

FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.	
6	CC 3510-4-55	1	
STATE	STATE DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	HIGHWAY NO.
3510	04	055	SH 99

STATE OF TEXAS  
DEPARTMENT OF TRANSPORTATION

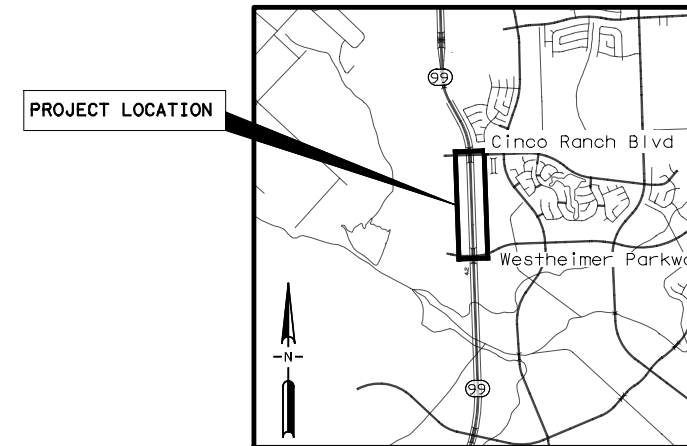
PLANS OF PROPOSED  
STATE HIGHWAY IMPROVEMENT  
PROJECT NO. CC 3510-4-55  
CSJ: 3510-04-055  
**SH 99**  
**SOUTHBOUND FRONTAGE ROAD**  
**FROM WESTHEIMER PARKWAY TO CINCO RANCH BLVD**

FORT BEND COUNTY

NET LENGTH OF ROADWAY = 3760.00 FT = 0.712 MI

NET LENGTH OF PROJECT = 3760.00 FT = 0.712 MI

FOR THE CONSTRUCTION OF FRONTAGE ROAD AND RAMP REVERSAL  
WORK CONSISTING OF: GRADING, CONCRETE PAVEMENT, STORM SEWER,  
RETAINING WALLS, SIGNING, AND PAVEMENT MARKING



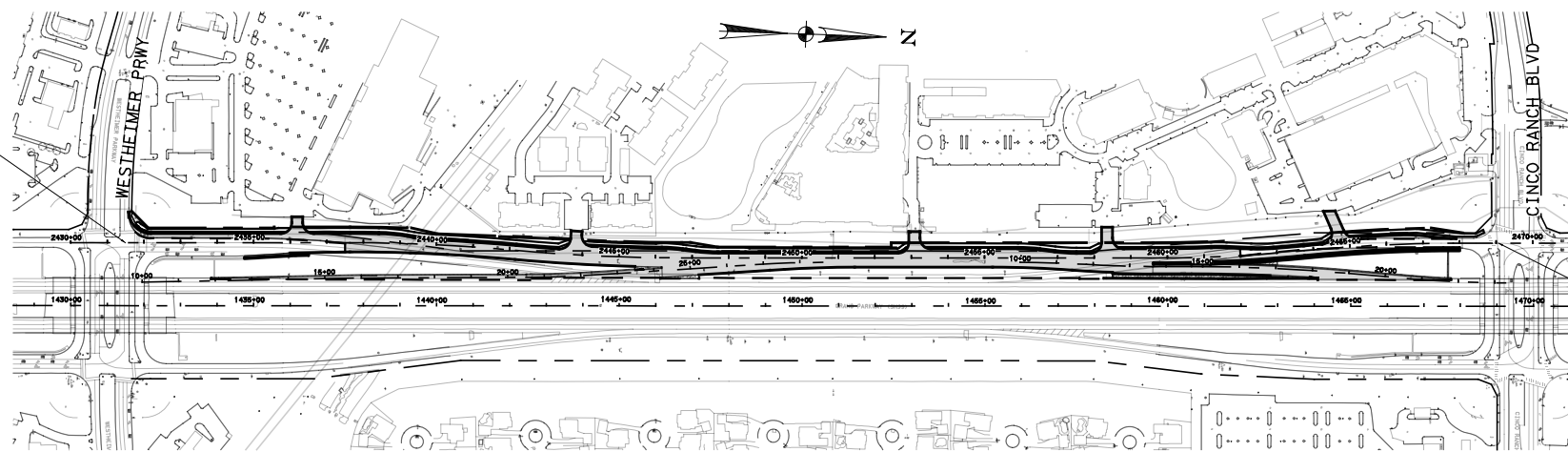
VICINITY MAP  
N. T. S.

DESIGN SPEED:  
MAINLANES : 60 MPH  
RAMPS : 45 MPH  
FRONTAGE RD : 45 MPH

FUNCTIONAL CLASSIFICATION :  
MAINLANES : URBAN FREEWAY  
FRONTAGE RD : COLLECTOR  
ADT (2023) = 23,160  
ADT (2043) = 40,902

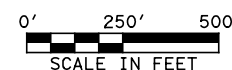
REGISTERED ACCESSIBILITY SPECIALIST  
(RAS) INSPECTION REQUIRED  
TDLR PROJECT NO. TABS2023008315

BEGIN PROJECT  
STA 2431+49  
REF MARK=694+1.746  
M. P. =14.960  
N= 13830191.546  
E= 2992744.544



END PROJECT  
STA 2469+09  
REF MARK=696+0.393  
M. P. =15.672  
N= 13833946.283  
E= 2992602.917

LOCATION MAP



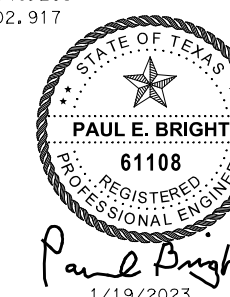
EXCEPTIONS: NONE  
EQUATIONS: NONE  
RAILROAD CROSSINGS: NONE



NOTES:

- ALL BEARINGS AND COORDINATES ARE BASED ON THE TEXAS COORDINATE SYSTEM, SOUTH CENTRAL ZONE, NORTH AMERICAN DATUM OF 1983 (NAD 83) 2011 ADJUSTMENT, EPOCH 2010.00 ALL DISTANCES AND COORDINATES ARE SURFACE AND MAY BE CONVERTED TO GRID BY DIVIDING BY A COMBINED ADJUSTMENT FACTOR OF 1.00013, ALL MEASUREMENTS ARE IN U.S. SURVEY FEET.
- THE PRIMARY CONTROL FOR THIS PROJECT ARE TXDOT MONUMENTS.
- ALL COORDINATES AND ELEVATIONS SHOWN HEREON ARE ESTABLISHED FROM TXDOT CONTROL MONUMENTS H-30, CP-3 AND CP-4 PREPARED BY SAM ENGINEERING DATED JUL 13, 2017
- ALL ELEVATIONS SHOWN HEREON ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM (NAVD88) GEOID12A.

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)



SUBMITTED FOR  
LETTING **01-24-2023**  
**Amer Qureshi, P.E.**  
PROJECT MANAGER

APPROVED FOR  
LETTING **2/2/2023**  
DocuSigned by:  
**James Koch**, P.E.  
FOR DISTRICT ENGINEER

1/23/2023 1:56:13 PM DW: N:\teds\paw\_bentley.com\teds\paw-01\Documents\Projects\2018\2018-2042-01 - Ft Bend Grand Parkway Frontage Road\CSJ\_351004055\SH99\Design\Plan\_Sett\1 - General\1.1 Title Sheet\0556T01

COUNTY FORT BEND PROJ. NO. CC 3510-4-55  
HWY. NO. SH 99 LETTING DATE APRIL 2023  
DATE ACCEPTED

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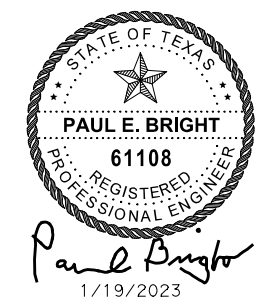
SHEET NO.	DESCRIPTION
	<b>GENERAL</b>
1	TITLE SHEET
2-3	INDEX OF SHEETS
4	PROJECT LAYOUT
5-7	EXISTING TYPICAL SECTIONS
8-12	PROPOSED TYPICAL SECTIONS
13, 13A-13S	GENERAL NOTES
14, 14A-14D	ESTIMATE & QUANTITY SUMMARY
15-16	SUMMARY OF TRAFFIC CONTROL QUANTITIES
17	SUMMARY OF REMOVAL QUANTITIES
18	SUMMARY OF ROADWAY QUANTITIES
19	SUMMARY OF DRAINAGE QUANTITIES
20	SUMMARY OF RETAINING WALLS AND SOUND WALL QUANTITIES
21	SUMMARY OF PAVEMENT MARKING QUANTITIES
22	SUMMARY OF SMALL SIGNS
23	SUMMARY OF OVERHEAD SIGN STRUCTURES
24	SUMMARY OF LARGE SIGNS
25	SUMMARY OF TRAFFIC SIGNAL QUANTITIES
26	SUMMARY OF RAMP ILLUMINATION
27	SUMMARY OF SWP3 QUANTITIES
27A	SUMMARY OF WATERLINE QUANTITIES
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28	TRAFFIC CONTROL PLAN NARRATIVE
29	TRAFFIC CONTROL PLAN - OVERALL LAYOUT
30-31	TRAFFIC CONTROL PLAN - ADVANCE WARNING SIGNS
32	TRAFFIC CONTROL PLAN - WESTHEIMER PKWY @ SB FRTG RD SIDEWALK CLOSURE
33	TRAFFIC CONTROL PLAN - CINCO RANCH BLVD @ SB FRTG RD SIDEWALK CLOSURE
34-39	TRAFFIC CONTROL PLAN - PHASE I
40-45	TRAFFIC CONTROL PLAN - PHASE II
46-51	TRAFFIC CONTROL PLAN - PHASE III STEP 1
52-57	TRAFFIC CONTROL PLAN - PHASE III STEP 2
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59	TREATMENT FOR VARIOUS EDGE CONDITIONS
60	CRASH CUSHION SUMMARY SHEET
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61-72	* BC(1)-21 THRU BC(12)-21 ~ BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS
73	* TCP(1-1)-18 ~ CONVENTIONAL ROAD SHOULDER WORK
74	* TCP(1-4)-18 ~ LANE CLOSURES ON MULTILANE CONVENTIONAL ROADS
75	* TCP(2-1)-18 ~ CONVENTIONAL ROAD SHOULDER WORK
76	* TCP(2-4)-18 ~ LANE CLOSURES ON MULTILANE CONVENTIONAL ROADS
77	* TCP(2-5)-18 ~ LONG TERM LANE CLOSURES ON MULTILANE CONVENTIONAL ROADS
78	* TCP(3-2)-13 ~ MOBIL OPERATIONS DIVIDED HIGHWAYS
79	* TCP(3-3)-14 ~ MOBIL OPERATIONS RAISED PAVEMENT MARKER
80	* TCP(5-1)-18 ~ SHOULDER WORK FOR FREEWAYS / EXPRESSWAYS
81	* TCP(6-2)-12 ~ WORK AREA NEAR RAMP
82	* TCP(6-3)-12 ~ WORK AREA BEYOND RAMP
83	* TCP(6-4)-12 ~ WORK AREA AT EXIT RAMP
84	* TCP(6-8)-14 ~ WORK IN EXIT GORE
85	* WZ(TD)-17 ~ TRAFFIC CONTROL PLAN TYPICAL DETAILS
86	* WZ(STPM)-13 ~ WORK ZONE SHORT TERM PAVEMENT MARKINGS
87	* WZ(BRK)-13 ~ WORK ZONE "GIVE US A BRAKE" SIGNS
88-89	* WZ(BTS-1)-13 THRU WZ(BTS-2)-13 ~ TRAFFIC SIGNAL WORK TYPICAL DETAILS
90-91	* PSSCB-JJ ~ PRECAST SINGLE SLOPE CONCRETE BARRIER (HOU DIST)
92-93	* LPCB-13 ~ LOW PROFILE CONCRETE BARRIER
94	* TEGS TC6000-96 ~ TEMPORARY EXIT GORE SIGN (HOU DIST)
95	* EGPM TC6001-04 ~ EXIT GORE PAVEMENT MARKINGS (HOU DIST)
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97	HORIZONTAL AND VERTICAL CONTROL
98-101	HORIZONTAL ALIGNMENT DATA
102-105	DEMOLITION LAYOUTS
106-109	SB FRONTAGE ROAD PLAN & PROFILE
110-111	SB ENTRANCE RAMP PLAN & PROFILE
112-113	SB EXIT RAMP PLAN & PROFILE
114	INTERSECTION LAYOUT
115	GORE DETAILS
116	DRIVEWAY TABLE & DETAILS

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117-118	* CRCP(1)-20 ~ CONTINUOUSLY REINFORCED CONCRETE PAVEMENT ONE LAYER STEEL BAR PLACEMENT
119-120	* CRCP(2)-20 ~ CONTINUOUSLY REINFORCED CONCRETE PAVEMENT TWO LAYER STEEL BAR PLACEMENT
121-122	* CPCD-14 ~ CONCRETE PAVEMENT DETAILS, CONTRACTION DESIGN
123	* JS-14 ~ CONCRETE PAVING DETAILS, JOINT SEALS
124	* FD ~ FLUME DETAILS (HOU DIST)
125-126	* SSTR ~ TRAFFIC RAIL SINGLE SLOPE
127	* GF(31)-19 ~ METAL BEAM GUARD FENCE TL-3 MASH COMPLIANT
128-129	* GF(31)TR TL3-20 ~ METAL BEAM GUARD FENCE TRANSITION (TL3) (THREE BEAM TRANSITION)
130	* GF(31)DAT-19 ~ METAL BEAM GUARD FENCE (DOWNSTREAM ANCHOR TERMINAL)
131	* SGT(11S)31-18 ~ SINGLE GUARDRAIL TERMINAL (MAX-TENSION)
132	* SGT(12S)31-18 ~ SINGLE GUARDRAIL TERMINAL (MSKT)
133	* QGELITE(M10)(N)-20 ~ QUADGUARD (ELITE) (M10) (NARROW)
134	* SMT(N)-16 ~ WORK AREA PROTECTION CORP (SMART-NARROW)
135	* CCCG-22 ~ CONCRETE CURB AND CURB AND GUTTER
136-137	* CRCP-HS ~ CONTINUOUSLY REINFORCED CONCRETE PAVEMENT HOUSTON SUPPLEMENT (HOU DIST)
138-139	* CPJ ~ CONCRETE PAVEMENT JUNCTIONS (HOU DIST)
140	* CC & DID ~ CONCRETE CURB AND DIRECTIONAL ISLAND DETAILS (HOU DIST)
141	* MS ~ MOW STRIP (HOU DIST)
142-144	* DD ~ DRIVEWAY DETAILS (HOU DIST)
145-148	* PED-18 ~ PEDESTRIAN FACILITIES CURB RAMPS
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149	BORE SITE PLAN
150-157	BORING LOGS
158	RETAINING WALL / SOUND WALL OVERALL LAYOUT
159	RETAINING WALL LAYOUT RW-1
160	RETAINING WALL LAYOUT RW-2
161	RETAINING WALL LAYOUT RW-3
162	SOUND WALL LAYOUT SW-1A & SW-1B
163	SOUND WALL LAYOUT SW-2
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164-165	* RW(MSE) ~ MECHANICALLY STABILIZED EARTH RETAINING WALL
166	* RW(TRF) ~ RETAINING WALL TRAFFIC RAILING FOUNDATIONS
167	* RW(EM) ~ EARTHWORK MEASUREMENT AT RETAINING WALLS
168	* RW(BTR) ~ RETAINING WALL TRAFFIC RAIL AT BASE
169-170	* RW(RI) ~ ROADWAY INLET FOR MSE RETAINING WALL TRAFFIC RAIL FOUNDATION
171	* RW(MSE)DD ~ DESIGN DATA FOR (MSE) RETAINING WALL
172	* MSRW-CSB ~ MECHANICALLY STABILIZED RETAINING WALL CEMENT STABILIZED BACKFILL (HOU DIST)
173-175	* RWD-HS ~ RETAINING WALL DETAILS HORIZONTAL SCHEME GREEN RIBBON (HOU DIST)
176-178	* SWD-HS ~ SOUND WALL DETAILS HORIZONTAL SCHEME GREEN RIBBON (HOU DIST)
179	* SFC-HS ~ SURFACE FINISHES FOR CONCRETE HORIZONTAL SCHEME (HOU DIST)
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180-183	DRAINAGE AREA MAPS
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189-192	STORM SEWER PLAN & PROFILE
193-195	IN-LINE MITIGATION PLAN & PROFILE
196-198	STORM SEWER LATERALS
199	RCB MANHOLE RISER DETAILS
200	MISCELLANEOUS DRAINAGE DETAILS INLETS TY C1 & TY C2 (MOD)
201	MISCELLANEOUS DRAINAGE DETAILS
202-203	JUNCTION BOX DETAILS JB-(12'X5') STA 2437+89.25
204-206	JUNCTION BOX DETAILS JB-(12'X9') STA 2444+75
207-208	JUNCTION BOX DETAILS JB-(13'X7') STA 2444+48.23
	<b>DRAINAGE DETAILS STANDARDS</b>
209	# HIL-A ~ CURB INLET TYPE A (HOU DIST)
210-211	# E&BD ~ EXCAVATION AND BACKFILL DIAGRAMS (HOU DIST)
212	# HIL-C1 ~ CURB INLET TYPE C1 (WITH OR WITHOUT EXTENSION) (HOU DIST)
213	# GD ~ GUTTER DEPRESSION DETAILS FOR CURB INLETS (HOU DIST)
214	# MH-A/B ~ MANHOLES TYPE A & B (HOU DIST)
215	# HIL-AD/AAD ~ INLET TYPE AD & AAD (HOU DIST)
216	# MSD ~ MISCELLANEOUS SEWER DETAILS (HOU DIST)
217-218	# SCC-5 & 6 ~ SINGLE BOX CULVERTS CAST-IN-PLACE (0' TO 30' FILL)
219-220	# SCC-8 ~ SINGLE BOX CULVERTS CAST-IN-PLACE (0' TO 30' FILL)
221	# SCP-6 ~ SINGLE BOX CULVERTS PRECAST 6'-0" SPAN
222	# PJB ~ PRECAST JUNCTION BOX
222A	# PB ~ PRECAST BASE
222B, C	# PSL ~ PRECAST SLAB LID
222D	# PDD ~ DESIGN DATA FOR PRECAST BASE AND JUNCTION BOX
223	# SCP-MD ~ BOX CULVERTS PRECAST MISCELLANEOUS DETAILS
224-225	# TDD ~ TRENCH DRAIN DETAILS (HOU DIST)



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 01-22-2023  
 SUJEEETH DRAKSHARAM, P.E. Date

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 1/19/2023  
 Paul E. Bright, P.E. Date



**TEDSI INFRASTRUCTURE GROUP**  
 Consulting Engineers  
 738 Hwy 6 South, Suite 430  
 Houston, Texas 77079  
 (832) 619-1000  
 TBPE F-1640



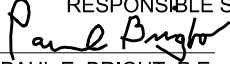
SH 99  
 SOUTHBOUND FRONTAGE ROAD  
 WESTHEIMER PKWY TO CINCO RANCH BLVD  
  
 INDEX OF SHEETS

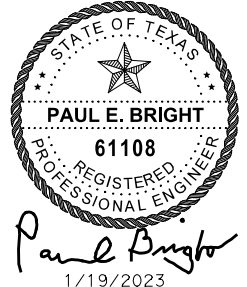
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6				SH 99	
STATE	DIST.	COUNTY			
TEXAS	HOU	FORT BEND			
CONT.	SECT.	JOB	SHEET NO.		
3510	04	055	2		

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<u><b>TRAFFIC SIGNALS</b></u>	
226	EXISTING CONDITIONS LAYOUT
227-228	MODIFICATIONS OF TRAFFIC SIGNAL LAYOUT
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229	* CD/PMPS ~ SIGNAL DETAILS/STANDARDS CONSTRUCTION DETAILS FOR POLE MOUNTED PED SIGNALS (HOU DIST)
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230	RAMP ILLUMINATION NOTES
231-234	ILLUMINATION LAYOUTS
235	ILLUMINATION CIRCUIT DIAGRAM
236	MOWING PAD DETAILS FOR ELECTRICAL SERVICES (HOU DIST)
<u><b>ILLUMINATION STANDARDS</b></u>	
237-243	* ED(1)-14 THRU ED(7)-14 ~ ELECTRICAL DETAILS
244-245	* RID(1)-20 THRU RID(2)-20 ~ ROADWAY ILLUMINATION DETAILS
246-249	* RIP(1)-19 THRU RIP(4)-19 ~ ROADWAY ILLUMINATION POLES
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250-253	SIGNING LAYOUT
254	GUIDE SIGN DETAILS
255	OVERHEAD SIGN ELEVATION
256-259	PAVEMENT MARKINGS LAYOUT
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260-264	* TSR(1)-13 THRU TSR(5)-13 ~ TYP SIGN REQUIREMENTS
265-267	* PM(1)-22 THRU PM(3)-22 ~ PAVEMENT MARKINGS
268	* PM(4)-22A ~ CROSSWALK PAVEMENT MARKINGS
269-272	* FPM(1)-22 THRU FPM(4)-22 ~ TYPICAL STANDARD FREEWAY PAVEMENT MARKINGS
273	* FPM(5)-22 ~ EXIT GORE PAVEMENT MARKINGS
274	* PM(CLL)-14 ~ PAVEMENT MARKINGS (CONTRAST LANE LINES) (HOU DIST)
275	* SMD(GEN)-08 ~ SIGN MOUNTING DETAILS- GENERAL NOTES & DETAILS
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283	* SMD(2-6)-01 ~ SIGN MOUNTING DETAILS -ELECTRICAL CONNECTION
284	* SMD(TY G)-08 ~ SIGN MOUNTING DETAILS- TYPE G SUPPORT
285	* WV & IZ-14 ~ WIND VELOCITY & ICE ZONES
286	* HCOSS-Z1-21 ~ OVERHEAD SIGN BRIDGE DETAILS
287-288	* COSS-HS ~ CANTILEVER OVERHEAD SIGN STRUCTURE DETAILS HORIZ SCHEME (HOU DIST)
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290-291	TxDOT STORM WATER POLLUTION PREVENTION PLAN (SWP3)
292-295	SWP3 LAYOUTS
296	ENVIRONMENTAL PERMITS ISSUES AND COMMITMENTS (EPIC)
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299	* EC(3)-16 ~ TEMPORARY EROSION CONTROL MEASURES (CONSTRUCTION EXITS)
300-302	* EC(9)-16 ~ TEMPORARY EROSION CONTROL MEASURES (EROSION CONTROL LOG)
303	* ECL-12 ~ EROSION CONTROL LOGS (HOU DIST)
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305	GENERAL CONSTRUCTION NOTES (1 OF 2)
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308	PLAN AND PROFILE - SH 99 - 24" WATER LINE (STA. 0+00 TO 6+00)
309	PLAN AND PROFILE - SH 99 - 24" WATER LINE (STA. 6+00 TO 11+45)
310	WATERLINE DETAILS (1 OF 2)
311	WATERLINE DETAILS (2 OF 2)
312	STORM WATER POLLUTION PREVENTION PLAN DETAILS

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 PAUL E. BRIGHT, P.E. Date



**SH 99**  
**SOUTHBOUND FRONTAGE ROAD**  
**WESTHEIMER PKWY TO CINCO RANCH BLVD**




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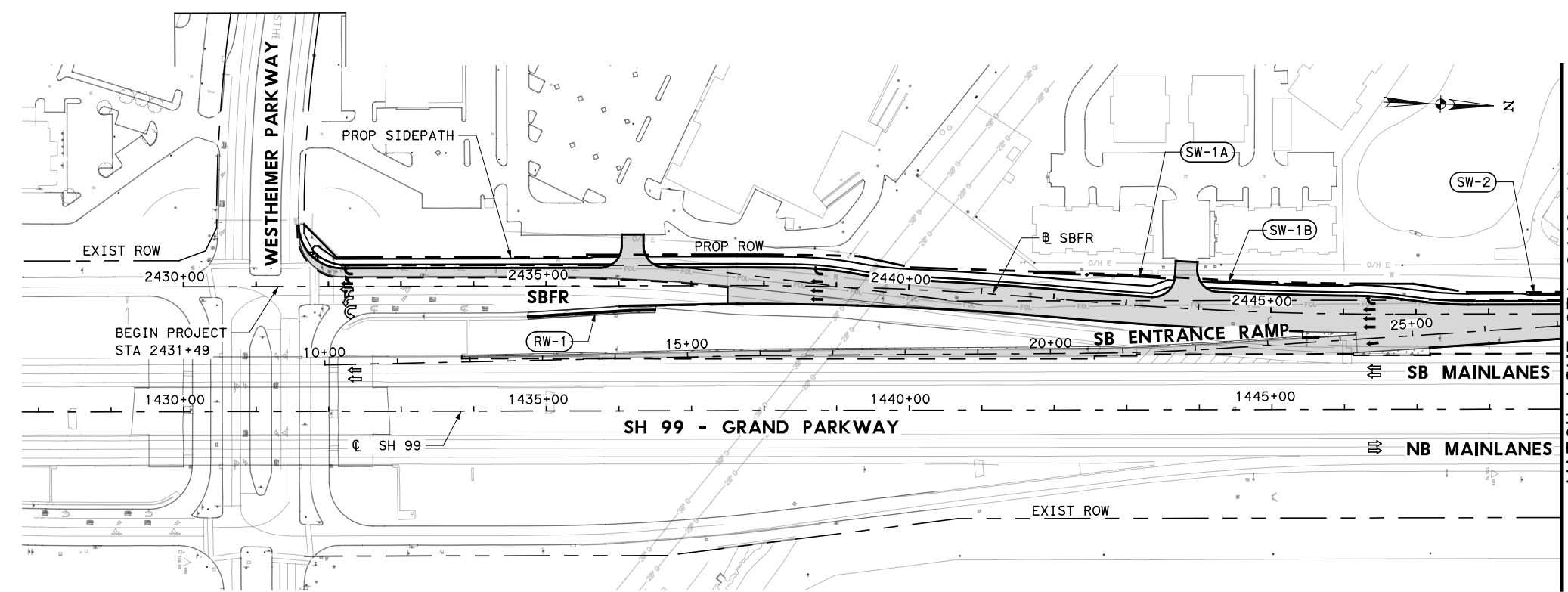
SHEET 2 OF 2

FED. RD. DIV. NO.	PROJECT NO.	HIGHWAY NO.	
6		SH 99	
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	3

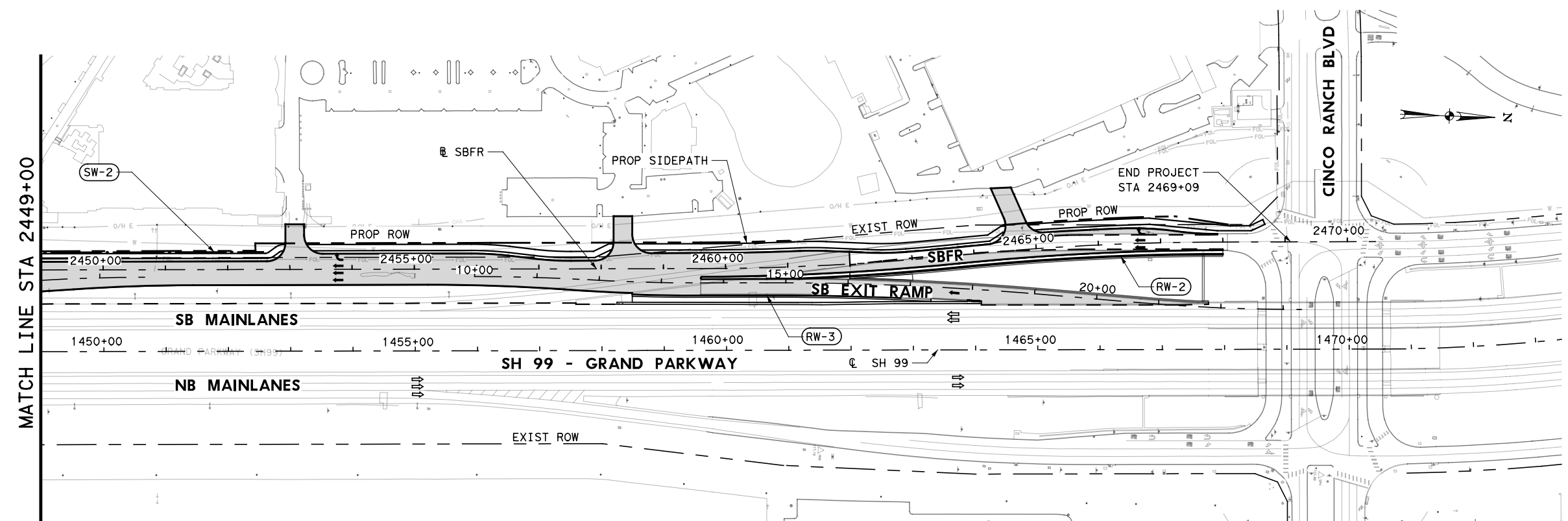
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LEGEND

-  PROPOSED CONCRETE PAVEMENT
-  PROPOSED RETAINING WALL
-  PROPOSED SOUNDWALL



MATCH LINE STA 2449+00



MATCH LINE STA 2449+00



**PAUL E. BRIGHT**  
61108  
REGISTERED PROFESSIONAL ENGINEER  
*Paul Bright*  
1/19/2023

**TEDSI INFRASTRUCTURE GROUP**  
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Texas Department of Transportation  
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SH 99  
SOUTHBOUND FRONTAGE ROAD  
WESTHEIMER PKWY TO CINCO RANCH BLVD  
PROJECT LAYOUT

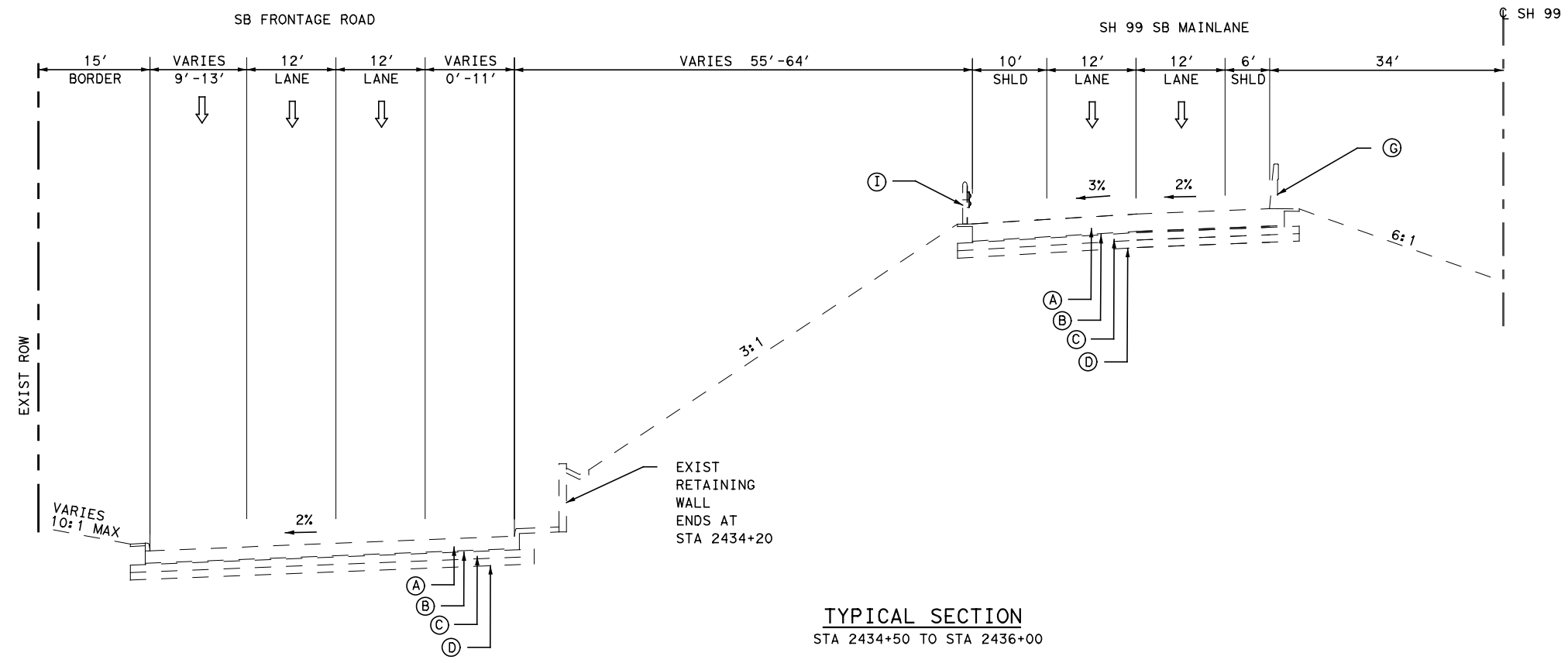
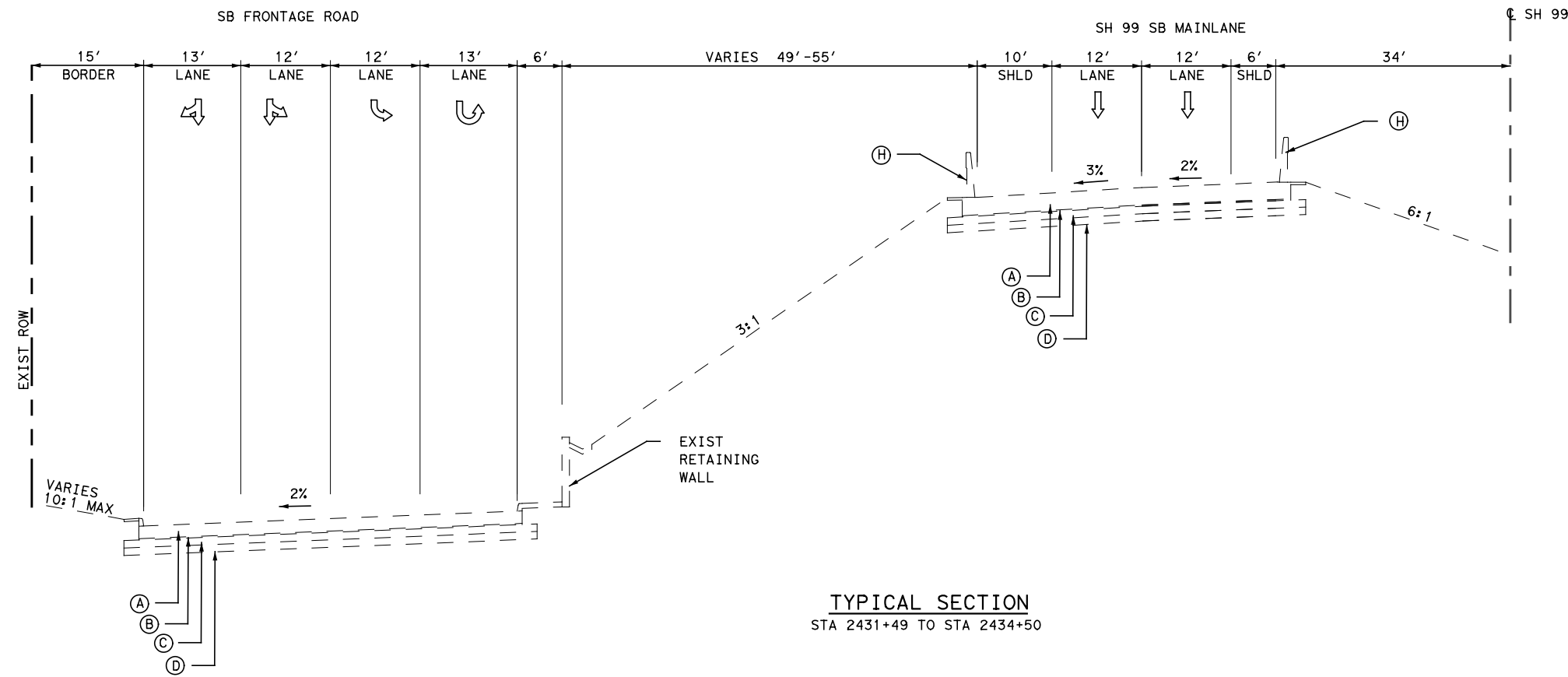
SHEET 1 OF 1

FED. RD. DIV. NO. 6	PROJECT NO.	HIGHWAY NO. SH 99
STATE TEXAS	DIST. HOU	COUNTY FORT BEND
CONT. 3510	SECT. 04	JOB 055
		SHEET NO. 4

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LEGEND

- ← DIRECTION OF TRAFFIC
- (A) 10" CONC PVMT (CRCP)
- (B) 1" ASPHALT BOND BREAKER
- (C) 6" CEMENT STABILIZED BASE
- (D) 6" LIME TREAT SUBGRADE
- (G) SSTR
- (H) SSTR (W/ SLOTS)
- (I) METAL BEAM GUARD FENCE



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Houston, Texas 77079  
(832) 619-1000  
TBPE F-1640

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**SH 99**  
**SOUTHBOUND FRONTAGE ROAD**  
**WESTHEIMER PKWY TO CINCO RANCH BLVD**

**EXISTING TYPICAL SECTIONS**

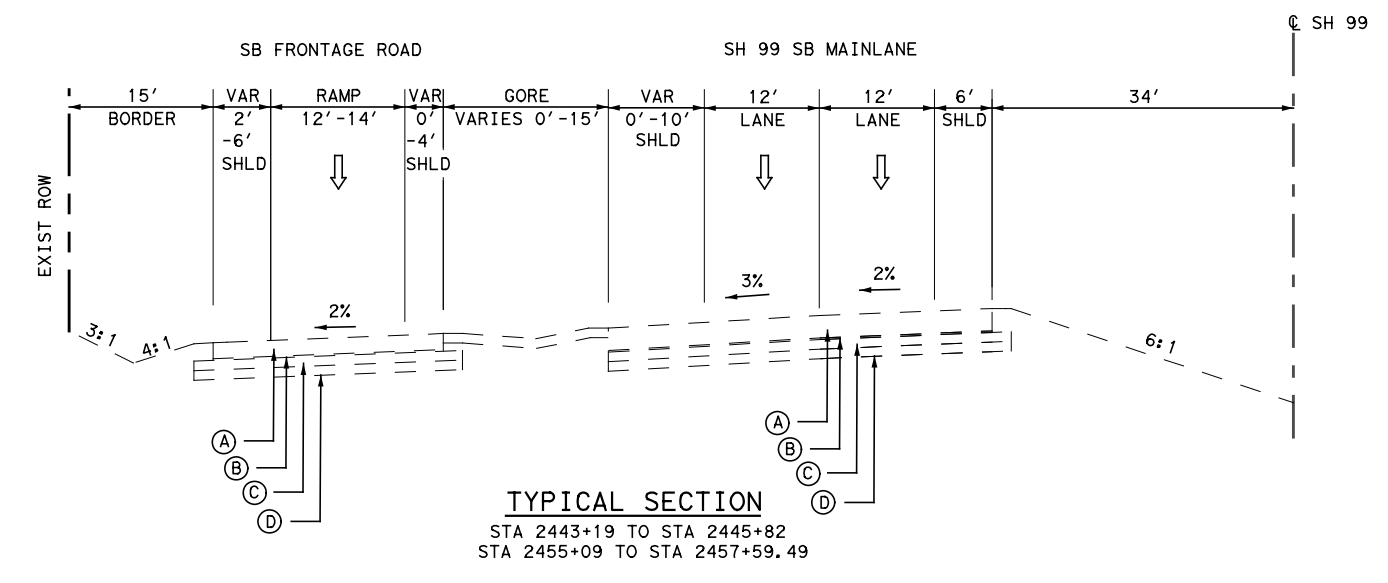
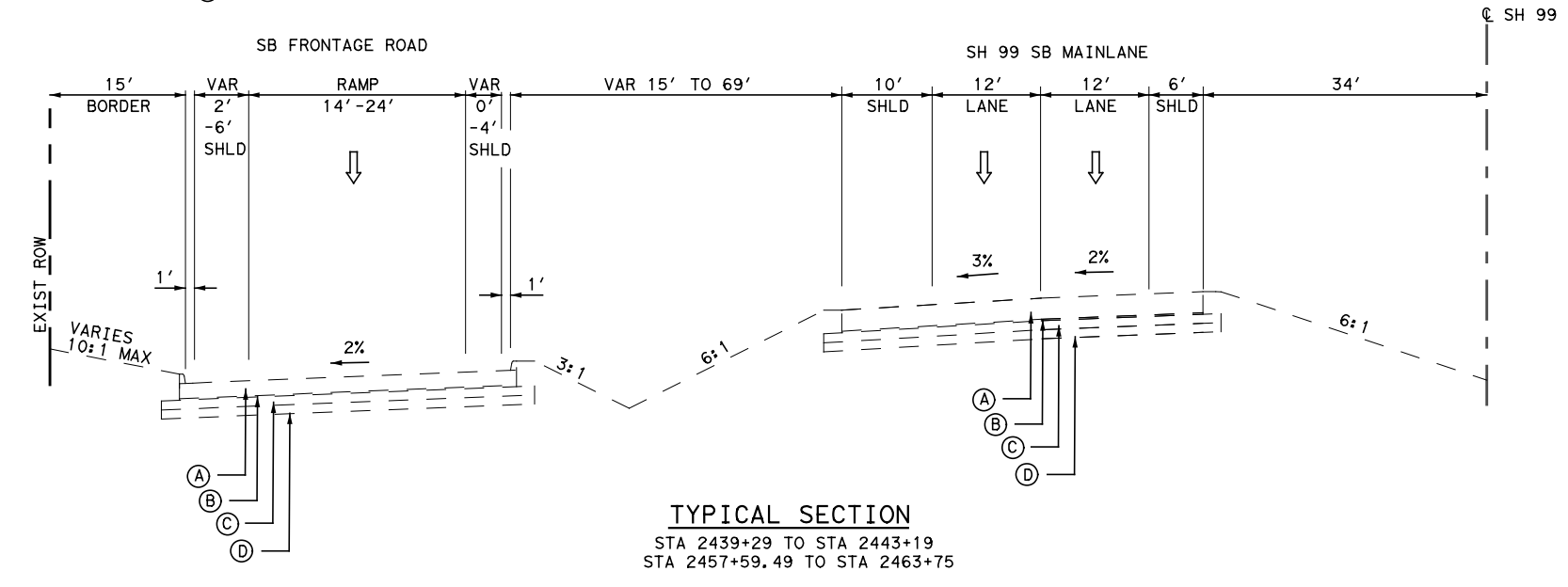
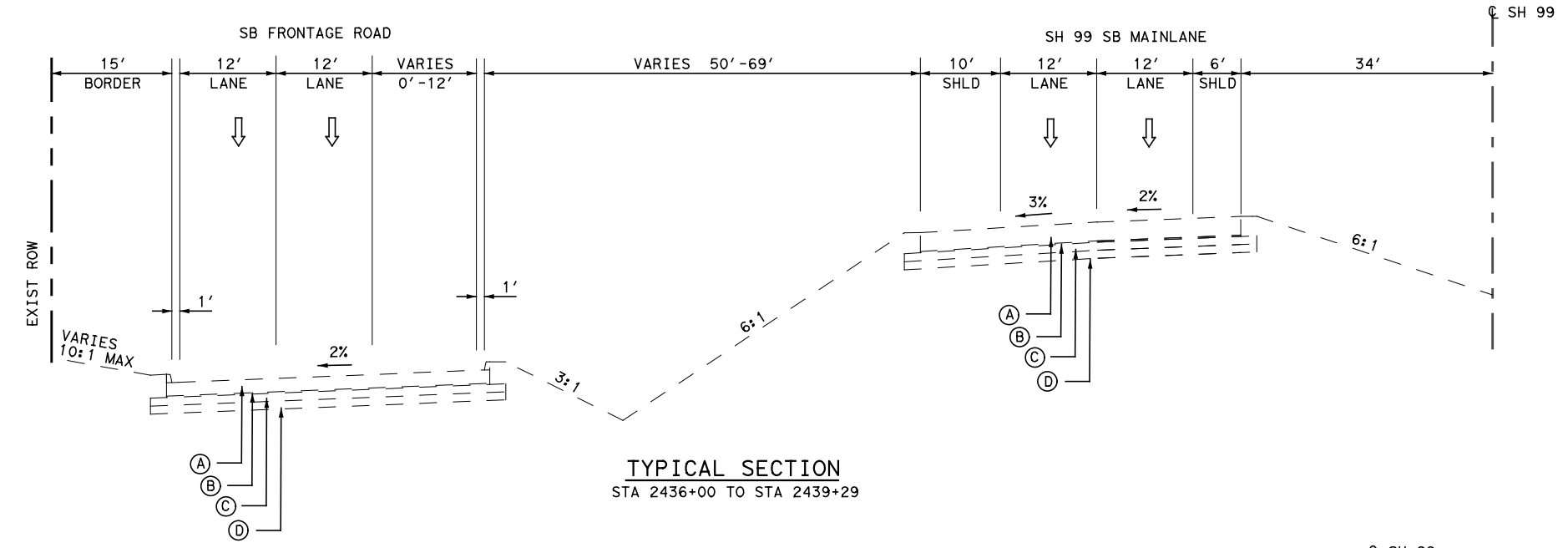
SHEET 1 OF 3

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	5

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**LEGEND**

- ← DIRECTION OF TRAFFIC
- (A) 10" CONC PVMT (CRCP)
- (B) 1" ASPHALT BOND BREAKER
- (C) 6" CEMENT STABILIZED BASE
- (D) 6" LIME TREAT SUBGRADE
- (G) SSTR
- (H) SSTR (W/ SLOTS)
- (I) METAL BEAM GUARD FENCE



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 (832) 619-1000  
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**SH 99**  
**SOUTHBOUND FRONTAGE ROAD**  
**WESTHEIMER PKWY TO CINCO RANCH BLVD**  
**EXISTING TYPICAL SECTIONS**

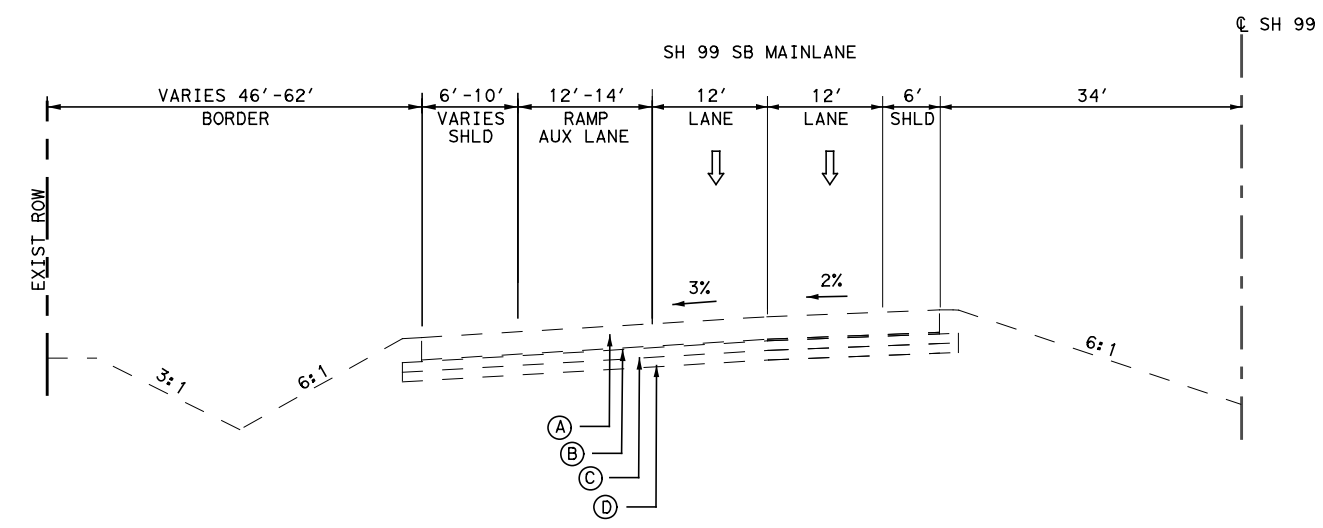
**SHEET 2 OF 3**

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
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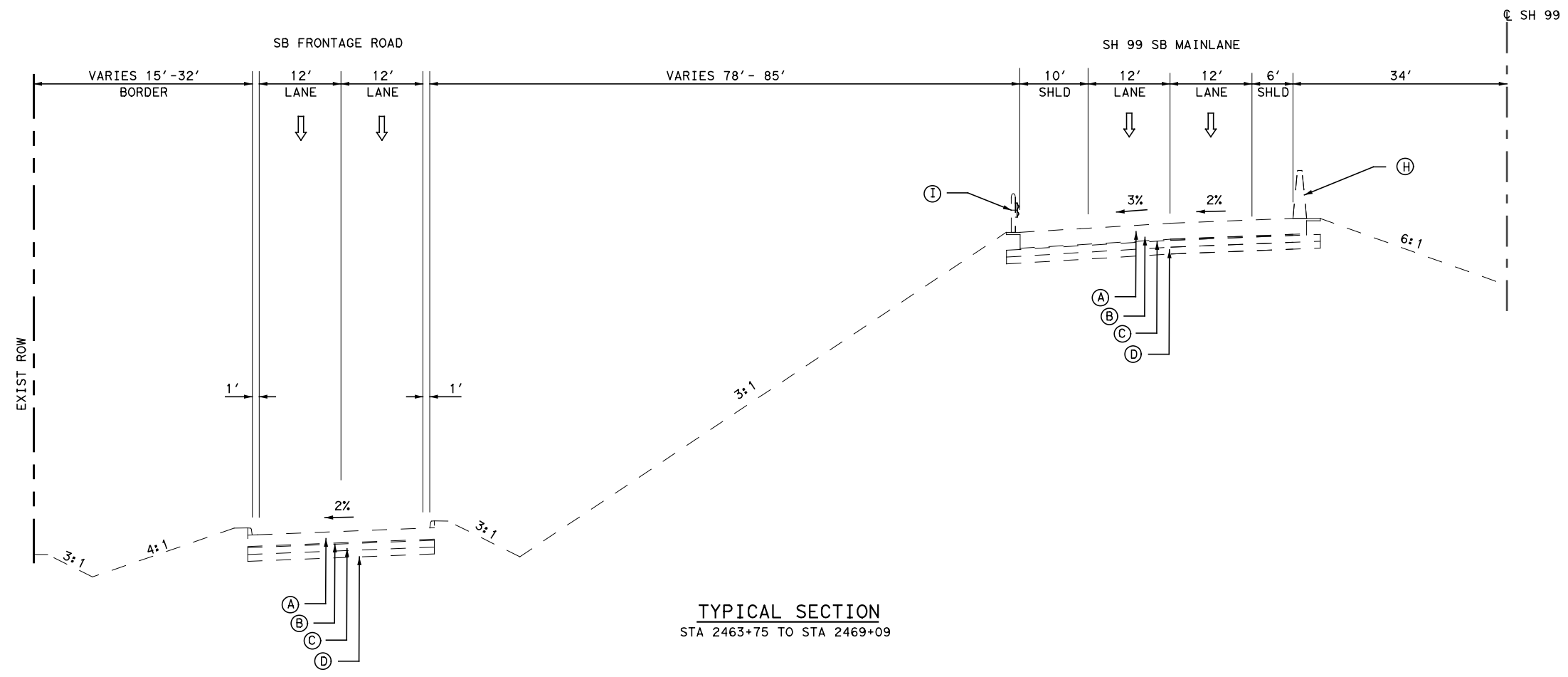
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**LEGEND**

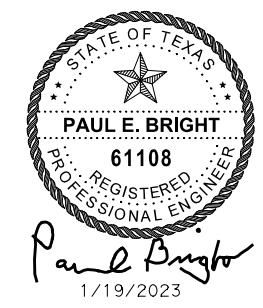
- ← DIRECTION OF TRAFFIC
- (A) 10" CONC PVMT (CRCP)
- (B) 1" ASPHALT BOND BREAKER
- (C) 6" CEMENT STABILIZED BASE
- (D) 6" LIME TREAT SUBGRADE
- (G) SSTR
- (H) SSTR (W/ SLOTS)
- (I) METAL BEAM GUARD FENCE



**TYPICAL SECTION**  
 STA 2445+82 TO 2455+09



**TYPICAL SECTION**  
 STA 2463+75 TO STA 2469+09

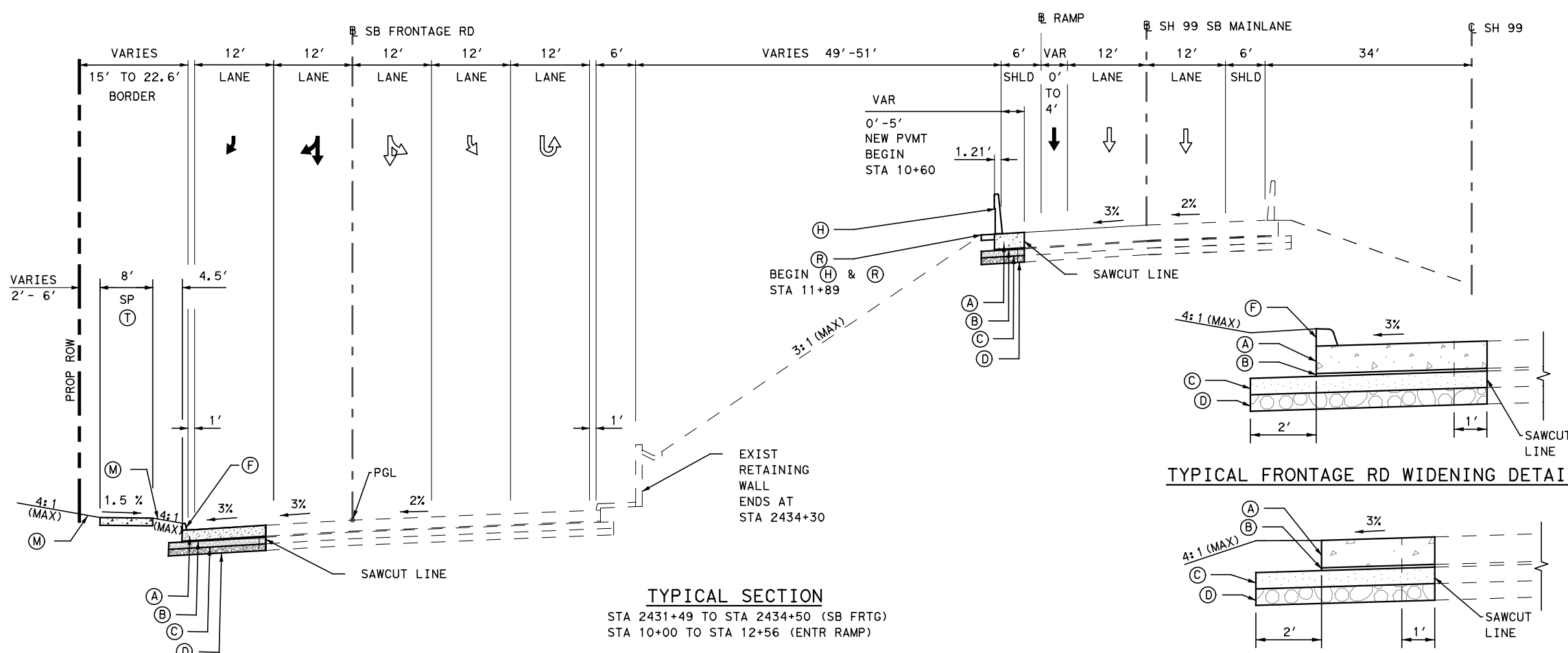


**SH 99**  
**SOUTHBOUND FRONTAGE ROAD**  
**WESTHEIMER PKWY TO CINCO RANCH BLVD**  
**EXISTING TYPICAL**  
**SECTIONS**

**SHEET 3 OF 3**

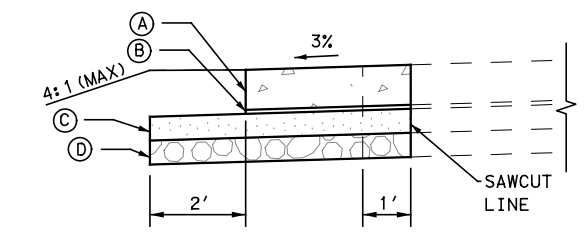
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6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	7

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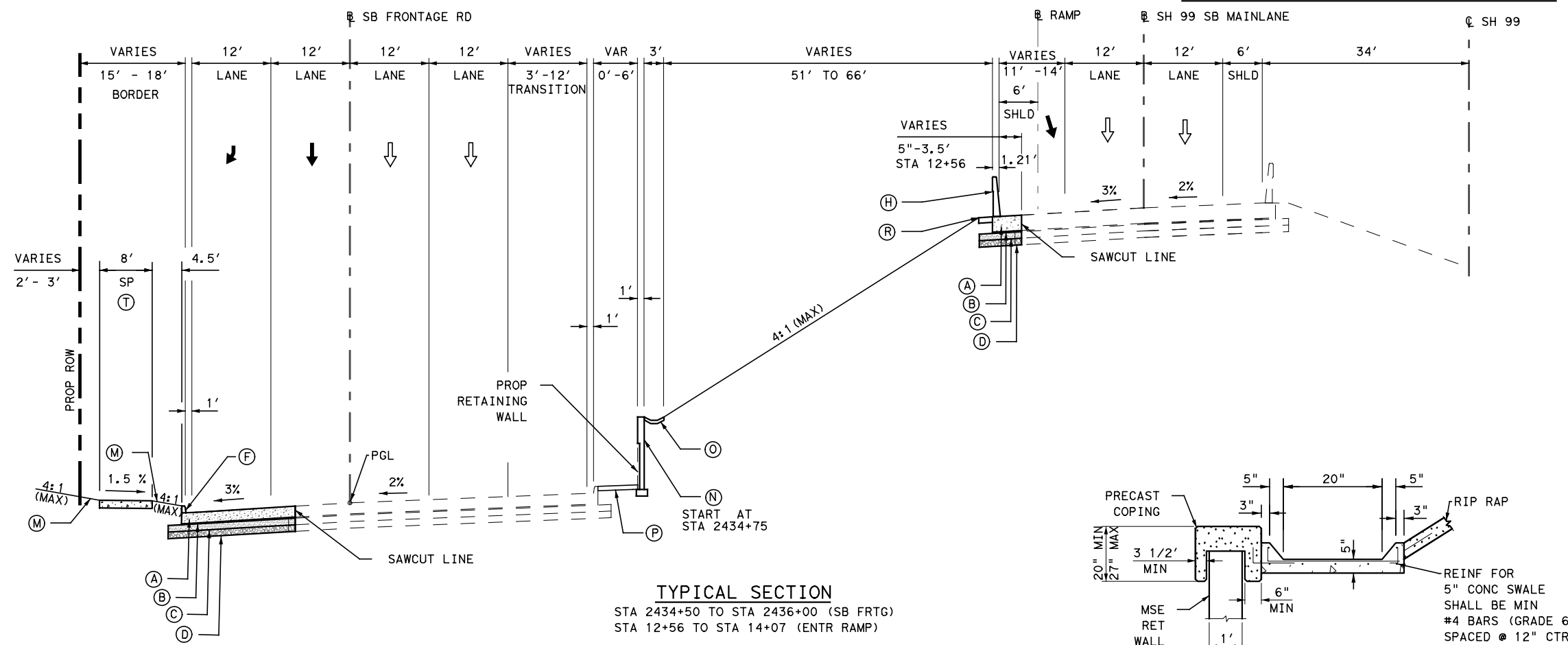


**TYPICAL SECTION**  
 STA 2431+49 TO STA 2434+50 (SB FRTG)  
 STA 10+00 TO STA 12+56 (ENTR RAMP)

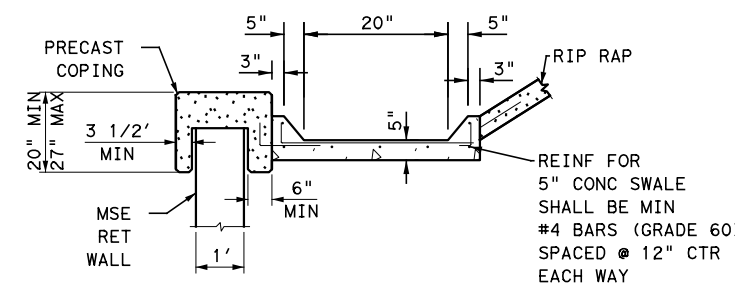
**TYPICAL FRONTAGE RD WIDENING DETAIL**



**TYPICAL MAINLANE WIDENING DETAIL**

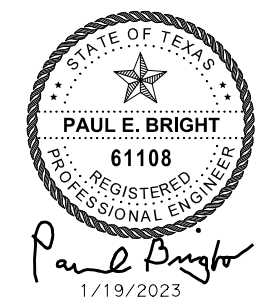


**TYPICAL SECTION**  
 STA 2434+50 TO STA 2436+00 (SB FRTG)  
 STA 12+56 TO STA 14+07 (ENTR RAMP)



**CONC SWALE DETAIL**

- LEGEND**
- EXIST ROW
  - PROPOSED ROW
  - ← EXIST TRAFFIC DIRECTION
  - ← PROPOSED TRAFFIC DIRECTION
  - (A) 10" CONC PVMT (CRCP)
  - (B) 1" ASPHALT BOND BREAKER
  - (C) 6" CEMENT STABILIZED BASE
  - (D) 6" LIME TREAT SUBGRADE
  - (E) 6" CONC CURB (DOWELED) (TY II)
  - (F) 6" CONC CURB (MONO) (TY II)
  - (G) SSTR
  - (H) SSTR (W/ SLOTS)
  - (I) METAL BEAM GUARD FENCE (MBGF)
  - (M) BLOCK SODDING
  - (N) MSE RETAINING WALL
  - (O) 3' WIDE X 5" THICK CONC SWALE
  - (P) CONC RIPRAP (5")
  - (R) 2' MOW STRIP (4" CONC)
  - (S) SOUND BARRIER
  - (T) SIDE PATH (SP) 8' OR 10' WIDE X 5" THICK



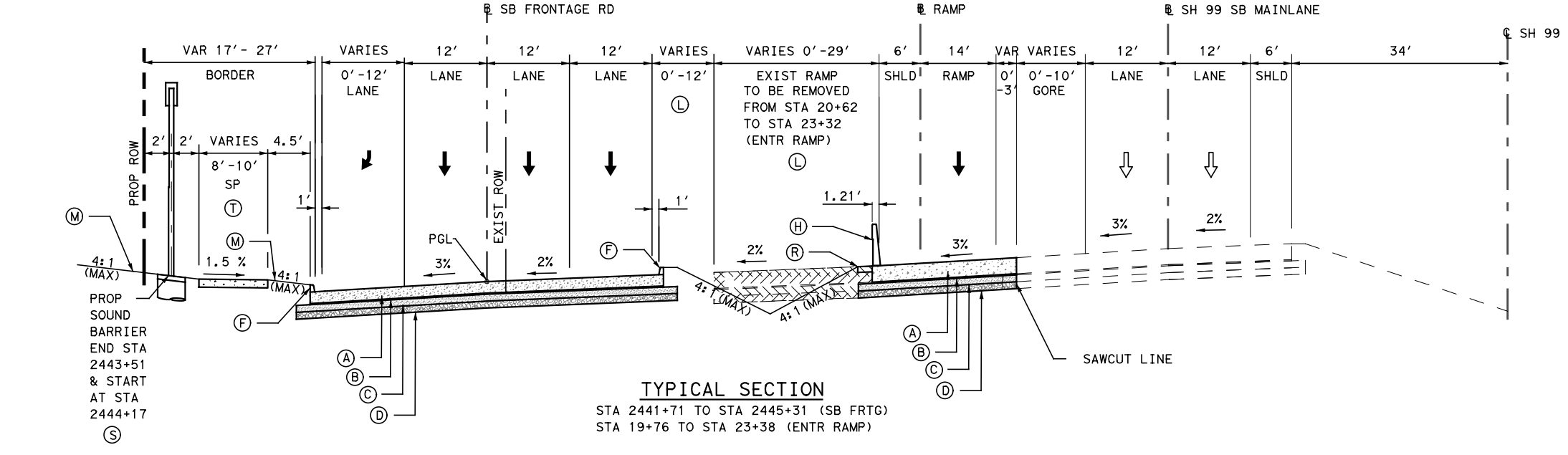
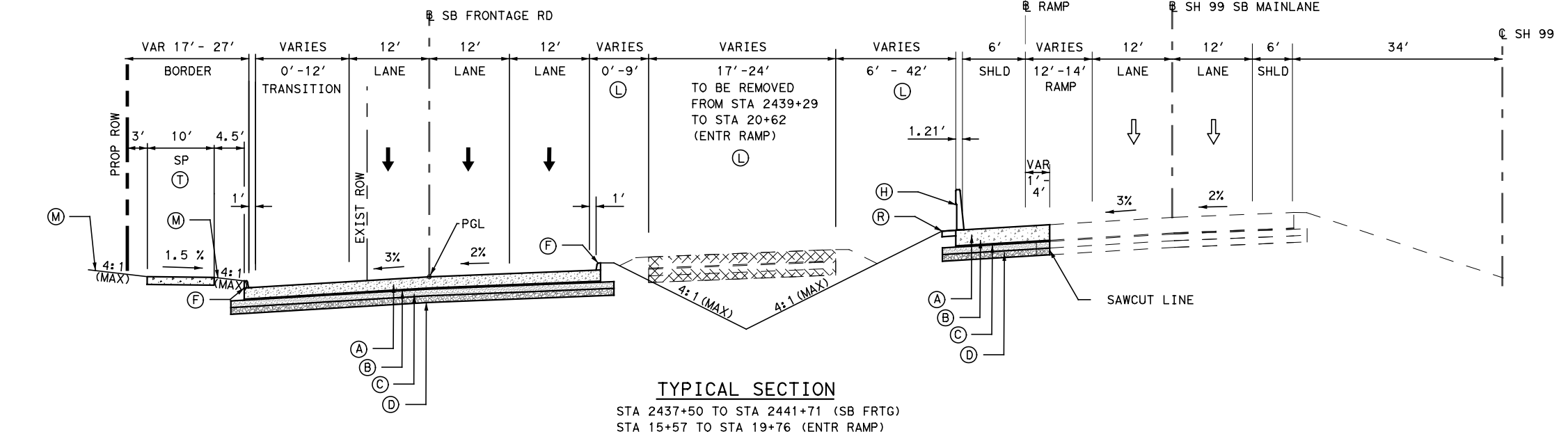
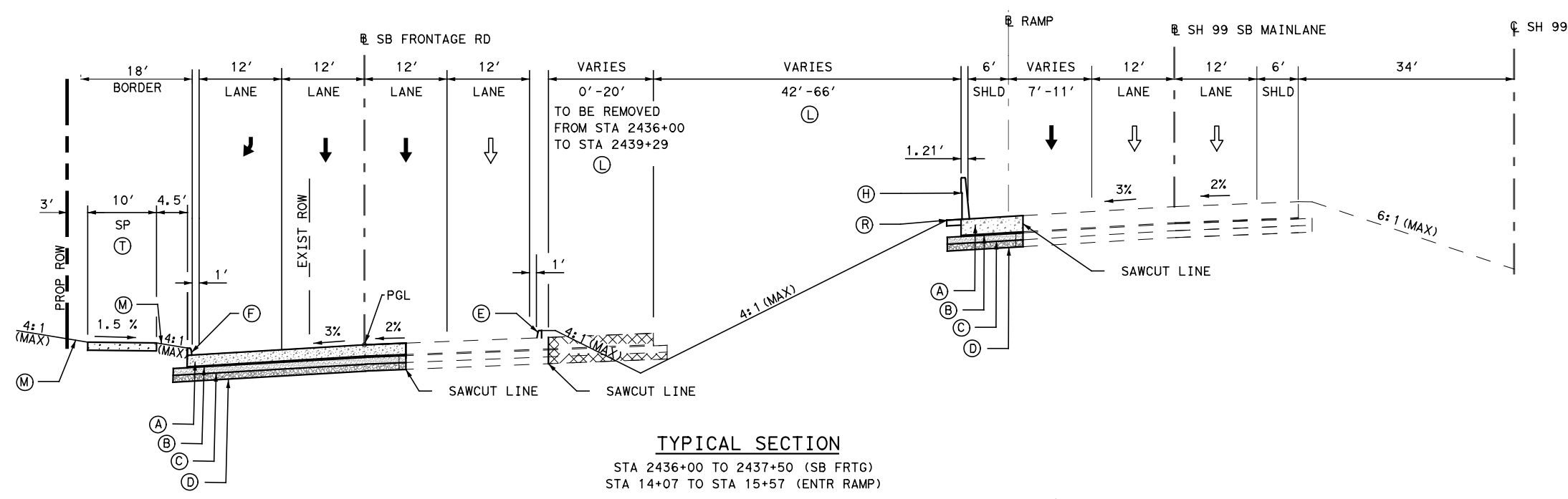
**SH 99**  
**SOUTHBOUND FRONTAGE ROAD**  
**WESTHEIMER PKWY TO CINCO RANCH BLVD**  
**PROP TYPICAL SECTIONS**

SHEET 1 OF 5

FED. RD. DIV. NO.	PROJECT NO.	HIGHWAY NO.	
6		SH 99	
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	8

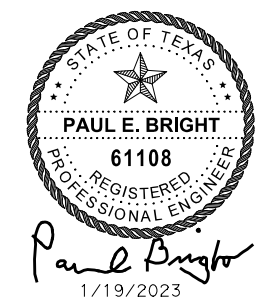


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**LEGEND**

- EXIST ROW
- PROPOSED ROW
- ← EXIST TRAFFIC DIRECTION
- ← PROPOSED TRAFFIC DIRECTION
- (A) 10" CONC PVMT (CRCP)
- (B) 1" ASPHALT BOND BREAKER
- (C) 6" CEMENT STABILIZED BASE
- (D) 6" LIME TREAT SUBGRADE
- (E) 6" CONC CURB (DOWELED) (TY II)
- (F) 6" CONC CURB (MONO) (TY II)
- (G) SSTR
- (H) SSTR (W/ SLOTS)
- (I) METAL BEAM GUARD FENCE (MBGF)
- (M) BLOCK SODDING
- (N) MSE RETAINING WALL
- (O) 3' WIDE x 5" THICK CONC SWALE
- (P) CONC RIPRAP (5")
- (R) 2' MOW STRIP (4" CONC)
- (S) SOUND BARRIER
- (T) SIDE PATH (SP) 8' OR 10' WIDE x 5" THICK



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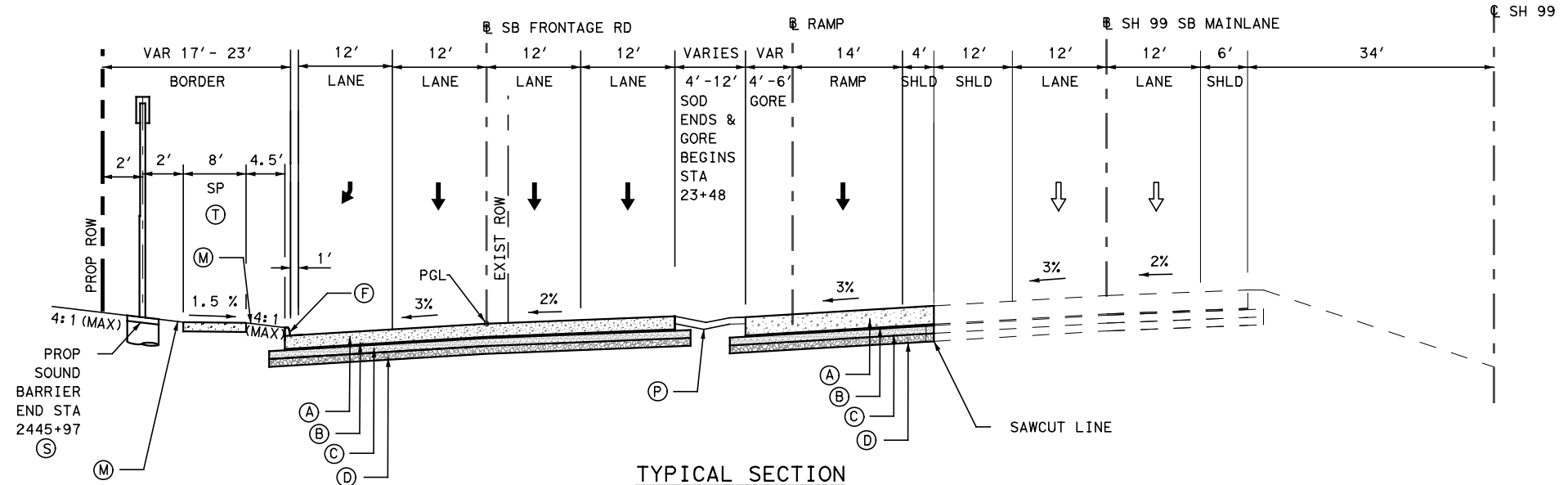


**SH 99**  
**SOUTHBOUND FRONTAGE ROAD**  
**WESTHEIMER PKWY TO CINCO RANCH BLVD**  
**PROP TYPICAL SECTIONS**

**SHEET 2 OF 5**

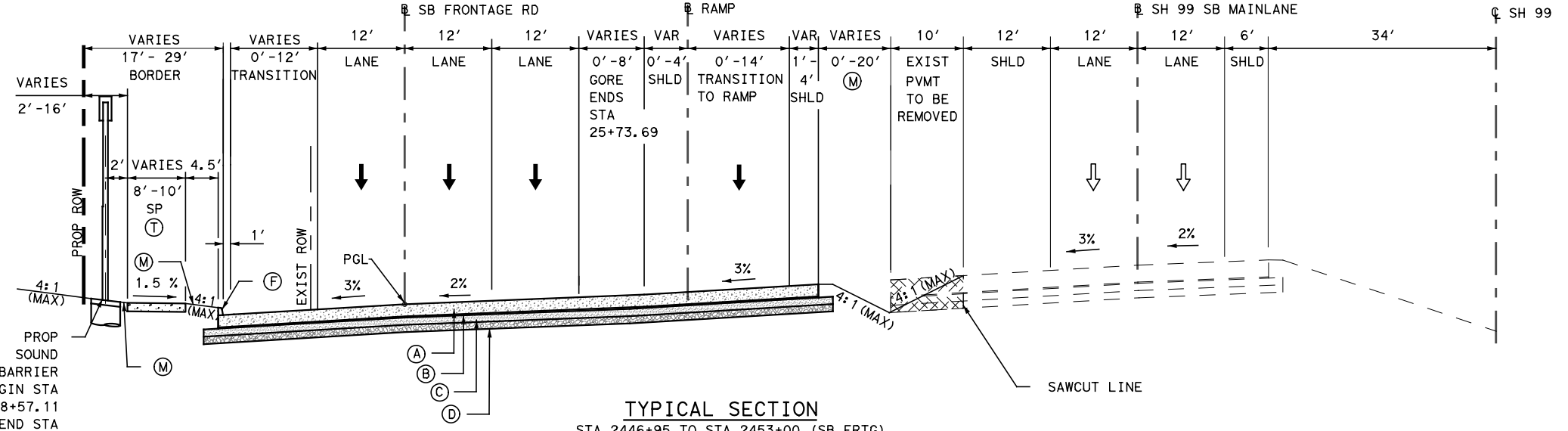
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STATE TEXAS	DIST. HOU	COUNTY FORT BEND
CONT. 3510	SECT. 04	JOB SHEET NO. 055 9

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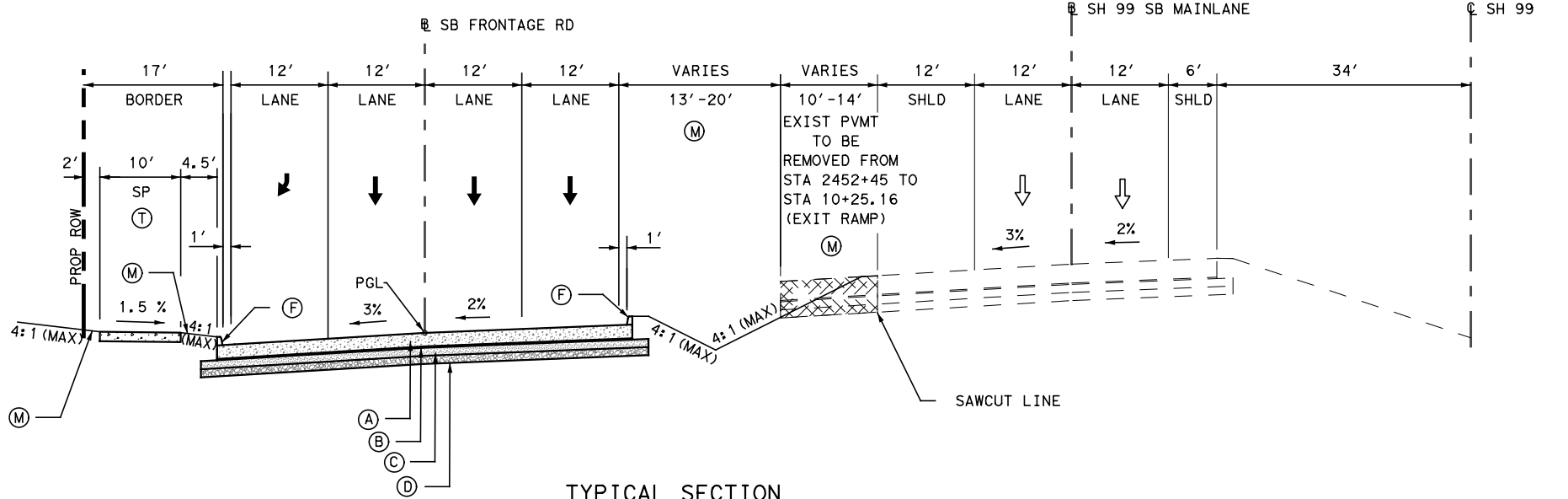
**TYPICAL SECTION**

STA 2445+31 TO STA 2446+95 (SB FRTG)  
STA 23+38 TO STA 25+01 (ENTR RAMP)



**TYPICAL SECTION**

STA 2446+95 TO STA 2453+00 (SB FRTG)  
STA 25+01 TO STA 28+72 (ENTR RAMP)

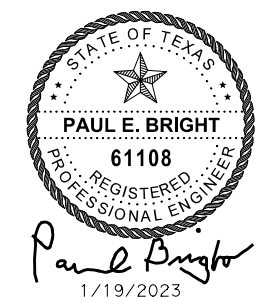


**TYPICAL SECTION**

STA 2453+00 TO STA 2456+22 (SB FRTG)  
STA 10+00 TO STA 10+25 (EXIT RAMP)

**LEGEND**

- EXIST ROW
- PROPOSED ROW
- ⇐ EXIST TRAFFIC DIRECTION
- ⇐ PROPOSED TRAFFIC DIRECTION
- (A) 10" CONC PVMT (CRCP)
- (B) 1" ASPHALT BOND BREAKER
- (C) 6" CEMENT STABILIZED BASE
- (D) 6" LIME TREAT SUBGRADE
- (E) 6" CONC CURB (DOWELED) (TY II)
- (F) 6" CONC CURB (MONO) (TY II)
- (G) SSTR
- (H) SSTR (W/ SLOTS)
- (I) METAL BEAM GUARD FENCE (MBGF)
- (M) BLOCK SODDING
- (N) MSE RETAINING WALL
- (O) 3' WIDE x 5" THICK CONC SWALE
- (P) CONC RIPRAP (5")
- (R) 2' MOW STRIP (4" CONC)
- (S) SOUND BARRIER
- (T) SIDE PATH (SP)  
8' OR 10' WIDE x 5" THICK



**TEDSI INFRASTRUCTURE GROUP**  
Consulting Engineers  
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Houston, Texas 77079  
(832) 619-1000



**SH 99**  
**SOUTHBOUND FRONTAGE ROAD**  
**WESTHEIMER PKWY TO CINCO RANCH BLVD**  
**PROP TYPICAL SECTIONS**

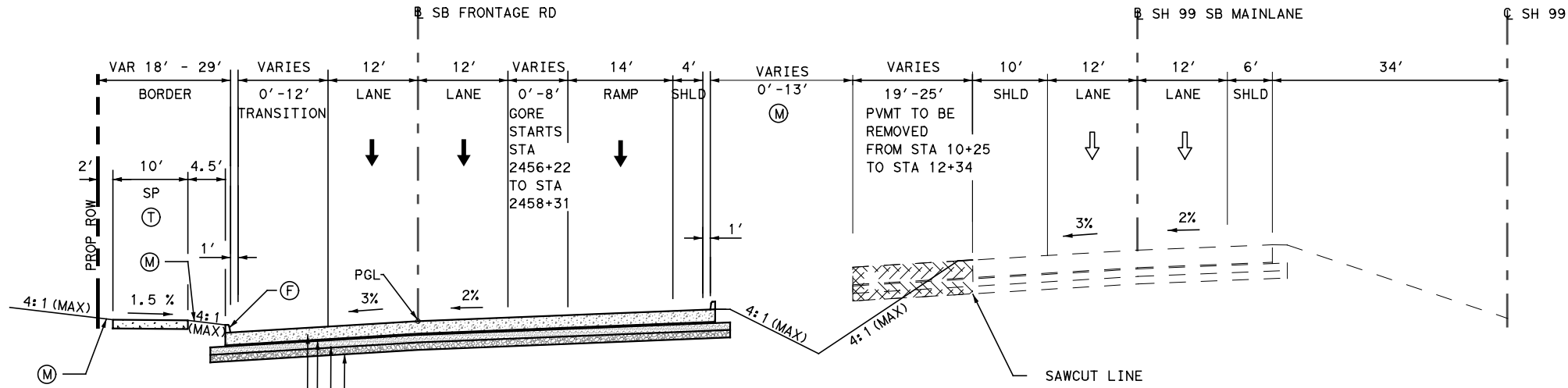
SHEET 3 OF 5

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	10

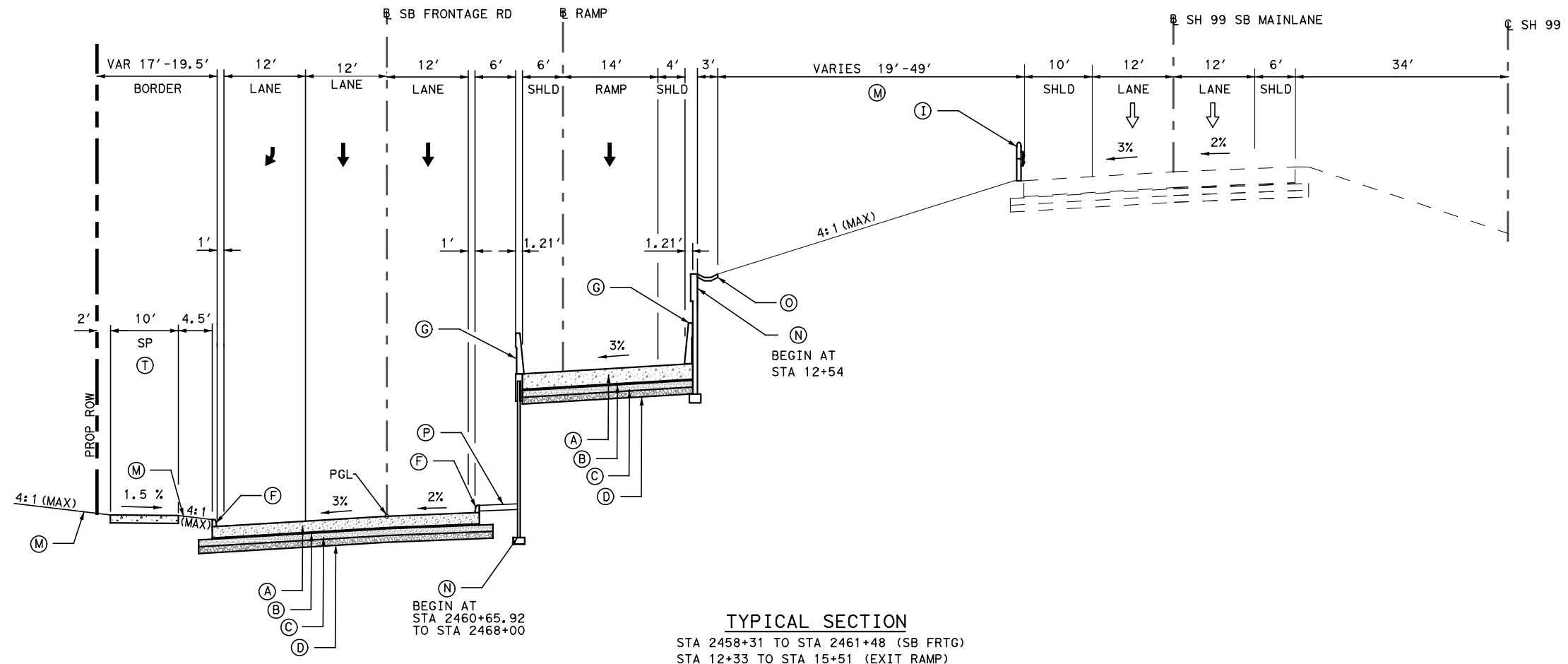
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**LEGEND**

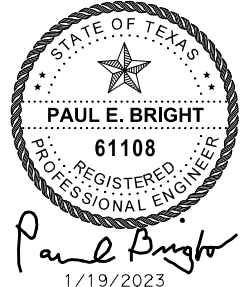
- EXIST ROW
- PROPOSED ROW
- ← EXIST TRAFFIC DIRECTION
- ← PROPOSED TRAFFIC DIRECTION
- (A) 10" CONC PVMT (CRCP)
- (B) 1" ASPHALT BOND BREAKER
- (C) 6" CEMENT STABILIZED BASE
- (D) 6" LIME TREAT SUBGRADE
- (E) 6" CONC CURB (DOWELED) (TY II)
- (F) 6" CONC CURB (MONO) (TY II)
- (G) SSTR
- (H) SSTR (W/ SLOTS)
- (I) METAL BEAM GUARD FENCE (MBGF)
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- (N) MSE RETAINING WALL
- (O) 3' WIDE x 5" THICK CONC SWALE
- (P) CONC RIPRAP (5")
- (R) 2' MOW STRIP (4" CONC)
- (S) SOUND BARRIER
- (T) SIDE PATH (SP)  
8' OR 10' WIDE x 5" THICK



**TYPICAL SECTION**  
 STA 2456+22 TO STA 2458+31 (SB FRTG)  
 STA 10+25 TO STA 12+33.3 (EXIT RAMP)



**TYPICAL SECTION**  
 STA 2458+31 TO STA 2461+48 (SB FRTG)  
 STA 12+33 TO STA 15+51 (EXIT RAMP)



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**SH 99**  
**SOUTHBOUND FRONTAGE ROAD**  
**WESTHEIMER PKWY TO CINCO RANCH BLVD**  
**PROP TYPICAL SECTIONS**

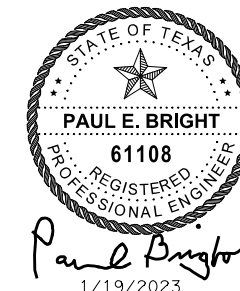
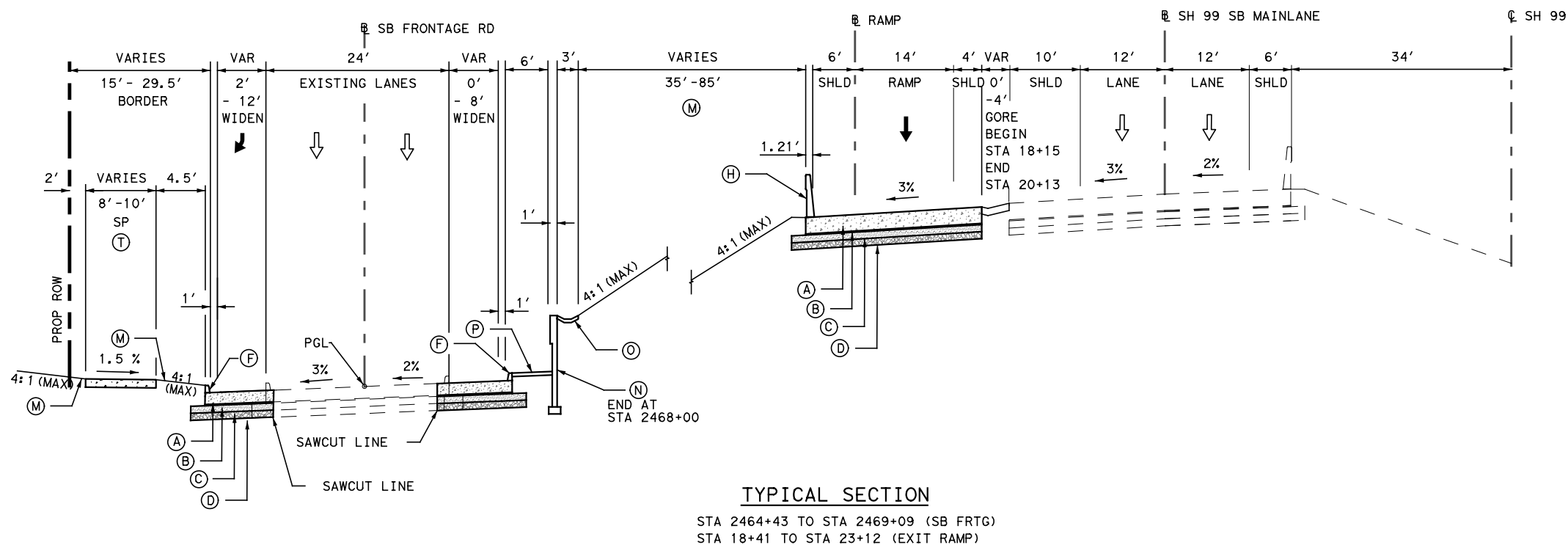
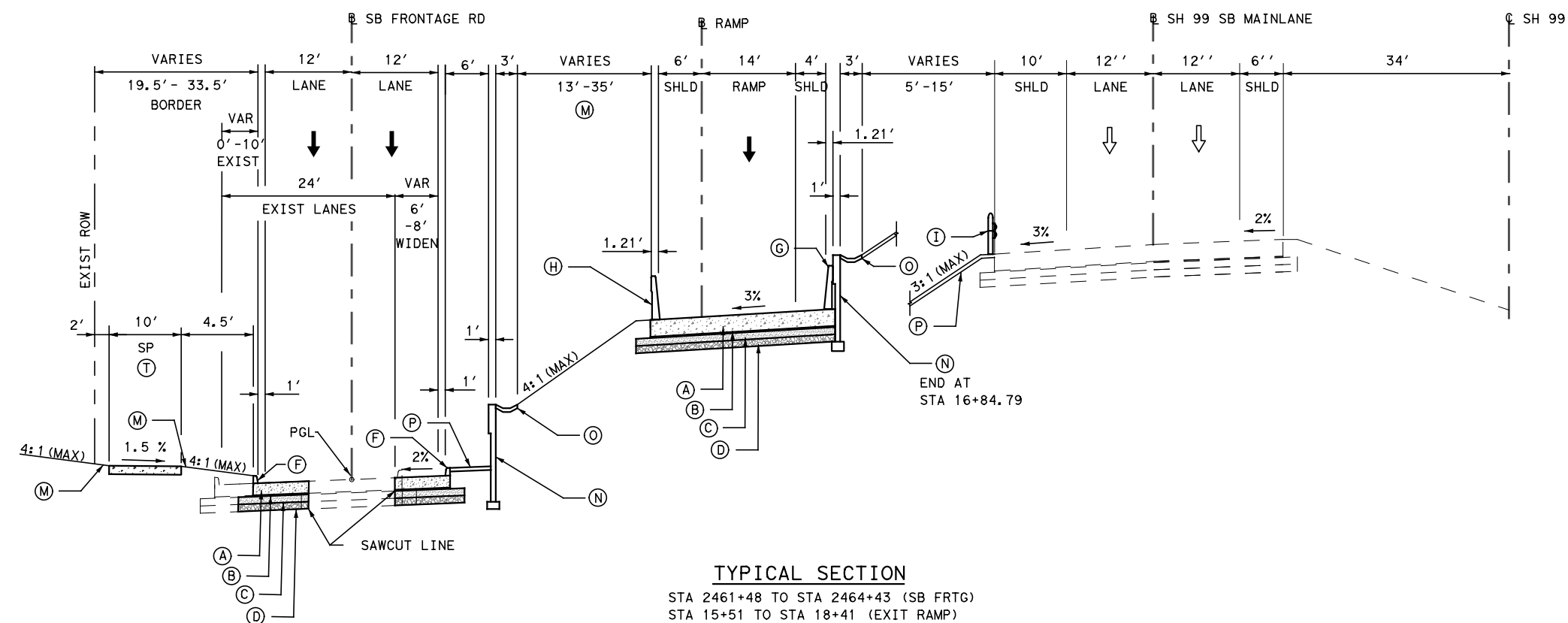
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FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	11

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LEGEND

- EXIST ROW
- PROPOSED ROW
- ← EXIST TRAFFIC DIRECTION
- PROPOSED TRAFFIC DIRECTION
- (A) 10" CONC PVMT (CRCP)
- (B) 1" ASPHALT BOND BREAKER
- (C) 6" CEMENT STABILIZED BASE
- (D) 6" LIME TREAT SUBGRADE
- (E) 6" CONC CURB (DOWELED) (TY II)
- (F) 6" CONC CURB (MONO) (TY II)
- (G) SSTR
- (H) SSTR (W/ SLOTS)
- (I) METAL BEAM GUARD FENCE (MBGF)
- (M) BLOCK SODDING
- (N) MSE RETAINING WALL
- (O) 3' WIDE X 5" THICK CONC SWALE
- (P) CONC RIPRAP (5")
- (R) 2' MOW STRIP (4" CONC)
- (S) SOUND BARRIER
- (T) SIDE PATH (SP)  
8' OR 10' WIDE X 5" THICK



**SH 99**  
**SOUTHBOUND FRONTAGE ROAD**  
**WESTHEIMER PKWY TO CINCO RANCH BLVD**  
**PROP TYPICAL SECTIONS**  
**SHEET 5 OF 5**

FED. RD. DIV. NO.		PROJECT NO.	HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	12

County: Fort Bend County

Control: 3510-04-055

Highway: SH 99

**General Notes:**

**General:**

Area Engineer contact information for this project follows:

-  
Area Engineer: Carlos M. Zepeda, P.E. ([Carlos.Zepeda@txdot.gov](mailto:Carlos.Zepeda@txdot.gov))  
Assistant Area Engineer: Daniel Dvorak, P.E. ([Daniel.Dvorak@txdot.gov](mailto:Daniel.Dvorak@txdot.gov))

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

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

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

All relevant project documentation, including Contract Time Determinations and cross-sections will continue to be provided on the following FTP site:

[Index of /pub/txdot-info/Pre-Letting Responses/Houston District \(state.tx.us\)](https://pub.txdot-info/Pre-Letting%20Responses/Houston%20District) or

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

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.

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.

The following standard detail sheets are modified:

**Modified Standards**

MISCELLANEOUS DRAINAGE DETAILS INLETS TY C1 & TY C2  
(MOD)

County: Fort Bend County

Control: 3510-04-055

Highway: SH 99

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 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.

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.

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

County: Fort Bend County

Control: 3510-04-055

Highway: SH 99

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

**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.

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/mpl/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.

**General: Site Management**

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

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

County: Fort Bend County

Control: 3510-04-055

Highway: SH 99

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

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

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

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

**Tricycle Type**

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.

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

**General: Utilities**

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

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

Be aware that an operational Computerized Transportation Management System (CTMS) exists within the limits of this project and that the system must remain operational throughout construction. If the Contractor damages or causes damage to this system, repair such damage within 8 hours of occurrence at no cost to the Department. In the event of system damage, notify the Director of Traffic Management Systems at 713-881-3283 within one hour of occurrence. Failure of the Contractor to repair damage to the main fiber optic cable and CCTV cable trunk lines, which convey all corridor information to TranStar, will result in the Contractor being billed for the full cost of emergency repairs.

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](mailto: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.

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

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

**Item 5: Control of Work**

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

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

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

Submit shop drawings electronically for the fabrication of items as documented in Table 1 or 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](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

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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

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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 <a href="mailto:paul.bright@tedsi.com">paul.bright@tedsi.com</a>

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.



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

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

Document both the Project Specific Locations (PSL) and their authorization.

Maintain copies for review by the Department or any regulatory agency. When an area within the project limits has been evaluated by the USACE as part of the permit process for this project:

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

**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 12.6 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

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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.

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

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

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

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

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

No significant traffic generator events have been identified.

**Item 8: Prosecution and Progress**

The 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 [*6-day*] workweek in accordance with Section 8.3.1.2.

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

**Item 100: Preparing Right of Way**

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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.

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

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

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

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

**Item 104: Removing Concrete**

**Item 105: Removing Treated and Untreated Base and Asphalt Pavement**

**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.

Store the treated material salvaged from this project at the project sites designated by the Engineer.

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

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."

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**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.

The total excavation quantity shown on the plans includes the quantity for excavating to 2 ft. behind the back of the proposed curb.

**Item 132: Embankment**

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

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

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

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.

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

**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 161: Compost**

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**Item 162: Sodding for Erosion Control**

**Item 164: Seeding for Erosion Control**

**Item 166: Fertilizer**

**Item 168: Vegetative Watering**

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

**Item 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 263: Lime Treatment (Plant-Mixed)**

Use the asphalt material (PCE) to cure the entire finished lime treatment.

**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.

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

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

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

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

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

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

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

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

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

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

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

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

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

If using salvaged existing base and asphalt concrete pavement as described above, size it so that all the material, except the existing individual aggregate, passes the 2-in. sieve and is of a gradation that allows satisfactory compaction. Provide salvaged material that does not contain deleterious material such as clay or organic material. Provide material passing the No. 40 sieve, defined as soil binder, with a maximum Plasticity Index of 10 and a maximum Liquid Limit of 35 when tested in accordance with test method TEX-106-E.

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

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

**Item 292: Asphalt Treatment (Plant-Mixed)**

**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 292: Asphalt Treatment (Plant-Mixed)**

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

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

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

Furnish the mix designs for approval.

Meet the following grading requirements:

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

Physical requirements are as follows:

Maximum Plasticity Index (PI) = 8

Maximum Liquid Limit (LL) = 35

Maximum Wet Ball Mill = 50 (crushed stone)

Maximum LA Abrasion = 50 (iron ore)

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

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

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

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

**Item 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.

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

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

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

Do not use limestone dust of fracture as fine aggregate.

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.

Slip form paving is required for this project.

**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.

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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.

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**

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 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.

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**

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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**

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/highway/bridge/approved-systems/mechanically-stabilized-earth.html>

**Item 427: Surface Finishes for Concrete**

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

**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, 0z/Gedney Stl, or Thomas & Betts Kopr-Shield).

**Item 462: Concrete Box Culverts and Drains**

**Item 464: Reinforced Concrete Pipe**

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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.

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.

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Do not leave excavations or trenches open overnight.

**Items 496: Removing Structures**

**Items 497: Sale of Salvageable Material**

**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.

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.

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

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

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

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

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

**One Lane Closure**

Day	Daytime Closure Hours	Nighttime Closure Hours	Restricted Hours Subject to Lane Assessment Fee
Monday	Not Permitted	8:00 PM - 5:00 AM	5:00 AM - 8:00 PM
Tuesday	Not Permitted	8:00 PM - 5:00 AM	5:00 AM - 8:00 PM
Wednesday	Not Permitted	8:00 PM - 5:00 AM	5:00 AM - 8:00 PM
Thursday	Not Permitted	8:00 PM - 5:00 AM	5:00 AM - 8:00 PM
Friday	Not Permitted	8:00 PM - 5:00 AM	5:00 AM - 8:00 PM
Saturday	Not Permitted	8:00 PM - 5:00 AM	5:00 AM - 8:00 PM
Sunday *	Not Permitted*	Not Permitted	Not Permitted

\* Work on Sundays requires written permission from the Area Engineer. Area Engineer may allow Sunday night time closure.

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

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

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

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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](mailto: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://d2dtl5nmlpf0r.cloudfront.net/tti.tamu.edu/documents/0-6782-2.pdf>

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



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Engineer may choose to use existing bid items if it does not slow the implementation of enhancement.

**Item 506: Temporary Erosion, Sedimentation and Environmental Controls**

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

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

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

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

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

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

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

**Item 512: Portable Traffic Barrier**

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

Where required by the Engineer, provide anchor pins for Type 2 Low Profile Concrete Barriers (LPCB) as shown on the current LPCB standard. Anchor pins are subsidiary to the Low Profile Concrete 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 Low Profile Concrete Barriers (LPCB) used for traffic handling, to the Department's stockpile located on the north side of IH 610 at Long Drive. After

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completing the project, return the associated LPCB connecting hardware to the area office or as directed.

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.

**Item 540: Metal Beam Guard Fence**

Painting the timber posts is not required.

Use timber posts for galvanized steel metal beam guard fence, except for anchorage at turned down ends.

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Furnish and install wood blocks between the rail elements and the timber posts as detailed on the plans. These block-outs are subsidiary to this bid Item.

The quantity of the metal beam guard fence is subject to change.

Provide a mow strip as shown on the plans, at metal beam guard fence locations, including any guardrail end treatments.

Galvanize the rail elements supplied for this project by using a Type II Zinc Coating.

At locations requiring attachment of Metal Beam Guard Fence (MBGF) to concrete railing or concrete traffic barrier, repair and fill any existing holes in the railing or barrier that are not in the correct location for attaching the new MBGF. Perform this work in accordance with the Item, "Concrete Structure Repair." Existing anchor bolt holes that cannot be utilized must be filled with an epoxy grout before drilling new holes. Then core-drill new holes in the correct locations and repair any resulting spalls at no expense to the Department. This work is considered subsidiary to the MBGF transition section (Item 540).

**Item 542: Removing Metal Beam Guard Fence**

Remove and assume ownership of unsalvageable metal beam guard fence rail elements and posts. Transport and store any functional, salvageable rail elements, including steel posts, which are not reused in this project, to the Department's stockpile located at XXXXXXXX.

Replace removed wood posts which are unusable because of damage by the Contractor, at no expense to the Department.

**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

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Square Sieve	Percent Retained
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 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 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](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.

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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 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.

**Item 618: Conduit**

**Item 620: Electrical Conductors**

**Item 628: Electrical Services**

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

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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 as shown on standar sheet ED(4)-14. 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."

**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).

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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.

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.

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**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.

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

Assume ownership of the removed existing signs.

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 650: Overhead Sign Supports**

Stencil the structure numbers on the new structures for permanent identification.

If sign panels mounted on an overhead sign support face the same direction of traffic, keep the bottoms of the sign panels in the same horizontal plane, unless otherwise shown in the plans.

There is no additional reimbursement for blocking or shims for fits of alignment.

Mill test reports are not required for the walkway, grating, miscellaneous secondary structural items, or hardware.

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Use the existing panel supports if removing existing guide signs and if placing new panels of different sizes at the same location. Extend the supports, if needed. If the supports extend over the top of the panel, cut off the supports at the top of the panel or the top of the truss, whichever is higher.

Before fabricating, field check the sign structure elevations, details, and dimensions shown on the plans.

If sign lighting and walkways are not used, trim the sign support brackets flush with the bottoms of the signs.

Assume ownership of removed existing overhead sign supports and other removed materials.

**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.

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 6019: Longitudinal Prefabricated Pavement Markings (PPM) with Warranty**

**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.

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.

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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 682: Vehicle and Pedestrian Signal Heads**

Install two set screws on vehicle signal head mounting hardware fittings.

Furnish black housings for vehicle and pedestrian signals. Furnish black vehicle signal head back plates with 2 in. retroreflective yellow borders.

Furnish black housings for vehicle and pedestrian signals. Ensure the door and visor match the mast arm and pedestrian pole color. Furnish black vehicle signal head back plates with 2 in. retroreflective yellow borders.

**Item 687: Pedestal Pole Assemblies**

Furnish black powder coated traffic signal poles. Apply powder coated finish over the galvanized surface. Prepare galvanized surfaces for powder coating in accordance with the powder coating manufacturer's recommendations. Do not water-quench or chromate-quench galvanized surfaces to be powder coated. After preparing galvanized surfaces, powder coat with a minimum of 2.0 mils dry film thickness (DFT) of urethane powder or triglycidyl isocyanurate (TGIC) polyester powder. Provide powder coat adhesion meeting the 5A or 5B classifications of ASTM D3359. Ensure powder coating is uniform in appearance and free of scratches.

**Item 688: Pedestrian Detectors and Vehicle Loop Detectors**

Provide pedestrian push buttons a minimum of 2 in. diameter in the smallest dimension.

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Install a rubber grommet or bushing between the push button assembly and the signal pole to protect the conductors.

Provide a black tube loop detector wire as specified in the "International Municipal Signal Association, Inc." (IMSA) Specifications.

At intersections where a minimum of 10 ft. spacing between adjacent accessible pedestrian signal units is not possible, provide each accessible pedestrian pushbutton with the following features: a pushbutton locator tone, a tactile arrow, a speech walk message for the walking person indication and a speech pushbutton information message.

Provide pedestrian push buttons a minimum of 2 in. diameter in the smallest dimension.

Install a rubber grommet or bushing between the push button assembly and the signal pole to protect the conductors.

**Item 3000: Crack Attenuating Mixture**

In areas where the International Roughness Index (IRI) data indicate a need for improvement to the ride quality of the roadway, the average thickness may vary in excess of 1 in. thick.

**Item 3076: Dense-Graded Hot Mix Asphalt**

Taper the asphalt concrete pavement at the beginning and ending points.

Use a maximum 6H:1V slope for the asphalt concrete pavement edge.

Where the 6H:1V ACP edge taper extends over onto the unsurfaced shoulders, blade off the loose existing shoulder material to provide a solid base for the outside taper edge. After placing the ACP overlay, blade this material back against the edge taper. This work is subsidiary to the various bid items.

The stockpile will be the point of sampling of coarse aggregate for test method TEX-217-F (Part II, decantation).

Place the asphalt concrete pavement in courses as shown on the typical sections.

Do not use petroleum-based solvents in the beds of hot mix asphalt delivery vehicles.

Dilution of tack coat is not allowed.

Do not use Surface Aggregate Classification (SAC) C for this project.

For determining the Asphalt Content, only ignition ovens will be allowed.

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The tack coat rate shown on the “Basis of Estimate” is an average rate for calculating tack coat quantities. Vary the rate based on the pavement conditions and other factors such as manufacturer’s recommendations and weather.

**Item 6053: Shifting or Removing Existing Overhead Signs**

Assume ownership of the removed sign panels.

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

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

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

A total of one (1) shadow vehicle with a TMA/TA is required for the work with the exception of Pavement Marking Operations. The Contractor is responsible for determining if one or more of these operations will be ongoing at the same time to determine the total number of TMAs/TAs needed on the project.

A total of three (3) shadow vehicles with a TMA/TA are required for Pavement Marking Operations. The Contractor is responsible for determining if one or more of these operations will be ongoing at the same time to determine the total number of TMAs/TAs needed on the project.

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

**Item 7049: Water Mains**

Construct water mains with Class A concrete in accordance with the Item, “Hydraulic Cement Concrete.” This work is subsidiary to this bid Item.

Assume ownership of removed fire hydrants, valves, and boxes.

Cutting and plugging tees, if called for on the plans, are subsidiary to the Item, “Remove Existing Fire Hydrant.”

Install only new fire hydrants, valves, and boxes conforming to the requirements of this specification. Install fire hydrants, valves, and boxes in accordance with the requirements of Section 3.13 of this specification.

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Provide valves that open in a (*counter*)clockwise direction only.

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**Basis of Estimate**

Item	Description	Limit and Rate	Unit
260	Lime Treatment (Road-Mixed) For materials used as subgrade *		SY
	<ul style="list-style-type: none"> <li>• Lime(HYD, COM, or QK)(SLRY) or QK(DRY)</li> </ul>	6 % by weight based on 100 Lb. / Cu. Ft. subgrade	TON
292	Asphalt Treatment (Plant-Mixed)	110 Lb. / Sq. Yd.-In.	TON
	<ul style="list-style-type: none"> <li>• Asphalt</li> <li>• Aggregate</li> </ul>	5 % by weight 95 % by weight	

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





# Estimate & Quantity Sheet

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PROJECT ID				A00124869			
COUNTY				Fort Bend			
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ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL		
	100-6002	PREPARING ROW	STA	38.000		38.000	
	104-6001	REMOVING CONC (PAV)	SY	5,629.000		5,629.000	
	104-6009	REMOVING CONC (RIPRAP)	SY	370.000		370.000	
	104-6015	REMOVING CONC (SIDEWALKS)	SY	21.000		21.000	
	104-6021	REMOVING CONC (CURB)	LF	2,914.000		2,914.000	
	104-6023	REMOVING CONC (CTB)	LF	300.000		300.000	
	104-6044	REMOVING CONC (FLUME)	SY	29.000		29.000	
	104-6054	REMOVING CONCRETE(MOW STRIP)	LF	200.000		200.000	
	110-6001	EXCAVATION (ROADWAY)	CY	14,433.000		14,433.000	
	132-6006	EMBANKMENT (FINAL)(DENS CONT)(TY C)	CY	10,177.000		10,177.000	
	162-6002	BLOCK SODDING	SY	14,685.000		14,685.000	
	162-6003	STRAW OR HAY MULCH	SY	13,951.000		13,951.000	
	164-6009	BROADCAST SEED (TEMP) (WARM)	SY	734.000		734.000	
	164-6051	DRILL SEED (TEMP)(WARM OR COOL)	SY	13,951.000		13,951.000	
	166-6001	FERTILIZER	AC	6.070		6.070	
	168-6001	VEGETATIVE WATERING	MG	728.400		728.400	
	260-6006	LIME TRT (EXST MATL) (6")	SY	19,620.000		19,620.000	
	260-6012	LIME(HYD,COM OR QK)(SLRY)OR QK(DRY)	TON	265.000		265.000	
	276-6224	CEM TRT(PLNT MX) (CL N)(TY E)(GR 4)(6")	SY	19,620.000		19,620.000	
	292-6017	ASPHALT STAB BASE (GR 4)(PG 64)	TON	1,079.000		1,079.000	
	360-6004	CONC PVMT (CONT REINF - CRCP) (10")	SY	17,723.000		17,723.000	
	400-6001	STRUCT EXCAV	CY	2,362.000		2,362.000	
	400-6005	CEM STABIL BKFL	CY	7,973.000		7,973.000	
	400-6009	CEMENT STAB BACKFILL (INLET OR MH)	CY	592.000		592.000	
	402-6001	TRENCH EXCAVATION PROTECTION	LF	7,272.000		7,272.000	
	403-6001	TEMPORARY SPL SHORING	SF	5,709.000		5,709.000	
	416-6003	DRILL SHAFT (30 IN)	LF	1,230.000		1,230.000	
	416-6015	DRILL SHAFT (NON - REINFORCED) (12 IN)	LF	7.000		7.000	
	416-6021	DRILL SHAFT (SIGN MTS) (42 IN)	LF	40.000		40.000	
	416-6029	DRILL SHAFT (RDWY ILL POLE) (30 IN)	LF	48.000		48.000	
	420-6068	CL C CONC (SIGN COLUMN)	CY	25.660		25.660	
	420-6134	CL C CONC (SIGN FOOTING)	CY	9.800		9.800	
	423-6014	RETAINING WALL (MSE)(HORIZONTAL SCHEME)	SF	9,017.000		9,017.000	
	432-6002	RIPRAP (CONC)(5 IN)	CY	129.000		129.000	
	432-6006	RIPRAP (CONC)(CL B)	CY	1.000		1.000	
	432-6009	RIPRAP (CONC) (CL B) (4")	CY	38.000		38.000	
	432-6044	RIPRAP (CONC)(FLUME)	CY	56.000		56.000	



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COUNTY Fort Bend

CONTROL SECTION JOB				3510-04-055		TOTAL EST.	TOTAL FINAL
PROJECT ID				A00124869			
COUNTY				Fort Bend			
HIGHWAY				SH 99			
ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL		
	432-6045	RIPRAP (MOW STRIP)(4 IN)	CY	83.000		83.000	
	450-6023	RAIL (TY SSTR)	LF	2,299.000		2,299.000	
	462-6010	CONC BOX CULV (6 FT X 3 FT)	LF	4,351.000		4,351.000	
	462-6019	CONC BOX CULV (8 FT X 4 FT)	LF	16.000		16.000	
	462-6020	CONC BOX CULV (8 FT X 5 FT)	LF	710.000		710.000	
	464-6005	RC PIPE (CL III)(24 IN)	LF	1,421.000		1,421.000	
	464-6008	RC PIPE (CL III)(36 IN)	LF	16.000		16.000	
	464-6010	RC PIPE (CL III)(48 IN)	LF	8.000		8.000	
	465-6006	JCTBOX(COMPL)(PJB)(4FTX4FT)	EA	2.000		2.000	
	465-6012	JCTBOX(COMPL)(PJB)(8FTX8FT)	EA	15.000		15.000	
	465-6166	INLET (COMPL)(TY AAD)	EA	10.000		10.000	
	465-6168	INLET (COMPL)(TY A)	EA	1.000		1.000	
	465-6173	MANH (COMPL)(TY A)	EA	3.000		3.000	
	465-6225	JCT BOX (COMPL)(SPL)	EA	4.000		4.000	
	465-6240	INLET (COMPL)(TY C1)(STAGE II)	EA	23.000		23.000	
	465-6547	INLET (COMPL)(CURB)(TY C1) MOD	EA	1.000		1.000	
	465-6640	INLET (COMP)(EXT TY C1)	EA	15.000		15.000	
	479-6006	ADJUSTING INLET (CAP)	EA	6.000		6.000	
	496-6002	REMOV STR (INLET)	EA	9.000		9.000	
	496-6005	REMOV STR (WINGWALL)	EA	2.000		2.000	
	496-6006	REMOV STR (HEADWALL)	EA	1.000		1.000	
	496-6040	REMOV STR (RET WALL)	LF	45.000		45.000	
	500-6001	MOBILIZATION	LS	1.000		1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	16.000		16.000	
	506-6020	CONSTRUCTION EXITS (INSTALL) (TY 1)	SY	750.000		750.000	
	506-6024	CONSTRUCTION EXITS (REMOVE)	SY	750.000		750.000	
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	1,160.000		1,160.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	1,160.000		1,160.000	
	506-6040	BIODEG EROSN CONT LOGS (INSTL) (8")	LF	345.000		345.000	
	506-6041	BIODEG EROSN CONT LOGS (INSTL) (12")	LF	364.000		364.000	
	506-6043	BIODEG EROSN CONT LOGS (REMOVE)	LF	709.000		709.000	
	508-6001	CONSTRUCTING DETOURS	SY	1,300.000		1,300.000	
	512-6013	PORT CTB (DES SOURCE)(SGL SLP)(TY 1)	LF	4,510.000		4,510.000	
	512-6021	PORT CTB (DES SOURCE)(LOW PROF)(TY 1)	LF	2,090.000		2,090.000	
	512-6022	PORT CTB (DES SOURCE)(LOW PROF)(TY 2)	LF	40.000		40.000	
	512-6025	PORT CTB (MOVE)(SGL SLP)(TY 1)	LF	2,140.000		2,140.000	
	512-6033	PORT CTB (MOVE)(LOW PROF)(TY 1)	LF	1,150.000		1,150.000	



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HIGHWAY SH 99

COUNTY Fort Bend

CONTROL SECTION JOB				3510-04-055		TOTAL EST.	TOTAL FINAL
PROJECT ID				A00124869			
COUNTY				Fort Bend			
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ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL		
	512-6034	PORT CTB (MOVE)(LOW PROF)(TY 2)	LF	20.000		20.000	
	512-6037	PORT CTB (STKPL)(SGL SLP)(TY 1)	LF	4,510.000		4,510.000	
	512-6045	PORT CTB (STKPL)(LOW PROF)(TY 1)	LF	2,090.000		2,090.000	
	512-6046	PORT CTB (STKPL)(LOW PROF)(TY 2)	LF	40.000		40.000	
	529-6005	CONC CURB (MONO) (TY II)	LF	5,869.000		5,869.000	
	529-6022	CONC CURB (DOWEL) (TY II)	LF	155.000		155.000	
	530-6004	DRIVEWAYS (CONC)	SY	1,181.000		1,181.000	
	531-6002	CONC SIDEWALKS (5")	SY	3,651.000		3,651.000	
	531-6004	CURB RAMPS (TY 1)	EA	1.000		1.000	
	540-6001	MTL W-BEAM GD FEN (TIM POST)	LF	525.000		525.000	
	540-6016	DOWNSTREAM ANCHOR TERMINAL SECTION	EA	1.000		1.000	
	542-6001	REMOVE METAL BEAM GUARD FENCE	LF	389.000		389.000	
	542-6002	REMOVE TERMINAL ANCHOR SECTION	EA	2.000		2.000	
	544-6001	GUARDRAIL END TREATMENT (INSTALL)	EA	1.000		1.000	
	544-6003	GUARDRAIL END TREATMENT (REMOVE)	EA	4.000		4.000	
	545-6003	CRASH CUSH ATTEN (MOVE & RESET)	EA	1.000		1.000	
	545-6005	CRASH CUSH ATTEN (REMOVE)	EA	3.000		3.000	
	545-6007	CRASH CUSH ATTEN (INSTL)(L)(N)(TL3)	EA	5.000		5.000	
	610-6254	IN RD IL (TY ST) 40T-8 (250W EQ) LED	EA	6.000		6.000	
	618-6046	CONDT (PVC) (SCH 80) (2")	LF	1,950.000		1,950.000	
	618-6047	CONDT (PVC) (SCH 80) (2") (BORE)	LF	235.000		235.000	
	618-6053	CONDT (PVC) (SCH 80) (3")	LF	255.000		255.000	
	618-6054	CONDT (PVC) (SCH 80) (3") (BORE)	LF	105.000		105.000	
	620-6007	ELEC CONDR (NO.8) BARE	LF	2,390.000		2,390.000	
	620-6008	ELEC CONDR (NO.8) INSULATED	LF	3,690.000		3,690.000	
	620-6009	ELEC CONDR (NO.6) BARE	LF	155.000		155.000	
	620-6010	ELEC CONDR (NO.6) INSULATED	LF	310.000		310.000	
	624-6010	GROUND BOX TY D (162922)W/APRON	EA	13.000		13.000	
	624-6028	REMOVE GROUND BOX	EA	1.000		1.000	
	628-6046	ELC SRV TY A 240/480 060(NS)SS(E)SP(U)	EA	2.000		2.000	
	636-6001	ALUMINUM SIGNS (TY A)	SF	7.500		7.500	
	636-6002	ALUMINUM SIGNS (TY G)	SF	30.000		30.000	
	636-6003	ALUMINUM SIGNS (TY O)	SF	150.500		150.500	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	9.000		9.000	
	644-6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	EA	18.000		18.000	
	644-6035	IN SM RD SN SUP&AM TYS80(1)SA(U-2EXT)	EA	3.000		3.000	
	650-6041	INS OH SN SUP(35 FT CANT)(SPAN ONLY)	EA	1.000		1.000	



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# Estimate & Quantity Sheet

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PROJECT ID				A00124869			
COUNTY				Fort Bend			
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ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL		
	650-6204	REMOVE OVERHD SIGN SUP	EA	2.000		2.000	
	662-6060	WK ZN PAV MRK REMOV (W)4"(BRK)	LF	1,763.000		1,763.000	
	662-6063	WK ZN PAV MRK REMOV (W)4"(SLD)	LF	5,410.000		5,410.000	
	662-6071	WK ZN PAV MRK REMOV (W)8"(SLD)	LF	200.000		200.000	
	662-6075	WK ZN PAV MRK REMOV (W)24"(SLD)	LF	45.000		45.000	
	662-6082	WK ZN PAV MRK REMOV (W)(ENTR GORE)	EA	1.000		1.000	
	662-6083	WK ZN PAV MRK REMOV (W)(EXIT GORE)	EA	1.000		1.000	
	662-6095	WK ZN PAV MRK REMOV (Y)4"(SLD)	LF	5,810.000		5,810.000	
	672-6010	REFL PAV MRKR TY II-C-R	EA	291.000		291.000	
	677-6001	ELIM EXT PAV MRK & MRKS (4")	LF	3,500.000		3,500.000	
	677-6002	ELIM EXT PAV MRK & MRKS (6")	LF	6,200.000		6,200.000	
	677-6003	ELIM EXT PAV MRK & MRKS (8")	LF	4,094.000		4,094.000	
	677-6005	ELIM EXT PAV MRK & MRKS (12")	LF	378.000		378.000	
	677-6007	ELIM EXT PAV MRK & MRKS (24")	LF	192.000		192.000	
	677-6008	ELIM EXT PAV MRK & MRKS (ARROW)	EA	2.000		2.000	
	677-6009	ELIM EXT PAV MRK & MRKS (DBL ARROW)	EA	2.000		2.000	
	677-6012	ELIM EXT PAV MRK & MRKS (WORD)	EA	4.000		4.000	
	677-6036	ELIM EXT PAV MRK & MRKS (UTURN ARROW)	EA	2.000		2.000	
	678-6002	PAV SURF PREP FOR MRK (6")	LF	6,458.000		6,458.000	
	678-6004	PAV SURF PREP FOR MRK (8")	LF	4,094.000		4,094.000	
	678-6006	PAV SURF PREP FOR MRK (12")	LF	140.000		140.000	
	678-6008	PAV SURF PREP FOR MRK (24")	LF	790.000		790.000	
	678-6009	PAV SURF PREP FOR MRK (ARROW)	EA	11.000		11.000	
	678-6010	PAV SURF PREP FOR MRK (DBL ARROW)	EA	2.000		2.000	
	678-6012	PAV SURF PREP FOR MRK (UTURN ARR)	EA	2.000		2.000	
	678-6016	PAV SURF PREP FOR MRK (WORD)	EA	13.000		13.000	
	682-6001	VEH SIG SEC (12")LED(GRN)	EA	2.000		2.000	
	682-6002	VEH SIG SEC (12")LED(GRN ARW)	EA	1.000		1.000	
	682-6003	VEH SIG SEC (12")LED(YEL)	EA	2.000		2.000	
	682-6004	VEH SIG SEC (12")LED(YEL ARW)	EA	1.000		1.000	
	682-6005	VEH SIG SEC (12")LED(RED)	EA	2.000		2.000	
	682-6054	BACKPLATE W/REF BRDR(3 SEC)(VENT)ALUM	EA	1.000		1.000	
	682-6056	BACKPLATE W/REF BRDR(5 SEC)(VENT)ALUM	EA	1.000		1.000	
	684-6007	TRF SIG CBL (TY A)(12 AWG)(2 CONDR)	LF	1,410.000		1,410.000	
	684-6009	TRF SIG CBL (TY A)(12 AWG)(4 CONDR)	LF	1,425.000		1,425.000	
	684-6012	TRF SIG CBL (TY A)(12 AWG)(7 CONDR)	LF	651.000		651.000	
	687-6003	RELOCATE PED POLE ASSEMBLY	EA	1.000		1.000	



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PROJECT ID				A00124869			
COUNTY				Fort Bend			
HIGHWAY				SH 99			
ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL		
	4006-6010	SOUND WALL (16FT)(HORIZ SCHEME)	LF	760.000		760.000	
	4008-6001	TRENCH DRAIN	LF	165.000		165.000	
	5153-6001	FLAP GATE (STAINLESS STEEL)(24 IN)	EA	1.000		1.000	
	6000-6136	REMOVE LUMINAIRE	EA	5.000		5.000	
	6001-6001	PORTABLE CHANGEABLE MESSAGE SIGN	DAY	300.000		300.000	
	6038-6004	MULTIPOLYMER PAV MRK (W)(6")(SLD)	LF	2,830.000		2,830.000	
	6038-6005	MULTIPOLYMER PAV MRK (W)(6")(BRK)	LF	1,270.000		1,270.000	
	6038-6006	MULTIPOLYMER PAV MRK (W)(6")(DOT)	LF	198.000		198.000	
	6038-6007	MULTIPOLYMER PAV MRK (W)(8")(SLD)	LF	4,094.000		4,094.000	
	6038-6011	MULTIPOLYMER PAV MRK (W)(12")(SLD)	LF	140.000		140.000	
	6038-6013	MULTIPOLYMER PAV MRK (W)(24")(SLD)	LF	790.000		790.000	
	6038-6017	MULTIPOLYMER PAV MRK (Y)(6")(SLD)	LF	1,270.000		1,270.000	
	6038-6024	MULTIPOLYMER PAV MRK (BLK)(6")(BRK)	LF	1,270.000		1,270.000	
	6038-6025	MULTIYPOLYMER PAV MRK (W) (ARROW)	EA	11.000		11.000	
	6038-6026	MULTIPOLYMER PAV MRK (W) (DBL ARROW)	EA	2.000		2.000	
	6038-6027	MULTIPOLYMER PAV MRK (W) (WORD)	EA	13.000		13.000	
	6038-6029	MULTIPOLYMER PAV MRK (W)(U-TURN ARROW)	EA	2.000		2.000	
	6185-6002	TMA (STATIONARY)	DAY	10.000		10.000	
	6185-6003	TMA (MOBILE OPERATION)	HR	40.000		40.000	
	7049-6011	WATER MAIN PIPE (PVC) (6IN) (C-900)	LF	5.000		5.000	
	7049-6073	JCK TUN BOR OR AUG CSG (STL) (36IN)	LF	144.000		144.000	
	7049-6104	FIRE HYDRANT ASSEMBLY	EA	1.000		1.000	
	7049-6106	AIR RELEASE/VACUUM RELEASE VALVE (2IN)	EA	2.000		2.000	
	7049-6134	CUT AND PLUG WATER MAIN (24IN)	EA	100.000		100.000	
	7049-6146	WET CONNECTION (24IN)	EA	2.000		2.000	
	7049-6152	WTR MAIN PIPE(PVC)(RESTRAINED JT)(24")	LF	750.000		750.000	
	7049-6180	REMOV AIR/VAC VAULT	EA	1.000		1.000	
	7049-6183	AIR RELEASE/VACUUM RELEASE VAULT	EA	2.000		2.000	
	7049-6216	REMOVE EXIST WATER PIPE(VAR)(SIZE)(MTL)	LF	647.000		647.000	
	7049-6378	REMOVE EXISTING AIR VALVE ASSEMBLY	EA	1.000		1.000	
	7049-6380	REMOVE EXIST FLUSHING HYDRANT & VALVE	EA	1.000		1.000	
	7318-6001	INSERTION VALVE (24-IN)	EA	2.000		2.000	
08		CONTRACTOR FORCE ACCOUNT EROSION CONTROL MAINTENANCE (NON-PARTICIPATING)	LS	1.000		1.000	
		CONTRACTOR FORCE ACCOUNT LAW ENFORCEMENT (NON-PARTICIPATING)	LS	1.000		1.000	
		CONTRACTOR FORCE ACCOUNT SAFETY CONTINGENCY (NON-PARTICIPATING)	LS	1.000		1.000	



DISTRICT	COUNTY	CCSJ	SHEET
Houston	Fort Bend	3510-04-055	14D



# Estimate & Quantity Sheet

CONTROLLING PROJECT ID 3510-04-055


DISTRICT Houston  
HIGHWAY SH 99


COUNTY Fort Bend

CONTROL SECTION JOB				3510-04-055		TOTAL EST.	TOTAL FINAL
PROJECT ID				A00124869			
COUNTY				Fort Bend			
HIGHWAY				SH 99			
ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL		
	08	CONTRACTOR FORCE ACCOUNT EROSION CONTROL MAINTENANCE (NON-PARTICIPATING)	LS	1.000		1.000	
		CONTRACTOR FORCE ACCOUNT SAFETY CONTINGENCY (NON-PARTICIPATING)	LS	1.000		1.000	

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SUMMARY OF WORKZONE TRAFFIC CONTROL ITEMS														
LOCATION	502	508	512	512	512	512	512	512	512	512	512	545	545	545
	6001	6001	6013	6021	6022	6025	6033	6034	6037	6045	6046	6003	6005	6007
	BARRICADES, SIGNS AND TRAFFIC HANDLING	CONSTRUCTING DETOURS	PORT CTB (DES SOURCE)(SGL SLP)(TY 1)	PORT CTB (DES SOURCE)(LO W PROF)(TY 1)	PORT CTB (DES SOURCE)(LO W PROF)(TY 2)	PORT CTB (MOVE)(SGL SLP)(TY 1)	PORT CTB (MOVE)(LOW PROF)(TY 1)	PORT CTB (MOVE)(LOW PROF)(TY 2)	PORT CTB (MOVE)(LOW PROF)(TY 2)	PORT CTB (STKPL)(SGL SLP)(TY 1)	PORT CTB (STKPL)(LOW PROF)(TY 1)	PORT CTB (STKPL)(LOW PROF)(TY 2)	CRASH CUSH ATTEN (MOVE & RESET)	CRASH CUSH ATTEN (REMOVE)
	MO	SY	LF	LF	LF	LF	LF	LF	LF	LF	LF	EA	EA	EA
<b>PHASE 1</b>														
SHEET 1 OF 6														
SHEET 2 OF 6			150	650										
SHEET 3 OF 6			1200											
SHEET 4 OF 6		1300	2160											1
SHEET 5 OF 6			550											2
SHEET 6 OF 6														
<b>PHASE 2</b>														
SHEET 1 OF 6														
SHEET 2 OF 6			450	160		150				650				
SHEET 3 OF 6				150	20	850								
SHEET 4 OF 6									360			1		
SHEET 5 OF 6														
SHEET 6 OF 6														
<b>PHASE 3 STEP 1</b>														
SHEET 1 OF 6														
SHEET 2 OF 6														
SHEET 3 OF 6										600	160			
SHEET 4 OF 6				650		650			240				2	
SHEET 5 OF 6				480	20									
SHEET 6 OF 6														
<b>PHASE 3 STEP 2</b>														
SHEET 1 OF 6														
SHEET 2 OF 6														
SHEET 3 OF 6									500					
SHEET 4 OF 6							650		1560	650				
SHEET 5 OF 6							500	20	550	480	20		1	
SHEET 6 OF 6														
<b>PROJECT TOTALS</b>	<b>16</b>	<b>1300</b>	<b>4510</b>	<b>2090</b>	<b>40</b>	<b>2140</b>	<b>1150</b>	<b>20</b>	<b>4510</b>	<b>2090</b>	<b>40</b>	<b>1</b>	<b>3</b>	<b>3</b>


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**SH 99**  
**SOUTHBOUND FRONTAGE ROAD**  
**WESTHEIMER PKWY TO CINCO RANCH BLVD**  
**SUMMARY OF TRAFFIC CONTROL**  
**QUANTITIES**  
**SHEET 1 OF 2**

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	15

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### SUMMARY OF WORKZONE TRAFFIC CONTROL ITEMS

LOCATION	662	662	662	662	662	662	662	677	6001	6185	6185
	6060	6063	6071	6075	6082	6083	6095	6001	6001	6002	6003
	WK ZN PAV MRK REMOV (W)4"(BRK)	WK ZN PAV MRK REMOV (W)4"(SLD)	WK ZN PAV MRK REMOV (W)8"(SLD)	WK ZN PAV MRK REMOV (W)24"(SLD)	WK ZN PAV MRK REMOV (W)(ENTR GORE)	WK ZN PAV MRK REMOV (W)(EXIT GORE)	WK ZN PAV MRK REMOV (Y)4"(SLD)	ELIM EXT PAV MRK & MRKS (4")	PORTABLE CHANGEABLE MESSAGE SIGN	TMA (STATIONARY)	TMA (MOBILE OPERATION)
	LF	LF	LF	LF	EA	EA	LF	LF	DAY	DAY	HR
<b>PHASE 1</b>											
SHEET 1 OF 6											
SHEET 2 OF 6	150	1400		45				700			
SHEET 3 OF 6		200									
SHEET 4 OF 6											
SHEET 5 OF 6											
SHEET 6 OF 6											
<b>PHASE 2</b>											
SHEET 1 OF 6											
SHEET 2 OF 6	310						450				
SHEET 3 OF 6	300	360					1200	300			
SHEET 4 OF 6	300	600					900	250			
SHEET 5 OF 6	35							100			
SHEET 6 OF 6											
<b>PHASE 3 STEP 1</b>											
SHEET 1 OF 6											
SHEET 2 OF 6	60	650						700			
SHEET 3 OF 6	30		200		1		480	550			
SHEET 4 OF 6	440						780	300			
SHEET 5 OF 6	138						500				
SHEET 6 OF 6											
<b>PHASE 3 STEP 2</b>											
SHEET 1 OF 6											
SHEET 2 OF 6											
SHEET 3 OF 6											
SHEET 4 OF 6		1750					740				
SHEET 5 OF 6		450				1	760	600			
SHEET 6 OF 6											
<b>PROJECT TOTALS</b>	<b>1763</b>	<b>5410</b>	<b>200</b>	<b>45</b>	<b>1</b>	<b>1</b>	<b>5810</b>	<b>3500</b>	<b>300</b>	<b>10</b>	<b>40</b>



**SH 99**  
**SOUTHBOUND FRONTAGE ROAD**  
**WESTHEIMER PKWY TO CINCO RANCH BLVD**  
**SUMMARY OF TRAFFIC CONTROL**  
**QUANTITIES**


SHEET 2 OF 2


FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	16



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SUMMARY OF REMOVAL ITEMS																
LOCATION	104	104	104	104	104	104	104	496	496	496	496	542	542	544	650	6000
	6001	6009	6015	6021	6023	6044	6054	6002	6005	6006	6040	6001	6002	6003	6204	6136
	REMOVING CONC (PAV)	REMOVING CONC (RIPRAP)	REMOVING CONC (SIDEWALKS)	REMOVING CONC (CURB)	REMOVING CONC (CTB)	REMOVING CONC (FLUME)	REMOVING CONCRETE (MOW STRIP)	REMOV STR (INLET)	REMOV STR (WINGWALL)	REMOV STR (HEADWALL)	REMOV STR (RET WALL)	REMOVE METAL BEAM GUARD FENCE	REMOVE TERMINAL ANCHOR SECTION	GUARDRAIL END TREATMENT (REMOVE)	REMOVE OVERHD SIGN SUP	REMOVE LUMINAIRE
	SY	SY	SY	LF	LF	SY	LF	EA	EA	EA	LF	LF	EA	EA	EA	EA
SHEET 1 OF 4	749	50	21	1080			200	3			45	189		1		
SHEET 2 OF 4	2325	207		227	300			2	1	1		125	1	2	1	2
SHEET 3 OF 4	1955	88						1	1			75	1		1	3
SHEET 4 OF 4	600	25		1607		29		3						1		
PROJECT TOTALS	5629	370	21	2914	300	29	200	9	2	1	45	389	2	4	2	5


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**SH 99**  
**SOUTHBOUND FRONTAGE ROAD**  
**WESTHEIMER PKWY TO CINCO RANCH BLVD**  
**SUMMARY OF REMOVAL**  
**QUANTITIES**  
 SHEET 1 OF 1

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	17

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SUMMARY OF ROADWAY ITEMS																				
LOCATION	100 6002	110 6001	132 6006	260 6006	260 6012	276 6224	292 6017	360 6004	432 6002	432 6045	450 6023	529 6005	529 6022	530 6004	531 6002	531 6004	540 6001	540 6016	544 6001	545 6007
	PREPARING ROW	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL)(DENS CONT)(TY C)	LIME TRT (EXST MATL) (6")	LIME(HYD,CO M 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) (10")	RIPRAP (CONC)(5 IN)	RIPRAP (MOW STRIP)(4 IN)	RAIL (TY SSTR)	CONC CURB (MONO) (TY II)	CONC CURB (DOWEL) (TY II)	DRIVEWAYS (CONC)	CONC SIDEWALKS (5")	CURB RAMPS (TY 1)	MTL W-BEAM GD FEN (TIM POST)	DOWNSTREAM ANCHOR TERMINAL SECTION	GUARDRAIL END TREATMENT (INSTALL)	CRASH CUSH ATTEN (INSTL)(L)(N)(TL3)
	STA	CY	CY	SY	TON	SY	TON	SY	CY	CY	LF	LF	LF	SY	SY	EA	LF	EA	EA	EA
SBFR																				
SHEET 1 OF 4	8			2027	27	2027	111	1839	16			845	155	191	675	1				
SHEET 2 OF 4	11			6238	84	6238	343	5871				1650		193	1100					
SHEET 3 OF 4	11			6264	85	6264	345	5839	9			1914		474	1078					
SHEET 4 OF 4	8			1197	16	1197	66	831	62			1355		323	798					
ENTR RAMP																				
SHEET 1 OF 2				461	6	461	25	347		6	514									
SHEET 2 OF 2				1297	18	1297	71	1154	18	8	645									1
EXT RAMP																				
SHEET 1 OF 2				1373	19	1373	76	1163	22	69	761	105					525	1	1	
SHEET 2 OF 2				763	10	763	42	679	2		379									1
		14433	10177																	
<b>PROJECT TOTALS</b>	<b>38</b>	<b>14433</b>	<b>10177</b>	<b>19620</b>	<b>265</b>	<b>19620</b>	<b>1079</b>	<b>17723</b>	<b>129</b>	<b>83</b>	<b>2299</b>	<b>5869</b>	<b>155</b>	<b>1181</b>	<b>3651</b>	<b>1</b>	<b>525</b>	<b>1</b>	<b>1</b>	<b>2</b>


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**SH 99**  
**SOUTHBOUND FRONTAGE ROAD**  
**WESTHEIMER PKWY TO CINCO RANCH BLVD**  
**SUMMARY OF ROADWAY**  
**QUANTITIES**

SHEET 1 OF 1

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	18

SUMMARY OF DRAINAGE QUANTITIES (SOUTHBOUND FRONTAGE ROAD)														
STORM SEWER PLAN & PROFILE SHEET NO.	STATION	400	400	400	402	462	462	462	464	464	464	465	465	465
		6001	6005	6009	6001	6010	6019	6020	6005	6008	6010	6166	6168	6173
		STRUCT EXCAV	CEM STABIL BKFL	CEMENT STAB BACKFILL (INLET OR MH)	TRENCH EXCAVATION PROTECTION	CONC BOX CULV (6 FT X 3 FT)	CONC BOX CULV (8 FT X 4 FT)	CONC BOX CULV (8 FT X 5 FT)	RC PIPE (CL III) (24 IN)	RC PIPE (CL III) (36 IN)	RC PIPE (CL III) (48 IN)	INLET (COMPL) (TY AAD)	INLET (COMPL) (TY A)	MANH (COMPL) (TY A)
		CY	CY	CY	LF	LF	LF	LF	LF	LF	LF	EA	EA	EA
SHT. 1 OF 4	BEGIN PROJECT TO 2441+00	202	213	113	446				446			3		2
SHT. 2 OF 4	2441+00 TO 2452+00	380	923	148	848	736			112			2		
SHT. 3 OF 4	2452+00 TO 2463+00	316	523	157	525	297			228			2		
SHT. 4 OF 4	2463+00 TO END PROJECT	182	177	74	371				371			1	1	1
SHT. 1 OF 1	INLINE MITIGATION - 2	118	1498	47	975		12	710	245		8			
SHT. 1 OF 2	INLINE MITIGATION - 1	558	2176	31	1585	1554	4		19	8		1		
SHT. 2 OF 2	INLINE MITIGATION - 1	606	2463	22	1772	1764				8		1		
<b>TOTAL</b>		<b>2,362</b>	<b>7,973</b>	<b>592</b>	<b>6,522</b>	<b>4,351</b>	<b>16</b>	<b>710</b>	<b>1,421</b>	<b>16</b>	<b>8</b>	<b>10</b>	<b>1</b>	<b>3</b>

SUMMARY OF DRAINAGE QUANTITIES (SOUTHBOUND FRONTAGE ROAD)										
STORM SEWER PLAN & PROFILE SHEET NO.	STATION	465	465	465	465	465	465	479	4008	5153
		6225	6012	6006	6240	6547	6640	6006	6001	6001
		JCT BOX (COMPL) (SPL)	JCTBOX (COMPL) (PJB) (8FTX8 FT)	JCTBOX (COMPL) (PJB) (4FTX4 FT)	INLET (COMPL) (TY C1) (STAGE II)	INLET (CURB) (TY C1) (MOD)	INLET (CURB) (EXT TY C1)	ADJUSTING INLET (CAP)	TRENCH DRAIN	FLAP GATE (STAINLESS STEEL) (24 IN)
		EA	EA	EA	EA	EA	EA	EA	LF	EA
SHT. 1 OF 4	BEGIN PROJECT TO 2441+00			2	5		2	3		
SHT. 2 OF 4	2441+00 TO 2452+00		5		7		5	1	165	
SHT. 3 OF 4	2452+00 TO 2463+00		8		8	1	5			
SHT. 4 OF 4	2463+00 TO END PROJECT		2		3		3	2		
SHT. 1 OF 1	INLINE MITIGATION - 2	1								1
SHT. 1 OF 2	INLINE MITIGATION - 1	3								
SHT. 2 OF 2	INLINE MITIGATION - 1									
<b>TOTAL</b>		<b>4</b>	<b>15</b>	<b>2</b>	<b>23</b>	<b>1</b>	<b>15</b>	<b>6</b>	<b>165</b>	<b>1</b>

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SH 99  
 SOUTHBOUND FRONTAGE ROAD  
 WESTHEIMER PKWY TO CINCO RANCH BLVD  
 SUMMARY OF DRAINAGE QUANTITIES

SHEET 1 OF 1

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	19


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SUMMARY OF RETAINING WALL ITEMS								
RETAINING / SOUND WALLS	*132 6006	403 6001	416 6003	423 6014	432 6009	432 6044	**556 6006	4006 6010
	EMBANKMENT (FINAL)(DENS CONT)(TY C) *	TEMPORARY SPL SHORING	DRILL SHAFT (30 IN)	RETAINING WALL (MSE) (HORIZONTAL SCHEME)	RIPRAP (CONC) (CL B) (4")	RIPRAP (CONC)(FLUM E)	PIPE UNDERDRAINS (TY 6) (6") **	SOUND WALL (16FT)(HORIZ SCHEME)
	CY	SF	LF	SF	CY	CY	LF	LF
RW-1	327	508		883		8	175	
RW-2	2218	2378		5988		28	725	
RW-3	795	2554		2146		20	531	
SW-1A			300		9			180
SW-1B			300		9			180
SW-2			630		20			400
<b>PROJECT TOTALS</b>	<b>3340</b>	<b>5440</b>	<b>1230</b>	<b>9017</b>	<b>38</b>	<b>56</b>	<b>1431</b>	<b>760</b>

\* THIS QUANTITY IS INTENDED FOR USE AS REINFORCED VOLUME AS DESCRIBED ON RETAINING WALL PLAN AND PROFILE SHEETS AND SHOULD COMPLY WITH REQUIREMENTS OF ITEM 423 2.4.4 CEMENT STABILIZED BACKFILL. QUANTITIES BASED ON A CONSTANT WIDTH EQUAL TO TEN FEET.

\*\* FOR CONTRACTOR'S INFORMATION ONLY, INCIDENTAL TO VARIOUS BID ITEMS.


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**SH 99**  
**SOUTHBOUND FRONTAGE ROAD**  
**WESTHEIMER PKWY TO CINCO RANCH BLVD**  
**SUMMARY OF RETAINING WALLS**  
**& SOUND WALL QUANTITIES**  
**SHEET 1 OF 1**

FED. RD. DIV. NO.	PROJECT NO.	HIGHWAY NO.
6		SH 99
STATE	DIST.	COUNTY
TEXAS	HOU	FORT BEND
CONT.	SECT.	JOB
3510	04	055
		SHEET NO.
		20

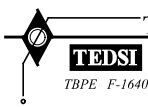
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**SUMMARY OF PAVEMENT MARKINGS ITEMS**


LOCATION	672	677	677	677	677	677	677	677	677	677	678	678	678	678	678	678
	6010	6002	6003	6005	6007	6008	6009	6012	6036	6002	6004	6006	6008	6009	6010	
	REFL PAV MRKR TY II-C-R	ELIM EXT PAV MRK & MRKS (6")	ELIM EXT PAV MRK & MRKS (8")	ELIM EXT PAV MRK & MRKS (12")	ELIM EXT PAV MRK & MRKS (24")	ELIM EXT PAV MRK & MRKS (ARROW)	ELIM EXT PAV MRK & MRKS (DBL ARROW)	ELIM EXT PAV MRK & MRKS (WORD)	ELIM EXT PAV MRK & MRKS (UTURN ARROW)	PAV SURF PREP FOR MRK (6")	PAV SURF PREP FOR MRK (8")	PAV SURF PREP FOR MRK (12")	PAV SURF PREP FOR MRK (24")	PAV SURF PREP FOR MRK (ARROW)	PAV SURF PREP FOR MRK (DBL ARROW)	
	EA	LF	LF	LF	LF	EA	EA	EA	EA	LF	LF	LF	LF	EA	EA	
SHEET 1 OF 4	74	360	1000	378	96	2	2	4	2	440	1000		574	6	2	
SHEET 2 OF 4	104	2710	1675							2710	1675		72	1		
SHEET 3 OF 4	63	2618	1246							2618	1246		72	3		
SHEET 4 OF 4	50	512	173							690	173	140	72	1		
<b>PROJECT TOTALS</b>	<b>291</b>	<b>6200</b>	<b>4094</b>	<b>378</b>	<b>96</b>	<b>2</b>	<b>2</b>	<b>4</b>	<b>2</b>	<b>6458</b>	<b>4094</b>	<b>140</b>	<b>790</b>	<b>11</b>	<b>2</b>	

**SUMMARY OF PAVEMENT MARKINGS ITEMS**

LOCATION	678	678	6038	6038	6038	6038	6038	6038	6038	6038	6038	6038	6038	6038	6038
	6012	6016	6004	6005	6006	6007	6011	6013	6017	6024	6025	6026	6027	6029	
	PAV SURF PREP FOR MRK (UTURN ARR)	PAV SURF PREP FOR MRK (WORD)	MULTIPOLYMER PAV MRK (W)(6")(SLD)	MULTIPOLYMER PAV MRK (W)(6")(BRK)	MULTIPOLYMER PAV MRK (W)(6")(DOT)	MULTIPOLYMER PAV MRK (W)(8")(SLD)	MULTIPOLYMER PAV MRK (W)(12")(SLD)	MULTIPOLYMER PAV MRK (W)(24")(SLD)	MULTIPOLYMER PAV MRK (Y)(6")(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)(U- TURN ARROW)	
	EA	EA	LF	LF	LF	LF	LF	LF	LF	LF	EA	EA	EA	EA	
SHEET 1 OF 4	2	8	40	320	80	1000		574		320	6	2	8	2	
SHEET 2 OF 4		1	1030	620	60	1675		72	380	620	1		1		
SHEET 3 OF 4		3	1348	220		1246		72	830	220	3		3		
SHEET 4 OF 4		1	412	110	58	173	140	72		110	1		1		
<b>PROJECT TOTALS</b>	<b>2</b>	<b>13</b>	<b>2830</b>	<b>1270</b>	<b>198</b>	<b>4094</b>	<b>140</b>	<b>790</b>	<b>1210</b>	<b>1270</b>	<b>11</b>	<b>2</b>	<b>13</b>	<b>2</b>	



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SH 99  
 SOUTHBOUND FRONTAGE ROAD  
 WESTHEIMER PKWY TO CINCO RANCH BLVD

**SUMMARY OF PAVEMENT MARKING  
 QUANTITIES**

SHEET 1 OF 1


FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	21



**SUMMARY OF OVERHEAD SIGN STRUCTURES ( 2014 SPEC )**

CONTROL NO.	LAYOUT SHEET NO.	ELEV. SHEET NO.	STATION	STRUCTURE NO.	STRUCTURE TYPE	416				636	636	650	654	XXX
						(6020) DRILL SHAFT (SIGN MTS) (36 IN) LF	(6021) DRILL SHAFT (SIGN MTS) (42 IN) LF	(6022) DRILL SHAFT (SIGN MTS) (48 IN) LF	(6023) DRILL SHAFT (SIGN MTS) (54 IN) LF	(6003) ALUMINIUM SIGNS (TY D) SF	(6006) REFURBISH ALUMINIUM SIGNS (TY D) EA	(6204) REMOVE OVERHD SIGN SUP EA	(6002) SIGN WALKWAY (24 IN) WITH HNDRL LF	(XXX) REMOV OVHD SIGNS EA
3510-04-055		1 OF 1	1466+30	SH 99-1466	COSS-HS		40			150.5				
<b>TOTALS</b>							40			150.5				

SUMMARY OF OVERHEAD SIGN STRUCTURES					403	420	420	432	650
HIGHWAY	ELEVATION SHEET NO.	STATION	STRUCTURE NO.	STRUCTURE TYPE	6001	6068	6134	6006	6041
					TEMPORARY SPL SHORING	CL C CONC (SIGN COLUMN)	CL C CONC (SIGN FOOTING)	RIPRAP (CONC)(CL B)	INS OH SN SUP(35 FT CANT)(SPAN ONLY)
					SF	CY	CY	CY	EA
SH 99	1 OF 1	1466+30	SH 99 - 1466	COSS-HS	269	25.66	9.8	1	1
<b>PROJECT TOTALS</b>					<b>269</b>	<b>25.66</b>	<b>9.8</b>	<b>1</b>	<b>1</b>


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**SH 99**  
**SOUTHBOUND FRONTAGE ROAD**  
**WESTHEIMER PKWY TO CINCO RANCH BLVD**  
**SUMMARY OF OVERHEAD**  
**SIGN STRUCTURES**

SHEET 1 OF 1

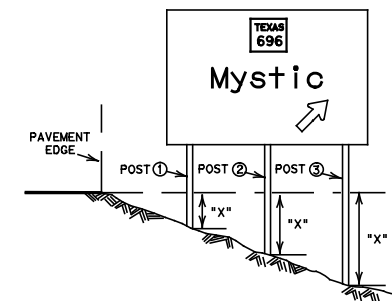
FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	23

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# SUMMARY OF LARGE SIGNS

LAYOUT SHEET NO.	SIGN NO.	STATION NO.	TYPE	BACKGROUND COLOR	TEXT	SIGN DIMENSIONS (FT)	636	636	647	416			
							(6002)	(6003)	(6001)	DRILL SHAFT FND			
							ALUM SIGNS (TY G)	ALUM SIGNS (TY O)	*INSTALL LRSS (STRUCT STL)	(6015)	(6018)		
							SF	SF		SIZE	TOTAL WEIGHT (NON-REINF) (12") (24") (24")		
3	1	2463+02		GREEN	EXIT	6.0' X 5.0'	30.0	120	GROUND MOUNT				
									S3X5.7	12	12	194.6	7
4	1	1466+30		GREEN	Westheimer Pkwy EXIT  ONLY	21.5' X 7.0'		150.5	CANTILEVER STRUCTURE NC				
TOTAL							30.0	150.5				194.6	7



The "x" dimension is the elevation difference at the post between the ground and the edge of pavement or top of curb.

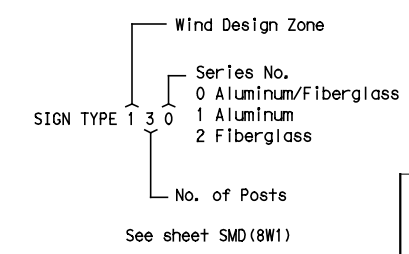
Sign supports shall be located as shown on the plans, except that the Engineer may shift the sign supports, within design guidelines, where necessary to secure a more desirable location or to avoid conflict with utilities. Unless otherwise shown on the plans, the Contractor shall stake and the Engineer will verify all sign support locations.

The post lengths listed here are approximations. The corrected post lengths will be furnished by the Contractor after the stud posts are placed.

Tower heights shall be verified with the Engineer before fabrication.

\* This column is for aluminum Type A and not direct apply. Direct apply is subsidiary to the sign.

### SIGN TYPE



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**SH 99**  
**SOUTHBOUND FRONTAGE ROAD**  
**WESTHEIMER PKWY TO CINCO RANCH BLVD**  
SUMMARY OF LARGE SIGNS

SHEET 1 OF 1

FED. RD. DIV. NO.	PROJECT NO.	HIGHWAY NO.
6		SH 99
STATE	DIST.	COUNTY
TEXAS	HOU	FORT BEND
CONT.	SECT.	JOB
3510	04	055
		SHEET NO.
		24



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					SH 99 SB FRONTAGE RD AT WESTHEIMER PKWY	
ITEM	CODE	DESCRIPTION	UNIT	ESTIMATE	FINAL	
0618	6046	CONDT (PVC) (SCH 80) (2")	LF	75		
0618	6047	CONDT (PVC) (SCH 80) (2") (BORE)	LF	110		
0618	6053	CONDT (PVC) (SCH 80) (3")	LF	255		
0618	6054	CONDT (PVC) (SCH 80) (3") (BORE)	LF	105		
0620	6007	ELEC CONDR (NO. 8) BARE	LF	545		
0624	6010	GROUND BOX TY D(162922) W/APRON	EA	5		
0624	6028	REMOVE GROUND BOX	EA	1		
0636	6001	ALUMINUM SIGNS (TY A)	SF	7.5		
	*	R10-10R (30"X36") "RIGHT TURN SIGNAL"	EA	1		
0682	6001	VEH SIG SEC (12") LED (GRN)	EA	2		
0682	6002	VEH SIG SEC (12") LED (GRN ARW)	EA	1		
0682	6003	VEH SIG SEC (12") LED (YEL)	EA	2		
0682	6004	VEH SIG SEC (12") LED (YEL ARW)	EA	1		
0682	6005	VEH SIG SEC (12") LED (RED)	EA	2		
0682	6054	BACKPLATE W/REF BRDR(3 SEC) (VENT) ALUM	EA	1		
0682	6056	BACKPLATE W/REF BRDR(5 SEC) (VENT) ALUM	EA	1		
0684	6007	TRF SIG CBL (TY A) (12 AWG) (2 CONDR)	LF	1410		
0684	6009	TRF SIG CBL (TY A) (12 AWG) (4 CONDR)	LF	1425		
0684	6012	TRF SIG CBL (TY A) (12 AWG) (7 CONDR)	LF	651		
0687	6003	RELOCATE PED POLE ASSEMBLY	EA	1		

\* SUBSIDIARY TO PERTINENT ITEMS.



**SH 99**  
**SOUTHBOUND FRONTAGE ROAD**  
**WESTHEIMER PKWY TO CINCO RANCH BLVD**  
**SUMMARY OF TRAFFIC SIGNAL**  
**QUANTITIES**

SHEET 1 OF 1

FED. RD. DIV. NO.		PROJECT NO.		HIGHWAY NO.	
6				SH 99	
STATE	DIST.	COUNTY			
TEXAS	HOU	FORT BEND			
CONT.	SECT.	JOB	SHEET NO.		
3510	04	055	25		

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SUMMARY OF ILLUMINATION ITEMS										
LOCATION	416 6029	610 6254	618 6046	618 6047	620 6007	620 6008	620 6009	620 6010	624 6010	628 6046
	DRILL SHAFT (RDWY ILL POLE) (30 IN)	IN RD IL (TY ST) 40T-8 (250W EQ) LED	CONDT (PVC) (SCH 80) (2")	CONDT (PVC) (SCH 80) (2") (BORE)	ELEC CONDR (NO.8) BARE	ELEC CONDR (NO.8) INSULATED	ELEC CONDR (NO.6) BARE	ELEC CONDR (NO.6) INSULATED	GROUND BOX TY D (162922)W/AP RON	ELC SRV TY A 240/480 060(NS)SS(E)S P(U)
	LF	EA	LF	LF	LF	LF	LF	LF	EA	EA
BEGIN TO STA 2438+00	24	3	950	80	965	1930	65	130	4	1
STA 2438+00 TO STA 2448+00	16	2	395		395	790				
STA 2448+00 TO STA 2458+00										
STA 2458+00 TO END	8	1	530	45	485	970	90	180	4	1
<b>PROJECT TOTALS</b>	<b>48</b>	<b>6</b>	<b>1875</b>	<b>125</b>	<b>1845</b>	<b>3690</b>	<b>155</b>	<b>310</b>	<b>8</b>	<b>2</b>

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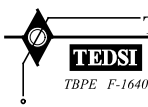
**SH 99**  
**SOUTHBOUND FRONTAGE ROAD**  
**WESTHEIMER PKWY TO CINCO RANCH BLVD**

**SUMMARY OF**  
**RAMP ILLUMINATION**


FED. RD. DIV. NO.	PROJECT NO.	HIGHWAY NO.	
6		SH 99	
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	26

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SUMMARY OF EROSION CONTROL ITEMS													
LOCATION	162	162	164	164	166	168	506	506	506	506	506	506	506
	6002	6003	6009	6051	6001	6001	6020	6024	6038	6039	6040	6041	6043
	BLOCK SODDING	STRAW OR HAY MULCH	BROADCAST SEED (TEMP) (WARM)	DRILL SEED (TEMP)(WARM OR COOL)	FERTILIZER	VEGETATIVE WATERING	CONSTRUCTION EXITS (INSTALL) (TY 1)	CONSTRUCTION EXITS (REMOVE)	TEMP SEDMT CONT FENCE (INSTALL)	TEMP SEDMT CONT FENCE (REMOVE)	BIODEG EROSN CONT LOGS (INSTR) (8")	BIODEG EROSN CONT LOGS (INSTR) (12")	BIODEG EROSN CONT LOGS (REMOVE)
	SY	SY	SY	SY	AC	MG	SY	SY	LF	LF	LF	LF	LF
SHEET 1 OF 4	3689	3505	184	3505	1.52	182.4	750	750	100	100	75	112	187
SHEET 2 OF 4	4276	4062	214	4062	1.77	212.4			370	370	90	112	202
SHEET 3 OF 4	3431	3259	172	3259	1.42	170.4			440	440	120	84	204
SHEET 4 OF 4	3289	3124	164	3124	1.36	163.2			250	250	60	56	116
<b>PROJECT TOTALS</b>	<b>14684</b>	<b>13950</b>	<b>734</b>	<b>13950</b>	<b>6.07</b>	<b>728.4</b>	<b>750</b>	<b>750</b>	<b>1160</b>	<b>1160</b>	<b>345</b>	<b>364</b>	<b>709</b>



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SH 99  
 SOUTHBOUND FRONTAGE ROAD  
 WESTHEIMER PKWY TO CINCO RANCH BLVD  
 SUMMARY OF SWP3  
 QUANTITIES

SHEET 1 OF 1

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	27

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CINCO MUNICIPAL UTILITY DISTRICT NO. 1 - SH 99 WATER LINE RELOCATION

SUMMARY OF WATER LINE ITEMS	402	7049	7049	7049	7049	7049	7049	7049	7049	7049	7049	7049	7049	7049	7318
LOCATION	6001	6011	6073	6104	6106	6146	6152	6180	6183	6216	6378	6380	6134	6001	
	TRENCH EXCAVATION PROTECTION	WATER MAIN PIPE (PVC) (6IN) (C-900)	JCK TUN BOR OR AUG CSG (STL) (36IN)	FIRE HYDRANT ASSEMBLY	AIR RELEASE / VACUUM RELEASE VAULT (2IN)	WET CONNECTION (24IN)	WTR MAIN PIPE (PVC) (RESTRAINED JT) 24"	REMOV AIR/VAC VAULT	AIR RELEASE / VACUUM RELEASE VAULT	REMOVE EXIST WATER PIPE (VAR) (SIZE) (MTL)	REMOVE EXISTING AIR VALVE ASSEMBLY	REMOVE EXIST FLUSHING HYDRANT & VALVE	CUT AND PLUG WATER MAIN (24IN)	INSERTION VALVE (24IN)	
	LF	LF	LF	EA	EA	EA	LF	EA	EA	LF	EA	EA	LF	EA	
WATER LINE "1"															
STA 2+11 TO 9+56	750	5	144	1	2	2	750	1	2	647	1	1	100	2	
PROJECT TOTALS	750	5	144	1	2	2	750	1	2	647	1	1	100	2	

**NOTES:**

1. PAYMENT FOR TESTING OF NEW WATER MAINS SHALL BE INCLUDED IN PAYMENT FOR WATER MAIN INSTALLATION.
2. PAYMENT FOR CASING PIPE SHALL BE INCLUDED WITH BORED AND HACKED STEEL CASING INSTALLATIONS.
3. PAYMENT FOR GATE VALVES AND BOXES SHALL BE SUBSIDIARY TO MAIN PIPE.



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 WESTHEIMER PKWY TO CINCO RANCH BLVD

SUMMARY OF WATERLINE QUANTITIES

SHEET OF

FED. RD DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	27A

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**GENERAL:**

1. THE CONTRACTOR SHALL PLACE ADVANCE WARNING SIGNS, BARRICADES AND WORKZONE PAVEMENT MARKINGS BASED ON LATEST TXDOT STANDARDS AND GUIDELINES PROVIDED IN TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD).
2. CONCRETE PAVEMENT SHALL BE CONSTRUCTED IN PHASES AS SHOWN IN THE TRAFFIC CONTROL PLANS. CONTRACTOR SHALL MAKE SURE THAT THE LONGITUDINAL CONSTRUCTION JOINT IS LOCATED EITHER ALONG THE LANE LINE OR ON THE CENTER OF THE LANE USING THE FINAL LINE CONFIGURATION.
3. THE CONTRACTOR SHALL ELIMINATE OR COVER ANY EXISTING PAVEMENT MARKINGS AND EXISTING SIGNS THAT ARE IN CONFLICT WITH THE TCP LAYOUTS AND DETOURS.
4. ALL BARRICADES, SIGNS, AND FLAGGERS SHALL BE SUBSIDIARY TO ITEM 502 BARRICADES, SIGNS, AND TRAFFIC HANDLING. ALL EROSION AND SEDIMENT CONTROL DEVICES SHALL BE PAID FOR UNDER ITEM 508 TEMPORARY EROSION, SEDIMENTATION, AND ENVIRONMENTAL CONTROL. ALL WORK ZONE PAVEMENT MARKINGS SHALL BE PAID FOR UNDER ITEM 662 WORK ZONE PAVEMENT MARKINGS. ALL OTHER WORK AND MATERIALS SHALL BE SUBSIDIARY TO THE VARIOUS BID ITEMS UNLESS OTHERWISE INDICATED IN THE PLANS.
5. THE CONTRACTOR SHALL PLACE CHANNELIZING DEVICES AS PER LATEST TXDOT STANDARDS UNLESS OTHERWISE SHOWN ON PLANS. ALL DISTANCES SHOWN ARE APPROXIMATE.
6. PLACE PLASTIC DRUMS ON THE EDGE OF WORK ZONE IN ALL AREAS AS SHOWN IN THE LAYOUTS OR AS DIRECTED BY THE ENGINEER.
7. WHERE APPLICABLE CONTRACTOR SHALL OVERLAP PORTABLE CONCRETE TRAFFIC BARRIER WITH EXISTING RAIL OF MBGF BY A MINIMUM OF 30-FOOT LENGTH.
8. PORTABLE CHANGEABLE MESSAGE SIGNS (PCMS) SHALL BE PLACED TWO WEEKS IN ADVANCE OF THE BEGINNING OF EACH PHASE OF CONSTRUCTION OR EACH CLOSURE.
9. FOR ANY ROADWAY DROP-OFF GREATER THAN 2 INCHES ADJACENT TO A ROADWAY PRIOR TO OPENING TO TRAFFIC THAT IS CARRYING TRAFFIC, MAINTAIN A 3:1 SLOPE INTO THE PROPOSED CONSTRUCTION. ANY OPEN TRENCHES OR OBSTRUCTIONS WITHIN CLEAR ZONE SHALL BE PROTECTED WITH PORTABLE BARRIER OR PERMANENT CURB/BARRIER PRIOR TO OPENING TO TRAFFIC.
10. THE CONTRACTOR SHALL MAINTAIN ACCESS TO BUSINESSES AND RESIDENCES AT ALL TIMES. THE CONTRACTOR SHALL ALSO MAINTAIN ACCESS TO ADJOINING PROPERTIES ALONG THE FRONTAGE ROAD AT ALL TIMES. TRAFFIC DRUMS AND TYPE III BARRICADES SHALL BE USED TO BLOCK INTERSECTIONS AND DRIVEWAYS UNLESS OTHERWISE NOTED. CONSTRUCTION OF TEMPORARY ACCESS DRIVEWAYS UNLESS OTHERWISE NOTED. CONSTRUCTION OF TEMPORARY ACCESS DRIVEWAYS SHALL BE SUBSIDIARY TO THE VARIOUS BID ITEMS. THE CONTRACTOR SHALL BE SUBSIDIARY TO THE VARIOUS BID ITEMS. THE CONTRACTOR SHALL ADJUST THE DRIVEWAY SIGNS AS REQUIRED FOR DRIVEWAY OPENINGS.
11. THE CONTRACTOR SHALL PLACE TEMPORARY CLEARANCE SIGNS AS SOON AS BEAMS FOR PROPOSED STRUCTURES ARE IN PLACE OR IF EXISTING SIGNS ARE REMOVED DUE TO PROPOSED CONSTRUCTION. REQUIRED FOR ALL STRUCTURES LESS THAN 20-FT MINIMUM VERTICAL CLEARANCE.
12. CONTRACTOR SHALL MAINTAIN POSITIVE DRAINAGE AT ALL TIMES.
13. PLACE SWP3 AS SHOWN ON THE SWP3 LAYOUTS OR AS DIRECTED BY THE ENGINEER.
14. CONSTRUCTION ENTRANCES AND EXITS TO BE COORDINATED WITH THE ENGINEER TO ADEQUATELY PROTECT THE TRAVELING PUBLIC. PRIOR TO PLACEMENT. THE CONTRACTOR SHALL CONTROL ALL CONSTRUCTION TRAFFIC TO MINIMIZE INCONVENIENCE TO THE TRAVELING PUBLIC. PROVIDE WARNING SIGNS AND FLAGGERS AT TRUCK STAGING LOCATIONS AS NECESSARY, TO ADEQUATELY PROTECT THE TRAVELING PUBLIC.
15. TEMPORARY LIGHTING TO BE PROVIDED AT ALL TEMPORARY RAMP LOCATIONS AS SHOWN ON THE TEMPORARY ILLUMINATION LAYOUTS.
16. THE CONTRACTOR DOES NOT HAVE EXCLUSIVE USE OF THE RIGHT-OF-WAY CONTRACTOR TO COOPERATE IN THE USE OF THE RIGHT-OF-WAY WITH THE VARIOUS UTILITY COMPANIES AS DIRECTED.
17. PLACE FINAL STRIPING AND SIGNING WITHIN THE PROJECT FOR THE MAINLANES AND FRONTAGE ROADS AFTER ALL CONSTRUCTION IS COMPLETED.
18. UPON COMPLETION OF THE WORK AND BEFORE FINAL ACCEPTANCE AND PAYMENT IS MADE, THE CONTRACTOR SHALL CLEAR AND REMOVE FROM THE WORK SITE ALL SURPLUS AND DISCARDED MATERIALS, DEBRIS OF EVERY KIND AND LEAVE THE ENTIRE PROJECT IN A SMOOTH, NEAT, AND SLIGHTLY CONDITION.

**PHASE 1:**

- INSTALL ADVANCE WARNING SIGNS, CHANNELIZING DEVICES, AND CONSTRUCTION SIGNING AS SHOWN ON THE TRAFFIC CONTROL PLANS AND FOLLOWING STANDARD DETAILS. INSTALL SWP3 IN ACCORDANCE WITH THE STORM WATER POLLUTION PREVENTION PLAN. INSTALL DRAINAGE AND RETAINING WALLS AS INDICATED ON THE PLANS.
- CONSTRUCT SB FRONTAGE ROAD WIDENING AT WESTHEIMER PARKWAY STA 2431+58 TO STA 2456+50
- CONSTRUCT SIDEPAH FROM STA 2431+79 TO STA 2456+50
- CONSTRUCT TEMPORARY PAVEMENT FROM SBFR STA 2456+50 TO EXISTING PAVEMENT AT EXISTING SB ENTRANCE RAMP
- CONSTRUCT RETAINING WALLS RW-2 AND RW-3
- CONSTRUCT SB EXIT RAMP FROM STA 14+70 TO TIE IN TO EXISTING SBML
- CONSTRUCTION OF SB EXIT RAMP MUST BE COMPLETED PRIOR TO PH 2 STEP 1 OF MAINLANE PROJECT CSJ 3510-04-019

**PHASE 2:**

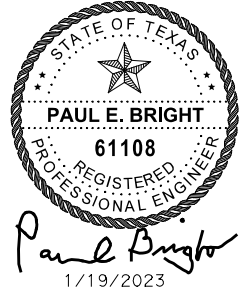
- PHASE 2 CAN ONLY START AFTER BEAMS AT WESTHEIMER PARKWAY BRIDGE HAVE BEEN SET FROM MAINLANE PROJECT CSJ 3510-04-019
- MAINTAIN ADVANCE WARNING SIGNS. INSTALL/ADJUST TEMPORARY DRAINAGE, CHANNELIZING DEVICES, CONSTRUCTION SIGNING, PERMANENT SIGNING, AND WORK ZONE PAVEMENT MARKINGS AS SHOWN ON THE TRAFFIC CONTROL PLANS AND FOLLOWING STANDARD DETAILS. INSTALL SWP3 IN ACCORDANCE WITH THE STORM WATER POLLUTION PREVENTION PLAN. INSTALL DRAINAGE AND RETAINING WALLS AS INDICATED ON THE PLANS.
- SHIFT SH 99 SBFR TRAFFIC TO COMPLETED SBFR PAVEMENT
- CLOSE EXISTING SB EXIT RAMP AND DIRECT SBML TRAFFIC EXITING FOR WESTHEIMER PARKWAY TO EXIT AT CINCO RANCH BLVD EXIT RAMP
- DEMO EXISTING SB EXIT RAMP
- CONSTRUCT PROPOSED RETAINING WALL RW-1
- COMPLETE SECTION OF SBFR FROM STA 2436+50 TO STA 2439+53
- CONSTRUCT PROPOSED SB ENTRANCE RAMP

**PHASE 3 STEP 1:**


- MAINTAIN ADVANCE WARNING SIGNS. INSTALL/ADJUST TEMPORARY DRAINAGE, CHANNELIZING DEVICES, CONSTRUCTION SIGNING, PERMANENT SIGNING, AND WORK ZONE PAVEMENT MARKINGS AS SHOWN ON THE TRAFFIC CONTROL PLANS AND FOLLOWING STANDARD DETAILS. INSTALL SWP3 IN ACCORDANCE WITH THE STORM WATER POLLUTION PREVENTION PLAN. INSTALL DRAINAGE AS INDICATED ON THE PLANS.
- SHIFT SH 99 SB ENTRANCE RAMP TRAFFIC TO COMPLETED ENTRANCE RAMP PAVEMENT
- CLOSE SBML AUXILIARY LANE AND DEMO EXISTING SBML SHOULDER
- CLOSE EXISTING SB ENTRANCE RAMP AND DEMO EXISTING SB ENTRANCE RAMP
- COMPLETE SBFR PERMANENT PAVEMENT INSIDE LANES FROM STA 2456+50 TO EXIT RAMP PAVEMENT STA 2459+60
- COMPLETE SBFR PAVEMENT INSIDE WIDENING FROM STA 2459+60 TO END OF PROJECT STA 2467+80

**PHASE 3 STEP 2:**


- MAINTAIN ADVANCE WARNING SIGNS. INSTALL/ADJUST TEMPORARY DRAINAGE, CHANNELIZING DEVICES, CONSTRUCTION SIGNING, PERMANENT SIGNING, AND WORK ZONE PAVEMENT MARKINGS AS SHOWN ON THE TRAFFIC CONTROL PLANS AND FOLLOWING STANDARD DETAILS. INSTALL SWP3 IN ACCORDANCE WITH THE STORM WATER POLLUTION PREVENTION PLAN. INSTALL DRAINAGE AS INDICATED ON THE PLANS.
- OPEN COMPLETED EXIT RAMP
- SHIFT SH 99 SBFR TO COMPLETED PERMANENT FRONTAGE ROAD PAVEMENT
- COMPLETE SBFR PERMANENT PAVEMENT OUTSIDE LANES FROM STA 2456+50 TO STA 2462+00
- COMPLETE SBFR PAVEMENT OUTSIDE WIDENING FROM STA 2464+45 TO END OF PROJECT STA 2468+08
- CONSTRUCT SIDEPAH FROM STA 2456+50 TO STA 2468+68



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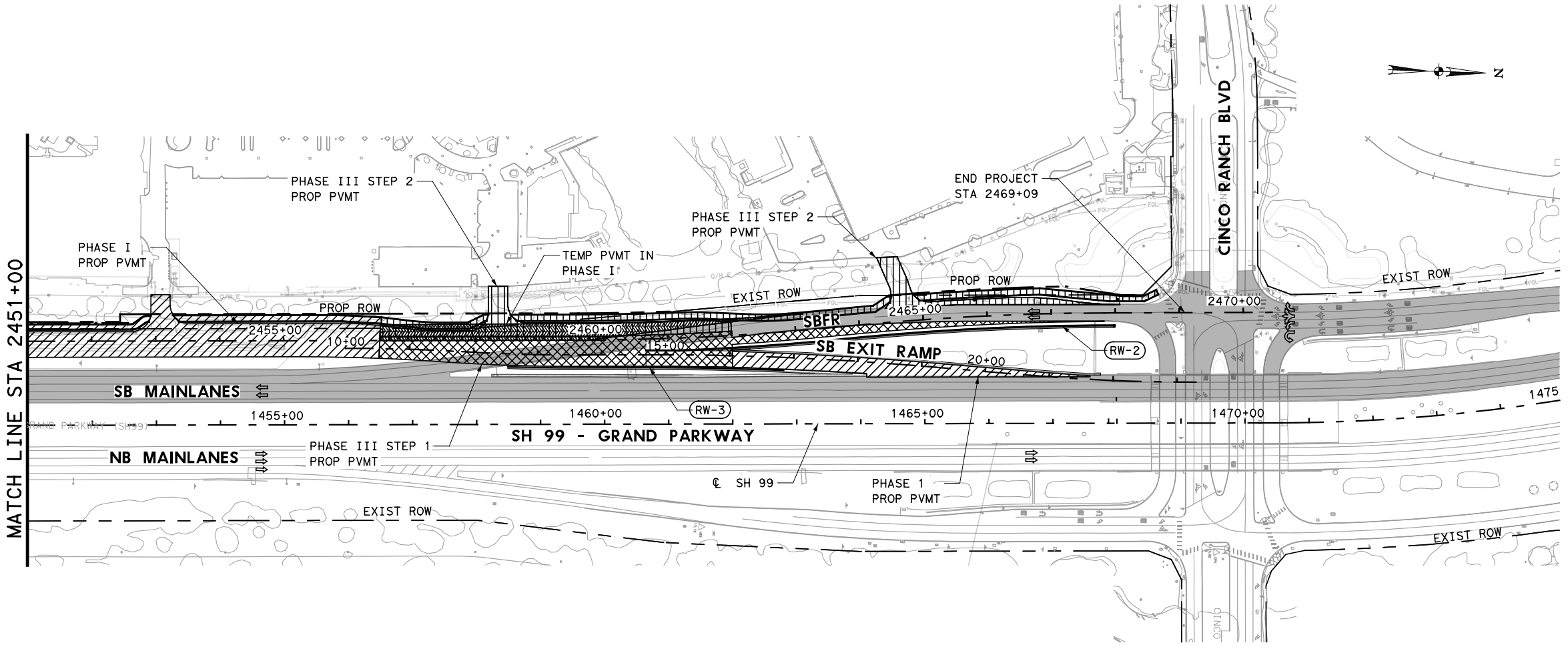
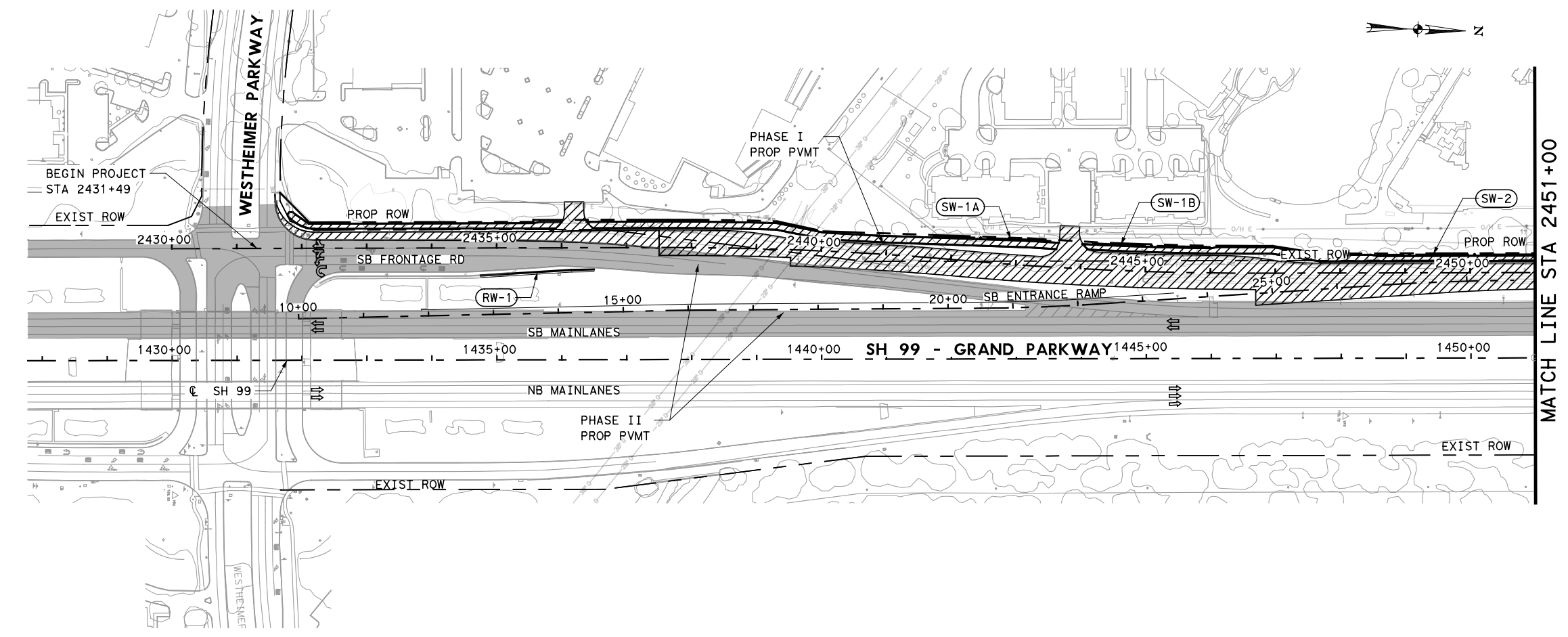
**SOUTHBOUND FRONTAGE ROAD  
WESTHEIMER PKWY TO CINCO RANCH BLVD**

**TRAFFIC CONTROL  
PLAN NARRATIVE**

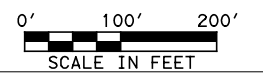
**SHEET 1 OF 1**

FED. RD. DIV. NO.	PROJECT NO.	HIGHWAY NO.	
6		SH 99	
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	28

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- LEGEND**
- EXIST PVMT
  - PHASE I PROP PVMT
  - PHASE II PROP PVMT
  - PHASE III STEP 1 PROP PVMT
  - PHASE III STEP 2 PROP PVMT



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SH 99  
 SOUTHBOUND FRONTAGE ROAD  
 WESTHEIMER PKWY TO CINCO RANCH BLVD  
 TRAFFIC CONTROL PLAN  
 OVERALL LAYOUT  
 STA 2431+49 TO STA 2469+09  
 SHEET 1 OF 1

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	29

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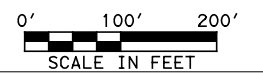
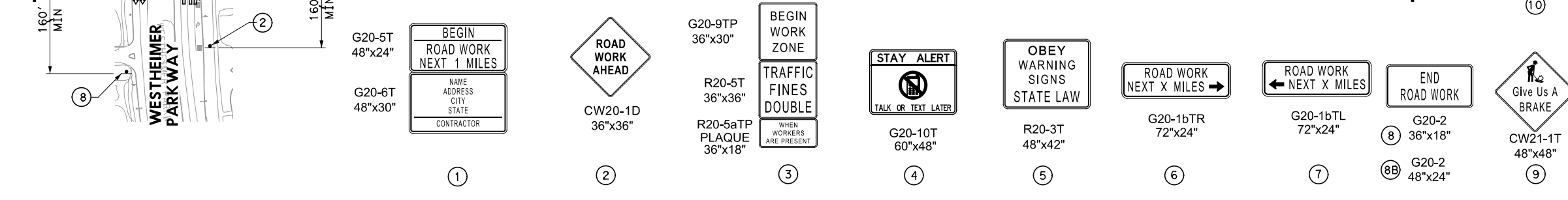
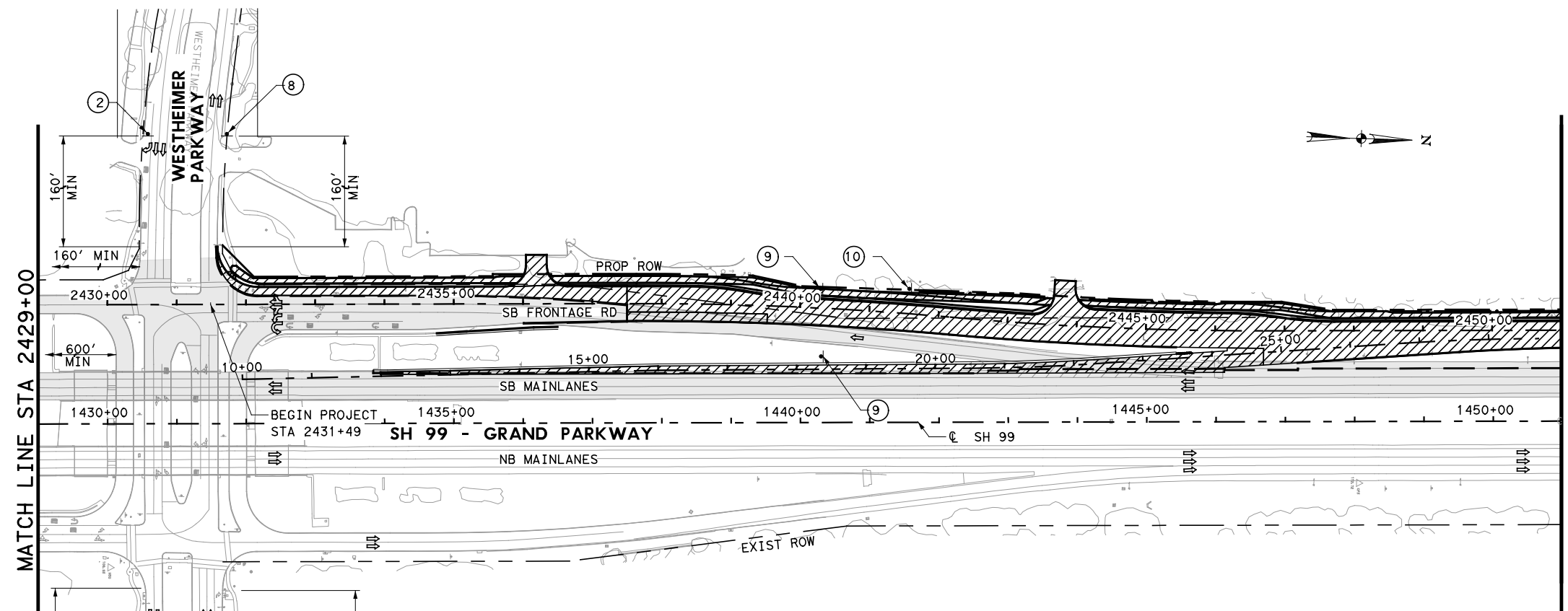
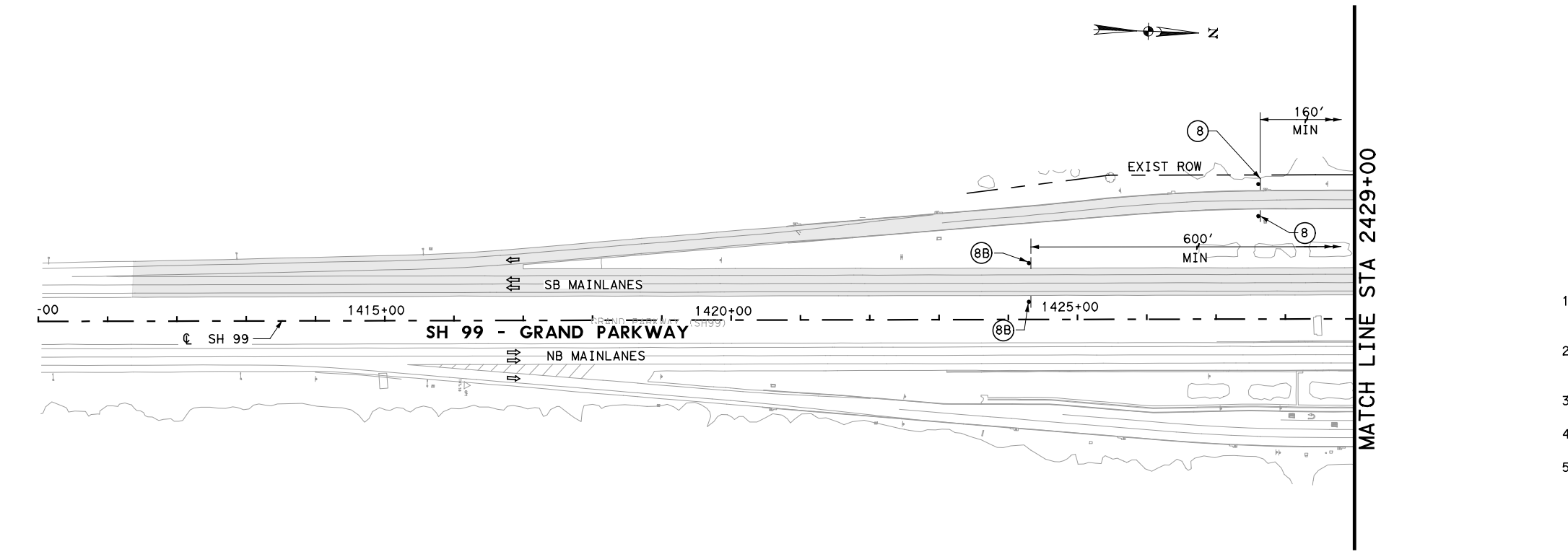
- DIRECTION OF TRAFFIC
- CONSTRUCTION WARNING/TEMPORARY SIGN

**EXISTING POSTED SPEED LIMIT**

SH 99 MAINLANES = 60 MPH  
 RAMP = 35 MPH  
 SH 99 FRONTAGE RD = 35 MPH  
 WESTHEIMER PARKWAY = 35 MPH  
 CINCO RANCH BLVD = 35 MPH

**NOTES:**

1. THIS SHEET REFLECTS ADVANCE SIGNING FOR WORK AT THE BEGINNING AND END OF THE PROJECT LIMITS AND SIGNS TO REMAIN FOR THE DURATION OF THE PROJECT.
2. CONTRACTOR SHALL CAREFULLY REVIEW "BARRICADES AND CONSTRUCTION PROJECT LIMITS" STANDARD BC(2)-21 (SHEET 2 OF 12), FOR ADDITIONAL SIGN PLACEMENT ALONG THE PROJECT.
3. REFER TO INDIVIDUAL TCP PHASING FOR ADDITIONAL WARNING SIGNS THROUGHOUT THE PROJECT DURING CONSTRUCTION.
4. CONTRACTOR SHALL PLACE SPEED LIMIT SIGNS R2-1 EVERY QUARTER MILE FOR 35 MPH ZONE ALONG SOUTH BOUND FRONTAGE ROAD.
5. UNLESS OTHERWISE NOTED, SPEED CONDITION REMAINS FOR THE ENTIRE CONSTRUCTION DURATION OR UNTIL ERECTION OF FINAL POSTED SPEED SIGNS IS GRANTED.



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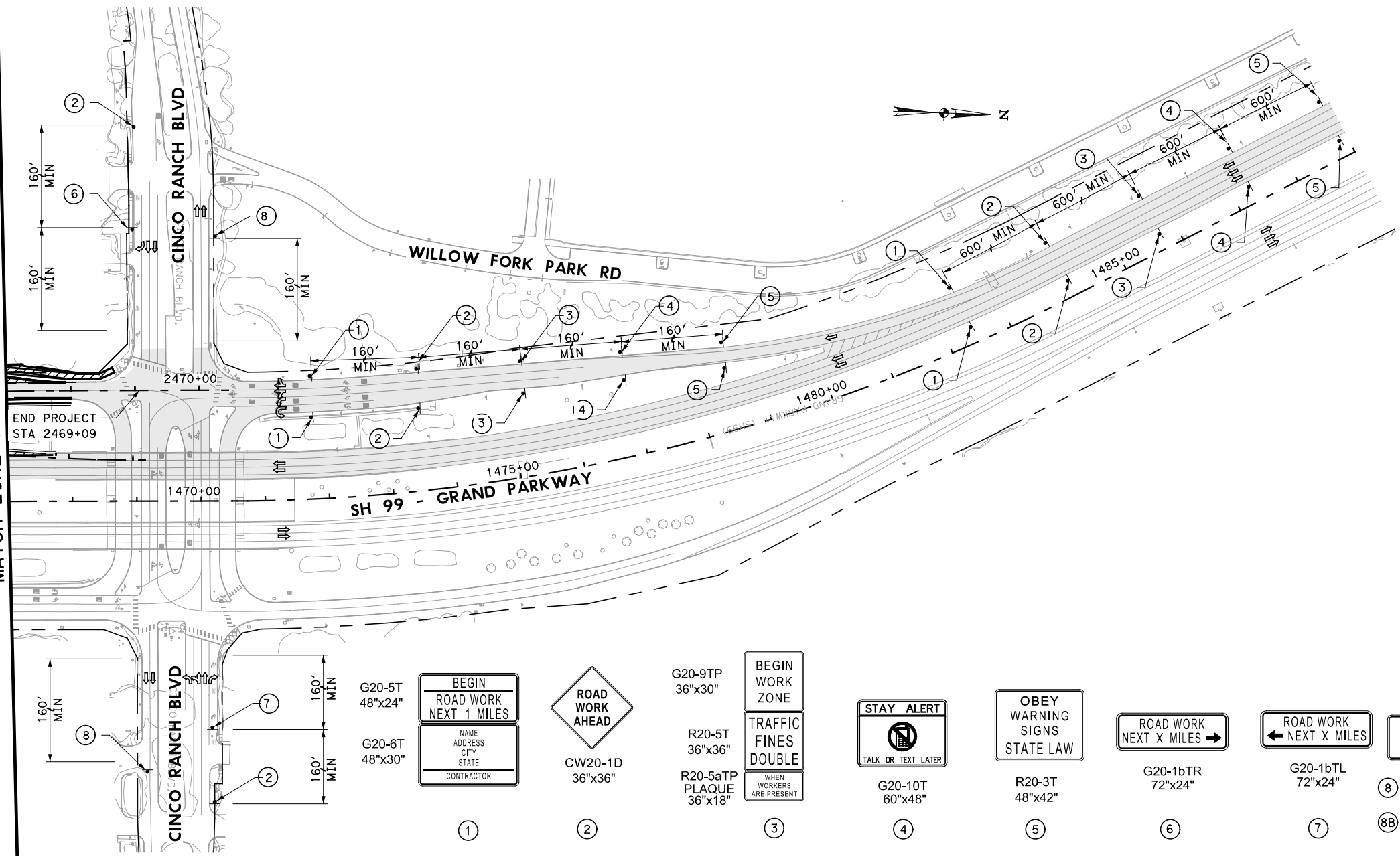
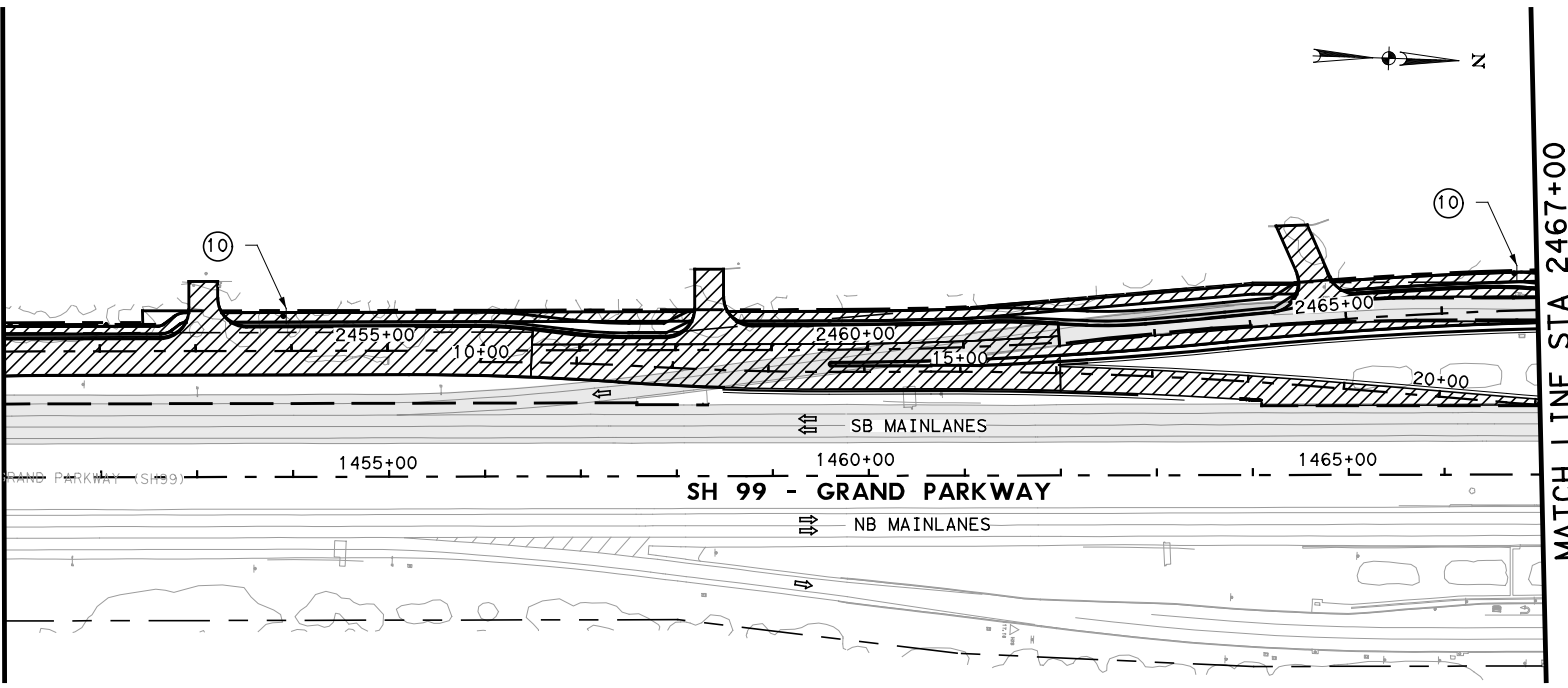
SH 99  
 SOUTHBOUND FRONTAGE ROAD  
 WESTHEIMER PKWY TO CINCO RANCH BLVD  
 TRAFFIC CONTROL PLAN  
 ADVANCE WARNING SIGNS  
 BEGIN TO STA 2451+00  
 SHEET 1 OF 2

FED. RD. DIV. NO.	PROJECT NO.	HIGHWAY NO.	
6		SH 99	
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	30

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MATCH LINE STA 2451+00

MATCH LINE STA 2467+00



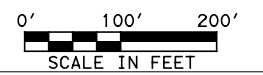
**LEGEND**

- ➔ DIRECTION OF TRAFFIC
- CONSTRUCTION WARNING/TEMPORARY SIGN

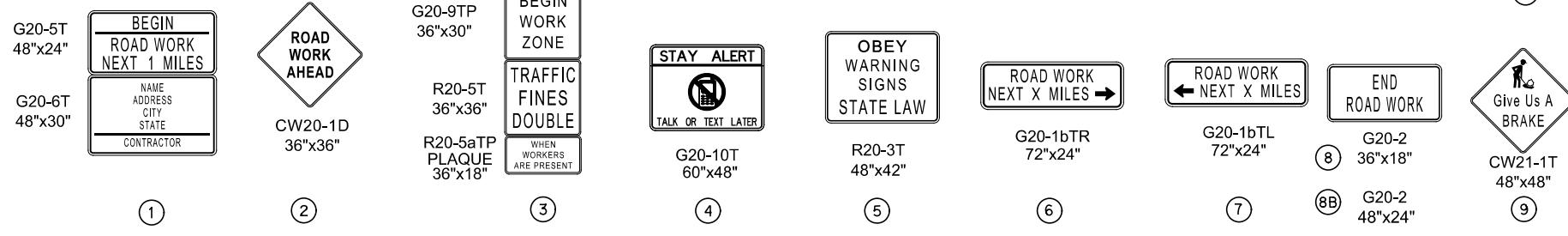
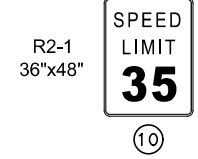
**EXISTING POSTED SPEED LIMIT**  
 SH 99 MAINLANES = 60 MPH  
 RAMPS = 35 MPH  
 SH 99 FRONTAGE RD = 35 MPH  
 WESTHEIMER PARKWAY = 35 MPH  
 CINCO RANCH BLVD = 35 MPH

**NOTES:**

1. THIS SHEET REFLECTS ADVANCE SIGNING FOR WORK AT THE BEGINNING AND END OF THE PROJECT LIMITS AND SIGNS TO REMAIN FOR THE DURATION OF THE PROJECT.
2. CONTRACTOR SHALL CAREFULLY REVIEW "BARRICADES AND CONSTRUCTION PROJECT LIMITS" STANDARD BC(2)-21 (SHEET 2 OF 12), FOR ADDITIONAL SIGN PLACEMENT ALONG THE PROJECT.
3. REFER TO INDIVIDUAL TCP PHASING FOR ADDITIONAL WARNING SIGNS THROUGHOUT THE PROJECT DURING CONSTRUCTION.
4. CONTRACTOR SHALL PLACE SPEED LIMIT SIGNS R2-1 EVERY QUARTER MILE FOR 35 MPH ZONE ALONG SOUTH BOUND FRONTAGE ROAD.
5. UNLESS OTHERWISE NOTED, SPEED CONDITION REMAINS FOR THE ENTIRE CONSTRUCTION DURATION OR UNTIL ERECTION OF FINAL POSTED SPEED SIGNS IS GRANTED.



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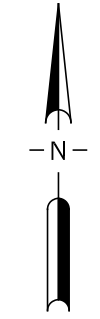
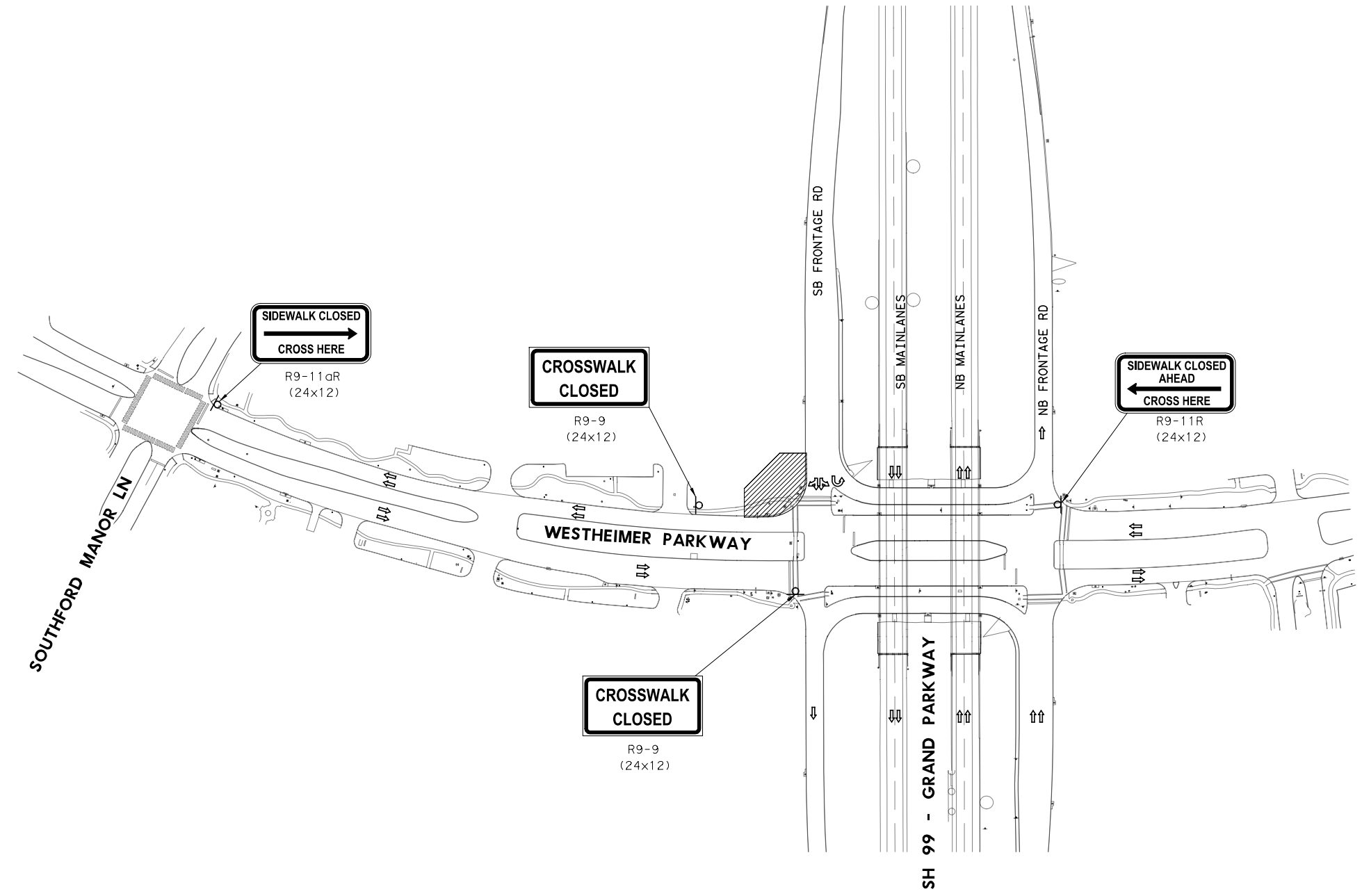


SH 99  
 SOUTHBOUND FRONTAGE ROAD  
 WESTHEIMER PKWY TO CINCO RANCH BLVD  
 TRAFFIC CONTROL PLAN  
 ADVANCE WARNING SIGNS  
 STA 2451+00 TO END  
 SHEET 2 OF 2

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	31



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- LEGEND:**
- SIGN POST
  - ▨ WORK ZONE
  - TRAFFIC FLOW

**PAUL E. BRIGHT**  
61108  
REGISTERED PROFESSIONAL ENGINEER  
1/19/2023

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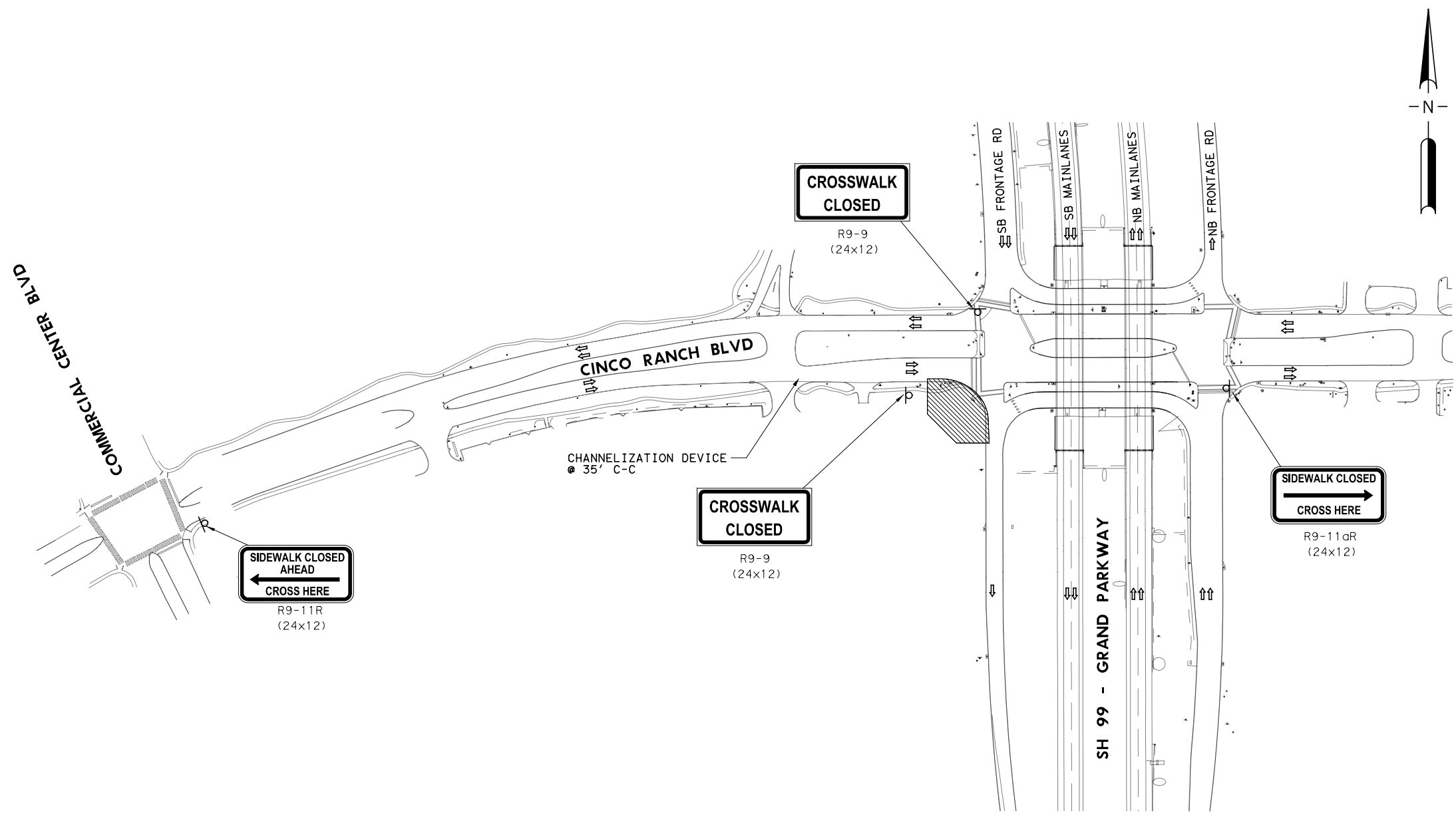
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**SH 99**  
**SOUTHBOUND FRONTAGE ROAD**  
**WESTHEIMER PKWY TO CINCO RANCH BLVD**  
**TRAFFIC CONTROL PLAN**  
**WESTHEIMER PKWY @ SB FRTG RD**  
**SIDEWALK CLOSURE**

**SHEET 1 OF 1**

FED. RD. DIV. NO.	PROJECT NO.	HIGHWAY NO.
6		SH 99
STATE	DIST.	COUNTY
TEXAS	HOU	FORT BEND
CONT.	SECT.	JOB
3510	04	055
SHEET NO.		
32		

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**LEGEND:**  
 □ SIGN POST  
 ▨ WORK ZONE  
 → TRAFFIC FLOW

PAUL E. BRIGHT  
 61108  
 REGISTERED PROFESSIONAL ENGINEER  
*Paul Bright*  
 1/19/2023

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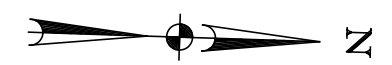
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**SH 99**  
**SOUTHBOUND FRONTAGE ROAD**  
**WESTHEIMER PKWY TO CINCO RANCH BLVD**  
**TRAFFIC CONTROL PLAN**  
**CINCO RANCH BLVD @ SB FRTG RD**  
**SIDEWALK CLOSURE**

SHEET 1 OF 1

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
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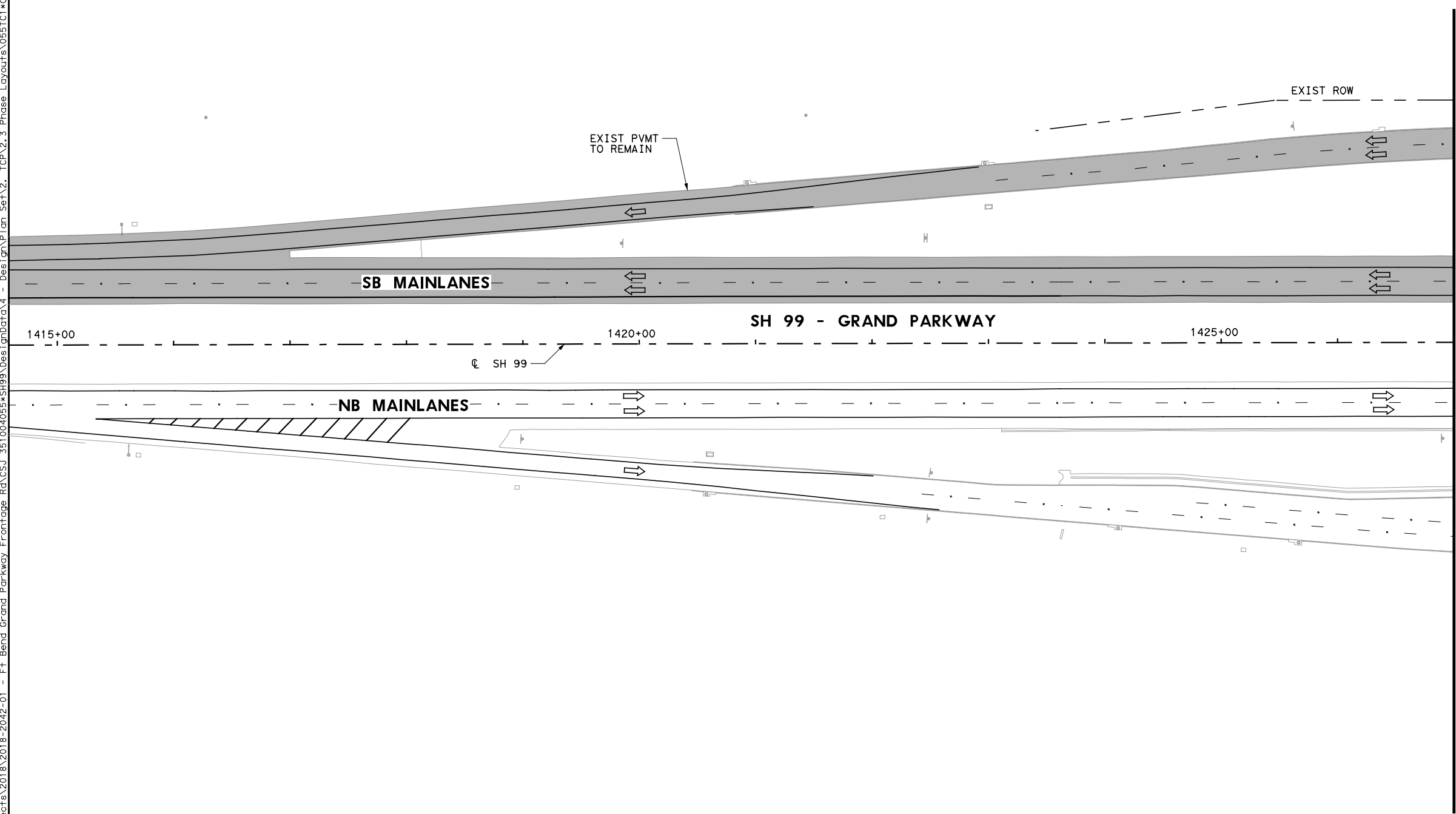
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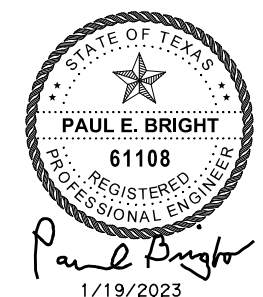
**LEGEND**

- EXIST PAV TO REMAIN
- PHASE I TEMP PAV CONSTRUCTION
- PHASE I TEMP PAV CONSTRUCTION IN PREVIOUS PHASE
- PHASE I PERM PAV CONSTRUCTION
- PHASE II PERM PAV CONSTRUCTION
- PHASE III STEP 1 PERM PAV CONSTRUCTION
- PHASE III STEP 2 PERM PAV CONSTRUCTION
- PHASE III STEP 2 PERM PAV CONSTRUCTION IN PREVIOUS PHASE
- PSSCTB PORTABLE CONC BARRIER
- LPCB LOW-PROFILE CONC BARRIER (TY 1)
- LPCB LOW-PROFILE CONC BARRIER (TY 2)
- PROP DIRECTION OF TRAFFIC
- EXIST DIRECTION OF TRAFFIC
- CHANNELIZING DEVICE
- CONSTRUCTION SIGN
- CRASH CUSHION ATTENUATOR (CCA)
- TYPE III BARRICADE
- (A) WK ZN PAV MRK REMOV (W) 4" (BRK)
- (B) WK ZN PAV MRK REMOV (W) 4" (DOT)
- (C) WK ZN PAV MRK REMOV (W) 4" (SLD)
- (D) WK ZN PAV MRK REMOV (W) 8" (SLD)
- (E) WK ZN PAV MRK REMOV (Y) 4" (SLD)
- (F) WK ZN PAV MRK REMOV (W) 24" (SLD)

NOTES:  
1. MAINTAIN ACCESS TO ALL DRIVEWAYS AT ALL TIMES DURING CONSTRUCTION.



MATCH LINE ML STA 1427+00



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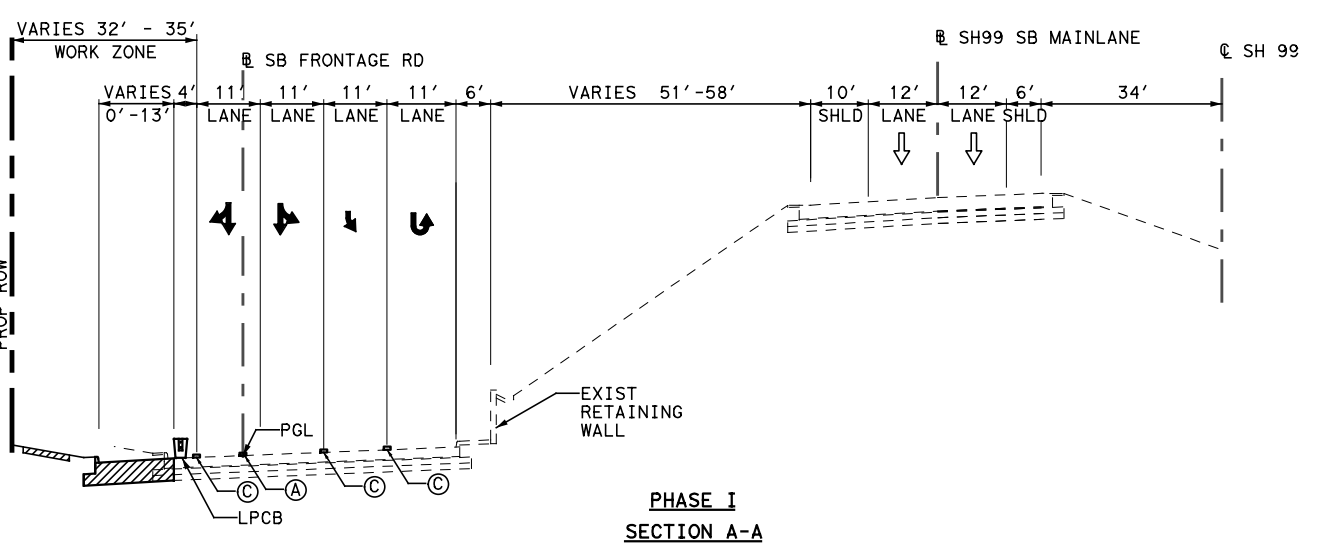
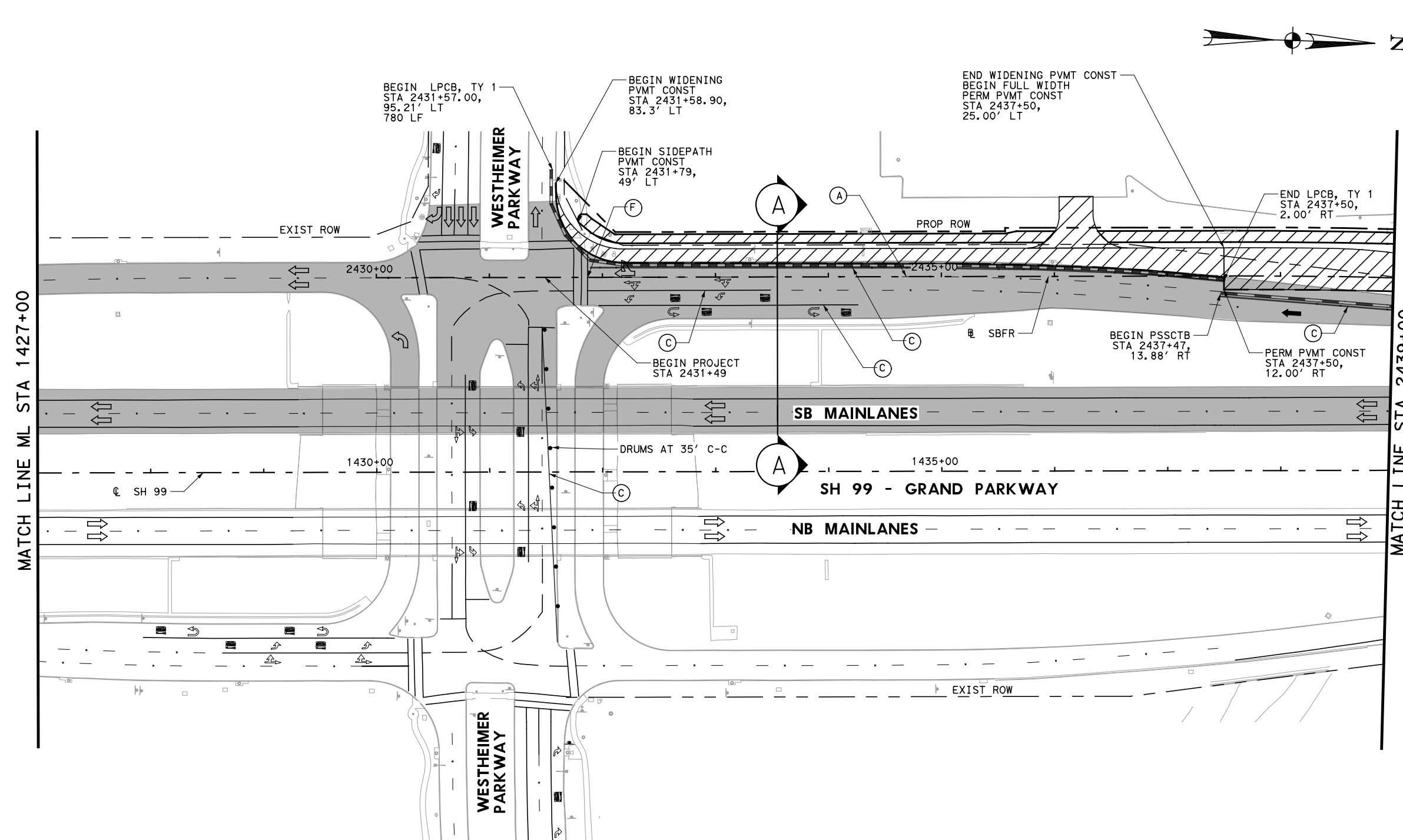


**SH 99**  
**SOUTHBOUND FRONTAGE ROAD**  
**WESTHEIMER PKWY TO CINCO RANCH BLVD**  
**TRAFFIC CONTROL PLAN**  
**PHASE I**  
**ML STA 1415+00 TO ML STA 1427+00**

SHEET 1 OF 6

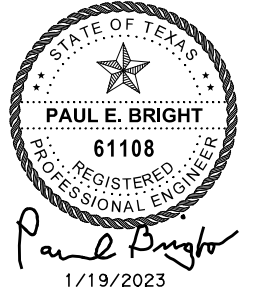
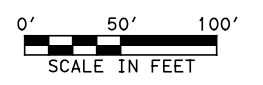
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6		SH 99
STATE	DIST.	COUNTY
TEXAS	HOU	FORT BEND
CONT.	SECT.	JOB
3510	04	055
		SHEET NO.
		34

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- LEGEND**
- EXIST PAV TO REMAIN
  - PHASE I TEMP PAV CONSTRUCTION
  - TEMP PAV CONSTRUCTED IN PREVIOUS PHASE
  - PHASE I PERM PAV CONSTRUCTION
  - PHASE II PERM PAV CONSTRUCTION
  - PHASE III STEP 1 PERM PAV CONSTRUCTION
  - PHASE III STEP 2 PERM PAV CONSTRUCTION
  - PERM PAV CONSTRUCTED IN PREVIOUS PHASE
  - PSSCTB PORTABLE CONC BARRIER
  - LPCB LOW-PROFILE CONC BARRIER (TY 1)
  - LPCB LOW-PROFILE CONC BARRIER (TY 2)
  - PROP DIRECTION OF TRAFFIC
  - EXIST DIRECTION OF TRAFFIC
  - CHANNELIZING DEVICE
  - CONSTRUCTION SIGN
  - CRASH CUSHION ATTENUATOR (CCA)
  - TYPE III BARRICADE
  - WK ZN PAV MRK REMOV (W) 4" (BRK)
  - WK ZN PAV MRK REMOV (W) 4" (DOT)
  - WK ZN PAV MRK REMOV (W) 4" (SLD)
  - WK ZN PAV MRK REMOV (W) 8" (SLD)
  - WK ZN PAV MRK REMOV (Y) 4" (SLD)
  - WK ZN PAV MRK REMOV (W) 24" (SLD)

NOTES:  
1. MAINTAIN ACCESS TO ALL DRIVEWAYS AT ALL TIMES DURING CONSTRUCTION.



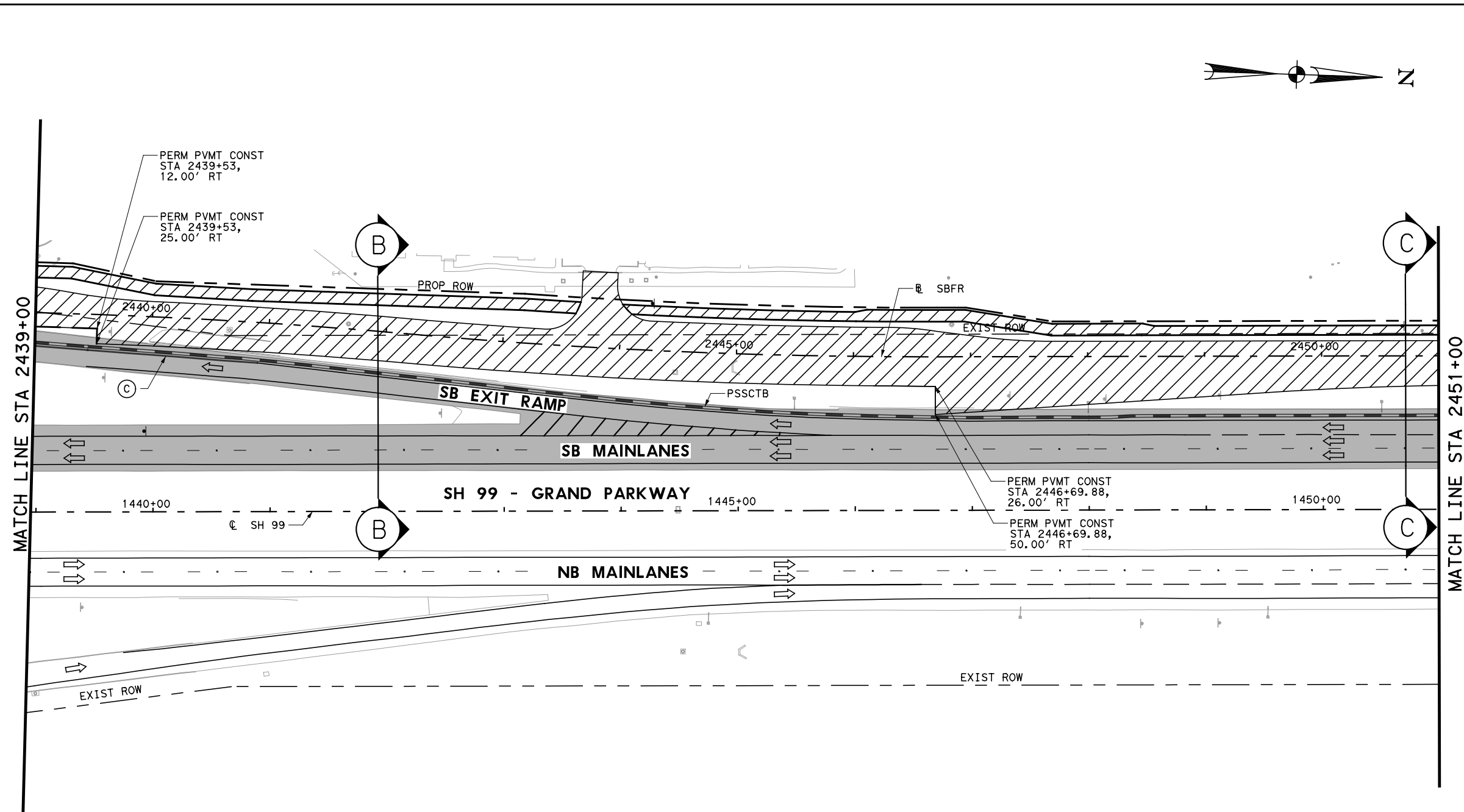
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Houston, Texas 77079  
(832) 619-1000



SH 99  
SOUTHBOUND FRONTAGE ROAD  
WESTHEIMER PKWY TO CINCO RANCH BLVD  
TRAFFIC CONTROL PLAN  
PHASE I  
ML STA 1427+00 TO STA 2439+00  
SHEET 2 OF 6

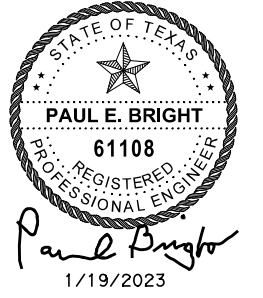
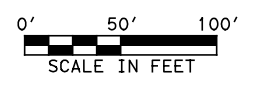
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6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	35

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- LEGEND**
- EXIST PAV TO REMAIN
  - PHASE I TEMP PAV CONSTRUCTION
  - PHASE I TEMP PAV CONSTRUCTION IN PREVIOUS PHASE
  - PHASE I PERM PAV CONSTRUCTION
  - PHASE II PERM PAV CONSTRUCTION
  - PHASE III STEP 1 PERM PAV CONSTRUCTION
  - PHASE III STEP 2 PERM PAV CONSTRUCTION
  - PHASE III STEP 2 PERM PAV CONSTRUCTION IN PREVIOUS PHASE
  - PSSCTB PORTABLE CONC BARRIER
  - LPCB LOW-PROFILE CONC BARRIER (TY 1)
  - LPCB LOW-PROFILE CONC BARRIER (TY 2)
  - PROP DIRECTION OF TRAFFIC
  - EXIST DIRECTION OF TRAFFIC
  - CHANNELIZING DEVICE
  - CONSTRUCTION SIGN
  - CRASH CUSHION ATTENUATOR (CCA)
  - TYPE III BARRICADE
  - WK ZN PAV MRK REMOV (W) 4" (BRK)
  - WK ZN PAV MRK REMOV (W) 4" (DOT)
  - WK ZN PAV MRK REMOV (W) 4" (SLD)
  - WK ZN PAV MRK REMOV (W) 8" (SLD)
  - WK ZN PAV MRK REMOV (Y) 4" (SLD)
  - WK ZN PAV MRK REMOV (W) 24" (SLD)

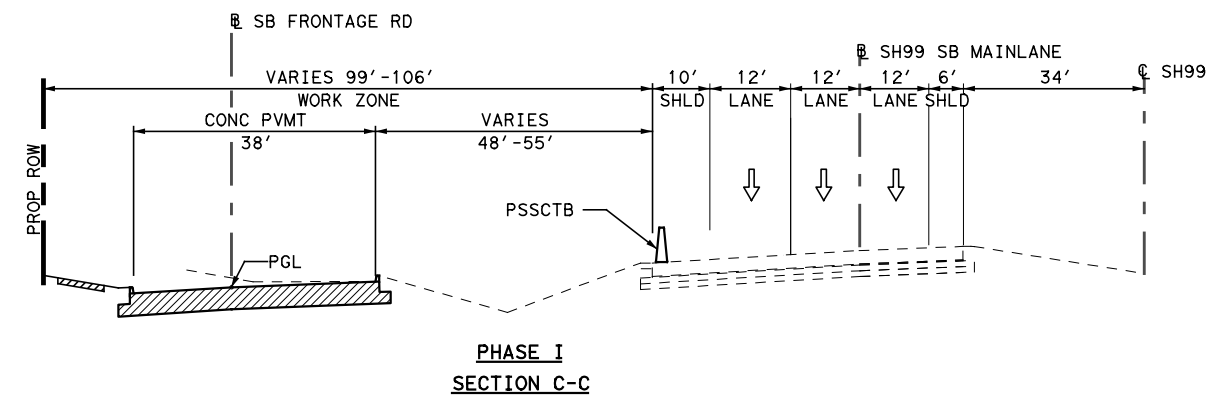
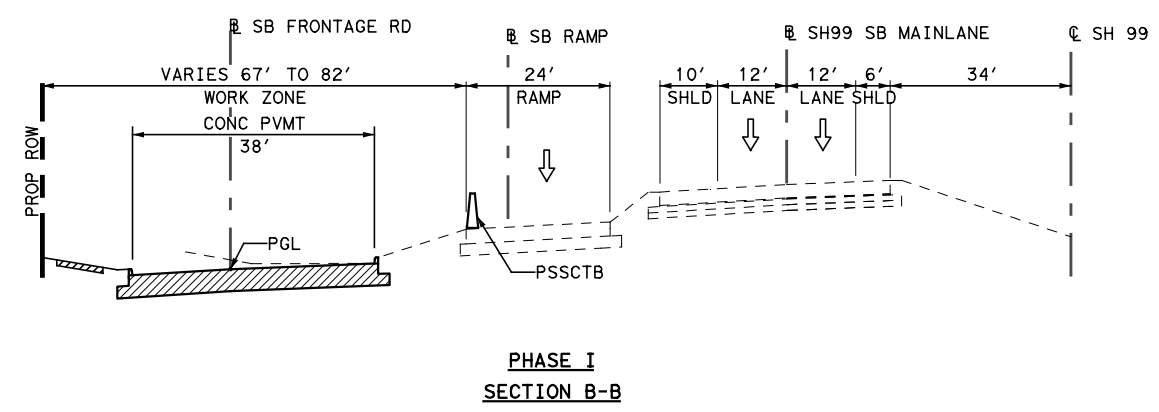
NOTES:  
 1. MAINTAIN ACCESS TO ALL DRIVEWAYS AT ALL TIMES DURING CONSTRUCTION.



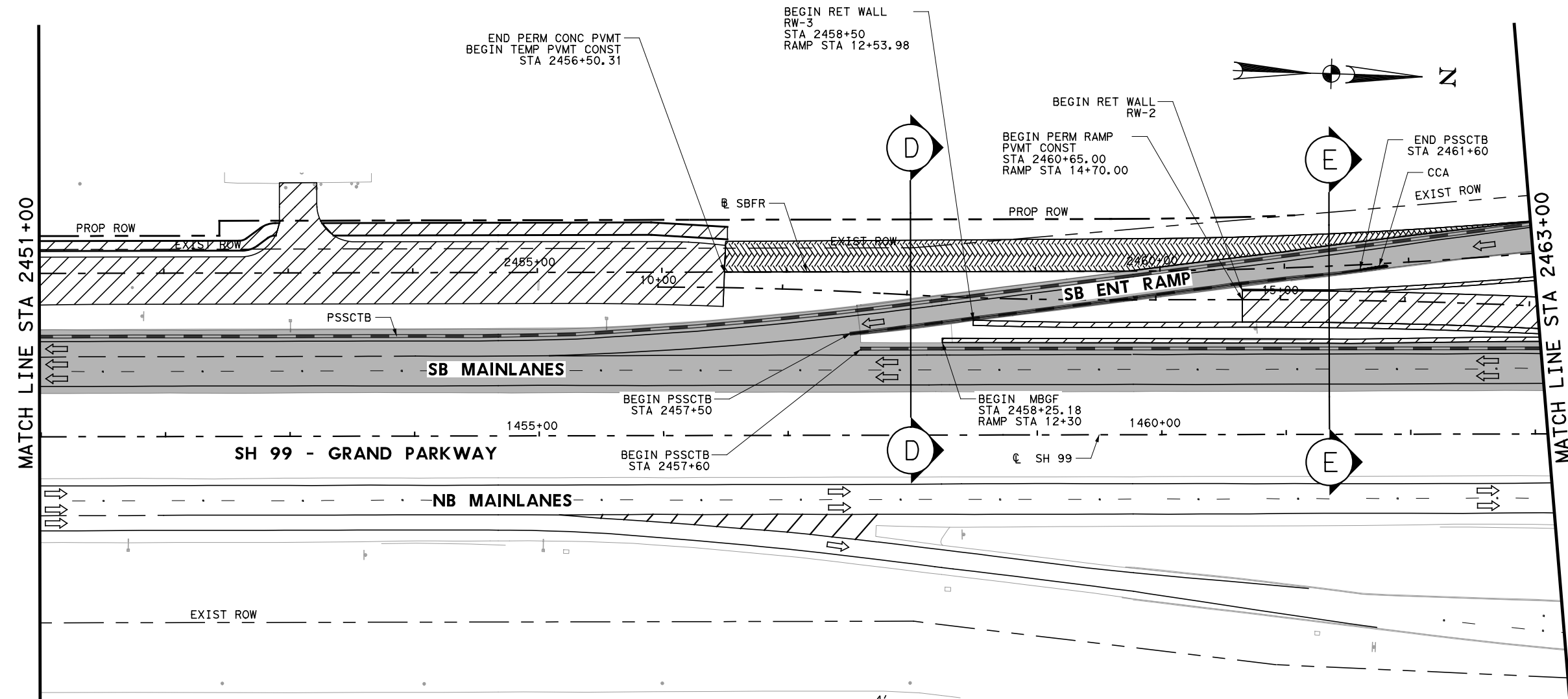
SH 99  
 SOUTHBOUND FRONTAGE ROAD  
 WESTHEIMER PKWY TO CINCO RANCH BLVD  
 TRAFFIC CONTROL PLAN  
 PHASE I  
 STA 2439+00 TO STA 2451+00

SHEET 3 OF 6

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	36



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**LEGEND**

- EXIST PAV TO REMAIN
- PHASE I TEMP PAV CONSTRUCTION
- TEMP PAV CONSTRUCTED IN PREVIOUS PHASE
- PHASE I PERM PAV CONSTRUCTION
- PHASE II PERM PAV CONSTRUCTION
- PHASE III STEP 1 PERM PAV CONSTRUCTION
- PHASE III STEP 2 PERM PAV CONSTRUCTION
- PERM PAV CONSTRUCTED IN PREVIOUS PHASE
- PSSCTB PORTABLE CONC BARRIER
- LPCB LOW-PROFILE CONC BARRIER (TY 1)
- LPCB LOW-PROFILE CONC BARRIER (TY 2)
- PROP DIRECTION OF TRAFFIC
- EXIST DIRECTION OF TRAFFIC
- CHANNELIZING DEVICE
- CONSTRUCTION SIGN
- CRASH CUSHION ATTENUATOR (CCA)
- TYPE III BARRICADE
- WK ZN PAV MRK REMOV (W) 4" (BRK)
- WK ZN PAV MRK REMOV (W) 4" (DOT)
- WK ZN PAV MRK REMOV (W) 4" (SLD)
- WK ZN PAV MRK REMOV (W) 8" (SLD)
- WK ZN PAV MRK REMOV (Y) 4" (SLD)
- WK ZN PAV MRK REMOV (W) 24" (SLD)

**NOTES:**  
1. MAINTAIN ACCESS TO ALL DRIVEWAYS AT ALL TIMES DURING CONSTRUCTION.



STATE OF TEXAS  
PAUL E. BRIGHT  
61108  
REGISTERED PROFESSIONAL ENGINEER  
Paul Bright  
1/19/2023

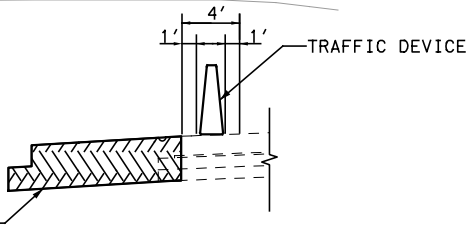
**TEDSI INFRASTRUCTURE GROUP**  
Consulting Engineers  
738 Hwy 6 South, Suite 430  
Houston, Texas 77079  
(832) 619-1000

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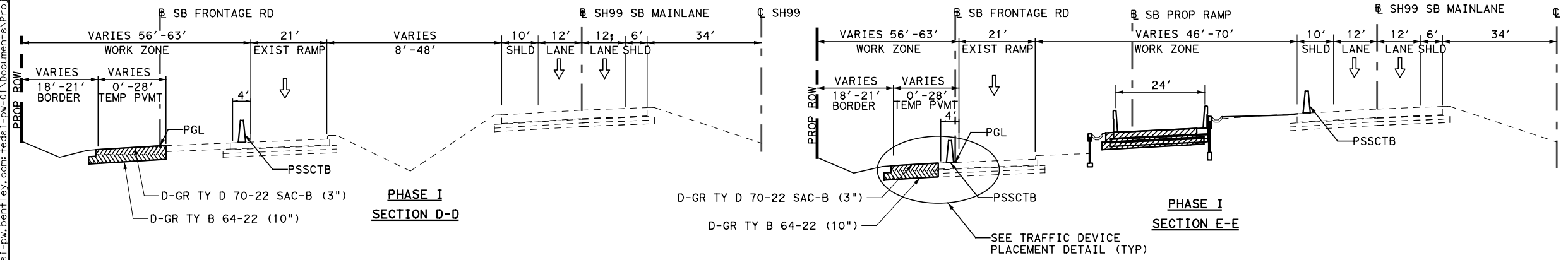
SH 99  
SOUTHBOUND FRONTAGE ROAD  
WESTHEIMER PKWY TO CINCO RANCH BLVD  
TRAFFIC CONTROL PLAN  
PHASE I  
STA 2451+00 TO STA 2463+00

SHEET 4 OF 6

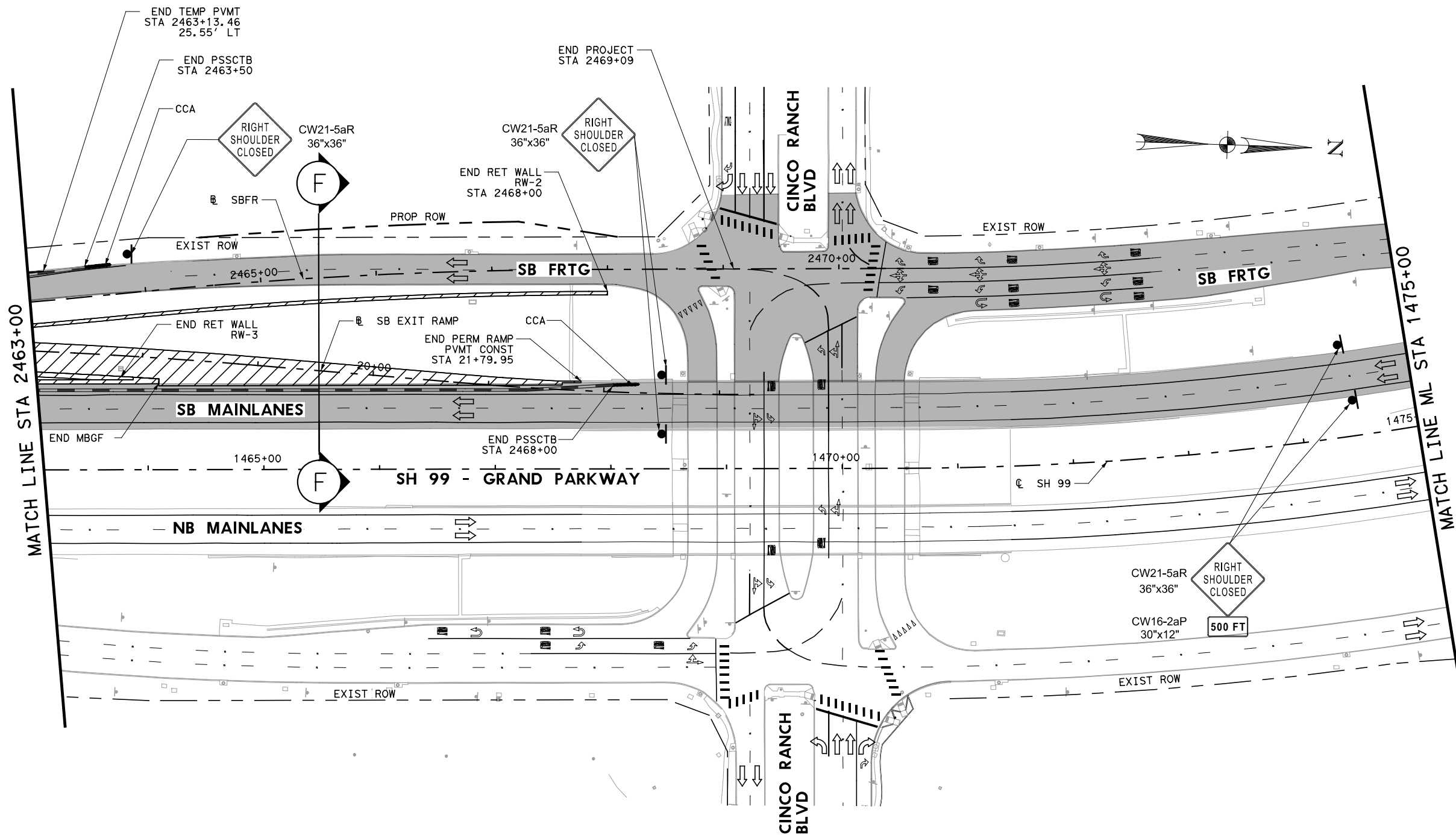
FED. RD. DIV. NO. 6	PROJECT NO.		HIGHWAY NO. SH 99
STATE TEXAS	DIST. HOU	COUNTY FORT BEND	
CONT. 3510	SECT. 04	JOB 055	SHEET NO. 37



SEE TRAFFIC DEVICE PLACEMENT DETAIL (TYP)

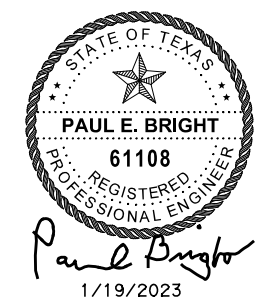
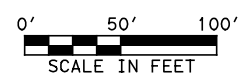


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- ### LEGEND
- EXIST PAV TO REMAIN
  - PHASE I TEMP PAV CONSTRUCTION
  - TEMP PAV CONSTRUCTED IN PREVIOUS PHASE
  - PHASE I PERM PAV CONSTRUCTION
  - PHASE II PERM PAV CONSTRUCTION
  - PHASE III STEP 1 PERM PAV CONSTRUCTION
  - PHASE III STEP 2 PERM PAV CONSTRUCTION
  - PERM PAV CONSTRUCTED IN PREVIOUS PHASE
  - PSSCTB PORTABLE CONC BARRIER
  - LPCB LOW-PROFILE CONC BARRIER (TY 1)
  - LPCB LOW-PROFILE CONC BARRIER (TY 2)
  - PROP DIRECTION OF TRAFFIC
  - EXIST DIRECTION OF TRAFFIC
  - CHANNELIZING DEVICE
  - CONSTRUCTION SIGN
  - CRASH CUSHION ATTENUATOR (CCA)
  - TYPE III BARRICADE
  - WK ZN PAV MRK REMOV (W) 4" (BRK)
  - WK ZN PAV MRK REMOV (W) 4" (DOT)
  - WK ZN PAV MRK REMOV (W) 4" (SLD)
  - WK ZN PAV MRK REMOV (W) 8" (SLD)
  - WK ZN PAV MRK REMOV (Y) 4" (SLD)
  - WK ZN PAV MRK REMOV (W) 24" (SLD)

NOTES:  
 1. MAINTAIN ACCESS TO ALL DRIVEWAYS AT ALL TIMES DURING CONSTRUCTION.



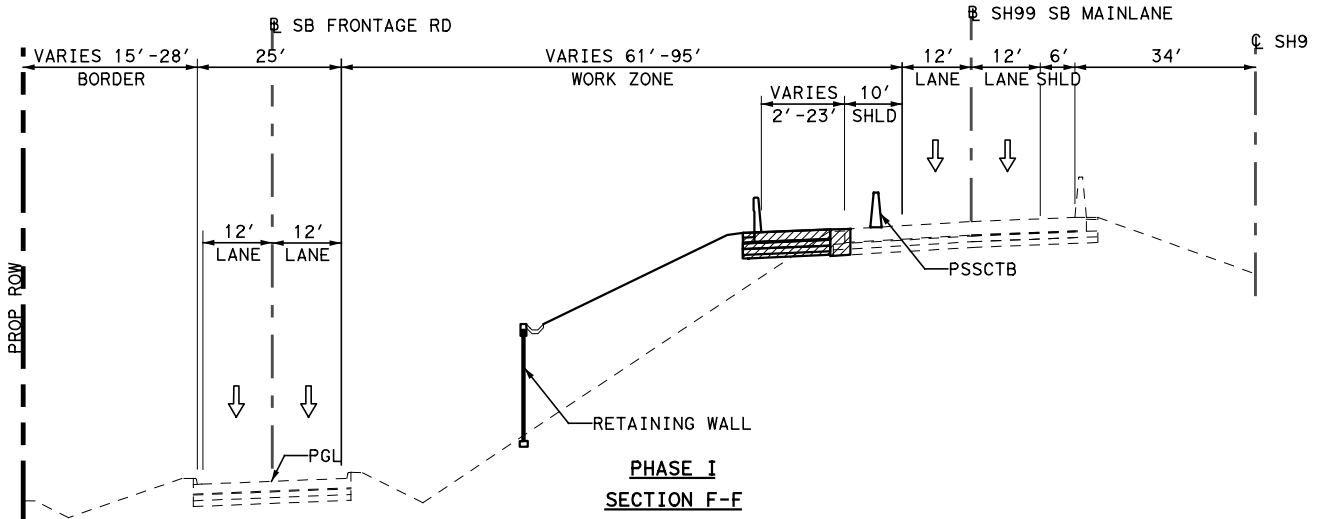
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 Consulting Engineers  
 TBPE F-1640  
 738 Hwy 6 South, Suite 430  
 Houston, Texas 77079  
 (832) 619-1000



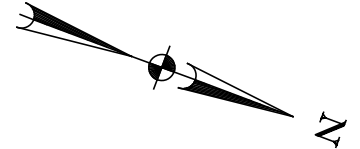
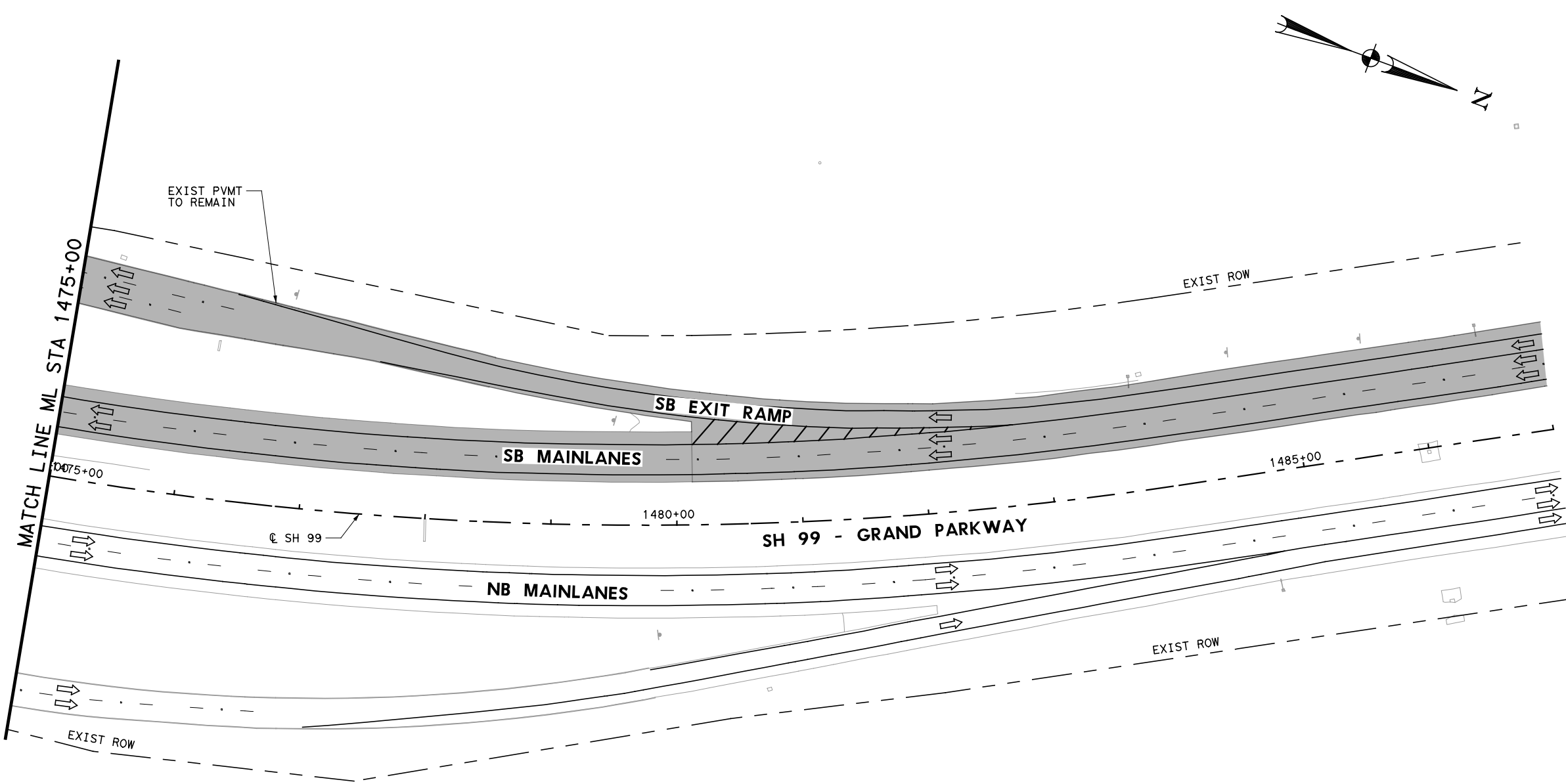
**SH 99  
 SOUTHBOUND FRONTAGE ROAD  
 WESTHEIMER PKWY TO CINCO RANCH BLVD  
 TRAFFIC CONTROL PLAN  
 PHASE I  
 STA 2463+00 TO ML 1475+00**

SHEET 5 OF 6

FED. RD. DIV. NO. 6	PROJECT NO.		HIGHWAY NO. SH 99
STATE TEXAS	DIST. HOU	COUNTY FORT BEND	
CONT. 3510	SECT. 04	JOB 055	SHEET NO. 38



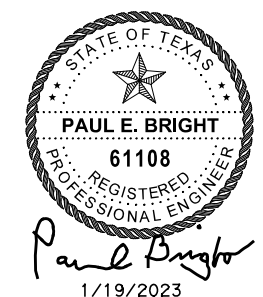
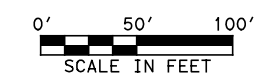
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**LEGEND**

- EXIST PAV TO REMAIN
- PHASE I TEMP PAV CONSTRUCTION
- TEMP PAV CONSTRUCTED IN PREVIOUS PHASE
- PHASE I PERM PAV CONSTRUCTION
- PHASE II PERM PAV CONSTRUCTION
- PHASE III STEP 1 PERM PAV CONSTRUCTION
- PHASE III STEP 2 PERM PAV CONSTRUCTION
- PERM PAV CONSTRUCTED IN PREVIOUS PHASE
- PSSCTB PORTABLE CONC BARRIER
- LPCB LOW-PROFILE CONC BARRIER (TY 1)
- LPCB LOW-PROFILE CONC BARRIER (TY 2)
- PROP DIRECTION OF TRAFFIC
- EXIST DIRECTION OF TRAFFIC
- CHANNELIZING DEVICE
- CONSTRUCTION SIGN
- CRASH CUSHION ATTENUATOR (CCA)
- TYPE III BARRICADE
- WK ZN PAV MRK REMOV (W) 4" (BRK)
- WK ZN PAV MRK REMOV (W) 4" (DOT)
- WK ZN PAV MRK REMOV (W) 4" (SLD)
- WK ZN PAV MRK REMOV (W) 8" (SLD)
- WK ZN PAV MRK REMOV (Y) 4" (SLD)
- WK ZN PAV MRK REMOV (W) 24" (SLD)

NOTES:  
1. MAINTAIN ACCESS TO ALL DRIVEWAYS AT ALL TIMES DURING CONSTRUCTION.



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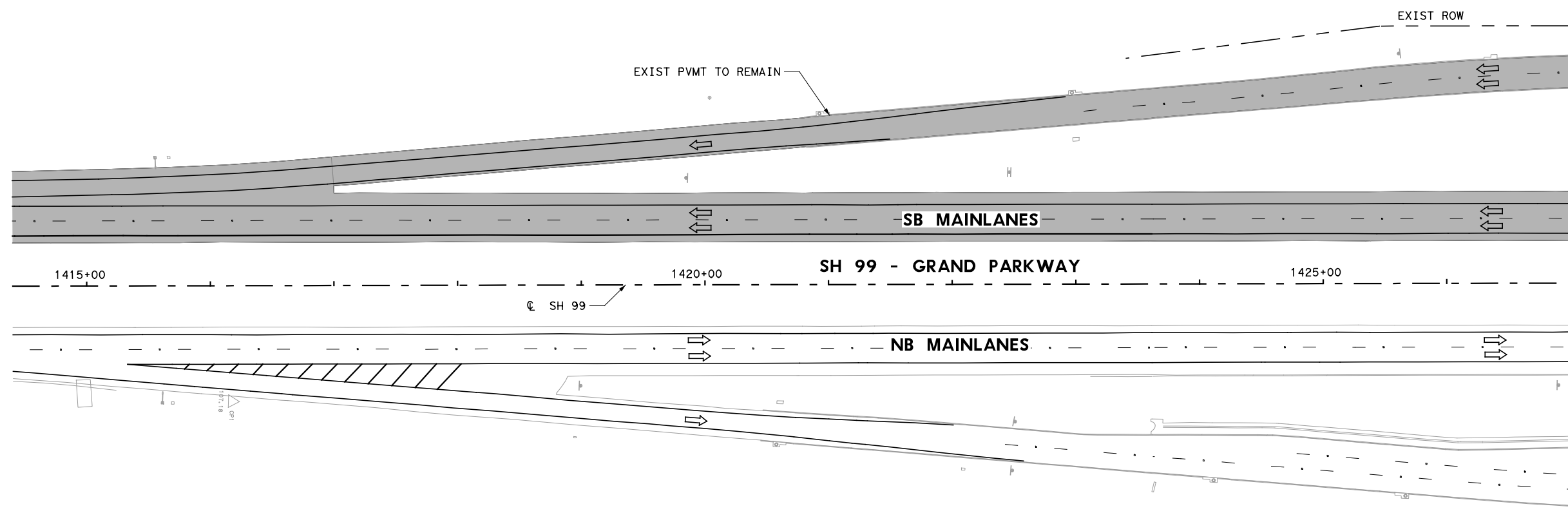
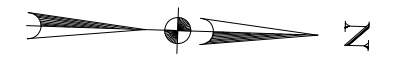
SH 99  
SOUTHBOUND FRONTAGE ROAD  
WESTHEIMER PKWY TO CINCO RANCH BLVD  
TRAFFIC CONTROL PLAN  
PHASE I  
ML STA 1475+00 TO ML STA 1487+00

SHEET 6 OF 6

FED. RD. DIV. NO. 6	PROJECT NO. 04 055	HIGHWAY NO. SH 99
STATE TEXAS	DIST. HOU	COUNTY FORT BEND
CONT. 3510	SECT. 04	JOB 055
		SHEET NO. 39

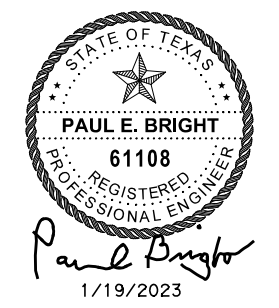
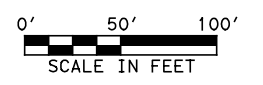


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- LEGEND**
- EXIST PAV TO REMAIN
  - PHASE I TEMP PAV CONSTRUCTION
  - PHASE I TEMP PAV CONSTRUCTION IN PREVIOUS PHASE
  - PHASE I PERM PAV CONSTRUCTION
  - PHASE II PERM PAV CONSTRUCTION
  - PHASE III STEP 1 PERM PAV CONSTRUCTION
  - PHASE III STEP 2 PERM PAV CONSTRUCTION
  - PHASE III STEP 2 PERM PAV CONSTRUCTION IN PREVIOUS PHASE
  - PSSCTB PORTABLE CONC BARRIER
  - LPCB LOW-PROFILE CONC BARRIER (TY 1)
  - LPCB LOW-PROFILE CONC BARRIER (TY 2)
  - PROP DIRECTION OF TRAFFIC
  - EXIST DIRECTION OF TRAFFIC
  - CHANNELIZING DEVICE
  - CONSTRUCTION SIGN
  - CRASH CUSHION ATTENUATOR (CCA)
  - TYPE III BARRICADE
  - (A) WK ZN PAV MRK REMOV (W) 4" (BRK)
  - (B) WK ZN PAV MRK REMOV (W) 4" (DOT)
  - (C) WK ZN PAV MRK REMOV (W) 4" (SLD)
  - (D) WK ZN PAV MRK REMOV (W) 8" (SLD)
  - (E) WK ZN PAV MRK REMOV (Y) 4" (SLD)
  - (F) WK ZN PAV MRK REMOV (W) 24" (SLD)

**NOTES:**  
 1. MAINTAIN ACCESS TO ALL DRIVEWAYS AT ALL TIMES DURING CONSTRUCTION.



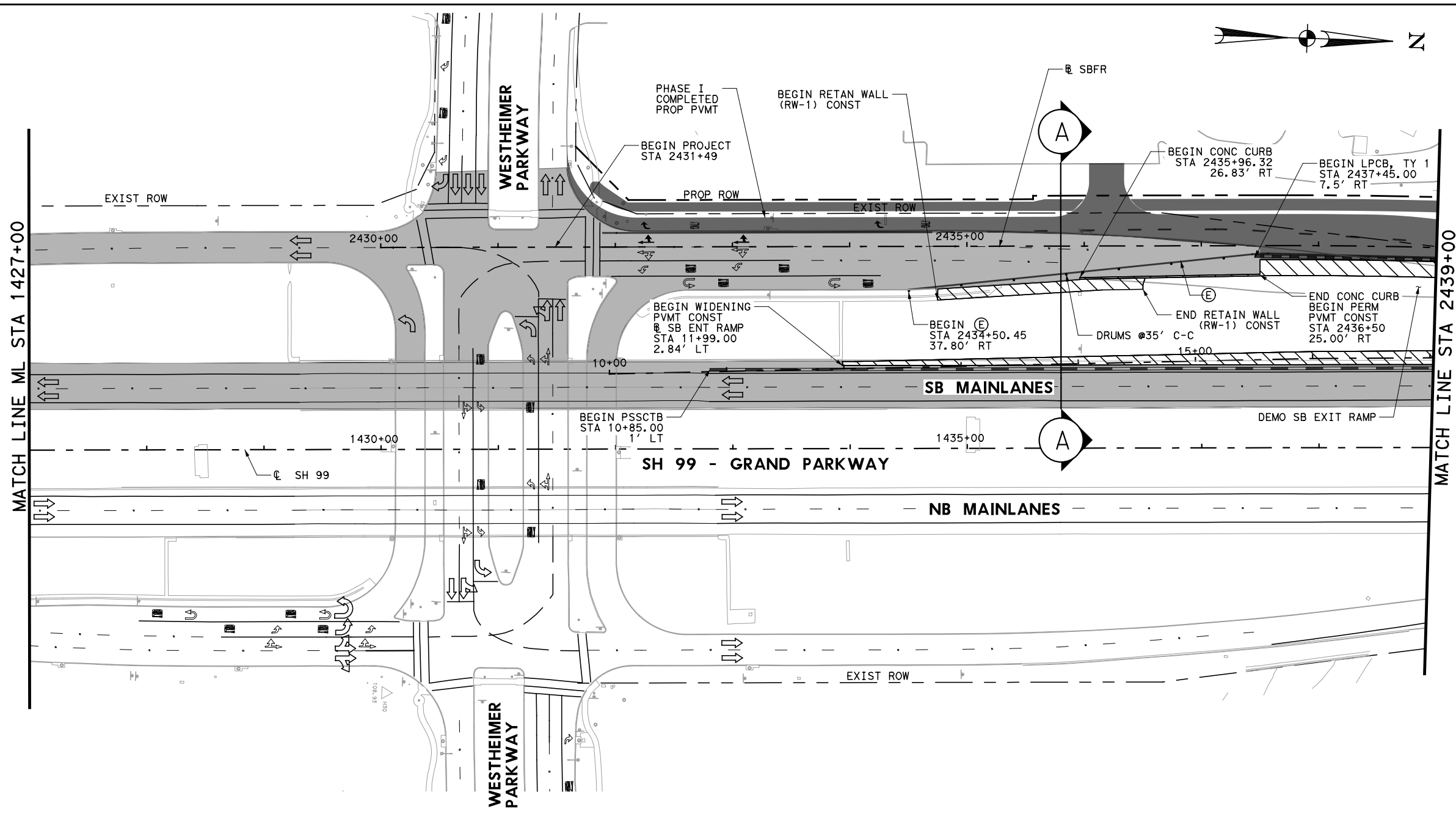
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 Consulting Engineers  
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 Houston, Texas 77079  
 (832) 619-1000  
 TBPE F-1640

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**SH 99**  
**SOUTHBOUND FRONTAGE ROAD**  
**WESTHEIMER PKWY TO CINCO RANCH BLVD**  
**TRAFFIC CONTROL PLAN**  
**PHASE II**  
**ML STA 1415+00 TO ML STA 1427+00**  
**SHEET 1 OF 6**

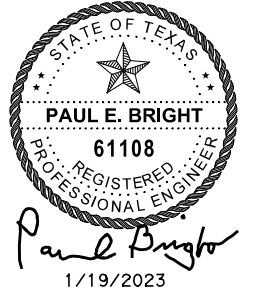
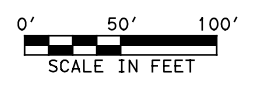
FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	40

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- LEGEND**
- EXIST PAV TO REMAIN
  - PHASE I TEMP PAV CONSTRUCTION
  - PHASE I TEMP PAV CONSTRUCTED IN PREVIOUS PHASE
  - PHASE I PERM PAV CONSTRUCTION
  - PHASE II PERM PAV CONSTRUCTION
  - PHASE III STEP 1 PERM PAV CONSTRUCTION
  - PHASE III STEP 2 PERM PAV CONSTRUCTION
  - PHASE III STEP 2 PERM PAV CONSTRUCTED IN PREVIOUS PHASE
  - PSSCTB PORTABLE CONC BARRIER
  - LPCB LOW-PROFILE CONC BARRIER (TY 1)
  - LPCB LOW-PROFILE CONC BARRIER (TY 2)
  - PROP DIRECTION OF TRAFFIC
  - EXIST DIRECTION OF TRAFFIC
  - CHANNELIZING DEVICE
  - CONSTRUCTION SIGN
  - CRASH CUSHION ATTENUATOR (CCA)
  - TYPE III BARRICADE
  - WK ZN PAV MRK REMOV (W) 4" (BRK)
  - WK ZN PAV MRK REMOV (W) 4" (DOT)
  - WK ZN PAV MRK REMOV (W) 4" (SLD)
  - WK ZN PAV MRK REMOV (W) 8" (SLD)
  - WK ZN PAV MRK REMOV (Y) 4" (SLD)
  - WK ZN PAV MRK REMOV (W) 24" (SLD)

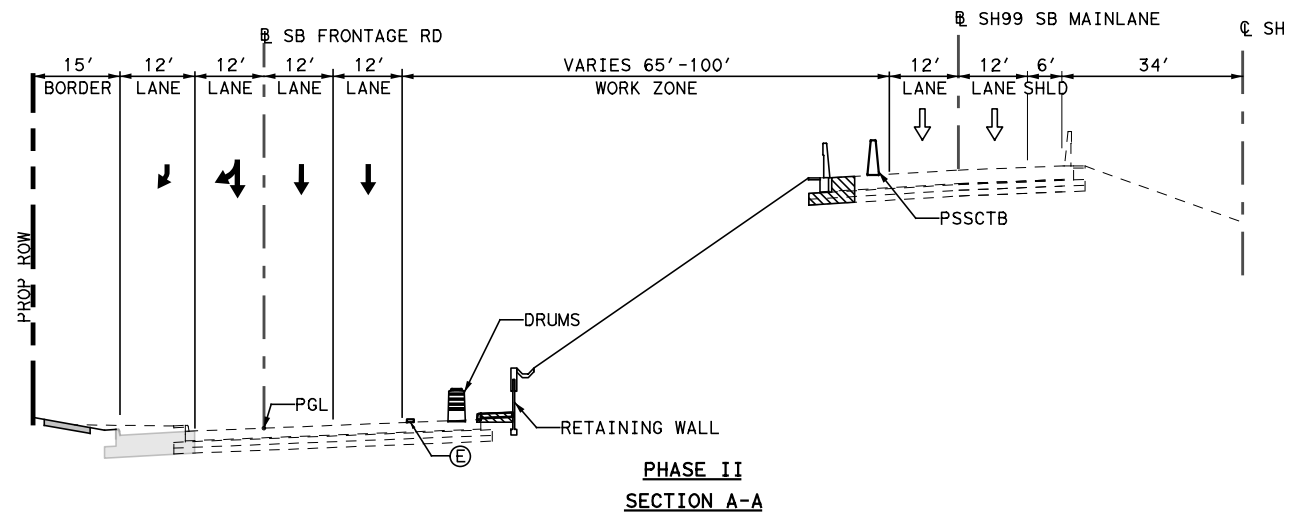
NOTES:  
1. MAINTAIN ACCESS TO ALL DRIVEWAYS AT ALL TIMES DURING CONSTRUCTION.



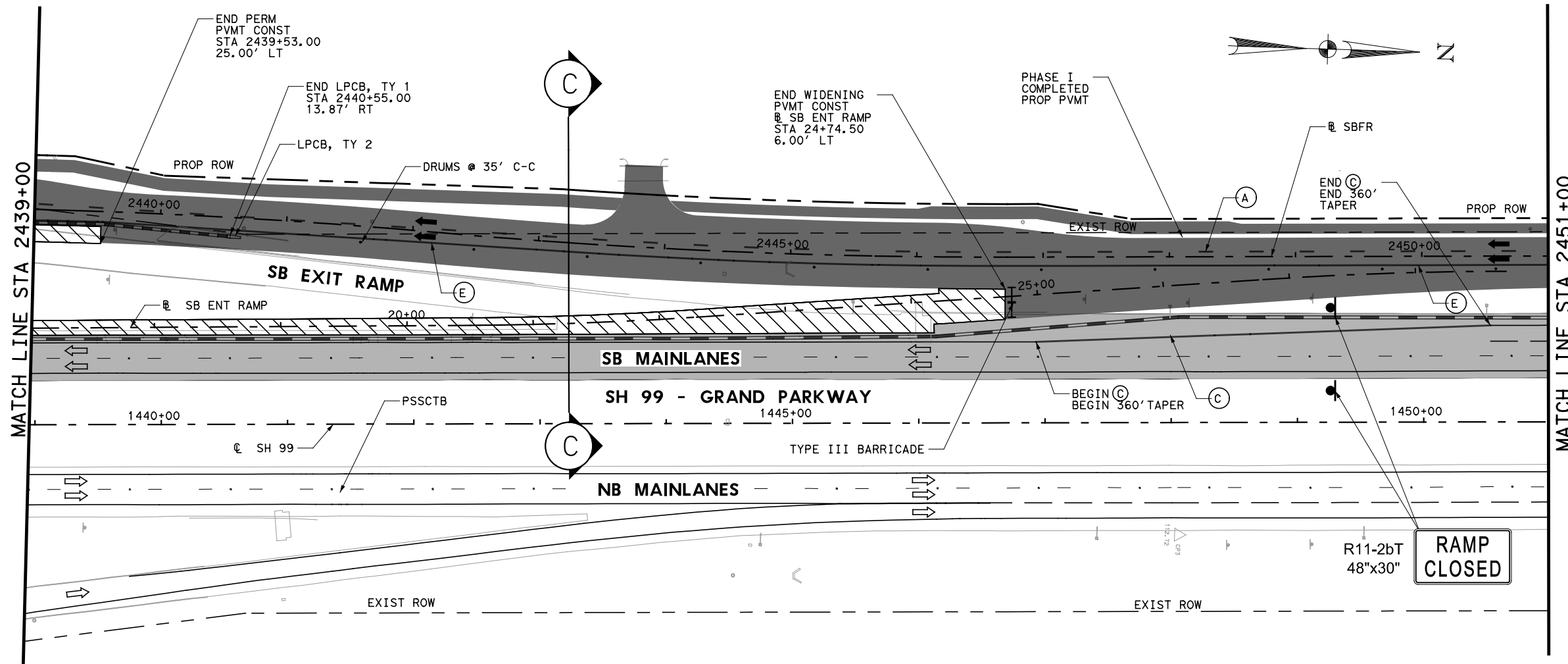
SH 99  
SOUTHBOUND FRONTAGE ROAD  
WESTHEIMER PKWY TO CINCO RANCH BLVD  
TRAFFIC CONTROL PLAN  
PHASE II  
ML STA 1427+00 TO STA 2439+00

SHEET 2 OF 6

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	41

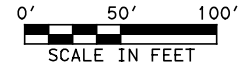


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- LEGEND**
- EXIST PAV TO REMAIN
  - PHASE I TEMP PAV CONSTRUCTION
  - PHASE I TEMP PAV CONSTRUCTION IN PREVIOUS PHASE
  - PHASE I PERM PAV CONSTRUCTION
  - PHASE II PERM PAV CONSTRUCTION
  - PHASE III STEP 1 PERM PAV CONSTRUCTION
  - PHASE III STEP 2 PERM PAV CONSTRUCTION
  - PERM PAV CONSTRUCTION IN PREVIOUS PHASE
  - PSSCTB PORTABLE CONC BARRIER
  - LPCB LOW-PROFILE CONC BARRIER (TY 1)
  - LPCB LOW-PROFILE CONC BARRIER (TY 2)
  - PROP DIRECTION OF TRAFFIC
  - EXIST DIRECTION OF TRAFFIC
  - CHANNELIZING DEVICE
  - CONSTRUCTION SIGN
  - CRASH CUSHION ATTENUATOR (CCA)
  - TYPE III BARRICADE
  - (A) WK ZN PAV MRK REMOV (W) 4" (BRK)
  - (B) WK ZN PAV MRK REMOV (W) 4" (DOT)
  - (C) WK ZN PAV MRK REMOV (W) 4" (SLD)
  - (D) WK ZN PAV MRK REMOV (W) 8" (SLD)
  - (E) WK ZN PAV MRK REMOV (Y) 4" (SLD)
  - (F) WK ZN PAV MRK REMOV (W) 24" (SLD)

NOTES:  
1. MAINTAIN ACCESS TO ALL DRIVEWAYS AT ALL TIMES DURING CONSTRUCTION.

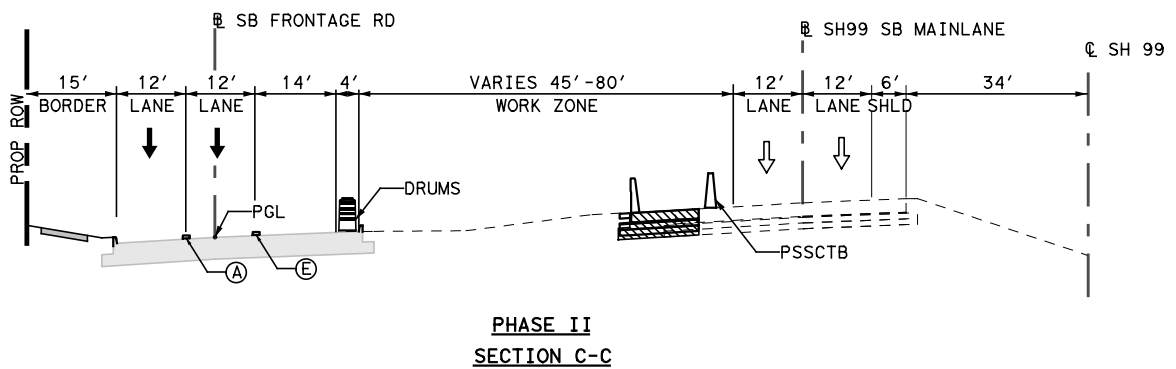


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Consulting Engineers  
738 Hwy 6 South, Suite 430  
Houston, Texas 77079  
(832) 619-1000  
TBPE F-1640

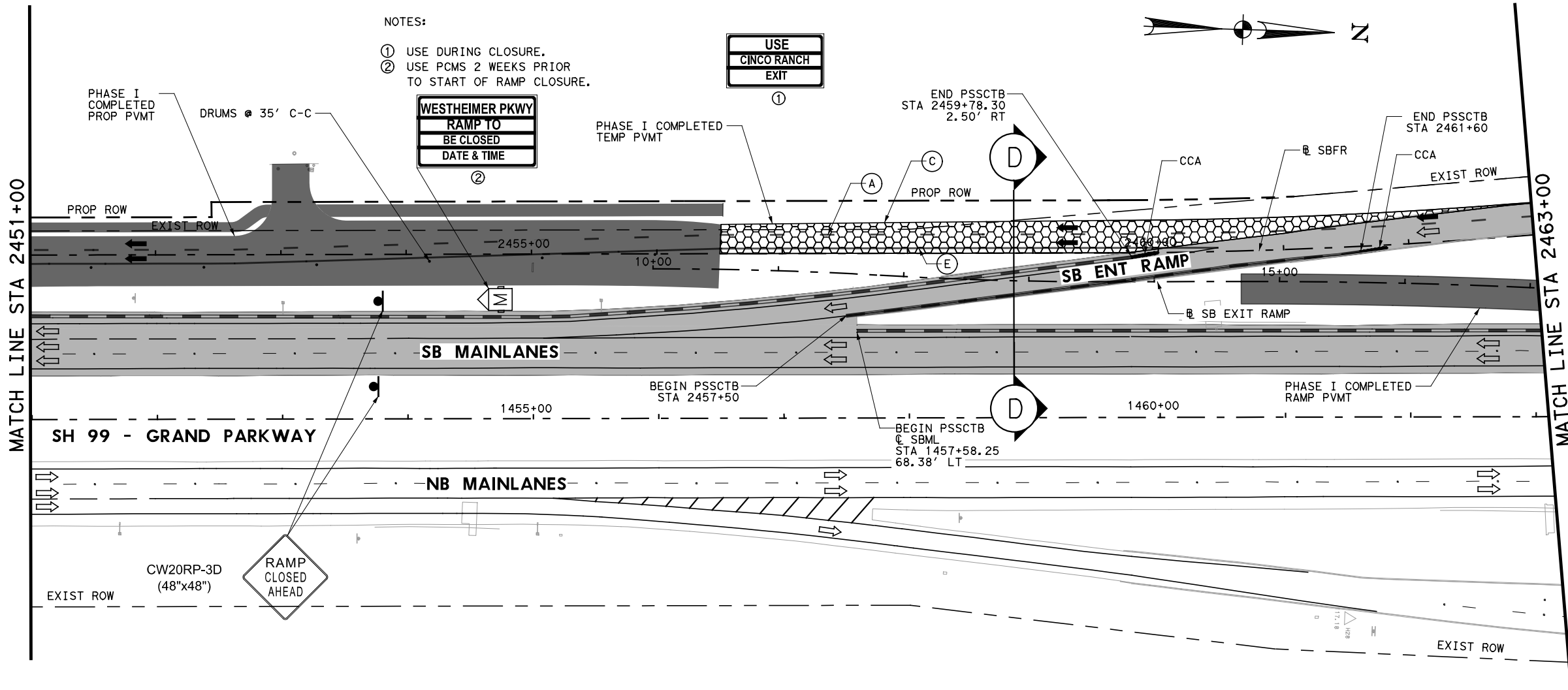


SH 99  
SOUTHBOUND FRONTAGE ROAD  
WESTHEIMER PKWY TO CINCO RANCH BLVD  
TRAFFIC CONTROL PLAN  
PHASE II  
STA 2439+00 TO STA 2451+00  
SHEET 3 OF 6

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	42



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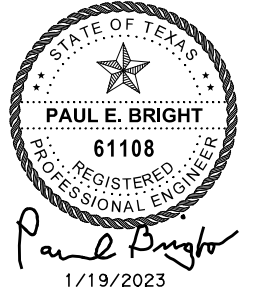


NOTES:  
 ① USE DURING CLOSURE.  
 ② USE PCMS 2 WEEKS PRIOR TO START OF RAMP CLOSURE.

**LEGEND**

- EXIST PAV TO REMAIN
- PHASE I TEMP PAV CONSTRUCTION
- PHASE I PERM PAV CONSTRUCTION
- PHASE II TEMP PAV CONSTRUCTION
- PHASE II PERM PAV CONSTRUCTION
- PHASE III STEP 1 TEMP PAV CONSTRUCTION
- PHASE III STEP 1 PERM PAV CONSTRUCTION
- PHASE III STEP 2 TEMP PAV CONSTRUCTION
- PHASE III STEP 2 PERM PAV CONSTRUCTION
- PHASE III STEP 2 PERM PAV CONSTRUCTION IN PREVIOUS PHASE
- PSSCTB PORTABLE CONC BARRIER
- LPCB LOW-PROFILE CONC BARRIER (TY 1)
- LPCB LOW-PROFILE CONC BARRIER (TY 2)
- PROP DIRECTION OF TRAFFIC
- EXIST DIRECTION OF TRAFFIC
- CHANNELIZING DEVICE
- CONSTRUCTION SIGN
- CRASH CUSHION ATTENUATOR (CCA)
- TYPE III BARRICADE
- WK ZN PAV MRK REMOV (W) 4" (BRK)
- WK ZN PAV MRK REMOV (W) 4" (DOT)
- WK ZN PAV MRK REMOV (W) 4" (SLD)
- WK ZN PAV MRK REMOV (W) 8" (SLD)
- WK ZN PAV MRK REMOV (Y) 4" (SLD)
- WK ZN PAV MRK REMOV (W) 24" (SLD)

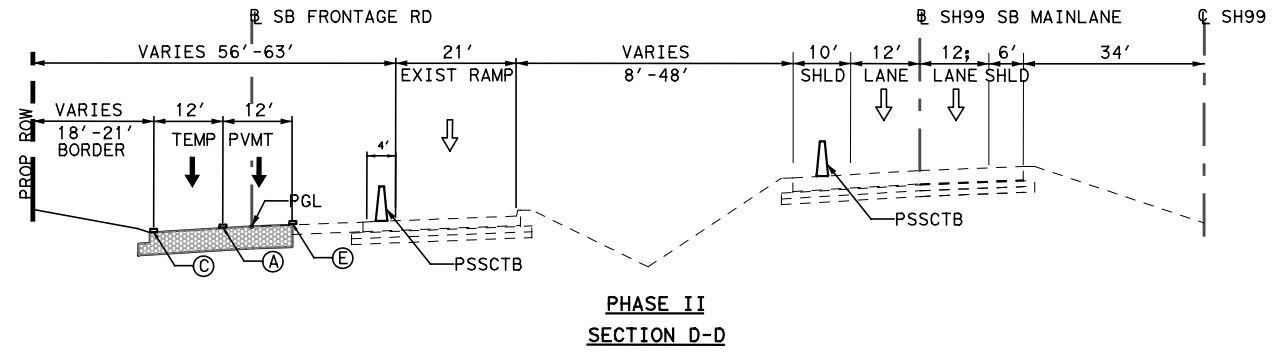
NOTES:  
 1. MAINTAIN ACCESS TO ALL DRIVEWAYS AT ALL TIMES DURING CONSTRUCTION.



SH 99  
 SOUTHBOUND FRONTAGE ROAD  
 WESTHEIMER PKWY TO CINCO RANCH BLVD  
 TRAFFIC CONTROL PLAN  
 PHASE II  
 STA 2451+00 TO STA 2463+00

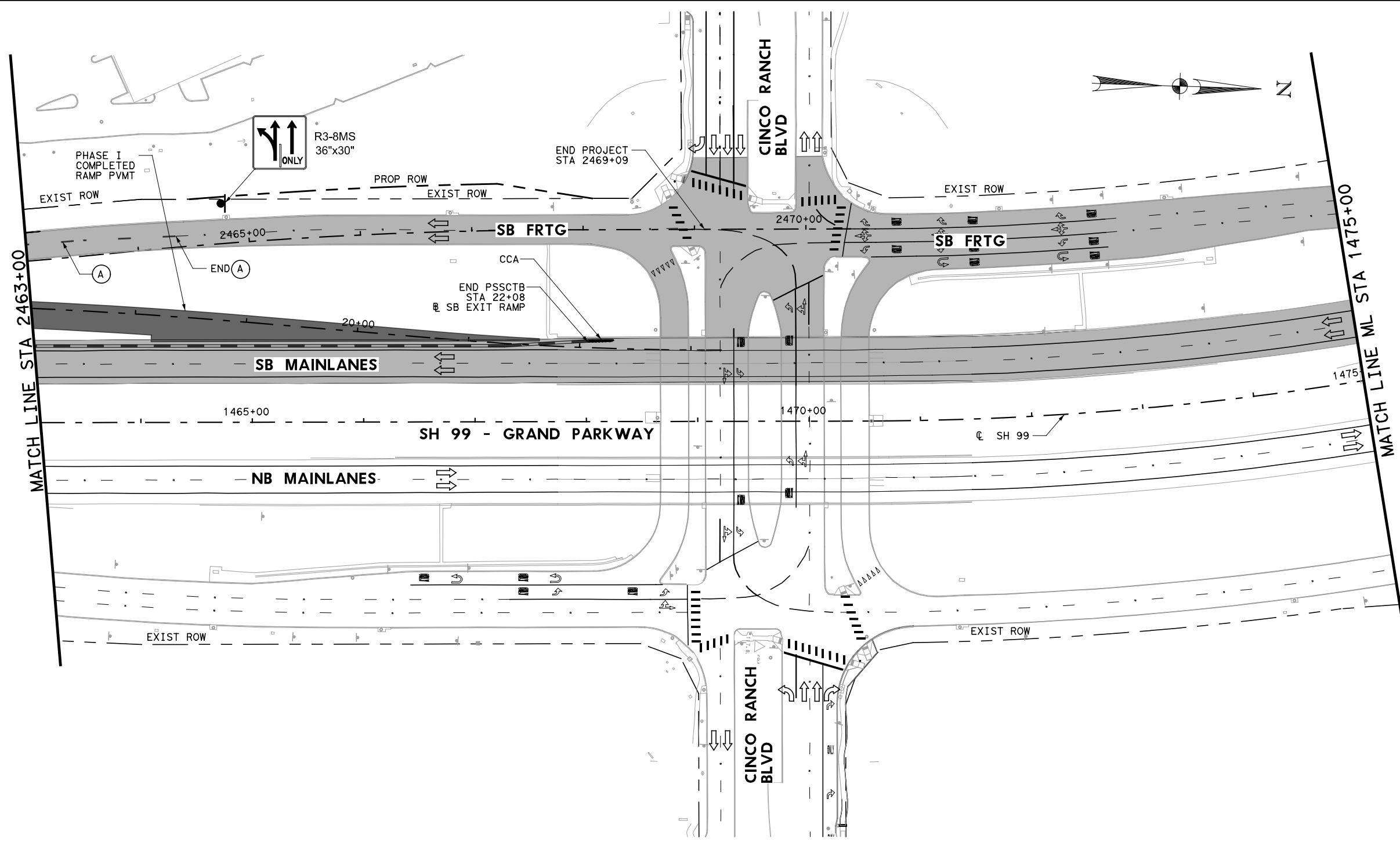
SHEET 4 OF 6

FED. RD. DIV. NO. 6	PROJECT NO.		HIGHWAY NO. SH 99
STATE TEXAS	DIST. HOU	COUNTY FORT BEND	
CONT. 3510	SECT. 04	JOB 055	SHEET NO. 43



NOTE: INSTALL SIGN AFTER REMOVAL OF PCMS.

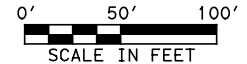
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- LEGEND**
- EXIST PAV TO REMAIN
  - PHASE I TEMP PAV CONSTRUCTION
  - PHASE I TEMP PAV CONSTRUCTION IN PREVIOUS PHASE
  - PHASE I PERM PAV CONSTRUCTION
  - PHASE II PERM PAV CONSTRUCTION
  - PHASE III STEP 1 PERM PAV CONSTRUCTION
  - PHASE III STEP 2 PERM PAV CONSTRUCTION
  - PERM PAV CONSTRUCTION IN PREVIOUS PHASE
  - PSSCTB PORTABLE CONC BARRIER
  - LPCB LOW-PROFILE CONC BARRIER (TY 1)
  - LPCB LOW-PROFILE CONC BARRIER (TY 2)
  - PROP DIRECTION OF TRAFFIC
  - EXIST DIRECTION OF TRAFFIC
  - CHANNELIZING DEVICE
  - CONSTRUCTION SIGN
  - CRASH CUSHION ATTENUATOR (CCA)
  - TYPE III BARRICADE
  - WK ZN PAV MRK REMOV (W) 4" (BRK)
  - WK ZN PAV MRK REMOV (W) 4" (DOT)
  - WK ZN PAV MRK REMOV (W) 4" (SLD)
  - WK ZN PAV MRK REMOV (W) 8" (SLD)
  - WK ZN PAV MRK REMOV (Y) 4" (SLD)
  - WK ZN PAV MRK REMOV (W) 24" (SLD)

**NOTES:**

1. MAINTAIN ACCESS TO ALL DRIVEWAYS AT ALL TIMES DURING CONSTRUCTION.



**PAUL E. BRIGHT**  
61108  
REGISTERED PROFESSIONAL ENGINEER  
Paul Bright  
1/19/2023

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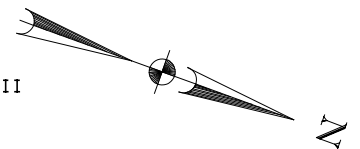


**SH 99**  
SOUTHBOUND FRONTAGE ROAD  
WESTHEIMER PKWY TO CINCO RANCH BLVD  
**TRAFFIC CONTROL PLAN**  
PHASE II  
STA 2463+00 TO ML STA 1475+00  
SHEET 5 OF 6

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6	04 055		SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	44

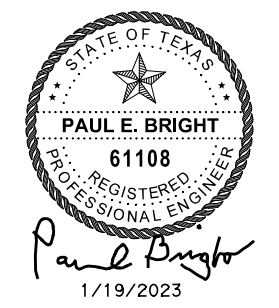
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NOTE:  
USE PCMS FOR THE DURATION OF PHASE II  
AND PHASE III STEP 1



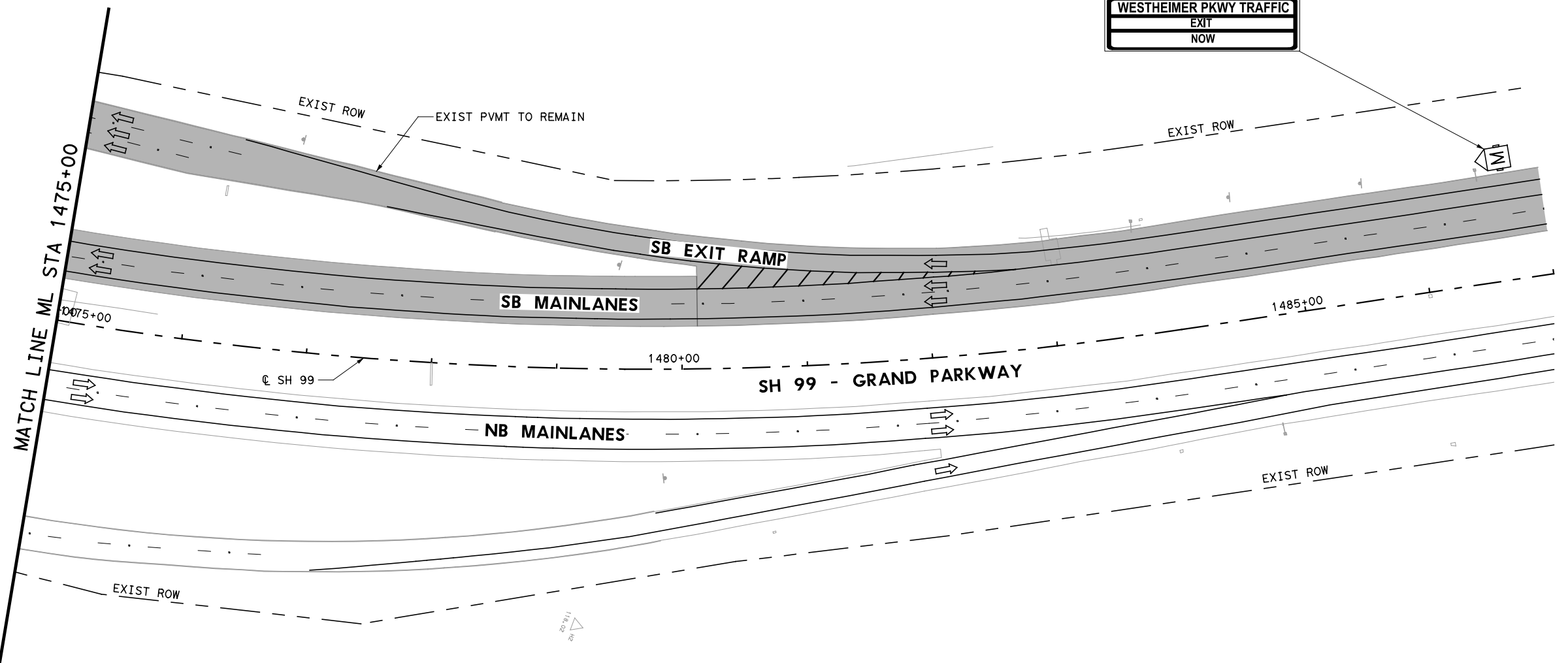
- ### LEGEND
- EXIST PAV TO REMAIN
  - PHASE I TEMP PAV CONSTRUCTION
  - PHASE I TEMP PAV CONSTRUCTION IN PREVIOUS PHASE
  - PHASE I PERM PAV CONSTRUCTION
  - PHASE II PERM PAV CONSTRUCTION
  - PHASE III STEP 1 PERM PAV CONSTRUCTION
  - PHASE III STEP 2 PERM PAV CONSTRUCTION
  - PERM PAV CONSTRUCTION IN PREVIOUS PHASE
  - PSSCTB PORTABLE CONC BARRIER
  - LPCB LOW-PROFILE CONC BARRIER (TY 1)
  - LPCB LOW-PROFILE CONC BARRIER (TY 2)
  - PROP DIRECTION OF TRAFFIC
  - EXIST DIRECTION OF TRAFFIC
  - CHANNELIZING DEVICE
  - CONSTRUCTION SIGN
  - CRASH CUSHION ATTENUATOR (CCA)
  - TYPE III BARRICADE
  - WK ZN PAV MRK REMOV (W) 4" (BRK)
  - WK ZN PAV MRK REMOV (W) 4" (DOT)
  - WK ZN PAV MRK REMOV (W) 4" (SLD)
  - WK ZN PAV MRK REMOV (W) 8" (SLD)
  - WK ZN PAV MRK REMOV (Y) 4" (SLD)
  - WK ZN PAV MRK REMOV (W) 24" (SLD)

NOTES:  
1. MAINTAIN ACCESS TO ALL DRIVEWAYS AT ALL TIMES DURING CONSTRUCTION.

