CONT	SECT	JOB	HIGHWAY
0914	33	068,ETC	RSLE
DIST	COUNTY		SHEET NO.
AUS	HAYS		1

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

STATE PROJECT NUMBER
C 914-33-68, ETC.

CSJ: 0914-33-068, ETC.

NET LENGTH OF PROJECT = 10,111.92 FEET = 1.915 MILES
- ROADWAY = 7,326.92 FEET = 1.388 MILES
- BRIDGE = 2,785.00 FEET = 0.527 MILES

	ROADWAY LENGTH		BRIDGE LENGTH		TOTAL LENGTH	
CSJ	(FT)	(MI)	(FT)	(MI)	(FT)	(MI)
0914-33-068	7,326.92	1.388	2,785.00	0.527	10,111.92	1.915
3210-01-014	2,536.00	0.480	0.00	0.00	2,536.00	0.480
0016-16-029	1,590.00	0.301	0.00	0.00	1,590.00	0.301
TOTAL	11,452.92	2.169	2,785.00	0.527	14,237.92	2.696

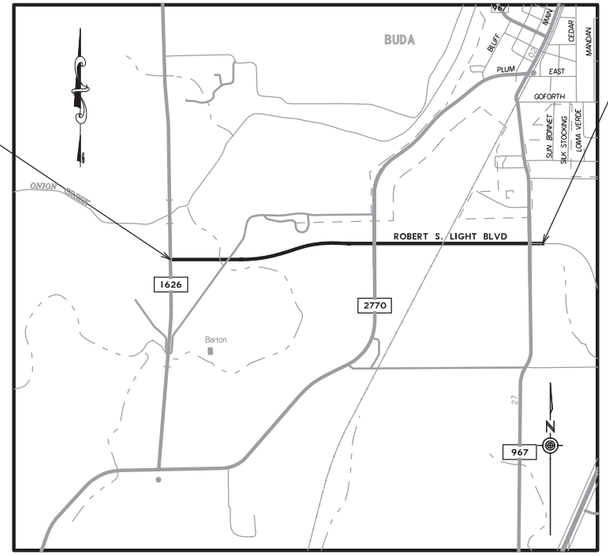
HAYS COUNTY
ROBERT S. LIGHT BLVD.

FROM: RM 967 AT ROBERT S. LIGHT BLVD.
TO: FM 1626

FOR THE CONSTRUCTION OF NEW LOCATION NON-FREEWAY

CONSTRUCT NEW 2-LANE ROADWAY WITH A GRADE SEPARATION AT THE UNION PACIFIC RAILROAD CONSISTING OF GRADING, BASE, ASPHALT PAVEMENT, BRIDGES, CULVERTS, STRUCTURES, ILLUMINATION, SIGNING, PAVEMENT MARKINGS AND EROSION CONTROL.

BEGIN PROJECT
CSJ: 0914-33-068
STA 1000+44.00 RSLE WB =
STA 100+44.00 RSLE
REF MRKR: NORTH OF 532+0.830
DFO: 10.861



END PROJECT
CSJ: 0914-33-068
STA 201+55.00 RSLE
REF MRKR: NORTHEAST OF 532+0.900
DFO: 14.910

LOCATION MAP NOT TO SCALE

EXCEPTIONS: NONE
EQUATIONS: RSLE WB STA 1086+50.92 (BK) = ℄ RSLE STA 186+50.00 (AH)
RAILROAD CROSSINGS: ℄ UPRR EXISTING TRACK 1 UPRR MP # 195.30 = RSLE WB STA 1072+09.79
℄ UPRR EXISTING TRACK 122 UPRR MP # 195.30 = RSLE WB STA 1072+28.04

Texas Department of Transportation

TDLR INSPECTION IS NOT REQUIRED

SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION ON NOVEMBER 1, 2014 AND SPECIFICATION ITEMS LISTED AND DATED AS FOLLOWS, SHALL GOVERN ON THIS PROJECT: SPECIAL LABOR PROVISIONS FOR STATE PROJECTS (000---008).

FILE: c:\pwworking\dal\d0446478\RSLE-TTLSHT*2020.dgn
DATE: 11/13/2020 11:32:09 AM

DESIGN SPEED

ROBERT S. LIGHT BLVD.
FUNCTIONAL CLASS:
RURAL MAJOR COLLECTOR
DESIGN SPEED: 60 MPH

FM 2770
FUNCTIONAL CLASS:
RURAL MAJOR COLLECTOR
DESIGN SPEED: 55 MPH

RM 967
FUNCTIONAL CLASS:
RURAL MAJOR COLLECTOR
DESIGN SPEED: 55 MPH

A.D.T.

AVERAGE DAILY TRAFFIC (ADT):
ROBERT S. LIGHT BLVD.: 1,500 (2015)
FM 2770: 5,300 (2015)
RM 967: 4,800 (2015)

ROBERT S. LIGHT BLVD.: 3,800 (2035)
FM 2770: 12,000 (2035)
RM 967: 12,300 (2035)

AREA ENGINEER SEAL

FINAL PLANS

DATE OF LETTING: _____

DATE WORK BEGAN: _____

DATE WORK COMPLETED AND ACCEPTED: _____

FINAL CONTRACT COST: $_____

CONTRACTOR: _____

LIST OF APPROVED CHANGE ORDERS:

I CERTIFY THAT THIS PROJECT WAS CONSTRUCTED IN SUBSTANTIAL COMPLIANCE WITH THE FINAL AS-BUILT PLANS AND SPECIFICATIONS.

_____ P.E. _____
AREA ENGINEER DATE

STATE OF TEXAS
ALLEN R. CROZIER
81450
LICENSED
PROFESSIONAL ENGINEER

01/06/2021

HDR Engineering, Inc.
1290 Wonder World Drive
Building #1, STE 1230
San Marcos, TX 78666-7969
(Firm No. F-754)

01/06/2021

HDR ENGINEERING, INC. (TBPE FIRM REG. F-754)

SUBMITTED FOR LETTING: 11/13/2020
LOCAL PUBLIC AGENCY

RECOMMENDED FOR LETTING: 4/1/2021
DocuSigned by: Dwayne M. Hellmann, P.E.
198012497A804A0...
DISTRICT DESIGN ENGINEER

SUBMITTED FOR LETTING: 3/31/2021
DocuSigned by: Eric Hagood, P.E.
A5A9883ECD1E4F7...
AREA ENGINEER

APPROVED FOR LETTING: 4/2/2021
DocuSigned by: Heather Ashley-Nguyen
8912AF18F45A416...
DIRECTOR OF TRANSPORTATION PLANNING & DEVELOPMENT

GENERAL

TRAFFIC CONTROL PLAN

ROADWAY PLANS

RETAINING WALLS

DRAINAGE PLANS

STATE OF TEXAS
RICARDO E. DE LA PARRA
94043
LICENSED PROFESSIONAL ENGINEER

Lockwood, Andrews & Newman, Inc., F-2615

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

P.E. , P.E. 11/18/2020
DESIGN ENGINEER DATE

STATE OF TEXAS
JACOB E. WALKER
122057
LICENSED PROFESSIONAL ENGINEER

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

Jacob E Walker, PE , P.E. 11/20/2020
DESIGN ENGINEER DATE

STATE OF TEXAS
ASHLEY S. HANSON
107373
LICENSED PROFESSIONAL ENGINEER

Lockwood, Andrews & Newman, Inc., F-2615

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

Ashley Hanson Digitally signed by Ashley Hanson DN: C=US, E=ashanson@lan-inc.com, CN=Ashley Hanson Date: 2020.11.20 09:09:16-06'00' , P.E. 11/20/2020
DESIGN ENGINEER DATE

STATE OF TEXAS
ALLEN R. CROZIER
81450
LICENSED PROFESSIONAL ENGINEER

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

, P.E. 11/20/2020
DESIGN ENGINEER DATE

HAYS COUNTY TEXAS

HDR Engineering, Inc.
1290 Wonder World Drive
Building #1, Suite 1230
San Marcos, TX 78666-7969
Texas Registered Engineering Firm F-754

Texas Department of Transportation

ROBERT S. LIGHT EXTENSION

SUPPLEMENTAL INDEX OF SHEETS

SHEET 1 OF 2

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JW	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
BD	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	2
DR	0914	33	068,ETC	
CHECK				
GV				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
USER: KBERGER
FILE: RSLE-INDEX01.dgn
PENTABLE: 000000000214615.tbl
DATE: 11/18/2020
TIME: 4:20:11 PM
SCALE: 1:1

SHEET NO.	BRIDGE PLANS
216 - 219	MUSTANG BRANCH BRIDGE - BRIDGE LAYOUT
220	MUSTANG BRANCH BRIDGE - GRADING PLAN
221	MUSTANG BRANCH BRIDGE - ESTIMATED QUANTITIES
222	MUSTANG BRANCH BRIDGE - ABUTMENT 1
223	MUSTANG BRANCH BRIDGE - ABUTMENT 14
224	MUSTANG BRANCH BRIDGE - ABUTMENT DETAILS
225	MUSTANG BRANCH BRIDGE - INTERIOR BENTS 2 THROUGH 4
226	MUSTANG BRANCH BRIDGE - INTERIOR BENTS 5 THROUGH 13
227 - 231	MUSTANG BRANCH BRIDGE - FRAMING PLAN
232	MUSTANG BRANCH BRIDGE - 240.000' PRESTR CONC GIRDER UNIT 1
233	MUSTANG BRANCH BRIDGE - 240.000' PRESTR CONC GIRDER UNIT 2
234	MUSTANG BRANCH BRIDGE - 360.000' PRESTR CONC GIRDER UNIT 3
235	MUSTANG BRANCH BRIDGE - 360.000' PRESTR CONC GIRDER UNIT 4
236	MUSTANG BRANCH BRIDGE - 375.000' PRESTR CONC GIRDER UNIT 5
237	MUSTANG BRANCH BRIDGE - PIPE HANGER DETAILS
238 - 241	RSLE OVERPASS AT UPRR - BRIDGE LAYOUT
242	RSLE OVERPASS AT UPRR - ESTIMATED QUANTITIES AND BEARING SEAT ELEVATIONS
243	RSLE OVERPASS AT UPRR - ABUTMENT 1
244	RSLE OVERPASS AT UPRR - ABUTMENT 1 DETAILS
245	RSLE OVERPASS AT UPRR - ABUTMENT 11
246	RSLE OVERPASS AT UPRR - ABUTMENT 11 DETAILS
247	RSLE OVERPASS AT UPRR - INTERIOR BENT 2 - 6 & 10 DETAILS
248 - 249	RSLE OVERPASS AT UPRR - INTERIOR BENT 7 & 9 DETAILS
250	RSLE OVERPASS AT UPRR - INTERIOR BENT 8 DETAILS
251 - 254	RSLE OVERPASS AT UPRR - FRAMING PLAN
255	RSLE OVERPASS AT UPRR - 345.000' PRESTR CONC GIRDER UNIT 1
256	RSLE OVERPASS AT UPRR - 345.000' PRESTR CONC GIRDER UNIT 2
257	RSLE OVERPASS AT UPRR - 270.000' PRESTR CONC GIRDER UNIT 3
258	RSLE OVERPASS AT UPRR - 250.000' PRESTR CONC GIRDER UNIT 4
259	IGND
260 - 261	BD-3(MOD)
#262 - 263	IGD
#264 - 266	IGEB
#267	IGCS
#268 - 269	IGMS
#270	IGSK
#271	IGTS
#272 - 273	MEBR(C)
#274	BAS-A
#275	CRR
#276 - 277	SRR
#278 - 279	CSAB
#280 - 281	FD
#282 - 285	PCP
#286	PCP-FAB
#287 - 288	PCP(O)
#289 - 290	PCP(O)-FAB
#291 - 292	PPBC-RC
#293 - 294	PBC-RC
#295 - 296	PMDF
#297 - 298	SSTR
#299 - 300	BL
#301 - 303	BMCS
#304	SEJ-M
#305 - 306	CLF-RO

SHEET NO.	ILLUMINATION
307	ROBERT S LIGHT BLVD ROADWAY ILLUMINATION GENERAL NOTES
308 - 311	ROBERT S LIGHT BLVD ROADWAY ILLUMINATION LAYOUT
##312 - 318	ED(1)-14 THROUGH ED(7)-14
##319	RID(1)-20
##320	RID(2)-20
##321 - 324	RIP(1)-19 THROUGH RIP(4)-19

SHEET NO.	SIGNING & STRIPING
325 - 335	ROBERT S. LIGHT BLVD SIGNING AND STRIPING LAYOUT
336 - 338	FM 2770 SIGNING AND STRIPING LAYOUT
339 - 340	RM 967 SIGNING AND STRIPING LAYOUT
341 - 342	SIGN DETAILS
###343	D & OM(1)-20
###344	D & OM(2)-20
###345	D & OM(3)-20
###346	D&OM(4)-20
###347	D&OM(5)-20
###348	D&OM(VIA)-20
###349	PM(1)-20
###350	PM(2)-20
###351	PM(3)-20
###352	CPM(1)-14
###353	SMD(2-1)-08
###354	SMD(BR-1)-14
###355	SMD(BR-2)-14
###356	SMD(BR-3)-14
###357	SMD(GEN)-08
###358	SMD(SLIP-1)-08
###359	SMD(SLIP-2)-08
###360	SMD(SLIP-3)-08
###361	TSR(3)-13
###362	TSR(4)-13
###363	TSR(5)-13
###364	RS(3)-13
###365	RS(4)-13

SHEET NO.	ENVIRONMENTAL ITEMS
366	EPIC
367	STORMWATER POLLUTION PREVENTION PLAN (SW3P)
368	TCEQ-RZ-19 (AUS)
369	VOID MITIGATION NOTES
370 - 375	VOID MITIGATION DETAILS
376 - 386	ROBERT S LIGHT SW3P
387 - 389	FM 2770 SW3P
390 - 391	RM 967 SW3P
***392	EC(1)-16
***393	EC(2)-16
***394	EC(3)-16

SHEET NO.	UPRR RAILROAD EXHIBIT "A"
395 - 397	RAILROAD REQUIREMENTS FOR BRIDGE CONSTRUCTION
398	RAILROAD SCOPE OF WORK PROJECT SPECIFIC DETAILS
399 - 401	EXHIBIT "A" UPRR MP 195.30 AUSTIN SUBDIVISION DOT #414987E EXISTING TRACK PROFILE

STATE OF TEXAS
ALLEN R. CROZIER
81450
LICENSED PROFESSIONAL ENGINEER

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

DESIGN ENGINEER, P.E. 11/20/2020 DATE

STATE OF TEXAS
KARAN KHOSLA
101134
LICENSED PROFESSIONAL ENGINEER

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

DESIGN ENGINEER, P.E. 11/20/2020 DATE

STATE OF TEXAS
TIMOTHY GRIMES
100107
LICENSED PROFESSIONAL ENGINEER

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

DESIGN ENGINEER, P.E. 11/20/2020 DATE

STATE OF TEXAS
ASHLEY S. HANSON
107373
LICENSED PROFESSIONAL ENGINEER

Lockwood, Andrews & Newman, Inc., F-2615

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Ashley Hanson Digitally signed by Ashley Hanson DN: C=US, E=ashanson@lan-inc.com, CN=Ashley Hanson Date: 2020.11.20 09:08:22-06'00'

DESIGN ENGINEER, P.E. 11/20/2020 DATE

HDR Engineering, Inc.
1290 Wonder World Drive
Building #1, Suite 1230
San Marcos, TX 78666-7969
Texas Registered Engineering Firm F-754

Texas Department of Transportation ® 2020

ROBERT S. LIGHT EXTENSION

SUPPLEMENTAL INDEX OF SHEETS

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JW	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
BD	TEXAS	AUS	HAYS	3
CHECK	CONTROL	SECTION	JOB	
DR	0914	33	068,ETC	
CHECK				
GV				

QUANTITY SHEET

CONTROLLING PROJECT ID 0914-33-068 **DISTRICT** Austin **COUNTY** Hays
HIGHWAY CR, FM 2770, RM 967

			CONTROL SECTION JOB	**0016-16-029**		**0914-33-068**		**3210-01-014**		TOTAL EST.	TOTAL FINAL
			PROJECT ID	**A00060665**		**A00039918**		**A00060664**			
			COUNTY	**Hays**		**Hays**		**Hays**			
			HIGHWAY	**RM 967**		**CR**		**FM 2770**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL	EST.	FINAL	EST.	FINAL		
	100-6002	PREPARING ROW	STA	13.000		101.000		23.000		137.000	
	104-6017	REMOVING CONC (DRIVEWAYS)	SY	660.000		238.000				898.000	
	105-6039	REMOVE STAB BASE AND ASPH PAV (6"-20")	SY	2,927.000		2,374.000		4,954.000		10,255.000	
	105-6074	REMOVING STAB BASE AND ASPH PAV (4")	SY			38.000				38.000	
	110-6001	EXCAVATION (ROADWAY)	CY	2,263.000		50,044.000		4,257.000		56,564.000	
	132-6047	EMBANKMENT (FINAL)(ORD COMP)(TY C1)	CY	320.000		86,979.000		941.000		88,240.000	
	134-6001	BACKFILL (TY A)	STA			3.000				3.000	
	160-6003	FURNISHING AND PLACING TOPSOIL (4")	SY	7,834.000		99,718.000		12,056.000		119,608.000	
	164-6009	BROADCAST SEED (TEMP) (WARM)	SY	3,917.000		49,860.000		6,028.000		59,805.000	
	164-6011	BROADCAST SEED (TEMP) (COOL)	SY	3,917.000		49,860.000		6,028.000		59,805.000	
	164-6035	DRILL SEEDING (PERM) (RURAL) (CLAY)	SY	7,834.000		99,718.000		12,056.000		119,608.000	
	168-6001	VEGETATIVE WATERING	MG	21.300		270.400		32.800		324.500	
	169-6005	SOIL RETENTION BLANKETS (CL 2) (TY E)	SY	7,834.000		99,718.000		12,056.000		119,608.000	
	180-6001	WILDFLOWER SEEDING	AC	1.600		20.700		2.500		24.800	
	247-6366	FL BS (CMP IN PLC)(TY A GR 5)(FNAL POS)	CY	2,320.000		15,617.000		5,141.000		23,078.000	
	260-6027	LIME TRT (EXST MATL)(8")	SY	651.000		4,358.000		1,420.000		6,429.000	
	260-6043	LIME (HYD, COM OR QK)(SLURRY)	TON	14.000		95.000		31.000		140.000	
	310-6001	PRIME COAT (MULTI OPTION)	GAL	1,085.000		7,920.000		2,439.000		11,444.000	
	310-6013	PRIME COAT (SS-1)	GAL			19.000				19.000	
	351-6004	FLEXIBLE PAVEMENT STRUCTURE REPAIR(8")	SY	262.000				492.000		754.000	
	354-6051	PLANE ASPH CONC PAV (0" TO 1 1/2")	SY	2,618.000		1,439.000		4,914.000		8,971.000	
	401-6001	FLOWABLE BACKFILL	CY			457.100				457.100	
	402-6001	TRENCH EXCAVATION PROTECTION	LF			535.000				535.000	
	416-6001	DRILL SHAFT (18 IN)	LF			333.000				333.000	
	416-6004	DRILL SHAFT (36 IN)	LF			1,930.000				1,930.000	
	416-6005	DRILL SHAFT (42 IN)	LF			260.000				260.000	
	416-6006	DRILL SHAFT (48 IN)	LF			956.000				956.000	
	416-6029	DRILL SHAFT (RDWY ILL POLE) (30 IN)	LF			72.000				72.000	
	420-6002	CL A CONC (MISC)	CY			1.000				1.000	
	420-6013	CL C CONC (ABUT)	CY			136.100				136.100	
	420-6025	CL C CONC (BENT)	CY			1,273.500				1,273.500	
	420-6062	CL C CONC (RETAINING WALL)	CY			21.000				21.000	
	422-6001	REINF CONC SLAB	SF			127,970.000				127,970.000	
	422-6015	APPROACH SLAB	CY			184.000				184.000	
	423-6002	RETAINING WALL (MSE) (ASHLAR STONE FIN)	SF			22,544.000				22,544.000	
	423-6005	RETAINING WALL (SPREAD FOOTING)	SF			2,500.000				2,500.000	
	425-6039	PRESTR CONC GIRDER (TX54)	LF			15,008.550				15,008.550	

QUANTITY SHEET

CONTROLLING PROJECT ID 0914-33-068 **DISTRICT** Austin **COUNTY** Hays
HIGHWAY CR, FM 2770, RM 967

			CONTROL SECTION JOB	**0016-16-029**		**0914-33-068**		**3210-01-014**		TOTAL EST.	TOTAL FINAL
			PROJECT ID	**A00060665**		**A00039918**		**A00060664**			
			COUNTY	**Hays**		**Hays**		**Hays**			
			HIGHWAY	**RM 967**		**CR**		**FM 2770**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL	EST.	FINAL	EST.	FINAL		
	425-6040	PRESTR CONC GIRDER (TX62)	LF			1,614.000				1,614.000	
	432-6001	RIPRAP (CONC)(4 IN)	CY			448.300				448.300	
	432-6010	RIPRAP (CONC)(CL B)(5 IN)	CY			149.000		42.000		191.000	
	432-6023	RIPRAP (STONE COMMON)(DRY)(8 IN)	CY			243.000				243.000	
	432-6024	RIPRAP (STONE COMMON)(DRY)(12 IN)	CY			1,751.600				1,751.600	
	432-6045	RIPRAP (MOW STRIP)(4 IN)	CY			129.000				129.000	
	442-6008	STR STEEL (MISCELLANEOUS BRIDGE)	LB			466.000				466.000	
	450-6023	RAIL (TY SSTR)	LF			6,826.860				6,826.860	
	454-6018	SEALED EXPANSION JOINT (4 IN) (SEJ - M)	LF			525.500				525.500	
	459-6009	GABIONS (3' X 3')(GALV)	CY			12.000				12.000	
	462-6001	CONC BOX CULV (3 FT X 2 FT)	LF			255.000				255.000	
	464-6003	RC PIPE (CL III)(18 IN)	LF			155.000		20.000		175.000	
	464-6005	RC PIPE (CL III)(24 IN)	LF	220.000		311.000		294.000		825.000	
	464-6007	RC PIPE (CL III)(30 IN)	LF	207.000		192.000		167.000		566.000	
	464-6031	RC PIPE (ARCH)(CL III)(DES 2)	LF	170.000						170.000	
	465-6002	MANH (COMPL)(PRM)(48IN)	EA			3.000				3.000	
	465-6006	JCTBOX(COMPL)(PJB)(4FTX4FT)	EA			2.000		1.000		3.000	
	465-6128	INLET (COMPL)(PSL)(FG)(4FTX4FT-4FTX4FT)	EA	2.000		1.000		1.000		4.000	
	466-6164	WINGWALL (FW - S) (HW=3 FT)	EA			2.000				2.000	
	467-6362	SET (TY II) (18 IN) (RCP) (6: 1) (C)	EA			2.000				2.000	
	467-6363	SET (TY II) (18 IN) (RCP) (6: 1) (P)	EA			2.000		2.000		4.000	
	467-6389	SET (TY II) (24 IN) (RCP) (3: 1) (P)	EA			2.000				2.000	
	467-6395	SET (TY II) (24 IN) (RCP) (6: 1) (P)	EA					2.000		2.000	
	467-6418	SET (TY II) (30 IN) (RCP) (3: 1) (P)	EA			1.000				1.000	
	467-6423	SET (TY II) (30 IN) (RCP) (6: 1) (P)	EA	1.000				2.000		3.000	
	467-6531	SET (TY II) (DES 2) (RCP) (6: 1) (P)	EA	2.000						2.000	
	471-6007	GRATE AND FRAME (BRIDGE DRAIN)	EA			16.000				16.000	
	481-6016	PIPE (PVC) (SCH 40) (12 IN)	LF			490.000				490.000	
	481-6017	PIPE (PVC) (SCH 40) (14 IN)	LF			751.000				751.000	
	481-6018	PIPE (PVC) (SCH 40) (16 IN)	LF			872.000				872.000	
	481-6023	PIPE (PVC) (SCH 80) (6 IN)	LF			1.000				1.000	
	496-6004	REMOV STR (SET)	EA	8.000		2.000		6.000		16.000	
	496-6007	REMOV STR (PIPE)	LF	321.000		59.000		207.000		587.000	
	496-6039	REMOV STR (BUILDING)	EA			1.000				1.000	
	496-6043	REMOV STR (SMALL FENCE)	LF	339.000		1,242.000		611.000		2,192.000	
	500-6001	MOBILIZATION	LS			100.00%				100.00%	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO			22.000				22.000	

QUANTITY SHEET

CONTROLLING PROJECT ID 0914-33-068 **DISTRICT** Austin **COUNTY** Hays
HIGHWAY CR, FM 2770, RM 967

			CONTROL SECTION JOB	**0016-16-029**		**0914-33-068**		**3210-01-014**		TOTAL EST.	TOTAL FINAL
			PROJECT ID	**A00060665**		**A00039918**		**A00060664**			
			COUNTY	**Hays**		**Hays**		**Hays**			
			HIGHWAY	**RM 967**		**CR**		**FM 2770**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL	EST.	FINAL	EST.	FINAL		
	506-6002	ROCK FILTER DAMS (INSTALL) (TY 2)	LF	110.000		1,253.000		282.000		1,645.000	
	506-6011	ROCK FILTER DAMS (REMOVE)	LF	110.000		1,253.000		282.000		1,645.000	
	506-6020	CONSTRUCTION EXITS (INSTALL) (TY 1)	SY	230.000		4,106.000		230.000		4,566.000	
	506-6024	CONSTRUCTION EXITS (REMOVE)	SY	230.000		230.000		230.000		690.000	
	506-6035	SANDBAGS FOR EROSION CONTROL	EA			1.000				1.000	
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	639.000		6,718.000		985.000		8,342.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	639.000		6,718.000		985.000		8,342.000	
	506-6040	BIODEG EROSN CONT LOGS (INSTL) (8")	LF			1.000				1.000	
	506-6043	BIODEG EROSN CONT LOGS (REMOVE)	LF			1.000				1.000	
	508-6001	CONSTRUCTING DETOURS	SY			10,125.000				10,125.000	
	512-6009	PORT CTB (FUR & INST)(LOW PROF)(TY 1)	LF			2,680.000				2,680.000	
	512-6010	PORT CTB (FUR & INST)(LOW PROF)(TY 2)	LF			200.000				200.000	
	512-6033	PORT CTB (MOVE)(LOW PROF)(TY 1)	LF			7,040.000				7,040.000	
	512-6034	PORT CTB (MOVE)(LOW PROF)(TY 2)	LF			300.000				300.000	
	512-6057	PORT CTB (REMOVE)(LOW PROF)(TY 1)	LF			2,680.000				2,680.000	
	512-6058	PORT CTB (REMOVE)(LOW PROF)(TY 2)	LF			200.000				200.000	
	530-6004	DRIVEWAYS (CONC)	SY	543.000		524.000		97.000		1,164.000	
	533-6003	RUMBLE STRIPS (SHOULDER) ASPHALT	LF			9,554.000				9,554.000	
	533-6004	RUMBLE STRIPS (CENTERLINE) ASPHALT	LF			3,106.000				3,106.000	
	540-6001	MTL W-BEAM GD FEN (TIM POST)	LF			900.000				900.000	
	540-6006	MTL BEAM GD FEN TRANS (THRIE-BEAM)	EA			8.000				8.000	
	544-6001	GUARDRAIL END TREATMENT (INSTALL)	EA			10.000				10.000	
	550-6001	CHAIN LINK FENCE (INSTALL) (6')	LF			401.000				401.000	
	550-6006	GATE (REMOVE)	EA			3.000				3.000	
	556-6006	PIPE UNDERDRAINS (TY 6) (6")	LF			1,160.000				1,160.000	
	560-6001	MAILBOX INSTALL-S (TWG-POST) TY 1	EA	1.000				1.000		2.000	
	610-6214	IN RD IL (TY SA) 40T-8 (250W EQ) LED	EA			9.000				9.000	
	618-6023	CONDT (PVC) (SCH 40) (2")	LF			1,825.000				1,825.000	
	618-6024	CONDT (PVC) (SCH 40) (2") (BORE)	LF			600.000				600.000	
	620-6007	ELEC CONDR (NO.8) BARE	LF			2,875.000				2,875.000	
	620-6008	ELEC CONDR (NO.8) INSULATED	LF			5,750.000				5,750.000	
	624-6010	GROUND BOX TY D (162922)W/APRON	EA			12.000				12.000	
	628-6045	ELC SRV TY A 240/480 060(NS)SS(E)SP(O)	EA			3.000				3.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	2.000		10.000		2.000		14.000	
	644-6002	IN SM RD SN SUP&AM TY10BWG(1)SA(P-BM)	EA			5.000		1.000		6.000	
	644-6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	EA	6.000		12.000		10.000		28.000	
	644-6005	IN SM RD SN SUP&AM TY10BWG(1)SA(T-2EXT)	EA	2.000		2.000		2.000		6.000	

QUANTITY SHEET

CONTROLLING PROJECT ID 0914-33-068 **DISTRICT** Austin **COUNTY** Hays
HIGHWAY CR, FM 2770, RM 967

			CONTROL SECTION JOB	**0016-16-029**		**0914-33-068**		**3210-01-014**		TOTAL EST.	TOTAL FINAL
			PROJECT ID	**A00060665**		**A00039918**		**A00060664**			
			COUNTY	**Hays**		**Hays**		**Hays**			
			HIGHWAY	**RM 967**		**CR**		**FM 2770**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL	EST.	FINAL	EST.	FINAL		
	644-6007	IN SM RD SN SUP&AM TY10BWG(1)SA(U)	EA			5.000				5.000	
	644-6008	IN SM RD SN SUP&AM TY10BWG(1)SA(U-EXAL)	EA			4.000				4.000	
	644-6033	IN SM RD SN SUP&AM TYS80(1)SA(U)	EA			3.000				3.000	
	644-6037	IN SM RD SN SUP&AM TYS80(1)SA(U-WC)	EA			1.000				1.000	
	644-6066	IN SM RD SN SUP&AM (RAIL MOUNT)	EA			7.000				7.000	
	644-6067	IN SM RD SN SUP&AM (INST SIGN ONLY)	EA			2.000				2.000	
	644-6068	RELOCATE SM RD SN SUP&AM TY 10BWG	EA			1.000				1.000	
	644-6076	REMOVE SM RD SN SUP&AM	EA	1.000		6.000		5.000		12.000	
	658-6011	INSTL DEL ASSM (D-SW)SZ 2(WC)GND(BI)	EA					14.000		14.000	
	658-6014	INSTL DEL ASSM (D-SW)SZ (BRF)CTB (BI)	EA			68.000				68.000	
	658-6062	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	EA			30.000				30.000	
	658-6073	INSTL OM ASSM (OM-2Y)(WC)GND(BI)	EA	8.000		4.000		10.000		22.000	
	662-6001	WK ZN PAV MRK NON-REMOV (W)4"(BRK)	LF			210.000				210.000	
	662-6004	WK ZN PAV MRK NON-REMOV (W)4"(SLD)	LF			1,720.000				1,720.000	
	662-6017	WK ZN PAV MRK NON-REMOV (W)(ARROW)	EA			4.000				4.000	
	662-6029	WK ZN PAV MRK NON-REMOV(W)(WORD)	EA			2.000				2.000	
	662-6034	WK ZN PAV MRK NON-REMOV (Y)4"(SLD)	LF			1,126.000				1,126.000	
	662-6063	WK ZN PAV MRK REMOV (W)4"(SLD)	LF			29,890.000				29,890.000	
	662-6075	WK ZN PAV MRK REMOV (W)24"(SLD)	LF			24.000				24.000	
	662-6095	WK ZN PAV MRK REMOV (Y)4"(SLD)	LF			29,430.000				29,430.000	
	666-6033	REFL PAV MRK TY I (W)8"(LNDP)(100MIL)	LF			63.000				63.000	
	666-6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF	880.000		2,007.000		915.000		3,802.000	
	666-6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF			195.000				195.000	
	666-6054	REFL PAV MRK TY I (W)(ARROW)(100MIL)	EA	4.000		14.000		8.000		26.000	
	666-6078	REFL PAV MRK TY I (W)(WORD)(100MIL)	EA	4.000		14.000		4.000		22.000	
	666-6170	REFL PAV MRK TY II (W) 4" (SLD)	LF			5,772.000				5,772.000	
	666-6283	REF PROF PAV MRK TY I(W)4"(SLD)(090MIL)	LF			5,772.000				5,772.000	
	666-6300	RE PM W/RET REQ TY I (W)4"(BRK)(100MIL)	LF			230.000				230.000	
	666-6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	LF	3,188.000		13,962.000		5,137.000		22,287.000	
	666-6312	RE PM W/RET REQ TY I (Y)4"(BRK)(100MIL)	LF			330.000		320.000		650.000	
	666-6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	LF	4,108.000		17,613.000		6,092.000		27,813.000	
	672-6007	REFL PAV MRKR TY I-C	EA	45.000		118.000		46.000		209.000	
	672-6009	REFL PAV MRKR TY II-A-A	EA	208.000		751.000		254.000		1,213.000	
	677-6001	ELIM EXT PAV MRK & MRKS (4")	LF			18,530.000				18,530.000	
	3076-6001	D-GR HMA TY-B PG64-22	TON	1,461.000		11,920.000		3,340.000		16,721.000	
	3076-6050	D-GR HMA TY-D SAC-B PG76-22	TON	662.000		3,559.000		1,431.000		5,652.000	
	3076-6066	TACK COAT	GAL	702.000		5,320.000		1,393.000		7,415.000	

QUANTITY SHEET

CONTROLLING PROJECT ID 0914-33-068 **DISTRICT** Austin **COUNTY** Hays
HIGHWAY CR, FM 2770, RM 967

			CONTROL SECTION JOB		**0016-16-029**		**0914-33-068**		**3210-01-014**		TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00060665**		**A00039918**		**A00060664**			
			COUNTY		**Hays**		**Hays**		**Hays**			
			HIGHWAY		**RM 967**		**CR**		**FM 2770**			
ALT	**BID CODE**	**DESCRIPTION**		**UNIT**	EST.	FINAL	EST.	FINAL	EST.	FINAL		
	3085-6001	UNDERSEAL COURSE		GAL	966.000		535.000		2,518.000		4,019.000	
	6001-6002	PORTABLE CHANGEABLE MESSAGE SIGN		EA			2.000				2.000	
	6019-6011	PREFB PV MK W/WNTY TY B(Y)4"(BRK)CNTST		LF			400.000				400.000	
	6019-6012	PREFB PV MK W/WNTY TY B(Y)4"(SLD)CNTST		LF			4,275.000				4,275.000	
	6120-6001	DEAD END ROADWAY BARRICADE		LF			40.000				40.000	
	6185-6002	TMA (STATIONARY)		DAY			20.000				20.000	
	6185-6003	TMA (MOBILE OPERATION)		HR			24.000				24.000	
	7133-6001	HAZARDOUS MATERIALS TRAP		EA			1.000				1.000	
	7246-6001	SAND FILTRATION SYSTEM		EA			1.000				1.000	
	18	RAILROAD FLAGGING: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)		LS			1.000				1.000	
		EROSION CONTROL MAINTENANCE		LS			1.000				1.000	
		UNIFORMED OFF DUTY POLICE OFFICER(S)		LS			1.000				1.000	
		SAFETY CONTINGENCY		LS			1.000				1.000	

GENERAL NOTES: Version: November 13, 2020

Item	Description	**Rate
**204	**Sprinkling** (Dust) (Item 132) (Item 247)	 30 GAL/CY 30 GAL/CY 30 GAL/CY
**210	**Rolling (Flat Wheel)** (Item 247) (Item 316)	 1 HR/200 TON 1 HR/6000 SY
**210	**Rolling (Tamping and Heavy Tamping)**	1 HR/200 CY
**210	**Rolling (Lt Pneumatic Tire)** (Item 132) (Item 247)	 1 HR/500 CY 1 HR/200 TON
247	**Flexible Base (CMP IN PLC)**	132 LB/CF
310	**Prime Coat**	0.20 GAL/SY
3076	**Dense-Graded Hot-Mix Asphalt and Superpave**	110 LB/SY/IN
3085	**UnderSeal Course**	0.20 GAL/SY
	Tack Coat	0.08 GAL/SY

** For Informational Purposes Only

The following standard detail sheet or sheets have been modified:

Modified Standards
BD-3(MOD)

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

South Austin Michelle.RomageChambers@txdot.gov
South Austin Tommy.Abrego@txdot.gov

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

All contractor questions will be reviewed by the Engineer. Once a response is developed, it will be posted to TxDOT's Public FTP at the following Address:

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

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

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.

If work is performed at Contractor's option, when inclement weather is impending, and the work is damaged by subsequent precipitation, the Contractor is responsible for all costs associated with replacing the work, if required.

The roadbed will be free of organic material prior to placing any section of the pavement structure.

Contact the supervisor for the passenger facility at Capital Metro and request the relocation of Capital Metro signs. Contact the supervisor at (512) 385-0190.

Equip all construction equipment used in roadway work with highly visible omnidirectional flashing warning lights.

Provide a smooth, clean sawcut along the existing asphalt or concrete pavement structure, as directed. Consider subsidiary to the pertinent Items.

Construct all manholes/valves to final pavement elevations prior to the placement of final surface. If the manholes/valves are going to be exposed to traffic, place temporary asphalt around the manhole/valve to provide a 50:1 taper. The asphalt taper is subsidiary to the ACP work.

Use a self-contained vacuum broom to sweep the roadway and keep it free of sediment as directed. The contractor will be responsible for any sweeping above and beyond the normal maintenance required to keep fugitive sediment off the roadway as directed by the Engineer.

Damage to existing pipes and SET's due to Contractor operations will be repaired at Contractor's expense.

All locations used for storing construction equipment, materials, and stockpiles of any type, within the right of way, will be as directed. Use of right of way for these purposes will be restricted to those locations where driver sight distance to businesses and side street intersections is not obstructed and at other locations where an unsightly appearance will not exist. The Contractor will not have exclusive use of right of way but will cooperate in the use of the right of way with the city/county and various public utility companies as required.

Coordinate and obtain approval for all bridgework over existing roadways.

Bridge Vertical Clearance and Traffic Handling
Notify TxDOT project staff and the local bridge engineer 10 business days prior to the following: change in vertical clearance, placing beams/girders over traffic, opening or removing traffic from a bridge or portion of a bridge, and completion of bridge work. This requirement includes bridge class culverts. Provide vertical clearance for all structures

(including signal mast arms, span wires, and overhead sign bridge structures) within the project limit. Submit information and notices to local bridge engineer at AUS_BRG_Notify@txdot.gov.

ITEM 5 – CONTROL OF THE WORK
Coordinating with Railroad ROW
Work outside railroad ROW to proceed in accordance with the plans. Work in the railroad ROW is not to begin until all work complete up to Phase 2 Step 3. Work in RR ROW to begin during Phase 3.

Place construction or silt fence 2 ft. inside TxDOT ROW along the Railroad ROW. If work is to be performed inside the Railroad ROW, then the Contractor will coordinate with the Railroad for a Railroad Flagger. This work is subsidiary.

Place construction stakes at intervals of no more than 100 ft. This work is subsidiary.

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

Electronic Shop Drawing Submittals:
Submit electronic shop drawing submittals according to the current Guide to Electronic Shop Drawing Submittal https://www.txdot.gov/business/resources/specifications/shop-drawings.html (TxDOT.gov Business > Resources - General > Shop Drawings). Pre-approved producers can be found online at TxDOT.gov > Business > Resources - Material Producer List. Use the following contact list for all submittals that are not required to be sent to Bridge Division and to copy the Engineer for all submittals to the Bridge Division.
Submittal Contact List
South Austin Michelle.RomageChambers@txdot.gov AUS_SA-ShopReview@txdot.gov

ITEM 6 - CONTROL OF MATERIALS
Give a minimum of 1 business day notice for materials, which require inspection at the Plant.

For structures with paint containing hazardous materials, provide locations of paint removal 60 days prior to begin removal.

For removal, tie, or tap of asbestos concrete (AC) pipe, contact TxDOT and the local utility company 60 days prior to performing the work. Expose the AC pipe to provide a minimum of 1 ft. of clearance around the top and sides. A minimal amount of soil may remain around the AC pipe to avoid disturbance. The local utility company will be responsible for the demo notice to DSHS and removal of the AC pipe. Tie or tap into existing AC pipe may require removing an entire section of pipe from collar to collar and replacement of pipe with new pipe using existing bid items.

ITEM 7 – LEGAL RELATIONS AND RESPONSIBILITIES
Roadway closures during key dates and/or special events are prohibited. See notes for Item 502 for the key dates and/or special events.

Refer to the Environmental Permits, Issues and Commitments (EPIC) plan sheets for additional requirements and permits.

When any abandoned well is encountered, cease construction operations in this area and notify the Engineer who will coordinate the proper plugging procedures. A water well driller licensed in the State of Texas must be used to plug a well.

Erosion control and stabilization measures must be initiated immediately in portions of the site where construction activities have temporarily ceased and will not resume for a period exceeding 14 calendar days. Track all exposed soil, stockpiles, and slopes. Tracking consists of operating a tracked vehicle or equipment up and down the slope, leaving track marks perpendicular to the direction of the slope. Re-track slopes and stockpiles after each rain event or every 14 days, whichever occurs first. This work is subsidiary.

Perform maintenance of vehicles or equipment at designated maintenance sites. Keep a spill kit on-site during fueling and maintenance. This work is subsidiary.

Maintain positive drainage for permanent and temporary work for the duration of the project. Be responsible for any items associated with the temporary or interim drainage and all related maintenance. This work is subsidiary.

Suspend all activities near any significant recharge features, such as sinkholes, caves, or any other subterranean openings that are discovered during construction or core sampling. Do not proceed until the designated Geologist or TCEQ representative is present to evaluate and approve remedial action.
Locate aboveground storage tanks kept on-site for construction purposes in a contained area as to not allow any exposure to soils. The containment will be sized to capture 150% of the total capacity of the storage tanks.

PSL in Edwards Aquifer Recharge and Contributing Zone.
Obtain written approval from the Engineer for all on or off right of way PSLs not specifically addressed in the plans. Provide a signed SW3P sketch of the location 30 business days prior to use of the PSL. Include a list of materials, equipment and portable facilities that will be stored at the PSL.

Work over or near Bodies of Water (Lakes, Rivers, Ponds, Creeks, etc.).
Keep on site a universal spill kit adequate for the body of water and the work being performed. Debris is not allowed to fall into the ordinary high water level (OHWL). Debris that falls into the OHWL must be removed at the end of each work day. Debris that falls into the floodway must be removed at the end of each work week or prior to a rain event. Install and maintain traffic

control devices to maintain a navigable corridor for water traffic, except during bridge demo and beam placement. This work is subsidiary.

DSHS Asbestos and Demolition Notification.
Complete and provide the Texas Department of State Health Services (DSHS) notification form to TxDOT and AUS_BRG_Notify@txdot.gov at least 30 calendar days prior to bridge removal or renovation. Notify the Engineer via email of any changes to the work start and end dates.

Migratory Birds and Bats.
Migratory birds and bats may be nesting within the project limits and concentrated on roadway structures such as bridges and culverts. Remove all old and unoccupied migratory bird nests from any structures, trees, etc. between September 16 and February 28. Prevent migratory birds from re-nesting between March 1 and September 15. Prevention shall include all areas within 25 ft. of proposed work. All methods used for the removal of old nesting areas and the prevention of re-nesting must be submitted to TxDOT 30 business days prior to begin work. This work is subsidiary.

If active nests are encountered on-site during construction, all construction activity within 25 ft. of the nest must stop. Contact the Engineer to determine how to proceed.

Tree and Brush Trimming and Removal.
Work will be conducted September 16 thru February 28. Work conducted outside this timeframe will require a bird survey. Submit a survey request to TxDOT 30 business days prior to begin work.

No extension of time or compensation will be granted for a delay or suspension due to the above bird, bat and tree/brush requirements.

Law Enforcement Personnel.
Submit charge summary and invoices using the Department forms.

Patrol vehicles must be clearly marked to correspond with the officer's agency and equipped with appropriate lights to identify them as law enforcement. For patrol vehicles not owned by a law enforcement agency, markings will be retroreflective and legible from 100 ft. from both sides and the rear of the vehicle. Lights will be high intensity and visible from all angles.

No payment will be made for law enforcement personnel needed for moving equipment or payment for drive time to/from the event site. A minimum number of hours is not guaranteed. Payment is for work performed. If the Contractor has a field office, provide an office location for a supervisory officer when event requires a supervising officer. This work is subsidiary.

A maximum combined rate of $70 per hour for the law enforcement personnel and the patrol vehicle will be allowed. Any scheduling fee is subsidiary per Standard Specification 502.4.2.

Cancel law enforcement personnel when the event is canceled. Cancellation, minimums or "show up" fees will not be paid when cancellation is made 12 hours prior to beginning of the

event. Failure to cancel within 12 hours will not be cause for payment for cancellation, minimums, or "show up" time. Payment of actual "show up" time to the event site due to cancellation will be on a case by case basis at a maximum of 2 hours per officer.

Alterations to the cancellation and maximum rate must be approved by the Engineer or pre-determined by official policy of the officers governing authority.

Water Quality Ponds.
Provide a sample of filter media for approval prior to installation. Confirm elevations of underdrain pipe after installation and prior to covering with filter media. Provide an electronic pdf of as-builts within 60 calendar days of a water quality pond becoming active. As-built shall include GPS coordinates and elevations of all flowlines for inlets, flowlines for outlets, elevations of underdrain pipes, top of the pond, and bottom of the pond. Schedule and conduct a walk thru inspection with a TxDOT registered professional engineer prior to providing the as-built. Clean the pond as directed. Cleaning of the pond will be paid using force account in accordance with Item 9.7, "Payment for Extra Work and Force Account Method."

ITEM 8 – PROSECUTION AND PROGRESS
The road-user cost liquidated damages are $753 per day.

Electronic versions of schedules will be saved in Primavera P6 format.

Working days will be charged in accordance with 8.3.1.1, "Five-Day Workweek."

ITEM 100 - PREPARING RIGHT OF WAY
Prep ROW must not begin until accessible trees designated for preservation have been protected, items listed in the EPIC have been addressed, and SW3P controls installed in accessible areas.

Backfill material will be Type B Embankment using ordinary compaction.

Follow Item 752.4 Work Methods and Item 752 general notes when removing or working on or near trees and brush.

Unless shown otherwise in the plans or a designated non-mow area, perform trimming or removal for areas within 30 ft. of edge of pavement under construction. Trim or remove to provide minimum of 5 ft. of horizontal clearance and 7 ft. of vertical clearance for the following: sidewalks, paths, guard fence, rails, signs, object markers, and structures. Trim to provide a minimum of 14 ft. vertical clearance under all trees. This work is subsidiary.

ITEM 110 – EXCAVATION
The Engineer will define unsuitable material.

ITEM 132 – EMBANKMENT
At no time will the retaining wall backfill material exceed the adjacent embankment operation by more than one lift. At no time will the embankment adjacent to the retaining wall backfill

exceed the wall backfill by any elevation. Embankment placed over the area of MSE backfill must meet the same backfill requirements for the type specified under Item 423.

The Engineer will define unsuitable material. Material which the Contractor might deem to be unsuitable due to moisture content will not be considered unsuitable material.

Prior to begin embankment of existing area, correct or replace unstable material to a depth of 6 in. below existing grade. Embankment areas will be inspected prior to beginning work.

Rock or broken concrete produced by the project is allowed in earth embankments. The size of the rock or broken concrete will not exceed the layer thickness requirements in Section 132.3.4., "Compaction Methods." The material will not be placed vertically within 5 ft. of the finished subgrade elevation.

Embankment placed vertically within 5 ft. of the finished subgrade elevation or within the edges of the subgrade and treated with lime, cement, or other calcium based additives must have a sulfate content less than 3000 ppm. Allow 5 business days for testing. Treatment of sulfate material 3000 ppm to 7000 ppm requires 7 days of mellowing and continuous water curing, in accordance TxDOT guidelines for Treatment of Sulfate-Rich Soils and Bases in Pavement Structures (9/2005). Material over 7000 ppm is not allowed.

ITEM 132 – EMBANKMENT TY C
Do not furnish shale clays. The Engineer must approve the embankment material before use on the project. Existing material from within the project limits or approved by the engineer may be used vertically beyond 5 ft. of the finished subgrade elevation or beyond the edge of the subgrade.
Furnish embankment with sulfate content less than 3000 ppm if treated with calcium-based chemicals or within 5 ft. of the finished subgrade elevation.

TY C Requirements

~~Percent Passing~~	~~LL~~	~~PI~~	~~PI~~
~~3"~~	~~Max~~	~~Max~~	~~Min~~
~~100~~	~~55~~	~~20~~	~~6~~

TY C1 and C2 Requirements

Description	Percent Retained					LL	PI	PI
	3"	1 3/4"	3/8"	#4	#40	Max	Max	Min
Embankment (Ordinary) (TY C1)	0	0-10	-	45-75	60-85	45	20	6
~~Embankment (Ordinary) (TY C2)~~	~~-~~	~~-~~	~~0~~	~~30-75~~	~~50-85~~	~~55~~	~~25~~	~~8~~

ITEM 134 - BACKFILLING PAVEMENT EDGES
For all backfill, compact using a light pneumatic roller, install at 3:1 slope to tie into existing terrain, and apply at rate of 0.12 GAL/SY a typical erosion control material per Item 300.

For TY A backfill, furnish flexible base meeting the requirement for any type or grade, except Grade 4, in accordance with Item 247. Compressive strengths and wet ball mill for flexible base

are waived for this item. In lieu of flexible base, RAP may be supplied and must be 100% passing a 2.5 in. sieve in accordance to Tex-110-E.

ITEM 160 - TOPSOIL
Off-site topsoil will have a minimum PI of 25.

No Sandy Loam allowed.

Obtain approval of the actual depth of the topsoil sources for both on-site and off-site sources.
Construct topsoil stockpiles of no more than five (5) feet in height.
It is permissible to use topsoil dikes for erosion control berms within the right of way, as directed.

Seed or track slopes within 14 days of placement.

Salvage topsoil from sites of excavation and embankment. Maximum salvage depth is 6 inches.

Windrowing of topsoil obtained from the Right of Way (ROW) is not allowed.

ITEM 168 – VEGETATIVE WATERING
Water all areas of project to be seeded or sodded.

Maintain the seedbed in a condition favorable for the growth of grass. Watering can be postponed immediately after a rainfall on the site of ½ inch or greater, but will be resumed before the soil dries out. Continue watering until final acceptance.

Vegetative watering rates and quantities are based on ¼ inch of watering per week over a 3-month watering cycle. The actual rates used and paid for will be as directed and will be based on prevailing weather conditions to maintain the seedbed.

Obtain water at a source that is metered (furnish a current certification of the meter being used) or furnish the manufacturer's specifications showing the tank capacity for each truck used. Notify the Engineer, each day that watering takes place, before watering, so that meter readings or truck counts can be verified.

ITEM 169 – SOIL RETENTION BLANKETS
Type A blankets containing straw fibers are not allowed.

ITEM 180 – WILDFLOWER SEEDING
The following default seed mixtures will be used on this project.

Common Name	Scientific Name	lb. PLS/acre
Illinois Bundleflower	*Desmanthus Illinoensis*	6.0
Indian Blanket	*Gaillardia Pulchella*	6.0
Lemon Mint	*Mondarda Citriodora*	1.0
Bluebonnet	*Lupinus Texensis*	12.0
Pink Evening Primrose	*Oenothera Speciosa*	1.0

Black-Eyed Susan	*Rudbecia Hirta*	1.0
Indian Paintbrush	*Castilleja Miniata*	1.0
Partridge Pea	*Cassia (Chamaecrista)Fasiculata*	8.0
Plains Coreopsis	*Coreopsis Tinctoria*	1.0

ITEM 204 – SPRINKLING
Apply water for dust control as directed. When dust control is not being maintained, cease operations until dust control is maintained. Consider subsidiary to the pertinent Items.

ITEM 216 - PROOF ROLLING
Correct and perform "Proof Rolling" retest at the Contractor's expense, to the satisfaction of the Engineer, when initial "Proof Rolling" yields a failing result.

ITEM 247 - FLEXIBLE BASE
The lift thickness will be 4" to 6" unless shown in the plans. When compacted in multiple lifts, the density of the bottom and middle lifts will be 95% and 98% of the maximum dry density, respectively.

Correction of subgrade soft spots is subsidiary.

Complete all subgrade, ditches, slopes, and place all drainage structures to conform to required lines, grades, and cross-sections, as shown and directed, prior to the placement of Flex Base.
Do not use a vibratory roller to compact the material directly over a box culvert.

ITEM 300s – SURFACE COURSES AND PAVEMENTS
Asphalt season is May 1 thru September 15. The latest work start date for asphalt season is August 1.

If an under seal is not provided, furnish a tack coat. Apply tack coat at 0.08 GAL/SY (residual). Apply non-tracking tack coat using manufacturer recommend rates.

ITEM 310 – PRIME COAT
Apply blotter material to all driveways and intersections. This work is subsidiary.
When Multi Option is allowed, provide MC 30, EC 30 or AE-P. MC 30 is not allowed in Travis County.

Rolling to ensure penetration is required.

ITEM 320 - EQUIPMENT FOR ASPHALT CONCRETE PAVEMENT
Use of motor grader is allowed for placement of mixtures greater than 10 inches from the riding surface, when hotmix is used in lieu of flexbase, or as allowed.

ITEM 340/3078 THRU 348/3082 - HOT-MIX ASPHALT PAVEMENT
Core holes may be filled with an Asphaltic patching material meeting the requirements of DMS-9203 or with SCM meeting requirements of DMS-9202.

Install transverse butt joints with 50 ft. H: 1 in. V transition from the new ACP to the existing surface. Install a butt joint with 24 in. H: 1 in. V transition from the new ACP to a driveway, pullout or intersection. Saw cut the existing pavement at the butt joints. This work is subsidiary.

Use a device to create a maximum 3H:1V notched wedge joint on all longitudinal joints of 2 in. or greater. This work is subsidiary.

Prior to milling, core the existing pavement to verify thickness. This work is subsidiary.

Ensure placement sequence to avoid excess distance of longitudinal joint lap back not to exceed one day's production rates.

Submit any proposed adjustments or changes to a JMF before production of the new JMF.

Tack every layer. Do not dilute tack coat. Apply it evenly through a distributor spray bar.
Provide a minimum transition of 10' for intersections, 10' for commercial driveways, and 6' for residential driveways unless otherwise shown on the plans.
Irregularities will require the replacement of a full lane width using an asphalt paver. Replace the entire sublot if the irregularities are greater than 40% of the sublot area.

Lime or an approved anti-stripping agent must be used when crushed gravel is utilized to meet a SAC "A" requirement.

When using RAP or RAS, include the management methods of processing, stockpiling, and testing the material in the QCP submitted for the project. If RAP and RAS are used in the same mix, the QCP must document that both of these materials have dedicated feeder bins for each recycled material. Blending of RAP and RAS in one feeder bin or in a stockpile is not permitted.

Asphalt content and binder properties of RAP and RAS stockpiles must be documented when recycled asphalt content greater than 20% is utilized.

No RAS is allowed in surface courses.
Department approved warm-mix additives is required for all surface mix application when RAP is used. Dosage rates will be approved during JMF approval.

The Hamburg Wheel Test will have a minimum rut depth of 3mm.

ITEM 340/3078 & 341/3076 - DENSE-GRADED HOT-MIX ASPHALT
Use the SGC for design and production testing of all mixtures. Design all Dense-Graded Type D mixtures as a surface mix, maximum 15% RAP and no RAS.

When using substitute binders, mold specimens for mix design and production at the temperature required for the substitute binder used to produce the HMA.

The Hamburg Wheel minimum number of passes for PG 64 or lower is reduced to 7,000. The Engineer may accept Hamburg Wheel test results for production and placement if no more than 1

of the 5 most recent tests is below the specified number of passes and the failing test is no more than 2,000 passes below the specified number of passes.

ITEM 354 - PLANING AND TEXTURING PAVEMENT
Contractor retains ownership of salvaged materials.

Mill and fill the work area during each shift unless otherwise shown on the plans.

Taper permanent transverse faces 50 ft. per 1 in. Taper temporary transverse faces 25 ft. per 1 in. Taper permanent longitudinal faces 6 ft. per 1 in. HMA may be used as temporary tapers. Provide minimum 1 in. butt joints at bridge ends and paving ends. This work is subsidiary.

ITEM 400 - EXCAVATION AND BACKFILL FOR STRUCTURES
Unless shown on the plans, the following backfill will apply to cutting and restoring flexible pavement. Backfill with cement-stabilized backfill. The cement-stabilized backfill is subsidiary. Cap the backfill with Type B hot-mix to a depth equal to the adjacent hot-mix. At locations where the backfill surface is final, place 1-1/2 in. Type D for the surface. The minimum hot-mix depth will be 4 in.

Saw-cut the pavement at the edge of the excavation. This work is subsidiary.

Backfill the bridge ends in accordance with the limits shown on TxDOT "CSAB" Standard. Use material in accordance with "CSAB" or Item 423, Type BS. The "CSAB" optional bond breaker materials are allowed. This work is subsidiary.

ITEM 416 - DRILLED SHAFT FOUNDATIONS
Stake all Foundations, for approval, before beginning drilling operations.

Obtain approval of placement prior to placing concrete.

Remove spoils from a flood plain at the end of each work day.

ITEM 420, 425, 441, & 462 - STRUCTURES
Bridge Vertical Clearance and Traffic Handling
Notify TxDOT project staff and the local bridge engineer 10 business days prior to the following: change in vertical clearance, placing beams/girders over traffic, opening or removing traffic from a bridge or portion of a bridge, and completion of bridge work. This requirement includes bridge class culverts. Provide vertical clearance for all structures (including signal mast arms, span wires, and overhead sign bridge structures) within the project limit. Submit information and notices to local bridge engineer at AUS_BRG_Notify@txdot.gov.

ITEM 420 – CONCRETE SUBSTRUCTURES
Do not use PMDF in areas where a "Free Joint" is indicated in the plans.

Check the sign plans for locations of clearance signs and brackets on structures, which will require inserts in the pre-stressed beams.

Where Retaining Walls are integral parts of the abutment header, do not place the abutment cap prior to backfilling the wall and the abutment area up to the elevation of the bottom of the abutment cap.

Mass placements are defined as placements with a least dimension greater than or equal to 5 ft., or designated elsewhere on the plans.
The "H" values shown on Bridge Layouts are estimated column heights. Calculate the actual column heights based on field conditions.

Perform work during good weather unless otherwise directed. If work is performed at Contractor's option, when inclement weather is impending, and the work is damaged by the weather, the Contractor is responsible for all costs associated with repairs/replacement.

Upon completion of the structure, stencil the National Bridge Inventory (NBI) number (structure number) using black paint and 4 in. tall numbers at 4 locations designated by TxDOT. This work is subsidiary.

Bonding agents are required at construction joints. Do not use membrane curing for structural concrete as defined in Item 421, Table 8.

Remove all loose Formwork and other Materials from the floodplain or drainage areas daily.

ITEM 423 - RETAINING WALLS
Mow strip shall be 2 ft. wide unless otherwise shown on the plans. Immediately backfill the face of the retaining wall after the wall height gets above the final grade in front of the wall. Retaining wall coping gap from the face of the wall panel to the inside face of coping shall not be more than 1.5 in.

Provide a test panel for approval of the form-liner surface finish prior to beginning precast operations. This work is subsidiary.

Type BS backfill will use modified gradation limits as shown below.

Type	Sieve Size	Percent Retained
BS MOD	3 in.	0
	No. 4	85-100

ITEM 425 - PRECAST PRESTRESSED CONCRETE STRUCTURAL MEMBERS
Conduct a pre-placement meeting for the erection of structural members.

ITEM 427 - SURFACE FINISHES FOR CONCRETE
Provide a rub finish to Surface Area I.

ITEM 432 - RIPRAP
Mow strip riprap will be 4 in. and all other riprap will be 5 in. unless otherwise shown on the plans or in the pay items. Fiber reinforcement is not allowed.

Saw-cut existing riprap then epoxy 12 in. long No. 3 or No. 4 bars 6 in. deep at a maximum spacing of 18 in. in each direction to tie new riprap to existing riprap. This work is subsidiary.

For cement-stabilized riprap, provide Type A Grade 5 flexible base. Compressive strengths for Item 247 are waived.

SGT approach taper, paid using mow strip item, shall be installed using concrete. Placement shall be ordinary compaction and does not require placement using an asphalt paver.

ITEM 465 – JUNCTION BOXES, MANHOLES, AND INLETS
Maintain drainage at curb inlets until the final roadway surface is placed.

For inlets not placed in roadway, construct cast-in-place reinforced concrete apron as shown in the standards. This work is subsidiary.

Backfill shall use cohesionless material per Item 400 or flowable fill if width between structure and extent of excavation is 2 ft. or less. This is subsidiary.

ITEM 466 - HEADWALLS AND WINGWALLS
Remove all loose formwork and materials from the waterway at the end of each work week or prior to a rain event. Debris that falls into the waterway must be removed at the end of each work day. Upon completion of the structure, stencil the National Bridge Inventory (NBI) number (structure number) using black paint and 4 in. tall numbers at 4 locations designated by TxDOT. This work is subsidiary.

ITEM 467 - SAFETY END TREATMENT
Field adjust pipe end to maintain the necessary slope. Field cutting of pipe end is allowed. Coat all metal field cuts or exposed reinforcement with asphalt paint.

For all Type II SETs, provide riprap aprons as shown on the plans.

ITEM 496 - REMOVING STRUCTURES
Submit a demolition plan to the Engineer. Have the plan signed and sealed by a licensed professional engineer when the structure will continue to accommodate traffic after removal has begun and the removal impacts any part of the structure below the deck or riding surface. If applicable, the plan must detail requirements for meeting the U.S. Army Corps of Engineers' Section 404 Permit. The demolition plan must detail handling of roadway and waterway traffic. Waterway traffic must be maintained at all times unless a closure is approved by the Engineer.

No debris is allowed to fall into a body of water. Debris that falls into the water must be removed at the end of each work day. Debris that falls into the floodway must be removed at the end of each work week or prior to a rain event.

ITEM 502 - BARRICADES, SIGNS, AND TRAFFIC HANDLING

Table 1

Roadway	Limits	Allowable Closure Time
IH 35	All (1 lane closed)	9 P to 5 A
IH 35	All (2 lanes closed, see allowable work below)	9 P to 5 A
IH 35	All (2 lanes closed, all work)	11 P to 5 A
SH 45	US 183 to SH130	8 P to 5 A
LP 1	William Cannon to Parmer Lane	8 P to 5 A
US 183	SH 29 to FM 1327	8 P to 5 A
SH 71	SH 130 to IH 35	8 P to 5 A
SH 71	SH 304 to Tahitian Drive	8 P to 5 A
SH 71	US 290 W to RM 3238	8 P to 5 A
US 290 W	IH 35 to Nutty Brown Rd	8 P to 5 A
US 290 E	IH 35 to SH 95	8 P to 5 A
FM 734	FM 1431 to US 290 E	8 P to 5 A
US 79	IH 35 to Bus 79 in Taylor	8 P to 5 A
RM 1431	Lohmans Ford Rd to IH 35	8 P to 5 A
SH 29	LP 332 western terminus to SH 130	8 P to 5 A
SH 80	Charles Austin to River Road	8 P to 5 A
RM 2222	All	8 P to 5 A
RM 620	All	8 P to 5 A
RM 2244	All	8 P to 5 A
SPUR 69	All	8 P to 5 A
LP 360	All	8 P to 5 A
LP 343	All	8 P to 5 A
LP 275	All	8 P to 5 A
FM 1325	All	8 P to 5 A
All	Within 200' of a signalized intersection	9 P to 5 A
All	All (Full Closure, see allowable work below)	11 P to 4 A

Table 2

Roadway	Limits	Allowable Closure Time
RM 967	All	7 P to 6 A
FM 1626	All	7 P to 6 A
FM 2770	All	7 P to 6 A
Robert S. Light Blvd.	All	7 P to 6 A

Table 3 (Mobile Operations)

Roadway	Allowable Sun Night thru Fri Noon	Allowable Sat thru Sun Morn
Within Austin City Limits	10 A to 2 P and 7 P to 6 A	7 P to 10 A
Outside Austin City Limits	9 A to 3 P and 7 P to 7 A	6 P to 11 A
IH 35 main lanes	10 P to 5 A	9 P to 9 A
AADT over 50,000	8 P to 6 A	8 P to 10 A

For roadways without defined allowable closure times, nighttime lane closures will be allowed from 7 P to 6 A. Unless stated, daytime or Friday night lane closures will not be allowed and one lane in each direction will remain open at all times for all roadways.

Full closures only allowed Friday night thru Monday morning for bridge beam installation, bridge demolition, or OSB truss removal/installation. Full closures only allowed for roadways with frontage roads or if a designated detour route is provided in the plans.

No closures will be allowed on the weekends, working day prior, and working day after the National Holidays defined in the Standard Specifications, Good Friday, and Easter weekend. Closures the Sunday of the Super Bowl will not be allowed from 1 P to 11 P. No closures will be allowed on Friday and the weekends for projects within 20 miles of Formula 1 at COTA, ACL Fest, SXSW, ROT Rally, UT home football games (includes games not on a Friday or weekend), sales tax holiday, Dell Match Play (includes Thursday) or other special events that could be impacted by the construction. All lanes will be open by noon of the day before these special events.

To account for directional traffic volumes, begin and end times of closures may be shifted equally by the Engineer. The closure duration will remain. Added compensation is not allowed. Submit an emailed request for a lane closure (LCN) to TxDOT. The email will be submitted in the format provided. Receive concurrence prior to implementation. Submit a cancellation of lane closures a minimum of 18 hours prior to implementation. Blanket requests for extended periods are not allowed. Max duration of a request is 2 weeks prior to requiring resubmittal.
Provide 2 hour notice prior to implementation and immediately upon removal of the closure.

For roadways listed in Table 1: Submit the request 96 hours prior to implementation.

For roadways not listed in Table 1: Submit the request a minimum of 48 hours prior to the closure and by the following deadline immediately prior to the closure: 11A on Tuesday or 11A on Friday.

For all roadways: Submit request for traffic detours and full roadway closures 168 hours prior to implementation. Submit request for nighttime work 96 hours to implementation date.

Cancellations of accepted closures (not applicable to full closures or detours) due to weather will not require resubmission in accordance with the above restrictions if the work is completed during the next allowable closure time.

Closures that conflict with adjacent contractor will be prioritized according to critical path work per latest schedule. Conflicting critical path or non-critical work will be approved for first LCN submitted. Denial of a closure due to prioritization or other reasons will not be reason for time suspension, delay, overhead, etc.

Cover, relocate or remove existing signs that conflict with traffic control. Install all permanent signs, delineation, and object markers required for the operation of the roadway before opening to traffic. Use of temporary mounts is allowed or may be required until the permanent mounts

are installed or not impacted by construction. Maintain the temporary mounts. This work is subsidiary.

Meet with the Engineer prior to lane closures to ensure that sufficient equipment, materials, devices, and workers will be used. Take immediate action to modify traffic control, if at any time the queue becomes greater than 20 minutes. Have a contingency plan of how modification will occur. Consider inclement weather prior to implementing the lane closures. Do not set up traffic control when the pavement is wet.

No one lane two-way traffic direction will be allowed during daytime hours, this work will only be allowed during nighttime hours between 7:00 PM to 6:00 AM, unless otherwise approved by the Engineer.

Place a 28-inch cone, meeting requirements of BC (10), on top of foundations that have protruding studs. This work is subsidiary.

Edge condition treatment types must be in accordance with the TxDOT standard. Installation and removal of a safety slope is subsidiary.

To determine a speed limit or an advisory speed limit, submit a request to TxDOT 60 business days prior to manufacture of the sign.
For non-site specific signal projects, 2 months of barricades will be paid per work order location.

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

ITEM 504 - FIELD OFFICE AND LABORATORY
Provide a Type E Field Office structure with at least 400 sq. ft. of gross floor area in room(s) 8 ft. high. The structure will include high speed internet service with WIFI signal, minimum of two desks, four chairs, and a storage cabinet. The cabinet will be lockable and a minimum of 3 ft wide by 2 ft deep by 3 ft high. If a field office is required, a concrete testing facility will be required regardless of quantity of concrete.

All labs and offices will include cleaning at least once a week. The cleaning will include sweeping and mopping of floors, cleaning the toilet and lavatory, and emptying wastebaskets. Space heaters are not considered adequate heating.

Projects with more than 500 CY of structural class concrete, 5000 SY of Class P concrete, and/or 2000 CY of non-structural concrete will include a concrete testing facility. Provide a structure with at least 200 sq. ft. of gross floor area in room 8 ft. high. The structure will include the

laboratory equipment and all other related items to perform the contract-controlling test procedures.

Projects with HMAC, furnish a Type D structure for the Engineer's exclusive use. The structure will include high speed internet service with WIFI signal, one desk, two chairs, and one file cabinet. Provide a minimum of three 120-volt circuits with 20-amp breakers and at most two grounded convenience outlets per circuit.

ITEM 506 - TEMPORARY EROSION, SEDIMENTATION, AND ENV CONTROLS
Install, maintain, remove erosion, sedimentation and environmental control measures in areas of the right of way utilized by the contractor that are outside the limits of disturbance required for construction. Permanently stabilize the area. This work is subsidiary.

ITEM 508 – CONSTRUCTING DETOURS
Detour typical section must match the adjacent roadway section, unless shown on the plans. Flexible base will be Type A Grade 5 placed using ordinary compaction. Base compressive strengths are waived for roadways not listed in Item 502, Table 1.

ITEM 530 – INTERSECTIONS, DRIVEWAYS, AND TURNOUTS
Notify property owners a minimum of 48 hr. in advance of beginning work on their driveway. Provide a list of each notification and contact prior to each closure. Only close driveways for reconstruction if duration and alternate access are approved. Install and maintain material across a work zone as temporary access. Temporary access must not have grade breaks that exceed 8%. This work is subsidiary.

Grade breaks must not exceed 8%. Sidewalk crossing slope will be 1.5% and 5 ft. wide with width reduction in approved locations.

For ACP or SURF TREAT, the pavement structure will match the adjacent roadway unless detailed on the plans. HMA, including surface, may use a maximum allowable amount of 40% RAP and 5% RAS for private driveways, public driveways for 2-lane roadways or smaller, and turnouts. Blending of 2 or more sources is allowed. Furnish base meeting the requirement for any type or grade in accordance with Item 247. Compressive strengths for flexible base are waived. Base must be placed using ordinary compaction.

For CONC, the pavement structure will be 6 in. thick and have 3 in. base bedding unless detailed on the plans. Furnish base meeting ACP or SURF TREAT requirements. Class A concrete is required and may use Coarse Aggregate Grades 1-8. Expansion joints will be placed every 20 ft. Expansion joints will be constructed as detailed in the latest TxDOT Concrete Curb and Curb and Gutter Standard. Reinforcement will be in accordance with concrete riprap for Item 432.3.1., unless specified on the plans.

ITEM 533 – MILLED RUMBLE STRIPS
If surface is a seal coat, rumble strips shall be installed prior to placing the seal coat.

For edge line rumble strips: Use Option 1 for shoulder width equal to or less than 2 ft. Use Option 3 for shoulder width greater than 2 ft. but less than 4 ft. Use Option 4 for shoulder width equal to or greater than 4 ft.

ITEM 540, 542, & 544 - METAL BEAM GUARD FENCE AND GUARDRAIL END TREATMENTS
Furnish round timber posts for guard fence. Steel posts for low fill culverts are subsidiary. Stake the locations for approval prior to installation. Adjust the limits of the fence to meet field conditions. Install delineators before opening the road to traffic.

Retain all materials. Contractor may reuse all existing materials that are structurally sound and dent free. All reused material shall be from this project and in compliance with current standards. Structurally sound rust spots with the largest dimension of 4 in. may be cleaned and repaired in accordance with 540.3.5. Contractor may punch or field drill holes in the metal rail element to accommodate post spacing. Additional holes for splice or connections are not allowed. The holes shall be spaced in accordance with the latest standard and shall not be closer than the minimum spacing shown on the current standard.

Remove, replace, and install mow strip block out material. Construct new block outs and backfill unused block outs with class B concrete. This work is subsidiary.

Repair of mow strip damage, not caused by contractor negligence, and installation of new mow strip will be paid with appropriate bid items. Backfill and shoulder up of area around fence and mow strip will be paid using embankment item.

ITEM 600s & 6000s – ITS, LIGHTING, SIGNING, MARKINGS, AND SIGNALS
Meet the requirements of the NEC, Texas MUTCD, TxDOT standards, and TxDOT Standard Specifications. Notify the Engineer if existing elements to remain do not meet code or specification.

Contractor shall provide all service, equipment and material required to provide a functional item and interface with existing equipment and software.

For signal shop contact Charles Vaughn Jr (Charles.Vaughn@txdot.gov) and Douglas Turner (Douglas.L.Turner@txdot.gov).

Use the TxDOT provided form to submit an electrical, illumination, and signal checklist prior to request for signal activation or a punch list.

Provide a 7 day advance email notice to the Engineer to request illumination or traffic signal punch list inspection.

Provide a 14 day advance email notice to the Engineer with signal technician contact information and signal locations prior to working or assuming operations of illumination or traffic signal.

Provide a 60 day advance email notice to the Engineer to request signal timing if timing is not provided in the plans.

Provide a 180 day advance email notice to the Engineer for equipment to be provided by TxDOT.

Prior to relief of maintenance, a Test Period is required for signals and ITS equipment in accordance with Item 680.3.1.8. Response time to reported trouble calls shall be less than 2 hours. Complete repairs within 24 hours. Notify the Engineer and maintain a logbook in the controller cabinet of each trouble call. Do not clear the error log in the conflict monitor without approval.

Maintain the existing ITS equipment and HUB buildings operational during construction. ITS downtime is allowed from 12A to 4A. Downtime is restricted to one time per HUB or equipment.

Definitions of abbreviations used to designate ITS equipment, material, etc. can be provided by the Engineer.

ITEM 610 - ROADWAY ILLUMINATION ASSEMBLIES
Upon removal, contact signal shop to stockpile a maximum of 10 assemblies that meet the current TxDOT standards at the Austin District Headquarters located at 7901 North IH 35, 78753. If signal shop declines receipt of these assemblies, Contractor will be responsible for disposal.

For each assembly, paint the service, circuit, run and assembly number/letter using 3 in. tall characters and black paint. The marking shall be stacked vertically with the service on top and the assembly number/letter on the bottom. Paint 6 ft. above the roadway surface on the hand access door side of the pole or adjacent to the assembly if mounted to a structure. This work is subsidiary.

For both transformer and shoe-base type illumination poles, provide double-pole breakaway fuse holder.

Provide 10-amp time delay fuses.

Maintain all new and existing illumination for the duration of the contract. All existing illumination will remain operational until replaced by new illumination or required to be removed due to construction.

ITEM 618 - CONDUIT
Fit PVC and HDPE conduit terminations with bell ends.

Shift the locations of conduit and ground boxes to accommodate field conditions.

Install conduit not exceeding 2 feet in any direction from a straight line. Install conduit at a minimum depth of 2 ft. below finished grade. Installation of the conduit by jacking or boring method will be at a depth of at least 1 ft. below subgrade.

Install a high tension, non-metallic pull rope in all conduit runs. Cap all empty conduit using standard weather tight conduit caps. This work is subsidiary.

Use a coring device when drilling holes through concrete structures.

Structurally mounted junction boxes will be as shown on the plans. When used for traffic signal installations, these boxes will be 12" x 12" x 8". This work is subsidiary.

When using existing conduit, ensure that all conduits have bushings and cleaned of dirt, mud, grease, and other debris. Re-strap existing or relocated conduit per the specification. This work is subsidiary. Abandon existing underground conduit that is unusable is allowed if all conductors are removed. Replacement conduit will be paid using the existing bid items.

ITEM 620 - ELECTRICAL CONDUCTORS
Provide 10 amp time delay fuses.

For Flashing Beacons (Item 685) and Pedestal Poles (Item 687), provide single-pole breakaway disconnects.

Install a minimum size 8 AWG equipment grounding conductor (EGC) in all conduits including loop detectors and traffic signal cables. Payment and the size of the EGC will be in accordance with standard ED (3)-14 note 12.
Permanently mark “illumination” on the luminaire conductors installed inside a traffic signal pole. Make the marks easily visible from the hand hole.

ITEM 624 – GROUND BOXES
Aggregate for fill under the box will be crushed, have a maximum size of 2 in., minimum size of ½ in., and requirements per Item 302 are waived.

ITEM 628 – ELECTRICAL SERVICES
Contact the utility company upon execution of contract and prior to the pre-construction meeting to make arrangements for all work and materials provided by the utility company. Contact AUS_Business_Services@txdot.gov for account approval and information. Accounts shall be placed in the name of TxDOT.

ITEM 644 – SMALL ROADSIDE SIGN ASSEMBLIES
Triangular slip base that use set screws to secure the post will require 1 of the set screws to penetrate the post by drilling a hole in the post at the location of the screw. All set screws shall be treated with anti-seize compound.

ITEM 662 - WORK ZONE PAVEMENT MARKINGS
Notify the Engineer at least 24 hours in advance of work for this item.

Maintain removable and short term markings daily. Remove within 48 hours after permanent striping has been completed.

Item 668 is not allowed for use as Item 662.

ITEM 666 - RETROREFLECTORIZED PAVEMENT MARKINGS
Notify the Engineer at least 24 hr. before beginning work.

Use of temporary flexible reflective roadway marker tabs is subsidiary and at the Contractor's option. Replace missing or damaged tabs nightly. If using tabs, place longitudinal markings weekly by 5 AM Friday for all weekday work and by 5 AM Monday for all weekend work. Failure to maintain tabs or place longitudinal markings by deadline will require nightly placement of longitudinal markings.

When the raised portion of a profile marking is placed as a separate operation from the pavement marking, the raised portion must be placed first then covered with TY I.

When using black shadow to cover existing stripe apply a non-retroreflective angular abrasive bead drop. The marking color shall be adjusted to resemble the pavement color. If Item 677 is not used prior to placement of black shadow, scrape the top of the marking with a blade or large piece of equipment unless surface is a seal coat. The scraping of the marking is subsidiary.

ITEM 677 - ELIMINATING EXISTING PAVEMENT MARKINGS AND MARKERS
Dispose of removed materials and debris at locations off the right of way.
Elimination using a pavement marking will not be allowed in lieu of methods listed in specification.

Remove pavement markings on concrete surfaces by a blasting method. Flail milling will be allowed when total quantity of removal on concrete surfaces is less than 1000 ft.

Strip seal is only method allowed on seal coat surface unless project includes placement of a new surface. If total quantity of removal on a seal coat surface is less than 2000 ft., elimination using a pavement marking is allowed if a test section is approved by the Engineer. Test section shall demonstrate the thermo marking color matches the existing pavement color.

Remove pavement markings outside the limits of the new surface by a blasting method.

Use a TRAIL or a non-retroreflective paint to cover stripe remnants that remain after elimination. The test requirements for these materials are waived. The paint color shall be adjusted to resemble the existing pavement color. Installation and maintenance is subsidiary.

ITEM 752 – TREE AND BRUSH REMOVAL
Follow Item 752.4 Work Methods and Item 752 general notes when removing or working on or near trees and brush even if Item 752 is not included as a pay item.

Flailing equipment is not allowed. Burning brush is not allowed in urban areas or on ROW. Use hand methods or other means of removal if doing work by mechanical methods is impractical. Prior to begin tree pruning, send email confirmation to the Engineer that training and demonstration of work methods has been provided to the employees. This work is subsidiary.

Shredded vegetation may be blended, at a rate not to exceed 15 percent by volume, with Item 160 if the maximum dimension is not greater than 2 in.

ITEM 3085 – UNDERSEAL COURSE
The minimum application rates are listed in Table UC. The target shear bond strengths are listed in Table UCS. The informational test cores shall be taken once a shift for first 5 lots of placement or a change to placement method of bonding course, bonding material, or hot mix material. The remaining informational test cores shall be taken once every 3 lots for surface mix. Informational tests are not required for non-surface mix beyond the first 5 lots unless there is a change to placement method of bonding course, bonding material, or hot mix material. Results from these informational tests will not be used for specification compliance.

Table UC

Material	Minimum Application Rate (gal. per square yard)
TRAIL – Hot Asphalt	0.15
Spray Applied Underseal Membrane	0.20
Seal Coat – Tier II emulsion	0.25
Seal Coat – Tier II asphalt	0.23

Table UCS

Material	Minimum Shear Strength (psi)
SMA – Stone-Matrix Asphalt	60.0
PFC – Permeable Friction Course	40.0
All Other Materials	40.0

ITEM 6001 – PORTABLE CHANGEABLE MESSAGE SIGN
Provide 2 PCMS. Provide a replacement within 12 hours. PCMS will be available for traffic control, event notices, roadway conditions, service announcements, etc.

Place PCMS 10 calendar days prior to begin work stating "Road Work Begin Soon, Contact 832-7000 For Info".

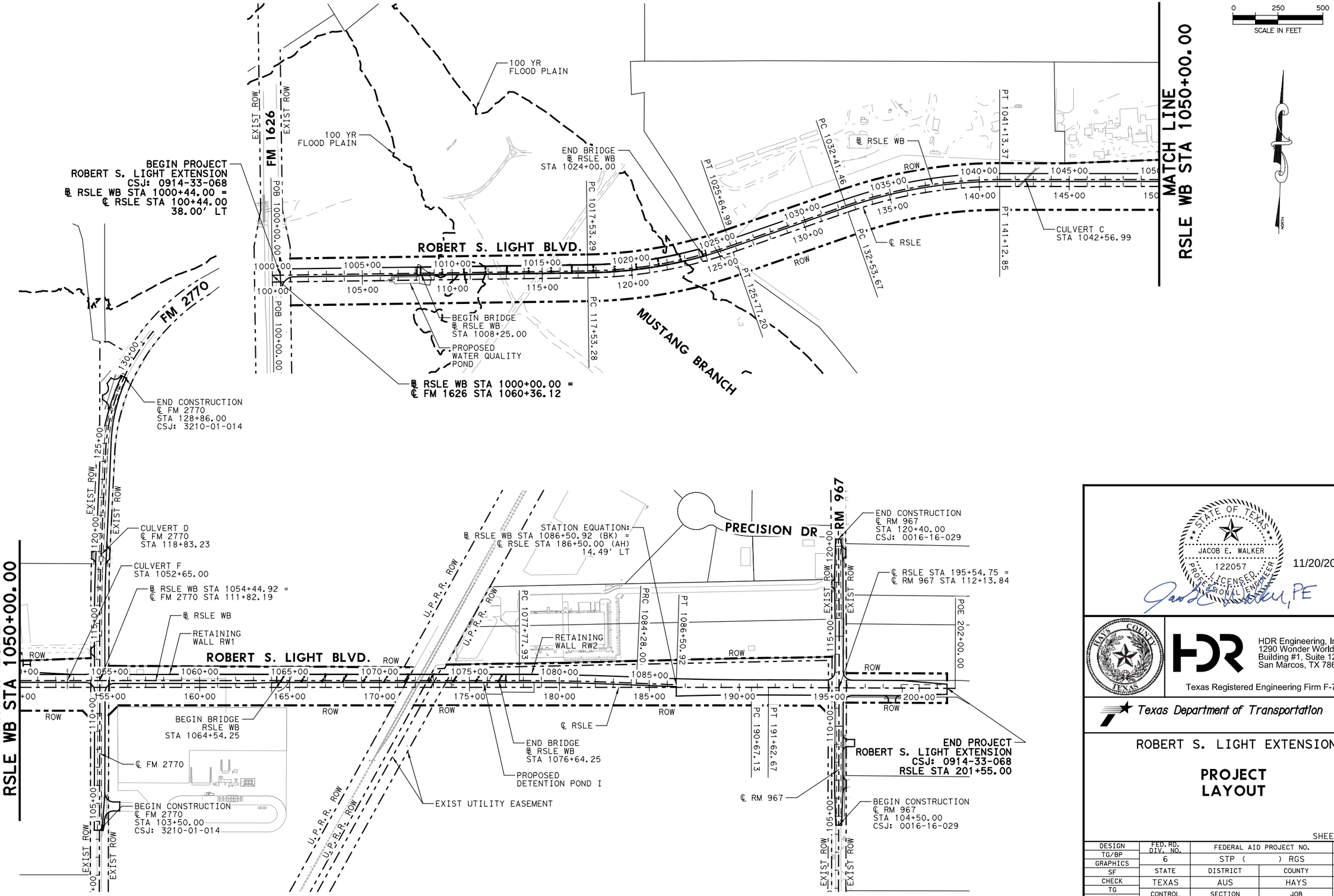
Place PCMS at time of LCN request. Place the PCMS at the expected end of queue caused by the closure. When the closure is active, revise the message to reflect the actual condition during the closure, such as "RIGHT LN CLOSED XXX FT".

Project Number: **Sheet:**
County: Hays **Control:** 0914-33-068, ETC.
Highway: CR

ITEM 6185 – TRUCK MOUNTED ATTENUATOR AND TRAILER ATTENUATOR
The TMA/TA used for installation/removal of traffic control for a work area will be subsidiary to the TMA/TA used to perform the work.

The contractor will be responsible for determining if one or more operations will be ongoing at the same time to determine the total number of TMA/TA required for the work. TMA/TAs paid by the day is full compensation for all worksite locations during an entire day.

TMA/TAs used to protect damaged attenuators will be paid by the day using the force account item for the repair.



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STATE OF TEXAS
JACOB E. WALKER
122057
LICENSED
PROFESSIONAL ENGINEER
11/20/2020

HAYS COUNTY TEXAS

HDR Engineering, Inc.
1290 Wonder World Drive
Building #1, Suite 1230
San Marcos, TX 78666-7969
Texas Registered Engineering Firm F-754

Texas Department of Transportation
℗ 2020

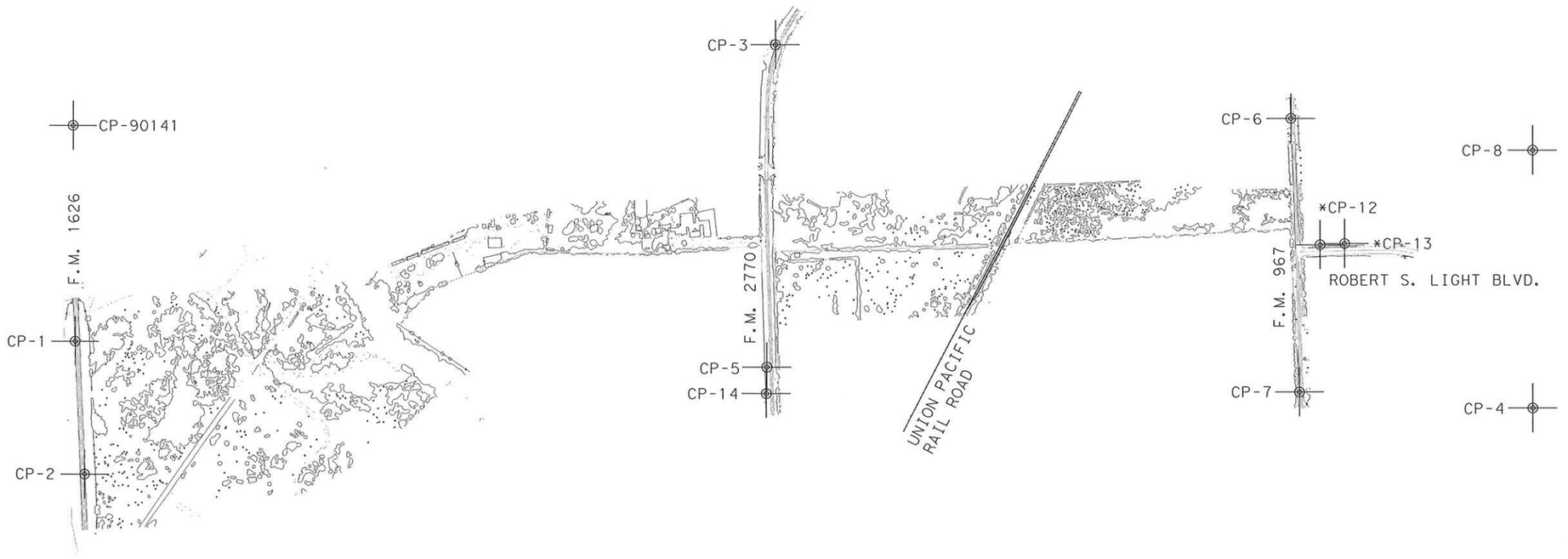
ROBERT S. LIGHT EXTENSION

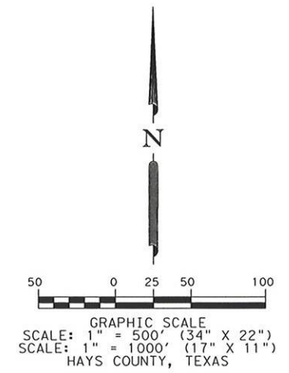
PROJECT LAYOUT

SHEET 1 OF 1

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
TG/BP	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
SF	TEXAS	AUS	HAYS	6
CHECK	CONTROL	SECTION	JOB	
TG	0914	33	068,ETC	
CHECK				
BP				

SURVEY CONTROL SHEET





PROJECT CONTROL - HORIZONTAL AND VERTICAL VALUES

PNT#	NORTHING	EASTING	ELEV.	DESCRIPTION
1	13938179.70	2324948.86	747.59'	MAG NAIL W/SHINER
2	13937151.62	2325024.43	726.53'	MAG NAIL W/SHINER
3	13940467.18	2330381.94	723.19'	MAG NAIL W/SHINER
4	13937653.61	2336262.83	736.26'	MAG NAIL W/SHINER
5	13937976.50	2330312.97	736.75'	MAG NAIL W/SHINER
6	13939893.06	2334386.92	737.71'	MAG NAIL W/SHINER
7	13937778.95	2334450.30	736.34'	MAG NAIL W/SHINER
8	13939647.77	2336264.31	761.08'	MAG NAIL W/SHINER
12	13938918.30	2334612.70	*	5/8"IR W/TXDOT ALUM. CAP
13	13938927.60	2334806.50	*	5/8"IR W/TXDOT ALUM. CAP
14	13937771.82	2330307.85	736.52'	5/8"IR W/TXDOT ALUM. CAP
90141	13939846.58	2324931.82	728.50'	TYPE II MONUMENT
90142	13932746.71	2324692.90	803.52'	5/8"IR W/TXDOT ALUM. CAP

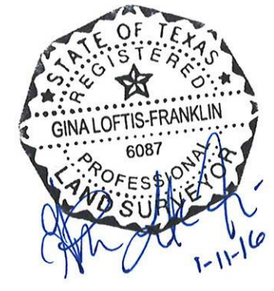
* SET IN AUGUST 2013 BUT HAVE BECOME UNUSABLE FOR POSITION DURING THE COURSE OF THE SURVEY.

CP-90142

NOTES:

1. ALL PROJECT COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, SOUTH CENTRAL ZONE, NAD 83(2011) (EPOCH 2010.00). THE VERTICAL DATUM UTILIZED IS NAVD88, GEOID MODEL 2012A. ALL COORDINATES SHOWN HEREON ARE ADJUSTED TO SURFACE BY MULTIPLYING BY A SURFACE ADJUSTMENT FACTOR OF 1.00011. UNITS: U.S. SURVEY FEET

BUDA BYPASS
HAYS COUNTY, TEXAS
SAM INC. JOB No. 33331
DATE: JANUARY 2014
FIELD BOOK No. 10508, 10908



Survey Date: JANUARY, 2014

SAM INC.
SURVEYING-AERIAL MAPPING-ENGINEERING
4801 Southwest Parkway
Building Two, Suite 100
Austin, Texas 78735
(512) 447-0575
Fax: (512) 326-3029
Texas Firm Registration No. 10064300

Texas Department of Transportation

CONTROL INDEX SHEET

FHWA TEXAS DIVISION	FEDERAL AID PROJECT NO.		SHEET NO.
			7
STATE	DISTRICT	COUNTY	
TEXAS		HAYS	
CONTROL	SECTION	JOB	HIGHWAY NO.
			BUDA BYPASS

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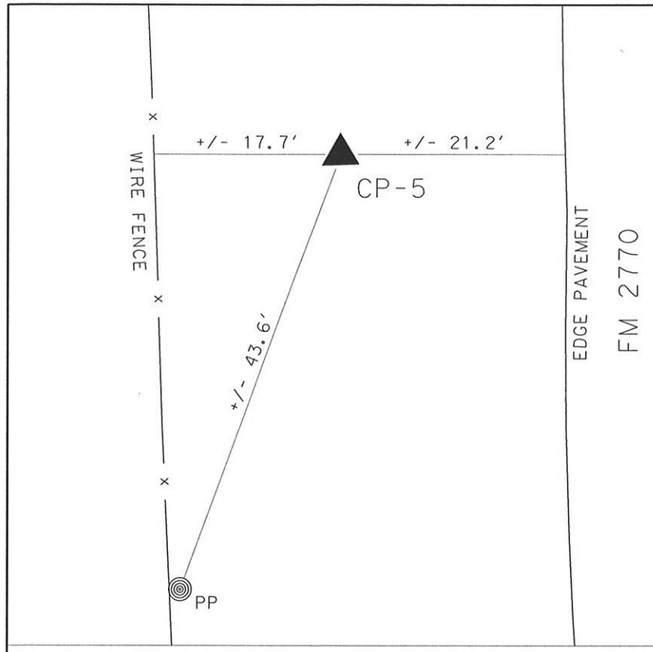
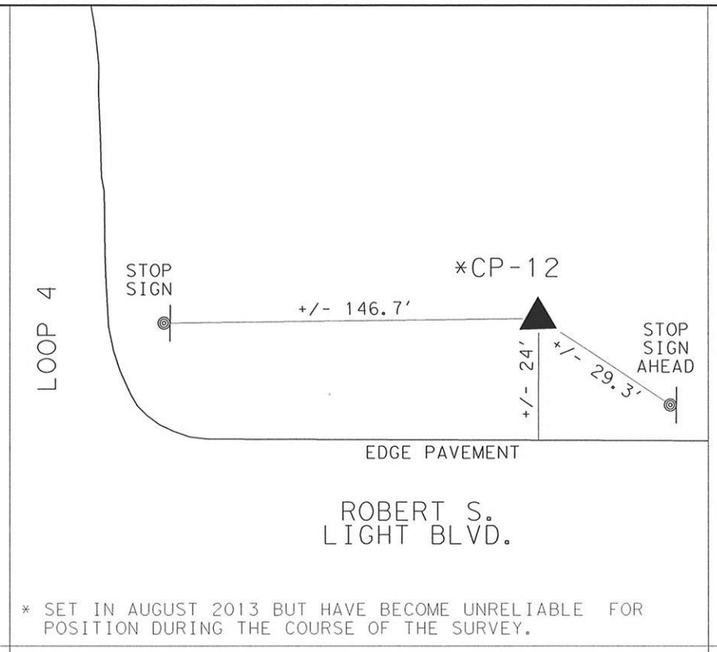
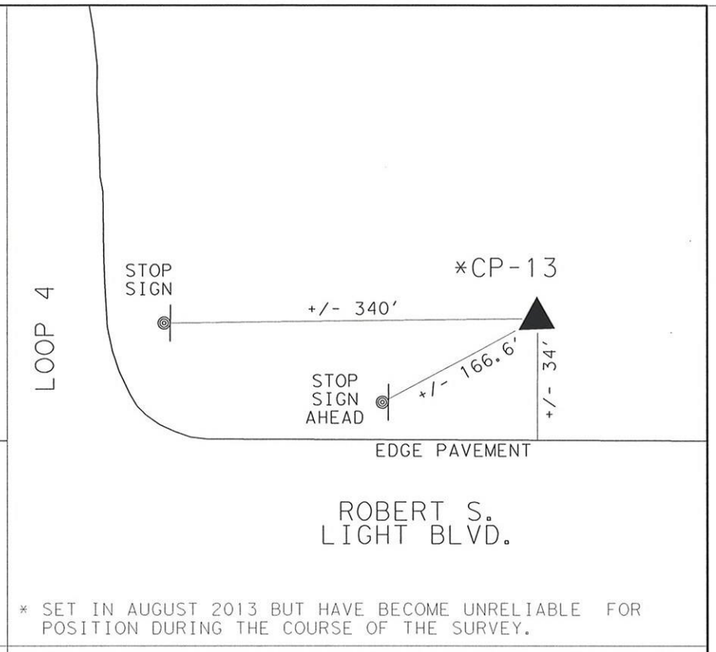


CP-5 IS A 5/8 INCH IRON ROD WITH TXDOT ALUMINUM CAP IN THE WEST ROW OF FM 2770 APPROXIMATELY 1770 FEET NORTH OF FM 132.



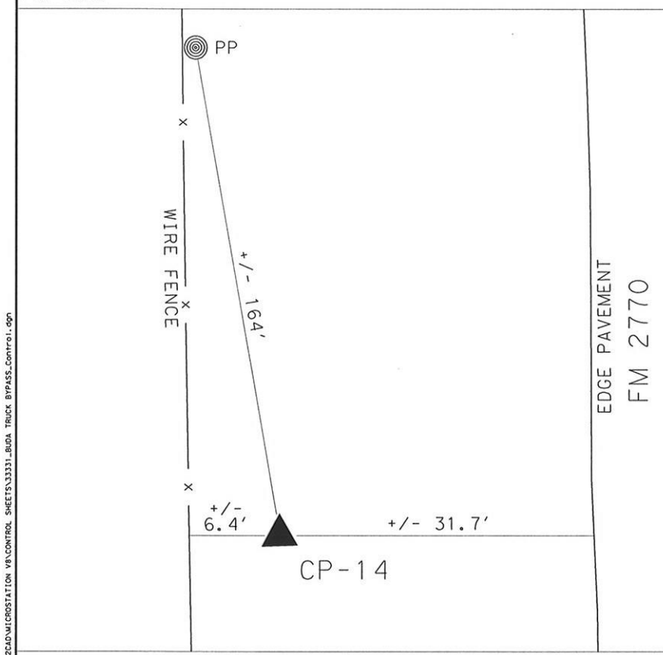
* SET IN AUGUST 2013 BUT HAVE BECOME UNRELIABLE FOR POSITION DURING THE COURSE OF THE SURVEY.

CP-12 IS A 5/8 INCH IRON ROD WITH TXDOT ALUMINUM CAP IN THE NORTH ROW OF ROBERT S. LIGHT BLVD. APPROXIMATELY 155 FEET EAST OF LOOP 4 NORTHBOUND EDGE OF PAVEMENT.

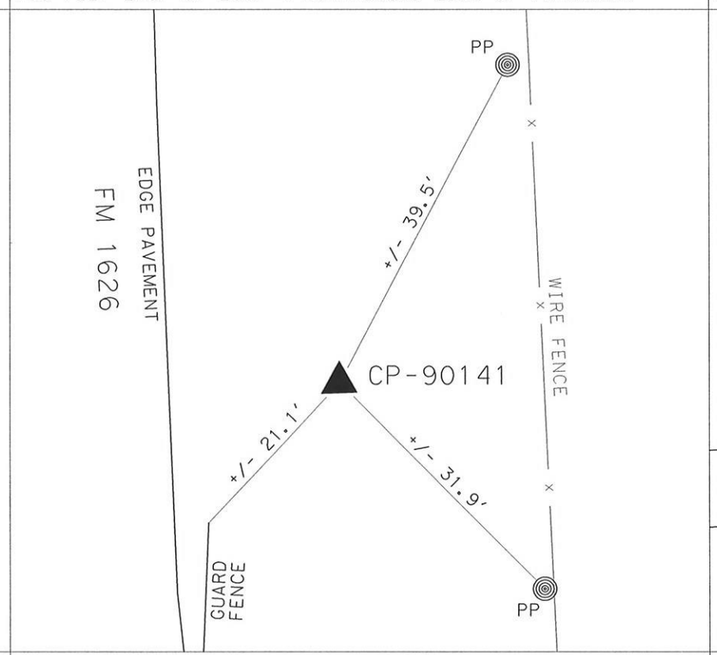


* SET IN AUGUST 2013 BUT HAVE BECOME UNRELIABLE FOR POSITION DURING THE COURSE OF THE SURVEY.

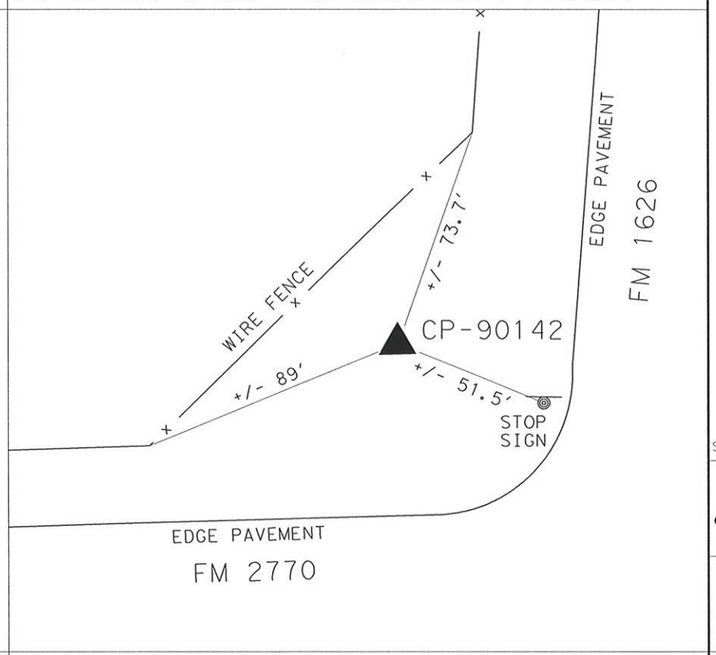
CP-13 IS A 5/8 INCH IRON ROD WITH TXDOT ALUMINUM CAP IN THE NORTH ROW OF ROBERT S. LIGHT BLVD. APPROXIMATELY 348 FEET EAST OF LOOP 4 NORTHBOUND EDGE OF PAVEMENT.



CP-14 IS A 5/8 INCH IRON ROD WITH TXDOT ALUMINUM CAP IN THE WEST ROW OF FM 2770 APPROXIMATELY 1566 FEET NORTH OF FM 132.



CP-90141 IS A TXDOT TYPE II CONCRETE MONUMENT IN THE EAST ROW OF FM 1626 APPROXIMATELY 3775 FEET SOUTH OF COLE SPRINGS ROAD (FM 148).



CP-90142 IS A 5/8 INCH IRON ROD WITH TXDOT ALUMINUM CAP IN THE NORTHWEST QUADRANT OF THE INTERSECTION OF FM 1626 AND FM 2770.

NOTES:

1. ALL PROJECT COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, SOUTH CENTRAL ZONE, NAD 83(2011) (EPOCH 2010.00). THE VERTICAL DATUM UTILIZED IS NAVD88, GEOID MODEL 2012A. ALL COORDINATES SHOWN HEREON ARE ADJUSTED TO SURFACE BY MULTIPLYING BY A SURFACE ADJUSTMENT FACTOR OF 1.00011. UNITS: U.S. SURVEY FEET

BUDA BYPASS
HAYS COUNTY, TEXAS
SAM INC. JOB No. 33331
DATE: JANUARY 2014
FIELD BOOK No. 10508, 10908

N

STATE OF TEXAS REGISTERED GINA LOFTIS-FRANKLIN 6087 PROFESSIONAL LAND SURVEYOR

1-11-16

Survey Date: JANUARY, 2014

SAM INC. SURVEYING · AERIAL MAPPING · ENGINEERING
4801 Southwest Parkway
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Fax: (512) 326-3029
Texas Firm Registration No. 10064300

Texas Department of Transportation

HORIZONTAL & VERTICAL CONTROL SHEET

FHWA TEXAS DIVISION	FEDERAL AID PROJECT NO.		SHEET NO.
			8
STATE	DISTRICT	COUNTY	
TEXAS		HAYS	
CONTROL	SECTION	JOB	HIGHWAY NO.
			BUDA BYPASS

TIME:9:54:31 AM
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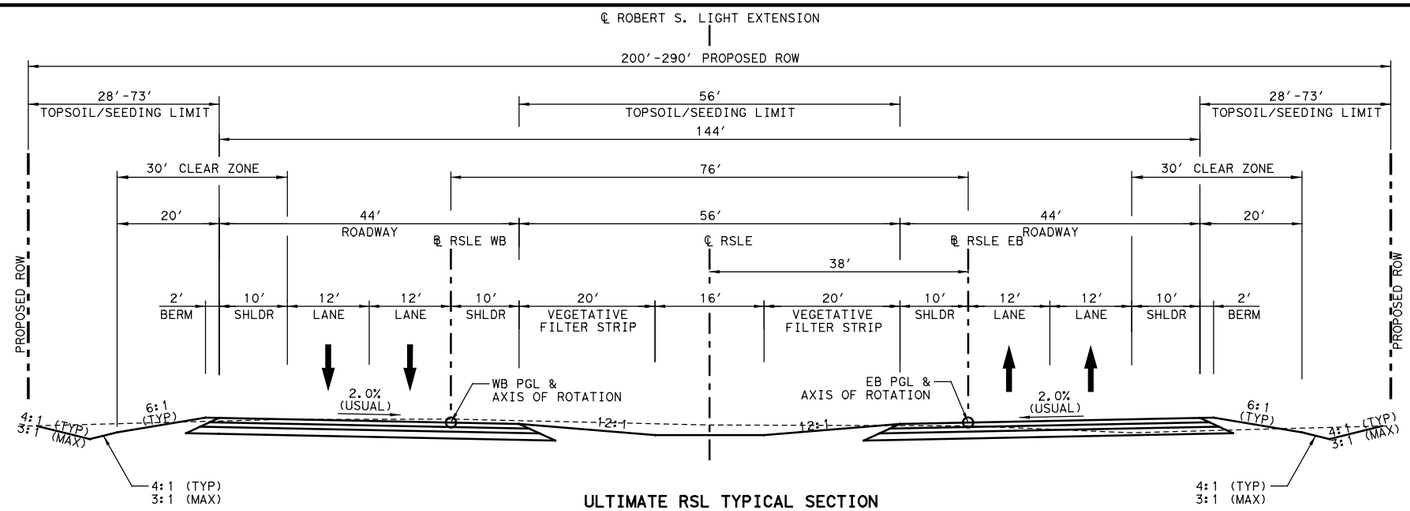
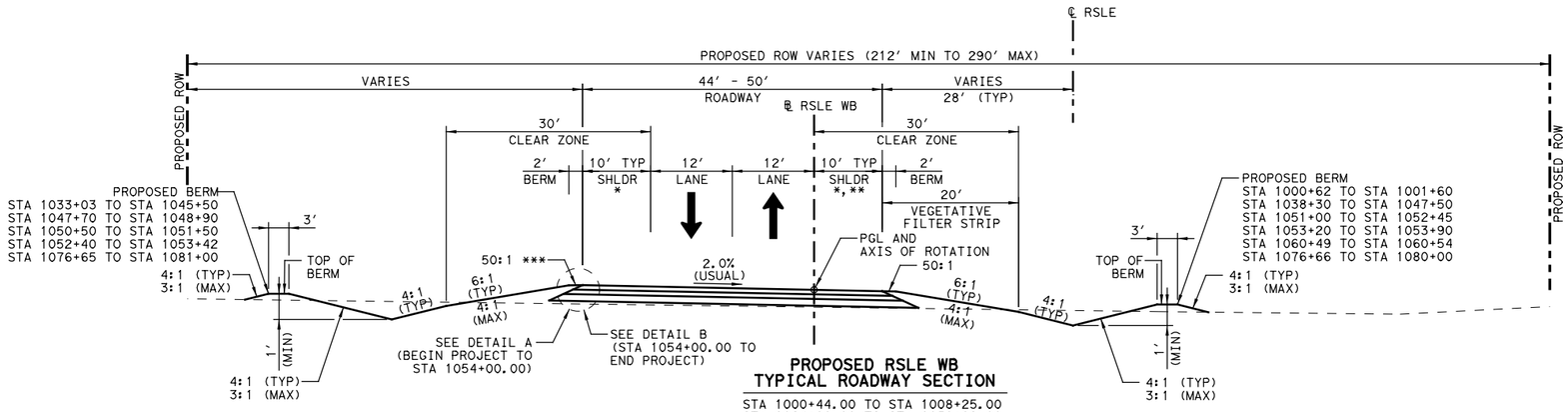


ULTIMATE RSL TYPICAL SECTION

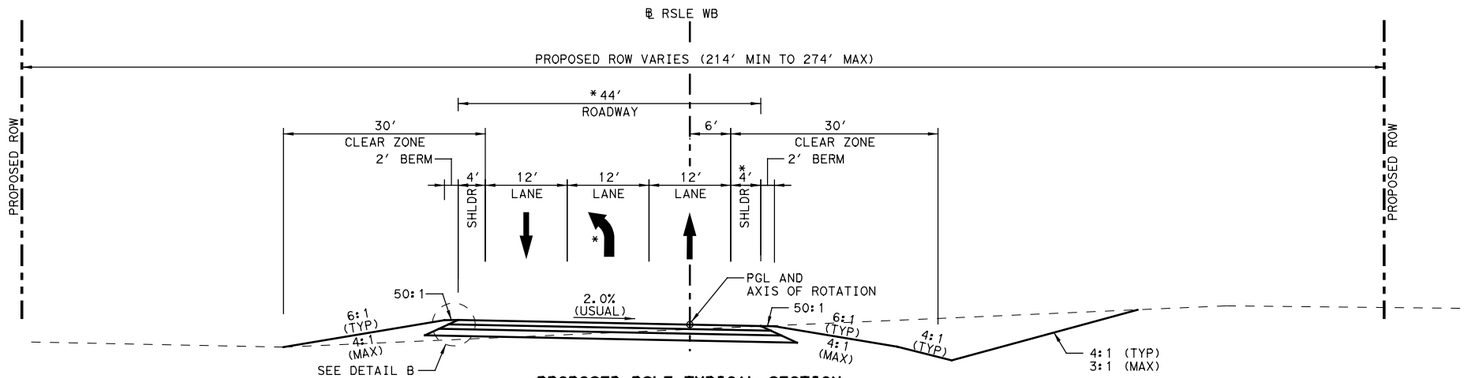


PROPOSED RSLE WB TYPICAL ROADWAY SECTION

STA 1000+44.00 TO STA 1008+25.00
STA 1024+00.00 TO STA 1050+81.00
STA 1058+08.00 TO STA 1064+29.00
STA 1077+03.00 TO STA 1086+51.00

* 4' SHOULDER FROM STA 1049+31.00 TO STA 1050+81.00
** 16' SHOULDER FROM STA 1061+38.00 TO 1064+29.00
*** RETAINING WALL FROM STA 1058+30.00 TO STA 1065+09.00
RETAINING WALL FROM STA 1076+39.61 TO STA 1081+00.00

NOTE:
RSLE WB BRIDGE FROM STA 1008+25.00 TO STA 1024+00.00
AND FROM STA 1064+54.25 TO STA 1076+64.25

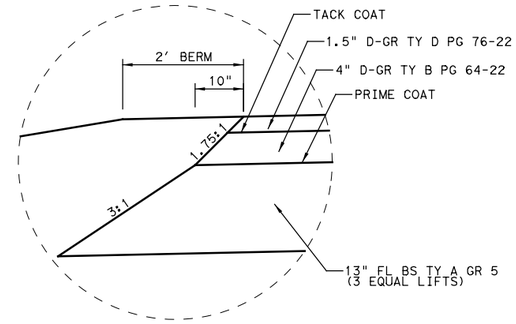


PROPOSED RSLE TYPICAL SECTION

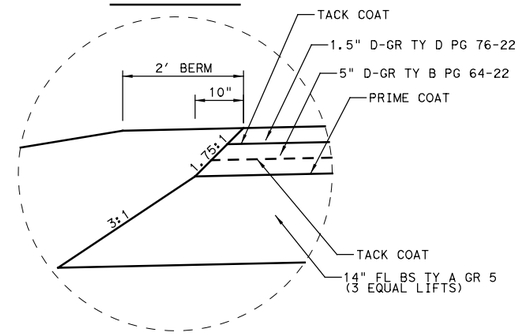
STA 1050+81.00 TO STA 1053+96.00

* STA 1054+93.00 TO STA 1058+08.00

* ◤, 50' ROADWAY, 10' SHOULDER



DETAIL A



DETAIL B

NOTE:
1. SEE TE(HMAC)-11 STANDARD FOR PAVEMENT EDGES AND TAPERS.
2. SEE GEOTECHNICAL ENGINEERING REPORT BY PAVETEX ENGINEERING & TESTING, INC. FOR PAVEMENT RECOMMENDATIONS AND GENERAL SUBSURFACE CONDITIONS.
3. SEE HORIZONTAL ALIGNMENT DATA SHEET FOR SUPERELEVATION TABLE SHOWING THE ACTUAL SUPERELEVATION TRANSITION RATES AND LOCATIONS.
4. LIME FOR STABILIZATION AS DETERMINED IN THE FIELD BY THE ENGINEER AS NECESSARY.

STATE OF TEXAS
JACOB E. WALKER
122057
LICENSED PROFESSIONAL ENGINEER
12/14/2020
Jacob E. Walker, PE

HAYS COUNTY TEXAS

HDR Engineering, Inc.
1290 Wonder World Drive
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San Marcos, TX 78666-7969
Texas Registered Engineering Firm F-754

Texas Department of Transportation
℗ 2020

ROBERT S. LIGHT EXTENSION

ROADWAY TYPICAL SECTIONS

SHEET 1 OF 4

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
TG/BP	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TG	TEXAS	AUS	HAYS	9
CHECK	CONTROL	SECTION	JOB	
SF	0914	33	068,ETC	
CHECK				
BP				

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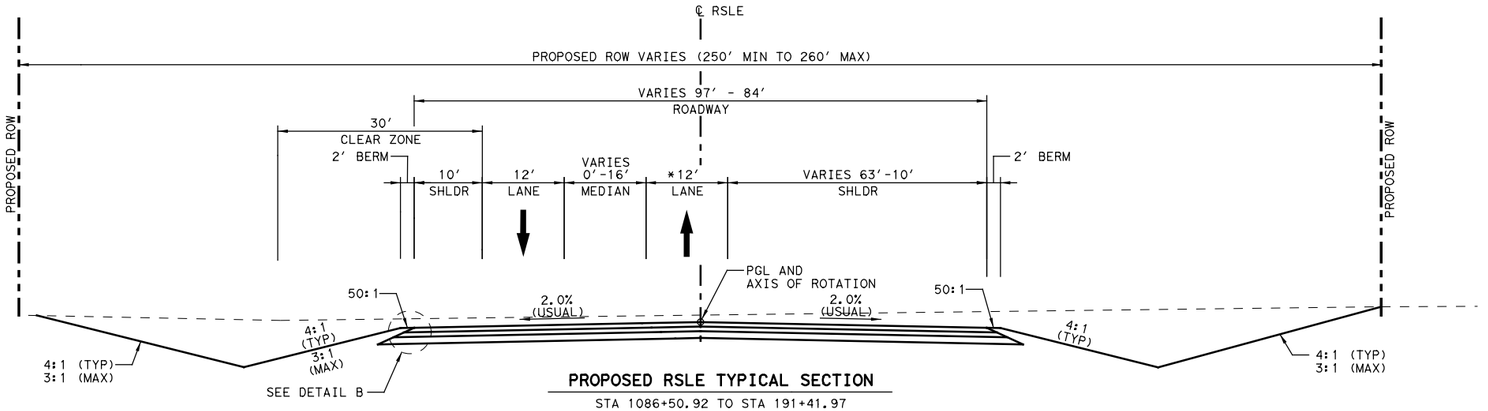
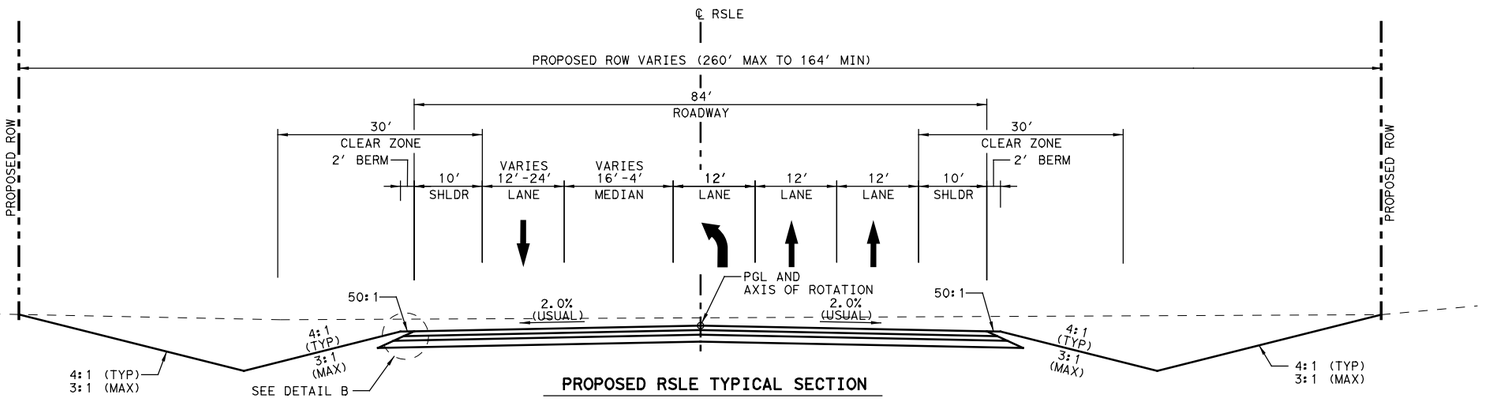


PROPOSED RSLE TYPICAL SECTION

STA 1086+50.92 TO STA 191+41.97

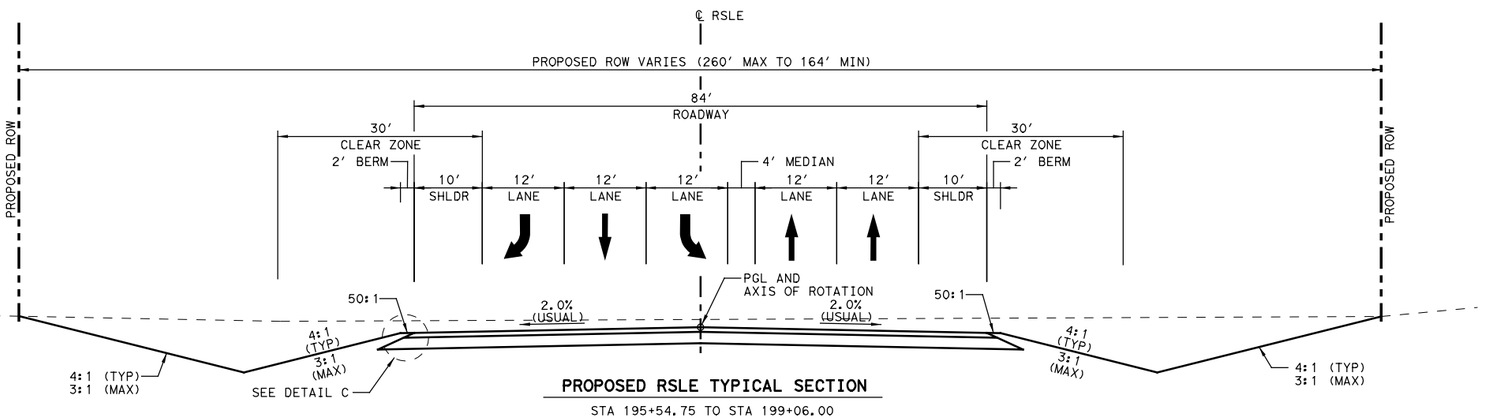
* LANE VARIES FROM 12′ TO 36′ STA 188+99.76 TO STA 191+41.97

STATION EQUATION:
℄ RSLE WB STA 1086+50.92 (BK) =
℄ RSLE STA 186+50.00 (AH)



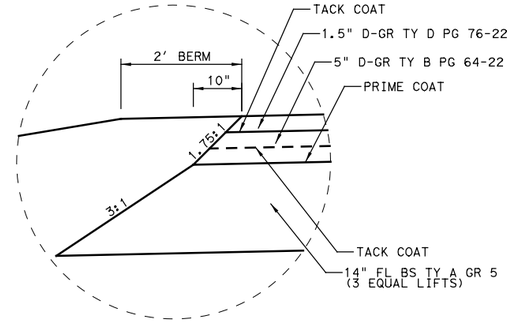
PROPOSED RSLE TYPICAL SECTION

STA 191+41.97 TO STA 195+54.75



PROPOSED RSLE TYPICAL SECTION

STA 195+54.75 TO STA 199+06.00



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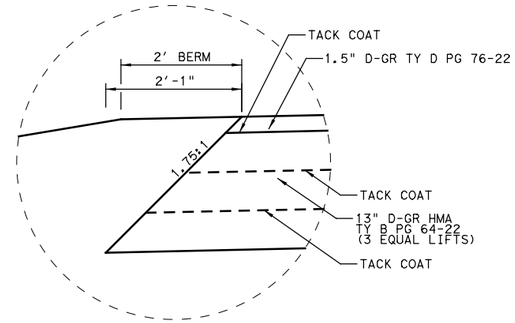

DETAIL C

NOTE:

1. SEE TE(HMAC)-11 STANDARD FOR PAVEMENT EDGES AND TAPERS.
2. SEE GEOTECHNICAL ENGINEERING REPORT BY PAVETEX ENGINEERING & TESTING, INC. FOR PAVEMENT RECOMMENDATIONS AND GENERAL SUBSURFACE CONDITIONS.
3. SEE HORIZONTAL ALIGNMENT DATA SHEET FOR SUPERELEVATION TABLE SHOWING THE ACTUAL SUPERELEVATION TRANSITION RATES AND LOCATIONS.
4. LIME FOR STABILIZATION AS DETERMINED IN THE FIELD BY THE ENGINEER AS NECESSARY.

STATE OF TEXAS
JACOB E. WALKER
122057
LICENSED
PROFESSIONAL ENGINEER

12/14/2020

HDR Engineering, Inc.
1290 Wonder World Drive
Building #1, Suite 1230
San Marcos, TX 78666-7969
Texas Registered Engineering Firm F-754

Texas Department of Transportation

ROBERT S. LIGHT EXTENSION

ROADWAY TYPICAL SECTIONS

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
TG/BP	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TG	TEXAS	AUS	HAYS	10
CHECK	CONTROL	SECTION	JOB	
SF	0914	33	068,ETC	
CHECK				
BP				

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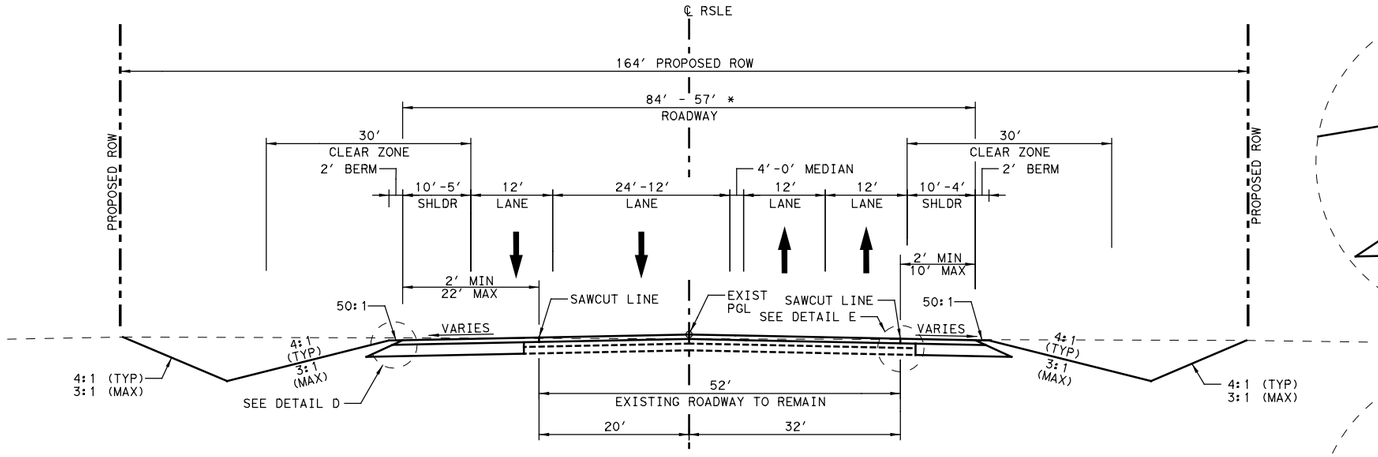
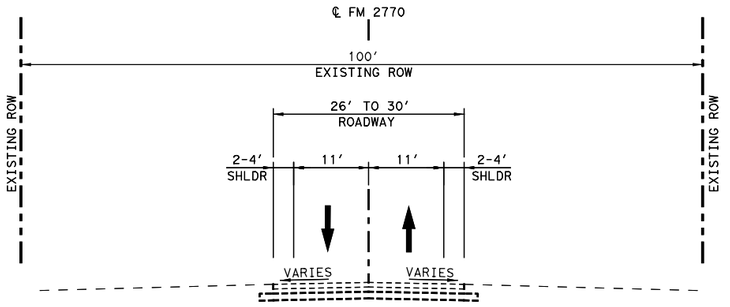


PROPOSED RSLE TYPICAL SECTION

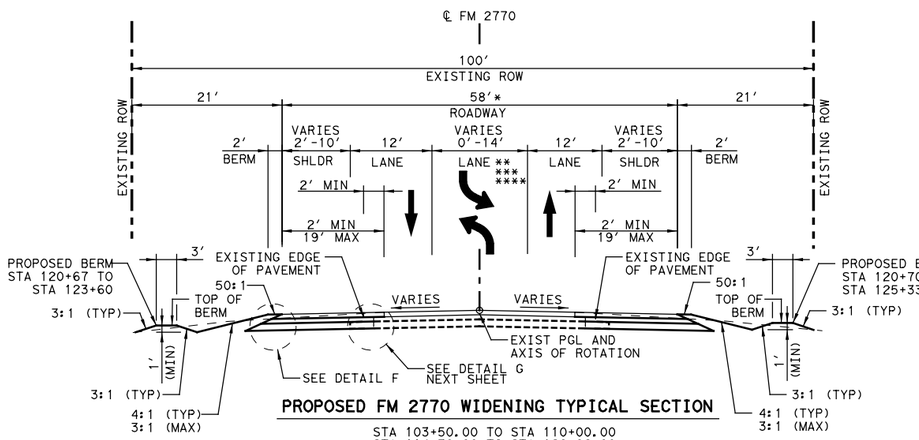
STA 199+06.00 TO STA 201+55.00

* STA 199+06.00 TO STA 201+55.00 ROAD TRANSITION 84′ TO 57′



EXISTING FM 2770 TYPICAL SECTION

STA 103+50.00 TO STA 128+86.00



PROPOSED FM 2770 WIDENING TYPICAL SECTION

STA 103+50.00 TO STA 110+00.00

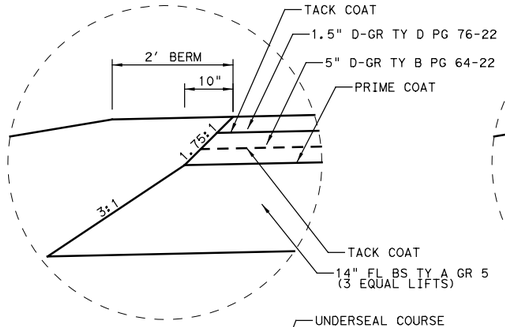
STA 114+30.00 TO STA 128+86.00

* STA 103+50.00 TO STA 105+45.00 ROAD TRANSITION 28′ TO 58′
STA 123+75.09 TO STA 128+86.00 ROAD TRANSITION 58′ TO 28′

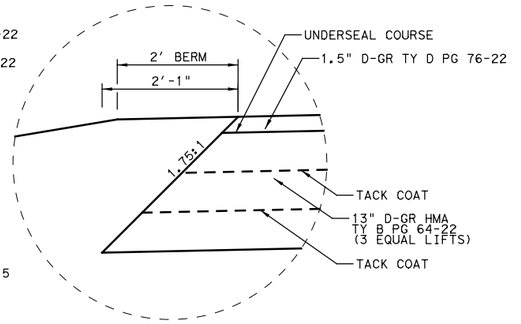
** LEFT TURN ONLY LANE FROM STA 106+45.00 TO STA 110+00.00

*** 0-14′ MEDIAN AT STATIONS 103+50.00 TO STA 106+45.00
AND STA 116+50.00 TO STA 117+35.00 AND STA 124+15.00
TO STA 126+14.30.

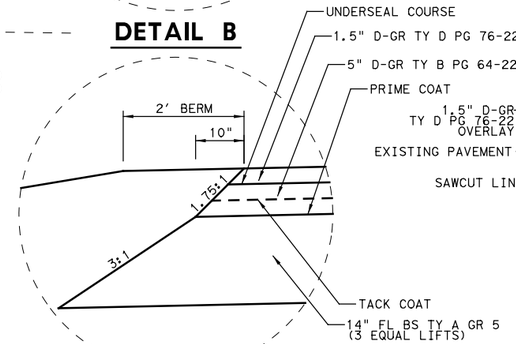
**** TWO-WAY LEFT TURN LANE FROM STA 117+35.00 TO
STA 124+15.00.



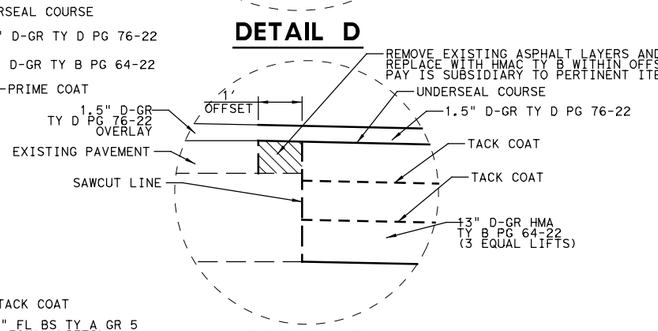
DETAIL B



DETAIL D



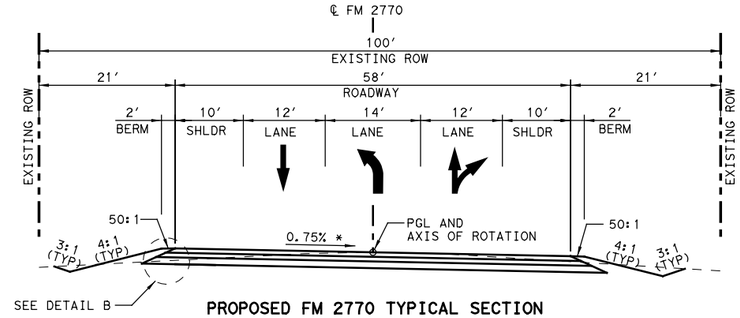
DETAIL F



DETAIL E

NOTE:

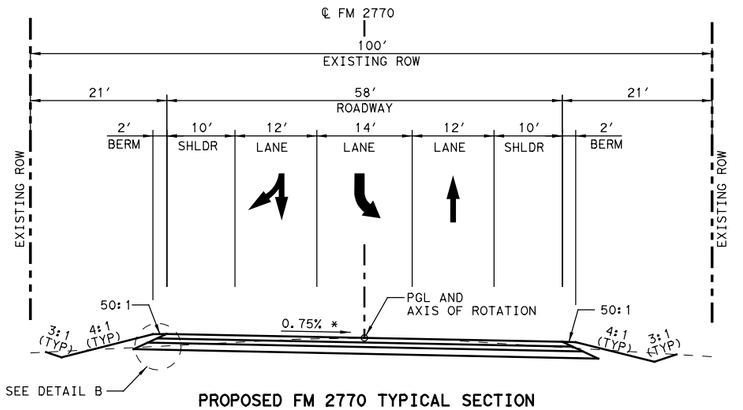
1. SEE TE(HMAC)-11 STANDARD FOR PAVEMENT EDGES AND TAPERS.
2. SEE GEOTECHNICAL ENGINEERING REPORT BY PAVETEX ENGINEERING & TESTING, INC. FOR PAVEMENT RECOMMENDATIONS AND GENERAL SUBSURFACE CONDITIONS.
3. SEE HORIZONTAL ALIGNMENT DATA SHEET FOR SUPERELEVATION TABLE SHOWING THE ACTUAL SUPERELEVATION TRANSITION RATES AND LOCATIONS.
4. LIME FOR STABILIZATION AS DETERMINED IN THE FIELD BY THE ENGINEER AS NECESSARY.
5. PROPOSED PAVEMENT DEPTH FOR WIDENING SECTIONS MAY BE ADJUSTED TO MATCH THE EXISTING AND AVOID ISSUES WITH EXISTING PAVEMENT SUBGRADE.



PROPOSED FM 2770 TYPICAL SECTION

STA 110+00.00 TO STA 111+50.00

* SEE FM 2770 INTERSECTION LAYOUT FOR ADDITIONAL DETAIL



PROPOSED FM 2770 TYPICAL SECTION

STA 112+40.00 TO STA 116+50.00

* SEE FM 2770 INTERSECTION LAYOUT FOR ADDITIONAL DETAIL

STATE OF TEXAS
JACOB E. WALKER
122057
PROFESSIONAL ENGINEER
LICENSED
12/14/2020

HAYS COUNTY TEXAS

HDR Engineering, Inc.
1290 Wonder World Drive
Building #1, Suite 1230
San Marcos, TX 78666-7969
Texas Registered Engineering Firm F-754

Texas Department of Transportation

ROBERT S. LIGHT EXTENSION

ROADWAY TYPICAL SECTIONS

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
TG/BP	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TG	TEXAS	AUS	HAYS	11
CHECK	CONTROL	SECTION	JOB	
SF	0914	33	068,ETC	
CHECK				
BP				

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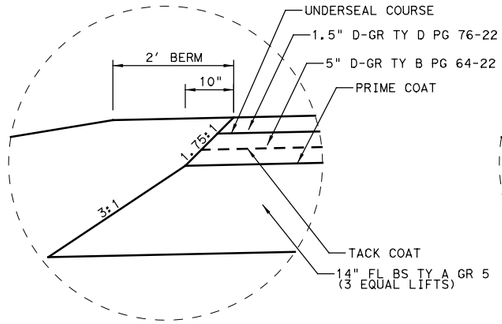
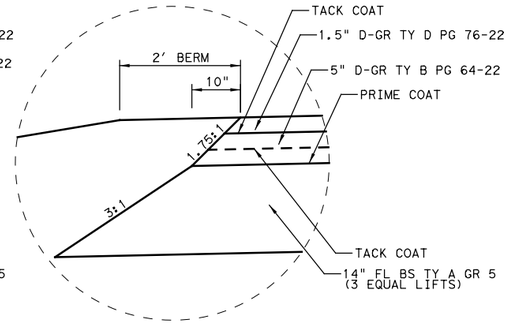
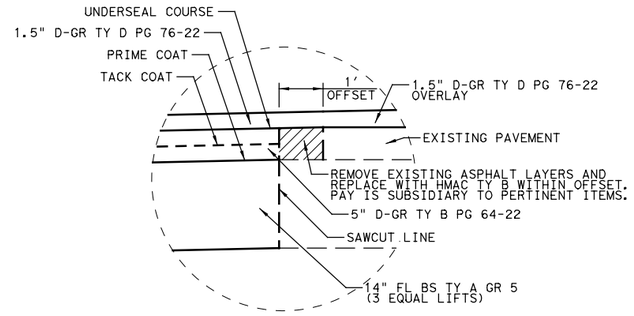


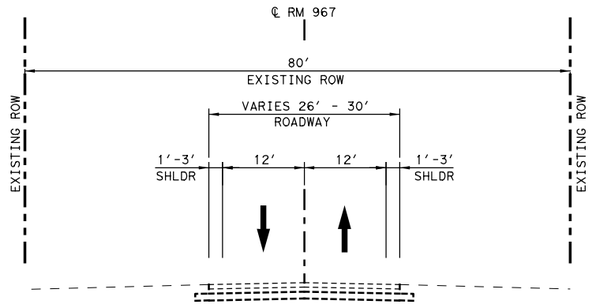
DETAIL F



DETAIL B

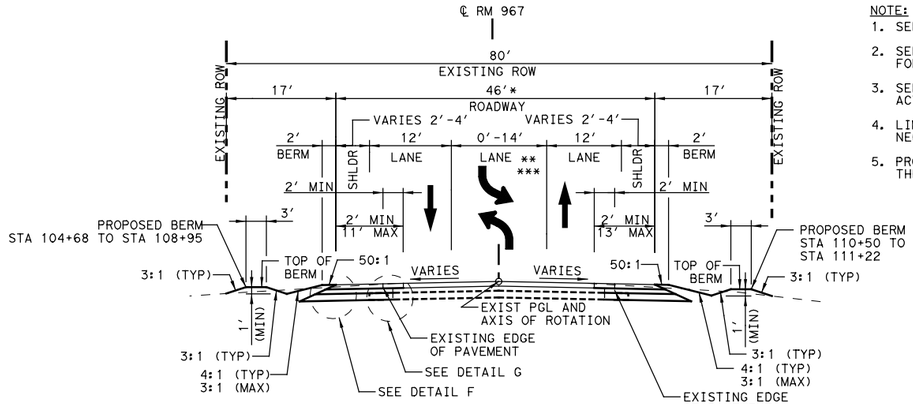


DETAIL G



EXISTING RM 967 TYPICAL SECTION

STA 104+50.00 TO STA 120+40.00

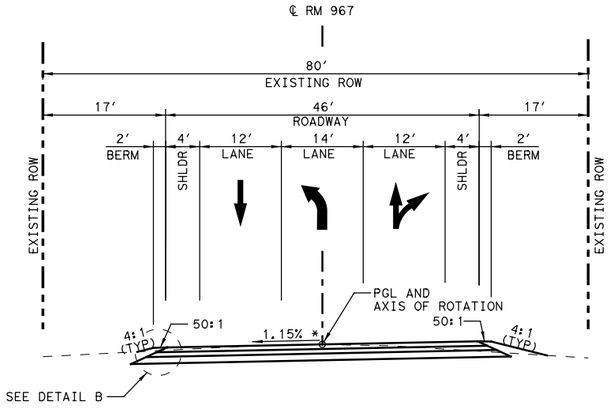


PROPOSED RM 967 WIDENING TYPICAL SECTION

STA 104+50.00 TO STA 110+00.00
STA 116+00.00 TO STA 120+40.00

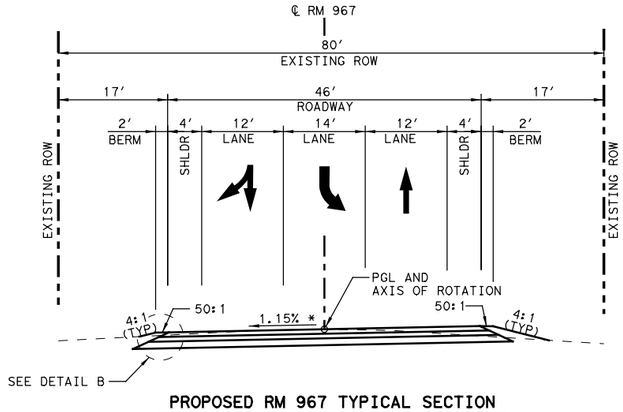
* STA 104+50.00 TO STA 106+43.00 ROAD TRANSITION 28' TO 46'
STA 118+46.00 TO STA 120+40.00 ROAD TRANSITION 46' TO 28'
** LEFT TURN ONLY LANE FROM STA 107+42.00 TO STA 110+00.00
AND FROM STA 116+00.00 TO STA 117+46.00
*** 0-14' MEDIAN AT STATIONS 104+50.00 TO STA 107+41.78
AND STA 117+46.00 TO STA 120+40.00

NOTE:
1. SEE TE(HMAC)-11 STANDARD FOR PAVEMENT EDGES AND TAPERS.
2. SEE GEOTECHNICAL ENGINEERING REPORT BY PAVETEX ENGINEERING & TESTING, INC. FOR PAVEMENT RECOMMENDATIONS AND GENERAL SUBSURFACE CONDITIONS.
3. SEE HORIZONTAL ALIGNMENT DATA SHEET FOR SUPERELEVATION TABLE SHOWING THE ACTUAL SUPERELEVATION TRANSITION RATES AND LOCATIONS.
4. LIME FOR STABILIZATION AS DETERMINED IN THE FIELD BY THE ENGINEER AS NECESSARY.
5. PROPOSED PAVEMENT DEPTH FOR WIDENING SECTIONS MAY BE ADJUSTED TO MATCH THE EXISTING AND AVOID ISSUES WITH EXISTING PAVEMENT SUBGRADE.



PROPOSED RM 967 TYPICAL SECTION

STA 110+00.00 TO STA 111+52.00
* SEE RM 967 INTERSECTION LAYOUT FOR ADDITIONAL DETAIL



PROPOSED RM 967 TYPICAL SECTION

STA 112+76.00 TO STA 116+00.00
* SEE RM 967 INTERSECTION LAYOUT FOR ADDITIONAL DETAIL

STATE OF TEXAS
JACOB E. WALKER
122057
LICENSED
PROFESSIONAL ENGINEER
12/14/2020

HAYS COUNTY TEXAS

HDR Engineering, Inc.
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Texas Registered Engineering Firm F-754

Texas Department of Transportation

ROBERT S. LIGHT EXTENSION

ROADWAY TYPICAL SECTIONS

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
TG/BP	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TG	TEXAS	AUS	HAYS	12
CHECK	CONTROL	SECTION	JOB	
SF	0914	33	068,ETC	
CHECK				
BP				

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PENTABLE: 000000000214615.tbl
DATE: 12/14/2020
TIME: 3:15:40 PM
SCALE: NTS

SUMMARY OF TRAFFIC CONTROL QUANTITIES

SHEET NO.	508 6001	510-6001	512-6009	512-6033	512-6057	512-6010	512-6034	512-6058	662-6001	662-6004
	CONSTRUCTING DETOURS	ONE-WAY TRAF CONT (FLAGGER)	PORT CTB (FUR & INST) (LOW PROF) (TY 1)	PORT CTB (MOV) (LOW PROF) (TY 1)	PORT CTB (REMOV) (LOW PROF) (TY 1)	PORT CTB (FUR & INST) (LOW PROF) (TY 2)	PORT CTB (FUR & INST) (MOV) (TY 2)	PORT CTB (FUR & INST) (REMOV) (TY 2)	WK ZN PAV MRK NON-REMOV (W) 4" (BRK)	WK ZN PAV MRK NON-REMOV (W) 4" (SLD)
	SY	HR	LF	LF	LF	LF	LF	LF	LF	LF
TCP SHEETS										
PHASE I - STEP 1										
SHEET 1 OF 4										
SHEET 2 OF 4										
SHEET 3 OF 4										
SHEET 4 OF 4										
PHASE 1 - STEP 2										
SHEET 1 OF 1	4,461	24								
PHASE II - STEP 1										
SHEET 1 OF 2	273	16	700			20				
SHEET 2 OF 2		16	200	700			20			
PHASE II - STEP 2										
SHEET 1 OF 3	644	6								
SHEET 2 OF 3	405	6	180	900		180		80	210	1,720
SHEET 3 OF 3			100				20	20		
PHASE II - STEP 3										
SHEET 1 OF 3		4					20			
SHEET 2 OF 3		4	520	1,180						
SHEET 3 OF 3			160				60			
PHASE III - STEP 1										
SHEET 1 OF 1	3,495	16								
PHASE III - STEP 2										
SHEET 1 OF 3	359	4		60			20			
SHEET 2 OF 3	488	4	140	1,800			40			
SHEET 3 OF 3			680		280		20			
PHASE III - STEP 3										
SHEET 1 OF 3				60	60		20	20		
SHEET 2 OF 3		4		1,860	1,860		40	40		
SHEET 3 OF 3		4		480	480		40	40		
PHASE IV - STEP 1										
TOTAL	**10,125**	**108**	**2,680**	**7,040**	**2,680**	**200**	**300**	**200**	**210**	**1,720**

(1) FOR CONTRACTOR'S INFORMATION ONLY. SUBSIDIARY TO VARIOUS BID ITEMS.

SHEET NO.	662-6017	662-6029	662-6034	662 6063	662 6075	662 6095	677 6001	6001 6002	6185-6002	6185-6003
	WK ZN PAV MRK NON-REMOV (W) (ARROW)	WK ZN PAV MRK NON-REMOV (W) (WORD)	WK ZN PAV MRK NON-REMOV (Y) 4" (SLD)	WK ZN PAV MRK REMOV (W) 4" (SLD)	WK ZN PAV MRK REMOV (W) 24" (SLD)	WK ZN PAV MRK REMOV (Y) 4" (SLD)	ELIM EXT PAV MRK & MRKS (4")	PORTABLE CHANGEABLE MESSAGE SIGN	TMA (STATIONARY)	TMA (MOBILE OPERATION)
	LF	LF	LF	LF	LF	LF	LF	EA	DAY	HR
TCP SHEETS										
PHASE I - STEP 1										
SHEET 1 OF 4										
SHEET 2 OF 4										
SHEET 3 OF 4										
SHEET 4 OF 4										
PHASE 1 - STEP 2										
SHEET 1 OF 1									10	
PHASE II - STEP 1										
SHEET 1 OF 2				2,190	12	2,190	2,610	2		
SHEET 2 OF 2				2,190	12	2,190				
PHASE II - STEP 2										
SHEET 1 OF 3				980		980	1,870			
SHEET 2 OF 3	4	2	1,126	3,400		3,100	5,100			
SHEET 3 OF 3				1,360		1,360	2,040			
PHASE II - STEP 3										
SHEET 1 OF 3				980		980				
SHEET 2 OF 3				3,240		3,080				
SHEET 3 OF 3				1,350		1,350				
PHASE III - STEP 1										
SHEET 1 OF 1									10	
PHASE III - STEP 2										
SHEET 1 OF 3				790		790	1,455			
SHEET 2 OF 3				4,110		4,110	2,025			
SHEET 3 OF 3				2,200		2,200	3,300			
PHASE III - STEP 3										
SHEET 1 OF 3				790		790				
SHEET 2 OF 3				4,110		4,110				
SHEET 3 OF 3				2,200		2,200				
PHASE IV - STEP 1										24
TOTAL	**4**	**2**	**1,126**	**29,890**	**24**	**29,430**	**18,400**	**2**	**20**	**24**

(1) FOR CONTRACTOR'S INFORMATION ONLY. SUBSIDIARY TO VARIOUS BID ITEMS.

