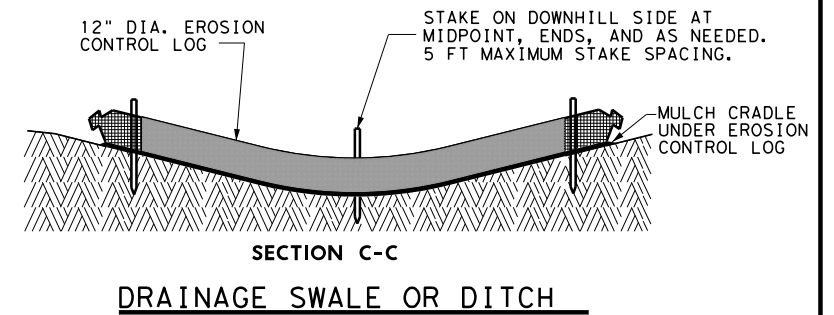
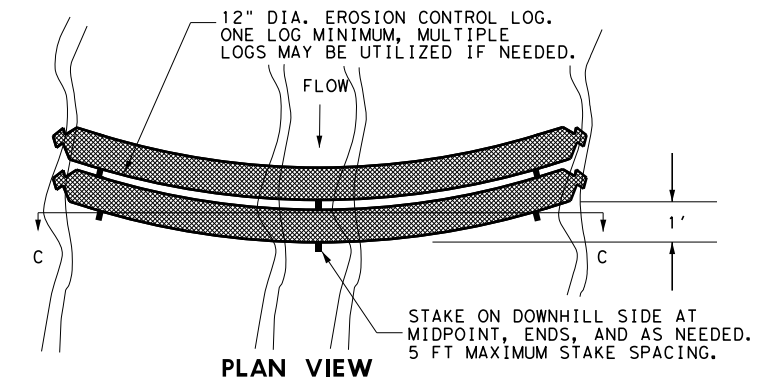
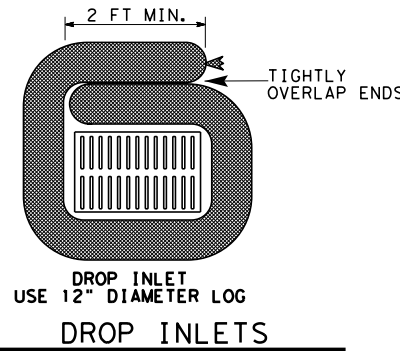
CURB INLETS 8" DIAMETER LOGS

ITEM 506-6040 BIODEG EROSN CONT LOGS (INSTL) (8")



DROP INLETS AND OTHER LOCATIONS 12" DIAMETER LOGS

ITEM 506-6041 BIODEG EROSN CONT LOGS (INSTL) (12")



MATERIAL REQUIREMENTS

FILL:

Use 100% shredded mulch or other non-compost biodegradable material as fill for logs. No compost or fines.

DO NOT USE MATERIAL WHICH PROHIBITS WATER INFILTRATION.

LOG MESH:

Use mesh with 1/4" openings or larger. Mesh must allow water infiltration but also hold fill material in place.

SEDIMENT BASIN & TRAP USAGE GUIDELINES

A sediment trap (erosion control log) may be used to filter sediment out of runoff draining from an unstabilized area.

Traps: The drainage area for a sediment trap should not exceed 5 acres. The trap capacity should be 1800 CF/Acre (0.5" over the drainage area).

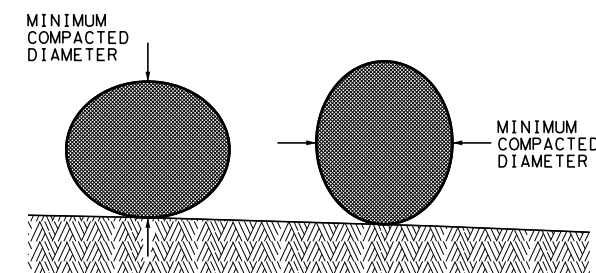
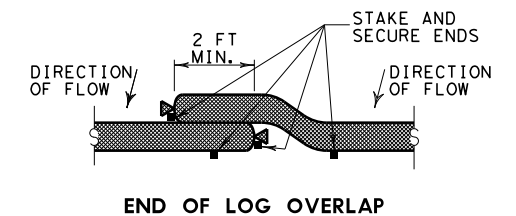
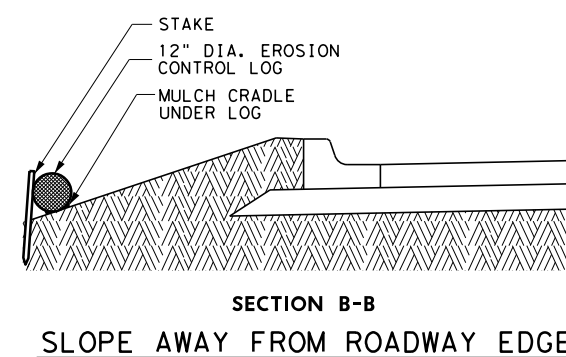
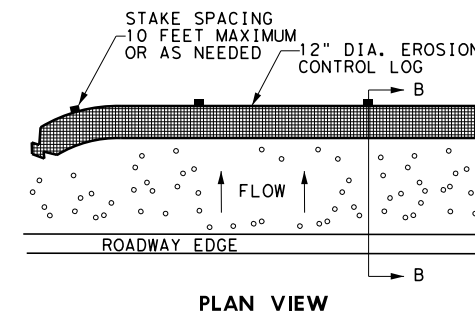
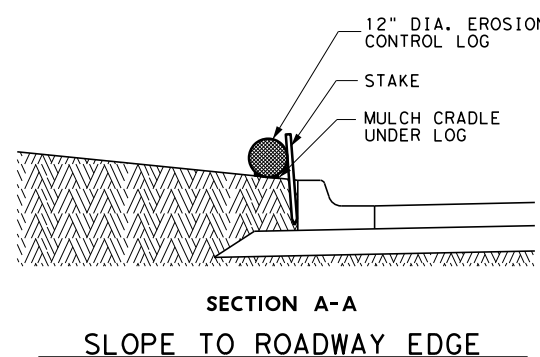
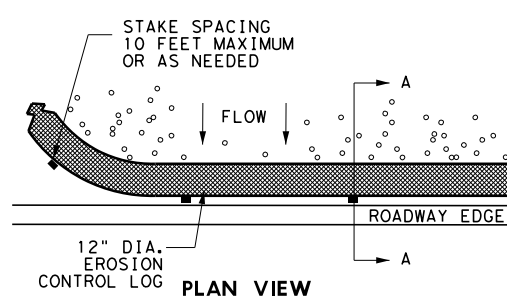
Sediment traps should be placed in the following locations:

1. Within drainage ditches spaced as needed or min. 500' on center
2. Immediately preceding ditch inlets
3. Just before the drainage enters a water course
4. Just before the drainage leaves the right of way

The trap should be cleaned when the capacity has been reduced by 1/2 or the sediment has accumulated to a depth of 1', whichever is less.

REQUIRED ITEMS:

- ITEM 506-6040 BIODEG EROSN CONT LOGS (INSTL) (8") LF
- ITEM 506-6041 BIODEG EROSN CONT LOGS (INSTL) (12") LF
- ITEM 506-6043 BIODEG EROSN CONT LOGS (REMOVE) LF



DIAMETER MEASUREMENTS OF EROSION CONTROL LOGS SPECIFIED IN PLANS

EROSION CONTROL LOG

ECL-12

FILE: STDG4a.DGN	DN: TxDot	CK: TxDot	DW: TxDot	CK: TxDot
© TXDOT 2014	DISTRICT: HOU	FED REG: 6	PROJECT NUMBER:	SHEET: 400
REVISIONS				
3/15 MINOR CORRECTIONS				
COUNTY: HARRIS	CONTROL: 0389	SECT: 13	JOB: 039	HIGHWAY: SH 146

TYPE OF WORK

ITEMS AND REQUIREMENTS FOR EACH TYPE OF WORK

SODDING	PERMANENT SEEDING	TEMPORARY SEEDING	Reference Item 161, 162, 164, 166, 168 of the Texas Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges 2014 for specifications, dimensions, volumes and measurements that are not shown. Use latest Houston District, Special Provisions for those items indicated.		
	✓		161-6017 COMPOST MANUF TOPSOIL (BIP) (4") SY	APPLICATION RATE Item 161.2.1. Compost Manufactured Topsoil (CMT)	Item 161.2. Materials. Submit quality control (QC) documentation to the Engineer. Compost producer's STA certification must be dated to meet STA requirements (certification must be within 30 or 90 days per STA requirements). Lab analysis performed by an STA-certified lab must be dated within 30 days before delivery of the compost.
✓			162-6002 BLOCK SODDING SY	GRASS SPECIES Item 162.2. Materials. Common Bermuda (Cynodon Dactylon)	Item 162.2.1. Block Sod. Use block palletized or roll type sod. REMOVE PLASTIC BACKING FROM ROLL TYPE SOD. Place sod within 48 hours of delivery to site. No exceptions. Place sod with joints alternating on each row to prevent continuous joint lines. Peg sod as needed with wood pegs to hold sod in place. Pegging sod is subsidiary to Item 162.
	✓		164-6066 DRILL SEEDING (PERM) (WARM OR COOL) SY Item 164.1. Description Provide and install seeding as shown on District Standard	PLANTING MONTH SEED MIX March, April, Hulled - Bermudagrass (Cynodon dactylon) - 40.0 lbs PLS/acre May, June, Foxtail Millet (Setaria italica) - 34.0 lbs PLS/acre July, August, Green Sprangletop (Leptochloa dubia) - 4.0 lbs PLS/acre September, Sideoats Grama (Bouteloua curtipendula) - 3.2 lbs PLS/acre October, Little Bluestem (Schizachyrium scoparium) - 1.4 lbs PLS/acre	PLS (Pure Live Seed) Provide documentation of PLS requirements per Item 164.2.1. CONSTRUCTION. Cultivate the area to a depth of 4 inches before placing the seed unless otherwise directed. When performing permanent seeding after an established temporary seeding, cultivate the seedbed to a depth of 4 inches or mow the area before placement of the permanent seed. Plant the seed and place the straw or hay mulch after the area has been completed to lines and grades as shown on the plans.
	✓		164-6052 BROADCAST SEED (PERM) (SPECIAL MIX) SY Item 164.1. Description Provide and install seeding as shown on District Standard	November, Unhulled - Bermudagrass (Cynodon dactylon) - 40.0 lbs PLS/acre December, Oats (Avena sativa) - 72.0 lbs PLS/acre January, Green Sprangletop (Leptochloa dubia) - 4.0 lbs PLS/acre February, Sideoats Grama (Bouteloua curtipendula) - 3.2 lbs PLS/acre Little Bluestem (Schizachyrium scoparium) - 1.4 lbs PLS/acre	Drill Seeding. Plant seed or seed mixture uniformly over the area shown on the plans at a depth of 1/4 to 1/3 inch using a cultipacker (turgrass) type seeder. Plant seed along the contour of the slopes.