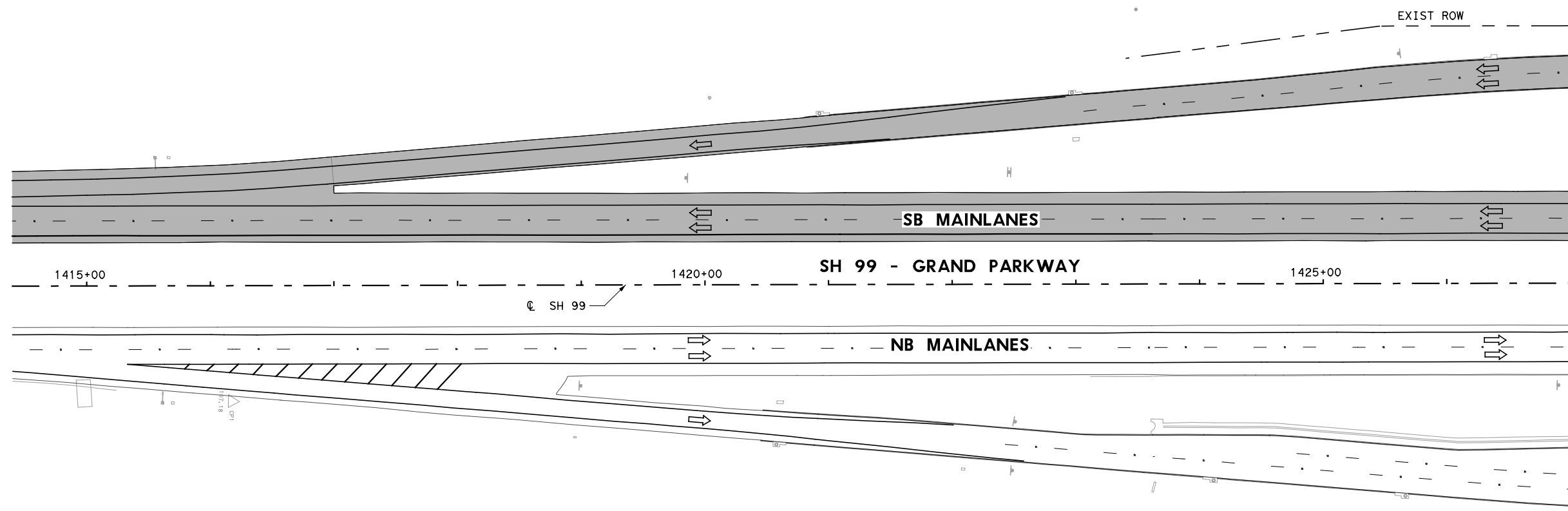
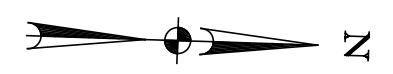


SH 99  
SOUTHBOUND FRONTAGE ROAD  
WESTHEIMER PKWY TO CINCO RANCH BLVD  
TRAFFIC CONTROL PLAN  
PHASE II  
ML STA 1475+00 TO ML STA 1487+00  
SHEET 6 OF 6

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	45



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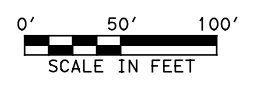


MATCH LINE ML STA 1427+00

**LEGEND**

- EXIST PAV TO REMAIN
- PHASE I TEMP PAV CONSTRUCTION
- PHASE I TEMP PAV CONSTRUCTION IN PREVIOUS PHASE
- PHASE I PERM PAV CONSTRUCTION
- PHASE II PERM PAV CONSTRUCTION
- PHASE III STEP 1 PERM PAV CONSTRUCTION
- PHASE III STEP 2 PERM PAV CONSTRUCTION
- PHASE III STEP 2 PERM PAV CONSTRUCTION IN PREVIOUS PHASE
- PSSCTB PORTABLE CONC BARRIER
- LPCB LOW-PROFILE CONC BARRIER (TY 1)
- LPCB LOW-PROFILE CONC BARRIER (TY 2)
- PROP DIRECTION OF TRAFFIC
- EXIST DIRECTION OF TRAFFIC
- CHANNELIZING DEVICE
- CONSTRUCTION SIGN
- CRASH CUSHION ATTENUATOR (CCA)
- TYPE III BARRICADE
- WK ZN PAV MRK REMOV (W) 4" (BRK)
- WK ZN PAV MRK REMOV (W) 4" (DOT)
- WK ZN PAV MRK REMOV (W) 4" (SLD)
- WK ZN PAV MRK REMOV (W) 8" (SLD)
- WK ZN PAV MRK REMOV (Y) 4" (SLD)
- WK ZN PAV MRK REMOV (W) 24" (SLD)

**NOTES:**  
 1. MAINTAIN ACCESS TO ALL DRIVEWAYS AT ALL TIMES DURING CONSTRUCTION.



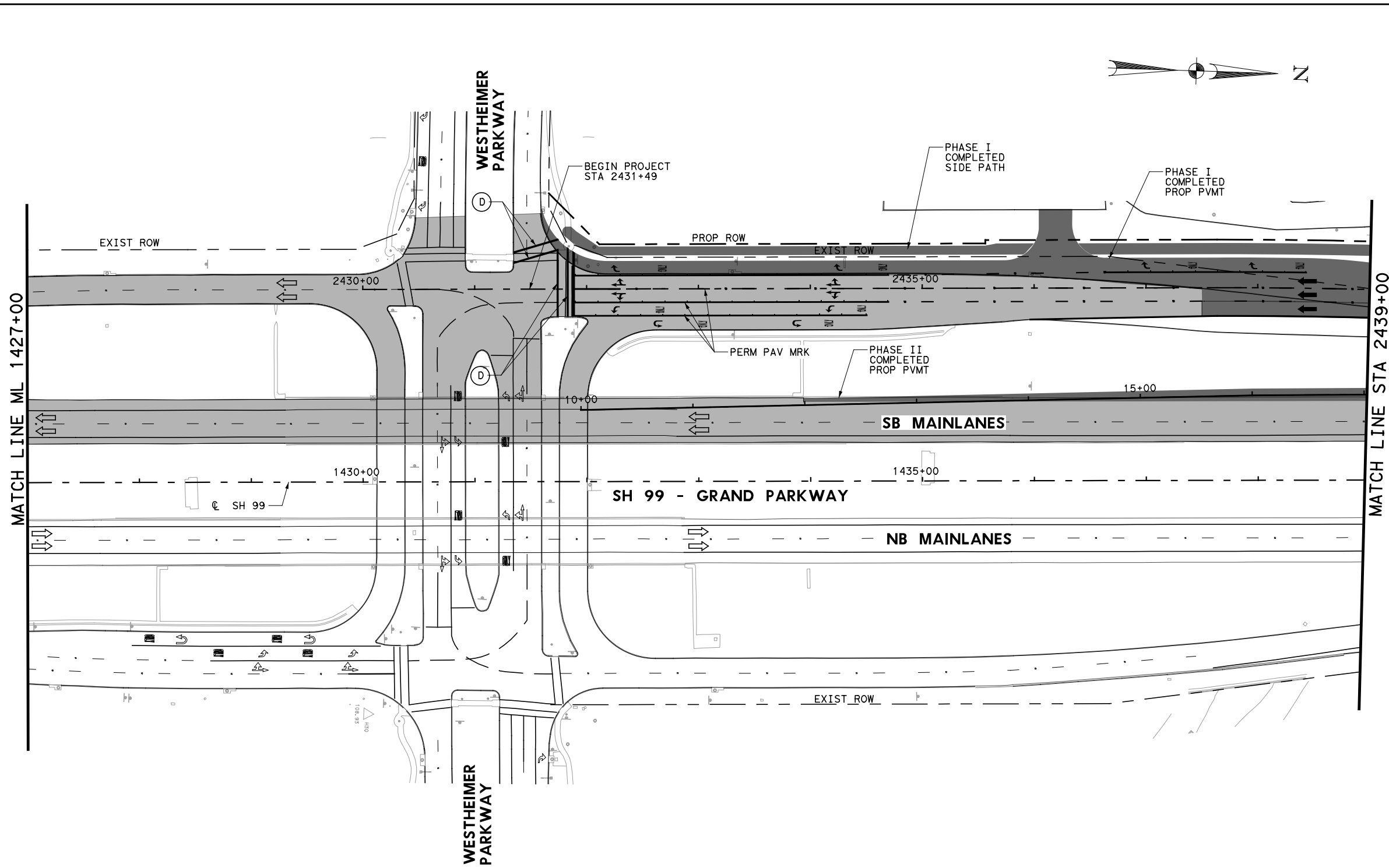
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 Consulting Engineers  
 738 Hwy 6 South, Suite 430  
 Houston, Texas 77079  
 (832) 619-1000  
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**SH 99**  
**SOUTHBOUND FRONTAGE ROAD**  
**WESTHEIMER PKWY TO CINCO RANCH BLVD**  
**TRAFFIC CONTROL PLAN**  
**PHASE III STEP 1**  
**ML STA 1415+00 TO ML STA 1427+00**  
**SHEET 1 OF 6**

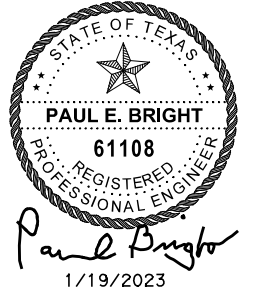
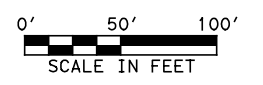
FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	46

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- LEGEND**
- EXIST PAV TO REMAIN
  - PHASE I TEMP PAV CONSTRUCTION
  - PHASE I TEMP PAV CONSTRUCTION IN PREVIOUS PHASE
  - PHASE I PERM PAV CONSTRUCTION
  - PHASE II PERM PAV CONSTRUCTION
  - PHASE III STEP 1 PERM PAV CONSTRUCTION
  - PHASE III STEP 2 PERM PAV CONSTRUCTION
  - PERM PAV CONSTRUCTION IN PREVIOUS PHASE
  - PSSCTB PORTABLE CONC BARRIER
  - LPCB LOW-PROFILE CONC BARRIER (TY 1)
  - LPCB LOW-PROFILE CONC BARRIER (TY 2)
  - PROP DIRECTION OF TRAFFIC
  - EXIST DIRECTION OF TRAFFIC
  - CHANNELIZING DEVICE
  - CONSTRUCTION SIGN
  - CRASH CUSHION ATTENUATOR (CCA)
  - TYPE III BARRICADE
  - WK ZN PAV MRK REMOV (W) 4" (BRK)
  - WK ZN PAV MRK REMOV (W) 4" (DOT)
  - WK ZN PAV MRK REMOV (W) 4" (SLD)
  - WK ZN PAV MRK REMOV (W) 8" (SLD)
  - WK ZN PAV MRK REMOV (Y) 4" (SLD)
  - WK ZN PAV MRK REMOV (W) 24" (SLD)

**NOTES:**  
 1. MAINTAIN ACCESS TO ALL DRIVEWAYS AT ALL TIMES DURING CONSTRUCTION.



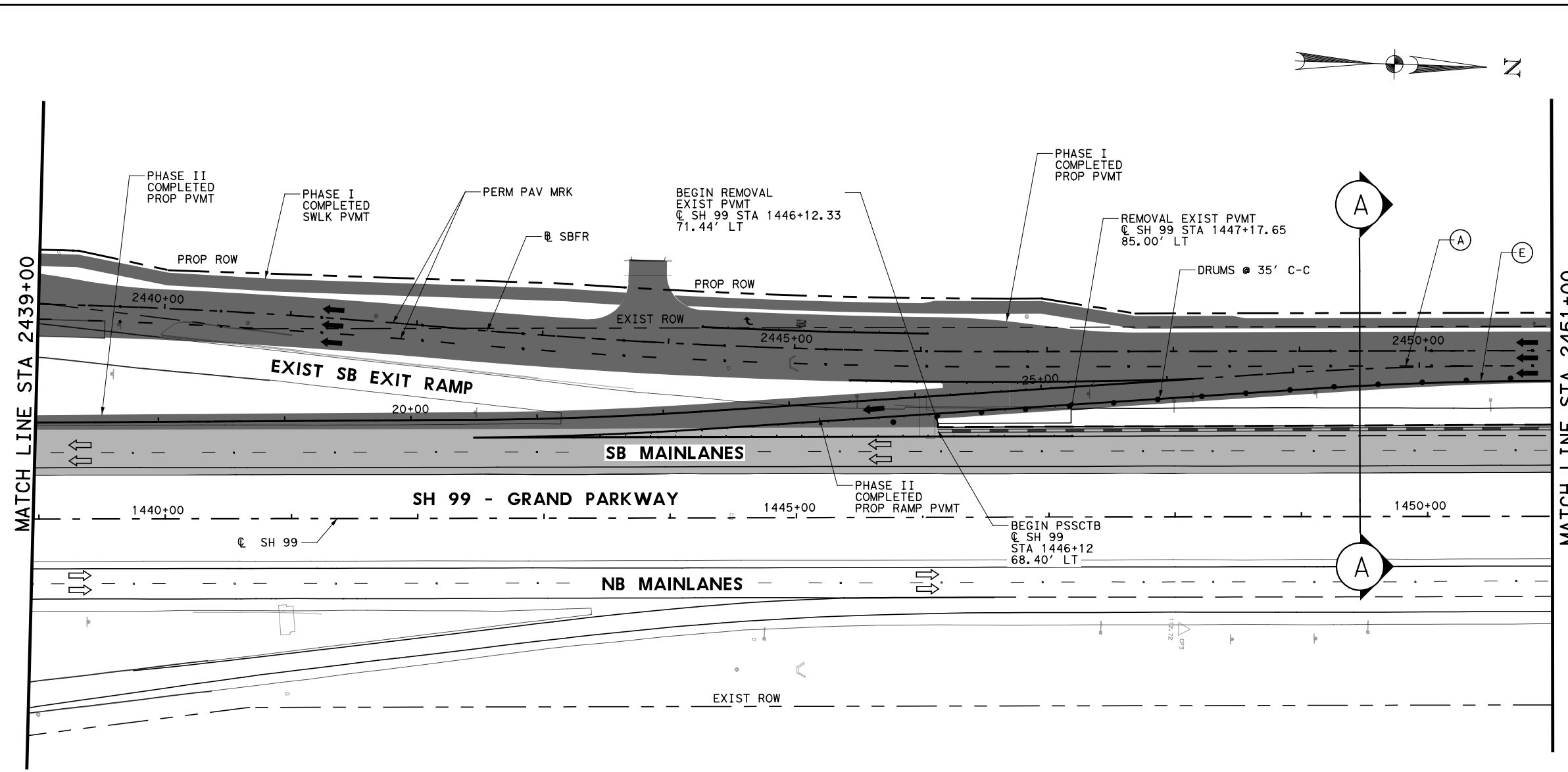
SH 99  
 SOUTHBOUND FRONTAGE ROAD  
 WESTHEIMER PKWY TO CINCO RANCH BLVD  
 TRAFFIC CONTROL PLAN  
 PHASE III STEP 1  
 ML STA 1427+00 TO STA 2439+00

SHEET 2 OF 6

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	47

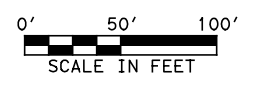


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- LEGEND**
- EXIST PAV TO REMAIN
  - PHASE I TEMP PAV CONSTRUCTION
  - PHASE I TEMP PAV CONSTRUCTION IN PREVIOUS PHASE
  - PHASE I PERM PAV CONSTRUCTION
  - PHASE II PERM PAV CONSTRUCTION
  - PHASE III STEP 1 PERM PAV CONSTRUCTION
  - PHASE III STEP 2 PERM PAV CONSTRUCTION
  - PERM PAV CONSTRUCTION IN PREVIOUS PHASE
  - PSSCTB PORTABLE CONC BARRIER
  - LPCB LOW-PROFILE CONC BARRIER (TY 1)
  - LPCB LOW-PROFILE CONC BARRIER (TY 2)
  - PROP DIRECTION OF TRAFFIC
  - EXIST DIRECTION OF TRAFFIC
  - CHANNELIZING DEVICE
  - CONSTRUCTION SIGN
  - CRASH CUSHION ATTENUATOR (CCA)
  - TYPE III BARRICADE
  - (A) WK ZN PAV MRK REMOV (W) 4" (BRK)
  - (B) WK ZN PAV MRK REMOV (W) 4" (DOT)
  - (C) WK ZN PAV MRK REMOV (W) 4" (SLD)
  - (D) WK ZN PAV MRK REMOV (W) 8" (SLD)
  - (E) WK ZN PAV MRK REMOV (Y) 4" (SLD)
  - (F) WK ZN PAV MRK REMOV (W) 24" (SLD)

**NOTES:**  
 1. MAINTAIN ACCESS TO ALL DRIVEWAYS AT ALL TIMES DURING CONSTRUCTION.



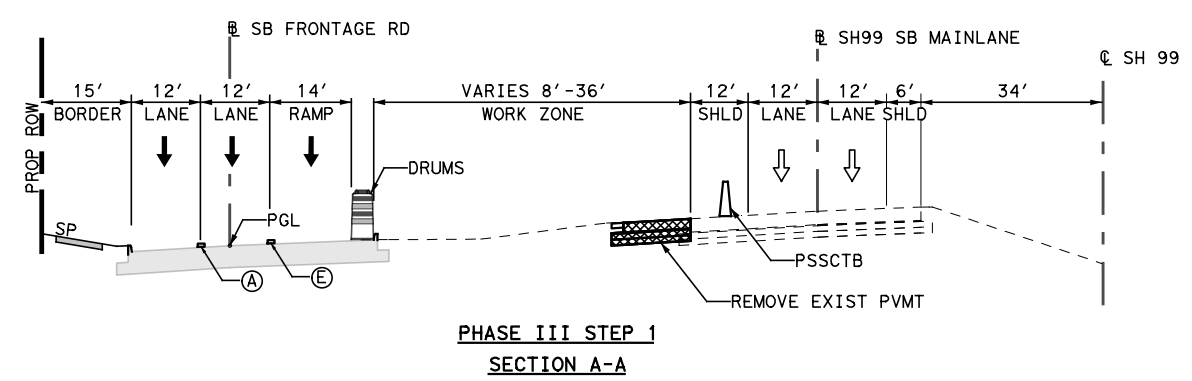
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 Consulting Engineers  
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 (832) 619-1000  
 TBPE F-1640



SH 99  
 SOUTHBOUND FRONTAGE ROAD  
 WESTHEIMER PKWY TO CINCO RANCH BLVD  
 TRAFFIC CONTROL PLAN  
 PHASE III STEP 1  
 STA 2439+00 TO STA 2451+00

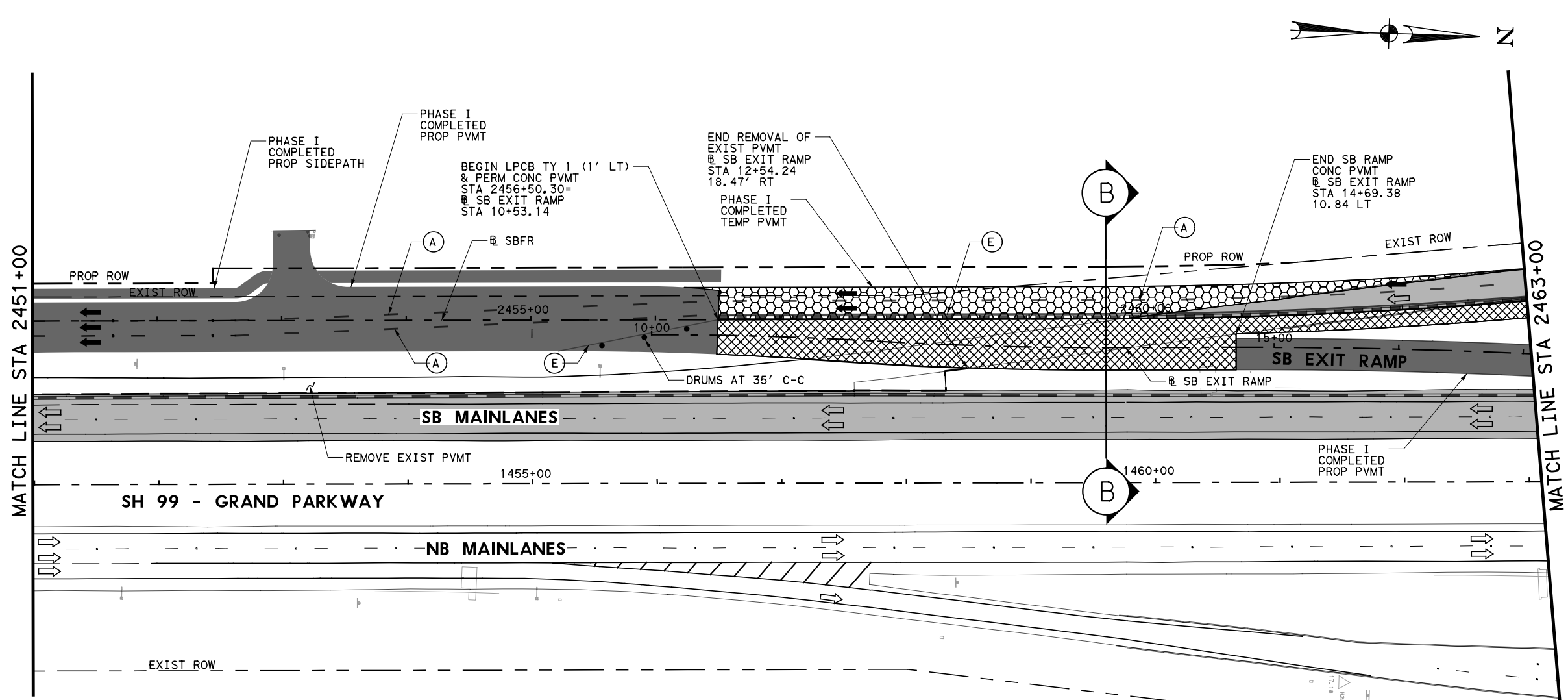
SHEET 3 OF 6

FED. RD. DIV. NO. 6	PROJECT NO.		HIGHWAY NO. SH 99
STATE TEXAS	DIST. HOU	COUNTY FORT BEND	
CONT. 3510	SECT. 04	JOB 055	SHEET NO. 48



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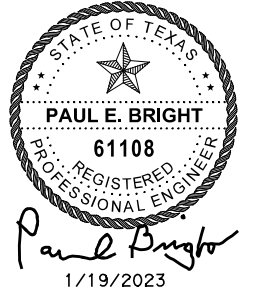
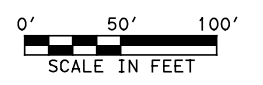
MATCH LINE STA 2451+00



**LEGEND**

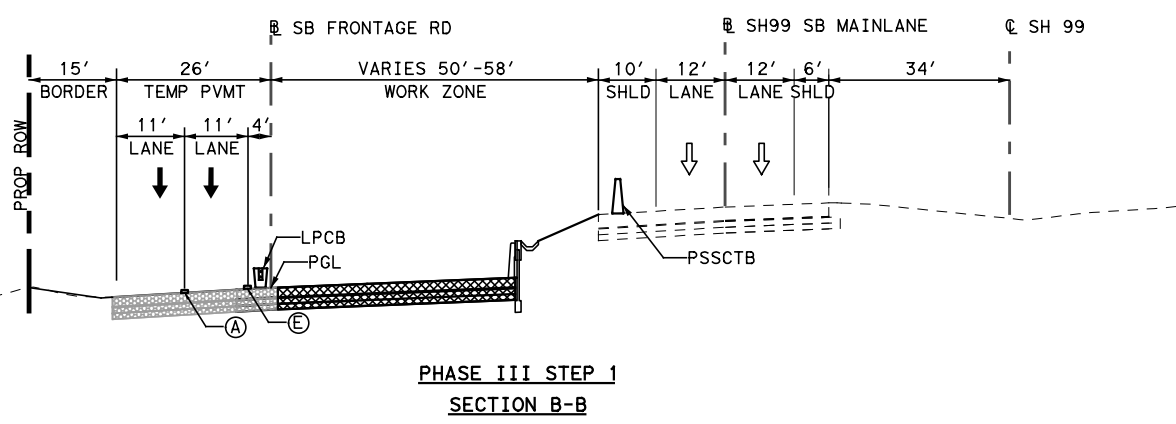
- EXIST PAV TO REMAIN
- PHASE I TEMP PAV CONSTRUCTION
- TEMP PAV CONSTRUCTED IN PREVIOUS PHASE
- PHASE I PERM PAV CONSTRUCTION
- PHASE II PERM PAV CONSTRUCTION
- PHASE III STEP 1 PERM PAV CONSTRUCTION
- PHASE III STEP 2 PERM PAV CONSTRUCTION
- PERM PAV CONSTRUCTED IN PREVIOUS PHASE
- PSSCTB PORTABLE CONC BARRIER
- LPCB LOW-PROFILE CONC BARRIER (TY 1)
- LPCB LOW-PROFILE CONC BARRIER (TY 2)
- PROP DIRECTION OF TRAFFIC
- EXIST DIRECTION OF TRAFFIC
- CHANNELIZING DEVICE
- CONSTRUCTION SIGN
- CRASH CUSHION ATTENUATOR (CCA)
- TYPE III BARRICADE
- (A) WK ZN PAV MRK REMOV (W) 4" (BRK)
- (B) WK ZN PAV MRK REMOV (W) 4" (DOT)
- (C) WK ZN PAV MRK REMOV (W) 4" (SLD)
- (D) WK ZN PAV MRK REMOV (W) 8" (SLD)
- (E) WK ZN PAV MRK REMOV (Y) 4" (SLD)
- (F) WK ZN PAV MRK REMOV (W) 24" (SLD)

NOTES:  
 1. MAINTAIN ACCESS TO ALL DRIVEWAYS AT ALL TIMES DURING CONSTRUCTION.

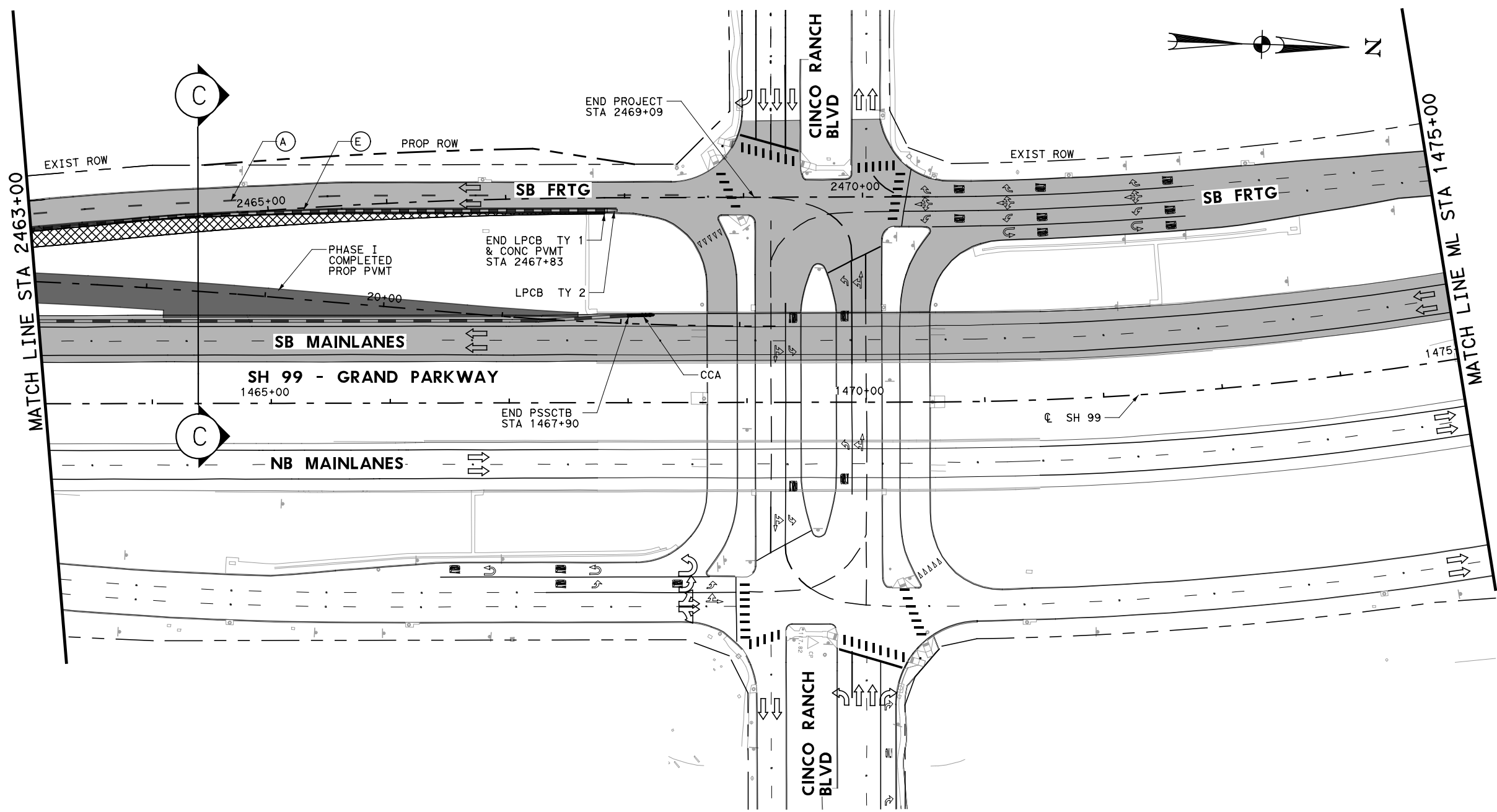


SH 99  
 SOUTHBOUND FRONTAGE ROAD  
 WESTHEIMER PKWY TO CINCO RANCH BLVD  
 TRAFFIC CONTROL PLAN  
 PHASE III STEP 1  
 STA 2451+00 TO STA 2463+00  
 SHEET 4 OF 6

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	49

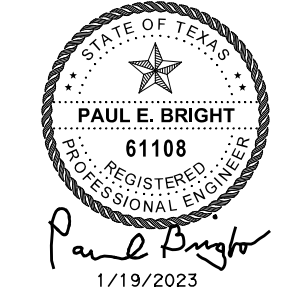
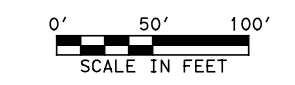


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- LEGEND**
- [Solid Grey] EXIST PAV TO REMAIN
  - [Diagonal Hatching] PHASE I TEMP PAV CONSTRUCTION
  - [Cross-hatching] PHASE I TEMP PAV CONSTRUCTED IN PREVIOUS PHASE
  - [Diagonal Hatching] PHASE I PERM PAV CONSTRUCTION
  - [Diagonal Hatching] PHASE II PERM PAV CONSTRUCTION
  - [Cross-hatching] PHASE III STEP 1 PERM PAV CONSTRUCTION
  - [Cross-hatching] PHASE III STEP 2 PERM PAV CONSTRUCTION
  - [Diagonal Hatching] PHASE III STEP 2 PERM PAV CONSTRUCTED IN PREVIOUS PHASE
  - [Dashed Line] PSSCTB PORTABLE CONC BARRIER
  - [Dashed Line] LPCB LOW-PROFILE CONC BARRIER (TY 1)
  - [Dashed Line] LPCB LOW-PROFILE CONC BARRIER (TY 2)
  - [Arrow] PROP DIRECTION OF TRAFFIC
  - [Arrow] EXIST DIRECTION OF TRAFFIC
  - [Dot] CHANNELIZING DEVICE
  - [Sign Symbol] CONSTRUCTION SIGN
  - [Dashed Line] CRASH CUSHION ATTENUATOR (CCA)
  - [T Symbol] TYPE III BARRICADE
  - (A) WK ZN PAV MRK REMOV (W) 4" (BRK)
  - (B) WK ZN PAV MRK REMOV (W) 4" (DOT)
  - (C) WK ZN PAV MRK REMOV (W) 4" (SLD)
  - (D) WK ZN PAV MRK REMOV (W) 8" (SLD)
  - (E) WK ZN PAV MRK REMOV (Y) 4" (SLD)
  - (F) WK ZN PAV MRK REMOV (W) 24" (SLD)

NOTES:  
1. MAINTAIN ACCESS TO ALL DRIVEWAYS AT ALL TIMES DURING CONSTRUCTION.

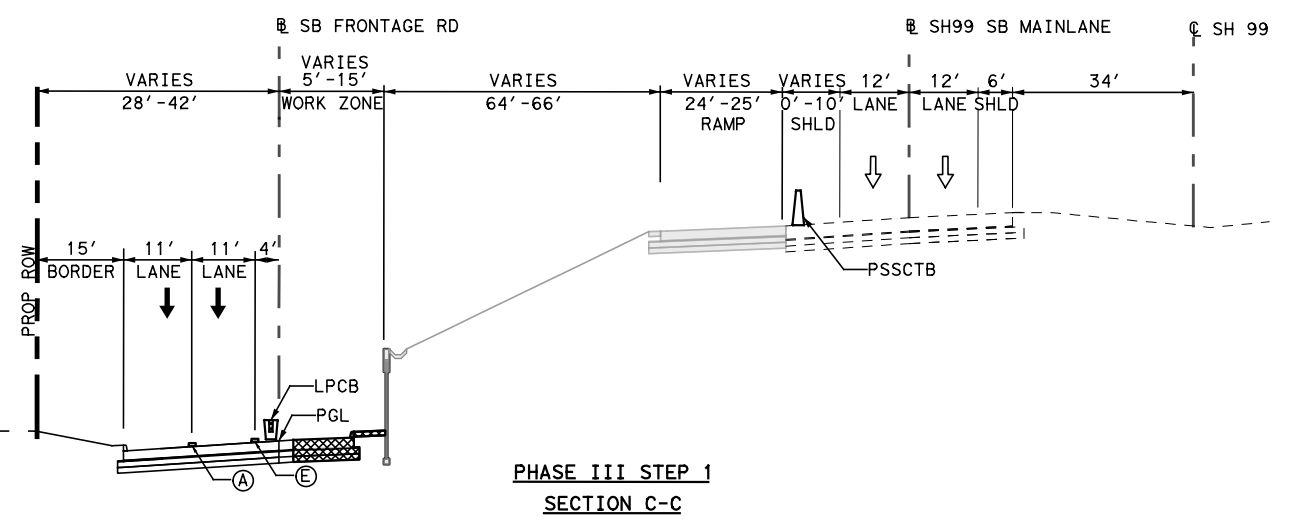


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Consulting Engineers  
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Houston, Texas 77079  
(832) 619-1000  
TBPE F-1640



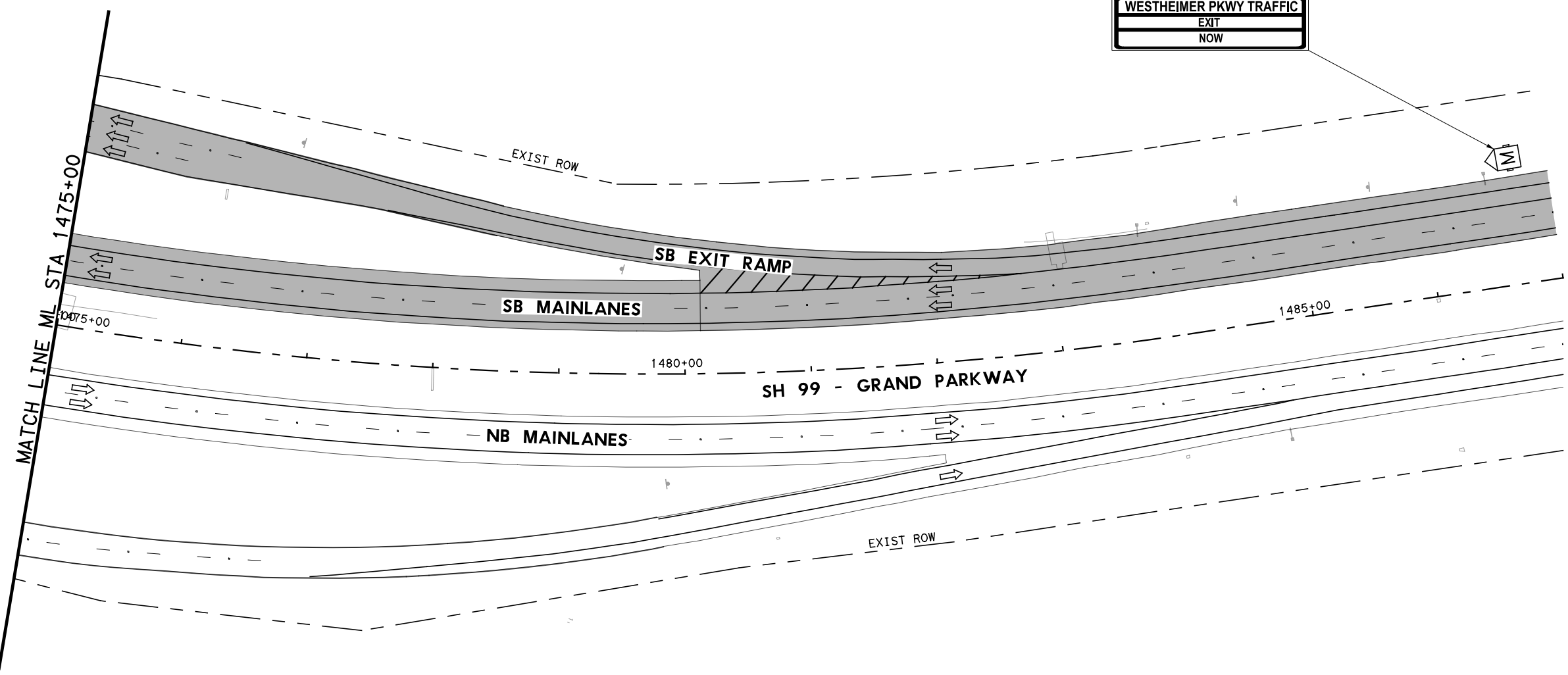
**SH 99**  
**SOUTHBOUND FRONTAGE ROAD**  
**WESTHEIMER PKWY TO CINCO RANCH BLVD**  
**TRAFFIC CONTROL PLAN**  
**PHASE III STEP 1**  
**STA 2463+00 TO ML STA 1475+00**  
**SHEET 5 OF 6**

FED. RD. DIV. NO.	PROJECT NO.	HIGHWAY NO.	
6		SH 99	
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	50

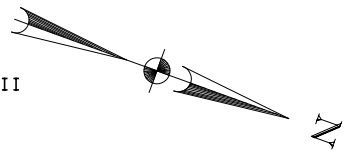


PHASE III STEP 1  
SECTION C-C

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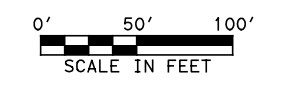


NOTE:  
USE PCMS FOR THE DURATION OF PHASE II AND PHASE III STEP 1



- LEGEND**
- EXIST PAV TO REMAIN
  - PHASE I TEMP PAV CONSTRUCTION
  - PHASE I TEMP PAV CONSTRUCTION IN PREVIOUS PHASE
  - PHASE I PERM PAV CONSTRUCTION
  - PHASE II PERM PAV CONSTRUCTION
  - PHASE III STEP 1 PERM PAV CONSTRUCTION
  - PHASE III STEP 2 PERM PAV CONSTRUCTION
  - PERM PAV CONSTRUCTION IN PREVIOUS PHASE
  - PSSCTB PORTABLE CONC BARRIER
  - LPCB LOW-PROFILE CONC BARRIER (TY 1)
  - LPCB LOW-PROFILE CONC BARRIER (TY 2)
  - PROP DIRECTION OF TRAFFIC
  - EXIST DIRECTION OF TRAFFIC
  - CHANNELIZING DEVICE
  - CONSTRUCTION SIGN
  - CRASH CUSHION ATTENUATOR (CCA)
  - TYPE III BARRICADE
  - (A) WK ZN PAV MRK REMOV (W) 4" (BRK)
  - (B) WK ZN PAV MRK REMOV (W) 4" (DOT)
  - (C) WK ZN PAV MRK REMOV (W) 4" (SLD)
  - (D) WK ZN PAV MRK REMOV (W) 8" (SLD)
  - (E) WK ZN PAV MRK REMOV (Y) 4" (SLD)
  - (F) WK ZN PAV MRK REMOV (W) 24" (SLD)

NOTES:  
1. MAINTAIN ACCESS TO ALL DRIVEWAYS AT ALL TIMES DURING CONSTRUCTION.



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Consulting Engineers  
738 Hwy 6 South, Suite 430  
Houston, Texas 77079  
(832) 619-1000

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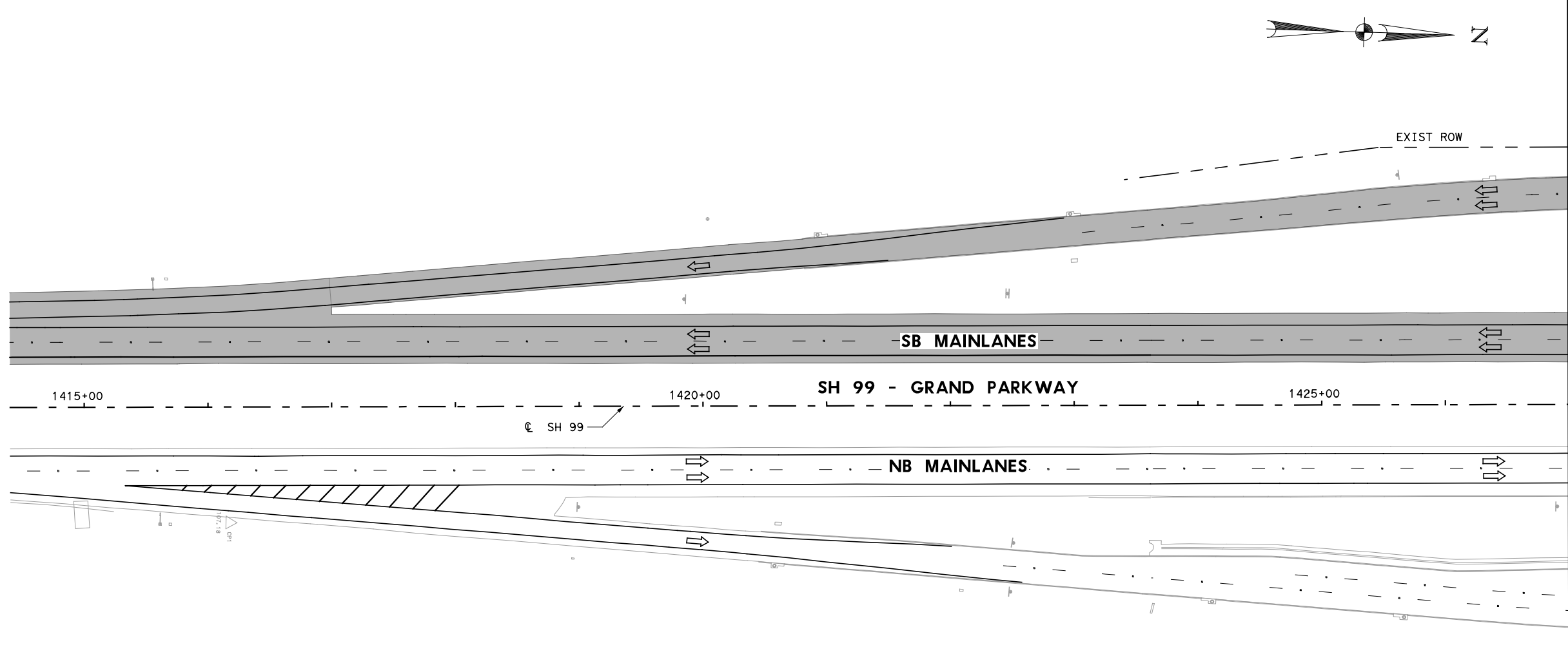
**SH 99**  
**SOUTHBOUND FRONTAGE ROAD**  
**WESTHEIMER PKWY TO CINCO RANCH BLVD**

**TRAFFIC CONTROL PLAN**  
**PHASE III STEP 1**  
**ML STA 1475+00 TO ML STA 1487+00**

SHEET 6 OF 6

FED. RD. DIV. NO.	PROJECT NO.	HIGHWAY NO.	
6		SH 99	
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	51

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- ### LEGEND
- EXIST PAV TO REMAIN
  - PHASE I TEMP PAV CONSTRUCTION
  - PHASE I TEMP PAV CONSTRUCTED IN PREVIOUS PHASE
  - PHASE I PERM PAV CONSTRUCTION
  - PHASE II PERM PAV CONSTRUCTION
  - PHASE III STEP 1 PERM PAV CONSTRUCTION
  - PHASE III STEP 2 PERM PAV CONSTRUCTION
  - PERM PAV CONSTRUCTED IN PREVIOUS PHASE
  - PSSCTB PORTABLE CONC BARRIER
  - LPCB LOW-PROFILE CONC BARRIER (TY 1)
  - LPCB LOW-PROFILE CONC BARRIER (TY 2)
  - PROP DIRECTION OF TRAFFIC
  - EXIST DIRECTION OF TRAFFIC
  - CHANNELIZING DEVICE
  - CONSTRUCTION SIGN
  - CRASH CUSHION ATTENUATOR (CCA)
  - TYPE III BARRICADE
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  - WK ZN PAV MRK REMOV (W) 4" (DOT)
  - WK ZN PAV MRK REMOV (W) 4" (SLD)
  - WK ZN PAV MRK REMOV (W) 8" (SLD)
  - WK ZN PAV MRK REMOV (Y) 4" (SLD)
  - WK ZN PAV MRK REMOV (W) 24" (SLD)

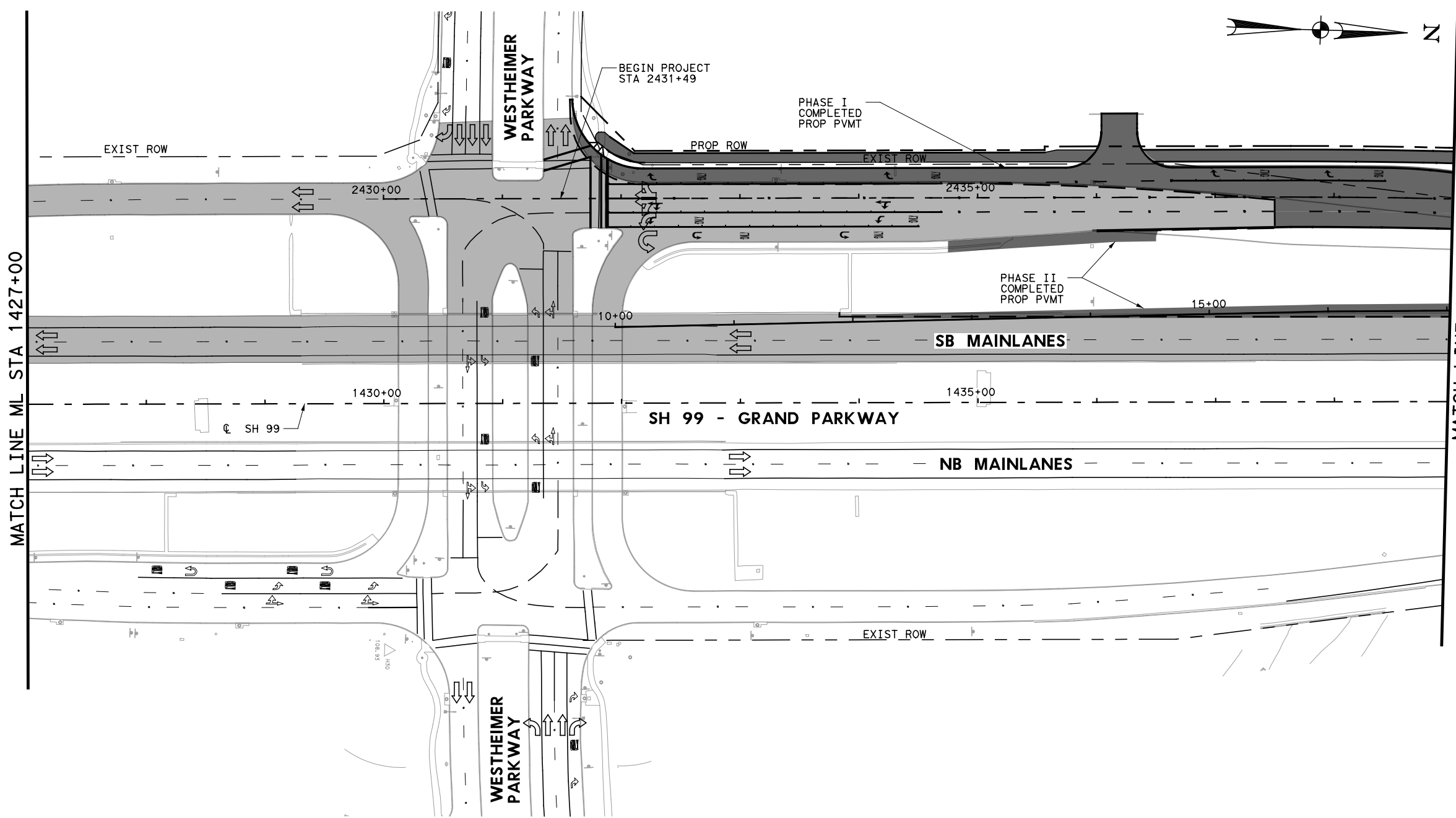
NOTES:  
1. MAINTAIN ACCESS TO ALL DRIVEWAYS AT ALL TIMES DURING CONSTRUCTION.



SH 99  
SOUTHBOUND FRONTAGE ROAD  
WESTHEIMER PKWY TO CINCO RANCH BLVD  
TRAFFIC CONTROL PLAN  
PHASE III STEP 2  
ML STA 1415+00 TO ML STA 1427+00  
SHEET 1 OF 6

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	52

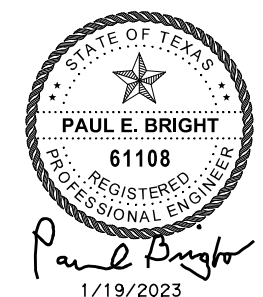
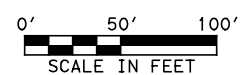
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**LEGEND**

- EXIST PAV TO REMAIN
- PHASE I TEMP PAV CONSTRUCTION
- PHASE I TEMP PAV CONSTRUCTION IN PREVIOUS PHASE
- PHASE I PERM PAV CONSTRUCTION
- PHASE II PERM PAV CONSTRUCTION
- PHASE III STEP 1 PERM PAV CONSTRUCTION
- PHASE III STEP 2 PERM PAV CONSTRUCTION
- PHASE III STEP 2 PERM PAV CONSTRUCTION IN PREVIOUS PHASE
- PSSCTB PORTABLE CONC BARRIER
- LPCB LOW-PROFILE CONC BARRIER (TY 1)
- LPCB LOW-PROFILE CONC BARRIER (TY 2)
- PROP DIRECTION OF TRAFFIC
- EXIST DIRECTION OF TRAFFIC
- CHANNELIZING DEVICE
- CONSTRUCTION SIGN
- CRASH CUSHION ATTENUATOR (CCA)
- TYPE III BARRICADE
- WK ZN PAV MRK REMOV (W) 4" (BRK)
- WK ZN PAV MRK REMOV (W) 4" (DOT)
- WK ZN PAV MRK REMOV (W) 4" (SLD)
- WK ZN PAV MRK REMOV (W) 8" (SLD)
- WK ZN PAV MRK REMOV (Y) 4" (SLD)
- WK ZN PAV MRK REMOV (W) 24" (SLD)

NOTES:  
1. MAINTAIN ACCESS TO ALL DRIVEWAYS AT ALL TIMES DURING CONSTRUCTION.

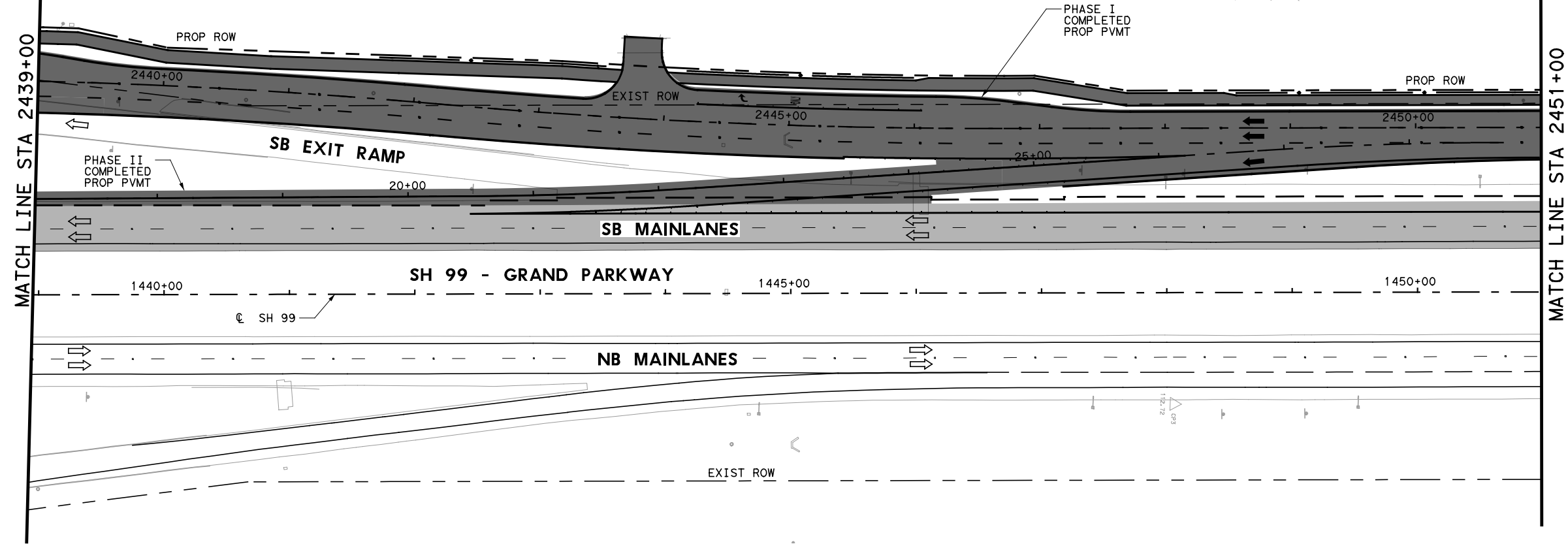


**SH 99**  
SOUTHBOUND FRONTAGE ROAD  
WESTHEIMER PKWY TO CINCO RANCH BLVD  
TRAFFIC CONTROL PLAN  
PHASE III STEP 2  
ML STA 1427+00 TO STA 2439+00

SHEET 2 OF 6

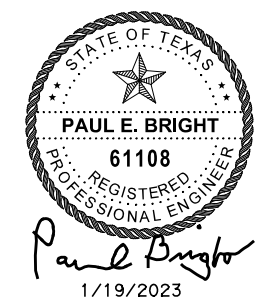
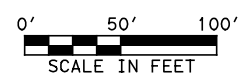
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6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	53

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- LEGEND**
- EXIST PAV TO REMAIN
  - PHASE I TEMP PAV CONSTRUCTION
  - PHASE I TEMP PAV CONSTRUCTED IN PREVIOUS PHASE
  - PHASE I PERM PAV CONSTRUCTION
  - PHASE II PERM PAV CONSTRUCTION
  - PHASE III STEP 1 PERM PAV CONSTRUCTION
  - PHASE III STEP 2 PERM PAV CONSTRUCTION
  - PHASE III STEP 2 PERM PAV CONSTRUCTED IN PREVIOUS PHASE
  - PSSCTB PORTABLE CONC BARRIER
  - LPCB LOW-PROFILE CONC BARRIER (TY 1)
  - LPCB LOW-PROFILE CONC BARRIER (TY 2)
  - PROP DIRECTION OF TRAFFIC
  - EXIST DIRECTION OF TRAFFIC
  - CHANNELIZING DEVICE
  - CONSTRUCTION SIGN
  - CRASH CUSHION ATTENUATOR (CCA)
  - TYPE III BARRICADE
  - WK ZN PAV MRK REMOV (W) 4" (BRK)
  - WK ZN PAV MRK REMOV (W) 4" (DOT)
  - WK ZN PAV MRK REMOV (W) 4" (SLD)
  - WK ZN PAV MRK REMOV (W) 8" (SLD)
  - WK ZN PAV MRK REMOV (Y) 4" (SLD)
  - WK ZN PAV MRK REMOV (W) 24" (SLD)

**NOTES:**  
 1. MAINTAIN ACCESS TO ALL DRIVEWAYS AT ALL TIMES DURING CONSTRUCTION.

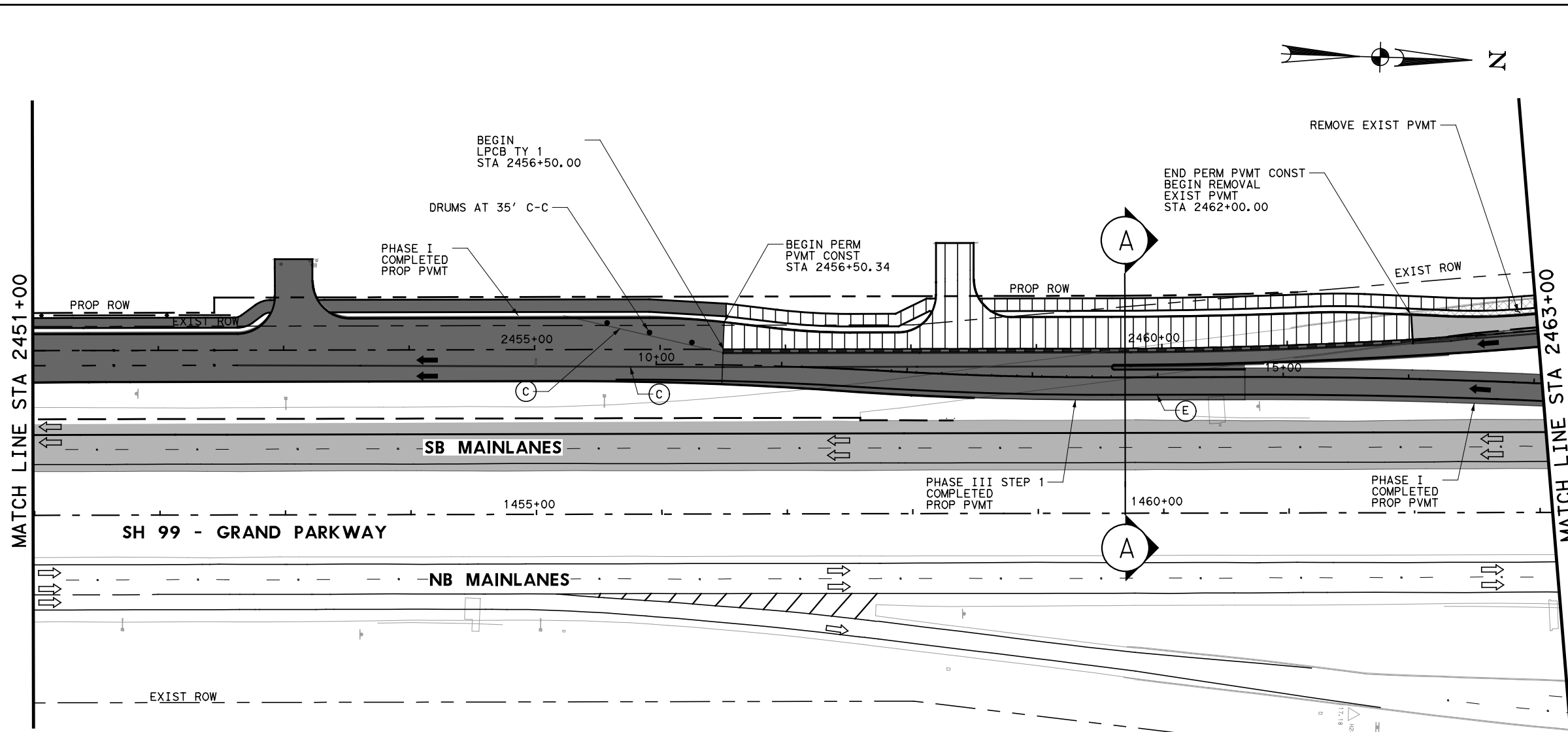


SH 99  
 SOUTHBOUND FRONTAGE ROAD  
 WESTHEIMER PKWY TO CINCO RANCH BLVD  
 TRAFFIC CONTROL PLAN  
 PHASE III STEP 2  
 STA 2439+00 TO STA 2451+00

SHEET 3 OF 6

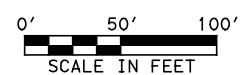
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6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	54

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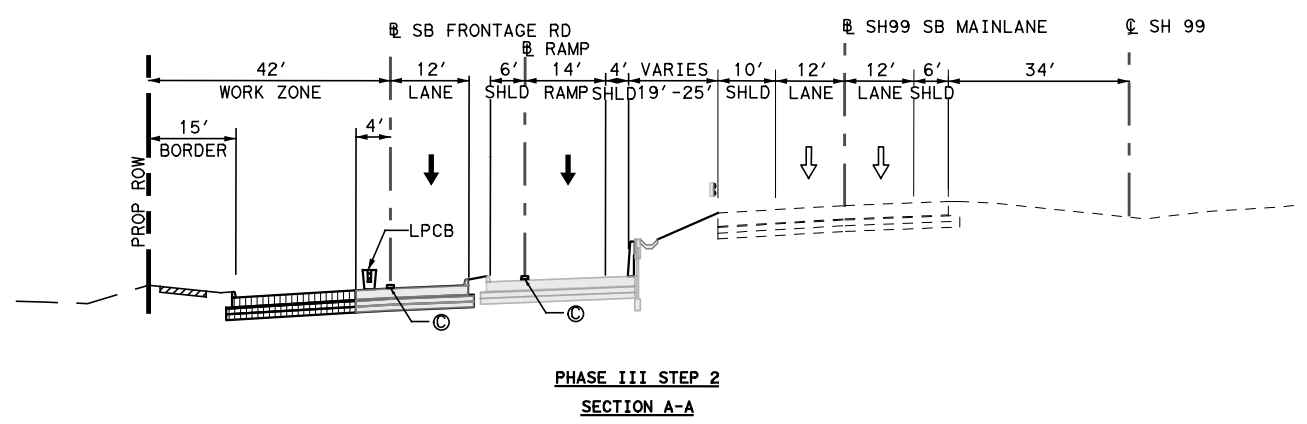
- LEGEND**
- [Solid Grey] EXIST PAV TO REMAIN
  - [Diagonal Hatching /] PHASE I TEMP PAV CONSTRUCTION
  - [Diagonal Hatching \] PHASE I TEMP PAV CONSTRUCTION IN PREVIOUS PHASE
  - [Cross-hatching] PHASE I PERM PAV CONSTRUCTION
  - [Diagonal Hatching /] PHASE II PERM PAV CONSTRUCTION
  - [Diagonal Hatching \] PHASE III STEP 1 PERM PAV CONSTRUCTION
  - [Cross-hatching] PHASE III STEP 2 PERM PAV CONSTRUCTION
  - [Solid Grey] PERM PAV CONSTRUCTION IN PREVIOUS PHASE
  - [Dashed Line] PSSCTB PORTABLE CONC BARRIER
  - [Solid Line] LPCB LOW-PROFILE CONC BARRIER (TY 1)
  - [Dotted Line] LPCB LOW-PROFILE CONC BARRIER (TY 2)
  - [Arrow] PROP DIRECTION OF TRAFFIC
  - [Open Arrow] EXIST DIRECTION OF TRAFFIC
  - [Circle with Dot] CHANNELIZING DEVICE
  - [Triangle] CONSTRUCTION SIGN
  - [Horizontal Line] CRASH CUSHION ATTENUATOR (CCA)
  - [Vertical Line] TYPE III BARRICADE
  - (A) WK ZN PAV MRK REMOV (W) 4" (BRK)
  - (B) WK ZN PAV MRK REMOV (W) 4" (DOT)
  - (C) WK ZN PAV MRK REMOV (W) 4" (SLD)
  - (D) WK ZN PAV MRK REMOV (W) 8" (SLD)
  - (E) WK ZN PAV MRK REMOV (Y) 4" (SLD)
  - (F) WK ZN PAV MRK REMOV (W) 24" (SLD)

**NOTES:**  
1. MAINTAIN ACCESS TO ALL DRIVEWAYS AT ALL TIMES DURING CONSTRUCTION.



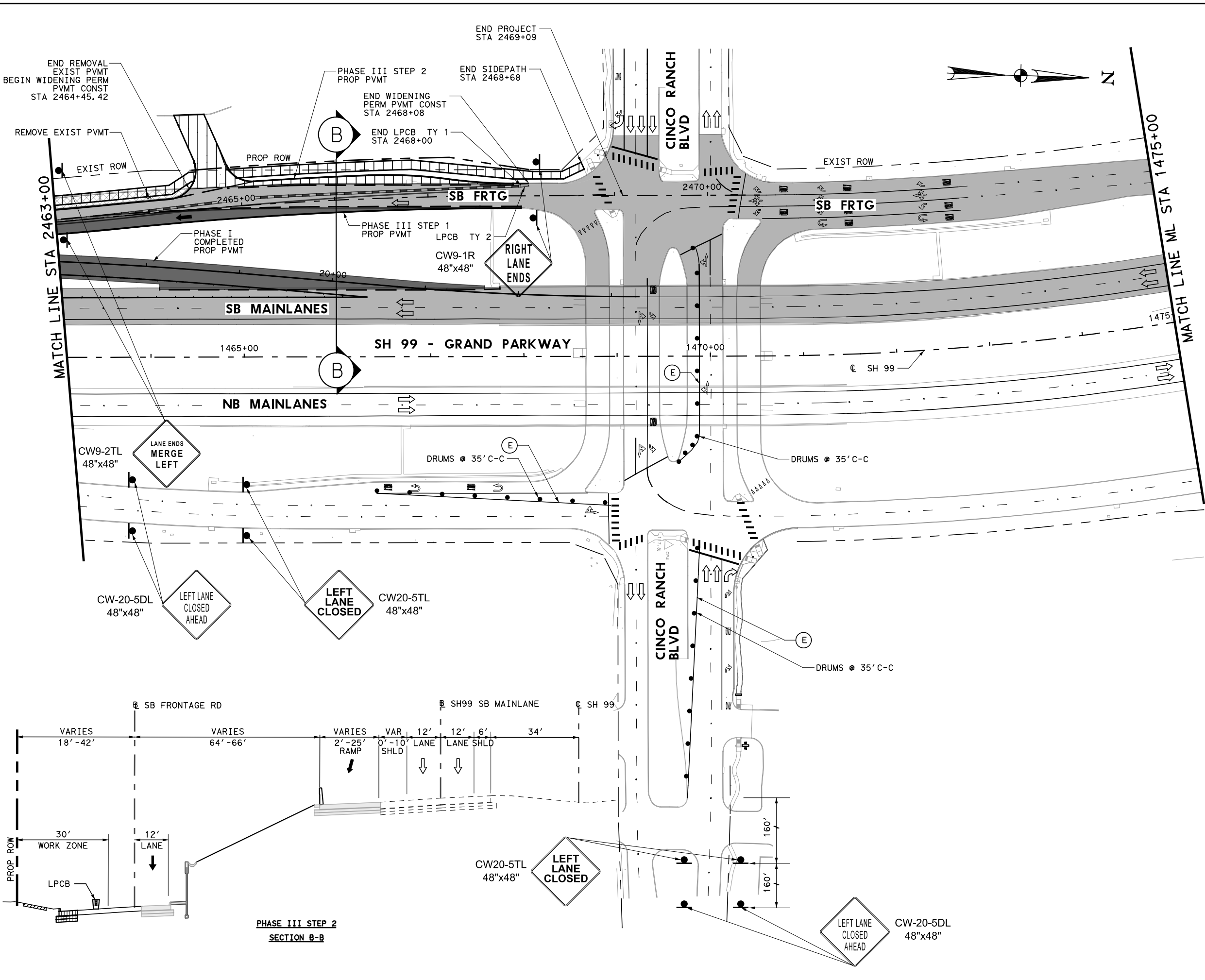
SH 99  
SOUTHBOUND FRONTAGE ROAD  
WESTHEIMER PKWY TO CINCO RANCH BLVD  
TRAFFIC CONTROL PLAN  
PHASE III STEP 2  
STA 2451+00 TO STA 2463+00  
SHEET 4 OF 6

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	55





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### LEGEND

- EXIST PAV TO REMAIN
- PHASE I TEMP PAV CONSTRUCTION
- PHASE I TEMP PAV CONSTRUCTION IN PREVIOUS PHASE
- PHASE I PERM PAV CONSTRUCTION
- PHASE II PERM PAV CONSTRUCTION
- PHASE III STEP 1 PERM PAV CONSTRUCTION
- PHASE III STEP 2 PERM PAV CONSTRUCTION
- PERM PAV CONSTRUCTION IN PREVIOUS PHASE
- PSSCTB PORTABLE CONC BARRIER
- LPCB LOW-PROFILE CONC BARRIER (TY 1)
- LPCB LOW-PROFILE CONC BARRIER (TY 2)
- PROP DIRECTION OF TRAFFIC
- EXIST DIRECTION OF TRAFFIC
- CHANNELIZING DEVICE
- CONSTRUCTION SIGN
- CRASH CUSHION ATTENUATOR (CCA)
- TYPE III BARRICADE
- WK ZN PAV MRK REMOV (W) 4" (BRK)
- WK ZN PAV MRK REMOV (W) 4" (DOT)
- WK ZN PAV MRK REMOV (W) 4" (SLD)
- WK ZN PAV MRK REMOV (W) 8" (SLD)
- WK ZN PAV MRK REMOV (Y) 4" (SLD)
- WK ZN PAV MRK REMOV (W) 24" (SLD)

NOTES:  
 1. MAINTAIN ACCESS TO ALL DRIVEWAYS AT ALL TIMES DURING CONSTRUCTION.



**PAUL E. BRIGHT**  
 61108  
 REGISTERED PROFESSIONAL ENGINEER  
*Paul Bright*  
 1/19/2023

**TEDSI INFRASTRUCTURE GROUP**  
 Consulting Engineers  
 738 Hwy 6 South, Suite 430  
 Houston, Texas 77079  
 (832) 619-1000

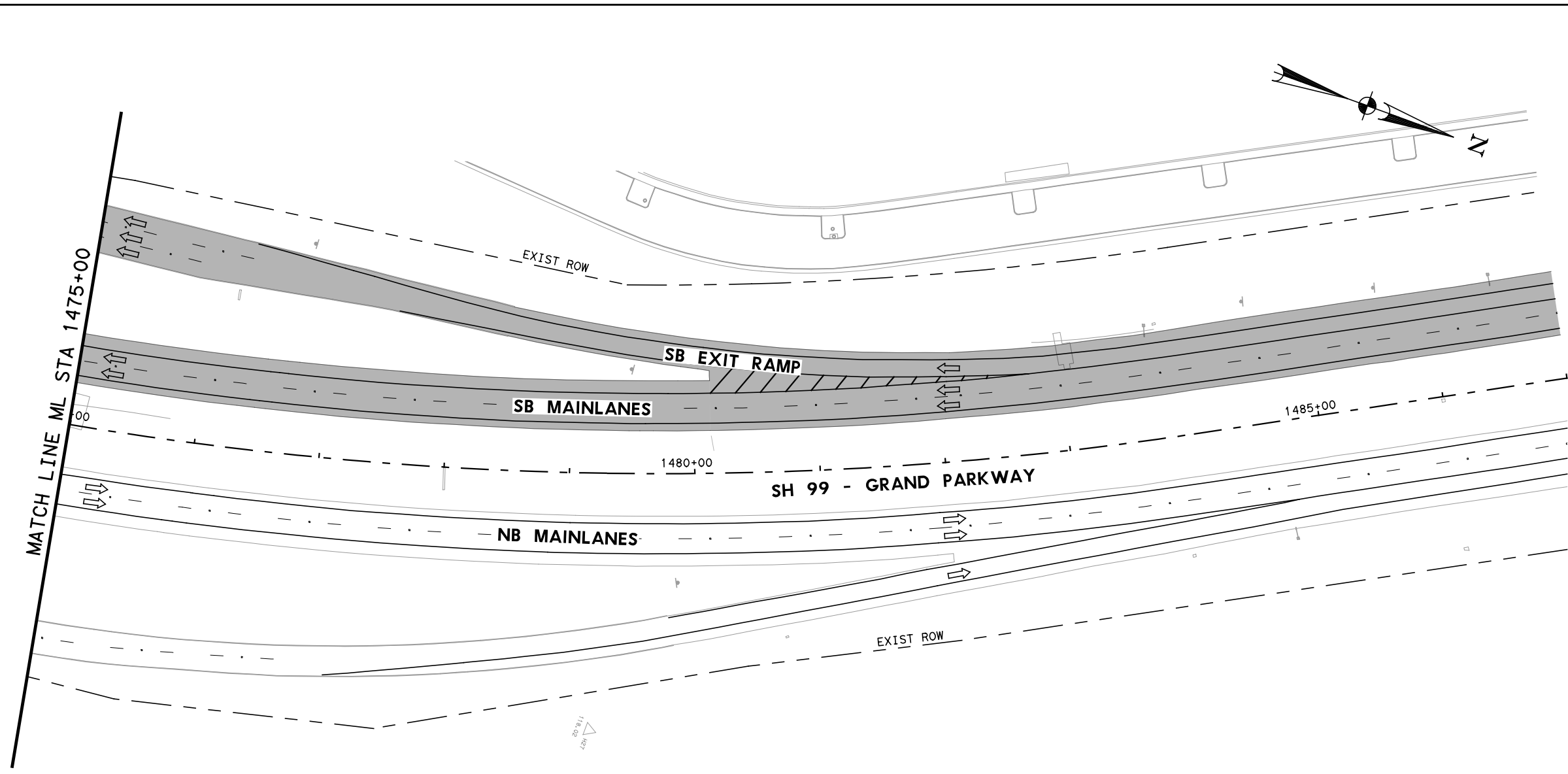
Texas Department of Transportation  
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**SH 99**  
**SOUTHBOUND FRONTAGE ROAD**  
**WESTHEIMER PKWY TO CINCO RANCH BLVD**  
**TRAFFIC CONTROL PLAN**  
**PHASE III STEP 2**  
**STA 2463+00 TO ML STA 1475+00**  
**SHEET 5 OF 6**

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	56

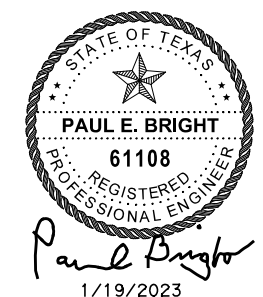
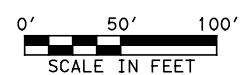
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**SECTION B-B**

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- LEGEND**
- EXIST PAV TO REMAIN
  - PHASE I TEMP PAV CONSTRUCTION
  - PHASE I TEMP PAV CONSTRUCTION IN PREVIOUS PHASE
  - PHASE I PERM PAV CONSTRUCTION
  - PHASE II PERM PAV CONSTRUCTION
  - PHASE III STEP 1 PERM PAV CONSTRUCTION
  - PHASE III STEP 2 PERM PAV CONSTRUCTION
  - PHASE III STEP 2 PERM PAV CONSTRUCTION IN PREVIOUS PHASE
  - PSSCTB PORTABLE CONC BARRIER
  - LPCB LOW-PROFILE CONC BARRIER (TY 1)
  - LPCB LOW-PROFILE CONC BARRIER (TY 2)
  - PROP DIRECTION OF TRAFFIC
  - EXIST DIRECTION OF TRAFFIC
  - CHANNELIZING DEVICE
  - CONSTRUCTION SIGN
  - CRASH CUSHION ATTENUATOR (CCA)
  - TYPE III BARRICADE
  - WK ZN PAV MRK REMOV (W) 4" (BRK)
  - WK ZN PAV MRK REMOV (W) 4" (DOT)
  - WK ZN PAV MRK REMOV (W) 4" (SLD)
  - WK ZN PAV MRK REMOV (W) 8" (SLD)
  - WK ZN PAV MRK REMOV (Y) 4" (SLD)
  - WK ZN PAV MRK REMOV (W) 24" (SLD)

**NOTES:**  
 1. MAINTAIN ACCESS TO ALL DRIVEWAYS AT ALL TIMES DURING CONSTRUCTION.



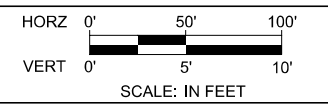
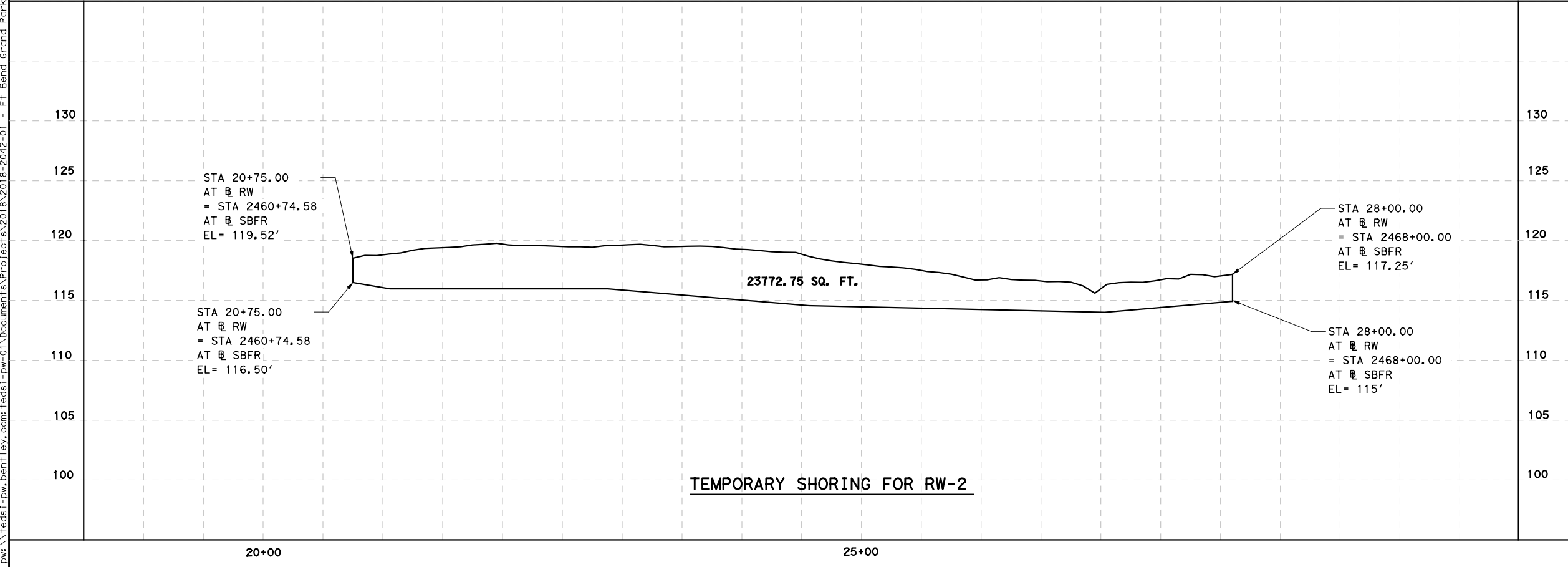
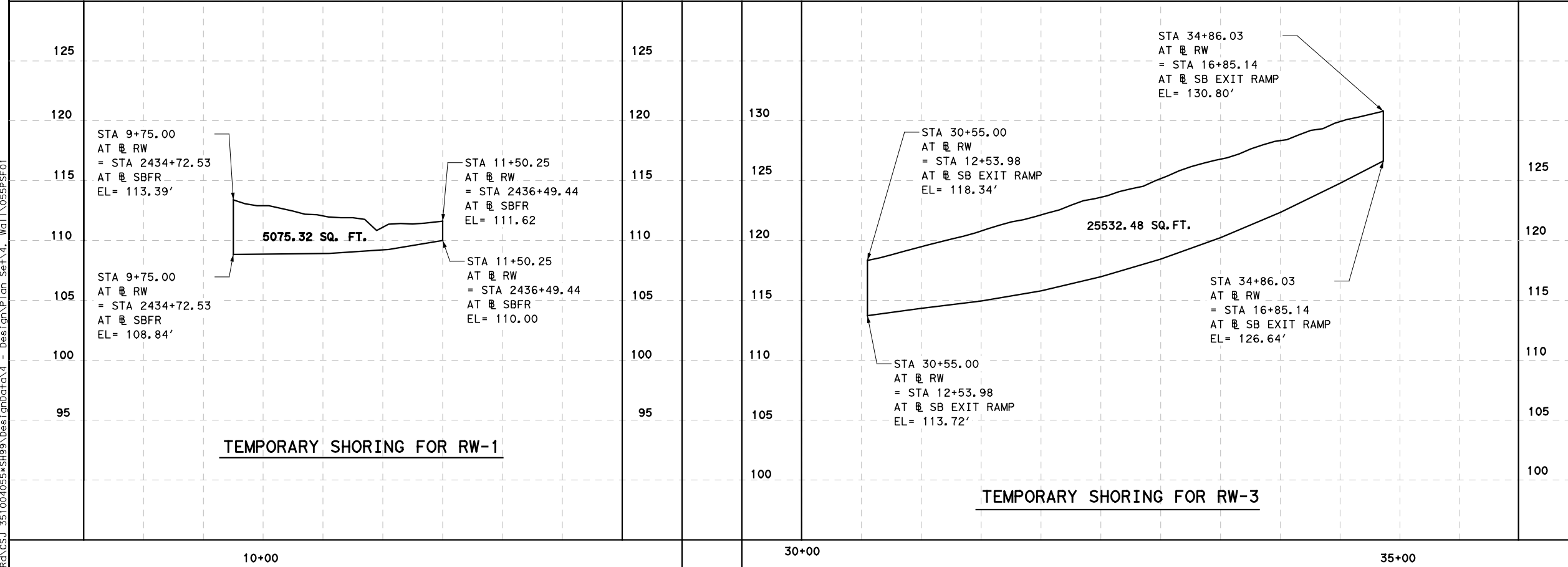
**TEDSI INFRASTRUCTURE GROUP**  
 Consulting Engineers  
 738 Hwy 6 South, Suite 430  
 Houston, Texas 77079  
 (832) 619-1000  
 TBPE F-1640



SH 99  
 SOUTHBOUND FRONTAGE ROAD  
 WESTHEIMER PKWY TO CINCO RANCH BLVD  
 TRAFFIC CONTROL PLAN  
 PHASE III STEP 2  
 ML STA 1475+00 TO ML STA 1487+00  
 SHEET 6 OF 6

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	57

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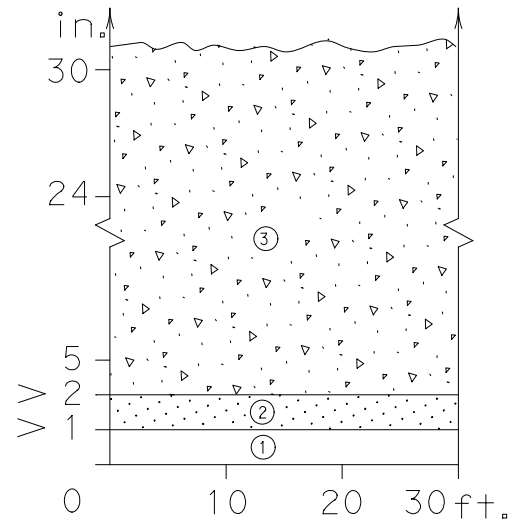
SH 99  
SOUTHBOUND FRONTAGE ROAD  
WESTHEIMER PKWY TO CINCO RANCH BLVD  
TEMPORARY SHORING LAYOUT  
FOR RW-1, RW-2 & RW-3

SHEET 1 OF 1

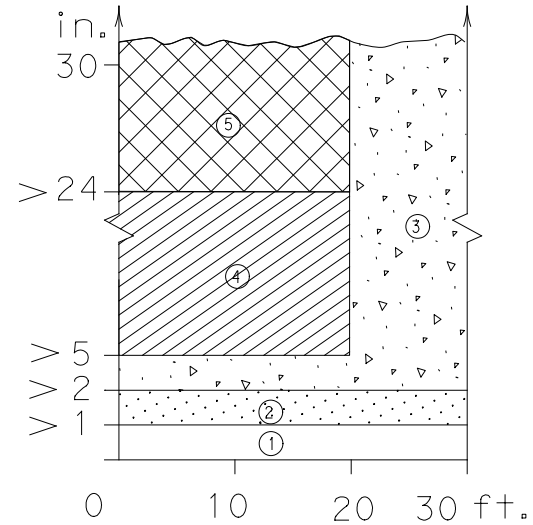
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6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	58

DEFINITION OF TREATMENT ZONES  
FOR VARIOUS EDGE CONDITIONS

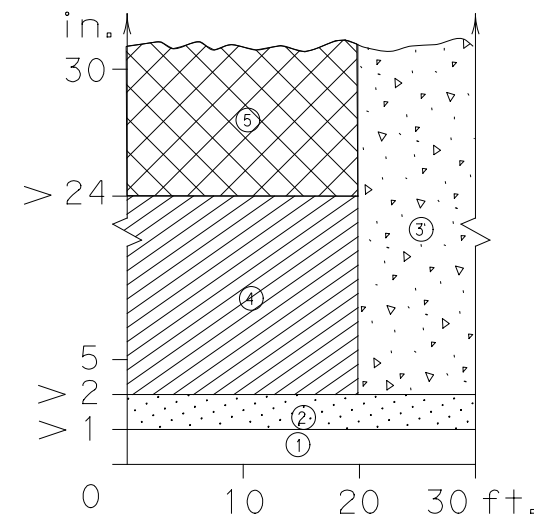
Edge Height (D) in Inches versus Lateral Clearance (Y) in Feet



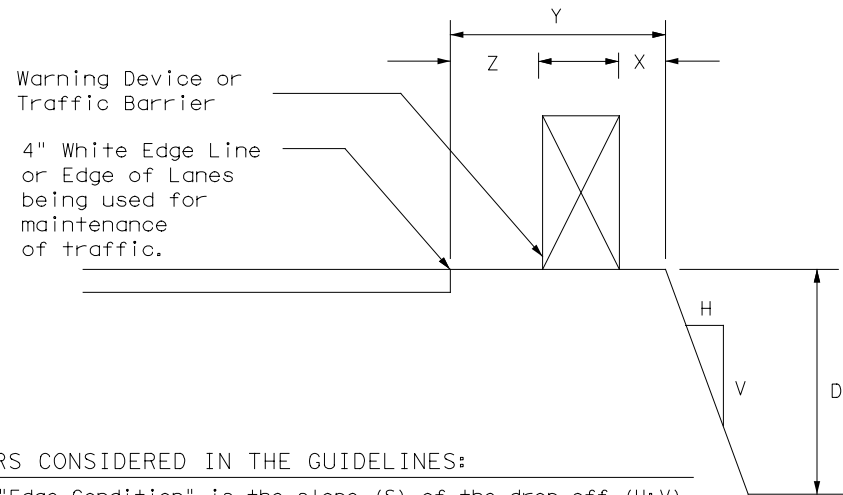
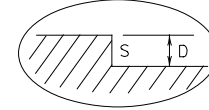
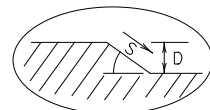
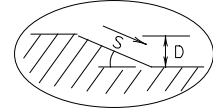
Edge Condition I  
S = (3:1) (or flatter)



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



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



Zone	Treatment Types Guidelines:
①	No treatment
②	CW 8-11 "Uneven Lanes" signs.
③	CW 8-9a Shoulder Drop-Off" or CW 8-11 signs plus vertical panels.
④	CW8-9a or CW 8-11, signs plus drums. Where restricted space precludes the use of drums, use vertical panels. An edge slope to that of the proferred 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.

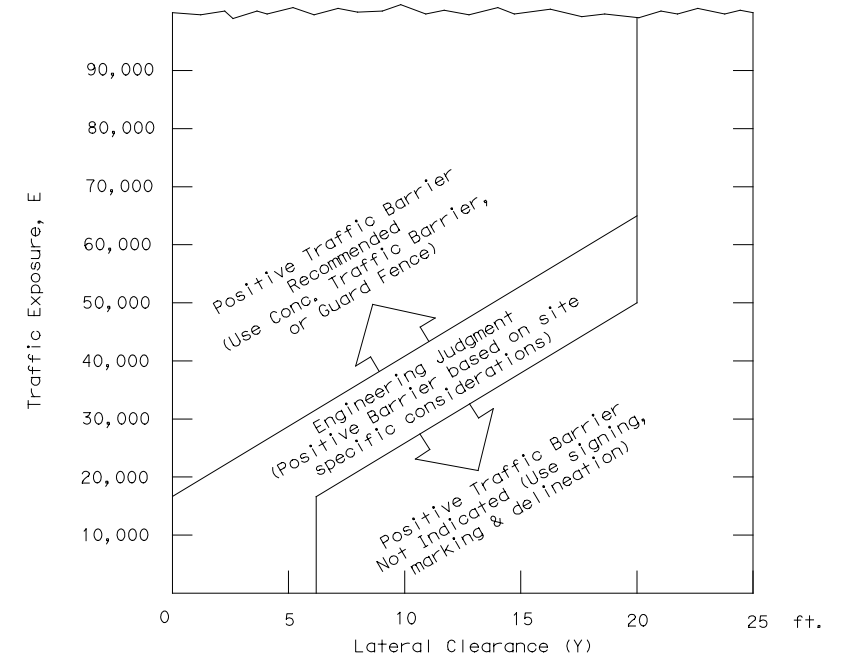
FACTORS CONSIDERED IN THE GUIDELINES:

- 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.

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



- $E = ADT \times T$   
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 the clear zone.

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

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:

Engineer's Seal

Paul E. Bright  
1/19/2023

Texas Department of Transportation  
Traffic Safety Division Standard

## TREATMENT FOR VARIOUS EDGE CONDITIONS

FILE: edgecon.dgn	DN: August 2000	CK: 04	DW: 055	CK: SH 99
© TxDOT August 2000		CONT SECT	JOB	HIGHWAY
REVISIONS		3510 04	055	SH 99
03-01	08-01	DIST	COUNTY	SHEET NO.
9-21		HOU	FORT BEND	59

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 TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

LOC NO.	TCP PHASE	PLAN SHEET NUMBER	LOCATION	STA	TEST LEVEL	DIRECTION OF TRAFFIC (UNI/BI)	FOUNDATION PAD		BACKUP SUPPORT			AVAILABLE SITE LENGTH	CRASH CUSHION														
							PROPOSED MATERIAL	PROPOSED THICKNESS	DESCRIPTION	WIDTH	HEIGHT		INSTALL	REMOVE	MOVE / RESET		L N	L W	R N	R W	S N	S W					
															MOVE / RESET	FROM LOC. #											
1	PHASE 1	4	SBFR	2461+60	TL-3	UNI	CRCP	10"	PSSCB	24"	42"		X					X									
2	PHASE 1	5	SBFR	2463+00	TL-3	UNI	CRCP	10"	PSSCB	24"	42"		X					X									
3	PHASE 1	5	SBML	2468+00	TL-3	UNI	CRCP	10"	PSSCB	24"	42"		X					X									
4	PHASE 2	4	SB ENTR RAMP	2459+78	TL-3	UNI	CRCP	10"	PSSCB	24"	42"							X									
5	PHASE 3 STEP 1	4	SB ENTR RAMP	2459+78	TL-3	UNI	CRCP	10"	PSSCB	24"	42"			X				X									
6	PHASE 3 STEP 1	4	SBFR	2461+60	TL-3	UNI	CRCP	10"	PSSCB	24"	42"			X				X									
7	PHASE 3 STEP 2	5	SBML	2468+00	TL-3	UNI	CRCP	10"	PSSCB	24"	42"			X				X									
												TOTALS	3	3	1												

LEGEND:  
 L=LOW MAINTENANCE  
 R=REUSABLE  
 S=SACRIFICIAL  
 N=NARROW  
 W=WIDE

CRASH CUSHION SUMMARY SHEET

FOR DEFINITIONS SEE THE "CRASH CUSHION CATEGORIZATION CHART.PDF" AT THE DESIGN DIVISION (ROADWAY STANDARDS) WEBSITE. USE QUICK LINKS TO ACCESS ATTENUATORS / CRASH CUSHIONS SECTION.  
<http://www.dot.state.tx.us/insdot/orgchart/cmd/cserve/standard/rdwylse.htm>

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	HOU	FORT BEND	
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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).

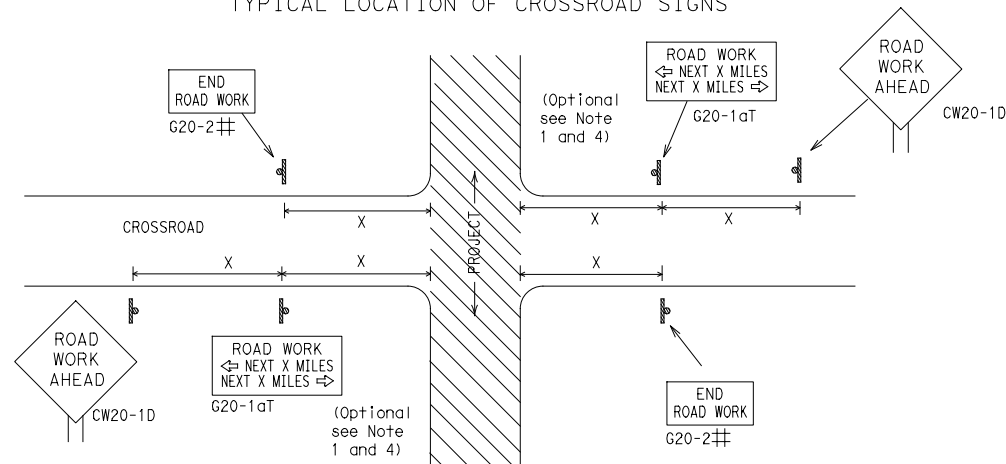
THE DOCUMENTS BELOW CAN BE FOUND ON-LINE AT <a href="http://www.txdot.gov">http://www.txdot.gov</a>
COMPLIANT WORK ZONE TRAFFIC CONTROL DEVICES LIST (CWZTCD)
DEPARTMENTAL MATERIAL SPECIFICATIONS (DMS)
MATERIAL PRODUCER LIST (MPL)
ROADWAY DESIGN MANUAL - SEE "MANUALS (ONLINE MANUALS) "
STANDARD HIGHWAY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

SHEET 1 OF 12

			
<b>BARRICADE AND CONSTRUCTION          GENERAL NOTES          AND REQUIREMENTS</b>			
<b>BC (1) -21</b>			
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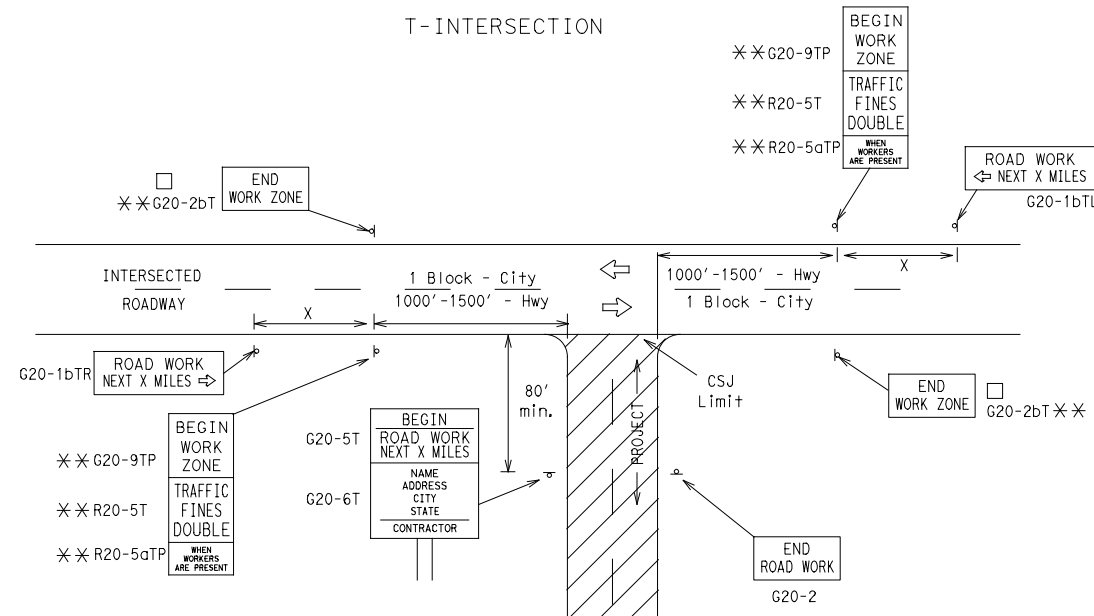
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TYPICAL LOCATION OF CROSSROAD SIGNS



- ## 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<sup>1,5,6</sup>

Sign Number or Series	SIZE		SPACING	
	Conventional Road	Expressway/Freeway	Posted Speed MPH	Sign Spacing "X" Feet (Apprx.)
CW20 <sup>4</sup>	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 <sup>2</sup>
CW3, CW4, CW5, CW6, CW8-3, CW10, CW12	48" x 48"	48" x 48"	60	600 <sup>2</sup>
			65	700 <sup>2</sup>
			70	800 <sup>2</sup>
			80	1000 <sup>2</sup>
*			*	* <sup>3</sup>

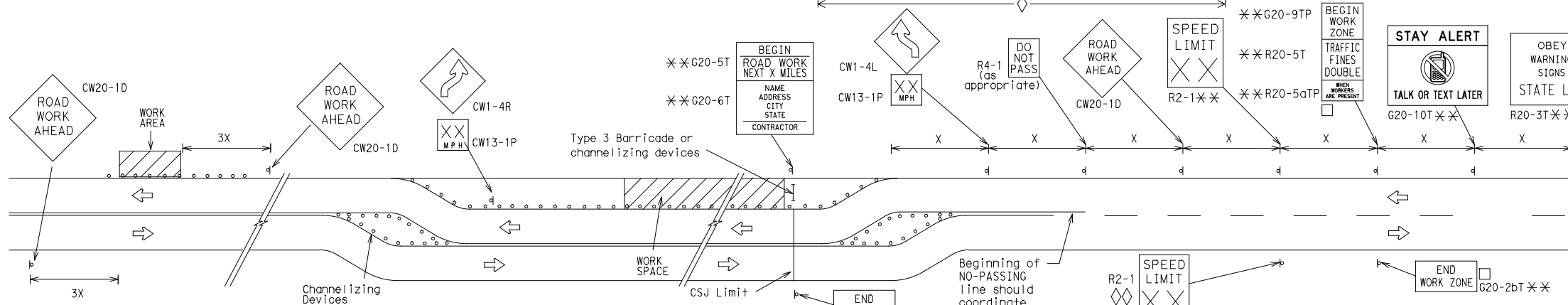
\* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

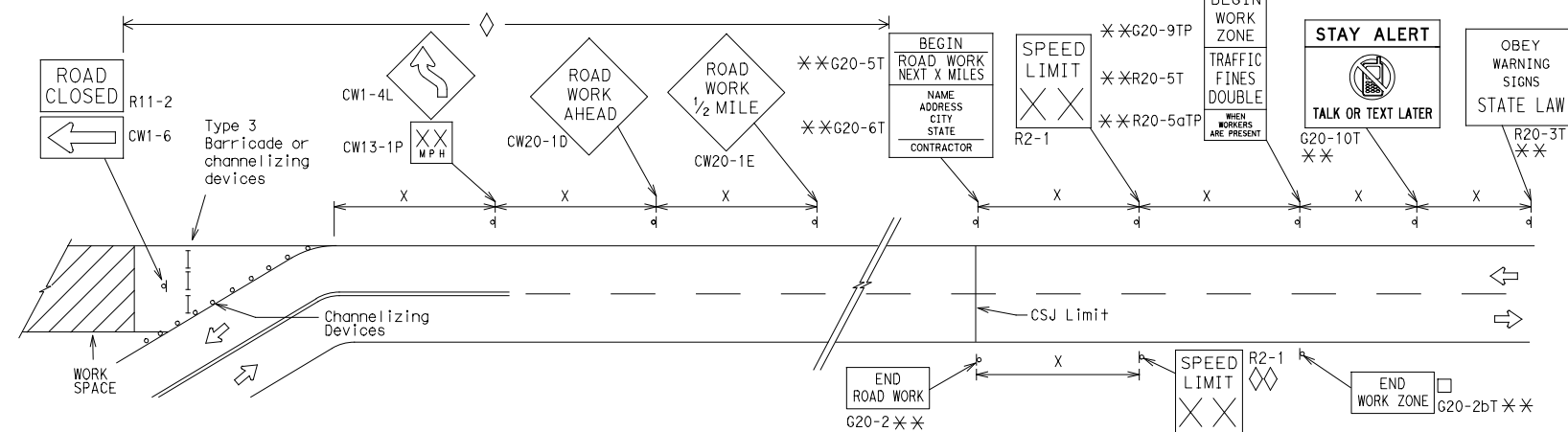
- Special or larger size signs may be used as necessary.
- Distance between signs should be increased as required to have 1500 feet advance warning.
- Distance between signs should be increased as required to have 1/2 mile or more advance warning.
- 36" x 36" "ROAD WORK AHEAD" (CW20-1D) signs may be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

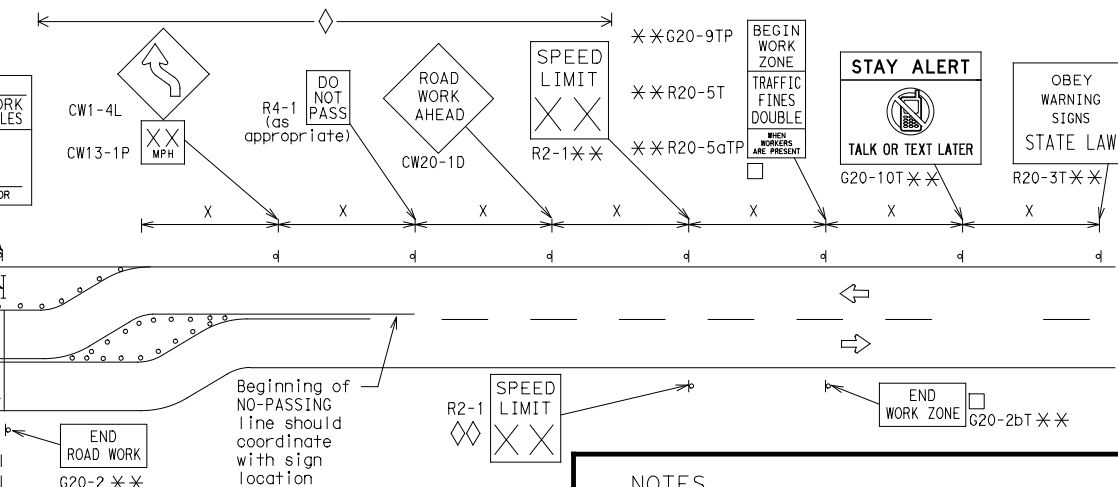


When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD" (CW20-1D) signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing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

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



SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT 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**

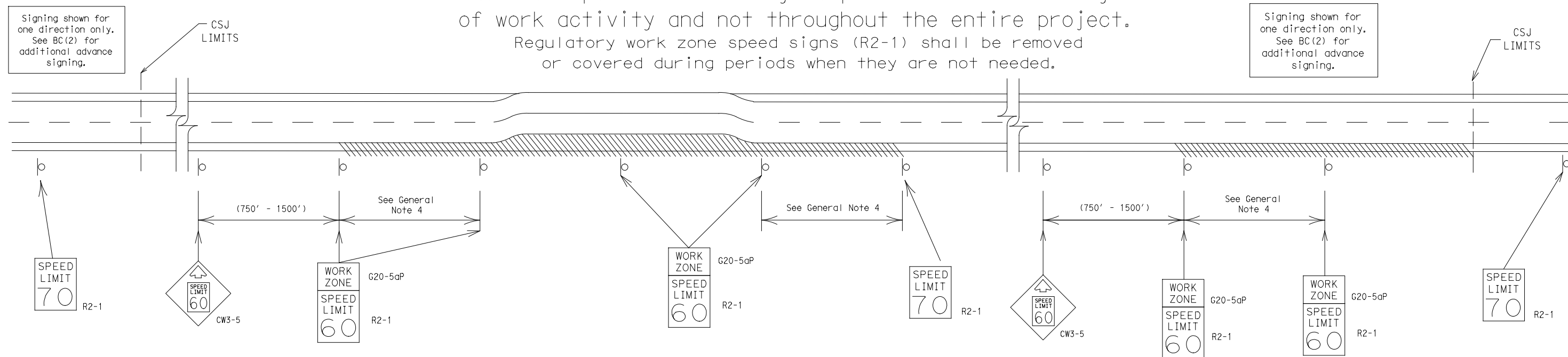
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© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
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# TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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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SHEET 3 OF 12



## BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

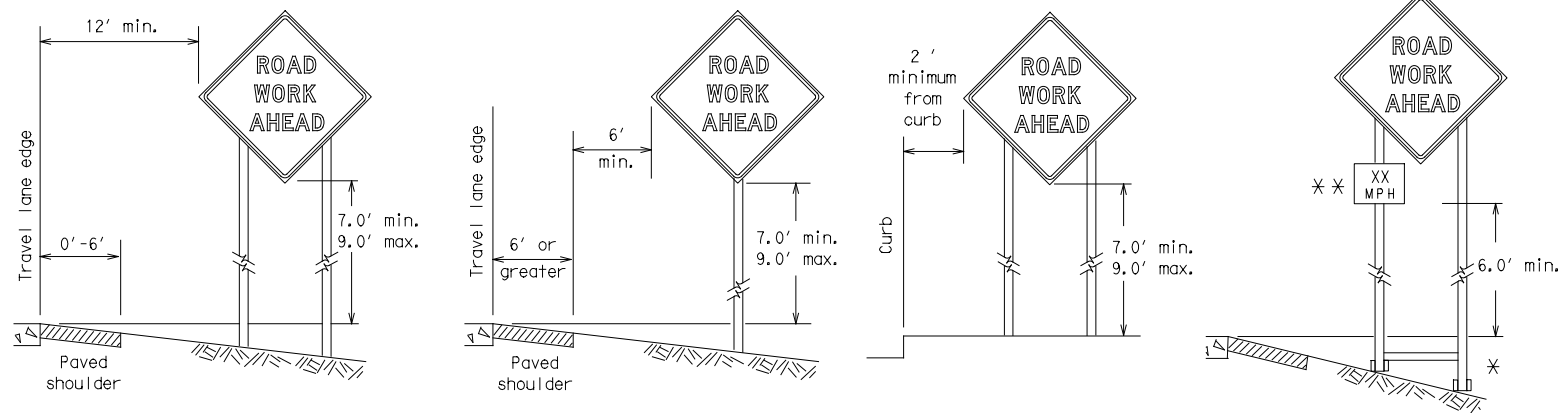
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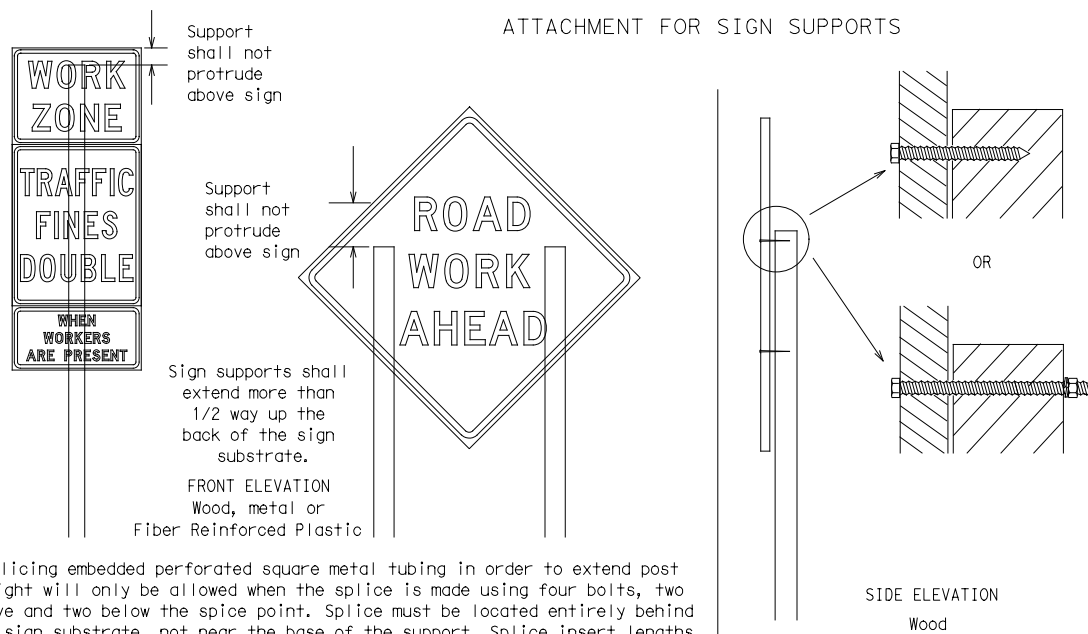
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



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

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

ATTACHMENT FOR SIGN SUPPORTS



Splicing embedded perforated square metal tubing in order to extend post height will only be allowed when the splice is made using four bolts, two above and two below the 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.

GENERAL NOTES FOR WORK ZONE SIGNS

- Contractor shall install and maintain signs in a straight and plumb condition and/or as directed by the Engineer.
- Wooden sign posts shall be painted white.
- Barricades shall NOT be used as sign supports.
- 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.
- 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.
- 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.
- 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.
- 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.
- 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)

- 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.
  - Long-term stationary - work that occupies a location more than 3 days.
  - 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.
  - Short-term stationary - daytime work that occupies a location for more than 1 hour in a single daylight period.
  - Short, duration - work that occupies a location up to 1 hour.
  - Mobile - work that moves continuously or intermittently (stopping for up to approximately 15 minutes.)

SIGN MOUNTING HEIGHT

- 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.
- 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.
- Long-term/Intermediate-term Signs may be used in lieu of Short-term/Short Duration signing.
- 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.
- 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

- 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

- 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.
- "Mesh" type materials are NOT an approved sign substrate, regardless of the tightness of the weave.
- 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

- 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).
- White sheeting, meeting the requirements of DMS-8300 Type A, shall be used for signs with a white background.
- Orange sheeting, meeting the requirements of DMS-8300 Type B<sub>FL</sub> or Type C<sub>FL</sub>, shall be used for rigid signs with orange backgrounds.

SIGN LETTERS

- 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

- When sign messages may be confusing or do not apply, the signs shall be removed or completely covered.
- 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.
- 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.
- 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 shall NOT be used to cover signs.
- Duct tape or other adhesive material shall NOT be affixed to a sign face.
- Signs and anchor stubs shall be removed and holes backfilled upon completion of work.

SIGN SUPPORT WEIGHTS

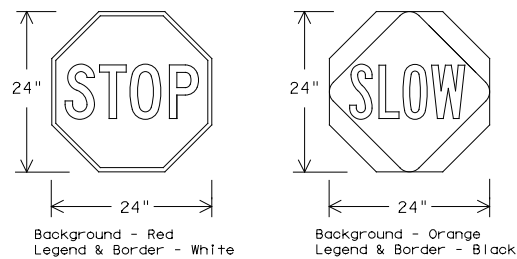
- Where sign supports require the use of weights to keep from turning over, the use of sandbags with dry, cohesionless sand should be used.
- The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
- Rock, concrete, iron, steel or other solid objects shall not be permitted for use as sign support weights.
- 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.
- 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.
- 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.
- Sandbags shall NOT be placed under the skid and shall not be used to level sign supports placed on slopes.

FLAGS ON SIGNS

- 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.

STOP/SLOW PADDLES

- STOP/SLOW paddles are the primary method to control traffic by flaggers. The STOP/SLOW paddle size should be 24" x 24".
- STOP/SLOW paddles shall be retroreflectorized when used at night.
- STOP/SLOW paddles may be attached to a staff with a minimum length of 6' to the bottom of the sign.
- 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 <sub>FL</sub> OR C <sub>FL</sub> 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

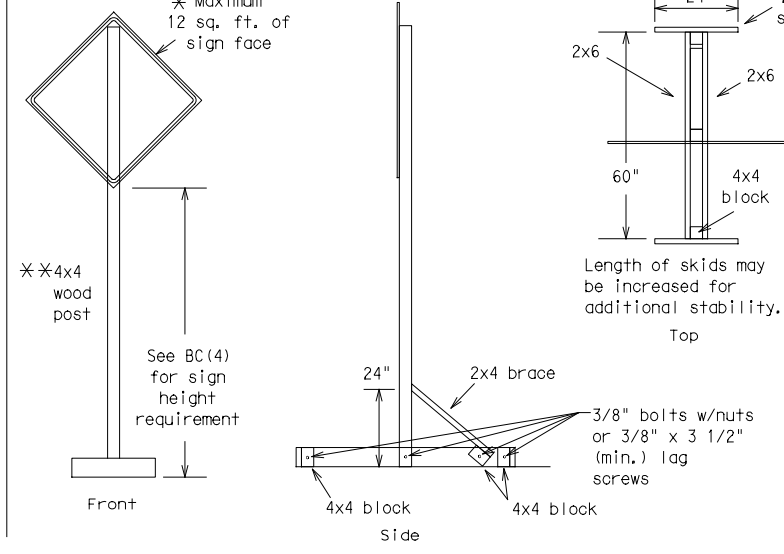
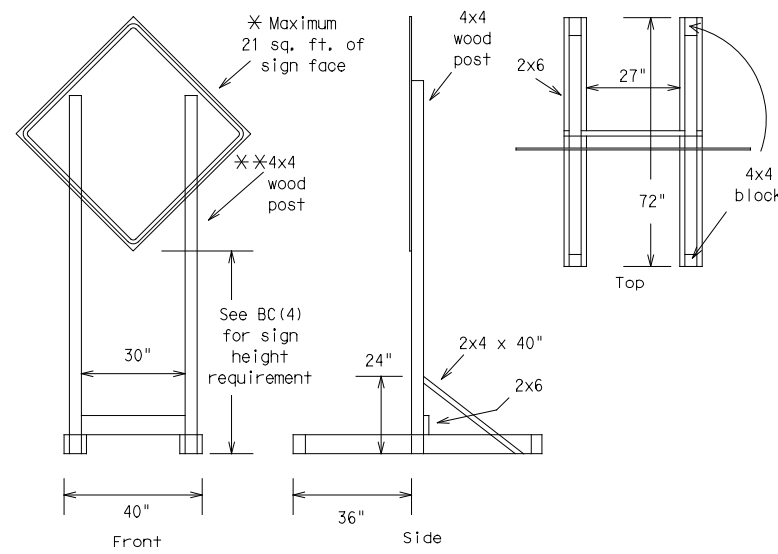
- Permanent signs are used to give notice of traffic laws or regulations, call attention to conditions that are potentially hazardous to traffic operations, show route designations, destinations, directions, distances, services, points of interest, and other geographical, recreational, specific service (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.
- 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.
- When existing permanent signs are moved and relocated due to construction purposes, they shall be visible to motorists at all times.
- 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.
- 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.
- 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.

SHEET 4 OF 12

<h2>BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES</h2>			
<h3>BC (4) -21</h3>			
FILE:	bc-21.dgn	DN:	TxDOT
© TxDOT	November 2002	CK:	TxDOT
REVISIONS		OW:	TxDOT
9-07	8-14	CK:	TxDOT
7-13	5-21	OW:	TxDOT
CONT	SECT	JOB	HIGHWAY
DIST	COUNTY	SHEET NO.	
HOU	FORT BEND	64	

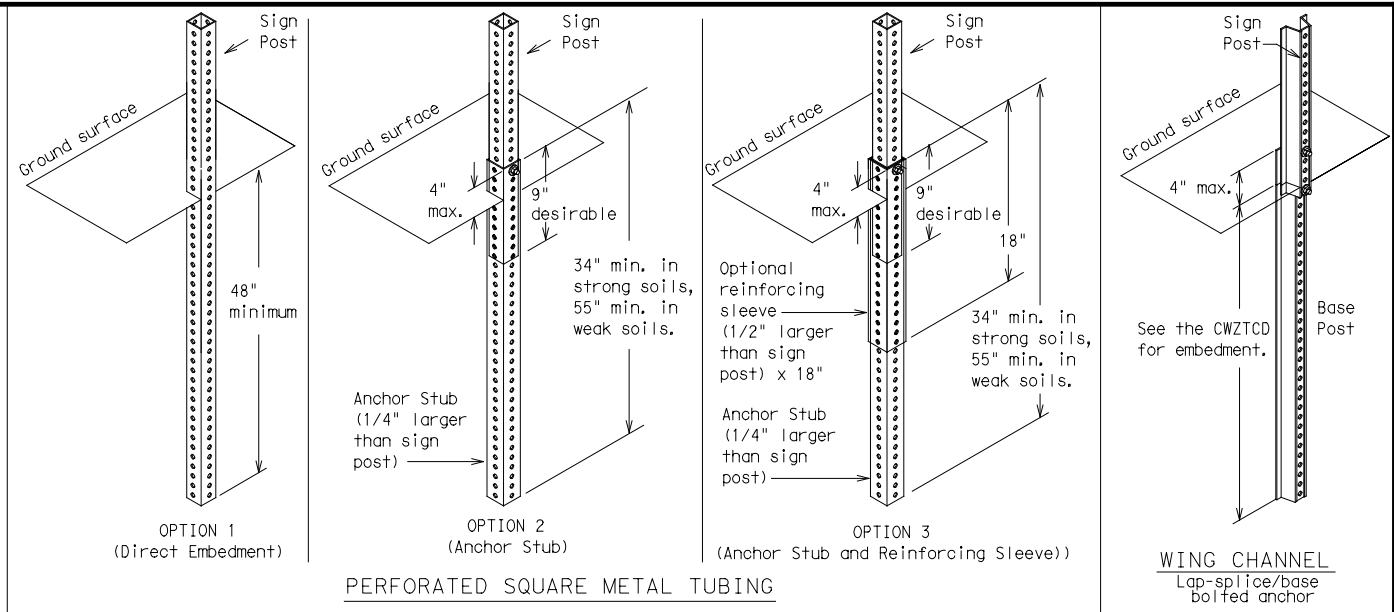
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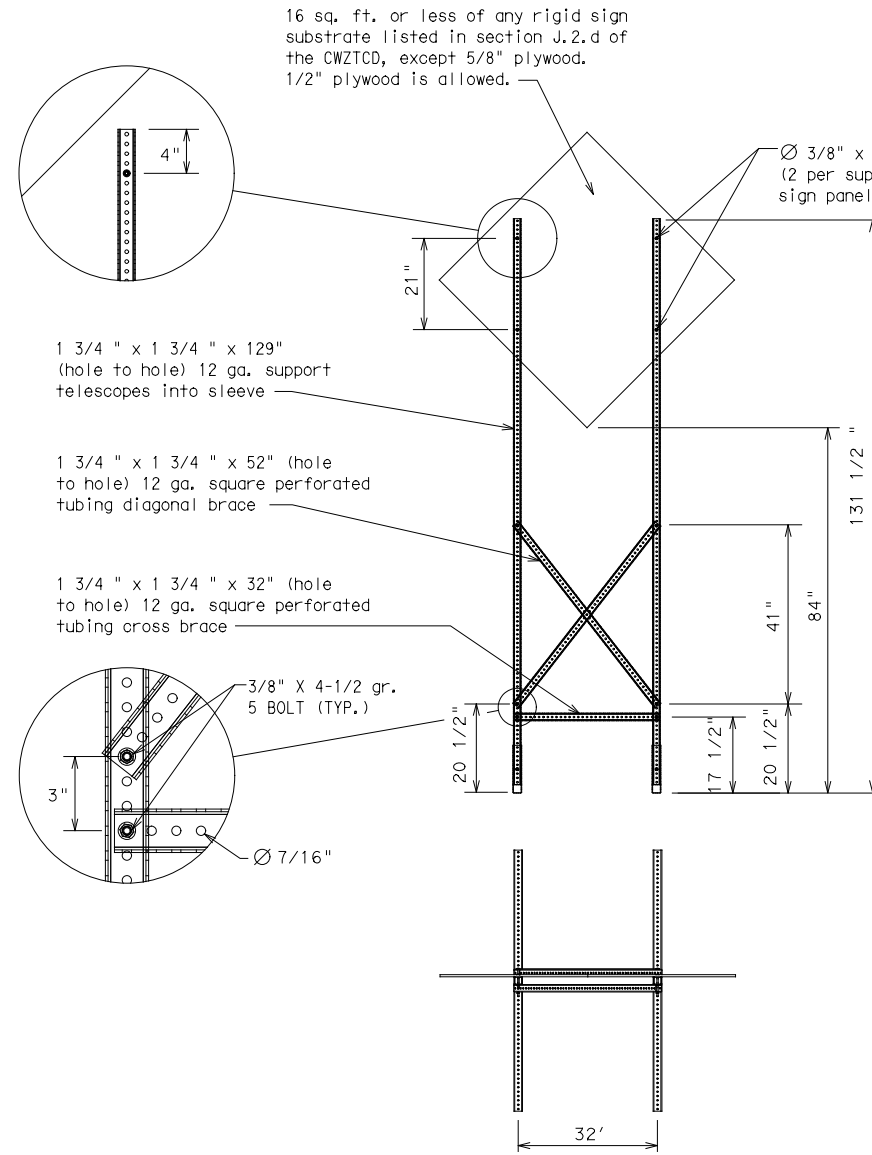
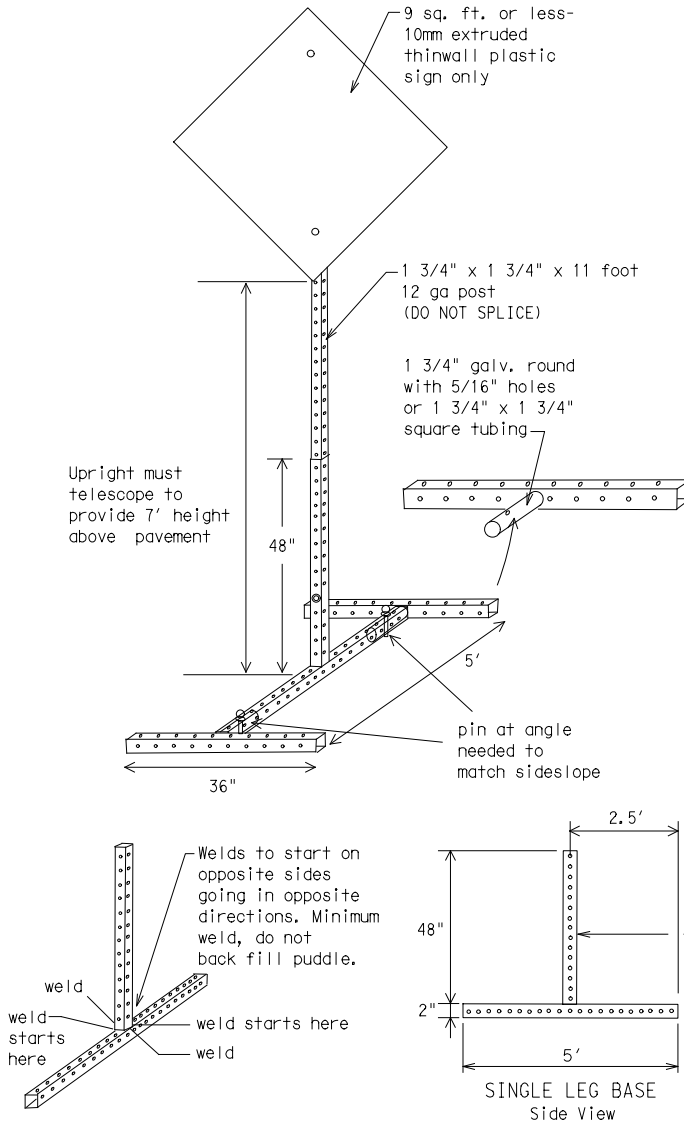
### SKID MOUNTED WOOD SIGN SUPPORTS

\* 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

- 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.
- No more than 2 sign posts shall be placed within a 7 ft. circle, except for specific materials noted on the CWZTCD List.
- 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

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	3510	04	055	SH 99
9-07 8-14	DIST	COUNTY	SHEET NO.	
7-13 5-21	HOU	FORT BEND	65	

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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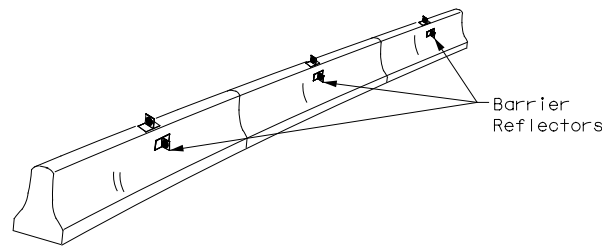
WORD OR PHRASE	ABBREVIATION	WORD OR PHRASE	ABBREVIATION
Access Road	ACCS RD	Major	MAJ
Alternate	ALT	Miles	MI
Avenue	AVE	Miles Per Hour	MPH
Best Route	BEST RTE	Minor	MNR
Boulevard	BLVD	Monday	MON
Bridge	BRDG	Normal	NORM
Canot	CANT	North	N
Center	CTR	Northbound	(route) N
Construction Ahead	CONST AHD	Parking	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

<h3>BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)</h3>			
<h2>BC (6) -21</h2>			
FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
© TxDOT November 2002	CONT: 3510	SECT: 04	JOB: 055
REVISIONS	3510	04	SH 99
9-07 8-14	DIST: HOU	COUNTY: FORT BEND	SHEET NO. 66
7-13 5-21			

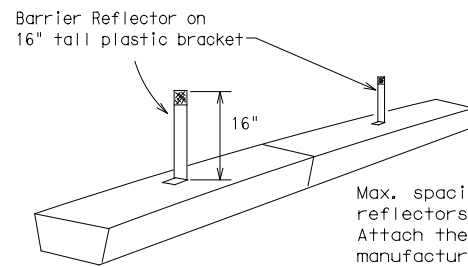
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- Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
- Color of Barrier Reflectors 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.

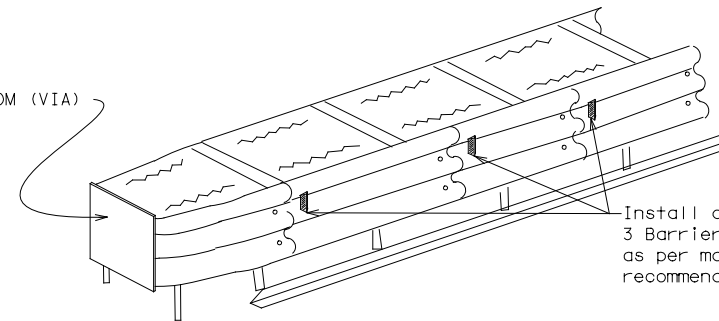


LOW PROFILE CONCRETE BARRIER (LPCB)

**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.



DELINEATION OF END TREATMENTS

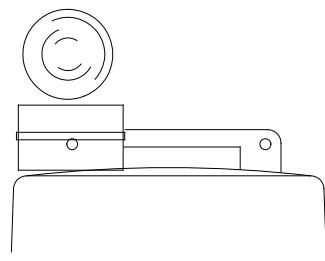
**END TREATMENTS FOR CTB'S USED IN WORK ZONES**

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**

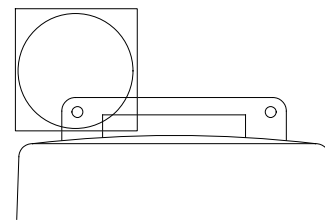
- Warning lights shall meet the requirements of the TMUTCD.
- Warning lights shall NOT be installed on barricades.
- Type A-Low Intensity Flashing Warning Lights are commonly used with drums. They are intended to warn of or mark a potentially hazardous area. Their use shall be as indicated on this sheet 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<sub>FL</sub> or C<sub>FL</sub> 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.



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

**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.



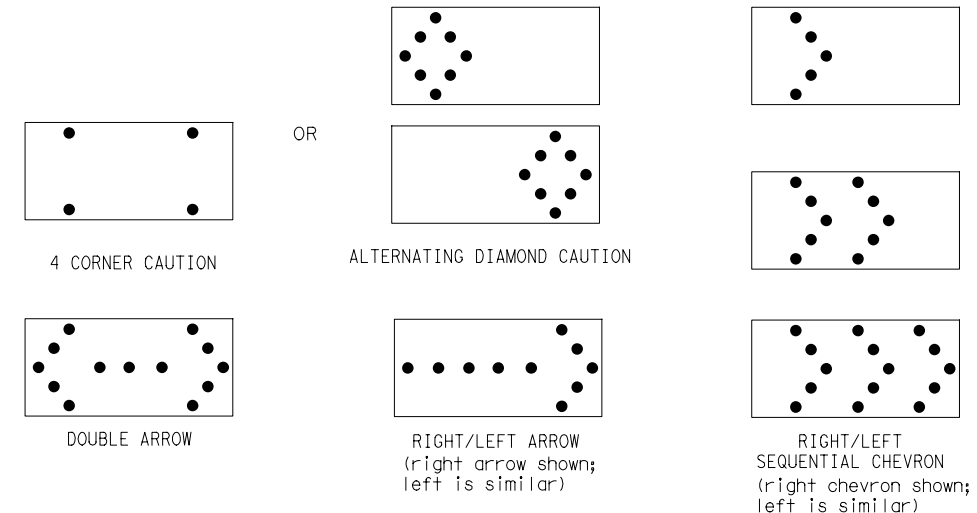
Warning reflector may be round or square. Must have a yellow reflective surface area of at least 30 square inches

**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.

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**

**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.

SHEET 7 OF 12



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

BC(7)-21

FILE:	bc-21.dgn	DN:	TxDOT	CK:	TxDOT	OW:	TxDOT	CK:	TxDOT
©TxDOT	November 2002	CONT	SECT	JOB	HIGHWAY				
REVISIONS		3510	04	055	SH 99				
9-07	8-14	DIST	COUNTY		SHEET NO.				
7-13	5-21	HOU	FORT BEND		67				

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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:

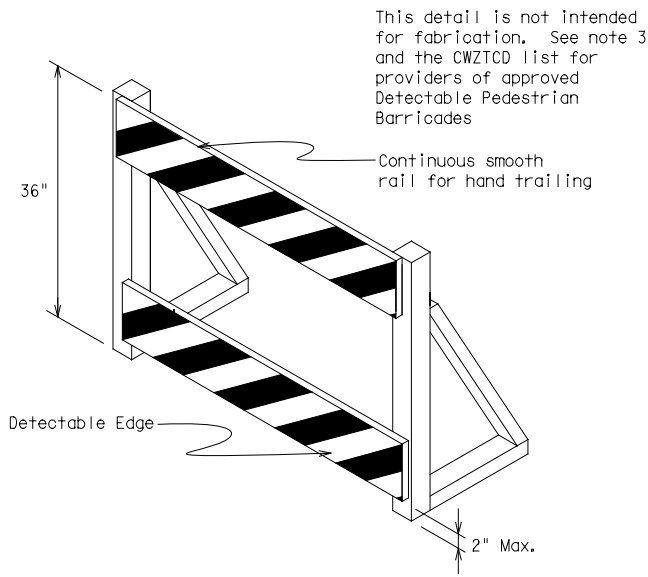
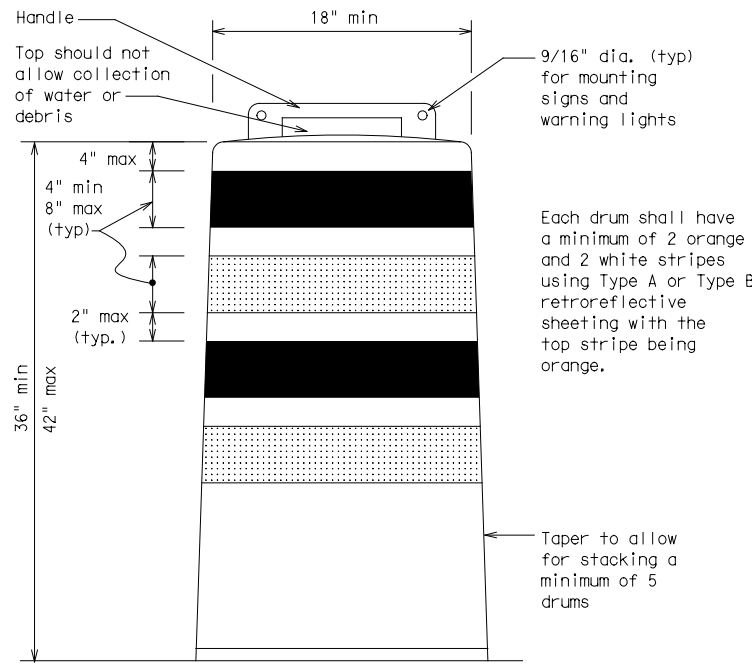
- Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
- The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

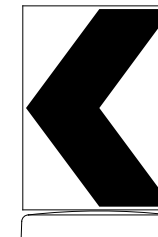
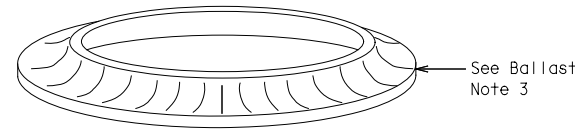
**BALLAST**

- 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.

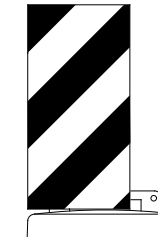


**DETECTABLE PEDESTRIAN BARRICADES**

- 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<sub>FL</sub> or Type C<sub>FL</sub> 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

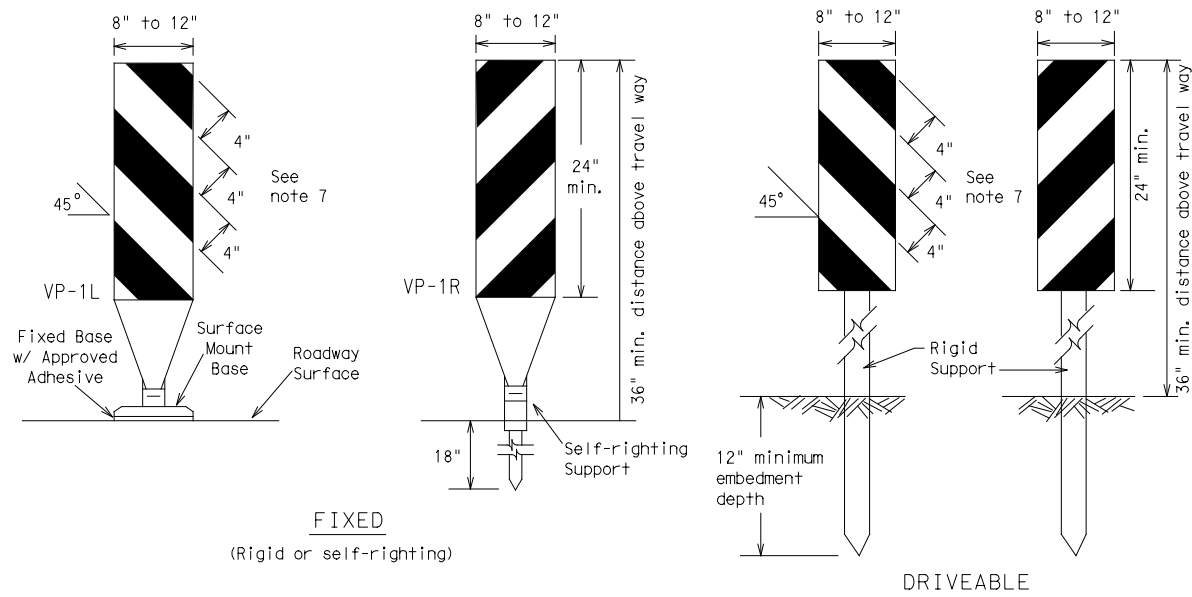


**BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES**

**BC(8)-21**

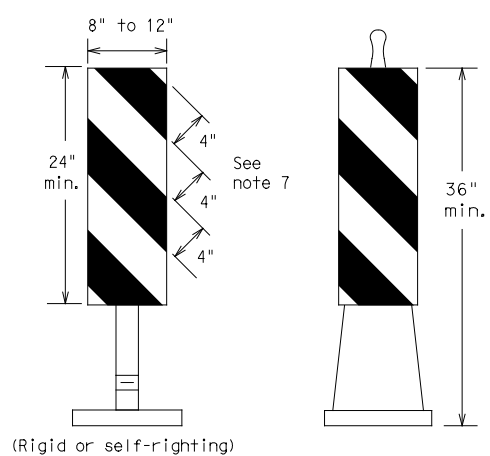
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**FIXED**  
(Rigid or self-righting)

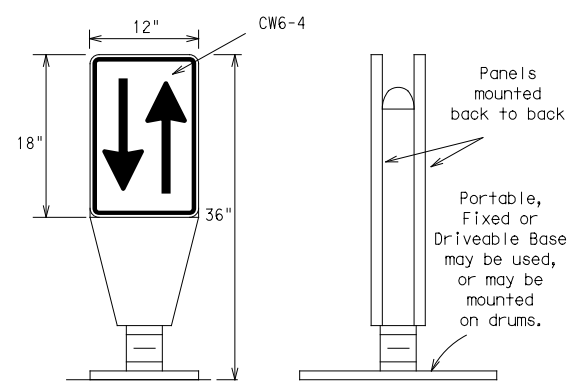
**DRIVEABLE**



**PORTABLE**

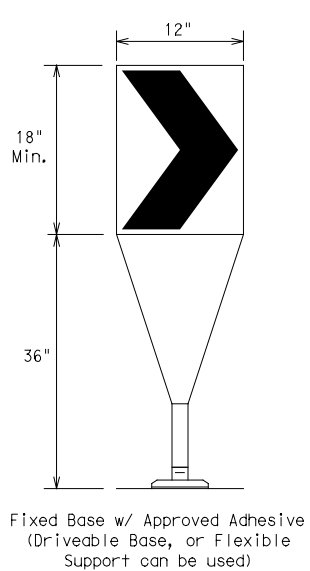
**VERTICAL PANELS (VPs)**

- 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.



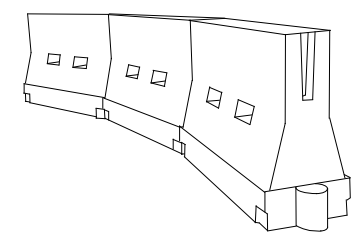
**OPPOSING TRAFFIC LANE DIVIDERS (OTLD)**

- 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<sub>FL</sub> or Type C<sub>FL</sub> 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<sub>FL</sub> or Type C<sub>FL</sub> 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 *X			Suggested Maximum Spacing of Channelizing Devices	
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent
30	L = WS <sup>2</sup> / 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'

\*X 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**



**BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES**

BC(9)-21

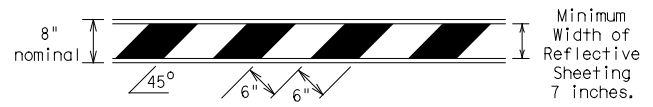
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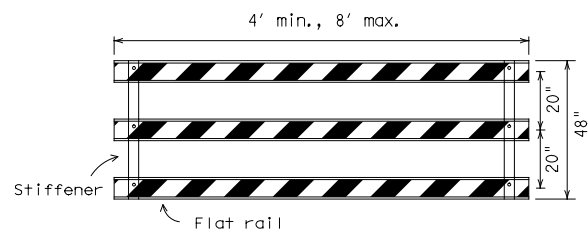
**TYPE 3 BARRICADES**

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.



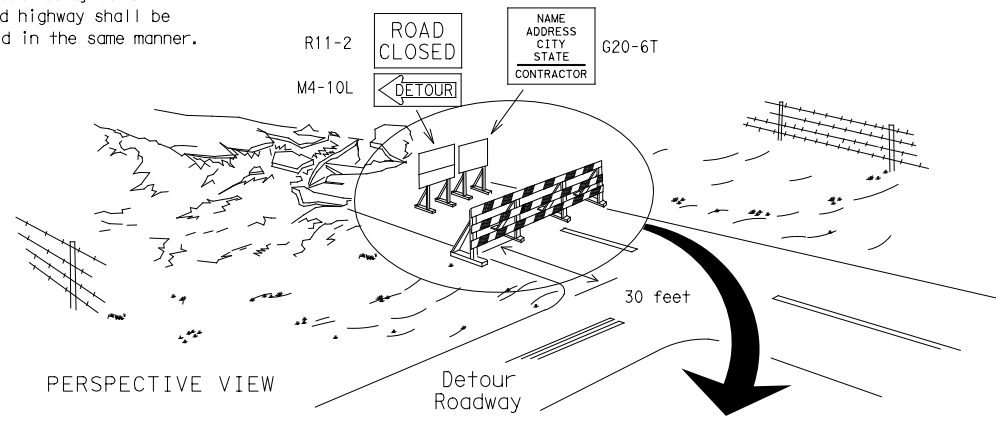
**TYPICAL STRIPING DETAIL FOR BARRICADE RAIL**



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

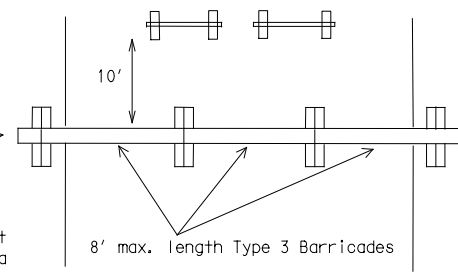
**TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES**

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



PERSPECTIVE VIEW

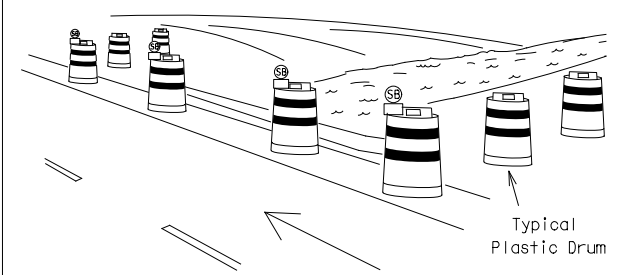
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic. Barricade striping should slant downward in the direction of detour.



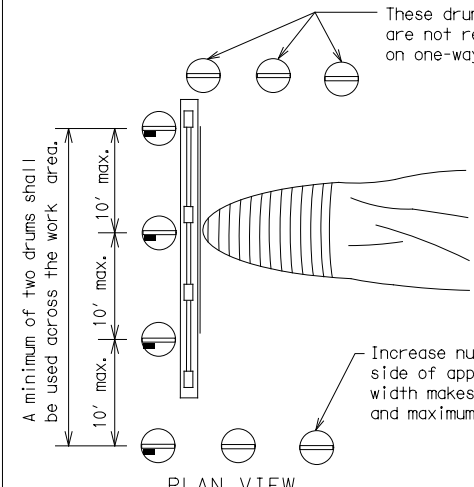
PLAN VIEW

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



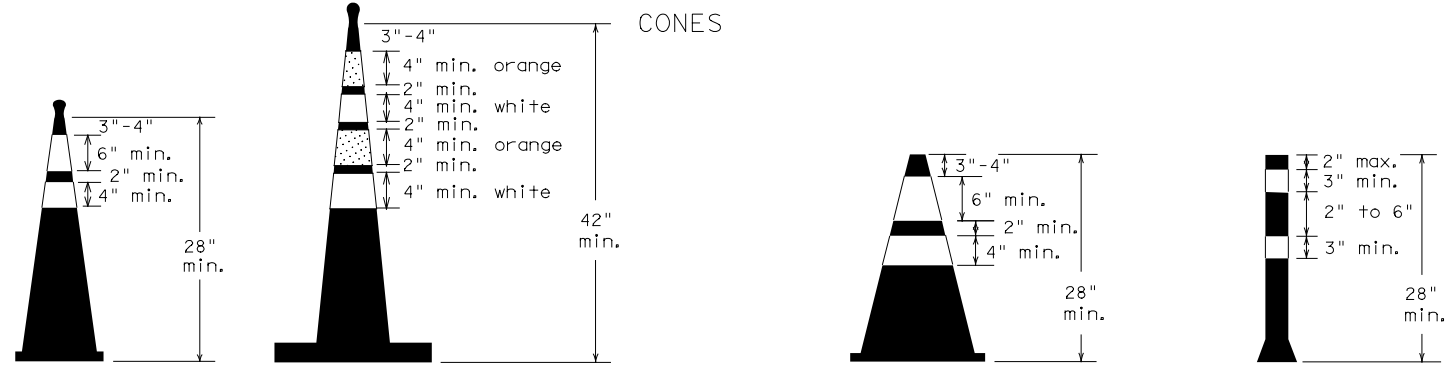
PLAN VIEW

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**



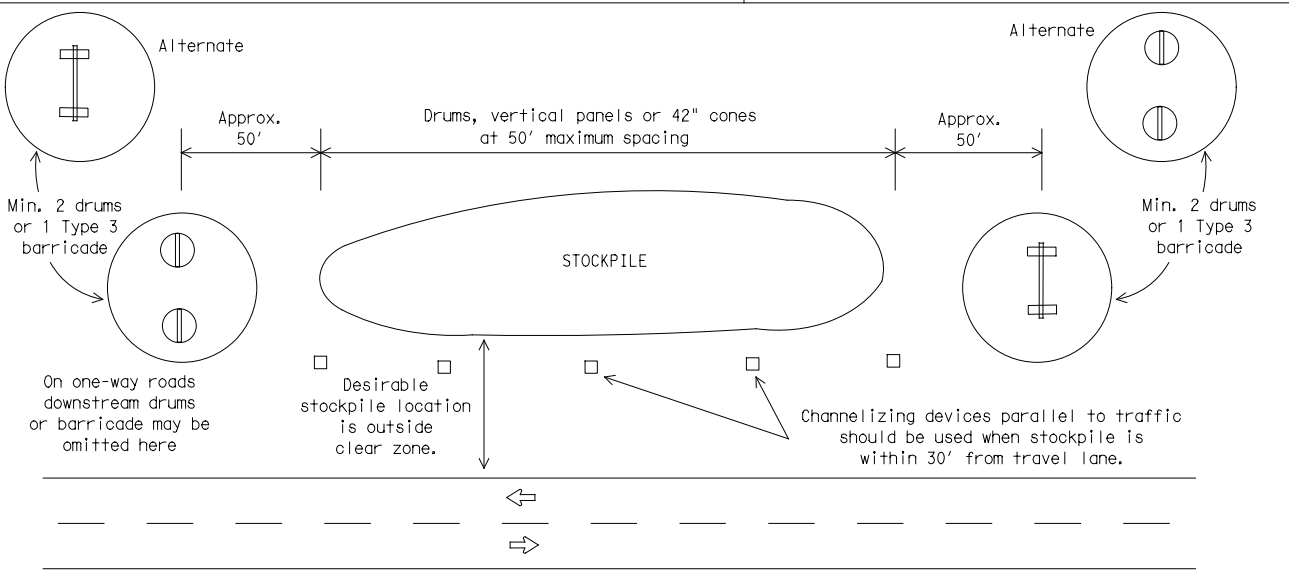
Two-Piece cones

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

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

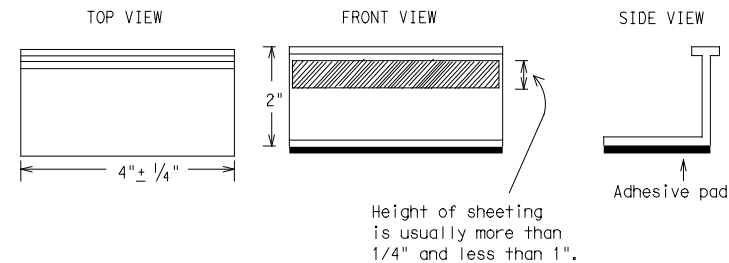
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

REMOVAL OF PAVEMENT MARKINGS

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

Temporary Flexible-Reflective Roadway Marker Tabs



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

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

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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

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DATE:  
FILE:

SHEET 11 OF 12



BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-21

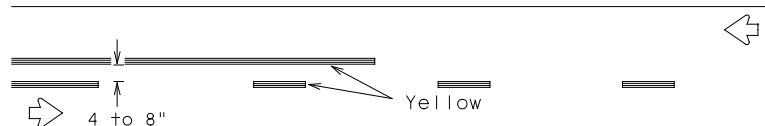
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©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	3510	04	055	SH 99
2-98 9-07 5-21	DIST	COUNTY	SHEET NO.	
1-02 7-13	HOU	FORT BEND	71	
11-02 8-14				



## PAVEMENT MARKING PATTERNS

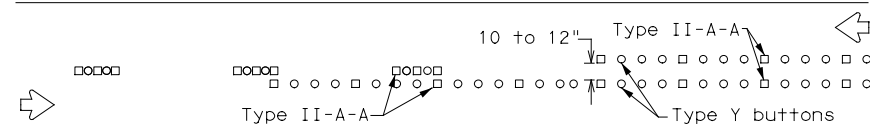


REFLECTORIZED PAVEMENT MARKINGS - PATTERN A

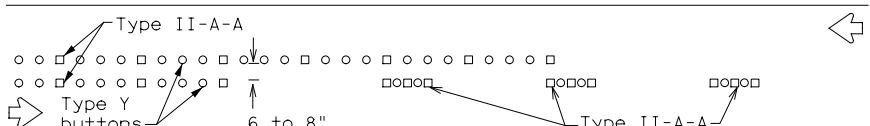


REFLECTORIZED PAVEMENT MARKINGS - PATTERN B

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.

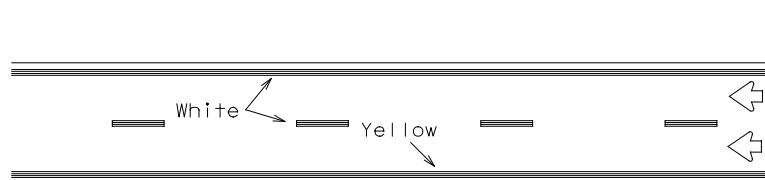


RAISED PAVEMENT MARKERS - PATTERN A



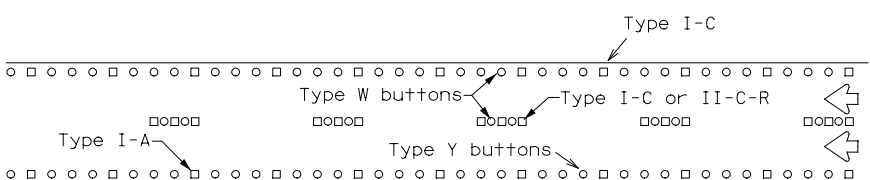
RAISED PAVEMENT MARKERS - PATTERN B

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



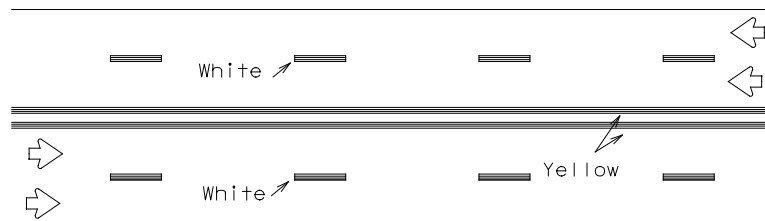
REFLECTORIZED PAVEMENT MARKINGS

Prefabricated markings may be substituted for reflectorized pavement markings.



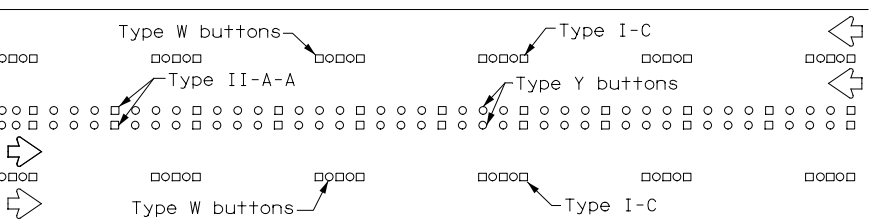
RAISED PAVEMENT MARKERS

## EDGE & LANE LINES FOR DIVIDED HIGHWAY



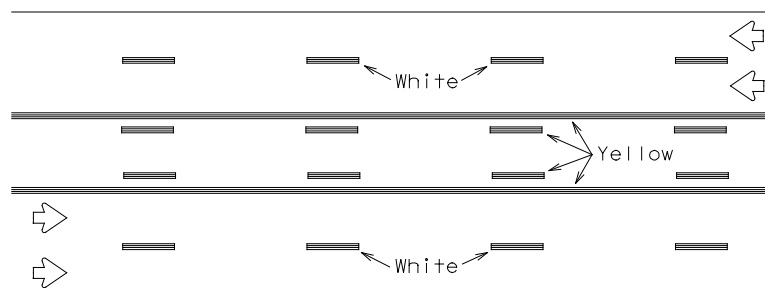
REFLECTORIZED PAVEMENT MARKINGS

Prefabricated markings may be substituted for reflectorized pavement markings.



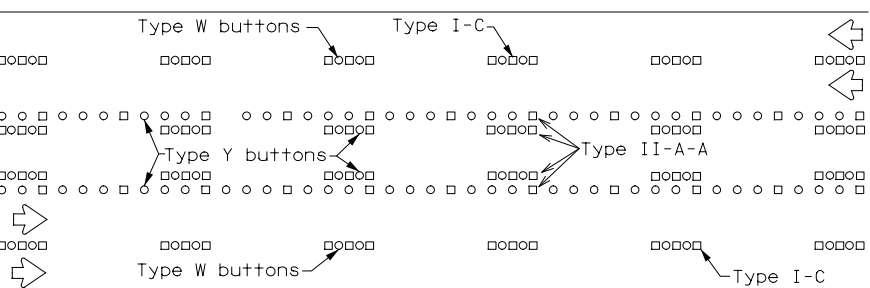
RAISED PAVEMENT MARKERS

## LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS

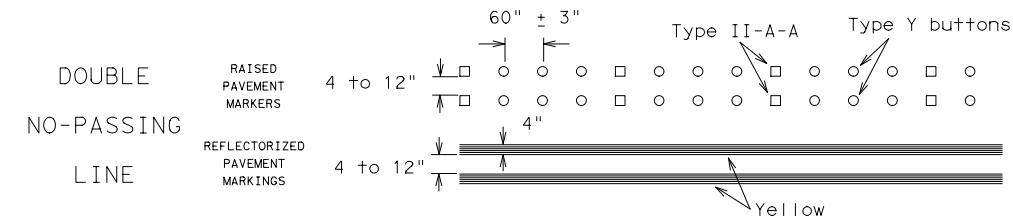
Prefabricated markings may be substituted for reflectorized pavement markings.



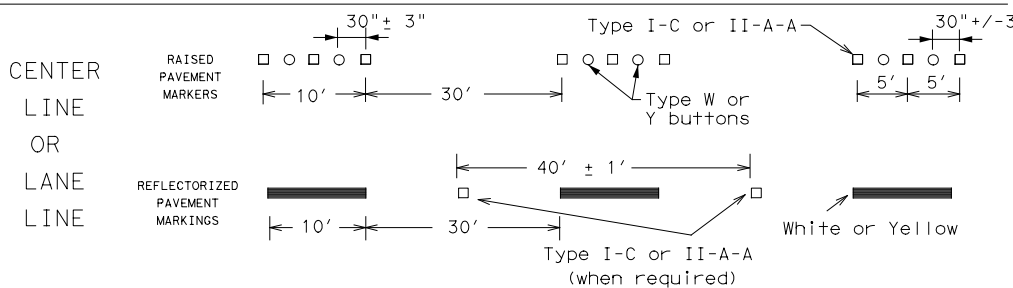
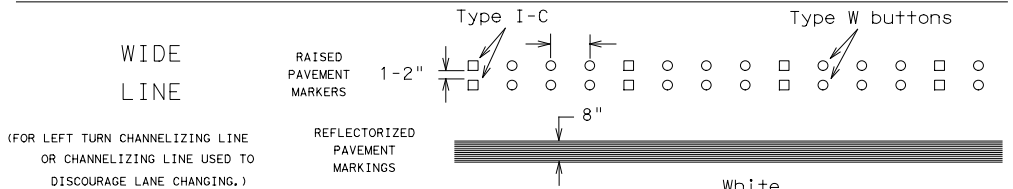
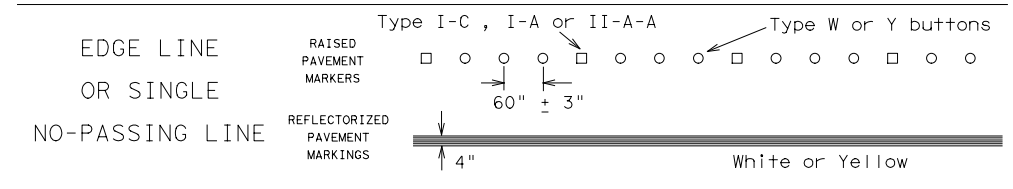
RAISED PAVEMENT MARKERS

## TWO-WAY LEFT TURN LANE

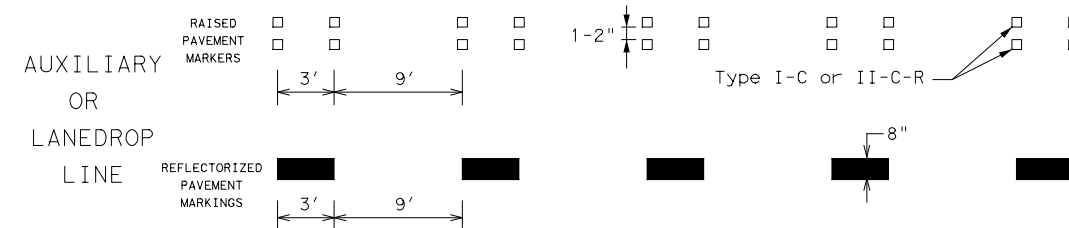
## STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS



### SOLID LINES

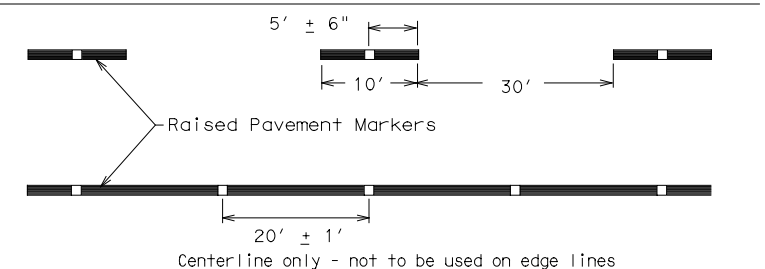


### BROKEN LINES



### 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

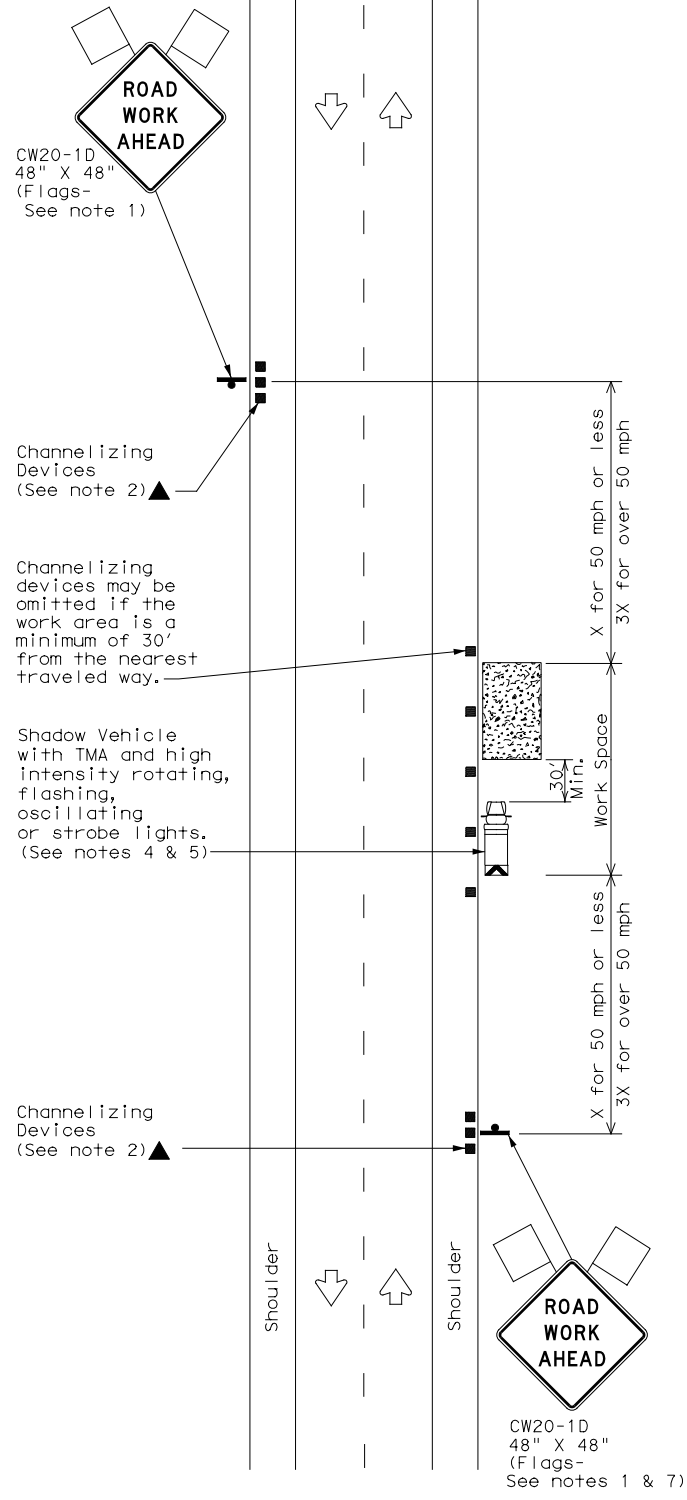
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©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	3510	04	055	SH 99
1-97 9-07 5-21	DIST	COUNTY	SHEET NO.	
2-98 7-13	HOU	FORT BEND	72	
11-02 8-14				

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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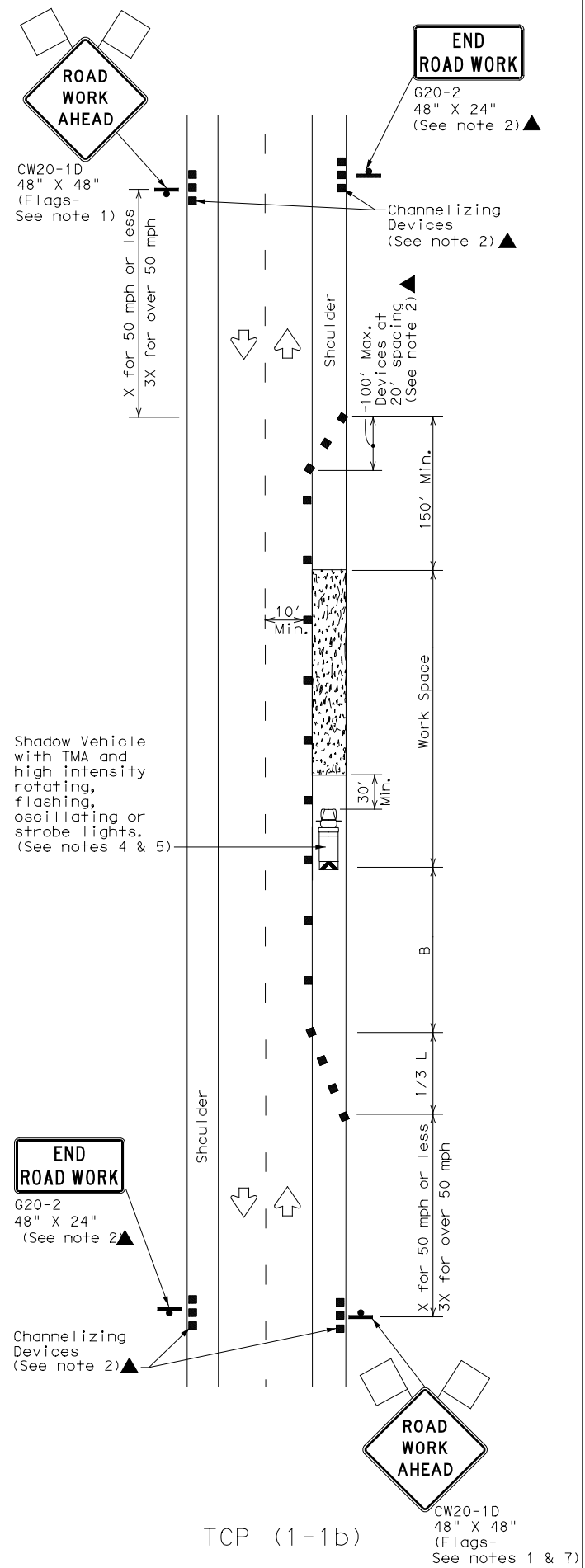
DATE:  
FILE:

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.



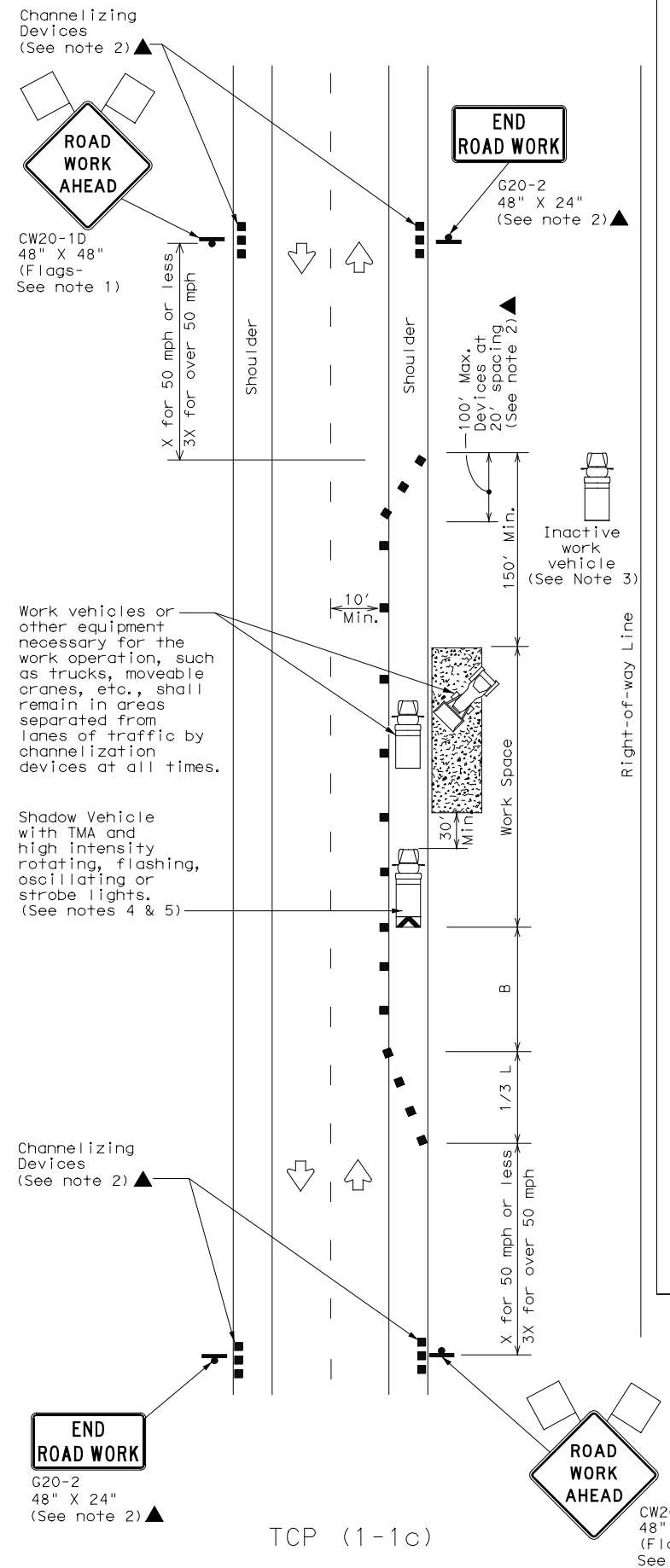
TCP (1-1a)

WORK SPACE NEAR SHOULDER  
Conventional Roads



TCP (1-1b)

WORK SPACE ON SHOULDER  
Conventional Roads



TCP (1-1c)

WORK VEHICLES ON SHOULDER  
Conventional Roads

LEGEND

	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.
  - Inactive work vehicles or other equipment should be parked near the right-of-way line and not parked on the paved shoulder.
  - 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 wider work spaces.
  - See TCP(5-1) for shoulder work on divided highways, expressways and freeways.
  - 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

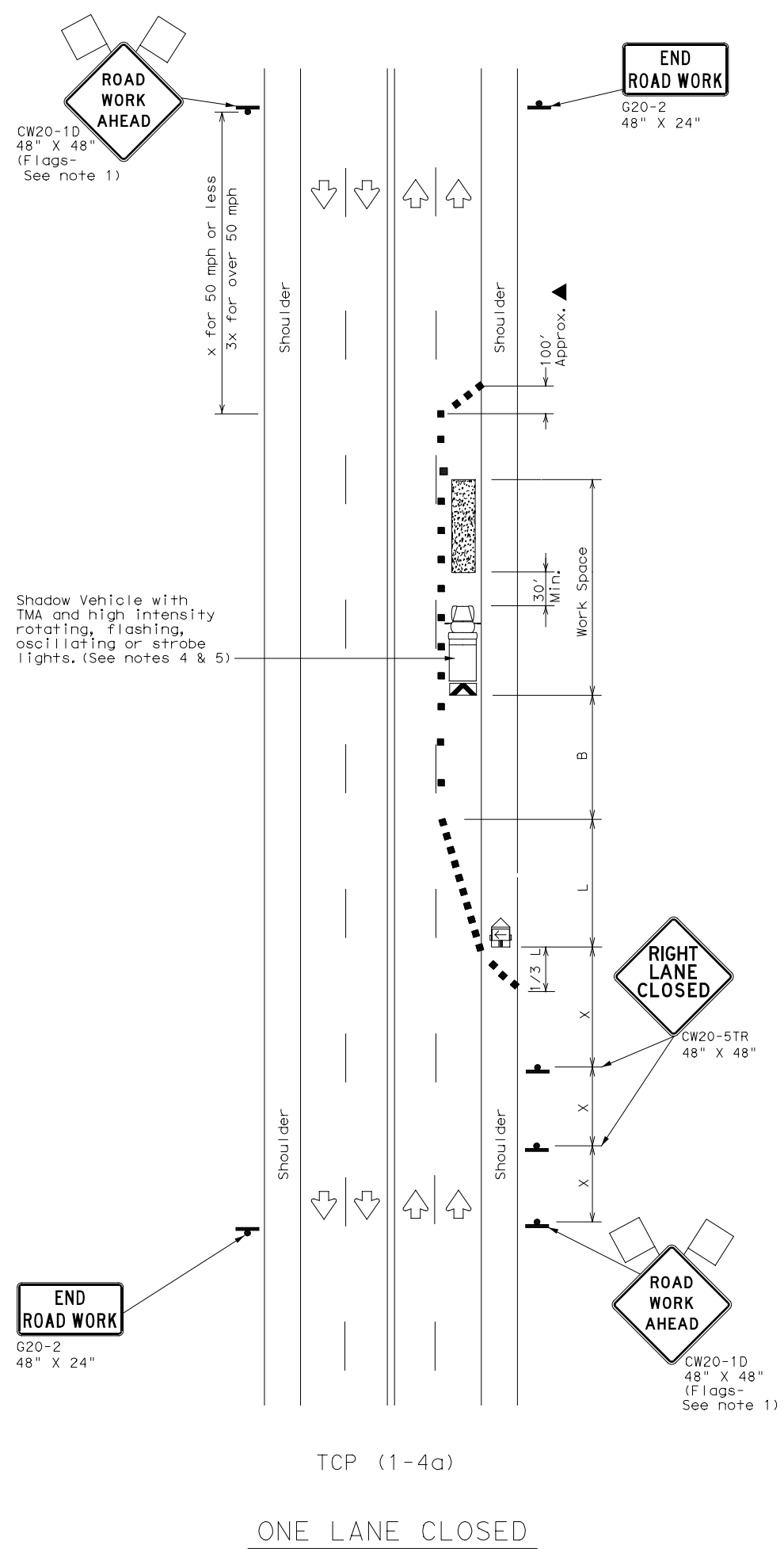
TCP (1-1)-18

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© TxDOT December 1985	CON:	SECT:	JOB:	HIGHWAY:
REVISIONS	3510	04	055	SH 99
2-94 4-98	DIST:	COUNTY:	SHEET NO.:	
8-95 2-12	HOU	FORT BEND	73	
1-97 2-18				

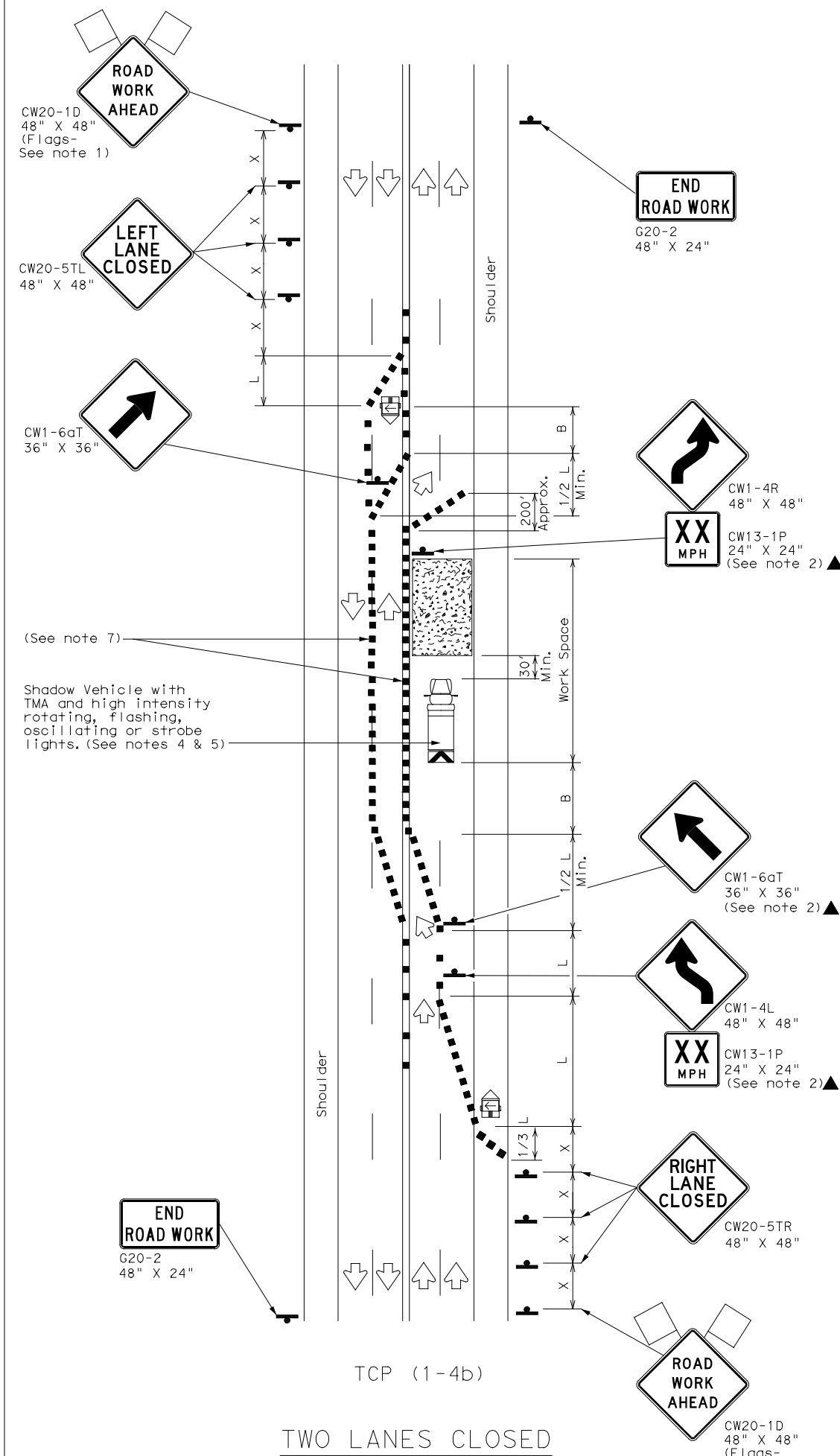
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DATE: FILE:



TCP (1-4a)  
ONE LANE CLOSED



TCP (1-4b)  
TWO LANES CLOSED

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.
  - The CW20-1D "ROAD WORK AHEAD" sign may be repeated if the visibility of the work zone is less than 1500 feet.
  - 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 wider work spaces.
- TCP (1-4a)
- If this TCP is used for a left lane closure, CW20-5TL "LEFT LANE CLOSED" signs shall be used and channelizing devices shall be placed on the centerline where needed to protect the work space from opposing traffic with the arrow panel placed in the closed lane near the end of the merging taper.
- TCP (1-4b)
- Where traffic is directed over a yellow centerline, channelizing devices which separate two-way traffic should be spaced on tapers at 20' or 15' if posted speeds are 35 mph or slower, and for tangent sections, at 1/2S where S is the speed in mph. This tighter device spacing is intended for the areas of conflicting markings, not the entire work zone.

**Texas Department of Transportation**

*Traffic Operations Division Standard*

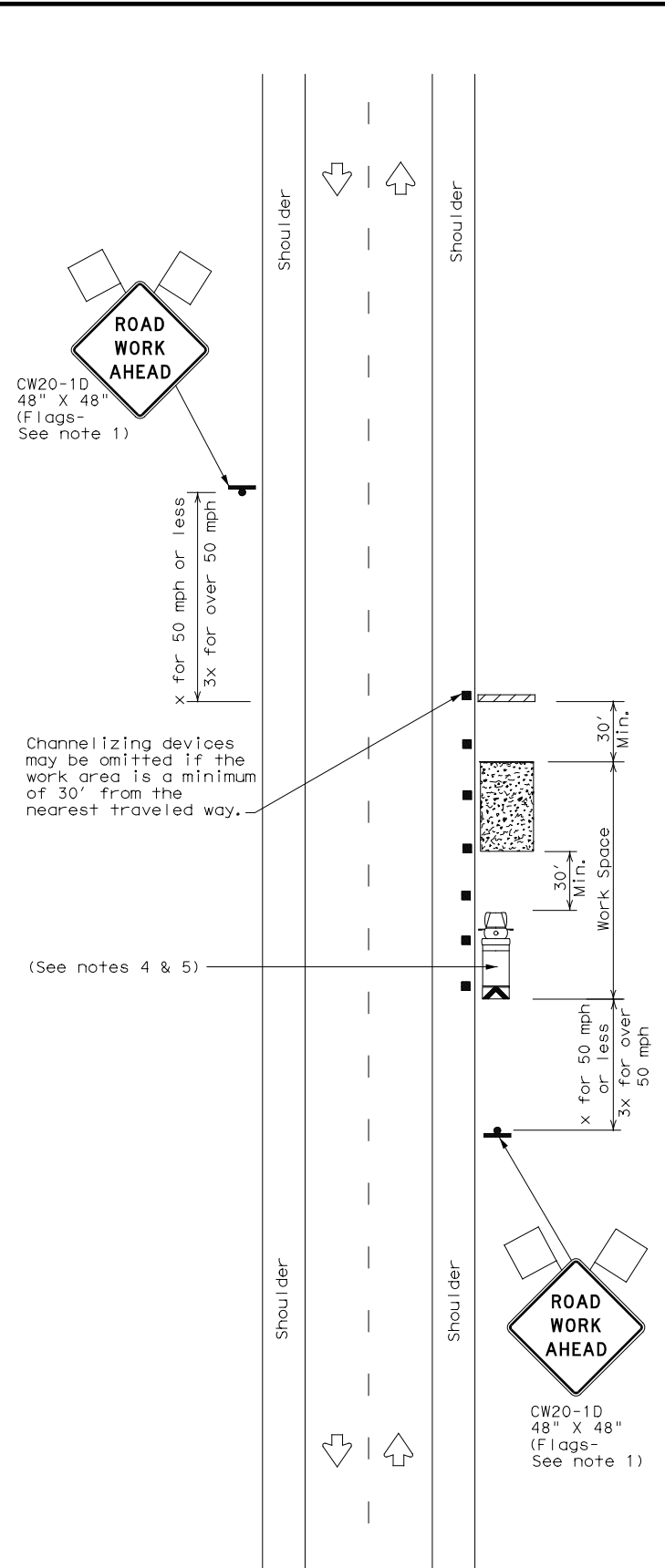
## TRAFFIC CONTROL PLAN LANE CLOSURES ON MULTILANE CONVENTIONAL ROADS

### TCP (1-4) - 18

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© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	3510	04	055	SH 99
2-94 4-98	DIST	COUNTY	SHEET NO.	
8-95 2-12	HOU	FORT BEND	74	
1-97 2-18				

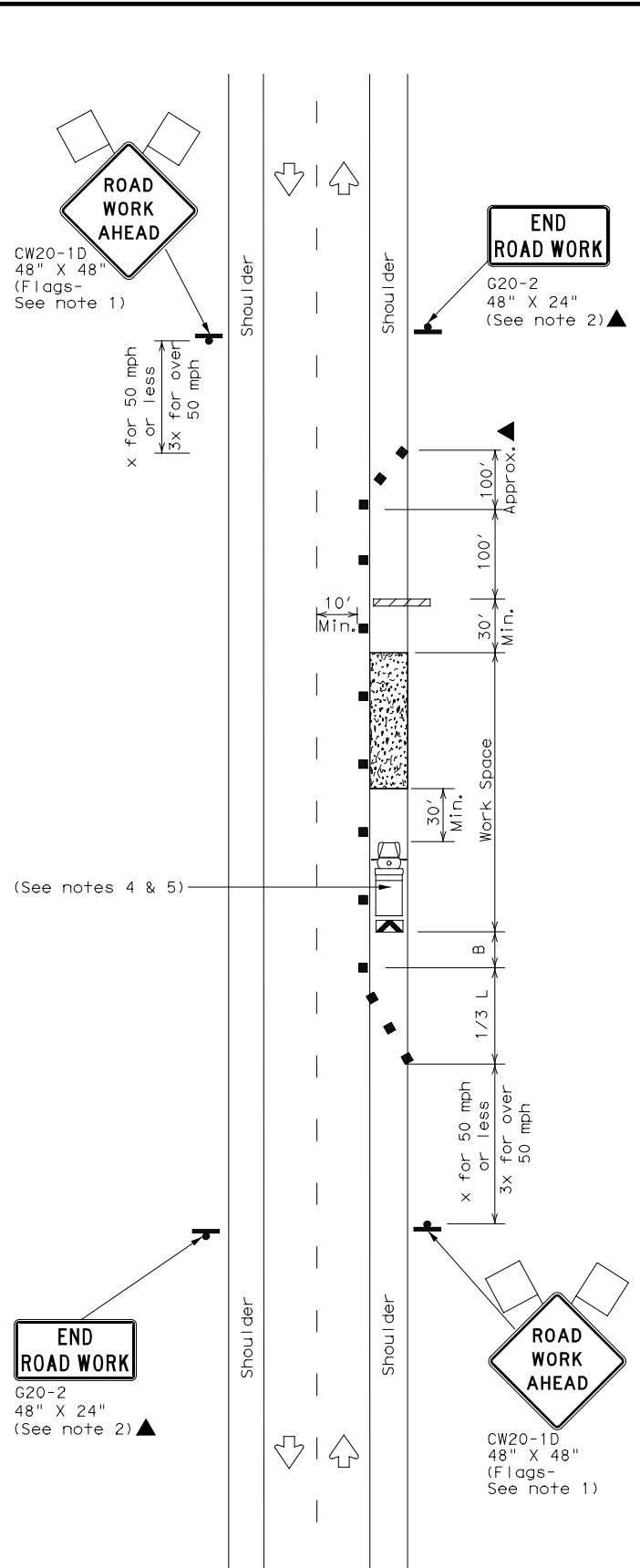
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DATE:  
FILE:



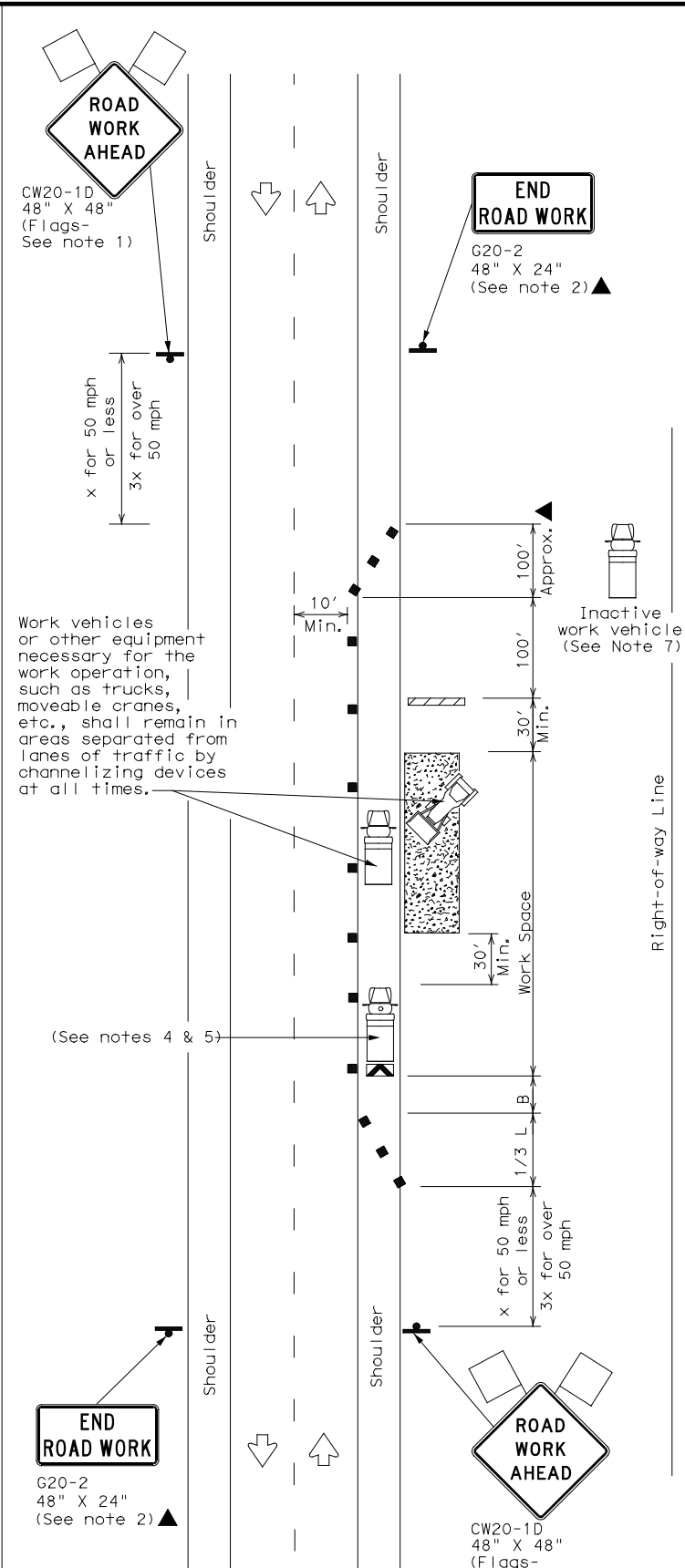
TCP (2-1a)

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.



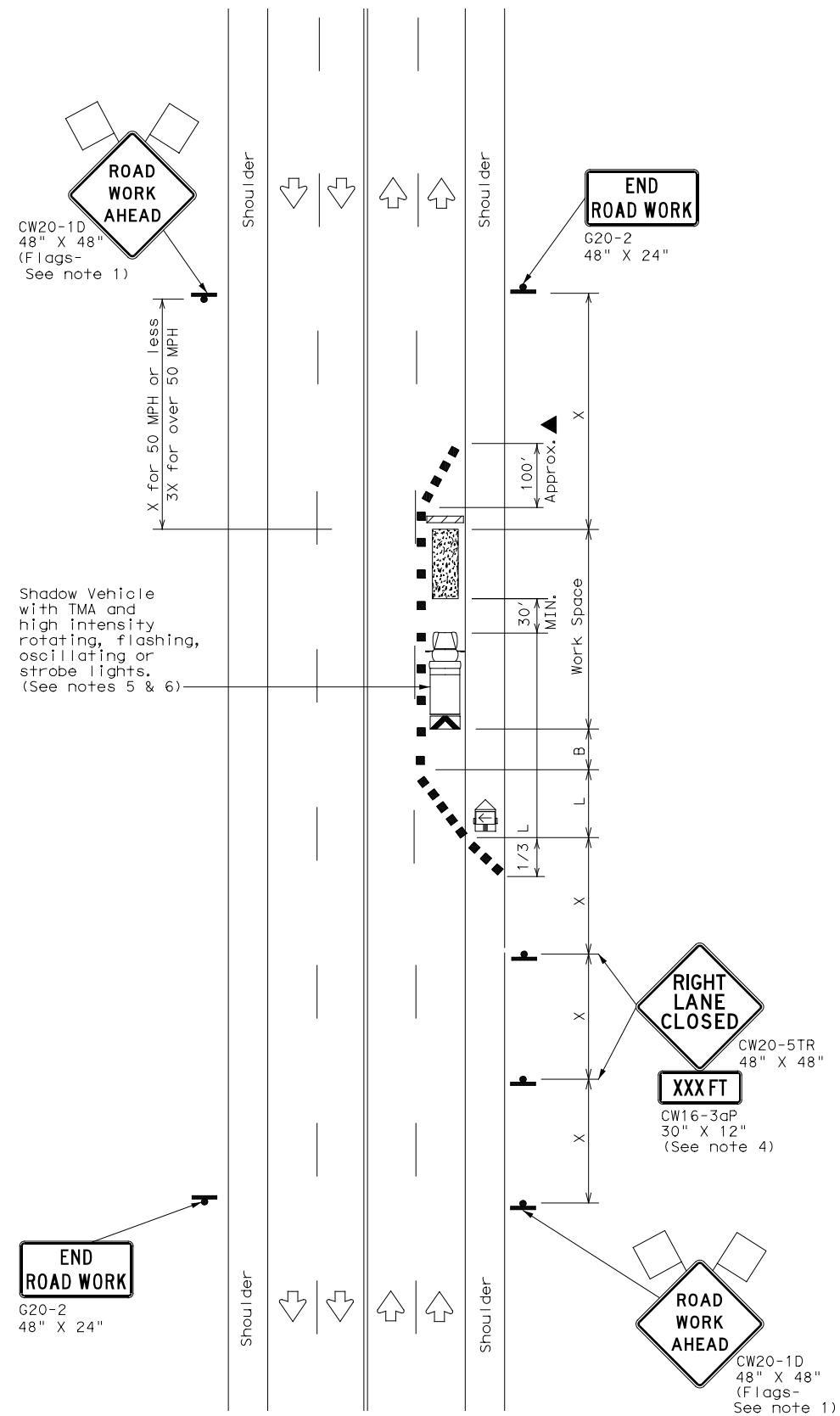
TRAFFIC CONTROL PLAN  
CONVENTIONAL ROAD  
SHOULDER WORK

TCP (2-1) - 18

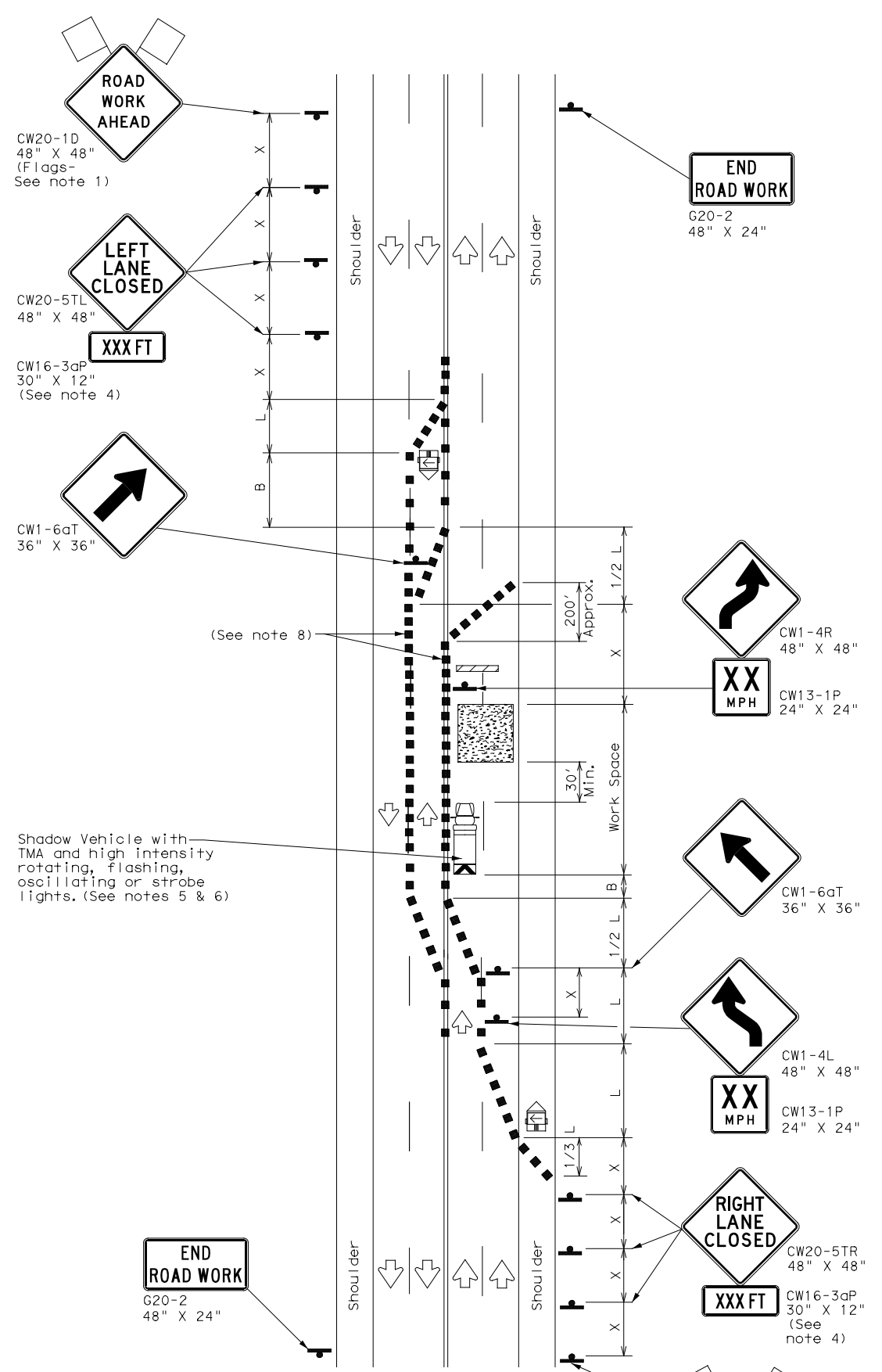
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© TxDOT December 1985	CON:	SECT:	JOB:	HIGHWAY:
REVISIONS	3510	04	055	SH 99
2-94 4-98	DIST:	COUNTY:	SHEET NO.:	
8-95 2-12	HOU	FORT BEND	75	
1-97 2-18				

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DATE: FILE:



TCP (2-4a)  
ONE LANE CLOSED



TCP (2-4b)  
TWO LANES CLOSED

LEGEND

	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board		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 = WS <sup>2</sup> / 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.
  - The downstream taper is optional. When used, it should be 100 feet minimum length per lane.
  - For short term applications, when post mounted signs are not used, the distance legend may be shown on the sign face rather than on a CW16-3aP supplemental plaque.
  - 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.
- TCP (2-4a)
- If this TCP is used for a left lane closure, CW20-5TL "LEFT LANE CLOSED" signs shall be used and channelizing devices shall be placed on the centerline to protect the work space from opposing traffic with the arrow board placed in the closed lane near the end of the merging taper.
- TCP (2-4b)
- For shorter durations where traffic is directed over a yellow centerline, channelizing devices which separate two-way traffic should be spaced on tapers at 20' or 15' if posted speeds are 35 mph or slower, and for tangent sections, at 1/2(S) where S is the speed in mph. This tighter devices spacing is intended for the area of conflicting markings, not the entire work zone.



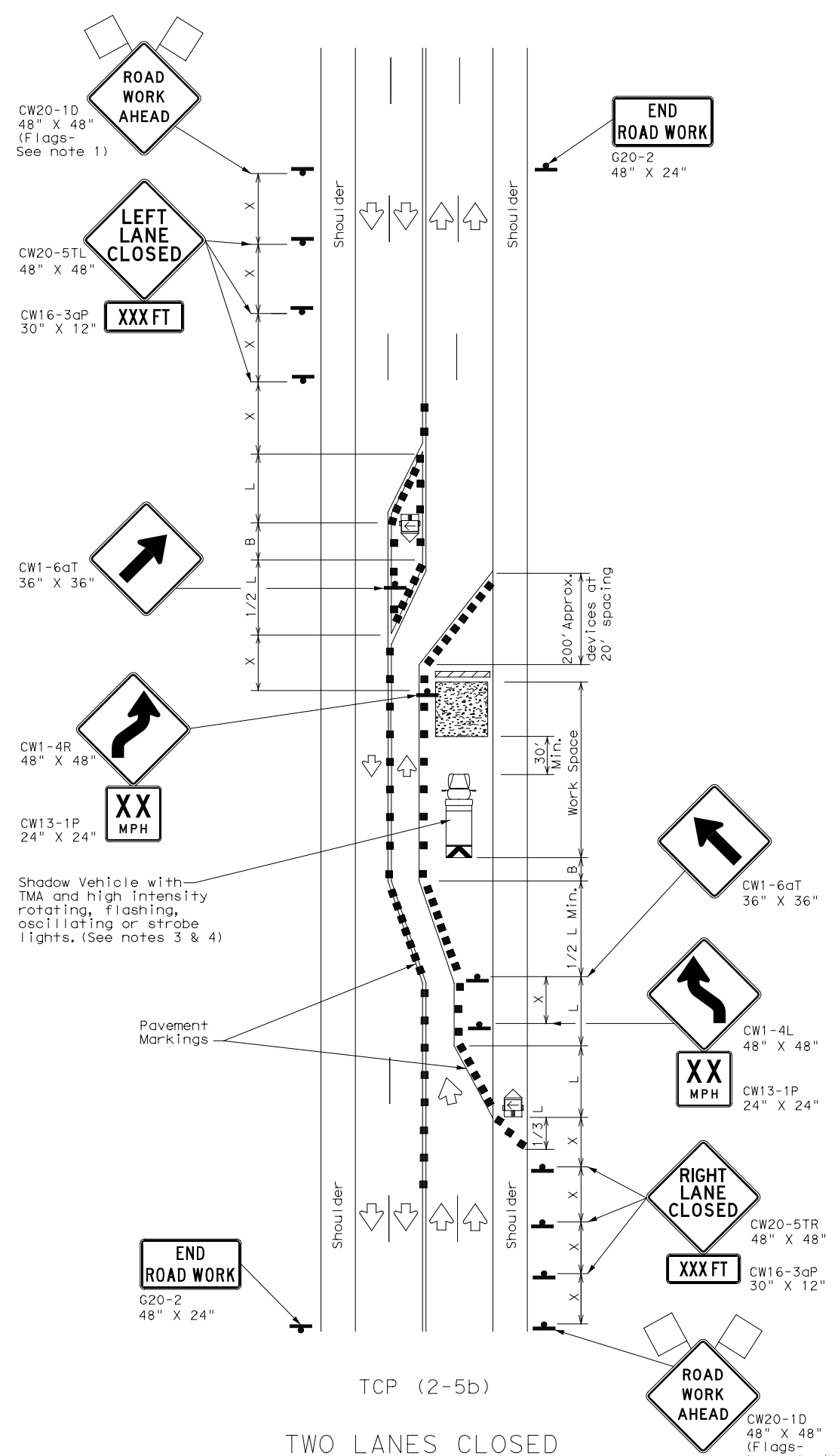
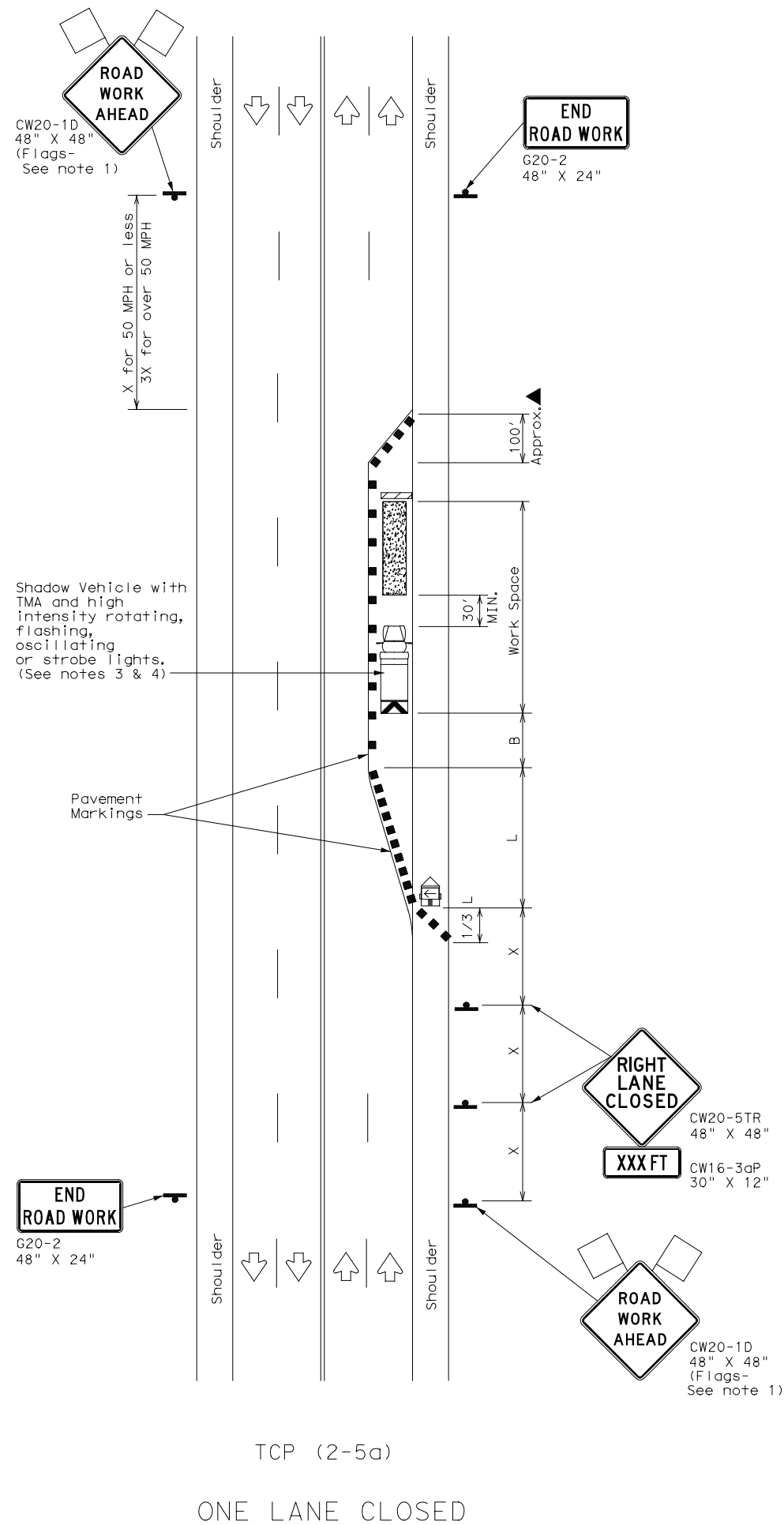
TRAFFIC CONTROL PLAN  
 LANE CLOSURES ON MULTILANE  
 CONVENTIONAL ROADS

TCP (2-4) - 18

FILE: tcp2-4-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	3510	04	055	SH 99
8-95 3-03	DIST	COUNTY	SHEET NO.	
1-97 2-12	HOU	FORT BEND	76	
4-98 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 X X			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.
  - 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.
  - The downstream taper is optional. When used, it should be 100 feet approximately per lane, with channelizing devices spaced at 20 feet.
- TCP (2-5a)**
- If this TCP is used for a left lane closure, CW20-5TL "LEFT LANE CLOSED" signs shall be used and channelizing devices shall be placed on the centerline to protect the work space from opposing traffic, with the arrow board placed in the closed lane near the end of the merging taper.
- TCP (2-5b)**
- Conflicting pavement markings shall be removed for long-term projects.

**Texas Department of Transportation**  
Traffic Operations Division Standard

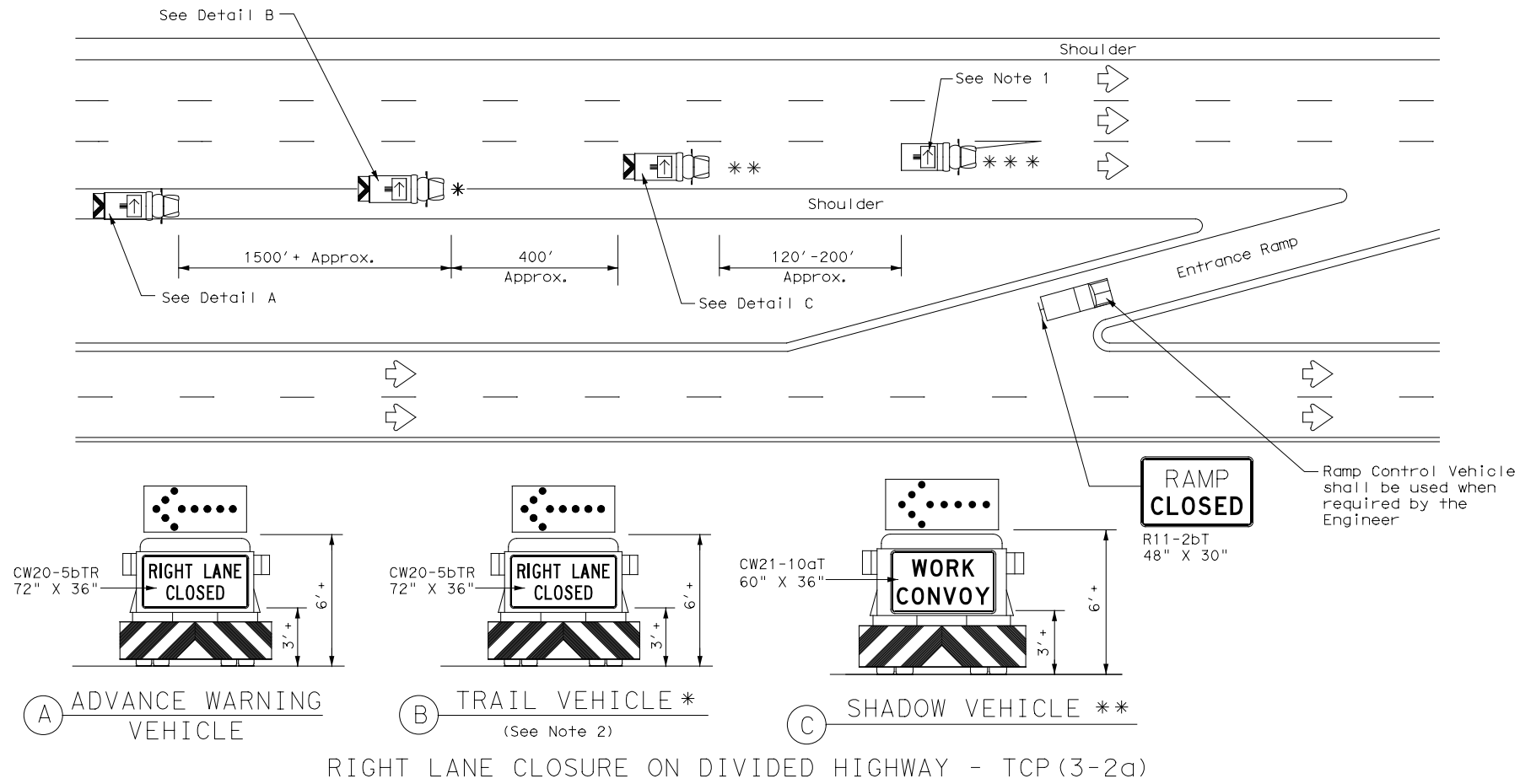
**TRAFFIC CONTROL PLAN  
LONG TERM LANE CLOSURES  
MULTILANE CONVENTIONAL RDS.**

**TCP (2-5) - 18**

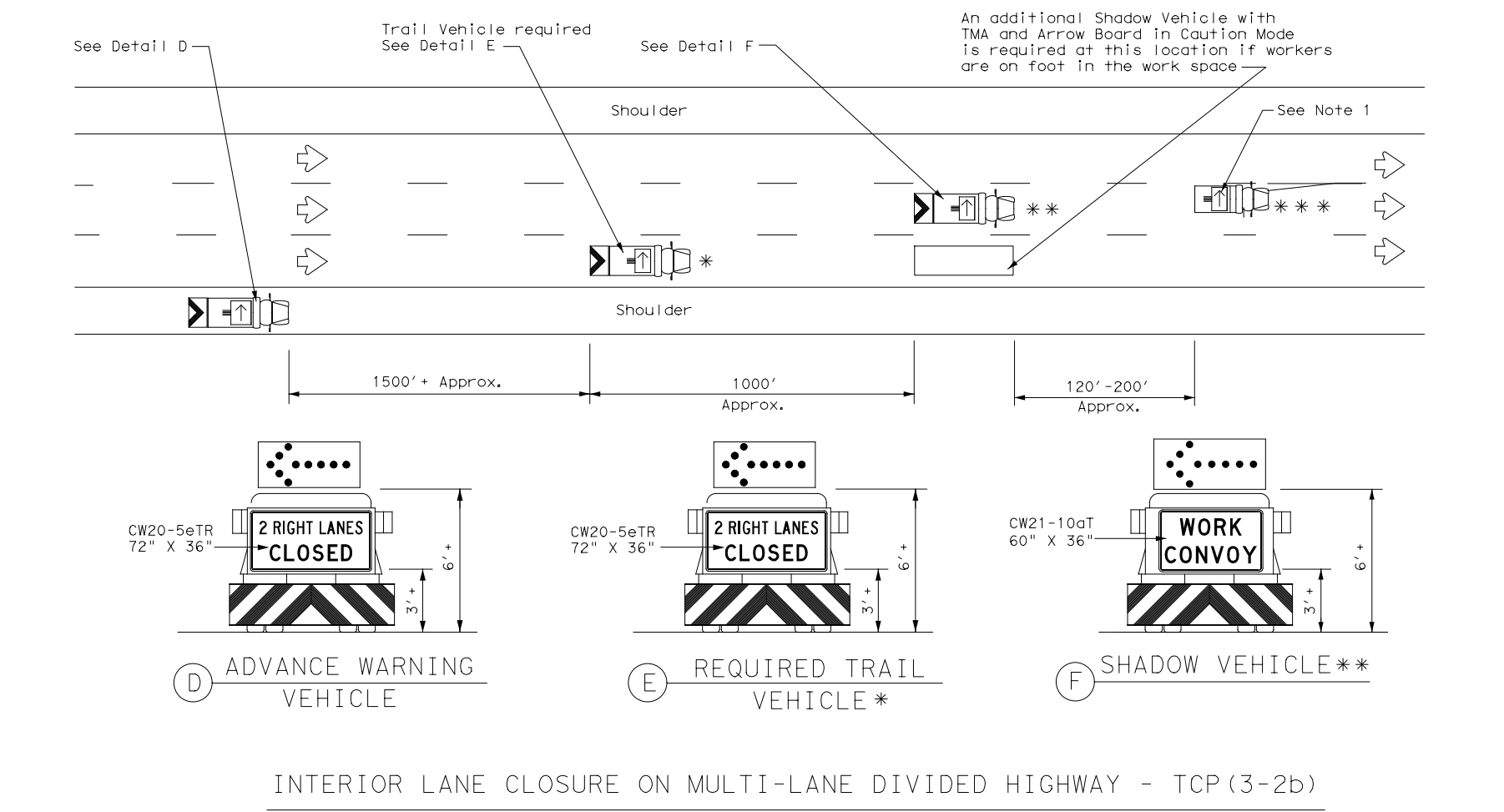
FILE: tcp2-5-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
8-95 2-12	3510	04	055	SH 99
1-97 3-03	DIST	COUNTY	SHEET NO.	
4-98 2-18	HOU	FORT BEND	77	

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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)

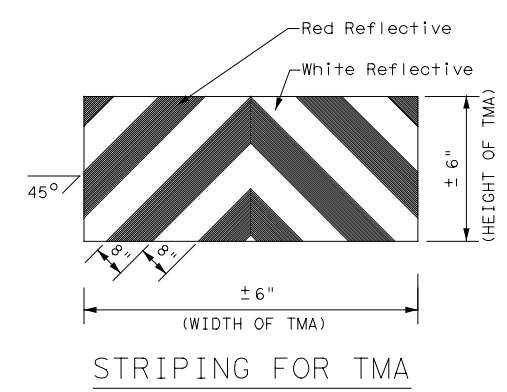
LEGEND				
*	Trail Vehicle	ARROW BOARD DISPLAY		
**	Shadow Vehicle			
***	Work Vehicle	→	RIGHT Directional	
↔	Heavy Work Vehicle	←	LEFT Directional	
↔	Truck Mounted Attenuator (TMA)	↔	Double Arrow	
⊠	Traffic Flow	⊠	CAUTION (Alternating Diamond or 4 Corner Flash)	

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.

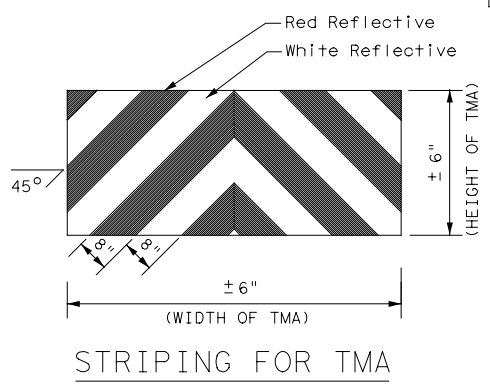
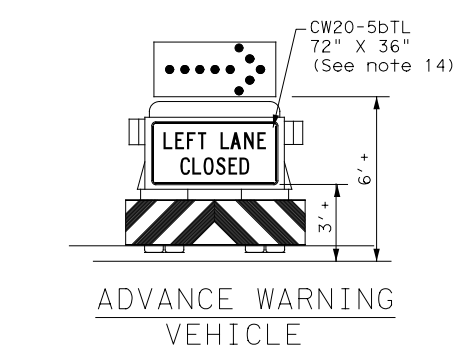
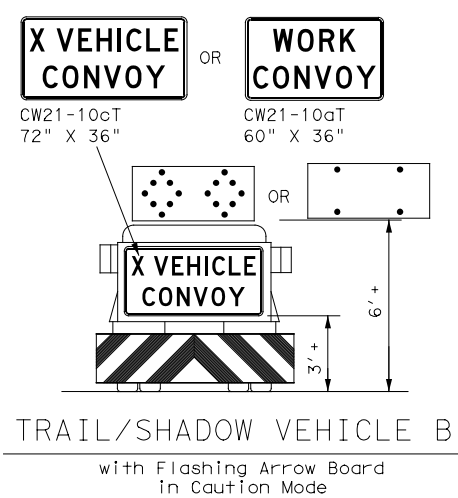
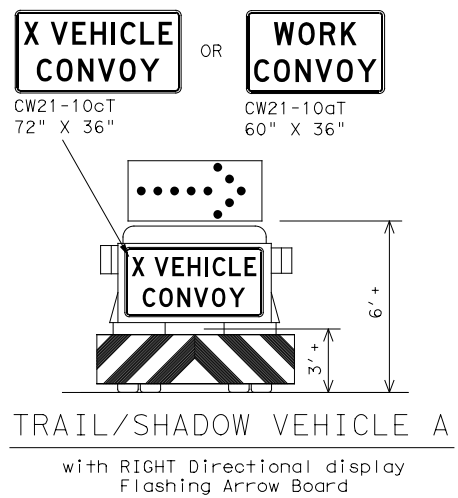
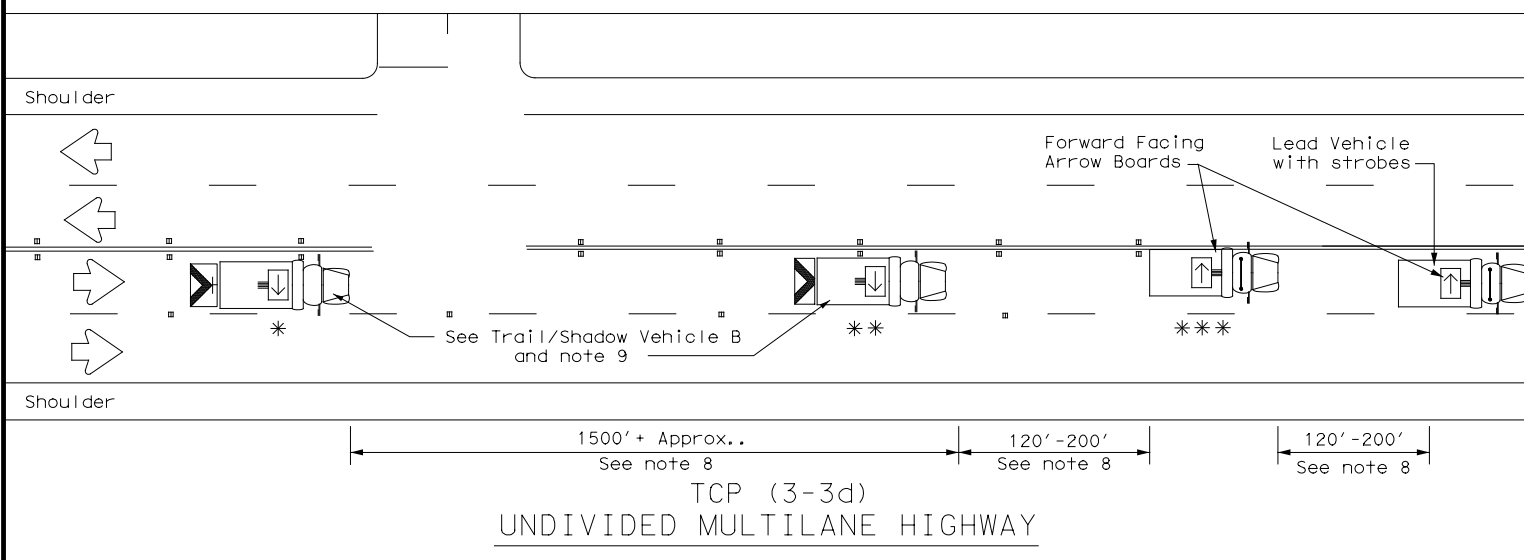
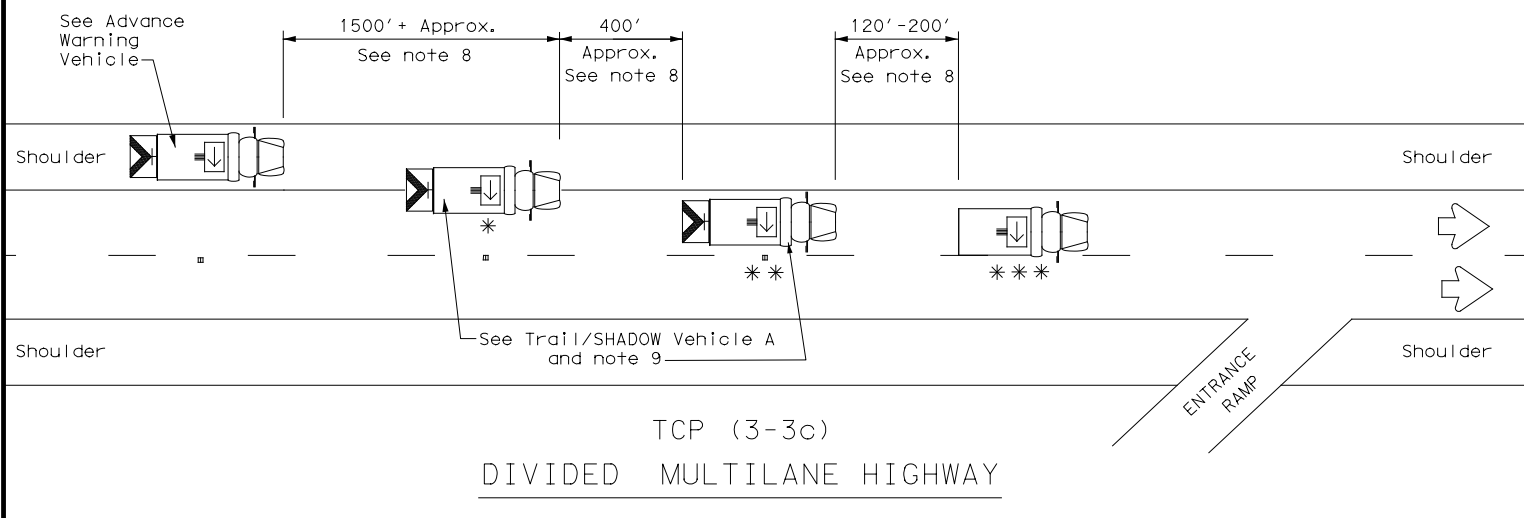
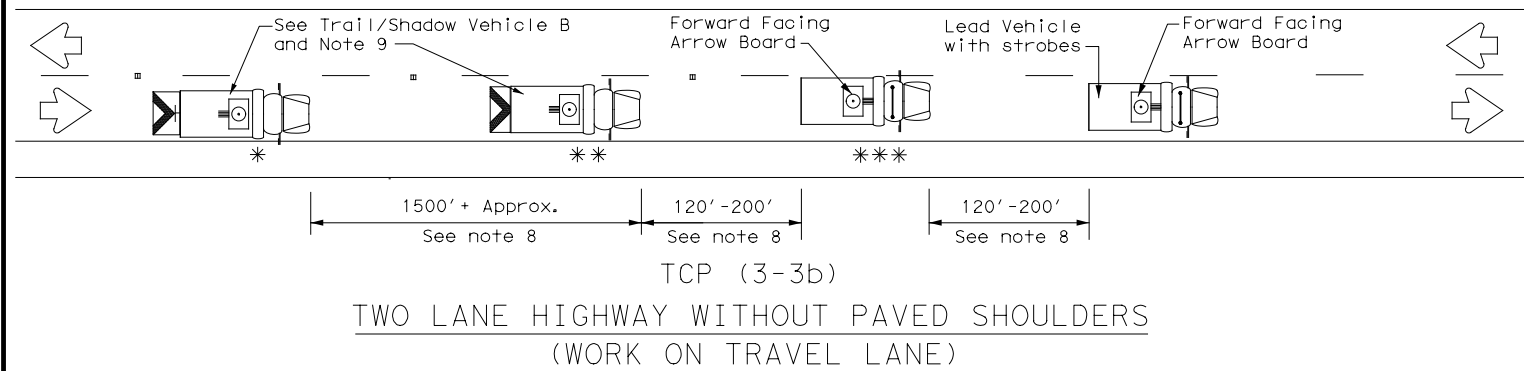
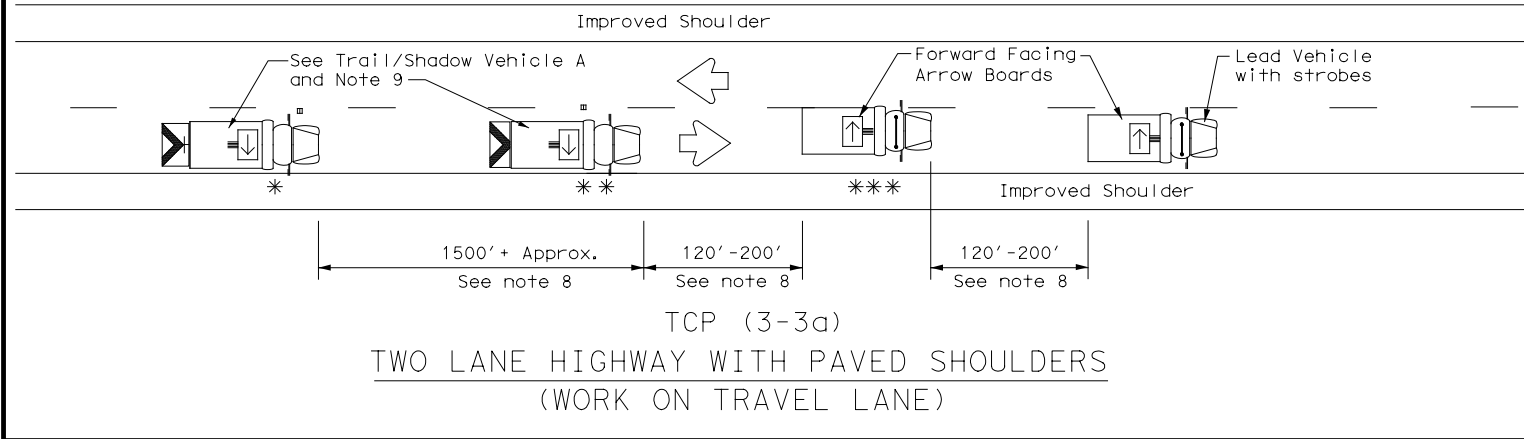


STRIPING FOR TMA

		<b>Traffic Operations Division Standard</b>	
<b>TRAFFIC CONTROL PLAN MOBILE OPERATIONS DIVIDED HIGHWAYS</b>			
<b>TCP(3-2)-13</b>			
FILE: tcp3-2.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
© TxDOT December 1985	CONT	SECT	JOB
REVISIONS	3510	04	055
2-94 4-98			
8-95 7-13			
1-97			
	DIST	COUNTY	SHEET NO.
	HOU	FORT BEND	78

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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

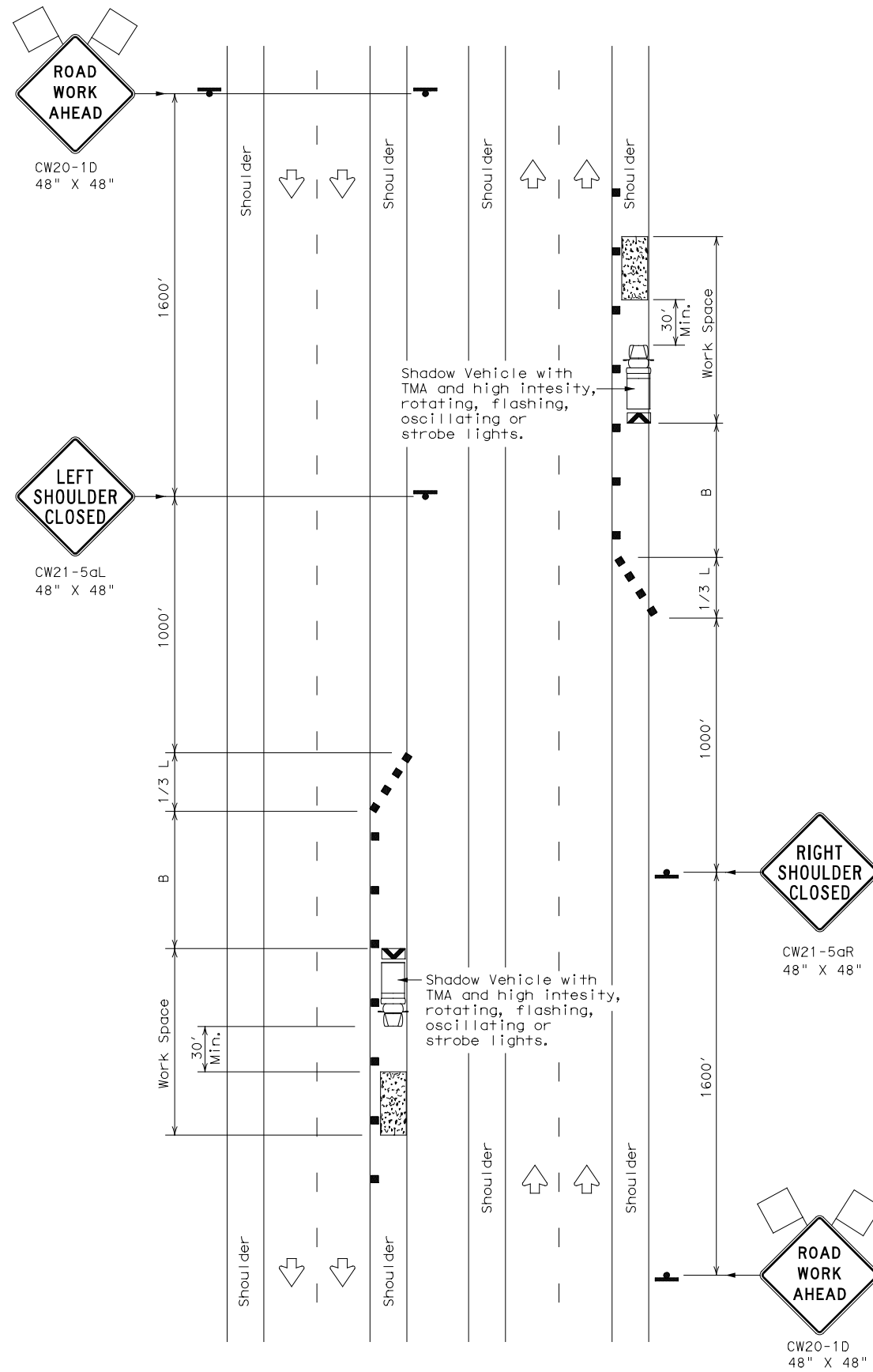
**TRAFFIC CONTROL PLAN  
MOBILE OPERATIONS  
RAISED PAVEMENT  
MARKER INSTALLATION/  
REMOVAL  
TCP (3-3) - 14**

FILE: tcp3-3.dgn	DN: TxDOT	CK: TxDOT	OW: TxDOT	CK: TxDOT
© TxDOT September 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	3510	04	055	SH 99
2-94 4-98	DIST	COUNTY	SHEET NO.	
8-95 7-13	HOU	FORT BEND	79	
1-97 7-14				



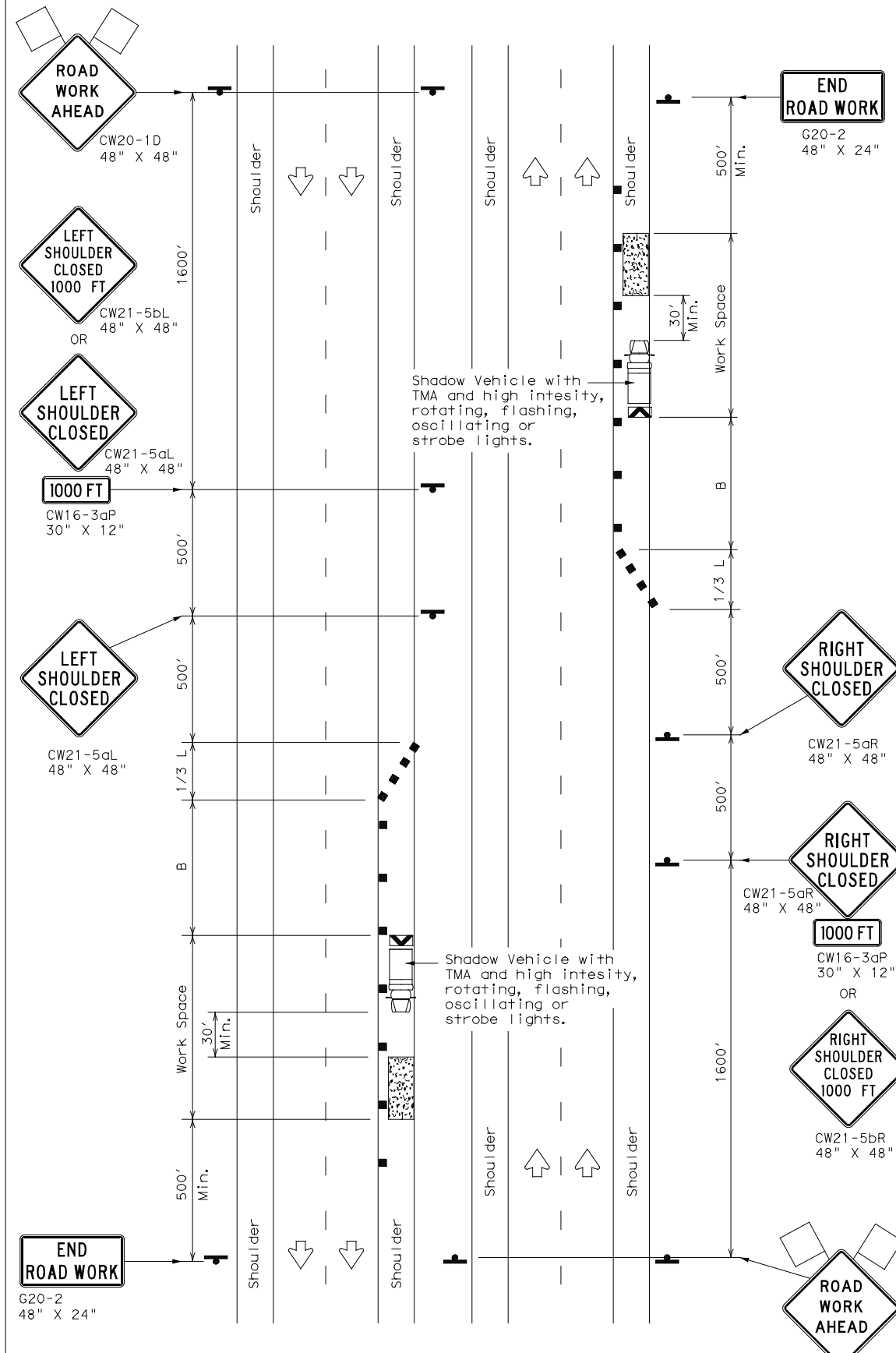
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DATE: FILE:



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 = WS <sup>2</sup> / 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.



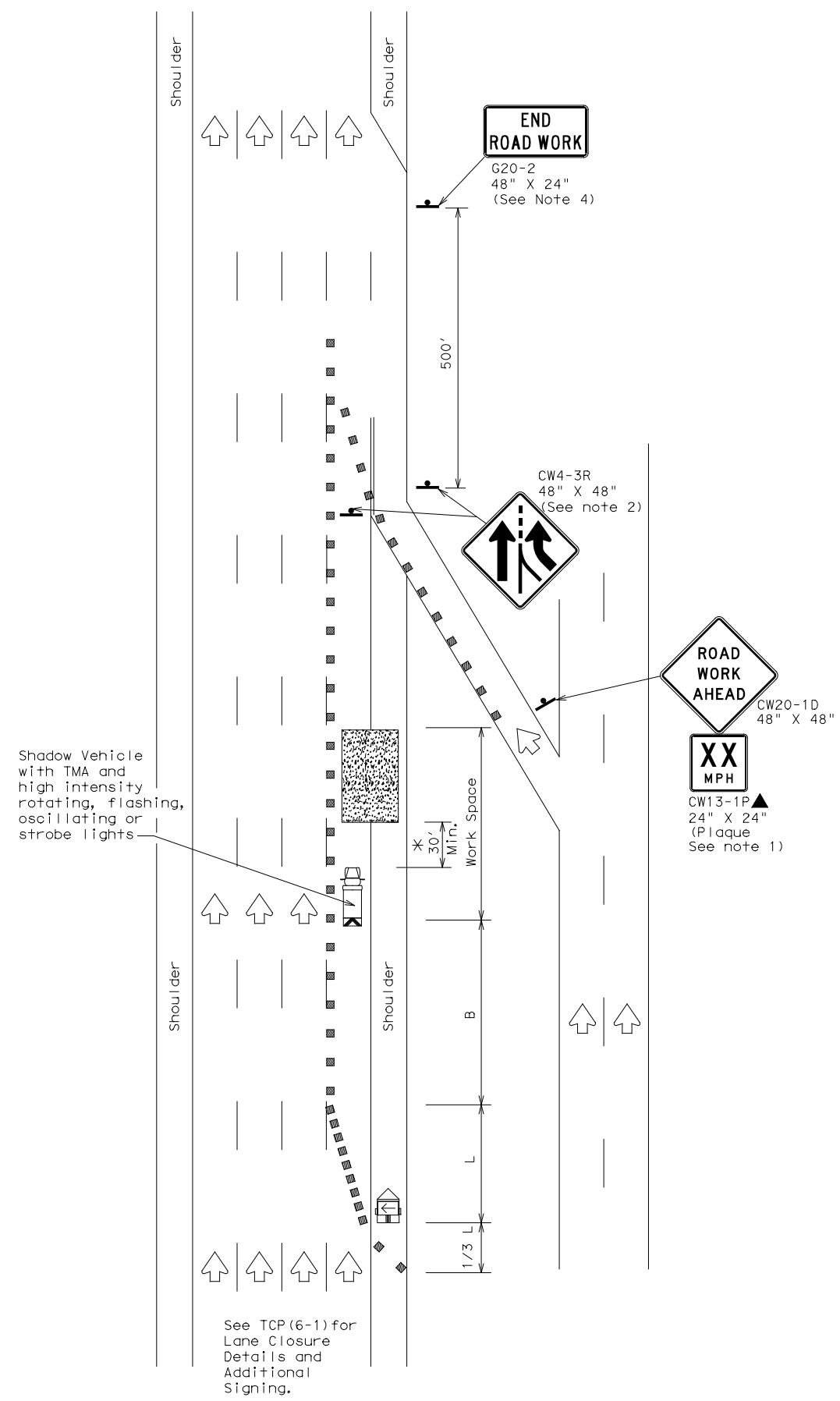
TRAFFIC CONTROL PLAN  
 SHOULDER WORK FOR  
 FREEWAYS / EXPRESSWAYS

TCP (5-1) - 18

FILE: tcp5-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT February 2012	CONT	SECT	JOB	HIGHWAY
2-18	REVISIONS	3510	04	055
	DIST	COUNTY	SHEET NO.	
	HOU	FORT BEND	80	

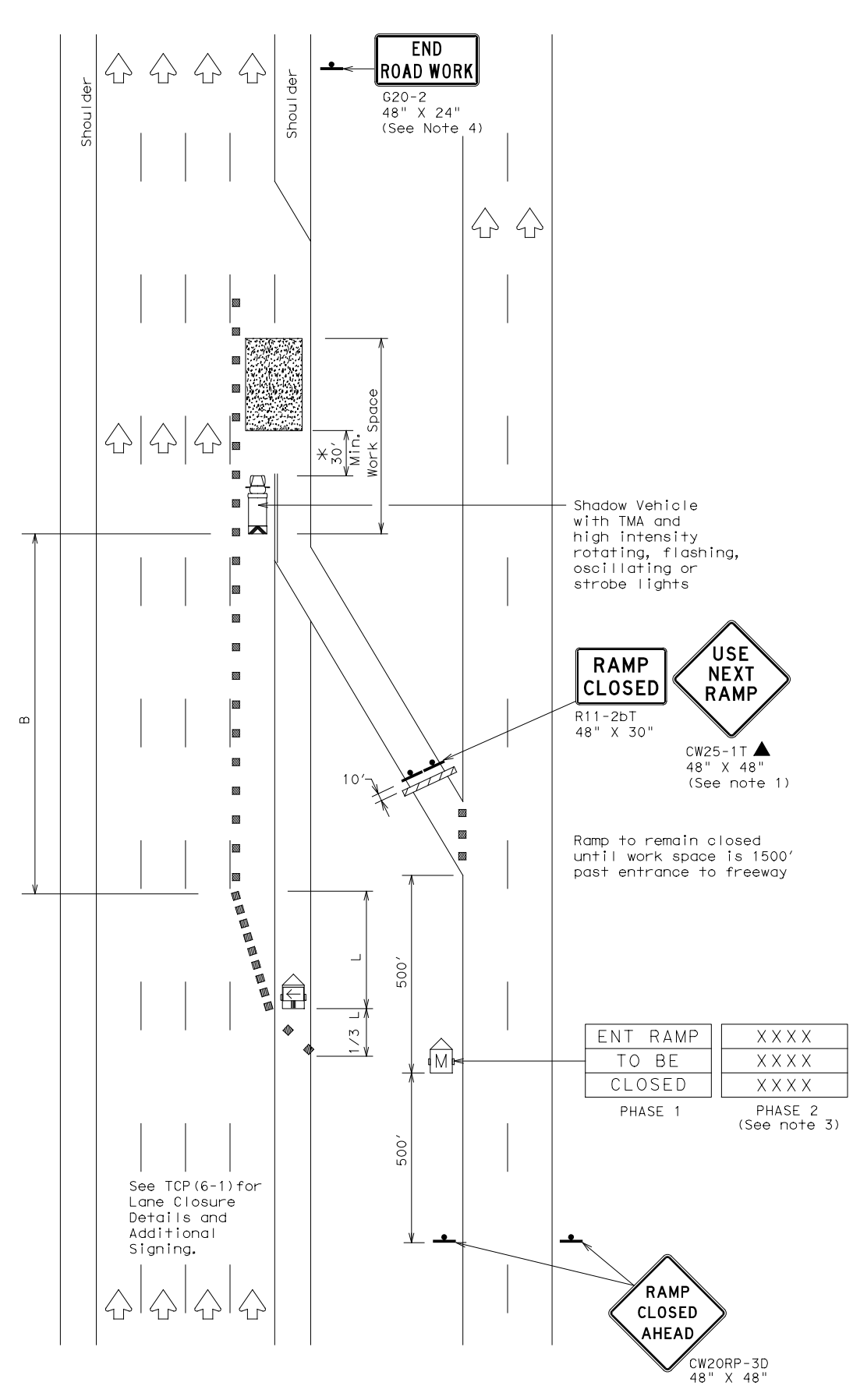
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DATE:  
FILE:



TCP (6-2a)

ENTRANCE RAMP OPEN  
WORK WITHIN 500' OF RAMP



TCP (6-2b)

ENTRANCE RAMP CLOSED

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board		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'

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.
- ADDED LANE Symbol (CW4-3) sign may be omitted when sign between ramp and mainlane can be seen from both roadways.
- See "Advance Notice List" on BC(6) for recommended date and time formatting options for PCMS Phase 2 message.
- The END ROAD WORK (G20-2) sign may be omitted when it conflicts with G20-2 signs already in place on the project.

XA shadow vehicle equipped with a Truck Mounted Attenuator is typically required. A shadow vehicle equipped with a TMA shall be used if it can be positioned 30' to 100' in advance of the area of crew exposure without adversely affecting the work performance.

Additional requirements for lane closures and advance signing shall be as shown on TCP (6-1) or as directed by the Engineer.

**Texas Department of Transportation**  
Traffic Operations Division Standard

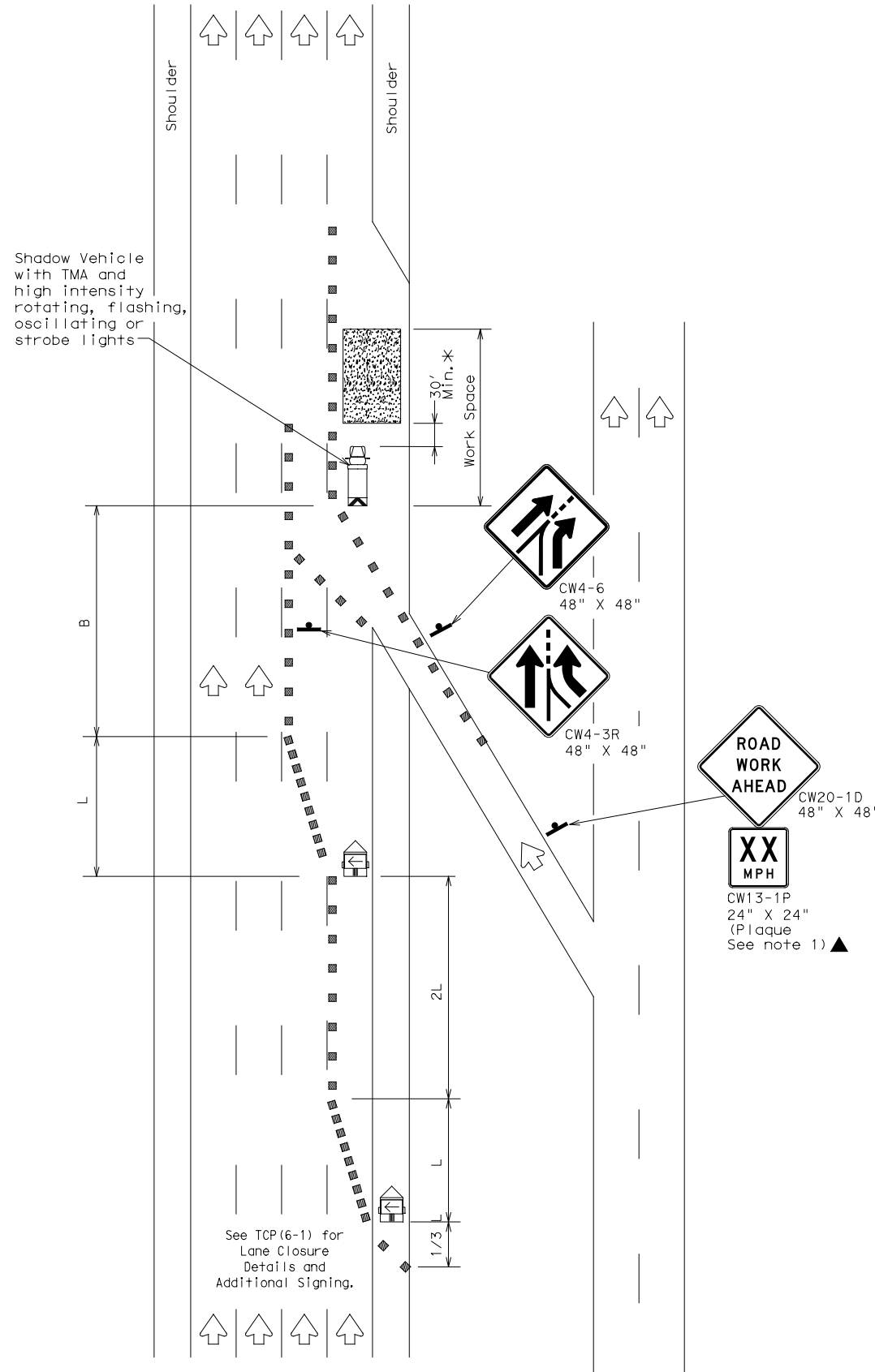
**TRAFFIC CONTROL PLAN**  
**WORK AREA NEAR RAMP**

**TCP (6-2) - 12**

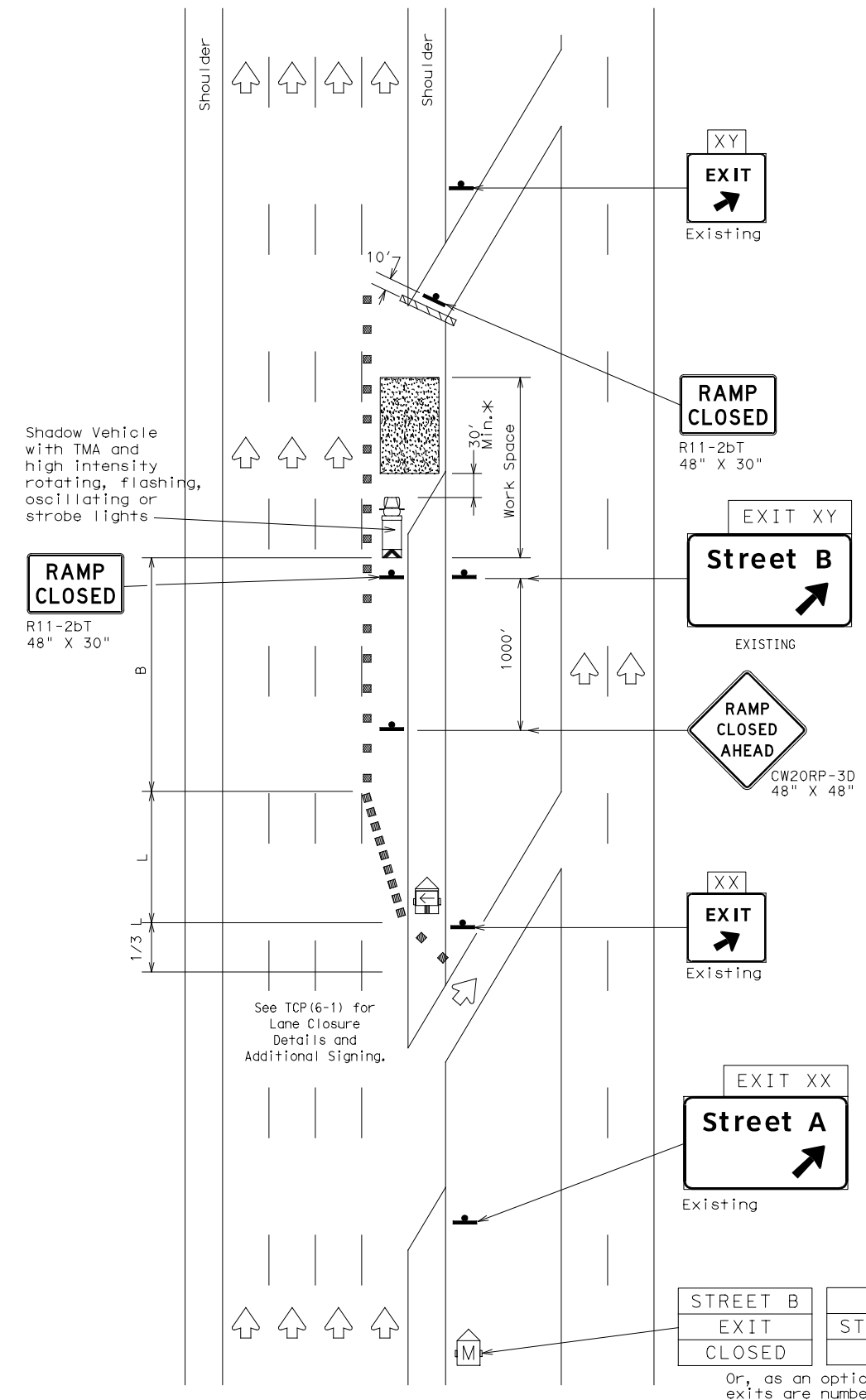
FILE: tcp6-2.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1994	CONT	SECT	JOB	HIGHWAY
REVISIONS	3510	04	055	SH 99
1-97 8-98	DIST	COUNTY	SHEET NO.	
4-98 8-12	HOU	FORT BEND	81	

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DATE:  
FILE:



TCP (6-3a)  
ENTRANCE RAMP OPEN



TCP (6-3b)  
EXIT RAMP CLOSED  
TRAFFIC EXITS PRIOR TO CLOSED RAMP

STREET B EXIT CLOSED	USE STREET A EXIT
EXIT XY CLOSED	USE EXIT XX

Or, as an option when exits are numbered

Place 1 mile (approx.)  
in advance of Street A  
exit.

	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 "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)

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

GENERAL NOTES:  
1. All traffic control devices illustrated are REQUIRED. Devices denoted with the triangle symbol may be omitted when stated elsewhere in the plans.

\*A shadow vehicle equipped with a Truck Mounted Attenuator is typically required. A shadow vehicle equipped with a TMA shall be used if it can be positioned 30' to 100' in advance of the area of crew exposure without adversely affecting the work performance.

Additional requirements for lane closures and advance signing shall be as shown on TCP (6-1) or as directed by the Engineer.

Texas Department of Transportation  
Traffic Operations Division Standard

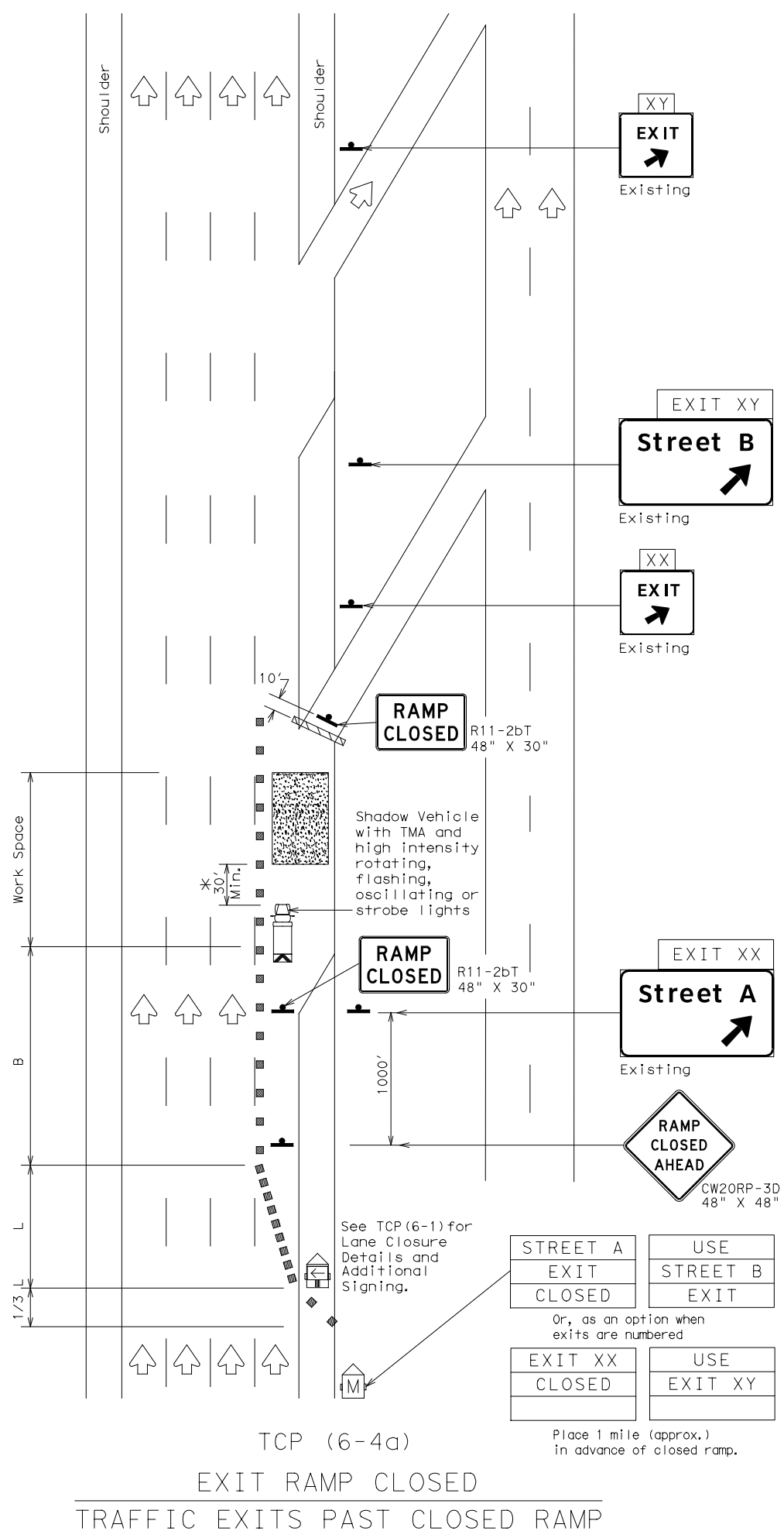
TRAFFIC CONTROL PLAN  
WORK AREA BEYOND RAMP

TCP (6-3)-12

FILE: tcp6-3.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1994	CONT	SECT	JOB	HIGHWAY
REVISIONS	3510	04	055	SH 99
1-97 8-98	DIST	COUNTY	SHEET NO.	
4-98 8-12	HOU	FORT BEND	82	

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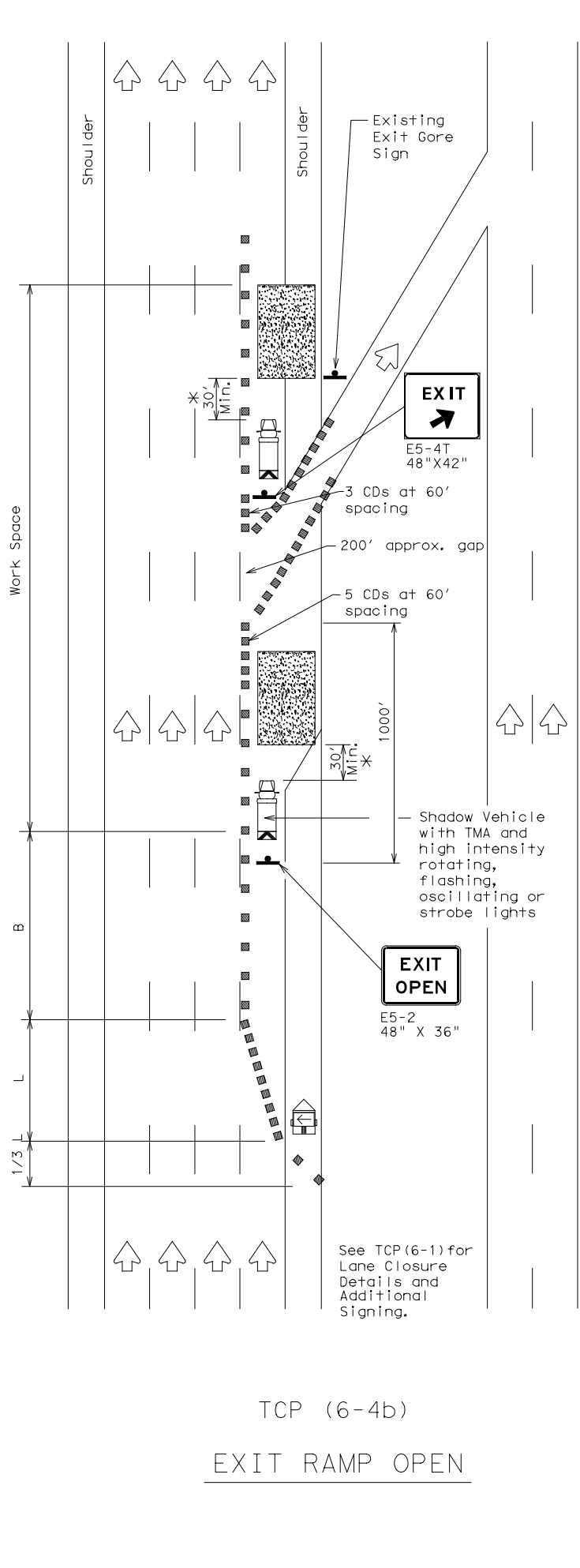
DATE: FILE:



TCP (6-4a)  
EXIT RAMP CLOSED  
TRAFFIC EXITS PAST CLOSED RAMP

STREET A	USE
EXIT	STREET B
CLOSED	EXIT
Or, as an option when exits are numbered	
EXIT XX	USE
CLOSED	EXIT XY

Place 1 mile (approx.) in advance of closed ramp.



TCP (6-4b)  
EXIT RAMP OPEN

	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)

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.
- See BC Standards for sign details.

\*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.



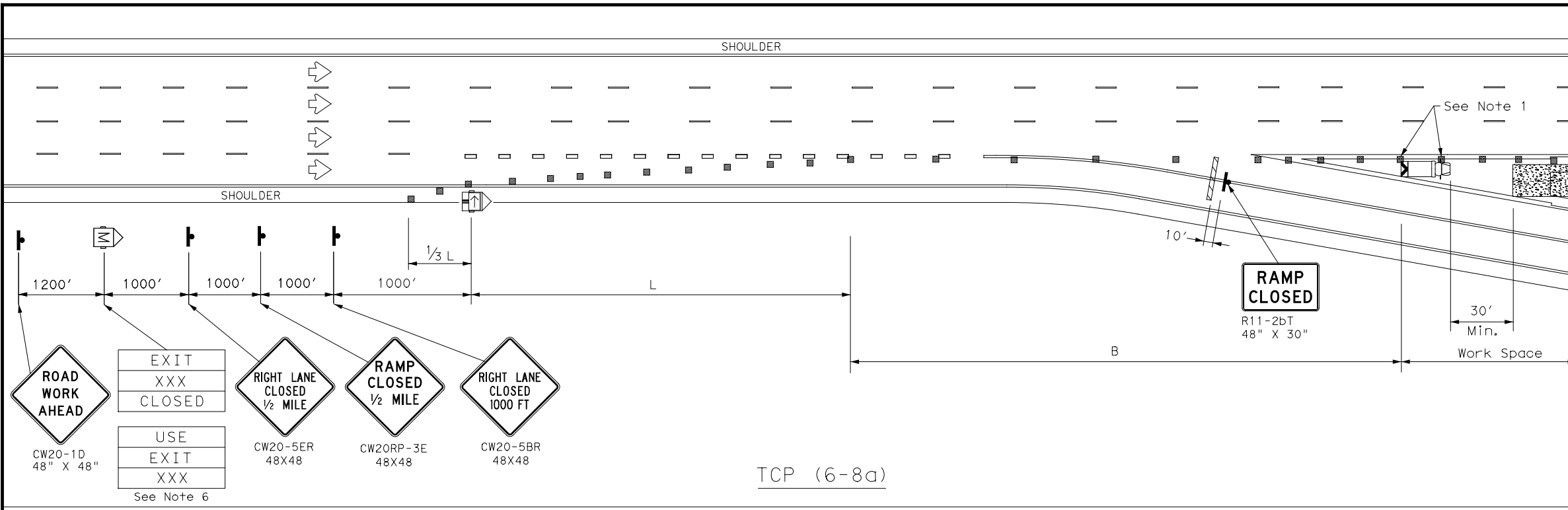
TRAFFIC CONTROL PLAN  
WORK AREA AT EXIT RAMP

TCP (6-4)-12

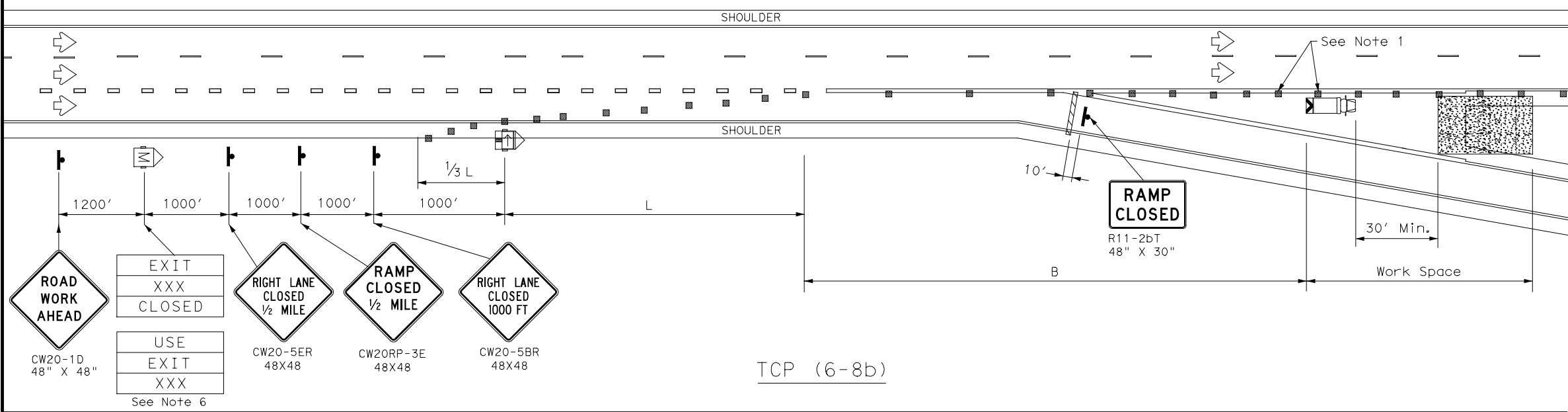
FILE: tcp6-4.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1994	CONT	SECT	JOB	HIGHWAY
REVISIONS	3510	04	055	SH 99
1-97 8-98	DIST	COUNTY	SHEET NO.	
4-98 8-12	HOU	FORT BEND	83	

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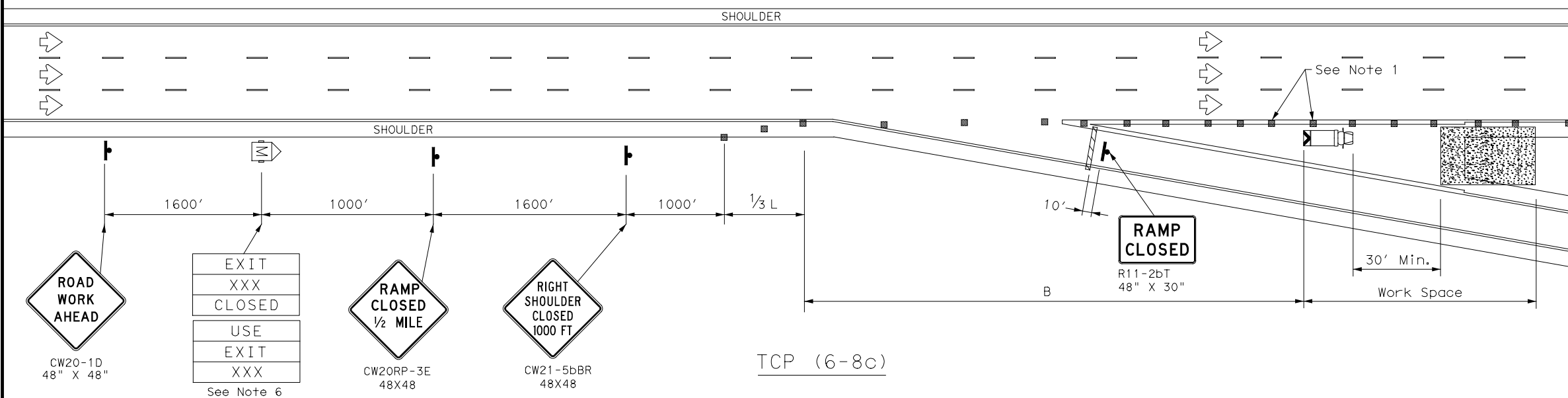
DATE:  
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TCP (6-8a)



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.



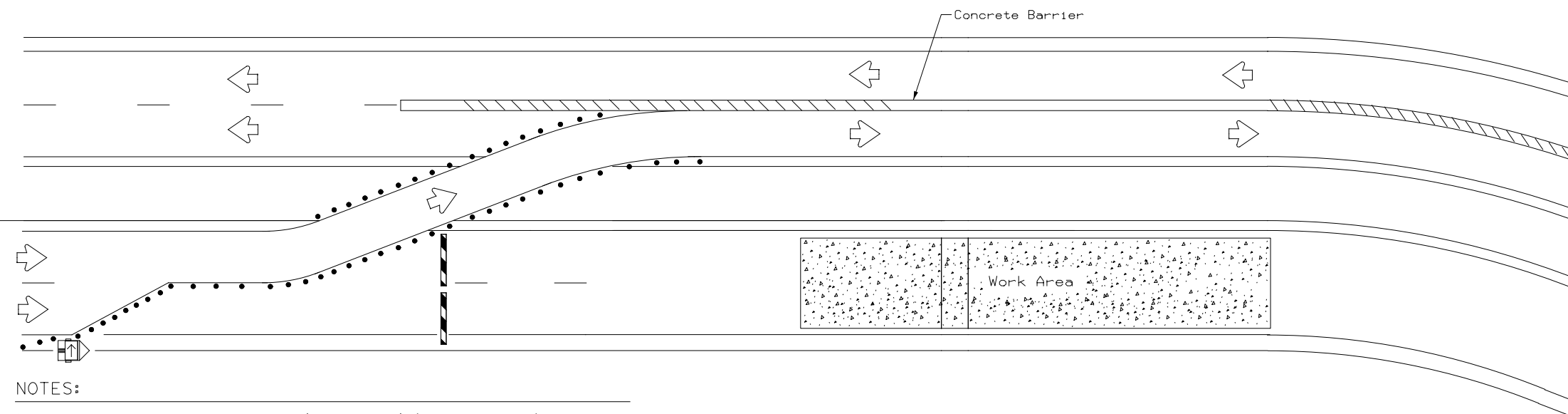
**WORK IN EXIT GORE FOR ADT GREATER THAN 10,000**

**TCP (6-8) - 14**

FILE: tcp6-8.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	3510	04	055	SH 99
	DIST	COUNTY	SHEET NO.	
	HOU	FORT BEND	84	

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FILE:



**NOTES:**

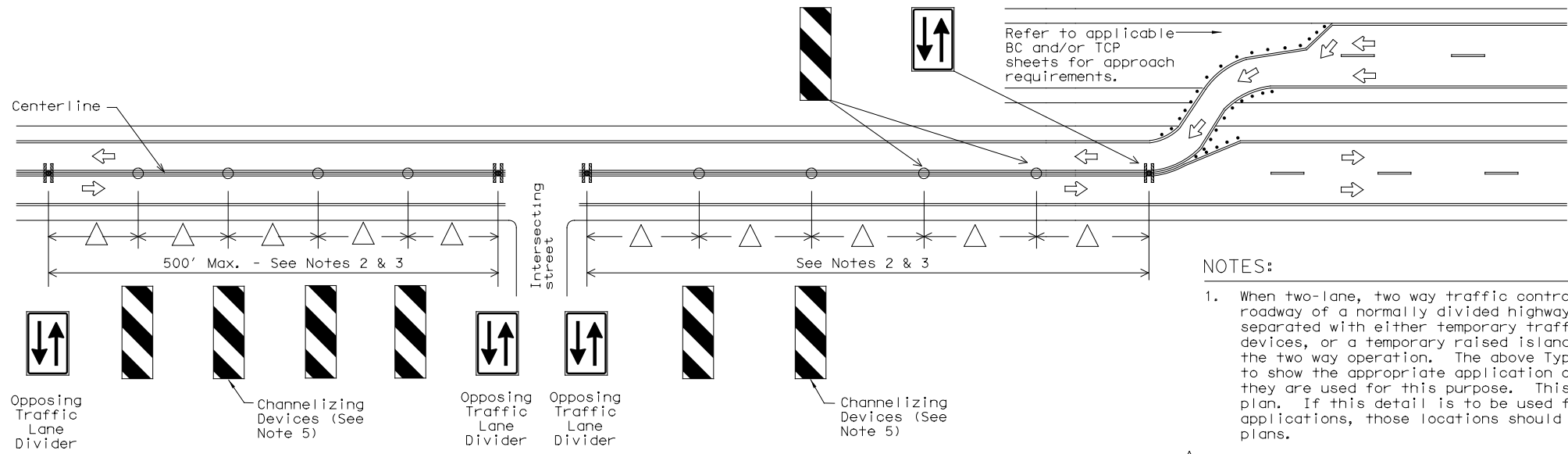
1. Length of Safety Glare screen will be specified elsewhere in the plans.
2. The cumulative nominal length of the modular safety glare screen units shall equal the length of the individual sections of temporary concrete traffic barrier on which they are installed so the joint between barrier sections will not be spanned by any one safety glare screen unit.
3. Screen Panel/blades will be designed such that reflective sheeting conforming with Departmental Material Specification DMS-8300, Sign Face Materials, Type B or C Yellow, minimum size of 2 inches by 12 inches can be attached to the edge of the panel/blade. The sheeting shall be attached to one glare screen panel/blade per section of concrete barrier not to exceed a spacing of 30 feet. Barrier reflectors are not necessary when panel/blades are installed with reflective sheeting as described.
4. Payment for these devices will be under statewide Special Specification "Modular Glare Screens for Headlight Barrier."
5. This detail is only intended to show types of locations where Glare Screens would be appropriate. Required signing and other devices shall be as shown elsewhere in the plans.

**BARRIER DELINEATION WITH MODULAR GLARE SCREENS**

LEGEND	
	Type 3 Barricade
	Channelizing Devices
	Trailer Mounted Flashing Arrow Board
	Sign
	Safety glare screen

DEPARTMENTAL MATERIAL SPECIFICATIONS	
SIGN FACE MATERIALS	DMS-8300
DELINEATORS AND OBJECT MARKERS	DMS-8600
MODULAR GLARE SCREENS FOR HEADLIGHT BARRIER	DMS-8610

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/business/resources/producer-list.html>



**NOTES:**

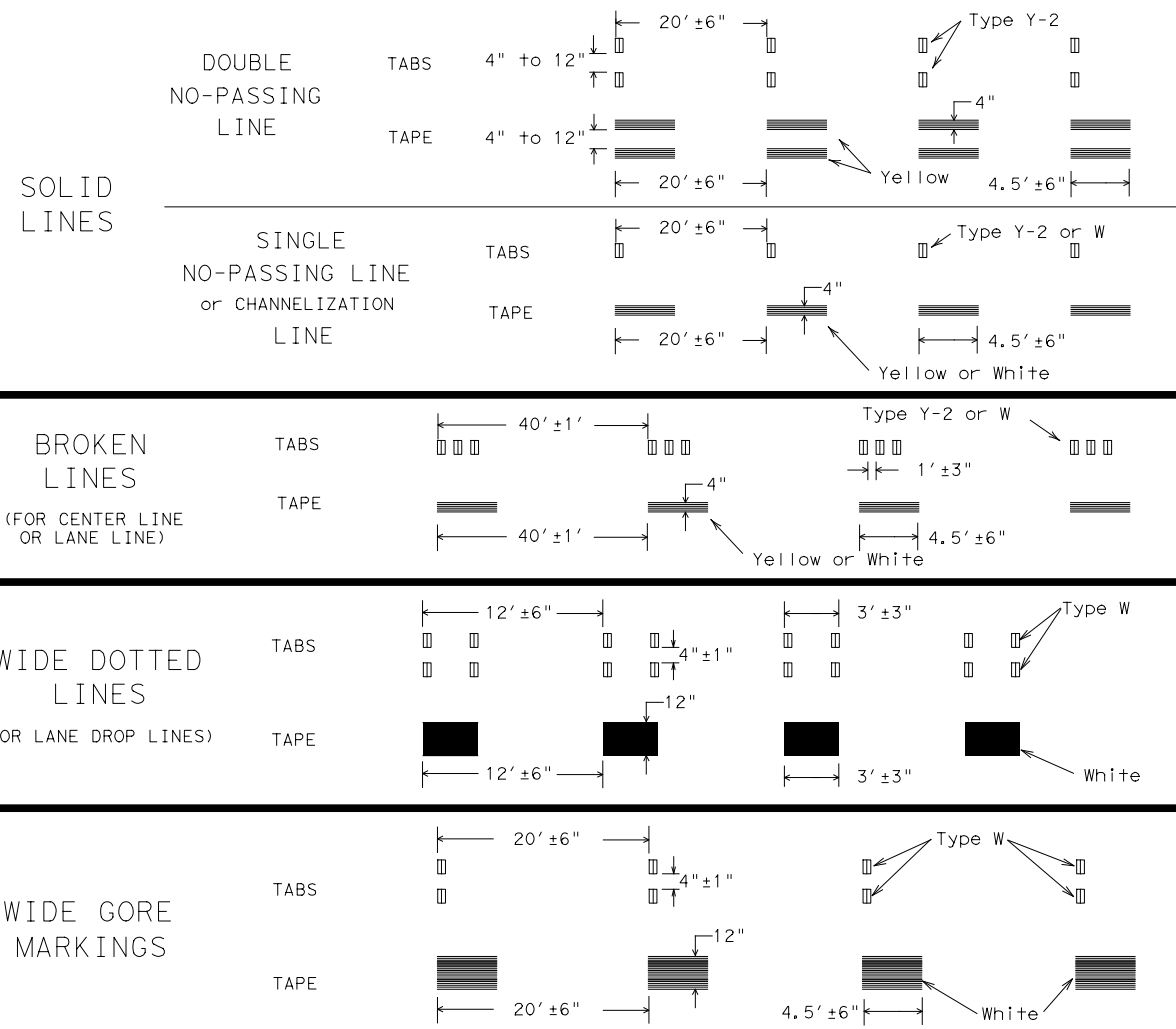
1. When two-lane, two way traffic control must be maintained on one roadway of a normally divided highway, opposing traffic shall be separated with either temporary traffic barriers, channelizing devices, or a temporary raised island throughout the length of the two way operation. The above Typical Application is intended to show the appropriate application of channelizing devices when they are used for this purpose. This is not a traffic control plan. If this detail is to be used for other types of roads or applications, those locations should be stated elsewhere in the plans.
2. Space devices according to the Tangent Spacing shown on the Device Spacing table on BC(9) but not exceeding 100'.
3. Every fifth device should be an OTLD except when spaced closer to accommodate an intersection. An OTLD should be the first device on each side of intersecting streets or roads.
4. Locations where surface mount bases with adhesives or self-righting devices will be required in order to maintain them in their proper position should be noted elsewhere in the plans.
5. Channelizing devices are to be vertical panels, 42" cones or tubular markers that are at least 36" tall. Tubular markers used to separate traffic should have a rubber base weighing at least 30 pounds. Tubular markers that are 42" tall or more shall have four bands of reflective material as detailed for 42" cones on BC(10). Tubular markers less than 42" but at least 36" tall shall have three bands of 3" wide white reflective material spaced 2" apart. Reflective material shall meet DMS-8300, Type A.

**VERTICAL PANELS & OPPOSING TRAFFIC LANE DIVIDERS (OTLD) SEPARATING TWO-WAY TRAFFIC ON NORMALLY DIVIDED HIGHWAYS**

		Traffic Operations Division Standard	
<b>TRAFFIC CONTROL PLAN TYPICAL DETAILS</b>			
<b>WZ (TD) - 17</b>			
FILE: wzt-d-17.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
© TxDOT February 1998	CONT	SECT	HIGHWAY
REVISIONS	3510	04	055 SH 99
4-98	2-17	DIST	COUNTY SHEET NO.
3-03		HOU	FORT BEND 85
7-13			

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## WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS



### NOTES:

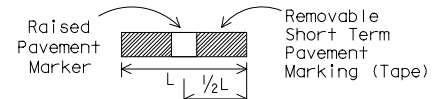
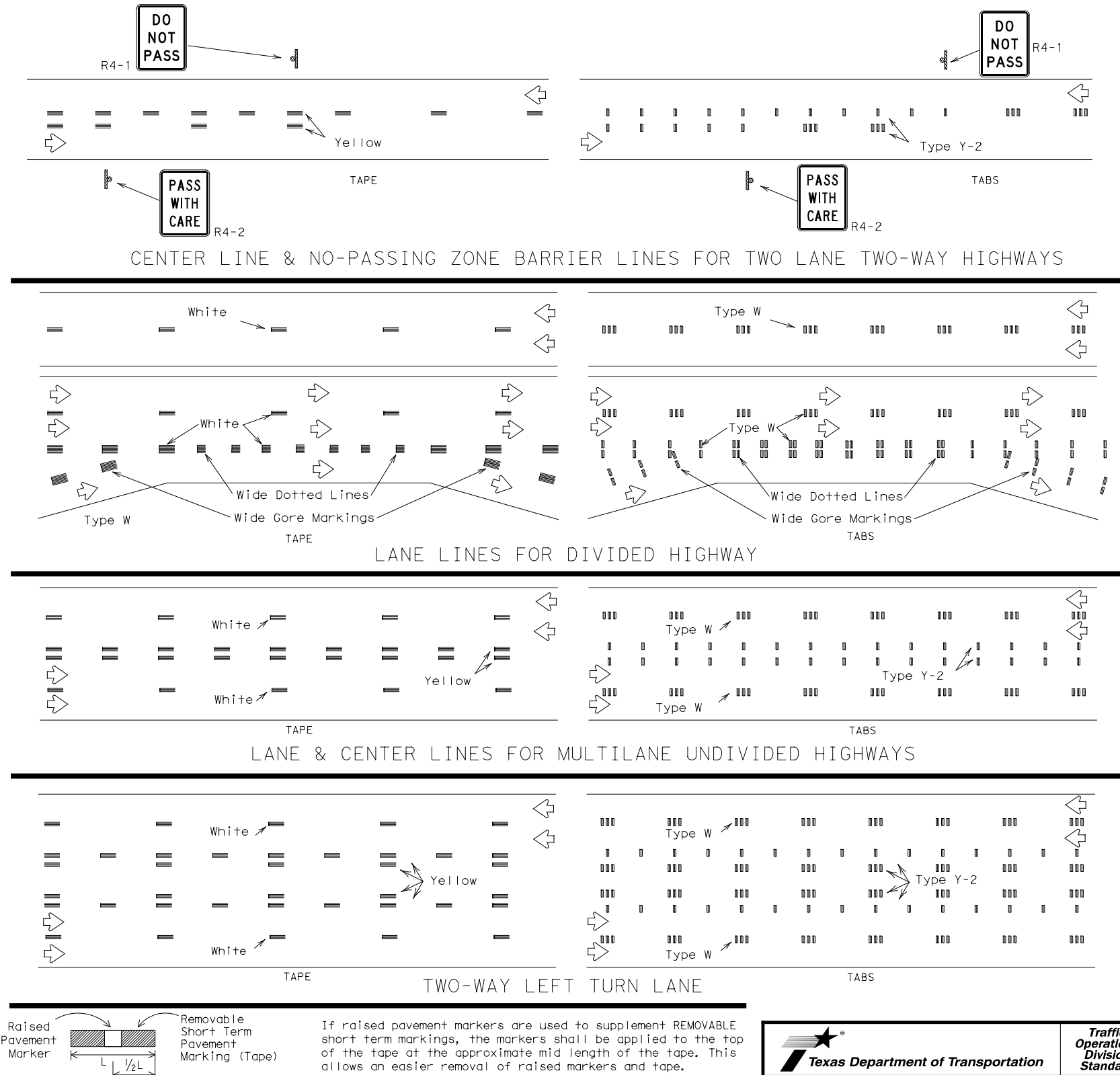
- Short term pavement markings may be prefabricated markings (stick down tape) or temporary flexible-reflective roadway marker tabs unless otherwise specified elsewhere in plans.
- Short term pavement markings shall NOT be used to simulate edge lines.
- Dimensions indicated on this sheet are typical 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.

DATE:  
FILE:

## 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](http://www.txdot.gov/business/contractors_consultants/material_specifications/default.htm)



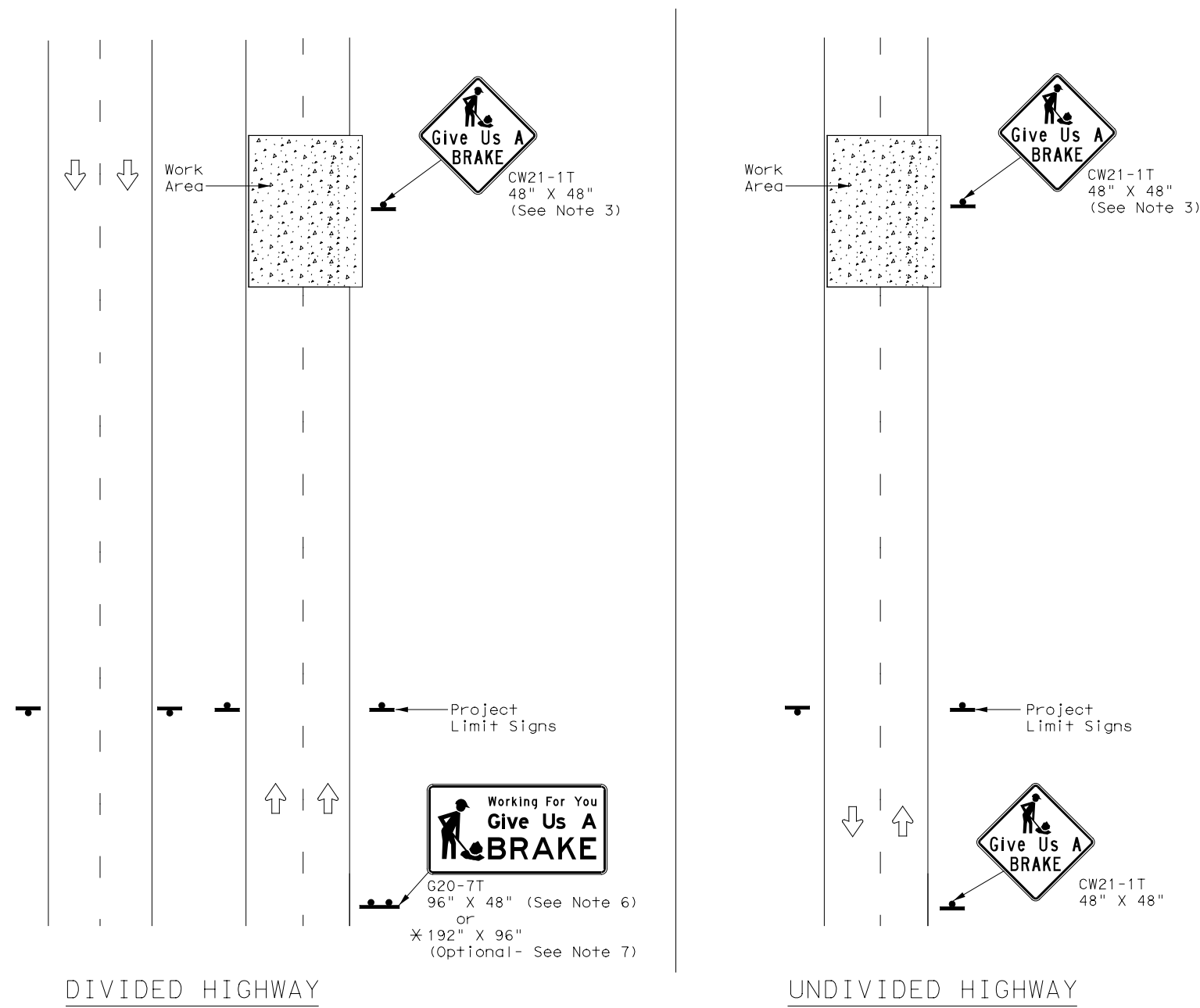
## WORK ZONE SHORT TERM PAVEMENT MARKINGS

### WZ (STPM) - 13

FILE:	wzstpm-13.dgn	DN:	TxDOT	CK:	TxDOT	OW:	TxDOT	CK:	TxDOT
©TxDOT	April 1992	CONT	SECT	JOB	HIGHWAY				
REVISIONS		3510	04	055	SH 99				
1-97	3-03	DIST	COUNTY	SHEET NO.					
7-13		HOU	FORT BEND	86					

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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 <sub>FL</sub> or C <sub>FL</sub>	32	▲	▲ ▲	▲
Orange	G20-7T		192" X 96"	Type B <sub>FL</sub> or C <sub>FL</sub>	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 <sub>FL</sub> OR TYPE C <sub>FL</sub>
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, "Barriades, 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

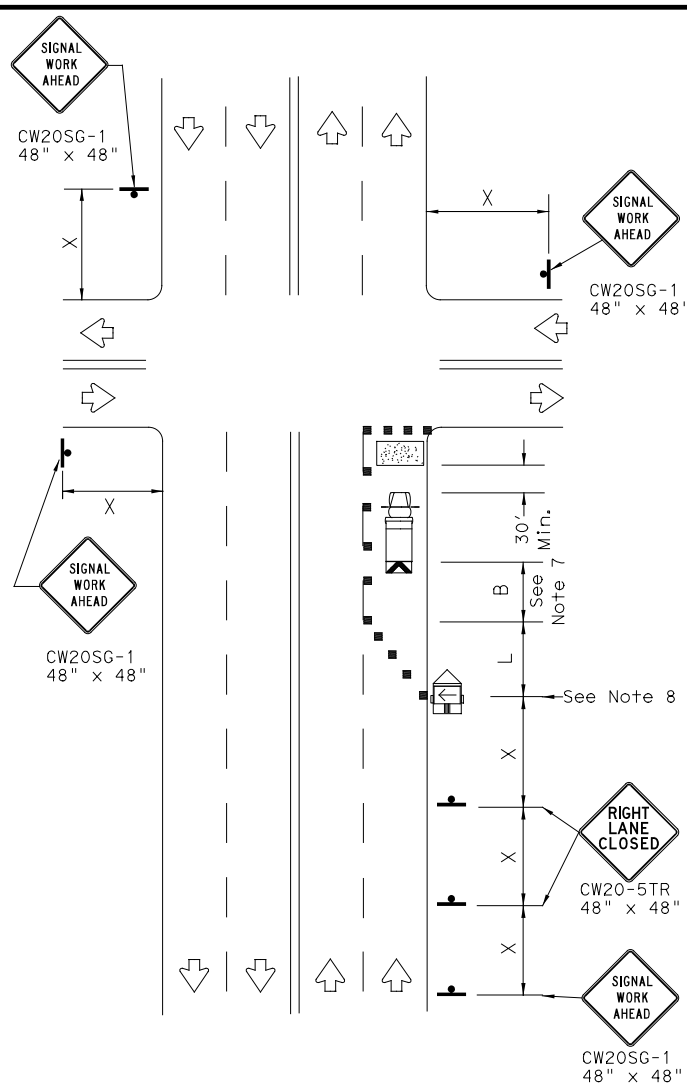
WZ (BRK) - 13

FILE: wzbrk-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 1995	CONT	SECT	JOB	HIGHWAY
REVISIONS	3510	04	055	SH 99
6-96 5-98 7-13	DIST	COUNTY		SHEET NO.
8-96 3-03	HOU	FORT BEND		87

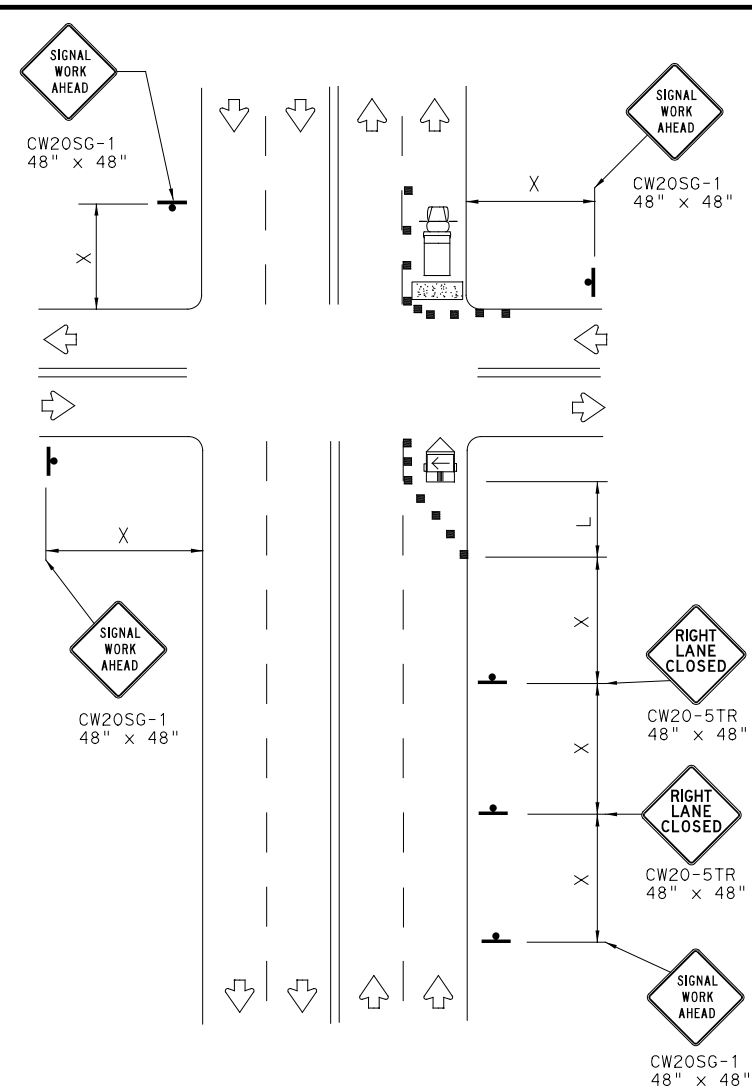


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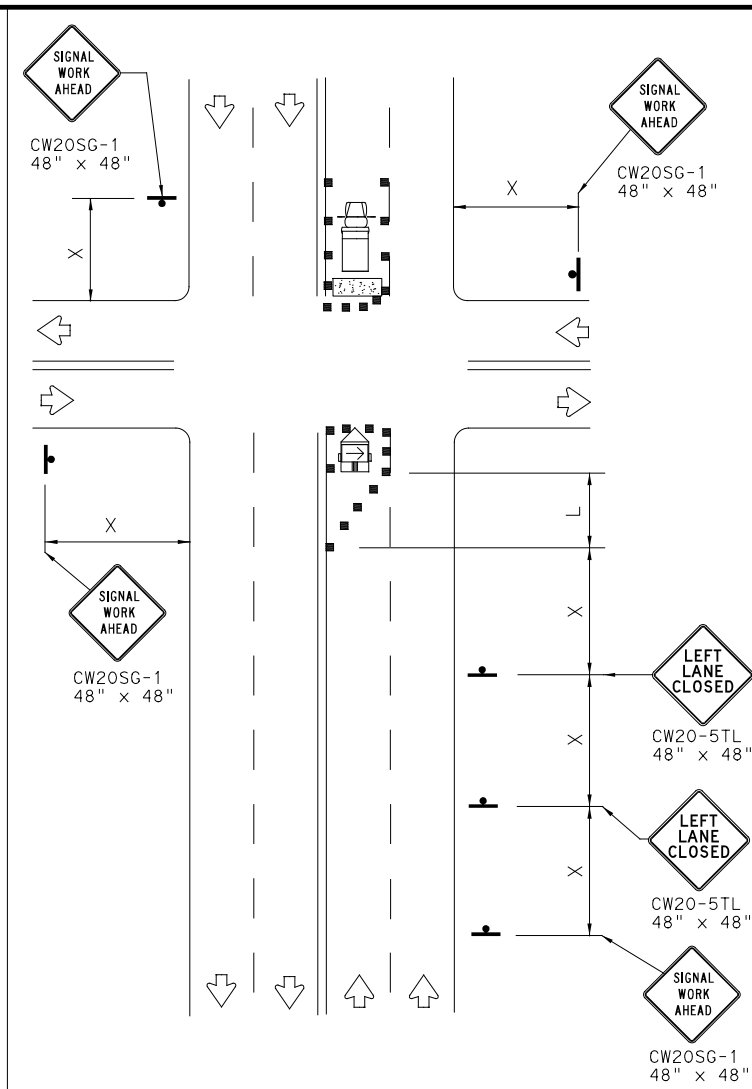
DATE: FILE:



NEAR SIDE LANE CLOSURE  
SHORT DURATION OR SHORT TERM STATIONARY



FAR SIDE RIGHT LANE CLOSURE  
SHORT DURATION OR SHORT TERM STATIONARY



FAR SIDE LEFT LANE CLOSURE  
SHORT DURATION OR SHORT TERM STATIONARY

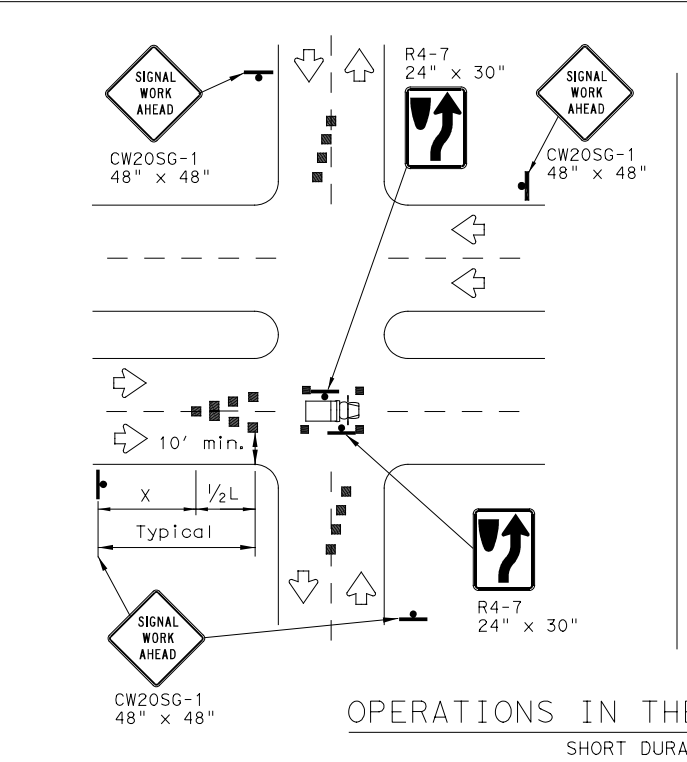
LEGEND

	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

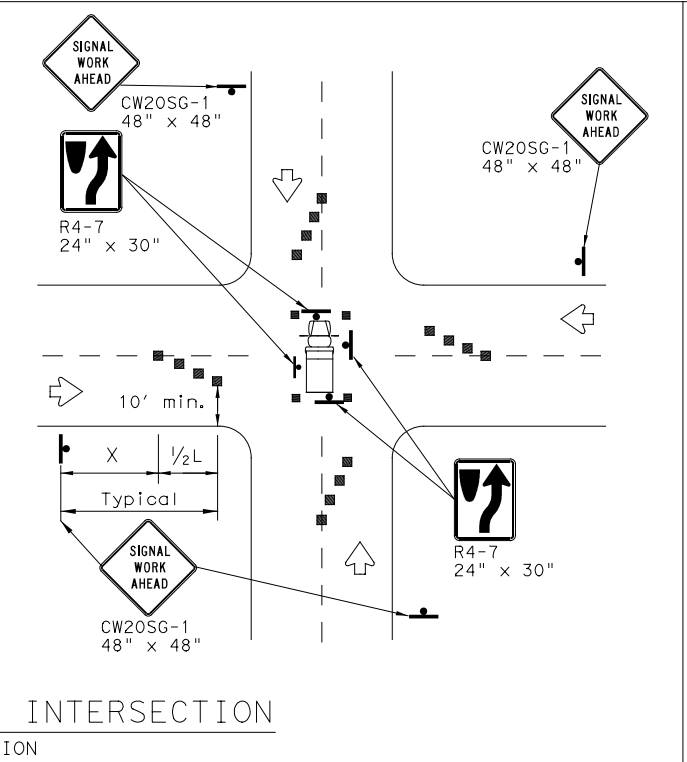
Posted Speed *	Formula	Minimum Desirable Taper Lengths * X			Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent		
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'
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.



OPERATIONS IN THE INTERSECTION  
SHORT DURATION



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.



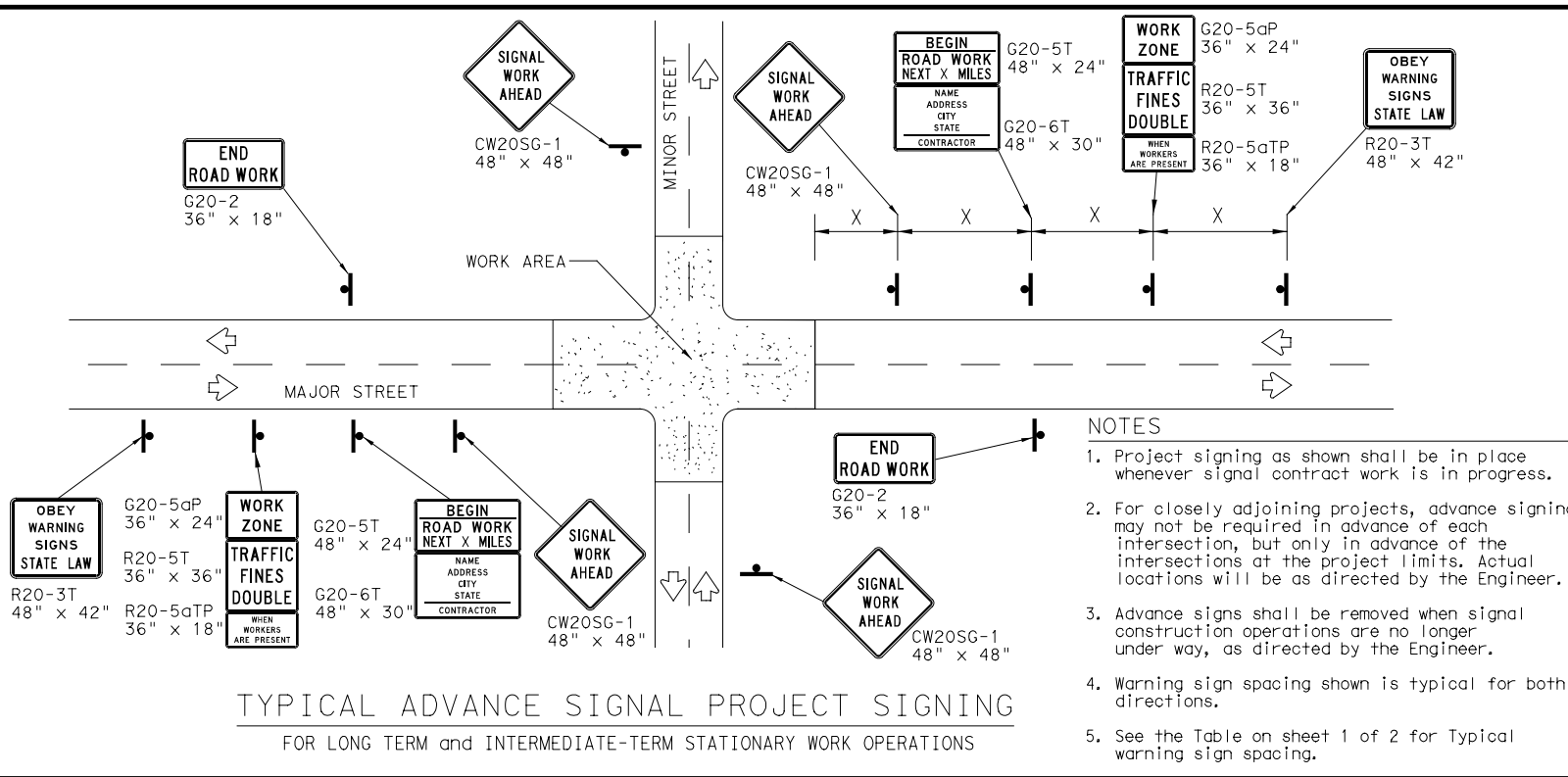
TRAFFIC SIGNAL WORK  
TYPICAL DETAILS

WZ (BTS-1) - 13

FILE: wzbts-13.dgn	DN: TxDOT	CK: TxDOT	OW: TxDOT	CK: TxDOT
© TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS	3510	04	055	SH 99
2-98 10-99 7-13	DIST	COUNTY	SHEET NO.	
4-98 3-03	HOU	FORT BEND	88	

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- NOTES**
- Project signing as shown shall be in place whenever signal contract work is in progress.
  - 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.
  - Advance signs shall be removed when signal construction operations are no longer under way, as directed by the Engineer.
  - Warning sign spacing shown is typical for both directions.
  - See the Table on sheet 1 of 2 for Typical warning sign spacing.