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USER: DATE: 12/8/2020 TIME: 2:56:33 PM SCALE: $SCALESHORT$
FILE: c:\proj\techwise\jarodriguez\d0786330\RSLE_TCP_SUMMARY.dgn

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY
TBPE FIRM REGISTRATION NO. 2614

Texas Department of Transportation
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ROBERT S. LIGHT EXTENSION

ROBERT S. LIGHT TRAFFIC CONTROL PLAN SUMMARY

SHEET 1 OF 1

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	AUS	HAYS	13
CHECK	CONTROL	SECTION	JOB	
	0914	33	068,etc	

RSLE - REMOVALS

LOCATION	100 6002	104 6017	105 6039	105 6074	354 6051	496 6004	496 6007	496 6039	496 6043	550 6006
	PREPARING ROW	REMOVING CONC (DRIVEWAYS)	REMOVE STAB BASE AND ASPH PAV (6"-20")	REMOVING STAB BASE AND ASPH PAV (4")	PLANE ASPH CONC PAV (0" TO 1 1/2")	REMOV STR (SET)	REMOV STR (PIPE)	REMOV STR (BUILDING)	REMOV STR (SMALL FENCE)	GATE (REMOVE)
	STA	SY	SY	SY	SY	EA	LF	EA	LF	EA
RSLE-WB										
SHEET 1 OF 1	101	238	2,374	38	1,439	2	59	1	1,242	3
SUB TOTALS	**101**	**238**	**2,374**	**38**	**1,439**	**2**	**59**	**1**	**1,242**	**3**

FM 2770 - REMOVALS

LOCATION	100 6002	105 6039	354 6051	496 6004	496 6007	496 6043
	PREPARING ROW	REMOVE STAB BASE AND ASPH PAV (6"-20")	PLANE ASPH CONC PAV (0" TO 1 1/2")	REMOV STR (SET)	REMOV STR (PIPE)	REMOV STR (SMALL FENCE)
	STA	SY	SY	EA	LF	LF
FM 2770						
SHEET 1 OF 3	8	2,224	1,517	2	8	611
SHEET 2 OF 3	10	1,538	2,147	4	199	-
SHEET 3 OF 3	5	1,192	1,250	-	-	-
SUB TOTALS	**23**	**4,954**	**4,914**	**6**	**207**	**611**

RM 967 - REMOVALS

LOCATION	100 6002	104 6017	105 6039	354 6051	496 6004	496 6007	496 6043
	PREPARING ROW	REMOVING CONC (DRIVEWAYS)	REMOVE STAB BASE AND ASPH PAV (6"-20")	PLANE ASPH CONC PAV (0" TO 1 1/2")	REMOV STR (SET)	REMOV STR (PIPE)	REMOV STR (SMALL FENCE)
	STA	SY	SY	SY	EA	LF	LF
RM 967							
SHEET 1 OF 2	7	520	1,612	1,467	4	133	302
SHEET 2 OF 2	6	140	1,315	1,151	4	188	37
SUB TOTALS	**13**	**660**	**2,927**	**2,618**	**8**	**321**	**339**

HDR Engineering, Inc.
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Texas Registered Engineering Firm F-754

Texas Department of Transportation

ROBERT S. LIGHT EXTENSION

REMOVALS SUMMARY

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	14
	0914	33	068, ETC	

RSLE - ROADWAY

LOCATION	110 6001	132 6047	134 6001	247 6366	260 6027 (1)	260 6043 (1)	310 6001	310 6013	432 6045	530 6004	540 6001	540 6006	544 6001	3076 6001	3076 6050	3076 6066	3085 6001
	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL) (ORD COMP) (TY C1)	BACKFILL (TY A)	FL BS (CMP IN PLC) (TY A GR 5) (FNAL POS)	LIME TRT (EXST MATL) (8")	LIME (HYD, COM OR QK) (SLURRY)	PRIME COAT (MULTI OPTION)	PRIME COAT (SS-1)	RIPRAP (MOW STRIP) (4 IN)	DRIVEWAYS (CONC)	MTL W-BEAM GD FEN (TIM POST)	MTL BEAM GD FEN TRANS (THRIE-BEAM)	GUARDRAIL END TREATMENT (INSTALL)	D-GR HMA TY-B PG64-22	D-GR HMA TY-D SAC-B PG76-22	TACK COAT	UNDERSEAL COURSE
	CY	CY	STA	CY	SY	TON	GAL	GAL	CY	SY	LF	EA	EA	TON	TON	GAL	GAL
RSLE-WB																	
SHEET 1 OF 11	17,473	1,048	-	1,429	412	9	752	-	17	-	261.0	-	1	788	291	283	-
SHEET 2 OF 11	3,864	256	3	252	61	1	121	19	27	-	301.5	2	3	116	42	41	-
SHEET 3 OF 11	4,844	875	-	574	162	3	304	-	16	-	50.0	2	2	307	113	110	-
SHEET 4 OF 11	3,372	5,876	-	1,955	580	13	1,016	-	-	-	-	-	-	1,103	406	396	-
SHEET 5 OF 11	642	12,642	-	1,954	580	13	1,015	-	-	-	-	-	-	1,102	406	396	-
SHEET 6 OF 11	1,228	3,713	-	2,234	642	14	1,138	-	-	316	-	-	-	1,321	455	570	-
SHEET 7 OF 11	546	31,793	-	1,676	441	10	837	-	16	-	50.0	2	2	1,113	331	644	-
SHEET 8 OF 11	29	3,642	-	-	-	-	-	-	1	-	-	1	-	-	-	-	-
SHEET 9 OF 11	5,247	25,757	-	2,222	593	13	1,096	-	23	-	237.5	1	2	1,449	428	839	-
SHEET 10 OF 11	9,588	105	-	3,321	887	19	1,641	-	-	-	-	-	-	3,166	768	1,606	-
SHEET 11 OF 11	1,088	112	-	-	-	-	-	-	-	208	-	-	-	1,455	319	435	535
DETENTION POND I	2,123	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SUB TOTALS	**50,044**	**85,819**	**3**	**15,617**	**4,358**	**95**	**7,920**	**19**	**100**	**524**	**900.0**	**8**	**10**	**11,920**	**3,559**	**5,320**	**535**

FM 2770 - ROADWAY

LOCATION	110 6001	132 6047	247 6366	260 6027 (1)	260 6043 (1)	310 6001	351 6004	530 6004	560 6001	3076 6001	3076 6050	3076 6066	3085 6001
	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL) (ORD COMP) (TY C1)	FL BS (CMP IN PLC) (TY A GR 5) (FNAL POS)	LIME TRT (EXST MATL) (8")	LIME (HYD, COM OR QK) (SLURRY)	PRIME COAT (MULTI OPTION)	FLEXIBLE PAVEMENT STRUCTURE REPAIR (8")	DRIVEWAYS (CONC)	MAILBOX INSTALL-S (TWG-POST) TY 1	D-GR HMA TY-B PG64-22	D-GR HMA TY-D SAC-B PG76-22	TACK COAT	UNDERSEAL COURSE
	CY	CY	CY	SY	TON	GAL	SY	SY	EA	TON	TON	GAL	GAL
FM 2770													
SHEET 1 OF 3	1,794	286	2,398	658	14	1,141	152	97	1	1,586	607	741	811
SHEET 2 OF 3	1,817	340	1,841	509	11	876	215	-	-	1,186	545	412	1,190
SHEET 3 OF 3	646	315	902	253	6	422	125	-	-	568	279	240	517
SUB TOTALS	4,257	941	5,141	1,420	31	2,439	492	97	1	3,340	1,431	1,393	2,518

RM 967 - ROADWAY

LOCATION	110 6001	132 6047	247 6366	260 6027 (1)	260 6043 (1)	310 6001	351 6004	530 6004	560 6001	3076 6001	3076 6050	3076 6066	3085 6001
	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL) (ORD COMP) (TY C1)	FL BS (CMP IN PLC) (TY A GR 5) (FNAL POS)	LIME TRT (EXST MATL) (8")	LIME (HYD, COM OR QK) (SLURRY)	PRIME COAT (MULTI OPTION)	FLEXIBLE PAVEMENT STRUCTURE REPAIR (8")	DRIVEWAYS (CONC)	MAILBOX INSTALL-S (TWG-POST) TY 1	D-GR HMA TY-B PG64-22	D-GR HMA TY-D SAC-B PG76-22	TACK COAT	UNDERSEAL COURSE
	CY	CY	CY	SY	TON	GAL	SY	SY	EA	TON	TON	GAL	GAL
RM 967													
SHEET 1 OF 2	1,194	191	1,279	357	8	602	147	427	-	812	369	392	538
SHEET 2 OF 2	1,069	129	1,041	294	6	483	115	116	1	649	293	310	428
SUB TOTALS	**2,263**	**320**	**2,320**	**651**	**14**	**1,085**	**262**	**543**	**1**	**1,461**	**662**	**702**	**966**

(1) LIME FOR STABILIZATION AS DETERMINED IN THE FIELD BY THE ENGINEER AS NECESSARY.

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Building #1, Suite 1230
San Marcos, TX 78666-7969
Texas Registered Engineering Firm F-754

Texas Department of Transportation

ROBERT S. LIGHT EXTENSION

ROADWAY SUMMARY

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	AUS	HAYS	15
CHECK	CONTROL	SECTION	JOB	
	0914	33	068,ETC	

RSLE - EARTHWORK

STATION	110 EXCAVATION (CY)	132 EMBANKMENT (CY)
1000+50.00	0	0
1001+00.00	29	406
1001+50.00	126	349
1002+00.00	520	255
1002+50.00	999	38
1003+00.00	1306	0
1003+50.00	1584	0
1004+00.00	1745	0
1004+50.00	1773	0
1005+00.00	1846	0
1005+50.00	1950	0
1006+00.00	1911	0
1006+50.00	1792	0
1007+00.00	1892	0
1007+50.00	1796	0
1008+00.00	1403	38
1008+25.00	466	119
1008+50.00	149	99
1009+00.00	0	0
1009+50.00	0	0
1010+00.00	0	0
1010+50.00	0	0
1011+00.00	0	0
1011+50.00	0	0
1012+00.00	0	0
1012+50.00	0	0
1013+00.00	0	0
1013+50.00	0	0
1014+00.00	0	0
1014+50.00	0	0
1015+00.00	50	0
1015+50.00	0	0
1016+00.00	0	0
1016+50.00	0	0
1017+00.00	0	0
1017+50.00	0	0
1018+00.00	0	0
1018+50.00	0	0
1019+00.00	0	0
1019+50.00	0	0
1020+00.00	0	0
1020+50.00	0	0
1021+00.00	0	0
1021+50.00	0	0
1022+00.00	0	0
1022+50.00	0	0
1023+00.00	0	0
1023+50.00	0	0
1024+00.00	0	432
1024+50.00	414	433
1025+00.00	1019	3
1025+50.00	1098	1
1026+00.00	899	2
1026+50.00	757	2
1027+00.00	657	2
1027+50.00	570	7
1028+00.00	488	15
1028+50.00	399	33
1029+00.00	324	53
1029+50.00	276	69
1030+00.00	238	92
1030+50.00	201	123

RSLE - EARTHWORK CONTINUED

STATION	110 EXCAVATION (CY)	132 EMBANKMENT (CY)
1031+00.00	166	161
1031+50.00	137	212
1032+00.00	107	279
1032+50.00	82	352
1033+00.00	62	410
1033+50.00	46	445
1034+00.00	36	479
1034+50.00	32	508
1035+00.00	31	528
1035+50.00	34	525
1036+00.00	45	510
1036+50.00	51	523
1037+00.00	47	552
1037+50.00	46	584
1038+00.00	67	614
1038+50.00	79	649
1039+00.00	71	716
1039+50.00	66	784
1040+00.00	72	809
1040+50.00	58	829
1041+00.00	33	833
1041+50.00	26	814
1042+00.00	23	790
1042+50.00	25	748
1043+00.00	22	688
1043+50.00	14	628
1044+00.00	6	581
1044+50.00	1	557
1045+00.00	2	520
1045+50.00	5	439
1046+00.00	8	373
1046+50.00	9	346
1047+00.00	9	340
1047+50.00	9	348
1048+00.00	8	358
1048+50.00	5	376
1049+00.00	2	371
1049+50.00	0	321
1050+00.00	0	275
1050+50.00	2	248
1051+00.00	9	221
1051+50.00	20	198
1052+00.00	22	182
1052+50.00	30	185
1053+00.00	46	151
1053+50.00	54	74
1054+00.00	76	30
1054+50.00	270	11
1055+00.00	249	19
1055+50.00	94	29
1056+00.00	126	26
1056+50.00	114	66
1057+00.00	92	224
1057+50.00	61	551
1058+00.00	36	961
1058+50.00	31	1151
1059+00.00	40	1227
1059+50.00	53	1390
1060+00.00	49	1556
1060+50.00	34	1750
1061+00.00	32	1928
1061+50.00	32	2081

RSLE - EARTHWORK CONTINUED

STATION	110 EXCAVATION (CY)	132 EMBANKMENT (CY)
1062+00.00	30	2314
1062+50.00	27	2632
1063+00.00	27	2917
1063+50.00	27	3238
1064+00.00	27	3285
1064+50.00	27	3124
1064+54.24	2	264
1065+00.00	11	1424
1065+50.00	0	0
1066+00.00	0	0
1066+50.00	0	0
1067+00.00	0	0
1067+50.00	0	0
1068+00.00	0	0
1068+50.00	0	0
1069+00.00	0	0
1069+50.00	0	0
1070+00.00	0	0
1070+50.00	0	0
1071+00.00	0	0
1071+50.00	0	0
1072+00.00	0	0
1072+50.00	0	0
1073+00.00	0	0
1073+50.00	0	0
1074+00.00	0	0
1074+50.00	0	0
1075+00.00	0	0
1075+50.00	0	0
1076+00.00	0	0
1076+50.00	0	0
1076+64.25	5	596
1077+00.00	24	3046
1077+50.00	31	4140
1078+00.00	33	3919
1078+50.00	40	3570
1079+00.00	52	2955
1079+50.00	67	2504
1080+00.00	100	2016
1080+50.00	143	1496
1081+00.00	173	1341
1081+50.00	246	1249
1082+00.00	259	994
1082+50.00	220	700
1083+00.00	236	422
1083+50.00	250	241
1084+00.00	266	113
1084+50.00	311	46
1085+00.00	400	26
1085+50.00	492	16
1086+00.00	571	6
1086+50.00	631	2
187+00.00	726	1
187+50.00	798	0
188+00.00	798	0
188+50.00	751	0
189+00.00	701	0
189+50.00	640	0
190+00.00	591	0
190+50.00	572	0
191+00.00	559	0
191+50.00	555	0

RSLE - EARTHWORK CONTINUED

STATION	110 EXCAVATION (CY)	132 EMBANKMENT (CY)
192+00.00	549	1
192+50.00	500	3
193+00.00	477	4
193+50.00	504	1
194+00.00	433	4
194+50.00	249	10
195+00.00	85	31
195+50.00	273	24
196+00.00	282	2
196+50.00	130	9
197+00.00	141	16
197+50.00	152	19
198+00.00	155	19
198+50.00	152	16
199+00.00	163	12
199+50.00	178	11
200+00.00	94	11
200+50.00	80	10
201+00.00	64	9
201+50.00	46	5
201+55.00	4	0
RSLE TOTAL	**47,921**	**85,819**
DETENTION POND I	**2,123**	**0**
TOTAL	**50,044**	**85,819**

RM 967 - EARTHWORK

STATION	110 EXCAVATION (CY)	132 EMBANKMENT (CY)
104+50.00	0	0
105+00.00	78	12
105+50.00	62	21
106+00.00	39	22
106+50.00	53	15
107+00.00	74	7
107+50.00	68	9
108+00.00	57	11
108+50.00	58	11
109+00.00	57	7
109+50.00	55	6
110+00.00	50	10
110+50.00	33	12
111+00.00	61	17
111+50.00	61	15
112+00.00	75	5
112+50.00	91	0
113+00.00	103	3
113+50.00	119	8
114+00.00	122	11
114+50.00	105	14
115+00.00	89	15
115+50.00	94	11
116+00.00	66	8
116+50.00	77	5
117+00.00	73	6
117+50.00	67	9
118+00.00	62	10
118+50.00	67	11
119+00.00	77	9
119+50.00	76	6
120+00.00	62	5
120+40.00	32	9
TOTAL	**2,263**	**320**

FM 2770 - EARTHWORK

STATION	110 EXCAVATION (CY)	132 EMBANKMENT (CY)
103+50.00	0	0
104+00.00	53	15
104+50.00	71	10
105+00.00	77	10
105+50.00	73	18
106+00.00	74	28
106+50.00	69	30
107+00.00	73	24
107+50.00	78	18
108+00.00	84	11
108+50.00	89	8
109+00.00	82	12
109+50.00	82	14
110+00.00	86	11
110+50.00	73	10
111+00.00	88	16
111+50.00	73	18
112+00.00	73	9
112+50.00	72	8
113+00.00	107	11
113+50.00	152	5
114+00.00	165	0
114+50.00	156	0
115+00.00	152	3
115+50.00	150	13
116+00.00	151	14
116+50.00	137	12

FM 2770 - EARTHWORK CONTINUED

STATION	110 EXCAVATION (CY)	132 EMBANKMENT (CY)
117+00.00	102	14
117+50.00	81	13
118+00.00	90	9
118+50.00	114	3
119+00.00	112	0
119+50.00	93	3
120+00.00	81	9
120+50.00	73	19
121+00.00	59	31
121+50.00	54	30
122+00.00	54	35
122+50.00	53	44
123+00.00	53	43
123+50.00	52	45
124+00.00	52	53
124+50.00	51	67
125+00.00	50	73
125+50.00	58	59
126+00.00	67	34
126+50.00	77	15
127+00.00	67	8
127+50.00	52	4
128+00.00	53	1
128+50.00	75	0
128+86.00	44	1
TOTAL	**4,257**	**941**

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USER: KBERGER DATE: 1/25/2021 TIME: 11:57:46 AM SCALE: 1:1
FILE: RSLE-SUM-EARTHWORK.DGN PENTABLE: 000000000246I5.tbl

HAYS COUNTY TEXAS

HDR Engineering, Inc.
1290 Wonder World Drive
Building #1, Suite 1230
San Marcos, TX 78666-7969

Texas Registered Engineering Firm F-754

Texas Department of Transportation

ROBERT S. LIGHT EXTENSION

EARTHWORK SUMMARY

SHEET 1 OF 1

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
GRAPHICS	6	STP ( ) RGS		RSLE
	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	AUS	HAYS	16
CHECK	CONTROL	SECTION	JOB	
	0914	33	068,ETC	

RSLE - SUMMARY OF BRIDGES

LOCATION	401 6001	416 6001	416 6004	416 6005	416 6006	420 6013	420 6025	422 6001	422 6015	425 6039	425 6040	432 6001	432 6024	442 6008	450 6023	454 6018	550 6008 (1)
	FLOWABLE BACKFILL	DRILL SHAFT (18 IN)	DRILL SHAFT (36 IN)	DRILL SHAFT (42 IN)	DRILL SHAFT (48 IN)	CL C CONC (ABUT)	CL C CONC (BENT)	REINF CONC SLAB	APPROACH SLAB	PRESTR CONC GIRDER (TX54)	PRESTR CONC GIRDER (TX62)	RIPRAP (CONC) (4 IN)	RIPRAP (STONE COMMON) (DRY) (12 IN)	STR STEEL (MISCELLANEOUS BRIDGE)	RAIL (TY SSTR)	SEALED EXPANSION JOINT (4IN) (SEJ-M)	CHAIN LINK FENCE (INSTALL) (8')
	CY	LF	LF	LF	LF	CY	CY	SF	CY	LF	LF	CY	CY	LB	LF	LF	LF
MUSTANG BRANCH BRIDGE	248.7	254	1,147	-	956	73.9	745.5	72,310	70.6	9,392.25	-	-	161.6	466	3,287.86	268.5	-
UPRR BRIDGE	208.4	79	783	260.0	-	62.2	528.0	55,660	113.4	5,616.30	1,614.00	448.3	-	-	2,480.00	257.0	270
SUB TOTALS	**457.1**	**333**	**1,930**	**260.0**	**956**	**136.1**	**1,273.5**	**127,970**	**184.0**	**15,008.55**	**1,614.00**	**448.3**	**161.6**	**466**	**5,767.86**	**525.5**	**270**

(1) FOR CONTRACTOR'S INFORMATION ONLY. SUBSIDIARY TO ITEM 450.

RSLE - RETAINING WALL

LOCATION	423 6002	432 6045	450 6023	556 6006
	RETAINING WALL (MSE) (ASHLAR STONE FIN)	RIPRAP (MOW STRIP) (4 IN)	RAIL (TY SSTR)	PIPE UNDERDRAINS (TY 6) (6")
	SF	CY	LF	LF
RETAINING WALL LAYOUTS				
RW1 (SHEET 1 OF 2)	6,486	10	400	400
RW1 (SHEET 2 OF 2)	6,151	7	243	279
RW2 (SHEET 1 OF 1)	9,907	12	416	481
SUB TOTALS	**22,544**	**29**	**1,059**	**1,160**

NOTE:
1. SEE "SUMMARY OF DRAINAGE QUANTITIES" SHEET FOR BRIDGE DRAIN QUANTITIES.

HDR Engineering, Inc.
1290 Wonder World Drive
Building #1, Suite 1230
San Marcos, TX 78666-7969
Texas Registered Engineering Firm F-754

Texas Department of Transportation

ROBERT S. LIGHT EXTENSION

RETAINING WALL AND BRIDGE SUMMARY

SHEET 1 OF 1

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	17
	0914	33	068,ETC	

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FILE: RSLE-SUM-RW_BRIDGE.DGN

SUMMARY OF DRAINAGE QUANTITIES

LOCATION	132 6047	432 6010	432 6023	432 6024	462 6001	464 6003	464 6005	464 6007	464 6031	465 6006	465 6128	466 6164
	EMBANKMENT (FINAL) (ORD COMP) (TY C1)	RIPRAP (CONC) (CL B) (5 IN)	RIPRAP (STONE COMMON) (DRY) (8 IN)	RIPRAP (STONE COMMON) (DRY) (12 IN)	CONC BOX CULV (3 FT X 2 FT)	RC PIPE (CL III) (18 IN)	RC PIPE (CL III) (24 IN)	RC PIPE (CL III) (30 IN)	RC PIPE (ARCH) (CL III) (DES 2)	JCTBOX (COMPL) (PJB) (4FTX4FT)	INLET (COMPL) (PSL) (FG) (4FTX4FT-4FTX4FT)	WINGWALL (FW - S) (HW=3 FT)
	CY	CY	CY	CY	LF	LF	LF	LF	LF	EA	EA	EA
RSLE-WB												
STA 1000+44-1007+00												
STA 1007+00-1017+00				17								
STA 1017+00-1027+00												
STA 1027+00-1037+00												
STA 1037+00-1047+00				6	255							2
STA 1047+00-1057+00						84						
STA 1057+00-1067+00			77									
STA 1067+00-1077+00	985	121	166	1567			44					
STA 1077+00-1087+00												
STA 187+00-197+00												
STA 197+00-201+55						71						
FM 2770		42				20	294	167		1	1	
RM967							220	207	170		2	
HAZ-MAT TRAP												
PROJECT TOTALS	985	163	243	1590	255	175	558	374	170	1	3	2

SUMMARY OF DRAINAGE QUANTITIES

LOCATION	467 6362	467 6363	467 6389	467 6395	467 6423	467 6531	471 6007	481 6016	481 6017	481 6018	481 6021	506 6020	7133 6001
	SET (TY II) (18 IN) (RCP) (6:1) (C)	SET (TY II) (18 IN) (RCP) (6:1) (P)	SET (TY II) (24 IN) (RCP) (3:1) (P)	SET (TY II) (24 IN) (RCP) (6:1) (P)	SET (TY II) (30 IN) (RCP) (6:1) (P)	SET (TY II) (DES 2) (RCP) (6:1) (P)	GRATE AND FRAME (BRIDGE DRAIN)	PIPE (PVC) (SCH 40) (12 IN)	PIPE (PVC) (SCH 40) (14 IN)	PIPE (PVC) (SCH 40) (16 IN)	PIPE (PVC) (SCH 40) (24 IN)	CONSTRUCTION EXITS (INSTALL) (TY 1)	HAZARDOUS MATERIALS TRAP
	EA	EA	EA	EA	EA	EA	EA	LF	LF	LF	LF	SY	EA
RSLE-WB													
STA 1000+44-1007+00												1044	
STA 1007+00-1017+00							9	120	544	872			
STA 1017+00-1027+00							7	370	207			272	
STA 1027+00-1037+00													
STA 1037+00-1047+00													
STA 1047+00-1057+00	2												
STA 1057+00-1067+00												24	
STA 1067+00-1077+00			2									1408	
STA 1077+00-1087+00												1128	
STA 187+00-197+00													
STA 197+00-201+55		2											
FM 2770		2		2	2								
RM967					1	2							
HAZ-MAT TRAP											30		1
PROJECT TOTALS	2	4	2	2	3	2	16	490	751	872	30	3876	1

SUMMARY OF DRAINAGE QUANTITIES-SAND FILTRATION POND

LOCATION	132 6047	402 6001	420 6062	423 6005	432 6010	459 6009	464 6005	464 6007	465 6002	465 6006	465 6128	467 6418	550 6001	481 * 6011	7246 6001
	EMBANKMENT (FINAL) (ORD COMP) (TY C1)	TRENCH EXCAVATION PROTECTION	CL C CONC (RETAINING WALL)	RETAINING WALL (SPREAD FOOTING)	RIPRAP (CONC) (CL B) (5 IN)	GABIONS (3' X 3') (GALV)	RC PIPE (CL III) (24 IN)	RC PIPE (CL III) (30 IN)	MANH (COMPL) (PRM) (48IN)	JCTBOX (COMPL) (PJB) (4FTX4FT)	INLET (COMPL) (PSL) (FG) (4FTX4FT-4FTX4FT)	SET (TY II) (30 IN) (RCP) (3:1) (P)	CHAIN LINK FENCE (INSTALL) (6')	PIPE (PVC) (SCH 40) (4 IN)	SAND FILTRATION SYSTEM
	CY	LF	CY	SF	CY	CY	LF	LF	EA	EA	EA	EA	LF	LF	EA
RSLE-WB															
SPLITTER BOX		535	21		3		267	192	3	2	1	1			
SAND FILT. WQ POND	175			2500	25	12							401	225	1
PROJECT TOTALS	175	535	21	2500	28	12	267	192	3	2	1	1	401	225	1

* FOR INFORMATION ONLY

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
USER: JDVillarreal DATE: 12/18/2020 TIME: 4:38:24 PM SCALE: 1:1
FILE: $PWVARVAULTPATHDESC$ PENTABLE: 000000002146.15

HAYS COUNTY TEXAS

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

Texas Registered Engineering Firm F-2614

Texas Department of Transportation

ROBERT S. LIGHT EXTENSION

SUMMARY OF DRAINAGE QUANTITIES

SHEET 1 OF 1

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	18
CHECK				
CMC				

ILLUMINATION QUANTITY SUMMARY

SHEET	416 6029	610 6214	618 6023	618 6024	620 6007	620 6008	628 6045	624 6010
	DRILL SHAFT (RDWY ILL POLE) (30 IN) LF	IN RD IL (TY SA) 40T-8 (250W EQ) LED EA	CONDT (PVC) (SCH 40) (2") LF	CONDT (PVC) (SCH 40) (2") (BORE) LF	ELEC CONDR (NO.8) BARE LF	ELEC CONDR (NO.8) INSULATED LF	ELC SRV TY A 240/480 060(NS)SS(E)SP(O) EA	GROUND BOX TY D (162922)W/APRON EA
SHEET 1 OF 4			1010		1010	2020	1	3
SHEET 2 OF 4	24	3	535	215	900	1800		3
SHEET 3 OF 4	16	2	40	150	290	580	1	2
SHEET 4 OF 4	32	4	240	235	675	1350	1	4
PROJECT TOTAL	72	9	1825	600	2875	5750	3	12

HDR Engineering, Inc.
1290 Wonder World Drive
Building #1, Suite 1230
San Marcos, TX 78666-7969
Texas Registered Engineering Firm F-754

Texas Department of Transportation

ROBERT S. LIGHT EXTENSION

ILLUMINATION SUMMARY

SHEET 1 OF 1

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	19
	0914	33	068,ETC	

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USER: KBERGER DATE: 11/19/2020 TIME: 1:27:51 PM SCALE: 1:00
FILE: RSLE-ILSUM.dgn

RSLE - SIGNING AND PAVEMENT MARKING

LOCATION	533 6003	533 6004	644 6001	644 6002	644 6004	644 6005	644 6007	644 6008	644 6033	644 6037	644 6066	644 6067	644 6068	644 6076	658 6014	658 6062	658 6073
	RUMBLE STRIPS (SHOULDER) ASPHALT	RUMBLE STRIPS (CENTERLINE) ASPHALT	IN SM RD SN SUP&AM TY10BWG(1) SA(P)	IN SM RD SN SUP&AM TY10BWG(1) SA(P-BM)	IN SM RD SN SUP&AM TY10BWG(1) SA(T)	IN SM RD SN SUP&AM TY10BWG(1) SA(T-2EXT)	IN SM RD SN SUP&AM TY10BWG(1) SA(U)	IN SM RD SN SUP&AM TY10BWG(1) SA(U-EXAL)	IN SM RD SN SUP&AM TYS80(1) SA(U)	IN SM RD SN SUP&AM TYS80(1) SA(U-WC)	IN SM RD SN SUP&AM (RAIL MOUNT)	IN SM RD SN SUP&AM (INST SIGN ONLY)	RELOCATE SM RD SN SUP&AM TY 10BWG	REMOVE SM RD SN SUP&AM	INSTL DEL ASSM (D-SW)SZ (BRF)CTB(BI)	INSTL DEL ASSM (D-SW)SZ 1 (BRF)GF2(BI)	INSTL OM ASSM (OM-2Y) (WC)GND(BI)
	LF	LF	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA
RSLE-WB																	
SHEET 1 OF 11	730	-	1	1	4	2	-	-	-	1	-	2	-	1	-	3	-
SHEET 2 OF 11	52	-	-	-	-	-	-	1	-	-	3	-	-	-	18	9	-
SHEET 3 OF 11	400	200	-	-	1	-	-	-	-	-	-	-	-	-	14	6	-
SHEET 4 OF 11	2,005	1,003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SHEET 5 OF 11	2,004	1,002	2	-	-	-	-	-	1	-	-	-	-	-	-	-	4
SHEET 6 OF 11	734	52	1	2	3	-	-	1	-	-	-	-	-	-	-	-	-
SHEET 7 OF 11	1,151	-	1	-	2	-	-	-	-	-	2	-	-	-	12	6	-
SHEET 8 OF 11	-	-	-	-	-	-	-	-	-	-	2	-	-	-	20	1	-
SHEET 9 OF 11	1,746	849	2	-	1	-	1	-	1	-	-	-	-	-	4	5	-
SHEET 10 OF 11	732	-	1	2	-	-	3	1	-	-	-	-	-	3	-	-	-
SHEET 11 OF 11	-	-	2	-	1	-	1	1	1	-	-	-	1	2	-	-	-
SUB TOTALS	**9,554**	**3,106**	**10**	**5**	**12**	**2**	**5**	**4**	**3**	**1**	**7**	**2**	**1**	**6**	**68**	**30**	**4**

RSLE - SIGNING AND PAVEMENT MARKING CON'T

LOCATION	666 6033	666 6036	666 6048	666 6054	666 6078	666 6170	666 6283	666 6300	666 6303	666 6312	666 6315	672 6007	672 6009	677 6001	6019 6011	6019 6012	6120 6001
	REFL PAV MRK TY I (W)8"(LNDP) (100MIL)	REFL PAV MRK TY I (W) 8"(SLD) (100MIL)	REFL PAV MRK TY I (W) 24"(SLD) (100MIL)	REFL PAV MRK TY I (W) (ARROW) (100MIL)	REFL PAV MRK TY I (W) (WORD) (100MIL)	REFL PAV MRK TY II (W) 4" (SLD)	REF PROF PAV MRK TY I (W)4"(SLD) (090MIL)	RE PM W/RET REQ TY I (W)4"(BRK) (100MIL)	RE PM W/RET REQ TY I (W) 4"(SLD) (100MIL)	RE PM W/RET REQ TY I (Y)4"(BRK) (100MIL)	RE PM W/RET REQ TY I (Y) 4"(SLD) (100MIL)	REFL PAV MRKR TY I-C	REFL PAV MRKR TY II-A-A	ELIM EXT PAV MRK & MRKS (4")	PREFB PV MK W/WNTY TY B (Y)4"(BRK) CNTST	PREFB PV MK W/WNTY TY B (Y)4"(SLD) CNTST	DEAD END ROADWAY BARRICADE
	LF	LF	LF	EA	EA	LF	LF	LF	LF	LF	LF	EA	EA	LF	LF	LF	LF
RSLE-WB																	
SHEET 1 OF 11	-	400	40	4	4	-	-	-	1,440	-	1,760	20	88	130	-	-	-
SHEET 2 OF 11	-	-	-	-	-	1,790	1,790	-	210	10	375	-	41	-	220	1,010	-
SHEET 3 OF 11	-	-	-	-	-	1,434	1,434	-	559	70	280	-	25	-	180	717	-
SHEET 4 OF 11	-	-	-	-	-	-	-	-	2,004	250	1,002	-	25	-	-	-	-
SHEET 5 OF 11	-	-	-	-	-	-	-	-	2,004	-	2,004	-	25	-	-	-	-
SHEET 6 OF 11	-	522	65	3	3	-	-	-	1,684	-	2,468	26	119	-	-	-	-
SHEET 7 OF 11	-	108	-	1	1	542	542	-	1,458	-	2,118	6	94	-	-	542	-
SHEET 8 OF 11	-	-	-	-	-	2,000	2,000	-	-	-	-	-	25	-	-	2,000	-
SHEET 9 OF 11	-	-	-	-	-	6	6	-	2,005	-	2,094	-	34	-	-	6	40
SHEET 10 OF 11	-	565	90	4	4	-	-	120	1,686	-	3,688	34	184	-	-	-	-
SHEET 11 OF 11	63	412	-	2	2	-	-	110	912	-	1,824	32	91	-	-	-	-
SUB TOTALS	**63**	**2,007**	**195**	**14**	**14**	**5,772**	**5,772**	**230**	**13,962**	**330**	**17,613**	**118**	**751**	**130**	**400**	**4,275**	**40**

FM 2770 - SIGNING AND PAVEMENT MARKING

LOCATION	644 6001	644 6002	644 6004	644 6005	644 6076	658 6011	658 6073	666 6036	666 6054	666 6078	666 6303	666 6312	666 6315	672 6007	672 6009
	IN SM RD SN SUP&AM TY10BWG(1) SA(P)	IN SM RD SN SUP&AM TY10BWG(1) SA(P-BM)	IN SM RD SN SUP&AM TY10BWG(1) SA(T)	IN SM RD SN SUP&AM TY10BWG(1) SA(T-2EXT)	REMOVE SM RD SN SUP&AM	INSTL DEL ASSM (D-SW)SZ 2 (WC)GND(BI)	INSTL OM ASSM (OM-2Y) (WC)GND(BI)	REFL PAV MRK TY I (W) 8"(SLD) (100MIL)	REFL PAV MRK TY I (W) (ARROW) (100MIL)	REFL PAV MRK TY I (W) (WORD) (100MIL)	RE PM W/RET REQ TY I (W) 4"(SLD) (100MIL)	RE PM W/RET REQ TY I (Y)4"(BRK) (100MIL)	RE PM W/RET REQ TY I (Y) 4"(SLD) (100MIL)	REFL PAV MRKR TY I-C	REFL PAV MRKR TY II-A-A
	EA	EA	EA	EA	EA	EA	EA	LF	EA	EA	LF	LF	LF	EA	EA
FM 2770															
SHEET 1 OF 3	1	-	4	1	-	-	2	665	3	3	2,165	-	2,512	33	126
SHEET 2 OF 3	1	1	3	1	4	3	8	250	5	1	1,900	300	1,900	13	66
SHEET 3 OF 3	-	-	3	-	1	11	-	-	-	-	1,072	20	1,680	-	62
SUB TOTALS	**2**	**1**	**10**	**2**	**5**	**14**	**10**	**915**	**8**	**4**	**5,137**	**320**	**6,092**	**46**	**254**

RM 967 - SIGNING AND PAVEMENT MARKING

LOCATION	644 6001	644 6004	644 6005	644 6076	658 6073	666 6036	666 6054	666 6078	666 6303	666 6315	672 6007	672 6009
	IN SM RD SN SUP&AM TY10BWG(1) SA(P)	IN SM RD SN SUP&AM TY10BWG(1) SA(T)	IN SM RD SN SUP&AM TY10BWG(1) SA(T-2EXT)	REMOVE SM RD SN SUP&AM	INSTL OM ASSM (OM-2Y) (WC)GND(BI)	REFL PAV MRK TY I (W) 8"(SLD) (100MIL)	REFL PAV MRK TY I (W) (ARROW) (100MIL)	REFL PAV MRK TY I (W) (WORD) (100MIL)	RE PM W/RET REQ TY I (W) 4"(SLD) (100MIL)	RE PM W/RET REQ TY I (Y) 4"(SLD) (100MIL)	REFL PAV MRKR TY I-C	REFL PAV MRKR TY II-A-A
	EA	EA	EA	EA	EA	LF	EA	EA	LF	LF	EA	EA
RM 967												
SHEET 1 OF 2	1	4	1	-	2	484	3	2	1,808	2,138	25	108
SHEET 2 OF 2	1	2	1	1	6	396	1	2	1,380	1,970	20	100
SUB TOTALS	**2**	**6**	**2**	**1**	**8**	**880**	**4**	**4**	**3,188**	**4,108**	**45**	**208**

HDR Engineering, Inc.
1290 Wonder World Drive
Building #1, Suite 1230
San Marcos, TX 78666-7969
Texas Registered Engineering Firm F-754

Texas Department of Transportation

ROBERT S. LIGHT EXTENSION

SIGNING AND PAVEMENT MARKINGS SUMMARY

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	AUS	HAYS	
	CONTROL	SECTION	JOB	20
CHECK	0914	33	068,ETC	

SUMMARY OF SW3P QUANTITES

LOCATION	160 6003	164 6009	164 6011	164 6035	166	168 6001	169 6005	180 6001	506 6002	506 6011	506 6020	506 6024	506 6038	506 6039
	FURNISHING AND PLACING TOPSOIL (4")	BROADCAST SEED (TEMP) (WARM)	BROADCAST SEED (TEMP) (COOL)	DRILL SEEDING (PERM) (RURAL) (CLAY)	FERTILIZER*	VEGETATIVE WATERING	SOIL RETENTION BLANKETS (CL 2) (TY E)	WILDFLOWER SEEDING	ROCK FILTER DAMS (INSTALL) (TY 2)	ROCK FILTER DAMS (REMOVE)	CONSTRUCTION EXITS (INSTALL) (TY 1)	CONSTRUCTION EXITS (REMOVE)	TEMP SEDMT CONT FENCE (INSTALL)	TEMP SEDMT CONT FENCE (REMOVE)
	SY	SY	SY	SY	TON	MG	SY	AC	LF	LF	SY	SY	LF	LF
RSLE - STA 1000+44-1007+00	9148	4574	4574	9148	0.3	24.8	9148	1.9	48	48	115	115	678	678
RSLE - STA 1007+00-1017+00	1586	793	793	1586	0.1	4.3	1586	0.3	348	348	0	0	250	250
RSLE - STA 1017+00-1027+00	4661	2331	2331	4661	0.2	12.7	4661	1.0	256	256	0	0	306	306
RSLE - STA 1027+00-1037+00	13039	6519	6519	13039	0.5	35.3	13039	2.7	91	91	0	0	15	15
RSLE - STA 1037+00-1047+00	13231	6616	6616	13231	0.5	35.9	13231	2.7	151	151	0	0	945	945
RSLE - STA 1047+00-1057+00	12386	6193	6193	12386	0.4	33.6	12386	2.6	52	52	0	0	640	640
RSLE - STA 1057+00-1067+00	8189	4094	4094	8189	0.3	22.2	8189	1.7	41	41	0	0	409	409
RSLE - STA 1067+00-1077+00	4717	2359	2359	4717	0.2	12.8	4717	1.0	52	52	0	0	1229	1229
RSLE - STA 1077+00-187+00	18280	9140	9140	18280	0.6	49.5	18280	3.8	132	132	0	0	1002	1002
RSLE - STA 187+00-197+00	10039	5020	5020	10039	0.4	27.2	10039	2.1	58	58	0	0	794	794
RSLE - STA 197+00-201+55	4442	2221	2221	4442	0.2	12.1	4442	0.9	24	24	115	115	450	450
FM 2770 - STA 103+50-109+40	2558	1279	1279	2558	0.1	7	2558	0.5	48	48	115	115	0	0
FM 2770 - STA 109+40-123+50	6676	3338	3338	6676	0.3	18.1	6676	1.4	97	97	0	0	455	455
FM 2770 - STA 123+50-128+86	2822	1411	1411	2822	0.1	7.7	2822	0.6	137	137	115	115	530	530
RM 967 - STA 104+50-110+13	3300	1650	1650	3300	0.2	9	3300	0.7	48	48	115	115	0	0
RM 967 - STA 110+13-120+40	4534	2267	2267	4534	0.2	12.3	4534	0.9	62	62	115	115	639	639
PROJECT TOTALS	119608	59804	59804	119608	5	325	119608	25	1645	1645	690	690	8342	8342

SUMMARY OF VOID MITIGATION QUANTITIES

506 6035	506 6040	506 6043	420 6002	481 6023
SANDBAGS FOR EROSION	BIODEG EROSN CONT LOGS	BIODEG EROSN CONT LOGS	CL A CONC (MISC)	PIPE (PVC) (SCH 80) (6 IN)
EA	LF	LF	CY	LF
1	1	1	1	1

PLOT DRIVER: TXDOT_PDF_BW.pltcfg PENTABLE: 0000000002|4615
USER: TCWatson DATE: 12/14/2020 TIME: 8:02:02 PM SCALE: 1:00
FILE: $PWVAR/AULTPATHDESC$

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY
Texas Registered Engineering Firm F-2614

Texas Department of Transportation

ROBERT S. LIGHT EXTENSION

SUMMARY OF SW3P QUANTITIES

SHEET 1 OF 1

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	21
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

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FILE: c:\pwworking\dal\d0446486\RSLE-SS017.dgn

SUMMARY OF SMALL SIGNS

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

Post Type
FRP = Fiberglass
TWT = Thin-Wall
10BWG = 10 BWG
S80 = Sch 80

Posts (1 or 2)

Anchor Type
UA=Univer-Conc
UB=Univer-Bolt
SA=Slip-Conc
SB=Slip-Bolt
WS=Wedge Steel
WP=Wedge Plastic

Mounting Designation
P = Prefab. "Plain"
T = Prefab. "T"
U = Prefab. "U"

1EXT or 2EXT = # of Ext.
BM = Extruded Wind Beam
WC = 1.12 #/ft Wing Chan.
EXAL= Extruded Aluminum

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN TEXT	DIMENSIONS	ALUMINUM TYPE A	ALUMINUM TYPE G	Post Type	Posts (1 or 2)	Anchor Type	Mounting Designation	
1 OF 11	1	D21-1T(L)	<- Robert S Light Blvd	108 X 12	X		10 BWG	1	SA	T	2EXT
	2	R1-1	STOP	36 X 36	X		10 BWG	1	SA	P	BM
	3	R3-8LR	<- ONLY | -> ONLY	36 X 30	X		10 BWG	1	SA	T	
	4	R3-8LR	<- ONLY | -> ONLY	36 X 30	X		10 BWG	1	SA	T	
	5	W1-7T	⟷	96 X 36	X		S80	1	SA	U	WC
	6	D21-1T(R)	Robert S Light Blvd ->	108 X 12	X		10 BWG	1	SA	T	2EXT
	7	R2-1	SPEED LIMIT XX	30 X 36	X		10 BWG	1	SA	P	
	8	W8-13aT	BRIDGE MAY ICE IN COLD WEATHER	36 X 36	X		10 BWG	1	SA	T	
	9	W8-13aT	BRIDGE MAY ICE IN COLD WEATHER	36 X 36	X		10 BWG	1	SA	T	
2 OF 11	1	D1-2	<- Kyle Austin ->	66 x 30		X	10 BWG	1	SA	U	EXAL
	2	W3-1	STOP AHEAD (Symbol)	30 X 30	X		BRIDGE RAIL MOUNT				
	3	M3-3	SOUTH	24 X 12	X		BRIDGE RAIL MOUNT				
		M1-6F	FARM ROAD 1626	24 X 24	X						
		M5-1L	<-	21 X 15	X						
		M3-1	NORTH	24 X 12	X						
		M1-6F	FARM ROAD 1626	24 X 24	X						
		M5-1R	->	21 X 15	X						
	4	M2-1	JCT	21 X 15	X		BRIDGE RAIL MOUNT				
		M1-6F	FARM ROAD 1626	24 X 24	X						
3 OF 11	1	W8-13aT	BRIDGE MAY ICE IN COLD WEATHER	36 X 36	X		10 BWG	1	SA	T	
5 OF 11	1	M2-1	JCT	21 X 15	X		10 BWG	1	SA	P	
		M1-6F	FARM ROAD 2770	24 X 24	X						
	2	M3-1	NORTH	24 X 12	X		S80	1	SA	U	
		M1-6F	FARM ROAD 2770	24 X 24	X						
		M5-1L	<-	21 X 15	X						
		M3-3	SOUTH	24 X 12	X						
		M1-6F	FARM ROAD 2770	24 X 24	X						
		M5-1R	->	21 X 15	X						
	3	W3-1	STOP AHEAD (Symbol)	30 X 30	X		10 BWG	1	SA	P	
6 OF 11	1	R2-1	SPEED LIMIT XX	30 X 36	X		10 BWG	1	SA	P	
	2	R1-1	STOP	36 X 36	X		10 BWG	1	SA	P	BM
		W4-4P	CROSS TRAFFIC DOES NOT STOP	24 X 12	X						
	3	R3-8LK	<- ONLY | ↱	36 X 30	X		10 BWG	1	SA	T	
	4	D1-2	<- Buda Kyle ->	60 x 30		X	10 BWG	1	SA	U	EXAL
	5	R3-8LK	<- ONLY | ↱	36 X 30	X		10 BWG	1	SA	T	
	6	R3-8LK	<- ONLY | ↱	36 X 30	X		10 BWG	1	SA	T	
	7	R1-1	STOP	36 X 36	X		10 BWG	1	SA	P	BM
		W4-4P	CROSS TRAFFIC DOES NOT STOP	24 X 12	X						

ALUMINUM SIGN BLANKS (TYPE A)

Square Ft.	Min. Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

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.

HDR Engineering, Inc.
1290 Wonder World Drive
Building #1, Suite 1220
San Marcos, TX 78666-7969
(Texas Registered Engineering Firm No. F-754)

STATE OF TEXAS
TIMOTHY GRIMES
100107
LICENSED PROFESSIONAL ENGINEER
11/19/2020

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DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT	REVISIONS
				11-93
				8-95
				1-02
				7-02
				2-07
				9-08

DIST	COUNTY	CONT	SECT	JOB	HIGHWAY
AUS	HAYS	0914	33	068,ETC	RSL

SHEET NO. 22

SHEET 1 OF 3

SUMMARY OF SMALL SIGNS
SOSS

18

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SUMMARY OF SMALL SIGNS

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

Post Type
FRP = Fiberglass
TWT = Thin-Wall
10BWG = 10 BWG
S80 = Sch 80

Posts (1 or 2)

Anchor Type
UA=Univer-Conc
UB=Univer-Bolt
SA=Slip-Conc
SB=Slip-Bolt
WS=Wedge Steel
WP=Wedge Plastic

Mounting Designation
P = Prefab. "Plain"
T = Prefab. "T"
U = Prefab. "U"

1EXT or 2EXT = # of Ext.
BM = Extruded Wind Beam
WC = 1.12 #/ft Wing Chan.
EXAL= Extruded Aluminum

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN TEXT	DIMENSIONS	ALUMINUM TYPE A	ALUMINUM TYPE G	Post Type	Posts (1 or 2)	Anchor Type	Mounting Designation	
7 OF 11	1	R3-8LK	<- ONLY | ↱	36 X 30	X		10 BWG	1	SA	T	
	2	D1-2	<- Kyle Buda ->	60 x 30		X	BRIDGE RAIL MOUNT				
	3	W3-1	STOP AHEAD (Symbol)	30 X 30	X		BRIDGE RAIL MOUNT				
	4	R2-1	SPEED LIMIT XX	30 X 36	X		10 BWG	1	SA	P	
	5	W8-13aT	BRIDGE MAY ICE IN COLD WEATHER	36 X 36	X		10 BWG	1	SA	T	
8 OF 11	1	M3-3	SOUTH	24 X 12	X		BRIDGE RAIL MOUNT				
		M1-6F	FARM ROAD 2770	24 X 24	X						
		M5-1L	<-	21 X 15	X						
		M3-1	NORTH	24 X 12	X						
		M1-6F	FARM ROAD 2770	24 X 24	X						
		M5-1R	->	21 X 15	X						
	2	M2-1	JCT	21 X 15	X		BRIDGE RAIL MOUNT				
		M1-6F	FARM ROAD 2770	24 X 24	X						
9 OF 11	1	W8-13aT	BRIDGE MAY ICE IN COLD WEATHER	36 X 36	X		10 BWG	1	SA	T	
	2	M2-1	JCT	21 X 15	X		10 BWG	1	SA	P	
		M1-6R	RANCH ROAD 967	24 X 24	X						
	3	M3-1	NORTH	24 X 12	X		S80	1	SA	U	
		M1-6R	RANCH ROAD 967	**24 X 24**	**X**						
		M5-1L	<-	21 X 15	X						
		M3-3	SOUTH	24 X 12	X						
		M1-6R	RANCH ROAD 967	24 X 24	X						
		M5-1R	->	21 X 15	X						
	4	W3-1	STOP AHEAD (Symbol)	30 X 30	X		10 BWG	1	SA	P	
	5	R11-2	ROAD CLOSED	48 X 30	X		10 BWG	1	SA	U	
10 OF 11	1	R2-1	SPEED LIMIT XX	30 X 36	X		10 BWG	1	SA	P	
	2	R3-8b	<- ONLY | ↑ ONLY | ONLY ->	48 X 30	X		10 BWG	1	SA	U	
	3	R1-1	STOP	36 X 36	X		10 BWG	1	SA	P	BM
		W4-4P	CROSS TRAFFIC DOES NOT STOP	24 X 12	X						
	4	D1-2	<- Buda Kyle ->	60 x 30		X	10 BWG	1	SA	U	EXAL
	5	R3-8LSK	<- ONLY | ↑ ONLY | ↱	48 X 30	X		10 BWG	1	SA	U	
	6	R3-8LSK	<- ONLY | ↑ ONLY | ↱	48 X 30	X		10 BWG	1	SA	U	
	7	R1-1	STOP	36 X 36	X		10 BWG	1	SA	P	BM
		W4-4P	CROSS TRAFFIC DOES NOT STOP	24 X 12	X						
11 OF 11	1	R3-8b	<- ONLY | ↑ ONLY | ONLY ->	48 X 30	X		10 BWG	1	SA	U	
	2	D1-2	<- Kyle Buda ->	60 x 30		X	10 BWG	1	SA	U	EXAL
	3	W3-1	STOP AHEAD (Symbol)	30 X 30	X		10 BWG	1	SA	P	
	4	M3-3	SOUTH	24 X 12	X		S80	1	SA	U	
		M1-6R	RANCH ROAD 967	24 X 24	X						
		M5-1L	<-	21 X 15	X						
		M3-1	NORTH	24 X 12	X						
		M1-6R	RANCH ROAD 967	24 X 24	X						
		M5-1R	->	21 X 15	X						
	5	M2-1	JCT	21 X 15	X		10 BWG	1	SA	P	
		M1-6R	RANCH ROAD 967	24 X 24	X						
	6	W1-2R	HORIZONTAL CURVE RIGHT(Symbol)	36 X 36	X		10 BWG	1	SA	T	
	7	EXISTING	EXISTING CITY OF BUDA WAYFINDING SIGN				SPECIAL - COORDINATE WITH CITY OF BUDA FOR INSTALLATION				

ALUMINUM SIGN BLANKS (TYPE A)

Square Ft.	Min. Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

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.

HDR Engineering, Inc.
1239 Wonder World Drive
Building #1, Suite 1230
San Marcos, TX 78666-7969
(Texas Registered Engineering Firm No. F-754)

11/19/2020

STATE OF TEXAS
TIMOTHY GRIMES
100107
LICENSED PROFESSIONAL ENGINEER

SUMMARY OF SMALL SIGNS
SOSS

SHEET 2 OF 3

DIST	COUNTY	CONT	SECT	JOB	HIGHWAY
AUS	HAYS	0914	33	068,ETC	RSL

REVISIONS
DN: TxDOT 11-93
CK: TxDOT 8-95
DW: TxDOT 1-02
CK: TxDOT 7-02
2-07
9-08

SHEET NO. 23

18

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SUMMARY OF SMALL SIGNS

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

Post Type
FRP = Fiberglass
TWT = Thin-Wall
10BWG = 10 BWG
S80 = Sch 80

Posts (1 or 2)

Anchor Type
UA=Univer-Conc
UB=Univer-Bolt
SA=Slip-Conc
SB=Slip-Bolt
WS=Wedge Steel
WP=Wedge Plastic

Mounting Designation
P = Prefab. "Plain"
T = Prefab. "T"
U = Prefab. "U"

1EXT or 2EXT = # of Ext.
BM = Extruded Wind Beam
WC = 1.12 #/ft Wing Chan.
EXAL= Extruded Aluminum

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN TEXT	DIMENSIONS	ALUMINUM TYPE A	ALUMINUM TYPE G	Post Type	Posts (1 or 2)	Anchor Type	Mounting Designation	
1 OF 3	1	R2-1	SPEED LIMIT 55	30 X 36	X		10 BWG	1	SA	P	
	2	R3-8LK	<- ONLY | ↱	36 X 30	X		10 BWG	1	SA	T	
	3	W2-1	INTERSECTION AHEAD (Symbol)	36 X 36	X		10 BWG	1	SA	T	
	4	D21-1TDBL LR	<-> Robert S Light Blvd	114 X 12	X		10 BWG	1	SA	T	2EXT
	5	R3-8LK	<- ONLY | ↱	36 X 30	X		10 BWG	1	SA	T	
	6	R3-8LK	<- ONLY | ↱	36 X 30	X		10 BWG	1	SA	T	
2 OF 3	1	R3-8LK	<- ONLY | ↱	36 X 30	X		10 BWG	1	SA	T	
	2	R1-1	STOP	36 X 36	X		10 BWG	1	SA	P	BM
	3	D21-1TDBL LR	<-> Robert S Light Blvd	114 X 12	X		10 BWG	1	SA	T	2EXT
	4	W2-1	INTERSECTION AHEAD (Symbol)	36 X 36	X		10 BWG	1	SA	T	
	5	W1-2R	HORIZONTAL CURVE RIGHT(Symbol)	36 X 36	X		10 BWG	1	SA	T	
	6	R2-1	SPEED LIMIT 55	30 X 36	X		10 BWG	1	SA	P	
3 OF 3	1	R5-4aT	NO ENGINE BRAKE BY CITY ORDINANCE	36 X 48	X		10 BWG	1	SA	T	
	2	W1-6R	LARGE RIGHT ARROW(Symbol)	48 X 24	X		10 BWG	1	SA	T	
	3	W1-6L	LARGE LEFT ARROW(Symbol)	48 X 24	X		10 BWG	1	SA	T	
1 OF 2	1	R2-1	SPEED LIMIT 55	30 X 36	X		10 BWG	1	SA	P	
	2	R3-8LK	<- ONLY | ↱	36 X 30	X		10 BWG	1	SA	T	
	3	W2-1	INTERSECTION AHEAD (Symbol)	36 X 36	X		10 BWG	1	SA	T	
	4	D21-1TDBL LR	<-> Robert S Light Blvd	114 X 12	X		10 BWG	1	SA	T	2EXT
	5	R3-8LK	<- ONLY | ↱	36 X 30	X		10 BWG	1	SA	T	
	6	R3-8LK	<- ONLY | ↱	36 X 30	X		10 BWG	1	SA	T	
2 OF 2	1	R3-8LK	<- ONLY | ↱	36 X 30	X		10 BWG	1	SA	T	
	2	D21-1TDBL LR	<-> Robert S Light Blvd	114 X 12	X		10 BWG	1	SA	T	2EXT
	3	W2-1	INTERSECTION AHEAD (Symbol)	36 X 36	X		10 BWG	1	SA	T	
	4	R2-1	SPEED LIMIT 55	30 X 36	X		10 BWG	1	SA	P	

ALUMINUM SIGN BLANKS (TYPE A)

Square Ft.	Min. Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

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.

HDR Engineering, Inc.
1290 Wonder World Drive
Building #1, Suite 1230
San Marcos, TX 78666-7969
(Texas Registered Engineering Firm No. F-754)

TIMOTHY GRIMES
100107
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS
11/19/2020

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DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT	REVISIONS
				11-93
				7-02
				8-95
				2-07
				1-02
				9-08

DIST	COUNTY	CONT	SECT	JOB	HIGHWAY
AUS	HAYS	0914	33	068,ETC	RSL

SHEET NO. 24

SHEET 3 OF 3

SUMMARY OF SMALL SIGNS

SOSS

18

GENERAL

1. PORTABLE CHANGEABLE MESSAGE SIGNS (PCMS) SHALL BE PLACED TO DIRECT TRAFFIC AT THE ENGINEER'S DISCRETION.
2. FLAGGERS SHALL BE EQUIPPED WITH COMMUNICATION DEVICES (MAY USE RADIOS) TO COORDINATE TRAFFIC MOVEMENT THROUGH THE ONE-LANE TWO-WAY WORK ZONE OR A PILOT VEHICLE MAY BE USED TO GUIDE TRAFFIC THROUGH THE WORK ZONE.
3. PROVIDE TRAIL AND PILOT VEHICLES WHEN USING TCP (2-2)-18, AS NEEDED.
4. PROVIDE SUITABLE WARNING LIGHTS MOUNTED HIGH ENOUGH TO BE VISIBLE FROM ALL DIRECTIONS ON ALL CONSTRUCTION EQUIPMENT, INCLUDING PILOT VEHICLES, AND OPERATE WARNING LIGHTS WHEN THE EQUIPMENT IS WITHIN THE RIGHT OF WAY. EQUIP OTHER EQUIPMENT SUCH AS TRUCKS, TRAILERS, AUTOS, ETC., WITH EMERGENCY FLASHERS AND USE EMERGENCY FLASHERS WITHIN THE WORK AREA.
5. NO ADDITIONAL PAYMENT WILL BE MADE FOR RELOCATING EXISTING SIGN ASSEMBLIES TO TEMPORARY MOUNTS.
6. PROVIDE A 3:1 SLOPE OR FLATTER FROM THE PAVEMENT EDGE WITH 42" CONES IN ALL WORK AREAS DURING NON-WORKING HOURS. IF ADEQUATE WIDTH IS NOT AVAILABLE TO SET THE 42" CONES, THE 3:1 EDGE BUILD UP SHALL BE WIDENED TO ACCOMMADATE 42" CONE PLACEMENT. LABOR AND MATERIALS INVOLVED IN THIS WORK SHALL NOT BE PAID FOR DIRECTLY, BUT SHALL BE CONSIDERED SUBSIDIARY TO THE VARIOUS BID ITEMS OF THE CONTRACT.
7. CONSTRUCTION OF DETOURS ALONG RM 967 AND FM 2770 (OR ANY ONE LANE-TWO WAY TRAFFIC CONDITION) WILL ONLY BE ALLOWED ONLY DURING NIGHT TIME HOURS BETWEEN 7:00 PM TO 6:00 AM UNLESS APPROVED BY THE ENGINEER.
8. ALL OVERHEAD WORK INCLUDING PLACEMENT OF BEAMS, PRECAST CONCRETE PANELS, SLAB CONCRETE ANDBRIDGE RAILS SHALL BE PERFORMED AT NIGHT FOR SPAN 6 OF THE MUSTANG BRANCH BRIDGE OVER THE CENTEX HAUL ROAD UNLESS PRIOR AUTHORIZATION IS OBTAINED FROM CENTEX TO PERFORM DURING QUARRY OPERATING HOURS.

ADVANCED WARNING SIGNS

1. INSTALL TEMPORARY ADVANCED WARNING SIGNS FOR CONSTRUCTION ALONG FM 1785 AND THE CROSS STREETS INTERSECTING WITH FM 1785.
2. THE ADVANCED WARNING SIGNS SHALL CONFORM TO THE TXDOT BARRICADE AND CONSTRUCTION STANDARD DETAILS AND THE ADVANCED WARNING SIGN SHEETS INCLUDED IN THESE PLANS.

PHASE I

1. STEP 1 - CONSTRUCT RS LIGHT BETWEEN FM 1626 AND RM 967
   A. SET PROJECT BARRICADES AND ADVANCE WARNING SIGNS AS SHOWN IN THE PLAN SET.
   B. INSTALL SWPPP ITEMS AS SHOWN IN THE PLAN SET.
   C. BEGIN CONSTRUCTION ON ROBERT S. LIGHT EXTENSION (RSL) BETWEEN FM 1626 AND RM 967 TO FINAL OVERLAY.
   D. MUSTANG BRANCH BRIDGE TO BE CONSTRUCTED BEFORE WORK MAY BEGIN ON THE UNION PACIFIC RAILROAD (U.P.R.R.) BRIDGE.
2. STEP 2 - TEMPORARILY WIDEN SOUTHBOUND RM 967
   A. THIS WORK IS NOT TO BEGIN UNTIL THE TYPE B HMAC IS PLACED ON ROBERT S. LIGHT BLVD. IN PHASE 1 - STEP 1.
   B. SET PROJECT BARRICADES AND ADVANCE WARNING SIGNS AS SHOWN IN THE PLAN SET.
   C. INSTALL SWPPP ITEMS AS SHOWN IN THE PLAN SET.
   D. DURING WORKING HOURS CLOSE THE SOUTHBOUND LANE OF RM 967 WITH CHANNELIZING DEVICES AND UTILIZE TCP(2-2)-18 FOR ONE-LANE TWO-WAY TRAFFIC CONTROL.
   E. CONSTRUCT TEMPORARY PAVEMENT ON WEST SIDE OF RM 967.

PHASE II

1. SET PROJECT BARRICADES AND ADVANCE WARNING SIGNS AS SHOWN IN THE PLAN SET.
2. INSTALL SWPPP ITEMS AS SHOWN IN THE PLAN SET.
3. RESTRIPE RM 967 AND SHIFT TRAFFIC TO TEMPORARY DETOUR.
4. STEP 1 - CONSTRUCTION ON INTERSECTION OF RM 967
   A. SET SIGNS FOR ROBERT S LIGHT TRAFFIC TO FOLLOW RM 967 DETOUR ROUTE. PCMS NOTIFYING OF CLOSURE SHALL BE SET TWO WEEKS MINIMUM BEFORE INTERSECTION CLOSURE.
   B. CLOSE EXISTING RSL INTERSECTION AND RECONSTRUCT PAVEMENT LIMITS FROM CENTERLINE OF RM 967 TO STA. 196+28. RSL INTERSECTION SHALL BE CONSTRUCTED DURING NIGHT TIME ONLY AND FROM 7:00 PM TO 6:00 AM. THIS WORK WILL BE DONE ONLY ON WEEKENDS
   C. SET BARRICADES, RESTRIPE SOUTH SIDE OF RSL, AND SHIFT TRAFFIC TO SOUTH SIDE OF RSL.
   D. CONSTRUCT THE NORTH SIDE OF RSL TO STA 201+50.
   E. SET BARRICADES, RESTRIPE NORTH SIDE OF RSL, AND SHIFT TRAFFIC TO NEWLY CONSTRUCTED NORTH SIDE OF RSL.
5. STEP 2 - CONSTRUCTION ON EAST SIDE OF RM 967
   A. RESTRIPE AND SHIFT TRAFFIC ON RECONSTRUCTED RLS TO INSIDE LANES
   B. CONSTRUCT EAST SIDE OF RM 967 PERMANENT AND TEMPORARY WIDENINGS.
6. STEP 3 - CONSTRUCTION ON WEST SIDE OF RM 967
   A. RESTRIPE AND SHIFT TRAFFIC TO RECONSTRUCTED EAST SIDE OF RM 967 AND RSL.
   B. CONSTRUCT WEST SIDE OF RM 967 AND TIE INTO RSL EXTENSION ON WEST SIDE.
   C. RESTRIPE RM 967 TO ORIGINAL CONFIGURATION AND RETURN TRAFFIC TO RM 967.

PHASE III

1. STEP 1 - TEMPORARILY WIDEN SB FM 2770
   A. SET PROJECT BARRICADES AND ADVANCE WARNING SIGNS AS SHOWN IN THE PLAN SET.
   B. INSTALL SWPPP ITEMS AS SHOWN IN THE PLAN SET.
   C. DURING WORKING HOURS CLOSE THE SOUTHBOUND LANE OF FM 2770 WITH CHANNELIZING DEVICES AND UTILIZE TCP(2-2)-18 FOR ONE-LANE TWO-WAY TRAFFIC CONTROL.
   D. CONSTRUCT TEMPORARY PAVEMENT ON WEST SIDE OF FM 2770.
2. STEP 2 - CONSTRUCTION ON EAST SIDE OF FM 2770
   A. RESTRIPE AND SHIFT TRAFFIC TO TEMPORARY PAVEMENT ON WEST SIDE OF FM 2770.
   B. CONSTRUCT EAST SIDE OF FM 2770 TO STA. 1055+44 ON RSL.
1. STEP 3 - CONSTRUCTION ON WEST SIDE OF FM 2770
   A. RESTRIPE AND SHIFT TRAFFIC TO NEW PAVEMENT ON EAST SIDE OF FM 2770.
   B. CONSTRUCT WEST SIDE OF FM 2770 TO STA. 1053+50 ON RSL.
   C. RESTRIPE FM 2770 TO ORIGINAL CONFIGURATION AND RETURN TRAFFIC TO FM 2770.

PHASE IV

1. PLACE FINAL LIFT OF HMAC ON RSL, RM 967 AND FM 2770 INCLUDING MAIN LANES AND INTERSECTIONS.
2. PLACE SIGNING, PAVEMENT MARKINGS AND PERMANENT EROSION CONTROL MEASURES ALONG PROJECT LIMITS.
3. FINAL CLEAN-UP
4. OPEN ROBERT S. LIGHT EXTENSION TO TRAFFIC.

RICARDO E. DE LA PARRA
94043
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS
12/08/2020

HAYS COUNTY TEXAS

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY
TBPE FIRM REGISTRATION NO. 2614

Texas Department of Transportation

ROBERT S. LIGHT EXTENSION

ROBERT S. LIGHT TRAFFIC CONTROL PLAN NARRATIVE

SHEET 1 OF 1

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
GRAPHICS	6	STP ( ) RGS		RSLE
	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	25
	0914	33	068,etc	

PLOT DRIVER: $PLTDRVS$ PENTABLE: RSLE1bl
USER: DATE: 12/8/2020 TIME: 4:57:58 PM SCALE: $SCALESHORT$
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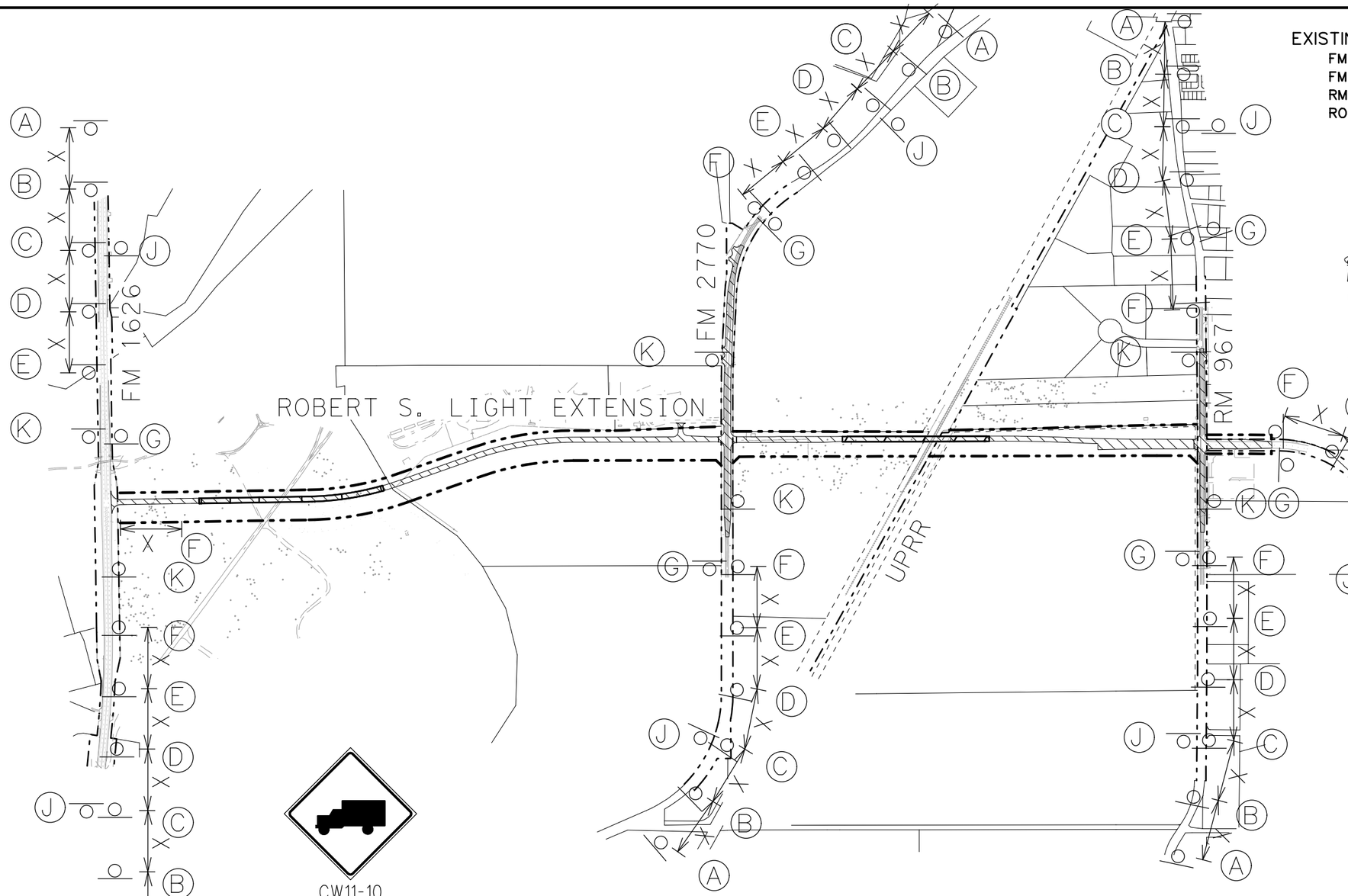

EXISTING POSTED SPEED

FM 1626 - 60 MPH
FM 2770 - 55 MPH
RM 967 - 55 MPH
ROBERT S. LIGHT - 35 MPH

SPACING

Posted Speed	Sign Spacing "X"
MPH	Feet (Apprx.)
35	160
55	500
60	600

NOTE:

1. SEE BC (1-5, 10)-14 FOR ADDITIONAL DETAIL.
2. SEE BC (2) FOR DETAILS OF INTERSECTION.

LEGEND

TRAFFIC SIGN

OBEY WARNING SIGNS STATE LAW
R20-3T
(A)

STAY ALERT
TALK OR TEXT LATER
G20-10T
(B)

G20-9TP BEGIN WORK ZONE
R20-5T TRAFFIC FINES DOUBLE
R20-5aTP WHEN WORKERS ARE PRESENT
(C)

CW11-10
(K)

SPEED LIMIT XX
R2-1
(D)

ROAD WORK AHEAD
CW20-1D
(E)

G20-5T BEGIN ROAD WORK NEXT 1 MILES
G20-6T NAME ADDRESS CITY STATE
CONTRACTOR
CW11-10L (36x36)
(F)

G20-2a END ROAD WORK
(G)

G20-1bTR ROAD WORK NEXT 2 MILES ⇨
(H)

G20-1bTL ⇦ ROAD WORK NEXT 2 MILES
(I)

G20-2b END WORK ZONE
(J)

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P.E.
12/09/2020

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ROBERT S. LIGHT EXTENSION

ROBERT S. LIGHT TRAFFIC CONTROL PLAN ADVANCE WARNING

SHEET OF 1 1

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
GRAPHICS	6	STP ( ) RGS		RSLE
	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	AUS	HAYS	
	CONTROL	SECTION	JOB	26
CHECK	0914	33	068,etc	

PLOT DRIVER: $PLTDRVS$ PENTABLE: RSLE1tbl
USER: DATE: 12/9/2020 TIME: 4:43:43 PM SCALE: $SCALESHORT$
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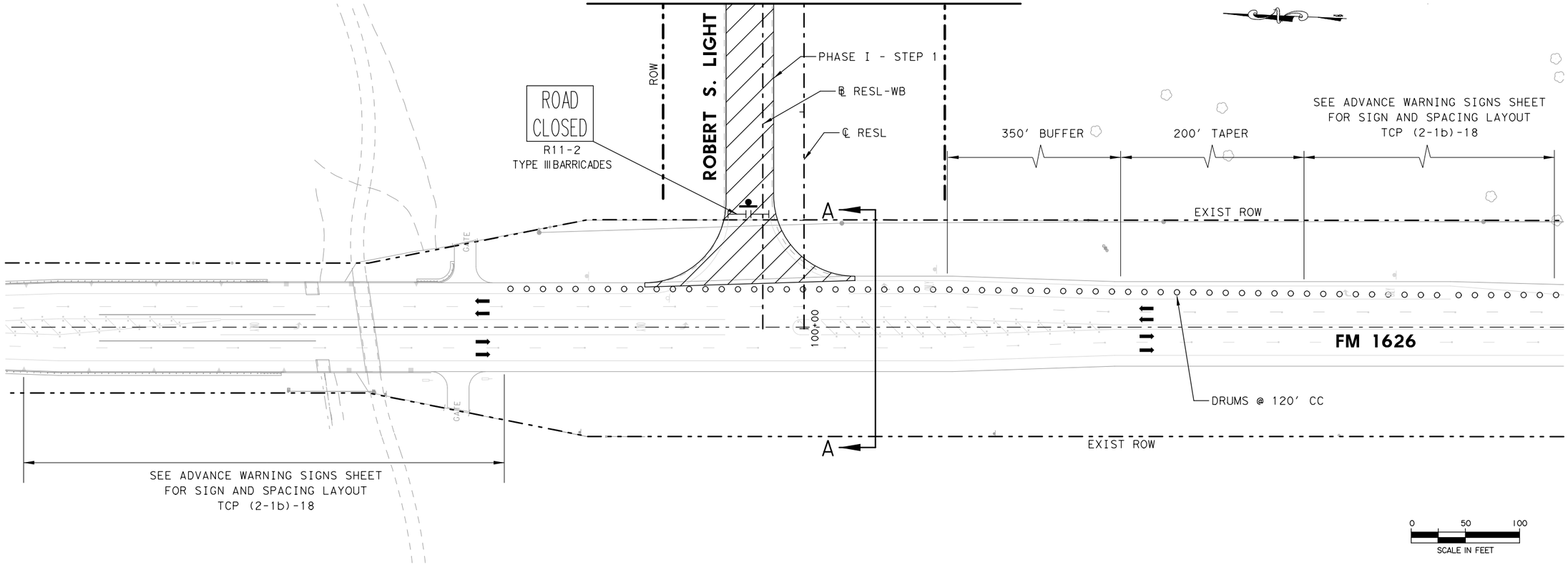

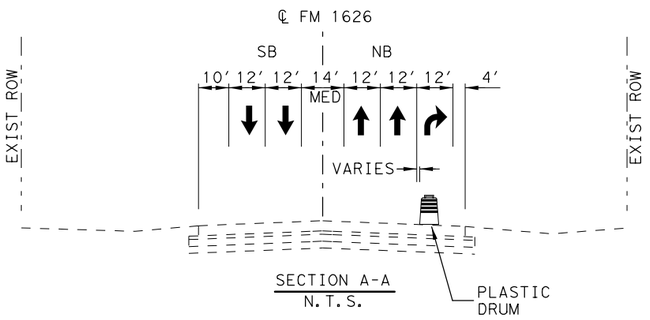

NOTES:

1. CONTRACTOR WILL PROVIDE ACCESS TO PROPERTY OWNERS DURING CONSTRUCTION.

2. DEVICE SPACING BASED ON 60 MPH POSTED SPEED.

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMP CONSTRUCTION
- DIRECTION OF TRAFFIC
- CHANNELIZING DEVICE
- TYPE 3 BARRICADE
- TEMP GROUND MOUNTED SIGNS
- TEMP PAVEMENT STRIPING
- LOW PROF TRAF BARR (LPTB)(W/DRAIN SLOT)
- (A) WRK ZN PAV MRK REMOV (Y) 4" (SLD) DBL
- (B) WRK ZN PAV MRK REMOV (W) 4" (SLD)
- (C) WRK ZN PAV MRK REMOV (W) 24" (SLD)

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ROBERT S. LIGHT EXTENSION

ROBERT S. LIGHT TRAFFIC CONTROL PLAN PHASE I - STEP 1

SHEET 1 OF 4

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
GRAPHICS	6	STP ( ) RGS		RSLE
	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	AUS	HAYS	
	CONTROL	SECTION	JOB	27
CHECK	0914	33	068,etc	

PLOT DRIVER: $PLTDRVS$ PENTABLE: RSLE1tbl
USER: DATE: 11/10/2020 TIME: 12:07:43 PM SCALE: $SCALESHORT$
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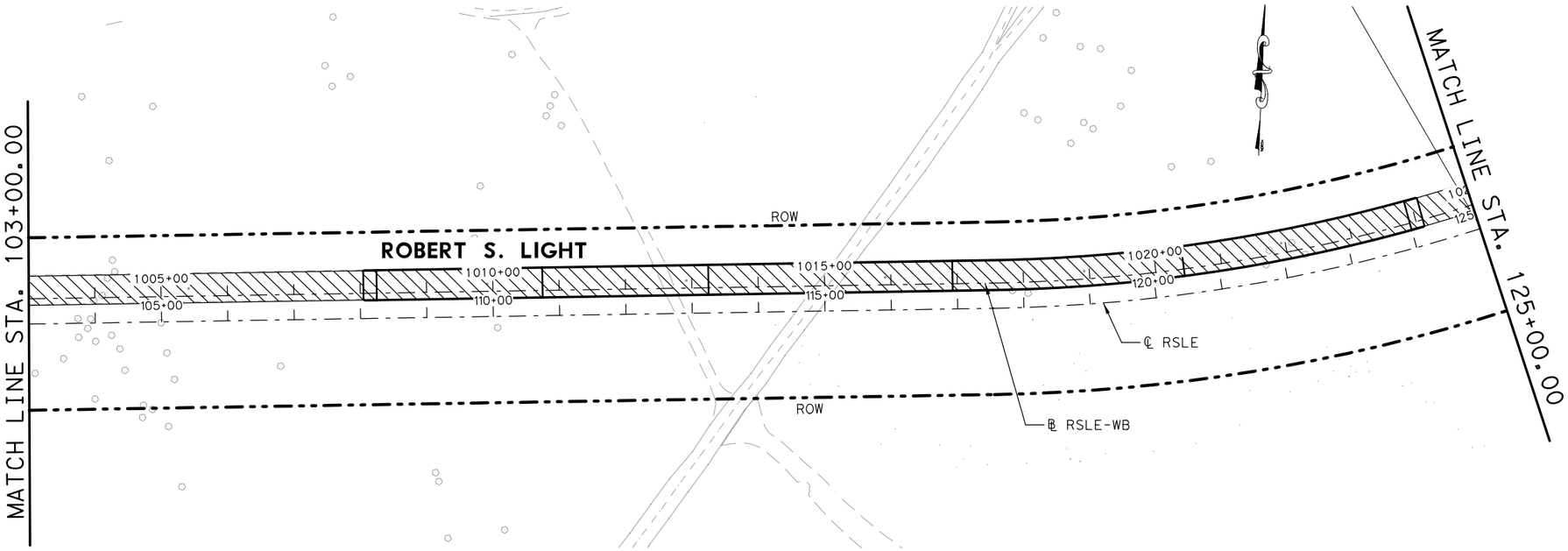

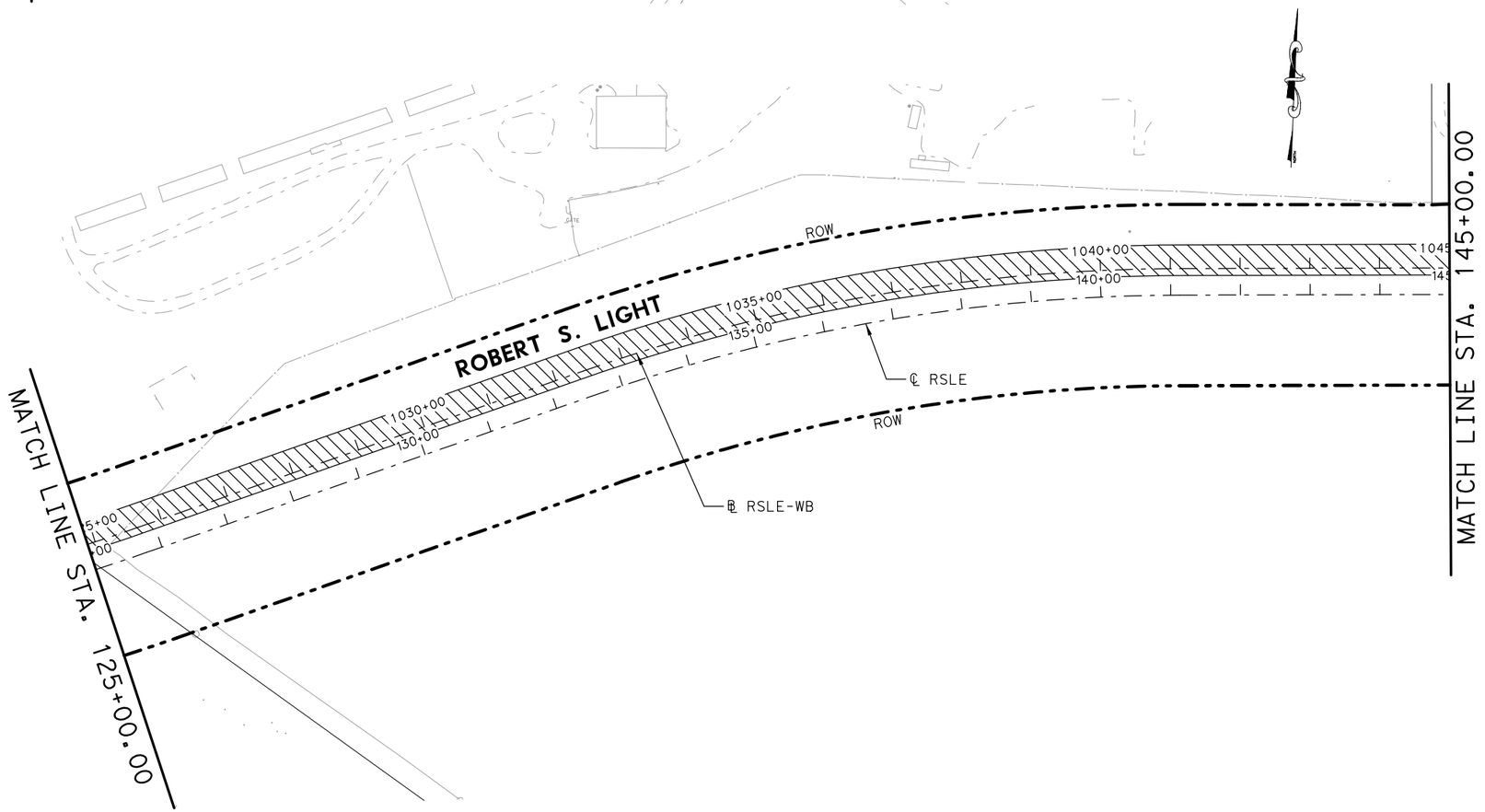

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMP CONSTRUCTION
- DIRECTION OF TRAFFIC
- CHANNELIZING DEVICE
- TYPE 3 BARRICADE
- TEMP GROUND MOUNTED SIGNS
- TEMP PAVEMENT STRIPING
- LOW PROF TRAF BARR (LPTB)(W/DRAIN SLOT)
- (A) WRK ZN PAV MRK REMOV (Y) 4" (SLD) DBL
- (B) WRK ZN PAV MRK REMOV (W) 4" (SLD)
- (C) WRK ZN PAV MRK REMOV (W) 24" (SLD)
- (D) WRK ZN PAV MRK REMOV (W) 4" (BRK)
- (E) WRK ZN PAV MRK REMOV (W)(ARROW)
- (F) WRK ZN PAV MRK REMOV (W)(WORD)

NOTES:

1. CONTRACTOR WILL PROVIDE ACCESS TO PROPERTY OWNERS DURING CONSTRUCTION.

0 100 200
SCALE IN FEET

STATE OF TEXAS
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ROBERT S. LIGHT EXTENSION

ROBERT S. LIGHT TRAFFIC CONTROL PLAN PHASE 1 - STEP 1

SHEET 2 OF 4

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
GRAPHICS	6	STP ( ) RGS		RSLE
	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	28
	0914	33	068,etc	

PLOT DRIVER: $PLTDRVS$ PENTABLE: RSLE.tbl
USER: DATE: 11/10/2020 TIME: 12:08:11 PM SCALE: $SCALESHORT$
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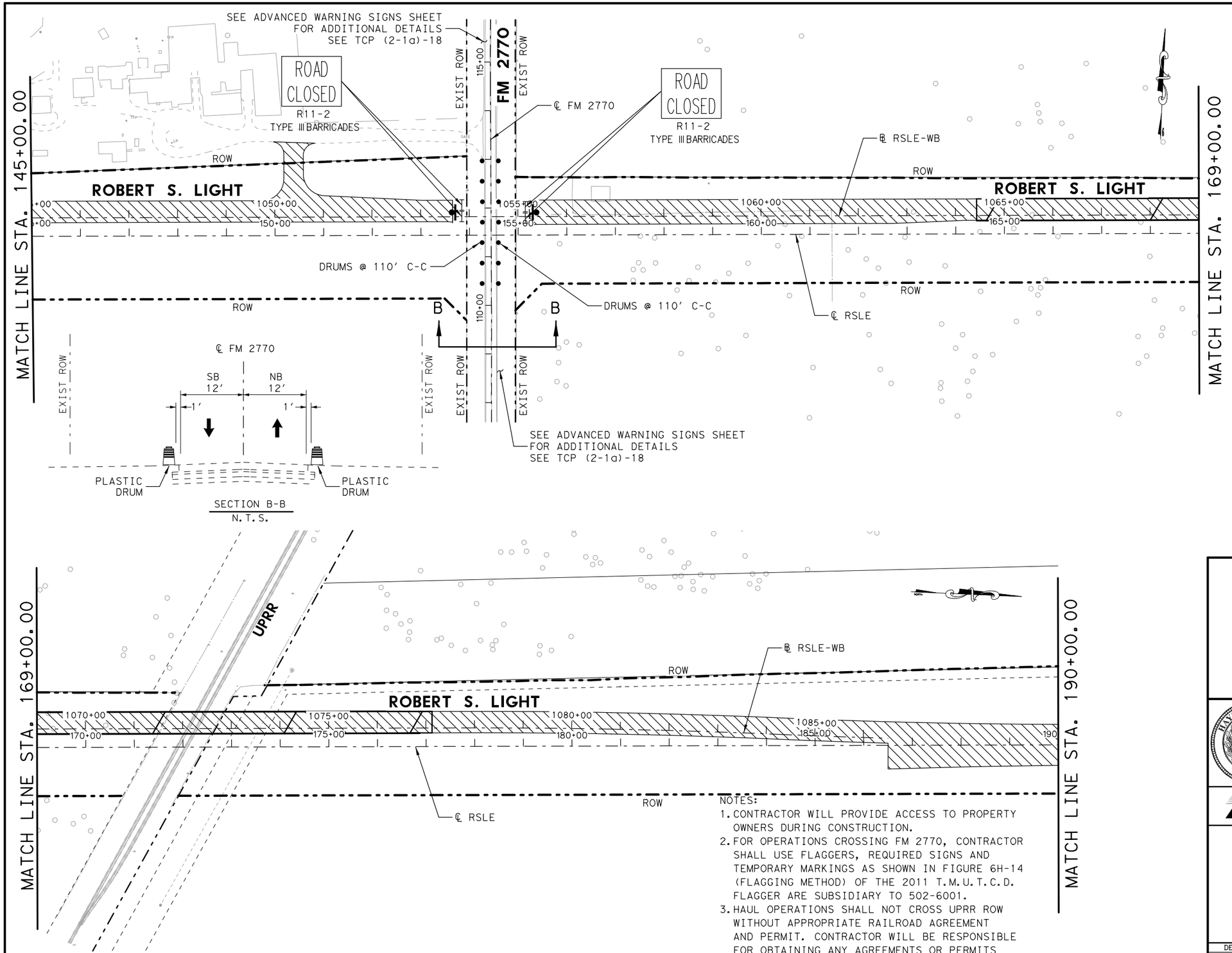

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMP CONSTRUCTION
- DIRECTION OF TRAFFIC
- CHANNELIZING DEVICE
- TYPE 3 BARRICADE
- TEMP GROUND MOUNTED SIGNS
- TEMP PAVEMENT STRIPING
- LOW PROF TRAF BARR (LPTB)(W/DRAIN SLOT)
- (A) WRK ZN PAV MRK REMOV (Y) 4" (SLD) DBL
- (B) WRK ZN PAV MRK REMOV (W) 4" (SLD)
- (C) WRK ZN PAV MRK REMOV (W) 24" (SLD)
- (D) WRK ZN PAV MRK REMOV (W) 4" (BRK)
- (E) WRK ZN PAV MRK REMOV (W)(ARROW)
- (F) WRK ZN PAV MRK REMOV (W)(WORD)

NOTES:

1. CONTRACTOR SHALL PROVIDE ACCESS TO PROPERTY OWNERS DURING CONSTRUCTION.
2. CHANNELIZING DEVICES ALONG FM 2770 BASED ON 55 MPH SPEED.

0 100 200
SCALE IN FEET

NOTES:

1. CONTRACTOR WILL PROVIDE ACCESS TO PROPERTY OWNERS DURING CONSTRUCTION.
2. FOR OPERATIONS CROSSING FM 2770, CONTRACTOR SHALL USE FLAGGERS, REQUIRED SIGNS AND TEMPORARY MARKINGS AS SHOWN IN FIGURE 6H-14 (FLAGGING METHOD) OF THE 2011 T.M.U.T.C.D. FLAGGER ARE SUBSIDIARY TO 502-6001.
3. HAUL OPERATIONS SHALL NOT CROSS UPRR ROW WITHOUT APPROPRIATE RAILROAD AGREEMENT AND PERMIT. CONTRACTOR WILL BE RESPONSIBLE FOR OBTAINING ANY AGREEMENTS OR PERMITS IF HAUL OPERTAIONS ACROSS RAILROAD ROW IS DESIRED.
4. DEVICE SPACING BASED ON 55 MPH POSTED SPEED.

STATE OF TEXAS
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P.E.
12/10/2020

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ROBERT S. LIGHT EXTENSION

ROBERT S. LIGHT TRAFFIC CONTROL PLAN PHASE 1 - STEP 1

SHEET OF 3 4

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
GRAPHICS	6	STP ( ) RGS		RSLE
CHECK	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	AUS	HAYS	29
	CONTROL	SECTION	JOB	
	0914	33	068,etc	

PLOT DRIVER: $PLTDRV$ PENTABLE: RSLE.tbl
USER: DATE: 12/10/2020 TIME: 9:49:49 AM SCALE: $SCALESHORT$
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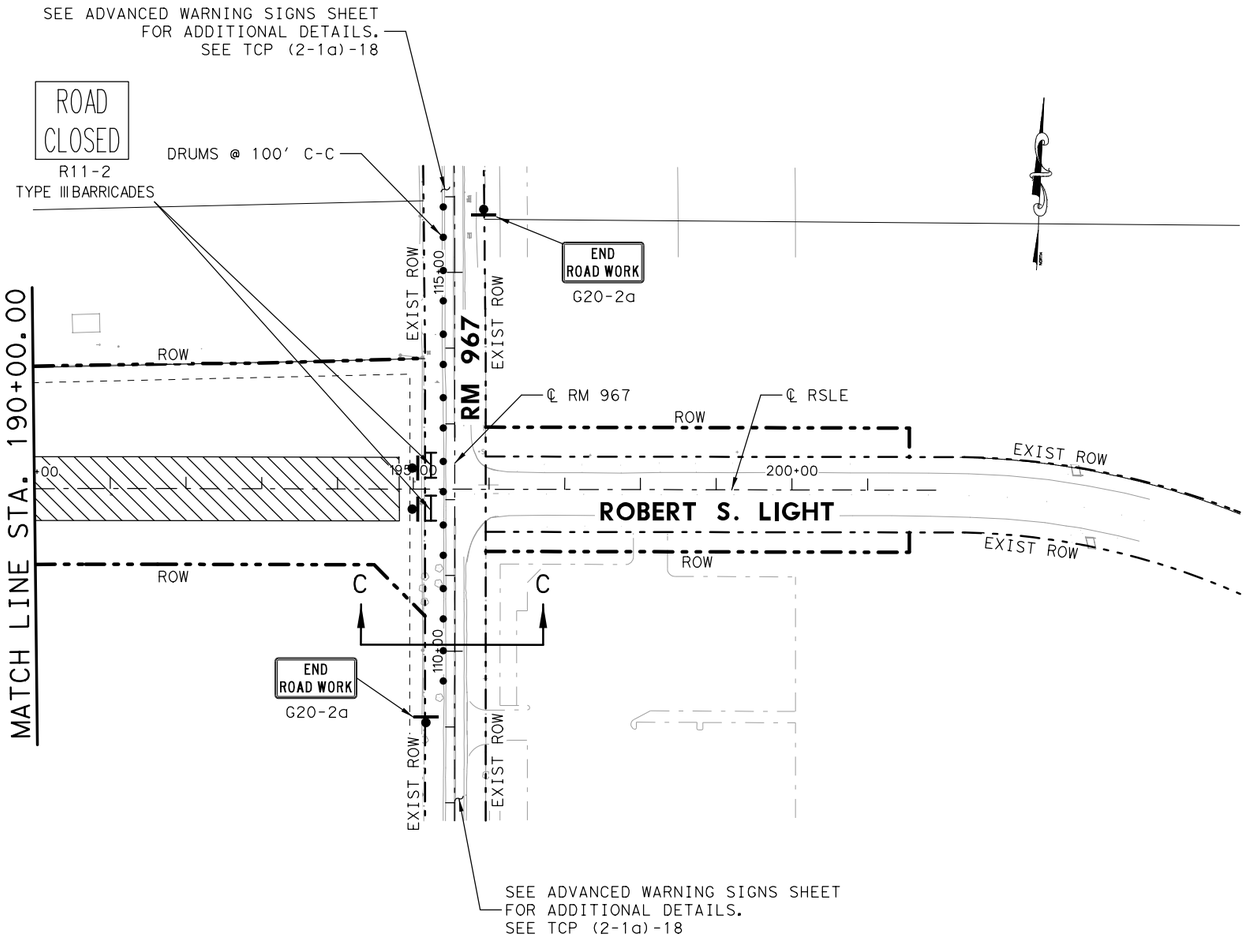

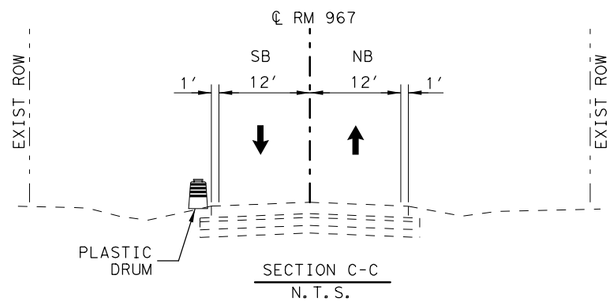

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMP CONSTRUCTION
- DIRECTION OF TRAFFIC
- CHANNELIZING DEVICE
- TYPE 3 BARRICADE
- TEMP GROUND MOUNTED SIGNS
- TEMP PAVEMENT STRIPING
- LOW PROF TRAF BARR (LPTB)(W/DRAIN SLOT)
- (A) WRK ZN PAV MRK REMOV (Y) 4" (SLD) DBL
- (B) WRK ZN PAV MRK REMOV (W) 4" (SLD)
- (C) WRK ZN PAV MRK REMOV (W) 24" (SLD)
- (D) WRK ZN PAV MRK REMOV (W) 4" (BRK)
- (E) WRK ZN PAV MRK REMOV (W)(ARROW)
- (F) WRK ZN PAV MRK REMOV (W)(WORD)

NOTES:

1. CONTRACTOR WILL PROVIDE ACCESS TO PROPERTY OWNERS DURING CONSTRUCTION.
2. DEVICES SPACING BASED ON 50 MPH POSTED SPEED.

0 100 200
SCALE IN FEET

STATE OF TEXAS
RICARDO E. DE LA PARRA
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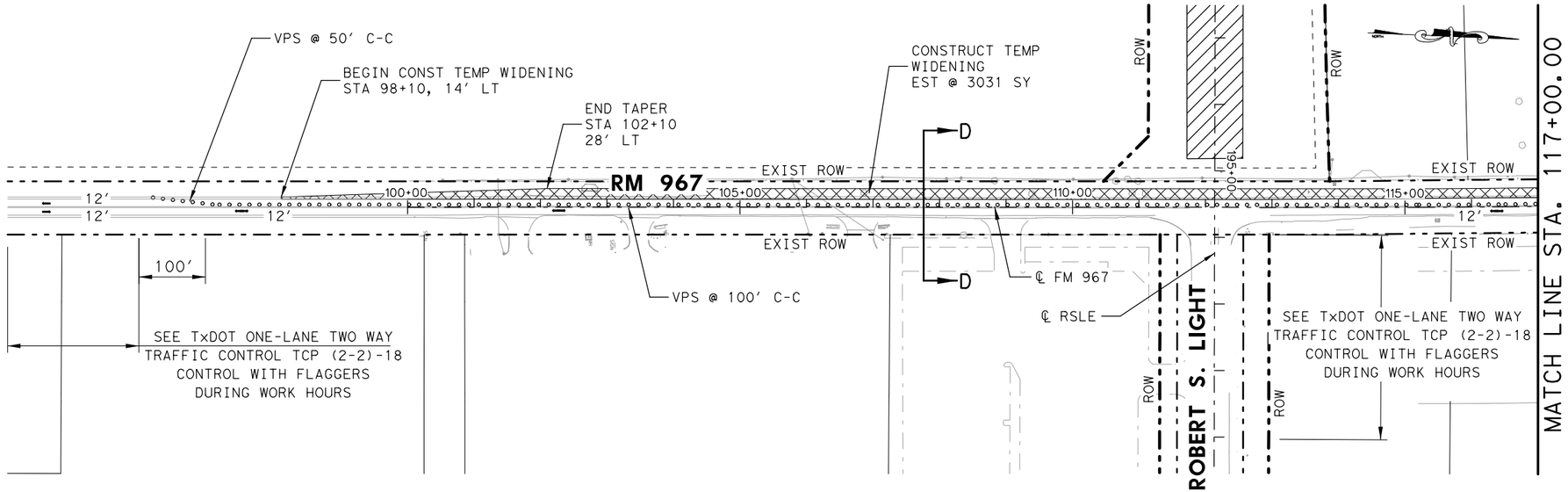
ROBERT S. LIGHT EXTENSION

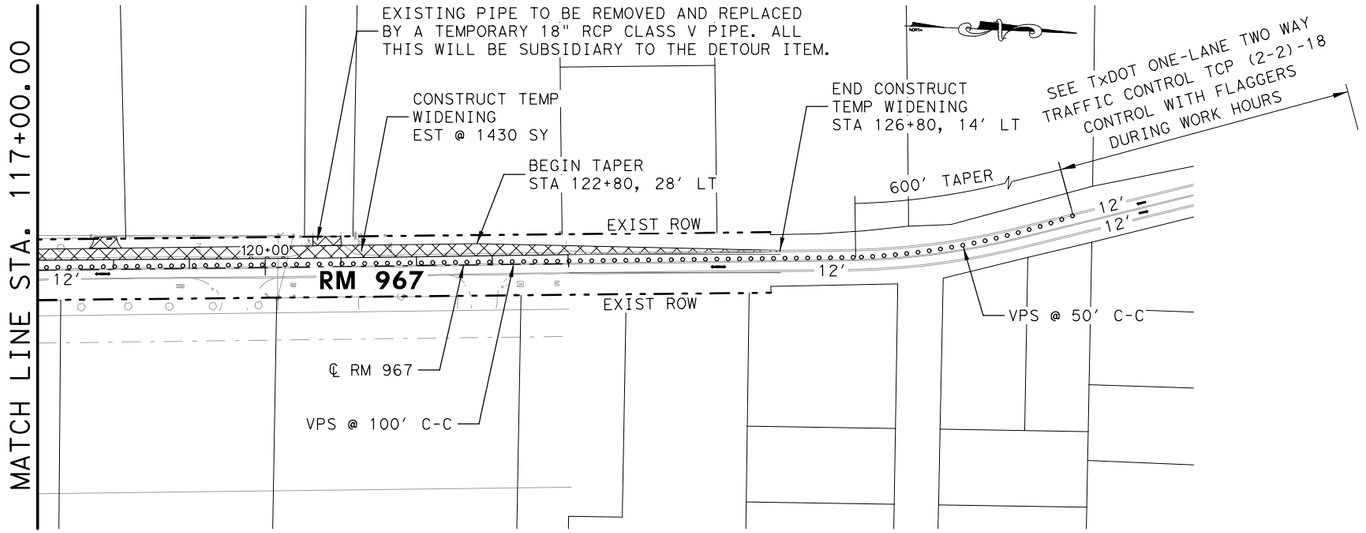
ROBERT S. LIGHT
TRAFFIC CONTROL PLAN
PHASE 1 - STEP 1

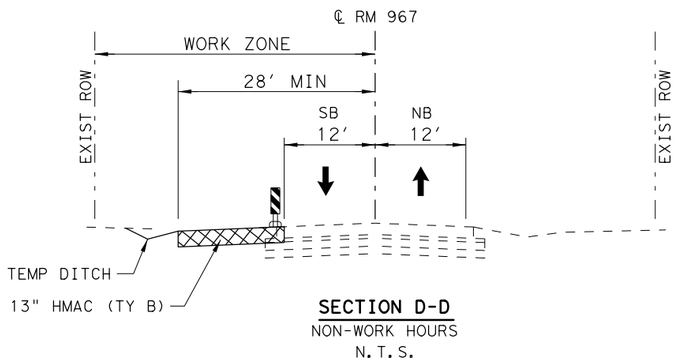
SHEET 4 OF 4

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
GRAPHICS	6	STP ( ) RGS		RSLE
	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	30
	0914	33	068,etc	

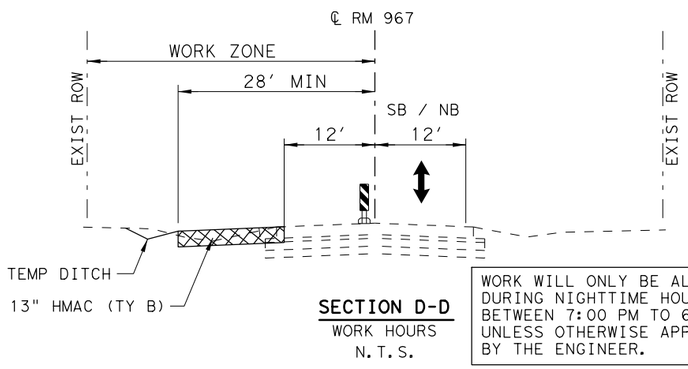
PLOT DRIVER: $PLTDRVS$
USER:
FILE: c:\proj\fechwlse\jarodriguez\d0786332\RSLE_TCP_04.dgn
DATE: 11/10/2020 TIME: 12:09:20 PM
PENTABLE: RSLE.tbl
SCALE: $SCALESHORT$







SECTION D-D
NON-WORK HOURS
N.T.S.



SECTION D-D
WORK HOURS
N.T.S.

WORK WILL ONLY BE ALLOWED DURING NIGHTTIME HOURS BETWEEN 7:00 PM TO 6:00 AM UNLESS OTHERWISE APPROVED BY THE ENGINEER.

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMP CONSTRUCTION
- DIRECTION OF TRAFFIC
- CHANNELIZING DEVICE
- TYPE 3 BARRICADE
- TEMP GROUND MOUNTED SIGNS
- TEMP PAVEMENT STRIPING
- LOW PROF TRAF BARR (LPTB)(W/DRAIN SLOT)
- (A) WRK ZN PAV MRK REMOV (Y) 4" (SLD) DBL
- (B) WRK ZN PAV MRK REMOV (W) 4" (SLD)
- (C) WRK ZN PAV MRK REMOV (W) 24" (SLD)
- (D) WRK ZN PAV MRK REMOV (W) 4" (BRK)
- (E) WRK ZN PAV MRK REMOV (W)(ARROW)
- (F) WRK ZN PAV MRK REMOV (W)(WORD)

NOTES:

1. CONTRACTOR SHALL PROVIDE ACCESS TO PROPERTY OWNER DURING CONSTRUCTION.
2. CONTRACTOR SHALL PROVIDE ADEQUATE DRAINAGE FOR TEMPORARY PAVEMENT AS APPROVED BY ENGINEER.
3. DURING WORK HOURS, THE CONTRACTOR SHALL SET UP TRAFFIC CONTROL DEVICES IN WORK HOURS CONFIGURATION. THIS CONFIGURATION REQUIRES THE USE OF FLAGGERS ON BOTH ENDS OF THE WORK ZONE TO CONTROL TRAFFIC IN THE WORK ZONE. AT THE CONCLUSION OF WORK HOURS. THE CONTRACTOR SHALL SET UP TRAFFIC CONTROL DEVISES IN NON-WORK HOURS CONFIGURATION. THIS CONFIGURATION DOES NOT REQUIRE THE USE OF FLAGGERS TO CONTROL TRAFFIC IN THE WORK ZONE.

0 100 200
SCALE IN FEET

STATE OF TEXAS
RICARDO E. DE LA PARRA
94043
LICENSED PROFESSIONAL ENGINEER
P.E.
12/09/2020

HAYS COUNTY TEXAS

Lockwood, Andrews & Newnam, Inc.
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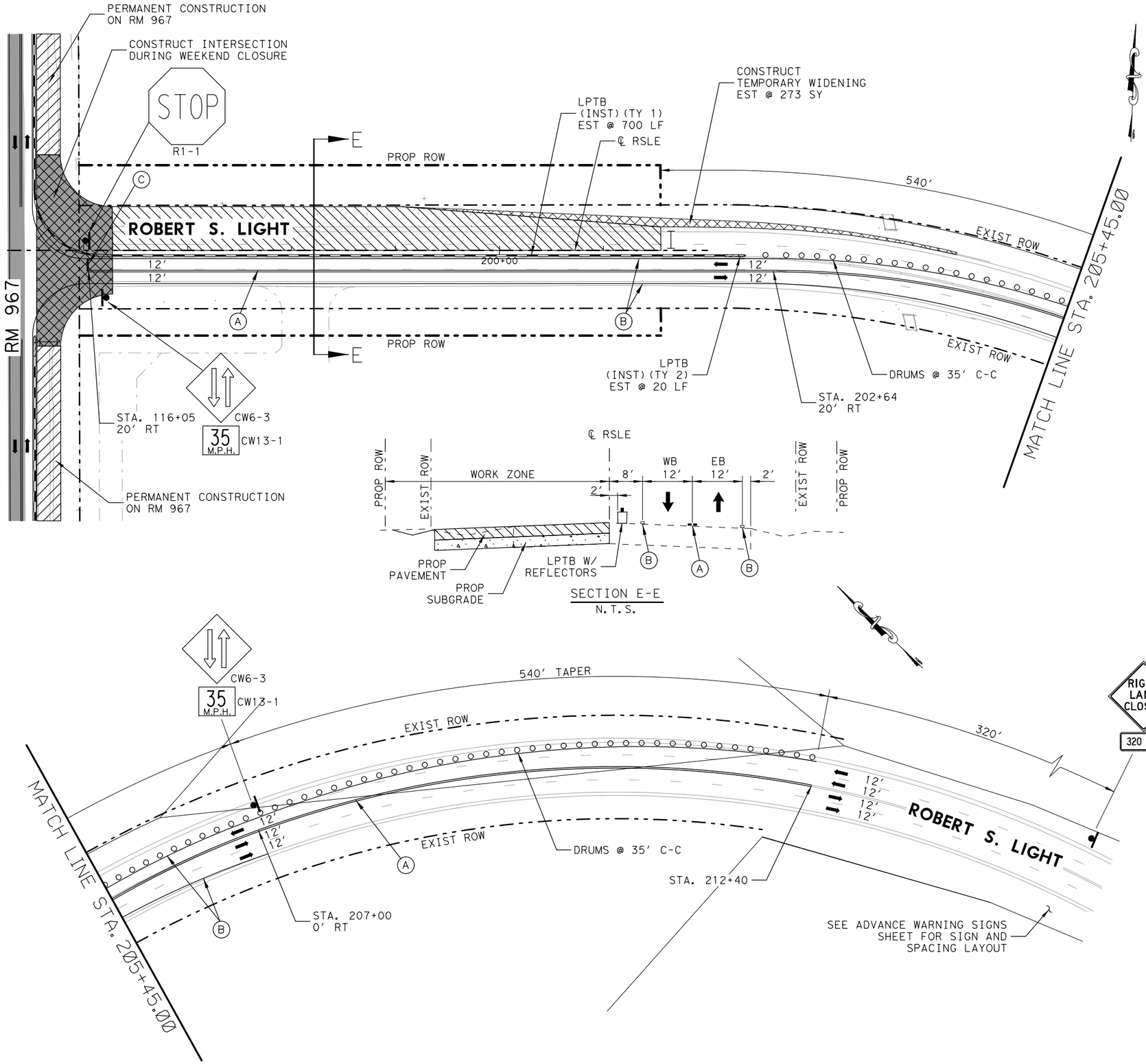
ROBERT S. LIGHT EXTENSION

ROBERT S. LIGHT TRAFFIC CONTROL PLAN PHASE I - STEP 2

SHEET OF 1 1

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	AUS	HAYS	
	CONTROL	SECTION	JOB	31
CHECK	0914	33	068,etc	

PLOT DRIVER: $PLTDRV$$ PENTABLE: RSLE.tbl
USER: DATE: 12/9/2020 TIME: 3:52:27 PM SCALE: $SCALESHORT$
FILE: c:\proj\ectwise\kmsltjuenfes@lan-inc.com\d0786332\RSLE_TCP_05.dgn



LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMP CONSTRUCTION
- DIRECTION OF TRAFFIC
- CHANNELIZING DEVICE
- TYPE 3 BARRICADE
- TEMP GROUND MOUNTED SIGNS
- TEMP PAVEMENT STRIPING
- LOW PROF TRAF BARR (LPTB)(W/DRAIN SLOT)
- (A) WRK ZN PAV MRK REMOV (Y) 4" (SLD) DBL
- (B) WRK ZN PAV MRK REMOV (W) 4" (SLD)
- (C) WRK ZN PAV MRK REMOV (W) 24" (SLD)
- (D) WRK ZN PAV MRK REMOV (W) 4" (BRK)
- (E) WRK ZN PAV MRK REMOV (W)(ARROW)
- (F) WRK ZN PAV MRK REMOV (W)(WORD)

NOTES:
1. CONTRACTOR WILL PROVIDE ACCESS TO PROPERTY OWNERS DURING CONSTRUCTION.
2. SEE TCP (2-5)-18 FOR ADDITIONAL DETAILS.
3. REFER TO DETOUR PLAN SHEETS FOR ADDITIONAL INFORMATION.

0 50 100
SCALE IN FEET

STATE OF TEXAS
RICARDO E. DE LA PARRA
94043
LICENSED PROFESSIONAL ENGINEER
P.E.
11/10/2020

HAYS COUNTY TEXAS

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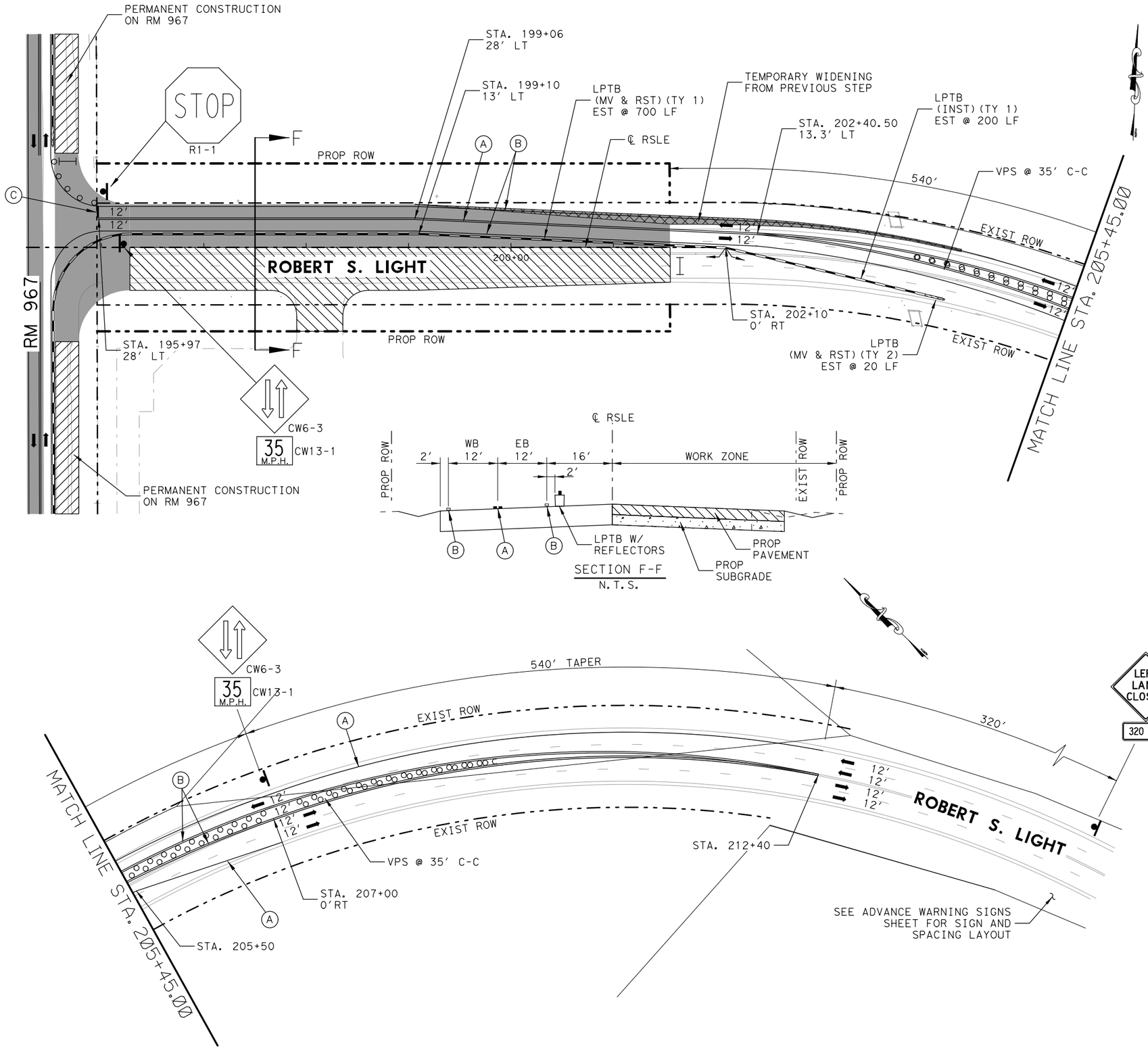
ROBERT S. LIGHT EXTENSION

ROBERT S. LIGHT TRAFFIC CONTROL PLAN PHASE II - STEP 1

SHEET 1 OF 2

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
GRAPHICS	6	STP ( ) RGS		RSLE
	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	AUS	HAYS	32
CHECK	CONTROL	SECTION	JOB	
	0914	33	068,etc	

PLOT DRIVER: $PLTDRVS$ PENTABLE: RSLE.tbl
USER: DATE: 11/10/2020 TIME: 12:10:38 PM SCALE: $SCALESHORT$
FILE: c:\projectwise\jarodriguez\d0786332\RSLE_TCP_06.dgn



LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMP CONSTRUCTION
- DIRECTION OF TRAFFIC
- CHANNELIZING DEVICE
- TYPE 3 BARRICADE
- TEMP GROUND MOUNTED SIGNS
- TEMP PAVEMENT STRIPING
- LOW PROF TRAF BARR (LPTB)(W/DRAIN SLOT)
- (A) WRK ZN PAV MRK REMOV (Y) 4" (SLD) DBL
- (B) WRK ZN PAV MRK REMOV (W) 4" (SLD)
- (C) WRK ZN PAV MRK REMOV (W) 24" (SLD)
- (D) WRK ZN PAV MRK REMOV (W) 4" (BRK)
- (E) WRK ZN PAV MRK REMOV (W)(ARROW)
- (F) WRK ZN PAV MRK REMOV (W)(WORD)

NOTES:
1. CONTRACTOR WILL PROVIDE ACCESS TO PROPERTY OWNERS DURING CONSTRUCTION.
2. SEE TCP (2-5)-18 FOR ADDITIONAL DETAILS.
3. REFER TO DETOUR PLAN SHEETS FOR ADDITIONAL INFORMATION.

0 50 100
SCALE IN FEET

STATE OF TEXAS
RICARDO E. DE LA PARRA
94043
LICENSED PROFESSIONAL ENGINEER
P.E.
11/10/2020

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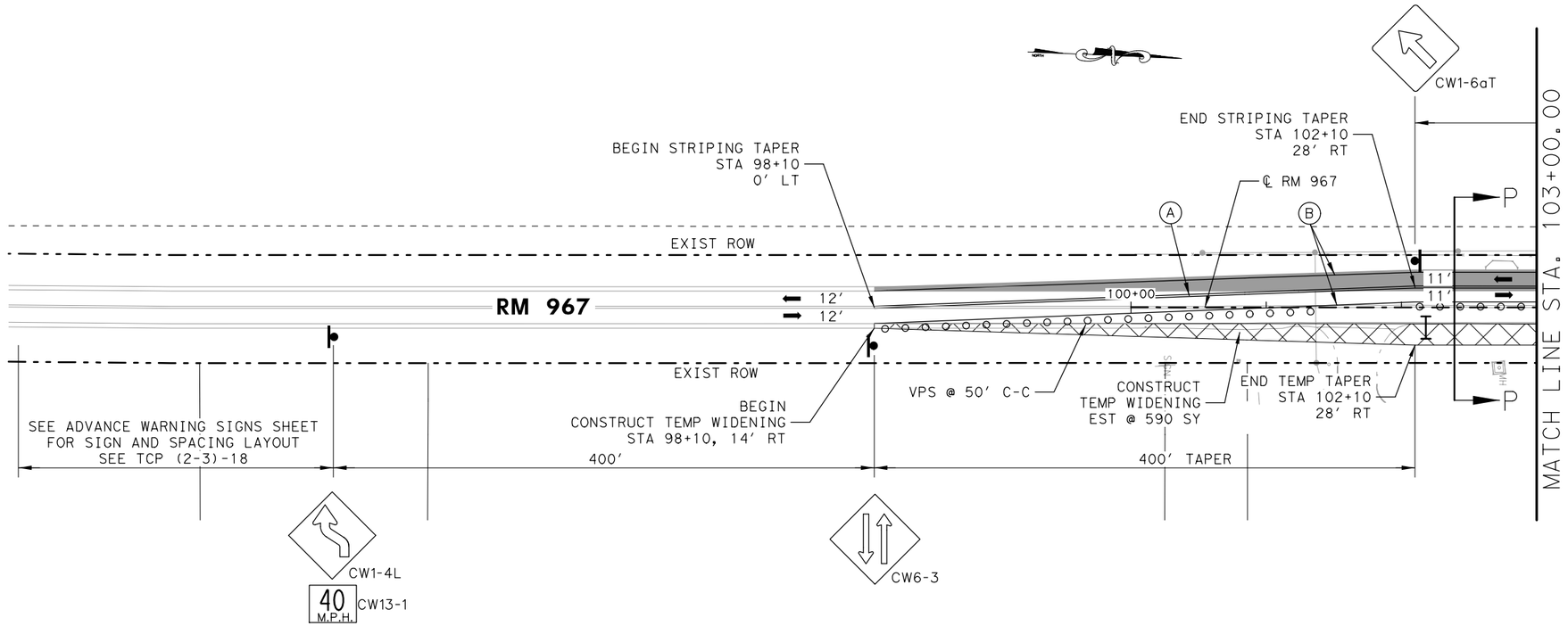
ROBERT S. LIGHT EXTENSION

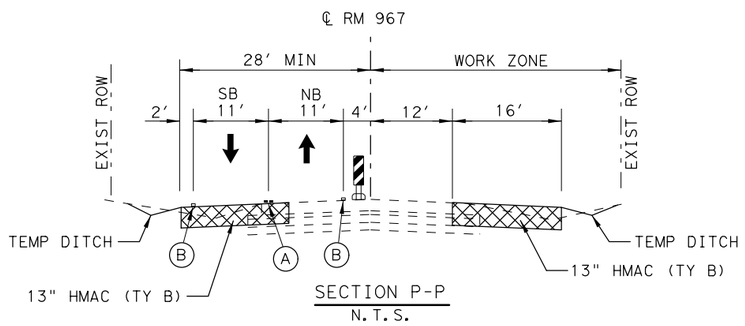
ROBERT S. LIGHT TRAFFIC CONTROL PLAN PHASE II - STEP 1

SHEET 2 OF 2

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	33
CHECK	0914	33	068,etc	

PLOT DRIVER: $PLTDRVS$ PENTABLE: RSLE.tbl
USER: DATE: 11/10/2020 TIME: 12:11:20 PM SCALE: $SCALESHORT$
FILE: c:\proj\techwlse\jarodriguez\d0786332\RSLE_TCP_07.dgn





SECTION P-P
N.T.S.

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMP CONSTRUCTION
- DIRECTION OF TRAFFIC
- CHANNELIZING DEVICE
- TYPE 3 BARRICADE
- TEMP GROUND MOUNTED SIGNS
- TEMP PAVEMENT STRIPING
- LOW PROF TRAF BARR (LPTB)(W/DRAIN SLOT)
- (A) WRK ZN PAV MRK REMOV (Y) 4" (SLD) DBL
- (B) WRK ZN PAV MRK REMOV (W) 4" (SLD)
- (C) WRK ZN PAV MRK REMOV (W) 24" (SLD)
- (D) WRK ZN PAV MRK REMOV (W) 4" (BRK)
- (E) WRK ZN PAV MRK REMOV (W)(ARROW)
- (F) WRK ZN PAV MRK REMOV (W)(WORD)

NOTES:

1. CONTRACTOR SHALL PROVIDE ACCESS TO PROPERTY OWNER DURING CONSTRUCTION.
2. CONTRACTOR SHALL PROVIDE ADEQUATE DRAINAGE FOR TEMPORARY PAVEMENT AS APPROVED BY ENGINEER.
3. SEE TCP(2-3)-18 FOR ADDITIONAL DETAILS.

0 50 100
SCALE IN FEET

STATE OF TEXAS
RICARDO E. DE LA PARRA
94043
LICENSED PROFESSIONAL ENGINEER
P.E.
11/18/2020

HAYS COUNTY TEXAS

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ROBERT S. LIGHT EXTENSION

ROBERT S. LIGHT TRAFFIC CONTROL PLAN PHASE II - STEP 2

SHEET 1 OF 3

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
GRAPHICS	6	STP ( ) RGS		RSLE
CHECK	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	AUS	HAYS	34
	CONTROL	SECTION	JOB	
	0914	33	068,etc	

PLOT DRIVER: $PLTDRVS$ PENTABLE: RSLE.tbl
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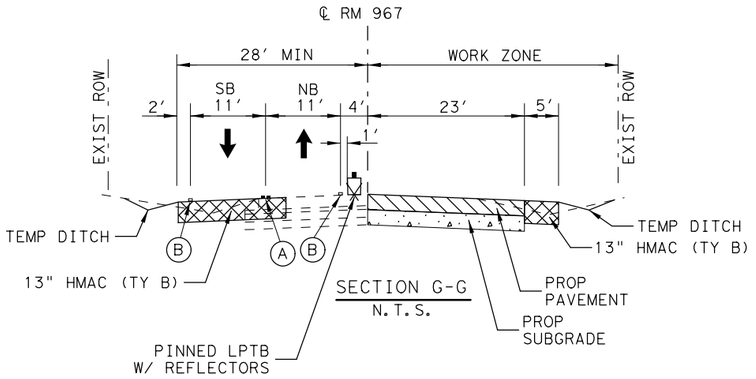
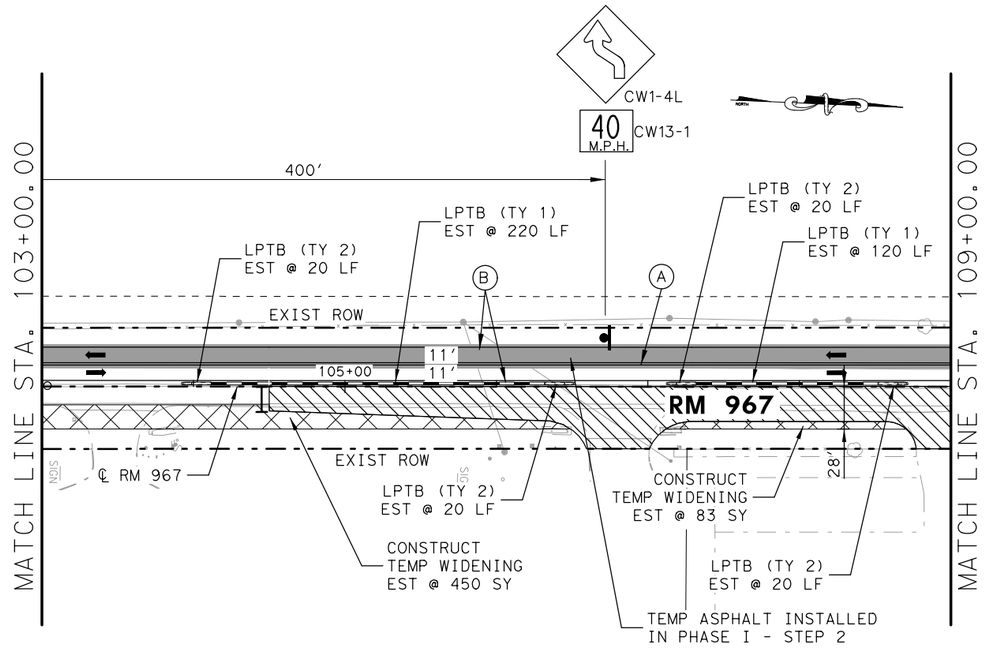
FILE: c:\projectwise\jmmelton2\d0786332\RSLE_TCP_08.dgn



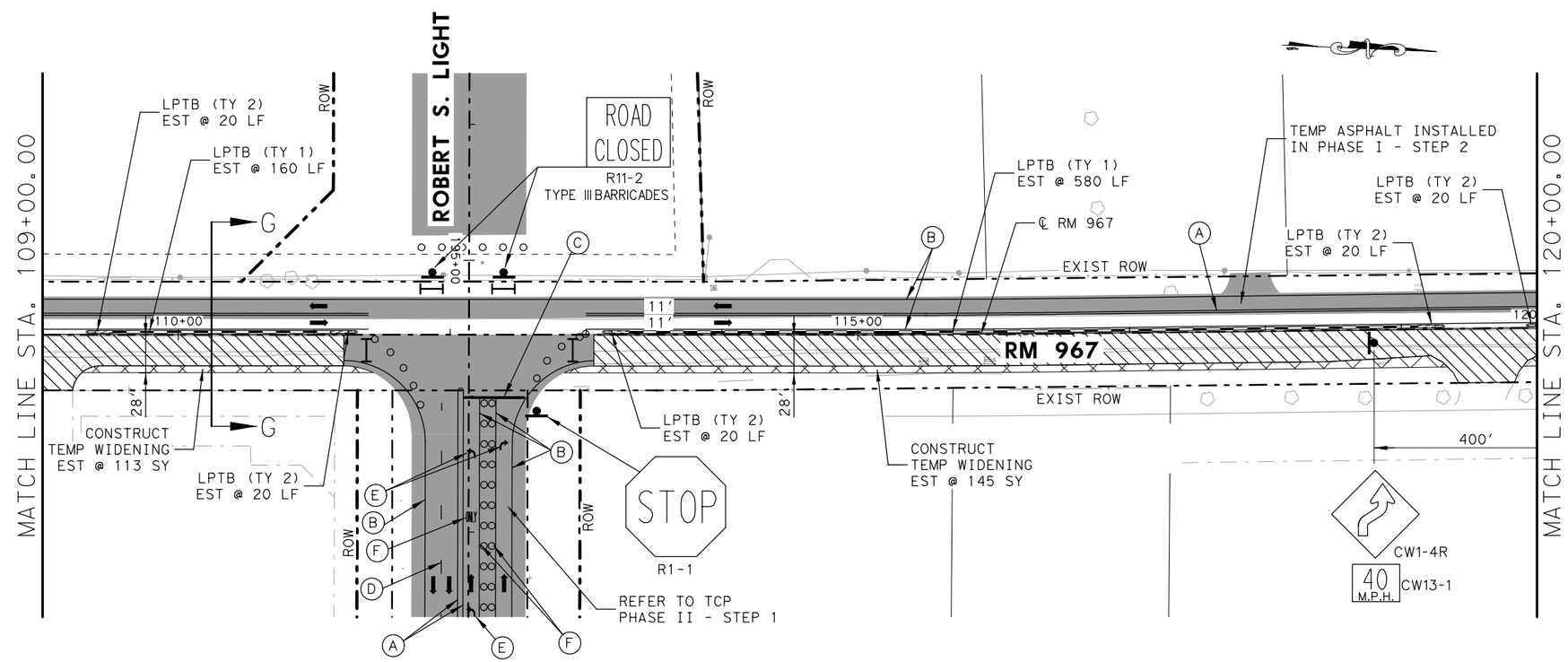


LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMP CONSTRUCTION
- DIRECTION OF TRAFFIC
- CHANNELIZING DEVICE
- TYPE 3 BARRICADE
- TEMP GROUND MOUNTED SIGNS
- TEMP PAVEMENT STRIPING
- LOW PROF TRAF BARR (LPTB)(W/DRAIN SLOT)
- (A) WRK ZN PAV MRK REMOV (Y) 4" (SLD) DBL
- (B) WRK ZN PAV MRK REMOV (W) 4" (SLD)
- (C) WRK ZN PAV MRK REMOV (W) 24" (SLD)
- (D) WRK ZN PAV MRK REMOV (W) 4" (BRK)
- (E) WRK ZN PAV MRK REMOV (W)(ARROW)
- (F) WRK ZN PAV MRK REMOV (W)(WORD)

NOTES:

1. CONTRACTOR SHALL PROVIDE ACCESS TO PROPERTY OWNER DURING CONSTRUCTION.
2. CONTRACTOR SHALL PROVIDE ADEQUATE DRAINAGE FOR TEMPORARY PAVEMENT AS APPROVED BY ENGINEER.
3. SEE TCP(2-3)-18 FOR ADDITIONAL DETAILS.



0 50 100
SCALE IN FEET

STATE OF TEXAS
RICARDO E. DE LA PARRA
94043
LICENSED PROFESSIONAL ENGINEER
P.E.
11/18/2020

HAYS COUNTY TEXAS

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ROBERT S. LIGHT EXTENSION

ROBERT S. LIGHT TRAFFIC CONTROL PLAN PHASE II - STEP 2

SHEET 2 OF 3

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	35
	0914	33	068,etc	

PLOT DRIVER: $PLTDRV$ PENTABLE: RSLE.tbl
USER: DATE: 11/18/2020 TIME: 10:27:39 AM SCALE: $SCALESHORT$
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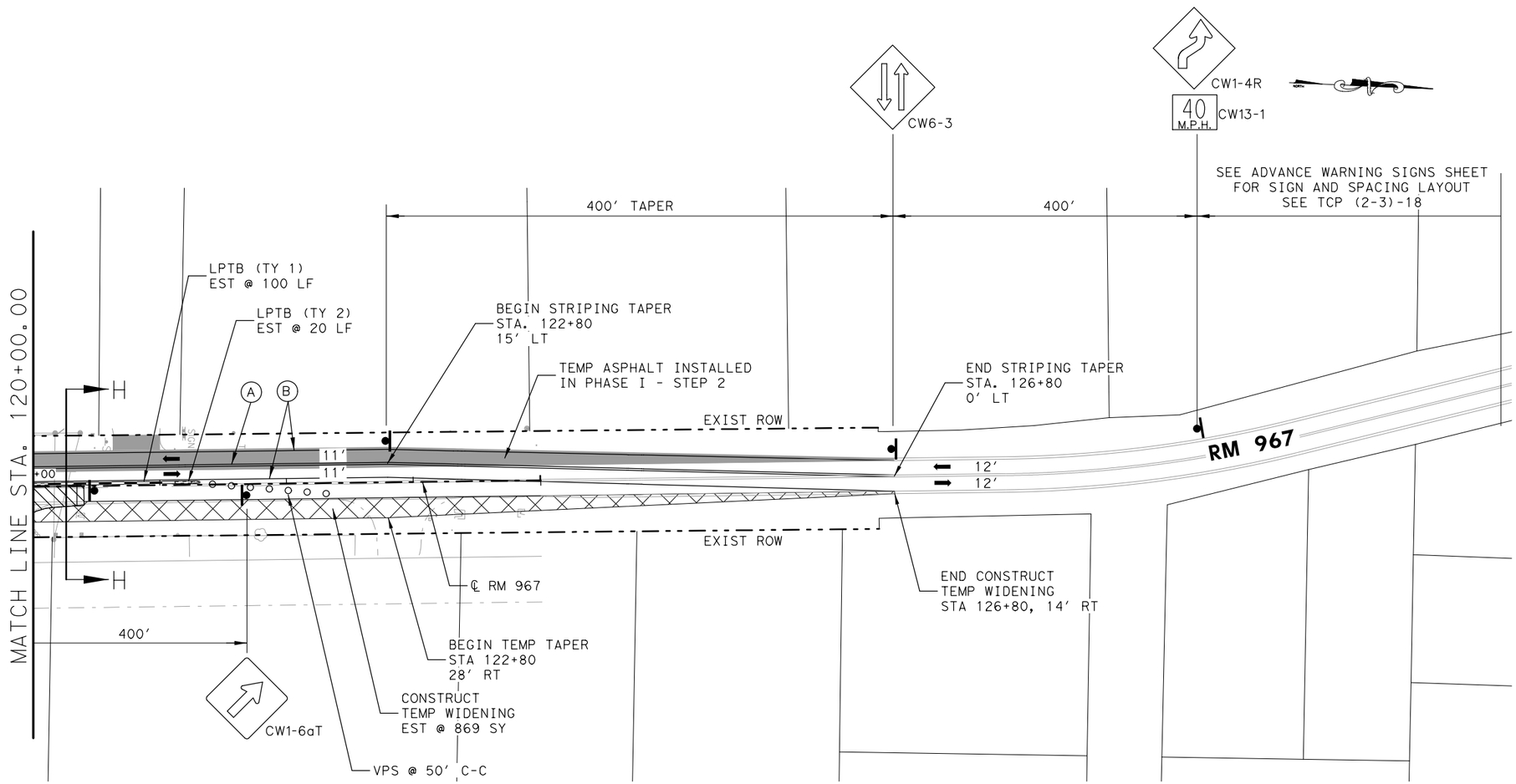

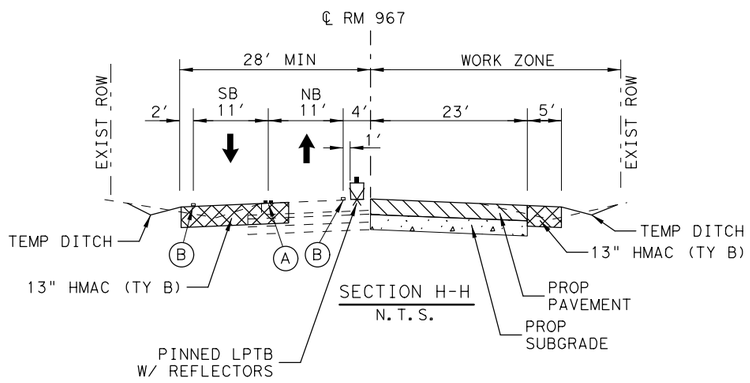

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMP CONSTRUCTION
- DIRECTION OF TRAFFIC
- CHANNELIZING DEVICE
- TYPE 3 BARRICADE
- TEMP GROUND MOUNTED SIGNS
- TEMP PAVEMENT STRIPING
- LOW PROF TRAF BARR (LPTB)(W/DRAIN SLOT)
- (A) WRK ZN PAV MRK REMOV (Y) 4" (SLD) DBL
- (B) WRK ZN PAV MRK REMOV (W) 4" (SLD)
- (C) WRK ZN PAV MRK REMOV (W) 24" (SLD)
- (D) WRK ZN PAV MRK REMOV (W) 4" (BRK)
- (E) WRK ZN PAV MRK REMOV (W)(ARROW)
- (F) WRK ZN PAV MRK REMOV (W)(WORD)

NOTES:

1. CONTRACTOR SHALL PROVIDE ACCESS TO PROPERTY OWNER DURING CONSTRUCTION.
2. CONTRACTOR SHALL PROVIDE ADEQUATE DRAINAGE FOR TEMPORARY PAVEMENT AS APPROVED BY ENGINEER.
3. SEE TCP(2-3)-18 FOR ADDITIONAL DETAILS.

0 50 100
SCALE IN FEET

STATE OF TEXAS
RICARDO E. DE LA PARRA
94043
LICENSED PROFESSIONAL ENGINEER
P.E.
11/18/2020

HAYS COUNTY TEXAS

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ROBERT S. LIGHT EXTENSION

ROBERT S. LIGHT TRAFFIC CONTROL PLAN PHASE II - STEP 2

SHEET 3 OF 3

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	36
	0914	33	068,etc	

PLOT DRIVER: $PLTDRV$$ PENTABLE: RSLE.tbl
USER: DATE: 11/18/2020 TIME: 10:32:34 AM SCALE: $SCALESHORT$
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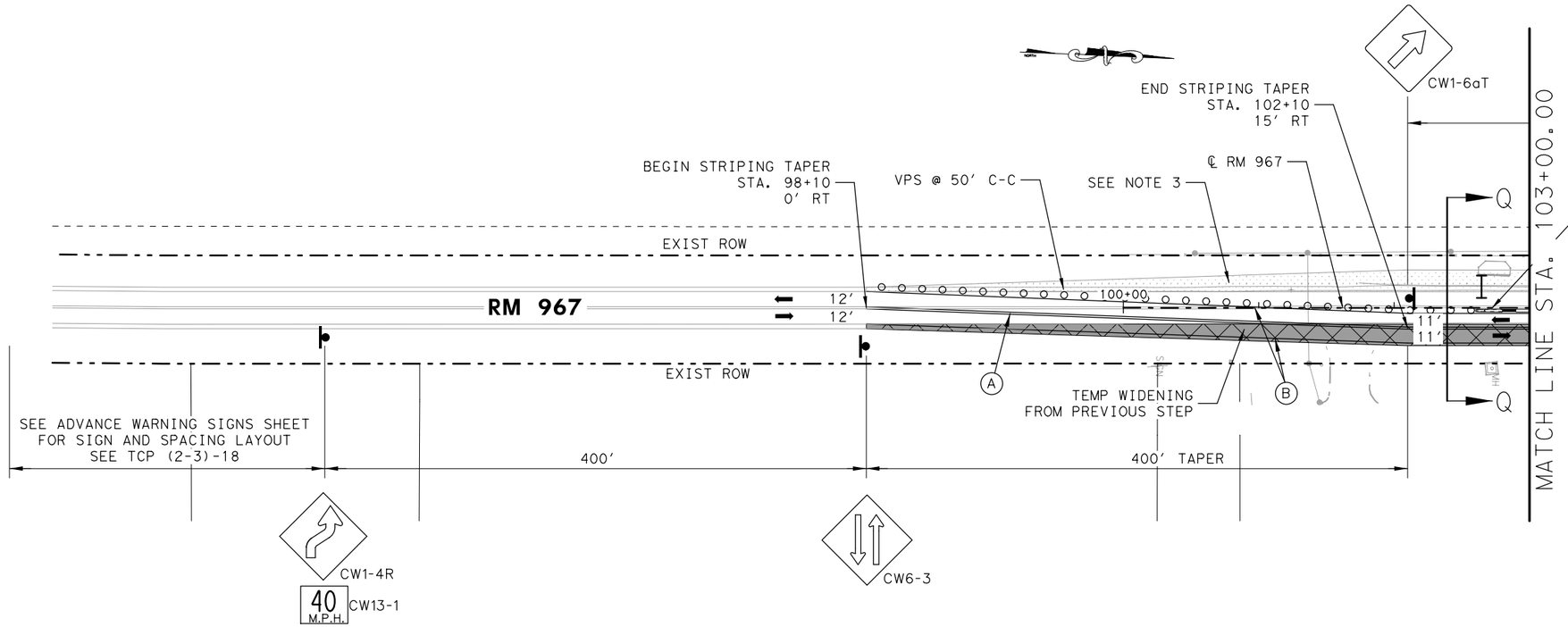


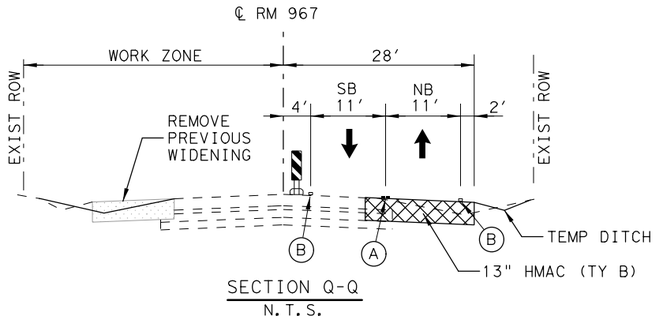
LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMP CONSTRUCTION
- DIRECTION OF TRAFFIC
- CHANNELIZING DEVICE
- TYPE 3 BARRICADE
- TEMP GROUND MOUNTED SIGNS
- TEMP PAVEMENT STRIPING
- LOW PROF TRAF BARR (LPTB)(W/DRAIN SLOT)
- (A) WRK ZN PAV MRK REMOV (Y) 4" (SLD) DBL
- (B) WRK ZN PAV MRK REMOV (W) 4" (SLD)
- (C) WRK ZN PAV MRK REMOV (W) 24" (SLD)
- (D) WRK ZN PAV MRK REMOV (W) 4" (BRK)
- (E) WRK ZN PAV MRK REMOV (W)(ARROW)
- (F) WRK ZN PAV MRK REMOV (W)(WORD)

NOTES:

1. CONTRACTOR SHALL PROVIDE ACCESS TO PROPERTY OWNER DURING CONSTRUCTION.
2. CONTRACTOR SHALL PROVIDE ADEQUATE DRAINAGE FOR TEMPORARY PAVEMENT AS APPROVED BY ENGINEER.
3. USE ONE-LANE TWO WAY TRAFFIC CONTROL, TCP (2-2)-18, TO REMOVE TEMPORARY WIDENING IN TAPER.
4. SEE TCP(2-3)-18 FOR ADDITIONAL DETAILS.

0 50 100
SCALE IN FEET



SECTION Q-Q
N.T.S.

STATE OF TEXAS
RICARDO E. DE LA PARRA
94043
LICENSED PROFESSIONAL ENGINEER
P.E.
11/18/2020

HAYS COUNTY TEXAS

Lockwood, Andrews & Newnam, Inc.
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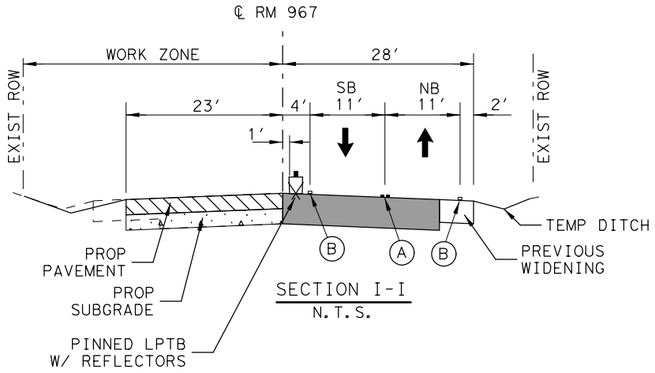
ROBERT S. LIGHT EXTENSION

ROBERT S. LIGHT TRAFFIC CONTROL PLAN PHASE II - STEP 3

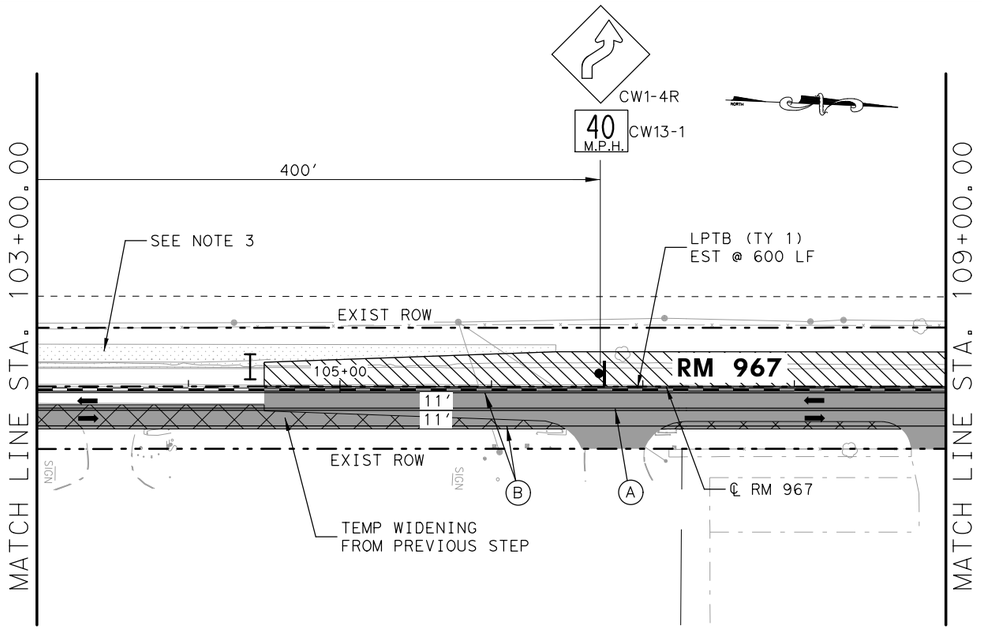
SHEET 1 OF 3

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
GRAPHICS	6	STP ( ) RGS		RSLE
CHECK	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	AUS	HAYS	37
	CONTROL	SECTION	JOB	
	0914	33	068,etc	

PLOT DRIVER: $PLTDRVS$ PENTABLE: RSLE.tbl
USER: DATE: 11/18/2020 TIME: 10:36:16 AM SCALE: $SCALESHORT$
FILE: c:\projectwise\jmmelton2\d0786332\RSLE_TCP_II.dgn



SECTION I-I
N.T.S.