		✓	164-6051 DRILL SEED (TEMP) (WARM OR COOL) SY Item 164.1. Description Provide and install seeding as shown on District Standard	PLANTING MONTH SEED MIX March, April, Foxtail Millet (Setaria italica) - 34.0 lbs PLS/acre May, June, July, August, September, October, November, Oats (Avena sativa) - 72.0 lbs PLS/acre December, January, February,	Use broadcast seeding method where site conditions prevent drill seeding method. Broadcast Seeding. Distribute the dry seed or dry seed mixture uniformly over the areas shown on the plans using hand or mechanical distribution on top of soil.
		✓	164-6009 BROADCAST SEED (TEMP) (WARM) SY Item 164.1. Description Provide and install seeding as shown on District Standard	November, Oats (Avena sativa) - 72.0 lbs PLS/acre December, January, February,	
	✓	✓	162-6003 STRAW OR HAY MULCH SY	APPLICATION RATE Immediately after planting the seed or seed mixture, apply straw or hay mulch uniformly over the seeded area. Apply straw or hay mulch at 2 tons per acre. Use tacking agent with straw or hay mulch as described on this sheet.	Use straw or hay mulch in conformance with Article 162.2.5, "Mulch." Use biodegradable tacking agents only applied at a rate in accordance with manufacturer's recommendations. Use the following products or an approved equal (see note this sheet): Conweb/Contac Guar Gum, Profile Products Corporation, (307) 655-9565, Ramtec/Procol/Viscol Guar Gum, Ramtec Corporation, (800) 366-1180
✓	✓	✓	166-6001 FERTILIZER AC Item 166.2. Materials Use fertilizer as shown on District Standard	APPLICATION RATE Deliver and evenly distribute fertilizer at a rate of 4000 lbs/acre.	Use a NON-CHEMICAL fertilizer which meets all the following criteria: (1) BRAND NAME must be registered with the Texas State Chemist as a commercial fertilizer. (2) Meets USEPA guidelines for unrestricted use. (3) Derived from biological sources such as, but not limited to: sewage sludge, manures, vegetation, etc. (4) In granular form and essentially dust free. Submit proof of registration and nutrient source to Engineer. Use the following products or an approved equal (see note this sheet): Sigma, SIGMA AgriScience, 281-851-6749 Sustanite-standard grade, Automation Nation, Inc., 713-675-4999 Milorganite, MMSD, 800-287-9645 Agricultural Organic P/L, Ag Org, INC., 713-523-4396
✓	✓	✓	168-6001 VEGETATIVE WATERING MG	APPLICATION RATE Item 168.3 Construction. 6000 gallons/acre x 20 consecutive working days = 120,000 gallons total/acre	Begin watering immediately after installation of seed or sod. Replace, fertilize, and water any seed or sod in poor condition due to the failure to apply the specified amount of water within the time allowed at no expense to the Department.

SEQUENCE OF WORK

BLOCK SOD	PERMANENT SEEDING	TEMPORARY SEEDING
1. FERTILIZER 2. CULTIVATE SOIL (ITEM 162.3) 3. SOD 4. VEGETATIVE WATERING	1. FERTILIZER 2. COMPOST MANUFACTURED TOPSOIL 3. CULTIVATE SOIL (ITEMS 164.3 AND 161.3.1) 4. PERMANENT SEEDING 5. STRAW OR HAY MULCH 6. VEGETATIVE WATERING	1. FERTILIZER 2. CULTIVATE SOIL (PER ITEM 164.3) 3. TEMPORARY SEEDING 4. STRAW OR HAY MULCH 5. VEGETATIVE WATERING



HOUSTON DISTRICT

FERTILIZER, SEED, SOD, STRAW, COMPOST, AND WATER

SHEET 1 OF 1

REVISIONS		FED	STATE	PROJECT NUMBER			SHEET		
10/2014 UPDATED TO 2014 SPECS	FILE: OCT 2014	6	TEXAS				401		
3/2015 MINOR CORRECTIONS				DIST	COUNTY	CONTROL	SECT	JOB	HIGHWAY
				12	HARRIS	0389	13	039	SH 146