**GENERAL NOTES FOR WORK ZONE SIGNS**

- Signs shall be installed and maintained in a straight and plumb condition.
- Wooden sign posts shall be painted white.
- Barricades shall NOT be used as sign supports.
- Nails shall NOT be used to attach signs to any support.
- All signs shall be installed in accordance with the plans or as directed by the Engineer.
- The Contractor shall furnish the sign design shown in the plans or in the "Standard Highway Sign Designs for Texas" (SHSD).
- 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.
- Temporary signs that have damaged or cracked substrates and/or damaged or marred reflective sheeting shall be replaced as directed by the Engineer.
- 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".
- Damaged wood posts shall be replaced. Splicing wood posts will not be allowed.

**DURATION OF WORK**

- Work zone durations are defined in Part 6, Section 66.02 of the Texas Manual on Uniform Traffic Control Devices (TMUTCD).

**SIGN MOUNTING HEIGHT**

- Sign height of Long-term/Intermediate-term warning signs shall be as shown on Figure 6F-1 of the TMUTCD.
- Sign height of Short-term/Short Duration warning signs shall be as shown on Figure 6F-2 of the TMUTCD.
- 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**

- When sign messages may be confusing or do not apply, the signs shall be removed or completely covered, unless otherwise approved by the Engineer.
- 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.
- Duct tape or other adhesive material shall NOT be affixed to a sign face.
- Signs and anchor stubs shall be removed and holes back filled upon completion of the work.

**REFLECTIVE SHEETING**

- 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**

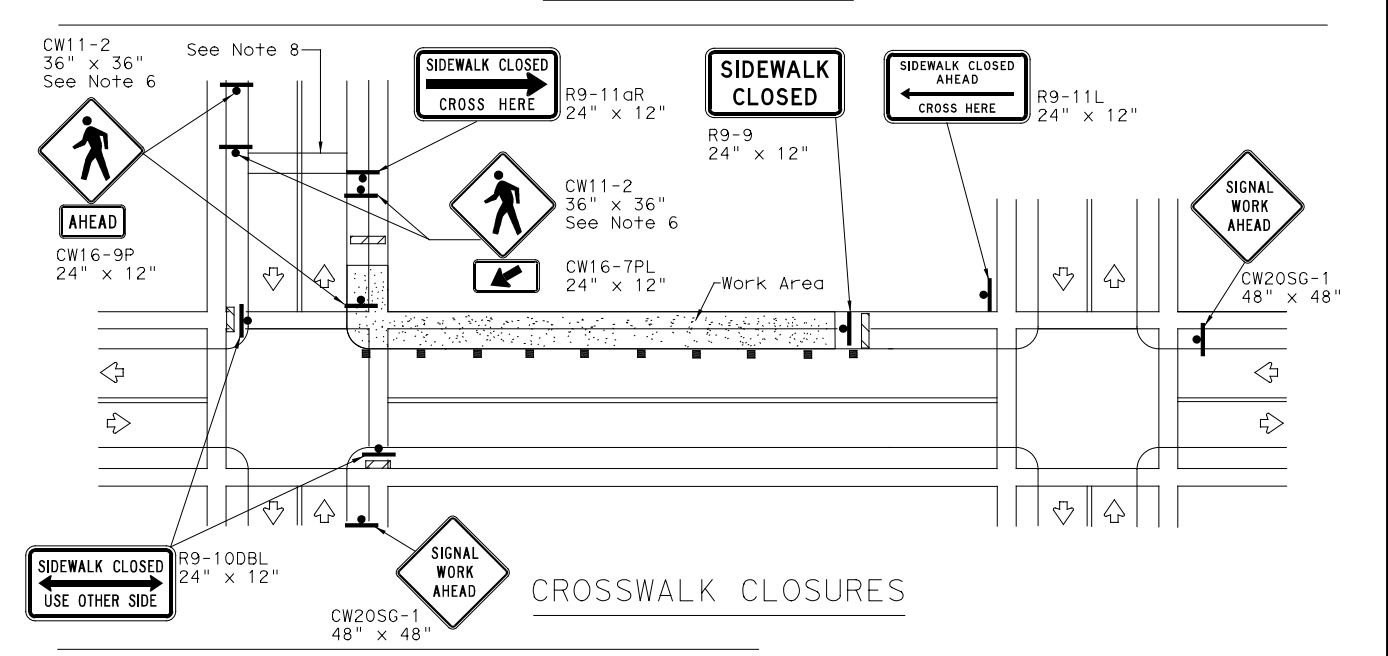
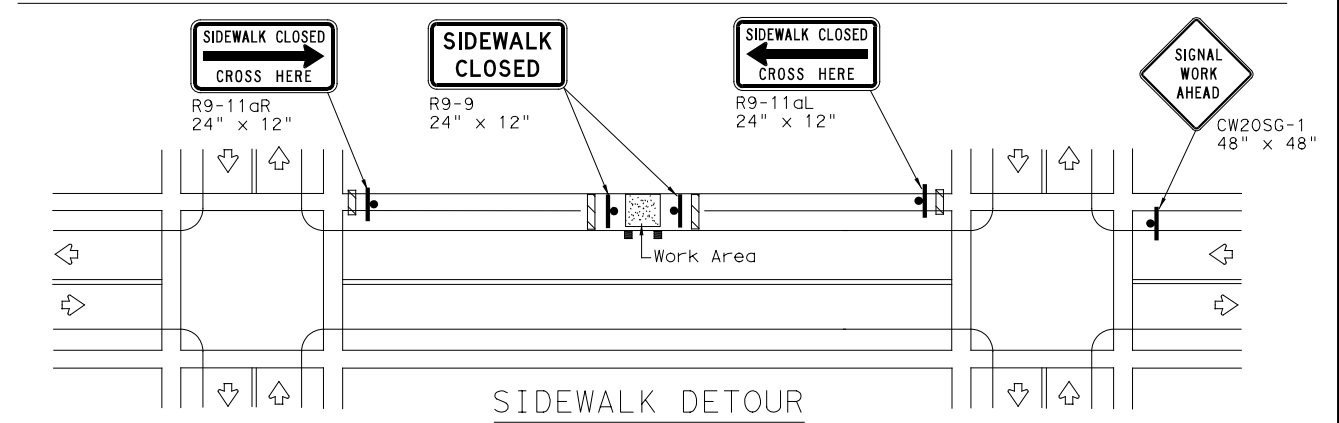
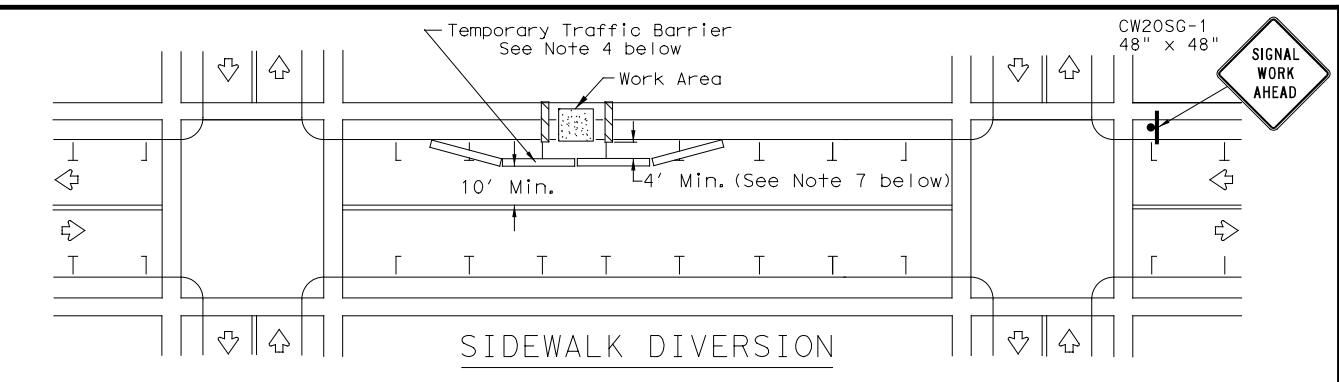
- Weights used to keep signs from turning over should be sandbags filled with dry, cohesionless material.
- The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
- Rock, concrete, iron, steel or other solid objects will not be permitted for use as sign support weights.
- 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.
- 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.
- 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.
- 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 <sub>FL</sub> OR TYPE C <sub>FL</sub> 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](http://www.txdot.gov/txdot_library/publications/construction.htm)

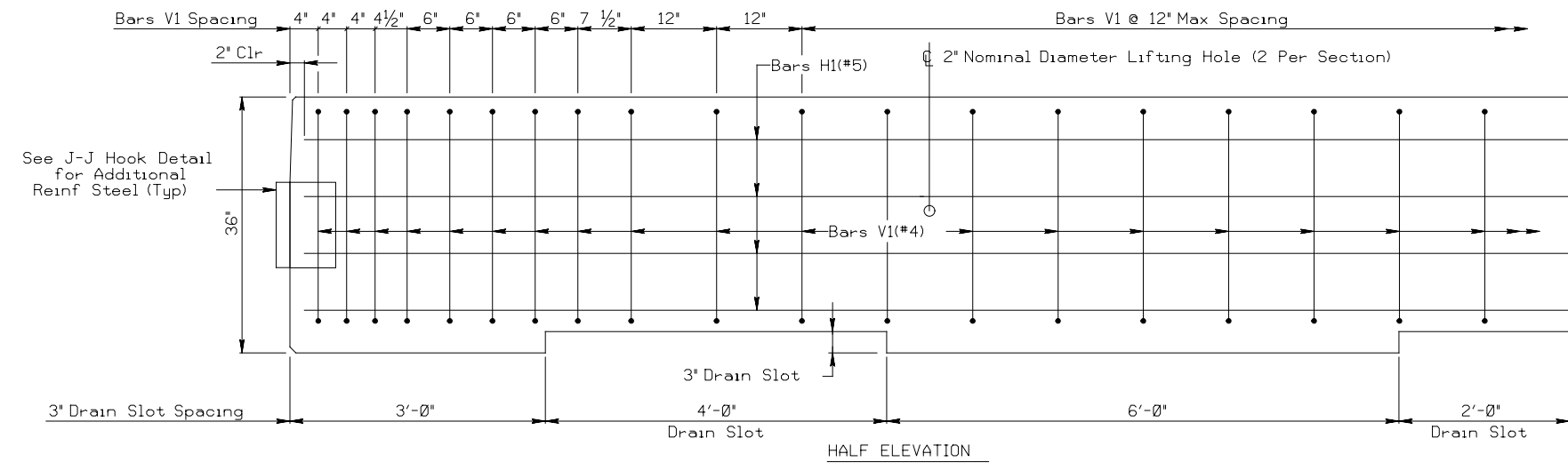
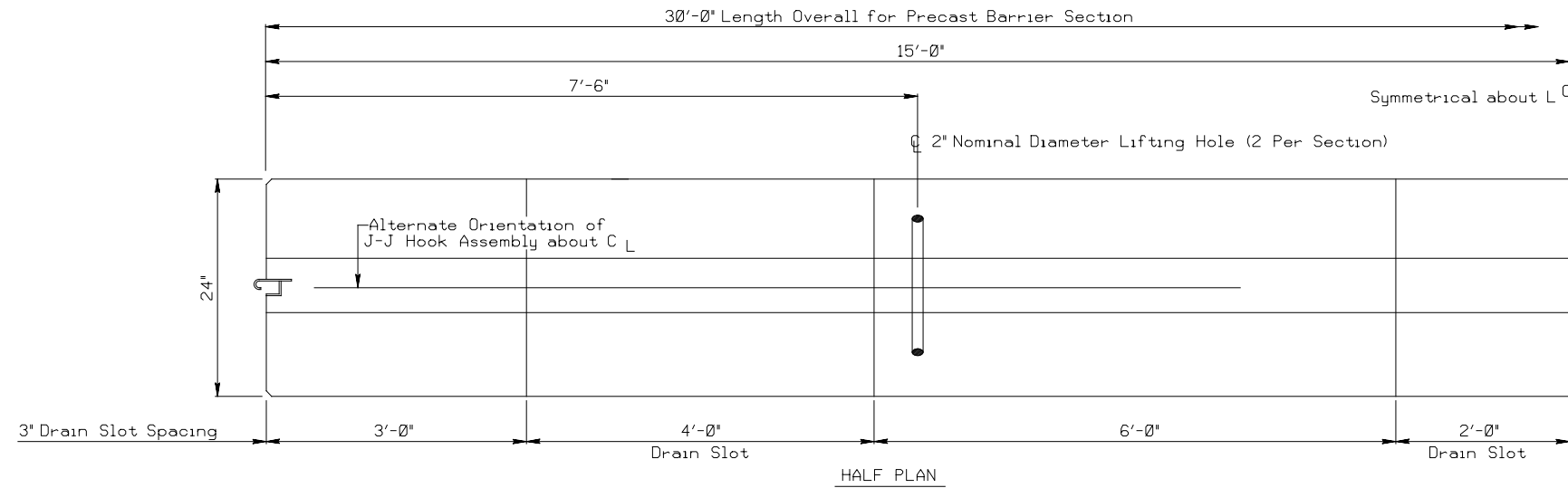


**PEDESTRIAN CONTROL**

- 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.
- "CROSSWALK CLOSURES" as detailed above will require the Engineer's approval prior to installation.
- 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.
- 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.
- Location of devices are for general guidance. Actual device spacing and location must be field adjusted to meet actual conditions.
- Where pedestrians with visual disabilities normally use the closed sidewalk Detectable Pedestrian Barricades should be used instead of the Type 3 Barricades shown.
- The width of existing sidewalk should be maintained if practical.
- Pavement markings for mid-block crosswalks shall be paid for under the appropriate bid items.
- 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.

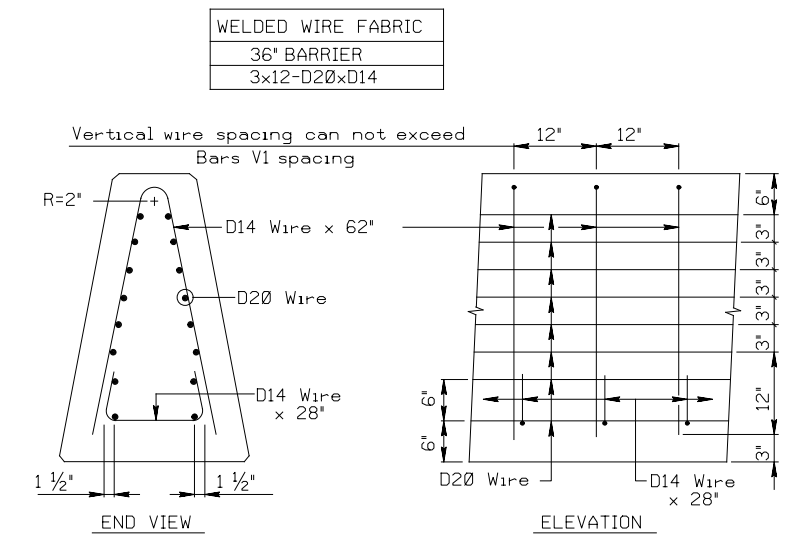
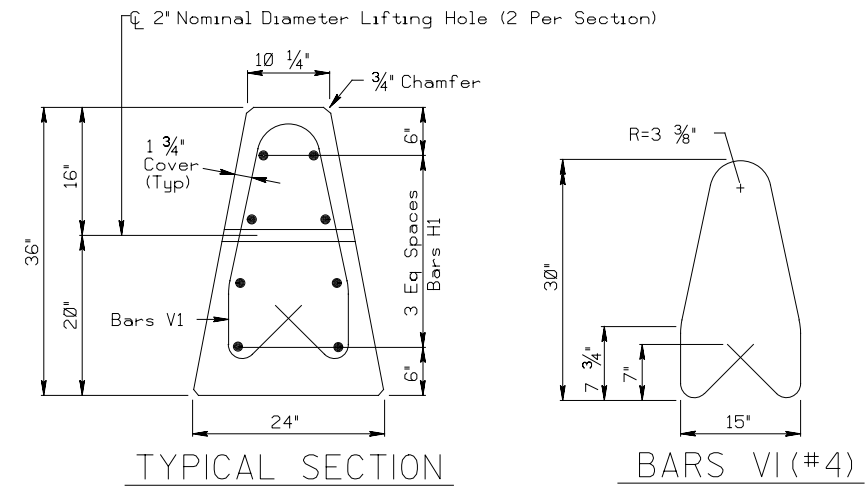
SHEET 2 OF 2

		<b>Traffic Operations Division Standard</b>	
<b>TRAFFIC SIGNAL WORK BARRICADES AND SIGNS</b>			
<b>WZ (BTS-2) - 13</b>			
FILE: wzbts-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
© TxDOT April 1992	CONT: 3510	SECT: 04	JOB: 055
REVISIONS	DIST: COUNTY		HIGHWAY: SH 99
2-98 10-99 7-13	HOU FORT BEND		SHEET NO. 89
4-98 3-03			



PRECAST SINGLE SLOPE CONCRETE BARRIER

- GENERAL NOTES:
- 1) Precast barrier length will be 30 feet (1 inch +/-) unless otherwise specified in the plans.
  - 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 barrier anchorage is not paid for directly. Installation is incidental to barrier bid items.



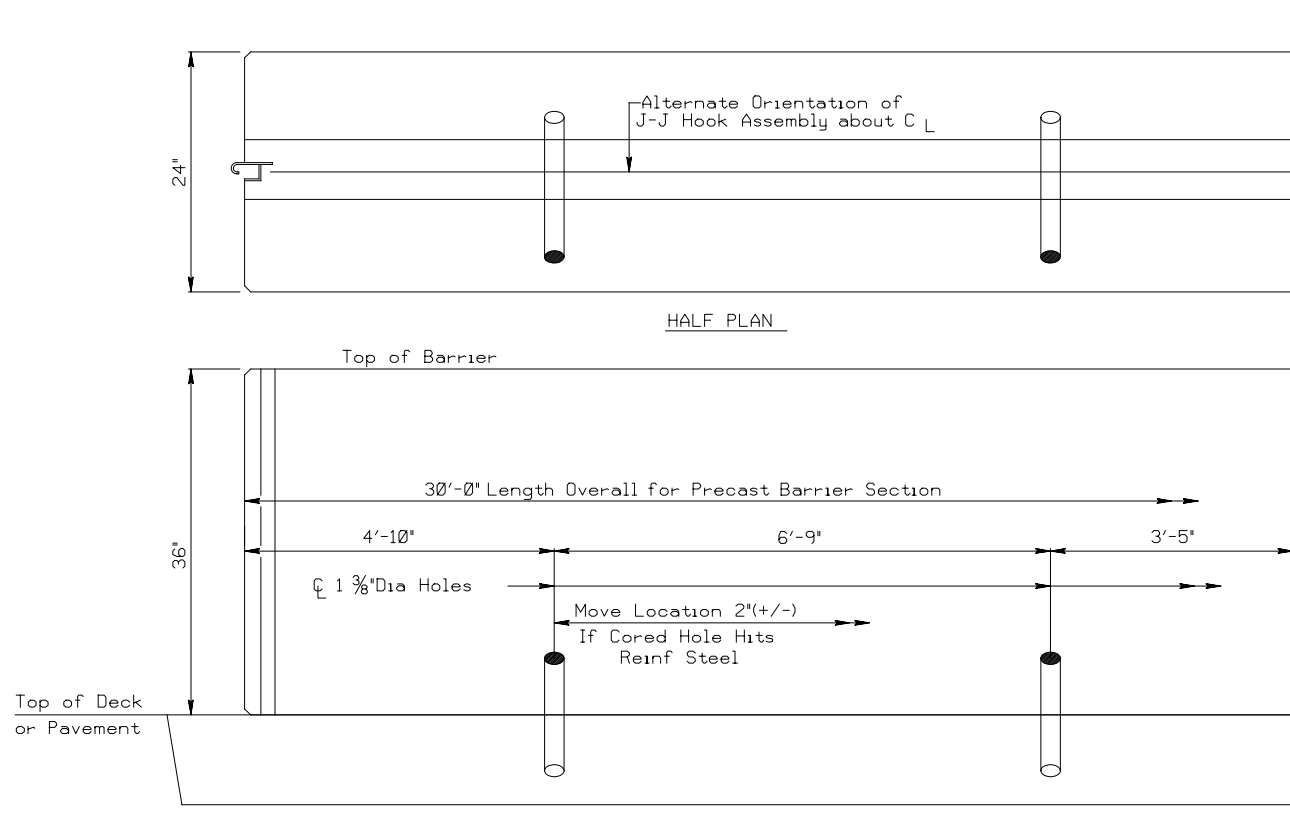
WELDED WIRE FABRIC (OPTIONAL REINFORCING)

R = Radius  
Dia = Diameter

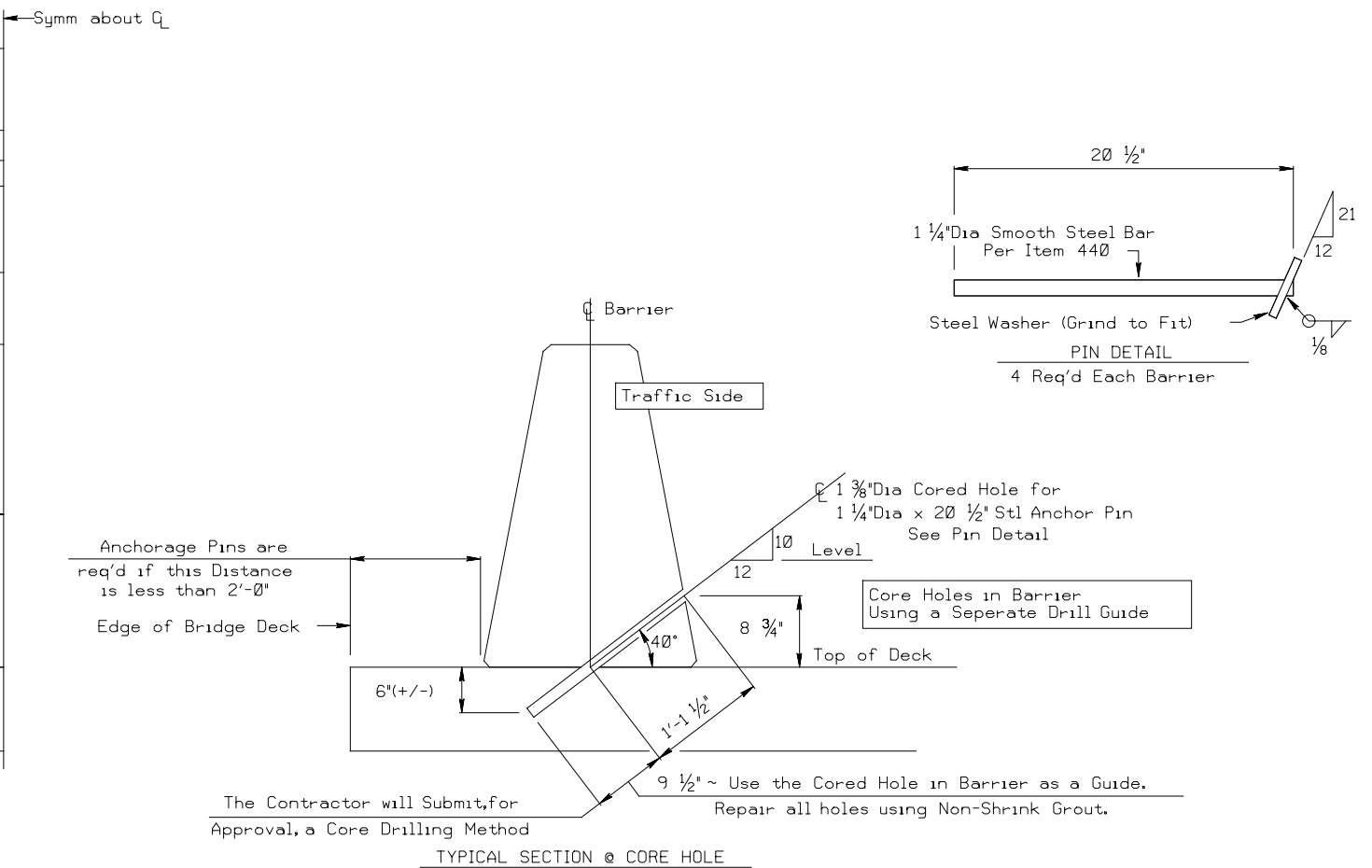


PRECAST SINGLE SLOPE CONCRETE BARRIER (J-J HOOK CONNECTION) PSSCB-JJ

FILE:	STDC3.DGN	DN:	TxDot	CK:	TxDot	DW:	TxDot	CK:	TxDot
©:	XDOT	JANUARY 2005	DIST:	FED REG	PROJECT NO.:				
REVISIONS	HOUSTON	6							
12/2004	COUNTY	CONTROL	SECT	JOB	HIGHWAY				
	FORT BEND	3510	04	055	SH 99				
						90			



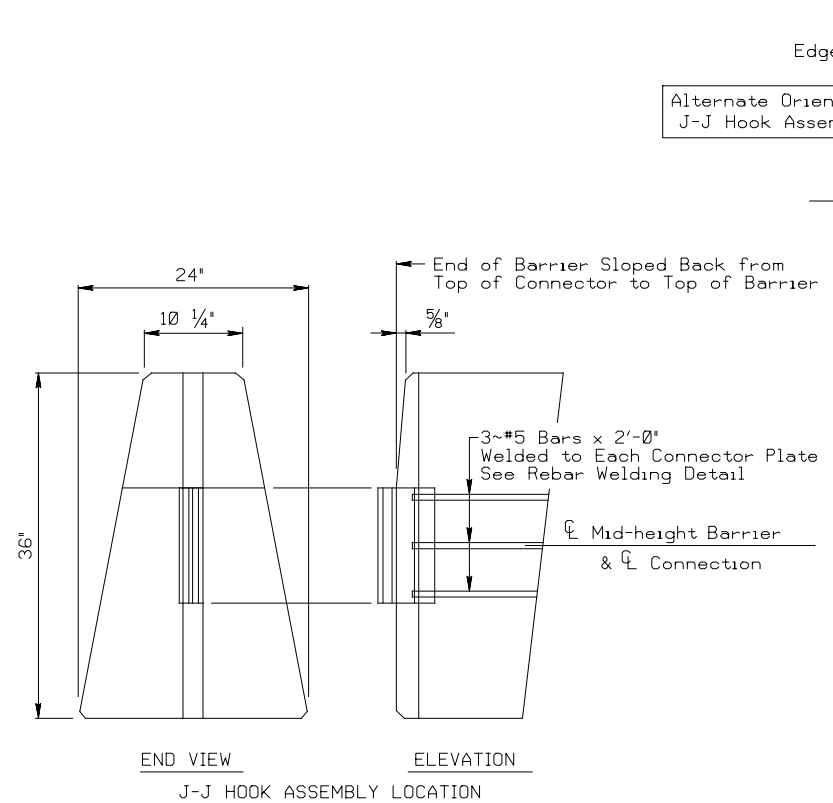
HALF ELEVATION (TRAFFIC SIDE)



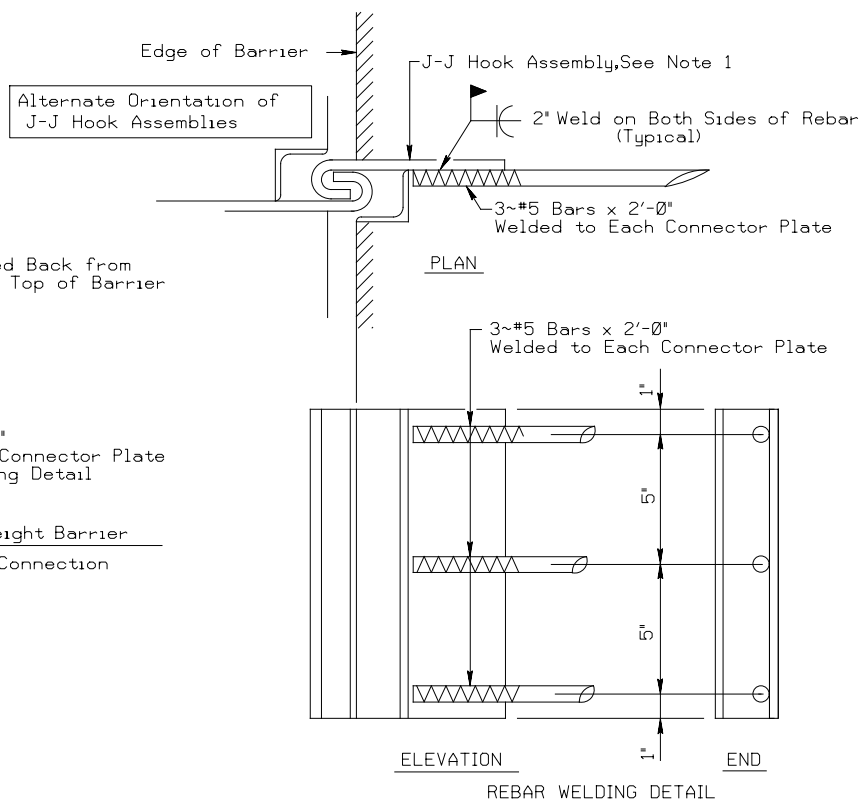
TYPICAL SECTION @ CORE HOLE

**BARRIER ANCHORAGE DETAIL**

For Barrier located on Bridge Deck with less than 2' clearance or transition to dissimilar Barrier



J-J HOOK DETAILS



REBAR WELDING DETAIL

**CONNECTOR NOTES AND SPECIFICATIONS**

- 1) J-J Hooks are a patented design as manufactured by EASI-SET Industries, phone 1-800-547-4045. All steel assemblies for joint shall be galvanized after fabrication in accordance with item 445, "Galvanizing."
- 2) Reinforcing Steel: ASTM A-36 (plain).
- 3) Welding: All Welding to be in accordance with American Welding Society (AWS) Structural Welding Codes. Use weldable rebar per item 440.
- 4) Tolerances: J-J Hook assembly tolerances as per manufacturer. Installation and fabrication tolerances as follows:  
 Barrier length  $+ \frac{1}{4}$ "  
 Connector location  $\pm \frac{1}{16}$ "

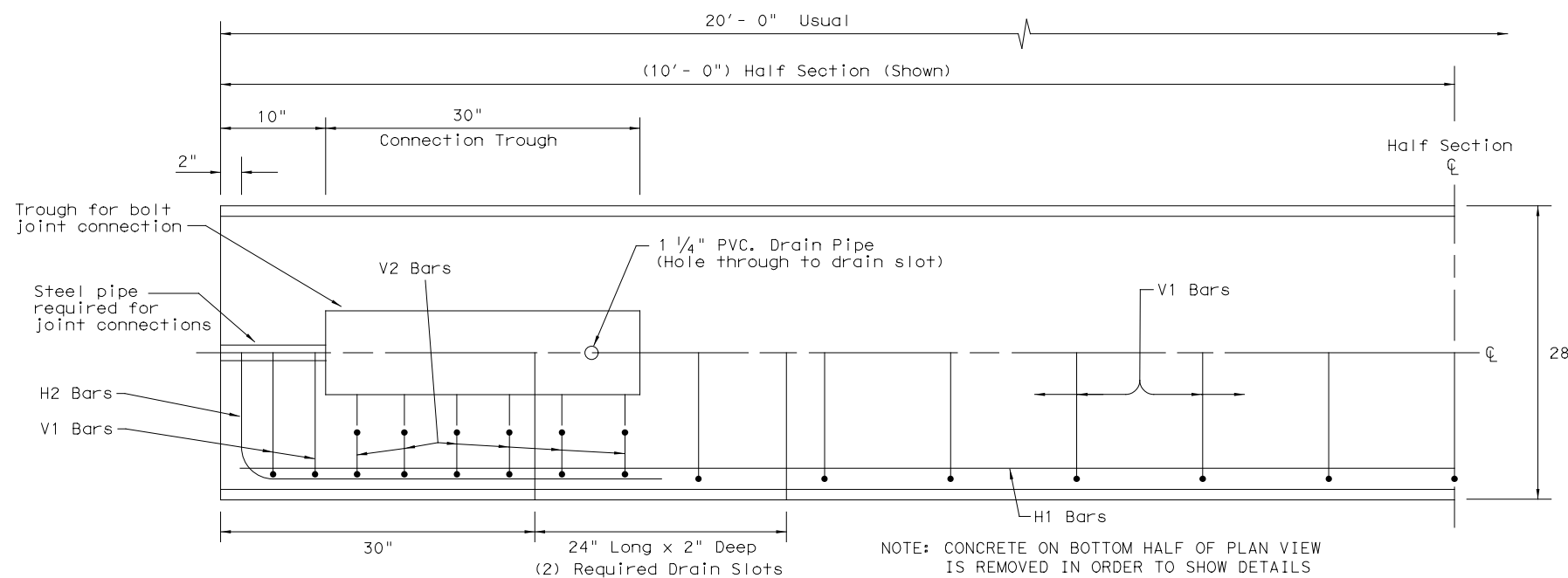


**PRECAST SINGLE SLOPE CONCRETE BARRIER (J-J HOOK CONNECTION) PSSCB-JJ**

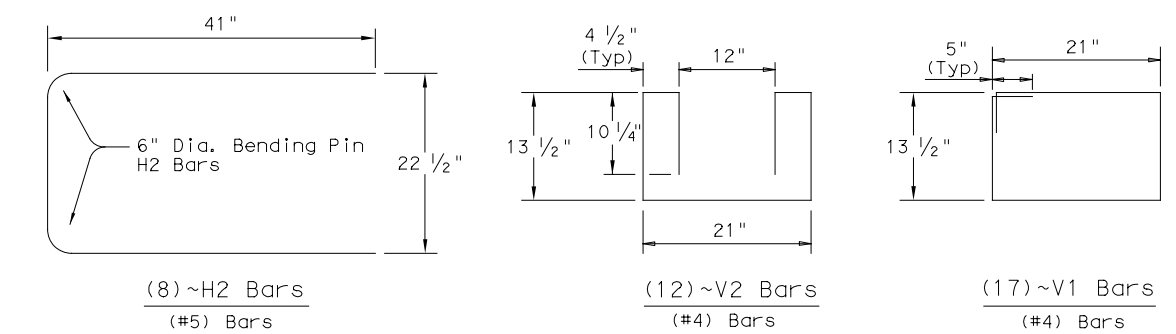
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©x:DOT JANUARY 2005	DIST	FED REG	PROJECT NO.	SHEET
12/2004	HOUSTON	6		91
COUNTY	CONTROL	SECT	JOB	HIGHWAY
FORT BEND	3510	04	055	SH 99

R = Radius  
Dia = Diameter

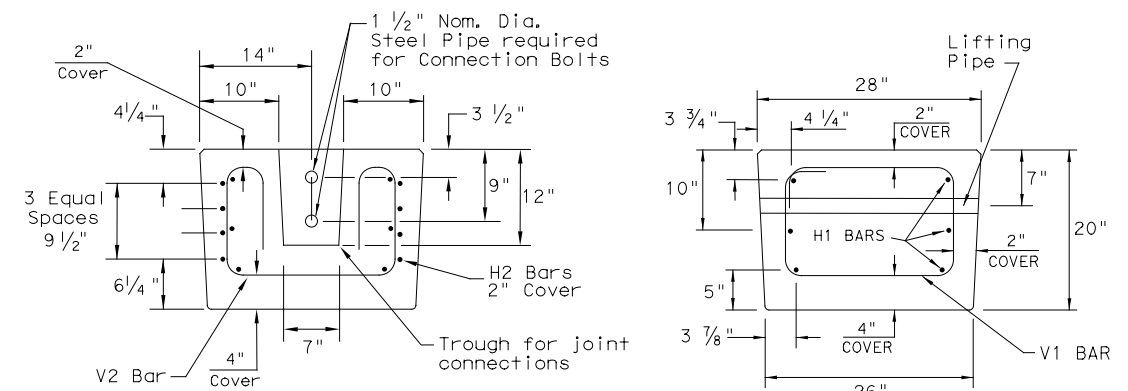
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.



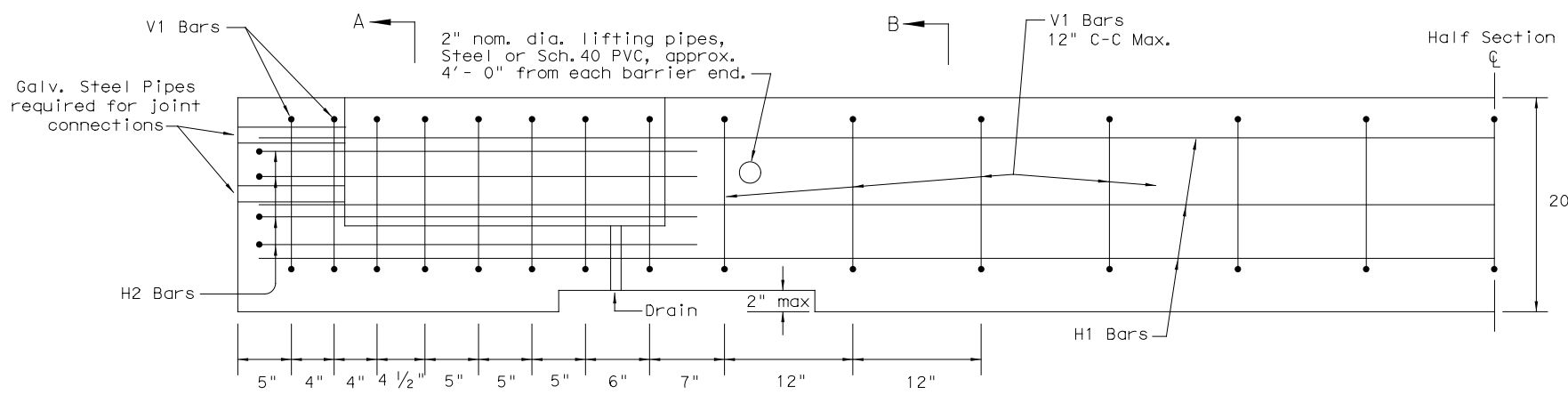
PLAN  
(TYPE 1) BARRIER SEGMENT  
(SYMMETRICAL ABOUT CENTER LINES)



REINFORCING STEEL DETAILS  
TYPE 1 - BARRIER SEGMENT  
Note: Use 2" Dia. Bending Pin, unless otherwise shown



SECTION A-A  
SECTION B-B



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

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

**FOR CONTRACTORS INFORMATION ONLY**

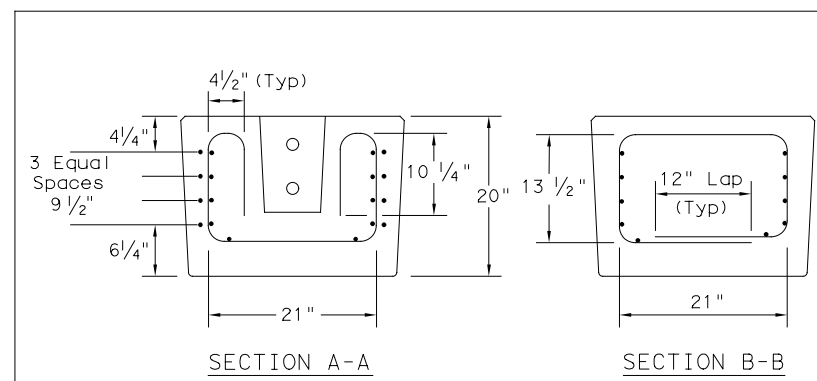
(TYPE 1) APPROX. QUANTITIES 20 FT. SECTION		
CONCRETE	CY	2.6
REINFORCING STEEL	LBS	330
TOTAL BARRIER WT.	LBS	11000

**(WWR) GENERAL NOTES**

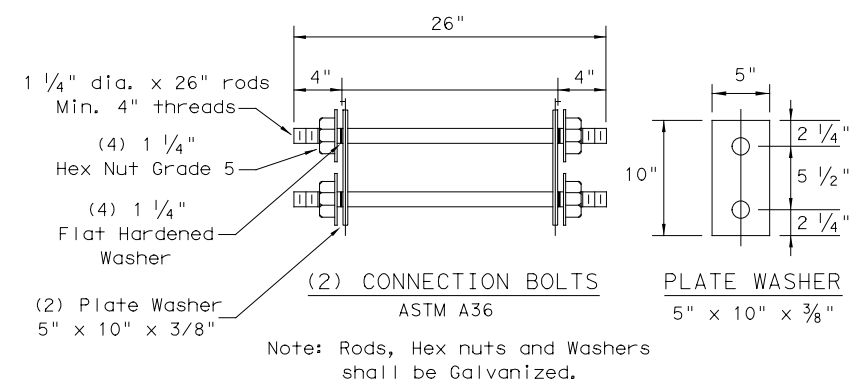
1. Deformed Welded Wire Reinforcement shall conform to ASTM A497.
2. Welded wire cage may be cut or bent, if necessary, but must be approved by the Engineer.
3. Combinations of reinforcing steel and WWR are permitted, as directed by the Engineer. The dimensions from the end of the barrier section to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

**REQUIRED (WWR) WIRE DESIGN**

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



WELDED WIRE REINFORCEMENT (WWR) - OPTIONAL REINFORCING



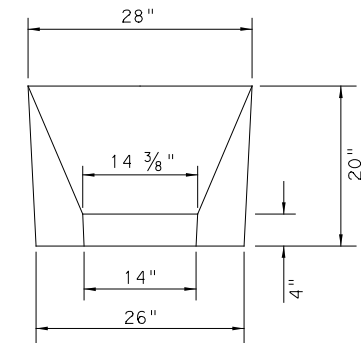
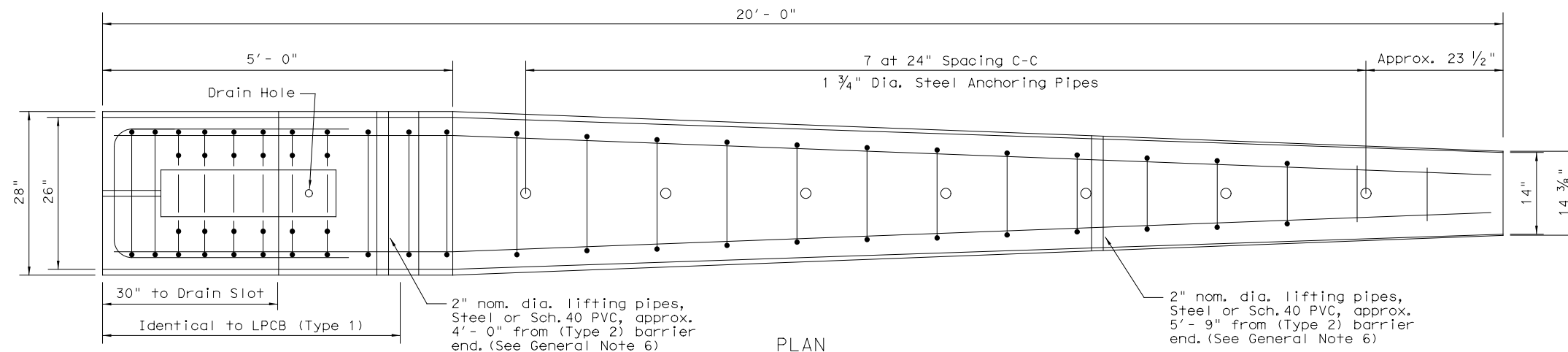
**Texas Department of Transportation**  
Design Division Standard

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

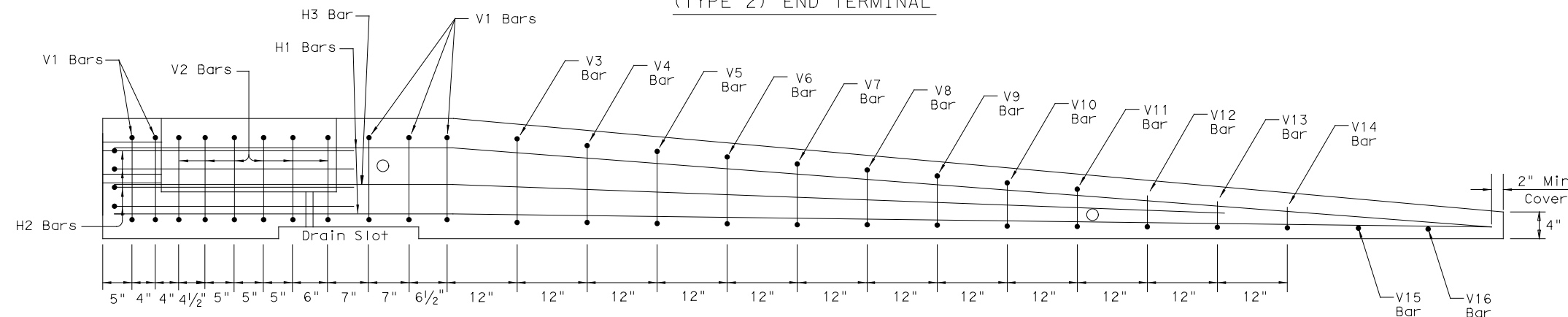
FILE: lpcb13.dgn	DN: TxDOT	CK: AM	DW: VP	CK:
©TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	3510	04	055	SH 99
	DIST	COUNTY	SHEET NO.	
	HOU	FORT BEND	92	

DATE:  
FILE:

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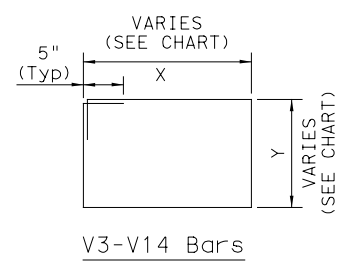
APPROACH VIEW



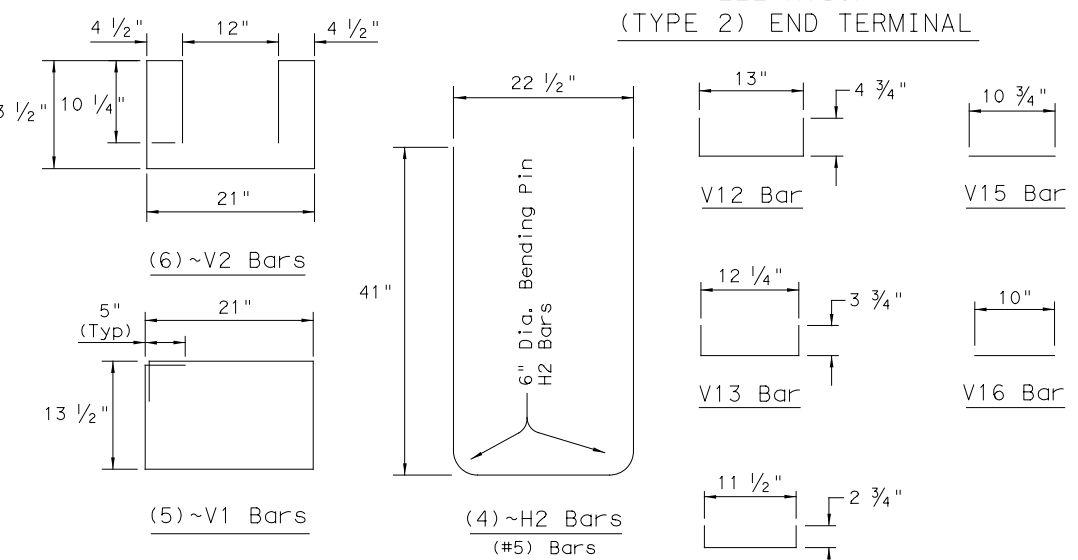
PLAN (TYPE 2) END TERMINAL

ELEVATION (TYPE 2) END TERMINAL

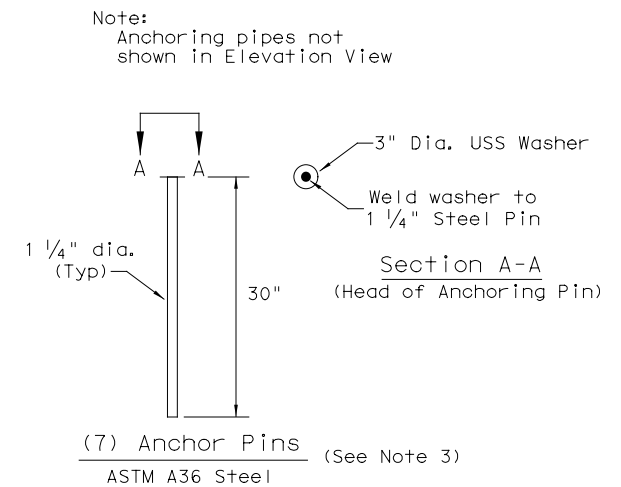
- TYPE 2 - NOTES**
1. Welded wire reinforcement (WWR) is "not" an option for Type 2 Barrier.
  2. Type 2 Barrier shall be used as an end treatment for the Type 1 barrier segments, when applicable.
  3. The end treatment can be used without the anchor pins in locations that can accommodate approximately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



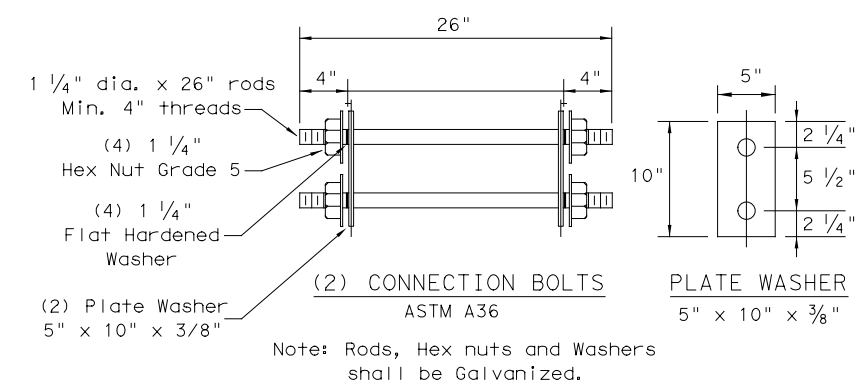
BAR (#4)	X (IN.)	Y (IN.)
V3 BAR	20 1/4	14 1/2
V4 BAR	19 1/2	13 1/2
V5 BAR	18 1/2	12 1/4
V6 BAR	17 1/2	11 1/4
V7 BAR	17	10 1/4
V8 BAR	16 1/4	9
V9 BAR	15 1/2	8
V10 BAR	14 1/2	7
V11 BAR	13 3/4	6



REINFORCING STEEL DETAILS  
TYPE 2 - END TERMINAL



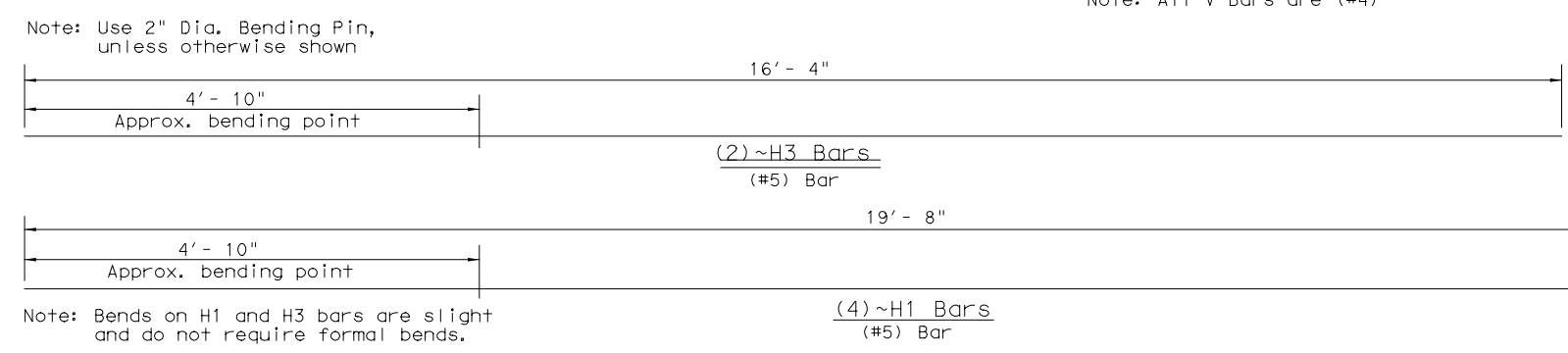
(7) Anchor Pins  
ASTM A36 Steel (See Note 3)



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

FOR CONTRACTORS INFORMATION ONLY

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



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

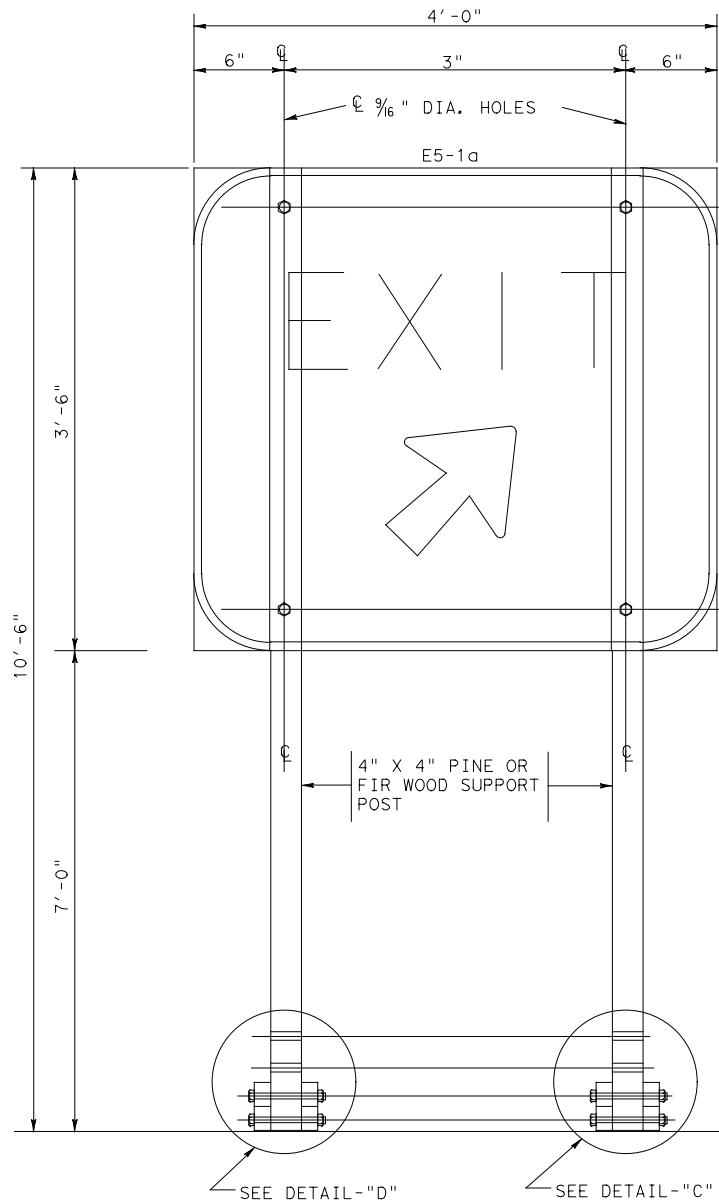
SHEET 2 OF 2

**Texas Department of Transportation** Design Division Standard

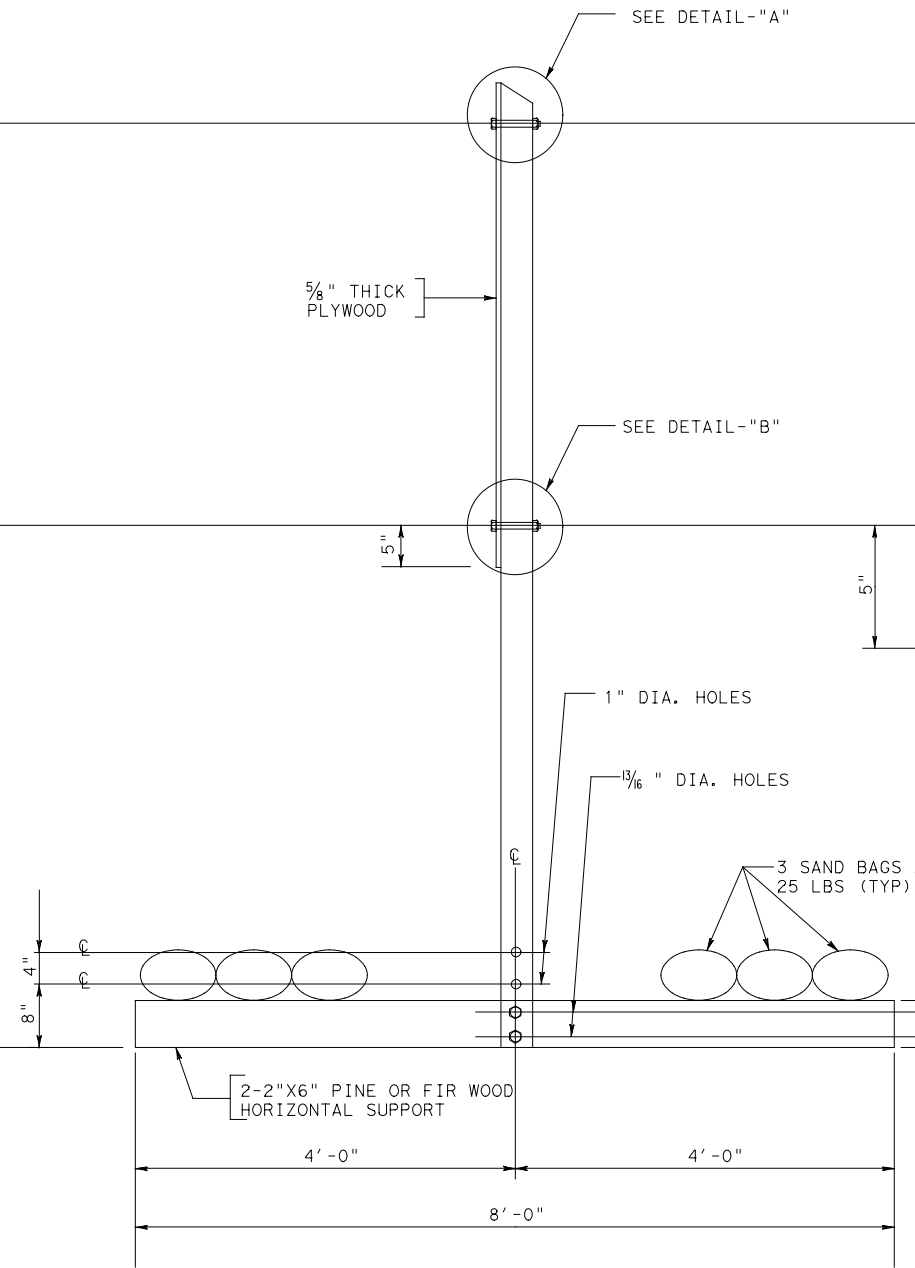
**LOW PROFILE CONCRETE BARRIER PRECAST BARRIER (TYPE 2) LPCB-13**

FILE: lpcb13.dgn	DN: TxDOT	CK: AM	DW: VP	CK:
© TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	3510	04	055	SH 99
DIST	COUNTY		SHEET NO.	
HOU	FORT BEND		93	

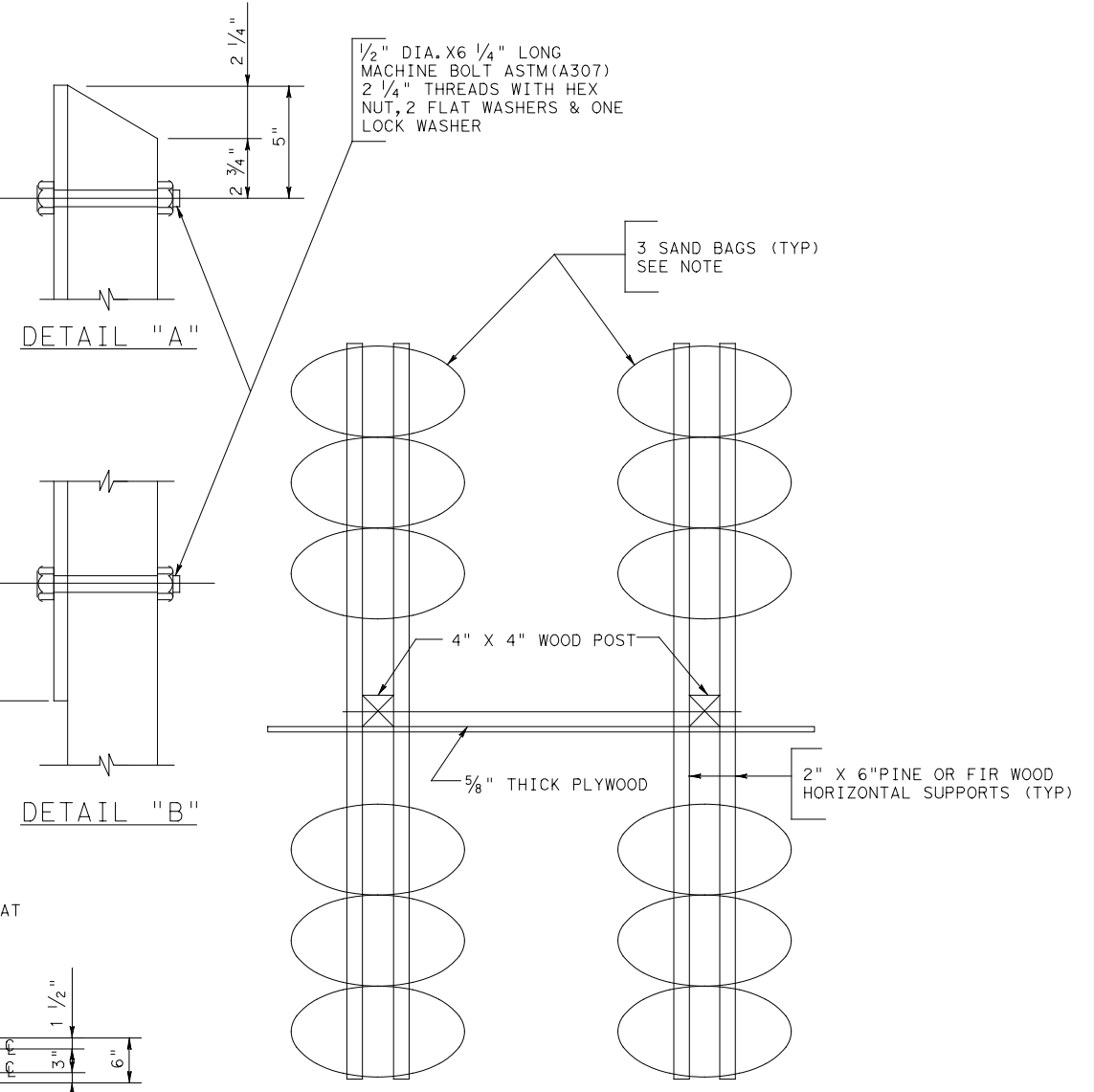
DATE: FILE:



FRONT VIEW



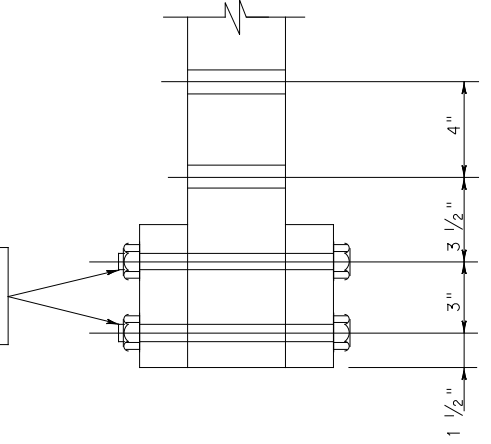
SIDE VIEW



TOP VIEW

NOTE:  
 PLACE SAND BAGS EQUALING 75 LBS'  
 3 BAGS AT 25 LBS. ON EACH END OF  
 WOOD HORIZONTAL SUPPORTS.

3/4" DIA. X 10 1/2" LONG  
 MACHINE BOLT ASTM(A307)  
 2 1/2" THREADS WITH HEX  
 NUT, 2 FLAT WASHERS & ONE  
 LOCK WASHER

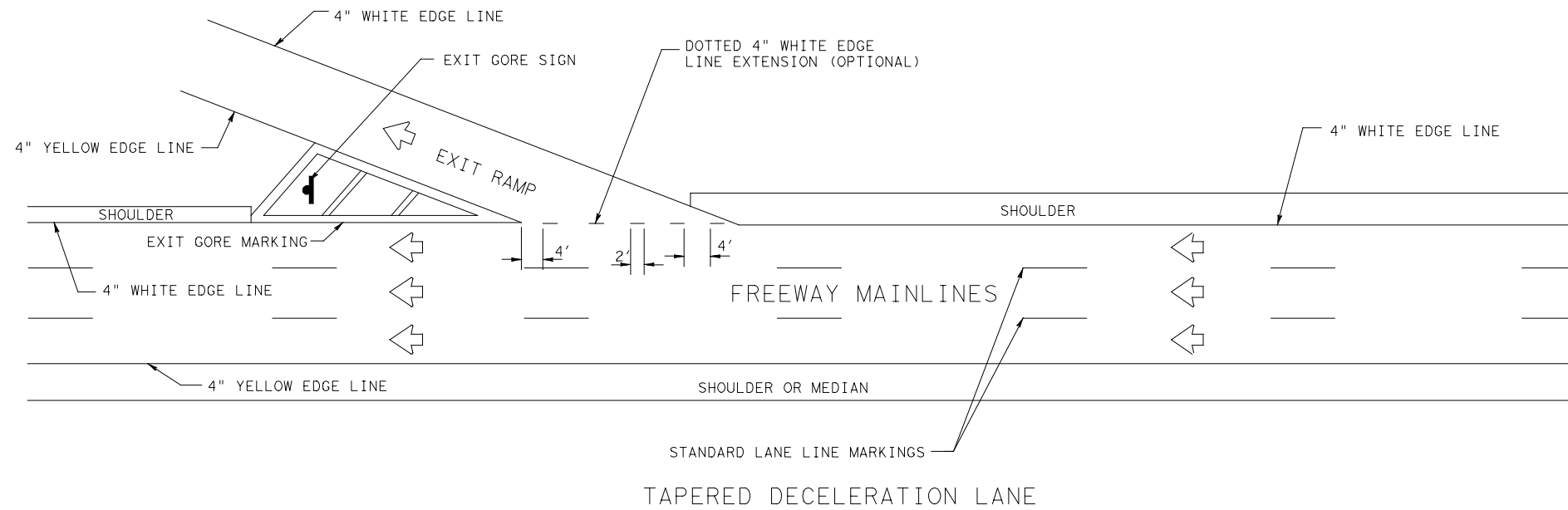


DETAIL "C" AS SHOWN  
 DETAIL "D" OPP. HAND

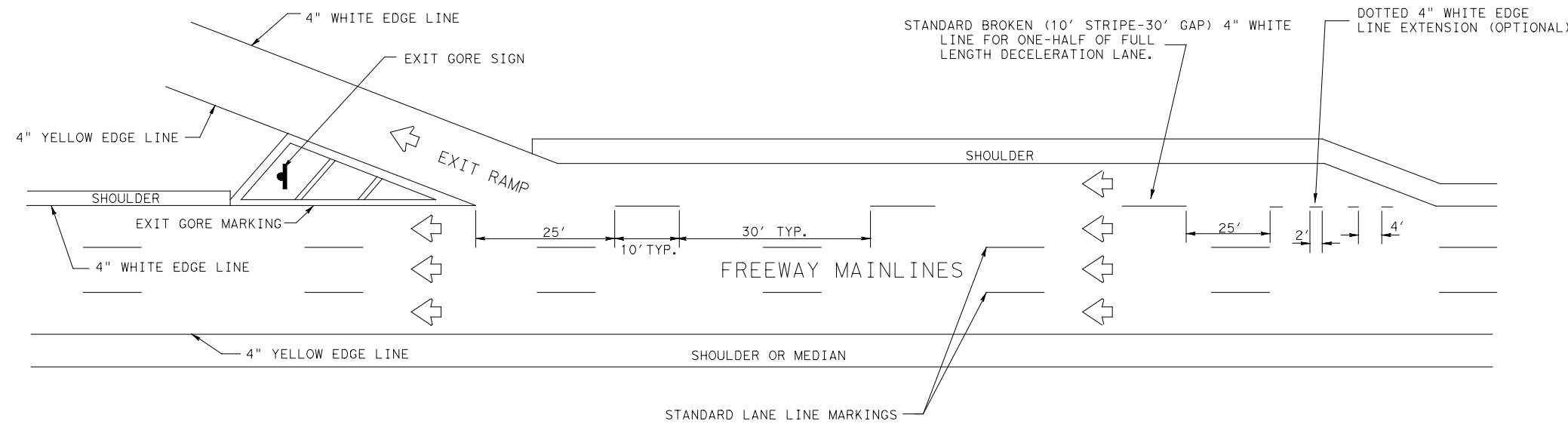
TEMPORARY EXIT GORE SIGN

TEGS TC6000-96

FILE:	DN:	CK:	DW:	CK:
© TxDOT	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS REV. 3/2010 Title	HOU	6		94
COUNTY	CONTROL	SECT	JOB	HIGHWAY
FORT BEND	3510	04	055	SH 99



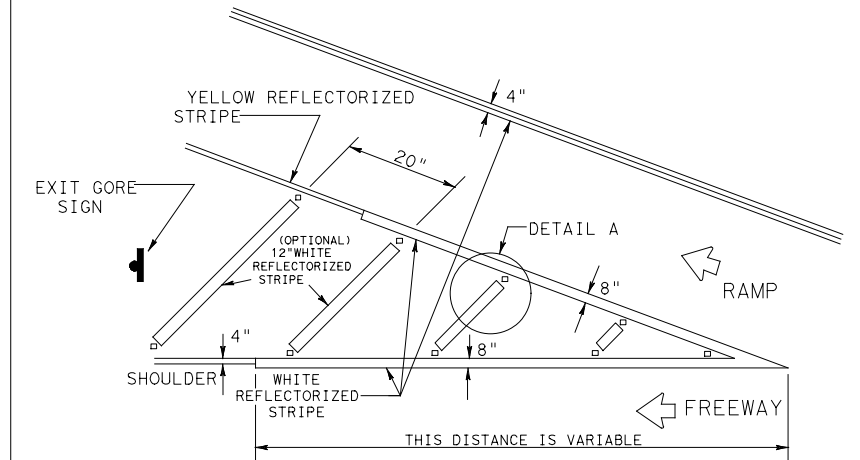
TAPERED DECELERATION LANE



PARALLEL DECELERATION LANE

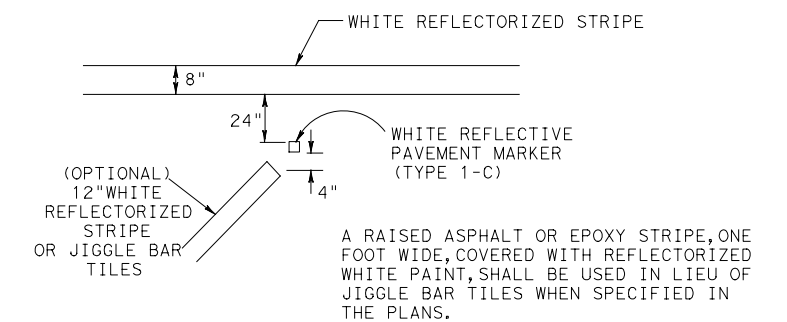
TYPICAL EXIT RAMP MARKINGS

THE ABOVE EXIT RAMP MARKINGS SHALL BE APPLIED ONLY ON ONE LANE EXIT RAMP 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



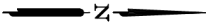
EXIT GORE PAVEMENT MARKINGS

EGPM TC6001-04

FILE#	DN#	CK#	DW#	CK#
© TxDOT	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS	HOU	6		95
	COUNTY	CONTROL	SECT	JOB
	FORT BEND	3510	04	055
				HIGHWAY
				SH 99



# THOMAS HOBERMAKER SURVEY A-190



CONVENTIONAL SIGNS

EXIST ROW

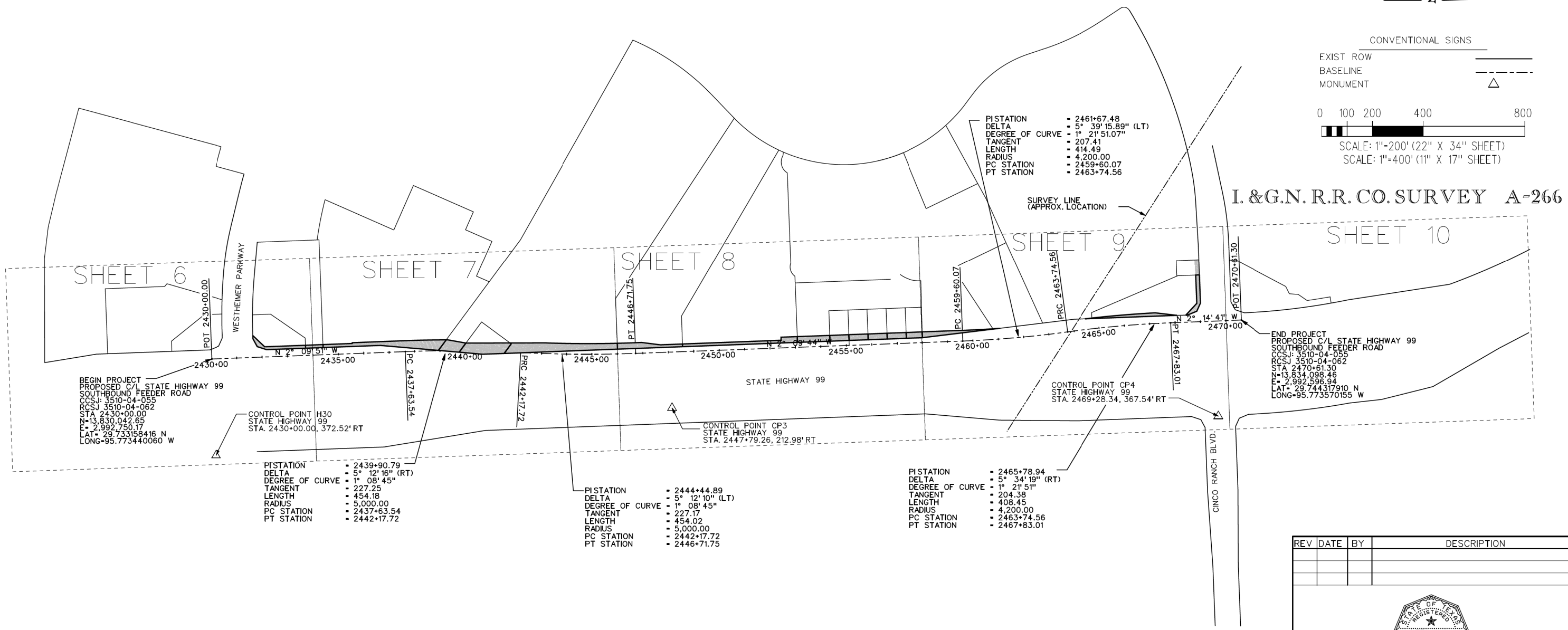
BASELINE

MONUMENT

0 100 200 400 800

SCALE: 1"=200' (22" X 34" SHEET)

SCALE: 1"=400' (11" X 17" SHEET)



BEGIN PROJECT  
PROPOSED C/L STATE HIGHWAY 99  
SOUTHBOUND FEEDER ROAD  
CCSJ: 3510-04-055  
RCSJ: 3510-04-062  
STA 2430+00.00  
N=13,830,042.65  
E=2,992,750.17  
LAT=29.733158416 N  
LONG=95.773440060 W

CONTROL POINT H30  
STATE HIGHWAY 99  
STA. 2430+00.00, 372.52' RT

PI STATION = 2439+90.79  
DELTA = 5° 12' 16" (RT)  
DEGREE OF CURVE = 1° 08' 45"  
TANGENT = 227.25  
LENGTH = 454.18  
RADIUS = 5,000.00  
PC STATION = 2437+63.54  
PT STATION = 2442+17.72

PI STATION = 2444+44.89  
DELTA = 5° 12' 10" (LT)  
DEGREE OF CURVE = 1° 08' 45"  
TANGENT = 227.17  
LENGTH = 454.02  
RADIUS = 5,000.00  
PC STATION = 2442+17.72  
PT STATION = 2446+71.75

PI STATION = 2461+67.48  
DELTA = 5° 39' 15.89" (LT)  
DEGREE OF CURVE = 1° 21' 51.07"  
TANGENT = 207.41  
LENGTH = 414.49  
RADIUS = 4,200.00  
PC STATION = 2459+60.07  
PT STATION = 2463+74.56

CONTROL POINT CP4  
STATE HIGHWAY 99  
STA. 2469+28.34, 367.54' RT

PI STATION = 2465+78.94  
DELTA = 5° 34' 19" (RT)  
DEGREE OF CURVE = 1° 21' 51"  
TANGENT = 204.38  
LENGTH = 408.45  
RADIUS = 4,200.00  
PC STATION = 2463+74.56  
PT STATION = 2467+83.01

END PROJECT  
PROPOSED C/L STATE HIGHWAY 99  
SOUTHBOUND FEEDER ROAD  
CCSJ: 3510-04-055  
RCSJ: 3510-04-062  
STA 2470+61.30  
N=13,834,098.46  
E=2,992,596.94  
LAT=29.74437910 N  
LONG=95.773570155 W

ROAD	STATION	N COORDINATE	E COORDINATE
WESTHEIMER PARKWAY	2430+98.38	13,830,147.04	2,992,907.44
CINCO RANCH BLVD.	2469+62.61	13,834,006.60	2,992,772.80

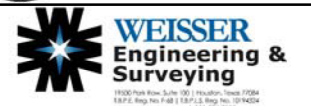
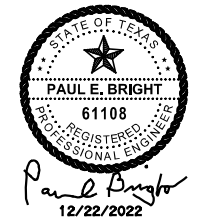
NO.	TYPE	N COORDINATE	E COORDINATE	ELEVATION
H30	FND. 5/8 " I.R. W/ TXDOT ALUMINUM CAP	13,830,060.06	2,993,129.33	108.93
CP3	FND. 5/8 " I.R. W/ TXDOT ALUMINUM CAP	13,831,856.65	2,992,943.05	112.72
CP4	FND. 5/8 " I.R. W/ TXDOT ALUMINUM CAP	13,834,007.65	2,992,975.40	117.82

- NOTES:
- ALL BEARINGS AND COORDINATES ARE BASED ON THE TEXAS COORDINATE SYSTEM, SOUTH CENTRAL ZONE, NORTH AMERICAN DATUM OF 1983 (NAD 83), 2011 ADJUSTMENT, EPOCH 2010.00. ALL DISTANCES AND COORDINATES ARE SURFACE AND MAY BE CONVERTED TO GRID BY DIVIDING BY A COMBINED ADJUSTMENT FACTOR OF 1.00013, ALL MEASUREMENTS ARE IN U.S. SURVEY FEET.
  - THE PRIMARY CONTROL FOR THIS PROJECT ARE TXDOT MONUMENTS.
  - ALL COORDINATES AND ELEVATIONS SHOWN HEREON ARE ESTABLISHED FROM TXDOT CONTROL MONUMENTS H-30, CP-3 AND CP-4 PREPARED BY SAM ENGINEERING DATED JULY 13, 2017
  - ALL ELEVATIONS SHOWN HEREON ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM (NAVD88) GEOID12A.

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

FROM POINT	BEARING	DISTANCE	TO POINT
H30	N 05° 55' 10" W	1,806.22'	CP3
CP3	N 00° 51' 42" E	2,151.24'	CP4

REV	DATE	BY	DESCRIPTION



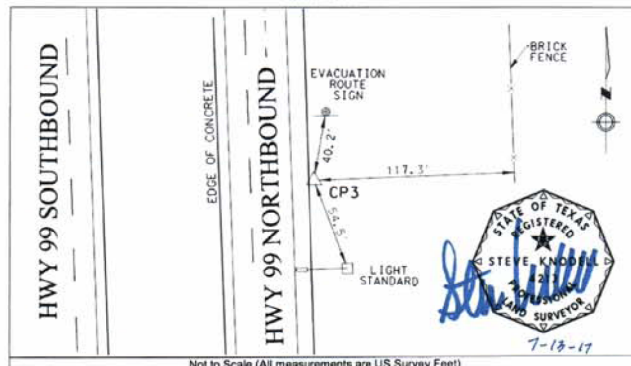
SH 99 (GRAND PARKWAY)  
SOUTHBOUND FRONTAGE ROAD  
WESTHEIMER PKWY. TO CINCO RANCH BLVD.  
HORIZONTAL AND VERTICAL  
CONTROL INDEX SHEET  
SHEET 1 OF 2

DESIGNED BY:	DRAWN BY:		
CHECKED BY:	CHECKED BY: JH		
CONT 3510	SEC 04	JOB 062	HWY NO. SH 99
FED. RD. DIV. NO. 6	PROJECT NO.	SHEET NO.	
STATE TEXAS	STATE DIST. 12	COUNTY FORT BEND	96

FILE: 3510-04-055\_S04.dgn  
DATE: 12/19/2022

Highway / Location	SH-99	Station Name	CP3
TxDOT CSJ No.	3510-04-019	Condition	Good
County	Fort Bend	Established By	Civil Concepts, Inc. Surveying and Mapping, LLC
State	Texas	Re-established By	Surveying and Mapping, LLC
TxDOT Survey Level	3	Date Established	January, 2008
Intervisible Stations	H28, H30	Date Re-established	May, 2017
Unit of Measure	US Survey Feet	Survey Method Hz.	GPS OBS (RTN)
Hz. Datum	NAD 83 (2011)	Survey Method Vt.	3-Wire Digital
Hz. Adjustment	Epoch 2010.00	Vt. Datum	NAVD 88
Projection Zone	4204-SC	Vt. Adjustment	N/A
Geoid Model	N/A	Geoid Model	N/A
Monument(s) Held Hz	Established with GPS OBS (VRS)		
Monument(s) Held Vt	Established with GPS OBS (VRS), Geoid12A		
Geodetic Position		Surface Coordinates	
Lat	N29°44'17.2672"	North	13,830,058.74
Long	W95°46'21.6297"	East	2,992,554.02
Elevation in US Survey Feet	Top of Cap = 112.72'	Natural Ground =	113.0'
TxDOT Surface Adjustment Factor	1.00013		
Mapping Angle	1°34'52"	Scale Factor	0.999887920
Mark Logo	None	Stamping	CP3
Type of Marker	5/8" Iron Rod with TxDOT Aluminum Cap	Combined Factor	0.999886843

Station Sketch



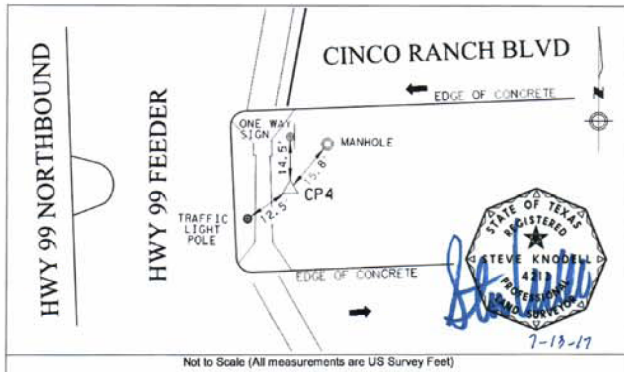
Not to Scale (All measurements are US Survey Feet)

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Control Point Data Sheet

Highway / Location	SH-99	Station Name	CP4
TxDOT CSJ No.	3510-04-019	Condition	Good
County	Fort Bend	Established By	Civil Concepts, Inc. Surveying and Mapping, LLC (SAM)
State	Texas	Re-established By	Surveying and Mapping, LLC (SAM)
TxDOT Survey Level	3	Date Established	January, 2008
Intervisible Stations	H27, H28, N0800126	Date Re-established	May, 2017
Unit of Measure	US Survey Feet	Survey Method Hz.	GPS OBS (RTN)
Hz. Datum	NAD 83 (2011)	Survey Method Vt.	3-Wire Digital
Hz. Adjustment	Epoch 2010.00	Vt. Datum	NAVD 88
Projection Zone	4204-SC	Vt. Adjustment	N/A
Geoid Model	N/A	Geoid Model	N/A
Monument(s) Held Hz	Established with GPS OBS (VRS)		
Monument(s) Held Vt	Established with GPS OBS (VRS), Geoid12A		
Geodetic Position		Surface Coordinates	
Lat	N29°44'38.5426"	North	13,832,209.46
Long	W95°46'20.5997"	East	2,992,586.36
Elevation in US Survey Feet	Top of Cap = 117.82'	Natural Ground =	118.1'
TxDOT Surface Adjustment Factor	1.00013		
Mapping Angle	1°34'52"	Scale Factor	0.999888649
Mark Logo	None	Stamping	CP4
Type of Marker	5/8" Iron Rod with TxDOT Aluminum Cap	Combined Factor	0.999887325

Station Sketch



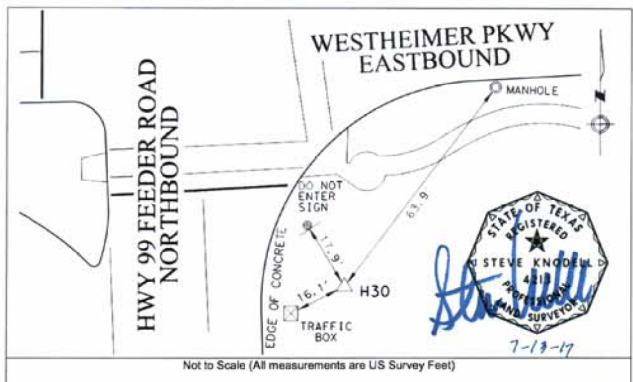
Not to Scale (All measurements are US Survey Feet)

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Control Point Data Sheet

Highway / Location	SH-99	Station Name	H30
TxDOT CSJ No.	3510-04-019	Condition	Set
County	Fort Bend	Established By	Surveying and Mapping, LLC
State	Texas	Re-established By	Surveying and Mapping, LLC
TxDOT Survey Level	3	Date Established	May, 2017
Intervisible Stations	CP3, CP1	Survey Method Hz.	GPS OBS (RTN)
Unit of Measure	US Survey Feet	Survey Method Vt.	3-Wire Digital
Hz. Datum	NAD 83 (2011)	Vt. Datum	NAVD 88
Hz. Adjustment	Epoch 2010.00	Vt. Adjustment	N/A
Projection Zone	4204-SC	Geoid Model	N/A
Monument(s) Held Hz	Established with GPS OBS (VRS)		
Monument(s) Held Vt	Established with GPS OBS (VRS), Geoid12A		
Geodetic Position		Surface Coordinates	
Lat	N29°43'59.4390"	North	13,828,262.39
Long	W95°46'20.0800"	East	2,992,740.27
Elevation in US Survey Feet	Top of Cap = 108.93'	Natural Ground =	109.2'
TxDOT Surface Adjustment Factor	1.00013		
Mapping Angle	1°34'53"	Scale Factor	0.999887317
Mark Logo	None	Stamping	H30
Type of Marker	5/8" Iron Rod with TxDOT Aluminum Cap	Combined Factor	0.999886411

Station Sketch



Not to Scale (All measurements are US Survey Feet)

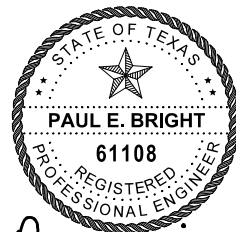
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Control Point Data Sheet

NOTES:

NOTES:

1. ALL BEARINGS AND COORDINATES ARE BASED ON THE TEXAS COORDINATE SYSTEM, SOUTH CENTRAL ZONE, NORTH AMERICAN DATUM OF 1983 (NAD 83), 2011 ADJUSTMENT, EPOCH 2010.00. ALL DISTANCES AND COORDINATES ARE SURFACE AND MAY BE CONVERTED TO GRID BY DIVIDING BY A COMBINED ADJUSTMENT FACTOR OF 1.00013, ALL MEASUREMENTS ARE IN U.S. SURVEY FEET.
2. THE PRIMARY CONTROL FOR THIS PROJECT ARE TxDOT MONUMENTS.
3. ALL COORDINATES AND ELEVATIONS SHOWN HEREON ARE ESTABLISHED FROM TxDOT CONTROL MONUMENTS H-30, CP-3 AND CP-4 PREPARED BY SAM ENGINEERING DATED JULY 13, 2017
4. ALL ELEVATIONS SHOWN HEREON ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM (NAVD88) GEOID12A.



Paul E. Bright  
12/22/2022

Highway/Location	SH-99	Station Name	CP3
TxDOT Project No.	3510-04-019		

To Reach Description

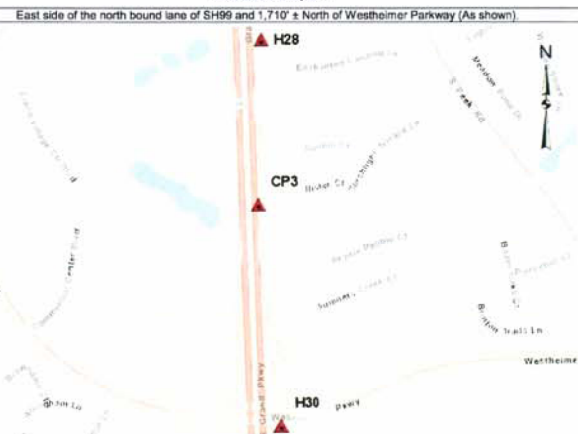


Photo 1-Station Detail

Photo 2 - Station Area Picture



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Control Point Data Sheet

Highway/Location	SH-99	Station Name	CP4
TxDOT Project No.	3510-04-019		

To Reach Description

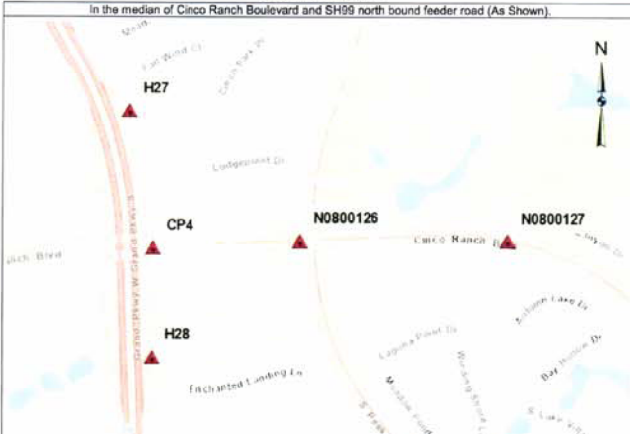


Photo 1-Station Detail

Photo 2 - Station Area Picture



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Control Point Data Sheet

Highway/Location	SH-99	Station Name	H30
TxDOT Project No.	3510-04-019		

To Reach Description

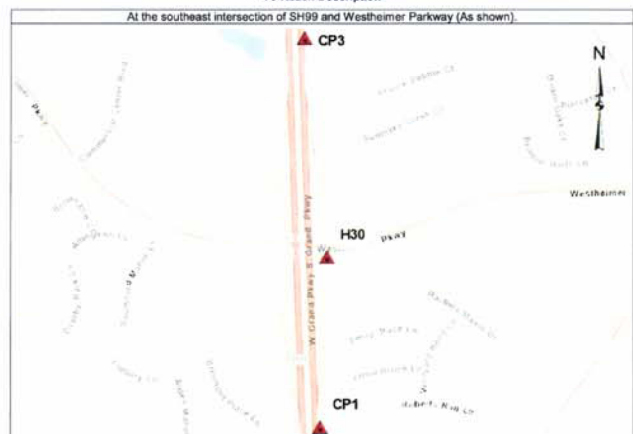


Photo 1-Station Detail

Photo 2 - Station Area Picture



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Control Point Data Sheet

REV	DATE	BY	DESCRIPTION



SH 99 (GRAND PARKWAY)  
SOUTHBOUND FRONTAGE ROAD  
WESTHEIMER PKWY. TO CINCO RANCH BLVD.  
HORIZONTAL AND  
VERTICAL CONTROL

SHEET 2 OF 2

DESIGNED BY:	DRAWN BY: CAB		
CHECKED BY:	CHECKED BY: JH		
CONT	SEC	JOB	HWY NO.
3510	04	062	SH 99
FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6			
STATE	STATE DIST.	COUNTY	97
TEXAS	12	FORT BEND	

SH 99 SBFR

Beginning chain SBFR description

Point SBFR01 N 13,830,042.6519 E 2,992,750.1704 Sta 2430+00.00

Course from SBFR01 to PC SBFR1 N 2° 09' 50.82" W Dist 763.5410

Curve Data  
\*-----\*

Curve SBFR1  
 P.I. Station 2439+90.79 N 13,831,032.7342 E 2,992,712.7562  
 Delta = 5° 12' 16.41" (RT)  
 Degree = 1° 08' 45.30"  
 Tangent = 227.2480  
 Length = 454.1835  
 Radius = 5,000.0000  
 External = 5.1615  
 Long Chord = 454.0273  
 Mid. Ord. = 5.1562  
 P.C. Station 2437+63.54 N 13,830,805.6483 E 2,992,721.3376  
 P.T. Station 2442+17.72 N 13,831,259.6623 E 2,992,724.8097  
 C.C. N 13,830,994.4582 E 2,997,717.7714  
 Back = N 2° 09' 50.82" W  
 Ahead = N 3° 02' 25.59" E  
 Chord Bear = N 0° 26' 17.39" E

Curve Data  
\*-----\*

Curve SBFR2  
 P.I. Station 2444+44.89 N 13,831,486.5097 E 2,992,736.8588  
 Delta = 5° 12' 09.75" (LT)  
 Degree = 1° 08' 45.30"  
 Tangent = 227.1671  
 Length = 454.0220  
 Radius = 5,000.0000  
 External = 5.1578  
 Long Chord = 453.8660  
 Mid. Ord. = 5.1525  
 P.C. Station 2442+17.72 N 13,831,259.6623 E 2,992,724.8097  
 P.T. Station 2446+71.75 N 13,831,713.5150 E 2,992,728.2878  
 C.C. N 13,831,524.8664 E 2,987,731.8479  
 Back = N 3° 02' 25.59" E  
 Ahead = N 2° 09' 44.16" W  
 Chord Bear = N 0° 26' 20.72" E

Course from PT SBFR2 to PC SBFR3 N 2° 09' 44.16" W Dist 1,288.3235

Curve Data  
\*-----\*

Curve SBFR3  
 P.I. Station 2461+67.48 N 13,833,208.1869 E 2,992,671.8541  
 Delta = 5° 39' 15.89" (LT)  
 Degree = 1° 21' 51.07"  
 Tangent = 207.4134  
 Length = 414.4902  
 Radius = 4,200.0000  
 External = 5.1183  
 Long Chord = 414.3220  
 Mid. Ord. = 5.1121  
 P.C. Station 2459+60.07 N 13,833,000.9212 E 2,992,679.6798  
 P.T. Station 2463+74.56 N 13,833,413.6732 E 2,992,643.6450  
 C.C. N 13,832,842.4564 E 2,988,482.6702  
 Back = N 2° 09' 44.16" W  
 Ahead = N 7° 49' 00.05" W  
 Chord Bear = N 4° 59' 22.10" W

SH 99 SBFR (CONTINUED)

Curve Data  
\*-----\*

Curve SBFR4  
 P.I. Station 2465+78.94 N 13,833,616.1580 E 2,992,615.8480  
 Delta = 5° 34' 19.04" (RT)  
 Degree = 1° 21' 51.07"  
 Tangent = 204.3839  
 Length = 408.4456  
 Radius = 4,200.0000  
 External = 4.9700  
 Long Chord = 408.2847  
 Mid. Ord. = 4.9641  
 P.C. Station 2463+74.56 N 13,833,413.6732 E 2,992,643.6450  
 P.T. Station 2467+83.01 N 13,833,820.3851 E 2,992,607.8427  
 C.C. N 13,833,984.8899 E 2,996,804.6198  
 Back = N 7° 49' 00.05" W  
 Ahead = N 2° 14' 41.01" W  
 Chord Bear = N 5° 01' 50.53" W

Course from PT SBFR4 to SBFR02 N 2° 14' 41.01" W Dist 278.2901

Point SBFR02 N 13,834,098.4616 E 2,992,596.9427 Sta 2470+61.30

Ending chain SBFR description

1/23/2023 10:55:08 AM D:\t\tdes\1-pw\_bentley.com\teds\1-pw-01\Documents\Projects\2018\2018-2042-01 - Ft Bend Grand Parkway Frontage Rd\CSJ\_351004055\SH99\DesignData\4 - Design\Plan\_Set\3\_Roadway\055PHD01.dgn



**TEDSI INFRASTRUCTURE GROUP**  
 Consulting Engineers  
 738 Hwy 6 South, Suite 430  
 Houston, Texas 77079  
 (832) 619-1000  
 TBPE F-1640

Texas Department of Transportation  
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SH 99  
 SOUTHBOUND FRONTAGE ROAD  
 WESTHEIMER PKWY TO CINCO RANCH BLVD  
 HORIZONTAL ALIGNMENT DATA

SHEET 1 OF 4

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	98

SH 99 EXIT RAMP

Beginning chain OFFRMP05 description

Curve Data  
\*-----\*

Curve OFFRMP051  
 P.I. Station      10+90.87    N      13,832,729.2875    E      2,992,701.9443  
 Delta            =      3° 28' 11.86" (RT)  
 Degree           =      1° 54' 35.49"  
 Tangent          =      90.8712  
 Length           =      181.6868  
 Radius           =      3,000.0000  
 External         =      1.3759  
 Long Chord       =      181.6590  
 Mid. Ord.        =      1.3753  
 P.C. Station     10+00.00    N      13,832,638.4810    E      2,992,705.3728  
 P.T. Station     11+81.69    N      13,832,820.1350    E      2,992,704.0181  
 C.C.             N      13,832,751.6702    E      2,995,703.2368  
 Back            = N    2° 09' 44.16" W  
 Ahead           = N    1° 18' 27.70" E  
 Chord Bear     = N    0° 25' 38.23" W

Curve Data  
\*-----\*

Curve OFFRMP052  
 P.I. Station      12+72.56    N      13,832,910.9825    E      2,992,706.0919  
 Delta            =      3° 28' 11.86" (LT)  
 Degree           =      1° 54' 35.49"  
 Tangent          =      90.8712  
 Length           =      181.6868  
 Radius           =      3,000.0000  
 External         =      1.3759  
 Long Chord       =      181.6590  
 Mid. Ord.        =      1.3753  
 P.C. Station     11+81.69    N      13,832,820.1350    E      2,992,704.0181  
 P.T. Station     13+63.37    N      13,833,001.7890    E      2,992,702.6634  
 C.C.             N      13,832,888.5998    E      2,989,704.7994  
 Back            = N    1° 18' 27.70" E  
 Ahead           = N    2° 09' 44.16" W  
 Chord Bear     = N    0° 25' 38.23" W

Course from PT OFFRMP052 to PC OFFRMP053 N 2° 09' 44.16" W Dist 106.0026

Curve Data  
\*-----\*

Curve OFFRMP053  
 P.I. Station      16+85.96    N      13,833,324.1415    E      2,992,690.4924  
 Delta            =      4° 57' 37.94" (RT)  
 Degree           =      1° 08' 45.30"  
 Tangent          =      216.5796  
 Length           =      432.8886  
 Radius           =      5,000.0000  
 External         =      4.6885  
 Long Chord       =      432.7534  
 Mid. Ord.        =      4.6841  
 P.C. Station     14+69.38    N      13,833,107.7161    E      2,992,698.6639  
 P.T. Station     19+02.26    N      13,833,540.4628    E      2,992,701.0658  
 C.C.             N      13,833,296.3647    E      2,997,695.1038  
 Back            = N    2° 09' 44.16" W  
 Ahead           = N    2° 47' 53.78" E  
 Chord Bear     = N    0° 19' 04.81" E

Course from PT OFFRMP053 to PC OFFRMP054 N 2° 47' 53.78" E Dist 167.8028

Curve Data  
\*-----\*

Curve OFFRMP054  
 P.I. Station      21+99.84    N      13,833,837.6820    E      2,992,715.5932  
 Delta            =      4° 57' 13.72" (LT)  
 Degree           =      1° 54' 35.49"  
 Tangent          =      129.7713  
 Length           =      259.3809  
 Radius           =      3,000.0000  
 External         =      2.8055  
 Long Chord       =      259.3001  
 Mid. Ord.        =      2.8028  
 P.C. Station     20+70.07    N      13,833,708.0655    E      2,992,709.2578  
 P.T. Station     23+29.45    N      13,833,967.3615    E      2,992,710.7122  
 C.C.             N      13,833,854.5244    E      2,989,712.8350  
 Back            = N    2° 47' 53.78" E  
 Ahead           = N    2° 09' 19.94" W  
 Chord Bear     = N    0° 19' 16.92" E

Ending chain OFFRMP05 description

SH 99 ENTRANCE RAMP

Beginning chain ONRMP04 description

Point EN01                    N 13,830,241.4725 E    2,992,850.9510 Sta      10+00.00

Course from EN01 to EN02 N 3° 18' 04.69" W Dist 600.1200

Point EN02                    N 13,830,840.5966 E    2,992,816.3921 Sta      16+00.12

Course from EN02 to PC SBENTR1 N 2° 24' 36.67" W Dist 450.0044

Curve Data  
\*-----\*

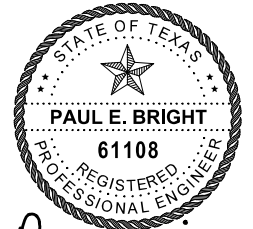
Curve SBENTR1  
 P.I. Station          21+39.94    N      13,831,379.9411    E      2,992,793.6908  
 Delta                =      3° 25' 47.12" (LT)  
 Degree               =      1° 54' 35.49"  
 Tangent             =      89.8176  
 Length              =      179.5815  
 Radius              =      3,000.0000  
 External            =      1.3442  
 Long Chord         =      179.5547  
 Mid. Ord.           =      1.3436  
 P.C. Station        20+50.12    N      13,831,290.2030    E      2,992,797.4679  
 P.T. Station        22+29.71    N      13,831,469.2925    E      2,992,784.5519  
 C.C.                N      13,831,164.0432    E      2,989,800.1218  
 Back                = N    2° 24' 36.67" W  
 Ahead               = N    5° 50' 23.78" W  
 Chord Bear         = N    4° 07' 30.22" W

Course from PT SBENTR1 to PC SBENTR2 N 5° 50' 23.78" W Dist 449.5779

Curve Data  
\*-----\*

Curve SBENTR2  
 P.I. Station          27+75.60    N      13,832,012.3516    E      2,992,729.0075  
 Delta                =      3° 40' 39.62" (RT)  
 Degree               =      1° 54' 35.49"  
 Tangent             =      96.3143  
 Length              =      192.5625  
 Radius              =      3,000.0000  
 External            =      1.5457  
 Long Chord         =      192.5294  
 Mid. Ord.           =      1.5449  
 P.C. Station        26+79.28    N      13,831,916.5371    E      2,992,738.8074  
 P.T. Station        28+71.85    N      13,832,108.5973    E      2,992,725.3735  
 C.C.                N      13,832,221.7864    E      2,995,723.2375  
 Back                = N    5° 50' 23.78" W  
 Ahead               = N    2° 09' 44.16" W  
 Chord Bear         = N    4° 00' 03.97" W

Ending chain ONRMP04 description



Paul E. Bright  
1/19/2023

**TEDSI INFRASTRUCTURE GROUP**  
 Consulting Engineers  
 738 Hwy 6 South, Suite 430  
 Houston, Texas 77079  
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 TBPE F-1640



SH 99  
 SOUTHBOUND FRONTAGE ROAD  
 WESTHEIMER PKWY TO CINCO RANCH BLVD  
 HORIZONTAL ALIGNMENT DATA

SHEET 2 OF 4

FED. RD. DIST. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	99

1/23/2023 10:56:10 AM  
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SH 99 RETAINING WALL (RW-1)

Beginning chain RW-1 description

Point 1100 N 13,830,518.8911 E 2,992,773.9919 Sta 9+75.00  
 Course from 1100 to 1101 N 5° 32' 45.59" W Dist 140.3823  
 Point 1101 N 13,830,658.6162 E 2,992,760.4246 Sta 11+15.38  
 Course from 1101 to 1102 N 3° 07' 56.60" W Dist 34.8672  
 Point 1102 N 13,830,693.4313 E 2,992,758.5194 Sta 11+50.25

Ending chain RW-1 description

SH 99 RETAINING WALL (RW-3)

Beginning chain RW-3 description

Curve Data  
\*-----\*

Curve RW-31  
 P.I. Station 31+10.05 N 13,832,947.4995 E 2,992,723.9369  
 Delta = 2° 06' 06.50" (LT)  
 Degree = 1° 54' 32.72"  
 Tangent = 55.0535  
 Length = 110.0946  
 Radius = 3,001.2100  
 External = 0.5049  
 Long Chord = 110.0884  
 Mid. Ord. = 0.5048  
 P.C. Station 30+55.00 N 13,832,892.4460 E 2,992,723.9949  
 P.T. Station 31+65.09 N 13,833,002.5137 E 2,992,721.8597  
 C.C. N 13,832,889.2789 E 2,989,722.7866  
 Back = N 0° 03' 37.66" W  
 Ahead = N 2° 09' 44.16" W  
 Chord Bear = N 1° 06' 40.91" W

Course from PT RW-31 to PC RW-32 N 2° 09' 44.16" W Dist 106.0026

Curve Data  
\*-----\*

Curve RW-32  
 P.I. Station 34+32.44 N 13,833,269.6684 E 2,992,711.7728  
 Delta = 3° 42' 38.37" (RT)  
 Degree = 1° 09' 01.21"  
 Tangent = 161.3423  
 Length = 322.5719  
 Radius = 4,980.7900  
 External = 2.6125  
 Long Chord = 322.5155  
 Mid. Ord. = 2.6111  
 P.C. Station 32+71.10 N 13,833,108.4409 E 2,992,717.8602  
 P.T. Station 35+93.67 N 13,833,430.9518 E 2,992,716.1325  
 C.C. N 13,833,296.3647 E 2,997,695.1038  
 Back = N 2° 09' 44.16" W  
 Ahead = N 1° 32' 54.21" E  
 Chord Bear = N 0° 18' 24.98" W

Ending chain RW-3 description

SH 99 RETAINING WALL (RW-2)

Beginning chain RW-2 description

Curve Data  
\*-----\*

Curve RW-21  
 P.I. Station 20+91.79 N 13,833,133.2205 E 2,992,690.4858  
 Delta = 0° 35' 25.14" (RT)  
 Degree = 1° 08' 39.36"  
 Tangent = 25.7948  
 Length = 51.5891  
 Radius = 5,007.2100  
 External = 0.0664  
 Long Chord = 51.5888  
 Mid. Ord. = 0.0664  
 P.C. Station 20+66.00 N 13,833,107.4441 E 2,992,691.4591  
 P.T. Station 21+17.59 N 13,833,159.0055 E 2,992,689.7782  
 C.C. N 13,833,296.3647 E 2,997,695.1038  
 Back = N 2° 09' 44.16" W  
 Ahead = N 1° 34' 19.02" W  
 Chord Bear = N 1° 52' 01.59" W

Curve Data  
\*-----\*

Curve RW-22  
 P.I. Station 21+73.04 N 13,833,214.2961 E 2,992,685.6181  
 Delta = 1° 30' 21.22" (LT)  
 Degree = 1° 21' 28.95"  
 Tangent = 55.4468  
 Length = 110.8873  
 Radius = 4,219.0000  
 External = 0.3643  
 Long Chord = 110.8841  
 Mid. Ord. = 0.3643  
 P.C. Station 21+17.59 N 13,833,159.0055 E 2,992,689.7782  
 P.T. Station 22+28.48 N 13,833,269.4582 E 2,992,680.0063  
 C.C. N 13,832,842.4564 E 2,988,482.6703  
 Back = N 4° 18' 10.49" W  
 Ahead = N 5° 48' 31.71" W  
 Chord Bear = N 5° 03' 21.10" W

Curve Data  
\*-----\*

Curve RW-23  
 P.I. Station 23+02.41 N 13,833,343.0114 E 2,992,672.5237  
 Delta = 2° 00' 28.34" (LT)  
 Degree = 1° 21' 28.95"  
 Tangent = 73.9328  
 Length = 147.8505  
 Radius = 4,219.0000  
 External = 0.6477  
 Long Chord = 147.8430  
 Mid. Ord. = 0.6476  
 P.C. Station 22+28.48 N 13,833,269.4582 E 2,992,680.0063  
 P.T. Station 23+76.33 N 13,833,416.2572 E 2,992,662.4685  
 C.C. N 13,832,842.4564 E 2,988,482.6702  
 Back = N 5° 48' 31.71" W  
 Ahead = N 7° 49' 00.05" W  
 Chord Bear = N 6° 48' 45.88" W

Curve Data  
\*-----\*

Curve RW-24  
 P.I. Station 25+88.26 N 13,833,626.2238 E 2,992,633.6444  
 Delta = 5° 48' 13.34" (RT)  
 Degree = 1° 22' 13.38"  
 Tangent = 211.9358  
 Length = 423.5092  
 Radius = 4,181.0000  
 External = 5.3681  
 Long Chord = 423.3282  
 Mid. Ord. = 5.3612  
 P.C. Station 23+76.33 N 13,833,416.2572 E 2,992,662.4685  
 P.T. Station 27+99.84 N 13,833,838.0289 E 2,992,626.2000  
 C.C. N 13,833,984.8899 E 2,996,804.6199  
 Back = N 7° 49' 00.05" W  
 Ahead = N 2° 00' 46.71" W  
 Chord Bear = N 4° 54' 53.38" W

Ending chain RW-2 description



**TEDSI INFRASTRUCTURE GROUP**  
 Consulting Engineers  
 738 Hwy 6 South, Suite 430  
 Houston, Texas 77079  
 (832) 619-1000  
 TBPE F-1640



SH 99  
 SOUTHBOUND FRONTAGE ROAD  
 WESTHEIMER PKWY TO CINCO RANCH BLVD  
 HORIZONTAL ALIGNMENT DATA

SHEET 3 OF 4			
FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	100

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**SH 99 SOUND WALL (SW-1)**

Beginning chain SW-1 description

Point 1108 N 13,831,218.4753 E 2,992,689.3485 Sta 10+00.00

Course from 1108 to PC SW-11 N 0° 06' 19.61" W Dist 140.9818

Curve Data  
\*-----\*

Curve SW-11  
 P.I. Station 12+82.14 N 13,831,500.5376 E 2,992,693.7965  
 Delta = 3° 15' 37.24" (LT)  
 Degree = 1° 09' 18.56"  
 Tangent = 141.1593  
 Length = 282.2425  
 Radius = 4,960.0000  
 External = 2.0083  
 Long Chord = 282.2044  
 Mid. Ord. = 2.0074  
 P.C. Station 11+40.98 N 13,831,359.4568 E 2,992,689.0891  
 P.T. Station 14+23.22 N 13,831,641.6578 E 2,992,690.4727  
 C.C. N 13,831,524.8664 E 2,987,731.8479  
 Back = N 1° 54' 39.94" E  
 Ahead = N 1° 20' 57.29" W  
 Chord Bear = N 0° 16' 51.33" E

Ending chain SW-1 description

**SH 99 SOUND WALL (SW-2)**

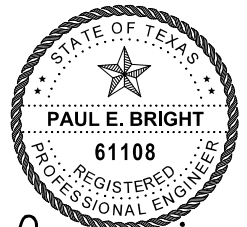
Beginning chain SW-2 description

Point 1109 N 13,831,897.6868 E 2,992,693.3142 Sta 20+00.00

Course from 1109 to 1110 N 2° 09' 44.16" W Dist 410.4636

Point 1110 N 13,832,307.8582 E 2,992,677.8275 Sta 24+10.46

Ending chain SW-2 description



*Paul Bright*  
1/19/2023

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 Consulting Engineers  
 738 Hwy 6 South, Suite 430  
 Houston, Texas 77079  
 (832) 619-1000  
 TBPE F-1640

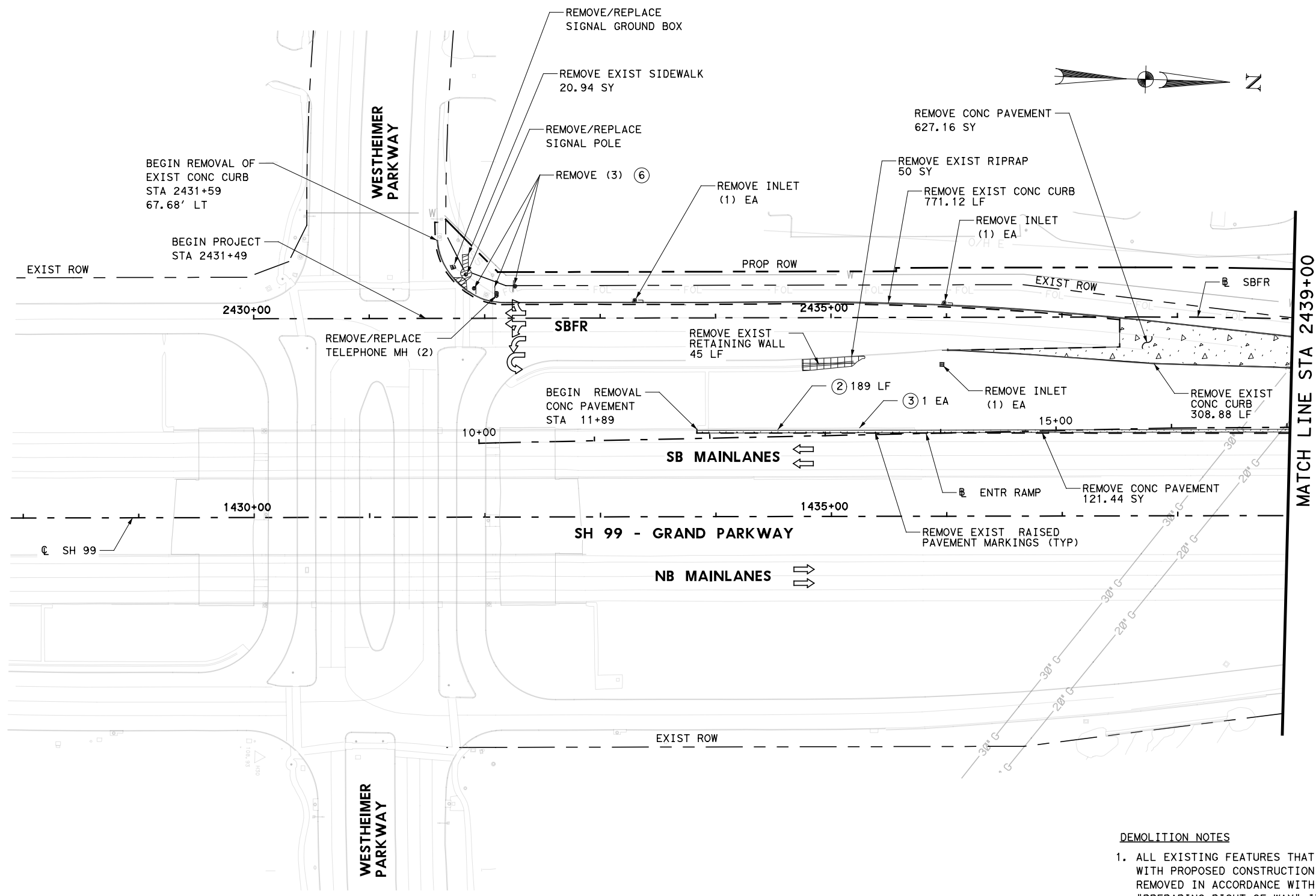


**SH 99**  
**SOUTHBOUND FRONTAGE ROAD**  
**WESTHEIMER PKWY TO CINCO RANCH BLVD**  
**HORIZONTAL ALIGNMENT DATA**

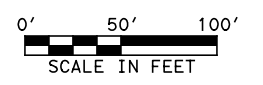
SHEET 4 OF 4

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	101

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- LEGEND**
- REMOVE CONCRETE PAVEMENT
  - REMOVE CONC CURB
  - REMOVE RIPRAP
  - REMOVE SIDEWALK
  - REMOVE/REPLACE GROUND BOX
  - REMOVE SIGN
  - REMOVE SIGNAL POLE
  - REMOVE TELEPHONE MH
  - DIRECTION OF TRAFFIC
  - ① REMOVE SSCB
  - ② REMOVE MGBF
  - ③ REMOVE GUARD RAIL END TREATMENT
  - ④ REMOVE TERMINAL ANCHOR SECTION
  - ⑤ REMOVE LUMINAIRE
  - ⑥ REMOVE SIGN



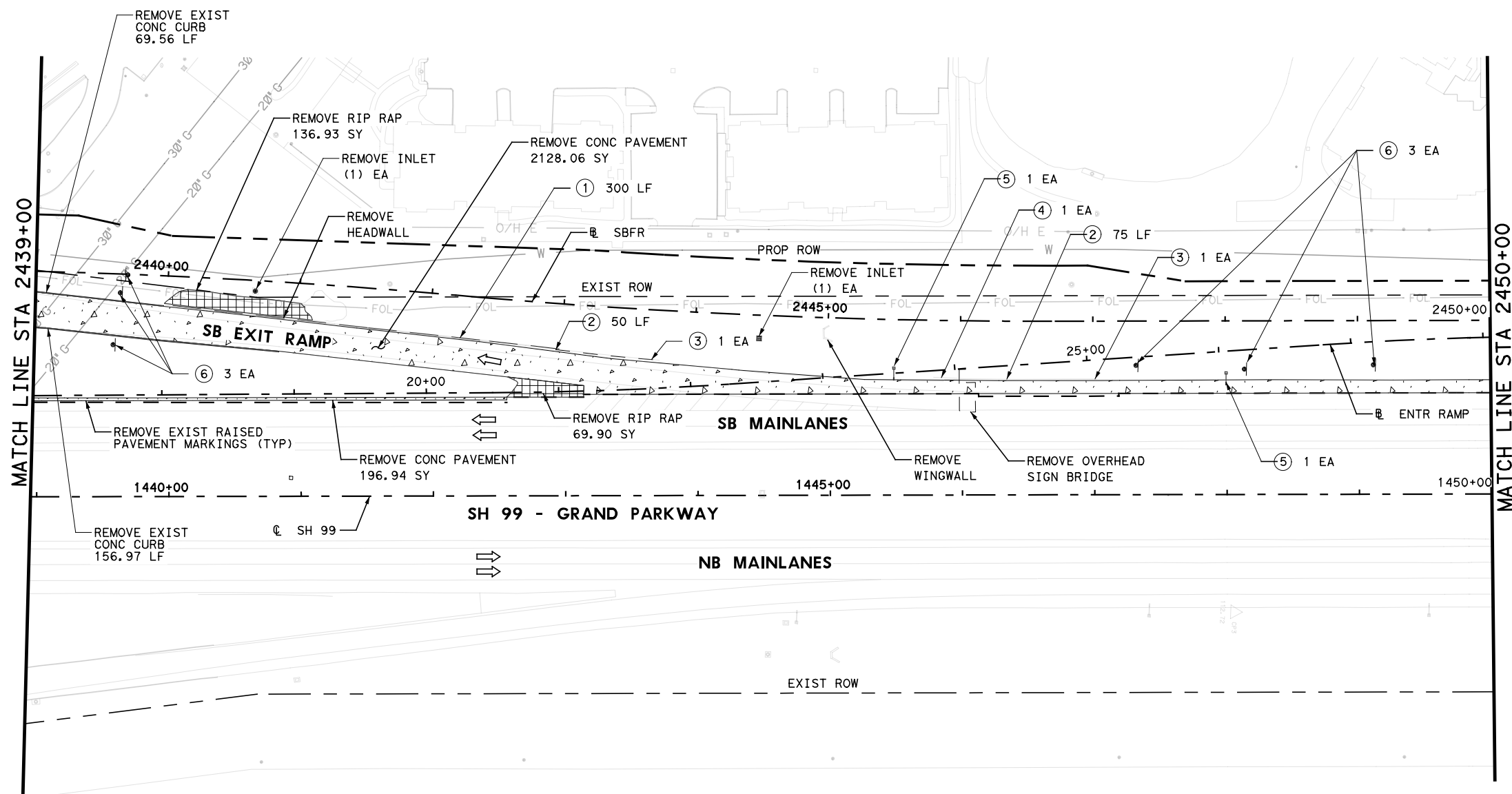
SH 99  
SOUTHBOUND FRONTAGE ROAD  
WESTHEIMER PKWY TO CINCO RANCH BLVD  
**DEMOLITION LAYOUT**  
BEGIN TO STA 2439+00

SHEET 1 OF 4

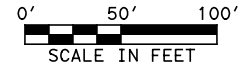
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STATE TEXAS	DIST. HOU	COUNTY FORT BEND	
CONT. 3510	SECT. 04	JOB 055	SHEET NO. 102

- DEMOLITION NOTES**
- ALL EXISTING FEATURES THAT CONFLICT WITH PROPOSED CONSTRUCTION SHALL BE REMOVED IN ACCORDANCE WITH "PREPARING RIGHT OF WAY" ITEM 100.
  - CONTRACTOR SHALL REMOVE ALL SIGN STRUCTURES AND BILLBOARDS, THIS IS CONSIDERED INCIDENTAL TO ITEM 100 EXCEPT FOR OVERHEAD SIGN BRIDGE SUPPORT STRUCTURES.
  - PREPARING ROW SHALL BE IN ACCORDANCE WITH ITEM 100. ALSO, ANY REMOVAL OF AND/OR APPURTENANCES SHALL BE INCIDENTAL TO PREP ROW. THIS WORK WILL NOT BE PAID FOR DIRECTLY.
  - WHERE EXISTING STRUCTURES ARE TO REMAIN IN PLACE, THE CONTRACTOR SHALL REPAIR ANY DAMAGE CAUSED BY HIS/HER OPERATIONS.

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- LEGEND**
- REMOVE CONCRETE PAVEMENT
  - REMOVE CONC CURB
  - REMOVE RIPRAP
  - REMOVE SIDEWALK
  - REMOVE/REPLACE GROUND BOX
  - REMOVE SIGN
  - REMOVE SIGNAL POLE
  - REMOVE TELEPHONE MH
  - DIRECTION OF TRAFFIC
  - REMOVE SSCB
  - REMOVE MGBF
  - REMOVE GUARD RAIL END TREATMENT
  - REMOVE TERMINAL ANCHOR SECTION
  - REMOVE LUMINAIRE
  - REMOVE SIGN



**SH 99**  
**SOUTHBOUND FRONTAGE ROAD**  
**WESTHEIMER PKWY TO CINCO RANCH BLVD**  
**DEMOLITION LAYOUT**  
**STA 2439+00 TO STA 2450+00**

SHEET 2 OF 4

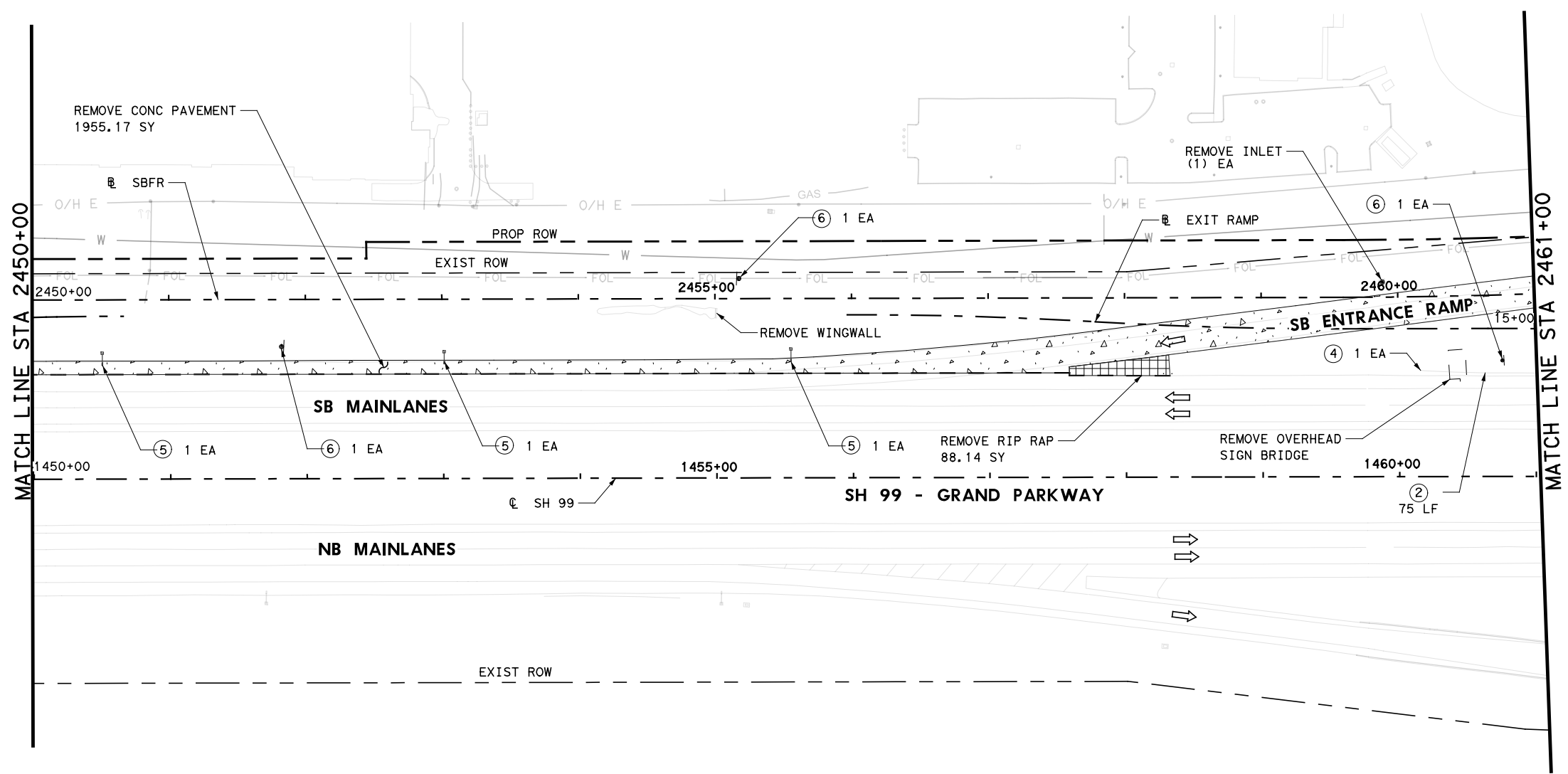
**DEMOLITION NOTES**

1. ALL EXISTING FEATURES THAT CONFLICT WITH PROPOSED CONSTRUCTION SHALL BE REMOVED IN ACCORDANCE WITH "PREPARING RIGHT OF WAY" ITEM 100.
2. CONTRACTOR SHALL REMOVE ALL SIGN STRUCTURES AND BILLBOARDS, THIS IS CONSIDERED INCIDENTAL TO ITEM 100 EXCEPT FOR OVERHEAD SIGN BRIDGE SUPPORT STRUCTURES.
3. PREPARING ROW SHALL BE IN ACCORDANCE WITH ITEM 100. ALSO, ANY REMOVAL OF AND/OR APPURTENANCES SHALL BE INCIDENTAL TO PREP ROW. THIS WORK WILL NOT BE PAID FOR DIRECTLY.
4. WHERE EXISTING STRUCTURES ARE TO REMAIN IN PLACE, THE CONTRACTOR SHALL REPAIR ANY DAMAGE CAUSED BY HIS/HER OPERATIONS.

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	103



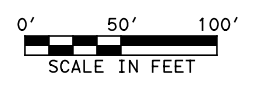
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- LEGEND**
- REMOVE CONCRETE PAVEMENT
  - REMOVE CONC CURB
  - REMOVE RIPRAP
  - REMOVE SIDEWALK
  - REMOVE/REPLACE GROUND BOX
  - REMOVE SIGN
  - REMOVE SIGNAL POLE
  - REMOVE TELEPHONE MH
  - DIRECTION OF TRAFFIC
  - REMOVE SSCB
  - REMOVE MGBF
  - REMOVE GUARD RAIL END TREATMENT
  - REMOVE TERMINAL ANCHOR SECTION
  - REMOVE LUMINAIRE
  - REMOVE SIGN

**DEMOLITION NOTES**

1. ALL EXISTING FEATURES THAT CONFLICT WITH PROPOSED CONSTRUCTION SHALL BE REMOVED IN ACCORDANCE WITH "PREPARING RIGHT OF WAY" ITEM 100.
2. CONTRACTOR SHALL REMOVE ALL SIGN STRUCTURES AND BILLBOARDS, THIS IS CONSIDERED INCIDENTAL TO ITEM 100 EXCEPT FOR OVERHEAD SIGN BRIDGE SUPPORT STRUCTURES.
3. PREPARING ROW SHALL BE IN ACCORDANCE WITH ITEM 100. ALSO, ANY REMOVAL OF AND/OR APPURTENANCES SHALL BE INCIDENTAL TO PREP ROW. THIS WORK WILL NOT BE PAID FOR DIRECTLY.
4. WHERE EXISTING STRUCTURES ARE TO REMAIN IN PLACE, THE CONTRACTOR SHALL REPAIR ANY DAMAGE CAUSED BY HIS/HER OPERATIONS.

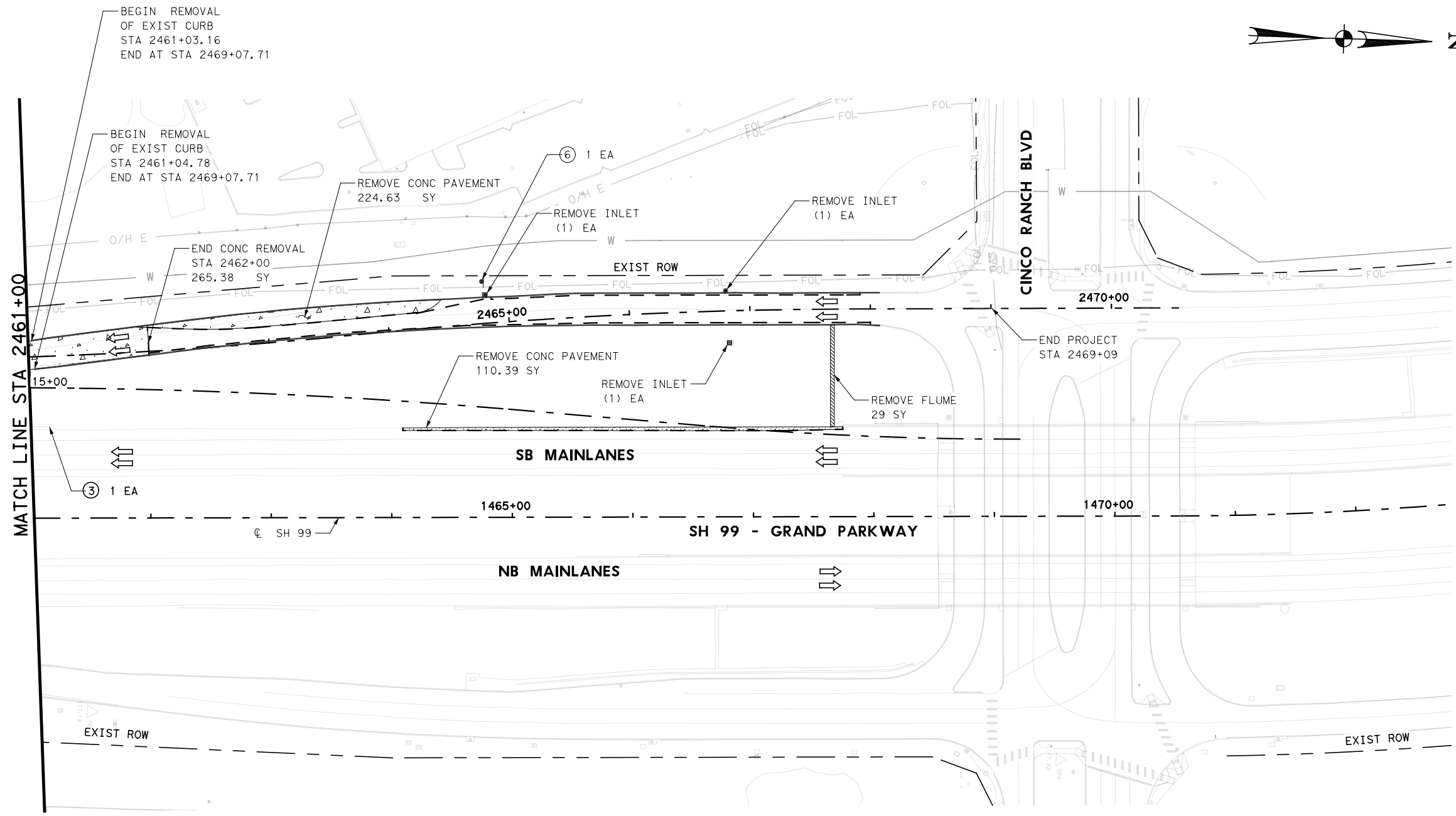


SH 99  
SOUTHBOUND FRONTAGE ROAD  
WESTHEIMER PKWY TO CINCO RANCH BLVD  
DEMOLITION LAYOUT  
STA 2450+00 TO STA 2461+00
















SHEET 3 OF 4

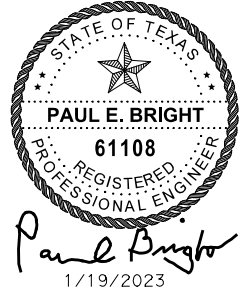
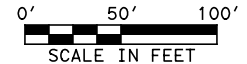
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6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	104

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**LEGEND**

-  REMOVE CONCRETE PAVEMENT
-  REMOVE CONC CURB
-  REMOVE RIPRAP
-  REMOVE SIDEWALK
-  REMOVE/REPLACE GROUND BOX
-  REMOVE SIGN
-  REMOVE SIGNAL POLE
-  REMOVE TELEPHONE MH
-  DIRECTION OF TRAFFIC
-  REMOVE SSCB
-  REMOVE MGBF
-  REMOVE GUARD RAIL END TREATMENT
-  REMOVE TERMINAL ANCHOR SECTION
-  REMOVE LUMINAIRE
-  REMOVE SIGN



**SH 99**  
**SOUTHBOUND FRONTAGE ROAD**  
**WESTHEIMER PKWY TO CINCO RANCH BLVD**  
**DEMOLITION LAYOUT**  
**STA 2461+00 TO END**

SHEET 4 OF 4

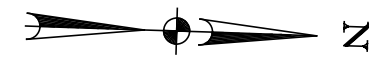
**DEMOLITION NOTES**

1. ALL EXISTING FEATURES THAT CONFLICT WITH PROPOSED CONSTRUCTION SHALL BE REMOVED IN ACCORDANCE WITH "PREPARING RIGHT OF WAY" ITEM 100.
2. CONTRACTOR SHALL REMOVE ALL SIGN STRUCTURES AND BILLBOARDS, THIS IS CONSIDERED INCIDENTAL TO ITEM 100 EXCEPT FOR OVERHEAD SIGN BRIDGE SUPPORT STRUCTURES.
3. PREPARING ROW SHALL BE IN ACCORDANCE WITH ITEM 100. ALSO, ANY REMOVAL OF AND/OR APPURTENANCES SHALL BE INCIDENTAL TO PREP ROW. THIS WORK WILL NOT BE PAID FOR DIRECTLY.
4. WHERE EXISTING STRUCTURES ARE TO REMAIN IN PLACE, THE CONTRACTOR SHALL REPAIR ANY DAMAGE CAUSED BY HIS/HER OPERATIONS.

FED. RD. DIV. NO.		PROJECT NO.		HIGHWAY NO.	
6				SH 99	
STATE	DIST.	COUNTY			
TEXAS	HOU	FORT BEND			
CONT.	SECT.	JOB	SHEET NO.		
3510	04	055	105		

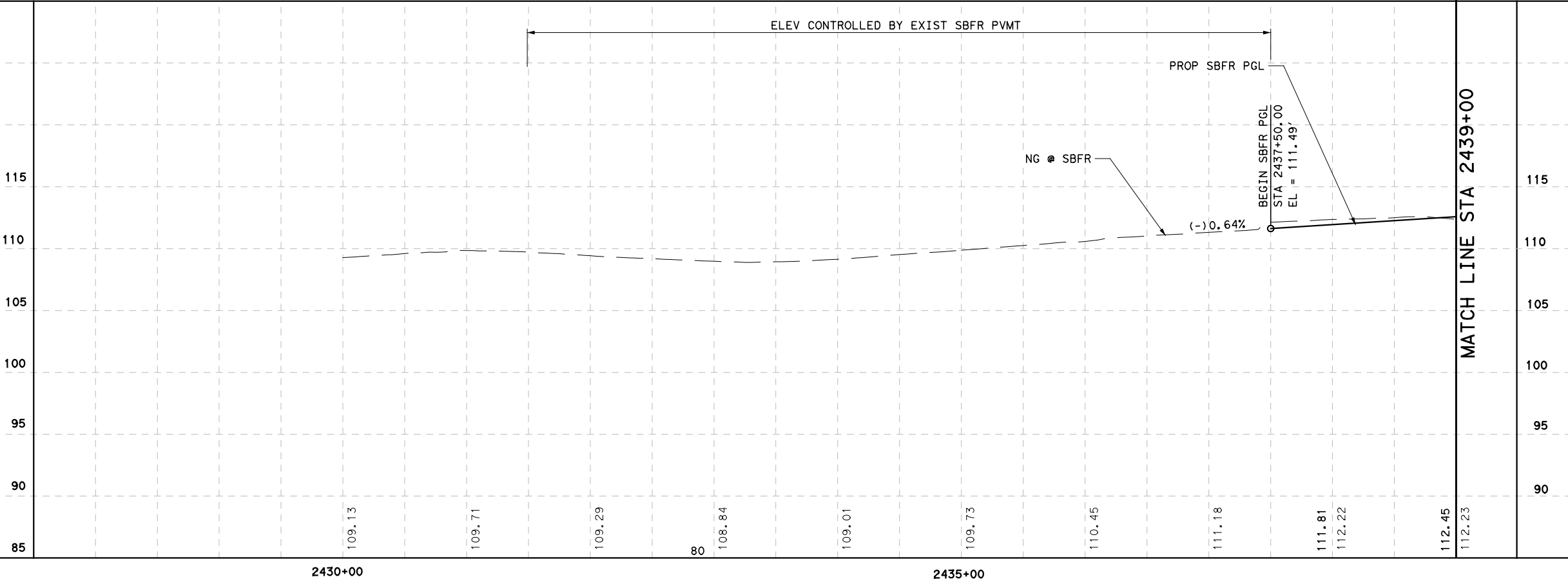
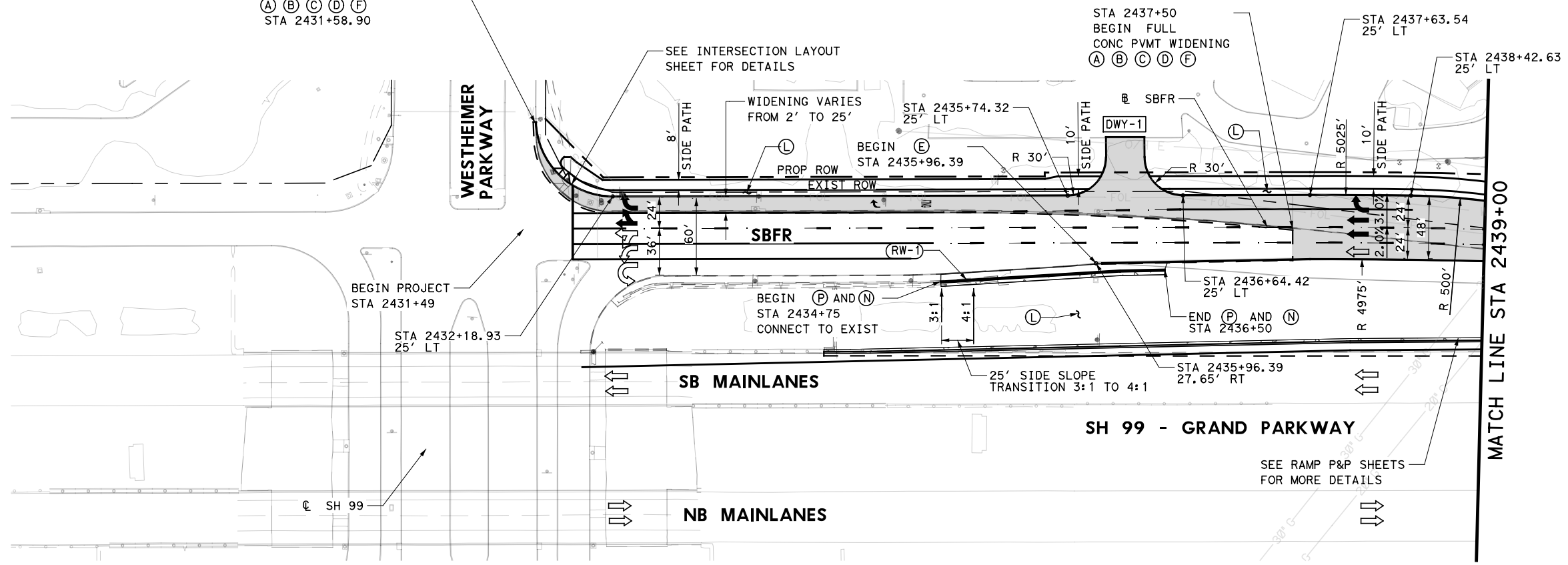
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BEGIN CONC PVMT WIDENING  
 (A) (B) (C) (D) (F)  
 STA 2431+58.90



LEGEND:

- (A) 10" CRCP (FRTG RD)
- (B) 1" ASPHALT BOND BREAKER
- (C) 6" CEMENT STABILIZED BASE
- (D) 6" LIME TREATED SUBGRADE
- (E) 6" CONC CURB (DOWELED) (TY II)
- (F) 6" CONC CURB (MONO) (TY II)
- (G) SSTR
- (H) SSTR (W/SLOTS)
- (I) MBGF
- (J) DOWNSTREAM ANCHOR TERMINAL (DAT)
- (K) SINGLE GUARDRAIL TERMINAL
- (L) SODDING/SEEDING
- (N) MSE RETAINING WALL
- (P) CONC RIPRAP
- (SW-X) SOUND BARRIER
- (DWY-X) DRIVEWAY NUMBER
- ▭ PROP IMPROVEMENTS DETAILED ON THIS SHEET
- ↔ EXIST TRAFFIC DIRECTION ARROW
- ➔ PROP TRAFFIC DIRECTION ARROW
- - SAWCUT LINE



HORZ 0' 50' 100'  
 VERT 0' 5' 10'  
 SCALE: IN FEET

**PAUL E. BRIGHT**  
 61108  
 REGISTERED PROFESSIONAL ENGINEER  
*Paul Bright*  
 1/19/2023

**TEDSI INFRASTRUCTURE GROUP**  
 Consulting Engineers  
 738 Hwy 6 South, Suite 430  
 Houston, Texas 77079  
 (832) 619-1000

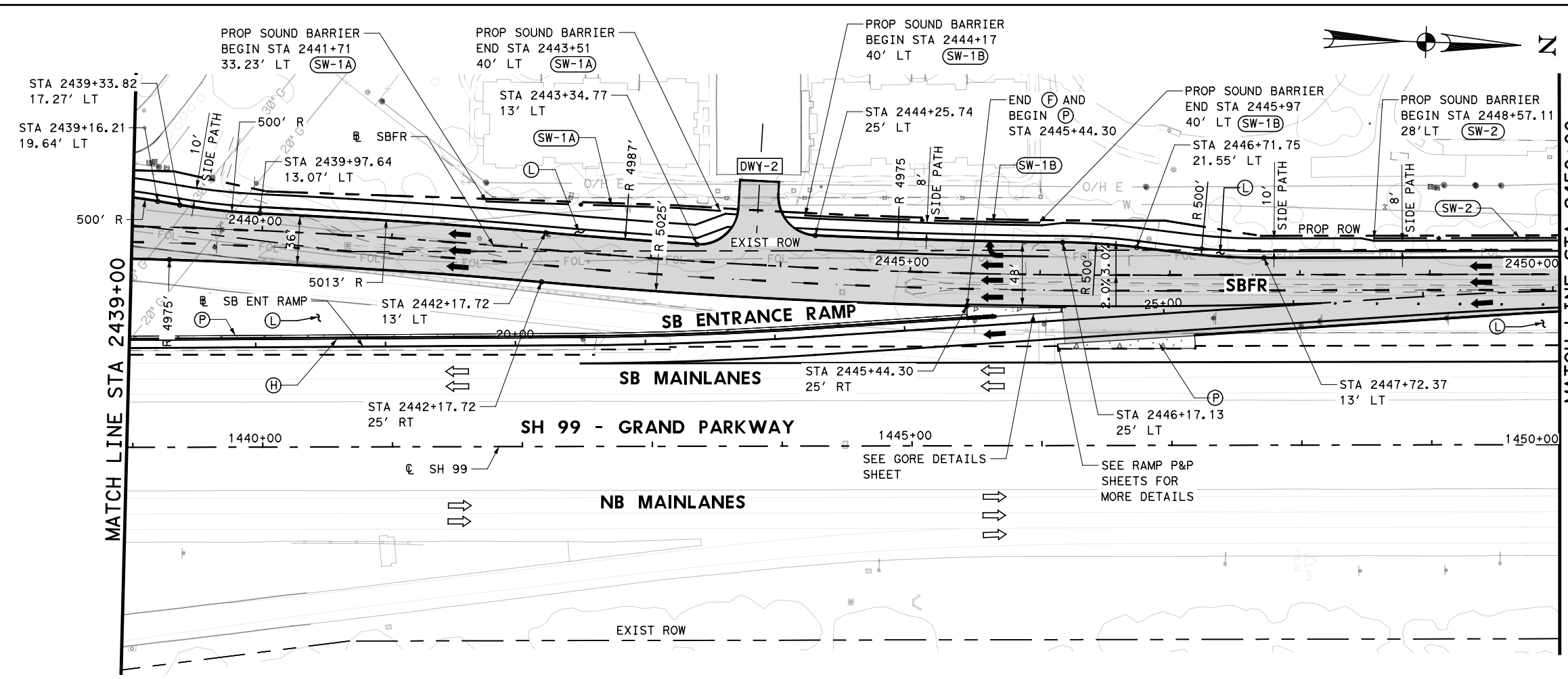
**Texas Department of Transportation**  
 © 2023 TxDOT

**SH 99**  
 SOUTHBOUND FRONTAGE ROAD  
 WESTHEIMER PKWY TO CINCO RANCH BLVD

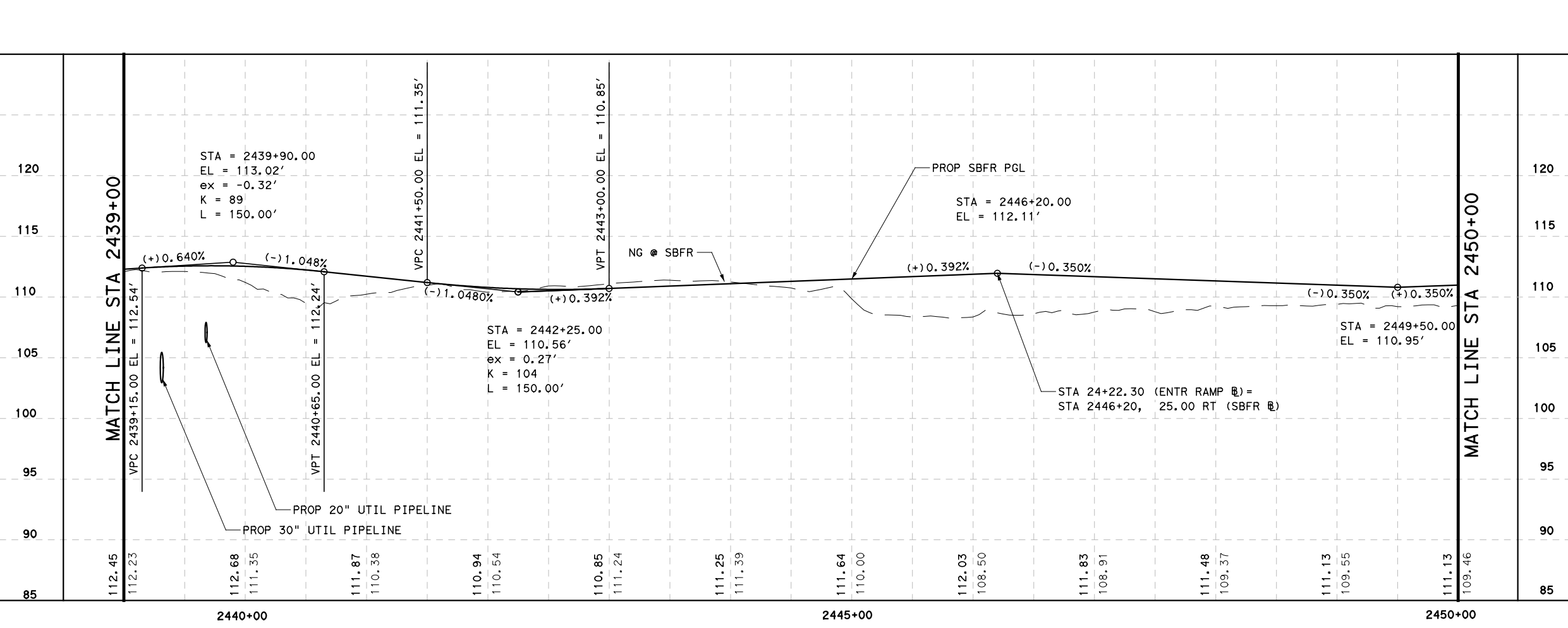
**PLAN AND PROFILE**  
 SB FRONTAGE RD  
 BEGIN TO STA 2439+00  
 SHEET 1 OF 4

FED. RD. DIST. NO.		PROJECT NO.		HIGHWAY NO.	
6				SH 99	
STATE	DIST.	COUNTY			
TEXAS	HOU	FORT BEND			
CONT.	SECT.	JOB	SHEET NO.		
3510	04	055	106		

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- LEGEND:**
- (A) 10" CRCP (FRTG RD)
  - (B) 1" ASPHALT BOND BREAKER
  - (C) 6" CEMENT STABILIZED BASE
  - (D) 6" LIME TREATED SUBGRADE
  - (E) 6" CONC CURB (DOWELED) (TY II)
  - (F) 6" CONC CURB (MONO) (TY II)
  - (G) SSTR
  - (H) SSTR (W/SLOTS)
  - (I) MGBF
  - (J) DOWNSTREAM ANCHOR TERMINAL (DAT)
  - (K) SINGLE GUARDRAIL TERMINAL
  - (L) SODDING/SEEDING
  - (N) MSE RETAINING WALL
  - (P) CONC RIPRAP
  - (SW-X) SOUND BARRIER
  - (DWY-X) DRIVEWAY NUMBER
- PROF IMPROVEMENTS DETAILED ON THIS SHEET
- EXIST TRAFFIC DIRECTION ARROW  
 PROP TRAFFIC DIRECTION ARROW
- SAWCUT LINE



HORZ 0' 50' 100'  
 VERT 0' 5' 10'  
 SCALE: IN FEET

**PAUL E. BRIGHT**  
 61108  
 REGISTERED PROFESSIONAL ENGINEER  
 Paul Bright  
 1/19/2023

**TEDSI INFRASTRUCTURE GROUP**  
 Consulting Engineers  
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 Houston, Texas 77079  
 (832) 619-1000

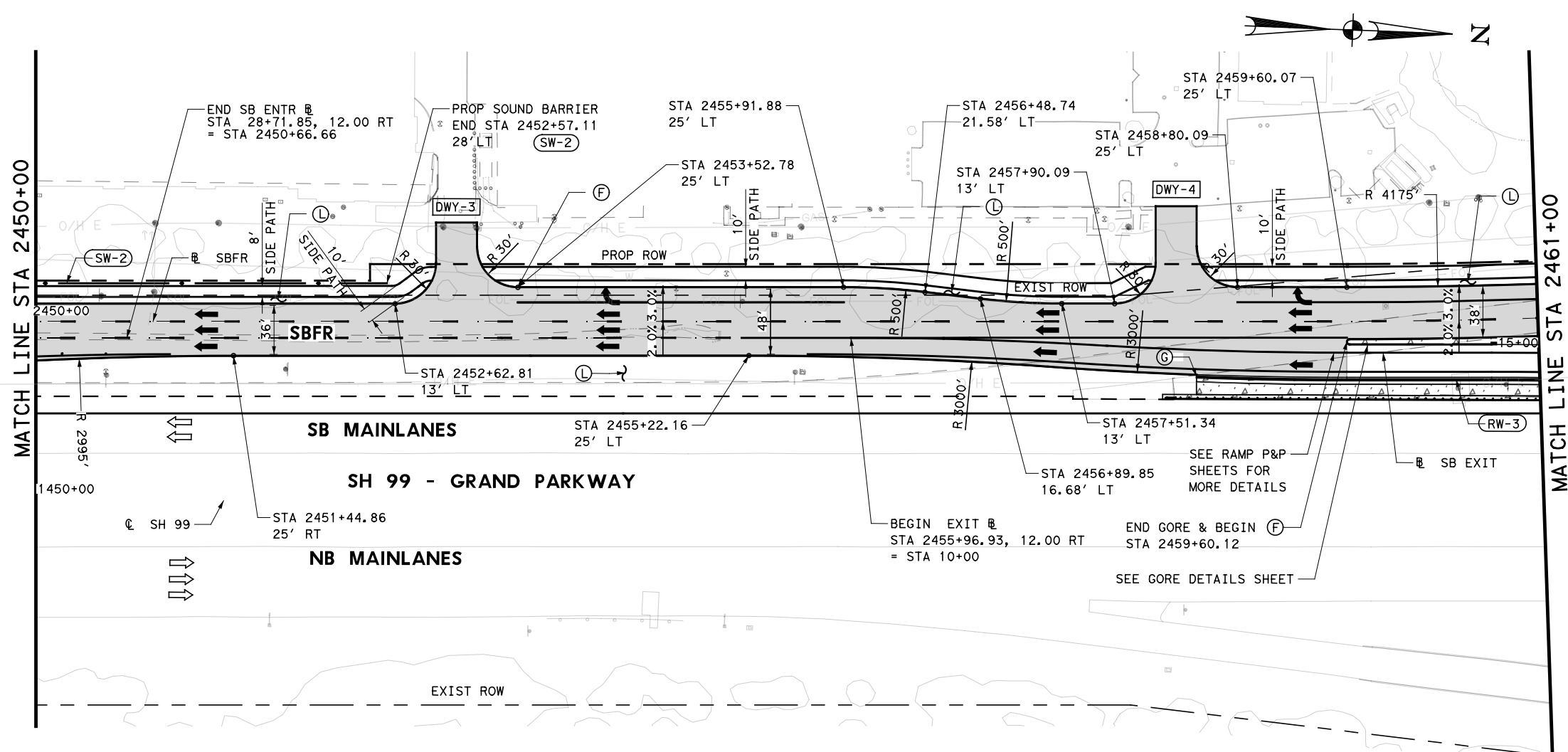
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**SH 99**  
 SOUTHBOUND FRONTAGE ROAD  
 WESTHEIMER PKWY TO CINCO RANCH BLVD

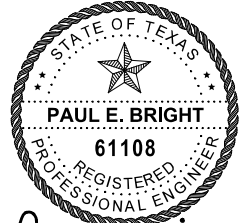
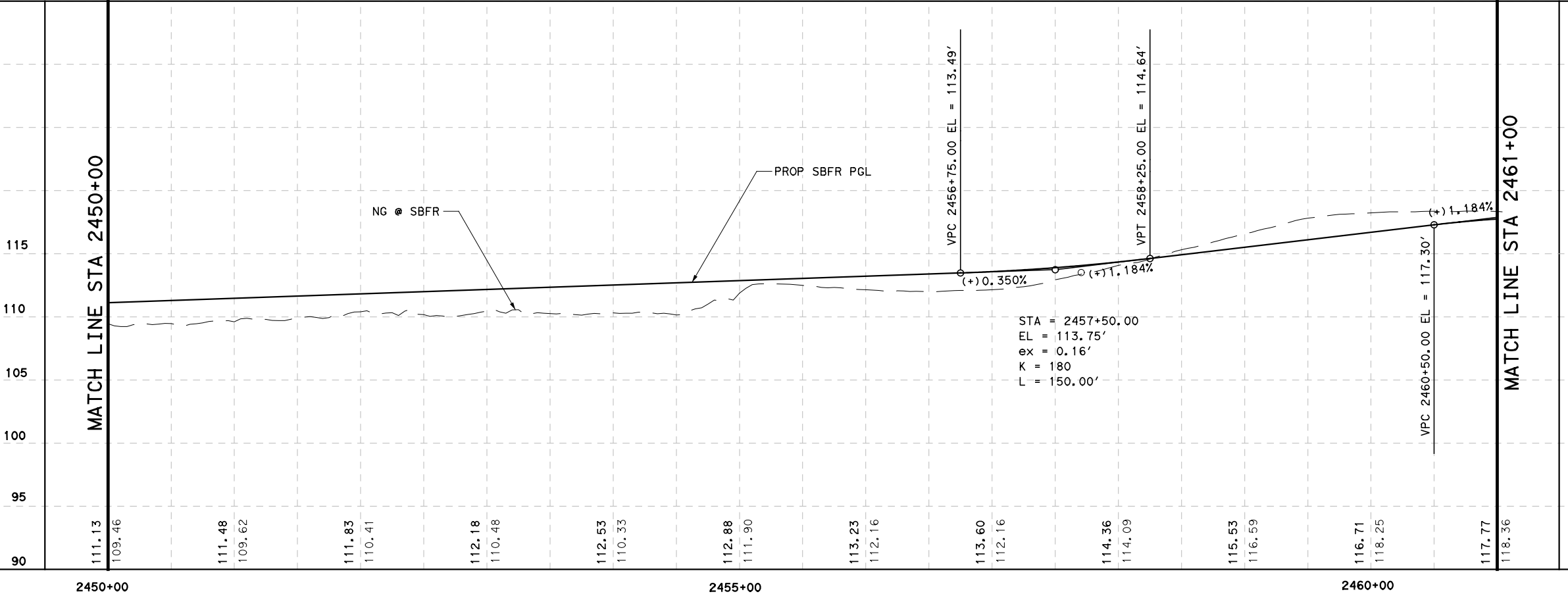
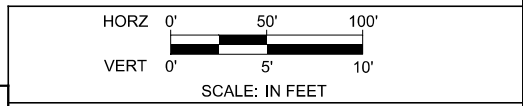
**PLAN AND PROFILE**  
 SB FRONTAGE ROAD  
 STA 2439+00 TO STA 2450+00  
 SHEET 2 OF 4

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	107

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- LEGEND:**
- (A) 10" CRCP (FRTG RD)
  - (B) 1" ASPHALT BOND BREAKER
  - (C) 6" CEMENT STABILIZED BASE
  - (D) 6" LIME TREATED SUBGRADE
  - (E) 6" CONC CURB (DOWELED) (TY II)
  - (F) 6" CONC CURB (MONO) (TY II)
  - (G) SSTR
  - (H) SSTR (W/SLOTS)
  - (I) MBSF
  - (J) DOWNSTREAM ANCHOR TERMINAL (DAT)
  - (K) SINGLE GUARDRAIL TERMINAL
  - (L) SODDING/SEEDING
  - (N) MSE RETAINING WALL
  - (P) CONC RIPRAP
  - (SW-X) SOUND BARRIER
  - (DWY-X) DRIVEWAY NUMBER
  - ▬ PROP IMPROVEMENTS DETAILED ON THIS SHEET
  - ↔ EXIST TRAFFIC DIRECTION ARROW
  - ➔ PROP TRAFFIC DIRECTION ARROW
  - SAWCUT LINE



Paul E. Bright  
1/19/2023

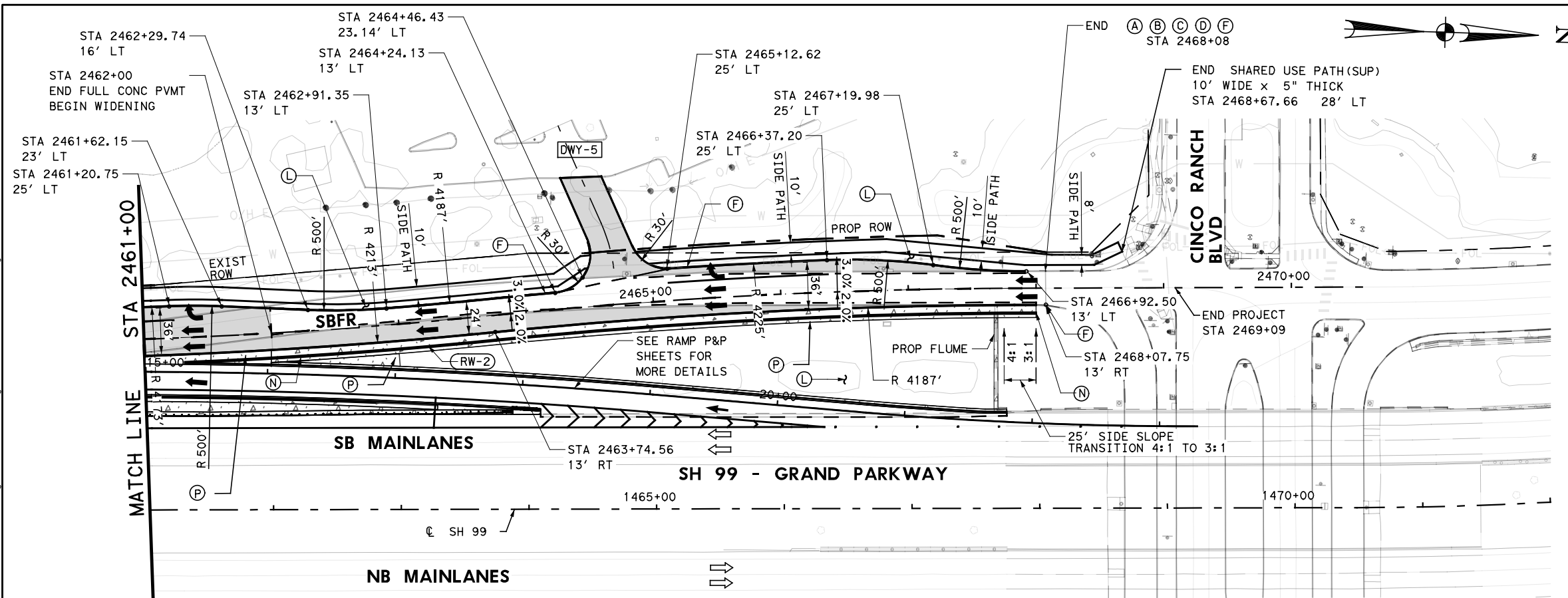
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 TBPE F-1640



SH 99  
 SOUTHBOUND FRONTAGE ROAD  
 WESTHEIMER PKWY TO CINCO RANCH BLVD  
 PLAN AND PROFILE  
 SB FRONTAGE ROAD  
 STA 2450+00 TO STA 2461+00  
 SHEET 3 OF 4

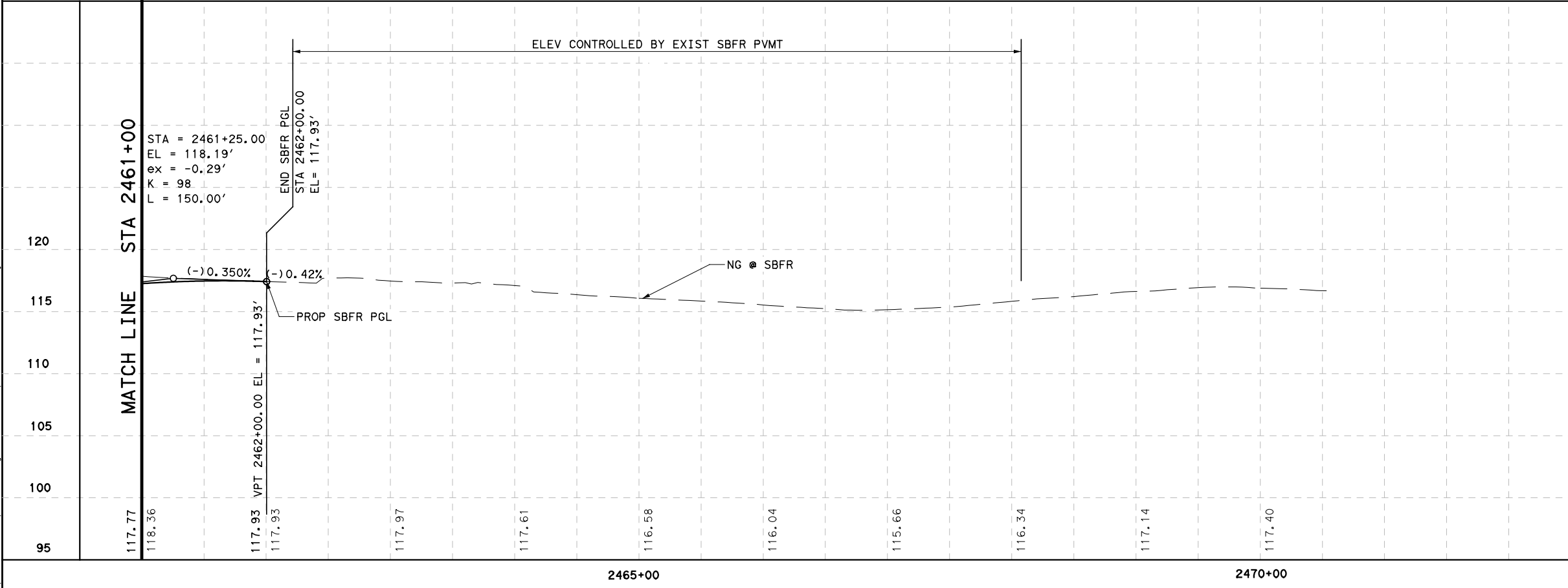
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6		SH 99
STATE	DIST.	COUNTY
TEXAS	HOU	FORT BEND
CONT. SECT.	JOB	SHEET NO.
3510	04	055
		108

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**LEGEND:**

- (A) 10" CRCP (FRTG RD)
- (B) 1" ASPHALT BOND BREAKER
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- (E) 6" CONC CURB (DOWELED) (TY II)
- (F) 6" CONC CURB (MONO) (TY II)
- (G) SSTR
- (H) SSTR (W/SLOTS)
- (I) MGBF
- (J) DOWNSTREAM ANCHOR TERMINAL (DAT)
- (K) SINGLE GUARDRAIL TERMINAL
- (L) SODDING/SEEDING
- (N) MSE RETAINING WALL
- (P) CONC RIPRAP
- (SW-X) SOUND BARRIER
- (DWY-X) DRIVEWAY NUMBER
- [Grey Box] PROP IMPROVEMENTS DETAILED ON THIS SHEET
- [Arrow] EXIST TRAFFIC DIRECTION ARROW
- [Thick Arrow] PROP TRAFFIC DIRECTION ARROW
- [Dashed Line] SAWCUT LINE



HORZ 0' 50' 100'

VERT 0' 5' 10'

SCALE: IN FEET

*Paul E. Bright*  
1/19/2023

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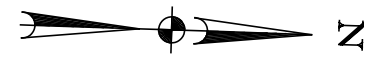
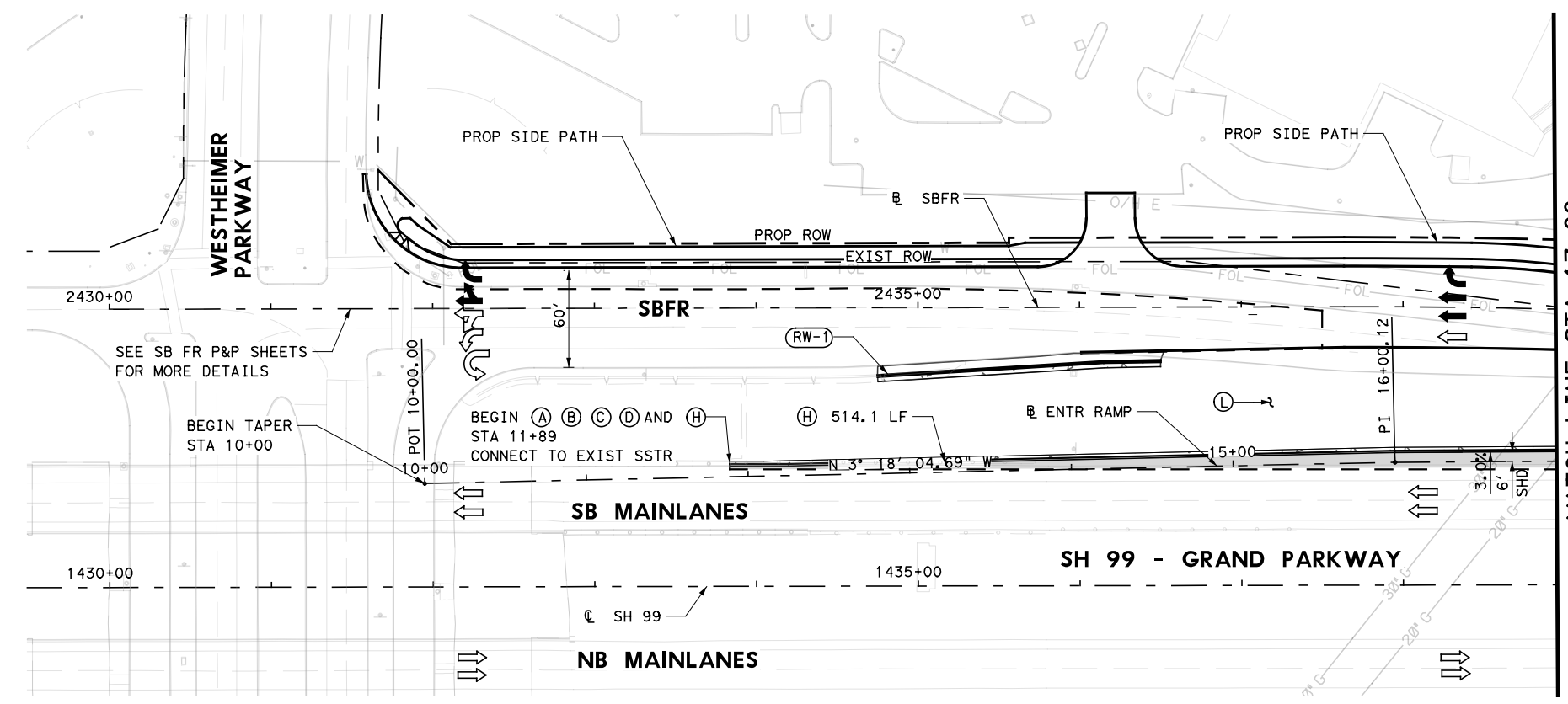
**SH 99**  
SOUTHBOUND FRONTAGE ROAD  
WESTHEIMER PKWY TO CINCO RANCH BLVD

**PLAN AND PROFILE**  
SB FRONTAGE ROAD  
STA 2461+00 TO END

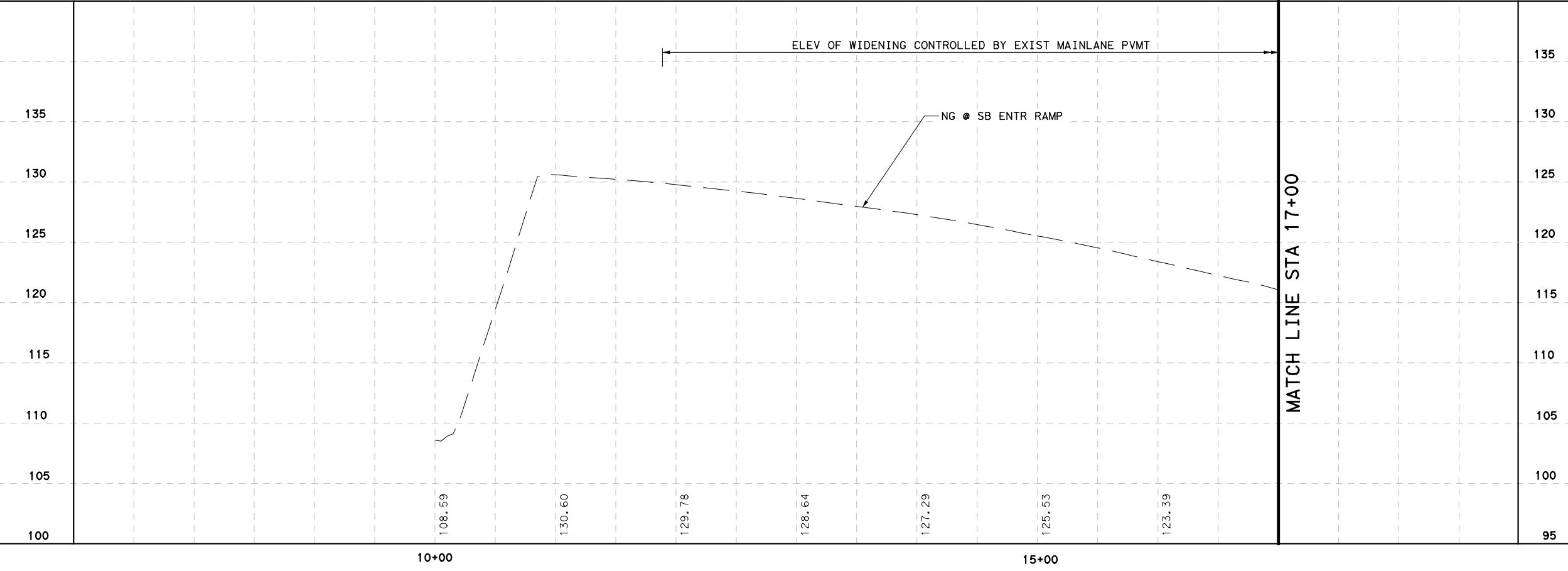
**SHEET 4 OF 4**

FED. RD. DIST. NO.		PROJECT NO.		HIGHWAY NO.	
6				SH 99	
STATE	DIST.	COUNTY			
TEXAS	HOU	FORT BEND			
CONT.	SECT.	JOB	SHEET NO.		
3510	04	055	109		

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- LEGEND:**
- (A) 10" CRCP (FRTG RD)
  - (B) 1" ASPHALT BOND BREAKER
  - (C) 6" CEMENT STABILIZED BASE
  - (D) 6" LIME TREATED SUBGRADE
  - (E) 6" CONC CURB (DOWELED) (TY II)
  - (F) 6" CONC CURB (MONO) (TY II)
  - (G) SSTR
  - (H) SSTR (W/SLOTS)
  - (I) MBGF
  - (J) DOWNSTREAM ANCHOR TERMINAL (DAT)
  - (K) SINGLE GUARDRAIL TERMINAL
  - (L) SODDING/SEEDING
  - (N) MSE RETAINING WALL
  - (P) CONC RIPRAP
  - (SW-X) SOUND BARRIER
  - (DWY-X) DRIVEWAY NUMBER
  - ▬ PROP IMPROVEMENTS DETAILED ON THIS SHEET
  - ⇐ EXIST TRAFFIC DIRECTION ARROW
  - ➔ PROP TRAFFIC DIRECTION ARROW
  - SAWCUT LINE



HORZ 0' 50' 100'  
VERT 0' 5' 10'  
SCALE: IN FEET

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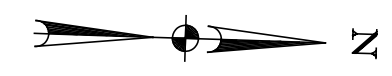
**SH 99**  
SOUTHBOUND FRONTAGE ROAD  
WESTHEIMER PKWY TO CINCO RANCH BLVD

**PLAN AND PROFILE**  
SB ENTRANCE RAMP RD  
BEGIN TO STA 17+00

SHEET 1 OF 2

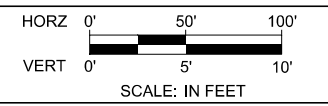
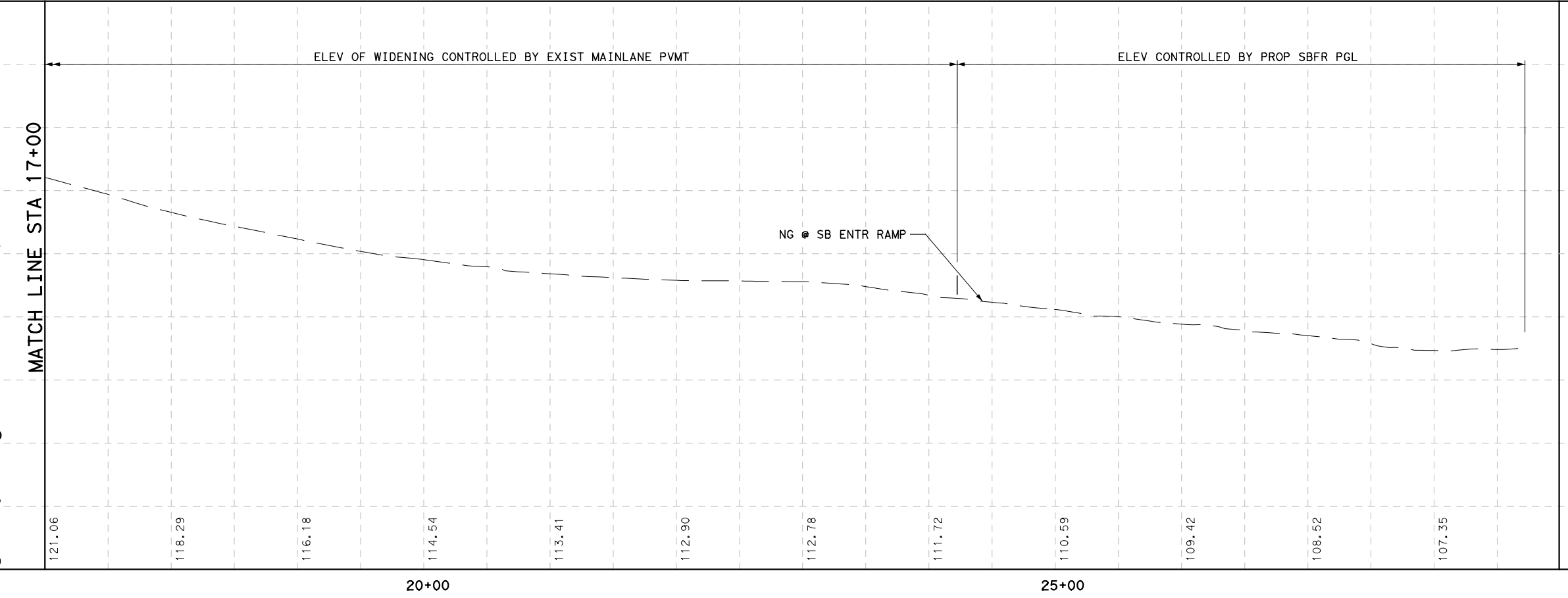
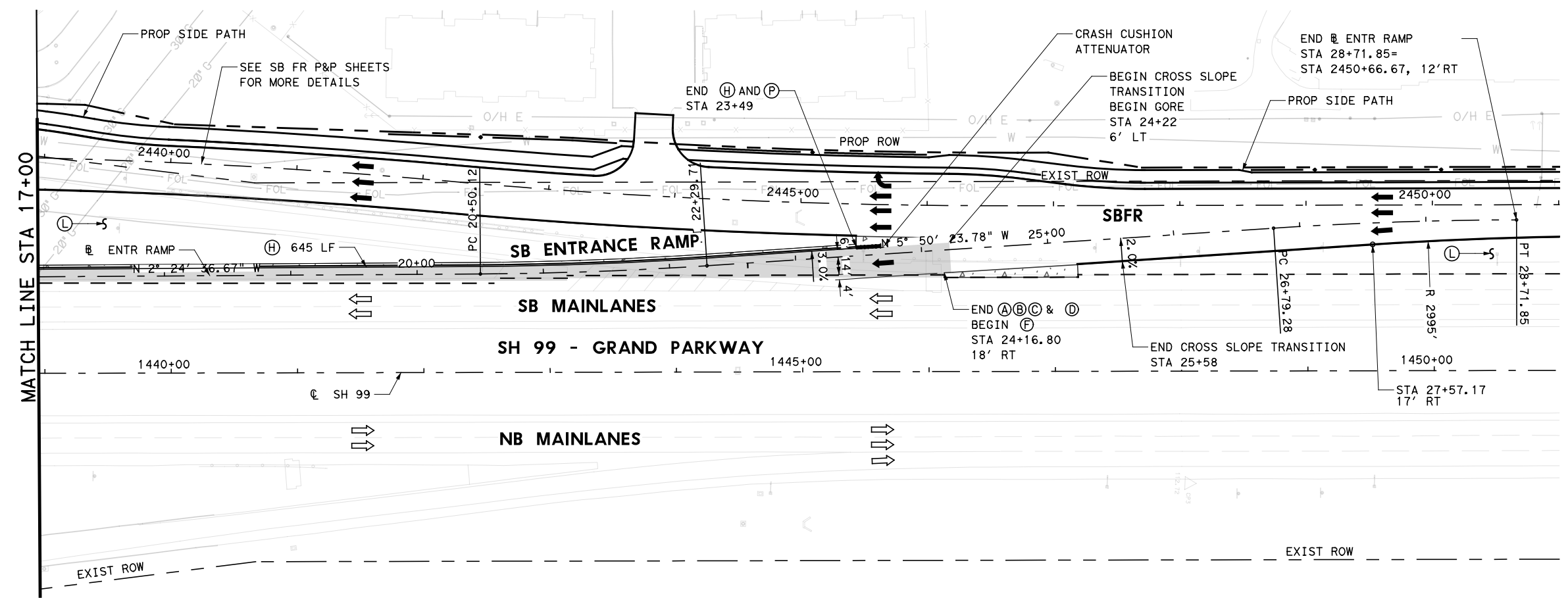
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STATE TEXAS	DIST. HOU	COUNTY FORT BEND	
CONT. 3510	SECT. 04	JOB 055	SHEET NO. 110

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**LEGEND:**

- (A) 10" CRCP (FRTG RD)
- (B) 1" ASPHALT BOND BREAKER
- (C) 6" CEMENT STABILIZED BASE
- (D) 6" LIME TREATED SUBGRADE
- (E) 6" CONC CURB (DOWELED) (TY II)
- (F) 6" CONC CURB (MONO) (TY II)
- (G) SSTR
- (H) SSTR (W/SLOTS)
- (I) MGBF
- (J) DOWNSTREAM ANCHOR TERMINAL (DAT)
- (K) SINGLE GUARDRAIL TERMINAL
- (L) SODDING/SEEDING
- (N) MSE RETAINING WALL
- (P) CONC RIPRAP
- (SW-X) SOUND BARRIER
- (DWY-X) DRIVEWAY NUMBER
- ▭ PROP IMPROVEMENTS DETAILED ON THIS SHEET
- ↔ EXIST TRAFFIC DIRECTION ARROW
- ➔ PROP TRAFFIC DIRECTION ARROW
- SAWCUT LINE

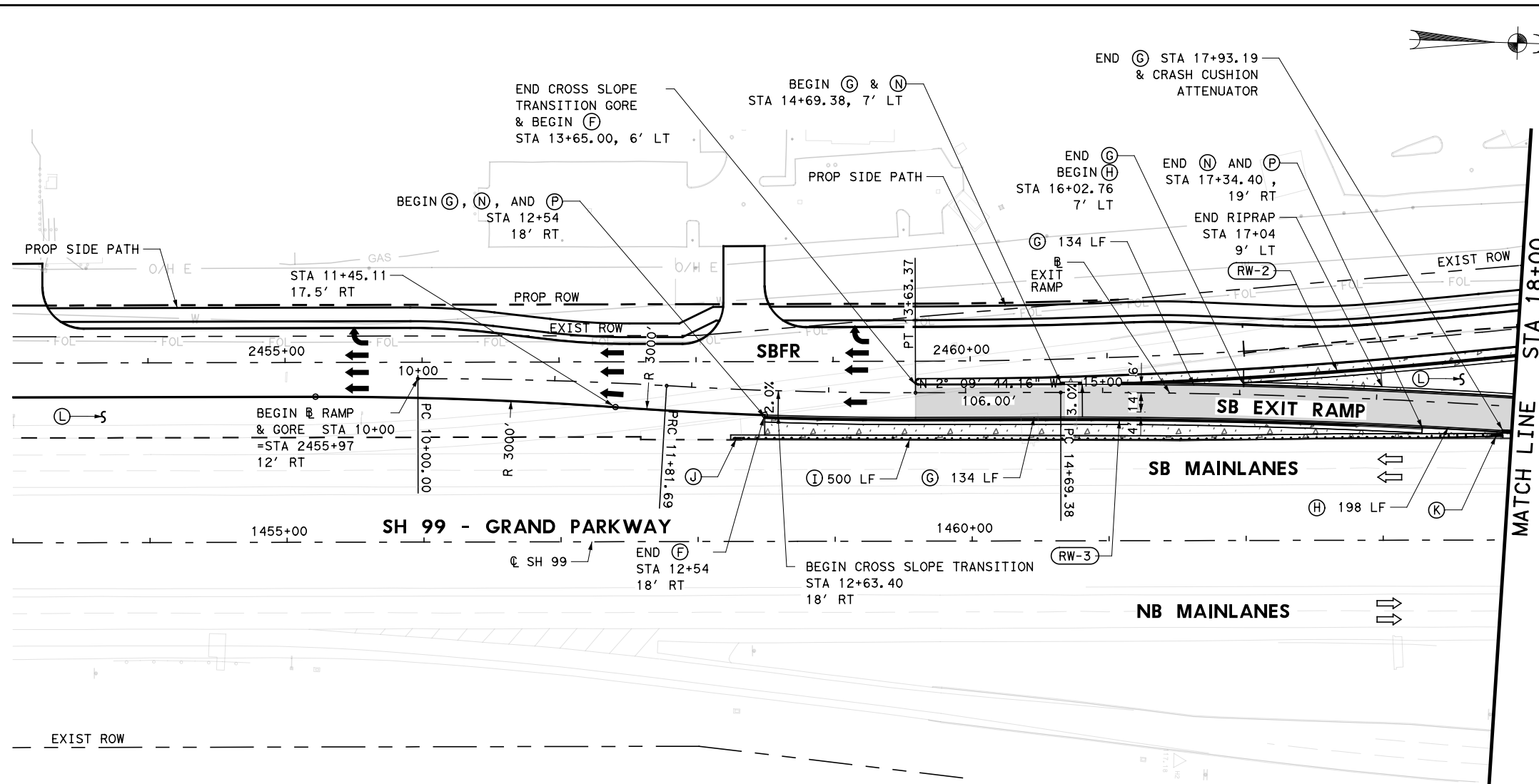


SH 99  
SOUTHBOUND FRONTAGE ROAD  
WESTHEIMER PKWY TO CINCO RANCH BLVD  
  
PLAN AND PROFILE  
SB ENTRANCE RAMP  
STA 17+00 TO END OF RAMP  
SHEET 2 OF 2

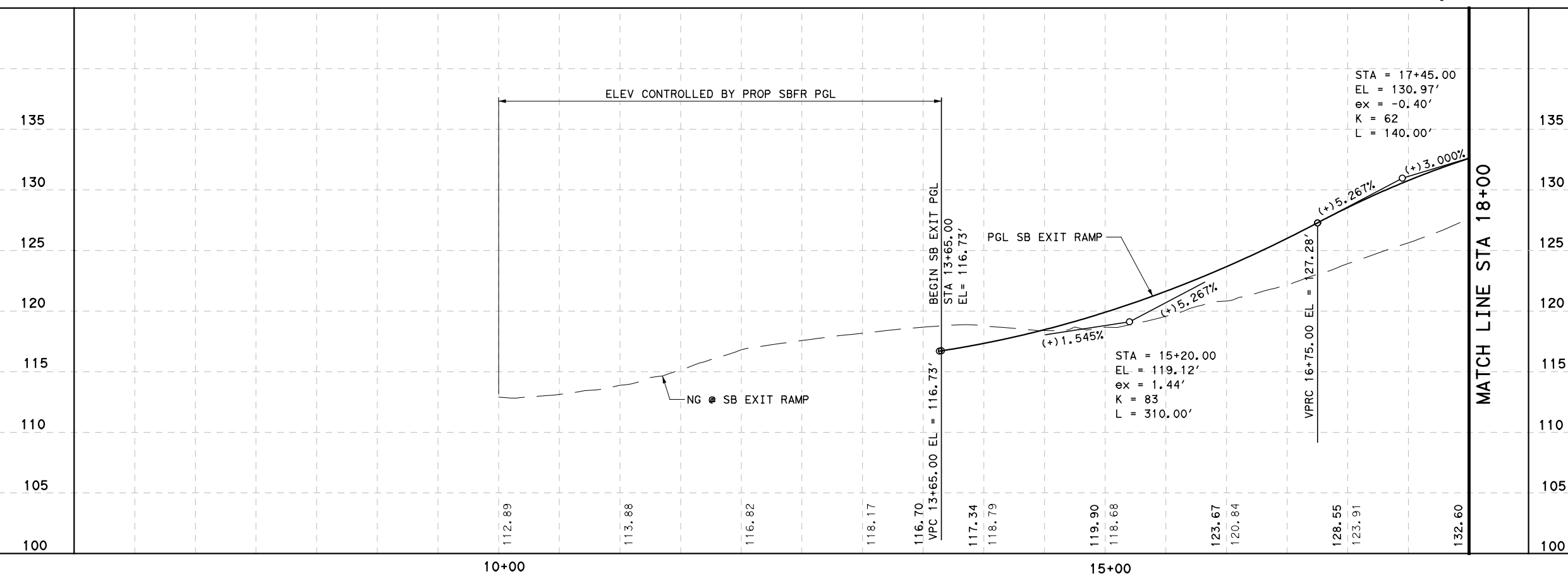
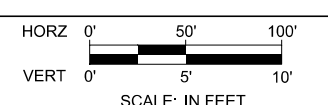
FED. RD. DIST. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	111



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- LEGEND:**
- (A) 10" CRCP (FRTG RD)
  - (B) 1" ASPHALT BOND BREAKER
  - (C) 6" CEMENT STABILIZED BASE
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  - (SW-X) SOUND BARRIER
  - (DWY-X) DRIVEWAY NUMBER
  - ▨ PROP IMPROVEMENTS DETAILED ON THIS SHEET
  - ⇐ EXIST TRAFFIC DIRECTION ARROW
  - ⇨ PROP TRAFFIC DIRECTION ARROW
  - SAWCUT LINE



PAUL E. BRIGHT  
61108  
REGISTERED PROFESSIONAL ENGINEER  
Paul E. Bright  
1/19/2023

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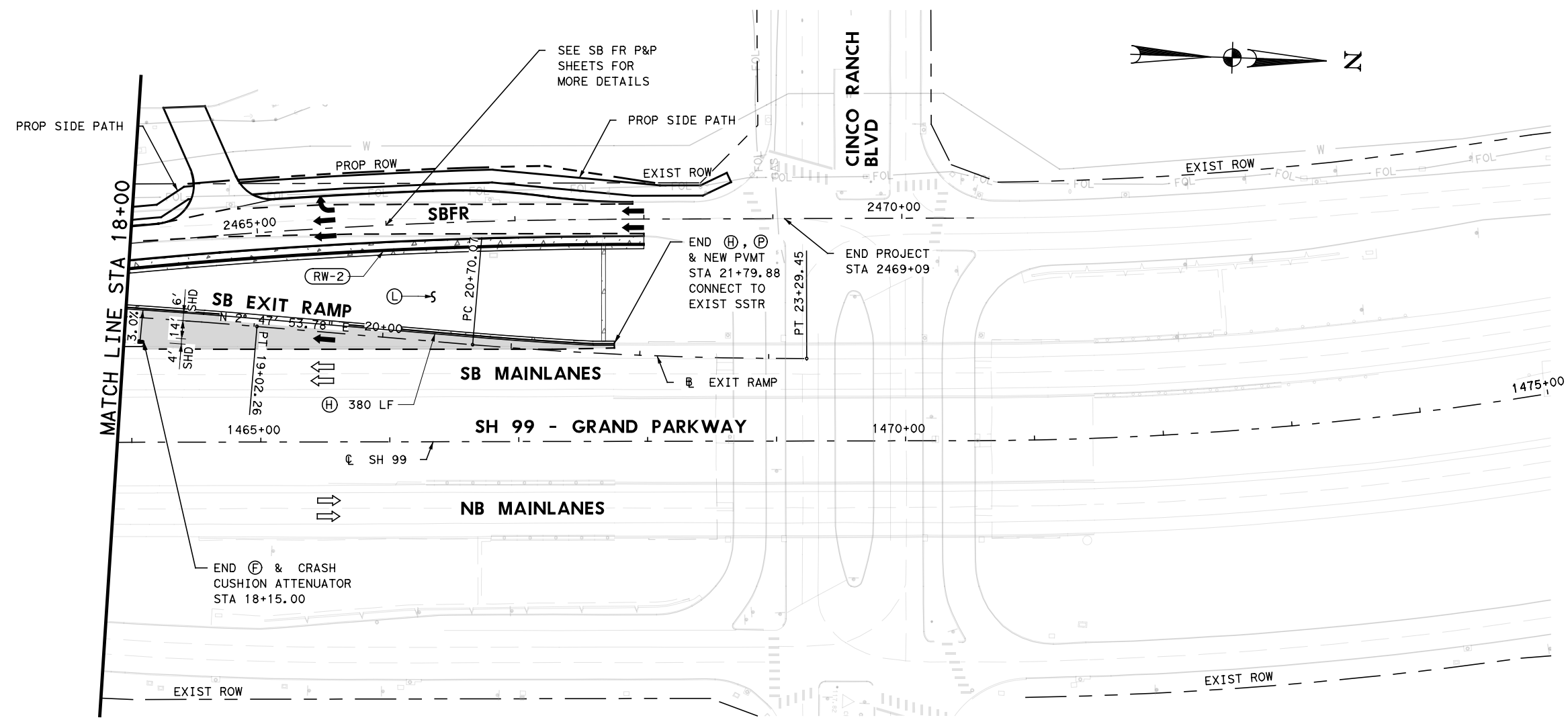
SH 99  
SOUTHBOUND FRONTAGE ROAD  
WESTHEIMER PKWY TO CINCO RANCH BLVD

PLAN AND PROFILE  
SB EXIT RAMP  
START TO STA 18+00

SHEET 1 OF 2

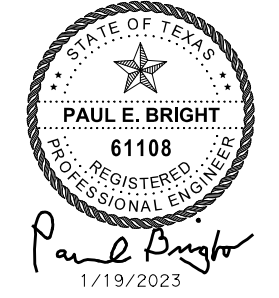
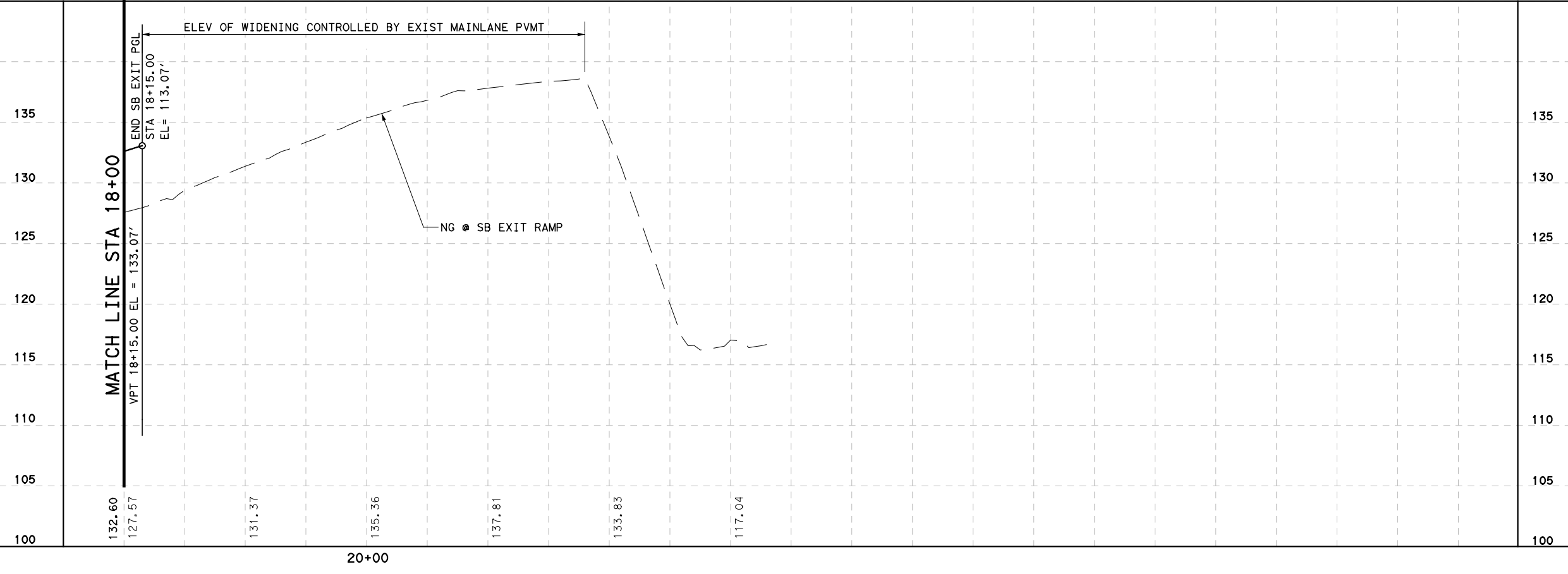
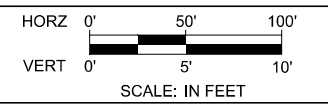
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6				SH 99	
STATE	DIST.	COUNTY			
TEXAS	HOU	FORT BEND			
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LEGEND:

- (A) 10" CRCP (FRTG RD)
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- (G) SSTR
- (H) SSTR (W/SLOTS)
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- (J) DOWNSTREAM ANCHOR TERMINAL (DAT)
- (K) SINGLE GUARDRAIL TERMINAL
- (L) SODDING/SEEDING
- (N) MSE RETAINING WALL
- (P) CONC RIPRAP
- (SW-X) SOUND BARRIER
- (DWY-X) DRIVEWAY NUMBER
- ▒ PROP IMPROVEMENTS DETAILED ON THIS SHEET
- ← EXIST TRAFFIC DIRECTION ARROW
- ➔ PROP TRAFFIC DIRECTION ARROW
- SAWCUT LINE



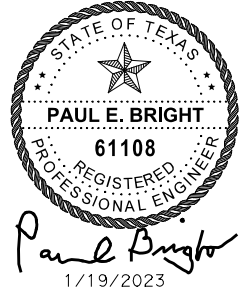
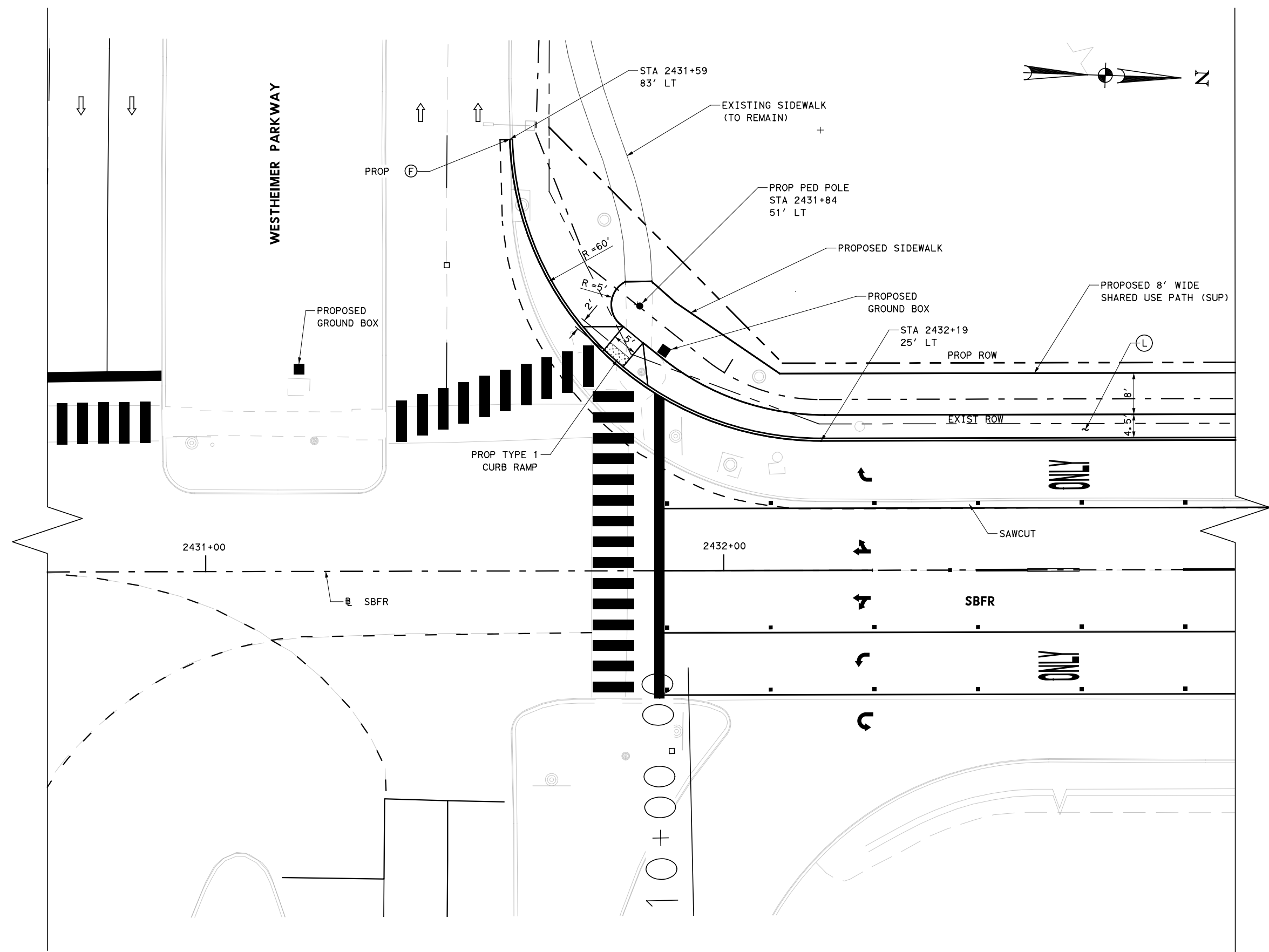
SH 99  
SOUTHBOUND FRONTAGE ROAD  
WESTHEIMER PKWY TO CINCO RANCH BLVD  
  
PLAN AND PROFILE  
SB EXIT RAMP  
STA 18+00 TO END  
SHEET 2 OF 2

FED. RD. DIST. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	113

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LEGEND:

- (A) 10" CRCP (FRTG RD)
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- (SW-X) SOUND BARRIER
- (DWY-X) DRIVEWAY NUMBER
- ▬ PROP IMPROVEMENTS DETAILED ON THIS SHEET
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- ➔ PROP TRAFFIC DIRECTION ARROW
- - SAWCUT LINE



SH 99  
SOUTHBOUND FRONTAGE ROAD  
WESTHEIMER PKWY TO CINCO RANCH BLVD  
INTERSECTION LAYOUT

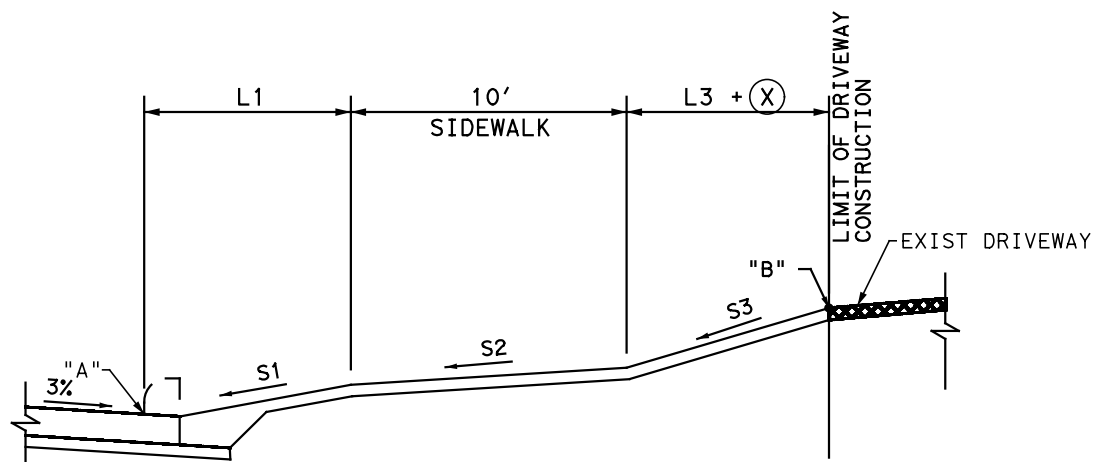
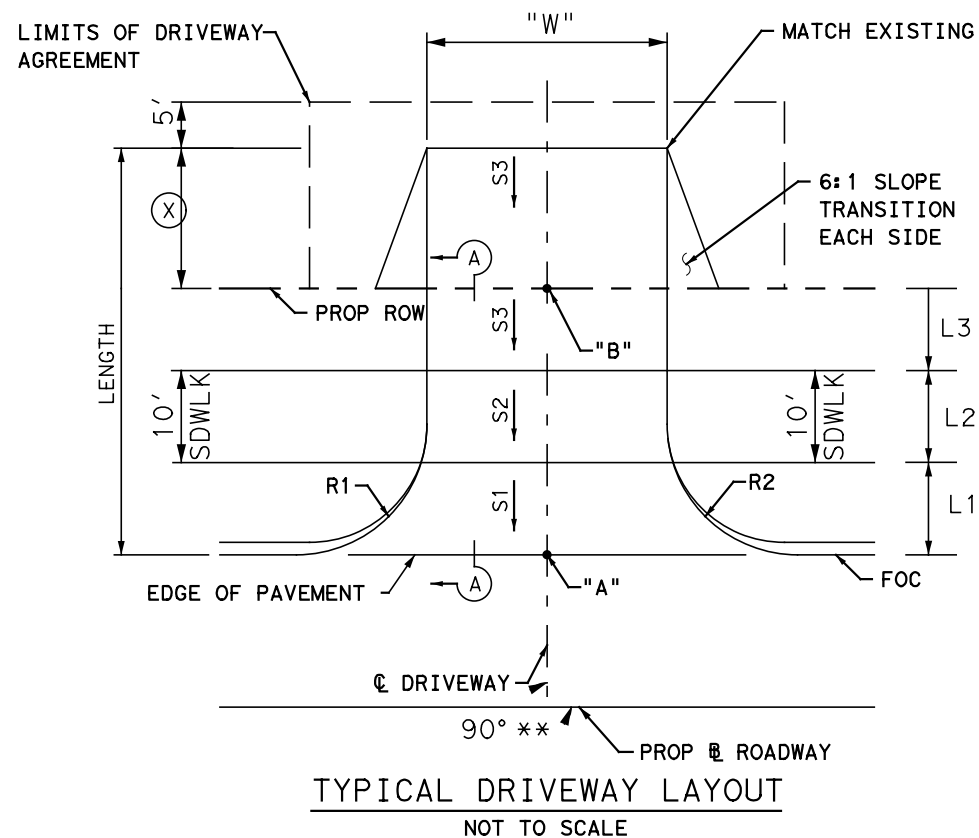
SHEET 1 OF 1

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	114



SH 99 SOUTHBOUND FRONTAGE ROAD DRIVEWAY SUMMARY

PLAN & PROFILE SHEET NO.	DRIVEWAY No.	DRIVEWAY STATION	ALIGNMENT	GUTTER OFFSET (FT)	LT/RT	CURB RADIUS		DRIVEWAY WIDTH (FT)	DRIVEWAY LENGTH (FT)	PROP ELEV AT GUTTER (FT)	EXIST ELEV AT END OF DRIVEWAY (FT)	STREET SIDE SIDEWALK ELEV (FT)	ROW SIDE SIDEWALK ELEV (FT)	GUTTER TO EDGE OF SIDEWALK LENGTH (L1) (FT)	SIDEWALK WIDTH (L2) (FT)	EDGE OF SIDEWALK TO ROW LENGTH (L3) (FT)	DRIVEWAY APRON SLOPE (S1) (%)	SIDEWALK SLOPE (S2) (%)	DRIVEWAY SLOPE (S3) (%)	DISTANCE REQUIRED (X) (FT)	ROE REQUIRED	DRIVEWAY TYPE
						R-1 (FT)	R-2 (FT)															
1 OF 4	DWY-1	2436+19.32	SBFR	25.00	LT	30	30	30	45.70	110.74	111.69	110.82	110.97	5.00	10.00	3.00	1.50	1.50	2.36	27.70	YES	COMMERCIAL
2 OF 4	DWY-2	2443+80.24	SBFR	19.21	LT	30	30	30	45.57	110.59	111.78	110.73	110.88	8.79	10.00	4.00	1.50	1.50	3.38	22.78	YES	COMMERCIAL
3 OF 4	DWY-3	2453+08.05	SBFR	19.00	LT	30	30	30	53.49	111.64	112.91	111.81	111.96	11.00	10.00	2.00	1.50	1.50	2.94	30.49	YES	COMMERCIAL
3 OF 4	DWY-4	2458+35.09	SBFR	19.00	LT	30	30	30	65.35	114.19	115.65	114.36	114.51	11.00	10.00	2.00	1.50	1.50	2.58	42.35	YES	COMMERCIAL
4 OF 4	DWY-5	2464+71.42	SBFR	19.17	LT	30	30	30	85.50	115.39	117.57	115.56	115.71	10.84	10.00	2.02	1.50	1.50	2.88	62.58	YES	COMMERCIAL



SECTION A-A  
TYPICAL AT ALL DRIVEWAYS  
NOT REQUIRING ICE  
NOT TO SCALE



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Houston, Texas 77079  
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SH 99  
SOUTHBOUND FRONTAGE ROAD  
WESTHEIMER PKWY TO CINCO RANCH BLVD

DRIVEWAY TABLE  
& DETAILS

SHEET 1 OF 1

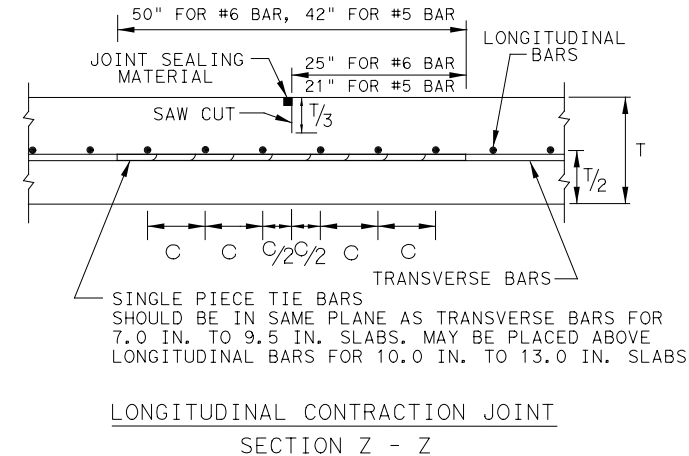
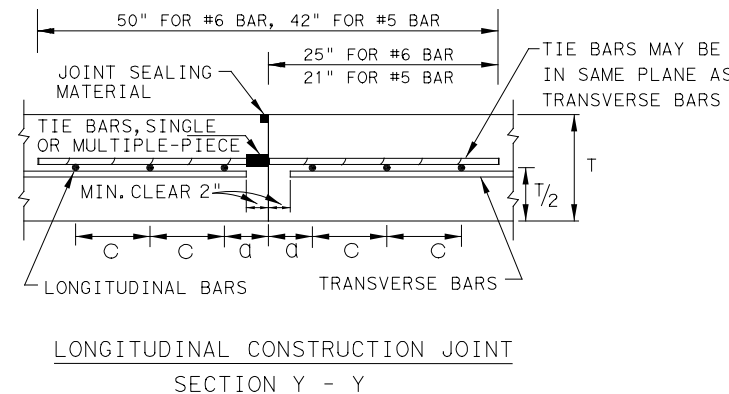
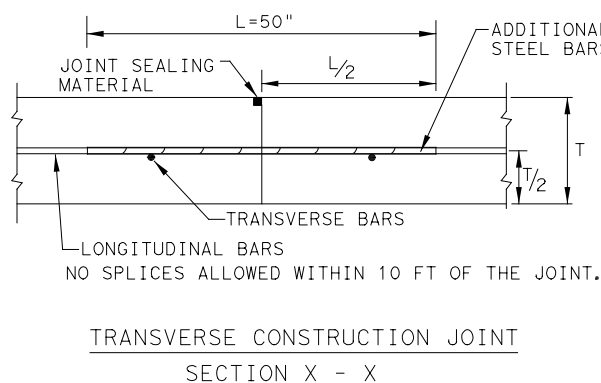
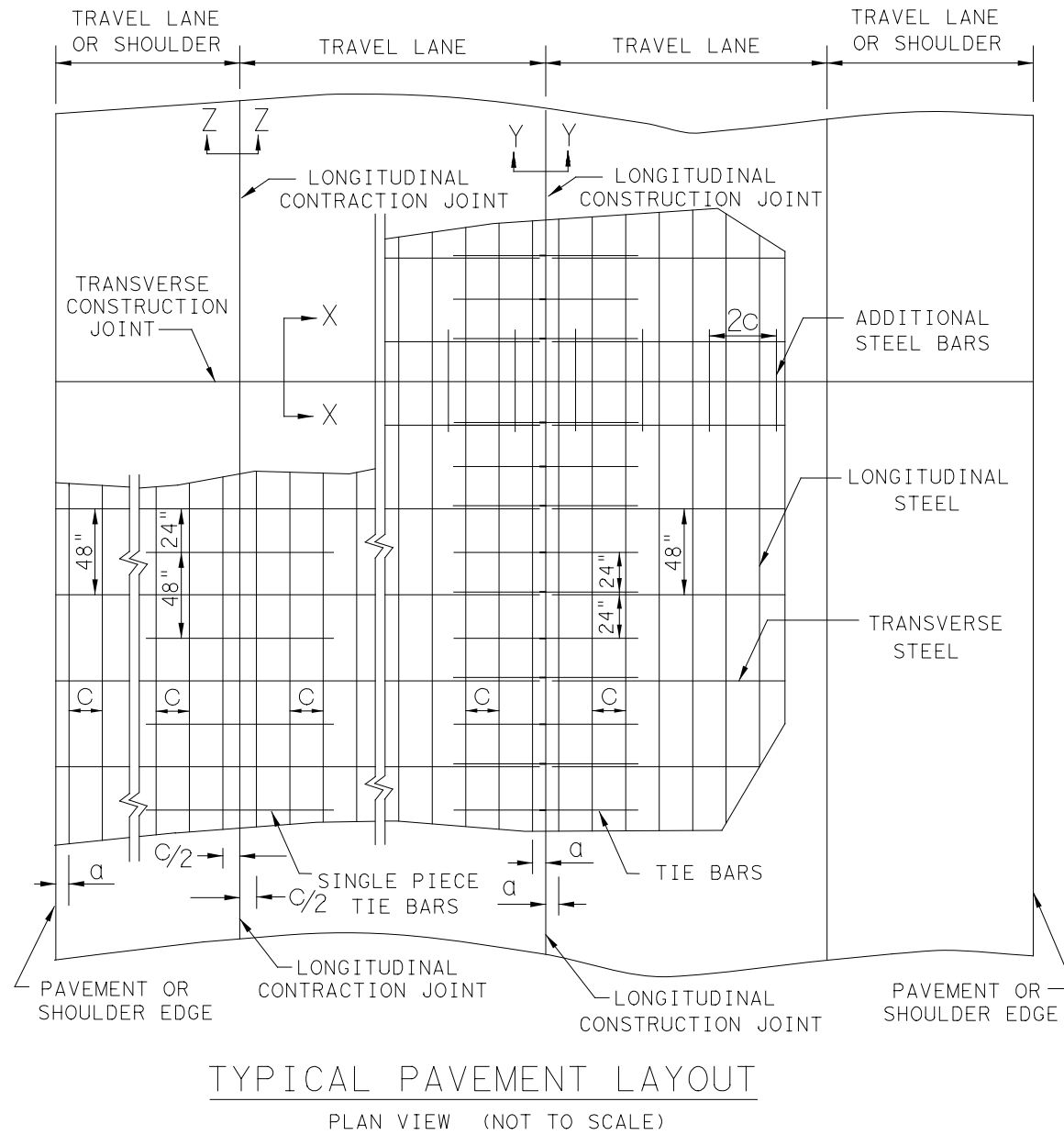
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6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	116

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TABLE NO.1 LONGITUDINAL STEEL					
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 $\frac{2}{3} \times C$ (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

TABLE NO.2 TRANSVERSE STEEL AND TIE BARS						
SLAB THICKNESS (IN.)	TRANSVERSE STEEL		TIE BARS AT LONGITUDINAL CONTRACTION 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

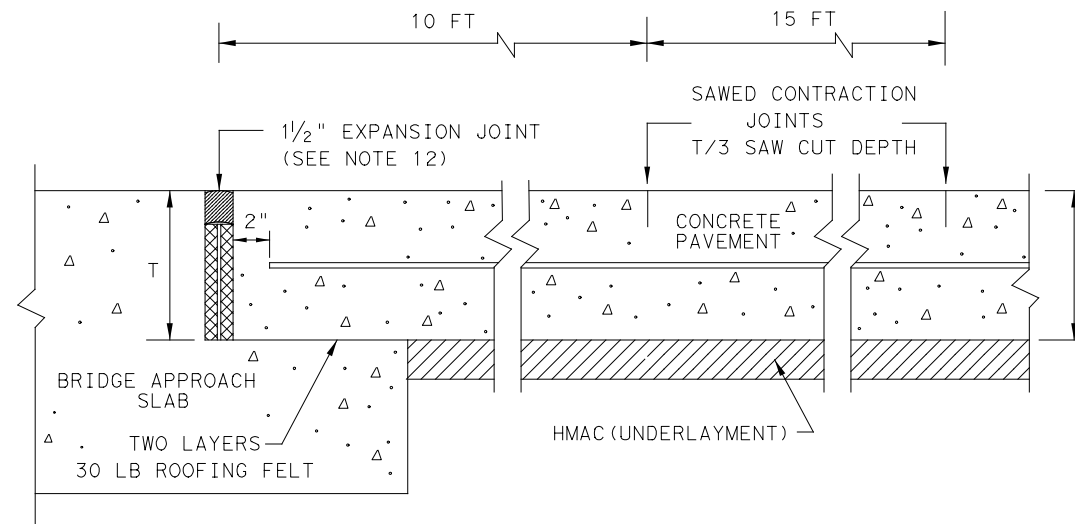


		<b>Design Division Standard</b>		
<b>CONTINUOUSLY REINFORCED CONCRETE PAVEMENT</b> ONE LAYER STEEL BAR PLACEMENT T - 7 TO 13 INCHES CRCP (1) - 20				
FILE: crcp120.dgn	DN: TxDOT	CK: KM	DW: AN	CK: VP
© TxDOT: APRIL 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	3510	04	055	SH 99
10/10/2011 ADD GN #12	DIST	COUNTY	SHEET NO.	
04/09/2013 REMOVE 6" AND 6.5" ADD CTE REQUIREMENTS	HOU	FORT BEND	117	
05/05/2017 COTE AS RATED 4.3				

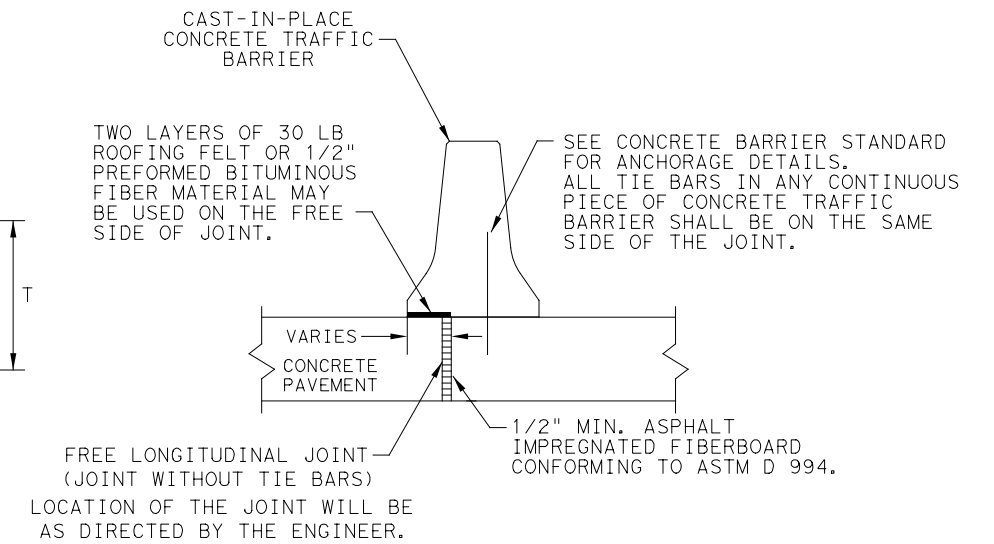
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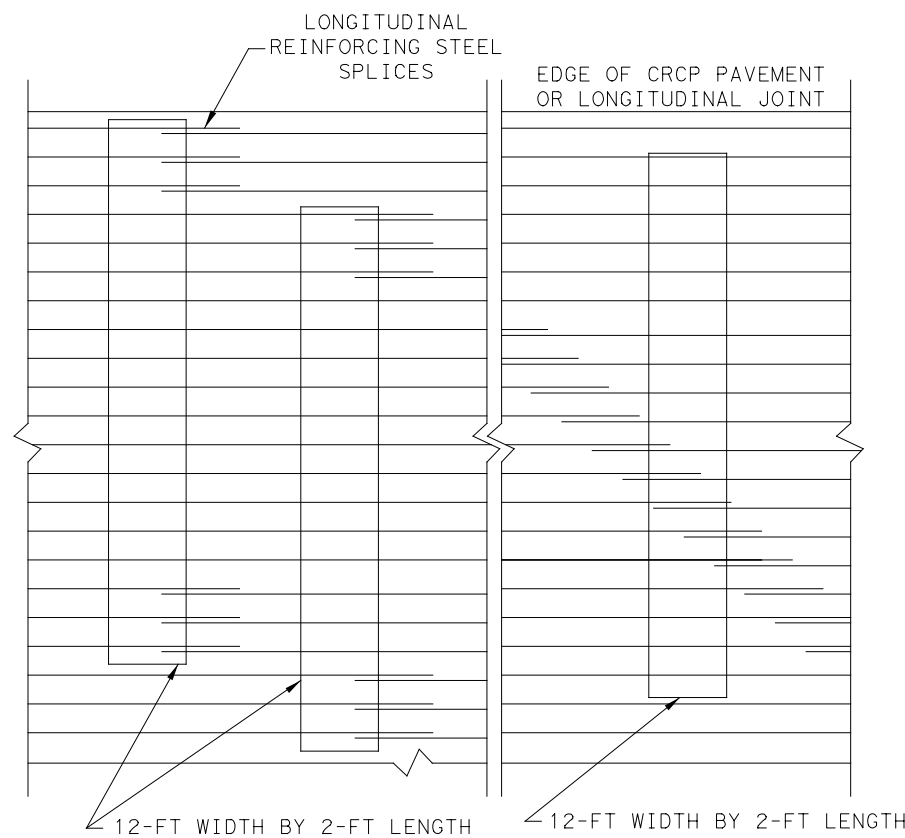
DATE:  
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TRANSVERSE EXPANSION JOINT DETAIL  
AT BRIDGE APPROACH

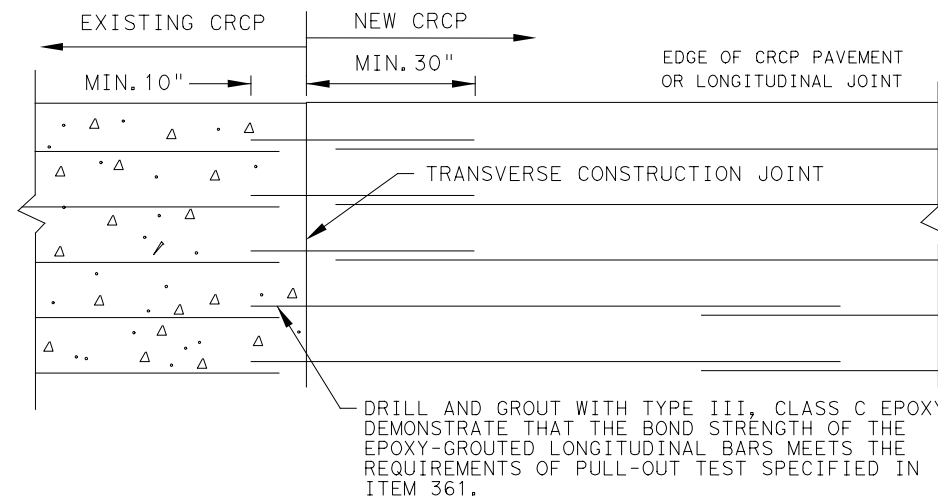


FREE LONGITUDINAL JOINT DETAIL

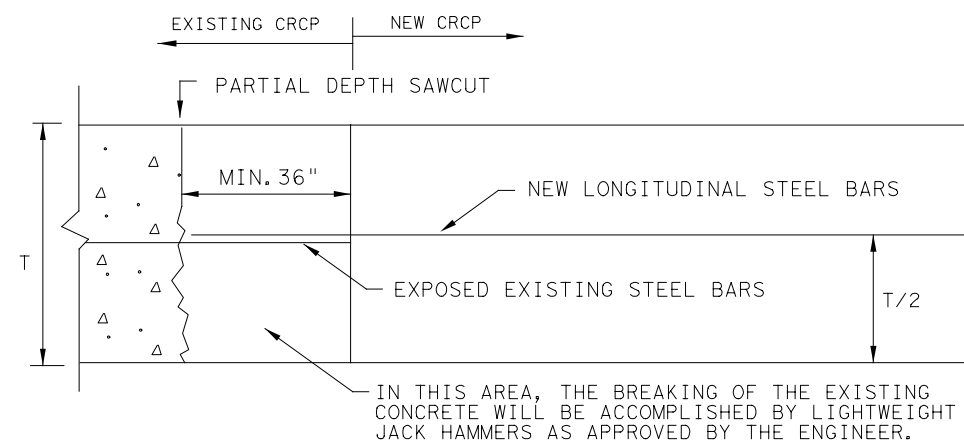


STAGGER THE LAP LOCATIONS SO THAT NO MORE THAN 1/3 OF THE LONGITUDINAL STEEL IS SPLICED IN ANY GIVEN 12-FT. WIDTH AND 2-FT. LENGTH OF THE PAVEMENT. ANY OTHER LAP CONFIGURATION MEETING THIS REQUIREMENT WILL BE ALLOWED.

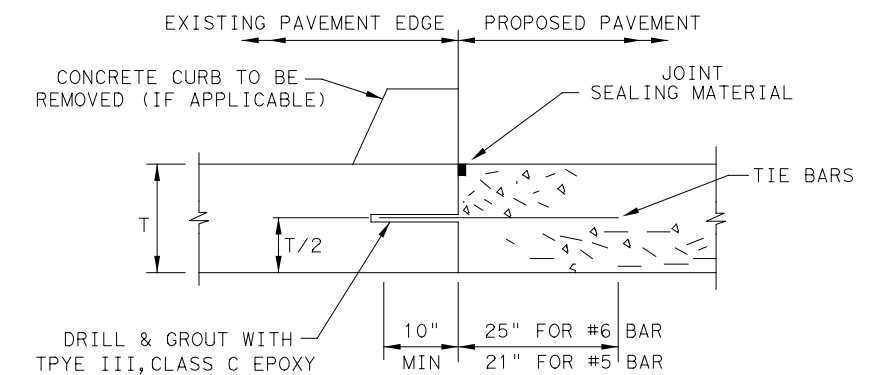
EXAMPLES OF LAP CONFIGURATION  
PLAN VIEW (NOT TO SCALE)



OPTION A: DRILL AND EPOXY  
PLAN VIEW (NOT TO SCALE)



OPTION B: BREAKBACK AND LAP  
TRANSVERSE TIE JOINT DETAIL  
EXISTING CRCP TO NEW CRCP



- 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.
- 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

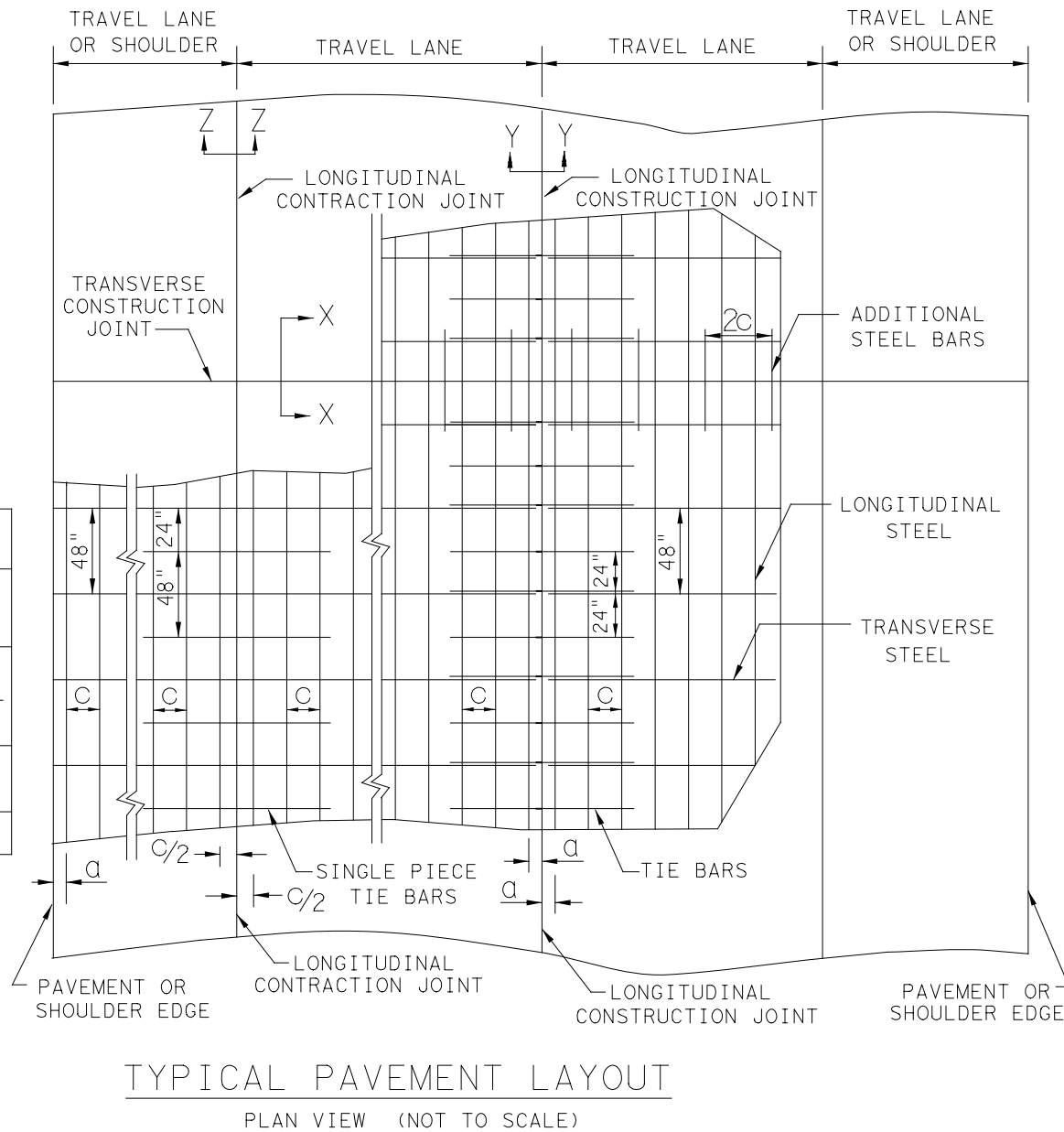
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© TxDOT: APRIL 2020	CONT: 3510	SECT: 04	JOB: 055	HIGHWAY: SH 99
REVISIONS	DIST: HOU	COUNTY: FORT BEND	SHEET NO. 118	
03/16/2020 REMOVED TABLE 1A				

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TABLE NO. 1 LONGITUDINAL STEEL					
SLAB THICKNESS AND BAR SIZE		FOR BOTH STEEL MATS		FOR TOP STEEL MAT ONLY	
		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.)
14	#6	9.5	3 TO 4	19	50
15	#6	8.5	3 TO 4	17	50

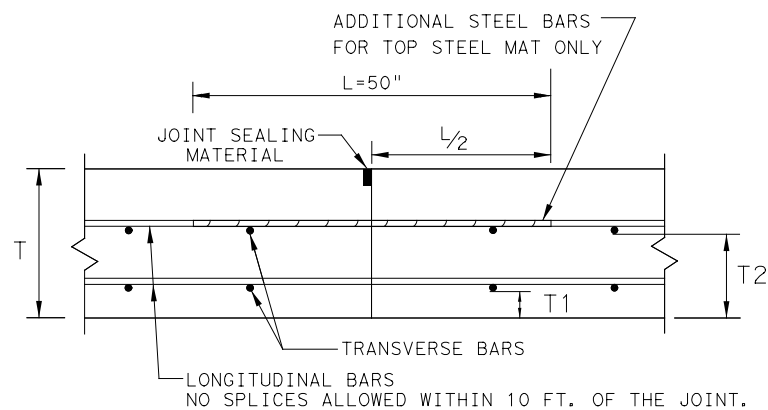
TABLE NO. 2 TRANSVERSE STEEL AND TIE BARS						
SLAB THICKNESS T (IN.)	FOR BOTH STEEL MATS		FOR LOWER STEEL MAT ONLY		FOR BOTH STEEL MATS	
	TRANSVERSE STEEL		TIE BARS AT LONGITUDINAL CONSTRUCTION JOINT (SECTION Z-Z)		TIE BARS AT LONGITUDINAL CONSTRUCTION JOINT (SECTION Y-Y)	
	BAR SIZE	SPACING (IN.)	BAR SIZE	SPACING (IN.)	BAR SIZE	SPACING (IN.)
14 - 15	#5	48	#6	48	#6	24

TABLE NO. 3 TWO LAYER STEEL PLACEMENT HEIGHT OF STEEL MATS		
SLAB THICKNESS T (IN.)	LOWER STEEL MAT HEIGHT T1 (IN.)	TOP STEEL MAT HEIGHT T2 (IN.)
14	4.5	8.0
15	5.0	8.5

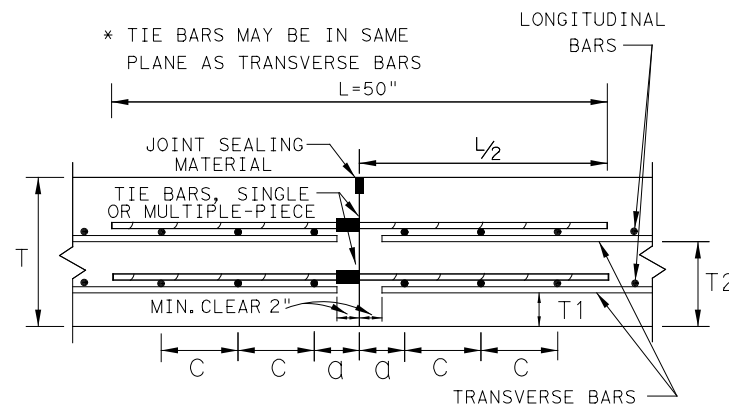


- GENERAL NOTES**
1. DETAILS FOR PAVEMENT WIDTH, PAVEMENT THICKNESS AND THE CROWN CROSS-SLOPE SHALL BE SHOWN ELSEWHERE IN THE PLANS. PAVEMENTS WIDER THAN 100 FT. WITHOUT A FREE LONGITUDINAL JOINT ARE NOT COVERED BY THIS STANDARD.
  2. USE COARSE AGGREGATES WITH A RATED COEFFICIENT OF THERMAL EXPANSION (COTE) OF NOT MORE THAN  $5.5 \times 10^{-6}$  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, TABLE NO. 2 AND TABLE NO. 3.
  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."

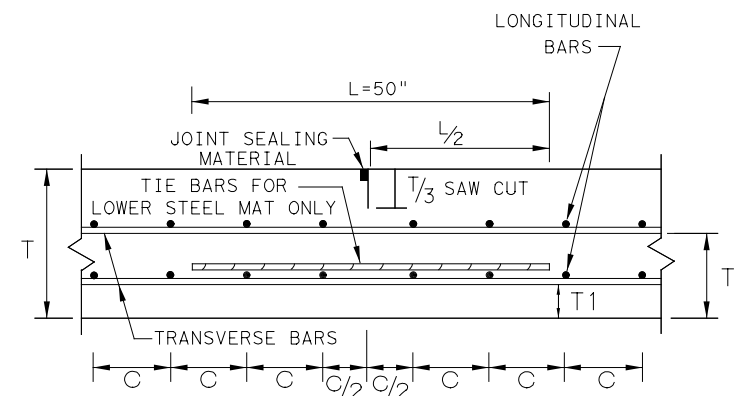
TYPICAL PAVEMENT LAYOUT  
PLAN VIEW (NOT TO SCALE)



TRANSVERSE CONSTRUCTION JOINT  
SECTION X - X



LONGITUDINAL CONSTRUCTION JOINT  
SECTION Y - Y



LONGITUDINAL CONTRACTION JOINT  
SECTION Z - Z

SHEET 1 OF 2

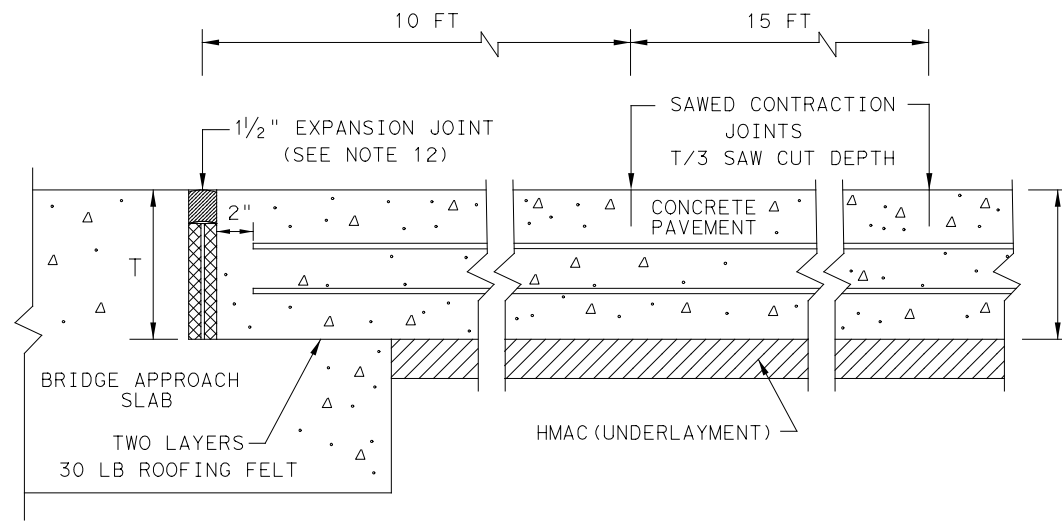
		<b>Design Division Standard</b>	
<b>CONTINUOUSLY REINFORCED CONCRETE PAVEMENT</b> TWO LAYER STEEL BAR PLACEMENT T - 14 & 15 INCHES CRCP (2) - 20			
FILE: crcp220.dgn	DN: TxDOT	CK: KM	DW: AN
© TxDOT: APRIL 2020	CONT	SECT	JOB
10/10/2011 ADD ON #12	3510	04	055
04/09/2013 REMOVE 6" AND 6.5" ADD CTE REQUIREMENTS	DIST	COUNTY	SHEET NO.
04/19/2017 COTE AS RATED 4.3	HOU	FORT BEND	119

DATE:  
FILE:

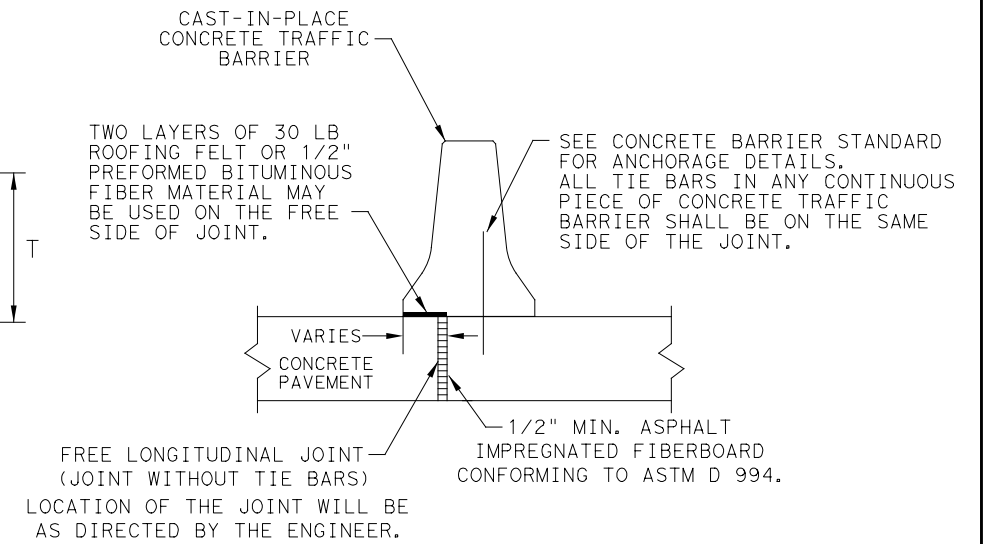


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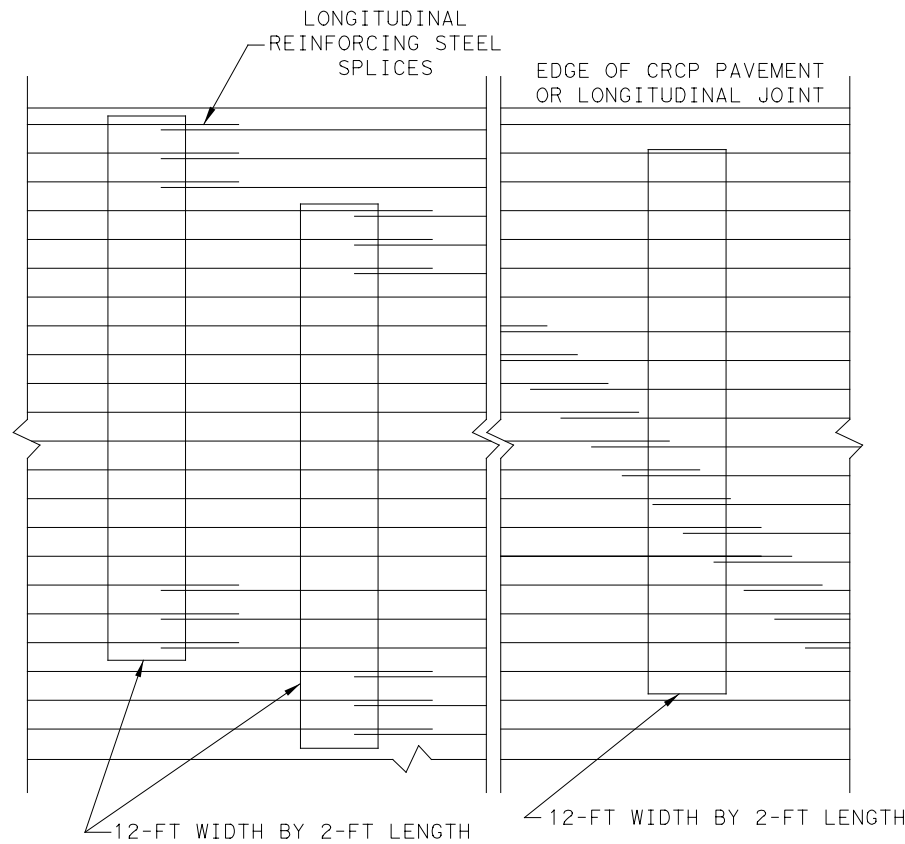
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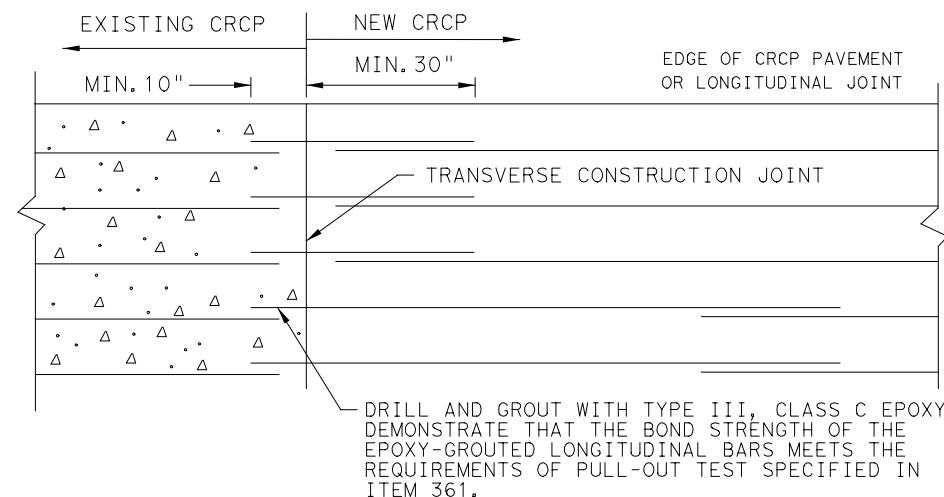
TRANSVERSE EXPANSION JOINT DETAIL  
AT BRIDGE APPROACH



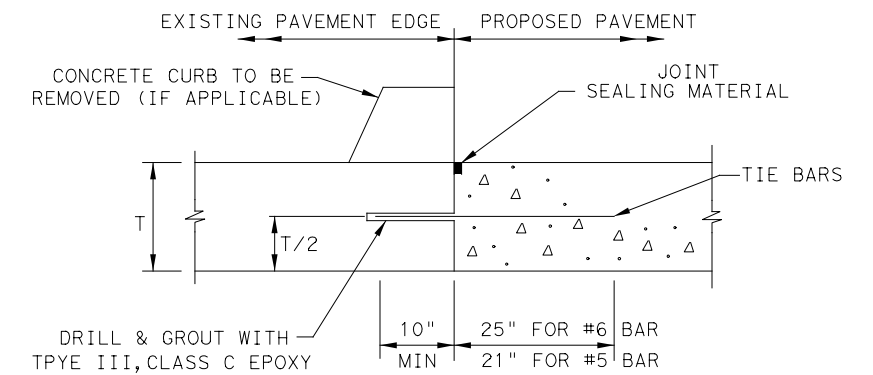
FREE LONGITUDINAL JOINT DETAIL



EXAMPLES OF LAP CONFIGURATION  
PLAN VIEW (NOT TO SCALE)

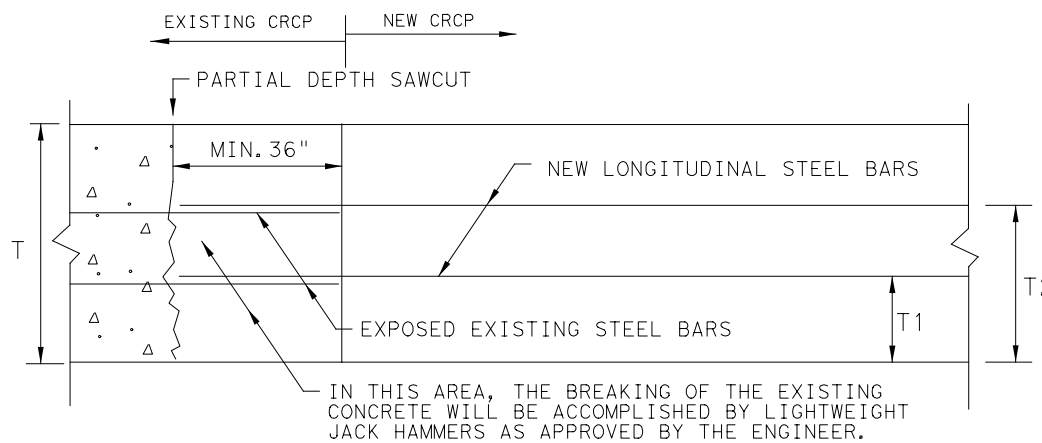


OPTION A: DRILL AND EPOXY  
PLAN VIEW (NOT TO SCALE)



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 TIE BARS FOR 8" AND THICKER SLABS, USE #5 TIE BARS FOR LESS THAN 8" THICK SLABS.

LONGITUDINAL WIDENING JOINT DETAIL



OPTION B: BREAKBACK AND LAP  
TRANSVERSE TIE JOINT DETAIL  
EXISTING CRCP TO NEW CRCP

SHEET 2 OF 2



CONTINUOUSLY REINFORCED  
CONCRETE PAVEMENT  
TWO LAYER STEEL BAR PLACEMENT  
T - 14 & 15 INCHES  
CRCP (2) - 20

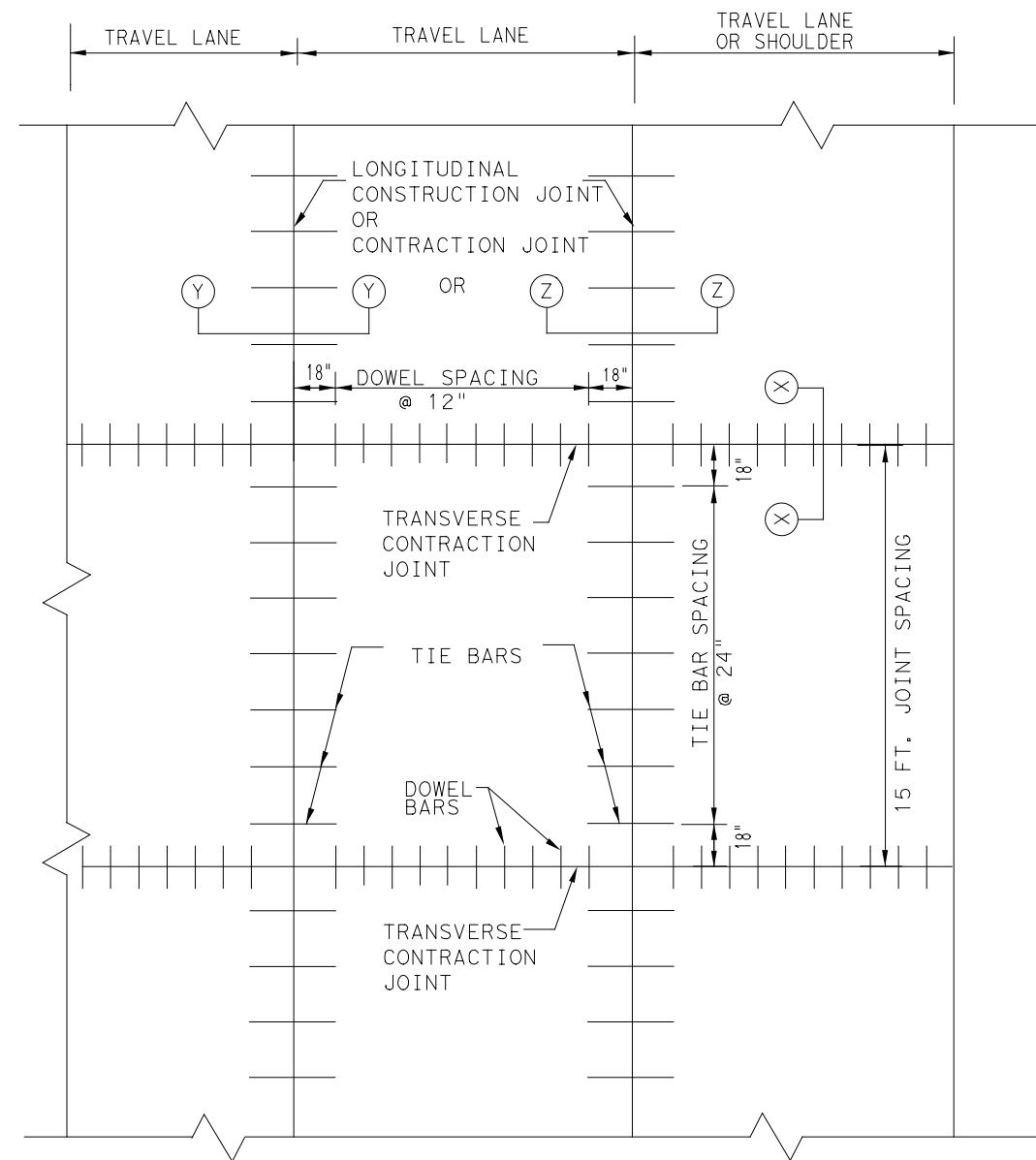
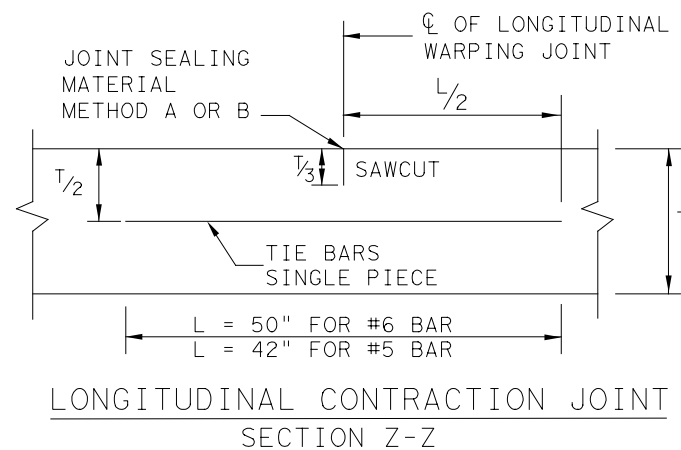
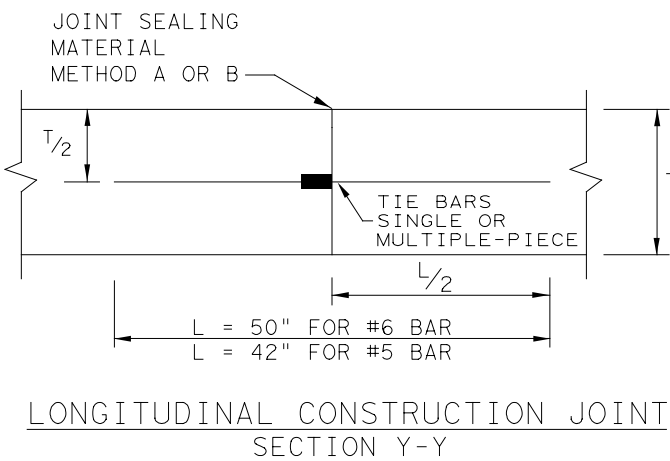
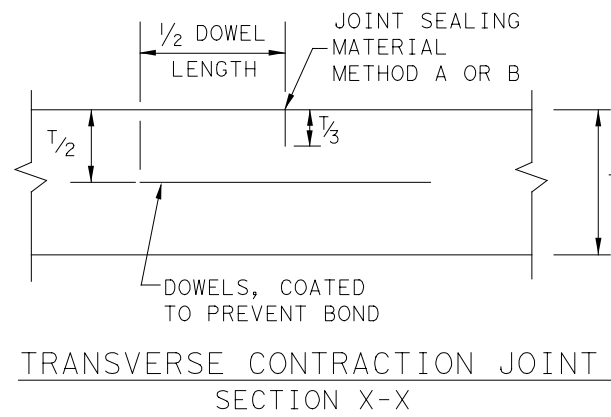
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© TxDOT: APRIL 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	3510	04	055	SH 99
03/16/2020 REMOVED TABLE 1A	DIST	COUNTY	SHEET NO.	
	HOU	FORT BEND	120	

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DATE:  
FILE:

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

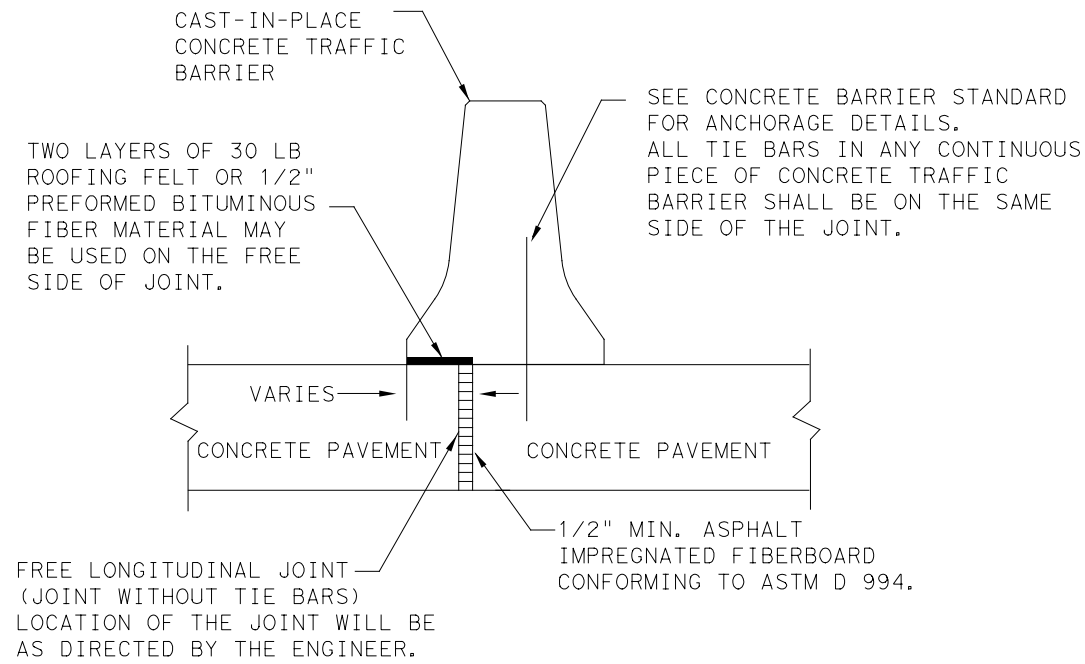


CONCRETE PAVEMENT DETAILS  
CONTRACTION DESIGN  
T-6 to 12 INCHES

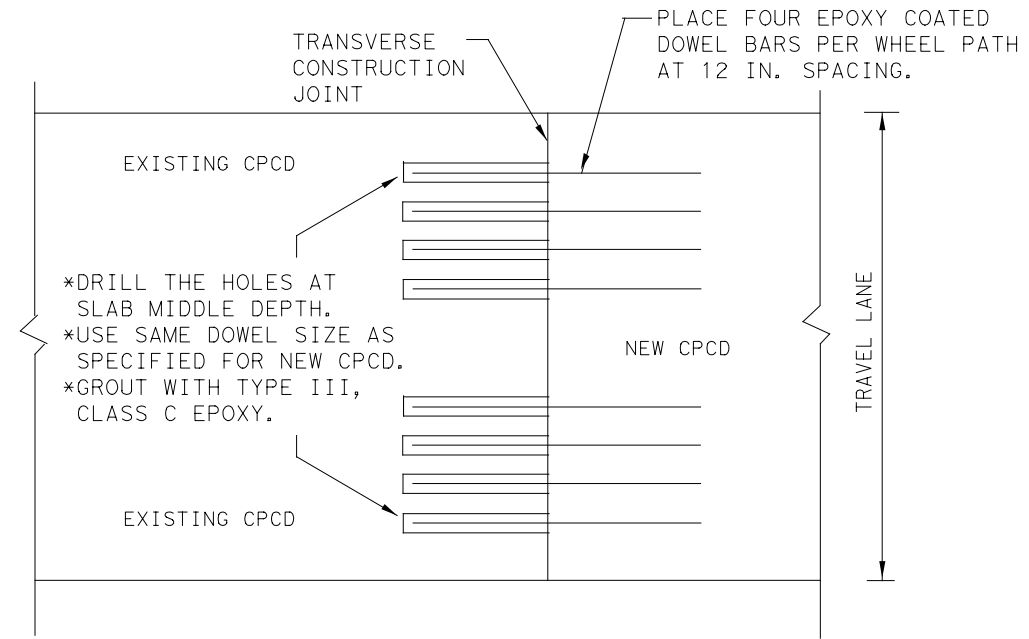
CPCD-14

FILE: cpcd14.dgn	DN: TxDOT	DN: HC	DN: HC	CK: AN
© TxDOT: DECEMBER 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	3510	04	055	SH 99
	DIST	COUNTY	SHEET NO.	
	HOU	FORT BEND	121	

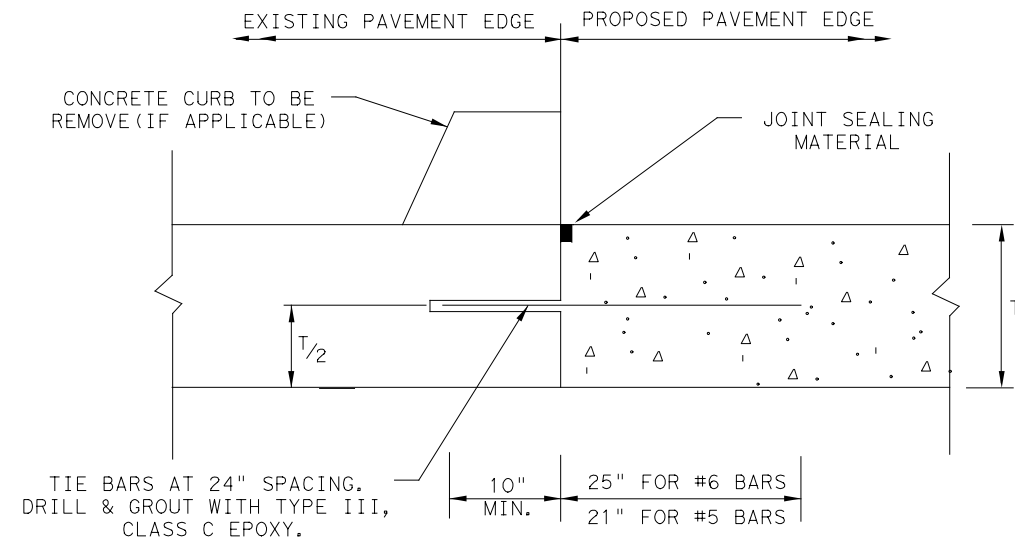
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FREE LONGITUDINAL JOINT DETAIL

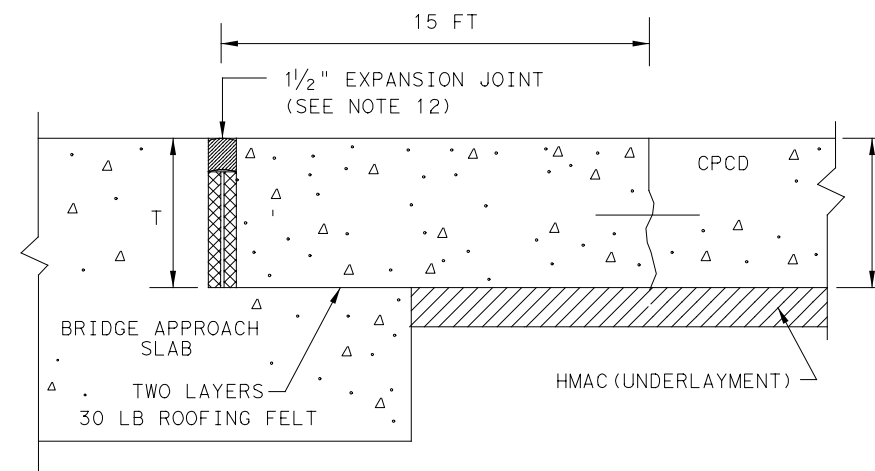


TRANSVERSE JOINT DETAIL  
EXISTING CPCD TO NEW CPCD  
PLAN VIEW (NOT TO SCALE)



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

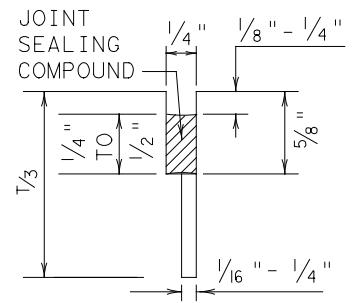
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© TxDOT: DECEMBER 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	3510	04	055	SH 99
	DIST	COUNTY	SHEET NO.	
	HOU	FORT BEND	122	

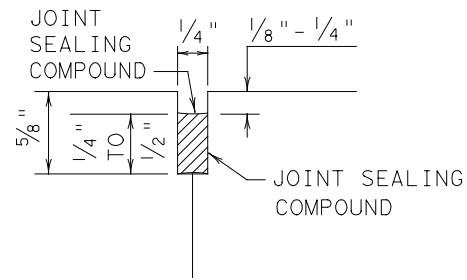
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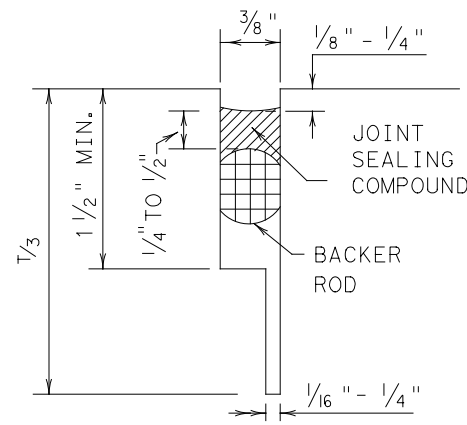
### METHOD B: JOINT SEALING COMPOUND



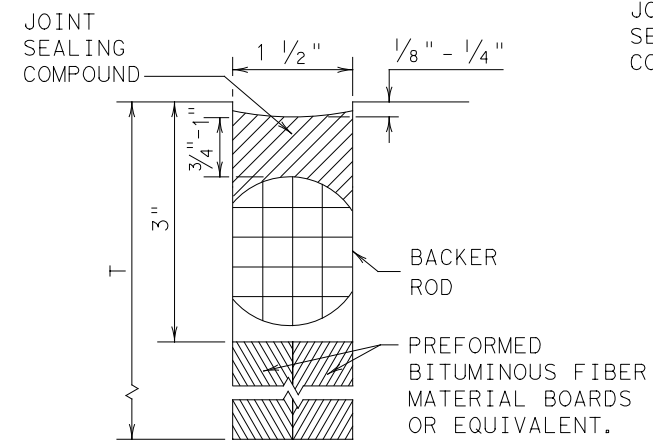
LONGITUDINAL SAWED CONTRACTION JOINT



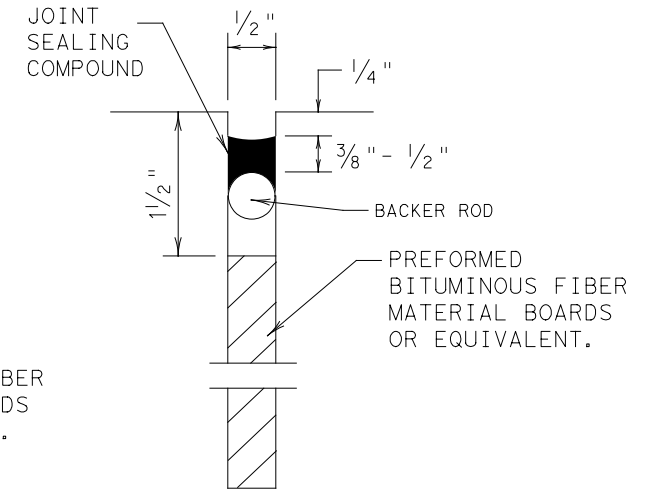
LONGITUDINAL OR TRANSVERSE CONSTRUCTION JOINT



TRANSVERSE SAWED CONTRACTION JOINT

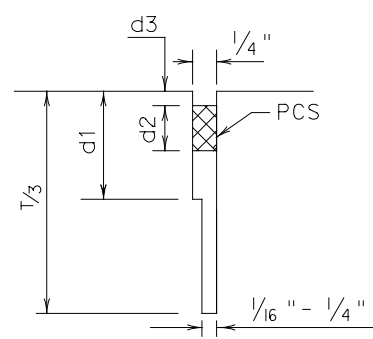


TRANSVERSE FORMED EXPANSION JOINT

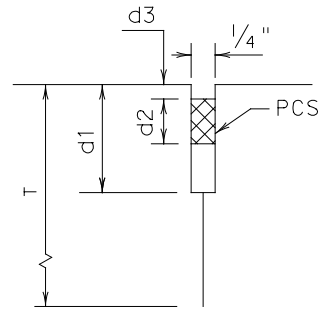


FORMED ISOLATION JOINT

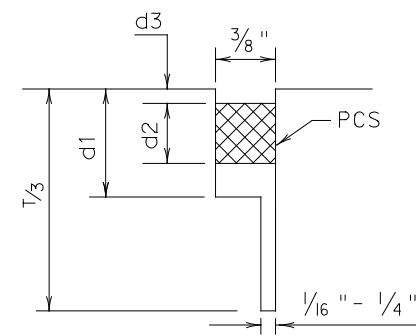
### METHOD A: PREFORMED COMPRESSION SEALS (PCS) (DMS-6310 CLASS 6)



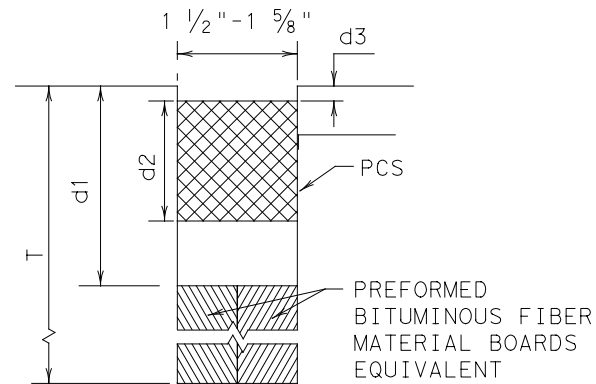
LONGITUDINAL SAWED CONTRACTION JOINT



LONGITUDINAL CONSTRUCTION JOINT



TRANSVERSE SAWED CONTRACTION JOINT



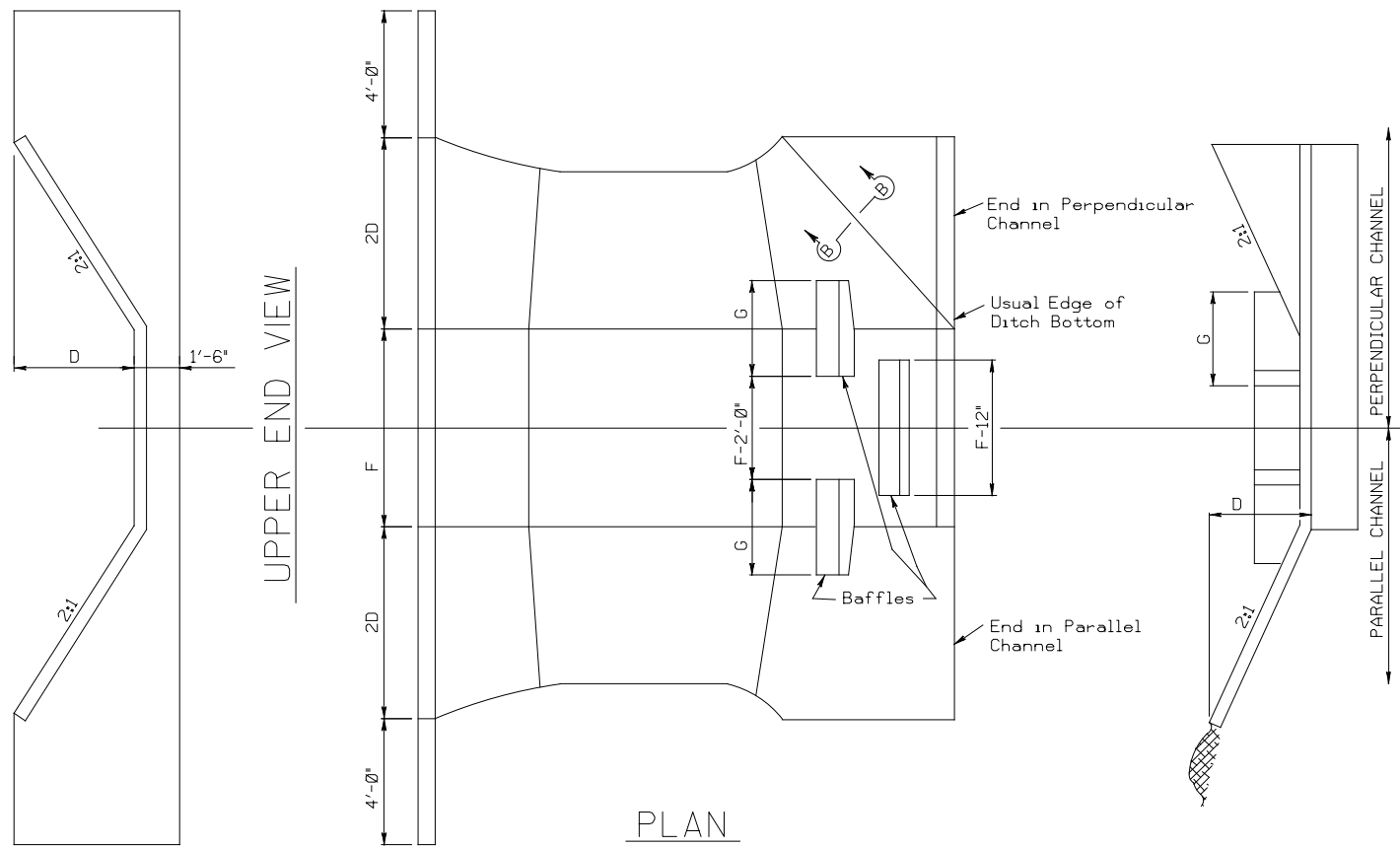
TRANSVERSE FORMED EXPANSION JOINT

### 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.

				<b>Design Division Standard</b>	
<b>CONCRETE PAVING DETAILS</b> <b>JOINT SEALS</b> <b>JS-14</b>					
FILE: js14.dgn	DN: TxDOT	DN: HC	DN: HC	CK: AN	
© TxDOT: DECEMBER 2014	CONT	SECT	JOB	HIGHWAY	
REVISIONS	3510	04	055	SH 99	
	DIST	COUNTY	SHEET NO.		
	HOU	FORT BEND	123		

DATE:  
FILE:



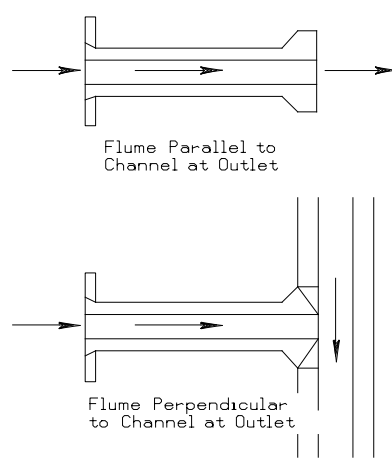
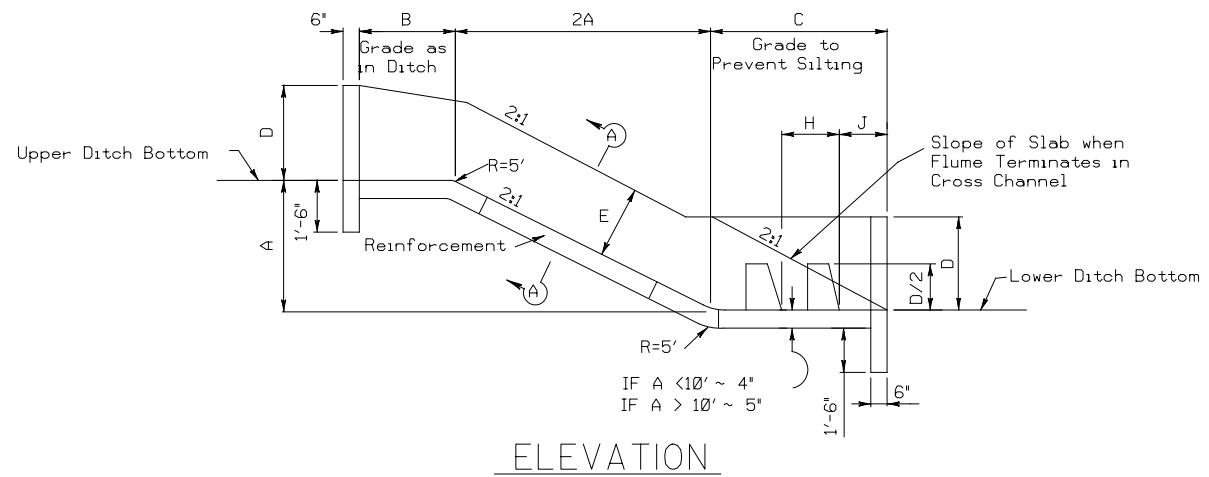
LOWER END HALF ELEVATION

VARIABLE DIMENSIONS		FLUME QUANTITIES (CLASS B CONC. C.Y.)													
		TY A CAP. = 17.8 CFS		TY B CAP. = 29.5 CFS		TY C CAP. = 40.6 CFS		TY D CAP. = 61.0 CFS		TY E CAP. = 81.3 CFS		TY F CAP. = 135 CFS		TY G CAP. = 172 CFS	
A	2A	PERP.	PAR.	PERP.	PAR.	PERP.	PAR.	PERP.	PAR.	PERP.	PAR.	PERP.	PAR.	PERP.	PAR.
2'-0"	4'-0"	2.491	2.324	3.061	2.839	3.596	3.373	4.453	4.120	4.998	4.665	6.249	5.804	7.049	6.604
2'-6"	5'-0"	2.615	2.449	3.208	2.987	3.771	3.546	4.647	4.314	5.220	4.886	6.517	6.072	7.344	6.900
3'-0"	6'-0"	2.740	2.573	3.356	3.135	3.946	3.724	4.842	4.508	5.441	5.108	6.340	5.895	7.196	6.751
3'-6"	7'-0"	2.865	2.698	3.504	3.282	4.122	3.900	5.036	4.702	5.663	5.330	6.517	6.072	7.344	6.900
4'-0"	8'-0"	2.989	2.823	3.652	3.430	4.297	4.075	5.230	4.896	5.885	5.552	6.721	6.276	7.577	7.131
4'-6"	9'-0"	3.114	2.947	3.799	3.578	4.473	4.251	5.424	5.091	6.107	5.773	6.936	6.491	7.786	7.341
5'-0"	10'-0"	3.239	3.072	3.947	3.726	4.648	4.426	5.618	5.285	6.328	5.995	7.141	6.696	7.991	7.546
5'-6"	11'-0"	3.363	3.197	4.095	3.874	4.824	4.602	5.812	5.479	6.550	6.217	7.346	6.901	8.196	7.751
6'-0"	12'-0"	3.488	3.321	4.243	4.022	4.999	4.777	6.006	5.673	6.772	6.439	7.491	7.046	8.341	7.906
6'-6"	13'-0"	3.613	3.446	4.391	4.169	5.175	4.952	6.201	5.867	6.994	6.660	7.636	7.191	8.486	8.051
7'-0"	14'-0"	3.737	3.571	4.538	4.317	5.350	5.128	6.395	6.061	7.215	6.882	7.781	7.336	8.631	8.206
7'-6"	15'-0"	3.862	3.695	4.686	4.465	5.526	5.303	6.589	6.255	7.437	7.104	7.926	7.481	8.776	8.351
8'-0"	16'-0"	3.987	3.820	4.834	4.613	5.701	5.479	6.783	6.450	7.659	7.326	8.071	7.626	8.921	8.506
8'-6"	17'-0"	4.111	3.945	4.982	4.761	5.876	5.654	6.977	6.644	7.881	7.547	8.216	7.771	9.066	8.651
9'-0"	18'-0"	4.236	4.070	5.129	4.909	6.052	5.830	7.171	6.838	8.103	7.769	8.361	7.916	9.211	8.806
9'-6"	19'-0"	4.361	4.194	5.278	5.057	6.227	6.005	7.366	7.032	8.324	7.991	8.506	8.061	9.356	8.951
10'-0"	20'-0"	4.486	4.319	5.426	5.204	6.403	6.181	7.560	7.226	8.546	8.213	8.651	8.206	9.501	9.106

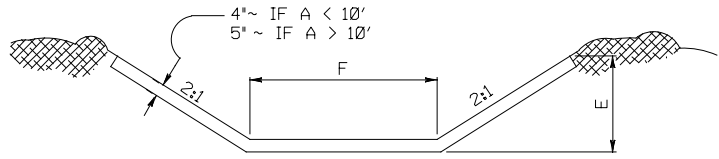
DIMENSION	FLUME TYPE						
	TY A	TY B	TY C	TY D	TY E	TY F	TY G
B	2'-6"	2'-6"	3'-0"	3'-0"	3'-6"	4'-0"	4'-6"
C	4'-6"	4'-9"	5'-0"	5'-6"	5'-6"	6'-0"	6'-0"
D	1'-6"	2'-0"	2'-0"	3'-0"	3'-0"	4'-0"	4'-0"
E	1'-1/2"	1'-6"	1'-6"	2'-3"	2'-3"	3'-0"	3'-0"
F	4'-0"	4'-0"	6'-0"	4'-0"	6'-0"	6'-0"	8'-0"
G	2'-6"	2'-6"	3'-0"	3'-0"	3'-0"	3'-0"	3'-0"
H	2'-0"	2'-3"	2'-6"	2'-6"	2'-6"	3'-0"	3'-0"
J	1'-6"	1'-6"	1'-6"	2'-0"	2'-0"	2'-0"	2'-0"

STATION TO STATION		LOCATION	FLUME	CLASS B CONC.			
STATION TO STATION	STATION	SIDE	TYPE	HEIGHT A	BAFFLES CY	FLUME CY	TOTAL CY
2467+66	2467+70	RT	A	17	0.15	4.11	4.26

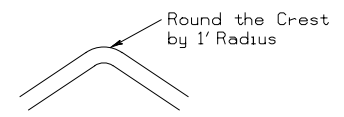
BAFFLE QUANTITIES	
FLUME	CONC.CY
TY A	0.15
TY B	0.21
TY C	0.27
TY D	0.33
TY E	0.44
TY F	0.61
TY G	0.73



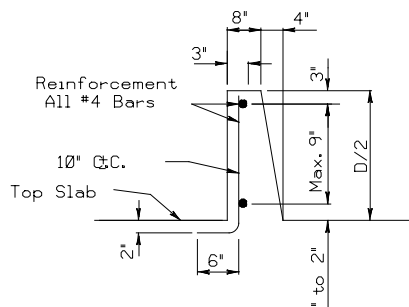
FLOW DIAGRAM



SECTION A-A



SECTION B-B



BAFFLE DETAIL



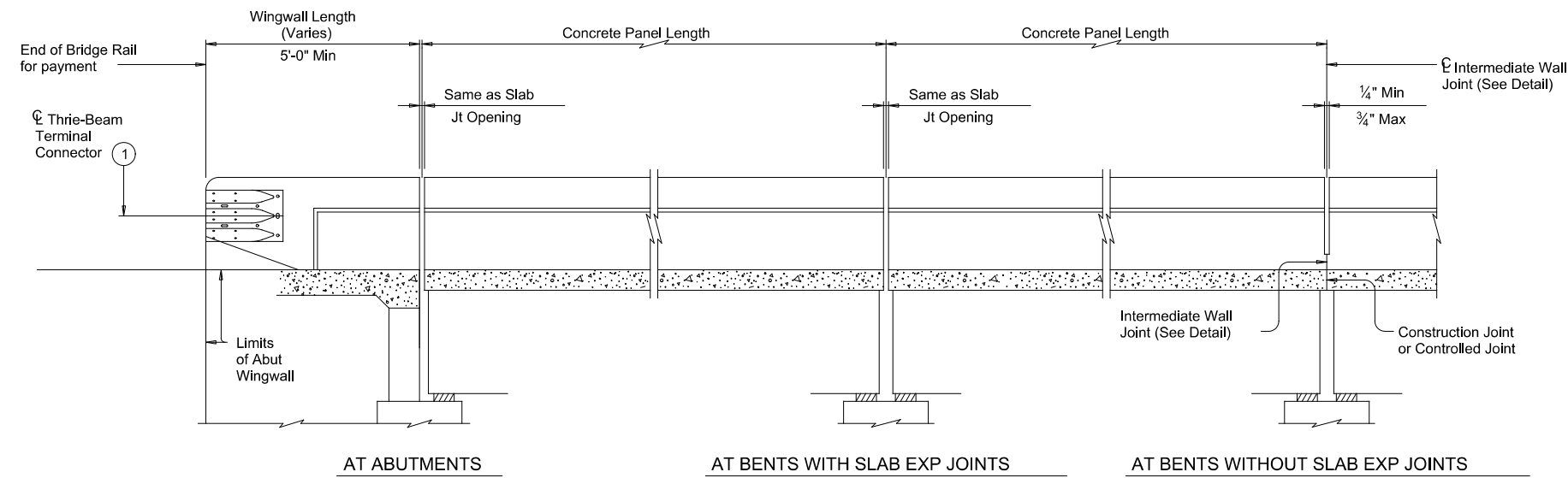
FLUME DETAILS  
FD

FILE: STDE4.DGN	DW: TxDot	CK: TxDot	DW: TxDot	CK: TxDot
© TxDOT MARCH 2004	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS	HOUSTON	6		124
	COUNTY	CONTROL	SECT	JOB
	FORT BEND	3510	04	055 SH 99

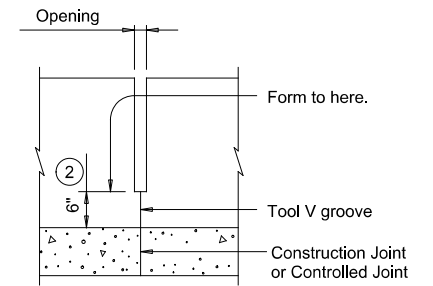
R = Radius  
Dia = Diameter

STDE4.DGN

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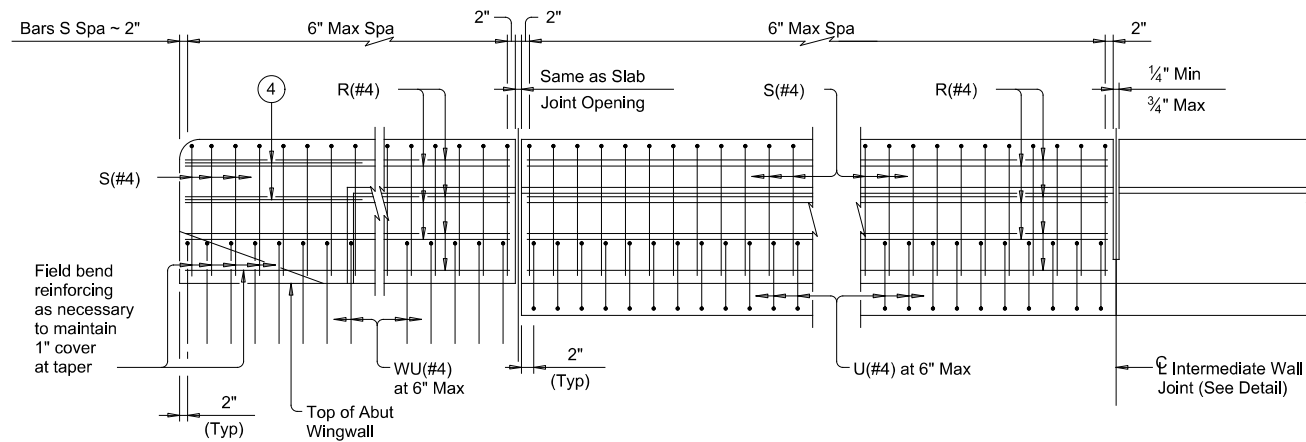


ROADWAY ELEVATION OF RAIL

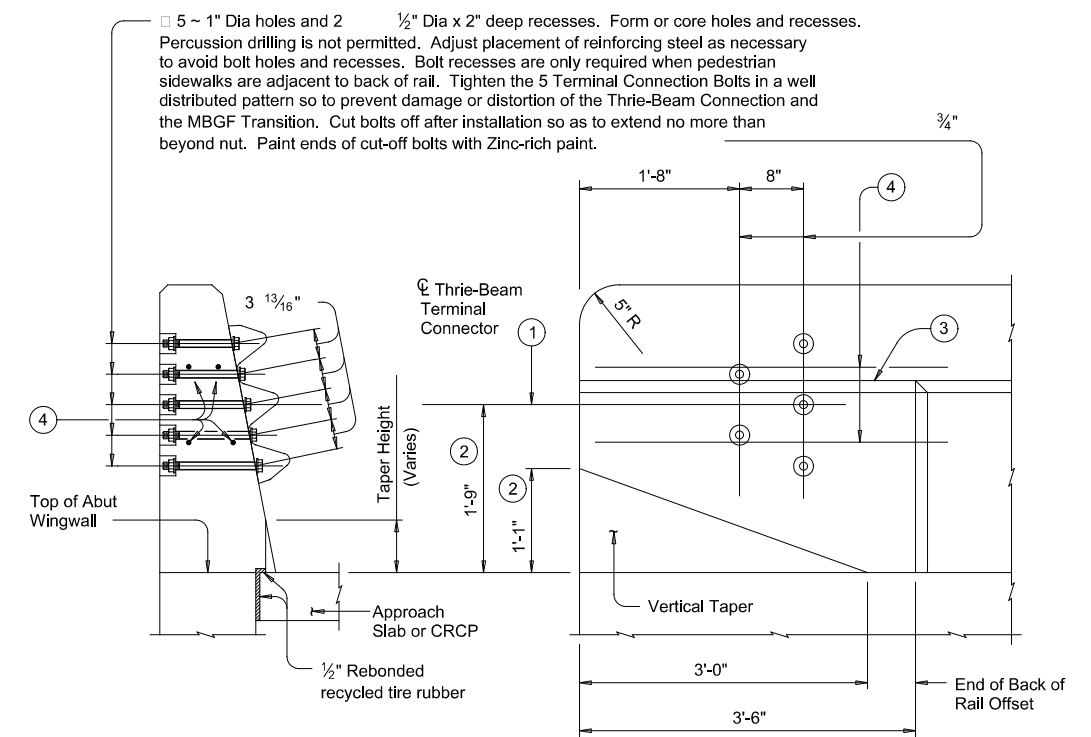


INTERMEDIATE WALL JOINT DETAIL

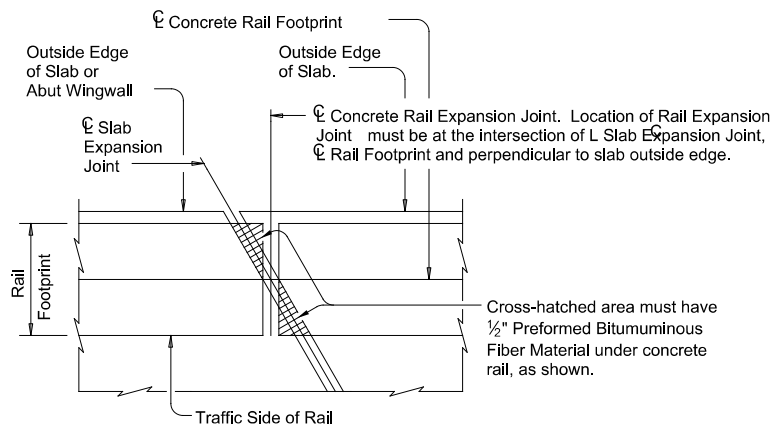
Provide at all interior bents without slab expansion joints.



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.

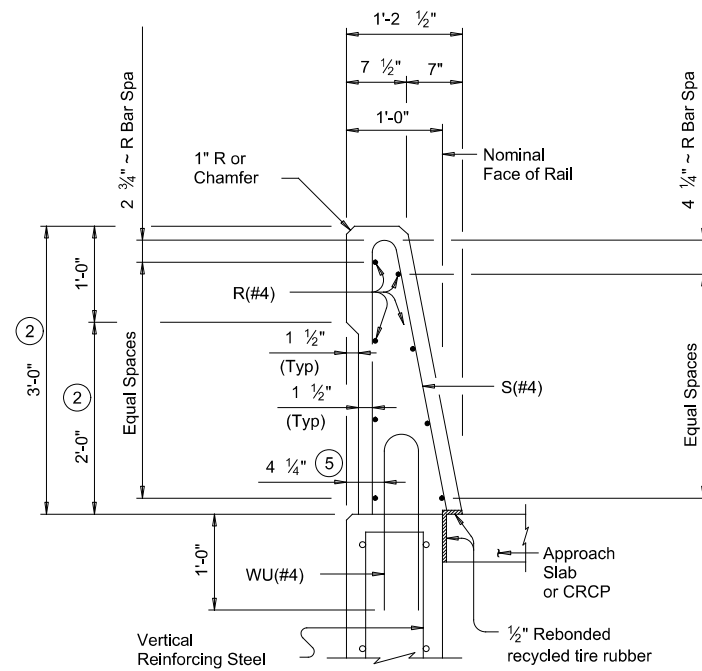
SHEET 1 OF 2

		<b>Bridge Division Standard</b>	
<h2>TRAFFIC RAIL SINGLE SLOPE</h2>			
<h3>TYPE SSTR</h3>			
FILE: rtsld014-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR
©TxDOT September 2019	CONT: 3510	SECT: 04	JOB: 055
REVISIONS			HIGHWAY: SH 99
	DIST: HOU	COUNTY: FORT BEND	SHEET NO.: 125

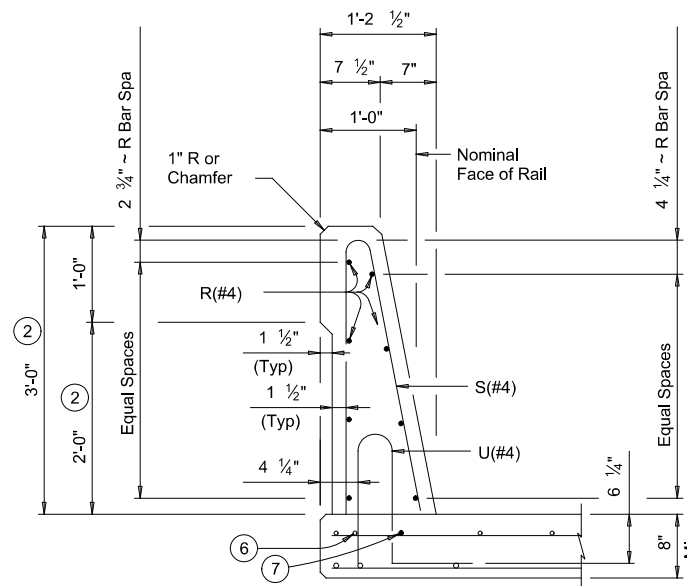
DATE:  
FILE:

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DATE: FILE:



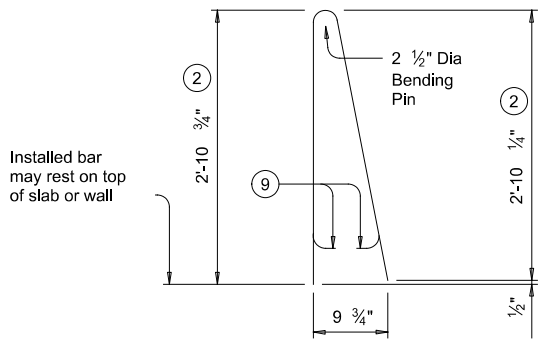
ON ABUTMENT WINGWALLS OR CIP RETAINING WALLS



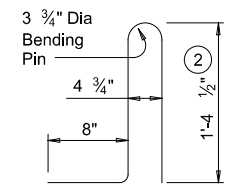
ON BRIDGE SLAB

SECTIONS THRU RAIL

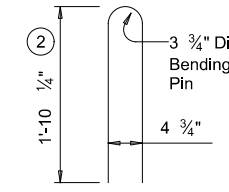
- ② Increase 2" for structures with Overlay.
- ⑤ 5 1/4" when vertical reinforcing has closer clear cover over horizontal reinforcing in abutment wingwalls or retaining walls on traffic side of wall.
- ⑥ As an aid in supporting reinforcement, additional longitudinal bars may be used in the slab with the 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.



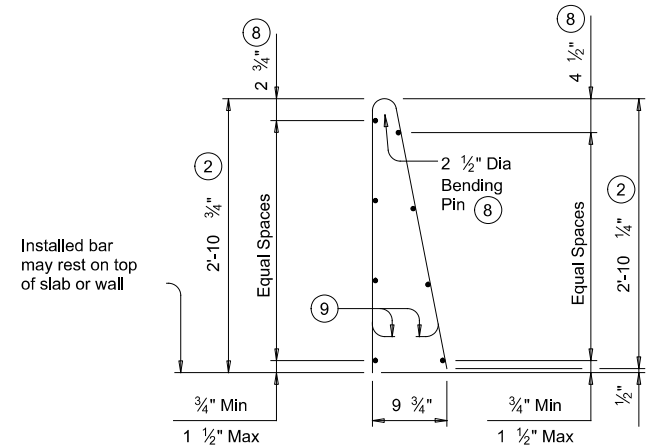
BARS S (#4)



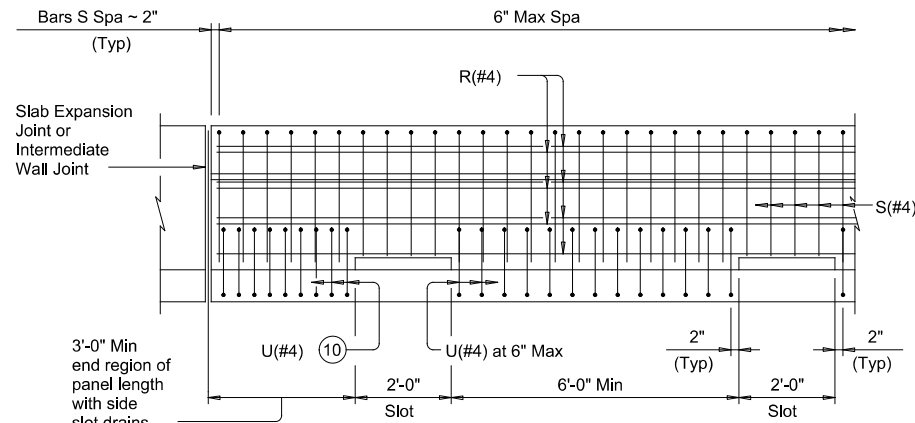
BARS U (#4)



BARS WU (#4)

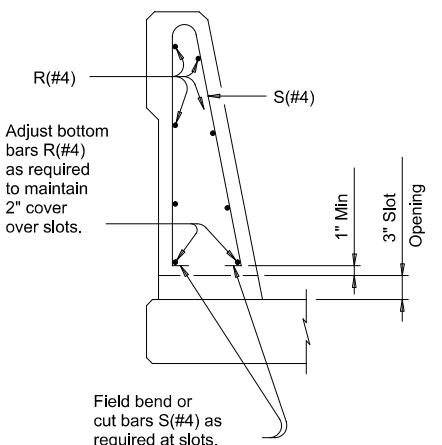


OPTIONAL WELDED WIRE REINFORCEMENT (WWR)



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"
	10	8"
Maximum Wire Size Differential	The smaller wire must have an area of 40% or more of the larger wire.	