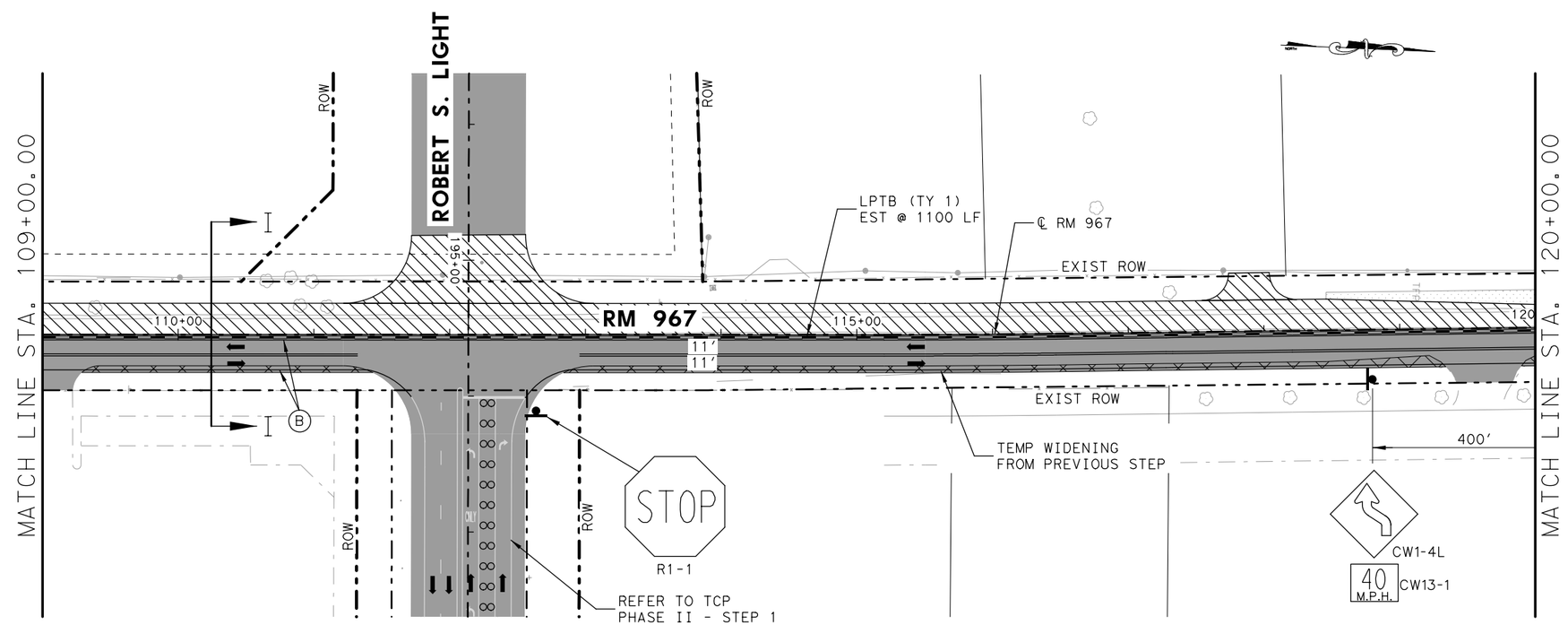


LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMP CONSTRUCTION
- DIRECTION OF TRAFFIC
- CHANNELIZING DEVICE
- TYPE 3 BARRICADE
- TEMP GROUND MOUNTED SIGNS
- TEMP PAVEMENT STRIPING
- LOW PROF TRAF BARR (LPTB)(W/DRAIN SLOT)
- (A) WRK ZN PAV MRK REMOV (Y) 4" (SLD) DBL
- (B) WRK ZN PAV MRK REMOV (W) 4" (SLD)
- (C) WRK ZN PAV MRK REMOV (W) 24" (SLD)
- (D) WRK ZN PAV MRK REMOV (W) 4" (BRK)
- (E) WRK ZN PAV MRK REMOV (W)(ARROW)
- (F) WRK ZN PAV MRK REMOV (W)(WORD)

NOTES:

1. CONTRACTOR SHALL PROVIDE ACCESS TO PROPERTY OWNER DURING CONSTRUCTION.
2. CONTRACTOR SHALL PROVIDE ADEQUATE DRAINAGE FOR TEMPORARY PAVEMENT AS APPROVED BY ENGINEER.
3. USE ONE-LANE TWO WAY TRAFFIC CONTROL, TCP (2-2)-18, TO REMOVE TEMPORARY WIDENING IN TAPER.
4. SEE TCP(2-3)-18 FOR ADDITIONAL DETAILS.



0 50 100
SCALE IN FEET

STATE OF TEXAS
RICARDO E. DE LA PARRA
94043
LICENSED PROFESSIONAL ENGINEER
P.E.
11/18/2020

HAYS COUNTY TEXAS

Lockwood, Andrews & Newnam, Inc.
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TBPE FIRM REGISTRATION NO. 2614

Texas Department of Transportation
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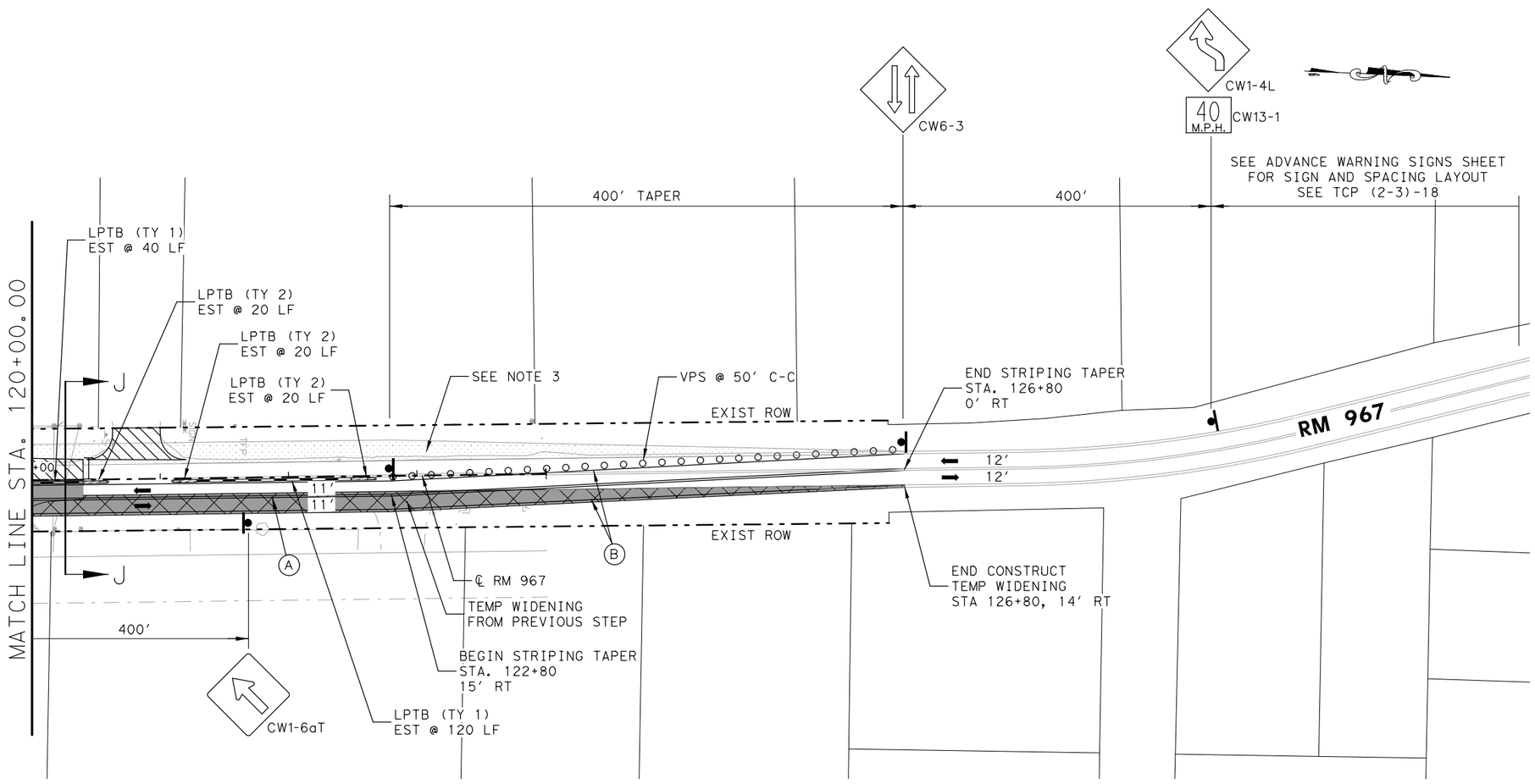
ROBERT S. LIGHT EXTENSION

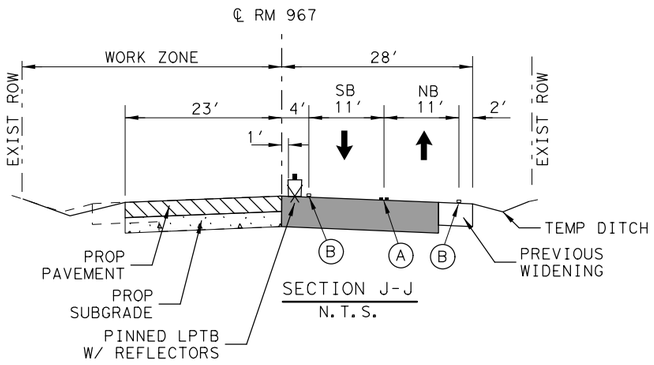
ROBERT S. LIGHT
TRAFFIC CONTROL PLAN
PHASE II - STEP 3

SHEET 2 OF 3

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	38
	0914	33	068,etc	

PLOT DRIVER: $PLTDRV$$ PENTABLE: RSLE.tbl
USER: DATE: 11/18/2020 TIME: 10:52:11 AM SCALE: $$SCALESHORT$$
FILE: c:\proj\ectw1se\jmmelton2\d0786332\RSLE_TCP_12.dgn





LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMP CONSTRUCTION
- DIRECTION OF TRAFFIC
- CHANNELIZING DEVICE
- TYPE 3 BARRICADE
- TEMP GROUND MOUNTED SIGNS
- TEMP PAVEMENT STRIPING
- LOW PROF TRAF BARR (LPTB)(W/DRAIN SLOT)
- (A) WRK ZN PAV MRK REMOV (Y) 4" (SLD) DBL
- (B) WRK ZN PAV MRK REMOV (W) 4" (SLD)
- (C) WRK ZN PAV MRK REMOV (W) 24" (SLD)
- (D) WRK ZN PAV MRK REMOV (W) 4" (BRK)
- (E) WRK ZN PAV MRK REMOV (W)(ARROW)
- (F) WRK ZN PAV MRK REMOV (W)(WORD)

NOTES:

1. CONTRACTOR SHALL PROVIDE ACCESS TO PROPERTY OWNER DURING CONSTRUCTION.
2. CONTRACTOR SHALL PROVIDE ADEQUATE DRAINAGE FOR TEMPORARY PAVEMENT AS APPROVED BY ENGINEER.
3. USE ONE-LANE TWO WAY TRAFFIC CONTROL, TCP (2-2)-18, TO REMOVE TEMPORARY WIDENING IN TAPER.
4. SEE TCP(2-3)-18 FOR ADDITIONAL DETAILS.

0 50 100
SCALE IN FEET

STATE OF TEXAS
RICARDO E. DE LA PARRA
94043
LICENSED PROFESSIONAL ENGINEER
P.E.
11/10/2020

HAYS COUNTY TEXAS

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY
TBPE FIRM REGISTRATION NO. 2614

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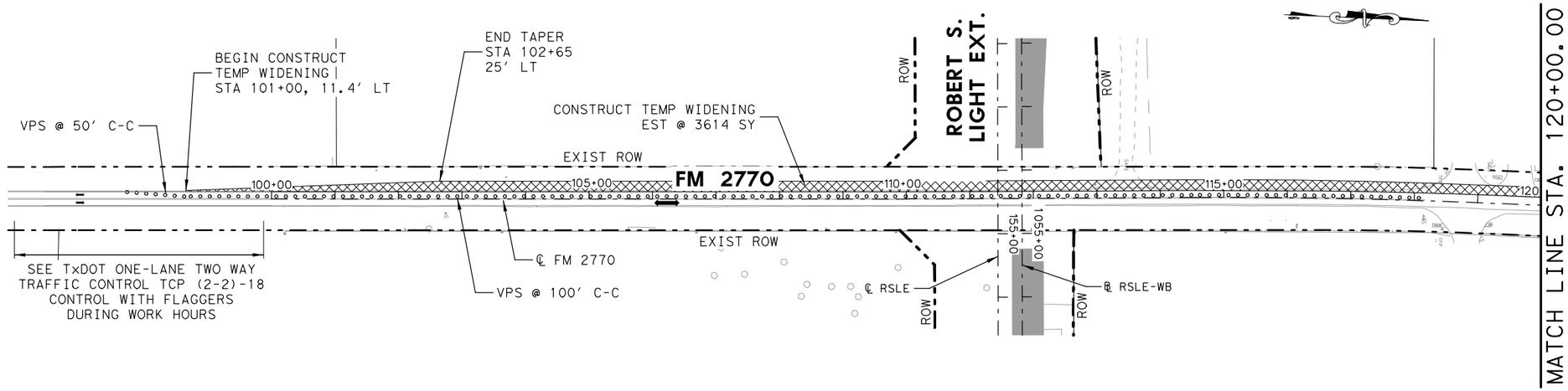
ROBERT S. LIGHT EXTENSION

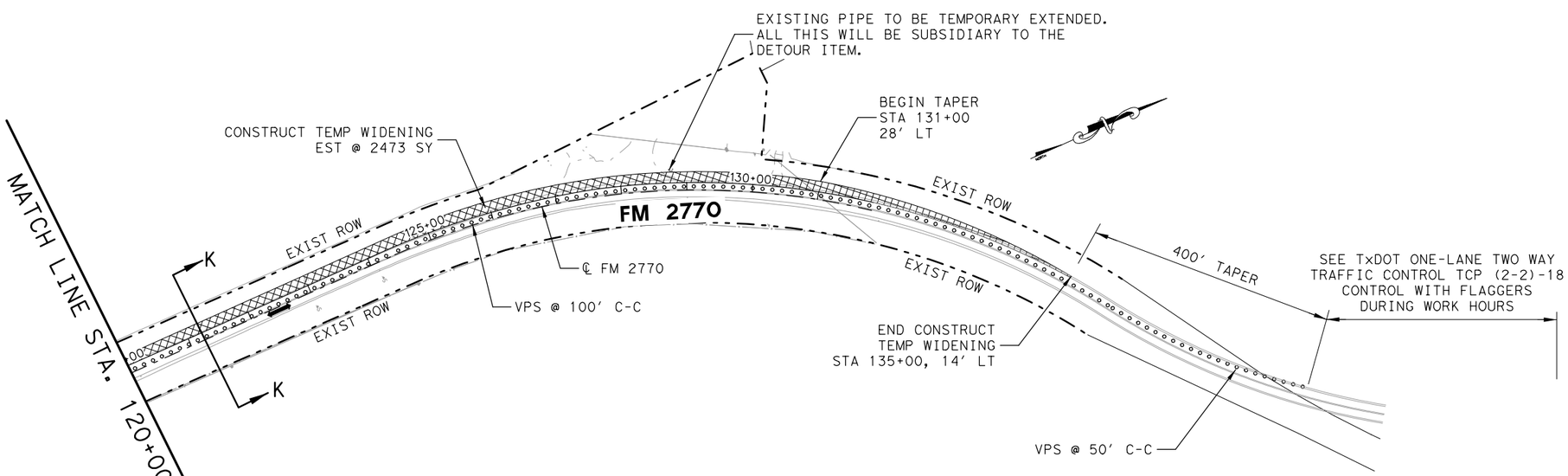
ROBERT S. LIGHT TRAFFIC CONTROL PLAN PHASE II - STEP 3

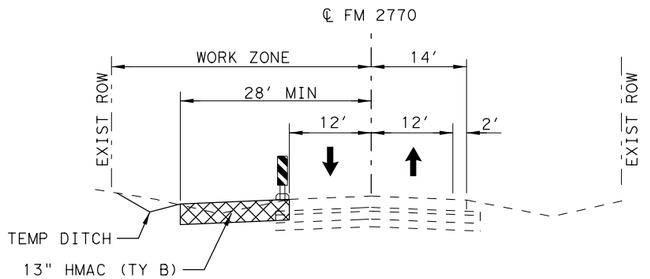
SHEET 3 OF 3

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
GRAPHICS	6	STP ( ) RGS		RSLE
	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	AUS	HAYS	39
CHECK	CONTROL	SECTION	JOB	
	0914	33	068,etc	

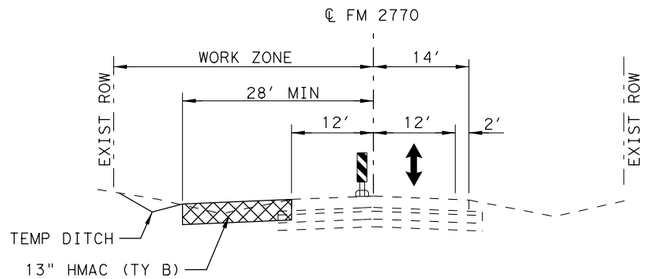
PLOT DRIVER: $PLTDRVS$
USER:
FILE: c:\proj\technlse\jarodriguez\d0786332\RSLE_TCP_13.dgn
PENTABLE: RSLE.tbl
DATE: 11/10/2020 TIME: 12:15:03 PM SCALE: $SCALESHORT$







SECTION K-K
NON-WORKING HOURS
N.T.S.



SECTION K-K
WORKING HOURS
N.T.S.

WORK WILL ONLY BE ALLOWED DURING NIGHTTIME HOURS BETWEEN 7:00 PM TO 6:00 AM UNLESS OTHERWISE APPROVED BY THE ENGINEER.

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMP CONSTRUCTION
- DIRECTION OF TRAFFIC
- CHANNELIZING DEVICE
- TYPE 3 BARRICADE
- TEMP GROUND MOUNTED SIGNS
- TEMP PAVEMENT STRIPING
- LOW PROF TRAF BARR (LPTB)(W/DRAIN SLOT)
- (A) WRK ZN PAV MRK REMOV (Y) 4" (SLD) DBL
- (B) WRK ZN PAV MRK REMOV (W) 4" (SLD)
- (C) WRK ZN PAV MRK REMOV (W) 24" (SLD)
- (D) WRK ZN PAV MRK REMOV (W) 4" (BRK)
- (E) WRK ZN PAV MRK REMOV (W)(ARROW)
- (F) WRK ZN PAV MRK REMOV (W)(WORD)

NOTES:
1. CONTRACTOR SHALL PLACE TEMPORARY PAVEMENT DURING ALLOWABLE LANE CLOSURES.
2. CONTRACTOR SHALL PROVIDE ACCESS TO PROPERTY OWNER DURING CONSTRUCTION.
3. CONTRACTOR SHALL PROVIDE ADEQUATE DRAINAGE FOR TEMPORARY PAVEMENT AS APPROVED BY ENGINEER.

0 100 200
SCALE IN FEET

STATE OF TEXAS
RICARDO E. DE LA PARRA
94043
LICENSED PROFESSIONAL ENGINEER
P.E.
12/09/2020

HAYS COUNTY TEXAS

Lockwood, Andrews & Newnam, Inc.
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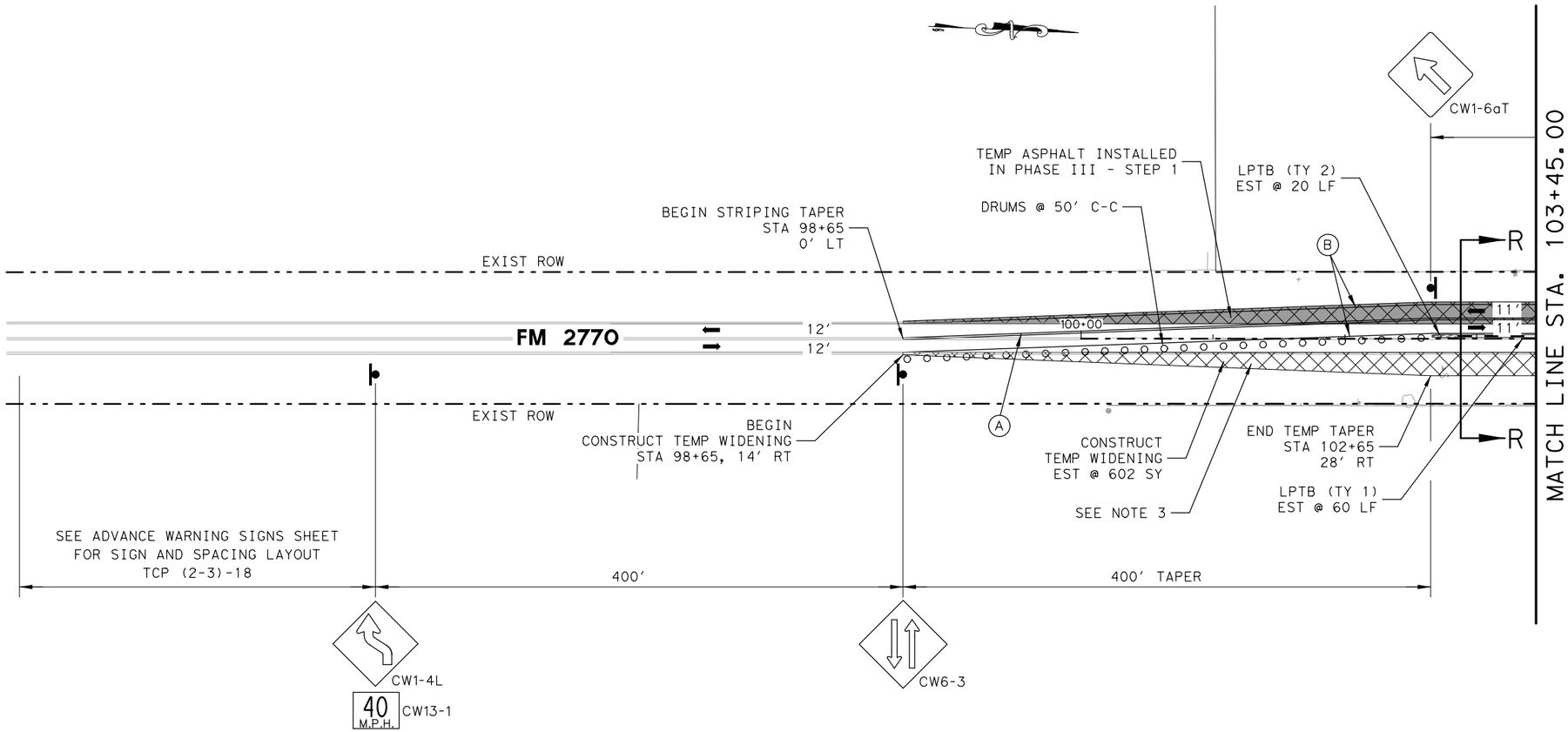
ROBERT S. LIGHT EXTENSION

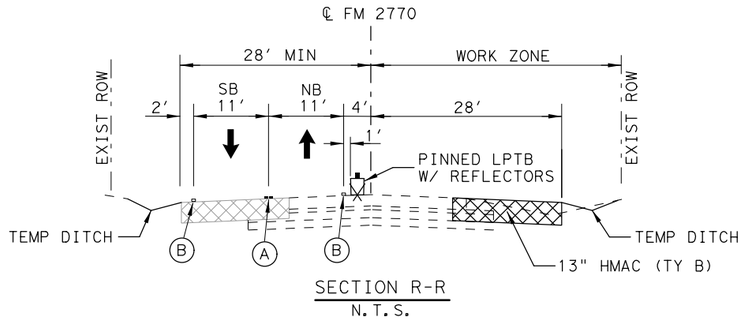
ROBERT S. LIGHT TRAFFIC CONTROL PLAN PHASE III - STEP 1

SHEET OF 1 1

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	40
CHECK	0914	33	068,etc	

PLOT DRIVER: $PLTDRVS$ PENTABLE: RSLE.tbl
USER: DATE: 12/9/2020 TIME: 3:57:51 PM SCALE: $SCALESHORT$
FILE: c:\proj\ecfw1se\kmsl\fuentes@lan-Inc.com\d0786332\RSLE_TCP_14.dgn





SECTION R-R
N.T.S.

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMP CONSTRUCTION
- DIRECTION OF TRAFFIC
- CHANNELIZING DEVICE
- TYPE 3 BARRICADE
- TEMP GROUND MOUNTED SIGNS
- TEMP PAVEMENT STRIPING
- LOW PROF TRAF BARR (LPTB)(W/DRAIN SLOT)
- (A) WRK ZN PAV MRK REMOV (Y) 4" (SLD) DBL
- (B) WRK ZN PAV MRK REMOV (W) 4" (SLD)
- (C) WRK ZN PAV MRK REMOV (W) 24" (SLD)
- (D) WRK ZN PAV MRK REMOV (W) 4" (BRK)
- (E) WRK ZN PAV MRK REMOV (W)(ARROW)
- (F) WRK ZN PAV MRK REMOV (W)(WORD)

NOTES:

1. CONTRACTOR SHALL PROVIDE ACCESS TO PROPERTY OWNER DURING CONSTRUCTION.
2. CONTRACTOR SHALL PROVIDE ADEQUATE DRAINAGE FOR TEMPORARY PAVEMENT AS APPROVED BY ENGINEER.
3. USE ONE-LANE TWO WAY TRAFFIC CONTROL, TCP (2-2)-18, TO CONSTRUCT TEMPORARY WIDENING IN TAPER.
4. SEE TCP(2-3)-18 FOR ADDITIONAL DETAILS.

0 50 100
SCALE IN FEET

STATE OF TEXAS
RICARDO E. DE LA PARRA
94043
LICENSED PROFESSIONAL ENGINEER
P.E.
11/18/2020

HAYS COUNTY TEXAS

Lockwood, Andrews & Newnam, Inc.
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TBPE FIRM REGISTRATION NO. 2614

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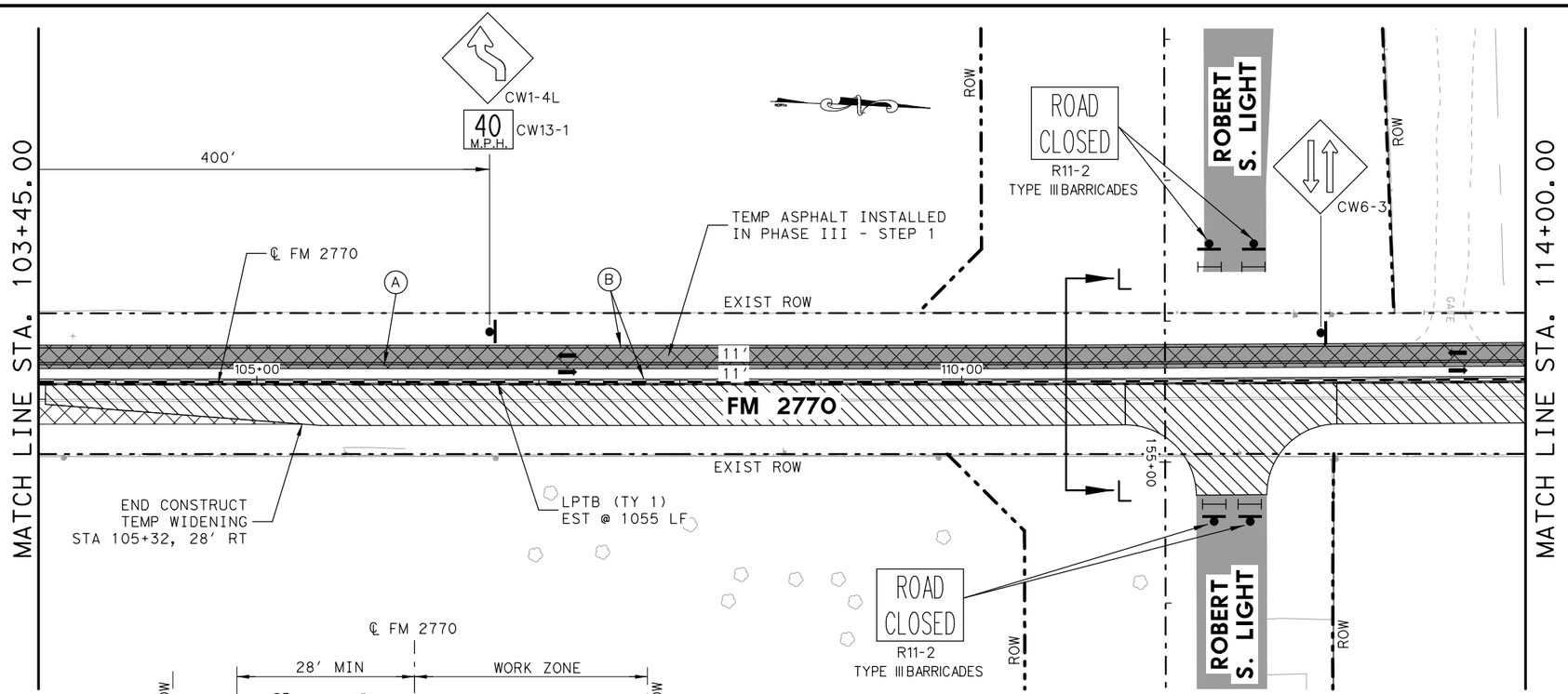
ROBERT S. LIGHT EXTENSION

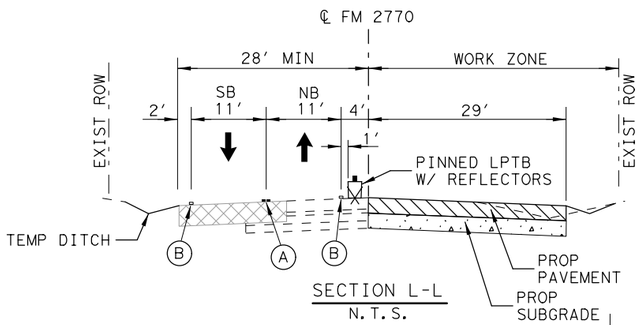
ROBERT S. LIGHT TRAFFIC CONTROL PLAN PHASE III - STEP 2

SHEET 1 OF 3

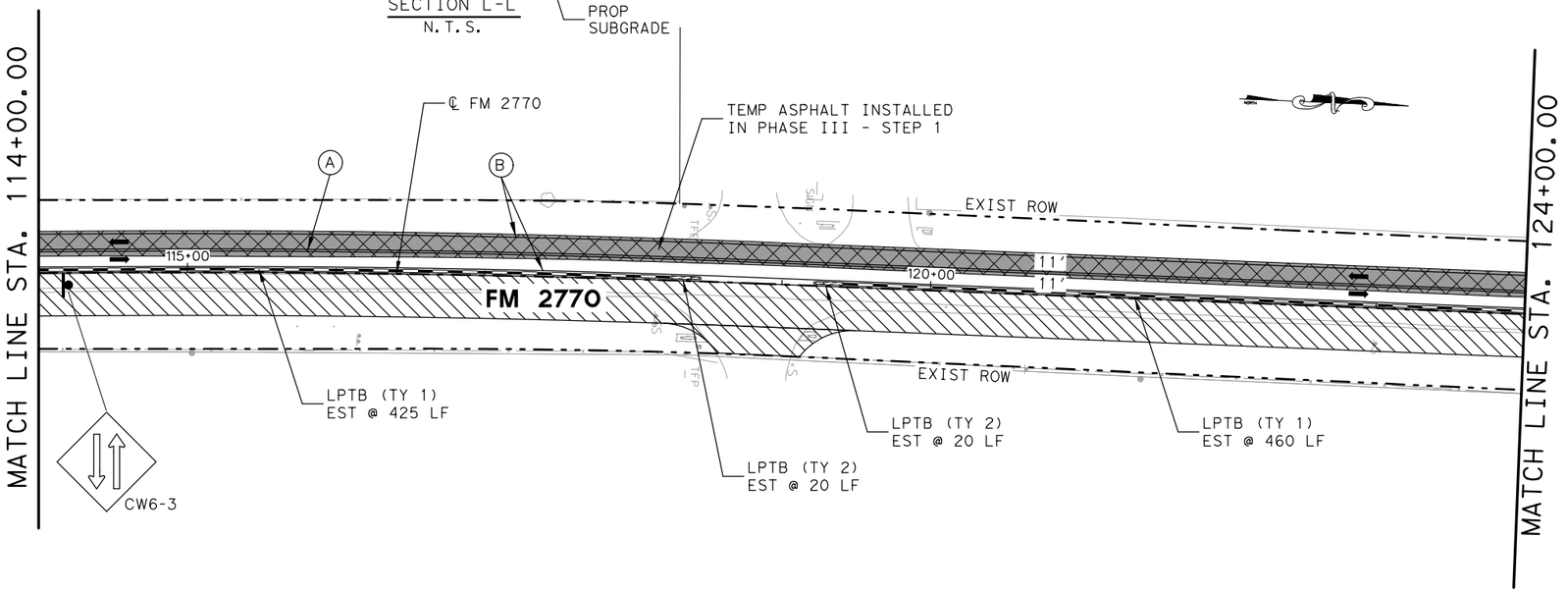
DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	AUS	HAYS	41
CHECK	CONTROL	SECTION	JOB	
	0914	33	068,etc	

PLOT DRIVER: $PLTDRV$$
USER:
FILE: c:\pro\jectwise\jmelton2\d0786332\RSLE_TCP_J5.dgn
PENTABLE: RSLE.tbl
DATE: 11/18/2020 TIME: 11:03:08 AM SCALE: $SCALESHORT$





SECTION L-L
N.T.S.



LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMP CONSTRUCTION
- DIRECTION OF TRAFFIC
- CHANNELIZING DEVICE
- TYPE 3 BARRICADE
- TEMP GROUND MOUNTED SIGNS
- TEMP PAVEMENT STRIPING
- LOW PROF TRAF BARR (LPTB)(W/DRAIN SLOT)
- (A) WRK ZN PAV MRK REMOV (Y) 4" (SLD) DBL
- (B) WRK ZN PAV MRK REMOV (W) 4" (SLD)
- (C) WRK ZN PAV MRK REMOV (W) 24" (SLD)
- (D) WRK ZN PAV MRK REMOV (W) 4" (BRK)
- (E) WRK ZN PAV MRK REMOV (W)(ARROW)
- (F) WRK ZN PAV MRK REMOV (W)(WORD)

NOTES:

1. CONTRACTOR SHALL PROVIDE ACCESS TO PROPERTY OWNER DURING CONSTRUCTION.
2. CONTRACTOR SHALL PROVIDE ADEQUATE DRAINAGE FOR TEMPORARY PAVEMENT AS APPROVED BY ENGINEER.
3. SEE TCP(2-3)-18 FOR ADDITIONAL DETAILS.

0 50 100
SCALE IN FEET

STATE OF TEXAS
RICARDO E. DE LA PARRA
94043
LICENSED PROFESSIONAL ENGINEER
P.E.
11/10/2020

HAYS COUNTY TEXAS

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY
TBPE FIRM REGISTRATION NO. 2614

Texas Department of Transportation
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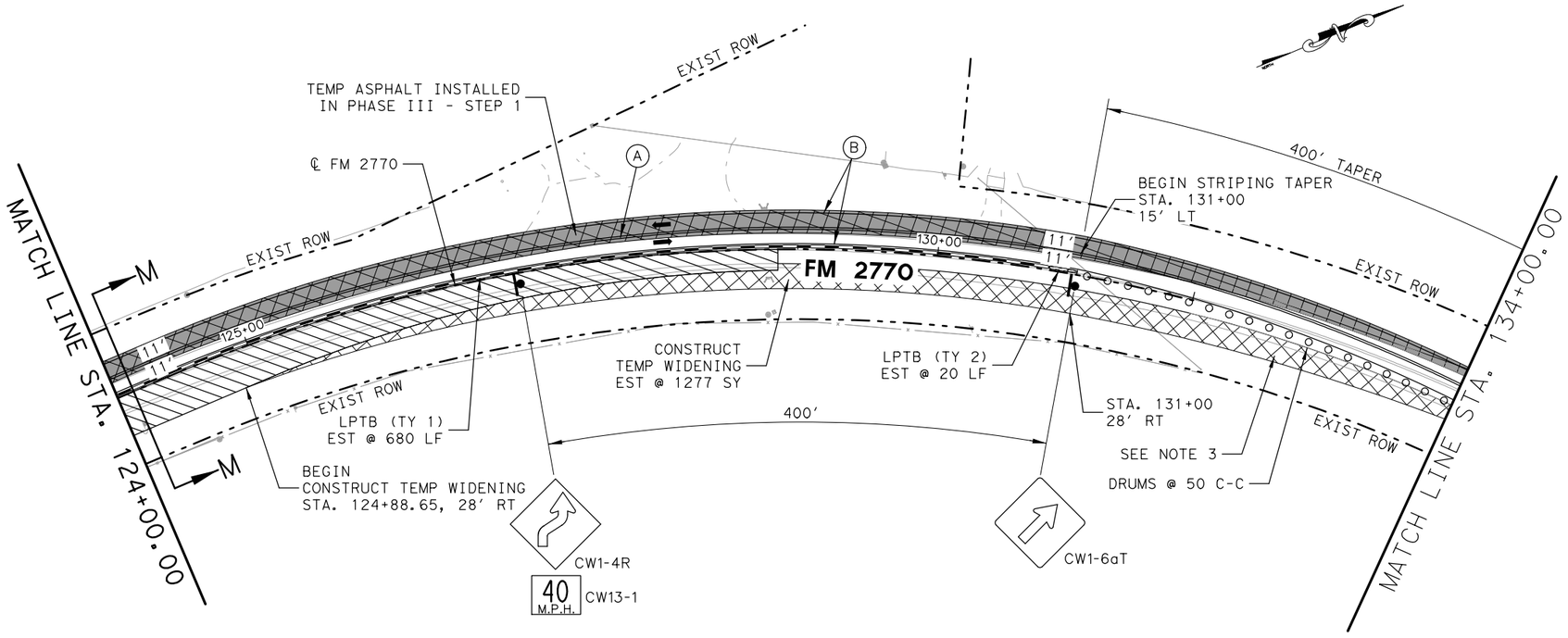
ROBERT S. LIGHT EXTENSION

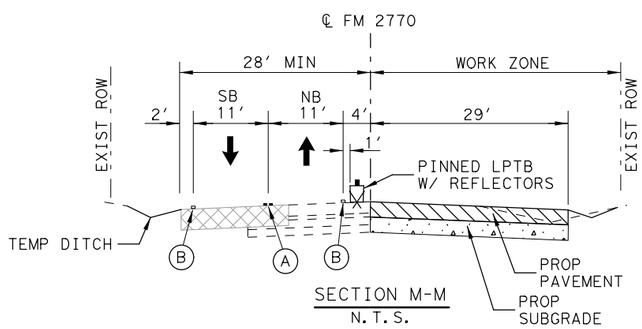
ROBERT S. LIGHT TRAFFIC CONTROL PLAN PHASE III - STEP 2

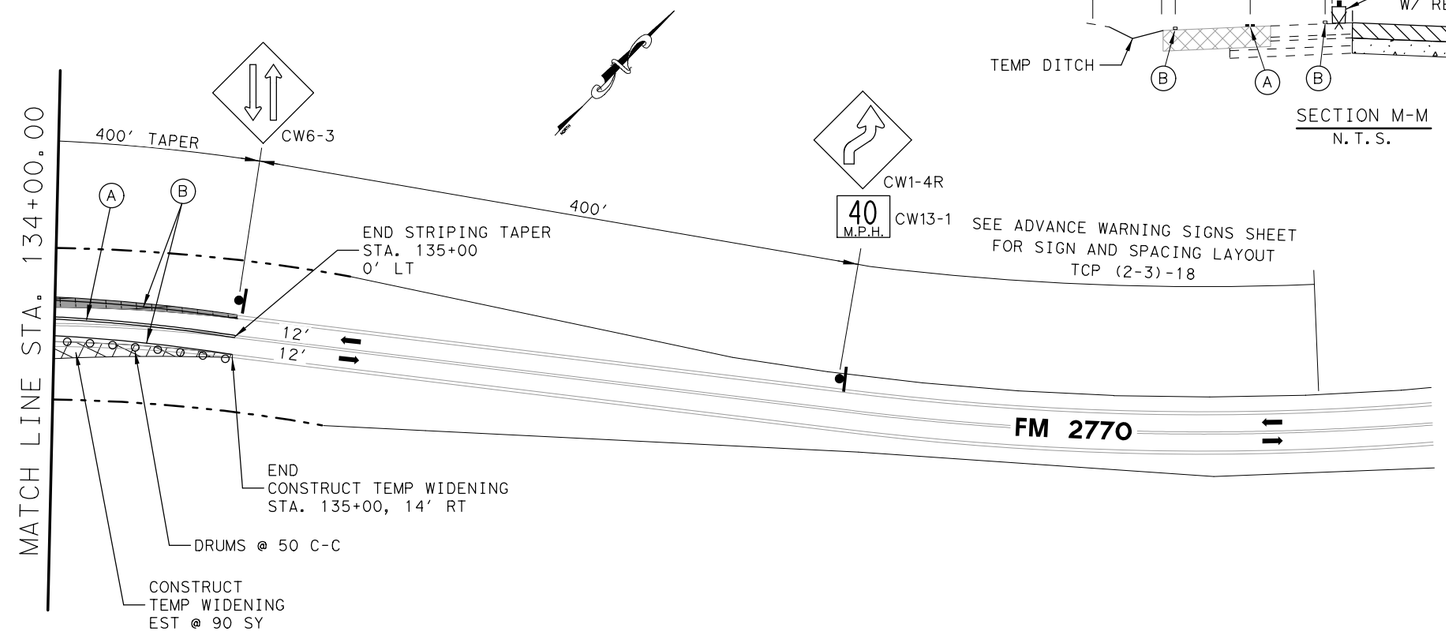
SHEET 2 OF 3

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
GRAPHICS	6	STP ( ) RGS		RSLE
CHECK	STATE	DISTRICT	COUNTY	SHEET NO.
	TEXAS	AUS	HAYS	42
CHECK	CONTROL	SECTION	JOB	
	0914	33	068,etc	

PLOT DRIVER: $PLTDRV$$
USER:
FILE: c:\proj\techwise\jarodriguez\d0786332\RSLE_TCP_16.dgn
PENTABLE: RSLE.tbl
DATE: 11/10/2020 TIME: 12:16:22 PM SCALE: $SCALESHORT$







LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMP CONSTRUCTION
- DIRECTION OF TRAFFIC
- CHANNELIZING DEVICE
- TYPE 3 BARRICADE
- TEMP GROUND MOUNTED SIGNS
- TEMP PAVEMENT STRIPING
- LOW PROF TRAF BARR (LPTB)(W/DRAIN SLOT)
- (A) WRK ZN PAV MRK REMOV (Y) 4" (SLD) DBL
- (B) WRK ZN PAV MRK REMOV (W) 4" (SLD)
- (C) WRK ZN PAV MRK REMOV (W) 24" (SLD)
- (D) WRK ZN PAV MRK REMOV (W) 4" (BRK)
- (E) WRK ZN PAV MRK REMOV (W)(ARROW)
- (F) WRK ZN PAV MRK REMOV (W)(WORD)

NOTES:

1. CONTRACTOR SHALL PROVIDE ACCESS TO PROPERTY OWNER DURING CONSTRUCTION.
2. CONTRACTOR SHALL PROVIDE ADEQUATE DRAINAGE FOR TEMPORARY PAVEMENT AS APPROVED BY ENGINEER.
3. USE ONE-LANE TWO WAY TRAFFIC CONTROL, TCP (2-2)-18, TO CONSTRUCT TEMPORARY WIDENING IN TAPER.
4. SEE TCP(2-3)-18 FOR ADDITIONAL DETAILS.

0 50 100
SCALE IN FEET

STATE OF TEXAS
RICARDO E. DE LA PARRA
94043
LICENSED PROFESSIONAL ENGINEER
P.E.
11/10/2020

HAYS COUNTY TEXAS

Lockwood, Andrews & Newnam, Inc.
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ROBERT S. LIGHT EXTENSION

ROBERT S. LIGHT TRAFFIC CONTROL PLAN PHASE III - STEP 2

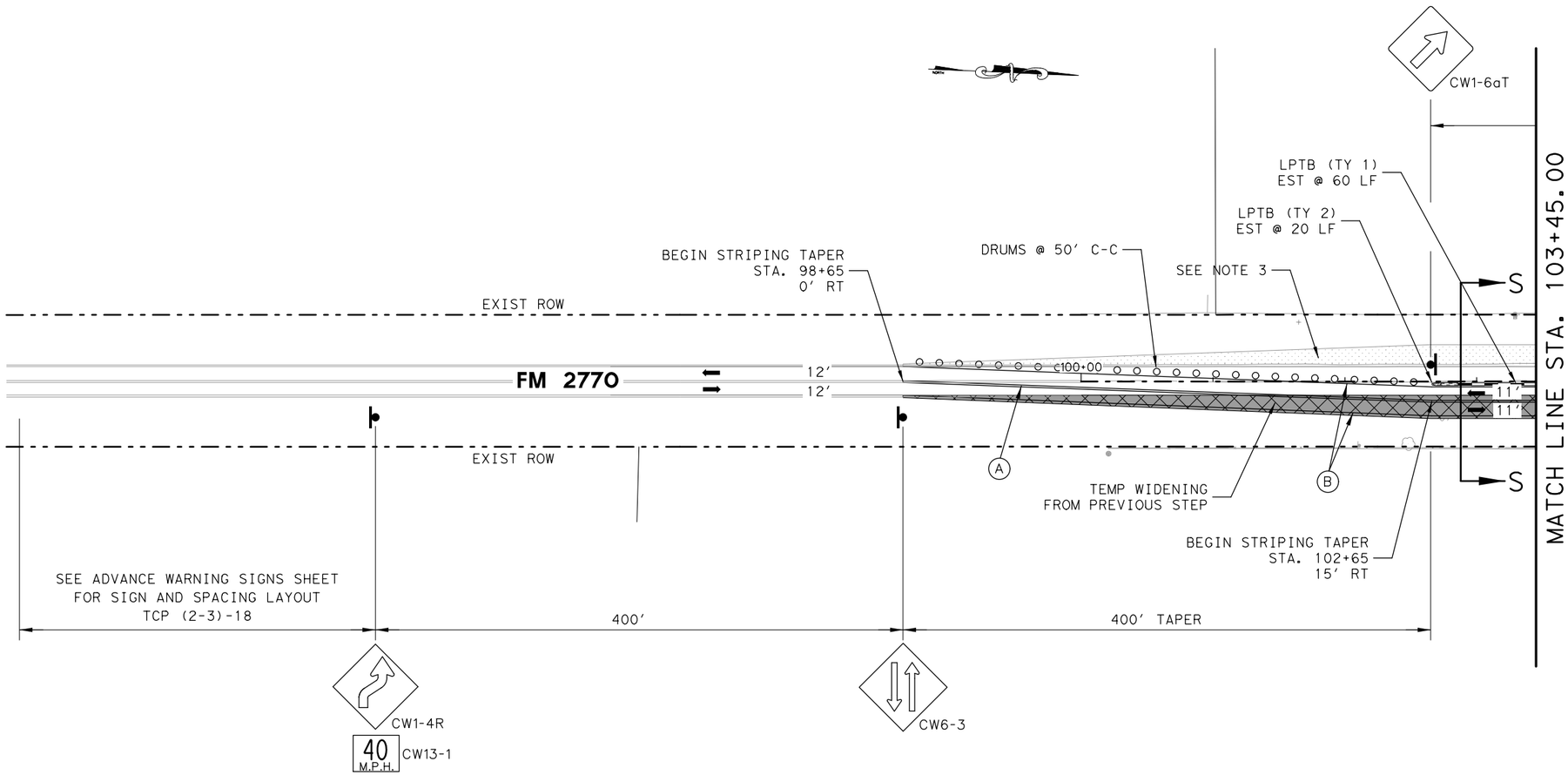
SHEET 3 OF 3

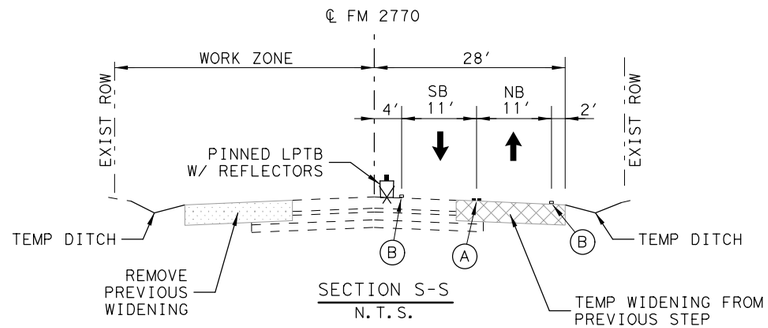
DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
GRAPHICS	6	STP ( ) RGS		RSLE
	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	43
	0914	33	068,etc	

PLOT DRIVER: $PLTDRV$ PENTABLE: RSLE.tbl
USER: DATE: 11/10/2020 TIME: 12:16:46 PM SCALE: $SCALESHORT$
FILE: c:\projtechwise\jarodriguez\d0786332\RSLE_TCP_17.dgn

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMP CONSTRUCTION
- DIRECTION OF TRAFFIC
- CHANNELIZING DEVICE
- TYPE 3 BARRICADE
- TEMP GROUND MOUNTED SIGNS
- TEMP PAVEMENT STRIPING
- LOW PROF TRAF BARR (LPTB)(W/DRAIN SLOT)
- (A) WRK ZN PAV MRK REMOV (Y) 4" (SLD) DBL
- (B) WRK ZN PAV MRK REMOV (W) 4" (SLD)
- (C) WRK ZN PAV MRK REMOV (W) 24" (SLD)
- (D) WRK ZN PAV MRK REMOV (W) 4" (BRK)
- (E) WRK ZN PAV MRK REMOV (W)(ARROW)
- (F) WRK ZN PAV MRK REMOV (W)(WORD)





NOTES:

1. CONTRACTOR SHALL PROVIDE ACCESS TO PROPERTY OWNER DURING CONSTRUCTION.
2. CONTRACTOR SHALL PROVIDE ADEQUATE DRAINAGE FOR TEMPORARY PAVEMENT AS APPROVED BY ENGINEER.
3. USE ONE-LANE TWO WAY TRAFFIC CONTROL, TCP (2-2)-18, TO REMOVE TEMPORARY WIDENING IN TAPER.
4. SEE TCP(2-3)-18 FOR ADDITIONAL DETAILS.

0 50 100
SCALE IN FEET

STATE OF TEXAS
RICARDO E. DE LA PARRA
94043
LICENSED PROFESSIONAL ENGINEER
P.E.
11/10/2020

HAYS COUNTY TEXAS

Lockwood, Andrews & Newnam, Inc.
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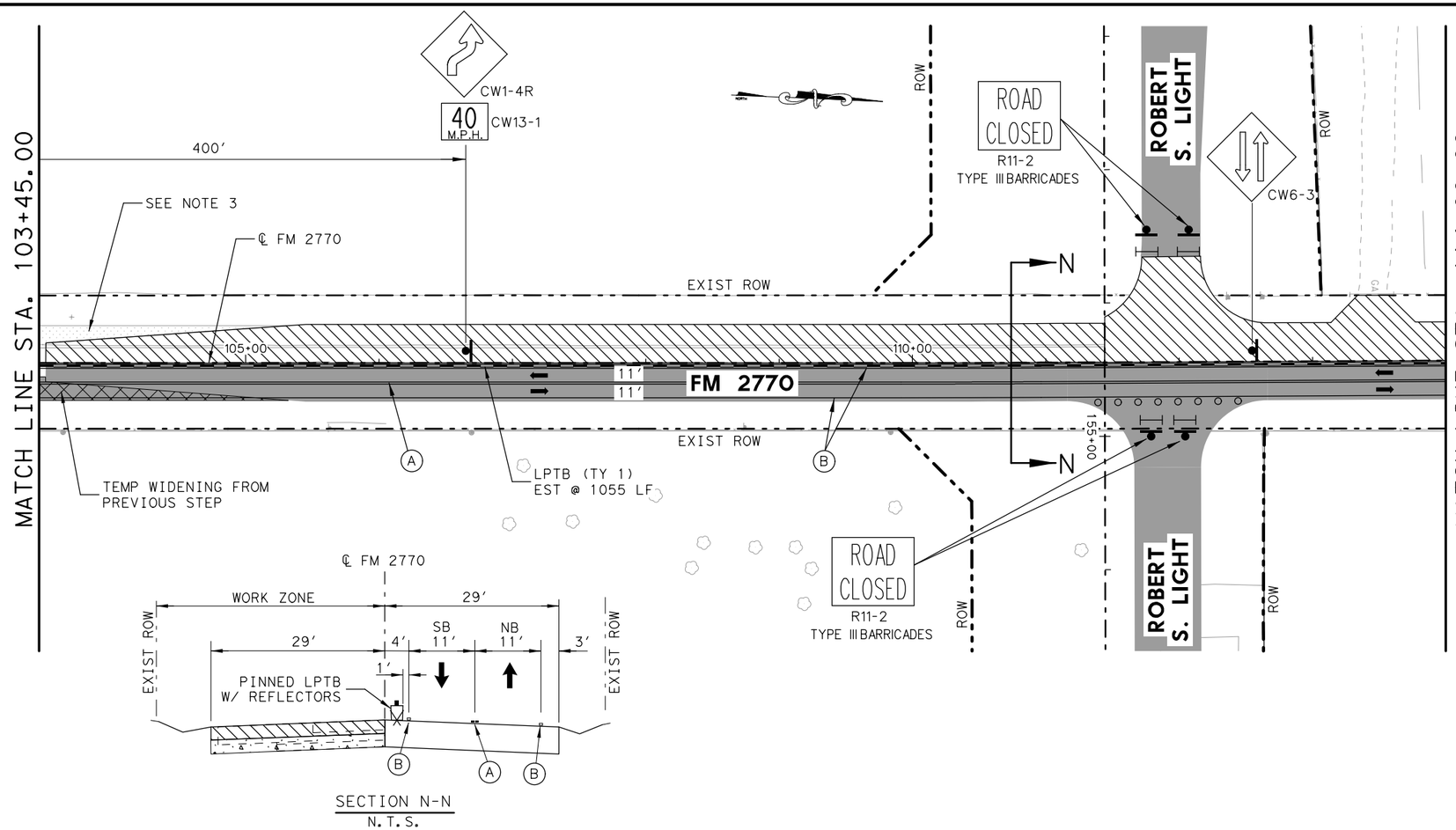
ROBERT S. LIGHT EXTENSION

ROBERT S. LIGHT TRAFFIC CONTROL PLAN PHASE III - STEP 3

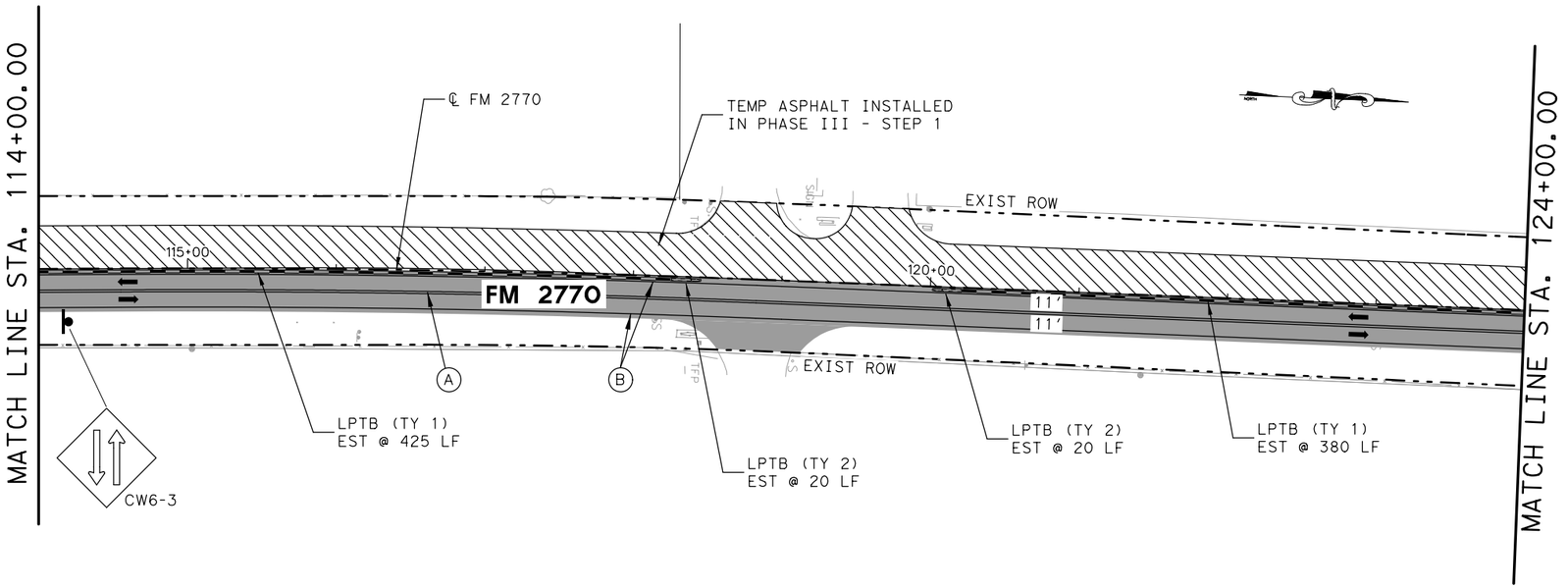
SHEET 1 OF 3

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	AUS	HAYS	44
CHECK	CONTROL	SECTION	JOB	
	0914	33	068,etc	

PLOT DRIVER: $PLTDRV$$
USER:
FILE: c:\projects\wse\jarodriguez\d0786332\RSLE_TCP_18.dgn
PENTABLE: RSLE.tbl
DATE: 11/10/2020
TIME: 12:17:21 PM
SCALE: $SCALESHORT$



SECTION N-N
N.T.S.



LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMP CONSTRUCTION
- DIRECTION OF TRAFFIC
- CHANNELIZING DEVICE
- TYPE 3 BARRICADE
- TEMP GROUND MOUNTED SIGNS
- TEMP PAVEMENT STRIPING
- LOW PROF TRAF BARR (LPTB)(W/DRAIN SLOT)
- (A) WRK ZN PAV MRK REMOV (Y) 4" (SLD) DBL
- (B) WRK ZN PAV MRK REMOV (W) 4" (SLD)
- (C) WRK ZN PAV MRK REMOV (W) 24" (SLD)
- (D) WRK ZN PAV MRK REMOV (W) 4" (BRK)
- (E) WRK ZN PAV MRK REMOV (W)(ARROW)
- (F) WRK ZN PAV MRK REMOV (W)(WORD)

NOTES:

1. CONTRACTOR SHALL PROVIDE ACCESS TO PROPERTY OWNER DURING CONSTRUCTION.
2. CONTRACTOR SHALL PROVIDE ADEQUATE DRAINAGE FOR TEMPORARY PAVEMENT AS APPROVED BY ENGINEER.
3. USE ONE-LANE TWO WAY TRAFFIC CONTROL, TCP (2-2)-18, TO REMOVE TEMPORARY WIDENING IN TAPER.
4. SEE TCP(2-3)-18 FOR ADDITIONAL DETAILS.

0 50 100
SCALE IN FEET

STATE OF TEXAS
RICARDO E. DE LA PARRA
94043
LICENSED PROFESSIONAL ENGINEER
P.E.
11/10/2020

HAYS COUNTY TEXAS

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY
TBPE FIRM REGISTRATION NO. 2614

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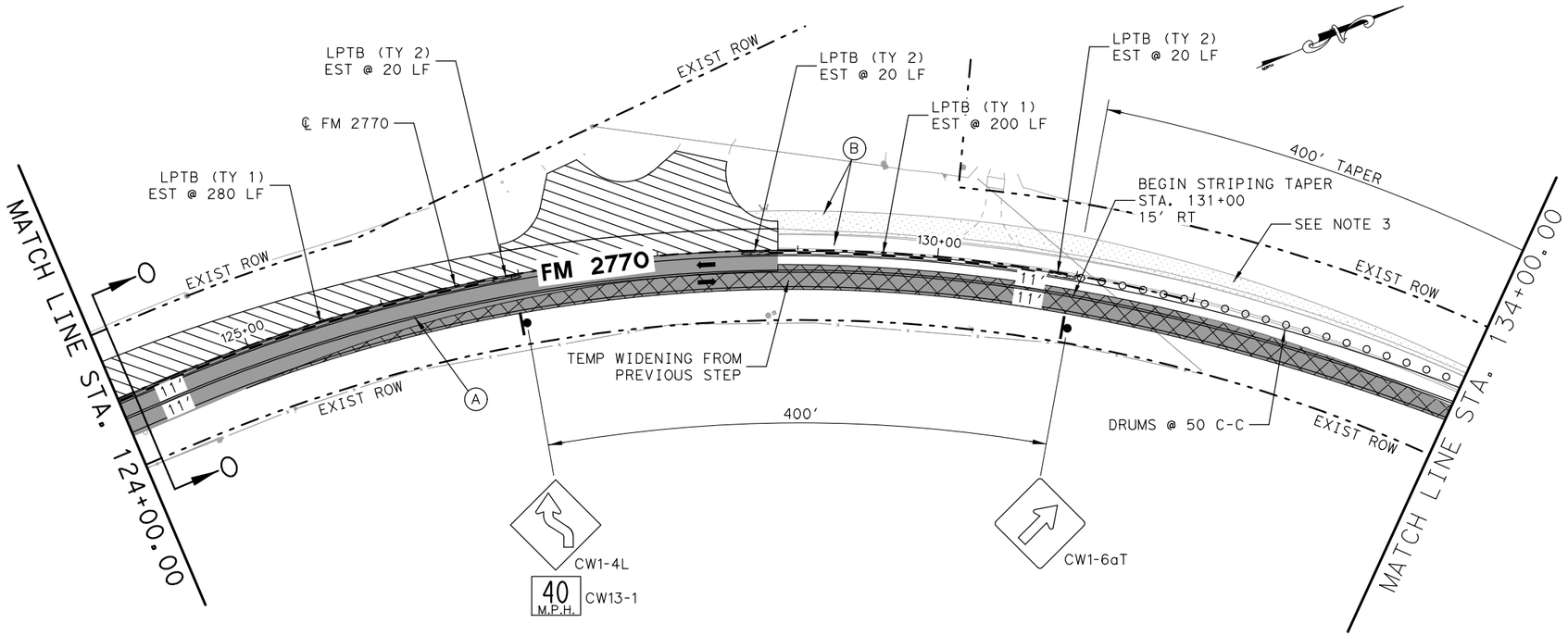
ROBERT S. LIGHT EXTENSION

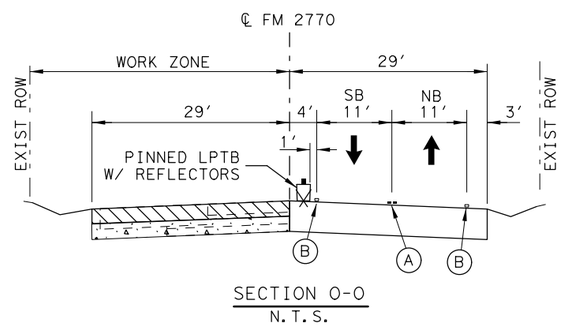
ROBERT S. LIGHT TRAFFIC CONTROL PLAN PHASE III - STEP 3

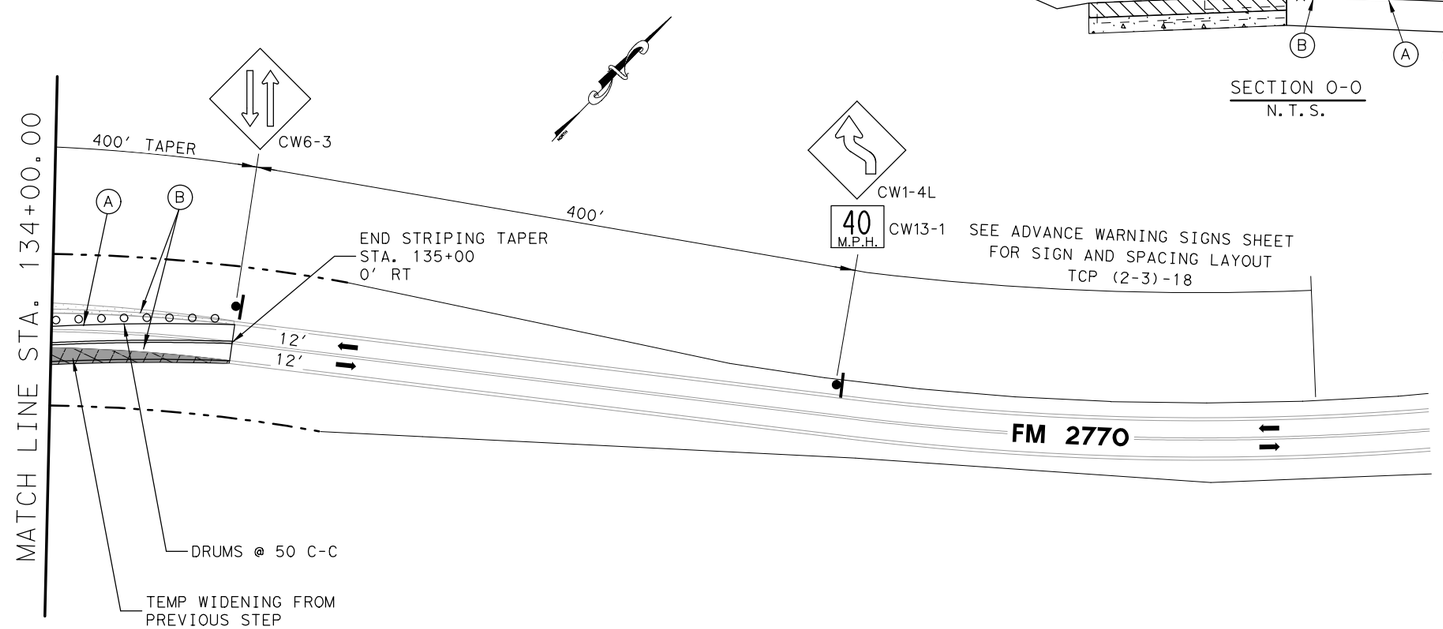
SHEET 2 OF 3

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	45
CHECK	0914	33	068,etc	

PLOT DRIVER: $PLTDRVS$
USER:
FILE: c:\proj\echwlse\jarodriguez\d0786332\RSLE_TCP_I9.dgn
PENTABLE: RSLE.tbl
DATE: 11/10/2020 TIME: 12:17:48 PM SCALE: $SCALESHORT$







LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMP CONSTRUCTION
- DIRECTION OF TRAFFIC
- CHANNELIZING DEVICE
- TYPE 3 BARRICADE
- TEMP GROUND MOUNTED SIGNS
- TEMP PAVEMENT STRIPING
- LOW PROF TRAF BARR (LPTB)(W/DRAIN SLOT)
- (A) WRK ZN PAV MRK REMOV (Y) 4" (SLD) DBL
- (B) WRK ZN PAV MRK REMOV (W) 4" (SLD)
- (C) WRK ZN PAV MRK REMOV (W) 24" (SLD)
- (D) WRK ZN PAV MRK REMOV (W) 4" (BRK)
- (E) WRK ZN PAV MRK REMOV (W)(ARROW)
- (F) WRK ZN PAV MRK REMOV (W)(WORD)

NOTES:

1. CONTRACTOR SHALL PROVIDE ACCESS TO PROPERTY OWNER DURING CONSTRUCTION.
2. CONTRACTOR SHALL PROVIDE ADEQUATE DRAINAGE FOR TEMPORARY PAVEMENT AS APPROVED BY ENGINEER.
3. USE ONE-LANE TWO WAY TRAFFIC CONTROL, TCP (2-2)-18, TO REMOVE TEMPORARY WIDENING IN TAPER.

0 50 100
SCALE IN FEET

STATE OF TEXAS
RICARDO E. DE LA PARRA
94043
LICENSED PROFESSIONAL ENGINEER
P.E.
11/10/2020

HAYS COUNTY TEXAS

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY
TBPE FIRM REGISTRATION NO. 2614

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ROBERT S. LIGHT EXTENSION

ROBERT S. LIGHT TRAFFIC CONTROL PLAN PHASE III - STEP 3

SHEET 3 OF 3

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
GRAPHICS	6	STP ( ) RGS		RSLE
CHECK	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	AUS	HAYS	46
	CONTROL	SECTION	JOB	
	0914	33	068,etc	

PLOT DRIVER: $PLTDRV$$
USER:
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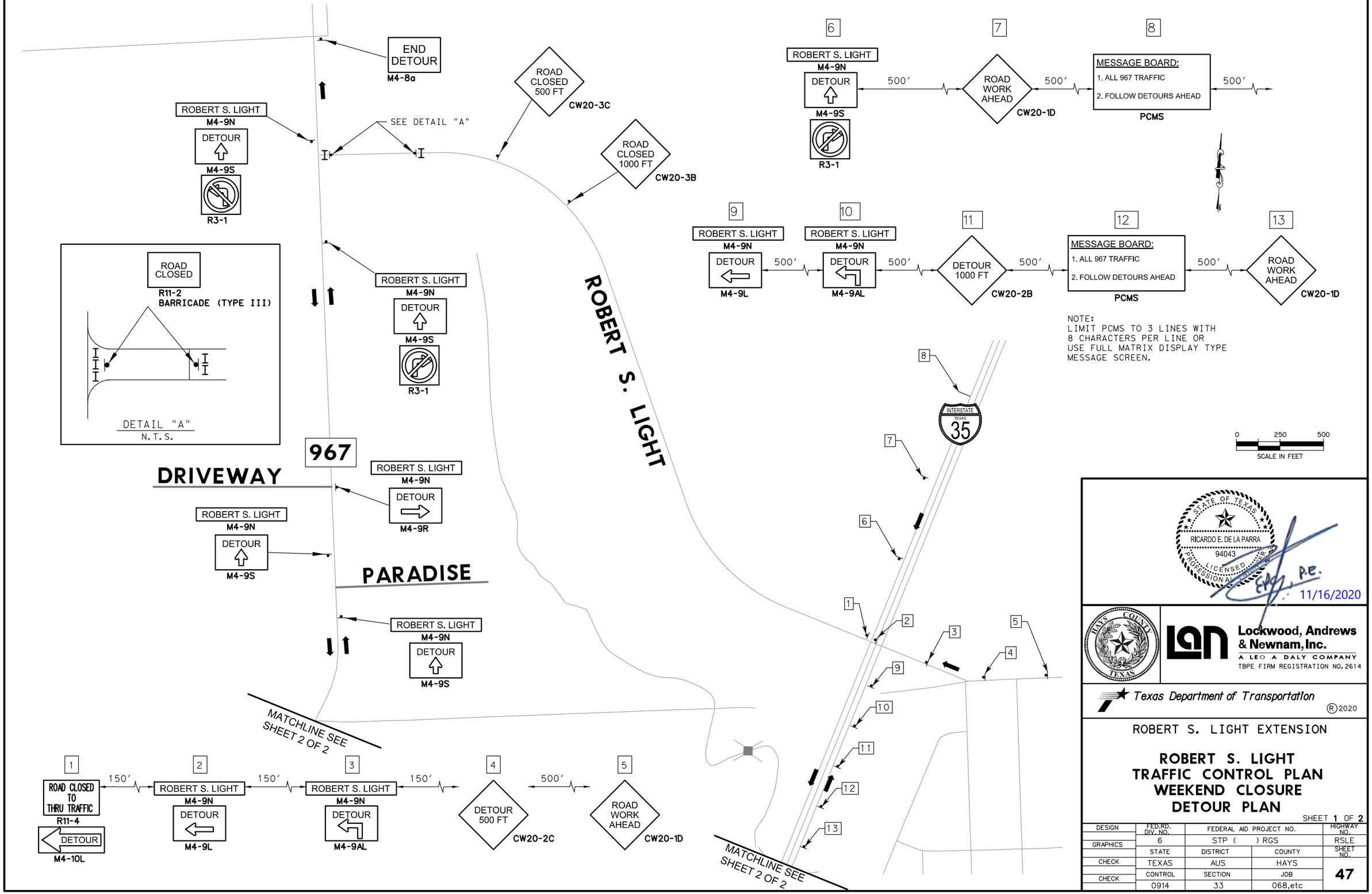
DATE: 11/10/2020 TIME: 12:18:16 PM SCALE: $SCALESHORT$



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STATE OF TEXAS
RICARDO E. DE LA PARRA
94043
LICENSED PROFESSIONAL ENGINEER
P.E.
11/16/2020

HAYS COUNTY TEXAS

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ROBERT S. LIGHT EXTENSION

ROBERT S. LIGHT TRAFFIC CONTROL PLAN WEEKEND CLOSURE DETOUR PLAN

SHEET 1 OF 2

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
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CHECK	CONTROL	SECTION	JOB	47
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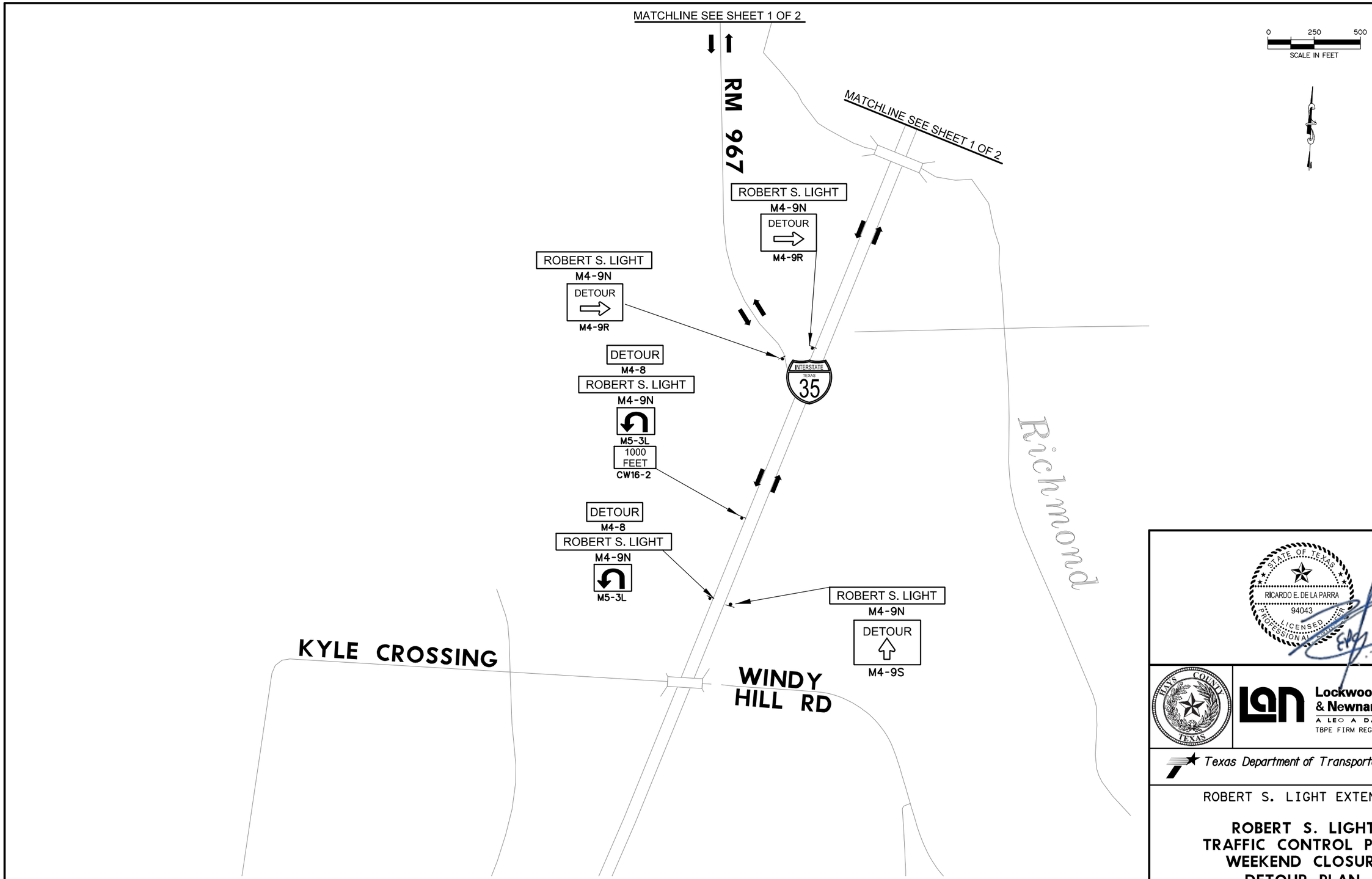

RICARDO E. DE LA PARRA
94043
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STATE OF TEXAS
P.E.
11/10/2020

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ROBERT S. LIGHT EXTENSION

ROBERT S. LIGHT TRAFFIC CONTROL PLAN WEEKEND CLOSURE DETOUR PLAN

SHEET 2 OF 2

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	AUS	HAYS	48
CHECK	CONTROL	SECTION	JOB	
	0914	33	068,etc	

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DATE: 11/10/2020 12:19:02 PM
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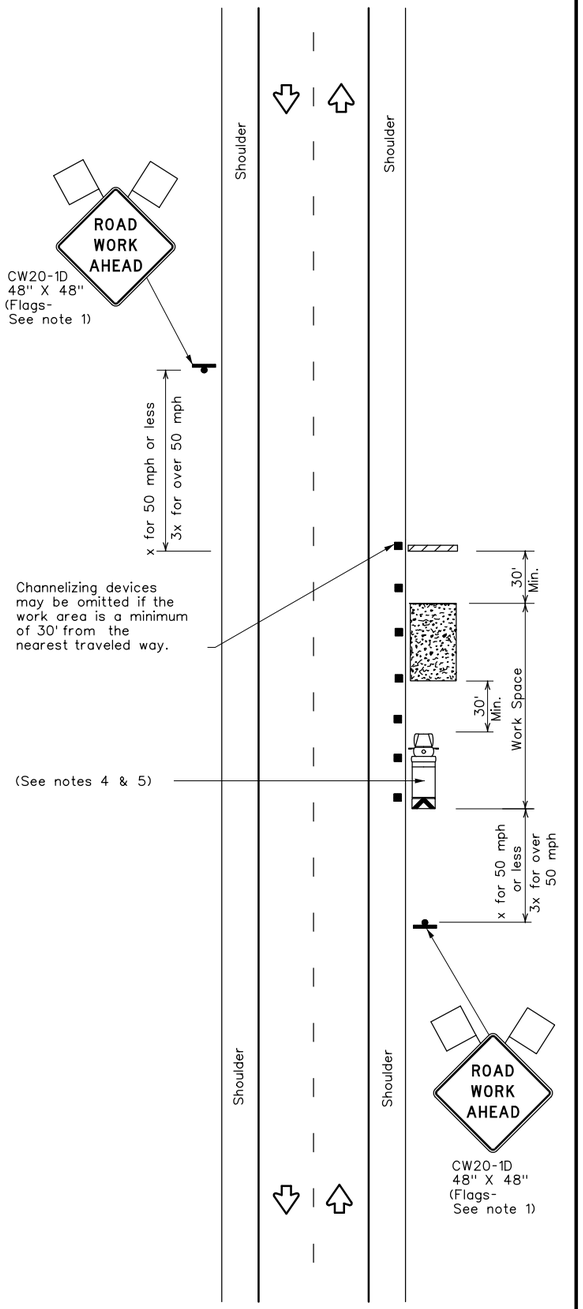
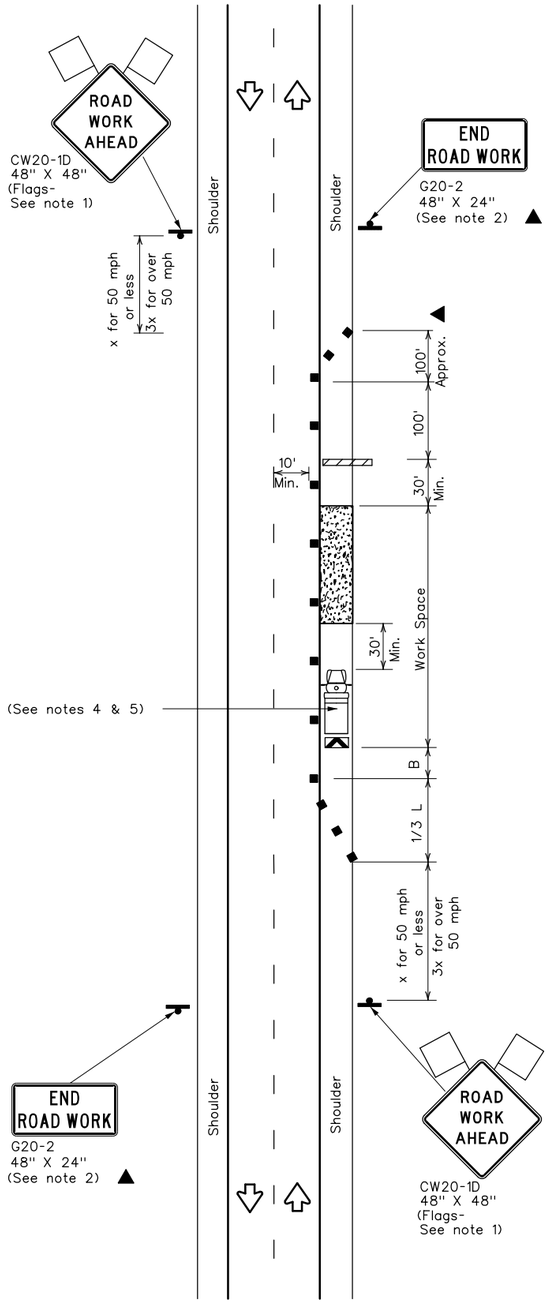


TCP (2-1a)

WORK SPACE NEAR SHOULDER

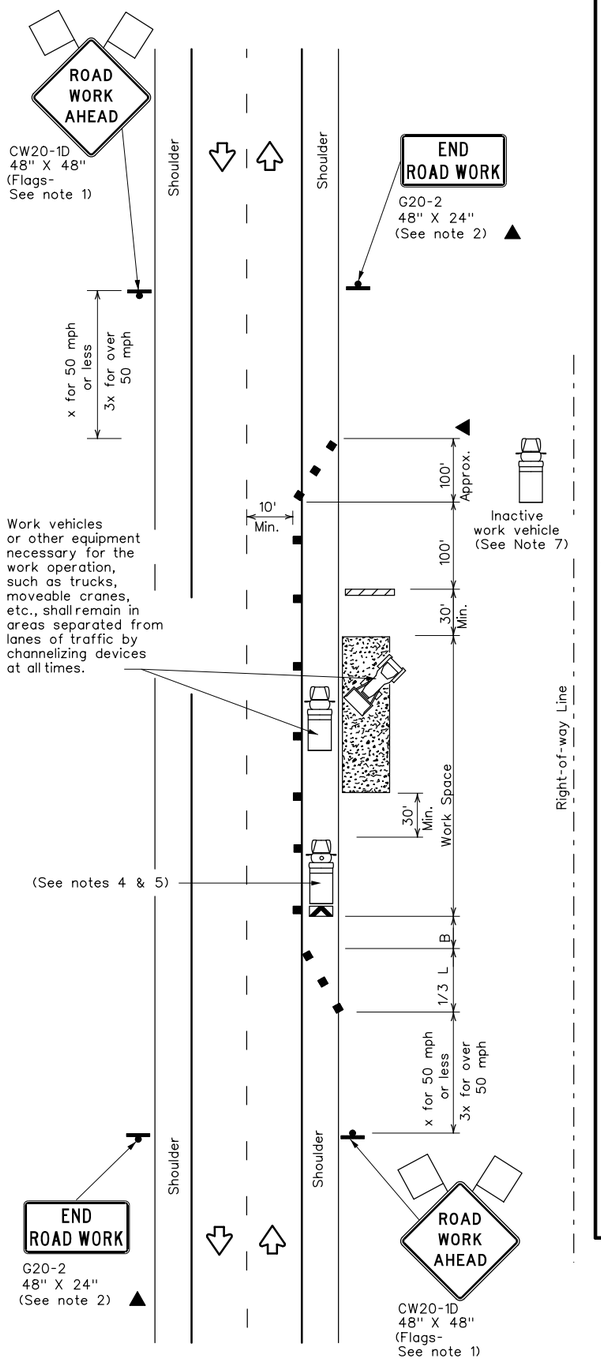
Conventional Roads



TCP (2-1b)

WORK SPACE ON SHOULDER

Conventional Roads



TCP (2-1c)

WORK VEHICLES ON SHOULDER

Conventional Roads

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(2-1)-18

FILE: tcp2-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	33	068,etc	RSL
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	AUS	HAYS		49
1-97 2-18				

DATE: 11/10/2020 12:19:13 PM
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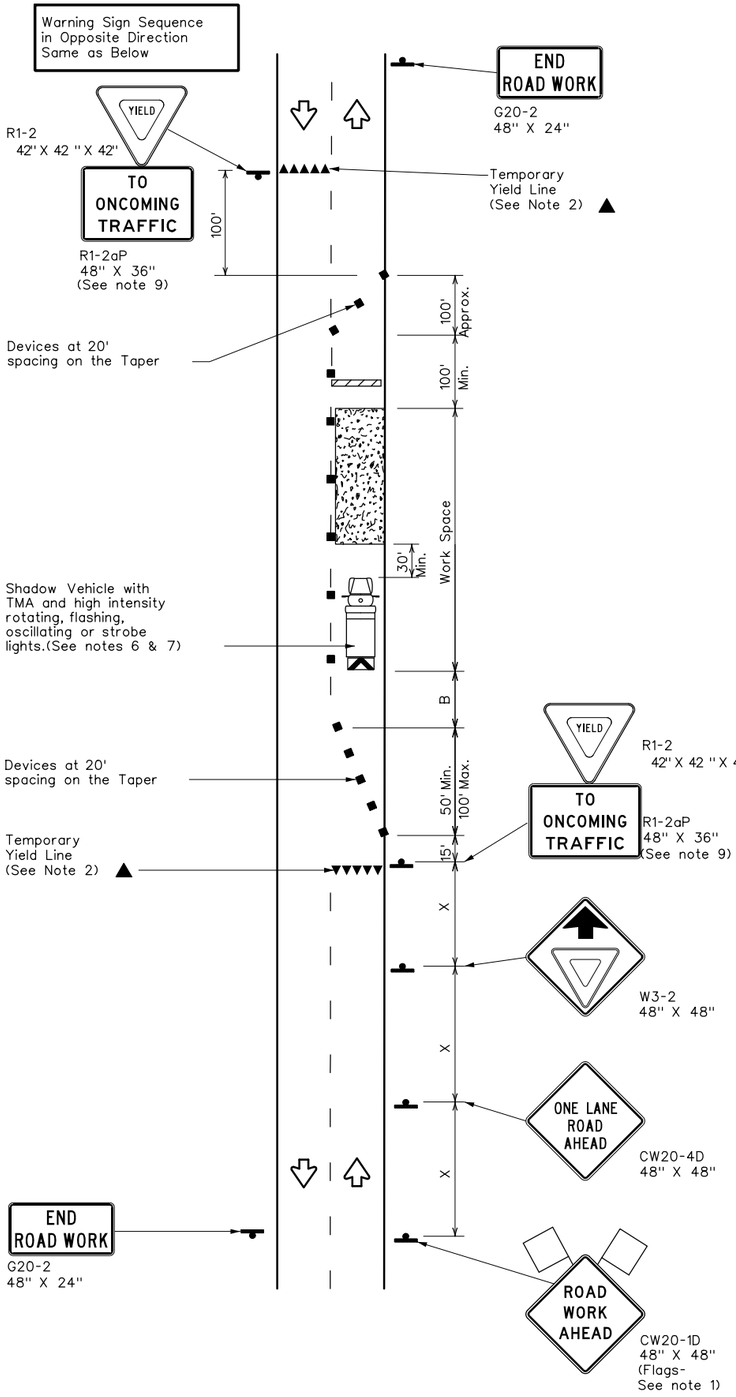
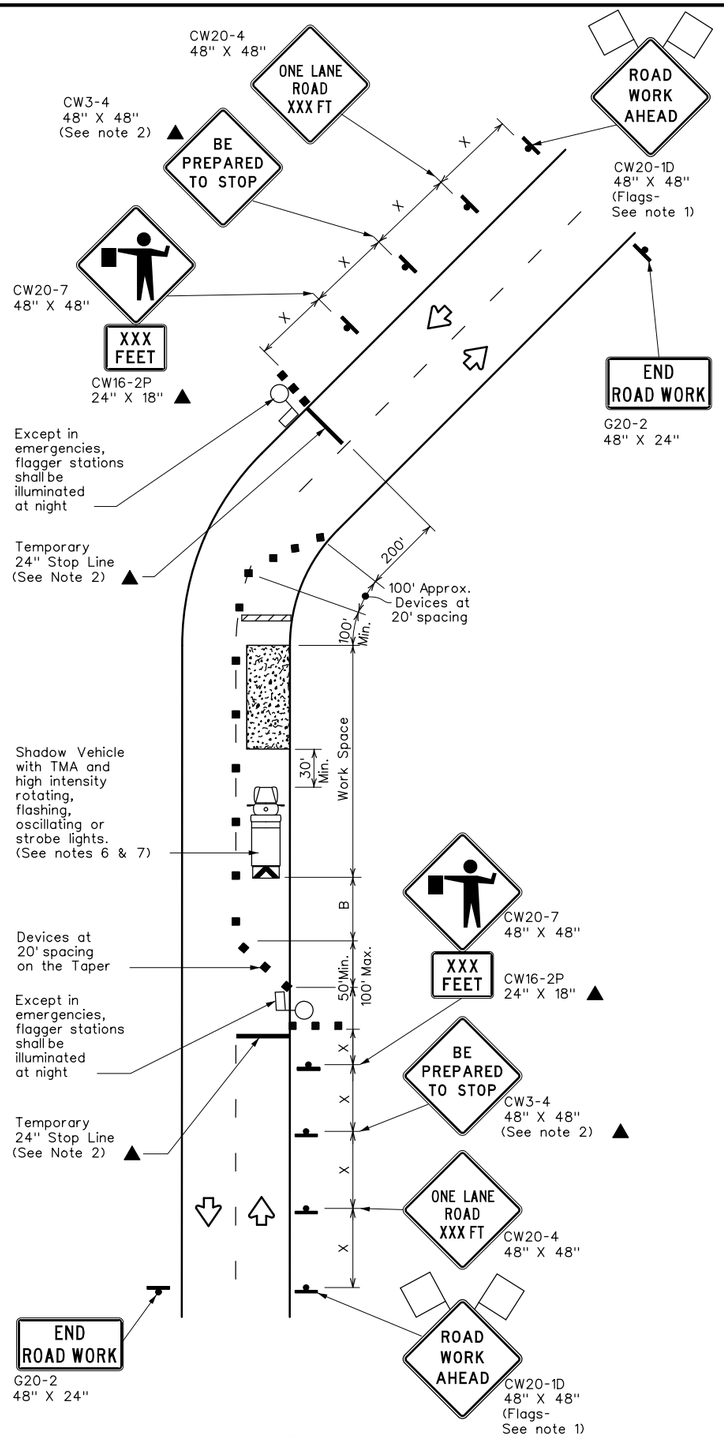


TCP (2-2a)
2-LANE ROADWAY WITHOUT PAVED SHOULDERS
ONE LANE TWO-WAY
CONTROL WITH YIELD SIGNS
(Less than 2000 ADT - See Note 9)



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

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

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

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

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

GENERAL NOTES

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

TCP (2-2a)

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

TCP (2-2b)

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

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
ONE-LANE TWO-WAY
TRAFFIC CONTROL

TCP(2-2)-18

FILE: tcp2-2-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03	0914	33	068,etc	RSL
1-97 2-12	DIST	COUNTY		SHEET NO.
4-98 2-18	AUS	HAYS		50

DATE: 11/10/2020 12:19:27 PM
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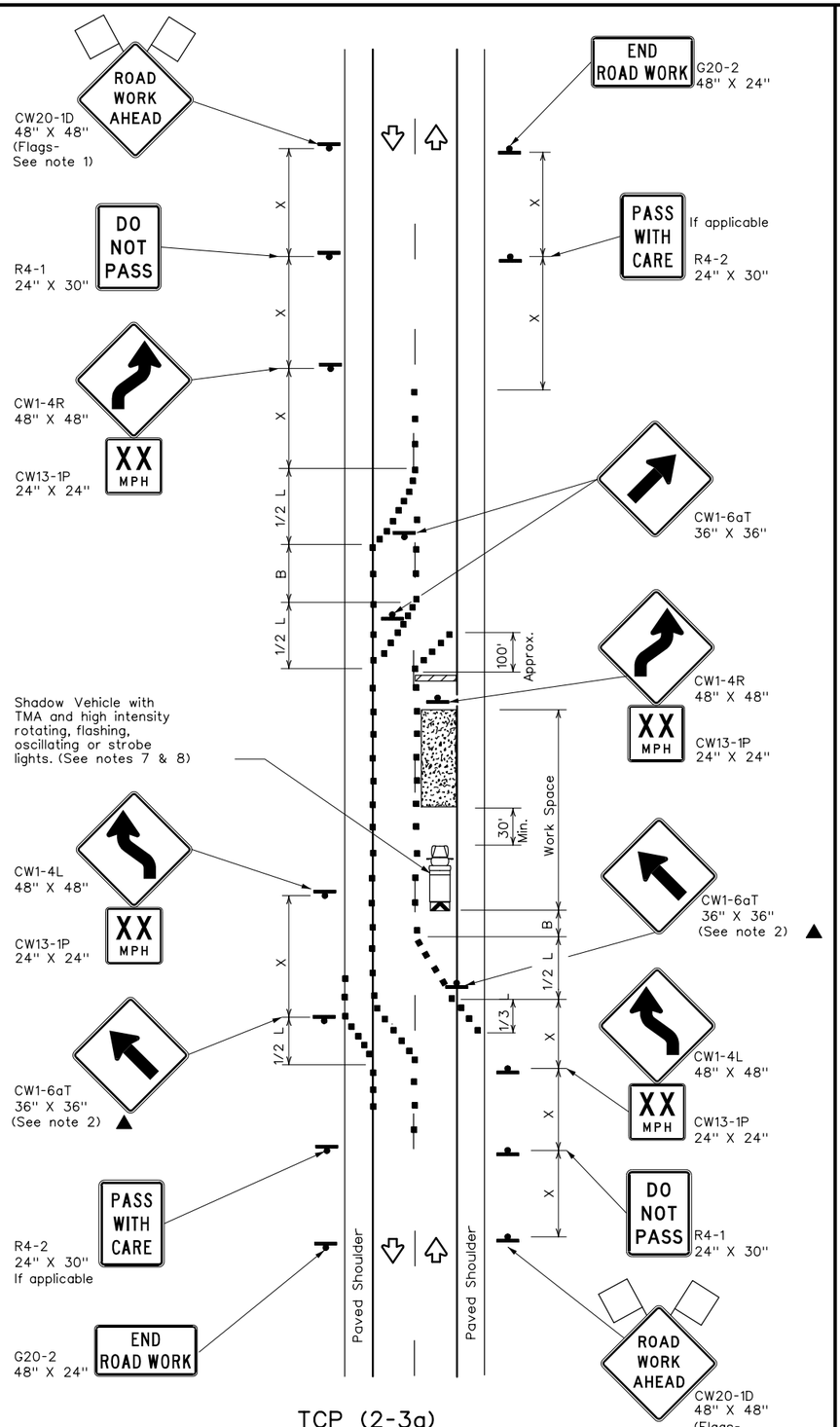
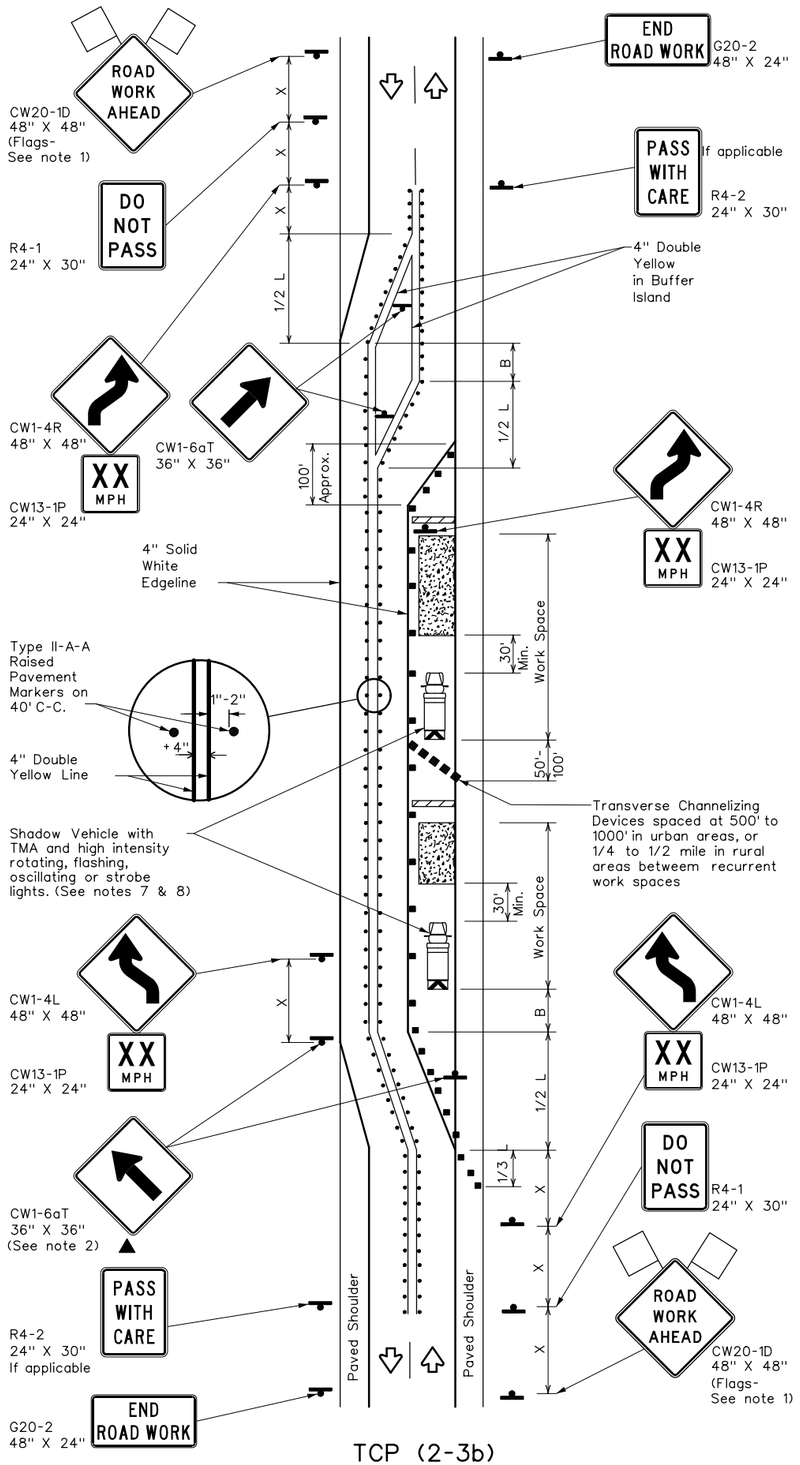


TCP (2-3a)
2-LANE ROADWAY WITH PAVED SHOULDERS

ONE LANE CLOSED
ADEQUATE FIELD OF VIEW



TCP (2-3b)
2-LANE ROADWAY WITH PAVED SHOULDERS

ONE LANE CLOSED
INADEQUATE FIELD OF VIEW

LEGEND

	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board		Raised Pavement Markers Ty II-AA
	Sign		Traffic Flow
	Flag		Flagger

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

* Conventional Roads Only

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

TYPICAL USAGE

MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
				TCP(2-3b)ONLY
			✓	✓

GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. When work space will be in place less than three days existing pavement markings may remain in place. Channelizing devices shall be used to separate traffic.
4. Flagger control should NOT be used unless roadway conditions or heavy traffic volume require additional emphasis to safely control traffic. Flagger should be positioned at end of traffic queue.
5. The R4-1 "DO NOT PASS," R4-2 " PASS WITH CARE" and construction regulatory speed zone signs may be installed within CW20-1D "ROAD WORK AHEAD" signs. Proper spacing of signs shall be maintained.
6. Conflicting pavement marking shall be removed for long term projects.
7. 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.
8. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect a wider work space.

TCP (2-3a)

9. Conflicting pavement markings shall be removed for long-term projects. 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 device spacing is intended for the area of the conflicting markings, not the entire work zone.

Texas Department of Transportation

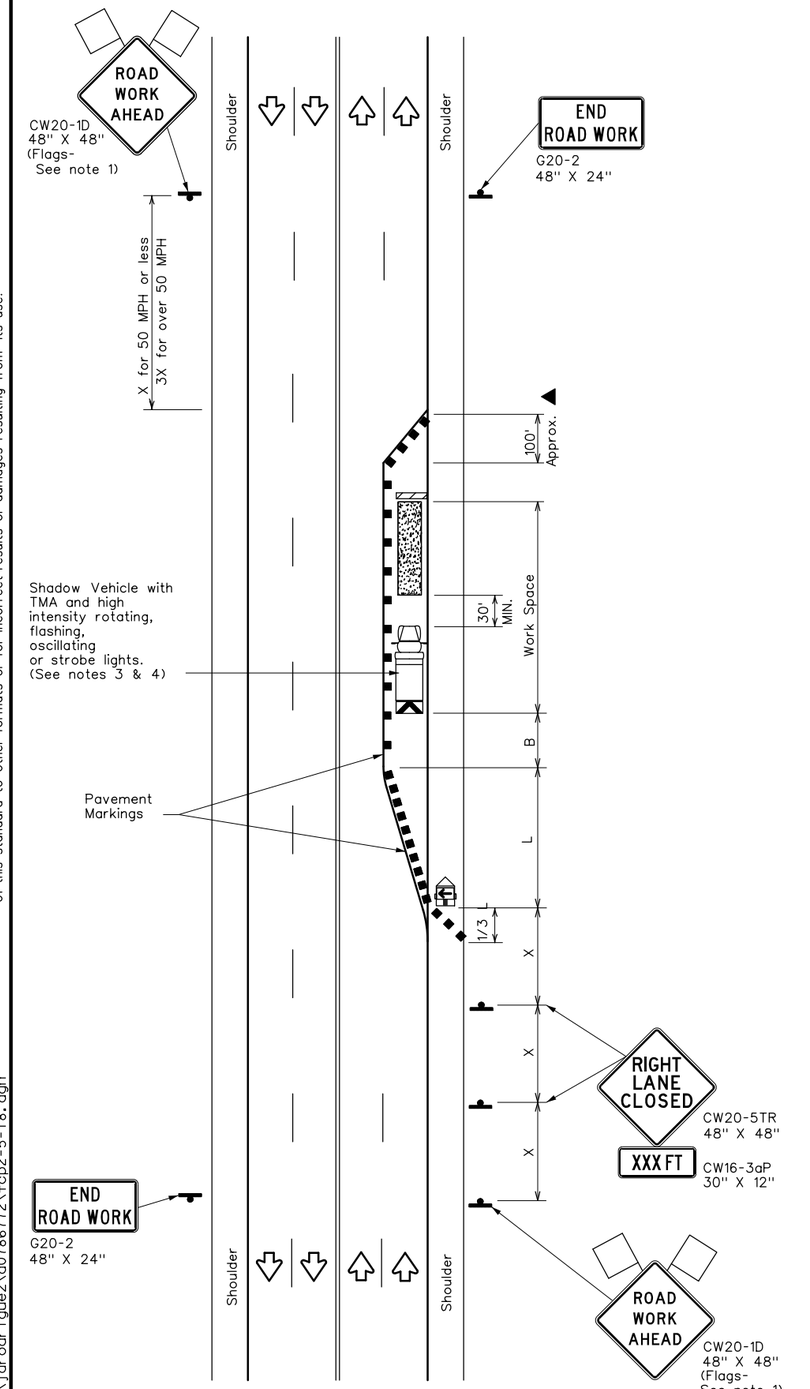
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN TRAFFIC SHIFTS ON TWO-LANE ROADS

TCP(2-3)-18

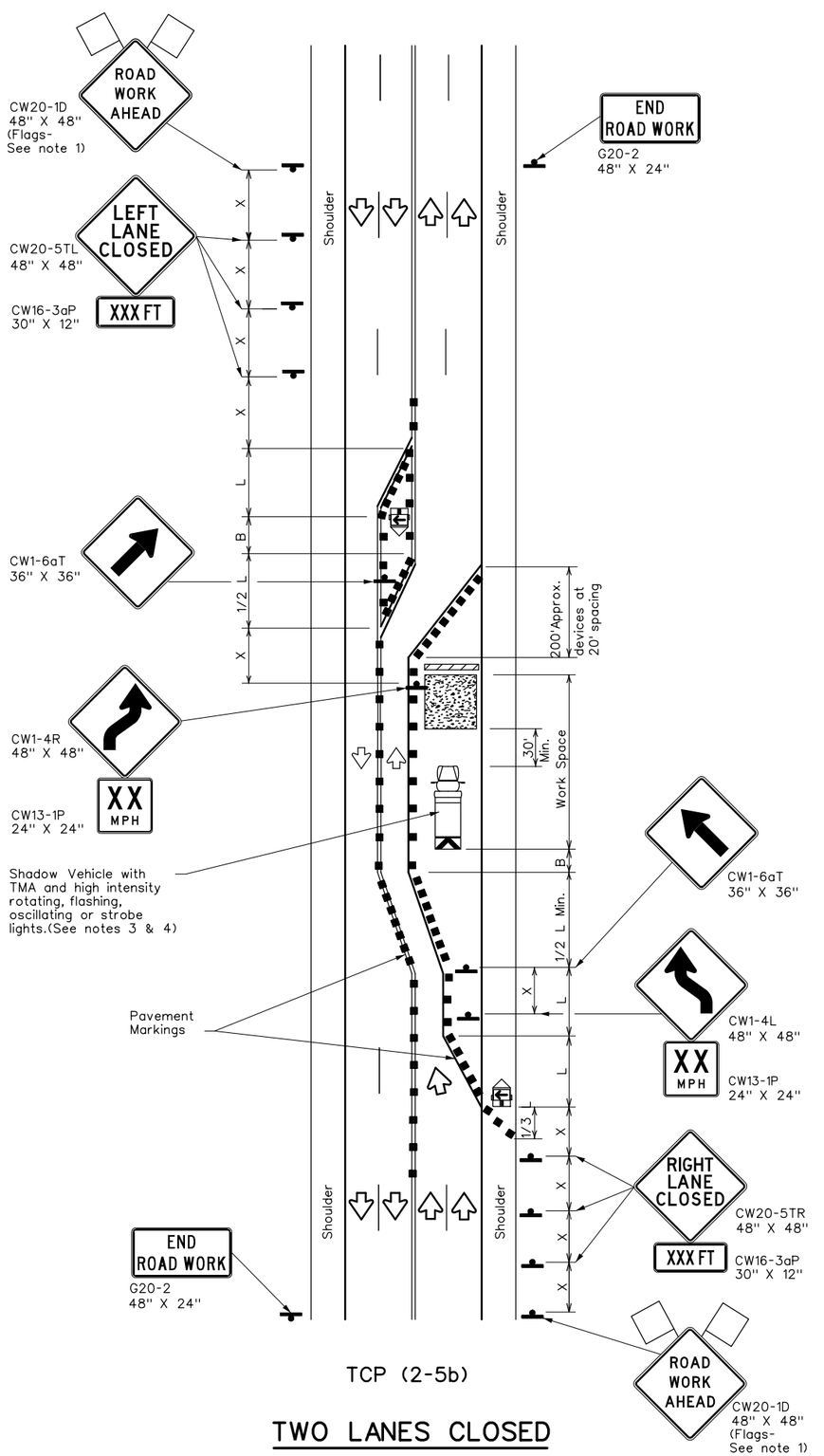
FILE: tcp(2-3)-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	33	068,etc	RSL
8-95 3-03	DIST	COUNTY		SHEET NO.
1-97 2-12	AUS	HAYS		51
4-98 2-18				

163



TCP (2-5a)

ONE LANE CLOSED



TCP (2-5b)

TWO LANES CLOSED

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

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

TCP (2-5a)

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

TCP (2-5b)

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

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
REVISIONS	0914	33	068,etc	RSL
8-95 2-12	DIST	COUNTY		SHEET NO.
1-97 3-03	AUS	HAYS		52
4-98 2-18				

DATE: 11/10/2020 12:19:37 PM
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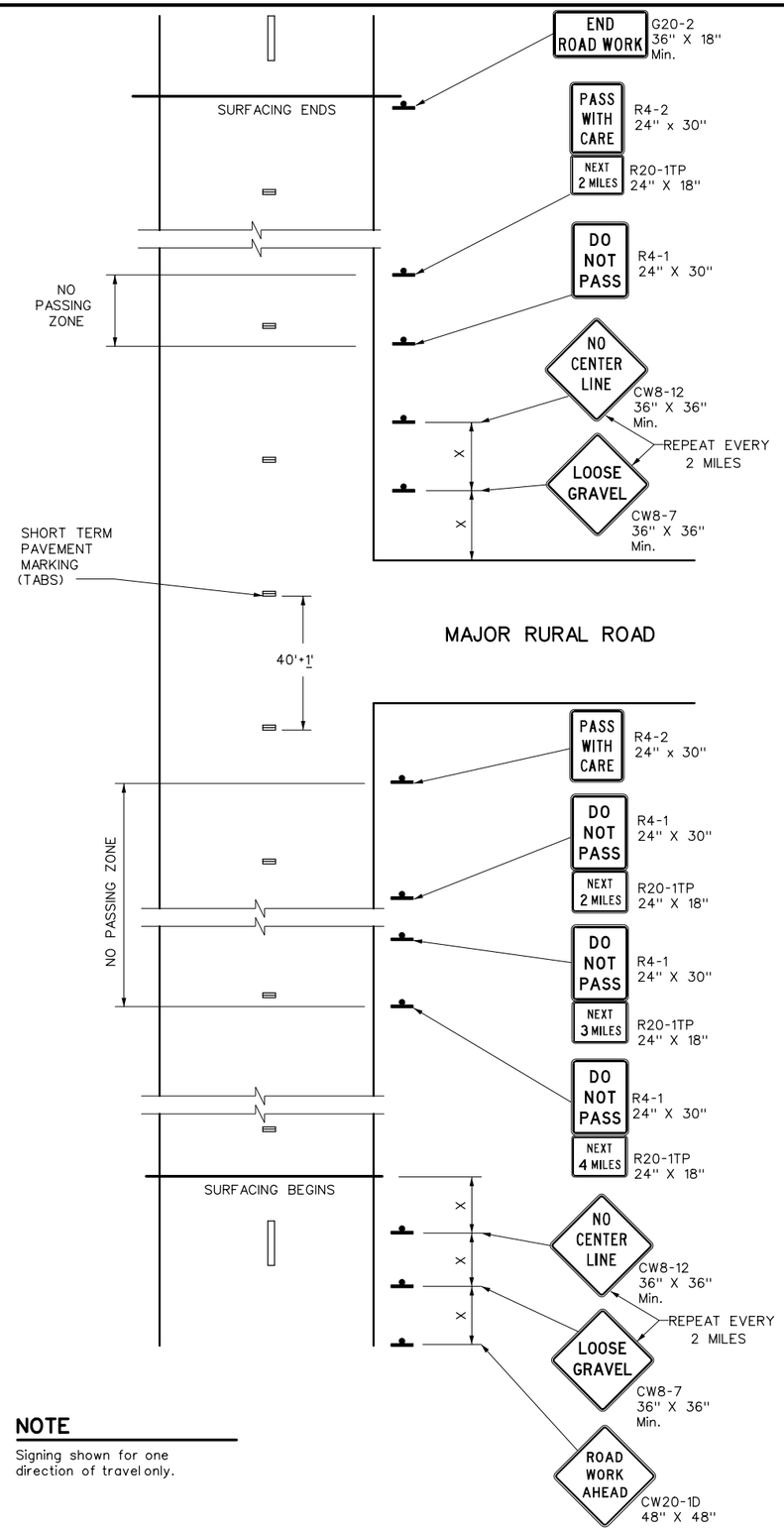
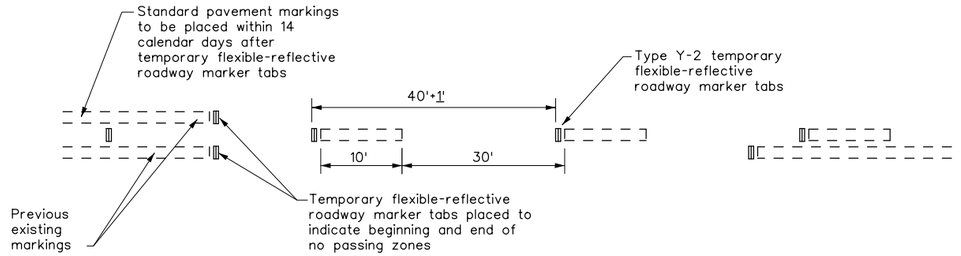


NOTE

Signing shown for one direction of travel only.

NO PASSING ZONES ON TWO-LANE TWO-WAY ROADS



TABS ON CENTERLINES OF TWO-LANE TWO-WAY ROADS

For seal coat, micro-surface or similar operations

"DO NOT PASS" SIGN (R4-1) and NO-PASSING ZONES

A. Prior to the beginning of construction, all currently striped no-passing zones shall be signed with the DO NOT PASS (R4-1) signs and PASS WITH CARE (R4-2) signs placed at the beginning and end of each zone for each direction of travel except as otherwise provided herein. Signs marking these individual no-passing zones need not be covered prior to construction if the signs supplement the existing pavement markings.

B. At the discretion of the Engineer, in areas of numerous no-passing zones, several zones may be combined as a single zone. If passing is to be prohibited over one or more lengthy sections, a DO NOT PASS sign and a NEXT XX MILES (R20-1TP) plaque may be used at the beginning of such zones. The DO NOT PASS sign and the NEXT XX MILES plaque should be repeated every mile to the end of the no-passing zone. In areas where there is considerable distance between no-passing zones, the end of the no-passing zone may be signed with a PASS WITH CARE sign and a NEXT XX MILES plaque.

C. Depending on traffic volumes and length of sections, it may be desirable to prohibit passing throughout the project to prevent damage to windshield and lights. The DO NOT PASS sign and NEXT XX MILES plaque should be used and repeated as often as necessary for this purpose. Where several existing zones are to be combined into one individual no-passing zone, the sign at the beginning of the zone should be covered until the surfacing operation has passed this location so as not to have the DO NOT PASS sign conflict with the existing pavement markings. Also, unless one days operation completes the entire length of such combined zones, appropriate DO NOT PASS and PASS WITH CARE signs should be placed at the beginning and end of the no-passing zones where the surfacing operation has stopped for the day.

D. R4-1 and R4-2 are to remain in place until standard pavement markings are installed.

"NO CENTER LINE" SIGN (CW8-12)

A. Center line markings are yellow pavement markings that delineate the separation of travel lanes that have opposite directions of travel on a roadway. Divided highways do not typically have center line markings.

B. At the time construction activity obliterates the existing center line markings(low volume roads may not have an existing centerline), a NO CENTER LINE (CW8-12) sign should be erected at the beginning of the work area, at approximately 2 mile intervals within the work area, beyond major intersections and other locations deemed necessary by the Engineer.

C. The NO CENTER LINE signs are to remain in place until standard pavement markings are installed.

"LOOSE GRAVEL" SIGN (CW8-7)

A. When construction begins, a LOOSE GRAVEL (CW8-7) sign should be erected at each end of the work area and repeated at intervals of approximately 2 miles in rural areas and closer in urban areas.

B. The LOOSE GRAVEL signs are to remain in place until the condition no longer exists.

PAVEMENT MARKINGS

A. Temporary markings for surfacing projects shall be Temporary Flexible-reflective Roadway Marker Tabs unless otherwise approved by the Engineer. Tabs are to be installed to provide true alignment for striping crews or as directed by the Engineer. Tabs will be placed at the spacing indicated. Tabs should be applied to the pavement no more than two (2) days before the surfacing is applied. After the surfacing is rolled and swept, the cover over the reflective strip shall be removed.

B. Tabs shall not be used to simulate edge lines.

C. Tab placement for overlay/inlay operations shall be as shown on the WZ(STPM) standard sheet.

COORDINATION OF SIGN LOCATIONS

A. The location of warning signs at the beginning and end of a work area are to be coordinated with other signing typically shown on the Barricade and Construction Standards for project limits to ensure adequate sign spacing.

B. Where possible the ROAD WORK AHEAD (CW20-1D), LOOSE GRAVEL (CW8-7), and NO CENTER LINE (CW8-12) signs should be placed in the sequence shown following the OBEY WARNING SIGNS STATE LAW (R20-3T) and the TRAFFIC FINES DOUBLE (R20-5T) sign, and one "X" sign spacing prior to the CONTRACTOR (G20-6T)sign typically located at or near the limits of surfacing. LOOSE GRAVEL and NO CENTER LINE signs will then be repeated as described above.

Posted Speed *	Minimum Sign Spacing "X" Distance
30	120'
35	160'
40	240'
45	320'
50	400'
55	500'
60	600'
65	700'
70	800'
75	900'

* Conventional Roads Only

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

GENERAL NOTES

1. The traffic control devices detailed on this sheet will be furnished and erected as directed by the Engineer on sections of roadway where tabs must be placed prior to the surfacing operation which will cover or obliterate the existing pavement markings.
2. The devices shown on this sheet are to be used to supplement those required by the BC Standards or others required elsewhere in the plans.
3. Signs shall be erected as detailed on the BC Standards or the Compliant Work Zone Traffic Control Devices List (CWZTCD) on supports approved for Long-Term / Intermediate-Term Work Zone Sign Supports.
4. When surfacing operations take place on divided highways, freeways or expressways, the size of diamond shaped construction warning signs shall be 48" x 48".
5. Signs on divided highways, freeways and expressways will be placed on both right and left sides of the roadway based on roadway conditions as directed by the Engineer.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL DETAILS FOR SURFACING OPERATIONS

TCP(7-1)-13

FILE: tcp7-1.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT March 1991	CONT	SECT	JOB	HIGHWAY
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1-97 7-13	AUS	HAYS		53

210

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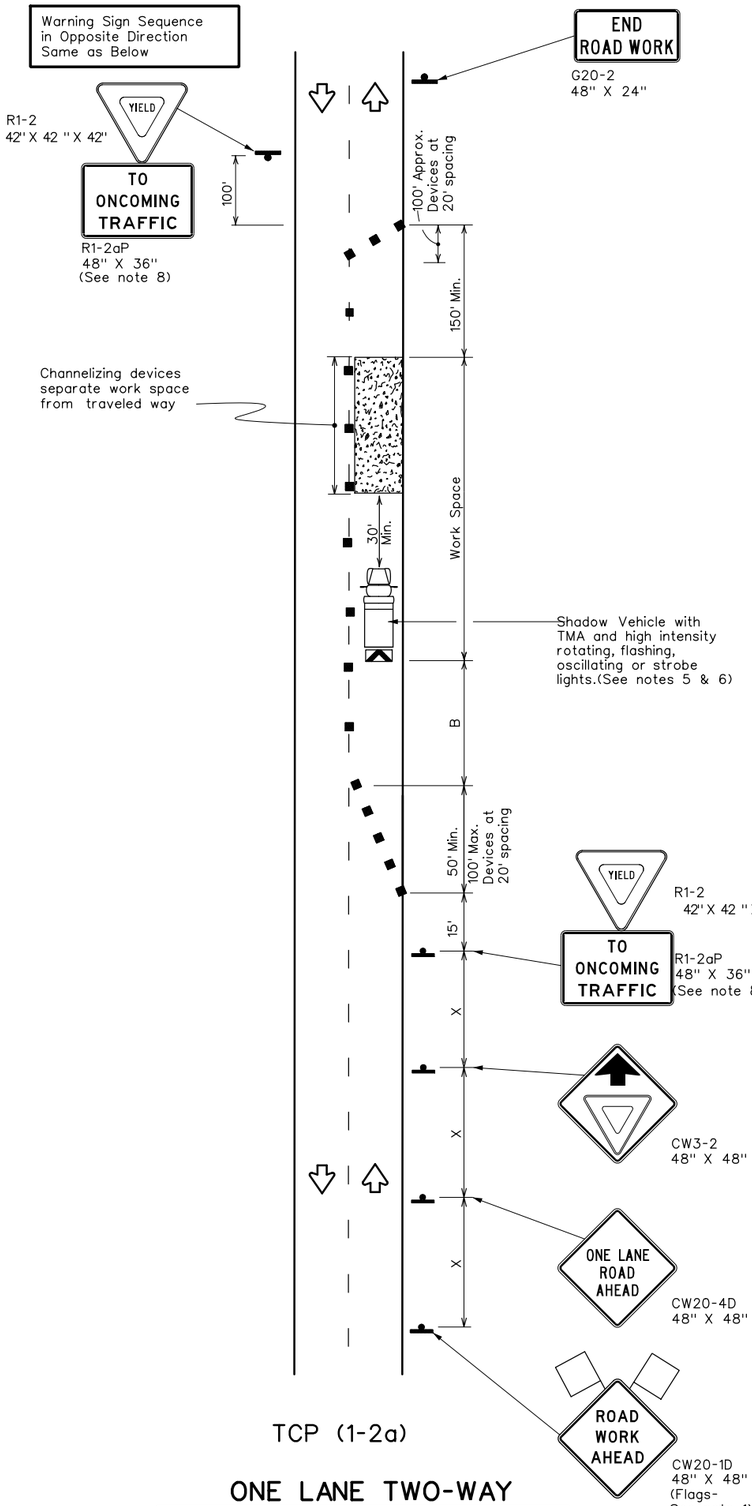
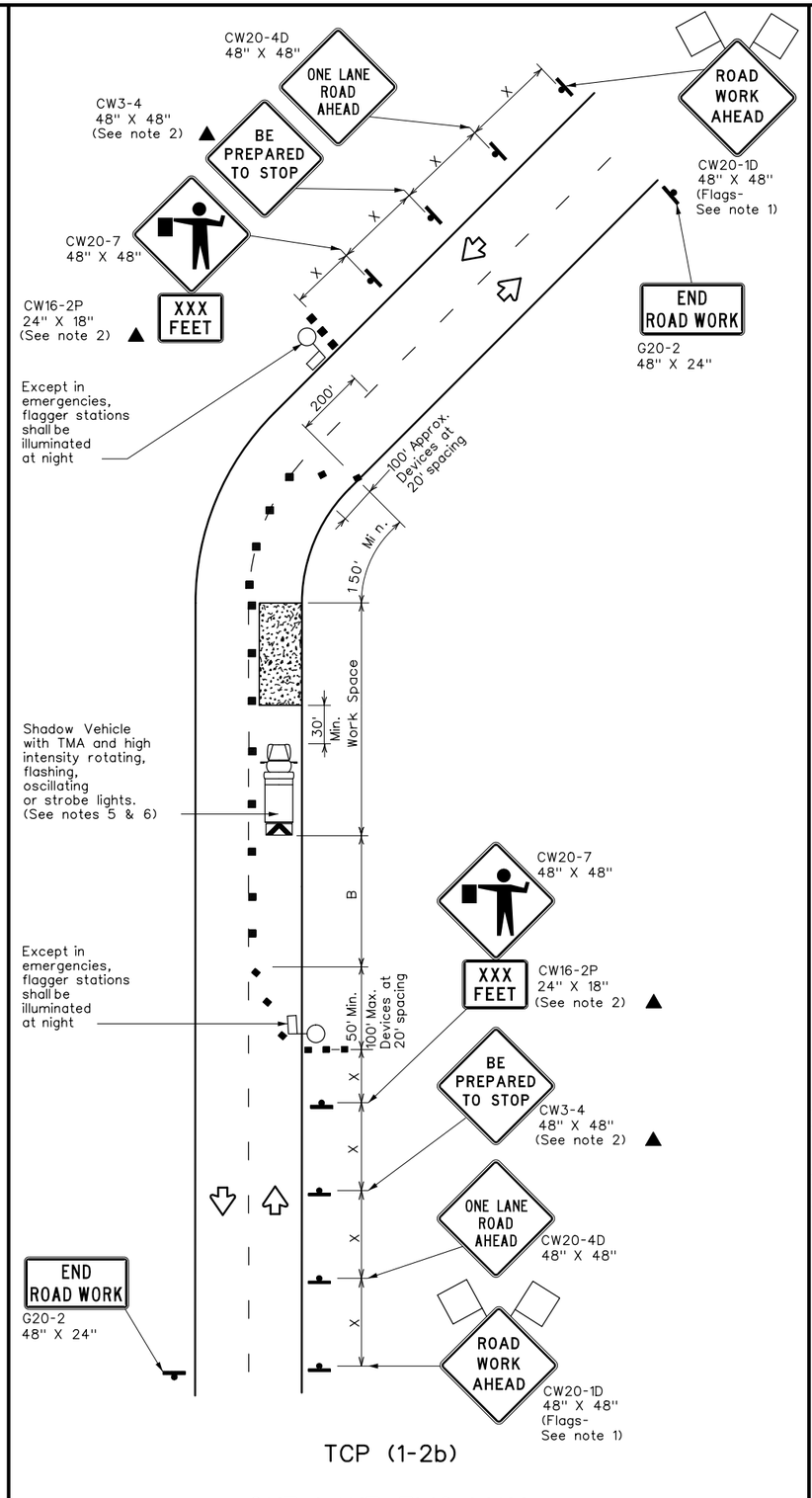


TCP (1-2a)

ONE LANE TWO-WAY CONTROL WITH YIELD SIGNS

(Less than 2000 ADT - See note 7)



TCP (1-2b)

ONE LANE TWO-WAY CONTROL WITH FLAGGERS

LEGEND

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

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

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

TYPICAL USAGE

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

GENERAL NOTES

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

TCP (1-2a)

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

TCP (1-2b)

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN ONE-LANE TWO-WAY TRAFFIC CONTROL

TCP(1-2)-18

FILE: tcp1-2-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-90 4-98 2-94 2-12 1-97 2-18	0914	33	068,etc	RSL
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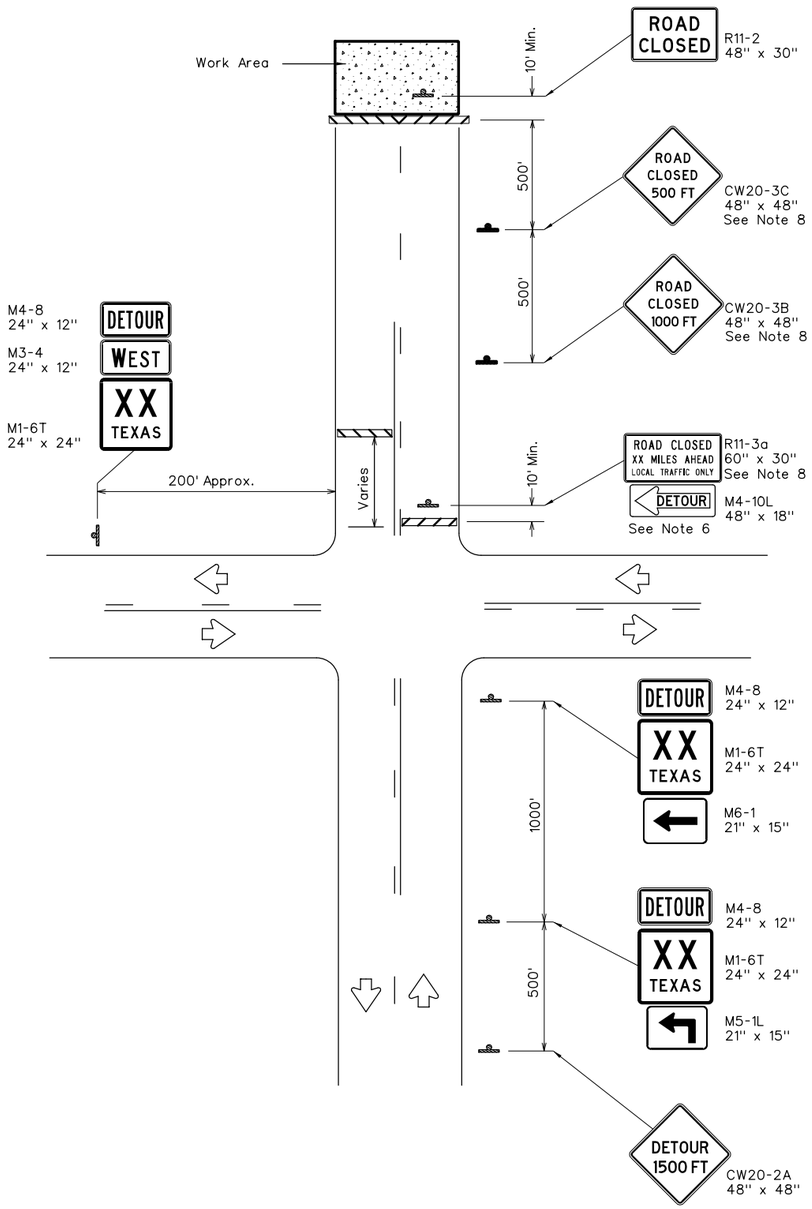
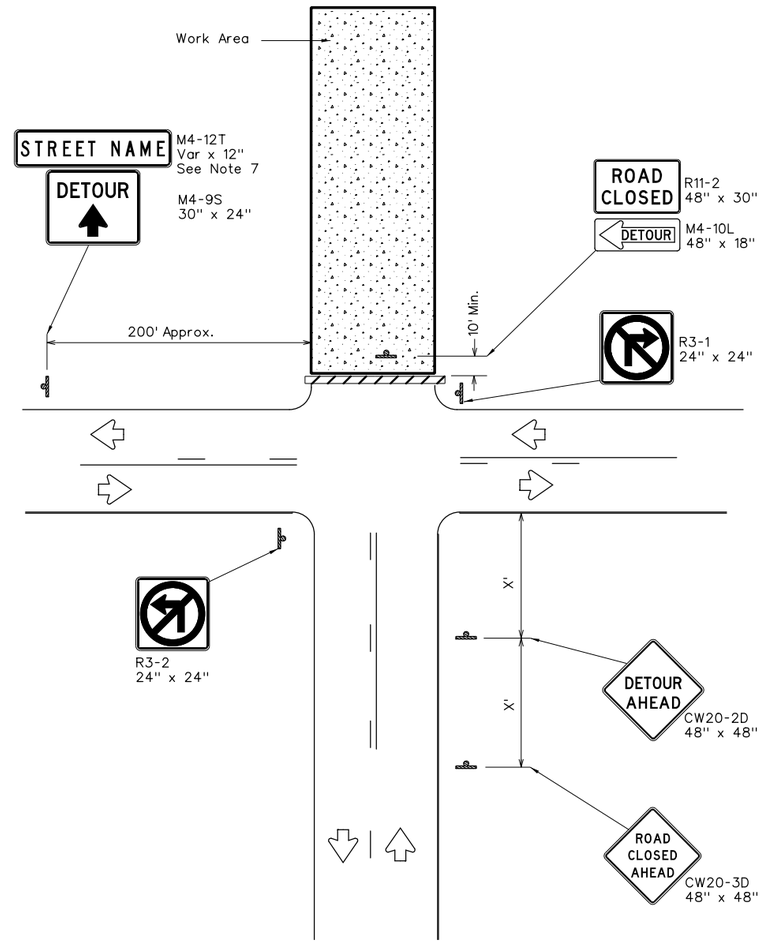


ROAD CLOSURE BEYOND THE INTERSECTION

Signing for a Numbered Route with an Off-Site Detour



ROAD CLOSURE AT THE INTERSECTION

Signing for an Un-numbered Route with an Off-Site Detour

LEGEND	
	Type 3 Barricade
	Sign

Posted Speed *	Minimum Sign Spacing "X" Distance
30	120'
35	160'
40	240'
45	320'
50	400'
55	500'
60	600'
65	700'
70	800'
75	900'

* Conventional Roads Only

GENERAL NOTES

1. This sheet is intended to provide details for temporary work zone road closures. For permanent road closure details see the D&OM standards.
2. Barricades used shall meet the requirements shown on Barricade and Construction Standard BC(10) and listed on the Compliant Work Zone Traffic Control Devices list (CWZTCD).
3. Stockpiled materials shall not be placed on the traffic side of barricades.
4. Barricades at the road closure should extend from pavement edge to pavement edge.
5. Detour signing shown is intended to illustrate the type of signing that is appropriate for numbered routes or un-numbered routes as labeled. It does not indicate the full extent of detour signing required. Detour routes should be signed as shown elsewhere in the plans.
6. If the road is open for a significant distance beyond the intersection or there are significant origin/destination points beyond the intersection, the signs and barricades at this location should be located at the edge of the traveled way.
7. The Street Name (M4-12T) sign is to be placed above the DETOUR (M4-9S) sign.
8. For urban areas where there is a shorter distance between the intersection and the actual closure location, the ROAD CLOSED XX MILES AHEAD (R11-3a) sign may be replaced with a ROAD CLOSED TO THRU TRAFFIC (R11-4) sign. If adequate space does not exist between the intersection and the closure a single ROAD CLOSED AHEAD (CW20-3D) sign spaced as per the table above may replace the ROAD CLOSED 1000 FT (CW20-3B) and ROAD CLOSED 500 FT (CW20-3C) signs.
9. Signs and barricades shown shall be subsidiary to Item 502. Locations where these details will be required shall be as shown elsewhere in the plans.

Texas Department of Transportation

Traffic Operations Division Standard

WORK ZONE ROAD CLOSURE DETAILS

WZ(RCD)-13

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© TxDOT August 1995	CONT	SECT	JOB	HIGHWAY
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1-97 4-98 7-13	DIST	COUNTY		SHEET NO.
2-98 3-03	AUS	HAYS		55

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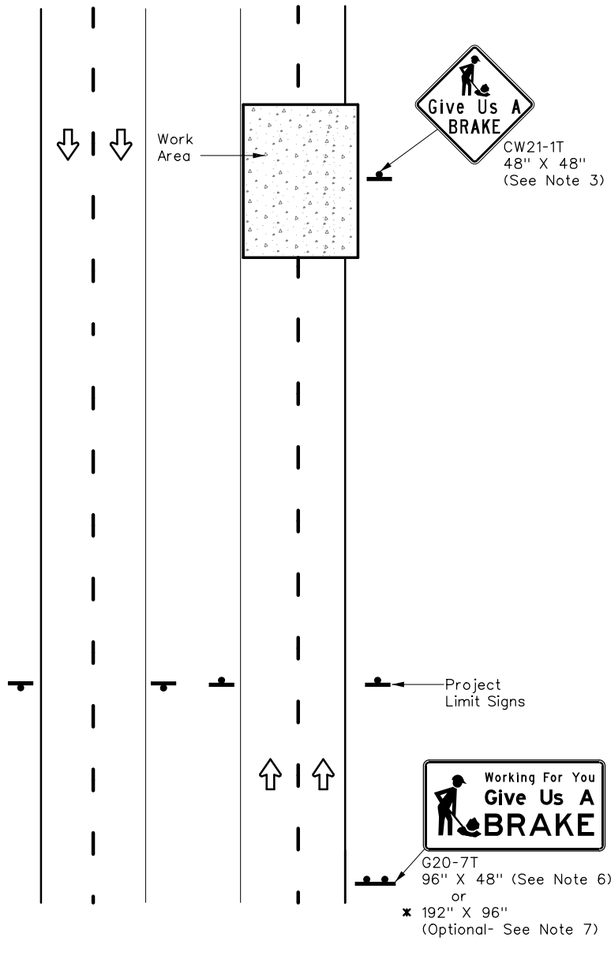
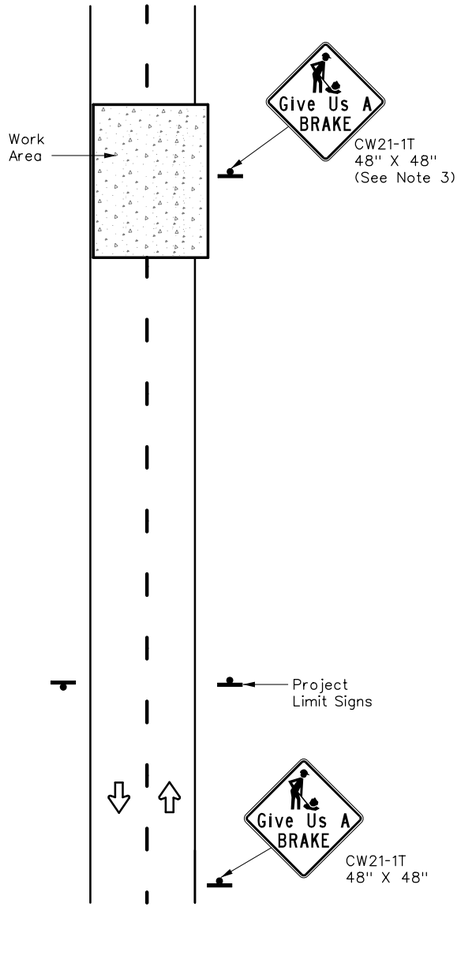


DIVIDED HIGHWAY



UNDIVIDED HIGHWAY

SIGNS ARE SHOWN FOR ONE DIRECTION OF TRAVEL

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

SUMMARY OF LARGE SIGNS

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

▲ See Note 6 Below

LEGEND	
	Sign
	Large Sign
	Traffic Flow

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

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

GENERAL NOTES

1. See BC and SMD sheets for additional sign support details.

2. Sign locations shall be approved by the Engineer.

3. For projects more than two miles in length, Give Us a BRAKE signs should be repeated halfway through the project. The Give Us a Brake (CW21-1T) may be used for this purpose.

4. Work zone speed limits are sometimes used in conjunction with GIVE US A BRAKE signing. See BC(3) for location and spacing of construction speed zone signing when required.

5. Give Us a Brake (CW21-1T) signs and supports shall be considered subsidiary to Item 502, "Barricades, Signs and Traffic Handling."

6. The 96" X 48" Working For You Give Us A BRAKE (G20-7T) may use a 1/2" or 5/8" plywood substrate or 0.125" aluminum sheeting substrate and may be supported by two 4" x 6" wood posts with drilled holes for breakaway as per BC(5) and will be subsidiary to Item 502.

7. The Working For You Give Us A BRAKE (G20-7T) 192" X 96" sign shall be paid for under the following specification items:
   Item 636 - Aluminum Signs
   Item 647 - Large Roadside Sign Supports and Assemblies.
   Item 416 - Drilled Shaft Foundations

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

Texas Department of Transportation

Traffic Operations Division Standard

WORK ZONE "GIVE US A BRAKE" SIGNS

WZ(BRK)-13

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©TxDOT August 1995	CONT	SECT	JOB	HIGHWAY
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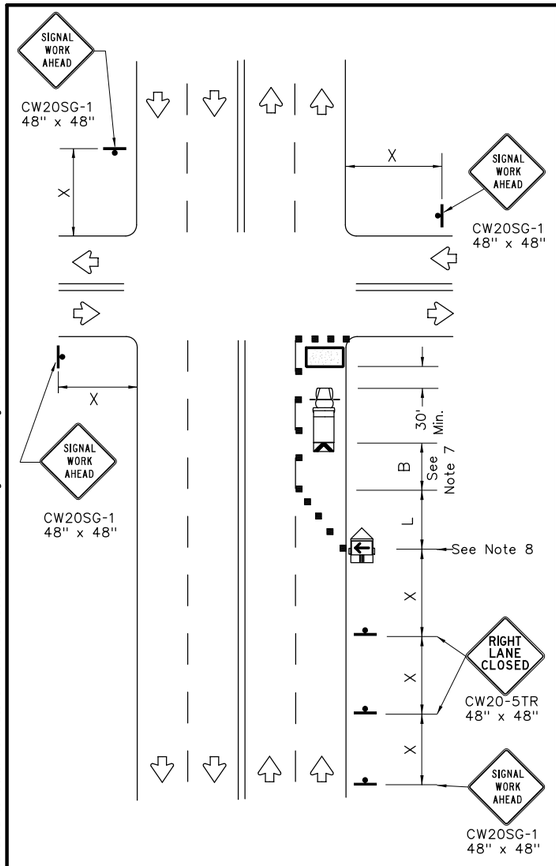
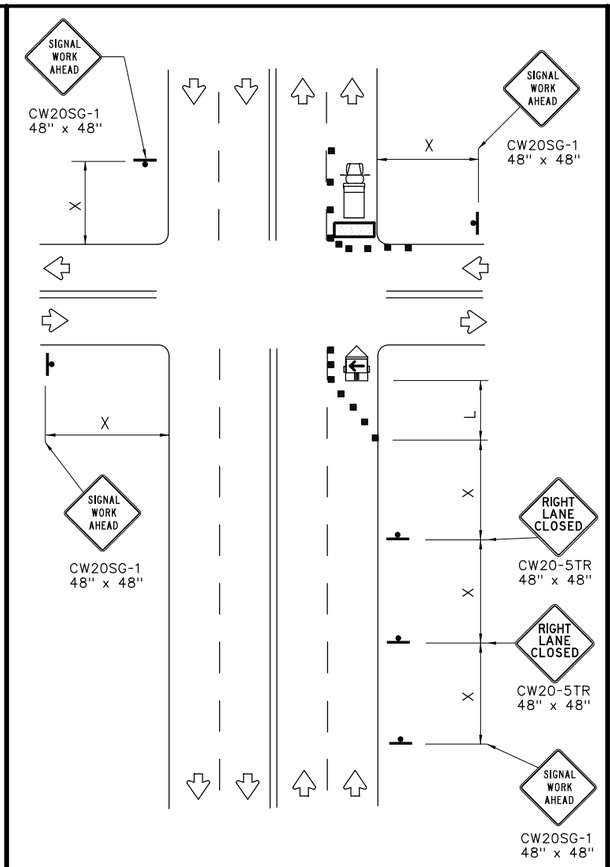


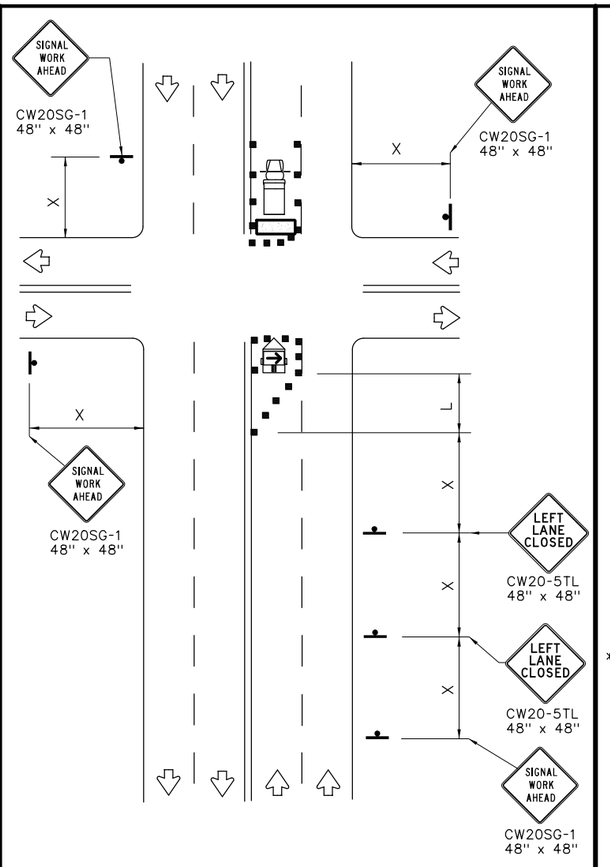
NEAR SIDE LANE CLOSURE

SHORT DURATION OR SHORT TERM STATIONARY



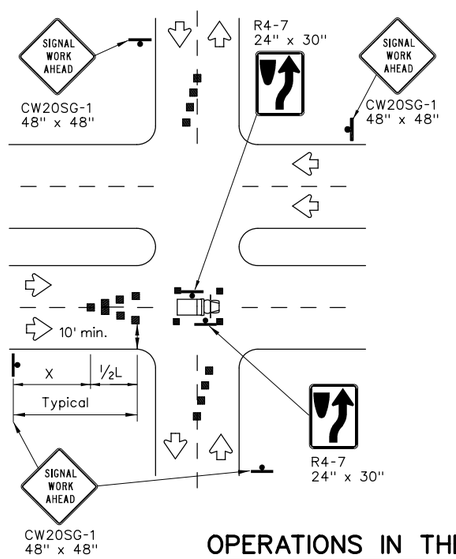
FAR SIDE RIGHT LANE CLOSURE

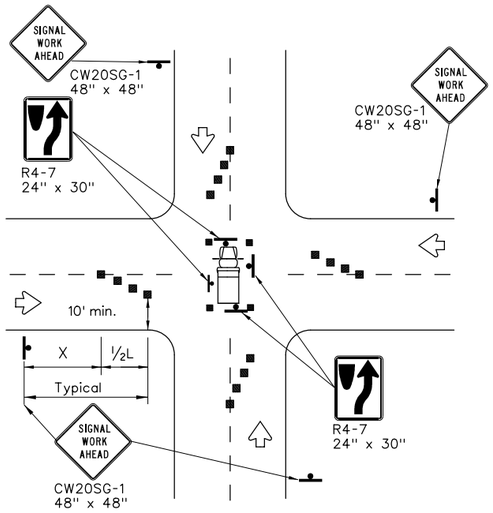
SHORT DURATION OR SHORT TERM STATIONARY



FAR SIDE LEFT LANE CLOSURE

SHORT DURATION OR SHORT TERM STATIONARY





OPERATIONS IN THE INTERSECTION

SHORT DURATION

GENERAL NOTES

1. 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.
2. Obstructions or hazards at the work area shall be clearly marked and delineated at all times.
3. Flaggers and Flagger Symbol (CW20-7) signs may be required according to field conditions.
4. Vehicles parked in roadway shall be equipped with at least two high intensity rotating, flashing, oscillating or strobe type lights.
5. High level warning devices (flag trees) may be used at corners of the vehicle.
6. 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.
7. 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.
8. 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.
9. 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.

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

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

* Conventional Roads Only

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

WORKERS IN BUCKET TRUCKS SHALL NOT WORK ABOVE OPEN LANES OF TRAFFIC.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC SIGNAL WORK TYPICAL DETAILS

WZ(BTS-1)-13

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© TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
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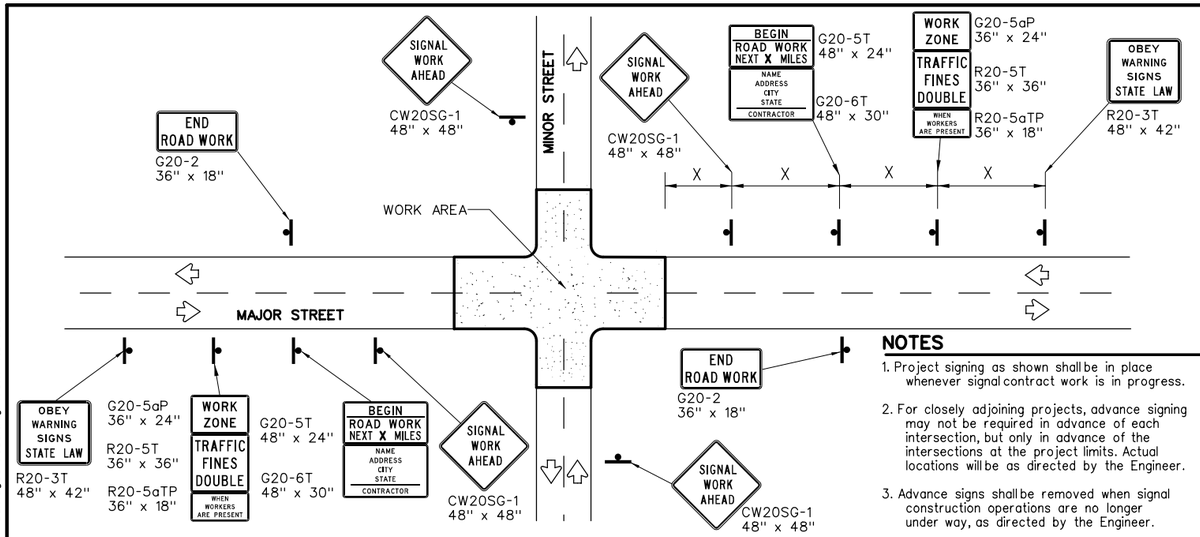


TYPICAL ADVANCE SIGNAL PROJECT SIGNING

FOR LONG TERM and INTERMEDIATE-TERM STATIONARY WORK OPERATIONS

NOTES

1. Project signing as shown shall be in place whenever signal contract work is in progress.
2. For closely adjoining projects, advance signing may not be required in advance of each intersection, but only in advance of the intersections at the project limits. Actual locations will be as directed by the Engineer.
3. Advance signs shall be removed when signal construction operations are no longer under way, as directed by the Engineer.
4. Warning sign spacing shown is typical for both directions.
5. See the Table on sheet 1 of 2 for Typical warning sign spacing.

GENERAL NOTES FOR WORK ZONE SIGNS

1. Signs shall be installed and maintained in a straight and plumb condition.
2. Wooden sign posts shall be painted white.
3. Barricades shall NOT be used as sign supports.
4. Nails shall NOT be used to attach signs to any support.
5. All signs shall be installed in accordance with the plans or as directed by the Engineer.
6. The Contractor shall furnish the sign design shown in the plans or in the "Standard Highway Sign Designs for Texas" (SHSD).
7. The Contractor shall furnish sign supports and substrates listed in the "Compliant Work Zone Traffic Control Device List" (CWZTCD), installed as per the manufacturer's recommendations.
8. Temporary signs that have damaged or cracked substrates and/or damaged or marred reflective sheeting shall be replaced as directed by the Engineer.
9. Identification markings may be shown only on the back of the sign substrate. The maximum height of letters and/or company logos used for identification shall be 1".
10. Damaged wood posts shall be replaced. Splicing wood posts will not be allowed.

DURATION OF WORK

1. Work zone durations are defined in Part 6, Section 6G.02 of the Texas Manual on Uniform Traffic Control Devices (TMUTCD).

SIGN MOUNTING HEIGHT

1. Sign height of Long-term/Intermediate-term warning signs shall be as shown on Figure 6F-1 of the TMUTCD.
2. Sign height of Short-term/Short Duration warning signs shall be as shown on Figure 6F-2 of the TMUTCD.
3. Regulatory signs shall be mounted at least 7 feet, but not more than 9 feet, above the paved surface regardless of work duration.

REMOVING OR COVERING

1. When sign messages may be confusing or do not apply, the signs shall be removed or completely covered, unless otherwise approved by the Engineer.
2. When signs are covered, the material used shall be opaque, such as heavy mil black plastic, or other materials which will cover the entire sign face and maintain their opaque properties under automobile headlights at night without damaging the sign sheeting. Burlap, or heavy materials such as plywood or aluminum shall not be used to cover signs.
3. Duct tape or other adhesive material shall NOT be affixed to a sign face.
4. Signs and anchor stubs shall be removed and holes back filled upon completion of the work.

REFLECTIVE SHEETING

1. All signs shall be retroreflective and constructed of sheeting meeting the requirements of the DMS and color usage table shown on this sheet.

SIGN SUPPORT WEIGHTS

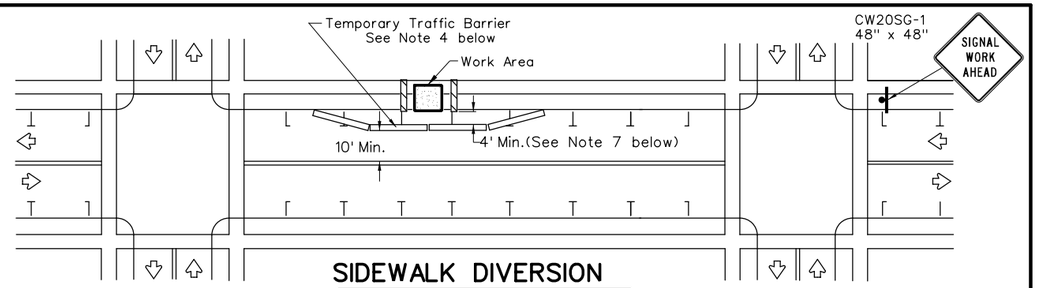
1. Weights used to keep signs from turning over should be sandbags filled with dry, cohesionless material.
2. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
3. Rock, concrete, iron, steel or other solid objects will not be permitted for use as sign support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

LEGEND	
	Sign
	Channelizing Devices
	Type 3 Barricade

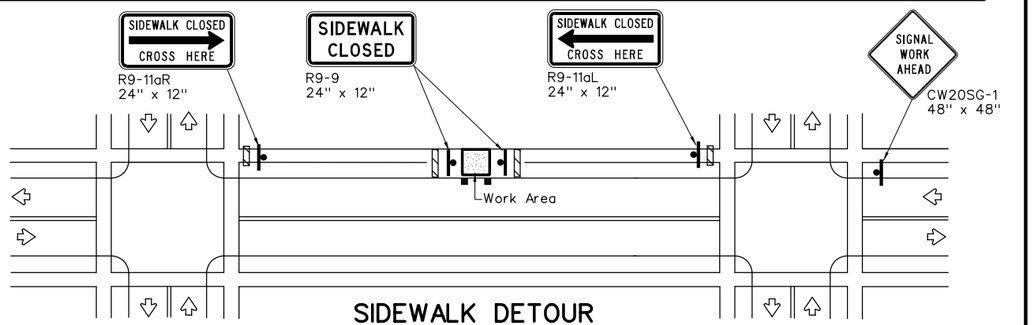
DEPARTMENTAL MATERIAL SPECIFICATIONS	
SIGN FACE MATERIALS	DMS-8300
FLEXIBLE ROLL-UP REFLECTIVE SIGNS	DMS-8310

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

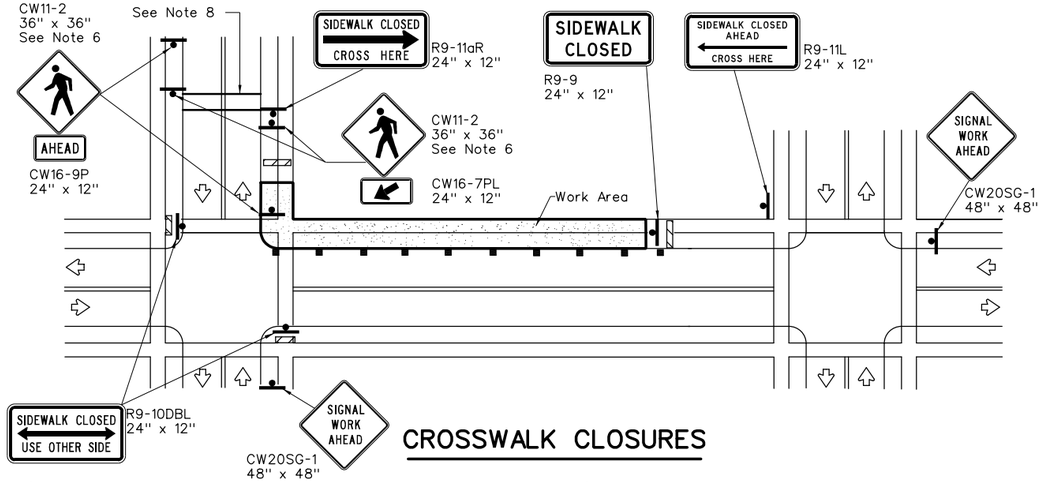
Only pre-qualified products shall be used. A copy of the "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources and may be found at the following web address:
http://www.txdot.gov/txdot_library/publications/construction.htm



SIDEWALK DIVERSION



SIDEWALK DETOUR



CROSSWALK CLOSURES

PEDESTRIAN CONTROL

1. Holes, trenches or other hazards shall be adequately protected by covering, delineating or surrounding the hazard with orange plastic pedestrian fencing or longitudinal channelizing devices, or as directed by the Engineer.
2. "CROSSWALK CLOSURES" as detailed above will require the Engineer's approval prior to installation.
3. R9 series signs shown may be placed on supports detailed on the BC standards or CWZTCD list, or when fabricated from approved lightweight plastic substrates, they may be mounted on top of a plastic drum at or near the location shown.
4. For speeds less than 45 mph longitudinal channelizing devices may be used instead of traffic barriers when approved by the Engineer. Attenuation of blunt ends and installation of water filled devices shall be as per BC(9) and manufacturer's recommendations.
5. Location of devices are for general guidance. Actual device spacing and location must be field adjusted to meet actual conditions.
6. Where pedestrians with visual disabilities normally use the closed sidewalk Detectable Pedestrian Barricades should be used instead of the Type 3 Barricades shown.
7. The width of existing sidewalk should be maintained if practical.
8. Pavement markings for mid-block crosswalks shall be paid for under the appropriate bid items.
9. When crosswalks or other pedestrian facilities are closed or relocated, temporary facilities shall be detectable and shall include accessibility features consistent with the features present in the existing pedestrian facility.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC SIGNAL WORK BARRICADES AND SIGNS

WZ(BTS-2)-13

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© TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	33	068,etc	RSL
2-98 10-99 7-13	DIST	COUNTY		SHEET NO.
4-98 3-03	AUS	HAYS		58

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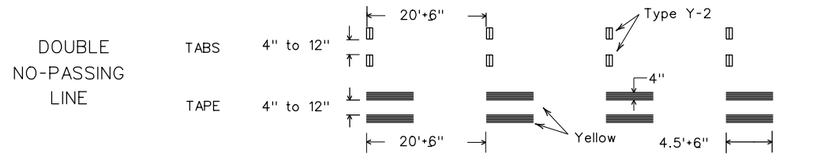
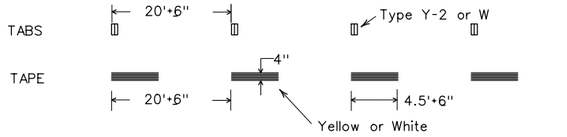
WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

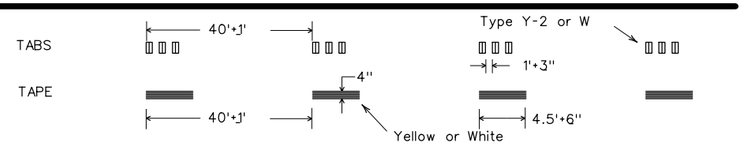


SINGLE NO-PASSING LINE or CHANNELIZATION LINE



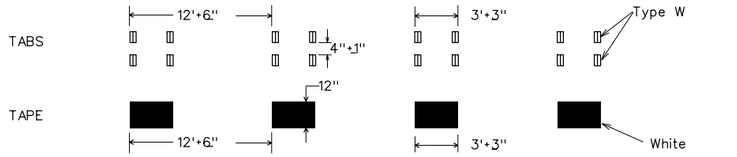
BROKEN LINES

(FOR CENTER LINE OR LANE LINE)

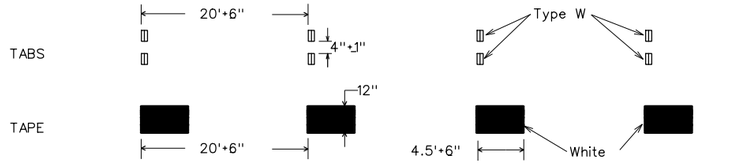


WIDE DOTTED LINES

(FOR LANE DROP LINES)



WIDE GORE MARKINGS



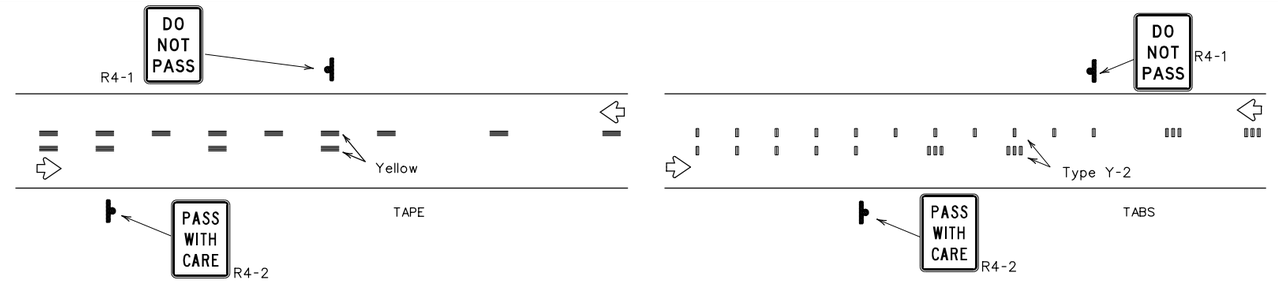
NOTES:

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

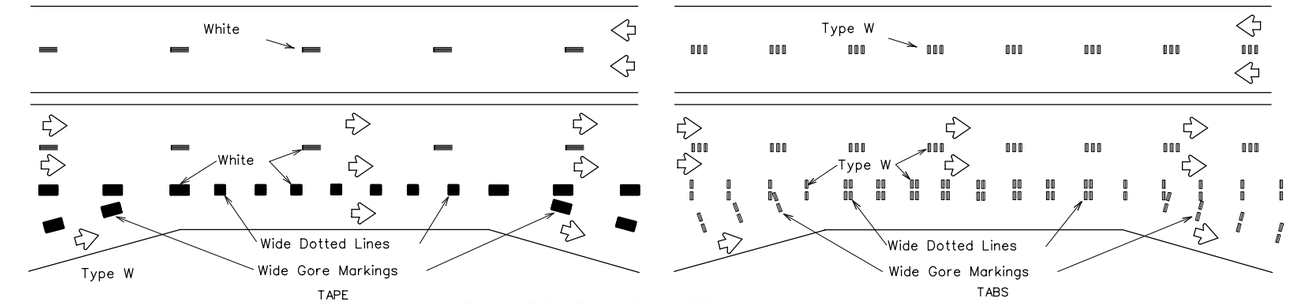
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS (TABS)

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

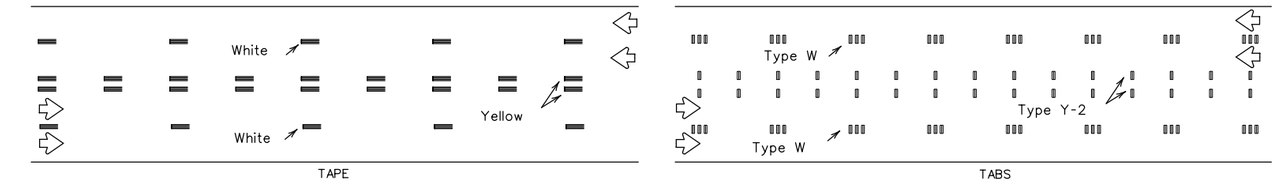
WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS



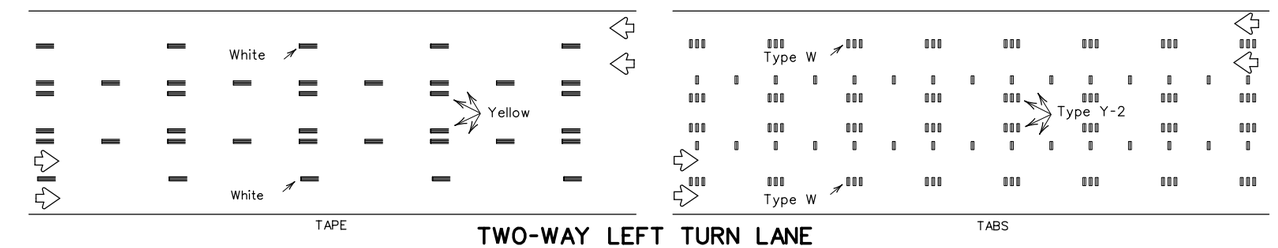
CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO LANE TWO-WAY HIGHWAYS



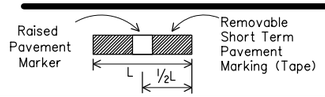
LANE LINES FOR DIVIDED HIGHWAY



LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



TWO-WAY LEFT TURN LANE



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

PREFABRICATED PAVEMENT MARKINGS

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

RAISED PAVEMENT MARKERS

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

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

1. DMSs referenced above can be found along with embedded links to their respective MPLs at the following website:

http://www.txdot.gov/business/contractors_consultants/material_specifications/default.htm

Texas Department of Transportation

Traffic Operations Division Standard

WORK ZONE SHORT TERM PAVEMENT MARKINGS

WZ(STPM)-13

FILE:	wzstpm-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT	April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS		0914	33	068,etc	RSL
1-97		DIST	COUNTY		SHEET NO.
3-03		AUS	HAYS		59
7-13					

111

BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

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

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

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

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

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

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

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

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

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

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

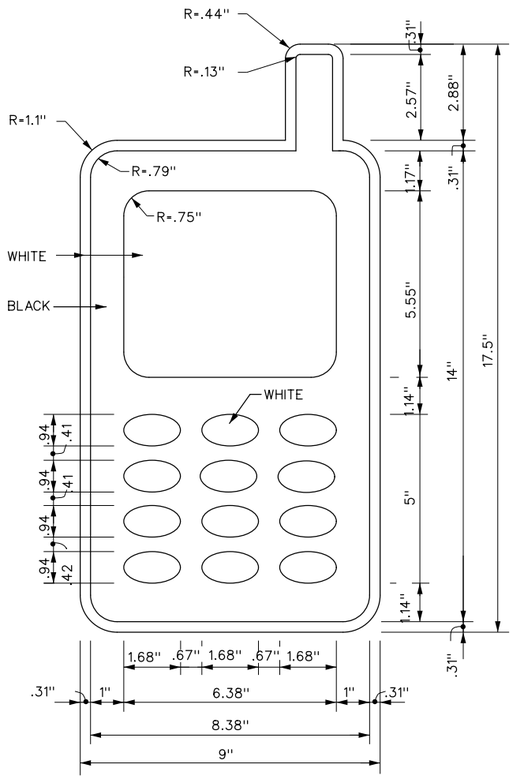
11. Except for devices required by Note 10, traffic control devices should be in place only while work is actually in progress or a definite need exists.

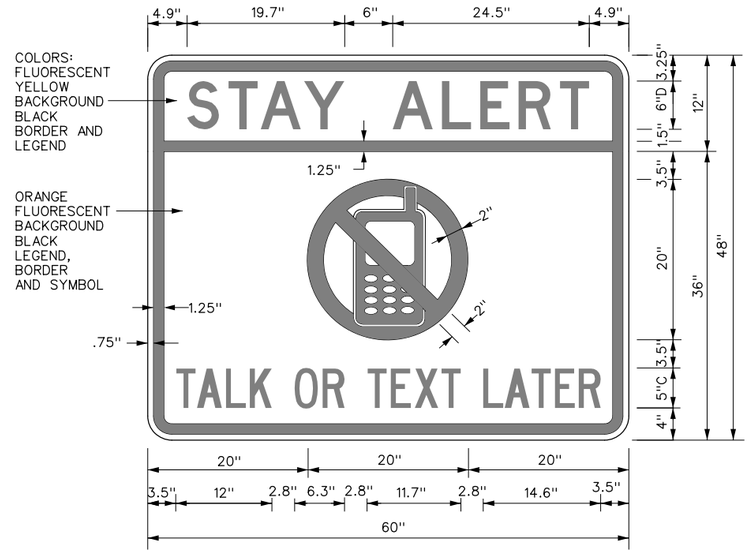
12. The Engineer has the final decision on the location of all traffic control devices.

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

WORKER SAFETY APPAREL NOTES:

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





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

SIGN DETAIL (G20-10T)

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

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

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

Texas Department of Transportation — Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	33	068,etc	RSL
4-03 5-10 8-14 9-07 7-13	DIST	COUNTY		SHEET NO.
	AUS	HAYS		60

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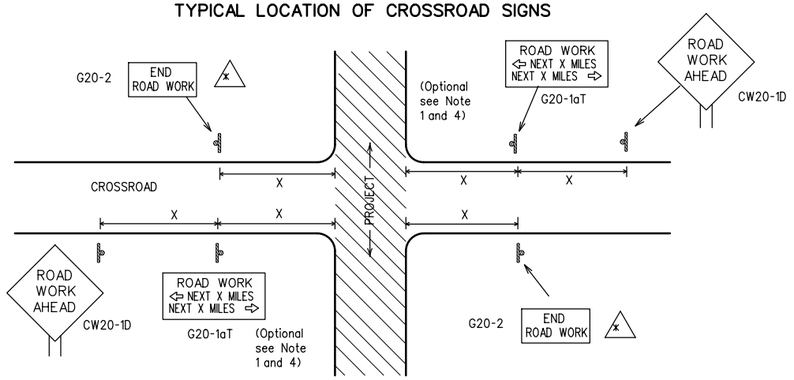
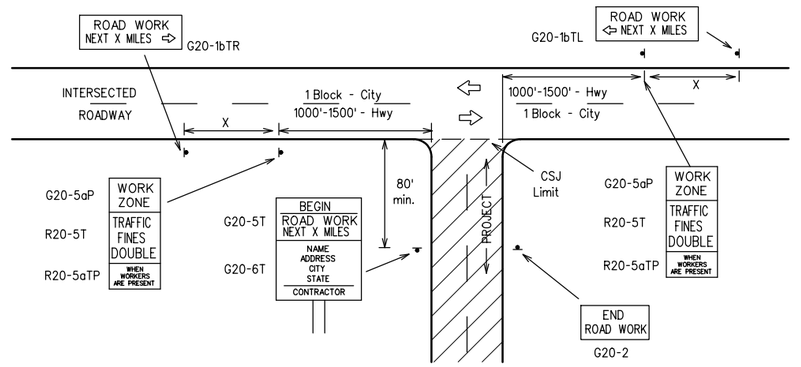
TYPICAL LOCATION OF CROSSROAD SIGNS



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

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

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

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

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

SIZE

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

SPACING

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

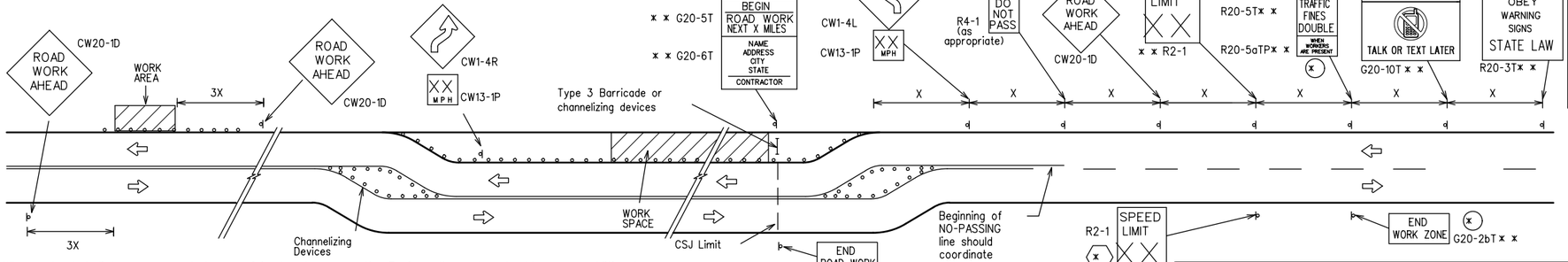
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

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

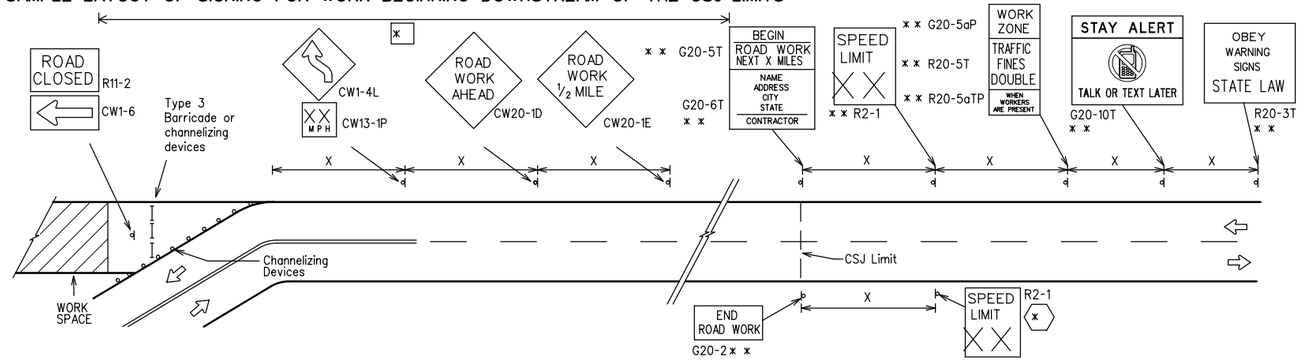
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



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

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS

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



NOTES

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

(x) 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.

x x Required CSJ Limit signing. See Note 10 on BC(1). TRAFFIC FINES DOUBLE signs will not be required on projects consisting solely of mobile operations work.

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

(x) Contractor will install a regulatory speed limit sign at the end of the work zone.

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-14

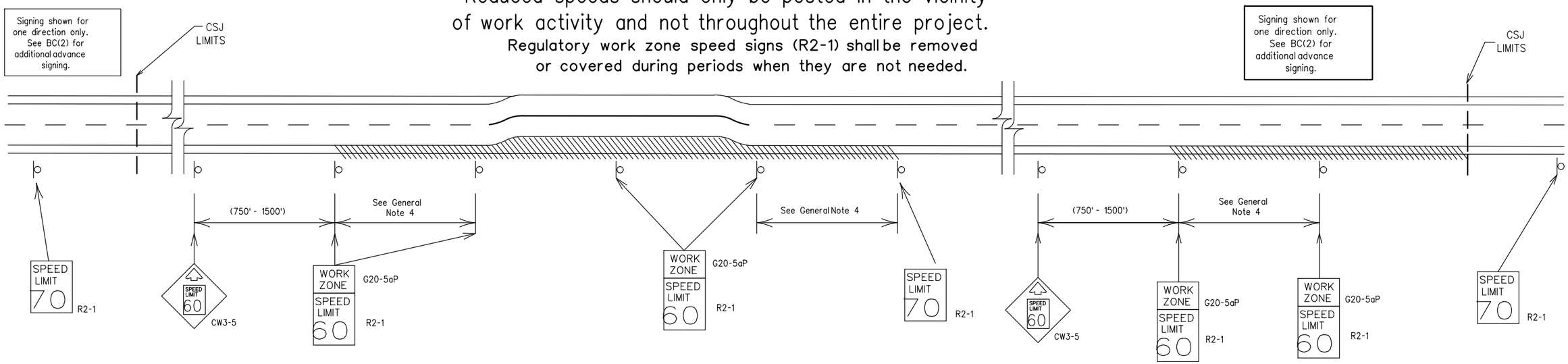
FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	33	068,etc	RSL
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13	AUS	HAYS		61

TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

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

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



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

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

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

SHORT TERM WORK ZONE SPEED LIMITS

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

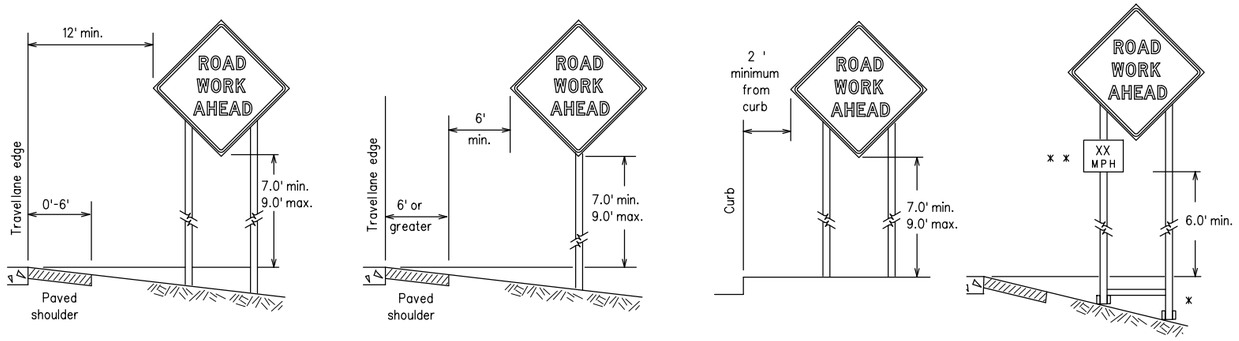
BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS 9-07 8-14 7-13	0914	33	068,etc	RSL
	DIST	COUNTY		SHEET NO.
	AUS	HAYS		62

97

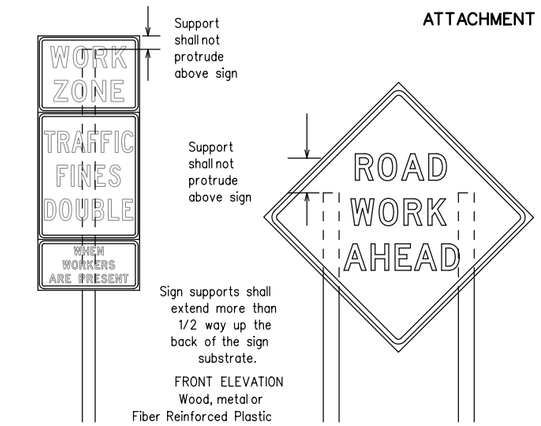
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



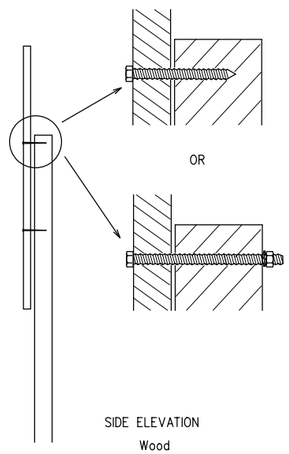
* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

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

ATTACHMENT FOR SIGN SUPPORTS



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

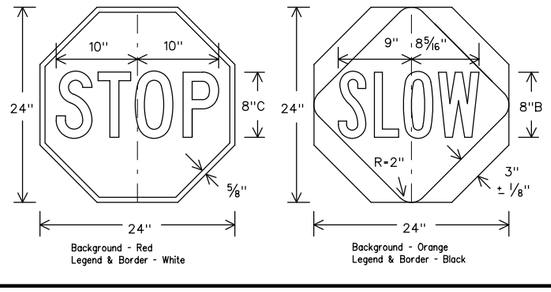


Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

STOP/SLOW PADDLES

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



CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

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

Texas Department of Transportation | Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS 9-07 8-14 7-13	0914	33	068,etc	RSL
	DIST	COUNTY		SHEET NO.
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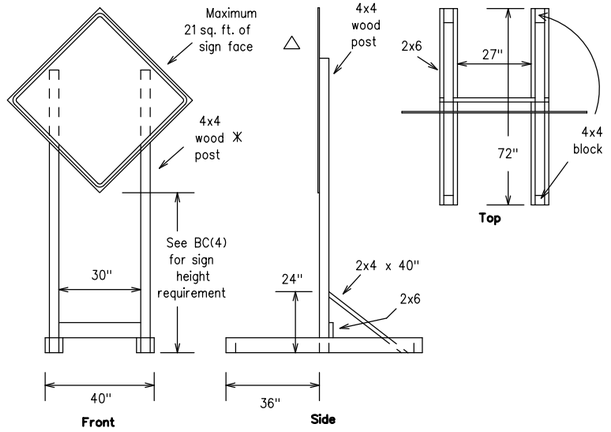
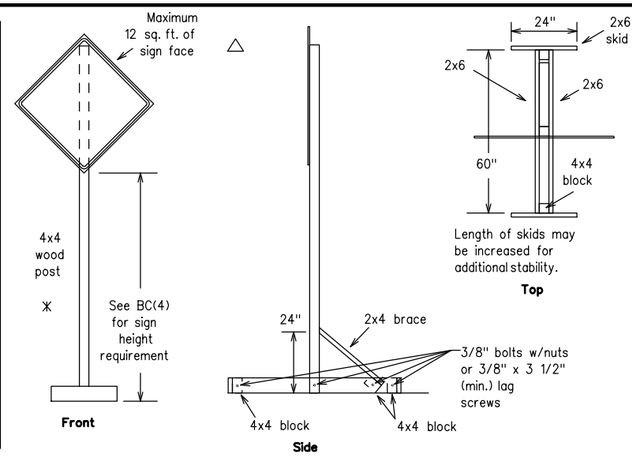
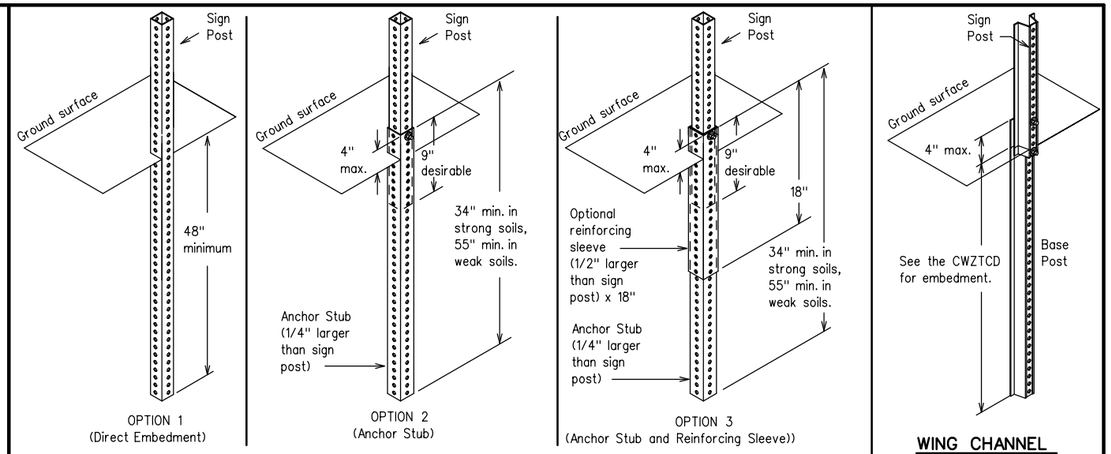




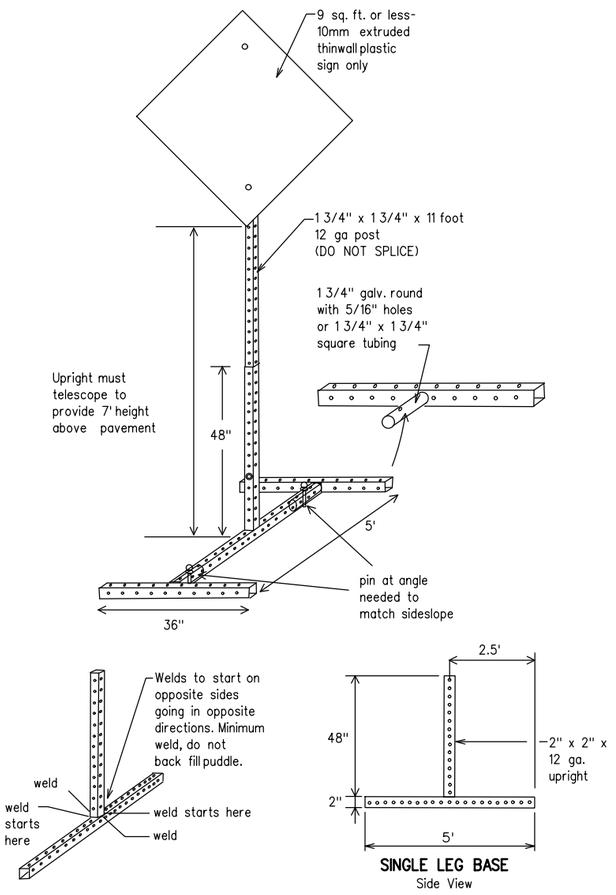
SKID MOUNTED WOOD SIGN SUPPORTS

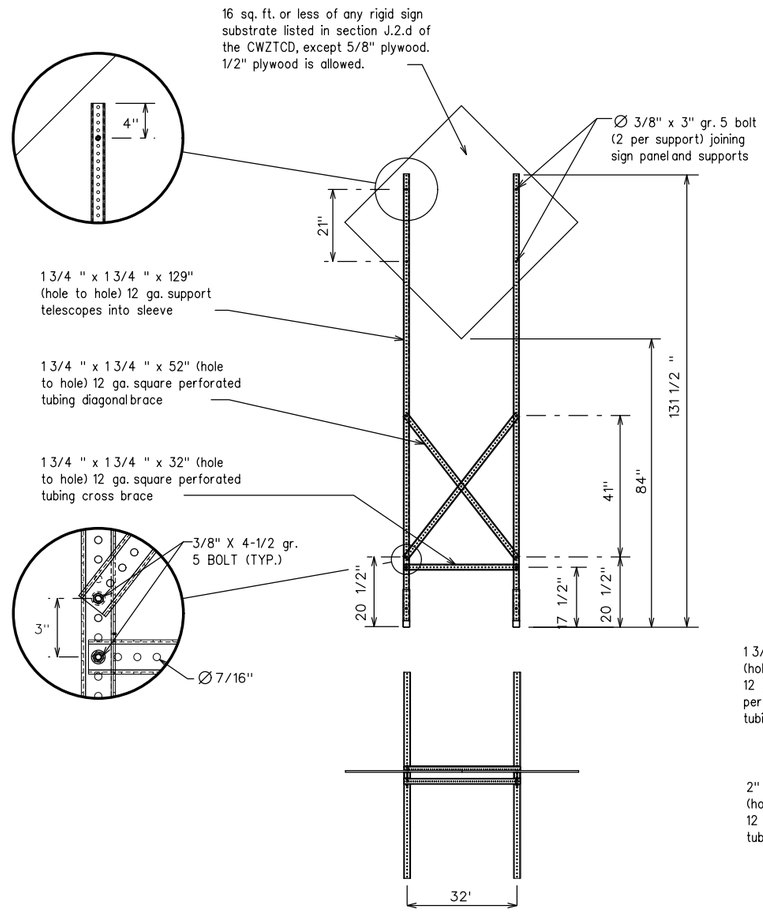
LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS □

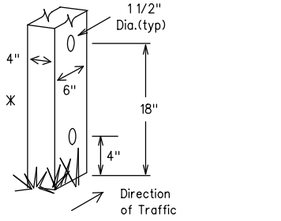


GROUND MOUNTED SIGN SUPPORTS

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

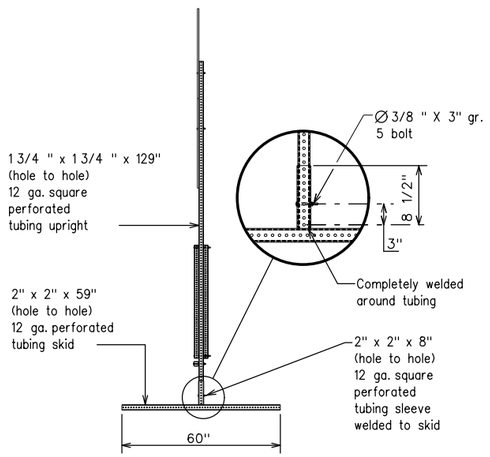






Nominal Post Size	Number of Posts	Maximum Sq. feet of Sign Face	Minimum Soil Embedment	Drilled Hole(s) Required
4 x 4	1	12	36"	NO
4 x 4	2	21	36"	NO
4 x 6	1	21	36"	YES
4 x 6	2	36	36"	YES

WOOD POST SYSTEM FOR GROUND MOUNTED SIGN SUPPORTS



WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

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

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

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

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-14

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©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS 9-07 8-14 7-13	0914	33	068,etc	RSL
	DIST	COUNTY		SHEET NO.
	AUS	HAYS		64

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WHEN NOT IN USE, REMOVE THE PCMS FROM THE RIGHT-OF-WAY OR PLACE THE PCMS BEHIND BARRIER OR GUARDRAIL WITH SIGN PANEL TURNED PARALLEL TO TRAFFIC

PORTABLE CHANGEABLE MESSAGE SIGNS

1. The Engineer/Inspector shall approve all messages used on portable changeable message signs (PCMS).
2. Messages on PCMS should contain no more than 8 words (about four to eight characters per word), not including simple words such as "TO," "FOR," "AT," etc.
3. Messages should consist of a single phase, or two phases that alternate. Three-phase messages are not allowed. Each phase of the message should convey a single thought, and must be understood by itself.
4. Use the word "EXIT" to refer to an exit ramp on a freeway; i.e., "EXIT CLOSED." Do not use the term "RAMP."
5. Always use the route or interstate designation (IH, US, SH, FM) along with the number when referring to a roadway.
6. When in use the bottom of a stationary PCMS message panel should be a minimum 7 feet above the roadway, where possible.
7. The message term "WEEKEND" should be used only if the work is to start on Saturday morning and end by Sunday evening at midnight. Actual days and hours of work should be displayed on the PCMS if work is to begin on Friday evening and/or continue into Monday morning.
8. The Engineer/Inspector may select one of two options which are available for displaying a two-phase message on a PCMS. Each phase may be displayed for either four seconds each or for three seconds each.
9. Do not "flash" messages or words included in a message. The message should be steady burn or continuous while displayed.
10. Do not present redundant information on a two-phase message; i.e., keeping two lines of the message the same and changing the third line.
11. Do not use the word "Danger" in message.
12. Do not display the message "LANES SHIFT LEFT" or "LANES SHIFT RIGHT" on a PCMS. Drivers do not understand the message.
13. Do not display messages that scroll horizontally or vertically across the face of the sign.
14. The following table lists abbreviated words and two-word phrases that are acceptable for use on a PCMS. Both words in a phrase must be displayed together. Words or phrases not on this list should not be abbreviated, unless shown in the TMUTCD.
15. PCMS character height should be at least 18 inches for trailer mounted units. They should be visible from at least 1/2 (.5) mile and the text should be legible from at least 600 feet at night and 800 feet in daylight. Truck mounted units must have a character height of 10 inches and must be legible from at least 400 feet.
16. Each line of text should be centered on the message board rather than left or right justified.
17. If disabled, the PCMS should default to an illegible display that will not alarm motorists and will only be used to alert workers that the PCMS has malfunctioned. A pattern such as a series of horizontal solid bars is appropriate.

WORD OR PHRASE	ABBREVIATION
Access Road	ACCS RD
Alternate	ALT
Avenue	AVE
Best Route	BEST RTE
Boulevard	BLVD
Bridge	BRDG
Cannot	CANT
Center	CTR
Construction Ahead	CONST AHD
CROSSING	XING
Detour Route	DETOUR RTE
Do Not	DONT
East	E
Eastbound	(route) E
Emergency	EMER
Emergency Vehicle	EMER VEH
Entrance, Enter	ENT
Express Lane	EXP LN
Expressway	EXPWY
XXXX Feet	XXXX FT
Fog Ahead	FOG AHD
Freeway	FRWY, FWY
Freeway Blocked	FWY BLKD
Friday	FRI
Hazardous Driving	HAZ DRIVING
Hazardous Material	HAZMAT
High-Occupancy	HOV
Vehicle Highway	HWY
Hour(s)	HR, HRS
Information	INFO
It Is	ITS
Junction	JCT
Left	LFT
Left Lane	LFT LN
Lane Closed	LN CLOSED
Lower Level	LWR LEVEL
Maintenance	MAINT

WORD OR PHRASE	ABBREVIATION
Major	MAJ
Miles	MI
Miles Per Hour	MPH
Minor	MNR
Monday	MON
Normal	NORM
North	N
Northbound	(route) N
Parking	PKING
Road	RD
Right Lane	RT LN
Saturday	SAT
Service Road	SERV RD
Shoulder	SHLDR
Slippery	SLIP
South	S
Southbound	(route) S
Speed	SPD
Street	ST
Sunday	SUN
Telephone	PHONE
Temporary	TEMP
Thursday	THURS
To Downtown	TO DWNTN
Traffic	TRAF
Travelers	TRVLRS
Tuesday	TUES
Time Minutes	TIME MIN
Upper Level	UPR LEVEL
Vehicles (s)	VEH, VEHS
Warning	WARN
Wednesday	WED
Weight Limit	WT LIMIT
West	W
Westbound	(route) W
Wet Pavement	WET PVMT
Will Not	WONT

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

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

FREEWAY CLOSED X MILE	FRONTAGE ROAD CLOSED
ROAD CLOSED AT SH XXX	SHOULDER CLOSED XXX FT
ROAD CLSD AT FM XXXX	RIGHT LN CLOSED XXX FT
RIGHT X LANES CLOSED	RIGHT X LANES OPEN
CENTER LANE CLOSED	DAYTIME LANE CLOSURES
NIGHT LANE CLOSURES	I-XX SOUTH EXIT CLOSED
VARIOUS LANES CLOSED	EXIT XXX CLOSED X MILE
EXIT CLOSED	RIGHT LN TO BE CLOSED
MALL DRIVEWAY CLOSED	X LANES CLOSED TUE - FRI
XXXXXXXX BLVD CLOSED	

Other Condition List

ROADWORK XXX FT	ROAD REPAIRS XXXX FT
FLAGGER XXXX FT	LANE NARROWS XXXX FT
RIGHT LN NARROWS XXXX FT	TWO-WAY TRAFFIC XX MILE
MERGING TRAFFIC XXXX FT	CONST TRAFFIC XXX FT
LOOSE GRAVEL XXXX FT	UNEVEN LANES XXXX FT
DETOUR X MILE	ROUGH ROAD XXXX FT
ROADWORK PAST SH XXXX	ROADWORK NEXT FRI-SUN
BUMP XXXX FT	US XXX EXIT X MILES
TRAFFIC SIGNAL XXXX FT	LANES SHIFT *

* LANES SHIFT in Phase 1 must be used with STAY IN LANE in Phase 2.

Phase 2: Possible Component Lists

Action to Take/Effect on Travel List

MERGE RIGHT	FORM X LINES RIGHT
DETOUR NEXT X EXITS	USE XXXXX RD EXIT
USE EXIT XXX	USE EXIT I-XX NORTH
STAY ON US XXX SOUTH	USE I-XX E TO I-XX N
TRUCKS USE US XXX N	WATCH FOR TRUCKS
WATCH FOR TRUCKS	EXPECT DELAYS
EXPECT DELAYS	PREPARE TO STOP
REDUCE SPEED XXX FT	END SHOULDER USE
USE OTHER ROUTES	WATCH FOR WORKERS
STAY IN LANE *	

Location List

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

Warning List

SPEED LIMIT XX MPH
MAXIMUM SPEED XX MPH
MINIMUM SPEED XX MPH
ADVISORY SPEED XX MPH
RIGHT LANE EXIT
USE CAUTION
DRIVE SAFELY
DRIVE WITH CARE

** Advance Notice List

TUE-FRI XX AM- X PM
APR XX-XX X PM-X AM
BEGINS MONDAY
BEGINS MAY XX
MAY X-X XX PM - XX AM
NEXT FRI-SUN
XX AM TO XX PM
NEXT TUE AUG XX
TONIGHT XX PM- XX AM

* LANES SHIFT in Phase 1 must be used with STAY IN LANE in Phase 2.

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

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

WORDING ALTERNATIVES

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

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

FULL MATRIX PCMS SIGNS

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	33	068,etc	RSL
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13	AUS	HAYS		65

100

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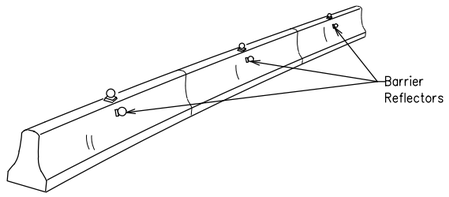
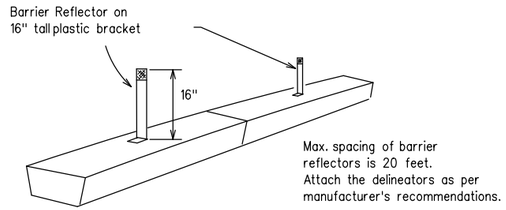
1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost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

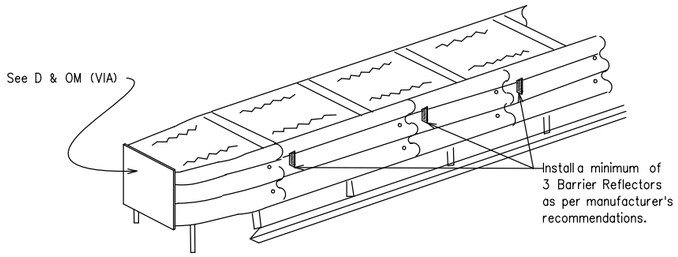


CONCRETE TRAFFIC BARRIER (CTB)

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



LOW PROFILE CONCRETE BARRIER (LPCB)

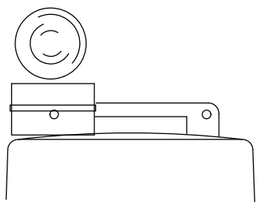


DELINEATION OF END TREATMENTS

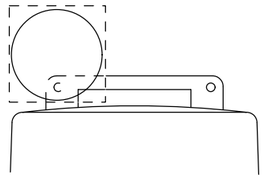
END TREATMENTS FOR CTB'S USED IN WORK ZONES

End treatments used on CTB's in work zones shall meet crashworthy standards as defined in the National Cooperative Highway Research Report 350. Refer to the CWZTCD List for approved end treatments and manufacturers.

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



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



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

WARNING LIGHTS

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

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

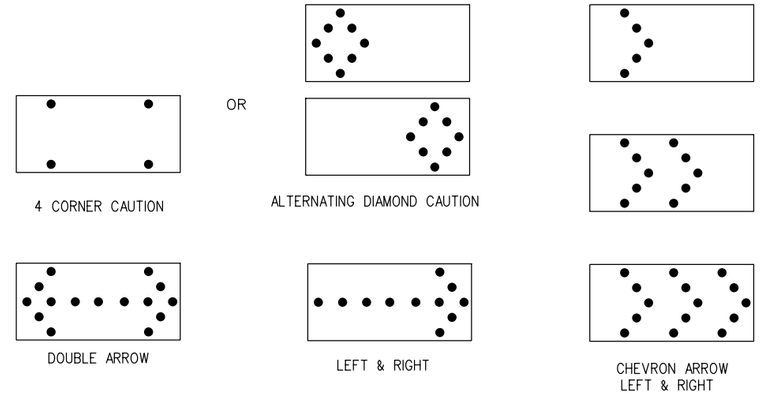
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

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

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

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

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



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

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

ATTENTION
Flashing Arrow Boards shall be equipped with automatic dimming devices.

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

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

1. Truck-mounted attenuators (TMA) used on TxDOT facilities must meet the requirements outlined in the National Cooperative Highway Research Report No. 350 (NCHRP 350) or the Manual for Assessing Safety Hardware (MASH).
2. Refer to the CWZTCD for the requirements of Level 2 or Level 3 TMAs.
3. Refer to the CWZTCD for a list of approved TMAs.
4. TMAs are required on freeways unless otherwise noted in the plans.
5. A TMA should be used anytime that it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the work performance.
6. The only reason a TMA should not be required is when a work area is spread down the roadway and the work crew is an extended distance from the TMA.

Texas Department of Transportation

Traffic Operations Division Standard

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

BC(7)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS 9-07 8-14 7-13	0914	33	068,etc	RSL
	DIST	COUNTY		SHEET NO.
	AUS	HAYS		66

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GENERAL NOTES

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

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

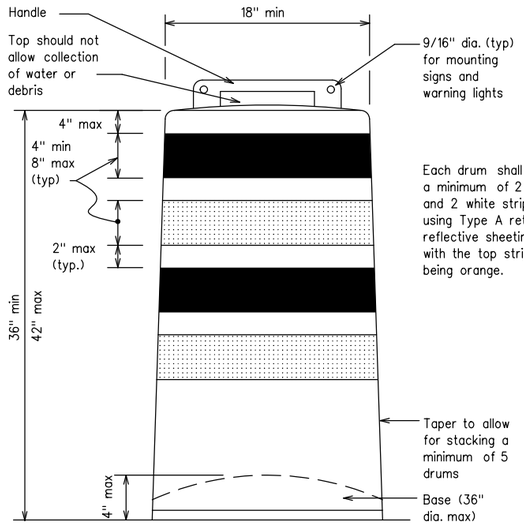
1. Plastic drums shall be a two-piece design: the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

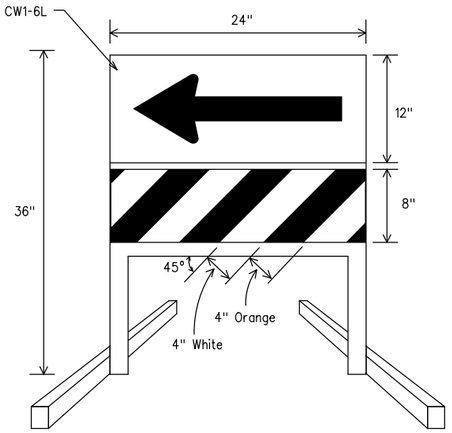
RETROREFLECTIVE SHEETING

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

BALLAST

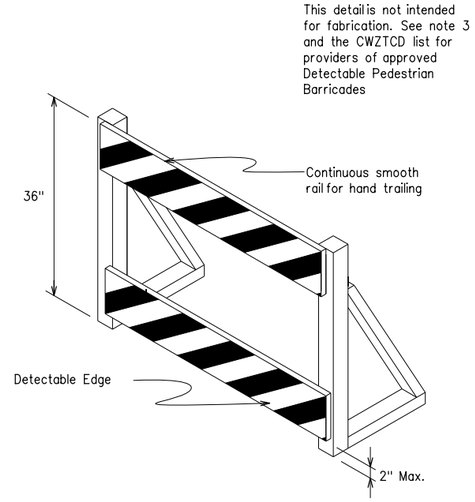
1. Unballasted bases shall be large enough to hold up to 50 lbs. of sand. This base, when filled with the ballast material, should weigh between 35 lbs (minimum) and 50 lbs (maximum). The ballast may be sand in one to three sandbags separate from the base, sand in a sand-filled plastic base, or other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





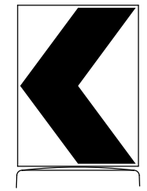
DIRECTION INDICATOR BARRICADE

1. The Direction Indicator Barricade may be used in tapers, transitions, and other areas where specific directional guidance to drivers is necessary.
2. If used, the Direction Indicator Barricade should be used in series to direct the driver through the transition and into the intended travel lane.
3. The Direction Indicator Barricade shall consist of One-Direction Large Arrow (CW1-6) sign in the size shown with a black arrow on a background of Type B or Type C Orange retroreflective sheeting above a rail with Type A retroreflective sheeting in alternating 4" white and orange stripes sloping downward at an angle of 45 degrees in the direction road users are to pass. Sheeting types shall be as per DMS 8300.
4. Double arrows on the Direction Indicator Barricade will not be allowed.
5. Approved manufacturers are shown on the CWZTCD List. Ballast shall be as approved by the manufacturers instructions.

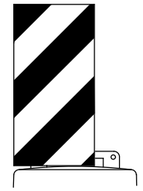


DETECTABLE PEDESTRIAN BARRICADES

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



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



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

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

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

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

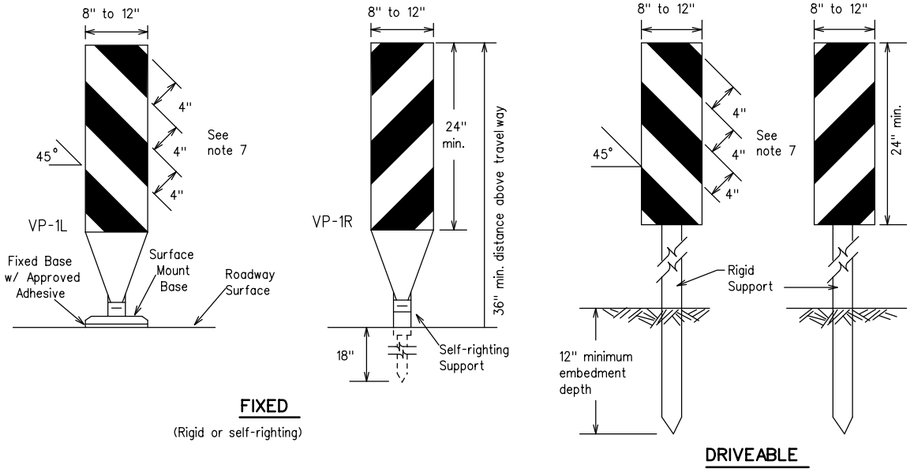
Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

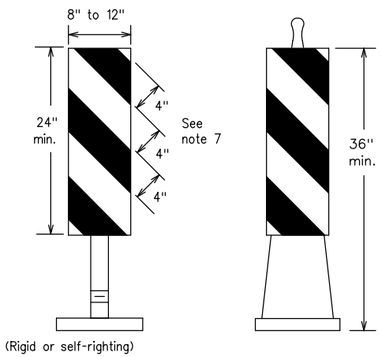
BC(8)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	33	068,etc	RSL
4-03 7-13	DIST	COUNTY		SHEET NO.
9-07 8-14	AUS	HAYS		67



FIXED
(Rigid or self-righting)

DRIVEABLE

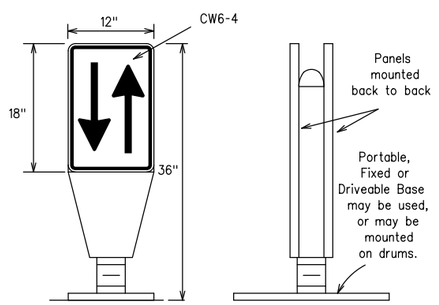


(Rigid or self-righting)

PORTABLE

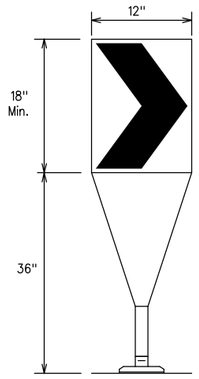
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is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

VERTICAL PANELS (VPs)



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

OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



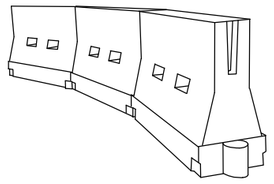
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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

CHEVRONS

GENERAL NOTES

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



LONGITUDINAL CHANNELIZING DEVICES (LCD)

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

WATER BALLASTED SYSTEMS USED AS BARRIERS

1. Water ballasted systems used as barriers shall not be used solely to channelize road users, but also to protect the work space per the appropriate NCHRP 350 crashworthiness requirements based on roadway speed and barrier application.
2. Water ballasted systems used to channelize vehicular traffic shall be supplemented with retroreflective delineation or channelizing devices to improve daytime/nighttime visibility. They may also be supplemented with pavement markings.
3. Water ballasted systems used as barriers shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
4. Water ballasted systems used as barriers should not be used for a merging taper except in low speed (less than 45 MPH) urban areas. When used on a taper in a low speed urban area, the taper shall be delineated and the taper length should be designed to optimize road user operations considering the available geometric conditions.
5. When water ballasted systems used as barriers have blunt ends exposed to traffic, they should be attenuated as per manufacturer recommendations or flared to a point outside the clear zone.

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

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

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

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS 9-07 8-14 7-13	0914	33	068,etc	RSL
	DIST	COUNTY		SHEET NO.
	AUS	HAYS		68

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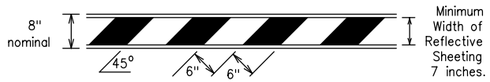
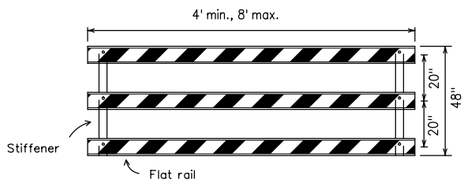
TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



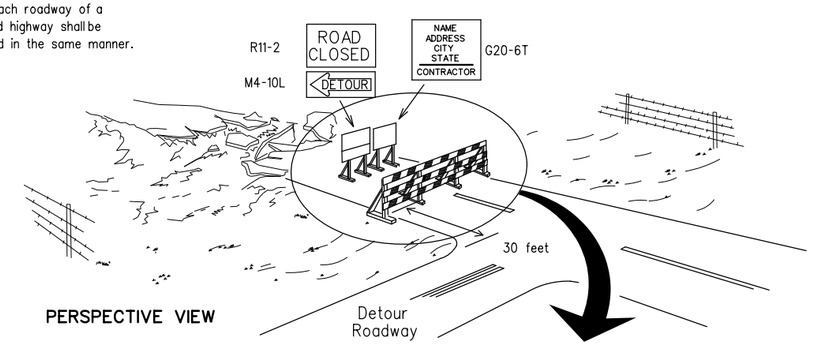
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

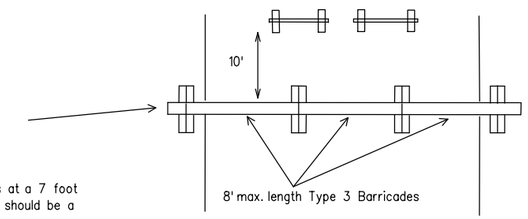
Each roadway of a divided highway shall be barricaded in the same manner.



PERSPECTIVE VIEW

The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.

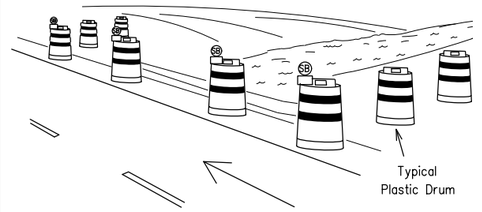
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

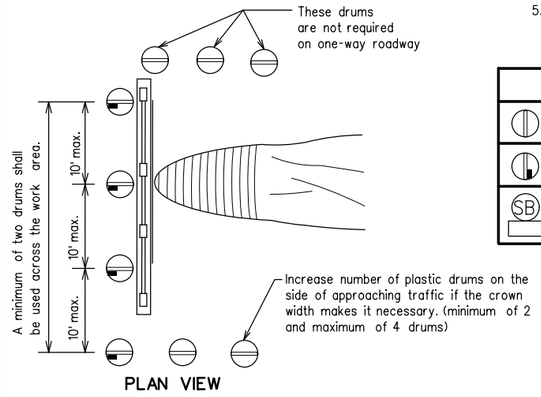
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

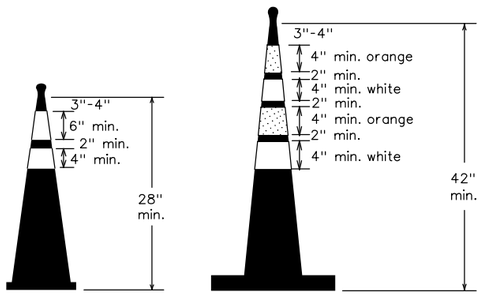
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



PLAN VIEW

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

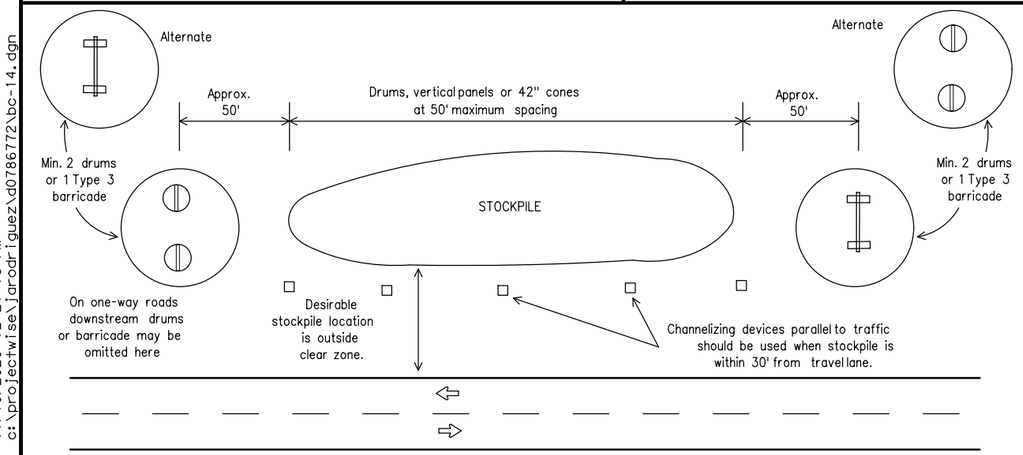
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



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

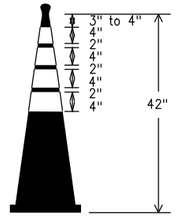
42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

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



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

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



EDGELINE CHANNELIZER

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-14

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WORK ZONE PAVEMENT MARKINGS

GENERAL

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

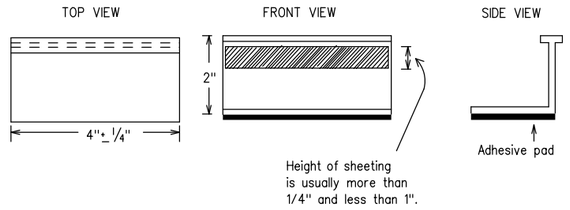
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

REMOVAL OF PAVEMENT MARKINGS

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

Temporary Flexible-Reflective Roadway Marker Tabs



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

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

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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2-98 9-07	DIST	COUNTY		SHEET NO.
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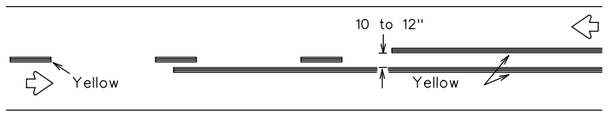
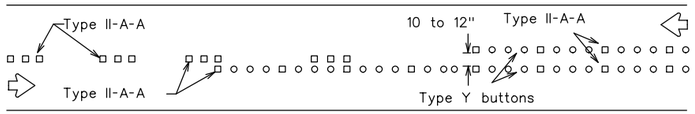
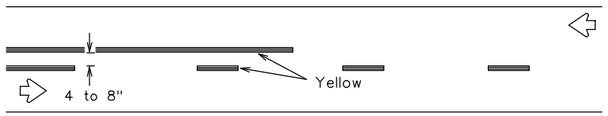
PAVEMENT MARKING PATTERNS



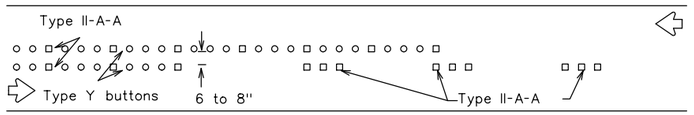
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



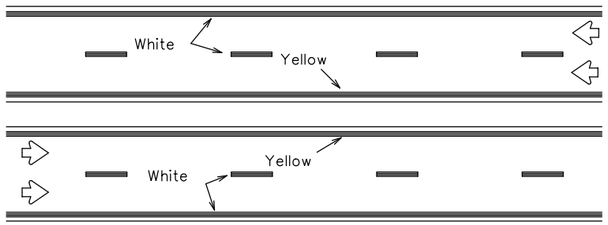
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



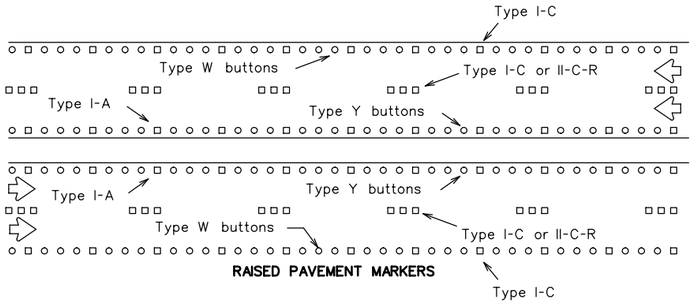
RAISED PAVEMENT MARKERS - PATTERN B

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

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



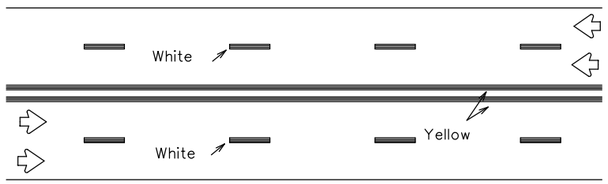
REFLECTORIZED PAVEMENT MARKINGS



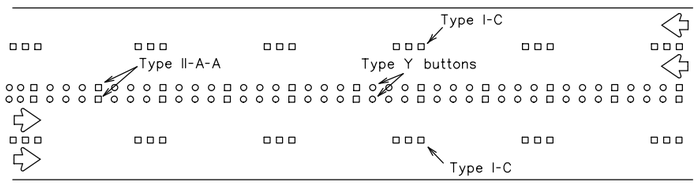
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



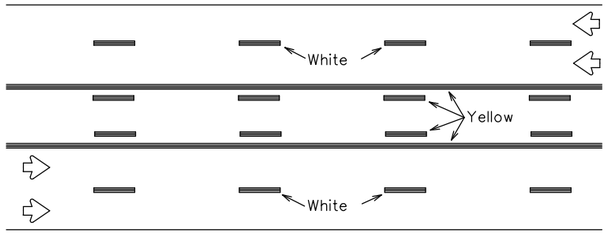
REFLECTORIZED PAVEMENT MARKINGS



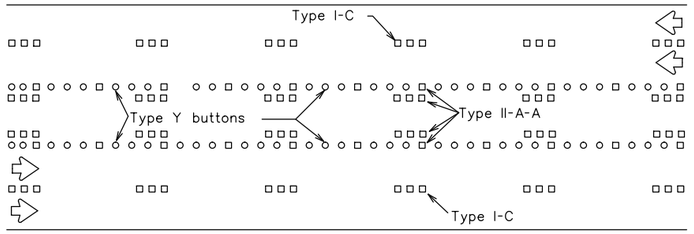
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

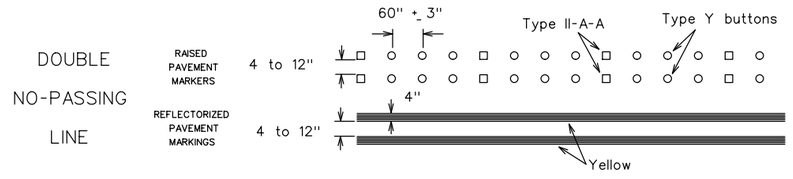
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

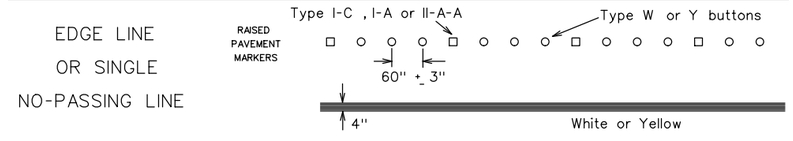
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

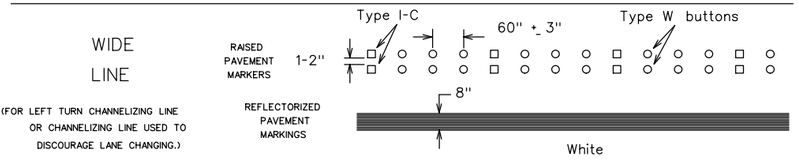


EDGE LINE OR SINGLE NO-PASSING LINE



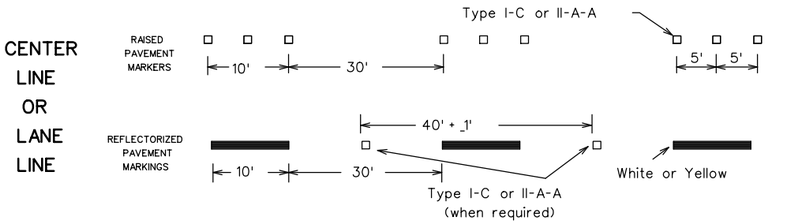
WIDE LINE

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

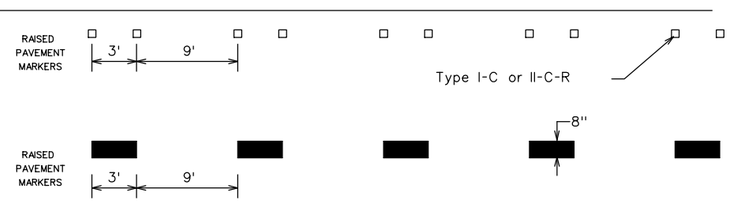


BROKEN LINES

CENTER LINE OR LANE LINE

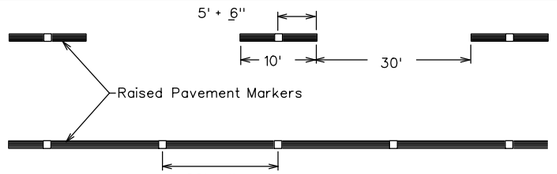


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

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



Centerline only - not to be used on edge lines

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	33	068,etc	RSL
1-97 9-07	DIST	COUNTY		SHEET NO.
2-98 7-13	AUS	HAYS		71
11-02 8-14				

106

DATE: 11/10/2020 12:21:18 PM
FILE: c:\projectwise\jarodriguez\d0786772\bc-14.dgn

ROBERT S. LIGHT EXTENSION CENTERLINE

		STATION	NORTHING	EASTING
Element: Linear				
POB	( )	1000+00.00	13938102.867	2324967.728
PC	( )	1017+53.29	13938177.730	2326719.414
Tangent Direction:		N 87°33'09.98" E		
Tangent Length:		1753.285		
Element: Circular				
PC	( )	1017+53.29	13938177.730	2326719.414
PI	( )	1021+62.66	13938195.211	2327128.420
CC	( )		13940701.427	2326611.556
PT	( )	1025+64.99	13938340.975	2327510.969
Radius:		2526.000		
Delta:		18°24'40.78" Left		
Degree of Curvature(Arc):		2°16'05.67"		
Length:		811.701		
Tangent:		409.379		
Chord:		808.213		
Middle Ordinate:		32.534		
External:		32.958		
Tangent Direction:		N 87°33'09.98" E		
Radial Direction:		S 2°26'50.02" E		
Chord Direction:		N 78°20'49.59" E		
Radial Direction:		S 20°51'30.80" E		
Tangent Direction:		N 69°08'29.20" E		
Element: Linear				
PT	( )	1025+64.99	13938340.975	2327510.969
PC	( )	1032+41.46	13938581.841	2328143.107
Tangent Direction:		N 69°08'29.20" E		
Tangent Length:		676.472		
Element: Circular				
PC	( )	1032+41.46	13938581.841	2328143.107
PI	( )	1036+81.54	13938738.538	2328554.346
CC	( )		13936150.370	2329069.581
PT	( )	1041+13.37	13938751.279	2328994.243
Radius:		2602.000		
Delta:		19°11'57.87" Right		
Degree of Curvature(Arc):		2°12'07.16"		
Length:		871.912		
Tangent:		440.082		
Chord:		867.838		
Middle Ordinate:		36.436		
External:		36.954		
Tangent Direction:		N 69°08'29.20" E		
Radial Direction:		S 20°51'30.80" E		
Chord Direction:		N 78°44'28.13" E		
Radial Direction:		S 1°39'32.93" E		
Tangent Direction:		N 88°20'27.07" E		
Element: Linear				
PT	( )	1041+13.37	13938751.279	2328994.243
PC	( )	1077+77.93	13938857.381	2332657.264
Tangent Direction:		N 88°20'27.07" E		
Tangent Length:		3664.557		
Element: Circular				
PC	( )	1077+77.93	13938857.381	2332657.264
PI	( )	1081+03.02	13938866.794	2332982.220
CC	( )		13924768.291	2333065.364
PRC	( )	1084+28.00	13938861.215	2333307.265
Radius:		14095.000		
Delta:		2°38'33.05" Right		
Degree of Curvature(Arc):		0°24'23.39"		
Length:		650.070		
Tangent:		325.092		
Chord:		650.012		
Middle Ordinate:		3.748		
External:		3.749		
Tangent Direction:		N 88°20'27.07" E		
Radial Direction:		S 1°39'32.93" E		
Chord Direction:		N 89°39'43.59" E		
Radial Direction:		S 0°59'00.12" W		
Tangent Direction:		S 89°00'59.88" E		

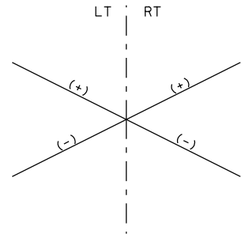
ROBERT S. LIGHT EXT WESTBOUND (BASELINE)

Element: Circular				
PRC	( )	1084+28.00	13938861.215	2333307.265
PI	( )	1085+39.46	13938859.302	2333418.712
CC	( )		13952978.135	2333549.577
PT	( )	1086+50.92	13938859.149	2333530.175
Radius:		14119.000		
Delta:		0°54'16.67" Left		
Degree of Curvature(Arc):		0°24'20.90"		
Length:		222.922		
Tangent:		111.463		
Chord:		222.920		
Middle Ordinate:		0.440		
External:		0.440		
Tangent Direction:		S 89°00'59.88" E		
Radial Direction:		S 0°59'00.12" W		
Chord Direction:		S 89°28'08.22" E		
Radial Direction:		S 0°04'43.45" W		
Tangent Direction:		S 89°55'16.55" E		
Non-coincident				
Element: Linear				
PT	( )	1086+50.92	13938844.662	2333530.595
Eqn	( )	1086+50.92	13938844.662	2333530.596
Eqn	( )	A 186+50.00	13938844.662	2333530.596
PC	( )	A 190+67.13	13938856.739	2333947.548
Tangent Direction:		N 88°20'27.07" E		
Tangent Length:		417.129		
Element: Circular				
PC	( )	A 190+67.13	13938856.739	2333947.548
PI	( )	A 191+14.90	13938858.123	2333995.297
CC	( )		13918865.124	2334526.619
PT	( )	A 191+62.66	13938859.278	2334043.052
Radius:		20000.000		
Delta:		0°16'25.30" Right		
Degree of Curvature(Arc):		0°17'11.32"		
Length:		95.538		
Tangent:		47.769		
Chord:		95.537		
Middle Ordinate:		0.057		
External:		0.057		
Tangent Direction:		N 88°20'27.07" E		
Radial Direction:		S 1°39'32.93" E		
Chord Direction:		N 88°28'39.72" E		
Radial Direction:		S 1°23'07.63" E		
Tangent Direction:		N 88°36'52.37" E		
Element: Linear				
PT	( )	A 191+62.66	13938859.278	2334043.052
POE	( )	A 202+00.00	13938884.359	2335080.083
Tangent Direction:		N 88°36'52.37" E		
Tangent Length:		1037.334		

RSLE WB CROSS-SLOPE		
STATION	LT	RT
1000+35.00	2.45%	-2.45%
1001+09.00	2.45%	-2.45%
1002+09.00	2.00%	-2.00%
1014+25.00	2.00%	-2.00%
1017+85.00	-4.80%	4.80%
1024+95.00	-4.80%	4.80%
1028+46.00	2.00%	-2.00%
1031+04.00	2.00%	-2.00%
1032+75.00	4.80%	-4.80%
1040+79.00	4.80%	-4.80%
1042+50.00	2.00%	-2.00%
1052+00.00	2.00%	-2.00%
1053+50.00	0.00%	0.00%
1055+44.00	0.00%	0.00%
1056+94.00	2.00%	-2.00%
1082+00.00	2.00%	-2.00%
1084+00.00	-2.00%	-2.00%
186+50.00	-2.00%	-2.00%
192+81.00	-2.00%	-2.00%
194+81.00	-0.50%	0.50%
196+28.00	-0.50%	0.50%
199+06.00*	-1.70%	-1.40%
201+55.00*	-1.80%	-0.80%

SUPERELEVATION TABLE

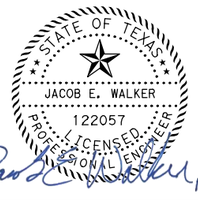
*CROSS SLOPE MATCHES EXISTING PAVEMENT THROUGHOUT NOTCH AND WIDEN SECTION



CROSS SLOPE DETAIL

NOTE:

STATION EQUATION:
℄ RSLE WB STA 1086+50.92 (BK) =
℄ RSLE STA 186+50.00 (AH)



11/20/2020

JW Walker, PE

HAYS COUNTY TEXAS

HDR Engineering, Inc.
1290 Wonder World Drive
Building #1, Suite 1230
San Marcos, TX 78666-7969

Texas Registered Engineering Firm F-754

Texas Department of Transportation

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ROBERT S. LIGHT EXTENSION

HORIZONTAL ALIGNMENT DATA

SHEET 1 OF 2

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JW	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
BD	TEXAS	AUS	HAYS	72
CHECK	CONTROL	SECTION	JOB	
DR	0914	33	068,ETC	
CHECK				
GV				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
USER: KBERGER
FILE: RSLE-HDATA01.dgn
PENTABLE: 000000000214615.tbl
DATE: 11/20/2020
TIME: 5:29:25 PM
SCALE: N

FM 2770

		STATION	NORTHING	EASTING
Element: Linear				
POB	( )	100+00.00	13937608.078	2330357.177
PC	( )	109+91.43	13938599.164	2330330.999
Tangent Direction:		N 1°30'46.93" W		
Tangent Length:		991.432		
Element: Circular				
PC	( )	109+91.43	13938599.164	2330330.999
PI	( )	110+43.90	13938651.616	2330329.614
CC	( )		13938071.076	2310337.972
PT	( )	110+96.37	13938704.059	2330327.953
Radius:		20000.000		
Delta:		0°18'02.26" Left		
Degree of Curvature(Arc):		0°17'11.32"		
Length:		104.939		
Tangent:		52.470		
Chord:		104.939		
Middle Ordinate:		0.069		
External:		0.069		
Tangent Direction:		N 1°30'46.93" W		
Radial Direction:		N 88°29'13.07" E		
Chord Direction:		N 1°39'48.07" W		
Radial Direction:		N 88°11'10.80" E		
Tangent Direction:		N 1°48'49.20" W		
Element: Linear				
PT	( )	110+96.37	13938704.059	2330327.953
PC	( )	114+55.03	13939062.534	2330316.602
Tangent Direction:		N 1°48'49.20" W		
Tangent Length:		358.654		
Element: Circular				
PC	( )	114+55.03	13939062.534	2330316.602
PI	( )	116+69.18	13939276.580	2330309.824
CC	( )		13939363.201	2339811.843
PT	( )	118+83.26	13939490.714	2330312.698
Radius:		9500.000		
Delta:		2°34'57.87" Right		
Degree of Curvature(Arc):		0°36'11.21"		
Length:		428.235		
Tangent:		214.154		
Chord:		428.198		
Middle Ordinate:		2.413		
External:		2.413		
Tangent Direction:		N 1°48'49.20" W		
Radial Direction:		N 88°11'10.80" E		
Chord Direction:		N 0°31'20.26" W		
Radial Direction:		S 89°13'51.33" E		
Tangent Direction:		N 0°46'08.67" E		
Element: Linear				
PT	( )	118+83.26	13939490.714	2330312.698
PC	( )	124+40.11	13940047.514	2330320.173
Tangent Direction:		N 0°46'08.67" E		
Tangent Length:		556.850		
Element: Circular				
PC	( )	124+40.11	13940047.514	2330320.173
PI	( )	128+26.23	13940433.597	2330325.355
CC	( )		13940032.280	2331455.071
PT	( )	131+84.47	13940736.426	2330564.900
Radius:		1135.000		
Delta:		37°34'32.77" Right		
Degree of Curvature(Arc):		5°02'53.11"		
Length:		744.357		
Tangent:		386.118		
Chord:		731.089		
Middle Ordinate:		60.476		
External:		63.879		
Tangent Direction:		N 0°46'08.67" E		
Radial Direction:		S 89°13'51.33" E		
Chord Direction:		N 19°33'25.06" E		
Radial Direction:		S 51°39'18.56" E		
Tangent Direction:		N 38°20'41.44" E		

DRIVEWAYS

DRWY1A

		STATION	NORTHING	EASTING
Element: Linear				
POB	( )	10+00.00	13938090.520	2330344.434
POE	( )	12+00.00	13938095.461	2330544.373
Tangent Direction:		N 88°35'04.284" E		
Tangent Length:		200.000		

DRWY1

		STATION	NORTHING	EASTING
Element: Linear				
POB	( )	10+00.00	13938953.217	2330320.063
POE	( )	10+69.06	13938951.031	2330251.038
Tangent Direction:		S 88°11'10.80" W		
Tangent Length:		69.059		

DRWY2

		STATION	NORTHING	EASTING
Element: Linear				
POB	( )	10+00.00	13939482.987	2330312.598
POE	( )	10+67.49	13939483.838	2330245.117
Tangent Direction:		N 89°16'39.12" W		
Tangent Length:		67.486		

DRWY3

		STATION	NORTHING	EASTING
Element: Linear				
POB	( )	10+00.00	13939571.926	2330313.789
POE	( )	10+75.01	13939572.933	2330238.789
Tangent Direction:		N 89°13'51.33" W		
Tangent Length:		75.006		

RM 967

		STATION	NORTHING	EASTING
Element: Linear				
POB	( )	100+00.00	13937655.337	2334466.807
PC	( )	115+20.07	13939174.888	2334427.003
Tangent Direction:		N 1°30'01.75" W		
Tangent Length:		1520.072		
Element: Circular				
PC	( )	115+20.07	13939174.888	2334427.003
PI	( )	115+83.34	13939238.136	2334425.346
CC	( )		13938913.034	2324430.432
PT	( )	116+46.61	13939301.358	2334422.889
Radius:		10000.000		
Delta:		0°43'30.03" Left		
Degree of Curvature(Arc):		0°34'22.65"		
Length:		126.538		
Tangent:		63.270		
Chord:		126.537		
Middle Ordinate:		0.200		
External:		0.200		
Tangent Direction:		N 1°30'01.75" W		
Radial Direction:		N 88°29'58.25" E		
Chord Direction:		N 1°51'46.77" W		
Radial Direction:		N 87°46'28.22" E		
Tangent Direction:		N 2°13'31.78" W		
Element: Linear				
PT	( )	116+46.61	13939301.358	2334422.889
POE	( )	124+00.73	13940054.912	2334393.605
Tangent Direction:		N 2°13'31.78" W		
Tangent Length:		754.122		

DRIVEWAYS (CONT.)

DRWY4

		STATION	NORTHING	EASTING
Element: Linear				
POB	( )	10+00.00	13939493.714	2330312.739
POE	( )	11+13.63	13939492.189	2330426.355
Tangent Direction:		S 89°13'51.33" E		
Tangent Length:		113.626		

DRWY5A

		STATION	NORTHING	EASTING
Element: Linear				
POB	( )	10+00.00	13940365.894	2330370.208
POE	( )	11+63.30	13940361.165	2330206.977
Tangent Direction:		S 88°20'27.07" W		
Tangent Length:		163.300		

DRWY5B

		STATION	NORTHING	EASTING
Element: Linear				
POB	( )	10+00.00	13940415.980	2330386.895
POE	( )	11+44.07	13940500.453	2330270.193
Tangent Direction:		N 54°06'05.47" W		
Tangent Length:		144.066		

DRWY6

		STATION	NORTHING	EASTING
Element: Linear				
POB	( )	10+00.00	13938336.481	2334448.965
POE	( )	10+65.25	13938338.189	2334514.196
Tangent Direction:		N 88°29'58.25" E		
Tangent Length:		65.254		

DRWY7

		STATION	NORTHING	EASTING
Element: Linear				
POB	( )	10+00.00	13939616.964	2334410.624
POE	( )	10+51.19	13939618.775	2334461.786
Tangent Direction:		N 87°58'22.08" E		
Tangent Length:		51.194		

DRWY7A

		STATION	NORTHING	EASTING
Element: Linear				
POB	( )	10+00.00	13939446.228	2334417.260
POE	( )	10+55.00	13939443.501	2334362.327
Tangent Direction:		S 87°09'29.80" W		
Tangent Length:		55.000		

DRWY8

		STATION	NORTHING	EASTING
Element: Linear				
POB	( )	10+00.00	13938778.078	2329919.411
POE	( )	11+95.84	13938973.833	2329913.741
Tangent Direction:		N 1°39'32.93" W		
Tangent Length:		195.838		

DRWY9

		STATION	NORTHING	EASTING
Element: Linear				
POB	( )	10+00.00	13938561.742	2334443.064
POE	( )	10+79.88	13938563.855	2334522.913
Tangent Direction:		N 88°29'02.22" E		
Tangent Length:		79.877		

DRWY10

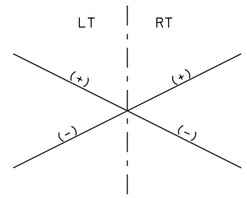
		STATION	NORTHING	EASTING
Element: Linear				
POB	( )	10+00.00	13938875.882	2334729.596
POE	( )	10+82.00	13938793.906	2334731.578
Tangent Direction:		S 1°23'07.63" E		
Tangent Length:		82.000		

FM 2770		
STATION	CROSS SLOPE LT	CROSS SLOPE RT
103+50.00*	-1.30%	-2.70%
110+00.00*	-2.10%	-3.70%
111+20.00	0.75%	-0.75%
112+66.00	0.75%	-0.75%
114+30.00*	-2.60%	-1.50%
128+86.00*	3.70%	-8.00%

RM 967		
STATION	CROSS SLOPE LT	CROSS SLOPE RT
104+50.00*	-1.30%	-2.10%
110+00.00*	-2.20%	-3.20%
111+21.00	-1.07%	1.07%
113+06.00	-1.07%	1.07%
116+00.00*	-2.10%	-2.10%
120+40.00*	-1.40%	-2.10%

SUPERELEVATION TABLES

*CROSS SLOPE MATCHES EXISTING PAVEMENT THROUGHOUT NOTCH AND WIDEN SECTION



CROSS SLOPE DETAIL

11/20/2020

Jacob E. Walker, PE

HAYS COUNTY TEXAS

HDR Engineering, Inc.
1290 Wonder World Drive
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San Marcos, TX 78666-7969

Texas Registered Engineering Firm F-754

Texas Department of Transportation

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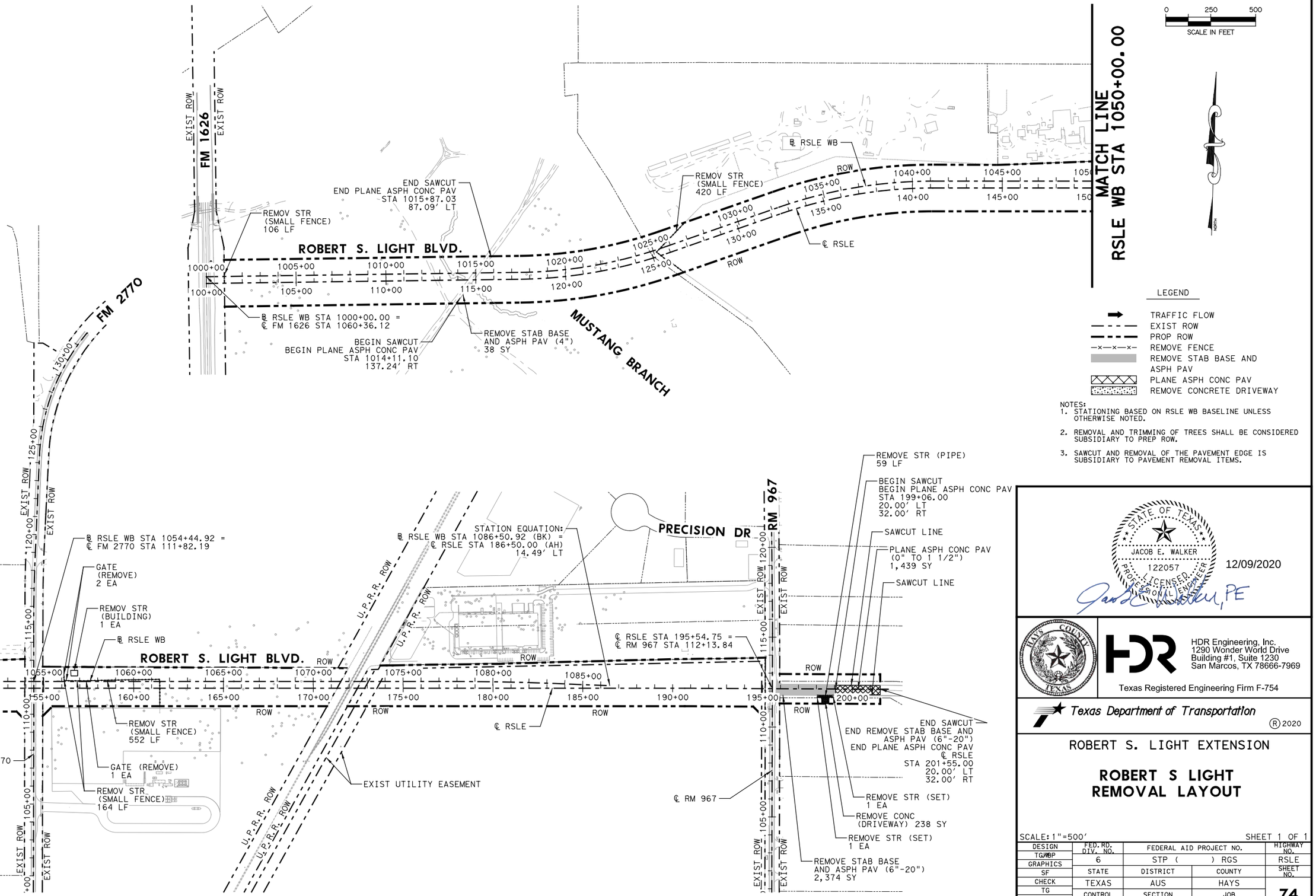
ROBERT S. LIGHT EXTENSION

HORIZONTAL ALIGNMENT DATA

SHEET 2 OF 2

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JW	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
BD	TEXAS	AUS	HAYS	73
CHECK	CONTROL	SECTION	JOB	
DR	0914	33	068,ETC	
CHECK				
GV				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg PENTABLE: 000000000246i5.tbl
USER: KBERGER DATE: 11/20/2020 TIME: 5:29:31 PM SCALE: 1:1
FILE: RSLE-HDATA02.dgn



LEGEND

- TRAFFIC FLOW
- EXIST ROW
- PROP ROW
- REMOVE FENCE
- REMOVE STAB BASE AND ASPH PAV
- PLANE ASPH CONC PAV
- REMOVE CONCRETE DRIVEWAY

NOTES:
1. STATIONING BASED ON RSLE WB BASELINE UNLESS OTHERWISE NOTED.
2. REMOVAL AND TRIMMING OF TREES SHALL BE CONSIDERED SUBSIDIARY TO PREP ROW.
3. SAWCUT AND REMOVAL OF THE PAVEMENT EDGE IS SUBSIDIARY TO PAVEMENT REMOVAL ITEMS.

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℗ 2020

ROBERT S. LIGHT EXTENSION

ROBERT S LIGHT REMOVAL LAYOUT

SCALE: 1"=500' SHEET 1 OF 1

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
TG/BP	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
SF	TEXAS	AUS	HAYS	74
CHECK	CONTROL	SECTION	JOB	
TG	0914	33	068,ETC	
CHECK				
BP				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
USER: KBERGER
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DATE: 12/2/2020
TIME: 11:05:25 AM
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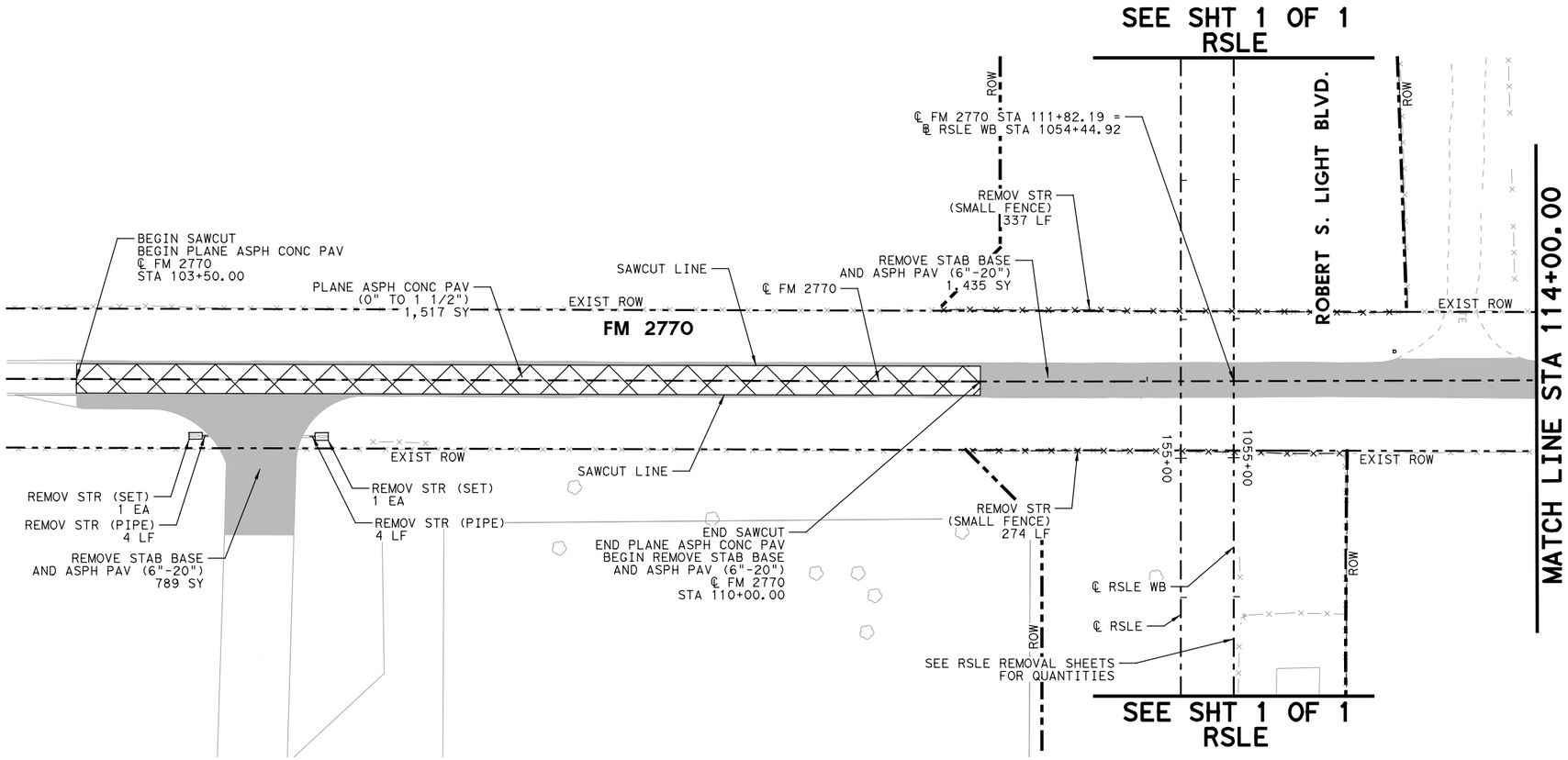

0 50 100
SCALE IN FEET

NORTH

LEGEND

- TRAFFIC FLOW
- EXIST ROW
- PROP ROW
- REMOVE FENCE
- REMOVE STAB BASE AND ASPH PAV (6"-20")
- PLANE ASPH CONC PAV
- REMOVE CONCRETE DRIVEWAY

NOTES:
1. STATIONING BASED ON FM 2770 CENTERLINE UNLESS OTHERWISE NOTED.
2. REMOVAL AND TRIMMING OF TREES SHALL BE CONSIDERED SUBSIDIARY TO PREP ROW.
3. SAWCUT AND REMOVAL OF THE PAVEMENT EDGE SHALL BE CONSIDERED SUBSIDIARY TO PAVEMENT REMOVAL ITEMS.

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ROBERT S. LIGHT EXTENSION

FM 2770
REMOVAL LAYOUT

SCALE: 1"=100'

SHEET 1 OF 3

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JW	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
BD	TEXAS	AUS	HAYS	75
CHECK	CONTROL	SECTION	JOB	
DR	0914	33	068, ETC	
CHECK				
GV				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
USER: KBERGER DATE: 11/20/2020 TIME: 5:29:42 PM SCALE: 1:100
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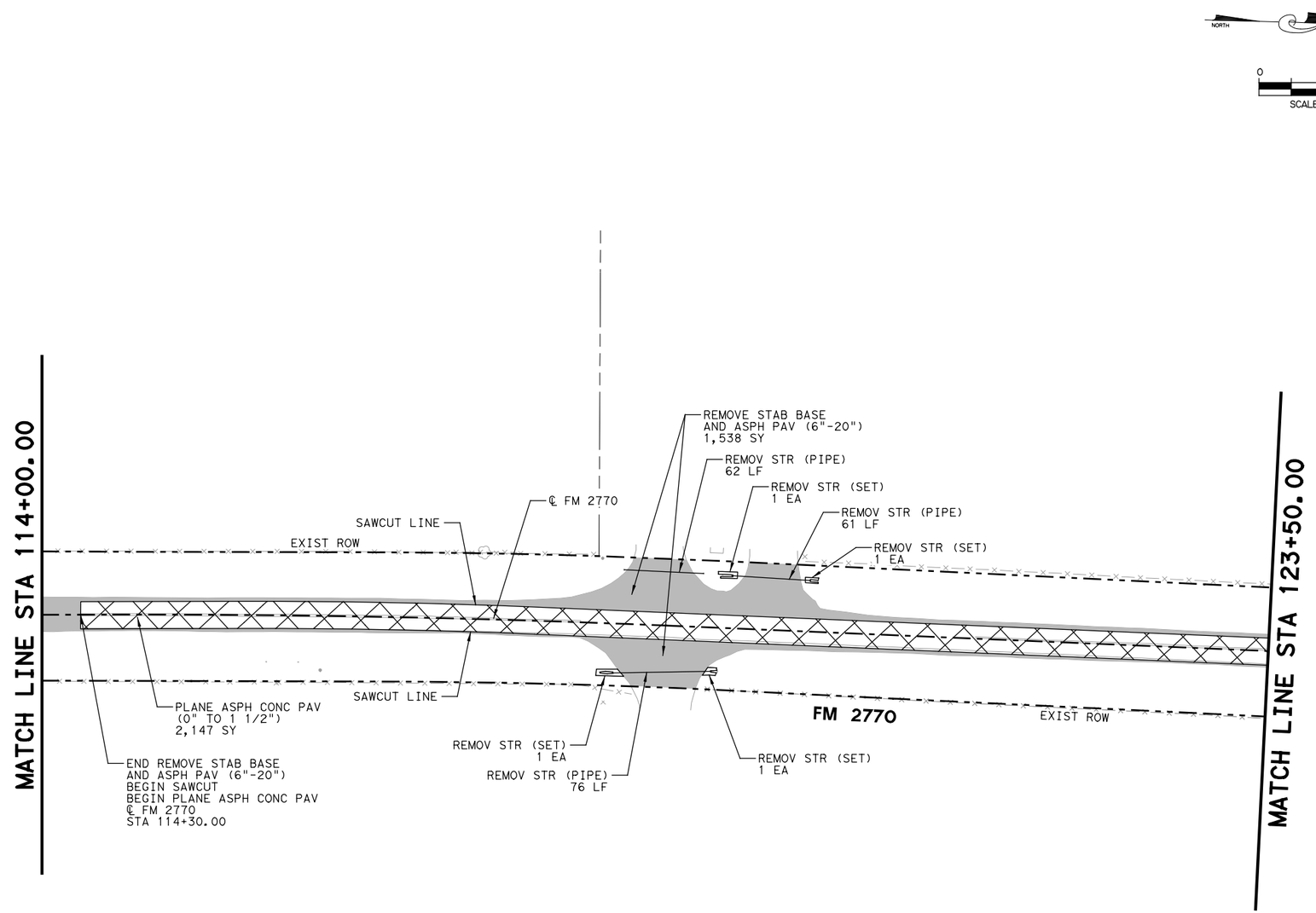

LEGEND

- TRAFFIC FLOW
- EXIST ROW
- PROP ROW
- REMOVE FENCE
- REMOVE STAB BASE AND ASPH PAV (6"-20")
- PLANE ASPH CONC PAV
- REMOVE CONCRETE DRIVEWAY

NOTES:
1. STATIONING BASED ON FM 2770 CENTERLINE UNLESS OTHERWISE NOTED.
2. REMOVAL AND TRIMMING OF TREES SHALL BE CONSIDERED SUBSIDIARY TO PREP ROW.
3. SAWCUT AND REMOVAL OF THE PAVEMENT EDGE SHALL BE CONSIDERED SUBSIDIARY TO PAVEMENT REMOVAL ITEMS.

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ROBERT S. LIGHT EXTENSION

FM 2770
REMOVAL LAYOUT

SCALE: 1"=100' SHEET 2 OF 3

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JW	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
BD	TEXAS	AUS	HAYS	76
CHECK	CONTROL	SECTION	JOB	
DR	0914	33	068,ETC	
CHECK				
GV				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
USER: KBERGER DATE: 11/20/2020 TIME: 5:29:47 PM SCALE: 1:100
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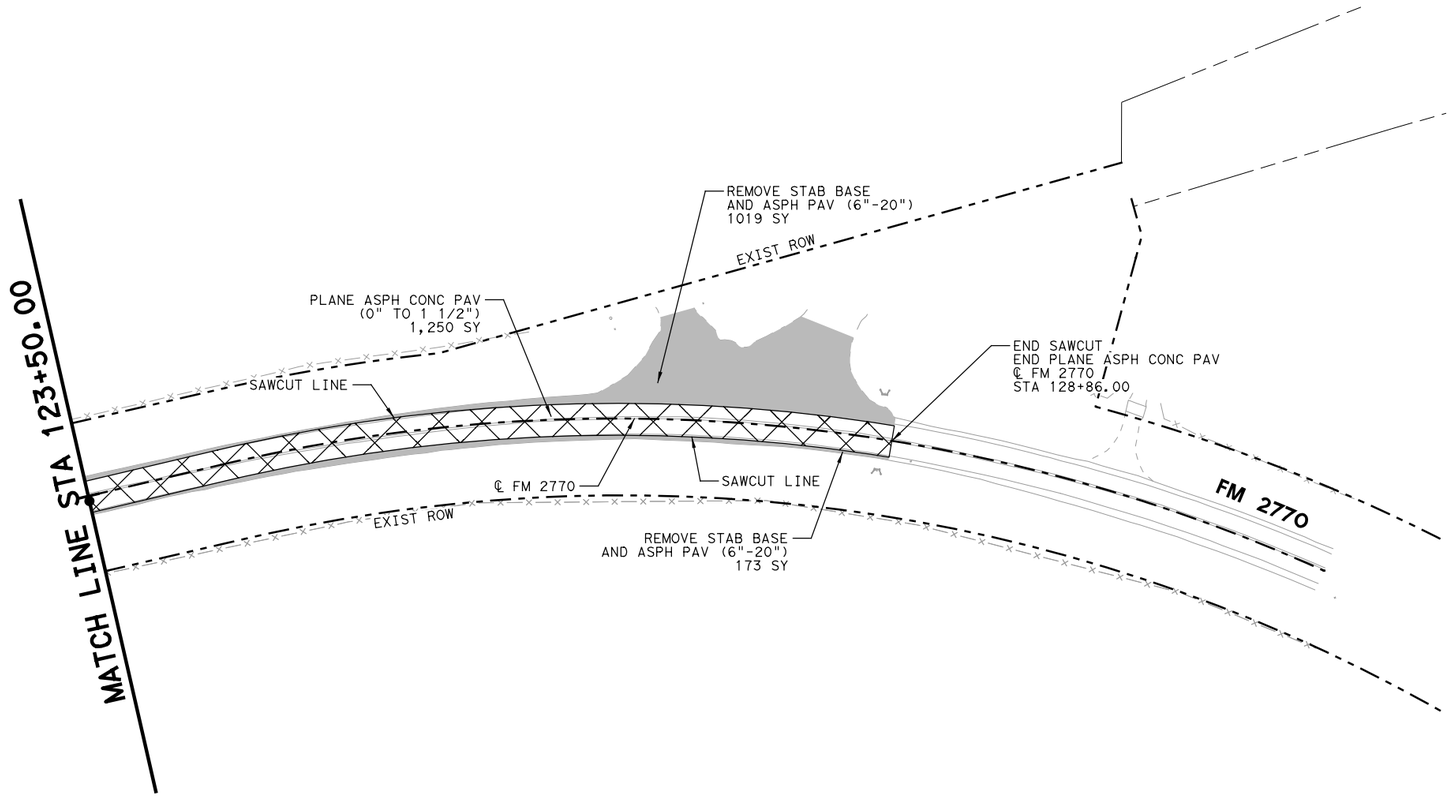
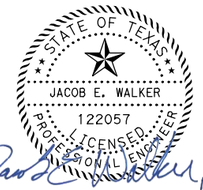


LEGEND

- TRAFFIC FLOW
- EXIST ROW
- PROP ROW
- REMOVE FENCE
- REMOVE STAB BASE AND ASPH PAV (6"-20")
- PLANE ASPH CONC PAV
- REMOVE CONCRETE DRIVEWAY

NOTES:
1. STATIONING BASED ON FM 2770 CENTERLINE UNLESS OTHERWISE NOTED.
2. REMOVAL AND TRIMMING OF TREES SHALL BE CONSIDERED SUBSIDIARY TO PREP ROW.
3. SAWCUT AND REMOVAL OF THE PAVEMENT EDGE SHALL BE CONSIDERED SUBSIDIARY TO PAVEMENT REMOVAL ITEMS.



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ROBERT S. LIGHT EXTENSION

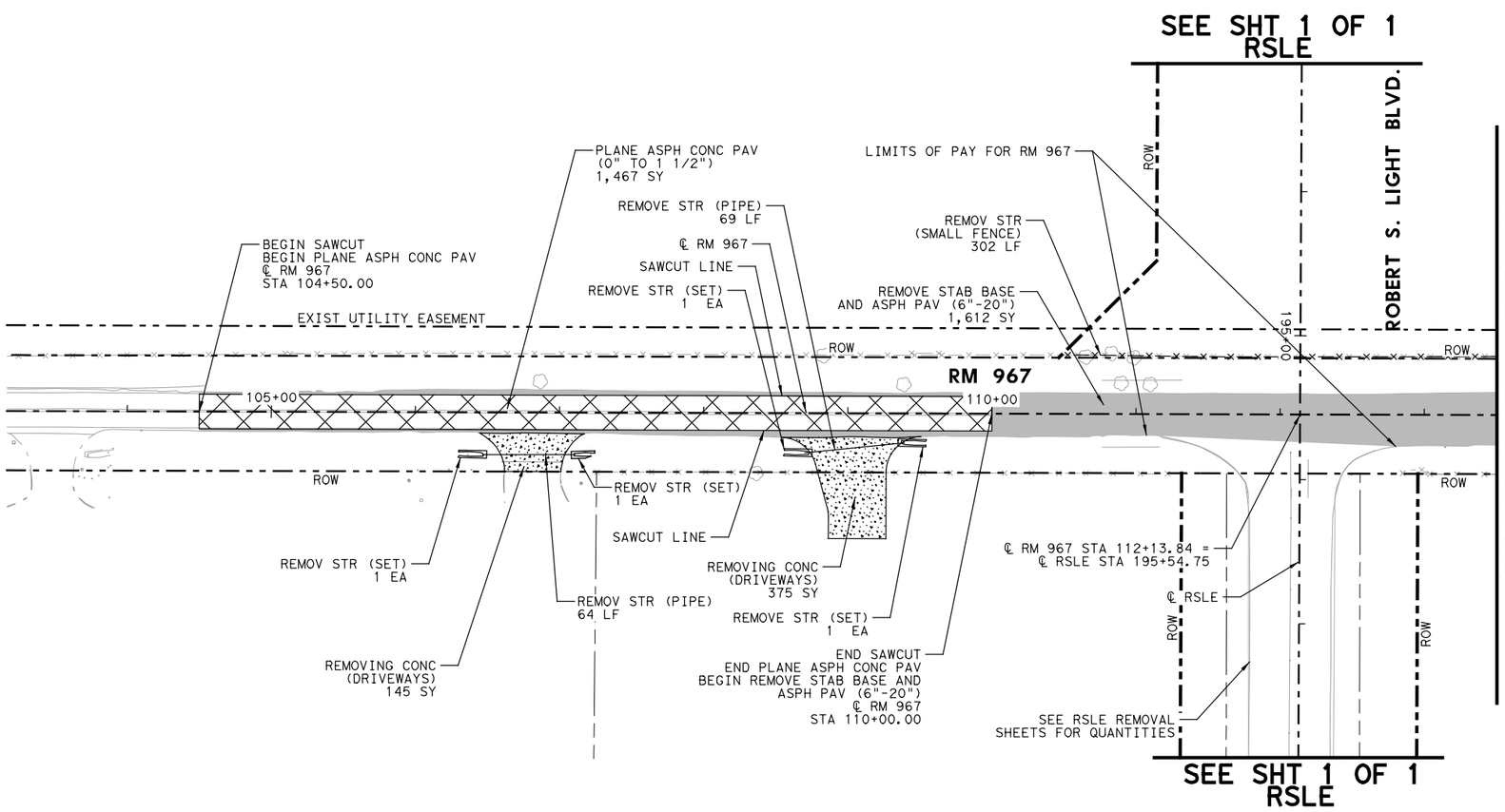
FM 2770
REMOVAL LAYOUT

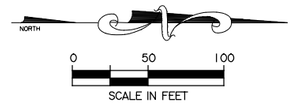
SCALE: 1"=100'

SHEET 3 OF 3

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JW	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
BD	TEXAS	AUS	HAYS	77
CHECK	CONTROL	SECTION	JOB	
DR	0914	33	068,ETC	
CHECK				
GV				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
USER: KBERGER DATE: 11/20/2020 TIME: 5:29:58 PM SCALE: 1:100
FILE: RSLE-REMV-04.dgn PENTABLE: 000000002(4615.tbl





LEGEND

- TRAFFIC FLOW
- EXIST ROW
- PROP ROW
- REMOVE FENCE
- REMOVE STAB BASE AND ASPH PAV (6"-20")
- PLANE ASPH CONC PAV
- REMOVE CONCRETE DRIVEWAY

NOTES:
1. STATIONING BASED ON RM 967 CENTERLINES UNLESS OTHERWISE NOTED.
2. REMOVAL AND TRIMMING OF TREES SHALL BE CONSIDERED SUBSIDIARY TO PREP ROW.

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ROBERT S. LIGHT EXTENSION

RM 967
REMOVAL LAYOUT

SCALE: 1"=100' SHEET 1 OF 2

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JW	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
BD	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	78
DR	0914	33	068,ETC	
CHECK				
GV				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
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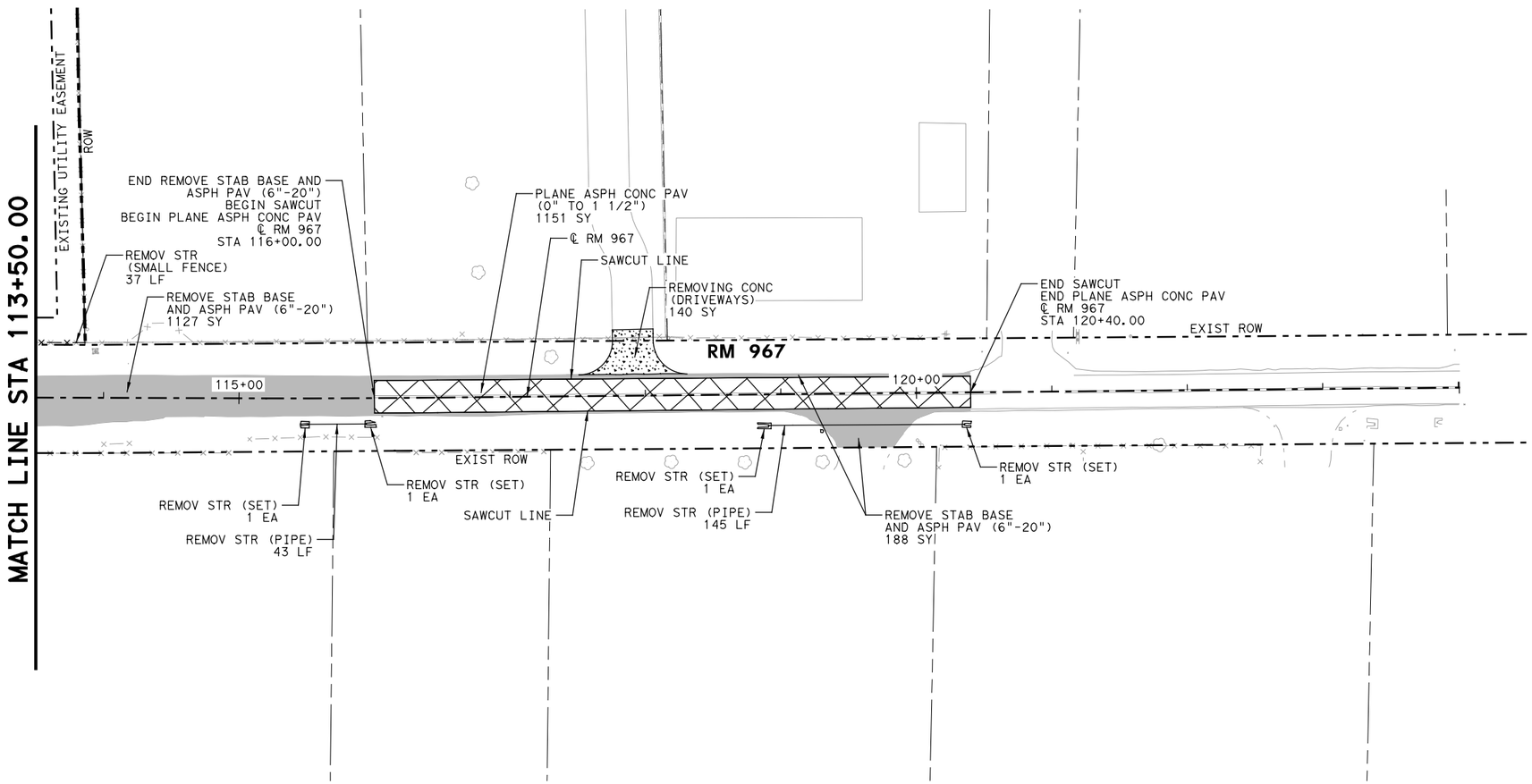
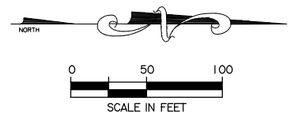
FILE: RSLE-REMV-05.dgn PENTABLE: 0000000002146I5.tbl





LEGEND

- TRAFFIC FLOW
- EXIST ROW
- PROP ROW
- REMOVE FENCE
- REMOVE STAB BASE AND ASPH PAV (6"-20")
- PLANE ASPH CONC PAV
- REMOVE CONCRETE DRIVEWAY

NOTES:
1. STATIONING BASED ON RM 967 CENTERLINES UNLESS OTHERWISE NOTED.
2. REMOVAL AND TRIMMING OF TREES SHALL BE CONSIDERED SUBSIDIARY TO PREP ROW.

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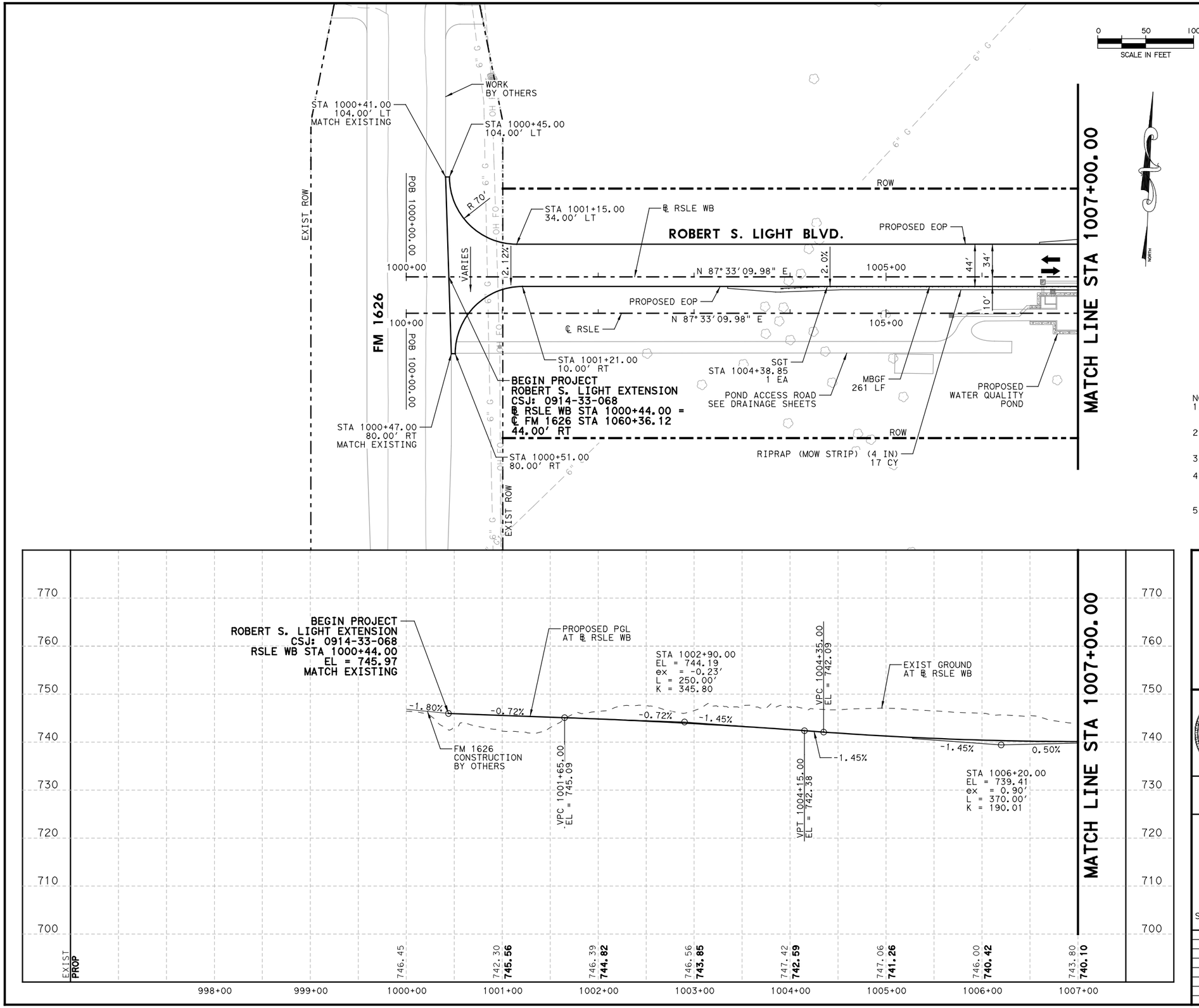
ROBERT S. LIGHT EXTENSION

RM 967 REMOVAL LAYOUT

SCALE: 1"=100'

SHEET 2 OF 2

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JW	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
BD	TEXAS	AUS	HAYS	79
CHECK	CONTROL	SECTION	JOB	
DR	0914	33	068,ETC	
CHECK				
GV				



NOTES:
1. STATIONING BASED ON RSLE WB BASELINE UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS ARE TO EDGE OF PAVEMENT (EOP) UNLESS OTHERWISE NOTED.
3. PGL LOCATION IS AT THE RSLE WB BASELINE.
4. REFER TO "DRIVEWAY SUMMARY" SHEET FOR ADDITIONAL INFORMATION. HMAC DRIVEWAYS TO BE CONSTRUCTED AND PAID SAME AS ROADWAY PAVEMENT.
5. REFER TO "INTERSECTION DETAIL" SHEETS FOR ADDITIONAL INFORMATION.

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ROBERT S. LIGHT EXTENSION

ROADWAY
PLAN AND PROFILE
ROBERT. S. LIGHT EXTENSION

SCALE: 1"=100'-H
1"=20'-V

SHEET 1 OF 11

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JW	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
DR	TEXAS	AUS	HAYS	80
CHECK	CONTROL	SECTION	JOB	
BD	0914	33	068,ETC	
CHECK				
GV				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
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DATE: 12/2/2020
TIME: 10:51:15 AM
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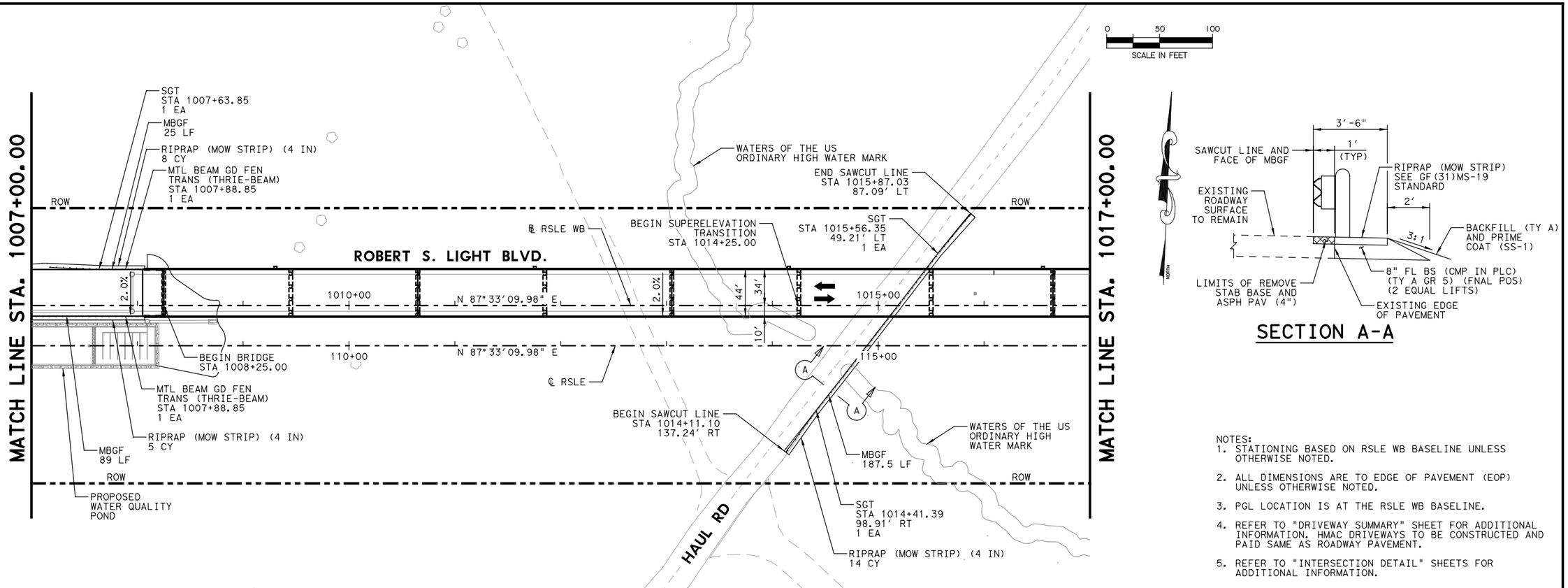
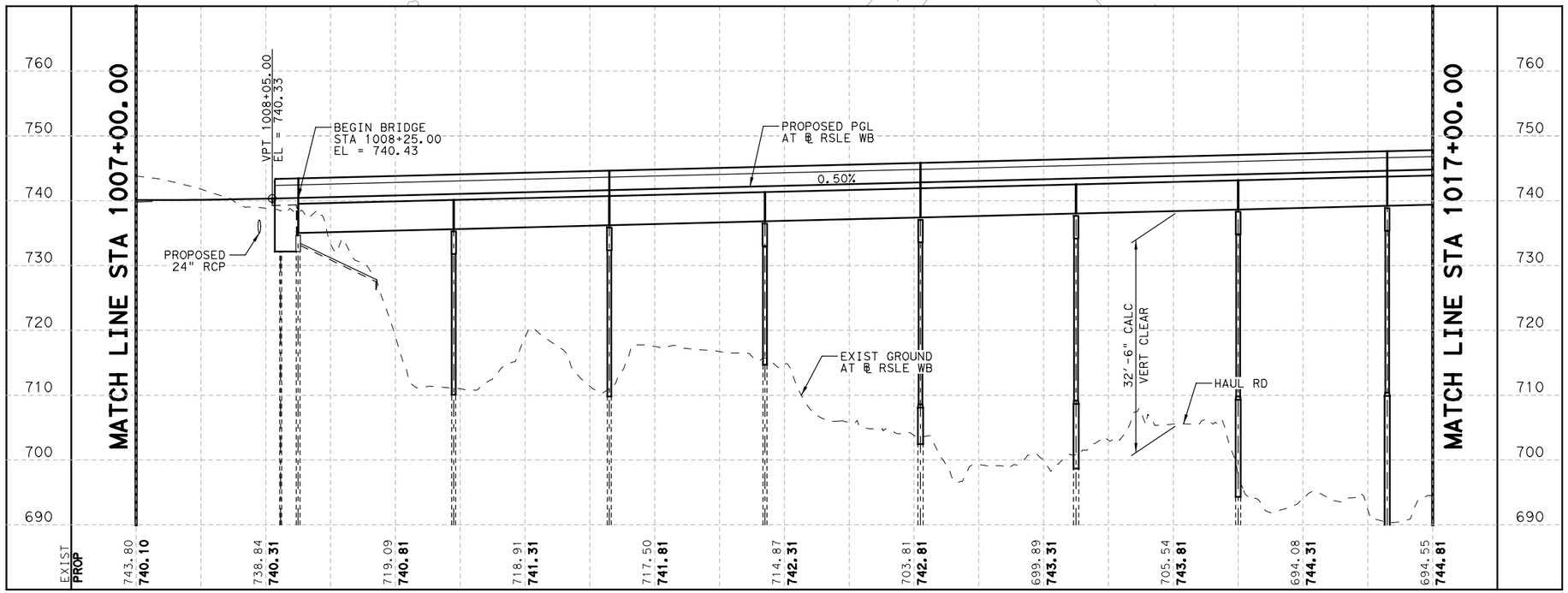


SECTION A-A

NOTES:
1. STATIONING BASED ON RSLE WB BASELINE UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS ARE TO EDGE OF PAVEMENT (EOP) UNLESS OTHERWISE NOTED.
3. PGL LOCATION IS AT THE RSLE WB BASELINE.
4. REFER TO "DRIVEWAY SUMMARY" SHEET FOR ADDITIONAL INFORMATION. HMAC DRIVEWAYS TO BE CONSTRUCTED AND PAID SAME AS ROADWAY PAVEMENT.
5. REFER TO "INTERSECTION DETAIL" SHEETS FOR ADDITIONAL INFORMATION.



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ROBERT S. LIGHT EXTENSION

ROADWAY PLAN AND PROFILE ROBERT. S. LIGHT EXTENSION

SCALE: 1"=100'-H
1"=20'-V

SHEET 2 OF 11

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JW	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
BD	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	81
DR	0914	33	068,ETC	
CHECK				
GV				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg PENTABLE: 000000000246l5.tbl
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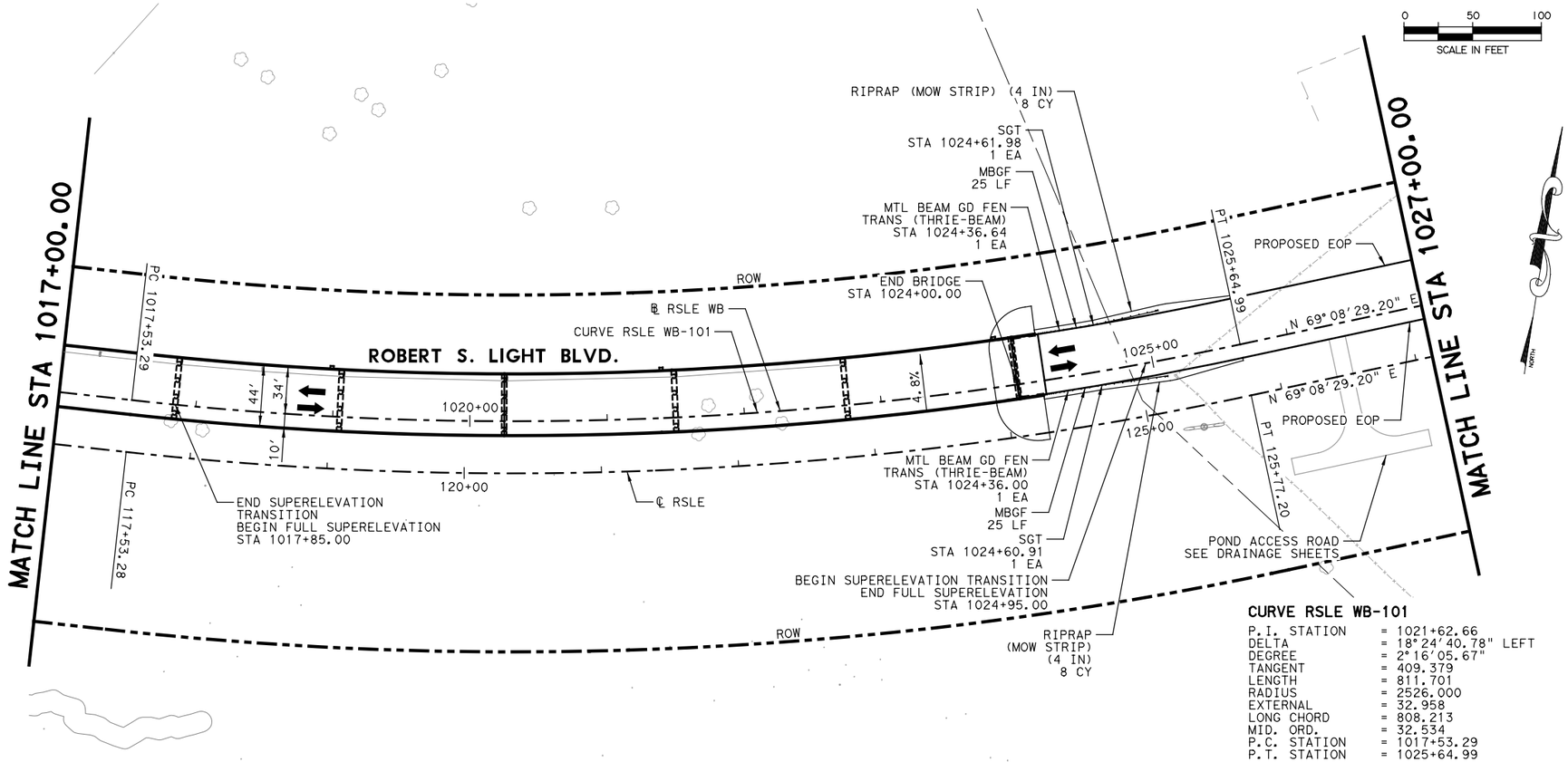
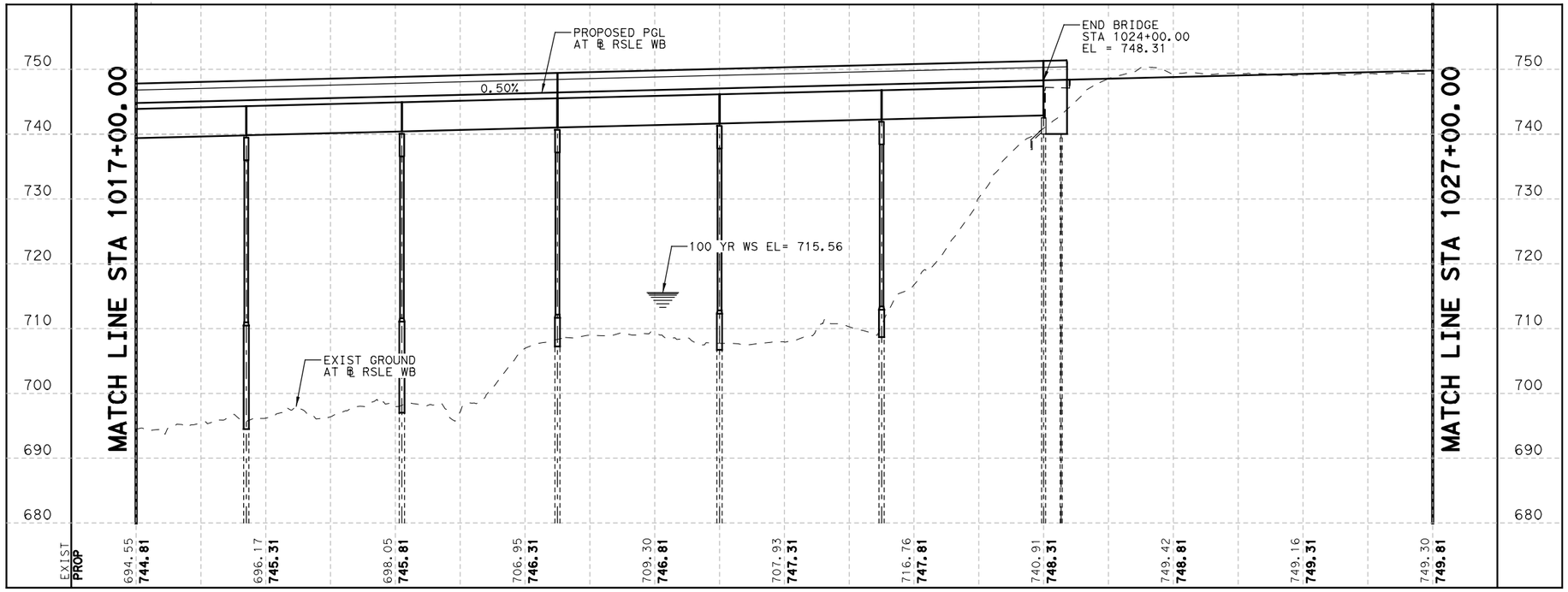
FILE: RSLE-RDWYPP02.dgn



CURVE RSLE WB-101

P.I. STATION	= 1021+62.66
DELTA	= 18°24'40.78" LEFT
DEGREE	= 2°16'05.67"
TANGENT	= 409.379
LENGTH	= 811.701
RADIUS	= 2526.000
EXTERNAL	= 32.958
LONG CHORD	= 808.213
MID. ORD.	= 32.534
P.C. STATION	= 1017+53.29
P.T. STATION	= 1025+64.99

NOTES:
1. STATIONING BASED ON RSLE WB BASELINE UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS ARE TO EDGE OF PAVEMENT (EOP) UNLESS OTHERWISE NOTED.
3. PGL LOCATION IS AT THE RSLE WB BASELINE.
4. REFER TO "DRIVEWAY SUMMARY" SHEET FOR ADDITIONAL INFORMATION. HMAC DRIVEWAYS TO BE CONSTRUCTED AND PAID SAME AS ROADWAY PAVEMENT.
5. REFER TO "INTERSECTION DETAIL" SHEETS FOR ADDITIONAL INFORMATION.



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ROBERT S. LIGHT EXTENSION

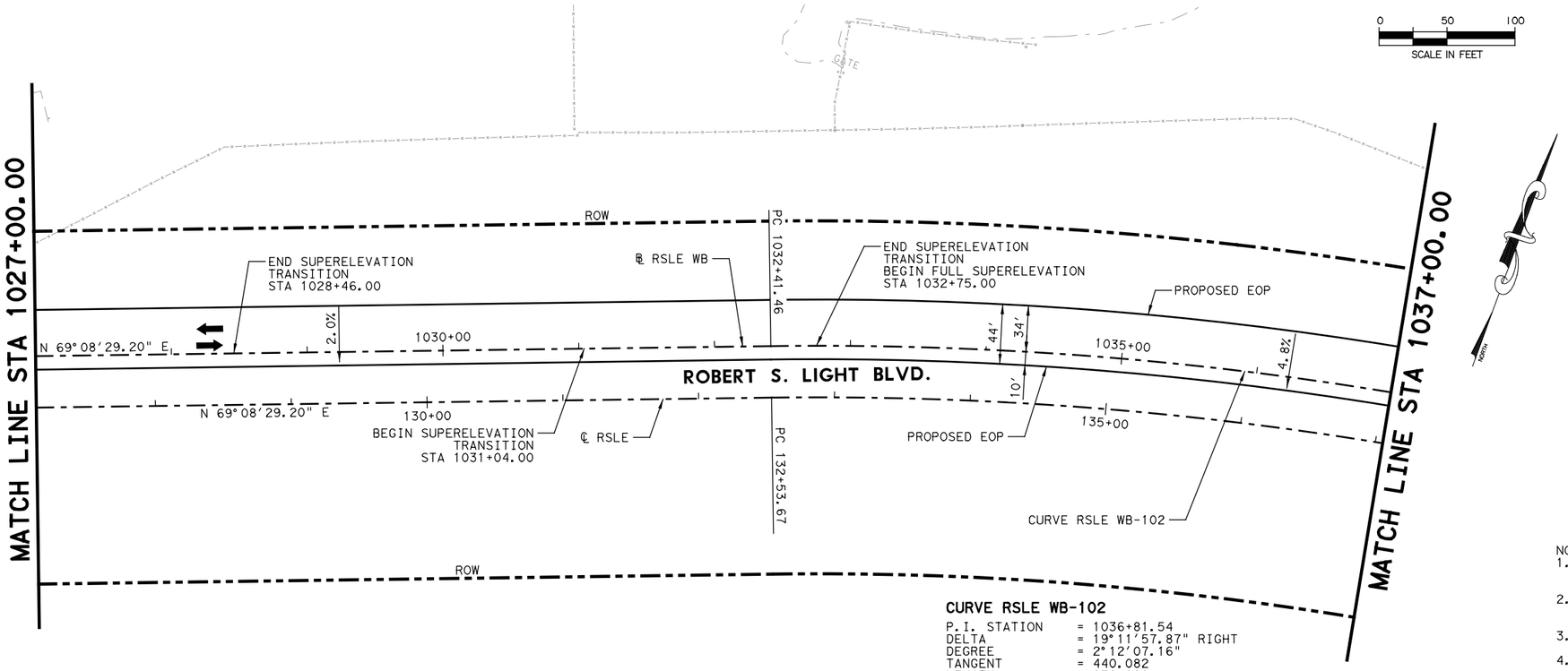
ROADWAY PLAN AND PROFILE ROBERT. S. LIGHT EXTENSION

SCALE: 1"=100'-H
1"=20'-V

SHEET 3 OF 11

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JW	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
BD	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	82
DR	0914	33	068,ETC	
CHECK				
GV				

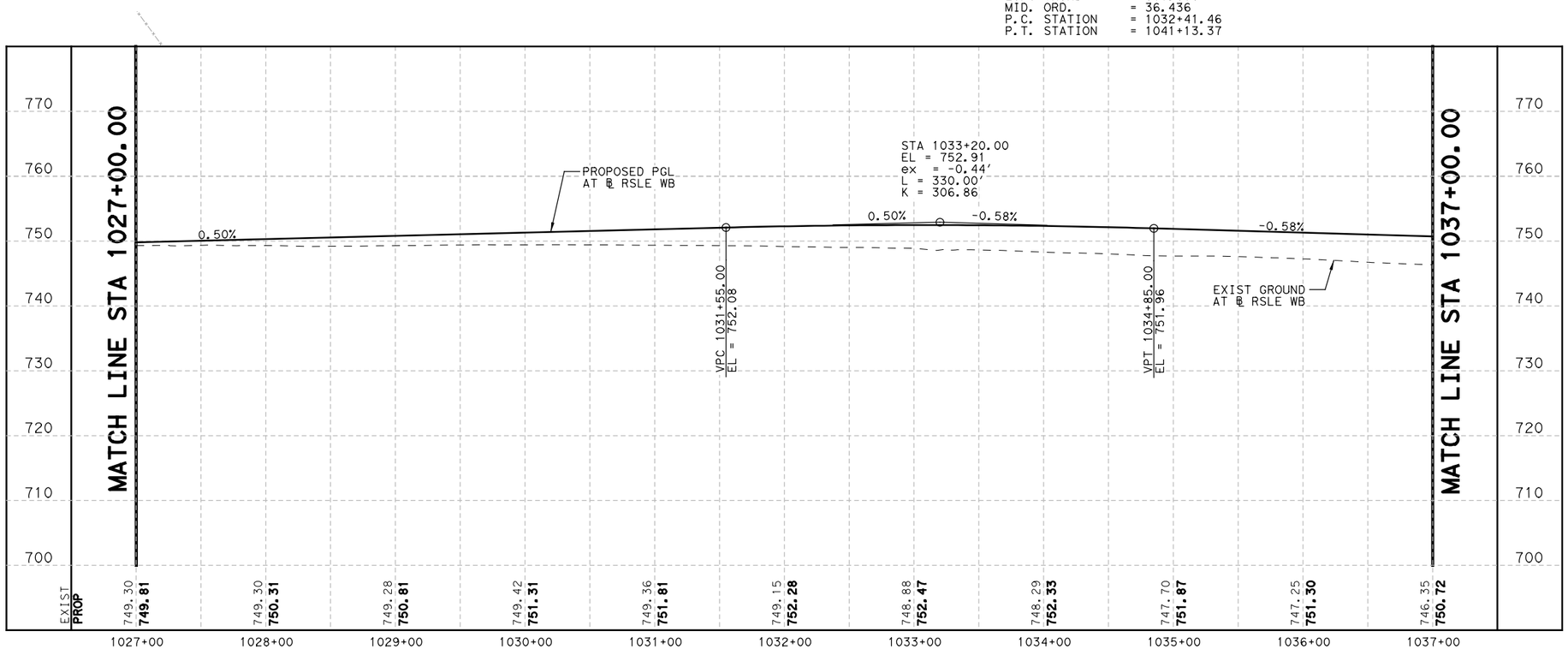
PLOT DRIVER: TXDOT_PDF_BW.pltcfg PENTABLE: 000000000246I5.tbl
USER: KBERGER DATE: 12/2/2020 TIME: 10:52:23 AM SCALE: 1:100
FILE: RSLE-RDWYPP03.dgn



CURVE RSLE WB-102

P.I. STATION	= 1036+81.54
DELTA	= 19°11'57.87" RIGHT
DEGREE	= 2°12'07.16"
TANGENT	= 440.082
LENGTH	= 871.912
RADIUS	= 2602.000
EXTERNAL	= 36.954
LONG CHORD	= 867.838
MID. ORD.	= 36.436
P.C. STATION	= 1032+41.46
P.T. STATION	= 1041+13.37

NOTES:
1. STATIONING BASED ON RSLE WB BASELINE UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS ARE TO EDGE OF PAVEMENT (EOP) UNLESS OTHERWISE NOTED.
3. PGL LOCATION IS AT THE RSLE WB BASELINE.
4. REFER TO "DRIVEWAY SUMMARY" SHEET FOR ADDITIONAL INFORMATION. HMAC DRIVEWAYS TO BE CONSTRUCTED AND PAID SAME AS ROADWAY PAVEMENT.
5. REFER TO "INTERSECTION DETAIL" SHEETS FOR ADDITIONAL INFORMATION.