**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 an 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"

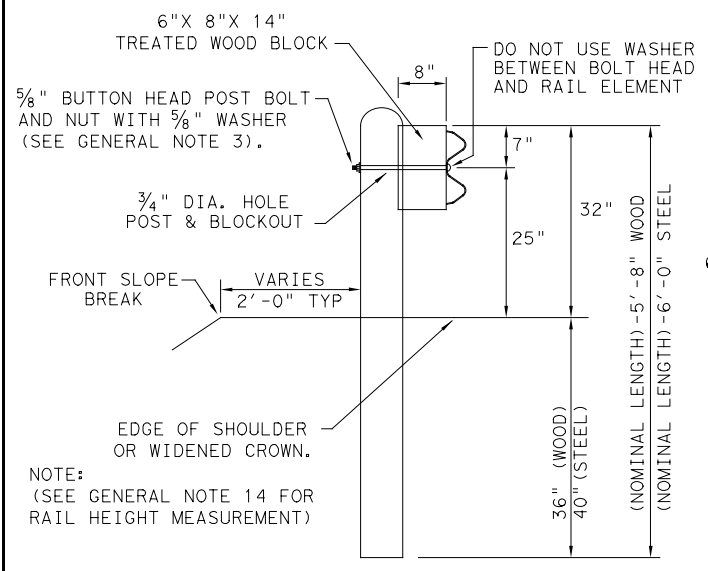
**GENERAL NOTES:**  
 This rail has been successfully evaluated by full-scale crash test to meet MASH TL-4 criteria. This rail can be used for speeds of 50 mph and greater when a TL-3 rated guard fence transition is used. When a TL-2 rated guard fence transition is used, this rail can only be used for 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.

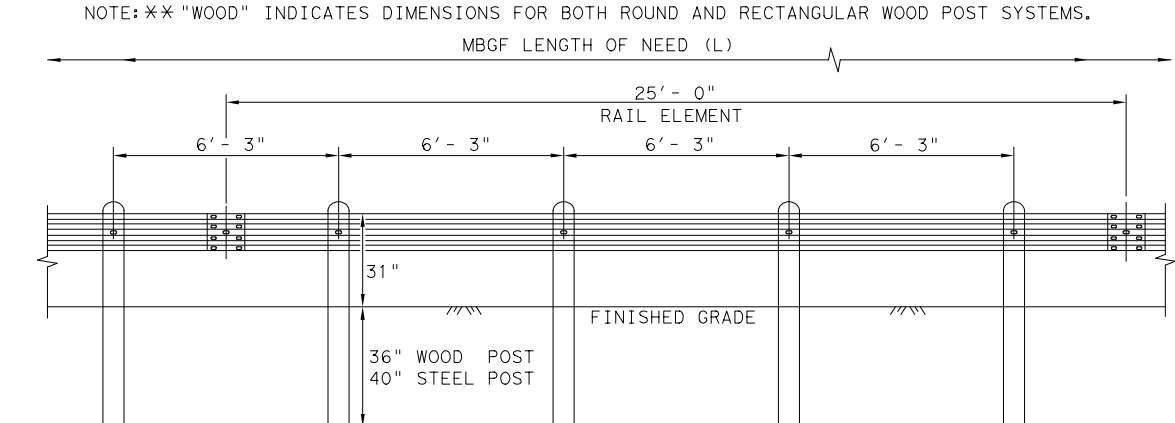
<h2>TRAFFIC RAIL SINGLE SLOPE</h2>			
<h3>TYPE SSTR</h3>			
FILE: rtsld014-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR
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REVISIONS	3510	04	055
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HOU	FORT BEND	126	

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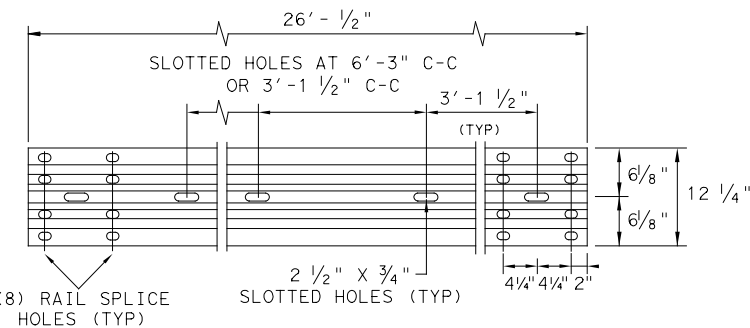


TYPICAL POST PLACEMENT



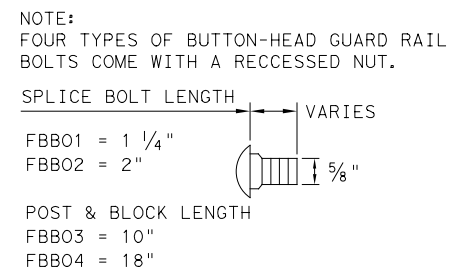
ELEVATION MID-SPAN RAIL SPLICE

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



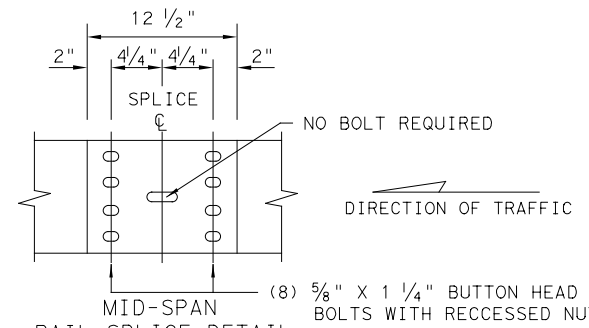
ELEVATION 25' - 0" (NOM.) W-BEAM SECTION

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



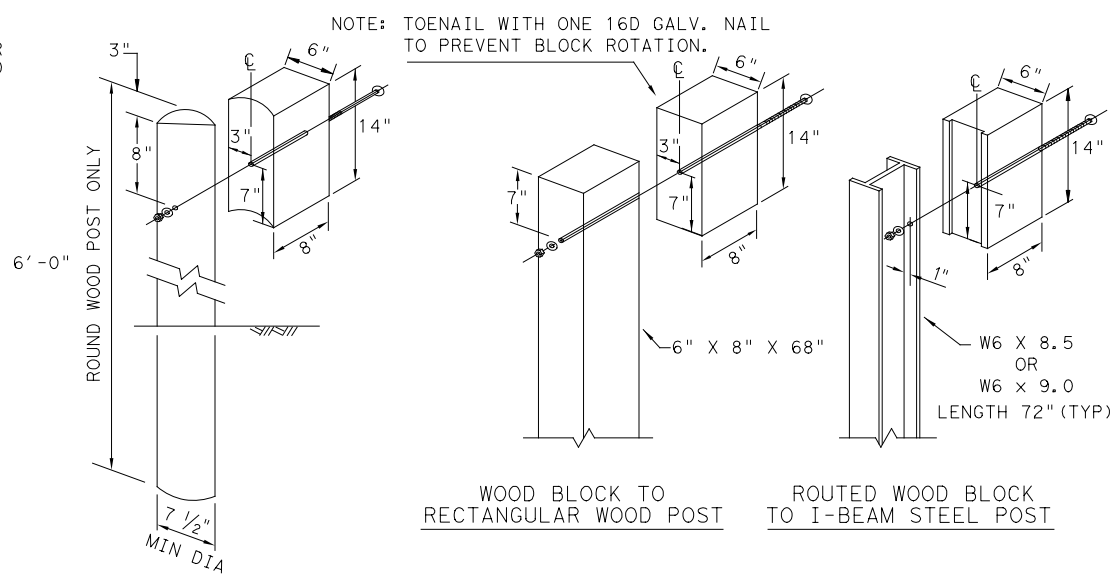
BUTTON HEAD BOLT

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



MID-SPAN RAIL SPLICE DETAIL

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

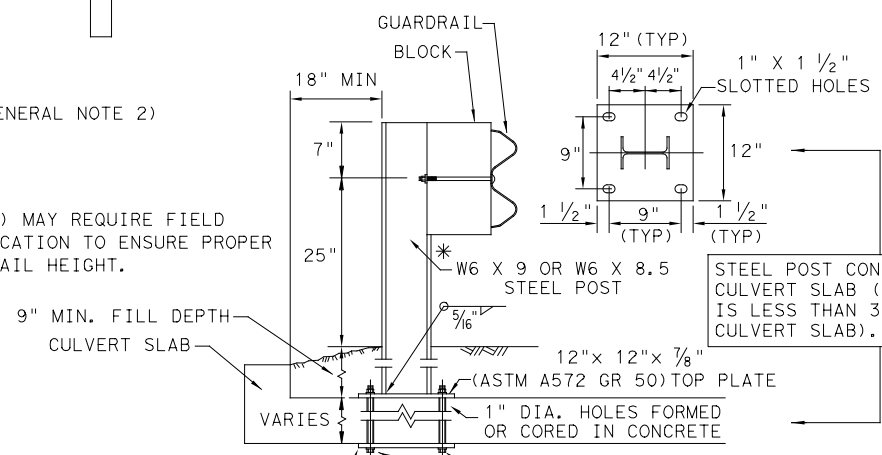


WOOD BLOCK TO ROUND WOOD POST ROUTED WOOD BLOCK TO I-BEAM STEEL POST

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

- GENERAL NOTES
1. THE TYPE OF POST (ROUND WOOD POST, RECTANGULAR WOOD POST, OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. THE EXACT POSITION OF MBGF SHALL BE SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER. STEEL POSTS TO BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING."
  2. RAIL ELEMENTS SHALL MEET THE REQUIREMENTS OF ITEM 540, "METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED IN THE PLANS. THE CONTRACTOR MAY FURNISH RAIL ELEMENTS OF 25' - 0", OR 12' - 6" (NOM.) LENGTHS. RAIL ELEMENTS MAY HAVE SLOTTED HOLES AT 3' - 1 1/2" C-C OR 6' - 3" C-C. A SPECIAL LENGTH OF RAIL MAY BE MANUFACTURED TO ACCOMMODATE THE DOWNSTREAM ANCHOR TERMINAL (DAT) AND THE TRANSITION SECTIONS OF GUARDRAIL.
  3. BUTTON HEAD "POST BOLTS & NUTS" SHALL MEET THE REQUIREMENTS OF (ASTM A307), AND SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT AND 5/8" WASHER (FWC16d) AND NOT MORE THAN 1" BEYOND IT. TRIM REMAINING BOLT LENGTH TO MEET REQUIRED LENGTH.
  4. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING." FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
  5. CROWN SHALL BE WIDENED TO ACCOMMODATE THE METAL BEAM GUARD FENCE.
  6. THE LATERAL APPROACH TO THE GUARD FENCE, SHALL HAVE A MAXIMUM SLOPE OF 1V:10H.
  7. IF SHOWN ELSEWHERE IN THE PLANS OR AS DIRECTED BY THE ENGINEER, THE GUARD FENCE MAY BE FLARED AT A RATE OF 25:1 OR FLATTER.
  8. UNLESS OTHERWISE SHOWN IN THE PLANS, GUARD FENCE PLACED IN THE VICINITY OF CURBS SHALL BE POSITIONED SO THAT THE FACE OF CURB IS LOCATED DIRECTLY BELOW OR BEHIND THE FACE OF THE RAIL. RAIL PLACED OVER CURBS SHALL BE INSTALLED SO THAT THE POST BOLT IS LOCATED APPROXIMATELY 25 INCHES ABOVE THE GUTTER PAN OR EDGE OF SHOULDER.
  9. APPLICATIONS IN SOLID ROCK ARE ONLY ALLOWED WITH STEEL POSTS. IF SOLID ROCK IS ENCOUNTERED WITHIN 0 TO 18" OF THE FINISHED GRADE, DRILL A 24" DIA. HOLE, 24" INTO THE ROCK. IF SOLID ROCK IS ENCOUNTERED BELOW 18", DRILL A 12" DIA. HOLE, 12" INTO THE ROCK OR TO THE STANDARD EMBEDMENT DEPTH, WHICHEVER MAYBE LESS. ANY EXCESS POST LENGTH, AFTER MEETING THESE DEPTHS, MAY BE FIELD CUT TO ENSURE PROPER GUARDRAIL MOUNTING HEIGHT. BACKFILL WITH COARSE AGGREGATE MATERIAL.
  10. POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
  11. SPECIAL FABRICATION WILL BE REQUIRED AT INSTALLATION LOCATIONS HAVING A CURVATURE OF LESS THAN 150 FT. RADIUS.
  12. UNLESS OTHERWISE SHOWN IN THE PLANS, A COMPOSITE MATERIAL BLOCK THAT MEETS THE REQUIREMENTS OF DMS-7210, "COMPOSITE MATERIAL POSTS AND BLOCKS FOR METAL BEAM GUARD FENCE" MAY BE SUBSTITUTED FOR BLOCKS OF SIMILAR DIMENSIONS. THE CONSTRUCTION DIVISION, TXDOT MAINTAINS A MATERIAL PRODUCER LIST (MPL) FOR PRODUCERS OF MATERIALS CONFORMING TO DMS-7210 ONLY PRODUCERS ON THE MPL MAY FURNISH COMPOSITE MATERIAL BLOCKS.
  13. FOR THE LOW FILL CULVERT OPTION, POSTS LOCATED PARTIALLY OR WHOLLY BETWEEN PRECAST BOX CULVERT UNITS, THE USE OF A CAST-IN-PLACE CONCRETE CLOSURE BETWEEN BOXES IS REQUIRED. THE LENGTH OF THE CAST-IN-PLACE CONCRETE CLOSURE SHALL ACCOMMODATE THE PLACEMENT OF THE LOW FILL CULVERT OPTION. SEE CONCRETE CLOSURE DETAILS ON BRIDGE STANDARD SCP-MD.
  14. GUARDRAIL HEIGHT MEASUREMENT: WHEN THE GUARDRAIL IS LOCATED ABOVE PAVEMENT, MEASURE THE HEIGHT FROM THE PAVEMENT TO THE TOP OF THE W-BEAM RAIL. WHEN THE GUARDRAIL IS LOCATED UP TO 2 FT. OFF OF THE EDGE OF PAVEMENT OR FOR A PAVEMENT OVERLAY, USE A 10-FOOT STRAIGHTEDGE TO EXTEND THE PAVEMENT/SHOULDER SLOPE TO THE BACK OF RAIL, MEASURE FROM THE BOTTOM OF STRAIGHTEDGE TO THE TOP OF RAIL. FOR GUARDRAIL LOCATED DOWN A 10:1 SLOPE, MEASURE FROM THE NOMINAL TERRAIN.

\* POST(S) MAY REQUIRE FIELD MODIFICATION TO ENSURE PROPER GUARDRAIL HEIGHT.



LOW FILL CULVERT POST

12" X 12" X 7/8" (ASTM A36) STEEL BOTTOM PLATE WITH 1" DIA. HOLES REQUIRED WITH BOLT-THROUGH INSTALLATION.

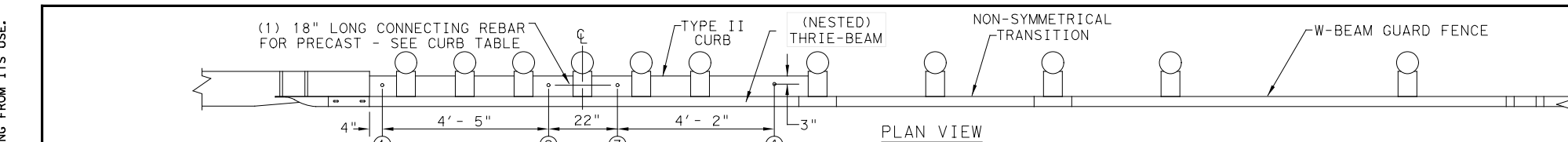
- NOTE: TWO INSTALLATION OPTIONS.
1. BOLT-THROUGH OPTION: REQUIRES A 6" MIN. SLAB THICKNESS. 7/8" DIA (ASTM A449) HEAVY HEX BOLTS WITH TWO HARDENED WASHER EACH AND HEAVY HEX NUTS. NOTE: BOLT LENGTH = SLAB PLUS 2 1/4" MIN.
  2. EPOXY ANCHOR OPTION: THIS OPTION MAY ONLY BE USED IF THE CULVERT SLAB IS 9" MIN. THICK. THREADED ANCHOR RODS MUST BE 7/8" DIA. ASTM A449 OR A193 GRADE B7 WITH HEAVY HEX NUT, AND ONE HARDENED WASHER EACH. EMBED ANCHOR RODS 6" WITH HILTI HIT RE 500 EPOXY ADHESIVE. OTHER TYPE III CLASS C EPOXY ADHESIVES MEETING THE REQUIREMENTS OF DMS-6100, "EPOXIES AND ADHESIVES", MAY BE USED IF IT CAN BE DEMONSTRATED THAT THEY MEET OR EXCEED THE STRENGTH OF HILTI HIT RE 500 WITH THE SAME EMBEDMENT DEPTH AND THREADED ROD DIA. FOLLOW THE MANUFACTURER'S REQUIREMENTS FOR INSTALLING EPOXIED THREADED RODS. EXTEND RODS 1/4" MIN. BEYOND NUT.

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

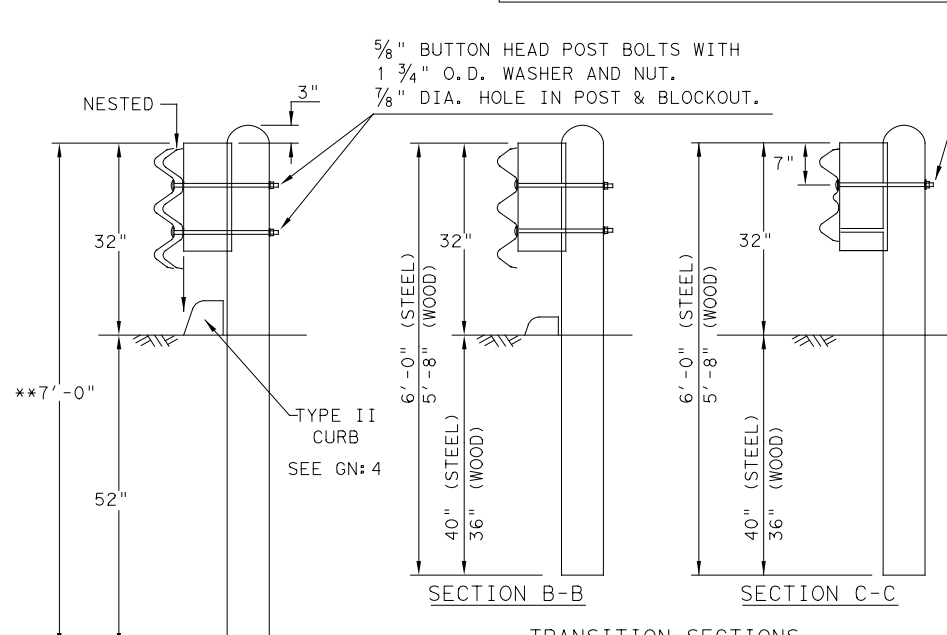
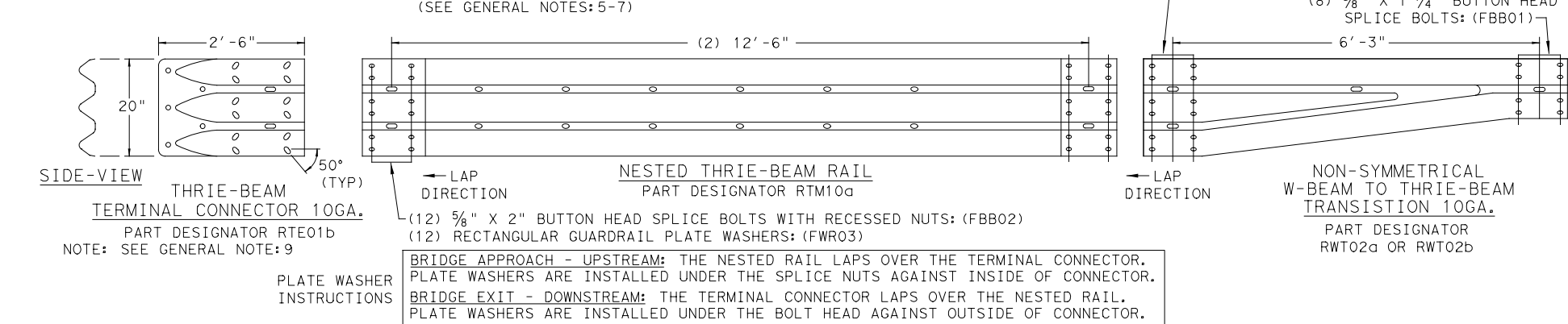
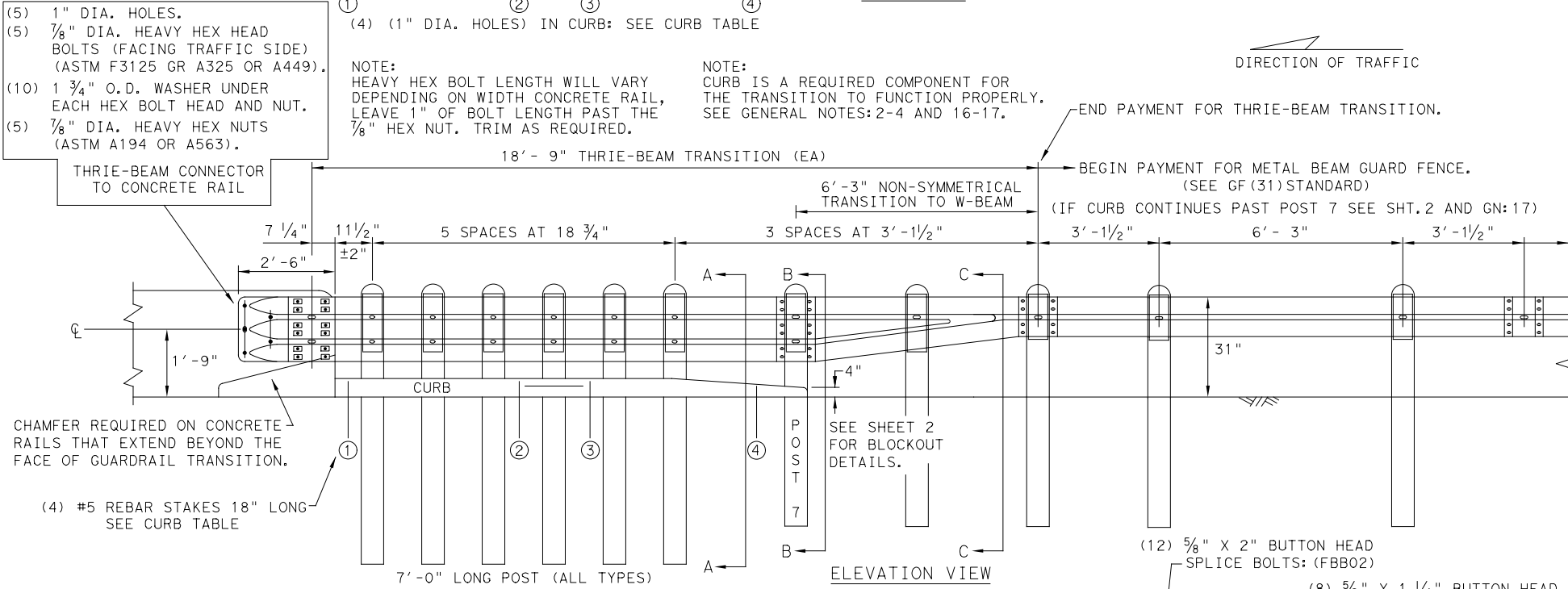
		<b>Design Division Standard</b>		
<h2>METAL BEAM GUARD FENCE</h2> <h3>TL-3 MASH COMPLIANT</h3> <h1>GF(31)-19</h1>				
FILE: gf3119.dgn	DN: TXDOT	CK: KM	DW: VP	CK: CGL/AG
© TXDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	3510	04	055	SH 99
	DIST	COUNTY	SHEET NO.	
	HOU	FORT BEND	127	



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- GENERAL NOTES**
- CONTACT THE DESIGN DIVISION FOR DRAINAGE CUT OUT OPTIONS NEEDED WITHIN THE CURB SECTION OF THE THRIE-BEAM TRANSITION. (512) 416-2678
  - CONCRETE CURB MAY BE CAST-IN-PLACE OR PRECAST AS SHOWN ON THIS SHEET. WHEN USED IN CONJUNCTION WITH THE THRIE-BEAM TRANSITIONS, CURB SHALL BE TYPE II (5'-3/4" HEIGHT); SEE CURRENT CCGG STANDARD SHEET FOR FURTHER DETAILS. IF OTHER CURB HEIGHTS ARE SHOWN IN THE PLANS IN CONJUNCTION WITH THE TRANSITION, THE CURB HEIGHT MAY BE FROM 4" TO 8" WITH A RELATIVELY VERTICAL FACE. CONCRETE CURB SHALL BE CONTINUOUS TO THE SEVENTH POST UNLESS OTHERWISE SHOWN IN THE PLANS. SEE GENERAL NOTE:17 FOR CIRCUMSTANCES WHERE CURB CONTINUES PAST POST 7.
  - CONCRETE CURB TYPE II SUBSIDIARY TO "METAL BEAM GUARD FENCE TRANSITION". IF NO ADDITIONAL CURB IS INDICATED BEYOND THE TRANSITION, THEN ANY CURB HEIGHT GREATER THAN 4" WILL BE TAPERED DOWN BEGINNING AT THE LAST 7 FT. POST TO A MAXIMUM HEIGHT OF 4" AT POST 7. IF SHOWN ELSEWHERE IN THE PLANS, ADDITIONAL CURB UNDERNEATH GUARDRAIL WILL BE PAID FOR BY THE LINEAR FOOT.
  - UNLESS OTHERWISE SHOWN IN THE PLANS, TRANSITIONS SHALL BE PLACED WITH THE BLOCKOUT FACE IN FRONT OF OR DIRECTLY ABOVE THE CURB FACE. SEE SECTION A-A.
  - FOR ROUND WOOD POST SYSTEMS, ALL ROUND WOOD POSTS SHALL BE 7 1/2" DIA. MINIMUM THROUGHOUT THE THRIE-BEAM TRANSITION.
  - THE TYPE OF POST (ROUND WOOD POST, RECTANGULAR WOOD POST OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. REFER TO GF (31) STANDARD SHEET.
  - THE POST LENGTH SHALL BE MARKED ON ALL 7'-0" LONG POSTS BY THE MANUFACTURER. THE MARK SHALL BE LOCATED WITHIN THE TOP 1 FT. REGION OF THE POST, AT LEAST 5/8" IN HEIGHT, AND VISIBLE AFTER INSTALLATION. WOODEN POSTS SHALL BE MARKED WITH A BRAND, AND STEEL POSTS WITH A STENCIL BEFORE GALVANIZING.
  - POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
  - RAIL ELEMENTS SHALL MEET THE REQUIREMENTS OF ITEM 540, "METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED ON THE PLANS. THE THRIE-BEAM TERMINAL CONNECTOR AND THE THRIE-BEAM TRANSITION TO W-BEAM SHALL BE OF THE SAME MATERIAL, BUT SHALL NOT BE LESS THAN 10 GAUGE. CONTRACTOR SHALL VERIFY THAT THE LOCATIONS OF BOLT HOLES MATCH THOSE IN THE THRIE-BEAM TERMINAL CONNECTOR PRIOR TO ORDERING MATERIALS.
  - BUTTON HEAD "POST BOLTS & NUTS" SHALL MEET THE REQUIREMENTS OF (ASTM A307), AND SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT AND 5/8" WASHER (FWC16a) AND NOT MORE THAN 1" BEYOND IT. TRIM REMAINING BOLT LENGTH TO MEET REQUIRED LENGTH.
  - FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
  - CROWN SHALL BE WIDENED TO ACCOMMODATE TRANSITIONS.
  - WHERE SOLID ROCK IS ENCOUNTERED, CONTACT THE DESIGN DIVISION FOR ADDITIONAL GUIDANCE. (512) 416-2678
  - UNLESS OTHERWISE SHOWN IN THE PLANS, A COMPOSITE MATERIAL BLOCK THAT MEETS THE REQUIREMENTS OF DMS-7210, "COMPOSITE MATERIAL POSTS AND BLOCKS FOR METAL BEAM GUARD FENCE" MAY BE SUBSTITUTED FOR BLOCKS OF SIMILAR DIMENSIONS. TXDOT'S MATERIALS AND TESTS DIVISION MAINTAINS A MATERIAL PRODUCER LIST (MPL) FOR PRODUCERS OF MATERIALS CONFORMING TO DMS-7210. ONLY PRODUCERS ON THE MPL CAN FURNISH COMPOSITE MATERIAL BLOCKS.
  - REFER TO GF (31) STANDARD SHEET & BRIDGE RAILING DETAILS FOR ADDITIONAL DETAILS.
  - THE INSTALLATION OF THE TYPE II CURB IS CRITICAL FOR THE PERFORMANCE OF THE THRIE-BEAM TRANSITION SYSTEM. THE CURB PREVENTS (VEHICLE WHEEL SNAGGING) AT THE CONCRETE RAIL AND IS REQUIRED TO MEET MASH CRASH TEST CRITERIA.
  - IF CURB EXTENDS BEYOND POST 7, 25' OF NESTED W-BEAM GUARDRAIL SHALL BE INSTALLED BEYOND THE PAY LIMITS OF THRIE-BEAM TRANSITION SECTION, (SEE SHT.2). PAYMENT FOR THIS 25' SECTION WILL BE BY LINEAR FOOT, PAY ITEM "0540 6XXX MTL W-BEAM GD FEN (NESTED) (TIM POST)" OR "540 6XXX MTL W-BEAM GD FEN (NESTED) (STEEL POST)" AS APPLICABLE FOR POST TYPE. SEE SHT.2 FOR ADDITIONAL INFORMATION.



**THRIE-BEAM TERMINAL - CURB TABLE**

PRECAST CURB FULL LENGTH EQUALS 12'-2" THE PRECAST CURB MAY BE FORMED INTO TWO SECTIONS.

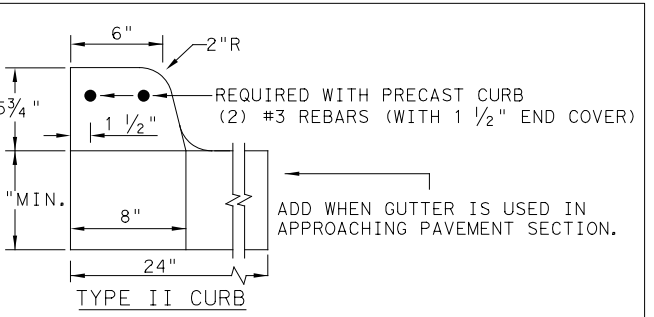
CURB (1) LENGTH 5'-8"

CURB (2) LENGTH 6'-6"

TAPER CURB (2) TO A HEIGHT OF 4" AT POST 7

CONNECTING PRECAST CURB SECTIONS (1) & (2): FORM OR CORE 1" DIA. HOLE 9" LONG INTO EACH CURB END. USE (1) #5 GR.60 REBAR 18" LONG TO CONNECT BOTH CURBS.

SECURING PRECAST OR CAST-IN-PLACE TO FINISHED GRADE \* : FORM OR CORE (4) 1" DIA. HOLES, SEE PLAN AND ELEVATION VIEWS FOR HOLE LOCATIONS. DRIVE (4) #5 GR.60 REBAR STAKES 18" LONG INTO THE GROUND AND 1/2" BELOW TOP OF CURB. FILL HOLES WITH APPROVED GROUT MIXTURE.



HIGH-SPEED TRANSITION

SHEET 1 OF 2

**Texas Department of Transportation** Design Division Standard

METAL BEAM GUARD FENCE  
THRIE-BEAM TRANSITION  
TL-3 MASH COMPLIANT  
GF (31) TR TL3-20

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	DIST	COUNTY		SHEET NO.
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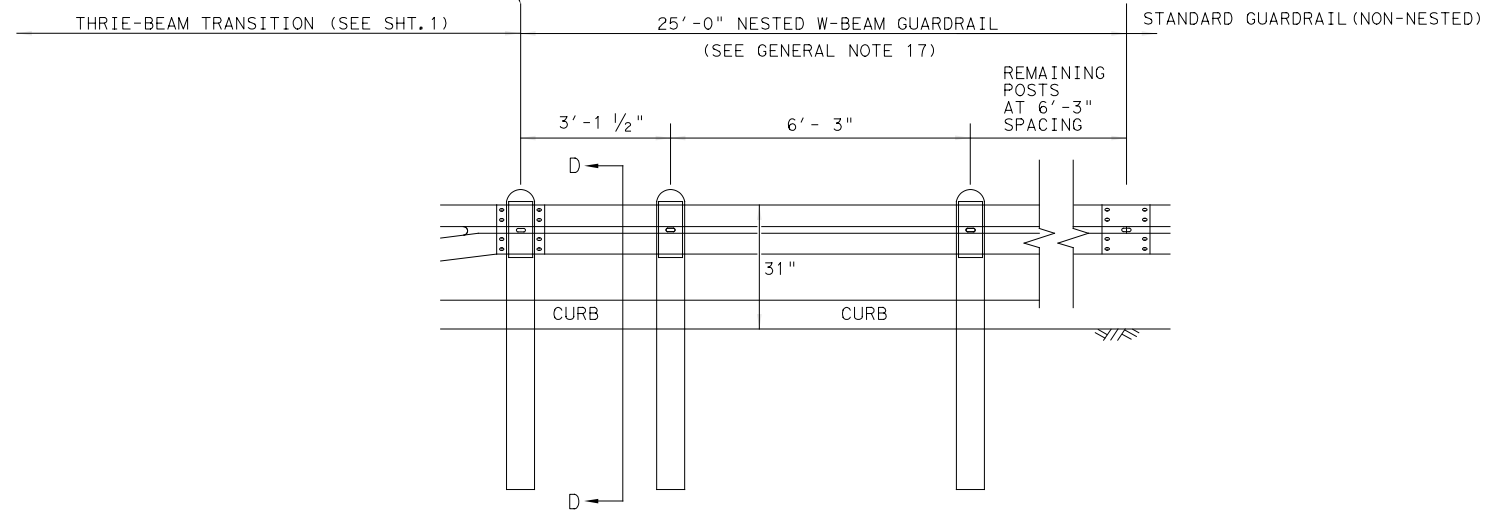
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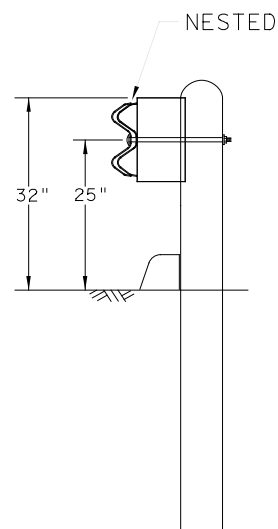
REQUIRED ALTERNATIVE FOR CONTINUOUS CURB EXTENDING PAST POST 7 (SEE SHT. 1 GENERAL NOTE 17)

END PAYMENT FOR METAL BEAM GUARD FENCE TRANSITION.  
 BEGIN PAYMENT FOR METAL BEAM GUARD FENCE.

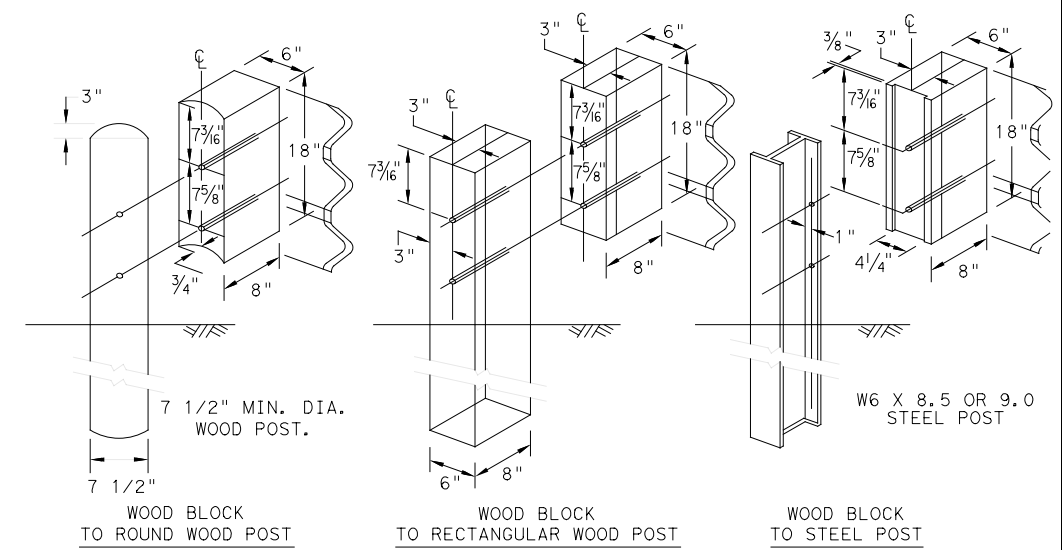
(SEE GF (31) STANDARD SHEET)



ELEVATION VIEW



SECTION D-D



THRIE BEAM TRANSITION BLOCKOUT DETAILS

HIGH-SPEED TRANSITION

SHEET 2 OF 2

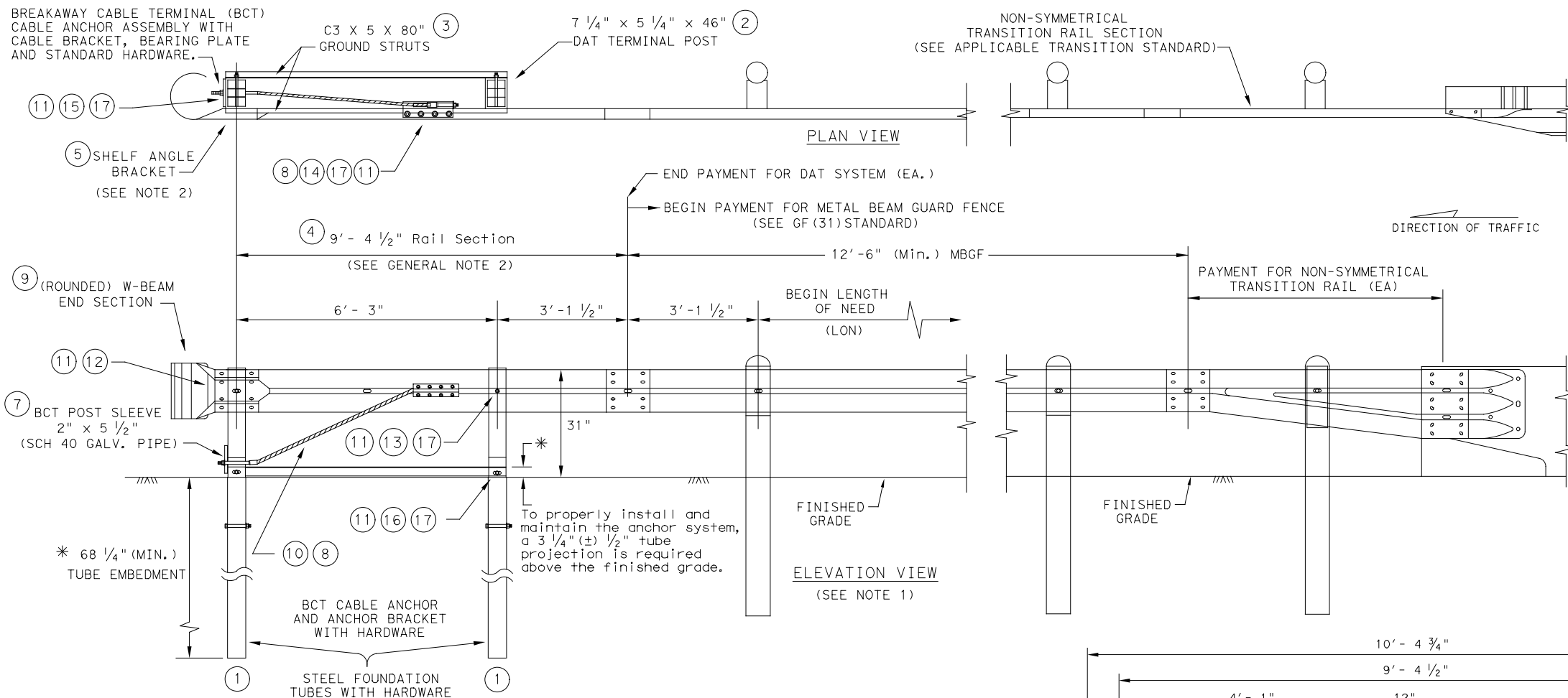


METAL BEAM GUARD FENCE  
 THRIE-BEAM TRANSITION  
 TL-3 MASH COMPLIANT  
 GF (31) TR TL3-20

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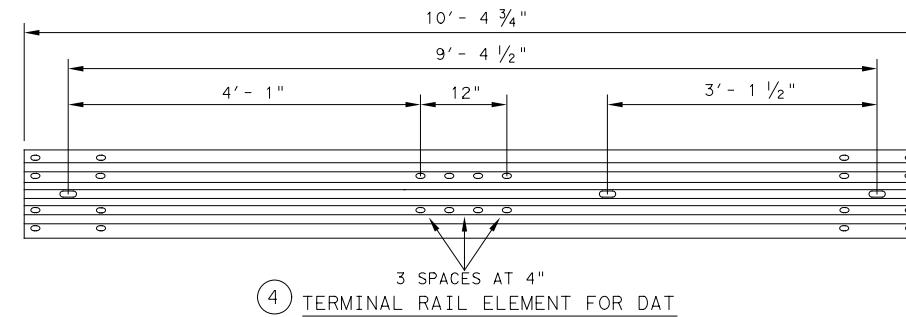
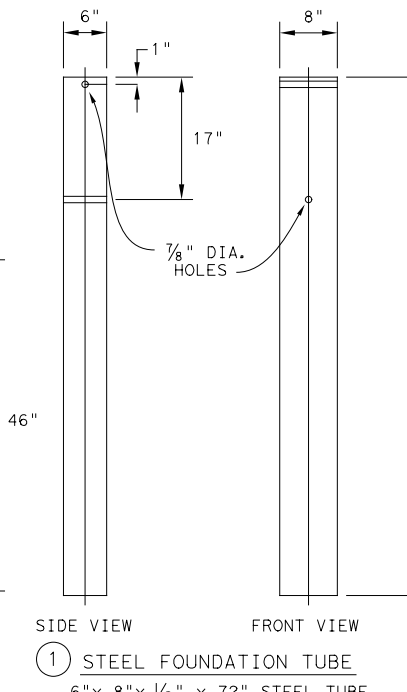
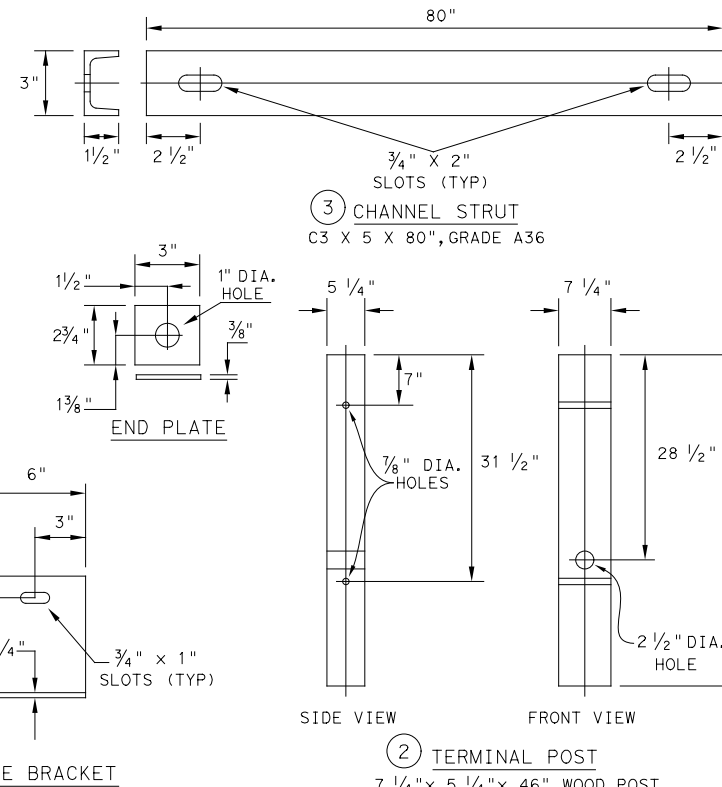
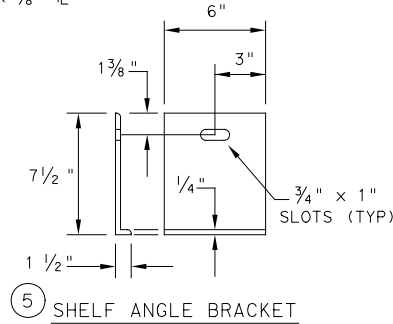
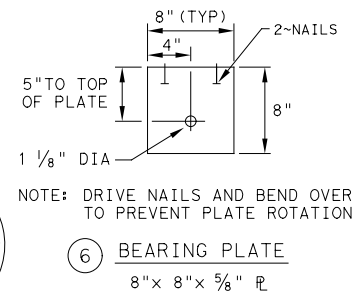
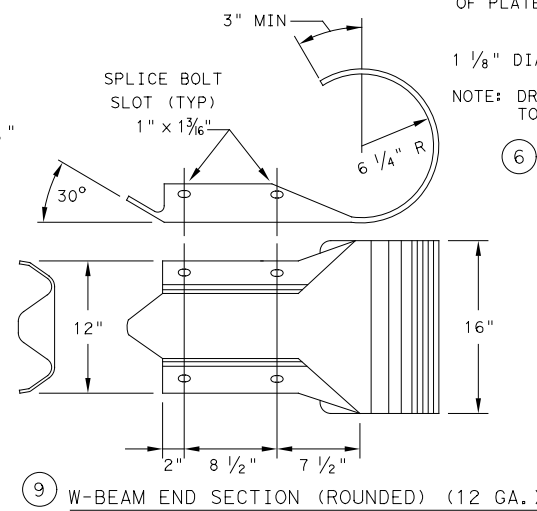
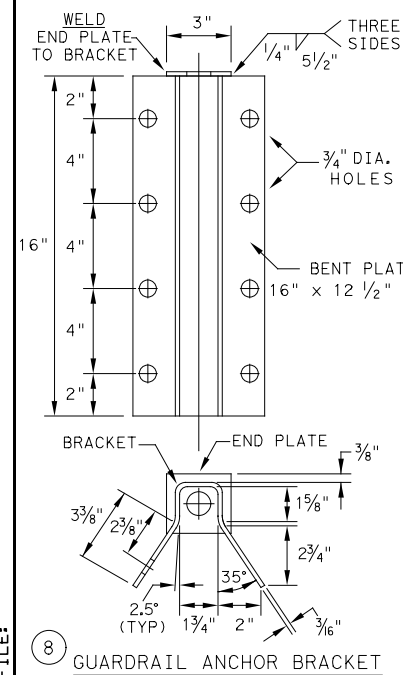
**DOWNSTREAM ANCHOR TERMINAL (DAT)**

NOTE: ONLY FOR DOWNSTREAM USE, WHEN LOCATED OUTSIDE THE HORIZONTAL CLEARANCE AREA OF OPPOSING TRAFFIC.

- GENERAL NOTES**
1. THE DETAIL SHOWN IS THE MINIMUM LENGTH OF NEED (LON) FOR A DOWNSTREAM ANCHOR TERMINAL (DAT) CONNECTED TO A CONCRETE RAIL.
  2. THE RAIL SECTION AT THE END POST IS SUPPORTED BY THE SHELF ANGLE BRACKET. THE RAIL ELEMENT IS NOT ATTACHED TO THE END POST.
  3. THE FOUNDATION TUBES SHALL NOT PROJECT MORE THAN 3 3/4" ABOVE THE FINISHED GRADE.
  4. ALL HARDWARE FOR DAT SHALL BE ASTM A307 UNLESS OTHERWISE SHOWN.
  5. REFER TO GF(31) SHEET FOR TERMINAL CONNECTION DETAILS.

**MOW STRIP INSTALLATION**  
 IF A MOW STRIP IS REQUIRED WITH THE DAT INSTALLATION THE LEAVE-OUT AREA AROUND THE STEEL FOUNDATION TUBES AND THE TWO CHANNEL STRUTS MAY BE OMITTED. THIS WILL REQUIRE A FULL POUR AT THE FOUNDATION TUBES.

#	(DAT) PARTS LIST	QTY
1	STEEL FOUNDATION TUBE	2
2	DAT TERMINAL POST	2
3	CHANNEL STRUT	2
4	TERMINAL RAIL ELEMENT	1
5	SHELF ANGLE BRACKET	1
6	BCT BEARING PLATE	1
7	BCT POST SLEEVE	1
8	GUARDRAIL ANCHOR BRACKET	1
9	(ROUNDED) W-BEAM END SECTION	1
10	BCT CABLE ANCHOR	1
11	RECESSED NUT, GUARDRAIL	20
12	1 1/4" BUTTON HEAD BOLT	4
13	10" BUTTON HEAD BOLT	2
14	5/8" X 2" HEX HEAD BOLT	8
15	5/8" X 8" HEX HEAD BOLT	4
16	5/8" X 10" HEX HEAD BOLT	2
17	5/8" FLAT WASHER	18

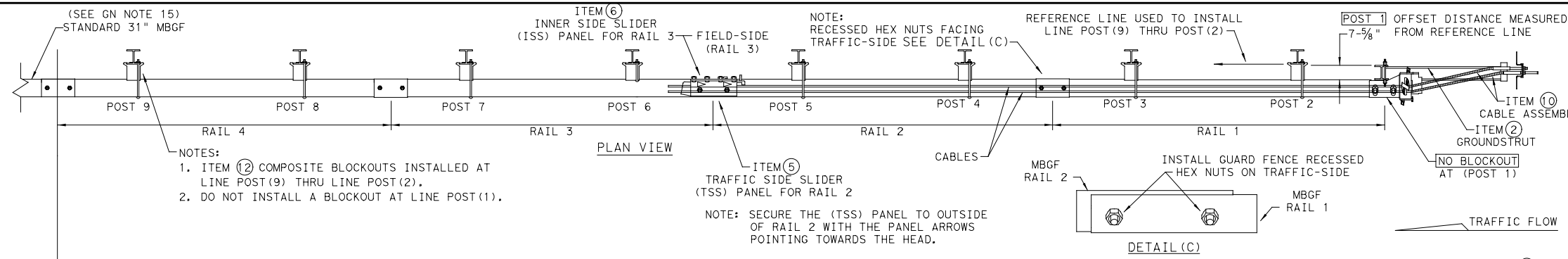


**Design Division Standard**

**METAL BEAM GUARD FENCE  
 (DOWNSTREAM ANCHOR TERMINAL)  
 TL-3 MASH COMPLIANT  
 GF(31) DAT-19**

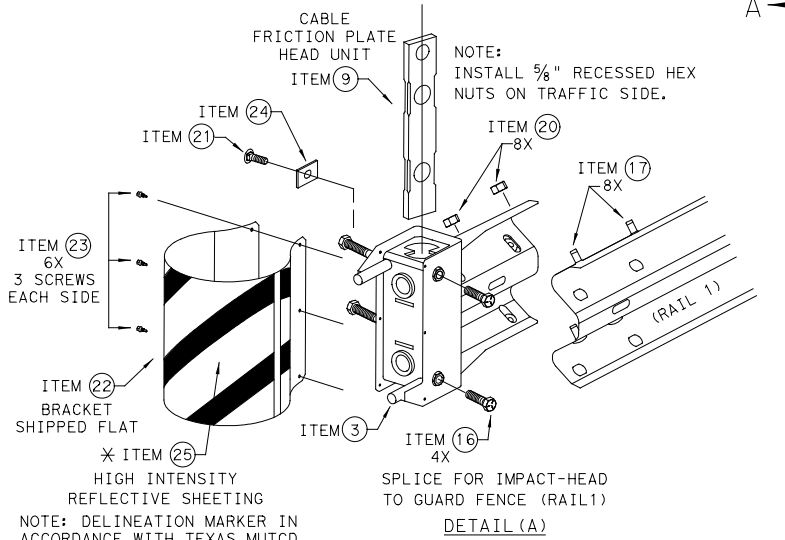
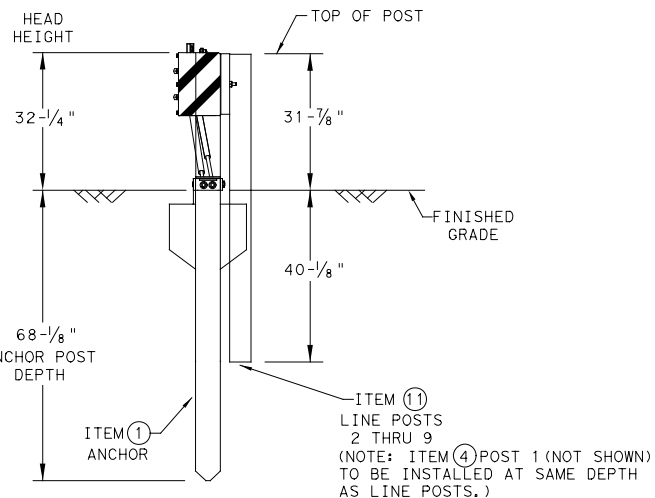
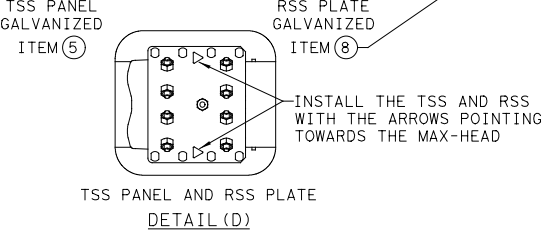
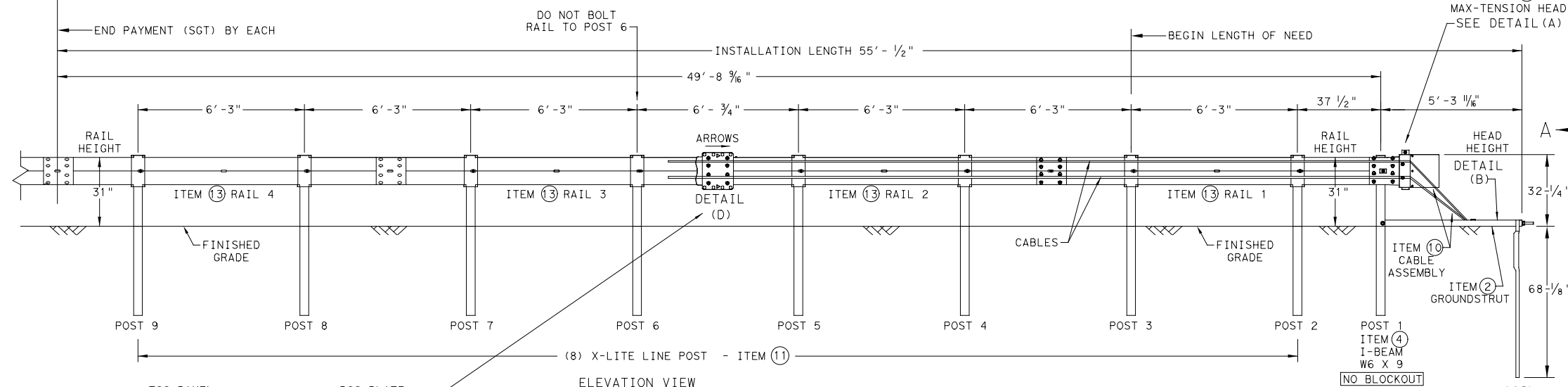
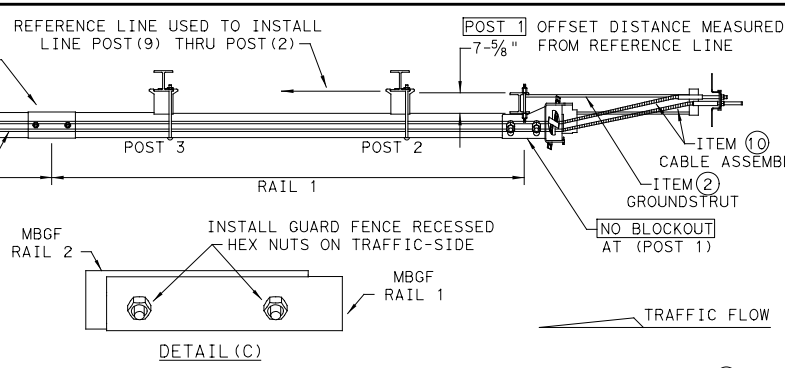
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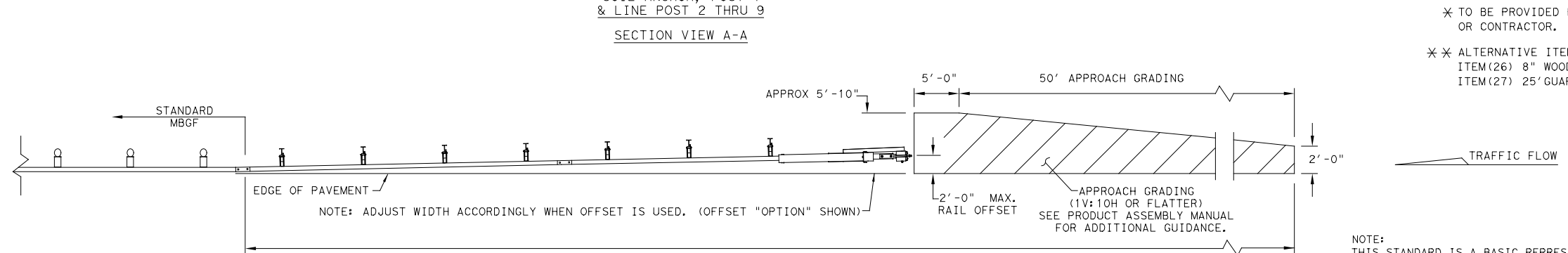
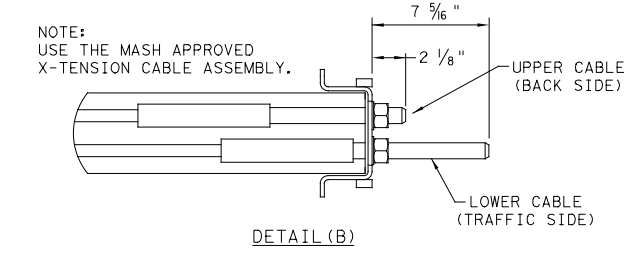
- NOTES:
- ITEM ② COMPOSITE BLOCKOUTS INSTALLED AT LINE POST (9) THRU LINE POST (2).
  - DO NOT INSTALL A BLOCKOUT AT LINE POST (1).

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



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

ITEM#	PART NUMBER	DESCRIPTION	QTY
1	BSI-1610060-00	SOIL ANCHOR - GALVANIZED	1
2	BSI-1610061-00	GROUND STRUT - GALVANIZED	1
3	BSI-1610062-00	MAX-TENSION IMPACT HEAD	1
4	BSI-1610063-00	W6x9 I-BEAM POST 6FT. -GALVANIZED	1
5	BSI-1610064-00	TSS PANEL - TRAFFIC SIDE SLIDER	1
6	BSI-1610065-00	ISS PANEL - INNER SIDE SLIDER	1
7	BSI-1610066-00	TOOTH - GEOMET	1
8	BSI-1610067-00	RSS PLATE - REAR SIDE SLIDER	1
9	B061058	CABLE FRICTION PLATE - HEAD UNIT	1
10	BSI-1610069-00	CABLE ASSEMBLY - MASH X-TENSION	2
11	BSI-1012078-00	X-LITE LINE POST-GALVANIZED	8
12	B090534	8" W-BEAM COMPOSITE-BLOCKOUT XT110	8
13	BSI-4004386	12'-6" W-BEAM GUARD FENCE PANELS 12GA.	4
14	BSI-1102027-00	X-LITE SQUARE WASHER	1
15	BSI-2001886	5/8" X 7" THREAD BOLT HH (GR.5) GEOMET	1
16	BSI-2001885	3/4" X 3" ALL-THREAD BOLT HH (GR.5) GEOMET	4
17	4001115	5/8" X 1 1/4" GUARD FENCE BOLTS (GR.2) MGAL	48
18	2001840	5/8" X 10" GUARD FENCE BOLTS MGAL	8
19	2001636	5/8" WASHER F436 STRUCTURAL MGAL	2
20	4001116	5/8" RECESSED GUARD FENCE NUT (GR.2) MGAL	59
21	BSI-2001888	5/8" X 2" ALL THREAD BOLT (GR.5) GEOMET	1
22	BSI-1701063-00	DELINEATION MOUNTING (BRACKET)	1
23	BSI-2001887	1/4" X 3/4" SCREW SD HH 410SS	7
24	4002051	GUARDRAIL WASHER RECT AASHTO FWRO3	1
25	SEE NOTE BELOW	HIGH INTENSITY REFLECTIVE SHEETING	1
26	4002337	8" W-BEAM TIMBER-BLOCKOUT, PDB01B	8
27	BSI-4004431	25' W-BEAM GUARDRAIL PANEL, 8-SPACE, 12GA.	2
28	MANMAX Rev- (D)	MAX-TENSION INSTALLATION INSTRUCTIONS	1



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

APPROACH GRADING AT GUARDRAIL END TREATMENTS

- \* TO BE PROVIDED BY DISTRIBUTOR OR CONTRACTOR.
- \*\* ALTERNATIVE ITEMS NOT SHOWN. ITEM (26) 8" WOOD-BLOCKOUTS ITEM (27) 25' GUARD FENCE PANELS

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

**Texas Department of Transportation**

**Design Division Standard**

**MAX-TENSION END TERMINAL**

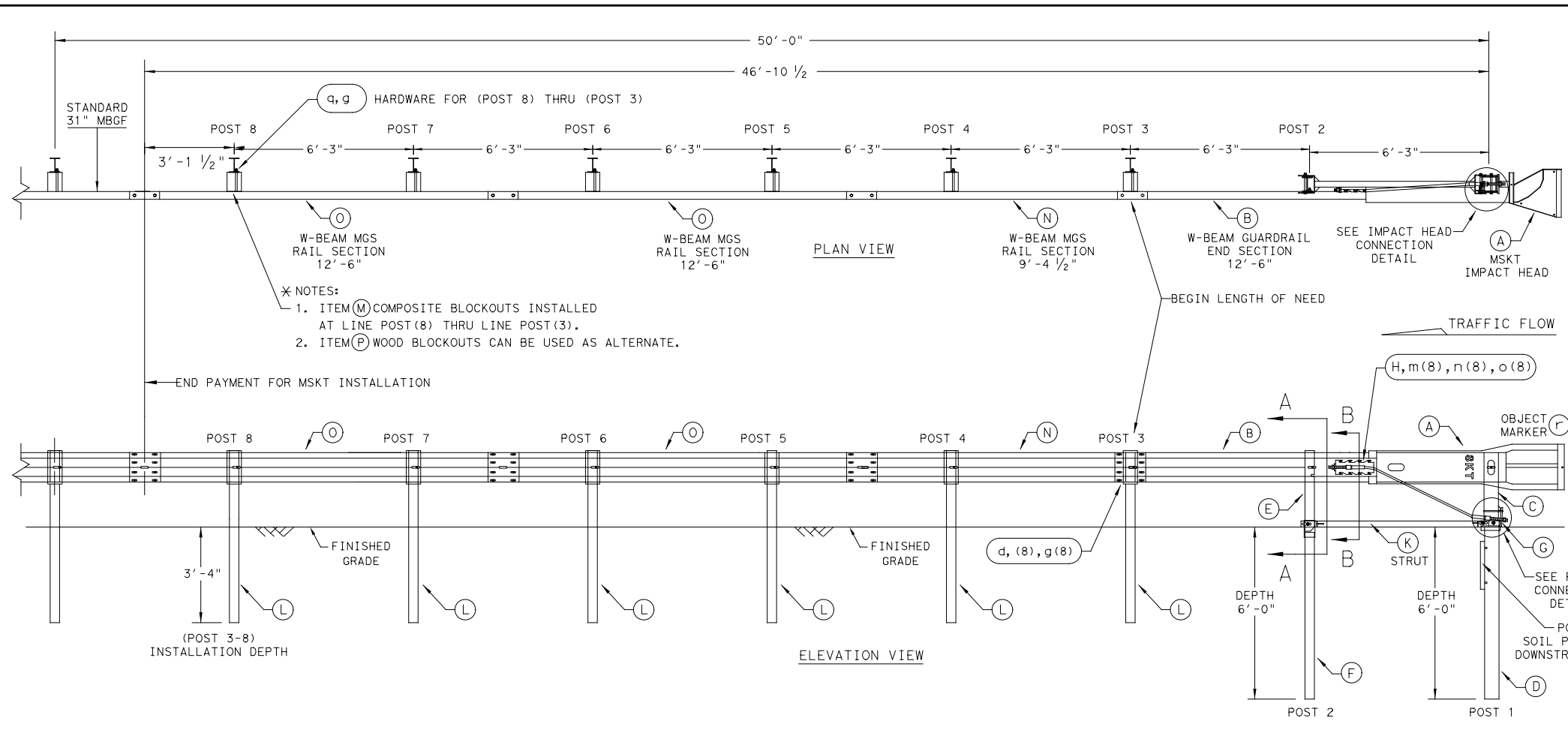
**MASH - TL-3**

**SGT (11S) 31-18**

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HOU	FORT BEND		131	

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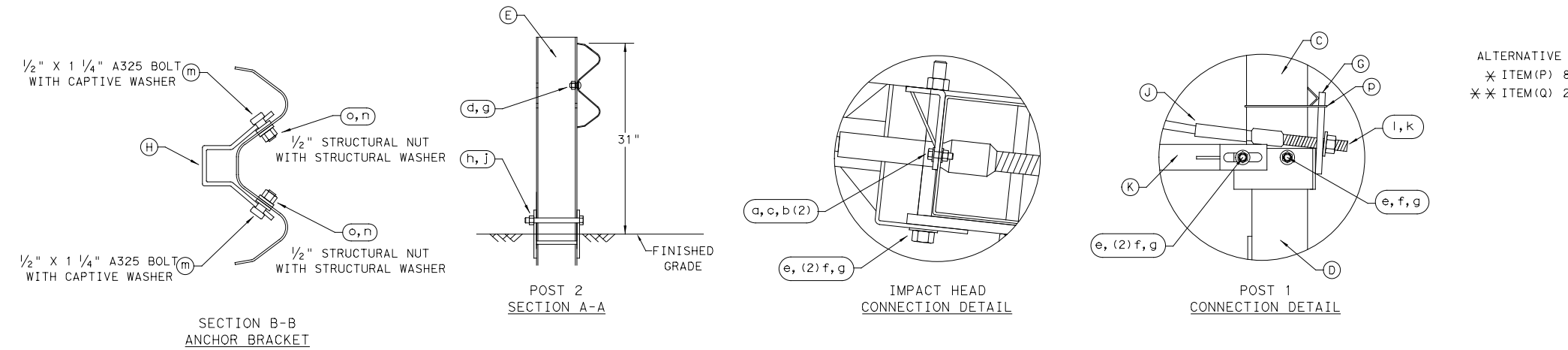
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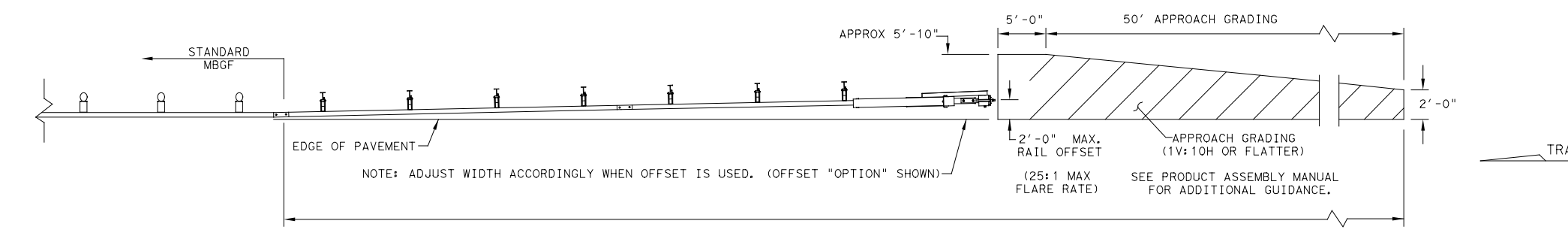
- NOTES:
- ITEM (M) COMPOSITE BLOCKOUTS INSTALLED AT LINE POST (8) THRU LINE POST (3).
  - ITEM (P) WOOD BLOCKOUTS CAN BE USED AS ALTERNATE.

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

ITEM	QTY	MAIN SYSTEM COMPONENTS	ITEM NUMBERS
A	1	MSKT IMPACT HEAD	MS3000
B	1	W-BEAM GUARDRAIL END SECTION, 12 Ga.	SF1303
C	1	POST 1 - TOP (6" X 6" X 1/8" TUBE)	MTPHP1A
D	1	POST 1 - BOTTOM (6' W6X15)	MTPHP1B
E	1	POST 2 - ASSEMBLY TOP	UHP2A
F	1	POST 2 - ASSEMBLY BOTTOM (6' W6X9)	HP2B
G	1	BEARING PLATE	E750
H	1	CABLE ANCHOR BOX	S760
J	1	BCT CABLE ANCHOR ASSEMBLY	E770
K	1	GROUND STRUT	MS785
L	6	W6X9 OR W6X8.5 STEEL POST	P621
M	6	COMPOSITE BLOCKOUTS	CBSP-14
N	1	W-BEAM MGS RAIL SECTION (9'-4 1/2")	G12025
O	2	W-BEAM MGS RAIL SECTION (12'-6")	G1203A
P	6	WOOD BLOCKOUT 6" X 8" X 14"	P675
Q	1	W-BEAM MGS RAIL SECTION (25'-0")	G1209
SMALL HARDWARE			
a	2	5/8" x 1" HEX BOLT (GRD 5)	B5160104A
b	4	5/8" WASHER	W0516
c	2	5/8" HEX NUT	N0516
d	25	5/8" Dia. x 1 1/4" SPLICE BOLT (POST 2)	B580122
e	2	5/8" Dia. x 9" HEX BOLT (GRD A449)	B580904A
f	3	5/8" WASHER	W050
g	33	5/8" Dia. H.G.R NUT	N050
h	1	3/4" Dia. x 8 1/2" HEX BOLT (GRD A449)	B340854A
j	1	3/4" Dia. HEX NUT	N030
k	2	1 ANCHOR CABLE HEX NUT	N100
l	2	1 ANCHOR CABLE WASHER	W100
m	8	1/2" x 1 1/4" A325 BOLT WITH CAPTIVE WASHER	SB12A
n	8	1/2" STRUCTURAL NUTS	N012A
o	8	1 1/8" O.D. x 3/8" I.D. STRUCTURAL WASHERS	W012A
p	1	BEARING PLATE RETAINER TIE	CT-100ST
q	6	5/8" x 10" H.G.R. BOLT	B581002
r	1	OBJECT MARKER 18" X 18"	E3151



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



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

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

Design Division Standard

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

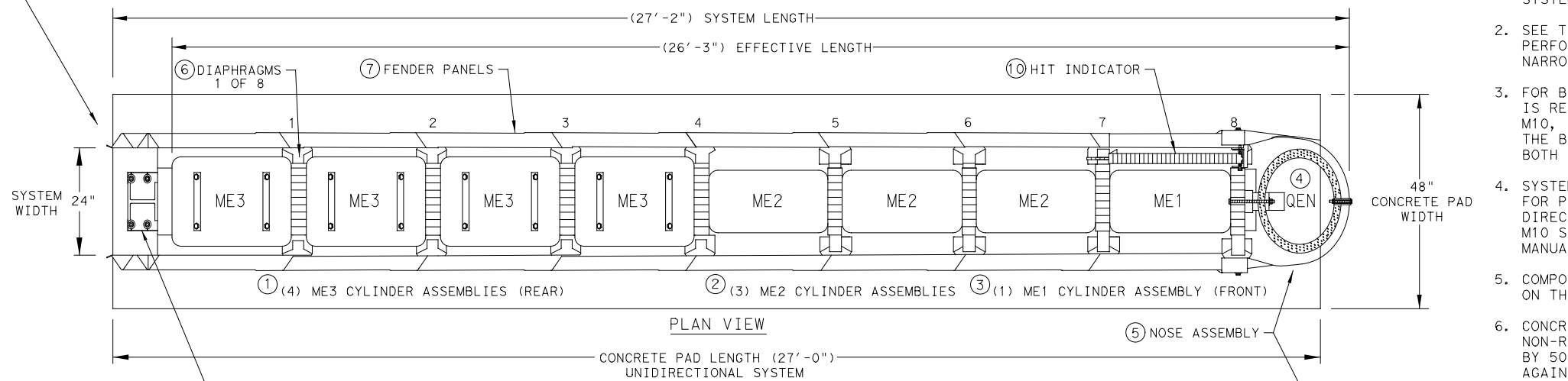
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	DIST	COUNTY	SHEET NO.	
	HOU	FORT BEND	132	

DATE:  
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DISCLAIMER: 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.

NOTE:  
 A TRANSITION MAY BE REQUIRED TO INSTALL THE QUADGUARD ELITE M10 TO THE OBJECT BEING SHIELDED.

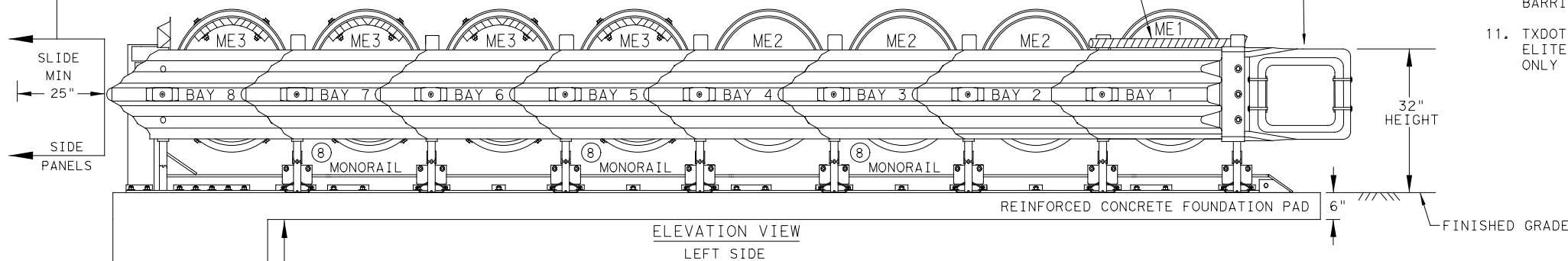
QUADGUARD ELITE M10 24" WIDE (8 BAY) SYSTEM



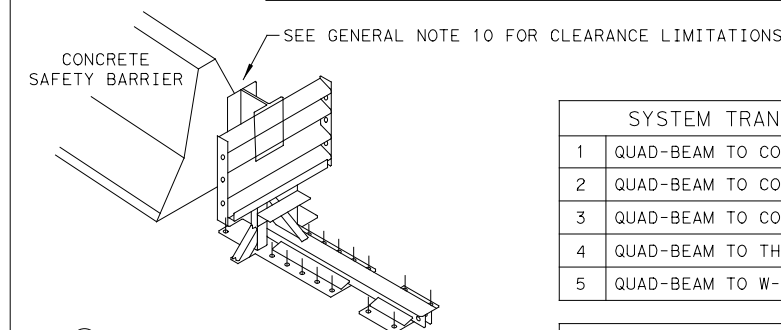
KEY	KEY
① ME3 CYLINDER ASSEMBLIES	⑥ DIAPHRAGMS
② ME2 CYLINDER ASSEMBLIES	⑦ FENDER PANELS
③ ME1 CYLINDER ASSEMBLY	⑧ MONORAILS
④ QEN CYLINDER	⑨ TYPE OF BACKUP
⑤ NOSE BELT ASSEMBLY	⑩ HIT INDICATOR

NOTE:  
 HIT INDICATOR WILL RAISE UPON IMPACT.

NOTE:  
 PROVISION SHALL BE MADE FOR REAR FENDER SIDE PANELS TO SLIDE REARWARD UPON IMPACT, 25" MIN.

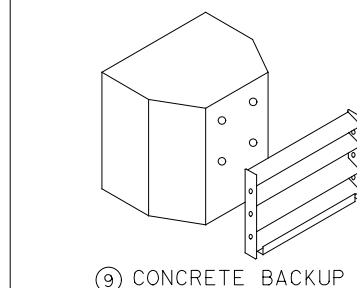


BACKUP ASSEMBLY TYPES FOR SYSTEM TRANSITIONS



SYSTEM TRANSITIONS TYPES	
1	QUAD-BEAM TO CONCRETE SAFETY BARRIER
2	QUAD-BEAM TO CONCRETE BRIDGE RAIL
3	QUAD-BEAM TO CONCRETE END SHOE
4	QUAD-BEAM TO THRIE-BEAM RAIL
5	QUAD-BEAM TO W-BEAM RAIL

NOTE:  
 TRANSITION ASSEMBLIES FOR THE QUADGUARD ELITE M10 TO THRIE-BEAM OR W-BEAM FENCE REQUIRES I-BEAM POSTS:  
 ALL POSTS W6X8.5/9 I-BEAMS (78" LONG).



NOTES:  
 CONTACT THE MANUFACTURER WITH SITE SPECIFIC DATA (SSD) FOR THE CORRECT BACKUP ASSEMBLY AND TRANSITION PANELS OR SIDE PANELS USED FOR STANDARD AND BI-DIRECTIONAL INSTALLATIONS: AT DIVIDED-HIGHWAY MEDIANS OR UNDIVIDED ROADWAYS WHERE THE SYSTEM IS EXPOSED TO IMPACTS FROM ONE OR TWO DIFFERENT DIRECTIONS OF TRAFFIC FLOW.

GENERAL NOTES

- FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: TRINITY HIGHWAY - ENERGY ABSORPTION INC. AT 1(888)323-6374.
- SEE THE RECENT QUADGUARD ELITE M10 PRODUCT DESCRIPTION ASSEMBLY MANUAL FOR IMPACT PERFORMANCE CHARACTERISTICS AND DESIGN LIMITATIONS AND THE DRAWING PACKAGE FOR THE NARROW 24" SYSTEM BEFORE INSTALLING THE QUADGUARD ELITE M10 AT ANY GIVEN LOCATION.
- FOR BI-DIRECTIONAL TRAFFIC: THE LOCATION AND OR WIDTH OF THE QUADGUARD ELITE M10 IS RESTRICTED. AS BI-DIRECTIONAL TRAFFIC APPROACHES THE REAR OF THE QUADGUARD ELITE M10, THE QUADGUARD ELITE M10 SHOULD NOT EXTEND FURTHER INTO THE TRAFFIC-SIDE OF THE BARRIER THAN THE OBSTACLE. ANY TRANSITION INSTALLED MUST EITHER BE TANGENT TO BOTH QUADGUARD ELITE M10 AND OBSTACLE OR MUST ANGLE TOWARD FIELD SIDE OF THE BARRIER.
- SYSTEM TRANSITION: APPROPRIATE TRANSITION PANELS OR SIDE PANELS WILL BE REQUIRED FOR PROPER IMPACT PERFORMANCE. THE CORRECT PANEL(S) TO USE WILL DEPEND ON THE DIRECTION OF TRAFFIC FLOW AND WHAT TYPE OF BARRIER OR ROAD FEATURE THE QUADGUARD ELITE M10 SYSTEM IS SHIELDING. SEE THE QUADGUARD ELITE M10 PRODUCT DESCRIPTION & ASSEMBLY MANUAL FOR FURTHER DETAILS.
- COMPONENTS FOR THE QUADGUARD ELITE (M10) BACKUP AND REINFORCING DETAILS ARE SHOWN ON THE QUADGUARD ELITE M10 PRODUCT DESCRIPTION & ASSEMBLY MANUAL.
- CONCRETE PAD SHALL BE 6" MIN. REINFORCED 28MPa [4,000 PSI] (P.C.) OR 8" MIN. NON-REINFORCED 28MPa [4,000 PSI] CONCRETE ROADWAY MEASURING AT LEAST 12'-0" WIDE BY 50'-0" LONG. ANCHOR BLOCK IS NOT REQUIRED WHEN USING 8" CONCRETE PAD INSTALLED AGAINST AN IMMOVABLE STRUCTURE, E.G. CONCRETE WALL.
- IF THE CROSS-SLOPE VARIES MORE THAN 2% OVER THE LENGTH OF THE SYSTEM, THE CONCRETE PAD WILL REQUIRE LEVELING. MAXIMUM PERMISSIBLE CROSS-SLOPE IS 8%.
- THE INSTALLATION AREA SHOULD BE FREE OF CURBS, ELEVATED OBJECTS, OR DEPRESSIONS.
- THE QUADGUARD ELITE M10 SYSTEM SHOULD BE INSTALLED APPROXIMATELY PARALLEL WITH THE BARRIER.
- FOR THE TENSION STRUT BACKUP THE DISTANCE BETWEEN THE BACK OF BACKUP AND THE BARRIER WALL SHOULD NOT EXCEED 7" IN ANY CASE.
- TXDOT HAS ONLY APPROVED THE 24" WIDE QUADGUARD ELITE M10 SYSTEM. THE QUADGUARD ELITE M10 PRODUCT DESCRIPTION AND ASSEMBLY MANUAL INCLUDES SYSTEM WIDTH OF 24". ONLY THE 24" SYSTEM IS ALLOWED TO BE INSTALLED ON TEXAS ROADWAYS.

FOUNDATION & ANCHORING REQUIREMENTS  
FOUNDATION TYPES: A, B, C, & D

FOUNDATION TYPE: A	REINFORCED CONCRETE PAD OR ROADWAY
FOUNDATION:	6" MINIMUM DEPTH (P.C.C.)
ANCHORAGE:	7" STUDS EMBEDDED 5 1/2" - APPROVED ADHESIVE
FOUNDATION TYPE: B	ASPHALT OVER P.C.C.
FOUNDATION:	3" MIN. (A.C.) OVER 3" MIN. (P.C.C.)
ANCHORAGE:	18" THREADED ROD EMBEDDED 16 1/2" - APPROVED ADHESIVE
FOUNDATION TYPE: C	ASPHALT OVER SUBBASE
FOUNDATION:	6" MIN. (A.C.) OVER 6" MIN. (C.S.)
ANCHORAGE:	18" THREADED ROD EMBEDDED 16 1/2" - APPROVED ADHESIVE
FOUNDATION TYPE: D	ASPHALT ONLY
FOUNDATION:	8" MIN. (A.C.)
ANCHORAGE:	18" THREADED ROD EMBEDDED 16 1/2" - APPROVED ADHESIVE

KEY:  
 ASPHALT CONCRETE (A.C.)  
 COMPACTED SUBBASE (C.S.)  
 PORTLAND CEMENT CONCRETE (P.C.C.)

NOTE: SEE TRINITY'S PRODUCT DESCRIPTION ASSEMBLY MANUAL FOR THE APPROVED ADHESIVE.

IF THE UNIT IS ANCHORED TO ASPHALTIC CONCRETE, IT SHOULD BE RELOCATED TO FRESH, UNDISTURBED ASPHALT AND RE-ANCHORED AFTER EACH IMPACT TO ENSURE ADEQUATE FUTURE PERFORMANCE.

TENSION STRUT BACKUP MAY BE USED IN CONSTRUCTION ZONES ON ASPHALT CONCRETE (A.C.) FOR TEMPORARY USE ONLY.

NOTES:  
 CONTACT THE MANUFACTURER WITH SITE SPECIFIC DATA (SSD) FOR CONCRETE PAD AND ANCHOR BLOCK INSTALLATION REQUIREMENTS.

A MANUFACTURER'S DRAWING PACKAGE UNIQUE AND SPECIFIC FOR THE QUADGUARD ELITE M10 FIELD INSTALLATION AND INFORMATION REGARDING THE TYPE OF BACKUP ASSEMBLY REQUIRED FOR THE TRANSITION WILL BE PROVIDED BY THE MANUFACTURER TO THE ENGINEER AND INSTALLER.

6" REINFORCED CONCRETE PAD REQUIRES THE INSTALLATION OF AN ANCHOR BLOCK AS SHOWN ON THE MANUFACTURER'S DRAWING PACKAGE.

8" NON-REINFORCED CONCRETE PAD MAY NOT REQUIRE AN ANCHOR BLOCK, IF THE PAD IS INSTALLED AGAINST AN IMMOVABLE CONCRETE BACKUP.

CONCRETE PAD AND ANCHOR BLOCK COMBINATIONS SHALL BE CONFIRMED WITH THE MANUFACTURER BASED UPON SITE SPECIFIC DATA (SSD).

NOTE:  
 THE QUADGUARD ELITE M10 8-BAY, 24" WIDE - NARROW SYSTEM TESTED TO MASH TEST LEVEL 3.

TL-3 MODEL #	QM10024E	CYLINDER TYPES IN BAYS			
BAYS	8	TYPE-ME3	TYPE-ME2	TYPE-ME1	TYPE-QEN
DIAPHRAGMS	8	4	3	1	1
WIDTH	24"	REAR	FRONT	NOSE	

NOTE:  
 THIS STANDARD IS A BASIC REPRESENTATION OF THE QUADGUARD ELITE M10 SYSTEM AND IS NOT INTENDED TO REPLACE THE PRODUCT DESCRIPTION ASSEMBLY MANUAL.

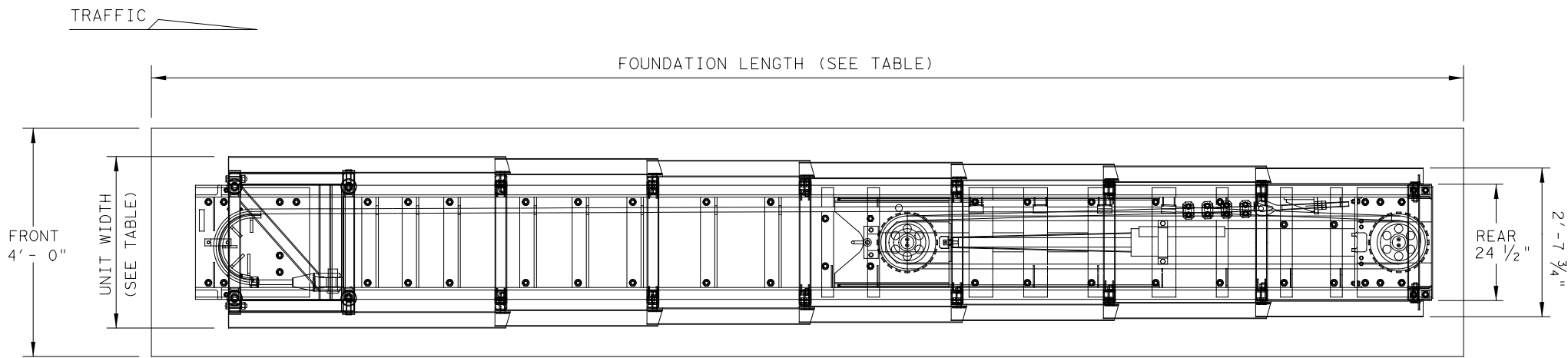
LOW MAINTENANCE

		<b>Design Division Standard</b>	
TRINITY HIGHWAY ENERGY ABSORPTION QUADGUARD ELITE M10 (MASH TL-3) QGELITE (M10) (N) -20			
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	HOU: FORT BEND		SHEET NO. 133

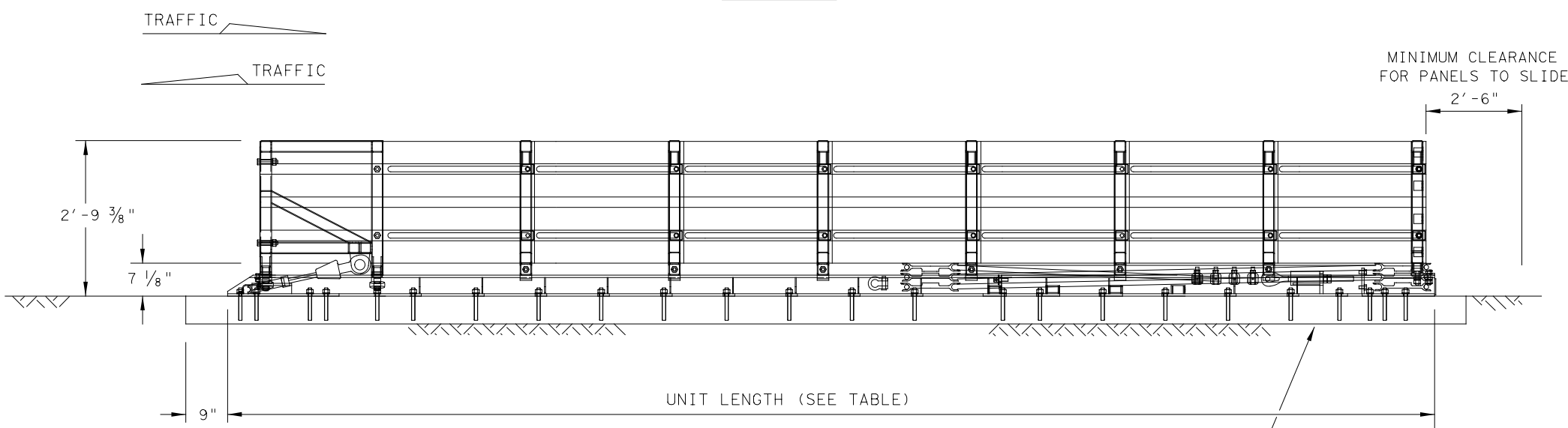
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PLAN VIEW



ELEVATION VIEW

GENERAL NOTES

1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: WORK AREA PROTECTION, CORP. AT (800) 327-4417, OR (630) 377-9100.
2. FOR BI-DIRECTIONAL TRAFFIC, APPROPRIATE TRANSITION PANELS WILL BE REQUIRED.
3. ADDITIONAL DETAILS FOR THE TRANSITION OPTION 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 SCI100GM & SCI70GM SYSTEMS SHOULD BE APPROXIMATELY PARALLEL WITH THE BARRIER OR CENTERLINE OF MERGING BARRIERS.

NOTE:  
 FOR ATTACHMENT AND TRANSITIONS TO OTHER SHAPES, BARRIERS, RAILINGS AND BI-DIRECTIONAL TRAFFIC FLOWS ARE AVAILABLE. (SEE MANUFACTURER'S PRODUCT MANUAL)

NOTE:  
 SIDE PANELS CAN TRAVEL 30" BEYOND THE LAST TERMINAL BRACE AT THE REAR OF THE CUSHION. ALL OBJECTS THAT MAY INTERFERE WITH THIS MOTION CAN AFFECT PERFORMANCE OF AND MAY CAUSE UNDUE DAMAGE TO THE CRASH CUSHION.

MODEL	TEST LEVEL	UNIT LENGTH (approx.)	UNIT WIDTH	FOUNDATION LENGTH	OBSTACLE WIDTH
SCI70GM	TL-2	13'-6"	2'-10 5/8"	15'- 6 1/4"	24" to 36"
SCI100GM	TL-3	21'-6"	3'-1 1/2"	23'- 0"	24" to 36"

SYSTEM AND PAD LENGTHS VARY DEPENDING ON BACKUP TYPE.

FOUNDATION OPTIONS
6" REINFORCED CONCRETE (5 1/2" ANCHOR EMBEDMENT)
8" UNREINFORCED CONCRETE (5 1/2" ANCHOR EMBEDMENT)
3" MIN. ASPHALT OVER 3" MIN. CONCRETE (16 1/2" ANCHOR EMBED.)
6" ASPHALT OVER 6" COMPACT SUBBASE (16 1/2" ANCHOR EMBED.)
8" MINIMUM ASPHALT (16 1/2" ANCHOR EMBEDMENT)

FOR STEEL PLACEMENT IN CONCRETE FOUNDATIONS, SEE MANUFACTURER'S PRODUCT MANUAL.

TRANSITION OPTIONS
CONCRETE VERTICAL WALL
CONCRETE TRAFFIC BARRIERS
GUARDRAIL (W-BEAM)
GUARDRAIL (THRIE-BEAM)

TRANSITION TYPES ARE SHOWN ELSEWHERE ON THE PLANS (I.E. ATTENUATOR LOCATION DETAILS OR IN THE GENERAL NOTES).

FOR BI-DIRECTIONAL TRANSITION PANEL AND END SHOE DETAILS, SEE MANUFACTURER'S PRODUCT MANUAL.



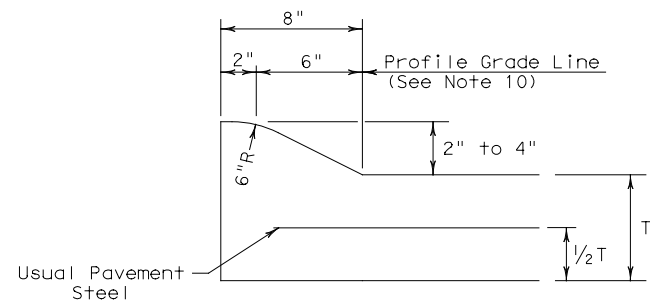
WORK AREA PROTECTION  
 CORP  
 (SMART-NARROW)  
 SMTN(N) - 16

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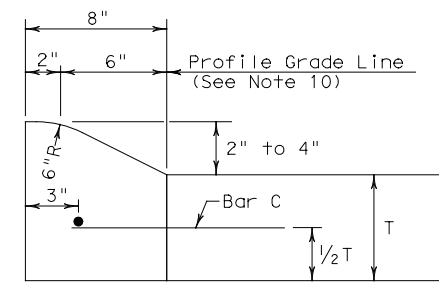
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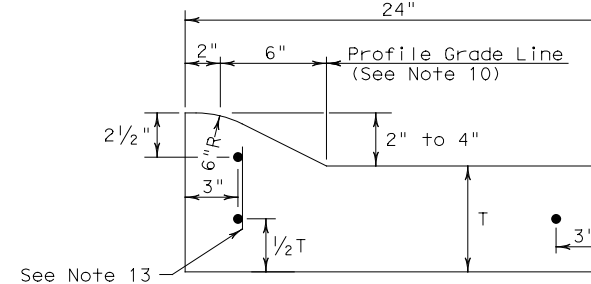
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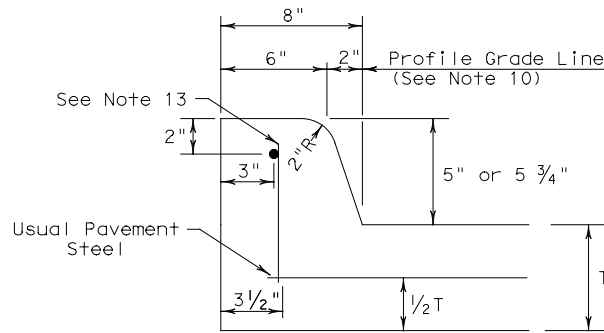
TYPE I CURB (MONOLITHIC)  
2" - 4" HEIGHT



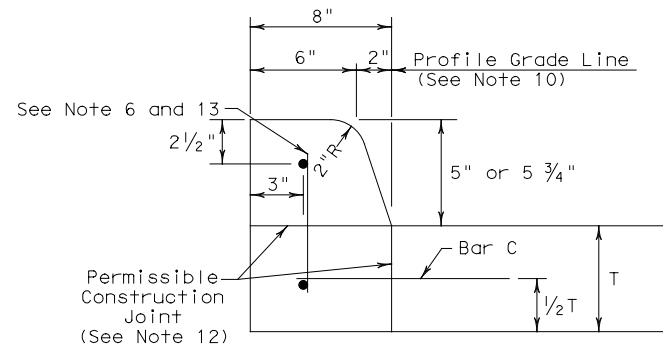
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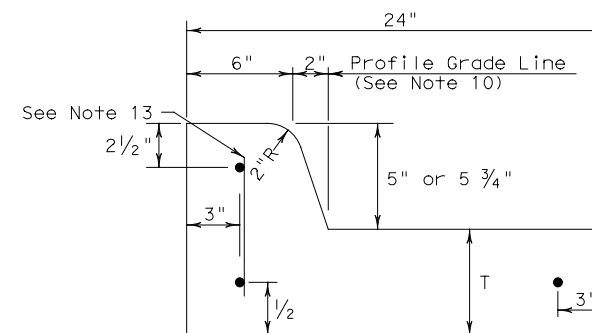
TYPE I CURB AND GUTTER  
2" - 4" HEIGHT



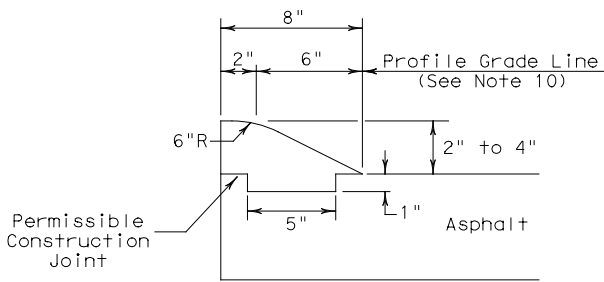
TYPE II CURB (MONOLITHIC)  
5" - 5 3/4" HEIGHT



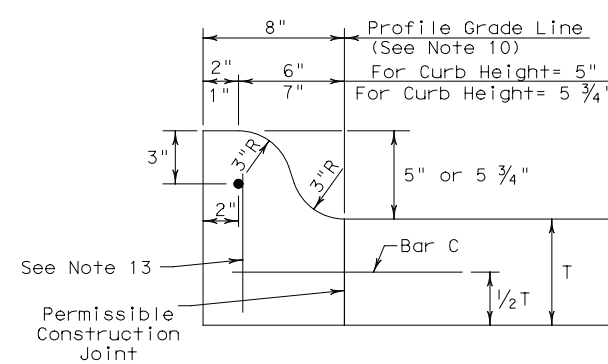
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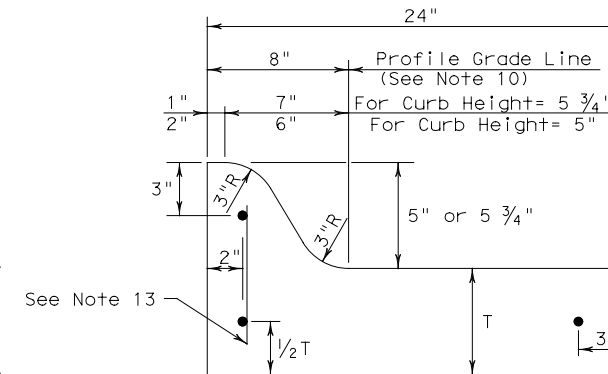
TYPE II CURB AND GUTTER  
5" - 5 3/4" HEIGHT



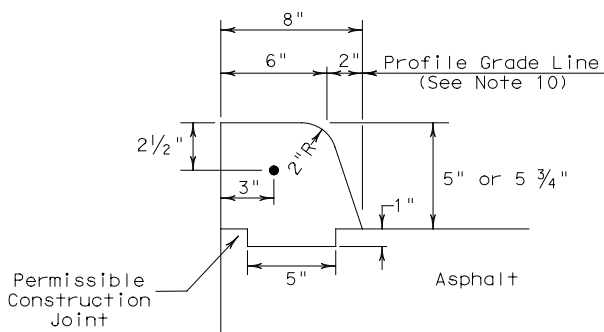
TYPE III CURB (KEYED)  
2" - 4" HEIGHT



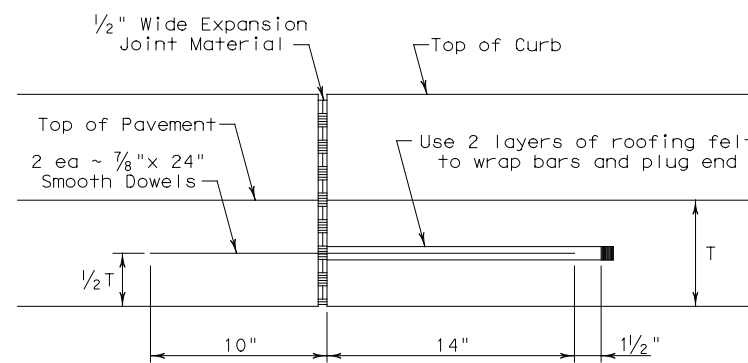
TYPE IIa CURB  
5" - 5 3/4" HEIGHT



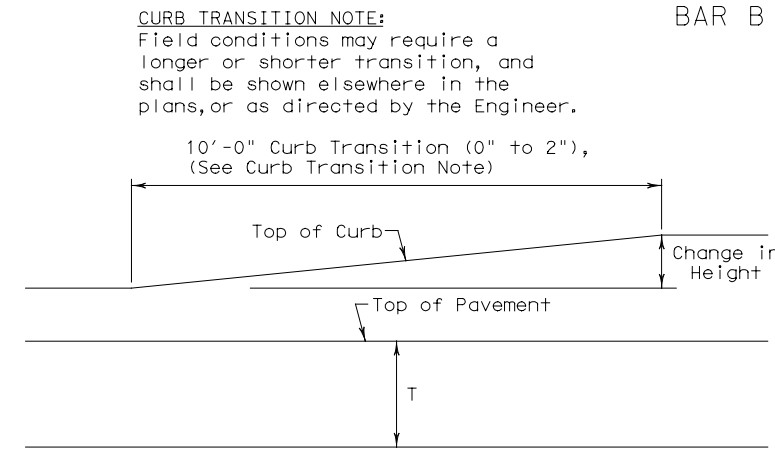
TYPE IIa CURB AND GUTTER  
5" - 5 3/4" HEIGHT



TYPE IV CURB (KEYED)  
5" - 5 3/4" HEIGHT



EXPANSION JOINT DETAIL

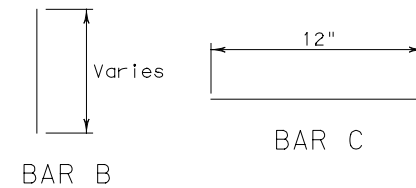


CURB TRANSITION

Note: To be paid for as Highest Curb

GENERAL NOTES

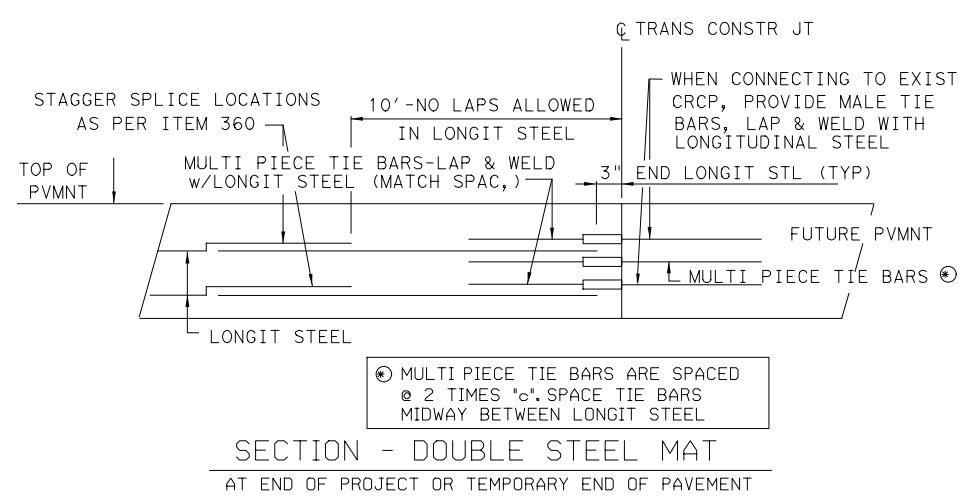
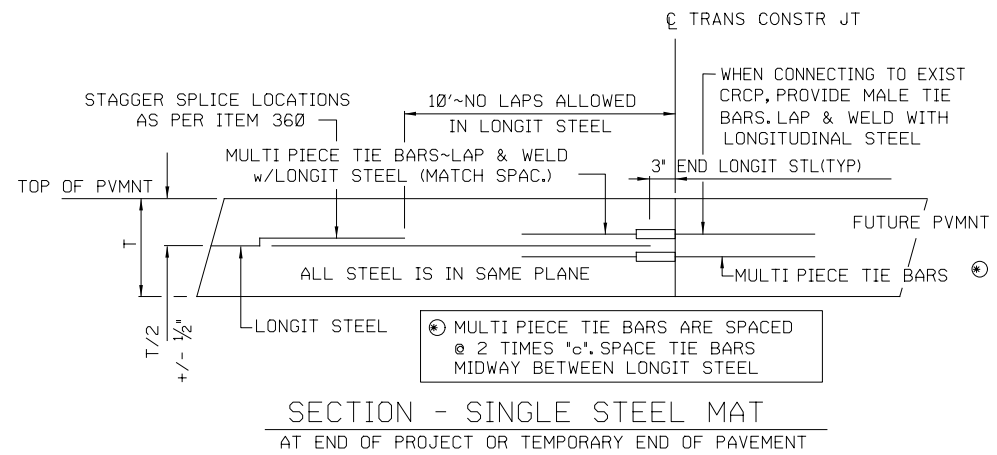
- All materials and construction shall be in accordance with Item 529, "Concrete Curb, Gutter, and Combined Curb and Gutter."
- Concrete shall be Class A.
- When reinforcing bars are used, they shall be No.4 unless otherwise shown. The use of fiber reinforced concrete in lieu of reinforcing steel is acceptable. Use fibers meeting the requirements of DMS 4550, "Fibers for Concrete," and dose fibers in accordance with Material Producers List (MPL) "Fibers for Class A and B Concrete Applications."
- Round exposed sharp edges with a rounding tool, to a minimum radius of 1/4 inch.
- All existing curbs and driveways to be removed shall be sawed or removed at existing joints.
- Where concrete curb is to be placed on existing concrete pavement, Bar B may be drilled and grouted in place, or may be inserted into fresh concrete.
- Expansion and contraction joints shall be constructed to match pavement joints in all curbs and curb and gutter adjacent to jointed concrete pavement. Where placement of curb or curb and gutter is not adjacent to concrete pavement, expansion joints shall be provided at structures, curb returns at streets, and at locations directed by The Engineer.
- Vertical and horizontal dowel bars and transverse reinforcing bars shall be placed at four feet C-C.
- Dimension 'T' shown is the thickness of concrete pavement. When curb is installed adjacent to flexible pavement dimension 'T' is 8" maximum.
- Usual profile grade line. Refer to typical sections and plan-profile sheets for exact locations.
- One-half inch expansion joint material shall be provided where curb or curb and gutter is adjacent to sidewalk or riprap.
- When horizontal permissible construction joints are used, the longitudinal pavement steel shall be placed in accordance with pavement details shown elsewhere in the plans. Reinforcing steel for curb section shall then conform to that required for concrete curb.
- Bar B placement as needed (typically at four ft. C-C) to support curb reinforcing steel during concrete placement.



CURB TRANSITION NOTE:  
Field conditions may require a longer or shorter transition, and shall be shown elsewhere in the plans, or as directed by the Engineer.

				<b>Design Division Standard</b>	
<p>CONCRETE CURB AND CURB AND GUTTER</p> <p>CCCG-22</p>					
FILE: cccg21.dgn	DN: TxDOT	CK: AN	DW: CS	CK: KM	
© TxDOT: JUNE 2022	CONT	SECT	JOB	HIGHWAY	
REVISIONS	3510	04	055	SH 99	
	DIST	COUNTY	SHEET NO.		
	HOU	FORT BEND	135		



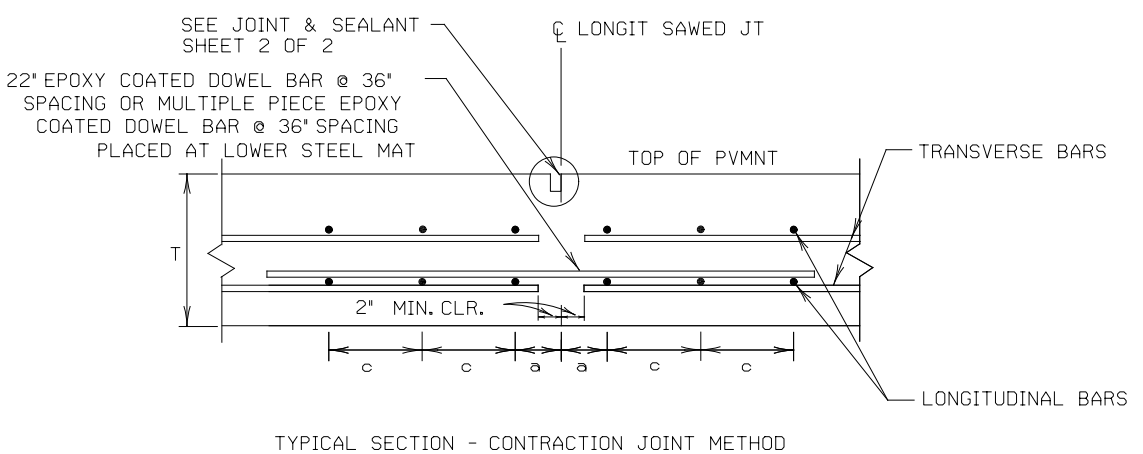
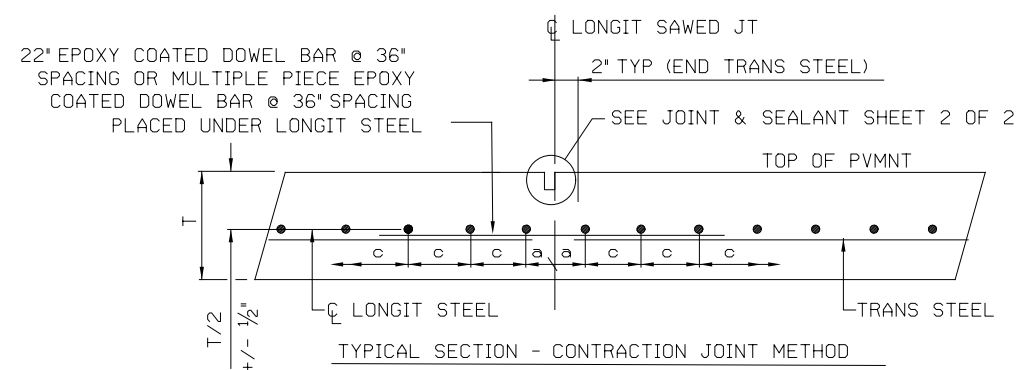
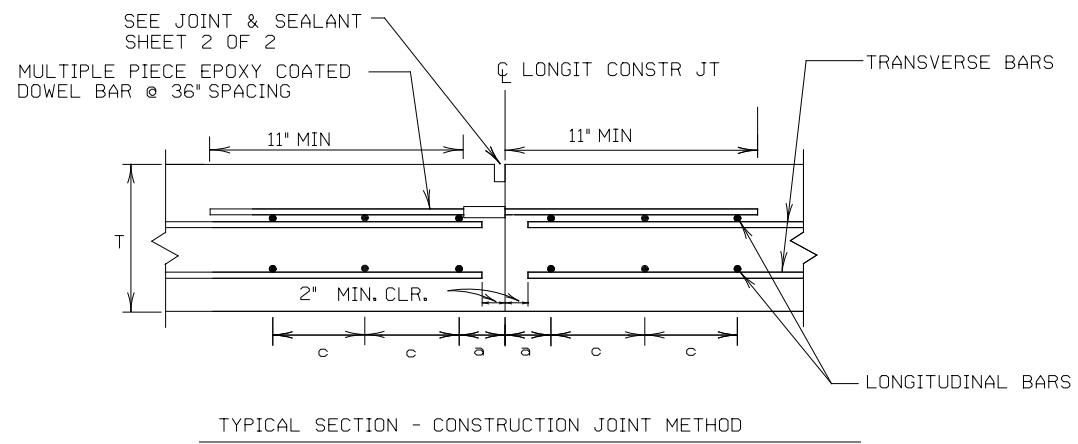
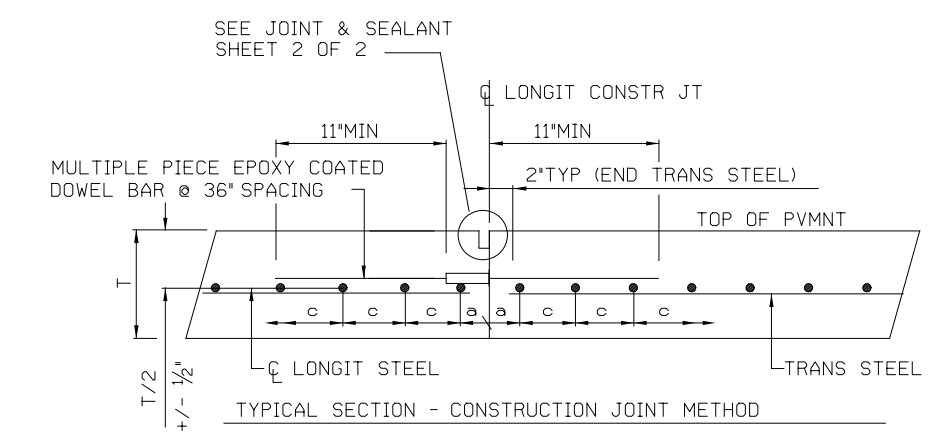


LONGITUDINAL DOWEL JOINT DETAILS

LOCATE WHERE SHOWN IN THE PLANS OR AS APPROVED. CONTRACTOR MAY USE EITHER METHOD

SINGLE STEEL MAT

DOUBLE STEEL MAT



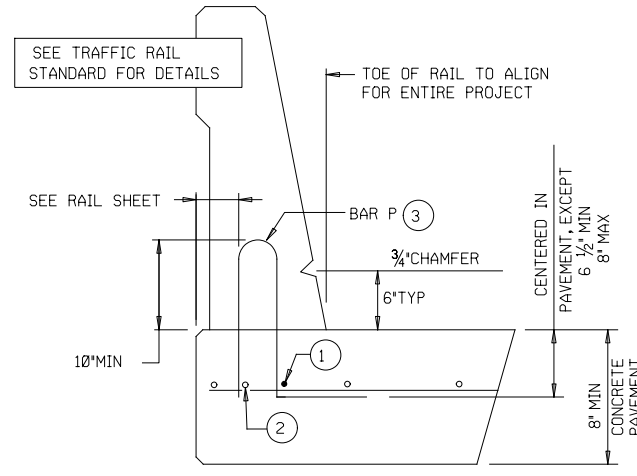
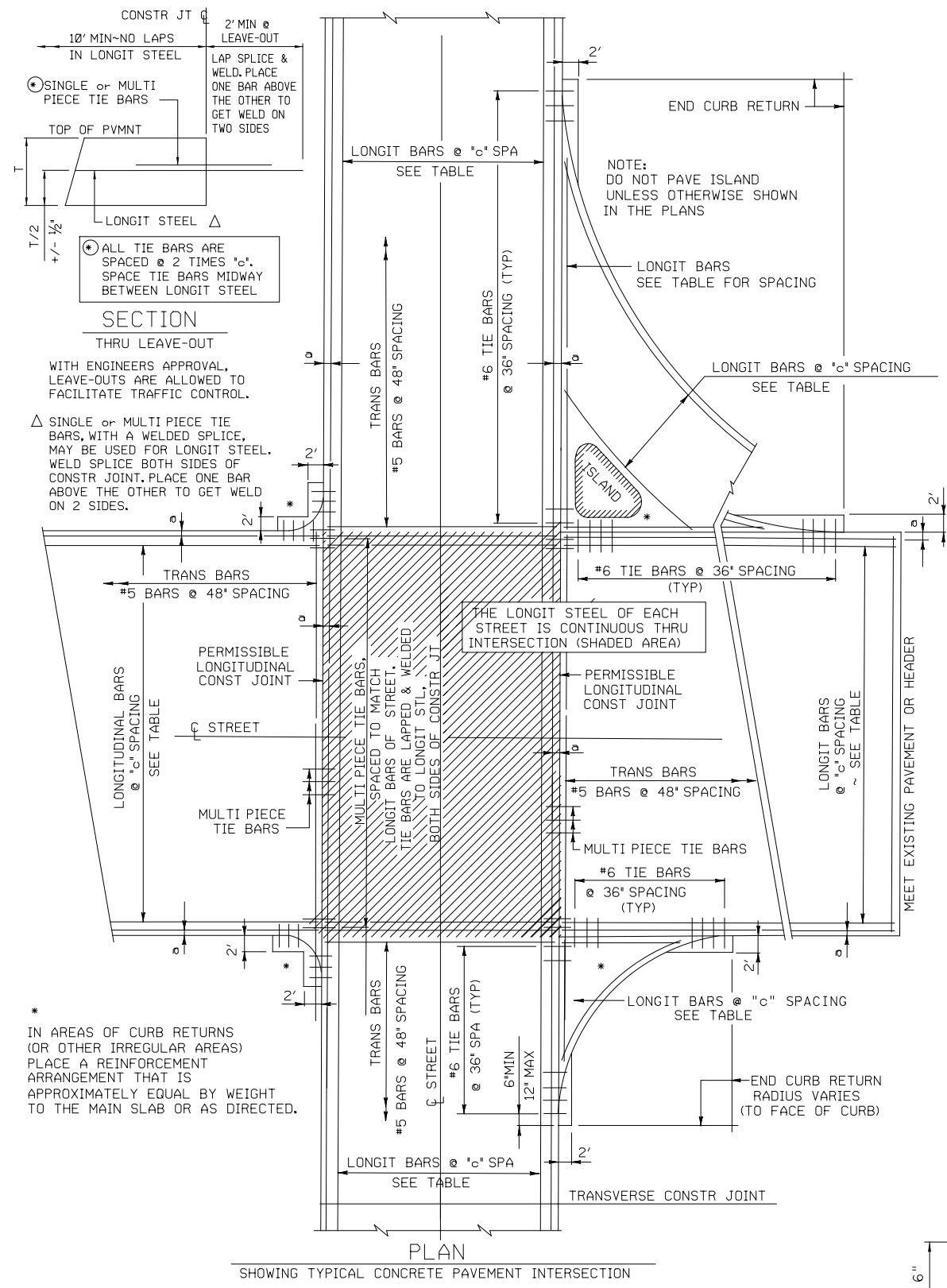
GENERAL NOTES

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.

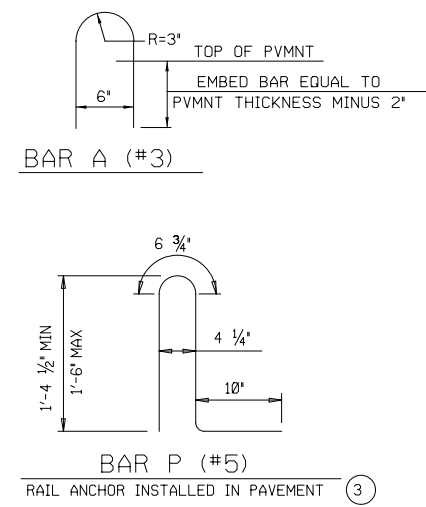
Texas Department of Transportation  
Houston District

CONTINUOUSLY REINFORCED  
CONCRETE PAVEMENT  
HOUSTON SUPPLEMENT  
CRCP-HS

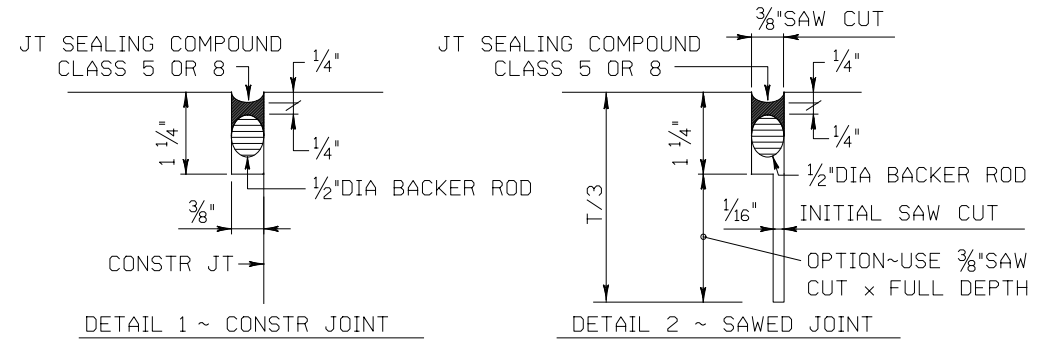
© TxDOT APR. 2012	DN-	CK-	DR-	CS-	
REVISIONS 4/12 CHANGED CTE FROM 6.0 TO 5.0 8/14 UPDATE TO REFERENCE CRCP-15 STD. 2/15 REVISED GENERAL NOTES, MINOR CORRECTIONS. 4/17 REVISED NOTE #3 OF GENERAL NOTES, MINOR CORRECTIONS.	DISTRICT	PROJECT NO.			SHEET
	HOU				136
	COUNTY	CONTROL SECTION	JOB	HIGHWAY	
	FORT BEND	3510 04	055	SH 99	



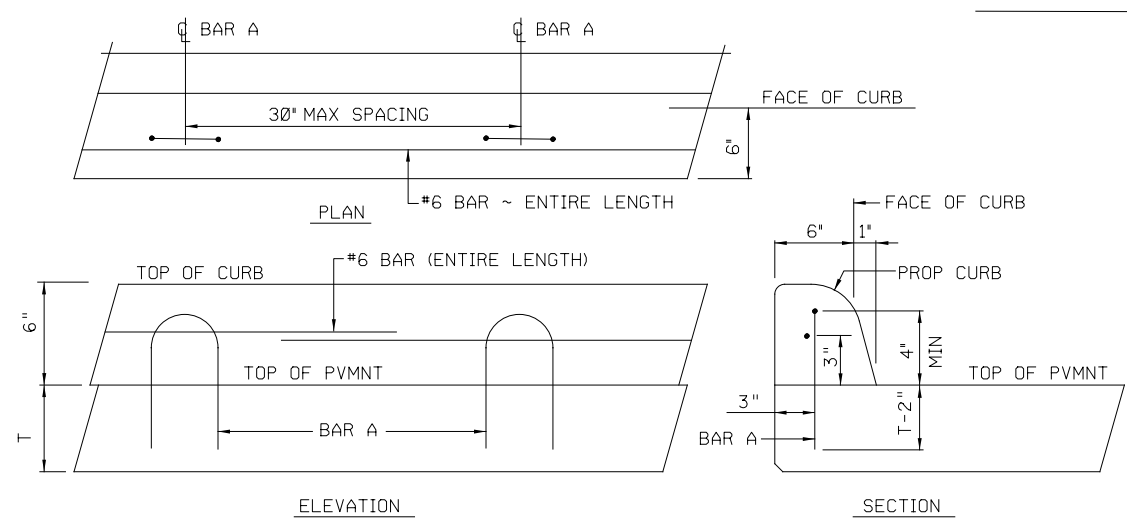
- ① AS AN AID IN SUPPORTING REINFORCEMENT, ADDITIONAL LONGITUDINAL BARS MAY BE USED IN THE SLAB WITH THE APPROVAL OF THE ENGINEER. FURNISH SUCH BARS AT NO EXPENSE TO THE DEPARTMENT.
- ② LONGITUDINAL SLAB BAR MAY BE ADJUSTED LATERALLY 3" +/- TO TIE REINFORCING.
- ③ ANCHORAGE BAR SHOWN IS FOR AN SSTR OR T551 RAIL. SEE RAILING DETAIL SHEET FOR SPACING OF BAR P. FOR OTHER RAIL TYPES SEE RAILING DETAIL SHEET.



RAIL DETAIL  
FOR ADDITIONAL DETAILS, SEE RAIL STANDARD SHEET.  
THE MINIMUM LENGTH OF A CONCRETE RAILING PANEL IS FIVE FEET.



JOINT AND SEALANT DETAILS



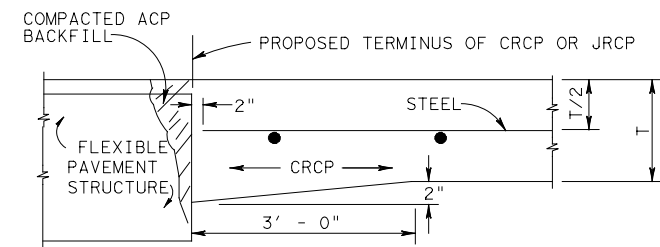
CURB DETAIL  
SEE CC & DID STANDARD

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Houston District  
CONTINUOUSLY REINFORCED  
CONCRETE PAVEMENT  
HOUSTON SUPPLEMENT  
CRCP-HS

© TxDOT APR. 2012	ONE -	CK -	ONE -	CK -	
REVISIONS 4/12 CHANGED CTE FROM 6.0 TO 5.0 (ON SHEET 1) 2/15 MINOR CORRECTIONS.	DISTRICT HOU	PROJECT NO.		SHEET 137	
	COUNTY FORT BEND	CONTROL SECTION 3510 04	JOB 055 SH 99	HIGHWAY	

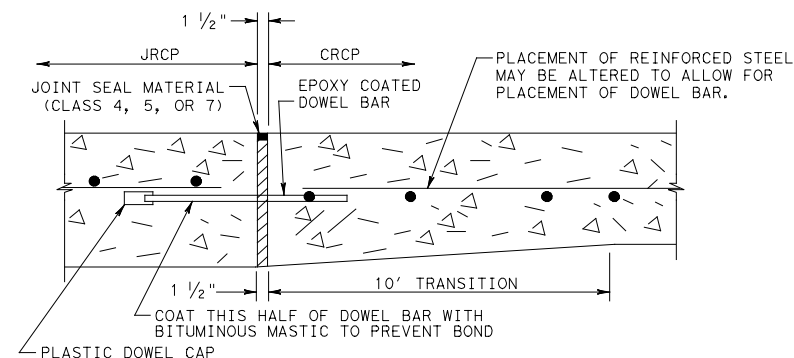
GENERAL NOTES

- 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

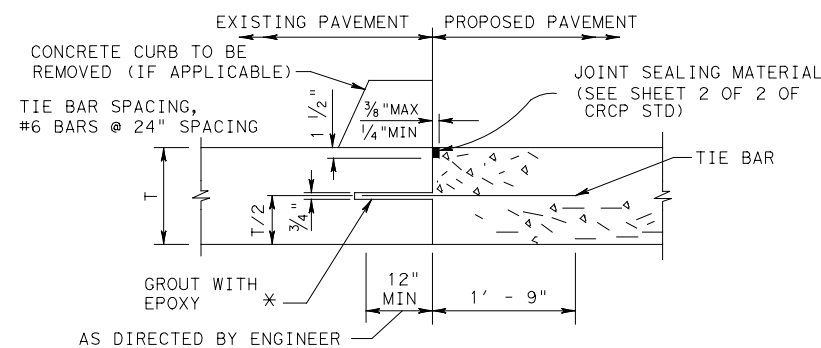


FOR DETAILS NOT SHOWN, SEE TRANSVERSE EXPANSION JOINT DETAILS ELSEWHERE IN PLANS.

DETAIL "B" - DOWEL ASSEMBLY AT EXPANSION JOINT

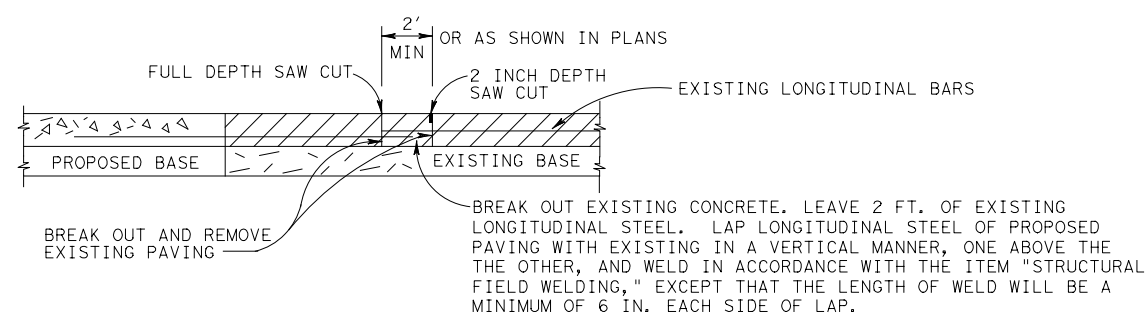
DOWEL BAR DATA			
SLAB THICKNESS (T)	6"-7.5"	8"-10"	10.5"-15"
DOWEL SIZE	1"	1 1/4"	1 1/2"
DOWEL LENGTH	18"	20"	22"
DOWEL BAR SPACING	12"	12"	12"

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

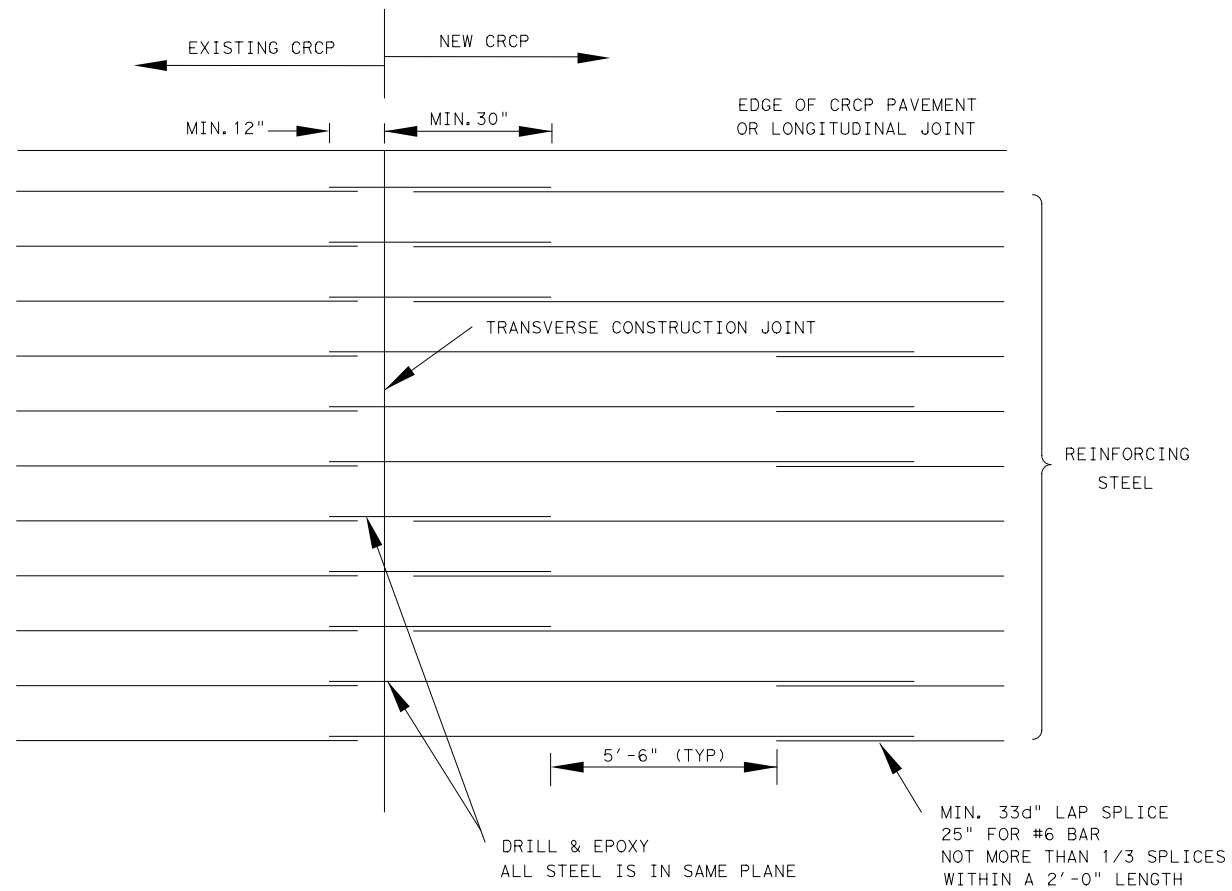
- ACP - ASPHALT CONCRETE PAVEMENT
- CRCP - CONTINUOUSLY REINFORCED CONCRETE PAVEMENT
- JRCP - JOINTED REINFORCED CONCRETE PAVEMENT
- T - THICKNESS

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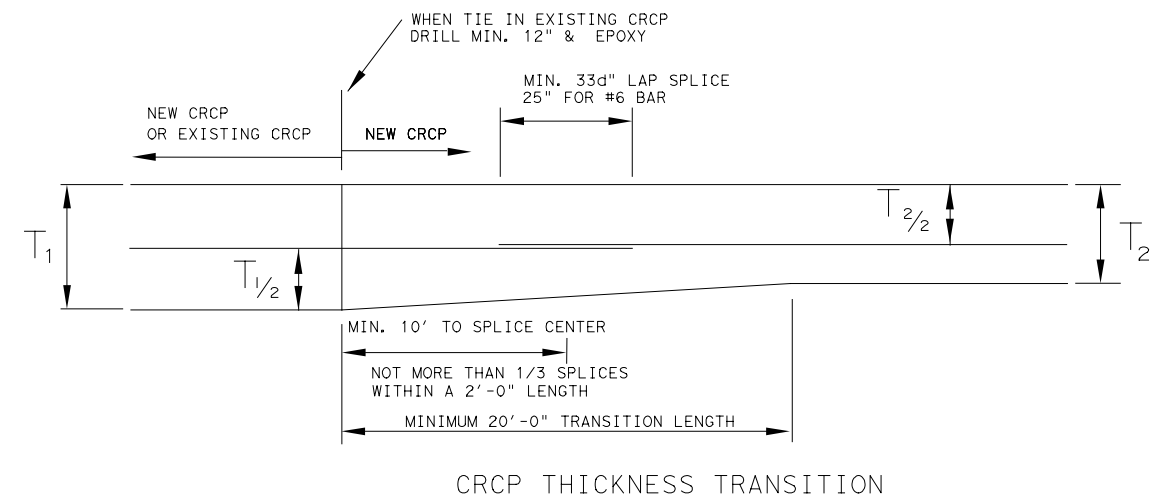
CONCRETE PAVEMENT JUNCTURES

CPJ

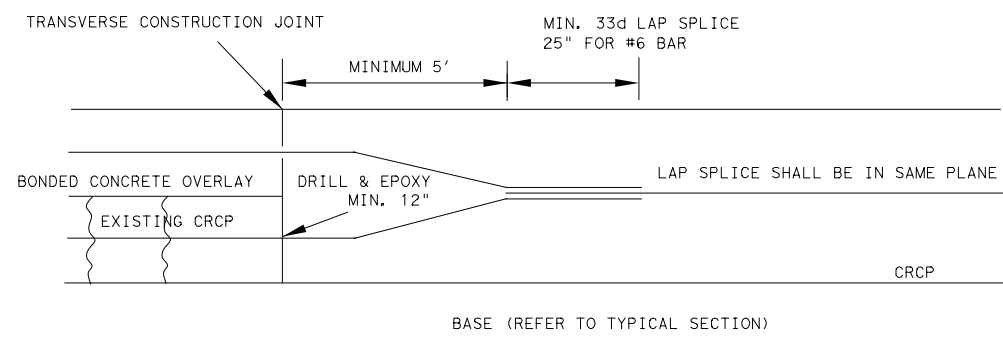
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© TxDOT DEC. 2009	DIST	FED REG	PROJECT NO.	
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COUNTY		CONTROL	SECT	JOB
FORT BEND		3510	04	055
			HIGHWAY	SH 99



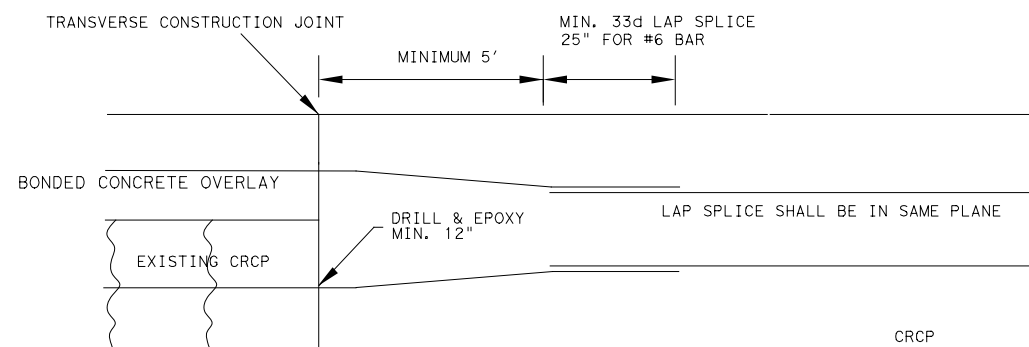
EXISTING CRCP TO NEW CRCP



CRCP THICKNESS TRANSITION



CRCP BONDED OVERLAY TO CRCP TRANSITION  
(ONE LAYER STEEL)



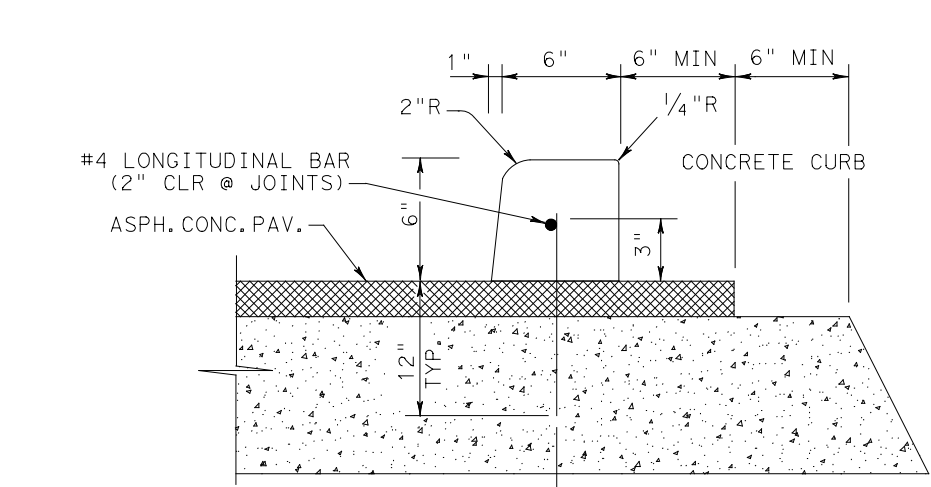
CRCP BONDED OVERLAY TO CRCP TRANSITION  
(TWO LAYER STEEL)



CONCRETE PAVEMENT  
JUNCTURES

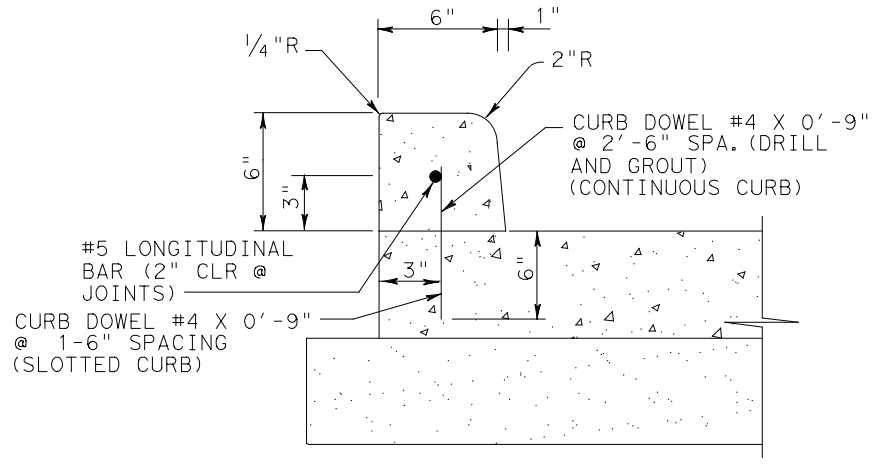
CPJ

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© TXDOT DEC. 2009	DIST	FED REG	PROJECT NO.	
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COUNTY		CONTROL	SECT	JOB
FORT BEND		3510	04	055
				HIGHWAY SH 99

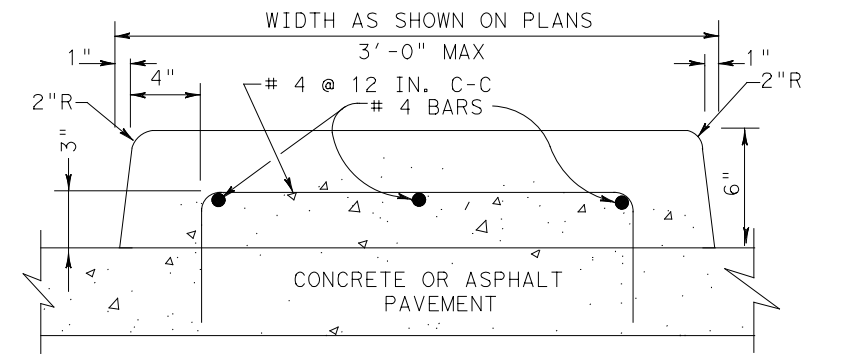


CONTINUOUS CURB; DOWEL #5 X 1'-3"  
@ 2'-6" SPA. (DRILL & GROUT)  
SLOTTED CURB; DOWEL #5 X 1'-3"  
@ 1'-6" SPA. (DRILL & GROUT)

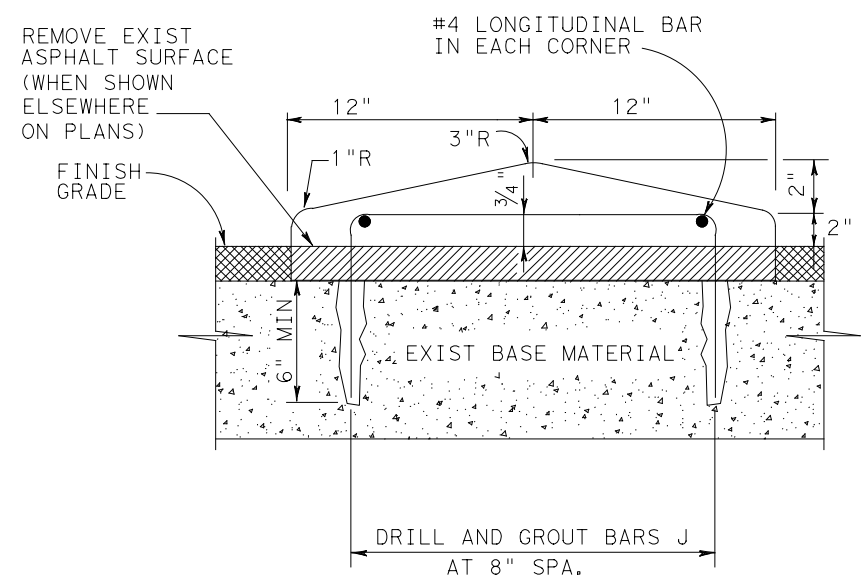
SHOWN ON EXISTING OR PROPOSED ACP PAVEMENT  
(PAY ITEM 529-6011) - FOR CONTINUOUS



SHOWN ON EXISTING OR PROPOSED  
CONCRETE PAVEMENT  
(PAY ITEM 529-6011) - FOR CONTINUOUS



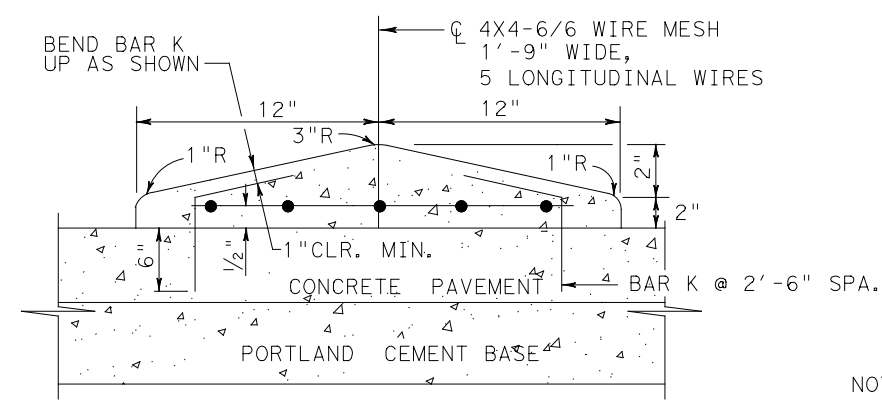
ITEM 536-6001 CONCRETE MEDIAN  
SEE NOTE 2



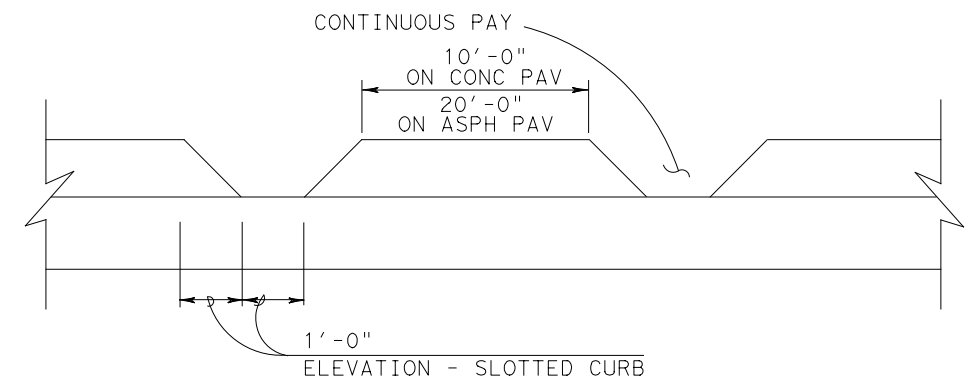
REMOVE EXIST ASPHALT SURFACE  
(WHEN SHOWN ELSEWHERE  
ON PLANS)

FINISH GRADE

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



ELEVATION - SLOTTED CURB

ITEM 529-6012 CONCRETE CURB (SLOTTED) - ON CONC.  
ITEM 529-6009 CONC CURB (DOWEL) (SLOTTED) - ON ASPH.

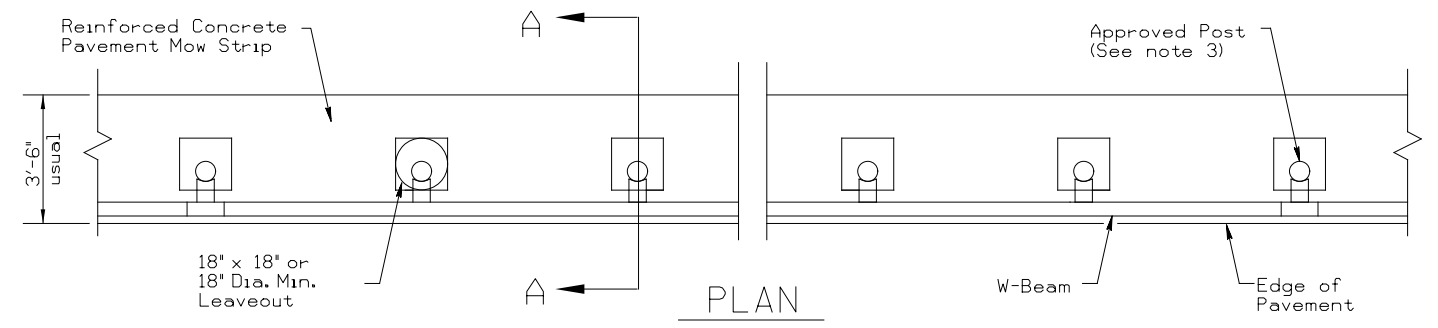
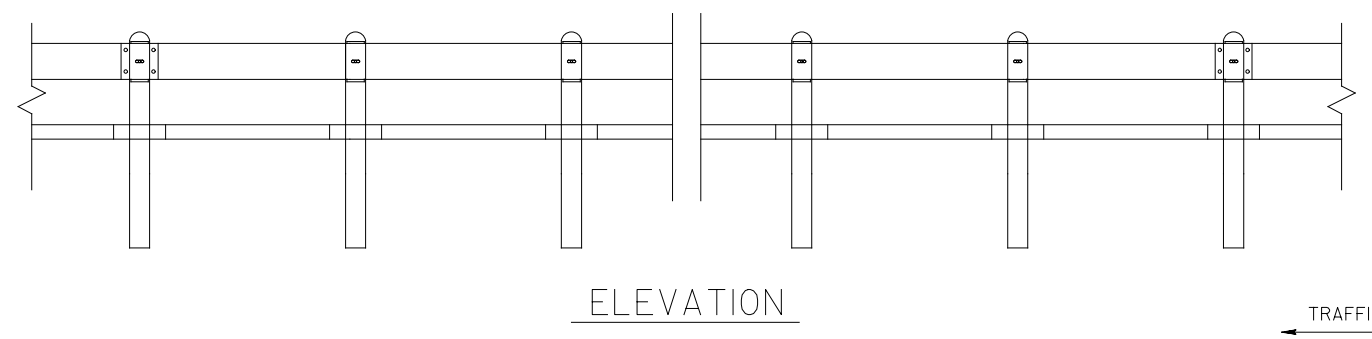
- NOTES:
1. DRILL AND GROUT BARS SHOWN AS PER ITEM 420.4.7.10, 6" EMBEDMENT, MINIMUM ON CONC.
  2. INSTALL A 2 INCH DRAINAGE OPENING AT 10 FT C-C WHEN CURB/ISLAND IS NOT ON TOP OF CROSS SECTION. (LOCATED ON A 2 OR 3 PERCENT TRANSVERSE GRADE, OR SUPERELEVATION.)

CONCRETE DIRECTIONAL ISLAND

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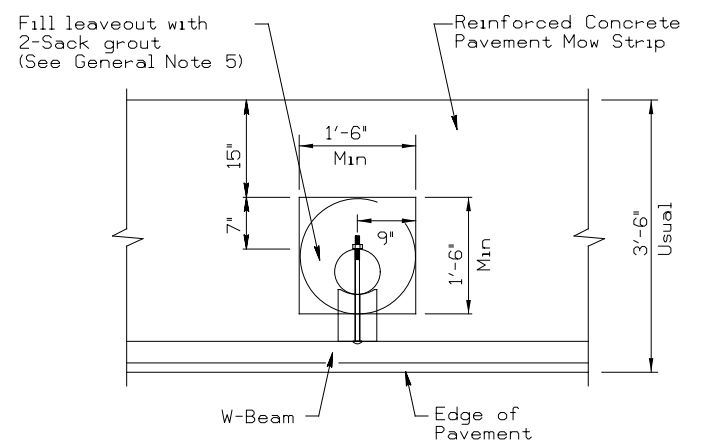
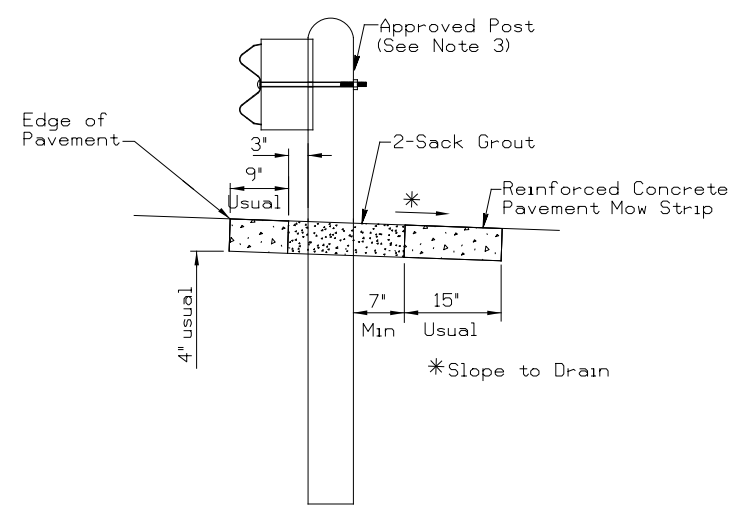
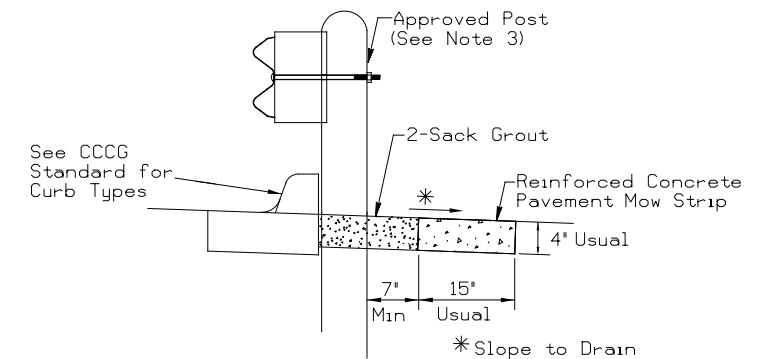
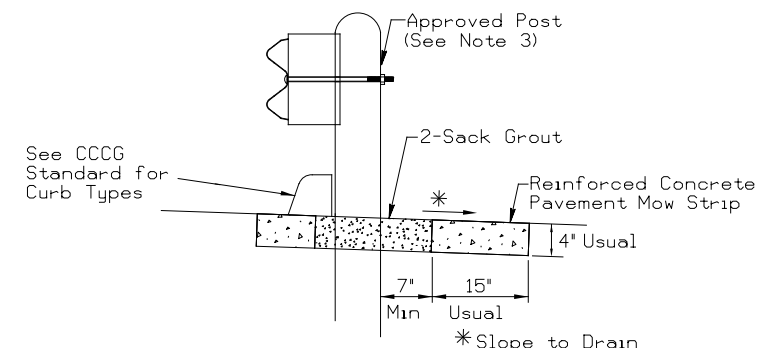
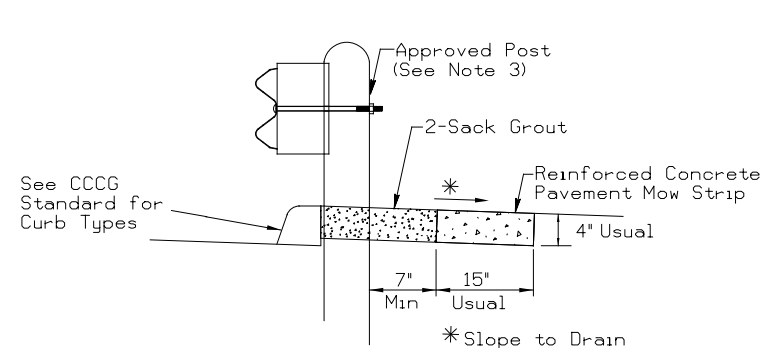
CONCRETE CURB  
AND  
DIRECTIONAL ISLAND  
DETAILS  
CC & DID

FILE: STDB-9.dgn	DN:	CK:	DW:	CK:
© TXDOT 2014	DIST	FED REG	PROJECT NO.	
REVISIONS	HOU	6	SHEET	
	COUNTY	CONTROL	SECT	JOB
	FORT BEND	3510	04	055
			SH	99



GENERAL NOTES

1. Place concrete riprap mow strips at all Metal Beam Guard Fence locations, and in accordance with Item 432, "Riprap". Use Class B Concrete, reinforced with No. 3 bars spaced at 18 in. centers each direction and 2 in. below the surface.
2. Provide a minimum of 7 in. leave out behind the post. Do not place concrete in the leave out.
3. The type of approved post is shown elsewhere on the plans. See the applicable standard sheets for additional details and information.
4. Other curb placement options may be used. Curbs are not considered part of the mow strip and are paid for under other pertinent bid items.
5. Fill the leave outs with no more than a 2-sack grout mixture and place in accordance with Section 421.2.7, "Mortar and Grout." Payment for furnishing and placing the grout mixture is subsidiary to the Item 432, "RIPRAP."
6. Place the mow strip the entire length of the guard fence plus any Terminal Anchor Section (TAS) or Single Guardrail Terminal (SGT) to 2 ft. beyond the face of the object marker at the end of the SGT. Do not allow concrete to adhere to the ground line strut shown on the SGT standard sheet.



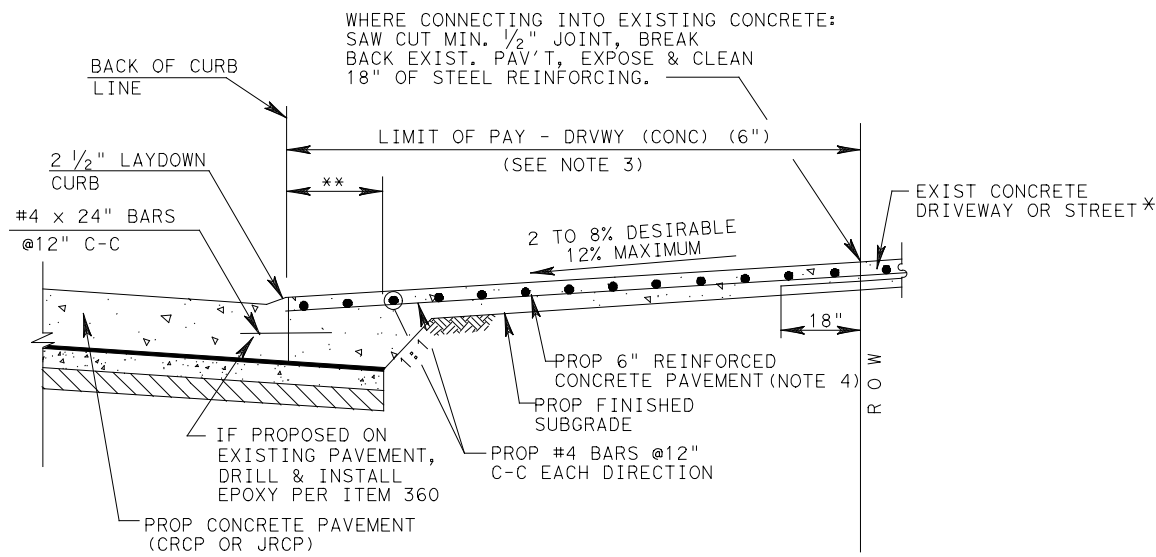
Reinforced Concrete Pavement Mow Strip with 18" x 18" or 18" dia. minimum leaveout.

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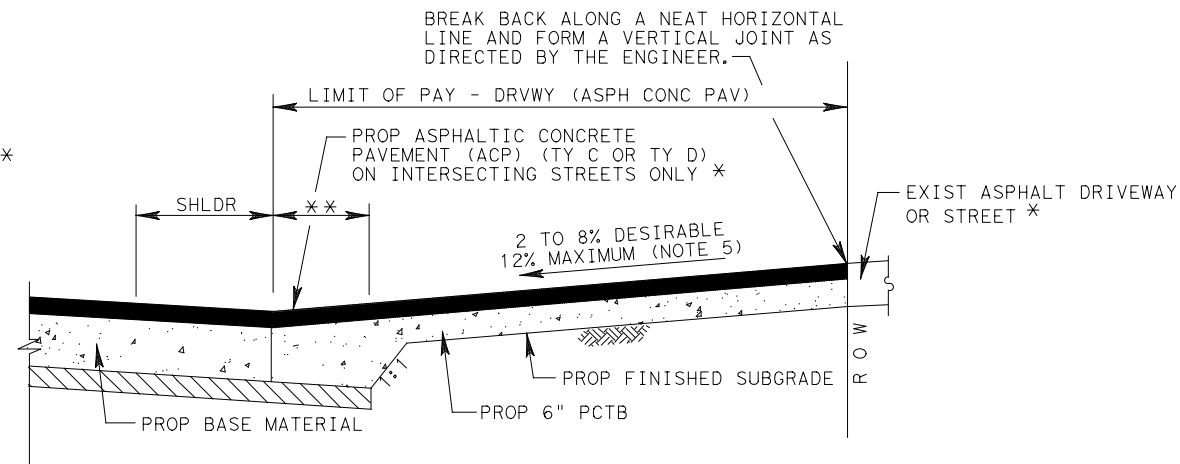
MOW STRIP

MS

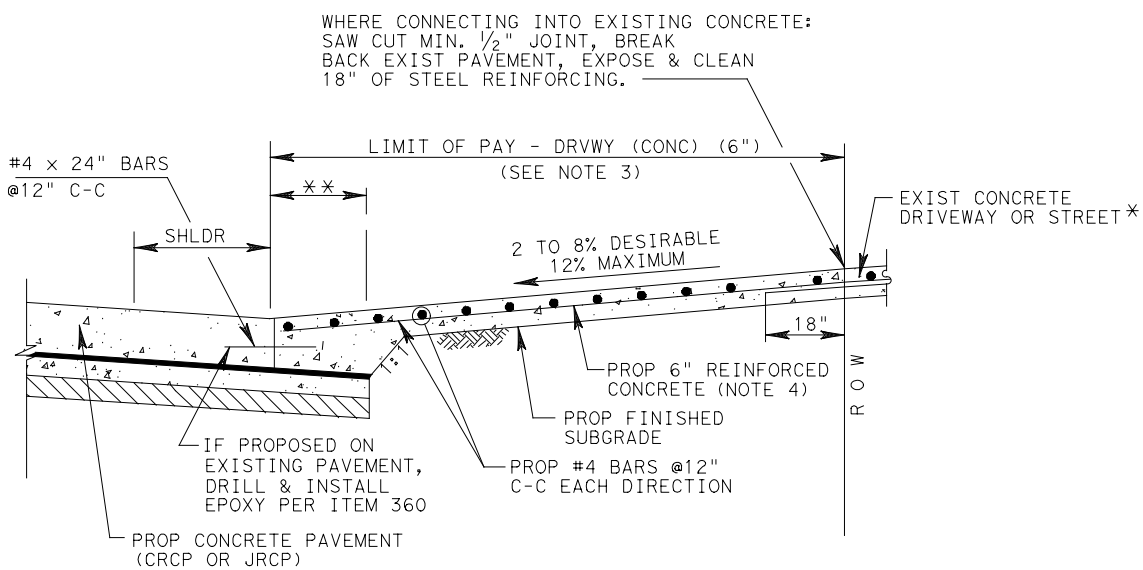
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		JOB	055	SH 99
		HIGHWAY	STDE5.DGN	



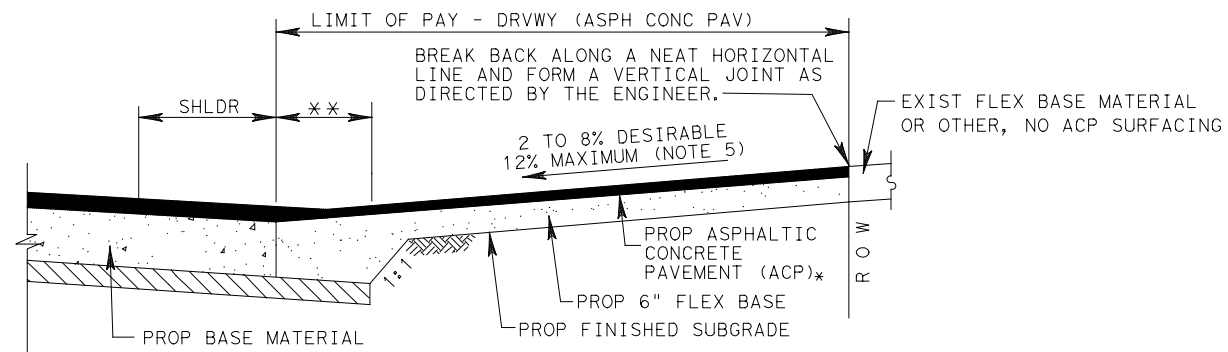
PROPOSED DRIVEWAY DETAIL  
REINFORCED CONCRETE AT CONCRETE  
CURB AND GUTTER ROADWAY



PROPOSED DRIVEWAY DETAIL  
ASPHALT W/ PCTB AT ASPHALT ROADWAY



PROPOSED DRIVEWAY DETAIL  
REINFORCED CONCRETE AT CONCRETE ROADWAY



PROPOSED DRIVEWAY DETAIL  
ASPHALT W/ FLEX BASE AT ASPHALT ROADWAY

NOTES:

1. ALSO SEE SHEET 2 OF 2 FOR DRIVEWAY SLOPES WITH PROPOSED SIDEWALKS.
2. FOR INTERSECTIONS BUILT WITH CRCP PAVEMENT SEE CRCP DETAIL.
3. FAST TRACK CONCRETE IS PAID AS DRVWY (CONC) (FAST TRACK).
4. THICKNESS OF DRIVEWAY IS 6 INCHES FOR REGULAR AND FAST TRACK CONCRETE.
5. MAXIMUM SLOPE IS: 12% RESIDENTIAL 8% OTHERS

LEGEND:

- PCTB- PORTLAND CEMENT TREATED BASE
- JRCP- JOINTED REINFORCED CONCRETE PAVEMENT
- CRCP- CONTINUOUSLY REINFORCED CONCRETE PAVEMENT
- ACP- ASPHALTIC CONCRETE PAVEMENT

\* FOR STREET INTERSECTIONS REFER TO PAVING DETAILS AND INTERSECTION DETAILS FOR REINFORCING STEEL AND SECTION REQUIREMENTS.

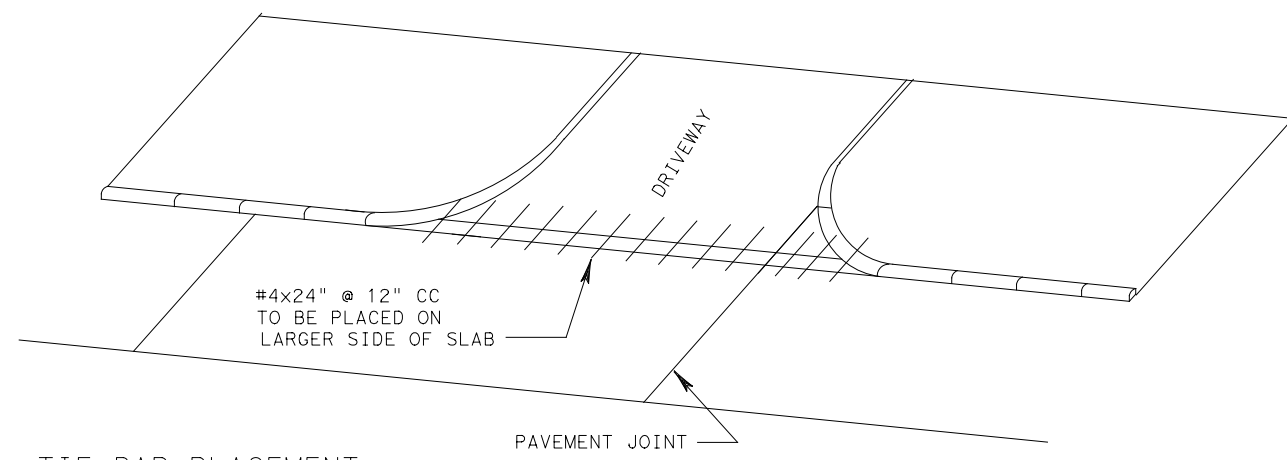
\*\* PROPOSED LIMIT OF ROADWAY BASE AND/OR SUBGRADE



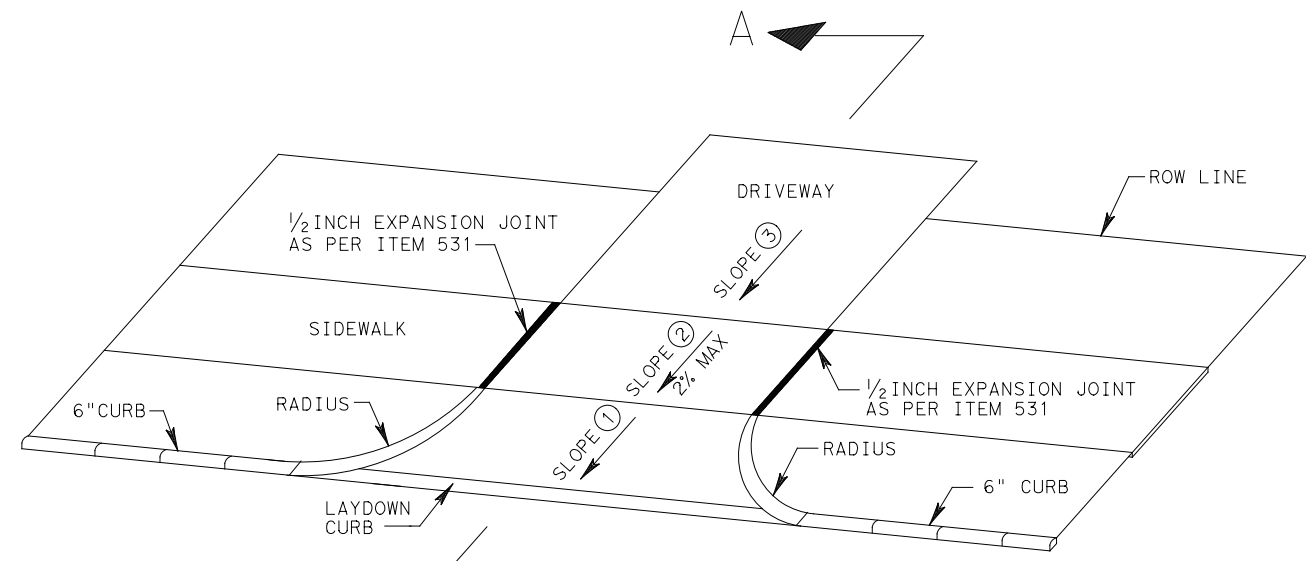
DRIVEWAY DETAILS

DD

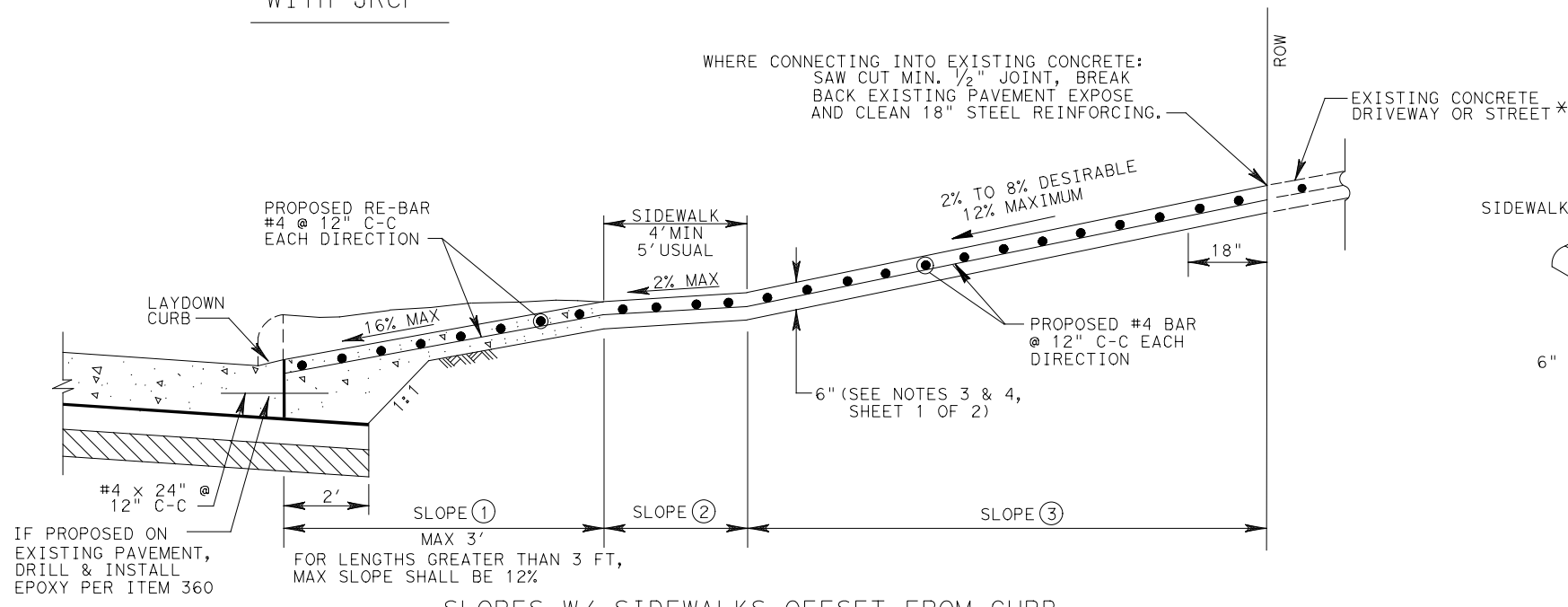
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11/15 ADDED NOTE FOR PCTB	COUNTY		CONTROL	SECT
3/17 MODIFIED PAVEMENT SLOPES	FORT BEND	3510	04	055
			JOB	HIGHWAY
			055	SH 99



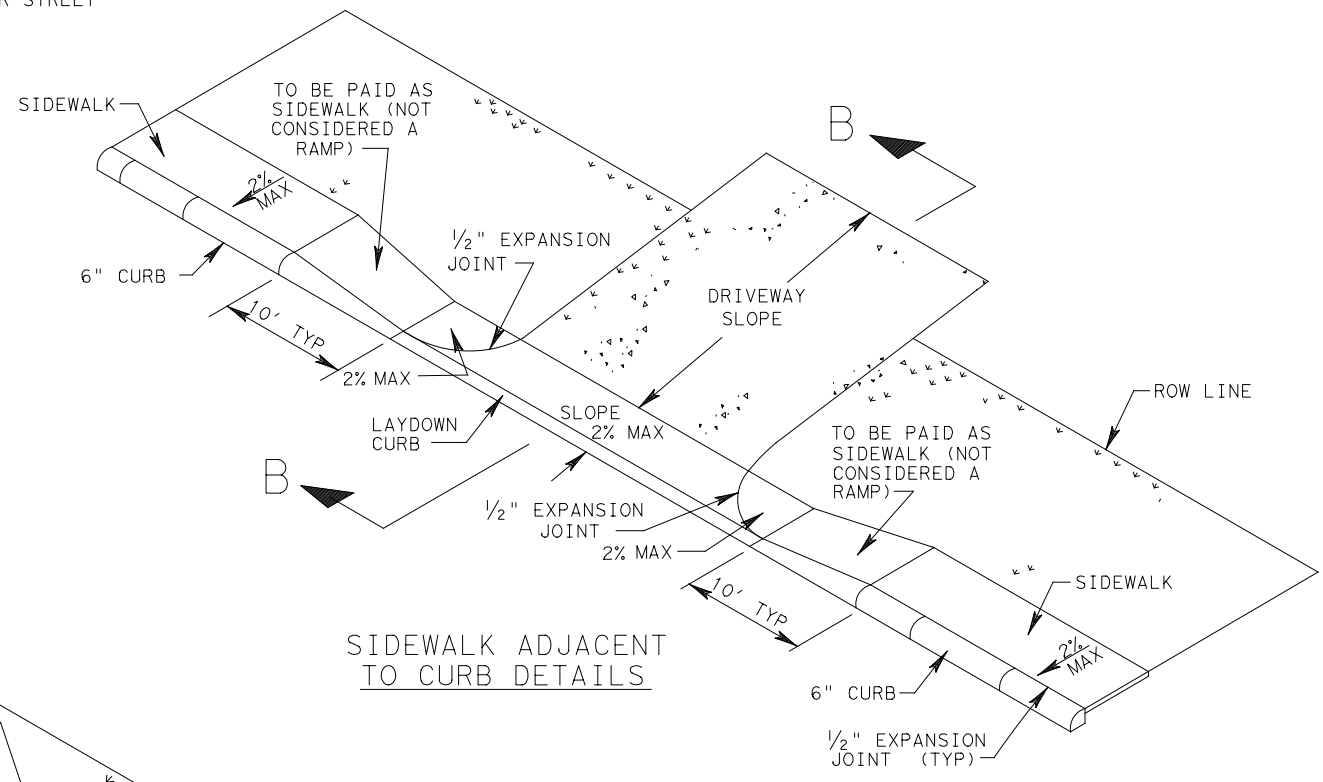
TIE BAR PLACEMENT WITH JRCP



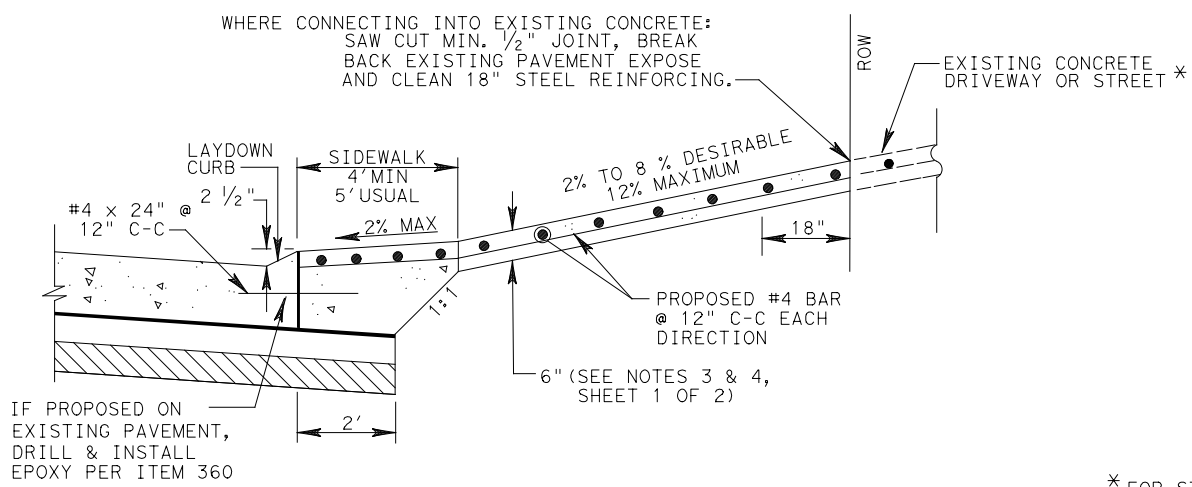
SIDEWALK OFFSET FROM CURB DETAILS



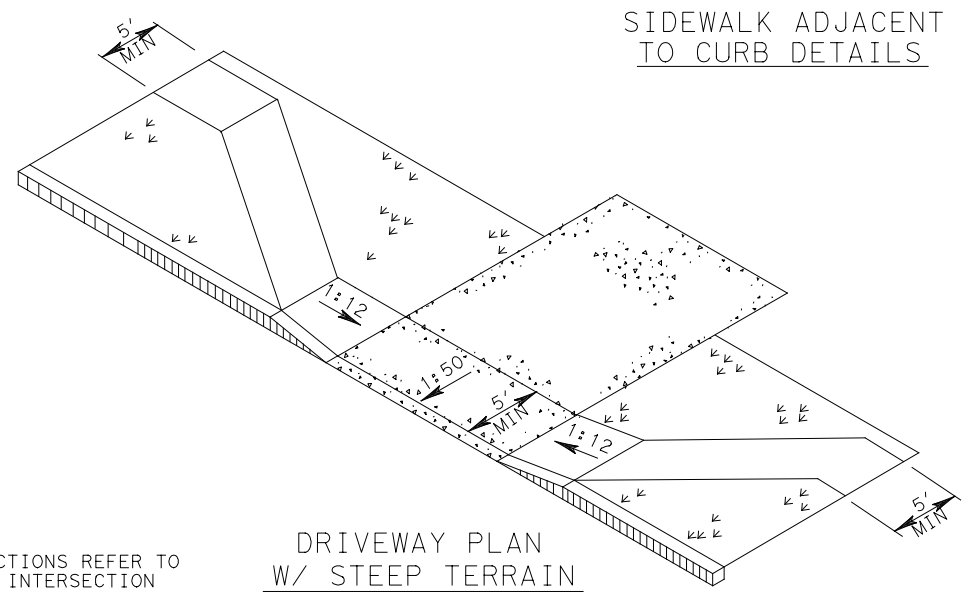
SLOPES W/ SIDEWALKS OFFSET FROM CURB (SECTION A-A)



SIDEWALK ADJACENT TO CURB DETAILS



DRIVEWAY SLOPES W/ SIDEWALKS ADJACENT TO CURB (SECTION B-B)



DRIVEWAY PLAN W/ STEEP TERRAIN

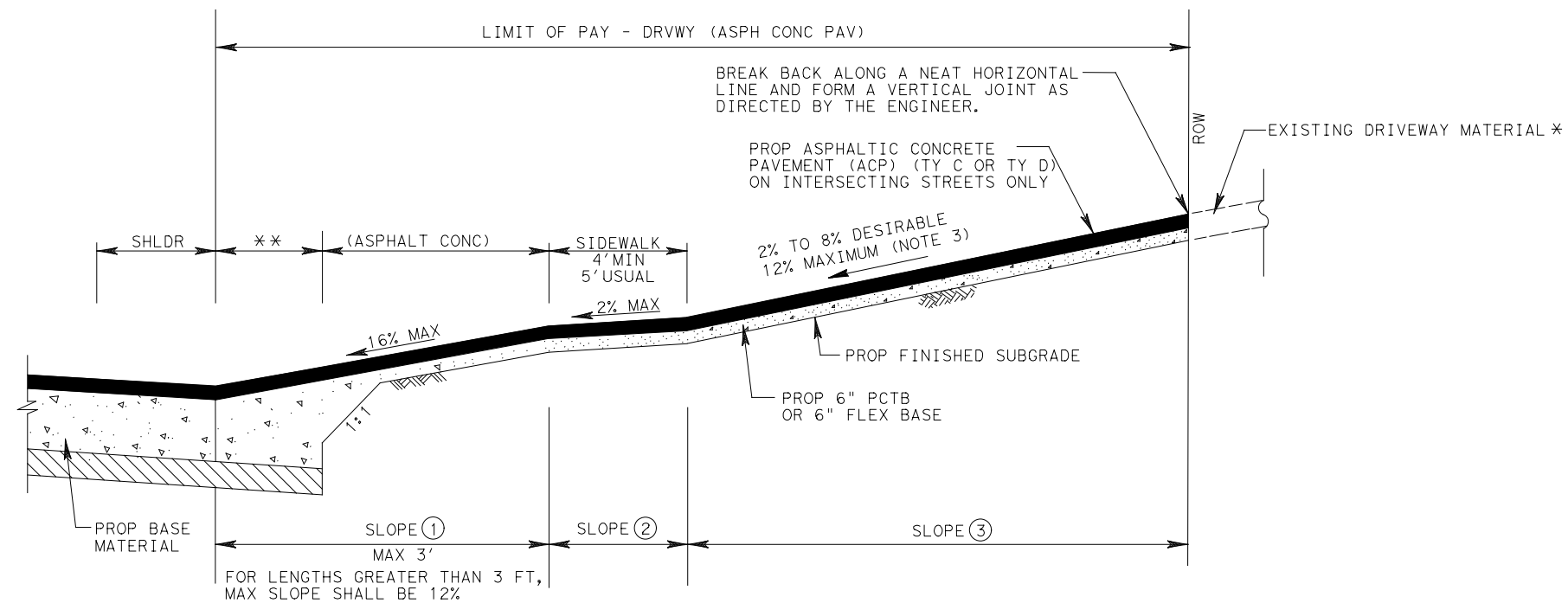
\* FOR STREET INTERSECTIONS REFER TO PAVING DETAILS AND INTERSECTION DETAILS FOR REINFORCING STEEL AND SECTION REQUIREMENTS.

DRIVEWAY DETAILS

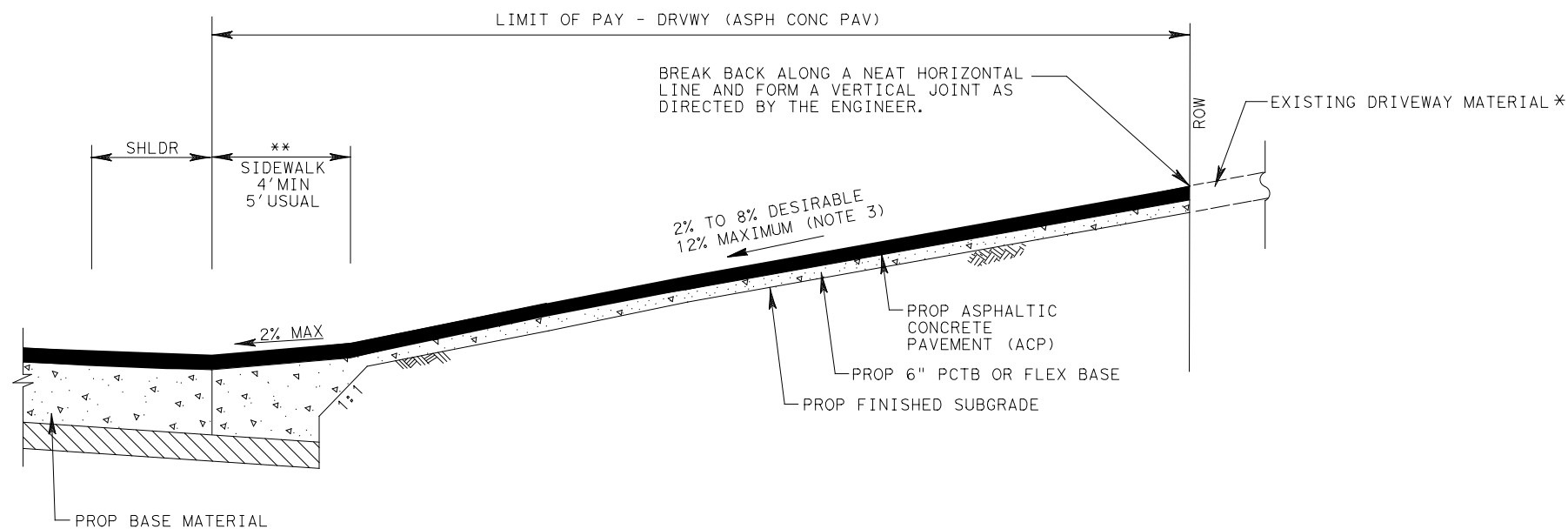
DD

FILE: STDB-8b.dgn	DN:	CK:	DW:	CK:
© TXDOT SEPT. 2004	DIST	FED REG	PROJECT NO.	
REVISIONS	HOU	6	SHEET	
9/09 ADDED NOTE FOR ITEM 360.	COUNTY	CONTROL	SECT	JOB
11/15 ADDED NOTE FOR PCTB	FORT BEND	3510	04	055
			SH	99





PROPOSED DRIVEWAY SLOPES WITH SIDEWALKS OFFSET



PROPOSED DRIVEWAY SLOPES WITH SIDEWALKS ADJACENT

NOTES:

1. ALSO SEE SHEET 2 OF 3 FOR DRIVEWAY SLOPES WITH PROPOSED SIDEWALKS.
2. FOR INTERSECTIONS BUILT WITH CRCP PAVEMENT SEE CRCP DETAIL.
3. MAXIMUM SLOPE IS: 12% RESIDENTIAL 8% OTHERS

LEGEND:

- PCTB- PORTLAND CEMENT TREATED BASE
- ACP- ASPHALTIC CONCRETE PAVEMENT

\* FOR STREET INTERSECTIONS REFER TO PAVING DETAILS AND INTERSECTION DETAILS.

\*\* PROPOSED LIMIT OF ROADWAY BASE AND/OR SUBGRADE

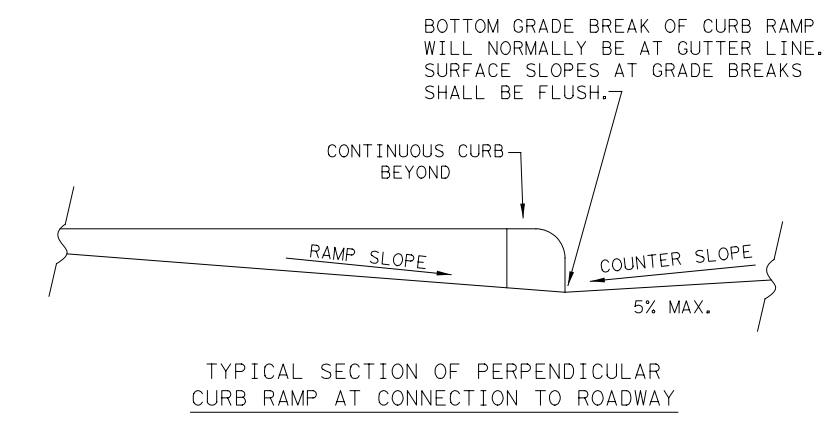
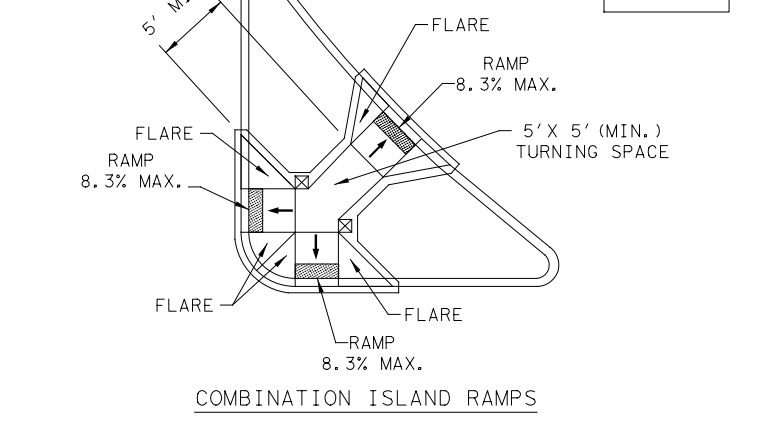
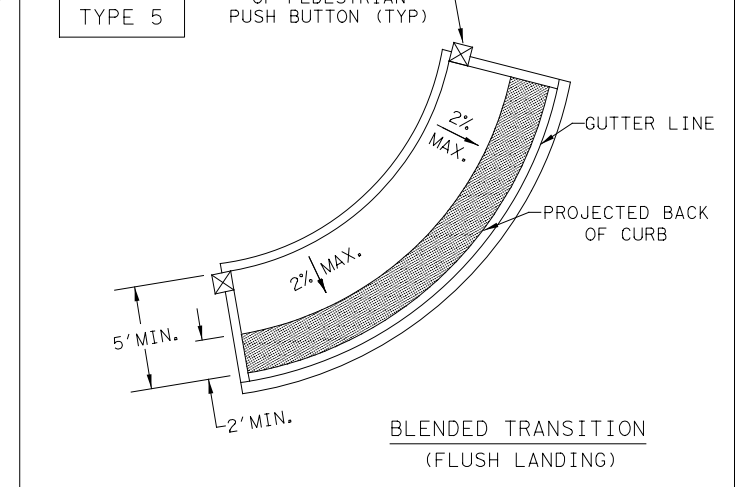
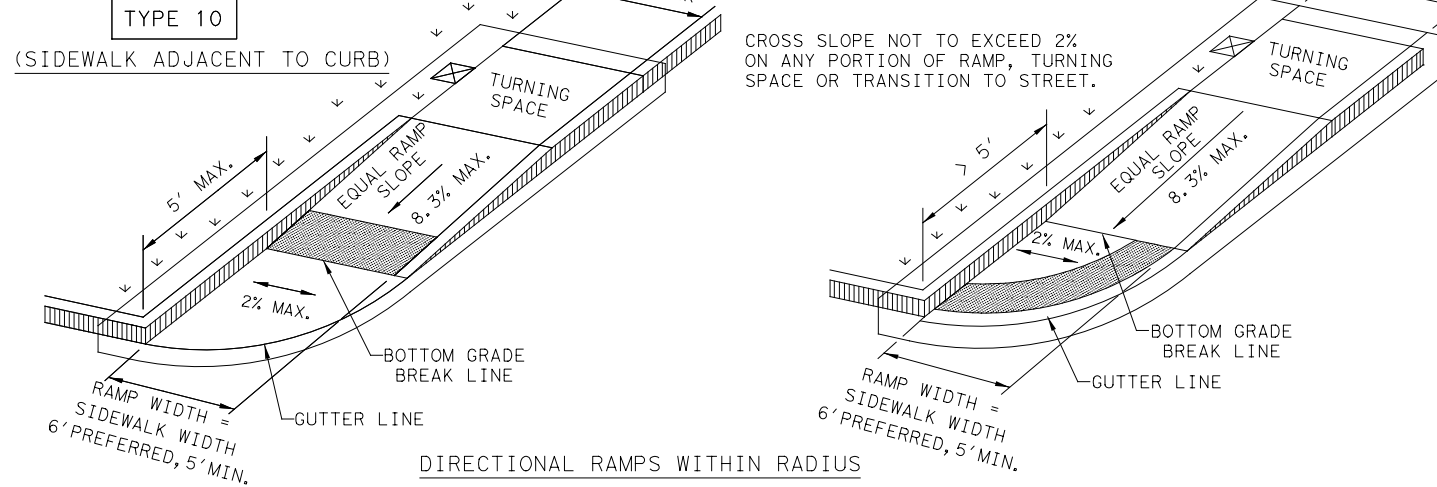
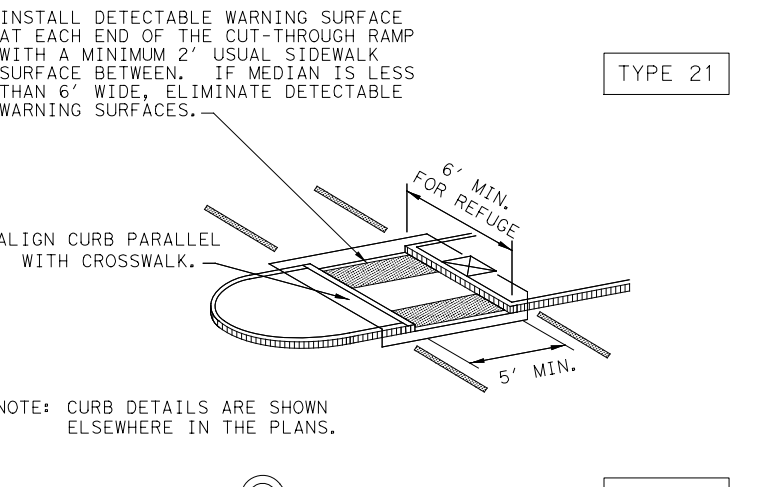
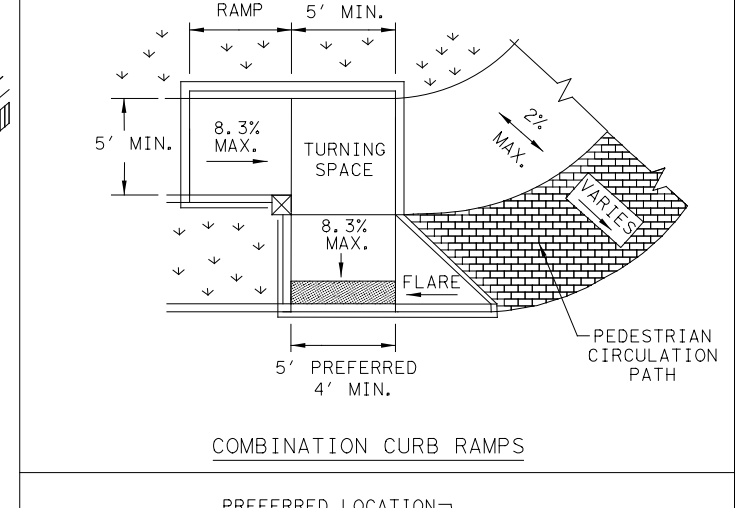
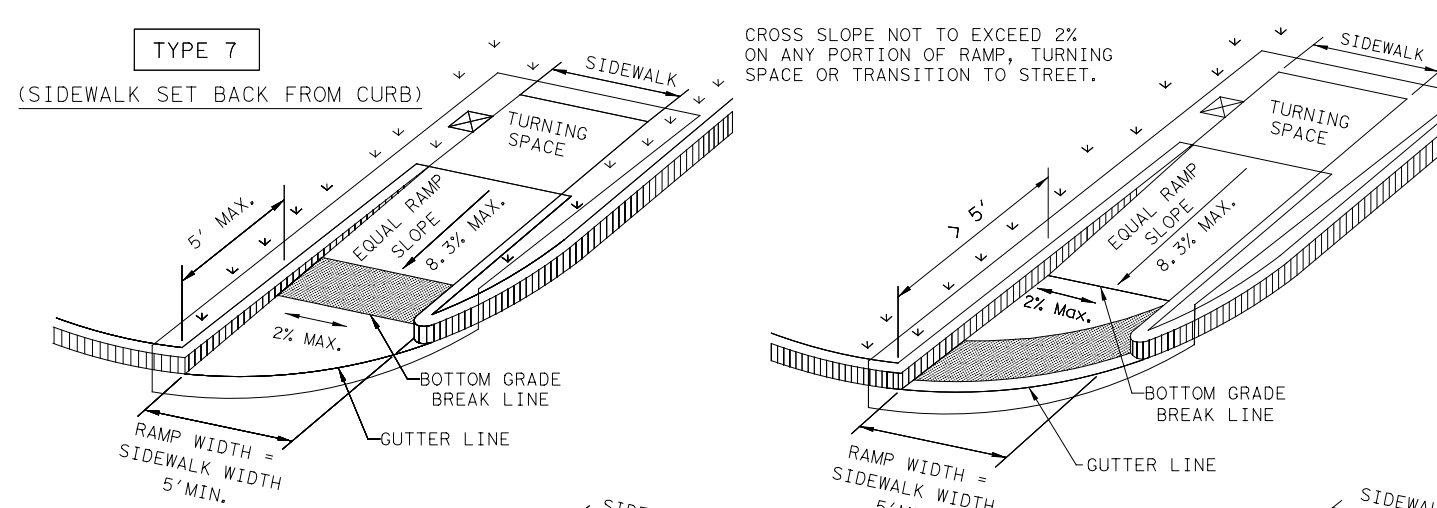
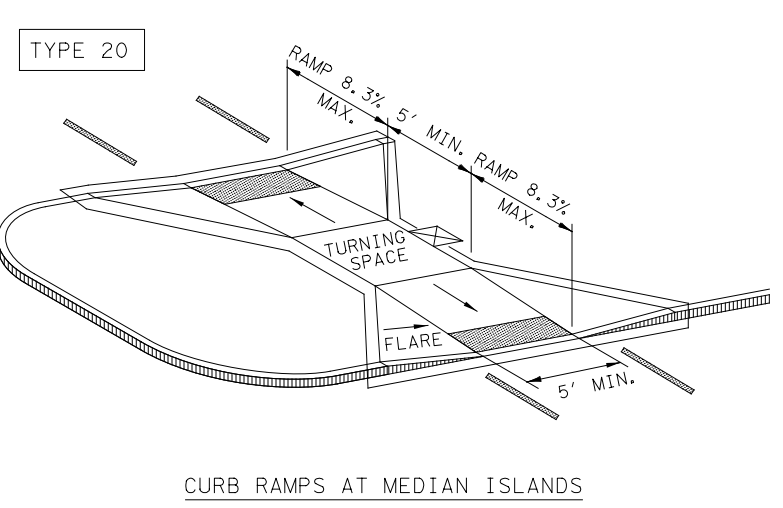
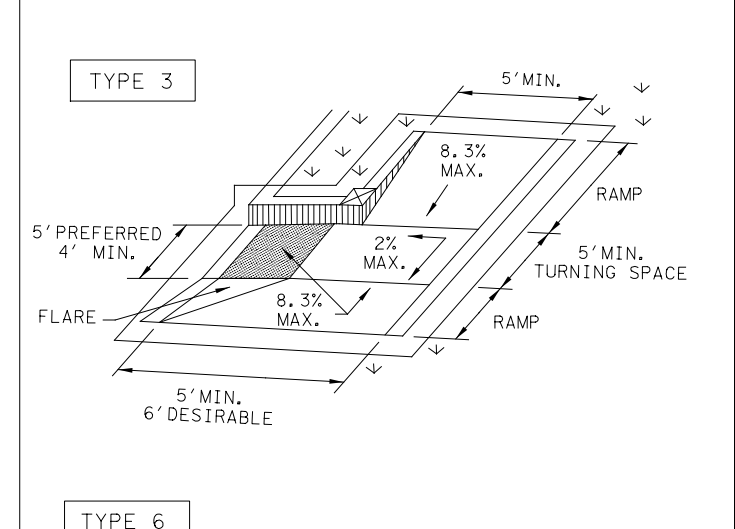
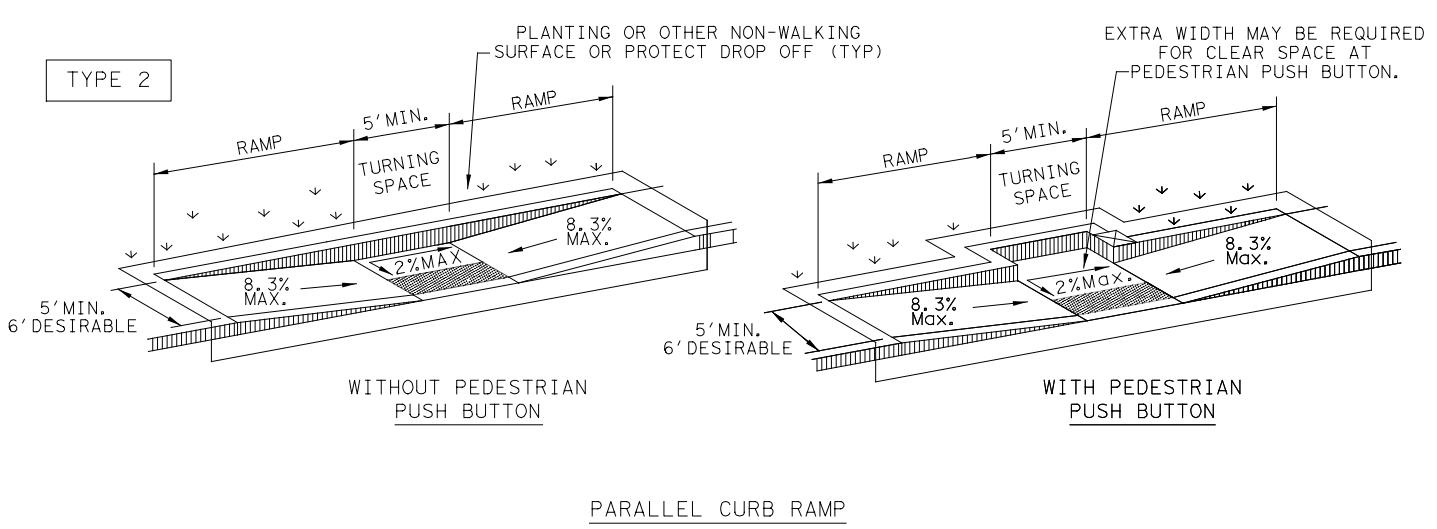
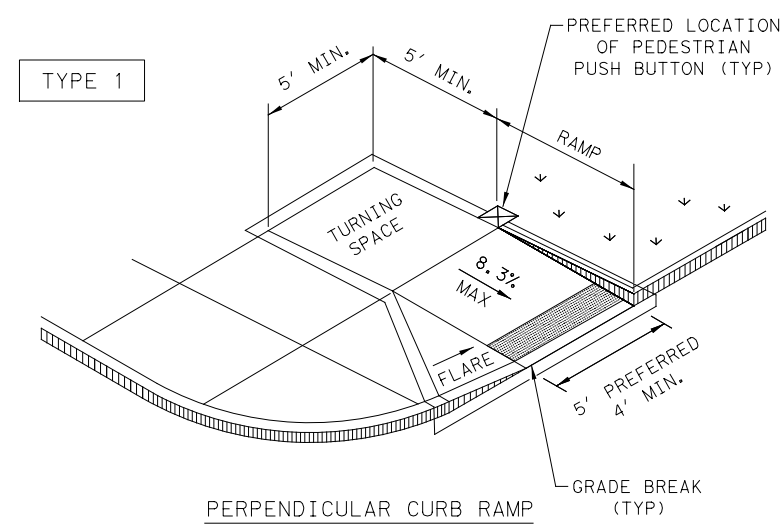


DRIVEWAY DETAILS

DD

FILE: STDB-8c.dgn	DN:	CK:	DW:	CK:
© TXDOT SEPT. 2004	DIST	FED REG	PROJECT NO.	
REVISIONS	HOU	6	SHEET	
11/15 ADDED NOTE FOR PCTB	COUNTY		CONTROL	SECT
3/17 MODIFIED PAVEMENT SLOPES	FORT BEND		3510	04
			JOB	HIGHWAY
			055	SH 99

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**NOTES / LEGEND:**  
SEE GENERAL NOTES ON SHEET 2 OF 4 FOR MORE INFORMATION.

DENOTES PLANTING OR NON-WALKING SURFACE NOT PART OF PEDESTRIAN CIRCULATION PATH.

DENOTES PREFERRED LOCATION OF PEDESTRIAN PUSH BUTTON IF APPLICABLE.

Detectable Warning Surface: [Symbol]

Gutter Line: [Symbol]

Grade Break: [Symbol]

Ramp Limits of Payment: [Symbol]

SHEET 1 OF 4

**Design Division Standard**

## PEDESTRIAN FACILITIES CURB RAMPS

### PED-18

FILE: ped18	DN: TxDOT	DW: VP	CK: KM	CK: PK & JG
© TxDOT: MARCH, 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	3510	04	055	SH 99
REVISED 08, 2005	DIST	COUNTY	SHEET NO.	
REVISED 06, 2012	HOU	FORT BEND	145	
REVISED 01, 2018				

DATE: FILE:

GENERAL NOTES

CURB RAMP

1. Install a curb ramp or blended transition at each pedestrian street crossing.
2. All slopes shown are maximum allowable. Cross slopes of 1.5% and lesser running should be used. Adjust curb ramp length or grade of approach sidewalks as directed.
3. Maximum allowable cross slope on sidewalk and curb ramp surfaces is 2%.
4. The minimum sidewalk width is 5'. Where the sidewalk is adjacent to the back of curb, a 6' sidewalk width is desirable. Where a 5' sidewalk cannot be provided due to site constraints, sidewalk width may be reduced to 4' for short distances. 5' x 5' passing areas at intervals not to exceed 200' are required.
5. Turning Spaces shall be 5' x 5' minimum. Cross slope shall be maximum 2%.
6. Clear space at the bottom of curb ramps shall be a minimum of 4' x 4' wholly contained within the crosswalk and wholly outside the parallel vehicular travel path.
7. Provide flared sides where the pedestrian circulation path crosses the curb ramp. Flared sides shall be sloped at 10% maximum, measured parallel to the curb. Returned curbs may be used only where pedestrians would not normally walk across the ramp, either because the adjacent surface is planted, substantially obstructed, or otherwise protected.
8. Additional information on curb ramp location, design, light reflective value and texture may be found in the latest draft of the Proposed Guidelines for Pedestrian Facilities in the Public Right of Way (PROWAG) as published by the U.S. Architectural and Transportation Barriers Compliance Board (Access Board).
9. To serve as a pedestrian refuge area, the median should be a minimum of 6' wide, measured from back of curbs. Medians should be designed to provide accessible passage over or through them.
10. Small channelization islands, which do not provide a minimum 5' x 5' landing at the top of curb ramps, shall be out through level with the surface of the street.
11. Crosswalk dimensions, crosswalk markings and stop bar locations shall be as shown elsewhere in the plans. At intersections where crosswalk markings are not required, curb ramps shall align with theoretical crosswalks unless otherwise directed.
12. Provide curb ramps to connect the pedestrian access route at each pedestrian street crossing. Handrails are not required on curb ramps.
13. Curb ramps and landings shall be constructed and paid for in accordance with Item 531 "Sidewalks".
14. Place concrete at a minimum depth of 5" for ramps, flares and landings, unless otherwise directed.
15. Furnish and install No. 3 reinforcing steel bars at 18" o.c. both ways, unless otherwise directed.
16. Provide a smooth transition where the curb ramps connect to the street.
17. Curbs shown on sheet 1 within the limits of payment are considered part of the curb ramp for payment, whether it is concrete curb, gutter, or combined curb and gutter.
18. Existing features that comply with applicable standards may remain in place unless otherwise shown on the plans.

DETECTABLE WARNING MATERIAL

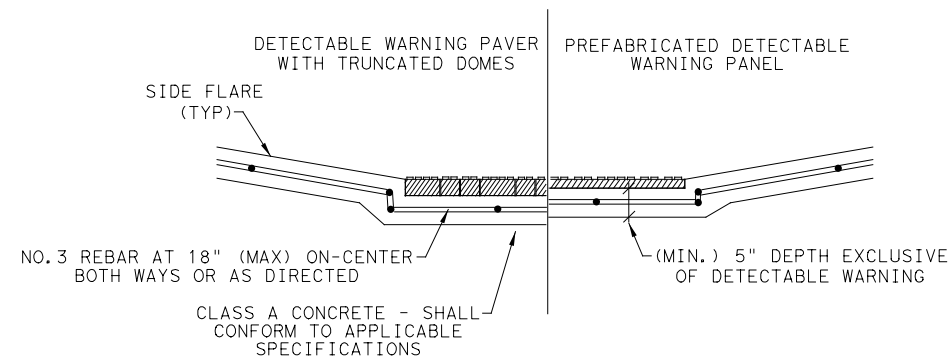
19. Curb ramps must contain a detectable warning surface that consists of raised truncated domes complying with PROWAG. The surface must contrast visually with adjoining surfaces, including side flares. Furnish and install an approved cast-in-place dark brown or dark red detectable warning surface material adjacent to uncolored concrete, unless specified elsewhere in the plans.
20. Detectable Warning Materials must meet TxDOT Departmental Materials Specification DMS 4350 and be listed on the Material Producer List. Install products in accordance with manufacturer's specifications.
21. Detectable warning surfaces must be firm, stable and slip resistant.
22. Detectable warning surfaces shall be a minimum of 24 inches in depth in the direction of pedestrian travel, and extend the full width of the curb ramp or landing where the pedestrian access route enters the street.
23. Detectable warning surfaces shall be located so that the edge nearest the curb line is at the back of curb and neither end of that edge is greater than 5 feet from the back of curb. Detectable warning surfaces may be curved along the corner radius.
24. Shaded areas on Sheet 1 of 4 indicate the approximate location for the detectable warning surface for each curb ramp type.

DETECTABLE WARNING PAVERS (IF USED)

25. Furnish detectable warning paver units meeting all requirements of ASTM C-936, C-33. Lay in a two by two unit basket weave pattern or as directed.
26. Lay full-size units first followed by closure units consisting of at least 25 percent (25%) of a full unit. Cut detectable warning paver units using a power saw.

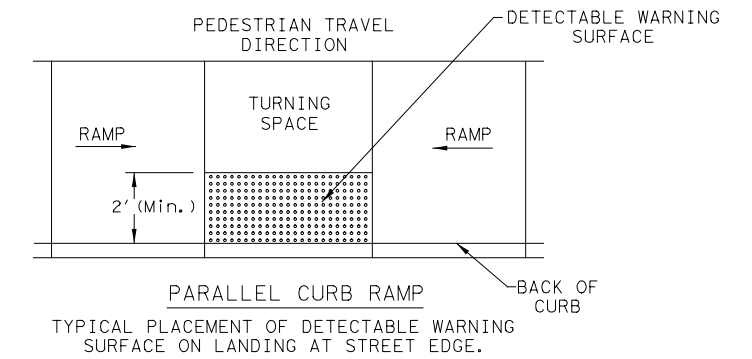
SIDEWALKS

27. Provide clear ground space at operable parts, including pedestrian push buttons. Operable parts shall be placed within unobstructed reach range specified in PROWAG section R406.
28. Place traffic signal or illumination poles, ground boxes, controller boxes, signs, drainage facilities and other items so as not to obstruct the pedestrian access route or clear ground space.
29. Street grades and cross slopes shall be as shown elsewhere in the plans.
30. Changes in level greater than 1/4 inch are not permitted.
31. The least possible grade should be used to maximize accessibility. The running slope of sidewalks and crosswalks within the public right of way may follow the grade of the parallel roadway. Where a continuous grade greater than five percent (5%) must be provided, handrails may be desirable to improve accessibility. Handrails may also be needed to protect pedestrians from potentially hazardous conditions. If provided, handrails shall comply with PROWAG R409.
32. Handrail extensions shall not protrude into the usable landing area or into intersecting pedestrian routes.
33. Driveways and turnouts shall be constructed and paid for in accordance with Item "Intersections, Driveways and Turnouts". Sidewalks shall be constructed and paid for in accordance with Item, "Sidewalks".
34. Sidewalk details are shown elsewhere in the plans.

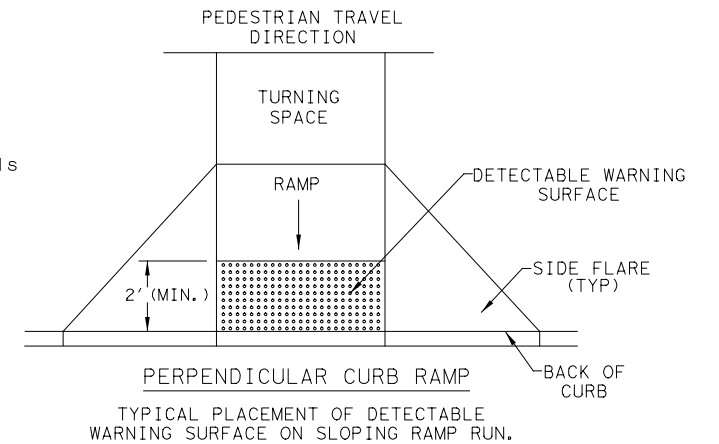


SECTION VIEW DETAIL  
CURB RAMP AT DETECTIBLE WARNINGS

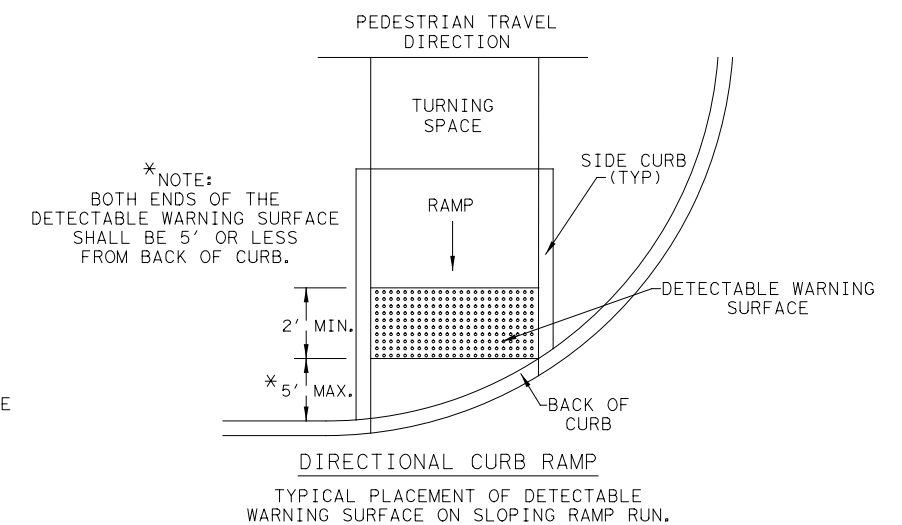
DETECTABLE WARNING SURFACE DETAILS



PARALLEL CURB RAMP  
TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON LANDING AT STREET EDGE.



PERPENDICULAR CURB RAMP  
TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON SLOPING RAMP RUN.



\* NOTE:  
BOTH ENDS OF THE  
DETECTABLE WARNING SURFACE  
SHALL BE 5' OR LESS  
FROM BACK OF CURB.

DIRECTIONAL CURB RAMP  
TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON SLOPING RAMP RUN.

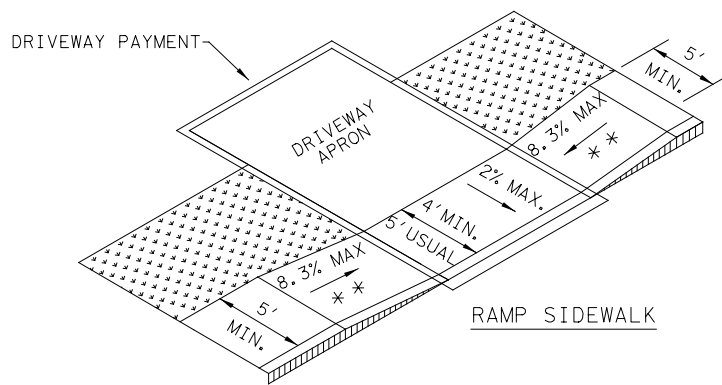
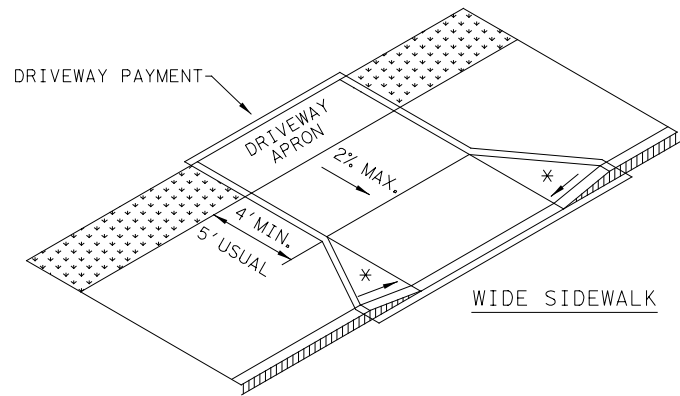
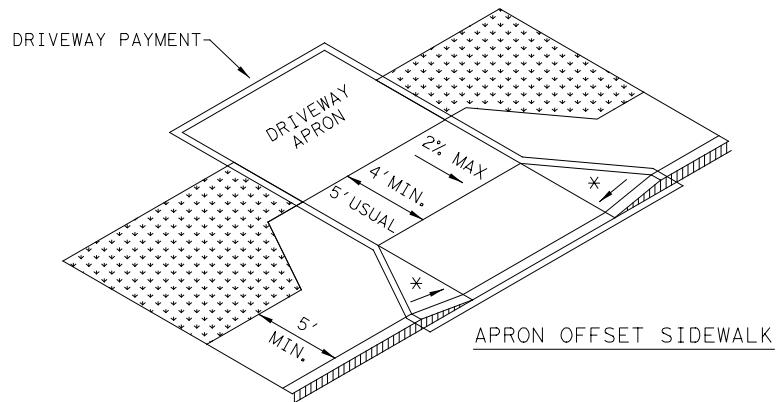
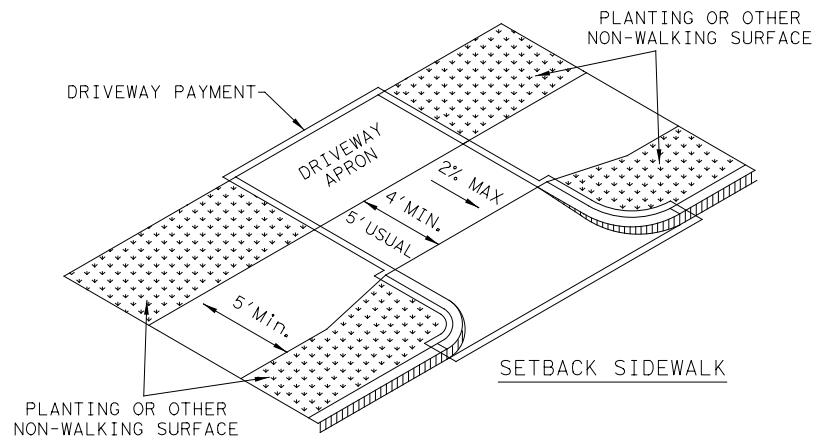
SHEET 2 OF 4

		<b>Design Division Standard</b>	
<h1>PEDESTRIAN FACILITIES</h1> <h2>CURB RAMP</h2> <h3>PED-18</h3>			
FILE: ped18	DN: TxDOT	DW: VP	CK: KM
© TxDOT: MARCH, 2002	CONT	SECT	JOB
REVISIONS	3510	04	055
REVISED 08, 2005	DIST	COUNTY	SHEET NO.
REVISED 06, 2012	HOU	FORT BEND	146
REVISED 01, 2018			

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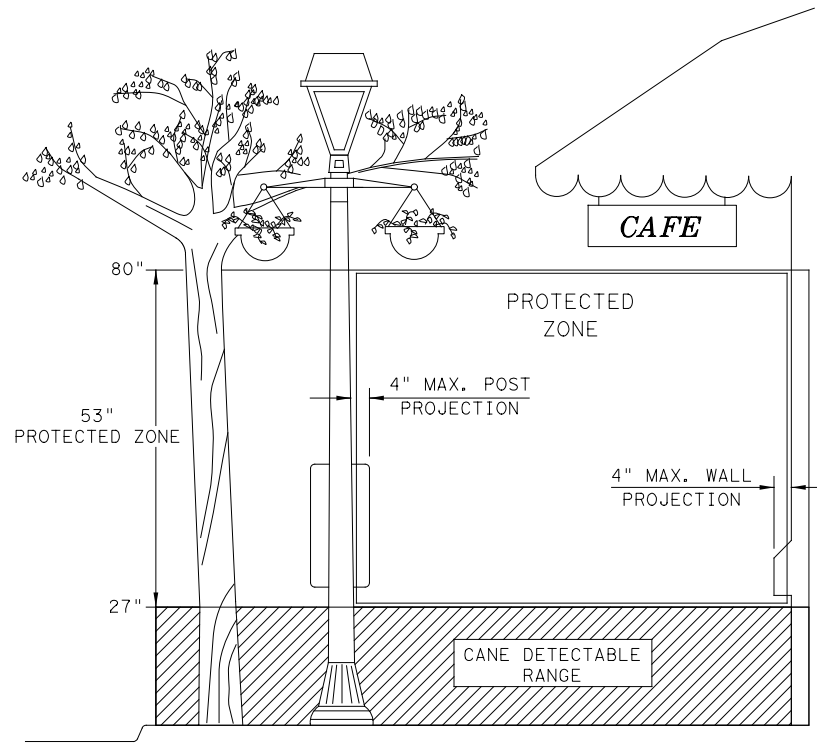
DATE:  
FILE:

SIDEWALK TREATMENT AT DRIVEWAYS



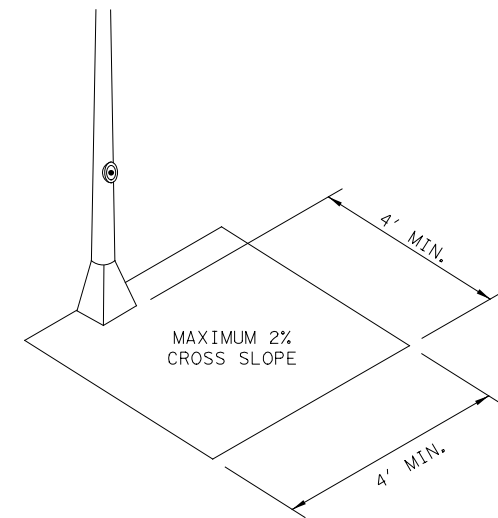
NOTES:  
 \* WHERE DRIVEWAYS CROSS THE PEDESTRIAN ROUTE, SIDES SHALL BE FLARED AT 10% MAX SLOPE.

\* \* IF CURB HEIGHT IS GREATER THAN 6 INCHES, USE GRADE LESS THAN OR EQUAL TO 5%. HANDRAIL AND DETECTABLE WARNING ARE NOT REQUIRED.

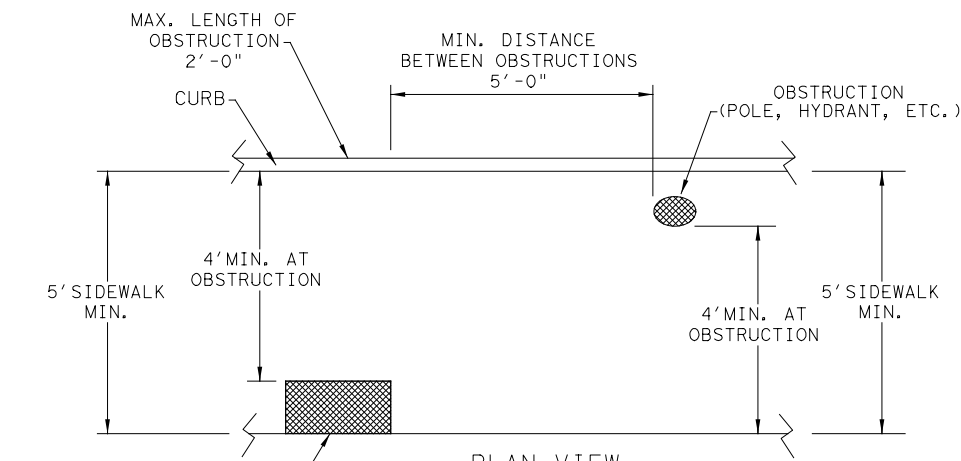


PROTECTED ZONE

NOTE: IN PEDESTRIAN CIRCULATION AREA, MAXIMUM 4" PROJECTION FOR POST OR WALL MOUNTED OBJECTS BETWEEN 27" AND 80" ABOVE THE SURFACE.

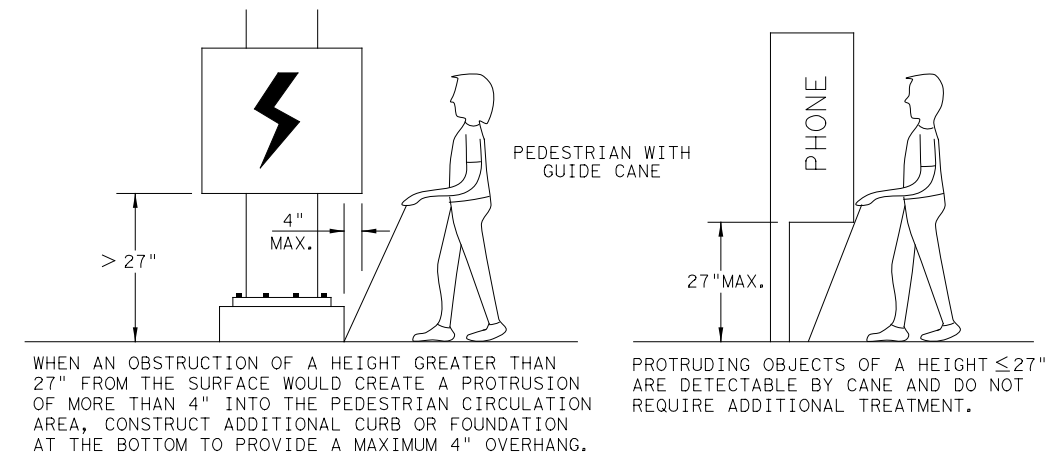


CLEAR SPACE ADJACENT TO PEDESTRIAN PUSH BUTTON



PLACEMENT OF STREET FIXTURES

NOTE: ITEMS NOT INTENDED FOR PUBLIC USE. MINIMUM 4' X 4' CLEAR GROUND SPACE REQUIRED AT PUBLIC USE FIXTURES.



DETECTION BARRIER FOR VERTICAL CLEARANCE < 80"

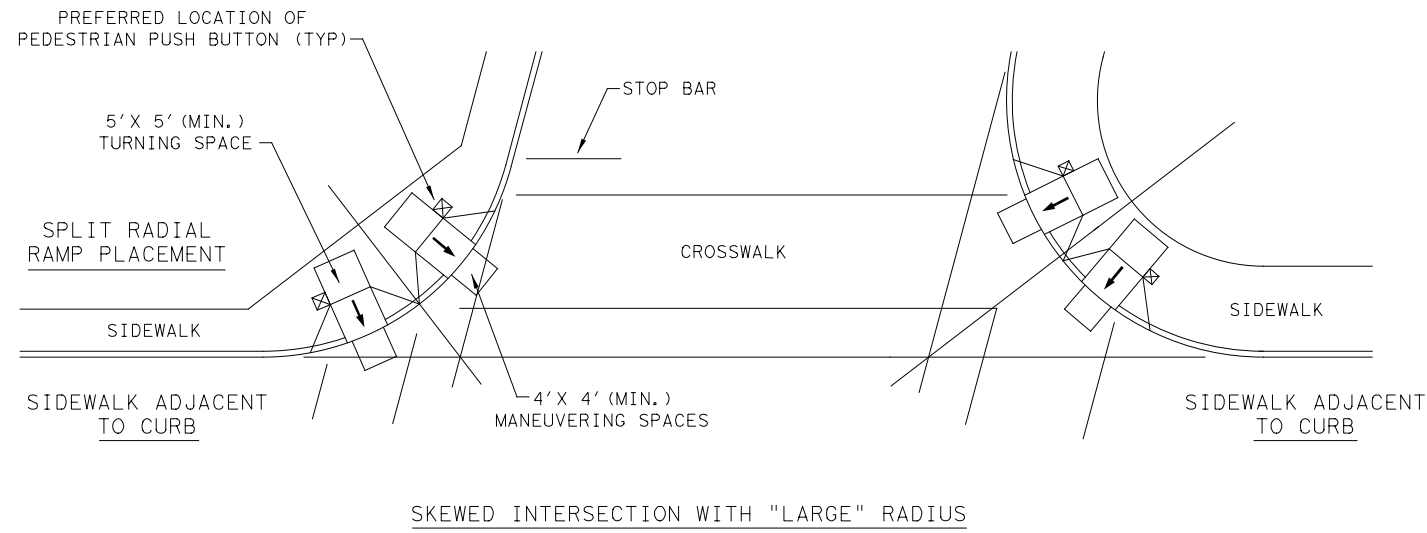
SHEET 3 OF 4

		<b>Design Division Standard</b>	
<h2>PEDESTRIAN FACILITIES</h2> <h3>CURB RAMPS</h3> <h1>PED-18</h1>			
FILE: ped18	DN: TxDOT	DW: VP	CK: KM
© TxDOT: MARCH, 2002	CONT	SECT	JOB
REVISIONS	3510	04	055
REVISED 08, 2005	DIST	COUNTY	SHEET NO.
REVISED 06, 2012	HOU	FORT BEND	147
REVISED 01, 2018			

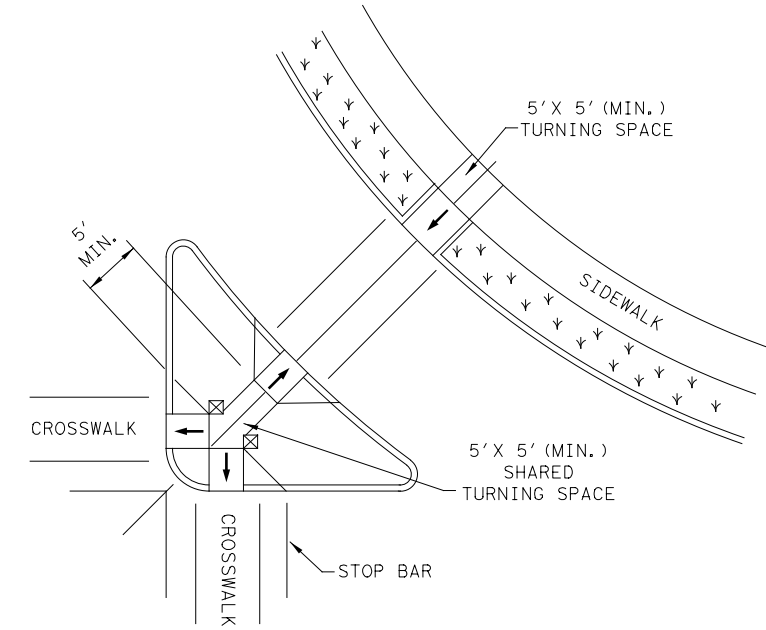
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE:  
FILE:

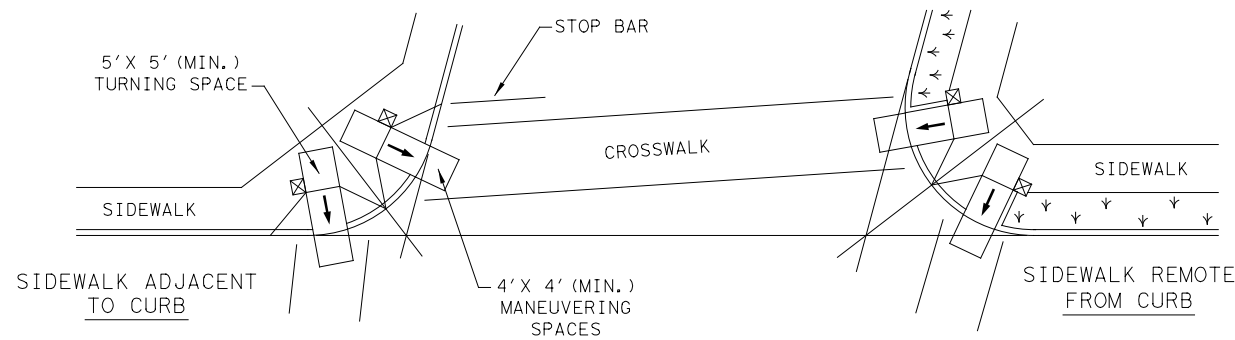
TYPICAL CROSSING LAYOUTS  
SEE SHEET 1 OF 4 FOR DETAILS AND DIMENSIONS



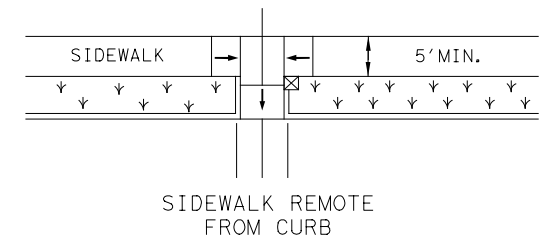
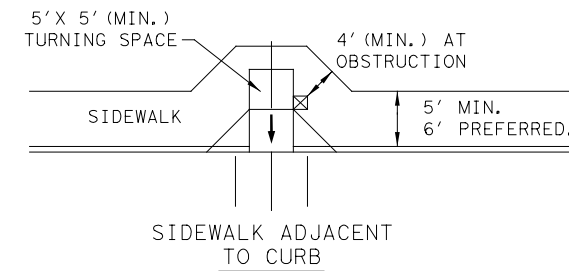
SKEWED INTERSECTION WITH "LARGE" RADIUS



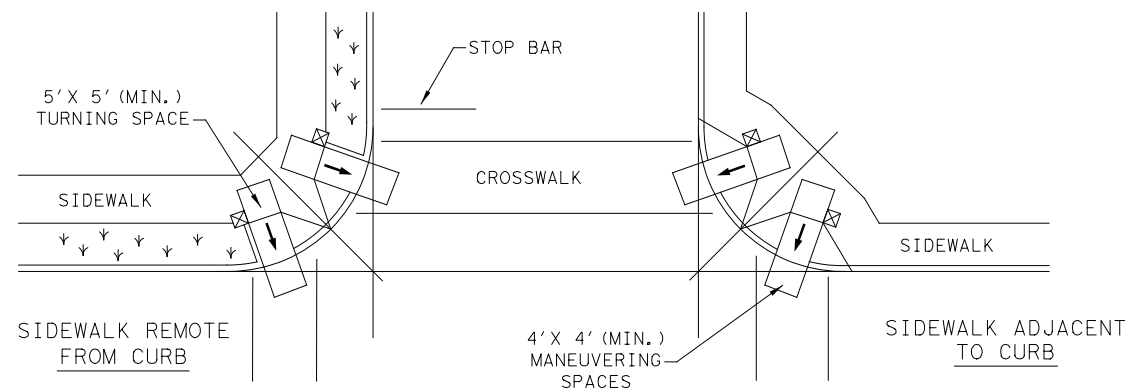
AT INTERSECTION  
W/FREE RIGHT TURN & ISLAND



SKEWED INTERSECTION WITH "SMALL" RADIUS



MID-BLOCK PLACEMENT  
PERPENDICULAR RAMPS



NORMAL INTERSECTION WITH "SMALL" RADIUS

LEGEND:

SHOWS DOWNWARD SLOPE. →

DENOTES PREFERRED LOCATION OF PEDESTRIAN PUSH BUTTON (IF APPLICABLE). ☒

DENOTES PLANTING OR NON-WALKING SURFACE NOT PART OF PEDESTRIAN CIRCULATION PATH. ↙ ↘

SHEET 4 OF 4



PEDESTRIAN FACILITIES  
CURB RAMPS

PED-18

FILE: ped18	DN: TxDOT	DW: VP	CK: KM	CK: PK & JG
© TxDOT: MARCH, 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	3510	04	055	SH 99
REVISED 08, 2005	DIST	COUNTY	SHEET NO.	
REVISED 06, 2012	HOU	FORT BEND	148	
REVISED 01, 2018				

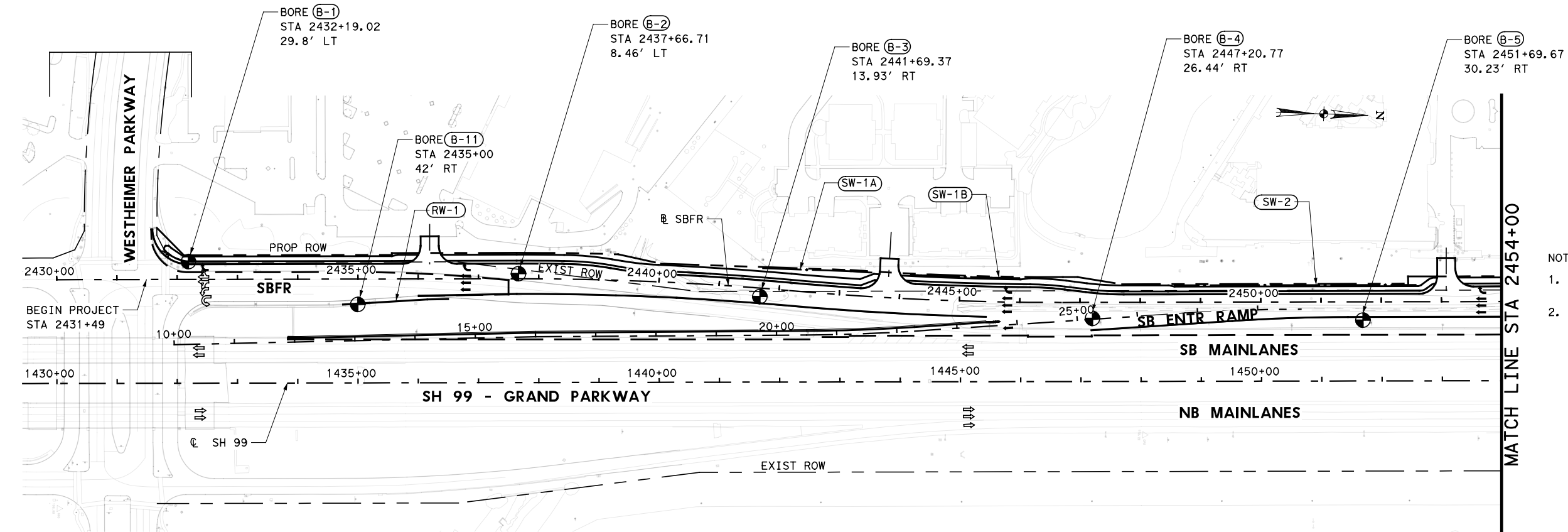
DISCLAIMER:  
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DATE:  
FILE:

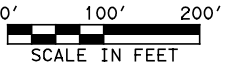
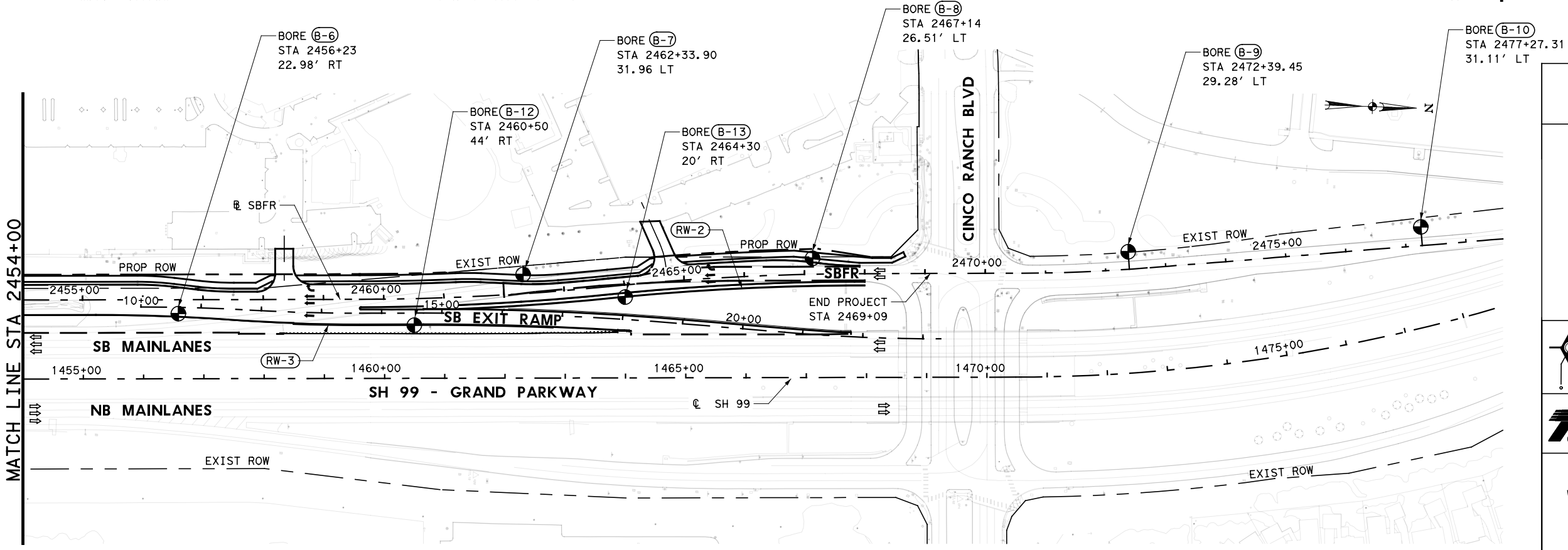
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LEGEND

BORE HOLES



- NOTES:
1. STATIONING IS BASED ON SH 99 SOUTHBOUND FRONTAGE ROAD ALIGNMENT.
  2. BORE HOLES DESIGNATED AS B-XX ARE BORE HOLES IDENTIFIED IN BORING REPORT. THE LOCATIONS SHOWN ON THIS DRAWING ARE APPROXIMATE.



STATE OF TEXAS  
 PAUL E. BRIGHT  
 61108  
 REGISTERED PROFESSIONAL ENGINEER  
*Paul Bright*  
 1/19/2023

TEDSI INFRASTRUCTURE GROUP  
 Consulting Engineers  
 738 Hwy 6 South, Suite 430  
 Houston, Texas 77079  
 (832) 619-1000  
 TBPE F-1640

Texas Department of Transportation  
 © 2023 TxDOT

SH 99  
 SOUTHBOUND FRONTAGE ROAD  
 WESTHEIMER PKWY TO CINCO RANCH BLVD  
 BORE SITE PLAN

SHEET 1 OF 1

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	149



1/23/2023 10:57:25 AM  
 D:\winapps\word\Soil18-288E FBC SH99 Grand Parkway Road\Report\Boring Logs\After incorporating survey data\18-288E\_B-3.CLG



## DRILLING LOG

1 of 1

WinCore Version 3.3	County Fort Bend County Highway 99 CSJ 3510-04-055	Hole B-3 Structure Station 2432+19.02 Offset 29.8	District Houston Date 7/26/2018 Grnd. Elev. 110.00 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)			
108.			CLAY, FILL: sandy lean, soft, light brown, brown, with root fibers (CL)			14	42	24		P: 1.40, T: 1.50		
106.		9 (6) 10 (6)	CLAY, sandy lean, very stiff, light gray, reddish brown, with root fibers (CL)			11				P: 1.50, T: 1.50		
			CLAY, fat, soft, gray, reddish brown, with root fibers, ferrous nodules (CH)			12	53	34		P: 1.50, T: 1.50, -200(%): 67		
103.			CLAY, sandy lean, soft to stiff, brown, light brown, with root fibers (CL)			12	48	30		P: 1.50, T: 1.50, -200(%): 67		
		10 (6) 12 (6)				12				P: 1.50, T: 1.50		
						0	40.28	14	38	21	134	P: 1.50, T: 1.50
95.		6 (6) 12 (6)	SAND, silty, slightly compact to compact, light brown, light gray, with root fibers to 19', clay pockets			11				SPT: 35, -200(%): 29		
						21				SPT: 32		
20		17 (6) 22 (6)				13				SPT: 32, -200(%): 10		
25		19 (6) 24 (6)				19				SPT: 34		
30		22 (6) 25 (6)				18				SPT: 31		
75.		26 (6) 33 (6)										

Remarks:  
The ground water elevation was not determined during the course of this boring.

Driller: Max                      Logger: Daniel                      Organization: GET

Z:\WINAPPS\WORD\Soil18-288E FBC SH99 Grand Parkway Road\Report\Boring Logs\After incorporating survey data\18-288E\_B-3.CLG



## DRILLING LOG

1 of 1

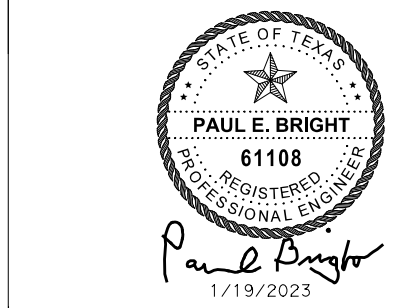
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------------------------	--	---	---

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)			
108.			CLAY, FILL: sandy lean, stiff, light brown, brown, with root fibers (CL)			12				P: 1.50, T: 1.50		
		14 (6) 16 (6)	CLAY, sandy lean, stiff, light brown, brown, with root fibers (CL)			9	41	24		P: 1.50, T: 1.50		
						10				P: 1.50, T: 1.50, -200(%): 65		
100.		10 (6) 13 (6)	CLAY, fat, stiff, light gray, reddish brown, with root fibers to 14', ferrous nodules (CH)			20	50	31	131	P: 1.50, T: 1.50, -200(%): 85		
						0	5	28		122	P: 1.50, T: 1.50	
95.		18 (6) 21 (6)	CLAY, sand lean, stiff, light gray, light brown (CL)			0	28.61	19	34	18	128	P: 1.50, T: 1.50
93.			SAND, silty, slightly compact to compact, light brown, light gray, with lay pockets			12					SPT: 31, -200(%): 20	
20		17 (6) 20 (6)				13				SPT: 31		
25		18 (6) 23 (6)				13				SPT: 28, -200(%): 15		
30		20 (6) 26 (6)				10				SPT: 36		
75.		24 (6) 32 (6)										

Remarks:  
The ground water elevation was not determined during the course of this boring.

Driller: Max                      Logger: Daniel                      Organization: GET

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**SH 99**  
**SOUTHBOUND FRONTAGE ROAD**  
**WESTHEIMER PKWY TO CINCO RANCH BLVD**  
  
**BORE LOG SHEETS**  
  
**SHEET 2 OF 8**

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	151



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# DRILLING LOG

1 of 1

County Fort Bend County Hole B-5 District Houston  
 Highway 99 Structure Date 7/26/2018  
 Version 3.3 CSJ 3510-04-055 Station 2451+69.67 Grnd. Elev. 110.00 ft  
 Offset 30.23 GW Elev. 87.00 ft

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)	
108			CLAY, FILL: sandy lean, soft, light brown, light gray, with root fibers (CL)			4	22	8		P: 1.50, T: 1.50
		5 (6) 5 (6)	CLAY, sandy lean, soft, light brown, light gray, with root fibers to 10' (CL)			3				P: 0.07, T: 0.12
						9	32	16		P: 1.50, T: 1.50
						12				P: 1.50, T: 1.50
100		7 (6) 10 (6)	SAND, silty, slightly compact, light brown, light gray, with clay pockets			12				SPT: 15, -200(%): 41
						12				SPT: 18
95		11 (6) 13 (6)	CLAY, fat, soft, reddish brown, light gray, with calcareous nodules (CH)	0	7.78	22			126	P: 0.07, T: 0.12
91		6 (6) 10 (6)	SAND, silty, loose to compact, reddish brown, light gray, with clay pockets	0	9.17	41	59	39	121	P: 0.39, T: 0.50
						19				SPT: 23, -200(%): 46
		10 (6) 16 (6)				19				SPT: 28
		12 (6) 18 (6)				19				SPT: 33
75		18 (6) 25 (6)				19				

Remarks:  
 Any ground water elevation information provided on this boring log is representative of conditions existing on the day and for the specific location where this information was collected. The actual groundwater elevation may fluctuate due to time, climatic conditions, and/or construction activity.

Driller: Max      Logger: Daniel      Organization: GET

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# DRILLING LOG

1 of 1

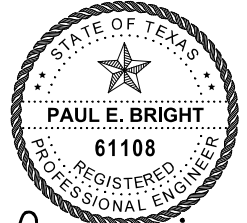
County Fort Bend County Hole B-6 District Houston  
 Highway 99 Structure Date 7/26/2018  
 Version 3.3 CSJ 3510-04-055 Station 2456+23 Grnd. Elev. 115.00 ft  
 Offset 22.98 GW Elev. N/A

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)			
113			CLAY, FILL: sandy lean, soft, dark gray, with root fibers, calcareous and ferrous nodules (CL)			12				PP: 1.50, T: 1.50		
		4 (6) 5 (6)	CLAY, sandy lean, soft, dark gray, light brown, with root fibers to 10', calcareous and ferrous nodules (CL)			11	37	20		PP: 1.50, T: 1.50		
						12			134	PP: 1.50, T: 1.50		
						0	30.28	15	42	24	131	PP: 1.50, T: 1.50
		8 (6) 12 (6)				14				PP: 1.50, T: 1.50		
						14				PP: 1.32, T: 1.38		
		5 (6) 11 (6)				9				PP: 0.69, T: 0.75		
98			SAND, silty, compact, light gray, with calcareous and ferrous nodules, clay pockets			6				SPT: 24, -200 (%): 18		
		17 (6) 30 (6)				19				SPT: 25		
						19						
90		27 (6) 29 (6)										

Remarks:  
 The ground water elevation was not determined during the course of this boring.

Driller: Max      Logger: Daniel      Organization: GET

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Paul E. Bright  
 1/19/2023



SH 99  
 SOUTHBOUND FRONTAGE ROAD  
 WESTHEIMER PKWY TO CINCO RANCH BLVD  
 BORE LOG SHEETS

SHEET 3 OF 8

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	152







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## DRILLING LOG

1 of 2



County	Fort Bend County	Hole	B-12	District	Houston
Highway	99	Structure		Date	2/24/2022
CSJ	3510-04-055	Station	2460+50	Grnd. Elev.	116.00 ft
		Offset	44' RT	GW Elev.	86.00 ft

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties			Additional Remarks	
				Lateral Deviator Press. (psi)	Stress (psi)	MC	LL	PI		Wet Den. (pcf)
114.			CLAY, LEAN CLAY (CL), stiff, light brown, brown, with root fibers to 2', sand (CL)						PP: 0.62, T: 0.75	
			SAND, SANDY SILT (ML), loose, light brown, brown			18				
112.			CLAY, FAT CLAY (CH), very stiff, brown, reddish brown (CH)	0	20.8	13				-200(%): 51, SPT: 10
5		5 (6) 7 (6)								
110.			CLAY, LEAN CLAY (CL), stiff to very stiff, brown, reddish brown (CL)			23	65	44		PP: 1.24, T: 1.25
						16	48	30		PP: 0.93, T: 1.0, -200(%): 76
10		6 (6) 8 (6)				15				PP: 1.24, T: 1.25
				0	18.1	14	33	17		PP: 1.32, T: 1.38, -200(%): 52
102.			SAND, SILTY SAND (SM), slightly compact, gray, light gray			15	31	15		PP: 1.24, T: 1.25
15		16 (6) 14 (6)				11				SPT: 14, -200(%): 13
						14				SPT: 17
96						14				SPT: 19

**Remarks:**  
Any ground water elevation information provided on this boring log is representative of conditions existing on the day and for the specific location where this information was collected. The actual groundwater elevation may fluctuate due to time, climatic conditions, and/or construction activity.

Driller: Van and Sons      Logger: Leo      Organization: GET

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## DRILLING LOG

2 of 2



County	Fort Bend County	Hole	B-12	District	Houston
Highway	99	Structure		Date	2/24/2022
CSJ	3510-04-055	Station	2460+50	Grnd. Elev.	116.00 ft
		Offset	44' RT	GW Elev.	86.00 ft

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test		Properties			Additional Remarks	
				Lateral Deviator Press. (psi)	Stress (psi)	MC	LL	PI		Wet Den. (pcf)
91.			CLAY, LEAN CLAY (CL), firm, light gray, reddish brown (CL)							
25		17 (6) 15 (6)								PP: 0.31, T: 0.38, SPT: 11
			SAND, SILTY SAND (SM), slightly compact, light gray, reddish brown							
30		13 (6) 22 (6)				22				SPT: 17
35		15 (6) 13 (6)				33				SPT: 17
76						22				SPT: 21

**Remarks:**  
Any ground water elevation information provided on this boring log is representative of conditions existing on the day and for the specific location where this information was collected. The actual groundwater elevation may fluctuate due to time, climatic conditions, and/or construction activity.

Driller: Van and Sons      Logger: Leo      Organization: GET

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**SH 99**  
**SOUTHBOUND FRONTAGE ROAD**  
**WESTHEIMER PKWY TO CINCO RANCH BLVD**  
  
**BORE LOG SHEETS**

SHEET 7 OF 8

FED. RD. DIV. NO.	PROJECT NO.	HIGHWAY NO.	
6		SH 99	
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	156

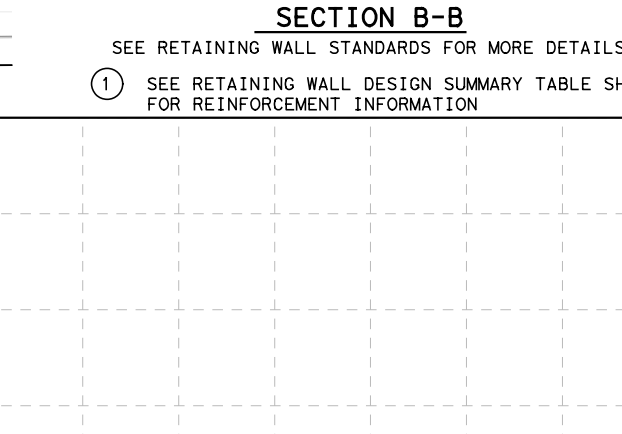
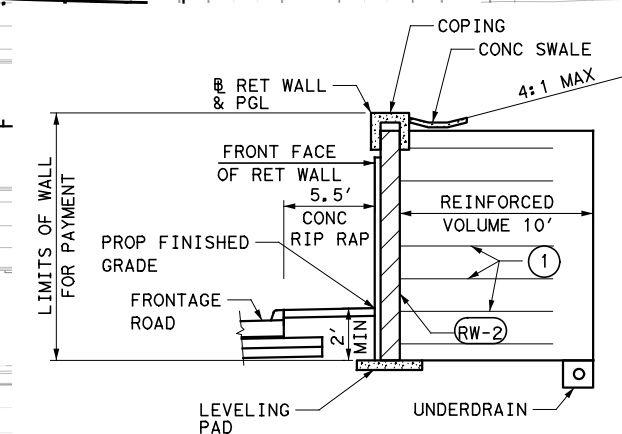
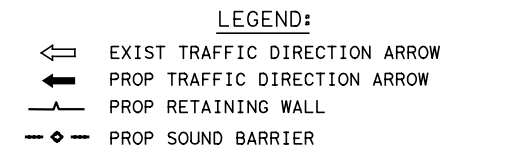
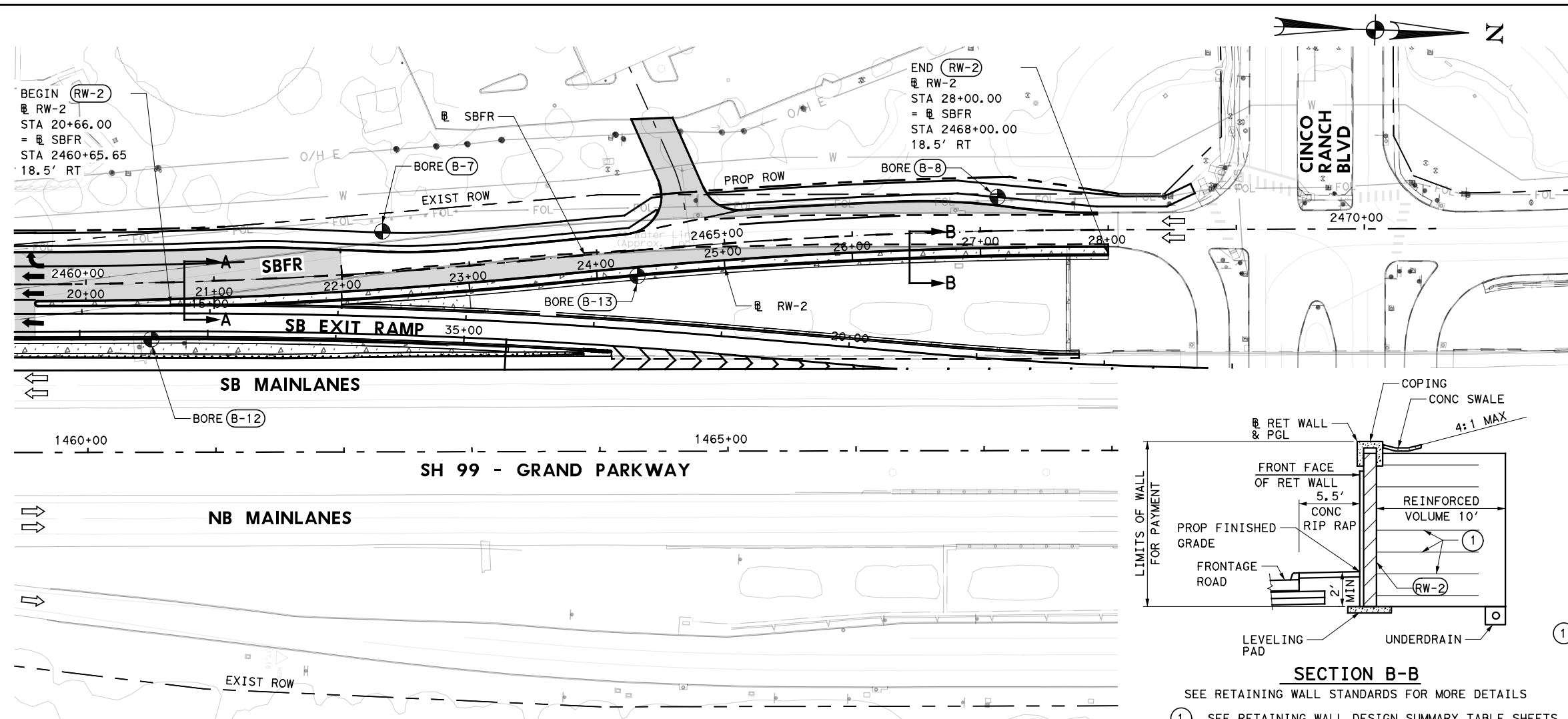




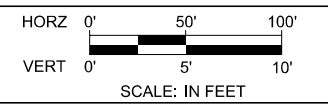




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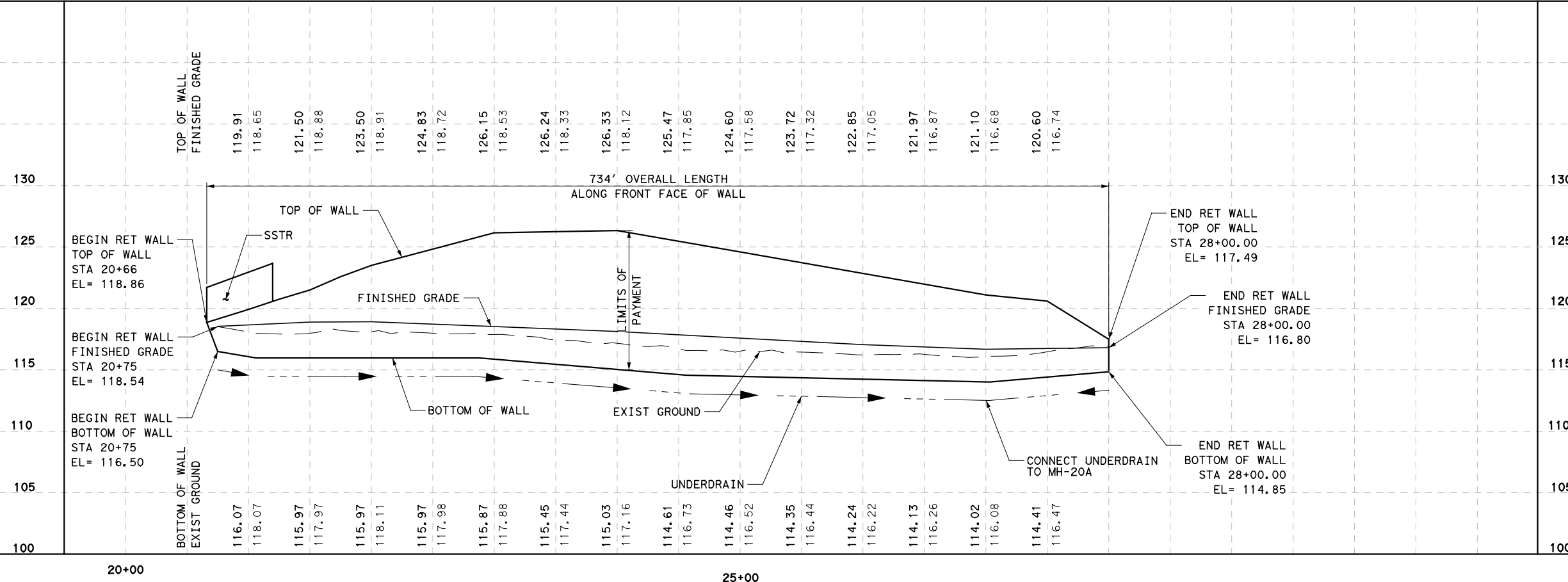
① SEE RETAINING WALL DESIGN SUMMARY TABLE SHEETS FOR REINFORCEMENT INFORMATION AND WALL SUMMARY SHEET



SH 99  
SOUTHBOUND FRONTAGE ROAD  
WESTHEIMER PKWY TO CINCO RANCH BLVD  
RETAINING WALL LAYOUT  
RW-2

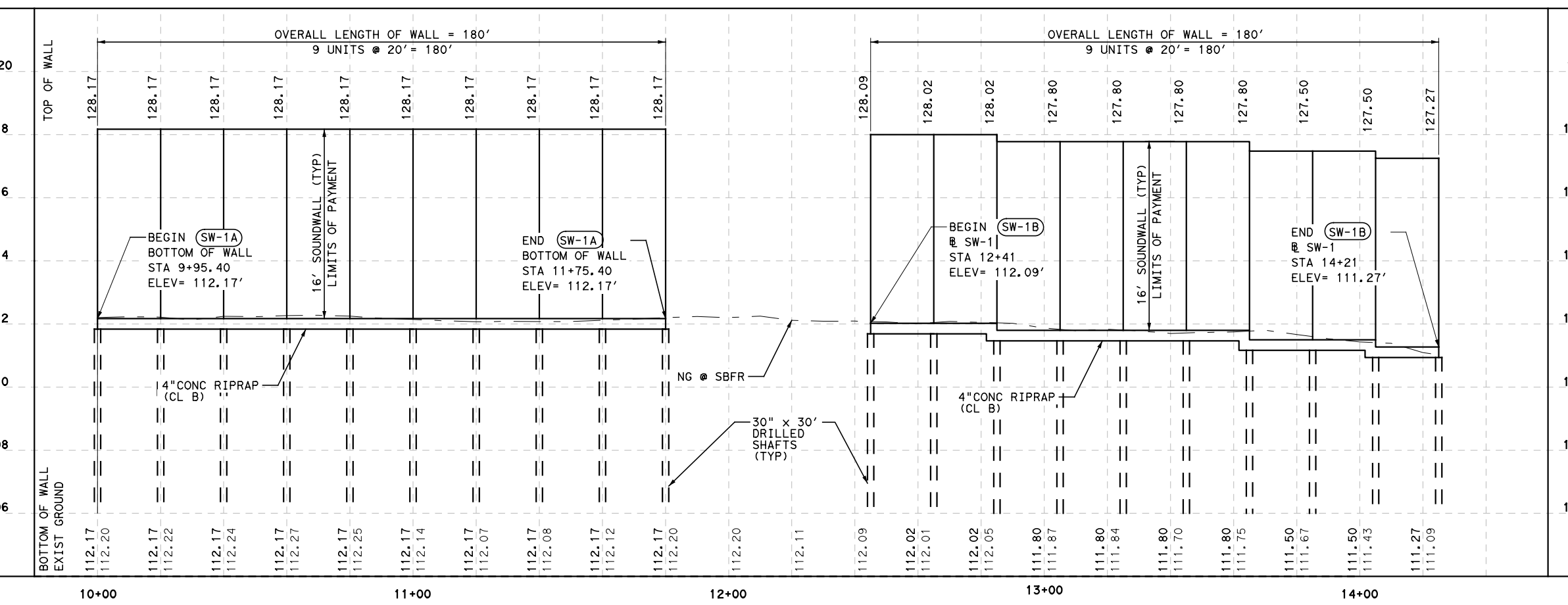
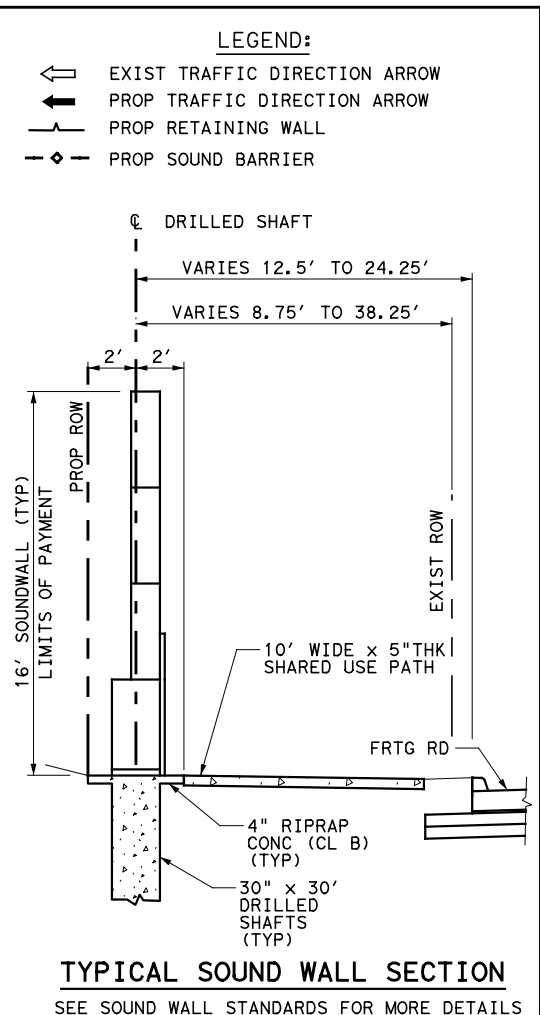
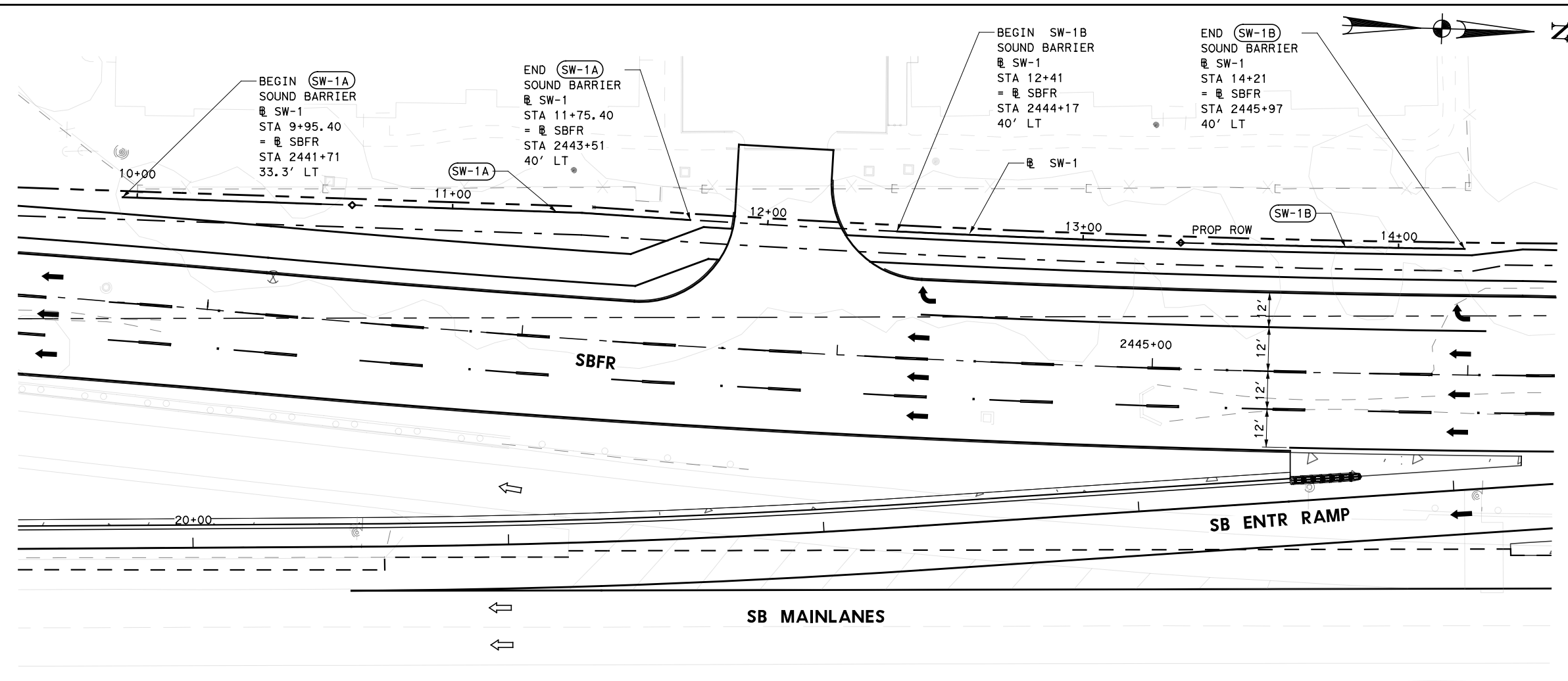
SHEET 2 OF 3

FED. RD. DIST. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	160





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HORIZ 0' 20' 40'  
 VERT 0' 5' 10'  
 SCALE: IN FEET

**PAUL E. BRIGHT**  
 61108  
 REGISTERED PROFESSIONAL ENGINEER  
 1/19/2023

**TEDSI INFRASTRUCTURE GROUP**  
 Consulting Engineers  
 738 Hwy 6 South, Suite 430  
 Houston, Texas 77079  
 (832) 619-1000

**Texas Department of Transportation**  
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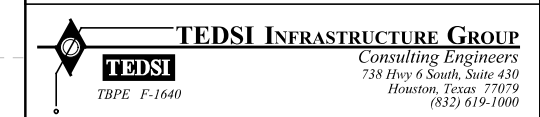
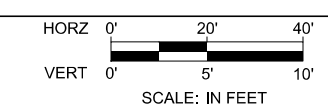
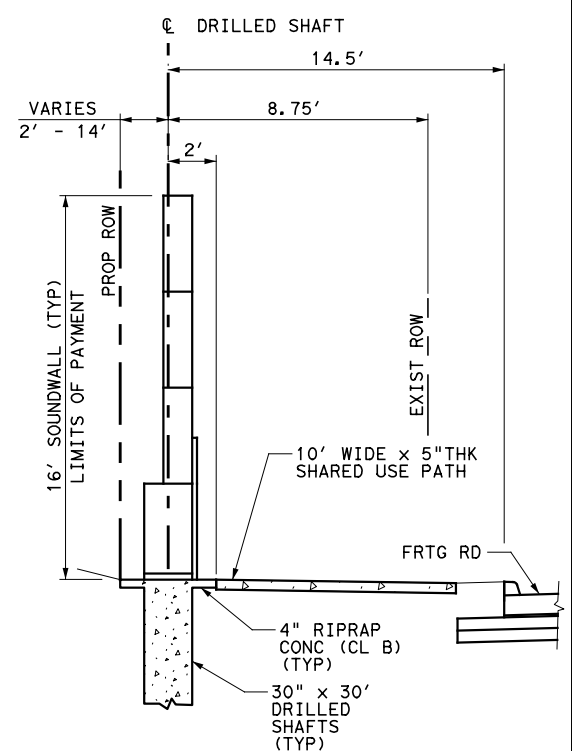
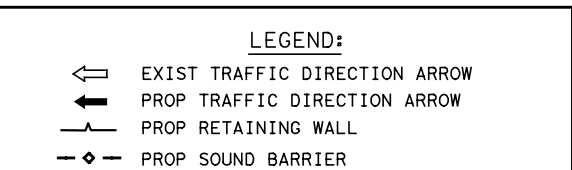
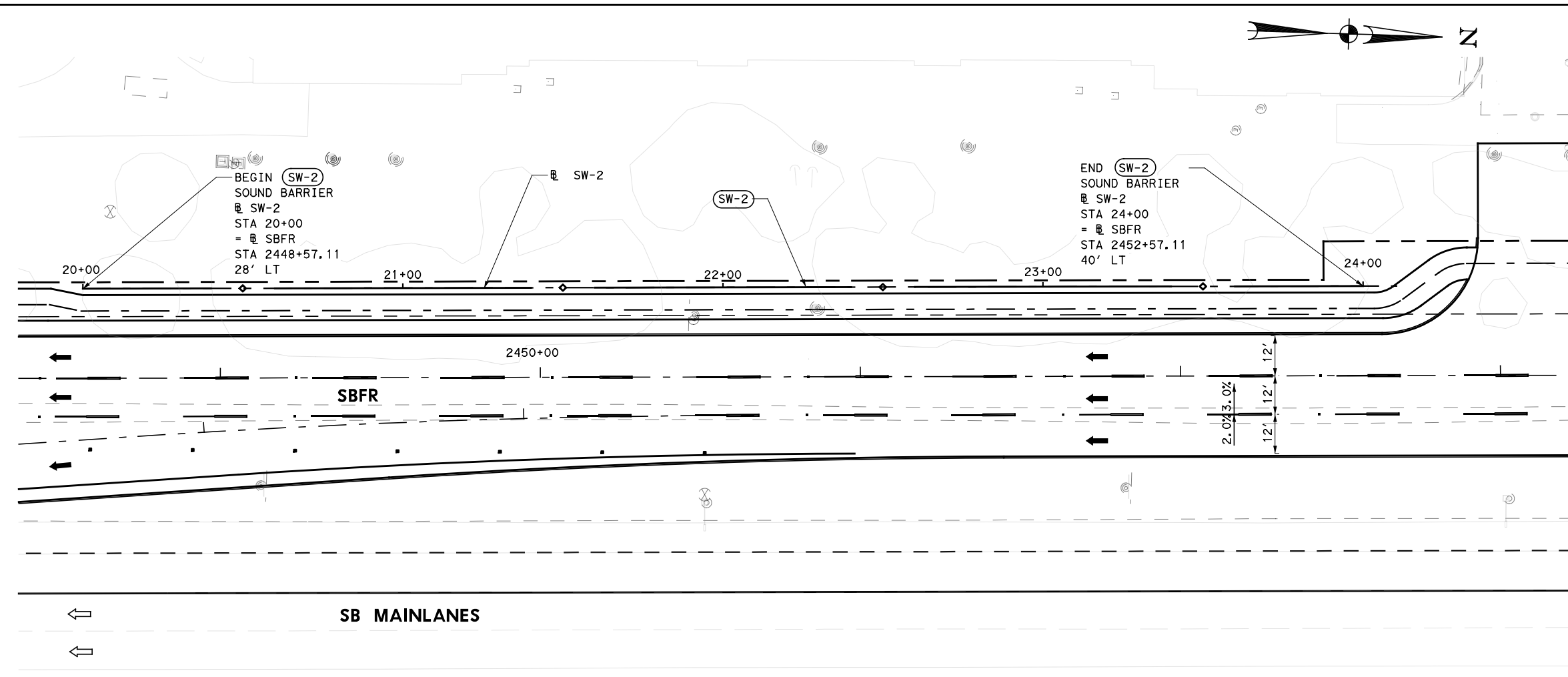
SH 99  
 SOUTHBOUND FRONTAGE ROAD  
 WESTHEIMER PKWY TO CINCO RANCH BLVD

**SOUND WALL LAYOUT**  
 SW-1A & SW-1B

SHEET 1 OF 2

FED. RD. DIST. NO.	PROJECT NO.	HIGHWAY NO.	
6		SH 99	
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	162

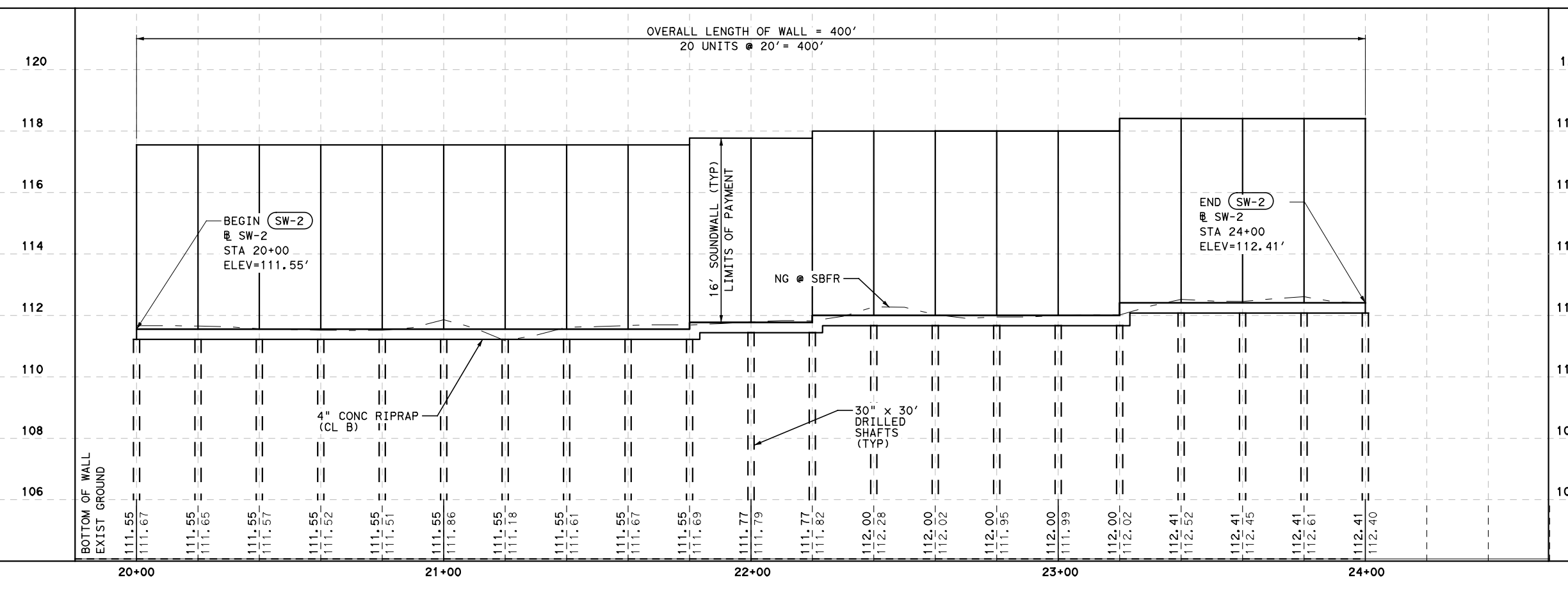
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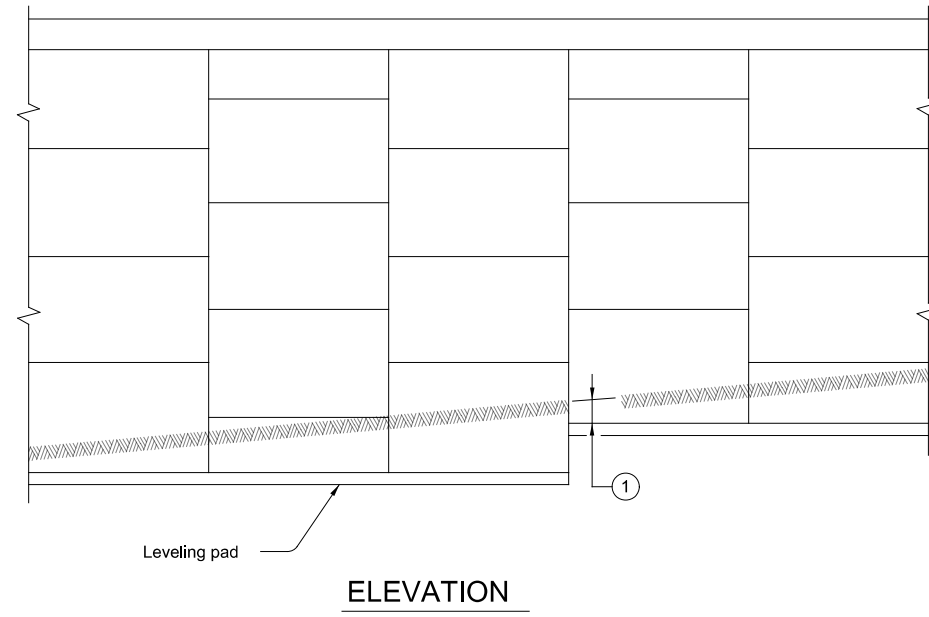
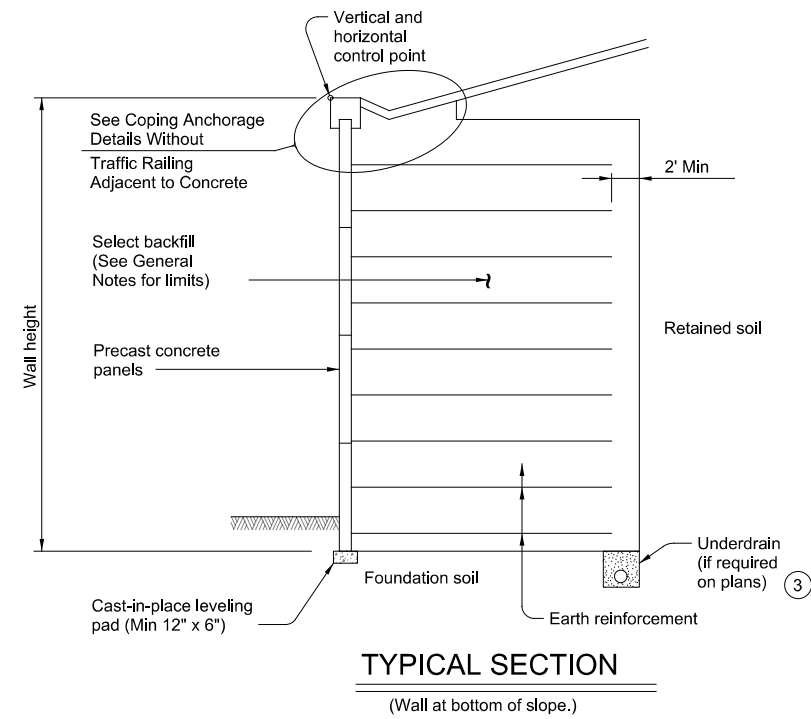
SH 99  
 SOUTHBOUND FRONTAGE ROAD  
 WESTHEIMER PKWY TO CINCO RANCH BLVD  
 SOUND WALL LAYOUT  
 SW-2

SHEET 2 OF 2

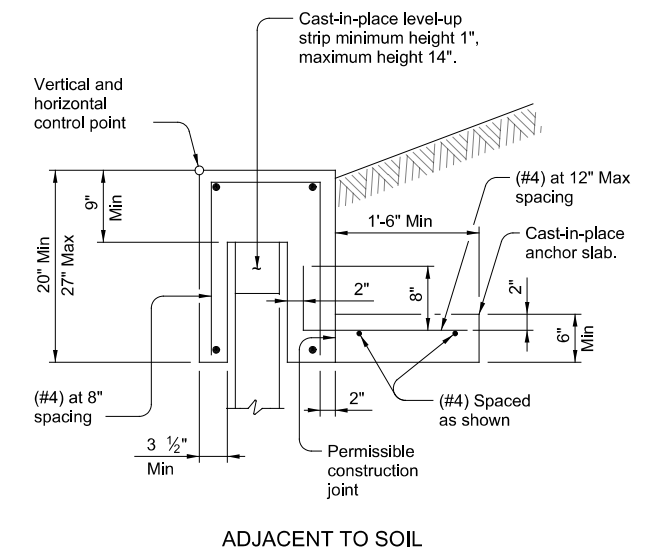
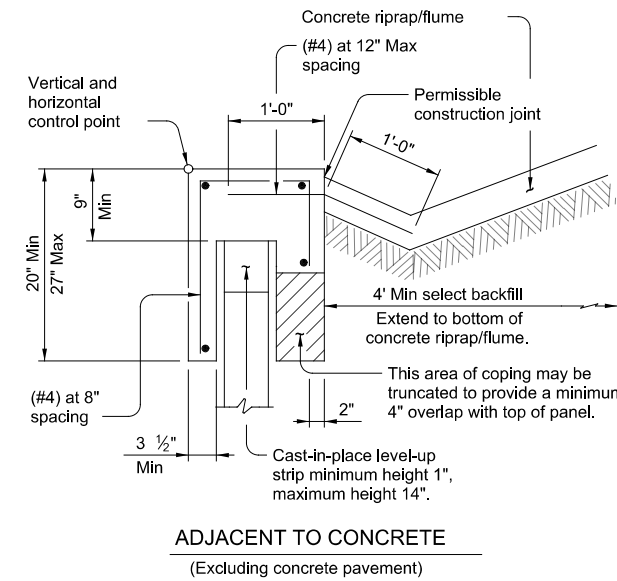
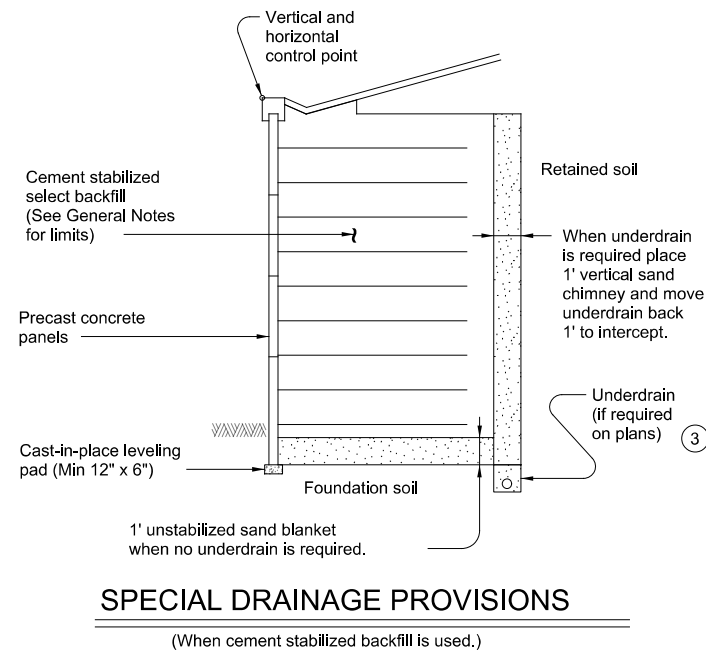
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6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	163



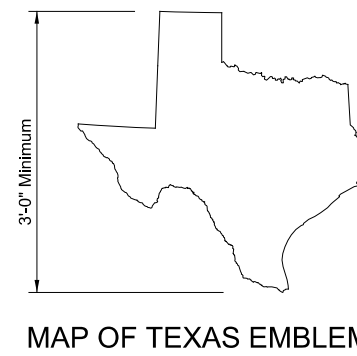
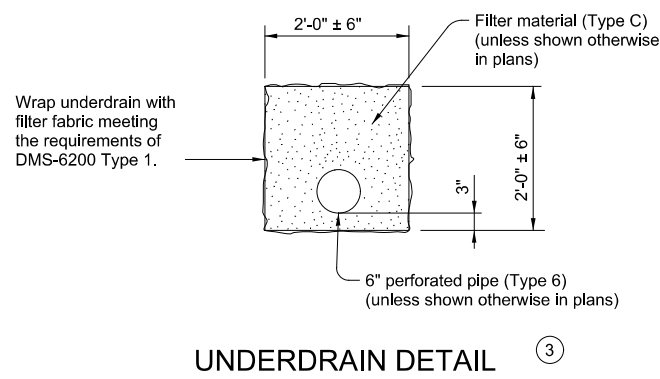
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- ① Minimum embedment conforming to values given on the RW(MSE)DD standard.
- ② Form map of Texas emblem into a wall panel next to each bridge abutment. Submit the exact location of each emblem to the Engineer for approval. The cost of forming the emblems will not be paid for directly, but is subsidiary to Item 423, "Retaining Walls." Inset the map of Texas a minimum of 3/4" into the face of the panel with a smooth finish. Finish the inset area in a contrasting color as approved by the Engineer.
- ③ Provide underdrain pipe and filter material in accordance with Item 556, "Pipe Underdrains."
- ④ Anchor precast coping to prevent rotation or displacement. Use these details to develop custom anchorage for precast copings. Provide details that include coping reinforcement. Concrete flume (if required) is paid for separately from Item 423, "Retaining Walls."



**COPING ANCHORAGE DETAILS WITHOUT TRAFFIC RAILING** ④



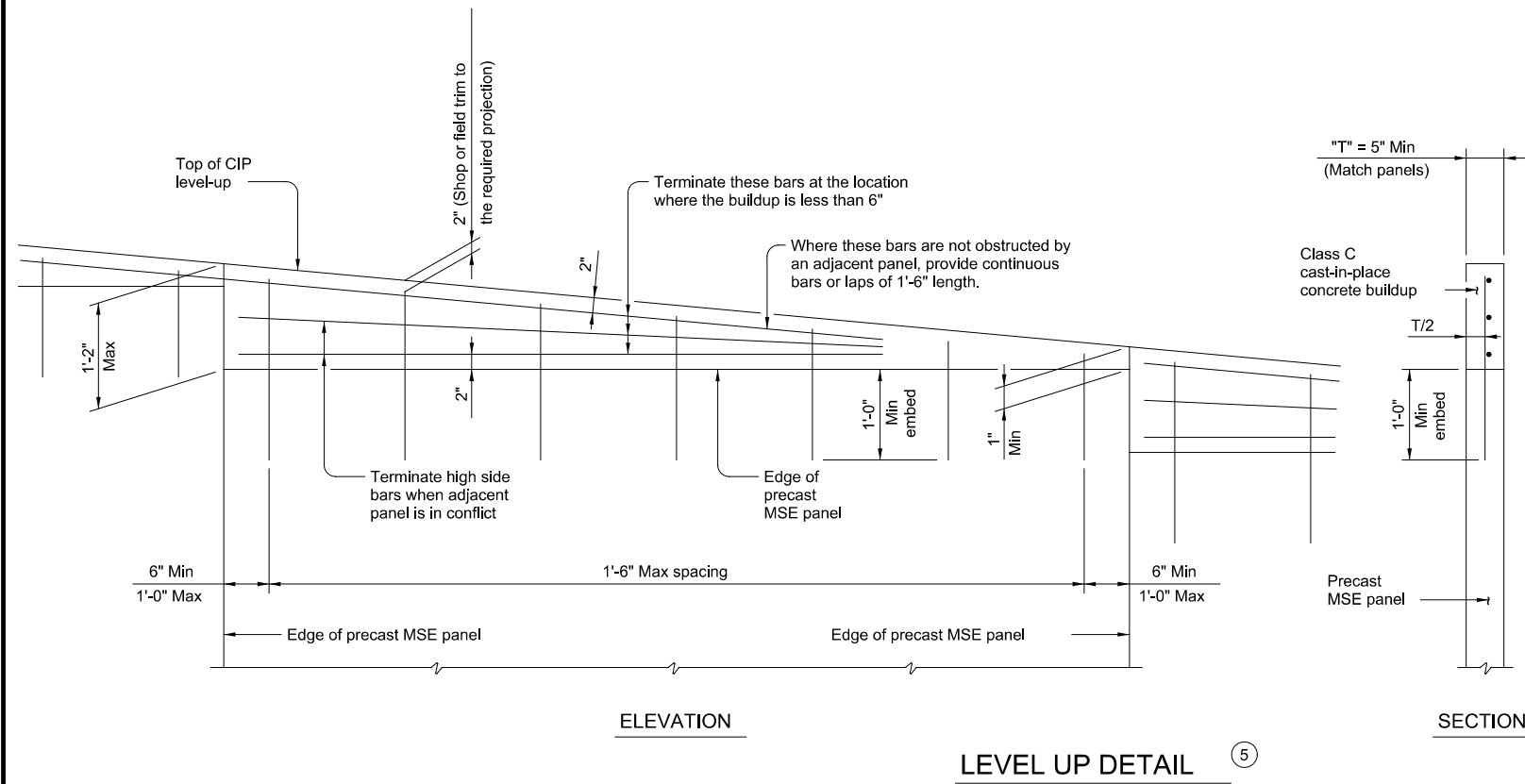
SHEET 1 OF 2

				<b>Bridge Division Standard</b>	
<b>MECHANICALLY STABILIZED EARTH RETAINING WALL</b>					
<b>RW(MSE)</b>					
FILE: RW-MSE-22.dgn	DN: TxDOT	CK: TxDOT	DW: JER	CHK: RLE	
©TxDOT June 2022	CONT: 3510	SECT: 04	JOB: 055	HIGHWAY: SH 99	
REVISIONS	DIST: HOU	COUNTY: FORT BEND	SHEET NO.: 164		

DATE:  
FILE:

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DATE:  
FILE:



- ⑤ Cast vertical bars into the top of panels. At Contractor's option vertical bars may be embedded 4 inches with a Type III Class C epoxy anchorage system. Follow manufacturer's directions for installing the epoxy vertical bars.
- ⑥ Soil design parameters must be based on long term soil strength. Design parameters must be listed on the RW(MSE)DD standard.

⑦

SELECT BACKFILL UNIT WEIGHT			
Type AS, BS & DS	Unit Weight	Internal Stability	External Stability
	105 PCF	Pullout	Sliding, Overturning, Eccentricity
	125 PCF	Rupture	Bearing

**PRECAST COPINGS:**

Wall supplier is to maximize lengths of precast coping. Provide precast coping in 10-foot minimum lengths (typical). To optimize coping lengths at radiuses, ends of runs, or other wall geometric conditions favorable to shorter coping sections, shorter lengths may be used pending approval by the Engineer. This applies only to coping without railing.

**JOINT SEALANT:**

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.

**EARTH REINFORCEMENT:**

Place the uppermost earth reinforcement no more than 3 feet below the top of wall.  
 Place the lowest level of earth reinforcement no more than 2 feet above the top of the leveling pad.  
 Provide earth reinforcement with a minimum wire size of W7.0. If different longitudinal and cross wires are used in an earth reinforcement mesh, the smaller wire must be at least 50% of the cross sectional area of the larger wire.  
 A maximum of four wire mesh configurations (wire sizes) will be allowed on a project. Provide unique transverse bar spacing for each mesh configuration, differing from other configurations by a minimum of 3 inches. Step earth reinforcement lengths in increments no finer than 12 inches.

**PANELS:**

Fabricate standard precast concrete panels to a maximum height of 6 feet and a maximum surface area of 50 sq ft. Top and bottom panels may exceed these limitations as necessary to achieve required wall grades. Maximum height of any panel must not exceed 7 ft.-6 in. Provide a minimum panel thickness of 5 inches. Arrange panels to provide offset horizontal joints.  
 Provide an open joint around the perimeter of the concrete panels. Configure joints such that 1) the filter fabric and/or pad materials are not exposed at the wall face and 2) the design opening is between 3/8" and 3/4".  
 Provide a one-piece corner panel for wall angle changes of greater than 30 degrees. Butting of chamfered panels will be allowed for angle changes of 30 degrees or less.

**MATERIAL NOTES:**

- Provide Class C concrete for reinforced concrete and precast coping.
- Provide Class H concrete for precast concrete panels.
- Provide Class A concrete for unreinforced concrete.
- Provide Grade 60 reinforcing steel.

**GENERAL NOTES:**

- Section and elevation shown is for informational purposes only. Determine specific geometry based on wall layouts and other plan information.
- Extend select backfill specified for use within the mechanically stabilized earth volume horizontally from the back of the panels a minimum 2 feet beyond the end of the earth reinforcement. Extend select backfill vertically to the top of the panels from either the top of the leveling pad, or from 4 inches below the lowest earth reinforcement, whichever is lower.
- Provide concrete coping along the top of wall, at the vertical steps at bridge backwalls, and at other vertical steps along the top of wall.
- Provide details and calculations that establish support for panels that are affected when obstructions (inlets, drilled shafts, piling, etc.) prevent placement of soil reinforcement in their normal locations. Furnish the same earth reinforcement coverage as that required in the absence of the obstruction. For skewed (rotated) earth reinforcement, no adjustment in length is needed for skew angles less than or equal to 10 degrees. Adjust the length of earth reinforcement to provide a cosine length of the reinforcement equivalent to the stated design length for the section of wall when skew angles are greater than 10 degrees. Provide calculations that justify any alterations made to the soil reinforcement or modifications to their normal placement. Do not use panels without any soil reinforcement connected to them unless they are connected with galvanized hardware to adjacent panels which do have supporting soil reinforcement attached to them and as approved by the Engineer.
- Coping and anchor slabs are considered subsidiary to the Item 423, "Retaining Walls."
- Use these details in conjunction with the retaining wall layout, the Mechanically Stabilized Earth Retaining Wall Design Data (RW[MSE]DD) standard and other applicable standards.