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ROBERT S. LIGHT EXTENSION

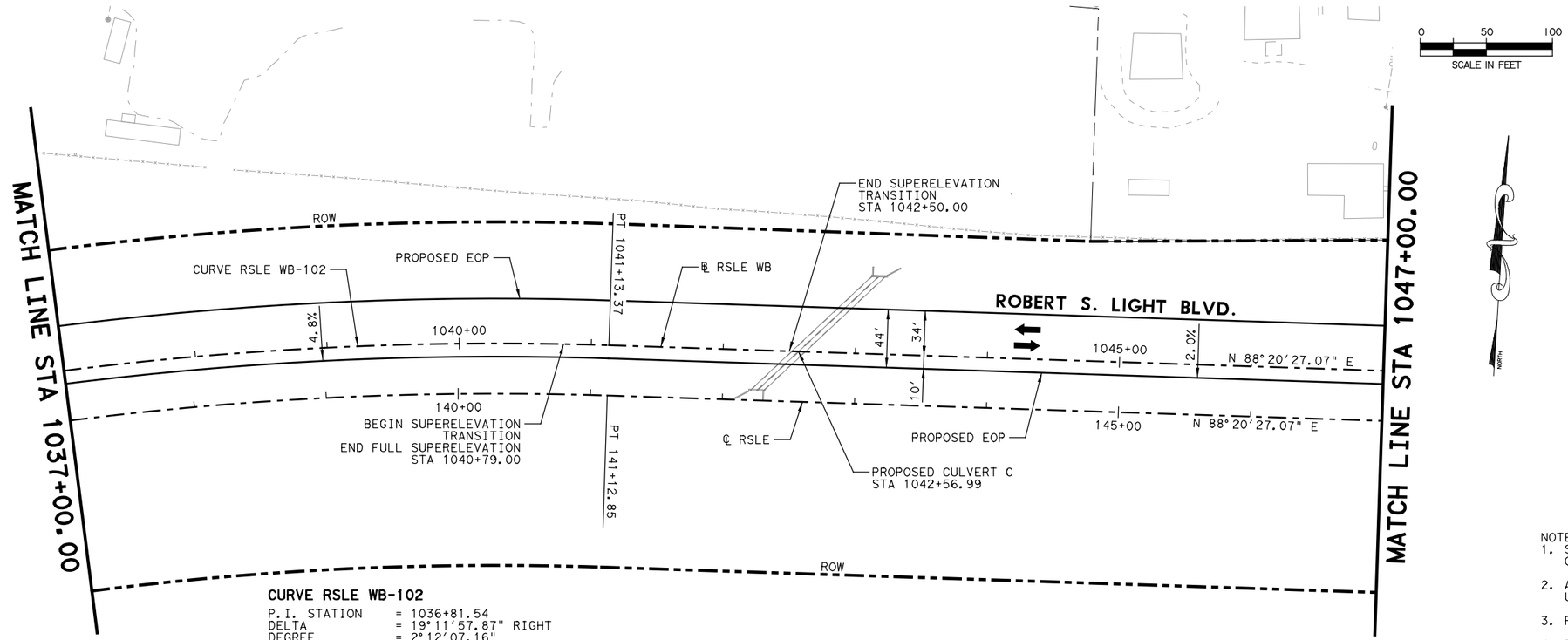
ROADWAY PLAN AND PROFILE ROBERT. S. LIGHT EXTENSION

SCALE: 1"=100'-H
1"=20'-V

SHEET 4 OF 11

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JW	6	STP ( ) RGS		RSLE
GRAPHICS				
BD	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	AUS	HAYS	
DR	CONTROL	SECTION	JOB	83
CHECK	0914	33	068,ETC	
GV				

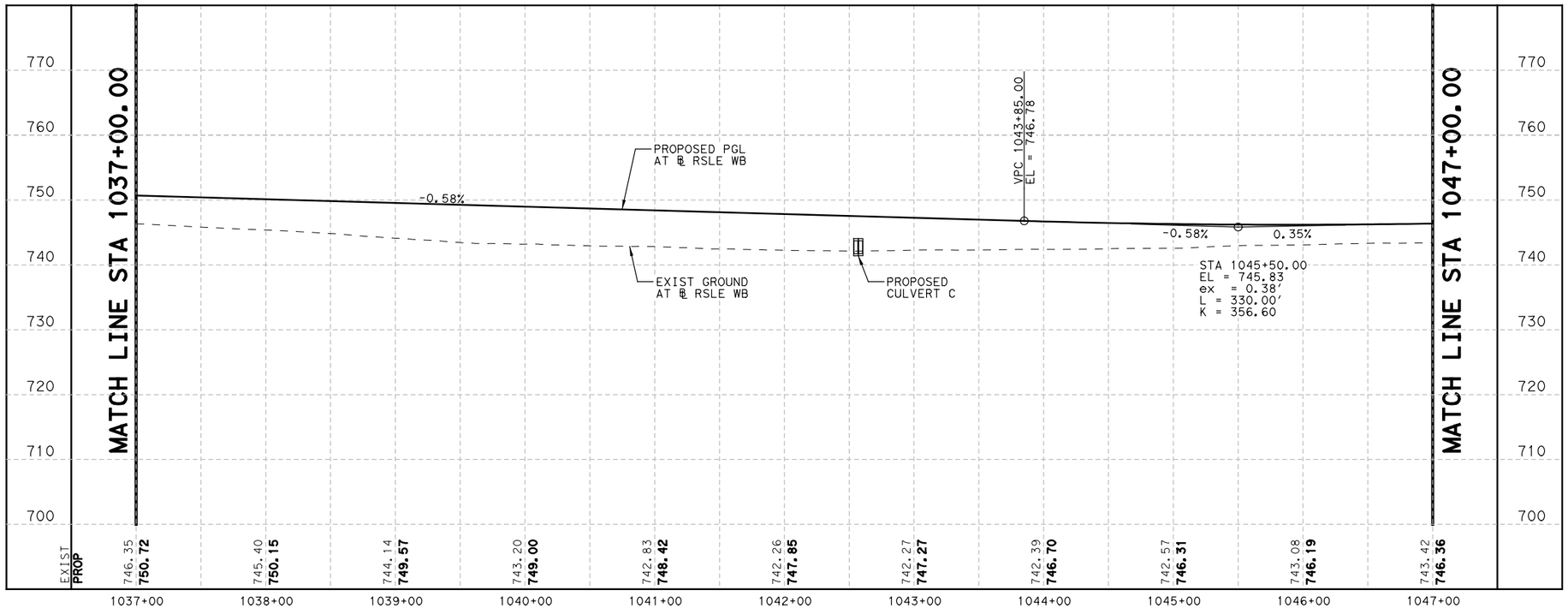
PLOT DRIVER: TXDOT_PDF_BW.pltcfg PENTABLE: 000000002\4615.tbl
USER: KBERGER DATE: 11/20/2020 TIME: 5:31:57 PM SCALE: 1:100
FILE: RSLE-RDWYPP04.dgn



CURVE RSLE WB-102

P.I. STATION	= 1036+81.54
DELTA	= 19°11'57.87" RIGHT
DEGREE	= 2°12'07.16"
TANGENT	= 440.082
LENGTH	= 871.912
RADIUS	= 2602.000
EXTERNAL	= 36.954
LONG CHORD	= 867.838
MID. ORD.	= 36.436
P.C. STATION	= 1032+41.46
P.T. STATION	= 1041+13.37

NOTES:
1. STATIONING BASED ON RSLE WB BASELINE UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS ARE TO EDGE OF PAVEMENT (EOP) UNLESS OTHERWISE NOTED.
3. PGL LOCATION IS AT THE RSLE WB BASELINE.
4. REFER TO "DRIVEWAY SUMMARY" SHEET FOR ADDITIONAL INFORMATION. HMAC DRIVEWAYS TO BE CONSTRUCTED AND PAID SAME AS ROADWAY PAVEMENT.
5. REFER TO "INTERSECTION DETAIL" SHEETS FOR ADDITIONAL INFORMATION.



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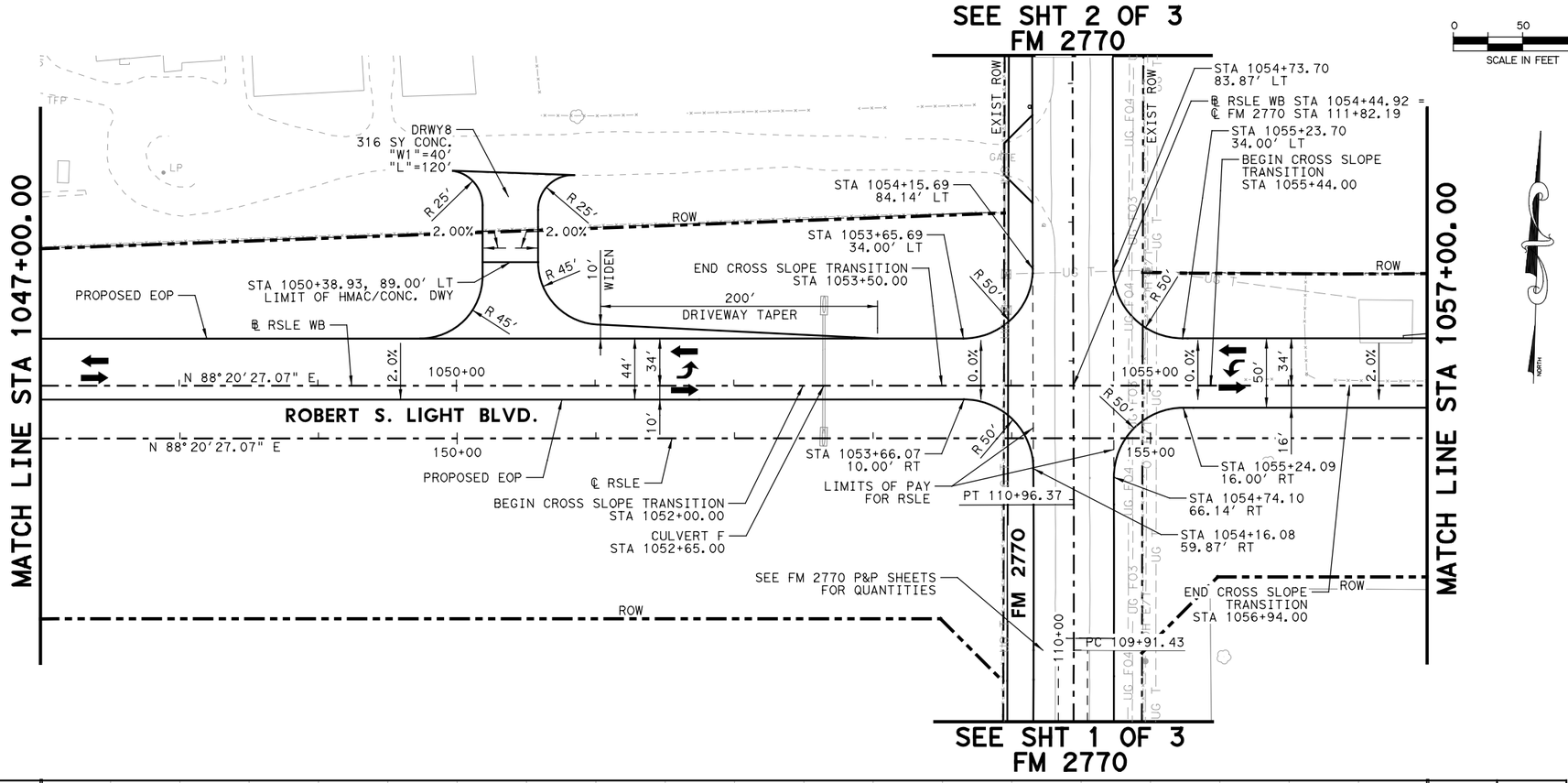
ROBERT S. LIGHT EXTENSION

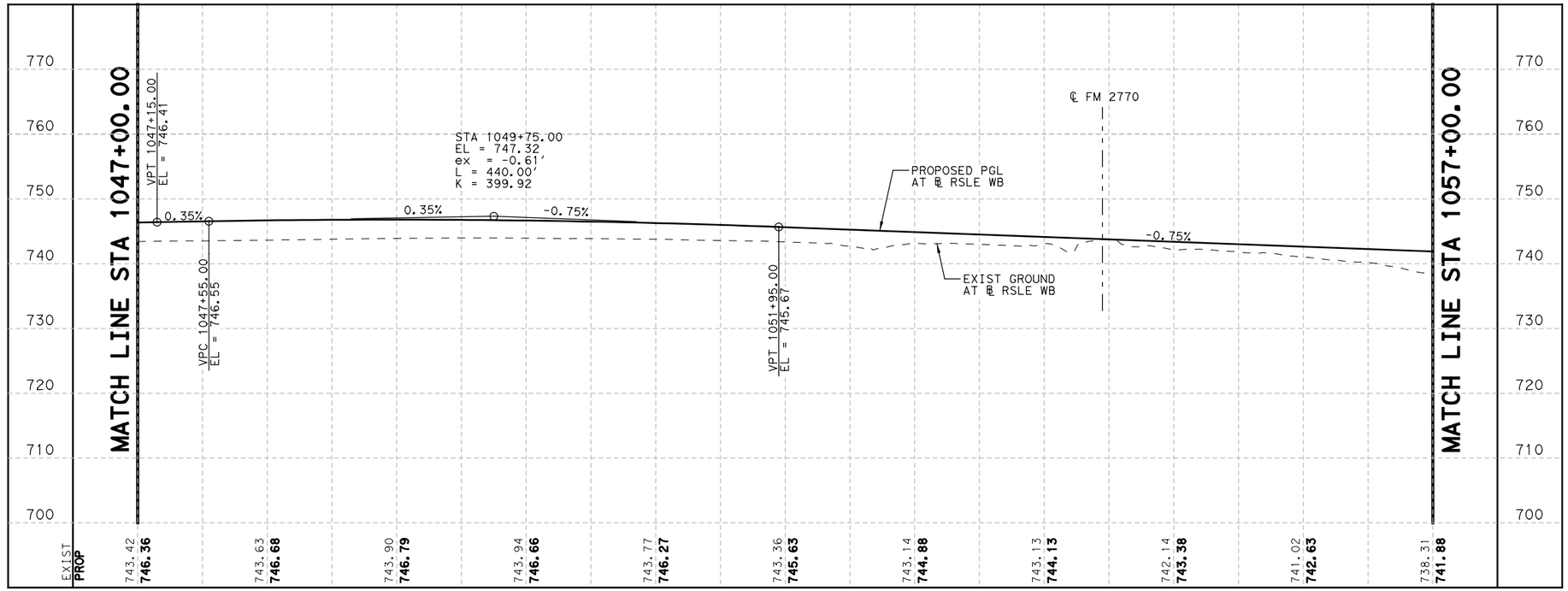
ROADWAY PLAN AND PROFILE ROBERT. S. LIGHT EXTENSION

SCALE: 1"=100'-H
1"=20'-V

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JW	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
BD	TEXAS	AUS	HAYS	84
CHECK	CONTROL	SECTION	JOB	
DR	0914	33	068,ETC	
CHECK				
GV				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg PENTABLE: 000000002l46l5.tbl
USER: KBERGER DATE: 11/20/2020 TIME: 5:32:10 PM SCALE: 1:100
FILE: RSLE-RDWYPP05.dgn





NOTES:
1. STATIONING BASED ON RSLE WB BASELINE UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS ARE TO EDGE OF PAVEMENT (EOP) UNLESS OTHERWISE NOTED.
3. PGL LOCATION IS AT THE RSLE WB BASELINE.
4. REFER TO "DRIVEWAY SUMMARY" SHEET FOR ADDITIONAL INFORMATION. HMAC DRIVEWAYS TO BE CONSTRUCTED AND PAID SAME AS ROADWAY PAVEMENT.
5. REFER TO "INTERSECTION DETAIL" SHEETS FOR ADDITIONAL INFORMATION.

STATE OF TEXAS
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12/09/2020

Jacob E. Walker, PE

HAYS COUNTY TEXAS

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Texas Registered Engineering Firm F-754

Texas Department of Transportation
℗ 2020

ROBERT S. LIGHT EXTENSION

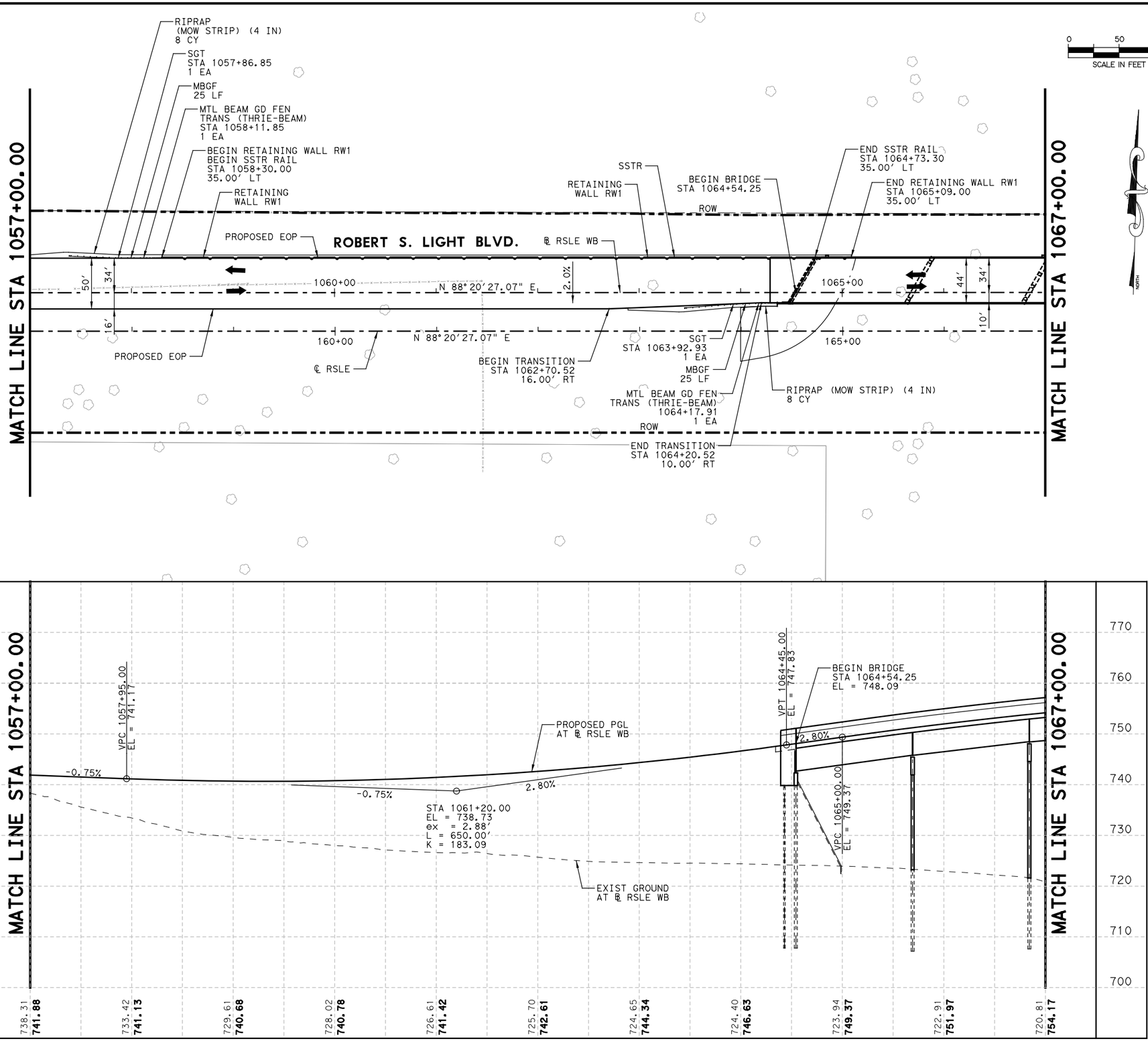
ROADWAY
PLAN AND PROFILE
ROBERT. S. LIGHT EXTENSION

SCALE: 1"=100'-H
1"=20'-V

SHEET 6 OF 11

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JW	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
BD	TEXAS	AUS	HAYS	85
CHECK	CONTROL	SECTION	JOB	
DR	0914	33	068,ETC	
CHECK				
GV				

PENTABLE: 0000000002\4615.tbl
TIME: 10:52:57 AM SCALE: 1:100
PLOT DRIVER: TXDOT_PDF_BW.pltcfg DATE: 12/2/2020
USER: KBERGER
FILE: RSLE-ROWYPP06.dgn



NOTES:
1. STATIONING BASED ON RSLE WB BASELINE UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS ARE TO EDGE OF PAVEMENT (EOP) UNLESS OTHERWISE NOTED.
3. PGL LOCATION IS AT THE RSLE WB BASELINE.
4. REFER TO "DRIVEWAY SUMMARY" SHEET FOR ADDITIONAL INFORMATION. HMAC DRIVEWAYS TO BE CONSTRUCTED AND PAID SAME AS ROADWAY PAVEMENT.
5. REFER TO "INTERSECTION DETAIL" SHEETS FOR ADDITIONAL INFORMATION.

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ROBERT S. LIGHT EXTENSION

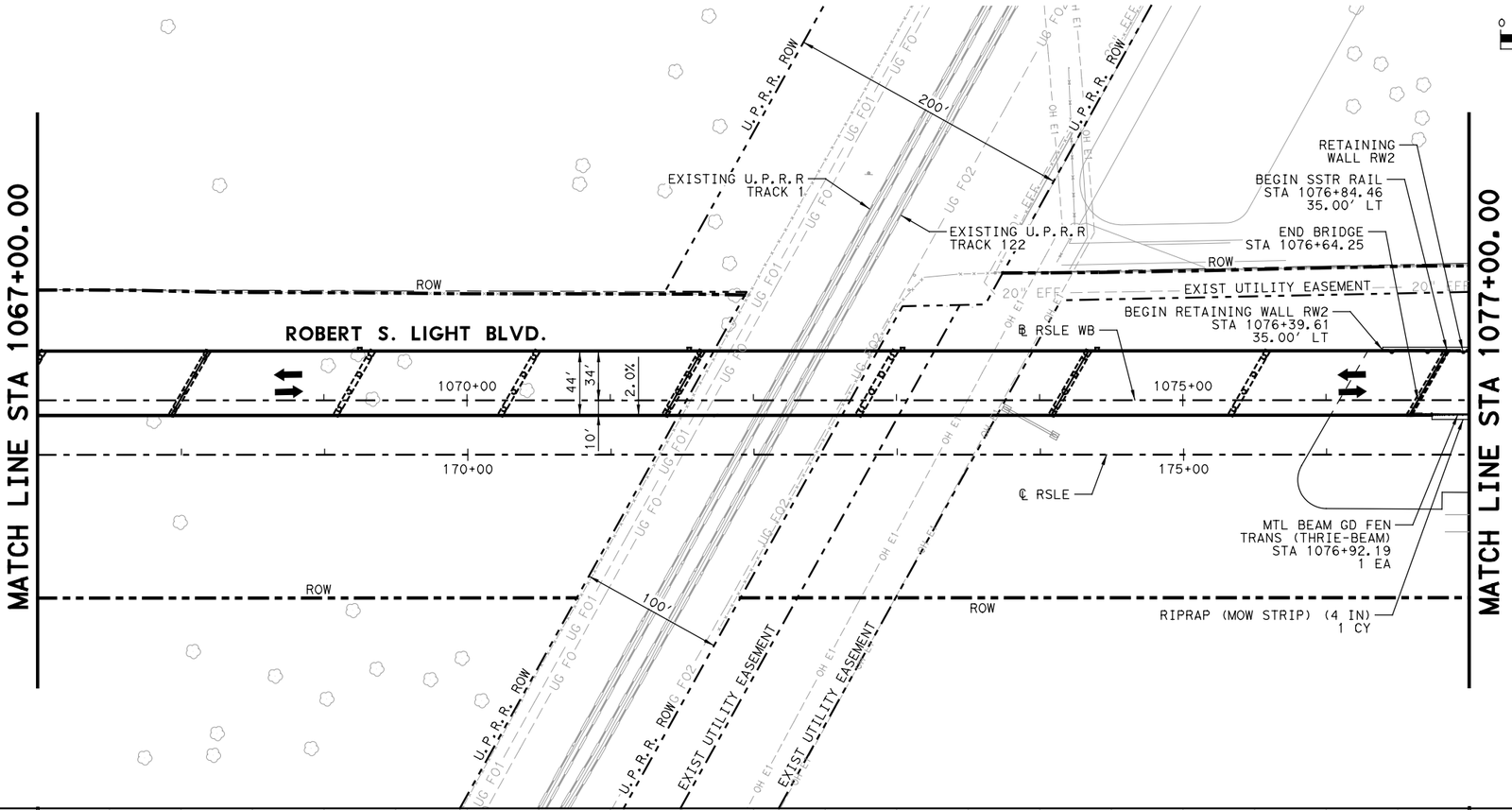
ROADWAY PLAN AND PROFILE ROBERT. S. LIGHT EXTENSION

SCALE: 1"=100'-H
1"=20'-V

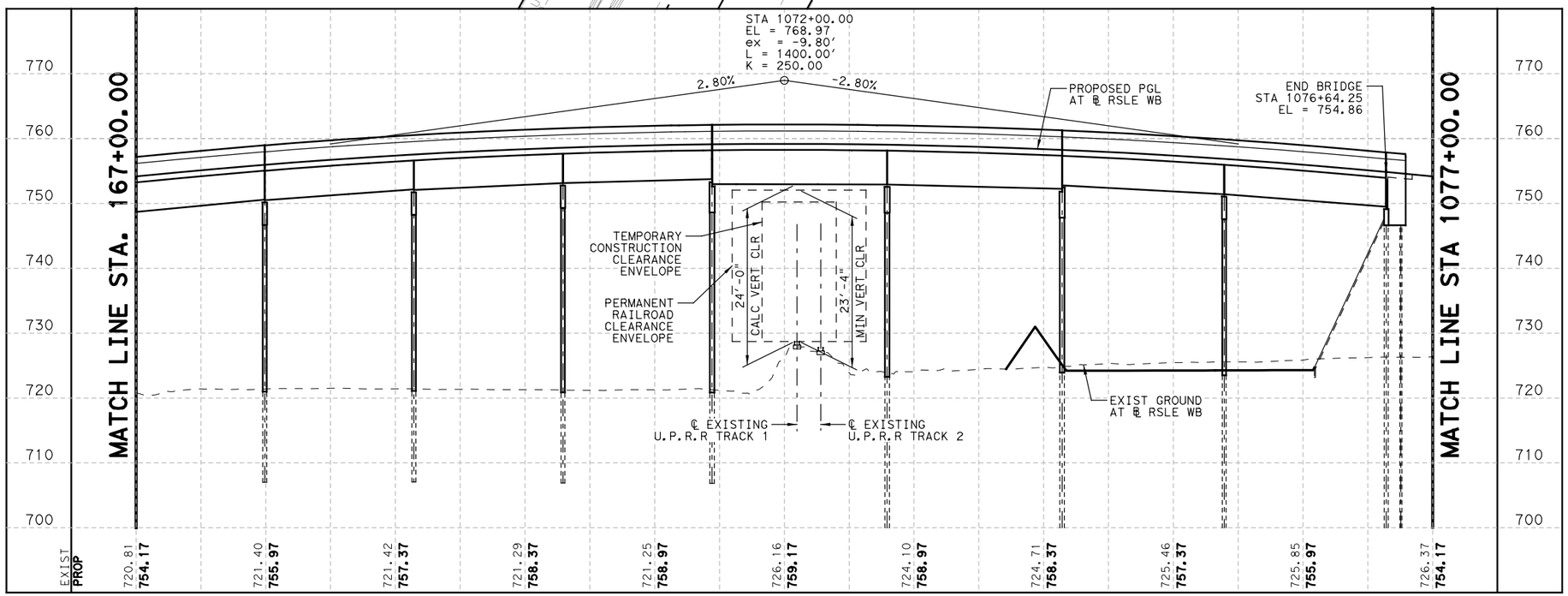
SHEET 7 OF 11

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JW	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
BD	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	86
DR	0914	33	068,ETC	
CHECK				
GV				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg PENTABLE: 000000000246I5.tbl
USER: KBERGER DATE: 12/2/2020 TIME: 10:53:34 AM SCALE: 1:100
FILE: RSLE-RDWYPP07.dgn



NOTES:
1. STATIONING BASED ON RSLE WB BASELINE UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS ARE TO EDGE OF PAVEMENT (EOP) UNLESS OTHERWISE NOTED.
3. PGL LOCATION IS AT THE RSLE WB BASELINE.
4. REFER TO "DRIVEWAY SUMMARY" SHEET FOR ADDITIONAL INFORMATION. HMAC DRIVEWAYS TO BE CONSTRUCTED AND PAID SAME AS ROADWAY PAVEMENT.
5. REFER TO "INTERSECTION DETAIL" SHEETS FOR ADDITIONAL INFORMATION.



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ROBERT S. LIGHT EXTENSION

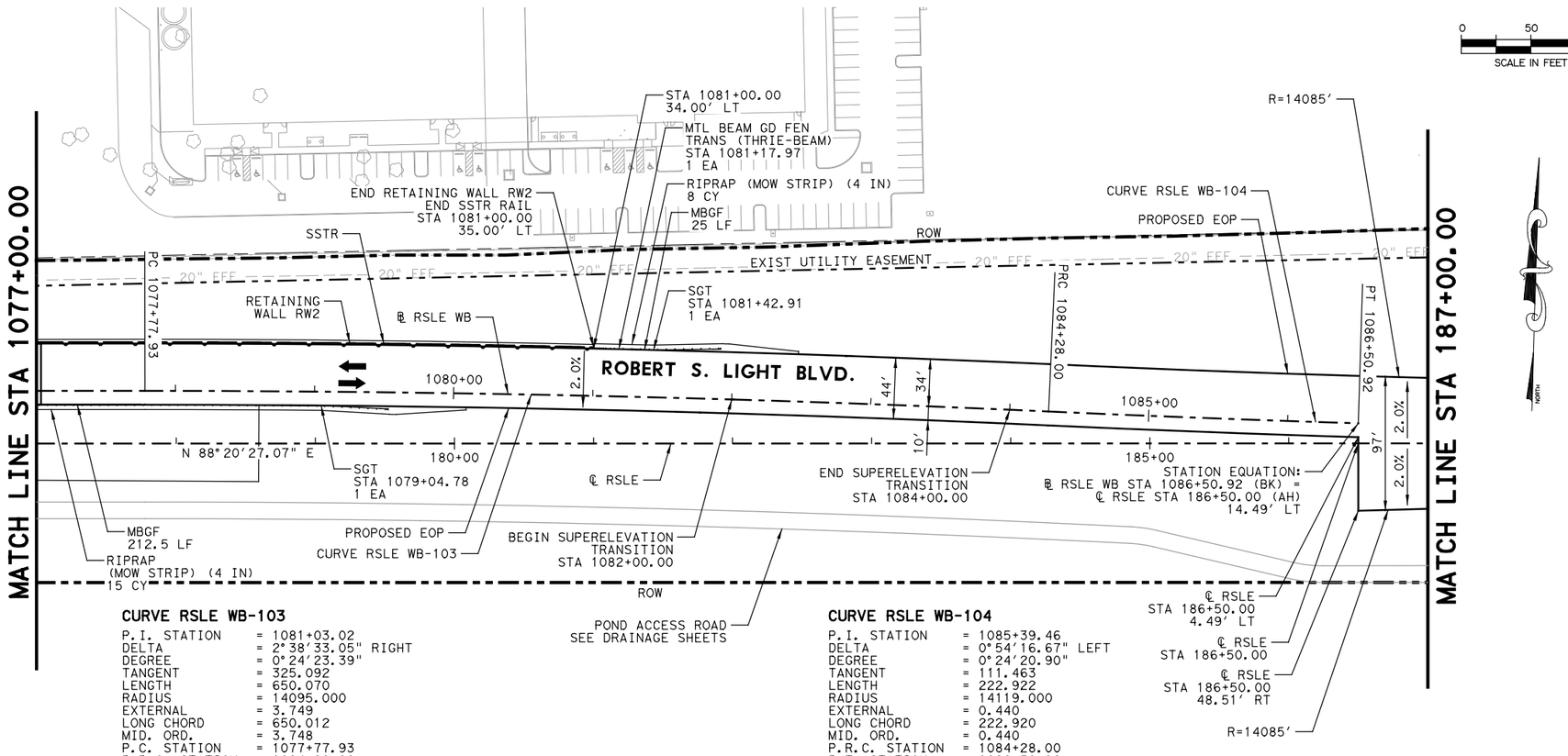
ROADWAY PLAN AND PROFILE ROBERT. S. LIGHT EXTENSION

SCALE: 1"=100'-H
1"=20'-V

SHEET 8 OF 11

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JW	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
BD	TEXAS	AUS	HAYS	87
CHECK	CONTROL	SECTION	JOB	
DR	0914	33	068,ETC	
CHECK				
GV				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg PENTABLE: 000000000246l5.tbl
USER: KBERGER DATE: 11/20/2020 TIME: 5:33:34 PM SCALE: H00
FILE: RSLE-RDWYPP08.dgn



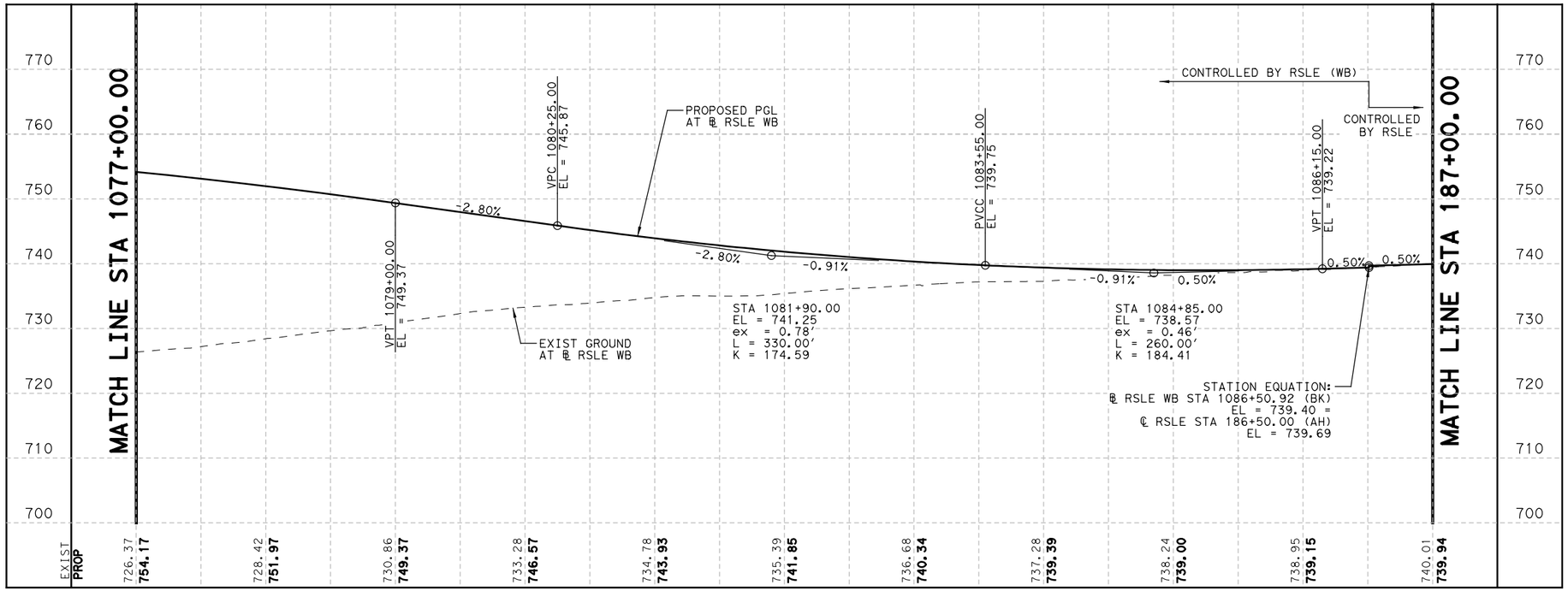
CURVE RSLE WB-103

P.I. STATION	= 1081+03.02
DELTA	= 2°38'33.05" RIGHT
DEGREE	= 0°24'23.39"
TANGENT	= 325.092
LENGTH	= 650.070
RADIUS	= 14095.000
EXTERNAL	= 3.749
LONG CHORD	= 650.012
MID. ORD.	= 3.748
P.C. STATION	= 1077+77.93
P.R.C. STATION	= 1084+28.00

CURVE RSLE WB-104

P.I. STATION	= 1085+39.46
DELTA	= 0°54'16.67" LEFT
DEGREE	= 0°24'20.90"
TANGENT	= 111.463
LENGTH	= 222.922
RADIUS	= 14119.000
EXTERNAL	= 0.440
LONG CHORD	= 222.920
MID. ORD.	= 0.440
P.R.C. STATION	= 1084+28.00
P.T. STATION	= 1086+50.92

NOTES:
1. STATIONING BASED ON RSLE WB BASELINE UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS ARE TO EDGE OF PAVEMENT (EOP) UNLESS OTHERWISE NOTED.
3. PGL LOCATION IS AT THE RSLE WB BASELINE.
4. REFER TO "DRIVEWAY SUMMARY" SHEET FOR ADDITIONAL INFORMATION. HMAC DRIVEWAYS TO BE CONSTRUCTED AND PAID SAME AS ROADWAY PAVEMENT.
5. REFER TO "INTERSECTION DETAIL" SHEETS FOR ADDITIONAL INFORMATION.



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ROBERT S. LIGHT EXTENSION

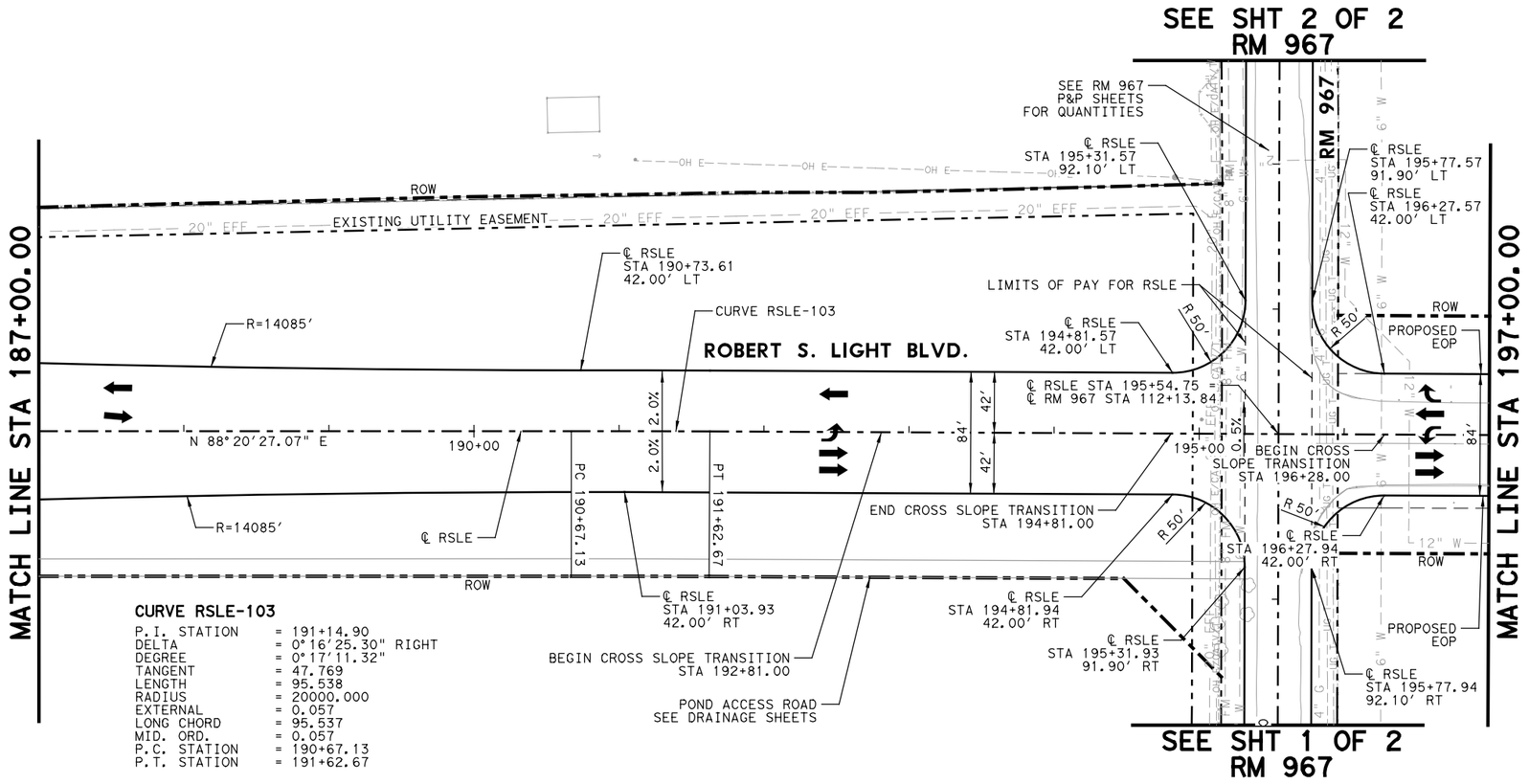
ROADWAY
PLAN AND PROFILE
ROBERT. S. LIGHT EXTENSION

SCALE: 1"=100'-H
1"=20'-V

SHEET 9 OF 11

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JW	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
BD	TEXAS	AUS	HAYS	88
CHECK	CONTROL	SECTION	JOB	
DR	0914	33	068,ETC	
CHECK				
GV				

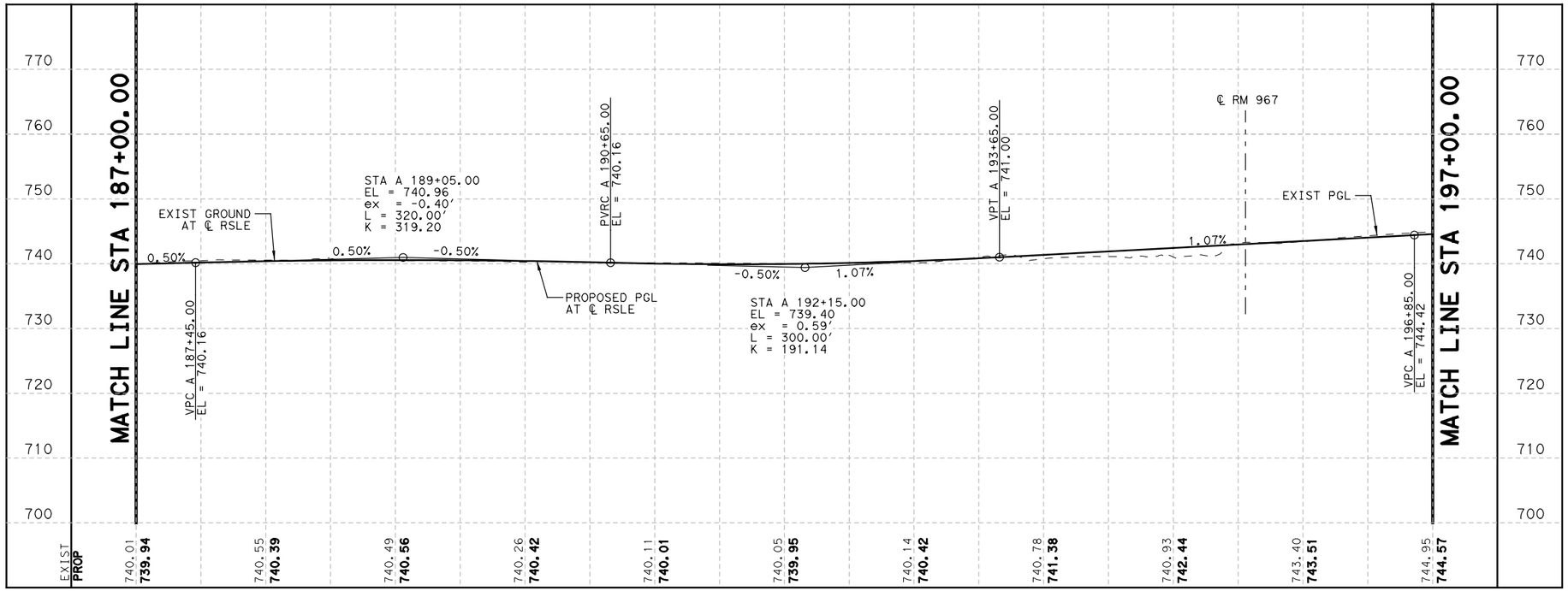
PLOT DRIVER: TXDOT_PDF_BW.pltcfg
USER: KBERGER
FILE: RSLE-ROWYPP09.dgn
DATE: 12/2/2020
TIME: 10:54:20 AM
PENTABLE: 000000000214615.tbl
SCALE: 1:100



CURVE RSLE-103

P.I. STATION	= 191+14.90
DELTA	= 0°16'25.30" RIGHT
DEGREE	= 0°17'11.32"
TANGENT	= 47.769
LENGTH	= 95.538
RADIUS	= 20000.000
EXTERNAL	= 0.057
LONG CHORD	= 95.537
MID. ORD.	= 0.057
P.C. STATION	= 190+67.13
P.T. STATION	= 191+62.67

NOTES:
1. STATIONING BASED ON RSLE WB BASELINE UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS ARE TO EDGE OF PAVEMENT (EOP) UNLESS OTHERWISE NOTED.
3. PGL LOCATION IS AT THE RSLE WB BASELINE.
4. REFER TO "DRIVEWAY SUMMARY" SHEET FOR ADDITIONAL INFORMATION. HMAC DRIVEWAYS TO BE CONSTRUCTED AND PAID SAME AS ROADWAY PAVEMENT.
5. REFER TO "INTERSECTION DETAIL" SHEETS FOR ADDITIONAL INFORMATION.



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ROBERT S. LIGHT EXTENSION

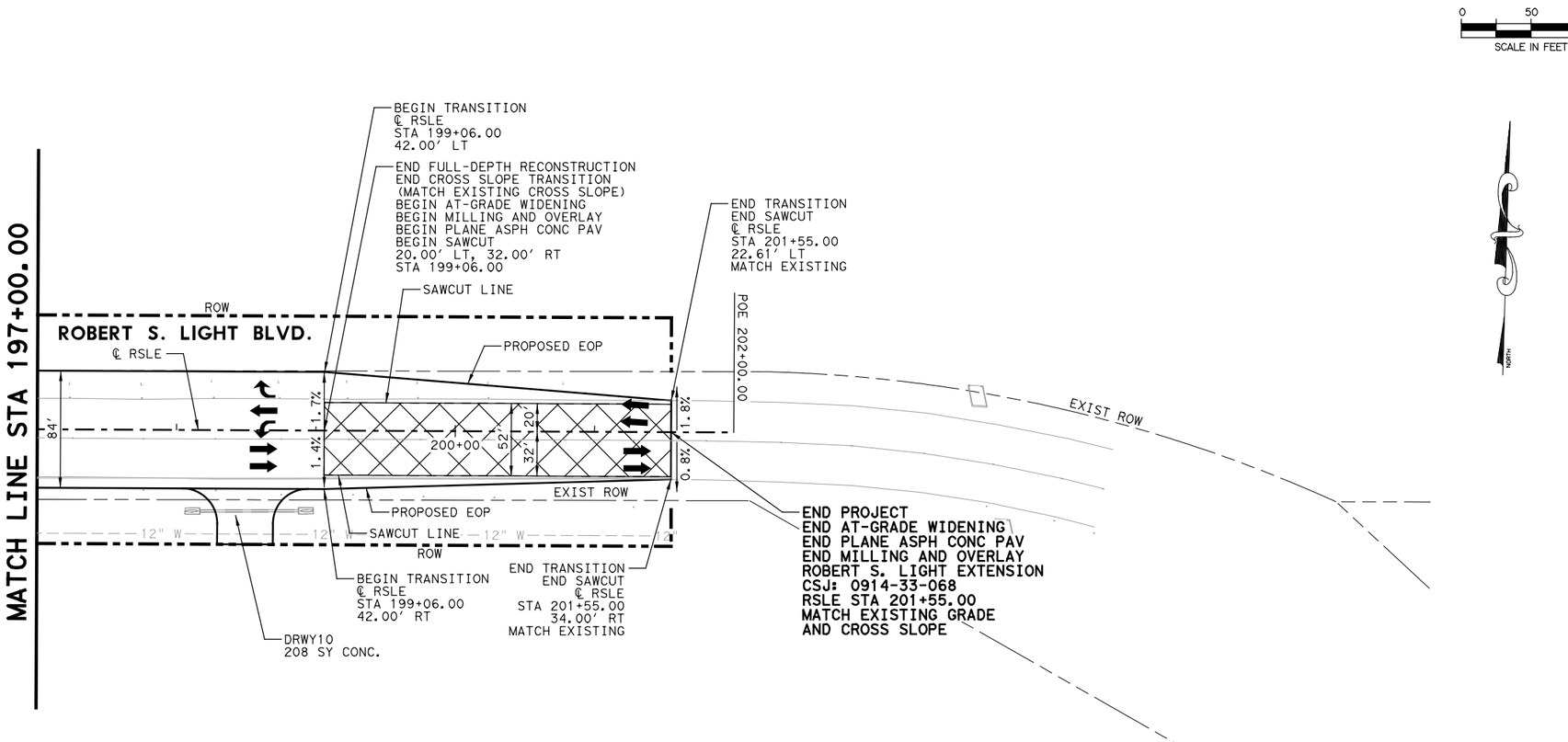
ROADWAY
PLAN AND PROFILE
ROBERT. S. LIGHT EXTENSION

SCALE: 1"=100'-H
1"=20'-V

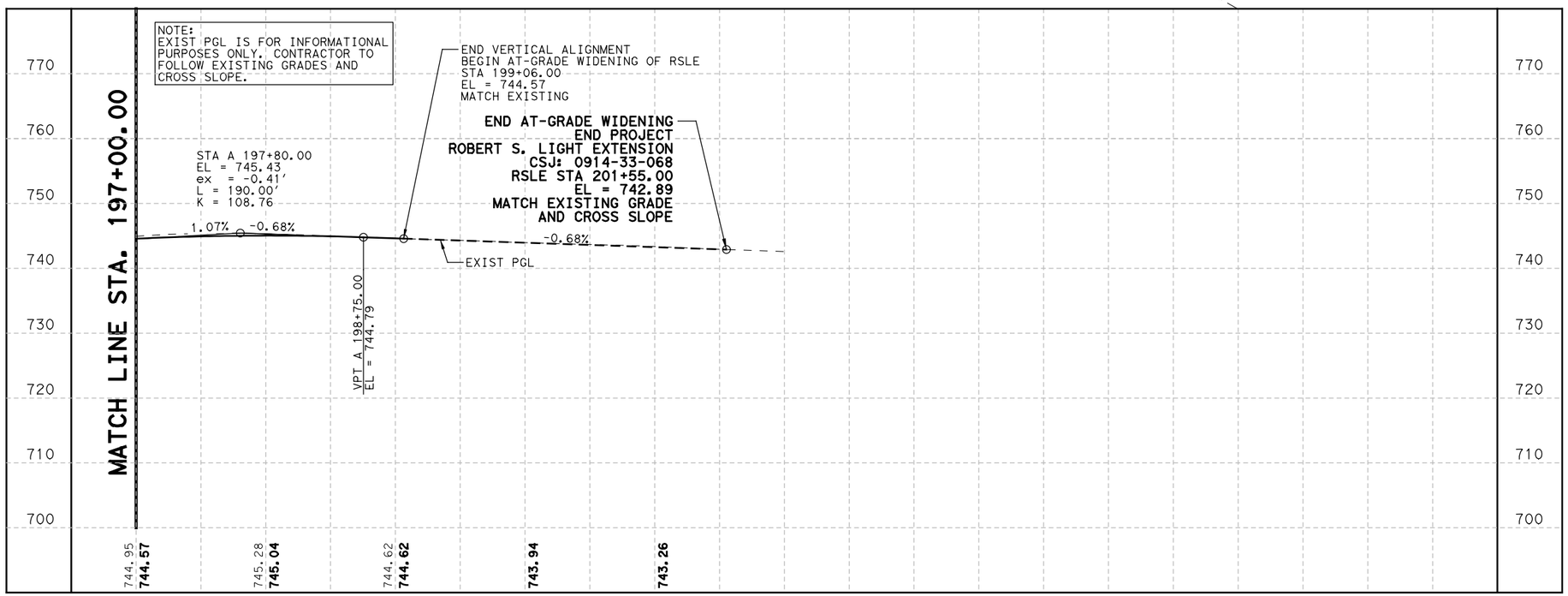
SHEET 10 OF 11

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JW	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
BD	TEXAS	AUS	HAYS	89
CHECK	CONTROL	SECTION	JOB	
DR	0914	33	068,ETC	
CHECK				
GV				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg PENTABLE: 000000000214615.tbl
USER: KBERGER DATE: 11/20/2020 TIME: 5:33:56 PM SCALE: 1:100
FILE: RSLE-RDWYPP10.dgn



NOTES:
1. STATIONING BASED ON RSLE WB BASELINE UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS ARE TO EDGE OF PAVEMENT (EOP) UNLESS OTHERWISE NOTED.
3. PGL LOCATION IS AT THE RSLE WB BASELINE.
4. REFER TO "DRIVEWAY SUMMARY" SHEET FOR ADDITIONAL INFORMATION. HMAC DRIVEWAYS TO BE CONSTRUCTED AND PAID SAME AS ROADWAY PAVEMENT.
5. REFER TO "INTERSECTION DETAIL" SHEETS FOR ADDITIONAL INFORMATION.



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ROBERT S. LIGHT EXTENSION

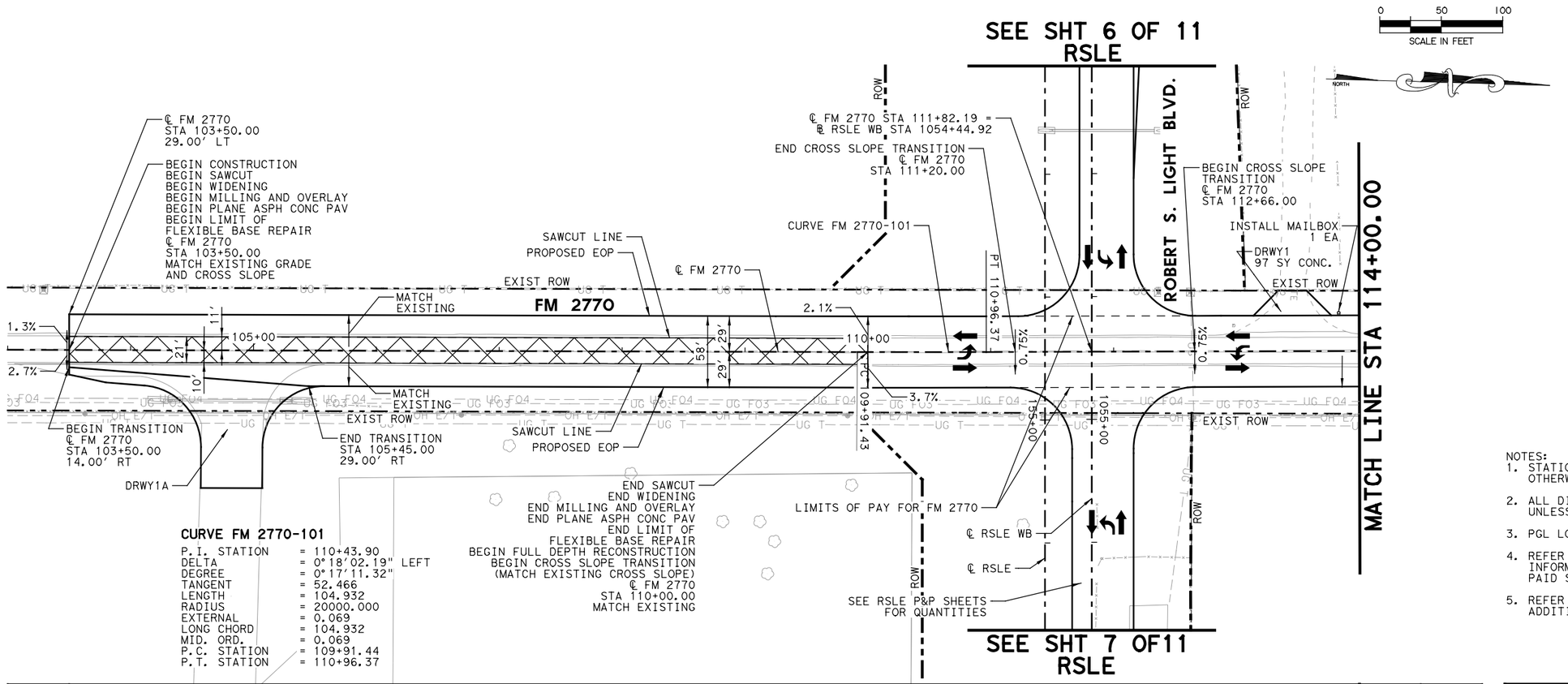
ROADWAY
PLAN AND PROFILE
ROBERT. S. LIGHT EXTENSION

SCALE: 1"=100'-H
1"=20'-V

SHEET 11 OF 11

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JW	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
BD	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	90
DR	0914	33	068,ETC	
CHECK				
GV				

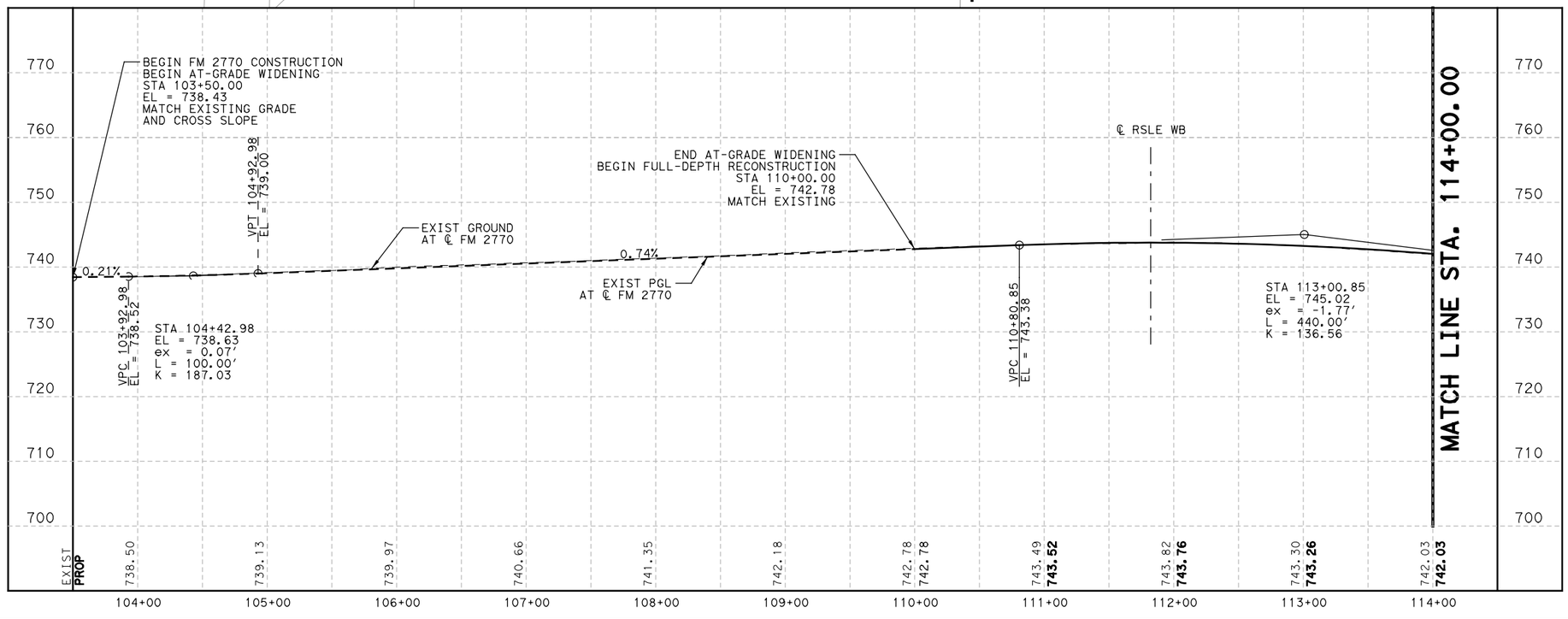
PENTABLE: 000000000246i5.tbl
TIME: 5:34:09 PM SCALE: 1:100
PLOT DRIVER: TXDOT_PDF_BW.pltcfg
USER: KBERGER DATE: 11/20/2020
FILE: RSLE-RDWYPPII.dgn



CURVE FM 2770-101

P.I. STATION	= 110+43.90
DELTA	= 0°18'02.19" LEFT
DEGREE	= 0°17'11.32"
TANGENT	= 52.466
LENGTH	= 104.932
RADIUS	= 20000.000
EXTERNAL	= 0.069
LONG CHORD	= 104.932
MID. ORD.	= 0.069
P.C. STATION	= 109+91.44
P.T. STATION	= 110+96.37

NOTES:
1. STATIONING BASED ON FM 2770 CENTERLINE UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS ARE TO EDGE OF PAVEMENT (EOP) UNLESS OTHERWISE NOTED.
3. PGL LOCATION IS AT THE FM 2770 CENTERLINE.
4. REFER TO "DRIVEWAY SUMMARY" SHEET FOR ADDITIONAL INFORMATION. HMAC DRIVEWAYS TO BE CONSTRUCTED AND PAID SAME AS ROADWAY PAVEMENT.
5. REFER TO "INTERSECTION DETAIL" SHEETS FOR ADDITIONAL INFORMATION.



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ROBERT S. LIGHT EXTENSION

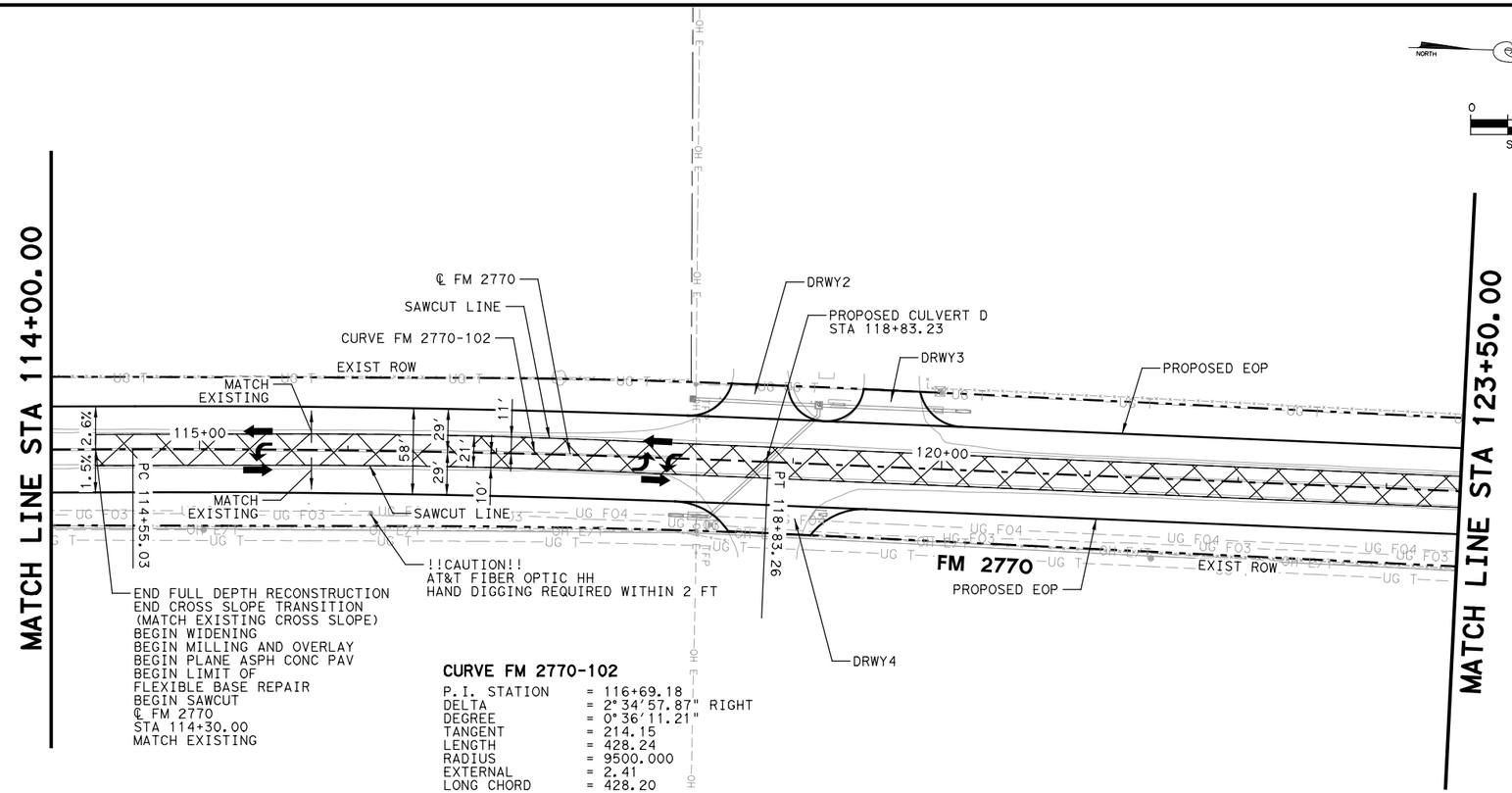
ROADWAY PLAN AND PROFILE FM 2770

SCALE: 1"=100'-H
1"=20'-V

SHEET 1 OF 3

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JW	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
BD	TEXAS	AUS	HAYS	91
CHECK	CONTROL	SECTION	JOB	
DR	0914	33	068,ETC	
CHECK				
GV				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
USER: KBERGER
FILE: RSLE-RDWYPP12.dgn
DATE: 12/2/2020
TIME: 11:29:25 AM
PENTABLE: 000000000214615.tbl
SCALE: 1:100



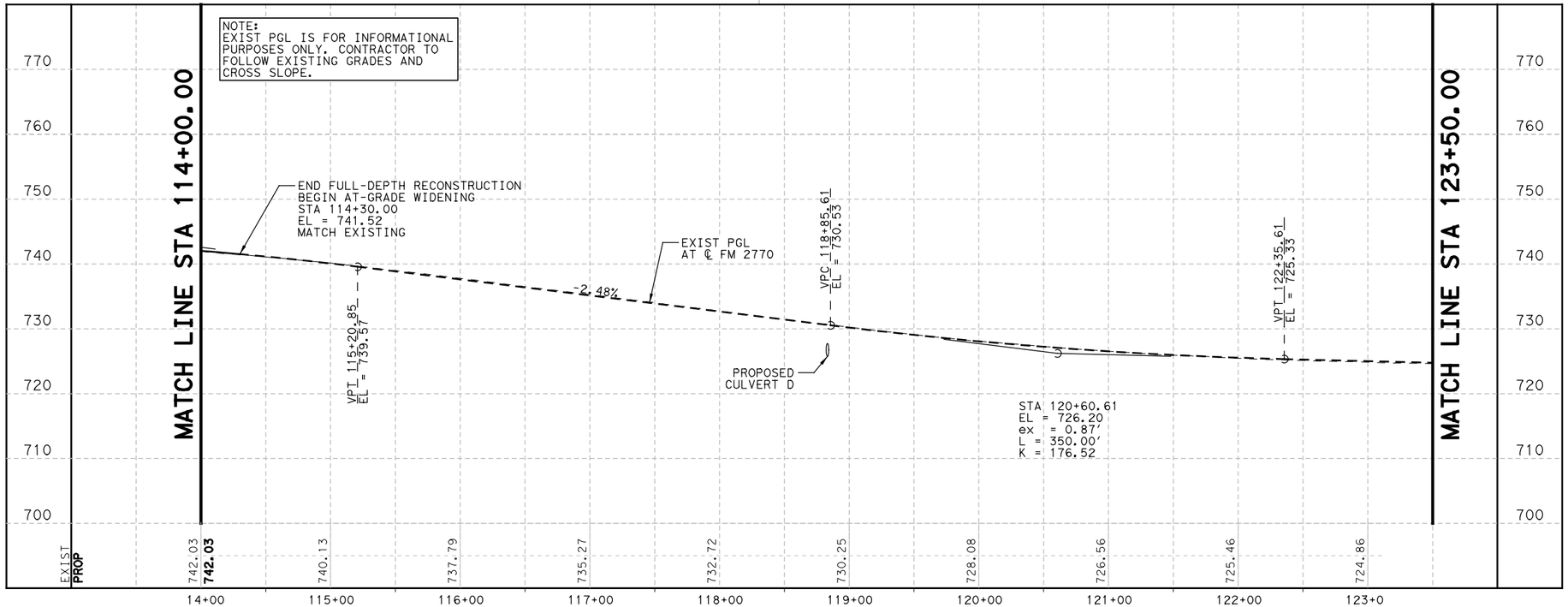
CURVE FM 2770-102

P.I. STATION	= 116+69.18
DELTA	= 2°34'57.87" RIGHT
DEGREE	= 0°36'11.21"
TANGENT	= 214.15
LENGTH	= 428.24
RADIUS	= 9500.000
EXTERNAL	= 2.41
LONG CHORD	= 428.20
MID. ORD.	= 2.41
P.C. STATION	= 114+55.03
P.T. STATION	= 118+83.26

LEGEND

MILL & OVERLAY

NOTES:
1. STATIONING BASED ON FM 2770 CENTERLINE UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS ARE TO EDGE OF PAVEMENT (EOP) UNLESS OTHERWISE NOTED.
3. PGL LOCATION IS AT THE FM 2770 CENTERLINE.
4. REFER TO "DRIVEWAY SUMMARY" SHEET FOR ADDITIONAL INFORMATION. HMAC DRIVEWAYS TO BE CONSTRUCTED AND PAID SAME AS ROADWAY PAVEMENT.
5. REFER TO "INTERSECTION DETAIL" SHEETS FOR ADDITIONAL INFORMATION.



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Texas Department of Transportation

ROBERT S. LIGHT EXTENSION

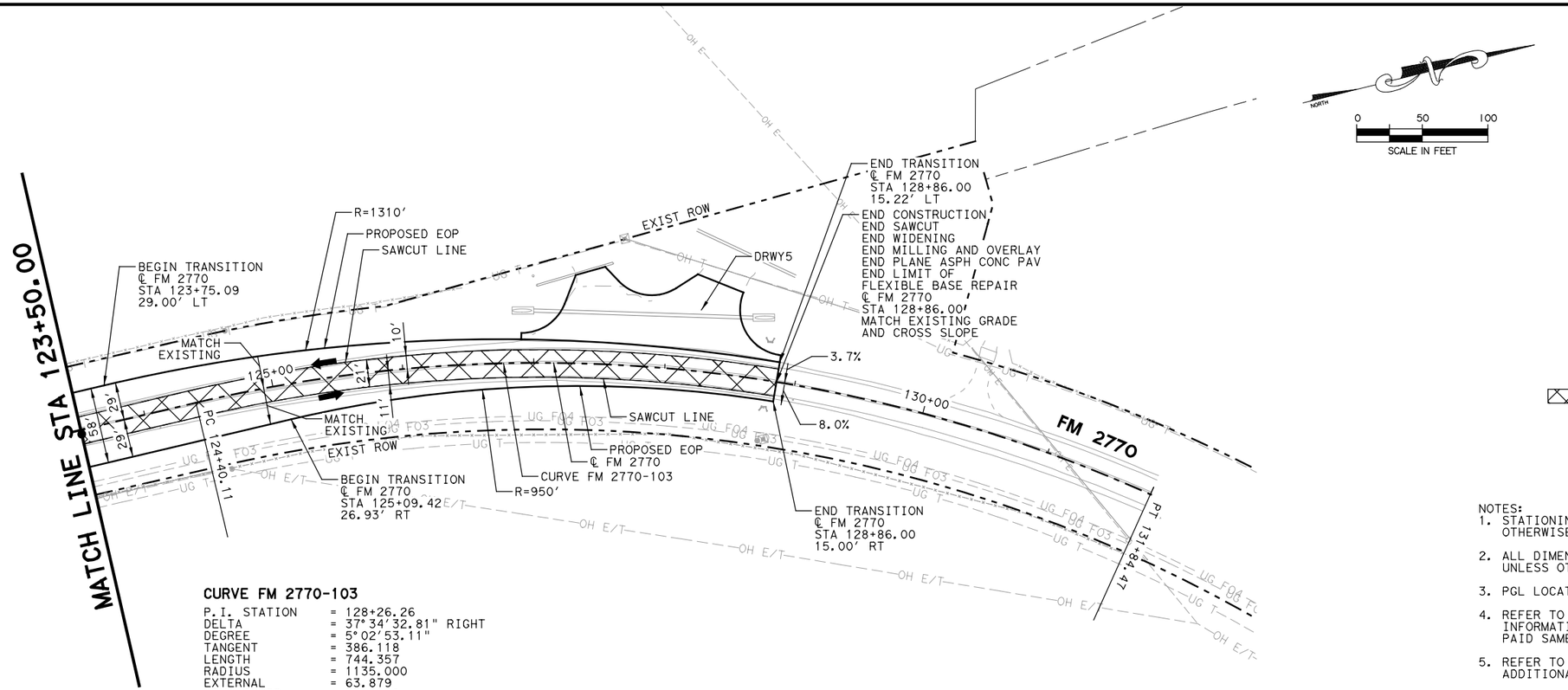
ROADWAY PLAN AND PROFILE FM 2770

SCALE: 1"=100'-H
1"=20'-V

SHEET 2 OF 3

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JW	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
BD	TEXAS	AUS	HAYS	92
CHECK	CONTROL	SECTION	JOB	
DR	0914	33	068,ETC	
CHECK				
GV				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg PENTABLE: 0000000002l4615.tbl
USER: KBERGER DATE: 12/2/2020 TIME: 11:29:27 AM SCALE: 1:100
FILE: RSLE-RDWYPP13.dgn



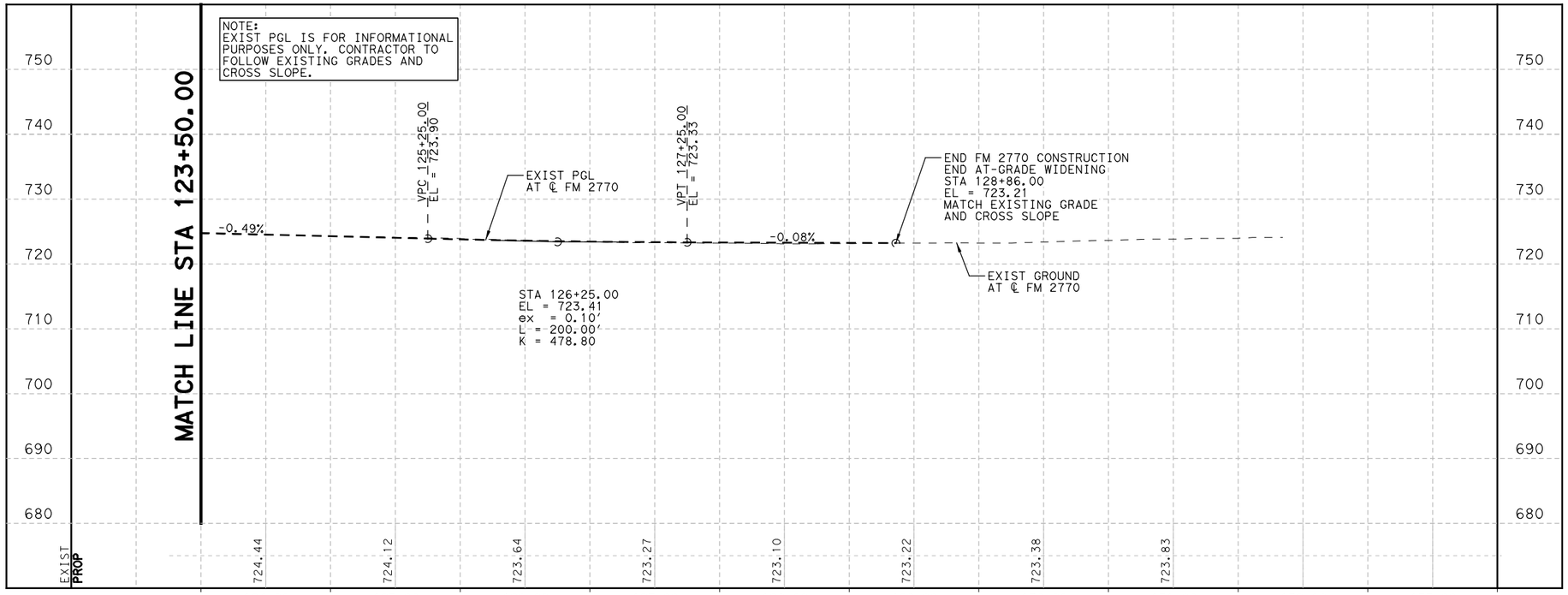
LEGEND

MILL & OVERLAY

NOTES:
1. STATIONING BASED ON FM 2770 CENTERLINE UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS ARE TO EDGE OF PAVEMENT (EOP) UNLESS OTHERWISE NOTED.
3. PGL LOCATION IS AT THE FM 2770 CENTERLINE.
4. REFER TO "DRIVEWAY SUMMARY" SHEET FOR ADDITIONAL INFORMATION. HMAC DRIVEWAYS TO BE CONSTRUCTED AND PAID SAME AS ROADWAY PAVEMENT.
5. REFER TO "INTERSECTION DETAIL" SHEETS FOR ADDITIONAL INFORMATION.

CURVE FM 2770-103

P.I. STATION	= 128+26.26
DELTA	= 37°34'32.81" RIGHT
DEGREE	= 5°02'53.11"
TANGENT	= 386.118
LENGTH	= 744.357
RADIUS	= 1135.000
EXTERNAL	= 63.879
LONG CHORD	= 731.089
MID. ORD.	= 60.476
P.C. STATION	= 124+40.14
P.T. STATION	= 131+84.50



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ROBERT S. LIGHT EXTENSION

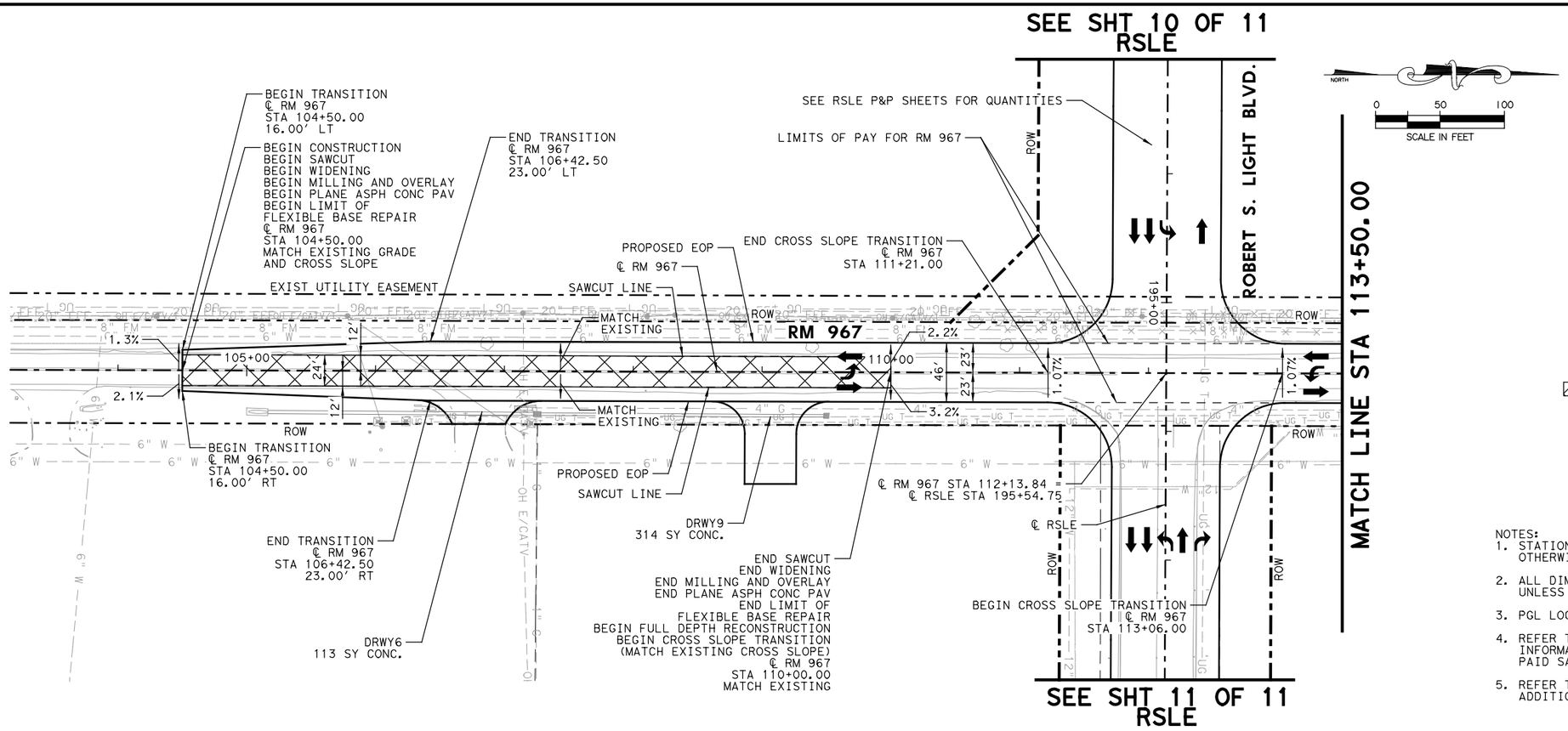
ROADWAY PLAN AND PROFILE FM 2770

SCALE: 1"=100'-H
1"=20'-V

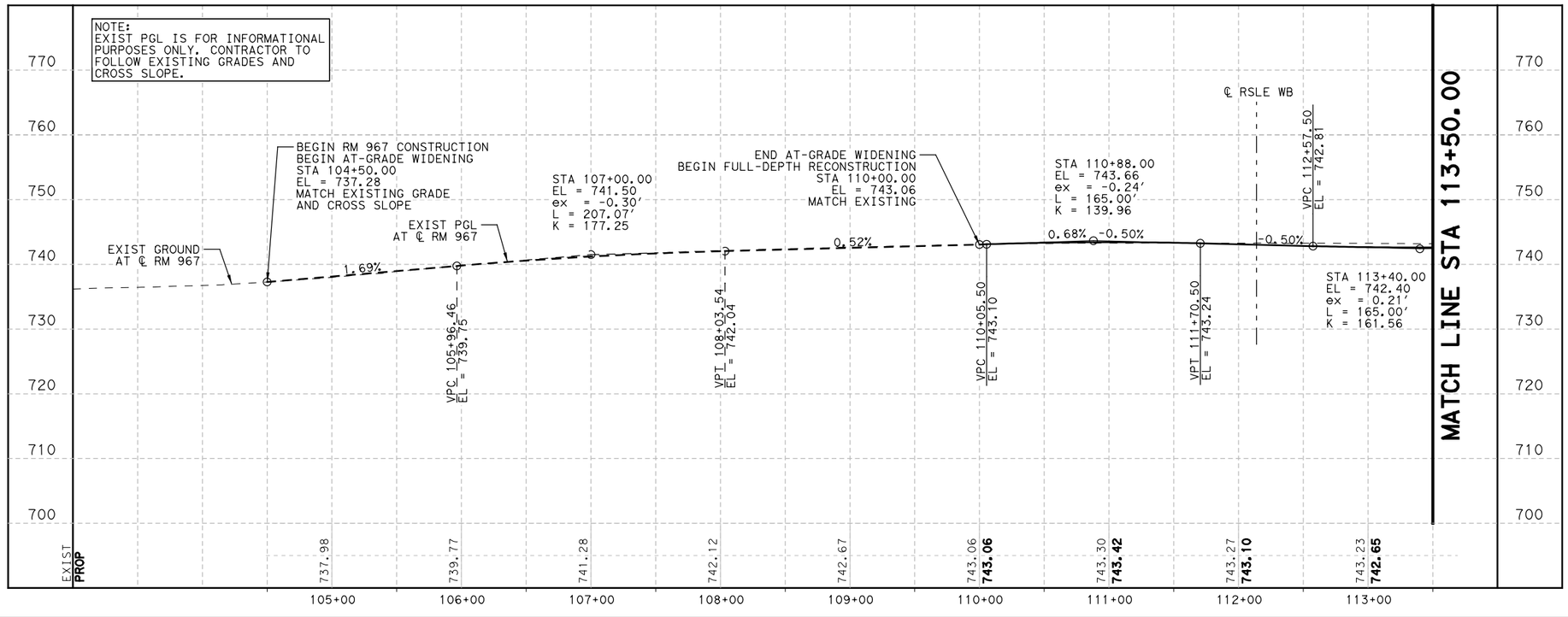
SHEET 3 OF 3

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JW	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
BD	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	93
DR	0914	33	068,ETC	
CHECK				
GV				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg PENTABLE: 000000002l46l5.tbl
USER: KBERGER DATE: 12/2/2020 TIME: 11:29:38 AM SCALE: 1:00
FILE: RSLE-RDWYPP14.dgn



NOTES:
1. STATIONING BASED ON RM 967 CENTERLINES UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS ARE TO EDGE OF PAVEMENT (EOP) UNLESS OTHERWISE NOTED.
3. PGL LOCATION IS AT THE RM 967 CENTERLINE.
4. REFER TO "DRIVEWAY SUMMARY" SHEET FOR ADDITIONAL INFORMATION. HMAC DRIVEWAYS TO BE CONSTRUCTED AND PAID SAME AS ROADWAY PAVEMENT.
5. REFER TO "INTERSECTION DETAIL" SHEETS FOR ADDITIONAL INFORMATION.



STATE OF TEXAS
JACOB E. WALKER
122057
LICENSED
PROFESSIONAL ENGINEER
12/09/2020
Jacob E. Walker, PE

HAYS COUNTY TEXAS

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San Marcos, TX 78666-7969
Texas Registered Engineering Firm F-754

Texas Department of Transportation
℗ 2020

ROBERT S. LIGHT EXTENSION

ROADWAY PLAN AND PROFILE RM 967

SCALE: 1"=100'-H
1"=20'-V

SHEET 1 OF 2

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JW	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
BD	TEXAS	AUS	HAYS	94
CHECK	CONTROL	SECTION	JOB	
DR	0914	33	068,ETC	
CHECK				
GV				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
USER: KBERGER DATE: 12/2/2020 TIME: 11:29:49 AM SCALE: 1:100
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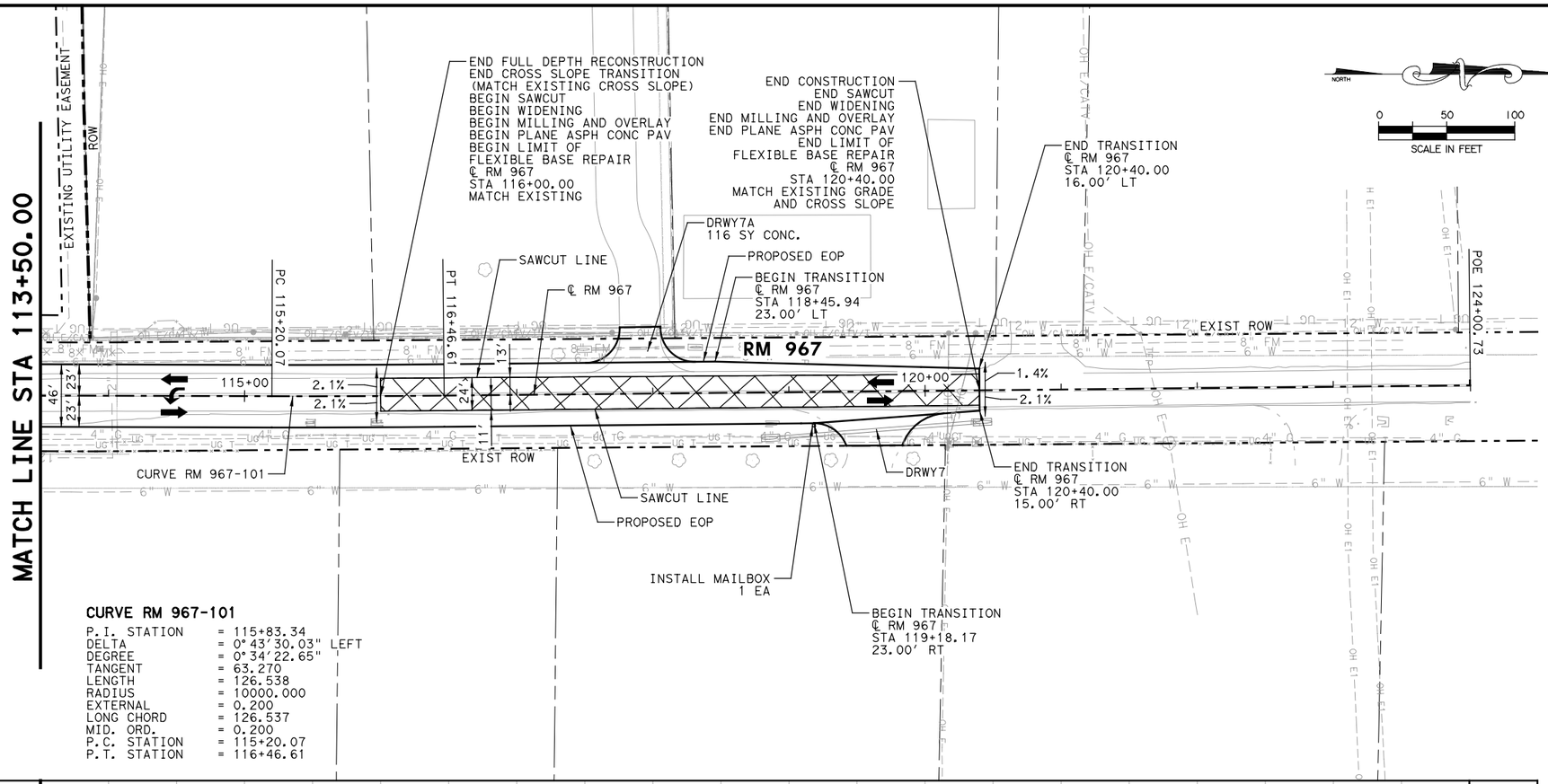
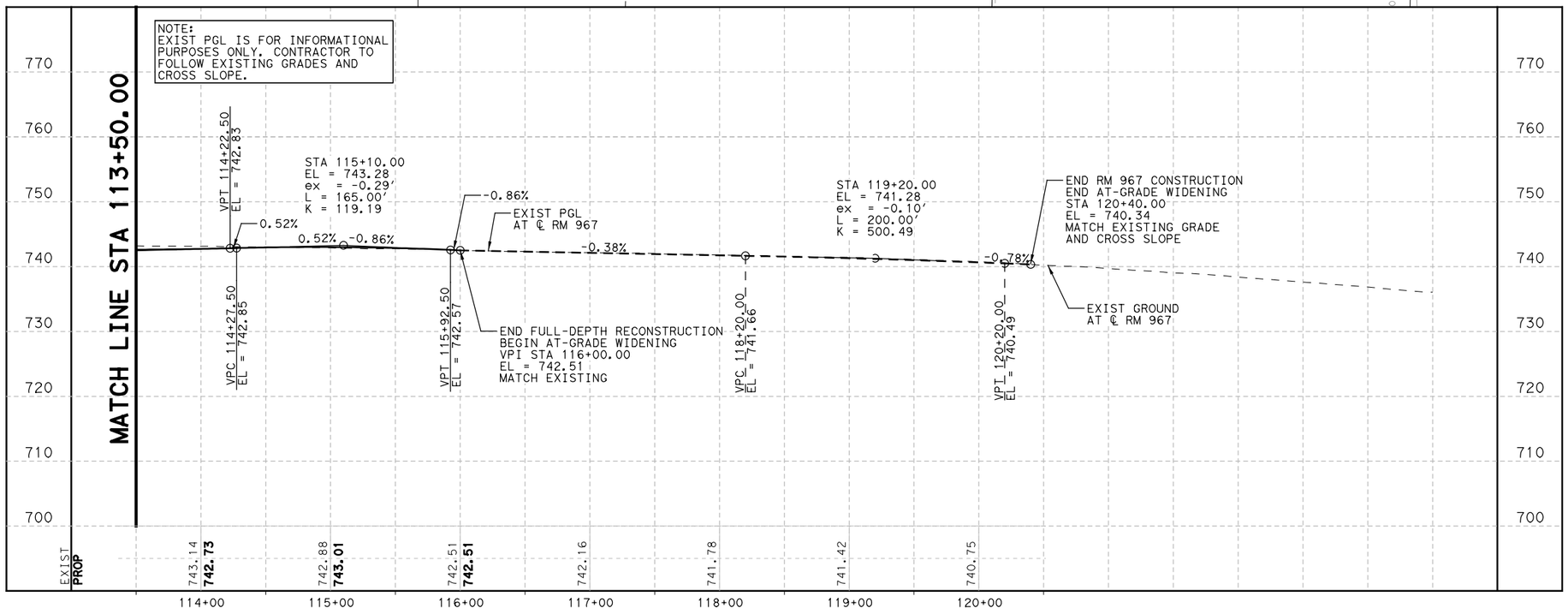


CURVE RM 967-101

P.I. STATION	= 115+83.34
DELTA	= 0°43'30.03" LEFT
DEGREE	= 0°34'22.65"
TANGENT	= 63.270
LENGTH	= 126.538
RADIUS	= 10000.000
EXTERNAL	= 0.200
LONG CHORD	= 126.537
MID. ORD.	= 0.200
P.C. STATION	= 115+20.07
P.T. STATION	= 116+46.61

NOTES:
1. STATIONING BASED ON RM 967 CENTERLINES UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS ARE TO EDGE OF PAVEMENT (EOP) UNLESS OTHERWISE NOTED.
3. PGL LOCATION IS AT THE RM 967 CENTERLINE.
4. REFER TO "DRIVEWAY SUMMARY" SHEET FOR ADDITIONAL INFORMATION. HMAC DRIVEWAYS TO BE CONSTRUCTED AND PAID SAME AS ROADWAY PAVEMENT.
5. REFER TO "INTERSECTION DETAIL" SHEETS FOR ADDITIONAL INFORMATION.



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ROBERT S. LIGHT EXTENSION

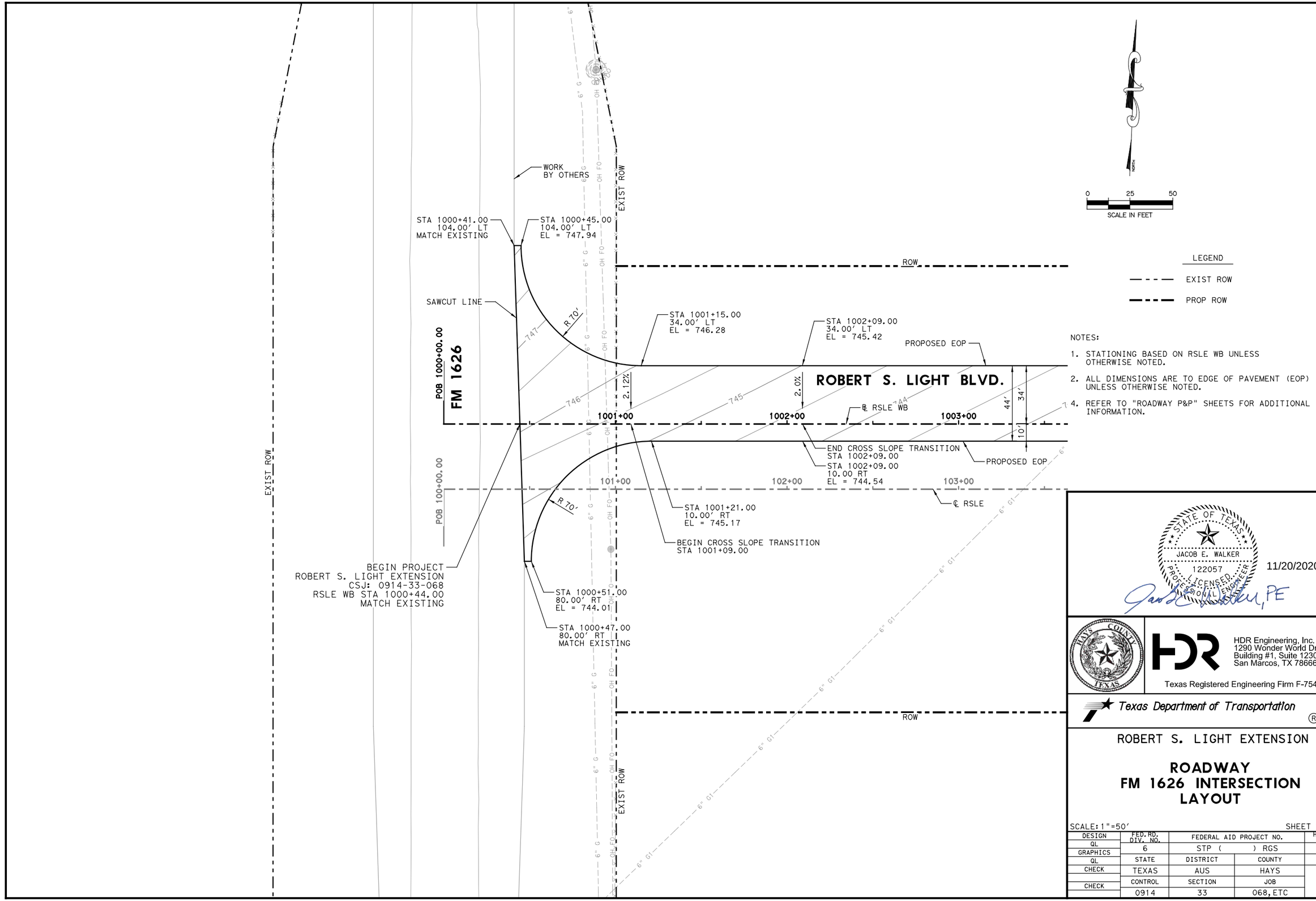
ROADWAY PLAN AND PROFILE RM 967

SCALE: 1"=100'-H
1"=20'-V

SHEET 2 OF 2

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JW	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
BD	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	95
DR	0914	33	068,ETC	
CHECK				
GV				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg PENTABLE: 000000002\46i5.tbl
USER: KBERGER DATE: 12/2/2020 TIME: 11:30:01 AM SCALE: 1:100
FILE: RSLE-RDWYPP16.dgn



NOTES:

1. STATIONING BASED ON RSLE WB UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS ARE TO EDGE OF PAVEMENT (EOP) UNLESS OTHERWISE NOTED.
4. REFER TO "ROADWAY P&P" SHEETS FOR ADDITIONAL INFORMATION.

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ROBERT S. LIGHT EXTENSION

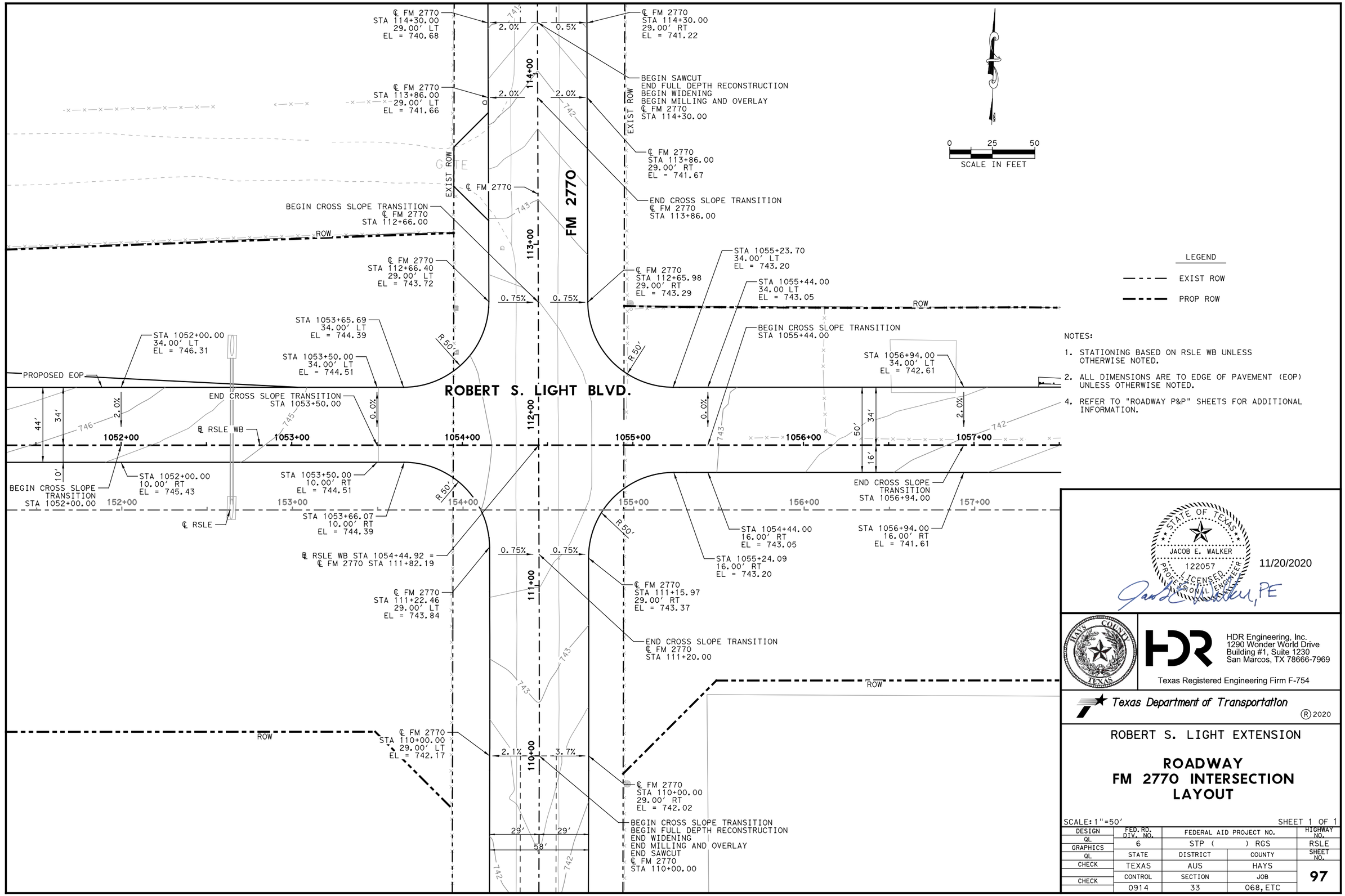
ROADWAY
FM 1626 INTERSECTION
LAYOUT

SCALE: 1"=50'

SHEET 1 OF 1

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
QL	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
QL	TEXAS	AUS	HAYS	96
CHECK	CONTROL	SECTION	JOB	
CHECK	0914	33	068,ETC	

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
USER: KBERGER DATE: 11/20/2020 TIME: 5:35:22 PM SCALE: 1:50
FILE: RSLE-FM1626INT.dgn PENTABLE: 000000000214615.tbl



NOTES:

1. STATIONING BASED ON RSLE WB UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS ARE TO EDGE OF PAVEMENT (EOP) UNLESS OTHERWISE NOTED.
4. REFER TO "ROADWAY P&P" SHEETS FOR ADDITIONAL INFORMATION.

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ROBERT S. LIGHT EXTENSION

ROADWAY
FM 2770 INTERSECTION
LAYOUT

SCALE: 1"=50'

SHEET 1 OF 1

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
QL	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
QL	TEXAS	AUS	HAYS	97
CHECK	CONTROL	SECTION	JOB	
CHECK	0914	33	068, ETC	

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
USER: KBERGER
FILE: RSLE-FM2770INT.dgn
DATE: 11/20/2020
TIME: 5:35:32 PM
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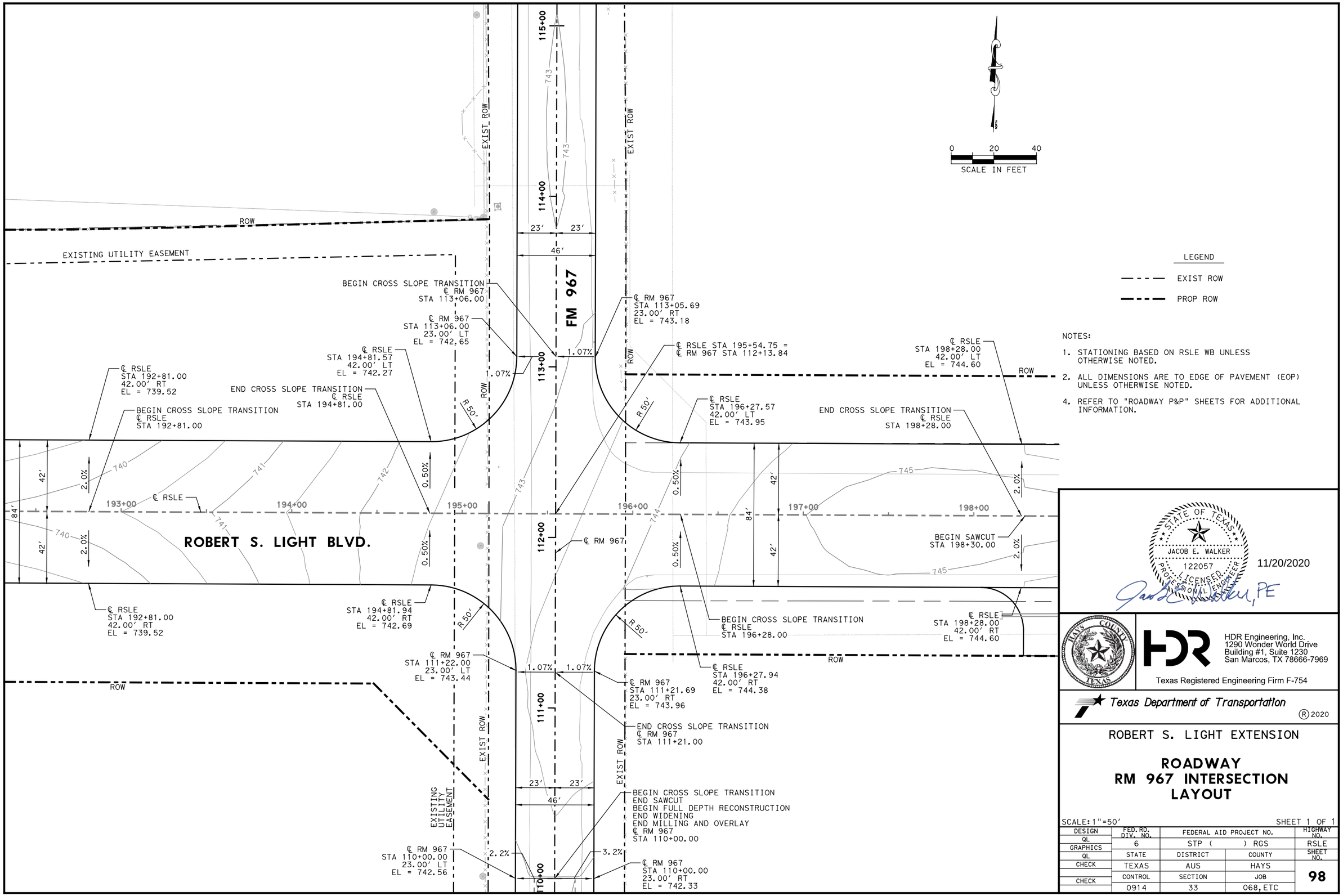

NOTES:

1. STATIONING BASED ON RSLE WB UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS ARE TO EDGE OF PAVEMENT (EOP) UNLESS OTHERWISE NOTED.
4. REFER TO "ROADWAY P&P" SHEETS FOR ADDITIONAL INFORMATION.

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ROBERT S. LIGHT EXTENSION

ROADWAY RM 967 INTERSECTION LAYOUT

SCALE: 1"=50′ SHEET 1 OF 1

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
QL	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
QL	TEXAS	AUS	HAYS	98
CHECK	CONTROL	SECTION	JOB	
CHECK	0914	33	068,ETC	

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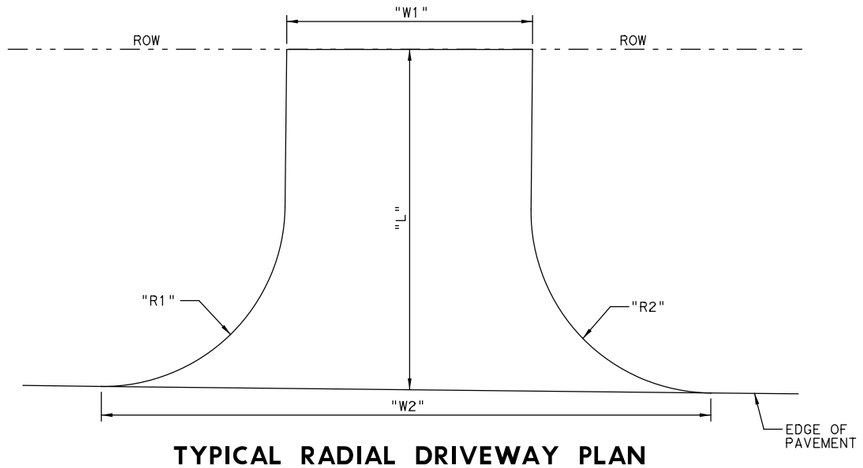
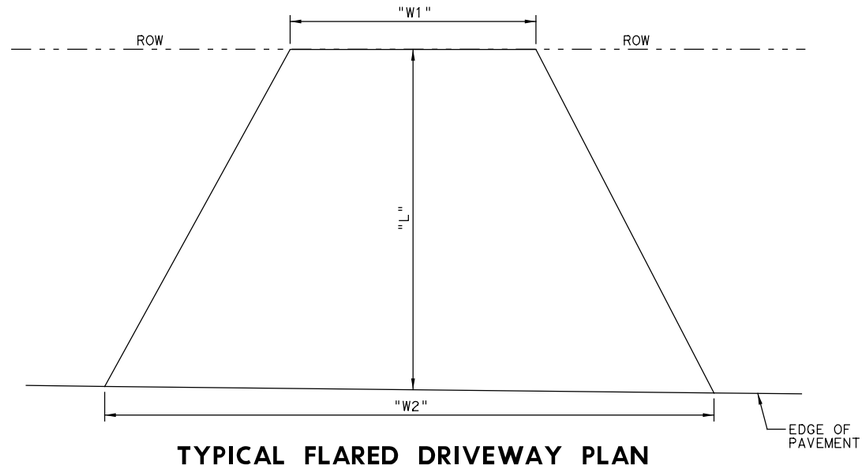
USER: KBERGER DATE: 11/20/2020 TIME: 5:35:41 PM SCALE: 1:50
FILE: RSLE-RM967INT.dgn

DRIVEWAY SUMMARY										
DRIVEWAY NO.	ALIGNMENT	TYPE	MATERIAL	STATION	OFFSET	"L"	"W1"	"W2"	"R1"	"R2"
1A	FM 2770	RADIAL	ASPHALT	104+82.61	SEE DRIVEWAY 1A PLAN AND PROFILE SHEET					
1	FM 2770	FLARED	CONCRETE	113+45.65	29.00′ LT	20.25′	23.05′	63.35	N/A	N/A
2	FM 2770	RADIAL	ASPHALT	118+75.53	29.00′ LT	22.70′	37.82′	N/A	30.00′	25.00′
3	FM 2770	RADIAL	ASPHALT	119+64.48	29.00′ LT	22.61′	38.08′	N/A	25.00′	30.00′
4	FM 2770	RADIAL	ASPHALT	118+86.26	29.00′ RT	18.93′	55.57′	N/A	45.00′	45.00′
5	FM 2770	RADIAL	ASPHALT	SEE DETAIL THIS SHEET						
6	RM 967	RADIAL	CONCRETE	106+81.38	23.00′ RT	41.00′	42.06′	N/A	30.00′	30.00′
7	RM 967	RADIAL	ASPHALT	119+62.39	20.10′ RT	19.77′	41.03′	N/A	35.00′	25.00′
7A	RM 967	RADIAL	CONCRETE	117+91.34	23.00′ LT	26.00′	30.00′	N/A	25.00′	25.00′
8	RSLE WB	RADIAL	ASPH. & CONC.	1050+38.93	34.00′ LT	SEE ROADWAY PLAN AND PROFILE SHEET				
9	RM 967	RADIAL	CONCRETE	109+06.72	23.00′ RT	64.00′	40.00′	N/A	25.00′	25.00′
10	RSLE WB	RADIAL	CONCRETE	198+49.41	42.00′ RT	41.00′	40.00′	N/A	25.00′	25.00′



TYPICAL RADIAL DRIVEWAY PLAN

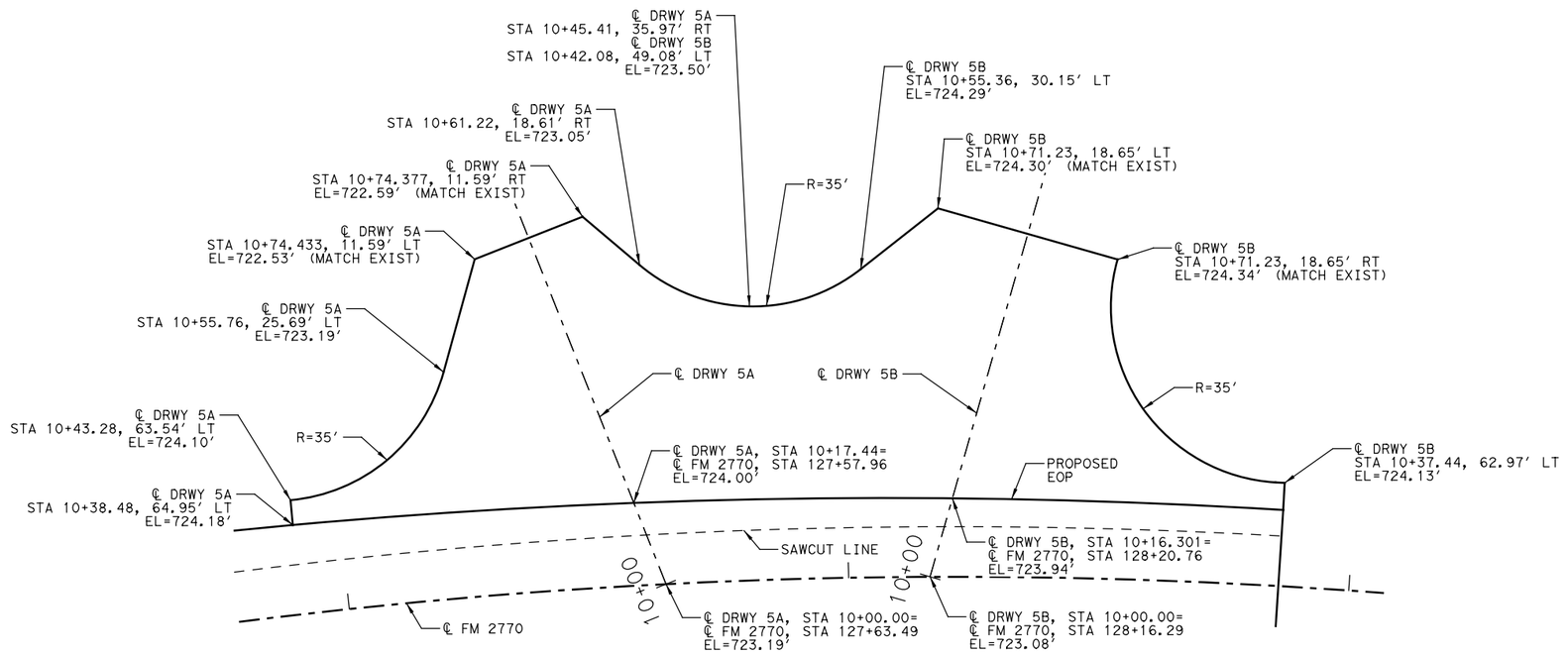
(NOT TO SCALE)



TYPICAL FLARED DRIVEWAY PLAN

(NOT TO SCALE)

NOTES:
1. SEE "CONCRETE DRIVEWAYS, SIDEWALKS AND MEDIANS" TXDOT AUSTIN DISTRICT STANDARD FOR CONCRETE DRIVEWAY DETAILS.
2. CONCRETE DRIVEWAYS TO BE CONSTRUCTED USING CLASS C CONCRETE.
3. ASPHALT DRIVEWAYS TO BE CONSTRUCTED USING THE SAME PAVEMENT SECTION AS THE ADJOINING ROAD.
4. NO SEPARATE PAY FOR ASPHALT DRIVEWAYS. ROADWAY PAVEMENT QUANTITIES REFLECT ASPHALT DRIVEWAYS.



DRIVEWAY 5 DETAIL

(NOT TO SCALE)

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11/20/2020

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Texas Department of Transportation

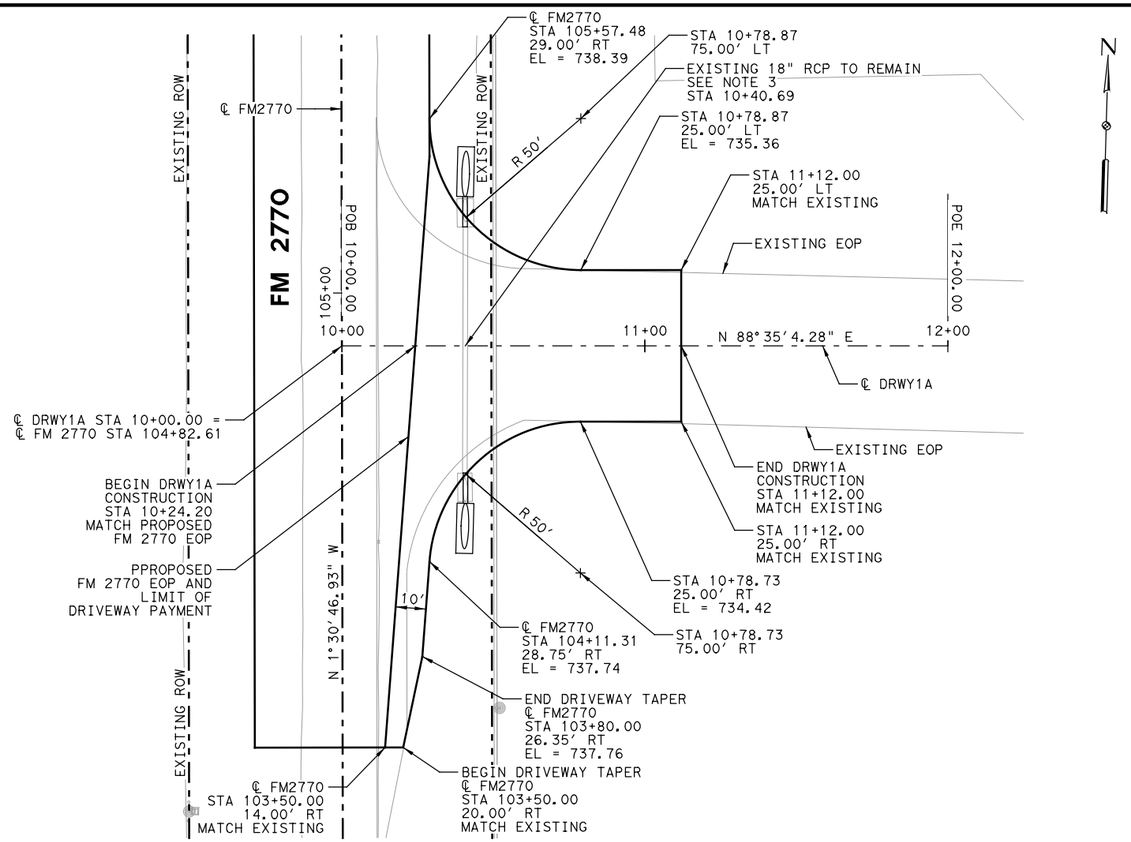
ROBERT S. LIGHT EXTENSION

DRIVEWAY SUMMARY

SHEET 1 OF 1

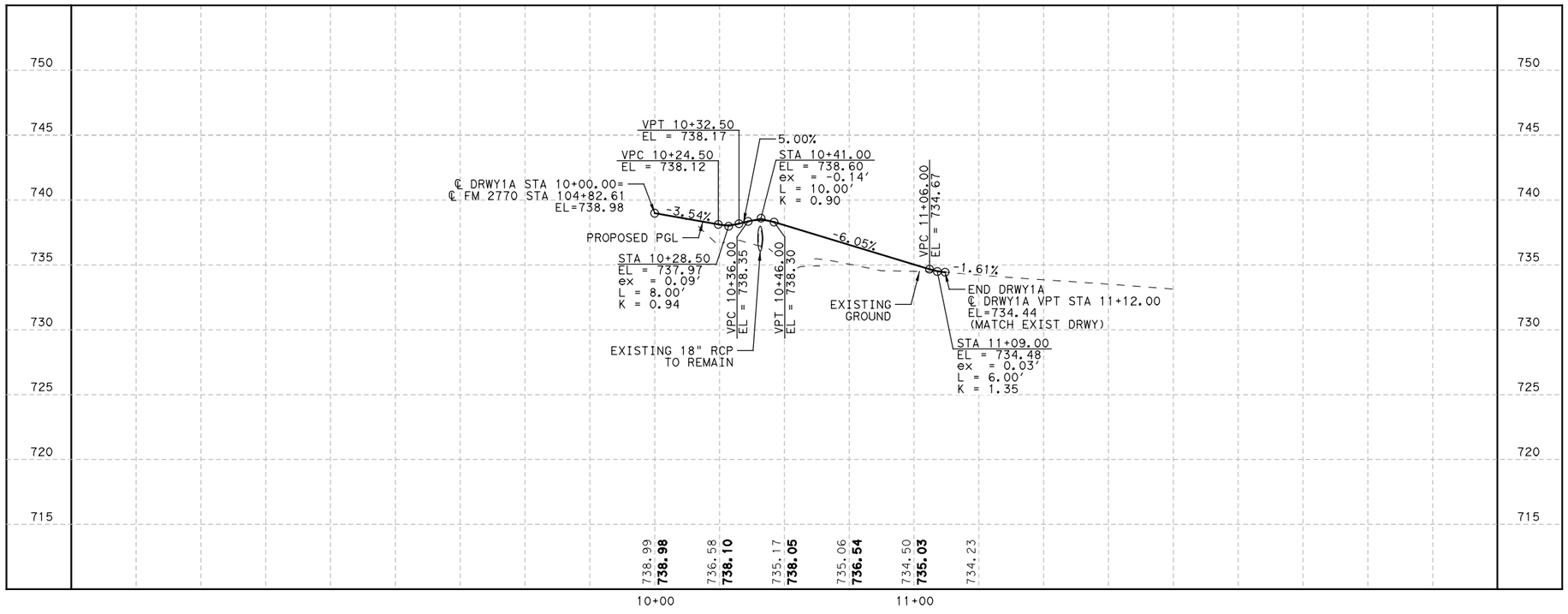
DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
QL	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
KB	TEXAS	AUS	HAYS	99
CHECK	CONTROL	SECTION	JOB	
JW	0914	33	068,ETC	
CHECK				
QL				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
USER: KBERGER
FILE: RSLE-DRVSUM01.dgn
PENTABLE: 000000002146I5.tbl
DATE: 11/20/2020
TIME: 5:35:45 PM
SCALE: NO



NOTES:

1. ALL DIMENSIONS AND OFFSETS ARE TO EDGE OF PAVEMENT (EOP) AND ARE BASED ON DRIVEWAY 1A CENTERLINE (℄ DRWY1A) UNLESS OTHERWISE NOTED.
2. SEE DRIVEWAY SUMMARY SHEET FOR DRIVEWAY MATERIAL AND NOTES.
3. SEE DRAINAGE SHEETS FOR EXISTING CULVERT EXTENSION DETAILS.



STATE OF TEXAS
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ROBERT S. LIGHT EXTENSION

DRIVEWAY 1A PLAN AND PROFILE

SCALE: 1"=50'-H
1"=10'-V

SHEET 1 OF 1

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
IA	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
IA	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	100
JCW	0914	33	068,ETC	
CHECK				
JCW				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
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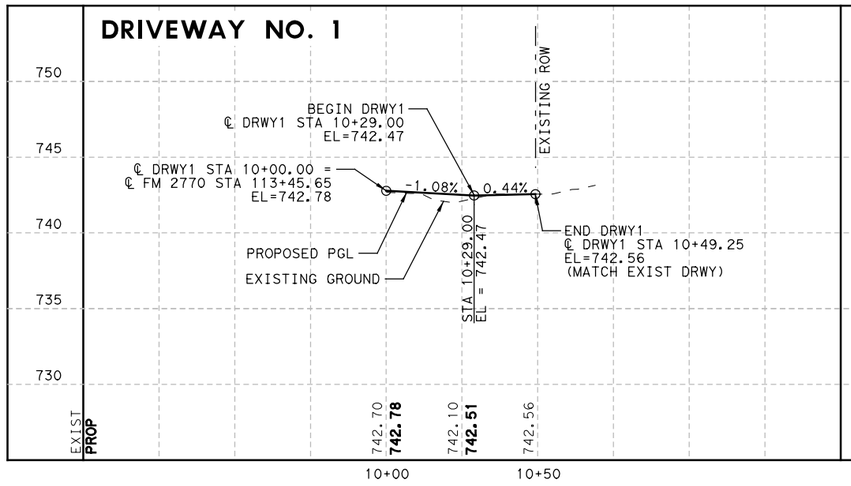
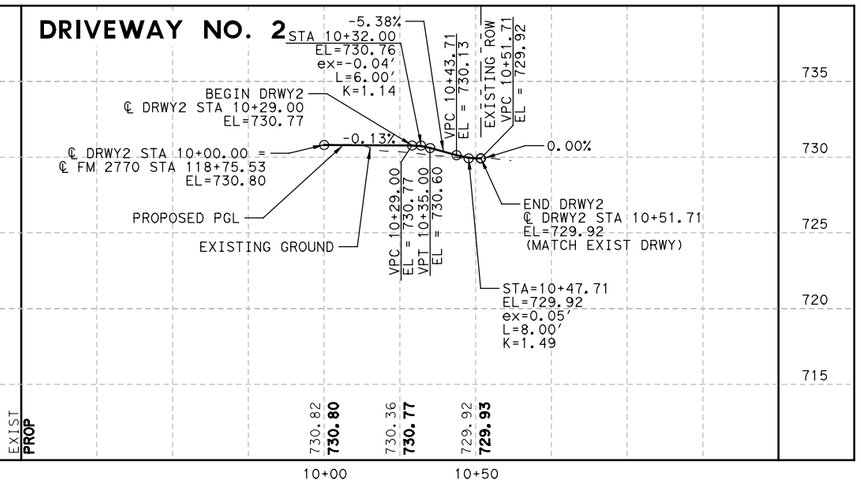
FILE: RSLE_DRVYPP1.dgn PENTABLE: 000000000214615.tbl

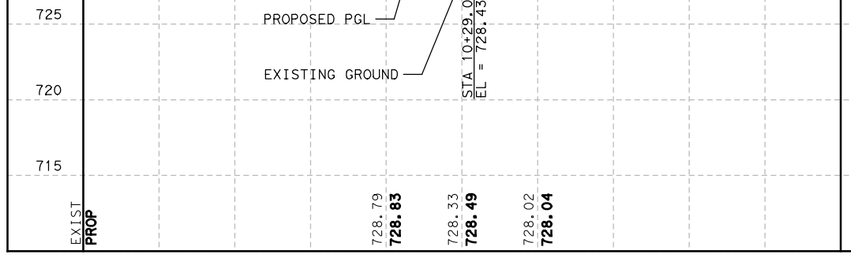
DRIVEWAY NO. 1



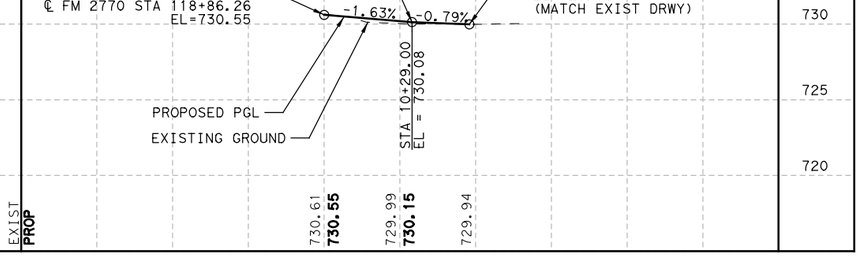
DRIVEWAY NO. 2



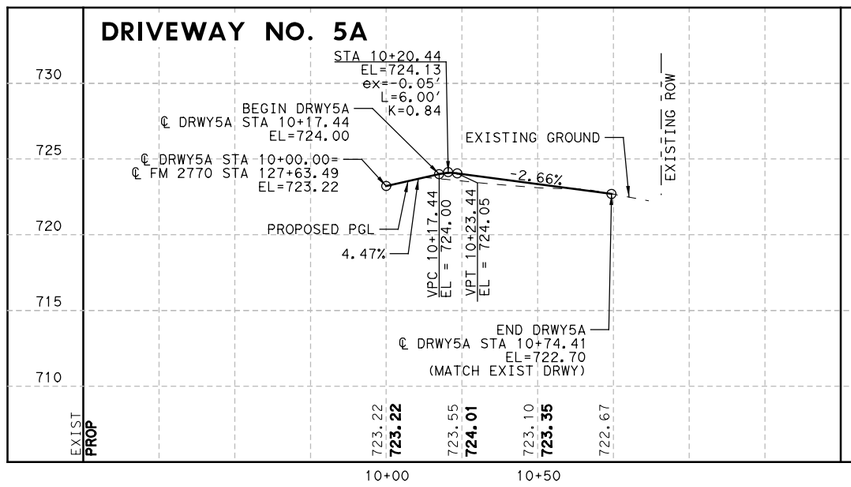
DRIVEWAY NO. 3



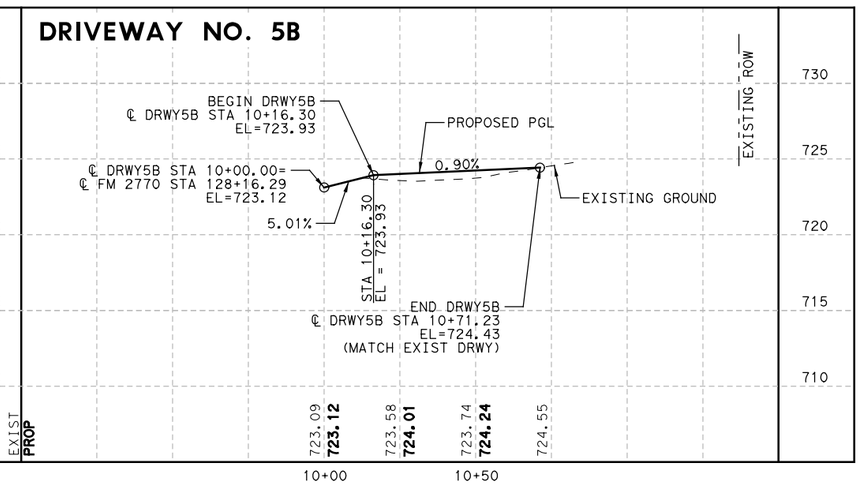
DRIVEWAY NO. 4



DRIVEWAY NO. 5A



DRIVEWAY NO. 5B



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ROBERT S. LIGHT EXTENSION

DRIVEWAY PROFILES

SCALE: 1"=50'-H
1"=10'-V

SHEET 1 OF 3

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
IA	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
IA	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	101
JCW	0914	33	068,ETC	
CHECK				
JCW				

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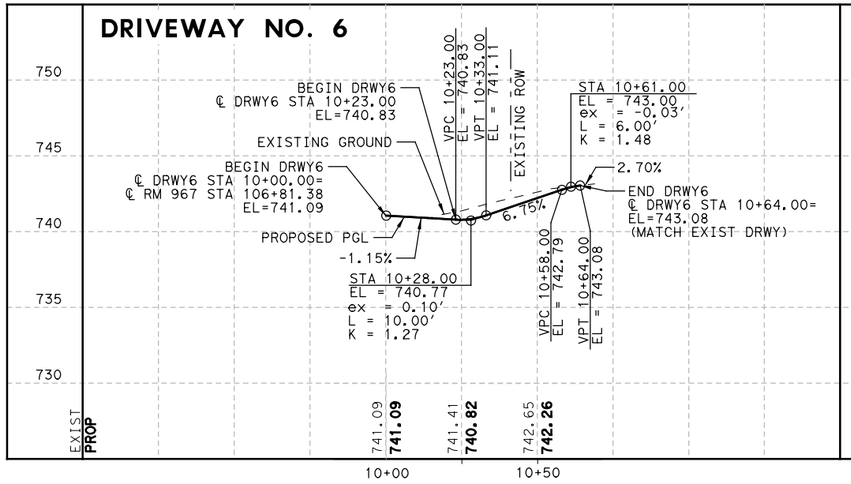
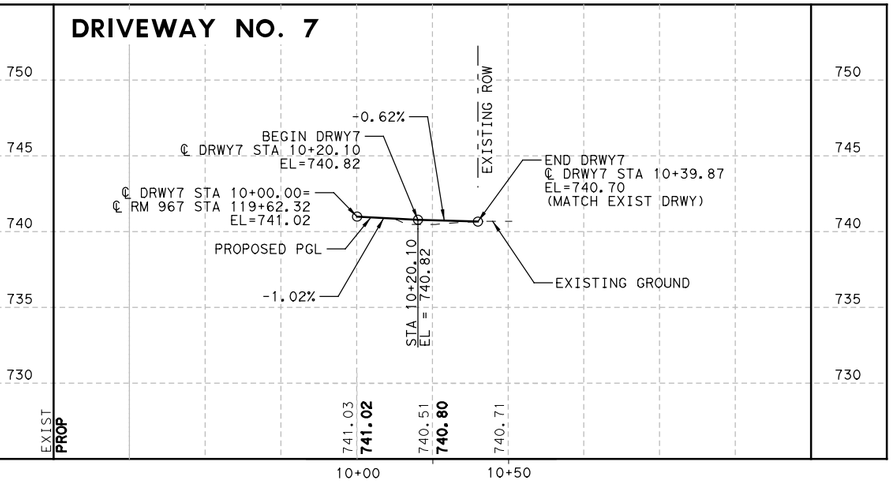
FILE: RSLE_DRWYPP2.dgn

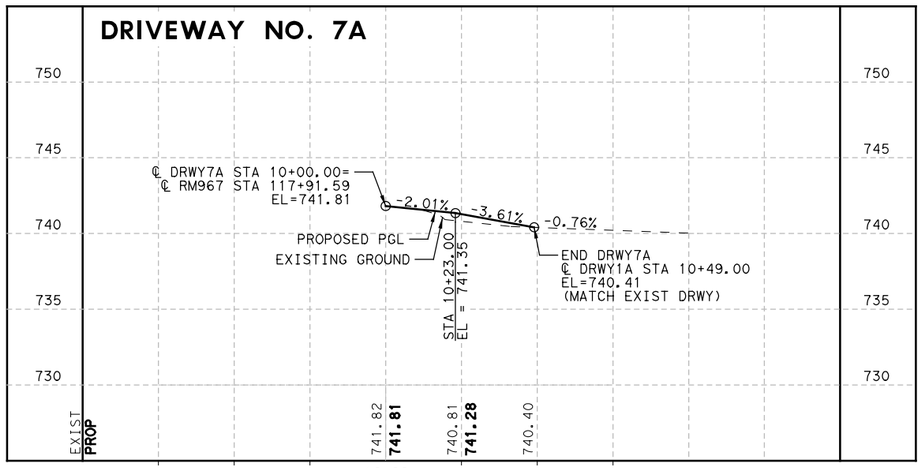
DRIVEWAY NO. 6



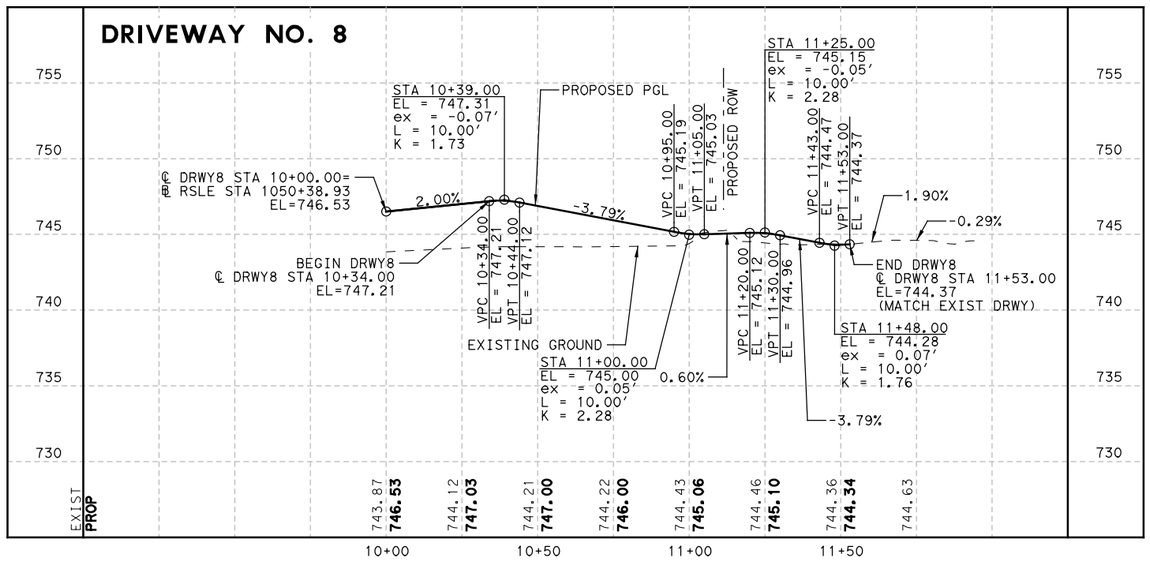
DRIVEWAY NO. 7



DRIVEWAY NO. 7A



DRIVEWAY NO. 8



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USER: KBERGER DATE: 11/20/2020 TIME: 5:36:03 PM SCALE: 1:50
FILE: RSLE_DRVYPP3.dgn

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ROBERT S. LIGHT EXTENSION

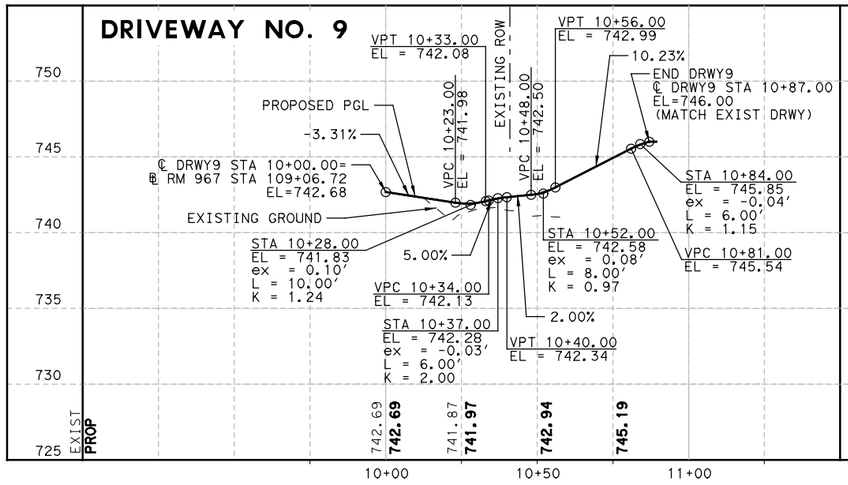
DRIVEWAY PROFILES

SCALE: 1"=50'-H
1"=10'-V

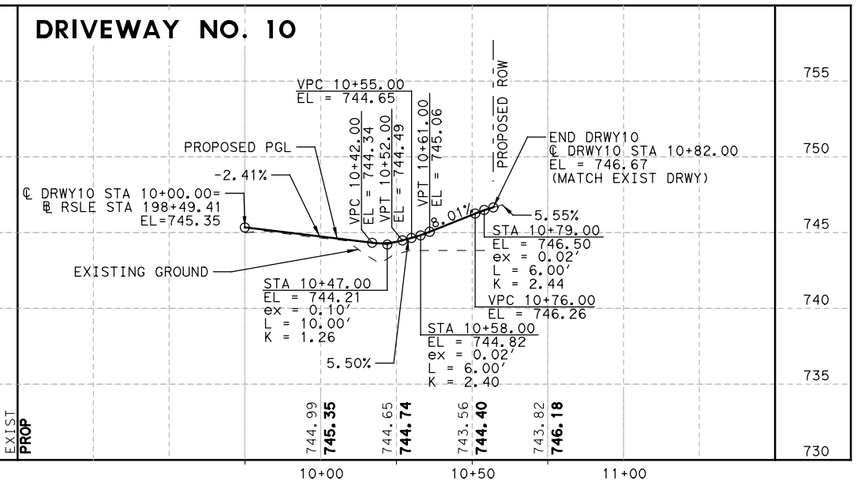
SHEET 2 OF 3

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
IA	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
IA	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	102
JCW	0914	33	068,ETC	
CHECK				
JCW				

DRIVEWAY NO. 9



DRIVEWAY NO. 10



ROBERT S. LIGHT EXTENSION

DRIVEWAY PROFILES

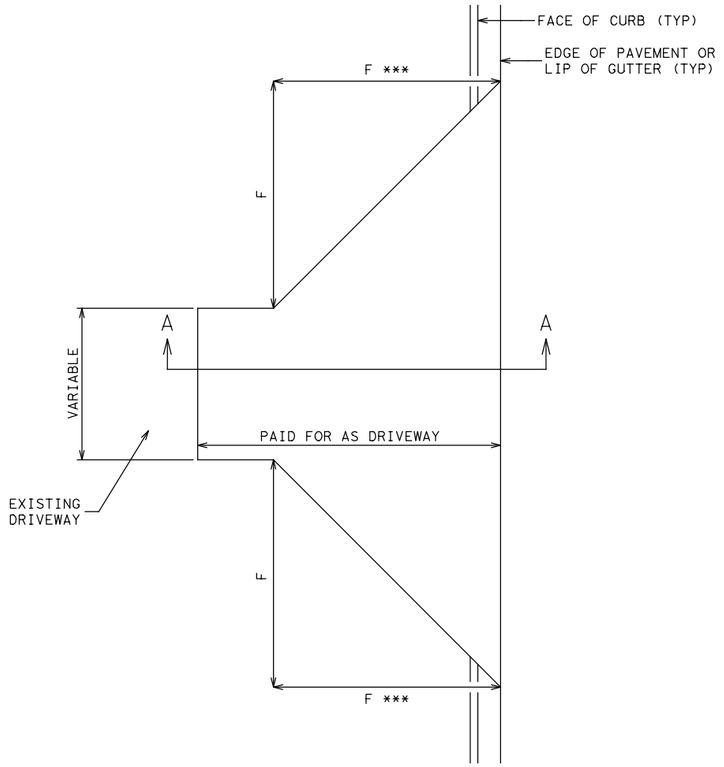
SCALE: 1"=50'-H
1"=10'-V

SHEET 3 OF 3

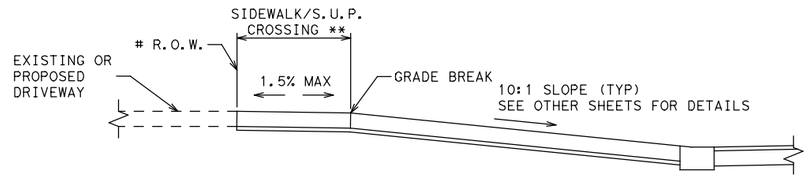
DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
IA	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
IA	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	103
JCW	0914	33	068,ETC	
CHECK				
JCW				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg PENTABLE: 000000000246I5.tbl
USER: KBERGER DATE: 11/20/2020 TIME: 5:36:05 PM SCALE: 1:50
FILE: RSLE_DRVYPP4.dgn

*** THIS DIMENSION MAY BE REDUCED TO KEEP WORK WITHIN THE ROW.



DRIVEWAY PLAN

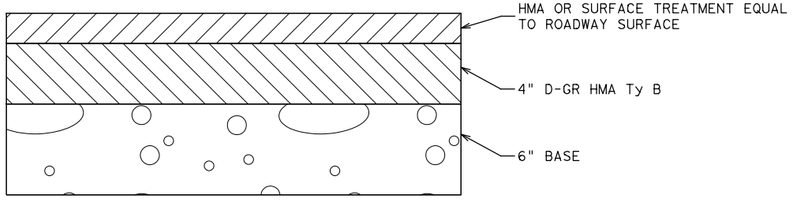


ACTUAL TIE-IN SHOWN ELSEWHERE IN PLANS OR AS DIRECTED

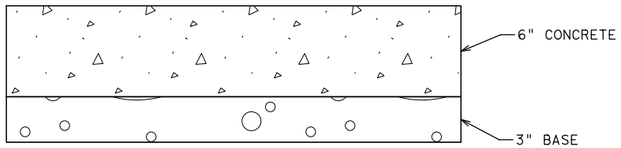
DRIVEWAY WITH GUTTER SECTION A-A

ENSURE GRADE BREAK DOES NOT EXCEED 8% UNLESS OTHERWISE DIRECTED. PROVIDE ABSOLUTE MINIMUM SIDEWALK CROSSING WIDTH OF 4' FOR DRIVEWAYS WIDTH OF 20' OR LESS

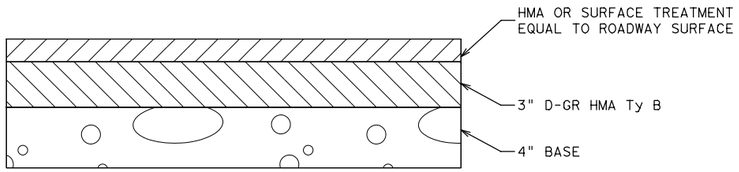
** LOCATE SIDEWALK CROSSING TO ALIGN WITH ADJACENT SIDEWALK; SIDEWALK/S.U.P. WIDTH AND LOCATION SHOWN ELSEWHERE IN PLANS.



HMA OR SURFACE TREATEMENT - COMMERCIAL



CONCRETE - ALL DRIVEWAY TYPES



HMA OR SURFACE TREATMENT - FARM/RANCH/RESIDENTIAL

FLARE	FARM/RANCH	RESIDENTIAL	COMMERCIAL
"F" (FT)	25	15	25

GENERAL NOTES

PROVIDE EXPANSION 20 FT C-C FOR WIDTH OR LENGTH OVER 25 FT. EXPANSION JOINT PER AUS STANDARD FOR SIDEWALK (MCPSWMD).

REINFORCEMENT WILL BE IN ACCORDANCE WITH ITEM 432.3.1 USING NO. 3 OR NO. 4 BARS.

FIBER REINFORCEMENT IS NOT ALLOWED. CLASS A CONCRETE IS ALLOWED TO USE COARSE AGGREGATE GRADES 1-8.

IN LIEU OF PFC OR TOM, SURFACE SHALL BE 1.5" D-GR HMA Ty D. IF SURFACE IS A MULTIPLE COURSE SURFACE TREATEMENT, ALL COURSES MUST BE PLACED ON DRIVEWAY.

BLADE LAY HMA IS ALLOWED.

FURNISH BASE MEETING THE REQUIREMENTS FOR ANY TYPE OR GRADE IN ACCORDANCE WITH ITEM 247. BASE COMPRESSIVE STRENGTHS ARE WAIVED.

THE BASE UNDER THE CONCRETE MAY BE REPLACED WITH CONCRETE AT A RATIO OF 3 INCHES OF BASE EQUALS 2 INCHES OF CONCRETE.

IF ROOTS ARE ENCOUNTERED VERIFY WITH THE ENGINEER PRIOR TO ACCOMMODATING OR REMOVING 2 IN. DIAMETER OR LARGER ROOTS. ROOT REMOVAL MUST BE IN ACCORDANCE WITH ITEM 752.4.2. ROOTS MAY REMAIN IN THE BASE. FOR IMPROVEMENTS WITHIN 6 IN. OF A ROOT, THE CONCRETE THICKNESS MAY BE REDUCED BY 1 IN. AND THE BASE INCREASED BY 1 IN. TO MINIMIZE IMPACTS TO THE ROOTS. ADJUST BASE AND SURFACE PROFILE TO PROVIDE A 1 IN. BASE CUSHION AROUND THE ROOTS. THE SURFACE PROFILE MAY BE ADJUSTED TO THE EXTENT ALLOWED BY ADA. THIS WORK IS SUBSIDIARY.