Cover dimensions are clear dimensions, unless noted otherwise.

**DESIGN CRITERIA NOTES:**

Design Parameters:  
 Base design of retaining walls on the following design parameters unless stated elsewhere in the plans:

Retained Soil	Unit Weight = 125 pcf φ = ⑥ C = 0 psf
Foundation Soil	φ = ⑥ C = 0 psf
Select Backfill	Unit Weight = See Table ⑦ φ = 34° C = 0 psf
Cement Stabilized Select Backfill	Unit Weight = 125 pcf φ = 45° C = 0 psf

Limit stress in steel and concrete in accordance with current AASHTO Standard Specifications for Highway Bridges and Interim Specifications.  
 The minimum length of earth reinforcement are as shown on the Mechanically Stabilized Earth Retaining Wall Design Data (RW[MSE]DD) standard.

Stability Criteria:  
 Stability criteria applies to both dry and drawdown analysis. Base design on the following factors of safety.

Sliding along the base of the structure	Factor of Safety ≥ 1.5
Overturning	Factor of Safety ≥ 2.0
Pullout of Earth Reinforcement at each level	Factor of Safety ≥ 1.5

Design the wall such that the base pressure resultant falls within the middle third of the retaining wall.  
 Determine pullout resistance from test data evaluated at 3/4 inch strain.

Corrosion Criteria:  
 Design the earth reinforcement elements to have a minimum design life of 75 years, using current AASHTO corrosion rates.  
 Perform stress calculations (rupture) on the calculated earth reinforcement section remaining after 75 years.  
 Pullout calculations may be based on non-corroded section.

SHEET 2 OF 2



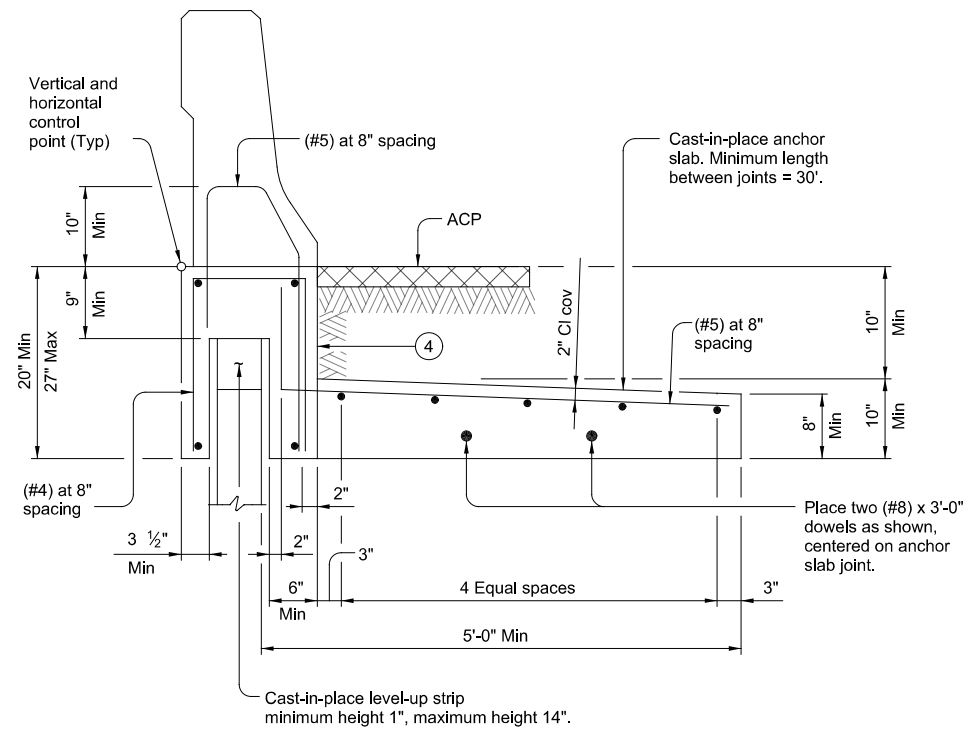
**MECHANICALLY STABILIZED EARTH RETAINING WALL**

**RW(MSE)**

FILE: RW-MSE-22.dgn	DN: TxDOT	CK: TxDOT	DW: JER	CK: RLE
©TxDOT June 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	3510	04	055	SH 99
	DIST	COUNTY	SHEET NO.	
	HOU	FORT BEND	165	

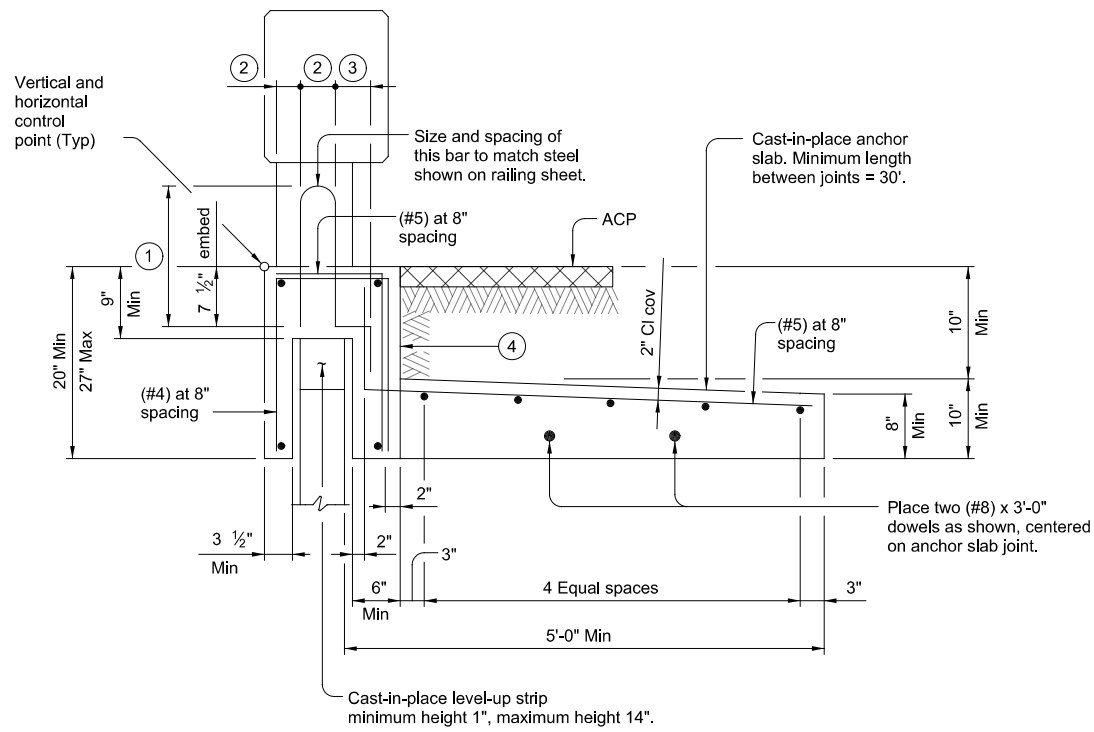
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE: FILE:



**"WIDE BASED" ADJACENT TO ACP**

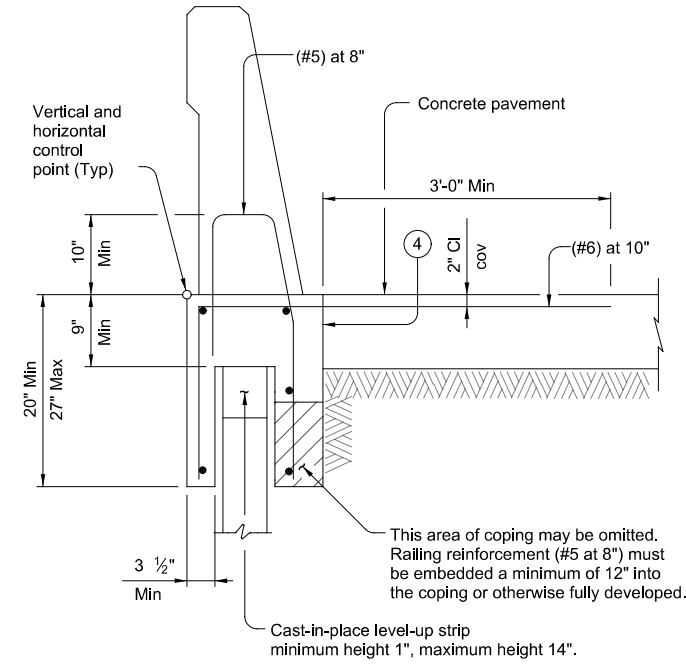
(Showing T551 Rail, other rails listed similar.)



**"NARROW BASED" ADJACENT TO ACP**

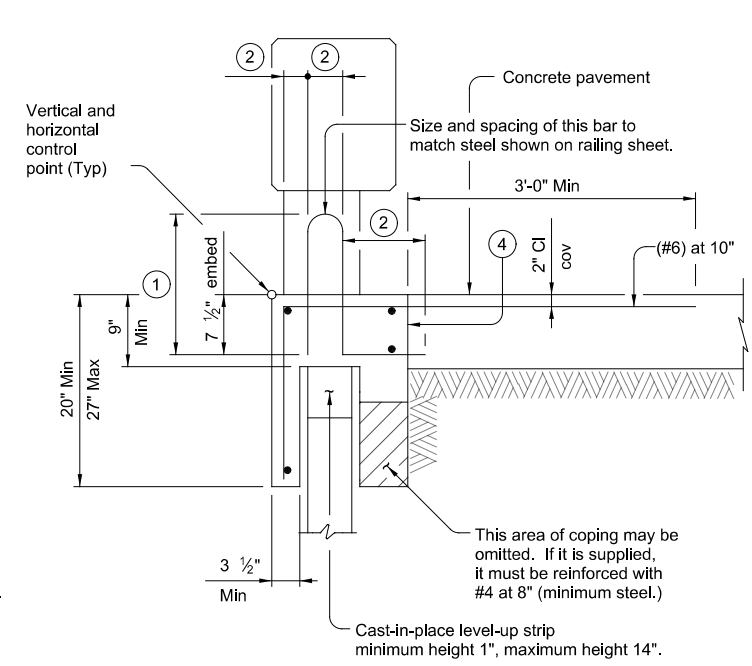
(Showing T223 Rail, other rails listed similar.)

- ① Reinforcement length equal to length shown on the appropriate rail standard plus 1 inch.
- 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."



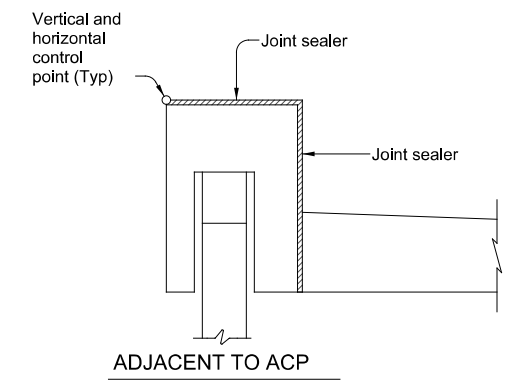
**"WIDE BASED" ADJACENT TO CONCRETE PAVEMENT**

(Showing SSTR Rail, other rails listed similar.)

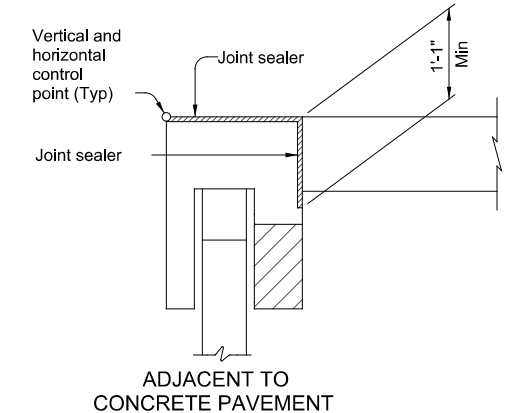


**"NARROW BASED" ADJACENT TO CONCRETE PAVEMENT**

(Showing T223 Rail, other rails listed similar.)



**ADJACENT TO ACP**



**ADJACENT TO CONCRETE PAVEMENT**

**COPING JOINT SEALER DETAILS**

(Reinforcing steel not shown for clarity.)

**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, provide a smooth level-up strip 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 100-foot maximum 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 level-up strips to facilitate alignment. Total shim thickness not to exceed 1 inch. Provide precast coping in 10-foot minimum lengths.

**JOINED CONCRETE PAVEMENT:**

When coping is adjacent to and anchored into jointed concrete pavement, align the coping joints with the pavement joints.

**JOINT SEALANT:**

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.

**MATERIAL NOTES:**

Provide Class C concrete (f'c=3,600 psi.)  
Provide Grade 60 reinforcing steel.  
Provide #4 longitudinal bars, unless otherwise shown.

**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 and must be submitted for approval. 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 Walls." 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 7.5. Coping and anchor slabs are considered subsidiary to Item 423, "Retaining Walls." Payment for traffic railing is per the linear foot for the appropriate railing type.

Cover dimensions are clear dimensions, unless noted otherwise.

Rail Type	Detail	Precasting Rail with Coping Allowed
T1F/T1W/C1W/T2P/C2P	NARROW	NO
T221/C221/T222	NARROW	YES
T223/C223	NARROW	NO
T402/C402	NARROW	NO
T411/C411	NARROW	NO
T551/T552	WIDE	YES
T66	NARROW	NO
SSTR	WIDE	YES

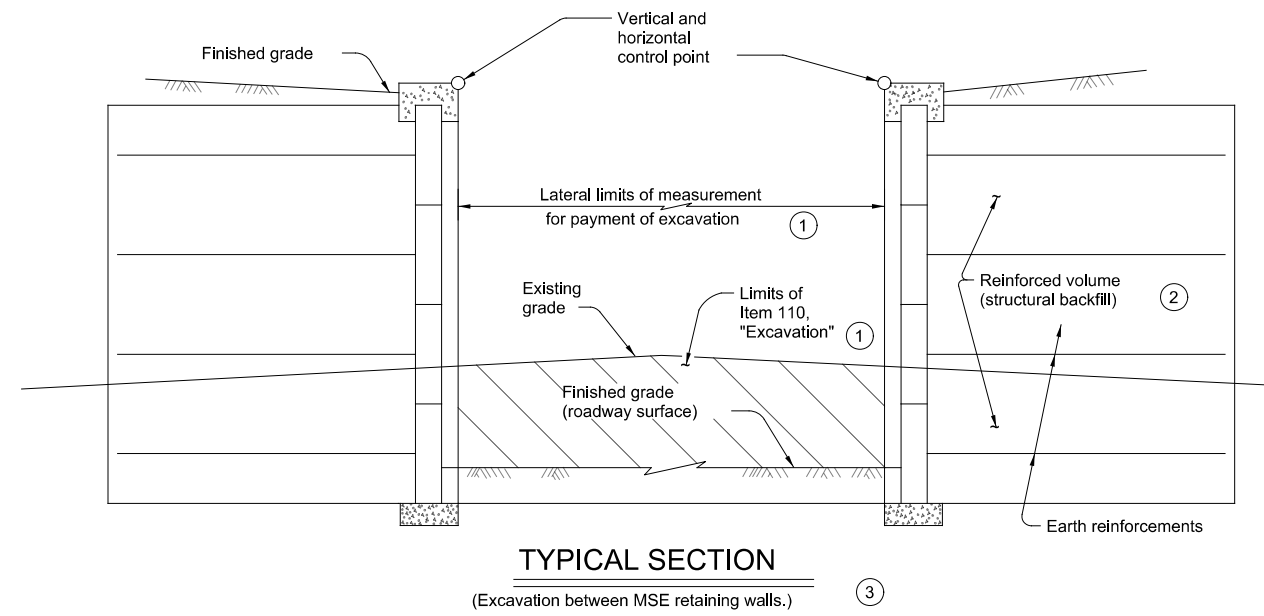
**Bridge Division Standard**

## RETAINING WALL TRAFFIC RAILING FOUNDATIONS

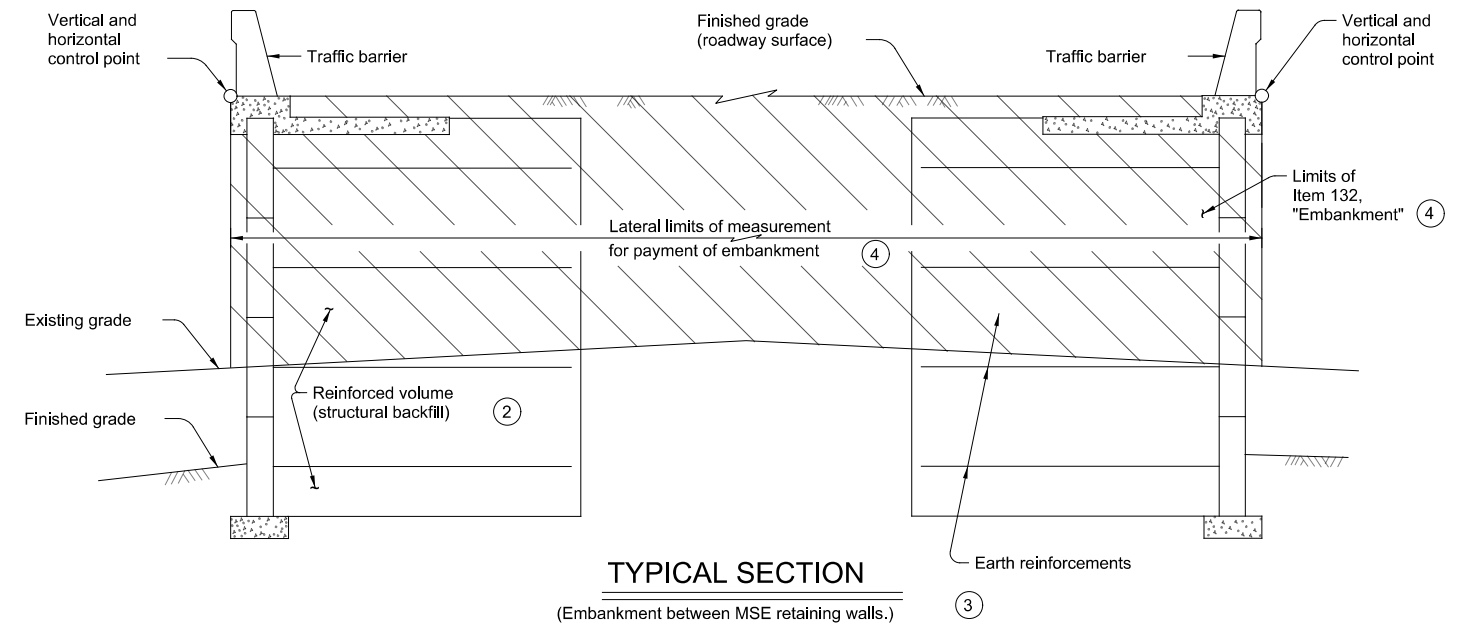
### RW(TRF)

FILE: RW-TRF-22.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TAR
©TxDOT	June 2022	CON: 3510	SECT: 04	JOB: 055
REVISIONS				HIGHWAY: SH 99
		DIST: HOU	COUNTY: FORT BEND	SHEET NO: 166

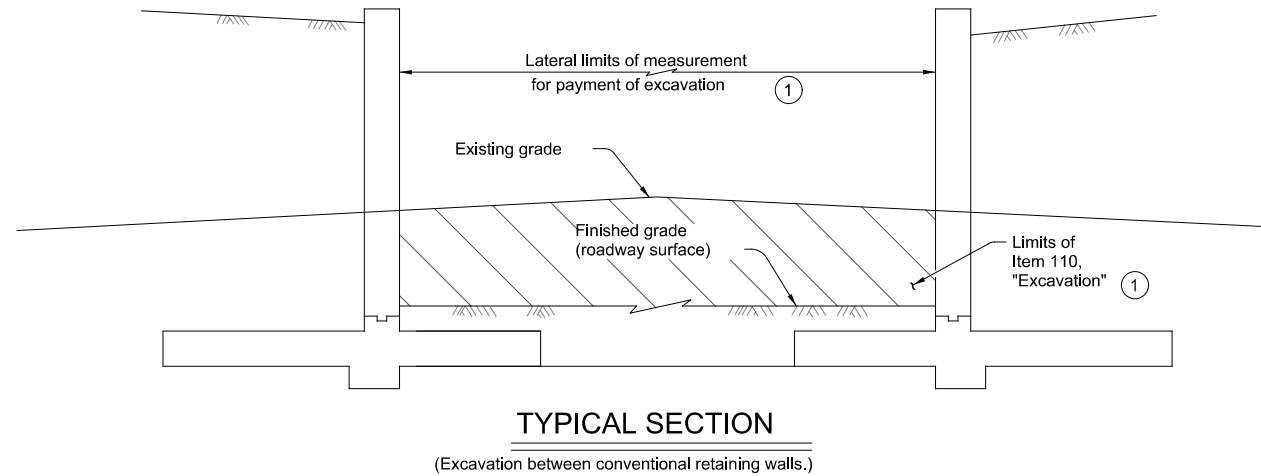
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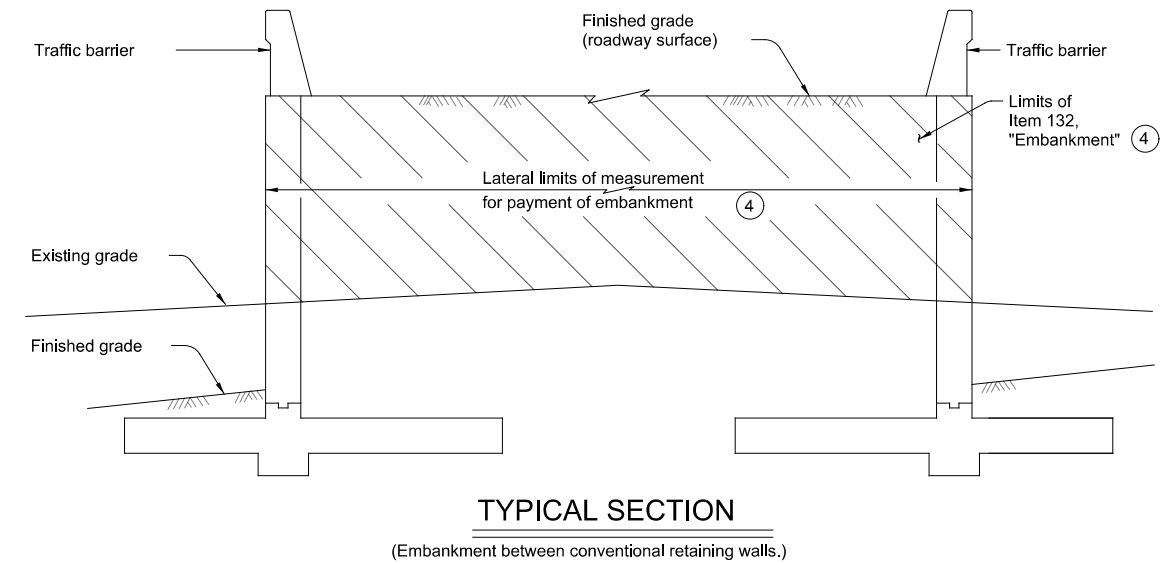
**TYPICAL SECTION**  
(Excavation between MSE retaining walls.) (3)



**TYPICAL SECTION**  
(Embankment between MSE retaining walls.) (3)

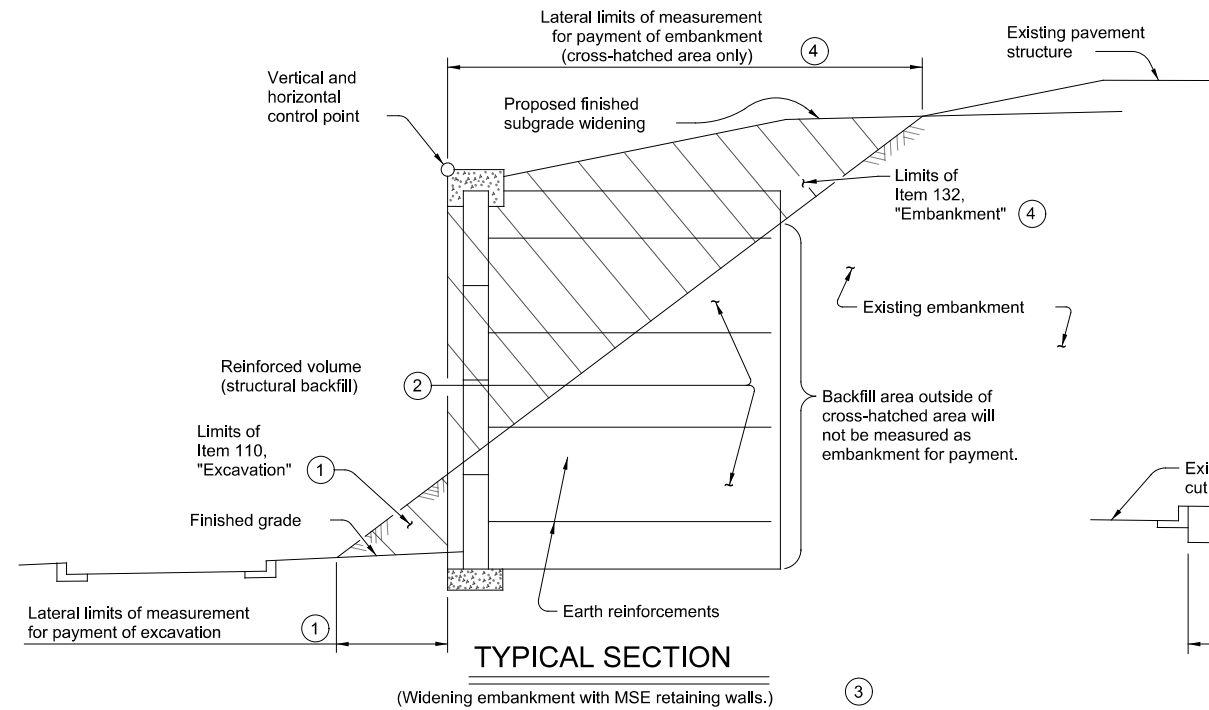


**TYPICAL SECTION**  
(Excavation between conventional retaining walls.)

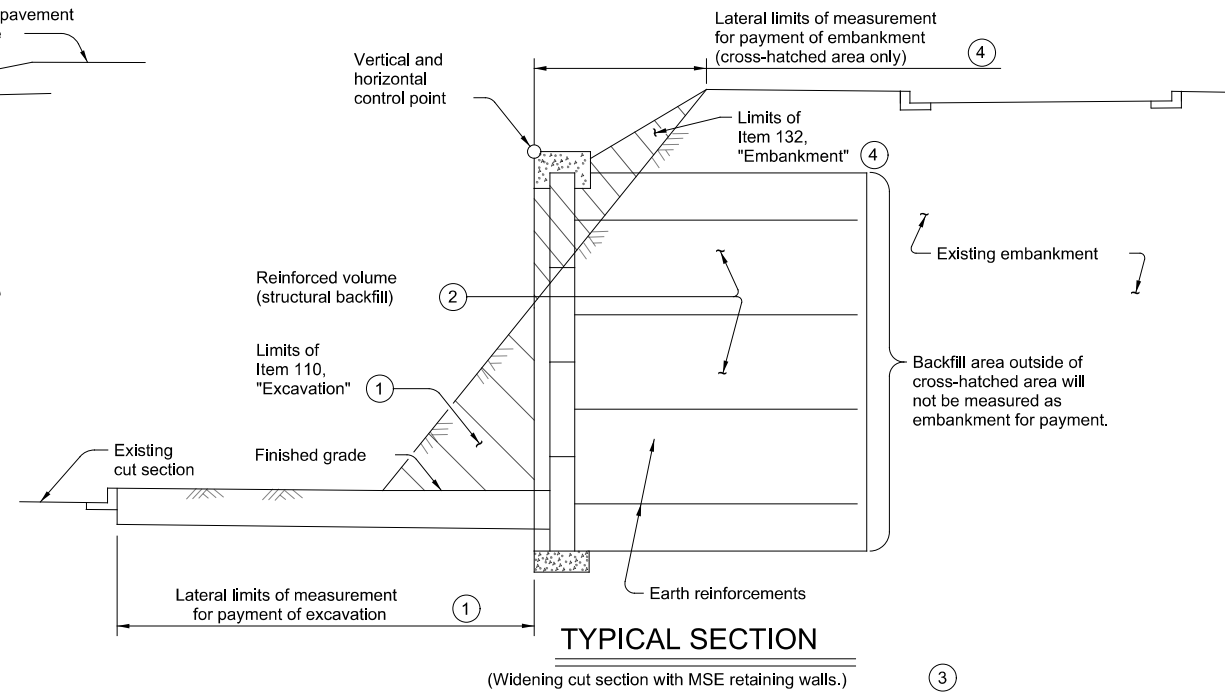


**TYPICAL SECTION**  
(Embankment between conventional retaining walls.)

- ① Only the excavation above the proposed subgrade elevation will be measured for payment.
- ② Meeting requirements for Item 423, "Retaining Walls."
- ③ Earthwork measurement with other retaining wall types 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**  
(Widening embankment with MSE retaining walls.) (3)



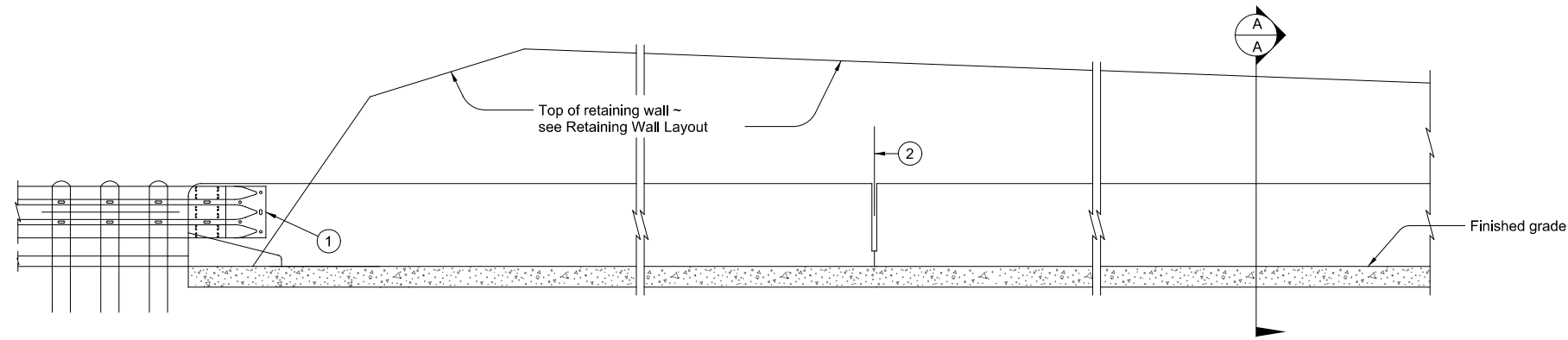
**TYPICAL SECTION**  
(Widening cut section with MSE retaining walls.) (3)

DATE:  
FILE:

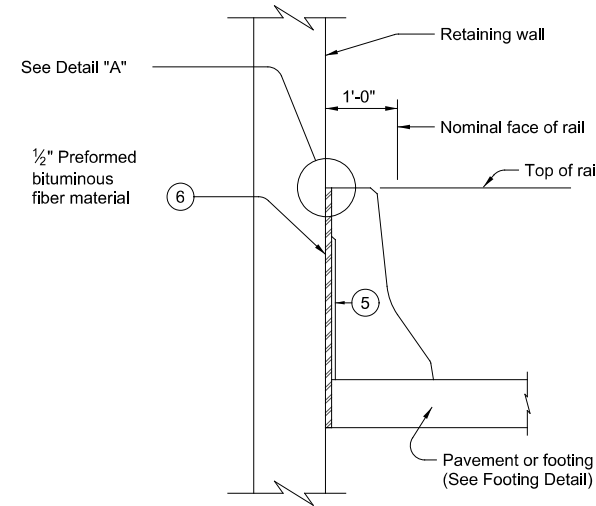
				<b>Bridge Division Standard</b>	
<h2>EARTHWORK MEASUREMENT AT RETAINING WALL</h2>					
<h3>RW(EM)</h3>					
FILE:	RW-EM-22.dgn	DN:	TxDOT	CK:	TxDOT
REVISED:	June 2022	DW:	JER	CK:	RLE
CONT:	3510	SECT:	04	JOB:	055
REVISIONS:		DIST:	HOU	COUNTY:	FORT BEND
				SHEET NO.:	167



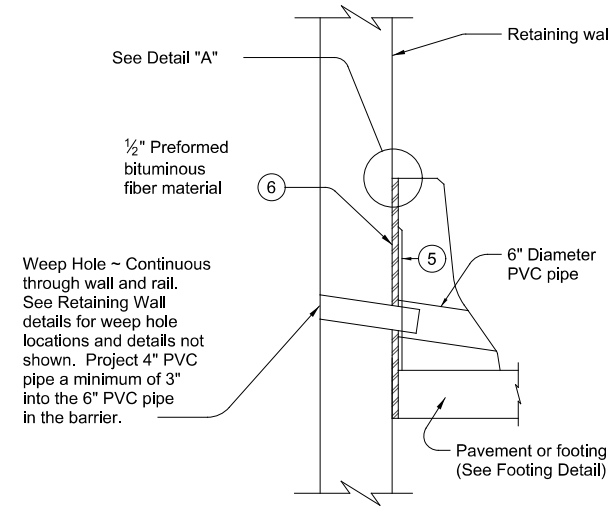
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**ELEVATION**



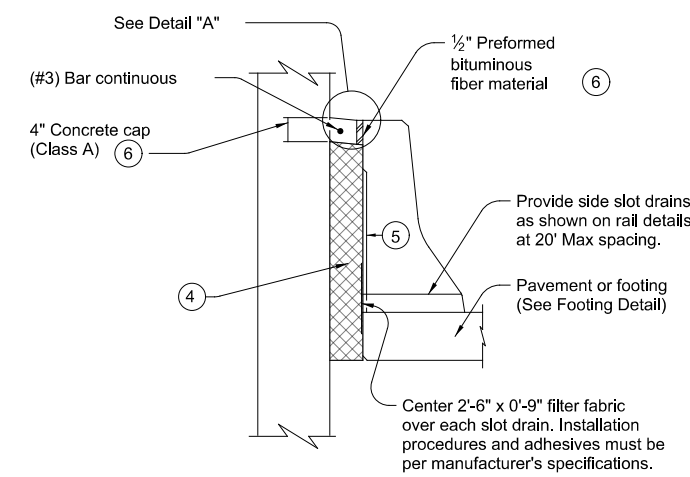
**TYPICAL SECTION**



Weep Hole ~ Continuous through wall and rail. See Retaining Wall details for weep hole locations and details not shown. Project 4" PVC pipe a minimum of 3" into the 6" PVC pipe in the barrier.

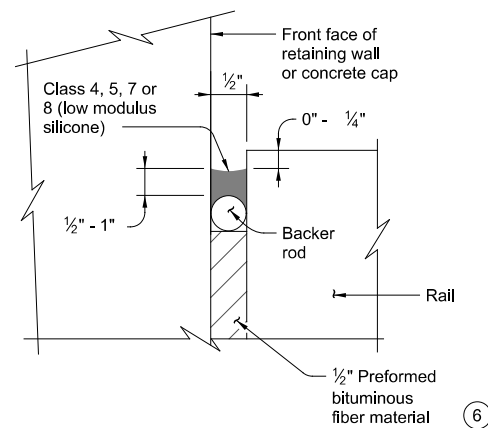
**SECTION AT WEEP HOLES**

(Note: Do not place weep holes within 1'-4" of intermediate rail joints. Adjust bar spacing or field bend bars in rail as required to clear weep holes by 1" Min.)



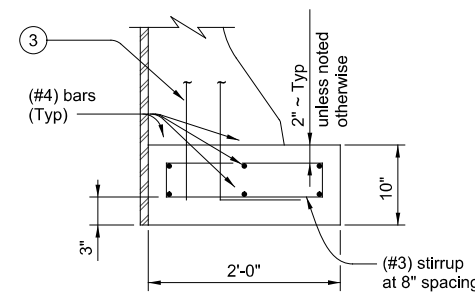
**SECTION AT MSE WALLS WITHOUT DRAINAGE SYSTEM**

- ① See details elsewhere in plans for rail end treatment.
- ② Provide intermediate rail wall joints at no greater than 100-foot spacing unless shown otherwise on the plans or approved by the Engineer.
- ③ See rail details for anchorage reinforcement. Use anchorage reinforcement required for bridge decks unless noted otherwise.
- ④ Clean gravel ( 1/4" - 1/2"). Example: Concrete course aggregate grades 6, 7, and 8. The width of the backfill will be dependent upon the width of the coping leg (3 1/2" Min). Minimum backfill width = width of front leg of MSE wall coping.
- ⑤ Do not recess back of rail as shown on rail details.
- ⑥ Place 1/2" bituminous fiber material and concrete cap continuously behind rail expansion joints and rail intermediate wall joints.



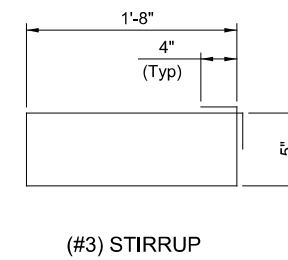
**DETAIL "A"**

(Place in accordance with Item 438, "Cleaning and Sealing Joints.")



**FOOTING DETAIL**

(Footing for traffic rail required when concrete pavement is not present. This footing is adequate only when back of rail is fully supported by the retaining wall. Use Traffic Railing Foundations (TRF) standard sheet for other cases.)



**(#3) STIRRUP**

**MATERIAL NOTES:**

Provide Class C concrete (f'c=3,600 psi) for rail footings.  
Provide Grade 60 reinforcing steel.

**GENERAL NOTES:**

These details are for constructing a concrete barrier-type rail against a retaining wall.  
All reinforcing steel, concrete, expansion joint material, etc. shown in these details is subsidiary to the rail type used.

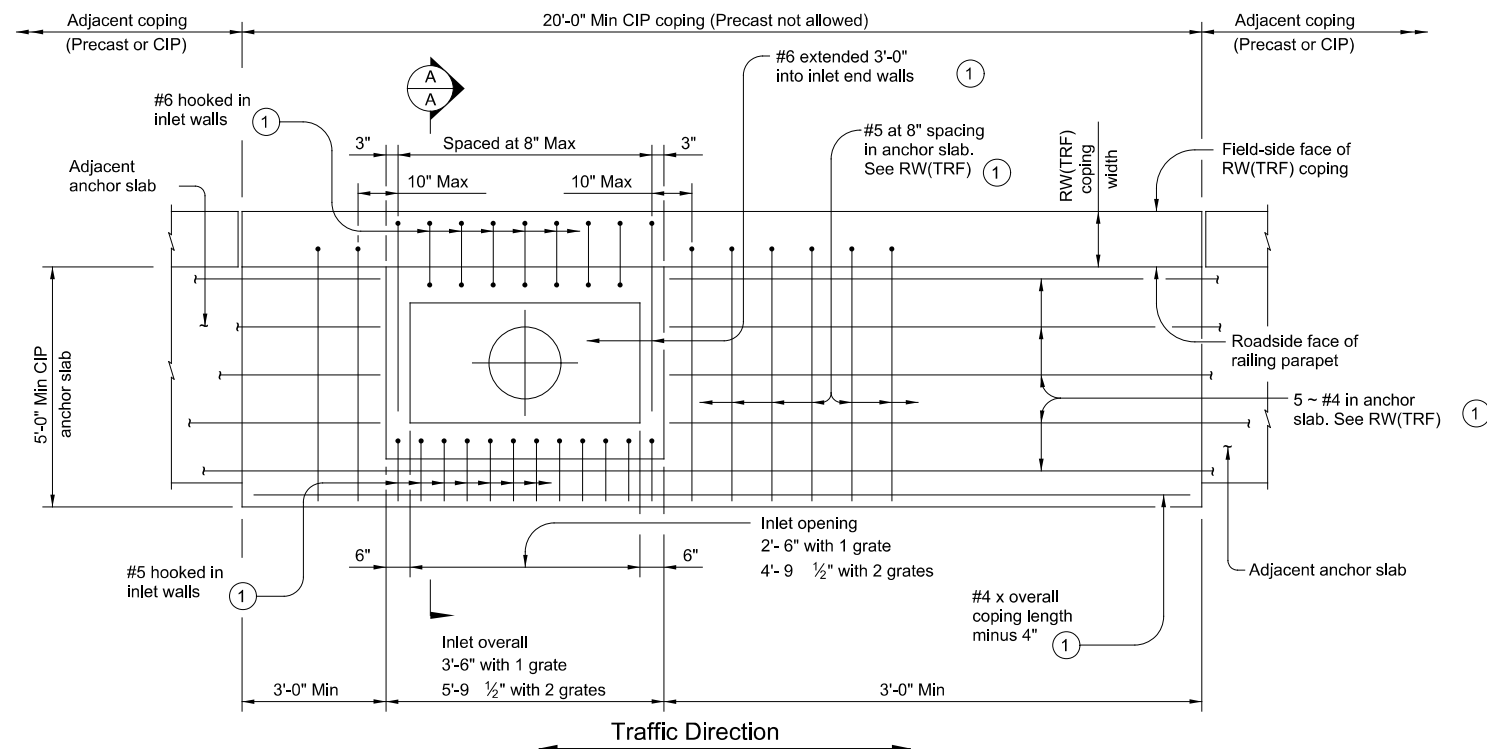
Cover dimensions are clear dimensions, unless noted otherwise.  
Reinforcing bar dimensions shown are out-to-out of bar.

				<b>Bridge Division Standard</b>	
<h2>RETAINING WALL TRAFFIC RAIL AT BASE</h2> <h3>RW(BTR)</h3>					
FILE: RW-BTR-22.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT	
©TxDOT June 2022	CONT	SECT	JOB	HIGHWAY	
REVISIONS	3510	04	055	SH 99	
	DIST	COUNTY		SHEET NO.	
	HOU	FORT BEND		168	

DATE:  
FILE:

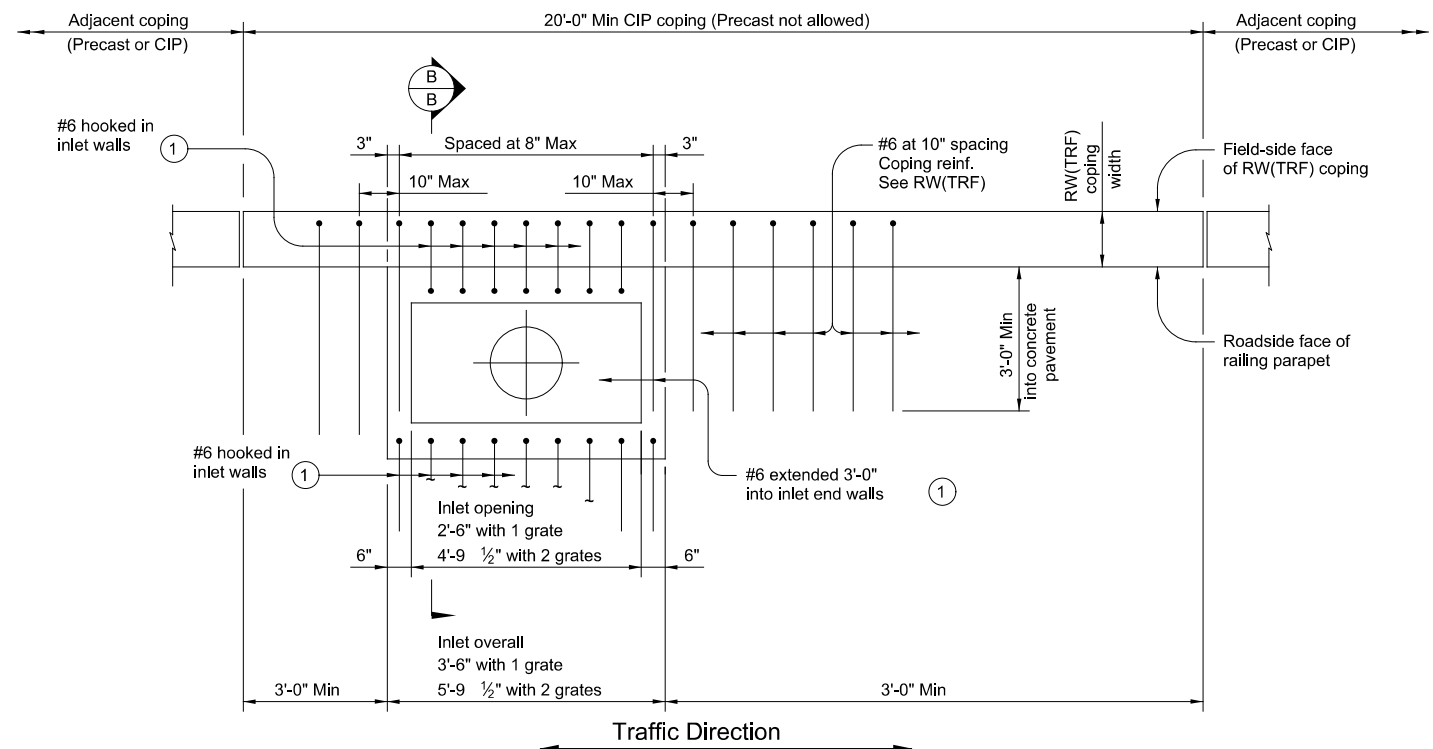
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

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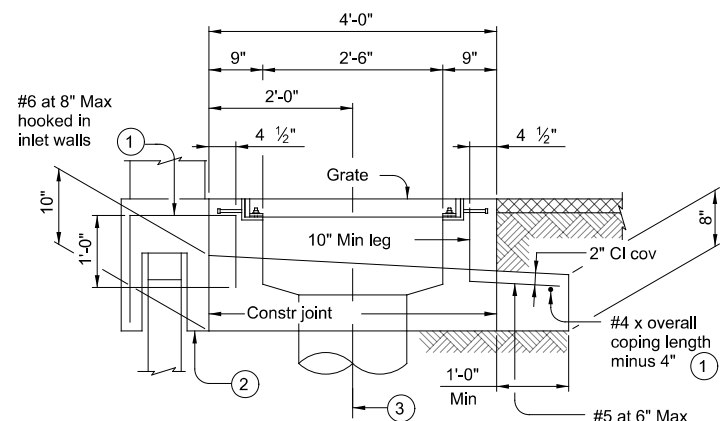
**PLAN WITH ANCHOR SLAB  
(ADJACENT TO ACP)**

(Frame and grate[s] not shown for clarity.)



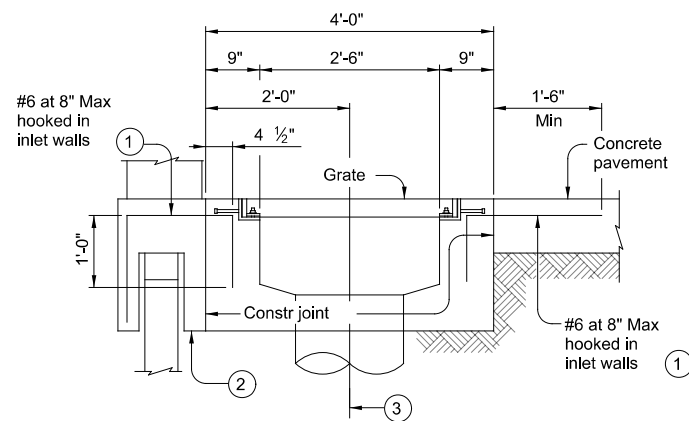
**PLAN WITHOUT ANCHOR SLAB  
(ADJACENT TO CONCRETE PAVEMENT)**

(Frame and grate[s] not shown for clarity.)



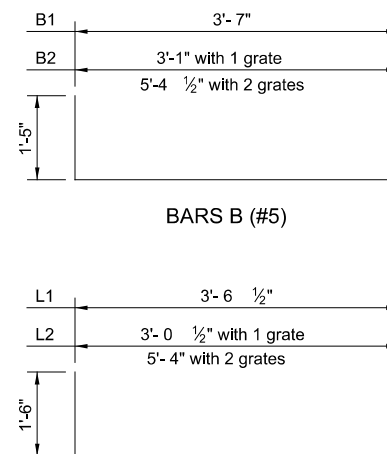
**SECTION A-A**

(Only showing reinforcement connecting inlet.)



**SECTION B-B**

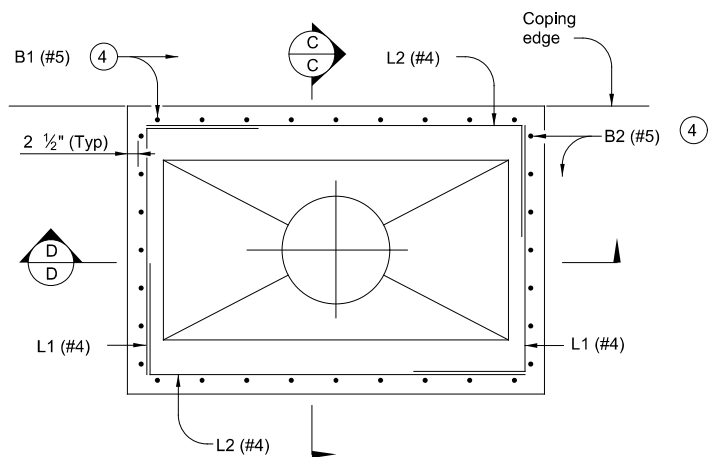
(Only showing reinforcement connecting inlet.)



**BARS B (#5)**

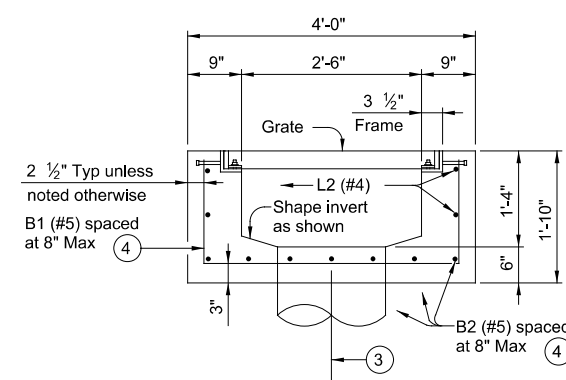
**BARS L (#4)**

- ① Reinforcement considered part of retaining wall coping and is subsidiary to Item 423, "Retaining Walls".
- ② Coping against inlet must extend to bottom of inlet or lower.
- ③ □ 12 inch diameter or 18 inch diameter pipe, straight drop. See details elsewhere for size and location.
- ④ Cut or bend to clear pipe.

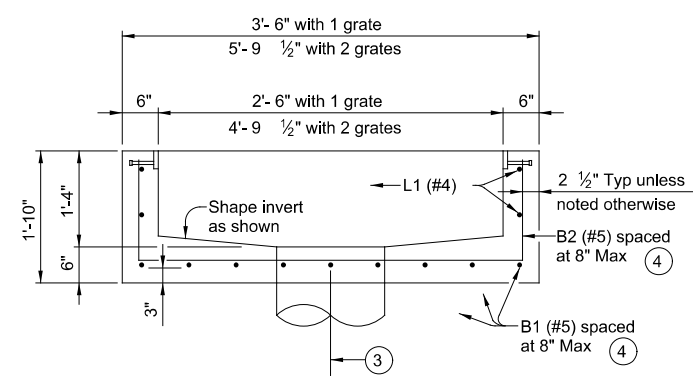


**PLAN OF INLET**

(Showing inlet reinforcing.)



**SECTION C-C**



**SECTION D-D**

HL93 LOADING

SHEET 1 OF 2



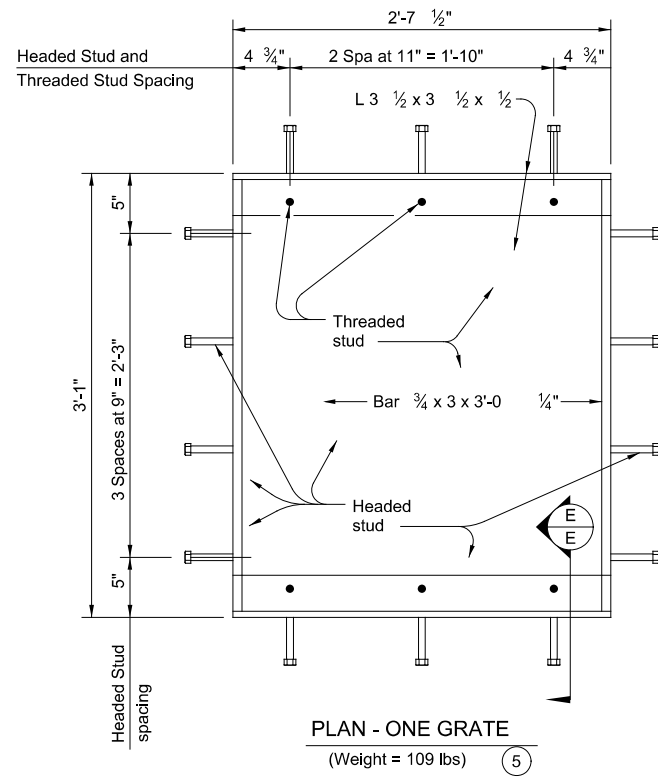
**ROADWAY INLET  
FOR MSE RETAINING WALL  
TRAFFIC RAIL FOUNDATION**

**RW(RI)**

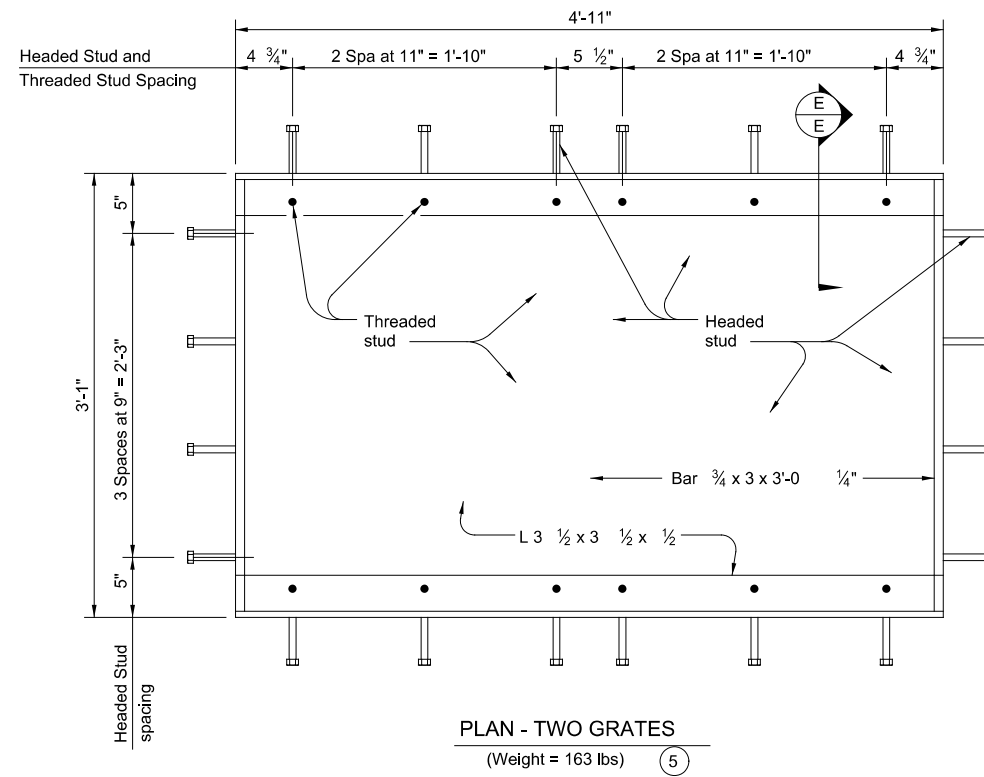
FILE: RW-RI-22.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
REVISIONS	CONT	SECT	JOB	HIGHWAY
	3510	04	055	SH 99
	DIST	COUNTY	SHEET NO.	
	HOU	FORT BEND	169	

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DATE: FILE:



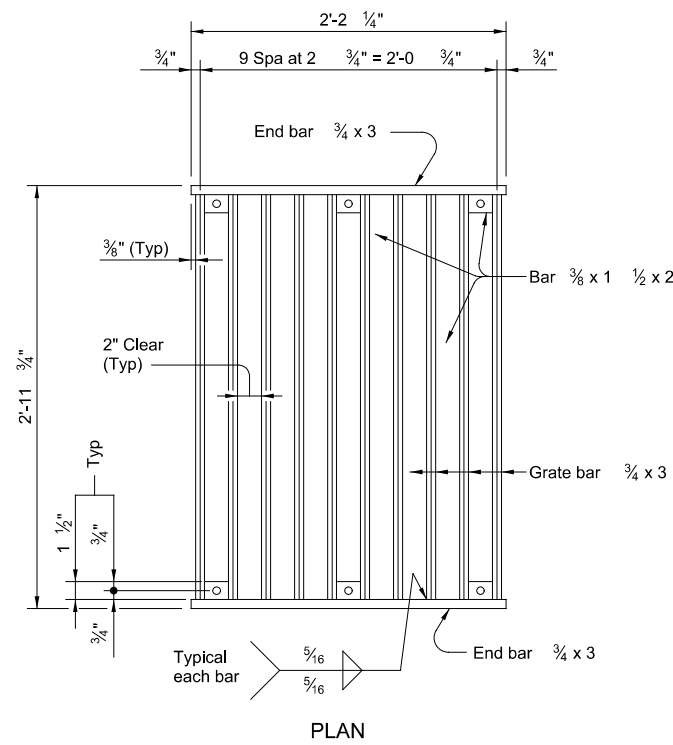
PLAN - ONE GRATE  
(Weight = 109 lbs) (5)



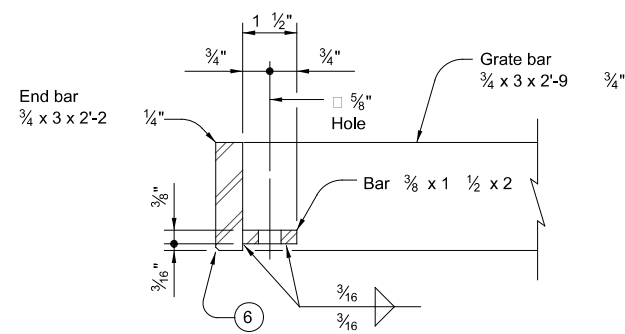
PLAN - TWO GRATES  
(Weight = 163 lbs) (5)

**FRAME DETAILS**

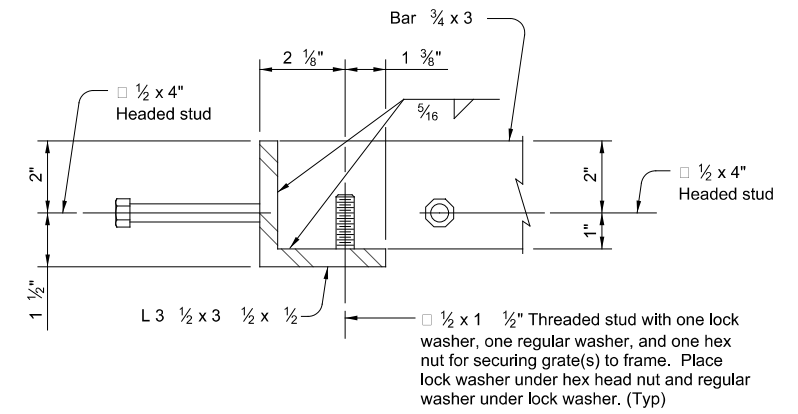
- (5) Weight provided for Contractor's information only.
- (6) Chamfer end bar as necessary to eliminate conflict with fillet on frame angles.



GRATE DETAILS  
(Weight of one grate = 251 lbs) (5)



SECTION THROUGH END



SECTION E-E

**FABRICATION NOTES:**

Assemble grate in shop to ensure fit in field.  
Electric-arc end weld all headed and threaded studs to frame with complete fusion.

**MATERIAL NOTES:**

Provide Class C concrete (f'c = 3,600 psi.)  
Provide Grade 60 reinforcing steel.  
Provide A572 Grade 50 or A709 Grade 50 steel for grate and frame.  
Galvanize grate, frame, nuts, and washers in accordance with Item 445, "Galvanizing."

**GENERAL NOTES:**

Designed in accordance with AASHTO LRFD Bridge Design Specifications.  
The inlets shown are intended for use as roadway inlets adjacent to traffic rail foundations placed on mechanically stabilized earth (MSE) retaining walls. See Retaining Wall Traffic Railing Foundations (RW/TRF) standard for details not shown.  
These details must be used in conjunction with the RW/TRF standard to develop specific details for submission with the shop drawings. The steel reinforcement shown is specifically for roadway inlet.  
Payment for inlets shown on this standard, including frame and grates, will be in accordance with Item 465, "Junction Boxes, Manholes, and Inlets" by the following types:  
Inlet (Complete) (Type MSE1) for one grate inlets  
Inlet (Complete) (Type MSE2) for two grate inlets

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

HL93 LOADING

SHEET 2 OF 2

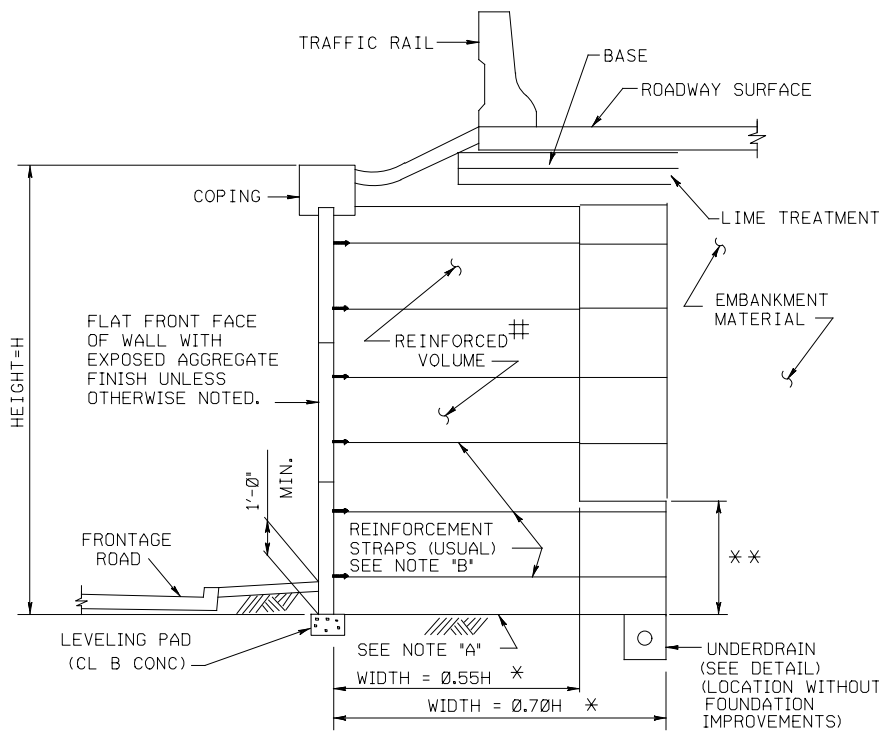


**ROADWAY INLET  
FOR MSE RETAINING WALL  
TRAFFIC RAIL FOUNDATION**

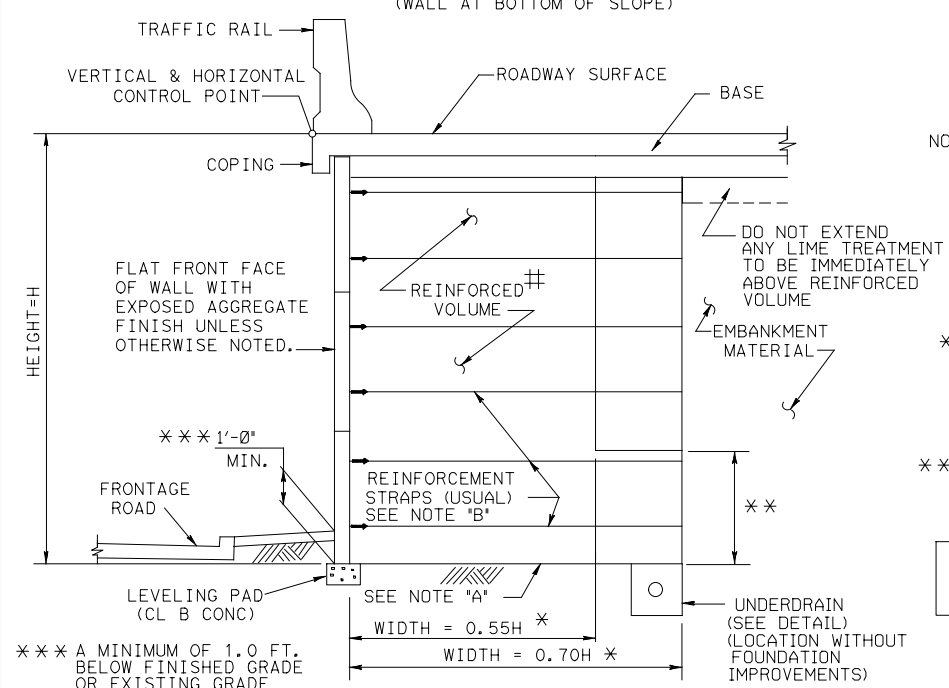
RW(RI)

FILE: RW-RI-22.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT June 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	3510	04	055	SH 99
DIST	COUNTY	SHEET NO.		
HOU	FORT BEND	170		



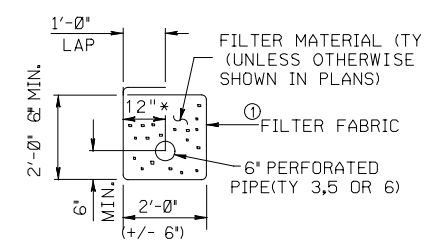


TYPICAL SECTION  
(WALL AT BOTTOM OF SLOPE)

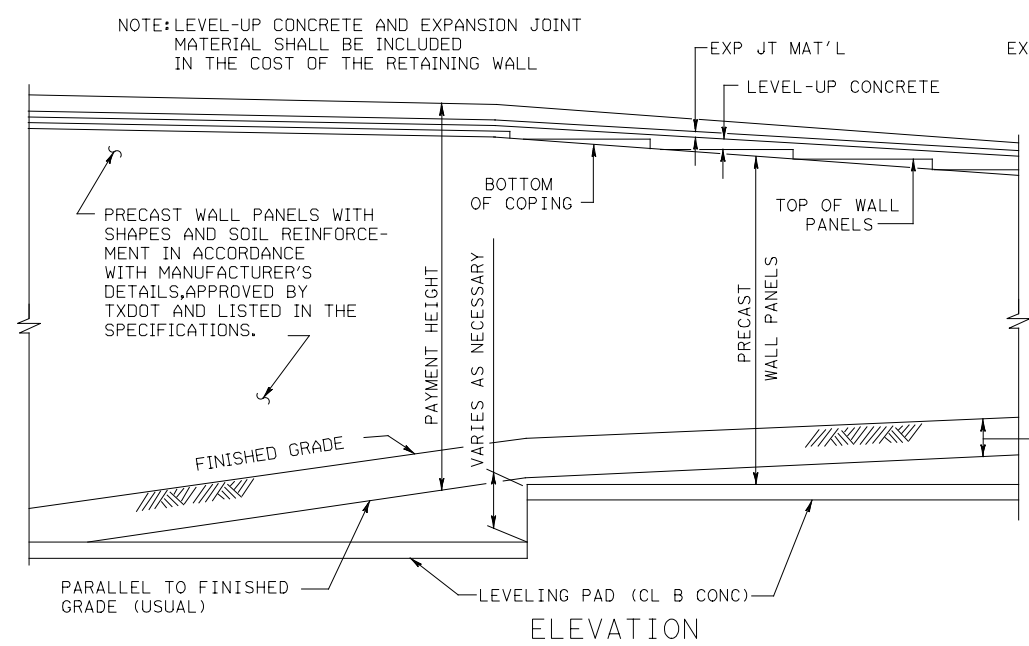


TYPICAL SECTION  
(SHOWING ROADWAY ON WALL)

① FILTER FABRIC MEETING THE REQUIREMENTS OF DMS-6200 TYPE 1.



UNDERDRAIN DETAIL



ELEVATION

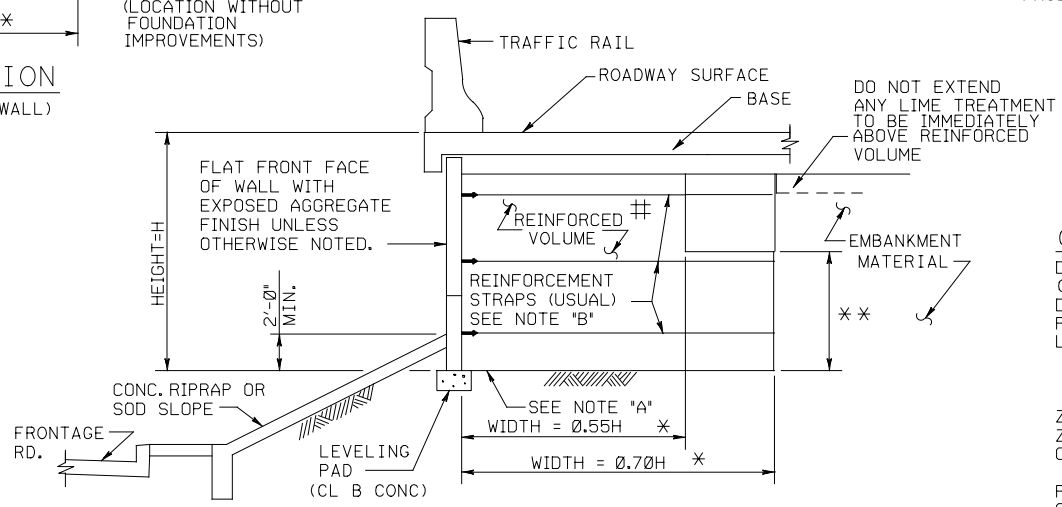
NOTE 'A': COMPACT THE SOIL UNDER THE LEVELING PAD AND THE REINFORCED VOLUME INCLUDING A MINIMUM OF TWO (2) FEET IN FRONT OF THE LEVELING PAD TO A MINIMUM OF 98% OF THE MAXIMUM DRY DENSITY, AS PRESENTED IN TEST METHOD TEX-114-E. THE DENSITY TESTING OF THE SOIL WILL BE OUTLINED IN TEST METHOD TEX-115-E. 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.'

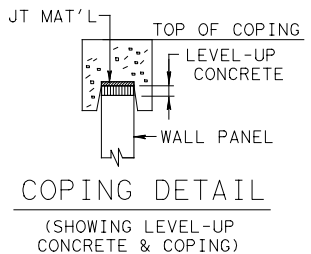
\* THE CONTRACTOR HAS THE OPTION OF PROVIDING A REINFORCED VOLUME WITH TWO DIFFERENT WIDTHS (0.55H BUT NOT LESS THAN SIX FEET AND 0.70H BUT NOT LESS THAN EIGHT FEET), OR WITH A CONSTANT WIDTH EQUAL TO 0.70H BUT NOT LESS THAN EIGHT FEET AS SHOWN.

\*\* 3 IN. MINIMUM ABOVE THE SECOND COURSE OF SOIL REINFORCEMENTS, BUT NO LESS THAN 4 FEET.

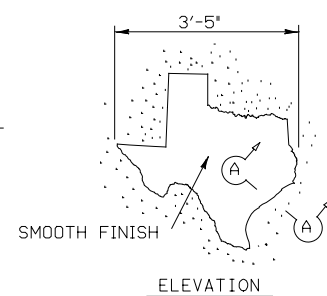
⊞ CEMENT STABILIZED BACKFILL REINFORCED VOLUME TO BE PAID AS ITEM 132-6006 EMBANKMENT (FINAL) (DENS CONT) (TY C)



TYPICAL SECTION  
(WALL AT TOP OF SLOPE)

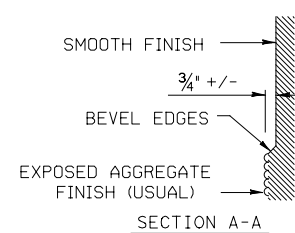


COPING DETAIL  
(SHOWING LEVEL-UP CONCRETE & COPING)

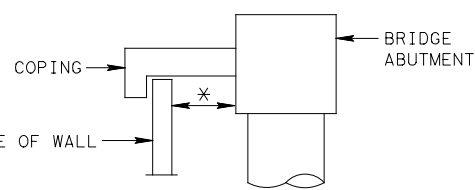


MAP OF TEXAS EMBLEM

(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)

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 φ 30°C = 0 PSF KA = 0.333
CEMENT STABILIZED BACKFILL	UNIT WEIGHT = 125 PCF φ 45°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.

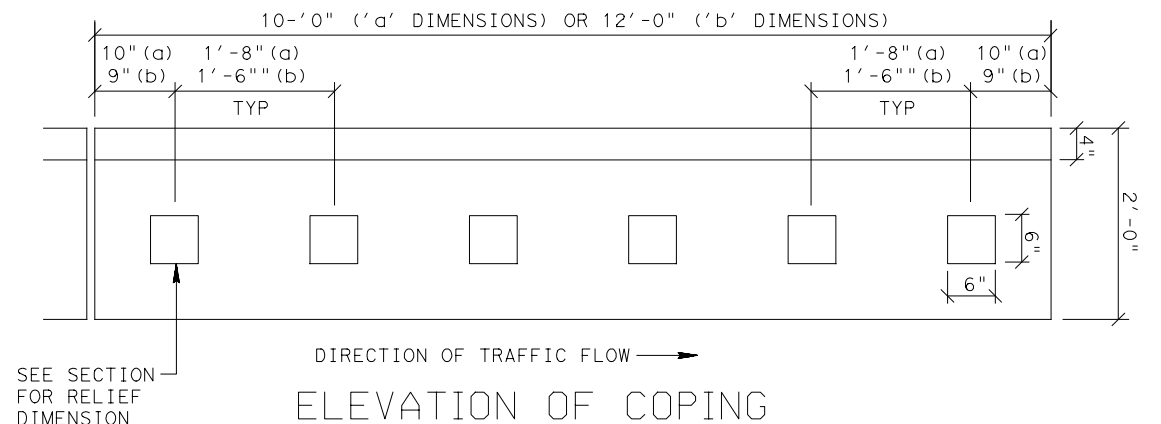
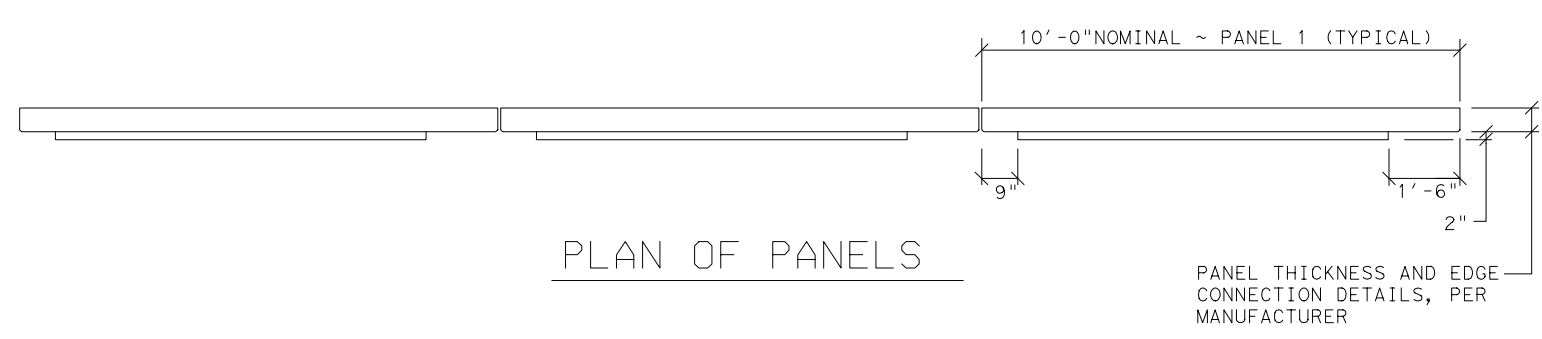
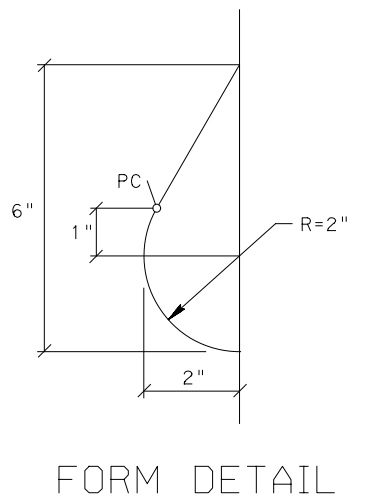
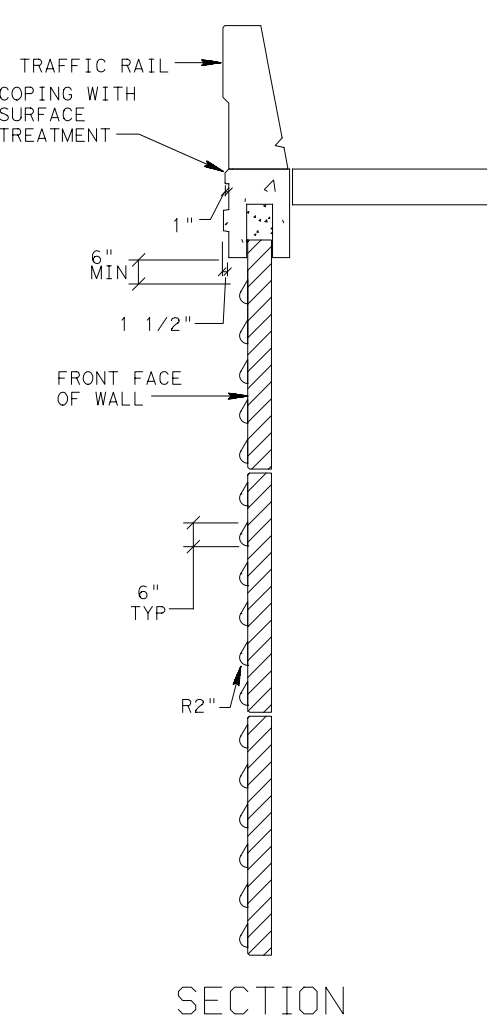
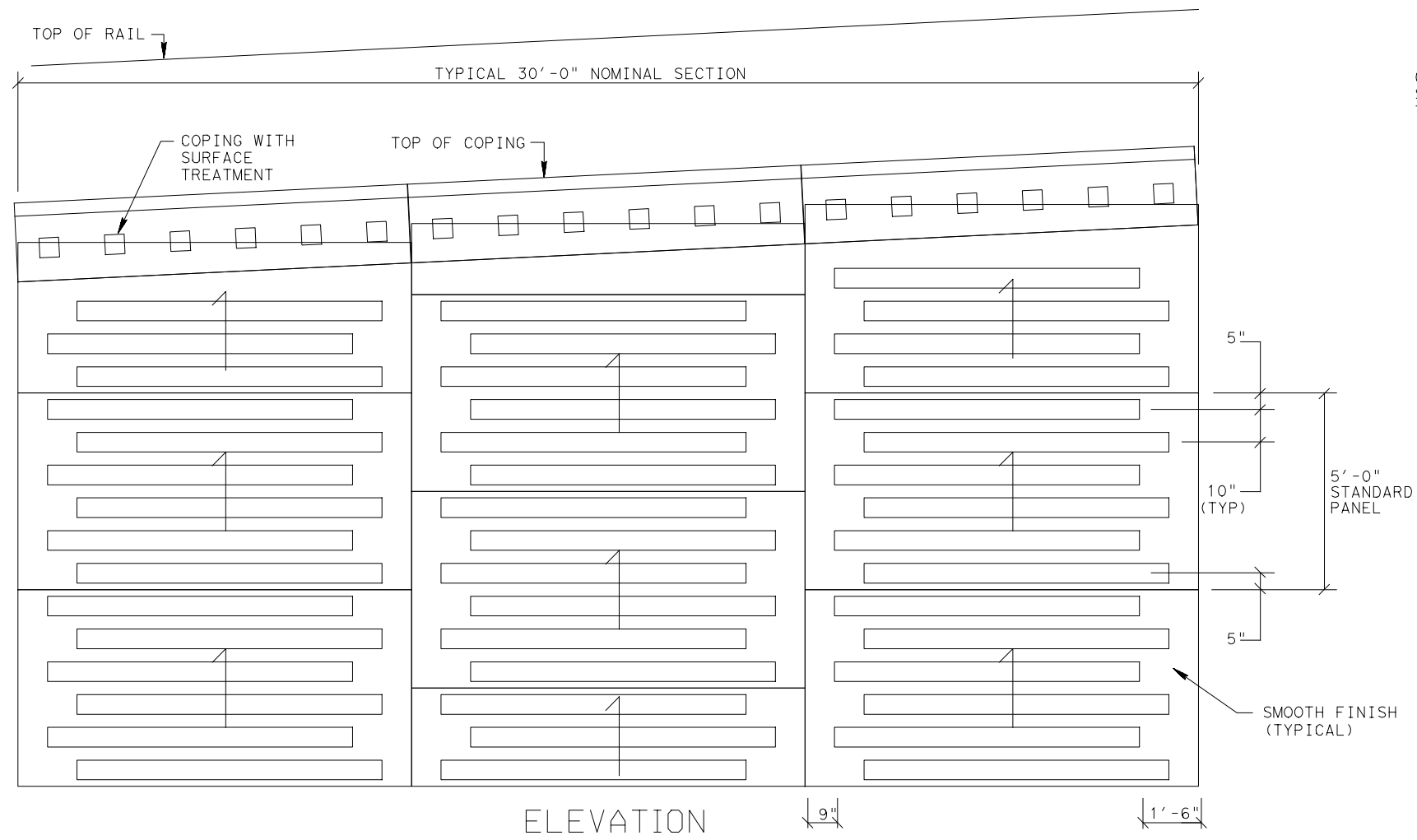
PROVIDE A FACTOR OF SAFETY AGAINST PULLOUT OF THE EARTH REINFORCEMENTS OF GREATER THAN OR EQUAL TO 1.5 AT EACH LEVEL. DETERMINE PULLOUT RESISTANCE FROM TEST DATA EVALUATED AT 3/4 INCH STRAIN.



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		172
	COUNTY	CONTROL	SECT	JOB
	FORT BEND	3510	04	055
				SH 99



- 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 FRACTURED GRANITE FORM LINER FOR APPROVAL PRIOR TO MANUFACTURING RETAINING WALL PANELS.

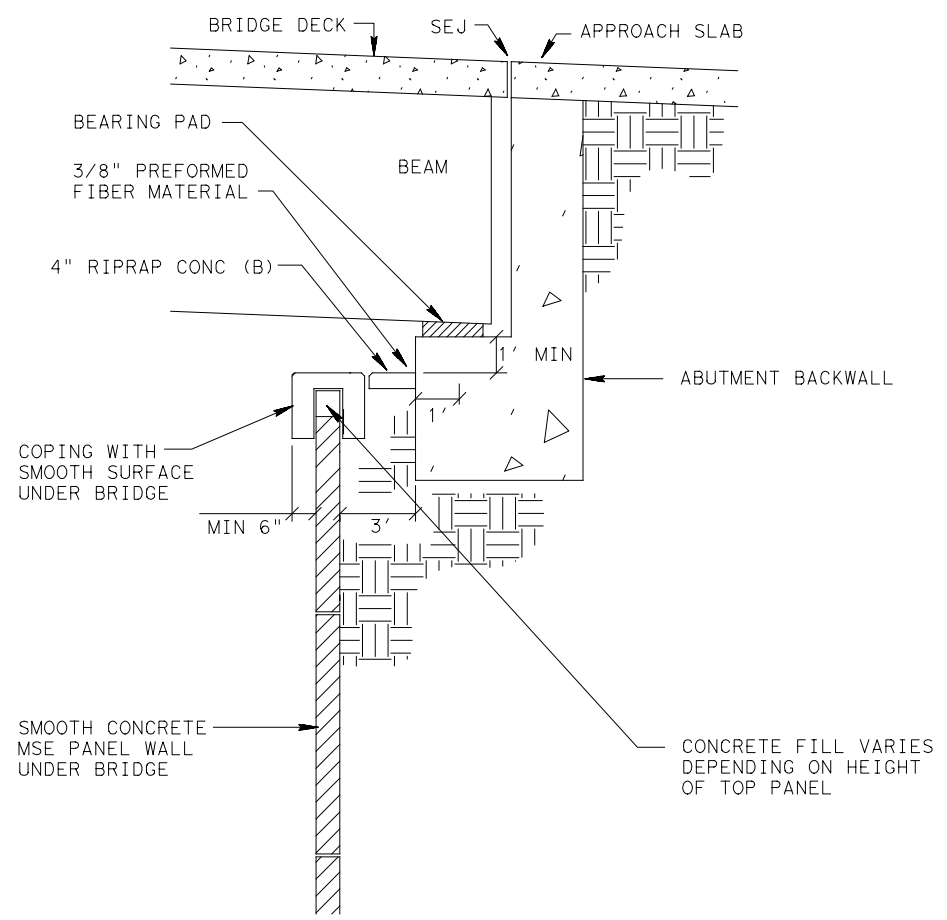
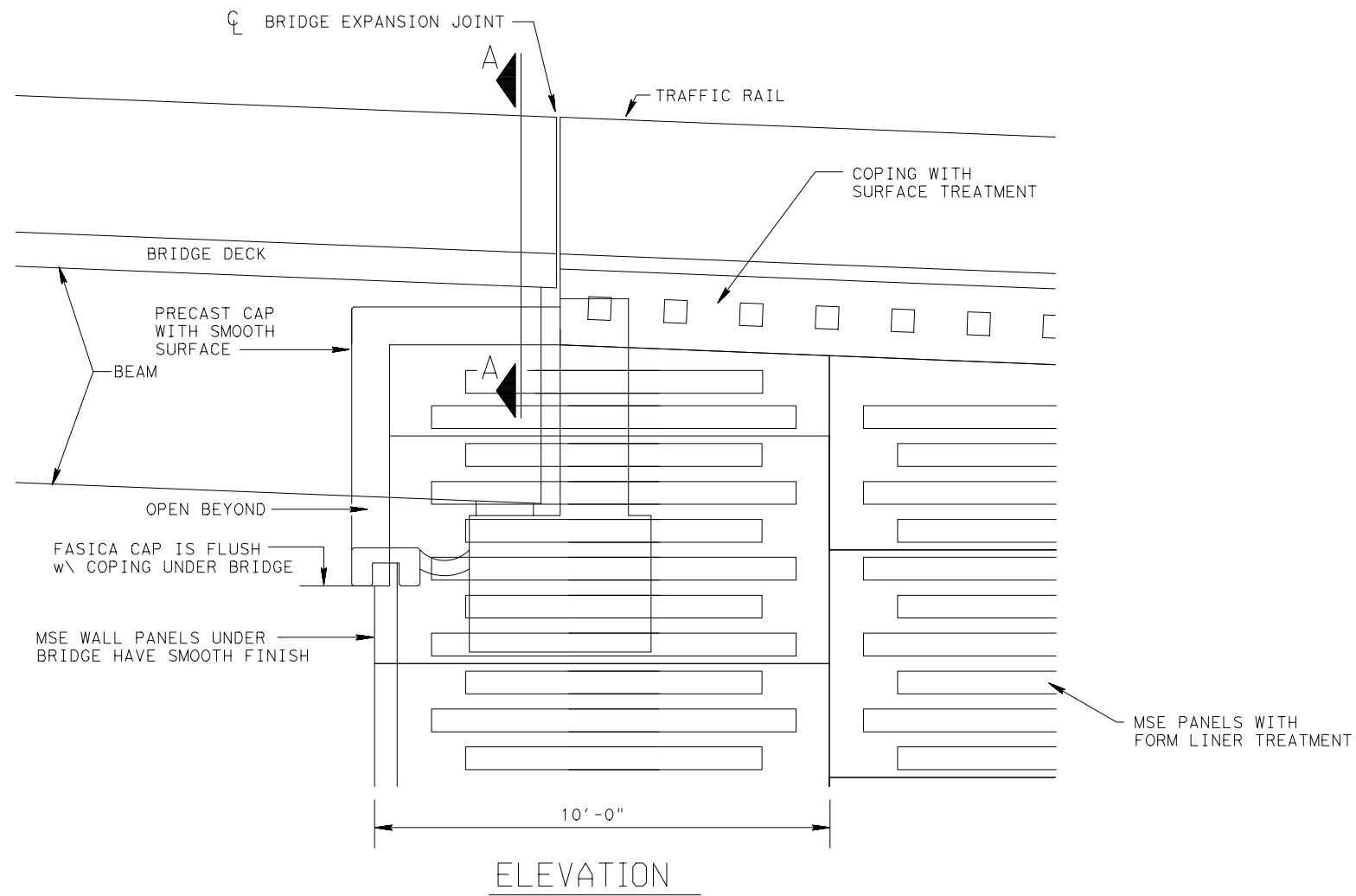
NOT TO SCALE

Texas Department of Transportation  
Houston District Bridge  
Green Ribbon Project

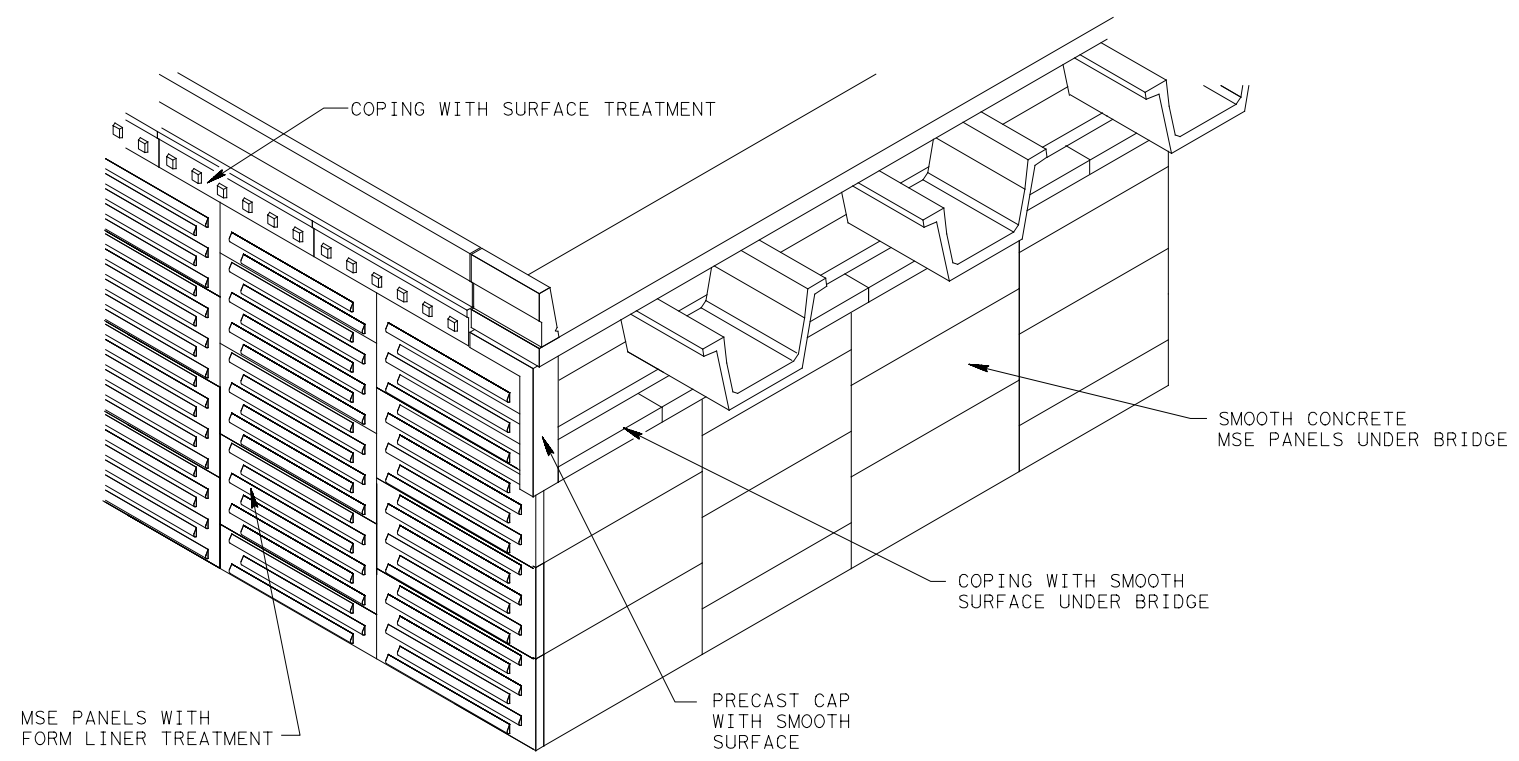
RETAINING WALL DETAILS  
HORIZONTAL SCHEME

RWD-HS SHEET 1 OF 3

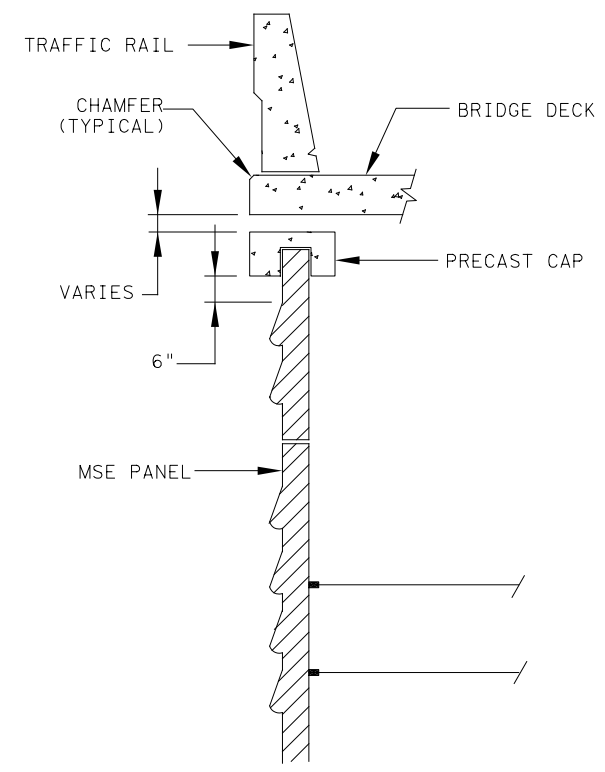
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© TxDOT	DEC 2005	DISTRICT	FED REG	PROJECT NO.	SHEET
REVISIONS		HOUSTON	6		173
		COUNTY	CONTROL	SECT	JOB
		FORT BEND	3510	04	055 SH 99



TYPICAL WALL SECTION @ ABUTMENT



HORIZONTAL SCHEME: MSE Retaining Wall w/ Vertical Front Face



SECTION A-A

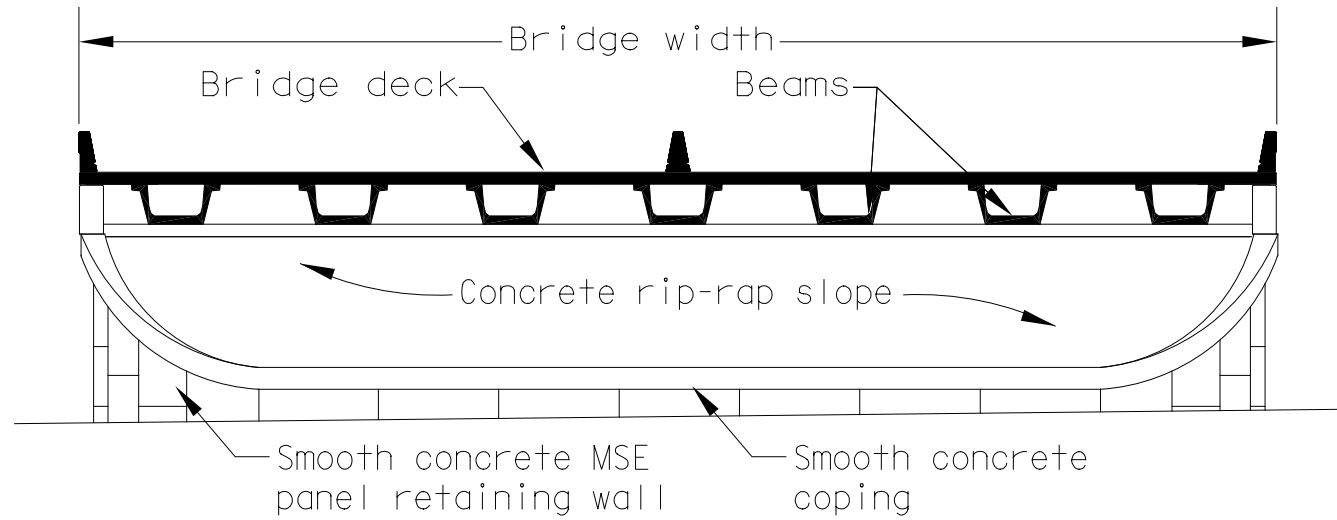
NOT TO SCALE

Texas Department of Transportation  
Houston District Bridge  
Green Ribbon Project

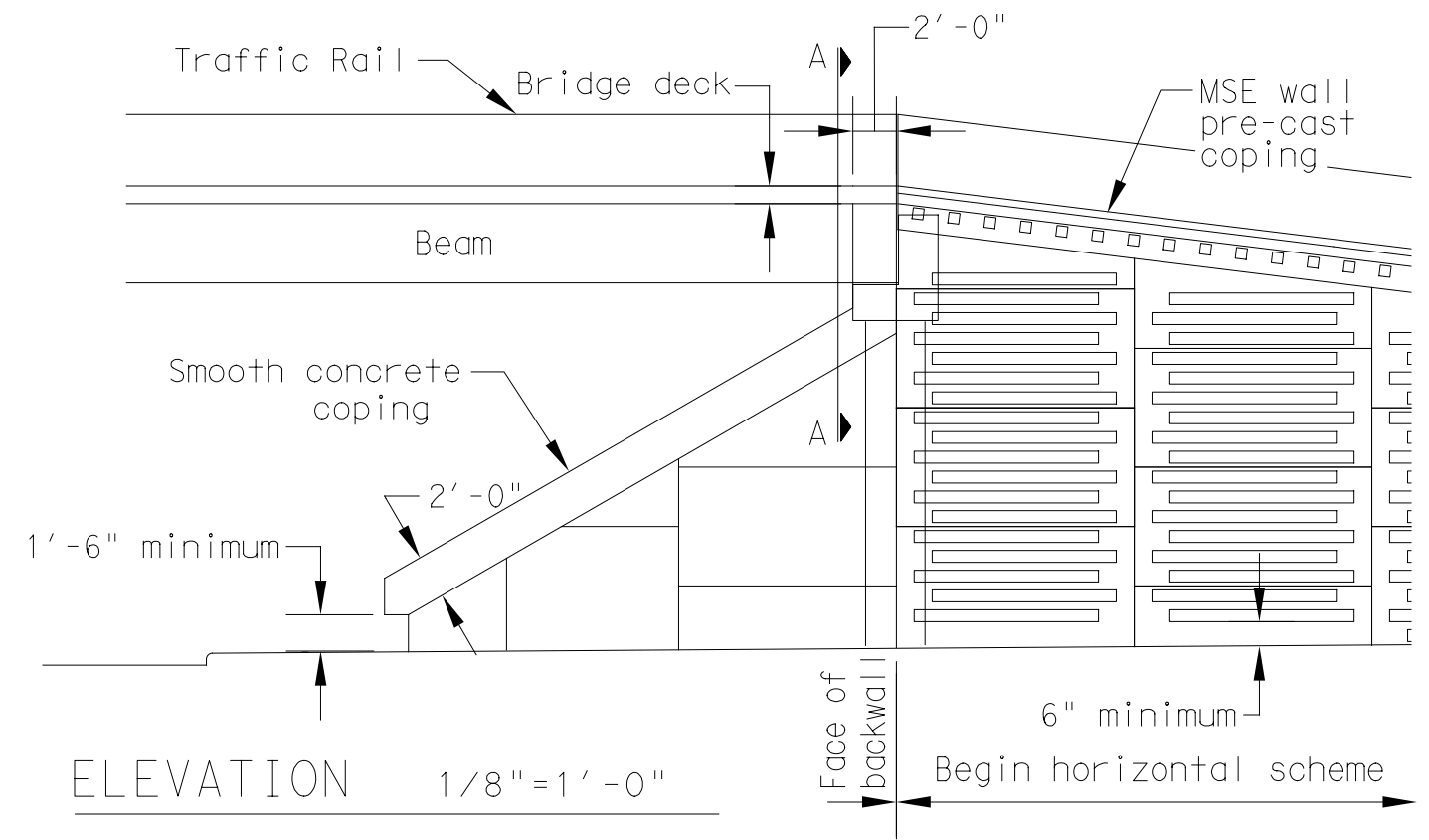
RETAINING WALL DETAILS  
HORIZONTAL SCHEME

RWD-HS SHEET 2 OF 3

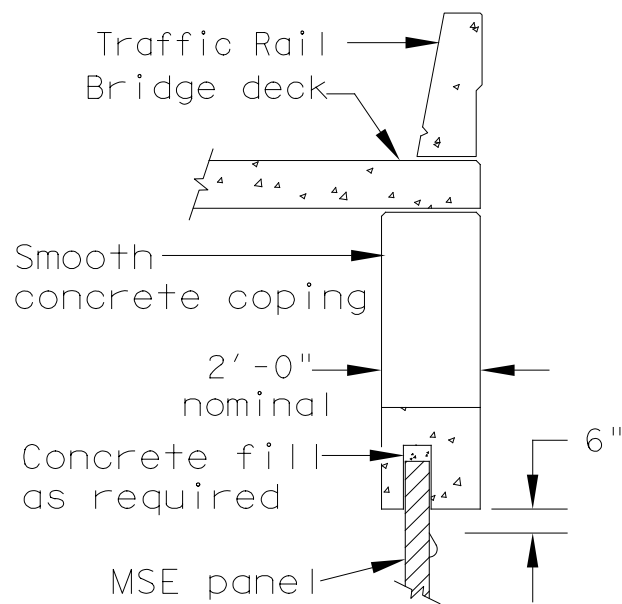
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REVISIONS	HOUSTON	6			SHEET
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	FORT BEND	3510	04	055	SH 99



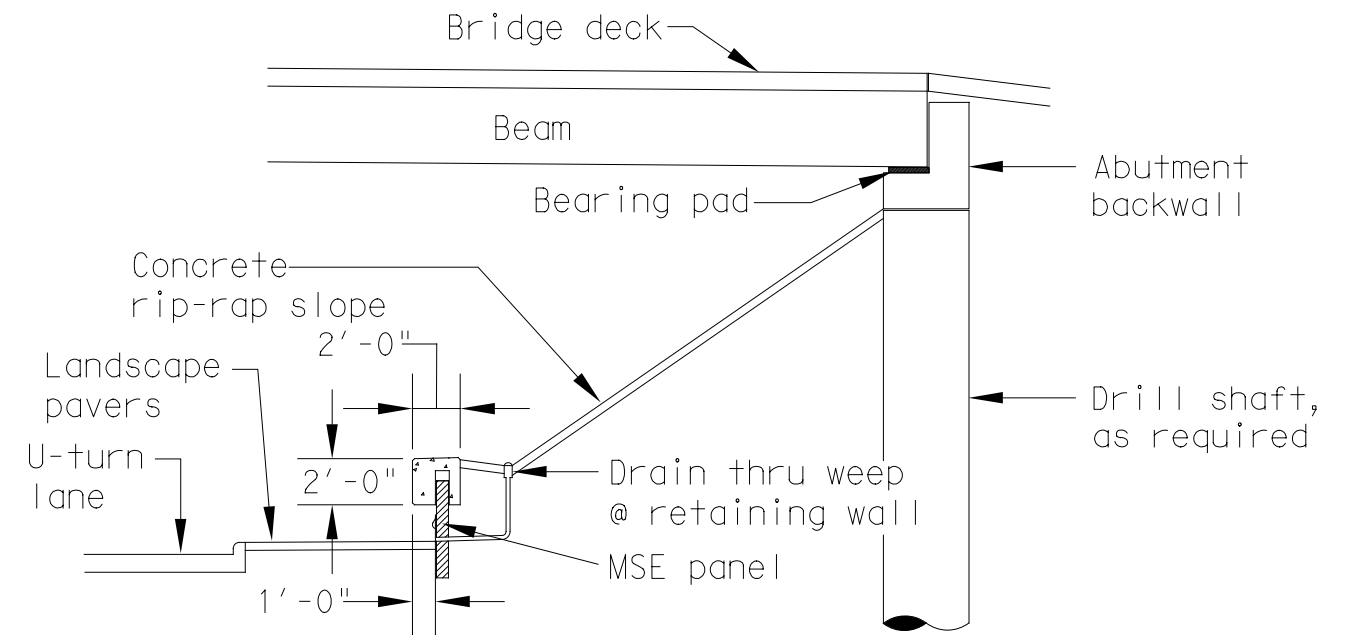
ELEVATION 1/16" = 1'-0"



ELEVATION 1/8" = 1'-0"



SECTION A-A 1/4" = 1'-0"



SECTION 1/8" = 1'-0"

HORIZONTAL SCHEME: MSE Retaining Wall w/ Sloped Rip Rap

Texas Department of Transportation  
Houston District Bridge  
Green Ribbon Project

RETAINING WALL DETAILS  
HORIZONTAL SCHEME

RWD-HS SHEET 3 OF 3

FILE: STDJ2.DGN	DWG:	CK:	DW:	CK:
© TXDOT DEC 2005	DISTRICT	FED REG	PROJECT NO.	SHEET
REVISIONS	HOUSTON	6		175
	COUNTY	CONTROL	SECT	JOB
	FORT BEND	3510	04	055 SH 99



DRILLED SHAFT DESIGN		
WALL HEIGHT	DRILLED SHAFT	
	DIAMETER	LENGTH
16'	30"	30'

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 AS SHOWN WITH SMOOTH CONCRETE FINISH. PROVIDE FORMLINERS USED FOR PATTERN MADE OF ONE PIECE CONSTRUCTION. JOINTS ARE NOT BE PERMITTED IN FORMLINERS.

SEE SHEET 3 OF 3, SOUND WALL DETAILS, OR AS DIRECTED FOR PAINT COLOR ON RESIDENTIAL AND FREEWAY SIDES.

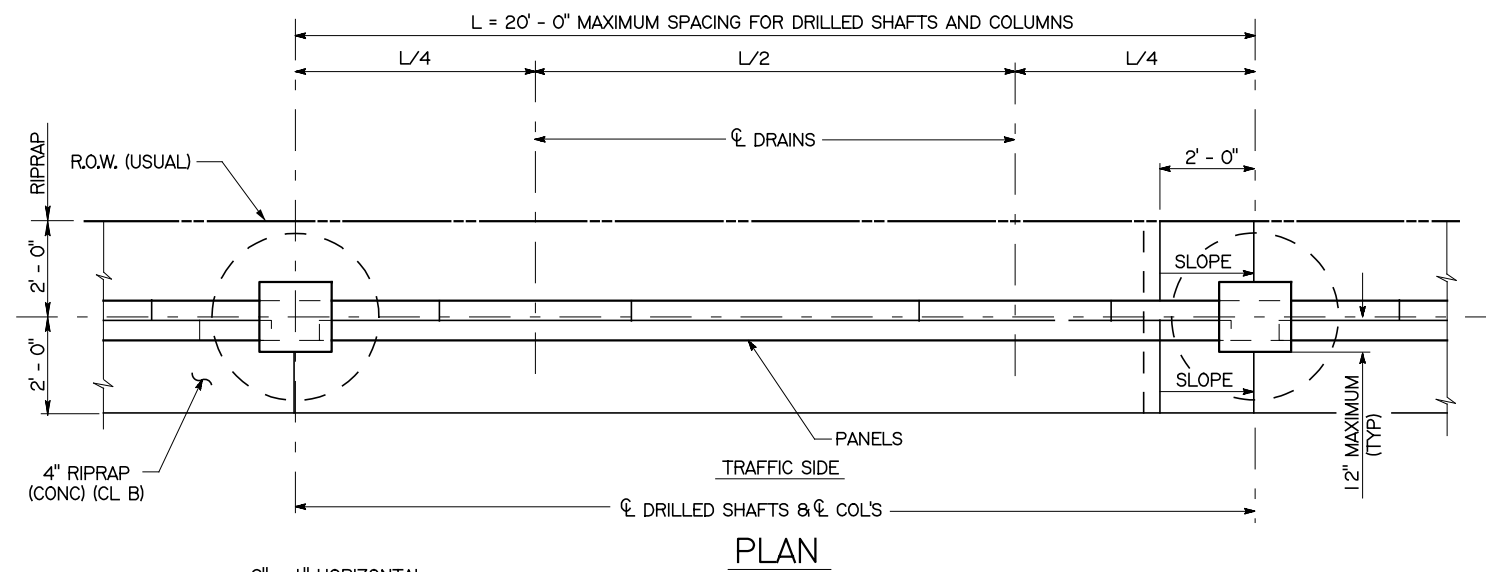
**PRECAST CONCRETE SEGMENTS**  
PRECAST SEGMENTS MAY BE CAST FULL HEIGHT. THE WALL MAY BE CAST MONOLITHICALLY WITH THE COLUMN. GROUT SEGMENTALLY PRECAST COLUMN JOINTS SMOOTH.

**STRUCTURAL STEEL**  
GALVANIZE EXPOSED STEEL PARTS IN ACCORDANCE WITH THE ITEM "GALVANIZING". PAINT GALVANIZED STEEL PER ITEM 446. GALVANIZED ANCHOR BOLTS MAY REMAIN UNPAINTED.

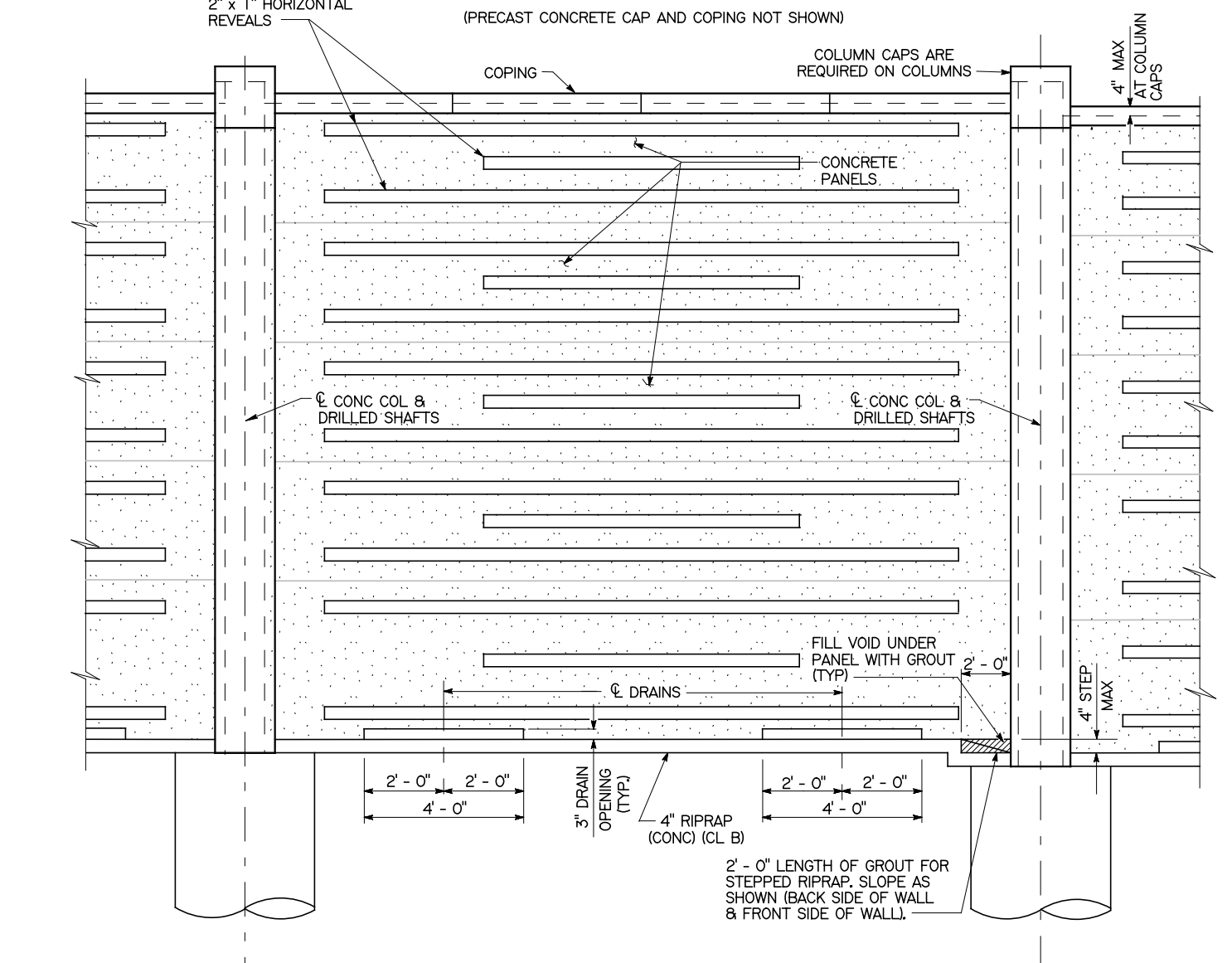
**LOADING**  
DESIGN THE SOUND WALL TO WITHSTAND A MINIMUM WIND SPEED OF 100 MILES PER HOUR AND FOR EXPOSURE B2.

**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.

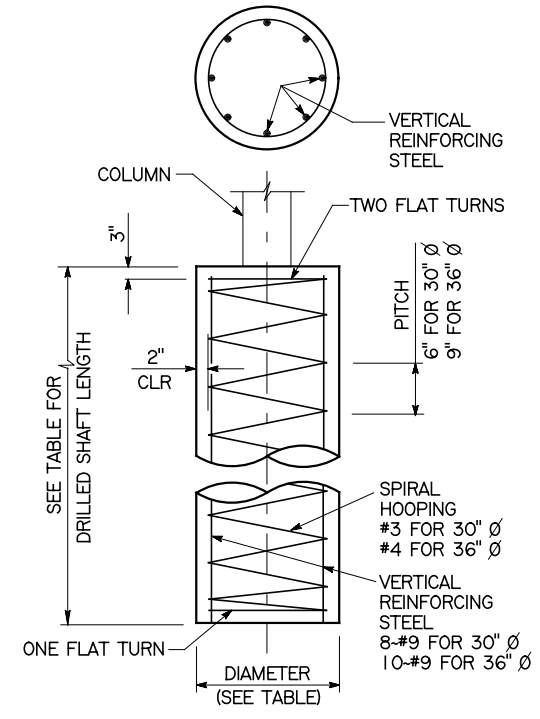


PLAN

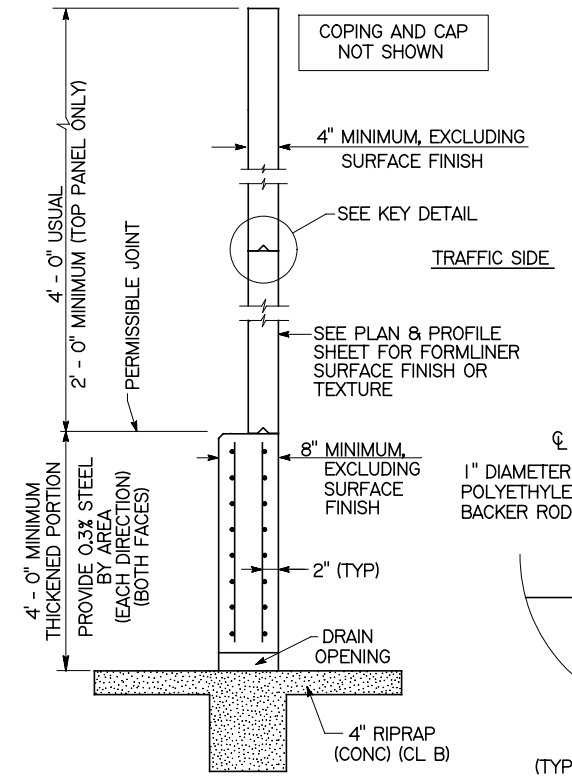


ELEVATION

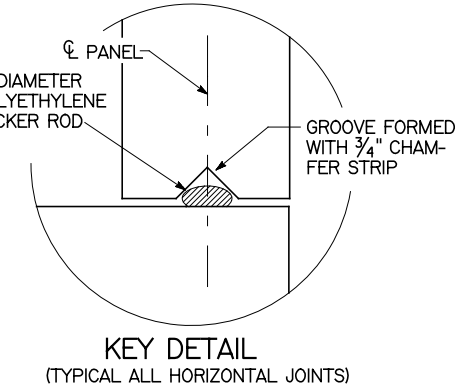
(SHOWN FOR SLOPING OR UNEVEN TERRAIN)



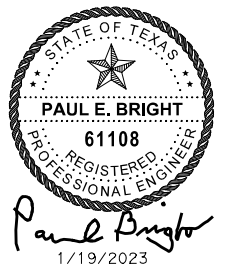
DRILLED SHAFT DETAIL



TYPICAL SECTION



KEY DETAIL

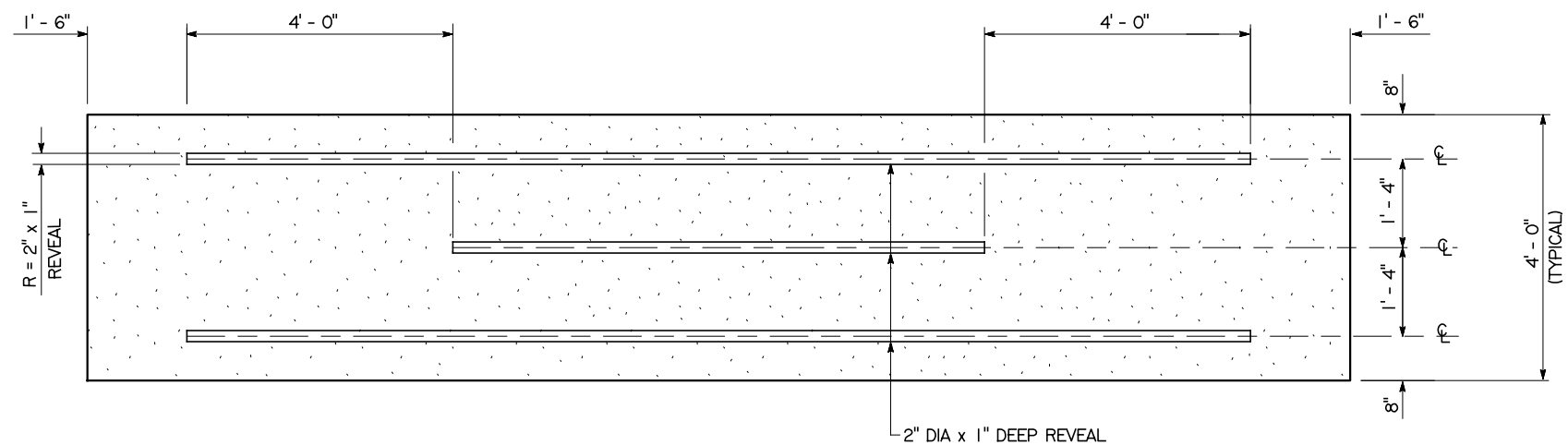


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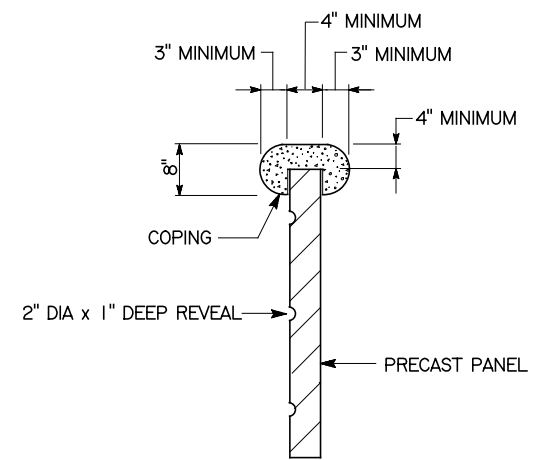
SOUND WALL DETAILS  
HORIZONTAL SCHEME

SWD-HS

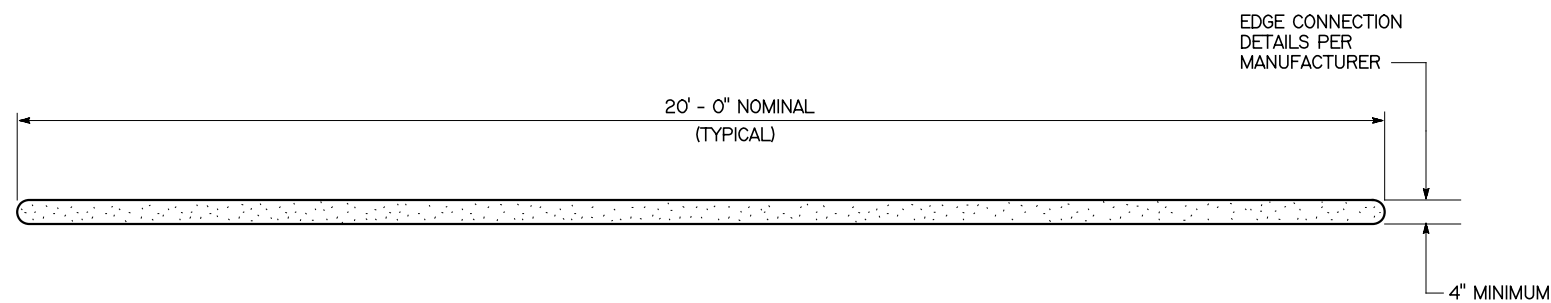
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© TxDOT DEC 2010	DISTRICT: HOUSTON	FED REG: 6	PROJECT NO.	SHEET: 176
REVISIONS 12/2010 Update bottom panel steel requirements. 8/2014 Usual added to ROW. 8/2017 Removed Minn'l Hand Blend.	COUNTY: FORT BEND	CONTROL: 3510	SECT: 04	JOB: 055 HIGHWAY: SH 99



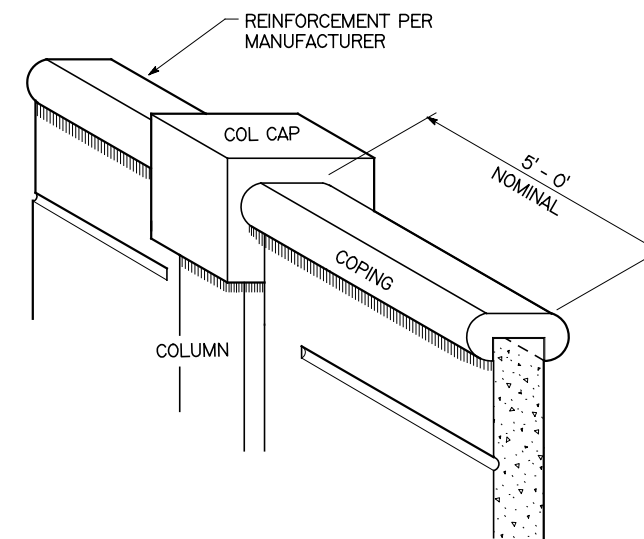
ELEVATION



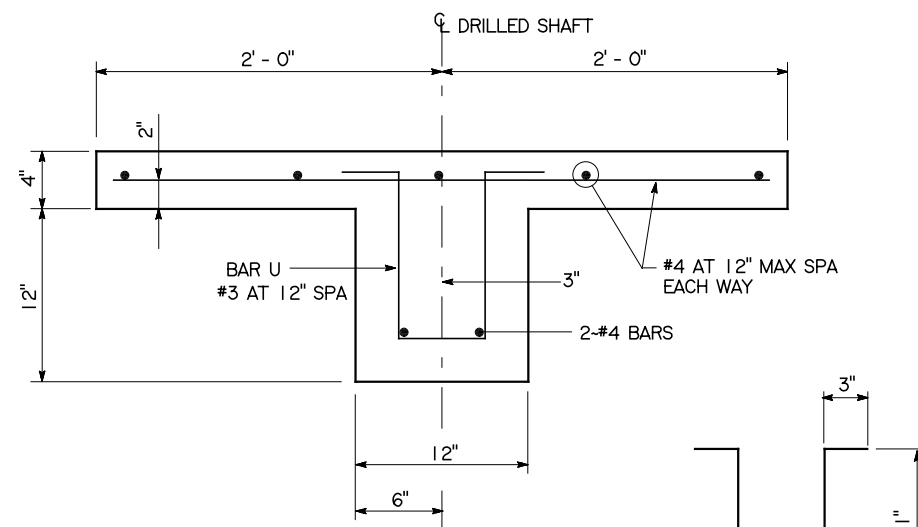
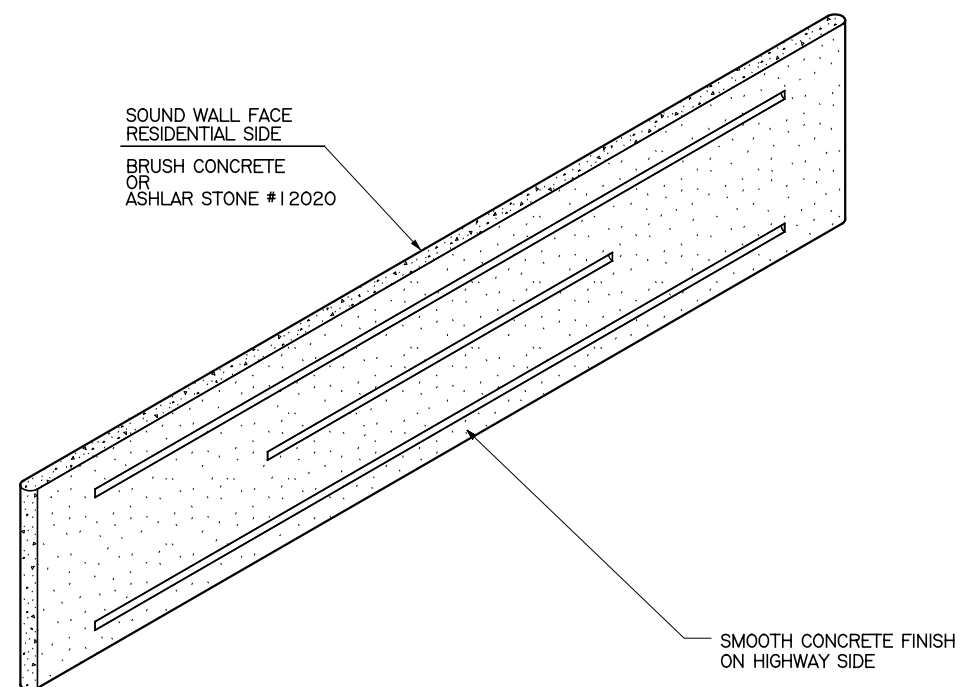
SECTION



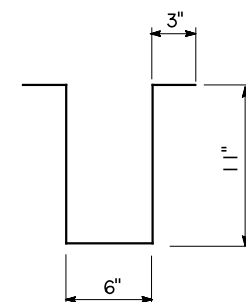
PLAN



PRECAST CONCRETE COPING  
N. T. S.



RIPRAP DETAIL

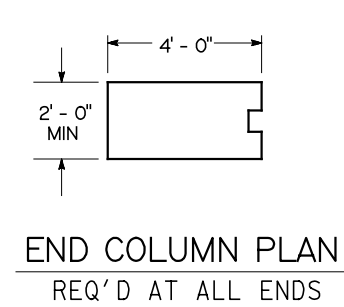
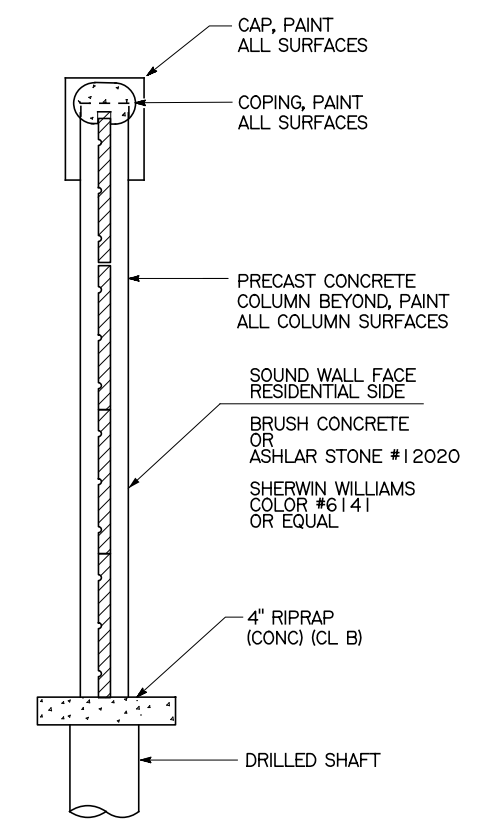
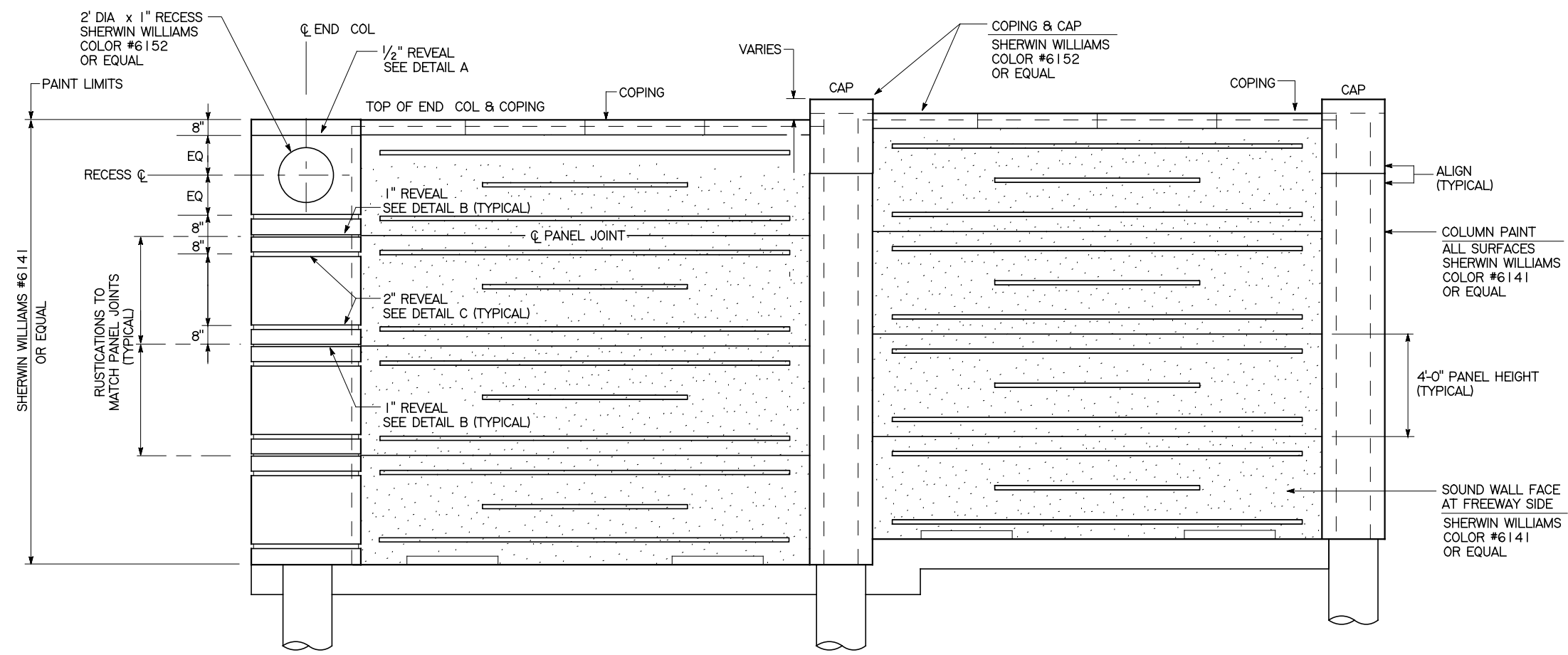


BAR U

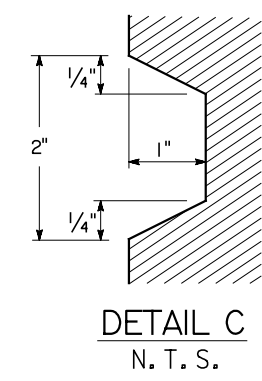
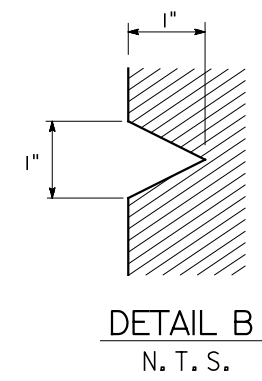
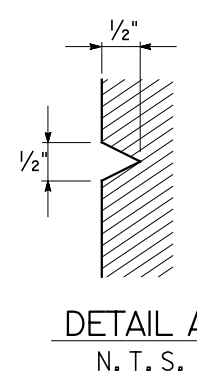
SOUND WALL DETAILS  
HORIZONTAL SCHEME

SWD-HS

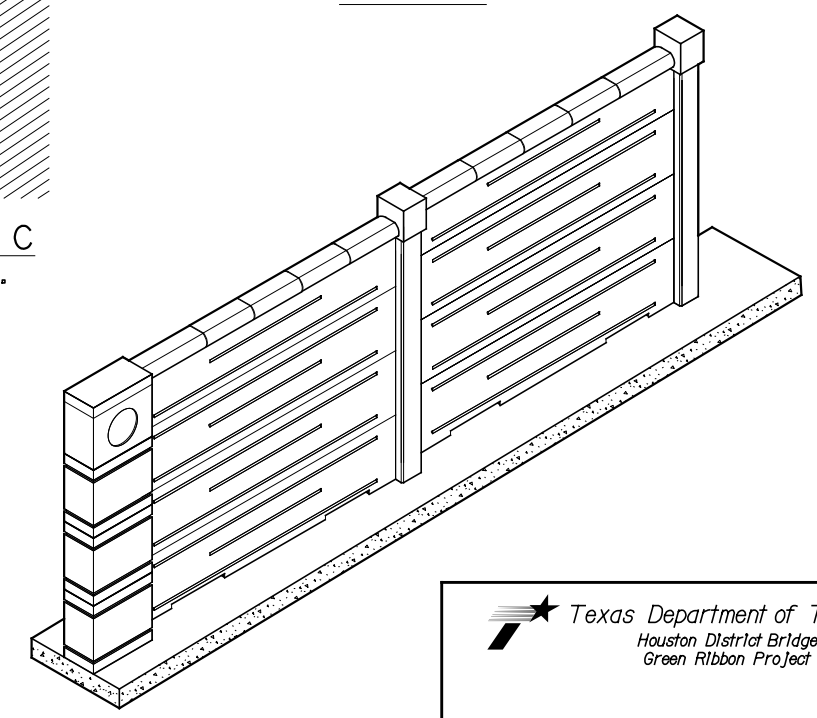
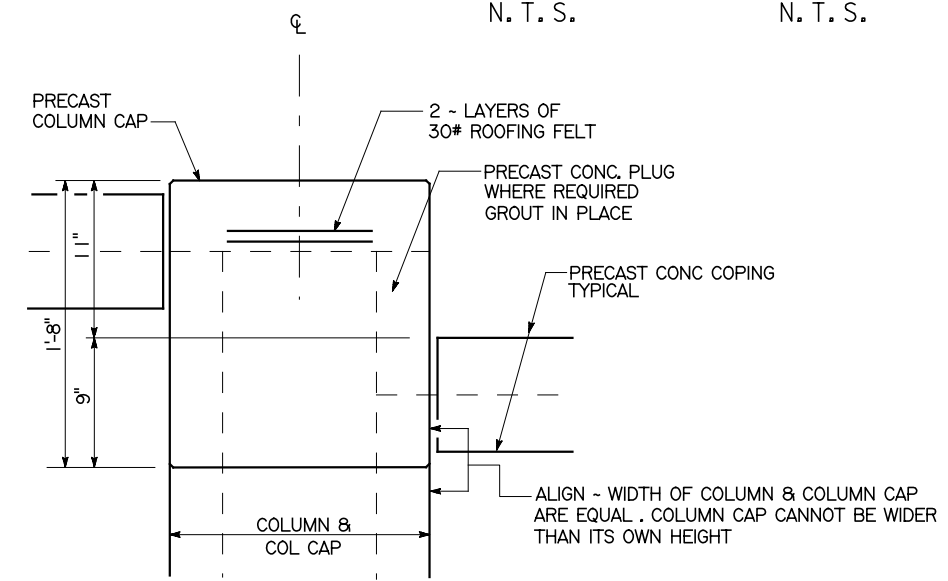
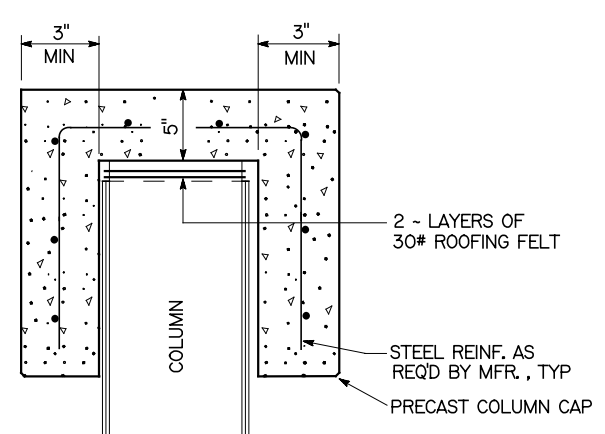
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© TxDOT DEC 2010	DISTRICT	FED REG	PROJECT NO.	SHEET
12/2010 Update bottom panel steel requirements.	HOUSTON	6		177
9/2014 Exposed Aggregate removed. Current face added.	COUNTY	CONTROL	SECT	JOB
6/2011 Hand Blend.	FORT BEND	3510	04	055 SH 99



ELEVATION



SECTION



SHEET 3 OF 3

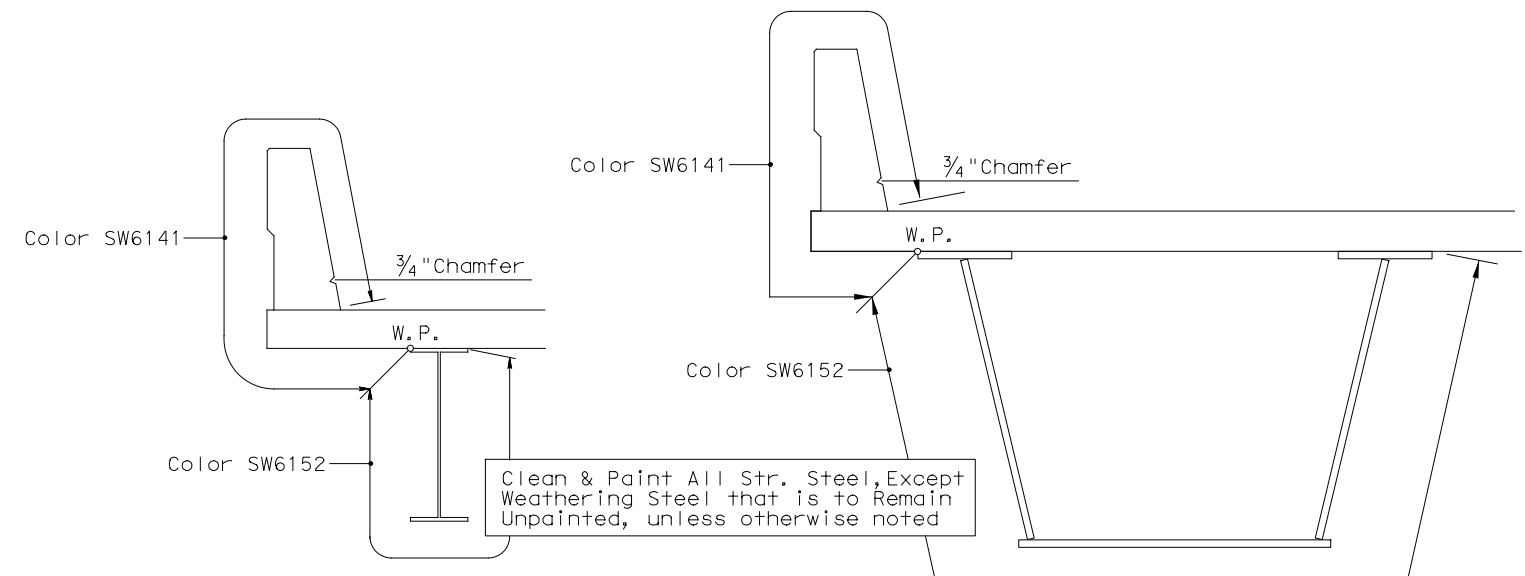
Texas Department of Transportation  
Houston District Bridge  
Green Ribbon Project

SOUND WALL DETAILS  
HORIZONTAL SCHEME

SWD-HS

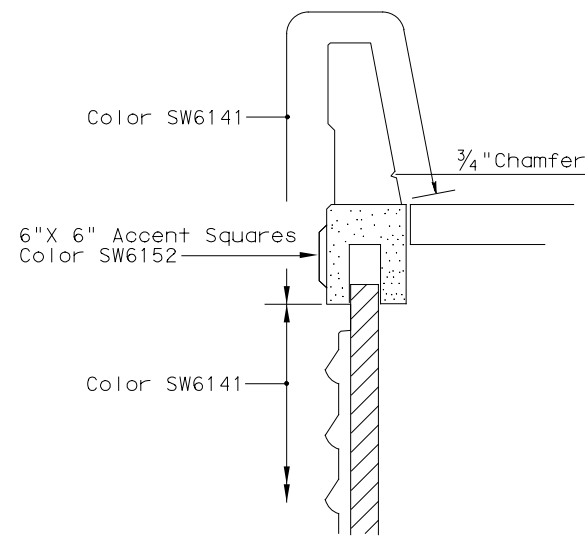
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© TxDOT DEC 2010	DISTRICT: HOUSTON	FED REG: 6	PROJECT NO.	SHEET: 178
REVISIONS:		COUNTY: FORT BEND	CONTROL: 3510	SECT: 04
12/2010 Update bottom panel steel requirements.		JOB: 055	SH: 99	
9/2014 Exposed Aggregate removed, current face added.				
6/2017 Removed Minn'l Hand Blend.				

HORIZONTAL SCHEME		SHERWIN WILLIAMS (SW) COLOR # 6141 OR EQUAL	SHERWIN WILLIAMS (SW) COLOR # 6152 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	

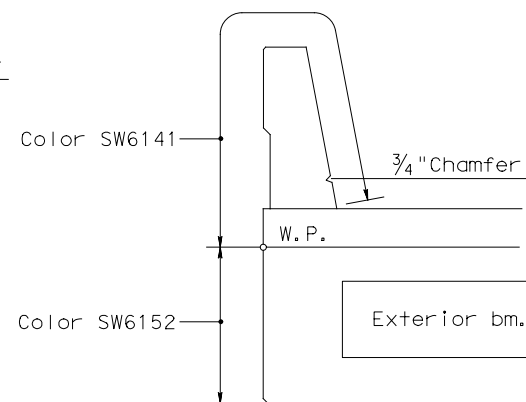


SECTION THRU BRIDGE STEEL I-BEAM  
TYPICAL ALL GIRDERS, U.N.O.

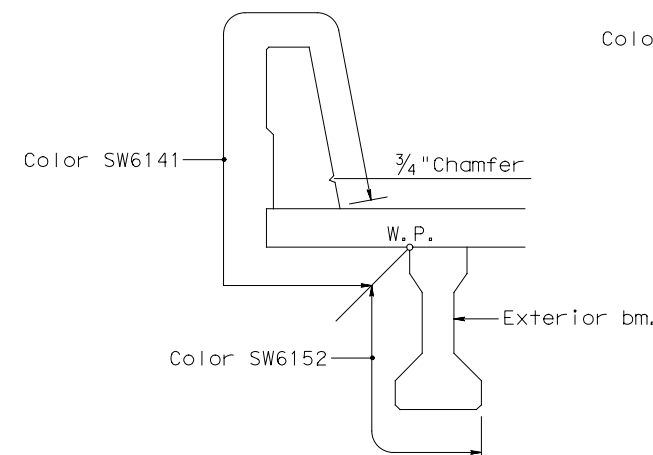
SECTION THRU BRIDGE STEEL TUB-GIRDER  
TYPICAL ALL GIRDERS, U.N.O.



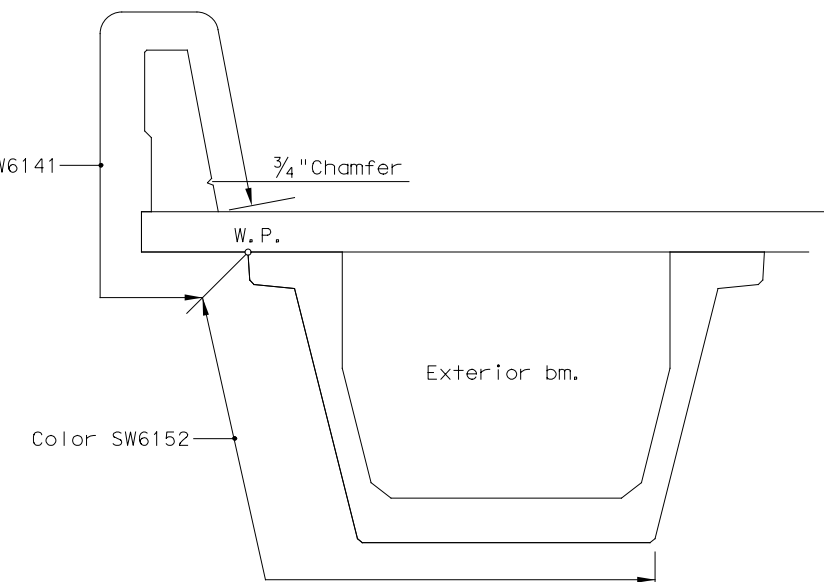
SECTION THRU RETAINING WALL



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.

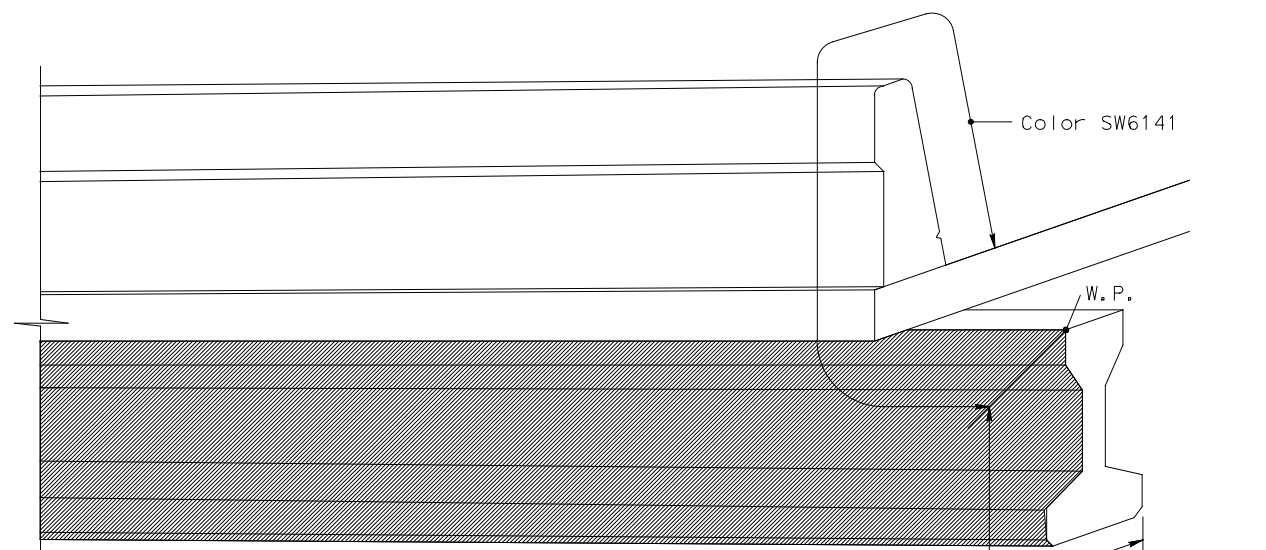
NOTES: Provide a Surface Area I, Concrete Paint Finish, as per the Standard Specifications and these Details

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  
HORIZONTAL SCHEME

SFC-HS

FILE: STDJ10.DGN	DN:	CK:	DW:	CK:
©TxDOT APRIL 2010	DISTRICT FED REG	PROJECT NO.	SHEET	
REVISIONS	HOUSTON 6		179	
6/2017 Removed rail patterns.	COUNTY	CONTROL SECT	JOB	HIGHWAY
	FORT BEND	3510 04	055	SH 99

**LEGEND**

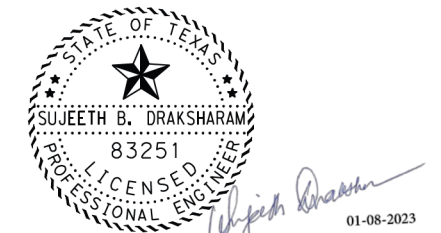
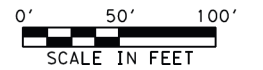
-  PROPOSED DITCH
-  EXIST DITCH
-  DRAINAGE AREA BOUNDARY
-  DIRECTION OF FLOW
-  DRAINAGE AREA ID
-  DRAINAGE AREA ACREAGE

**NOTE:**

THE DRAINAGE STUDY ENTITLED "FOR STATE HIGHWAY 99 ROADWAY IMPROVEMENT PROJECT", LIMITS: SH 99 FROM FM 1093 TO KINGSLAND BLVD, TXDOT CSJ NO'S. 3510-04-019, 3510-05-041, PREPARED BY CIVILTECH, A WOOLPERT COMPANY, DATED SEPTEMBER 2022, SEALED SEPTEMBER 30, 2022. DOCUMENTS THE DRAINAGE IMPACTS ASSOCIATED WITH THIS PROJECT.

THESE 10-YEAR FLOOD FREQUENCY CALCULATIONS ARE FOR THE SIZING OF THE STORM SEWERS ONLY. IN THE FLOW CALCULATIONS THERE WILL BE ROUNDING UP THE FLOWS AND GEOPAK FLOWS ARE THE BASIS FOR THE CALCULATIONS.

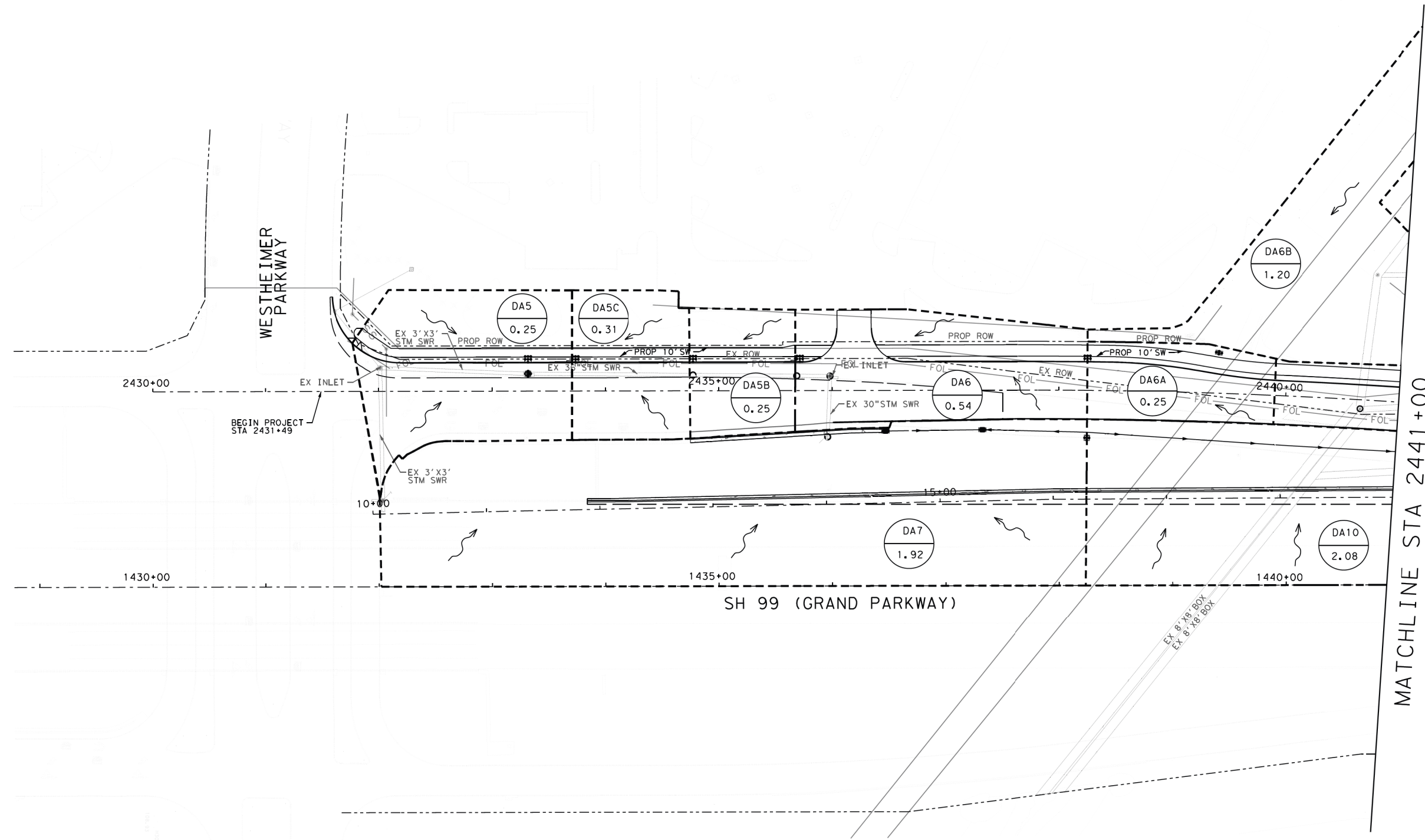
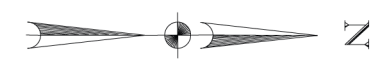
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**SH 99  
SOUTHBOUND FRONTAGE ROAD  
WESTHEIMER PKWY TO CINCO RANCH BLVD  
DRAINAGE AREA MAP  
BEGIN TO 2441+00**

SHEET 01 OF 04

FED. RD. DIST. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	180



\$DATE\$  
\$TIME\$  
\$FILE\$



**LEGEND**

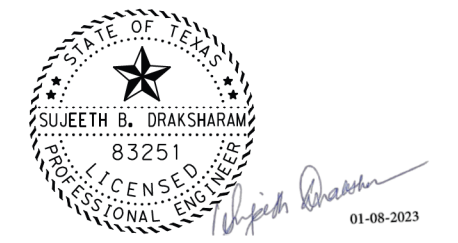
- Ⓞ PROPOSED DITCH
- - - -      Ⓞ EXIST DITCH
- - - -      DRAINAGE AREA BOUNDARY
- ~>      DIRECTION OF FLOW
- Ⓞ ID      DRAINAGE AREA ID
- Ⓞ 0.00      DRAINAGE AREA ACREAGE

**NOTE:**

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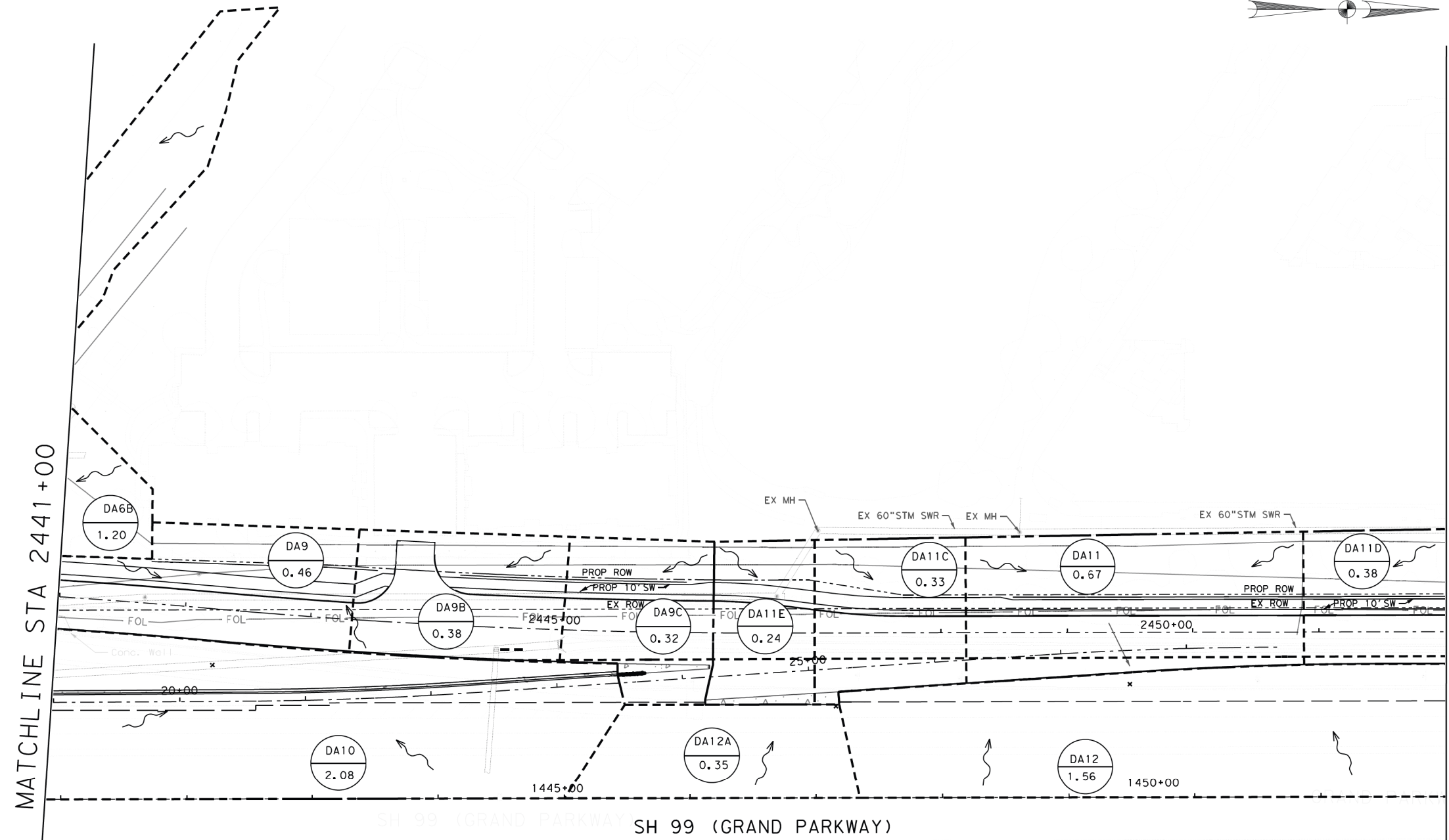
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**SH 99**  
**SOUTHBOUND FRONTAGE ROAD**  
**WESTHEIMER PKWY TO CINCO RANCH BLVD**  
**DRAINAGE AREA MAP**  
**STA 2441+00 TO 2452+00**

SHEET 02 OF 04

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	181





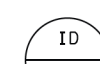



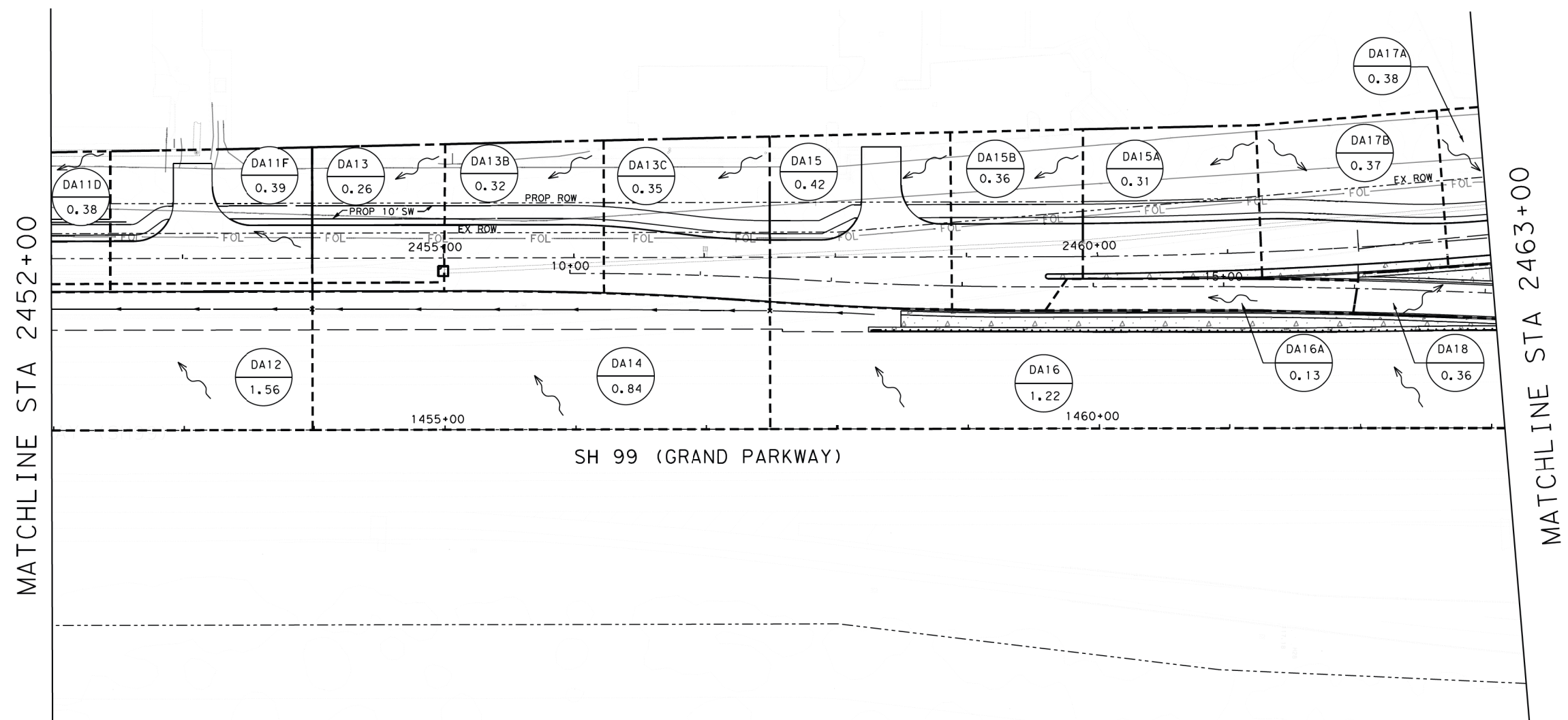
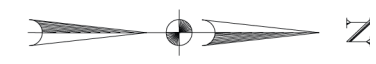
MATCHLINE STA 2441+00

MATCHLINE STA 2452+00

DATE: 6/1/23  
 TIME: 10:30 AM  
 FILE: 3510-04-019-05-041

**LEGEND**

-  PROPOSED DITCH
-  EXIST DITCH
-  DRAINAGE AREA BOUNDARY
-  DIRECTION OF FLOW
-  DRAINAGE AREA ID
-  DRAINAGE AREA ACREAGE

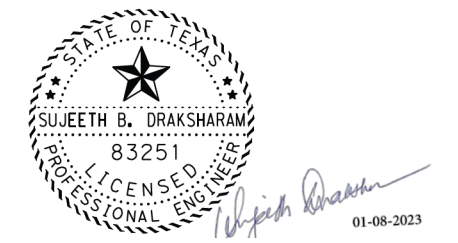
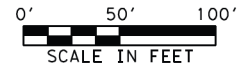


**NOTE:**

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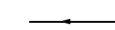
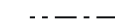




SH 99  
SOUTHBOUND FRONTAGE ROAD  
WESTHEIMER PKWY TO CINCO RANCH BLVD  
  
DRAINAGE AREA MAP  
STA 2452+00 TO 2463+00

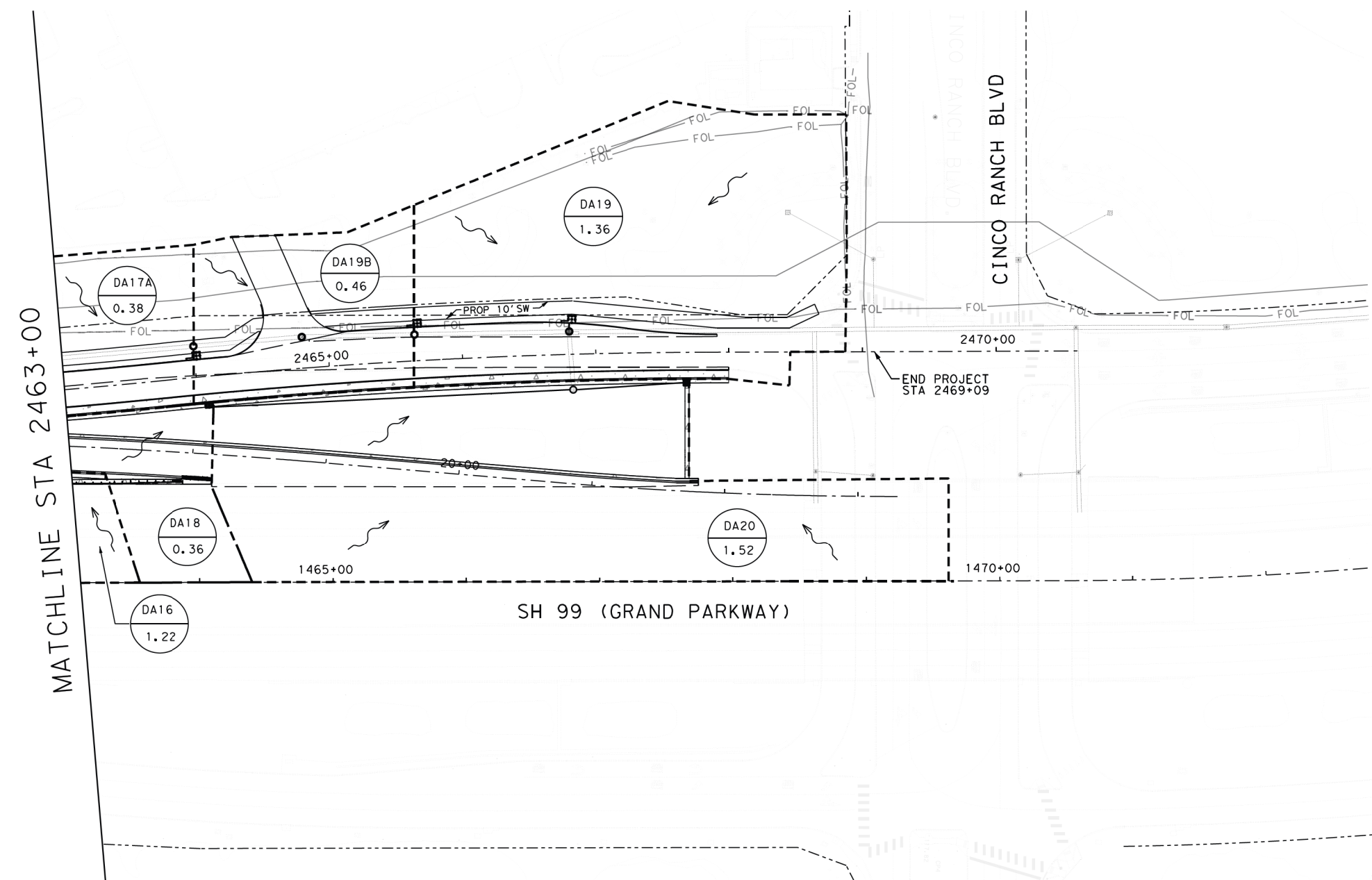
SHEET 03 OF 04

FED. RD. DIV. NO.	PROJECT NO.	HIGHWAY NO.
6		SH 99
STATE	DIST.	COUNTY
TEXAS	HOU	FORT BEND
CONT.	SECT.	JOB
3510	04	055
		SHEET NO.
		182

DATE: 6/1/23  
TIME: 11:33 AM  
FILE: 6

**LEGEND**

-  @ PROPOSED DITCH
-  @ EXIST DITCH
-  DRAINAGE AREA BOUNDARY
-  DIRECTION OF FLOW
-  DRAINAGE AREA ID
-  DRAINAGE AREA ACREAGE

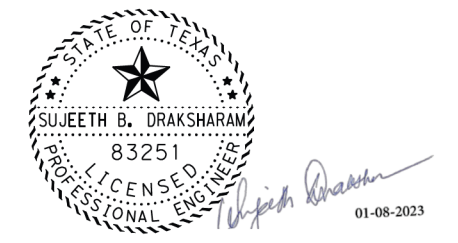
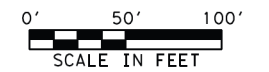


**NOTE:**

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**SIRRUS ENGINEERS, INC.**  
 3100 TIMMONS LN, SUITE 500  
 HOUSTON, TX 77027  
 TEXAS FIRM REGISTRATION NO. 5901  
 PHONE: 713-334-7300  
 FAX: 713-334-7303



**SH 99**  
**SOUTHBOUND FRONTAGE ROAD**  
**WESTHEIMER PKWY TO CINCO RANCH BLVD**  
**DRAINAGE AREA MAP**  
**STA 2463+00 TO END**

**SHEET 04 OF 04**

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	183

DATE: 6  
 TIME: 6  
 SHEET: 6



GEOPAK Drainage - Storm Drain Design  
 Project Name: SH 99 South Bound Frontage Rd (Westheimer Pkwy to Cinco Ranch Blvd)  
 Job No: 3510-04-055  
 Project Description : Storm Sewer  
 Design Frequency: 10-YR  
 Measurement Units: English  
 County: Fort Bend (Harris County Rainfall Intensity Used) (ATLAS 14)

**RUNOFF COMPUTATION FOR DESIGN FREQUENCY**

SYSTEM - OUTFALL -1								
ID	Drainage Area (acres)	Grassed Area C=0.35 (Acres)	Paved Area C=0.9 (Acres)	Composite "C"	Time of Conc. (min)	Time of Conc. Used (min)	Intensity (in/hr)	Discharge (cfs)
I-5	0.25	0.07	0.18	0.78	6.60	10.00	8.39	1.56
I-5C	0.31	0.11	0.20	0.73	6.60	10.00	8.39	1.83
I-5B	0.25	0.07	0.18	0.78	6.60	10.00	8.39	1.56
I-6	0.54	0.12	0.42	0.82	6.60	10.00	8.39	3.52
I-7	1.92	0.78	1.14	0.71	6.60	10.00	8.39	10.90

GEOPAK Drainage - Storm Drain Design  
 Project Name: SH 99 South Bound Frontage Rd (Westheimer Pkwy to Cinco Ranch Blvd)  
 Job No: 3510-04-055  
 Project Description : Storm Sewer  
 Design Frequency: 10-YR  
 Measurement Units: English  
 County: Fort Bend (Harris County Rainfall Intensity Used) (ATLAS 14)

**RUNOFF COMPUTATION FOR DESIGN FREQUENCY**

SYSTEM - OUTFALL -2									
ID	Runoff C	Drainage Area (acres)	Grassed Area C=0.35 (Acres)	Paved Area C=0.9 (Acres)	Composite "C"	Time of Conc. (min)	Time of Conc. Used (min)	Intensity (in/hr)	Discharge (cfs)
I-10	0.73	2.08	0.64	1.44	0.73	6.60	10.00	8.39	12.75
I-11E	0.77	0.24	0.06	0.18	0.77	6.60	10.00	8.39	1.55
I-11C	0.70	0.33	0.14	0.19	0.70	6.60	10.00	8.39	1.93
I-11	0.66	0.67	0.29	0.38	0.66	6.60	10.00	8.39	3.73
I-12	0.76	1.56	0.41	1.15	0.76	6.60	10.00	8.39	9.88
I-12A	0.90	0.35	0.00	0.35	0.90	3.60	10.00	8.39	2.61
I-11D	0.64	0.38	0.18	0.20	0.64	6.60	10.00	8.39	2.05
I-11F	0.69	0.39	0.15	0.24	0.69	6.60	10.00	8.39	2.25
I-13	0.69	0.26	0.10	0.16	0.69	5.49	10.00	8.39	1.50
I-14	0.75	0.84	0.28	0.56	0.68	5.67	10.00	8.39	5.29
I-13B	0.68	0.32	0.13	0.19	0.68	5.67	10.00	8.39	1.82
I-13C	0.68	0.35	0.14	0.21	0.68	5.67	10.00	8.39	2.00
I-15	0.68	0.42	0.16	0.26	0.67	5.67	10.00	8.39	2.39
I-16	0.88	1.22	0.10	1.12	0.88	5.49	10.00	8.39	9.02
I-15A	0.69	0.31	0.13	0.18	0.67	5.67	10.00	8.39	1.80
I-15B	0.64	0.36	0.17	0.19	0.64	5.67	10.00	8.39	1.93
I-16A	0.90	0.13	0.00	0.13	0.90	2.89	10.00	8.39	0.98
I-17B	0.65	0.37	0.17	0.20	0.65	4.94	10.00	8.39	2.01
I-17A	0.65	0.38	0.17	0.21	0.65	4.94	10.00	8.39	2.08
I-19B	0.63	0.46	0.26	0.26	0.63	4.94	10.00	8.39	2.41
I-19	0.52	1.36	0.89	0.41	0.52	4.94	10.00	8.39	5.92
I-18	0.84	0.36	0.04	0.32	0.84	4.94	10.00	8.39	2.53
I-20	0.74	1.52	0.45	1.07	0.74	5.55	10.00	8.39	9.40

GEOPAK Drainage - Storm Drain Design  
 Project Name: SH 99 South Bound Frontage Rd (Westheimer Pkwy to Cinco Ranch Blvd)  
 Job No: 3510-04-055  
 Project Description : Storm Sewer  
 Design Frequency: 10-YR  
 Measurement Units: English  
 County:

**RUNOFF COMPUTATION FOR DESIGN FREQUENCY**

SYSTEM - OUTFALL -1A								
ID	Drainage Area (acres)	Grassed Area C=0.35 (Acres)	Paved Area C=0.9 (Acres)	Composite "C"	Time of Conc. (min)	Time of Conc. Used (min)	Intensity (in/hr)	Discharge (cfs)
I-6A	0.25	0.07	0.15	0.67	6.60	10.00	8.39	1.43
I-6B	1.20	1.20	0.20	0.35	6.60	10.00	8.39	3.54

GEOPAK Drainage - Storm Drain Design  
 Project Name: SH 99 South Bound Frontage Rd (Westheimer Pkwy to Cinco Ranch Blvd)  
 Job No: 3510-04-055  
 Project Description : Storm Sewer  
 Design Frequency: 10-YR  
 Measurement Units: English  
 County: Fort Bend (Harris County Rainfall Intensity Used) (ATLAS 14)

**RUNOFF COMPUTATION FOR DESIGN FREQUENCY**

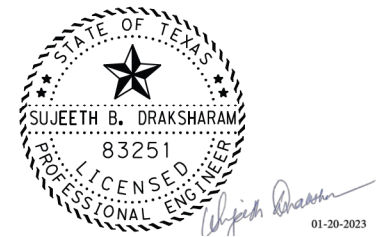
SYSTEM - OUTFALL -3									
ID	Runoff C	Drainage Area (acres)	Grassed Area C=0.35 (Acres)	Paved Area C=0.9 (Acres)	Composite "C"	Time of Conc. (min)	Time of Conc. Used (min)	Intensity (in/hr)	Discharge (cfs)
I-9	0.78	0.46	0.13	0.33	0.78	6.60	10.00	8.39	3.01
I-9B	0.71	0.38	0.15	0.23	0.71	6.60	10.00	8.39	2.27
I-9C	0.71	0.32	0.13	0.19	0.71	6.60	10.00	8.39	1.90

NOTE:

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SH 99  
 SOUTHBOUND FRONTAGE ROAD  
 WESTHEIMER PKWY TO CINCO RANCH BLVD  
 RUNOFF COMPUTATIONS

SHEET 1 OF 5

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	184

GEOPAK Drainage - Storm Drain Design  
 Project Name: SH 99 South Bound Frontage Rd (Westheimer Pkwy to Cinco Ranch Blvd)  
 Job No: 3510-04-055  
 Project Description : Storm Sewer  
 Design Frequency: 10-YR  
 Measurement Units: English  
 County: Fort Bend (Harris County Rainfall Intensity Used) (ATLAS 14)

**ON GRADE INLET COMPUTATION DATA**

SYSTEM - OUTFALL -1															
ID	Type	Discharge (cfs)	Max Allow Pond Depth (ft)	Ponded Depth (ft)	Max Pondered Width (ft)	Pondered Width (ft)	Transverse Slope (%)	Longitudinal Slope (%)	Curb Length (ft)	Grate Length (ft)	Grate Width (ft)	Depression (ft)	Capacity (cfs)	By Pass (cfs)	By Pass To Node
I-5C	Curb	2.25	0.50	0.24	13.00	7.96	3.00	0.69	10.00	n/a	n/a	0.25	2.25	0	I-5
I-5B	Curb	1.71	0.50	0.19	13.00	9.37	2.00	0.64	5.00	n/a	n/a	0.25	1.29	0.42	I-5C
I-6	Curb	3.68	0.50	0.29	13.00	9.70	3.00	0.64	10.00	n/a	n/a	0.25	3.54	0.15	I-5B

GEOPAK Drainage - Storm Drain Design  
 Project Name: SH 99 South Bound Frontage Rd (Westheimer Pkwy to Cinco Ranch Blvd)  
 Job No: 3510-04-055  
 Project Description : Storm Sewer  
 Design Frequency: 10-YR  
 Measurement Units: English  
 County: Fort Bend (Harris County Rainfall Intensity Used) (ATLAS 14)

**ON GRADE INLET COMPUTATION DATA**

SYSTEM - OUTFALL -1A															
ID	Type	Discharge (cfs)	Max Allow Pond Depth (ft)	Ponded Depth (ft)	Max Pondered Width (ft)	Pondered Width (ft)	Transverse Slope (%)	Longitudinal Slope (%)	Curb Length (ft)	Grate Length (ft)	Grate Width (ft)	Depression (ft)	Capacity (cfs)	By Pass (cfs)	By Pass To Node
I-6A	Curb	1.43	0.50	0.20	12.00	6.80	3.00	0.64	5.00	n/a	n/a	0.25	1.27	0.16	I-6

GEOPAK Drainage - Storm Drain Design  
 Project Name: SH 99 South Bound Frontage Rd (Westheimer Pkwy to Cinco Ranch Blvd)  
 Job No: 3510-04-055  
 Project Description : Storm Sewer  
 Design Frequency: 10-YR  
 Measurement Units: English  
 County: Fort Bend (Harris County Rainfall Intensity Used) (ATLAS 14)

**ON GRADE INLET COMPUTATION DATA**

SYSTEM - OUTFALL -2															
ID	Type	Discharge (cfs)	Max Allow Pond Depth (ft)	Ponded Depth (ft)	Max Pondered Width (ft)	Pondered Width (ft)	Transverse Slope (%)	Longitudinal Slope (%)	Curb Length (ft)	Grate Length (ft)	Grate Width (ft)	Depression (ft)	Capacity (cfs)	By Pass (cfs)	By Pass To Node
I-11E	Curb	1.55	0.50	0.20	13.00	10.13	2.00	0.35	10.00	n/a	n/a	0.25	1.55	0.00	I-11C
I-11C	Curb	1.93	0.50	0.22	13.00	10.97	2.00	0.35	10.00	n/a	n/a	0.25	1.93	0.00	I-11
I-12A	Grate	2.61	1.00	0.24	13.00	11.90	2.00	0.35	n/a	5.00	2.50	n/a	2.14	0.47	I-12
I-11F	Curb	2.25	0.50	0.23	13.00	11.62	2.00	0.35	10.00	n/a	n/a	0.25	2.25	0.00	I-11D
I-13	Curb	1.50	0.50	0.23	13.00	7.76	3.00	0.35	10.00	n/a	n/a	0.25	1.50	0.00	I-11F
I-14	Grate	5.29	1.00	0.92	13.00	2.76	33.33	0.35	n/a	5.00	2.50	n/a	5.29	0.00	I-12
I-13B	Curb	1.82	0.50	0.40	13.00	9.14	16.67	0.35	5.00	n/a	n/a	0.25	1.82	0.00	I-13
I-13C	Curb	2.05	0.50	0.41	13.00	9.74	16.67	0.35	5.00	n/a	n/a	0.25	2.05	0.00	I-13B
I-15	Curb	2.58	0.50	0.23	13.00	7.56	3.00	1.18	10.00	n/a	n/a	0.25	2.52	0.06	I-13C
I-16	Grate	9.02	1.50	1.12	13.00	3.37	33.37	0.35	n/a	5.00	2.50	n/a	8.99	0.04	CB-14C
I-15A	Curb	2.51	0.50	0.19	13.00	9.64	2.00	1.18	10.00	n/a	n/a	0.25	2.32	0.19	I-15
I-15B	Curb	1.93	0.50	0.17	13.00	8.75	2.00	1.18	5.00	n/a	n/a	0.25	1.25	0.68	I-15A
I-16A	Curb	0.98	0.50	0.17	13.00	8.52	2.00	0.35	5.00	n/a	n/a	0.25	0.95	0.03	I-15A
I-17B	Curb	2.01	0.50	0.22	13.00	11.15	2.00	0.35	10.00	n/a	n/a	0.25	2.01	0.00	I-17A
I-17A	Curb	2.08	0.50	0.23	13.00	11.30	2.00	0.35	10.00	n/a	n/a	0.25	2.08	0.00	I-19B
I-19B	Curb	2.41	0.50	0.24	13.00	11.90	2.00	0.35	10.00	n/a	n/a	0.25	2.41	0.00	I-19
I-18	Grate	2.53	1.00	0.72	13.00	2.15	33.33	0.30	n/a	5.00	2.50	n/a	2.53	0.00	I-20

GEOPAK Drainage - Storm Drain Design  
 Project Name: SH 99 South Bound Frontage Rd (Westheimer Pkwy to Cinco Ranch Blvd)  
 Job No: 3510-04-055  
 Project Description : Storm Sewer  
 Design Frequency: 10-YR  
 Measurement Units: English  
 County: Fort Bend (Harris County Rainfall Intensity Used) (ATLAS 14)

**ON GRADE INLET COMPUTATION DATA**

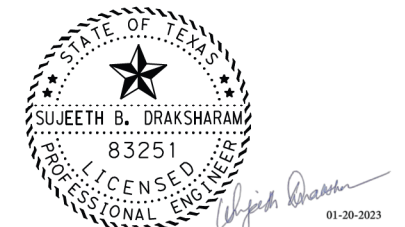
SYSTEM - OUTFALL -3															
ID	Type	Discharge (cfs)	Max Allow Pond Depth (ft)	Ponded Depth (ft)	Max Pondered Width (ft)	Pondered Width (ft)	Transverse Slope (%)	Longitudinal Slope (%)	Curb Length (ft)	Grate Length (ft)	Grate Width (ft)	Depression (ft)	Capacity (cfs)	By Pass (cfs)	By Pass To Node
I-9B	Curb	2.27	0.50	0.23	13.00	11.42	2.00	0.39	10.00	n/a	n/a	0.25	2.27	0.00	I-9
I-9C	Curb	1.90	0.50	0.25	13.00	8.29	3.00	0.39	10.00	n/a	n/a	0.25	1.90	0.00	I-9B

**NOTE:**

THE DRAINAGE STUDY ENTITLED "FOR STATE HIGHWAY 99 ROADWAY IMPROVEMENT PROJECT", LIMITS: SH 99 FROM FM 1093 TO KINGSLAND BLVD, TXDOT CSJ NO'S. 3510-04-019, 3510-05-041, PREPARED BY CIVILTECH, A WOOLPERT COMPANY, DATED SEPTEMBER 2022, SEALED SEPTEMBER 30, 2022, DOCUMENTS THE DRAINAGE IMPACTS ASSOCIATED WITH THIS PROJECT.

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SH 99  
 SOUTHBOUND FRONTAGE ROAD  
 WESTHEIMER PKWY TO CINCO RANCH BLVD  
 INLET COMPUTATIONS

SHEET 2 OF 5

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	185

\$DATE\$  
 \$TIME\$  
 \$FILE\$

GEOPAK Drainage - Storm Drain Design  
 Project Name: SH 99 South Bound Frontage Rd (Westheimer Pkwy to Cinco Ranch Blvd)  
 Job No: 3510-04-055  
 Project Description : Storm Sewer  
 Design Frequency: 10-YR  
 Measurement Units: English  
 County: Fort Bend (Harris County Rainfall Intensity Used) (ATLAS 14)

**SAG INLET COMPUTATION DATA**

SYSTEM - OUTFALL - 1															
ID	Type	Curb Length (ft)	Grate Length (ft)	Grate Width (ft)	Depression (ft)	Area (ac)	Perimeter (ft)	Transverse Slope (%)	Discharge (cfs)	Capacity (cfs)	Ponded Width (ft)		Max Allowed Ponded Width (ft)	Ponded Depth (ft)	Max Allowed Ponded Depth (ft)
											Left	Right			
I-5	Curb	5.00	n/a	n/a	0.25	n/a	n/a	3.00	1.56	6.26	3.85	6.39	12.00	0.20	0.50
I-7	Grate	n/a	4.96	2.48	n/a	8.28	14.87	33.33	10.90	6.55	2.87	2.87	12.00	0.70	1.00

GEOPAK Drainage - Storm Drain Design  
 Project Name: SH 99 South Bound Frontage Rd (Westheimer Pkwy to Cinco Ranch Blvd)  
 Job No: 3510-04-055  
 Project Description : Storm Sewer  
 Design Frequency: 10-YR  
 Measurement Units: English  
 County: Fort Bend (Harris County Rainfall Intensity Used) (ATLAS 14)

**SAG INLET COMPUTATION DATA**

SYSTEM - OUTFALL - 1A															
ID	Type	Curb Length (ft)	Grate Length (ft)	Grate Width (ft)	Depression (ft)	Area (ac)	Perimeter (ft)	Transverse Slope (%)	Discharge (cfs)	Capacity (cfs)	Ponded Width (ft)		Max Allowed Ponded Width (ft)	Ponded Depth (ft)	Max Allowed Ponded Depth (ft)
											Left	Right			
I-6B	Grate	n/a	5.00	2.50	n/a	6.78	14.00	3.00	3.54	7.64	5.23	8.67	12.00	0.30	0.50

GEOPAK Drainage - Storm Drain Design  
 Project Name: SH 99 South Bound Frontage Rd (Westheimer Pkwy to Cinco Ranch Blvd)  
 Job No: 3510-04-055  
 Project Description : Storm Sewer  
 Design Frequency: 10-YR  
 Measurement Units: English  
 County: Fort Bend (Harris County Rainfall Intensity Used) (ATLAS 14)

**SAG INLET COMPUTATION DATA**

SYSTEM - OUTFALL - 2															
ID	Type	Curb Length (ft)	Grate Length (ft)	Grate Width (ft)	Depression (ft)	Area (ac)	Perimeter (ft)	Transverse Slope (%)	Discharge (cfs)	Capacity (cfs)	Ponded Width (ft)		Max Allowed Ponded Width (ft)	Ponded Depth (ft)	Max Allowed Ponded Depth (ft)
											Left	Right			
I-10	Grate	n/a	5.00	2.50	n/a	6.78	14.00	33.33	12.75	7.64	2.96	2.96	13.00	0.70	1.00
I-11	Curb	5.00	n/a	n/a	0.25	n/a	n/a	2.00	3.73	6.26	10.85	10.85	12.00	0.35	0.50
I-12	Grate	n/a	4.96	2.48	n/a	8.28	9.92	33.33	10.36	8.12	2.74	2.74	13.00	0.59	1.00
I-19	Curb	10.00	n/a	n/a	0.25	n/a	n/a	3.00	5.92	10.33	10.29	10.00	13.00	0.34	0.50
I-20	Grate	n/a	2.50	2.50	n/a	3.39	7.00	33.33	9.40	3.82	2.72	2.72	13.00	1.06	1.50

GEOPAK Drainage - Storm Drain Design  
 Project Name: SH 99 South Bound Frontage Rd (Westheimer Pkwy to Cinco Ranch Blvd)  
 Job No: 3510-04-055  
 Project Description : Storm Sewer  
 Design Frequency: 10-YR  
 Measurement Units: English  
 County: Fort Bend (Harris County Rainfall Intensity Used) (ATLAS 14)

**SAG INLET COMPUTATION DATA**

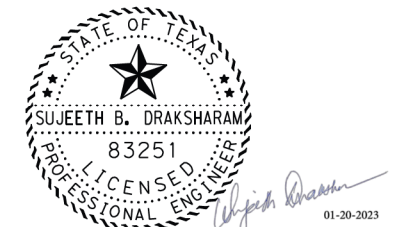
SYSTEM - OUTFALL - 3															
ID	Type	Curb Length (ft)	Grate Length (ft)	Grate Width (ft)	Depression (ft)	Area (ac)	Perimeter (ft)	Transverse Slope (%)	Discharge (cfs)	Capacity (cfs)	Ponded Width (ft)		Max Allowed Ponded Width (ft)	Ponded Depth (ft)	Max Allowed Ponded Depth (ft)
											Left	Right			
I-9	Curb	5.00	n/a	n/a	0.25	n/a	n/a	2.00	3.01	6.26	8.15	9.80	12.00	0.31	0.50

**NOTE:**

THE DRAINAGE STUDY ENTITLED "FOR STATE HIGHWAY 99 ROADWAY IMPROVEMENT PROJECT", LIMITS: SH 99 FROM FM 1093 TO KINGSLAND BLVD. TXDOT CSJ NO'S. 3510-04-019, 3510-05-041, PREPARED BY CIVILTECH, A WOOLPERT COMPANY, DATED SEPTEMBER 2022, SEALED SEPTEMBER 30, 2022. DOCUMENTS THE DRAINAGE IMPACTS ASSOCIATED WITH THIS PROJECT.

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SH 99  
 SOUTHBOUND FRONTAGE ROAD  
 WESTHEIMER PKWY TO CINCO RANCH BLVD  
 INLET COMPUTATIONS

SHEET 3 OF 5

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	186

GEOPAK Drainage - Storm Drain Design  
 Project Name: SH 99 South Bound Frontage Rd (Westheimer Pkwy to Cinco Ranch Blvd)  
 Job No: 3510-04-055  
 Project Description : Storm Sewer  
 Design Frequency: 10-YR  
 Measurement Units: English  
 County: Fort Bend (Harris County Rainfall Intensity Used) (ATLAS 14)

**CONVEYANCE CONFIGURATION DATA**

SYSTEM - OUTFALL -1												
ID	Upstream ID	Downstream ID	Hydraulic Length (ft)	Pay Length (ft)	Shape	No. of Barrel	Rise (ft)	Span (ft)	n	Slope (%)	Upstream Invert (ft)	Downstream Invert (ft)
SS-5A	MH-5A	OUT-1	128.50	129.00	Box	1.00	3.00	3	0.013	0.21	103.02	102.75
SS5	I-5	MH-5A	8.17	8.00	Circular	1.00	2.00	n/a	0.013	0.20	103.05	103.02
SS-5D	MH-5D	MH-5A	141.31	141.00	Circular	1.00	3.00	n/a	0.013	0.18	103.35	103.09
SS-5C	I-5C	I-5	36.80	37.00	Circular	1.00	2.00	n/a	0.013	0.20	103.17	103.08
SS-5B	I-5B	MH-5D	9.08	9.00	Circular	1.00	2.00	n/a	0.013	0.20	103.38	103.35
SS-7C	MH-7C	MH-5D	86.28	86.00	Circular	1.00	3.00	n/a	0.013	0.18	103.51	103.35
SS6	I-6	MH-7C	10.00	10.00	Circular	1.00	2.00	n/a	0.013	0.20	103.54	103.51
SS7B	MH-7B	MH-7C	24.26	24.00	Circular	1.00	3.00	n/a	0.013	0.14	103.55	103.51
SS7A	MH-7A	MH-7B	48.56	49.00	Circular	1.00	2.50	n/a	0.013	1.72	104.43	103.51
SS7	I-7	MH-7A	64.28	64.00	Circular	1.00	2.00	n/a	0.013	0.20	104.57	104.43

GEOPAK Drainage - Storm Drain Design  
 Project Name: SH 99 South Bound Frontage Rd (Westheimer Pkwy to Cinco Ranch Blvd)  
 Job No: 3510-04-055  
 Project Description : Storm Sewer  
 Design Frequency: 10-YR  
 Measurement Units: English  
 County: Fort Bend (Harris County Rainfall Intensity Used) (ATLAS 14)

**CONVEYANCE CONFIGURATION DATA**

SYSTEM - OUTFALL -2												
ID	Upstream ID	Downstream ID	Hydraulic Length (ft)	Pay Length (ft)	Shape	No. of Barrel	Rise (ft)	Span (ft)	n	Slope (%)	Upstream Invert (ft)	Downstream Invert (ft)
SS-10	I-10	OUT-2	181.05	181.00	Box	1.00	3.00	6.00	0.013	0.50	94.93	94.02
SS-11B	MH-11B	I-10	242.51	243.00	Box	1.00	3.00	6.00	0.013	0.20	104.85	104.36
SS-11J	MH-11J	MH-11B	250.64	251.00	Box	1.00	3.00	6.00	0.013	0.22	105.32	104.85
SS-11E	I-11E	MH-11J	28.49	29.00	Circular	1.00	2.00	n/a	0.013	0.20	105.87	105.82
SS-11I	MH-11I	MH-11J	115.76	116.00	Box	1.00	3.00	6.00	0.013	0.22	105.56	105.32
SS-11A	MH-11A	MH-11I	126.10	126.00	Box	1.00	3.00	6.00	0.013	0.22	105.82	105.56
SS-11C	I-11C	MH-11I	23.33	23.00	Circular	1.00	2.00	n/a	0.013	0.20	106.10	106.06
SS-11	I-11	MH-11A	22.88	23.00	Circular	1.00	2.00	n/a	0.013	0.20	106.36	106.32
SS-12	I-12	MH-11A	28.78	29.00	Circular	1.00	2.00	n/a	0.013	0.20	106.37	106.32
SS-11H	MH-11H	MH-11A	134.13	134.00	Box	1.00	3.00	6.00	0.013	0.22	106.09	105.82
SS-12A	I-12A	I-12	233.77	234.00	Circular	1.00	2.00	n/a	0.013	0.50	108.47	107.30
SS-11D	I-11D	MH-11H	21.75	22.00	Circular	1.00	2.00	n/a	0.013	0.20	106.63	106.59
SS-11G	MH-11G	MH-11H	158.08	158.00	Box	1.00	3.00	6.00	0.013	0.22	106.42	106.09
SS-11F	I-11F	MH-11G	21.74	22.00	Circular	1.00	2.00	n/a	0.013	0.20	106.96	106.42
SS-13A	MH-13A	MH-11G	147.71	148.00	Box	1.00	3.00	3.00	0.013	0.22	106.74	106.42
SS-13	I-13	MH-13A	35.63	36.00	Circular	1.00	2.00	n/a	0.013	0.20	107.30	107.24
SS-14	I-14	MH-13A	27.67	28.00	Circular	1.00	2.00	n/a	0.013	0.20	106.99	106.93
SS-14A	MH-14A	MH-13A	100.82	101.00	Box	1.00	3.00	6.00	0.013	0.22	106.94	106.74
SS-13B	I-13B	MH-14A	35.38	35.00	Circular	1.00	2.00	n/a	0.013	0.20	107.50	107.44
SS-14B	MH-14B	MH-14A	120.13	120.00	Box	1.00	3.00	6.00	0.013	0.22	107.42	107.15
SS-13C	I-13C	MH-14B	27.60	28.00	Circular	1.00	2.00	n/a	0.013	0.20	107.48	107.42
SS-16D	MH-16D	MH-14B	123.28	123.00	Box	1.00	3.00	6.00	0.013	0.21	107.69	107.42
SS-15	I-15	MH-16D	10.97	11.00	Circular	1.00	2.00	n/a	0.013	0.20	107.72	107.69
SS-16	I-16	MH-16D	40.36	40.00	Circular	1.00	2.00	n/a	0.013	0.20	107.77	107.69
SS-16C	MH-16C	MH-16D	136.78	137.00	Box	1.00	3.00	6.00	0.013	0.21	107.99	107.69
SS-15A	I-15A	MH-16C	16.49	17.00	Circular	1.00	2.00	n/a	0.013	0.20	108.03	107.99
SS-16B	MH-16B	MH-16C	94.42	94.00	Box	1.00	3.00	6.00	0.013	0.20	108.32	108.12
SS-15B	I-15B	MH-16B	12.31	12.00	Circular	1.00	2.00	n/a	0.013	0.20	108.35	108.32
SS-16A	I-16A	MH-16B	24.86	25.00	Circular	1.00	2.00	n/a	0.013	0.20	108.38	108.32
SS-17C	MH-17C	MH-16B	273.36	273.00	Box	1.00	3.00	6.00	0.013	0.08	108.53	108.32
SS-17	MH-17	MH-17C	128.26	128.00	Box	1.00	3.00	6.00	0.013	0.07	108.62	108.53
SS-17B	I-17B	MH-17C	7.92	8.00	Circular	1.00	2.00	n/a	0.013	0.20	108.56	108.53
SS-17A	I-17A	MH-17	7.95	8.00	Circular	1.00	2.00	n/a	0.013	0.20	108.65	108.62
SS-19A	MH-19A	MH-17	77.53	78.00	Box	1.00	3.00	6.00	0.013	0.07	108.68	108.62
SS-19C	MH-19C	MH-19A	97.51	98.00	Box	1.00	3.00	6.00	0.013	0.20	108.75	108.55
SS-19B	I-19B	MH-19C	4.40	4.00	Circular	1.00	2.00	n/a	0.013	0.20	108.77	108.75
SS-20B	MH-20B	MH-19C	94.94	95.00	Box	1.00	3.00	6.00	0.013	0.07	108.82	108.75
SS-19	I-19	MH-20B	5.68	6.00	Circular	1.00	2.00	n/a	0.013	0.20	108.84	108.82
SS-20A	MH-20A	MH-20B	42.24	42.00	Circular	1.00	2.00	n/a	0.013	1.19	109.34	108.82
SS-18	I-18	MH-20A	271.12	271.00	Circular	1.00	2.00	n/a	0.013	0.20	109.88	109.34
SS-20	I-20	MH-20A	82.03	82.00	Circular	1.00	2.00	n/a	0.013	0.20	109.51	109.34

GEOPAK Drainage - Storm Drain Design  
 Project Name: SH 99 South Bound Frontage Rd (Westheimer Pkwy to Cinco Ranch Blvd)  
 Job No: 3510-04-055  
 Project Description : Storm Sewer  
 Design Frequency: 10-YR  
 Measurement Units: English  
 County: Fort Bend (Harris County Rainfall Intensity Used) (ATLAS 14)

**CONVEYANCE CONFIGURATION DATA**

SYSTEM - OUTFALL -3												
ID	Upstream ID	Downstream ID	Hydraulic Length (ft)	Pay Length (ft)	Shape	No. of Barrel	Rise (ft)	Span (ft)	n	Slope (%)	Upstream Invert (ft)	Downstream Invert (ft)
SS-9E	MH-9E	OUT-3	100.14	100.00	Circular	1.00	5.00	n/a	0.013	0.80	99.81	98.99
SS-9D	MH-9D	MH-9E	54.02	54.00	Circular	1.00	5.00	n/a	0.013	0.16	99.98	99.89
SS-9	I-9	MH-9D	2.00	2.00	Circular	1.00	2.00	n/a	0.013	0.20	99.99	99.98
SS-9B	I-9B	MH-9D	102.93	103.00	Circular	1.00	5.00	n/a	0.013	0.16	100.15	99.98
SS-9C	I-9C	I-9B	164.69	165.00	Circular	1.00	5.00	n/a	0.013	0.16	100.42	100.15

GEOPAK Drainage - Storm Drain Design  
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 Project Description : Storm Sewer  
 Design Frequency: 10-YR  
 Measurement Units: English  
 County: Fort Bend (Harris County Rainfall Intensity Used) (ATLAS 14)

**CONVEYANCE CONFIGURATION DATA**

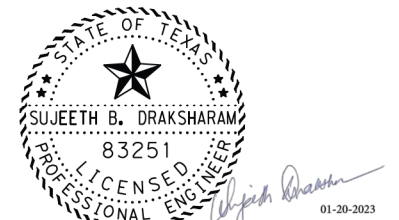
SYSTEM - OUTFALL -1A												
ID	Upstream ID	Downstream ID	Hydraulic Length (ft)	Pay Length (ft)	Shape	No. of Barrel	Rise (ft)	Span (ft)	n	Slope (%)	Upstream Invert (ft)	Downstream Invert (ft)
SS-6C	MH-6C	OUT-1A	204.45	205.00	Circular	1.00	2.00	n/a	0.013	0.19	98.66	98.25
SS-6A	I-6A	MH-6C	65.30	65.00	Circular	1.00	2.00	n/a	0.013	0.20	103.68	103.55
SS-6B	I-6B	I-6A	110.90	112.00	Circular	1.00	2.00	n/a	0.013	0.20	103.68	103.90

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3100 TIMMONS LN., SUITE 500  
 HOUSTON, TX 77027  
 TEXAS FIRM REGISTRATION NO. 5901  
 PHONE 713-334-7300  
 FAX 713-334-7303



SH 99  
 SOUTHBOUND FRONTAGE ROAD  
 WESTHEIMER PKWY TO CINCO RANCH BLVD  
 STORM SEWER COMPUTATIONS

SHEET 4 OF 5

FED. RD. DIST. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	187

\$DATE\$  
 \$TIME\$  
 \$FILE\$

GEOPAK Drainage - Storm Drain Design  
 Project Name: SH 99 South Bound Frontage Rd (Westheimer Pkwy to Cinco Ranch Blvd)  
 Job No: 3510-04-055  
 Project Description : Storm Sewer  
 Design Frequency: 10-YR  
 Measurement Units: English  
 County: Fort Bend (Harris County Rainfall Intensity Used)(ATLAS 14)

**CONVEYANCE HYDRAULIC CONFIGURATION DATA**

ID	Upstream ID	Downstream ID	HGL (ft)		Discharge (cfs)	Capacity (cfs)	Slope (%)	Junct. Loss (ft)	Uniform		Actual Vel (fps)		Actual Depth (ft)	
			U/S	D/S					Velocity (fps)	Depth (ft)	U/S	D/S	U/S	D/S
SS-5A	MH-5A	OUT-1	104.99	103.80	18.50	50.45	0.21	0.66	4.58	1.35	3.12	5.83	1.97	1.06
SS5	I-5	MH-5A	105.02	104.99	3.37	11.79	0.20	0.02	3.06	0.76	1.07	1.07	1.97	1.97
SS-5D	MH-5D	MH-5A	105.18	104.99	15.53	32.79	0.18	0.08	4.41	1.50	3.44	3.28	1.83	1.90
SS-5C	I-5C	I-5	105.03	105.02	1.83	11.79	0.20	0.01	2.56	0.56	0.60	0.59	1.86	1.94
SS-5B	I-5B	MH-5D	105.18	105.18	1.56	11.79	0.20	0.00	2.45	0.51	0.52	0.52	1.81	1.83
SS-7C	MH-7C	MH-5D	105.38	105.18	14.17	32.54	0.18	0.14	4.18	1.45	3.06	3.14	1.87	1.83
SS6	I-6	MH-7C	105.41	105.38	3.52	11.79	0.20	0.02	3.12	0.78	1.16	1.15	1.86	1.87
SS7B	MH-7B	MH-7C	105.51	105.38	10.90	28.74	0.14	0.12	3.64	1.32	2.22	2.35	1.96	1.87
SS7A	MH-7A	MH-7B	106.10	104.28	10.90	62.65	1.72	0.56	9.08	0.73	3.13	8.44	1.67	0.77
SS7	I-7	MH-7A	106.47	106.10	10.90	11.79	0.20	0.24	3.95	1.64	3.54	3.89	1.90	1.67

GEOPAK Drainage - Storm Drain Design  
 Project Name: SH 99 South Bound Frontage Rd (Westheimer Pkwy to Cinco Ranch Blvd)  
 Job No: 3510-04-055  
 Project Description : Storm Sewer  
 Design Frequency: 10-YR  
 Measurement Units: English  
 County: Fort Bend (Harris County Rainfall Intensity Used)(ATLAS 14)

**CONVEYANCE HYDRAULIC CONFIGURATION DATA**

ID	Upstream ID	Downstream ID	HGL (ft)		Discharge (cfs)	Capacity (cfs)	Slope (%)	Junct. Loss (ft)	Uniform		Actual Vel (fps)		Actual Depth (ft)	
			U/S	D/S					Velocity (fps)	Depth (ft)	U/S	D/S	U/S	D/S
SS-6C	MH-6C	OUT-1A	99.83	99.03	4.86	11.63	0.19	0.23	3.36	0.94	2.55	4.32	1.17	0.78
SS-6A	I-6A	MH-6C	104.88	104.33	4.86	11.79	0.20	0.28	3.36	0.94	2.50	4.32	1.19	0.78
SS-6B	I-6B	I-6A	105.17	104.88	3.54	11.79	0.20	0.14	3.06	0.79	2.44	2.71	0.94	0.87

GEOPAK Drainage - Storm Drain Design  
 Project Name: SH 99 South Bound Frontage Rd (Westheimer Pkwy to Cinco Ranch Blvd)  
 Job No: 3510-04-055  
 Project Description : Storm Sewer  
 Design Frequency: 10-YR  
 Measurement Units: English  
 County: Fort Bend (Harris County Rainfall Intensity Used) (ATLAS 14)

**CONVEYANCE HYDRAULIC CONFIGURATION DATA**

ID	Upstream ID	Downstream ID	HGL (ft)		Discharge (cfs)	Capacity (cfs)	Slope (%)	Junct. Loss (ft)	Uniform		Actual Vel (fps)		Actual Depth (ft)	
			U/S	D/S					Velocity (fps)	Depth (ft)	U/S	D/S	U/S	D/S
SS-10	I-10	OUT-2	96.97	97.02	64.69	157.69	0.50	0.05	8.22	1.31	5.26	3.59	2.05	3.00
SS-11B	MH-11B	I-10	106.52	105.78	57.19	99.68	0.20	0.03	5.71	1.67	5.71	6.74	1.67	1.41
SS-11J	MH-11J	MH-11B	107.08	106.52	57.19	93.02	0.17	0.04	5.41	1.76	5.41	5.81	1.76	1.64
SS-11E	I-11E	MH-11J	107.59	107.35	1.55	10.96	0.20	0.10	2.44	0.51	1.97	3.12	0.60	0.43
SS-11I	MH-11I	MH-11J	107.31	107.08	56.46	99.78	0.20	0.06	5.79	1.62	5.39	5.34	1.75	1.76
SS-11A	MH-11A	MH-11I	108.00	107.31	55.47	99.64	0.20	0.51	5.69	1.62	4.24	5.29	2.18	1.75
SS-11C	I-11C	MH-11I	107.32	107.31	1.93	10.96	0.20	0.02	2.60	0.57	0.97	0.94	1.21	1.25
SS-11	I-11	MH-11A	108.03	108.00	3.73	10.96	0.20	0.03	3.15	0.81	1.34	1.33	1.66	1.68
SS-12	I-12	MH-11A	108.50	108.00	12.10	10.96	0.20	0.42	3.95	2.00	3.85	4.29	2.00	1.68
SS-11H	MH-11H	MH-11A	108.11	108.00	43.35	98.55	0.20	0.07	5.19	1.39	3.58	3.31	2.02	2.18
SS-12A	I-12A	I-12	109.24	107.83	2.61	17.33	0.50	0.20	3.98	0.52	2.37	3.98	0.76	0.52
SS-11D	I-11D	MH-11H	108.12	108.11	2.05	10.96	0.20	0.01	2.67	0.59	0.82	0.80	1.48	1.52
SS-11G	MH-11G	MH-11H	108.17	108.11	42.27	100.58	0.20	0.00	5.24	1.35	4.03	3.49	1.75	2.02
SS-11F	I-11F	MH-11G	108.18	108.17	2.25	10.96	0.20	0.01	2.73	0.62	0.87	0.85	1.53	1.57
SS-13A	MH-13A	MH-11G	109.50	108.22	40.95	42.53	0.21	0.47	5.45	2.51	4.95	7.60	2.76	1.80
SS-13	I-13	MH-13A	109.50	109.50	1.50	10.96	0.20	0.00	2.45	0.50	0.48	0.48	2.00	2.00
SS-14	I-14	MH-13A	109.55	109.50	5.29	10.96	0.20	0.04	3.51	0.97	1.68	1.68	2.00	2.00
SS-14A	MH-14A	MH-13A	109.77	109.50	35.81	99.68	0.20	0.27	4.95	1.21	2.11	2.17	2.83	2.76
SS-13B	I-13B	MH-14A	109.78	109.77	1.82	10.96	0.20	0.01	2.54	0.56	0.58	0.58	2.00	2.00
SS-14B	MH-14B	MH-14A	109.80	109.77	34.69	104.47	0.22	0.01	5.09	1.14	2.43	2.20	2.38	2.62
SS-13C	I-13C	MH-14B	109.81	109.80	2.00	10.96	0.20	0.01	2.69	0.57	0.64	0.64	2.00	2.00
SS-16D	MH-16D	MH-14B	109.92	109.80	33.42	102.66	0.21	0.10	5.00	1.11	2.50	2.34	2.23	2.38
SS-15	I-15	MH-16D	109.93	109.92	2.39	10.96	0.20	0.01	2.81	0.63	0.76	0.76	2.00	2.00
SS-16	I-16	MH-16D	110.10	109.92	9.02	10.96	0.20	0.13	3.82	1.41	2.87	2.87	2.00	2.00
SS-16C	MH-16C	MH-16D	109.94	109.92	24.33	102.90	0.21	0.01	4.48	0.90	2.08	1.82	1.95	2.23
SS-15A	I-15A	MH-16C	109.95	109.94	1.80	10.96	0.20	0.01	2.61	0.54	0.58	0.58	1.91	1.95
SS-16B	MH-16B	MH-16C	110.23	109.94	23.05	99.68	0.20	0.28	4.36	0.88	2.01	2.11	1.91	1.82
SS-15B	I-15B	MH-16B	110.24	110.23	1.93	10.96	0.20	0.01	2.61	0.57	0.63	0.62	1.89	1.91
SS-16A	I-16A	MH-16B	110.24	110.23	0.98	10.96	0.20	0.00	2.17	0.40	0.32	0.32	1.86	1.91
SS-17C	MH-17C	MH-16B	110.30	110.23	21.48	61.33	0.08	0.02	2.97	1.21	2.02	1.87	1.77	1.91
SS-17	MH-17	MH-17C	110.34	110.30	20.16	58.15	0.07	0.01	2.78	1.21	1.95	1.90	1.72	1.77
SS-17B	I-17B	MH-17C	110.32	110.30	2.01	10.96	0.20	0.01	2.61	0.59	0.96	0.95	1.26	1.27
SS-17A	I-17A	MH-17	110.36	110.34	2.08	10.96	0.20	0.02	2.71	0.59	1.05	1.04	1.21	1.22
SS-19A	MH-19A	MH-17	110.36	110.34	18.74	58.97	0.07	0.00	2.80	1.11	1.86	1.82	1.68	1.72
SS-19C	MH-19C	MH-19A	110.39	110.36	18.74	99.68	0.20	0.03	3.96	0.79	1.90	1.76	1.64	1.78
SS-19B	I-19B	MH-19C	110.42	110.39	2.41	10.96	0.20	0.03	2.75	0.65	1.29	1.30	1.15	1.14
SS-20B	MH-20B	MH-19C	111.40	110.39	16.90	54.38	0.06	0.99	2.53	1.11	1.09	1.72	2.58	1.64
SS-19	I-19	MH-20B	111.46	111.40	5.92	10.96	0.20	0.06	3.52	1.06	1.88	1.88	2.00	2.00
SS-20A	MH-20A	MH-20B	111.71	111.40	11.33	26.71	1.19	0.22	8.15	0.91	3.61	3.61	2.00	2.00
SS-18	I-18	MH-20A	111.75	111.71	2.53	10.96	0.20	0.01	2.80	0.66	0.83	0.81	1.87	2.00
SS-20	I-20	MH-20A	111.97	111.71	9.40	10.96	0.20	0.14	3.98	1.41	2.99	2.99	2.00	2.00

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 TIME: 10:00 AM  
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GEOPAK Drainage - Storm Drain Design  
 Project Name: SH 99 South Bound Frontage Rd (Westheimer Pkwy to Cinco Ranch Blvd)  
 Job No: 3510-04-055  
 Project Description : Storm Sewer  
 Design Frequency: 10-YR  
 Measurement Units: English  
 County: Fort Bend (Harris County Rainfall Intensity Used)(ATLAS 14)

**CONVEYANCE HYDRAULIC CONFIGURATION DATA**

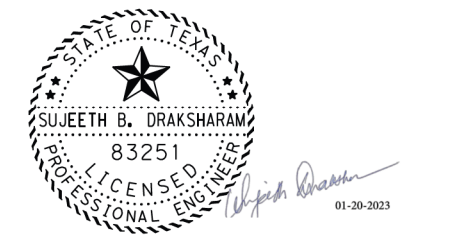
ID	Upstream ID	Downstream ID	HGL (ft)		Discharge (cfs)	Capacity (cfs)	Slope (%)	Junct. Loss (ft)	Uniform		Actual Vel (fps)		Actual Depth (ft)	
			U/S	D/S					Velocity (fps)	Depth (ft)	U/S	D/S	U/S	D/S
SS-9E	MH-9E	OUT-3	103.99	103.99	6.74	271.94	0.80	0.00	5.56	0.56	0.38	0.34	4.18	5.00
SS-9D	MH-9D	MH-9E	104.00	103.99	6.74	121.40	0.16	0.01	3.18	0.83	0.40	0.39	4.02	4.10
SS-9	I-9	MH-9D	104.02	104.00	3.01	11.79	0.20	0.01	2.96	0.72	0.96	0.96	2.00	2.00
SS-9B	I-9B	MH-9D	104.00	104.00	3.99	121.40	0.16	0.00	2.71	0.64	0.25	0.24	3.85	4.02
SS-9C	I-9C	I-9B	104.00	104.00	1.90	121.40	0.16	0.00	2.17	0.45	0.13	0.12	3.58	3.85

**NOTE:**

THE DRAINAGE STUDY ENTITLED "FOR STATE HIGHWAY 99 ROADWAY IMPROVEMENT PROJECT", LIMITS: SH 99 FROM FM 1093 TO KINGSLAND BLVD, TXDOT CSJ NO' S. 3510-04-019, 3510-05-041, PREPARED BY CIVILTECH, A WOOLPERT COMPANY, DATED SEPTEMBER 2022, SEALED SEPTEMBER 30, 2022. DOCUMENTS THE DRAINAGE IMPACTS ASSOCIATED WITH THIS PROJECT.

THESE 10-YEAR FLOOD FREQUENCY CALCULATIONS ARE FOR THE SIZING OF THE STORM SEWERS ONLY. IN THE FLOW CALCULATIONS THERE WILL BE ROUNDING UP THE FLOWS AND GEOPAK FLOWS ARE THE BASIS FOR THE CALCULATIONS.

THE MITIGATION AS IN THE DRAINAGE IMPACT STUDY REPORT FOR IN-LINE DETENTION IS NOT PART OF THESE RUNOFF CALCULATIONS.



SH 99  
 SOUTHBOUND FRONTAGE ROAD  
 WESTHEIMER PKWY TO CINCO RANCH BLVD  
 STORM SEWER COMPUTATIONS

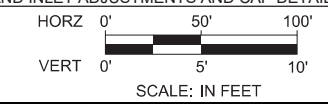
SHEET 5 OF 5

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	188

LEGEND:

- PROP STORM SEWER
- EXIST STORM SEWER
- PROP SWALE
- - - EXIST SWALE
- /■ PROPOSED INLET, JCT BOX, OR MH
- /■ EXISTING INLET OR JUNCTION BOX

- NOTE:  
 THE DRAINAGE STUDY ENTITLED "FOR STATE HIGHWAY 99 ROADWAY IMPROVEMENT PROJECT", LIMITS: SH 99 FROM FM 1093 TO KINGSLAND BLVD, TXDOT CSJ N.O.S. 3510-04-019, 3510-05-041, PREPARED BY CIVILTECH, A WOOLPERT COMPANY, DATED SEPTEMBER 2022, SEALED SEPTEMBER 30, 2022. DOCUMENTS THE DRAINAGE IMPACTS ASSOCIATED WITH THIS PROJECT.
1. STATIONS AND OFFSETS ARE BASED ON SOUTH BOUND FRONTAGE ROAD ALIGNMENT UNLESS OTHERWISE NOTED.
  2. STATIONS AND OFFSETS FOR ALL MANHOLES AND GRATE INLETS ARE TAKEN FROM THE CENTER RIM OR GRATE RESPECTIVELY.
  3. STATIONS AND OFFSETS FOR ALL SAFETY END TREATMENTS ARE TAKEN FROM SOFFIT OF TRIM.
  4. STATIONS AND OFFSETS FOR CURB INLETS ARE TAKEN AT FACE OF CURB. ELEVATION CORRESPONDS TO TOP OF CURB (TOC).
  5. STATIONS AND OFFSETS FOR GRATE INLETS ARE TAKEN AT CENTER OF STRUCTURE. ELEVATION CORRESPONDS TO TOP OF GRATE (TOG).
  6. STORM SEWER LENGTH SHOWN IS CENTER TO CENTER OF STRUCTURE WHICH DIFFERS FROM PAY LENGTH IN QUANTITY SHEET.
  7. ALL THE MANHOLES, MH ON RCB AND JB ON THE PAVEMENT TO BE FLUSHED/CAPPED UNDER THE PAVEMENT SUBGRADE. BURIED TOP ELEVATIONS ARE PROVIDED IN PROFILE. SEE MH AND INLET ADJUSTMENTS AND CAP DETAILS.

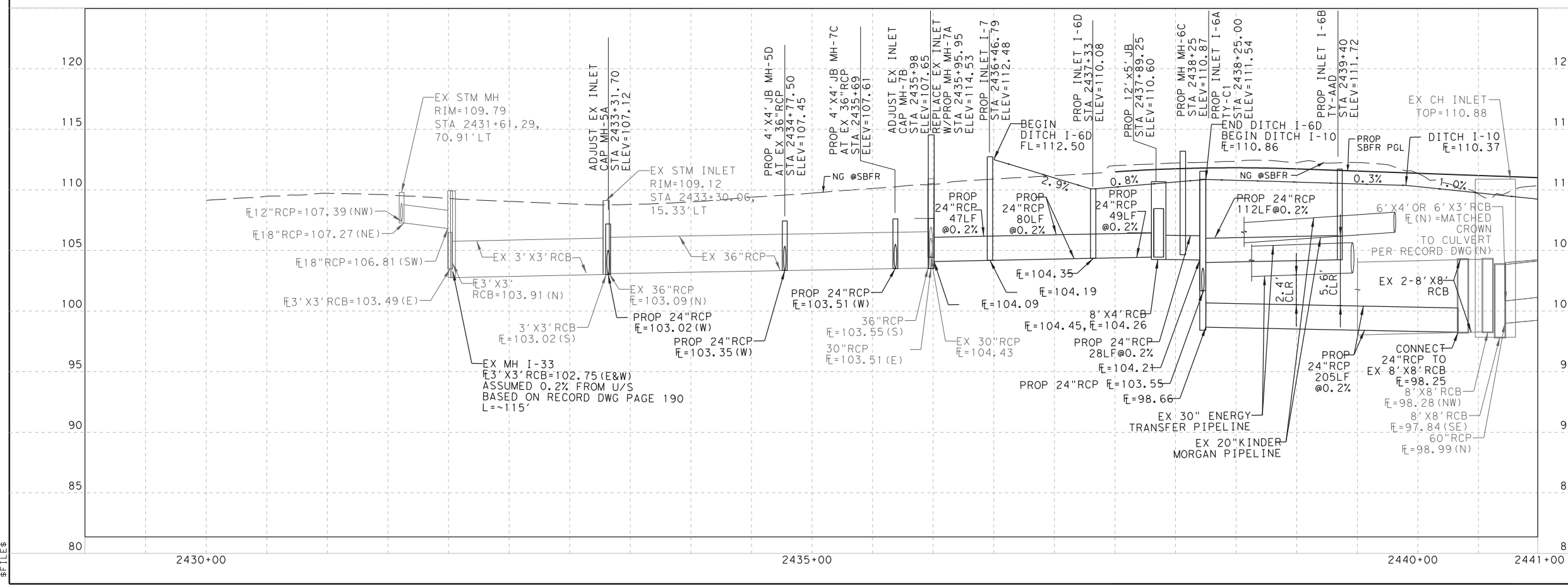
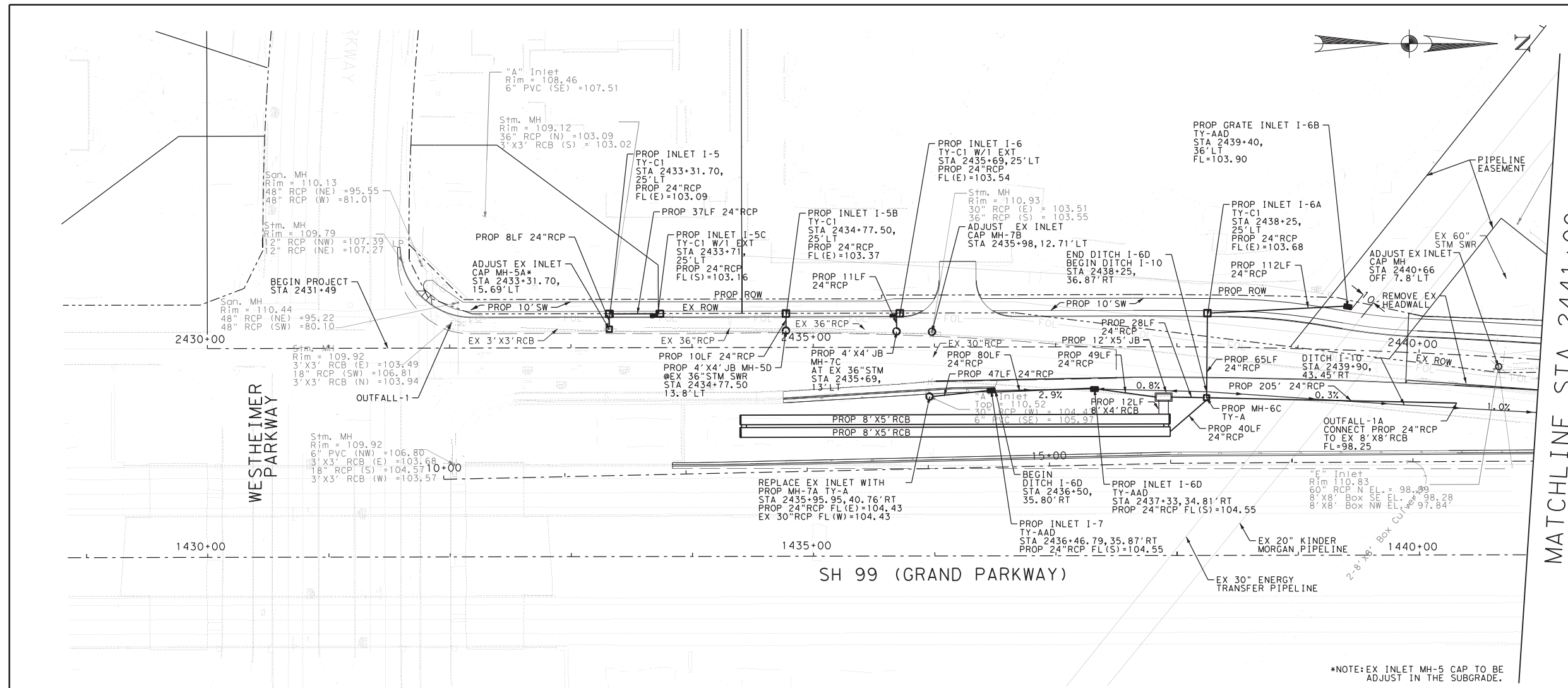


**SH 99**  
**SOUTHBOUND FRONTAGE ROAD**  
**WESTHEIMER PKWY TO CINCO RANCH BLVD**

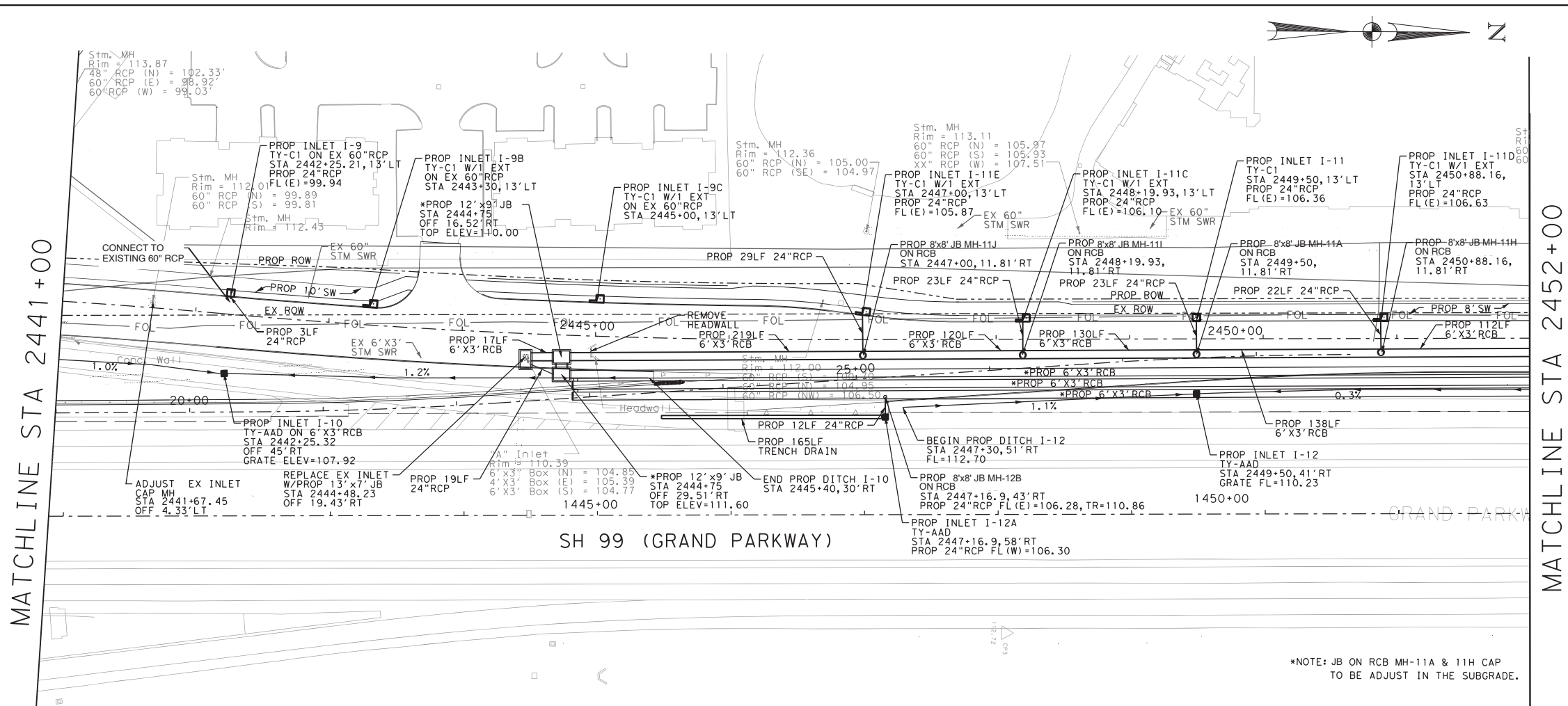
**STORM SEWER**  
**PLAN & PROFILE**  
**BEGIN TO 2441+00**

SHEET 01 OF 04

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	189



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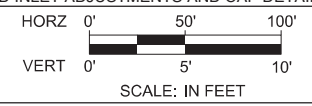


- LEGEND:**
- PROP STORM SEWER
  - EXIST STORM SEWER
  - PROP SWALE
  - EXIST SWALE
  - /□/■ PROPOSED INLET, JCT BOX, OR MH
  - /■ EXISTING INLET OR JUNCTION BOX

**NOTE:**  
 THE DRAINAGE STUDY ENTITLED "FOR STATE HIGHWAY 99 ROADWAY IMPROVEMENT PROJECT", LIMITS: SH 99 FROM FM 1093 TO KINGSLAND BLVD. TXDOT CSJ NO. S. 3510-04-019, 3510-05-041, PREPARED BY CIVILTECH, A WOOLPERT COMPANY, DATED SEPTEMBER 2022, SEALED SEPTEMBER 30, 2022. DOCUMENTS THE DRAINAGE IMPACTS ASSOCIATED WITH THIS PROJECT.

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6. STORM SEWER LENGTH SHOWN IS CENTER TO CENTER OF STRUCTURE WHICH DIFFERS FROM PAY LENGTH IN QUANTITY SHEET.
7. ALL THE MANHOLES, MH ON RCB AND JB ON THE PAVEMENT TO BE FLUSHED/CAPPED UNDER THE PAVEMENT SUBGRADE. BURIED TOP ELEVATIONS ARE PROVIDED IN PROFILE. SEE MH AND INLET ADJUSTMENTS AND CAP DETAILS.

\*NOTE: JB ON RCB MH-11A & 11H CAP TO BE ADJUST IN THE SUBGRADE.



*Sujeeth Draksharam*  
 02/27/2023



3100 TIMMONS LN., SUITE 500  
 HOUSTON, TX 77027  
 TEXAS FIRM REGISTRATION NO. 5901  
 PHONE: 713-334-7300  
 FAX: 713-334-7303



SH 99  
 SOUTHBOUND FRONTAGE ROAD  
 WESTHEIMER PKWY TO CINCO RANCH BLVD  
 STORM SEWER  
 PLAN & PROFILE  
 STA 2441+00 TO 2452+00

SHEET 02 OF 04

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	190

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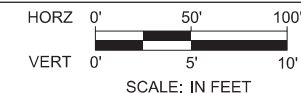


LEGEND:

- PROP STORM SEWER
- EXIST STORM SEWER
- PROP SWALE
- EXIST SWALE
- /□/■ PROPOSED INLET, JCT BOX, OR MH
- /■ EXISTING INLET OR JUNCTION BOX

NOTE:  
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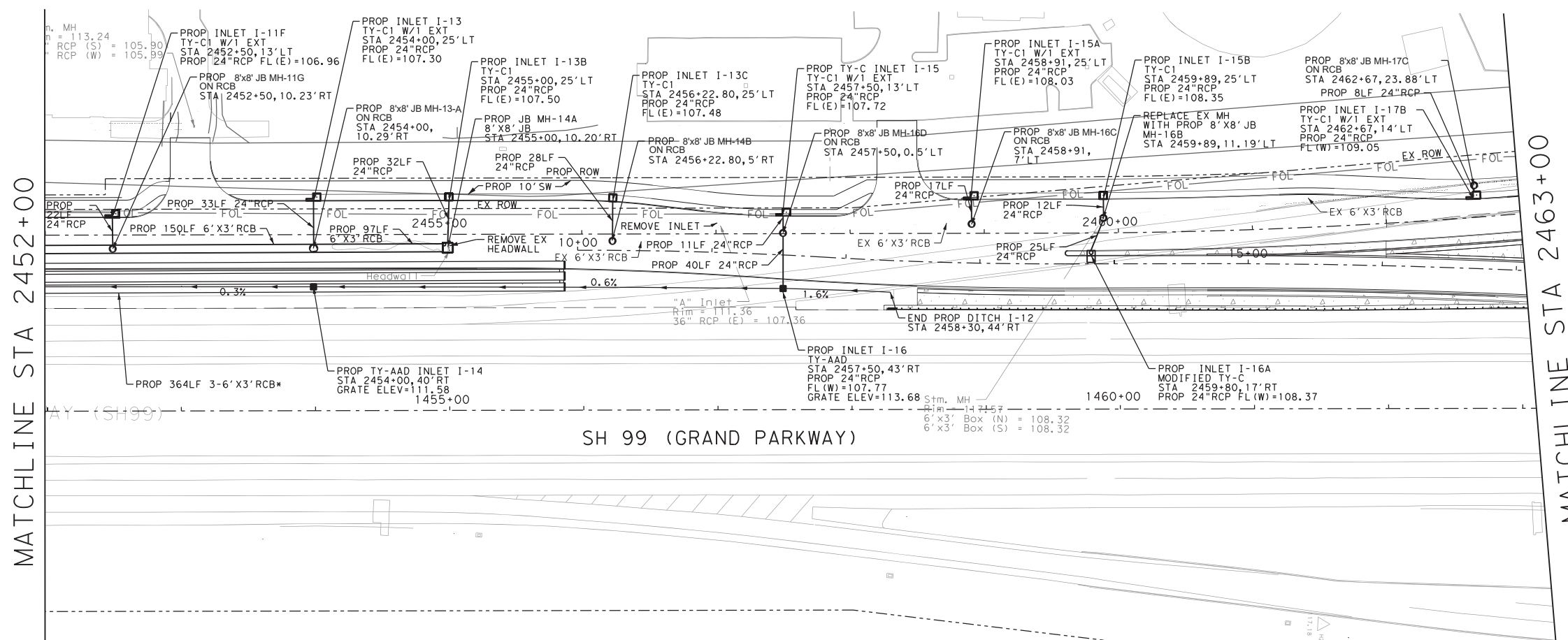
*Sujeeeth B. Draksharam*  
 02/27/2023



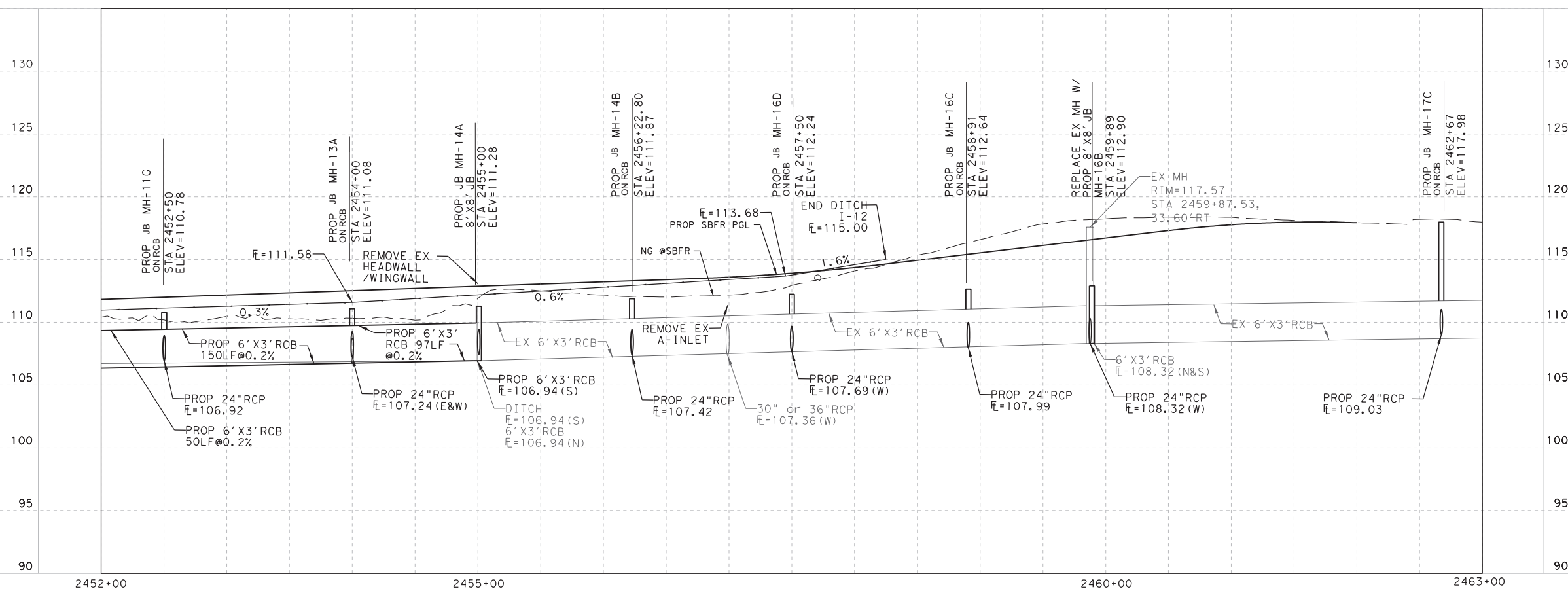
SH 99  
 SOUTHBOUND FRONTAGE ROAD  
 WESTHEIMER PKWY TO CINCO RANCH BLVD  
 STORM SEWER  
 PLAN & PROFILE  
 STA 2452+00 TO 2463+00

SHEET 03 OF 04

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	191



\*NOTE: JB ON RCB MH-11G & 13A CAP TO BE ADJUST IN THE SUBGRADE



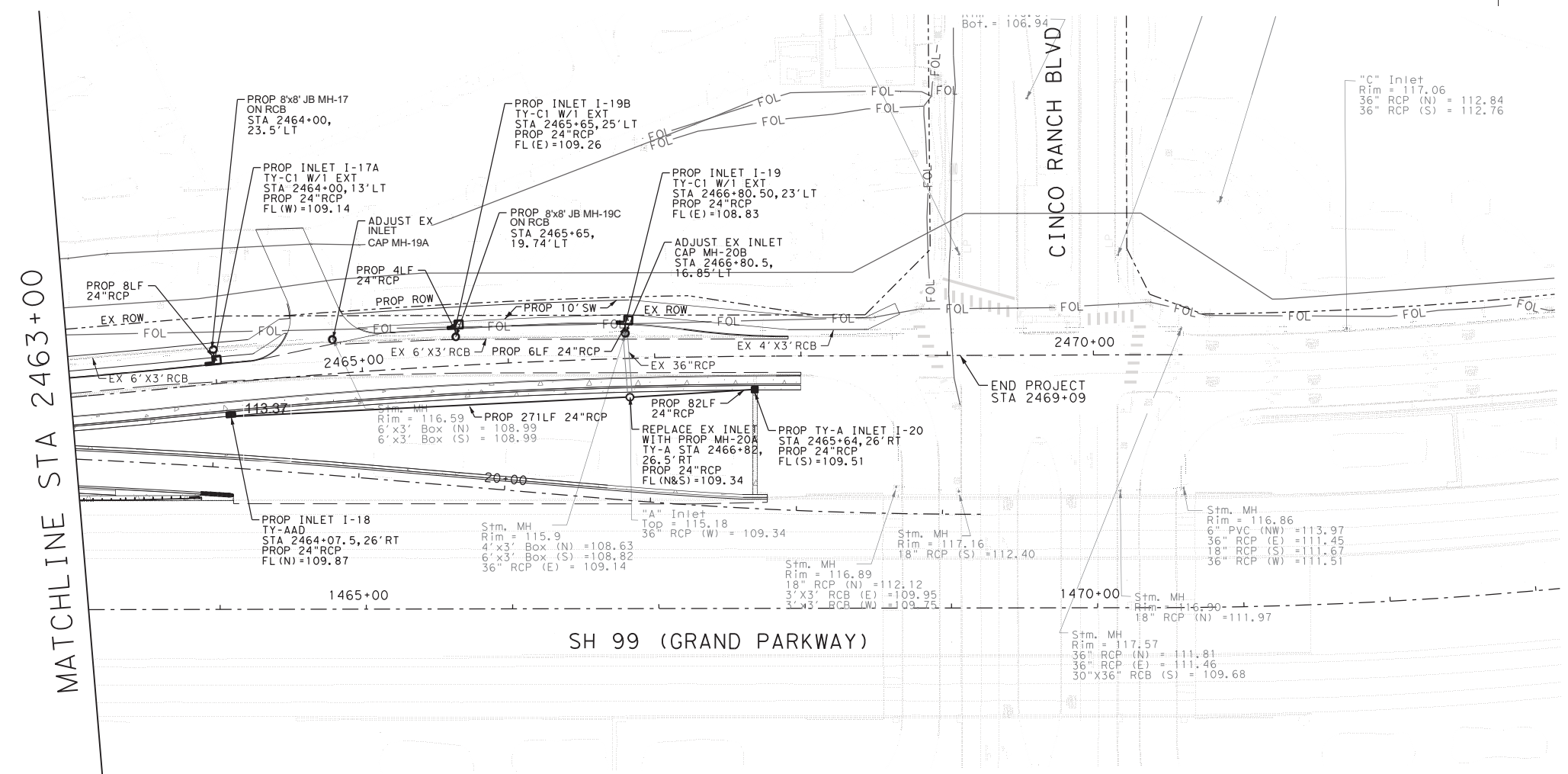
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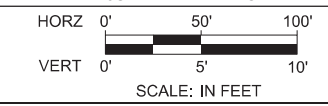
LEGEND:

- PROP STORM SEWER
- EXIST STORM SEWER
- PROP SWALE
- - - EXIST SWALE
- /■ PROPOSED INLET, JCT BOX, OR MH
- /■ EXISTING INLET OR JUNCTION BOX



NOTE:  
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*Sujeeth Draksharam*  
 02/27/2023



SH 99  
 SOUTHBOUND FRONTAGE ROAD  
 WESTHEIMER PKWY TO CINCO RANCH BLVD

STORM SEWER  
 PLAN & PROFILE  
 STA 2463+00 TO END

SHEET 04 OF 04

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	192

\$DATE\$  
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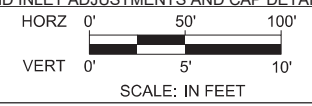


**LEGEND:**

- PROP STORM SEWER
- EXIST STORM SEWER
- PROP SWALE
- EXIST SWALE
- /■ PROPOSED INLET, JCT BOX, OR MH
- /■ EXISTING INLET OR JUNCTION BOX

**NOTE:**  
 THE DRAINAGE STUDY ENTITLED "FOR STATE HIGHWAY 99 ROADWAY IMPROVEMENT PROJECT", LIMITS: SH 99 FROM FM 1093 TO KINGSLAND BLVD. TXDOT CSJ NO. S.3510-04-019, 3510-05-041, PREPARED BY CIVILTECH, A WOOLPERT COMPANY, DATED SEPTEMBER 2022, SEALED SEPTEMBER 30, 2022. DOCUMENTS THE DRAINAGE IMPACTS ASSOCIATED WITH THIS PROJECT.

1. STATIONS AND OFFSETS ARE BASED ON SOUTH BOUND FRONTAGE ROAD ALIGNMENT UNLESS OTHERWISE NOTED.
2. STATIONS AND OFFSETS FOR ALL MANHOLES AND GRATE INLETS ARE TAKEN FROM THE CENTER RIM OR GRATE RESPECTIVELY.
3. STATIONS AND OFFSETS FOR ALL SAFETY END TREATMENTS ARE TAKEN FROM SOFFIT OF TRIM.
4. STATIONS AND OFFSETS FOR CURB INLETS ARE TAKEN AT FACE OF CURB. ELEVATION CORRESPONDS TO TOP OF CURB (TOC).
5. STATIONS AND OFFSETS FOR GRATE INLETS ARE TAKEN AT CENTER OF STRUCTURE. ELEVATION CORRESPONDS TO TOP OF GRATE (TOG).
6. STORM SEWER LENGTH SHOWN IS CENTER TO CENTER OF STRUCTURE WHICH DIFFERS FROM PAY LENGTH IN QUANTITY SHEET.
7. ALL THE MANHOLES, MH ON RCB AND JB ON THE PAVEMENT TO BE FLUSHED/CAPPED UNDER THE PAVEMENT SUBGRADE. BURIED TOP ELEVATIONS ARE PROVIDED IN PROFILE. SEE MH AND INLET ADJUSTMENTS AND CAP DETAILS.



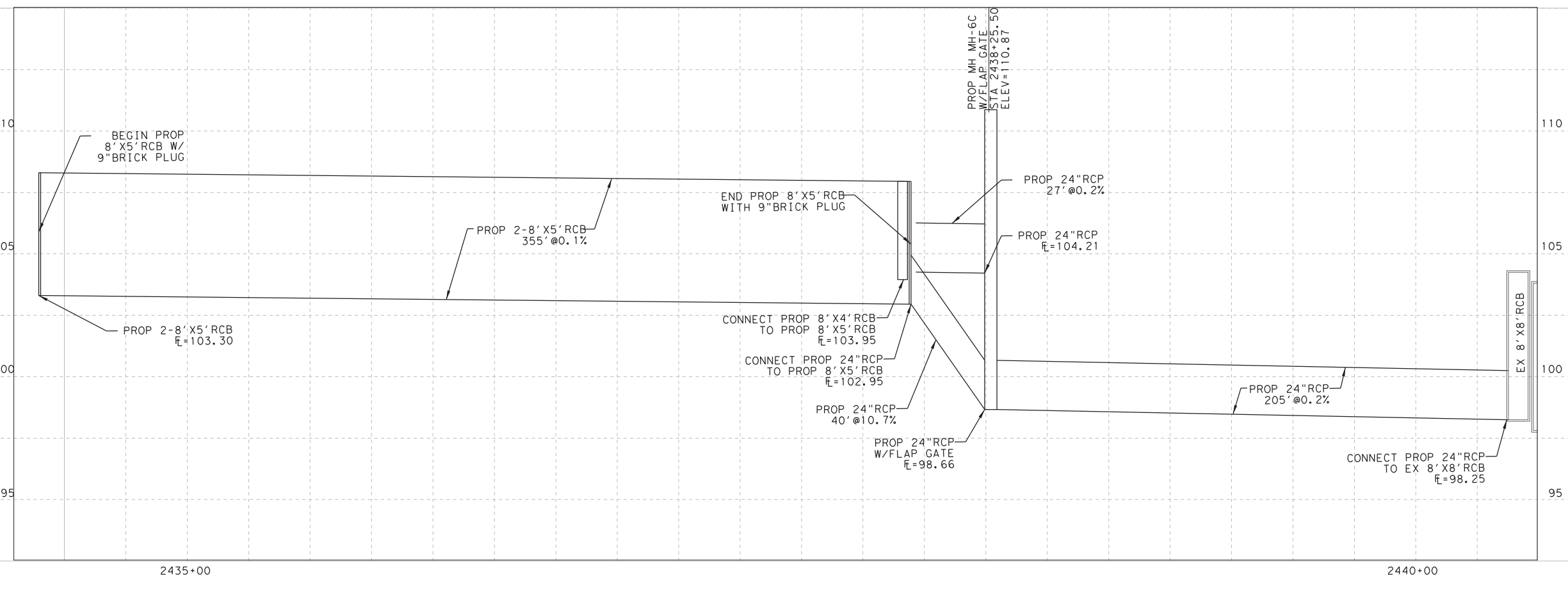
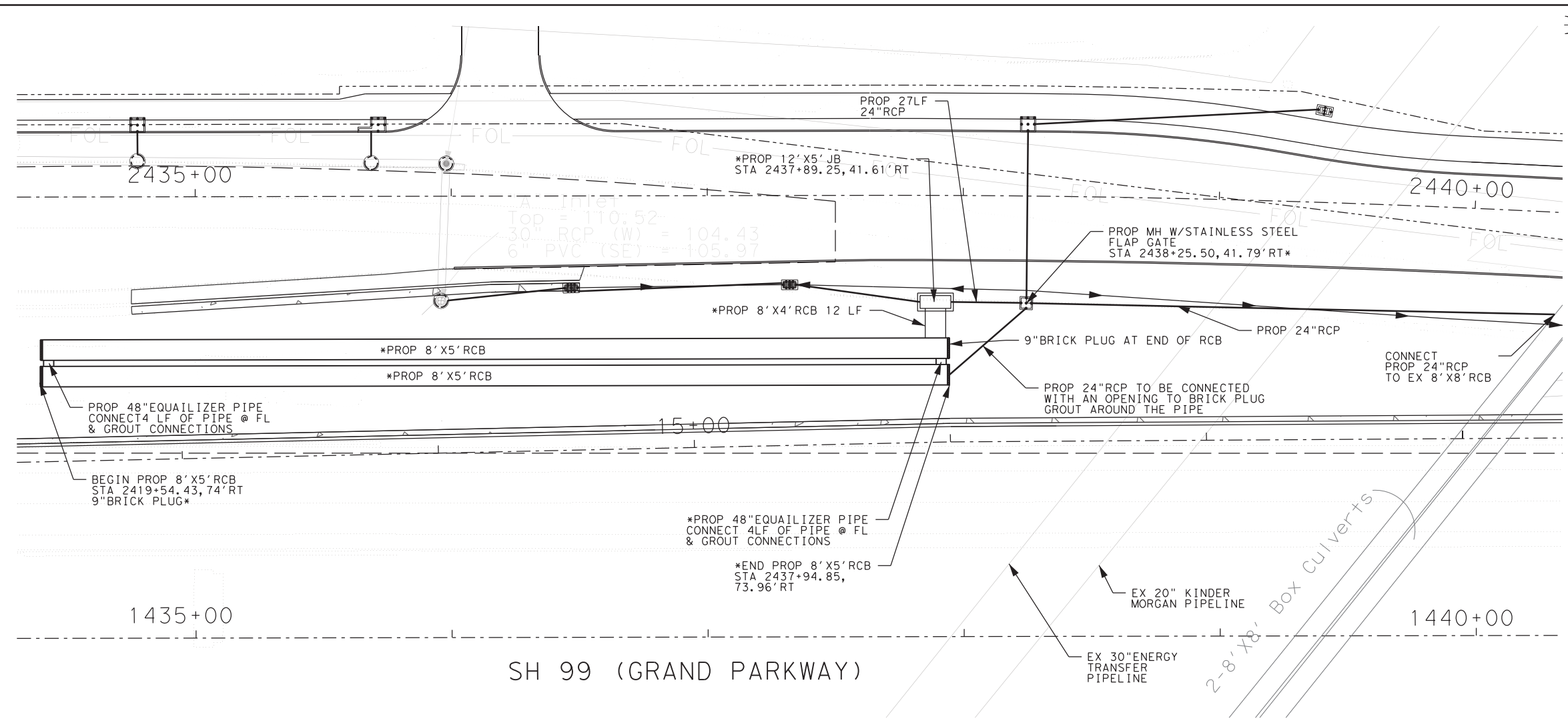
*Sujeeth Draksharam*  
 02/27/2023



**SH 99  
 SOUTHBOUND FRONTAGE ROAD  
 WESTHEIMER PKWY TO CINCO RANCH BLVD  
 IN-LINE MITIGATION-2  
 PLAN & PROFILE**

SHEET 1 OF 1

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	193



\$DATE\$  
 \$TIME\$  
 \$FILE\$



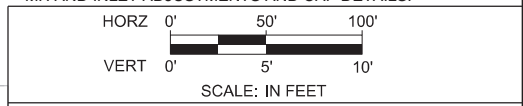


**LEGEND:**

- PROP STORM SEWER
- EXIST STORM SEWER
- PROP SWALE
- EXIST SWALE
- /■ PROPOSED INLET, JCT BOX, OR MH
- /■ EXISTING INLET OR JUNCTION BOX

**NOTE:**  
 THE DRAINAGE STUDY ENTITLED "FOR STATE HIGHWAY 99 ROADWAY IMPROVEMENT PROJECT", LIMITS: SH 99 FROM FM 1093 TO KINGSLAND BLVD. TXDOT CSJ NO'S. 3510-04-019, 3510-05-041, PREPARED BY CIVILTECH, A WOOLPERT COMPANY, DATED SEPTEMBER 2022, SEALED SEPTEMBER 30, 2022. DOCUMENTS THE DRAINAGE IMPACTS ASSOCIATED WITH THIS PROJECT.

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2. STATIONS AND OFFSETS FOR ALL MANHOLES AND GRATE INLETS ARE TAKEN FROM THE CENTER RIM OR GRATE RESPECTIVELY.
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6. STORM SEWER LENGTH SHOWN IS CENTER TO CENTER OF STRUCTURE WHICH DIFFERS FROM PAY LENGTH IN QUANTITY SHEET.
7. ALL THE MANHOLES, MH ON RCB AND JB ON THE PAVEMENT TO BE FLUSHED/CAPPED UNDER THE PAVEMENT SUBGRADE. BURIED TOP ELEVATIONS ARE PROVIDED IN PROFILE. SEE MH AND INLET ADJUSTMENTS AND CAP DETAILS.



Sujeeeth B. Draksharam  
 83251  
 LICENSED PROFESSIONAL ENGINEER  
*Sujeeeth B. Draksharam*  
 02/27/2023

3100 TIMMONS LN, SUITE 500  
 HOUSTON, TX 77027  
 TEXAS FIRM REGISTRATION NO. 5901  
 PHONE: 713-334-7300  
 FAX: 713-334-7303

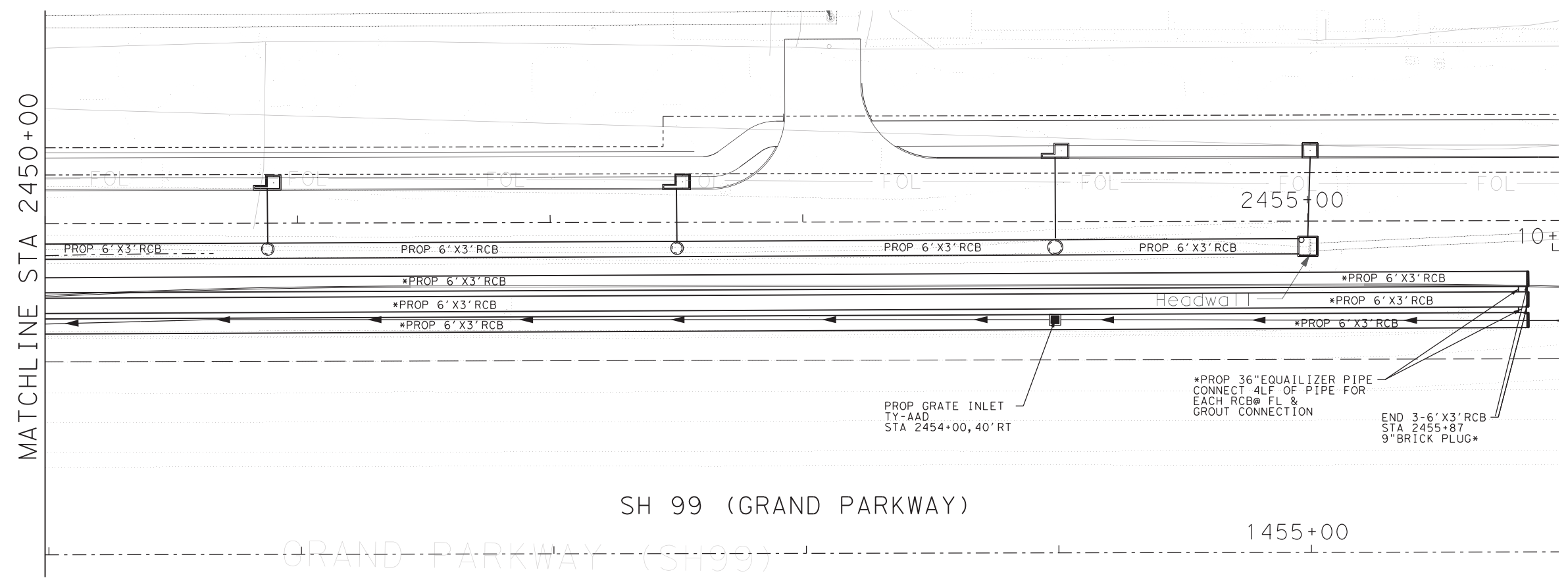
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**SH 99**  
**SOUTHBOUND FRONTAGE ROAD**  
**WESTHEIMER PKWY TO CINCO RANCH BLVD**  
**IN-LINE MITIGATION-1**  
**PLAN & PROFILE**

SHEET 2 OF 2

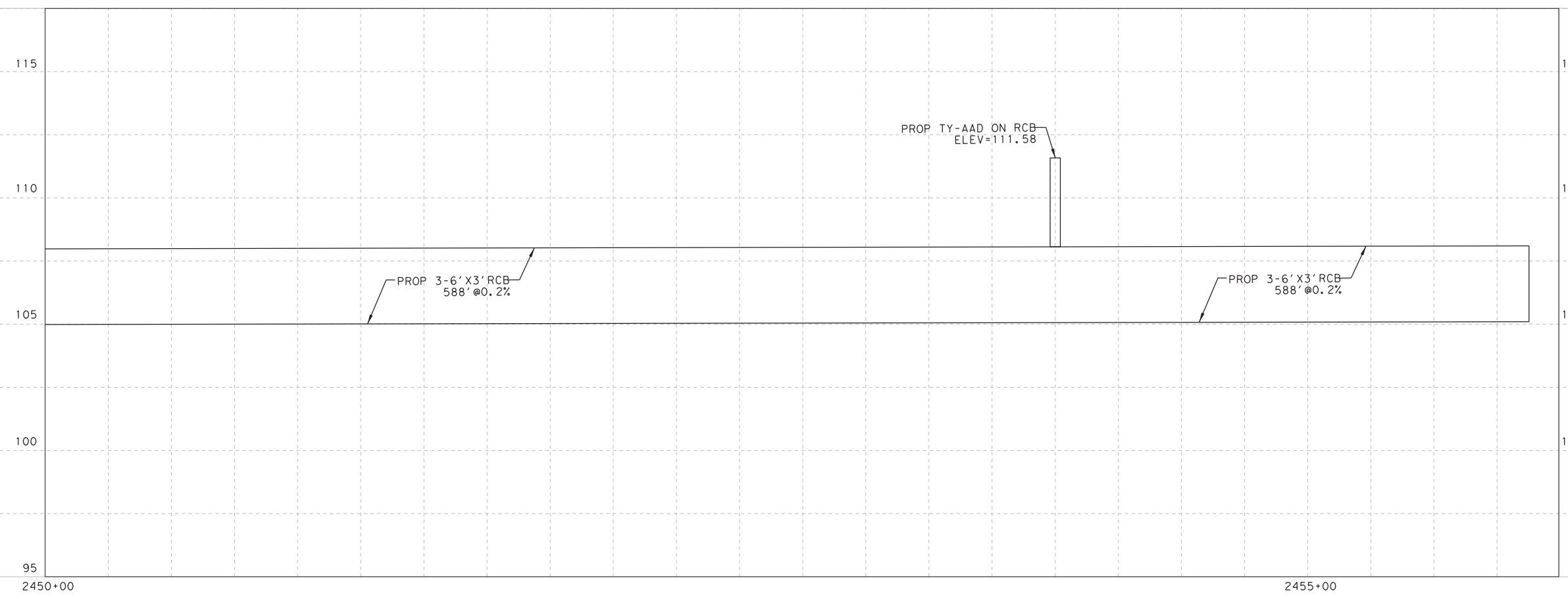
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6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	195

MATCHLINE STA 2450+00

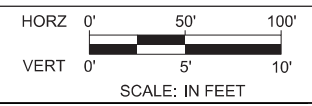
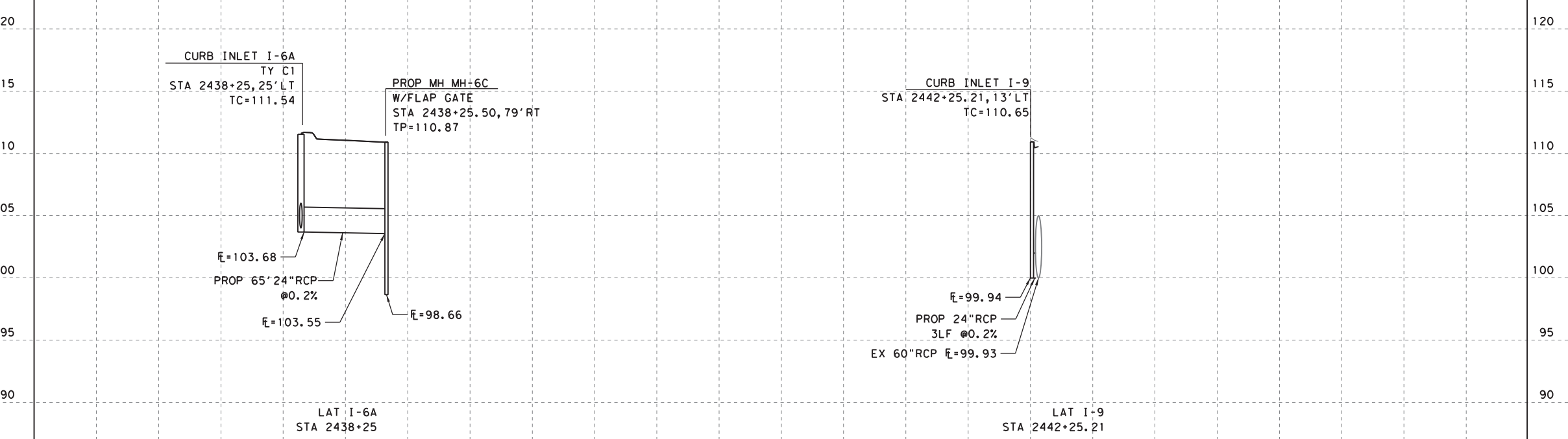
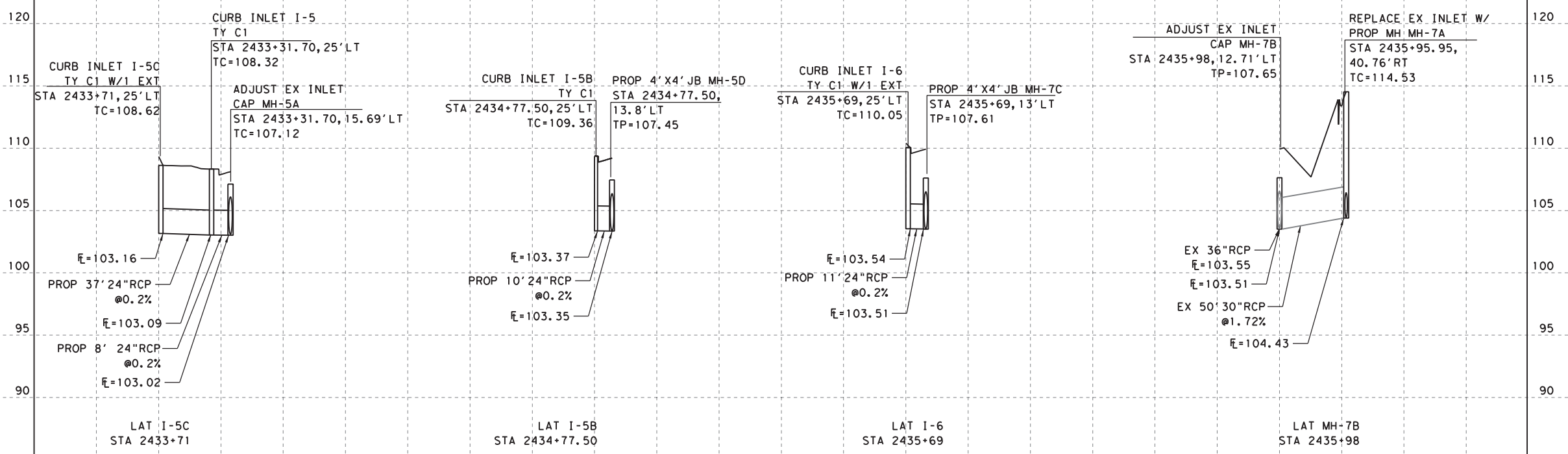


SH 99 (GRAND PARKWAY)

GRAND PARKWAY (SH99)



\$DATE\$  
 \$TIME\$  
 \$FILE\$



*Sujeeeth B. Draksharam*  
02/27/2023

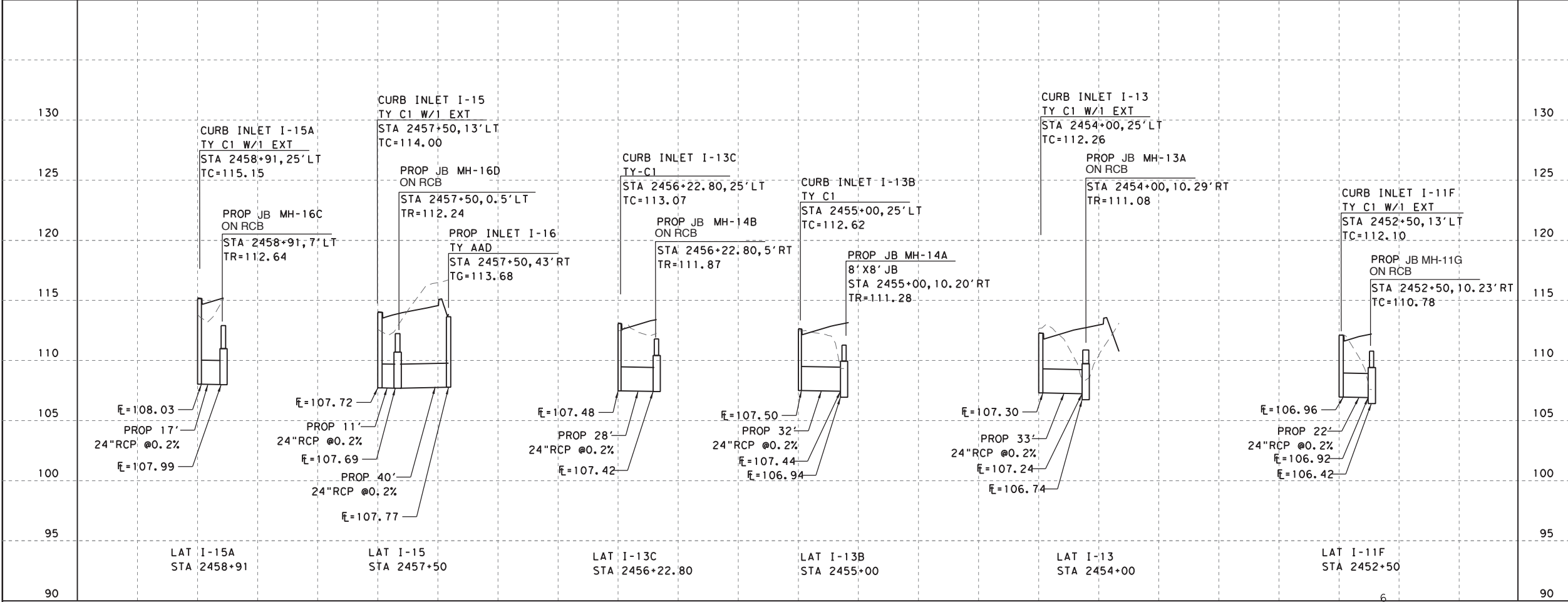
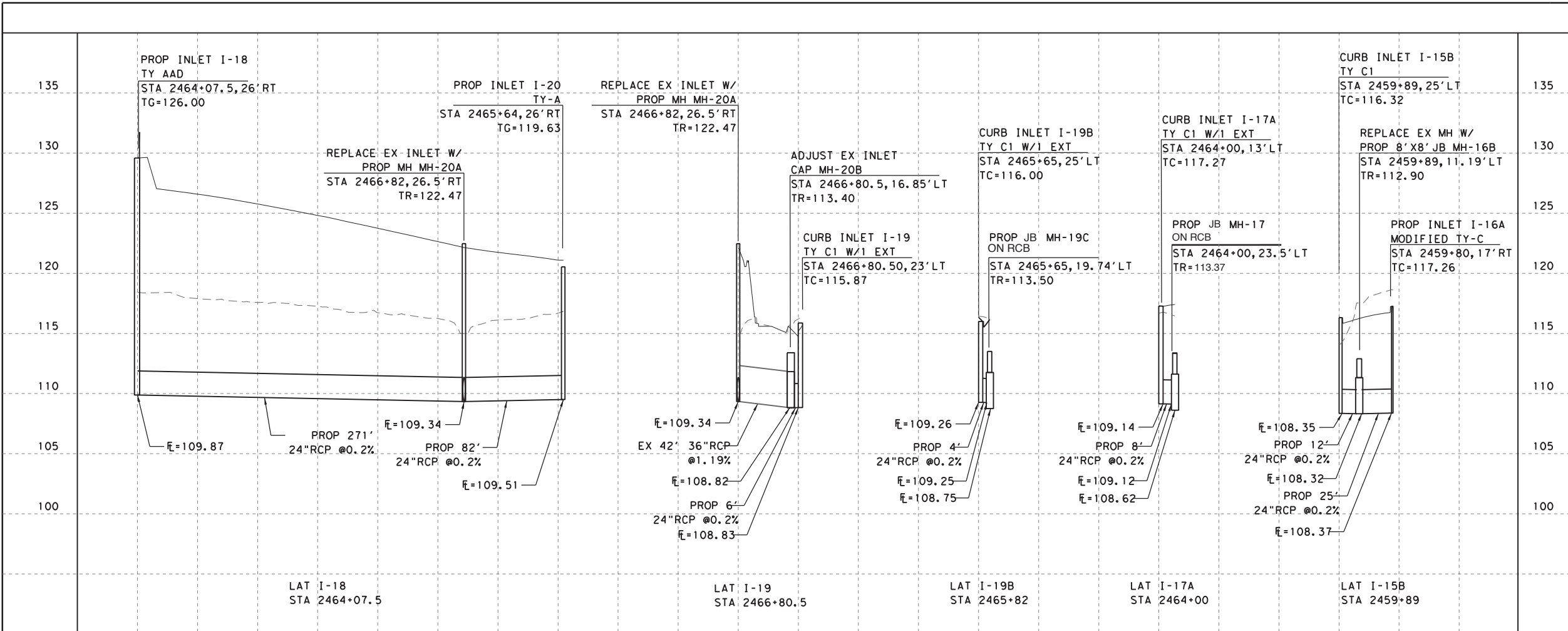


SH 99  
SOUTHBOUND FRONTAGE ROAD  
WESTHEIMER PKWY TO CINCO RANCH BLVD  
STORM SEWER LATERALS

SHEET 1 OF 3

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	\$PAGE\$ 196

\$DATE\$  
\$TIME\$  
\$FILE\$



HORZ 0' 50' 100'  
VERT 0' 5' 10'  
SCALE: IN FEET

*Sujeeth B. Draksharam*  
02/27/2023

**SIRRUS**  
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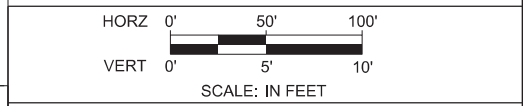
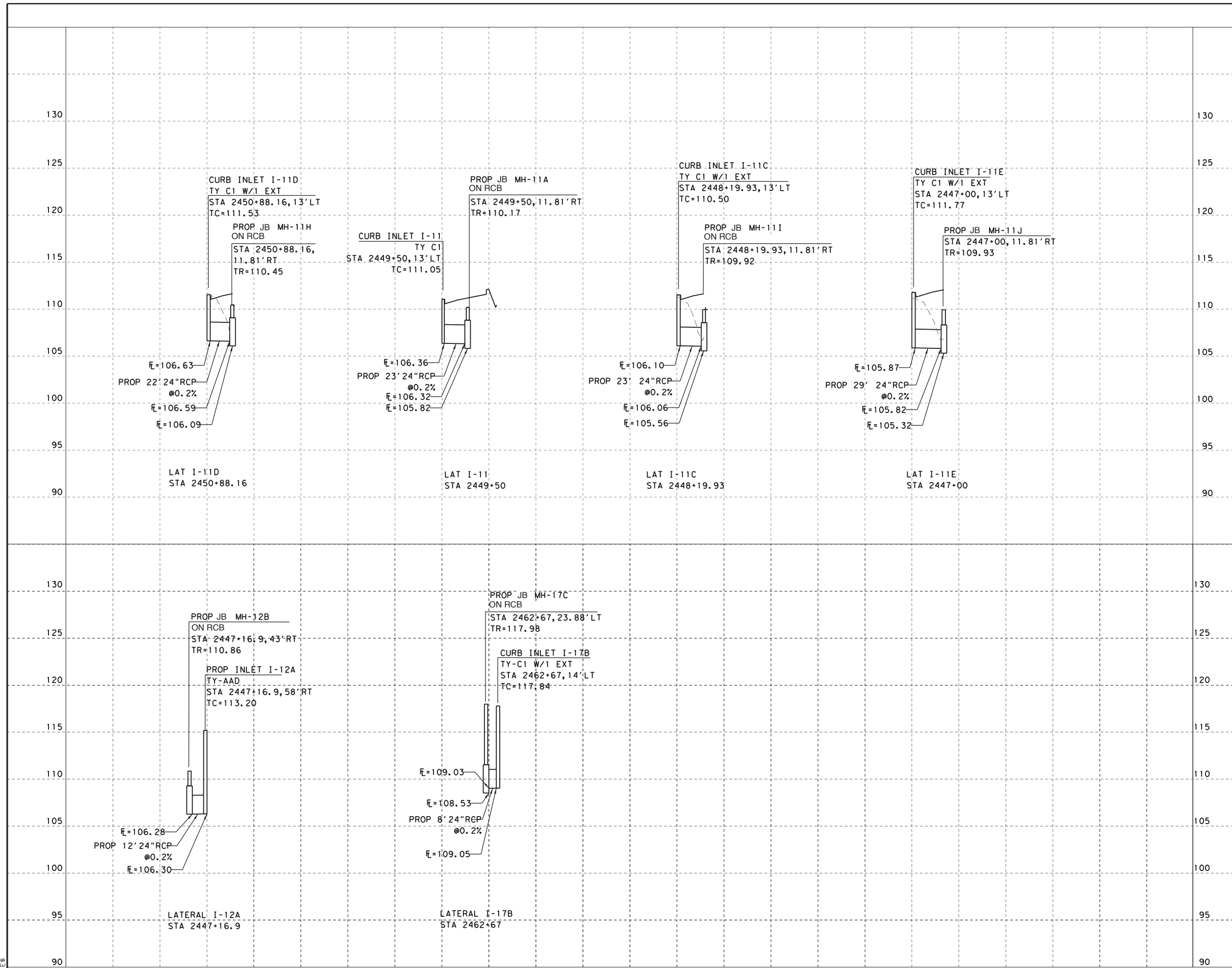
**SOUTHBOUND FRONTAGE ROAD  
WESTHEIMER PKWY TO CINCO RANCH BLVD  
STORM SEWER LATERALS**

SHEET 2 OF 3

FED. RD. DIV. NO.	PROJECT NO.	HIGHWAY NO.	
6		SH 99	
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	197

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\$TIME\$  
\$FILES\$

\$DATE\$  
\$TIME\$  
\$FILE\$



STATE OF TEXAS  
  
 SUJEETH B. DRAKSHARAM  
 83251  
 LICENSED PROFESSIONAL ENGINEER  
*Sujeeth Draksharam*  
 02/27/2023

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SH 99  
 SOUTHBOUND FRONTAGE ROAD  
 WESTHEIMER PKWY TO CINCO RANCH BLVD

STORM SEWER LATERALS

SHEET 3 OF 3

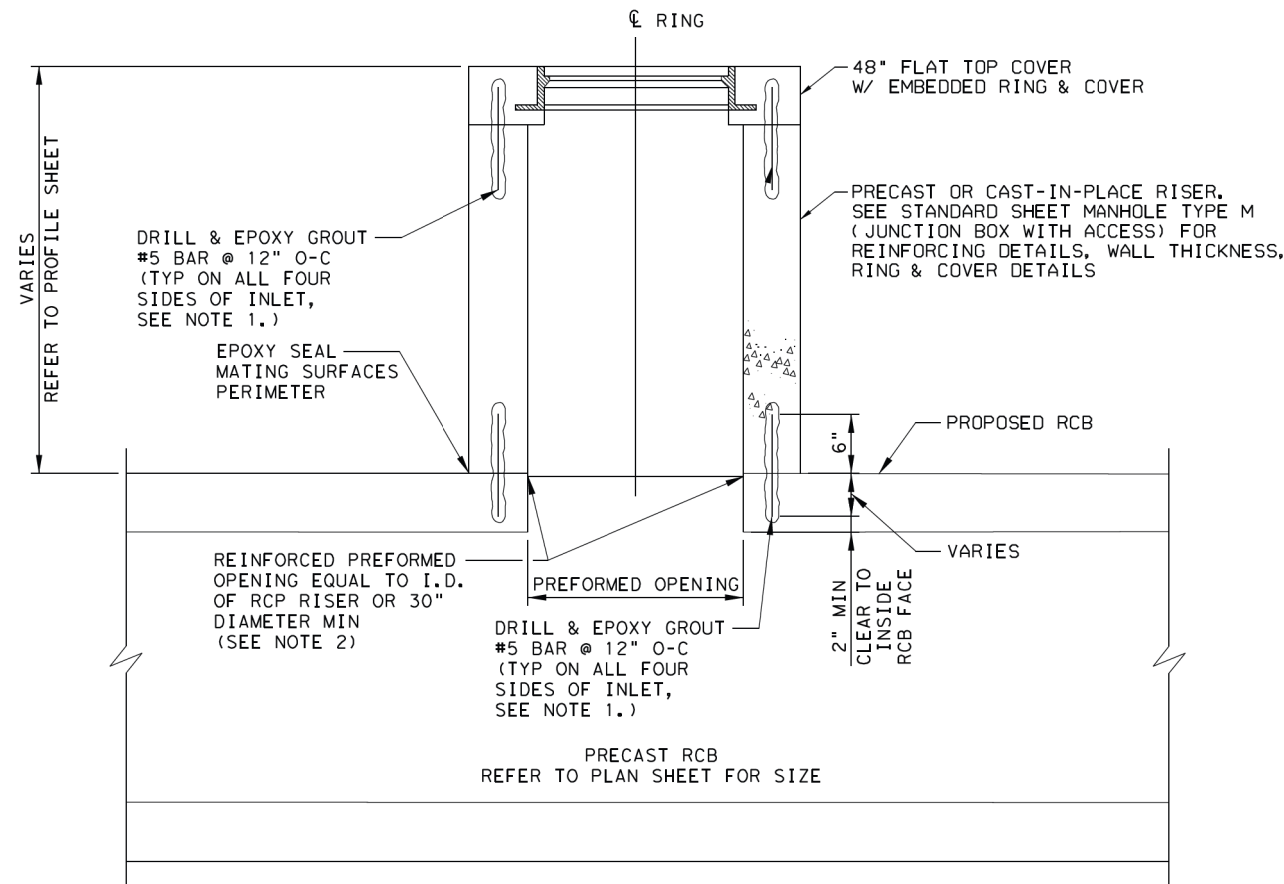
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6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	198

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\$PLTDRV\$

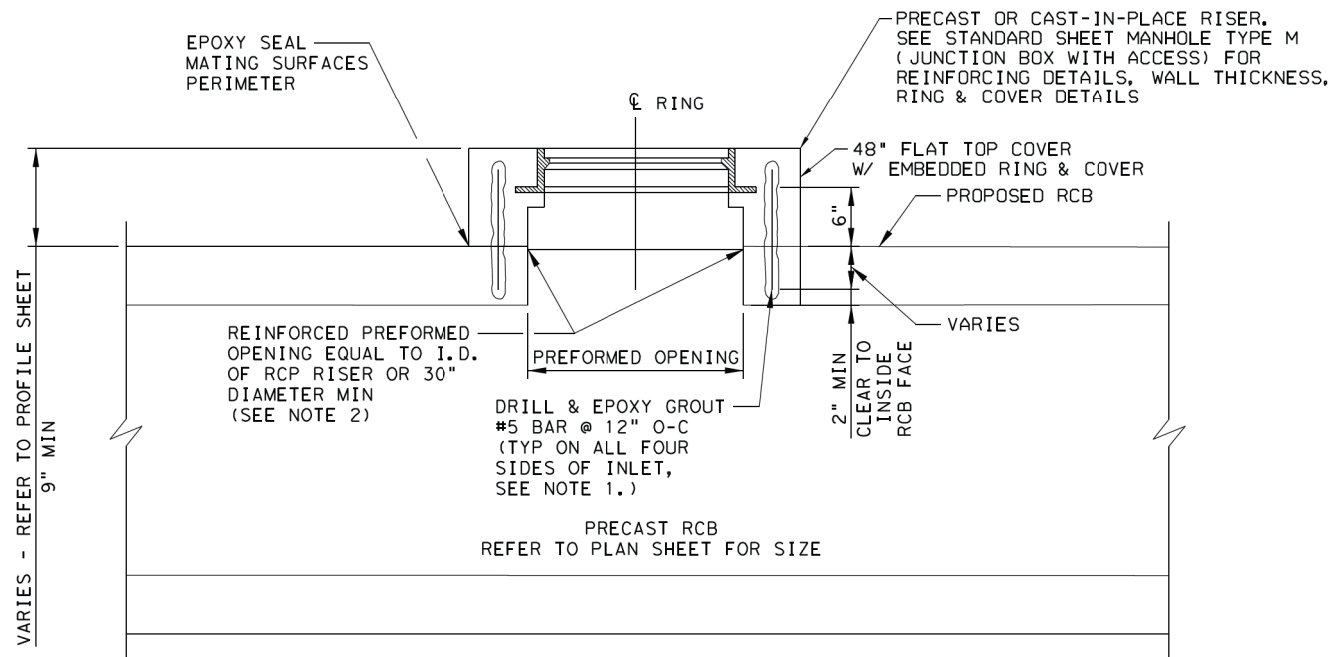
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ELEVATION (TYP)

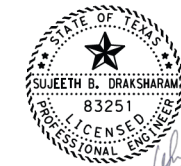


ELEVATION (TYP)

SHOWING MIN HEIGHT OF MH

NOTES:

1. EMBED ANCHOR BARS WITH HILTI HIT RE500 EPOXY ADHESIVE. OTHER TYPE III CLASS C EPOXY ADHESIVE MEETING THE REQUIREMENT OF DMS-6100, "EPOXIES AND ADHESIVES" MAY BE USED IF IT CAN BE DEMONSTRATED THAT THEY MEET OR EXCEED THE STRENGTH OF AFOREMENTIONED EPOXY WITH THE SAME EMBEDMENT DEPTH AND ANCHOR BAR SIZE AND SPACING. FOLLOW MANUFACTURER'S DIRECTIONS FOR INSTALLATION.
2. CONCRETE SHALL BE CLASS "C" WITH 28 DAY COMPRESSIVE STRENGTH  $f'_c = 3.6$  ksi. ALL REINFORCING STEEL SHALL BE GRADE 60.
3. REINFORCED PREFORMED OPENING TO HAVE ADDITIONAL REINFORCEMENT AND SIGNED AND SEALED SHOP DRAWING IS REQUIRED FOR APPROVAL WHETHER PRECAST OR CAST-IN-PLACE.



*Sujeeth B. Draksharam*  
01-20-2023

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**SH 99**  
**RCB MH RISER DETAILS**

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6			199
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	HIGHWAY NO.
3510	04	055	SH 99

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\$TIMES\$

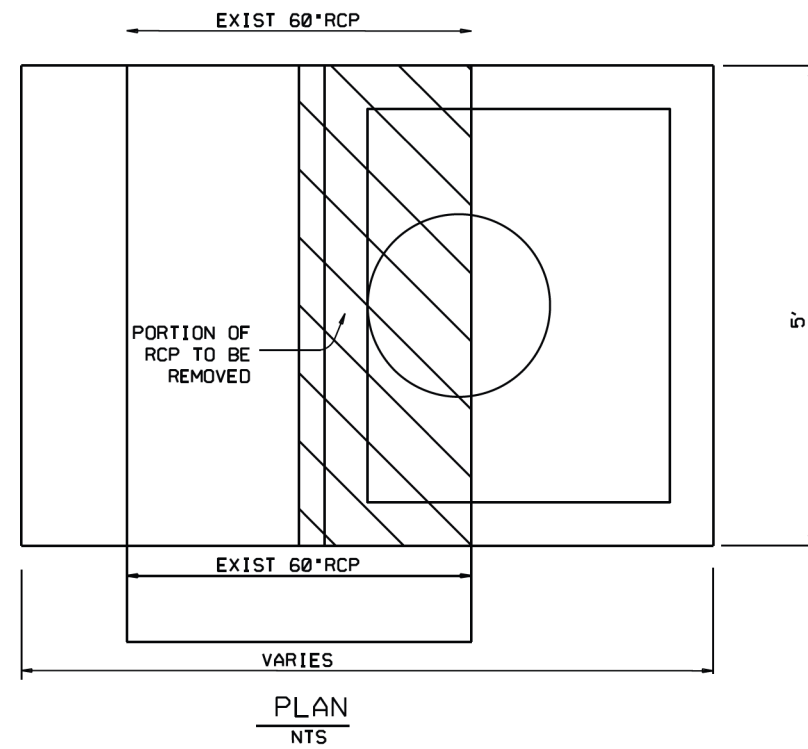


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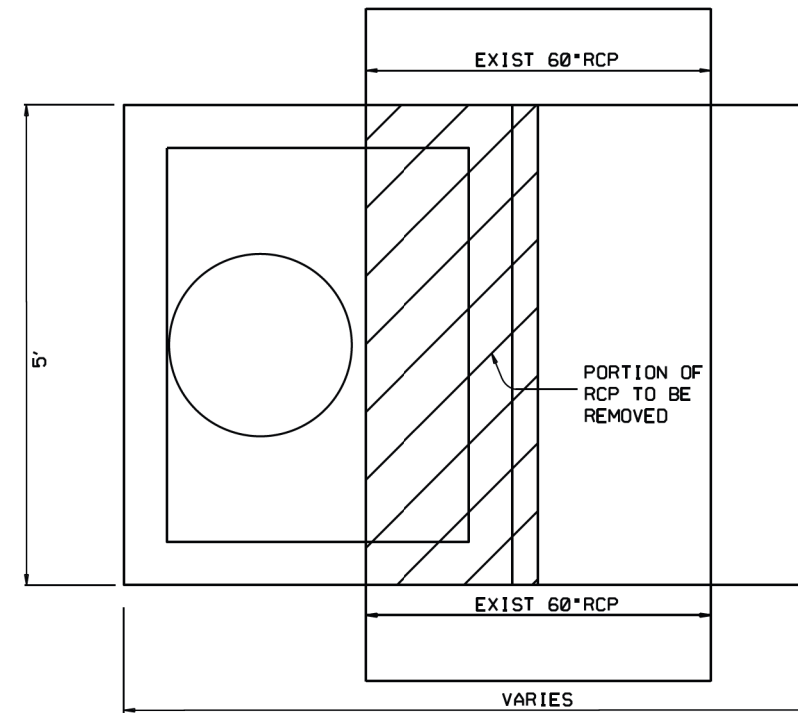
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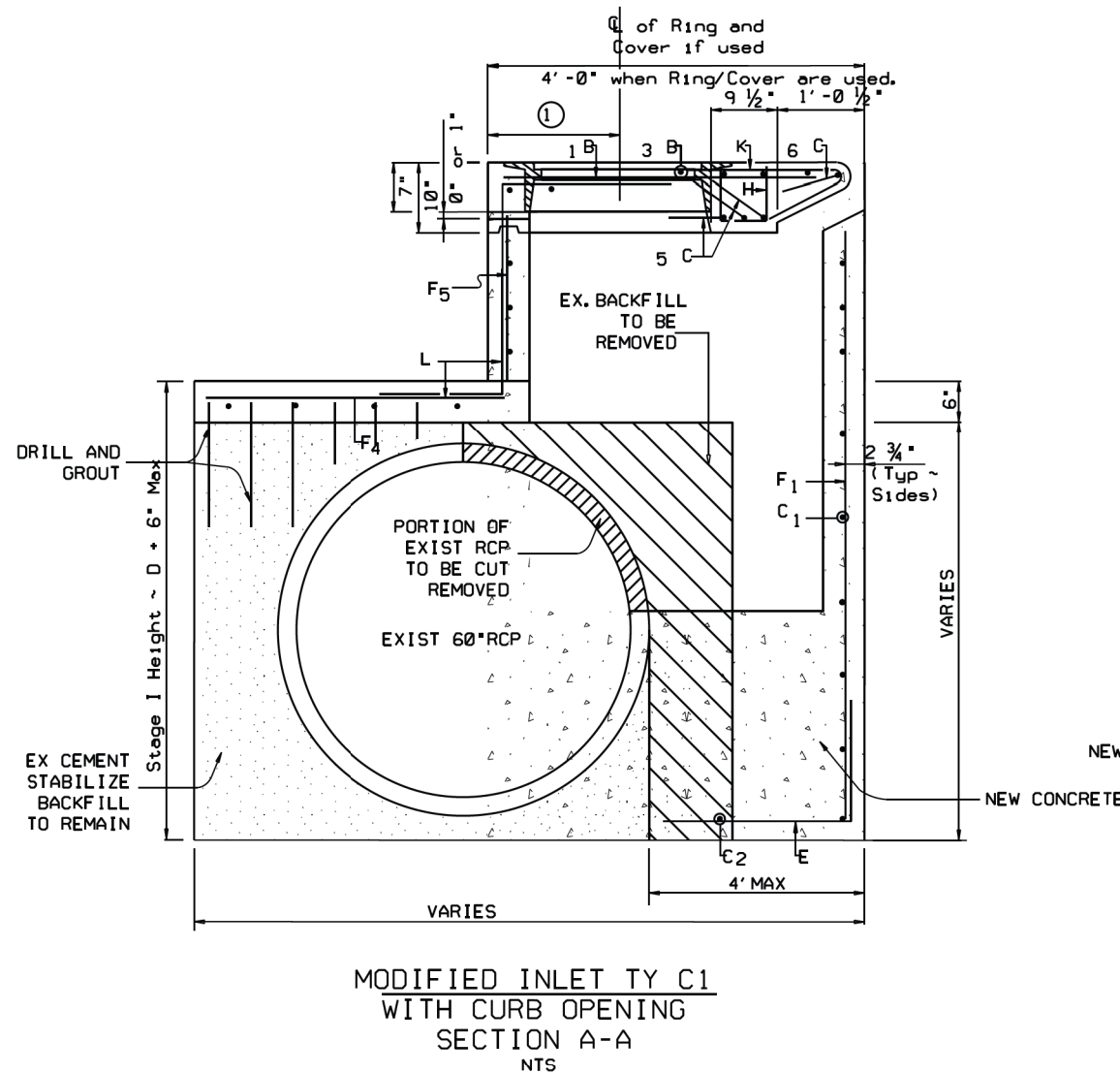


PLAN  
NTS

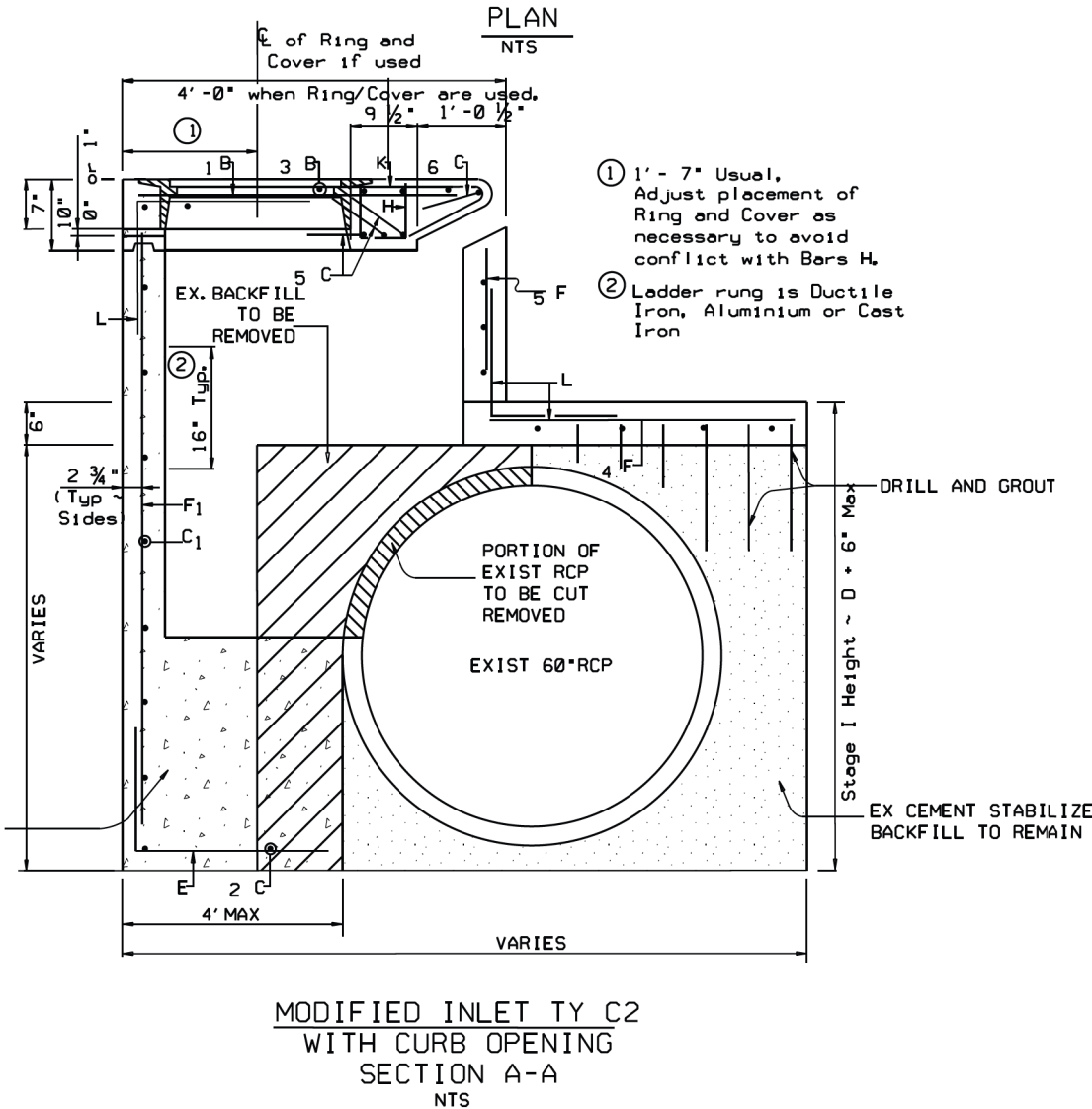


PLAN  
NTS

GENERAL NOTES:  
 REMOVE PART OF EXISTING INLET THAT CONFLICTS WITH THESE DETAILS.  
 ALSO, REMOVE AND CAP PART OF EXISTING INLET THAT CONFLICTS WITH PROPOSED RETAINING WALL



MODIFIED INLET TY C1  
WITH CURB OPENING  
SECTION A-A  
NTS



MODIFIED INLET TY C2  
WITH CURB OPENING  
SECTION A-A  
NTS

- ① 1' - 7" Usual, Adjust placement of Ring and Cover as necessary to avoid conflict with Bars H.
- ② Ladder rung is Ductile Iron, Aluminium or Cast Iron



NO.	DATE	REVISION	APPROV.

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SH 99  
MISCELLANEOUS  
DRAINAGE DETAILS  
INLETS TYC1 & TYC2-MOD

FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.	
6		200	
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	HIGHWAY NO.
3510	04	055	SH 99

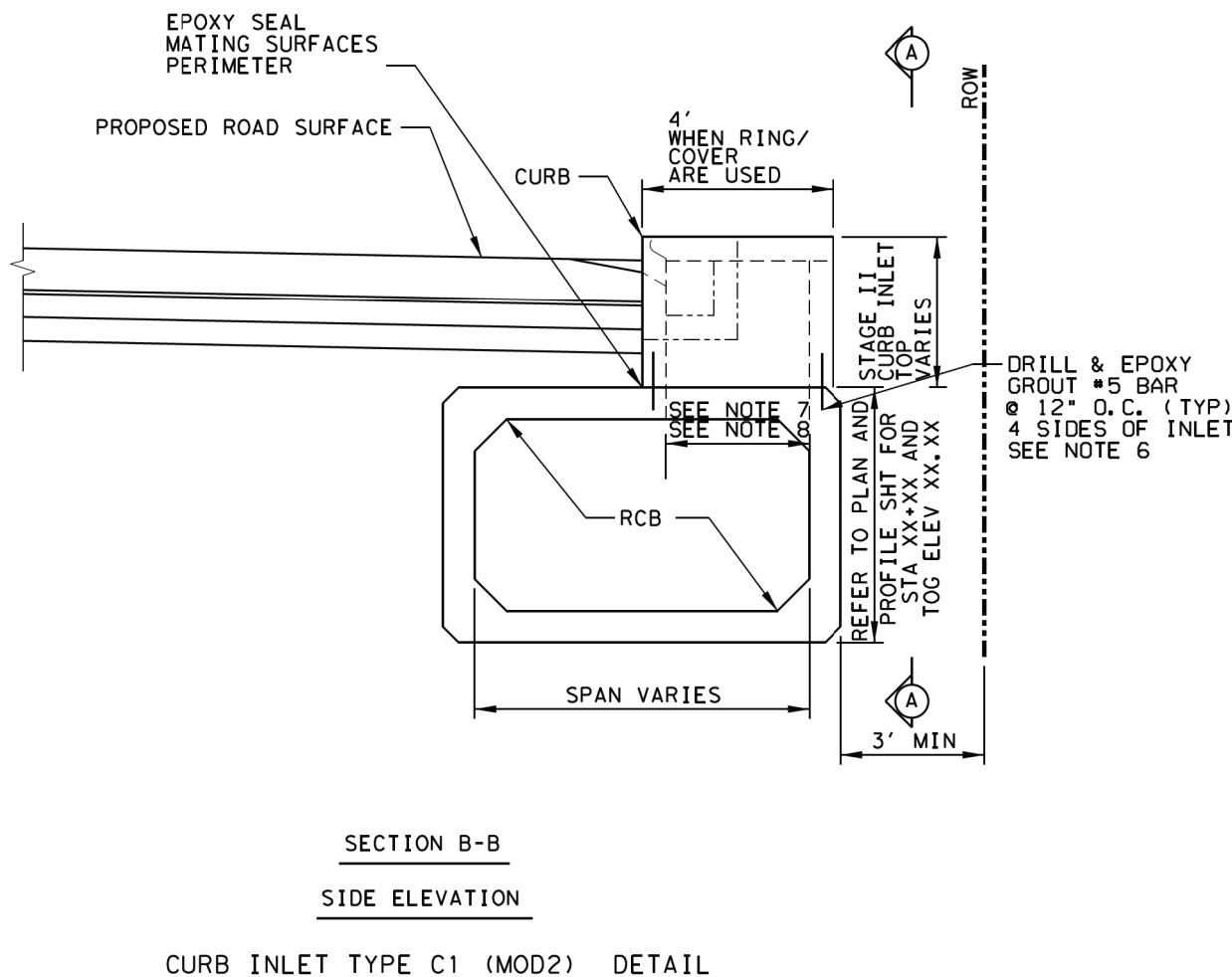
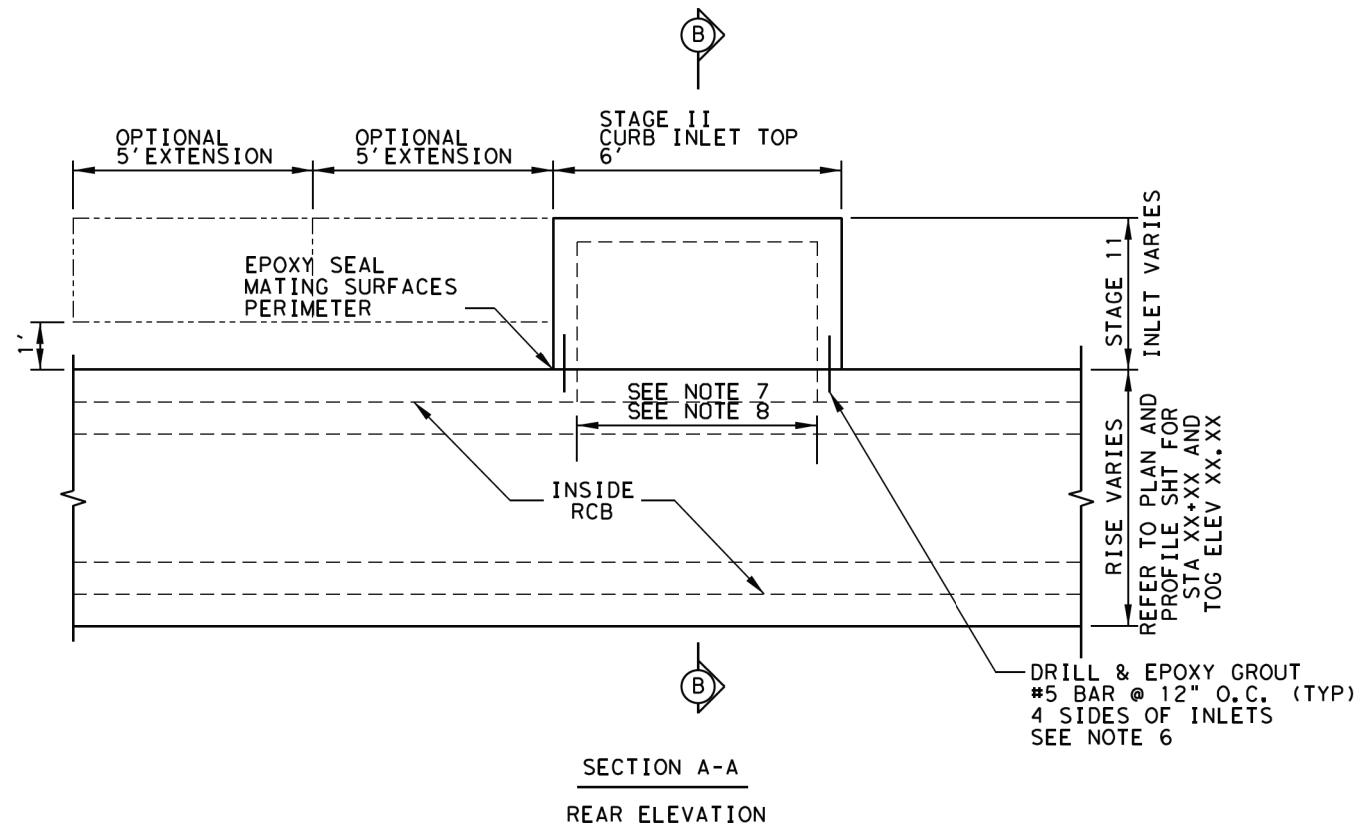
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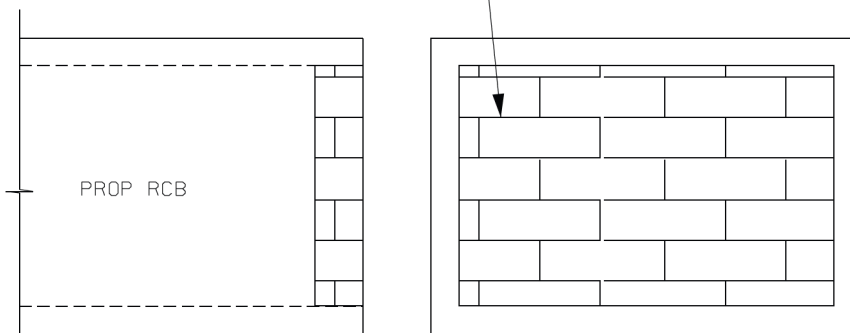
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9" BRICK PLUG WITH MORTAR SEAL



RCB  
BRICK PLUG DETAIL-A  
N.T.S.

NOTE:  
BRICK PLUG INCIDENTAL  
TO STORM SEWER ITEMS  
NO SEPERATE PAY

1. INLET TO BE DESIGNED BY PRECAST MANUFACTURER, AND APPROVED BY THE ENGINEER.
2. INLET DESIGN SHALL CONFORM TO STAGE II PORTION OF PREFABRICATED TYPE C1 CURB INLET AND EXTENSIONS AND APPLICABLE PROJECT STANDARDS.
3. EACH FIVE FOOT CURB OPENING OF THE EXTENSION IS CONSIDERED "ONE EXTENSION" REGARDLESS OF WHETHER PLACED MONOLITHICALLY OR PRECAST. EXTENSION LENGTH SHALL BE IN MULTIPLES OF 5 FEET.
4. RING AND COVER SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M306, "STANDARD SPECIFICATIONS FOR DRAINAGE STRUCTURE CASTINGS". MATERIALS SHALL CONFORM TO ASTM A48, CLASS 35B FOR GRAY IRON CASTINGS OR ASTM A536, GRADE 65-45-12 FOR DUCTILE IRON CASTINGS. ALUMINUM ALLOY CASTINGS SHALL NOT BE PERMITTED.
5. IF MORE THAN ONE EXTENSION IS REQUIRED, THEY SHOULD ALL BE LOCATED ON ONE SIDE OF THE STAGE II CURB INLET TOP AS INDICATED ON SECTION A-A. NO SLOPE IS REQUIRED IN FLOW LINE OF EXTENSION.
6. DRILL HOLE FOR EMBEDDED REINFORCING BARS PER EPOXY GROUT MANUFACTURER'S REQUIREMENTS.
7. REINFORCED PREFORMED OPENING EQUAL TO INLET INSIDE DIMENSION.
8. REINFORCED PREFORMED OPENING TO HAVE ADDITIONAL REINFORCEMENT AND SIGNED AND SEALED SHOP DRAWING IS REQUIRED FOR APPROVAL WHETHER PRECAST OR CAST-IN-PLACE.



NO.	DATE	REVISION	APPROV.

**SIRRUS**  
ENGINEERS, INC.

3100 TIMMONS LN. SUITE 500  
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TEXAS FIRM REGISTRATION NO. 5901  
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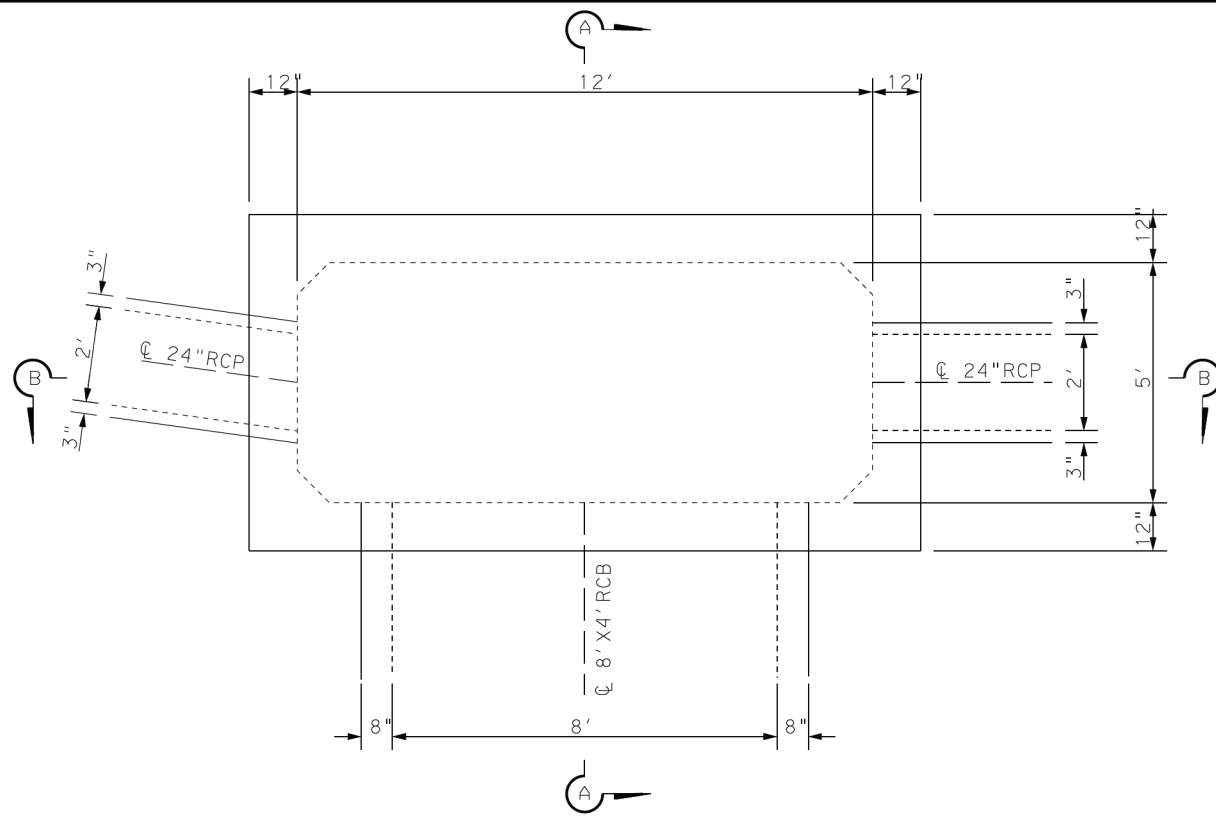
**SH 99**  
MISCELLANEOUS  
DRAINAGE DETAILS

SHEET 1 OF 1

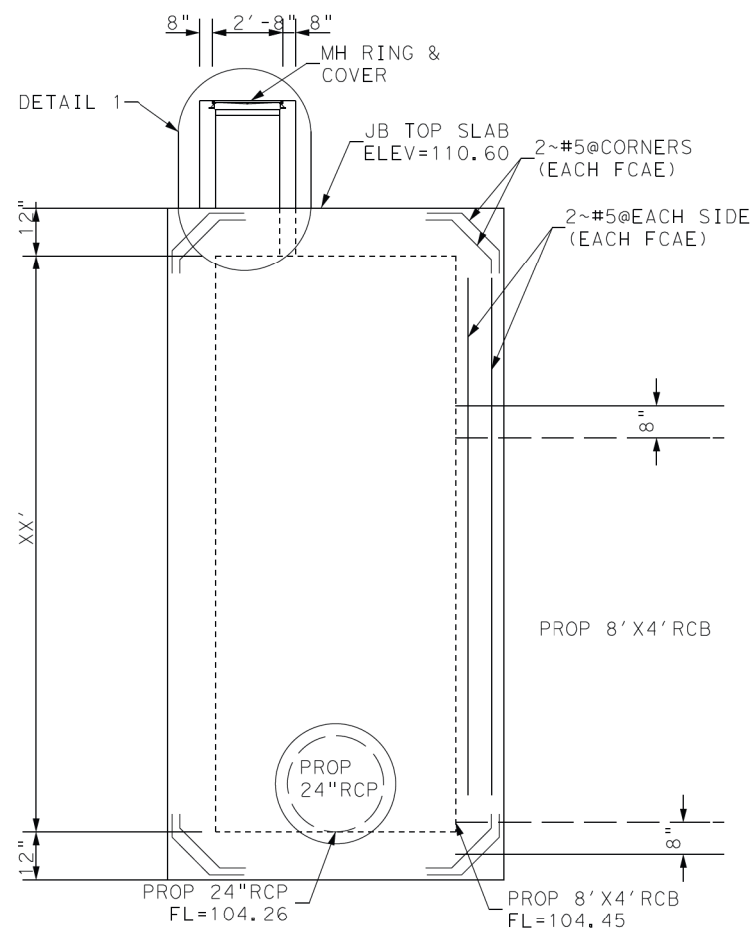
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6		201	
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	HIGHWAY NO.
3510	04	055	SH 99

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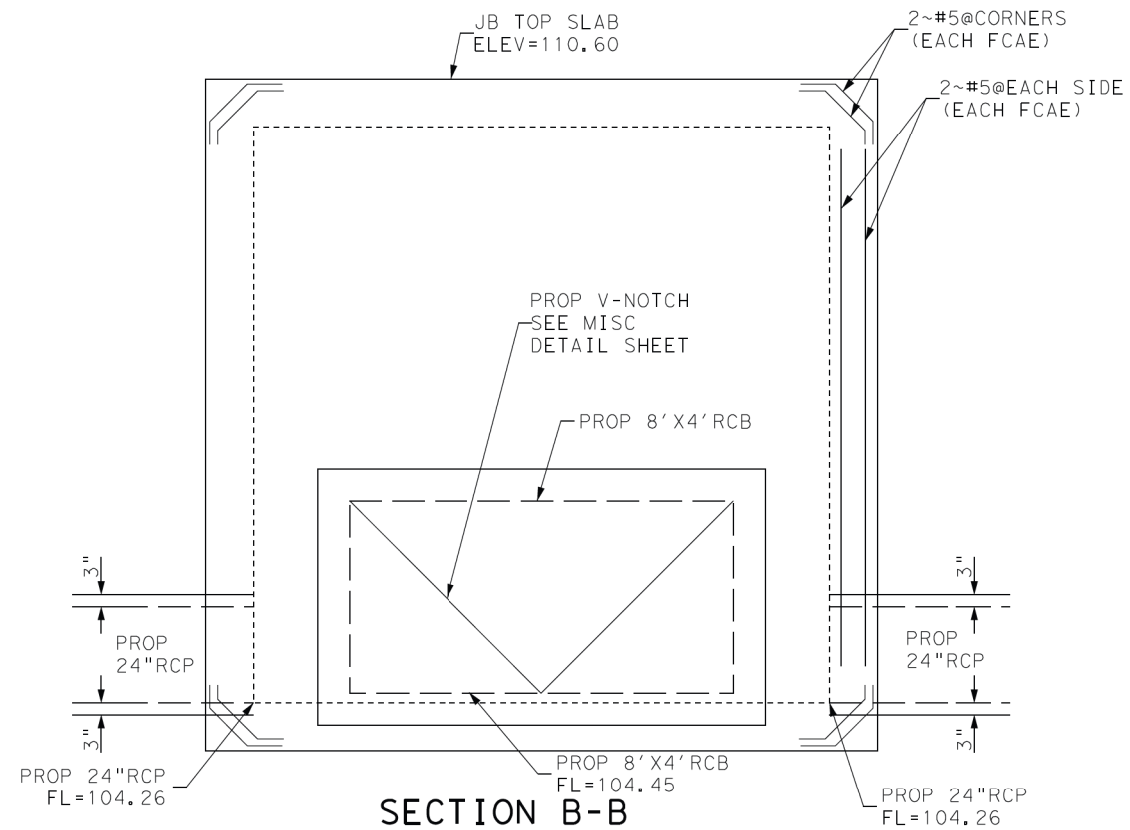


PLAN~JUNCTION BOX  
SCALE: N. T. S.



SECTION A-A

NOTE: Cut And Bend Wall Reinforcing  
Steel To Clear Openings

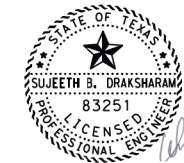


SECTION B-B

NOTE: Cut And Bend Wall Reinforcing  
Steel To Clear Openings

NOTES:

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3. STATIONS AND OFFSETS FOR ALL SAFETY END TREATMENTS ARE TAKEN FROM SOFFIT OF TRIM.
4. STATIONS AND OFFSETS FOR CURB INLETS ARE TAKEN AT FACE OF CURB. ELEVATION CORRESPONDS TO TOP OF CURB (TOC).
5. STATIONS AND OFFSETS FOR GRATE INLETS ARE TAKEN AT CENTER OF STRUCTURE. ELEVATION CORRESPONDS TO TOP OF GRATE (TOG).



*Sujeeth Draksharam*  
01-20-2023

NO.	DATE	REVISION	APPROV.



3100 TIMMONS LN, SUITE 500  
HOUSTON, TX 77027  
TEXAS FIRM REGISTRATION NO. 5901  
PHONE: 713-334-7300  
FAX: 713-334-7303



SH 99

JUNCTION BOX DETAILS  
JB- (12' X 5') @2437+89.25  
SB FRONTAGE RD

SHEET 1 OF 2

FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.	
6		202	
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	HIGHWAY NO.
3510	04	055	SH 99

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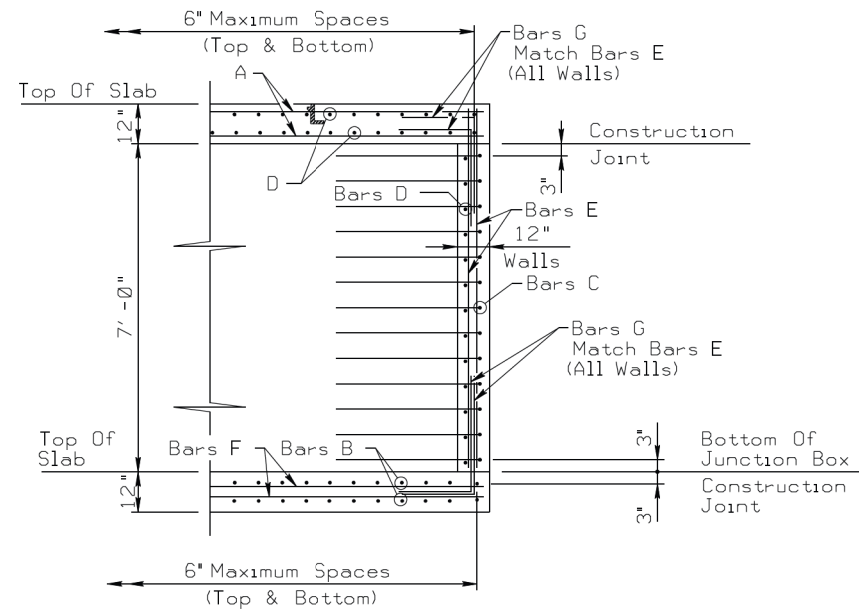
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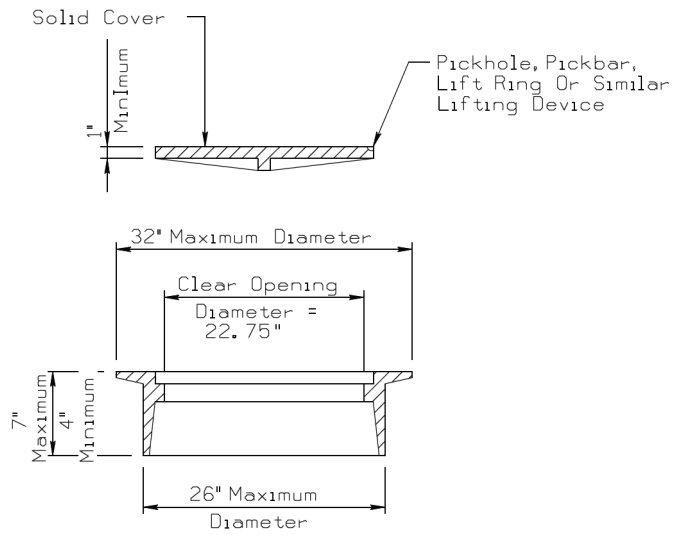
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TYPICAL REINFORCING DETAIL  
(N. T. S)



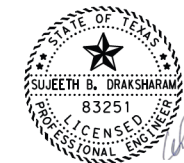
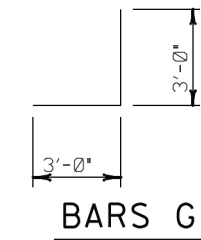
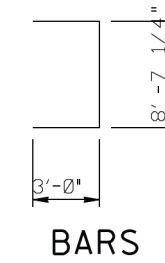
RING AND COVER DETAILS

Approximate Weight = 245 lbs.

GENERAL NOTES:

Ring and cover shall conform to the requirements of AASHTO M306, "Standard Specification for Drainage Structure Castings". Materials shall conform to ASTM A48, Class 35B for gray iron castings or ASTM A536, Grade 65-45-12 for ductile iron castings. Aluminum alloy castings shall not be permitted.

BAR TABLE	
BAR	SIZE
A	#6
B	#5
C	#5
D	#5
E	#5
F	#6
G	#5
H	#5
J	#5
K	#5
M	#5

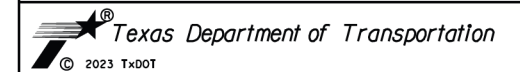


*Sureeth B. Draksharan*  
01-20-2023

NO.	DATE	REVISION	APPROV.



3100 TIMMONS LN. SUITE 500  
HOUSTON, TX 77027  
TEXAS FIRM REGISTRATION NO. 5901  
PHONE 713-334-7300  
FAX 713-334-7303



SH 99

JUNCTION BOX DETAILS  
JB- (12' X 5') 2437+89.25  
SB FRONTAGE RD

SHEET 2 OF 2

FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.	
6		203	
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	HIGHWAY NO.
3510	04	055	SH 99

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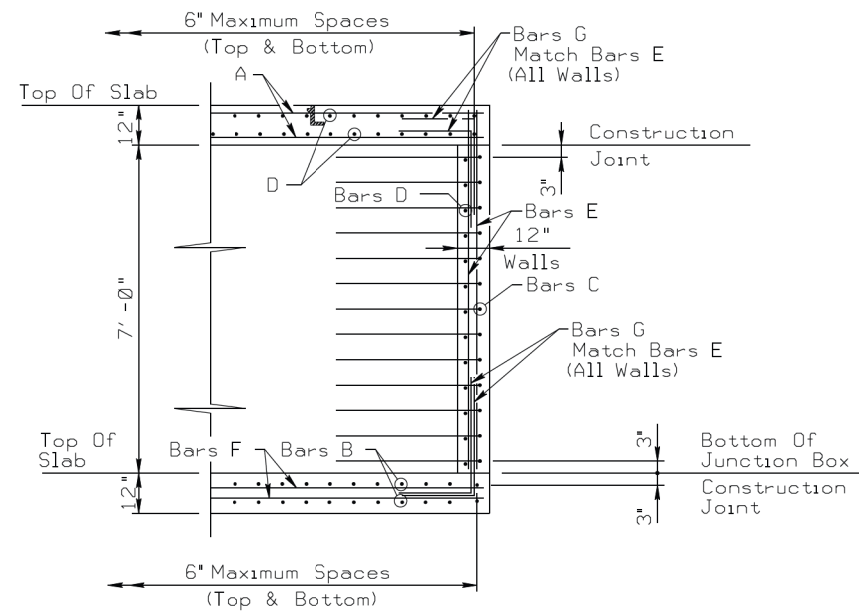


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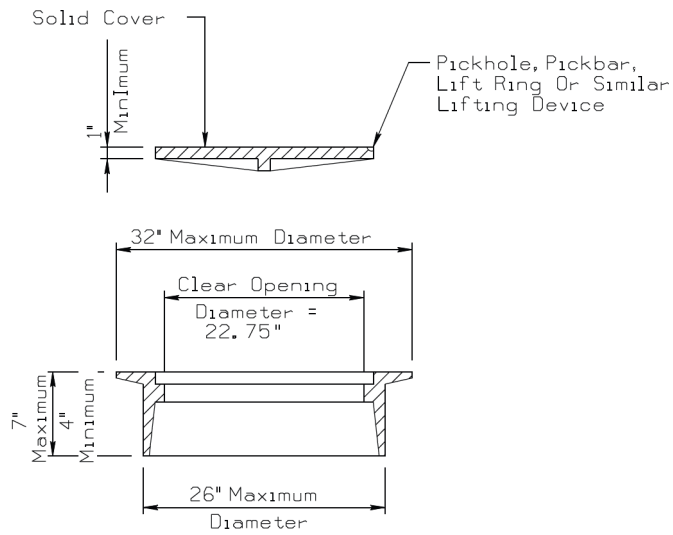
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**TYPICAL REINFORCING DETAIL**  
(N. T. S)



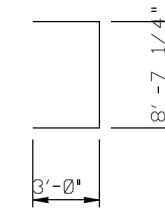
**RING AND COVER DETAILS**

Approximate Weight = 245 lbs.

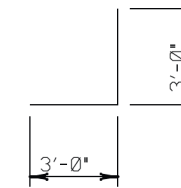
**GENERAL NOTES:**

Ring and cover shall conform to the requirements of AASHTO M306, "Standard Specification for Drainage Structure Castings". Materials shall conform to ASTM A48, Class 35B for gray iron castings or ASTM A536, Grade 65-45-12 for ductile iron castings. Aluminum alloy castings shall not be permitted.

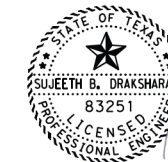
BAR TABLE	
BARS	SIZE
A	#6
B	#5
C	#5
D	#5
E	#5
F	#6
G	#5
H	#5
J	#5
K	#5
M	#5



**BARS C**



**BARS G**

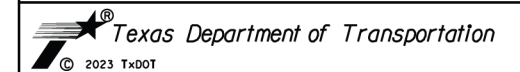


*Sujeeth Draksharam*  
01-20-2023

NO.	DATE	REVISION	APPROV.



3100 TIMMONS LN, SUITE 500  
HOUSTON, TX 77027  
TEXAS FIRM REGISTRATION NO. 5901  
PHONE: 713-334-7300  
FAX: 713-334-7303



**SH 99**

JUNCTION BOX DETAILS  
JB - (12' X 9') 2444+75  
SB FRONTAGE RD

SHEET 2 OF 2

FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.	
6		206	
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	HIGHWAY NO.
3510	04	055	SH 99

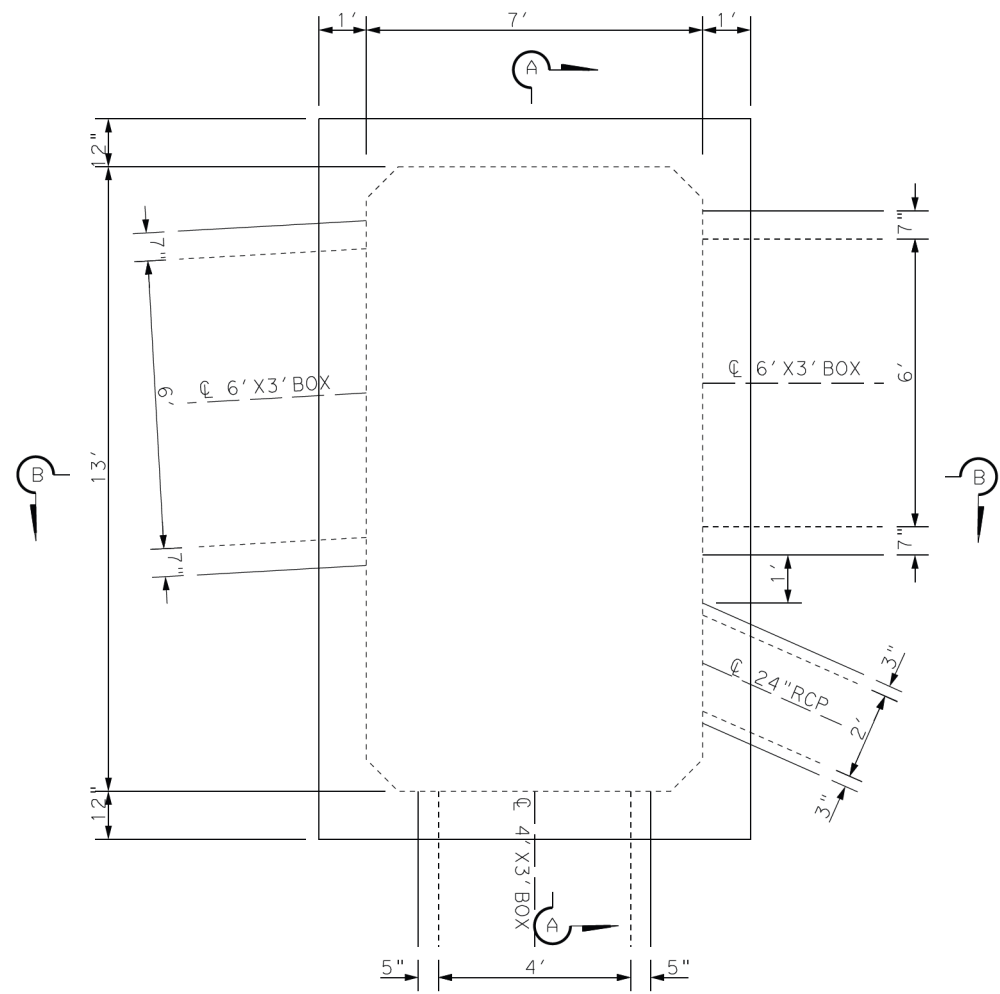
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\$PENTBL\$  
\$PLTDRVS\$

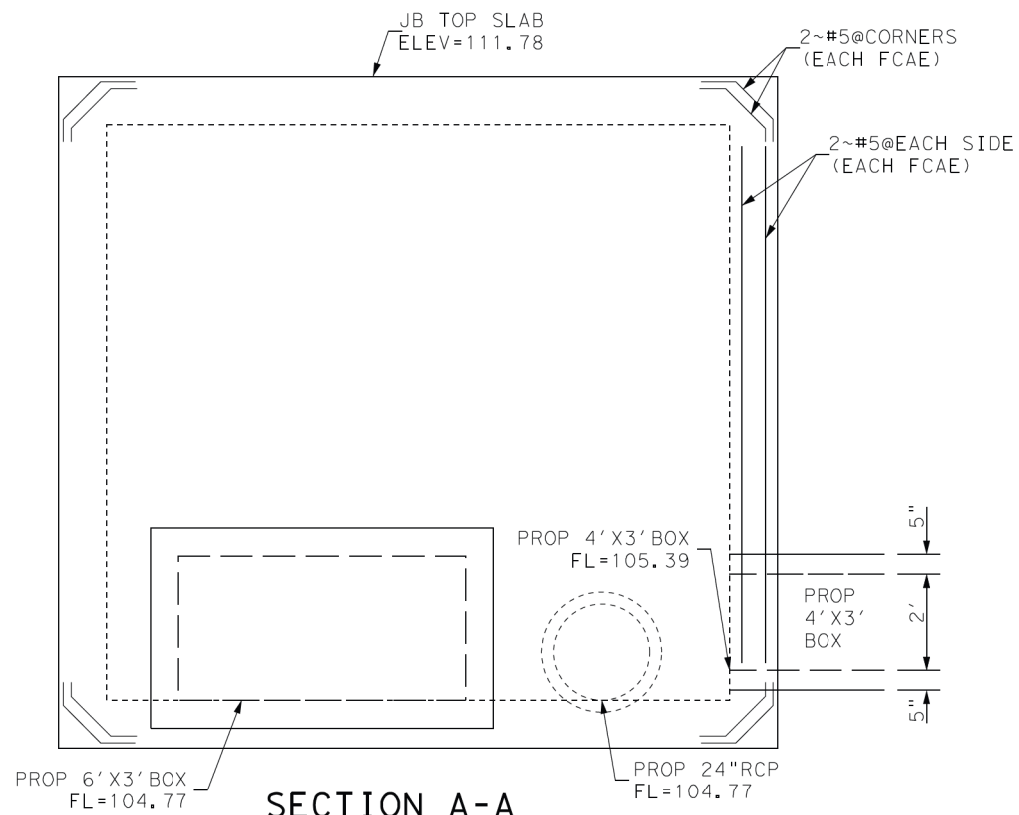
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\$TIMES\$

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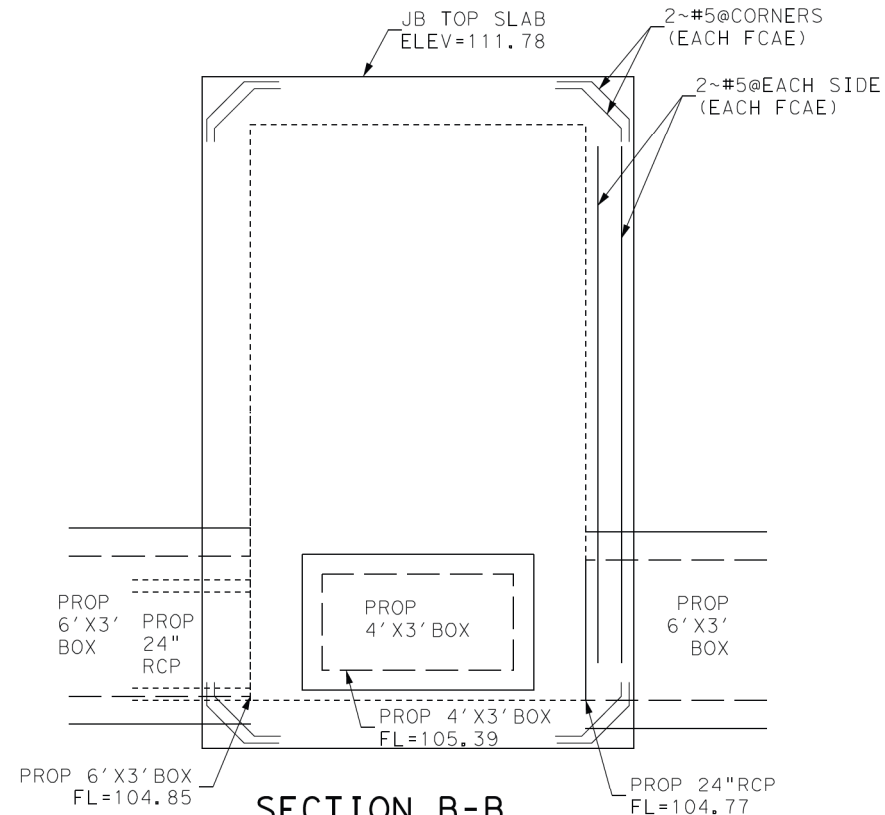


PLAN~JUNCTION BOX  
SCALE: N. T. S.



SECTION A-A

NOTE: Cut And Bend Wall Reinforcing Steel To Clear Openings

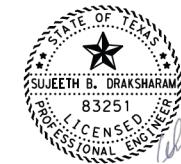


SECTION B-B

NOTE: Cut And Bend Wall Reinforcing Steel To Clear Openings

NOTES:

1. STATIONS AND OFFSETS ARE BASED ON  $\phi$  EBFR UNLESS OTHERWISE NOTED.
2. STATIONS AND OFFSETS FOR ALL MANHOLES AND GRATE INLETS ARE TAKEN FROM THE CENTER RIM OR GRATE RESPECTIVELY.
3. STATIONS AND OFFSETS FOR ALL SAFETY END TREATMENTS ARE TAKEN FROM SOFFIT OF TRIM.
4. STATIONS AND OFFSETS FOR CURB INLETS ARE TAKEN AT FACE OF CURB. ELEVATION CORRESPONDS TO TOP OF CURB (TOC).
5. STATIONS AND OFFSETS FOR GRATE INLETS ARE TAKEN AT CENTER OF STRUCTURE. ELEVATION CORRESPONDS TO TOP OF GRATE (TOG).

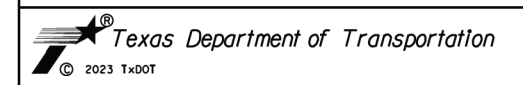


*Sujeeeth B. Draksharam*  
01-20-2023

NO.	DATE	REVISION	APPROV.

**SIRRUS**  
ENGINEERS, INC.

3100 TIMMONS LN, SUITE 500  
HOUSTON, TX 77027  
TEXAS FIRM REGISTRATION NO. 5901  
PHONE: 713-334-7300  
FAX: 713-334-7303



SH 99

JUNCTION BOX DETAILS  
JB-(13' X 7')@2444+48.23  
SB FRONTAGE RD

SHEET 1 OF 2

FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.	
6		207	
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	HIGHWAY NO.
3510	04	055	SH 99

\$FILES\$  
\$TIMES\$

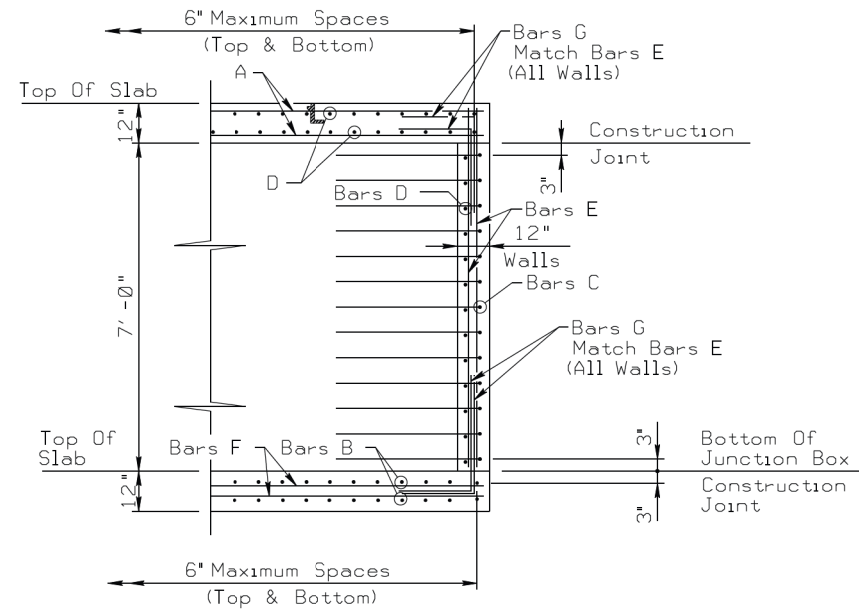


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\$PLTDRVS\$

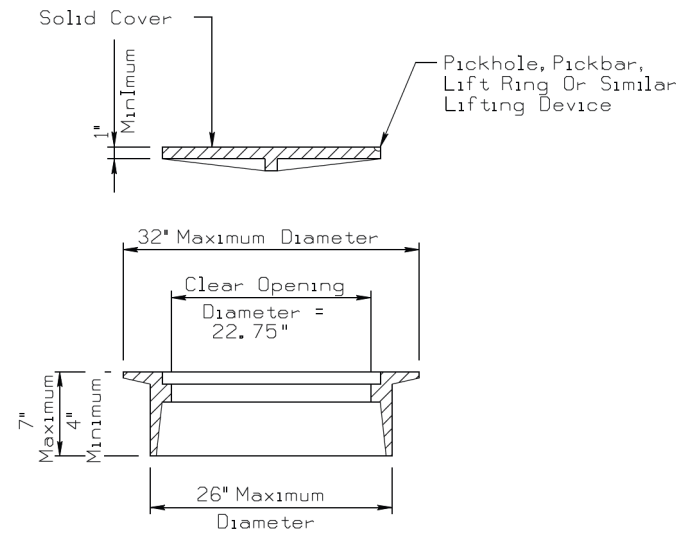
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\$TIMES\$

\$DATES\$  
\$FILES\$



**TYPICAL REINFORCING DETAIL**  
(N. T. S)



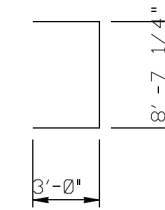
**RING AND COVER DETAILS**

Approximate Weight = 245 lbs.

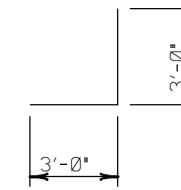
**GENERAL NOTES:**

Ring and cover shall conform to the requirements of AASHTO M306, "Standard Specification for Drainage Structure Castings". Materials shall conform to ASTM A48, Class 35B for gray iron castings or ASTM A536, Grade 65-45-12 for ductile iron castings. Aluminum alloy castings shall not be permitted.

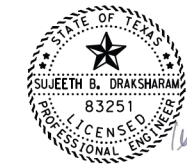
BAR TABLE	
BARS	SIZE
A	#6
B	#5
C	#5
D	#5
E	#5
F	#6
G	#5
H	#5
J	#5
K	#5
M	#5



**BARS C**



**BARS G**



NO.	DATE	REVISION	APPROV.



3100 TIMMONS LN, SUITE 500  
HOUSTON, TX 77027  
TEXAS FIRM REGISTRATION NO. 5901  
PHONE: 713-334-7300  
FAX: 713-334-7303



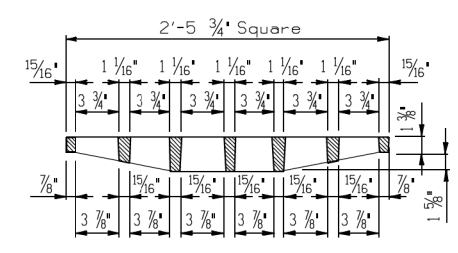
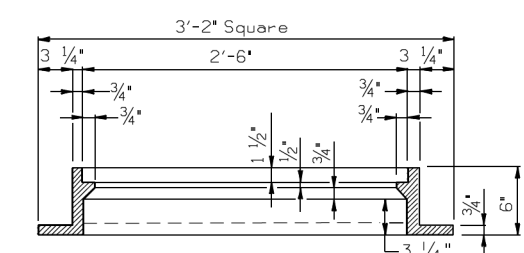
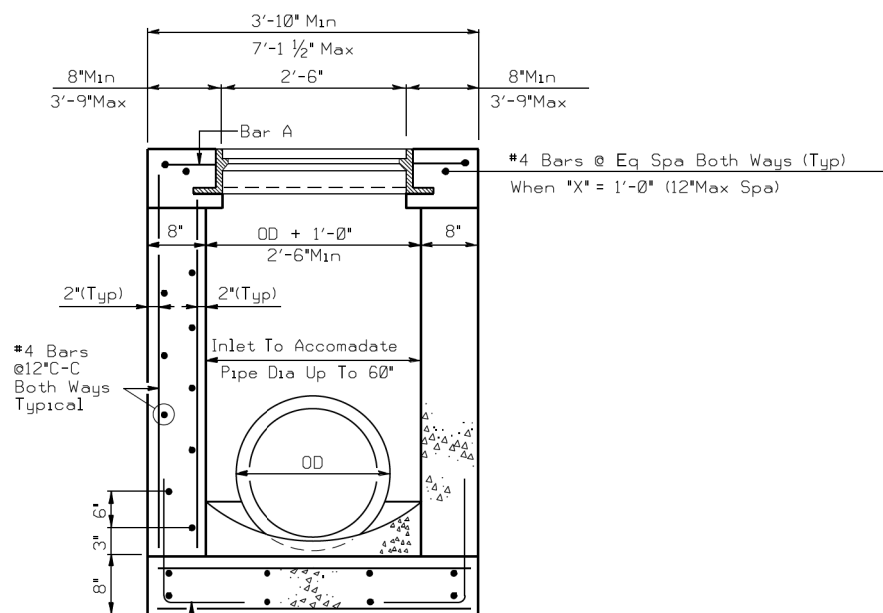
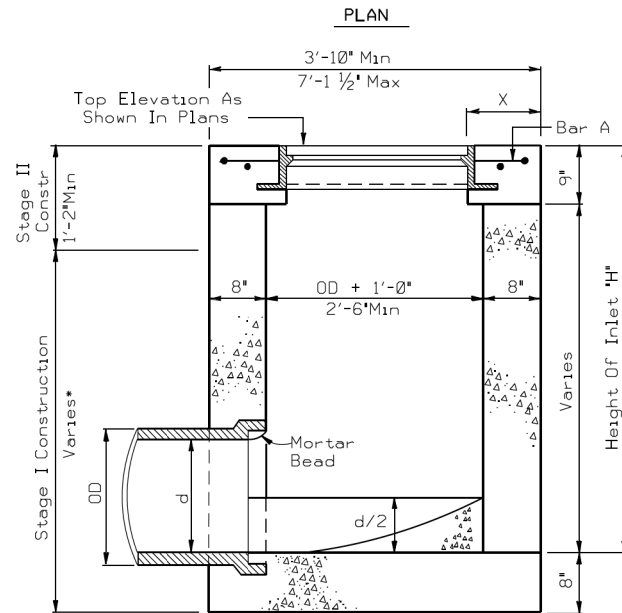
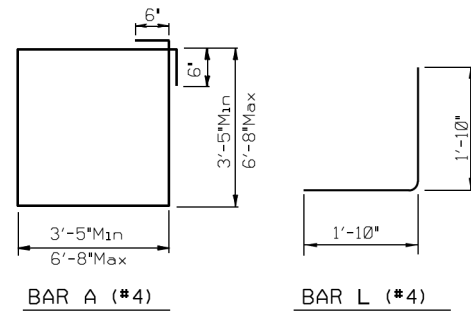
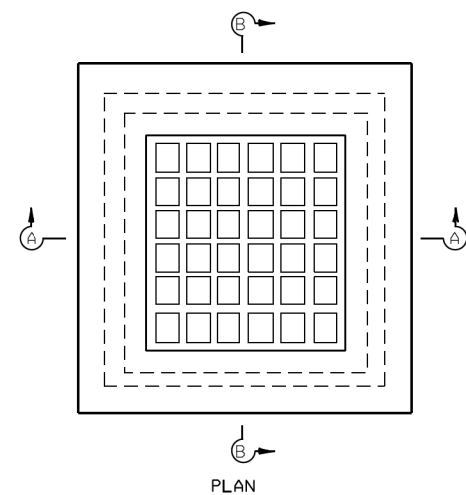
**SH 99**

JUNCTION BOX DETAILS  
JB- (13' X 7') 2444+48.23  
SB FRONTAGE RD

SHEET 2 OF 2

FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.	
6		208	
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	HIGHWAY NO.
3510	04	055	SH 99

\$FILES\$  
\$TIMES\$



\* But Not Less Than Six Inches Over Highest Entering Pipe.

SECTION A-A

SECTION B-B

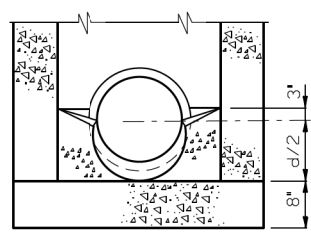
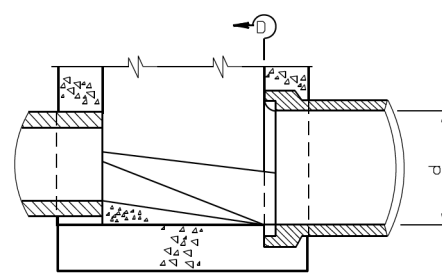
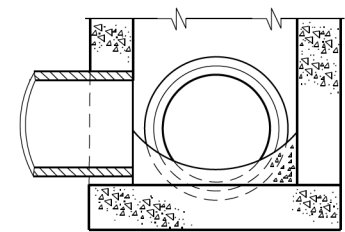
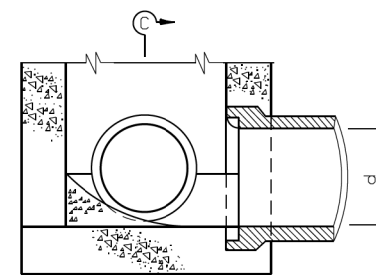
SECTION THRU FRAME

SECTION THRU GRATE

**TYPE A INLET**

**FRAME AND GRATE**

Neenah No. R3418-A  
EJIW No. V-4880-1



PART SECTION AT INVERT

SECTION C-C

PART SECTION AT INVERT

SECTION D-D

Showing Shaping Of Invert, Pipe Entering From Adjacent Sides

Showing Shaping Of Invert, Pipe Entering From Opposite Sides

NOT FOR TRAFFIC LOADS



**INLET TYPE A**

**HIL-A**

FILE#	STDD4.DGN	DN#	TxDOT	CK#	TxDOT	DN#	TxDOT	CK#	TxDOT	STD#
©	TxDOT	2014	DIST	FED REC	PROJECT NO.					
REVISIONS		HOUS	6							<b>209</b>
9/30/2016: Removed Manhole Steps		COUNTY	CONTROL	SECT	JOB	HIGHWAY				
		FORT BEND	3510	04	055	SH 99				

d = Diameter

STDD4.DGN

REINFORCED CONCRETE PIPE

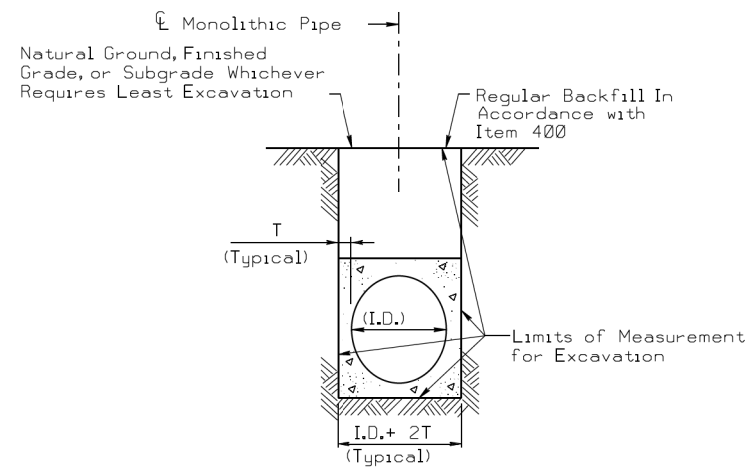
EXCAVATION AND BACKFILL QUANTITIES

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

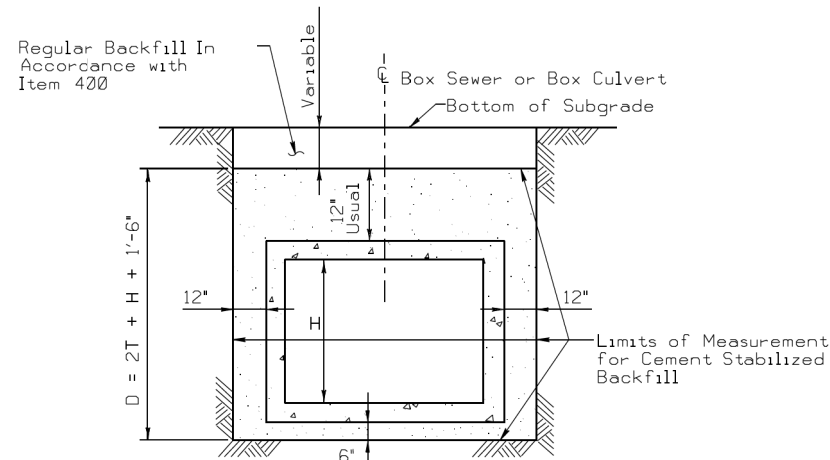
EXCAVATION QUANTITIES

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



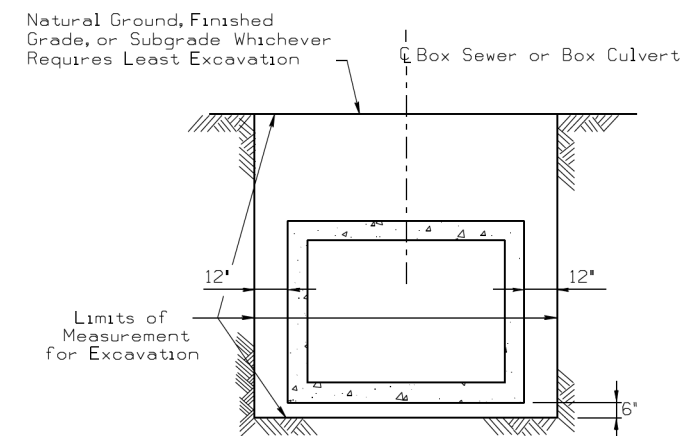
EXCAVATION DETAIL

MONOLITHIC PIPE  
IN A PAVED OR GRADED AREA



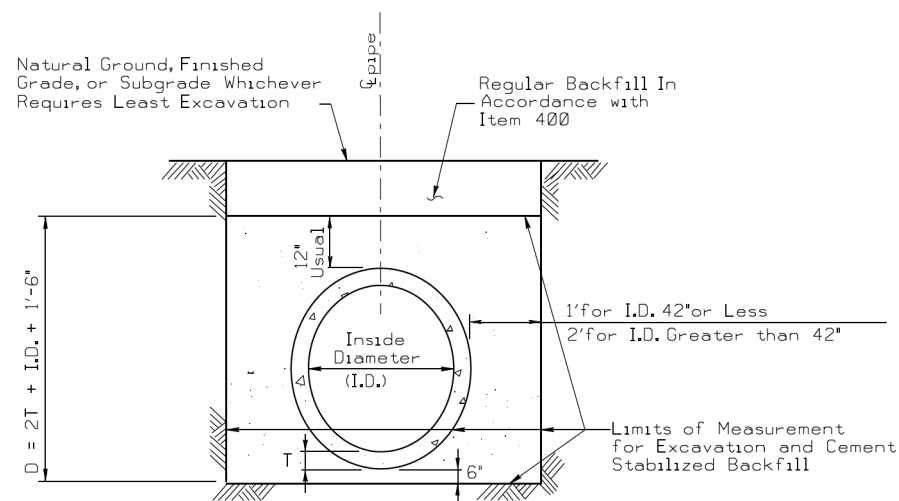
BACKFILL DETAIL

BOX CULVERTS  
IN A GRADED OR PAVED AREA  
INCLUDING DETOURS \*



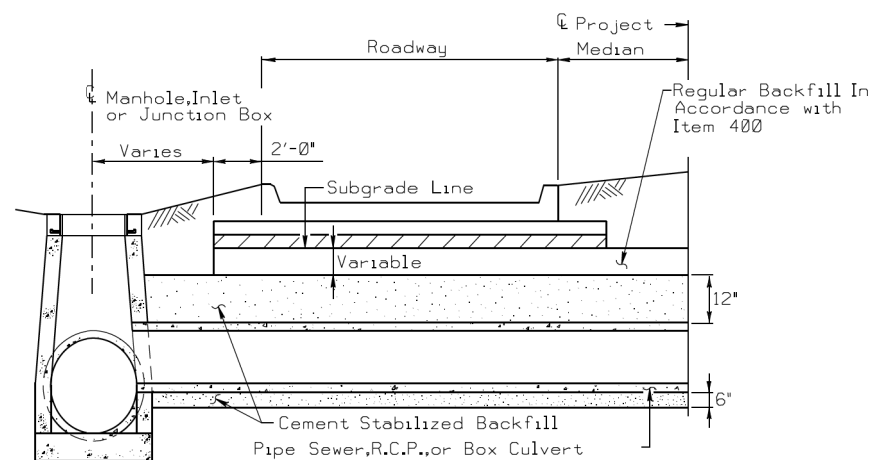
EXCAVATION DETAIL

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

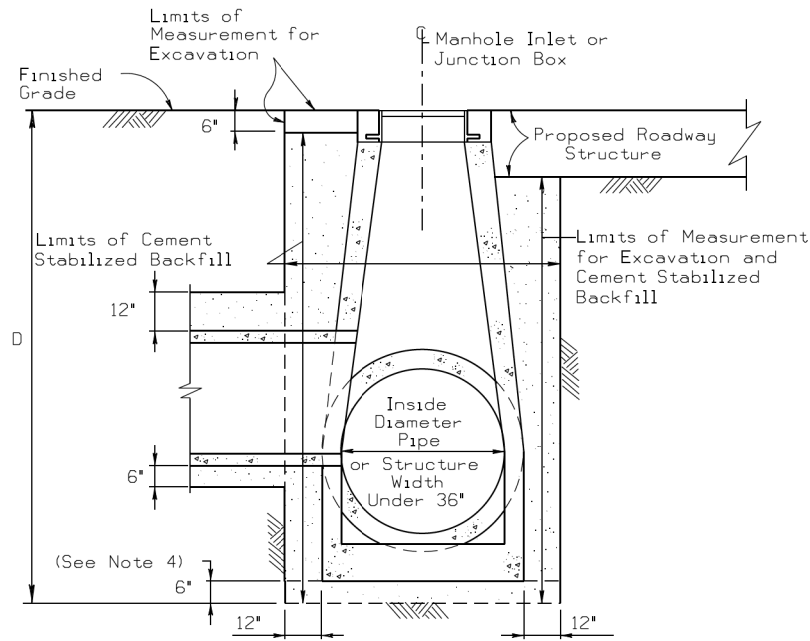


EXCAVATION AND BACKFILL  
DIAGRAMS

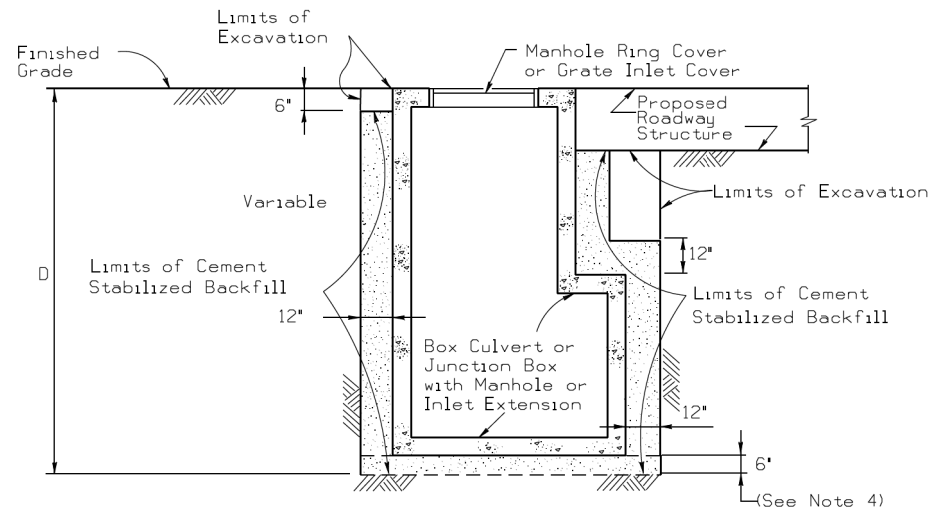
E&BD

D = Depth  
H = Height  
T = Thickness  
R = Radius  
Dia = Diameter

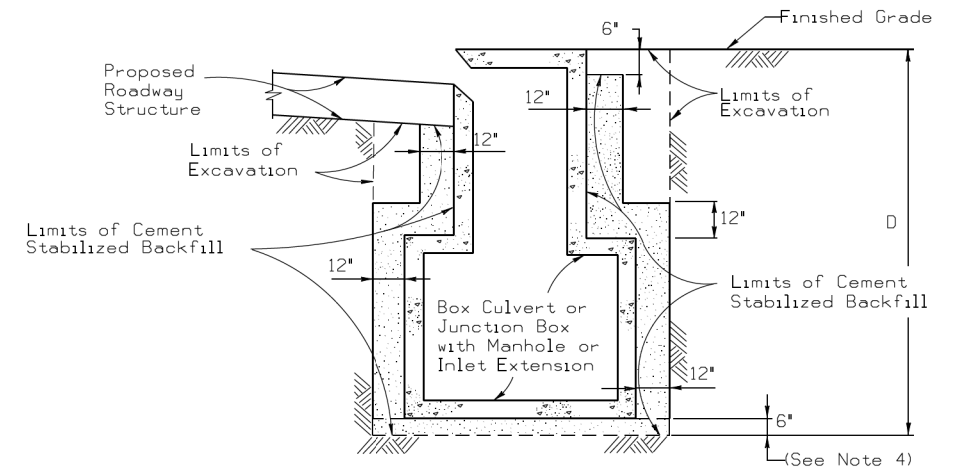
FILE: ST0E1.DGN	DWG: TxDot	CHK: TxDot	DWG: TxDot	CHK: TxDot
© TxDOT FEB 2010	DIST	FED REG	PROJECT NO.	SHEET
REVISED 11/05	HOUSTON	6		210
REVISED 2/2010 Added note to Table 1, Sht 2 of 2.	COUNTY	CONTROL	SECT	JOB
REVISED 6/12	FORT BEND	3510	04	055
REVISED 9/14				SH 99



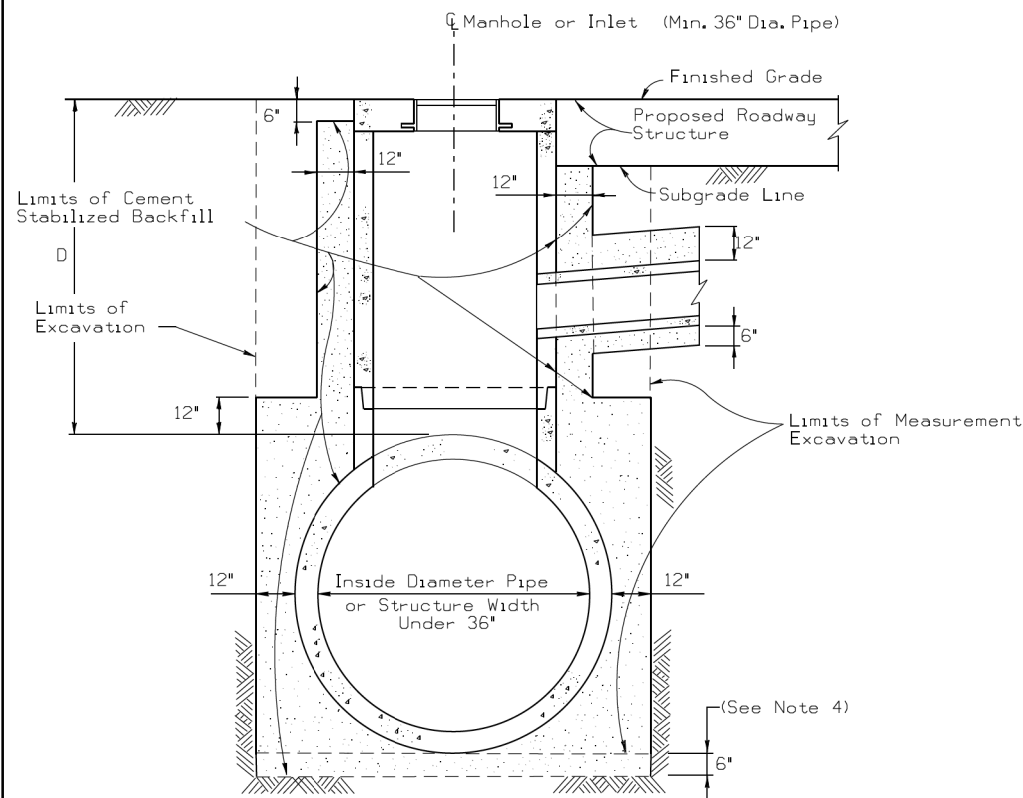
**EXCAVATION AND BACKFILL DETAIL**  
**MANHOLES SMALLER THAN 36 IN.**  
**IN A PAVED OR GRADED AREAS**  
 N.T.S.



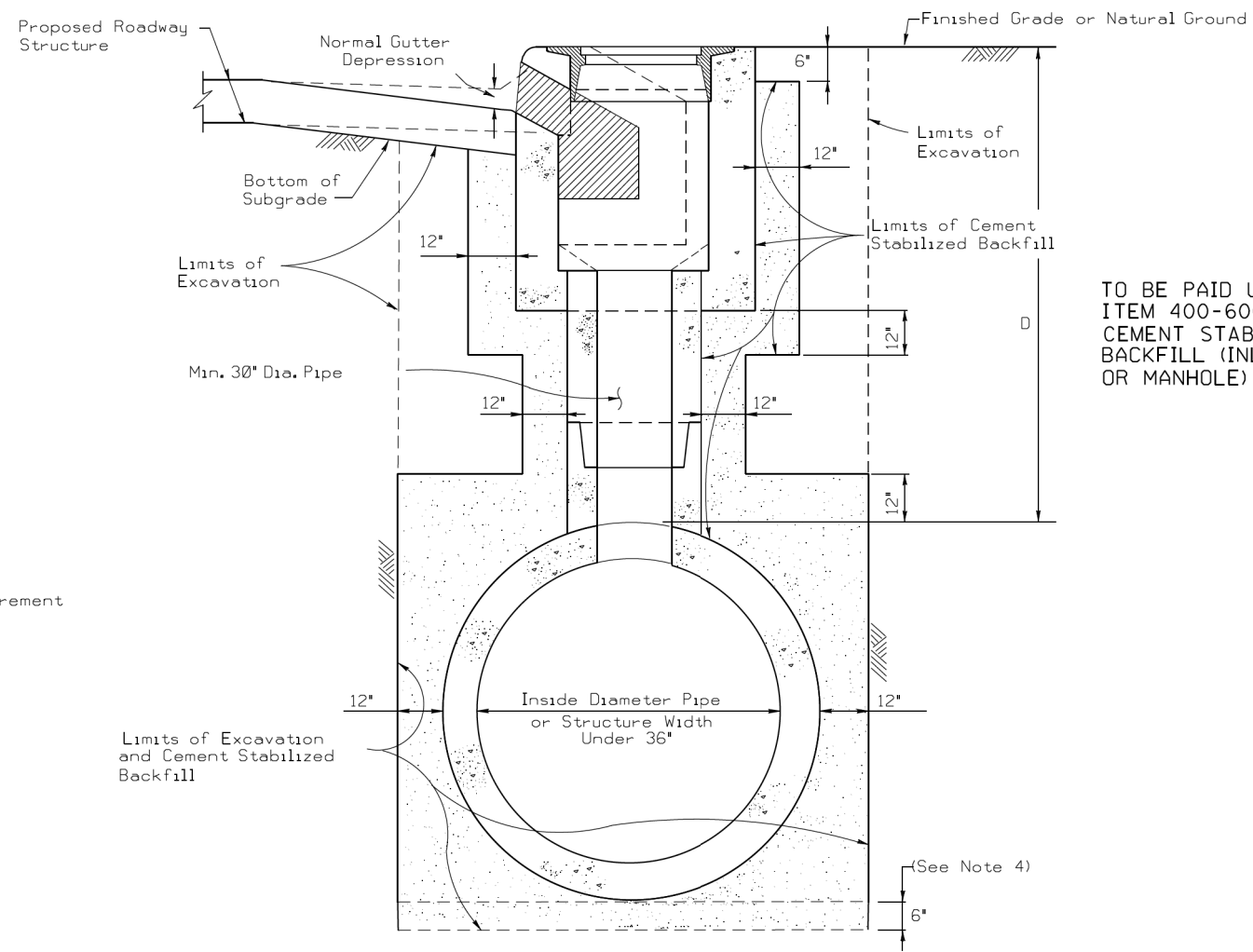
**EXCAVATION AND BACKFILL DETAIL**  
**JUNCTION BOXES IN A**  
**PAVED OR GRADED AREA**  
 N.T.S.



**EXCAVATION AND BACKFILL DETAIL**  
**INLET EXTENSIONS ON A BOX CULVERT**  
**IN A PAVED OR GRADED AREA**  
 N.T.S.



**EXCAVATION AND BACKFILL DETAIL**  
**MANHOLES 36 IN. AND GREATER**  
**IN A PAVED OR GRADED AREA**  
 N.T.S.



**EXCAVATION AND BACKFILL DETAIL**  
**CURB INLETS IN A PAVED OR GRADED AREA**  
 N.T.S.

TABLE 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

TO BE PAID UNDER ITEM 400-6009 CEMENT STABILIZED BACKFILL (INLET OR MANHOLE)

**NOTES:**

1. The Contractor is paid a fixed estimated amount for cement stabilized backfill based on depth (D) and Table I.
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.

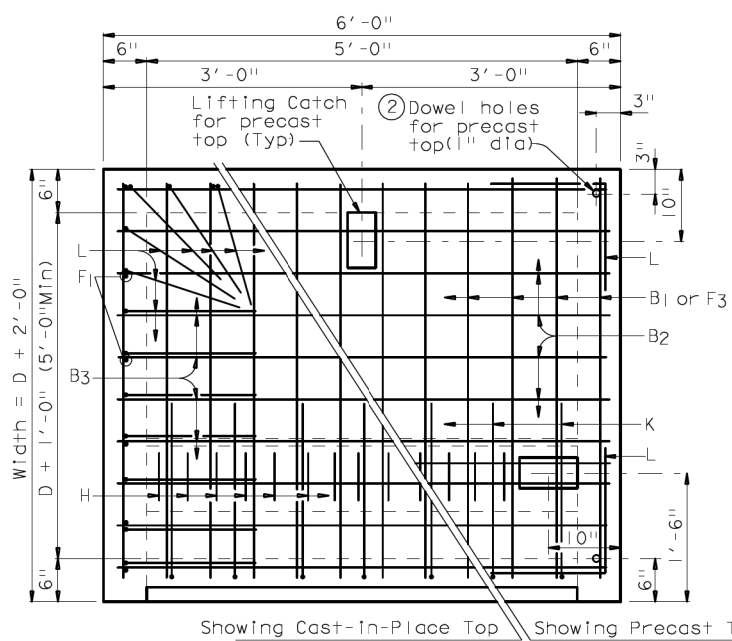
D = Depth  
 H = Height  
 T = Thickness  
 R = Radius  
 Dia = Diameter

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© TxDOT	FEB 2010	DIST	FED REG	PROJECT NO.	SHEET
REVISED	2/2010	HOUSTON	6		211
REVISED	6/12	COUNTY	CONTROL	SECT	JOB
REVISED	3/14	FORT BEND	3510	04	055
REVISED	3/15				SH 99

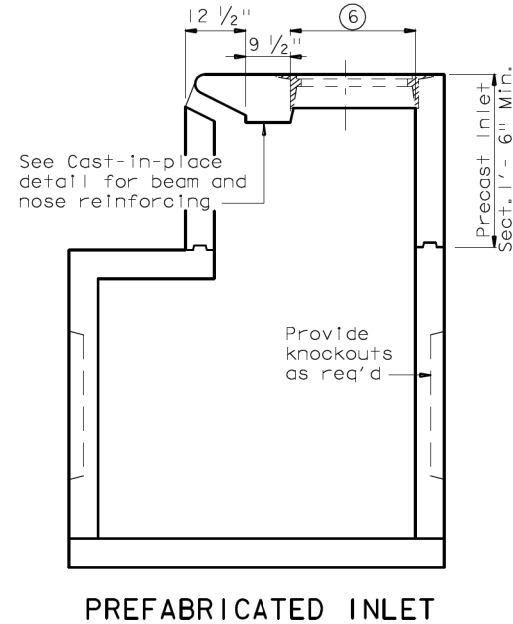
**REINF STEEL**

Bar	Size	Spacing
B1	#4	6"
B2	#5	6"
B3	#4	6"
C1-2	#4	12"
C3-4	#4	9"
C5	#6	9"
C6	#4	9"
D	#4	9"
E	#4	12"
F1-5	#4	12"
G	#4	6"
H	#3	4"
K	#4	9"
L	#4	6"

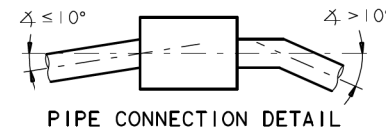
⑨ As shown



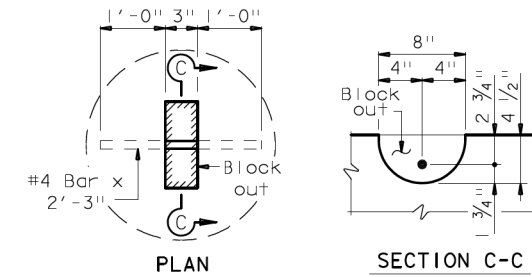
**PLAN**



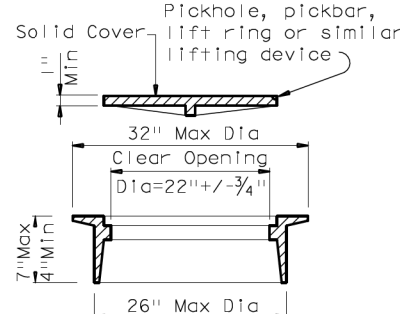
**PREFABRICATED INLET**



**PIPE CONNECTION DETAIL**  
Connecting pipes should enter within 10° of normal to inlet wall. If necessary, pipe elbow or curved approach alignment should be used to stay within this limit.

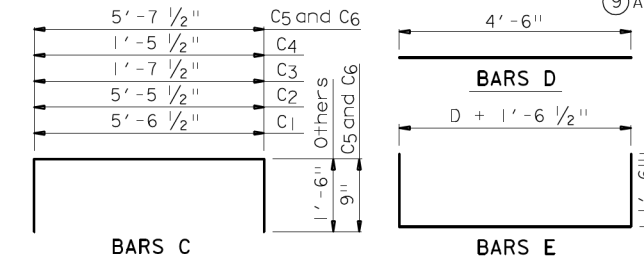


**LIFTING CATCH**



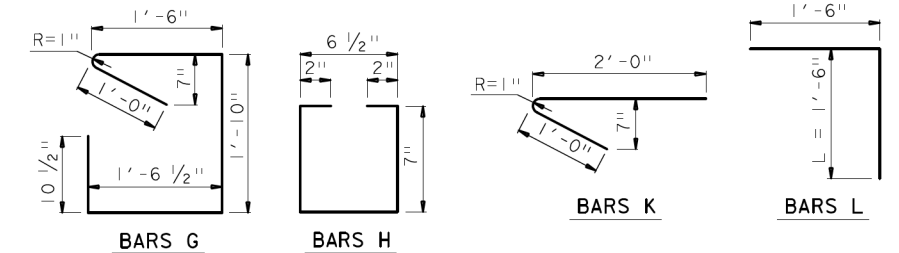
**RING AND COVER DETAILS**

EJIW No V-1814 or Neenah No R5900 FTX



**BARS C**

**BARS E**



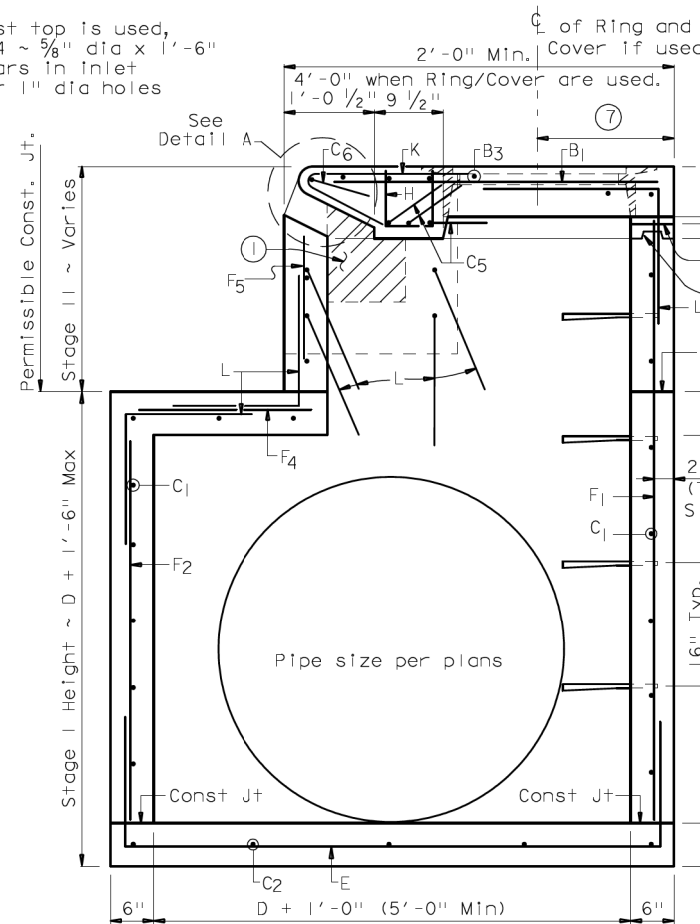
**BARS G**

**BARS H**

**BARS K**

**BARS L**

② If precast top is used, provide 4 ~ 5/8" dia x 1'-6" smooth bars in inlet walls for 1" dia holes

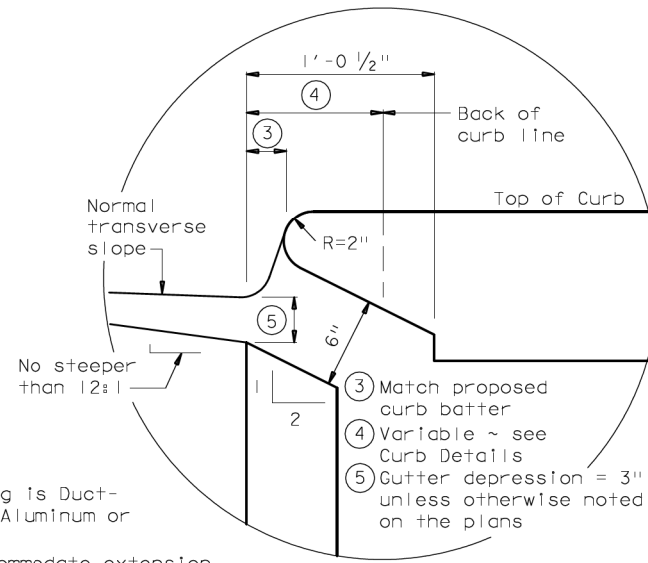


**SECTION A-A**

⑦ 1'-7" Usual, Adjust placement of Ring and Cover as necessary to avoid conflict with Bars H.

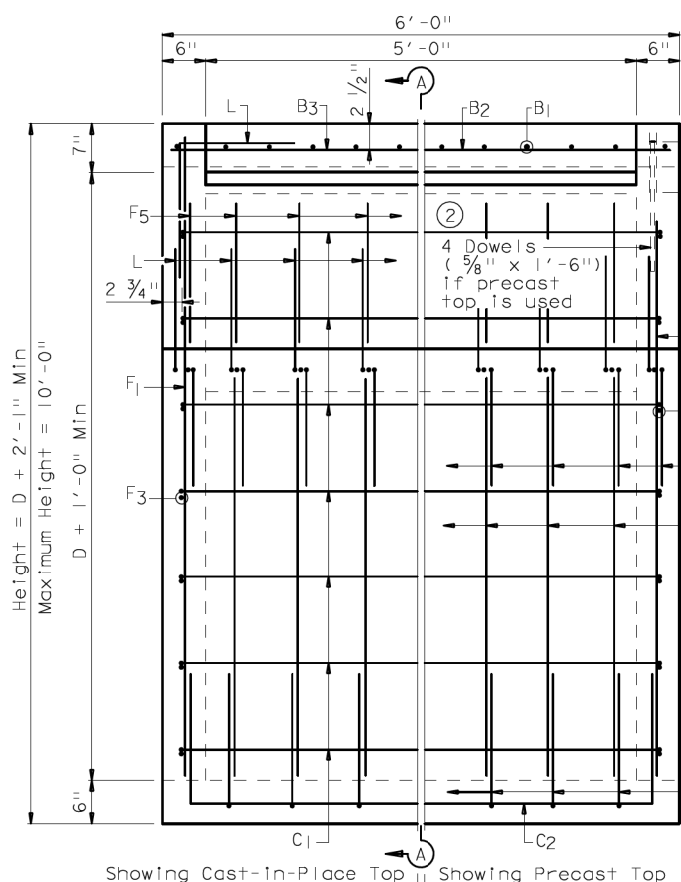
⑧ Ladder rung is Ductile Iron, Aluminum or Cast Iron.

① Block out to accommodate extension if used and to place 4 Bars L

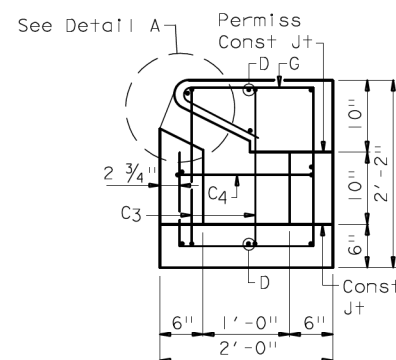


**DETAIL A**

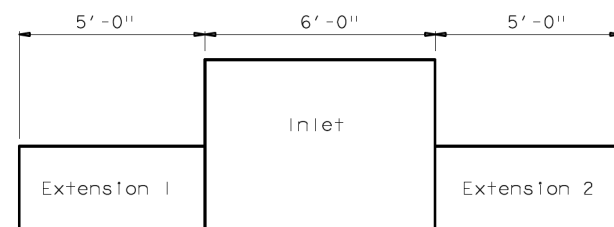
**GENERAL NOTES:**  
No alternate designs nor alternate details shall be permitted for precast or cast in place inlets.  
Quantities shown herein are for Contractor's information only. Unless otherwise shown in the plans, payment will be made for each inlet of the type specified and for each extension. Each five foot curb opening of extension is considered "one extension" regardless of whether placed monolithically or precast. Extension length shall be in multiples of 5 feet.  
Engineer has the option of specifying cast-in-place top with ring and cover or removable precast top as specified elsewhere in plans. Shop drawings will be required for precast construction of inlets.  
In areas of conflict between reinforcing steel, blockouts, pipes, anchor bolts or other reinforcing steel, the reinforcement shall be bent or adjusted to clear as directed by the Engineer.  
Ring and cover shall conform to the requirements of AASHTO M306, "Standard Specification for Drainage Structure Castings". Materials shall conform to ASTM A48, Class 35B for gray iron castings or ASTM A536, Grade 65-45-12 for ductile iron castings. Aluminum alloy castings shall not be permitted.



**ELEVATION**



**SECTION B-B**



**EXTENSION PLACEMENT**

Note: If more than one extension is required, they should be located as indicated above. No slope is required in flowline of extension.

**INSTALL A 3 FT. (HORIZ.) x 6 IN. (VERT.) OPENING ON THE BACK OF THE INLET WHEN SPECIFIED ELSEWHERE ON THE PLANS. MOVE STEPS AS NEEDED. NO REINFORCING ON OPENING/ON 2 IN. ADJACENT TO OPENING.**

**DESIGNERS: CLARIFY FLOWLINE OF OPENING AND INCLUDE OPENING IN HYDRAULIC CALCULATIONS.**

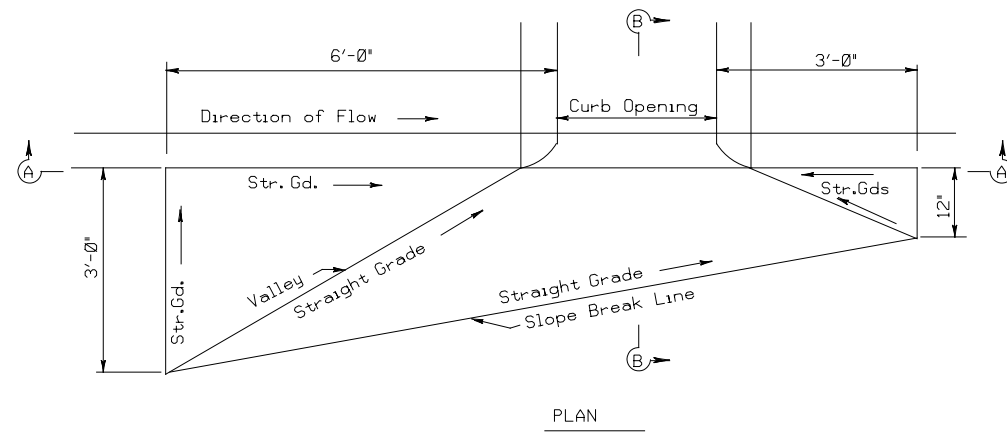
D = Diameter  
R = Radius

Texas Department of Transportation  
Houston District

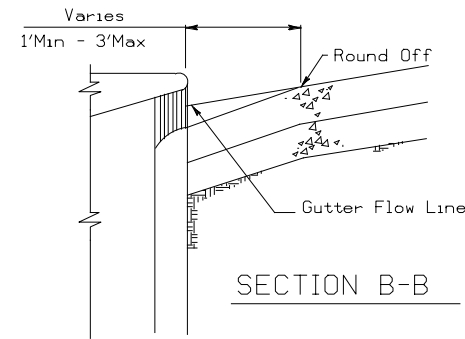
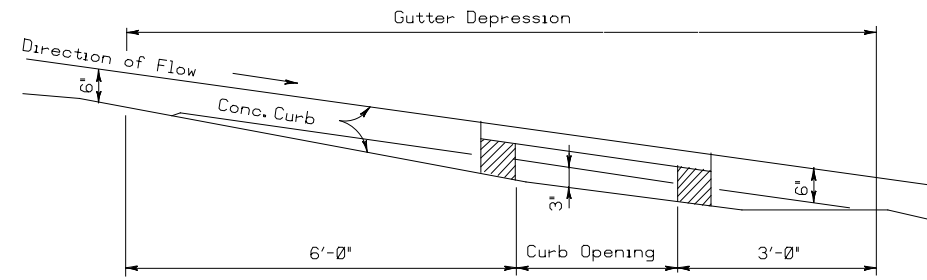
**CURB INLET TYPE C1 (WITH OR WITHOUT EXTENSION)**

**HIL-C1**

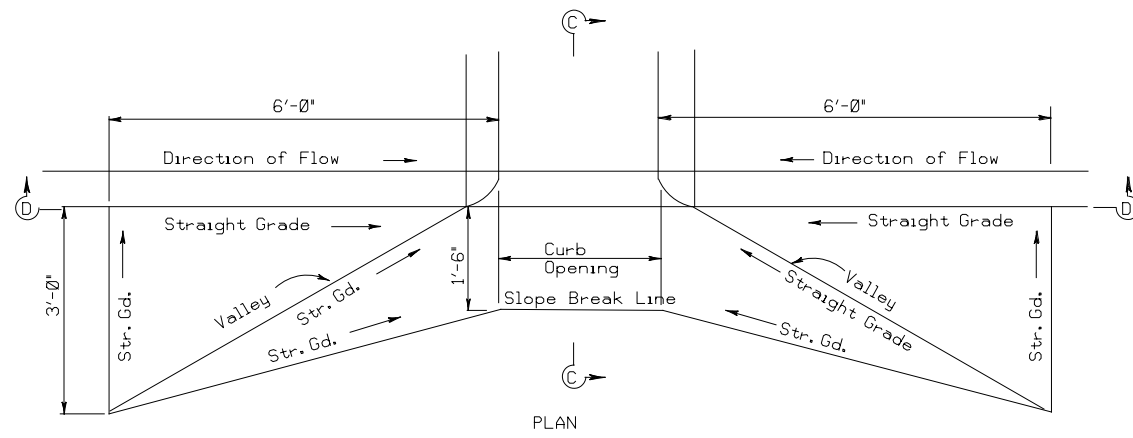
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© TxDOT	Feb 2010	DIST	FED REG	PROJECT NO.						
2/2010	Note for alternate design added.	HOUS	6							212
2/2010	Added note concerning opening on the back of inlet.	COUNTY	CONTROL	SECT	JOB	HIGHWAY				



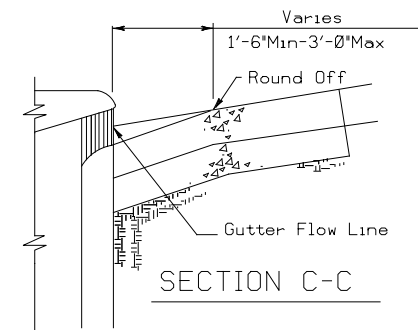
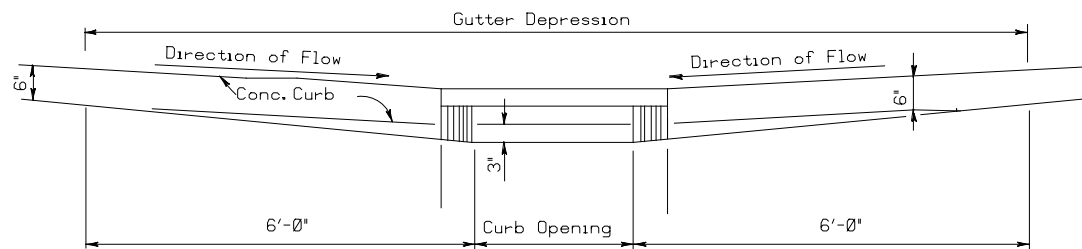
PLAN  
SECTION A-A  
CURB INLET ON GRADE



SECTION B-B



PLAN  
SECTION D-D  
CURB INLET AT SAG



SECTION C-C

GENERAL NOTES:

Base Course under Concrete Pavement shall be full depth and shall conform to surface depression details.

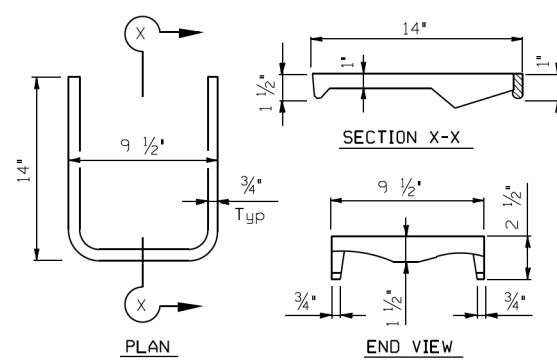
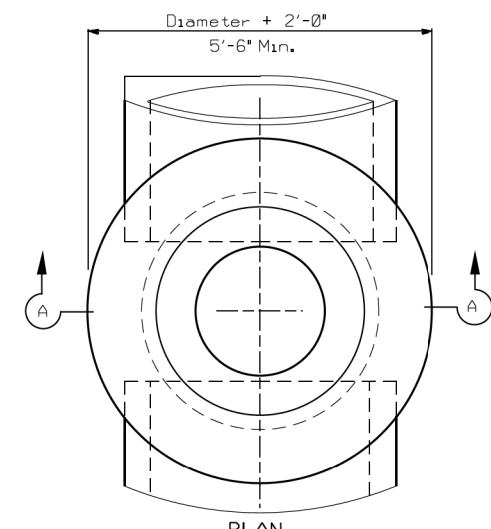


GUTTER DEPRESSION DETAILS FOR CURB INLETS

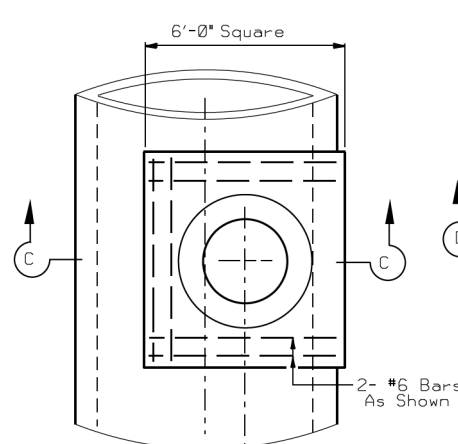
GD

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REVISIONS	© TxDOT Mar 2004	DIST	HOUS	FED REG	6	PROJECT NO.		SHEET	213		
		COUNTY	FORT BEND	CONTROL SECT	3510 04	JOB	055	HIGHWAY	SH 99		

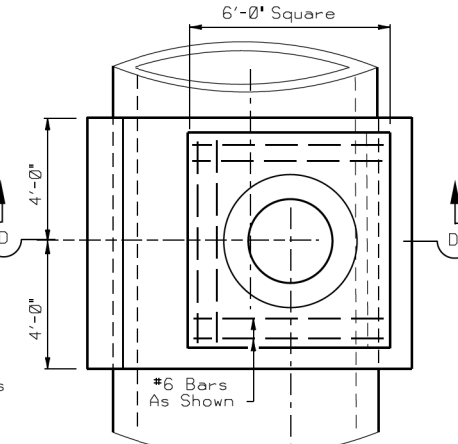
STDD12.DGN



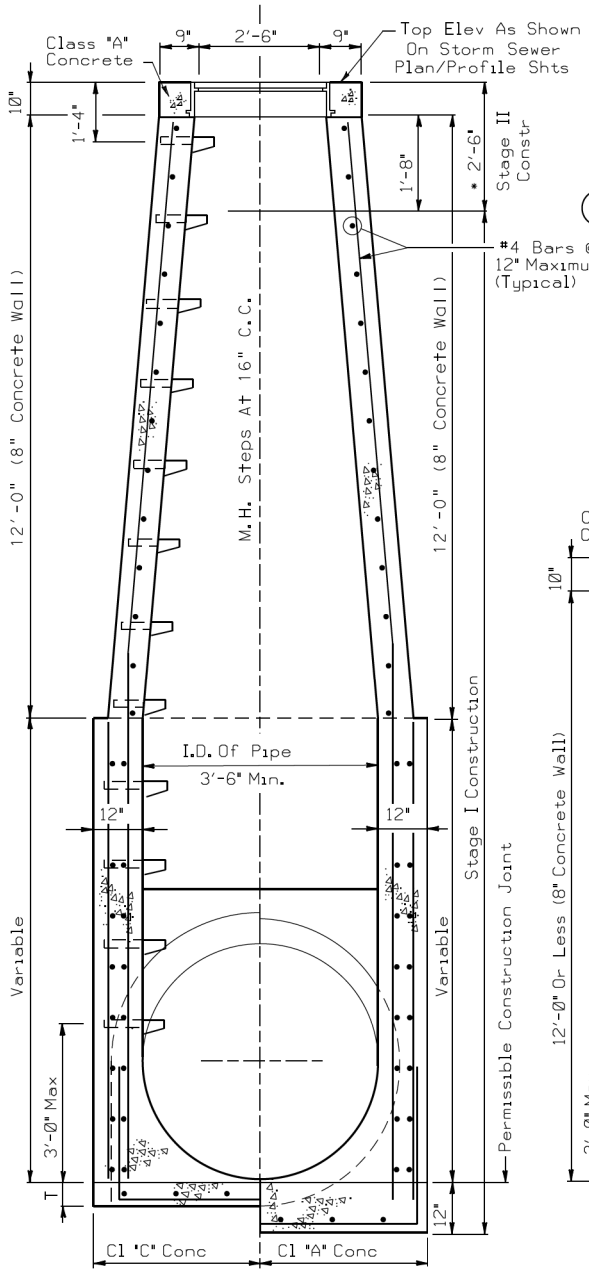
CAST IRON MANHOLE STEPS  
(In Stock Locally)



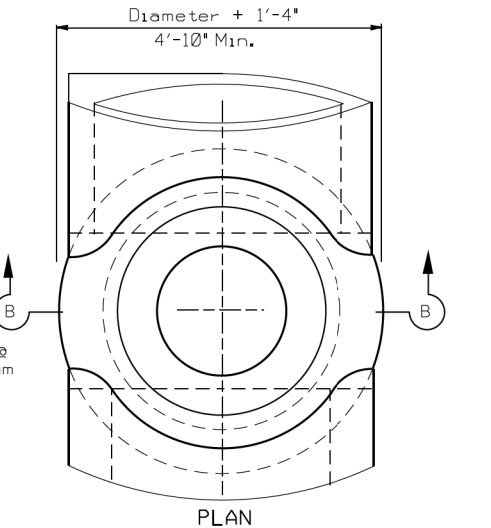
MONOLITHIC SEWERS



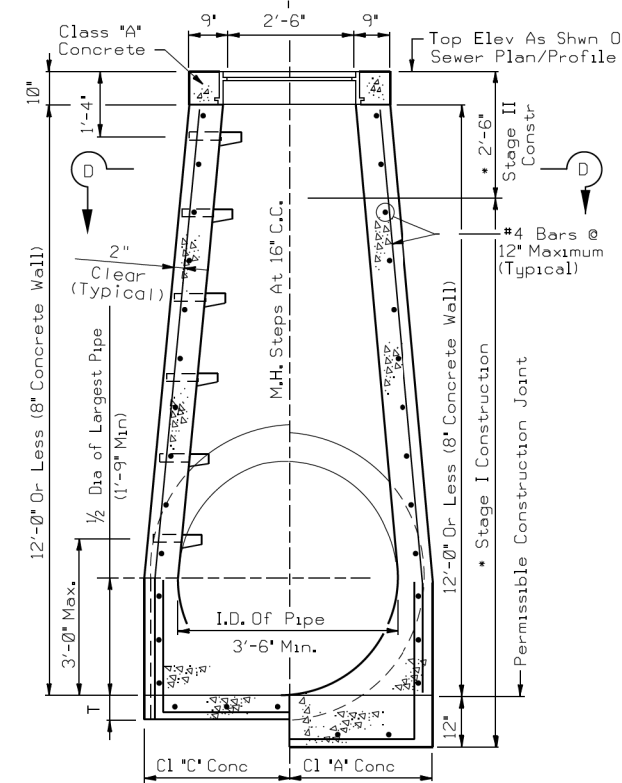
PRECAST PIPE SEWERS



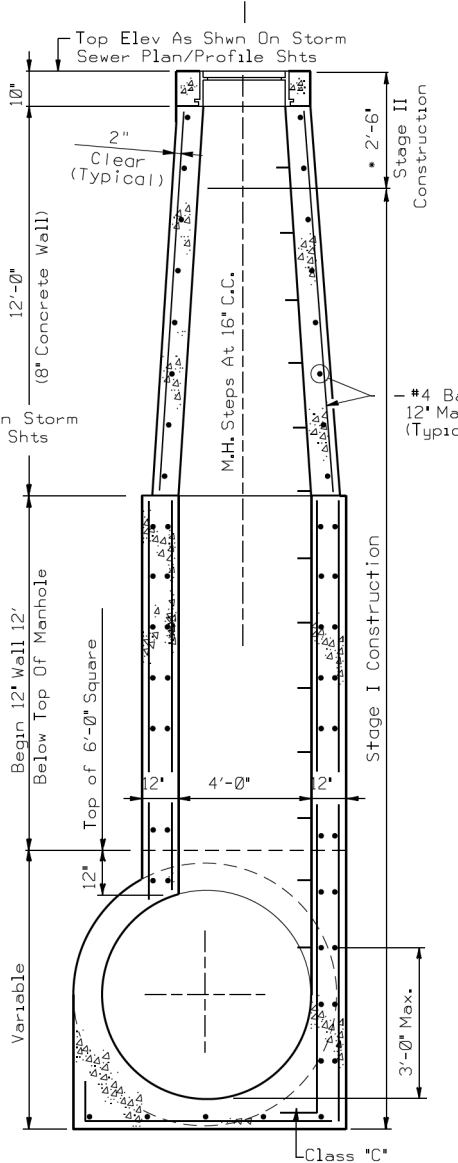
MONOLITHIC SEWERS PRECAST PIPE SEWERS  
SECTION A-A



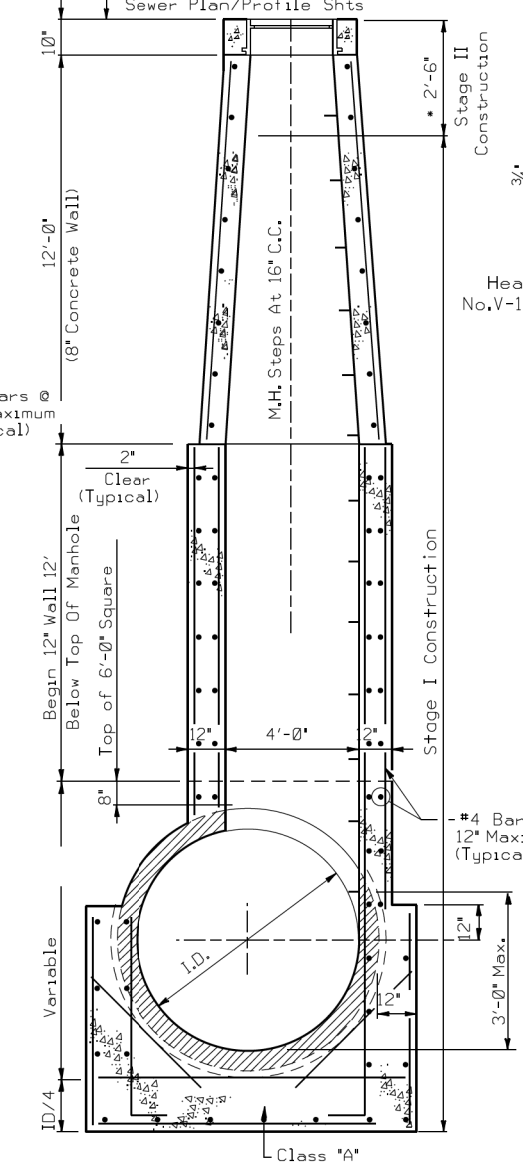
12" HEIGHT & UNDER



MONOLITHIC SEWERS PRECAST PIPE SEWERS  
SECTION B-B



SECTION C-C

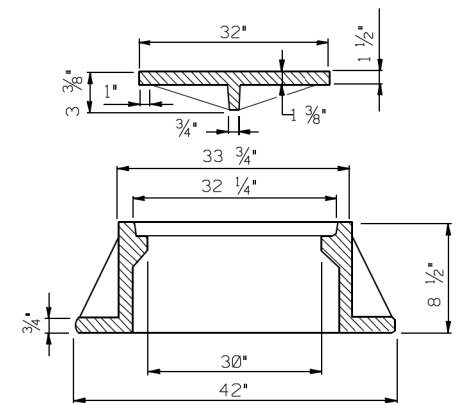


SECTION D-D

MANHOLE - TYPE A  
FOR PIPES 54" AND SMALLER

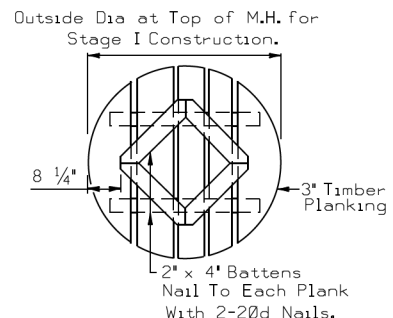
MANHOLE - TYPE B  
FOR PIPES 60" AND LARGER

GENERAL NOTES:  
See Standard or Detail Sheet For Excavation And Backfill Diagrams.  
All Manholes In Graded Areas Shall Be Built To Stage I And Finished After All Grading Operations Are Substantially Completed.  
• But Not Less Than 6 Inches Above Highest Pipe.  
• T Thickness Of Shell Equals That Of Larger Diameter Pipe.  
Optional Monolithic Or Precast Designs Permitted. Optional Designs Shall Be Signed & Sealed By A Registered Professional Engineer.

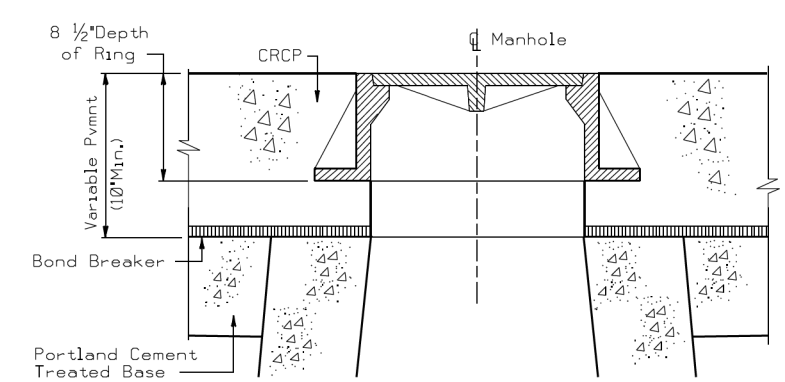


Heavy Duty 30" ID Ring as Required, Vulcan No. V-1419 w/ribbed cover, Neenah No. R1740-BTX

RING AND COVER

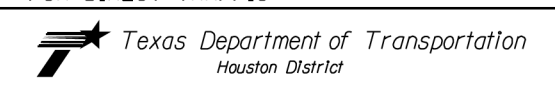


TEMPORARY TIMBER COVER



RING AND COVER CAST MONOLITHICALLY WITH PAVEMENT

FOR DIRECT TRAFFIC

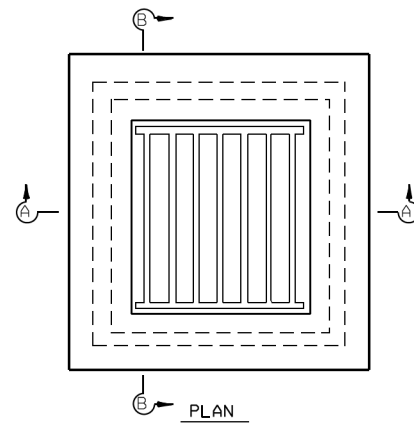


MANHOLES  
TYPE A & B

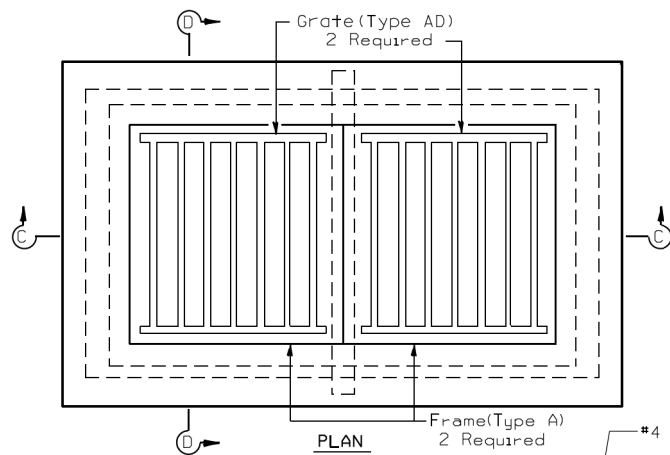
MH-A/B

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REVISIONS	December 2006	DIST	FED REC	PROJECT NO.		SHEET
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		FORT BEND	3510	04	055	SH 99

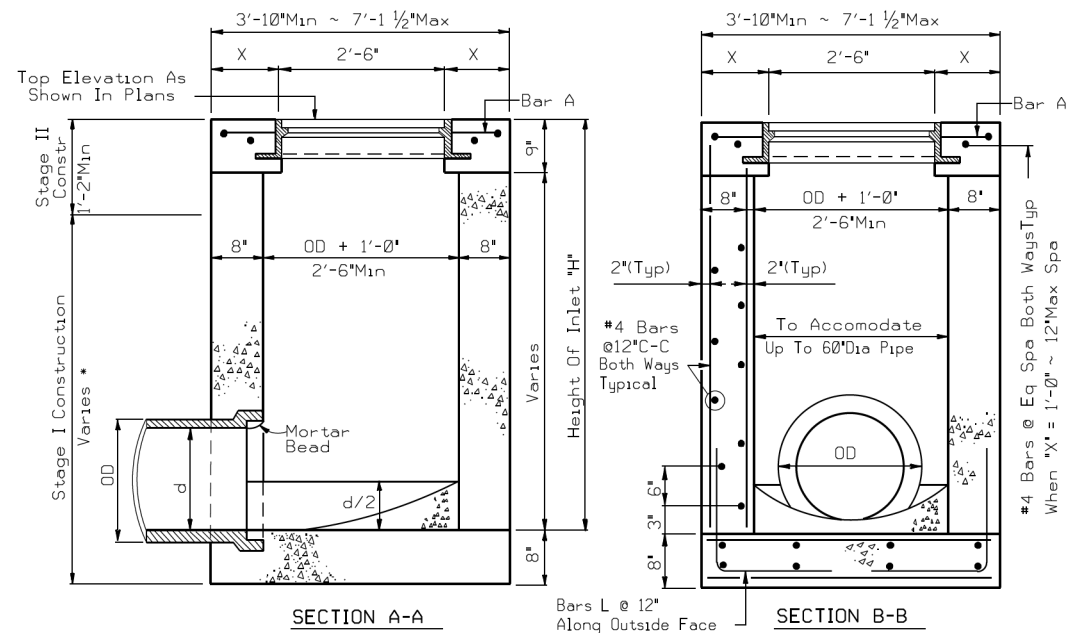
d = Diameter  
R = Radius



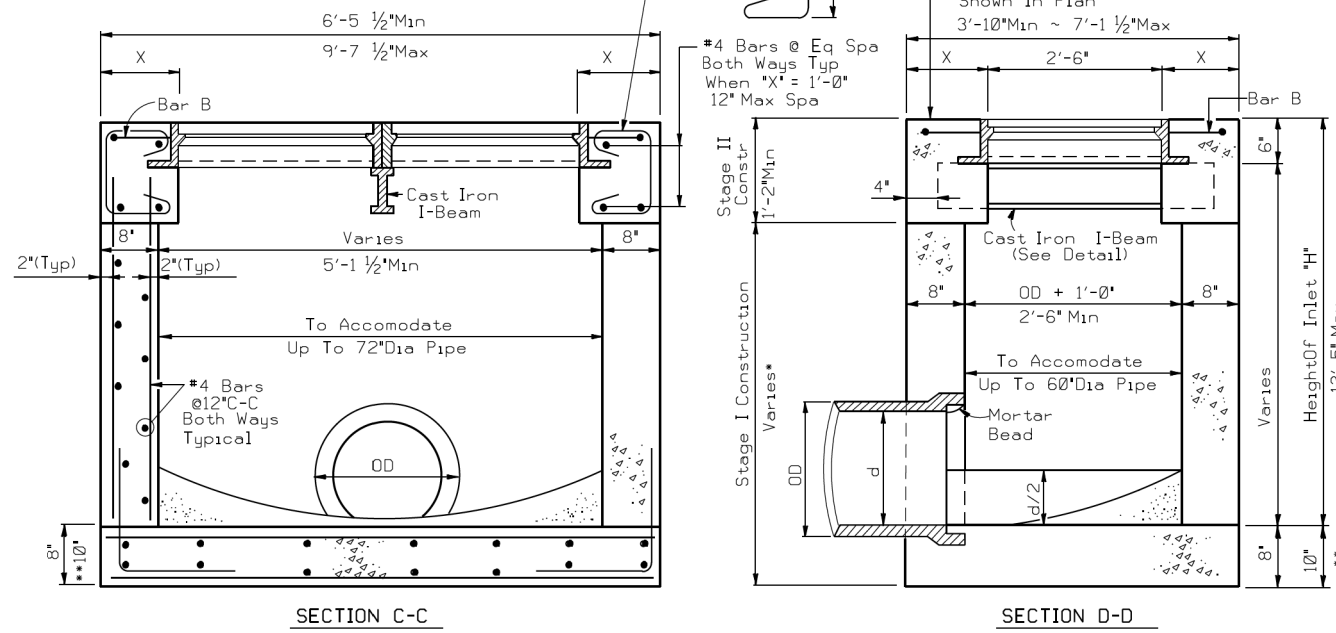
• But Not Less Than Six Inches Over Highest Entering Pipe.  
X = 8" Min to 3'-9" Max



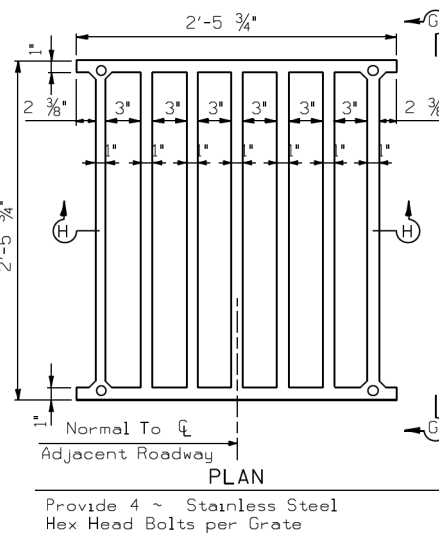
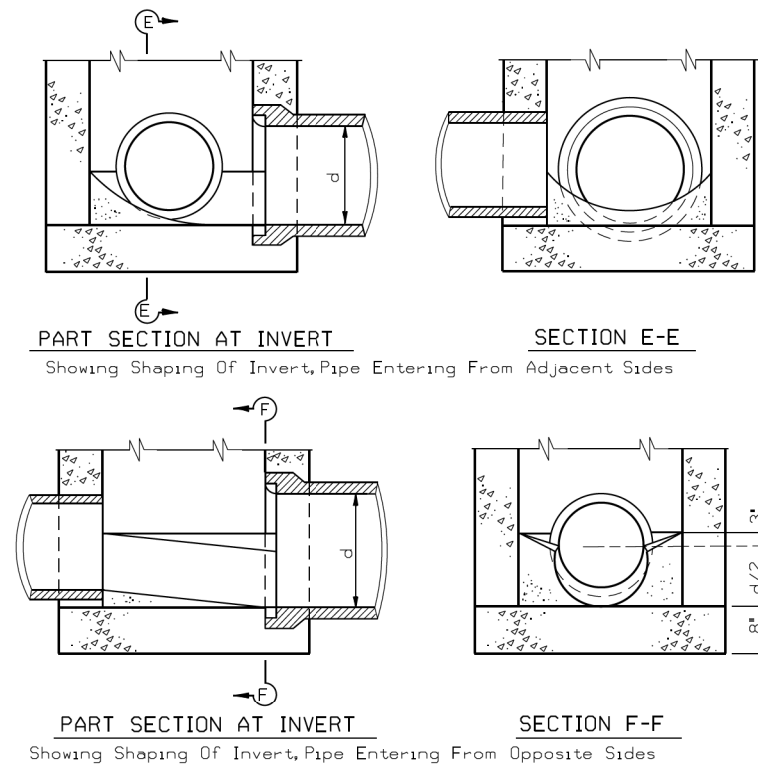
• But Not Less Than Six Inches Over Highest Entering Pipe.  
•• For Pipe Diameters 66" And Greater



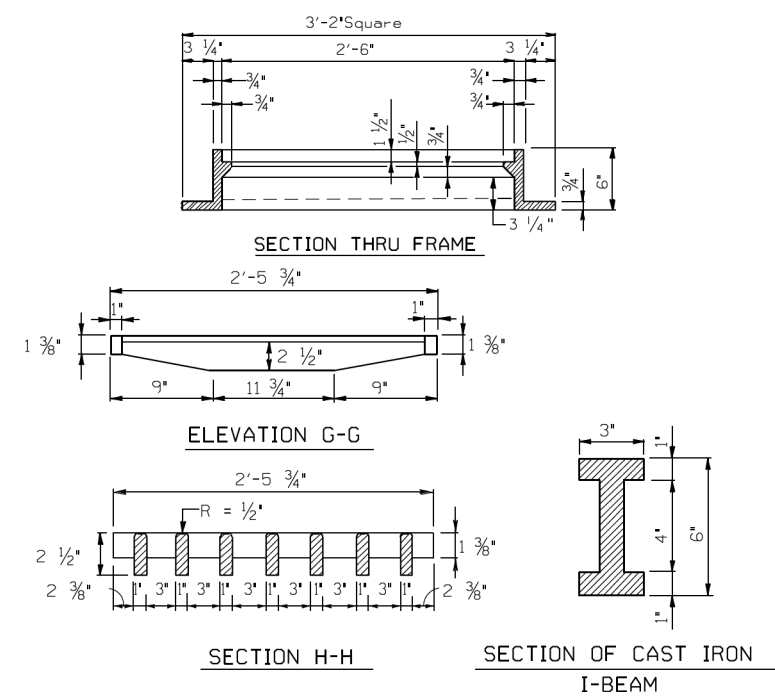
INLET TYPE AD



INLET TYPE AAD



FRAME AND GRATE



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".

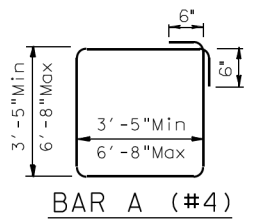
See Standard or Detail Sheet For Excavation and Backfill Diagrams.

Type AD & AAD Inlets Shall Be Built To Stage I And Finished After All Grading Operations Are Substantially Completed.

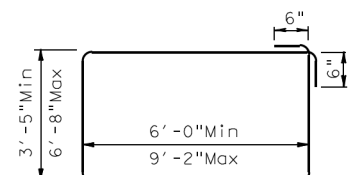
Shop Drawings Will Be Required For Precast Construction Of Inlets.

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.

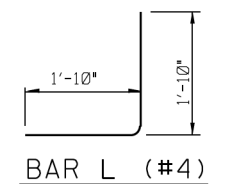
Bolted grates and frames are a matched set, do not unbolt without "Match Marking" so that grates and frames are re-installed as originally built.



BAR A (#4)



BAR B (#4)



BAR L (#4)

NOT FOR TRAFFIC LOADS



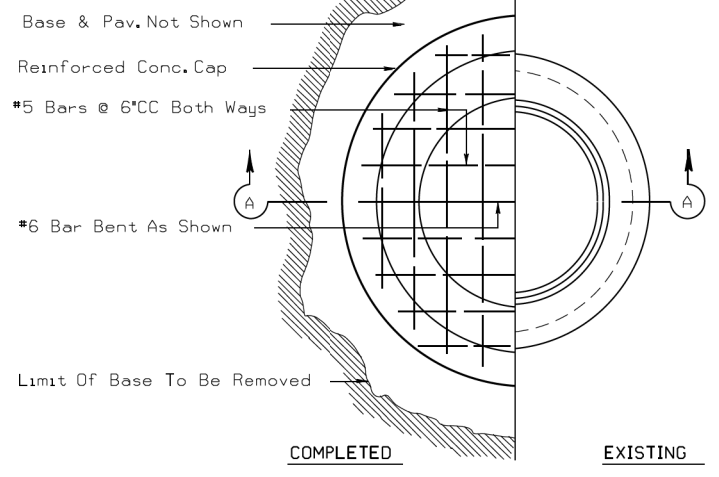
INLETS TYPE AD & AAD

HIL-AD/AAD

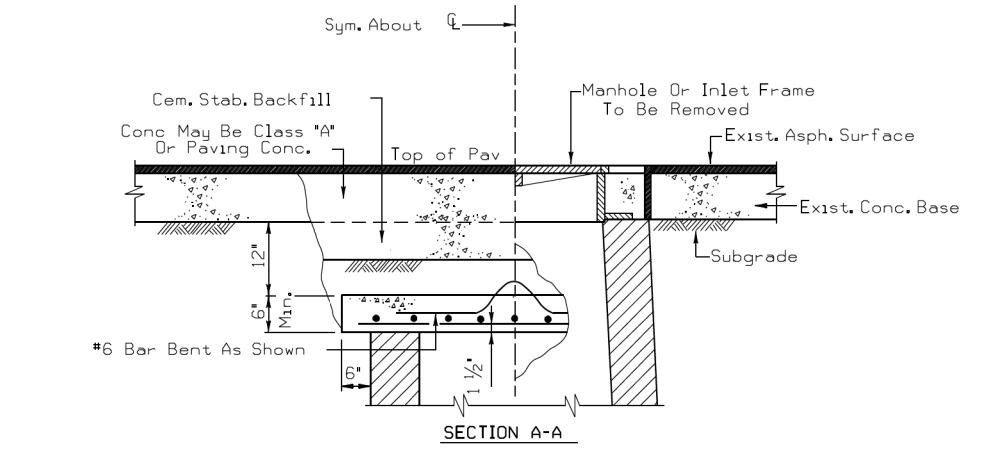
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© TxDOT	2014	DIST	FED	REG	PROJECT	NO.					SHEET
REVISIONS		HOUS	6	CONTROL		SECT	JOB	HIGHWAY			215
		FORT BEND		3510	04	055	SH		99		



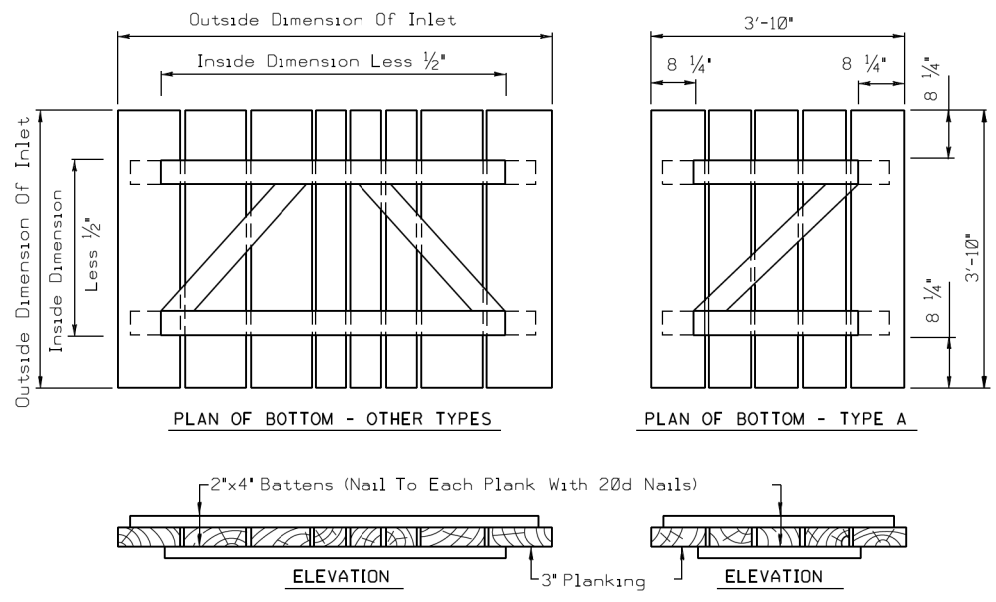
Note: No Conc Or Cem Stab Bkfl Required In Graded Areas.



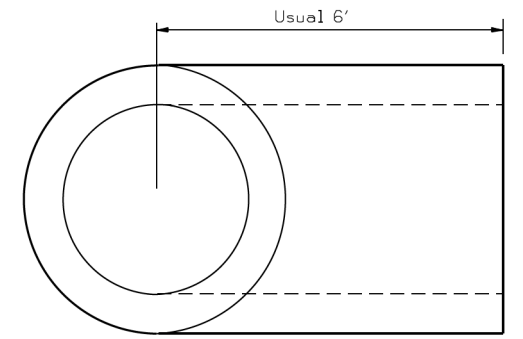
Note: Reinforced Conc. Cap Shall Be Precast & Properly Cured Before Placing in Position.



DETAIL SHOWING METHOD OF CAPPING ABANDONED MANHOLES OR INLETS (GRADED OR PAVED AREAS)

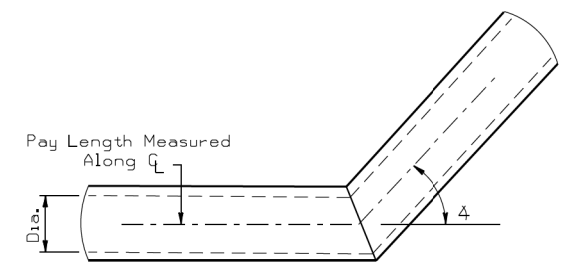


TEMPORARY COVERS FOR ALL TYPES OF INLETS



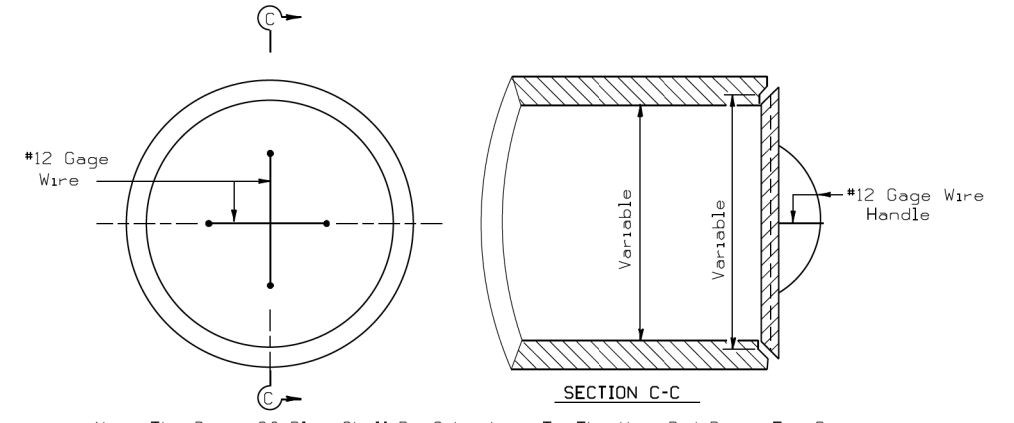
Note: Jointing Material Shall Conform To Requirements Of Item "Reinforced Concrete Pipe." Material For Tees Shall Conform To Requirements Of Item "Reinforced Concrete Tee." Payment For Tee To Be In Accordance With Item "Reinforced Concrete Pipe."

PRECAST STORM SEWER TEE



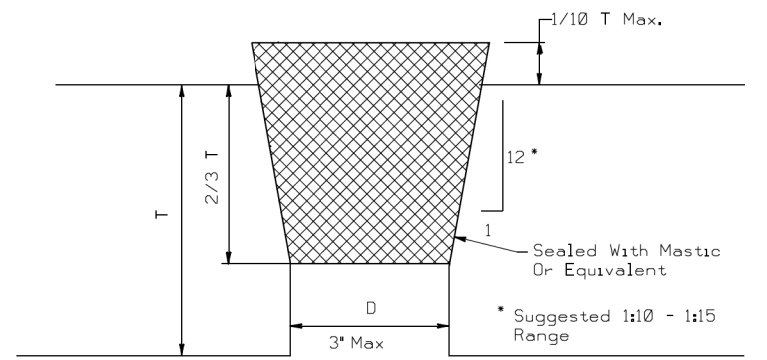
BENDING DETAIL

Note: Bending Of Proposed Pipe Sewer Or RCP In A Vertical & /Or Horizontal Plane Shall Be Accomplished By The Use Of A "Pipe Collar" Or A "Precast Elbow", As Approved By The Engineer. Price Of "Pipe Collar" Or "Precast Elbow" Shall Be Subsidiary To The Unit Prices Bid For Item Reinforced Concrete Pipe. Pay Length Measurement To Be Along Horizontal C & Horizontal Plane Of Pipes.



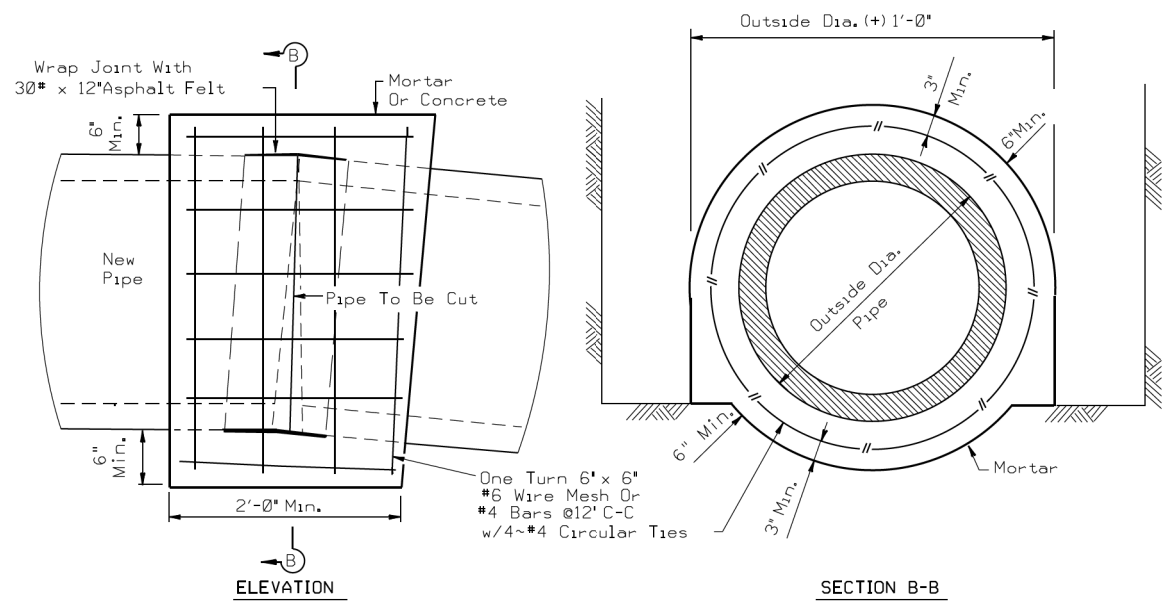
Note: The Price Of Plug Shall Be Subsidiary To The Unit Bid Price For Pipe Sewer Or RCP. Mortar Joints To Be Used As Directed By The Engineer. Removal Of The Existing Plugs For Storm Sewer Or RCP Conns. Shall Be Considered Incidental To Item "Excavation And Backfill For Structures."

Concrete Plug For End Of Pipe Culvert Or Sewer  
CONCRETE PLUG FOR PIPE



T = Wall Thickness On Top Of Box Or Pipe  
D = Diameter Of Lifting Hole  
Minimum Length Of Plug Is 2/3 T +/-  
Minimum Diameter At Bottom Of Plug = D - 1/8"  
Maximum 1/10 T Of Plug Not Seated In Lifting Hole  
Note: The Plug Shall Be Cast With The Same Taper As The Lifting Hole.

DETAIL OF PLUG FOR LIFTING HOLES IN RCB AND RCP



PIPE COLLAR DETAIL  
For Horizontal Or Vertical Placement

d = Diameter  
R = Radius

MISCELLANEOUS SEWER DETAILS

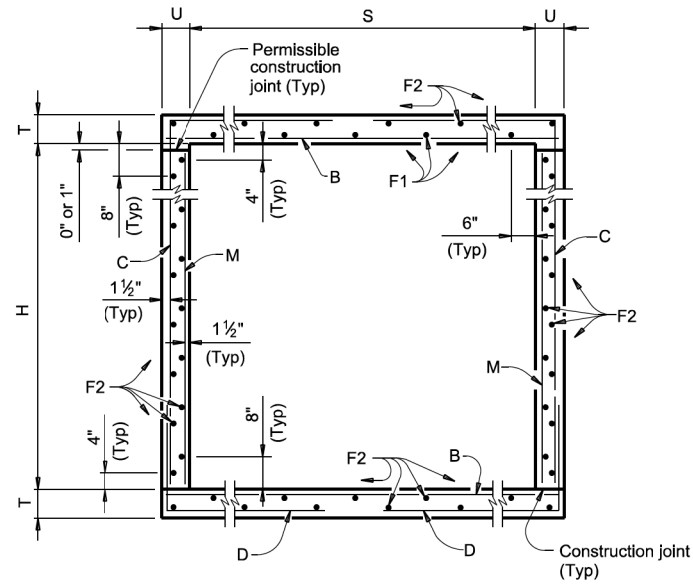
MSD

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©	TxDOT	Mar	2004	DISTRICT	FED REG	PROJECT NO.		SHEET	
REVISIONS		HOU	6					216	
3/2015 2014 Specs				COUNTY	CONTROL	SECT	JOB	HIGHWAY	
				FORT BEND	3510	04	055	SH 99	

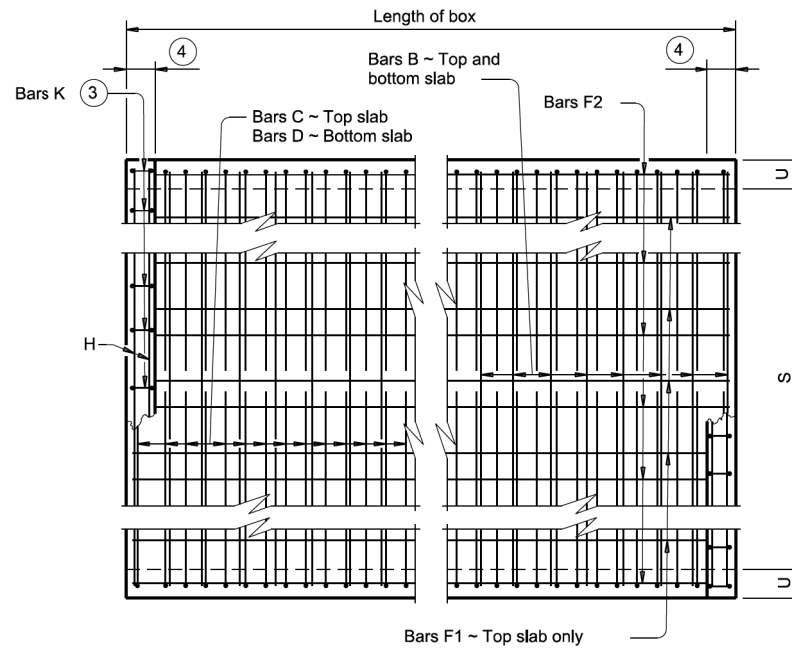
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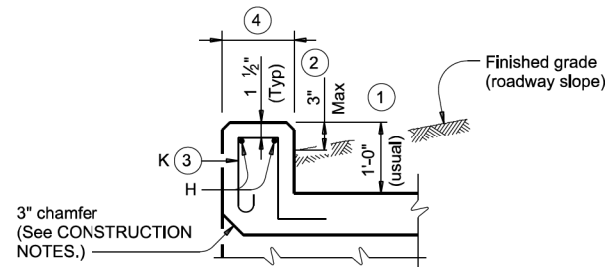
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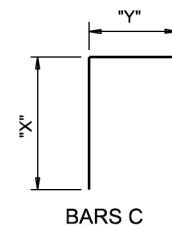
**TYPICAL SECTION**



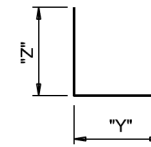
**PLAN OF REINF STEEL**



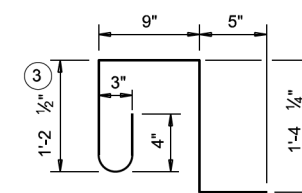
**SECTION THRU CURB**



BARS C



BARS D



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

- ① 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Rail Anchorage Curb (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.
- ② For vehicle safety, the following requirements must be met:
  - For structures without bridge rail, construct curbs no more than 3" above finished grade.
  - For structures with bridge rail, construct curbs flush with finished grade. Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
- ③ For curbs less than 1'-0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.
- ④ 1'-0" typical. 2'-3" when the Rail Anchorage Curb (RAC) standard sheet is referred to elsewhere in the plans.

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

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

**CONSTRUCTION NOTES:**

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

**MATERIAL NOTES:**

- Provide Grade 60 reinforcing steel.
- Provide galvanized reinforcing steel if required elsewhere in the plans.
- Provide Class C concrete (f'c = 3,600 psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete (f'c = 4,000 psi) for top slabs of:
  - culverts with overlay,
  - culverts with 1-to-2 course surface treatment, or
  - culverts with the top slab as the final riding surface.
- Provide bar laps, where required, as follows:
  - Uncoated or galvanized ~ #4 = 1'-8" Min
  - Uncoated or galvanized ~ #5 = 2'-1" Min
  - Uncoated or galvanized ~ #6 = 2'-6" Min

**GENERAL NOTES:**

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

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

HL93 LOADING

SHEET 1 OF 2



<b>SINGLE BOX CULVERTS CAST-IN-PLACE 0' TO 30' FILL</b>			
<b>SCC-5 &amp; 6</b>			
FILE: scc56ste-21.dgn	DN: TBE	CK: BMP	DW: TxDOT
©TxDOT February 2020	CONT	SECT	JOB
REVISIONS	3510	04	055
04/2021 Updated X values.	DIST	COUNTY	SHEET NO.
	HOU	FORT BEND	217

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DATE: FILE:

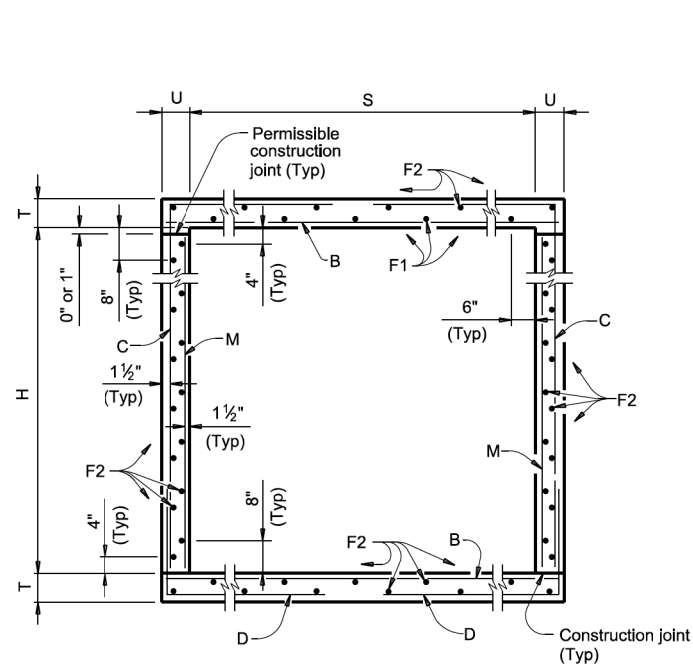
SECTION DIMENSIONS				FILL HEIGHT	BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																								QUANTITIES														
					Bars B					Bars C					Bars D					Bars M ~ #4				Bars F1 ~ #4 at 18" Spa			Bars F2 ~ #4 at 18" Spa		Bars H 4 ~ #4		Bars K		Per Foot of Barrel		Curb		Total						
					S	H	T	U	No.	Size	Spa	Length	Weight	No.	Size	Spa	Length	Weight	" X "	" Y "	No.	Size	Spa	Length	Weight	" Y "	" Z "	No.	Size	Length	Weight	No.	Length	Wt	No.	Length	Weight	Length	Wt	No.	Wt	Conc (CY)	Reinf (Lb)
5' - 0"	2' - 0"	8"	7"	26'	108	#6	9"	5' - 11"	960	108	#5	9"	6' - 3"	704	2' - 6"	3' - 9"	108	#5	9"	6' - 5"	723	3' - 9"	2' - 8"	108	9"	2' - 0"	144	4	39' - 9"	106	22	39' - 9"	584	5' - 11"	16	14	39	0.391	80.5	0.5	55	16.1	3,276
5' - 0"	2' - 0"	9"	7"	30'	108	#6	9"	5' - 11"	960	108	#5	9"	6' - 4"	713	2' - 7"	3' - 9"	108	#5	9"	6' - 6"	732	3' - 9"	2' - 9"	108	9"	2' - 0"	144	4	39' - 9"	106	22	39' - 9"	584	5' - 11"	16	14	39	0.429	81.0	0.5	55	17.6	3,294
5' - 0"	3' - 0"	8"	7"	26'	108	#6	9"	5' - 11"	960	108	#5	9"	7' - 3"	817	3' - 6"	3' - 9"	108	#5	9"	6' - 5"	723	3' - 9"	2' - 8"	108	9"	3' - 0"	216	4	39' - 9"	106	26	39' - 9"	690	5' - 11"	16	14	39	0.434	87.8	0.5	55	17.8	3,567
5' - 0"	3' - 0"	9"	7"	30'	108	#6	9"	5' - 11"	960	108	#5	9"	7' - 4"	826	3' - 7"	3' - 9"	108	#5	9"	6' - 6"	732	3' - 9"	2' - 9"	108	9"	3' - 0"	216	4	39' - 9"	106	26	39' - 9"	690	5' - 11"	16	14	39	0.472	88.3	0.5	55	19.3	3,585
5' - 0"	4' - 0"	8"	7"	26'	108	#6	9"	5' - 11"	960	108	#5	9"	8' - 3"	929	4' - 6"	3' - 9"	108	#5	9"	6' - 5"	723	3' - 9"	2' - 8"	108	9"	4' - 0"	289	4	39' - 9"	106	26	39' - 9"	690	5' - 11"	16	14	39	0.477	92.4	0.5	55	19.5	3,752
5' - 0"	4' - 0"	9"	7"	30'	108	#6	9"	5' - 11"	960	108	#5	9"	8' - 4"	939	4' - 7"	3' - 9"	108	#5	9"	6' - 6"	732	3' - 9"	2' - 9"	108	9"	4' - 0"	289	4	39' - 9"	106	26	39' - 9"	690	5' - 11"	16	14	39	0.515	92.9	0.5	55	21.1	3,771
5' - 0"	5' - 0"	8"	7"	26'	108	#6	9"	5' - 11"	960	108	#5	9"	9' - 3"	1,042	5' - 6"	3' - 9"	108	#5	9"	6' - 5"	723	3' - 9"	2' - 8"	108	9"	5' - 0"	361	4	39' - 9"	106	30	39' - 9"	797	5' - 11"	16	14	39	0.521	99.7	0.5	55	21.3	4,044
5' - 0"	5' - 0"	9"	7"	30'	108	#6	9"	5' - 11"	960	108	#5	9"	9' - 4"	1,051	5' - 7"	3' - 9"	108	#5	9"	6' - 6"	732	3' - 9"	2' - 9"	108	9"	5' - 0"	361	4	39' - 9"	106	30	39' - 9"	797	5' - 11"	16	14	39	0.559	100.2	0.5	55	22.8	4,062
6' - 0"	2' - 0"	8"	7"	20'	108	#6	9"	6' - 11"	1,122	108	#5	9"	6' - 7"	742	2' - 6"	4' - 1"	108	#5	9"	6' - 9"	760	4' - 1"	2' - 8"	108	9"	2' - 0"	144	5	39' - 9"	133	25	39' - 9"	664	6' - 11"	18	16	45	0.440	89.1	0.5	63	18.1	3,628
6' - 0"	2' - 0"	9"	7"	26'	108	#6	9"	6' - 11"	1,122	162	#5	6"	6' - 8"	1,126	2' - 7"	4' - 1"	162	#5	6"	6' - 10"	1,155	4' - 1"	2' - 9"	108	9"	2' - 0"	144	5	39' - 9"	133	25	39' - 9"	664	6' - 11"	18	16	45	0.485	108.6	0.5	63	19.9	4,407
6' - 0"	2' - 0"	10"	8"	30'	108	#6	9"	7' - 1"	1,149	162	#5	6"	6' - 10"	1,155	2' - 8"	4' - 2"	162	#5	6"	7' - 0"	1,183	4' - 2"	2' - 10"	82	12"	2' - 0"	110	5	39' - 9"	133	25	39' - 9"	664	7' - 1"	19	18	50	0.551	109.9	0.5	69	22.6	4,463
6' - 0"	3' - 0"	8"	7"	20'	108	#6	9"	6' - 11"	1,122	108	#5	9"	7' - 7"	854	3' - 6"	4' - 1"	108	#5	9"	6' - 9"	760	4' - 1"	2' - 8"	108	9"	3' - 0"	216	5	39' - 9"	133	29	39' - 9"	770	6' - 11"	18	16	45	0.484	96.4	0.5	63	19.9	3,918
6' - 0"	3' - 0"	9"	7"	26'	108	#6	9"	6' - 11"	1,122	162	#5	6"	7' - 8"	1,295	3' - 7"	4' - 1"	162	#5	6"	6' - 10"	1,155	4' - 1"	2' - 9"	108	9"	3' - 0"	216	5	39' - 9"	133	29	39' - 9"	770	6' - 11"	18	16	45	0.528	117.3	0.5	63	21.6	4,754
6' - 0"	3' - 0"	10"	8"	30'	108	#6	9"	7' - 1"	1,149	162	#5	6"	7' - 10"	1,324	3' - 8"	4' - 2"	162	#5	6"	7' - 0"	1,183	4' - 2"	2' - 10"	82	12"	3' - 0"	164	5	39' - 9"	133	29	39' - 9"	770	7' - 1"	19	18	50	0.601	118.1	0.5	69	24.6	4,792
6' - 0"	4' - 0"	8"	7"	20'	108	#6	9"	6' - 11"	1,122	108	#5	9"	8' - 7"	967	4' - 6"	4' - 1"	108	#5	9"	6' - 9"	760	4' - 1"	2' - 8"	108	9"	4' - 0"	289	5	39' - 9"	133	29	39' - 9"	770	6' - 11"	18	16	45	0.527	101.0	0.5	63	21.6	4,104
6' - 0"	4' - 0"	9"	7"	26'	108	#6	9"	6' - 11"	1,122	162	#5	6"	8' - 8"	1,464	4' - 7"	4' - 1"	162	#5	6"	6' - 10"	1,155	4' - 1"	2' - 9"	108	9"	4' - 0"	289	5	39' - 9"	133	29	39' - 9"	770	6' - 11"	18	16	45	0.571	123.3	0.5	63	23.4	4,996
6' - 0"	4' - 0"	10"	8"	30'	108	#6	9"	7' - 1"	1,149	162	#5	6"	8' - 10"	1,493	4' - 8"	4' - 2"	162	#5	6"	7' - 0"	1,183	4' - 2"	2' - 10"	82	12"	4' - 0"	219	5	39' - 9"	133	29	39' - 9"	770	7' - 1"	19	18	50	0.650	123.7	0.5	69	26.5	5,016
6' - 0"	5' - 0"	8"	7"	20'	108	#6	9"	6' - 11"	1,122	108	#5	9"	9' - 7"	1,080	5' - 6"	4' - 1"	108	#5	9"	6' - 9"	760	4' - 1"	2' - 8"	108	9"	5' - 0"	361	5	39' - 9"	133	33	39' - 9"	876	6' - 11"	18	16	45	0.570	108.3	0.5	63	23.3	4,395
6' - 0"	5' - 0"	9"	7"	26'	108	#6	9"	6' - 11"	1,122	162	#5	6"	9' - 8"	1,633	5' - 7"	4' - 1"	162	#5	6"	6' - 10"	1,155	4' - 1"	2' - 9"	108	9"	5' - 0"	361	5	39' - 9"	133	33	39' - 9"	876	6' - 11"	18	16	45	0.614	132.0	0.5	63	25.1	5,343
6' - 0"	5' - 0"	10"	8"	30'	108	#6	9"	7' - 1"	1,149	162	#5	6"	9' - 10"	1,661	5' - 8"	4' - 2"	162	#5	6"	7' - 0"	1,183	4' - 2"	2' - 10"	82	12"	5' - 0"	274	5	39' - 9"	133	33	39' - 9"	876	7' - 1"	19	18	50	0.700	131.9	0.5	69	28.5	5,345
6' - 0"	6' - 0"	8"	7"	20'	108	#6	9"	6' - 11"	1,122	108	#5	9"	10' - 7"	1,192	6' - 6"	4' - 1"	108	#5	9"	6' - 9"	760	4' - 1"	2' - 8"	108	9"	6' - 0"	433	5	39' - 9"	133	37	39' - 9"	982	6' - 11"	18	16	45	0.613	115.6	0.5	63	25.0	4,685
6' - 0"	6' - 0"	9"	7"	26'	108	#6	9"	6' - 11"	1,122	162	#5	6"	10' - 8"	1,802	6' - 7"	4' - 1"	162	#5	6"	6' - 10"	1,155	4' - 1"	2' - 9"	108	9"	6' - 0"	433	5	39' - 9"	133	37	39' - 9"	982	6' - 11"	18	16	45	0.657	140.7	0.5	63	26.8	5,690
6' - 0"	6' - 0"	10"	8"	30'	108	#6	9"	7' - 1"	1,149	162	#5	6"	10' - 10"	1,830	6' - 8"	4' - 2"	162	#5	6"	7' - 0"	1,183	4' - 2"	2' - 10"	82	12"	6' - 0"	329	5	39' - 9"	133	37	39' - 9"	982	7' - 1"	19	18	50	0.749	140.2	0.5	69	30.5	5,675

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

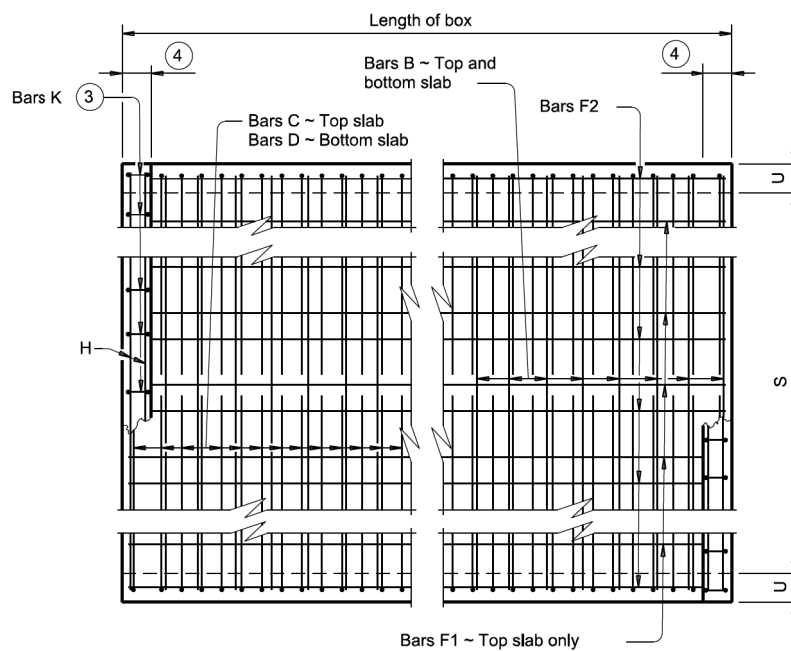
			
<b>SINGLE BOX CULVERTS CAST-IN-PLACE 0' TO 30' FILL</b>			
<b>SCC-5 &amp; 6</b>			
FILE: scc56ste-21.dgn	DN: TBE	CK: BMP	DW: TxDOT
REVISIONS	CONT	SECT	JOB
04/2021 Updated X values.	3510	04	055
	DIST	COUNTY	SHEET NO.
	HOU	FORT BEND	218

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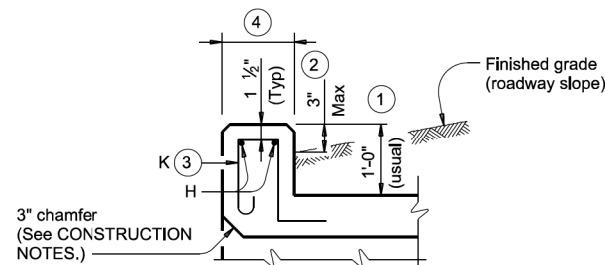
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FILE:



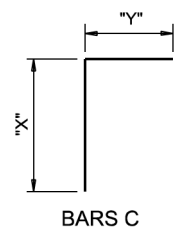
**TYPICAL SECTION**



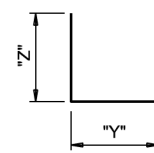
**PLAN OF REINF STEEL**



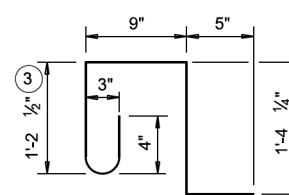
**SECTION THRU CURB**



BARS C



BARS D



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

- ① 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Rail Anchorage Curb (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.
- ② For vehicle safety, the following requirements must be met:
  - For structures without bridge rail, construct curbs no more than 3" above finished grade.
  - For structures with bridge rail, construct curbs flush with finished grade. Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
- ③ For curbs less than 1'-0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.
- ④ 1'-0" typical. 2'-3" when the Rail Anchorage Curb (RAC) standard sheet is referred to elsewhere in the plans.

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

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

**CONSTRUCTION NOTES:**

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

**MATERIAL NOTES:**

- Provide Grade 60 reinforcing steel.
- Provide galvanized reinforcing steel if required elsewhere in the plans.
- Provide Class C concrete (f<sub>c</sub> = 3,600 psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete (f<sub>c</sub> = 4,000 psi) for top slabs of:
  - culverts with overlay,
  - culverts with 1-to-2 course surface treatment, or
  - culverts with the top slab as the final riding surface.
- Provide bar laps, where required, as follows:
  - Uncoated or galvanized ~ #4 = 1'-8" Min
  - Uncoated or galvanized ~ #5 = 2'-1" Min
  - Uncoated or galvanized ~ #6 = 2'-6" Min

**GENERAL NOTES:**

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

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



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

**SCC-8**

FILE: scc08ste-21.dgn	DW: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	3510	04	055	SH 99
04/2021 Updated X values.	DIST	COUNTY	SHEET NO.	
	HOU	FORT BEND	219	

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DATE: FILE:

SECTION DIMENSIONS				FILL HEIGHT	BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																												QUANTITIES										
					Bars B					Bars C					Bars D					Bars M ~ #4				Bars F1 ~ #4 at 18" Spa			Bars F2 ~ #4 at 18" Spa			Bars H 4 ~ #4		Bars K		Per Foot of Barrel		Curb		Total					
S	H	T	U		No.	Size	Spa	Length	Weight	No.	Size	Spa	Length	Weight	" X "	" Y "	No.	Size	Spa	Length	Weight	" Y "	" Z "	No.	Spa	Length	Weight	No.	Length	Wt	No.	Length	Weight	Length	Wt	No.	Wt	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)
8' - 0"	3' - 0"	8"	7"	13'	162	#6	6"	8' - 11"	2,170	108	#6	9"	8' - 8"	1,406	3' - 6"	5' - 2"	108	#6	9"	8' - 3"	1,338	5' - 2"	3' - 1"	108	9"	3' - 0"	216	6	39' - 9"	159	32	39' - 9"	850	8' - 11"	24	20	56	0.582	153.5	0.7	80	24.0	6,219
8' - 0"	3' - 0"	8"	7"	16'	162	#6	6"	8' - 11"	2,170	108	#6	9"	8' - 8"	1,406	3' - 6"	5' - 2"	108	#6	9"	8' - 3"	1,338	5' - 2"	3' - 1"	108	9"	3' - 0"	216	6	39' - 9"	159	32	39' - 9"	850	8' - 11"	24	20	56	0.582	153.5	0.7	80	24.0	6,219
8' - 0"	3' - 0"	10"	8"	20'	162	#6	6"	9' - 1"	2,210	108	#6	9"	8' - 10"	1,433	3' - 8"	5' - 2"	108	#6	9"	8' - 5"	1,365	5' - 2"	3' - 3"	82	12"	3' - 0"	164	6	39' - 9"	159	32	39' - 9"	850	9' - 1"	24	22	61	0.724	154.5	0.7	85	29.6	6,266
8' - 0"	3' - 0"	11"	8"	23'	162	#6	6"	9' - 1"	2,210	108	#6	9"	8' - 11"	1,446	3' - 9"	5' - 2"	108	#6	9"	8' - 6"	1,379	5' - 2"	3' - 4"	82	12"	3' - 0"	164	6	39' - 9"	159	32	39' - 9"	850	9' - 1"	24	22	61	0.782	155.2	0.7	85	32.0	6,293
8' - 0"	3' - 0"	13"	9"	30'	162	#6	6"	9' - 3"	2,251	108	#6	9"	9' - 2"	1,487	3' - 11"	5' - 3"	108	#6	9"	8' - 9"	1,419	5' - 3"	3' - 6"	108	9"	3' - 0"	216	6	39' - 9"	159	32	39' - 9"	850	9' - 3"	25	22	61	0.929	159.6	0.7	86	37.9	6,468
8' - 0"	4' - 0"	8"	7"	13'	162	#6	6"	8' - 11"	2,170	108	#6	9"	9' - 8"	1,568	4' - 6"	5' - 2"	108	#6	9"	8' - 3"	1,338	5' - 2"	3' - 1"	108	9"	4' - 0"	289	6	39' - 9"	159	32	39' - 9"	850	8' - 11"	24	20	56	0.626	159.4	0.7	80	25.7	6,454
8' - 0"	4' - 0"	8"	7"	16'	162	#6	6"	8' - 11"	2,170	108	#6	9"	9' - 8"	1,568	4' - 6"	5' - 2"	108	#6	9"	8' - 3"	1,338	5' - 2"	3' - 1"	108	9"	4' - 0"	289	6	39' - 9"	159	32	39' - 9"	850	8' - 11"	24	20	56	0.626	159.4	0.7	80	25.7	6,454
8' - 0"	4' - 0"	10"	8"	20'	162	#6	6"	9' - 1"	2,210	108	#6	9"	9' - 10"	1,595	4' - 8"	5' - 2"	108	#6	9"	8' - 5"	1,365	5' - 2"	3' - 3"	82	12"	4' - 0"	219	6	39' - 9"	159	32	39' - 9"	850	9' - 1"	24	22	61	0.774	160.0	0.7	85	31.6	6,483
8' - 0"	4' - 0"	11"	8"	23'	162	#6	6"	9' - 1"	2,210	108	#6	9"	9' - 11"	1,609	4' - 9"	5' - 2"	108	#6	9"	8' - 6"	1,379	5' - 2"	3' - 4"	82	12"	4' - 0"	219	6	39' - 9"	159	32	39' - 9"	850	9' - 1"	24	22	61	0.831	160.7	0.7	85	33.9	6,511
8' - 0"	4' - 0"	13"	9"	30'	162	#6	6"	9' - 3"	2,251	108	#6	9"	10' - 2"	1,649	4' - 11"	5' - 3"	108	#6	9"	8' - 9"	1,419	5' - 3"	3' - 6"	108	9"	4' - 0"	289	6	39' - 9"	159	32	39' - 9"	850	9' - 3"	25	22	61	0.985	165.4	0.7	86	40.1	6,703
8' - 0"	5' - 0"	8"	7"	13'	162	#6	6"	8' - 11"	2,170	108	#6	9"	10' - 8"	1,730	5' - 6"	5' - 2"	108	#6	9"	8' - 3"	1,338	5' - 2"	3' - 1"	108	9"	5' - 0"	361	6	39' - 9"	159	36	39' - 9"	956	8' - 11"	24	20	56	0.669	167.9	0.7	80	27.4	6,794
8' - 0"	5' - 0"	8"	7"	16'	162	#6	6"	8' - 11"	2,170	108	#6	9"	10' - 8"	1,730	5' - 6"	5' - 2"	108	#6	9"	8' - 3"	1,338	5' - 2"	3' - 1"	108	9"	5' - 0"	361	6	39' - 9"	159	36	39' - 9"	956	8' - 11"	24	20	56	0.669	167.9	0.7	80	27.4	6,794
8' - 0"	5' - 0"	10"	8"	20'	162	#6	6"	9' - 1"	2,210	108	#6	9"	10' - 10"	1,757	5' - 8"	5' - 2"	108	#6	9"	8' - 5"	1,365	5' - 2"	3' - 3"	82	12"	5' - 0"	274	6	39' - 9"	159	36	39' - 9"	956	9' - 1"	24	22	61	0.823	168.0	0.7	85	33.6	6,806
8' - 0"	5' - 0"	11"	8"	23'	162	#6	6"	9' - 1"	2,210	108	#6	9"	10' - 11"	1,771	5' - 9"	5' - 2"	108	#6	9"	8' - 6"	1,379	5' - 2"	3' - 4"	82	12"	5' - 0"	274	6	39' - 9"	159	36	39' - 9"	956	9' - 1"	24	22	61	0.881	168.7	0.7	85	35.9	6,834
8' - 0"	5' - 0"	13"	9"	30'	162	#6	6"	9' - 3"	2,251	108	#6	9"	11' - 2"	1,811	5' - 11"	5' - 3"	108	#6	9"	8' - 9"	1,419	5' - 3"	3' - 6"	108	9"	5' - 0"	361	6	39' - 9"	159	36	39' - 9"	956	9' - 3"	25	22	61	1.040	173.9	0.7	86	42.3	7,043
8' - 0"	6' - 0"	8"	7"	13'	162	#6	6"	8' - 11"	2,170	108	#6	9"	11' - 8"	1,893	6' - 6"	5' - 2"	108	#6	9"	8' - 3"	1,338	5' - 2"	3' - 1"	108	9"	6' - 0"	433	6	39' - 9"	159	40	39' - 9"	1,062	8' - 11"	24	20	56	0.712	176.4	0.7	80	29.2	7,135
8' - 0"	6' - 0"	8"	7"	16'	162	#6	6"	8' - 11"	2,170	108	#6	9"	11' - 8"	1,893	6' - 6"	5' - 2"	108	#6	9"	8' - 3"	1,338	5' - 2"	3' - 1"	108	9"	6' - 0"	433	6	39' - 9"	159	40	39' - 9"	1,062	8' - 11"	24	20	56	0.712	176.4	0.7	80	29.2	7,135
8' - 0"	6' - 0"	10"	8"	20'	162	#6	6"	9' - 1"	2,210	108	#6	9"	11' - 10"	1,920	6' - 8"	5' - 2"	108	#6	9"	8' - 5"	1,365	5' - 2"	3' - 3"	82	12"	6' - 0"	329	6	39' - 9"	159	40	39' - 9"	1,062	9' - 1"	24	22	61	0.872	176.1	0.7	85	35.6	7,130
8' - 0"	6' - 0"	11"	8"	23'	162	#6	6"	9' - 1"	2,210	108	#6	9"	11' - 11"	1,933	6' - 9"	5' - 2"	108	#6	9"	8' - 6"	1,379	5' - 2"	3' - 4"	82	12"	6' - 0"	329	6	39' - 9"	159	40	39' - 9"	1,062	9' - 1"	24	22	61	0.930	176.8	0.7	85	37.9	7,157
8' - 0"	6' - 0"	13"	9"	30'	162	#6	6"	9' - 3"	2,251	108	#6	9"	12' - 2"	1,974	6' - 11"	5' - 3"	108	#6	9"	8' - 9"	1,419	5' - 3"	3' - 6"	108	9"	6' - 0"	433	6	39' - 9"	159	40	39' - 9"	1,062	9' - 3"	25	22	61	1.096	182.5	0.7	86	44.5	7,384
8' - 0"	7' - 0"	8"	7"	13'	162	#6	6"	8' - 11"	2,170	108	#6	9"	12' - 8"	2,055	7' - 6"	5' - 2"	108	#6	9"	8' - 3"	1,338	5' - 2"	3' - 1"	108	9"	7' - 0"	505	6	39' - 9"	159	40	39' - 9"	1,062	8' - 11"	24	20	56	0.755	182.2	0.7	80	30.9	7,369
8' - 0"	7' - 0"	8"	7"	16'	162	#6	6"	8' - 11"	2,170	162	#6	6"	12' - 8"	3,082	7' - 6"	5' - 2"	162	#6	6"	8' - 3"	2,007	5' - 2"	3' - 1"	108	9"	7' - 0"	505	6	39' - 9"	159	40	39' - 9"	1,062	8' - 11"	24	20	56	0.755	224.6	0.7	80	30.9	9,065
8' - 0"	7' - 0"	10"	8"	20'	162	#6	6"	9' - 1"	2,210	162	#6	6"	12' - 10"	3,123	7' - 8"	5' - 2"	162	#6	6"	8' - 5"	2,048	5' - 2"	3' - 3"	82	12"	7' - 0"	383	6	39' - 9"	159	40	39' - 9"	1,062	9' - 1"	24	22	61	0.922	224.6	0.7	85	37.6	9,070
8' - 0"	7' - 0"	11"	8"	23'	162	#6	6"	9' - 1"	2,210	162	#6	6"	12' - 11"	3,143	7' - 9"	5' - 2"	162	#6	6"	8' - 6"	2,068	5' - 2"	3' - 4"	82	12"	7' - 0"	383	6	39' - 9"	159	40	39' - 9"	1,062	9' - 1"	24	22	61	0.979	225.6	0.7	85	39.8	9,110
8' - 0"	7' - 0"	13"	9"	30'	162	#6	6"	9' - 3"	2,251	162	#6	6"	13' - 2"	3,204	7' - 11"	5' - 3"	162	#6	6"	8' - 9"	2,129	5' - 3"	3' - 6"	108	9"	7' - 0"	505	6	39' - 9"	159	40	39' - 9"	1,062	9' - 3"	25	22	61	1.151	232.8	0.7	86	46.7	9,396
8' - 0"	8' - 0"	8"	7"	13'	162	#6	6"	8' - 11"	2,170	108	#6	9"	13' - 8"	2,217	8' - 6"	5' - 2"	108	#6	9"	8' - 3"	1,338	5' - 2"	3' - 1"	108	9"	8' - 0"	577	6	39' - 9"	159	44	39' - 9"	1,168	8' - 11"	24	20	56	0.798	190.7	0.7	80	32.6	7,709
8' - 0"	8' - 0"	8"	7"	16'	162	#6	6"	8' - 11"	2,170	162	#6	6"	13' - 8"	3,325	8' - 6"	5' - 2"	162	#6	6"	8' - 3"	2,007	5' - 2"	3' - 1"	108	9"	8' - 0"	577	6	39' - 9"	159	44	39' - 9"	1,168	8' - 11"	24	20	56	0.798	235.2	0.7	80	32.6	9,486
8' - 0"	8' - 0"	10"	8"	20'	162	#6	6"	9' - 1"	2,210	162	#6	6"	13' - 10"	3,366	8' - 8"	5' - 2"	162	#6	6"	8' - 5"	2,048	5' - 2"	3' - 3"	108	9"	8' - 0"	577	6	39' - 9"	159	44	39' - 9"	1,168	9' - 1"	24	22	61	0.971	238.2	0.7	85	39.5	9,613
8' - 0"	8' - 0"	11"	8"	23'	162	#6	6"	9' - 1"	2,210	162	#6	6"	13' - 11"	3,386	8' - 9"	5' - 2"	162	#6	6"	8' - 6"	2,068	5' - 2"	3' - 4"	162	6"	8' - 0"	866	6	39' - 9"	159	44	39' - 9"	1,168	9' - 1"	24	22	61	1.029	246.4	0.7	85	41.8	9,942
8' - 0"	8' - 0"	13"	9"	30'	162	#6	6"	9' - 3"	2,251	162	#6	6"	14' - 2"	3,447	8' - 11"	5' - 3"	162	#6	6"	8' - 9"	2,129	5' - 3"	3' - 6"	162	6"	8' - 0"	866	6	39' - 9"	159	44	39' - 9"	1,168	9' - 3"	25	22	61	1.207	250.5	0.7	86	49.0	10,106

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



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

**SCC-8**

FILE
------

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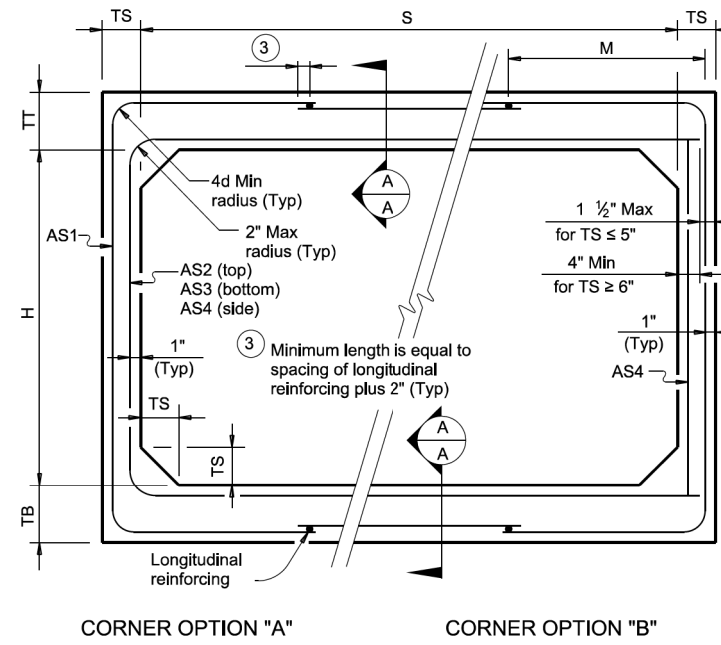
DATE:  
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### BOX DATA

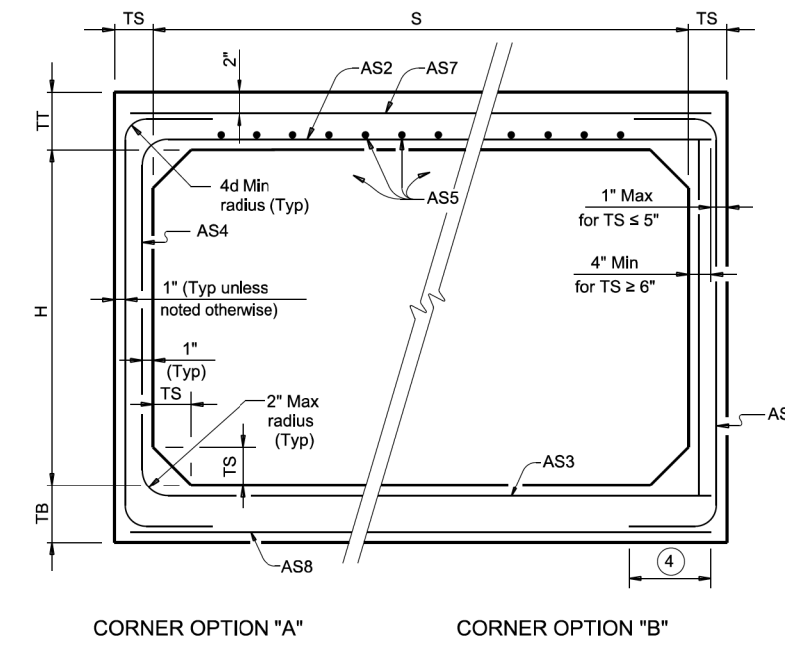
SECTION DIMENSIONS					Fill Height (ft.)	M (Min) (in.)	REINFORCING (sq. in. / ft.) <sup>②</sup>							Lift Weight (tons) <sup>①</sup>
S (ft.)	H (ft.)	TT (in.)	TB (in.)	TS (in.)			AS1	AS2	AS3	AS4	AS5	AS7	AS8	
6	2	8	7	7	< 2	-	0.23	0.27	0.19	0.17	0.19	0.19	0.17	7.2
6	2	7	7	7	2 < 3	43	0.25	0.21	0.17	0.17	-	-	-	6.8
6	2	7	7	7	3 - 5	43	0.20	0.17	0.17	0.17	-	-	-	6.8
6	2	7	7	7	10	39	0.20	0.17	0.17	0.17	-	-	-	6.8
6	2	7	7	7	15	39	0.26	0.20	0.20	0.17	-	-	-	6.8
6	2	7	7	7	20	39	0.34	0.26	0.26	0.17	-	-	-	6.8
6	2	7	7	7	25	39	0.43	0.32	0.32	0.17	-	-	-	6.8
6	2	7	7	7	30	39	0.52	0.38	0.39	0.17	-	-	-	6.8
6	3	8	7	7	< 2	-	0.20	0.31	0.22	0.17	0.19	0.19	0.17	7.9
6	3	7	7	7	2 < 3	43	0.21	0.24	0.19	0.17	-	-	-	7.5
6	3	7	7	7	3 - 5	39	0.17	0.18	0.17	0.17	-	-	-	7.5
6	3	7	7	7	10	39	0.17	0.18	0.19	0.17	-	-	-	7.5
6	3	7	7	7	15	38	0.22	0.24	0.24	0.17	-	-	-	7.5
6	3	7	7	7	20	38	0.28	0.31	0.31	0.17	-	-	-	7.5
6	3	7	7	7	25	38	0.35	0.38	0.39	0.17	-	-	-	7.5
6	3	7	7	7	30	38	0.42	0.46	0.46	0.17	-	-	-	7.5
6	4	8	7	7	< 2	-	0.19	0.34	0.25	0.17	0.19	0.19	0.17	8.6
6	4	7	7	7	2 < 3	43	0.19	0.27	0.21	0.17	-	-	-	8.2
6	4	7	7	7	3 - 5	39	0.17	0.21	0.19	0.17	-	-	-	8.2
6	4	7	7	7	10	39	0.17	0.20	0.21	0.17	-	-	-	8.2
6	4	7	7	7	15	38	0.18	0.27	0.27	0.17	-	-	-	8.2
6	4	7	7	7	20	38	0.24	0.34	0.35	0.17	-	-	-	8.2
6	4	7	7	7	25	38	0.29	0.43	0.42	0.17	-	-	-	8.2
6	4	7	7	7	30	38	0.35	0.51	0.52	0.17	-	-	-	8.2
6	5	8	7	7	< 2	-	0.19	0.37	0.28	0.17	0.19	0.19	0.17	9.3
6	5	7	7	7	2 < 3	43	0.17	0.30	0.24	0.17	-	-	-	8.9
6	5	7	7	7	3 - 5	43	0.17	0.23	0.21	0.17	-	-	-	8.9
6	5	7	7	7	10	39	0.17	0.22	0.23	0.17	-	-	-	8.9
6	5	7	7	7	15	38	0.17	0.28	0.29	0.17	-	-	-	8.9
6	5	7	7	7	20	38	0.20	0.37	0.38	0.17	-	-	-	8.9
6	5	7	7	7	25	38	0.25	0.45	0.46	0.17	-	-	-	8.9
6	5	7	7	7	30	38	0.30	0.54	0.55	0.17	-	-	-	8.9
6	6	8	7	7	< 2	-	0.19	0.38	0.30	0.17	0.19	0.19	0.17	10
6	6	7	7	7	2 < 3	52	0.17	0.32	0.26	0.17	-	-	-	9.6
6	6	7	7	7	3 - 5	52	0.17	0.24	0.22	0.17	-	-	-	9.6
6	6	7	7	7	10	43	0.17	0.23	0.24	0.17	-	-	-	9.6
6	6	7	7	7	15	39	0.17	0.29	0.31	0.17	-	-	-	9.6
6	6	7	7	7	20	39	0.18	0.38	0.39	0.17	-	-	-	9.6
6	6	7	7	7	25	38	0.23	0.46	0.48	0.17	-	-	-	9.6
6	6	7	7	7	30	38	0.27	0.55	0.57	0.17	-	-	-	9.6

① For box length = 8'-0"

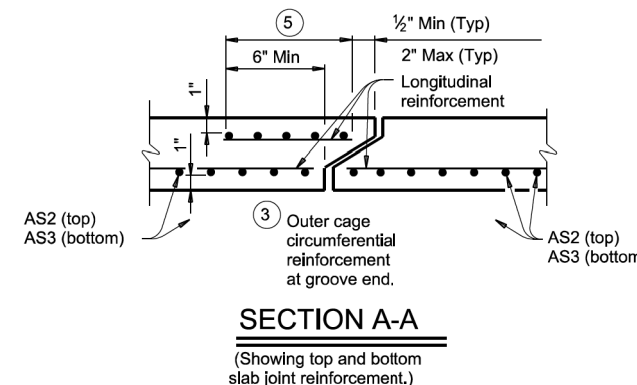
② AS1 thru AS4, AS7 and AS8 are minimum required areas of reinforcement per linear foot of box length. AS5 is minimum required area of reinforcement per linear foot of box width.



**FILL HEIGHT 2 FT AND GREATER**



**FILL HEIGHT LESS THAN 2 FT**



**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

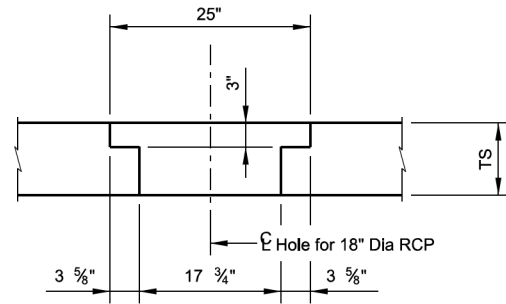


**SINGLE BOX CULVERTS  
PRECAST  
6'-0" SPAN**

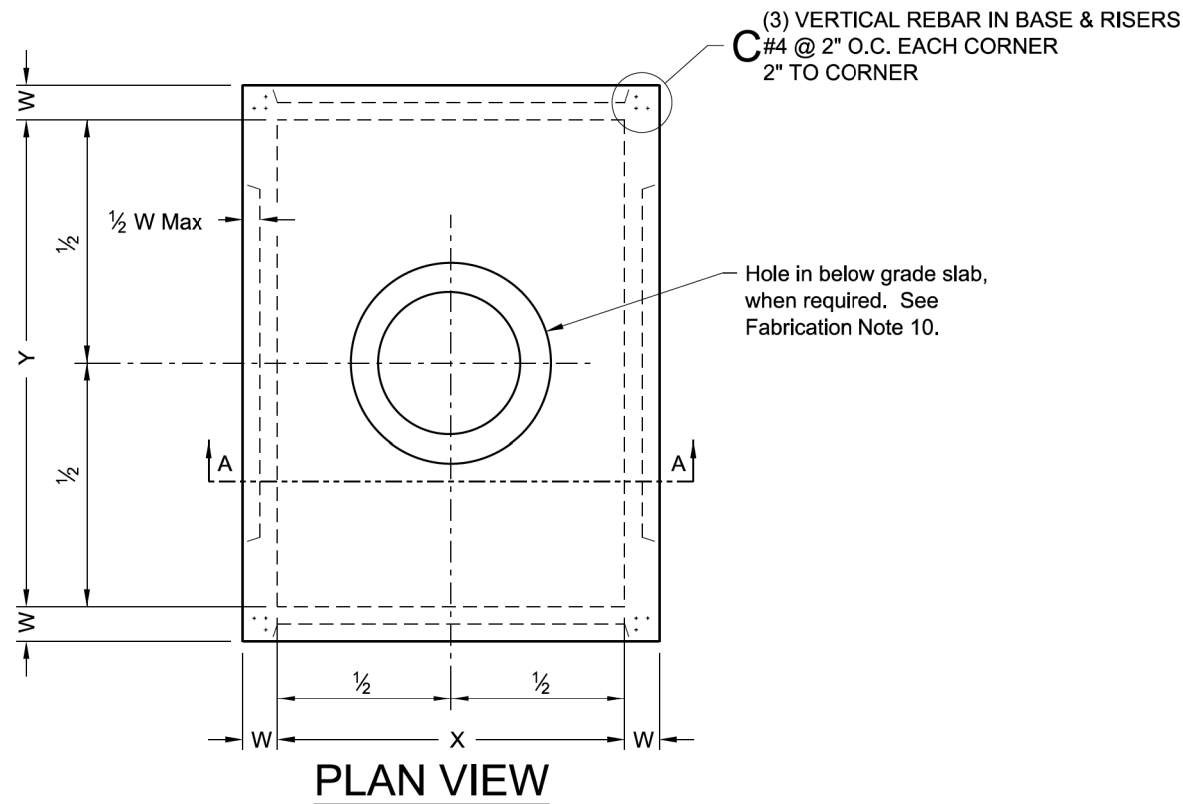
**SCP-6**

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©TxDOT	February 2020	CONT	SECT	JOB	HIGHWAY				
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		HOU	FORT BEND		221				

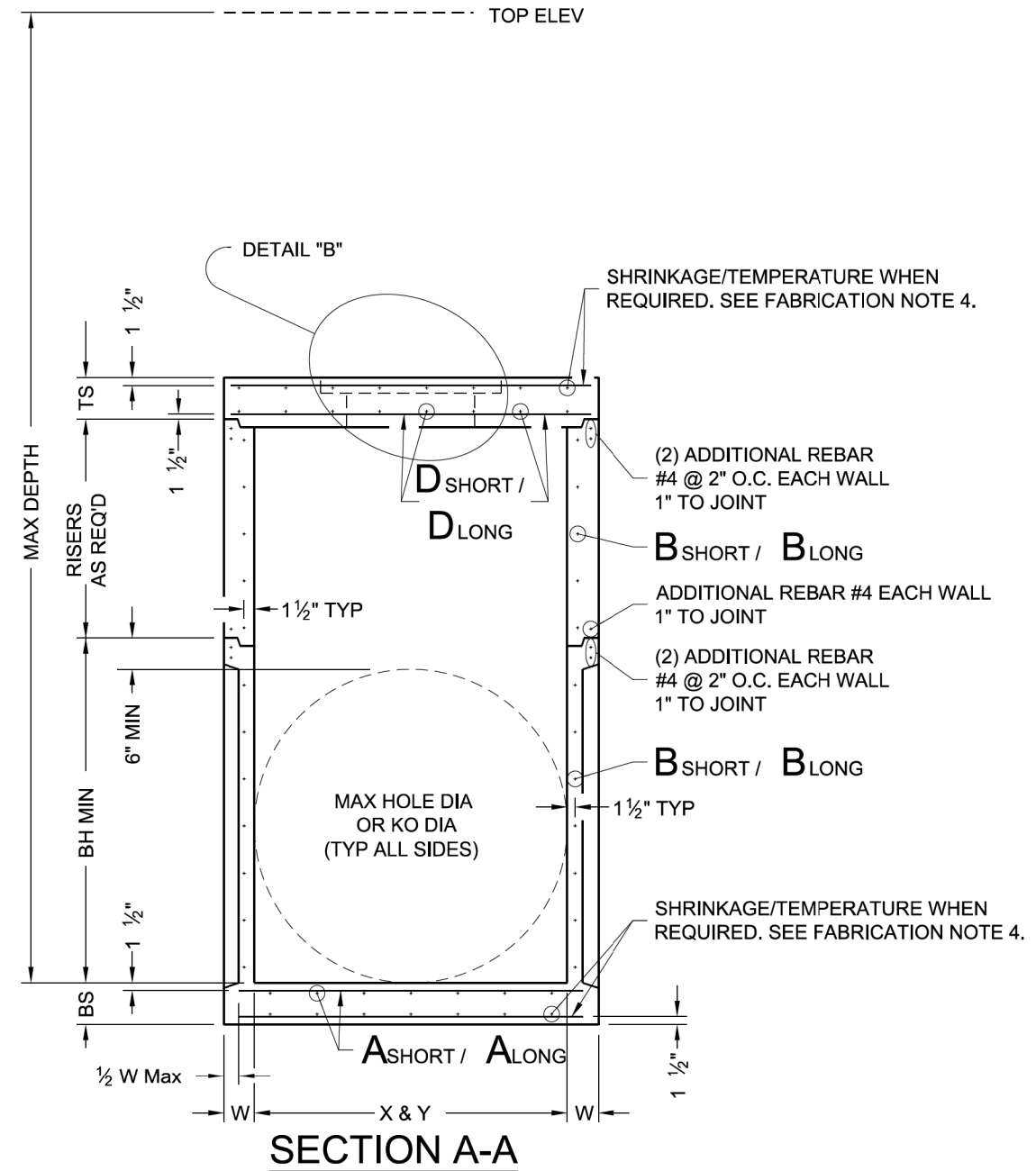
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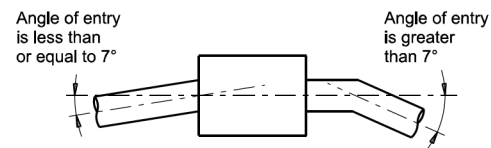
**DETAIL "B"**



**PLAN VIEW**



**SECTION A-A**



**PIPE CONNECTION DETAIL**

Connect pipes within 7° of normal to PJB wall. If necessary, use pipe elbow or curved approach alignment to stay within this limit.

**FABRICATION NOTES:**

1. Provide Class "H" concrete in accordance with Item 421 and having a minimum compressive strength of 5,000 psi.
2. Provide Grade 60 reinforcing steel or equivalent area of WWWR.
3. Provide typical clear cover of 1 1/2" to reinforcing steel at interior or exterior walls.
4. Walls or slabs with a thickness of 8" or greater require shrinkage and temperature reinforcing steel. Provide steel area = 0.11 in<sup>2</sup>/ft each way.
5. No substitution is allowed for vertical and horizontal #4 bars in corners.
6. Manufacture base and risers to nearest 3" increment.
7. Design tongue and groove joints for full closure on both shoulders. Minimum spigot depth is 3/4".
8. Provide lifting devices in conformance with Manufacturer's recommendations.
9. See sheet PDD for sizes, dimensions, and reinforcing steel not shown.
10. Provide hole in below grade slab only when PJB is installed with inlet type POD.

**INSTALLATION NOTES:**

1. Inverts (benching) to be provided by Contractor. Concrete or mortar used for invert is subsidiary to junction box.
2. Seal tongue and groove joints with preformed or bulk mastic in conformance with Manufacturer's recommendations. Tongue and groove joints may be grouted no more than 1" between each section, or 1/2 the joint depth, whichever is greater.
3. Do not grout rubber gasket joints without Manufacturer's recommendation.
4. For rigid pipe, cut hole in thin wall panel (KO) 4" Max, 2" Min larger than pipe OD.
5. For flexible pipe, consult boot/seal Manufacturer's specification for placement tolerance and hole size. Center pipe in hole and install boot/seal per Manufacturer's specification.

**GENERAL NOTES:**

1. Precast Junction Box consists of base slab, base unit, risers (as required), and below grade slab. See sheet PDD for sizes.
2. Designed according to ASTM C913.
3. Payment for junction box is per Item 465 "Junction Boxes, Manholes, and Inlets" by type and size.

Cover dimensions are clear dimensions, unless noted otherwise.

HL93 LOADING



Bridge Division Standard

**PRECAST JUNCTION BOX**

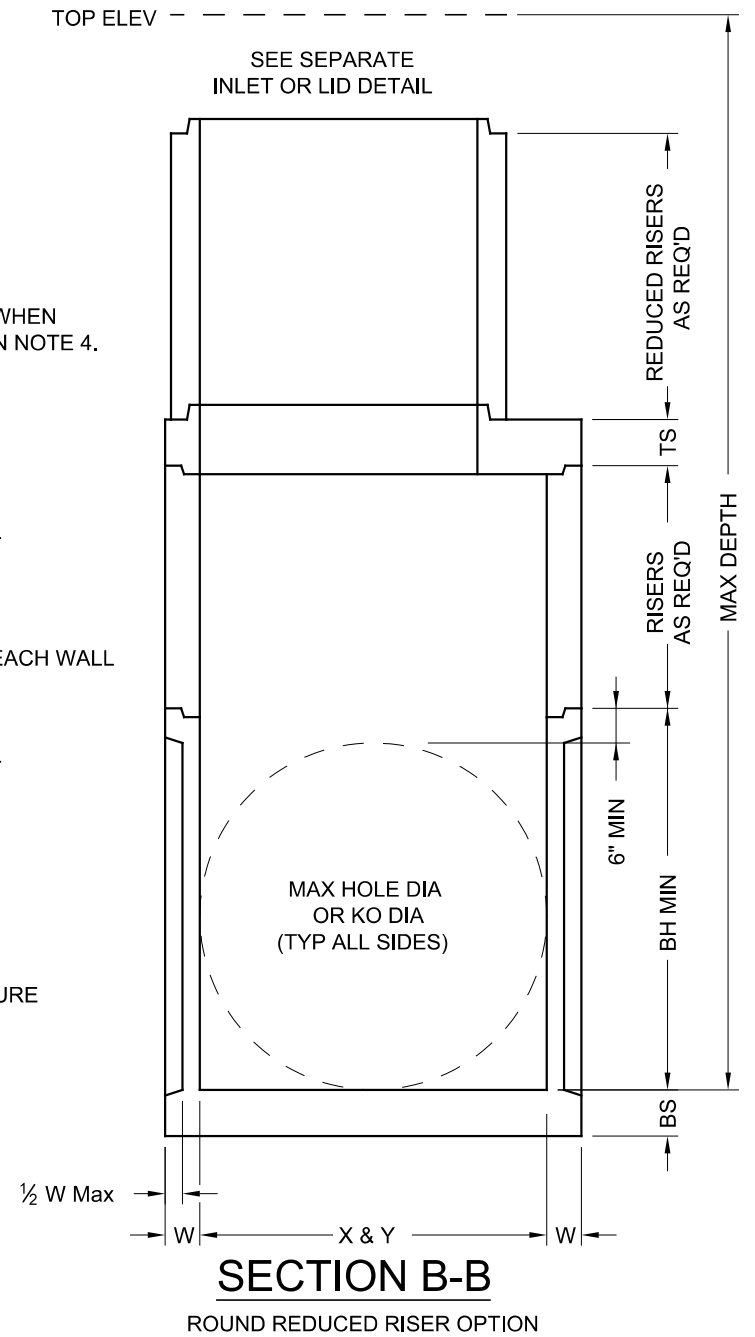
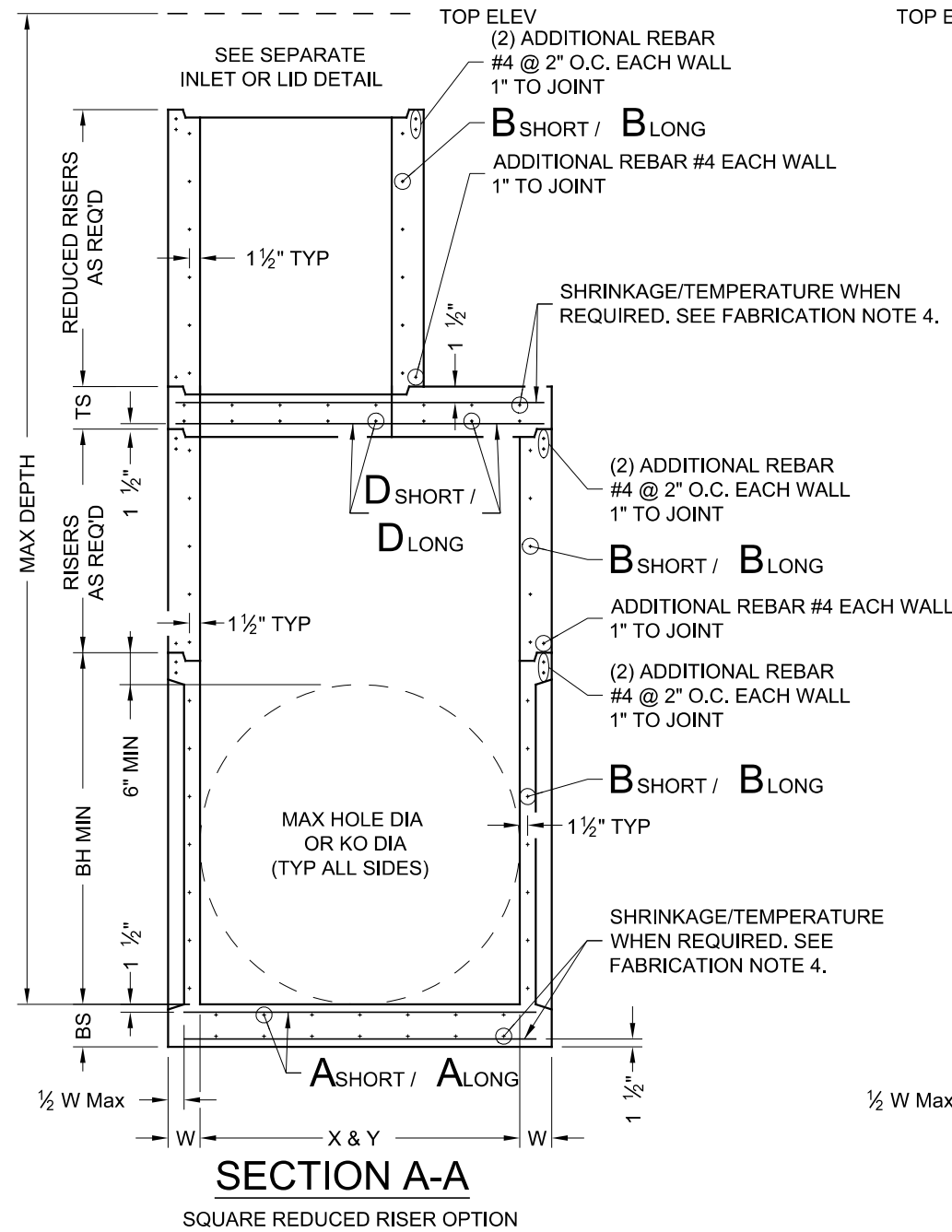
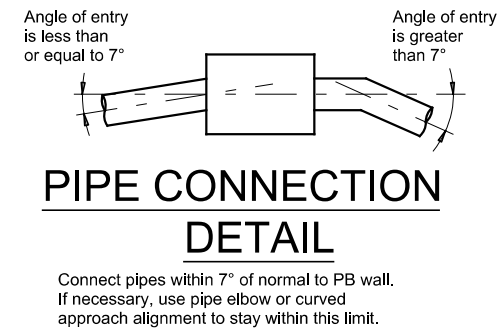
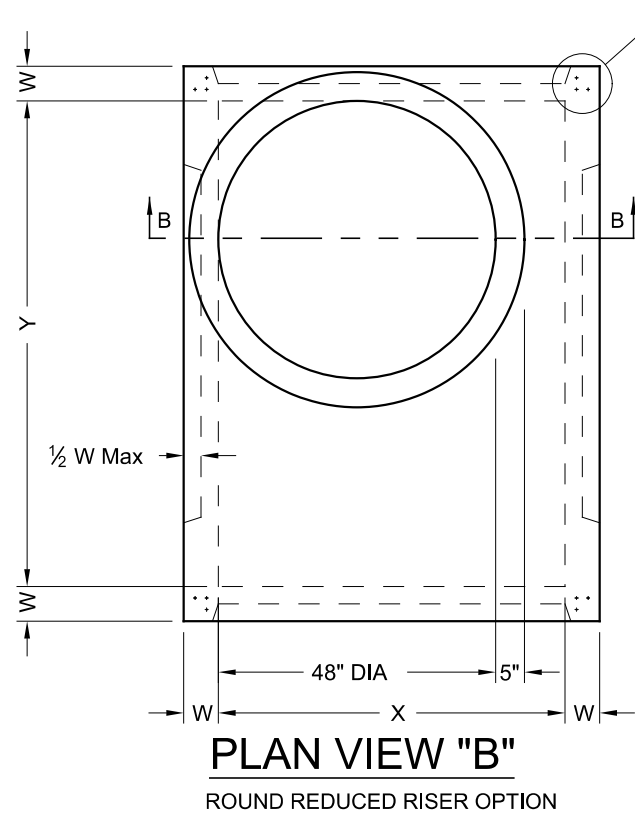
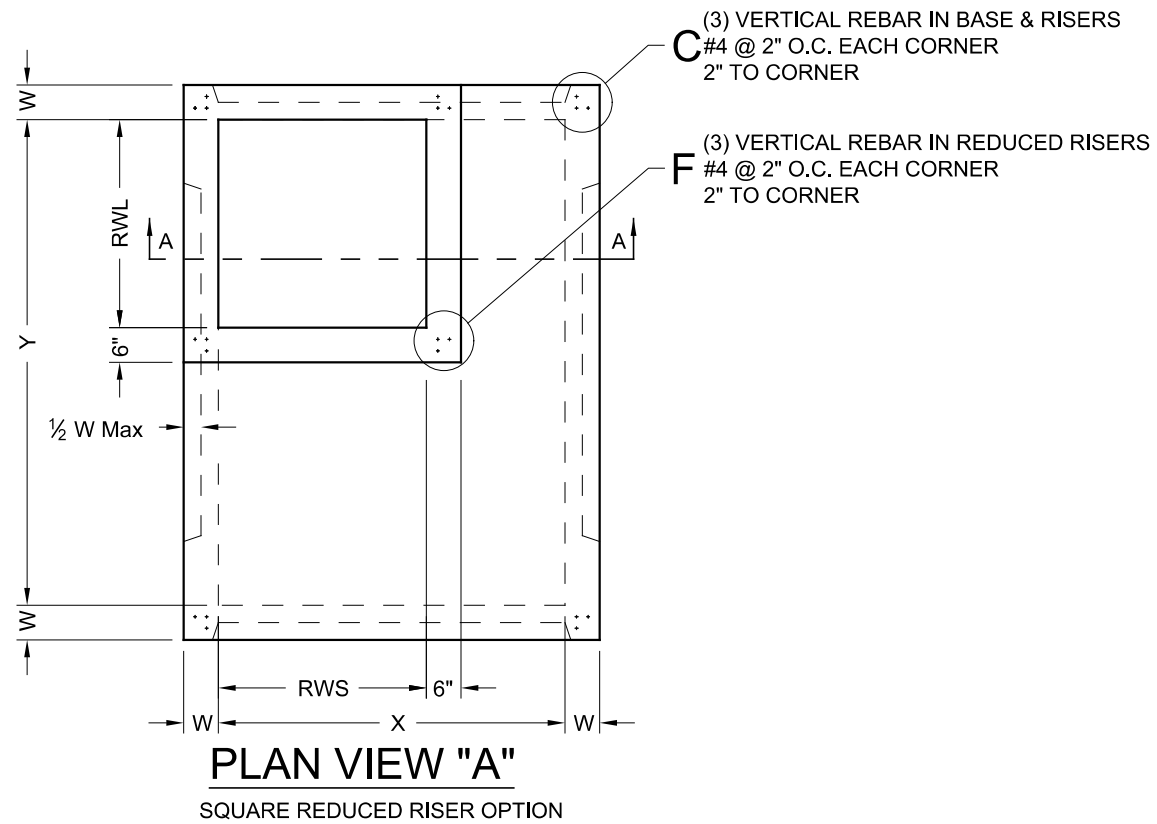
**PJB**

FILE: prest09-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	3510	04	055	SH 99
	DIST	COUNTY	SHEET NO.	
	HOU	FORT BEND	222	

DATE:  
FILE:

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DATE: FILE:



Cover dimensions are clear dimensions, unless noted otherwise.

**FABRICATION NOTES:**

1. Provide Class "H" concrete in accordance with Item 421 and having a minimum compressive strength of 5,000 psi.
2. Provide Grade 60 reinforcing steel or equivalent area of WWR.
3. Provide typical clear cover of 1 1/2" to reinforcing steel at interior or exterior walls.
4. Walls or slabs with a thickness of 8" or greater require shrinkage and temperature reinforcing steel. Provide steel area = 0.11 in<sup>2</sup>/ft each way.
5. No substitution is allowed for vertical and horizontal #4 bars in corners.
6. Manufacture base and risers to nearest 3" increment.
7. Design tongue and groove joints for full closure on both shoulders. Minimum spigot depth is 3/4".
8. Provide lifting devices in conformance with Manufacturer's recommendations.
9. See sheet PDD for sizes, dimensions, and reinforcing steel not shown.

**INSTALLATION NOTES:**

1. If required elsewhere. Inverts (benching) to be provided by Contractor. Concrete or mortar used for invert is subsidiary to specified inlet or manhole.
2. Seal tongue and groove joints with preformed or bulk mastic in conformance with Manufacturer's recommendations. Tongue and groove joints may be grouted no more than 1" between each section, or 1/2 the joint depth, whichever is greater.
3. Do not grout rubber gasket joints without Manufacturer's recommendation.
4. For rigid pipe, cut hole in thin wall panel (KO) 4" Max, 2" Min larger than pipe OD.
5. For flexible pipe, consult boot/seal Manufacturer's specification for placement tolerance and hole size. Center pipe in hole and install boot/seal per Manufacturer's specification.

**GENERAL NOTES:**

1. Precast Base consists of base slab, base unit, risers (as required), reducing slab (as required), and reduced risers (as required). See sheet PDD for sizes.
2. Designed according to ASTM C913.
3. Payment for precast base is subsidiary to the specified inlet, per Item 465, "Junction Boxes, Manholes, and Inlets."

HL93 LOADING



**PRECAST BASE**

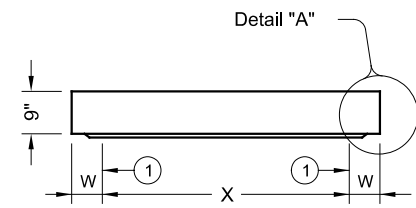
PB

FILE: presto01-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	3510	04	055	SH 99
DIST	COUNTY	SHEET NO.		
HOU	FORT BEND	222A		

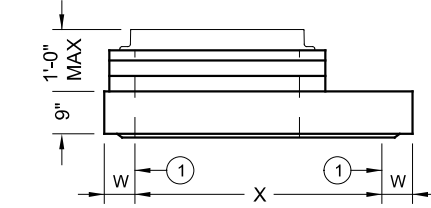


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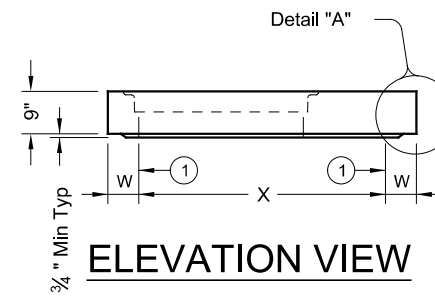
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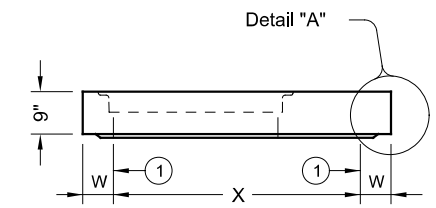
**ELEVATION VIEW**



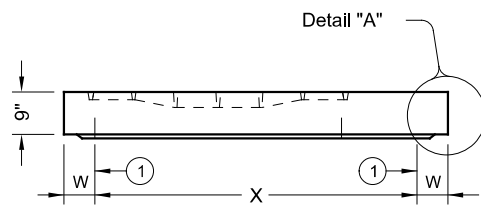
**ELEVATION VIEW**



**ELEVATION VIEW**

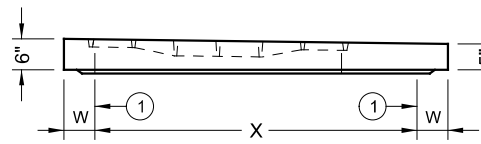


**ELEVATION VIEW**

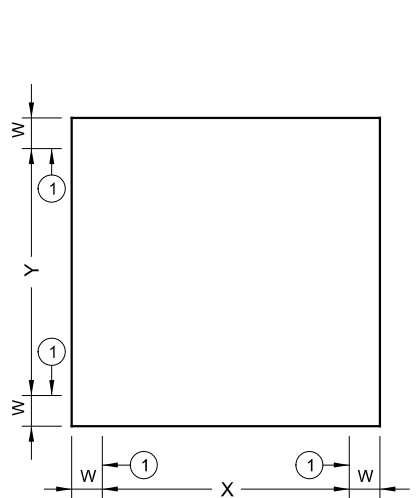


**STYLE 'FG'**

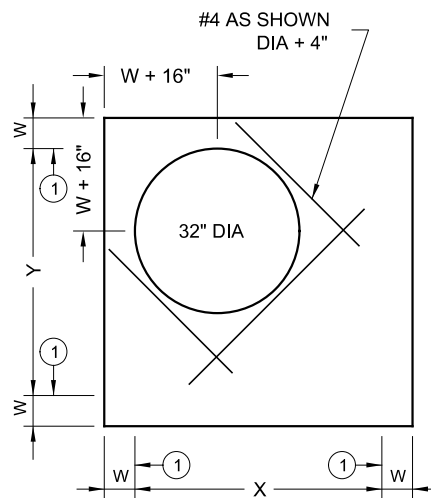
ORIENT TAPER TO CORRESPOND WITH ROADWAY CROSS-SLOPE.



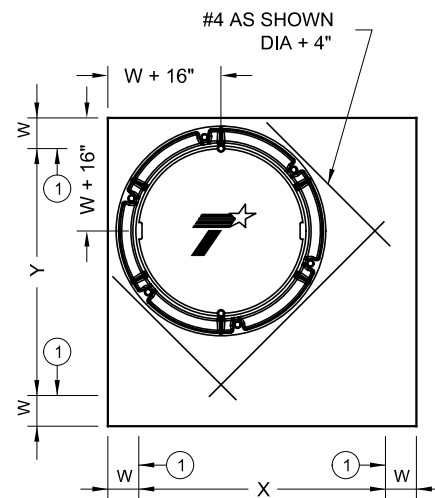
**STYLE 'SFG'**  
**ELEVATION VIEW**



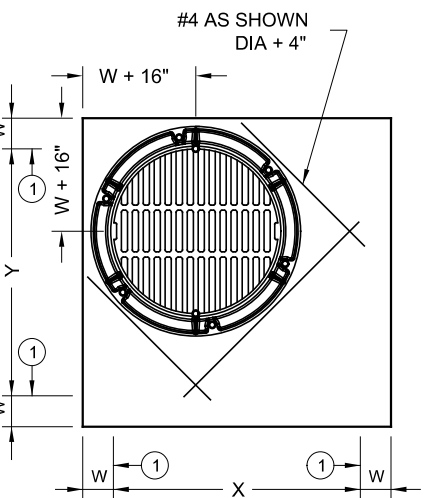
**PLAN VIEW**  
NO OPENINGS  
**STYLE 'SL'**



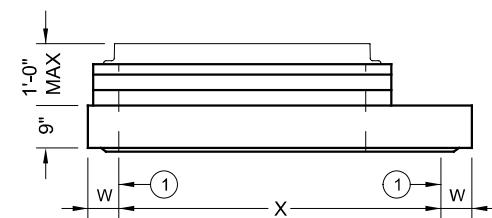
**PLAN VIEW**  
SHIP LOOSE RING & COVER  
**STYLE 'RH'**



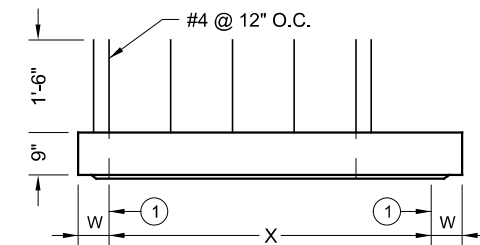
**PLAN VIEW**  
32" DIA CAST-IN RING & COVER  
**STYLE 'RC'**



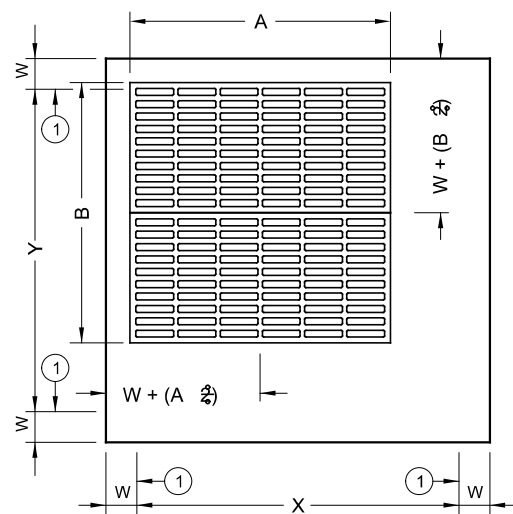
**PLAN VIEW**  
32" DIA CAST-IN RING & GRATE  
**STYLE 'RG'**



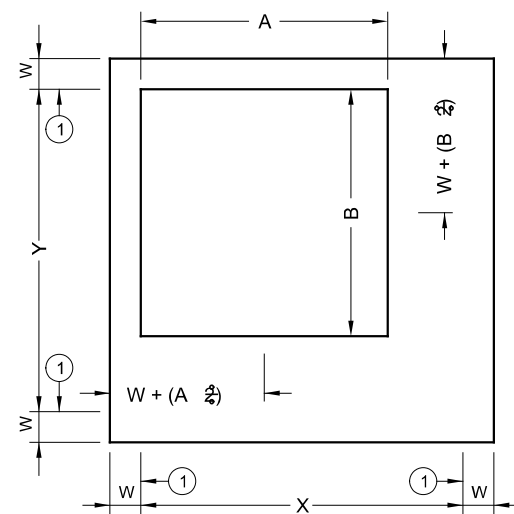
**ELEVATION VIEW**



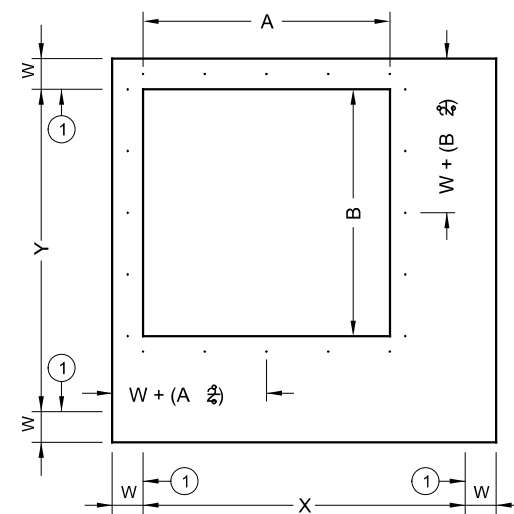
**ELEVATION VIEW**



**PLAN VIEW**  
CAST-IN FRAME & GRATE  
**STYLES 'FG' & 'SFG'**



**PLAN VIEW**  
SHIP LOOSE FRAME & GRATE  
**STYLE 'SH'**



**PLAN VIEW**  
EXPOSED REBAR  
**STYLE 'S1'**

① Matches inside face of wall of precast base or riser below inlet.

HL93 LOADING SHEET 1 OF 2



**PRECAST SLAB LID**

PSL

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REVISIONS	3510	04	055	SH 99
DIST	COUNTY		SHEET NO.	
HOU	FORT BEND		222B	

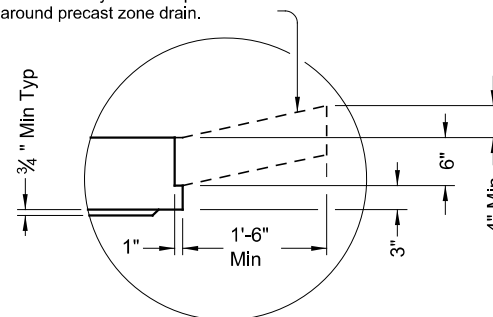
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DATE:  
FILE:

Style	Size (X x Y)	W <sup>②</sup>	A x B (nominal)	Short Span Reinf Steel Area	Long Span Reinf Steel Area
SL	3'x3'	6"	n/a	0.37 in <sup>2</sup> /ft	0.37 in <sup>2</sup> /ft
RH,RC,RG,SH,S1,FG	3'x3'	6"	3'x3' or 32" Dia	0.37 in <sup>2</sup> /ft	0.37 in <sup>2</sup> /ft
SFG	3'x3'	6"	3'x3'	0.32 in <sup>2</sup> /ft	0.32 in <sup>2</sup> /ft
SL	4'x4'	6"	n/a	0.34 in <sup>2</sup> /ft	0.34 in <sup>2</sup> /ft
RH,RC,RG,SH,S1,FG	4'x4'	6"	3'x3' or 32" Dia	0.41 in <sup>2</sup> /ft	0.41 in <sup>2</sup> /ft
SH,S1,FG	4'x4'	6"	4'x4'	0.41 in <sup>2</sup> /ft	0.41 in <sup>2</sup> /ft
SFG	4'x4'	6"	4'x4'	0.32 in <sup>2</sup> /ft	0.32 in <sup>2</sup> /ft
SL	3'x5'	6"	n/a	0.39 in <sup>2</sup> /ft	0.39 in <sup>2</sup> /ft
RH,RC,RG,SH,S1,FG	3'x5'	6"	3'x3' or 32" Dia	0.48 in <sup>2</sup> /ft	0.48 in <sup>2</sup> /ft
SH,S1,FG	3'x5'	6"	3'x5'	0.48 in <sup>2</sup> /ft	0.48 in <sup>2</sup> /ft
SFG	3'x5'	6"	3'x5'	0.32 in <sup>2</sup> /ft	0.32 in <sup>2</sup> /ft
SL	4'x5'	6"	n/a	0.42 in <sup>2</sup> /ft	0.42 in <sup>2</sup> /ft
RH,RC,RG,SH,S1,FG	4'x5'	6"	3'x3' or 32" Dia	0.42 in <sup>2</sup> /ft	0.42 in <sup>2</sup> /ft
SH,S1,FG	4'x5'	6"	4'x4'	0.63 in <sup>2</sup> /ft	0.63 in <sup>2</sup> /ft
SH,S1,FG	4'x5'	6"	3'x5'	0.66 in <sup>2</sup> /ft	0.66 in <sup>2</sup> /ft
SL	5'x5'	6"	n/a	0.36 in <sup>2</sup> /ft	0.36 in <sup>2</sup> /ft
RH,RC,RG,SH,S1,FG	5'x5'	6"	3'x3' or 32" Dia	0.43 in <sup>2</sup> /ft	0.43 in <sup>2</sup> /ft
SH,S1,FG	5'x5'	6"	4'x4'	0.63 in <sup>2</sup> /ft	0.63 in <sup>2</sup> /ft
SH,S1,FG	5'x5'	6"	3'x5'	0.63 in <sup>2</sup> /ft	0.63 in <sup>2</sup> /ft
SL	5'x6'	6"/8"	n/a	0.48 in <sup>2</sup> /ft	0.48 in <sup>2</sup> /ft
RH,RC,RG,SH,S1,FG	5'x6'	6"/8"	3'x3' or 32" Dia	0.48 in <sup>2</sup> /ft	0.48 in <sup>2</sup> /ft
SH,S1,FG	5'x6'	6"/8"	4'x4'	0.60 in <sup>2</sup> /ft	0.60 in <sup>2</sup> /ft
SH,S1,FG	5'x6'	6"/8"	3'x5'	0.60 in <sup>2</sup> /ft	0.60 in <sup>2</sup> /ft
SL	6'x6'	6"/8"	n/a	0.43 in <sup>2</sup> /ft	0.43 in <sup>2</sup> /ft
RH,RC,RG,SH,S1,FG	6'x6'	6"/8"	3'x3' or 32" Dia	0.56 in <sup>2</sup> /ft	0.56 in <sup>2</sup> /ft
SH,S1,FG	6'x6'	6"/8"	4'x4'	0.56 in <sup>2</sup> /ft	0.56 in <sup>2</sup> /ft
SH,S1,FG	6'x6'	6"/8"	3'x5'	0.59 in <sup>2</sup> /ft	0.59 in <sup>2</sup> /ft
SL	8'x8'	8"/10"	n/a	0.45 in <sup>2</sup> /ft	0.45 in <sup>2</sup> /ft
RH,RC,RG,SH,S1,FG	8'x8'	8"/10"	3'x3' or 32" Dia	0.45 in <sup>2</sup> /ft	0.45 in <sup>2</sup> /ft
SH,S1,FG	8'x8'	8"/10"	4'x4'	0.45 in <sup>2</sup> /ft	0.45 in <sup>2</sup> /ft
SH,S1,FG	8'x8'	8"/10"	3'x5'	0.45 in <sup>2</sup> /ft	0.45 in <sup>2</sup> /ft

<sup>②</sup> See sheet PDD for corresponding wall thickness (W) of base unit or riser.

Construct cast-in-place reinforced concrete apron, when shown elsewhere in plans. Use Class "A" concrete. Apron is subsidiary to PSL. Apron is 1'-6" Min width around precast zone drain.



### DETAIL "A"

(Reinforcing not shown for clarity)  
When an apron is to be cast around PSL, use detail above to create an apron ledge on all 4 sides.

### FABRICATION NOTES:

1. Locate penetration (Style 'RH'), ring and cover (Style 'RC'), ring and grate (Style 'RG'), and frame and grate (Style 'FG') in a corner. Only one penetration is allowed per slab lid.
2. Provide Class "H" concrete in accordance with Item 421 and having a minimum compressive strength of 5,000 psi.
3. Provide Grade 60 reinforcing steel or equivalent area of WWR.
4. Provide clear cover of 3/4" to reinforcing from lower outside shoulder of slab for structural reinforcement, and 2" from top of slab for shrinkage and temperature reinforcement. Place short span reinforcing closest to surface.
5. Slabs with a thickness of 8" or greater require shrinkage and temperature reinforcing. Provide steel area = 0.11 in<sup>2</sup>/ft each way.
6. No substitution is allowed for diagonal #4 bars around openings.
7. Design tongue and groove joints for full closure on both shoulders. Minimum spigot depth is 3/4".
8. Provide lifting devices in conformance with Manufacturer's recommendations.

### INSTALLATION NOTES:

1. Precast slab lids are intended for direct traffic and may be placed in roadway.
2. Seal tongue and groove joints with preformed or bulk mastic in conformance with Manufacturer's recommendations. Tongue and groove joints may be grouted no more than 1" between each section, or 1/2 the joint depth, whichever is greater.
3. Do not grout rubber gasket joints without Manufacturer's recommendation.
4. Initial installation of grade adjustment rings for Styles 'RH' and 'SH' is limited to 1'-0" Max as shown.
5. Grade adjustment rings for Styles 'RH' and 'SH' may be increased to 2'-0" Max when future construction affects final grade of structure. Make adjustments greater than 2'-0" with additional risers. Adjustments can be made up to Max depth shown on sheet PDD. Structure must be evaluated if Max depth will be exceeded.
6. Orient long dimension of grate slots perpendicular to traffic, unless noted otherwise on plans.

### GENERAL NOTES:

1. Designed according to ASTM C913.
2. Payment for lid is per Item 465, "Junction Boxes, Manholes, and Inlets" by type, style, size, and opening size (when applicable).

Cover dimensions are clear dimensions, unless noted otherwise.

HL93 LOADING SHEET 2 OF 2



## PRECAST SLAB LID

### PSL

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Size	MAXDEPTH = 15 ft. to top of BASE SLAB											MAXDEPTH = 25 ft. to top of BASE SLAB											Min Height (See Gen Note 3)	Max HOLE DIA (See Fab Note 2)	Max KO DIA (See Fab Note 2)
	Base Slab			Base Unit or Riser Walls			Below Grade Slab (w/PJB) Reducing Slab (w/PB)				Base Slab			Base Unit or Riser Walls			Below Grade Slab (w/PJB) Reducing Slab (w/PB)								
	Short Span Reinf Steel Area	Long Span Reinf Steel Area	Thickness	Short Span Reinf Steel Area	Long Span Reinf Steel Area	Thickness	Reduced Riser Size	Short Span Reinf Steel Area	Long Span Reinf Steel Area	Thickness	Short Span Reinf Steel Area	Long Span Reinf Steel Area	Thickness	Short Span Reinf Steel Area	Long Span Reinf Steel Area	Thickness	Reduced Riser Size	Short Span Reinf Steel Area	Long Span Reinf Steel Area	Thickness					
	Ashort	Along	BS	Bshort	Blong	W	RWSxRWL or ID	Dshort	Dlong	TS	Ashort	Along	BS	Bshort	Blong	W	RWSxRWL or ID	Dshort	Dlong	TS					
X x Y	in <sup>2</sup> /ft	in <sup>2</sup> /ft	in.	in <sup>2</sup> /ft	in <sup>2</sup> /ft	in.	ft. **	in <sup>2</sup> /ft	in <sup>2</sup> /ft	in.	in <sup>2</sup> /ft	in <sup>2</sup> /ft	in.	in <sup>2</sup> /ft	in <sup>2</sup> /ft	in.	ft. **	in <sup>2</sup> /ft	in <sup>2</sup> /ft	in.	ft.	in.	in.		
Precast Junction Box (PJB)	3x3	0.23	0.23	6	0.19	0.19	6	N/A	0.37	0.37	9	0.29	0.29	6	0.24	0.24	6	N/A	0.37	0.37	9	3.5	36	36	
	4x4	0.29	0.29	6	0.24	0.24	6	N/A	0.41	0.41	9	0.47	0.47	6	0.38	0.38	6	N/A	0.41	0.41	9	4.5	48	48	
	3x5	0.29	0.18	6	0.19	0.35	6	N/A	0.48	0.48	9	0.39	0.18	6	0.23	0.59	6	N/A	0.48	0.48	9	3.5	36/60	36/60	
	4x5	0.36	0.18	6	0.22	0.34	6	N/A	0.42	0.42	9	0.53	0.26	6	0.39	0.59	6	N/A	0.42	0.42	9	4.5	48/60	48/60	
	5x5	0.36	0.36	6	0.34	0.34	6	N/A	0.43	0.43	9	0.62	0.62	6	0.59	0.59	6	N/A	0.43	0.43	9	5.5	60	60	
	5x6	0.27	0.27	9	0.34	0.45	6	N/A	0.48	0.48	9	0.47	0.45	9	0.38	0.54	8	N/A	0.48	0.48	9	5.5	60/72	60/72	
	6x6	0.27	0.27	9	0.45	0.45	6	N/A	0.56	0.56	9	0.52	0.52	9	0.54	0.54	8	N/A	0.56	0.56	9	6.5	72	72	
	8x8	0.46	0.46	9	0.51	0.51	8	N/A	0.45	0.45	12	0.87	0.87	9	0.59	0.59	10	N/A	0.45	0.45	12	8.5	96	72	
Precast Base (PB)	3x3	0.23	0.23	6	0.19	0.19	6	N/A	N/A	N/A	N/A	0.29	0.29	6	0.24	0.24	6	N/A	N/A	N/A	N/A	3.5	36	36	
	4x4	0.29	0.29	6	0.24	0.24	6	N/A	N/A	N/A	N/A	0.47	0.47	6	0.38	0.38	6	N/A	N/A	N/A	N/A	4.5	48	48	
	3x5	0.29	0.18	6	0.19	0.35	6	3x3	0.30	0.34	9	0.39	0.18	6	0.23	0.59	6	3x3	0.40	0.40	9	3.5	36/60	36/60	
	4x5	0.36	0.18	6	0.22	0.34	6	3x3	0.30	0.30	9	0.53	0.26	6	0.39	0.59	6	3x3	0.46	0.37	9	4.5	48/60	48/60	
	4x5	0.36	0.18	6	0.22	0.34	6	4x4	0.30	0.30	9	0.53	0.26	6	0.39	0.59	6	4x4	0.39	0.39	9	4.5	48/60	48/60	
	4x5	0.36	0.18	6	0.22	0.34	6	48"	0.39	0.39	9	0.53	0.26	6	0.39	0.59	6	48"	0.47	0.47	9	4.5	48/60	48/60	
	4x5	0.36	0.18	6	0.22	0.34	6	3x5	0.33	0.40	9	0.53	0.26	6	0.39	0.59	6	3x5	0.48	0.48	9	4.5	48/60	48/60	
	5x5	0.36	0.36	6	0.34	0.34	6	3x3	0.34	0.34	9	0.62	0.62	6	0.59	0.59	6	3x3	0.53	0.53	9	5.5	60	60	
	5x5	0.36	0.36	6	0.34	0.34	6	4x4	0.36	0.36	9	0.62	0.62	6	0.59	0.59	6	4x4	0.64	0.64	9	5.5	60	60	
	5x5	0.38	0.38	6	0.34	0.34	6	48"	0.36	0.36	9	0.62	0.62	6	0.59	0.59	6	48"	0.64	0.64	9	5.5	60	60	
	5x5	0.36	0.36	6	0.34	0.34	6	3x5	0.34	0.40	9	0.62	0.62	6	0.59	0.59	6	3x5	0.53	0.53	9	5.5	60	60	
	5x6	0.31	0.31	9	0.34	0.45	6	3x3	0.34	0.34	9	0.47	0.45	9	0.38	0.54	8	3x3	0.61	0.50	9	5.5	60/72	60/72	
	5x6	0.27	0.27	9	0.34	0.45	6	4x4	0.36	0.45	9	0.47	0.45	9	0.38	0.54	8	4x4	0.74	0.57	9	5.5	60/72	60/72	
	5x6	0.29	0.29	9	0.34	0.45	6	48"	0.36	0.45	9	0.47	0.45	9	0.38	0.54	8	48"	0.74	0.57	9	5.5	60/72	60/72	
	5x6	0.29	0.29	9	0.34	0.45	6	3x5	0.45	0.45	9	0.47	0.45	9	0.38	0.54	8	3x5	0.61	0.61	9	5.5	60/72	60/72	
	6x6	0.29	0.29	9	0.45	0.45	6	3x3	0.41	0.41	9	0.52	0.52	9	0.54	0.54	8	3x3	0.74	0.74	9	6.5	72	72	
	6x6	0.27	0.27	9	0.45	0.45	6	4x4	0.45	0.45	9	0.52	0.52	9	0.54	0.54	8	4x4	0.87	0.87	9	6.5	72	72	
	6x6	0.29	0.29	9	0.45	0.45	6	48"	0.45	0.45	9	0.52	0.52	9	0.54	0.54	8	48"	0.87	0.87	9	6.5	72	72	
	6x6	0.29	0.29	9	0.45	0.45	6	3x5	0.45	0.45	9	0.52	0.52	9	0.54	0.54	8	3x5	0.87	0.87	9	6.5	72	72	
	8x8	0.52	0.52	9	0.51	0.51	8	3x3	0.61	0.61	12	0.91	0.91	9	0.70	0.70	10	3x3	0.85	0.85	12	8.5	96	72	
8x8	0.52	0.52	9	0.51	0.51	8	4x4	0.70	0.70	12	0.87	0.87	9	0.70	0.70	10	4x4	1.01	1.01	12	8.5	96	72		
8x8	0.52	0.52	9	0.51	0.51	8	48"	0.70	0.70	12	0.87	0.87	9	0.70	0.70	10	48"	1.01	1.01	12	8.5	96	72		
8x8	0.52	0.52	9	0.51	0.51	8	3x5	0.70	0.85	12	0.87	0.87	9	0.70	0.70	10	3x5	1.01	1.01	12	8.5	96	72		

\*\* Unless otherwise indicated.


**FABRICATION NOTES:**

- Maximum spacing of reinforcement is 8".
- At manufacturer's option, provide cast or cored holes or thin wall panels (KO) to the maximum diameter shown for each. When no penetration is required, it is acceptable to provide a wall with no sectional reduction.

**GENERAL NOTES:**

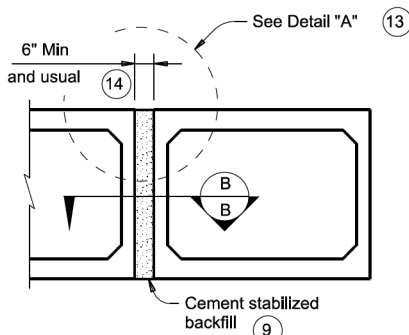
- Precast Junction Box consists of base slab, base unit, risers (as required), and below grade slab. See sheet PJB for details.
- Precast Base consists of base slab, base unit, risers (as required), reducing slab (as required), and reduced risers (as required). See sheet PB for details.
- Min Height shown is for stock base units. Use stock base units whenever practical. Smaller height base units can be used in special installation circumstances, when noted elsewhere in the plans. Absolute minimum height of base units is 2'-6".

HL93 LOADING

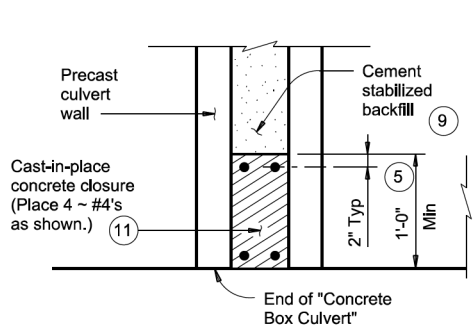
 <b>Texas Department of Transportation</b>		<b>Bridge Division Standard</b>	
<h2>DESIGN DATA FOR PRECAST BASE AND JUNCTION BOX</h2>			
<h3>PDD</h3>			
FILE: presto10-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
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REVISIONS	3510	04	055 SH 99
DIST	COUNTY		SHEET NO.
HOU	FORT BEND		222D

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.

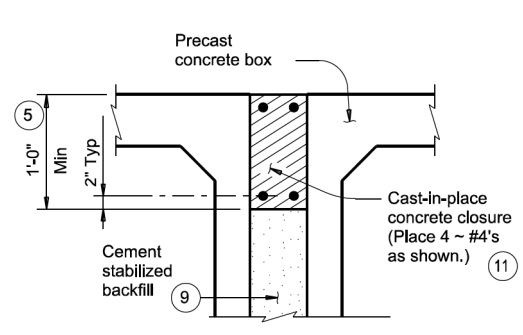
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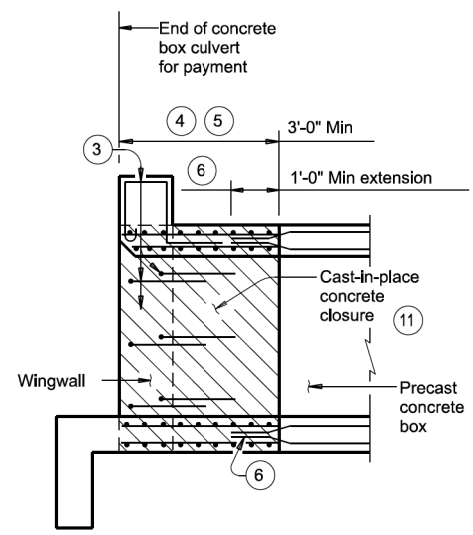
**MULTIPLE UNIT PLACEMENT**



**SECTION B-B**

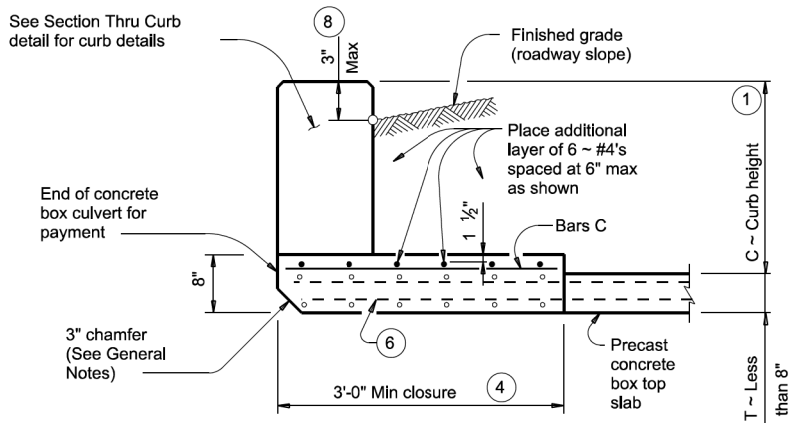


**DETAIL "A"**

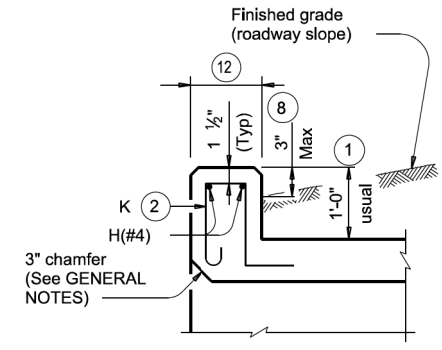


**WINGWALL CONNECTION**

(Also applies to safety end treatment.)

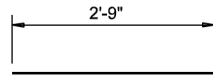


**SECTION THRU TOP SLABS LESS THAN 8"**

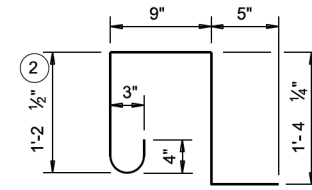


**SECTION THRU CURB**

QUANTITIES PER FOOT OF CURB 10	
Reinforcing Steel	4.12 Lb
Concrete	0.037 CY



**BARS C (#4)**  
(Spa = 1'-0" Max)



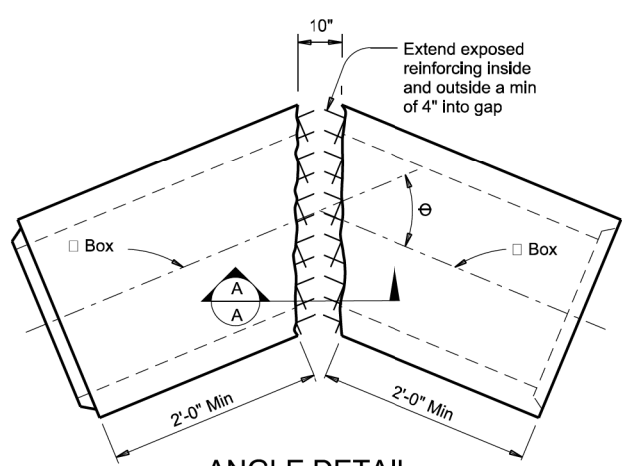
**BARS K (#4)**  
(Spa = 1'-0" Max)  
(Length = 4'-2")

- 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail, bicycle rail, or curbs taller than 1'-0, refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Box Culvert Rail Mounting Details (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.
- For curbs less than 1'-0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.
- Extend curb, wingwall, or safety end treatment reinforcing into concrete closure. Bend or trim, as necessary, any reinforcing that does not fit into closure area.
- Provide a 3'-0" Min cast-in-place concrete closure. Break back boxes in the field or cast boxes short. Provide bands of reinforcing in the closure that are the same size and spacing as in the precast box section. Provide #4 longitudinal reinforcement spaced at 12 inches Max within the closure. Except where shown otherwise, construct the cast-in-place closure flush with the inside and outside faces of the precast box section.
- For multiple unit placements, adjust the length of the closure for the interior walls as necessary. Provide a 3'-0" Min cast-in-place closure in the top slab, bottom slab, and exterior wall. See Section B-B detail when interior walls are cast full length.
- Extend precast box reinforcing a minimum of 1'-0" into concrete closure (Typ).
- Place bands of reinforcing matching the inside and outside face reinforcing in the gaps of the top and bottom slabs. Place a band matching the outside face reinforcing of the wall in the gaps of the walls (placed in the outside face only). Tack weld the bands to the exposed reinforcing at each point of contact.
- For vehicle safety, the following requirements must be met:
  - For structures without bridge rail, construct curbs no more than 3" above finished grade.
  - For structures with bridge rail, construct curbs flush with finished grade. Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
- Cement stabilized backfill between boxes is considered part of the box culvert for payment.
- All curb concrete and reinforcing is considered part of the box culvert for payment.
- Any additional concrete and reinforcing required for the closures will be considered subsidiary to the box culvert for payment.
- 1'-0" typical. 2'-3" when the Box Culvert Rail Mounting Details (RAC) standard sheet is referred to elsewhere in the plans.
- For multiple unit placement with overlay, with 1 to 2 course surface treatment, or with the top slab as the final riding surface, provide wall closure as shown in Detail "A".
- This dimension may be increased with approval of the Engineer to allow the precast boxes to be tunneled or jacked in accordance with Item 476, "Jacking, Boring, or Tunneling Pipe or Box". No payment will be made for any additional material in the gap between adjacent boxes.

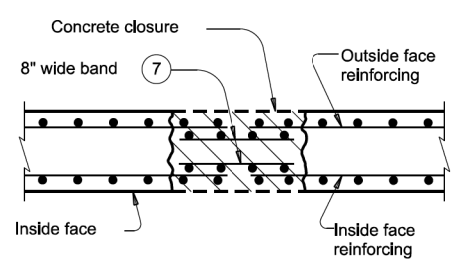
**MATERIAL NOTES:**  
Provide Grade 60 reinforcing steel.  
Provide ASTM A1064 welded wire reinforcement.  
Provide Class C concrete (f<sub>c</sub> = 3,600 psi) for the closures.  
Provide cement stabilized backfill meeting the requirements of Item 400, "Excavation and Backfill for Structures."  
Any additional concrete required for the closures will be considered subsidiary to the box culvert.

**GENERAL NOTES:**  
Designed according to AASHTO LRFD Bridge Design Specifications.  
Refer to the Single Box Culverts Precast (SCP) standard sheets for details and notes not shown.  
Chamfer the bottom edge of the top slab closure 3 inches at culvert closure ends.

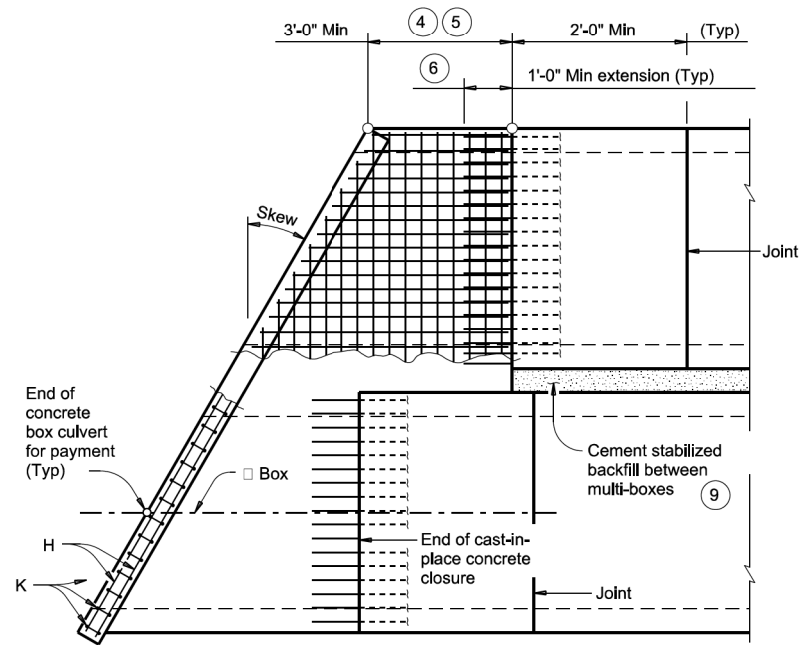
Cover dimensions are clear dimensions, unless noted otherwise.  
Reinforcing bars dimensions are out-to-out of bars.



**ANGLE DETAIL**



**SECTION A-A**

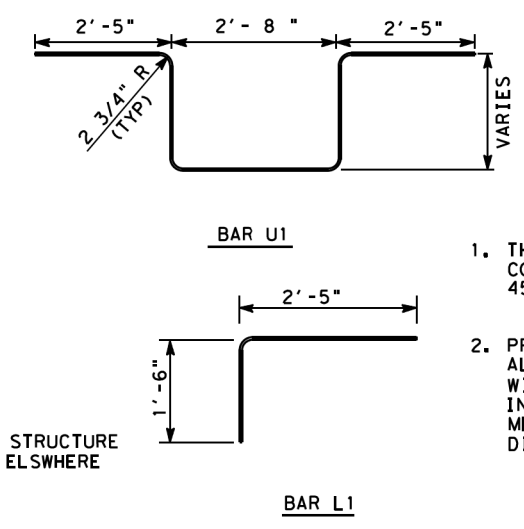
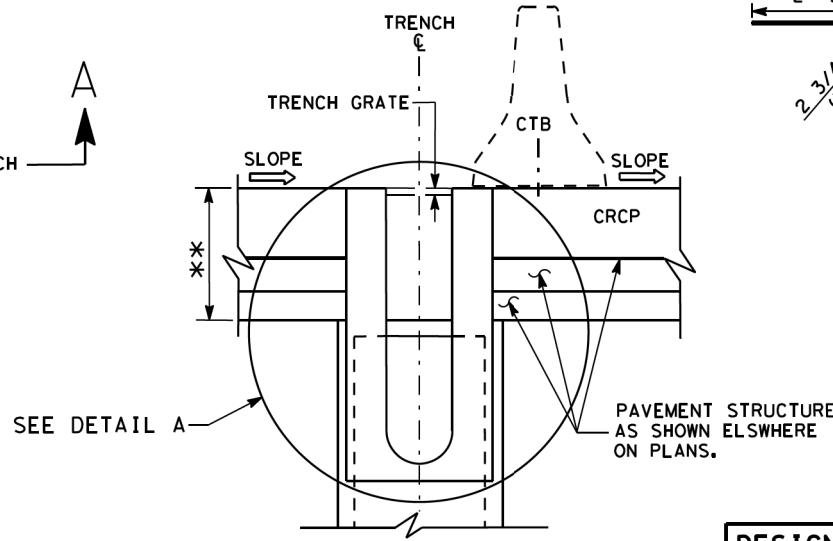
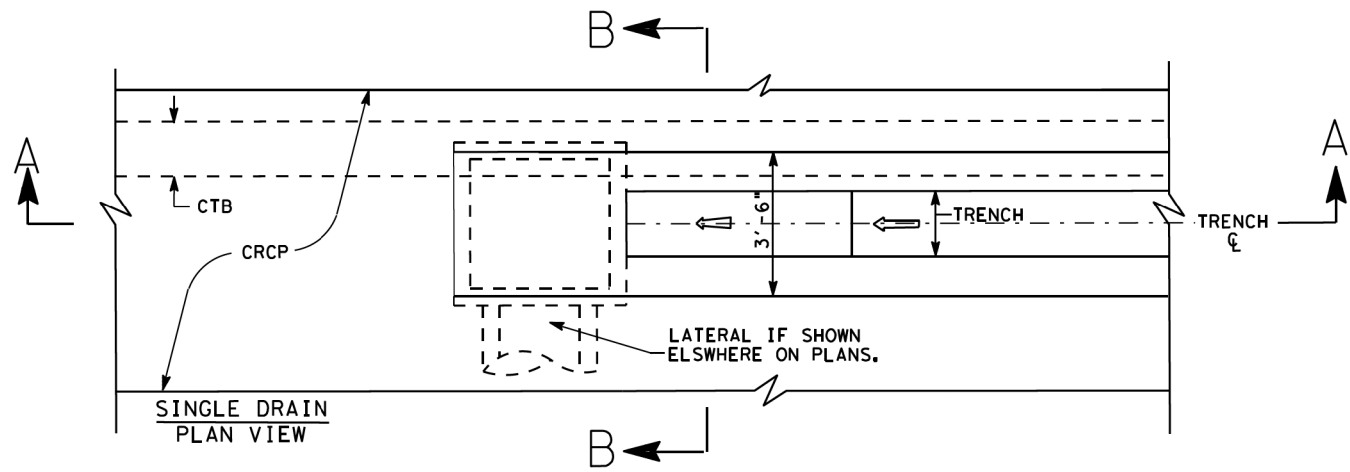


**PLAN OF SKEWED ENDS**

(Showing multi-box placement.)

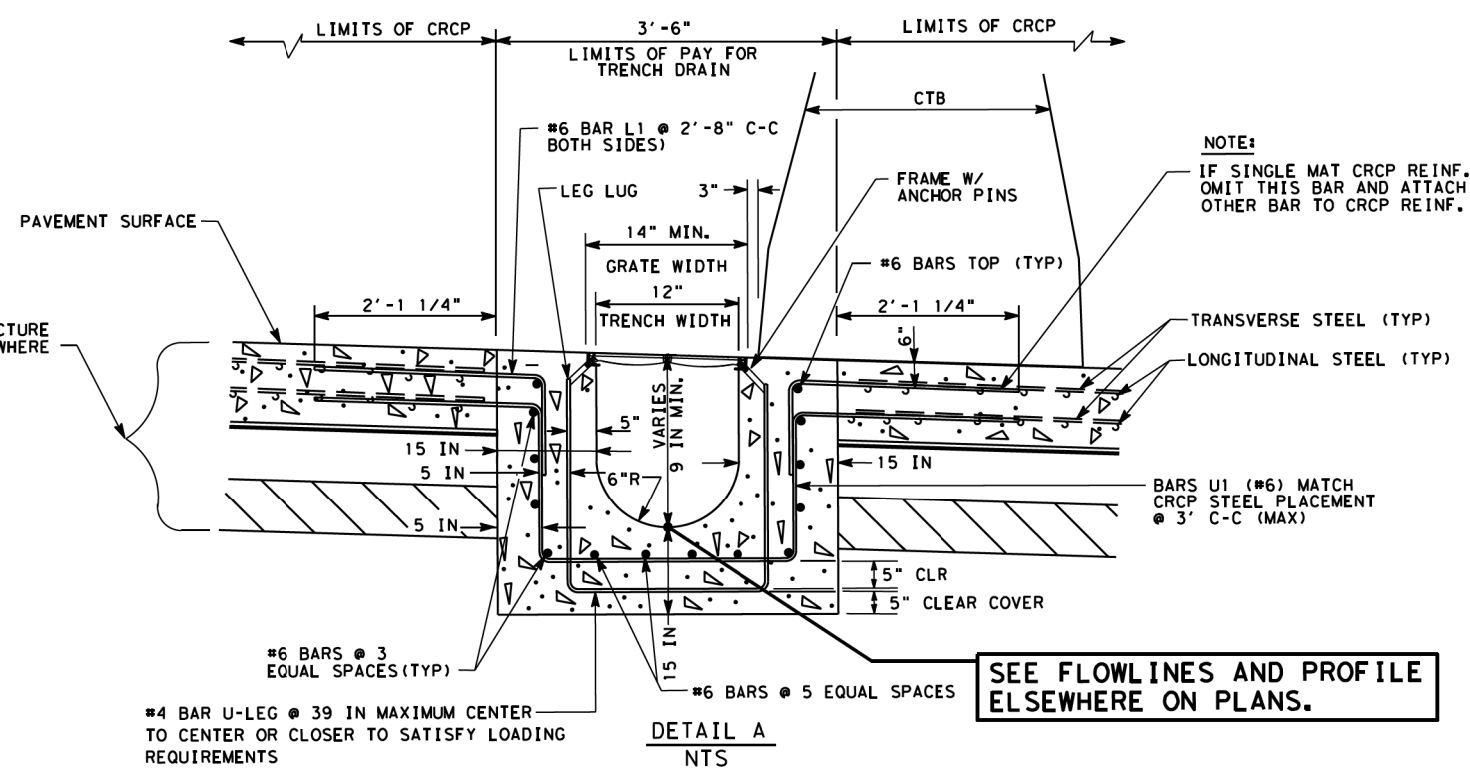
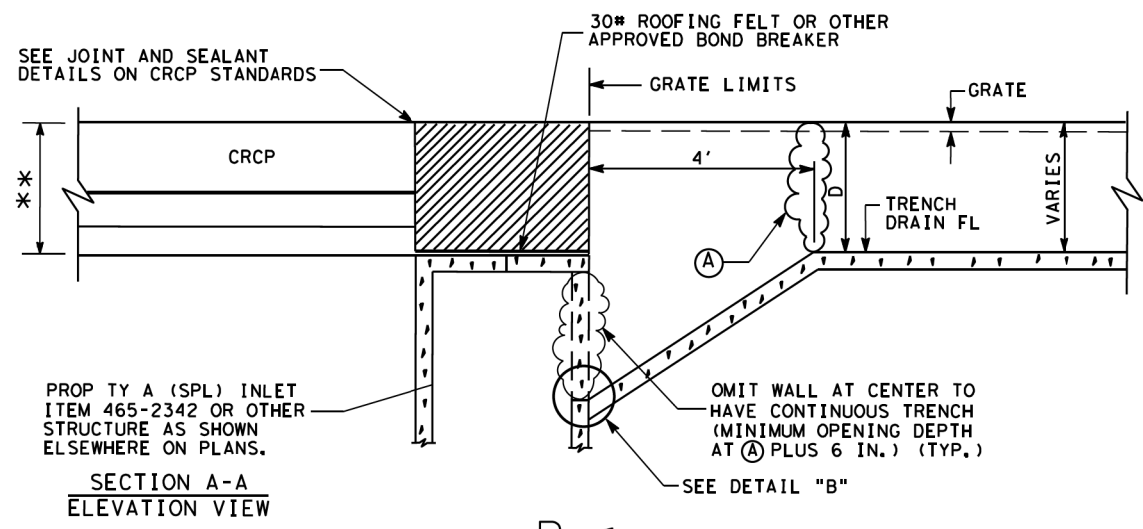
HL93 LOADING

		<b>Bridge Division Standard</b>	
<b>BOX CULVERTS          PRECAST          MISCELLANEOUS DETAILS</b>			
<b>SCP-MD</b>			
FILE: scpmdists-20.dgn	DN: GAF	CK: LMW	DW: BWH/TXDOT
REVISIONS	CONT	SECT	JOB
February 2020	3510	04	055
	DIST	COUNTY	SHEET NO.
	HOU	FORT BEND	223

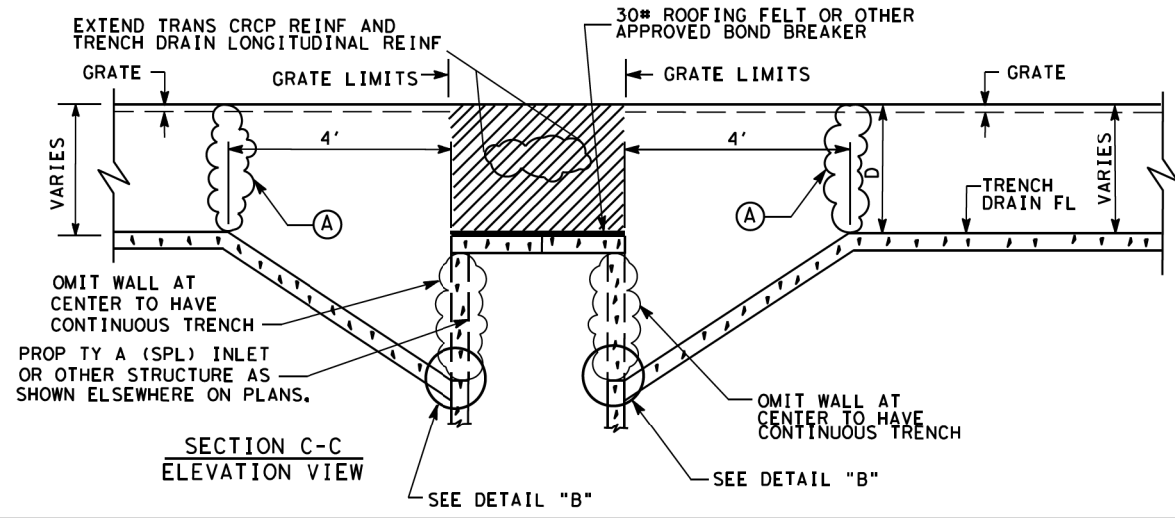
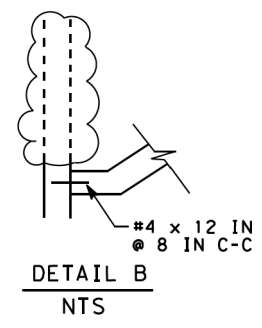
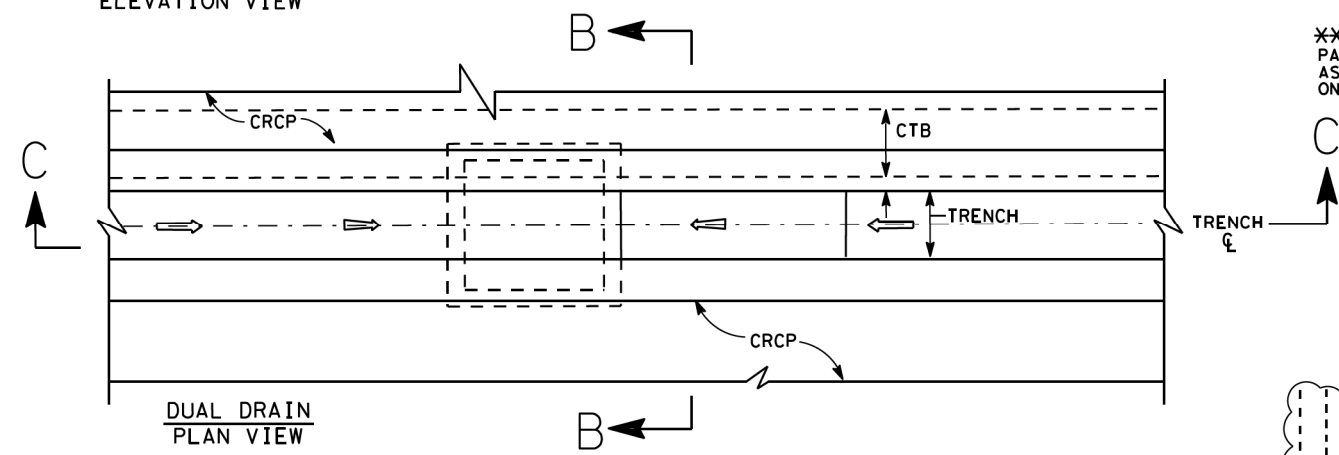


- NOTES**
1. THIS STANDARD IS TO BE USED IN CONJUNCTION WITH SPECIAL SPECIFICATION, 4521, "TRENCH DRAIN."
  2. PROPRIETARY TRENCH DRAIN SYSTEMS ARE ALLOWED. SUBMIT PRE-CONSTRUCTION DRAWINGS WITH ENOUGH DETAIL TO SHOW HOW TO INTEGRATE INTO THE PLAN DETAILS. SUBMITTALS SHALL MEET MINIMUM REQUIREMENTS, AREAS, AND DIMENSIONS.

**DESIGNER: SPECIAL SPECIFICATION REQUIRES 66% OPENING OF GRATE AREA. FOR SAFETY FACTOR, USE 33% OPENING ON HYDRAULIC CALCULATIONS.**



**SEE FLOWLINES AND PROFILE ELSEWHERE ON PLANS.**

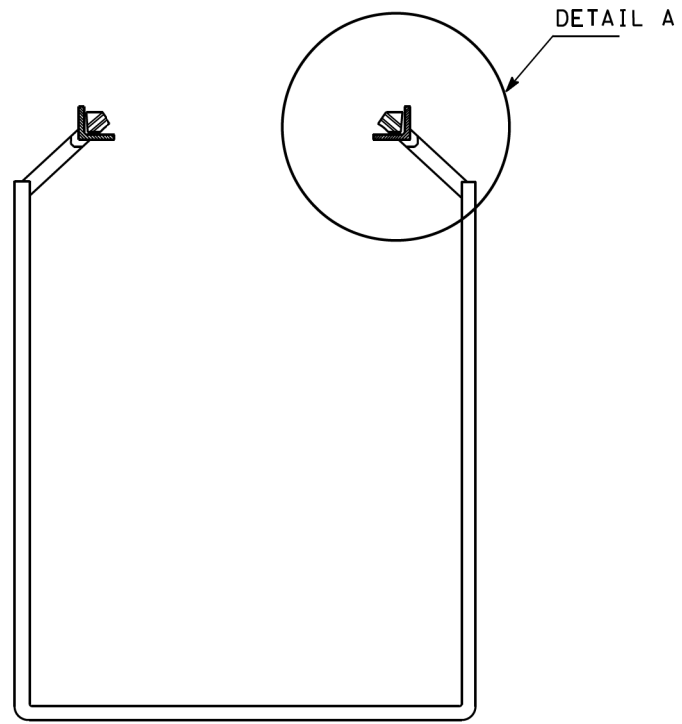


- LEGEND**
- CRCP = CONTINUOUSLY REINFORCED CONCRETE PAVEMENT
  - (A) = MAXIMUM TRENCH DEPTH

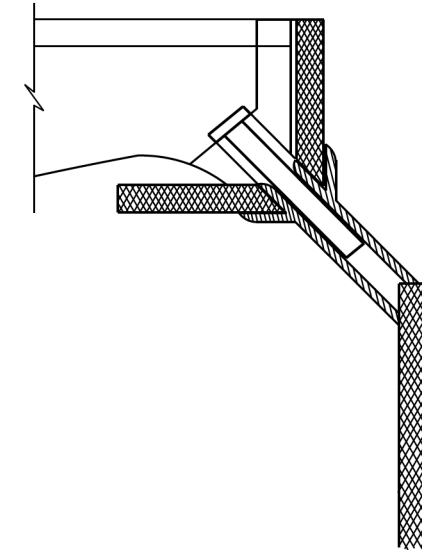


**TRENCH DRAIN DETAILS**  
**TDD**

FILE#	STDD14g, DGN	DW# TxDOT	CK# TxDOT	DW# TxDOT	CK# TxDOT	STD#
© TxDOT	Feb. 2010	DIST	FED REG	PROJECT NO.		SHEET
REVISIONS		HOUS	6			224
REV 11/11	ADDED MIN. TO 14" DIMENSION.	COUNTY	CONTROL	SECT	JOB	HIGHWAY
REV 6/12	ADDED CALLOUT					



BAR U-LEG



DETAIL A  
GRATE RETAINER  
PIN-REMOVABLE  
STAINLESS

SHEET 2 OF 2



TRENCH DRAIN  
DETAILS

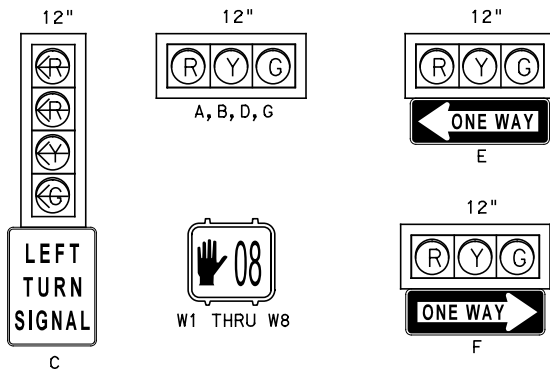
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REVISIONS		HOUS	6				225			
REV 6/12 ADDED CALLOUT		COUNTY	CONTROL	SECT	JOB	HIGHWAY				

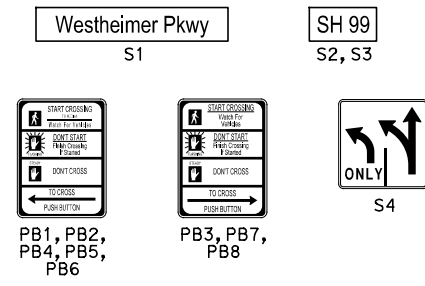
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**EXISTING SIGNAL HEAD SCHEDULE**

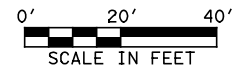
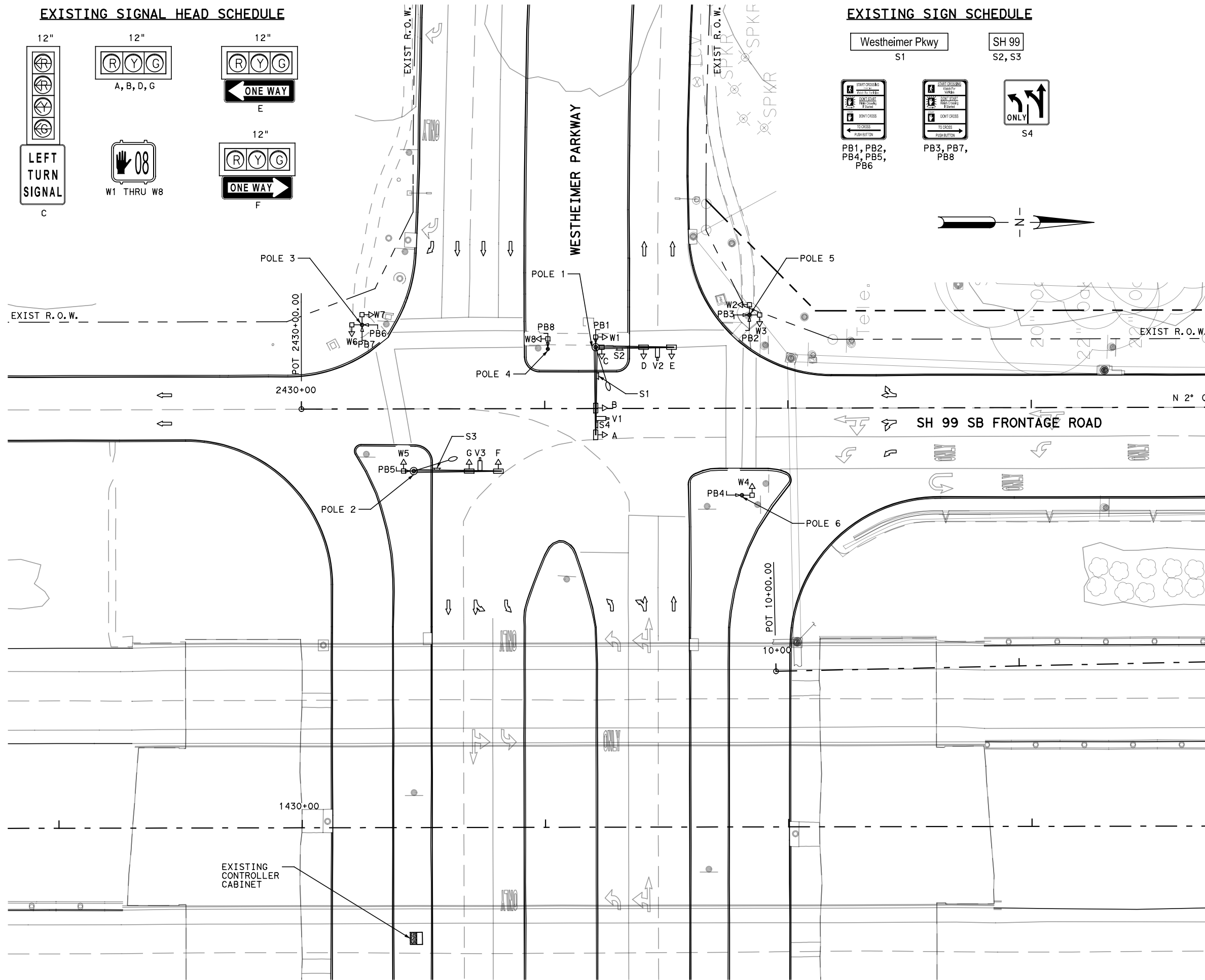


**EXISTING SIGN SCHEDULE**



**LEGEND**

- EXIST SIGNAL POLE W. MAST ARM
- EXIST PEDESTAL POLE
- ◁ EXIST HORIZONTAL SIGNAL HEAD
- ⇩ EXIST VERTICAL SIGNAL HEAD
- ⇩⇩ EXIST PEDESTRAIN SIGNAL HEAD
- ⇩⇩ EXIST PEDESTRIAN PUSH BUTTON
- EXIST CONTROLLER CABINET
- ↑ EXIST OVERHEAD SIGN
- ◻ EXIST VIVDS CAMERA
- EXIST LUMINAIRE
- ⇨ DIRECTION OF TRAFFIC FLOW



SH 99  
SOUTHBOUND FRONTAGE ROAD  
WESTHEIMER PKWY TO CINCO RANCH BLVD  
EXISTING CONDITIONS  
LAYOUT

SHEET 1 OF 1

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	226





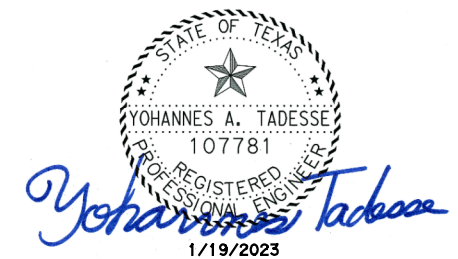
RELOCATED TRAFFIC SIGNAL POLE				
POLE NO.	SIGNAL POLE DESIGNATION	FOUNDATION TYPE/DEPTH	BASELINE STATION	OFFSET
5	PEDESTAL POLE	SCREW-IN	2431+87.4	46.2' L

RUN NO.	CONDUIT (618)								CONDUCTORS (620)		CABLES (684)					
	PVC								GROUND		PEDESTRIAN		SIGNAL			
	2" (SCHD 80)				3" (SCHD 80)				#8 BARE		#12/2C		#12/4C		#12/7C	
	(6046)		(6047)		(6053)		(6054)		(6007)		(6007)		(6009)		(6012)	
	NO.	TRENCH	NO.	BORE	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH
1	1	5	-	-	-	-	-	1	5	1	5	1	5	-	-	
2	1	10	1	65	-	-	-	1	75	1	75	1	75	-	-	
3	1	5	-	-	-	-	-	1	5	2	5	2	5	-	-	
4	1	30	1	45	-	-	-	1	75	3	75	3	75	-	-	
5	-	-	-	-	-	-	-	-	-	-	-	-	-	1	14	
6	1	15	-	-	-	-	-	1	15	-	-	-	-	1	15	
7	-	-	-	-	1	35	1	55	1	90	3	90	3	90	1	90
8	-	-	-	-	1	20	1	50	1	70	3	70	3	70	1	70
9	-	-	-	-	-	-	-	-	-	-	-	-	-	1	12	
10	1	10	-	-	-	-	-	1	10	-	-	-	-	1	10	
11	-	-	-	-	1	190	-	-	1	190	3	190	3	190	2	190
12	-	-	-	-	1	10	-	-	1	10	3	10	3	10	2	10
POLE 1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	20	
POLE 2	-	-	-	-	-	-	-	-	-	-	-	-	-	1	20	
POLE 5	-	-	-	-	-	-	-	-	-	2	5	2	10	-	-	
POLE 6	-	-	-	-	-	-	-	-	-	1	5	1	10	-	-	
TOTAL (LF)		75		110		255		105		545		1410		1425		651

**NOTES:**

- REPAIR OR REPLACE PAVEMENT AND SIDEWALKS DAMAGED BY THE CONTRACTOR'S FORCES DURING CONSTRUCTION AT NO COST TO THE DEPARTMENT.
- PLACE PAVEMENT MARKINGS AS SHOWN ON THE PLANS OR AS DIRECTED.
- PROVIDE POLYVINYL CHLORIDE (PVC) CONDUIT AND FITTINGS.
- REFER TO TXDOT'S WEBSITE FOR PREQUALIFIED PRODUCTS LIST REGARDING SYMBOLIC PEDESTRIAN SIGNAL HEAD, SYMBOLIC PEDESTRIAN SIGNAL LAMP, CONDUIT, CONDUCTORS, AND GROUND BOXES. CHECK WEBSITE PERIODICALLY FOR CURRENT UPDATES.
- LIMITS OF PAY FOR BORED CONDUITS SHALL NOT EXTEND MORE THAN THREE FEET IN FRONT OF AND BEYOND THE ROADWAY OR DRIVEWAY THAT IS BEING BORED UNDER. WHEN MULTIPLE DRIVEWAYS EXIST, THE CONTRACTOR MAY BE ALLOWED TO BORE UNDER THE ENTIRE GROUP OF DRIVEWAYS PROVIDED THE DRIVEWAYS DO NOT EXCEED FORTY FOOT SPACING AS APPROVED BY THE ENGINEER IN THE FIELD. NO INCREASE FOR BORED CONDUITS WILL BE INCURRED FOR THIS WORK. CONDUIT BORED BETWEEN MULTIPLE DRIVEWAYS TO BE PAID FOR AS TRENCHED CONDUIT.
- 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 PED POLES; HIS EMPLOYEES WILL DETERMINE WHICH ITEMS WILL BE SALVAGED. 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.
- CAP SPARE CONDUITS INSTALLED IN POLE FOUNDATIONS AND GROUND BOXES USING APPROVED CAPPING DEVICES.
- PROVIDE CONTINUED OPERATION OF THE EXISTING SIGNALS DURING CONSTRUCTION AND UNTIL THE PROPOSED OPERATION IS COMPLETED.
- 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 OPERATION DESIGN.

NOT TO SCALE

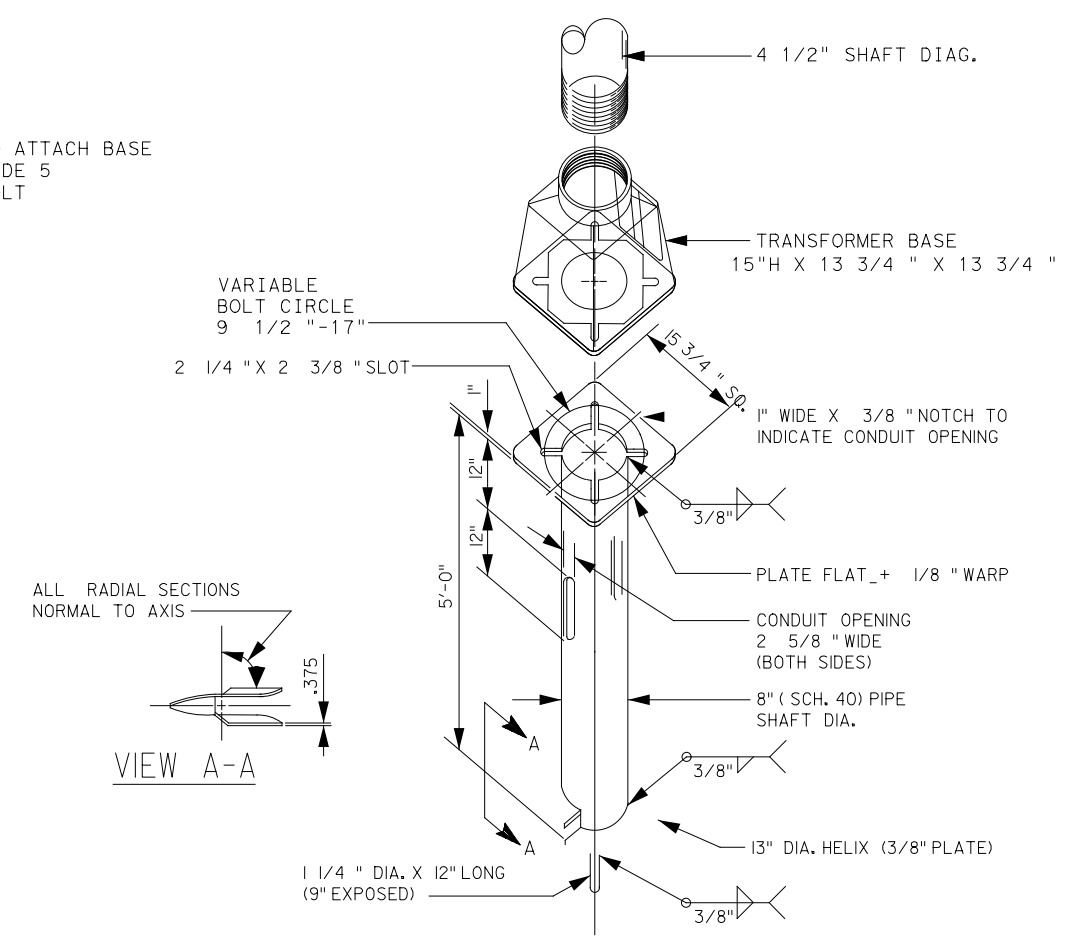
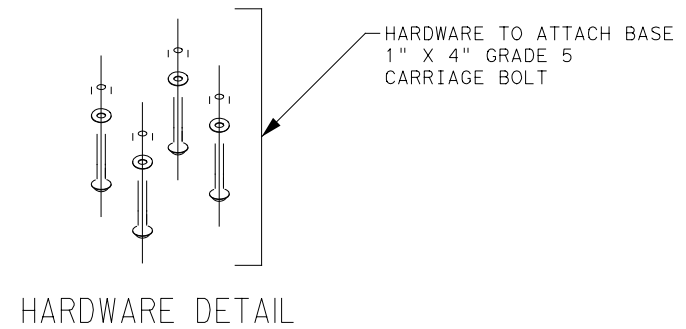
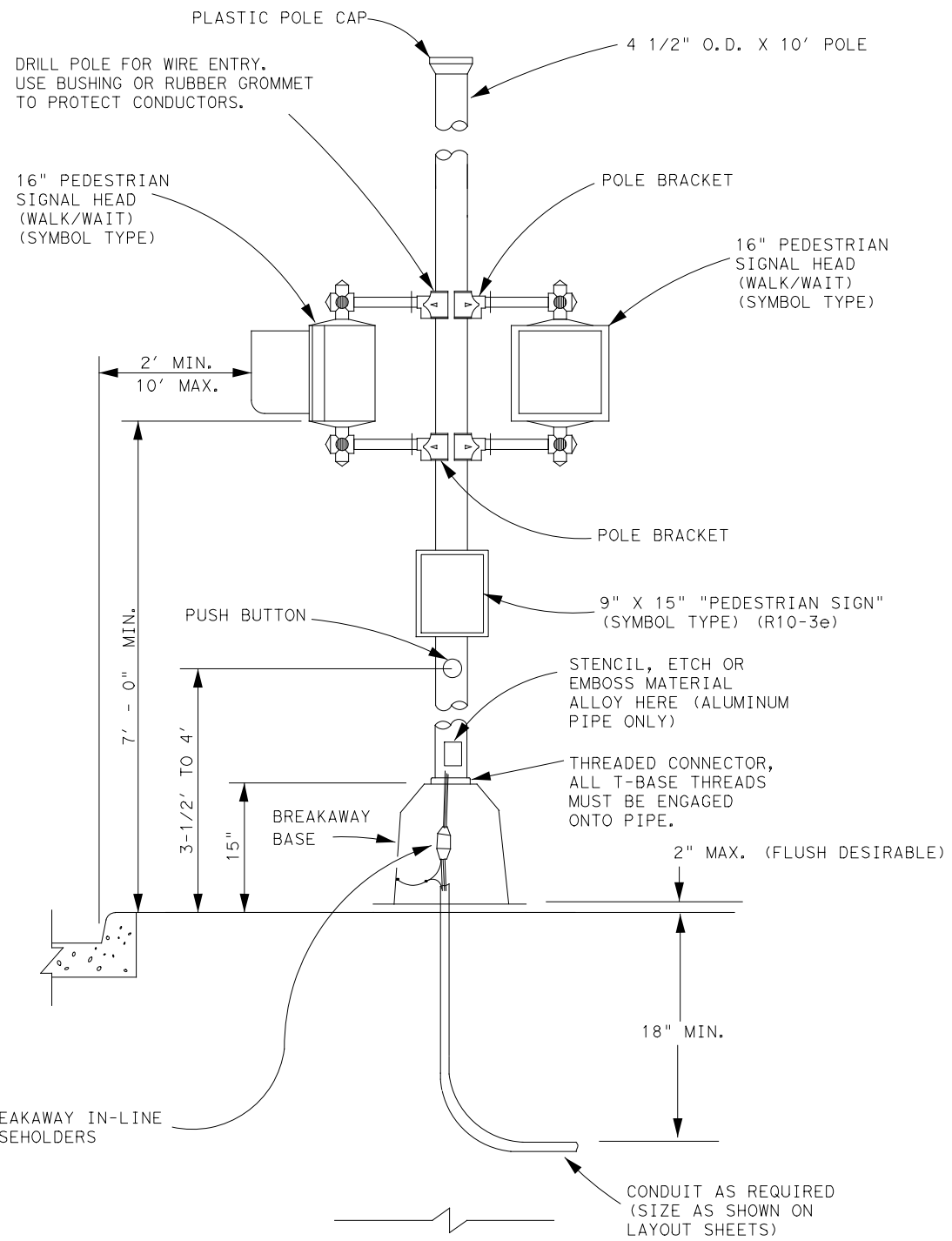


SH 99  
SOUTHBOUND FRONTAGE ROAD  
WESTHEIMER PKWY TO CINCO RANCH BLVD  
MODIFICATIONS OF TRAFFIC  
SIGNAL LAYOUT

SHEET 2 OF 2

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	228

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**NOTE:**

SEE STANDARD (RFBA - 13) FOR NOTES AND NON - FUSED BREAKAWAY ELECTRICAL CONNECTOR DETAILS

Texas Department of Transportation  
Houston District

SIGNAL DETAILS/STANDARDS  
CONSTRUCTION DETAILS  
FOR POLE MOUNTED  
PEDESTRIAN SIGNALS  
CD/PMPS

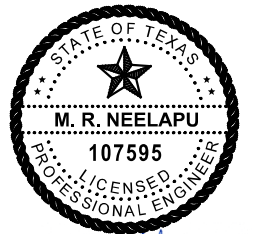
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© TxDOT 2007	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS		HOU	6	229
04-05	11-08	02-15	COUNTY	CONTROL
05-05	01-14		SECT	JOB
03-07	07-14		FORT BEND	3510 04 055
				SH 99

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**NOTES FOR ILLUMINATION:**

1. ANY WIRES USED IN POLE FOUNDATION OR POLE BASE TO MAKE CONNECTION SHALL BE CONSIDERED INCIDENTAL TO ELECTRICAL CONDUCTORS.
2. CONDUCTORS FOR PAYEMENT SHALL BE SURFACE DISTANCE BETWEEN LOCATIONS.
3. THE CONTRACTOR SHALL VERIFY THE LOCATION OF ALL UNDERGROUND UTILITIES OR OTHER INSTALLATIONS AND PROVIDE ADEQUATE PROTECTION FOR THEM. ANY DAMAGE BY CONTRACTOR SHALL BE PAID BY CONTRACTOR.
4. ALL STUB-OUTS IN FOUNDATIONS AND CONCRETE STRUCTURES ARE TO BE RIGID METAL CONDUIT (RMC).
5. ANY AND ALL COST ASSOCIATED WITH THE INSTALLATION AND CONNECTION OF SERVICE POLE TO THE ELECTRICAL UTILITY COMPANY WILL BE CONSIDERED INCIDENTAL TO THE SERVICE POLE. THIS INCLUDES CONDUIT, CONDUIT FITTINGS AND ELECTRICAL CONDUCTORS.
6. ALL EXPOSED CONDUIT SHALL BE RIGID METAL CONDUIT (RMC).
7. CONDUIT PLACED UNDER PAVED AREAS SHALL BE BY BORING. IF PLACED PRIOR TO PAVING, MAY BE TRENCHED.
8. THE CONTRACTOR SHALL COORDINATE AND VERIFY SERVICE POLE LOCATION WITH LOCAL ELECTRICAL UTILITY COMPANY.
9. PULLING CONDUCTORS IN PVC CONDUIT SHALL BE ACCOMPLISHED WITH NON-METALLIC PULL ROPE.
10. CONDUIT INSTALLED ON BRIDGE SHALL HAVE EXPANSION DEVICE AT ALL EXPANSION JOINTS AND ABUTMENTS.
11. IF CASING IS REQUIRED TO PLACE BORED CONDUIT, CASING SHALL BE INCIDENTAL TO CONDUIT.
12. ALL CONDUIT PLACED UNDER RIPRAP SHALL BE PLACED PRIOR TO PLACEMENT OF THE RIPRAP.
13. ALL WORK SHALL BE DONE IN ACCORDANCE TO THE LATEST EDITION OF THE NATIONAL ELECTRICAL CODE.
14. ALL POWER LINES ARE SHOWN AS APPROXIMATE LOCATIONS. CONTRACTOR SHALL VERIFY ALL POWER LINE LOCATIONS PRIOR TO DOING WORK.

NOT TO SCALE



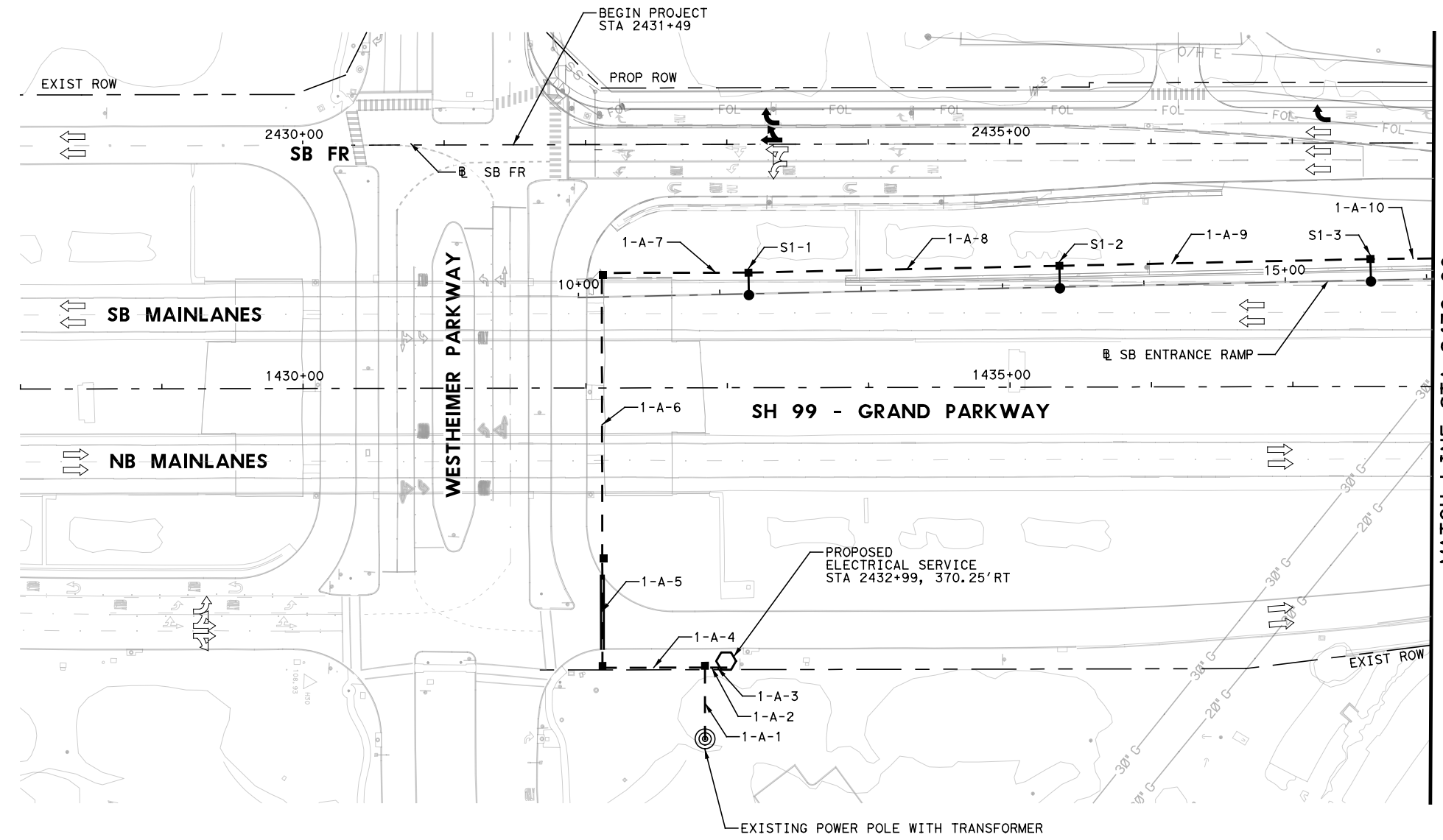
*M. R. Neelapu*  
1/19/2023



**SH 99**  
**SOUTHBOUND FRONTAGE ROAD**  
**WESTHEIMER PKWY TO CINCO RANCH BLVD**  
**RAMP ILLUMINATION**  
**NOTES**

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	230

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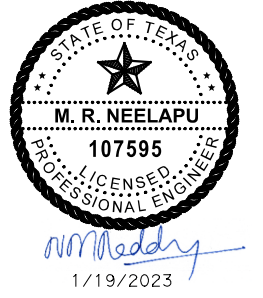
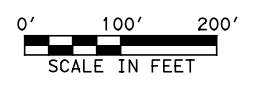


**LEGEND**

- PROPOSED 40' BREAKAWAY BASE POLE W/ 1-8' ARM (TY ST 40T-8) (250W EQ) LED
- PROPOSED ELECTRICAL SERVICE POLE
- PROPOSED GROUND BOX TY D W/APRON
- PROPOSED 2" SCHD 80 PVC CONDUIT
- PROPOSED 2" SCHD 80 PVC CONDUIT (BORE)
- DIRECTION OF PROPOSED TRAFFIC FLOW
- DIRECTION OF EXISTING TRAFFIC FLOW

S 1-1  
 POLE/FIXTURE NUMBER  
 ELECTRICAL SERVICE NUMBER  
 SAFETY LIGHT POLE

X-X-X  
 RUN NUMBER  
 CIRCUIT NUMBER  
 SERVICE NUMBER



**TEDSI INFRASTRUCTURE GROUP**  
 Consulting Engineers  
 738 Hwy 6 South, Suite 430  
 Houston, Texas 77079  
 (832) 619-1000



**SH 99**  
**SOUTHBOUND FRONTAGE ROAD**  
**WESTHEIMER PKWY TO CINCO RANCH BLVD**  
**ILLUMINATION LAYOUT**  
**BEGIN TO STA 2438+00**

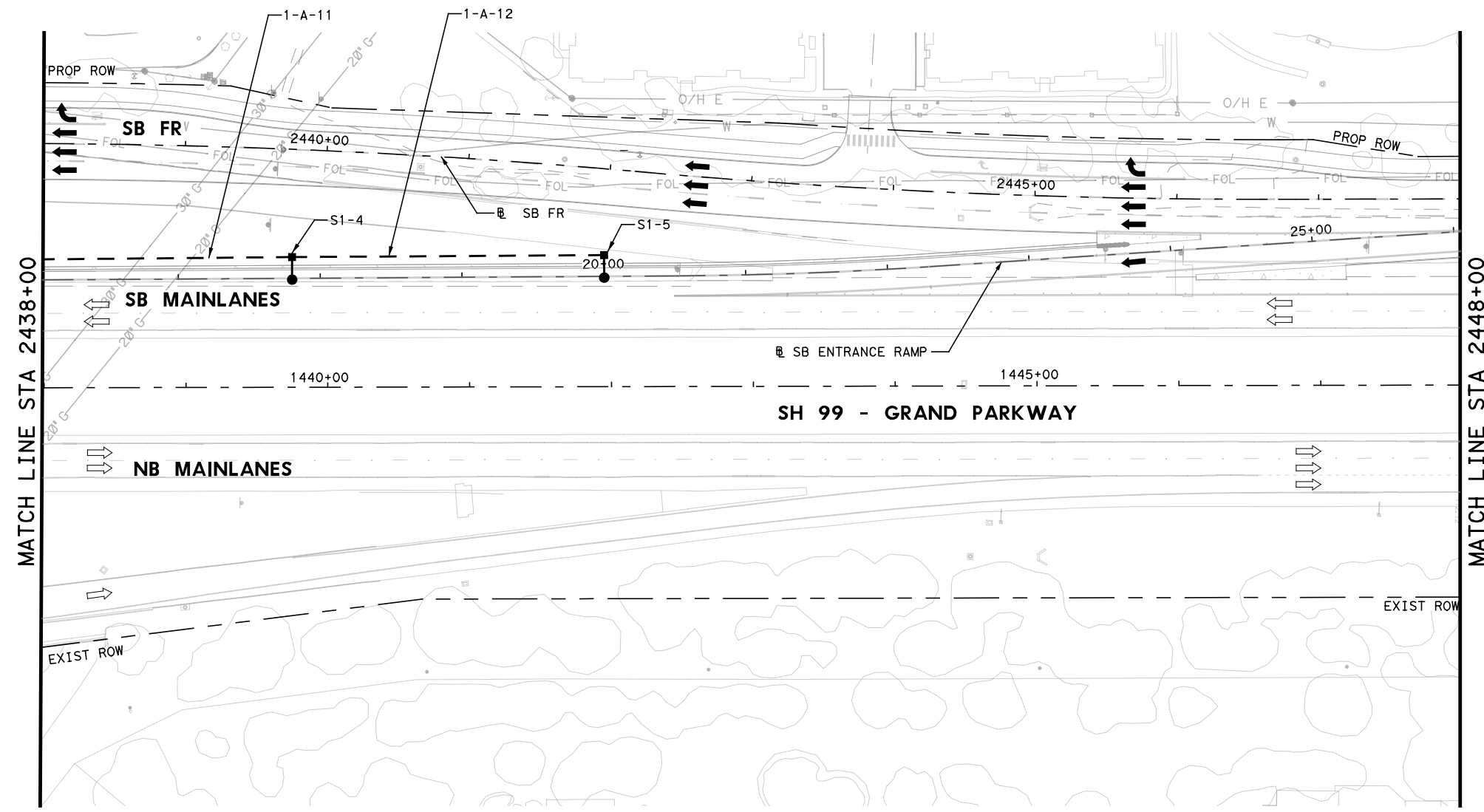
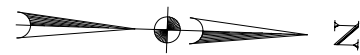
SHEET 1 OF 4

CIRCUIT	RUN NUMBER	GRD WIRE & COND NUMBER & LENGTH (FEET)				CONDUIT LENGTH (FEET)				
		NO. 8 BAR	NO. 8 INSULT	NO. 6 BAR	NO. 6 INSULT	2" RMC	3/4" RMC	1 1/4" RMC	2" PVC SCHD 80	2" (BORE) PVC SCHD 80
A	1-A-1			1-50	2-50				50	
A	1-A-2			1-15	2-15				15	
A	1-A-3	1-15	2-15						15	
A	1-A-4	1-75	2-75						75	
A	1-A-5	1-80	2-80							80
A	1-A-6	1-205	2-205						205	
A	1-A-7	1-105	2-105						105	
A	1-A-8	1-220	2-220						220	
A	1-A-9	1-220	2-220						220	
A	1-A-10	1-45	2-45						45	

ILLUMINATION ASSEMBLY LOCATIONS			
NUMBER	STATION/OFFSET	LOCATION	TYPE
S1-1	2433+15, 90.83' RT	GROUND MOUNT SB SH 99 ENTRANCE RAMP	(TY ST) 40T-8 (250W EQ) LED
S1-2	2435+35, 86.46' RT	GROUND MOUNT SB SH 99 ENTRANCE RAMP	(TY ST) 40T-8 (250W EQ) LED
S1-3	2437+55, 82.09' RT	GROUND MOUNT SB SH 99 ENTRANCE RAMP	(TY ST) 40T-8 (250W EQ) LED

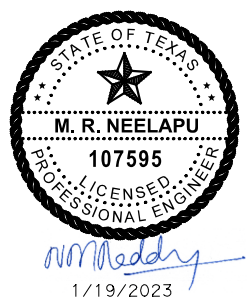
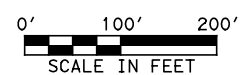
FED. RD. DIV. NO.	PROJECT NO.	HIGHWAY NO.	
6		SH 99	
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	231

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- LEGEND**
- PROPOSED 40' BREAKAWAY BASE POLE W/ 1-8' ARM (TY ST 40T-8) (250W EQ) LED
  - PROPOSED ELECTRICAL SERVICE POLE
  - PROPOSED GROUND BOX TY D W/APRON
  - PROPOSED 2" SCHD 80 PVC CONDUIT
  - PROPOSED 2" SCHD 80 PVC CONDUIT (BORE)
  - DIRECTION OF PROPOSED TRAFFIC FLOW
  - DIRECTION OF EXISTING TRAFFIC FLOW

- S 1-1**
- POLE/FIXTURE NUMBER
  - ELECTRICAL SERVICE NUMBER
  - SAFETY LIGHT POLE
- X-X-X**
- RUN NUMBER
  - CIRCUIT NUMBER
  - SERVICE NUMBER



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 TBPE F-1640



**SH 99**  
**SOUTHBOUND FRONTAGE ROAD**  
**WESTHEIMER PKWY TO CINCO RANCH BLVD**  
 ILLUMINATION LAYOUT  
 STA 2438+00 TO STA 2448+00

SHEET 2 OF 4

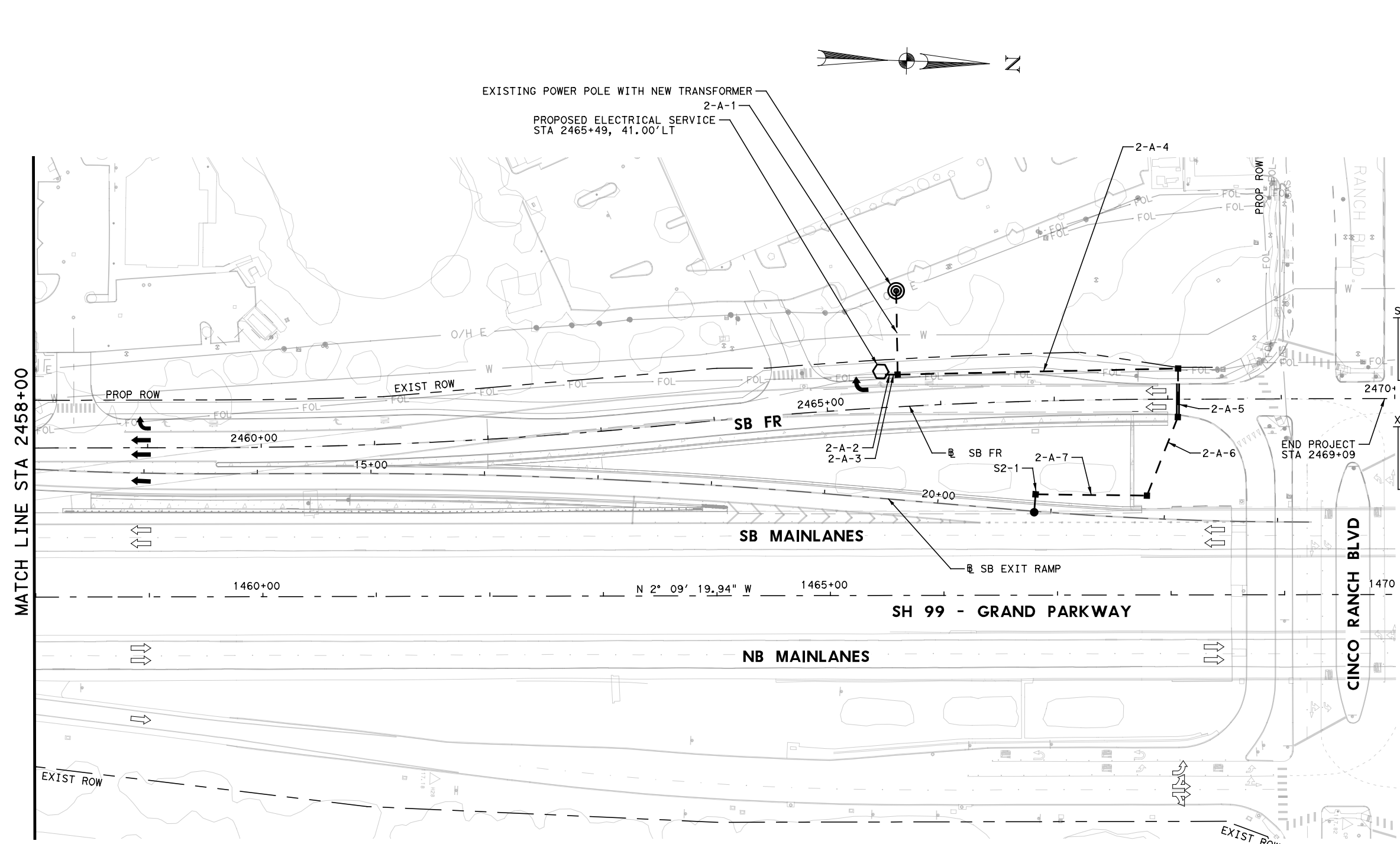
ESTIMATED CONDUIT AND CONDUCTOR RUNS								
CIRCUIT	RUN NUMBER	GRD WIRE & COND NUMBER & LENGTH (FEET)		CONDUIT LENGTH (FEET)				
		NO. 8 BARE	NO. 8 INSULT	2" RMC	3/4" RMC	1 1/4" RMC	2" PVC SCHD 80	2" (BORE) PVC SCHD 80
A	1-A-11	1-175	2-175				175	
A	1-A-12	1-220	2-220				220	

ILLUMINATION ASSEMBLY LOCATIONS			
NUMBER	STATION/OFFSET	LOCATION	TYPE
S1-4	2439+78, 75.99'RT	GROUND MOUNT SB SH 99 ENTRANCE RAMP	(TY ST) 40T-8 (250W EQ) LED
S1-5	2442+01, 60.71'RT	GROUND MOUNT SB SH 99 ENTRANCE RAMP	(TY ST) 40T-8 (250W EQ) LED

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	232

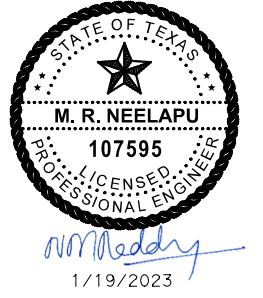
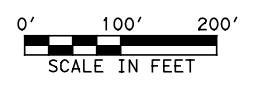


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- LEGEND**
- PROPOSED 40' BREAKAWAY BASE POLE W/ 1-8' ARM (TY ST 40T-8) (250W EQ) LED
  - PROPOSED ELECTRICAL SERVICE POLE
  - PROPOSED GROUND BOX TY D W/APRON
  - PROPOSED 2" SCHD 80 PVC CONDUIT
  - PROPOSED 2" SCHD 80 PVC CONDUIT (BORE)
  - DIRECTION OF PROPOSED TRAFFIC FLOW
  - DIRECTION OF EXISTING TRAFFIC FLOW

- S 1-1 POLE/FIXTURE NUMBER
- ELECTRICAL SERVICE NUMBER
- SAFETY LIGHT POLE
- X-X-X RUN NUMBER
- CIRCUIT NUMBER
- SERVICE NUMBER



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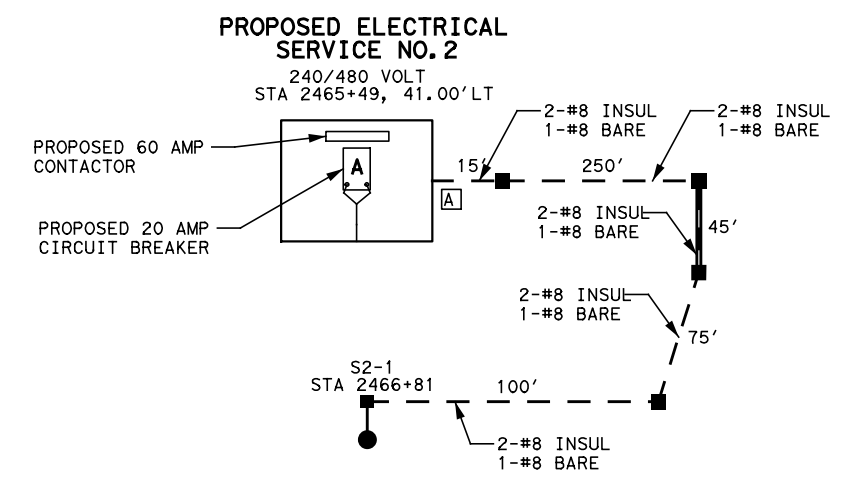
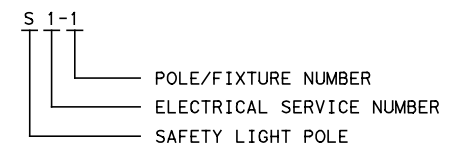
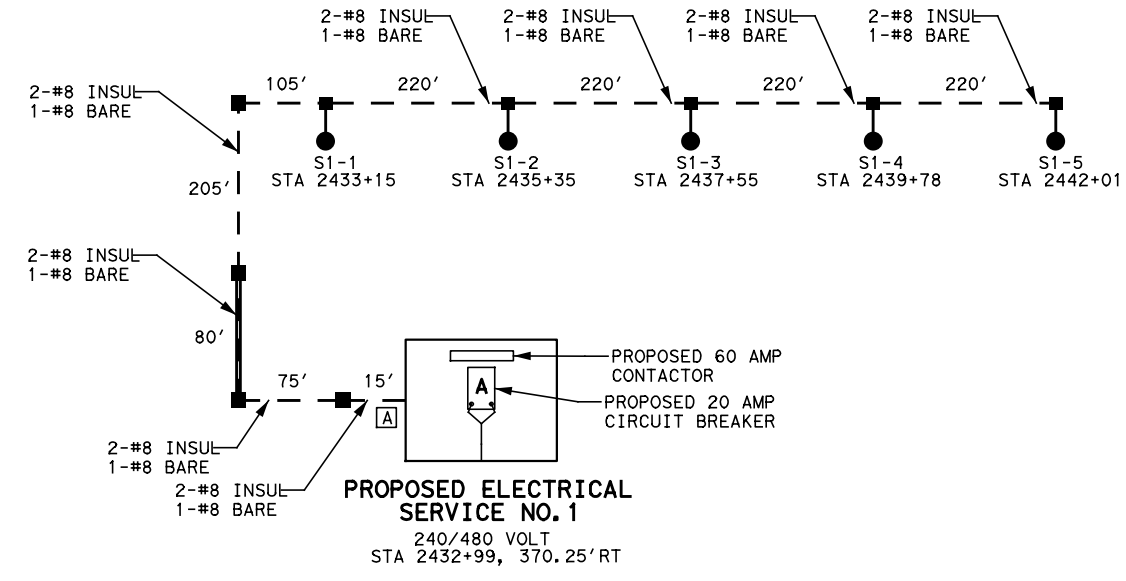
**SH 99**  
**SOUTHBOUND FRONTAGE ROAD**  
**WESTHEIMER PKWY TO CINCO RANCH BLVD**  
**ILLUMINATION LAYOUT**  
**STA 2458+00 TO END**  
**SHEET 4 OF 4**

CIRCUIT	RUN NUMBER	GRD WIRE & COND NUMBER & LENGTH (FEET)				CONDUIT LENGTH (FEET)				
		NO. 8 BARE	NO. 8 INSULT	NO. 6 BARE	NO. 6 INSULT	2" RMC	3/4" RMC	1 1/4" RMC	2" PVC SCHD 80	2" (BORE) PVC SCHD 80
A	2-A-1			1-75	2-75				75	
A	2-A-2			1-15	2-15				15	
A	2-A-3	1-15	2-15						15	
A	2-A-4	1-250	2-250						250	
A	2-A-5	1-45	2-45						45	
A	2-A-6	1-75	2-75						75	
A	2-A-7	1-100	2-100						100	

ILLUMINATION ASSEMBLY LOCATIONS			
NUMBER	STATION/OFFSET	LOCATION	TYPE
S2-1	2466+81, 82.09'RT	GROUND MOUNT SB SH 99 EXIT RAMP	(TY ST) 40T-8 (250W EQ) LED

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	234

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Elec. Service No.	Elec. Service ID	Electrical Service Description	Service Conduit Size	Service Conductors No./Size	Safety Switch Amps	Main Ckt. Bkr. Pole/Amp	Two-Pole Contactor Amps	Panel bd/ Loadcenter Amp Rating	Circuit No.	Branch Circuit ID	Branch Ckt. Bkr. Pole/Amp	Branch Circuit Amps	KVA Load
1	SH 99 SB Entrance Ramp from Cinco Ranch Blvd	ELC SRV TY A 240/480 060 (NS)SS(E)SP(U)	2"	3#6	N/A	2P/60	60	N/A	A	Lighting	2P/20	1.75	0.8
2	SH 99 SB Exit Ramp to Westheimer Pkwy	ELC SRV TY A 240/480 060 (NS)SS(E)SP(U)	2"	3#6	N/A	2P/60	60	N/A	A	Lighting	2P/20	0.35	0.2

NOT TO SCALE

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**SH 99**  
**SOUTHBOUND FRONTAGE ROAD**  
**WESTHEIMER PKWY TO CINCO RANCH BLVD**  
**ILLUMINATION CIRCUIT DIAGRAM**

SHEET 1 OF 1

FED. RD. DIV. NO.	PROJECT NO.	HIGHWAY NO.
6		SH 99
STATE	DIST.	COUNTY
TEXAS	HOU	FORT BEND
CONT.	SECT.	JOB
3510	04	055
		SHEET NO.
		235



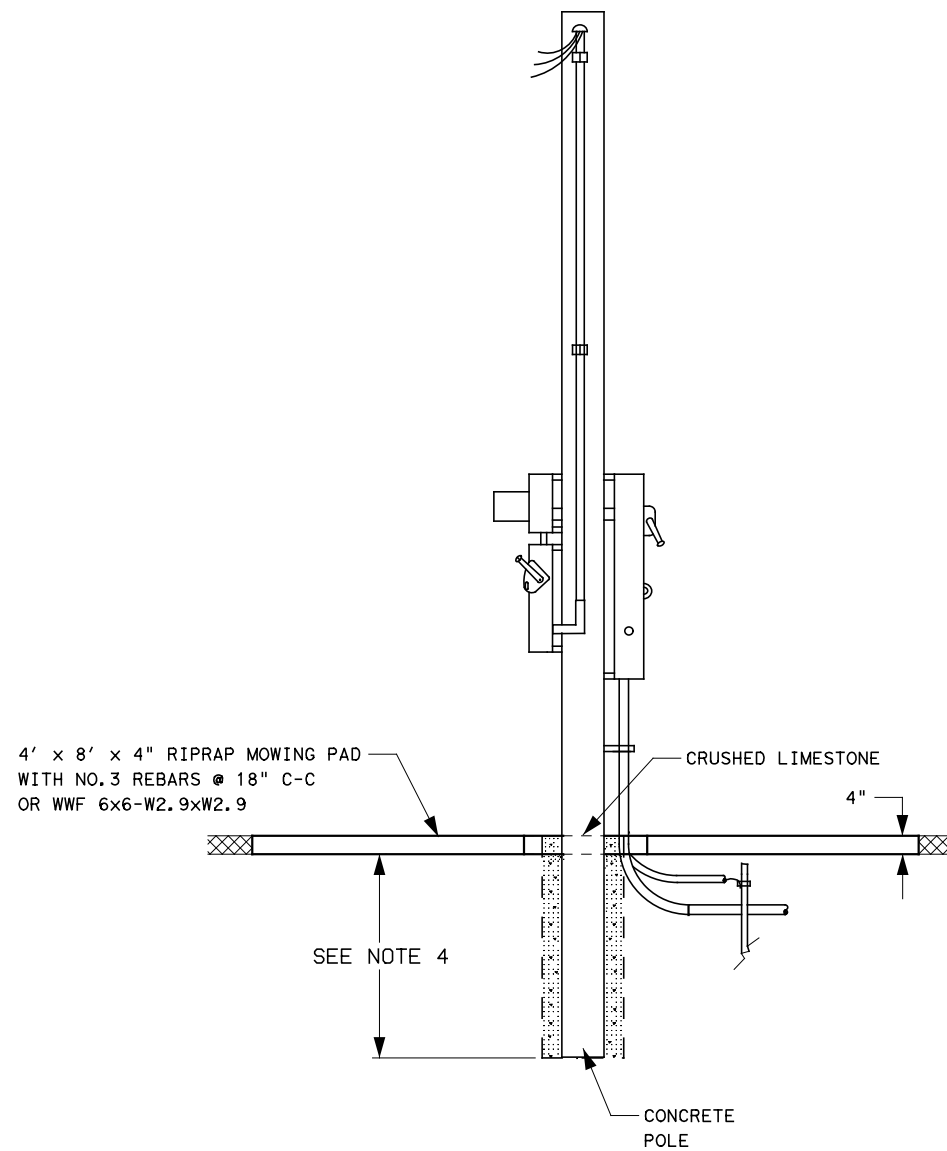
NOTES:

1. BLOCK-OUT SHALL BE LARGE ENOUGH TO ACCOMMODATE THE SERVICE POLE, CONDUITS AND GROUND ROD OR AS DIRECTED BY THE ENGINEER.