Texas Department of Transportation

Austin District Standard

DRIVEWAYS

NOT TO SCALE

DW-20 (AUS)

CONT	SECT	JOB	HIGHWAY
0914	33	068,ETC	RSL
DIST	COUNTY		SHEET NO.
AUS	HAYS		104

REVISIONS
01/16: SHEET CREATED
04/19: APPROVED
11/20: TABLE REVISED, GN ADDED, PLAN & PROFILE MODIFIED

DATE: 11/23/2020 11:56:30 AM
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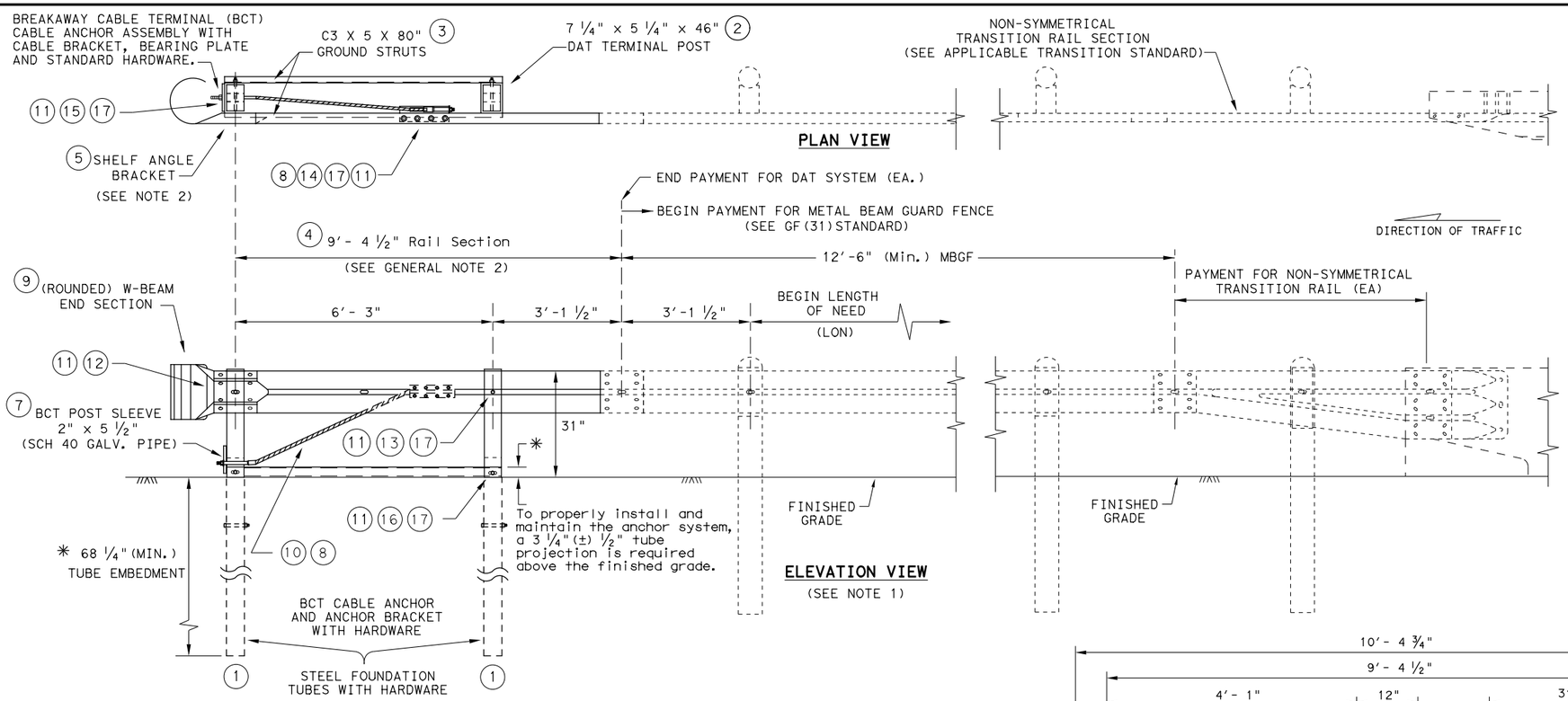


DOWNSTREAM ANCHOR TERMINAL (DAT)

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

GENERAL NOTES

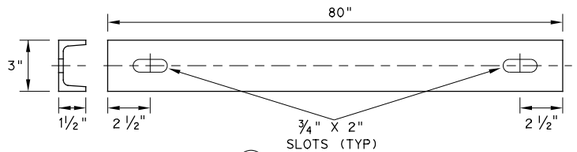
1. THE DETAIL SHOWN IS THE MINIMUM LENGTH OF NEED (LON) FOR A DOWNSTREAM ANCHOR TERMINAL (DAT) CONNECTED TO A CONCRETE RAIL.
2. THE RAIL SECTION AT THE END POST IS SUPPORTED BY THE SHELF ANGLE BRACKET. THE RAIL ELEMENT IS NOT ATTACHED TO THE END POST.
3. THE FOUNDATION TUBES SHALL NOT PROJECT MORE THAN 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

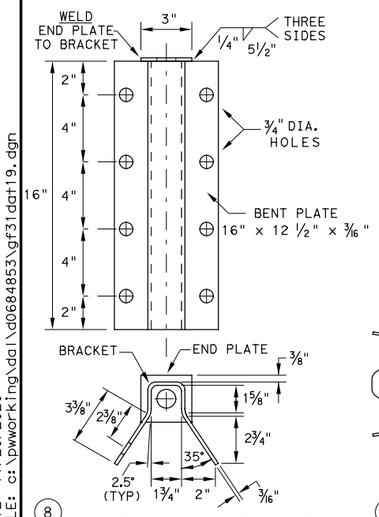
IF A MOW STRIP IS REQUIRED WITH THE DAT INSTALLATION THE LEAVE-OUT AREA AROUND THE STEEL FOUNDATION TUBES AND THE TWO CHANNEL STRUTS MAY BE OMITTED. THIS WILL REQUIRE A FULL POUR AT THE FOUNDATION TUBES.

#	(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

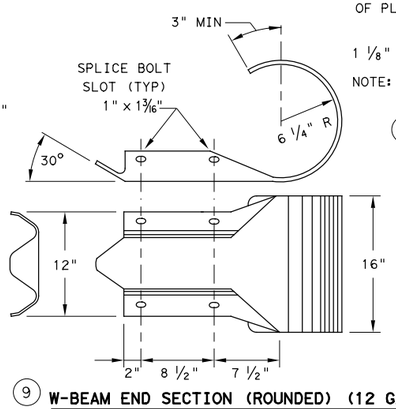
(4) TERMINAL RAIL ELEMENT FOR DAT



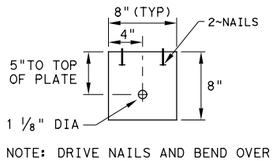
(3) CHANNEL STRUT
C3 X 5 X 80", GRADE A36



(8) GUARDRAIL ANCHOR BRACKET

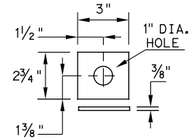


(9) W-BEAM END SECTION (ROUNDED) (12 GA.)

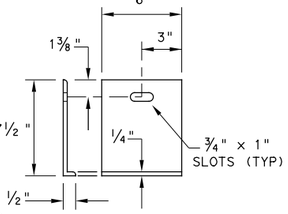


NOTE: DRIVE NAILS AND BEND OVER TO PREVENT PLATE ROTATION

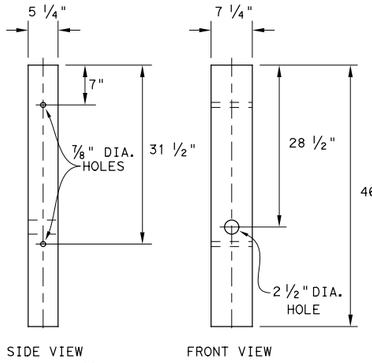
(6) BEARING PLATE
8"x 8"x 5/8" R



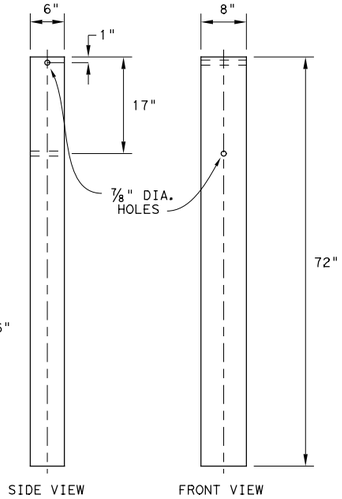
END PLATE



(5) SHELF ANGLE BRACKET



(2) TERMINAL POST
7 1/4"x 5 1/4"x 46" WOOD POST



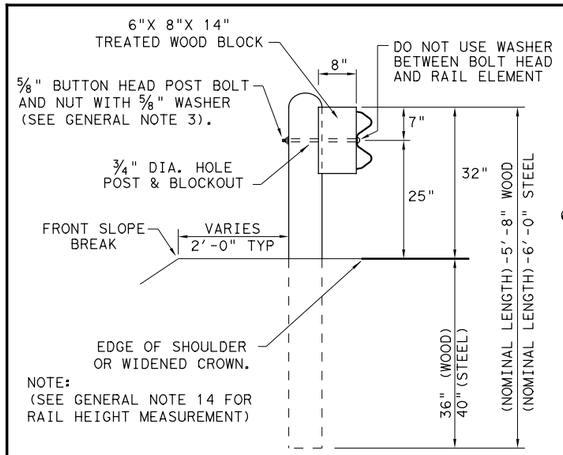
(1) STEEL FOUNDATION TUBE
6"x 8"x 1/8" x 72" STEEL TUBE

Texas Department of Transportation — Design Division Standard

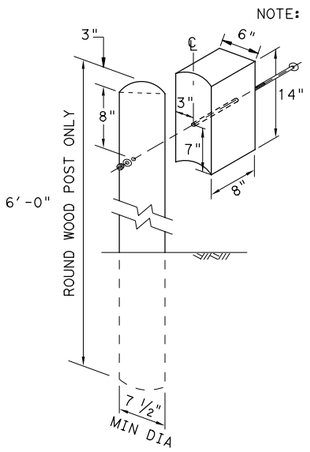
METAL BEAM GUARD FENCE
(DOWNSTREAM ANCHOR TERMINAL)
TL-3 MASH COMPLIANT

GF(31)DAT-19

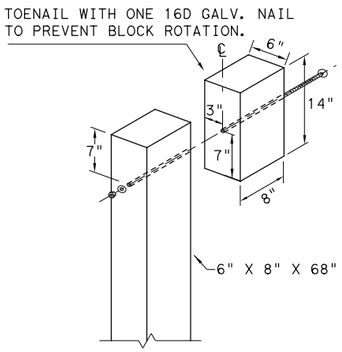
FILE: gf31dat19.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	33	068,ETC	RSL
	DIST	COUNTY		SHEET NO.
	AUS	HAYS		105



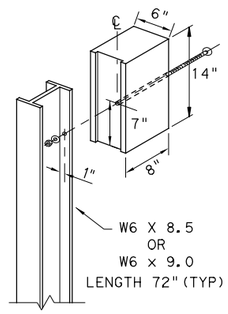
TYPICAL POST PLACEMENT



WOOD BLOCK TO ROUND WOOD POST

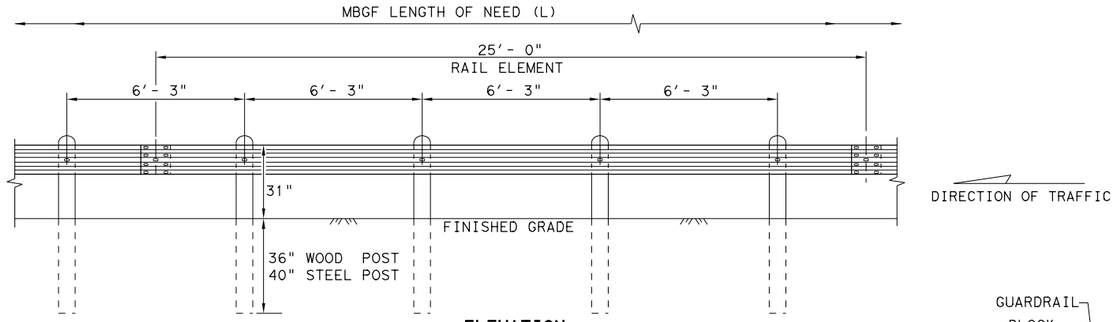


WOOD BLOCK TO RECTANGULAR WOOD POST



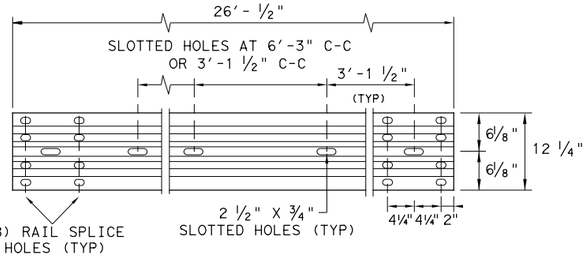
ROUTED WOOD BLOCK TO I-BEAM STEEL POST

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



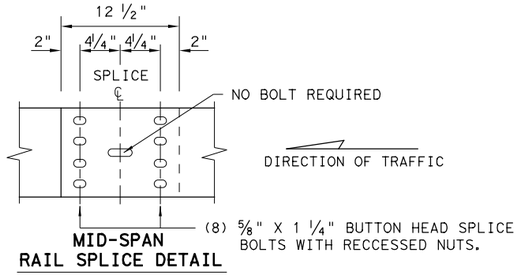
ELEVATION
MID-SPAN RAIL SPLICE

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



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

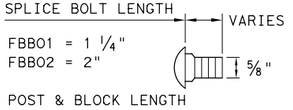
NOTES: SEE GENERAL NOTE 2 FOR ALLOWABLE RAIL TYPES.
SEE RAIL SPLICE DETAIL FOR REQUIRED HARDWARE.



MID-SPAN RAIL SPLICE DETAIL

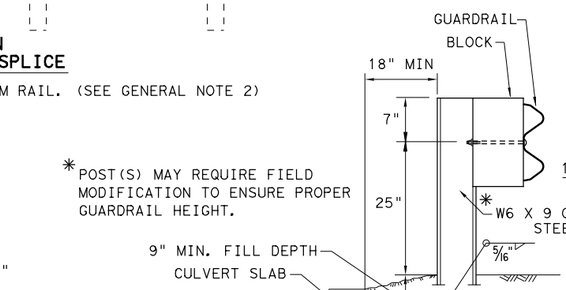
NOTE: GF(31), MID-SPAN RAIL SPLICES ARE REQUIRED WITH 6'-3" POST SPACINGS.

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

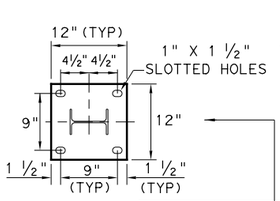


BUTTON HEAD BOLT

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



LOW FILL CULVERT POST



STEEL POST CONNECTION TO CULVERT SLAB (USE WHEN THERE IS LESS THAN 36" COVER OVER CULVERT SLAB).

NOTE: TWO INSTALLATION OPTIONS.

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

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

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

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

GENERAL NOTES

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

Texas Department of Transportation — Design Division Standard

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

FILE: gf3119.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	33	068,ETC	RSL
	DIST	COUNTY		SHEET NO.
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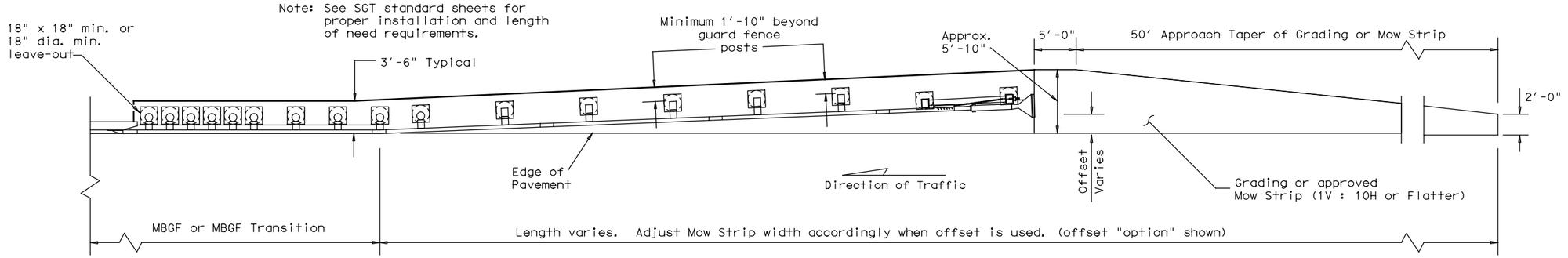
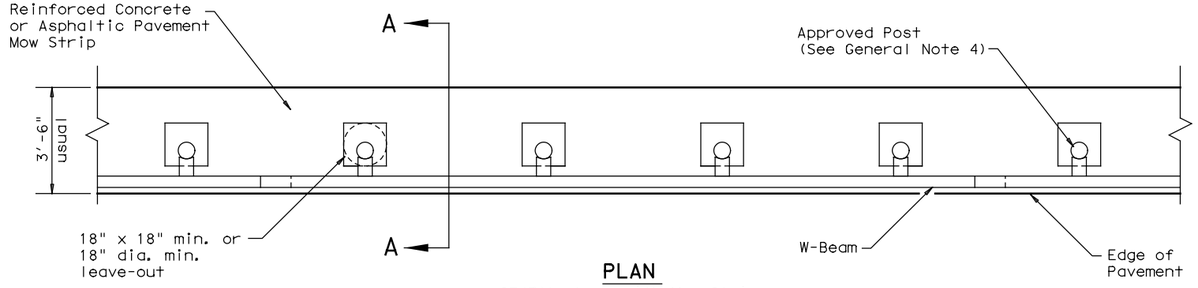
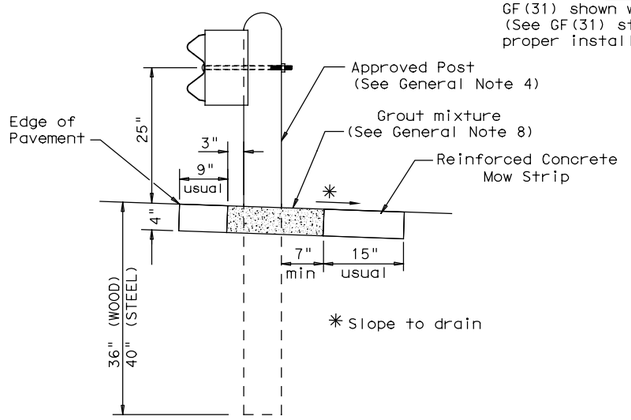


GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS



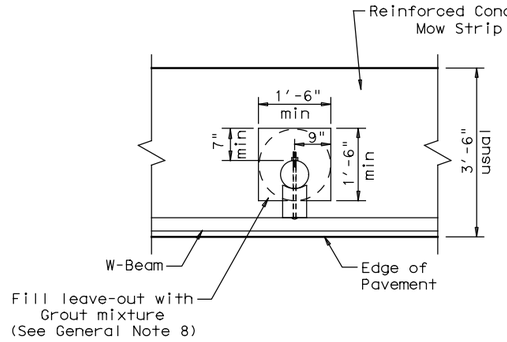
PLAN

GF(31) shown with Mow Strip
(See GF(31) standard sheet for proper installation)



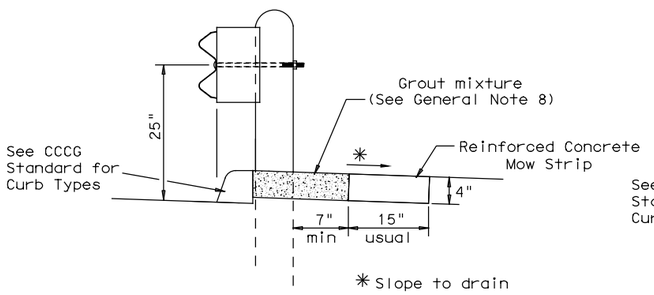
SECTION A-A

Typical



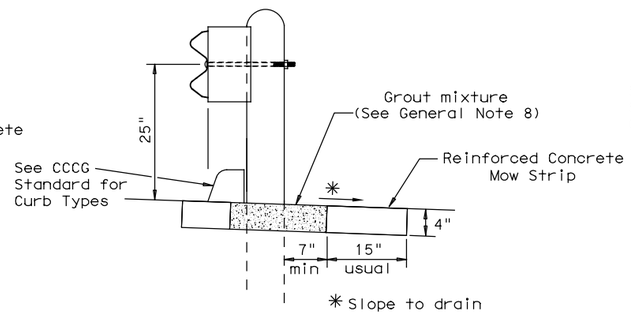
MOW STRIP DETAIL

Reinforced Concrete Mow Strip
with 18" x 18" Square or
18" Dia. minimum leave-out.



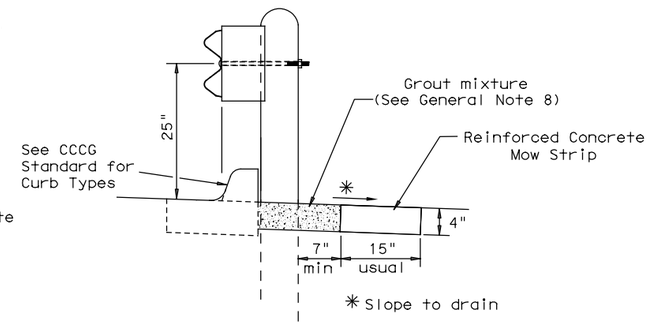
CURB OPTION (1)

This option will increase the post embedment throughout the system.



CURB OPTION (2)

Curb shown on top of mow strip



CURB OPTION (3)

Note: Site Condition(s)

Site conditions may exist where grading is required for the proper installation of metal guard fence and end treatments.

Approach grading or mow strip may be decreased or eliminated, as directed by the Engineer.

GENERAL NOTES

1. This mow strip design is for use with metal beam guard fence, guard fence transitions, and guard fence end treatments. See applicable GF(31) MBGF or GF(31) Transition Standard sheet for additional information.
2. Mow strips shall be reinforced concrete with (wire mesh or synthetic fiber), as shown on the plans and will be paid for under the pertinent bid item. Reinforced concrete shall be placed in accordance with Item 432, "Riprap." The use of the synthetic fiber in lieu of steel reinforcing is acceptable, provided the fiber producer is on the Department Material Producer List (MPL), maintained by TxDOT, Construction Division.
3. The leave-out behind the post shall be a minimum of 7".
4. Only steel (W6 x 8.5 or W6 x 9.0), or 7 ½" Dia. round wood posts are acceptable for use in the mow strip. See GF(31) Standard for additional details.
5. Other curb placement options may be used. Curbs are not considered part of the mow strip and will be paid for under other pertinent bid item.
6. Thickness of the mow strip will be 4".
7. The limits of payment for reinforced concrete will include leave-outs for the posts.
8. The leave-outs shall be filled with a Grout mixture consisting of: 2719 pounds sand, 188 pounds Type 1 or II cement, and 550 pounds of water per cubic yard, with a 28-day compressive strength of approximately 230 psi or less. Provide grout with a consistency that will flow into and completely fill all voids. Due to auger size, larger leave-out dimensions are acceptable from both an impact performance and maintenance repair standpoint (Suggested Maximum leave-out of 20"). Payment for furnishing and placing the grout mixture will be subsidiary to the pay item of riprap mow strip.

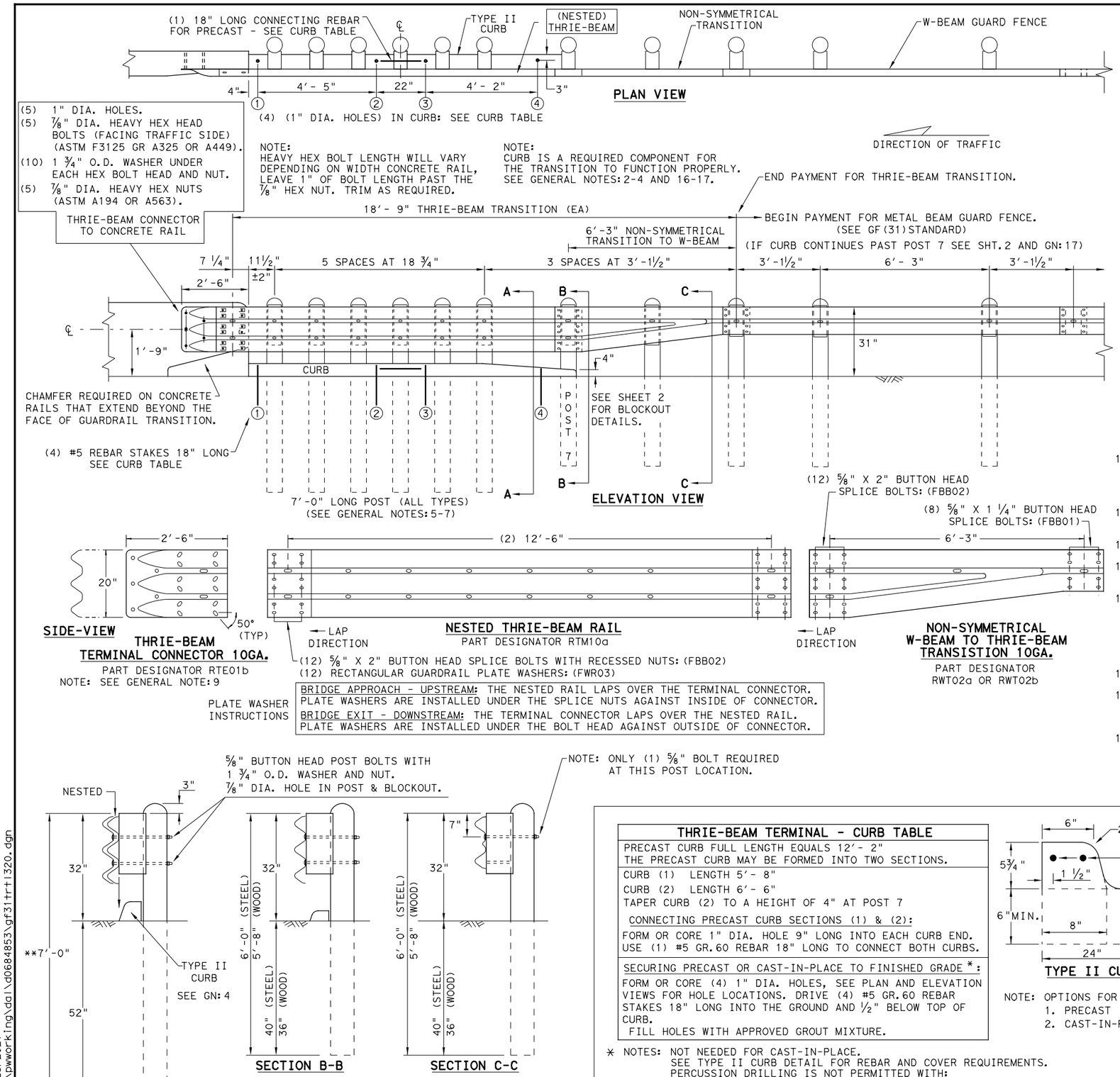
Texas Department of Transportation

Design Division Standard

METAL BEAM GUARD FENCE (MOW STRIP) TL-3 MASH COMPLIANT

GF(31)MS-19

FILE: gf31ms19.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	33	068,ETC	RSL
	DIST	COUNTY		SHEET NO.
	AUS	HAYS		107



GENERAL NOTES

1. CONTACT THE DESIGN DIVISION FOR DRAINAGE CUT OUT OPTIONS NEEDED WITHIN THE CURB SECTION OF THE THRIE-BEAM TRANSITION. (512) 416-2678
2. 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 CCCG 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.
3. 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.
4. 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.
5. FOR ROUND WOOD POST SYSTEMS, ALL ROUND WOOD POSTS SHALL BE 7 1/2" DIA. MINIMUM THROUGHOUT THE THRIE-BEAM TRANSITION.
6. 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.
7. 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.
8. POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
9. 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.
10. 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.
11. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
12. CROWN SHALL BE WIDENED TO ACCOMMODATE TRANSITIONS.
13. WHERE SOLID ROCK IS ENCOUNTERED, CONTACT THE DESIGN DIVISION FOR ADDITIONAL GUIDANCE. (512) 416-2678
14. 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.
15. REFER TO GF(31) STANDARD SHEET & BRIDGE RAILING DETAILS FOR ADDITIONAL DETAILS.
16. 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.
17. 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

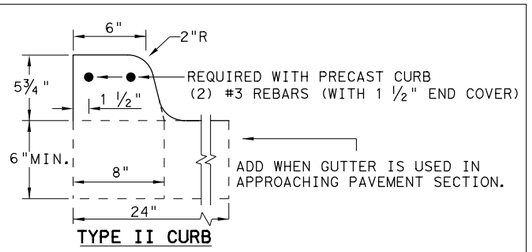
PRECAST CURB FULL LENGTH EQUALS 12'- 2"
THE PRECAST CURB MAY BE FORMED INTO TWO SECTIONS.

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.

* NOTES: NOT NEEDED FOR CAST-IN-PLACE.
SEE TYPE II CURB DETAIL FOR REBAR AND COVER REQUIREMENTS.
PERCUSSION DRILLING IS NOT PERMITTED WITH:
TYPE II CURB, BRIDGE RAIL OR CONCRETE TRAFFIC RAIL.



TYPE II CURB

NOTE: OPTIONS FOR TYPE II CURB:
1. PRECAST
2. CAST-IN-PLACE

TYPE II CURB DETAILS

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

FILE: gf31tr-tl320.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG	
©TxDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0914	33	068,ETC	RSL	
	DIST	COUNTY		SHEET NO.	
	AUS	HAYS		108	

DATE: 4/23/2021
FILE: c:\pwworking\dal\d0684853\gf31tr-tl320.dgn

DATE: 4/23/2021
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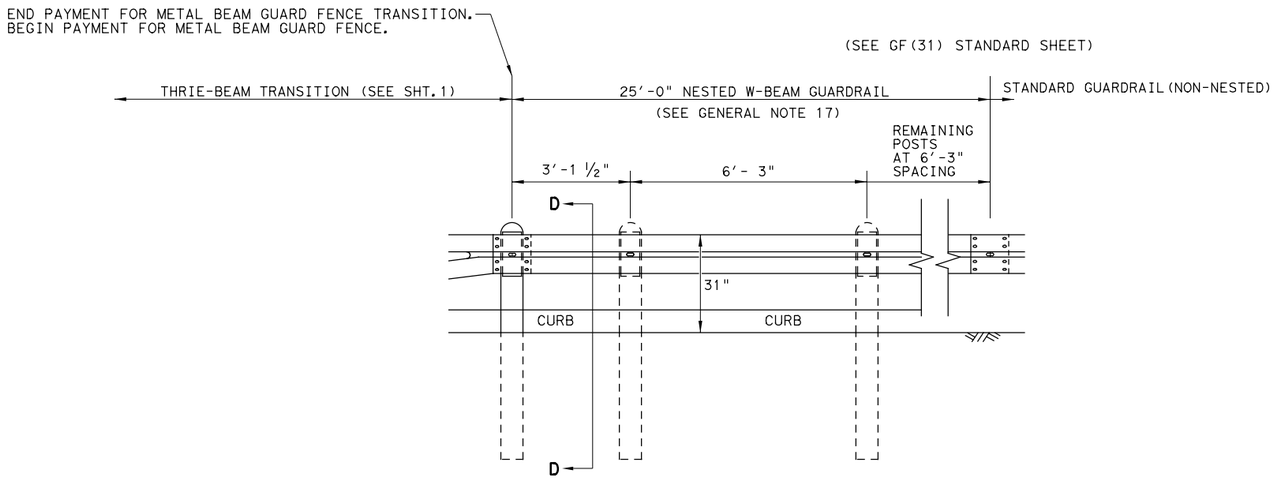
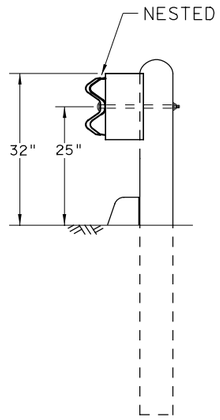
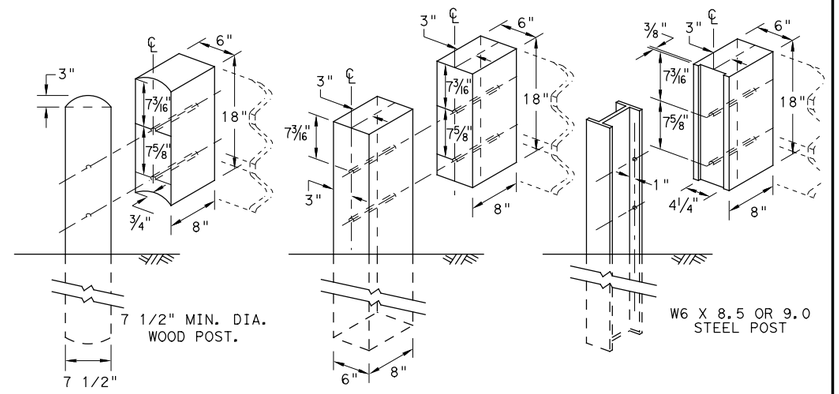
REQUIRED ALTERNATIVE FOR CONTINUOUS CURB EXTENDING PAST POST 7 (SEE SHT. 1 GENERAL NOTE 17)



ELEVATION VIEW



SECTION D-D



THRIE BEAM TRANSITION BLOCKOUT DETAILS

HIGH-SPEED TRANSITION

SHEET 2 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

FILE: gf31trt1320.dgn	DN: TxDOT	CK: KM	DW: KM	CK: CGL/AG		
©TxDOT: NOVEMBER 2020	CONT	SECT	JOB		HIGHWAY	
REVISIONS	0914	33	068,ETC		RSL	
	DIST	COUNTY			SHEET NO.	
	AUS	HAYS			109	

DATE: 11/20/2020
FILE: c:\pwworking\dal\d0684853\sgt10s3116.dgn

NOTE: STEEL I-BEAM POST W6 X 8.5 (6'-0") PN: 533G
STANDARD WOOD BLOCKOUTS (6"X8"X14") PN: 4076B
AT (POSTS 2 THRU 8)

5/8" X 10" HGR BOLT PN: 3500G
5/8" HGR NUT PN: 3340G

LINE AT THE BACK OF POST #2 THRU #8

FROM THE CENTERLINE OF POST(1) & POST(0)

ANCHOR PADDLE PN: 15204A

ANGLE STRUT PN: 15202G

16"

POST(8) POST(7) POST(6) POST(5) POST(4) POST(3) POST(1) POST(0)

DO NOT BOLT ANCHOR RAIL TO - POST (2)

SEE DETAIL 1

BEGIN LENGTH OF NEED

MASH TEST LEVEL 3 (TL-3) LENGTH OF SoftStop TERMINAL (50'-9 1/2")

PLAN VIEW

TRAFFIC FLOW

50'-9 1/2" STANDARD INSTALLATION LENGTH (MASH TL-3 SoftStop)

BEGIN STANDARD MBGF

END PAYMENT FOR SGT

6¼" 3'-1 1/2" 6'-3" 6'-3"

ANCHOR RAIL WITH SLOTS - (THREADED THRU HEAD)
SEE SoftStop MANUAL FOR COMPLETE DETAILS

MIDDLE SLOT CUTOUT (1) 1 3/4" X 6'-10 1/4"

OUTSIDE SLOTS CUTOUT (2)1/2" X 6'-9 5/8"

SoftStop FACE SEE GN(3) & NOTE: B

MBGF LAPPED IN DIRECTION OF TRAFFIC FLOW

25'-0" DOWNSTREAM W-BEAM GUARDRAIL PN: 61G

SoftStop ANCHOR RAIL (12GA) PN: 15215G

3'-1 1/2"(+/-) 6'-3" 6'-3" 6'-3" 6'-3" 6'-3" 6'-3" 5'-8" 4'-7"

B B A A

ANCHOR PADDLE PN: 15204A

END OF ANCHOR RAIL PN: 15215G

SEE NOTE: A

SEE NOTE: C

POST 32" HEIGHT

31"

RAIL HEIGHT

RAIL 25'-0" PN: 61G

RAIL 25'-0" PN: 15215G

DO NOT BOLT ANCHOR RAIL TO POST(2)

SEE DETAIL 2

13/16" DIA. YIELDING HOLES

13/16" DIA. YIELDING HOLES

SEE DETAIL 3

6'-1 3/8"

(8) 5/8"x 1- 1/4" GR BOLTS PN: 3360G
5/8" HEX NUTS PN: 3340G

POST 40" DEPTH (TYP 1-8)

(8) 5/8"x 1- 1/4" HGR BOLTS PN: 3360G
5/8" HEX NUTS PN: 3340G

POST(8) POST(7) POST(6) POST(5) POST(4) POST(3) POST(2) 6'-0" (SYTP) PN: 15000G POST(1) 4'-9 1/2" SYTP PN: 15203G POST(0) 6'-5 3/8" PN: 15205A

ELEVATION VIEW

HARDWARE FOR POST(2) THRU POST(8)
(1) 5/8"x 10" HGR BOLT PN: 3500G
(1) 5/8" HGR HEX NUT PN: 3340G

NOTE: DO NOT BOLT ANCHOR RAIL PANEL TO POST(2)

(1) 5/8" x 1 3/4" HEX HD BOLT PN 3391G

ANGLE STRUT PN: 15202G

(2) 5/8" WASHERS PN 4372G

(1) 5/8" HGR HEX NUT PN 3340G

DETAIL 1

SHOWN AT POST(1) NEAR GROUND

(1) 5/8" HEX NUT

(1) 5/8" x 1- 1/2" HEX HD BOLT-GR-5 PN: 105286

(2) 5/8" ROUND WASHERS PN: 3240G

DETAIL 2

SHOWN AT POST(1)

ANCHOR KEEPER PLATE (24 GA) PN: 15207G

ANCHOR PLATE WASHER 1/2" THICK PN: 15206G

1" ROUND WASHER F463 PN: 4902G

(2) 5/8" x 2 1/2" HEX HD BOLT GR-5 PN: 105285G

ALTERNATE BLOCKOUT SEE GENERAL NOTE: 6

(2) 5/8" ROUND WASHER (WIDE) PN: 3240G

1" NUT PN: 3908G SHALL BE SECURELY TIGHTENED AFTER FINAL ASSEMBLY, BUT NOT DEFORMING THE KEEPER PLATE.

ANCHOR PADDLE PN: 15204A

(2) 5/8" HEX NUT A563 GR. DH PN: 3245G

W-BEAM FLATTENED (4 PLIES)

ANGLE STRUT PN: 15202G

SEE NOTE: A

(2) 3/4" x 2 1/2" HEX BOLT (TYP) PN: 3717G

(4) 3/4" FLAT WASHER (TYP) PN: 3701G

(2) 3/4" HEX NUT (TYP) PN: 3704G

6'- 1 3/8" POST DEPTH

(2) ANCHOR POST ANGLE PN: 15201G

DETAIL 3 AT POST(0)

6'-5 3/8" (W6 X 15)
I-BEAM POST PN: 15205A

TRAFFIC FLOW

ALTERNATE BLOCKOUT SEE GENERAL NOTE: 6

4" X 7 1/2" X 14" BLOCKOUT COMPOSITE PN: 6777B

6" X 8" X 14" BLOCKOUT WOOD PN: 4076B

NOTE: DO NOT BOLT ANCHOR RAIL TO POST(2)

8" 6" 14"

5/8" HGR NUT PN: 3340G

5/8" X 10" HGR POST BOLT PN: 3500G

13/16"DIAMETER YIELDING HOLES LOCATED IN FLANGES

FINISHED GRADE

(HOLES APROXIMATELY CENTERED AT FINISHED GRADE)

ISOMETRIC VIEW POST(1 & 2)

W6 X 8.5 I-BEAM POST SHOWING STANDARD WOOD BLOCKOUT

NOTE: NO BLOCKOUT INSTALLED AT POST(1)

W-BEAM RAIL 25'-0"

6" X 8" X 14" BLOCKOUT WOOD

5/8" X 10" HGR POST BOLT PN: 3500G

5/8" HGR NUT PN: 3340G

POST HEIGHT 32"

31" RAIL HEIGHT

40"

LINE POST (3, 4, 5, 6, 7 & 8)

FINISHED GRADE

SECTION VIEW B-B

6'-0" (W6 X 8.5)
I-BEAM POST PN: 533G

6" X 8" X 14" BLOCKOUT WOOD

W-BEAM RAIL 25'-0"

5/8" X 10" HGR POST BOLT PN: 3500G

5/8" HGR NUT PN: 3340G

POST HEIGHT 32"

31" RAIL HEIGHT

40"

POST(2)

FINISHED GRADE

SECTION VIEW A-A

6'-0" (W6 X 8.5)
(SYTP) I-BEAM POST PN: 15000G

NOTE: DO NOT BOLT ANCHOR RAIL PANEL TO POST(2)

POST 17"- 1/2" HEIGHT

4'- 9 1/2"

13/16" DIA. YIELDING HOLES

40"

POST(1)

FRONT VIEW POST(1)

4'-9 1/2" (W6 X 8.5)
(SYTP) I-BEAM POST PN: 15203G

NOTE: NO BLOCKOUT INSTALLED AT POST(1)

APPROX 5'-10"

5'-0"

50' APPROACH GRADING

2'-0"

STANDARD MBGF

EDGE OF PAVEMENT

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

2'-0" MAX. RAIL OFFSET

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

APPROACH GRADING AT GUARDRAIL END TREATMENTS

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

GENERAL NOTES

1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: TRINITY HIGHWAY AT 1(888)323-6374. 2525 N. STEMMONS FREEWAY, DALLAS, TX 75207
2. FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE; SoftStop END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY MANUAL. PN: 620237B
3. APPLY HIGH INTENSITY REFLECTIVE SHEETING, "OBJECT MARKER" ON THE FRONT FACE OF THE DEVICE PER MANUFACTURER'S RECOMMENDATIONS. OBJECT MARKER SHALL CONFORM TO THE STANDARDS REQUIRED IN TEXAS MUTCD.
4. FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TXDOT'S LATEST ROADWAY MOW STRIP STANDARD.
5. HARDWARE (BOLTS, NUTS, & WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445,"GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
6. A COMPOSITE MATERIAL BLOCKOUT 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.
7. IF SOLID ROCK IS ENCOUNTERED SEE THE MANUFACTURER'S INSTALLATION MANUAL AND REFER TO THE LATEST ROADWAY MBGF STANDARD FOR INSTALLATION GUIDANCE.
8. POSTS SHALL NOT BE SET IN CONCRETE.
9. IT IS ACCEPTABLE TO INSTALL THE SoftStop IMPACT HEAD PARALLEL TO THE GRADE LINE OR WITH AN UPWARD TILT.
10. DO NOT ATTACH THE SoftStop SYSTEM DIRECTLY TO A RIGID BARRIER.
11. UNDER NO CIRCUMSTANCES SHALL THE GUARDRAIL WITHIN THE SoftStop SYSTEM BE CURVED.
12. A FLARE RATE OF UP TO 25:1 MAY BE USED TO PREVENT THE TERMINAL HEAD FROM ENCROACHING ON THE SHOULDER. THE FLARE MAY BE DECREASED OR ELIMINATED FOR SPECIFIC INSTALLATIONS, IF DIRECTED BY THE ENGINEER.

NOTE: A	THE INSTALLATION HEIGHT OF FULLY ASSEMBLED ANCHOR POST WILL VARY FROM 3-3/4" MIN. TO 4" MAX. ABOVE FINISHED GRADE.
NOTE: B	PART PN: 5852B RIGHT-SIDE (HIGH INTENSITY REFLECTIVE SHEETING) PART PN: 5851B LEFT-SIDE (HIGH INTENSITY REFLECTIVE SHEETING)
NOTE: C	W-BEAM SPLICE LOCATED BETWEEN LINE POST(4)AND LINE POST(5) GUARDRAIL PANEL 25'-0" PN: 61G ANCHOR RAIL 25'-0" PN: 15215G LAP GUARDRAIL IN DIRECTION OF TRAFFIC FLOW.

PART	QTY	MAIN SYSTEM COMPONENTS
620237B	1	PRODUCT DESCRIPTION ASSEMBLY MANUAL (LATEST REV.)
15208A	1	SoftStop HEAD (SEE MANUAL FOR RIGHT-LEFT APPROACH)
15215G	1	SoftStop ANCHOR RAIL (12GA) WITH CUTOUT SLOTS
61G	1	SoftStop DOWNSTREAM W-BEAM RAIL (12GA) (25'- 0")
15205A	1	POST #0 - ANCHOR POST (6'- 5 7/8")
15203G	1	POST #1 - (SYTP) (4'- 9 1/2")
15000G	1	POST #2 - (SYTP) (6'- 0")
533G	6	POST #3 THRU #8 - I-BEAM (W6 x 8.5) (6'- 0")
4076B	7	BLOCKOUT - WOOD (ROUTED) (6" x 8" x 14")
6777B	7	BLOCKOUT - COMPOSITE (4" x 7 1/2" x 14")
15204A	1	ANCHOR PADDLE
15207G	1	ANCHOR KEEPER PLATE (24 GA)
15206G	1	ANCHOR PLATE WASHER (1/2" THICK)
15201G	2	ANCHOR POST ANGLE (10" LONG)
15202G	1	ANGLE STRUT
		HARDWARE
4902G	1	1" ROUND WASHER F436
3908G	1	1" HEAVY HEX NUT A563 GR.DH
3717G	2	3/4" x 2 1/2" HEX BOLT A325
3701G	4	3/4" ROUND WASHER F436
3704G	2	3/4" HEAVY HEX NUT A563 GR.DH
3360G	16	5/8" x 1 1/4" W-BEAM RAIL SPLICE BOLTS HGR
3340G	25	5/8" W-BEAM RAIL SPLICE NUTS HGR
3500G	7	5/8" x 10" HGR POST BOLT A307
3391G	1	5/8" x 1 3/4" HEX HD BOLT A325
4489G	1	5/8" x 9" HEX HD BOLT A325
4372G	4	5/8" WASHER F436
105285G	2	5/8" x 2 1/2" HEX HD BOLT GR-5
105286G	1	7/8" x 1 1/2" HEX HD BOLT GR-5
3240G	6	5/8" ROUND WASHER (WIDE)
3245G	3	5/8" HEX NUT A563 GR.DH
5852B	1	HIGH INTENSITY REFLECTIVE SHEETING - SEE NOTE: B

Texas Department of Transportation

Design Division Standard

TRINITY HIGHWAY
SOFTSTOP END TERMINAL
MASH - TL-3
SGT(10S)31-16

FILE: sgt10s3116	DN: TxDOT	CK: KM	DW: VP	CK: MB/VP
©TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
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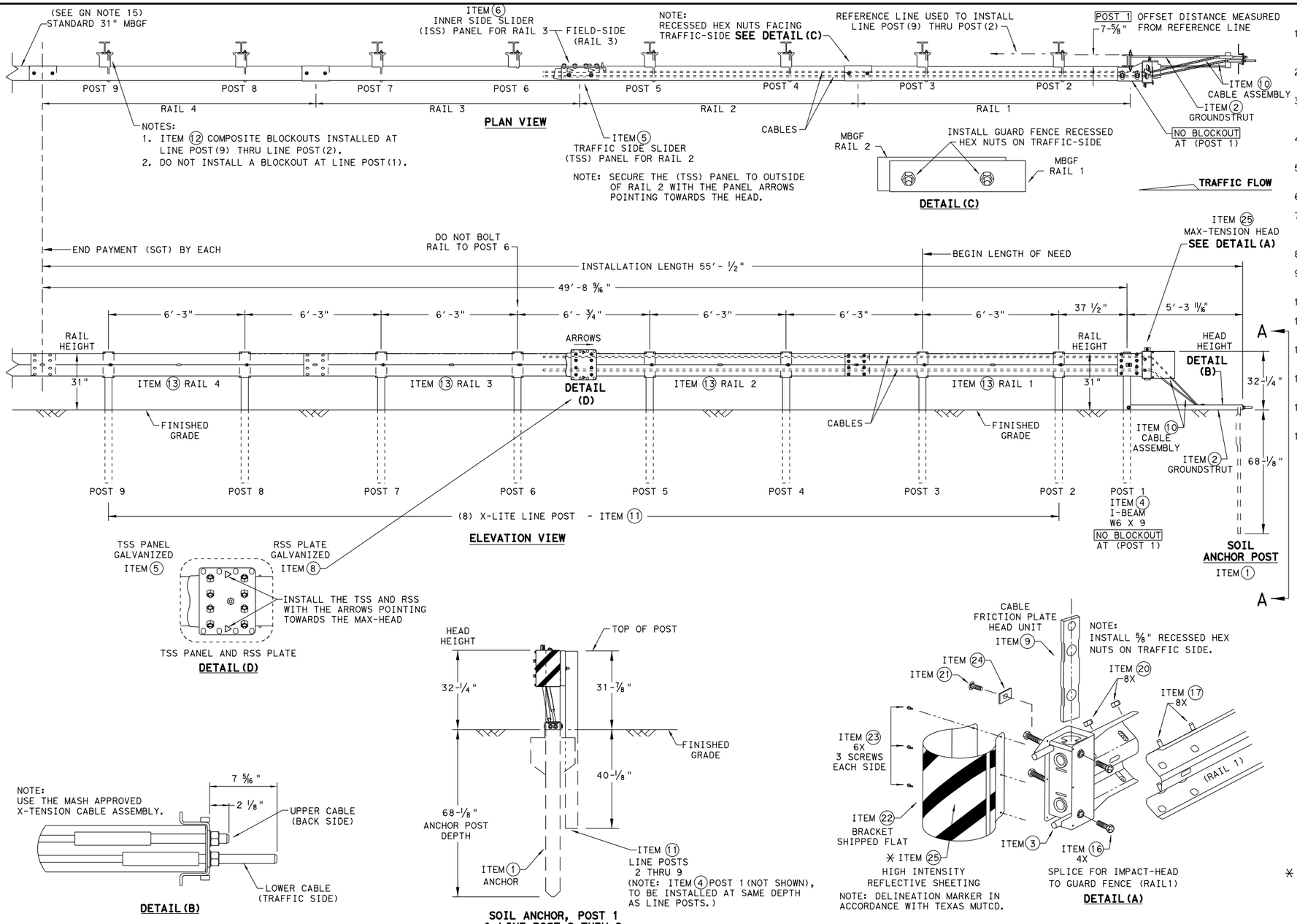

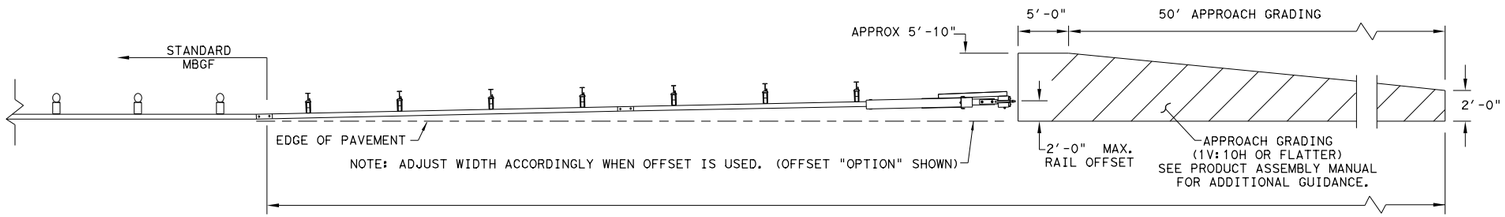

GENERAL NOTES

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

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	BSI-1610060-00	SOIL ANCHOR - GALVANIZED	1
2	BSI-1610061-00	GROUND STRUT - GALVANIZED	1
3	BSI-1610062-00	MAX-TENSION IMPACT HEAD	1
4	BSI-1610063-00	W6x9 I-BEAM POST 6FT.-GALVANIZED	1
5	BSI-1610064-00	TSS PANEL - TRAFFIC SIDE SLIDER	1
6	BSI-1610065-00	ISS PANEL - INNER SIDE SLIDER	1
7	BSI-1610066-00	TOOTH - GEOMET	1
8	BSI-1610067-00	RSS PLATE - REAR SIDE SLIDER	1
9	B061058	CABLE FRICTION PLATE - HEAD UNIT	1
10	BSI-1610069-00	CABLE ASSEMBLY - MASH X-TENSION	2
11	BSI-1012078-00	X-LITE LINE POST-GALVANIZED	8
12	B090534	8" W-BEAM COMPOSITE-BLOCKOUT XT110	8
13	BSI-4004386	12'-6" W-BEAM GUARD FENCE PANELS 12GA.	4
14	BSI-1102027-00	X-LITE SQUARE WASHER	1
15	BSI-2001886	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 FWR03	1
* 25	SEE NOTE BELOW	HIGH INTENSITY REFLECTIVE SHEETING	1
** 26	4002337	8" W-BEAM TIMBER-BLOCKOUT, PDB01B	8
** 27	BSI-4004431	25' W-BEAM GUARDRAIL PANEL,8-SPACE,12GA.	2
28	MANMAX Rev-(D)	MAX-TENSION INSTALLATION INSTRUCTIONS	1

* TO BE PROVIDED BY DISTRIBUTOR OR CONTRACTOR.

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

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

Texas Department of Transportation

Design Division Standard

MAX-TENSION END TERMINAL MASH - TL-3

SGT(11S)31-18

FILE: sgt11s3118.dgn	DN: TxDOT	CK: KM	DW: TxDOT	CK: CL
© TxDOT: FEBRUARY 2018	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	AUS	HAYS		11

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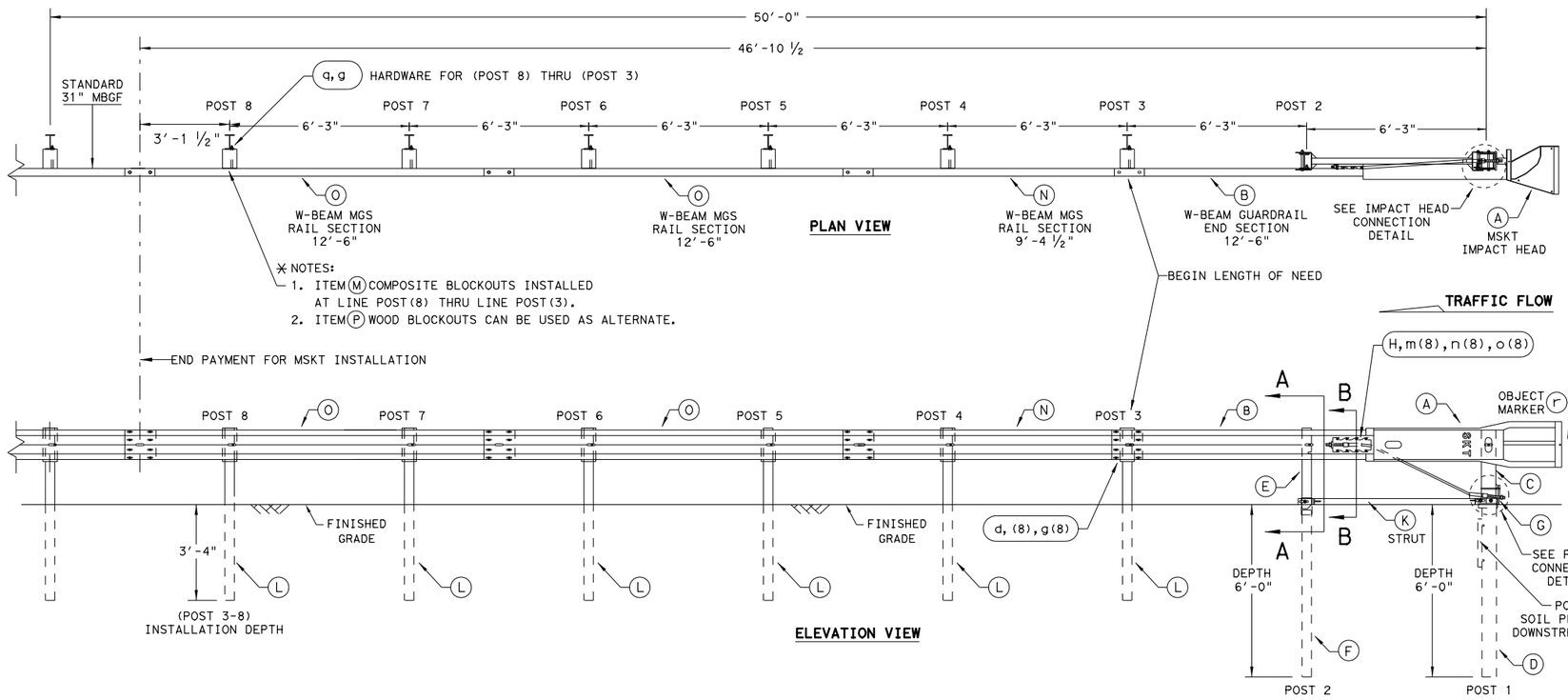


NOTE: SEE (GENERAL NOTE 14) FOR DRIVING CAP INFORMATION.

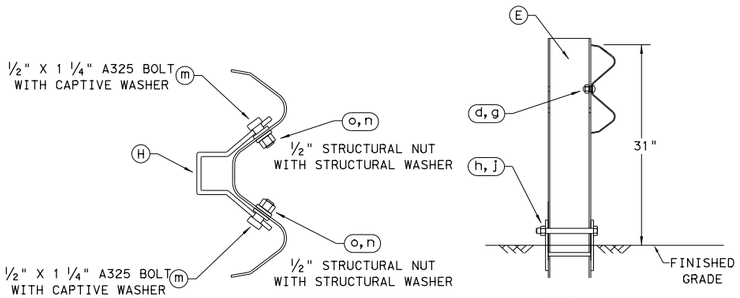
GENERAL NOTES

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

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

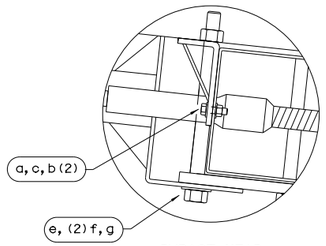
SEE NOTES: ✳

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

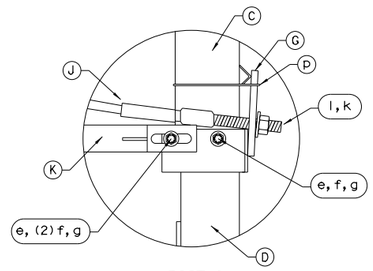


SECTION B-B
ANCHOR BRACKET

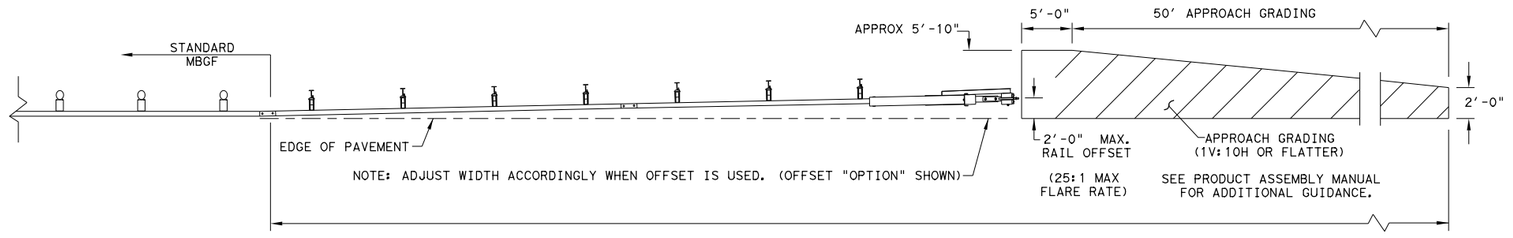
POST 2
SECTION A-A



IMPACT HEAD
CONNECTION DETAIL



POST 1
CONNECTION DETAIL



APPROACH GRADING AT GUARDRAIL END TREATMENTS

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

TRAFFIC FLOW

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

Texas Department of Transportation

Design Division Standard

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

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© TxDOT: APRIL 2018	CONT	SECT	JOB	HIGHWAY	
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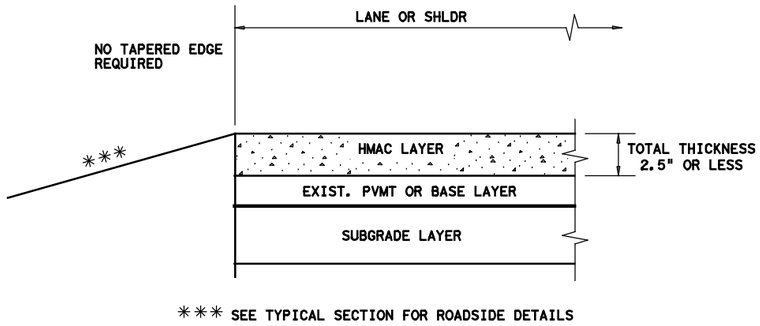
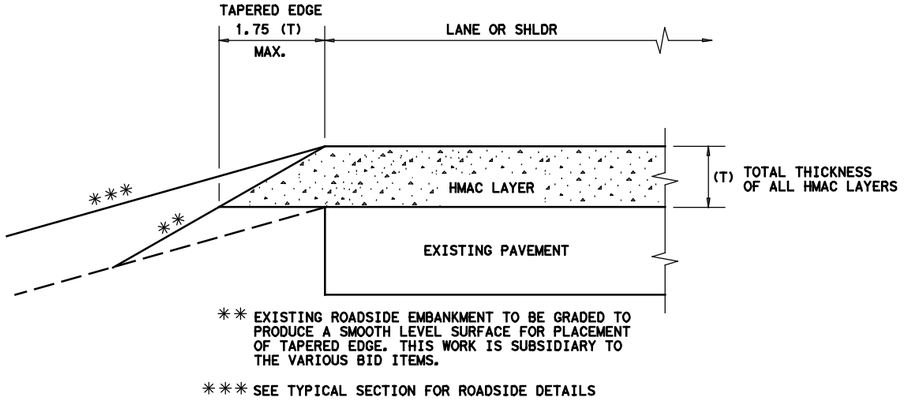


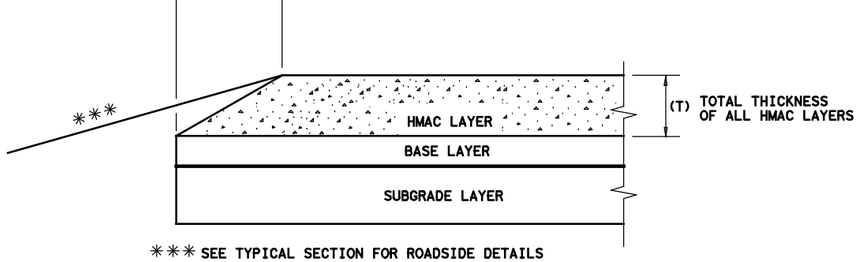
CONDITION - 1

THIN HMAC SURFACES OR HMAC OVERLAY
WITH THICKNESS OF 2.5" OR LESS



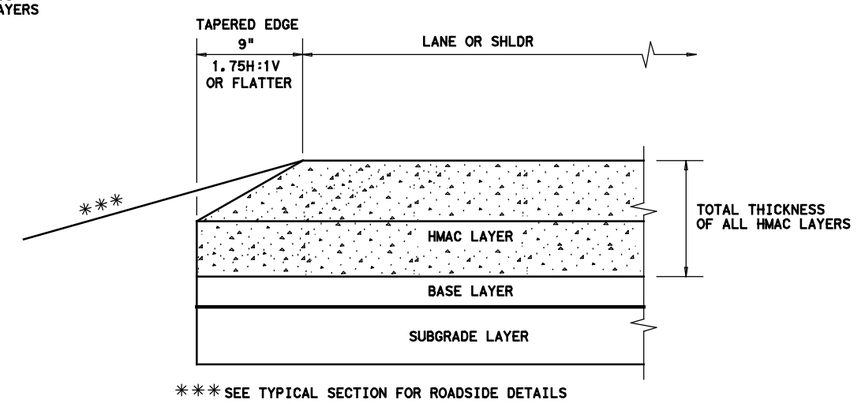
CONDITION - 2

OVERLAY OF EXISTING PAVEMENT
HMAC THICKNESS 2.5" TO 5"



CONDITION - 3

NEW OR RECONSTRUCTED PAVEMENT
HMAC THICKNESS 2.5" TO 5"



CONDITION - 4

NEW OR RECONSTRUCTED PAVEMENT
HMAC THICKNESS 5" OR GREATER

(NOT TO SCALE)

GENERAL NOTES

1. UNLESS OTHERWISE SHOWN IN THE PLANS, A VERTICAL EDGE IS PERMISSIBLE FOR HMAC PLACED GREATER THAN 5" BELOW THE EDGE OF PAVEMENT AND FOR THICKNESS OF HMAC LESS THAN 2.5".
2. FOR FURTHER INFORMATION REGARDING THE ROADSIDE AND PAVEMENT DETAILS, SEE TYPICAL SECTIONS.
3. PAYMENT FOR TAPERED EDGE WILL BE IN ACCORDANCE WITH APPLICABLE ITEMS IN THE CONTRACT.
4. THE SLOPE OF THE TAPERED EDGE SHALL BE 1.75H:1V OR FLATTER.
5. THE TAPERED EDGE SHALL BE PRODUCED BY USE OF A SCREED ATTACHMENT CAPABLE OF PRODUCING A SMOOTH COMPACTED SURFACE. ADDITIONAL COMPACTING EFFORT BEHIND THE SCREED IS NOT REQUIRED.

Texas Department of Transportation

Design Division Standard

TAPERED EDGE DETAILS
HMAC PAVEMENT

TE(HMAC)-11

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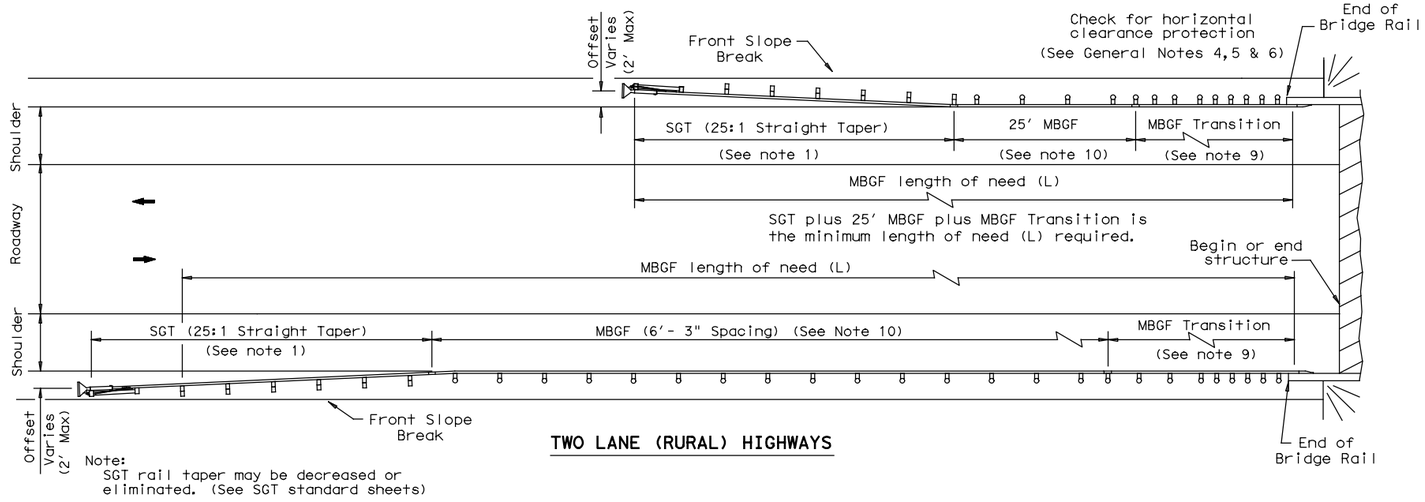
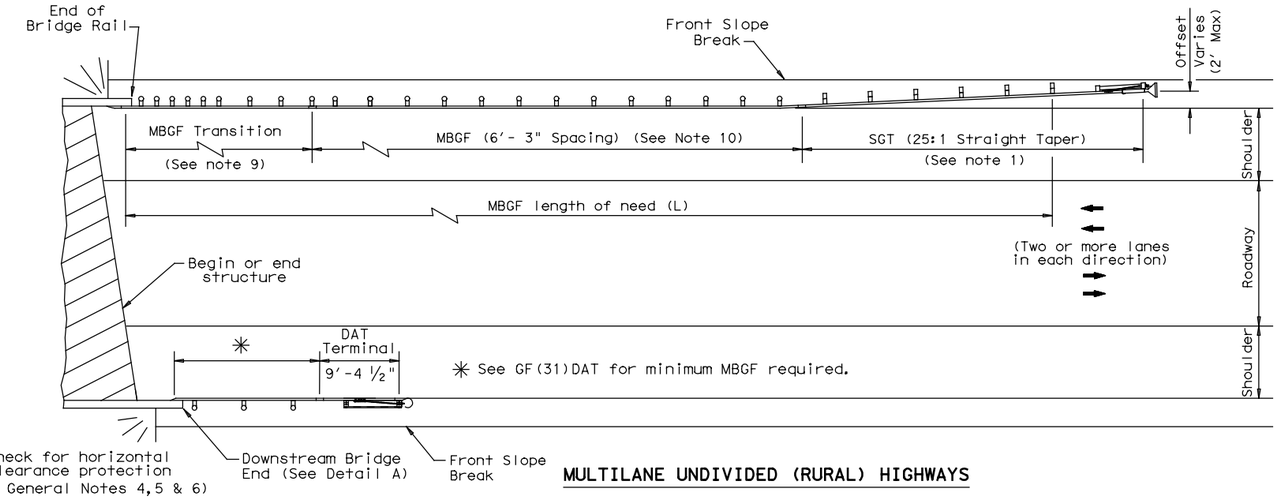
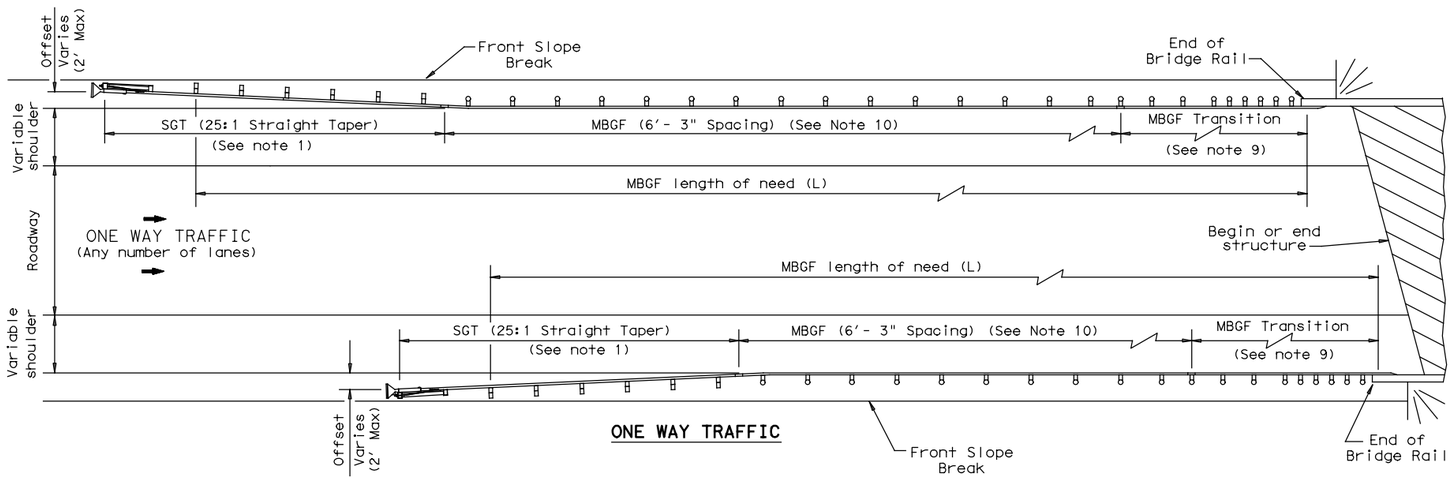


TWO LANE (RURAL) HIGHWAYS

Note:
SGT rail taper may be decreased or eliminated. (See SGT standard sheets)



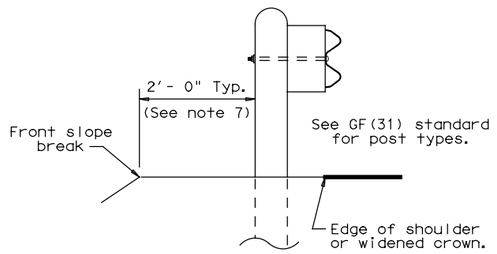
MULTILANE UNDIVIDED (RURAL) HIGHWAYS



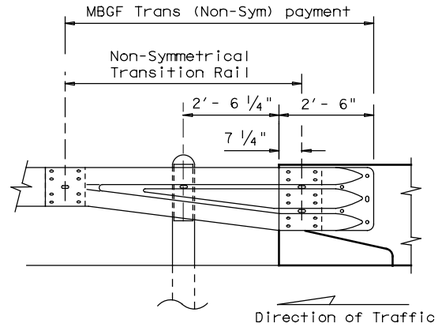
ONE WAY TRAFFIC

GENERAL NOTES

1. For more detail: See GF(31), SGT( )31, GF(31)TR, and GF(31)TL2 standard sheets.
2. Quantities of metal beam guard fence (MBGF) at individual bridge ends are as shown in the plans.
3. Use average daily traffic (ADT) for the current year to determine MBGF length of need in accordance with the Roadway Design Manual unless otherwise specified. Where significant traffic volume growth is anticipated on low volume (0-750 ADT) highways, use length determinations for the higher volume category.
4. MBGF may not be required to shield departure end of bridge unless other obstacles within the horizontal clearance limits or opposing traffic indicate a MBGF consideration.
5. Downstream anchor terminals (DAT) are only for downstream end anchorage use, outside the horizontal clearance area of opposing traffic.
6. Direct connection of MBGF to concrete rails are only for downstream rail connections outside the horizontal clearance area of opposing traffic. (This requires a minimum of three standard line posts plus the DAT terminal, See Detail A)
7. The crown shall be widened to accommodate MBGF. Typically the "front slope" break should be 2'- 0" from the back of the MBGF post. This applies to new construction on new alignment or where existing roadway cross section is to be widened to increase roadway width. This does not apply to rehabilitation work where existing roadway crown width is to be retained (See Typical Cross Section at MBGF).
8. <u>For restrictive bridge widths:</u> The MBGF should be properly transitioned from the existing bridge rail to the adjoining MBGF (See MBGF Transition Standards). Metal beam guard fence at these bridge location(s) shall be flared at the rate of 25:1 or flatter, and be of the length necessary to locate the terminal end at the 2 ft."maximum" offset from the shoulder edge in the approach direction.
9. Transition length and post spacing will vary depending on the transition type. Transition type will be shown elsewhere in the plans.
10. A minimum 25' length of MBGF will be required.



TYPICAL CROSS SECTION AT MBGF



Note:
All rail elements shall be lapped in the direction of adjacent traffic.

DETAIL A

Showing Downstream Rail Attachment

Texas Department of Transportation

Design Division Standard

BRIDGE END DETAILS

(METAL BEAM GUARD FENCE APPLICATIONS TO RIGID RAILS)

BED-14

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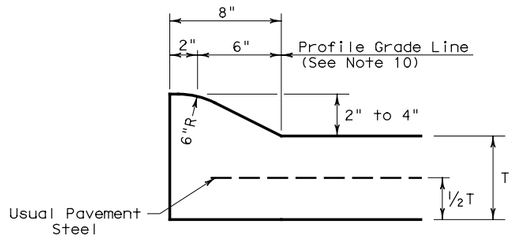

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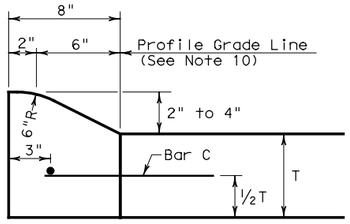
2" - 4" HEIGHT



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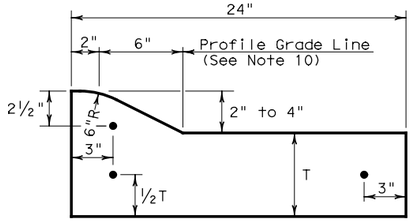

TYPE I CURB AND GUTTER
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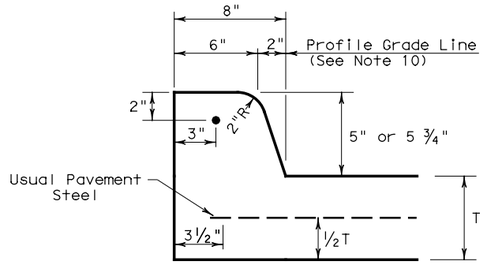
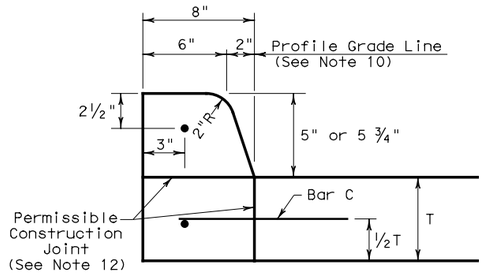
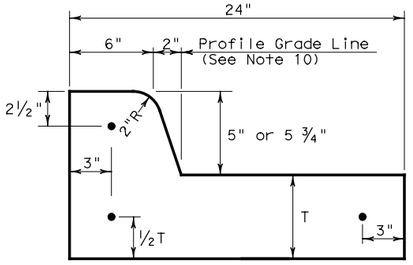


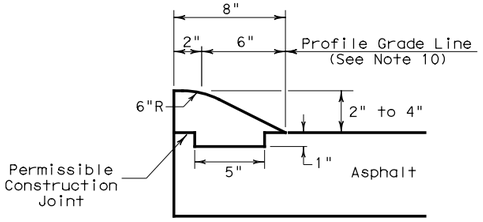
TYPE II CURB (MONOLITHIC)
5" - 5 ¾" HEIGHT



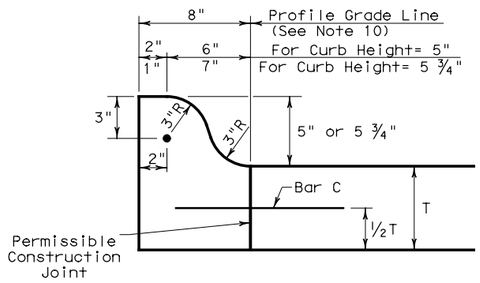
TYPE II CURB
5" - 5 ¾" HEIGHT



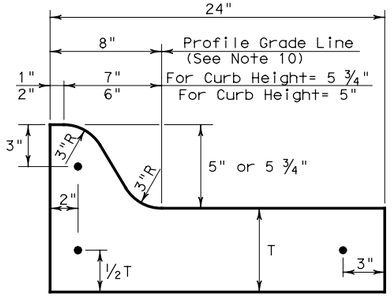
TYPE II CURB AND GUTTER
5" - 5 ¾" HEIGHT



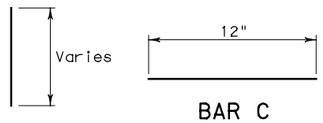
TYPE III CURB (KEYED)
2" - 4" HEIGHT



TYPE IIa CURB
5" - 5 ¾" HEIGHT

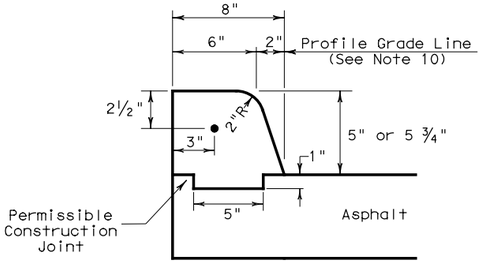


TYPE IIa CURB AND GUTTER
5" - 5 ¾" HEIGHT

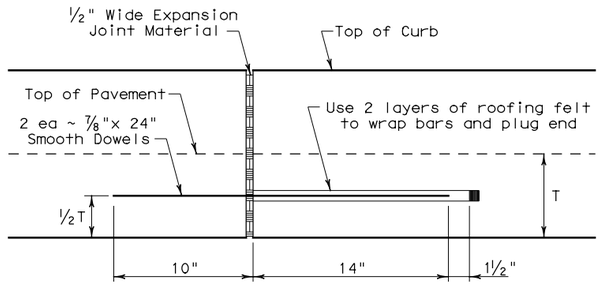


BAR B

BAR C

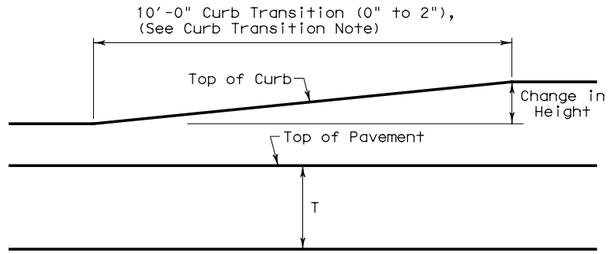


TYPE IV CURB (KEYED)
5" - 5 ¾" HEIGHT



EXPANSION JOINT DETAIL

CURB TRANSITION NOTE:
Field conditions may require a longer or shorter transition, and shall be shown elsewhere in the plans, or as directed by the Engineer.



CURB TRANSITION
Note: To be paid for as Highest Curb

GENERAL NOTES

1. All materials and construction shall be in accordance with Item 529, "Concrete Curb, Gutter, and Combined Curb and Gutter."
2. Concrete shall be Class A.
3. When reinforcing bars are used, they shall be No.4 unless otherwise shown. The use of fiber reinforced concrete in lieu of reinforcing steel is acceptable. Use fibers meeting the requirements of DMS 4550, "Fibers for Concrete," and dose fibers in accordance with Material Producers List (MPL) "Fibers for Class A and B Concrete Applications."
4. Round exposed sharp edges with a rounding tool, to a minimum radius of ¼ inch.
5. All existing curbs and driveways to be removed shall be sawed or removed at existing joints.
6. Where concrete curb is to be placed on existing concrete pavement, Bar B may be drilled and the grouted in place, or may be inserted into fresh concrete.
7. Expansion and contraction joints shall be constructed to match pavement joints in all curbs and curb and gutter adjacent to jointed concrete pavement. Where placement of curb or curb and gutter is not adjacent to concrete pavement, expansion joints shall be provided at structures, curb returns at streets, and at locations directed by The Engineer.
8. Vertical and horizontal dowel bars and transverse reinforcing bars shall be placed at four feet C~C.
9. Dimension 'T' shown is the thickness of concrete pavement. When curb is installed adjacent to flexible pavement dimension 'T' is 8" maximum.
10. Usual profile grade line. Refer to typical sections and plan-profile sheets for exact locations.
11. One-half inch expansion joint material shall be provided where curb or curb and gutter is adjacent to sidewalk or riprap.
12. When horizontal permissible construction joints are used, the longitudinal pavement steel shall be placed in accordance with pavement details shown elsewhere in the plans. Reinforcing steel for curb section shall then conform to that required for concrete curb.
13. Bar B used as needed to support curb reinforcing steel during concrete placement.

Texas Department of Transportation

Design Division Standard

CONCRETE CURB AND CURB AND GUTTER

CCCG-21

FILE: cccg21.dgn	DN: TXDOT	CK: AN	DW: SS	CK: KM
©TxDOT: FEBRUARY 2021	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	33	068,ETC	RSL
	DIST	COUNTY		SHEET NO.
	AUS	HAYS		115

RW1

Project Name: RSLE PS&E (INTERIM)
Description:
Horizontal Alignment Name: RW1
Description:
Style: RET

		STATION	NORTHING	EASTING
Element: Linear				
POB	( )	10+00.00	13938835.967	2330709.141
POE	( )	16+79.00	13938855.627	2331387.856
Tangent Direction:		N 88°20′27.07" E		
Tangent Length:		679.000		

RW2

Project Name: RSLE PS&E (INTERIM)
Description:
Horizontal Alignment Name: RW2
Description:
Style: RET

		STATION	NORTHING	EASTING
Element: Linear				
POB	( )	10+00.00	13938888.362	2332517.992
PC	( )	11+38.32	13938892.367	2332656.251
Tangent Direction:		N 88°20′27.07" E		
Tangent Length:		138.317		
Element: Circular				
PC	( )	11+38.32	13938892.367	2332656.251
PI	( )	12+99.70	13938897.039	2332817.571
CC	( )		13924768.291	2333065.364
PT	( )	14+61.08	13938898.026	2332978.955
Radius:		14130.000		
Delta:		1°18′31.55" Right		
Degree of Curvature(Arc):		0°24′19.77"		
Length:		322.761		
Tangent:		161.387		
Chord:		322.754		
Middle Ordinate:		0.922		
External:		0.922		
Tangent Direction:		N 88°20′27.07" E		
Radial Direction:		S 1°39′32.93" E		
Chord Direction:		N 88°59′42.84" E		
Radial Direction:		S 0°21′01.38" E		
Tangent Direction:		N 89°38′58.62" E		

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
USER: KBERGER DATE: 11/20/2020 TIME: 5:36:9 PM SCALE: 1:1
FILE: RSLE-RETHADOI.dgn PENTABLE: 000000000214615.tbl

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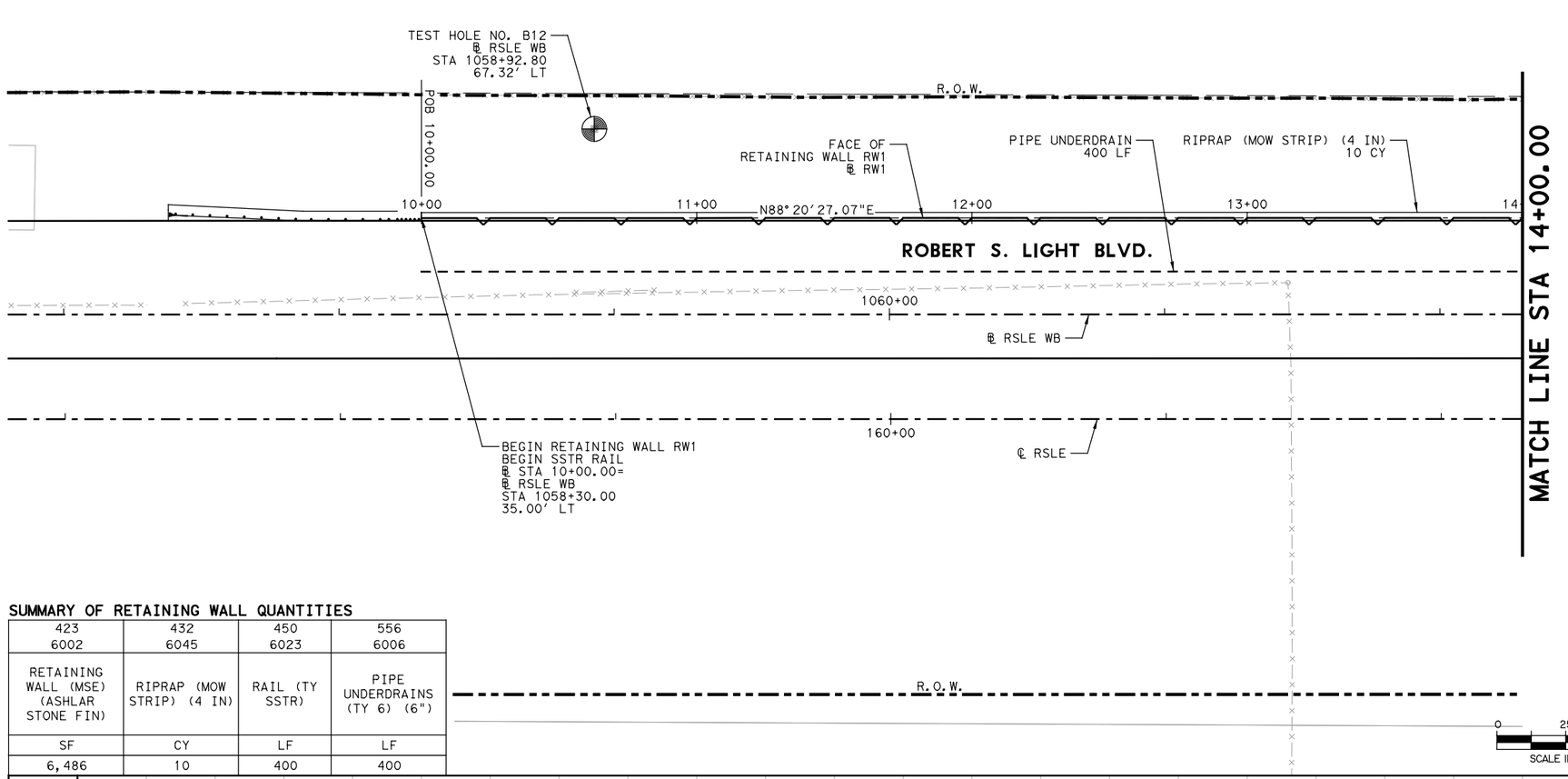
Texas Department of Transportation

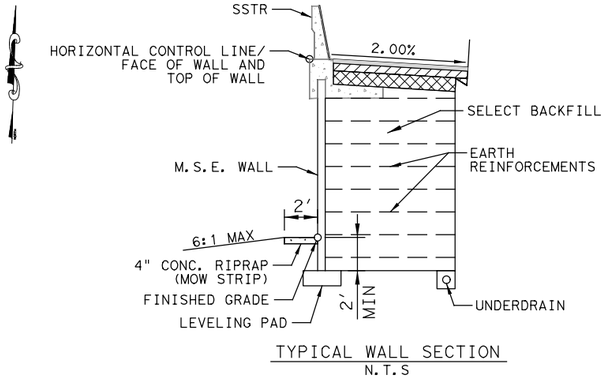
ROBERT S. LIGHT EXTENSION

RETAINING WALL ALIGNMENT DATA

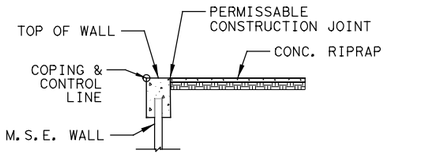
SHEET 1 OF 1

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
QL	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
QL	TEXAS	AUS	HAYS	116
CHECK	CONTROL	SECTION	JOB	
CHECK	0914	33	068,ETC	





TYPICAL WALL SECTION
N.T.S



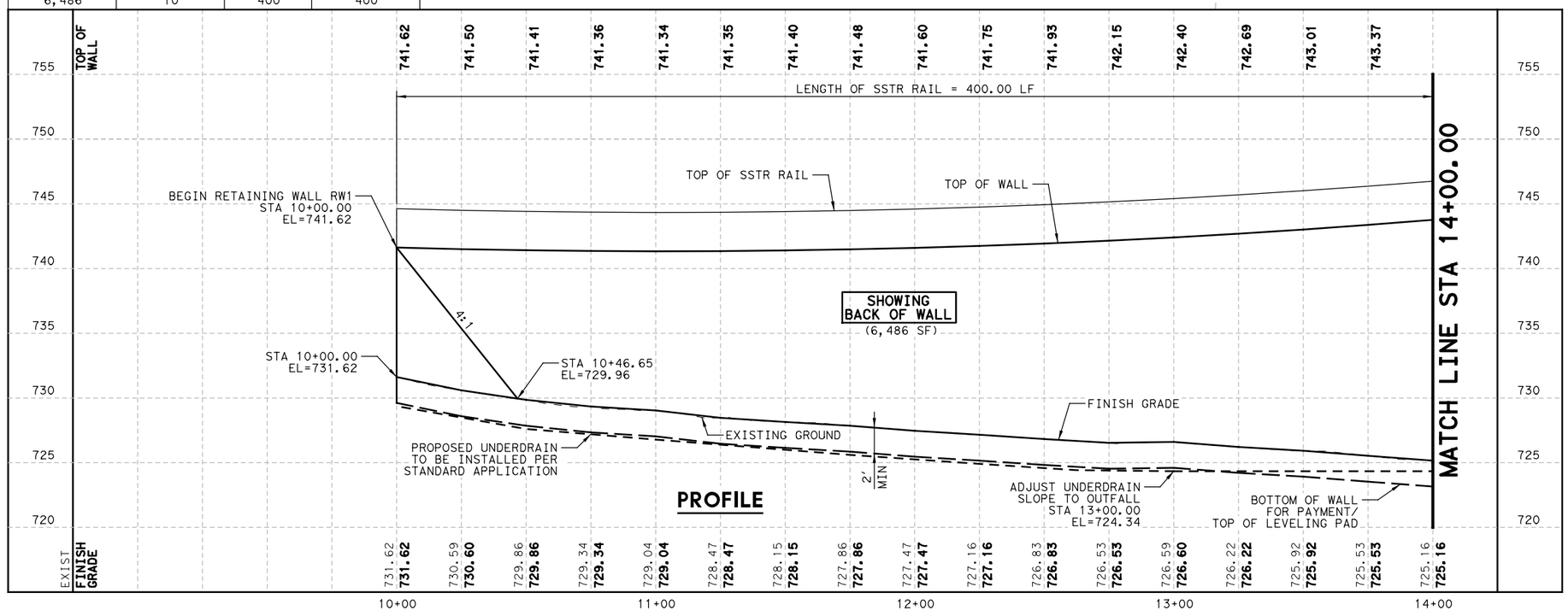
TYPICAL WALL SECTION UNDER BRIDGE
N.T.S

NOTES:

1. THE REQUIRED WALL EMBEDMENT DEPTH WILL BE 2' MINIMUM. WALL MEASURED FROM TOP OF WALL TO BOTTOM OF WALL/TOP OF LEVELING PAD FOR PAYMENT.
2. MAINTAIN POSITIVE DRAINAGE AWAY FROM WALL.
3. SEE "RETAINING WALL ALIGNMENT DATA" SHEET FOR RETAINING WALL ALIGNMENT DATA.
4. SEE "RETAINING WALL BORING LOGS" SHEET FOR TEST HOLE INFORMATION.
5. SEE RW STANDARDS (RW(MSE)DD, RW(MSE), RW(TRF), AND RW(EM) FOR NOTES, DIMENSIONS, AND DETAILS NOT SHOWN.

SUMMARY OF RETAINING WALL QUANTITIES

423 6002	432 6045	450 6023	556 6006
RETAINING WALL (MSE) (ASHLAR STONE FIN)	RIPRAP (MOW STRIP) (4 IN)	RAIL (TY SSTR)	PIPE UNDERDRAINS (TY 6) (6")
SF	CY	LF	LF
6,486	10	400	400



PROFILE

0 25 50
SCALE IN FEET

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Texas Registered Engineering Firm F-754

Texas Department of Transportation
℗ 2020

ROBERT S. LIGHT EXTENSION

RETAINING WALL RW1 PLAN AND PROFILE

SCALE: 1"=50'-H
1"=10'-V

SHEET 1 OF 2

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
QL	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
QL	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	117
CHECK	0914	33	068,ETC	

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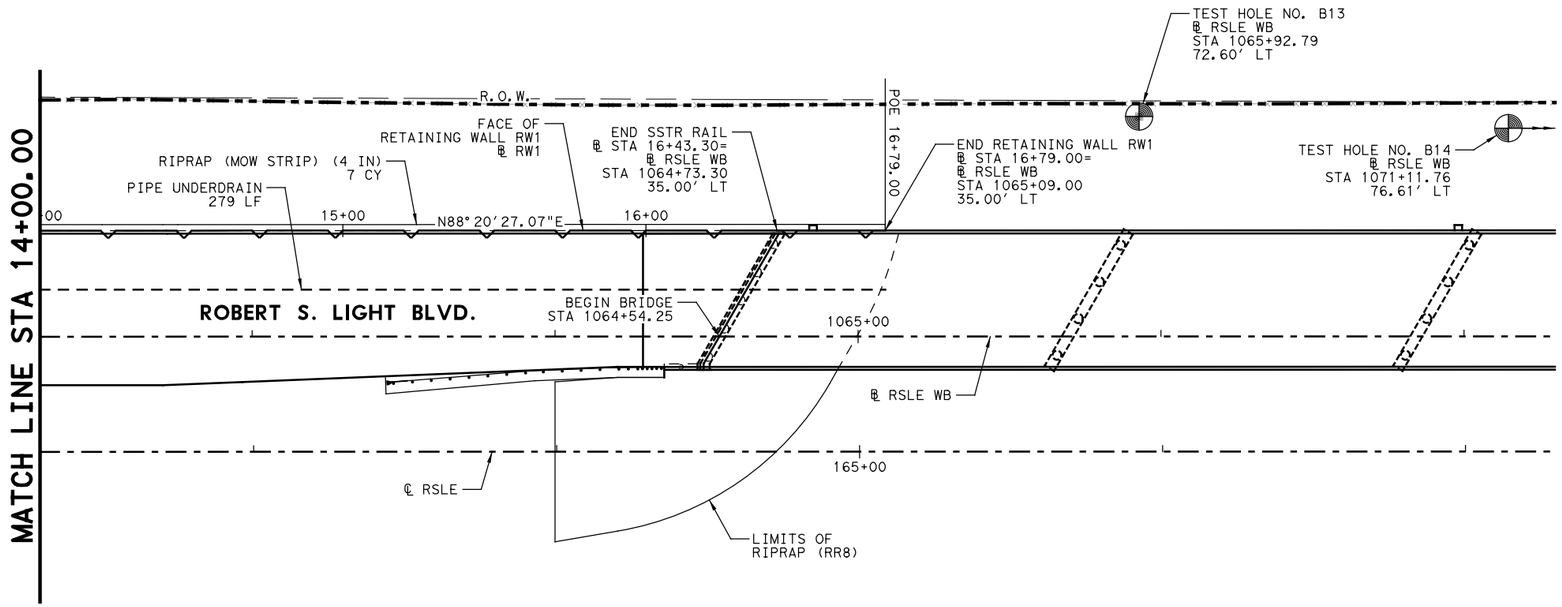
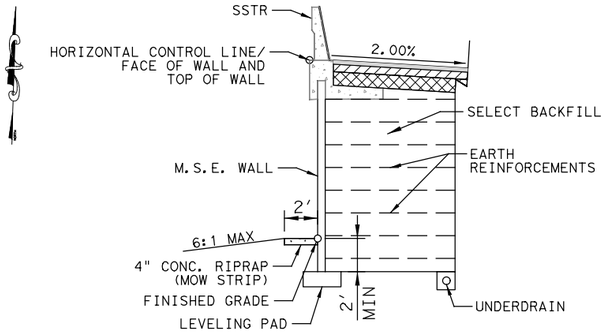
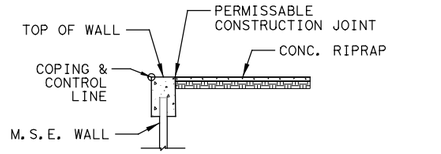




TYPICAL WALL SECTION
N.T.S



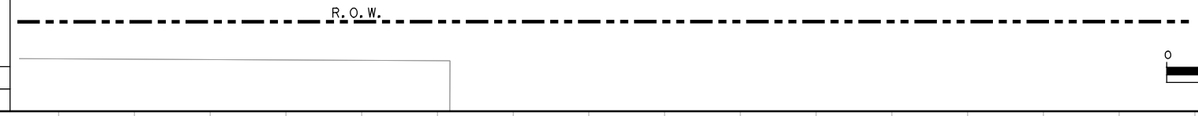
TYPICAL WALL SECTION UNDER BRIDGE
N.T.S

NOTES:

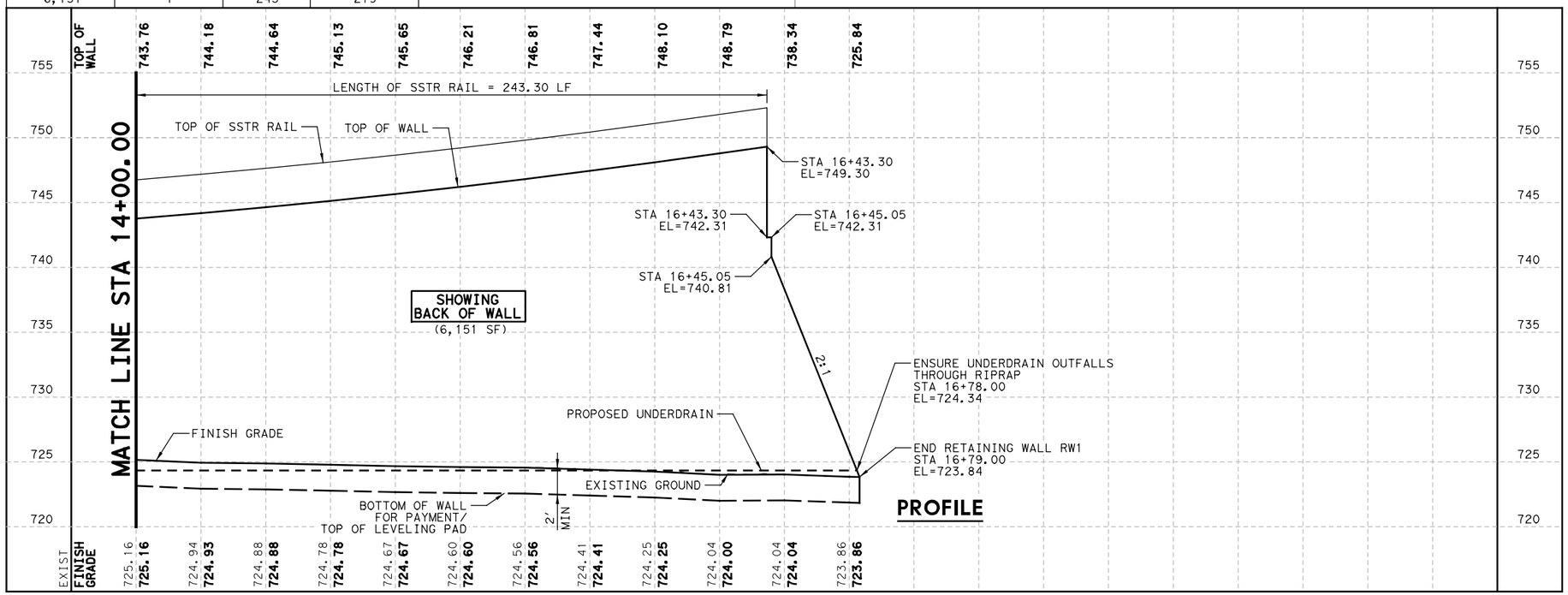
1. THE REQUIRED WALL EMBEDMENT DEPTH WILL BE 2' MINIMUM. WALL MEASURED FROM TOP OF WALL TO BOTTOM OF WALL/TOP OF LEVELING PAD FOR PAYMENT.
2. MAINTAIN POSITIVE DRAINAGE AWAY FROM WALL.
3. SEE "RETAINING WALL ALIGNMENT DATA" SHEET FOR RETAINING WALL ALIGNMENT DATA.
4. SEE "RETAINING WALL BORING LOGS" SHEET FOR TEST HOLE INFORMATION.
5. SEE RW STANDARDS (RW(MSE)DD, RW(MSE), RW(TRF), AND RW(EM) FOR NOTES, DIMENSIONS, AND DETAILS NOT SHOWN.

SUMMARY OF RETAINING WALL QUANTITIES

423 6002	432 6045	450 6023	556 6006
RETAINING WALL (MSE) (ASHLAR STONE FIN)	RIPRAP (MOW STRIP) (4 IN)	RAIL (TY SSTR)	PIPE UNDERDRAINS (TY 6) (6")
SF	CY	LF	LF
6,151	7	243	279



0 25 50
SCALE IN FEET



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Texas Registered Engineering Firm F-754

Texas Department of Transportation

ROBERT S. LIGHT EXTENSION

RETAINING WALL RW1 PLAN AND PROFILE

SCALE: 1"=50'-H
1"=10'-V

SHEET 2 OF 2

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
QL	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
QL	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	118
CHECK	0914	33	068,ETC	

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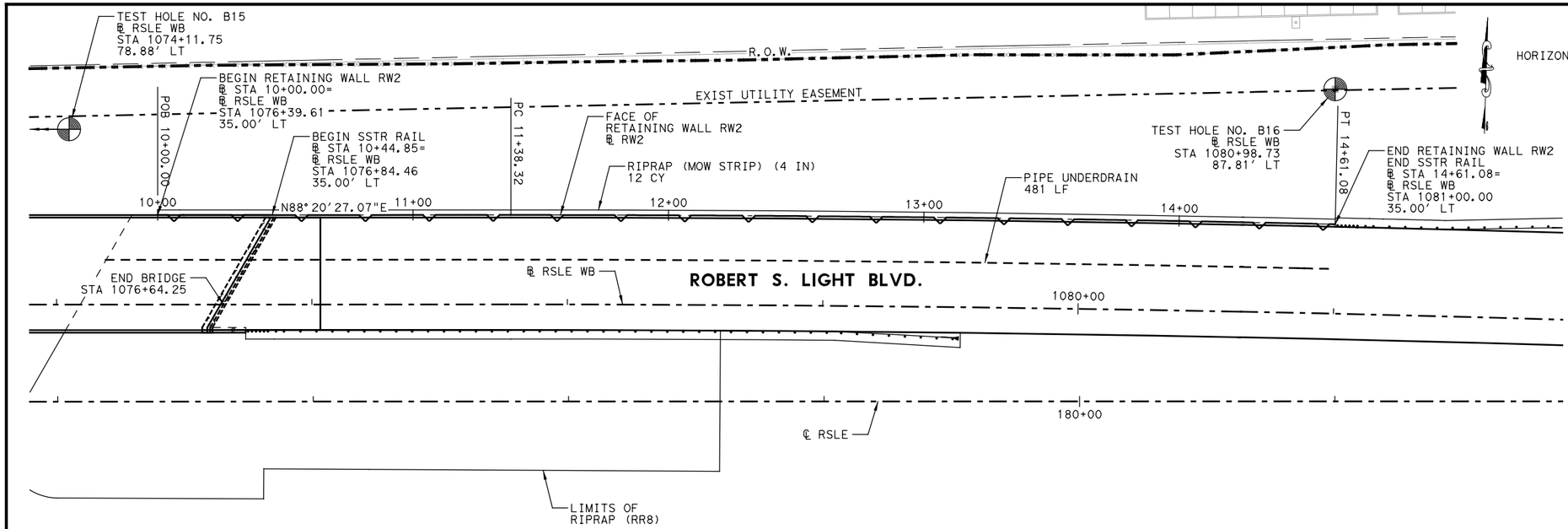
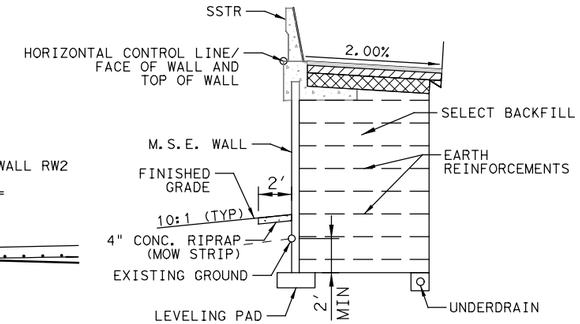
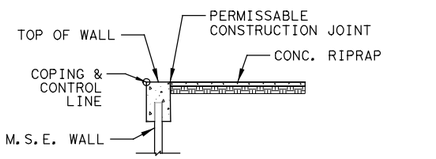




TYPICAL WALL SECTION
N.T.S



TYPICAL WALL SECTION UNDER BRIDGE
N.T.S

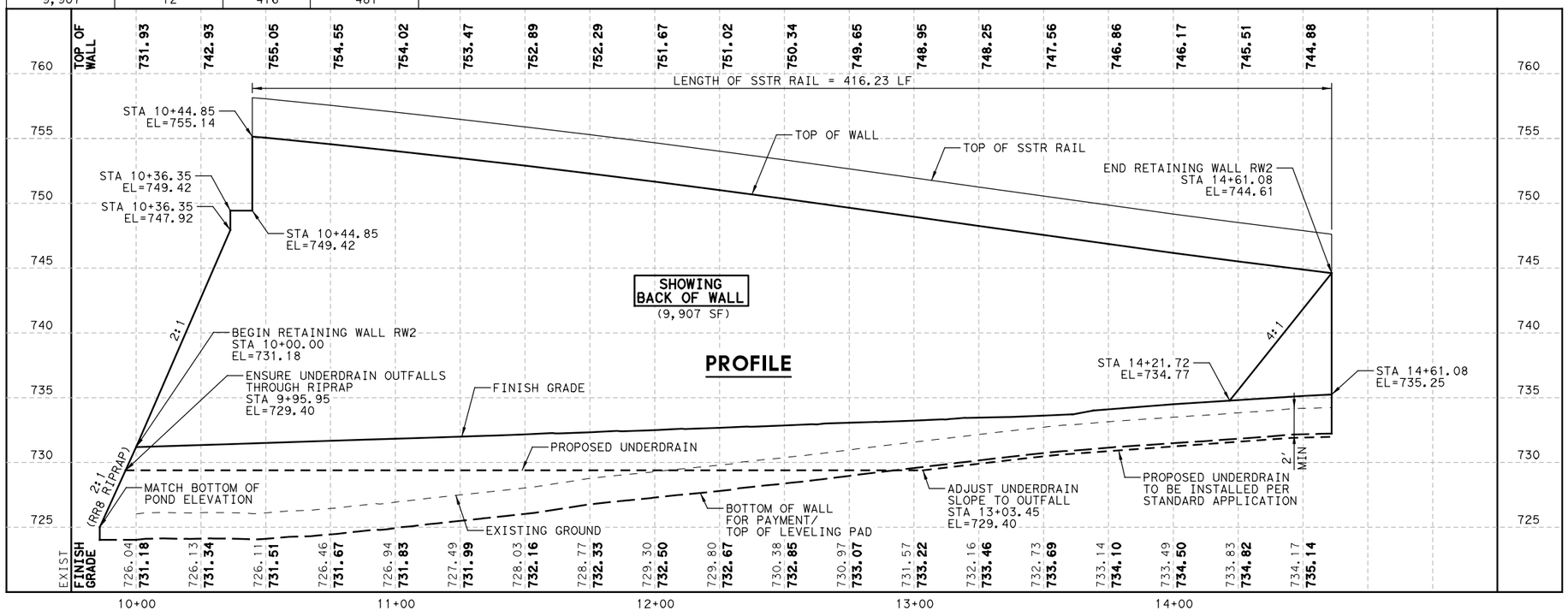
NOTES:

1. THE REQUIRED WALL EMBEDMENT DEPTH WILL BE 2' MINIMUM. WALL MEASURED FROM TOP OF WALL TO BOTTOM OF WALL/TOP OF LEVELING PAD FOR PAYMENT.
2. MAINTAIN POSITIVE DRAINAGE AWAY FROM WALL.
3. SEE "RETAINING WALL ALIGNMENT DATA" SHEET FOR RETAINING WALL ALIGNMENT DATA.
4. SEE "RETAINING WALL BORING LOGS" SHEET FOR TEST HOLE INFORMATION.
5. SEE RW STANDARDS (RW(MSE)DD, RW(MSE), RW(TRF), AND RW(EM) FOR NOTES, DIMENSIONS, AND DETAILS NOT SHOWN.

SUMMARY OF RETAINING WALL QUANTITIES

423 6002	432 6045	450 6023	556 6006
RETAINING WALL (MSE) (ASHLAR STONE FIN)	RIPRAP (MOW STRIP) (4 IN)	RAIL (TY SSTR)	PIPE UNDERDRAINS (TY 6) (6")
SF	CY	LF	LF
9,907	12	416	481

0 25 50
SCALE IN FEET



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Texas Department of Transportation

ROBERT S. LIGHT EXTENSION

RETAINING WALL RW2 PLAN AND PROFILE

SCALE: 1"=50'-H
1"=10'-V

SHEET 1 OF 1

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
QL	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
QL	TEXAS	AUS	HAYS	119
CHECK	CONTROL	SECTION	JOB	
CHECK	0914	33	068,ETC	

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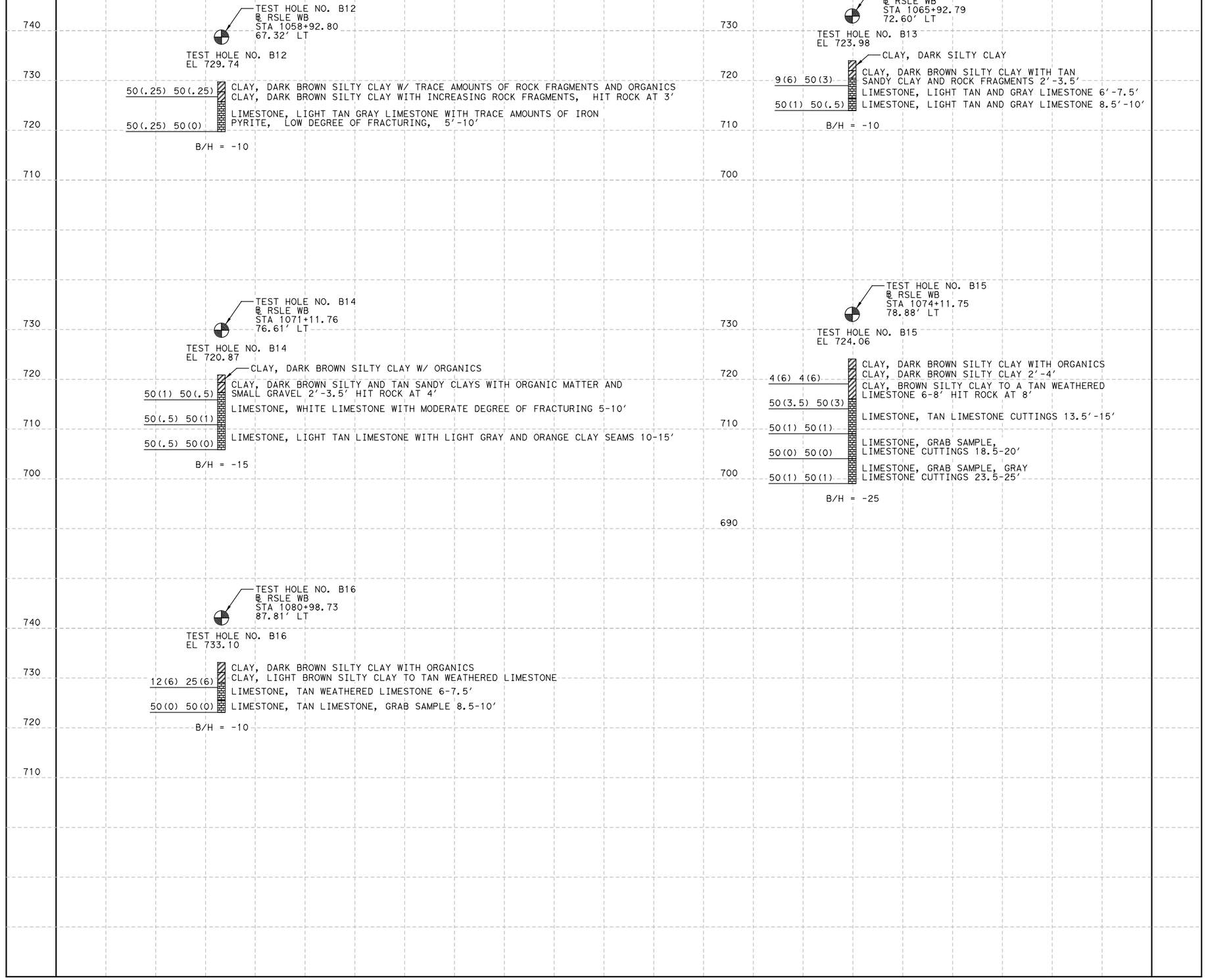

NOTES:

1. TEST HOLE LOGS CONDUCTED BY PAVETEX ENGINEERING AND TESTING, INC. ARE SHOWN HERE FOR INFORMATIONAL PURPOSES ONLY. SEE GEOTECHNICAL ENGINEERING STUDY, BUDA TRUCK BYPASS, BUDA, TEXAS.

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Texas Department of Transportation

ROBERT S. LIGHT EXTENSION

RETAINING WALL BORING LOGS

SHEET 1 OF 1

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
QL	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
QL	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	120
CHECK	0914	33	068,ETC	

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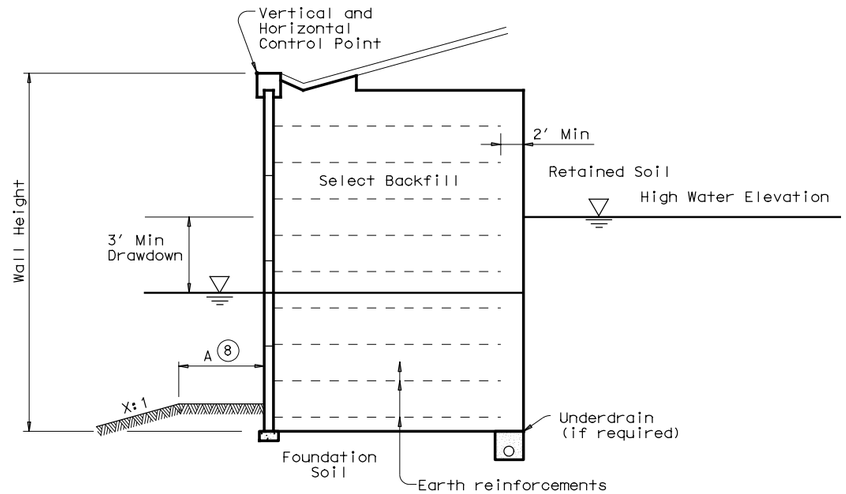
FILE: RSLE-RETBOREO1.dgn PENTABLE: 000000000214615.tbl

WALL SUMMARY

MSE Retaining Wall	Begin Station (1)	End Station (1)	Retained Soil Friction Angle (2)	Foundation Soil Friction Angle (2)	Ground Improvement (3)	Min Earth Reinforcement Length (4)	Min Wall Embedment (7)	Underdrain Required (5)	Drawdown Analysis (6)	Bench Width (8)
RW1	STA 10+00.00	STA 11+50.00	30°	26° CH / 30° CL	NO	8′ OR 0.8H	2′	YES	NO	2′
RW1	STA 11+50.00	STA 15+75.00	30°	26° CH / 30° CL	NO	8′ OR 0.75H	2′	YES	NO	2′
RW1	STA 15+75.00	STA 16+43.00	30°	26° CH / 30° CL	NO	8′ OR 0.7H	2′	YES	NO	2′
RW1	STA 16+43.00	STA 16+79.00	30°	26° CH / 30° CL	NO	8′ OR 0.8H	2′	YES	NO	2′
RW2	STA 10+00.00	STA 10+45.00	30°	26° CH / 30° CL	NO	8′ OR 0.8H	2′	YES	NO	2′
RW2	STA 10+45.00	STA 12+00.00	30°	26° CH / 30° CL	NO	8′ OR 0.7H	2′	YES	NO	2′
RW2	STA 12+00.00	STA 13+75.00	30°	26° CH / 30° CL	NO	8′ OR 0.75H	2′	YES	NO	2′
RW2	STA 13+75.00	STA 14+61.00	30°	26° CH / 30° CL	NO	8′ OR 0.8H	2′	YES	NO	2′



TYPICAL SECTION
(RAPID DRAWDOWN CONDITION)

(1) Indicate limits for which the stated soil design requirements/assumptions are applicable.

(2) Retained and Foundation friction angle listed should be based on local experience or measured/correlated long term strength values.

(3) Indicate if ground improvement is required or not required. If shown as required, refer to Ground Improvement Detail(s) for additional information.

(4) Indicate on table minimum length and length ratio required. The minimum default length of earth reinforcements shall be either 8′-0" or 70% of the wall height, whichever is greater. Wall height and design wall height may differ depending on project geometry and loading conditions. Note: Wall height at bridge abutments is equal to the distance between the top of leveling pad and finished grade at the bridge abutment backwall.

(5) Indicate if underdrain is required or not required.

(6) Indicate if rapid drawdown analysis is required.

(7) Guidance to wall designer of record for determination of minimum wall embedment: Unless noted elsewhere in the plans, the minimum embedment provided from the top of leveling pad to finish grade shall be 1′ for level ground where there is no potential for erosion or future excavation or 2′ for sloping ground (4.0H:1.0V or steeper) or where there is potential for removal of soil in front of the wall.

(8) Horizontal Bench width at base of wall varies. Use the following criteria to establish base width.
A = 2.0′ Min for X $\geq$ 4. or
A = 4.0′ Min for X $\leq$ 4.
Applicable to both drawdown and dry condition.

Note:
Retained fill should consist of density controlled material meeting TxDOT standard specifications Item 132, Type C as defined in the General Notes.

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Texas Department of Transportation

Bridge Division Standard

MECHANICALLY STABILIZED EARTH RETAINING WALL DESIGN DATA

RW(MSE)DD

FILE: rwstde16.dgn	DN: TxDOT	CK: MJG	DW: JTR	CK: MJG
©TxDOT January 2013	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	33	068, ETC	RSL
	DIST	COUNTY		SHEET NO.
	AUS	HAYS		121

DATE: 11/19/2020 6:53:16 PM
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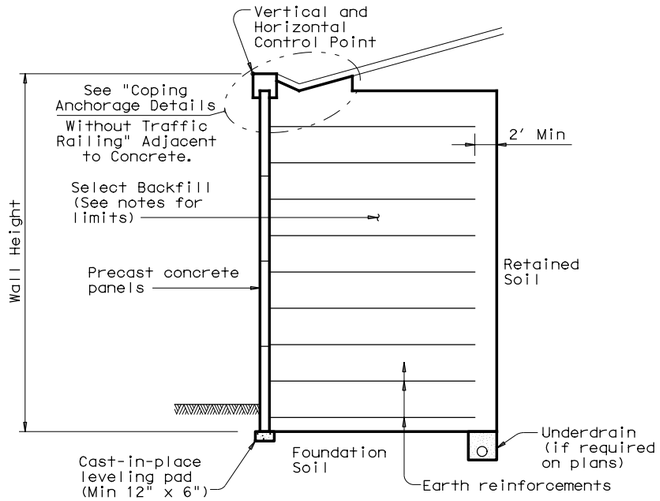
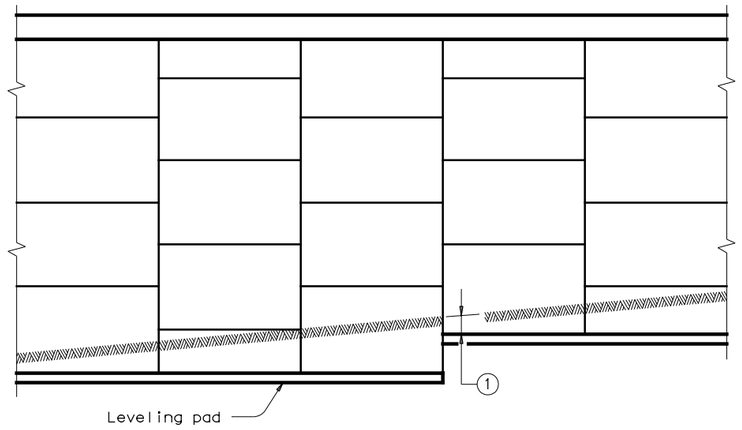
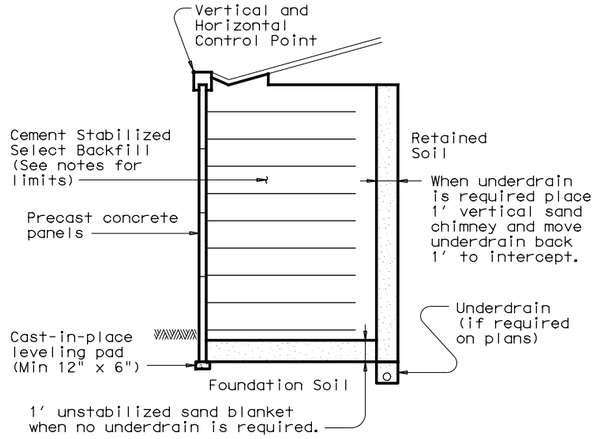


TYPICAL SECTION

(Wall at bottom of slope)

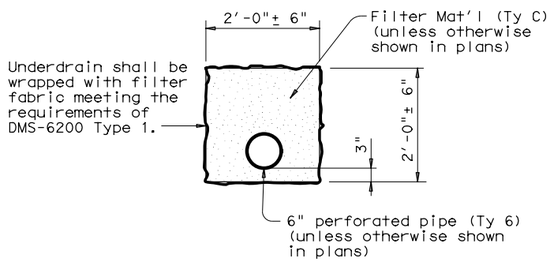


ELEVATION

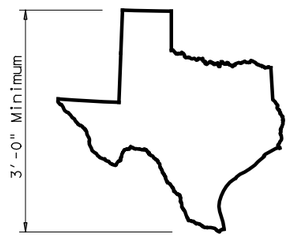


SPECIAL DRAINAGE PROVISIONS

(When cement stabilized backfill is used)



UNDERDRAIN DETAIL



MAP OF TEXAS EMBLEM ②

① Minimum embedment conforming to values given on the RW(MSE)DD standard.

② Map of Texas emblem shall be formed into a wall panel next to each bridge abutment. The exact location of each emblem shall be approved by the Engineer. The cost of forming the emblems will not be paid for directly, but shall be incidental to the Item "Retaining Wall". The map of Texas shall be inset a minimum of ¾" into the face of the panel, and shall receive a smooth finish. The inset area shall be finished in a contrasting color as approved by the Engineer.

Texas Department of Transportation

Bridge Division Standard

MECHANICALLY STABILIZED EARTH RETAINING WALL

RW(MSE)

FILE: rwstde01.dgn	DN: TxDOT	CK: TxDOT	DW: JGD	CK: MJG
©TxDOT March 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS 04-11: Added Table & Corrosion Criteria. 01-13: Wall embed, (WS) table, retained fill, soil strength.	0914	33	068,ETC	RSL
	DIST	COUNTY		SHEET NO.
	AUS	HAYS		122

DATE: 11/20/2020 5:36:28 PM
FILE: c:\pwworking\dal\d0684854\rwstde01.dgn

DATE: 11/20/2020 5:36:28 PM
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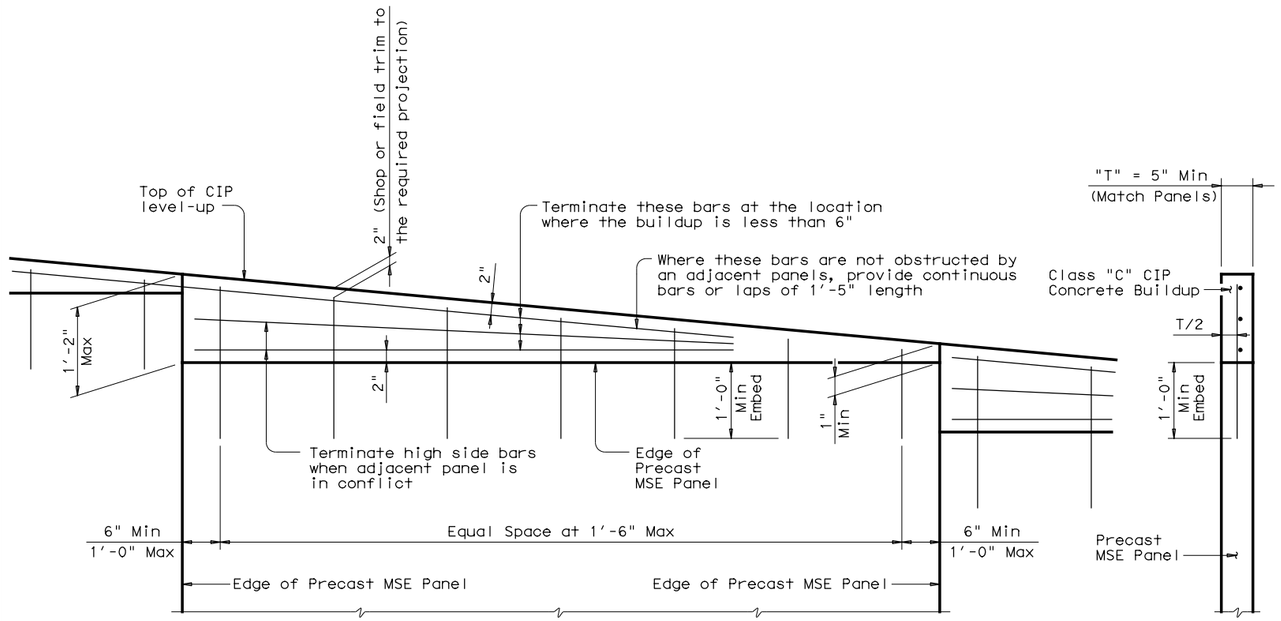


LEVEL UP DETAIL (5)

Provide Grade 60 (#4) Reinforcement

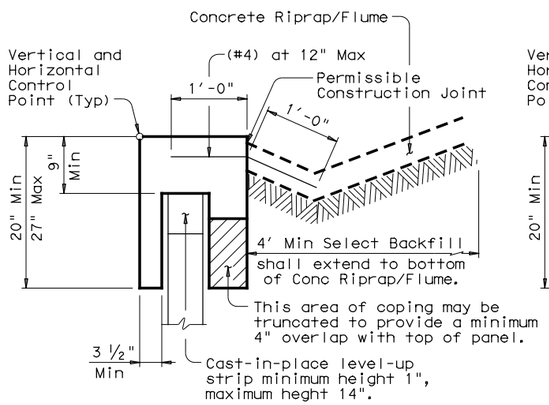
(3) Precast coping shall be anchored to prevent rotation or displacement. Use these details to develop custom anchorage for precast copings. Details shall include coping reinforcement. Concrete flume (if required) shall be paid for separately from Item 423.

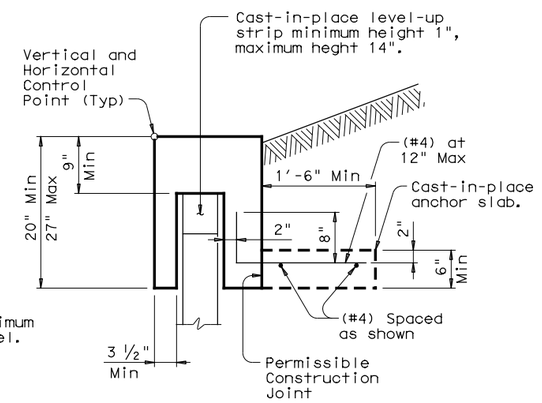
(4) Soil design parameter must be based on long term soil strength. Design parameters must be listed on the RW(MSE)DD standard.

(5) Cast vertical bars into the top of panels. At contractor's option vertical bars may be embedded 4" with a Type III Clac C epoxy anchorage system. Follow manufacturer's directions for installing the epoxied vertical bars.

(6)

SELECT BACKFILL UNIT WEIGHT			
Type AS, BS & DS	Unit Weight	Inernal Stability	External Stability
	105 PCF	Pullout	Sliding, Overturning, Eccentricity
	125 PCF	Rupture	Bearing





COPING ANCHORAGE DETAILS WITHOUT TRAFFIC RAILING (3)

DESIGN PARAMETERS:

Design of retaining walls shall be based on the following design parameters unless stated elsewhere in the plans:

Retained Soil	Unit Weight = 125 pcf Ø = (4) C = 0 psf
Foundation Soil	Ø = (4) C = 0 psf
Select Backfill	Unit Weight = See Table (6) Ø = 34 C = 0 psf
Cement Stabilized Select Backfill	Unit Weight = 125 pcf Ø = 45 C = 0 psf

Stress in steel and concrete shall be in accordance with current AASHTO Standard and Interim Specifications. The minimum length of earth reinforcements are as shown on the RW(MSE)DD standard.

STABILITY CRITERIA:

Stability criteria applies to both dry and drawdown analysis.
Factor of safety in sliding along the base of the structure shall be greater than or equal to 1.5.
Factor of safety in overturning shall be greater than or equal to 2.0.
The base pressure resultant shall fall within the middle third of the retaining wall.
The factor of safety against pullout of the earth reinforcements shall be greater than or equal to 1.5 at each level. Pullout resistance shall be determined from test data evaluated at ¾ inch strain.

CORROSION CRITERIA:

The earth reinforcement elements shall be designed to have a minimum design life of 75 years, using current AASHTO corrosion rates.
Stress calculations (rupture) shall be done on the calculated earth reinforcement section remaining after 75 years. Pullout calculations may be based on non-corroded section.

PRECAST COPINGS:

Wall supplier is to maximize lengths of precast coping. Precast coping is to be provided in 10′ minimum lengths (typical). To optimize coping lengths at radiuses, end 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 SEALER:

The joints between coping segments must be sealed in accordance with the DMS-6310 "Joint Sealant's and Fillers", joint sealing material, Class 4. The joint must be sealed 3" below and 6" above the adjoining pavement surface, or as directed by the Engineer. The purpose of the joint sealing is to contain surface drainage and prevent infiltration into the retaining wall backfill.

GENERAL NOTES:

Section and elevation shown is for informational purposes only. Specific geometry is to be determined based on wall layouts and other plan information.
The select backfill specified for use within the mechanically stabilized earth volume shall extend horizontally from the back of the panels to a minimum 2′ beyond the end of the earth reinforcements. The select backfill shall extend vertically from the top of the leveling pad or 4" below the lowest earth reinforcement, whichever is lower, to the top of panels.
The uppermost earth reinforcements shall be no more than 3.0′ below the top of wall.
The lowest level of earth reinforcements shall be no more than 2.0′ above the top of the leveling pad.
Minimum wire size for earth reinforcements shall be W7.0. If different longitudinal and cross wires are used in an earth reinforcement mesh, the smaller wire shall have 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. Each mesh configuration shall have a unique transverse bar spacing, differing from other configurations by a minimum of 3". Earth reinforcement lengths shall be stepped in increments no finer than 12".
Standard precast concrete panels shall have a maximum height of 6′, 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 shall be 7′-6". Minimum panel thickness shall be 5". Panels shall be arranged to provide offset horizontal joints.
An open joint shall be provided around the perimeter of the concrete panels. The joint configuration shall be such that 1) the filter fabric and/or pad materials are not exposed at the wall face and 2) the design opening is between ⅜" and ¾".
A one-piece corner panel shall be provided for wall angle changes of greater than 30 degrees. Butting of chamfered panels will be allowed for angle changes of 30 degrees or less.
Concrete coping shall be provided along the top of wall, at the vertical steps at bridge backwalls, and at other vertical steps along the top of wall. The joints between all coping segments shall be sealed to prevent infiltration of water into the retaining wall backfill. Sealing shall be in accordance with the DMS-6310 "Joint Sealants and Fillers", using Class 4 joint sealant.
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 earth reinforcement coverage as that required in the absence of the obstruction. For skewed (rotated) earth reinforcements no adjustment in length is needed for skew angles between 1 and 10 degrees. For skew angles greater than 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. 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.
Reinforced concrete must be Class "C", Precast concrete Class "H", Unreinforced concrete Class "A".
All reinforcing steel must be Grade 60.
Coping and anchor slabs are considered subsidiary to the Item "Retaining Wall".
These details are to be used in conjunction with the retaining wall layout, standard RW(MSE)DD and other applicable standards.

Texas Department of Transportation

Bridge Division Standard

MECHANICALLY STABILIZED EARTH RETAINING WALL

RW(MSE)

FILE: rwstde01.dgn	DN: TxDOT	CK: TxDOT	DW: JGD	CK: MJG
©TxDOT March 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS 04-11: Added Table & Corrosion Criteria. 01-13: Wall embed, (WS) table, retained fill, soil strength.	0914	33	068,ETC	RSL
	DIST	COUNTY		SHEET NO.
	AUS	HAYS		123

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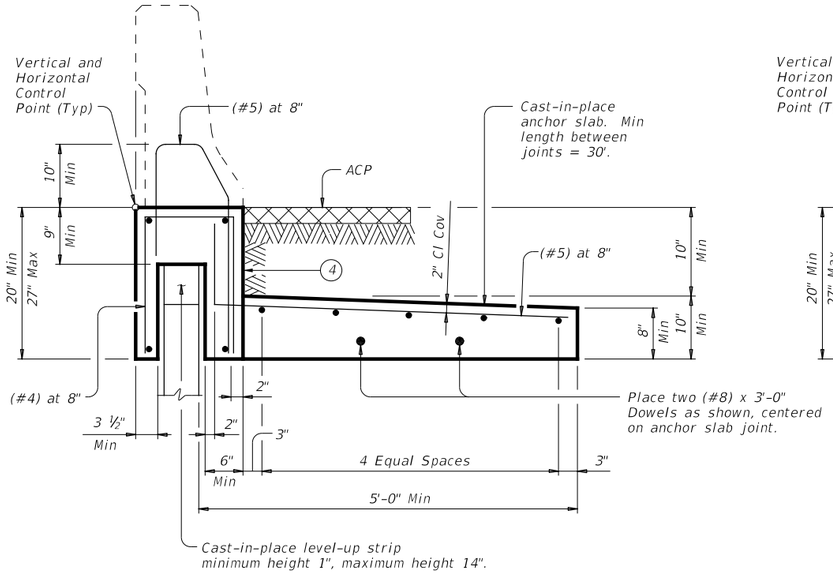
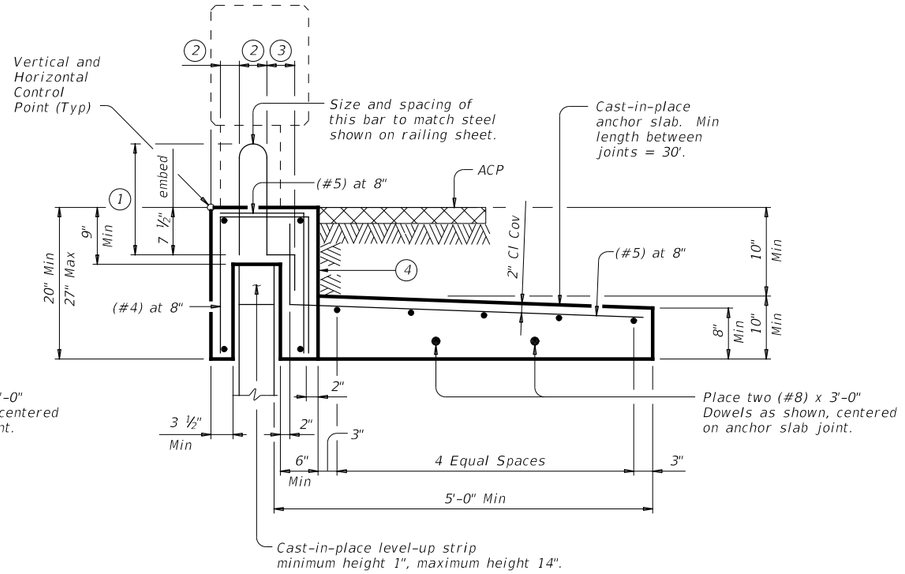


"WIDE BASED" ADJACENT TO ACP

(Showing T551 Rail, other rails listed similar)

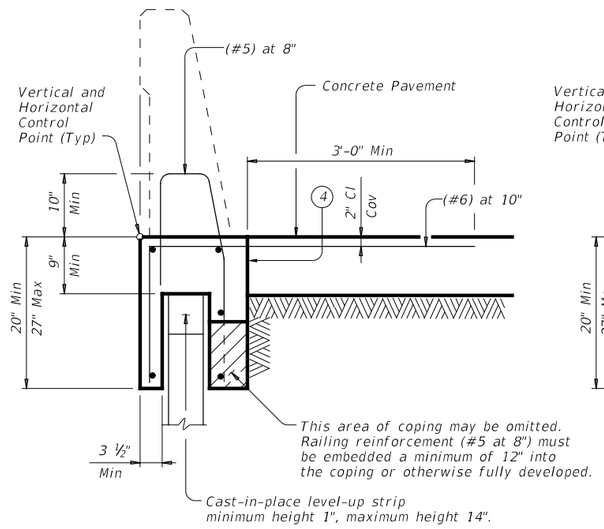


"NARROW BASED" ADJACENT TO ACP

(Showing T223 Rail, other rails listed similar)

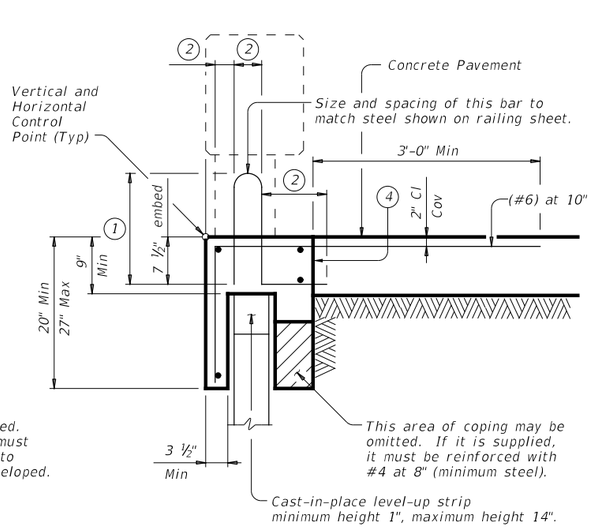
Rail Type (5)	Detail	Precasting Rail with Coping Allowed
T1F/T1W/C1W/T2P/C2P	NARROW	NO
T221/C221/T222	NARROW	YES
T223/C223	NARROW	NO
T401/T402/C402	NARROW	NO
T411/C411	NARROW	NO
T551/T552	WIDE	YES
T66	NARROW	NO
SSTR	WIDE	YES

1. Reinforcement length equal to length shown on the appropriate Rail standard plus 1".
2. Match dimension on the appropriate Rail standard.
3. Match dimension on the appropriate Rail standard. Bend end of rail anchorage reinforcing as shown as required to maintain clear cover.
4. See "Coping Joint Sealer Details".
5. Use of these rails will result in a railing acceptable for MASH Test Level 3 (TL-3) regardless of the higher ratings that may be indicated on the rail standard.



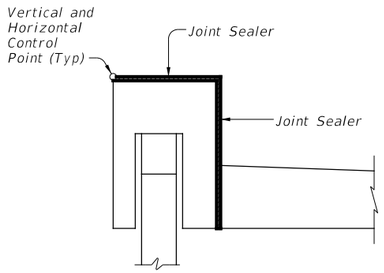
"WIDE BASED" ADJACENT TO CONCRETE PAVEMENT

(Showing SSTR Rail, other rails listed similar)

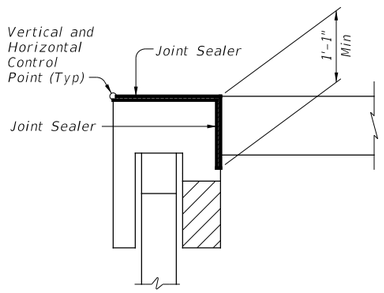


"NARROW BASED" ADJACENT TO CONCRETE PAVEMENT

(Showing T223 Rail, other rails listed similar)



ADJACENT TO ACP



ADJACENT TO CONCRETE PAVEMENT

COPING JOINT SEALER DETAILS

(Reinforcing steel not shown for clarity)

CAST-IN-PLACE COPINGS:

Provide compressible material to isolate precast panel from cast-in-place coping to prevent cracking. Attach compressible material to both sides of precast panel prior to casting concrete for coping.

When cast-in-place coping is anchored to reinforced concrete pavement, a smooth level-up strip must be provided on the top of the precast panels. The purpose of the level-up is to allow the pavement and coping to move longitudinally relative to the wall without causing damage.

Align coping and railing joints with precast panel joints. Optional rail joints are allowed as approved by Engineer. Provide railing construction joints or expansion joints at no greater than 100' spacing.

PRECAST COPINGS:

Provide a smooth level-up strip on top of the precast panels prior to installation of the coping. Shims may be used on top of the level-up strip to facilitate alignment. Total shim thickness not to exceed 1".

Provide precast coping in 10' minimum lengths.

JOINTED CONCRETE PAVEMENT:

When coping is adjacent to and anchored into jointed concrete pavement, the coping joints must coincide with the pavement joints.

JOINT SEALER:

Seal joints between coping segments in accordance with Item 438, "Cleaning and Sealing Joints". Provide Class 4 joint seal. Place sealant flush with coping surface. The purpose of the joint sealing is to reduce surface drainage infiltration into the retaining wall backfill. Sealing coping joint is considered subsidiary to other items.

GENERAL NOTES:

Details on this sheet are to be used in development of specific details for mounting traffic railing on mechanically stabilized earth (MSE) walls.

The specific details proposed must have strengths equivalent to those shown on this sheet. Areas of particular importance are the connection of the coping to the railing, the strength of the vertical coping leg connecting the railing to the anchor slab, and the connection of the coping to the anchor slab or concrete pavement.

Submit shop drawings for the traffic railing foundations to the Engineer in accordance with Item 423 "Retaining Wall". The shop drawings must include bar bending details.

Precasting of railing with the coping will be allowed as noted in the table on this sheet.

The Contractor's attention is directed to the fact that various configurations of precast coping/railing combinations are covered by patent. The contractor must provide for use of these systems in accordance with Article 7.3.

Provide Class C concrete (f'c=3,600 psi).

Provide Grade 60 reinforcing steel.

Provide (#4) longitudinal bars, unless otherwise shown.

Coping and anchor slabs are considered subsidiary to Item 423 "Retaining Wall". Payment for traffic railing is per the linear foot for the appropriate railing type.

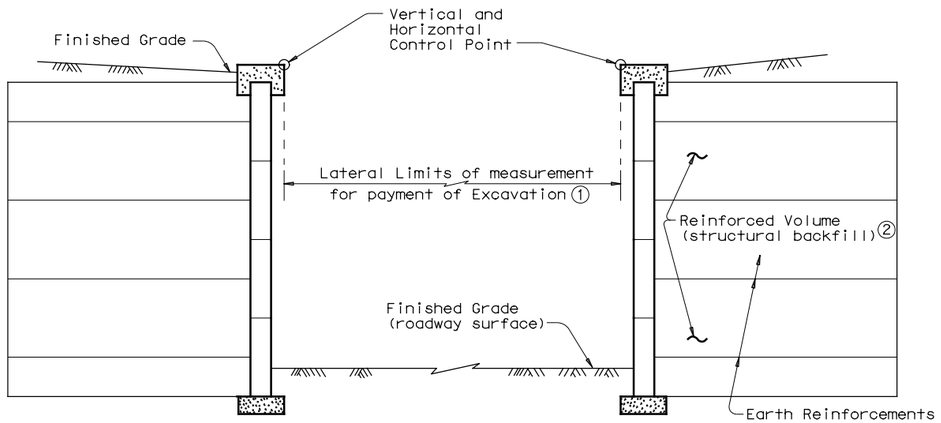
Texas Department of Transportation

Bridge Division Standard

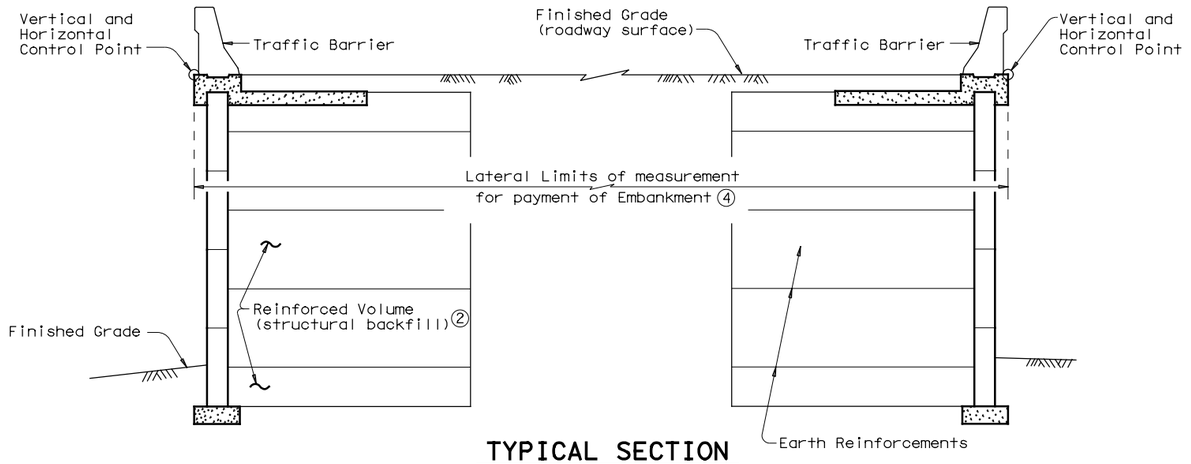
RETAINING WALL TRAFFIC RAILING FOUNDATIONS

RW(TRF)

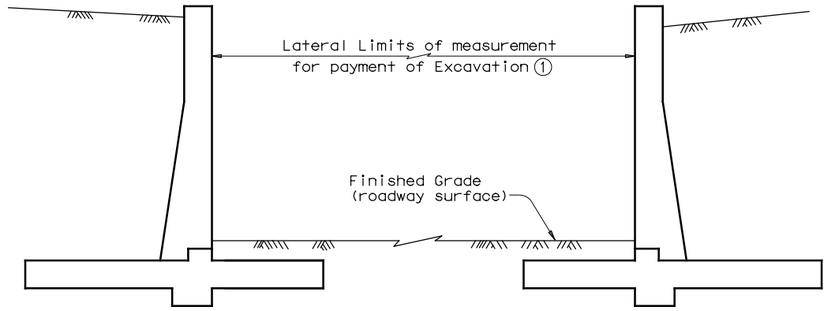
FILE: rwstde03-20.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: MPM
©TxDOT March 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS 01-13: Precast option with Rails. 03-18: Cast-in-Place Copings, railing construction and expansion joints. 02-20: Note 5 added for precast rail option.	0914	33	068,ETC	RSL
	DIST	COUNTY		SHEET NO.
	AUS	HAYS		124



TYPICAL SECTION
Excavation Between MSE Retaining Walls ③



TYPICAL SECTION
Embankment Between MSE Retaining Walls ③



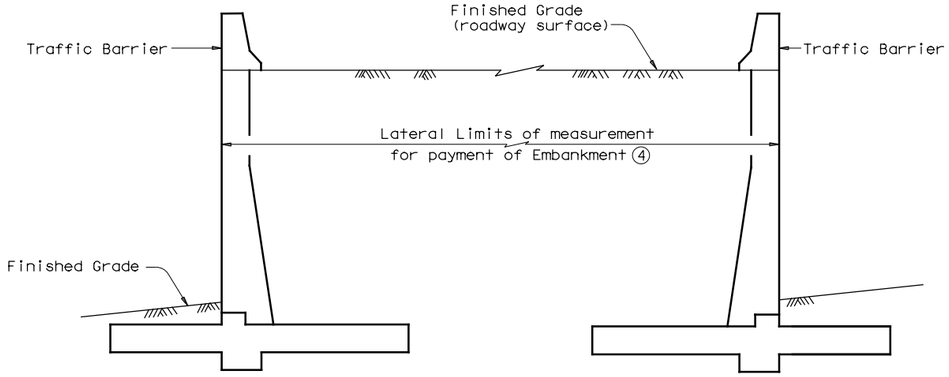
TYPICAL SECTION
Excavation Between Conventional Retaining Walls

① Only the Excavation above the proposed subgrade elevation will be measured for payment.

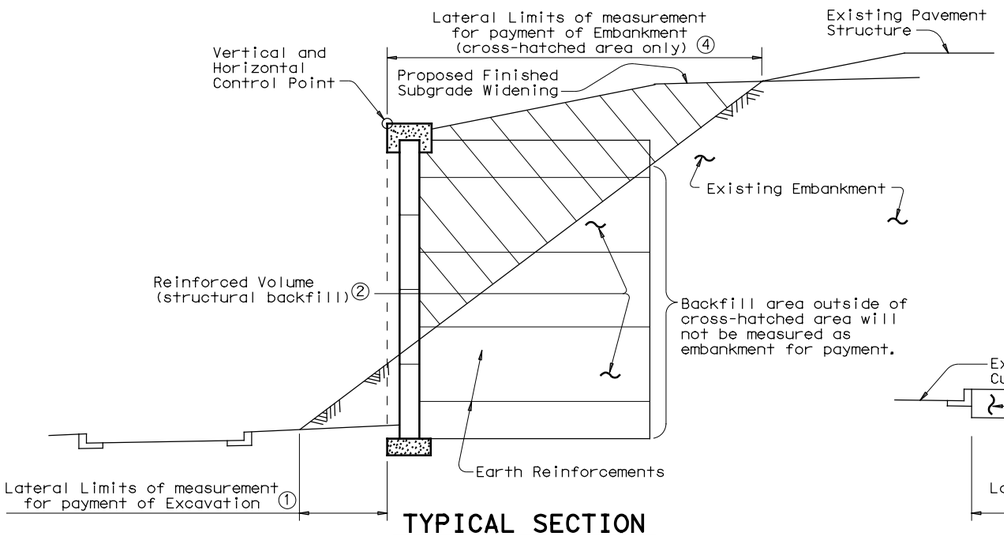
② Meeting requirements of Retaining-Wall Item.

③ Earthwork measurement with other designs of retaining walls will be made to the outside finished face in the same manner.

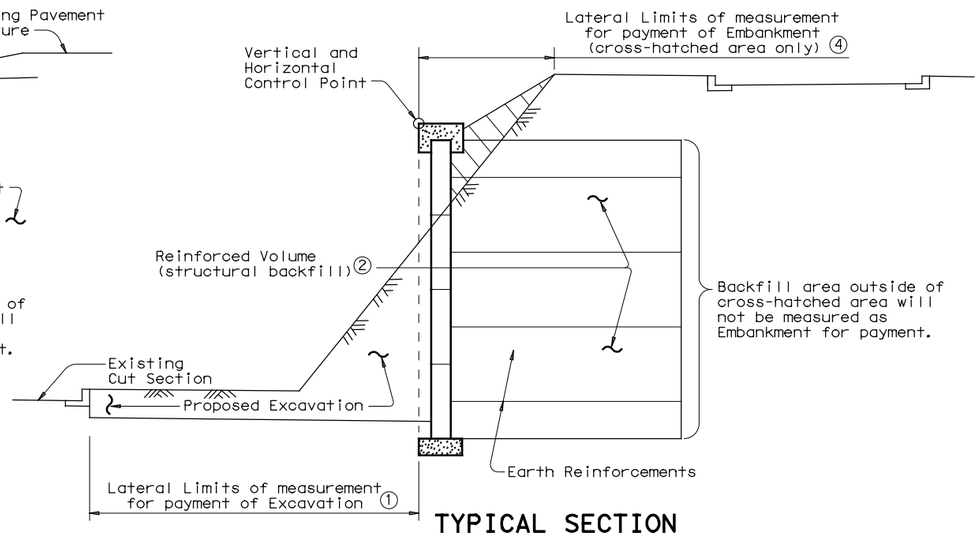
④ Only the Embankment above the existing ground line will be measured for payment.



TYPICAL SECTION
Embankment Between Conventional Retaining Walls



TYPICAL SECTION
Widening Embankment with MSE Retaining Walls ③



TYPICAL SECTION
Widening Cut Section with MSE Retaining Walls ③

Texas Department of Transportation

Bridge Division Standard

EARTHWORK MEASUREMENT AT RETAINING WALLS

RW(EM)

FILE: rwstde12.dgn	DN: TxDOT	CK: TxDOT	DW: BWH	CK: JMH
©TxDOT March 2010	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	AUS	HAYS		125

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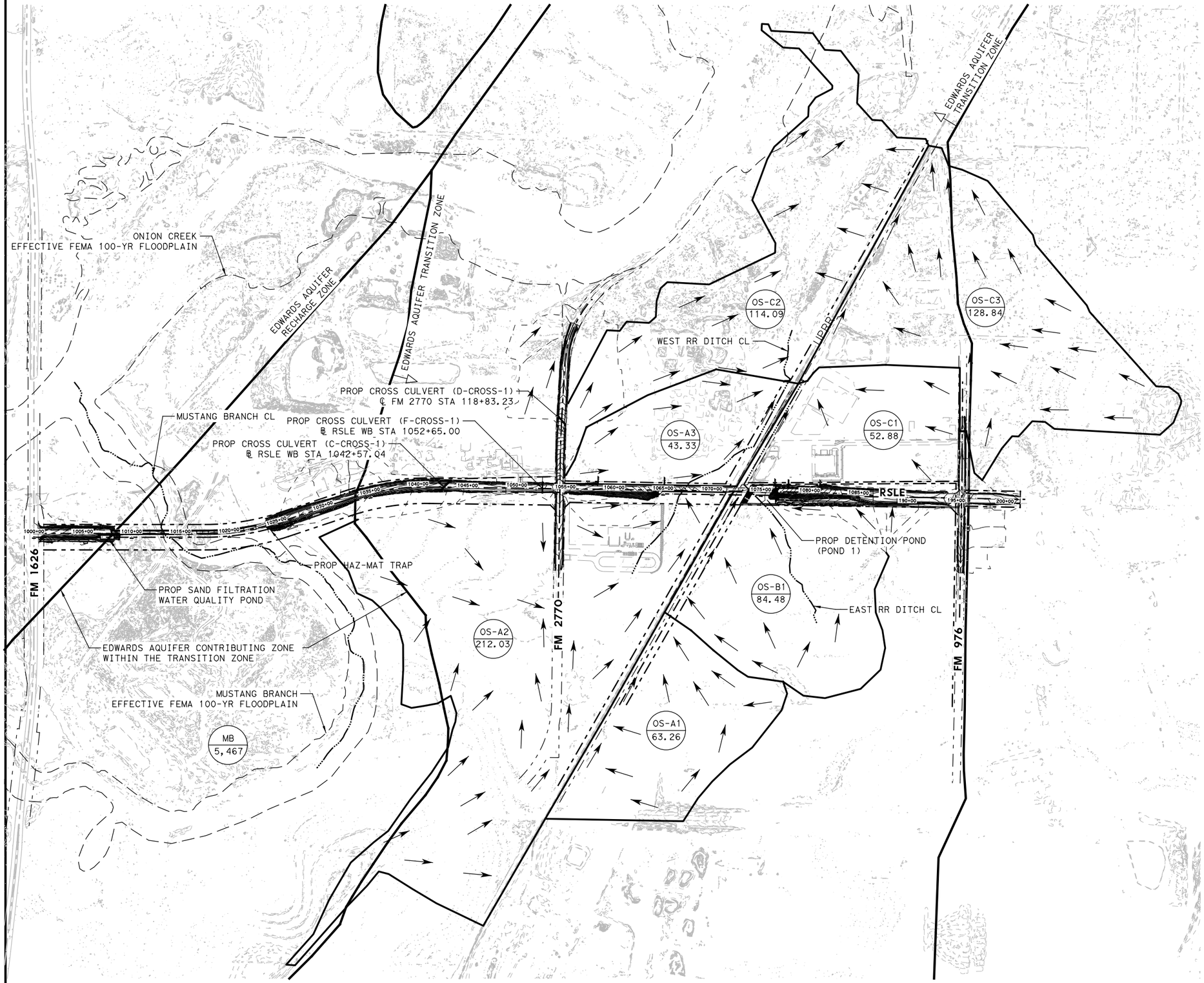

0 500 1000
SCALE IN FEET

LEGEND

- X-X-X / XX.XX — DRAINAGE AREA ID / DRAINAGE AREA (ACRES)
- FLOW ARROW
- EXTERNAL DRAINAGE AREA BOUNDARY
- INTERNAL DRAINAGE AREA BOUNDARY
- 100-YR FLOODPLAIN
- STREAM ℄
- PROP CONTOURS
- EXIST CONTOURS

NOTES:
1. SEE INTERNAL DRAINAGE AREA MAP FOR ON SITE DRAINAGE.
2. 2012 LIDAR DATA FROM CAPCOG FOR HAYS COUNTY. LIDAR PROCESSED INTO 3' DEM, AND 2' CONTOURS FOR DESIGN AND DISPLAY.
3. PROJECT AREA IS LOCATED ON FEMA FIRM 48209C PANEL 0280F EFFECTIVE SEPT. 2 2005.
4. REFER TO MUSTANG BRANCH HYDROLOGY DATA AND DRAINAGE AREA MAP SHEET FOR BASIN DELINEATION'S AT MUSTANG BRANCH THIS DELINEATION WAS DEVELOPED IN THE 2013 ONION CREEK WATERSHED HYDROLOGY STUDY.

12/11/2020

STATE OF TEXAS
ASHLEY S. HANSON
107373
LICENSED
PROFESSIONAL ENGINEER

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY
Texas Registered Engineering Firm F-2614

Texas Department of Transportation
℗ 2020

ROBERT S. LIGHT EXTENSION

OFFSITE DRAINAGE AREA

SHEET 1 OF 1

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	126
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

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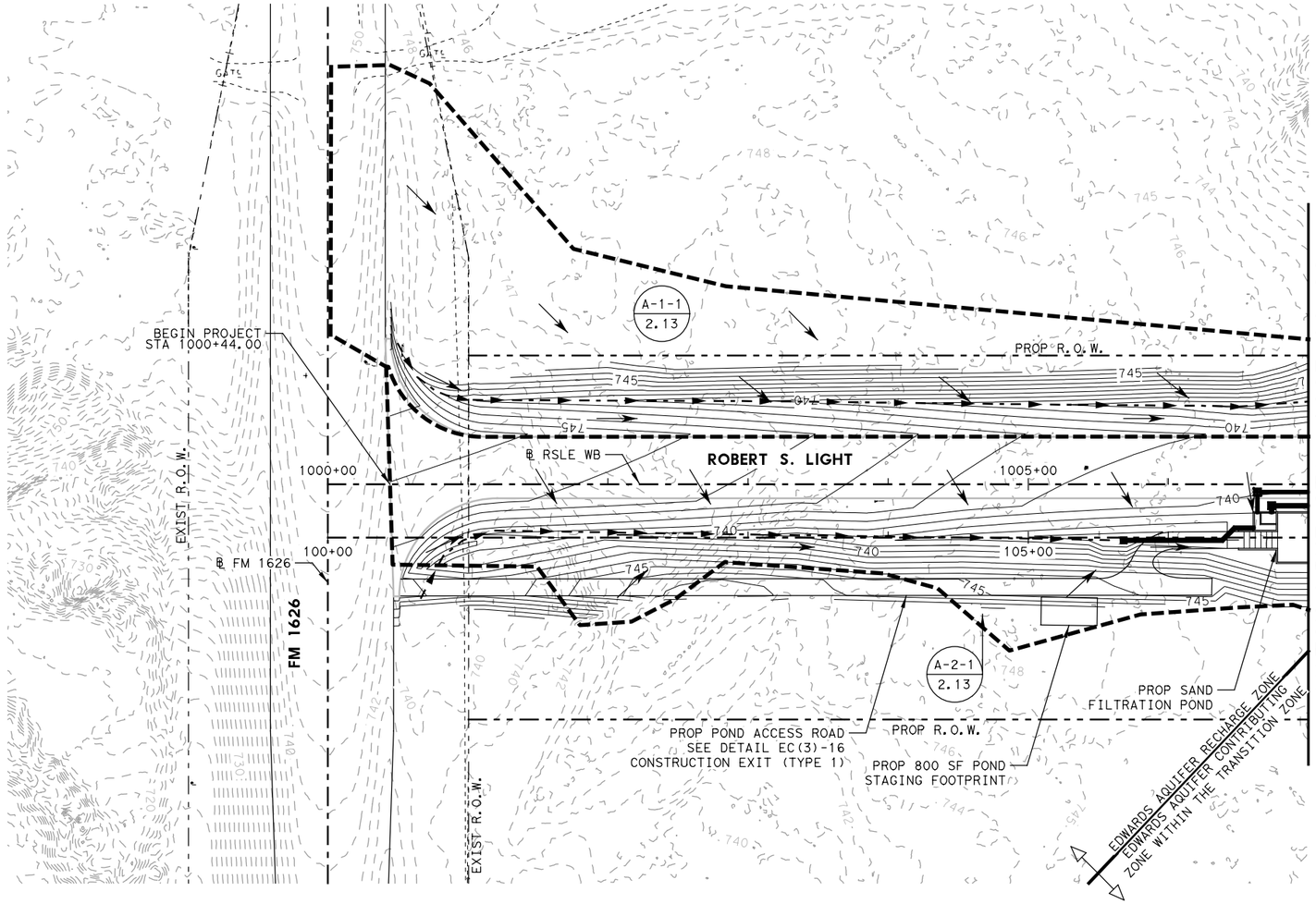

0 50 100
SCALE IN FEET

LEGEND

- PROP DRAINAGE AREA
- BL ALIGNMENT
- ROW
- FLOW ARROW
- PROP VEGETATED FILTER STRIP
- X-X-X / XX.XX — DRAINAGE AREA ID / DRAINAGE AREA (ACRES)
- DITCH FLOWLINE
- PROP CONTOURS
- EXIST CONTOURS
- STREAM ℄
- 100-YR FLOODPLAIN
- RIPRAP
- PROP BRIDGE
- EDWARDS AQUIFER ZONES
- STORMSEWER

NOTES:
1. SEE OFFSITE DRAINAGE AREA MAP FOR OFFSITE DRAINAGE.
2. INTERIM (NOT FUTURE) VEGETATIVE FILTER STRIPS TO BE BUILT FOR THIS PROJECT.
3. POND ACCESS TO BE INSTALLED AT LOCATION SHOWN ON PLANS IN ACCORDANCE WITH CONSTRUCTION EXIT (TYPE 1) AS SHOWN ON EC()-16. PAYMENT IN ACCORDANCE WITH THE CONSTRUCTION EXIT ITEM.

1/19/2021

STATE OF TEXAS
ASHLEY S. HANSON
107373
LICENSED
PROFESSIONAL ENGINEER

HAYS COUNTY TEXAS

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY
Texas Registered Engineering Firm F-2614

Texas Department of Transportation
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ROBERT S. LIGHT EXTENSION

ROBERT S LIGHT DRAINAGE AREA MAP BEGIN PROJECT TO STA 1007+00

SCALE: 1"=100'-H

SHEET 1 OF 16

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
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CHECK				
CMC				

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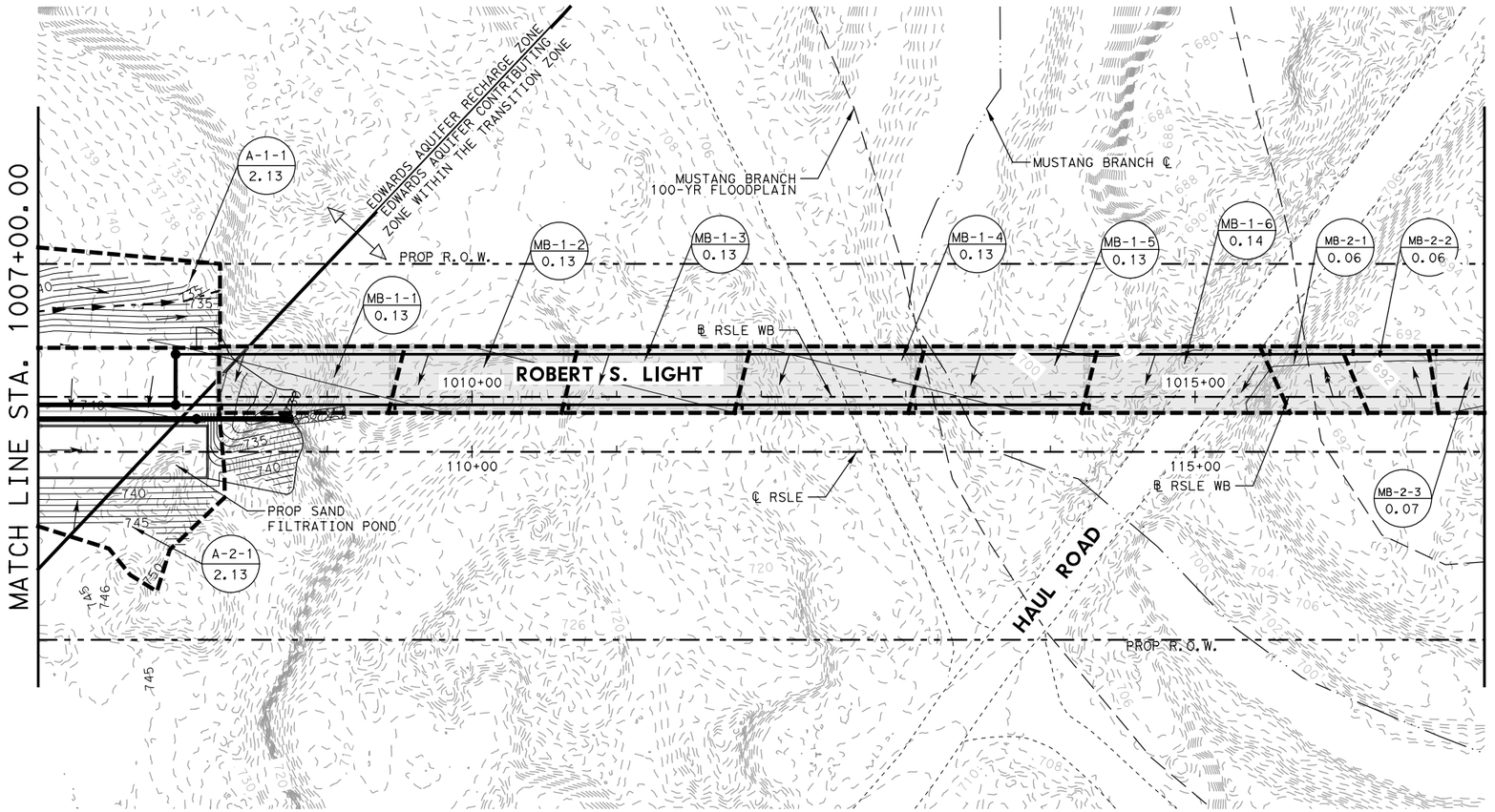

0 50 100
SCALE IN FEET

NORTH

LEGEND

- PROP DRAINAGE AREA
- BL ALIGNMENT
- ROW
- FLOW ARROW
- PROP VEGETATED FILTER STRIP
- X-X-X / XX.XX — DRAINAGE AREA ID / DRAINAGE AREA (ACRES)
- DITCH FLOWLINE
- PROP CONTOURS
- EXIST CONTOURS
- STREAM ℄
- 100-YR FLOODPLAIN
- RIPRAP
- PROP BRIDGE
- EDWARDS AQUIFER ZONES
- STORMSEWER

NOTES:
1. SEE OFFSITE DRAINAGE AREA MAP FOR OFFSITE DRAINAGE.
2. FOR HYDRAULIC ANALYSIS SEE MUSTANG BRANCH HYDRAULIC DATA SHEET.
3. INTERIM (NOT ULTIMATE) VEGETATIVE FILTER STRIPS TO BE BUILT FOR THIS PROJECT.

1/19/2021

STATE OF TEXAS
ASHLEY S. HANSON
107373
LICENSED PROFESSIONAL ENGINEER

HAYS COUNTY TEXAS

Lockwood, Andrews & Newnam, Inc.
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ROBERT S. LIGHT EXTENSION

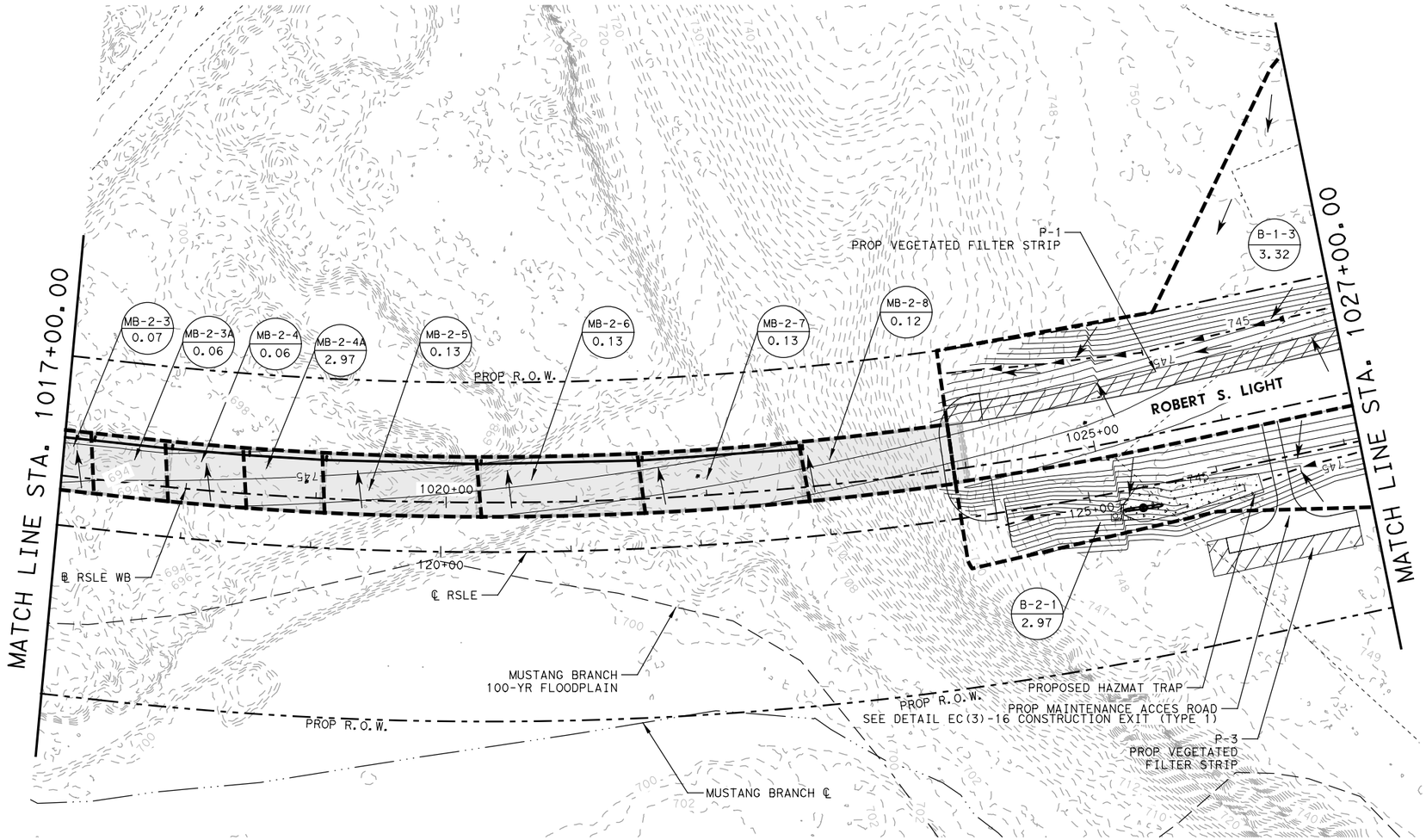
ROBERT S LIGHT DRAINAGE AREA MAP STA 1007+00 TO STA 1017+00

SCALE: 1"=100'-H

SHEET 2 OF 16

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	128
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
USER: DLayala
FILE: $PWWARVAULTPATHDESC$
DATE: 1/19/2021
TIME: 3:45:09 PM
PENTABLE: 000000002146\5
SCALE: 1:100



0 50 100
SCALE IN FEET

NORTH

LEGEND

- PROP DRAINAGE AREA
- BL ALIGNMENT
- ROW
- FLOW ARROW
- PROP VEGETATED FILTER STRIP
- X-X-X / XX.XX — DRAINAGE AREA ID / DRAINAGE AREA (ACRES)
- DITCH FLOWLINE
- PROP CONTOURS
- EXIST CONTOURS
- STREAM ℄
- 100-YR FLOODPLAIN
- RIPRAP
- PROP BRIDGE
- EDWARDS AQUIFER ZONES
- STORMSEWER

NOTES:
1. SEE OFFSITE DRAINAGE AREA MAP FOR OFFSITE DRAINAGE.
2. FOR HYDRAULIC ANALYSIS SEE MUSTANG BRANCH HYDRAULIC DATA SHEET.
3. INTERIM (NOT ULTIMATE) VEGETATIVE FILTER STRIPS TO BE BUILT FOR THIS PROJECT.

1/19/2021

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ROBERT S. LIGHT EXTENSION

ROBERT S LIGHT DRAINAGE AREA MAP STA 1017+00 TO STA 1027+00

SCALE: 1"=100'-H

SHEET 3 OF 16

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	129
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

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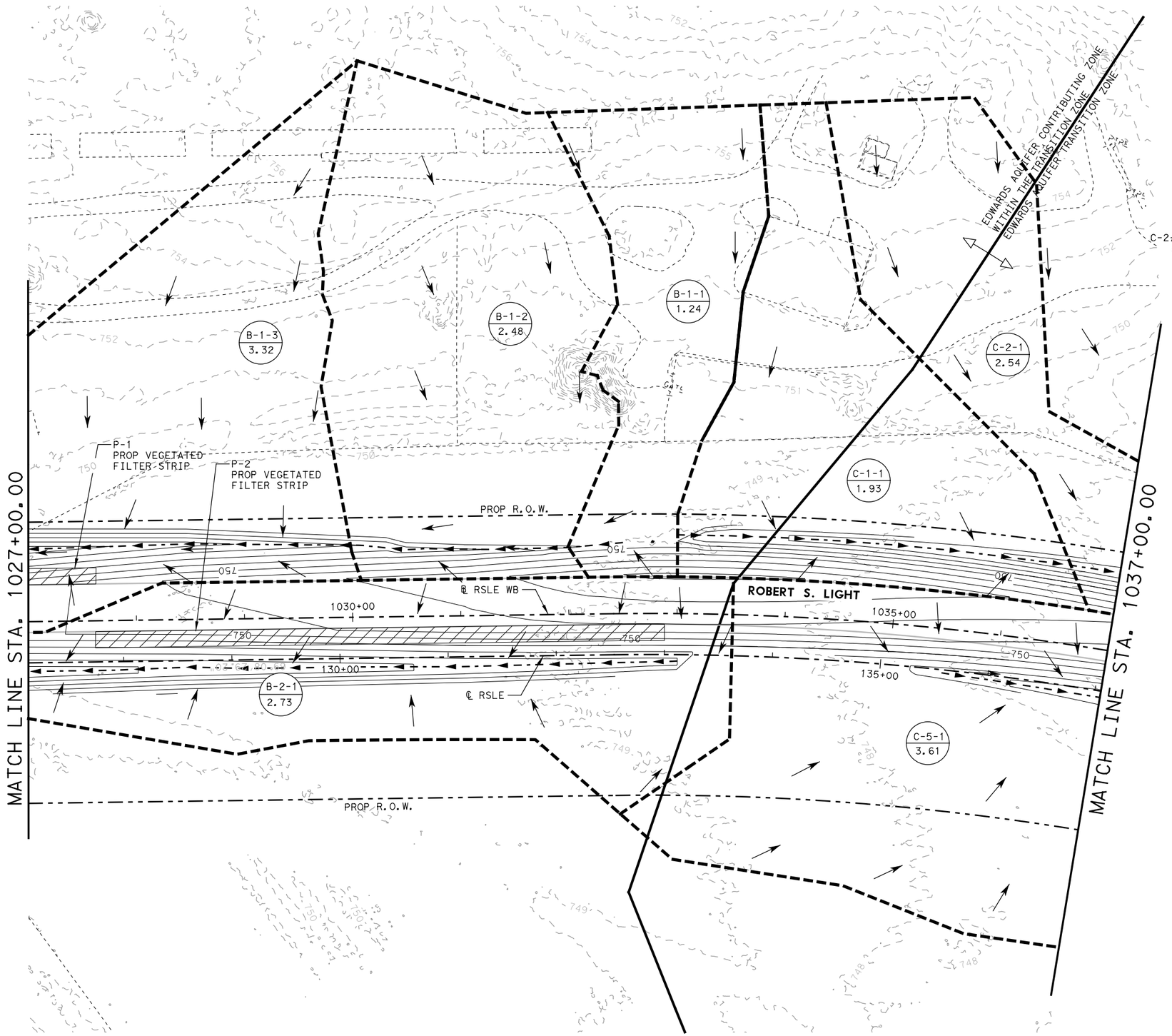

LEGEND

0 50 100
SCALE IN FEET

- PROP DRAINAGE AREA
- BL ALIGNMENT
- ROW
- FLOW ARROW
- PROP VEGETATED FILTER STRIP
- X-X-X / XX.XX — DRAINAGE AREA ID / DRAINAGE AREA (ACRES)
- DITCH FLOWLINE
- PROP CONTOURS
- EXIST CONTOURS
- STREAM ℄
- 100-YR FLOODPLAIN
- RIPRAP
- PROP BRIDGE
- EDWARDS AQUIFER ZONES
- STORMSEWER

NOTES:
1. SEE OFFSITE DRAINAGE AREA MAP FOR OFFSITE DRAINAGE.
2. INTERIM (NOT ULTIMATE) VEGETATIVE FILTER STRIPS TO BE BUILT FOR THIS PROJECT.

1/25/2021

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ROBERT S. LIGHT EXTENSION

ROBERT S LIGHT DRAINAGE AREA MAP STA 1027+00 TO STA 1037+00

SCALE: 1"=100'-H

SHEET 4 OF 16

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	130
CLH	0914	33	068	
CHECK				
CMC				

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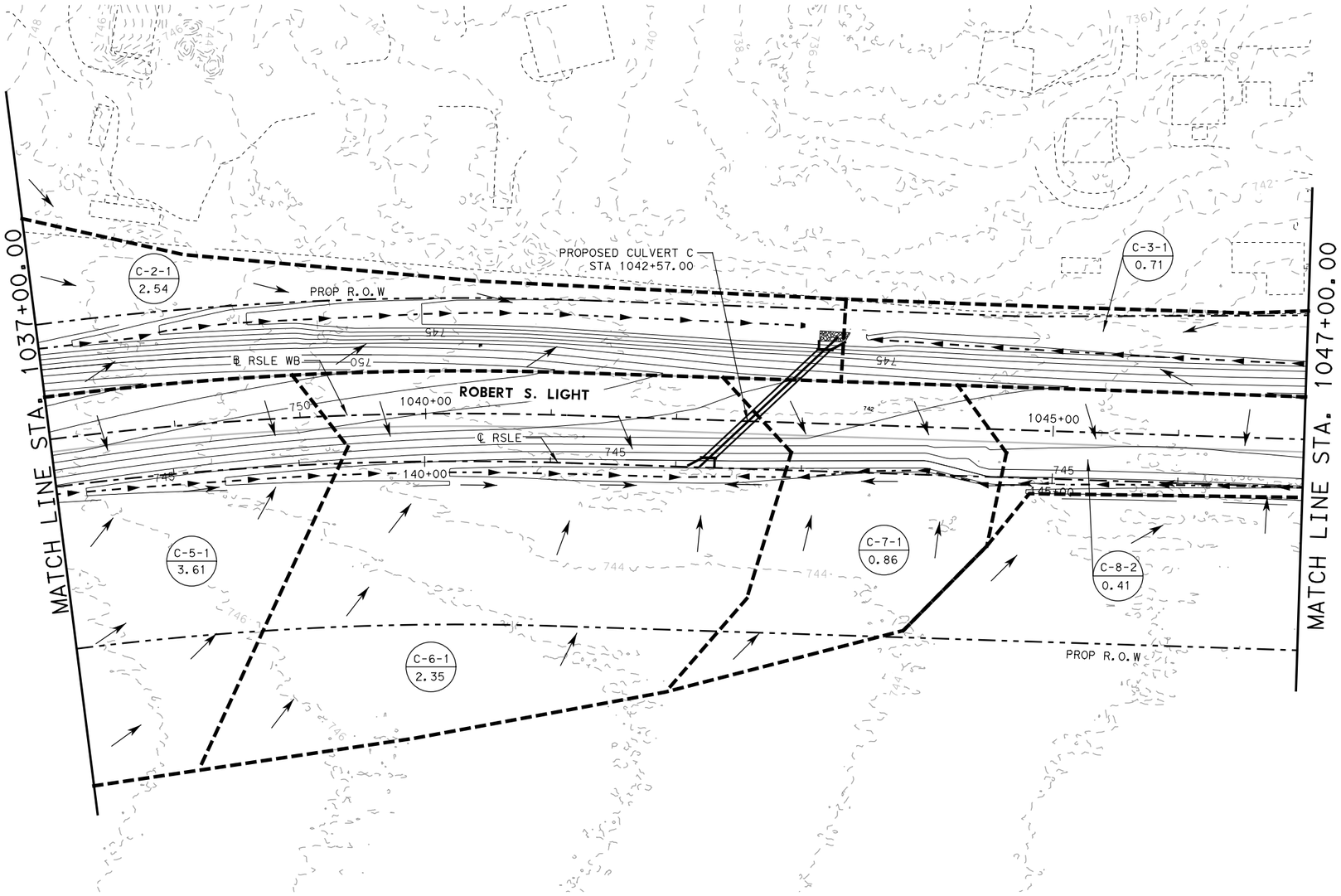

0 50 100
SCALE IN FEET

NORTH

LEGEND

- PROP DRAINAGE AREA
- BL ALIGNMENT
- ROW
- FLOW ARROW
- PROP VEGETATED FILTER STRIP
- X-X-X / XX.XX — DRAINAGE AREA ID / DRAINAGE AREA (ACRES)
- DITCH FLOWLINE
- PROP CONTOURS
- EXIST CONTOURS
- STREAM ℄
- 100-YR FLOODPLAIN
- RIPRAP
- PROP BRIDGE
- EDWARDS AQUIFER ZONES
- STORMSEWER

NOTES:
1. SEE OFFSITE DRAINAGE AREA MAP FOR OFFSITE DRAINAGE.

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ROBERT S. LIGHT EXTENSION

ROBERT S LIGHT
DRAINAGE AREA MAP
STA 1037+00 TO STA 1047+00

SCALE: 1"=100'-H

SHEET 5 OF 16

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	131
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

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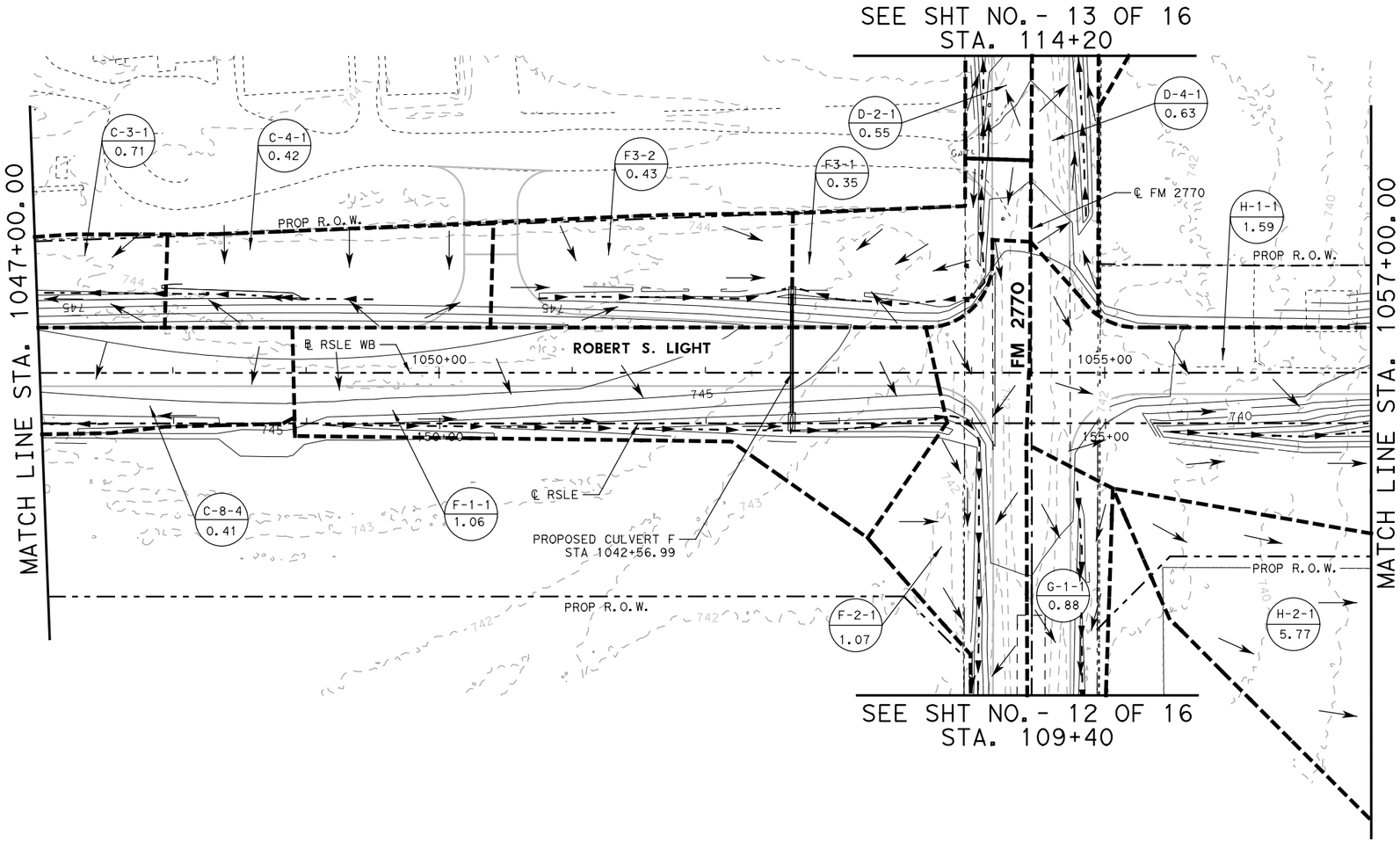

0 50 100
SCALE IN FEET

NORTH

LEGEND

- PROP DRAINAGE AREA
- BL ALIGNMENT
- ROW
- FLOW ARROW
- PROP VEGETATED FILTER STRIP
- X-X-X / XX.XX — DRAINAGE AREA ID / DRAINAGE AREA (ACRES)
- DITCH FLOWLINE
- PROP CONTOURS
- EXIST CONTOURS
- STREAM ℄
- 100-YR FLOODPLAIN
- RIPRAP
- PROP BRIDGE
- EDWARDS AQUIFER ZONES
- STORMSEWER

NOTES:
1. SEE OFFSITE DRAINAGE AREA MAP FOR OFFSITE DRAINAGE.

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ROBERT S. LIGHT EXTENSION

ROBERT S LIGHT
DRAINAGE AREA MAP
STA 1047+00 TO STA 1057+00

SCALE: 1"=100'-H

SHEET 6 OF 16

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	132
CHECK CLH	CONTROL	SECTION	JOB	
CHECK CMC	0914	33	068	

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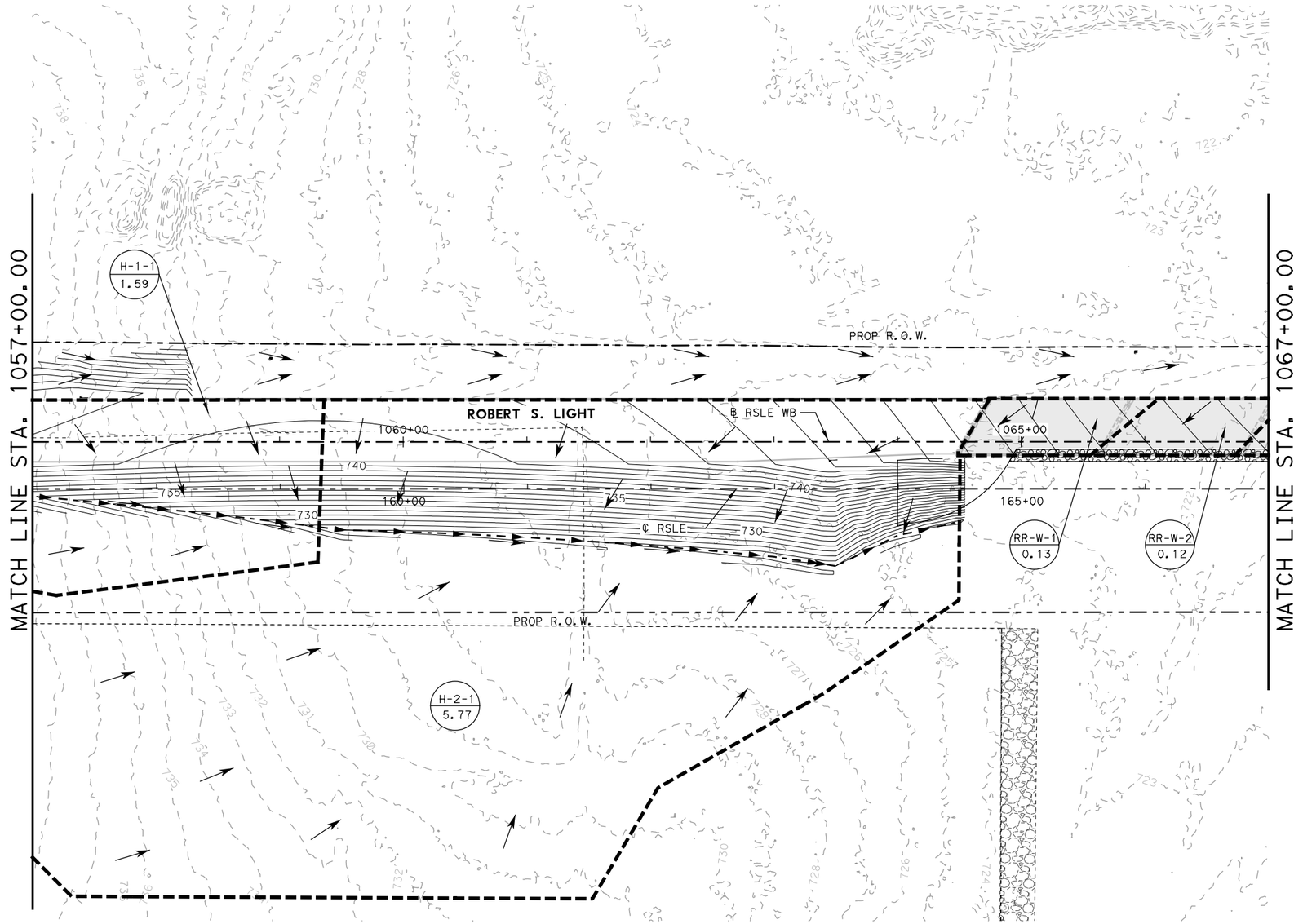

0 50 100
SCALE IN FEET

NORTH

LEGEND

- PROP DRAINAGE AREA
- BL ALIGNMENT
- ROW
- FLOW ARROW
- PROP VEGETATED FILTER STRIP
- X-X-X / XX.XX — DRAINAGE AREA ID / DRAINAGE AREA (ACRES)
- DITCH FLOWLINE
- PROP CONTOURS
- EXIST CONTOURS
- STREAM ℄
- 100-YR FLOODPLAIN
- RIPRAP
- PROP BRIDGE
- EDWARDS AQUIFER ZONES
- STORMSEWER

NOTES:
1. SEE OFFSITE DRAINAGE AREA MAP FOR OFFSITE DRAINAGE.
2. FOR HYDRAULIC ANALYSIS SEE UPRR BRIDGE HYDRAULIC DATA SHEET.

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ROBERT S. LIGHT EXTENSION

ROBERT S LIGHT
DRAINAGE AREA MAP
STA 1057+00 TO STA 1067+00

SCALE: 1"=100'-H

SHEET 7 OF 16

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	133
CLH	0914	33	068	
CHECK				
CMC				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
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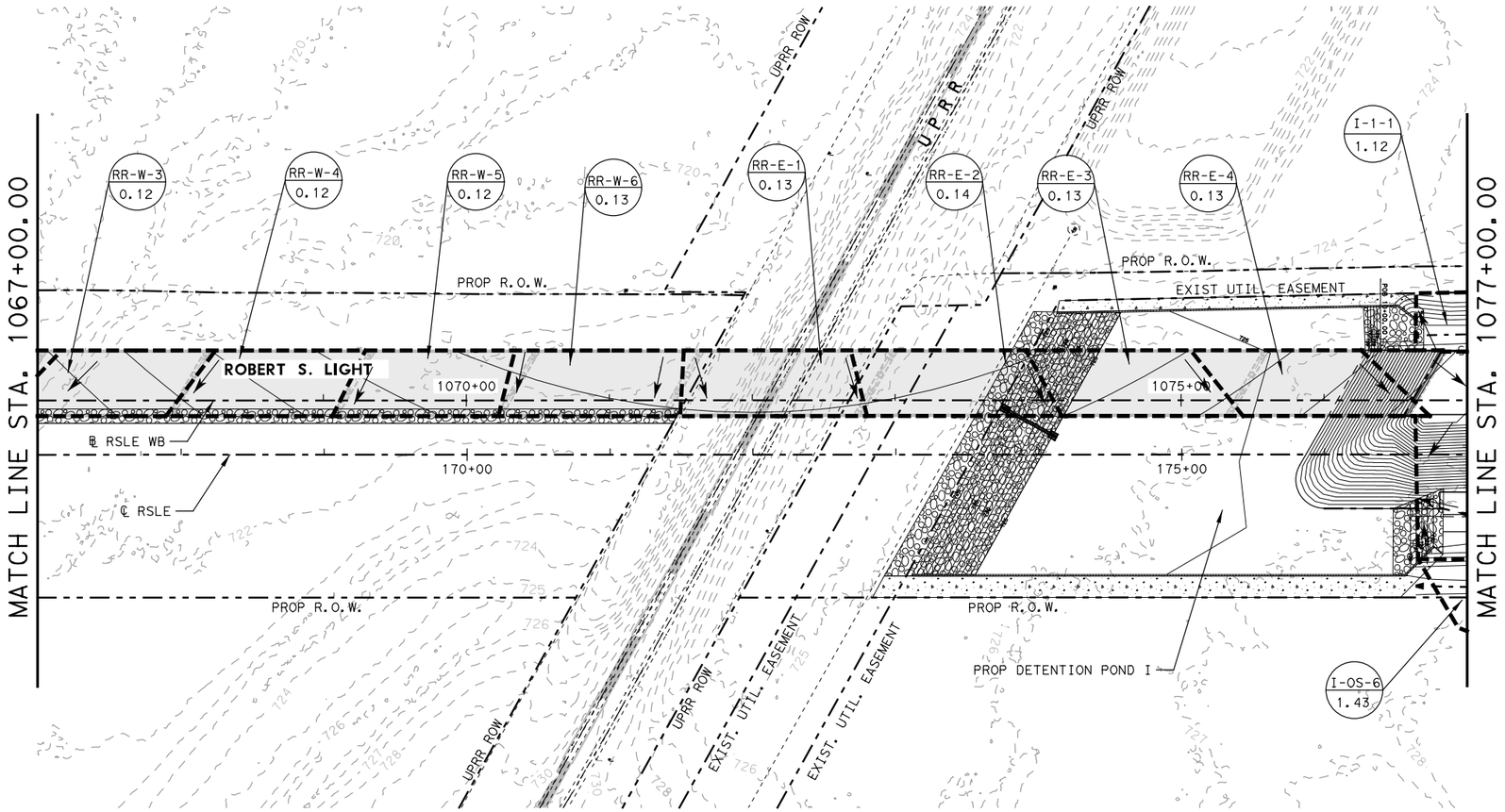

0 50 100
SCALE IN FEET

LEGEND

- PROP DRAINAGE AREA
- BL ALIGNMENT
- ROW
- FLOW ARROW
- PROP VEGETATED FILTER STRIP
- X-X-X / XX.XX — DRAINAGE AREA ID / DRAINAGE AREA (ACRES)
- DITCH FLOWLINE
- PROP CONTOURS
- EXIST CONTOURS
- STREAM ℄
- 100-YR FLOODPLAIN
- RIPRAP
- PROP BRIDGE
- EDWARDS AQUIFER ZONES
- STORMSEWER

NOTES:
1. SEE OFFSITE DRAINAGE AREA MAP FOR OFFSITE DRAINAGE.
2. FOR HYDRAULIC ANALYSIS SEE UPRR BRIDGE HYDRAULIC DATA SHEET.

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ROBERT S. LIGHT EXTENSION

ROBERT S LIGHT DRAINAGE AREA MAP STA 1067+00 TO STA 1077+00

SCALE: 1"=100'-H

SHEET 8 OF 16

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	134
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
USER: DLAyala
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DATE: 1/19/2021
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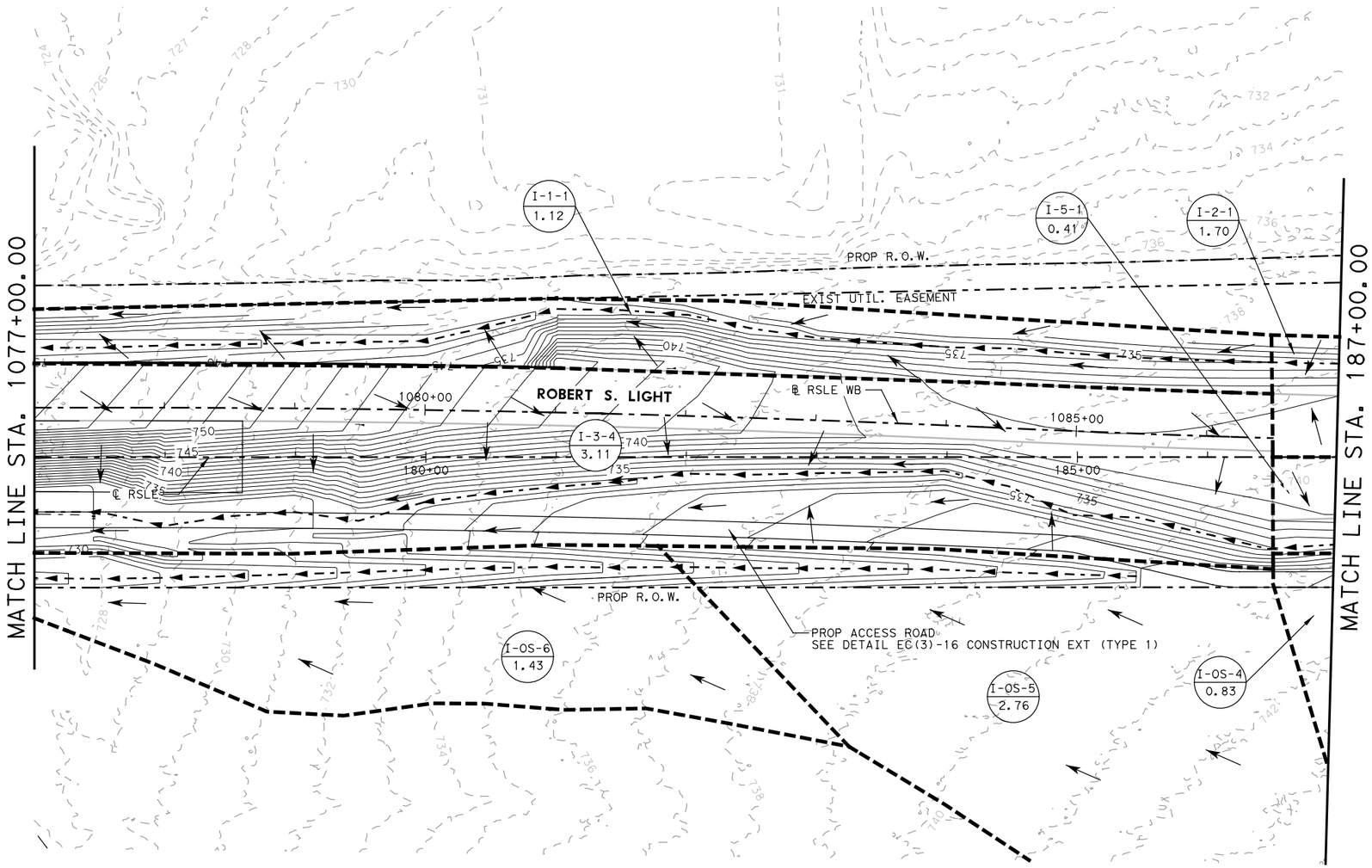

0 50 100
SCALE IN FEET

NORTH

LEGEND

- PROP DRAINAGE AREA
- BL ALIGNMENT
- ROW
- FLOW ARROW
- PROP VEGETATED FILTER STRIP
- X-X-X / XX.XX — DRAINAGE AREA ID / DRAINAGE AREA (ACRES)
- DITCH FLOWLINE
- PROP CONTOURS
- EXIST CONTOURS
- STREAM ℄
- 100-YR FLOODPLAIN
- RIPRAP
- PROP BRIDGE
- EDWARDS AQUIFER ZONES
- STORMSEWER

NOTES:
1. SEE OFFSITE DRAINAGE AREA MAP FOR OFFSITE DRAINAGE.

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ROBERT S. LIGHT EXTENSION

ROBERT S LIGHT DRAINAGE AREA MAP STA 1077+00 TO STA 1087+00

SCALE: 1"=100'-H

SHEET 9 OF 16

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	135
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

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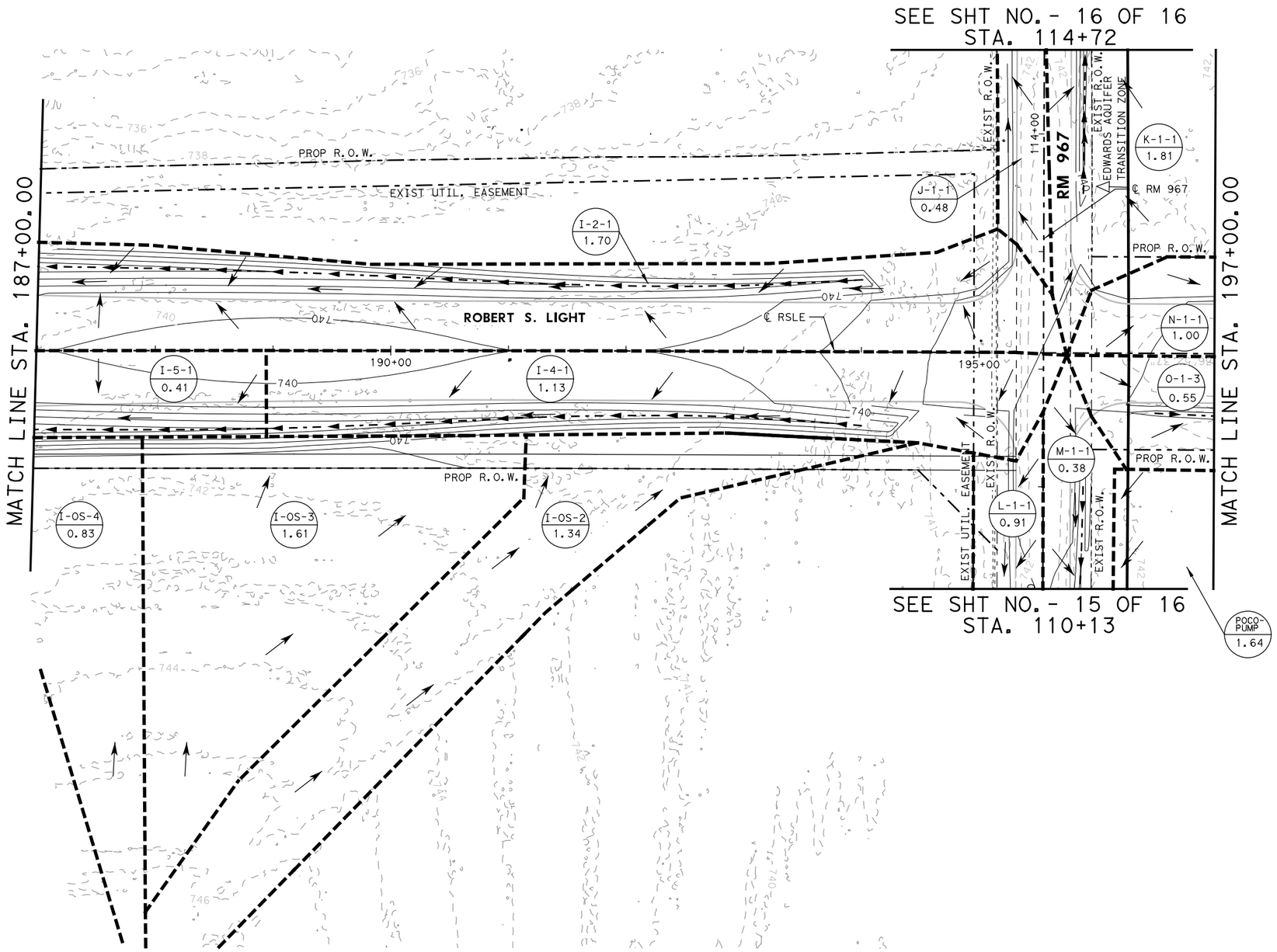

0 50 100
SCALE IN FEET

NORTH

LEGEND

- PROP DRAINAGE AREA
- BL ALIGNMENT
- ROW
- FLOW ARROW
- PROP VEGETATED FILTER STRIP
- X-X-X / XX.XX — DRAINAGE AREA ID / DRAINAGE AREA (ACRES)
- DITCH FLOWLINE
- PROP CONTOURS
- EXIST CONTOURS
- STREAM ℄
- 100-YR FLOODPLAIN
- RIPRAP
- PROP BRIDGE
- EDWARDS AQUIFER ZONES
- STORMSEWER

NOTES:
1. SEE OFFSITE DRAINAGE AREA MAP FOR OFFSITE DRAINAGE.

2 DELINEATION OF BASIN POCO-PUMP IS BASED ON THE 2016 PLANS OF SITE PLAN FOR BUDA C-STORE, ROBERT S. LIGHT DR., BUDA, TX, 78610. PREPARED BY MIGUEL GONZALES JR, P.E., TEXAS FIRM NO. F-15437, SHEET 7 OF 20.

3. DELINEATION OF BASINS M-CULV-1 AND M-CULV-2 WERE BASED ON AERIAL IMAGERY AND FIELD CONDITIONS.

1/19/2021

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ROBERT S. LIGHT EXTENSION

ROBERT S LIGHT DRAINAGE AREA MAP STA 187+00 TO STA 197+00

SCALE: 1"=100'-H

SHEET 10 OF 16

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	136
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

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DATE: 1/19/2021
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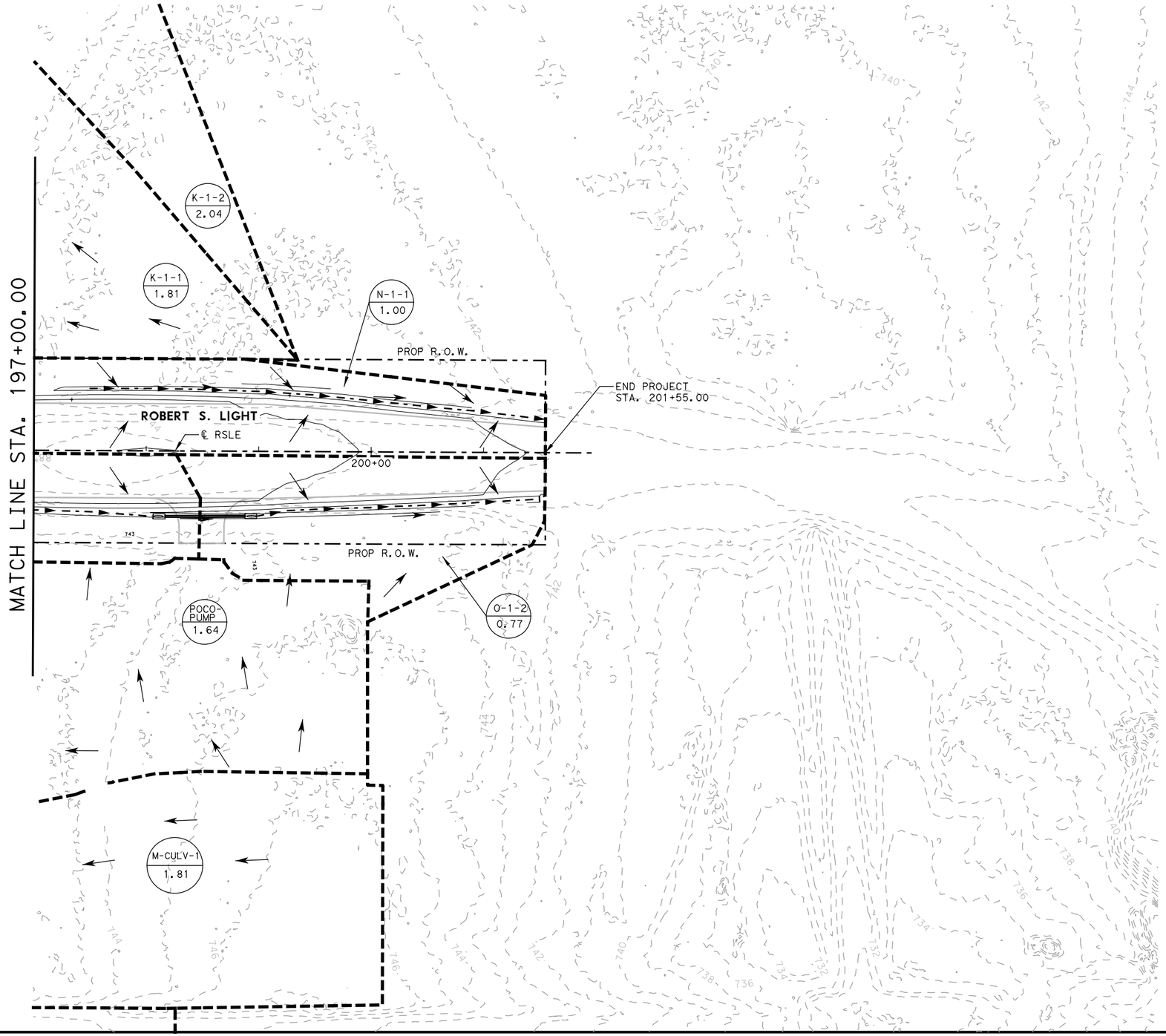

LEGEND

- PROP DRAINAGE AREA
- BL ALIGNMENT
- ROW
- FLOW ARROW
- PROP VEGETATED FILTER STRIP
- X-X-X / XX.XX — DRAINAGE AREA ID / DRAINAGE AREA (ACRES)
- DITCH FLOWLINE
- PROP CONTOURS
- EXIST CONTOURS
- STREAM ℄
- 100-YR FLOODPLAIN
- RIPRAP
- PROP BRIDGE
- EDWARDS AQUIFER ZONES
- STORMSEWER

0 50 100
SCALE IN FEET

NORTH

NOTES:
1. SEE OFFSITE DRAINAGE AREA MAP FOR OFFSITE DRAINAGE.
2 DELINEATION OF BASIN POCO-PUMP IS BASED ON THE 2016 PLANS OF SITE PLAN FOR BUDA C-STORE, ROBERT S. LIGHT DR., BUDA, TX, 78610. PREPARED BY MIGUEL GONZALES JR, P.E., TEXAS FIRM NO. F-15437, SHEET 7 OF 20.
3. DELINEATION OF BASINS M-CULV-1 AND M-CULV-2 WERE BASED ON AERIAL IMAGERY AND FIELD CONDITIONS.

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ROBERT S. LIGHT EXTENSION

ROBERT S LIGHT DRAINAGE AREA MAP STA 197+00 TO END PROJECT

SCALE: 1"=100'-H

SHEET 11 OF 16

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	137
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

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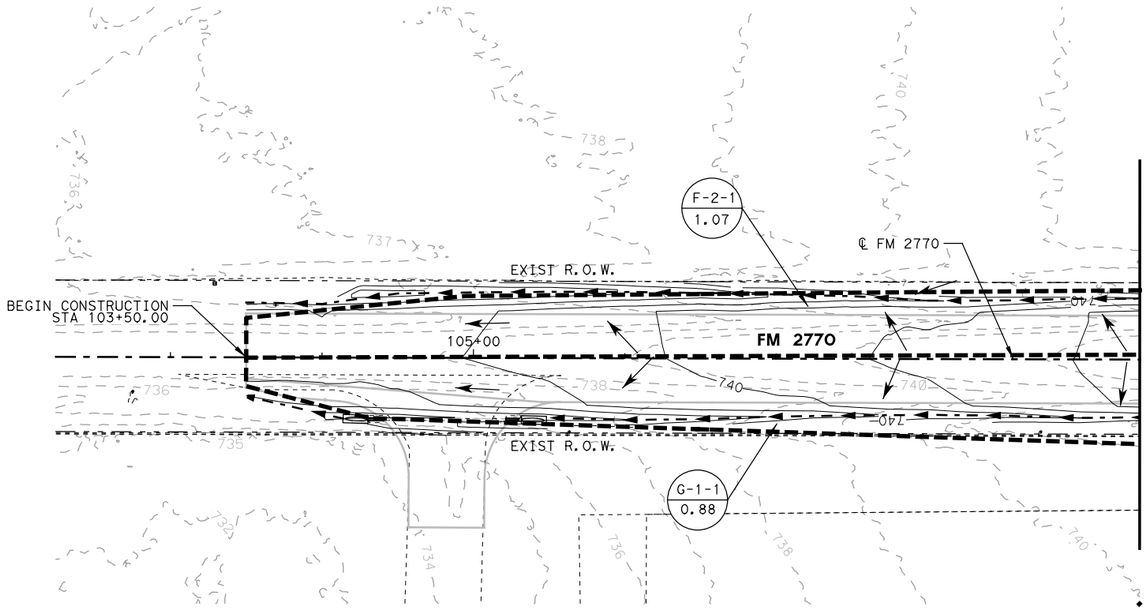

LEGEND

- PROP DRAINAGE AREA
- BL ALIGNMENT
- ROW
- FLOW ARROW
- PROP VEGETATED FILTER STRIP
- X-X-X / XX.XX — DRAINAGE AREA ID / DRAINAGE AREA (ACRES)
- DITCH FLOWLINE
- PROP CONTOURS
- EXIST CONTOURS
- STREAM ℄
- 100-YR FLOODPLAIN
- RIPRAP
- PROP BRIDGE
- EDWARDS AQUIFER ZONES
- STORMSEWER

NORTH

0 50 100
SCALE IN FEET

NOTES:
1. SEE OFFSITE DRAINAGE AREA MAP FOR OFFSITE DRAINAGE.

1/19/2021

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ROBERT S. LIGHT EXTENSION

FM 2770
DRAINAGE AREA MAP
BEGIN PROJECT TO STA 109+40

SCALE: 1"=100'-H

SHEET 12 OF 16

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	138
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

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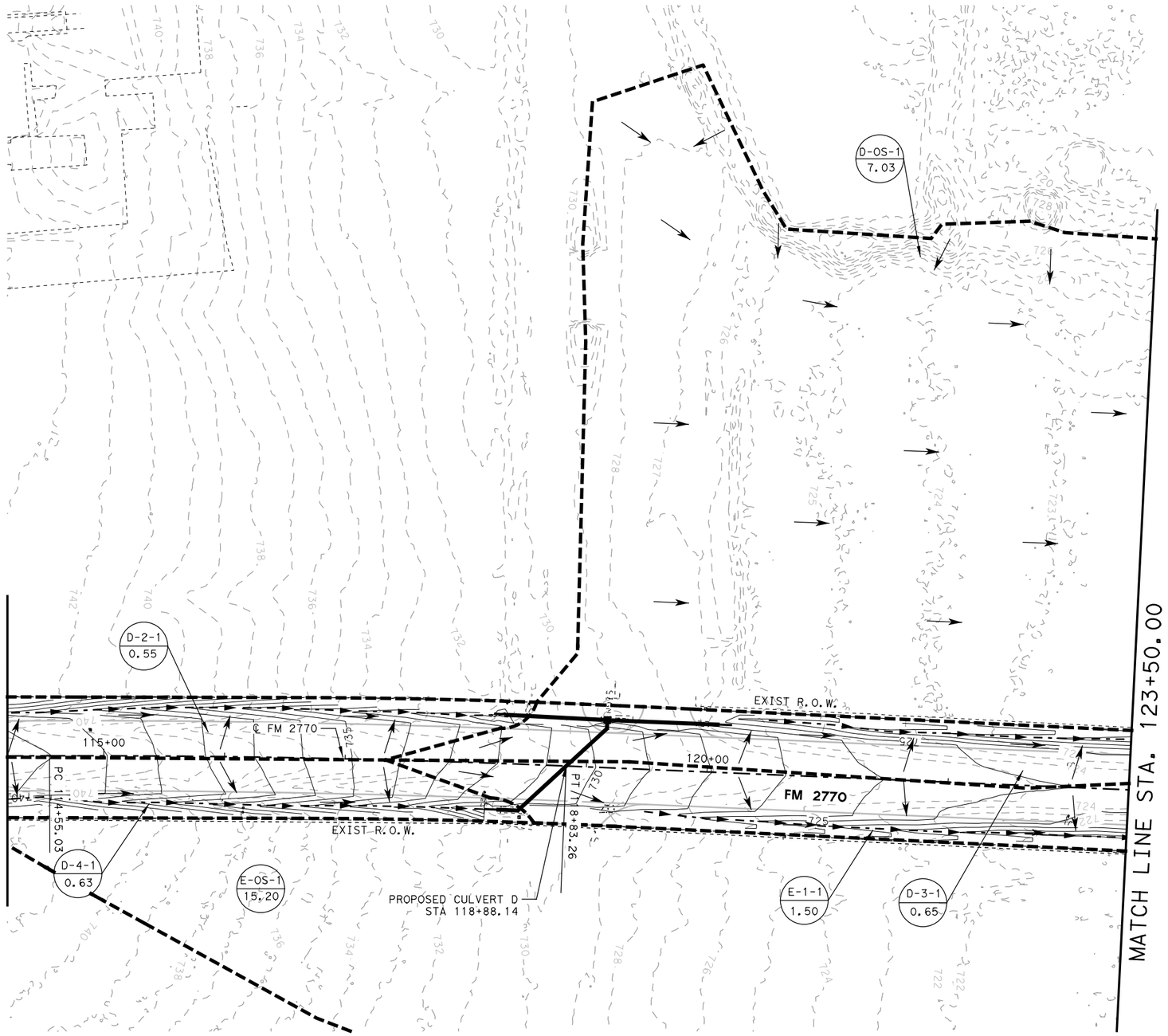
FILE: $PWVARVAULTPATHDESC$ PENTABLE: 000000000214615



LEGEND

- PROP DRAINAGE AREA
- BL ALIGNMENT
- ROW
- FLOW ARROW
- PROP VEGETATED FILTER STRIP
- X-X-X / XX.XX — DRAINAGE AREA ID / DRAINAGE AREA (ACRES)
- DITCH FLOWLINE
- PROP CONTOURS
- EXIST CONTOURS
- STREAM ℄
- 100-YR FLOODPLAIN
- RIPRAP
- PROP BRIDGE
- EDWARDS AQUIFER ZONES
- STORMSEWER

NOTES:
1. SEE OFFSITE DRAINAGE AREA MAP FOR OFFSITE DRAINAGE.

1/19/2021

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ROBERT S. LIGHT EXTENSION

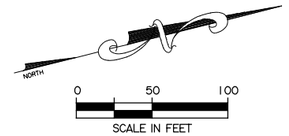
FM 2770
DRAINAGE AREA MAP
STA 114+20 TO STA 123+50

SCALE: 1"=100'-H

SHEET 13 OF 16

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	139
CLH	0914	33	068	
CHECK				
CMC				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg PENTABLE: 000000002/4615
USER: DLayda DATE: 1/19/2021 TIME: 3:52:20 PM SCALE: 1:100
FILE: $PWVARVAULTPATHDESC$



LEGEND

- PROP DRAINAGE AREA
- BL ALIGNMENT
- ROW
- FLOW ARROW
- PROP VEGETATED FILTER STRIP
- X-X-X / XX.XX — DRAINAGE AREA ID / DRAINAGE AREA (ACRES)
- DITCH FLOWLINE
- PROP CONTOURS
- EXIST CONTOURS
- STREAM ℄
- 100-YR FLOODPLAIN
- RIPRAP
- PROP BRIDGE
- EDWARDS AQUIFER ZONES
- STORMSEWER

NOTES:
1. SEE OFFSITE DRAINAGE AREA MAP FOR OFFSITE DRAINAGE.

1/19/2021

STATE OF TEXAS
ASHLEY S. HANSON
107373
LICENSED
PROFESSIONAL ENGINEER

HAYS COUNTY TEXAS

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY
Texas Registered Engineering Firm F-2614

Texas Department of Transportation
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ROBERT S. LIGHT EXTENSION

FM 2770
DRAINAGE AREA MAP
STA 123+50 TO END PROJECT

SCALE: 1"=100'-H

SHEET 14 OF 16

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	140
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

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USER: DLAyala
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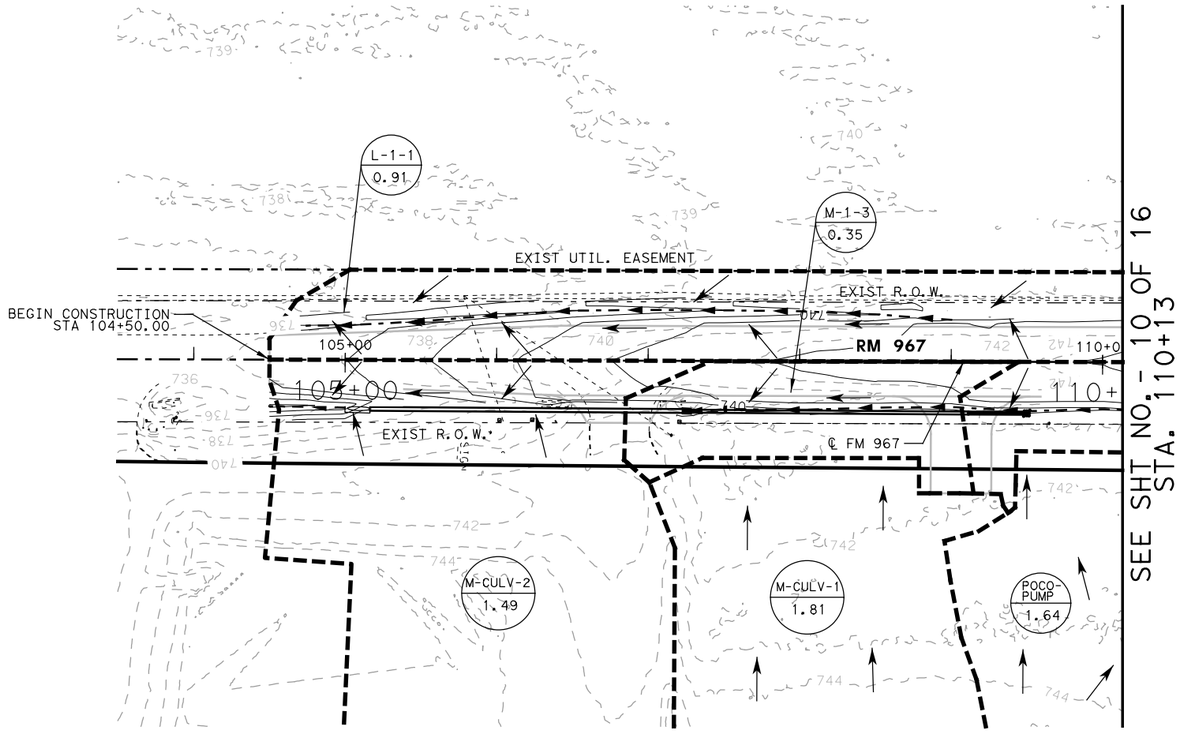
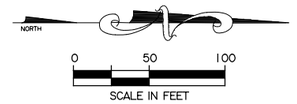
DATE: 1/19/2021
TIME: 3:52:36 PM
PENTABLE: 000000000214615
SCALE: 1:100





LEGEND

- PROP DRAINAGE AREA
- BL ALIGNMENT
- ROW
- FLOW ARROW
- PROP VEGETATED FILTER STRIP
- X-X-X / XX.XX — DRAINAGE AREA ID / DRAINAGE AREA (ACRES)
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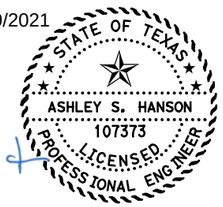
- RIPRAP
- PROP BRIDGE
- EDWARDS AQUIFER ZONES
- STORMSEWER

NOTES:
1. SEE OFFSITE DRAINAGE AREA MAP FOR OFFSITE DRAINAGE.
2 DELINEATION OF BASIN POCO-PUMP IS BASED ON THE 2016 PLANS OF SITE PLAN FOR BUDA C-STORE, ROBERT S. LIGHT DR., BUDA, TX, 78610. PREPARED BY MIGUEL GONZALES JR, P.E., TEXAS FIRM NO. F-15437, SHEET 7 OF 20.
3. DELINEATION OF BASINS M-CULV-1 AND M-CULV-2 WERE BASED ON AERIAL IMAGERY AND FIELD CONDITIONS.

1/19/2021



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ROBERT S. LIGHT EXTENSION

RM 967
DRAINAGE AREA MAP
BEGIN CONSTRUCTION TO STA 110+13

SCALE: 1"=100'-H

SHEET 15 OF 16

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	141
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
USER: DLAyala
FILE: $FMVARVAULTPATHDESC$
DATE: 1/19/2021
TIME: 3:52:48 PM
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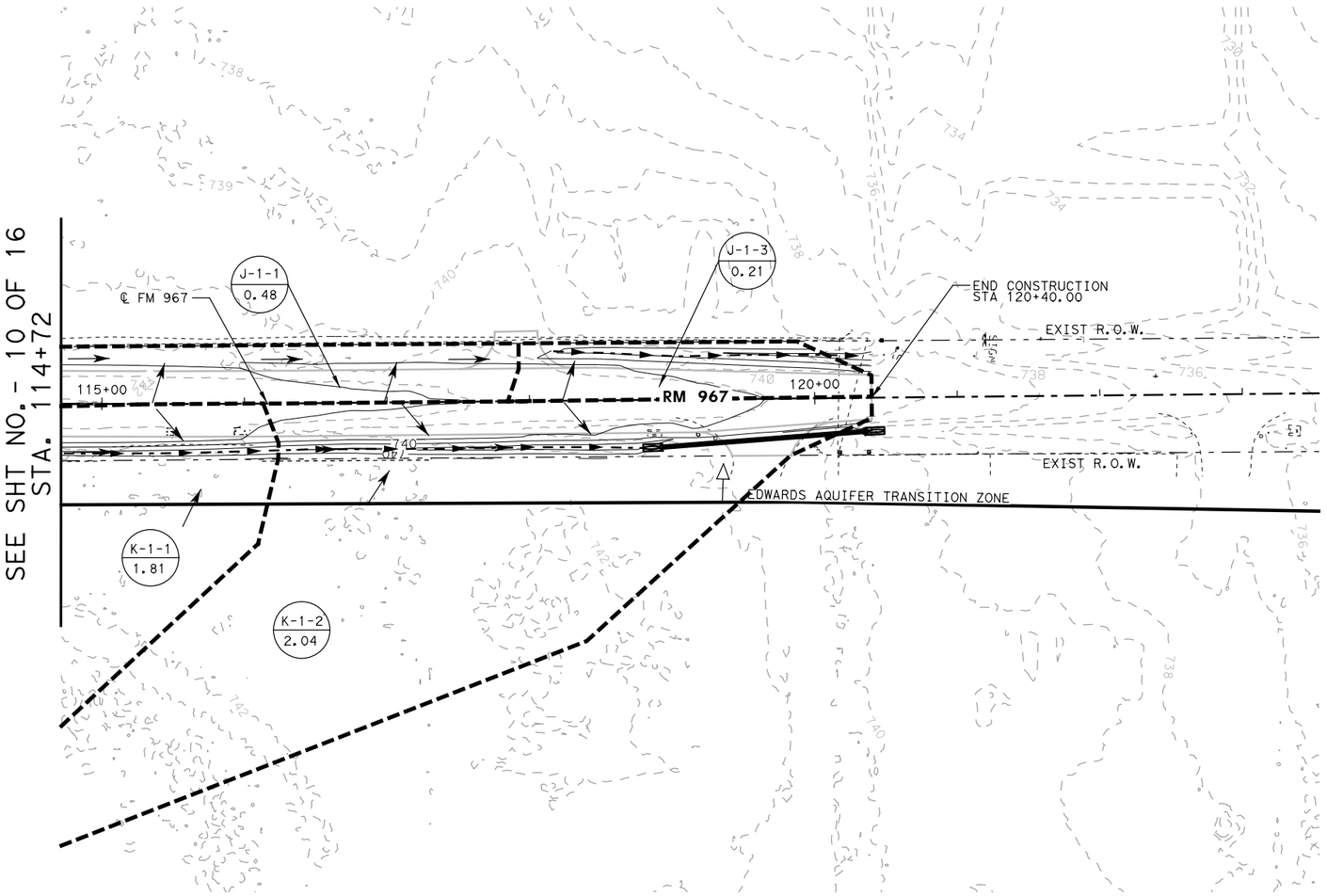
SCALE: H00



NORTH

0 50 100

SCALE IN FEET

LEGEND

- PROP DRAINAGE AREA
- BL ALIGNMENT
- ROW
- FLOW ARROW
- PROP VEGETATED FILTER STRIP
- X-X-X / XX.XX — DRAINAGE AREA ID / DRAINAGE AREA (ACRES)
- DITCH FLOWLINE
- PROP CONTOURS
- EXIST CONTOURS
- STREAM ℄
- 100-YR FLOODPLAIN
- RIPRAP
- PROP BRIDGE
- EDWARDS AQUIFER ZONES
- STORMSEWER

NOTES:
1. SEE OFFSITE DRAINAGE AREA MAP FOR OFFSITE DRAINAGE.

1/22/2021

STATE OF TEXAS
ASHLEY S. HANSON
107373
LICENSED
PROFESSIONAL ENGINEER

HAYS COUNTY TEXAS

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

Texas Registered Engineering Firm F-2614

Texas Department of Transportation
℗ 2020

ROBERT S. LIGHT EXTENSION

RM 967
DRAINAGE AREA MAP
STA 114+72 TO
END CONSTRUCTION

SCALE: 1"=100'-H

SHEET 16 OF 16

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	142
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
USER: DLAyala DATE: 1/22/2021 TIME: 4:44:13 PM SCALE: 1:100
FILE: $PWVARVAULTPATHDESC$ PENTABLE: 000000002146.tbl

INLET CALCULATIONS

INLET ID	INLET	INLET TYPE	FREQUENCY (YR)	FLOW (CFS)	N VALUE	LONG. SLOPE (%)	Cross Slope (%)	PONDING DEPTH (FT)	PONDING WIDTH (FT)	ALLOWABLE PONDING WIDTH (FT)	INTERCEPTED FLOW (CFS)	BYPASS FLOW (CFS)	BYPASS TARGET
MB-1-1	TX BD-3	Grate	10	1.59	0.012	0.500	2%	0.18	8.78	12	0.86	0.73	A-DITCH-INLET
MB-1-2	TX BD-3	Grate	10	1.54	0.012	0.500	2%	0.17	8.69	12	0.84	0.70	MB-1-1
MB-1-3	TX BD-3	Grate	10	1.51	0.012	0.500	2%	0.17	8.63	12	0.83	0.68	MB-1-2
MB-1-4	TX BD-3	Grate	10	1.47	0.012	0.500	2%	0.17	8.53	12	0.81	0.66	MB-1-3
MB-1-5	TX BD-3	Grate	10	1.38	0.012	0.500	2%	0.17	8.33	12	0.78	0.60	MB-1-4
MB-1-6	TX BD-3	Grate	10	1.24	0.012	0.500	2%	0.16	8.00	12	0.72	0.52	MB-1-5
MB-2-1	TX BD-3	Grate	10	0.57	0.012	0.500	1%	0.13	13.45	12	0.26	0.32	MB-1-6
MB-2-2	TX BD-3	Grate	10	0.46	0.012	0.500	1%	0.09	7.26	12	0.29	0.17	MB-2-1
MB-2-3	TX BD-3	Grate	10	0.50	0.012	0.500	3%	0.14	4.25	12	0.43	0.07	MB-2-2
MB-2-4	TX BD-3	Grate	10	0.48	0.012	0.500	5%	0.16	3.24	12	0.45	0.03	MB-2-3A
MB-2-5	TX BD-3	Grate	10	1.02	0.012	0.500	5%	0.21	4.30	12	0.87	0.15	MB-2-4A
MB-2-6	TX BD-3	Grate	10	1.04	0.012	0.500	5%	0.21	4.34	12	0.88	0.16	MB-2-5
MB-2-7	TX BD-3	Grate	10	1.00	0.012	0.500	5%	0.21	4.27	12	0.85	0.15	MB-2-6
MB-2-8	TX BD-3	Grate	10	0.82	0.012	0.500	5%	0.19	3.96	12	0.72	0.10	MB-2-7
RR-E-1	SSTR-SLOT	Curb	10	0.89	0.012	0.287	2%	0.16	7.85	12	0.21	0.68	RR-E-2
RR-E-2	SSTR-SLOT	Curb	10	1.62	0.012	0.610	2%	0.17	8.52	12	0.24	1.38	RR-E-3
RR-E-3	SSTR-SLOT	Curb	10	2.25	0.012	1.140	2%	0.17	8.57	12	0.24	2.01	RR-E-4
RR-E-4	SSTR-SLOT	Curb	10	2.91	0.012	1.750	2%	0.17	8.71	12	0.25	2.66	I-OUT-POND-S
RR-W-1	SSTR-SLOT	Curb	10	3.80	0.012	2.780	2%	0.18	8.83	12	0.25	3.54	H-OUT
RR-W-2	SSTR-SLOT	Curb	10	3.16	0.012	2.270	2%	0.17	8.56	12	0.24	2.91	RR-W-1
RR-W-3	SSTR-SLOT	Curb	10	2.59	0.012	1.720	2%	0.17	8.37	12	0.23	2.35	RR-W-2
RR-W-4	SSTR-SLOT	Curb	10	2.01	0.012	1.050	2%	0.17	8.35	12	0.23	1.78	RR-W-3
RR-W-5	SSTR-SLOT	Curb	10	1.44	0.012	0.550	2%	0.17	8.33	12	0.23	1.21	RR-W-4
RR-W-6	SSTR-SLOT	Curb	10	0.88	0.012	0.180	2%	0.17	8.54	12	0.23	0.65	RR-W-5
MB-2-3A	TX BD-3	Grate	10	0.44	0.012	0.500	3%	0.13	4.04	12	0.38	0.05	MB-2-3
MB-2-4A	TX BD-3	Grate	10	0.59	0.012	0.500	5%	0.17	3.50	12	0.54	0.04	MB-2-4

INLET ID	INLET TYPE	10-YR FLOW	DISCHARGE LEFT	DISCHARGE RIGHT	PONDING WIDTH	PONDING WIDTH	CAPACITY (CFS)	PONDING DEPTH	ALLOWABLE PONDING
*D-2-5	Grate	2.67	2.54	0.13	1.23	0.41	6.55	0.28	0.50
M-1-2	Grate	1.72	0.00	0.61	1.38	0.30	13.35	0.20	1.20
M-CULV-1	Grate	12.06	0.00	1.86	2.03	1.14	20.69	0.62	1.00
A-DITCH-INLET	Grate	9.53	0.00	6.12	6.34	4.16	23.43	0.53	1.00

*FLOW IS GENERATED FROM UPSTREAM DITCH D-2-4

NOTES:

1. GEOPAK DRAINAGE USED FOR HYDRAULIC ANALYSIS.
2. ALLOWABLE PONDING WIDTH CALCULATED TO LEAVE 24' OF DRY DRIVING LANES OPEN DURING 10-YR EVENT.

12/14/2020

STATE OF TEXAS
ASHLEY S. HANSON
107373
LICENSED
PROFESSIONAL ENGINEER

HAYS COUNTY TEXAS

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

Texas Registered Engineering Firm F-2614

Texas Department of Transportation

ROBERT S. LIGHT EXTENSION

INLET CALCULATION SHEET

SHEET 1 OF 1

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	143
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg PENTABLE: 000000000214615
USER: JLDangerfield@ATE: 12/14/2020 TIME: 11:44:42 PM SCALE: 1:100
FILE: $PWWAR\AULTPATHDESC$

PROPOSED TIME OF CONCENTRATION CALCULATIONS

DRAINAGE AREA ID	SHEET FLOW*					SHALLOW CONCENTRATED					CHANNEL FLOW							TC**	
	MANNING'S N	LENGTH (FT)	2-YR 24-HR RAINFALL (IN)	SLOPE FT/FT	SHEET TRAVEL TIME (MIN)	SURFACE	SLOPE (FT/FT)	AVG VEL (FPS)	LENGTH (FT)	SHALLOW TRAVEL TIME (MIN)	CROSS SECTION AREA (SQFT)	WETTED PERIMETER (FT)	SLOPE (FT/FT)	MANNING'S N	LENGTH (FT)	VELOCITY (FPS)	CHANNEL TRAVEL TIME (MIN)	CALC Tc (MIN)	(MIN)
A-1-1	0.011	25	4.19	0.080	0	unpaved	0.150	6.25	20	0	4.00	8.25	0.011	0.035	950	2.70	6	6	10
A-2-2	0.011	90	4.19	0.022	1	unpaved	0.300	8.84	15	0	4.00	8.25	0.009	0.035	482	2.54	3	5	10
MB-1-2 to MB-2-8	0.011	44	4.19	0.020	1					0								5	10
RR-W-1 to RR-W-6	0.011	50	4.19	0.020	1													5	10
RR-E-1 to RR-E-4	0.011	50	4.19	0.020	1													5	10
B-1-1	0.15	100	4.19	0.025	8	unpaved	0.017	2.08	330	3								10	10
B-1-2	0.15	100	4.19	0.030	7	unpaved	0.017	2.11	350	3								10	10
B-1-3	0.15	100	4.19	0.020	9	unpaved	0.024	2.47	255	2	4.00	8.25	0.005	0.035	364	1.95	3	13	13
B-2-1	0.011	44	4.19	0.020	1	unpaved	0.333	9.32	33	0	4.00	8.25	0.005	0.035	725	1.86	7	7	10
C-1-1	0.15	100	4.19	0.025	8	unpaved	0.016	2.06	338	3	1.00	4.12	0.005	0.035	150	1.17	2	13	13
C-2-1	0.15	100	4.19	0.025	8	unpaved	0.017	2.11	410	3	1.00	2.06	0.005	0.035	485	1.86	4	15	15
C-3-1	0.15	50	4.19	0.020	5					0	4.00	4.12	0.005	0.035	440	2.95	2	7	10
C-4-1	0.011	30	4.19	0.020	0	unpaved	0.008	1.45	123	1	4.00	4.12	0.009	0.035	107	4.03	0	5	10
C-5-1	0.011	44	4.19	0.020	1	unpaved	0.167	6.59	33	0	4.00	4.12	0.006	0.035	396	3.31	2	5	10
C-6-1	0.011	44	4.19	0.020	1	unpaved	0.167	6.59	33	0	4.00	4.12	0.002	0.035	300	1.70	3	5	10
C-7-1	0.011	44	4.19	0.020	1	unpaved	0.200	7.22	20	0	4.00	4.12	0.008	0.035	129	3.67	1	5	10
C-8-1	0.011	44	4.19	0.015	1	unpaved	0.043	3.34	35	0	4.00	4.12	0.002	0.035	256	1.84	2	5	10
D-2-1	0.011	25	4.19	0.020	0	unpaved					1.00	2.06	0.021	0.035	466	3.85	2	5	10
D-3-1	0.011	100	4.19	0.030	1	unpaved	0.014	1.93	70	1	0.13	0.56	0.015	0.016	480	4.14	2	5	10
D-4-1	0.011	25	4.19	0.020	0	unpaved	0.250	8.07	12	0	4.00	4.12	0.024	0.035	508	6.41	1	5	10
D-OS-1	0.15	100	4.19	0.020	9	unpaved	0.007	1.31	758	10	0.00	0.00						18	18
D-OS-2	0.15	100	4.19	0.020	9	unpaved	0.007	1.35	545	7	0.00	0.00						15	15
E-1-1	0.011	100	4.19	0.030	1	unpaved	0.017	2.13	115	1	1.00	2.06	0.009	0.035	996	2.50	7	8	10
E-OS-1	0.15	100	4.19	0.005	15	unpaved	0.020	2.28	976	7								22	22
E-OS-2	0.15	30	4.19	0.020	3	unpaved	0.020	2.28	648	5								8	10
F-1-1	0.011	44	4.19	0.015	1	unpaved	0.043	3.34	35	0	4.00	4.12	0.004	0.035	450	2.78	3	5	10
F-2-1	0.011	35	4.19	0.020	0						4.00	4.12	0.008	0.035	775	3.67	4	5	10
F-3-1	0.011	50	4.19	0.020	1						1.00	2.06	0.005	0.035	165	1.86	1	5	10
F-3-2	0.011	25	4.19	0.020	0	unpaved	0.005	1.14	213	3	1.00							5	10
G-1-1	0.011	25	4.19	0.020	0	unpaved	0.020	2.28	25	0	4.00	4.12	0.008	0.035	740	3.76	3	5	10
H-1-1	0.011	50	4.19	0.020	1	unpaved	0.075	4.42	40	0	4.00	4.12	0.023	0.035	395	6.30	1	5	10
H-2-1	0.011	50	4.19	0.010	1	paved	0.250	10.16	55	0	0.50	1.12	0.004	0.035	500	1.57	5	6	10
I-1-1	0.15	60	4.19	0.008	8	unpaved	0.250	8.07	15	0	4.00	4.12	0.004	0.035	920	2.75	6	14	14
I-2-1	0.011	60	4.19	0.015	1	unpaved	0.120	5.59	25	0	1.00	2.06	0.003	0.035	750	1.36	9	10	10
I-4-1	0.011	60	4.19	0.015	1	unpaved	0.150	6.25	20	0	1.00	2.06	0.006	0.035	510	2.02	4	5	10
I-OS-1	0.15	100	4.19	0.010	11	unpaved	0.015	1.98	545	5	2.50	5.02	0.003	0.035	88	1.34	1	17	17
I-OS-2	0.15	100	4.19	0.010	11	unpaved	0.015	1.98	315	3	2.50	5.02	0.003	0.035	135	1.34	2	16	16
I-OS-3	0.15	100	4.19	0.010	11	unpaved	0.015	1.98	330	3	2.50	5.02	0.003	0.035	135	1.34	2	16	16
I-OS-4	0.15	100	4.19	0.010	11	unpaved	0.015	1.98	380	3	2.50	5.02	0.003	0.035	80	1.34	1	16	16
I-OS-5	0.15	100	4.19	0.010	11	unpaved	0.015	1.98	435	4	1.00	2.06	0.014	0.035	366	3.07	2	17	17
I-OS-6	0.15	100	4.19	0.010	11	unpaved	0.017	2.10	176	1	1.00	2.06	0.014	0.035	345	3.16	2	15	15
J-1-1	0.011	25	4.19	0.020	0	unpaved	0.250	8.07	20	0	0.13	0.56	0.005	0.035	462	1.11	7	7	10
J-1-3	0.011	25	4.19	0.020	0	unpaved	0.250	8.07	20	0	0.13	0.56	0.005	0.035	200	1.11	3	5	10
K-1-1	0.15	100	4.19	0.010	11	unpaved	0.005	1.14	192	3	0.19	0.79	0.003	0.035	138	0.89	3	17	17
K-2-1	0.15	100	4.19	0.005	15	unpaved	0.005	1.14	456	7	0.75	1.58	0.003	0.035	200	1.42	2	24	24
L-1-1	0.011	25	4.19	0.020	0	unpaved	0.250	8.07	10	0	0.19	0.79	0.008	0.035	652	1.43	8	8	10
M-1-1	0.011	25	4.19	0.020	0	unpaved	0.050	3.61	20	0	0.19	0.79	0.007	0.035	215	1.36	3	5	10
M-1-2	0.011	25	4.19	0.020	0	unpaved	0.300	8.84	5	0	0.19	0.79	0.003	0.35	153	0.09	27	28	28
M-CULV-1	0.011	100	4.19	0.020	1	paved	0.005	1.44	350	4								5	10
M-CULV-2	0.011	100	4.19	0.020	1	paved	0.005	1.44	153	2								5	10
N-1-1	0.011	25	4.19	0.020	0	unpaved	0.003	0.88	40	1	0.25	1.03	0.003	0.035	478	0.91	9	10	10
O-1-2	0.015	25	4.19	0.020	0	unpaved	0.250	8.07	20	0	0.25	1.03	0.006	0.035	210	1.28	3	5	10
O-1-3	0.015	25	4.19	0.020	0	unpaved	0.250	8.07	20	0	0.25	1.03	0.006	0.035	295	1.28	4	5	10

* PRECIPITATION FOR THE ATLAS 14 2-YR, 24 HOUR EVENT IS EQUAL TO 4.19 INCHES
** MINIMUM Tc IS EQUALTO 10 MIN PER HDM

PROPOSED DRAINAGE AREA CALCULATIONS

Area ID	Composite C Value	Composite Area (AC)	Tc Used (min)	10-YR Intensity (in/hr)	10-YR Discharge (cfs)	100-YR Intensity (in/hr)	100-YR Discharge (cfs)
A-1-1	0.36	2.13	10	7.57	5.84	11.96	9.23
A-2-1	0.54	2.13	10	7.57	8.79	11.96	13.90
B-1-1	0.50	1.24	10	7.57	4.68	11.96	7.39
B-1-2	0.38	2.48	10	7.57	7.21	11.96	11.39
B-1-3	0.40	3.32	13	6.87	9.25	10.99	14.79
B-2-1	0.44	2.73	10	7.57	9.00	11.96	14.23
C-1-1	0.43	1.93	13	6.87	5.76	10.99	9.20
C-2-1	0.44	2.54	15	6.48	7.21	10.44	11.61
C-3-1	0.30	0.71	10	7.57	1.60	11.96	2.53
C-4-1	0.37	0.41	10	7.57	1.16	11.96	1.83
C-5-1	0.48	3.61	10	7.57	13.06	11.96	20.63
C-6-1	0.48	2.35	10	7.57	8.59	11.96	13.58
C-7-1	0.55	0.85	10	7.57	3.58	11.96	5.65
C-8-2	0.64	0.41	10	7.57	1.98	11.96	3.13
C-8-4	0.64	0.41	10	7.57	1.96	11.96	3.10
D-2-1	0.65	0.55	10	7.57	2.67	11.96	4.22
D-3-1	0.70	0.65	10	7.57	3.43	11.96	5.41
D-3-2	0.40	0.25	10	7.57	0.74	11.96	1.17
D-4-1	0.62	0.63	10	7.57	2.93	11.96	4.63
E-1-1	0.68	1.50	10	7.57	7.69	11.96	12.15
F-1-1	0.57	1.06	10	7.57	4.62	11.96	7.29
F-2-1	0.64	1.07	10	7.57	5.22	11.96	8.25
F-3-1	0.39	0.35	10	7.57	1.03	11.96	1.62
F-3-2	0.41	0.43	10	7.57	1.33	11.96	2.10
G-1-1	0.65	0.88	10	7.57	4.32	11.96	6.83
H-1-1	0.55	1.59	10	7.57	6.59	11.96	10.41
H-2-1	0.37	5.77	10	7.57	16.09	11.96	25.42
I-1-1	0.31	1.12	10	7.57	2.58	11.96	4.08
I-2-1	0.63	1.70	10	7.57	8.13	11.96	12.84
I-3-4	0.54	3.11	10	7.57	12.79	11.96	20.20
I-4-1	0.66	1.13	10	7.57	5.64	11.96	8.92
I-5-1	0.67	0.41	10	7.57	2.10	11.96	3.31
J-1-1	0.30	0.48	10	7.57	1.08	11.96	3.75
J-1-3	0.30	0.21	10	7.57	0.49	11.96	1.59
K-1-1	0.36	1.81	17	6.14	4.03	9.94	6.52
K-1-2	0.37	2.04	24	5.20	3.92	8.56	6.45
L-1-1	0.30	0.91	10	7.57	2.06	11.96	5.77
M-1-1	0.30	0.38	10	7.57	0.86	11.96	2.71
M-1-3	0.30	0.35	10	7.57	0.79	11.96	2.76
N-1-1	0.63	1.00	10	7.57	4.74	11.96	7.49

Area ID	Composite C Value	Composite Area (AC)	Tc Used (min)	10-YR Intensity (in/hr)	10-YR Discharge (cfs)	100-YR Intensity (in/hr)	100-YR Discharge (cfs)
O-1-2	0.53	0.77	10	7.57	3.10	11.96	4.90
O-1-3	0.59	0.55	10	7.57	2.45	11.96	3.87
D-OS-1	0.37	7.03	18	5.98	15.75	9.71	25.58
D-OS-2	0.65	4.29	15	6.48	18.11	10.44	29.16
E-OS-1	0.30	15.20	22	5.43	24.78	8.91	46.23
I-OS-2	0.40	1.34	10	7.57	4.05	11.96	6.39
I-OS-3	0.40	1.61	10	7.57	4.87	11.96	7.69
I-OS-4	0.40	0.83	10	7.57	2.51	11.96	3.96
I-OS-5	0.40	2.76	10	7.57	8.35	11.96	13.20
I-OS-6	0.40	1.43	10	7.57	4.33	11.96	6.84
MB-1-1	0.90	0.13	10	7.57	0.88	11.96	1.40
MB-1-2	0.90	0.13	10	7.57	0.86	11.96	1.36
MB-1-3	0.90	0.13	10	7.57	0.86	11.96	1.36
MB-1-4	0.90	0.13	10	7.57	0.87	11.96	1.37
MB-1-5	0.90	0.13	10	7.57	0.86	11.96	1.36
MB-1-6	0.90	0.14	10	7.57	0.92	11.96	1.46
MB-2-1	0.90	0.06	10	7.57	0.40	11.96	0.62
MB-2-2	0.90	0.06	10	7.57	0.39	11.96	0.62
MB-2-3	0.90	0.07	10	7.57	0.45	11.96	0.70
MB-2-4	0.90	0.06	10	7.57	0.43	11.96	0.68
MB-2-5	0.90	0.13	10	7.57	0.86	11.96	1.36
MB-2-6	0.90	0.13	10	7.57	0.90	11.96	1.42
MB-2-7	0.90	0.13	10	7.57	0.90	11.96	1.42
MB-2-8	0.90	0.12	10	7.57	0.82	11.96	1.29
RR-E-1	0.90	0.13	10	7.57	0.89	11.96	1.41
RR-E-2	0.90	0.14	10	7.57	0.93	11.96	1.47
RR-E-3	0.90	0.13	10	7.57	0.87	11.96	1.38
RR-E-4	0.90	0.13	10	7.57	0.90	11.96	1.42
RR-W-1	0.90	0.13	10	7.57	0.88	11.96	1.39
RR-W-2	0.90	0.12	10	7.57	0.80	11.96	1.26
RR-W-3	0.90	0.12	10	7.57	0.81	11.96	1.28
RR-W-4	0.90	0.12	10	7.57	0.80	11.96	1.26
RR-W-5	0.90	0.12	10	7.57	0.79	11.96	1.26
RR-W-6	0.90	0.13	10	7.57	0.88	11.96	1.40
MB-2-3A	0.90	0.06	10	7.57	0.41	11.96	0.65
MB-2-4A	0.90	0.06	10	7.57	0.44	11.96	0.69
M-CULV-1	0.30	1.81	10	7.57	4.10	11.96	16.30
M-CULV-2	0.30	1.49	10	7.57	3.39	11.96	5.36
POCO-PUMP	0.30	1.64	10	7.57	3.73	11.96	17.64

NOTES:
1. ONSITE RUNOFF CALCULATIONS PERFORMED USING THE RATIONAL METHOD IN GEOPAK DRAINAGE SOFTWARE. INTENSITY BASED ON e,b, AND d COEFFICIENTS FOR HAYS COUNTY.
2. C VALUES ARE TAKEN FROM TXDOT HYDRAULIC DESIGN MANUAL.
3. TIME OF CONCENTRATION VALUES ARE CALCULATED USING SCS LONGEST FLOWPATH METHOD AND A 10 MINUTE MINIMUM.

1/19/2021

STATE OF TEXAS
ASHLEY S. HANSON
107373
LICENSED
PROFESSIONAL ENGINEER

HAYS COUNTY TEXAS

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY
Texas Registered Engineering Firm F-2614

Texas Department of Transportation
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ROBERT S. LIGHT EXTENSION

RUNOFF CALCULATION SHEET

SHEET 1 OF 1

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	144
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
USER: DLAyala
FILE: $PWVARVAULTPATHDESC$
DATE: 1/19/2021
TIME: 3:53:09 PM
PENTABLE: 000000000214615
SCALE: 1:100

HYDRAULIC STORM SEWER CALCULATIONS

ID	U/S NODE	D/S NODE	U/S HGL	D/S HGL	U/S FL	D/S FL	10-YEAR DISCHARGE (CFS)	CAPACITY (CFS)	N	SIZE/TYPE	MATERIAL	SHAPE	NO. OF BARRELS	LENGTH (FT)	RISE (FT)	SPAN (FT)	SLOPE (%)	UNIFORM VELOCITY (FPS)	U/S ACUTAL DEPTH	D/S ACTUAL DEPTH	U/S ACTUAL VELOCITY	D/S ACTUAL VELOCITY
A-P-1	A-DITCH-INLET	A-BEND-1	737.79	737.57	732.76	732.34	8.80	20.24	0.012	24" RCP	Concrete	Circular	1	71.63	2.00	n/a	0.59	5.90	2.00	2.00	2.80	2.80
A-P-2	A-BEND-1	A-BEND-2	737.57	737.50	732.34	732.27	8.80	20.24	0.012	24" RCP	Concrete	Circular	1	12.40	2.00	n/a	0.59	5.90	2.00	2.00	2.80	2.80
A-P-3	A-BEND-2	A-OUT	737.50	737.44	732.27	732.20	8.80	20.30	0.012	24" RCP	Concrete	Circular	1	10.96	2.00	n/a	0.59	5.90	2.00	2.00	2.80	2.80
G-1-6	G-1-5	G-1-6	738.08	737.63	737.18	737.00	4.32	16.60	0.012	18" RCP	Concrete	Circular	1	10.00	1.50	n/a	1.84	7.48	0.89	0.63	3.94	6.12
G-1-8	G-1-7	G-1-8	736.30	735.95	735.50	735.32	4.32	16.64	0.012	18" RCP	Concrete	Circular	1	10.00	1.50	n/a	1.85	7.51	0.80	0.63	4.53	6.14
J-1-2	J-1-1	J-1-3	739.54	739.40	738.92	738.55	2.37	7.77	0.012	DES2 (15.5x26)	Concrete	Pipe-Arch	1	74.04	1.29	2.17	0.50	3.77	0.62	0.85	2.10	1.91
K-1-3	K-1-3	K-OUT	739.26	737.20	738.20	736.48	7.33	12.08	0.012	DES2 (15.5x26)	Concrete	Pipe-Arch	1	142.61	1.29	2.17	1.21	7.28	1.06	0.72	4.71	7.21
M-1-2	M-1-2	M-1-2.1	737.74	737.73	737.00	736.78	2.52	20.25	0.012	24" RCP	Concrete	Circular	1	37.09	2.00	n/a	0.59	4.16	0.74	0.95	2.38	1.70
O-1-1	O-1-1	O-1-2	742.78	742.75	741.95	741.60	2.45	8.66	0.012	18" RCP	Concrete	Circular	1	70.99	1.50	n/a	0.50	4.01	0.83	1.15	2.43	1.68
WQ*P1	WQ*	WQ-JB-1	735.36	733.89	732.20	732.16	29.60	47.80	0.012	30" RCP	Concrete	Circular	1	3.71	2.50	n/a	1.00	9.67	2.50	1.73	6.03	8.18
WQ*P2	WQ-JB-1	WQ-MH-1	731.51	729.68	728.49	727.82	29.60	34.03	0.012	30" RCP	Concrete	Circular	1	132.22	2.50	n/a	0.51	7.37	2.50	1.86	6.03	7.58
WQ*P3	WQ-MH-1	WQ*OUT	729.63	729.23	727.72	727.40	29.60	36.13	0.012	30" RCP	Concrete	Circular	1	56.00	2.50	n/a	0.57	7.67	1.91	1.83	7.35	7.67
G-1-5A	G-1-6	G-1-7	737.80	736.05	737.00	735.50	4.32	16.64	0.012	18" RCP	Concrete	Circular	1	81.21	1.50	n/a	1.85	7.51	0.80	0.55	4.53	7.42
MB-1-1	MB-1-1	MB-MH-2	738.01	737.91	734.20	734.05	4.85	6.90	0.011	16" SCH40 PVC	Plastic	Circular	1	29.71	1.33	n/a	0.50	5.03	1.33	1.33	3.48	3.48
MB-1-2	MB-1-2	MB-1-1	738.52	738.01	734.80	734.20	4.09	4.83	0.011	14" SCH40 PVC	Plastic	Circular	1	120.00	1.17	n/a	0.50	4.77	1.17	1.17	3.83	3.83
MB-1-3	MB-1-3	MB-1-2	738.85	738.52	735.40	734.80	3.33	4.83	0.011	14" SCH40 PVC	Plastic	Circular	1	120.01	1.17	n/a	0.50	4.57	1.17	1.17	3.12	3.12
MB-1-4	MB-1-4	MB-1-3	739.04	738.85	736.00	735.40	2.55	4.83	0.011	14" SCH40 PVC	Plastic	Circular	1	119.99	1.17	n/a	0.50	4.31	1.17	1.17	2.39	2.39
MB-1-5	MB-1-5	MB-1-4	739.26	739.04	736.60	736.00	1.75	3.20	0.011	12" SCH40 PVC	Plastic	Circular	1	120.00	1.00	n/a	0.50	3.95	1.00	1.00	2.23	2.23
MB-1-6	MB-1-6	MB-1-5	739.34	739.26	737.20	736.60	0.92	3.20	0.011	12" SCH40 PVC	Plastic	Circular	1	120.00	1.00	n/a	0.50	3.35	1.00	1.00	1.17	1.17
MB-2-1	MB-2-1	MB-MH-1	740.76	738.01	737.82	734.05	5.46	6.90	0.011	16" SCH40 PVC	Plastic	Circular	1	754.71	1.33	n/a	0.50	5.20	1.33	1.33	3.91	3.91
MB-2-2	MB-2-2	MB-2-1	740.94	740.76	738.11	737.82	5.13	6.90	0.011	16" SCH40 PVC	Plastic	Circular	1	57.50	1.33	n/a	0.50	5.12	1.33	1.33	3.67	3.67
MB-2-3	MB-2-3	MB-2-2	741.11	740.94	738.40	738.11	4.80	6.90	0.011	16" SCH40 PVC	Plastic	Circular	1	57.50	1.33	n/a	0.50	5.04	1.33	1.33	3.44	3.44
MB-2-4	MB-2-4	MB-2-3A	741.67	741.41	739.00	738.70	4.06	4.83	0.011	14" SCH40 PVC	Plastic	Circular	1	59.81	1.17	n/a	0.50	4.73	1.17	1.17	3.80	3.80
MB-2-5	MB-2-5	MB-2-4A	742.05	741.88	739.59	739.30	3.29	4.83	0.011	14" SCH40 PVC	Plastic	Circular	1	59.31	1.17	n/a	0.50	4.57	1.17	1.17	3.08	3.08
MB-2-6	MB-2-6	MB-2-5	742.49	742.05	740.19	739.59	2.52	3.20	0.011	12" SCH40 PVC	Plastic	Circular	1	118.60	1.00	n/a	0.50	4.26	1.00	1.00	3.20	3.20
MB-2-7	MB-2-7	MB-2-6	742.70	742.49	740.80	740.19	1.68	3.20	0.011	12" SCH40 PVC	Plastic	Circular	1	123.51	1.00	n/a	0.50	3.93	1.00	1.00	2.14	2.14
MB-2-8	MB-2-8	MB-2-7	742.76	742.70	741.42	740.80	0.82	3.20	0.011	12" SCH40 PVC	Plastic	Circular	1	123.52	1.00	n/a	0.50	3.22	1.00	1.00	1.04	1.04
M-1-2.1	M-1-2.1	M-CULV-1	737.73	736.54	736.78	735.70	6.99	20.25	0.012	24" RCP	Concrete	Circular	1	183.34	2.00	n/a	0.59	5.55	0.95	0.84	4.73	5.55
MB-2-3A	MB-2-3A	MB-2-3	741.41	741.11	738.70	738.40	4.41	4.83	0.011	14" SCH40 PVC	Plastic	Circular	1	59.81	1.17	n/a	0.50	4.78	1.17	1.17	4.13	4.13
MB-2-4A	MB-2-4A	MB-2-4	741.88	741.67	739.30	739.00	3.68	4.83	0.011	14" SCH40 PVC	Plastic	Circular	1	59.31	1.17	n/a	0.50	4.68	1.17	1.17	3.44	3.44
MB-JB-1	MB-JB-1	MB-BRG-OUT	737.65	737.44	732.46	732.20	9.53	37.28	0.012	24" RCP	Concrete	Circular	1	13.00	2.00	n/a	2.00	9.41	2.00	2.00	3.03	3.03
MB-MH-1	MB-MH-1	MB-MH-2	738.01	737.91	734.05	733.74	5.46	26.36	0.012	24" RCP	Concrete	Circular	1	30.99	2.00	n/a	1.00	6.28	2.00	2.00	1.74	1.74
MB-MH-2	MB-MH-2	MB-JB-1	737.91	737.65	733.74	732.46	9.53	26.42	0.012	24" RCP	Concrete	Circular	1	127.50	2.00	n/a	1.00	7.31	2.00	2.00	3.03	3.03
D-5-CULV	D-5-CULV	D-5-CULV-DS	719.88	718.93	717.85	717.39	16.10	25.07	0.012	30" RCP	Concrete	Circular	1	167.29	2.50	n/a	0.28	5.07	2.03	1.54	3.78	5.07
D-CULV-1	D-2-5	D-JCT	726.30	725.37	725.47	724.90	2.45	21.91	0.012	24" RCP	Concrete	Circular	1	82.97	2.00	n/a	0.69	4.36	0.82	0.47	2.01	4.36
D-CULV-2	D-JCT	D-3-1	725.75	724.74	724.70	724.07	4.90	21.95	0.012	24" RCP	Concrete	Circular	1	90.44	2.00	n/a	0.69	5.33	1.06	0.67	2.91	5.32
F-3-CULV	F-3-CULV	F-3-CULV2	742.41	741.48	741.64	741.00	2.19	10.88	0.012	18" RCP	Concrete	Circular	1	81.00	1.50	n/a	0.79	4.59	0.77	0.48	2.39	4.57
M-CULV-1	M-CULV-1	M-CULV-2	737.32	735.60	735.20	734.17	19.75	33.80	0.012	30" RCP	Concrete	Circular	1	206.58	2.50	n/a	0.50	6.80	2.12	1.43	4.46	6.80
C-CROSS-1	C-CROSS-S	C-OUT	743.08	741.86	742.06	741.15	25.52	103.38	0.012	2ft x 3ft Box	Concrete	Box	2	149.71	2.00	3.00	0.61	5.98	1.01	0.71	4.20	5.95
D-CROSS-1	D-SET3	D-CROSS-B1	730.27	727.41	728.40	727.13	2.93	80.66	0.012	24" RCP	Concrete	Circular	1	13.58	2.00	n/a	9.36	11.56	1.87	0.29	0.96	10.65
D-CROSS-2	D-CROSS-B1	D-CROSS-B2	727.73	725.40	727.13	725.01	2.93	38.29	0.012	24" RCP	Concrete	Circular	1	100.38	2.00	n/a	2.11	6.85	0.60	0.39	3.72	6.83
D-CROSS-3	D-CROSS-B2	D-JCT	725.65	725.37	725.01	724.90	2.93	38.29	0.012	24" RCP	Concrete	Circular	1	5.05	2.00	n/a	2.11	6.85	0.64	0.46	3.38	5.33
POCO-PUMP	POCO-PUMP	M-1-2.1	7599.97	741.02	741.00	740.85	4.48	0.02	0.011	2" SCH40 PVC	Plastic	Circular	1	38.78	0.17	n/a	0.39	210.68	0.17	0.17	205.35	205.35
Pond I Out	Pond I	Pond I Out	724.33	724.01	724.20	724.00	0.00	8.63	0.012	18" RCP	Concrete	Circular	1	40.24	1.50	n/a	0.50	0.38	0.13	0.01	0.01	0.38

ID	U/S NODE	D/S NODE	U/S HGL	D/S HGL	U/S FL	D/S FL	25-YEAR DISCHARGE (CFS)	CAPACITY (CFS)	N	SIZE/TYPE	MATERIAL	SHAPE	NO. OF BARRELS	LENGTH (FT)	RISE (FT)	SPAN (FT)	SLOPE (%)	UNIFORM VELOCITY (FPS)	U/S ACUTAL DEPTH	D/S ACTUAL DEPTH	U/S ACTUAL VELOCITY	D/S ACTUAL VELOCITY
D-CULV-2	D-JCT	D-3-1	725.89	725.73	724.70	724.07	6.04	21.95	0.012	24" RCP	Concrete	Circular	1	90.44	2.00	n/a	0.69	5.64	1.20	1.66	3.08	2.17
D-CULV-1	D-2-5	D-JCT	726.40	725.42	725.47	724.90	3.01	21.91	0.012	24" RCP	Concrete	Circular	1	82.97	2.00	n/a	0.69	4.63	0.93	0.52	2.12	4.63
D-CROSS-3	D-CROSS-B2	D-JCT	725.83	725.89	725.01	724.90	3.58	38.29	0.012	24" RCP	Concrete	Circular	1	5.05	2.00	n/a	2.11	7.26	0.82	0.99	2.96	2.31
D-CROSS-2	D-CROSS-B1	D-CROSS-B2	727.79	725.44	727.13	725.01	3.58	38.29	0.012	24" RCP	Concrete	Circular	1	100.38	2.00	n/a	2.11	7.26	0.66	0.43	3.94	7.23
D-CROSS-1	D-SET3	D-CROSS-B1	730.33	727.45	728.40	727.13	3.58	80.66	0.012	24" RCP	Concrete	Circular	1	13.58	2.00	n/a	9.36	12.27	1.93	0.32	1.15	11.12
F-3-CULV	F-3-CULV	F-3-CULV2	742.50	741.53	741.64	741.00	2.69	10.88	0.012	18" RCP	Concrete	Circular	1	81.00	1.50	n/a	0.79	4.85	0.86	0.53	2.56	4.84

NOTES:
1. GEOPAK DRAINAGE USED FOR HYDRAULIC ANALYSIS
2. POCO-PUMP ANALYSIS CAN BE FOUND IN THE AS-BUILTS SITE PLAN FOR BUDA C-STORE DATED 04/10/2019.

HYDRAULIC DITCH CALCULATIONS

ID	U/S NODE	D/S NODE	U/S HGL	D/S HGL	U/S FL	D/S FL	10-YEAR DISCHARGE (CFS)	CAPACITY (CFS)	N	LENGTH (FT)	DEPTH (FT)	BOTTOM WIDTH (FT)	SIDE SLOPE LEFT (H:1)	SIDE SLOPE RIGHT (H:1)	SLOPE (%)	UNIFORM VELOCITY (FPS)	U/S ACUTAL DEPTH	D/S ACTUAL DEPTH	U/S ACTUAL VELOCITY	D/S ACTUAL VELOCITY
A-1-1	A-1-1	A-1-2	745.00	742.81	744.24	742.22	5.84	269.97	0.035	64.09	2.50	0.00	4	6	3.16	3.31	0.76	0.76	2.01	3.31
A-1-2	A-1-2	A-1-2.1	743.05	740.96	742.22	740.15	5.84	122.83	0.035	200.00	2.50	0.00	4	4	1.04	2.29	0.83	0.83	2.11	2.19
A-1-2.1	A-1-2.1	A-1-2.2	740.96	739.07	740.15	738.25	5.84	117.39	0.035	200.02	2.50	0.00	4	4	0.95	2.22	0.82	0.82	2.19	2.19
A-1-2.2	A-1-2.2	A-1-2.3	739.07	738.13	738.25	737.31	5.84	117.15	0.035	100.00	2.50	0.00	4	4	0.94	2.21	0.82	0.82	2.19	2.20
A-1-2.3	A-1-2.3	A-1-3	738.13	737.62	737.31	736.84	5.84	117.60	0.035	50.04	2.50	0.00	4	4	0.95	2.22	0.82	0.82	2.20	2.39
A-1-3	A-1-3	A-1-3.1	737.62	736.96	736.84	736.23	5.84	132.67	0.035	50.16	2.50	0.00	4	4	1.21	2.43	0.78	0.78	2.39	2.73
A-1-3.1	A-1-3.1	A-1-4	736.96	735.18	736.23	734.50	5.84	158.55	0.035	100.21	2.50	0.00	4	4	1.73	2.78	0.73	0.73	2.73	3.15
A-1-4	A-1-4	A-OUT-NORTH	735.18	733.34	734.50	732.78	5.84	310.57	0.035	26.07	2.50	0.00	4	4	6.62	4.60	0.68	0.68	3.15	4.60
A-2-1	A-2-1	A-2-2	742.44	741.96	741.50	741.00	8.79	156.67	0.035	46.99	2.50	0.00	6	4	1.06	2.44	0.94	0.94	1.98	1.92
A-2-2	A-2-2	A-2-3	741.96	737.98	741.00	737.00	8.79	120.95	0.035	398.41	2.50	0.00	4	4	1.00	2.51	0.96	0.96	2.40	2.28
A-2-3	A-2-3	A-END	737.98	737.30	737.00	736.51	8.79	107.14	0.035	61.78	2.50	0.00	4	4	0.79	2.29	0.98	0.98	2.28	3.56
B-1-1	B-1-1	B-1-2	749.82	749.65	748.89	748.64	4.68	7.41	0.035	50.37	1.00	0.00	4	4	0.50	1.64	0.92	0.92	1.38	1.17
B-1-2	B-1-2	B-1-2.1	749.65	748.37	748.64	747.36	11.68	50.31	0.035	150.00	1.70	0.00	6	4	0.86	2.42	1.01	1.01	2.30	2.25
B-1-3	B-1-3	B-1-3.1	748.16	746.84	746.93	745.63	20.03	141.38	0.035	150.03	2.50	0.00	6	4	0.87	2.78	1.23	1.23	2.64	2.72
B-2-1	B-2-1	B-2-2.7	748.95	747.12	748.39	746.08	9.00	153.37	0.035	234.34	2.00	6.00	6	4	0.99	2.18	0.56	0.56	1.82	0.77
B-2-2	B-2-2	B-OUT-SOUTH	741.53	740.78	740.65	739.91	9.00	151.04	0.035	75.13	2.50	0.00	6	4	0.99	2.38	0.87	0.87	2.36	2.38
B-1-2.1	B-1-2.1	B-1-3	748.37	748.16	747.36	746.93	11.68	49.95	0.035	50.25	1.70	0.00	6	4	0.85	2.40	1.02	1.02	2.25	1.54
B-1-3.1	B-1-3.1	B-1-3.2	746.84	745.57	745.63	744.35	20.03	140.56	0.035	150.03	2.50	0.00	6	4	0.86	2.75	1.21	1.21	2.72	2.66
B-1-3.2	B-1-3.2	B-1-3.3	745.57	744.25	744.35	743.17	20.03	134.80	0.035	149.67	2.50	0.00	4	6	0.79	2.69	1.23	1.23	2.66	3.42
B-1-3.3	B-1-3.3	B-OUT-NORTH	744.25	741.90	743.17	740.84	20.03	192.49	0.035	145.13	2.50	0.00	4	6	1.61	3.50	1.08	1.08	3.42	3.50
B-2-2.1	B-2-2.1	B-2-2	742.52	741.53	741.76	740.65	9.00	222.28	0.035	51.59	2.50	0.00	4	6	2.14	3.20	0.76	0.76	3.08	2.36
B-2-2.2	B-2-2.2	B-2-2.1	744.73	742.52	743.98	741.76	9.00	225.24	0.035	100.85	2.50	0.00	4	6	2.20	3.23	0.76	0.76	3.15	3.08
B-2-2.3	B-2-2.3	B-2-2.2	745.44	744.73	744.60	743.98	9.00	169.93	0.035	50.09	2.50	0.00	4	6	1.25	2.61	0.84	0.84	2.58	3.15
B-2-2.4	B-2-2.4	B-2-2.3	746.02	745.44	745.00	744.60	9.00	95.22	0.035	100.00	2.50	0.00	4	6	0.39	1.68	1.03	1.03	1.71	2.58
B-2-2.5	B-2-2.5	B-2-2.4	746.23	746.02	745.19	745.00	9.00	95.06	0.035	50.04	2.50	0.00	4	6	0.39	1.68	1.03	1.03	1.69	1.71
B-2-2.6	B-2-2.6	B-2-2.5	746.43	746.23	745.39	745.19	9.00	95.06	0.035	50.04	2.50	0.00	4	6	0.39	1.68	1.04	1.04	1.67	1.69
B-2-2.7	B-2-2.7	B-2-2.6	747.12	746.43	746.08	745.39	9.00	95.16	0.035	175.00	2.50	0.00	4	6	0.39	1.68	1.05	1.05	1.64	1.67
C-1-1	C-1-1	C-1-2	747.88	747.71	747.26	747.11	5.76	63.39	0.035	51.40	1.93	5.00	4	4	0.30	1.33	0.62	0.62	1.24	1.28
C-1-2	C-1-2	C-1-3	747.71	747.54	747.11	747.00	5.76	37.78	0.035	51.40	1.64	5.00	4	4	0.21	1.19	0.61	0.61	1.28	1.47
C-1-3	C-1-3	C-1-4	747.54	747.31	747.00	746.81	5.76	49.52	0.035	51.40	1.64	5.00	4	4	0.37	1.45	0.55	0.55	1.47	1.62
C-1-4	C-1-4	C-1-5	747.31	747.04	746.81	746.54	5.76	56.15	0.035	51.40	1.60	5.00	4	4	0.52	1.62	0.51	0.51	1.62	1.65
C-1-5	C-1-5	C-1-6	747.04	746.75	746.54	746.25	5.76	44.67	0.035	51.40	1.41	5.00	4	4	0.56	1.66	0.50	0.50	1.65	1.63
C-1-6	C-1-6	C-2-1	746.75	746.42	746.25	745.68	5.76	44.72	0.035	102.79	1.41	5.00	4	4	0.56	1.66	0.50	0.50	1.64	0.98
C-2-1	C-2-1	C-2-2	746.42	745.97	745.68	745.39	11.96	36.70	0.035	51.40	1.29	5.00	4	4	0.56	2.06	0.74	0.74	2.03	2.83
C-2-2	C-2-2	C-2-3	745.97	744.78	745.39	744.29	11.96	35.34	0.035	77.11	1.00	5.00	4	4	1.43	2.88	0.58	0.58	2.83	3.51
C-2-3	C-2-3	C-2-4	744.71	744.36	744.29	743.92	11.96	223.23	0.035	25.96	2.00	10.00	4	4	1.42	2.53	0.42	0.42	2.42	2.31
C-2-4	C-2-4	C-2-5	744.36	743.68	743.92	743.18	11.96	176.13	0.035	51.52	1.83	9.03	4	4	1.43	2.60	0.44	0.44	2.52	2.17

1/19/2021

STATE OF TEXAS
ASHLEY S. HANSON
107373
LICENSED
PROFESSIONAL ENGINEER

HAYS COUNTY TEXAS

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY
Texas Registered Engineering Firm F-2614

Texas Department of Transportation
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ROBERT S. LIGHT EXTENSION

HYDRAULIC CALCULATION SHEET

SHEET 1 OF 3

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	145
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
USER: DLayala
FILE: $PWVAR/AULTPATHDESC$
PENTABLE: 000000000214615
DATE: 1/19/2021
TIME: 3:53:46 PM
SCALE: 1:100

HYDRAULIC DITCH CALCULATIONS - CONT.

ID	U/S NODE	D/S NODE	U/S HGL	D/S HGL	U/S FL	D/S FL	10-YEAR DISCHARGE (CFS)	CAPACITY (CFS)	N	LENGTH (FT)	DEPTH (FT)	BOTTOM WIDTH (FT)	SIDE SLOPE LEFT (H:1)	SIDE SLOPE RIGHT (H:1)	SLOPE (%)	UNIFORM VELOCITY (FPS)	U/S ACUTAL DEPTH	D/S ACTUAL DEPTH	U/S ACTUAL VELOCITY	D/S ACTUAL VELOCITY
C-2-5	C-2-5	C-2-6	743.68	742.85	743.18	742.45	11.96	158.19	0.035	51.50	1.87	7.14	4	4	1.43	2.73	0.50	0.50	2.61	3.33
C-2-6	C-2-6	C-2-7	742.71	742.23	742.45	741.99	11.96	270.64	0.012	103.03	1.43	16.51	3	3	0.44	2.99	0.26	0.26	2.65	2.99
C-2-7	C-2-7	C-1-8	742.24	742.07	741.99	741.84	11.96	65.31	0.012	51.55	0.65	19.26	3	3	0.30	2.52	0.25	0.25	2.43	2.56
C-2-8	C-1-8	C-1-9	742.07	741.90	741.84	741.68	11.96	40.39	0.012	51.54	0.47	20.56	4	4	0.30	2.47	0.23	0.23	2.39	2.54
C-2-9	C-1-9	C-1-10	741.90	741.60	741.68	741.38	11.96	42.77	0.012	100.42	0.46	22.87	3	3	0.30	2.38	0.22	0.22	2.31	2.35
C-3-1	C-3-1	C-3-2	743.73	742.84	743.05	742.17	2.55	7.46	0.035	175.01	1.00	0.00	4	4	0.51	1.43	0.68	0.68	1.39	1.40
C-3-2	C-3-2	C-OUT	742.84	741.67	742.17	741.00	2.55	7.38	0.035	299.25	1.00	0.00	4	4	0.39	1.25	0.67	0.67	1.25	1.25
C-4-1	C-4-1	C-4-2	744.88	744.62	744.28	744.23	1.16	9.38	0.035	50.00	1.50	0.00	4	4	0.09	0.63	0.60	0.60	0.81	1.88
C-4-2	C-4-2	C-4-3	744.62	743.83	744.23	743.30	1.16	42.16	0.035	50.10	1.50	0.00	6	3	1.86	1.91	0.39	0.39	1.88	1.03
C-4-3	C-4-3	C-3-1	743.83	743.73	743.30	743.05	1.16	21.73	0.035	50.00	1.50	0.00	4	4	0.49	1.17	0.53	0.53	1.03	0.63
C-5-1	C-5-1	C-5-2	748.58	746.51	747.93	745.90	13.06	47.18	0.035	118.61	1.00	6.00	4	4	1.71	2.97	0.65	0.65	2.17	2.37
C-5-2	C-5-2	C-5-3	746.51	745.83	745.90	745.22	13.06	34.74	0.035	73.75	1.00	6.00	4	4	0.93	2.39	0.61	0.61	2.37	2.36
C-5-3	C-5-3	C-5-4	745.83	744.77	745.22	744.08	13.06	34.75	0.035	122.84	1.00	6.00	4	4	0.93	2.39	0.61	0.61	2.36	1.99
C-5-4	C-5-4	C-6-1	744.77	744.39	744.08	743.51	13.06	27.56	0.035	98.19	1.00	6.00	4	4	0.58	2.03	0.69	0.69	1.99	1.43
C-6-1	C-6-1	C-6-2	744.39	743.99	743.51	743.10	19.75	26.75	0.035	73.64	1.00	6.00	4	4	0.55	2.23	0.88	0.88	2.16	2.13
C-6-2	C-6-2	C-6-3	743.99	743.68	743.10	742.72	19.75	26.08	0.035	73.65	1.00	6.00	4	4	0.52	2.20	0.89	0.89	2.13	1.88
C-6-3	C-6-3	C-6-4	743.68	743.13	742.72	742.42	19.75	19.55	0.035	124.31	1.00	7.00	4	4	0.24	1.65	0.97	0.97	1.72	2.62
C-6-4	C-6-4	C-CROSS-S	743.13	743.08	742.42	742.06	19.75	50.98	0.035	22.05	1.00	7.00	4	4	1.62	3.23	0.71	0.71	2.62	1.65
C-7-1	C-7-1	C-7-2	743.99	743.88	742.89	742.73	6.48	17.36	0.035	51.05	1.50	0.00	4	4	0.32	1.52	1.10	1.10	1.34	1.21
C-7-2	C-7-2	C-7-3	743.88	743.68	742.73	742.63	6.48	4.57	0.035	50.05	1.00	0.00	4	4	0.19	1.62	1.00	1.00	1.62	1.62
C-7-3	C-7-3	C-7-4	743.68	743.47	742.63	742.54	6.48	13.06	0.035	50.45	1.50	0.00	4	4	0.18	1.23	1.05	1.05	1.46	1.88
C-7-4	C-7-4	C-CROSS-S	743.47	743.08	742.54	742.06	6.48	23.82	0.035	80.32	1.50	0.00	4	4	0.59	1.91	0.93	0.93	1.88	1.58
C-8-1	C-8-1	C-8-2	744.73	744.45	744.11	743.63	1.96	7.23	0.035	102.20	1.00	0.00	4	4	0.48	1.30	0.62	0.62	1.27	0.72
C-8-2	C-8-2	C-8-3	744.45	744.20	743.63	743.35	3.65	6.34	0.035	75.01	1.00	0.00	4	4	0.37	1.38	0.83	0.83	1.34	1.27
C-8-3	C-8-3	C-7-1	744.20	743.99	743.35	742.89	3.65	6.40	0.035	125.08	1.00	0.00	4	4	0.37	1.38	0.85	0.85	1.27	0.91
C-8-4	C-8-4	C-8-1	745.14	744.73	744.50	744.11	1.96	3.34	0.035	82.52	0.75	0.00	4	4	0.47	1.30	0.64	0.64	1.19	1.27
C-2-10	C-1-10	C-1-11	741.60	741.30	741.38	741.08	11.96	73.04	0.012	100.01	0.61	23.70	3	3	0.30	2.33	0.22	0.22	2.27	2.24
C-2-11	C-1-11	C-OUT	741.30	741.21	741.08	741.00	11.96	73.04	0.012	27.32	0.61	23.70	3	3	0.30	2.33	0.22	0.22	2.24	2.33
D-2-1	D-2-1	D-2-2	741.64	738.22	741.09	737.76	1.77	86.23	0.035	150.02	2.00	0.00	3	4	2.22	2.33	0.55	0.55	1.67	2.37
D-2-2	D-2-2	D-2-3	738.22	734.68	737.76	734.10	1.77	90.19	0.035	150.74	2.00	0.00	3	4	2.43	2.42	0.46	0.46	2.37	1.52
D-2-3	D-2-3	D-2-4	734.68	731.61	734.10	731.03	1.77	18.87	0.035	151.04	1.15	0.00	3	4	2.03	2.26	0.58	0.58	1.52	1.50
D-2-4	D-2-4	D-2-5	731.61	730.46	731.03	730.03	1.77	23.84	0.035	30.82	1.15	0.00	3	4	3.25	2.69	0.58	0.58	1.50	2.69
* D-3-1	D-3-1	D-3-1.2	725.13	724.60	724.07	723.64	5.13	23.19	0.035	28.80	1.40	0.00	3	3	1.49	2.70	1.06	1.06	1.52	1.86
D-3-1.1	D-3-1.1	D-3-2	721.52	720.33	720.57	719.76	5.13	23.21	0.012	76.61	1.00	0.00	3	3	1.06	5.30	0.95	0.95	1.91	5.27
*D-3-1.2	D-3-1.2	D-3-1.3	724.60	723.38	723.64	722.53	5.13	20.01	0.035	100.13	1.40	0.00	3	3	1.11	2.43	0.96	0.96	1.86	2.40
*D-3-1.3	D-3-1.3	D-3-1.1	723.38	721.52	722.53	720.57	5.13	20.11	0.035	175.09	1.40	0.00	3	3	1.12	2.43	0.85	0.85	2.40	1.91
* D-3-2	D-3-2	D-3-2.1	720.70	720.67	719.76	719.68	5.20	9.28	0.012	48.61	1.00	0.00	3	3	0.17	2.62	0.93	0.93	1.99	1.76
*D-3-2.1	D-3-2.1	D-3-2.2	720.67	720.47	719.68	719.59	5.20	10.82	0.012	103.88	1.20	0.00	3	3	0.09	2.14	0.99	0.99	1.76	2.22
*D-3-2.2	D-3-2.2	D-3-2.3	720.47	720.24	719.59	719.51	5.20	10.21	0.012	103.63	1.20	0.00	3	3	0.08	1.97	0.88	0.88	2.22	3.29
D-3-2.3	D-3-2.3	D-OUT	720.24	718.30	719.51	717.85	5.20	79.25	0.012	35.69	1.20	0.00	3	3	4.65	9.29	0.73	0.73	3.29	8.64
D-4-1	D-4-1	D-4-2	741.03	740.29	740.35	739.69	1.95	69.57	0.035	150.18	2.50	0.00	4	3	0.44	1.30	0.68	0.68	1.20	1.54
D-4-2	D-4-2	D-4-3	740.29	738.97	739.69	738.37	1.95	170.10	0.035	50.24	2.50	0.00	4	3	2.63	2.54	0.60	0.60	1.54	1.54
D-4-3	D-4-3	D-4-4	738.97	732.34	738.37	731.74	1.95	171.42	0.035	248.47	2.50	0.00	4	3	2.67	2.56	0.60	0.60	1.54	1.53
D-4-4	D-4-4	D-SET3	732.34	728.82	731.74	728.40	1.95	233.57	0.035	67.42	2.50	0.00	4	3	4.95	3.23	0.60	0.60	1.53	3.23
E-1-1	E-1-1	E-1-2	728.50	726.48	727.52	725.74	7.69	17.18	0.035	50.12	1.00	0.00	4	3	3.55	4.01	0.98	0.98	2.28	4.01
E-1-10	E-1-10	E-1-11	720.62	720.40	719.52	719.31	7.69	17.62	0.035	48.84	1.50	0.00	4	3	0.43	1.81	1.10	1.10	1.81	1.84
E-1-11	E-1-11	E-OUT	720.40	720.09	719.31	719.00	7.69	17.85	0.035	70.26	1.50	0.00	4	3	0.44	1.85	1.09	1.09	1.84	1.85
E-1-2	E-1-2	E-1-3	726.60	723.94	725.75	723.09	7.69	12.14	0.035	150.02	1.00	0.00	4	3	1.77	3.10	0.85	0.85	3.04	3.07
E-1-3	E-1-3	E-1-4	723.94	723.22	723.09	722.18	7.69	12.30	0.035	50.00	1.00	0.00	4	3	1.82	3.13	0.85	0.85	3.07	2.20
E-1-4	E-1-4	E-1-5	723.22	722.43	722.18	721.27	7.69	27.37	0.035	50.02	1.35	0.00	4	3	1.82	3.12	1.04	1.04	2.04	1.64
E-1-5	E-1-5	E-1-6	722.43	721.33	721.27	720.12	7.69	18.30	0.035	248.06	1.50	0.00	4	3	0.46	1.87	1.16	1.16	1.64	1.50
E-1-6	E-1-6	E-1-7	721.33	721.21	720.12	719.97	7.69	14.95	0.035	48.48	1.50	0.00	4	3	0.31	1.60	1.21	1.21	1.50	1.42
E-1-7	E-1-7	E-1-8	721.21	721.10	719.97	719.87	7.69	12.18	0.035	48.71	1.50	0.00	4	3	0.21	1.37	1.24	1.24	1.42	1.46
E-1-8	E-1-8	E-1-9	721.10	720.96	719.87	719.78	7.69	11.55	0.035	48.74	1.50	0.00	4	3	0.19	1.32	1.23	1.23	1.46	1.57
E-1-9	E-1-9	E-1-10	720.96	720.62	719.78	719.52	7.69	13.88	0.035	97.49	1.50	0.00	4	3	0.27	1.54	1.18	1.18	1.57	1.81
F-1-1	F-1-1	F-1-1.1	744.67	743.72	744.00	743.00	4.62	14.95	0.035	126.23	1.00	1.00	6	4	0.79	1.85	0.67	0.67	1.60	1.39
F-1-1.1	F-1-1.1	F-3-CULV2	743.72	742.09	743.00	741.00	4.62	15.89	0.035	223.37	1.00	1.00	6	4	0.90	1.94	0.72	0.72	1.39	0.77
F-1-2	F-3-CULV2	F-2-1	742.09	742.09	739.90	739.78	6.30	116.65	0.035	35.39	3.00	0.00	4	4	0.35	1.55	2.19	2.19	0.33	0.29
F-2-1	F-2-1	F-2-2	742.09	741.76	740.78	740.50	10.84	32.99	0.035	83.49	2.00	0.00	4	3	0.33	1.80	1.32	1.32	1.79	1.98
F-2-10	F-1-10	F-2-11	737.60	736.65	736.80	735.89	10.84	17.36	0.035	125.01	1.00	3.00	4	3	0.73	2.35	0.80	0.80	2.34	2.49
F-2-11	F-2-11	F-2-12	736.65	736.21	735.89	735.44	10.84	19.10	0.035	50.49	1.00	3.00	4	3	0.88	2.53	0.77	0.77	2.49	2.49
F-2-12	F-2-12	F-OUT	736.21	735.76	735.44	735.00	10.84	19.09	0.035	50.01	1.00	3.00	4	3	0.88	2.53	0.77	0.77	2.50	2.53
F-2-2	F-2-2	F-2-3	741.76	741.36	740.50	740.38	10.84	13.53	0.035	39.29	1.43	0.00	4	3	0.33	1.78	1.25	1.25	1.98	3.22
F-2-3	F-2-3	F-2-4	741.36	741.27	740.38	740.30	10.84	11.62	0.035	22.25	1.00	3.00	4	3	0.33	1.75	0.98	0.98	1.72	1.76
F-2-4	F-2-4	F-2-5	741.27	740.83	740.30	739.90	10.84	11.62	0.035	124.80	1.00	3.00	4	3	0.33	1.75	0.97	0.97	1.76	1.84
F-2-5	F-2-5	F-2-6	740.83	740.45	739.90	739.65	10.84	11.62	0.035	74.99	1.00	3.00	4	3	0.33	1.75	0.94	0.94	1.84	2.34
F-2-6	F-2-6	F-2-7	740.45	739.71	739.65	738.92	10.84	17.38	0.035	100.01	1.00	3.00	4	3	0.73	2.35	0.80	0.80	2.34	2.36
F-2-7	F-2-7	F-2-8	739.71	739.29	738.92	738.55	10.84	17.56	0.035	50.08	1.00	3.00	4	3	0.75	2.38	0.79	0.79	2.36	2.60
F-2-8	F-2-8	F-2-9	739.29	738.29	738.55	737.55	10.84	20.23	0.035	100.02	1.00	3.00	4	3	0.99	2.63	0.74	0.74	2.60	2.62
F-2-9	F-2-9	F-1-10	738.29	737.60	737.55	736.80	10.84	20.39	0.035	75.00	1.00	3.00	4	3	1.01	2.65	0.74	0.74	2.62	2.34
F-3-1	F-3-1	F-3-1.1	743.38	742.63	742.95	742.11	1.03	13.58	0.035	50.26	1.00	0.00	4	4	1.68	1.78	0.43	0.43	1.39	0.95
F-3-1.1	F-3-1.1	F-3-1.2	742.63	742.50	742.11	741.93	1.03	6.27	0.035	50.13	1.00	0.00	4	4	0.36	0.99	0.52	0.52	0.95	0.79
F-3-1.2	F-3-1.2	F-3-CULV	742.50	742.41	741.93	741.64	1.03	9.43	0.035	35.85	1.00	0.00	4	4	0.81	1.35	0.57	0.57	0.79	0.44
F-3-2	F-3-2	F-3-2.1	743.88	743.74	743.32	743.20	1.33	7.41	0.035	25.04	1.00	0.00	4	4	0.50	1.22	0.55	0.55	1.09	1.13
F-3-2.1	F-3-2.1	F-3-2.2	743.74	743.47	743.20	742.87	1.33	6.92	0.035	75.00	1.00	0.00	4	4	0.44	1.15	0.54	0.54	1.13	0.94
F-3-2.2	F-3-2.2	F-3-2.3	743.47	743.39	742.87	742.63	1.33	6.87	0.035	55.92	1.00	0.00	4	4	0.43	1.15	0.60	0.60	0.94	0.58
F-3-2.3	F-3-2.3	F-3-CULV	743.39	742.41	742.63	741.64	1.33	17.49	0.035	35.66	1.00	0.00	4	4	2.78	2.30	0.76	0.76	0.58	0.57
G-1-1	G-1-1	G-1-2	743.75	741.81	742.97	741.21	4.32	108.19	0.035	50.20	2.00	0.00	3	4	3.49	3.46	0.78	0.78	2.03	3.46
G-1-2	G-1-2	G-1-3	742.00	740.78	741.21	740.00	4.32	52.13	0.035	150.11	2.00	0.00	3	4	0.81	2.00	0.79	0.79	1.98	2.00
G-1-3	G-1-3	G-1-4	740.78	740.06	740.00	739.16	4.32	8.34	0.035	100.02	1.00	0.00	3	4	0.84	2.02	0.79	0.79	2.00	1.53
G-1-4	G-1-4	G-1-5	740.06	738.08	739.16	737.18	4.32	8.02	0.035	254.79	1.00	0.00	3	4	0.77	1.96	0.90	0.90	1.53	1.55
G-1-5	G-1-5	G-1-8	G-OUT	736.26	735.83	735.32	734.98	4.32	6.45	0.035	67.99	1.00	0.00	3	4	0.50	1.67	0.95	0.95	1.37	1.67
H-1-1	H-1-1	H-1-2	738.76	736.74	737.88	735.98	6.59	270.46	0.035	100.07	3.00	0.00	4	4	1.90	2.96	0.88	0.88	2.12	2.87
H-1-2	H-1-2	H-1-3	736.74	735.76	735.98	735.05	6.59	267.22	0.035	50.18	3.00	0.00	4	4	1.85	2.94	0.76	0.76	2.87	3.23
H-1-3	H-1-3	H-1-4	735.76	732.53	735.05	731.85	6.59	350.27	0.035	100.48	3.00	0.00	4	4	3.19	3.60	0.71	0.71	3.23	3.60
H-1-4	H-1-4	H-2-1	732.56	727.68	731.85	727.00	6.59	351.75	0.035	151.02	3.00	0.00	4	4	3.21	3.61	0.71	0.71	3.27	3.61
H-2-1	H-2-1	H-2-2	728.67	727.60	727.00	726.25	21.22	18.08	0.035	150.12	1.00	4.00	4	4	0.50	2.65	1.00	1.00	2.65	2.65

*DESIGNED FOR THE 2-YR STORM EVENT

NOTES:
1. GEOPAK DRAINAGE USED FOR HYDRAULIC ANALYSIS

1/22/2021

STATE OF TEXAS
ASHLEY S. HANSON
107373
LICENSED
PROFESSIONAL ENGINEER

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY
Texas Registered Engineering Firm F-2614

Texas Department of Transportation
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ROBERT S. LIGHT EXTENSION

HYDRAULIC CALCULATION SHEET

SHEET 2 OF 3

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS				
TJP	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	AUS	HAYS	
CLH	CONTROL	SECTION	JOB	146
CHECK	0914	33	068	
CMC				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
USER: DLAyala
FILE: $PWWARVAULTPATHDESC$
DATE: 1/22/2021
TIME: 4:44:23 PM
SCALE: 1:100
PENTABLE: 000000000214615

HYDRAULIC DITCH CALCULATIONS - CONT.