2. CONCRETE RIPRAP WILL NOT BE PAID DIRECTLY BUT WILL BE SUBSIDIARY TO ITEM 628.

3. CONCRETE FOR RIPRAP SHALL BE CLASS "B" IN ACCORDANCE WITH THE ITEM 421, "HYDRAULIC CEMENT CONCRETE".

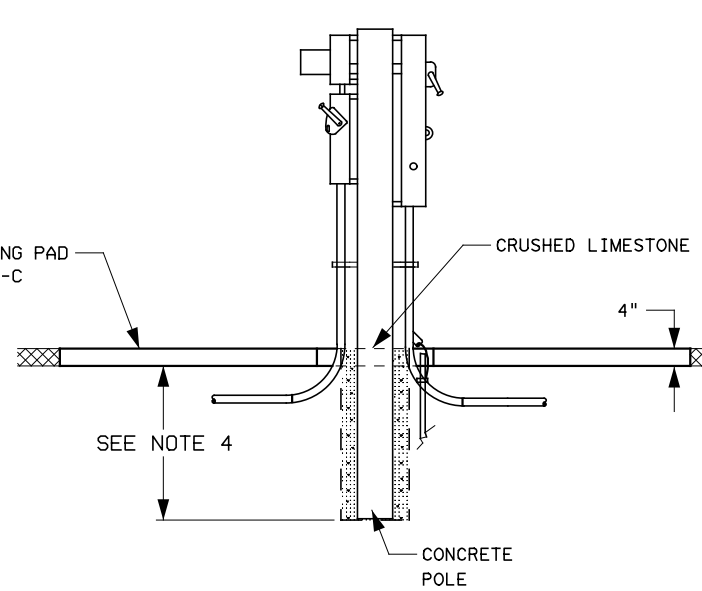
4. FOR ELECTRICAL SERVICE AND CONCRETE SUPPORT DETAILS SEE TXDOT ELECTRICAL DETAIL STANDARDS.



CONCRETE SERVICE SUPPORT WITH RIPRAP MOWING PAD

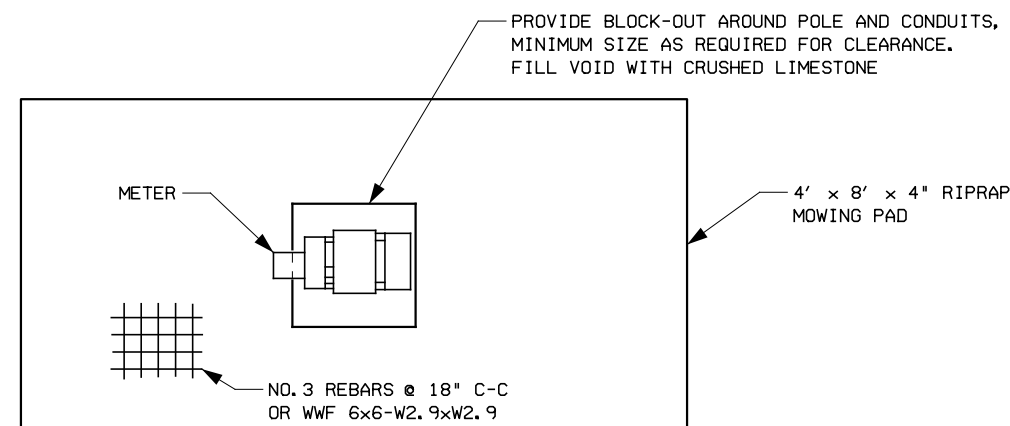
(OVERHEAD) ELEVATION

4' x 8' x 4" RIPRAP MOWING PAD WITH NO. 3 REBARS @ 18" C-C OR WWF 6x6-W2.9xW2.9



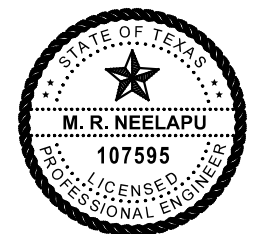
CONCRETE SERVICE SUPPORT WITH RIPRAP MOWING PAD

(UNDERGROUND) ELEVATION




CONCRETE SERVICE SUPPORT WITH RIPRAP MOWING PAD

PLAN



*M. R. Neelapu*

1/19/2023


**TEXAS DEPARTMENT OF TRANSPORTATION**  
*Houston District*  
**MOWING PAD DETAILS FOR ELECTRICAL SERVICES SH 99**

SHEET 1 OF 1				SCALE: N. T. S.	
DATE:	REVISIONS				
DN -	STATE DISTRICT	FEDERAL REGION	PROJECT NO.		SHEET
CK -	HOU	6			236
DN -	COUNTY		CONTROL	SECTION	JOB
CK -	FORT BEND		3510	04	055 SH 99

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**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.

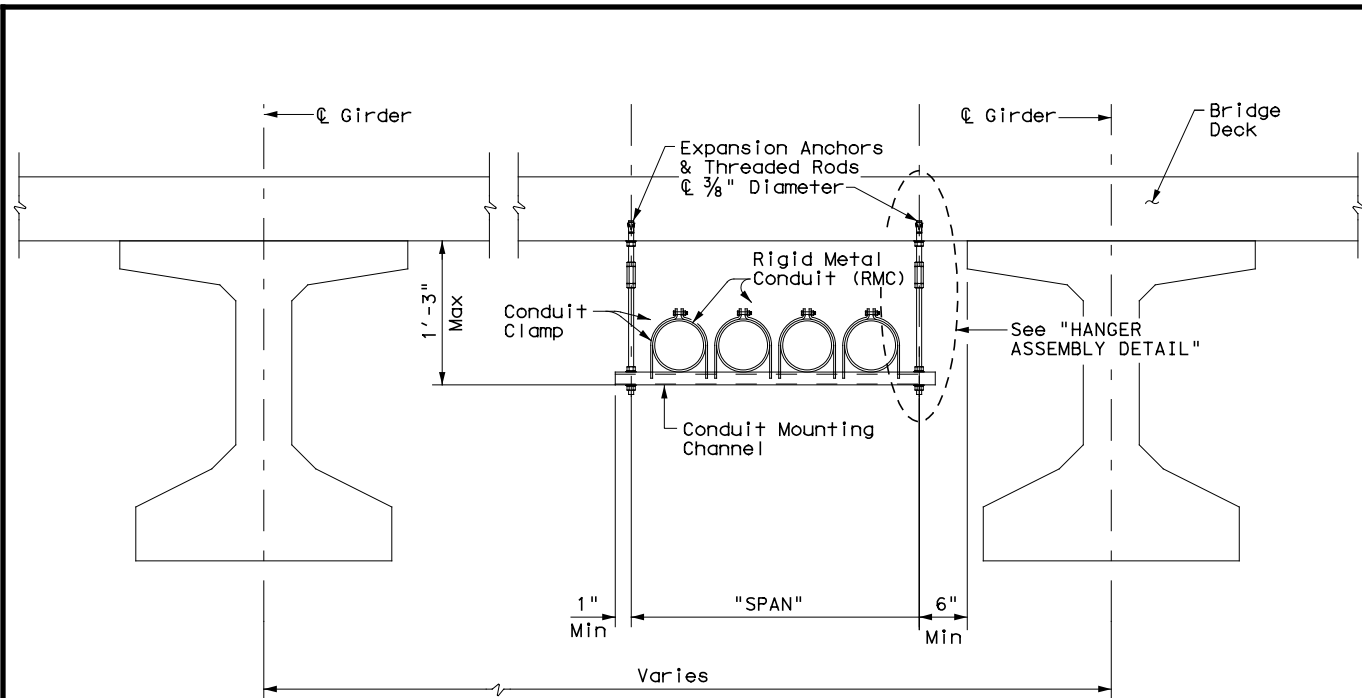
**B. CONSTRUCTION METHODS**

- 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.

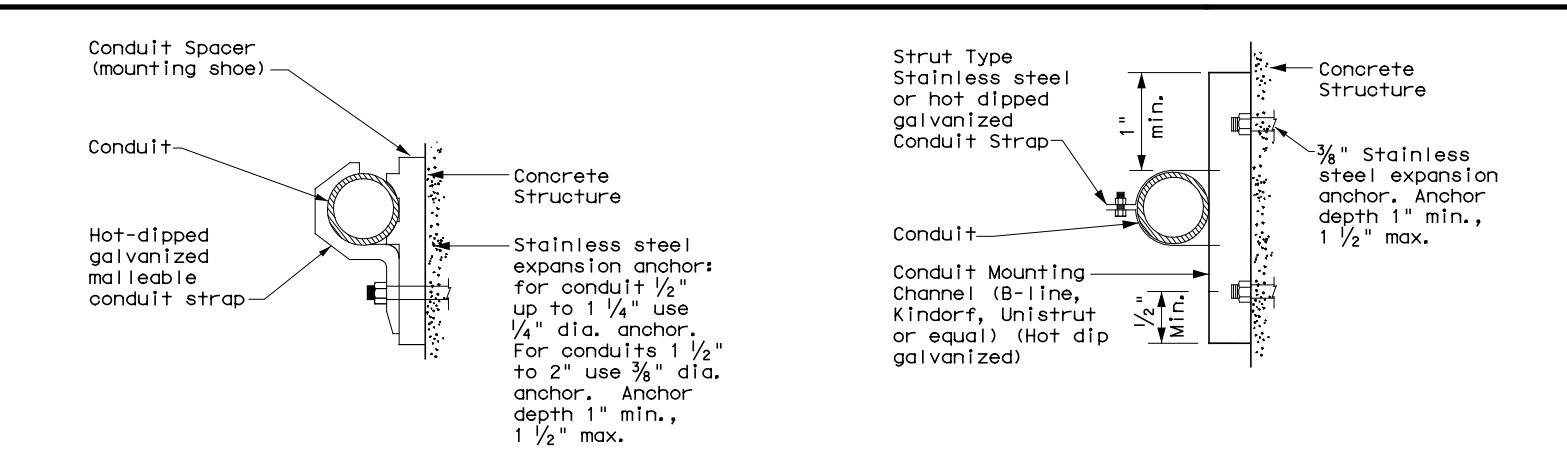
		<b>Traffic Operations Division Standard</b>	
<h1>ELECTRICAL DETAILS CONDUITS &amp; NOTES</h1>			
<h2>ED(1)-14</h2>			
FILE:	ed1-14.dgn	DN:	CK:
© TxDOT	October 2014	CONT	SECT
REVISIONS		JOB	HIGHWAY
		DIST	COUNTY
		HOU	FORT BEND
		SHEET NO.	<b>237</b>

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DATE: 1/23/2023  
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CONDUIT HANGING DETAIL

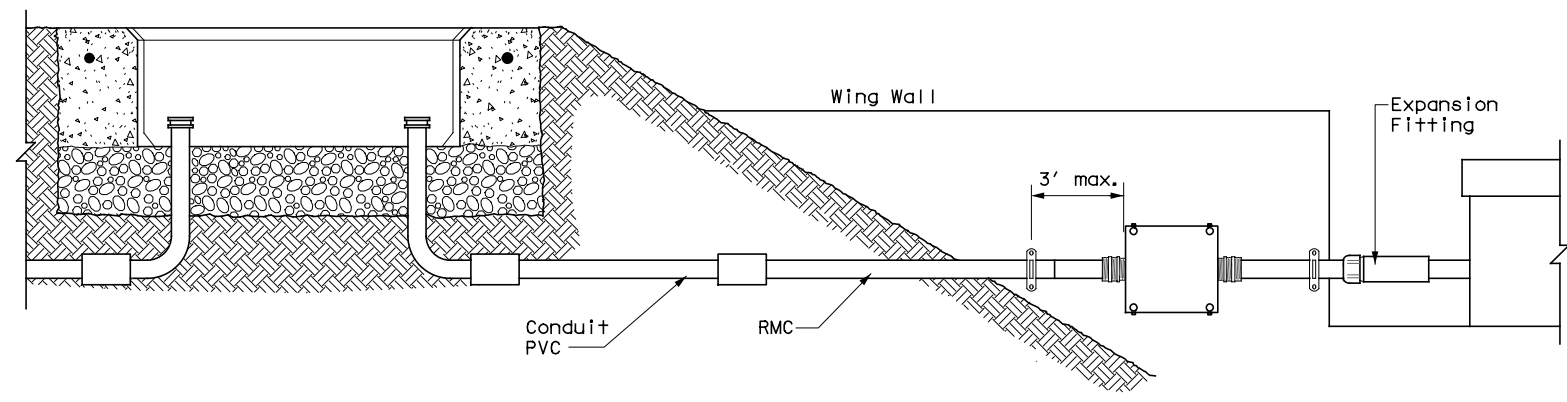


CONDUIT MOUNTING OPTIONS

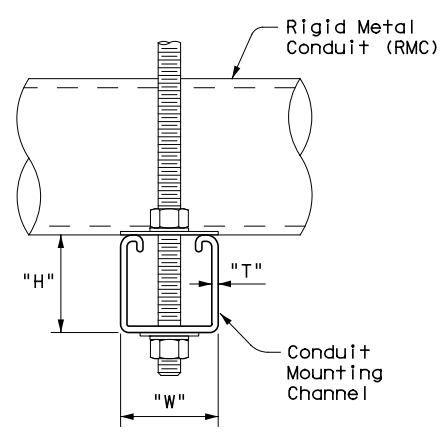
Attachment to concrete surfaces  
 See ED(1)B.2

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.

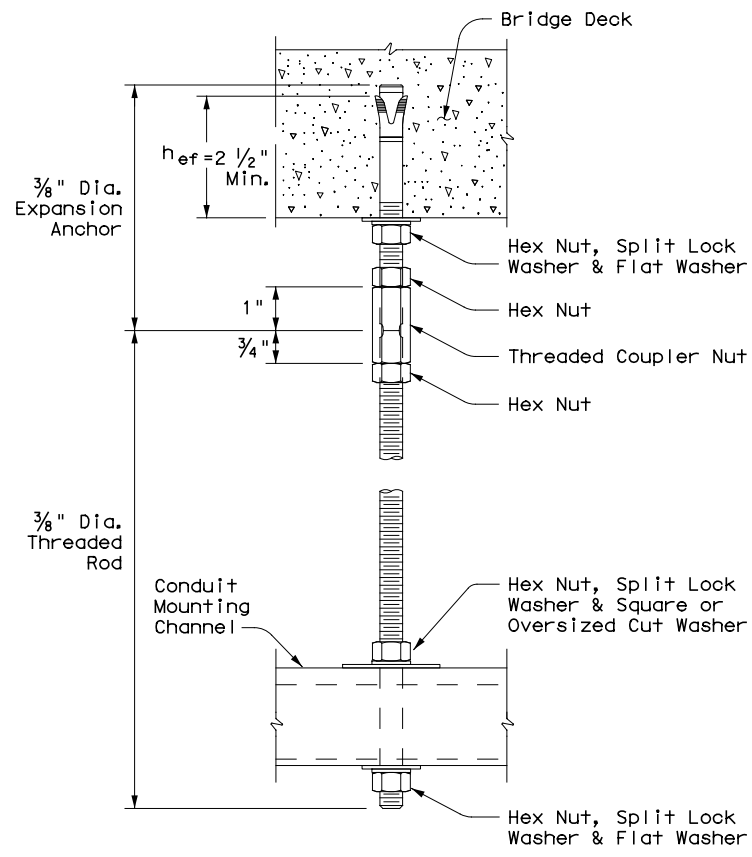
Channels with round or short slotted hole patterns are allowed, if the load carrying capacity is not reduced by more than 15%.



TYPICAL CONDUIT ENTRY TO BRIDGE STRUCTURE DETAIL



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<sub>ef</sub>), as shown. Increase (h<sub>ef</sub>) as needed to ensure sufficient thread length for proper torquing 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<sub>ef</sub>). No lateral loads shall be introduced after conduit installation.

		<b>Traffic Operations Division Standard</b>	
<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
REVISIONS	3510	04	055
	DIST	COUNTY	SHEET NO.
	HOU	FORT BEND	238

# 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.

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.

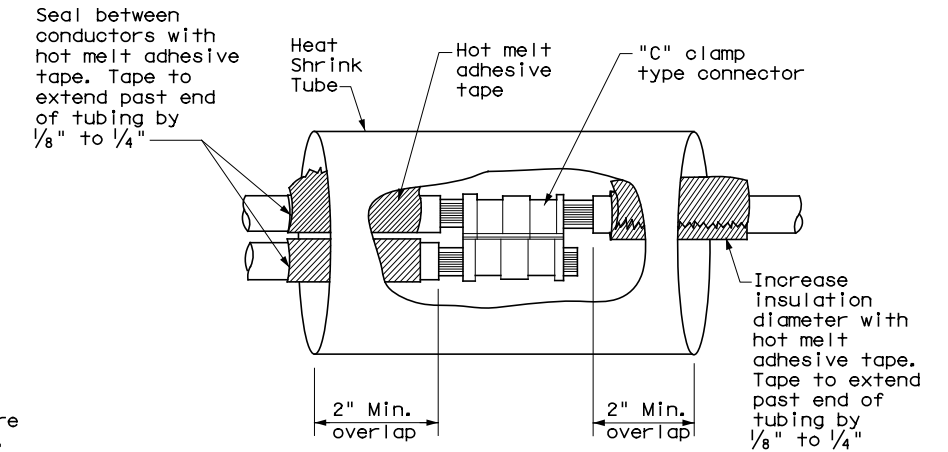
## GROUND RODS & GROUNDING ELECTRODES

### A. MATERIAL INFORMATION

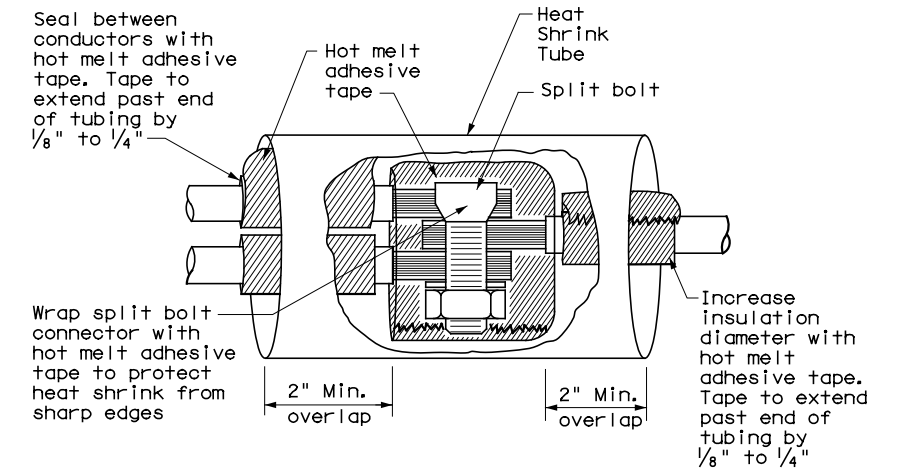
1. Provide and install a grounding electrode at electrical services. Provide ground rods according to DMS 11040 and the plans. Larger diameter or longer length rods may be called for in some specific locations, see the individual plans sheets. Concrete encased grounding electrodes may be called for in specific locations including electrical service, see individual plan sheets.

### B. CONSTRUCTION METHODS

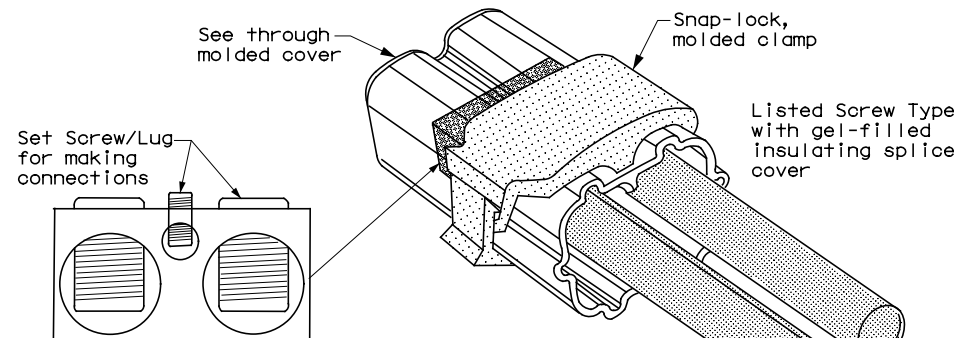
1. Furnish auxiliary ground rods for lightning protection and install in soil, concrete, or both, as called for in the plans. For ground rods installed in concrete, ensure the connection of the conductor to the ground rod is readily accessible for inspection or repairs. For ground rods installed in soil, 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**

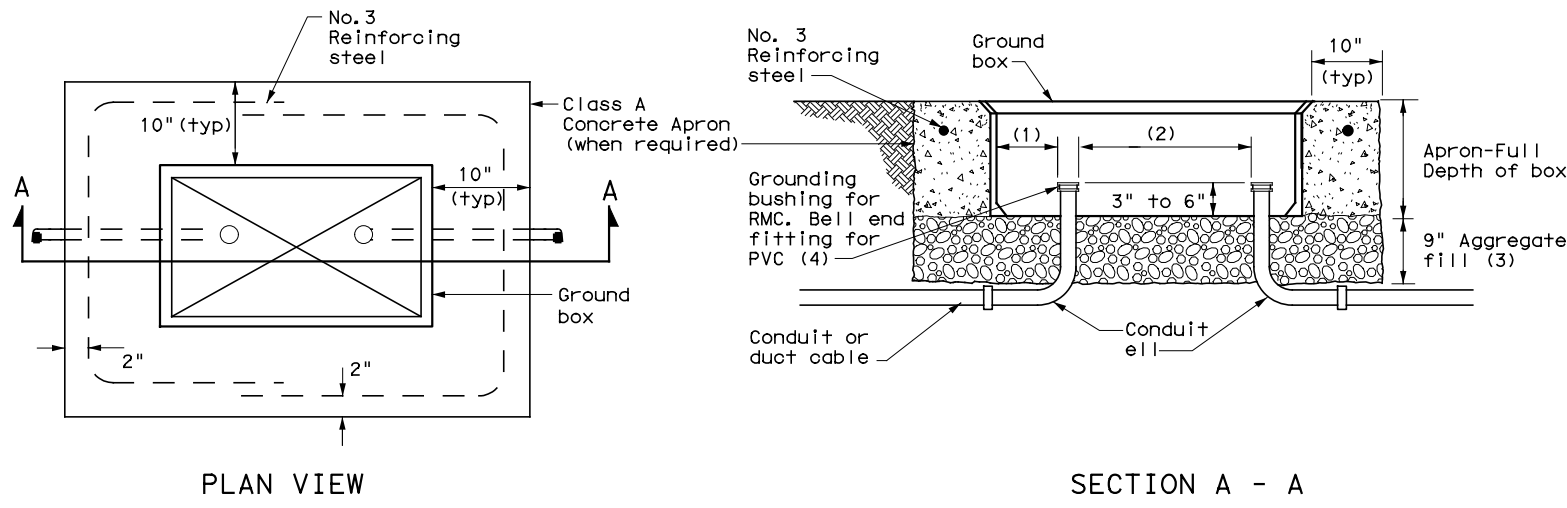


**SPLICE OPTION 3  
Listed Screw Type**

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		<b>Texas Department of Transportation</b>		<b>Traffic Operations Division Standard</b>	
<h1>ELECTRICAL DETAILS CONDUCTORS</h1>					
<h2>ED(3)-14</h2>					
FILE:	ed3-14.dgn	DN:	TxDOT	CK:	TxDOT
© TxDOT	October 2014	CONT:	SECT:	JOB:	HIGHWAY:
REVISIONS		3510	04	055	SH 99
		DIST:	COUNTY:		SHEET NO.
		HOU	FORT BEND		239

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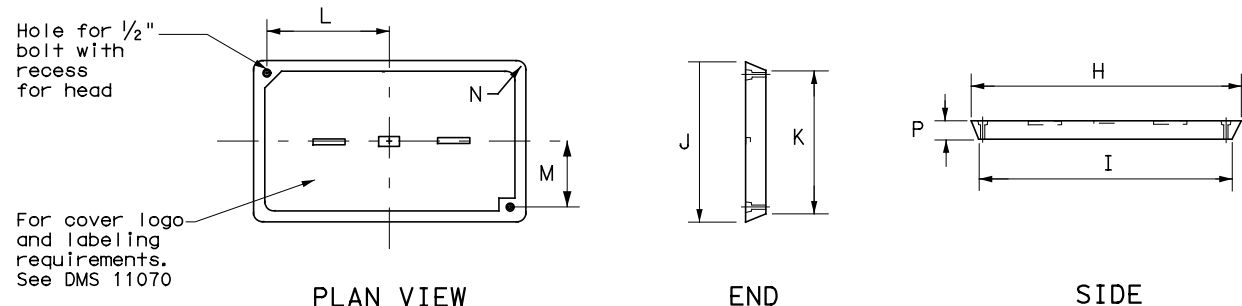


**APRON FOR GROUND BOX**

- (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.

				<b>Traffic Operations Division Standard</b>	
<h2>ELECTRICAL DETAILS</h2> <h3>GROUND BOXES</h3>					
<h3>ED(4)-14</h3>					
FILE:	ed4-14.dgn	DN:	TxDOT	CK:	TxDOT
© TxDOT	October 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS		3510	04	055	SH 99
DIST	COUNTY	SHEET NO.			
HOU	FORT BEND	240			

ELECTRICAL SERVICES NOTES

1. Provide new materials. Ensure installation and materials comply with the applicable provisions of the National Electrical Code (NEC) and National Electrical Manufacturers Association (NEMA) standards. Ensure material is Underwriters Laboratories (UL) listed. Provide and install electrical service conduits, conductors, disconnects, contactors, circuit breaker panels, and branch circuit breakers as shown on the Electrical Service Data chart in the plans. Faulty fabrication or poor workmanship in material, equipment, or installation is justification for rejection. Where manufacturers provide warranties and guarantees as a customary trade practice, furnish these to the State.
2. Provide electrical services in accordance with Electrical Details standard sheets, Departmental Material Specification (DMS) 11080 "Electrical Services," DMS 11081 "Electrical Services-Type A," DMS 11082 "Electrical Services-Type C," DMS 11083 "Electrical Services-Type D," DMS 11084 "Electrical Services-Type T," DMS 11085 "Electrical Services-Pedestal (PS)", and Item 628 "Electrical Services" of the Standard Specifications. Provide electrical service types A, C, and D, as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies," Item 628. Provide other service types as detailed on the plans.
3. Provide all work, materials, services, and any incidentals needed to install a complete electrical service as specified in the plans.
4. Coordinate with the Engineer and the utility provider for metering and compliance with utility requirements. Primary line extensions, connection charges, meter charges, and other charges by the utility company to provide power to the location are paid for in accordance with Item 628. Get approval for the costs associated with these charges prior to engaging the utility company to do the work. Consult with the utility provider to determine costs and requirements, and coordinate the work as approved.
5. The enclosure manufacturer will provide Master Lock Type 2 with brass tumblers keyed #2195 for all custom electrical enclosures. Installing Contractor is to provide Master Lock #2195 Type 2 with brass tumblers for "off the shelf" enclosures. Master Lock #2195 keys and locks become property of the State. Unless otherwise approved, do not energize electrical service equipment until locks are installed.
6. Enclosures with external disconnects that de-energize all equipment inside the enclosure do not need a dead front trim. Protect incoming line terminations from incidental contact as required by the NEC.
7. When galvanized is specified for nuts, screws, bolts or miscellaneous hardware, stainless steel may be used.
8. Provide wiring and electrical components rated for 75°C. Provide red, black, and white colored XHHW service entrance conductors of minimum size 6 American Wire Gauge (AWG). Identify size 6 AWG conductors by continuous color jacket. Identify electrical conductors sized 4 AWG and larger by continuous color jacket or by colored tape. Mark at least 6 inches of the conductor's insulation with half laps of colored tape, when identifying conductors. Ensure each service entrance conductor exits through a separately bushed non-metallic opening in the weatherhead. The lengths of the conductors outside the weatherhead are to be 12 inches minimum, 18 inches maximum, or as required by utility.
9. All electrical service conduit and conductors attached to the electrical service including the riser or the elbow below ground are subsidiary to the electrical service. For an underground utility feed, all service conduit and conductors after the elbow, including service conduit and conductors for the utility pole riser when furnished by the Contractor, will be paid for separately.
10. Provide rigid metal conduit (RMC) for all conduits on service, except for the 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.
11. Use of liquidtight flexible metal conduit (LFMC) is allowed between the meter and service enclosure when they are mounted 90 to 180 degrees to each other. Size the LFMC the same size as service entrance conduit. LFMC must not exceed 3 feet in length. Strap LFMC within 1 foot of each end. LFMC less than 12 inches in length need not be strapped. Each end of LFMC must have a grounding bushing or be terminated with a grounding fitting. The LFMC must contain a grounded (neutral) conductor. Ensure any bend in LFMC never exceeds 180 degrees. A pull test is required on all installed conductors, with at least six inches of free conductor movement demonstrated to the satisfaction of the Engineer.
12. Ensure all mounting hardware and installation details of services conform to utility company specifications.
13. For all electrical service enclosures listed under Item 628 on the MPL, the UL 508 enclosure manufacturers will prepare and submit a schematic drawing unique to each service. Before shipment to the job site, place the applicable laminated schematic drawings and the laminated plan sheet showing the electrical service data chart used to build the enclosure in the enclosure's data pocket. The installing contractor will copy and laminate the actual project plan sheets detailing all equipment and branch circuits supplied by that service. The laminated plan sheets are to be placed in the service enclosure's document pocket. Reduce 11 in. x 17 in. plan sheets to 8 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.
14. When providing an "Off The Shelf" Type D or Type T service, provide laminated plan sheets detailing equipment and branch circuits supplied by that service. Reduce 11 in. x 17 in. plan sheets to 8 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.
15. Do not install conduit in the back wall of a service enclosure where it would penetrate the equipment mounting panel inside the enclosure. Provide grounding bushings on all metal conduits, and terminate bonding jumpers to grounding bus. Grounding bushings are not required when the end of the metal conduit is fitted with a conduit sealing hub or threaded boss, such as a meter base hub.

SERVICE ASSEMBLY ENCLOSURE

1. Provide threaded hub for all conduit entries into the top of enclosure.
2. Type galvanized steel (GS) enclosures may be used for Type C panelboards and for Type D and T services that do not use an enclosure mounted photocell or lighting contactor. Provide GS enclosures in accordance with DMS 11080, 11082, 11083, and 11084.
3. Provide aluminum (AL) and stainless steel (SS) enclosures for Types A, C, and D in accordance with DMS 11080, 11081, 11082, 11083, and 11084. Do not paint stainless steel.
4. Provide pedestal service (PS) enclosures in accordance with ED(9) and DMS 11080 and 11085. Do not provide GS pedestal services. If GS is shown in the PS descriptive code, provide an AL enclosure.

MAIN DISCONNECT & BRANCH CIRCUIT BREAKERS

1. Field drill flange-mounted remote operator handle if needed, to ensure handle is lockable in both the "On" and "Off" positions.
2. When the utility company provides a transformer larger than 50 KVA, verify that the available fault current is less than the circuit breaker's ampere interrupting capacity (AIC) rating and provide documentation from the electric utility provider to the Engineer.

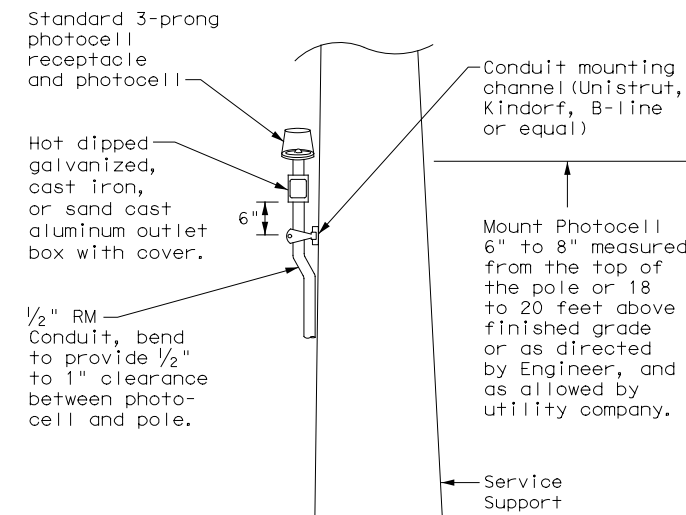
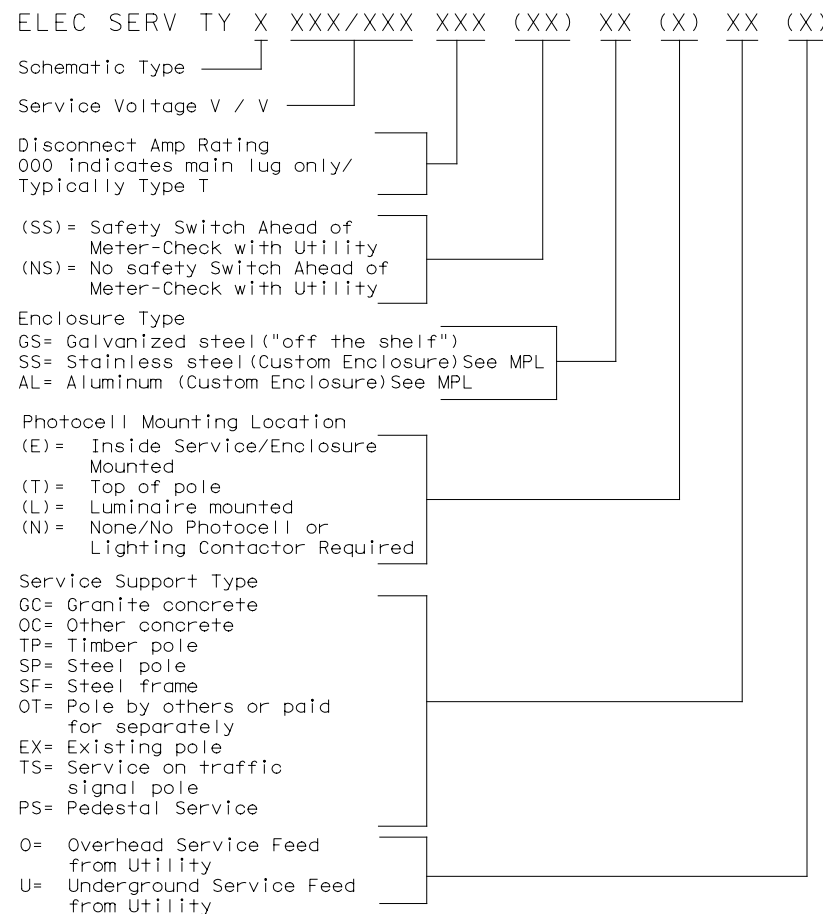
PHOTOELECTRIC CONTROL

1. Provide photocell as listed on the MPL. Move, adjust, or shield the photocell from stray or ambient night time light to ensure proper operation. Mount photocell facing north when practical. Mount top of pole photocells as shown on Top Mounted Photocell Detail.

* ELECTRICAL SERVICE DATA												
Elec. Service ID	Plan Sheet Number	Electrical Service Description	Service Conduit *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		Luminares	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.

Texas Department of Transportation Traffic Operations Division Standard

## ELECTRICAL DETAILS SERVICE NOTES & DATA

### ED(5)-14

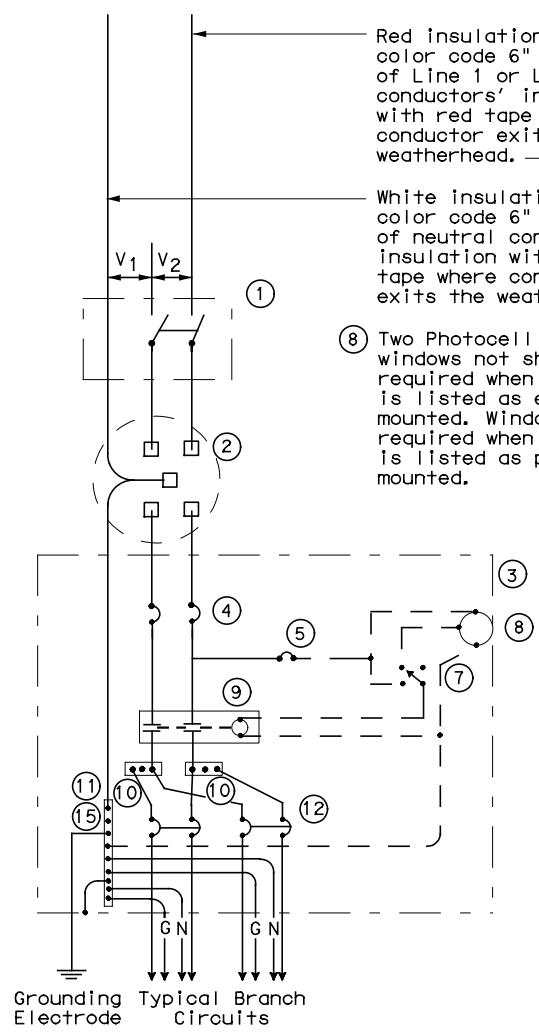
FILE: ed5-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	3510	04	055	SH 99
	DIST	COUNTY		SHEET NO.
	HOU	FORT BEND		241

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DATE: 1/23/2023  
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DATE: 1/23/2023  
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**SCHEMATIC TYPE A  
THREE WIRE**

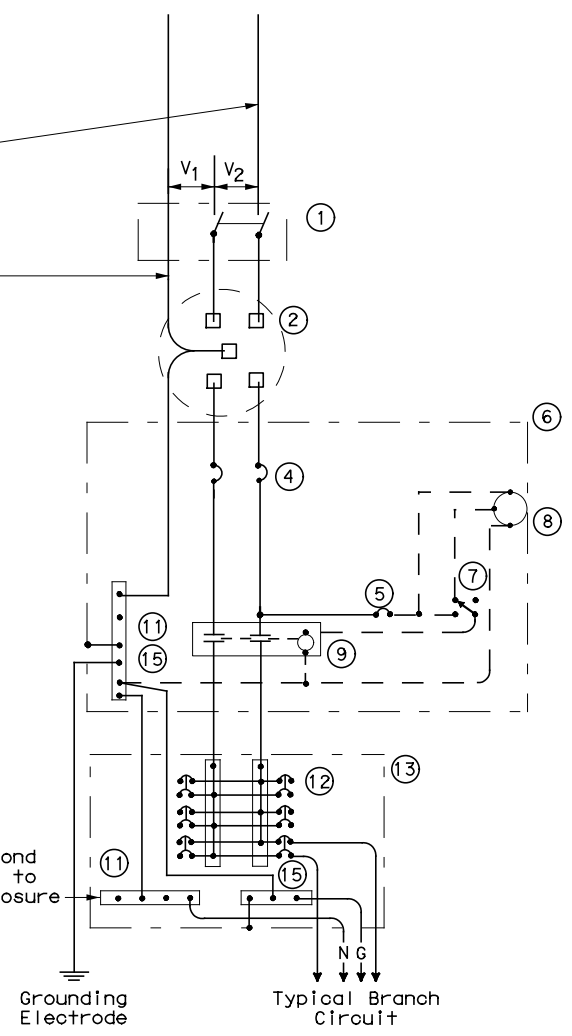
Red insulation or color code 6" length of Line 1 or Line 2 conductors' insulation with red tape where conductor exits the weatherhead.

White insulation or color code 6" length of neutral conductors' insulation with white tape where conductor exits the weatherhead.

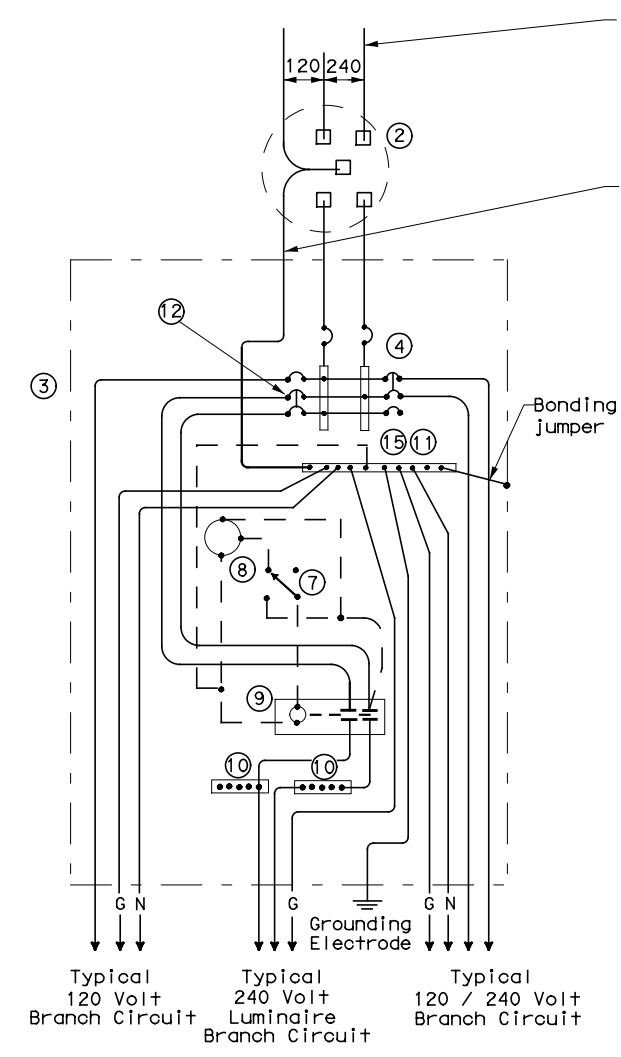
8 Two Photocell viewing windows not shown but required when photocell is listed as enclosure mounted. Windows not required when photocell is listed as pole top mounted.

Do not bond this bus to the enclosure

WIRING LEGEND	
—	Power Wiring
- - -	Control Wiring
—N—	Neutral Conductor
—G—	Equipment grounding conductor-always required



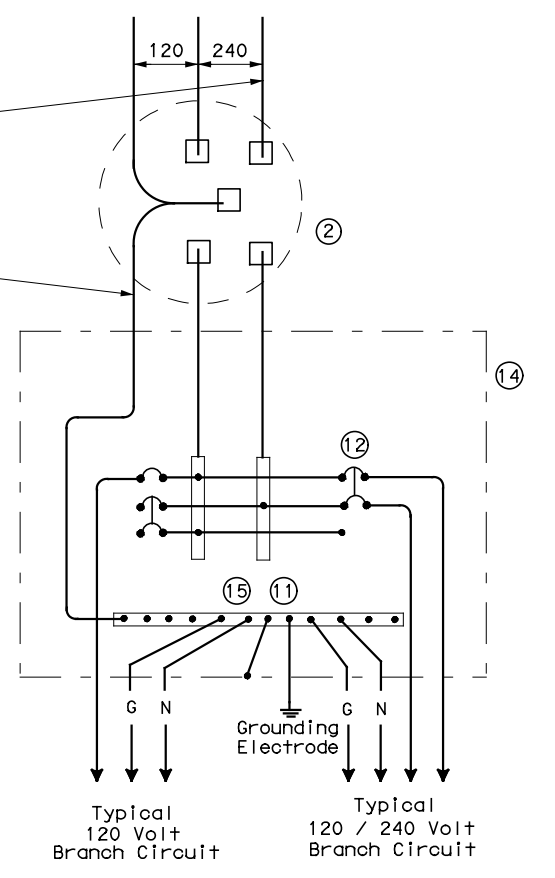
**SCHEMATIC TYPE C  
THREE WIRE**



**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	
<b>ELECTRICAL DETAILS SERVICE ENCLOSURE AND NOTES</b>					
<b>ED(6)-14</b>					
FILE:	ed6-14.dgn	DN:	TxDOT	CK:	TxDOT
© TxDOT	October 2014	CONT:	3510	SECT:	04
REVISIONS		JOB:	055	HIGHWAY:	SH 99
DIST:	HOU	COUNTY:	FORT BEND	SHEET NO.:	242

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**SUPPORT TYPE STEEL POLE (SP) AND STEEL FRAME (SF)**

- 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.
- 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.
- 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.
- 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.
- Furnish and install rigid metallic ellis in all steel pole and steel frame foundations for all conduits entering the service from underground.
- Use class C concrete for foundations. Ensure reinforcing steel is Grade 60 with 3" of unobstructed concrete cover.
- 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.
- If Steel pole or frame is painted, bond each separate painted piece with a bonding jumper attached to a tapped hole.
- 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.
- Avoid contact of the service drop and service entrance conductors with the metal pole to prevent abrasion of the insulated conductors.
- Shop drawings are not required for service support structure unless specifically stated elsewhere or directed by the Engineer.

White insulation or color code 6" of neutral conductor's insulation with white tape where conductor exits weatherhead.

Red insulation or color code 6" length of Line 1 or Line 2 conductor's insulation with red tape where conductor exits the weatherhead. Conductor slack length, 12" min., 18" max.

2" to 6" 4" (typ.)

RMC

Service Enclosure

Inset A

Channel bracket or other arrangement approved by the Engineer. (Kindorf, Unistrut, B-line or equal.)

Meter

Safety Switch

Inset B

60" TYP.

2"

18" Min.

Class "C" concrete

RMC

PVC

24 Dia. x 60" depth foundation 4-#5 reinforcing bars and #2 spiral (typ.) at 6" pitch

WITH SAFETY SWITCH  
WITHOUT SAFETY SWITCH  
SERVICE SUPPORT TYPE SP (O) - OVERHEAD SERVICE

20' measured from grade. Circumstances may require the electrical service support to be taller than the 20" shown, check with utility before installing.

Top of weatherhead to be 2" to 6", 4" typical below the top of pole.

White insulation or color code 6" of neutral conductor's insulation with white tape where conductor exits weatherhead.

Red insulation or color code 6" length of Line 1 or Line 2 conductor's insulation with red tape where conductor exits the weatherhead. Conductor slack length, 12" min., 18" max.

Point of attachment of service drop to be below weatherhead.

Conduit support spacing, 3' max from the ends, and 5' in between unless otherwise called for by the utility.

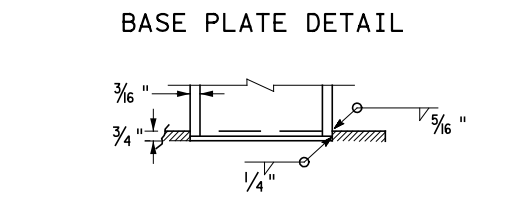
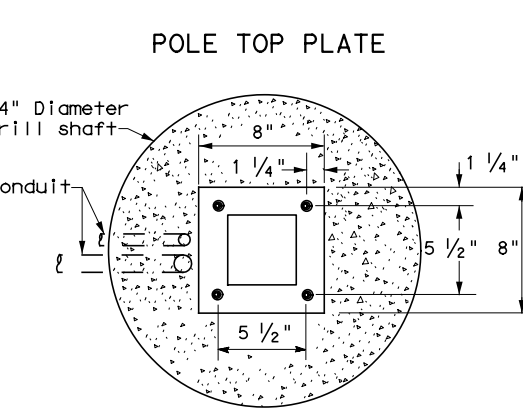
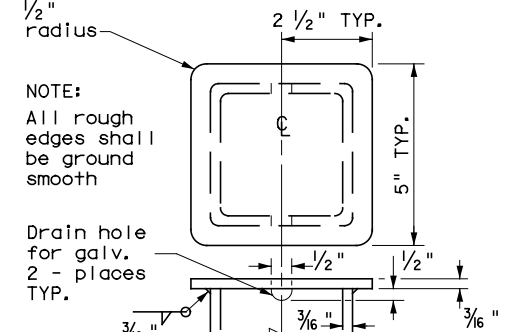
Service Enclosure

Inset A

Meter

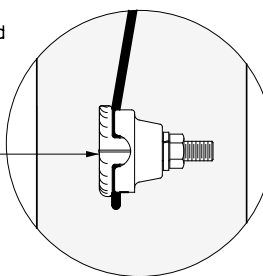
Inset B

24" dia. X 60" foundation 4-#5 reinforcing bars and #2 spiral at 6" pitch (typ.)

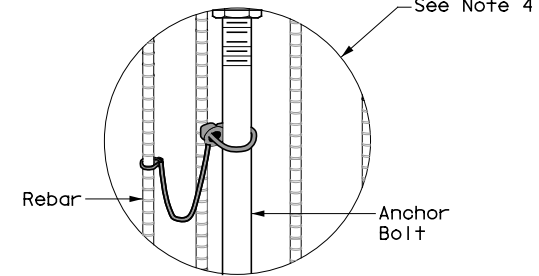


POLE TOP PLATE  
BASE PLATE DETAIL  
BOTTOM OF POLE  
SERVICE SUPPORT TYPE SF & SP

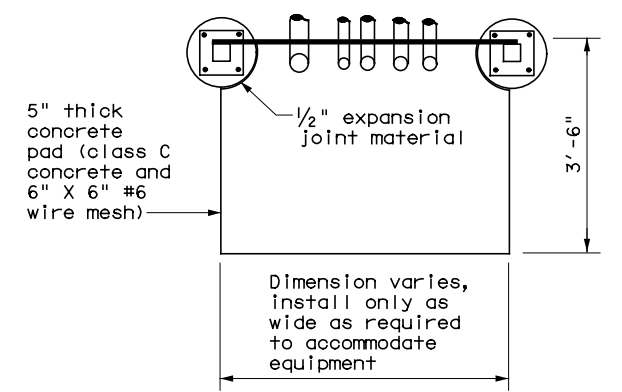
Drill, tap, and thread 1/2" X 13 UNC. Install tank ground fitting, connect electrical service grounding electrode conductor. See Note 7.



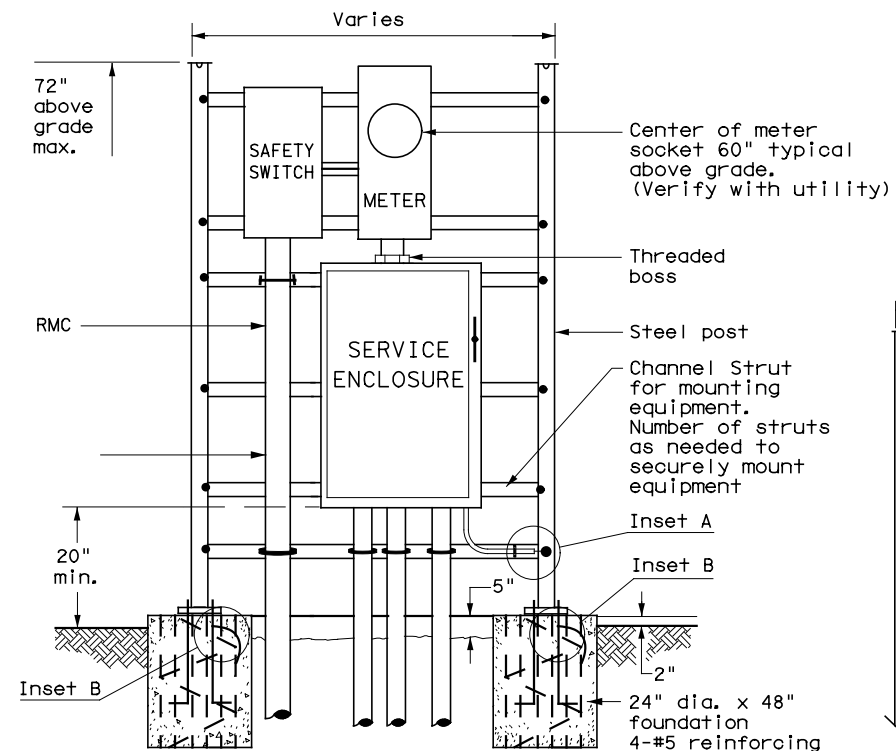
FRONT VIEW  
INSET A



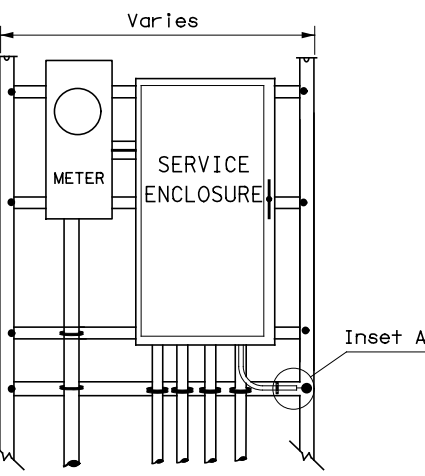
INSET B



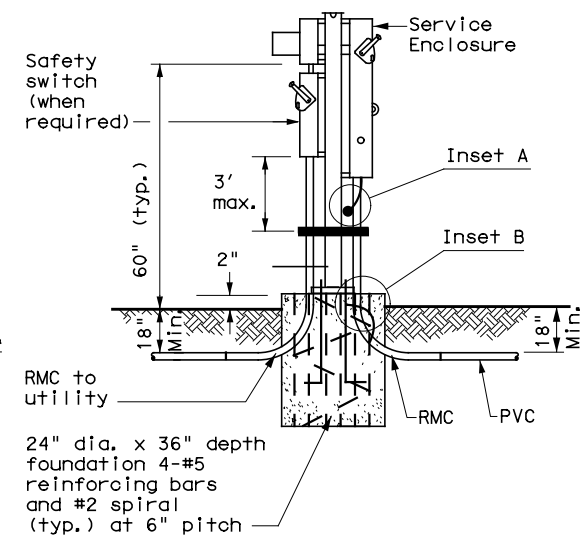
TOP VIEW  
SERVICE SUPPORT TY SF (O) & SF (U)



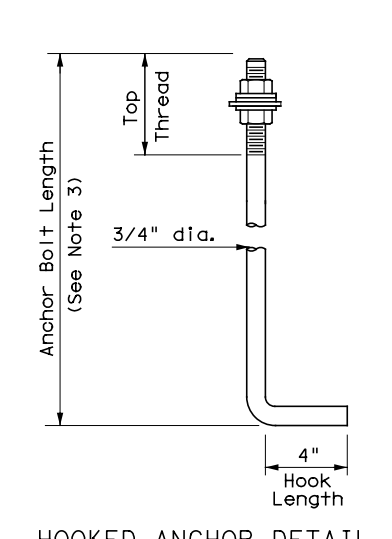
WITH SAFETY SWITCH  
FRONT VIEW  
SERVICE SUPPORT TYPE SF (U) - UNDERGROUND SERVICE



WITHOUT SAFETY SWITCH



WITH SAFETY SWITCH  
SERVICE SUPPORT TYPE SP (U) - UNDERGROUND SERVICE



HOOKED ANCHOR DETAIL

		Traffic Operations Division Standard	
<b>ELECTRICAL DETAILS SERVICE SUPPORT TYPES SF &amp; SP ED(7)-14</b>			
FILE: ed7-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
© TxDOT October 2014	CONT SECT	JOB	HIGHWAY
REVISIONS	3510 04	055	SH 99
	DIST	COUNTY	SHEET NO.
	HOU	FORT BEND	243



# 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.

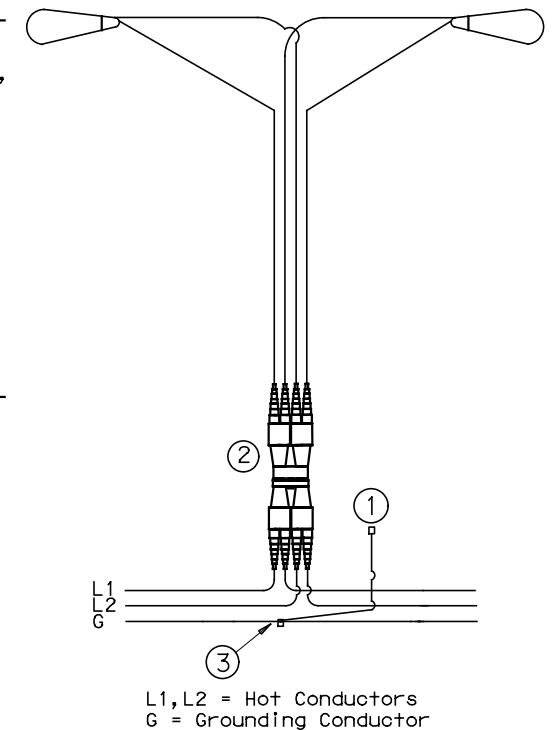
- ii. Install bolts and 1/2" connecting washers from the inside of the T-base, thread up through the pole base. Install flat washers, lock washers and nuts snug tight according to Item 447, "Structural Bolting."
- iii. Tighten each nut to 150 ft-lb. using a torque wrench.
- c. Level and Plumb
  - i. 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.

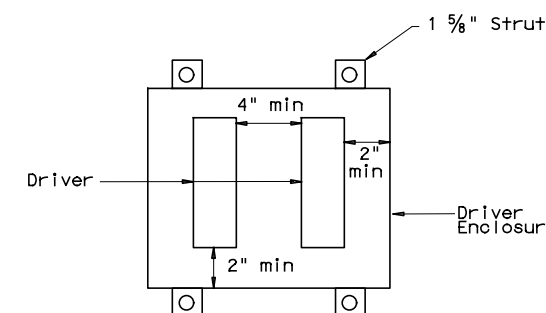
## Decorative LED Lighting Notes:

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 Tc 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.

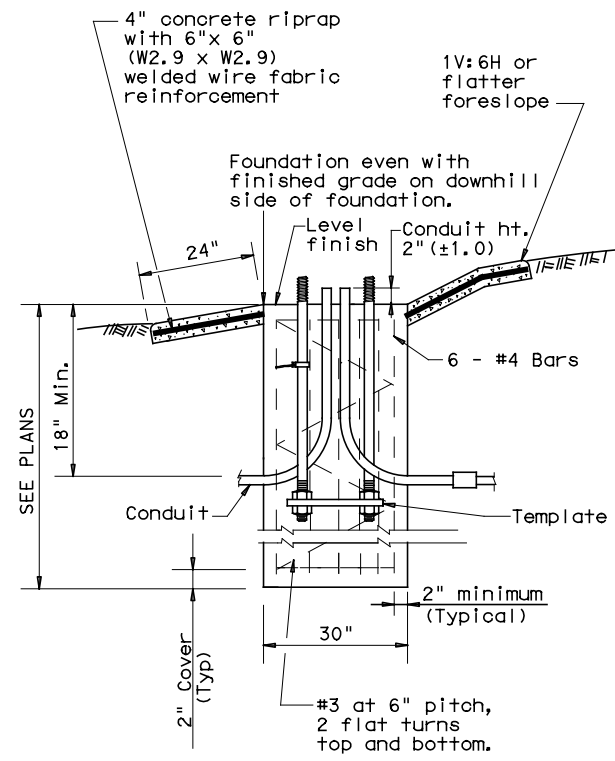


Driver Spacing In Remote Enclosure

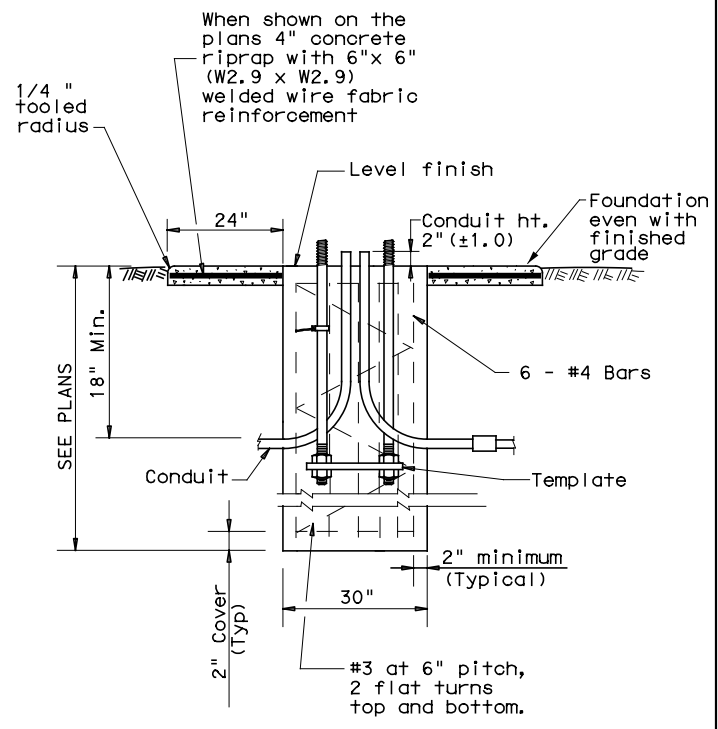
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12-20	HOU	FORT BEND	244	

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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'

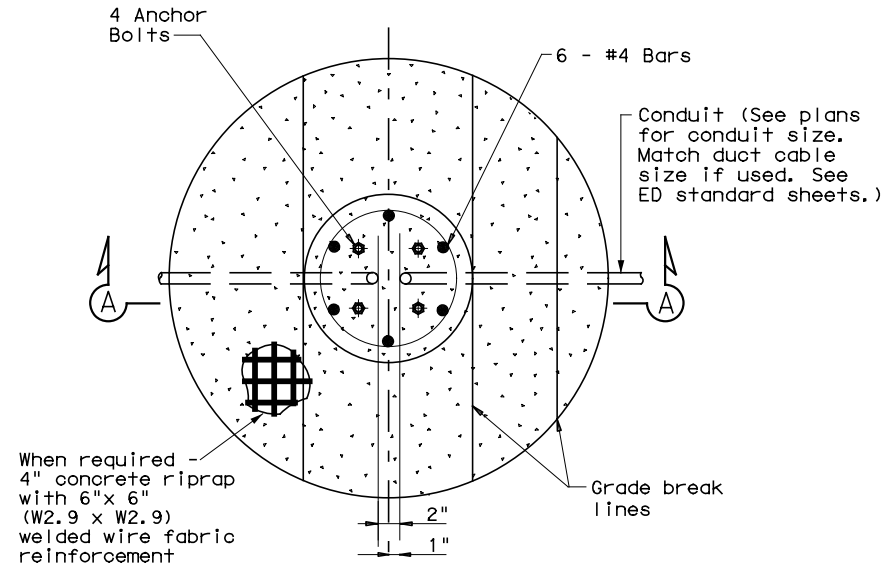
**TABLE 3**

**PAY QUANTITY OF RIPRAP PER FOUNDATION**  
 (Install only when shown on the plans)

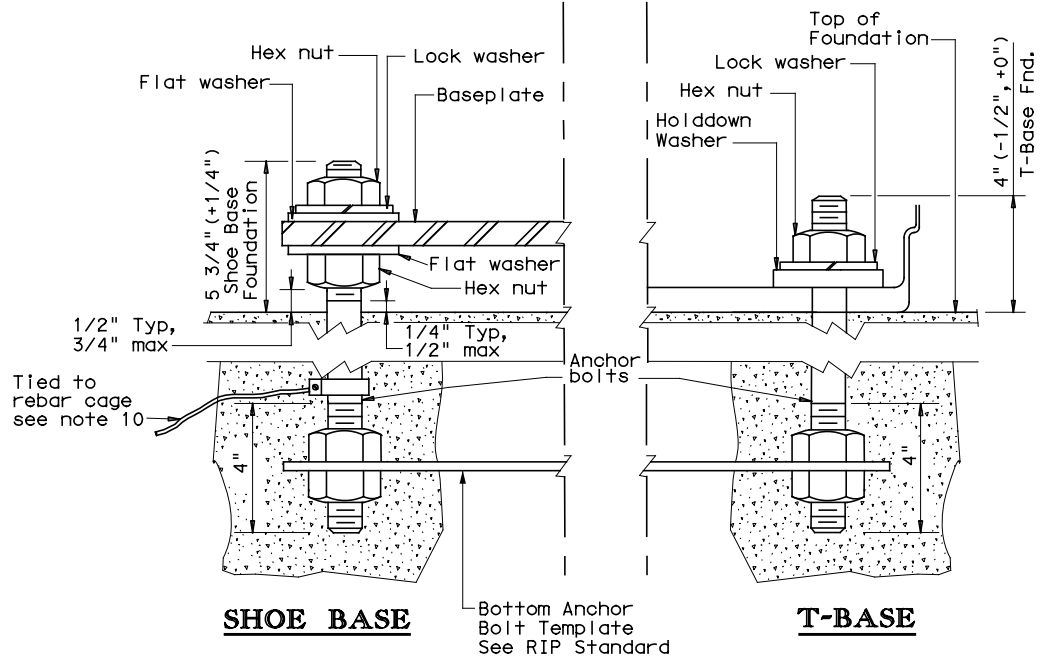
Foundation Diameter	RIPRAP DIAMETER	RIPRAP (CONC) (CL B)
30 in.	78 in.	0.35 CY

**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)  
 RID (2) - 20

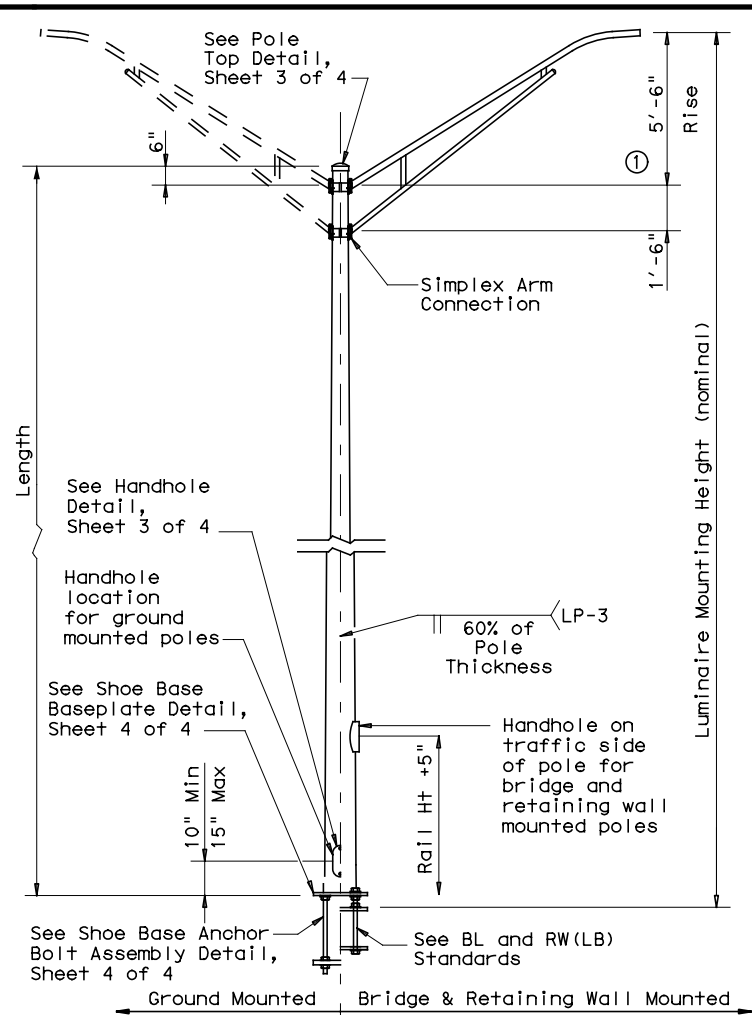
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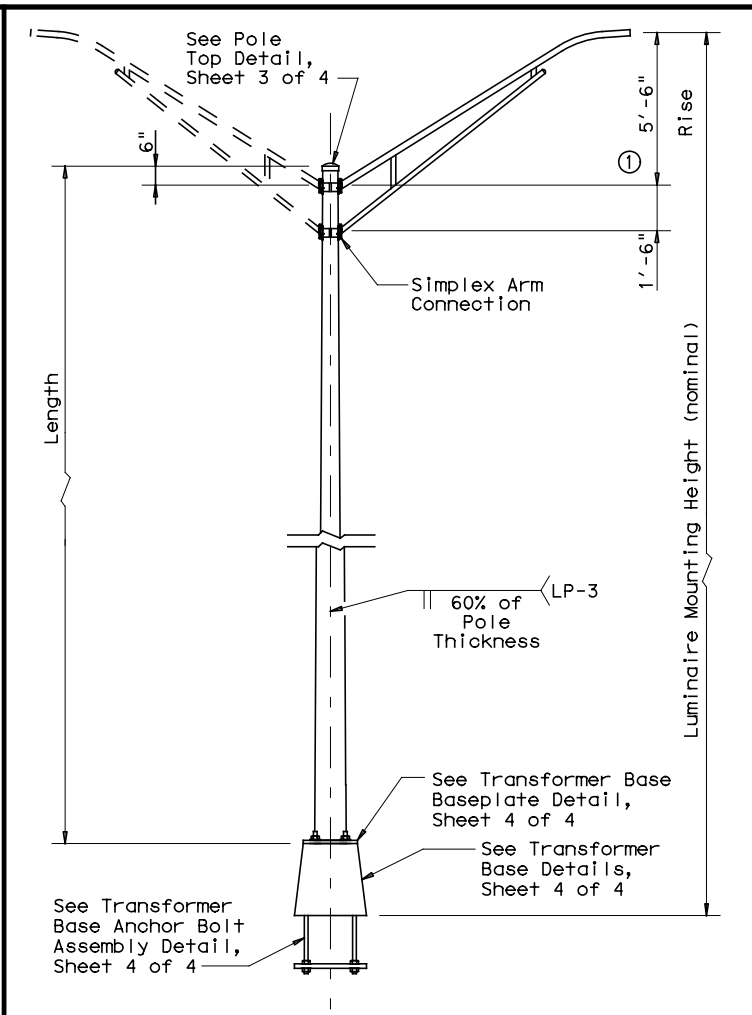
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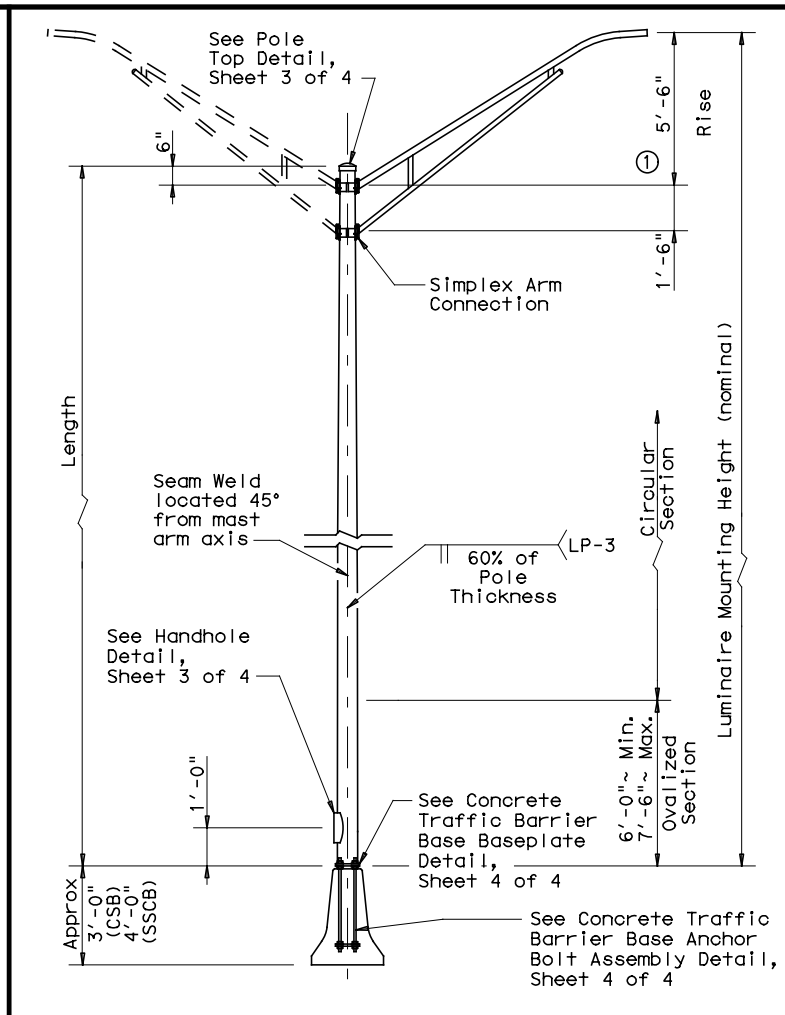
**SHOE BASE POLE**

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 CI 2, or A1008 HSLAS Gr 50 CI 2	50
Base Plate and Handhole Frame	A572 Gr.50, or A36	36
T-Base Connecting Bolts	F3125 Gr A325	92
Anchor Bolts	F1554 Gr 55, A193-B7 or A321	55 105
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

Texas Department of Transportation  
 Traffic Safety Division Standard

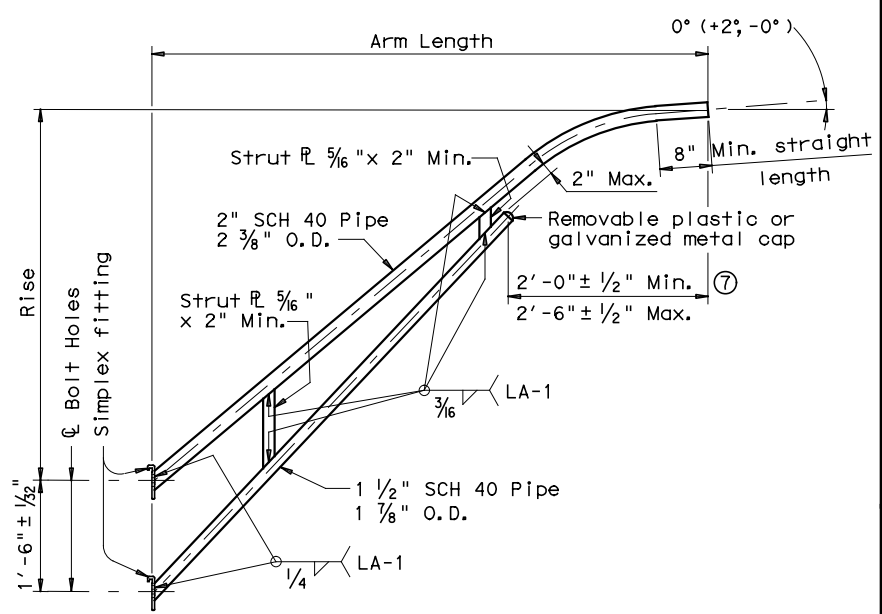
**ROADWAY ILLUMINATION POLES**

**RIP(2)-19**

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© TxDOT January 2007	CONT	SECT	JOB	HIGHWAY
REVISIONS	3510	04	055	SH 99
7-17	DIST	COUNTY	SHEET NO.	
12-19	HOU	FORT BEND	247	

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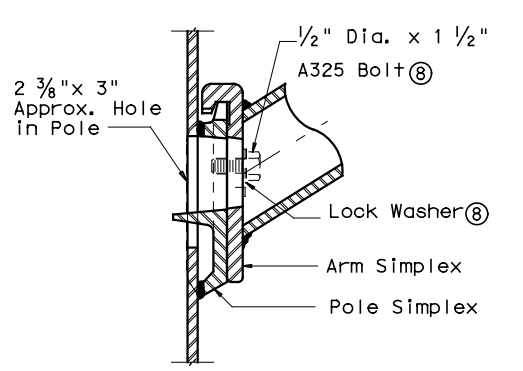
**LUMINAIRE ARM**

**LUMINAIRE ARM DIMENSIONS**

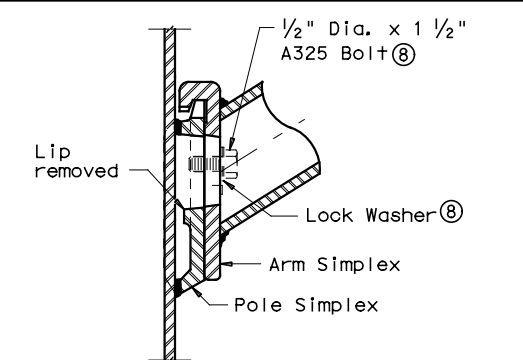
Nominal Arm Length	Arm Length	Rise
4'-0"	3'-6"	2'-6"
6'-0"	5'-6"	5'-6"
8'-0"	7'-6"	5'-6"
10'-0"	9'-6"	5'-6"
12'-0"	11'-6"	5'-6"

**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"

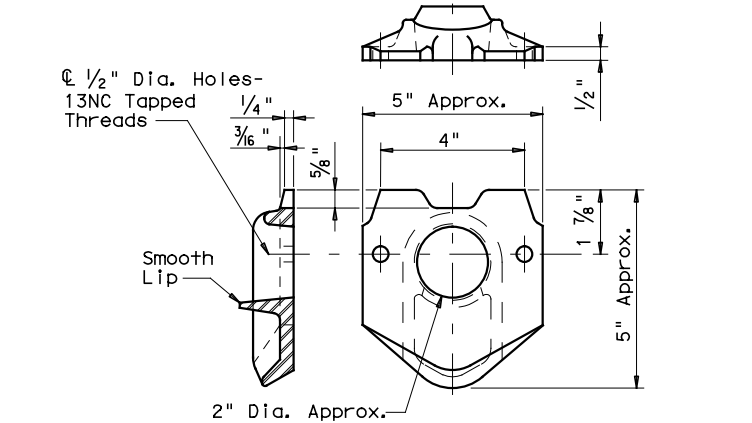


**UPPER SIMPLEX FITTING**  
(Gusset not shown for clarity)

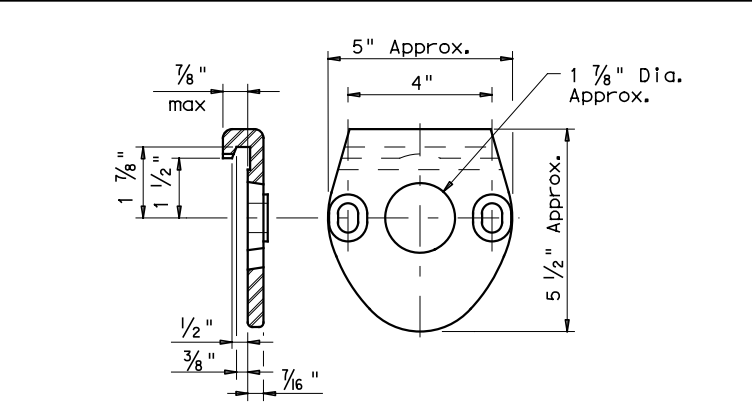


**LOWER SIMPLEX FITTING**  
(Gusset not shown for clarity)

**SECTION B-B**



**POLE SIMPLEX DETAIL**



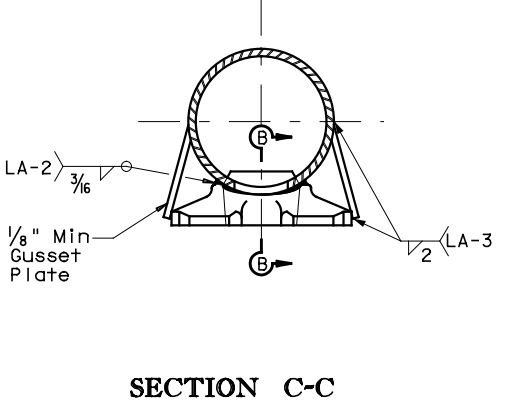
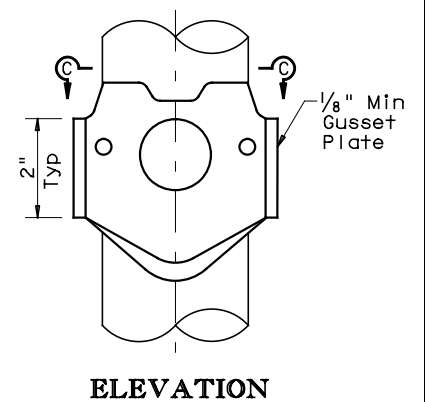
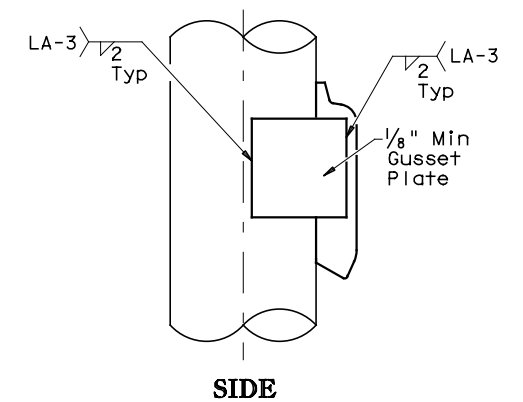
**ARM SIMPLEX DETAIL**

**NOTES:**

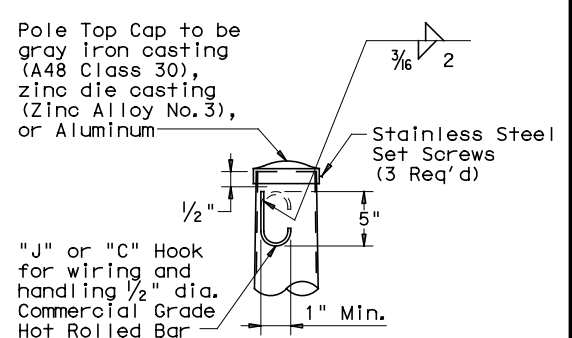
- ④ Any of the materials listed for plates may be used where the drawings do not specify a particular ASTM designation.
- ⑤ A576 must be suitable for forging and also meet minimum tensile strength of 65 ksi, minimum yield of 35 ksi, and elongation in 2 inches of 22 percent.
- ⑥ A572, A1008 HSLAS-F, and 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**

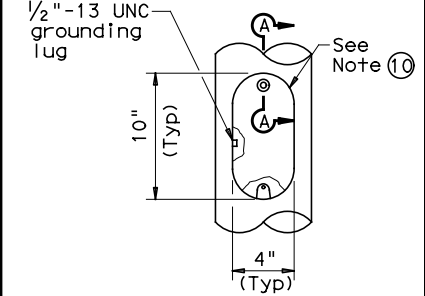
Pole or Arm Simplex	ASTM A27 Gr 65-35 or Gr 70-36, A148 Gr 80-50, A576 Gr 1021 5, or A36 (Arm only)
Arm Pipes	ASTM A53 Gr A or B, A500 Gr B, A501, A 1008 HSLAS-F Gr ⑤ 6, or A1011 HSLAS-F Gr ⑤ 6
Arm Struts and Gusset Plates 4	ASTM A36, A572 Gr 50 ⑥, or A588
Misc.	ASTM designations as noted



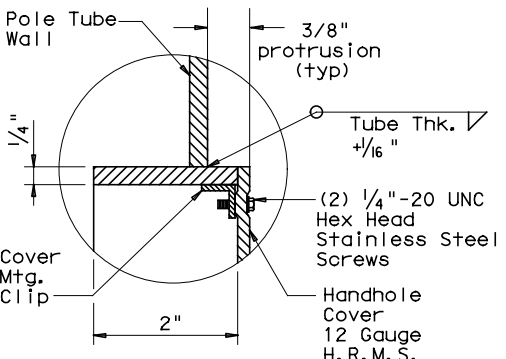
**SIMPLEX ATTACHMENT DETAIL**



**POLE TOP**



**ELEVATION**



**SECTION A-A**

**HANDHOLE**

SHEET 3 OF 4

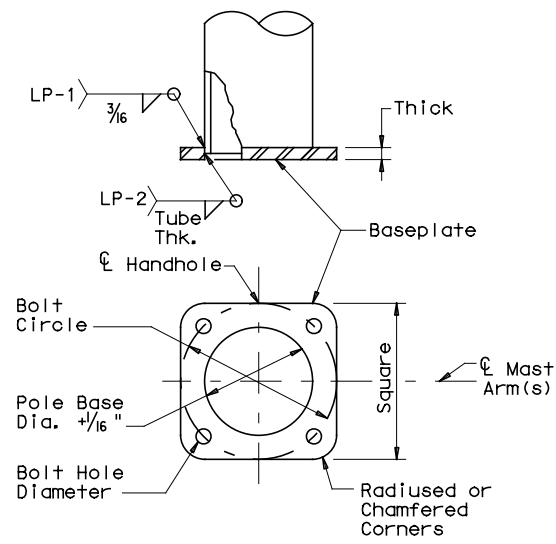


**ROADWAY ILLUMINATION POLES**  
**RIP (3) - 19**

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7-17	DIST	COUNTY	SHEET NO.	
12-19	HOU	FORT BEND	248	

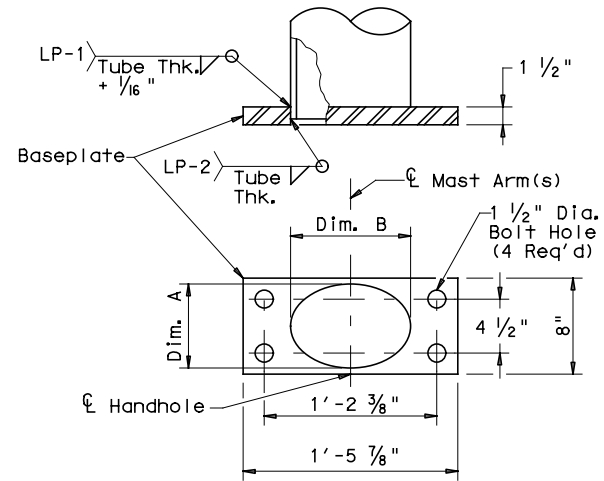
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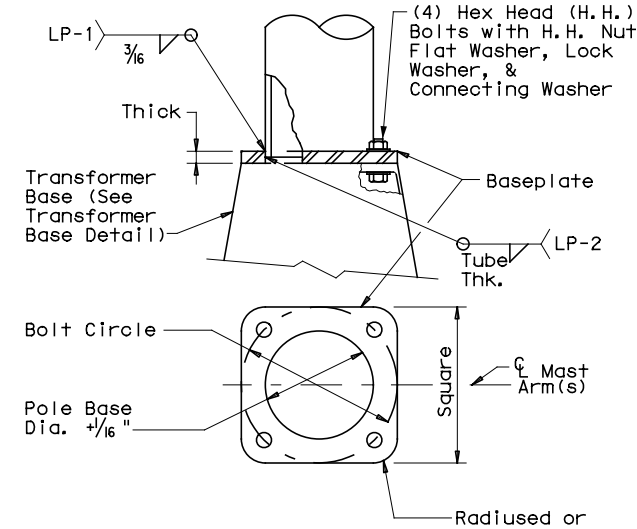
**SHOE BASE BASEPLATE**

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"



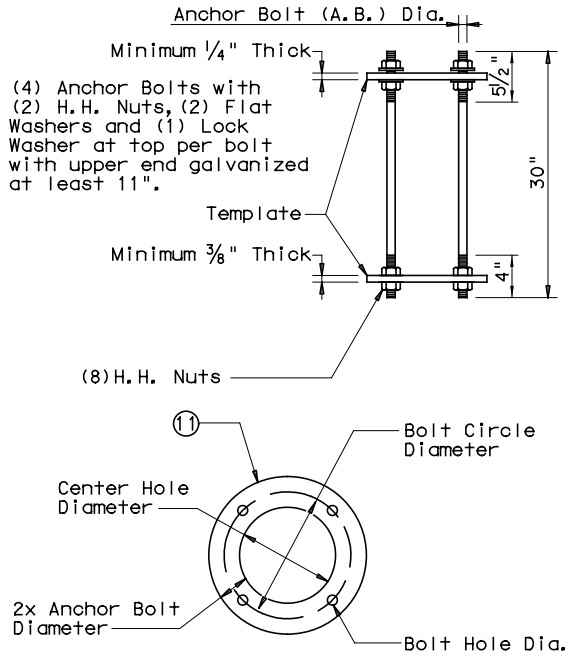
**CONCRETE TRAFFIC BARRIER BASE BASEPLATE**

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"



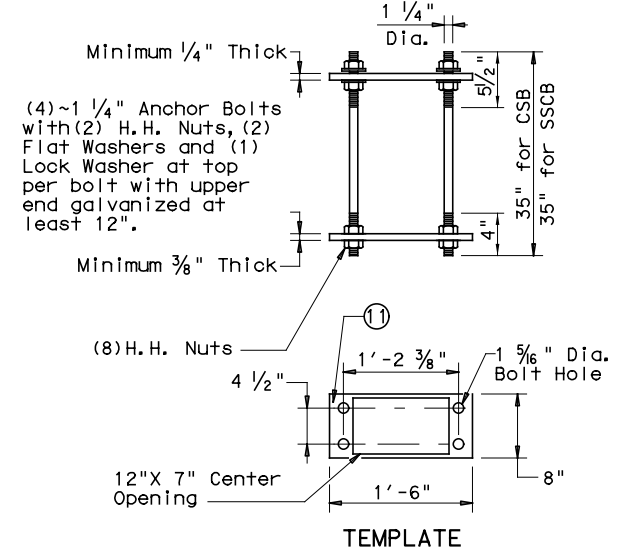
**TRANSFORMER BASE BASEPLATE**

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



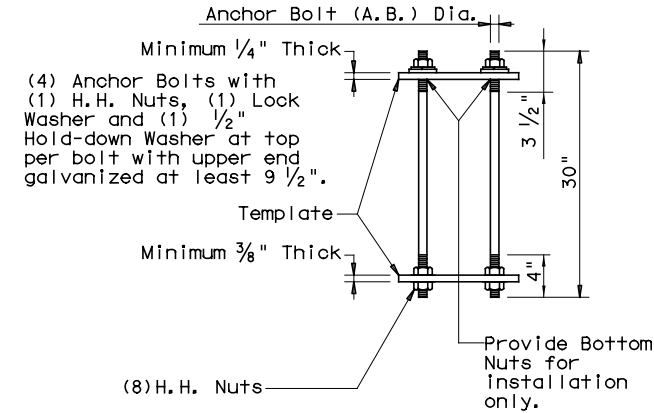
**SHOE BASE ANCHOR BOLT ASSEMBLY**

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"

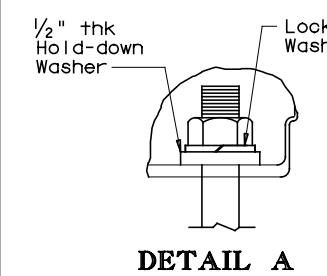


**CONCRETE TRAFFIC BARRIER BASE ANCHOR BOLT ASSEMBLY**

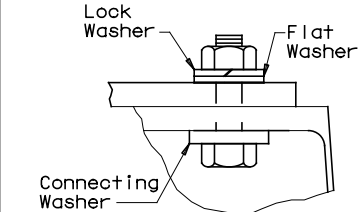
CONCRETE TRAFFIC BARRIER BASE ANCHOR BOLT ASSEMBLY TABLE				
MOUNTING HEIGHTS (nominal)	A.B. Dia.	BOLT CIRCLE DIAMETER	CTR. HOLE DIAMETER	BOLT HOLE DIAMETER
20' - 39'	1"	14"	12"	1 1/16"
40' - 50'	1 1/4"	17 1/4"	14 3/4"	1 5/16"



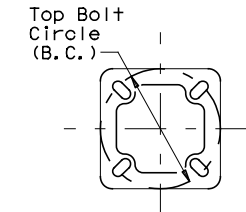
**TRANSFORMER BASE ANCHOR BOLT ASSEMBLY**



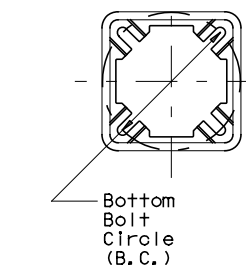
**DETAIL A**



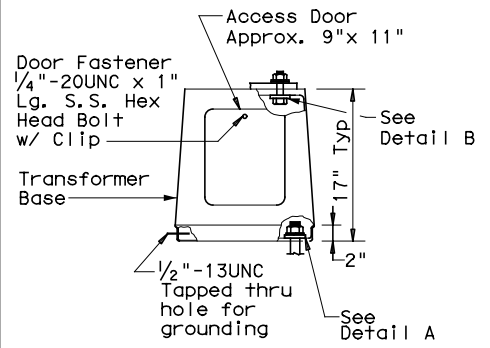
**DETAIL B**



**TOP PLAN**



**BOTTOM PLAN**



**ELEVATION**

**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 metal 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"

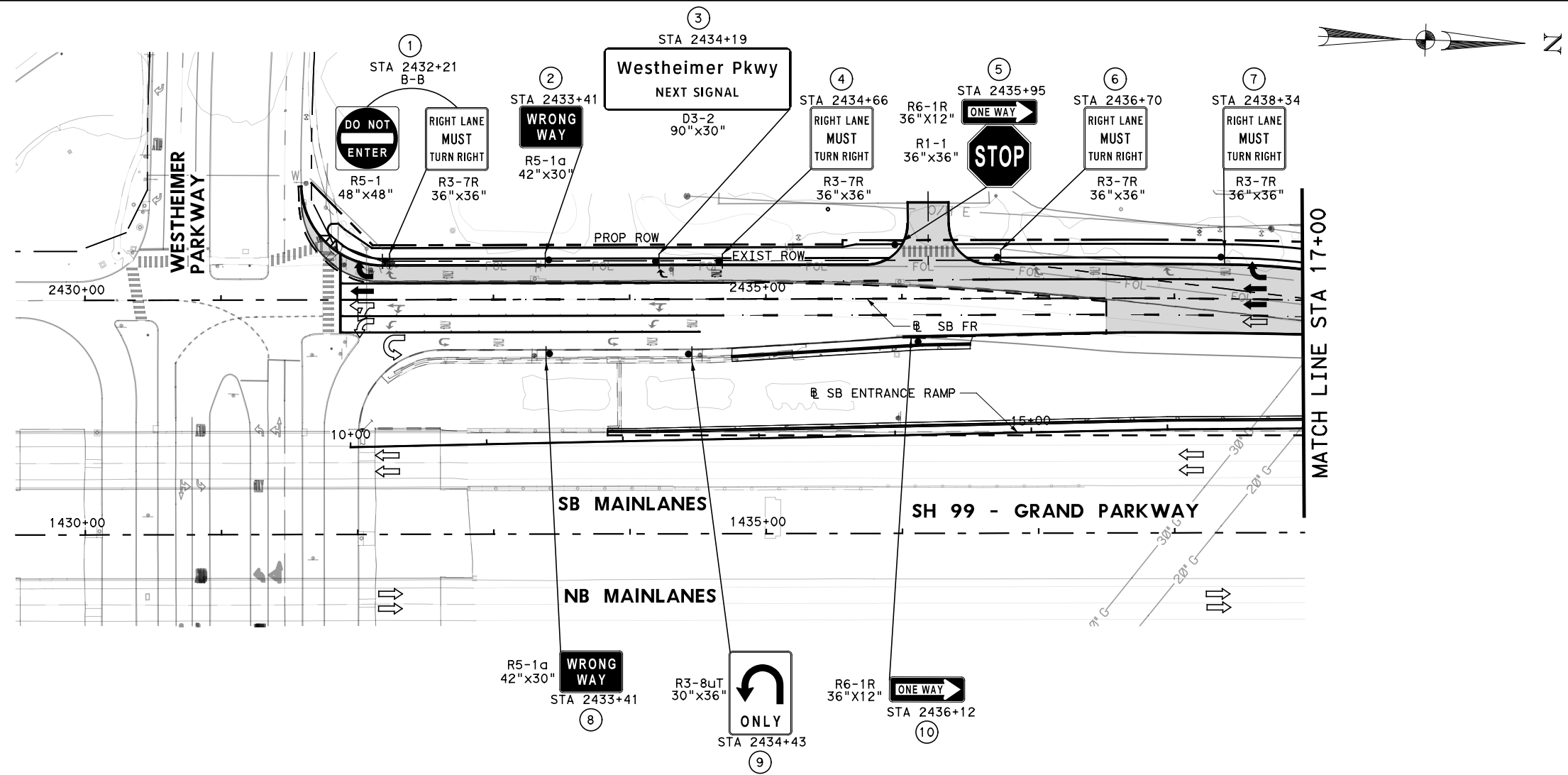
SHEET 4 OF 4



**ROADWAY ILLUMINATION POLES  
 RIP (4) - 19**

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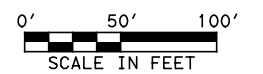


**LEGEND**

- ▬ PROPOSED SMALL SIGN
- ▬ EXISTING GROUND MOUNTED SIGN TO BE REMOVED
- ▬ PROPOSED CANTILEVER SIGN
- Ⓝ PROPOSED SMALL SIGN NUMBER
- Ⓝ PROPOSED LARGE SIGN NUMBER
- Ⓡ EXISTING SMALL SIGN TO BE REMOVED
- Ⓡ EXISTING LARGE SIGN TO BE REMOVED
- ⇨ DIRECTION OF TRAFFIC FLOW (EXISTING)
- ⇨ DIRECTION OF TRAFFIC FLOW (PROPOSED)

**NOTES:**

1. ALL SIGNING AND PAVEMENT MARKINGS SHALL CONFORM TO THE TEXAS M. U. T. C. D.
2. ALL EXISTING PAVEMENT MARKINGS AND SIGNING IN CONFLICT WITH PROPOSED WORK SHALL BE REMOVED.
3. PROPOSED PAVEMENT MARKING SHALL MATCH EXISTING PAVEMENT MARKING AT THE POINT THE PROPOSED MARKINGS MEET THE EXISTING. AND MEET THE PM(20) STANDARDS.
4. LOCATION OF THE SIGNS SHOWN ON THE PLAN SHALL BE PLACED AT STA SHOWN. EXACT LOCATION OF THE SIGNS CAN BE ADJUSTED BY THE ENGINEER IN THE FIELD.



**Johannes Tadesse**  
 REGISTERED PROFESSIONAL ENGINEER  
 1/19/2023

**TEDSI INFRASTRUCTURE GROUP**  
 Consulting Engineers  
 738 Hwy 6 South, Suite 430  
 Houston, Texas 77079  
 (832) 619-1000  
 TBPE F-1640

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**SH 99**  
**SOUTHBOUND FRONTAGE ROAD**  
**WESTHEIMER PKWY TO CINCO RANCH BLVD**  
**SIGNING LAYOUT**  
**SB ENTRANCE RAMP RD**  
**BEGIN TO STA 17+00**

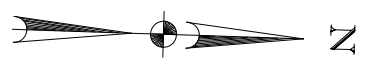
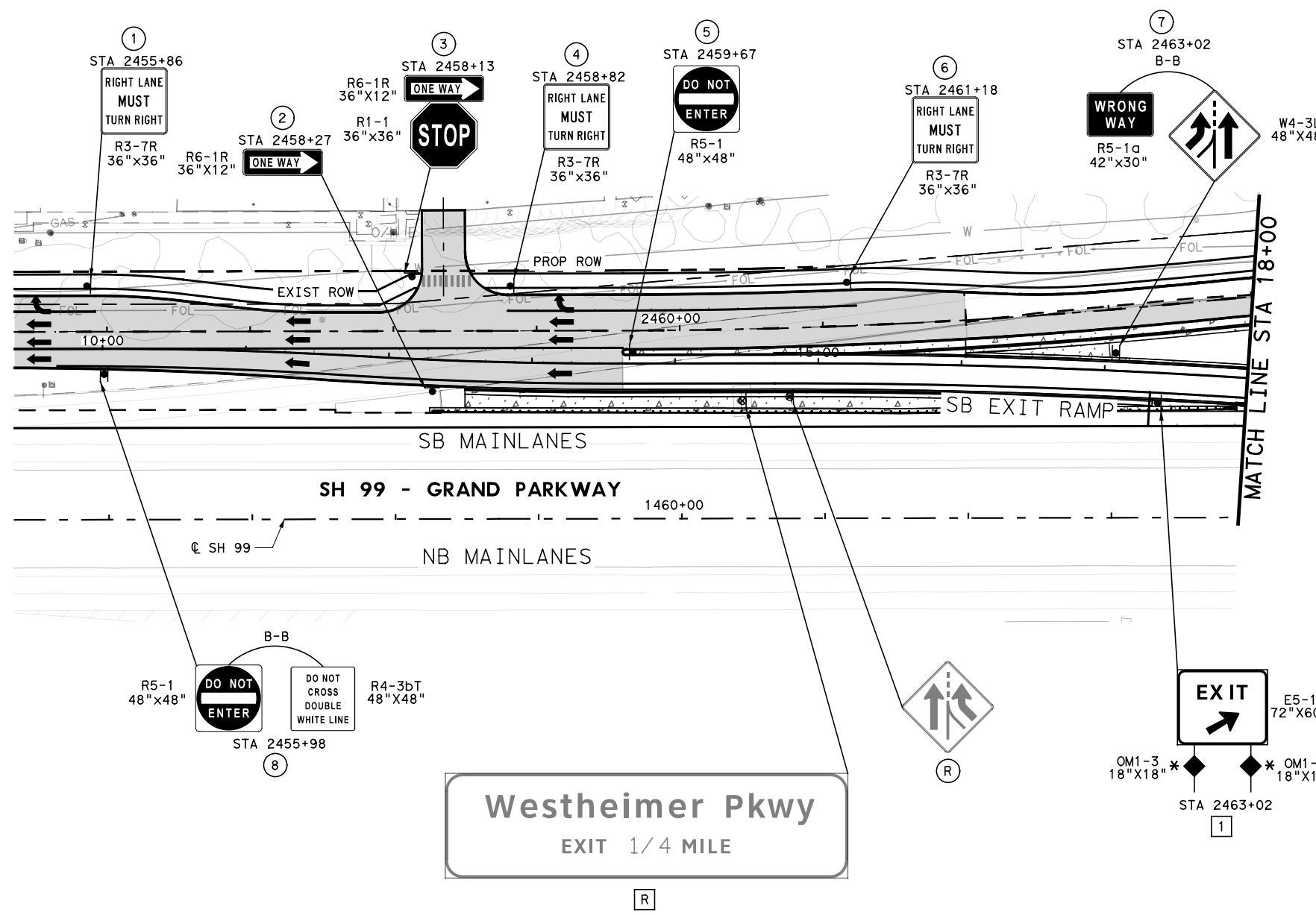
SHEET 1 OF 4

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STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	250



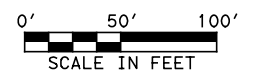


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**LEGEND**

- ▬ PROPOSED SMALL SIGN
- ▬ EXISTING GROUND MOUNTED SIGN TO BE REMOVED
- PROPOSED CANTILEVER SIGN
- # PROPOSED SMALL SIGN NUMBER
- # PROPOSED LARGE SIGN NUMBER
- Ⓜ EXISTING SMALL SIGN TO BE REMOVED
- Ⓜ EXISTING LARGE SIGN TO BE REMOVED
- ⇨ DIRECTION OF TRAFFIC FLOW (EXISTING)
- ⇨ DIRECTION OF TRAFFIC FLOW (PROPOSED)



STATE OF TEXAS  
YOHANNES A. TADESSE  
107781  
REGISTERED PROFESSIONAL ENGINEER  
*Yohannes Tadesse*  
1/19/2023

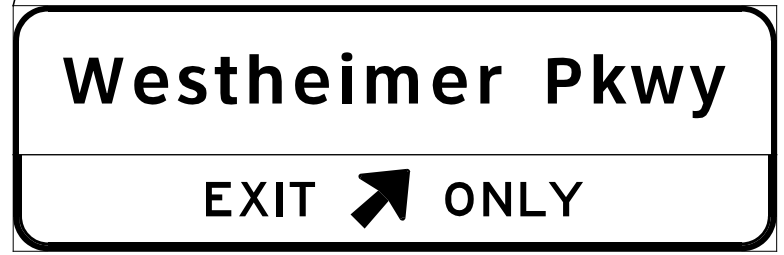
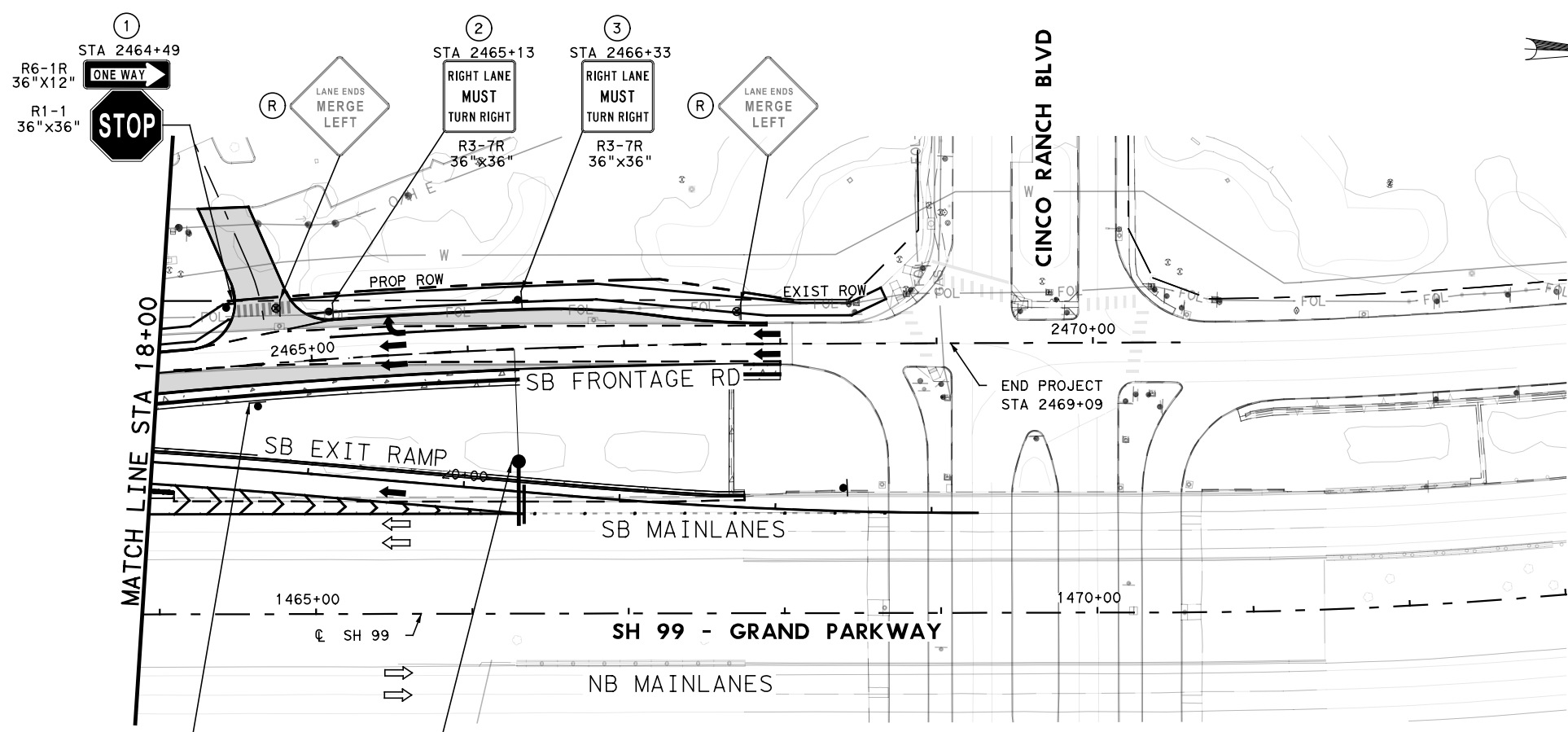
**TEDSI INFRASTRUCTURE GROUP**  
Consulting Engineers  
738 Hwy 6 South, Suite 430  
Houston, Texas 77079  
(832) 619-1000

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SH 99  
SOUTHBOUND FRONTAGE ROAD  
WESTHEIMER PKWY TO CINCO RANCH BLVD  
SIGNING LAYOUT  
SB EXIT RAMP  
START TO STA 18+00  
SHEET 3 OF 4

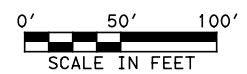
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STRUCTURE NO 1466  
1466+30

- LEGEND**
- ▬ PROPOSED SMALL SIGN
  - ▬ EXISTING GROUND MOUNTED SIGN TO BE REMOVED
  - ▬ PROPOSED CANTILEVER SIGN
  - ⊕ PROPOSED SMALL SIGN NUMBER
  - ⊕ PROPOSED LARGE SIGN NUMBER
  - Ⓡ EXISTING SMALL SIGN TO BE REMOVED
  - Ⓡ EXISTING LARGE SIGN TO BE REMOVED
  - ⇨ DIRECTION OF TRAFFIC FLOW (EXISTING)
  - ⇨ DIRECTION OF TRAFFIC FLOW (PROPOSED)



STATE OF TEXAS  
YOHANNES A. TADESSE  
107781  
REGISTERED PROFESSIONAL ENGINEER  
*Yohannes Tadesse*  
1/19/2023

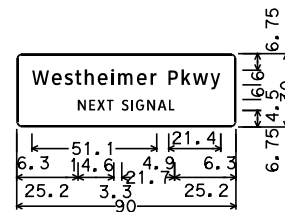
**TEDSI INFRASTRUCTURE GROUP**  
Consulting Engineers  
738 Hwy 6 South, Suite 430  
Houston, Texas 77079  
(832) 619-1000  
TBPE F-1640

Texas Department of Transportation  
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SH 99  
SOUTHBOUND FRONTAGE ROAD  
WESTHEIMER PKWY TO CINCO RANCH BLVD  
SIGNING LAYOUT  
SB EXIT RAMP  
STA 18+00 TO END  
SHEET 4 OF 4

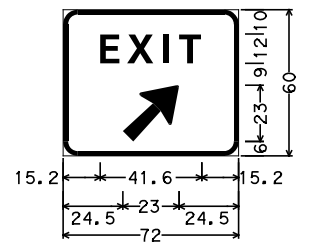
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6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	253

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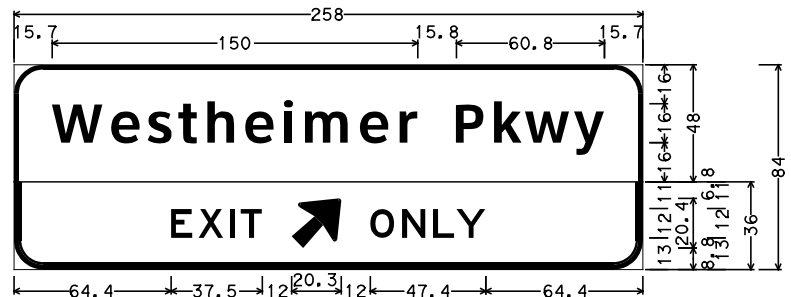
1.9" Radius, 0.8" Border, White on, Green;  
 "Westheimer Pkwy", ClearviewHwy-3-W;  
 "NEXT SIGNAL", ClearviewHwy-3-W;

SIGN NO. = 3  
 LAYOUT SHEET NO. = 1 OF 4  
 STATION = 2434+19  
 MOUNT TYPE = GROUND



6.0" Radius, 2.0" Border, White on, Green;  
 "EXIT", ClearviewHwy-6-W;  
 Arrow A-2 - 29.3" 45';

SIGN NO. = 1  
 LAYOUT SHEET NO. = 3 OF 4  
 STATION = 2463+02  
 MOUNT TYPE = GROUND



E11-1TR;  
 12.0" Radius, 2.0" Border, White on, Green;  
 "Westheimer Pkwy", ClearviewHwy-5-W-R;  
 1.0" Inner border Green, 12.0" Radius, 2.0" Outer border, White on, Yellow;  
 "EXIT" Black, E; Arrow B-3 - 25.0" 45' Black; "ONLY" Black, E;

SIGN NO. = 1  
 LAYOUT SHEET NO. = 4 OF 4  
 STATION = 1466+30  
 MOUNT TYPE = GROUND

NOT TO SCALE



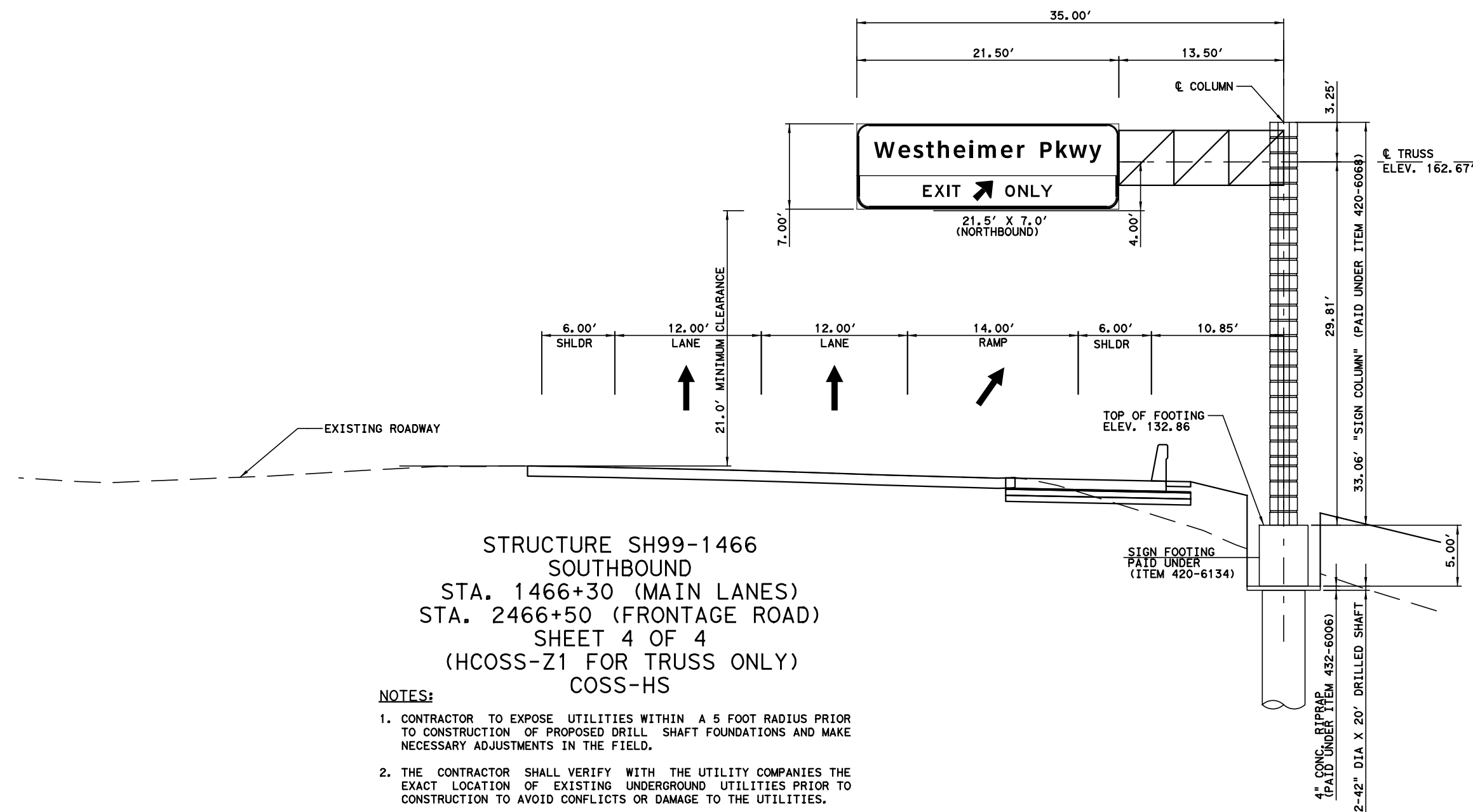
SH 99  
 SOUTHBOUND FRONTAGE ROAD  
 WESTHEIMER PKWY TO CINCO RANCH BLVD  
 GUIDE SIGN  
 DETAILS

SHEET 1 OF 1

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	254

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STRUCTURE INFORMATION	
COLUMN HEIGHT	H=33.06'
DESIGN SIGN AREA	437.50 SF
ACTUAL SIGN AREA	150.50 SF
DESIGN WIND HEIGHT	29.81'
MOMENT	699.28 K-FT
N-VALUE	35
DRILLED SHAFT SIZE	42"
DRILLED SHAFT LENGTH	2-20'
TRUSS WIDTH X DEPTH	4.5' X 4.5'



**STRUCTURE SH99-1466**  
**SOUTHBOUND**  
**STA. 1466+30 (MAIN LANES)**  
**STA. 2466+50 (FRONTAGE ROAD)**  
**SHEET 4 OF 4**  
**(HCOSS-Z1 FOR TRUSS ONLY)**  
**COSS-HS**

- NOTES:**
- CONTRACTOR TO EXPOSE UTILITIES WITHIN A 5 FOOT RADIUS PRIOR TO CONSTRUCTION OF PROPOSED DRILL SHAFT FOUNDATIONS AND MAKE NECESSARY ADJUSTMENTS IN THE FIELD.
  - THE CONTRACTOR SHALL VERIFY WITH THE UTILITY COMPANIES THE EXACT LOCATION OF EXISTING UNDERGROUND UTILITIES PRIOR TO CONSTRUCTION TO AVOID CONFLICTS OR DAMAGE TO THE UTILITIES.
  - ALL SIGN STRUCTURE ELEVATIONS, DETAILS, DIMENSIONS SHOWN SHALL BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO FABRICATION AND CONSTRUCTION.
  - CONTRACTOR SHALL VERIFY PRIOR TO CONSTRUCTION EXISTING ROADWAY GEOMETRICS AND CROSS SECTIONS .

SCALE IN FEET

*Johannes Tadesse*  
 1/19/2023

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 (832) 619-1000

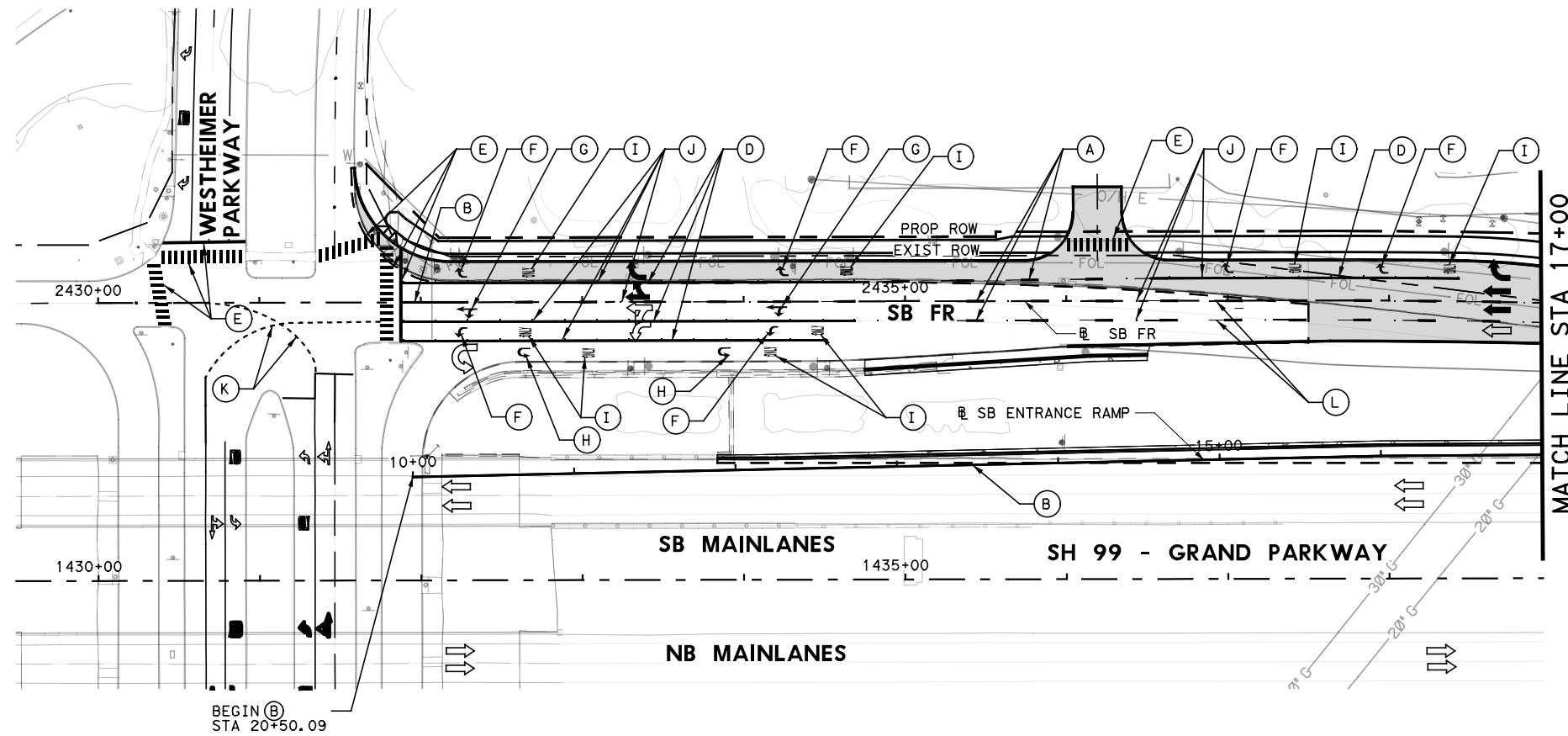
Texas Department of Transportation  
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SH 99  
 SOUTHBOUND FRONTAGE ROAD  
 WESTHEIMER PKWY TO CINCO RANCH BLVD  
**OVERHEAD SIGN**  
**ELEVATION**

FED. RD. DIV. NO.		PROJECT NO.		HIGHWAY NO.	
6				SH 99	
STATE	DIST.	COUNTY			
TEXAS	HOU	FORT BEND			
CONT.	SECT.	JOB	SHEET NO.		
3510	04	055	255		

SHEET 1 OF 1

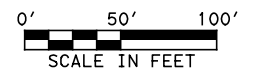
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- LEGEND**
- (A) MULTIPOLYMER PAV MRK (W) (6") (BRK)
  - (B) MULTIPOLYMER PAV MRK (W) (6") (SLD)
  - (C) MULTIPOLYMER PAV MRK (Y) (6") (SLD)
  - (D) MULTIPOLYMER PAV MRK (W) (8") (SLD)
  - (E) MULTIPOLYMER PAV MRK (W) (24") (SLD)
  - (F) MULTIPOLYMER PAV MRK (W) (ARROW)
  - (G) MULTIPOLYMER PAV MRK (W) (DBL ARROW)
  - (H) MULTIPOLYMER PAV MRK (W) (U-TURN ARROW)
  - (I) MULTIPOLYMER PAV MRK (W) (WORD)
  - (J) REFL PAV MRKR TY II-C-R
  - (K) MULTIPOLYMER PAV MRK (W) (6") (DOT)
  - (L) MULTIPOLYMER PAV MRK (BLK) (6") (BRK)
  - (M) MULTIPOLYMER PAV MRK (W) (12") (SLD)
  - ⇨ DIRECTION OF TRAFFIC FLOW (EXISTING)
  - ⇨ DIRECTION OF TRAFFIC FLOW (PROPOSED)

**NOTES:**

1. ALL SIGNING AND PAVEMENT MARKINGS SHALL CONFORM TO THE TEXAS M.U.T.C.D AND FORT BEND COUNTY STANDARD DETAILS.
2. ALL EXISTING PAVEMENT MARKINGS AND SIGNING IN CONFLICT WITH PROPOSED WORK SHALL BE REMOVED.
3. PROPOSED PAVEMENT MARKING SHALL MATCH EXISTING PAVEMENT MARKING AT THE POINT THE PROPOSED MARKINGS MEET THE EXISTING.



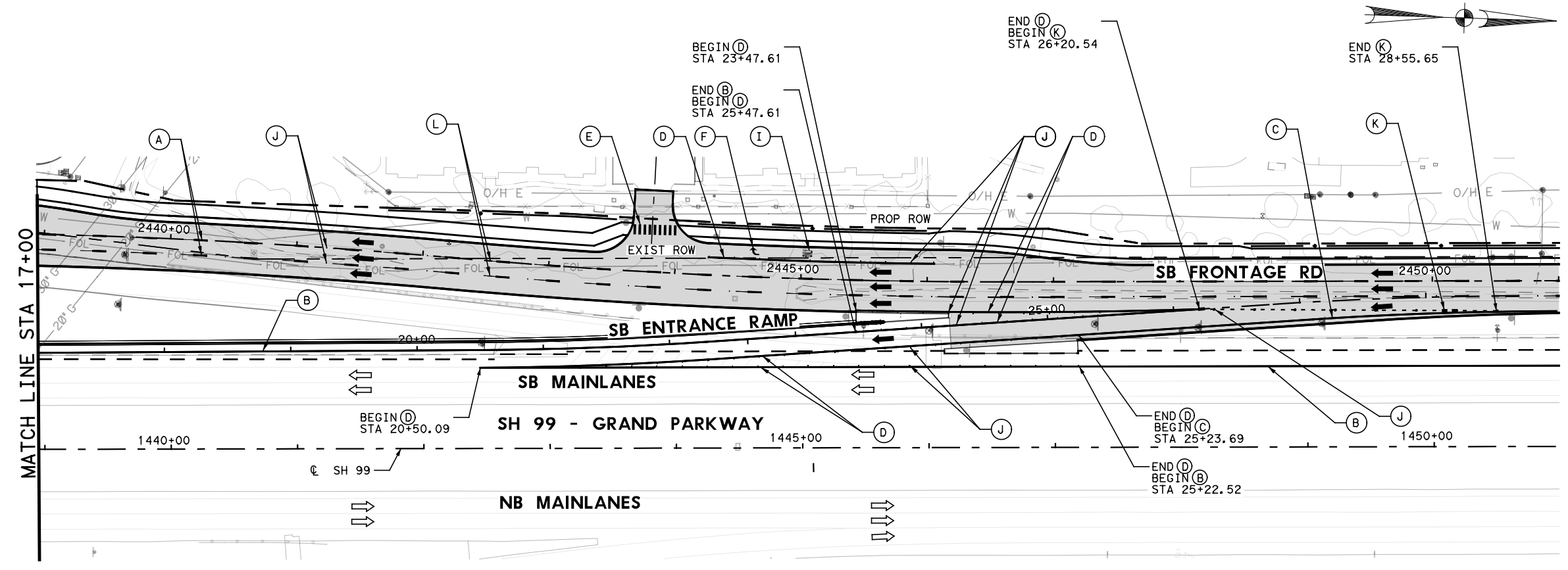
SH 99  
SOUTHBOUND FRONTAGE ROAD  
WESTHEIMER PKWY TO CINCO RANCH BLVD  
PAVEMENT MARKINGS LAYOUT  
SB ENTRANCE RAMP RD  
BEGIN TO STA 17+00

SHEET 1 OF 4

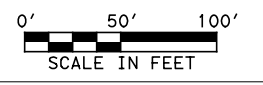
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6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	256

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MATCH LINE STA 17+00



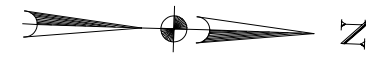
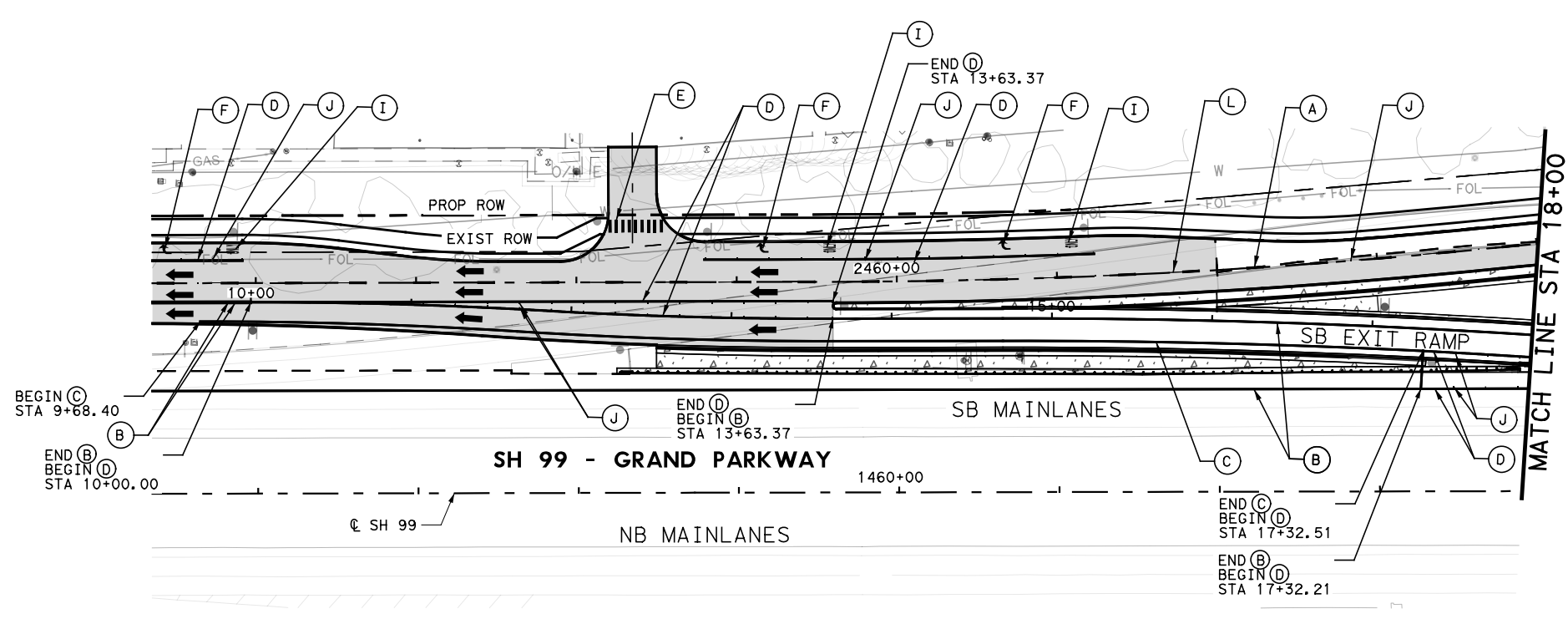
- LEGEND**
- (A) MULTIPOLYMER PAV MRK (W) (6") (BRK)
  - (B) MULTIPOLYMER PAV MRK (W) (6") (SLD)
  - (C) MULTIPOLYMER PAV MRK (Y) (6") (SLD)
  - (D) MULTIPOLYMER PAV MRK (W) (8") (SLD)
  - (E) MULTIPOLYMER PAV MRK (W) (24") (SLD)
  - (F) MULTIPOLYMER PAV MRK (W) (ARROW)
  - (G) MULTIPOLYMER PAV MRK (W) (DBL ARROW)
  - (H) MULTIPOLYMER PAV MRK (W) (U-TURN ARROW)
  - (I) MULTIPOLYMER PAV MRK (W) (WORD)
  - (J) REFL PAV MRKR TY II-C-R
  - (K) MULTIPOLYMER PAV MRK (W) (6") (DOT)
  - (L) MULTIPOLYMER PAV MRK (BLK) (6") (BRK)
  - (M) MULTIPOLYMER PAV MRK (W) (12") (SLD)
  - ⇨ DIRECTION OF TRAFFIC FLOW (EXISTING)
  - ➔ DIRECTION OF TRAFFIC FLOW (PROPOSED)



SH 99  
SOUTHBOUND FRONTAGE ROAD  
WESTHEIMER PKWY TO CINCO RANCH BLVD  
PAVEMENT MARKINGS LAYOUT  
SB ENTRANCE RAMP  
STA 17+00 TO END OF RAMP  
SHEET 2 OF 4

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	257

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- LEGEND**
- (A) MULTIPOLYMER PAV MRK (W) (6") (BRK)
  - (B) MULTIPOLYMER PAV MRK (W) (6") (SLD)
  - (C) MULTIPOLYMER PAV MRK (Y) (6") (SLD)
  - (D) MULTIPOLYMER PAV MRK (W) (8") (SLD)
  - (E) MULTIPOLYMER PAV MRK (W) (24") (SLD)
  - (F) MULTIPOLYMER PAV MRK (W) (ARROW)
  - (G) MULTIPOLYMER PAV MRK (W) (DBL ARROW)
  - (H) MULTIPOLYMER PAV MRK (W) (U-TURN ARROW)
  - (I) MULTIPOLYMER PAV MRK (W) (WORD)
  - (J) REFL PAV MRKR TY II-C-R
  - (K) MULTIPOLYMER PAV MRK (W) (6") (DOT)
  - (L) MULTIPOLYMER PAV MRK (BLK) (6") (BRK)
  - (M) MULTIPOLYMER PAV MRK (W) (12") (SLD)
  - ⇨ DIRECTION OF TRAFFIC FLOW (EXISTING)
  - ➔ DIRECTION OF TRAFFIC FLOW (PROPOSED)

0' 50' 100'  
 SCALE IN FEET

*Johannes Tadesse*  
 1/19/2023

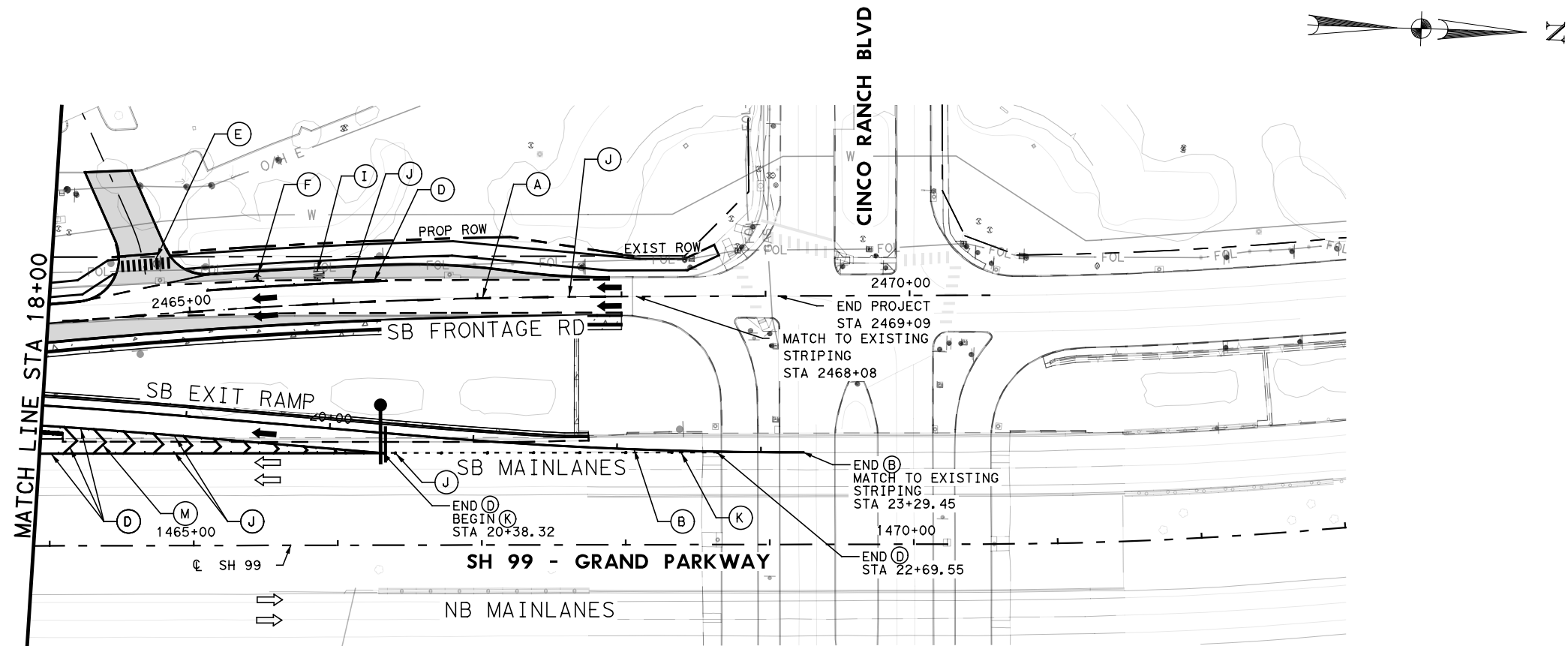
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 Houston, Texas 77079  
 (832) 619-1000

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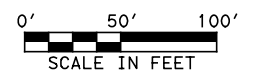
SH 99  
 SOUTHBOUND FRONTAGE ROAD  
 WESTHEIMER PKWY TO CINCO RANCH BLVD  
 PAVEMENT MARKINGS LAYOUT  
 SB EXIT RAMP  
 START TO STA 18+00  
 SHEET 3 OF 4

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	258

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- LEGEND**
- (A) MULTIPOLYMER PAV MRK (W) (6") (BRK)
  - (B) MULTIPOLYMER PAV MRK (W) (6") (SLD)
  - (C) MULTIPOLYMER PAV MRK (Y) (6") (SLD)
  - (D) MULTIPOLYMER PAV MRK (W) (8") (SLD)
  - (E) MULTIPOLYMER PAV MRK (W) (24") (SLD)
  - (F) MULTIPOLYMER PAV MRK (W) (ARROW)
  - (G) MULTIPOLYMER PAV MRK (W) (DBL ARROW)
  - (H) MULTIPOLYMER PAV MRK (W) (U-TURN ARROW)
  - (I) MULTIPOLYMER PAV MRK (W) (WORD)
  - (J) REFL PAV MRKR TY II-C-R
  - (K) MULTIPOLYMER PAV MRK (W) (6") (DOT)
  - (L) MULTIPOLYMER PAV MRK (BLK) (6") (BRK)
  - (M) MULTIPOLYMER PAV MRK (W) (12") (SLD)
  - ⇨ DIRECTION OF TRAFFIC FLOW (EXISTING)
  - ➔ DIRECTION OF TRAFFIC FLOW (PROPOSED)



SH 99  
SOUTHBOUND FRONTAGE ROAD  
WESTHEIMER PKWY TO CINCO RANCH BLVD  
PAVEMENT MARKINGS LAYOUT  
SB EXIT RAMP  
STA 18+00 TO END  
SHEET 4 OF 4

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	259

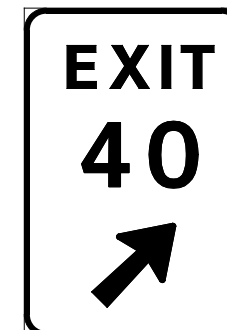
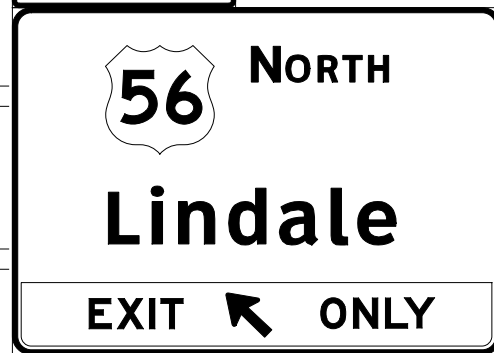


REQUIREMENTS FOR OVERHEAD AND LARGE GROUND-MOUNTED SIGNS

TYPICAL EXAMPLES

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.

**LEFT**  
**EXIT 45**



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

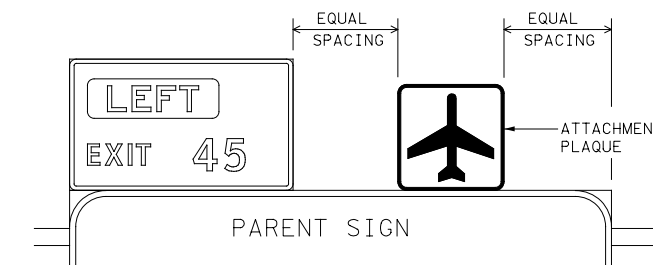
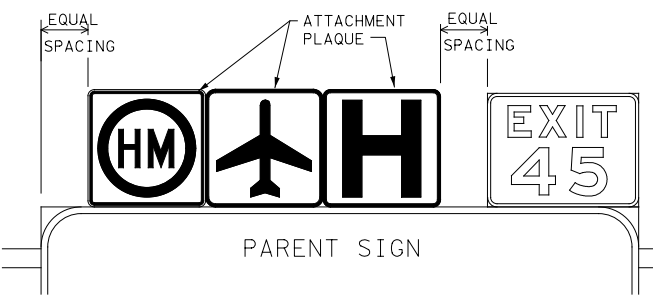
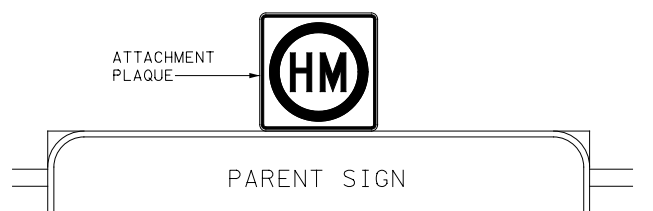
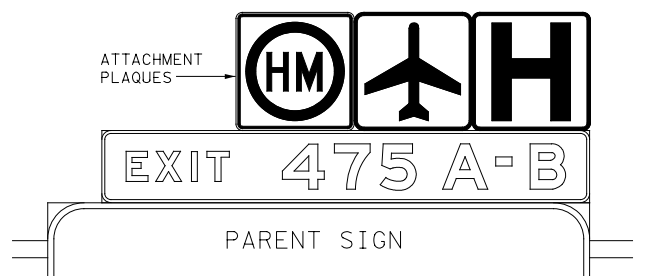
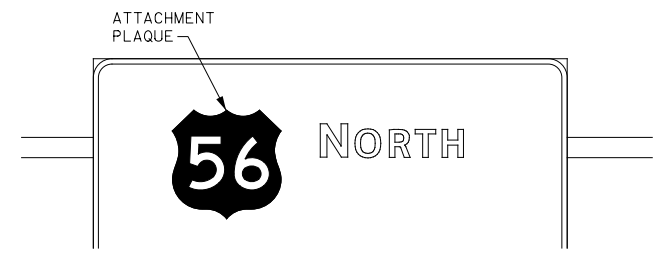
TSR(1)-13

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©TxDOT	October 2003	CONT	3510	SECT	04	JOB	055	HIGHWAY	SH 99
REVISIONS		DIST	COUNTY		SHEET NO.				
12-03	7-13	HOU	FORT BEND		260				
9-08									

DATE:  
FILE:

# REQUIREMENTS FOR ATTACHMENTS TO OVERHEAD AND LARGE GROUND MOUNTED SIGNS

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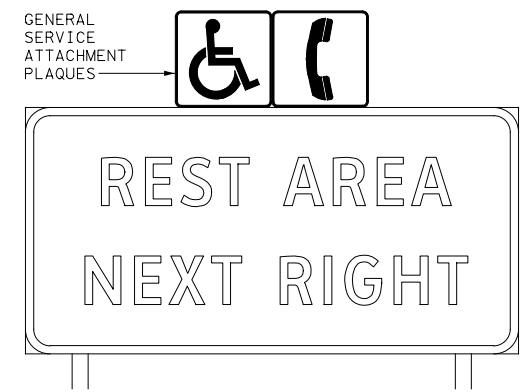


DEPARTMENTAL MATERIAL SPECIFICATIONS	
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

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

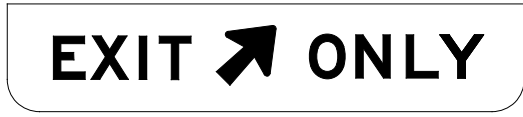
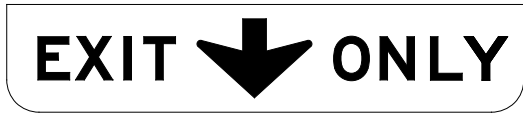
# REQUIREMENTS FOR EXIT ONLY AND LEFT EXIT PANELS

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 <sub>FL</sub> OR C <sub>FL</sub> 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/>

Texas Department of Transportation
Traffic Operations Division Standard

## TYPICAL SIGN REQUIREMENTS

### TSR (2) - 13

FILE: tsr2-13.dgn	DN: TxDOT	CK: TxDOT	OW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	3510	04	055	SH 99
12-03 7-13	DIST	COUNTY	SHEET NO.	
9-08	HOU	FORT BEND	261	

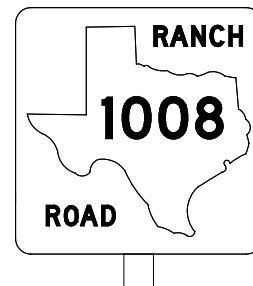
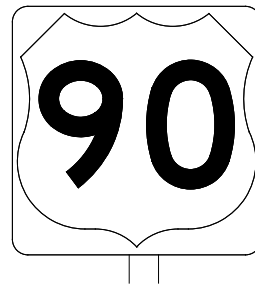
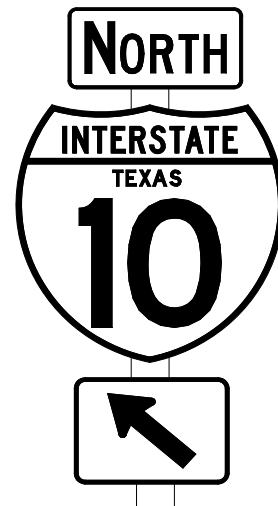
DATE: FILE:

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DATE: FILE:

## REQUIREMENTS FOR INDEPENDENT MOUNTED ROUTE SIGNS

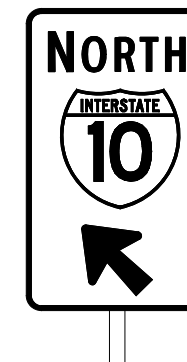
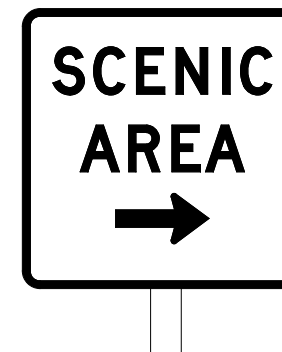
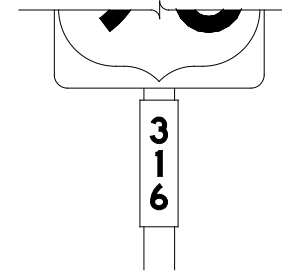
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE A SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & BORDERS	ALL OTHERS	TYPE B or C SHEETING



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/>

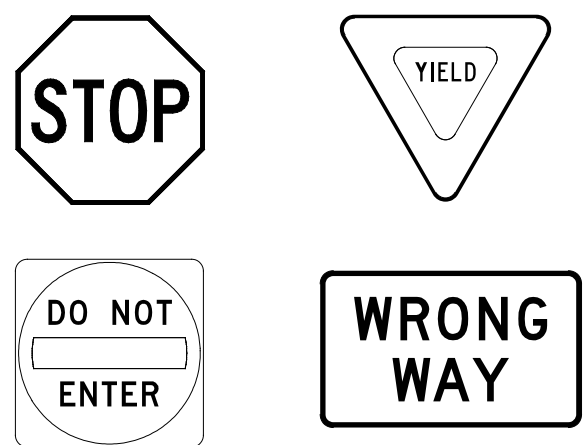
<b>Texas Department of Transportation</b>	<b>Traffic Operations Division Standard</b>
<h1 style="margin: 0;">TYPICAL SIGN REQUIREMENTS</h1> <h2 style="margin: 0;">TSR(3) - 13</h2>	
FILE: tsr3-13.dgn    DN: TxDOT    CK: TxDOT    DW: TxDOT    CK: TxDOT © TxDOT October 2003    CONT SECT    JOB    HIGHWAY REVISIONS    3510 04    055    SH 99 12-03 7-13    DIST    COUNTY    SHEET NO. 9-08    HOU    FORT BEND    262	

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DATE: FILE:

### 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

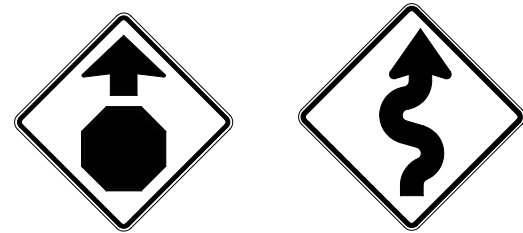
(EXCLUDING STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)



#### 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 <sub>FL</sub> OR C <sub>FL</sub> 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 <sub>FL</sub> OR C <sub>FL</sub> 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/>



## TYPICAL SIGN REQUIREMENTS

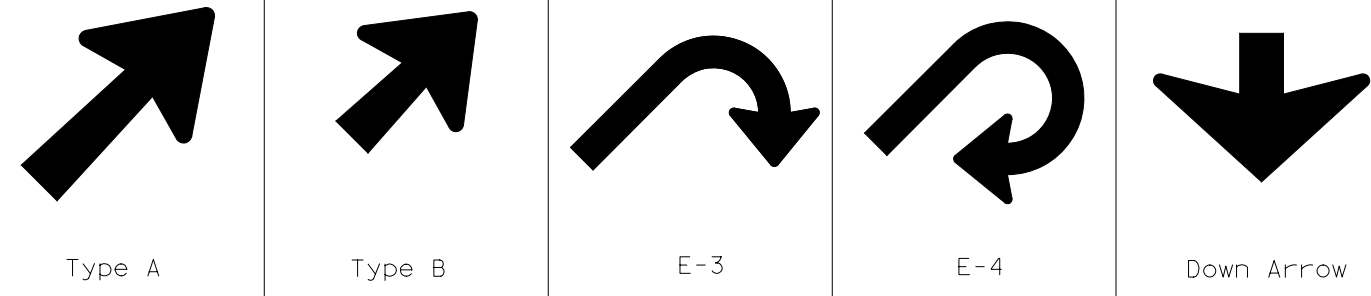
### TSR (4) - 13

FILE:	tsr4-13.dgn	DN:	TxDOT	CK:	TxDOT	DW:	TxDOT	CK:	TxDOT
© TxDOT	October 2003	CONT	SECT	JOB	HIGHWAY				
REVISIONS		3510	04	055	SH 99				
12-03	7-13	DIST	COUNTY		SHEET NO.				
9-08		HOU	FORT BEND		263				

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### ARROW DETAILS

for Large Ground-Mounted and Overhead Guide Signs



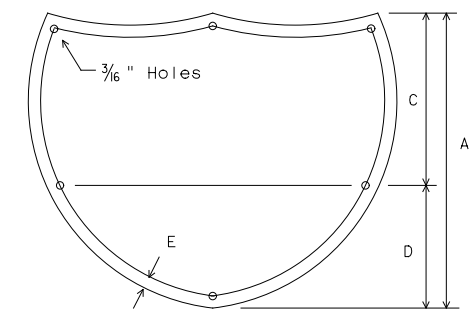
TYPE	LETTER SIZE	USE
A-1	10.67" U/L and 10" Caps	Single Lane Exits
A-2	13.33" U/L and 12" Caps	
A-3	16" & 20" U/L	
B-1	10.67" U/L and 10" Caps	Multiple Lane Exits
B-2	13.33" U/L and 12" Caps	
B-3	16" & 20" U/L	

CODE	USED ON SIGN NO.
E-3	E5-1aT
E-4	E5-1bT

NOTE  
 Arrow dimensions are shown in the "Standard Highway Sign Designs for Texas" manual.

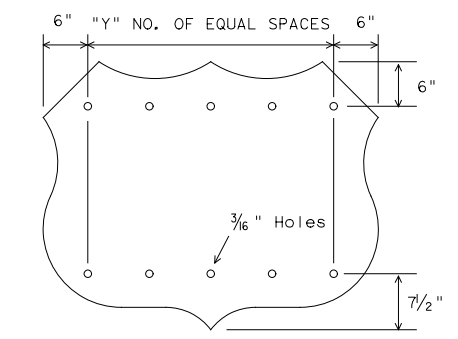
The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website:  
<http://www.txdot.gov/>

### SIGN BLANK PUNCHING DETAILS FOR ATTACHMENTS WHEN SPECIFIED TO BE TYPE A ALUMINUM SIGNS (FOR MOUNTING TO GUIDE SIGN FACE)



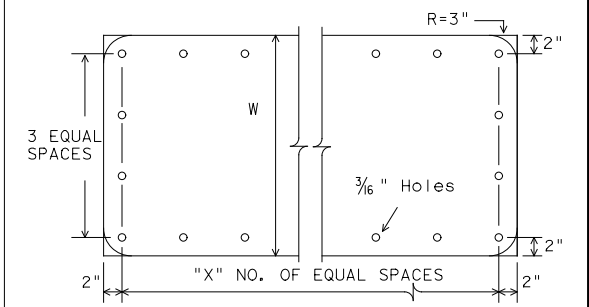
INTERSTATE ROUTE MARKERS

A	C	D	E
36	21	15	1 1/2
48	28	20	1 3/4



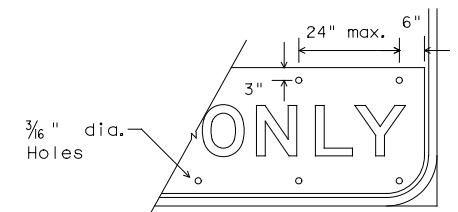
U.S. ROUTE MARKERS

Sign Size	"Y"
24x24	2
30x24	3
36x36	3
45x36	4
48x48	4
60x48	5



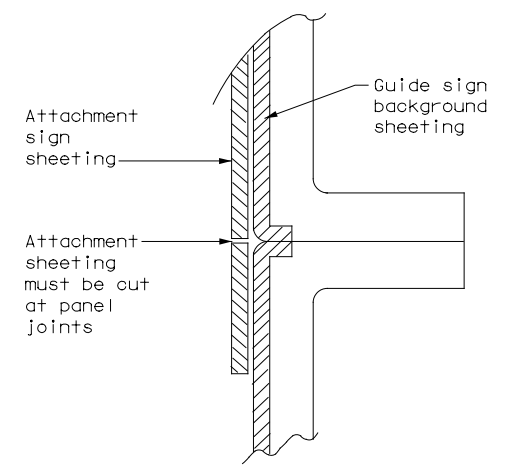
STATE ROUTE MARKERS

No. of Digits	W	X
4	24	4
4	36	5
4	48	6
3	24	3
3	36	4
3	48	5

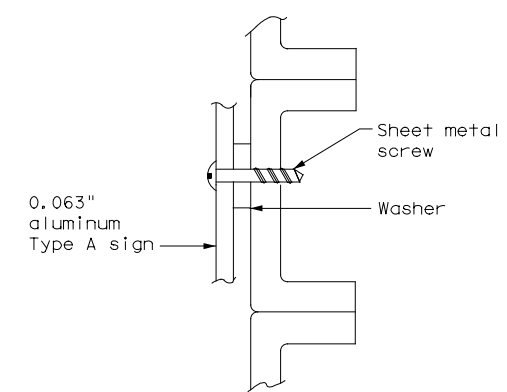


EXIT ONLY PANEL

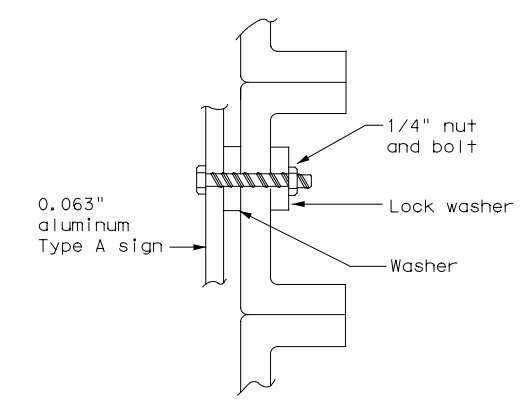
### MOUNTING DETAILS OF ATTACHMENTS TO GUIDE SIGN FACE ("EXIT ONLY" AND "LEFT EXIT" PANELS, ROUTE MARKERS AND OTHER ATTACHMENTS)



DIRECT APPLIED ATTACHMENT



SCREW ATTACHMENT

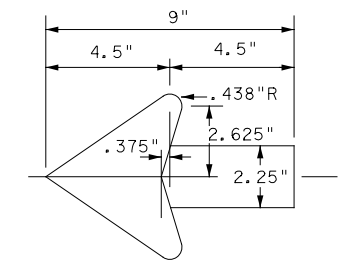


NUT/BOLT ATTACHMENT

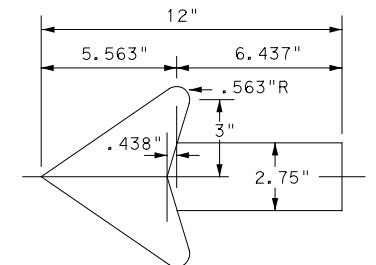
- NOTE:
- Sheeting for legend, symbols, and borders must be cut at panel joints.
  - Direct applied attachment signs will be subsidiary to "Aluminum Signs" or "Fiberglass Signs".

- 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

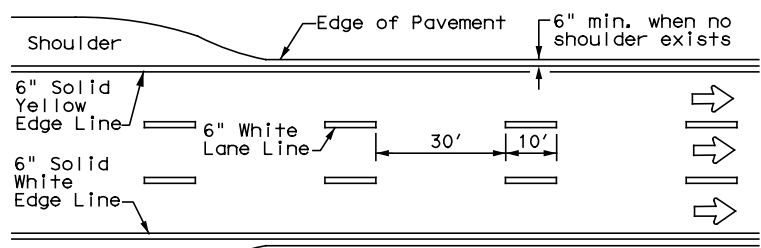
#### TSR (5) - 13

FILE: tsr5-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	3510	04	055	SH 99
12-03 7-13	DIST	COUNTY	SHEET NO.	
9-08	HOU	FORT BEND	264	

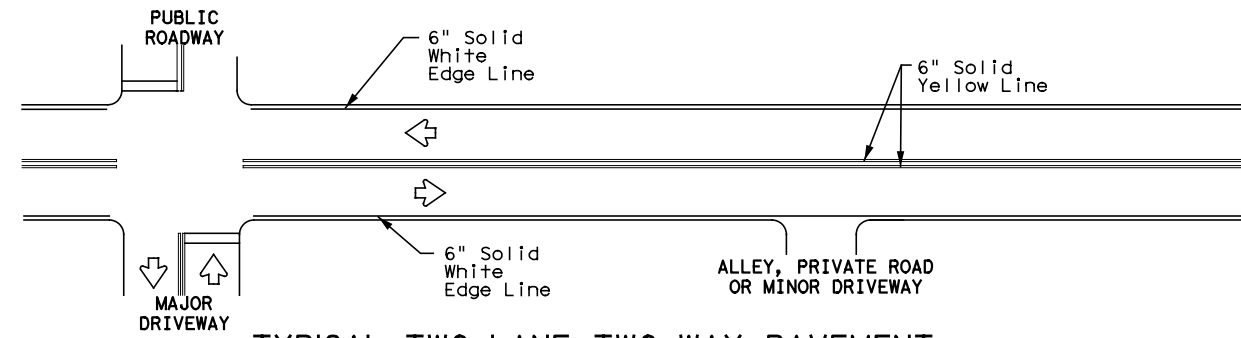
DATE:  
FILE:

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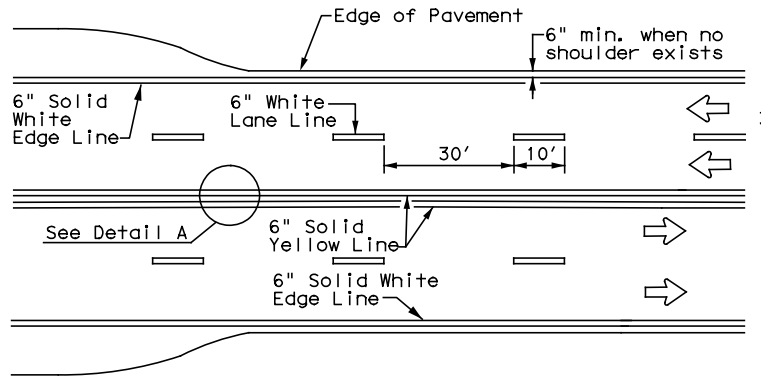
DATE: FILE:



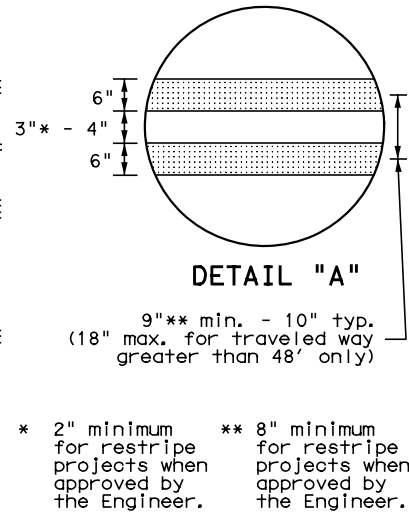
**EDGE LINE AND LANE LINES  
ONE-WAY ROADWAY  
WITH OR WITHOUT SHOULDERS**



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

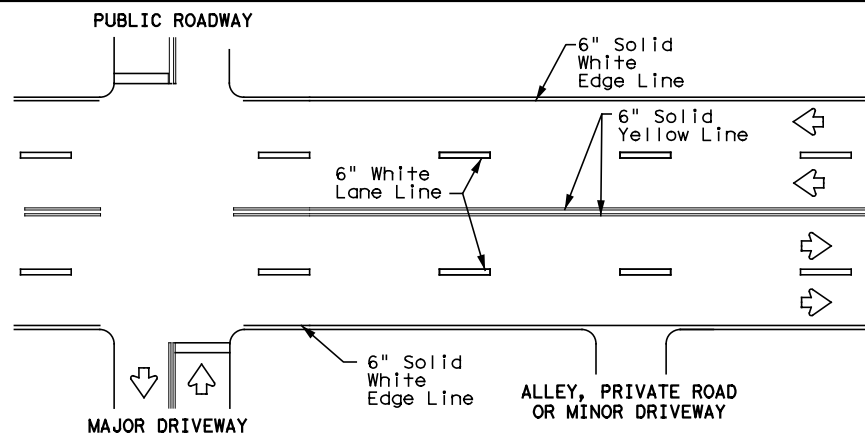


**CENTERLINE AND LANE LINES  
FOUR LANE TWO-WAY ROADWAY  
WITH OR WITHOUT SHOULDERS**

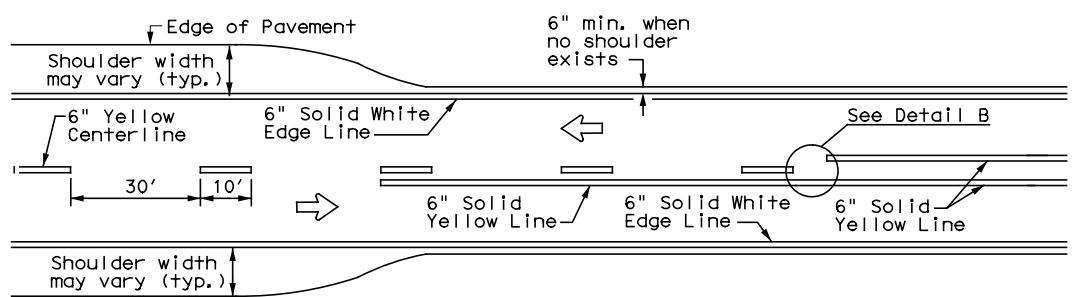


**DETAIL "A"**  
 9" min. - 10" typ.  
 (18" max. for traveled way greater than 48' only)

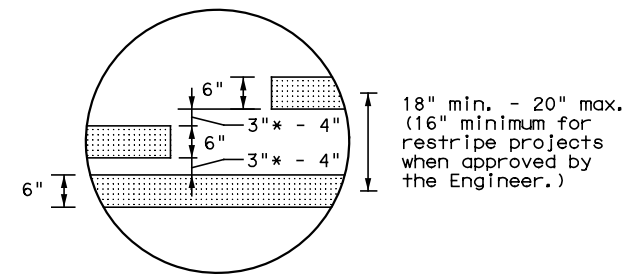
\* 2" minimum for restripe projects when approved by the Engineer.  
 \*\* 8" minimum for restripe projects when approved by the Engineer.



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

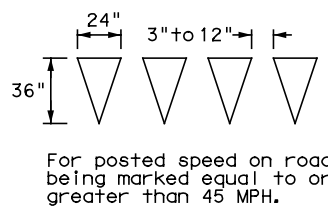


**TWO LANE TWO-WAY ROADWAY  
WITH OR WITHOUT SHOULDERS**



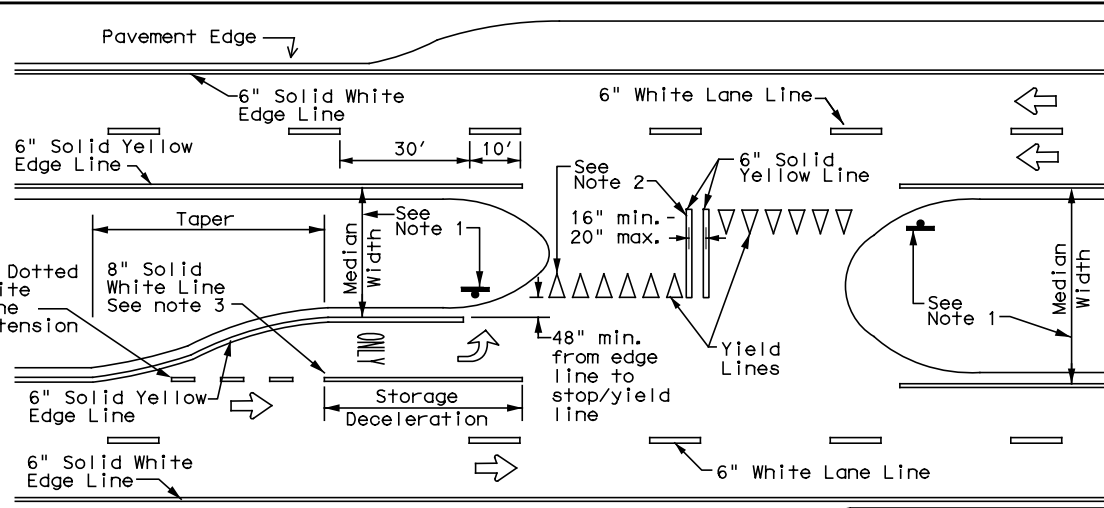
**DETAIL "B"**  
 18" min. - 20" max.  
 (16" minimum for restripe projects when approved by the Engineer.)

\* 2" minimum for restripe projects when approved by the Engineer.



**YIELD LINES**

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



**FOUR LANE DIVIDED ROADWAY CROSSOVERS**

**NOTES**

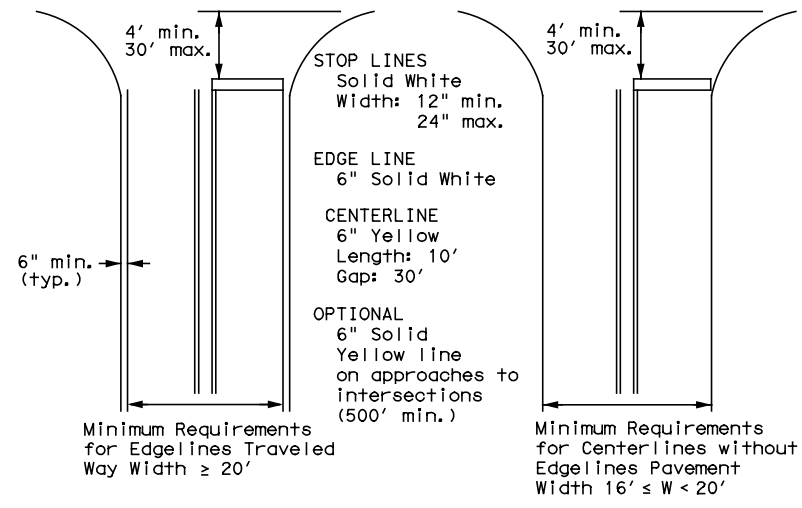
- Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections. Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling width to determine if signs are required. Yield signs are the typical intersection control. Stop signs and stop bars are optional as determined by the Engineer.
- Install median striping (double yellow centerlines and stop lines/yield lines) when a 50' or greater median centerline can be placed. Stop lines shall only be used with stop signs. Yield lines shall only be used with yield signs.
- 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**

- Edge line striping shall be as shown in the plans or as directed by the Engineer. The edge line should not be placed less than 6 inches from the edge of pavement. This distance may vary due to pavement raveling or other conditions. Edge lines are not required in curb and gutter sections of roadways.
- The traveled way includes only that portion of the roadway used for vehicular travel. It does not include the parking lanes, sidewalks, berms and shoulders. The traveled ways shall be measured from the center of edge line to the center of edge line of a two lane roadway.

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

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



NOTE: Traveled way is exclusive of shoulder widths. Refer to General Note 2 for additional details.

**GUIDE FOR PLACEMENT OF STOP LINES,  
EDGE LINE & CENTERLINE**  
 Based on Traveled Way and Pavement Widths for Undivided Roadways



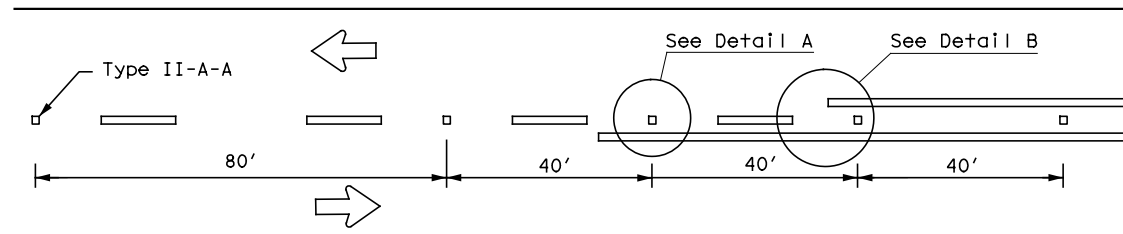
**TYPICAL STANDARD  
PAVEMENT MARKINGS**

**PM(1)-22**

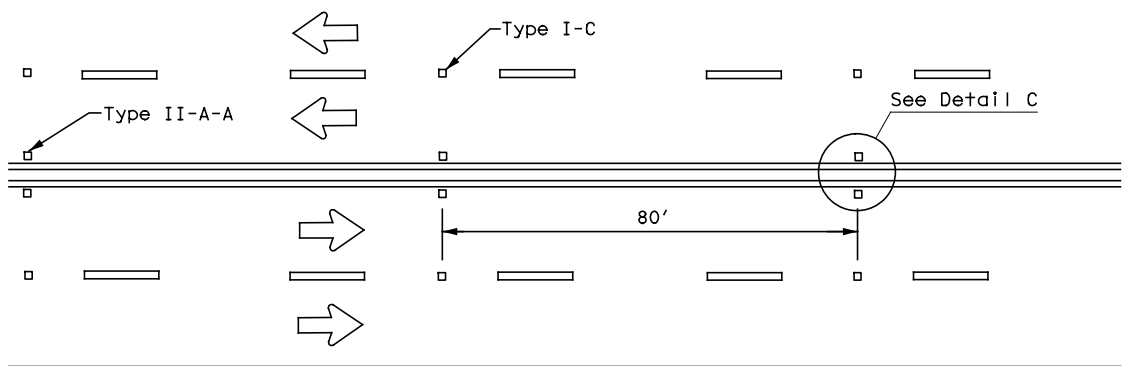
FILE: pml-22.dgn	DN: 3510	CK: 04	DW: 055	CK: SH 99
© TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	3510	04	055	SH 99
11-78 8-00 6-20	DIST	COUNTY	SHEET NO.	
8-95 3-03 12-22	HOU	FORT BEND	265	
5-00 2-12				

# REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE

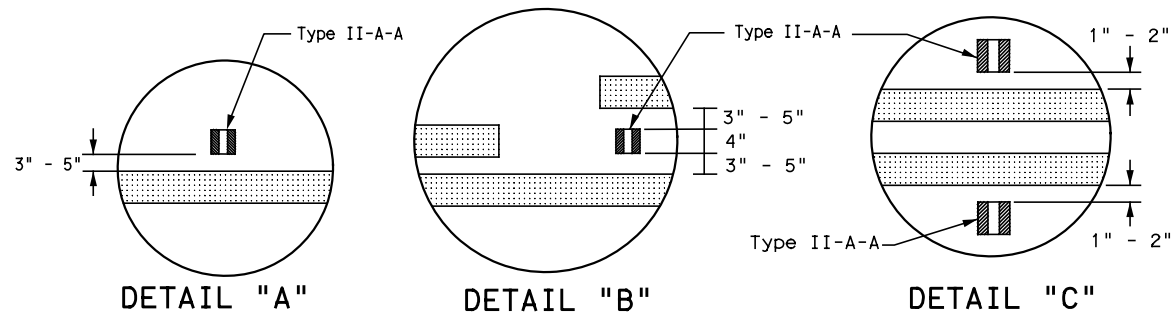
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CENTERLINE FOR ALL TWO LANE TWO-WAY ROADWAYS



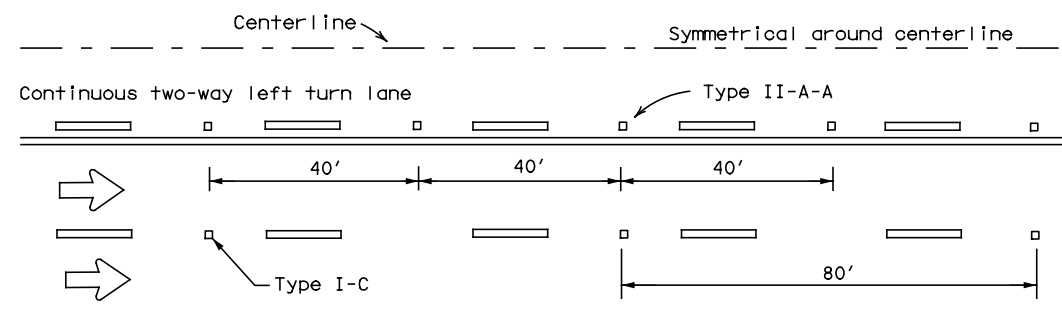
CENTERLINE & LANE LINES  
FOR FOUR LANE TWO-WAY ROADWAYS



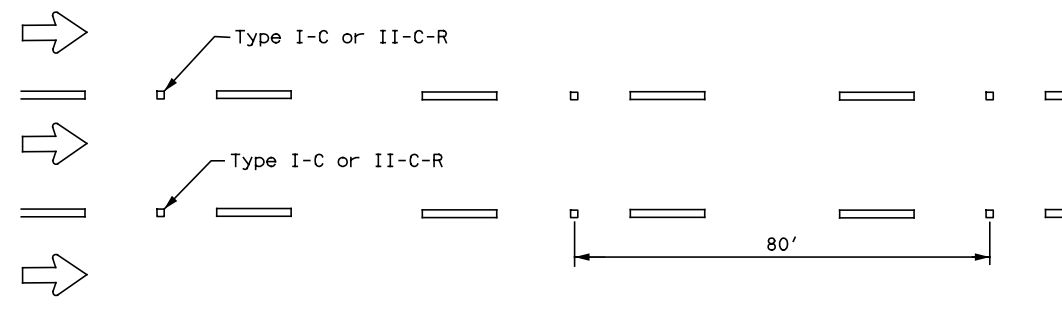
DETAIL "A"

DETAIL "B"

DETAIL "C"



CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE

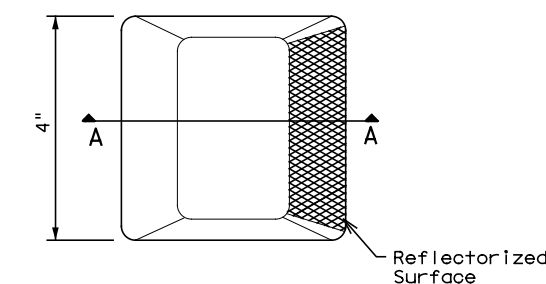


LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

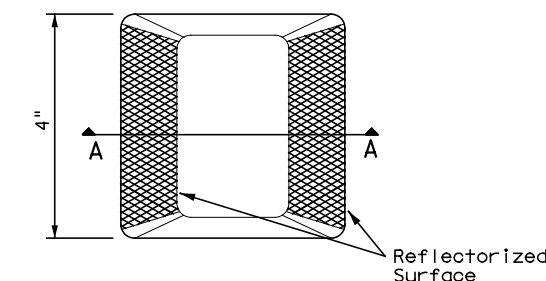
Raised pavement markers Type II-C-R shall have clear face toward normal traffic and red face toward wrong-way traffic.  
See Note 3.

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

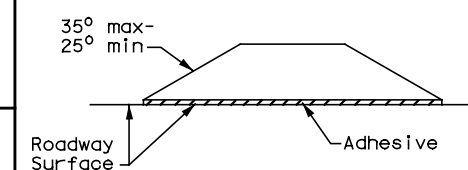
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)

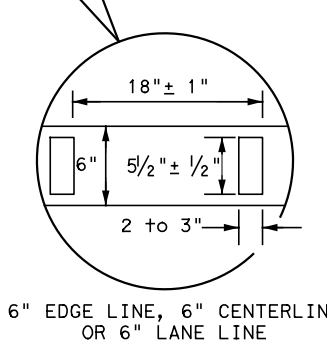
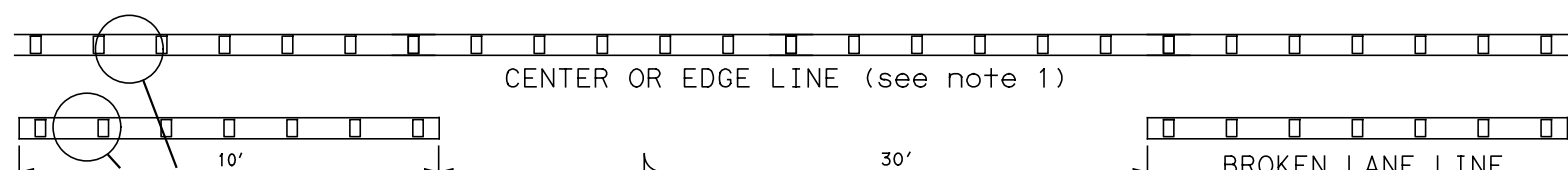


Type II (Top View)



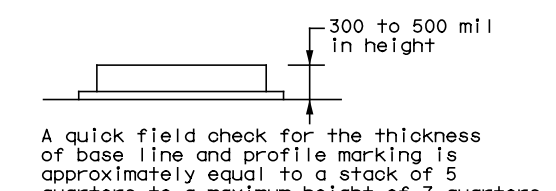
SECTION A

RAISED PAVEMENT MARKERS



REFLECTORIZED PROFILE  
PATTERN DETAIL  
USING REFLECTIVE PROFILE PAVEMENT MARKINGS

6" EDGE LINE, 6" CENTERLINE  
OR 6" LANE LINE



- NOTES**
- Edge lines should typically be 6" wide and the materials shall be specified in the plans.
  - Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

- GENERAL NOTES**
- All raised pavement markers placed along 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.
  - Use raised pavement marker Type I-C with undivided roadways, flush medians and two way left turn lanes. Use raised pavement marker Type II-C-R with divided highways and raised medians.



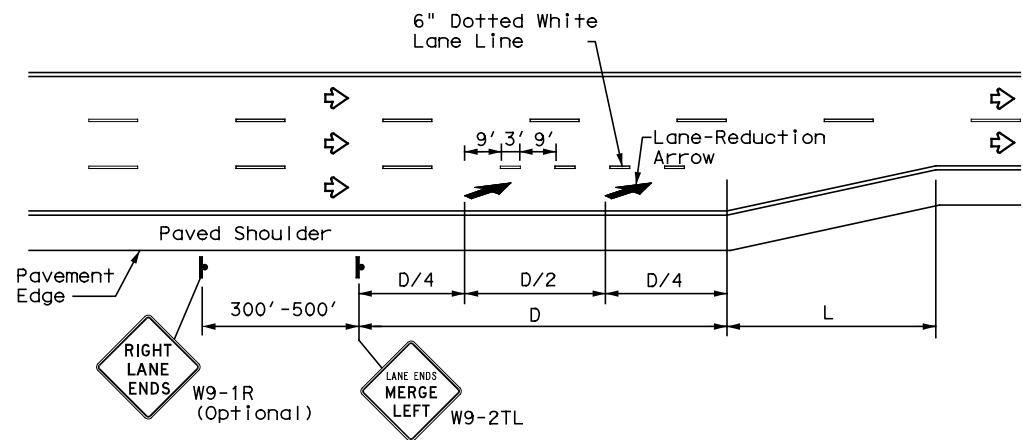
## POSITION GUIDANCE USING RAISED MARKERS REFLECTORIZED PROFILE MARKINGS PM(2)-22

FILE: pm2-22.dgn	DN:	CK:	DW:	CK:
© TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	3510	04	055	SH 99
4-77 8-00 6-20	DIST	COUNTY	SHEET NO.	
4-92 2-10 12-22	HOU	FORT BEND	266	
5-00 2-12				

DATE:  
FILE:

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DATE: FILE:



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 RIGHT LANE ENDS (W9-1R) sign may be installed in the median aligned with the W9-1R sign on the right side of the highway.
- 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.

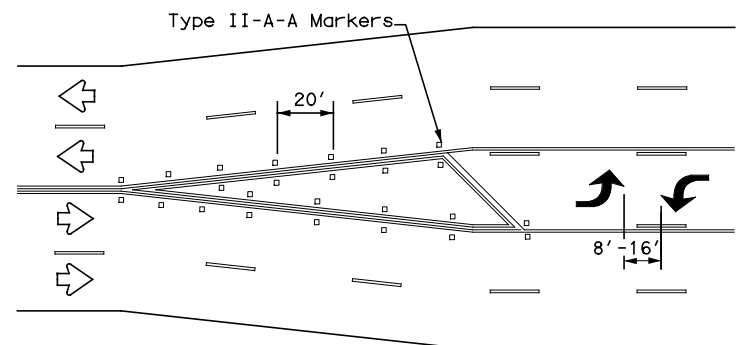
ADVANCED WARNING SIGN DISTANCE (D)		
Posted Speed	D (ft)	L (ft)
30 MPH	460	$L = \frac{WS^2}{60}$
35 MPH	565	
40 MPH	670	L=WS
45 MPH	775	
50 MPH	885	
55 MPH	990	
60 MPH	1,100	
65 MPH	1,200	
70 MPH	1,250	
75 MPH	1,350	

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. See Chapter 3 of the Roadway Design Manual for additional information on turning lanes or storage lengths.

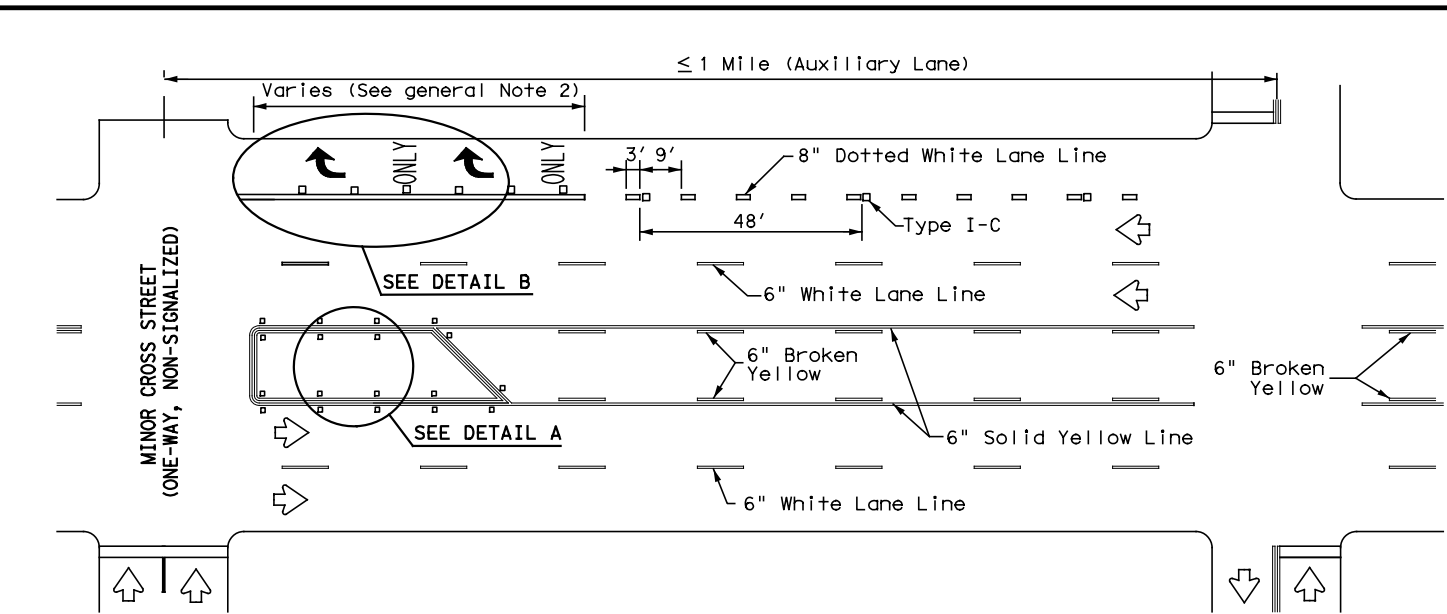
MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

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

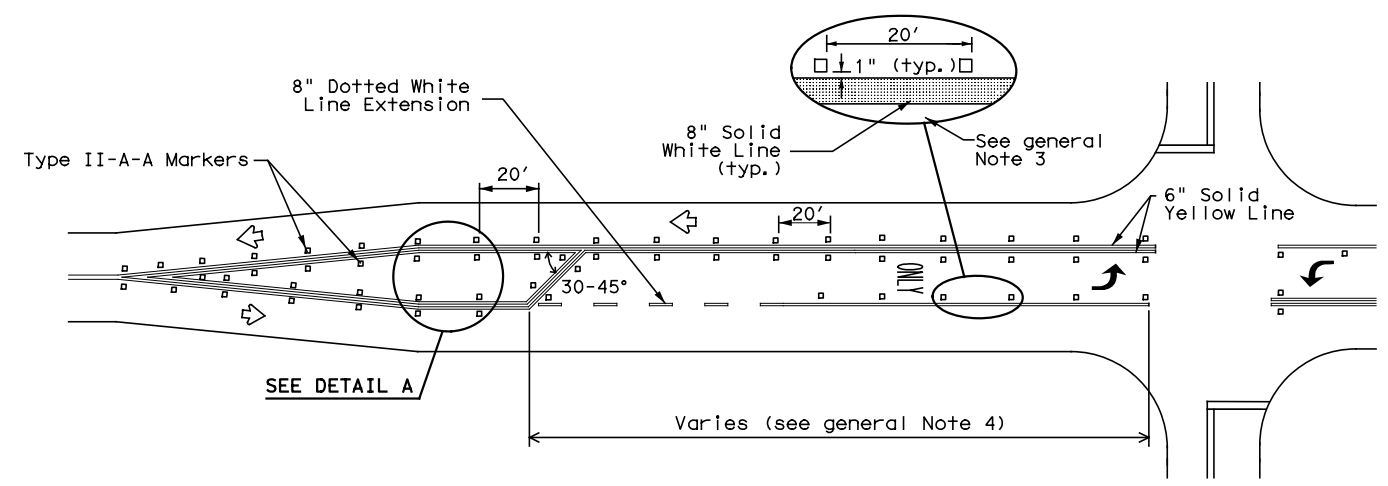


A two-way left-turn (TWLTL) lane-use arrow pavement marking should be used at or just downstream from the beginning of a two-way left-turn lane within a corridor. Repeating the marking after each intersection or dedicated turn bay is not required unless stated elsewhere in the plans.

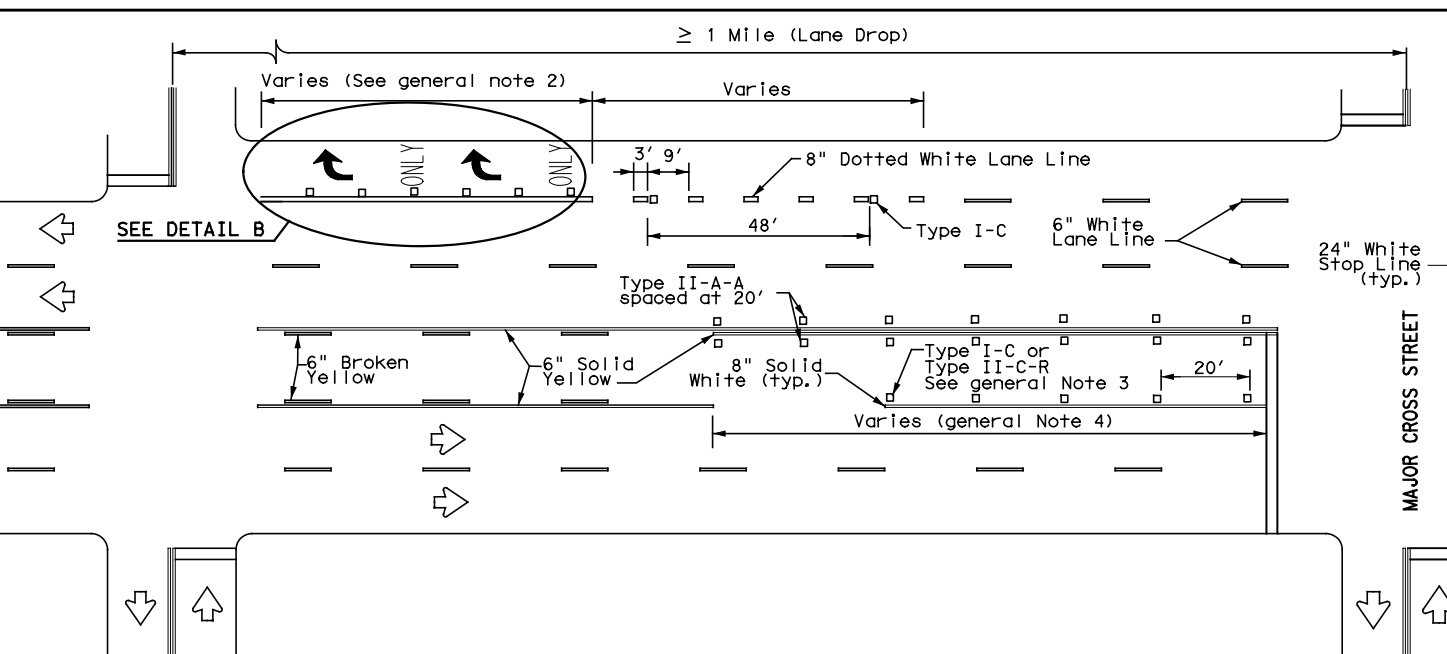
TYPICAL TRANSITION FOR TWLTL AND DIVIDED HIGHWAY



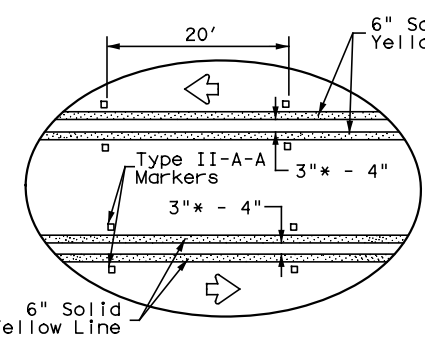
TYPICAL TWLTL AT ONE-WAY STREET AND RIGHT TURN AUXILIARY LANE



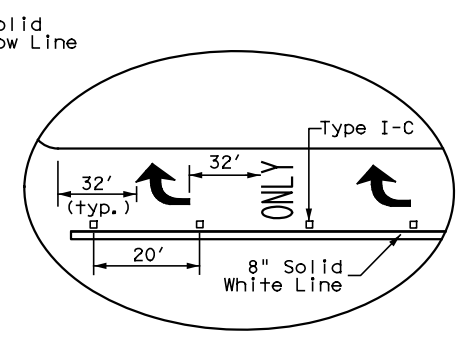
TYPICAL TWO-LANE ROADWAY INTERSECTION WITH LEFT TURN BAYS



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



DETAIL A



DETAIL B

\* 2" minimum allowed for restripe projects when approved by the Engineer.

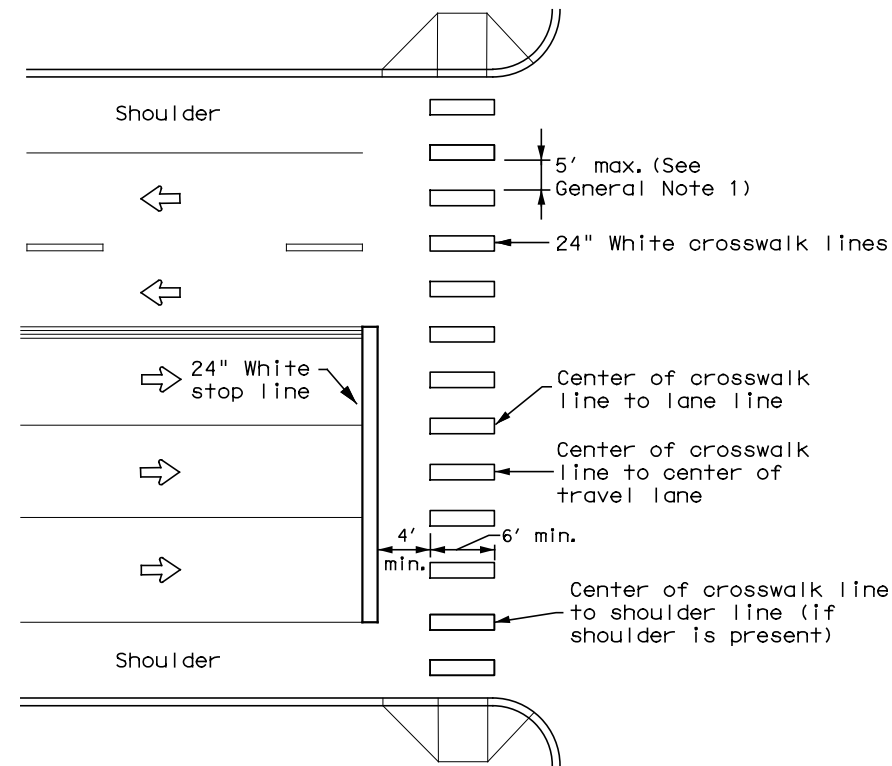
Texas Department of Transportation  
Traffic Safety Division Standard

### TWO-WAY LEFT TURN LANES, RURAL LEFT TURN BAYS, AND LANE REDUCTION PAVEMENT MARKINGS PM(3)-22

FILE: pm3-22.dgn	DN:	CK:	DW:	CK:
© TxDOT Revision 2022	CONT	SECT	JOB	HIGHWAY
4-98	3-03	6-20	3510	04
5-00	2-10	12-22	055	SH 99
8-00	2-12		DIST	COUNTY
			HOU	FORT BEND
				SHEET NO.
				267



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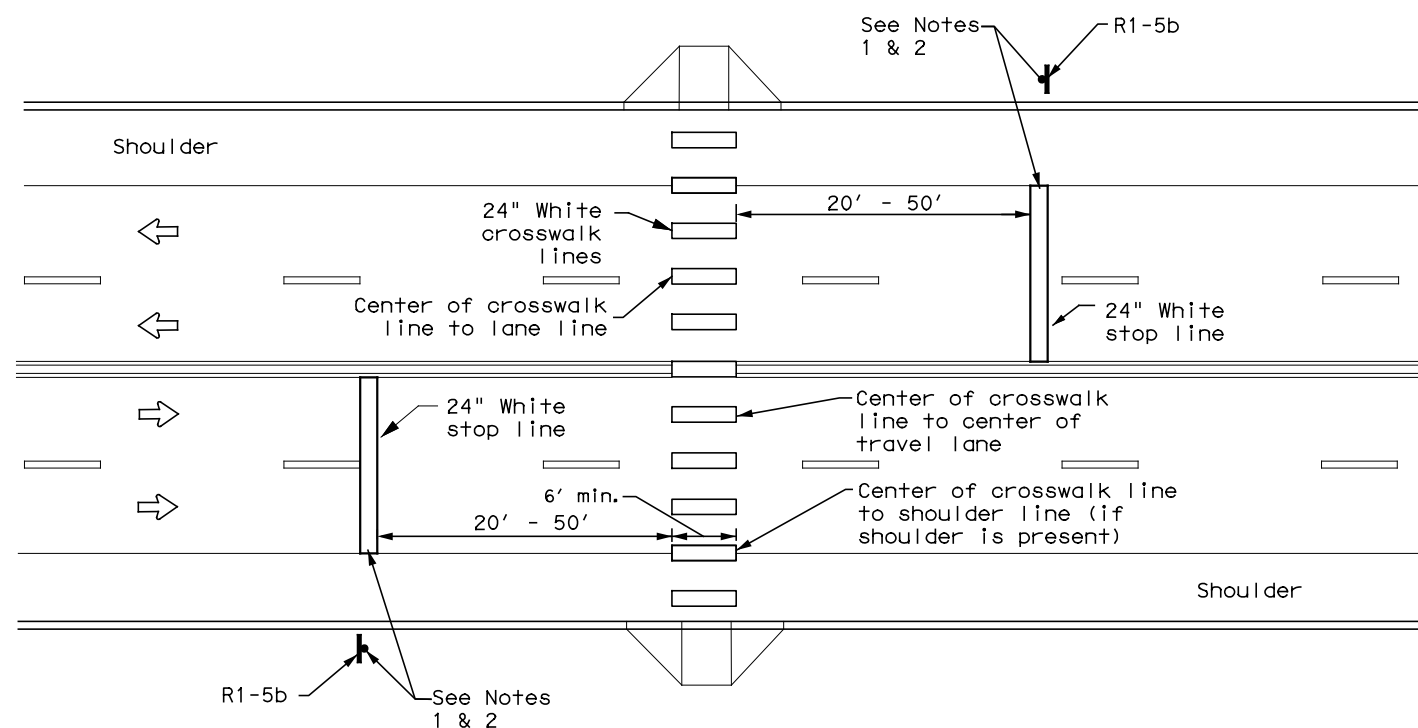
HIGH-VISIBILITY LONGITUDINAL CROSSWALK AT CONTROLLED APPROACH

GENERAL NOTES

1. Longitudinal crosswalk lines should not be placed in the wheel path of vehicles. Center the crosswalk lines on travel lanes, lane lines, and shoulder lines (if present).
2. A minimum 6" clear distance shall be provided to the curb face. If the last crosswalk line falls into this distance it must be omitted.
3. For divided roadways, adjustments in spacing of the crosswalk lines should be made in the median so that the crosswalk lines are maintained in their proper location across the travel portion of the roadway.
4. At skewed crosswalks, the crosswalk lines are to remain parallel to the lane lines.
5. Each crosswalk shall be a minimum of 6' wide.
6. The High-Visibility Longitudinal Crosswalk is the preferred crosswalk pattern on State Highways. Other crosswalk patterns as shown in the "Texas Manual on Uniform Traffic Control Devices" may be used. All crosswalk designs and dimension shall comply with the "Texas Manual on Uniform Traffic Control Devices."
7. Final placement of Stop Bar and Crosswalk shall be approved by the Engineer in the field.

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

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



UNSIGNALIZED MIDBLOCK HIGH-VISIBILITY LONGITUDINAL CROSSWALK

NOTES:

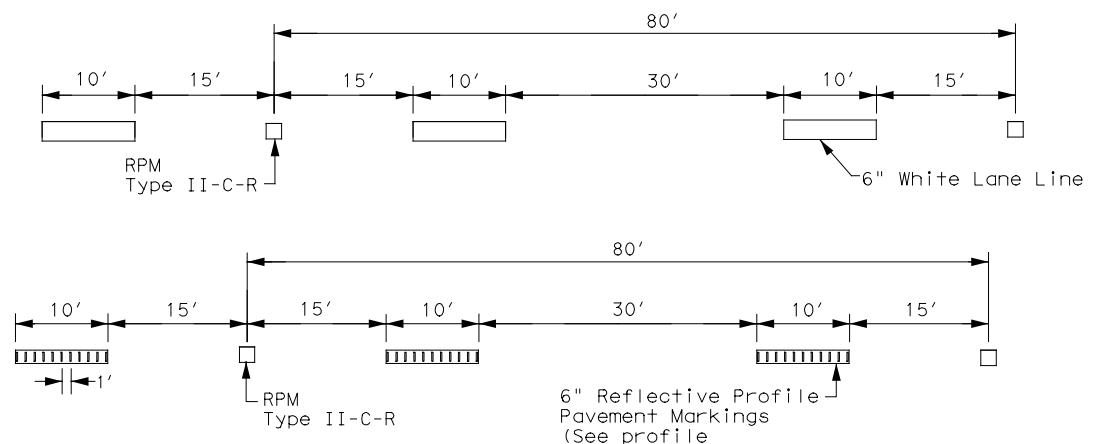
1. Use stop bars with Stop Here For Pedestrians (R1-5b) signs at unsignalized midblock crosswalks.
2. Use stop bars with STOP HERE ON RED (R10-6 or R10-6a) signs at mid block crosswalks controlled by traffic signals or pedestrian hybrid beacons.

DATE:  
FILE:

<h2>CROSSWALK PAVEMENT MARKINGS</h2> <h3>PM(4)-22A</h3>			
FILE: pm4-22a.dgn	DN:	CK:	DW:
© TxDOT December 2022	CONT	SECT	JOB
REVISIONS	3510	04	055
6-20	DIST	COUNTY	SHEET NO.
6-22	HOU	FORT BEND	268
12-22			

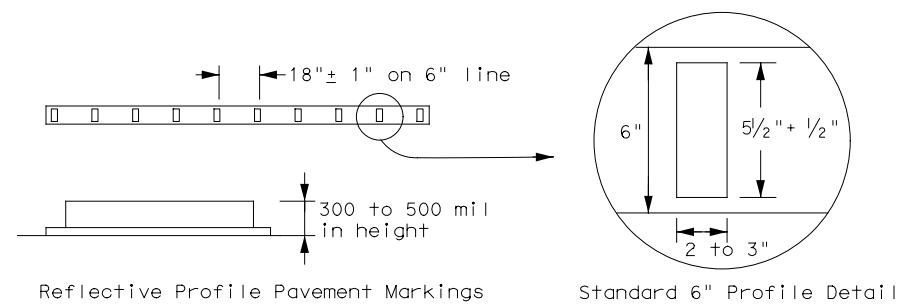
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DATE: FILE:



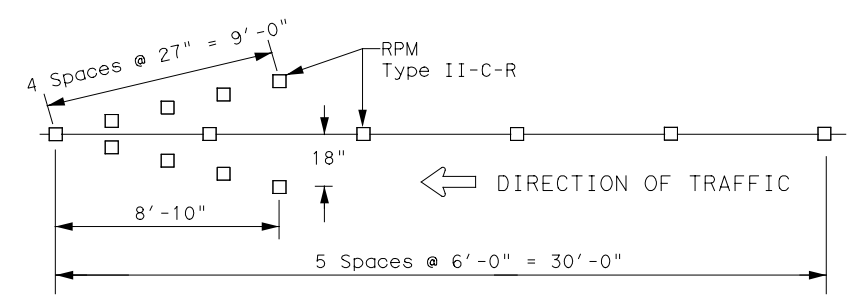
**NOTE**  
 Reflectorized raised pavement markers Type II-C-R shall be spaced on 80' centers with the clear face toward normal traffic and the red face toward wrong way traffic. All raised pavement markers placed along broken lines shall be placed in line with and midway between the stripes.

**TRAFFIC LANE LINES PAVEMENT MARKING**



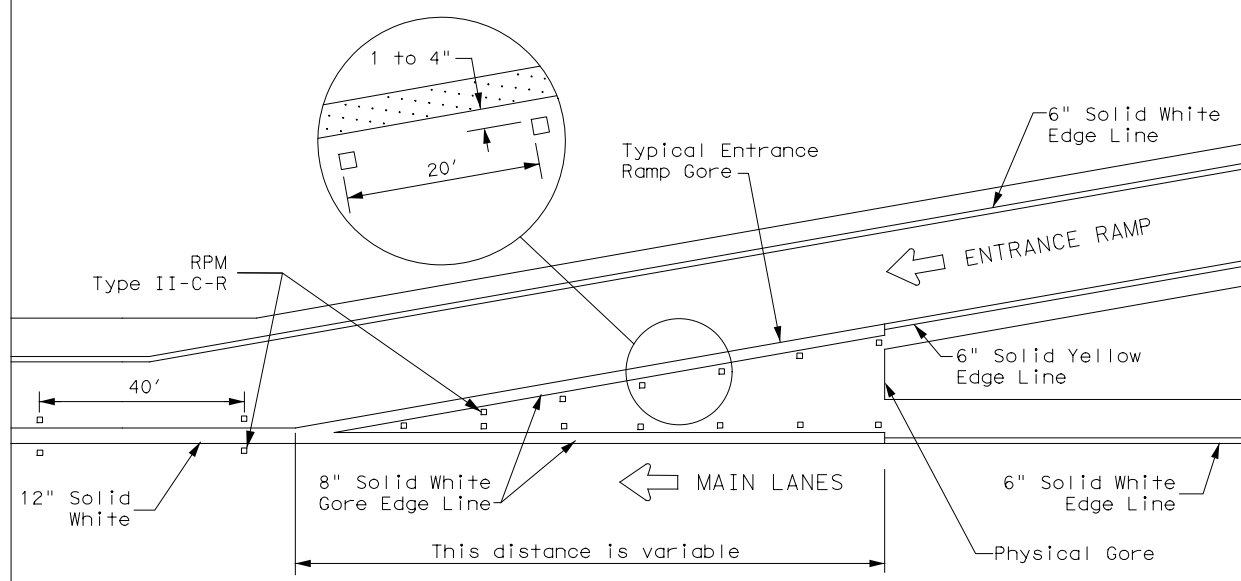
**NOTE**  
 Edge lines should typically be 6" wide and the materials shall be as specified in the plans. See details above if reflective profile pavement markings are to be used.

**EDGE LINE PAVEMENT MARKINGS**

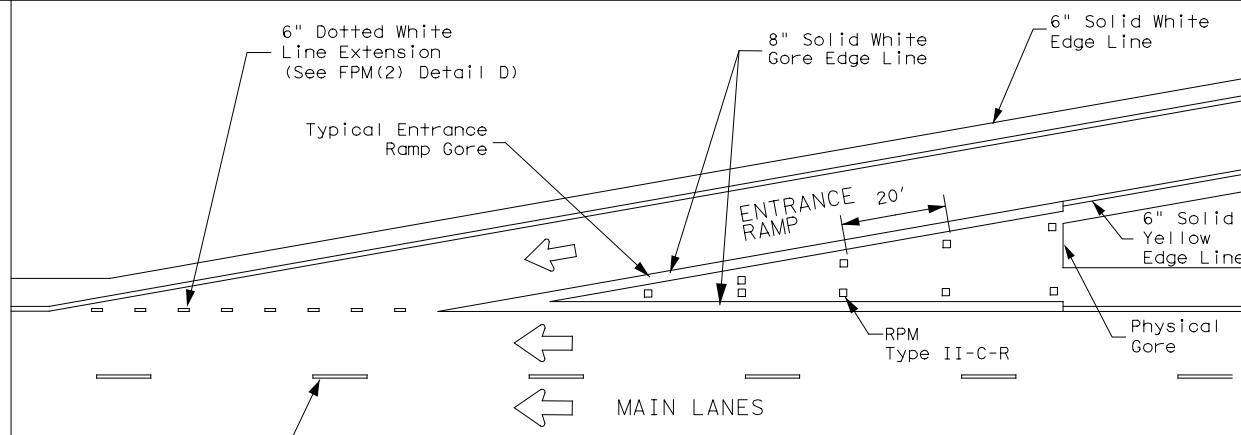


**NOTES**  
 1. Reflectorized raised pavement markers Type-II-C-R in the wrong way arrow shall have the clear face toward normal traffic and the red face toward the wrong way traffic.  
 2. Red reflectorized wrong way arrows, not to exceed two, may be placed on exit ramps. Locations of the arrows shall be as shown in the plans or as directed by the engineer.

**WRONG WAY ARROW**

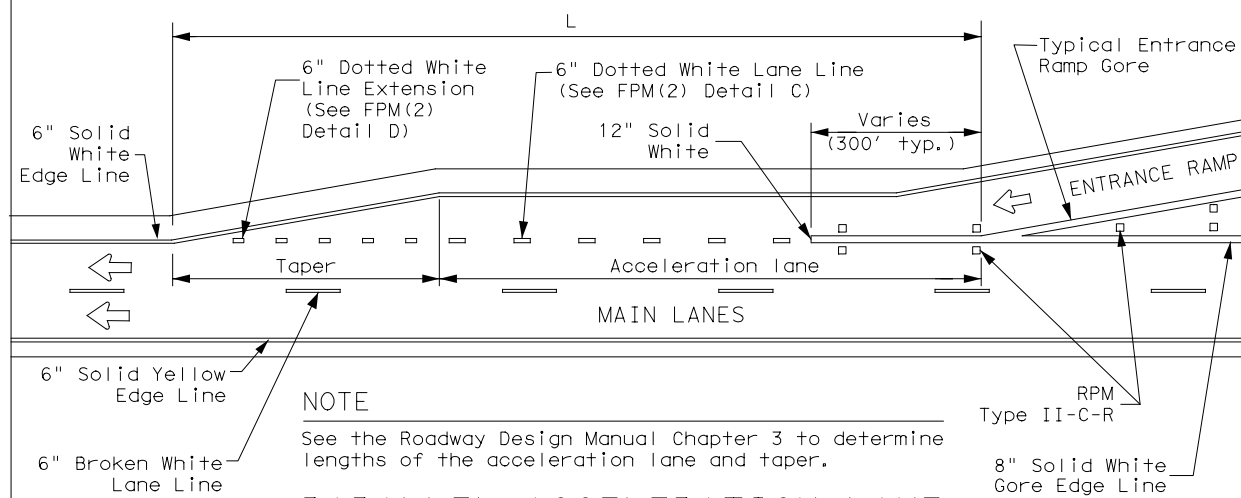


**TYPICAL ENTRANCE RAMP GORE MARKING**



**NOTE**  
 See the Roadway Design Manual Chapter 3 to determine if a tapered acceleration lane may be used.

**TAPERED ACCELERATION LANE**



**NOTE**  
 See the Roadway Design Manual Chapter 3 to determine lengths of the acceleration lane and taper.

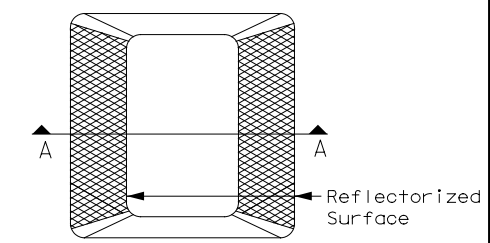
**PARALLEL ACCELERATION LANE**

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

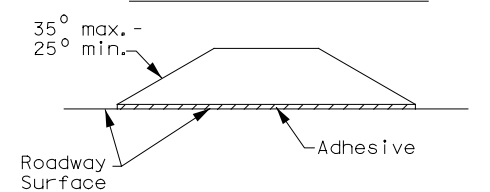
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.

LEGEND	
←	Traffic flow
↩	Pavement marking arrows (white)
□	Reflectorized Raised Markers (RPM) Type II-C-R

**GENERAL NOTE**  
 On concrete pavements the raised pavement markers shall be placed to one side of the longitudinal joints.



**Type II (Top View)**



**SECTION A REFLECTORIZED RAISED PAVEMENT MARKER (RPM)**

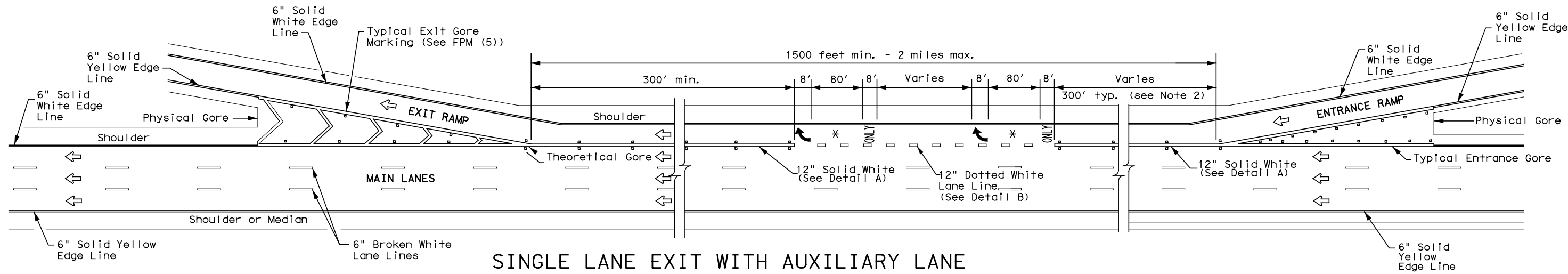


**TYPICAL STANDARD FREEWAY PAVEMENT MARKINGS WITH RAISED PAVEMENT MARKERS FPM(1)-22**

FILE: fpm(1)-22.dgn	DATE: October 2022	CONTRACT: 3510	SECTION: 04	JOB: 055	HIGHWAY: SH 99
REVISIONS					
5-74	8-00	2-12			
4-92	2-08	10-22			
5-00	2-10				
		DIST: HOU	COUNTY: FORT BEND		SHEET NO.: 269

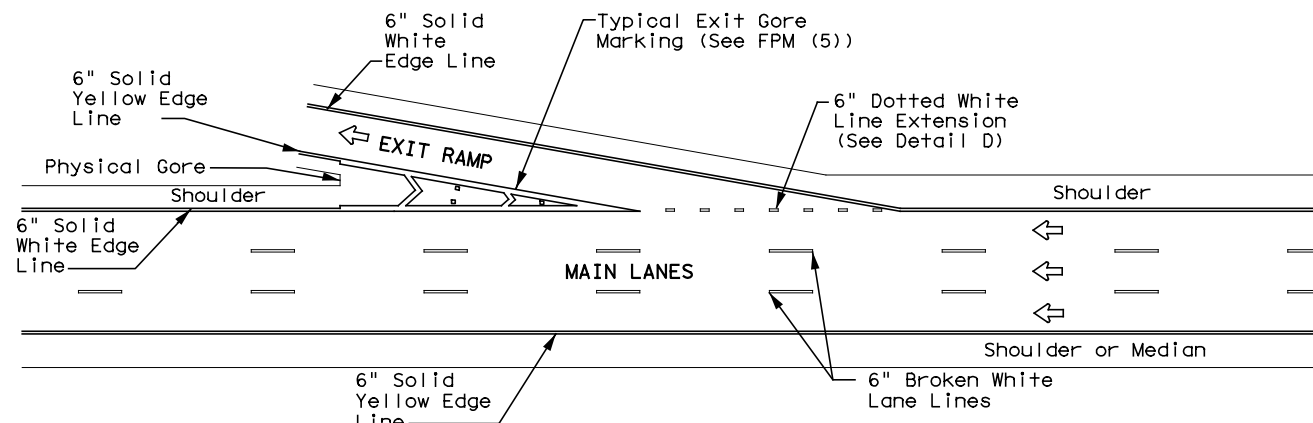
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DATE:  
FILE:



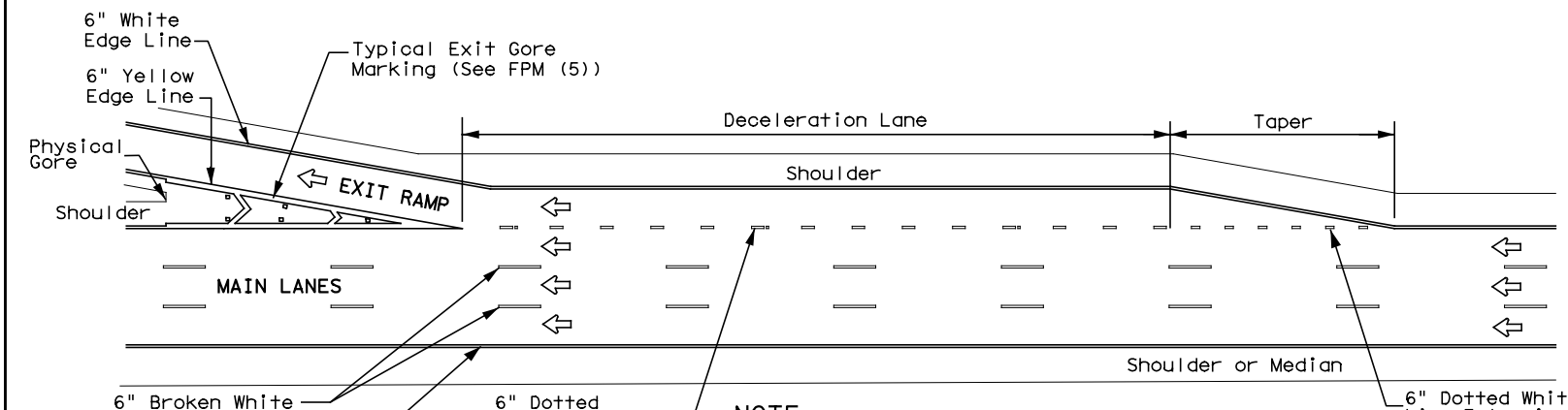
**SINGLE LANE EXIT WITH AUXILIARY LANE**

(See Note 2)



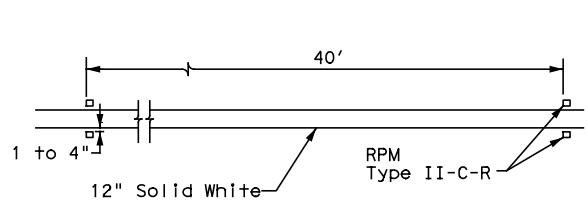
**NOTE**  
Reference Roadway Design Manual Chapter 3 to determine if tapered deceleration lane may be used.

**TAPERED DECELERATION LANE**

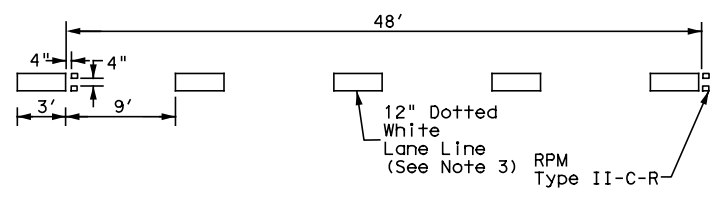


**NOTE**  
Reference Roadway Design Manual Chapter 3 to determine length of deceleration lane and taper.

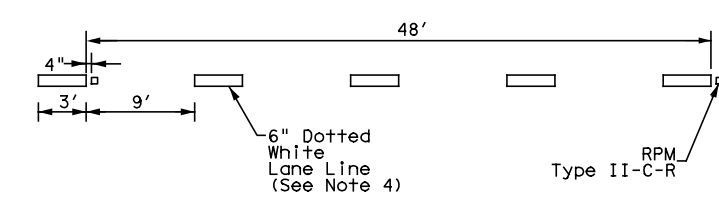
**PARALLEL DECELERATION LANE**



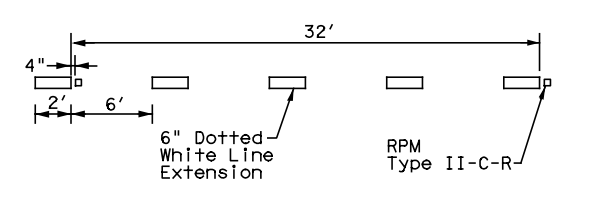
**DETAIL A**



**DETAIL B**



**DETAIL C**



**DETAIL D**

**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 that continues beyond the interchange from an adjacent mandatory exit lane.
4. Normal (6") dotted lane line (see Detail C) is used at parallel acceleration and deceleration lanes.
5. See FPM(1) for traffic lane line pavement marking details.

**LEGEND**

	Traffic flow
	Pavement marking arrows (white)
	Reflectorized Raised Markers (RPM) Type II-C-R
	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

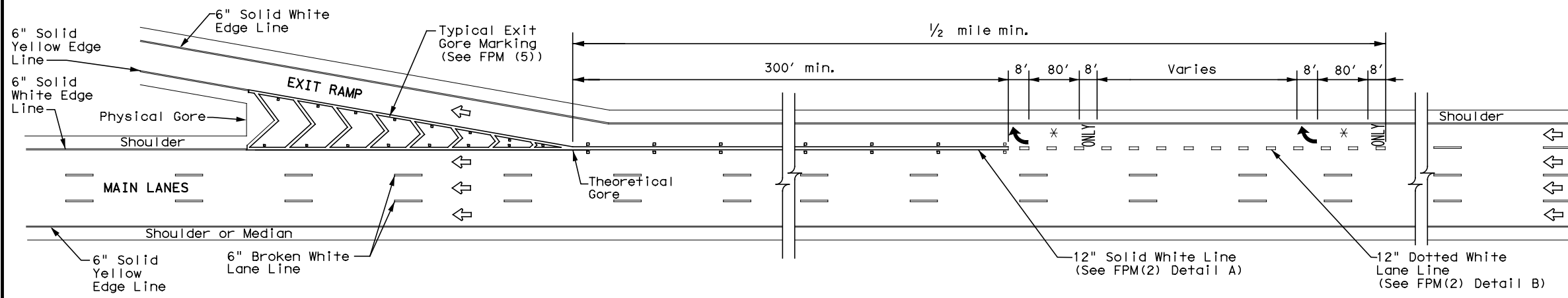
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



**TYPICAL STANDARD FREEWAY PAVEMENT MARKINGS ENTRANCE AND EXIT RAMP**

**FPM(2)-22**

FILE: fpm(2)-22.dgn	DN:	CK:	DW:	CK:
© TxDOT October 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	3510	04	055	SH 99
2-77 5-00 2-12	DIST	COUNTY	SHEET NO.	
4-92 8-00 10-22	HOU	FORT BEND	270	
8-95 2-10				

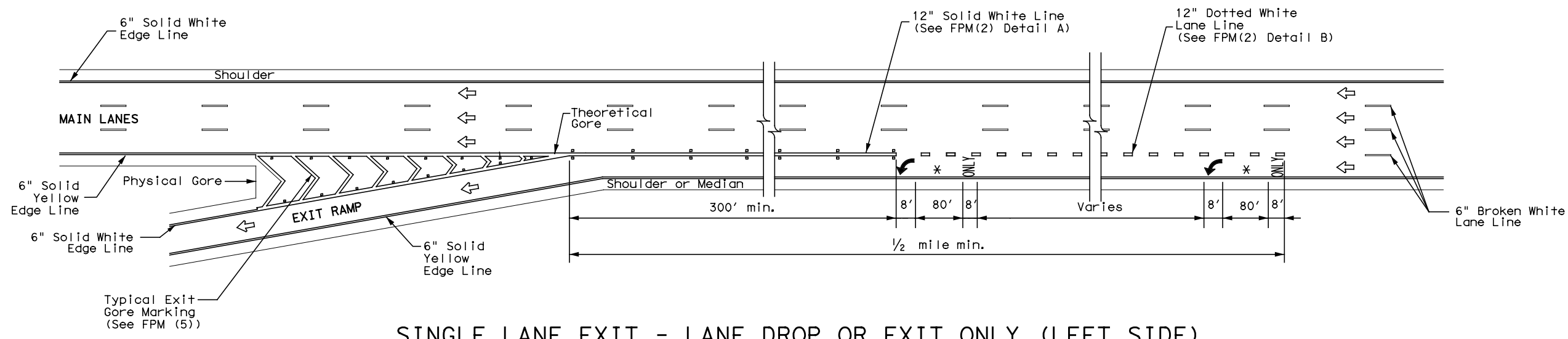


**SINGLE LANE EXIT - LANE DROP OR EXIT ONLY**

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
	Pavement marking arrows (white)
	ReflectORIZED Raised Markers (RPM) Type II-C-R
	Arrow markings are optional, however "ONLY" is required if arrow is used



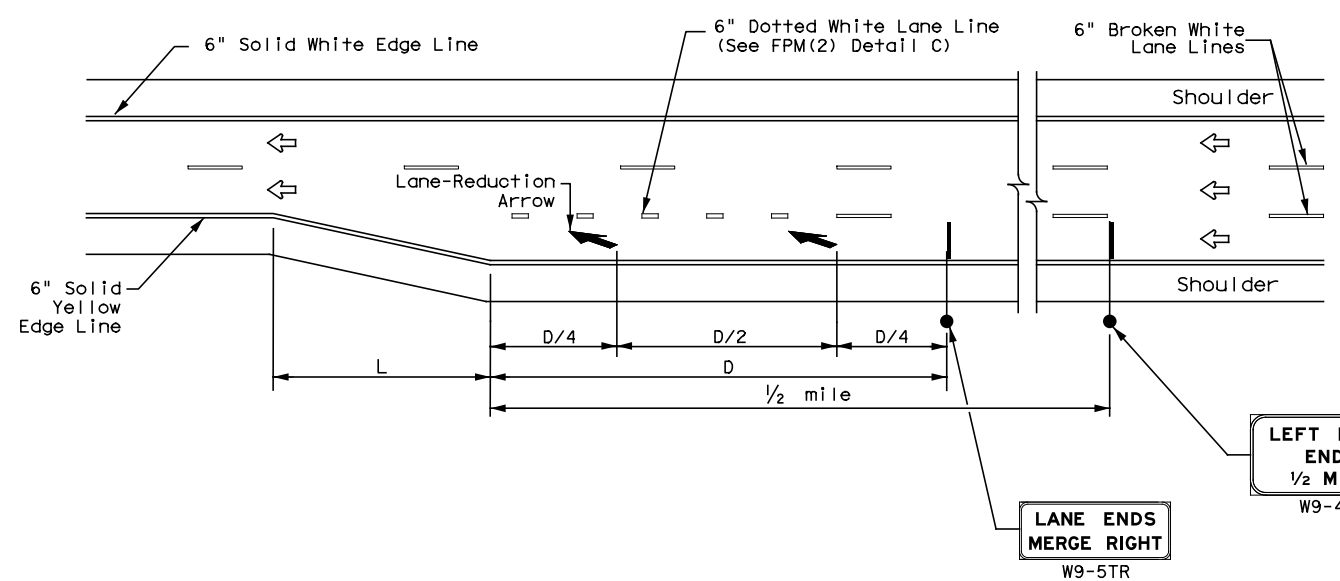
**SINGLE LANE EXIT - LANE DROP OR EXIT ONLY (LEFT SIDE)**

**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 FPM(2) Detail B) is used to separate a through lane that continues beyond the interchange from an adjacent mandatory exit lane.
4. Edge lines are not required in curb and gutter sections of frontage roads.
5. See FPM(1) for traffic lane line pavement marking details.

**NOTES**

1. Large Guide signs shall conform to the TxDOT Freeway Signing Handbook.
2. 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.
3. Arrows and sign details can be found in the Standard Highway Sign Designs for Texas (SHSD) at <http://www.txdot.gov>.
4. These guidelines may also be applied to the design of a right side lane reduction. Use LANE ENDS MERGE LEFT (W9-5TL) and RIGHT LANE ENDS 1/2 MILE (W9-4TR) signs in lieu of what is shown on drawing.



**FREEWAY LANE REDUCTION**

ADVANCED WARNING SIGN DISTANCE (D)		
Posted Speed	D (ft)	L (ft)
45 MPH	775	L=WS
50 MPH	885	
55 MPH	990	
60 MPH	1,100	
65 MPH	1,200	
70 MPH	1,250	
75 MPH	1,350	
80 MPH	1,500	
85 MPH	1,625	

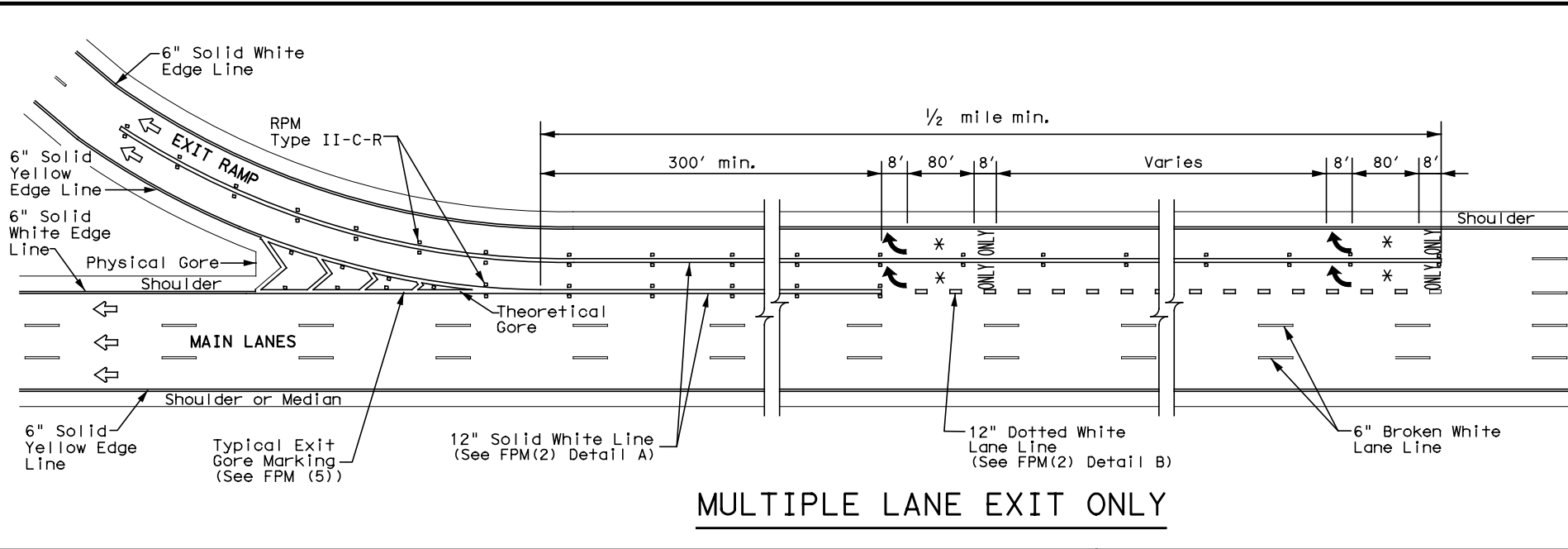


**TYPICAL STANDARD FREEWAY PAVEMENT MARKINGS SINGLE LANE DROP (EXIT ONLY) AND LANE REDUCTION DETAILS**

**FPM(3)-22**

FILE: fpm(3)-22.dgn	DN:	CK:	DW:	CK:
© TxDOT October 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	3510	04	055	SH 99
4-92 2-10	DIST	COUNTY	SHEET NO.	
5-00 2-12	HOU	FORT BEND	271	
8-00 10-22				

DATE:  
FILE:



LEGEND	
↔	Traffic Flow
□	Reflectorized Raised Markers (RPM) Type II-C-R
↔	Pavement marking arrow (white)
*	Arrow markings are optional, however "ONLY" is required if arrow is used
**	Arrow markings are optional

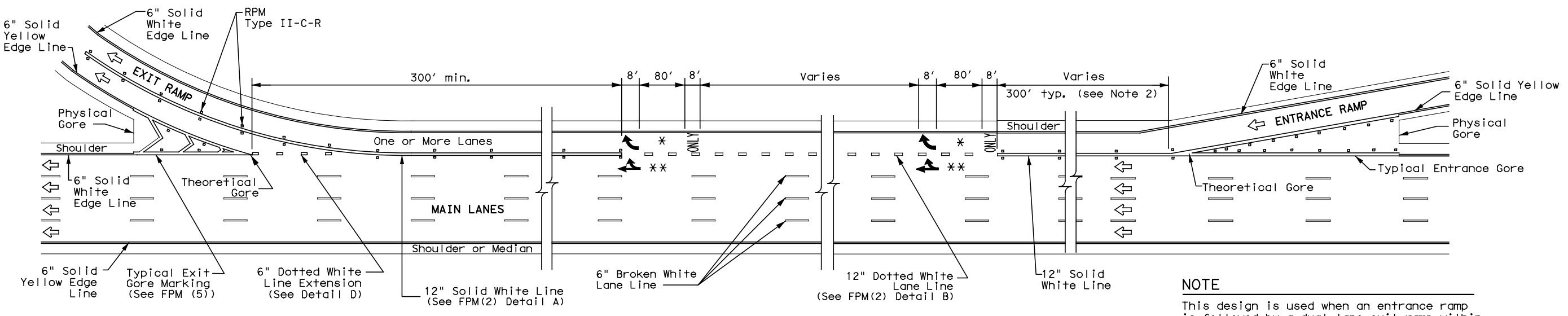
MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

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 FPM(2) Detail B) is used to separate a through lane that continues beyond the interchange from an adjacent mandatory exit lane.
4. Edge lines are not required in curb and gutter sections of frontage roads.
5. See FPM(1) for traffic lane line pavement marking details.

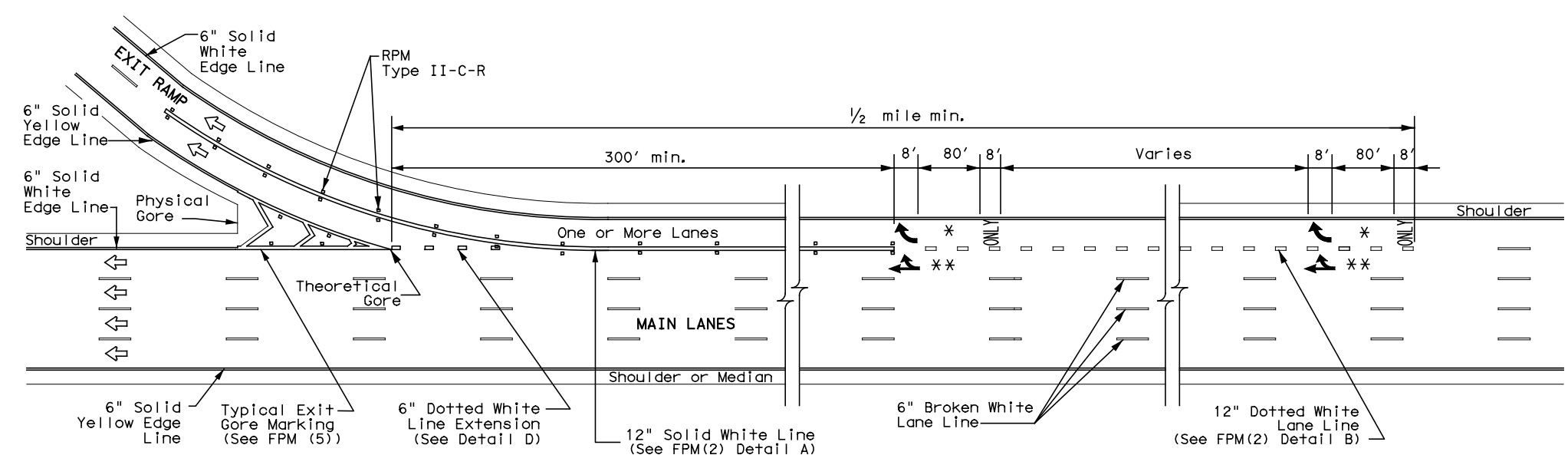
**MULTIPLE LANE EXIT ONLY**



**NOTE**

This design is used when an entrance ramp is followed by a dual lane exit ramp within 2400' downstream (theoretical gore to theoretical gore).

**SINGLE LANE ENTRANCE WITH MULTIPLE LANE EXIT - EXIT ONLY WITH OPTION LANE**



**MULTIPLE LANE EXIT - EXIT ONLY WITH OPTION LANE**

DATE:  
FILE:



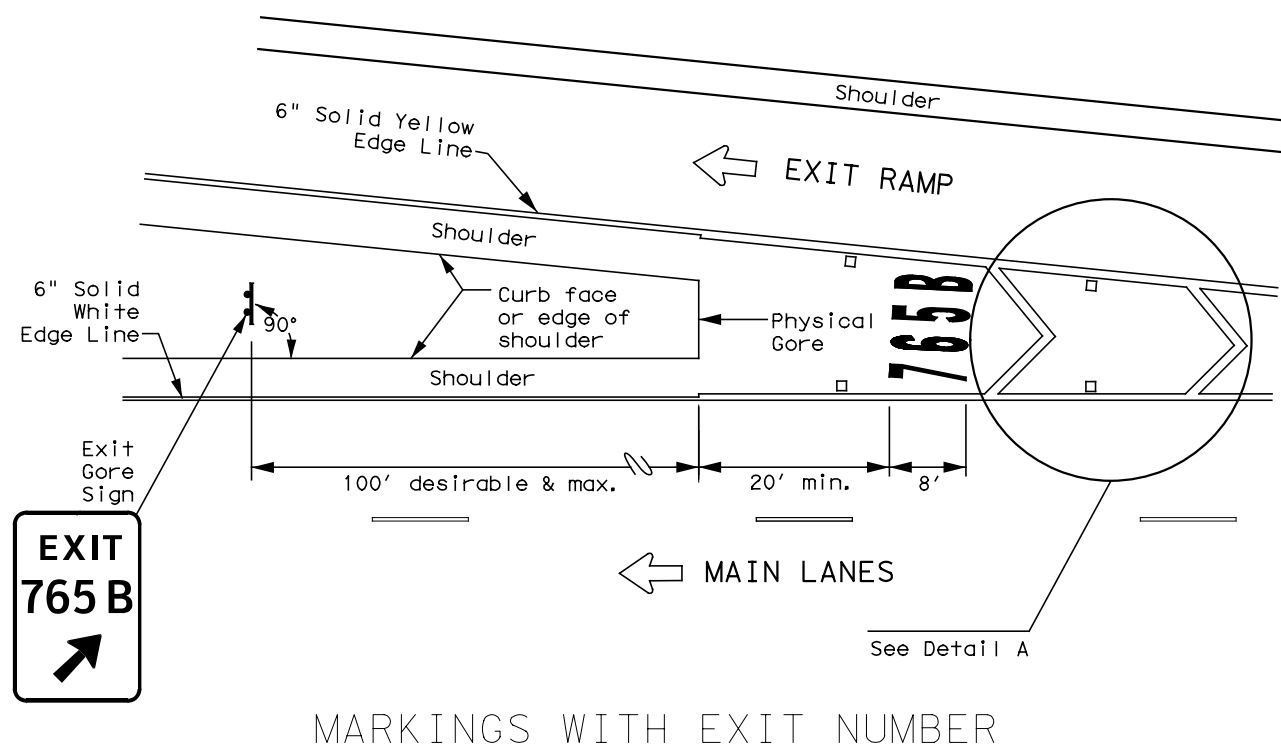
**TYPICAL STANDARD FREEWAY PAVEMENT MARKINGS MULTIPLE LANE DROP (EXIT) DETAILS FPM(4)-22**

FILE: fpm(4)-22.dgn	DN:	CK:	DW:	CK:
© TXDOT October 2022	CONT	SECT	JOB	HIGHWAY
2-77 2-10	3510	04	055	SH 99
5-00 2-12	DIST	COUNTY	SHEET NO.	
8-00 10-22	HOU	FORT BEND	272	

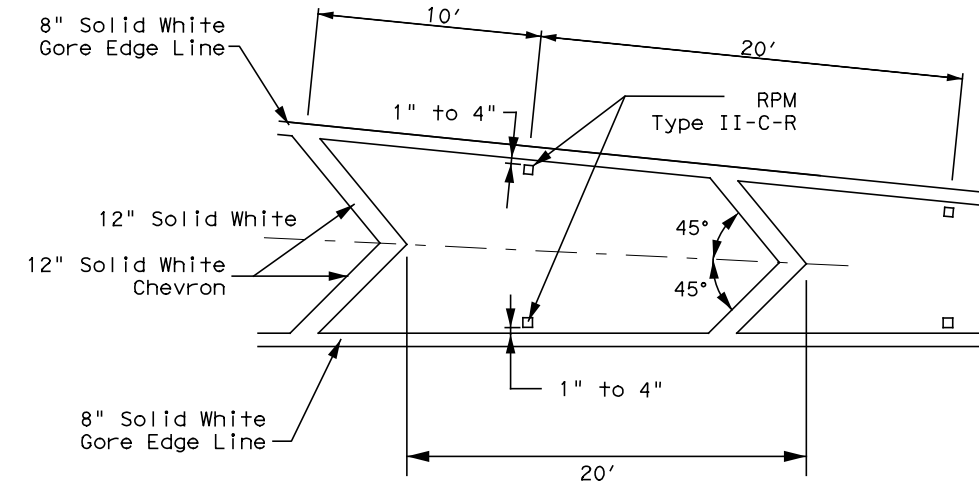
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**EXIT NUMBER PAVEMENT MARKING NOTES**

1. Minimum 8 foot white exit number pavement 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. Numbers and Letters details can be found in the Standard Highway Design for Texas (SHSD) Section 12 at <http://www.txdot.gov>



**MARKINGS WITH EXIT NUMBER**



**NOTES**

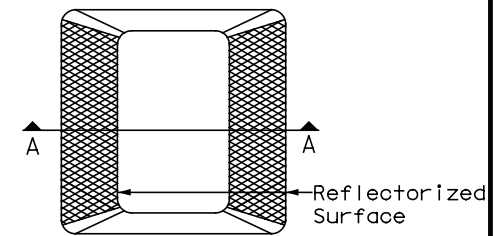
1. Raised pavement markers shall be centered between each chevron or neutral area line.
2. For more information, see Reflectorized Raised Pavement Marker Detail.

**DETAIL A**

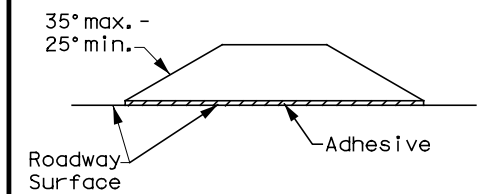
MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

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

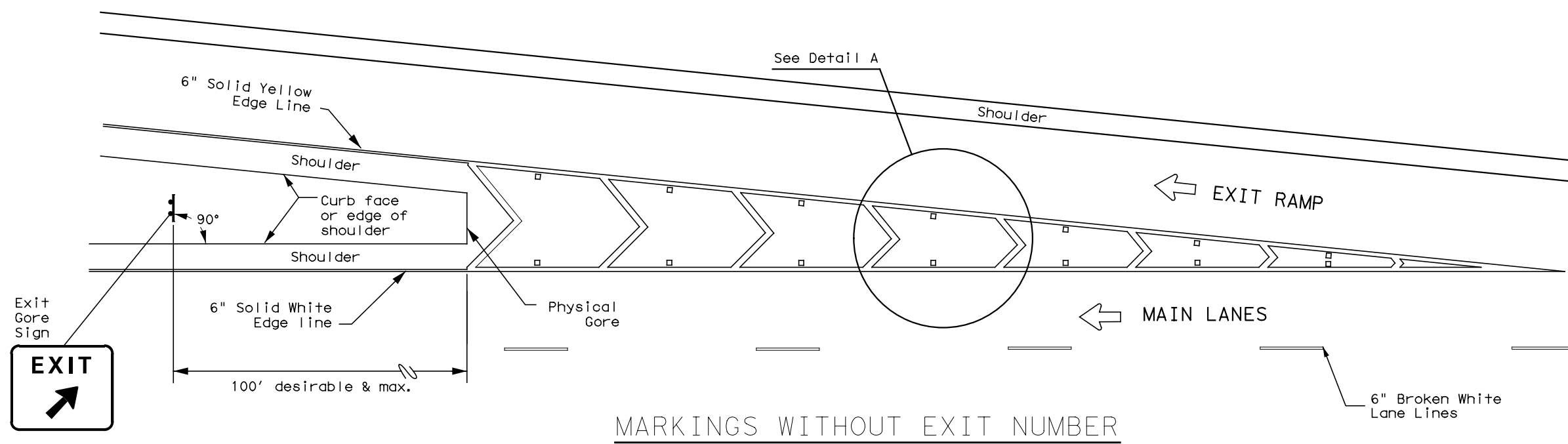


**Type II (Top View)**



**SECTION A**

**REFLECTORIZED RAISED PAVEMENT MARKER (RPM)**



**MARKINGS WITHOUT EXIT NUMBER**



**EXIT GORE PAVEMENT MARKINGS**

**FPM(5) - 22**

FILE: fpm(5) - 22.dgn	DN:	CK:	DW:	CK:
© TxDOT October 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	3510	04	055	SH 99
9-19	DIST	COUNTY	SHEET NO.	
10-22	HOU	FORT BEND	273	

DATE:  
FILE:



CONTRAST LANE LINES USING PREFABRICATED PAVEMENT MARKINGS

➔ DIRECTION OF TRAFFIC



CONTRAST LANE LINES USING LIQUID APPLICATIONS  
(MULTIPOLYMER, THERMOPLASTIC, ETC.)

x 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 9" to 10"	HOU	6		274
	COUNTY	CONTROL	SECT	JOB
	FORT BEND	3510	04	055
				HIGHWAY
				SH 99

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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) \_\_\_\_\_

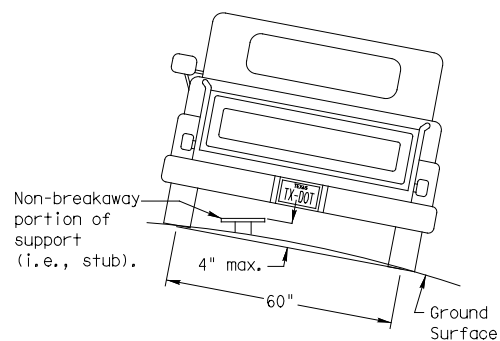
Anchor Type \_\_\_\_\_

- 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))

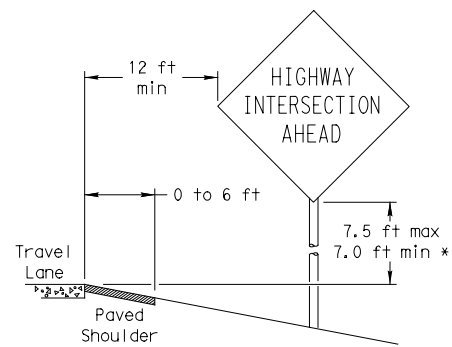
## REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



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).

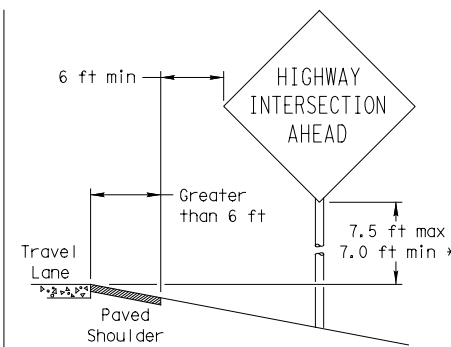
## SIGN LOCATION

### PAVED SHOULDERS



LESS THAN 6 FT. WIDE

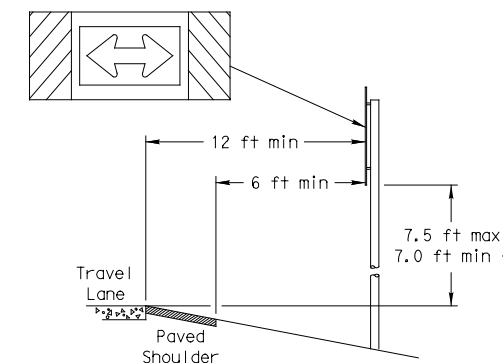
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



GREATER THAN 6 FT. WIDE

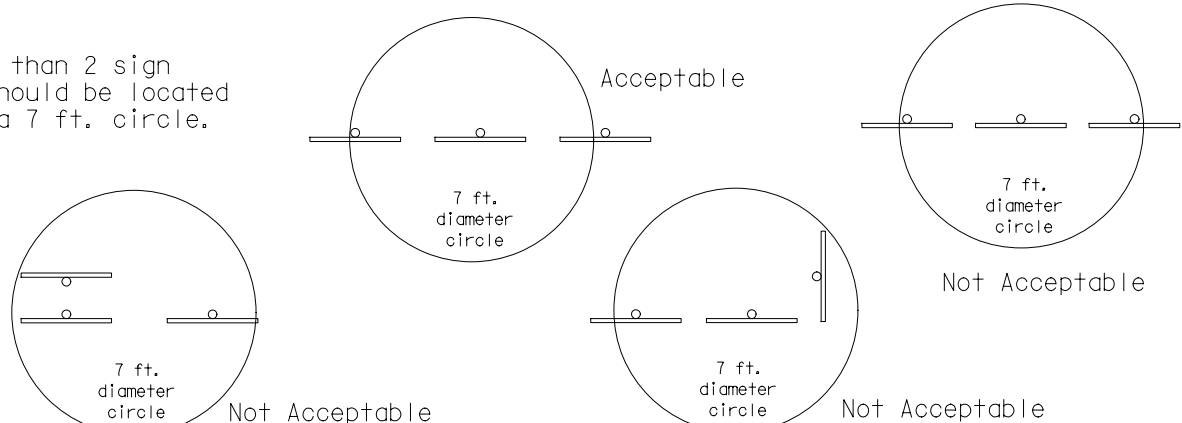
When the shoulder is greater than 6 ft in width, the sign must be placed at least 6 ft. from the edge of the shoulder.

### T-INTERSECTION

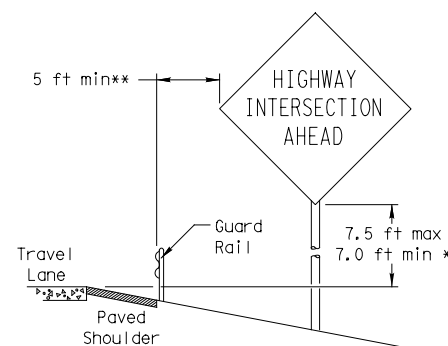


When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.

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

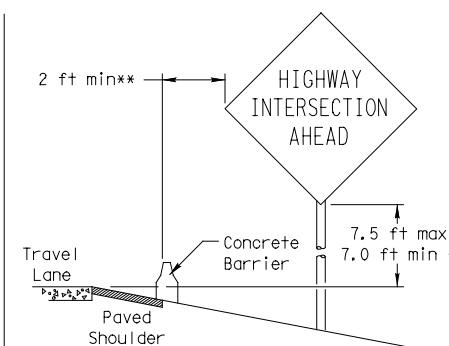


### BEHIND BARRIER



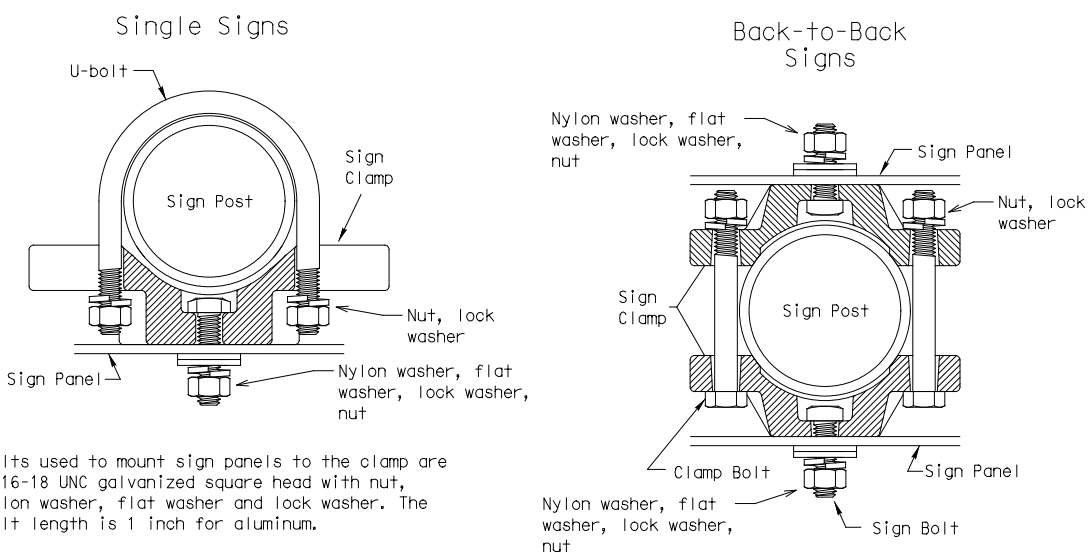
BEHIND GUARDRAIL

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



BEHIND CONCRETE BARRIER

## TYPICAL SIGN ATTACHMENT DETAIL



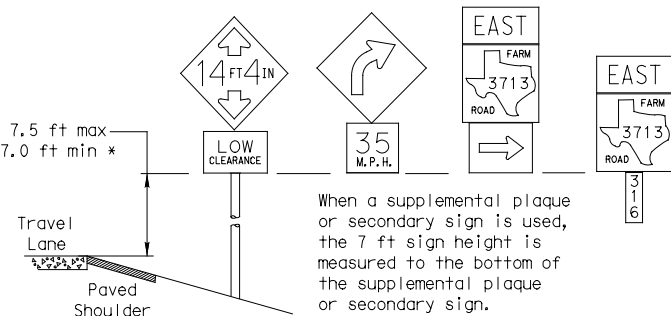
Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

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.

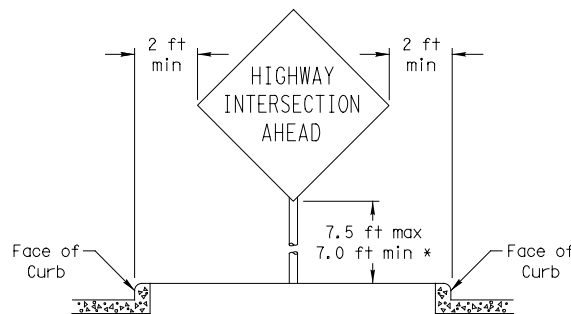
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

### SIGNS WITH PLAQUES

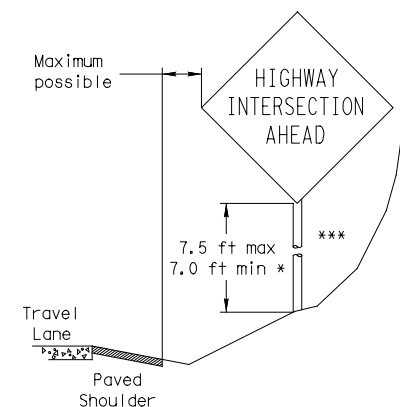


When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

### 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.

\* 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>



## SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

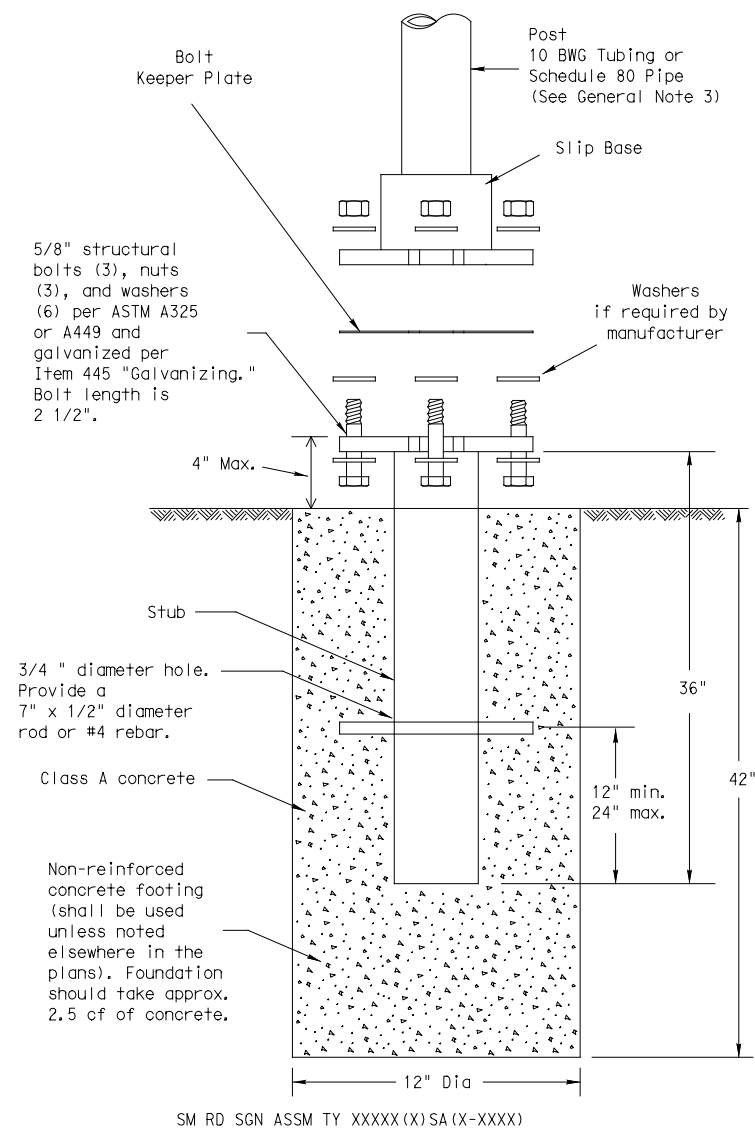
SMD (GEN) -08

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		DIST	COUNTY	SHEET NO.
		HOU	FORT BEND	275



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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](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

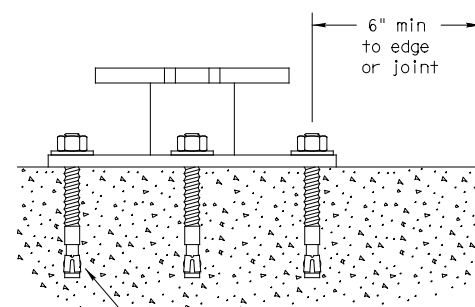
#### Foundation

- 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.

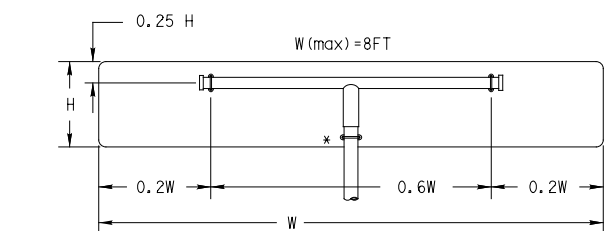
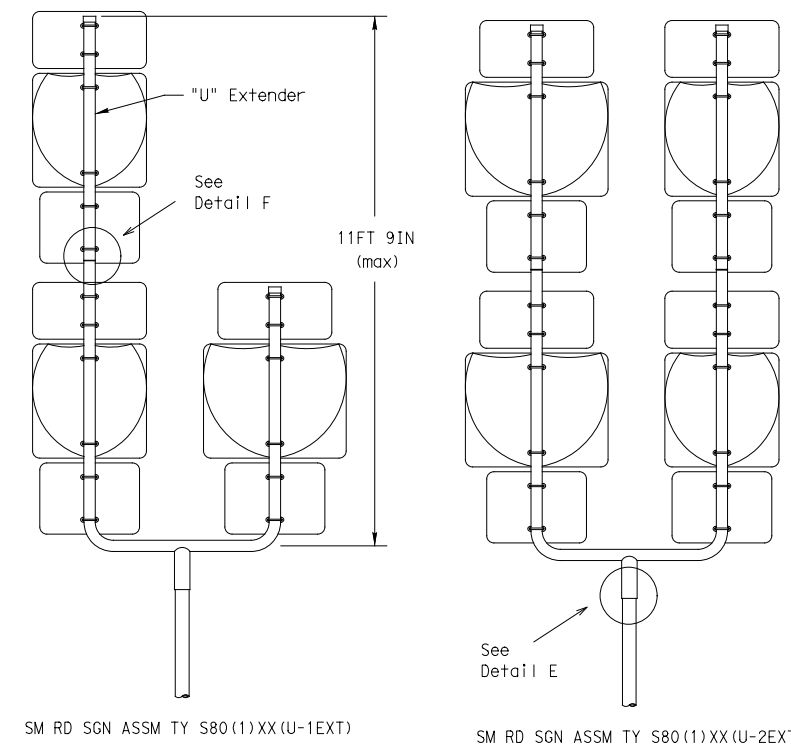
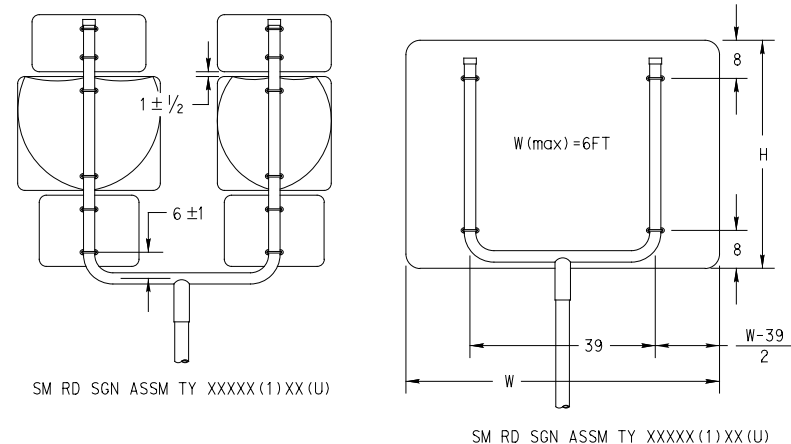
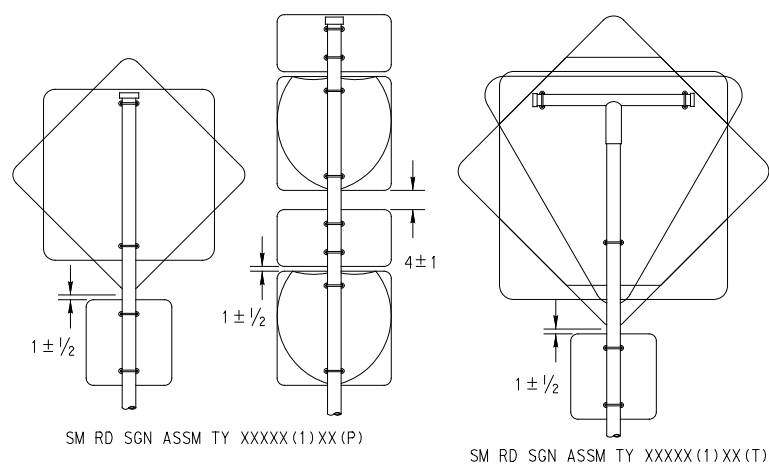


## SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-1)-08

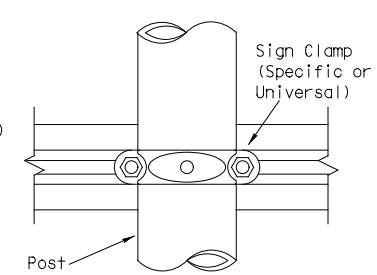
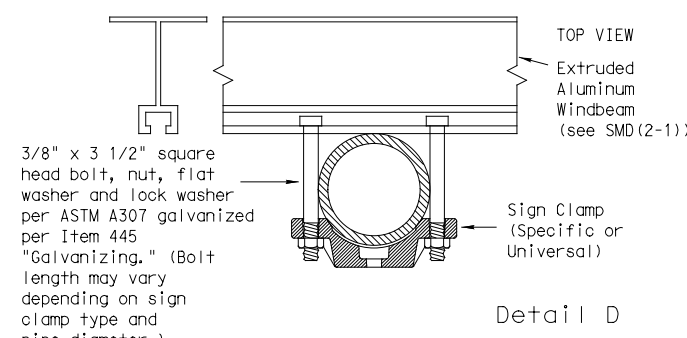
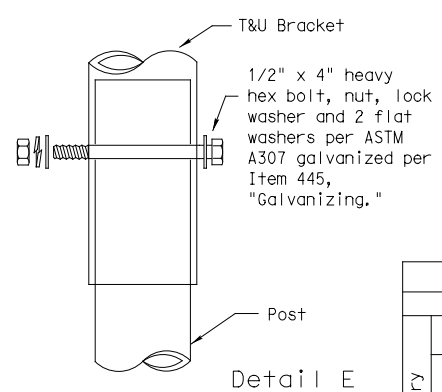
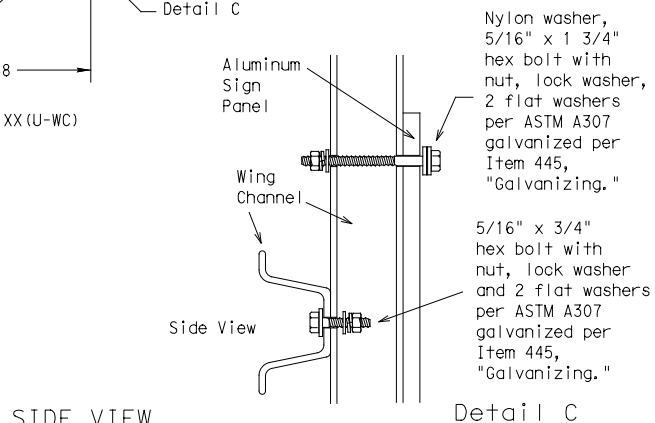
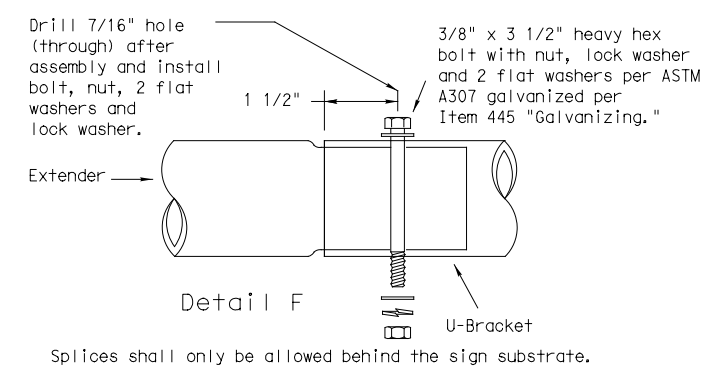
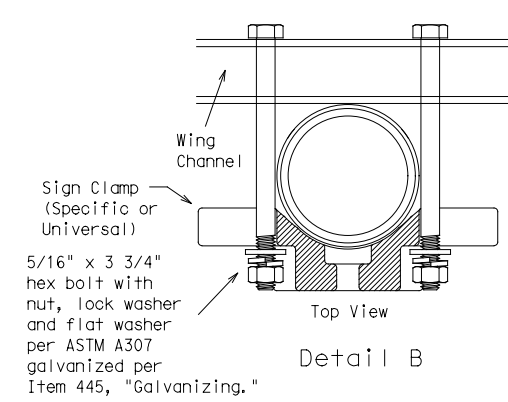
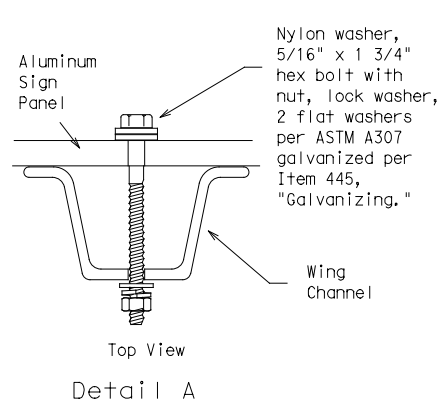
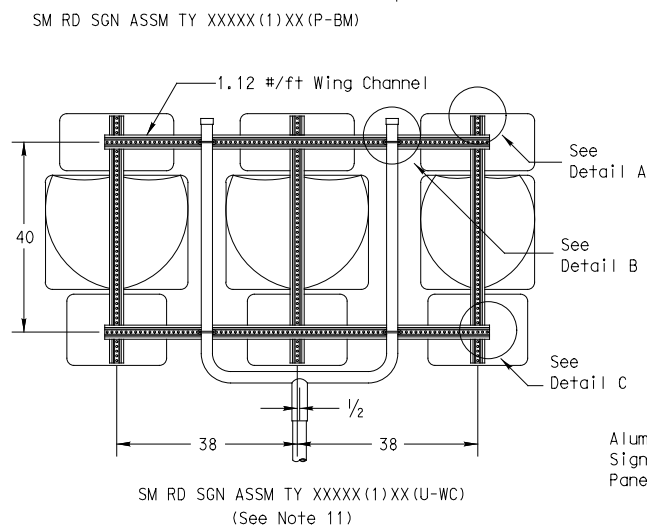
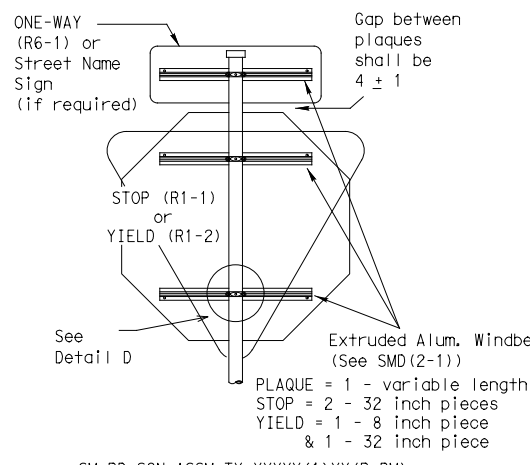
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9-08	REVISIONS				
	CONT	SECT	JOB	HIGHWAY	
	3510	04	055	SH 99	
	DIST	COUNTY		SHEET NO.	
	HOU	FORT BEND		276	

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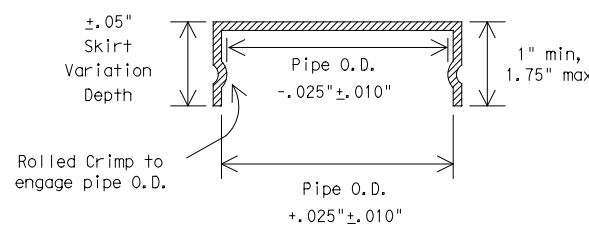


All dimensions are in english unless detailed otherwise.

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



FRICION CAP DETAIL



Friction caps may be manufactured from hot rolled or cold rolled steel sheets. The minimum sheet metal thickness shall be 24 gauge for all cap sizes. The rim edges shall be reasonably straight and smooth. Caps shall be sized and formed in such a manner as to produce a drive-on friction fit and have no tendency to rock when seated on the pipe. The depth shall be sufficient to give positive protection against entrance of rainwater. They shall be free of sharp creases or indentations and show no evidence of metal fracture. Caps shall have an electrodeposited coating of zinc in accordance with the requirements of ASTM B633 Class FE/ZN 8.

GENERAL NOTES:

- | 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)	



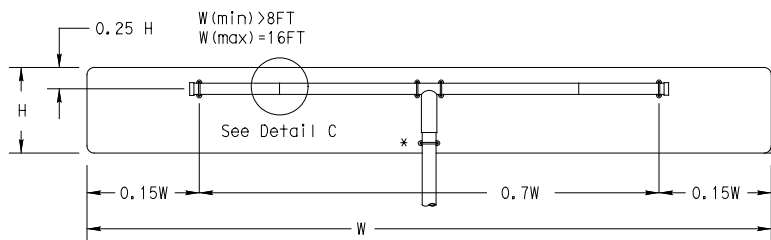
SIGN MOUNTING DETAILS  
SMALL ROADSIDE SIGNS  
TRIANGULAR SLIPBASE SYSTEM  
SMD(SLIP-2)-08

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		DIST	COUNTY		SHEET NO.
		HOU	FORT BEND		277

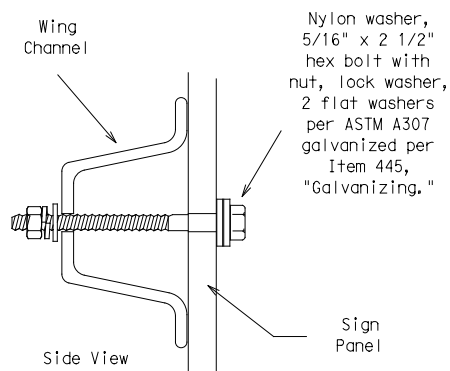
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FILE:

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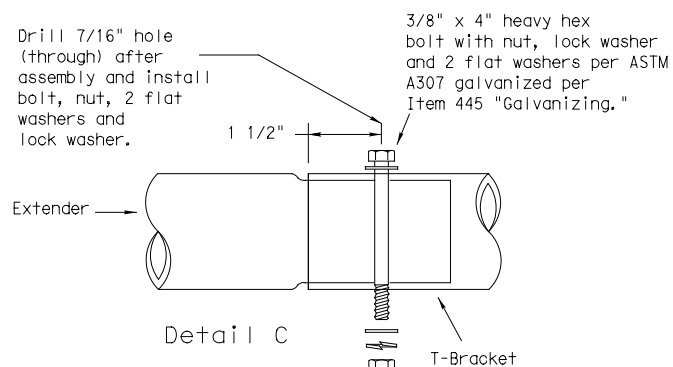
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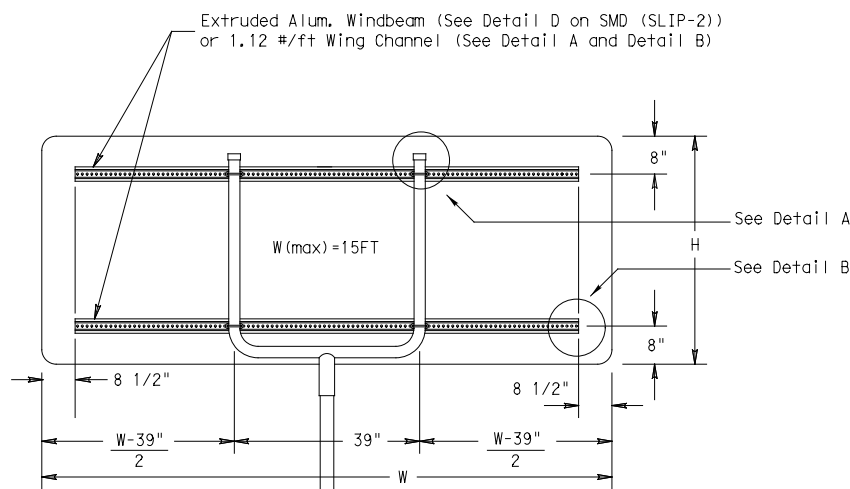
SM RD SGN ASSM TY XXXX(1)XX(T-2EXT)  
(\* - See Note 12)



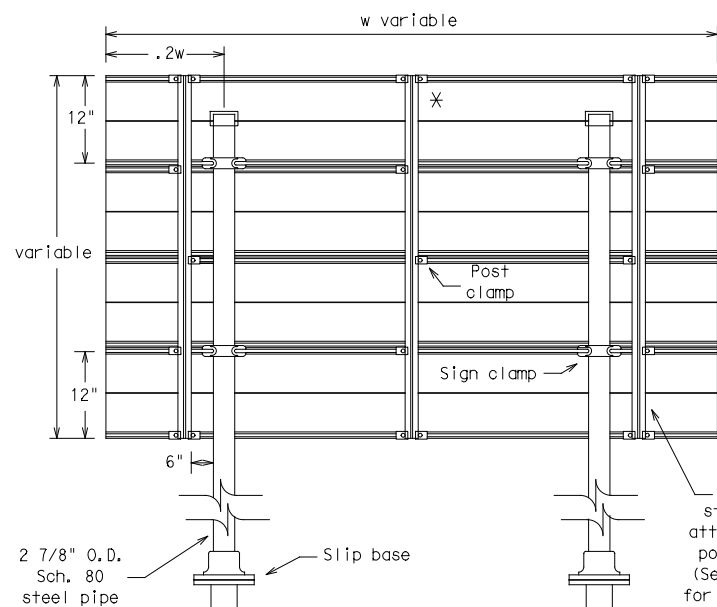
Detail B



Splices shall only be allowed behind the sign substrate.



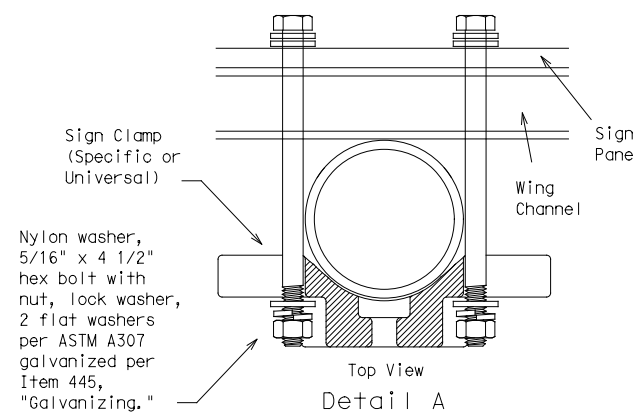
SM RD SGN ASSM TY XXXX(1)XX(U-XX)



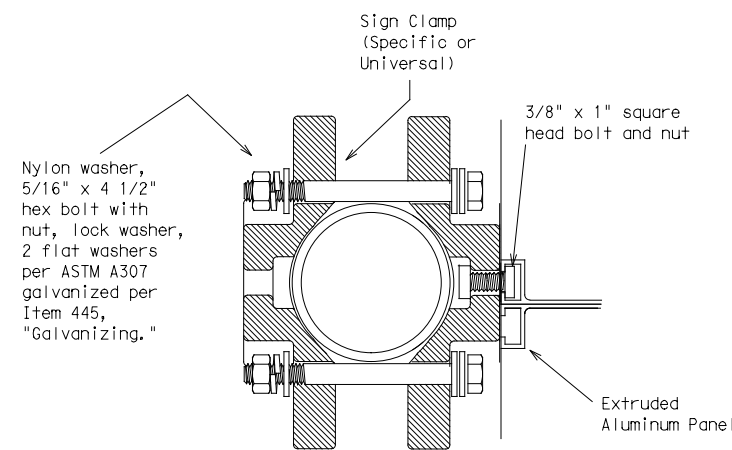
Typical Sign Mount

SM RD SGN ASSM TY S80(2)XX(P-EXAL)  
\* Additional stiffener placed at approximate center of signs when sign width is greater than 10'.

See Detail E for clamp installation

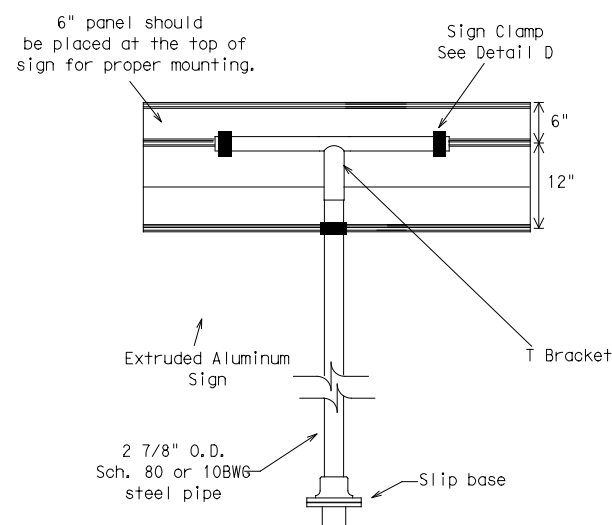


Detail A

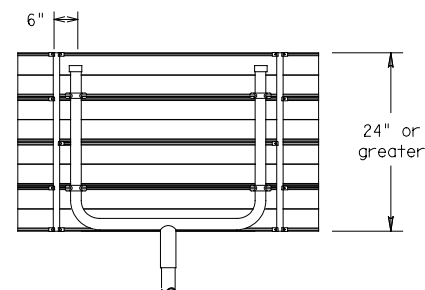


Detail D

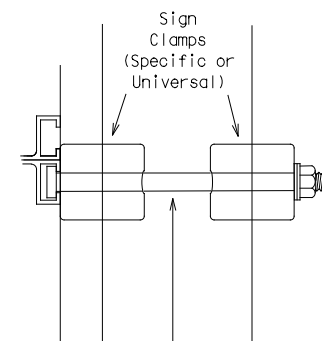
EXTRUDED ALUMINUM SIGN WITH T BRACKET



Extruded Aluminum Sign With T Bracket



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



Detail E

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."
- 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)

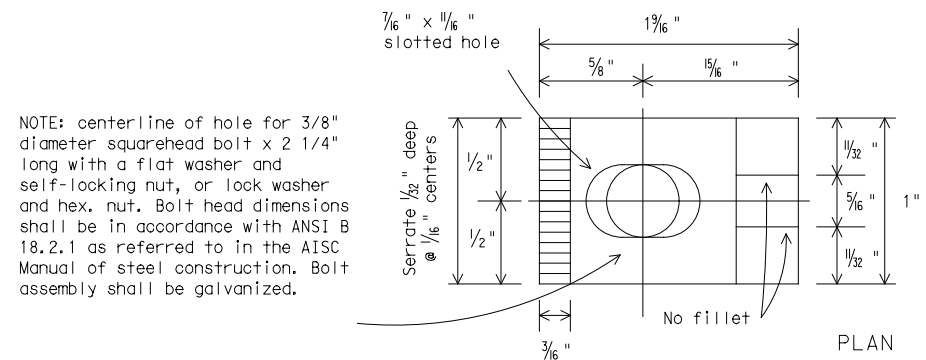
Texas Department of Transportation  
Traffic Operations Division

SIGN MOUNTING DETAILS  
SMALL ROADSIDE SIGNS  
TRIANGULAR SLIPBASE SYSTEM  
SMD(SLIP-3)-08

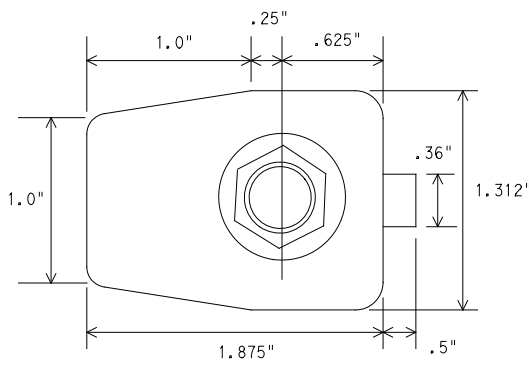
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		DIST	COUNTY		SHEET NO.
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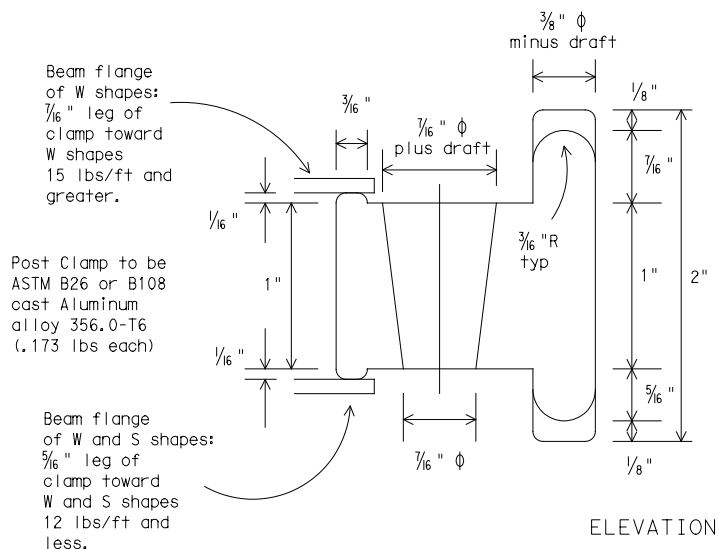
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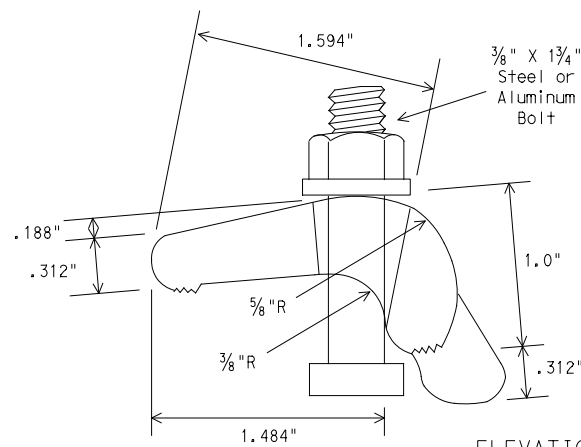
NOTE: centerline of hole for 3/8" diameter squarehead bolt x 2 1/4" long with a flat washer and self-locking nut, or lock washer and hex. nut. Bolt head dimensions shall be in accordance with ANSI B 18.2.1 as referred to in the AISC Manual of steel construction. Bolt assembly shall be galvanized.



PLAN

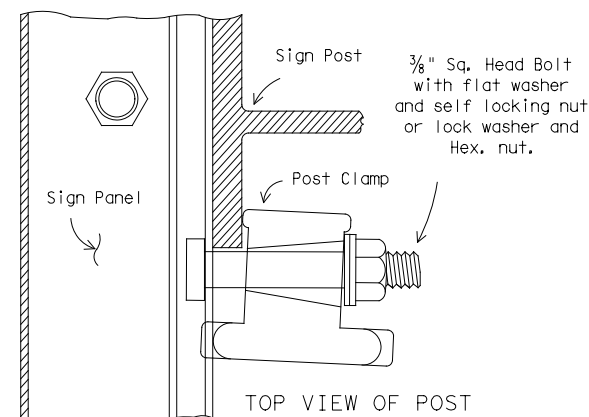


POST CLAMP DETAIL

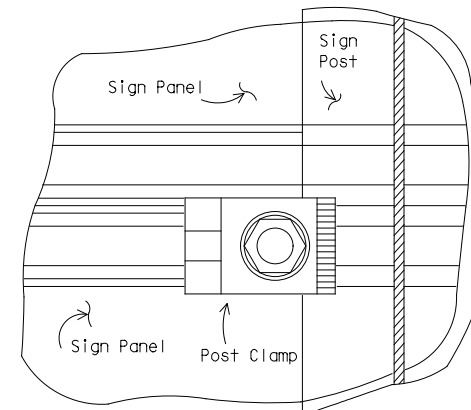


ELEVATION

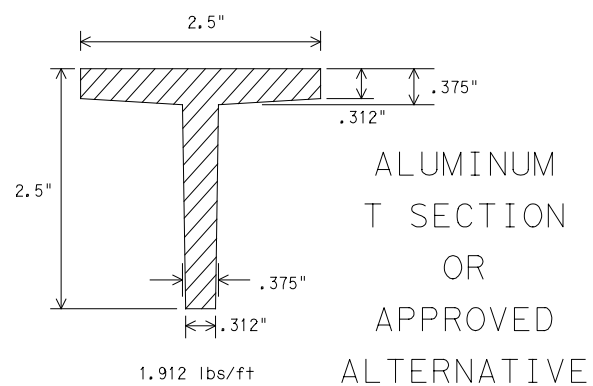
ALTERNATE POST CLAMP DETAIL



TOP VIEW OF POST



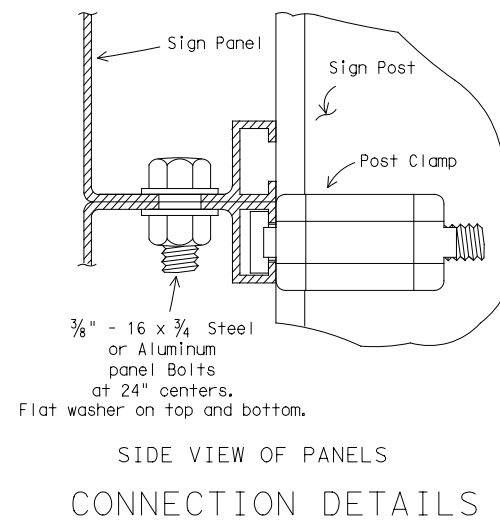
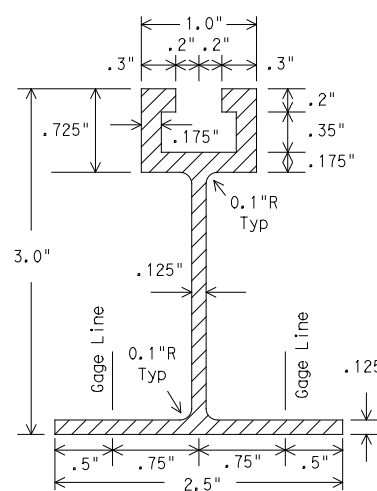
TOP VIEW OF CLAMP



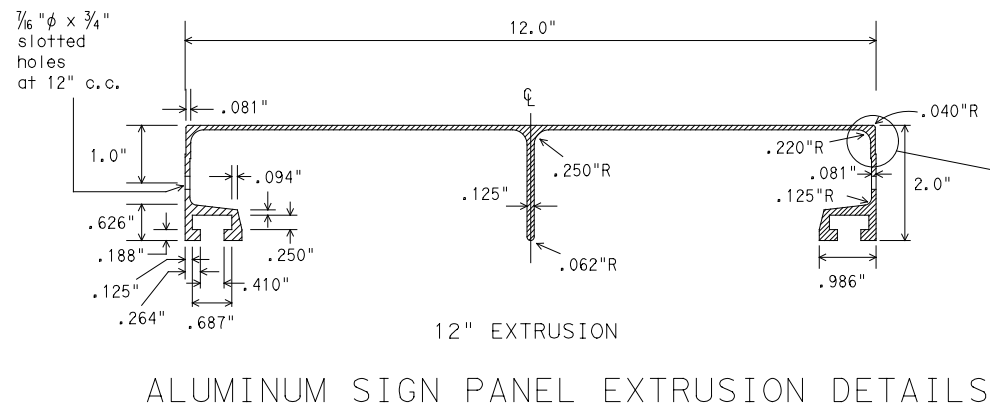
ALUMINUM T SECTION OR APPROVED ALTERNATIVE

WINDBEAM CROSS SECTION

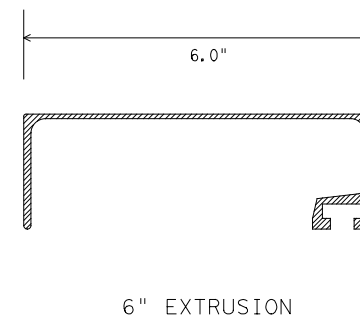
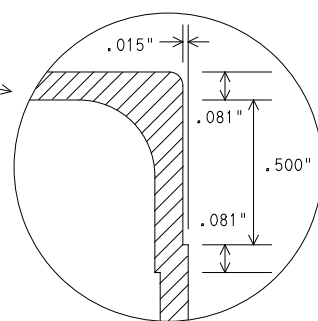
Windbeam to be extruded aluminum (1.175 lbs/ft) or approved alternative



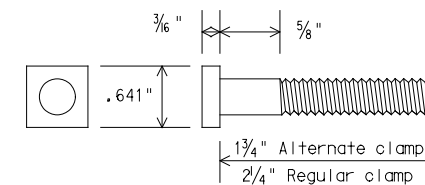
SIDE VIEW OF PANELS CONNECTION DETAILS



ALUMINUM SIGN PANEL EXTRUSION DETAILS



6" EXTRUSION



POST CLAMP BOLT DETAIL

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.

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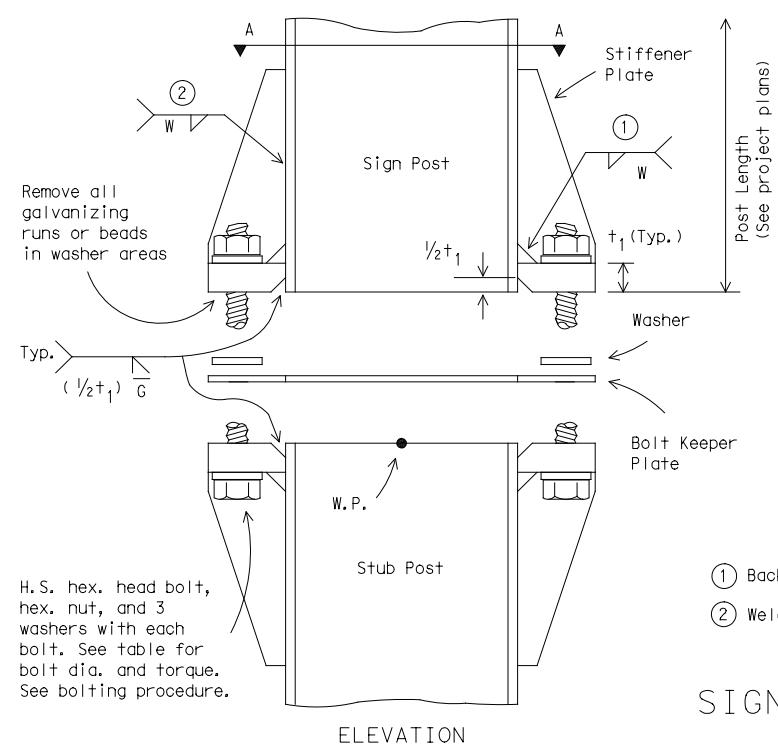
SIGN MOUNTING DETAILS-  
EXTRUDED ALUMINUM  
SIGN PANELS & HARDWARE

SMD(2-1)-08

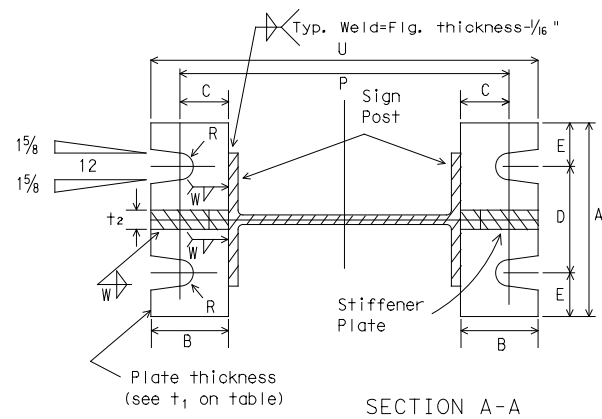
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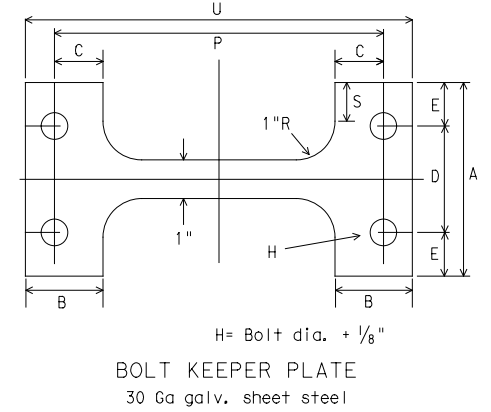
ELEVATION



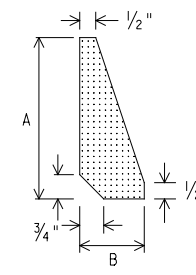
SECTION A-A

- ① Back up weld to be made before installing stiffener plate
- ② Weld W may be continued across clips to seal joint

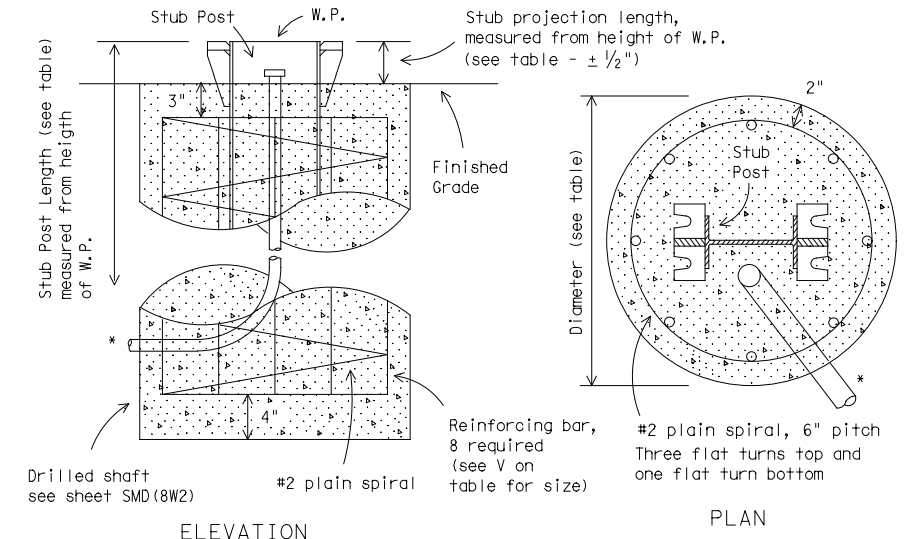
SIGN POST AND STUB POST  
(For W Shapes)



BOLT KEEPER PLATE  
30 Ga galv. sheet steel

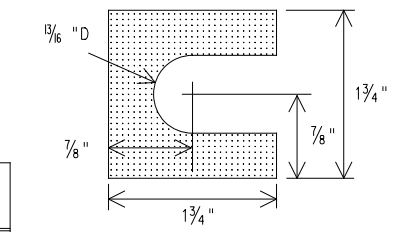


STIFFENER PLATE  
DETAIL  
Steel Plate (thickness =  $t_2$ )  
(See table for dimensions)



FOUNDATION DETAIL

\*Note: For signs with electrical apparatus, see ED(10) for conduit required in foundation.

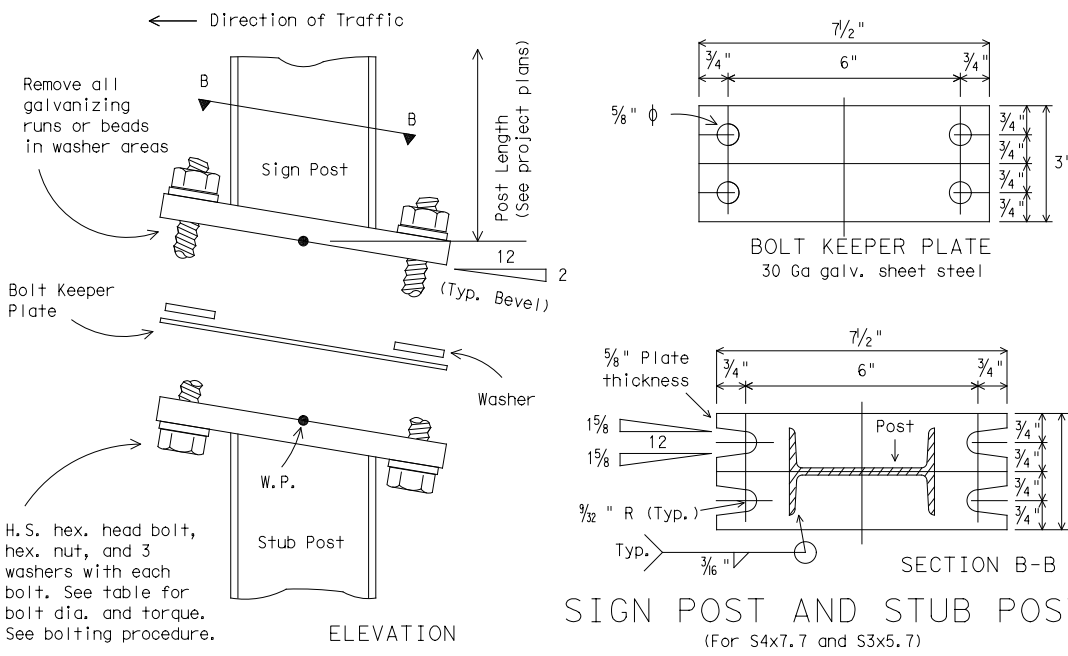


SHIM DETAIL  
Furnish two .012" + thick and two .032" + thick shims per post. Shims shall be fabricated from brass shim stock or strip conforming to ASTM B36.

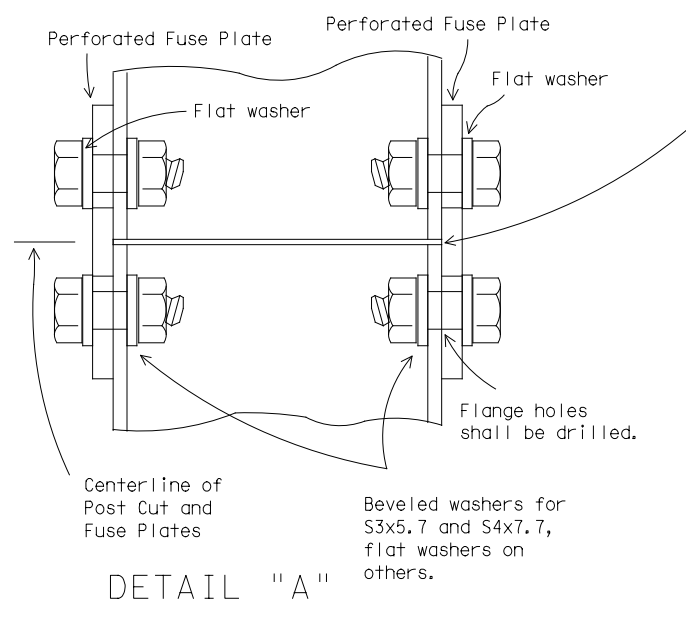
- BOLTING PROCEDURE FOR ASSEMBLY OF BASE CONNECTION:**
1. Assemble sign post, BOLT KEEPER PLATE and stub post with bolts and three flat washers per bolt as shown.
  2. Shim as required to plumb post.
  3. Tighten all bolts the maximum possible with a 12 to 15 inch wrench to clean bolt threads and to bed washers and shims.
  4. Loosen each bolt in sequence and retighten bolts in a systematic order to the prescribed torque. Do not over-tighten.
  5. 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 <sub>1</sub>	t <sub>2</sub>	W	R	F	G	J	K	M	d <sub>1</sub>	d <sub>2</sub>	t <sub>3</sub>	Bolt Dia. (ea.) (lbs.)	Bolt length	P	S	U	Stub length	Stub projection	Dr. Shaft diameter	Bar V Size		
W6x9	5/8" $\phi$ x 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"	1"	9 7/8"	2'-0"	3"	24"	#5	
W6x12	440-450 inch pounds	5"	2"	1 1/4"	2 3/4"	1 1/8"	3/4"	1/2"	1/4"	1 1/32"	5"	2 1/2"	6"	3 1/2"	1 1/2"	1 1/8"	1/4"	3/8"	5/8"	2.51	2 1/4"	8 1/2"		10"	2'-0"	3"		#5	
W6x15	36-38 foot pounds										5"	2 1/2"	5 1/4"	2 3/4"	1 1/4"	1 1/8"	1/16"	3/8"	5/8"	2.26	2 1/4"	10 5/8"		12 1/8"	2'-6"	3"		#6	
W8x18											5"	2 1/2"	5 1/4"	2 3/4"	1 1/4"	1 1/8"	1/16"	3/8"	5/8"	2.26	2 1/4"	10 5/8"	12 1/8"	2'-6"	3"	#7			
W8x21	3/4" $\phi$ x 3 1/2"										5 1/2"	2 1/2"	5 1/4"	2 3/4"	1 1/4"	1 3/16"	1"	1/2"	3/4"	3.35	2 1/4"	11"	1 1/2"	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"	1 3/32"	6"	3"	5 3/4"	2 3/4"	1 3/8"	1 3/16"	1/8"	1/2"	3/4"	4.03	2 1/4"	12 7/8"		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"	1 3/16"	1 5/16"	1/2"	3/4"	4.47	2 1/4"	15"		14 7/8"	3'-0"	2 1/2"	#10		
W12x26											6"	3"	6 1/2"	3 1/2"	1 5/8"	1 3/16"	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" $\phi$ x 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"	3/2"	12"	Non-reinforced
S4x7.7	440-450 inch pounds 36-38 foot 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"	3/2"	12"	Non-reinforced

③ Foundation design shall be Type G Mount, see SMD (TY G).



SIGN POST AND STUB POST  
(For S4x7.7 and S3x5.7)



DETAIL "A"

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."

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.

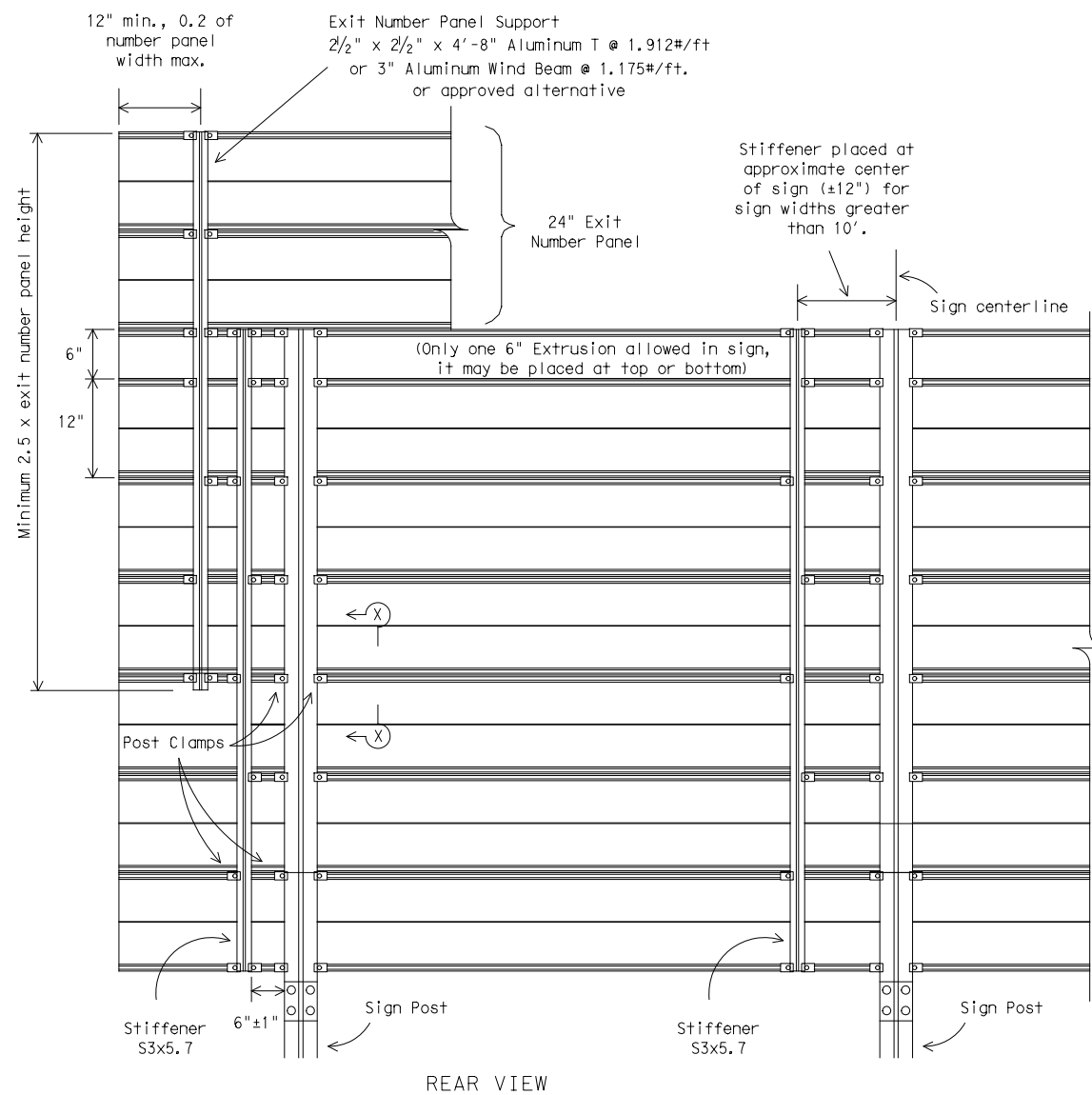


SIGN MOUNTING DETAILS-  
LARGE ROADSIDE SIGNS  
FOUNDATION & STUB

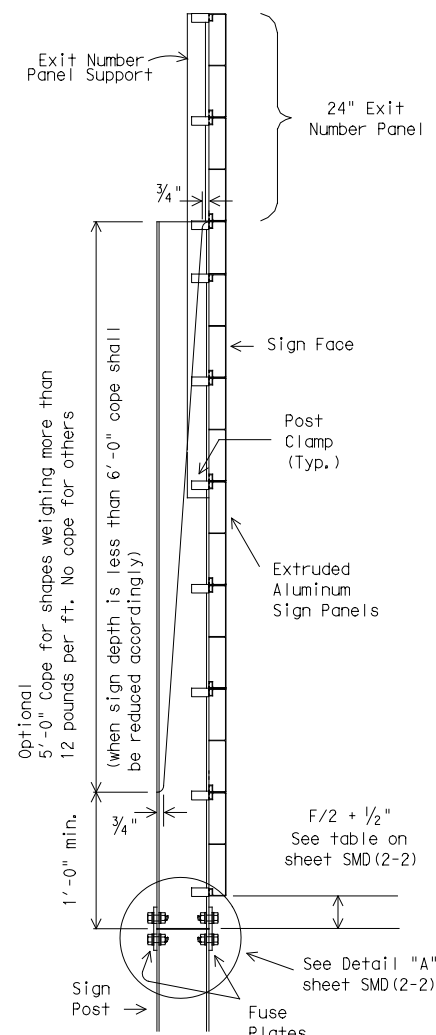
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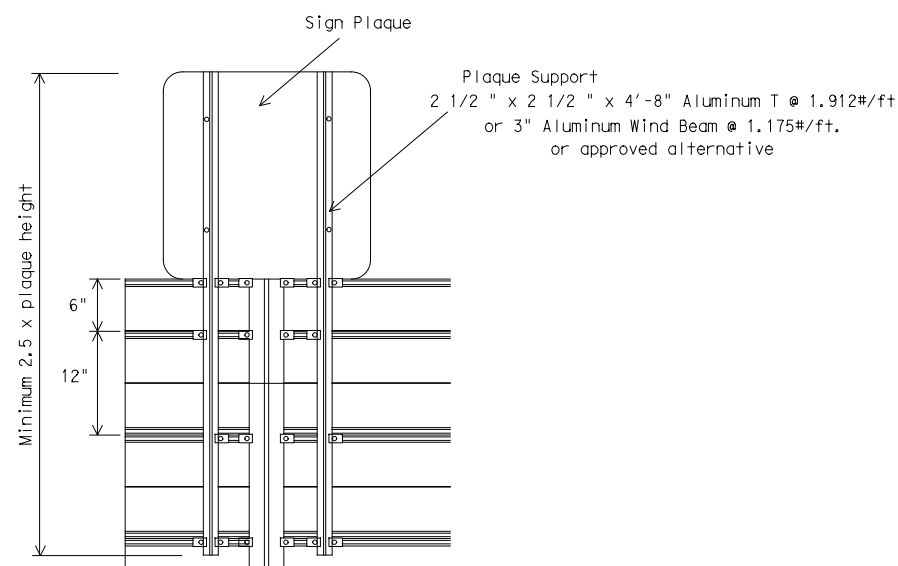


REAR VIEW



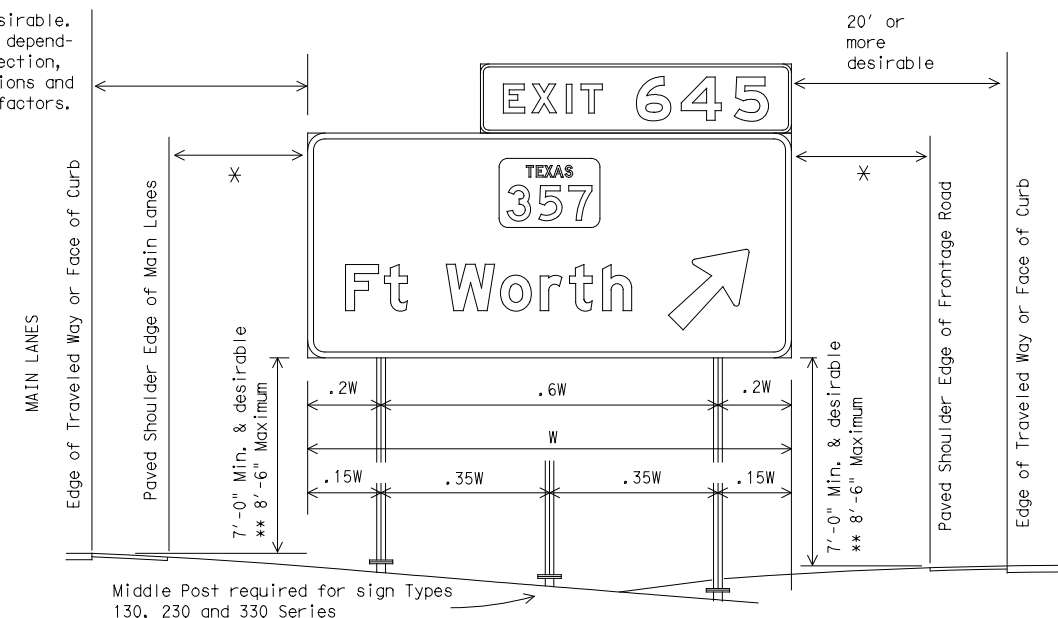
SIDE VIEW

ALUMINUM PARENT SIGN & EXIT NUMBER PANEL MOUNTING DETAILS



SIGN PLAQUE MOUNTING DETAIL TO ALUMINUM PARENT SIGN

30' or more desirable. May be reduced depending on cross section, viewing conditions and other related factors.



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.

X - 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.



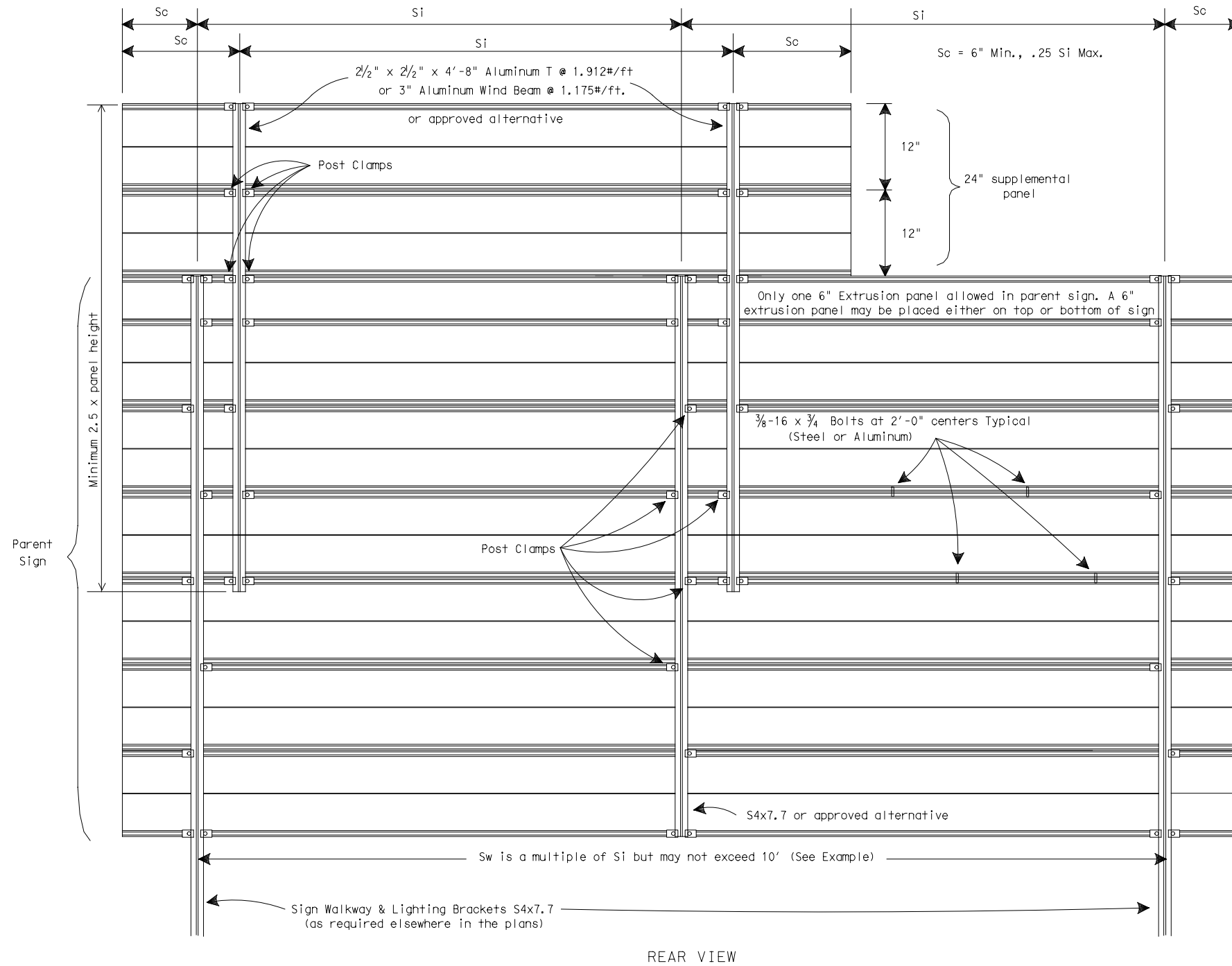
SIGN MOUNTING DETAILS-  
LARGE ROADSIDE SIGNS

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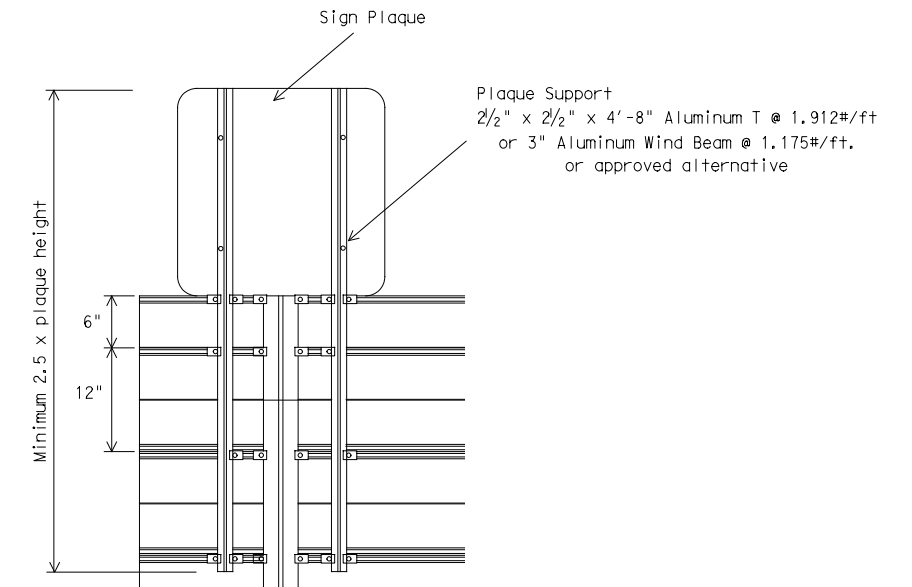
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EXAMPLES (FOR DETERMINING Si and Sw)

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.



"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

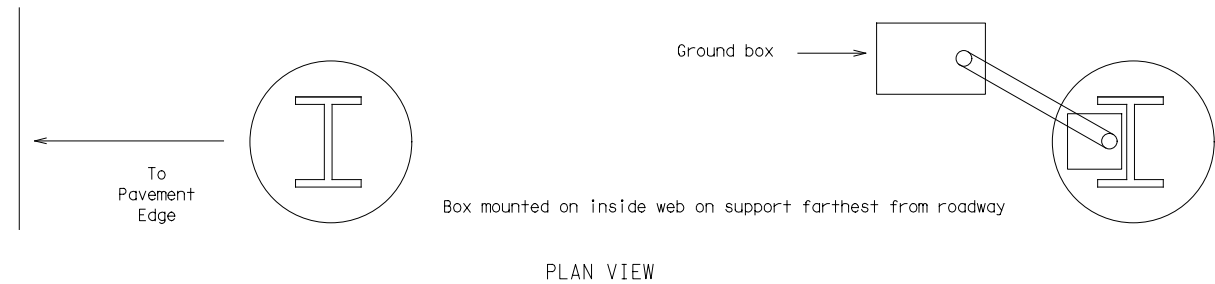
For fiberglass sign installations, see manufacturer's recommendations.



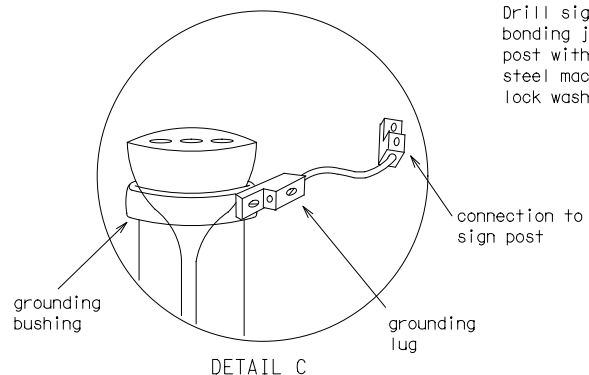
SIGN MOUNTING DETAILS-  
OVERHEAD SIGNS  
EXTRUDED ALUMINUM  
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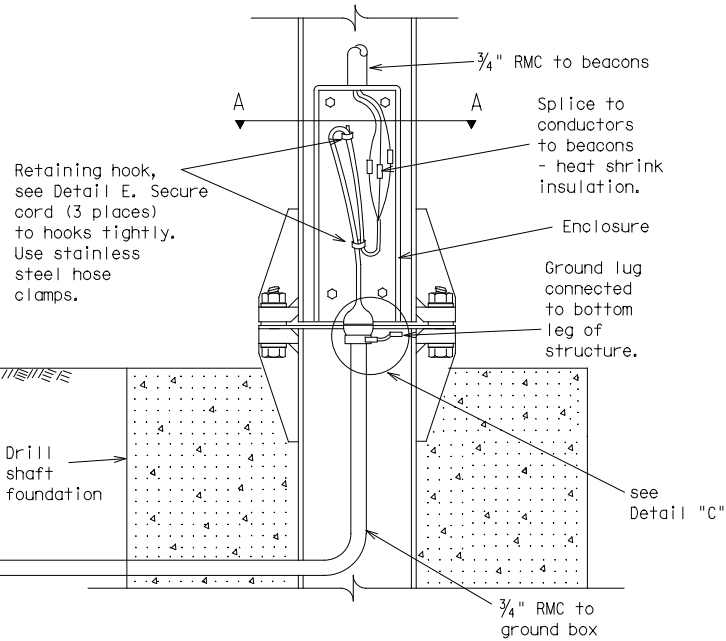
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Drill sign post - structure leg, terminate bonding jumper with listed connector to post with a 10-24 (3/16") min. stainless steel machine screw, nut, flat washer and lock washer made wrench tight.



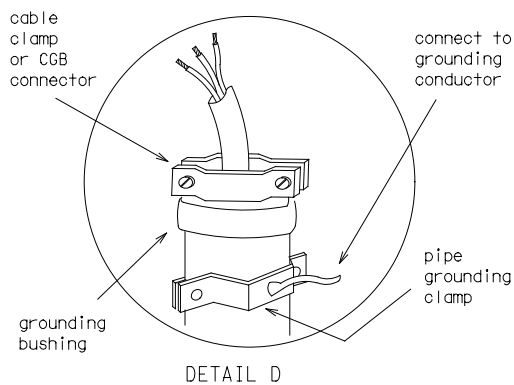
△ Pull connector down tight against conduit then clamp in ground box. See Detail "D"



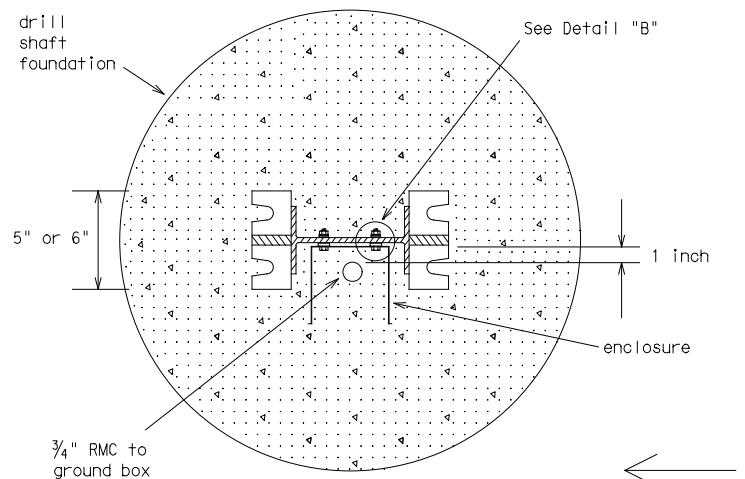
**ELECTRICAL CONNECTION DETAIL**

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.



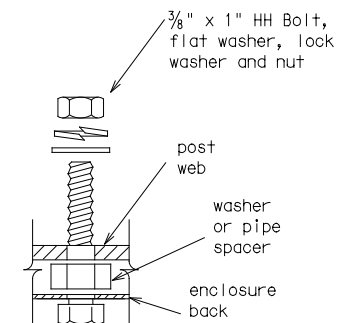
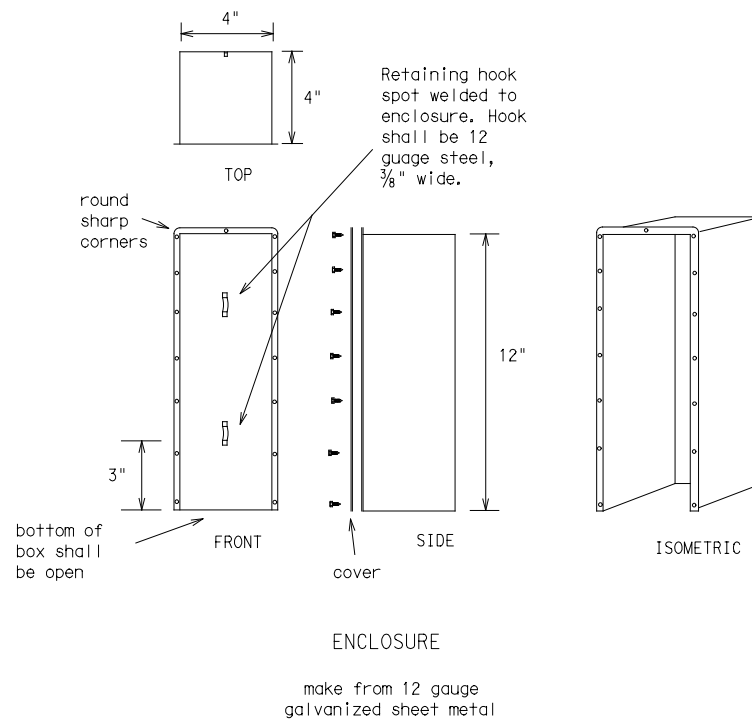
Pull cable so opposite end connector is tight against conduit end, clamp cable at top of conduit as shown.



**SECTION A-A**

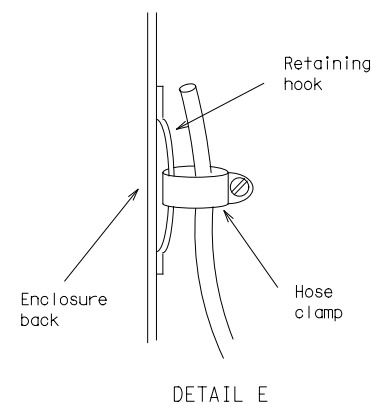
Stub-post connection  
conduit, bolts and enclosure  
(cover not shown)

direction of traffic

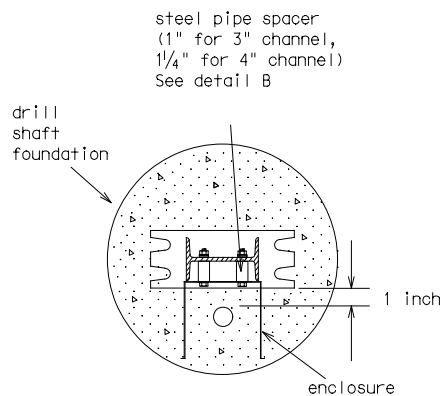


**DETAIL B**

enclosure connection  
(4 places)  
(use 2 inch bolt for  
3 and 4 inch channels)



**DETAIL E**



**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 S0 cord containing three number 10 or number 8 AWG conductors. The male connector shall be integrally molded to a 20' length of Type S0 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, Littelfuse 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.



11-01 Revision

- △ Liquidtight conduit size corrected.
- △ Editing of minor notes.

Texas Department of Transportation  
Traffic Operations Division

**SIGN MOUNTING DETAILS-  
LARGE ROADSIDE SIGNS  
ELECTRICAL CONNECTION**

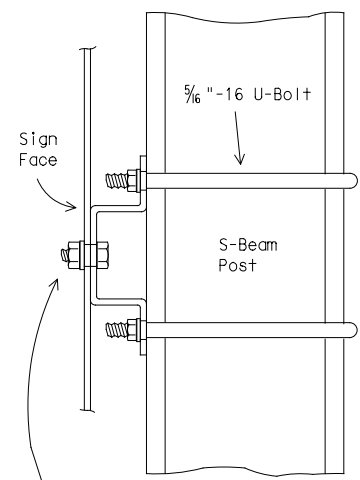
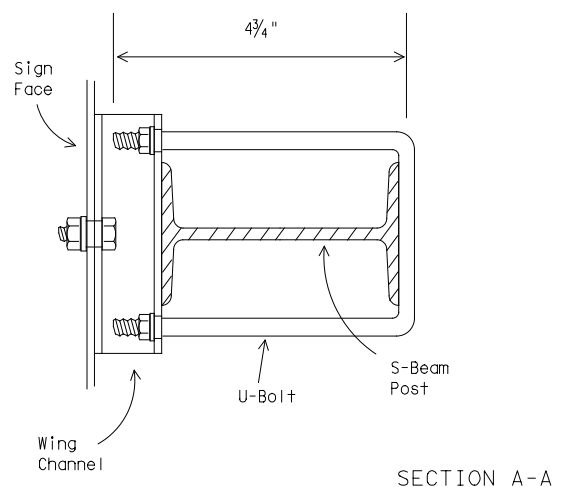
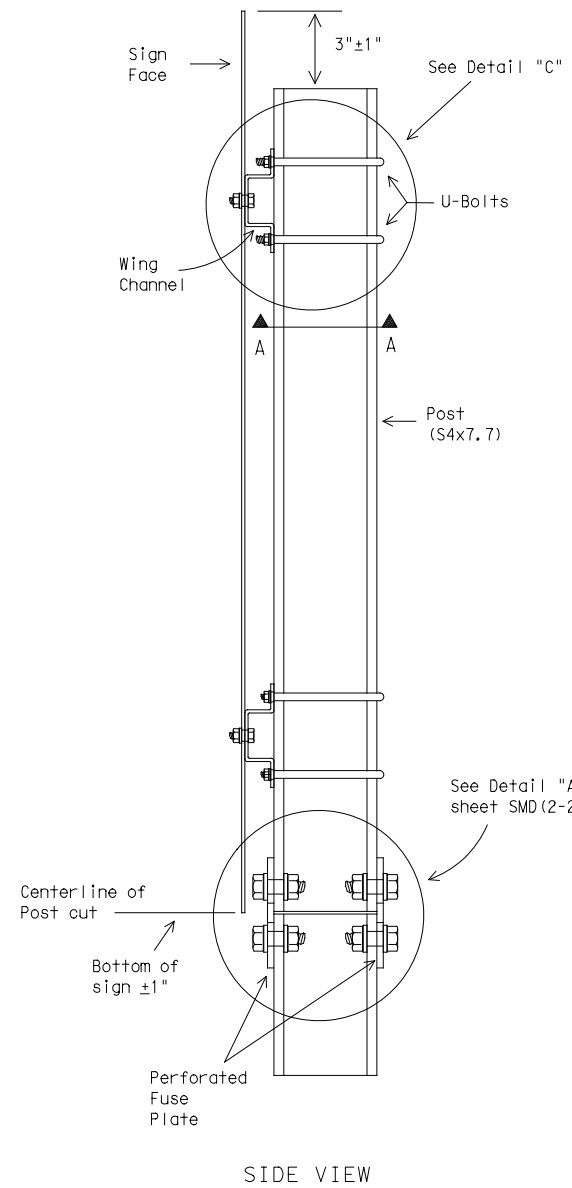
SMD(2-6)-01

© TxDOT April 1998		DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
11-98	REVISIONS	CONT	SECT	JOB	HIGHWAY
11-01		3510	04	055	SH 99
		DIST	COUNTY		SHEET NO.
		HOU	FORT BEND		283

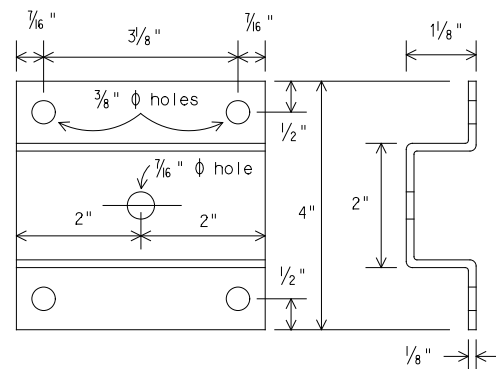


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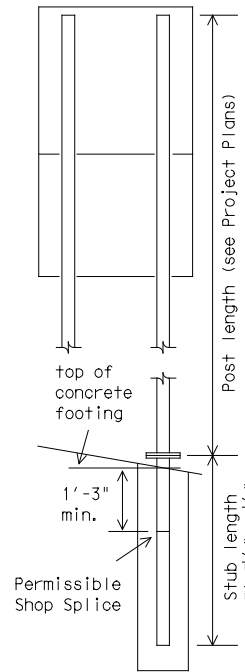
# WING CHANNEL CLAMP DETAIL FOR TYPE G MOUNT



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.

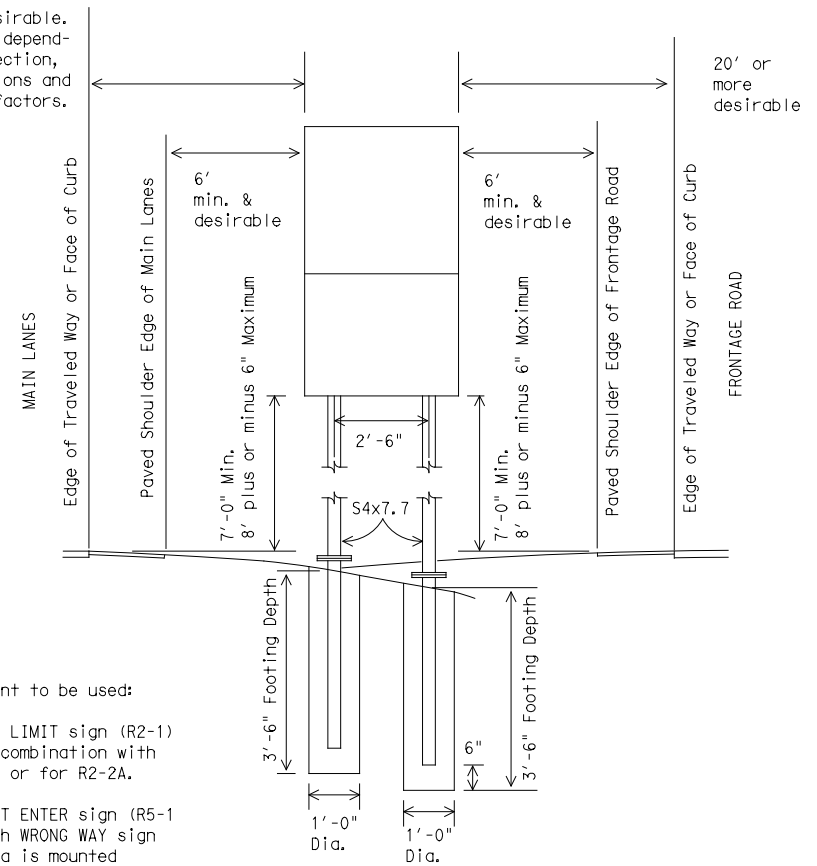


Wing channel, 4" width x 1/8" depth x 1/8" thickness, shall be aluminum (ASTM B221 6061-T6 or B308 6061-T6), galvanized steel (ASTM A36) or stainless steel (ASTM A167 type 304, No. 2B finish).



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.

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:

- Design conforms with AASHTO Specifications for the design and construction of structural supports for highway signs.
- Materials and fabrication shall conform to the requirements of the Department material specifications.
- Structural steel shall be "Low-Alloy Steel" for non-bridge structures per Item 442, "Metal For Structures."
- 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.)

Texas Department of Transportation  
Traffic Operations Division

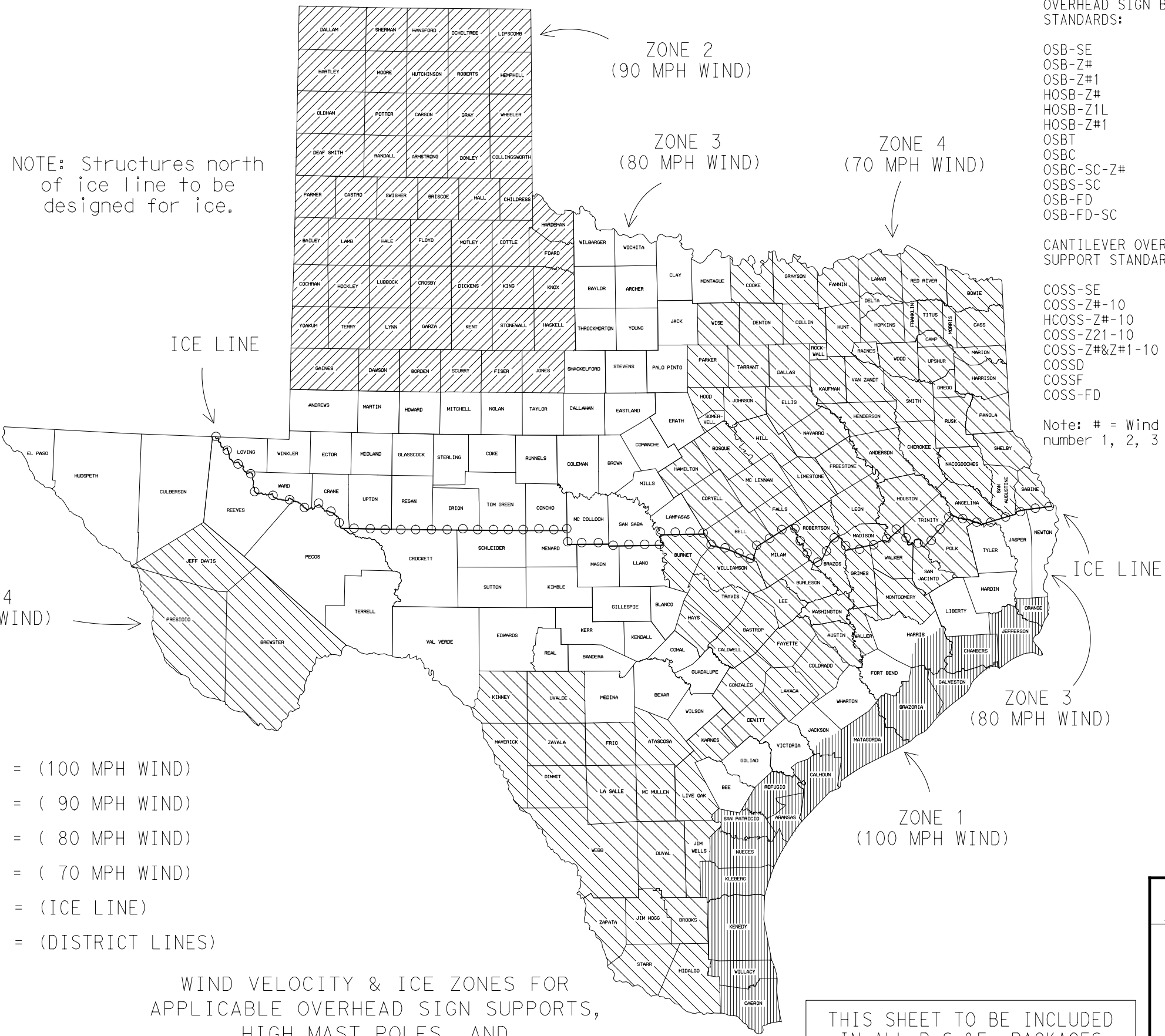
## SIGN MOUNTING DETAILS, TYPE G SUPPORT

SMD(TY G)-08

© TxDOT August 1995		DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
REVISIONS					
1-97	CONT	SECT	JOB	HIGHWAY	
9-08	3510	04	055	SH 99	
DIST		COUNTY		SHEET NO.	
HOU		FORT BEND		284	

DATE:  
FILE:

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NOTE: Structures north of ice line to be designed for ice.

- LEGEND
- ZONE 1 - [diagonal lines] = (100 MPH WIND)
  - ZONE 2 - [diagonal lines] = ( 90 MPH WIND)
  - ZONE 3 - [white box] = ( 80 MPH WIND)
  - ZONE 4 - [diagonal lines] = ( 70 MPH WIND)
  - = (ICE 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.

- 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
- 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
- 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

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.

THIS SHEET TO BE INCLUDED IN ALL P.S.&E. PACKAGES CONTAINING ONE OR MORE OF THE APPLICABLE STANDARD SHEETS LISTED HEREON

		Traffic Operations Division Standard	
<h2>WIND VELOCITY AND ICE ZONES</h2> <h3>WV &amp; IZ-14</h3>			
FILE:	windioe.dgn	DN: TxDOT	CK: TxDOT
© TxDOT	April 1996	CON: 3510	SECT: 04
REVISIONS		JOB: 055	HIGHWAY: SH 99
8-14-Added list of applicable standards, restricting use to structures designed for Fastest Mile wind speeds.		DIST: HOU	COUNTY: FORT BEND
		SHEET NO. 285	

DATE: FILE:

ZONE 1 100 MPH WIND

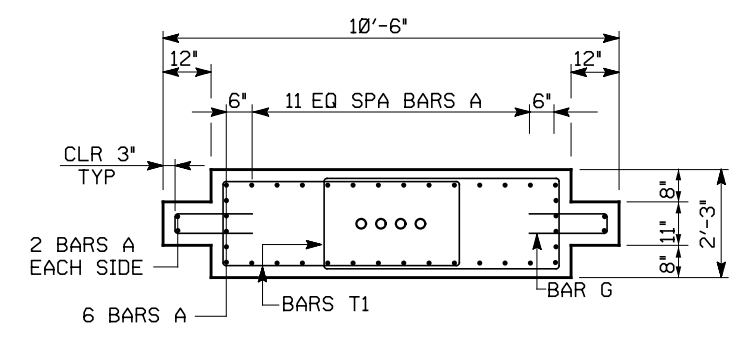
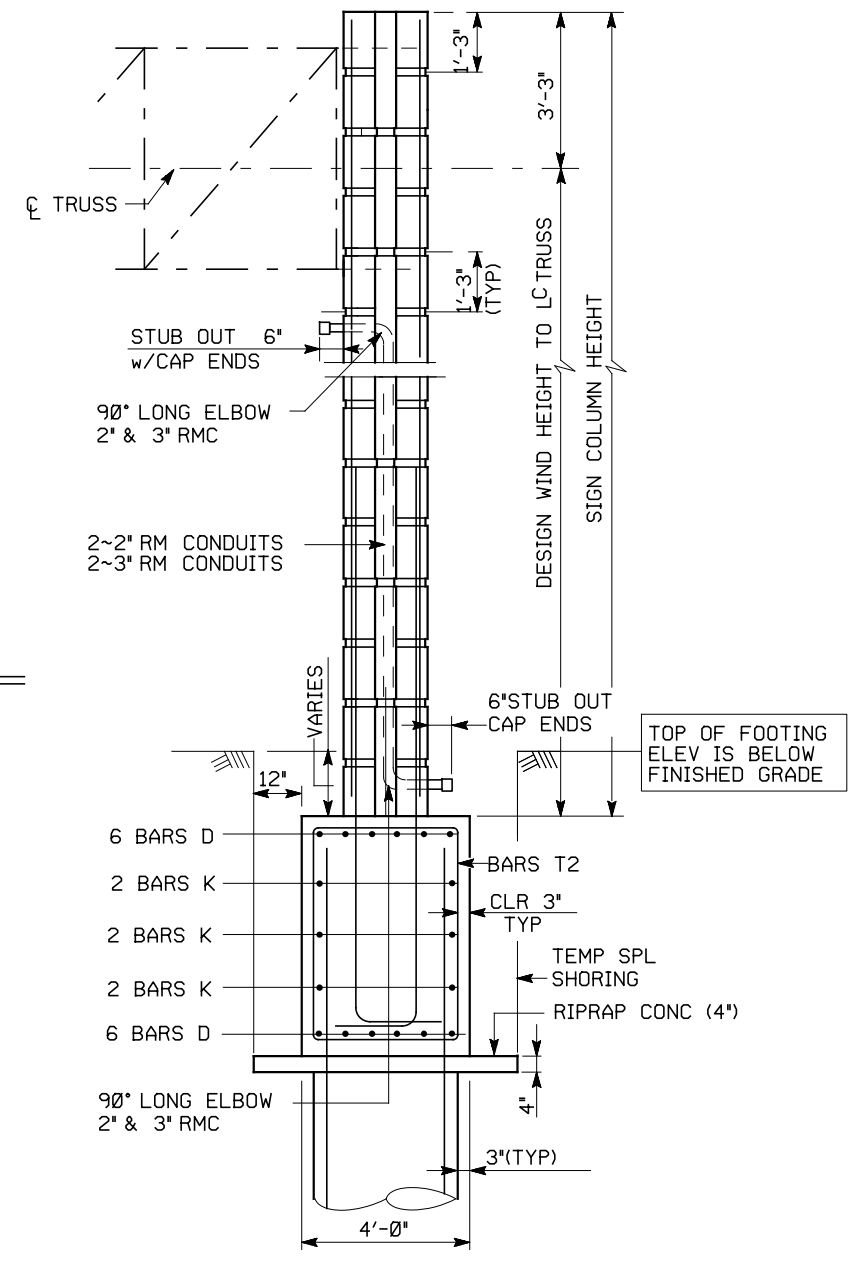
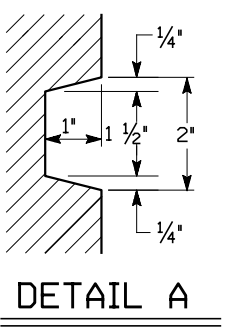
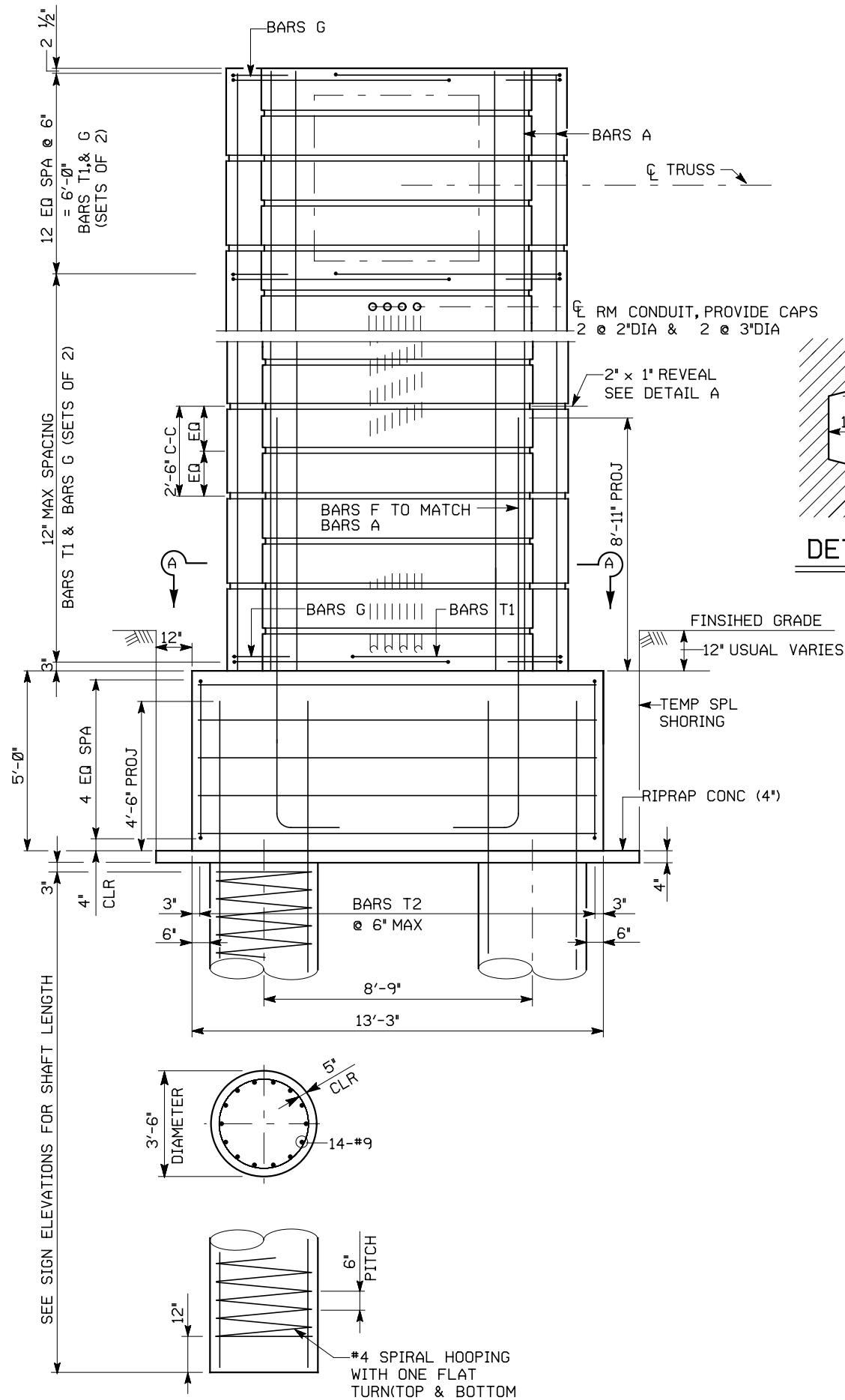
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DATE: FILE:

TOWER HEIGHT (ft)	10' SPAN												15' SPAN												20' SPAN												25' SPAN												TOWER HEIGHT (ft)					
	TOWER PIPE		ANCHOR BOLTS		BASE PLATE	TRUSS		DESIGN LOADS				TOWER PIPE		ANCHOR BOLTS		BASE PLATE	TRUSS		DESIGN LOADS				TOWER PIPE		ANCHOR BOLTS		BASE PLATE	TRUSS		DESIGN LOADS				TOWER PIPE		ANCHOR BOLTS		BASE PLATE	TRUSS		DESIGN LOADS													
	O.D. (in)	WALL THICK (in)	DEFL ΔH (in)	SIZE DIA (in)	NO.	BOLT CIR DIA	SIZE (in)	DEFL ΔV (in)	SHEAR V (Kips)	TORSION T (K-ft)	MOMENT M (K-ft)	O.D. (in)	WALL THICK (in)	DEFL ΔH (in)	SIZE DIA (in)	NO.	BOLT CIR DIA	SIZE (in)	DEFL ΔV (in)	SHEAR V (Kips)	TORSION T (K-ft)	MOMENT M (K-ft)	O.D. (in)	WALL THICK (in)	DEFL ΔH (in)	SIZE DIA (in)	NO.	BOLT CIR DIA	SIZE (in)	DEFL ΔV (in)	SHEAR V (Kips)	TORSION T (K-ft)	MOMENT M (K-ft)	O.D. (in)	WALL THICK (in)	DEFL ΔH (in)	SIZE DIA (in)	NO.	BOLT CIR DIA	SIZE (in)	DEFL ΔV (in)	SHEAR V (Kips)	TORSION T (K-ft)	MOMENT M (K-ft)	O.D. (in)	WALL THICK (in)	DEFL ΔH (in)	SIZE DIA (in)		NO.	BOLT CIR DIA	SIZE (in)	DEFL ΔV (in)	SHEAR V (Kips)
25'	16	0.375	0.240	1 1/2	8	21"	25 x 1 3/4	0.2	6.46	27.82	153.70	16	0.531	0.384	1 3/4	8	21 1/2"	26 x 2 1/4	0.5	9.30	62.60	225.51	20	0.438	0.411	2	8	25 3/4"	30 1/2 x 2 1/8	0.8	12.34	111.29	300.38	24	0.469	0.356	2	8	29 3/4"	34 1/2 x 2 1/8	0.9	15.37	173.89	375.94	25'									
26'		0.375	0.250				25 x 1 3/4		6.49		160.15		0.531	0.415	1 3/4	8	21 1/2"	26 x 2 1/4		9.33		234.80		0.438	0.444				30 1/2 x 2 1/8		12.37		312.67		0.469	0.385	2	8	29 3/4"	34 1/2 x 2 1/8		15.41		391.21	26'									
27'		0.406	0.260				25 x 1 3/4		6.52		166.65		0.531	0.448	1 3/4	8	21 1/2"	26 x 2 1/4		9.36		244.12		0.469	0.449				30 1/2 x 2 1/4		12.41		325.01		0.500	0.391	2	8	29 3/4"	34 1/2 x 2 1/4		15.46		406.54	27'									
28'		0.438	0.260				25 x 1 7/8		6.55		173.18		0.656	0.400	2		22"	27 x 2 3/8		9.39		253.47		0.500	0.455						12.44		337.38			0.421	2 1/4	30"	35 x 2 1/4		15.50		421.92	28'										
29'		0.469	0.260	1 1/2		21"	25 x 1 7/8		6.58		179.73		0.656	0.429				27 x 2 3/8		9.42		262.85		0.500	0.488						12.48		349.80			0.451					15.54		437.35	29'										
30'		0.270	0.270	1 3/4		21 1/2"	26 x 1 7/8		6.61		186.32		0.687	0.441				27 x 2 1/2		9.45		272.26		0.531	0.495				30 1/2 x 2 1/4		12.52		362.25		0.500	0.483					15.59		452.82	30'										
31'		0.290					26 x 2		6.64		192.94		0.471							9.48		281.70		0.562	0.501	2		25 3/4"	30 1/2 x 2 3/8		12.55		374.75		0.531	0.488					0.9	15.63		468.35	31'									
32'		0.469	0.310				26 x 2		6.67		199.59		0.502							9.50		291.17		0.562	0.534	2 1/4		26"	31 x 2 3/8		12.59		387.28		0.520						1.0	15.68		483.93	32'									
33'		0.500	0.320				26 x 2 1/8		6.70		206.26		0.687	0.534						9.53		300.68		0.562	0.568				31 x 2 3/8		12.63		399.85		0.553				35 x 2 1/4		15.72		499.55	33'										
34'		0.500	0.330						6.73		212.97		0.750	0.525	2		22"	27 x 2 1/2		9.56		310.21		0.594	0.573				31 x 2 3/8		12.66		412.46		0.587	2 1/4	30"	35 x 2 3/8		15.76		515.23	34'											
35'		0.500	0.350						6.75		219.70		0.557	2 1/4	22 1/2"		28 x 2 5/8		9.59		319.77		0.594	0.607				31 x 2 1/2		12.70		425.11		0.531	0.622	2 1/2	30 1/2"	36 x 2 3/8		15.81		530.95	35'											
36'		0.531	0.350				26 x 2 1/8		6.78		226.47		0.589				28 x 2 5/8		9.62		329.37		0.594	0.643				31 x 2 3/8		12.74		437.80		0.562	0.624				36 x 2 1/2		15.85		546.71	36'										
37'		0.531	0.370				26 x 2 1/4		6.81		233.26		0.622				28 x 2 3/4		9.65		338.99		0.625	0.648				31 x 2 3/8		12.77		450.53		0.562	0.659			36 x 2 1/2	1.0	15.89		562.53	37'											
38'		0.531	0.390						6.84		240.08		0.750	0.656			28 x 2 3/4		9.65		347.49		0.625	0.684				31 x 2 3/8		12.81		463.29		0.562	0.695			36 x 2 1/2	1.1	15.94		578.39	38'											
39'		0.656	0.350						6.87		246.94		0.843	0.626			28 x 2 7/8		9.71		358.32		0.656	0.689				31 x 2 3/4		12.84		476.09		0.594	0.696			36 x 2 5/8		15.98		594.30	39'											
40'		0.656	0.360	1 3/4		21 1/2"	26 x 2 1/4		6.90		253.82		0.843	0.658			28 x 2 7/8		9.74		368.03		0.656	0.725	2 1/4		26"	31 x 2 3/4		12.88		488.93		0.594	0.732			36 x 2 5/8		16.03		610.25	40'											
42'		0.656	0.400	2		22"	27 x 2 3/8		6.96		267.67		0.843	0.726			28 x 3		9.80		387.55		0.719	0.736	2 1/2		26 1/2"	31 1/2 x 2 3/4		12.95		514.72		0.625	0.770			36 x 2 3/4		16.11		642.29	42'											
44'		0.687	0.420	2		22"	27 x 2 3/8		7.02		281.64		1.031	0.675			28 x 3		9.85		407.18		0.750	0.779	2 1/2		26 1/2"	31 1/2 x 2 3/8		13.03		540.66		0.656	0.808			36 x 2 3/4		16.20		674.52	44'											
45'	16	0.687	0.440	2	8	22"	27 x 2 3/8	0.2	7.05	27.82	288.67	16	1.218	0.619	2 1/4	8	22 1/2"	28 x 3	0.5	9.88	62.60	417.04	20	0.750	0.814	2 1/2	8	26 1/2"	31 1/2 x 2 7/8	0.8	13.06	111.29	553.68	24	0.688	0.809	2 1/2	8	30 1/2"	36 x 2 3/4	1.1	16.24	173.89	690.71	45'									

ZONE 1 100 MPH WIND

TOWER HEIGHT (ft)	30' SPAN												35' SPAN												40' SPAN												TOWER HEIGHT (ft)																	
	TOWER PIPE		ANCHOR BOLTS		BASE PLATE	TRUSS		DESIGN LOADS				TOWER PIPE		ANCHOR BOLTS		BASE PLATE	TRUSS		DESIGN LOADS				TOWER PIPE		ANCHOR BOLTS		BASE PLATE	TRUSS		DESIGN LOADS																								
	O.D. (in)	WALL THICK (in)	DEFL ΔH (in)	SIZE DIA (in)	NO.	BOLT CIR DIA	SIZE (in)	DEFL ΔV (in)	SHEAR V (Kips)	TORSION T (K-ft)	MOMENT M (K-ft)	O.D. (in)	WALL THICK (in)	DEFL ΔH (in)	SIZE DIA (in)	NO.	BOLT CIR DIA	SIZE (in)	DEFL ΔV (in)	SHEAR V (Kips)	TORSION T (K-ft)	MOMENT M (K-ft)	O.D. (in)	WALL THICK (in)	DEFL ΔH (in)	SIZE DIA (in)	NO.	BOLT CIR DIA	SIZE (in)	DEFL ΔV (in)	SHEAR V (Kips)	TORSION T (K-ft)	MOMENT M (K-ft)	O.D. (in)	WALL THICK (in)	DEFL ΔH (in)		SIZE DIA (in)	NO.	BOLT CIR DIA	SIZE (in)	DEFL ΔV (in)	SHEAR V (Kips)	TORSION T (K-ft)	MOMENT M (K-ft)	O.D. (in)	WALL THICK (in)	DEFL ΔH (in)	SIZE DIA (in)	NO.	BOLT CIR DIA	SIZE (in)	DEFL ΔV (in)	SHEAR V (Kips)
25'	24	0.531	0.475	2 1/4	8	30"	35 x 2 1/4	1.4	18.21	250.41	449.85	30	0.406	0.442	2 1/4	8	36"	41 x 2	1.6	21.34	340.83	529.13	30	0.500	0.502	2 1/2	8	36 1/2"	42 x 2 1/4	2.1	24.18	445.17	606.83	25'																				
26'		0.531	0.514				35 x 2 1/4		18.25		467.86		0.406	0.478				41 x 2	1.7	21.40		550.13		0.500	0.543				42 x 2 1/4	2.2	24.23		630.43	26'																				
27'		0.562	0.526				35 x 2 3/8		18.29		485.93		0.438	0.479				41 x 2 1/8		21.45		571.21		0.500	0.586				42 x 2 3/8	2.3	24.29		654.13	27'																				
28'		0.562	0.566				35 x 2 3/8	1.4	18.34		504.07		0.515					41 x 2 1/8		21.50		592.37		0.531	0.595				42 x 2 3/8		24.34		677.92	28'																				
29'		0.562	0.607	2 1/4		30"	35 x 2 3/8	1.5	18.38		522.25		0.552	2 1/4	36"			41 x 2 1/8		21.56		613.61		0.531	0.638				42 x 2 3/8		24.40		701.81	29'																				
30'		0.594	0.617	2 1/2		30 1/2"	36 x 2 1/2	1.5	18.43		540.50		0.438	0.591	2 1/2	36 1/2"			42 x 2 1/4		21.61		634.92		0.531	0.683				42 x 2 1/2	2.3	24.45		725.77	30'																			
31'		0.594	0.659				36 x 2 1/2	1.5	18.47		558.79		0.469	0.591				42 x 2 1/4	1.7	21.67		656.31		0.562	0.691	2 1/2		36 1/2"	42 x 2 1/2	2.4	24.51		749.82	31'																				
32'		0.594	0.702				36 x 2 5/8	1.6	18.51		577.14		0.469	0.630				42 x 2 1/4	1.8	21.72		677.76		0.562	0.737	2 3/4		37"	43 x 2 1/2		24.56		773.96	32'																				
33'		0.625	0.712				36 x 2 5/8		18.56		595.54		0.469	0.670				42 x 2 3/8		21.78		699.28		0.562	0.783				43 x 2 5/8		24.61		798.17	33'																				
34'		0.625	0.756				36 x 2 5/8		18.60		614.00		0.500	0.669				42 x 2 3/8		21.83		720.87		0.594	0.789				43 x 2 5/8		24.67		822.45	34'																				
35'		0.656	0.766				36 x 2 3/4		18.64		632.50		0.500	0.709				42 x 2 1/2		21.89		742.53		0.594	0.836				43 x 2 5/8	2.4	24.72		846.81	35'																				
36'		0.656	0.811				36 x 2 3/4	18.69		651.05		0.500	0.750				42 x 2 1/2		21.94		764.25		0.594	0.885				43 x 2 3/4	2.5	24.78		871.25	36'																					
37'		0.688	0.820				36 x 2 3/4	18.73		669.66		0.531	0.749	2 1/2	36 1/2"		42 x 2 1/2		22.00		786.04		0.625	0.891				43 x 2 3/4		24.83		895.75	37'																					
38'		0.688	0.865				36 x 2 3/4	18.78		688.31		0.531	0.790	2 3/4	37"		43 x 2 5/8		22.05		807.89		0.625	0.940				43 x 2 3/4		24.89		920.33	38'																					



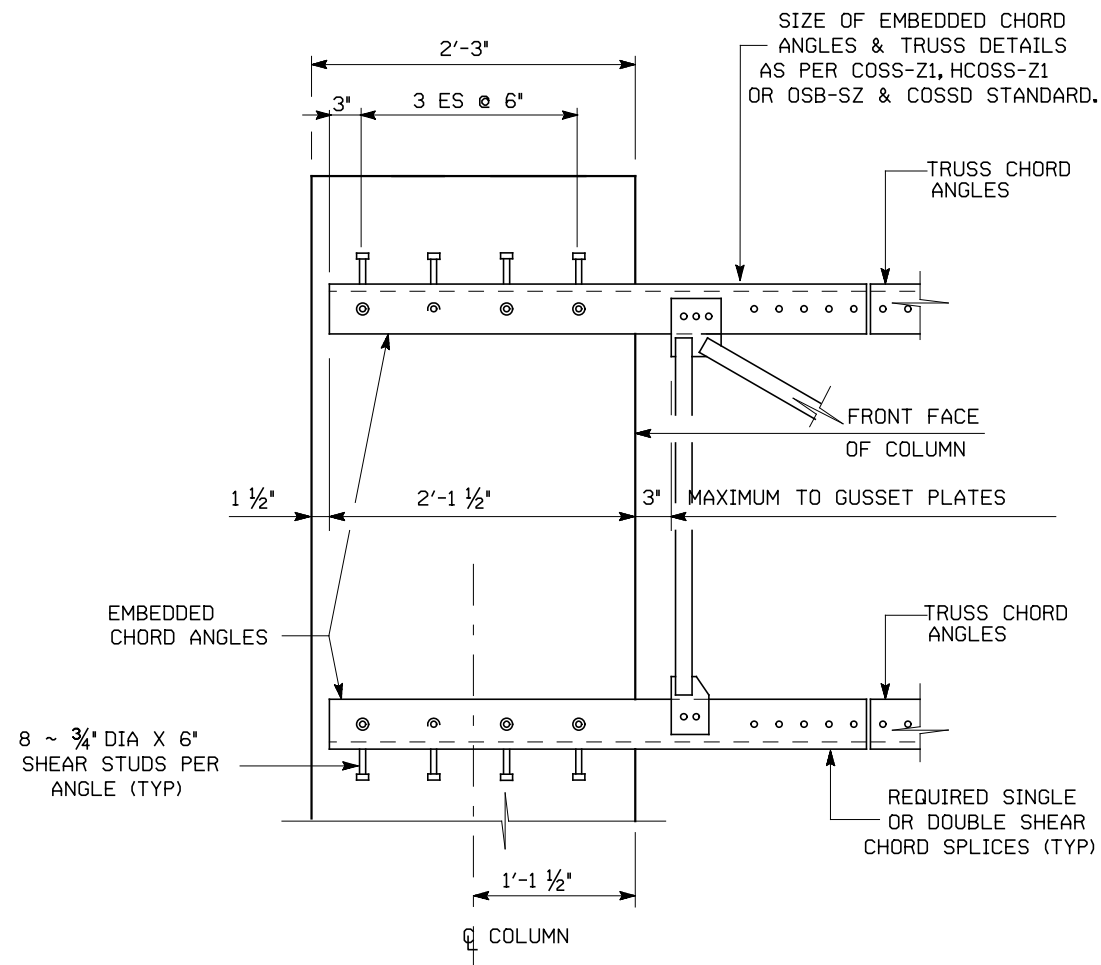
- NOTES:
1. CONCRETE SHALL BE CLASS "C" F'C = 3600 PSI.
  2. ALL REINFORCING SHALL BE GRADE 60.
  3. ALL DIMENSIONS OF THE REINFORCING BARS ARE TO C OF BARS UNLESS OTHERWISE NOTED.
  4. CHAMFER ALL EXPOSED CORNERS 3/4".
  5. ANGLE AND STUD ASSEMBLIES AND ALL STEEL HARDWARE, INCLUDING EMBEDDED CHORD ANGLES, STUDS & CONDUIT IN THE COLUMNS ARE INCIDENTAL TO ITEM 650 OVERHEAD SIGN SUPPORTS.
  6. ALL STEEL HARDWARE SHALL BE GALVANIZED.
  7. COMPONENTS OF THE STRUCTURE DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS AND/OR AASHTO STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES, AND TRAFFIC SIGNALS.
  8. EMBEDDED CHORD ANGLES, COMPLETE WITH STUDS & HOLES, SHALL BE PROVIDED BY THE TRUSS FABRICATOR.
  9. CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING & MAINTAINING LOCATION & ORIENTATION OF THE EMBEDDED ANGLES FOR TRUSS FIT-UP, CAMBER, & DEFLECTION. TEMPLATES MAY BE NEEDED TO HOLD THE ANGLES IN PLACE.(NO DIRECT PAY)
  10. IF SINGLE SHEAR SPLICES CONFLICT WITH THE GUSSET PLATES, THEN USE DOUBLE SHEAR SPLICES.
  11. WELD STUDS TO ANGLE FLANGES IN ACCORDANCE WITH AWS D1.5.
  12. FOR CANTILEVER TRUSS LENGTHS FALLING BETWEEN THOSE SHOWN USE SIZES CALLED FOR IN THE NEXT LONGER SPAN.
  13. CONCRETE COLUMNS ARE DESIGNED FOR THE EQUIVALENT AREA OF A 12'-6" DEEP SIGN PANEL OVER 100% OF THE SPAN LENGTH. DESIGN INCLUDES 3 POUNDS PER FOOT SQUARED FOR SIGN PANEL AND 20 POUNDS PER FOOT FOR LIGHTS AND 50 POUNDS PER FOOT FOR WALKWAYS OVER 100% OF THE SPAN LENGTH.



CANTILEVER OVERHEAD SIGN STRUCTURE DETAILS  
HORIZONTAL SCHEME

COSS-HS

FILE:	STDN40.DGN	DW:	HOU	CK:	HOU	DW:	HOU	CK:	HOU
©TXDOT	AUGUST 2011	DISTRICT	FED REG	PROJECT NO.		SHEET			
REVISIONS		HOUSTON	6			287			
		COUNTY	CONTROL	SECT	JOB	HIGHWAY			
		FORT BEND	3510	04	055	SH 99			



**SECTION THRU EMBEDDED TRUSS**

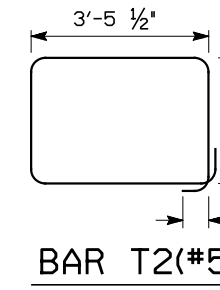
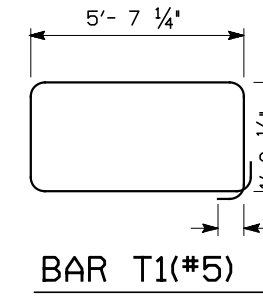
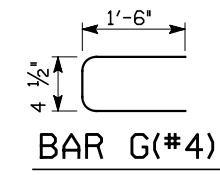
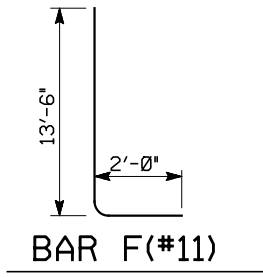
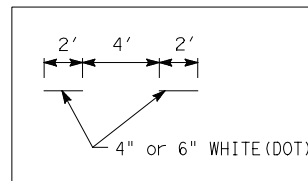


TABLE OF ESTIMATED COLUMN QUANTITIES (FOR ONE COLUMN) ①				
4.5' x 4.5' TRUSS				
BARS	NO.	SIZE	LENGTH	WEIGHT
A	40	#11	29'-10"	6,340
D	12	#11	12'-11"	824
F	40	#11	15'-6"	3,294
G	74	# 4	3'-4 1/2"	167
K	6	# 6	12'-11"	116
T1	74	# 5	15'-7 1/2"	1,206
T2	27	# 5	16'-7"	467
REINFORCING STEEL			LBS	12,414
TEMPORARY SPECIAL SHORING			SF	269
CL C CONC(SIGN FOOTING)			CY	9.8
CL C CONC(SIGN COLUMN)			CY	23.3
RIPRAP CONC (4 IN)			CY	1.0

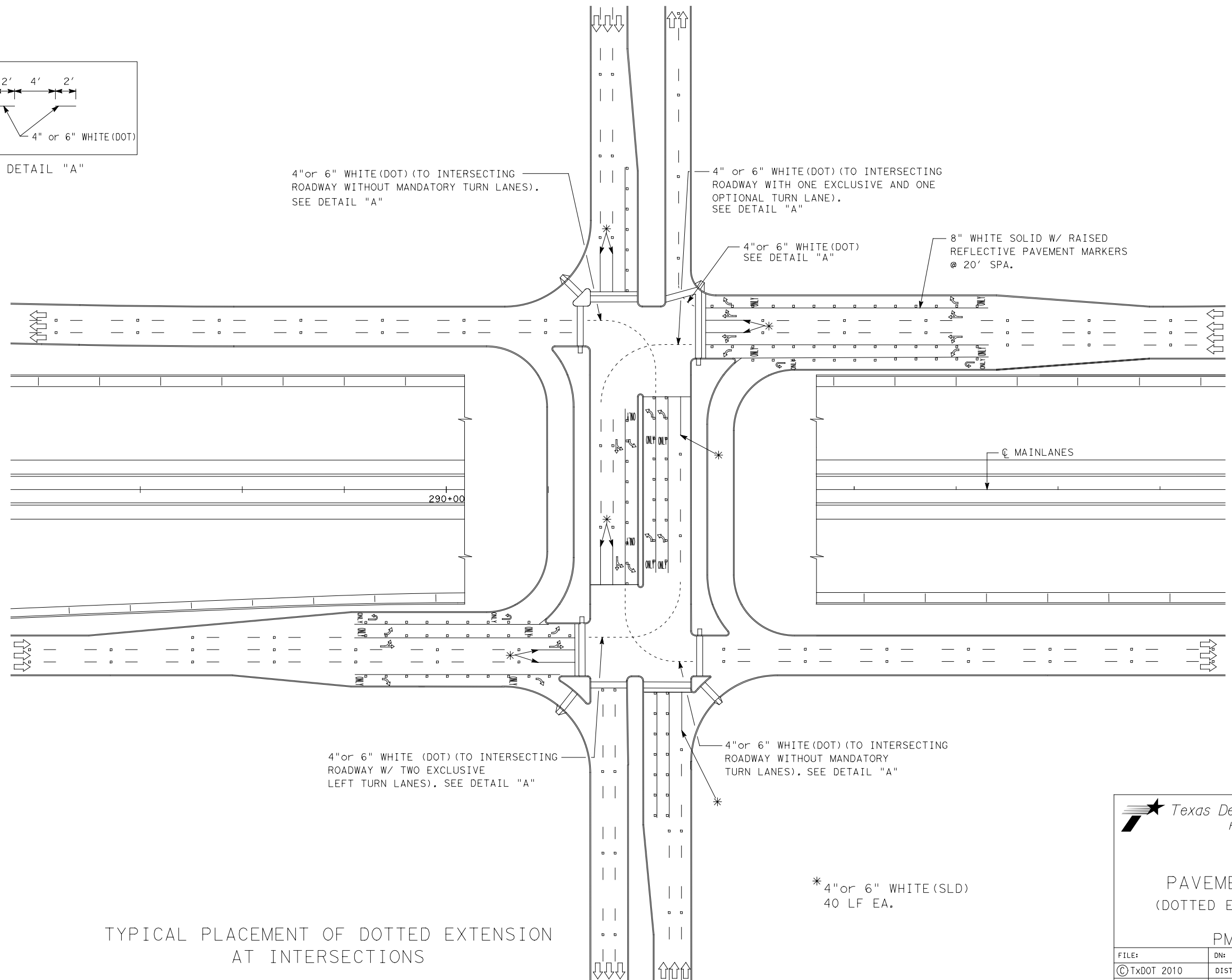
① QUANTITIES SHOWN ARE BASED ON A SIGN COLUMN HEIGHT OF 30'. FOR EACH LINEAR FOOT VARIATION IN HEIGHT MAKE THE FOLLOWING ADJUSTMENTS:

BARS A LENGTH, 1'-0"  
 REINFORCING STEEL, 250 LB  
 CL C CONC(SIGN COLUMN), 0.78 CY.

FILE:	STDN40.DGN	DN:	HOU	CK:	HOU	DW:	HOU	CK:	HOU
©TXDOT	AUGUST 2011	DISTRICT	FED REG	PROJECT NO.					
REVISIONS		HOUSTON	6			288			
		COUNTY	CONTROL	SECT	JOB	HIGHWAY			
		FORT BEND	3510	04	055	SH 99			



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		289
4/2011	COUNTY	CONTROL	SECT	JOB
	FORT BEND	3510	04	055
				HIGHWAY
				SH 99

**STORMWATER POLLUTION PREVENTION PLAN (SWP3):**

This SWP3 has been developed in accordance with the TPDES Construction General Permit TXR150000 (CGP). The Texas Department of Transportation (TxDOT) ensures that project specifications include adequate best management practices (BMPs) for this project.

For all projects with any soil disturbing activities, TxDOT will maintain a SWP3 with all pertinent records, correspondence, environmental documents, etc. at the project field office. If no field office is available, then this SWP3 shall be kept in the appropriate TxDOT Area Office.

This SWP3 is consistent with requirements specified in applicable stormwater plans and the projects environmental permits, issues, and commitments (EPICs). A copy of the CGP is included in Attachment 2.12 of the SWP3 binder.

**1.0 SITE/PROJECT DESCRIPTION**

**1.1 PROJECT CONTROL SECTION JOB (CSJ):**

3510-04-055

**1.2 PROJECT LIMITS:**

From: WESTHEIMER PARKWAY

To: CINCO RANCH BLVD

**1.3 PROJECT COORDINATES:**

BEGIN: (Lat) 29° 44' 00.90", (Long) 95° 46' 24.36"

END: (Lat) 29° 44' 38.14", (Long) 95° 46' 24.92"

**1.4 TOTAL PROJECT AREA (Acres):** 8.50

**1.5 TOTAL AREA TO BE DISTURBED (Acres):** 8.50

**1.6 NATURE OF CONSTRUCTION ACTIVITY:**

EXCAVATION, EMBANKMENT, GRADING  
STORM SEWER, RETAINING WALL,  
CONCRETE PAVEMENT

**1.7 MAJOR SOIL TYPES:**

Soil Type	Description
CLAY	WITH SAND AND SILT LAYERS

**1.8 PROJECT SPECIFIC LOCATIONS (PSLs):**

PSLs must be depicted on the Environmental Layout Sheets in Attachment 1.2 of this SWP3. PSLs may be identified during preconstruction meetings or during the construction process. Please choose from the options below:

- PSLs determined during preconstruction meeting
- PSLs determined during construction
- No PSLs planned for construction

Type	Sheet #s

All off-ROW PSLs required by the Contractor are the Contractor's responsibility. The Contractor shall secure all permits required by local, state, federal laws for off-ROW PSLs. The contractor shall provide diagrams, areas of disturbance, acreage, and BMPs for all off-ROW PSLs within one mile of the project.

**1.9 CONSTRUCTION ACTIVITIES:**

(Use the following list as a starting point when developing the Construction Activity Schedule and Ceasing Record in Attachment 2.5.)

- Mobilization
- Install sediment and erosion controls
- Blade existing topsoil into windrows, prep ROW, clear and grub
- Remove existing pavement
- Grading operations, excavation, and embankment
- Excavate and prepare subgrade for proposed pavement widening
- Remove existing culverts, safety end treatments (SETs)
- Remove existing metal beam guard fence (MBGF), bridge rail
- Install proposed pavement per plans
- Install culverts, culvert extensions, SETs
- Install mow strip, MBGF, bridge rail
- Place flex base
- Rework slopes, grade ditches
- Blade windrowed material back across slopes
- Revegetation of unpaved areas
- Achieve site stabilization and remove sediment and erosion control measures
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_

**1.10 POTENTIAL POLLUTANTS AND SOURCES:**

- Sediment laden stormwater from stormwater conveyance over disturbed area
- Fuels, oils, and lubricants from construction vehicles, equipment, and storage
- Solvents, paints, adhesives, etc. from various construction activities
- Transported soils from offsite vehicle tracking
- Construction debris and waste from various construction activities
- Contaminated water from excavation or dewatering pump-out water
- Sanitary waste from onsite restroom facilities
- Trash from various construction activities/receptacles
- Long-term stockpiles of material and waste
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_

**1.11 RECEIVING WATERS:**

Receiving waters must be depicted on the Environmental Layout Sheets in Attachment 1.2 of this SWP3. Include Segment # for receiving waters.

Tributaries	Classified Waterbody
SEGMENT 1014	BUFFALO BAYOU

\* Add (\*) for impaired waterbodies with pollutant in ().

**1.12 ROLES AND RESPONSIBILITIES: TxDOT**

- Development of plans and specifications
- Submit Notice of Intent (NOI) to TCEQ (≥5 acres)
- Post Construction Site Notice
- Submit NOI/CSN to local MS4
- Perform SWP3 inspections
- Maintain SWP3 records and update to reflect daily operations
- Complete and submit Notice of Termination to TCEQ
- Maintain SWP3 records for 3 years
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_

**1.13 ROLES AND RESPONSIBILITIES: CONTRACTOR**

- Day To Day Operational Control
- Submit Notice of Intent (NOI) to TCEQ (≥5 acres)
- Post Construction Site Notice
- Submit NOI/CSN to local MS4
- Maintain schedule of major construction activities
- Install, maintain and modify BMPs
- Complete and submit Notice of Termination to TCEQ
- Maintain SWP3 records for 3 years
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_

**1.14 LOCAL MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) OPERATOR COORDINATION:**

MS4 Entity



**STORMWATER POLLUTION PREVENTION PLAN (SWP3)**

FED. RD. DIV. NO.	PROJECT NO.			SHEET NO.
				290
STATE	STATE DIST.	COUNTY		
TEXAS	HOU	FORT BEND		
CONT.	SECT.	JOB	HIGHWAY NO.	
3510	04	055	SH 99	

**STORMWATER POLLUTION PREVENTION PLAN (SWP3):**

**2.0 BEST MANAGEMENT PRACTICES (BMPs) AND CONTROLS, INSPECTION, AND MAINTENANCE**

The Contractor shall be the responsible party for implementing the BMPs described herein and for complying with the SWP3 for control of erosion and sedimentation during day-to-day operations. The Contractor shall implement changes to this SWP3 approved by TxDOT within the times specified in this SWP3 or the CGP.

**2.1 EROSION CONTROL AND SOIL STABILIZATION BMPs:**

**T / P**

- Protection of Existing Vegetation
- Vegetated Buffer Zones
- Soil Retention Blankets
- Geotextiles
- Mulching/ Hydromulching
- Soil Surface Treatments
- Temporary Seeding
- Permanent Planting, Sodding or Seeding
- Biodegradable Erosion Control Logs
- Rock Filter Dams/ Rock Check Dams
- Vertical Tracking
- Interceptor Swale
- Riprap
- Diversion Dike
- Temporary Pipe Slope Drain
- Embankment for Erosion Control
- Paved Flumes
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_

**2.2 SEDIMENT CONTROL BMPs:**

**T / P**

- Biodegradable Erosion Control Logs
- Dewatering Controls
- Inlet Protection
- Rock Filter Dams/ Rock Check Dams
- Sandbag Berms
- Sediment Control Fence
- Stabilized Construction Exit
- Floating Turbidity Barrier
- Vegetated Buffer Zones
- Vegetated Filter Strips
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

Sediment control BMPs requiring design capacity calculations (See SWP3 Attachment 1.3.):

**T / P**

- Sediment Trap
  - Calculated volume runoff from 2-year, 24-hour storm for each acre of disturbed area
  - 3,600 cubic feet of storage per acre drained
- Sedimentation Basin
  - Not required (<10 acres disturbed)
  - Required (>10 acres) and implemented.
    - Calculated volume runoff from 2-year, 24-hour storm for each acre of disturbed area
    - 3,600 cubic feet of storage per acre drained
  - Required (>10 acres), but not feasible due to:
    - Available area/Site geometry
    - Site slope/Drainage patterns
    - Site soils/Geotechnical factors
    - Public safety
    - Other: \_\_\_\_\_

**2.3 PERMANENT CONTROLS:**

(Coordinate post-construction BMPs with appropriate TxDOT maintenance sections.)

BMPs To Be Left In Place Post Construction:

Type	Stationing	
	From	To

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

**2.4 OFFSITE VEHICLE TRACKING CONTROLS:**

- Excess dirt/mud on road removed daily
- Haul roads dampened for dust control
- Loaded haul trucks to be covered with tarpaulin
- Stabilized construction exit
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_

**2.5 POLLUTION PREVENTION MEASURES:**

- Chemical Management
- Concrete and Materials Waste Management
- Debris and Trash Management
- Dust Control
- Sanitary Facilities
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_
- Other: \_\_\_\_\_

**2.6 VEGETATED BUFFER ZONES:**

Natural vegetated buffers shall be maintained as feasible to protect adjacent surface waters. If vegetated natural buffer zones are not feasible due to site geometry, the appropriate additional sediment control measures have been incorporated into this SWP3.

Type	Stationing	
	From	To

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

**2.7 ALLOWABLE NON-STORMWATER DISCHARGES:**

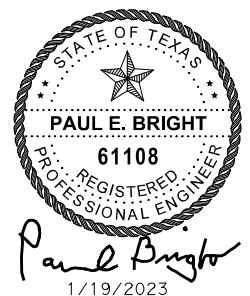
- Fire hydrant flushings
- Irrigation drainage
- Pavement washwater (where spills or leaks have not occurred, and detergents are not used)
- Potable water sources
- Springs
- Uncontaminated groundwater
- Water used to wash vehicles or control dust
- Other allowable non-stormwater discharges as allowed by TPDES GP TXR150000.

**2.8 INSPECTIONS:**

All disturbed areas and erosion and sediment control devices shall be inspected at least once every seven (7) days. Inspections shall be performed by TxDOT as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.5 of this SWP3 .

**2.9 MAINTENANCE:**

Control measures shall be properly installed according to specifications. If it is determined that a BMP or control measure is not operating effectively, maintenance must be accomplished as soon as possible and before the next anticipated rain event, but in no case later than 7 calendar days after being able to access the site. Maintenance shall be performed by the Contractor as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.5 of this SWP3.








**STORMWATER POLLUTION PREVENTION PLAN (SWP3)**

FED. RD. DIV. NO.	PROJECT NO.			SHEET NO.
				291
STATE	STATE DIST.	COUNTY		
TEXAS	HOU	FORT BEND		
CONT.	SECT.	JOB	HIGHWAY NO.	
3510	04	055	SH 99	



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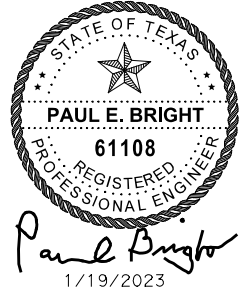
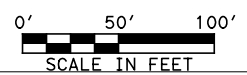
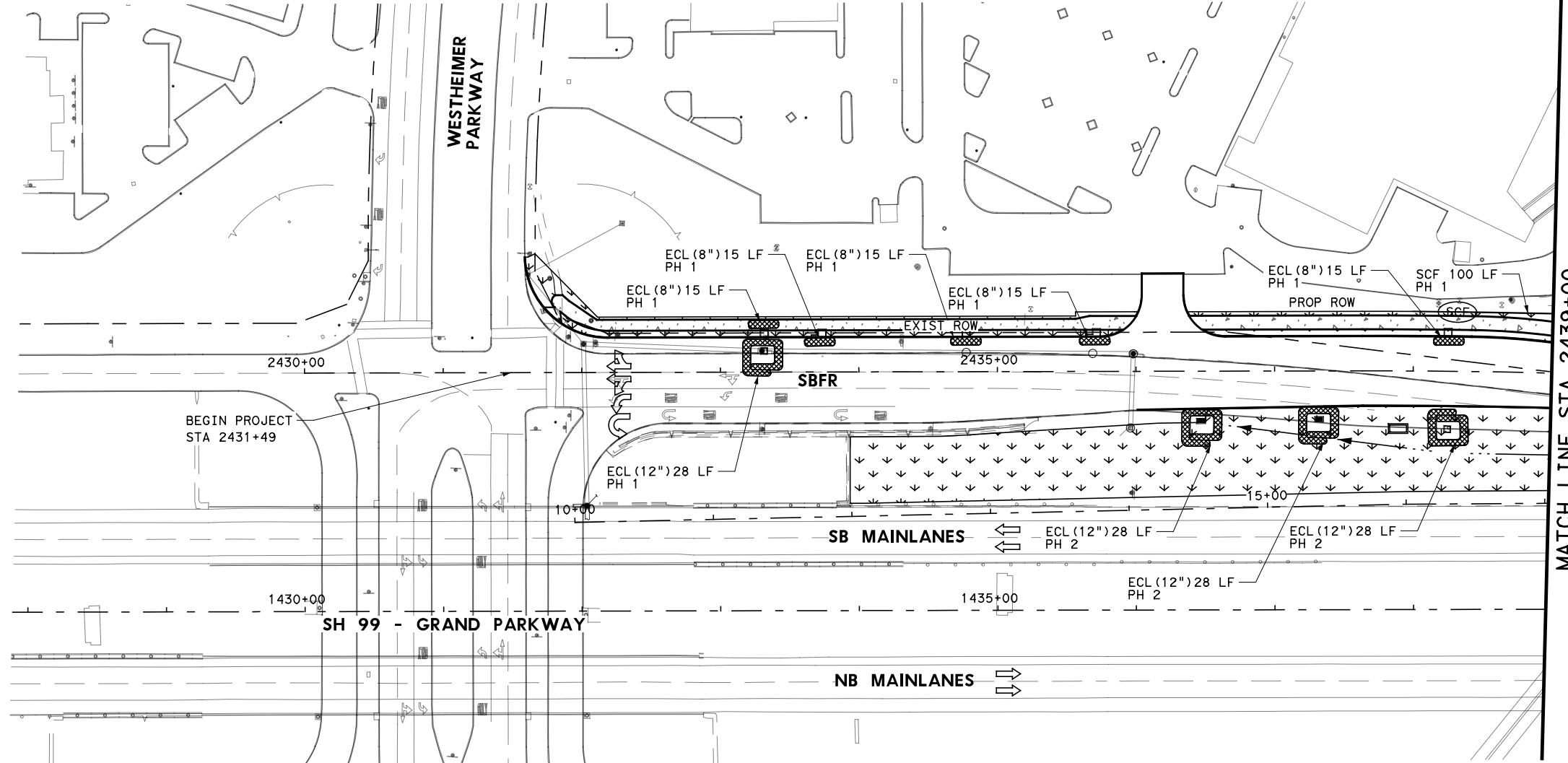
**LEGEND**

-  RFD2 ROCK FILTER DAM TYPE 2
-  SCF TEMPORARY SEDIMENT CONTROL FENCE
-  ECL EROSION CONTROL LOG
-  DIRECTION OF FLOW
-  BLOCK SODDING



**NOTES:**

1. SEE SWP3 STANDARD SHEETS FOR DETAILS.
2. THE CONTRACTOR SHALL USE CONSTRUCTION EXITS TO MINIMIZE DEBRIS ON PAVEMENT. TEMPORARY CONSTRUCTION EXITS ARE TO BE PLACED DURING EACH PHASE FOR EACH DISTURBED AREA. ADDITIONAL LOCATIONS MAY BE SPECIFIED BY THE ENGINEER.
3. PLACE SEDIMENT CONTROL MEASURES PRIOR TO INITIATING EACH PHASE OF CONSTRUCTION.
4. THE CONTRACTOR SHALL STAGE CONSTRUCTION OPERATIONS TO MINIMIZE DISTURBED AREAS.
5. THE CONTRACTOR SHALL EXPEDITE WORK ACTIVITIES TO DISTURBED AREAS AS SOON AS POSSIBLE TO RESTORE VEGETATION OR INSTALL FIRST PAVEMENT SUBSTRUCTURES. IF DISTURBED AREAS DO NOT RECEIVE PERMANENT SEEDING OR THE FIRST PAVEMENT SUBSTRUCTURE WITHIN 21 DAYS, THE DISTURBED AREA SHALL BE TEMPORARILY SEEDDED.
6. THE CONTRACTOR SHALL DIRECT INTERIM STORM WATER TO MANHOLES AND INLET OPENINGS.



**TEDSI INFRASTRUCTURE GROUP**  
 Consulting Engineers  
 738 Hwy 6 South, Suite 430  
 Houston, Texas 77079  
 (832) 619-1000



SH 99  
 SOUTHBOUND FRONTAGE ROAD  
 WESTHEIMER PKWY TO CINCO RANCH BLVD






SWP3 LAYOUT  
 BEGIN TO STA 2439+00

SHEET 1 OF 4

FED. RD. DIV. NO.	PROJECT NO.	HIGHWAY NO.
6		SH 99
STATE	DIST.	COUNTY
TEXAS	HOU	FORT BEND
CONT.	SECT.	JOB
3510	04	055
		SHEET NO.
		292

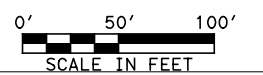
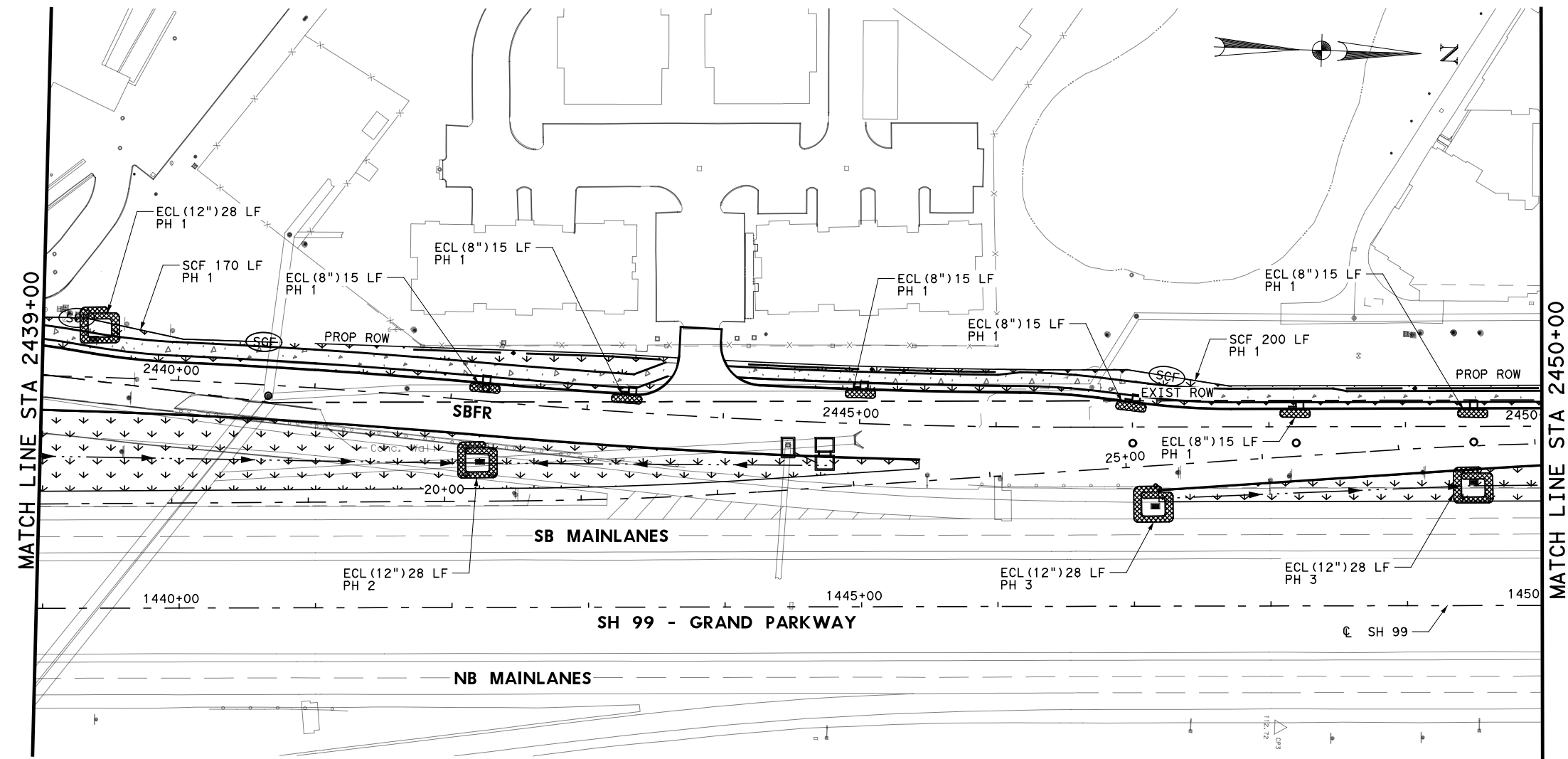
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**LEGEND**

-  RFD2 ROCK FILTER DAM TYPE 2
-  SCF TEMPORARY SEDIMENT CONTROL FENCE
-  ECL EROSION CONTROL LOG
-  DIRECTION OF FLOW
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 Houston, Texas 77079  
 (832) 619-1000








**SH 99**  
**SOUTHBOUND FRONTAGE ROAD**  
**WESTHEIMER PKWY TO CINCO RANCH BLVD**  
  
**SW3P LAYOUT**  
**STA 2439+00 TO STA 2450+00**

SHEET 2 OF 4

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	293

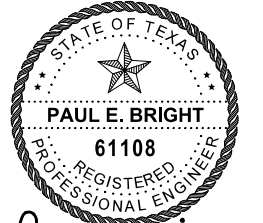
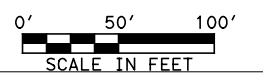
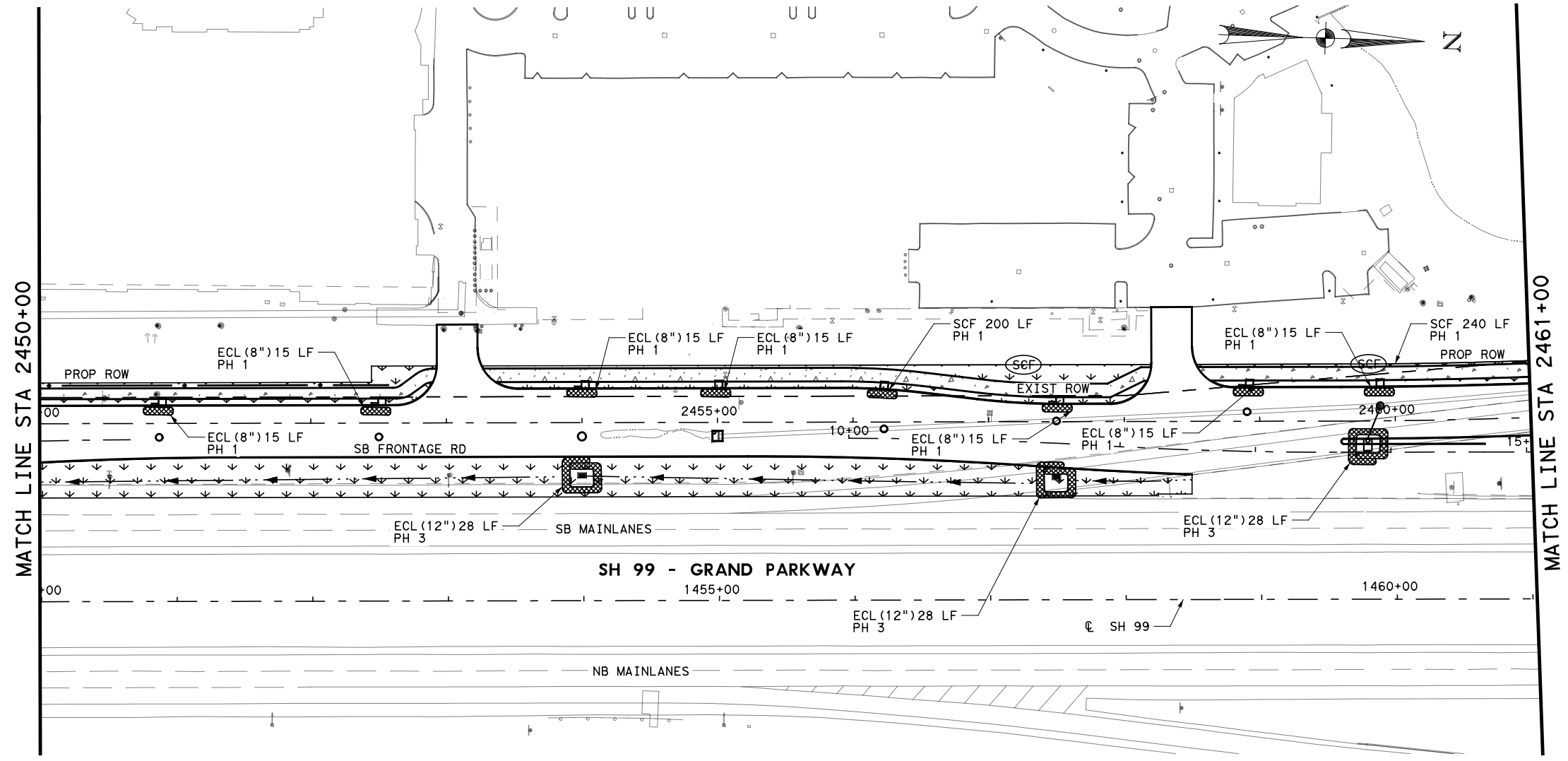
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**LEGEND**

-  RFD2 ROCK FILTER DAM TYPE 2
-  SCF TEMPORARY SEDIMENT CONTROL FENCE
-  ECL EROSION CONTROL LOG
-  DIRECTION OF FLOW
-  BLOCK SODDING

**NOTES:**

1. SEE SWP3 STANDARD SHEETS FOR DETAILS.
2. THE CONTRACTOR SHALL USE CONSTRUCTION EXITS TO MINIMIZE DEBRIS ON PAVEMENT. TEMPORARY CONSTRUCTION EXITS ARE TO BE PLACED DURING EACH PHASE FOR EACH DISTURBED AREA. ADDITIONAL LOCATIONS MAY BE SPECIFIED BY THE ENGINEER.
3. PLACE SEDIMENT CONTROL MEASURES PRIOR TO INITIATING EACH PHASE OF CONSTRUCTION.
4. THE CONTRACTOR SHALL STAGE CONSTRUCTION OPERATIONS TO MINIMIZE DISTURBED AREAS.
5. THE CONTRACTOR SHALL EXPEDITE WORK ACTIVITIES TO DISTURBED AREAS AS SOON AS POSSIBLE TO RESTORE VEGETATION OR INSTALL FIRST PAVEMENT SUBSTRUCTURES. IF DISTURBED AREAS DO NOT RECEIVE PERMANENT SEEDING OR THE FIRST PAVEMENT SUBSTRUCTURE WITHIN 21 DAYS, THE DISTURBED AREA SHALL BE TEMPORARILY SEED.
6. THE CONTRACTOR SHALL DIRECT INTERIM STORM WATER TO MANHOLES AND INLET OPENINGS.



*Paul Bright*  
1/19/2023

**TEDSI INFRASTRUCTURE GROUP**  
Consulting Engineers  
738 Hwy 6 South, Suite 430  
Houston, Texas 77079  
(832) 619-1000



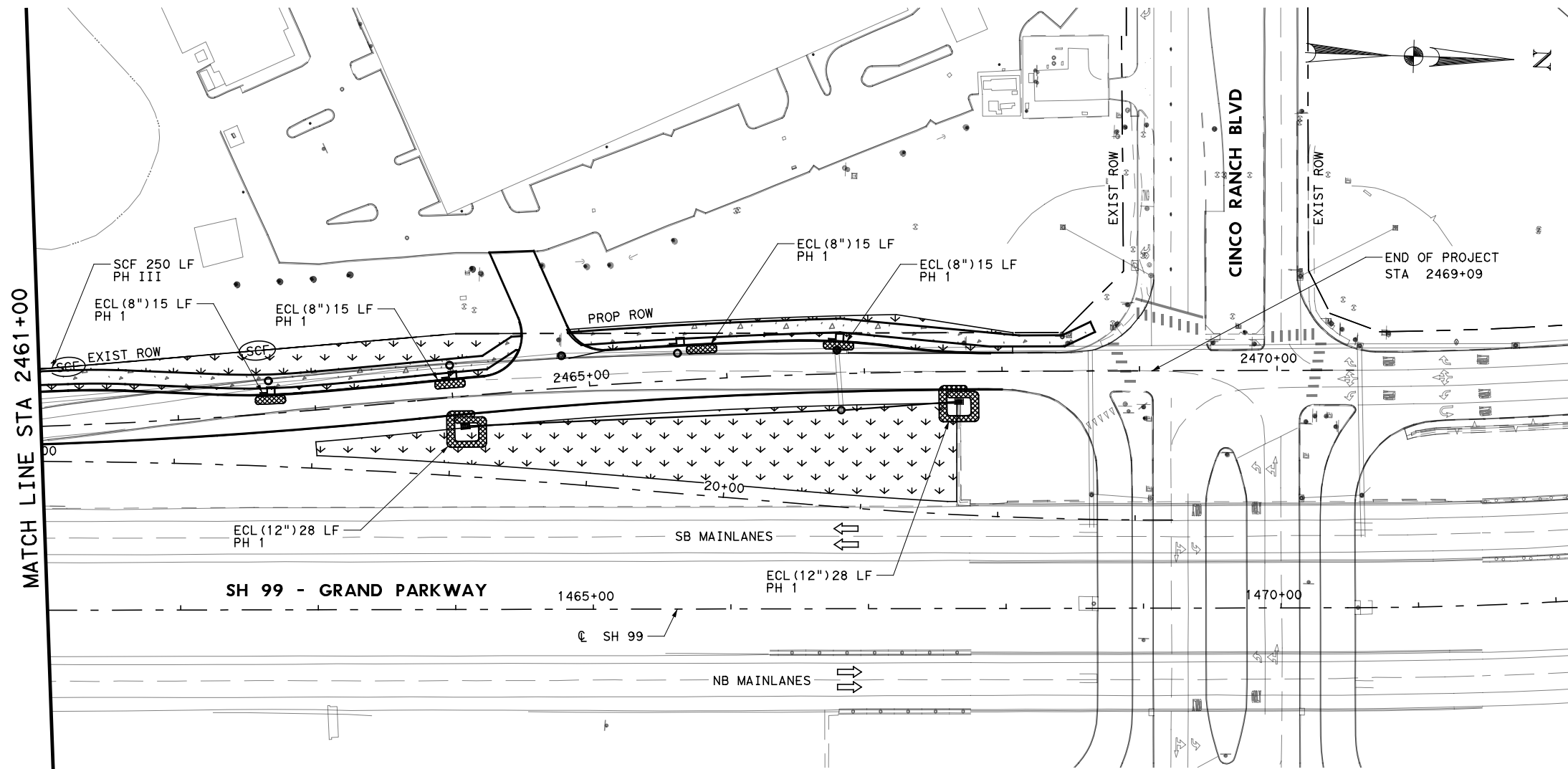
**SH 99**  
**SOUTHBOUND FRONTAGE ROAD**  
**WESTHEIMER PKWY TO CINCO RANCH BLVD**

**SW3P LAYOUT**  
**STA 2450+00 TO STA 2461+00**


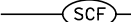



**SHEET 3 OF 4**

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	294

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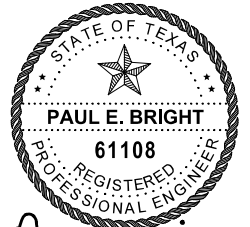
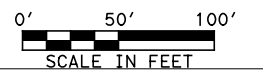


**LEGEND**

-  ROCK FILTER DAM TYPE 2
-  TEMPORARY SEDIMENT CONTROL FENCE
-  EROSION CONTROL LOG
-  DIRECTION OF FLOW
-  BLOCK SODDING

**NOTES:**

1. SEE SWP3 STANDARD SHEETS FOR DETAILS.
2. THE CONTRACTOR SHALL USE CONSTRUCTION EXITS TO MINIMIZE DEBRIS ON PAVEMENT. TEMPORARY CONSTRUCTION EXITS ARE TO BE PLACED DURING EACH PHASE FOR EACH DISTURBED AREA. ADDITIONAL LOCATIONS MAY BE SPECIFIED BY THE ENGINEER.
3. PLACE SEDIMENT CONTROL MEASURES PRIOR TO INITIATING EACH PHASE OF CONSTRUCTION.
4. THE CONTRACTOR SHALL STAGE CONSTRUCTION OPERATIONS TO MINIMIZE DISTURBED AREAS.
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6. THE CONTRACTOR SHALL DIRECT INTERIM STORM WATER TO MANHOLES AND INLET OPENINGS.



*Paul Bright*  
1/19/2023

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 TBPE F-1640

Texas Department of Transportation  
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**SH 99**  
**SOUTHBOUND FRONTAGE ROAD**  
**WESTHEIMER PKWY TO CINCO RANCH BLVD**  
**SW3P LAYOUT**  
**STA 2461+00 TO END**

SHEET 4 OF 4

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	295

**I. STORMWATER POLLUTION PREVENTION**

Texas Pollutant Discharge Elimination System (TPDES) TXR 150000: Stormwater Discharge Permit or Construction General Permit is required for projects with 1 or more acres disturbed soil. Projects with any disturbed soil must protect for erosion and sedimentation in accordance with Item 506. Refer to Storm Water Pollution Prevention Plan (SWP3) Houston District standard plan.

**Comments:** No Additional Comments

**II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS**

United States Army Corps of Engineers (USACE) Permit is required for filling, dredging, excavating or other work in water bodies, rivers, creeks, streams, wetlands or wet areas. The Contractor must adhere to all of the terms and general conditions associated with the following permit(s). If additional work not represented in the plans is required, contact the Engineer immediately.

No United States Army Corps (USACE) Permit Required

Work is authorized by the United States Army Corps of Engineers (USACE) under a Nationwide Permit (NWP) without a Pre-Construction Notification (PCN). Project specific permit was not issued by USACE, therefore is not in the plan set. The USACE general conditions are in the "General Notes."

Work is authorized by the United States Army Corps of Engineers (USACE) under a Nationwide Permit (NWP) with a Pre-Construction Notification (PCN). The project specific permit issued by the United States Army Corps of Engineers (USACE) is included in the plan set. The USACE general conditions are in the "General Notes."

Work is authorized by the United States Army Corps of Engineers (USACE) under a Individual Permit (IP). The project specific permit issued by the United States Army Corps of Engineers (USACE) is included in the plan set.

Work would be authorized by the United States Army Corps of Engineers (USACE) permit. The project specific permit issued by the USACE will be provided to the contractor.

United States Coast Guard (USCG) Permit is required for projects that involve the construction or modification (including changes to lighting) of a bridge or causeway across a water body determined to be navigable by the United States Coast Guard (USCG) under Section 9 of the Rivers and Harbors Act. If additional work not represented in the plans is required, contact the Engineer immediately.

No United States Coast Guard (USCG) Coordination Required

United States Coast Guard (USCG) Permit

United States Coast Guard (USCG) Exemption

**Comments:** Additional Comments [Click to Add Wetland Sheet](#)

Construction of bridges at Buffalo Bayou is restricted as shown on the plans due to pending approval of Environmental Permit (USCG #404) associated with wetland areas 1 and 2 as shown in Figure 6 on this sheet.

**III. CULTURAL RESOURCES**

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

**Comments:** Additional Comments

**IV. VEGETATION RESOURCES**

Preserve native vegetation to the extent practical. Refer to TxDOT Standard Specifications in order to comply with requirements for invasive species, beneficial landscaping and tree/brush removal.

**Comments:** Additional Comments

Apply the Water Quality BMPs as written in Section 1 of the 2017 BMP PA: Minimize the use of equipment in streams and riparian areas during construction. When possible, equipment access should be from banks, bridge decks, or barges. When temporary stream crossings are unavoidable, remove stream crossings once they are no longer needed and stabilize banks and soils around the crossing.

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

If any of the listed species below are observed, cease work in the area, do not disturb species or habitat and contact the Engineer immediately.

The work may not remove active nests (from bridges, structures, or vegetation adjacent to the roadway, etc.) during nesting season (February 15 to October 1). If removal of structures or vegetation is necessary during the nesting season, the Contractor shall conduct a bird survey no more than 3 days in advance of the clearing/demolish start date. All bird surveys shall be conducted by a Field Biologist and adhere to the guidance document "Avoiding Migratory Birds and Handling Potential Violations" found in the TxDOT Environmental Compliance Toolkits at the time of the survey. (See below for Field Biologist and Ornithologist qualifications)

**Comments:** Additional Comments

Apply the Amphibian BMPs to the following additional species  
Cajun chorus frog, Strecker's chorus frog, smooth softshell

Apply the Terrestrial Reptile BMPS to the following additional species  
Eastern box turtle, slender glass lizard, western box turtle

Contractors will be advised of the potential occurrence in the project area, and to avoid harming the species if encountered  
astern spotted skunk, long-tailed weasel, southern short-tailed shrew, swamp rabbit, thirteen-lined ground squirrel

Field Biologist, Ornithologist – a field biologist is defined as an individual qualified to perform field investigations, presence/absence surveys and habitat surveys for protected avian species or species of concern. A mandatory bachelor's degree in biology or a related science is required. At a minimum, the Field Biologist, Ornithologist, shall have completed and reported a minimum of three presence/absence and habitat surveys for protected avian species in the past five years. A minimum of three projects must have been conducted in Texas. Surveys shall have been performed for documentation of species in accordance with a protocol approved by USFWS or TPWD, or following generally accepted methodologies.

**VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES**

Refer to TxDOT Standard Specifications in the event potentially contaminated materials are observed, such as dead or distressed vegetation, trash disposal areas, drums, canisters, barrels, leaching or seepage of substances, unusual smells or odors, or stained soil, cease work in the area and contact the Engineer immediately.

**Comments:** No Additional Comments

**VII. OTHER ENVIRONMENTAL ISSUES**

**Comments:**

Notify TxDOT Engineer when activities permitted under the United States Army Corps of Engineers (USACE) Nationwide Permit (NWP) or Individual Permit (IP) has been completed.

**More Comments**



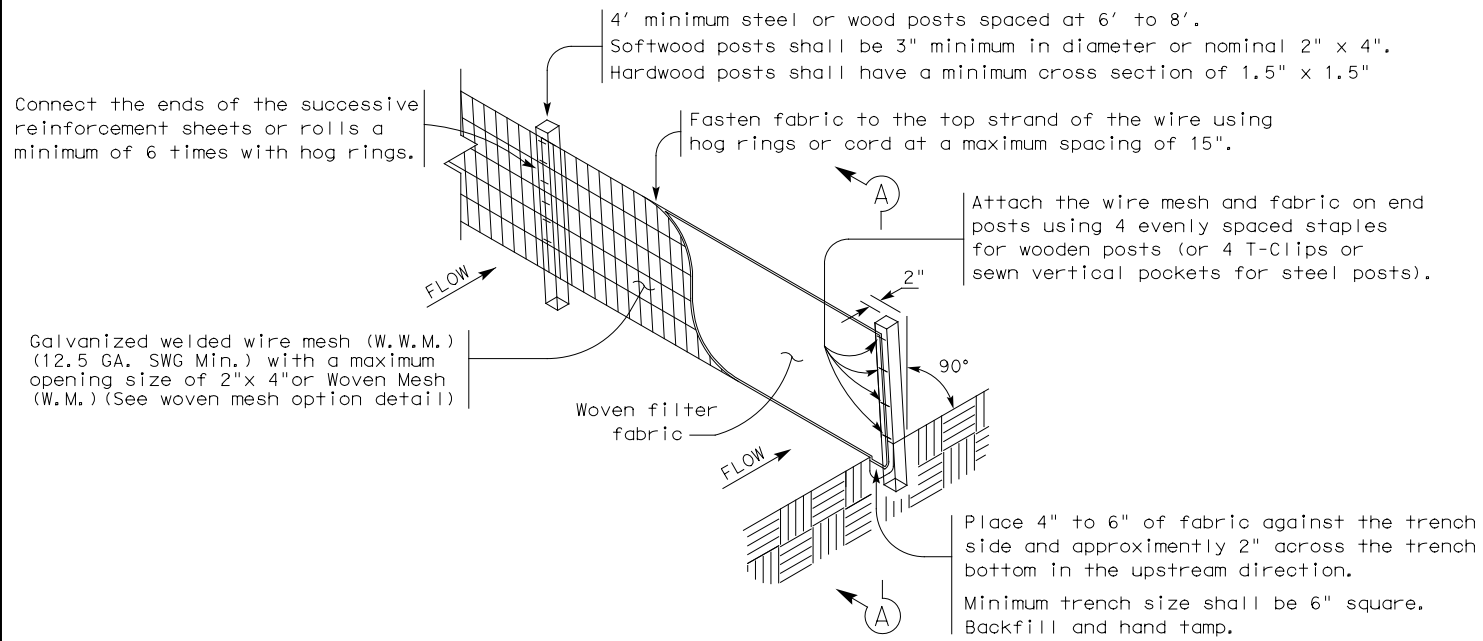
**ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS**

**EPIC**

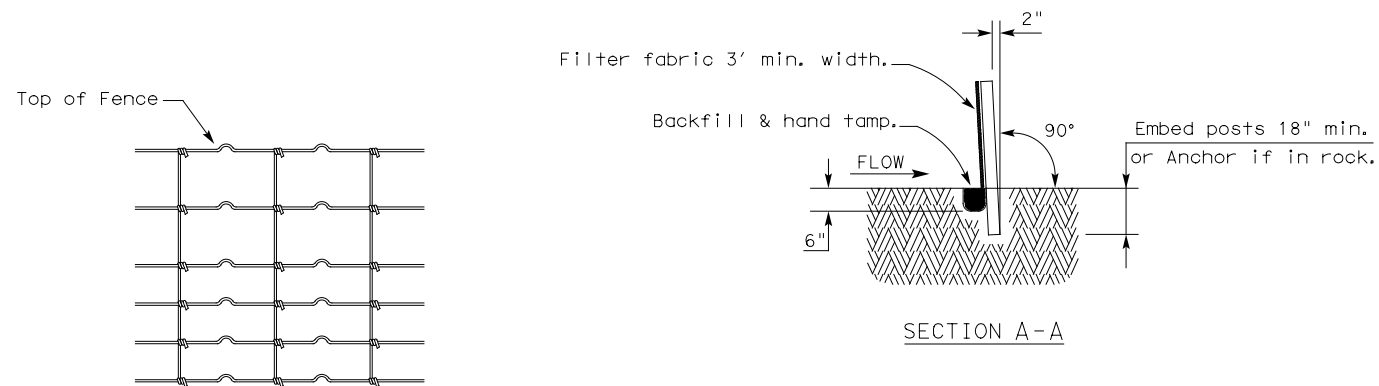
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© TxDOT: March 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	3510	04	055	SH 99
UPDATED section V text and added definition (10/17)	DIST	COUNTY		SHEET NO.
ADDED USCG and USACE notes in Section VII (04/18)	HOU	Fort Bend County		296

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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.

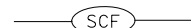
**SEDIMENT CONTROL FENCE USAGE GUIDELINES**

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/FT<sup>2</sup>. Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.

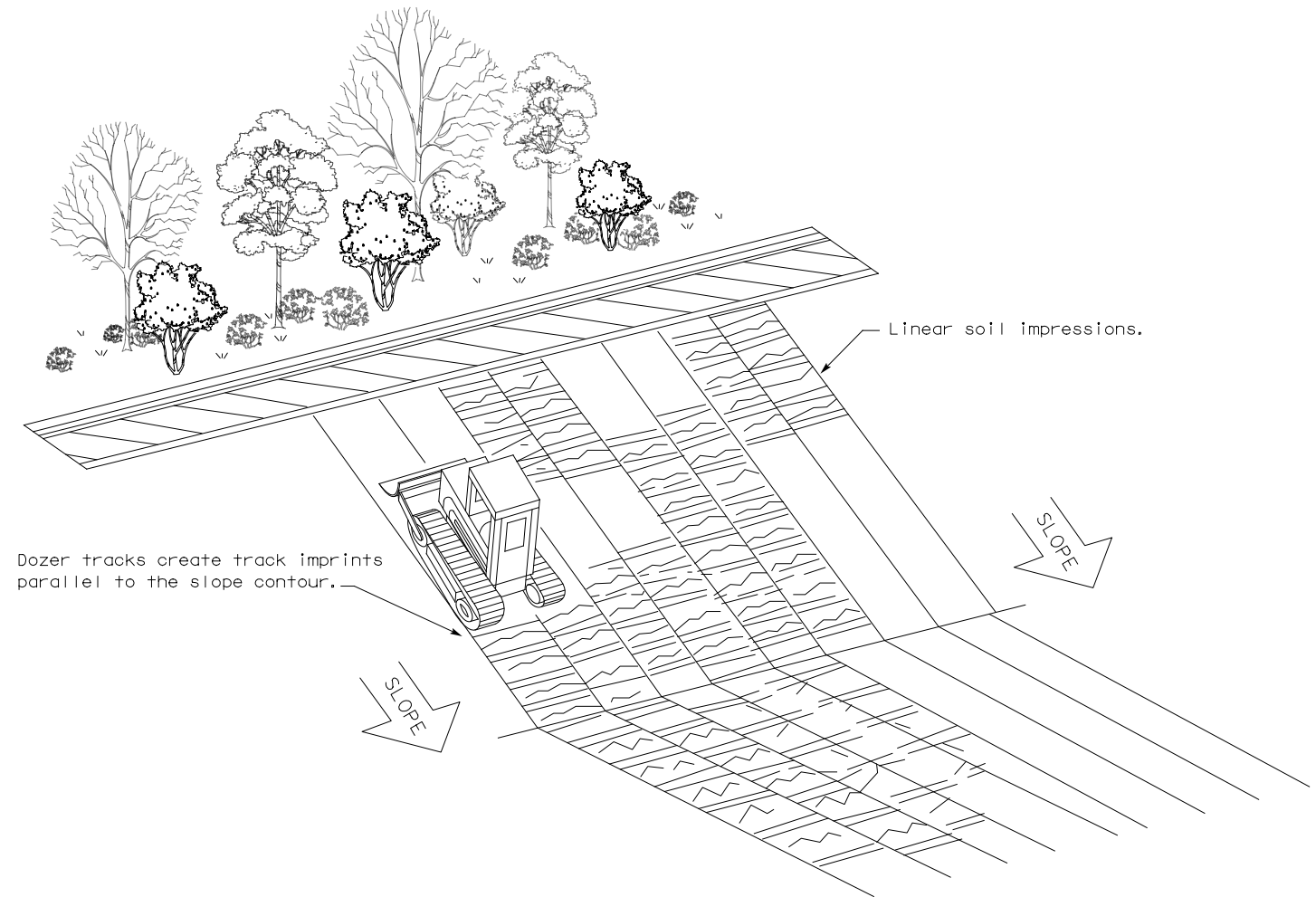
**LEGEND**

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

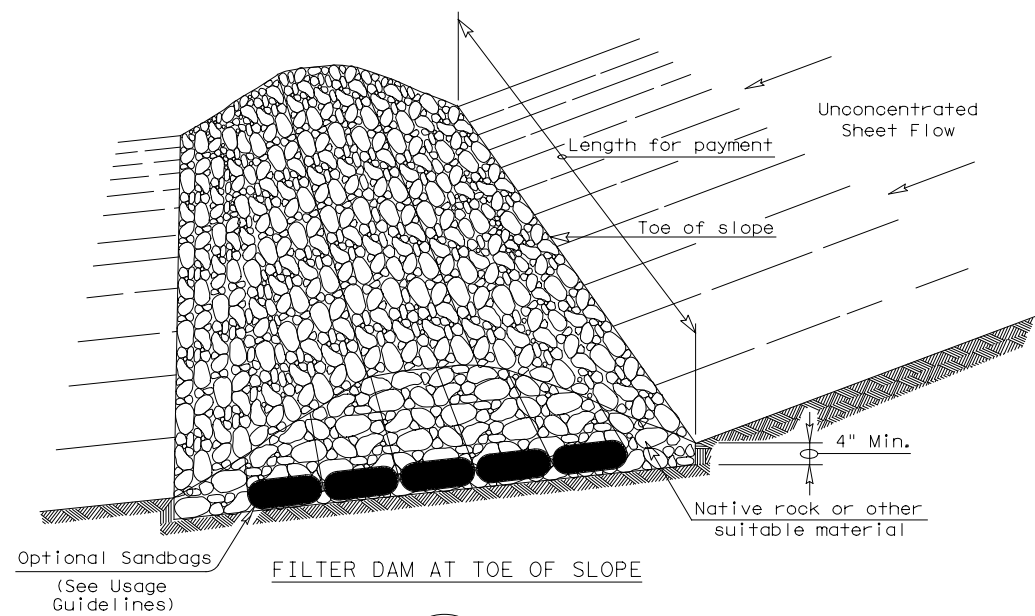


TEMPORARY EROSION,  
SEDIMENT AND WATER  
POLLUTION CONTROL MEASURES  
FENCE & VERTICAL TRACKING  
**EC(1)-16**

FILE: ec116	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY	SHEET NO.	
	HOU	FORT BEND	297	

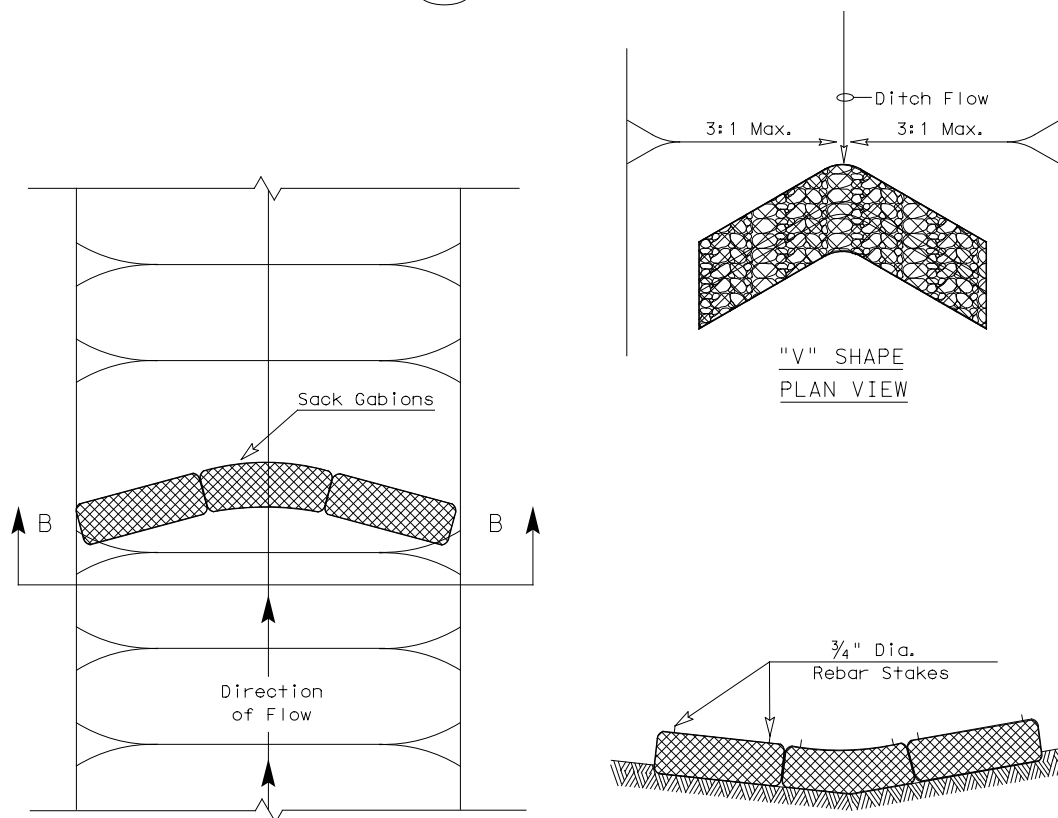
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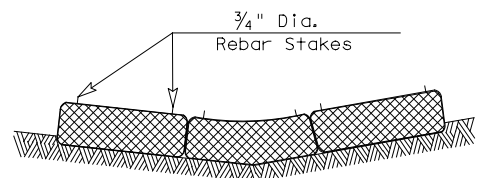
FILTER DAM AT TOE OF SLOPE

— (RFD1) —

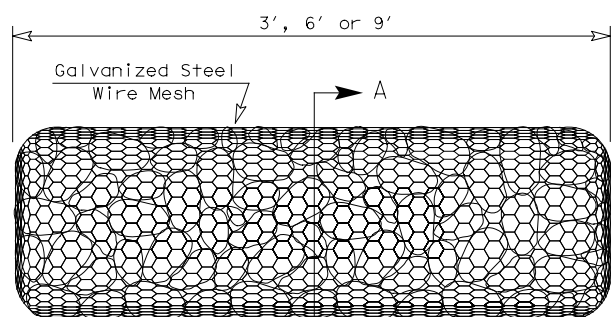


"V" SHAPE PLAN VIEW

PLAN VIEW

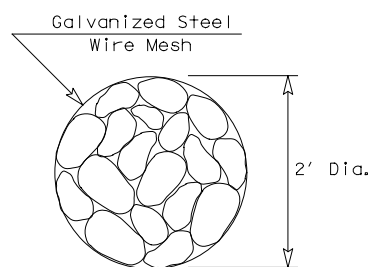


SECTION B-B

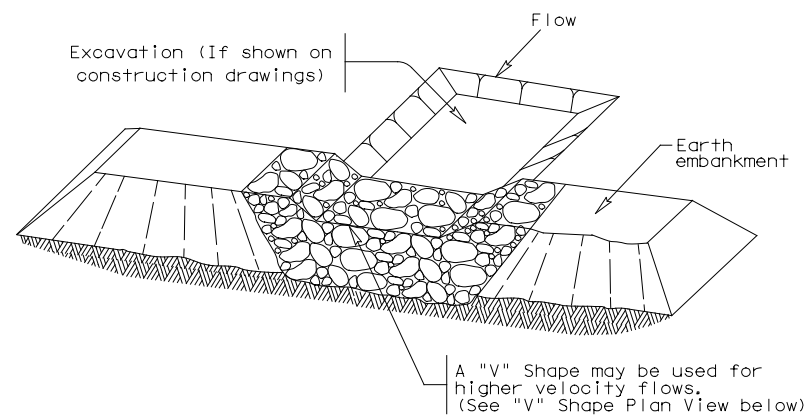


TYPE 4 (SACK GABIONS)

— (RFD4) —

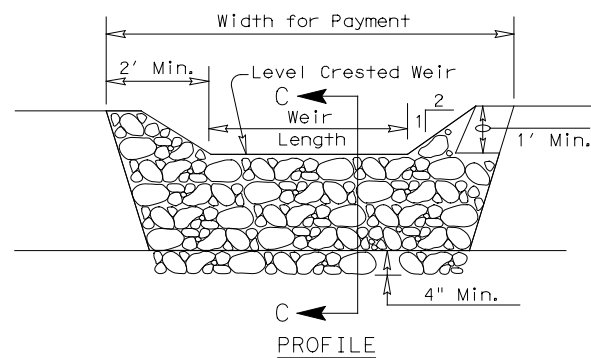


SECTION A-A

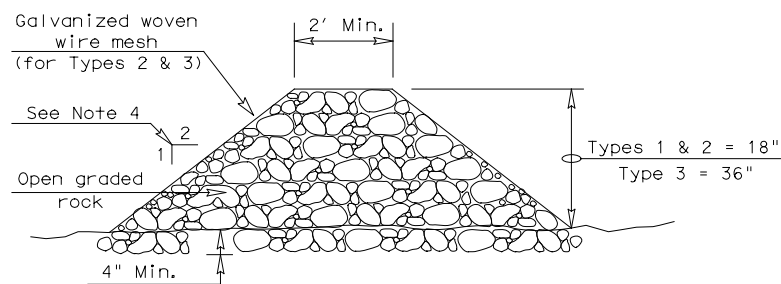


FILTER DAM AT SEDIMENT TRAP

— (RFD2) —



PROFILE



SECTION C-C

**ROCK FILTER DAM USAGE GUIDELINES**

Rock Filter Dams should be constructed downstream from disturbed areas to intercept sediment from overland runoff and/or concentrated flow. The dams should be sized to filter a maximum flow through rate of 60 GPM/FT<sup>2</sup> of cross sectional area. A 2 year storm frequency may be used to calculate the flow rate.

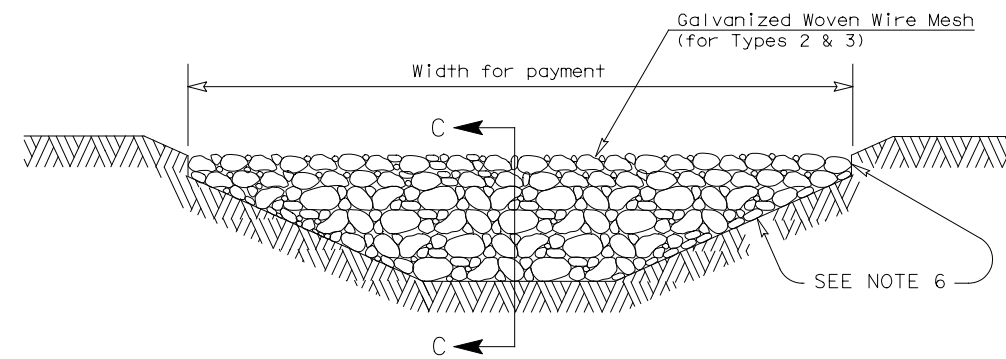
**Type 1 (18" high with no wire mesh) (3" to 6" aggregate):** Type 1 may be used at the toe of slopes, around inlets, in small ditches, and at dike or swale outlets. This type of dam is recommended to control erosion from a drainage area of 5 acres or less. Type 1 may not be used in concentrated high 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

— (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) —



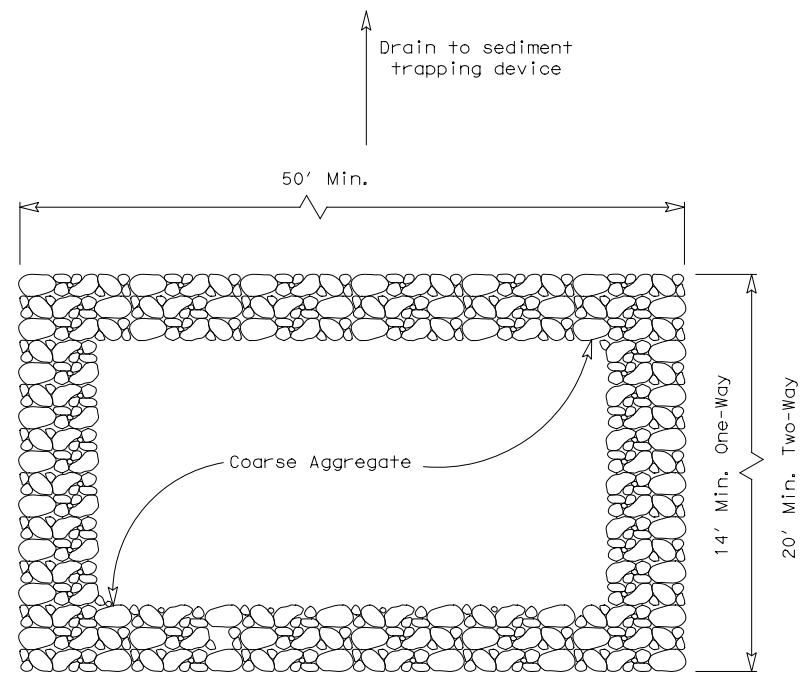
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES  
ROCK FILTER DAMS

EC (2) - 16

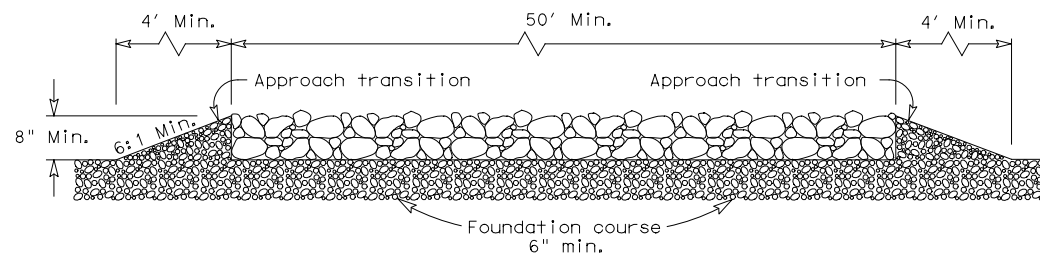
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© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	3510	04	055	SH 99
	DIST	COUNTY	SHEET NO.	
	HOU	FORT BEND	298	

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PLAN VIEW

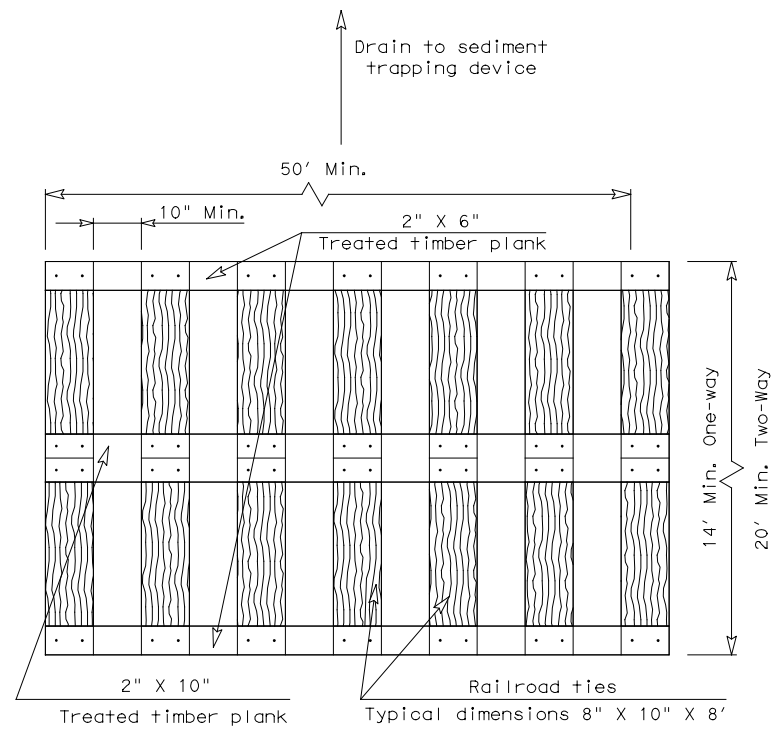


ELEVATION VIEW

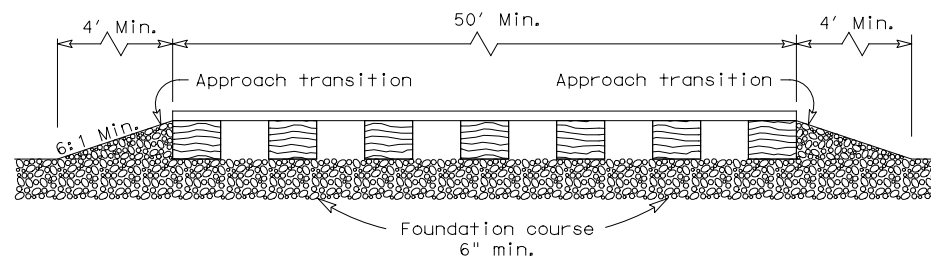
CONSTRUCTION EXIT (TYPE 1)  
 ROCK CONSTRUCTION (LONG TERM)

**GENERAL NOTES (TYPE 1)**

- The length of the type 1 construction exit shall be as indicated on the plans, but not less than 50'.
- The coarse aggregate should be open graded with a size of 4" to 8".
- The approach transitions should be no steeper than 6:1 and constructed as directed by the Engineer.
- The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other materials approved by the Engineer.
- The construction exit shall be graded to allow drainage to a sediment trapping device.
- The guidelines shown hereon are suggestions only and may be modified by the Engineer.
- 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

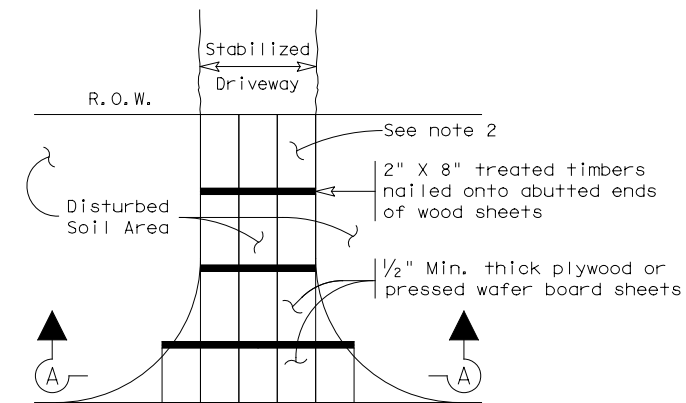


ELEVATION VIEW

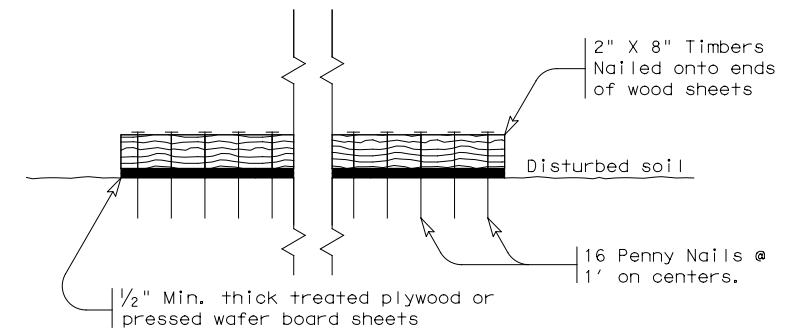
CONSTRUCTION EXIT (TYPE 2)  
 TIMBER CONSTRUCTION (LONG TERM)

**GENERAL NOTES (TYPE 2)**

- The length of the type 2 construction exit shall be as indicated on the plans, but not less than 50'.
- 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.
- The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
- The approach transitions shall be no steeper than 6:1 and constructed as directed by the Engineer.
- The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other material as approved by the Engineer.
- The construction exit should be graded to allow drainage to a sediment trapping device.
- The guidelines shown hereon are suggestions only and may be modified by the Engineer.
- 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

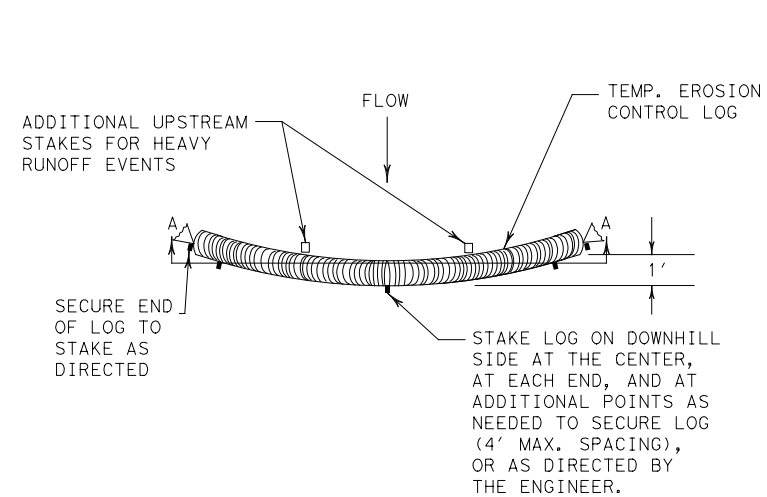
**GENERAL NOTES (TYPE 3)**

- The length of the type 3 construction exit shall be as shown on the plans, or as directed by the Engineer.
- 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.
- The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
- The guidelines shown hereon are suggestions only and may be modified by the Engineer.

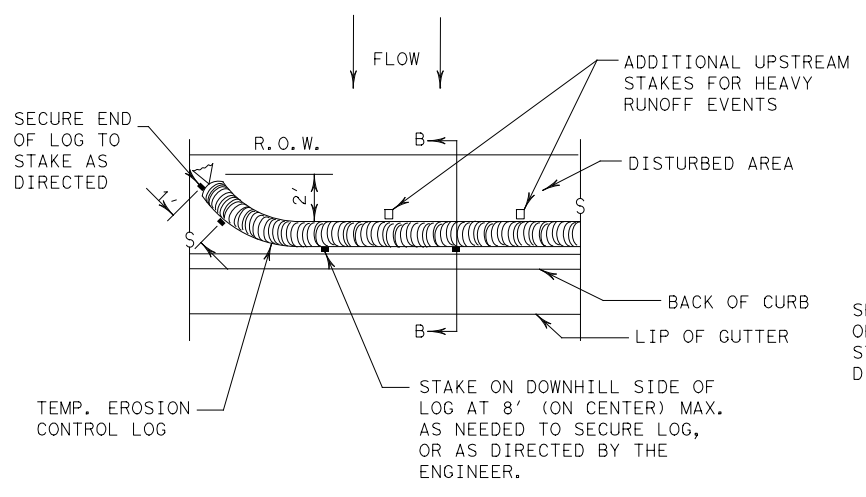
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TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES CONSTRUCTION EXITS EC(3)-16					
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© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY	
REVISIONS	3510	04	055	SH 99	
	DIST	COUNTY	SHEET NO.		
	HOU	FORT BEND	299		



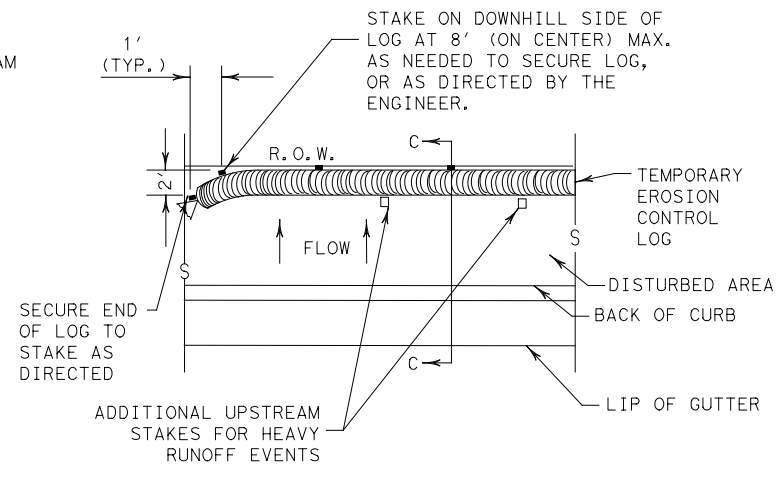
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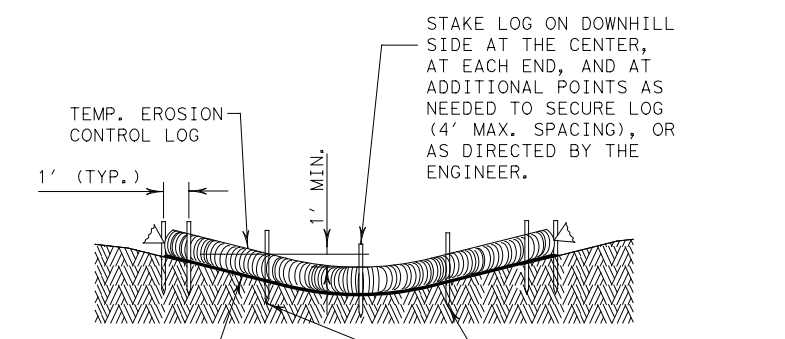
PLAN VIEW



PLAN VIEW



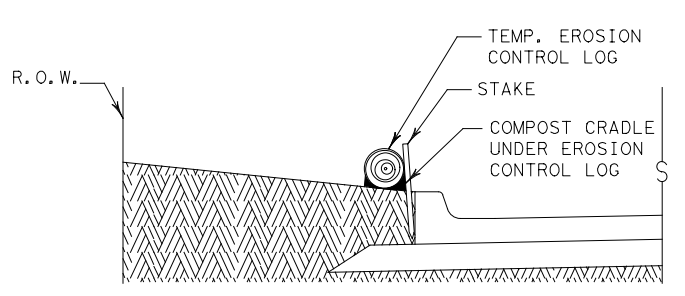
PLAN VIEW



SECTION A-A

EROSION CONTROL LOG DAM

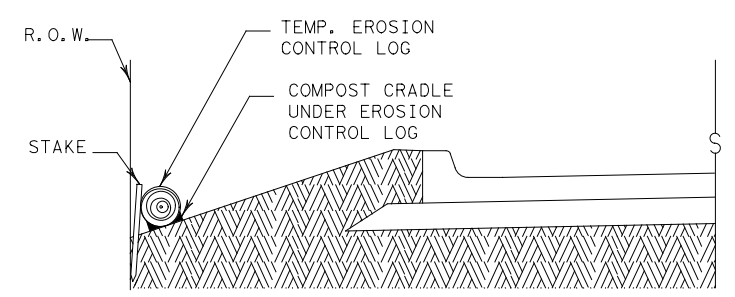
CL-D



SECTION B-B

EROSION CONTROL LOG AT BACK OF CURB

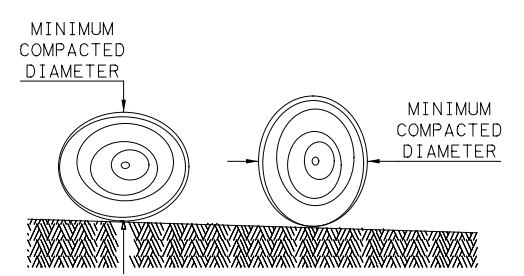
CL-BOC



SECTION C-C

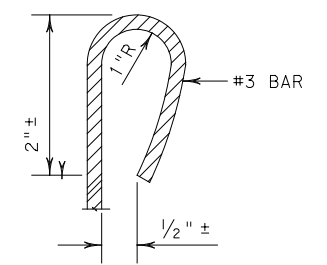
EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY

CL-ROW



DIAMETER MEASUREMENTS OF EROSION CONTROL LOGS SPECIFIED IN PLANS

- 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



REBAR STAKE DETAIL

**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.

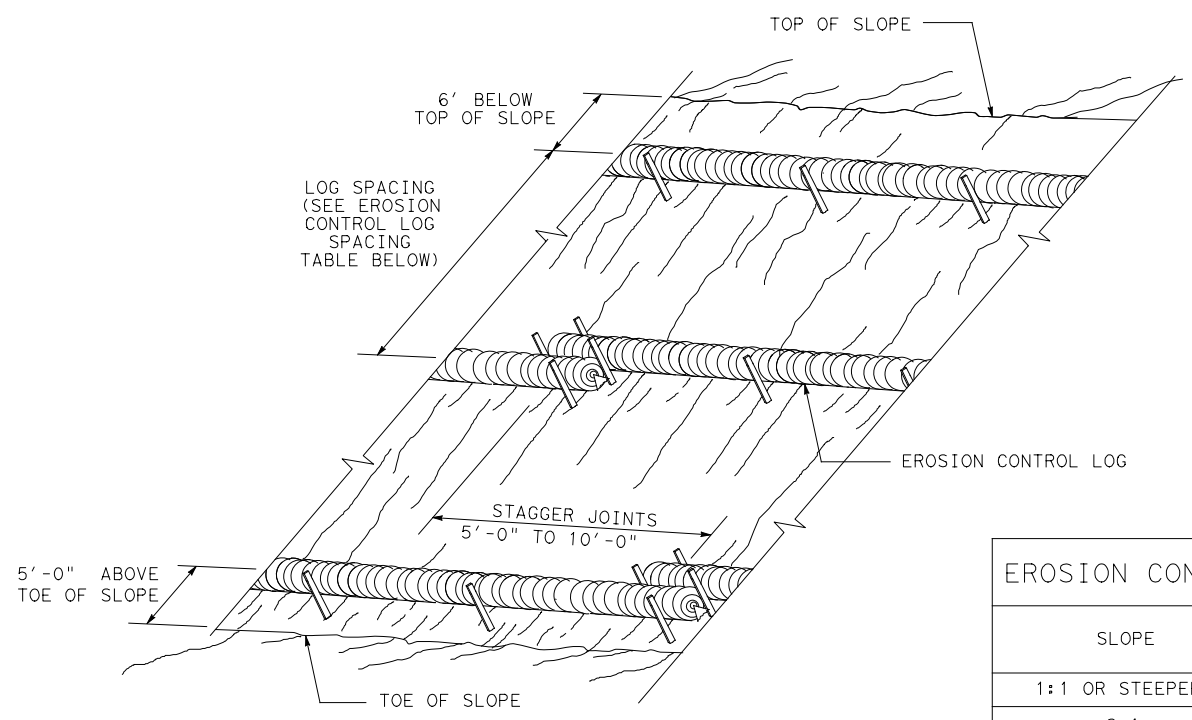
- GENERAL NOTES:**
1. EROSION CONTROL LOGS SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS, OR AS DIRECTED BY THE ENGINEER.
  2. LENGTHS OF EROSION CONTROL LOGS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND AS REQUIRED FOR THE PURPOSE INTENDED.
  3. UNLESS OTHERWISE 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

		<b>Design Division Standard</b>	
<b>TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES</b> <b>EROSION CONTROL LOG</b> <b>EC (9) - 16</b>			
FILE: ec916	DN: TxDOT	CK: KM	DW: LS/PT
© TxDOT: JULY 2016	CONT: 3510	SECT: 04	JOB: 055
REVISIONS	HOU	COUNTY: FORT BEND	SHEET NO.: 300

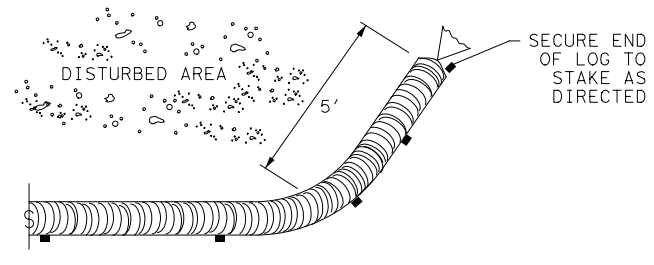
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DATE: 1/23/2023  
 FILE: pw:\fedsl-pw-01\Documents\Projects\2018\2018-2042-01 - Ft Bend Grand Parkway Frontage Rd\CSJ 351004055\_SH99\DesignData\4 - Design\Plan Set\9. Environmental



EROSION CONTROL LOGS ON SLOPES  
 STAKE AND TRENCHING ANCHORING

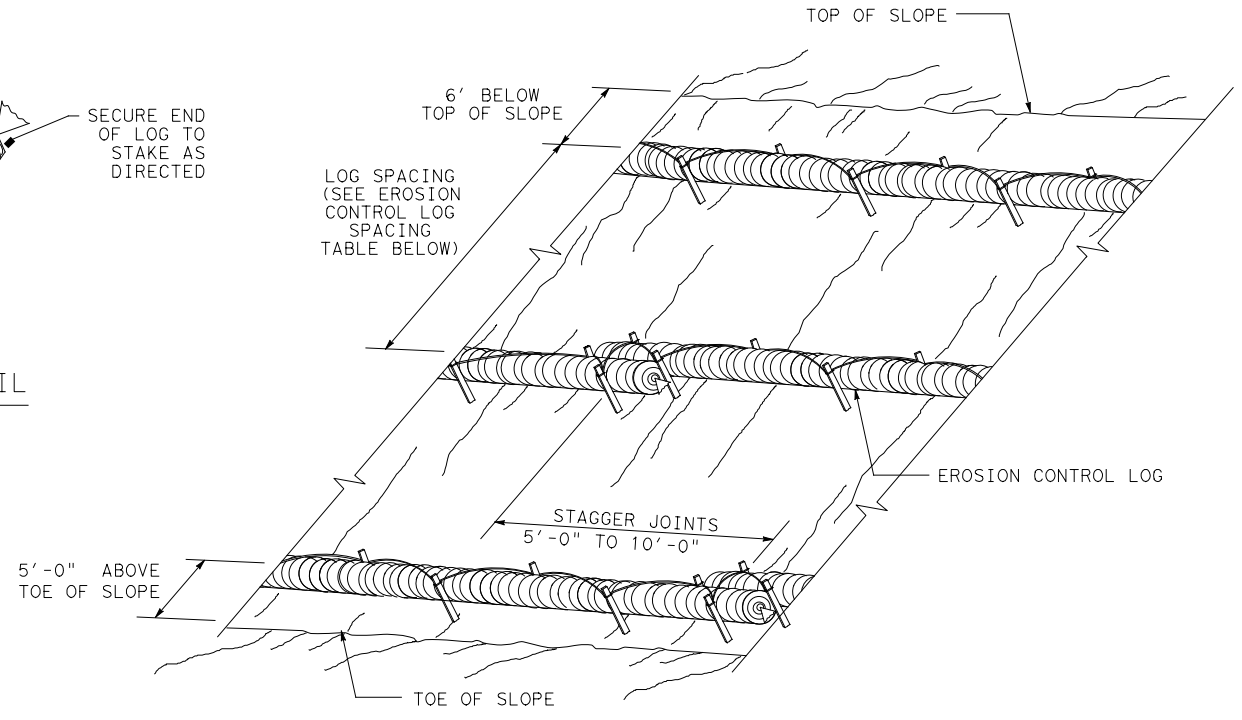
CL-SST



END SECTION RAP DETAIL

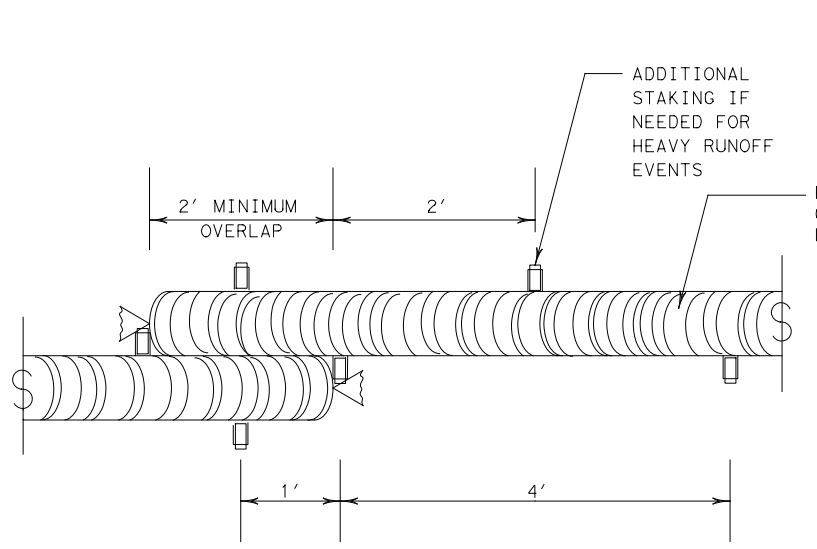
SLOPE	LOG DIAMETER			
	6"	8"	12"	18"
1:1 OR STEEPER	5'	10'	15'	20'
2:1	10'	20'	30'	40'
3:1	15'	30'	45'	60'
4:1 OR FLATTER	20'	40'	60'	80'

\* ADJUSTMENTS CAN BE MADE FOR SOIL TYPE:  
 SOFT, LOAMY SOILS-ADJUST ROWS CLOSER TOGETHER;  
 HARD, ROCKY SOILS- ADJUST ROWS FARTHER APART



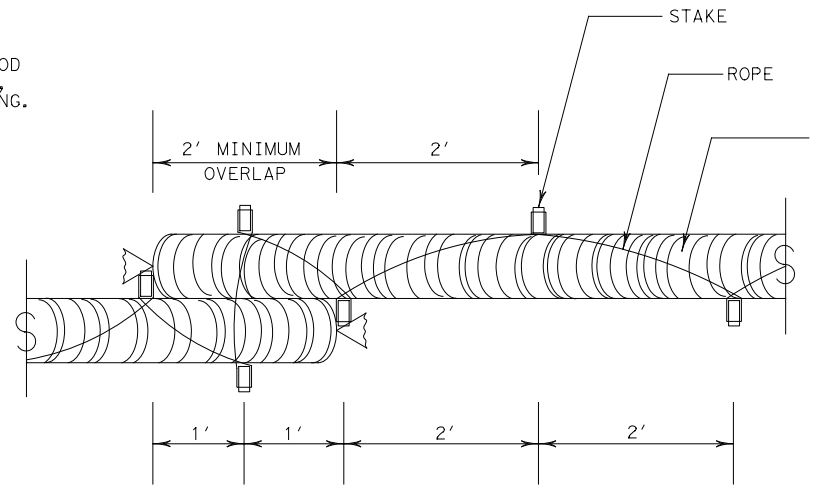
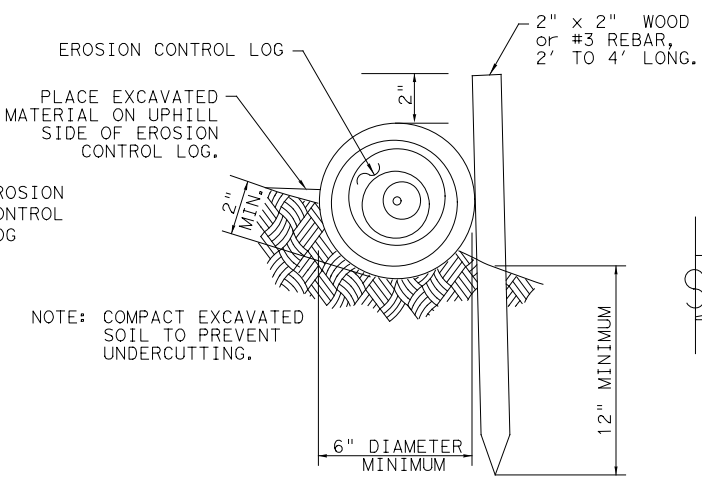
EROSION CONTROL LOGS ON SLOPES  
 STAKE AND LASHING ANCHORING

CL-SSL



STAKE AND TRENCHING ANCHORING DETAIL

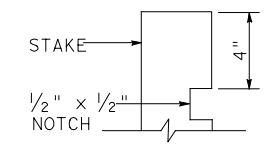
CL-SST



STAKE AND LASHING ANCHORING DETAIL

CL-SSL

LOG DIAMETER	DEPTH
6"	2"
8"	3"
12"	4"
18"	5"



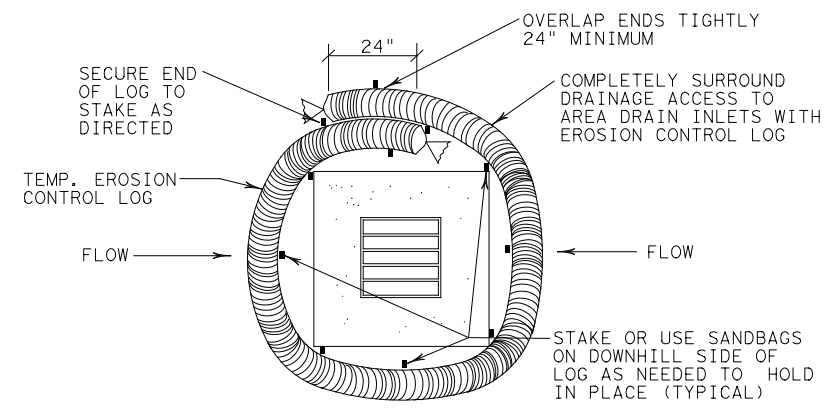
STAKE NOTCH DETAIL

SHEET 2 OF 3

		<b>Design Division Standard</b>	
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES EROSION CONTROL LOG <b>EC (9) - 16</b>			
FILE: ec116	DN: TxDOT	CK: KM	DW: LS/PT
© TxDOT: JULY 2016	CONT SECT	JOB	HIGHWAY
REVISIONS	3510 04	055	SH 99
DIST	COUNTY	SHEET NO.	
HOU	FORT BEND	301	

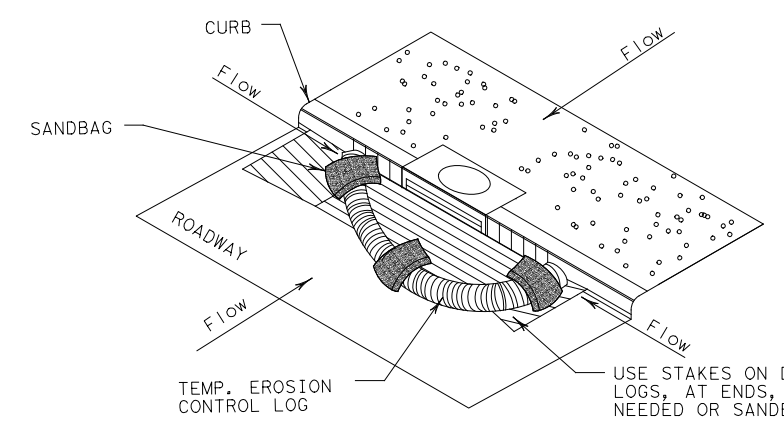
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DATE: 1/23/2023  
 FILE: pw:\teds\pw.bentley.com\teds\pw-01\Documents\Projects\2018\2018-2042-01 - Ft Bend Grand Parkway Frontage Rd\CSJ 351004055\_SH99\Plan Set\9. Environmental



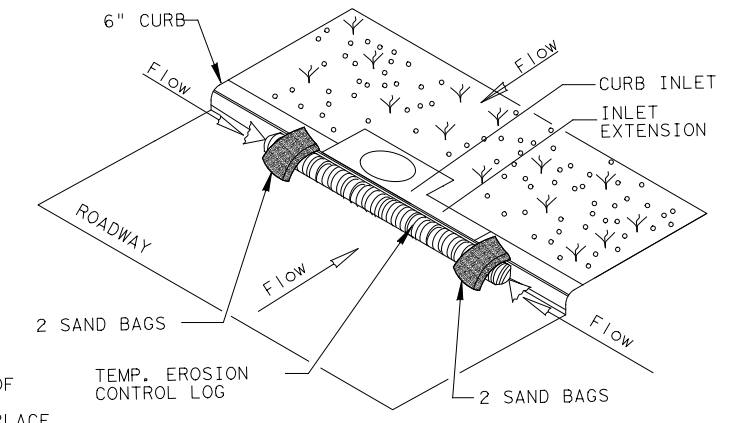
EROSION CONTROL LOG AT DROP INLET

CL-DI



EROSION CONTROL LOG AT CURB INLET

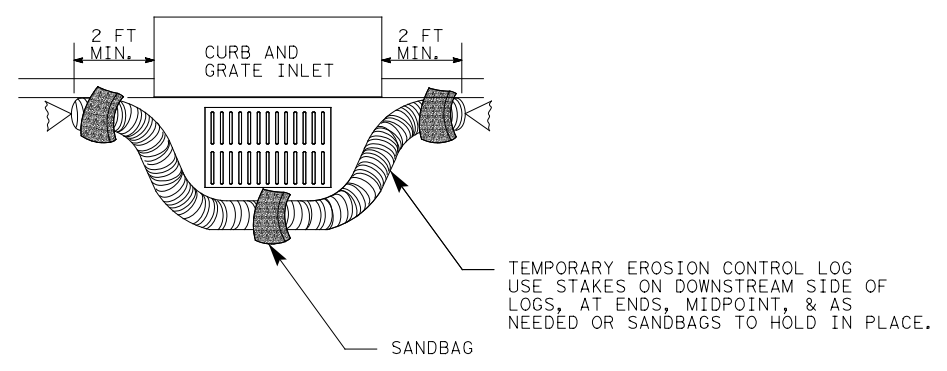
CL-CI



EROSION CONTROL LOG AT CURB INLET

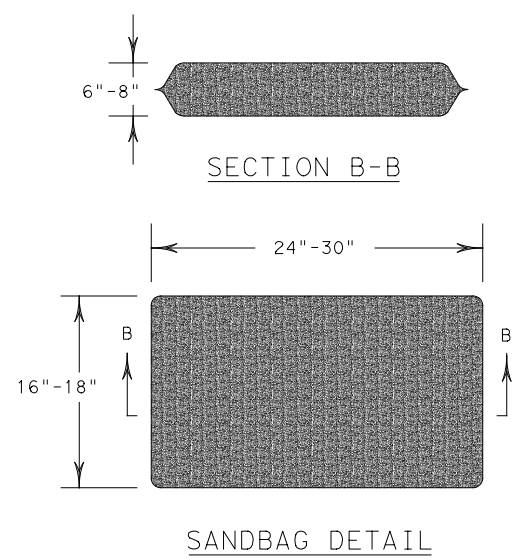
CL-CI

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

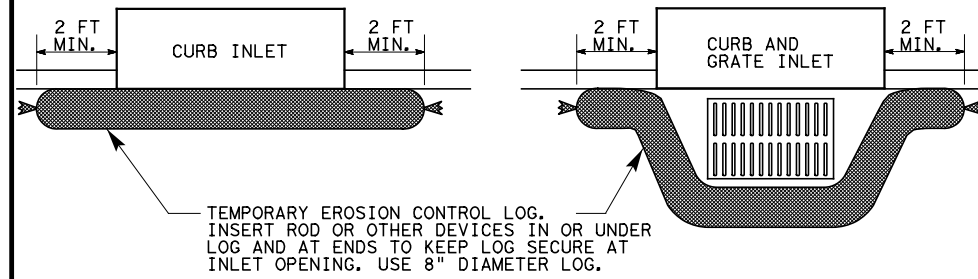


SHEET 3 OF 3

		<b>Design Division Standard</b>	
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES EROSION CONTROL LOG <b>EC (9) - 16</b>			
FILE: ec916	DN: TxDOT	CK: KM	DW: LS/PT
© TxDOT: JULY 2016	CONT: 3510	SECT: 04	JOB: 055
REVISIONS	DIST: HOU		COUNTY: FORT BEND
			SHEET NO.: 302

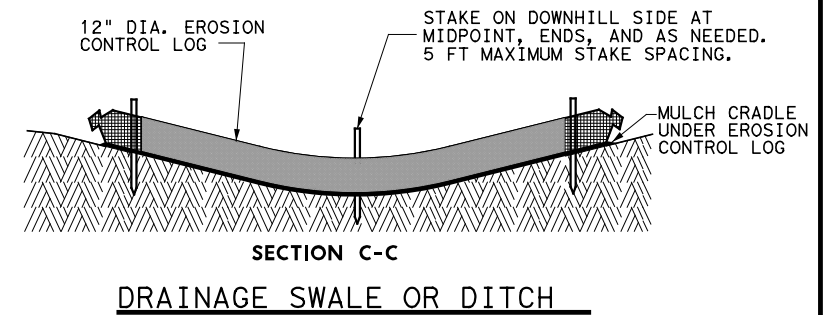
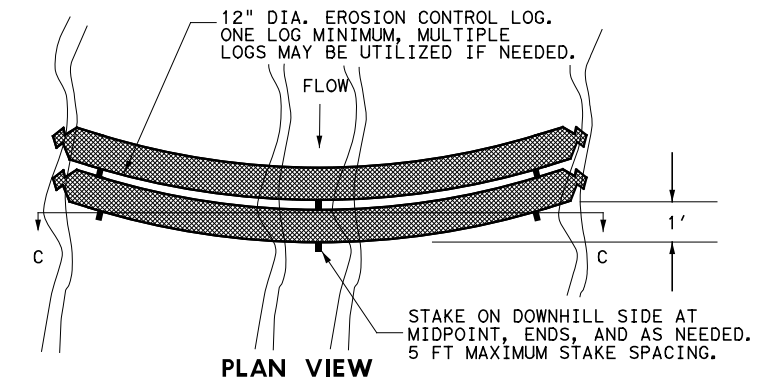
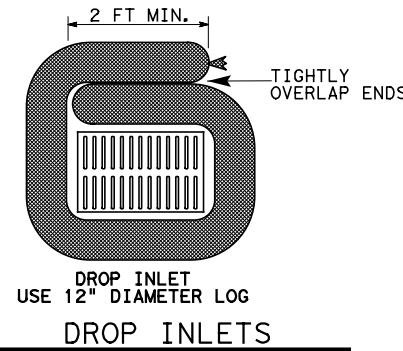
# CURB INLETS 8" DIAMETER LOGS

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).

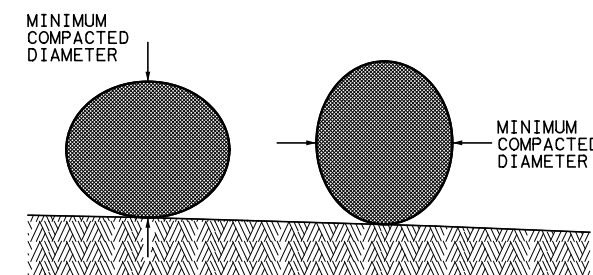
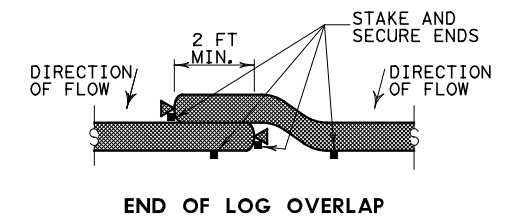
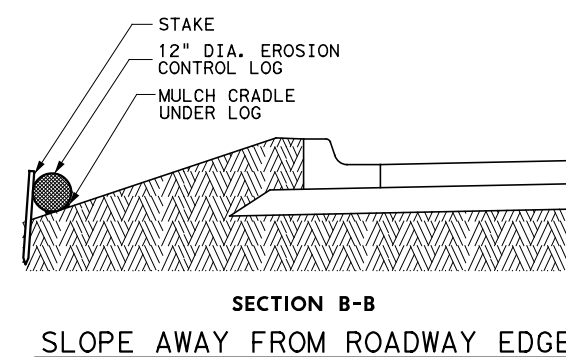
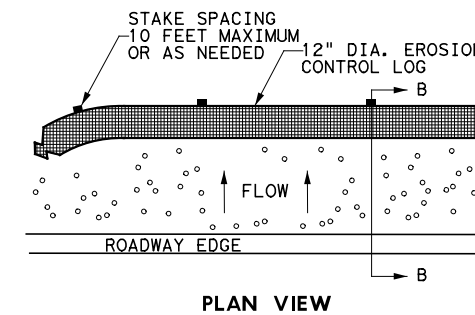
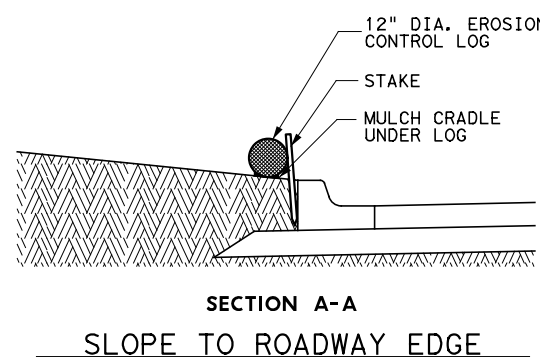
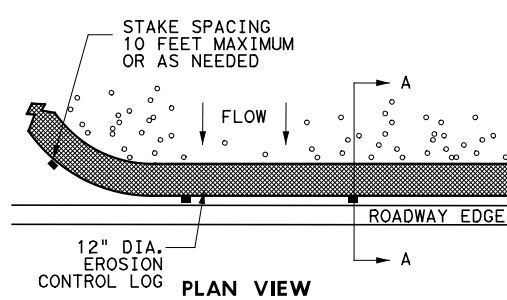
Sediment traps should be placed in the following locations:

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	OW: TxDot	CK: TxDot
©TXDOT 2014	DISTRICT: HOU	FED REG: 6	PROJECT NUMBER:	SHEET: 303
REVISIONS: 3/15 MINOR CORRECTIONS	COUNTY: FORT BEND	CONTROL: 3510	SECT: 04	JOB: 055
			HIGHWAY: SH 99	

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 (turfglass) 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, May, June, July, August, September, October, Foxtail Millet (Setaria italica) - 34.0 lbs PLS/acre	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, December, January, February, Oats (Avena sativa) - 72.0 lbs PLS/acre	
	✓	✓	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 <b>NON-CHEMICAL</b> 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		FILE:	FED	STATE	PROJECT NUMBER			SHEET
10/2014	UPDATED TO 2014 SPECS	OCT 2014	6	TEXAS				304
ORIGINAL:		DIST	COUNTY	CONTROL	SECT	JOB	HIGHWAY	
		12	FORT BEND	3510	04	055	SH 99	

**GENERAL**

- THESE PLANS WERE PREPARED TO MEET OR EXCEED TEXAS COMMISSION ON ENVIRONMENTAL QUALITY, FORT BEND COUNTY AND CITY OF HOUSTON RULES AND REGULATIONS AS CURRENTLY AMENDED, WHEN CONFLICTS ARE NOTED WITH LOCAL STANDARDS, THE MORE STRINGENT SHALL BE APPLIED. CONSTRUCTION FOR PUBLIC WATER SYSTEMS MUST ALWAYS @ A MINIMUM MEET TCEQ'S RULES & REGULATIONS FOR PUBLIC WATER SYSTEMS.
- WATER LINES, WASTEWATER COLLECTION SYSTEMS, AND DRAINAGE SYSTEMS SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE CITY OF HOUSTON, DEPARTMENT OF PUBLIC WORKS AND ENGINEERING'S STANDARD CONSTRUCTION SPECIFICATIONS FOR WASTEWATER COLLECTION SYSTEMS, WATER LINES, STORM DRAINAGE, STREET PAVING, AND TRAFFIC, DATED JULY 2, 2021, LATEST REVISION, UNLESS OTHERWISE NOTED AND APPROVED ON THESE PLANS. THE DESIGN IS CONSISTENT WITH THE MINIMUM STANDARDS ESTABLISHED IN THE "INFRASTRUCTURE DESIGN MANUAL" DATED JULY 2, 2021, LATEST REVISION. CONTRACTOR SHALL USE CURRENT COPIES OF DESIGN MANUAL, STANDARD CONSTRUCTION SPECIFICATIONS AND STANDARD CONSTRUCTION DETAILS ISSUED BY THE CITY OF HOUSTON, COPIES CAN BE OBTAINED AT THE CITY OF HOUSTON, 1002 WASHINGTON.
- CONTRACTOR SHALL COMPLY WITH OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION STANDARDS AND ANY OTHER FEDERAL, STATE AND LOCAL REGULATIONS REGARDING TRENCH SAFETY SYSTEMS FOR TRENCH EXCAVATION.
- CONTRACTOR SHALL NOTIFY THE OFFICE OF THE CITY ENGINEER, DEPARTMENT OF PUBLIC WORKS AND ENGINEERING AT (832)394-6098 FOR INSPECTION AT LEAST 48 HOURS PRIOR TO COMMENCING THE CONSTRUCTION.
- THIS PROJECT IS NOT TIED INTO THE OFFICIAL CITY OF HOUSTON SURVEY SYSTEM IN COMPLIANCE WITH ORDINANCE NO.89-1978 BECAUSE A CITY SURVEY MARKER HAS NOT BEEN ESTABLISHED WITHIN 2,000 FEET OF THIS PROPERTY.
- CONTRACTOR SHALL NOTIFY FORT BEND COUNTY ENGINEERING DEPARTMENT 24 HOURS IN ADVANCE OF COMMENCING CONSTRUCTION AT (713)755-6370 AND GIVE WRITTEN NOTICE 48 HOURS IN ADVANCE.
- AUTHORIZATION NOTICE ISSUED BY FORT BEND COUNTY PUBLIC INFRASTRUCTURE ENGINEERING DEPARTMENT PERMIT OFFICE REQUIRED PRIOR TO CONSTRUCTION OF UTILITIES OR LEFT TURN LANES WITHIN HARRIS COUNTY RIGHT-OF-WAY. CONTACT HARRIS COUNTY PERMIT OFFICE 713-274-3900.
- CONTRACTOR TO OBTAIN ALL CONSTRUCTION PERMITS REQUIRED BY THE "REGULATIONS OF FORT BEND COUNTY, TEXAS FOR FLOOD PLAIN MANAGEMENT" PRIOR TO STARTING CONSTRUCTION.
- CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING AND PROTECTING ALL EXISTING UTILITIES AND OTHER FACILITIES. CONTRACTOR SHALL VERIFY IN THE FIELD THE EXACT LOCATIONS PRIOR TO COMMENCING CONSTRUCTION, CONTRACTOR SHALL NOTIFY TEXAS ONE CALL AT 811 OR 1-800-344-8377 AT LEAST 48 HOURS BEFORE PROCEEDING WITH ANY EXCAVATION.
- ADEQUATE DRAINAGE SHALL BE MAINTAINED AT ALL TIMES DURING CONSTRUCTION AND ANY DRAINAGE DITCH OR STRUCTURE DISTURBED DURING CONSTRUCTION SHALL BE RESTORED TO THE SATISFACTION OF THE OWNING AUTHORITY. ALL CONSTRUCTION STORM RUNOFF SHALL COMPLY WITH THE FINAL DRAFT OF STORMWATER MANAGEMENT HANDBOOK FOR CONSTRUCTION ACTIVITIES AS PREPARED BY HARRIS COUNTY/HCFCD, AND THE CITY OF HOUSTON ALL IN COMPLIANCE WITH THE TEXAS POLLUTANT DISCHARGE ELIMINATION SYSTEM (TPDES) REQUIREMENTS.
- CONDITION OF THE ROAD AND/OR RIGHT-OF-WAY, UPON COMPLETION OF JOB, SHALL BE AS GOOD OR BETTER THAN CONDITION PRIOR TO STARTING WORK.
- THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGE TO THE EXISTING PUBLIC OR PRIVATE UTILITY LINES INCLUDING BUT NOT LIMITED TO WATER LINES, WASTEWATER COLLECTION SYSTEMS AND STORM SEWERS DURING CONSTRUCTION. ALL DAMAGES SHALL BE REPAIRED IN ACCORDANCE WITH CITY OF HOUSTON, DEPARTMENT OF PUBLIC WORKS AND ENGINEERING "STANDARD CONSTRUCTION SPECIFICATIONS" WITH LATEST ADDENDA AND AMENDMENTS THERETO, WITH NO COST TO THE PUBLIC. (NO ADDITIONAL PAY TO CONTRACTOR).
- CONTRACTOR SHALL TAKE NECESSARY PRECAUTIONS TO PROTECT ROOT SYSTEMS OF SHRUBS PLANTS AND TREES ALONG THE AREA OF EXCAVATION.
- UNLESS SPECIFICALLY INDICATED OTHERWISE ON THE PLANS, UTILITIES WITHIN EASEMENTS SHALL BE LOCATED IN ACCORDANCE WITH STANDARDS OUTLINED BY THE MOST CURRENT UTILITY COORDINATING COMMITTEE DRAWINGS.
- IF THE CONSTRUCTION DOES NOT BEGIN WITHIN A YEAR AFTER THE PLANS HAVE BEEN SIGNED, NEW SIGNATURES MUST BE OBTAINED AND LETTERS OF AVAILABILITY (IF NECESSARY) MUST BE UPDATED.
- CONTRACTOR SHALL PREPARE A SET OF "AS-BUILT" DRAWINGS SHOWING ANY FIELD CHANGES MADE TO THE APPROVED ENGINEERING PLANS AND SUBMIT TO THE DESIGN CONSULTANT FOR SUBMISSION TO THE CITY ENGINEER.

**COMPACTION OF SITE FILL**

- ALL AREAS TO BE FILLED ARE TO BE FREE OF VEGETATION, DEBRIS, PONDED WATER, LOOSE SOILS, MUD & MUCK, (STRIP 3" MIN).
- THE PLACEMENT OF ANY FILL OR THE DISPOSAL OF ANY EXCESS MATERIAL ON ANY PORTION OF THIS PROJECT SHALL BE MADE IN EIGHT (8) INCH LOOSE LIFTS, UNIFORMLY SPREAD AND COMPACTED TO 95% STANDARD PROCTOR DENSITY.

**SPECIAL CONSTRUCTION NOTES:**

- NO DISRUPTION TO WATER SERVICES OF EXISTING COMMERCIAL CUSTOMERS WILL BE ALLOWED DURING BUSINESS HOURS.
- IF PREVIOUSLY PLANNED WITH CUSTOMERS, DISTRICT ENGINEER AND DISTRICT OPERATOR, WATER SERVICE DISRUPTIONS MAY BE DONE DURING NON-BUSINESS HOURS, CUSTOMERS SHALL BE GIVEN 48-HOURS NOTICE OF ALL PLANNED WATER SERVICE DISRUPTIONS, TO BE COORDINATED THROUGH THE DISTRICT OPERATOR.
- IF TEMPORARY WATER FACILITIES ARE REQUIRED, CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATION WITH THE DISTRICT OPERATOR FOR ESTABLISHING AND MAINTAINING SERVICE TO EXISTING CUSTOMERS, INCLUDING RUNNING OF TEMPORARY ABOVE-GROUND FACILITIES AND ALL NECESSARY TEMPORARY PLUMBING, AS DIRECTED BY THE DISTRICT OPERATOR TO MAINTAIN WATER SERVICE TO EXISTING COMMERCIAL CUSTOMERS, NO SEPARATE PAY.
- CONTRACTOR SHALL RECEIVE DIRECTION FROM DISTRICT OPERATOR OF DISINFECTION AND FLUSHING REQUIREMENTS PRIOR TO PLACING NEW WATERLINE IN SERVICE, OPERATING OF ALL EXISTING VALVES AND ANY REQUIRED FLUSHING SHALL BE PERFORMED UNDER THE DIRECT SUPERVISION OF THE DISTRICT OPERATOR.
- CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING AND AVOIDING ANY EXISTING IRRIGATION FACILITIES. IF IRRIGATION FACILITIES ARE DAMAGED OR ADJUSTMENTS REQUIRED, THIS SHALL BE PERFORMED BY CONTRACTOR, NO SEPARATE PAY.
- CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ALL TRAFFIC CONTROL AS REQUIRED DUE TO CONSTRUCTION ACTIVITIES, NO SEPARATE PAY, INCLUDING PREPARATION OF ANY SPECIAL PLANS AND OBTAINING PERMITTING AS MAY BE REQUIRED BY TEXAS DEPARTMENT OF TRANSPORTATION AND FORT BEND COUNTY.
- CONTRACTOR WILL NOT BE ALLOWED TO UTILIZE ADJACENT PARKING LOT FACILITIES FOR EITHER PROJECT ACCESS OR STAGING, WITHOUT APPROVAL, THESE AREAS ARE PRIVATE PROPERTY AND SHALL BE TREATED AS SUCH.
- CONTRACTOR SHALL PROVIDE ALL TEMPORARY APPURTENANCES AND CONNECTIONS NECESSARY TO PERFORM HYDROSTATIC PRESSURE TESTING OF NEWLY INSTALLED WATERLINE SEGMENT, NO SEPARATE PAY.

**WATER LINES**

**GENERAL:**

- SEPARATION DISTANCES AND ENCASEMENT REQUIREMENTS FOR INSTALLATION OF POTABLE WATER DISTRIBUTION LINES AND APPURTENANCES MUST CONFORM TO 30 TAC §290.44(e).
- "W.L.E." INDICATES "WATER LINE EASEMENT"
- THIS PROJECT SHALL BE CONSTRUCTED BY MEANS OF OPEN CUT, EXCEPT WHERE NOTED ON THE DRAWINGS, THE CONTRACTOR WILL DETERMINE THE LOCATIONS OF BORE PITS IN THE FIELD, SUBJECT TO THE CITY ENGINEER'S APPROVAL.
- ALL UTILITIES PRESENTED ON THESE DRAWINGS ARE SHOWN AT THE APPROXIMATE LOCATIONS BASED ON THE BEST AVAILABLE INFORMATION, THE CONTRACTOR SHALL FIELD DETERMINE THE EXACT LOCATIONS PRIOR TO COMMENCING CONSTRUCTION, HE SHALL BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES CAUSED BY THE FAILURE TO EXACTLY LOCATE AND MAINTAIN THESE UNDERGROUND UTILITIES.
- NO PIPE WHICH HAS BEEN USED FOR ANY PURPOSE OTHER THAN THE CONVEYANCE OF DRINKING WATER SHALL BE ACCEPTED OR RELOCATED FOR USE IN ANY PUBLIC DRINKING WATER SUPPLY, AS REQUIRED BY 30 TAC §290.44(a)(3).
- WATER TRANSMISSION AND DISTRIBUTION LINES SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS, HOWEVER, THE TOP OF THE WATER LINE MUST BE LOCATED BELOW THE FROST LINE AND IN NO CASE SHALL THE TOP OF THE WATER LINE BE LESS THAN 24 INCHES BELOW GROUND SURFACE, AS REQUIRED BY 30 TAC §290.44(a)(4).
- WHEN AIR RELEASE DEVICES ARE REQUIRED, THE AIR RELEASE DEVICE SHALL BE INSTALLED IN SUCH A MANNER AS TO PRECLUDE THE POSSIBILITY OF SUBMERGENCE OR POSSIBLE ENTRANCE OF CONTAMINATES. ALL OPENING TO THE ATMOSPHERE SHALL BE COVERED WITH A 16-INCH MESH OR FINER, CORROSION-RESISTANT SCREENING MATERIAL OR ACCEPTABLE EQUIVALENT IN COMPLIANCE WITH 30 TAC §290.44(d)(1).
- ANY SERVICE CONNECTIONS MADE TO THE PUBLIC WATER SYSTEM MUST COMPLY WITH 30 TAC §290.44(d)(4).

**PIPE:**

- ALL WATER LINE MINIMUM PRESSURE REQUIREMENTS CONFORM TO 30 TAC §290.44(d)(1-4), INCLUDING MAINTAINING A MINIMUM PRESSURE OF 35 PSI @ ALL POINTS WITHIN THE DISTRIBUTION SYSTEM @ FLOW RATES OF @ LEAST 1.5 GALLONS PER MINUTE PER CONNECTION.
- THE DESIGN PROVISIONS WITH REGARDS TO LEAD CONTENT CONFORM TO 30 TAC §290.44(B)(1-2). IF CONSTRUCTED AFTER JANUARY 1, 2014, THE MAXIMUM ALLOWABLE LEAD CONTENT ALLOWABLE IS 0.25% FOR PIPES, PIPE FITTINGS, PLUMBING FIXTURES, & FITTINGS.
- 4" THRU 12" WATER LINES SHALL BE P.V.C. CLASS 235, DR-18, AWWA C-900; WATER LINES LARGER THAN 12" SHALL BE PVC CLASS 235, DR-18 AWWA C-905.
- ALL WATER LINES SHALL HAVE A 6" BOTTOM AND SIDE BANK-SAND ENVELOPE PER CITY OF HOUSTON SECTION 02317 AND SHALL BE BACKFILLED TO A MINIMUM COMPACTED DEPTH OF 12" OVER THE TOP OF THE PIPE TO PROVIDE A COMPACTED ENCASEMENT IN ACCORDANCE WITH CITY OF HOUSTON WATER DEPARTMENT SPECIFICATIONS AND DETAILS INCLUDED IN THIS PLAN SET, (COH SECTION 02317).
- ALL WATER PIPE AND RELATED PRODUCTS MUST CONFORM TO ANS/NSF STANDARD 61 IN COMPLIANCE WITH 30 TAC §290.44(a)(1).
- PIPE SHALL NOT BE LAID IN WATER OR PLACED WHERE IT CAN BE FLOODED WITH WATER OR SEWAGE DURING ITS STORAGE OR INSTALLATION IN COMPLIANCE WITH 30 TAC §290.44(b)(1).
- ALL PLASTIC PIPE FOR USE IN PUBLIC WATER SYSTEMS MUST ALSO BEAR THE NATIONAL SANITATION FOUNDATION SEAL OF APPROVAL (NSF-PM) AS REQUIRED IN SECTION 30 TAC §290.44(a)(2) OF THE RULES.
- 4" THROUGH 12" FITTINGS SHALL BE CEMENT MORTAR LINED COMPACT DUCTILE IRON PRESSURE FITTINGS PER ANSI A21.53 CONFORMING TO THE REQUIREMENTS OF SECTION 02326- POLYETHYLENE WRAP, OR PUSH ON FITTINGS PER ANSI A21.10 PRESSURE RATED AT 250 PSI.

**BEDDING:**

- WATER LINES UNDER PROPOSED OR FUTURE PAVING AND TO WITHIN ONE (1) FOOT BACK OF ALL PROPOSED OR FUTURE CURBS SHALL BE ENCASED IN BANK SAND TO 12" ABOVE PIPE AND BACKFILLED WITH 1 1/2 SACK CEMENT /TON STABILIZED SAND TO WITHIN ONE (1) FOOT OF SUBGRADE.
- ALL FILL AND COMPACTION TO 95% STANDARD PROCTOR DENSITY SHALL BE PERFORMED PRIOR TO CONSTRUCTION OF WATER LINES.

**TESTING:**

- THE CONTRACTOR SHALL PROVIDE ADEQUATE CONCRETE THRUST BLOCKING TO WITHSTAND TEST PRESSURE AS SPECIFIED IN CITY OF HOUSTON, DEPARTMENT OF PUBLIC WORKS & ENGINEERING SPECIFICATIONS.
- ALL WATER LINES TO BE DISINFECTED IN CONFORMANCE WITH AWWA C-651, A MINIMUM OF ONE BACTERIOLOGICAL SAMPLE SHALL BE COLLECTED FOR EACH 1,000 FEET OF COMPLETED WATERLINE TO CHECK EFFICIENCY OF DISINFECTION PROCEDURES AND SHALL BE REPEATED IF CONTAMINATION PERSISTS.
- HYDROSTATIC TESTING: ALL WATER PIPE SHALL BE TESTED FOR LEAKAGE IN ACCORDANCE WITH SECTION 02615, ALLOW THE WALL LINING TO ABSORB WATER AFTER PIPE HAS BEEN DISINFECTED (MINIMUM OF 24 HOURS), PRESSURE THE PIPE TO 125 PSI FOR SMALL DIAMETER PIPES AND 150 PSI FOR LARGE DIAMETER PIPES, RUN THE TEST FOR 8 HOURS, STOP THE TEST IF LARGE QUANTITIES OF WATER ARE REQUIRED TO MAINTAIN PRESSURE, NO LEAKAGE ALLOWED FOR SECTION OF WATER LINES CONSISTING OF WELDED JOINT, MAXIMUM ALLOWABLE LEAKAGE FOR WATER LINES WITH RUBBER GASKETED JOINTS SHALL BE CALCULATED USING THE MOST STRINGENT FORMULA AS FOLLOWS:

CITY OF HOUSTON & CITY OF HOUSTON ETJ $L = (L(19)(D)(S))/128.720$ WHERE L = ALLOWABLE LEAKAGE IN GAL./HR. S = LENGTH OF PIPE TESTED IN FEET D = INSIDE DIAMETER OF PIPE IN INCHES	OR	TCEQ (NON CITY OF HOUSTON) $L = S(d)(P)^2(0.5)/148.000$ WHERE L = QUANTITY OF MAKEUP WATER IN GAL./HR. D = DIAMETER IN INCHES P = PRESSURE IN POUNDS PER SQUARE INCH S = LENGTH OF PIPE SECTION BEING TESTED IN FEET
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REPAIR VISIBLE LEAKS ON SURFACE AND REPLACE OR REPAIR FAILED LINE SEGMENTS, DISINFECT LINE AFTER REPAIR AND RETEST UNTIL PASSES HYDROSTATIC TEST.

**PRIVATE UTILITY NOTES**

**CAUTION: AT&T TEXAS/SWBT CABLES**

THE LOCATION OF AT&T TEXAS/SWBT FACILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY, THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION BEFORE COMMENCING WORK. HE AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THIS FAILURE TO EXACTLY LOCATE AND PRESERVE THESE UNDERGROUND UTILITIES.

THE CONTRACTOR SHALL NOTIFY TEXAS ONE CALL AT 811 OR 1-(800)344-8377 A MINIMUM OF 48 HOURS PRIOR TO CONSTRUCTION TO HAVE UNDERGROUND LINES FIELD LOCATED, WHEN EXCAVATING WITH EIGHTEEN INCHES (18") OF THE INDICATED LOCATION OF AT&T TEXAS/SWBT FACILITIES, ALL EXCAVATIONS MUST BE ACCOMPLISHED USING NON-MECHANIZED EXCAVATION PROCEDURES, WHEN BORING, THE CONTRACTOR SHALL EXPOSE THE AT&T TEXAS/SWBT FACILITIES.

WHEN AT&T TEXAS/SWBT FACILITIES ARE EXPOSED, THE CONTRACTOR WILL PROVIDE SUPPORT TO PREVENT DAMAGE TO THE CONDUIT DUCTS OR CABLES, WHEN EXCAVATING NEAR TELEPHONE POLES THE CONTRACTOR SHALL BRACE THE POLE FOR SUPPORT.

THE PRESENCE OR ABSENCE OF AT&T TEXAS/SWBT UNDERGROUND CONDUIT FACILITIES DOES NOT MEAN THAT THERE ARE NO DIRECT BURIED CABLES IN THE AREA, PLEASE CONTACT THE AT&T TEXAS DAMAGE PREVENTION MANAGER, MR. ROOSEVELT LEE, JR. AT (713)667-4552 OR EMAIL HIM AT RL7259@ATT.COM. IF THERE ARE QUESTIONS ABOUT BORING OR EXCAVATING NEAR OUR AT&T TEXAS/SWBT FACILITIES.

**CAUTION: UNDERGROUND GAS FACILITIES**

LOCATIONS OF CENTERPOINT ENERGY MAIN LINES (TO INCLUDE CENTERPOINT ENERGY, INTRASTATE PIPELINE LLC, WHERE APPLICABLE) ARE SHOWN IN AN APPROXIMATE LOCATION ONLY, SERVICE LINES ARE USUALLY NOT SHOWN, OUR SIGNATURE ON THESE PLANS ONLY INDICATES THAT OUR FACILITIES ARE SHOWN IN APPROXIMATE LOCATION, IT DOES NOT IMPLY THAT A CONFLICT ANALYSIS HAS BEEN MADE, THE CONTRACTOR SHALL CONTACT THE UTILITY COORDINATING COMMITTEE AT 1-800-545-8005 OR 811 A MINIMUM OF 48 HOURS PRIOR TO CONSTRUCTION TO HAVE MAIN AND SERVICE LINES FIELD LOCATED.

WHEN CENTERPOINT ENERGY PIPE LINE MARKINGS ARE NOT VISIBLE, CALL (713) 207-5463 OR (713)845-8037 (7:00 AM TO 4:30 PM), FOR STATUS OF LINE LOCATION. REQUEST BEFORE EXCAVATION BEGINS.

WHEN EXCAVATING WITHIN EIGHTEEN INCHES (18") OF THE INDICATED LOCATION OF CENTERPOINT ENERGY FACILITIES, ALL EXCAVATION MUST BE ACCOMPLISHED USING NON-MECHANIZED EXCAVATION PROCEDURES.

WHEN CENTERPOINT ENERGY FACILITIES ARE EXPOSED, SUFFICIENT SUPPORT MUST BE PROVIDED TO THE FACILITIES TO PREVENT EXCESSIVE STRESS ON THE PIPING.

FOR EMERGENCIES REGARDING GAS LINES CALL (713) 659-3552 OR (713) 207-4200.

THE CONTRACTOR IS FULLY RESPONSIBLE FOR ANY DAMAGES CAUSED BY HIS FAILURE TO EXACTLY LOCATE AND PRESERVE THESE UNDERGROUND FACILITIES.

**WARNING: OVERHEAD ELECTRICAL LINES**

OVERHEAD LINES MAY EXIST ON THE PROPERTY, THE LOCATION OF OVERHEAD LINES HAS NOT BEEN SHOWN ON THESE DRAWINGS AS THE LINES ARE CLEARLY VISIBLE, BUT YOU SHOULD LOCATE THEM PRIOR TO BEGINNING ANY CONSTRUCTION, TEXAS LAW, SECTION 752, HEALTH AND SAFETY CODE FORBIDS ACTIVITIES THAT OCCUR IN CLOSE PROXIMITY TO HIGH VOLTAGE LINES, SPECIFICALLY:

- ANY ACTIVITY WHERE PERSON OR THINGS MAY COME WITHIN SIX (6) FEET OF LIVE OVERHEAD HIGH VOLTAGE LINES, AND
- OPERATING A CRANE, DERRICK, POWER SHOVEL, DRILLING RIG, PILE DRIVER, HOISTING EQUIPMENT, OR SIMILAR APPARATUS WITHIN (10) FEET OF LIVE OVERHEAD HIGH VOLTAGE LINES.

PARTIES RESPONSIBLE FOR THE WORK, INCLUDING CONTRACTORS ARE LEGALLY RESPONSIBLE FOR THE SAFETY OF CONSTRUCTION WORKERS UNDER THIS LAW, THIS LAW CARRIES BOTH CRIMINAL AND CIVIL LIABILITY, TO ARRANGE FOR LINES TO BE TURNED OFF OR REMOVED CALL CENTERPOINT ENERGY AT (713)207-2222.

**ACTIVITIES ON OR ACROSS CENTERPOINT ENERGY FEE OR EASEMENT PROPERTY**

NO APPROVAL TO USE, CROSS OR OCCUPY CENTERPOINT FEE OR EASEMENT PROPERTY IS GIVEN. IF YOU NEED TO USE CENTERPOINT PROPERTY, PLEASE CONTACT OUR SURVEYING & RIGHT OF WAY DIVISION AT (713) 207-6346 OR (713) 207-5769.

BENCH-MARKS: Project elevations are based on GPS-derived elevations computed using GEOID 12B from the following National Geodetic Survey (NGS) GPS-CORS reference stations: TXHE (DH3609), TXRS (DM7155), ROO1 (DJ8995).

TBM 13: 5/8-inch iron rod with Aluminum Cap stamped "TEXAS DEPT OF TRANSPORTATION CONTROL MARK 14-13" found in the grass ±140 feet north of Westheimer Parkway, ±196 feet east of SH 99, 11 feet east of the back of curb at SH 99 entrance ramp, 90 feet northwest of an A-inlet, 42 feet northwest of a sanitary manhole, and 65 feet northwest of a pedestrian signal box.

ELEVATION 108.88 FT. NAVD-88, GEOID 12B



02/16/2023  
 Brown & Goy Engineers, Inc.  
 F-1046



BGE, Inc.  
 10777 Westheimer, Suite 400  
 Houston, TX 77042  
 Tel: 281-559-4700 • www.bgeinc.com  
 TBPE Registration No. F-1046



SH 99  
 SOUTHBOUND FRONTAGE ROAD  
 WESTHEIMER PKWY TO CINCO RANCH BLVD

GENERAL CONSTRUCTION NOTES  
 (SHEET 1 OF 2)

FED. RD. DIV. NO.		PROJECT NO.	HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	305

SHEET 1 OF 8

BENCHMARKS: Project elevations are based on GPS-derived elevations computed using GEOID 12B from the following National Geodetic Survey (NGS) GPS-CORS reference stations: TXHE (DHS609), TXRS (DM7155), R001 (DJ8995).

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ELEVATION 108.88 FT. NAVD-88, GEOID 12B

**CITY OF HOUSTON-HOUSTON PUBLIC WORKS-WATER CONSTRUCTION NOTES**

1. WATER LINES SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE LATEST CITY OF HOUSTON INFRASTRUCTURE DESIGN MANUAL, STANDARD SPECIFICATION, AND CONSTRUCTION DETAILS.
2. ALL 4" THROUGH 60" WATER LINE TO BE AWWA C-900 PVC DR-18 BLUE PRESSURE RATED WATER MAIN WITH 2" AND SMALLER WATER SERVICE LINE TO BE CONTINUOUS TYPE K COPPER TUBING PER COH STANDARD SPECIFICATION SECTION 02503. ALL 4" THRU 54" DI PIPE WATER LINES SHALL BE AWWA C151 WITH INSIDE LINING WITH AWWA C104 AND DOUBLE WRAPPED WITH 6-MIL POLYETHYLENE SHEETS.
3. CONCRETE THRUST BLOCKS SHALL BE PROVIDED AS NECESSARY TO PREVENT PIPE MOVEMENT. USE RESTRAINED JOINTS WHERE PREVENTING MOVEMENT OF 16" OR GREATER PIPES IS NECESSARY DUE TO THRUST.
4. ALL WATER LINES UNDER PROPOSED OF FUTURE PAVING AND TO A POINT OF ONE (1) FOOT BACK OF ALL PROPOSED OR FUTURE CURBS SHALL BE INCASED IN BANK SAND TO 12" OVER PIPE AND BACKFILLED WITH CEMENT STABILIZED SAND TO WITHIN ONE (1) FOOT OF SUBGRADE.
5. ALL WATER LINE AND SEWER LINE CROSSING SHALL BE CONSTRUCTED PER CITY OF HOUSTON AND TCEQ REGULATIONS.
6. ALL WATER VALVES SHALL BE SUPPLIED AND INSTALLED IN ACCORDANCE WITH THE LATEST EDITION OF AWWA C-600 AND SHALL BE OF THE RESILIENT SEAT TYPE.
7. ALL WATER LINES TO BE DISINFECTED IN CONFORMANCE WITH AWWA C651 AND THE TEXAS STATED DEPARTMENT OF HEALTH. AT LEAST ONE BACTERIOLOGICAL SAMPLE SHALL BE COLLECTED FOR EVERY 1,000 LINEAR FEET PF WATER LINE AND SHALL BE REPEATED IF CONTAMINATION PERSISTS.
8. ALL BELOW GRADE VALVES SHALL BE CASKETED, HUB-END GATE VALVES WITH A CAST IRON BOX. EXCEPT WHERE FLANGES ARE CALLED OUT ON THE PLANS.
9. 4" THRU 12" FITTINGS SHALL BE CEMENT MORTAR LINED COMPACT DUCTILE IRON PRESSURE FITTINGS PER ANSI A21.53, OR PUSH ON FITTINGS PER ANSI A21.10 PRESSURE RATED AT 250 PSIG.
10. HYDROSTATIC TESTING: ALL WATER PIPE SHALL BE TESTED FOR LEAKAGE IN ACCORDANCE WITH THE LATEST CITY OF HOUSTON STANDARD CONSTRUCTION SPECIFICATIONS. TESTS ARE TO BE PERFORMED ON THE ENTIRE FOOTAGE OF WATER PIPE LINE INCLUDED IN THE PROJECT.
11. ALL WATER LINES TO HAVE 45 MINIMUM COVER TO FINISHED GRADE AND MINIMUM 24" CLEARANCE TO OTHER UTILITIES AT CROSSING UNLESS OTHERWISE NOTED ON PLANS. ALL WATER LINE INSTALLED OVER 6" DEEP SHALL UTILIZE RESTRAINED JOINT FITTINGS.
12. CONTRACTOR SHALL KEEP WATER PIPE CLEAN AND CAPPED (OR OTHERWISE EFFECTIVELY COVERED) OPEN PIPE ENDS TO EXCLUDE INSECTS, ANIMALS OR OTHER SOURCES OF CONTAMINATION FROM UNFINISHED PIPE LINES AT TIMES WHEN CONSTRUCTION IS NOW IN PROGRESS.

**UTILITY BACKFILL**

1. BACKFILL FOR UTILITIES SHALL BE IN ACCORDANCE WITH CITY OF HOUSTON SPECIFICATION 02317 AND PER CITY OF HOUSTON DETAILS INCLUDED IN THESE PLANS OR ANY OTHER APPLICABLE CITY OF HOUSTON DETAILS.
2. BACKFILL COMPACTION TO BE AT A MINIMUM OF 90 PERCENT (OUTSIDE OF PAVEMENT) AND 95 PERCENT (UNDER OR WITHIN ONE (1) FOOT OF PAVEMENT) OF THE MAXIMUM DRY DENSITY AND AT A MOISTURE CONTENT RECOMMENDED FROM GEOTECHNICAL INVESTIGATION.
3. THE TESTING OF MATERIALS USED FOR BEDDING AND BACKFILL OF STORM SEWERS AS WELL AS OTHER UTILITY LOCATED UNDERNEATH OR WITHIN ONE FOOT (1') OF SUBGRADE SHALL BE CONDUCTED TO ENSURE COMPLIANCE WITH HARRIS COUNTY SPECIFICATION NO. 430' AND THE PROJECT SPECIFICATIONS.
4. IN CONSTRUCTION APPLICATIONS WHERE UTILITIES UNDER THE PAVEMENT ON KNUCKLES AND/OR CUL-DE-SACS EXIST, A SPECIAL GEOTECHNICAL NOTE SHALL BE PLACED ON THE GEOTECHNICAL CERTIFICATION PAGE DETAILING THE METHOD OF STABILIZATION AND BACKFILL USED TO MEET HARRIS COUNTY SPECIFICATIONS FOR THESE APPLICATIONS.

**CONSTRUCTION NOTES INVOLVING UTILITIES AND PAVING WORK**

**LOCATED WITHIN A PUBLIC RIGHT-OF-WAY**

NOTE: NOTIFICATION ISSUED BY HARRIS COUNTY PUBLIC INFRASTRUCTURE DEPARTMENT - ARCHITECTURE AND ENGINEERING DIVISION - PERMIT OFFICE - REQUIRED PRIOR TO CONSTRUCTION OF UTILITIES OR LEFT TURN LANES WITHIN HARRIS COUNTY AND HARRIS COUNTY FLOOD CONTROL DISTRICT RIGHT-OF-WAY: CONTACT HARRIS COUNTY PERMIT OFFICE (713)274-3931.

**FORT BEND COUNTY**

**CONSTRUCTION - GENERAL NOTES**

1. FORT BEND COUNTY MUST BE NOTIFIED TO THE PRE-CONSTRUCTION MEETING.
2. CONTRACTOR SHALL NOTIFY FORT BEND COUNTY ENGINEERING DEPARTMENT 48 HOURS PRIOR TO COMMENCING CONSTRUCTION AND 48 HOUR NOTICE TO ANY CONSTRUCTION ACTIVITY WITHIN THE LIMITS OF THE PAVING AT [Construction@fortbendcountytx.gov](mailto:Construction@fortbendcountytx.gov).
3. CONTRACTOR IS RESPONSIBLE FOR OBTAINING ALL PERMITS REQUIRED FROM FORT BEND COUNTY PRIOR TO COMMENCING CONSTRUCTION OF ANY IMPROVEMENTS WITHIN COUNTY ROAD RIGHT OF WAYS.
4. ALL PAVING IMPROVEMENTS SHALL BE CONSTRUCTED IN ACCORDANCE WITH FORT BEND COUNTY "RULES, REGULATIONS AND REQUIREMENTS" RELATING TO THE APPROVAL AND ACCEPTANCE OF IMPROVEMENTS IN SUBORDINATION AS CURRENTLY AMENDED.
5. ALL ROAD WIDTHS, CURB RADII AND CURB ALIGNMENT SHOWN INDICATES BACK OF CURB.
6. A CONTINUOUS LONGITUDINAL REINFORCING BAR SHALL BE USED IN THE CURBS.
7. ALL CONCRETE PAVEMENT SHALL BE 5 1/2 SACK CEMENT WITH A MINIMUM COMPRESSIVE STRENGTH OF 3500 PSI AT 28 DAYS. TRANSVERSE EXPANSION JOINTS SHALL BE INSTALLED AT EACH CURB RETURN AND AT A MINIMUM SPACING OF 60 FEET.
8. ALL WEATHER ACCESS TO ALL EXISTING STREETS AND DRIVEWAYS SHALL BE MAINTAINED AT ALL TIMES.
9. 4" X 12" REINFORCED CONCRETE CURB SHALL BE PLACED IN FRONT OF SINGLE FAMILY LOTS ONLY. ALL OTHER AREAS SHALL BE 6" REINFORCED CONCRETE CURB.
10. AT ALL INTERSECTION LOCATIONS, TYPE 7 RAMPS SHALL BE PLACED IN ACCORDANCE WITH TXDOT PED-18 STANDARD DETAIL SHEET, A.D.A. - HANDICAP RAMPS SHALL BE INSTALLED WITH STREET PAVING AT ALL INTERSECTIONS AND COMPLY WITH CURRENT A.D.A. REGULATIONS.
11. CURB HEADERS ARE REQUIRED AT CURB CONNECTIONS TO HANDICAP RAMPS, WITH NO CONSTRUCTION JOINT WITHIN 5' OF RAMPS.
12. ALL INTERSECTIONS UTILIZING TRAFFIC CONTROL MEASURES SHALL HAVE A.D.A. WHEEL CHAIR RAMPS INSTALLED.
13. GUIDELINES ARE SET FORTH IN THE TEXAS "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES", AS CURRENTLY AMENDED, SHALL BE OBSERVED, THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ADEQUATE FLAGMEN, SIGNING, STRIPING, AND WARNING DEVICES, ETC., DURING CONSTRUCTION - BOTH DAY AND NIGHT.
14. ALL R-1 STOP SIGNS SHALL BE A MINIMUM OF 30" X 30" WITH DIAMOND GRADE SHEETING PER TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.
15. STREET NAME SIGNAGE SHALL BE ON A 9" HIGH SIGN FLAT BLADE W/ REFLECTIVE GREEN BACKGROUND, STREET NAMES SHALL BE UPPER AND LOWERCASE LETTERING WITH UPPERCASE LETTERS OF 6" MINIMUM AND LOWERCASE LETTERS OF 4.5" MINIMUM. THE LETTERS SHALL BE REFLECTIVE WHITE. STREET NAME SIGNS SHALL BE MOUNTED ON STOP SIGN POST.
16. A BLUE DOUBLE REFLECTORIZED BUTTON SHALL BE PLACED AT ALL FIRE HYDRANT LOCATIONS. THE BUTTON SHALL BE PLACED 12 INCHES OFF THE CENTERLINE OF THE STREET ON THE SAME SIDE AS THE HYDRANT.
17. THE PROJECT AND ALL PARTS THEREOF SHALL BE SUBJECT TO INSPECTION FROM TIME TO TIME BY INSPECTORS DESIGNATED BY FORT BEND COUNTY, NO SUCH INSPECTIONS SHALL RELIEVE THE CONTRACTOR OF ANY OF ITS OBLIGATIONS HEREUNDER. NEITHER FAILURE TO INSPECT NOR FAILURE TO DISCOVER OR REJECT ANY OF THE WORK AS NOT IN ACCORDANCE WITH THE DRAWINGS AND SPECIFICATIONS, REQUIREMENTS AND SPECIFICATIONS OF FORT BEND COUNTY OR ANY PROVISION OF THIS PROJECT SHALL BE CONSTRUED TO IMPLY AN ACCEPTANCE OF SUCH WORK OR TO RELIEVE THE CONTRACTOR OF ANY OF ITS OBLIGATIONS HEREUNDER.
18. STABILIZED SUBGRADE: DETERMINE THE THICKNESS OF THE STABILIZED SUBGRADE AFTER CURING AND COMPACTION. IF THE SUBGRADE DEPTH IS GREATER THAN THE PROPOSED THICKNESS BY 20% OR MORE, THE CMT LAB MUST PROVIDE VERIFICATION THE PERCENTAGE OF MATERIAL BEING USED TO STABILIZED THE SUBGRADE MEETS OR EXCEEDS PROJECT REQUIREMENTS, TEST RESULTS REQUIRED.

**STANDARD FBCCD NOTES FOR CONSTRUCTION DRAWINGS**

1. OBTAIN AND COMPLY WITH ALL APPLICABLE CITY, COUNTY, STATE AND FEDERAL PERMITS AND APPROVALS WITH ASSISTANCE FROM ENGINEER. IF NECESSARY OBTAIN PERMIT OR CERTIFICATIONS FROM FORT BEND COUNTY ENGINEER TO ENTER FORT BEND DRAINAGE DISTRICT RIGHT-OF-WAY.
2. NOTIFY THE FORT BEND COUNTY DRAINAGE DISTRICT IN WRITING AT LEAST 48 HOURS PRIOR TO CONSTRUCTION.
3. ENGINEER SHALL SUBMIT CERTIFICATION LETTER AND RECORD DRAWINGS TO THE FORT BEND COUNTY DRAINAGE DISTRICT REQUESTING INSPECTION OF ITEMS CONSTRUCTED IN FORT BEND COUNTY DRAINAGE DISTRICT RIGHT-OF-WAY. PRIOR TO REQUESTING INSPECTION, THE DRAINAGE RIGHT-OF-WAY AND/OR EASEMENTS SHALL BE STAKED AND FLAGGED.
4. PROTECT, MAINTAIN, AND RESTORE EXISTING BACKSLOPE DRAINAGE SYSTEMS.
5. BACKSLOPE SWALE AND INTERCEPTOR STRUCTURE ELEVATIONS AND LOCATIONS SHOWN ON PLANS ARE APPROXIMATE. FINAL ELEVATIONS AND LOCATIONS SHALL BE FIELD VERIFIED BY THE ENGINEER PRIOR TO THE INSTALLATION.
6. ESTABLISH TURF GRASS ON ALL DISTURBED AREAS WITHIN THE CHANNEL OR DETENTION RIGHT-OF-WAY, EXCEPT THE CHANNEL BOTTOM AND WHERE STRUCTURAL EROSION MEASURES ARE USED, MINIMUM ACCEPTANCE CRITERIA ARE 75% COVERAGE OF LIVE BERMUDA GRASS AND NO EROSION OR RILLS DEEPER THAN 4".
7. BACKFILL IN ACCORDANCE WITH THE FORT BEND COUNTY FLOOD CONTROL DISTRICT STANDARD SPECIFICATION, SECTION 02315- EXCAVATION OR BACKFILLING, OR EQUIVALENT.
8. EXCAVATE CHANNEL FLOWLINE TO DESIGN ELEVATION AS SHOWN ON PLANS AND DOWNSTREAM, AS NECESSARY TO ENSURE NO WATER REMAINS IN THE FACILITY (STORM SEWER, LATERAL CHANNEL, OR DRY BOTTOM DETENTION BASIN) DURING NORMAL WATER SURFACE CONDITIONS IN THE CHANNEL, SO THE FACILITY WILL FUNCTION AS INTENDED. FOR WET BOTTOM DETENTION BASINS, ENSURE NO WATER IS ABOVE THE DESIGN LEVEL IN THE WET BOTTOM DURING NORMAL WATER SURFACE CONDITIONS IN THE CHANNEL.
9. MAINTAIN FLOW IN CHANNEL DURING CONSTRUCTION AND RESTORE CHANNEL TO ORIGINAL CONDITION.
10. REMOVE ALL EXCAVATED MATERIAL FROM THE FORT BEND COUNTY DRAINAGE DISTRICT OR DRAINAGE RIGHT-OF-WAY. NO FILLS IS TO BE PLACED WITHIN A DESIGNATED FLOOD PLAIN AREA WITHOUT FIRST OBTAINING A FILL PERMIT FROM THE APPROPRIATE JURISDICTION AUTHORITY.

**PIPELINE CONTACT INFORMATION**

ENERGY TRANSFER PHONE: 1-800-382-1965  
KINDER MORGAN PHONE: 713-369-9000



*Larry J. Muelles* 02/16/2023  
Brown & Gay Engineers, Inc.  
F-1046



BGE, Inc.  
10777 Westheimer, Suite 400  
Houston, TX 77042  
Tel: 281-558-4700 • www.bgeinc.com  
TBPE Registration No. F-1046



SH 99  
SOUTHBOUND FRONTAGE ROAD  
WESTHEIMER PKWY TO CINCO RANCH BLVD

**GENERAL CONSTRUCTION NOTES  
(SHEET 2 OF 2)**

SHEET 2 OF 8

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	306

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CINCO MUNICIPAL UTILITY DISTRICT NO. 1 - SH 99 WATER LINE RELOCATION

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RESIDUE OF RESTRICTED RESERVE 'C' BLOCK 1  
 CINCO VILLAGE CENTER SECTION 2  
 CINCO COMMERCIAL PROPERTY ASSOCIATION, INC.  
 FILE NO. 2009035238  
 F.B.C.O.P.R.

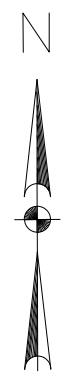
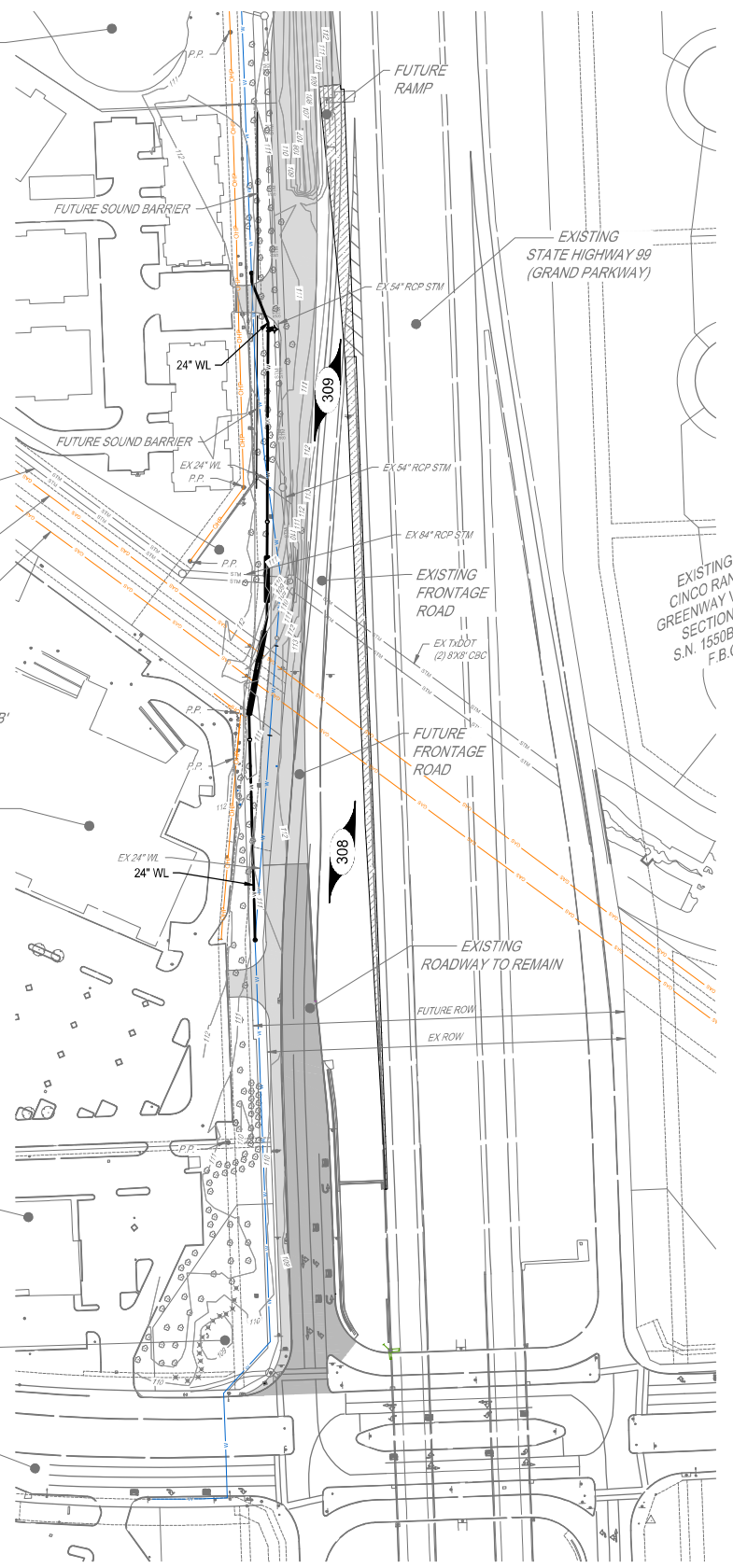
PORTION OF CALLED 6.6666 ACRES (DITCH VALB)  
 WILLOW FORK DRAINAGE DISTRICT VOL. 2178, PG. 2548  
 F.B.C.D.R.

ALL OF RESTRICTED RESERVE 'B' BLOCK 1  
 CINCO RETAIL CENTER BRE RC CINCO RANCH TX LP  
 FILE NO. 2016054670  
 F.B.C.O.P.R.

CALLED 2.0798 ACRES 5690 - (WESTHEIMER, HOUSTON), LP.  
 FILE NO. 2004010261  
 F.B.C.O.R.

CALLED 0.489 ACRES PARCEL 1  
 CINCO RANCH RESIDENTIAL PROPERTY ASSOCIATION, INC.  
 FILE NO. 2001024638  
 F.B.C.O.R.

EXISTING WESTHEIMER PARKWAY



BENCH-MARKS: Project elevations are based on GPS-derived elevations computed using GEOID 12B from the following National Geodetic Survey (NGS) GPS-CORS reference stations: TXHE (DH3609), TXRS (DM7156), ROD1 (DJ8996).

TBM 13: 5/8-inch iron rod with Aluminum Cap stamped 'TEXAS DEPT OF TRANSPORTATION CONTROL MARK 14-13' found in the grass ±140 feet north of Westheimer Parkway, ±196 feet east of SH 99, 11 feet east of the back of curb at SH 99 entrance ramp, 90 feet northwest of an A-inlet, 42 feet northwest of a sanitary manhole, and 66 feet northwest of a pedestrian signal box.

ELEVATION: 108.88 FT. NAVD-88, GEOID 12B

**LEGEND**

- PROPOSED WATER LINE, GV & BOX WITH FIRE HYDRANT
- EXISTING WATER LINE, GV & BOX WITH FIRE HYDRANT
- EXISTING CENTERPOINT ENERGY HL&P OVERHEAD LINE
- EXISTING CENTERPOINT ENERGY GAS LINE
- EXISTING STORM SEWER LINE, MANHOLE AND INLETS
- SHEET REFERENCE NUMBER

**CAUTION !!!**  
 OVERHEAD POWER LINES IN AREA  
 SEE NOTES SHT 305

**CAUTION !!!**  
 NATURAL GAS LINES IN AREA  
 SEE NOTES SHT 305

**NOTE:**  
 IN AREAS WHERE THE PROJECT DESIGN INCORPORATES FILL ADJACENT TO NEIGHBORING LANDOWNERS, THE CONTRACTOR SHALL IMPLEMENT GRADING AND/OR PERIMETER RUNOFF CATCHMENT DEVICES (E.G. PERIMETER DITCHES OR OTHER BEST MANAGEMENT PRACTICES) DURING CONSTRUCTION TO ENSURE THAT ADJACENT PARCELS BORDERING THE PROJECT SITE DO NOT EXPERIENCE INTERIM DRAINAGE FLOWS THAT EXCEED PRE-DEVELOPMENT CONDITIONS FOR STORM EVENTS UP TO AND INCLUDING THE CURRENT STORM DRAINAGE DESIGN CRITERIA AT THE TIME OF PERMIT OR CARRY SEDIMENT GENERATED AS PART OF CONSTRUCTION ACTIVITIES. WHERE APPLICABLE, THESE PRACTICES ARE IN ADDITION TO THE STANDARD STORM WATER POLLUTION PREVENTION DESIGN AND SHALL INCLUDE ADDITIONAL DITCHES REDIRECTING SITE DRAINAGE OR TEMPORARY PIPING. THIS NOTE IS NOT INTENDED TO ADDRESS ANY LIABILITY OR RESPONSIBILITY UNDER TEXAS WATER CODE 11.086.

**NOTICE**  
 FOR LOCATION OF UNDERGROUND UTILITY LINES, CALL 811, 48 HOURS BEFORE EXCAVATING.

- PERMIT NOTES:**
- CONTRACTOR TO OBTAIN ALL PERMITS REQUIRED BY FORT BEND COUNTY, TEXAS PRIOR TO STARTING CONSTRUCTION OF UTILITIES AND/OR CULVERTS WITHIN COUNTY ROAD RIGHT-OF-WAY. THE PERMIT IS TO BE ISSUED IN THE OWNERS NAME.
  - CONTRACTOR TO OBTAIN ALL PERMITS REQUIRED BY REGULATION OF FORT BEND COUNTY, TEXAS FOR FLOOD PLAIN MANAGEMENT PRIOR TO STARTING CONSTRUCTION.

**WATER USAGE NOTE:**  
 CONTRACTOR SHALL NOTIFY DISTRICT OPERATOR 24 HOURS PRIOR TO UTILIZING ANY AMOUNT OF DISTRICT WATER AND BEFORE OPERATING ANY VALVES, FIRE HYDRANTS OR APPURTENANCE OF THE DISTRICT WATER SUPPLY, STORAGE OR DISTRIBUTION SYSTEM.

**TRAFFIC CONTROL PLAN NOTE:**  
 NO LANE CLOSURE BETWEEN 7:00 AM - 9:00 AM AND 4:00 PM - 6:30 PM.

**CAUTION!!!**  
 CONTRACTOR TO VERIFY ALL UNDERGROUND UTILITIES IN THE FIELD PRIOR TO STARTING CONSTRUCTION.  
 THE LOCATION OF ALL UTILITIES PRESENTED ON THESE DRAWINGS IS SHOWN IN AN APPROXIMATE WAY ONLY. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION BEFORE COMMENCING WORK. HE AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY HIS FAILURE TO EXACTLY LOCATE AND PRESERVE THESE UNDERGROUND UTILITIES.

- POLLUTION PREVENTION NOTES:**
- CONTRACTOR SHALL IMPLEMENT INLET PROTECTION DEVICES AND REINFORCED FILTER FABRIC BARRIER ALONG ROAD AND SIDE DITCHES AT LOCATIONS AS REQUIRED TO KEEP SILT AND OR EXCAVATED MATERIALS FROM ENTERING INTO THE STORM WATER INLETS AND DITCHES EVENTUALLY POLLUTING THE RECEIVING STORM. NO SEPARATE PAY.
  - DURING THE EXCAVATION PHASE OF THE PROJECT, CONTRACTOR SHALL SCHEDULE THE WORK IN SHORT SEGMENTS SO THAT EXCAVATION MATERIAL CAN BE QUICKLY HAULED AWAY FROM THE SITE AND TO PREVENT IT FROM STAYING UNCOLLECTED ON THE EXISTING PAVEMENT. ANY LOOSE EXCAVATED MATERIAL WHICH FALLS ON PAVEMENTS OR DRIVEWAYS SHALL BE SWEEPED BACK INTO THE EXCAVATED AREA.
  - CONTRACTOR SHALL CLEAN UP THE EXISTING STREET INTERSECTIONS AND DRIVEWAYS DAILY, AS NECESSARY, TO REMOVE ANY EXCESS MUD, SILT OR ROCK TRACKED FORM THE EXCAVATED AREA.
  - CONTRACTOR SHALL FOLLOW GOOD HOUSEKEEPING PRACTICES DURING THE CONSTRUCTION OF THE PROJECT, ALWAYS CLEANING UP DIRT AND LOOSE MATERIAL AS CONSTRUCTION PROGRESSES.
  - CONTRACTOR TO INSPECT AND MAINTAIN THE AREAS LISTED BELOW AT LEAST ONCE EVERY FOURTEEN (14) CALENDAR DAYS AND WITHIN 24 HOURS OF THE END OF A STORM EVENT OF 0.5 INCHES OR GREATER.
    - DISTURBED AREAS OF THE CONSTRUCTION SITE THAT HAVE NOT BEEN FINALLY STABILIZED.
    - AREAS USED FOR STORAGE OF MATERIALS THAT ARE EXPOSED TO PRECIPITATION.
    - STRUCTURAL CONTROL MEASURES.
    - LOCATIONS WHERE VEHICLES ENTER OR EXIT THE SITE.
  - CONTRACTOR TO BE RESPONSIBLE TO MAINTAIN EXISTING DITCHES AND OR CULVERTS FOR UNOBSTRUCTED DRAINAGE AT ALL TIMES. WHERE SODDING IS DISTURBED BY EXCAVATION ON BACKFILLING OPERATIONS, SUCH AREAS SHALL BE REPLACED BY SEEDING OR SODDING. SLOPES 4:1 OR STEEPER SHALL BE REPLACED BY BLOCK SODDING.



02/16/2023  
 Brown & Goy Engineers, Inc.  
 F-1046



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SH 99  
 SOUTHBOUND FRONTAGE ROAD  
 WESTHEIMER PKWY TO CINCO RANCH BLVD  
 OVERALL LAYOUT AND  
 STORM WATER POLLUTION  
 PREVENTION PLAN

SHEET 3 OF 8

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	307

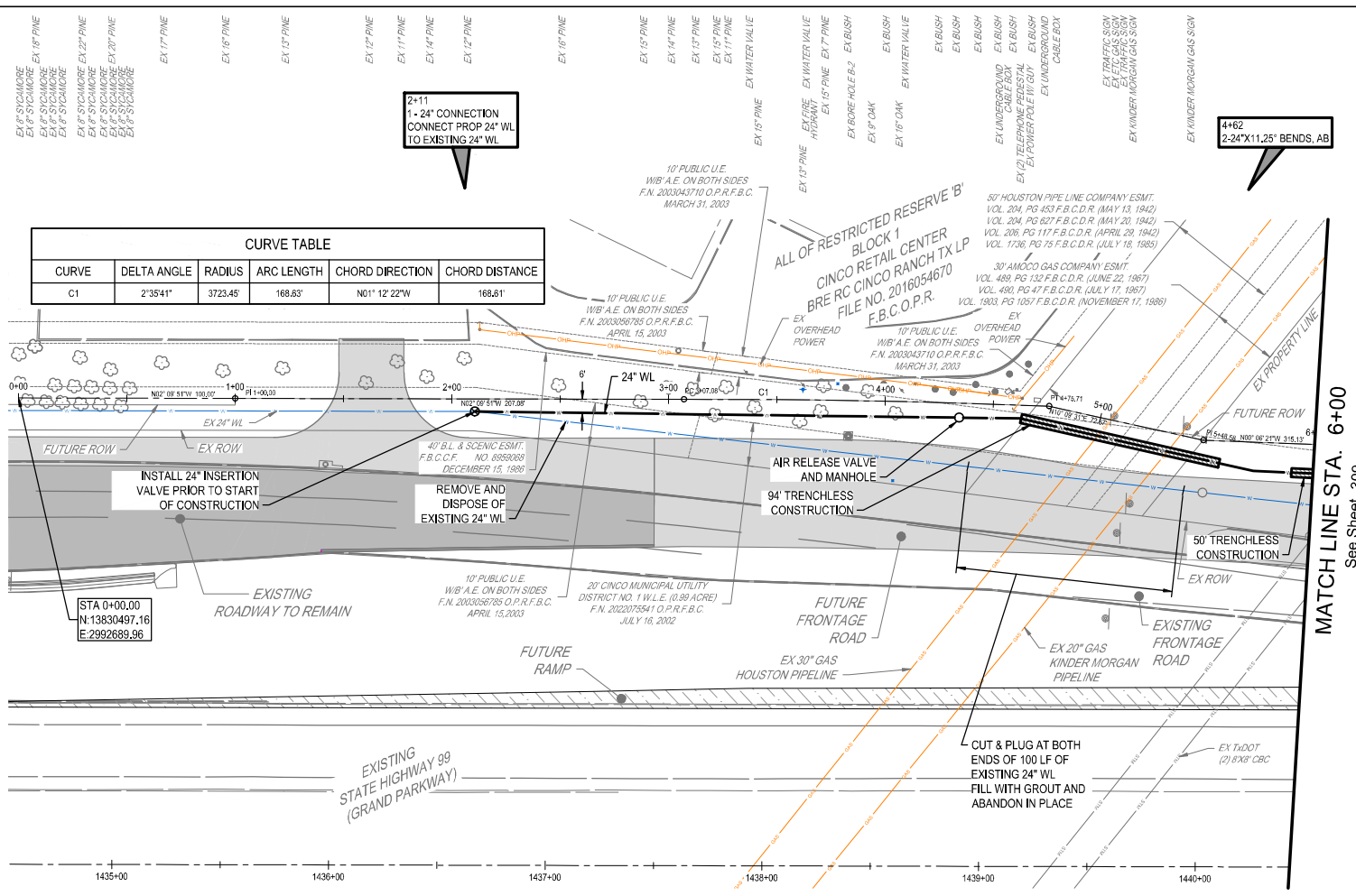
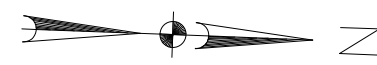
CINCO MUNICIPAL UTILITY DISTRICT NO. 1 - SH 99 WATER LINE RELOCATION



BENCHMARKS: Project elevations are based on GPS-derived elevations computed using GEOID 12B from the following National Geodetic Survey (NGS) GSP-CORS reference stations: TXHE (DH3609), TXRS (DM7155), ROD1 (DJ8955).

TBM 13: 5/8-inch iron rod with Aluminum Cap stamped TEXAS DEPT OF TRANSPORTATION CONTROL MARK 14-13 found in the grass ±140 feet north of Westheimer Parkway, ±196 feet east of SH 99, 11 feet east of the back of curb at SH 99 entrance ramp, 90 feet northwest of an A-inlet, 42 feet northwest of a sanitary manhole, and 65 feet northwest of a pedestrian signal box.

ELEVATION 108.88 FT. NAVD-88, GEOID 12B



**CAUTION !!!**  
OVERHEAD POWER LINES IN AREA  
SEE NOTES SHT 305

**CAUTION !!!**  
NATURAL GAS LINES  
IN AREA  
SEE NOTES SHT 305

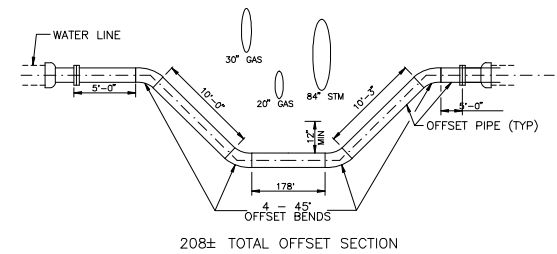
CURVE TABLE				
CURVE	DELTA ANGLE	RADIUS	ARC LENGTH	CHORD DIRECTION
C1	2°35'41"	3723.45'	168.83'	N01°12'22"W
				168.81'

**LEGEND**

- INDICATES RESTRAINED JOINT WATERLINE
- INDICATES MINIMUM CLEARANCE (INCHES)
- EXISTING 24" WATERLINE TO BE REMOVED

**WATER LINE OFFSET NOTES:**

1. ALL MATERIALS AND COATINGS TO BE IN ACCORDANCE WITH WATER MAIN STANDARD SPECIFICATIONS.
2. RESTRAIN EXISTING PIPING BEYOND OFFSET SECTION AS REQUIRED TO PREVENT MOVEMENT.
3. INSULATED JOINT TO BE MADE UP USING INSULATING GASKETS, PLASTIC BOLT SLEEVES, WASHERS OF INSULATING GASKET MATERIAL BACKED WITH CAD-PLATED WASHERS OR OTHER METHODS APPROVED BY THE ENGINEER.
4. SEE ADDITIONAL NOTES ON WATER LINE DETAIL 02511-01 INCLUDED ON WATER LINE DETAIL SHEET.

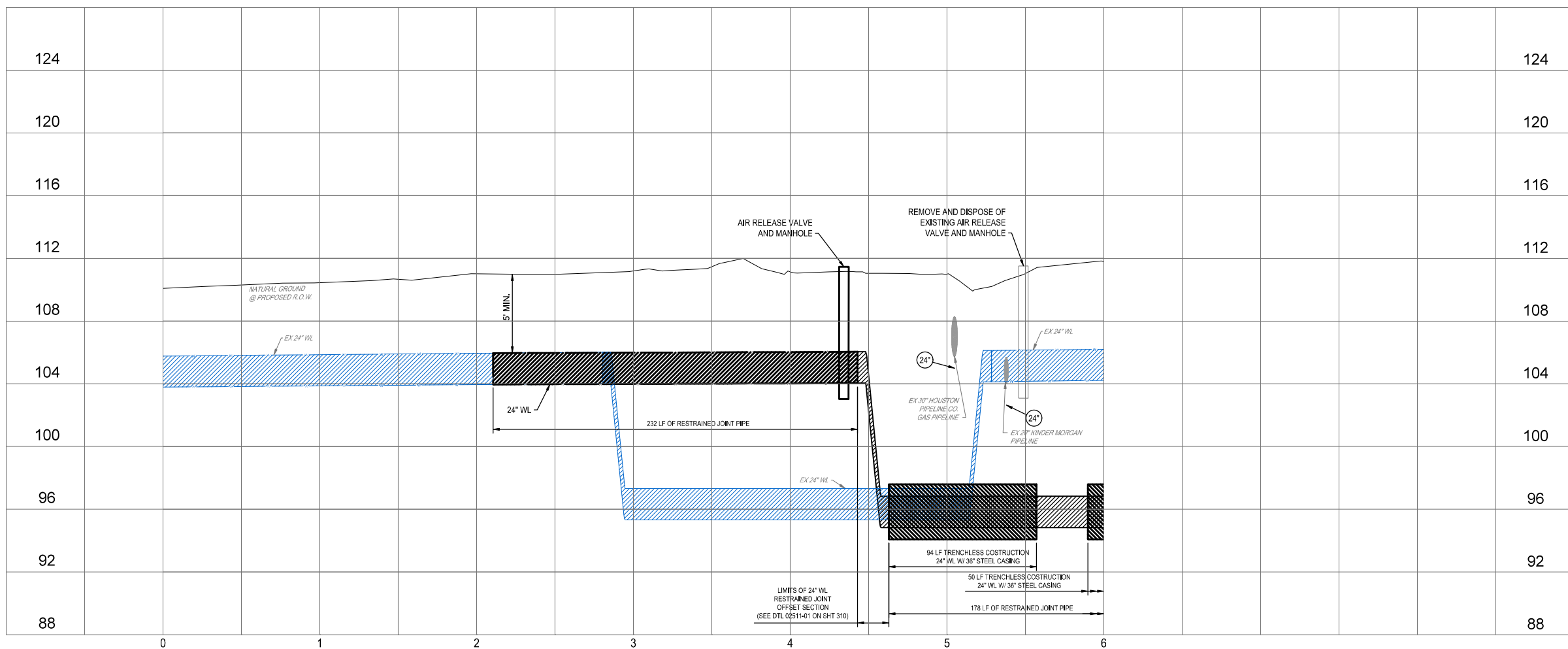


**STA. 4+43**  
**24" WL RESTRAINED JOINT OFFSET SECTION**  
N.T.S.

**NOTES:**

1. ALL WATER LINES TO BE PROPOSED PVC CLASS 235, DR-18, AWWA C-900 UNLESS OTHERWISE INDICATED.
2. CONTRACTOR TO FILL SPACE BETWEEN STEEL CASING AND PVC PIPE WITH FLOWABLE FILL. FLOWABLE FILL MATERIALS TO CONFORM TO SECTION 434.2 FROM HARRIS COUNTY SPECS.
3. SPACERS ARE TO BE UTILIZED IN ORDER TO CENTER PIPE WITHIN CASING ALONG BORE (SEE CASING SPACER DETAIL P1-S11-2005 ON SHT. 310) SUBMIT SPACER PRODUCT TO ENGINEER FOR APPROVAL PRIOR TO CONSTRUCTION.
4. END SEALS ARE TO BE INSTALLED AT EACH END OF THE BORE CASING. (SEE CASING SPACER DETAIL P1-S11-2005 ON SHT. 310) SUBMIT TO ENGINEER FOR APPROVAL PRIOR TO CONSTRUCTION.
5. CONTRACTOR IS RESPONSIBLE FOR FIELD VERIFYING AND LOCATING ALL EXISTING UTILITIES PRIOR TO CONSTRUCTION. UTILITIES SHOWN ARE APPROXIMATE.

**SH 99 - 24" WATER LINE**



02/16/2023  
Brown & Goy Engineers, Inc.  
F-1046



**BGE, Inc.**  
10777 Westheimer, Suite 400  
Houston, TX 77042  
Tel: 281-558-4700 • www.bgeinc.com  
TBPE Registration No. F-1046

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**SH 99**  
SOUTHBOUND FRONTAGE ROAD  
WESTHEIMER PKWY TO CINCO RANCH BLVD  
**PLAN AND PROFILE -**  
**SH 99- 24" WATER LINE**  
(STA. 0+00 TO 6+00)

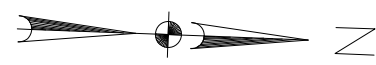
SHEET 4 OF 8

FED. RD. DIV. NO.	PROJECT NO.	HIGHWAY NO.	
6		<b>SH 99</b>	
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	308

**BENCHMARKS:** Project elevations are based on GPS-derived elevations computed using GEOID 12B from the following National Geodetic Survey (NGS) GPS-CORS reference stations: TXHE (DH3609), TXRS (DM7155), ROD1 (DJ8955).

**TBM 13:** 5/8-inch iron rod with Aluminum Cap stamped 'TEXAS DEPT OF TRANSPORTATION CONTROL MARK 14-13' found in the grass ±140 feet north of Westheimer Parkway, ±196 feet east of SH 99, 11 feet east of the back of curb at SH 99 entrance ramp, 90 feet northwest of an A-inlet, 42 feet northwest of a sanitary manhole, and 65 feet northwest of a pedestrian signal box.

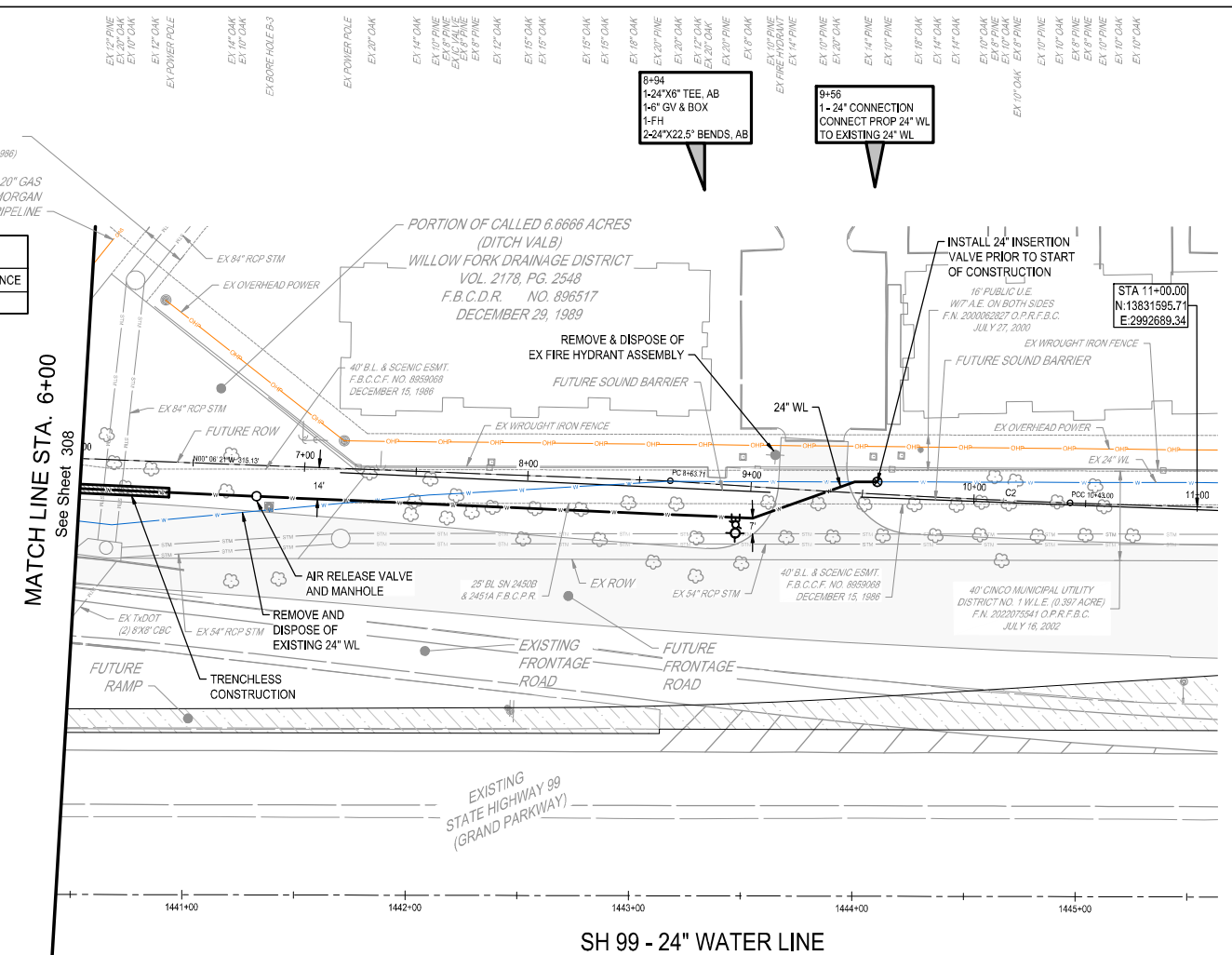
ELEVATION 108.88 FT. NAVD-88, GEOID 12B



CURVE TABLE					
CURVE	DELTA ANGLE	RADIUS	ARC LENGTH	CHORD DIRECTION	CHORD DISTANCE
C2	2°04'19"	4958.00'	179.29'	N00° 52' 33"E	179.28'

**CAUTION !!!**  
OVERHEAD POWER LINES IN AREA  
SEE NOTES SHT 305

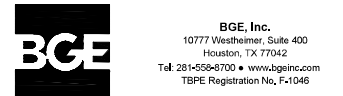
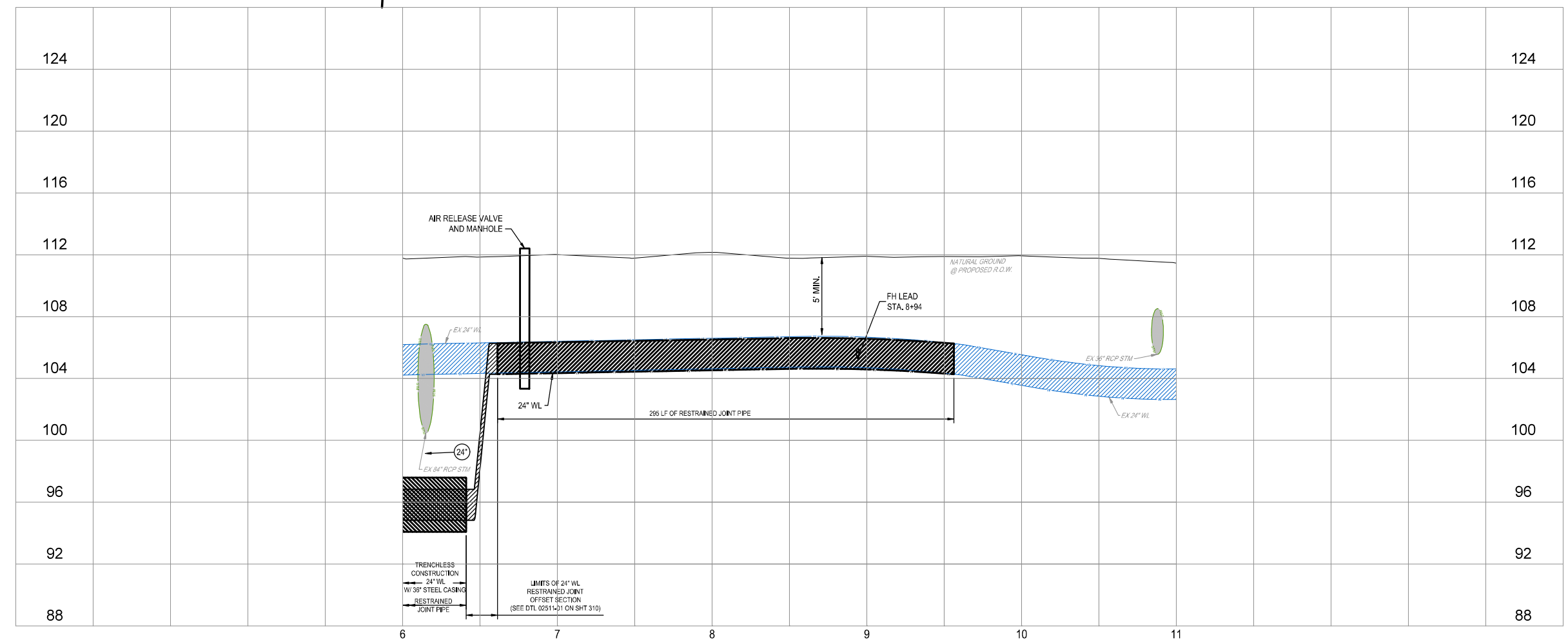
**CAUTION !!!**  
NATURAL GAS LINES IN AREA  
SEE NOTES SHT 305



- LEGEND**
- INDICATES RESTRAINED JOINT WATERLINE
  - INDICATES MINIMUM CLEARANCE (INCHES)
  - EXISTING 24" WATERLINE TO BE REMOVED

- NOTES:**
- ALL WATER LINES TO BE PROPOSED PVC CLASS 235, DR-18, AWWA C-900 UNLESS OTHERWISE INDICATED.
  - CONTRACTOR TO FILL SPACE BETWEEN STEEL CASING AND PVC PIPE WITH FLOWABLE FILL, FLOWABLE FILL MATERIALS TO CONFORM TO SECTION 434.2 FROM HARRIS COUNTY SPECS.
  - SPACERS ARE TO BE UTILIZED IN ORDER TO CENTER PIPE WITHIN CASING ALONG BORE (SEE CASING SPACER DETAIL P1-S1-12005 ON SHT. 310) SUBMIT SPACER PRODUCT TO ENGINEER FOR APPROVAL PRIOR TO CONSTRUCTION.
  - END SEALS ARE TO BE INSTALLED AT EACH END OF THE BORE CASING. (SEE CASING SPACER DETAIL P1-S1-12005 ON SHT. 310) SUBMIT TO ENGINEER FOR APPROVAL PRIOR TO CONSTRUCTION.
  - CONTRACTOR IS RESPONSIBLE FOR FIELD VERIFYING AND LOCATING ALL EXISTING UTILITIES PRIOR TO CONSTRUCTION. UTILITIES SHOWN ARE APPROXIMATE.

PLOTTED: CMINNAAR 2/16/2023 9:55 AM  
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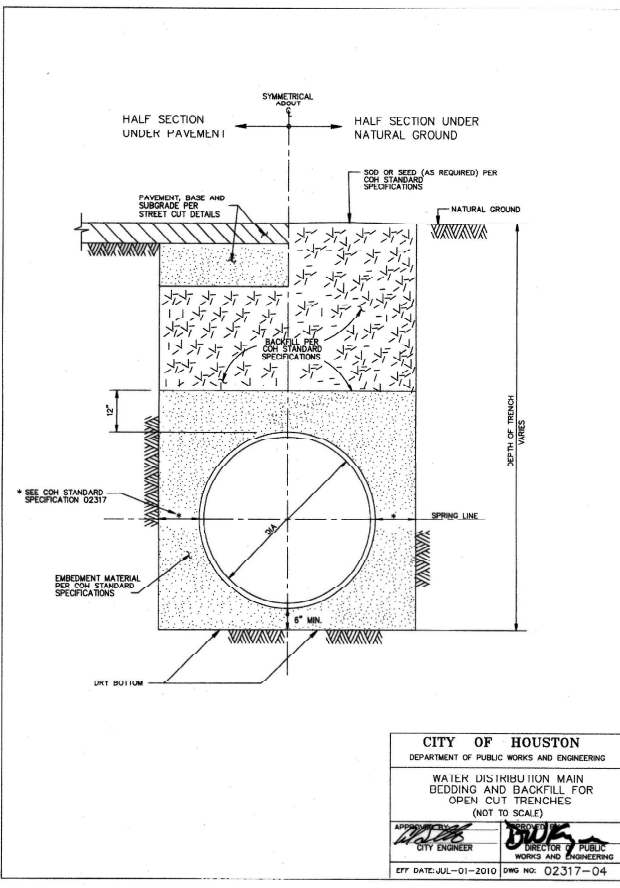
SH 99  
SOUTHBOUND FRONTAGE ROAD  
WESTHEIMER PKWY TO CINCO RANCH BLVD

PLAN AND PROFILE -  
SH 99- 24" WATER LINE  
(STA. 6+00 TO 11+45)

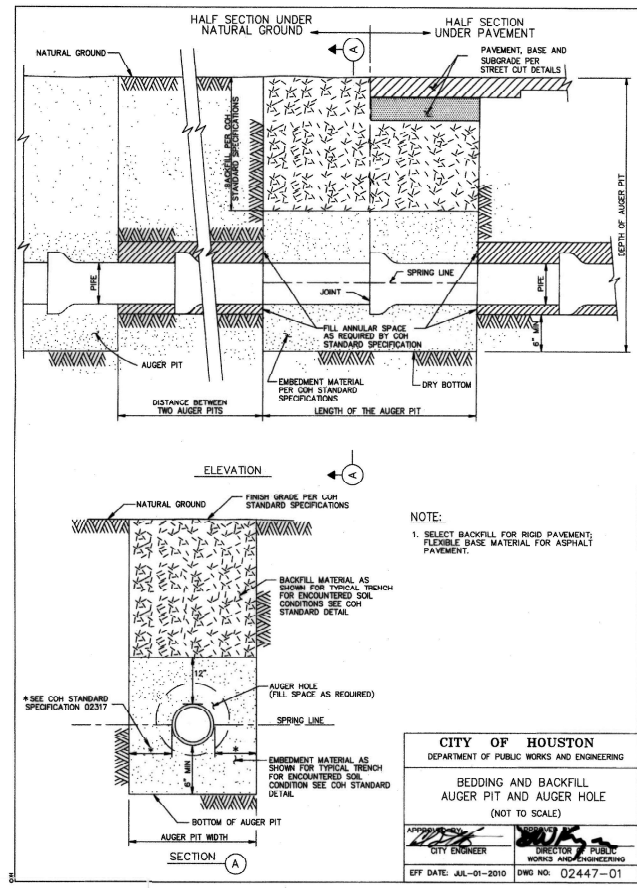
SHEET 5 OF 8

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	309

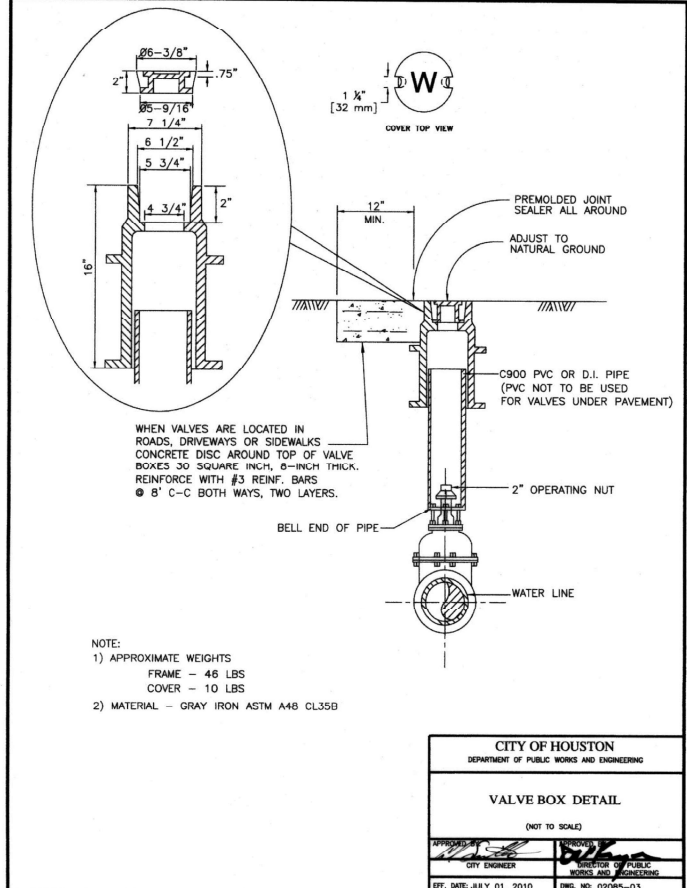
BENCH-MARKS: Project elevations are based on GPS-derived elevations computed using GEOID 12B from the following National Geodetic Survey (NGS) GPS-CORS reference stations: TXPE (DHS609), TXRS (DM7155), R001 (D48955).  
TBM 13: 5/8-inch iron rod with Aluminum Cap stamped TEXAS DEPT OF TRANSPORTATION CONTROL MARK H-13 found in the grass ±140 feet north of Westheimer Parkway, ±196 feet east of SH 99, 11 feet east of the back of curb at SH 99 entrance ramp, 90 feet northwest of an A-inlet, 42 feet northwest of a sanitary manhole, and 65 feet northwest of a pedestrian signal box.  
ELEVATION 108.88 FT. NAVD-88, GEOID 12B



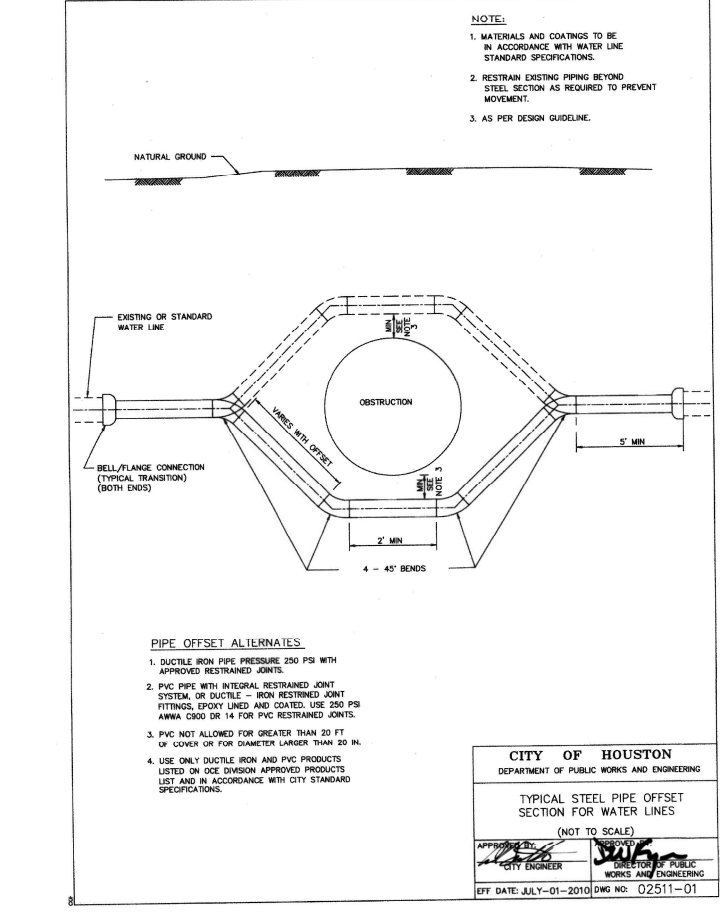
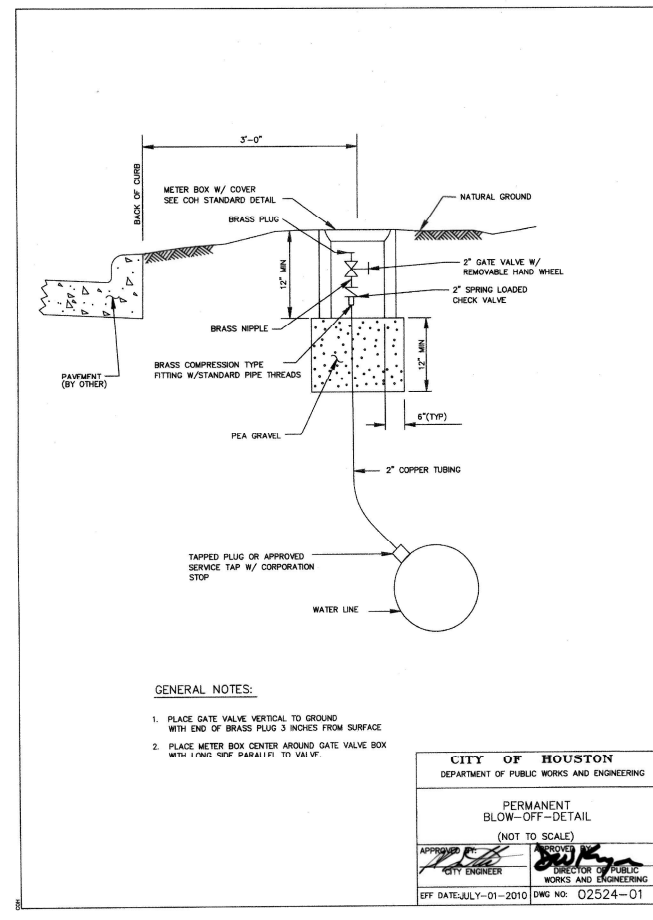
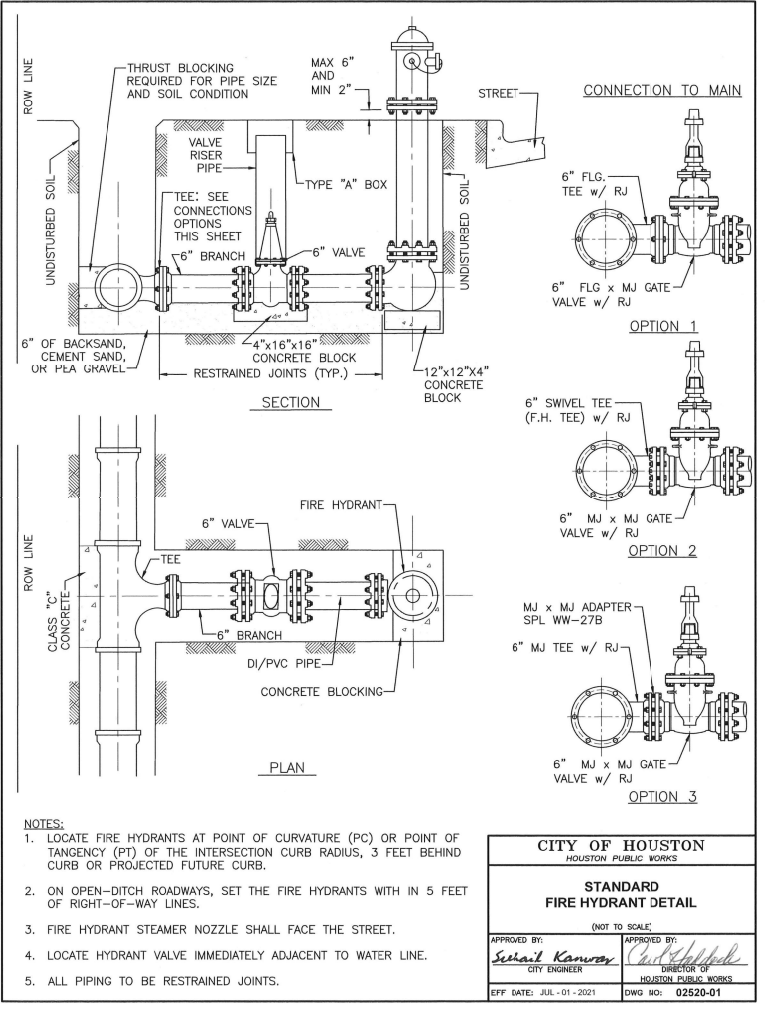
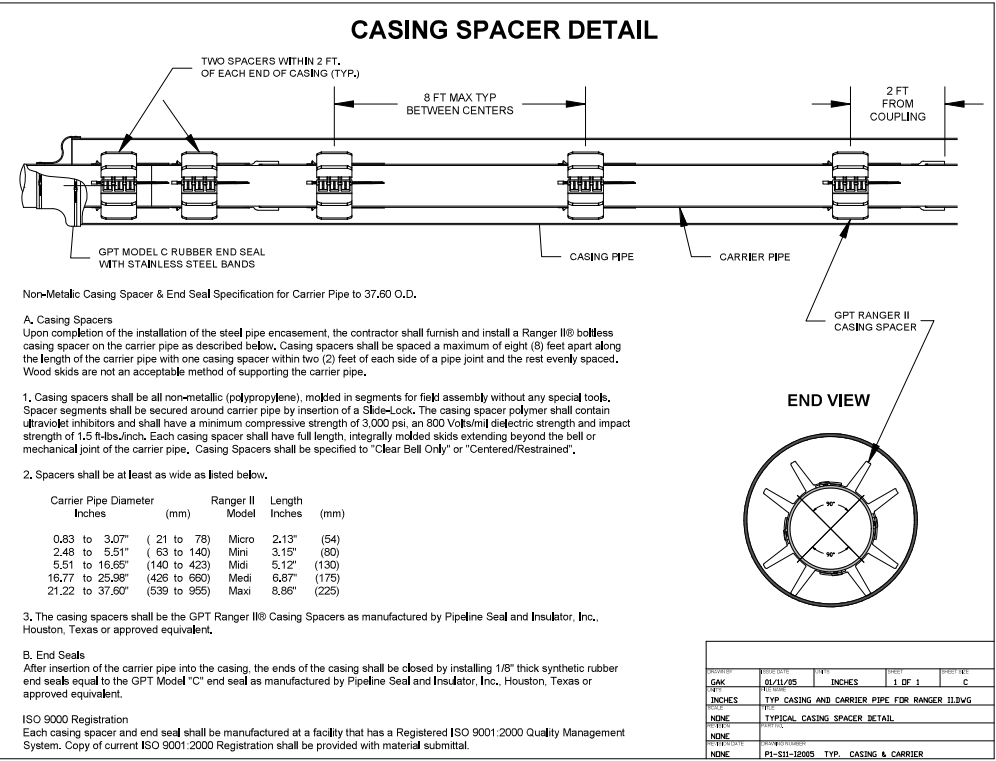
**CITY OF HOUSTON**  
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING  
WATER DISTRIBUTION MAIN  
BEDDING AND BACKFILL FOR  
OPEN CUT TRENCHES  
(NOT TO SCALE)  
APPROVED BY: [Signature]  
CITY ENGINEER  
DIRECTOR OF PUBLIC  
WORKS AND ENGINEERING  
EFF DATE: JUL-01-2010 DWG NO. 02317-04



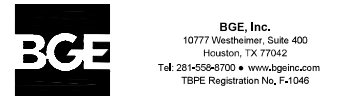
**CITY OF HOUSTON**  
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING  
BEDDING AND BACKFILL  
AUGER PIT AND AUGER HOLE  
(NOT TO SCALE)  
APPROVED BY: [Signature]  
CITY ENGINEER  
DIRECTOR OF PUBLIC  
WORKS AND ENGINEERING  
EFF DATE: JUL-01-2010 DWG NO. 02447-01



**CITY OF HOUSTON**  
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING  
VALVE BOX DETAIL  
(NOT TO SCALE)  
APPROVED BY: [Signature]  
CITY ENGINEER  
DIRECTOR OF PUBLIC  
WORKS AND ENGINEERING  
EFF DATE: JULY 01, 2010 DWG. NO. G2005-03



02/16/2023  
Brown & Goy Engineers, Inc.  
F-1046



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SH 99  
SOUTHBOUND FRONTAGE ROAD  
WESTHEIMER PKWY TO CINCO RANCH BLVD

WATER LINE DETAILS  
(SHEET 1 OF 2)

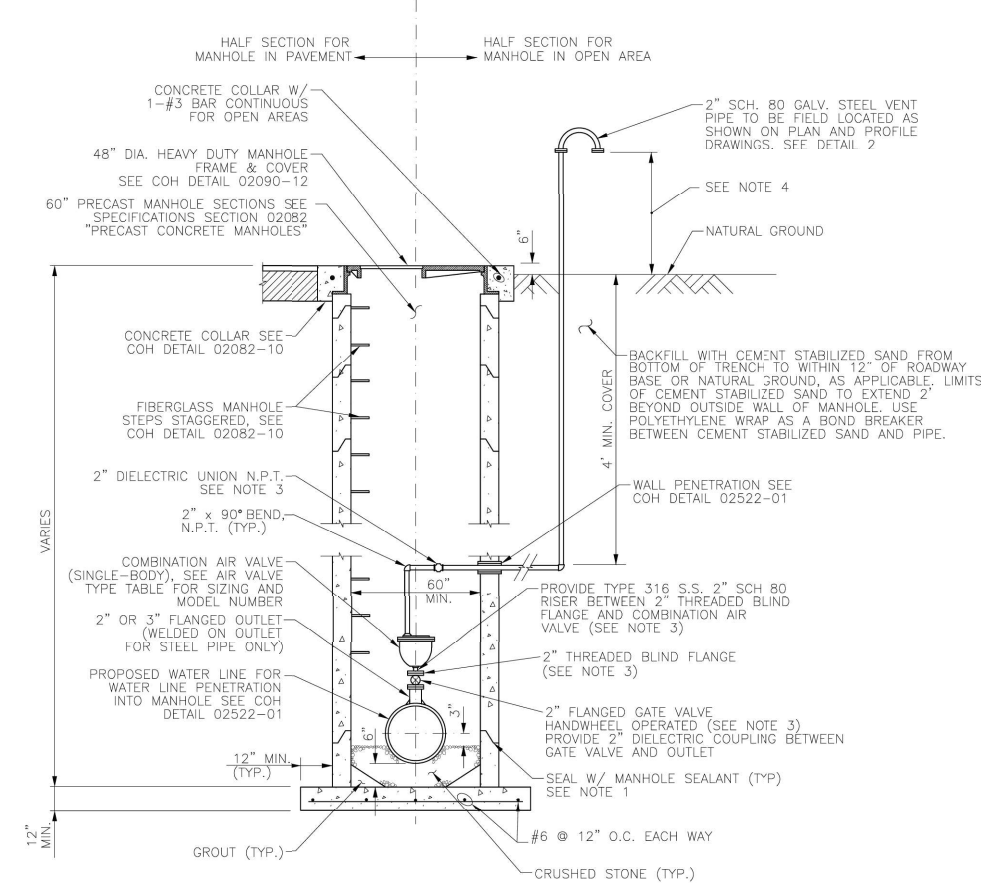
SHEET 6 OF 8

FED. RD. DIV. NO.	PROJECT NO.	HIGHWAY NO.	
6		SH 99	
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	310

BENCHMARKS: Project elevations are based on GPS-derived elevations computed using GEOID 12B from the following National Geodetic Survey (NGS) GPS-CORS reference stations: TXHE (DH3609), TXRS (DM7155), R001 (DJ8955).

TBM 13: 5/8-inch iron rod with Aluminum Cap stamped TEXAS DEPT OF TRANSPORTATION CONTROL MARK 14-13 found in the grass ±140 feet north of Westheimer Parkway, ±196 feet east of SH 99, 11 feet east of the back of curb at SH 99 entrance ramp, 90 feet northwest of an A-inlet, 42 feet northwest of a sanitary manhole, and 65 feet northwest of a pedestrian signal box.

ELEVATION 108.88 FT. NAVD88, GEOID 12B



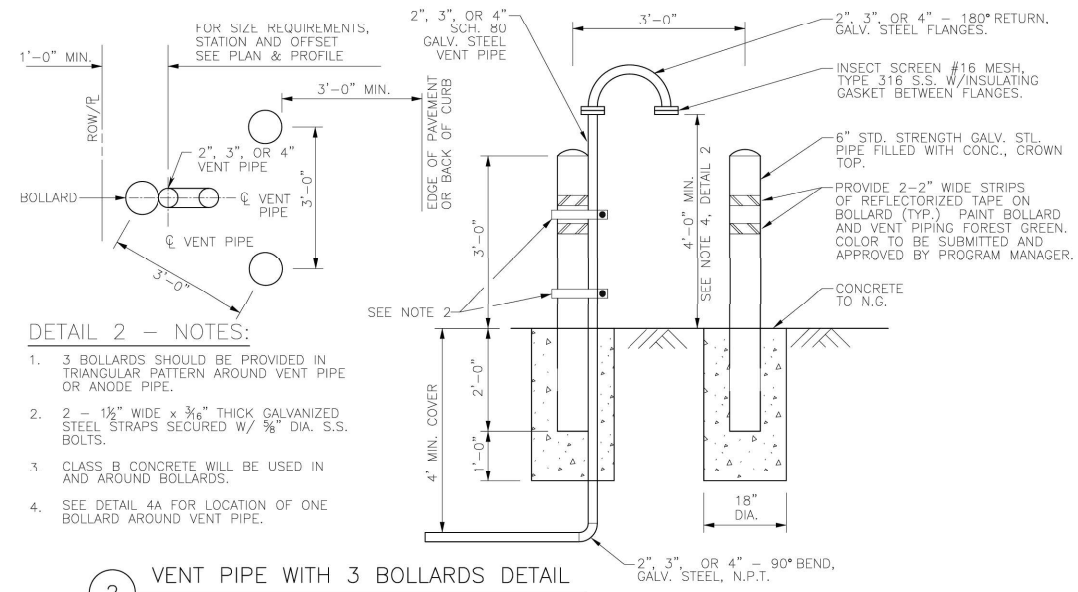
1 COMBINATION AIR VALVE ASSEMBLY IN SERVICE MANHOLE  
(FOR WATER LINES SMALLER THAN 36-INCHES DIAMETER)

		VACUUM (AI/VR)	
WATER MAIN DIAMETER	MANUFACTURER (1)	SERIES	ORIFICE SIZE
<=36"	APCO	1403	
	CLAVAL	36	
	PRATT	WCV 01	

COMBINATION AIR VALVE & TYPE TABLE  
(FOR WATER LINES SMALLER THAN 36" DIAMETER)  
(1) OR APPROVED EQUAL.

DETAIL 1 - NOTES:

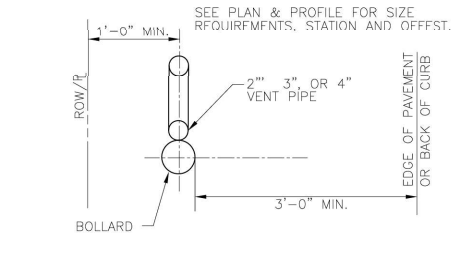
1. PROVIDE RAM-NEK OR APPROVED EQUAL BETWEEN PRECAST SEGMENTS OF THE MANHOLE.
2. FOR MANHOLES DEEPER THAN 20 FEET, SAFETY CLIMBING RAIL MUST BE PROVIDED (SAF-T-CLIMB OR APPROVED EQUAL). SEE COH DETAIL 02082-11.
3. PIPING AND APPURTENANCES OF THE SAME DIAMETER AND CONSTRUCTED OF THE SAME MATERIAL AND CLASS.
4. VERIFY THAT LOCATION OF VENT PIPE SCREEN IS 1 FOOT ABOVE 100-YEAR FLOOD PLAIN ELEVATION OR 4 FEET ABOVE NATURAL GROUND WHICHEVER IS HIGHER.
5. REFER TO PLAN AND PROFILE SHEETS FOR LOCATIONS OF AIR VALVES.
6. FOR PAVEMENT REPAIR, SEE COH DETAILS 02902-01 & 02902-02.
7. PROVIDE AN APPROVED PETROLATUM BASED TAPE ENCAPSULATING ALL BOLTS IN ACCESS MANHOLE.



DETAIL 2 - NOTES:

1. 3 BOLLARDS SHOULD BE PROVIDED IN TRIANGULAR PATTERN AROUND VENT PIPE OR ANODE PIPE.
2. 2 - 1 1/2" WIDE x 3/16" THICK GALVANIZED STEEL STRIPS SECURED W/ 3/8" DIA. S.S. BOLTS.
3. CLASS B CONCRETE WILL BE USED IN AND AROUND BOLLARDS.
4. SEE DETAIL 4A FOR LOCATION OF ONE BOLLARD AROUND VENT PIPE.

2 VENT PIPE WITH 3 BOLLARDS DETAIL



2A VENT PIPE WITH 1 BOLLARD DETAIL

CITY OF HOUSTON  
HOUSTON PUBLIC WORKS

**LDWL**  
**COMBINATION AIR VALVE ASSEMBLY**  
**IN SERVICE MANHOLE DETAILS**  
(NOT TO SCALE)

REVISED ON: \_\_\_\_\_  
REVISED BY: \_\_\_\_\_

EFF DATE: **MAR-20-2018** DWG NO: **02524-02**



02/16/2023  
Brown & Goy Engineers, Inc.  
F-1046



SH 99  
SOUTHBOUND FRONTAGE ROAD  
WESTHEIMER PKWY TO CINCO RANCH BLVD

WATER LINE DETAILS  
(SHEET 2 OF 2)

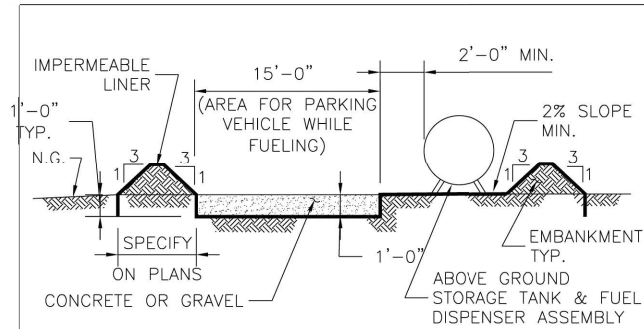
SHEET 7 OF 8

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	311

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CINCO MUNICIPAL UTILITY DISTRICT NO. 1 - SH 99 WATER LINE RELOCATION

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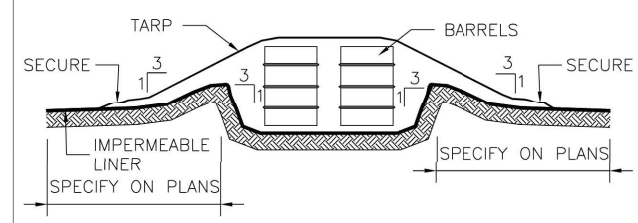


**ABOVE GROUND TEMP. VEHICLE & EQUIPMENT FUELING AREA WITH TANK**

TFA SYMBOL

**GENERAL NOTES:**

1. THE SIZE OF TANK FOUNDATION AREA DEPENDS ON THE SIZE OF ABOVE GROUND STORAGE TANK AND DISPENSER ASSEMBLY.
2. PROVIDE A MINIMUM SLOPE OF 2% TOWARD THE SUMP PIT.
3. INSTALL IMPERMEABLE LINER AS PER MANUFACTURER'S RECOMMENDATIONS.

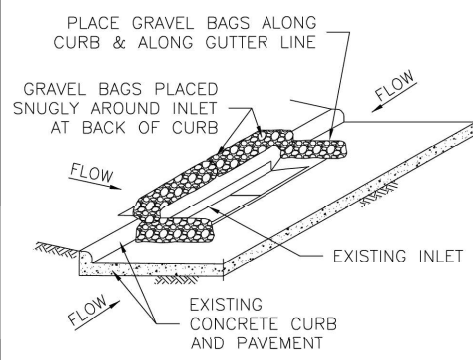


**BARREL STORAGE AREA**

BSA SYMBOL

**GENERAL NOTES:**

1. ALTERNATIVELY, STORE BARRELS IN AN ENCLOSED BUILDING OR SHED.
2. INSTALL IMPERMEABLE LINER AS PER MANUFACTURER'S RECOMMENDATIONS. 60 mil MINIMUM.
3. CONSTRUCT BERMED AREA WITH VOLUME GREATER THAN OR EQUAL TO 110% VOLUME OF BARRELS.

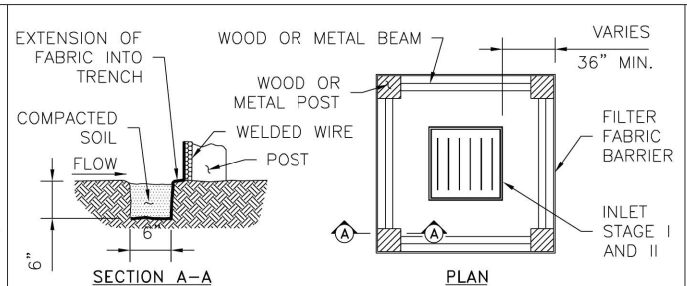


**INLET PROTECTION BARRIERS FOR STAGE II INLETS**

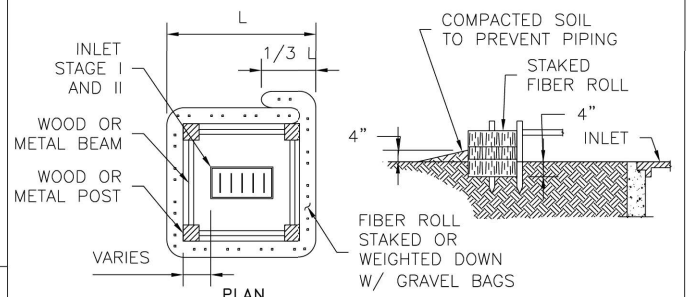
IPB-II SYMBOL

**GENERAL NOTES:**

1. REMOVE SEDIMENT DEPOSIT WHEN THE SEDIMENT HAS ACCUMULATED TO ONE-THIRD THE HEIGHT OF THE BARRIER.
2. GRAVEL BAGS SHALL NOT BLOCK THROAT OF INLET UNLESS DIRECTED BY ENGINEER.



**INLET PROTECTION BARRIER WITH REINFORCED FILTER FABRIC**



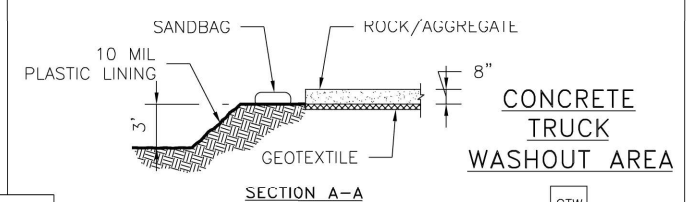
**INLET PROTECTION BARRIER WITH FILTER ROLLS**

**GENERAL NOTES:**

1. FIBER ROLLS WILL BE UTILIZED ONLY WHEN SITE CONDITIONS DO NOT PERMIT THE USE OF FILTER FABRIC BARRIER, AND AS APPROVED BY THE ENGINEER.

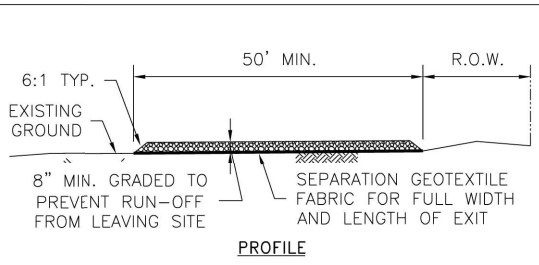
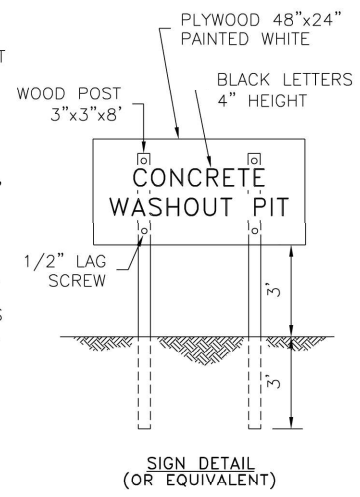
**INLET PROTECTION BARRIERS FOR STAGE I INLETS**

IPB SYMBOL



**GENERAL NOTES:**

1. POST A SIGN READING "CONCRETE WASHOUT PIT" NEXT TO THE PIT.
2. VERBALLY INSTRUCT THE CONCRETE TRUCK DRIVERS WHERE THE PIT IS AND TO WASHOUT THEIR TRUCKS IN THE PIT AND NOWHERE ELSE.
3. UPON THE CONCRETE SETTING UP (CURING, DRYING OUT), THE CONCRETE WASTE SHALL BE REMOVED FROM THE PROJECT SITE AND DISPOSED OF PROPERLY BY THE CONTRACTOR. AFTER REMOVAL OF THE CONCRETE WASTE, THE WASHOUT PIT SHALL BE FILLED WITH CLEAN FILL MATERIAL AND COMPACTED TO IN-SITU CONDITIONS, OR AS DIRECTED BY THE PROJECT SPECIFICATIONS.
4. CONCRETE WASHOUT PITS SHALL NOT BE LOCATED DIRECTLY ADJACENT TO, NOR AT ANY TIME DRAIN INTO THE STORM SEWER SYSTEM OR ANY OTHER SWALE, DITCH, OR WATERWAY.
5. CONSTRUCT ENTRY ROAD AND BOTTOM OF WASHOUT AREA TO SUPPORT EXPECTED LOADINGS FROM TRUCKS EQUIPMENT.

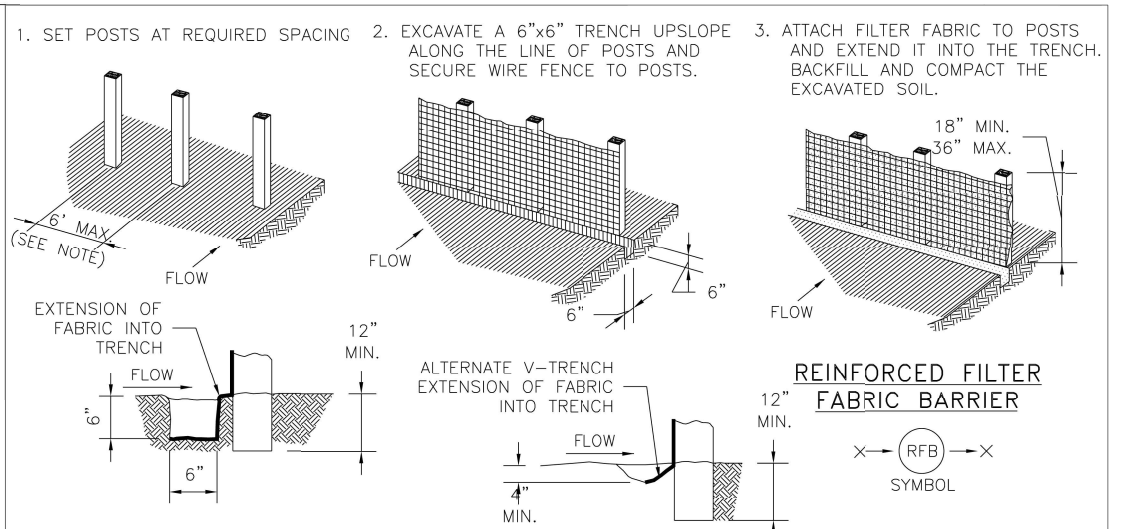


**STABILIZED CONSTRUCTION ACCESS**

SC-1 SYMBOL

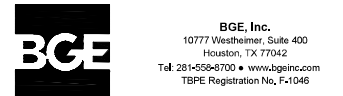
**GENERAL NOTES:**

1. MINIMUM LENGTH IS AS SHOWN ON CONSTRUCTION DRAWINGS OR 50 FEET, WHICHEVER IS MORE.
2. CONSTRUCT AND MAINTAIN CONSTRUCTION EXIT WITH CONSTANT WIDTH ACROSS ITS LENGTH, INCLUDING ALL POINTS OF INGRESS OR EGRESS.
3. UNLESS SHOWN ON THE CONSTRUCTION DRAWINGS, STABILIZATION FOR OTHER AREAS WILL HAVE THE SAME AGGREGATE THICKNESS AND WIDTH REQUIREMENTS AS THE STABILIZED CONSTRUCTION EXIT.
4. WHEN SHOWN ON THE CONSTRUCTION DRAWINGS, WIDEN OR LENGTHEN STABILIZED AREA TO ACCOMMODATE A TRUCK WASHING AREA. PROVIDE OUTLET SEDIMENT TRAP FOR THE TRUCK WASHING AREA.
5. PROVIDE PERIODIC TOP DRESSING WITH ADDITIONAL COARSE AGGREGATE TO MAINTAIN THE REQUIRED DEPTH OR WHEN SURFACE BECOMES PACKED WITH MUD.
6. PERIODICALLY TURN AGGREGATE TO EXPOSE A CLEAN DRIVING SURFACE.
7. MINIMUM 14' WIDTH FOR ONE WAY TRAFFIC AND 20' WIDTH FOR TWO WAY TRAFFIC.



**GENERAL NOTES:**

1. SECURELY FASTEN MESH FENCING TO POSTS WITH STAPLES OR TIE WIRES.
2. SECURELY FASTEN FILTER FABRIC TO MESH FENCING.
3. WHEN TWO SECTIONS OF FILTER FABRIC ADJOIN EACH OTHER, OVERLAP 6 INCHES AT A POST, FOLD TOGETHER, AND ATTACH TO A POST.
4. REMOVE SEDIMENT DEPOSITS WHEN SILT REACHES ONE-THIRD OF THE HEIGHT OF THE FENCE IN DEPTH.
5. SILT FENCE MINIMUM 2' BEHIND CURB.



SH 99  
SOUTHBOUND FRONTAGE ROAD  
WESTHEIMER PKWY TO CINCO RANCH BLVD

**STORM WATER POLLUTION PREVENTION PLAN DETAILS**

SHEET 8 OF 8

FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
6			SH 99
STATE	DIST.	COUNTY	
TEXAS	HOU	FORT BEND	
CONT.	SECT.	JOB	SHEET NO.
3510	04	055	312

CINCO MUNICIPAL UTILITY DISTRICT NO. 1 - SH 99 WATER LINE RELOCATION