ID	U/S NODE	D/S NODE	U/S HGL	D/S HGL	U/S FL	D/S FL	10-YEAR DISCHARGE (CFS)	CAPACITY (CFS)	N	LENGTH (FT)	DEPTH (FT)	BOTTOM WIDTH (FT)	SIDE SLOPE LEFT (H:1)	SIDE SLOPE RIGHT (H:1)	SLOPE (%)	UNIFORM VELOCITY (FPS)	U/S ACUTAL DEPTH	D/S ACTUAL DEPTH	U/S ACTUAL VELOCITY	D/S ACTUAL VELOCITY
H-2-2	H-2-2	H-2-2.1	727.60	726.90	726.25	725.75	21.22	18.06	0.035	100.22	1.00	4.00	4	4	0.50	2.65	1.00	1.00	2.65	2.65
H-2-2.1	H-2-2.1	H-2-3	726.90	726.08	725.75	725.25	21.22	18.05	0.035	100.37	1.00	4.00	4	4	0.50	2.65	1.00	1.00	2.65	3.49
H-2-3	H-2-3	H-2-3.1	726.08	725.68	725.25	724.99	21.22	29.84	0.035	50.60	1.00	8.00	4	4	0.51	2.24	0.83	0.83	2.26	2.87
H-2-3.1	H-2-3.1	H-2-3.2	725.68	724.91	724.99	724.27	21.22	47.30	0.035	55.77	1.00	8.00	4	4	1.29	3.09	0.69	0.69	2.87	3.12
H-2-3.2	H-2-3.2	H-OUT	724.91	724.18	724.27	723.55	21.22	49.71	0.035	50.50	1.00	8.00	4	4	1.43	3.21	0.64	0.64	3.12	3.21
I-1-1	I-1-1	I-1-2	735.69	735.14	734.59	734.00	8.44	41.81	0.035	149.62	2.00	0.00	4	4	0.39	1.76	1.10	1.10	1.73	1.61
I-1-2	I-1-2	I-1-3	735.14	734.41	734.00	733.59	8.44	17.17	0.035	100.48	1.50	0.00	3	4	0.41	1.83	1.14	1.14	1.84	3.62
I-1-3	I-1-3	I-1-3.1	734.25	733.50	733.59	732.88	8.44	20.28	0.035	101.52	1.00	4.00	3	4	0.70	2.11	0.66	0.66	2.04	2.19
I-1-3.1	I-1-3.1	I-1-4	733.50	732.69	732.88	732.08	8.44	21.63	0.035	100.58	1.00	4.00	3	4	0.80	2.22	0.62	0.62	2.19	2.23
I-1-4	I-1-4	I-1-4.1	732.69	732.21	732.08	731.60	8.44	21.06	0.035	103.88	1.00	6.00	3	3	0.46	1.77	0.61	0.61	1.75	1.78
I-1-4.1	I-1-4.1	I-OUT-POND-N	732.21	730.60	731.60	730.00	8.44	21.38	0.035	336.11	1.00	6.00	3	3	0.48	1.80	0.61	0.61	1.78	1.80
I-2-1	I-2-1	I-2-2	739.12	738.27	737.99	737.19	8.13	42.09	0.035	200.09	2.00	0.00	4	4	0.40	1.75	1.13	1.13	1.60	1.74
I-2-2	I-2-2	I-2-3	738.27	737.27	737.19	736.19	8.13	42.06	0.035	250.48	2.00	0.00	4	4	0.40	1.75	1.08	1.08	1.74	1.74
I-2-3	I-2-3	I-2-4	737.27	736.07	736.19	734.99	8.13	42.16	0.035	299.24	2.00	0.00	4	4	0.40	1.75	1.08	1.08	1.74	1.73
I-2-4	I-2-4	I-1-1	736.07	735.69	734.99	734.59	8.13	42.19	0.035	99.59	2.00	0.00	4	4	0.40	1.75	1.08	1.08	1.73	1.67
I-3-1	I-3-1	I-3-2	735.18	734.98	734.15	733.94	17.12	72.72	0.035	50.91	2.00	4.00	4	4	0.41	2.09	1.03	1.03	2.03	2.01
I-3-1.1	I-3-1A	I-3-1.1	735.60	735.40	734.56	734.35	17.12	73.21	0.035	50.23	2.00	4.00	4	4	0.42	2.09	1.04	1.04	2.03	1.99
I-3-1.2	I-3-1.1	I-3-1	735.40	735.18	734.35	734.15	17.12	68.91	0.035	53.99	2.00	4.00	4	4	0.37	2.00	1.05	1.05	1.99	2.03
I-3-1A	I-OS-4	I-3-1A	736.04	735.60	734.99	734.56	17.12	72.44	0.035	105.53	2.00	4.00	4	4	0.41	2.07	1.04	1.04	2.01	2.03
I-3-2	I-3-2	I-3-3	734.98	734.63	733.94	733.54	17.12	71.64	0.035	99.90	2.00	4.00	4	4	0.40	2.04	1.04	1.04	2.01	1.87
I-3-3	I-3-3	I-3-4	734.63	734.41	733.54	733.14	17.12	71.69	0.035	99.77	2.00	4.00	4	4	0.40	2.04	1.09	1.09	1.87	1.49
I-3-4	I-3-4	I-3-4.1	734.41	733.60	733.14	732.34	25.40	71.44	0.035	200.94	2.00	4.00	4	4	0.40	2.26	1.27	1.27	2.21	2.24
I-3-4.1	I-3-4.1	I-3-5	733.60	733.39	732.34	732.14	25.40	70.29	0.035	51.89	2.00	4.00	4	4	0.39	2.26	1.26	1.26	2.24	2.27
I-3-5	I-3-5	I-3-6	733.39	733.17	732.14	731.94	25.40	71.53	0.035	50.11	2.00	4.00	4	4	0.40	2.26	1.25	1.25	2.27	2.32
I-3-6	I-3-6	I-3-6.1	733.17	732.93	731.94	731.74	25.40	38.06	0.035	49.85	1.50	4.00	4	4	0.40	2.28	1.23	1.23	2.32	2.44
I-3-6.1	I-3-6.1	I-3-6.2	732.93	732.57	731.74	731.54	25.40	37.90	0.035	50.27	1.50	4.00	4	4	0.40	2.28	1.19	1.19	2.44	3.05
I-3-6.2	I-3-6.2	I-3-6.3	732.57	732.02	731.54	731.06	25.40	58.29	0.035	51.00	1.50	4.00	4	4	0.94	3.11	1.03	1.03	3.05	3.39
I-3-6.3	I-3-6.3	I-3-7	732.02	731.27	731.06	730.43	25.40	67.44	0.035	50.00	1.50	4.00	4	4	1.26	3.46	0.96	0.96	3.39	4.09
I-3-7	I-3-7	I-OUT-POND-S	731.27	727.29	730.43	726.73	25.40	189.78	0.035	37.08	1.50	4.00	4	4	9.98	7.32	0.84	0.84	4.09	7.32
I-4-1	I-OS-1	I-OS-2	738.58	738.39	738.06	737.48	1.00	19.21	0.035	150.21	1.50	0.00	4	4	0.39	1.02	0.52	0.52	0.91	0.30
I-4-2	I-OS-2	I-4-1	738.39	737.62	737.48	736.44	5.05	19.94	0.035	249.85	1.50	0.00	4	4	0.42	1.57	0.91	0.91	1.52	0.90
I-4-3	I-4-1	I-OS-3	737.62	737.34	736.44	735.99	9.89	44.64	0.035	100.07	2.00	0.00	4	4	0.45	1.90	1.18	1.18	1.77	1.36
I-4-4	I-OS-3	I-5-1	737.34	736.52	735.99	735.23	14.00	41.04	0.035	200.00	2.00	0.00	4	4	0.38	1.96	1.35	1.35	1.93	2.09
I-4-5	I-5-1	I-OS-4	736.52	736.04	735.23	734.99	15.17	45.67	0.035	50.56	2.00	0.00	4	4	0.47	2.18	1.29	1.29	2.27	3.48
I-OS-5	I-OS-5	I-OS-6	734.31	727.85	733.88	727.32	9.35	196.80	0.035	446.56	2.00	8.00	4	4	1.47	2.48	0.43	0.43	2.26	1.73
I-OS-5A	I-OS-5A	I-OS-5	738.47	734.31	738.28	733.88	1.00	127.09	0.035	349.17	2.00	4.00	4	4	1.26	1.31	0.19	0.19	1.10	0.41
I-OS-6	I-OS-6	I-OS-OUT	727.85	726.96	727.32	726.44	12.51	42.11	0.035	86.01	1.00	8.00	4	4	1.02	2.41	0.53	0.53	2.32	2.41
J-1-3	J-1-3	J-OUT	740.71	737.79	740.36	737.47	0.49	10.00	0.035	240.00	1.00	0.00	3	4	1.20	1.35	0.35	0.35	1.14	1.35
K-1-1	K-1-1	K-1-2	741.13	740.42	739.90	739.17	4.03	4.18	0.035	250.27	1.00	0.00	3	3	0.29	1.39	1.00	1.00	1.34	1.34
K-1-2	K-1-2	K-1-3	740.42	739.26	739.17	738.20	7.33	6.76	0.035	293.11	1.10	0.00	4	3	0.33	1.73	1.10	1.10	1.73	1.87
L-1-1	L-1-1	L-1-2	742.05	739.52	741.46	738.94	2.06	11.81	0.035	150.12	1.00	0.00	4	3	1.68	2.18	0.59	0.59	1.67	1.78
L-1-2	L-1-2	L-1-3	739.52	738.58	738.94	737.93	2.06	9.16	0.035	100.00	1.00	0.00	4	3	1.01	1.80	0.58	0.58	1.78	1.42
L-1-3	L-1-3	L-1-4	738.58	737.93	737.93	737.39	2.06	6.69	0.035	100.27	1.00	0.00	4	3	0.54	1.42	0.65	0.65	1.42	2.03
L-1-4	L-1-4	L-OUT	737.93	736.50	737.39	735.96	2.06	10.90	0.035	100.05	1.00	0.00	4	3	1.43	2.06	0.54	0.54	2.03	2.06
M-1-1	M-1-1	M-1-2	741.77	740.83	741.28	740.50	0.86	6.61	0.035	148.50	1.00	0.00	4	3	0.53	1.14	0.49	0.49	1.02	2.33
M-1-3	M-1-3	M-CULV-1	741.00	739.54	740.50	739.20	0.79	5.93	0.035	222.28	1.00	0.00	3	3	0.59	1.20	0.50	0.50	1.06	2.33
M-1-4	M-CULV-2	M-OUT	735.91	734.77	734.17	733.20	22.74	127.26	0.035	125.60	3.00	0.00	3	3	0.77	3.07	1.74	1.74	2.50	3.07
N-1-1	N-1-1	N-1-2	742.46	742.27	741.60	741.39	4.74	7.02	0.035	200.06	1.00	3.00	4	4	0.11	0.93	0.86	0.86	0.86	0.83
N-1-2	N-1-2	N-OUT	742.27	742.08	741.39	741.20	4.74	6.58	0.035	206.04	1.00	3.00	4	4	0.09	0.83	0.88	0.88	0.83	0.83
O-1-2	O-1-2	O-OUT	742.75	742.45	741.60	741.30	5.10	10.35	0.035	263.18	1.50	0.00	4	4	0.11	0.97	1.15	1.15	0.96	0.97
O-1-3	O-1-3	O-1-1	743.23	742.78	742.46	741.95	2.45	17.67	0.035	156.01	1.50	0.00	4	4	0.33	1.20	0.77	0.77	1.03	0.88

HYDRAULIC DITCH CALCULATIONS - 2-YEAR

ID	U/S NODE	D/S NODE	U/S HGL	D/S HGL	U/S FL	D/S FL	2-YEAR DISCHARGE (CFS)	CAPACITY (CFS)	N	LENGTH (FT)	DEPTH (FT)	BOTTOM WIDTH (FT)	SIDE SLOPE LEFT (H:1)	SIDE SLOPE RIGHT (H:1)	SLOPE (%)	UNIFORM VELOCITY (FPS)	U/S ACUTAL DEPTH	D/S ACTUAL DEPTH	U/S ACTUAL VELOCITY	D/S ACTUAL VELOCITY
D-3-1	D-3-1	D-3-1.2	725.13	724.60	724.07	723.64	5.13	23.19	0.035	28.80	1.40	0.00	3	3	1.49	2.70	1.06	1.06	1.52	1.86
D-3-1.2	D-3-1.2	D-3-1.3	724.60	723.38	723.64	722.53	5.13	20.01	0.035	100.13	1.40	0.00	3	3	1.11	2.43	0.96	0.96	1.86	2.40
D-3-1.3	D-3-1.3	D-3-1.1	723.38	721.52	722.53	720.57	5.13	20.11	0.035	175.09	1.40	0.00	3	3	1.12	2.43	0.85	0.85	2.40	1.91
D-3-2	D-3-2	D-3-2.1	720.70	720.67	719.76	719.68	5.20	9.28	0.012	48.61	1.00	0.00	3	3	0.17	2.62	0.93	0.93	1.99	1.76
D-3-2.1	D-3-2.1	D-3-2.2	720.67	720.47	719.68	719.59	5.20	10.82	0.012	103.88	1.20	0.00	3	3	0.09	2.14	0.99	0.99	1.76	2.22
D-3-2.2	D-3-2.2	D-3-2.3	720.47	720.24	719.59	719.51	5.20	10.21	0.012	103.63	1.20	0.00	3	3	0.08	1.97	0.88	0.88	2.22	3.29

NOTE: DITCHES INCLUDED ON THIS TABLE WERE DESIGNED TO THE 2-YR DESIGN FREQUENCY

NOTES:
1. GEOPAK DRAINAGE USED FOR HYDRAULIC ANALYSIS

1/19/2021

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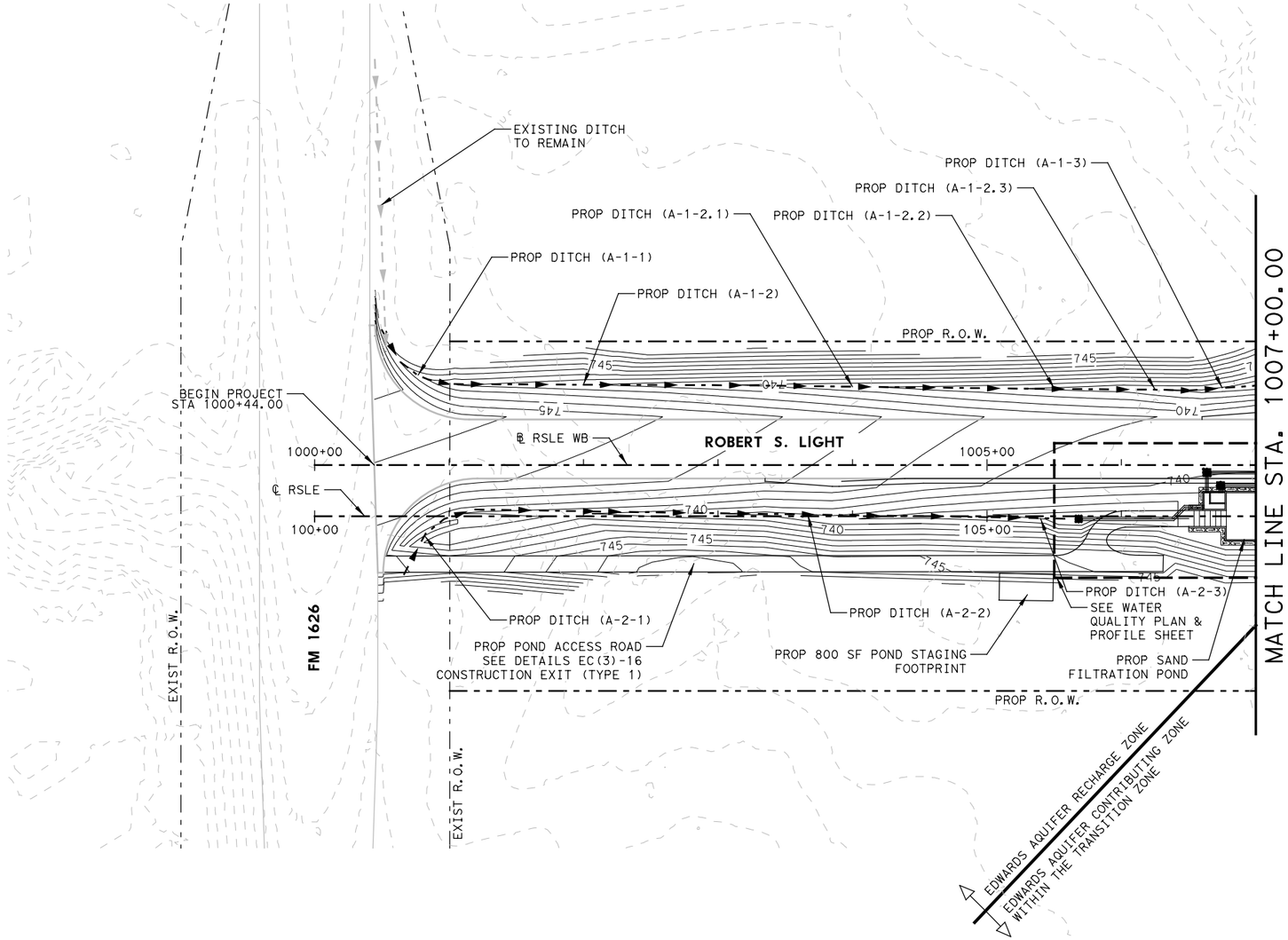
ROBERT S. LIGHT EXTENSION

HYDRAULIC CALCULATION SHEET

SHEET 3 OF 3

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	146A
CLH	0914	33	068	
CHECK				
CMC				

PLOT DRIVER: $PLTDRV$$ USER: $USER$ DATE: $$DATE$$ FILE: $PWWARVAULTPATHDESC$
PENTABLE: $PENTBLS$ TIME: $TIME$ SCALE: $SCALESHORT$



LEGEND

0 50 100
SCALE IN FEET

- PROP STORM SEWER
- PROP INLET
- BL ALIGNMENT
- PROP ROW
- EXIST ROW
- PROP VEGETATED FILTER STRIP
- DITCH FLOWLINE
- PROP CONTOURS
- 100-YR FLOODPLAIN
- STONE RIPRAP
- PROP BRIDGE

NOTES:
1. REFER TO DITCH PROFILE SHEETS FOR DITCH FLOWLINES.
2. REFER TO WATER QUALITY POND SHEETS FOR SAND FILTRATION POND DETAILS, AND INFORMATION REGARDING STORM DRAINAGE SYSTEMS TYING INTO THE POND.

1/25/2021

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ROBERT S. LIGHT EXTENSION

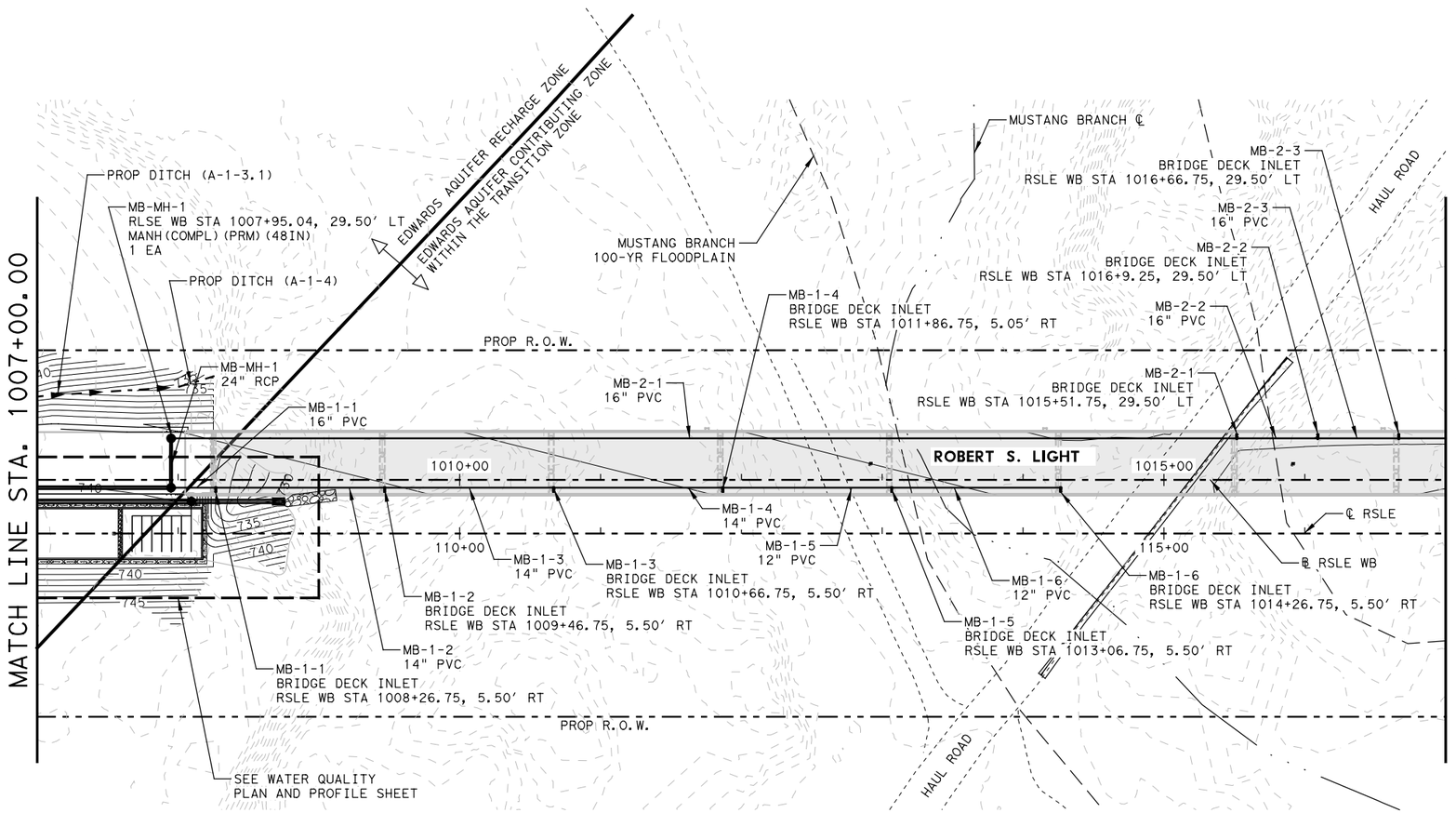
ROBERT S LIGHT DRAINAGE PLAN BEGIN PROJECT TO STA 1007+00

SCALE: 1"=100'-H

SHEET 1 OF 16

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	147
CHECK CLH	CONTROL	SECTION	JOB	
CHECK CMC	0914	33	068	

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
USER: DLAyala DATE: 1/25/2021 TIME: 12:35:52 PM SCALE: 1:100
FILE: $PWVARVAULTPATHDESC$ PENTABLE: 000000002\4615



LEGEND

0 50 100
SCALE IN FEET

- PROP STORM SEWER
- PROP INLET
- BL ALIGNMENT
- PROP ROW
- EXIST ROW
- PROP VEGETATED FILTER STRIP
- DITCH FLOWLINE
- PROP CONTOURS
- 100-YR FLOODPLAIN
- STONE RIPRAP
- PROP BRIDGE

NOTES:
1. REFER TO MUSTANG BRANCH HYD. DATA SHEET FOR HYDROLOGIC AND HYDRAULIC ANALYSIS.
2. REFER TO DITCH PROFILE SHEETS FOR DITCH FLOWLINES.
3. REFER TO WATER QUALITY POND SHEETS FOR SAND FILTRATION POND DETAILS.
4. REFER TO BRIDGE SHEETS FOR DECK DRAIN AND PVC DETAILS.

1/25/2021

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ROBERT S. LIGHT EXTENSION

ROBERT S LIGHT DRAINAGE PLAN STA 1007+00 TO STA 1017+00

SCALE: 1"=100'-H

SHEET 2 OF 16

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	148
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
USER: DLAyala
FILE: $FNVARVAULTPATHDESC$
DATE: 1/25/2021
TIME: 12:36:58 PM
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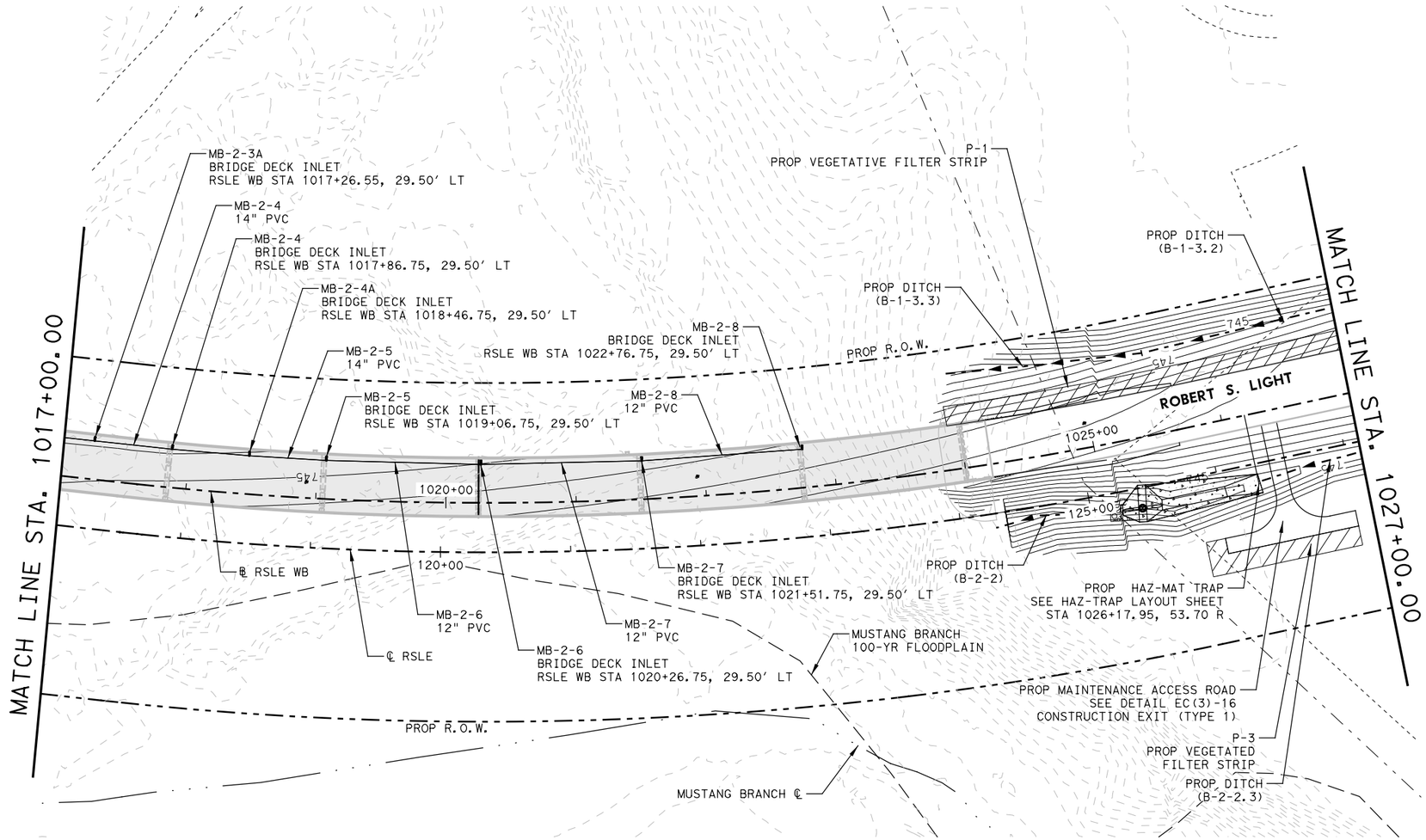
SCALE: H00



0 50 100
SCALE IN FEET

NORTH

LEGEND

- PROP STORM SEWER
- PROP INLET
- BL ALIGNMENT
- PROP ROW
- EXIST ROW
- PROP VEGETATED FILTER STRIP
- DITCH FLOWLINE
- PROP CONTOURS
- 100-YR FLOODPLAIN
- STONE RIPRAP
- PROP BRIDGE

NOTES:
1. REFER TO MUSTANG BRANCH HYD. DATA SHEET. FOR HYDROLOGIC AND HYDRAULIC ANALYSIS.
2. REFER TO DITCH PROFILE SHEETS FOR DITCH FLOWLINES.
3. REFER TO BRIDGE SHEETS FOR DECK DRAIN AND PVC DETAILS.

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ROBERT S. LIGHT EXTENSION

ROBERT S LIGHT DRAINAGE PLAN STA 1017+00 TO STA 1027+00

SCALE: 1"=100'-H

SHEET 3 OF 16

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	149
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
USER: DLAyala DATE: 1/25/2021 TIME: 12:38:04 PM SCALE: 1:100
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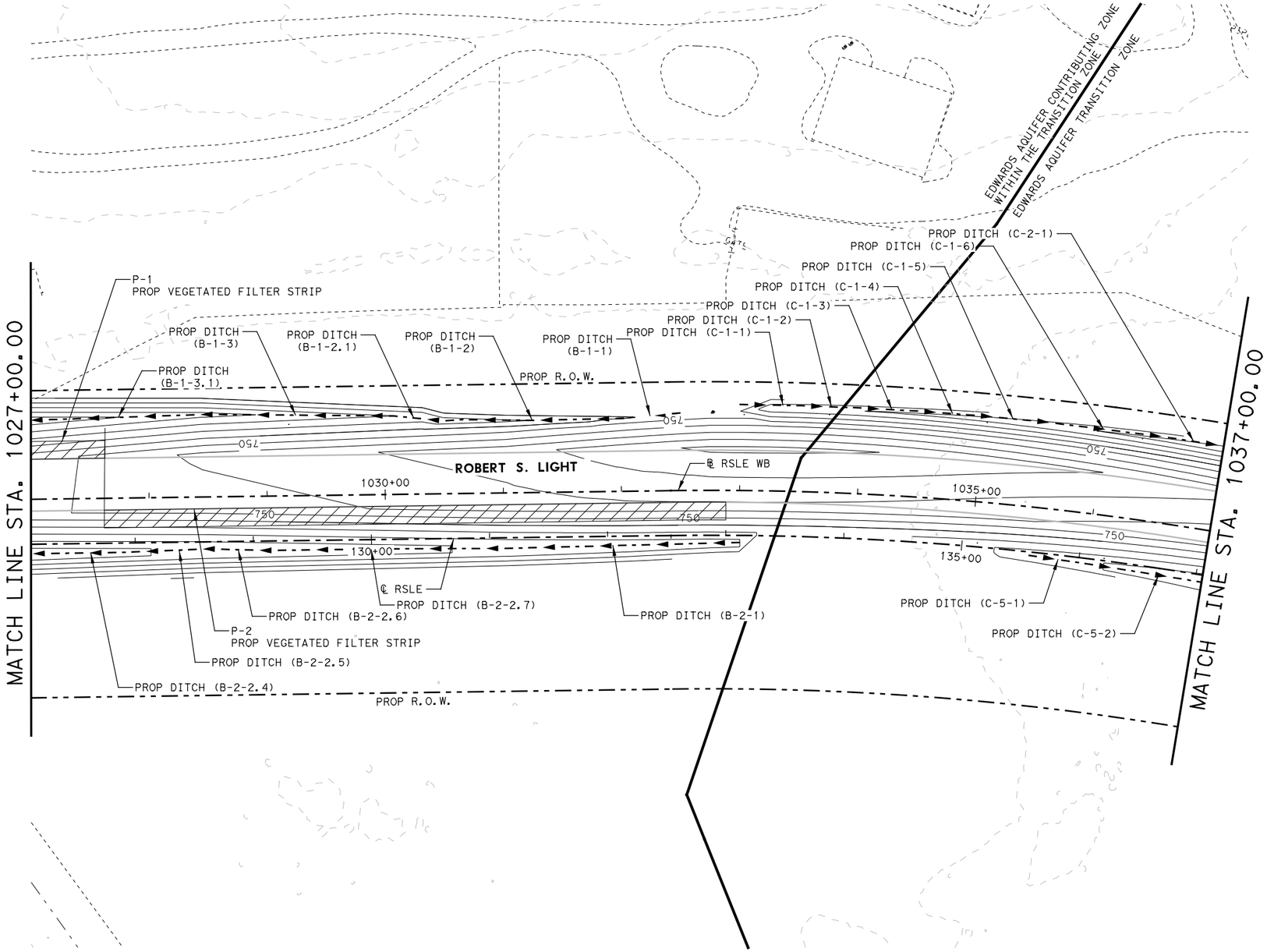

LEGEND

0 50 100
SCALE IN FEET

- PROP STORM SEWER
- PROP INLET
- BL ALIGNMENT
- PROP ROW
- EXIST ROW
- PROP VEGETATED FILTER STRIP
- DITCH FLOWLINE
- PROP CONTOURS
- 100-YR FLOODPLAIN
- STONE RIPRAP
- PROP BRIDGE

NOTES:
1. REFER TO DITCH PROFILE SHEETS FOR DITCH FLOWLINES.

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ROBERT S. LIGHT EXTENSION

ROBERT S LIGHT
DRAINAGE PLAN
STA 1027+00 TO STA 1037+00

SCALE: 1"=100'-H

SHEET 4 OF 16

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	150
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

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USER: DLAyala
FILE: $PWWARVAULTPATHDESC$
DATE: 1/25/2021
TIME: 12:39:10 PM
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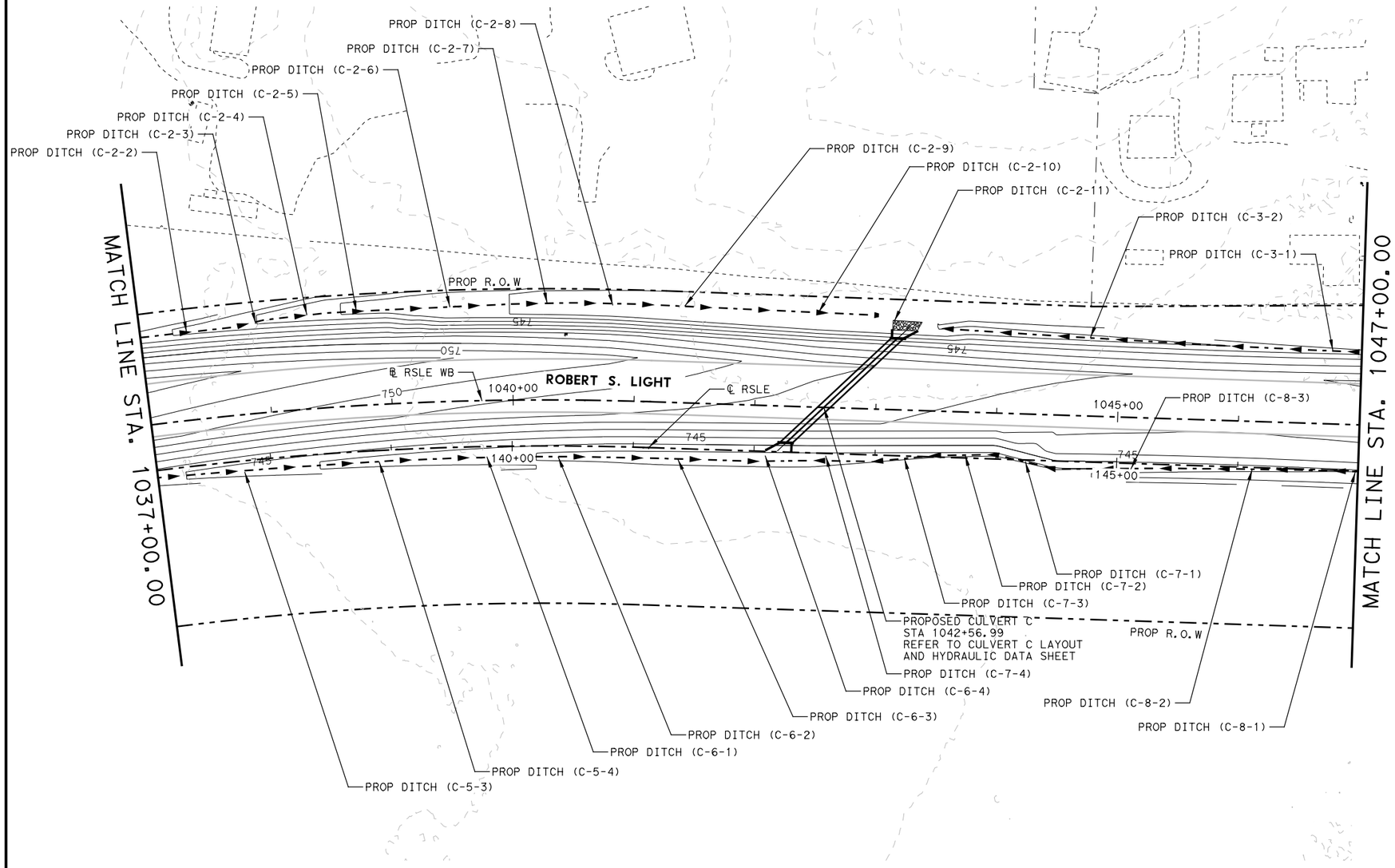
SCALE: 1:100



LEGEND

- PROP STORM SEWER
- PROP INLET
- BL ALIGNMENT
- PROP ROW
- EXIST ROW
- PROP VEGETATED FILTER STRIP
- DITCH FLOWLINE
- PROP CONTOURS
- 100-YR FLOODPLAIN
- STONE RIPRAP
- PROP BRIDGE

0 50 100
SCALE IN FEET

NORTH

NOTES:
1. REFER TO DITCH PROFILE SHEETS FOR DITCH FLOWLINES.

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ROBERT S. LIGHT EXTENSION

ROBERT S LIGHT
DRAINAGE PLAN
STA 1037+00 TO STA 1047+00

SCALE: 1"=100'-H

SHEET 5 OF 16

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	151
CLH	0914	33	068	
CHECK				
CMC				

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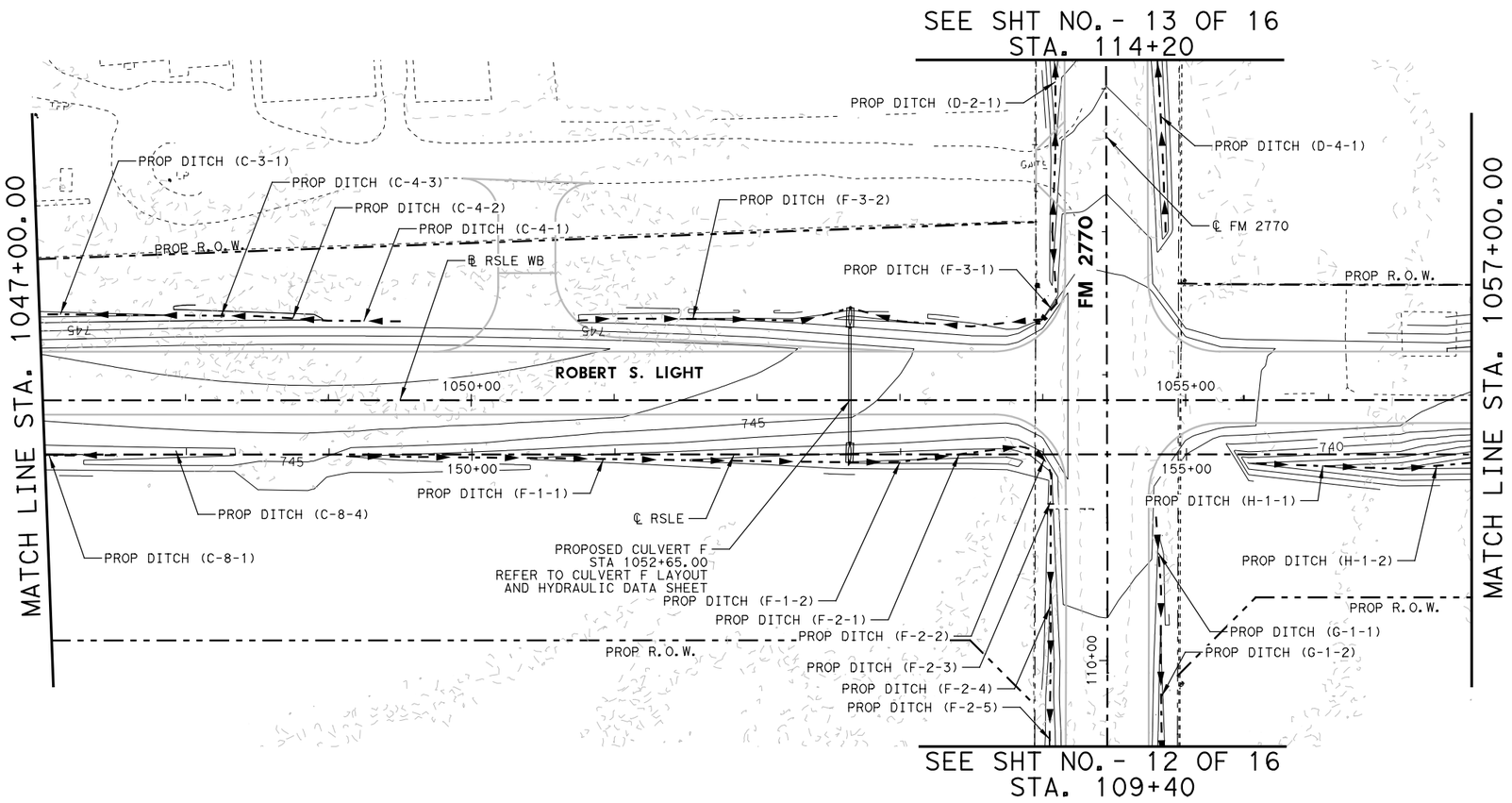

LEGEND

- PROP STORM SEWER
- PROP INLET
- BL ALIGNMENT
- PROP ROW
- EXIST ROW
- PROP VEGETATED FILTER STRIP
- DITCH FLOWLINE
- PROP CONTOURS
- 100-YR FLOODPLAIN
- STONE RIPRAP
- PROP BRIDGE

0 50 100
SCALE IN FEET

NOTES:
1. REFER TO DITCH PROFILE SHEETS FOR DITCH FLOWLINES.

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ROBERT S. LIGHT EXTENSION

ROBERT S LIGHT DRAINAGE PLAN STA 1047+00 TO STA 1057+00

SCALE: 1"=100'-H

SHEET 6 OF 16

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	152
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
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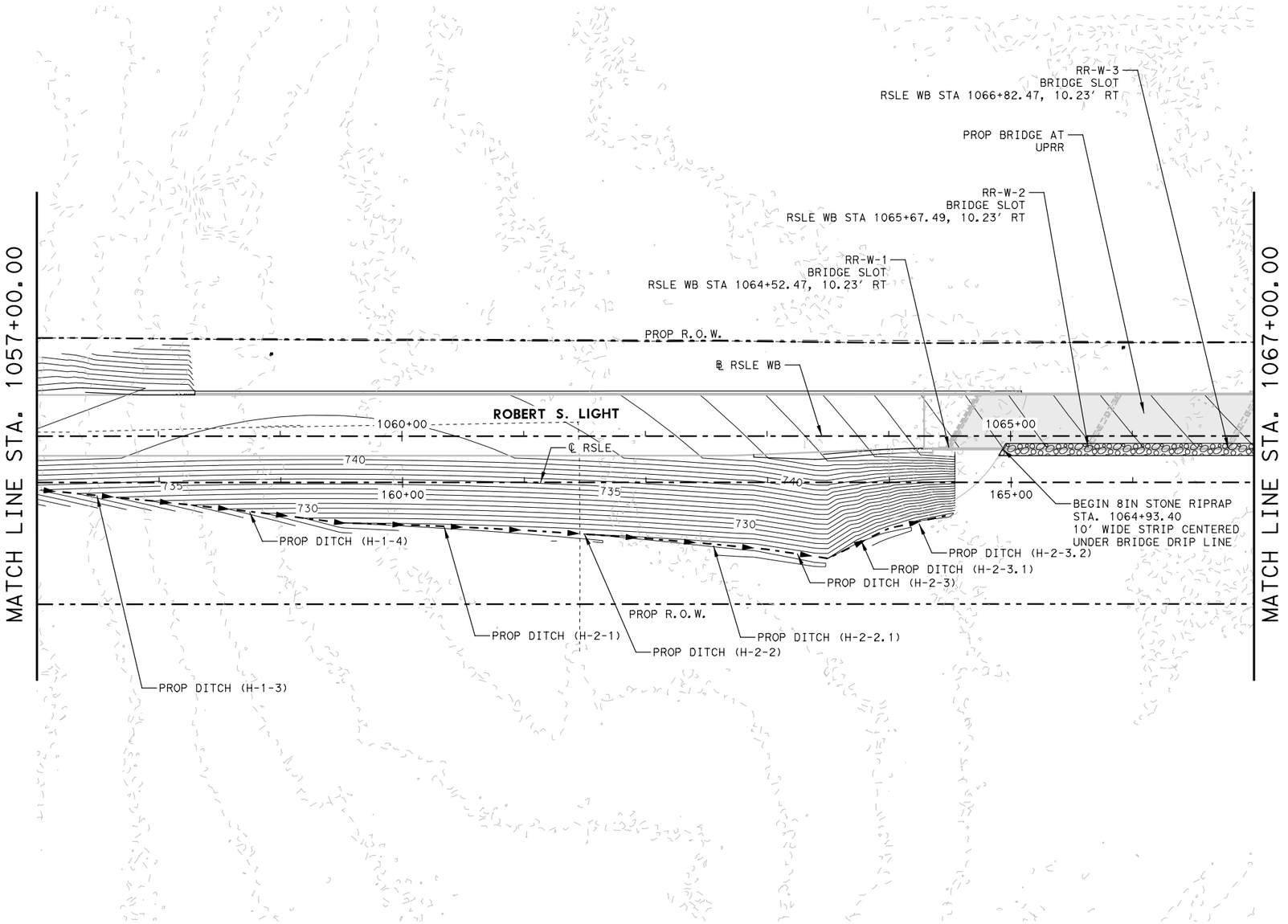

0 50 100
SCALE IN FEET

NORTH

LEGEND

- PROP STORM SEWER
- PROP INLET
- BL ALIGNMENT
- PROP ROW
- EXIST ROW
- PROP VEGETATED FILTER STRIP
- DITCH FLOWLINE
- PROP CONTOURS
- 100-YR FLOODPLAIN
- STONE RIPRAP
- PROP BRIDGE

NOTES:
1. REFER TO UPRR HYD. DATA SHEET FOR HYDROLOGIC AND HYDRAULIC ANALYSIS.
2. REFER TO DITCH PROFILE SHEETS FOR DITCH FLOWLINES.

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ROBERT S. LIGHT EXTENSION

ROBERT S LIGHT DRAINAGE PLAN STA 1057+00 TO STA 1067+00

SCALE: 1"=100'-H

SHEET 7 OF 16

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	153
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
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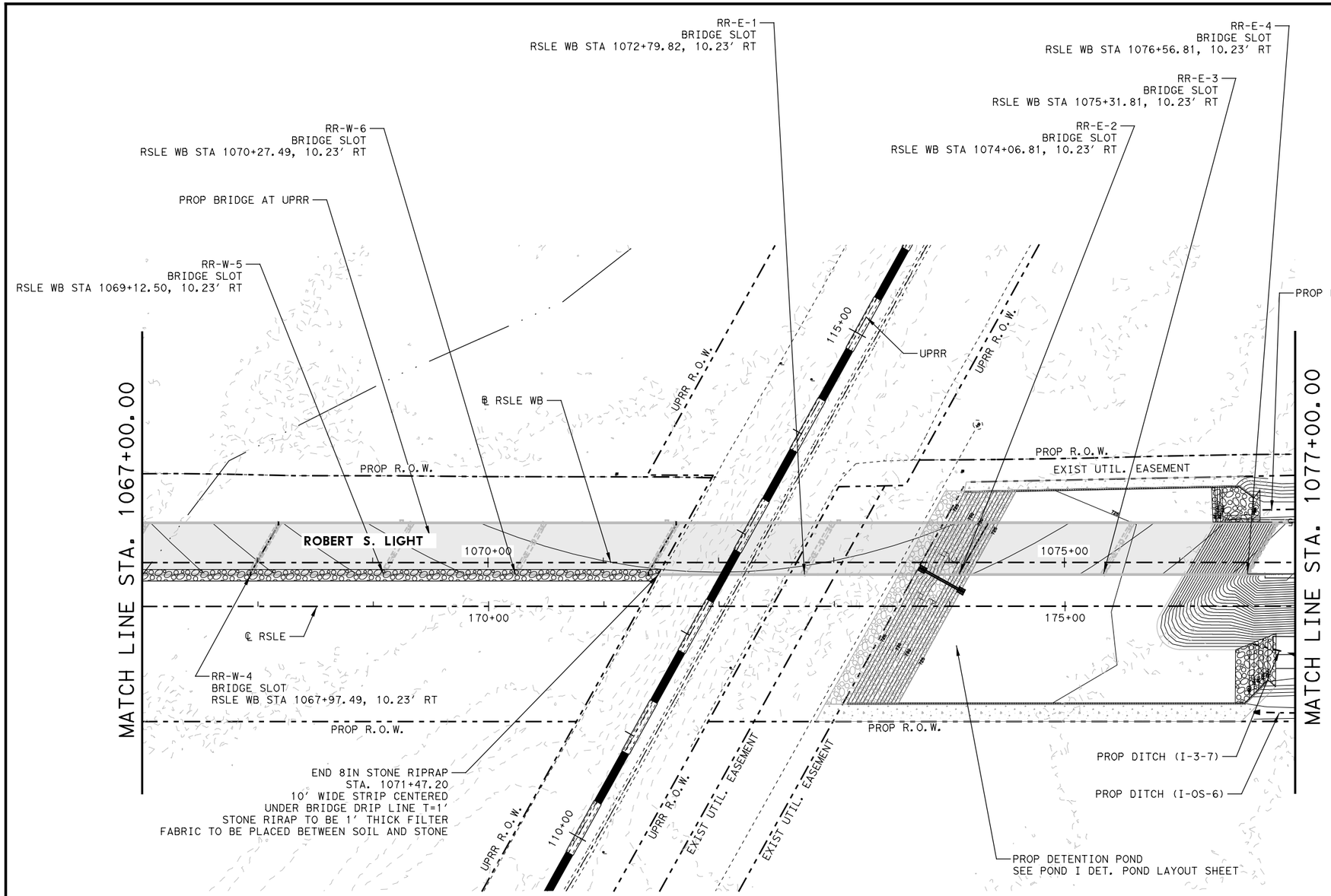

NOTES:
1. REFER TO UPRR HYD. DATA SHEET FOR HYDROLOGIC AND HYDRAULIC ANALYSIS.
2. REFER TO DITCH PROFILE SHEETS FOR DITCH FLOWLINES.
3. REFER TO POND I SHEETS FOR DETAILS ON DETENTION POND.

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ROBERT S. LIGHT EXTENSION

ROBERT S LIGHT DRAINAGE PLAN STA 1067+00 TO STA 1077+00

SCALE: 1"=100'-H

SHEET 8 OF 16

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	154
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
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DATE: 1/25/2021
TIME: 12:42:30 PM
SCALE: 1:100
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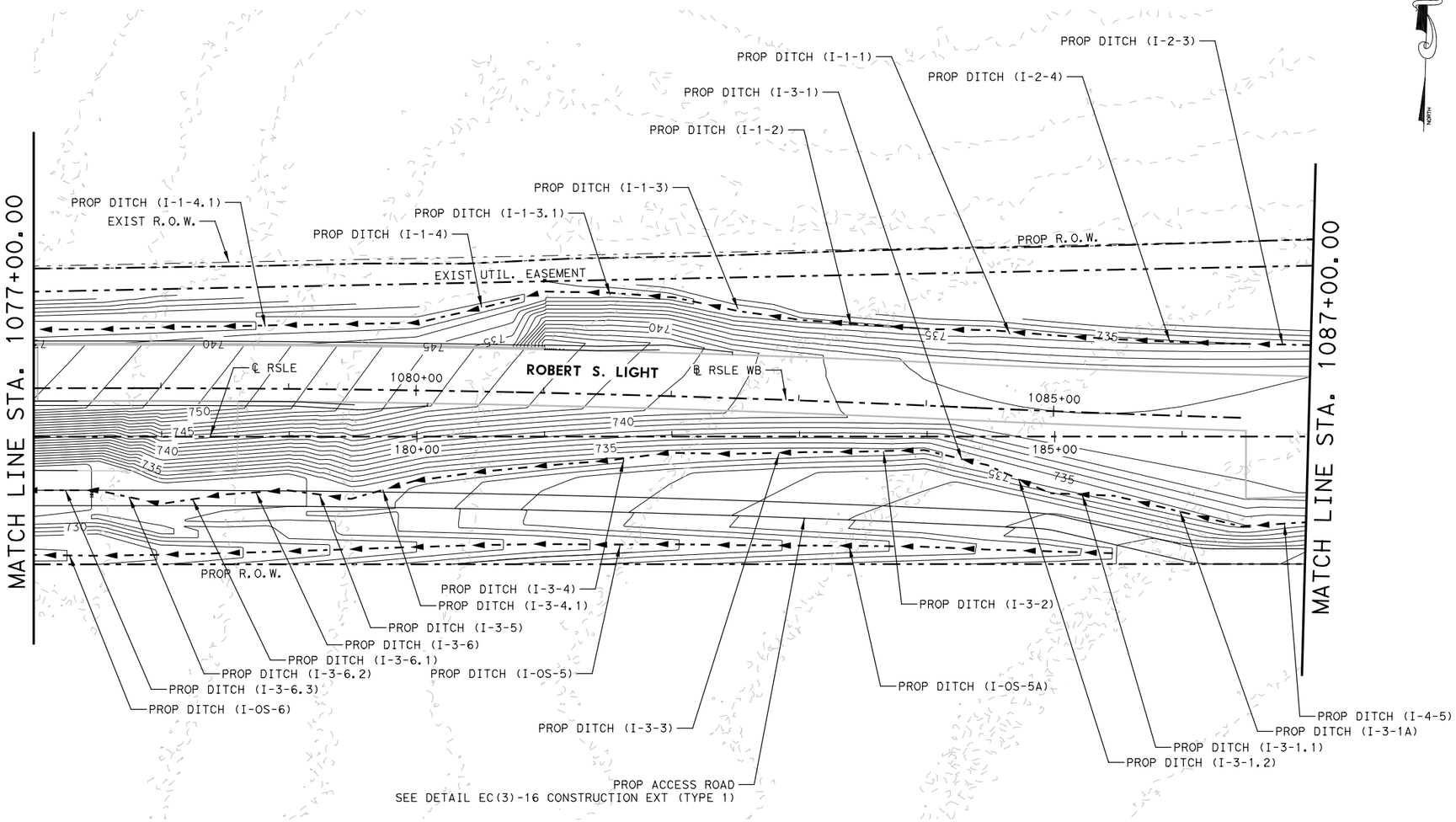

0 50 100
SCALE IN FEET

NORTH

LEGEND

- PROP STORM SEWER
- PROP INLET
- BL ALIGNMENT
- PROP ROW
- EXIST ROW
- PROP VEGETATED FILTER STRIP
- DITCH FLOWLINE
- PROP CONTOURS
- 100-YR FLOODPLAIN
- STONE RIPRAP
- PROP BRIDGE

NOTES:
1. REFER TO DITCH PROFILE SHEETS FOR DITCH FLOWLINES.

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ROBERT S. LIGHT EXTENSION

ROBERT S LIGHT DRAINAGE PLAN STA 1077+00 TO STA 1087+00

SCALE: 1"=100'-H

SHEET 9 OF 16

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	155
CLH	0914	33	068	
CHECK				
CMC				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
USER: DLAyala DATE: 1/25/2021 TIME: 12:42:40 PM SCALE: 1:100
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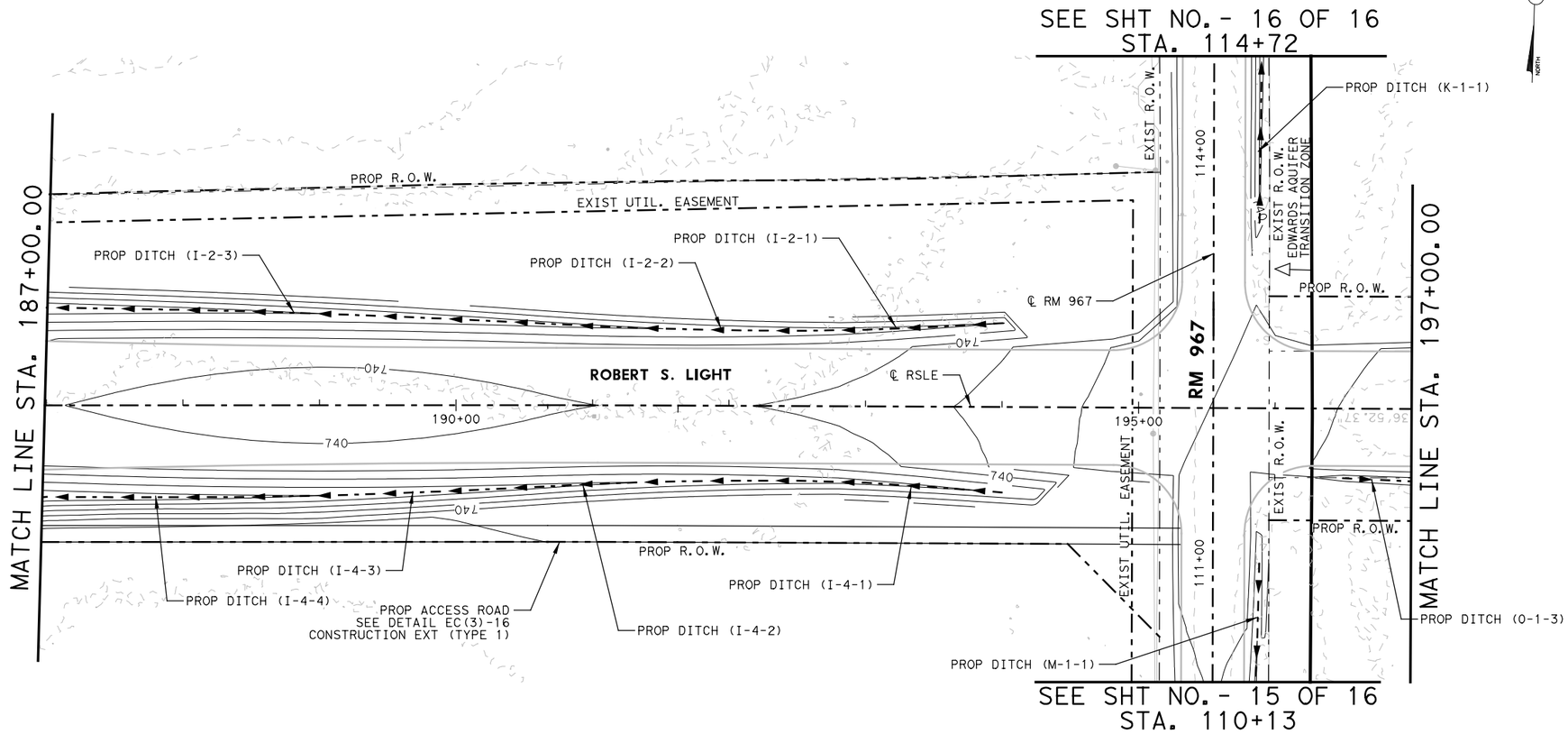

0 50 100
SCALE IN FEET

NORTH

LEGEND

- PROP STORM SEWER
- PROP INLET
- BL ALIGNMENT
- PROP ROW
- EXIST ROW
- PROP VEGETATED FILTER STRIP
- DITCH FLOWLINE
- PROP CONTOURS
- 100-YR FLOODPLAIN
- STONE RIPRAP
- PROP BRIDGE

NOTES:
1. REFER TO DITCH PROFILE SHEETS FOR DITCH FLOWLINES.

1/25/2021

STATE OF TEXAS
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ROBERT S. LIGHT EXTENSION

ROBERT S LIGHT DRAINAGE PLAN STA 187+00 TO STA 197+00

SCALE: 1"=100'-H

SHEET 10 OF 16

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	156
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
USER: DLAyala
FILE: $PWWARVAULTPATHDESC$
DATE: 1/25/2021
TIME: 12:42:52 PM
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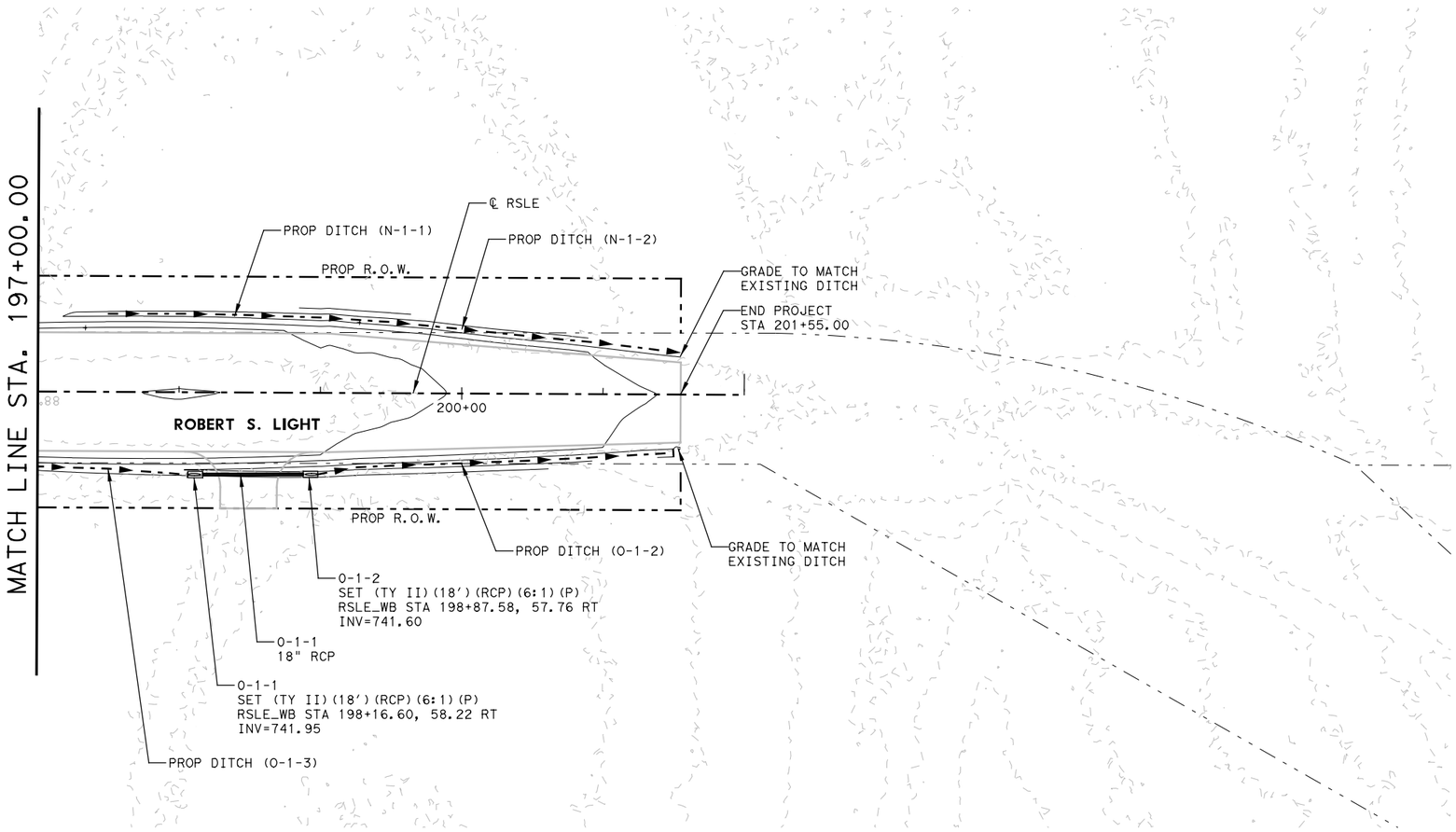
SCALE: 1:100



0 50 100
SCALE IN FEET

NORTH

LEGEND

- PROP STORM SEWER
- PROP INLET
- BL ALIGNMENT
- PROP ROW
- EXIST ROW
- PROP VEGETATED FILTER STRIP
- DITCH FLOWLINE
- PROP CONTOURS
- 100-YR FLOODPLAIN
- STONE RIPRAP
- PROP BRIDGE

NOTES:
1. REFER TO DITCH PROFILE SHEETS FOR DITCH FLOWLINES.

1/25/2021

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ROBERT S. LIGHT EXTENSION

ROBERT S LIGHT DRAINAGE PLAN STA 197+00 TO END PROJECT

SCALE: 1"=100'-H

SHEET 11 OF 16

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	157
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
USER: DLAyala
FILE: $PWVARVAULTPATHDESC$
DATE: 1/25/2021
TIME: 12:43:05 PM
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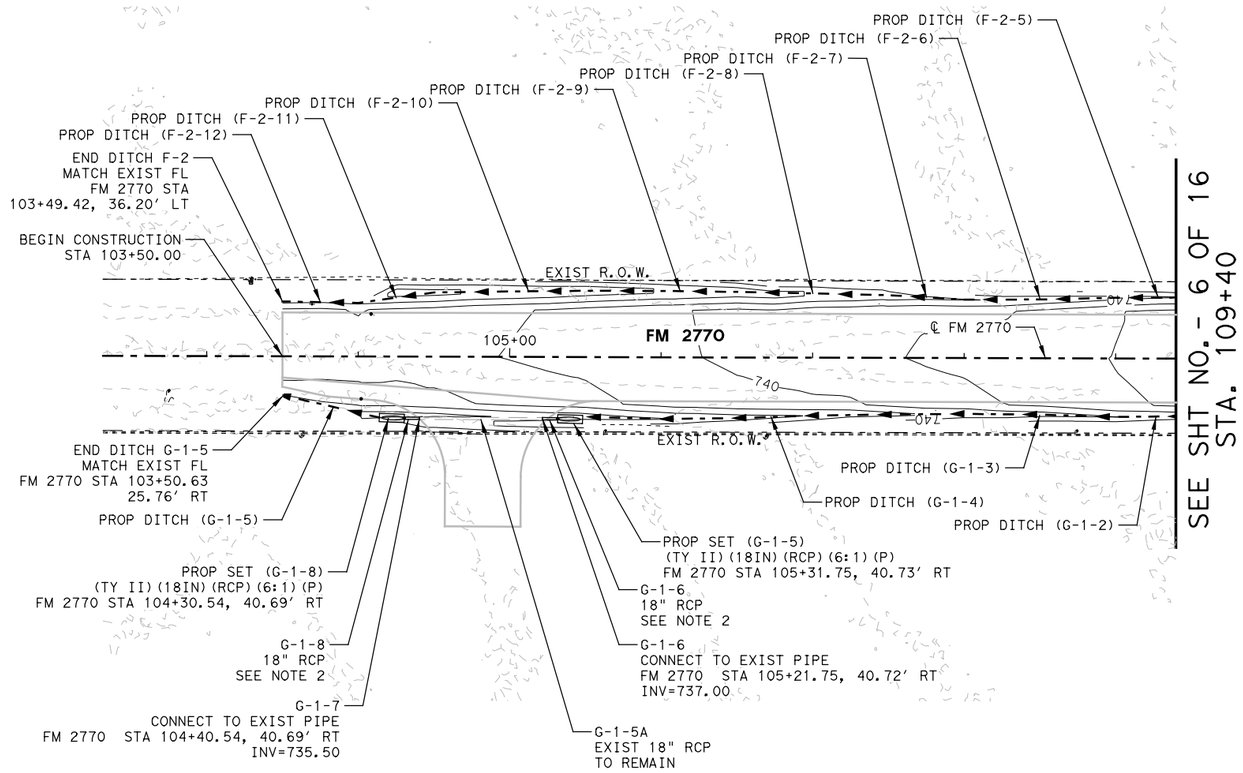

LEGEND

NORTH

0 50 100
SCALE IN FEET

- PROP STORM SEWER
- PROP INLET
- BL ALIGNMENT
- PROP ROW
- EXIST ROW
- PROP VEGETATED FILTER STRIP
- DITCH FLOWLINE
- PROP CONTOURS
- 100-YR FLOODPLAIN
- STONE RIPRAP
- PROP BRIDGE

NOTES:
1. REFER TO DITCH PROFILE SHEETS FOR DITCH FLOWLINES.
2. REMOVE TO NEAREST JOINT AND CONNECT NEW RC PIPE.

1/25/2021

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ROBERT S. LIGHT EXTENSION

FM 2770
DRAINAGE PLAN
BEGIN CONSTRUCTION TO STA 109+40

SCALE: 1"=100'-H

SHEET 12 OF 16

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	158
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
USER: DLAyala DATE: 1/25/2021
FILE: $PWVARVAULTPATHDESC$
TIME: 12:43:8 PM SCALE: 1:100
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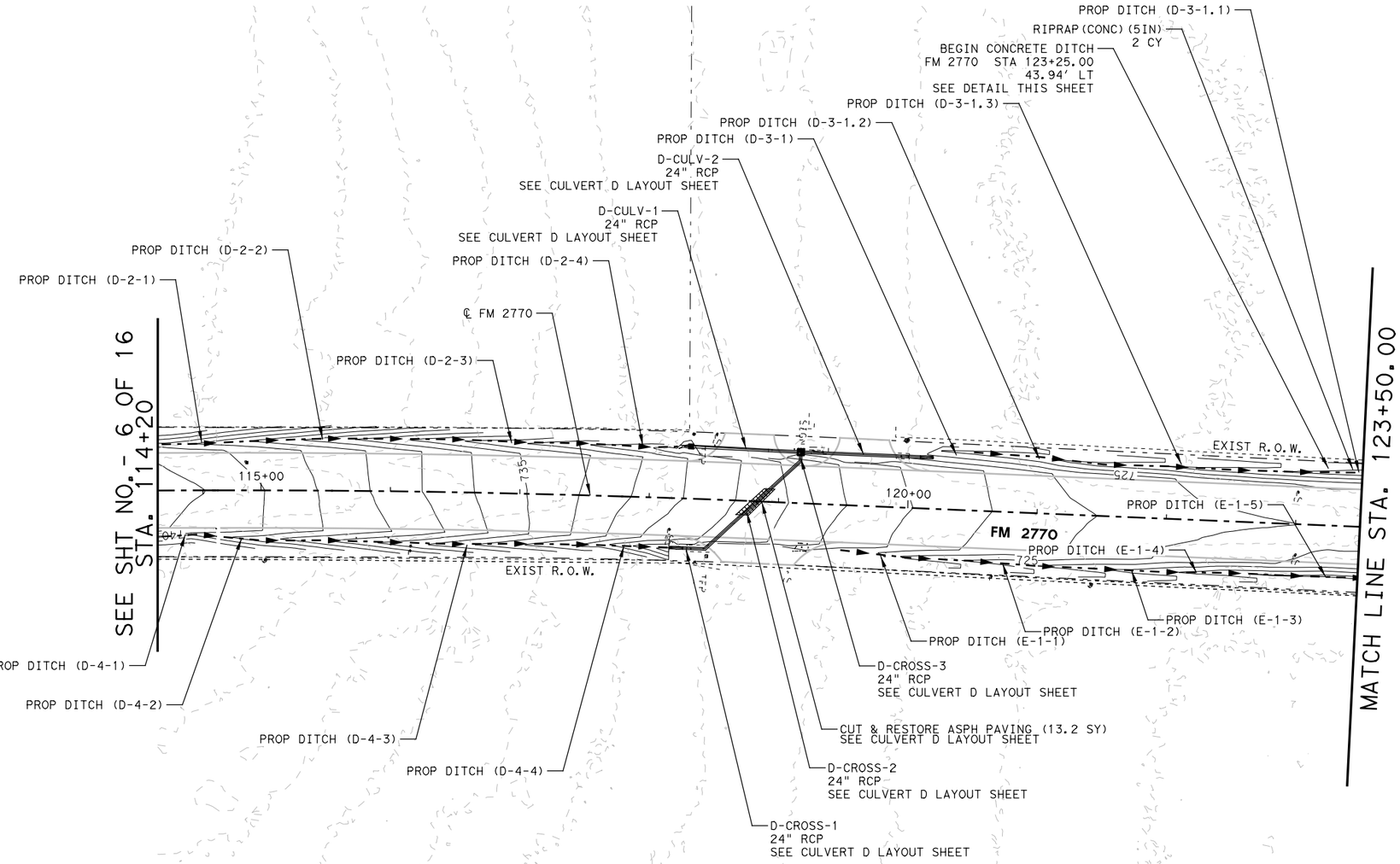

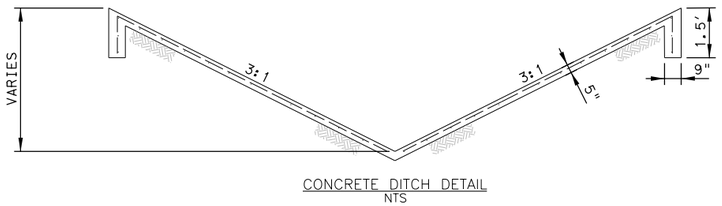

CONCRETE DITCH DETAIL
NTS

LEGEND

- PROP STORM SEWER
- PROP INLET
- BL ALIGNMENT
- PROP ROW
- EXIST ROW
- PROP VEGETATED FILTER STRIP
- DITCH FLOWLINE
- PROP CONTOURS
- 100-YR FLOODPLAIN
- STONE RIPRAP
- PROP BRIDGE

NORTH

0 50 100
SCALE IN FEET

NOTES:
1. REFER TO DITCH PROFILE SHEETS FOR DITCH FLOWLINES.

1/25/2021

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ROBERT S. LIGHT EXTENSION

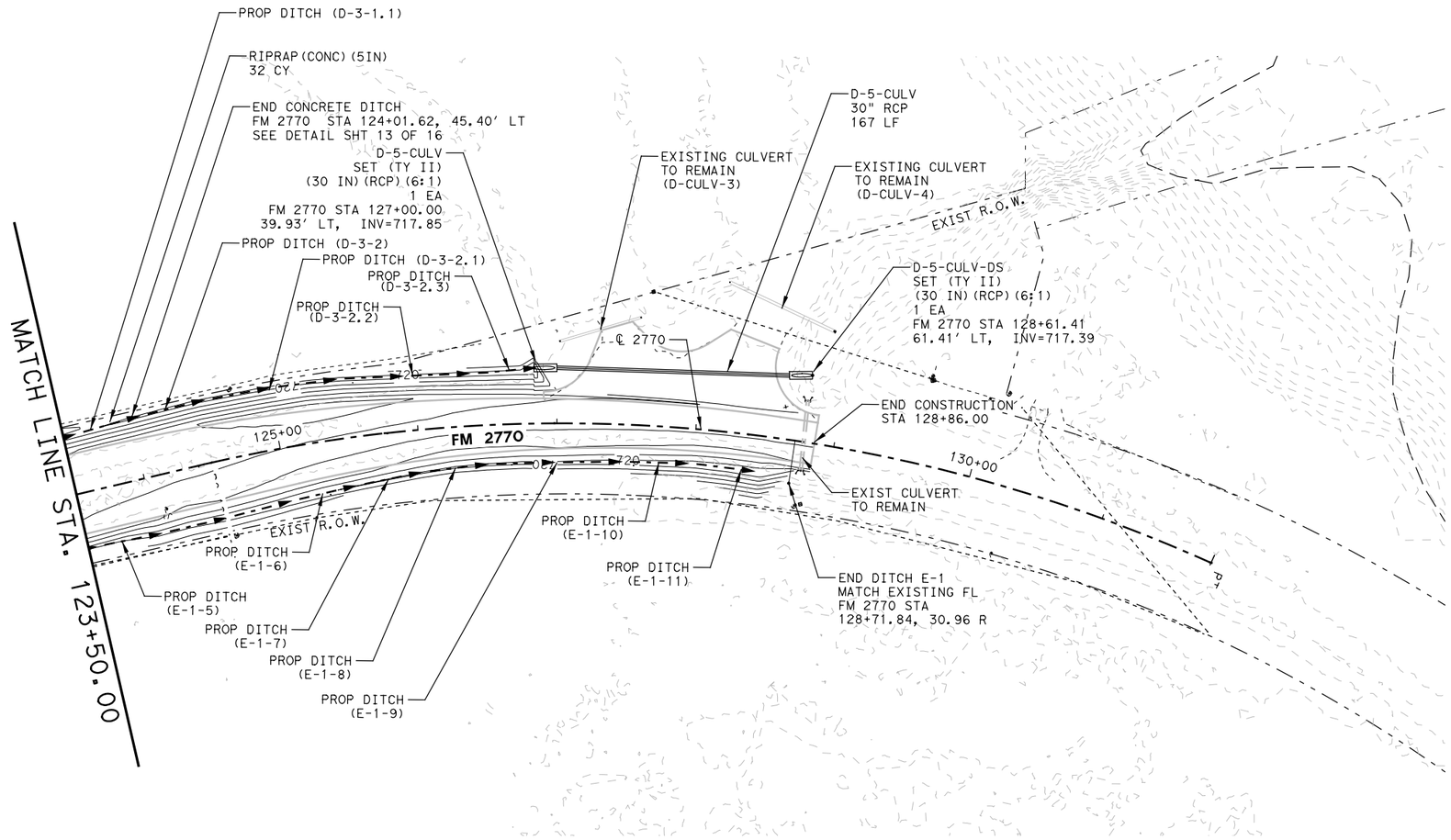
FM 2770
DRAINAGE PLAN
STA 114+20 TO STA 123+50

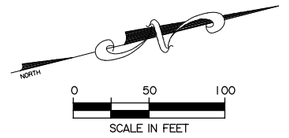
SCALE: 1"=100'-H

SHEET 13 OF 16

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	159
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
USER: DLayola
FILE: $PWVAR/AULTPATHDESC$
PENTABLE: 000000000214615
DATE: 1/25/2021
TIME: 2:10:51 PM
SCALE: 1:100





LEGEND

- PROP STORM SEWER
- PROP INLET
- BL ALIGNMENT
- PROP ROW
- EXIST ROW
- PROP VEGETATED FILTER STRIP
- DITCH FLOWLINE
- PROP CONTOURS
- 100-YR FLOODPLAIN
- STONE RIPRAP
- PROP BRIDGE

NOTES:
1. REFER TO DITCH PROFILE SHEETS FOR DITCH FLOWLINES.

1/25/2021

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ROBERT S. LIGHT EXTENSION

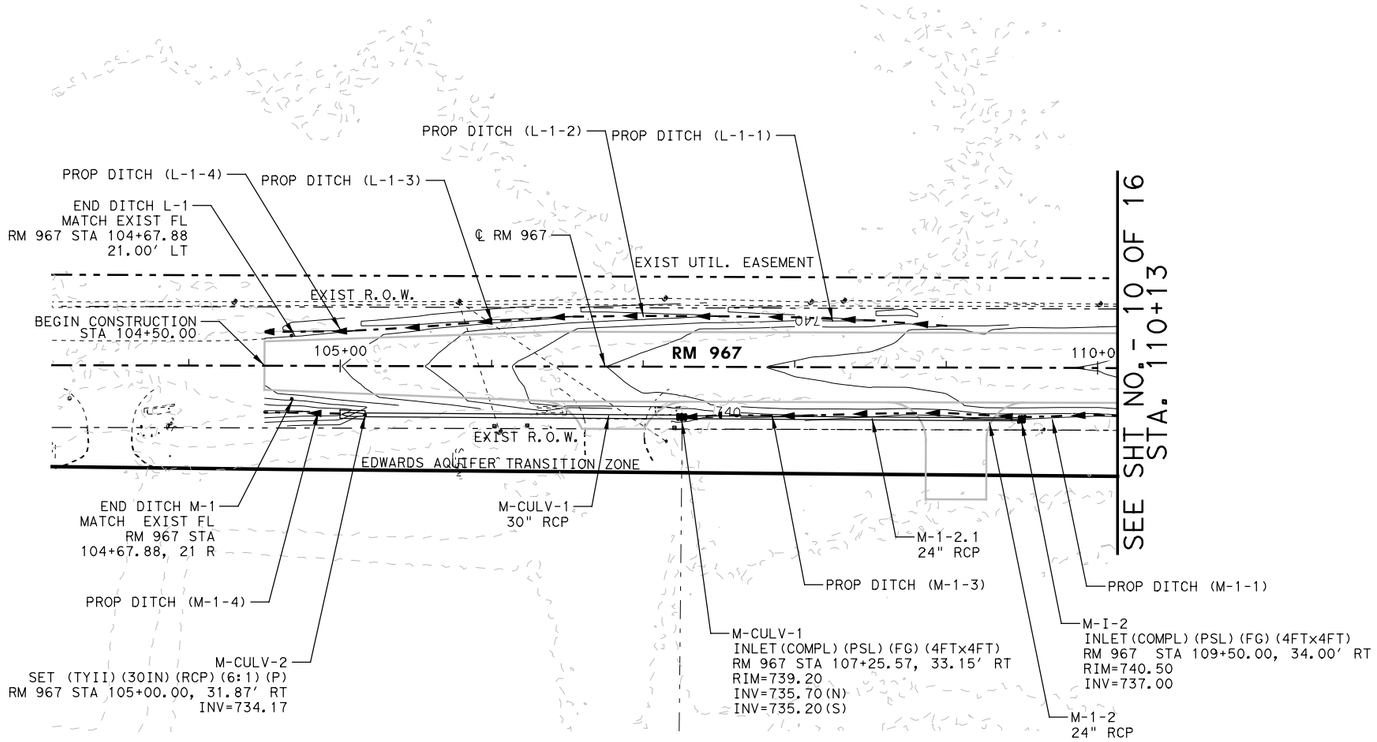
FM 2770
DRAINAGE PLAN
STA 123+50 TO END CONSTRUCTION

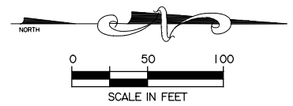
SCALE: 1"=100'-H

SHEET 14 OF 16

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	160
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
USER: DLAyala DATE: 1/25/2021 TIME: 12:43:48 PM SCALE: 1:100
FILE: $PWVARVAULTPATHDESC$ PENTABLE: 000000002146.tb





LEGEND

- PROP STORM SEWER
- PROP INLET
- BL ALIGNMENT
- PROP ROW
- EXIST ROW
- PROP VEGETATED FILTER STRIP
- DITCH FLOWLINE
- PROP CONTOURS
- 100-YR FLOODPLAIN
- STONE RIPRAP
- PROP BRIDGE

NOTES:
1. REFER TO DITCH PROFILE SHEETS FOR DITCH FLOWLINES.
2. SPECIAL INSTALLATION REQUIRED FOR PSL INLETS REFER TO ELEVATIONS FOR STRUCTURE HEIGHT.
3. POCO-PUMP ANALYSIS CAN BE FOUND IN THE AS-BUILTS SITE PLAN FOR BUDA C-STORE DATED 04/10/2019.

1/25/2021

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ROBERT S. LIGHT EXTENSION

RM 967
DRAINAGE PLAN
BEGIN CONSTRUCTION TO STA 110+13

SCALE: 1"=100'-H

SHEET 15 OF 16

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	161
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
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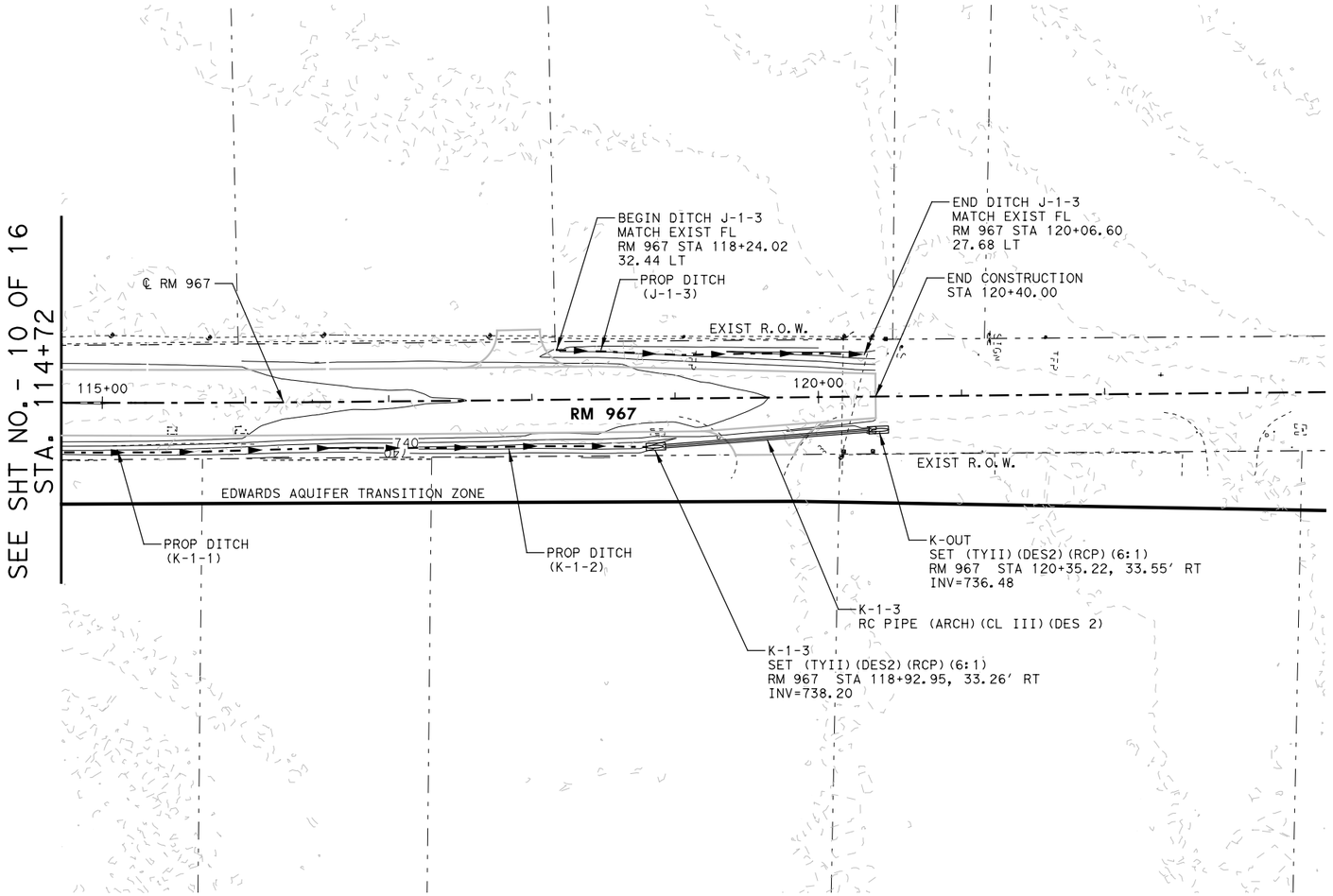
DATE: 1/25/2021
TIME: 12:44:04 PM
PENTABLE: 000000002H4I5
SCALE: 1:100



NORTH

0 50 100

SCALE IN FEET

LEGEND

- PROP STORM SEWER
- PROP INLET
- BL ALIGNMENT
- PROP ROW
- EXIST ROW
- PROP VEGETATED FILTER STRIP
- DITCH FLOWLINE
- PROP CONTOURS
- 100-YR FLOODPLAIN
- STONE RIPRAP
- PROP BRIDGE

NOTES:
1. REFER TO DITCH PROFILE SHEETS FOR DITCH FLOWLINES.

1/25/2021

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ROBERT S. LIGHT EXTENSION

RM 967
DRAINAGE PLAN
STA 114+72 TO END CONSTRUCTION

SCALE: 1"=100'-H

SHEET 16 OF 16

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	162
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
USER: DLAyala
FILE: $PMVARVAULTPATHDESC$
DATE: 1/25/2021
TIME: 12:44:20 PM
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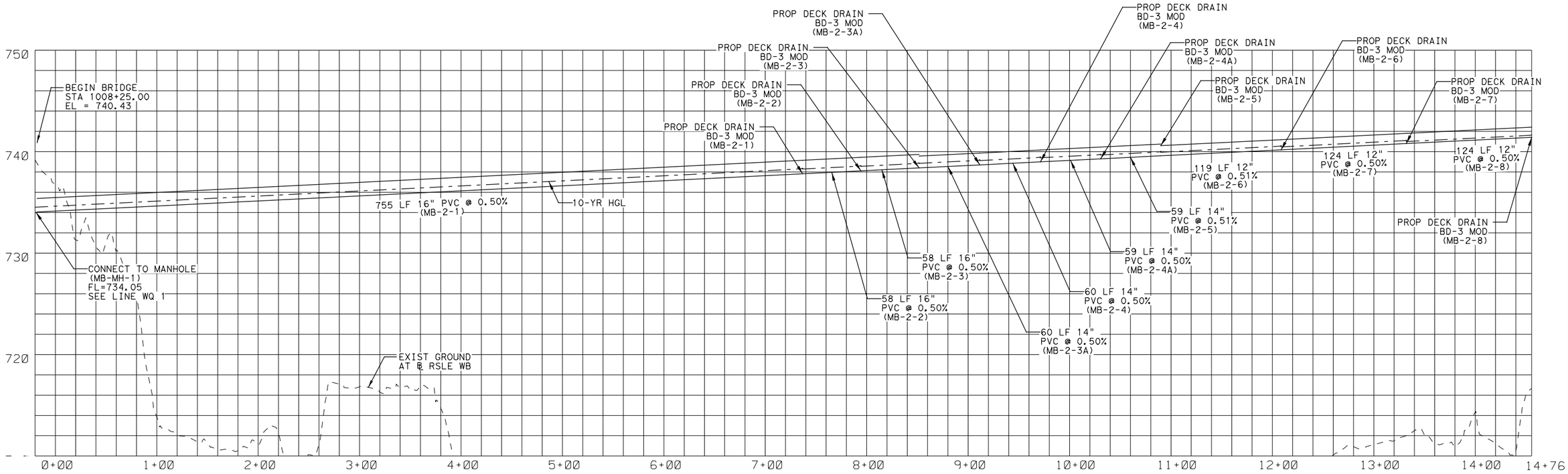
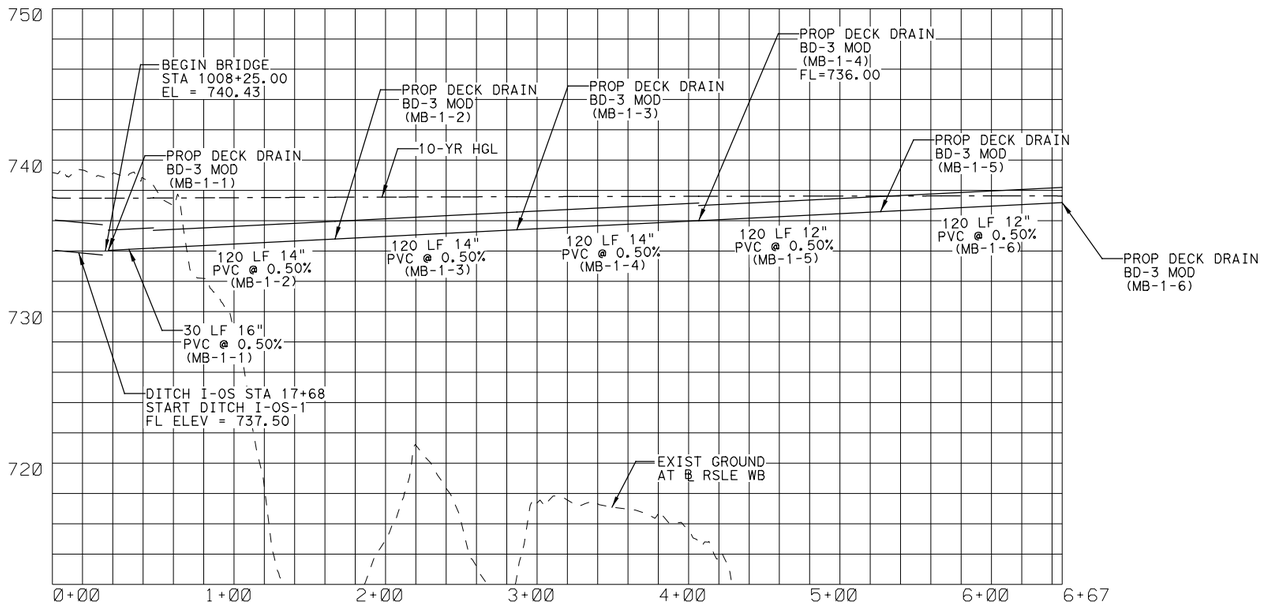
SCALE: H00



MUSTANG BRANCH PVC DECK DRAIN - NORTH

NOTES:
1. REFER TO HYDRAULIC CALCULATION SHEET.



MUSTANG BRANCH PVC DECK DRAIN - SOUTH

LEGEND

- EXISTING GROUND
- PROPOSED GROUND
- DITCH FLOWLINE
- PROP PIPE
- 10-YR HGL
- PROP STRUCTURE

12/18/2020

STATE OF TEXAS
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ROBERT S. LIGHT EXTENSION

ROBERT S LIGHT DRAINAGE PROFILES

SCALE: 1"=100'-H
1"=10'-V

SHEET 1 OF 2

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	163
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
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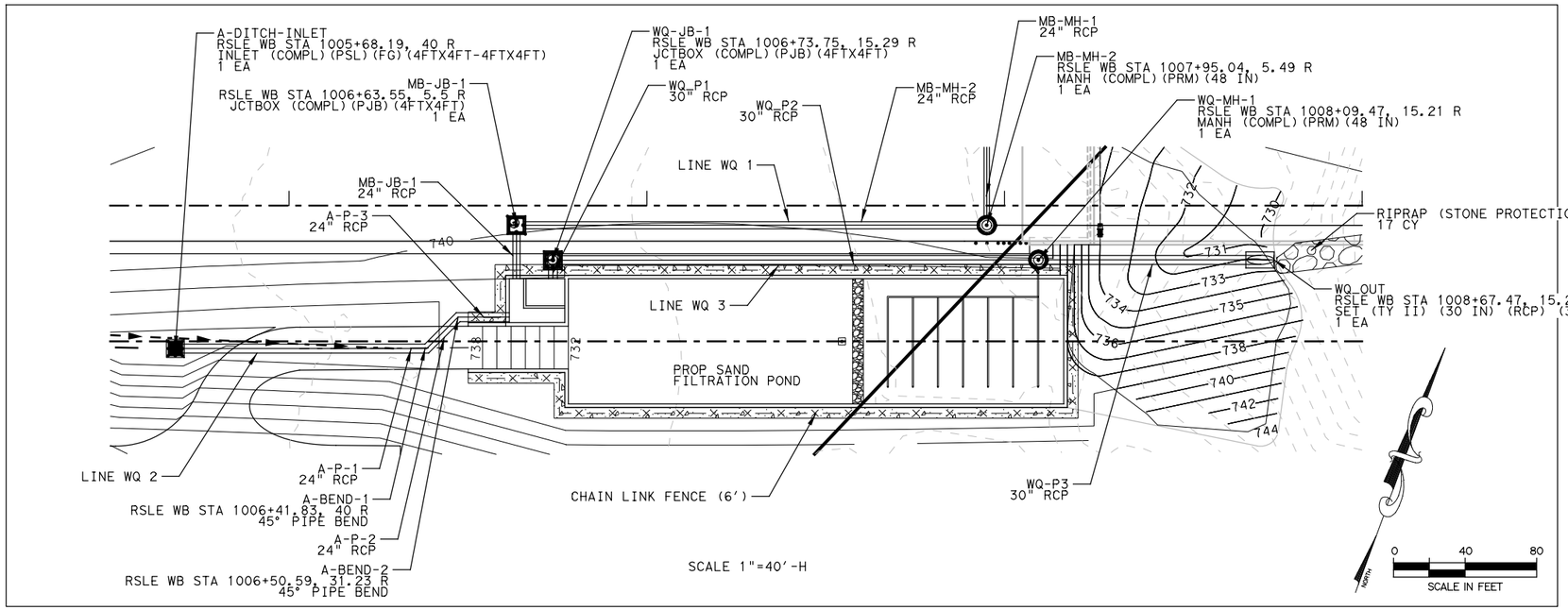
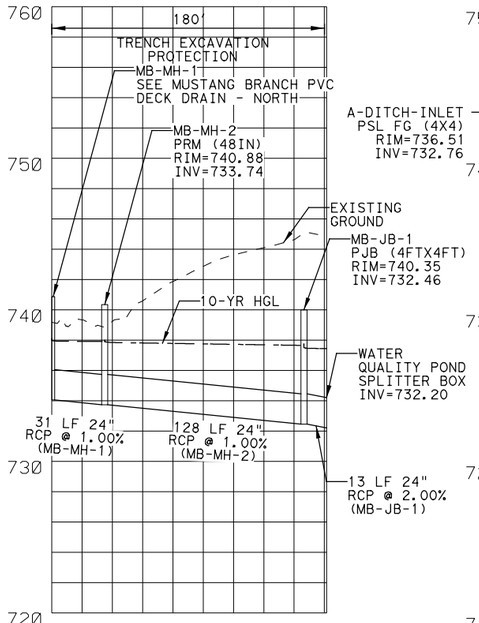
DATE: 12/18/2020
TIME: 5:06:21 PM
SCALE: 1:100
PENTABLE: 0000000002146\5
FILE: $PWVARVAULTPATHDESC$



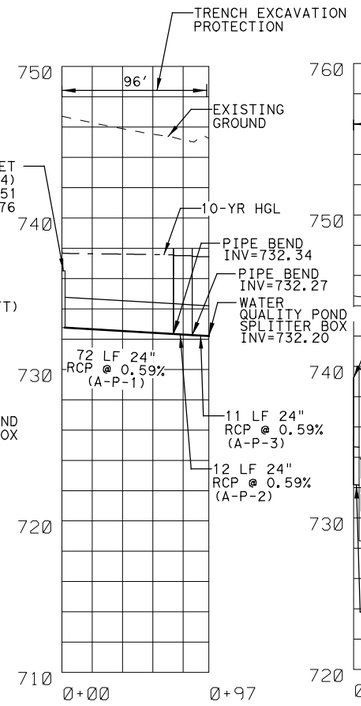
LEGEND

- PROP STORM SEWER
- PROP INLET
- BL ALIGNMENT
- PROP ROW
- EXIST ROW
- PROP VEGETATED FILTER STRIP
- DITCH FLOWLINE
- PROP CONTOURS
- 100-YR FLOODPLAIN
- STONE RIPRAP
- PROP BRIDGE

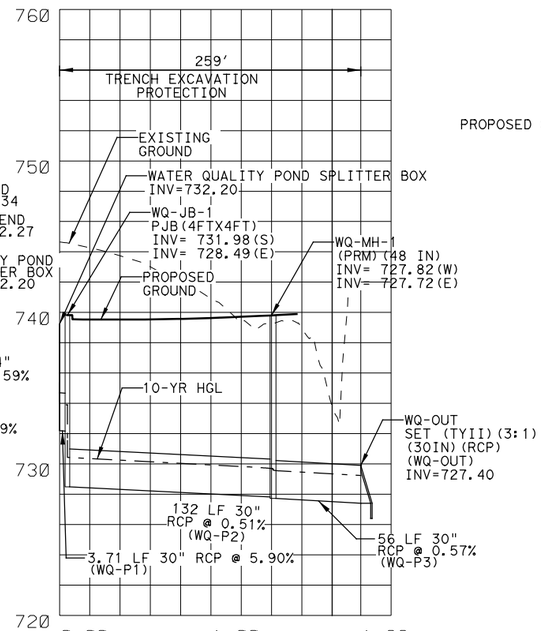
NOTES:
1. REFER TO HYDRAULIC DATA SHEET FOR CALCULATIONS.
2. SEE WATER QUALITY POND LAYOUT SHEET FOR ADDITIONAL POND INFORMATION.
3. SEE PROFILES ON THIS SHEET FOR SYSTEMS TYING INTO WATER QUALITY POND.
4. TAILWATER CONDITION OF LINE WQ-1 AND WQ-2 ARE BASED ON WATER SURFACE ELEVATION OF WATER QUALITY POND.



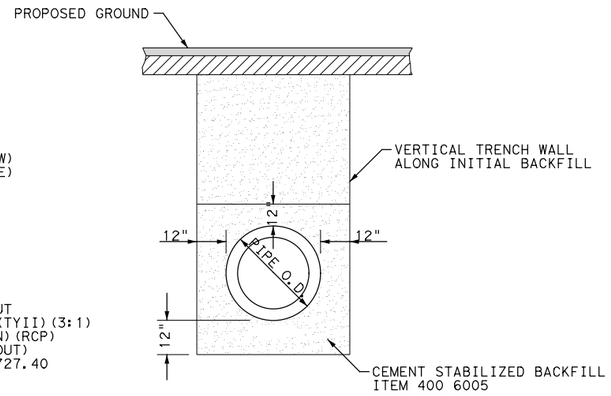
LINE WQ 1



LINE WQ 2



LINE WQ 3



STORM DRAINAGE BACKFILL DETAILS

12/11/ 2020

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ROBERT S. LIGHT EXTENSION

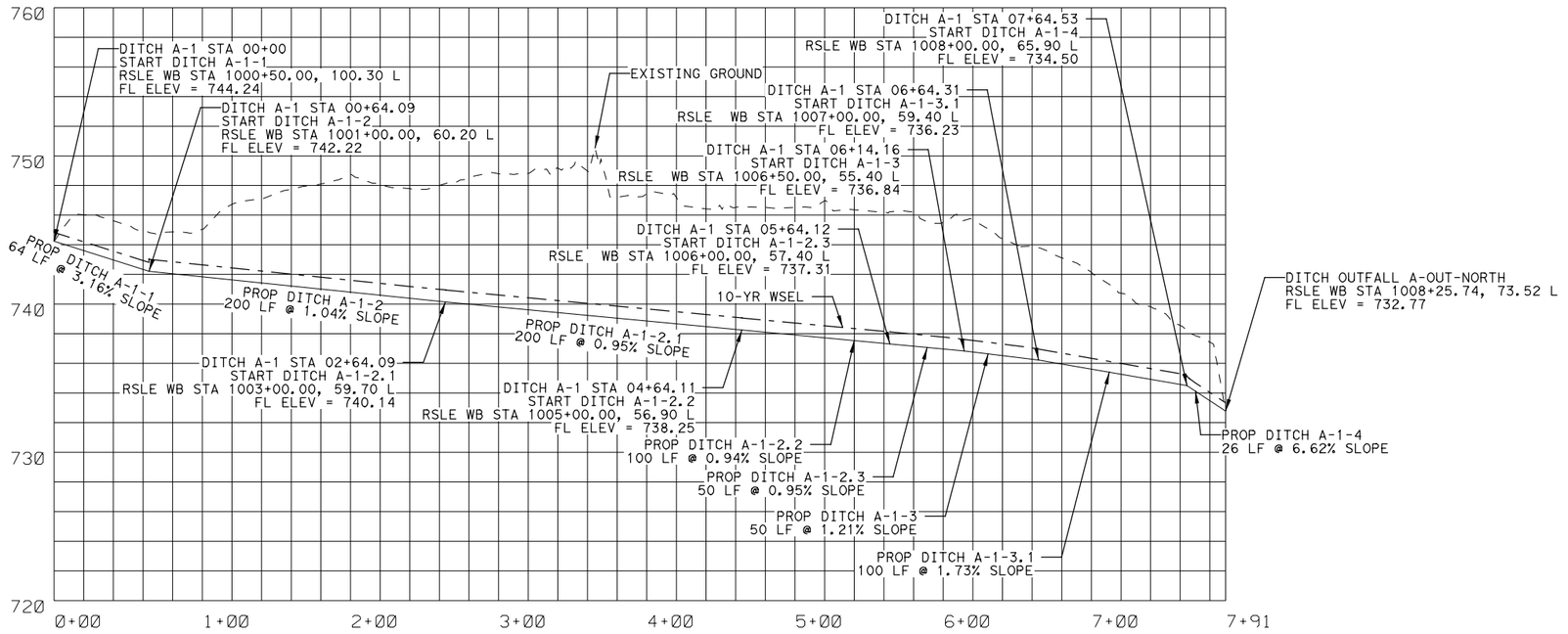
ROBERT S LIGHT WATER QUALITY PLAN AND PROFILE

SCALE: 1"=100'-H
1"=10'-V

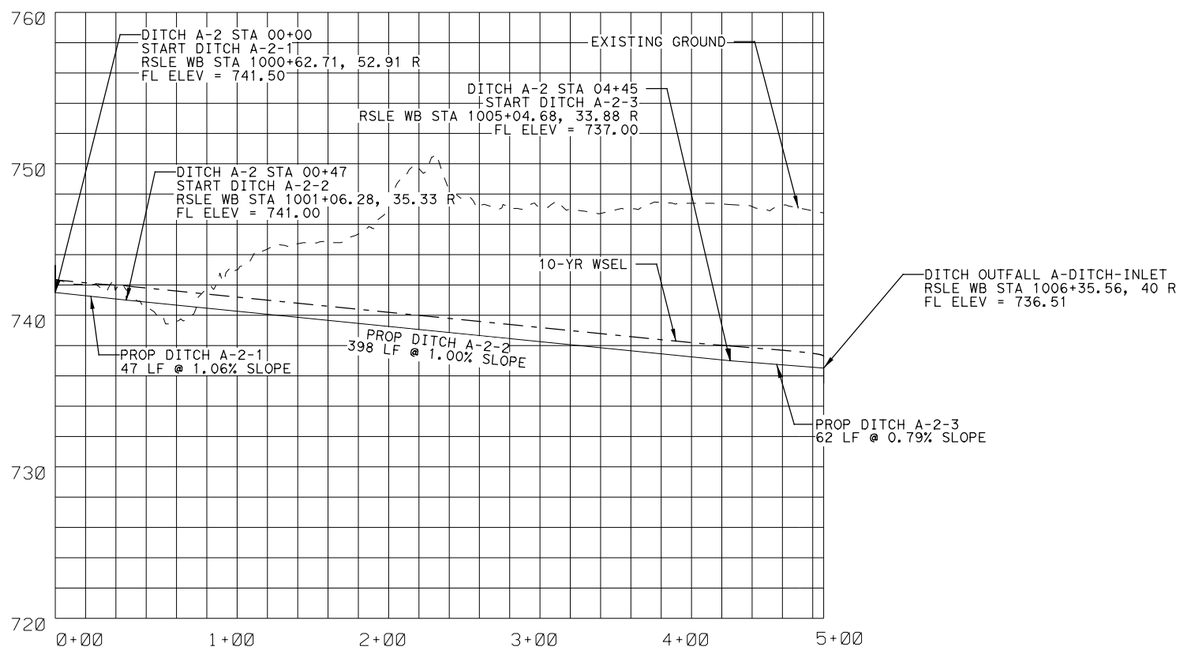
SHEET 1 OF 1

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	164
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
USER: JDVillarreal
DATE: 12/12/2020
TIME: 6:53:37 PM
SCALE: 1:100
PENTABLE: 000000000214615
FILE: $PWVARVAULTPATHDESC$



DITCH A-NORTH (RSLE)



DITCH A-SOUTH (RSLE)

LEGEND

- EXISTING GROUND
- PROPOSED GROUND
- DITCH FLOWLINE
- PROP PIPE
- 10-YR HGL
- PROP STRUCTURE

NOTES:
1. REFER TO DITCH HYDRAULIC DATA SHEET FOR DITCH CALCULATIONS

1/19/2021

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ROBERT S. LIGHT EXTENSION

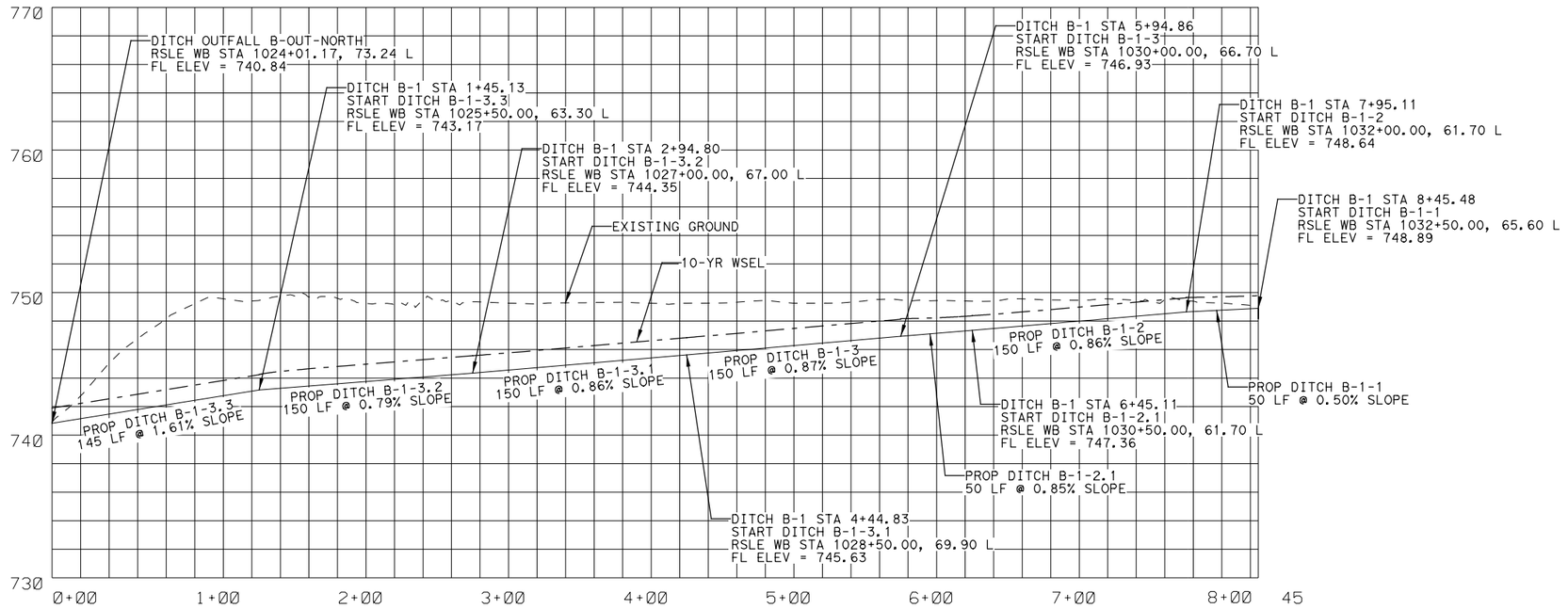
ROBERT S LIGHT DITCH PROFILES

SCALE: 1"=100'-H
1"=10'-V

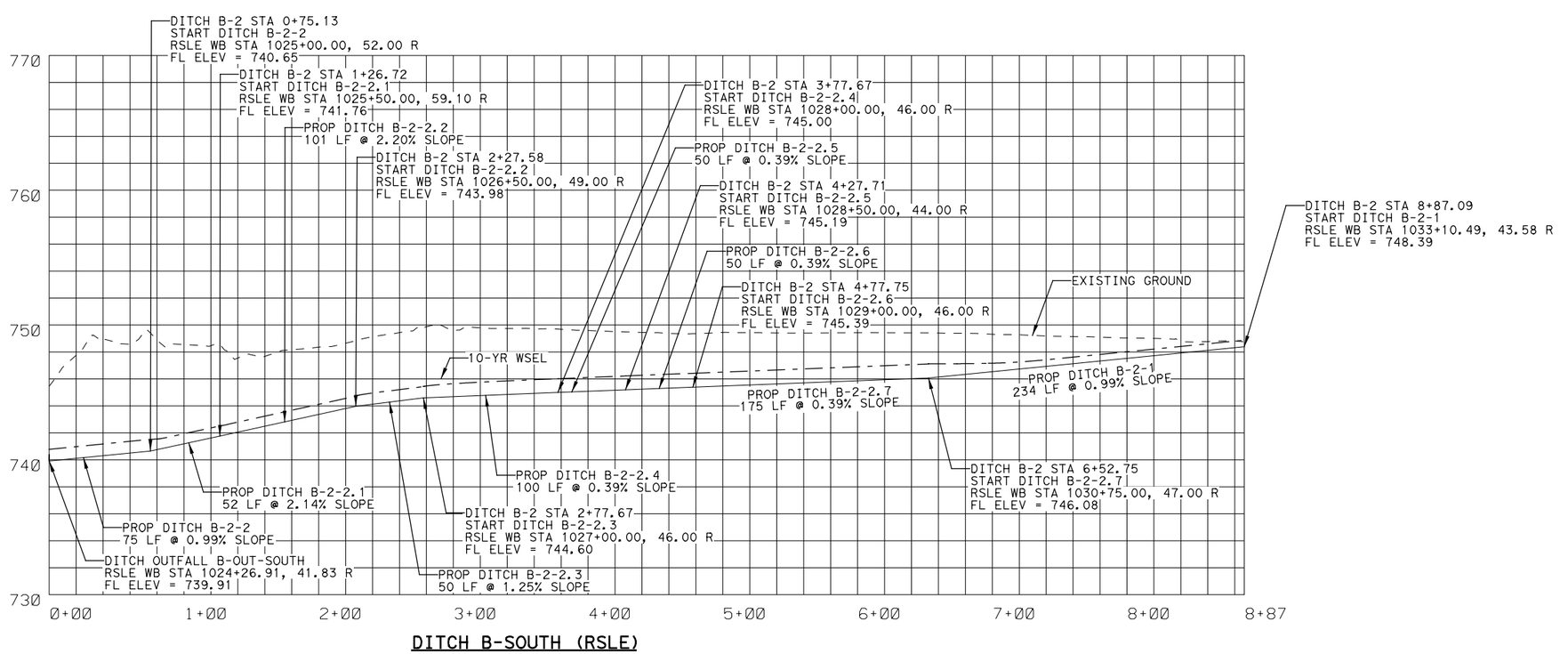
SHEET 1 OF 13

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	165
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
USER: DLayala
FILE: $PWVAR/AULTPATHDESC$
PENTABLE: 000000000214615
DATE: 1/19/2021
TIME: 3:54:20 PM
SCALE: 1:00



DITCH B-NORTH (RSLE)



DITCH B-SOUTH (RSLE)

LEGEND

- EXISTING GROUND
- PROPOSED GROUND
- DITCH FLOWLINE
- PROP PIPE
- 10-YR HGL
- PROP STRUCTURE

NOTES:
1. REFER TO DITCH HYDRAULIC DATA SHEET FOR DITCH CALCULATIONS

1/19/2021

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ROBERT S. LIGHT EXTENSION

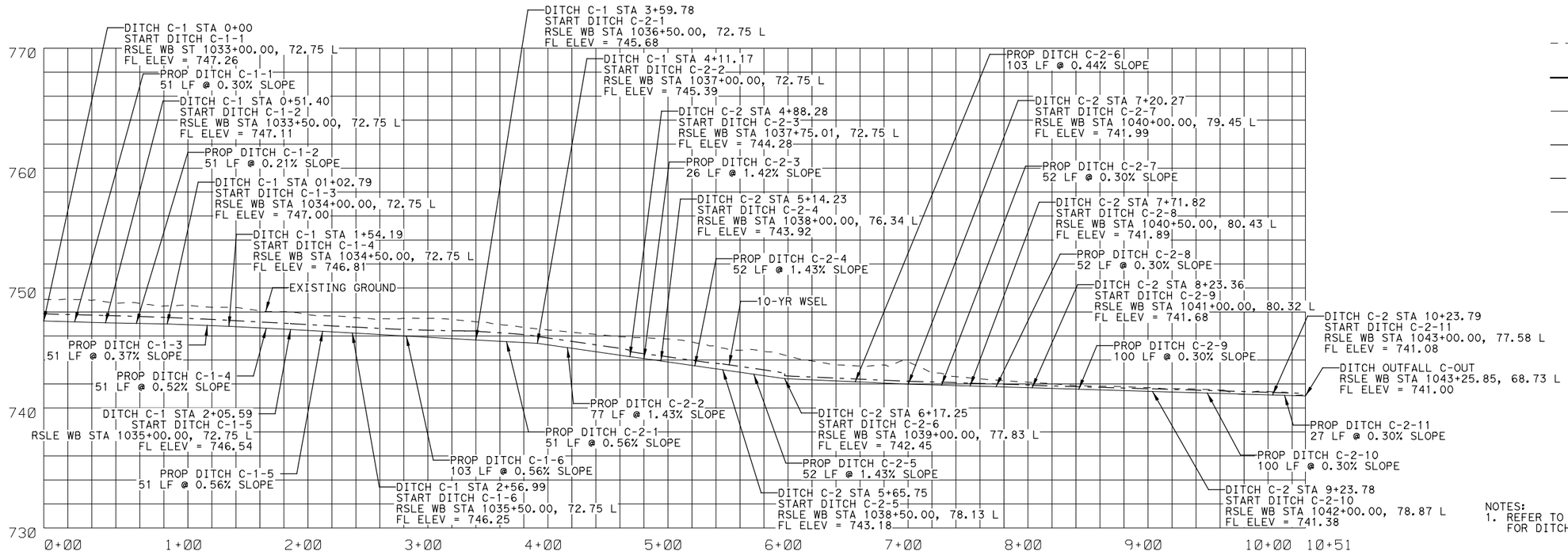
ROBERT S LIGHT DITCH PROFILES

SCALE: 1"=100'-H
1"=10'-V

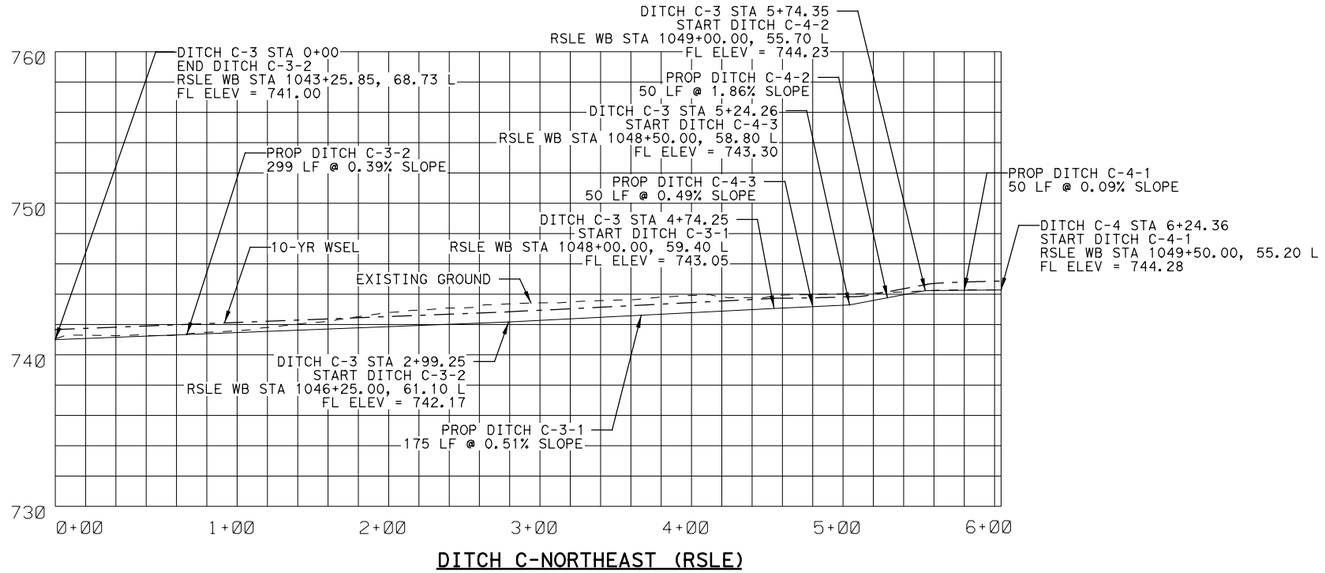
SHEET 2 OF 13

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	166
CLH	0914	33	068	
CHECK				
CMC				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
USER: DLAyala
FILE: $FMVARVAULTPATHDESC$
PENTABLE: 000000000246I5
DATE: 1/19/2021
TIME: 3:54:31 PM
SCALE: H:00



DITCH C-NORTHWEST (RSLE)



DITCH C-NORTHEAST (RSLE)

PLOT DRIVER: TXDOT_PDF_BW.pltcfg PENTABLE: 000000000214615
USER: DLAyala DATE: 1/19/2021 TIME: 3:54:43 PM SCALE: 1:100
FILE: $PWVAR/AULTPATHDESC$

1/19/2021

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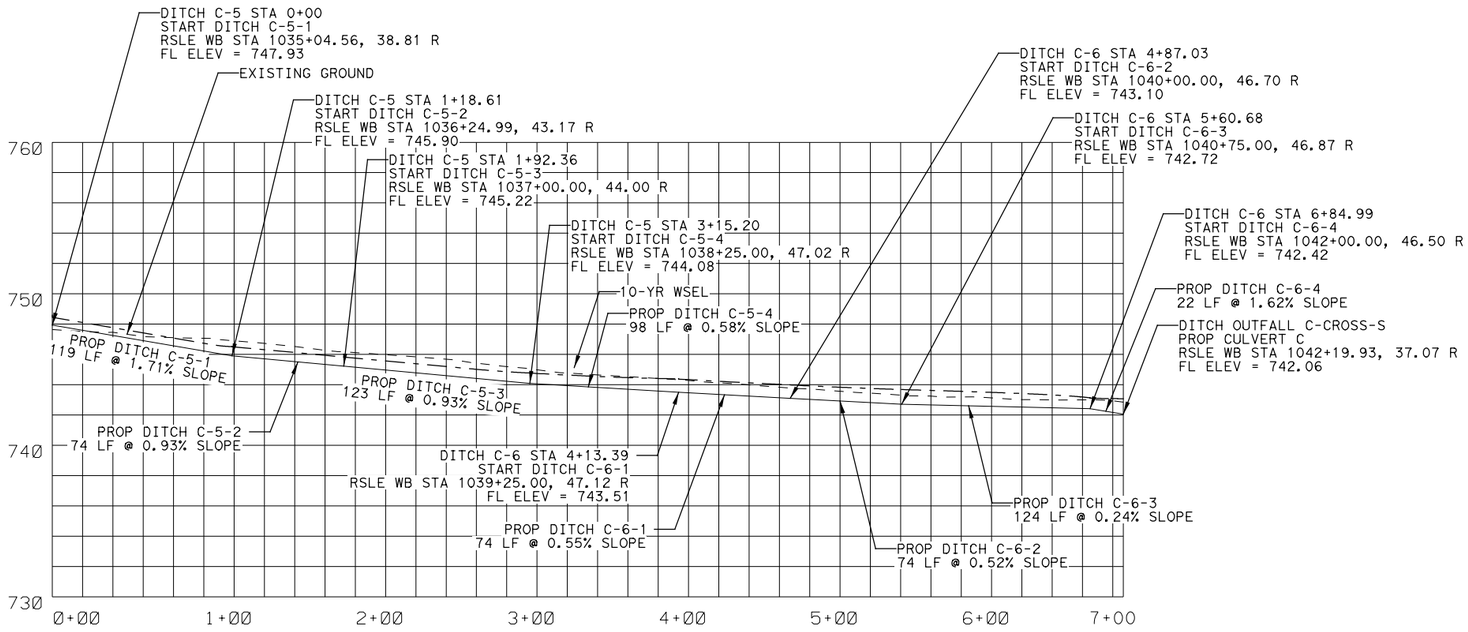
ROBERT S. LIGHT EXTENSION

ROBERT S LIGHT DITCH PROFILES

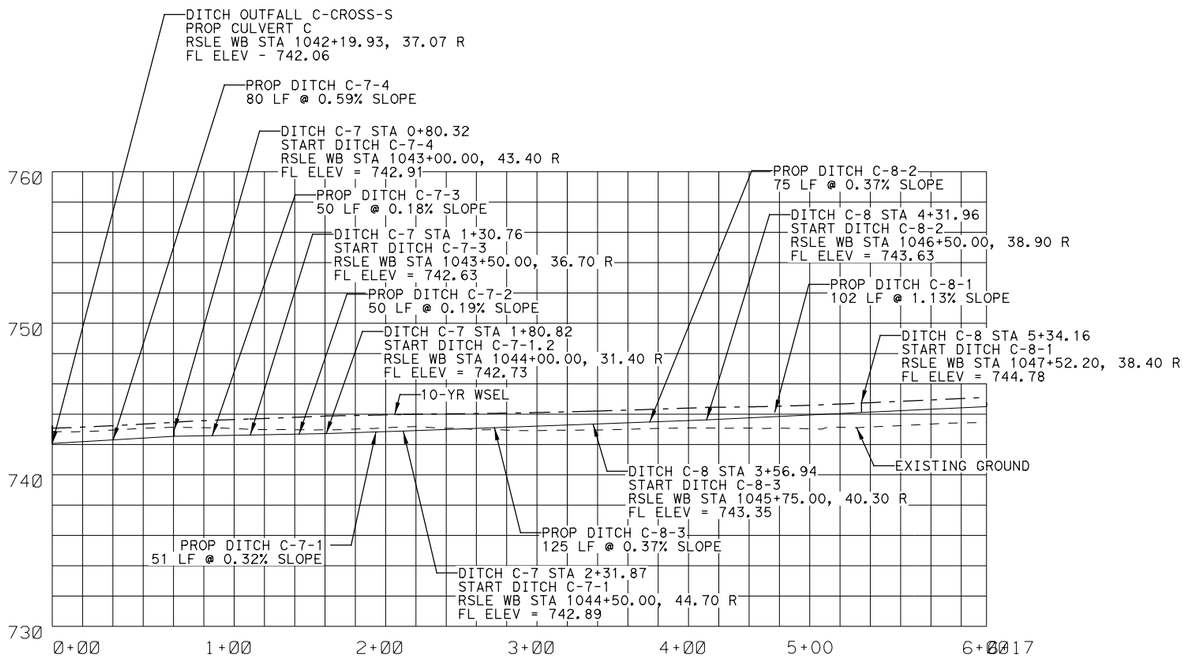
SCALE: 1"=100'-H
1"=10'-V

SHEET 3 OF 13

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	167
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				



DITCH C-SOUTHWEST (RSLE)



DITCH C-SOUTHEAST (RSLE)

LEGEND

- EXISTING GROUND
- PROPOSED GROUND
- DITCH FLOWLINE
- PROP PIPE
- 10-YR HGL
- PROP STRUCTURE

NOTES:
1. REFER TO DITCH HYDRAULIC DATA SHEET FOR DITCH CALCULATIONS

1/22/2021

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ROBERT S. LIGHT EXTENSION

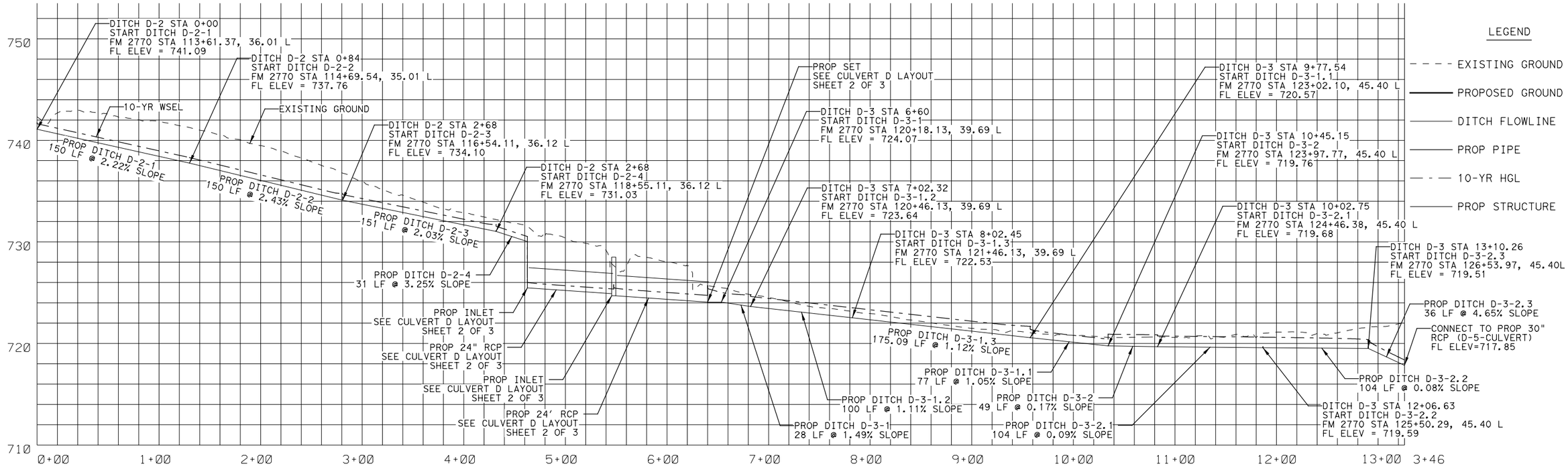
ROBERT S LIGHT DITCH PROFILES

SCALE: 1"=100'-H
1"=10'-V

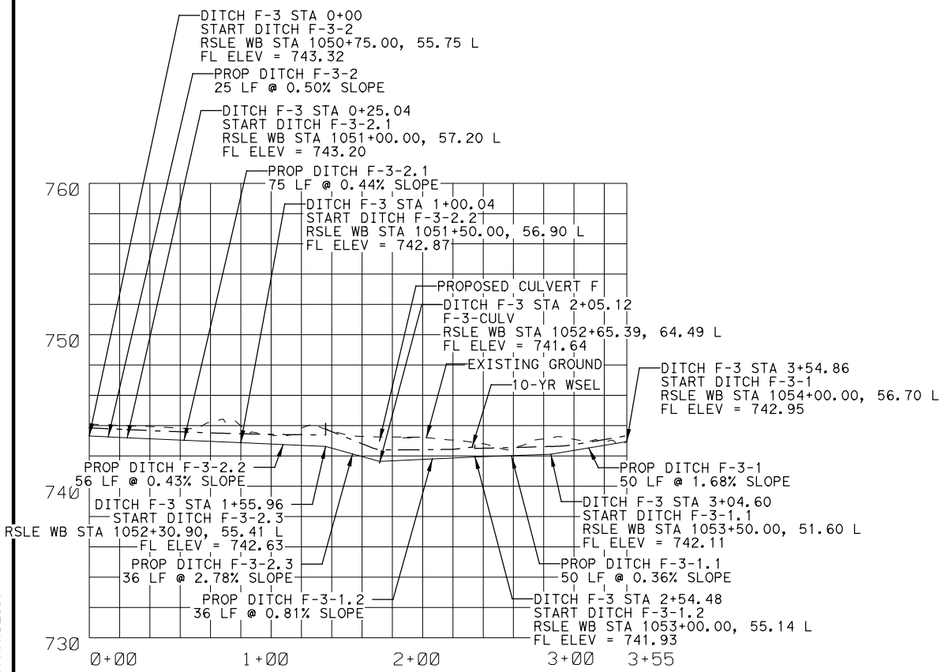
SHEET 4 OF 13

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	168
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg PENTABLE: 000000000214615
USER: DLAyala DATE: 1/22/2021 TIME: 4:44:49 PM SCALE: 1:100
FILE: $PWVAR/AULTPATHDESC$



DITCH D-WEST (FM2770)



DITCH F-NORTH (RSLE)

NOTES:
1. REFER TO DITCH HYDRAULIC DATA SHEET FOR DITCH CALCULATIONS

1/19/2021

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ROBERT S. LIGHT EXTENSION

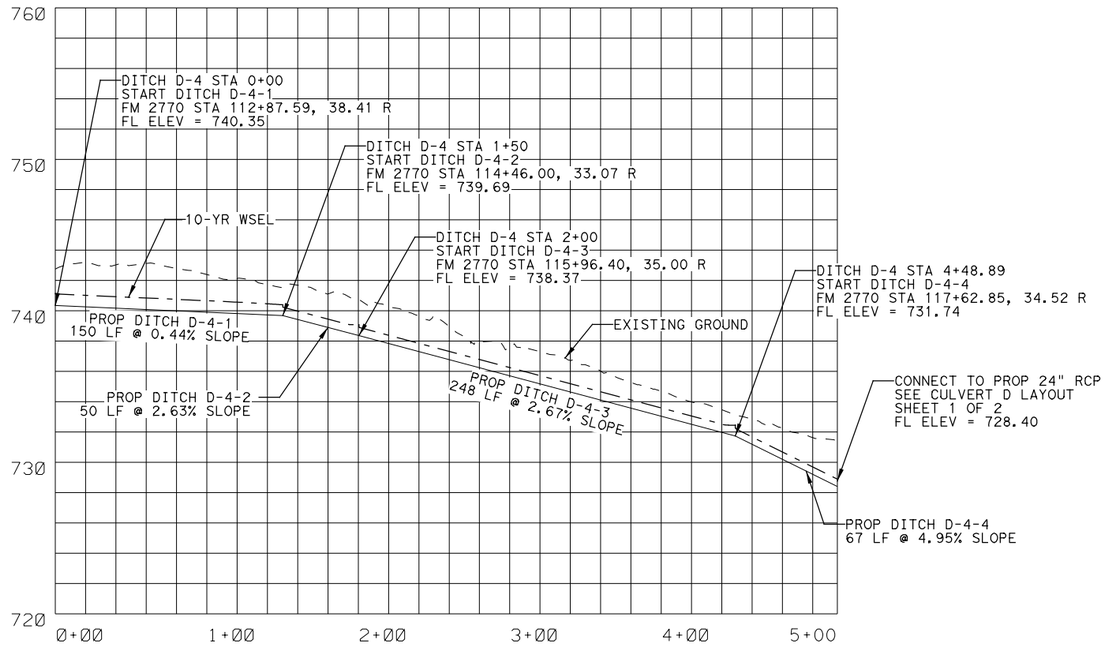
RSLE / FM 2770
DITCH PROFILES

SCALE: 1"=100'-H
1"=10'-V

SHEET 5 OF 13

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	169
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
USER: DLAyala
FILE: $FMVARVAULTPATHDESC$
DATE: 1/19/2021
TIME: 3:55:07 PM
SCALE: H:00
PENTABLE: 000000000246/5

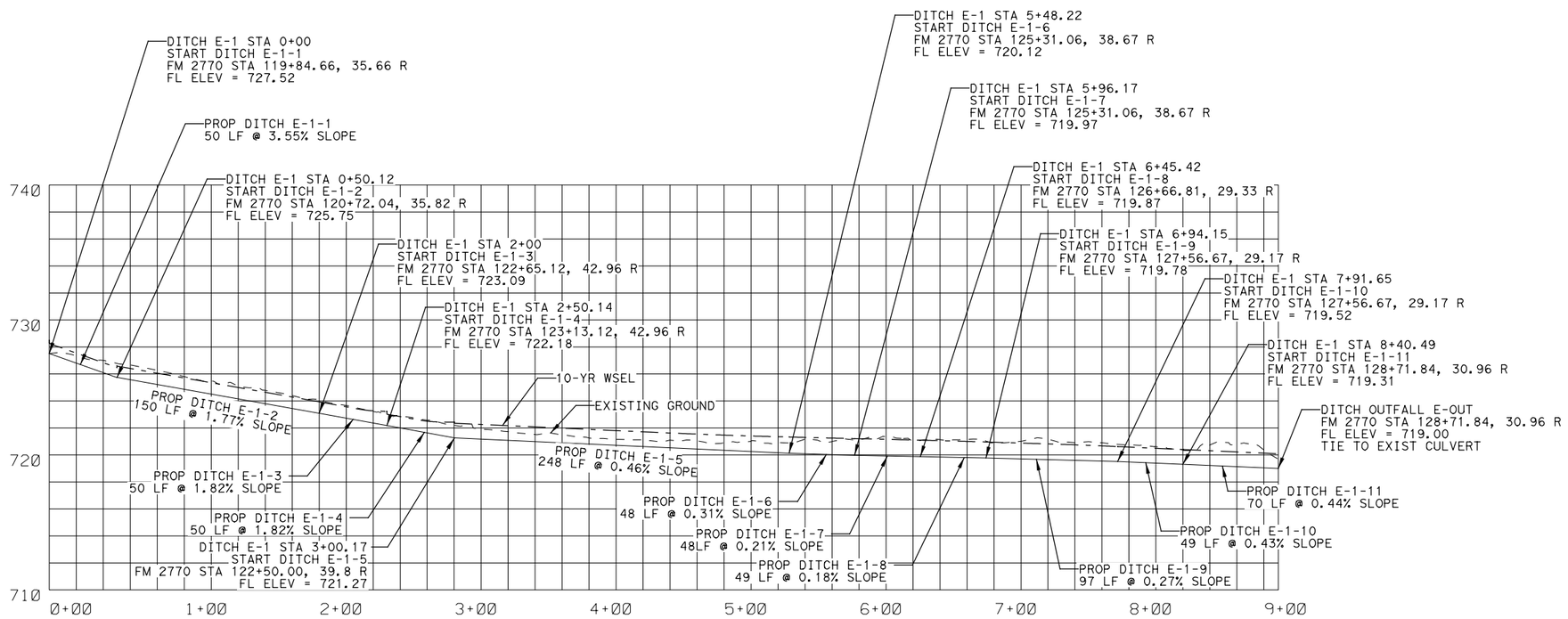


DITCH D-EAST (FM 2770)

LEGEND

- EXISTING GROUND
- PROPOSED GROUND
- DITCH FLOWLINE
- PROP PIPE
- 10-YR HGL
- PROP STRUCTURE

NOTES:
1. REFER TO DITCH HYDRAULIC DATA SHEET FOR DITCH CALCULATIONS



DITCH E (FM 2770)

1/19/2021

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ROBERT S. LIGHT EXTENSION

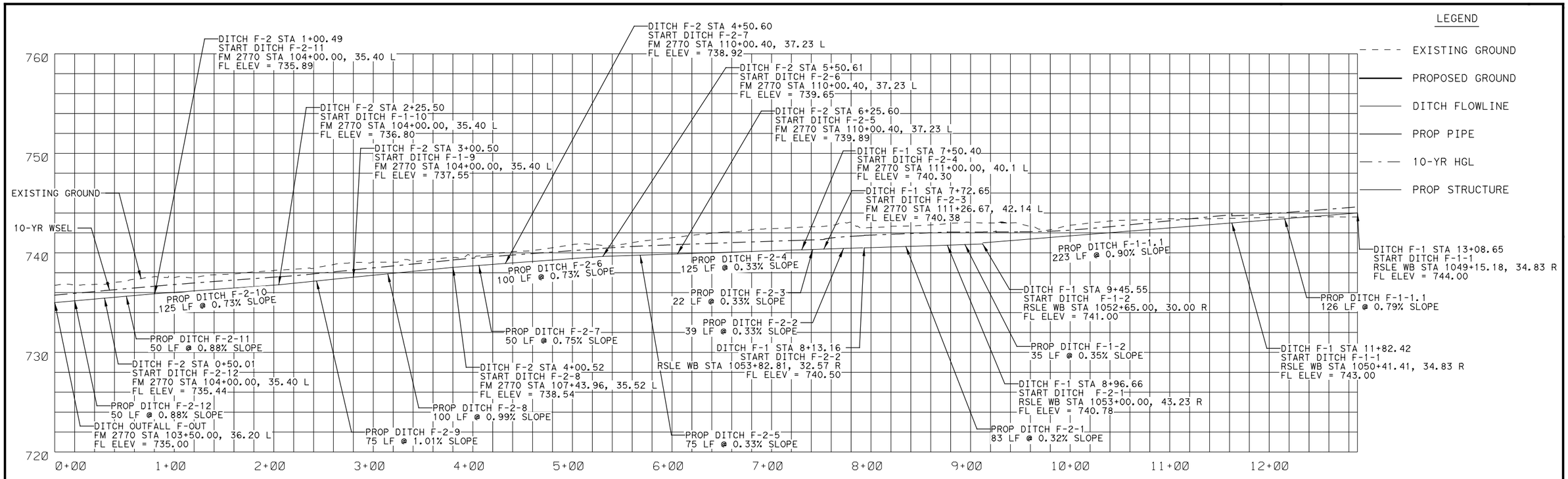
FM 2770
DITCH PROFILES

SCALE: 1"=100'-H
1"=10'-V

SHEET 6 OF 13

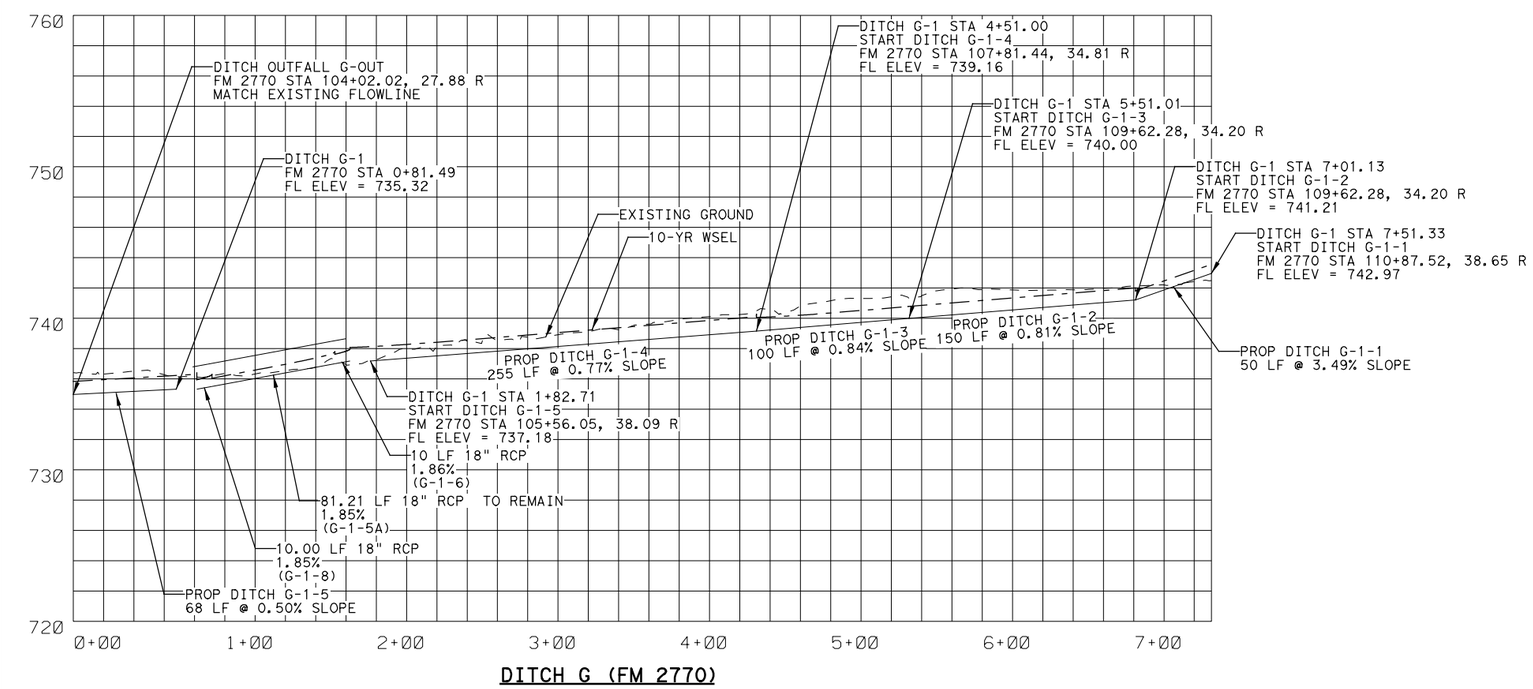
DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	170
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
USER: DLAyala
FILE: $FMVARVAULTPATHDESC$
DATE: 1/19/2021
TIME: 3:55:19 PM
SCALE: H:00
PENTABLE: 0000000002146|5



DITCH F-SOUTH (RSLE / FM 2770)

NOTES:
1. REFER TO DITCH HYDRAULIC DATA SHEET FOR DITCH CALCULATIONS



DITCH G (FM 2770)

1/19/2021

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ROBERT S. LIGHT EXTENSION

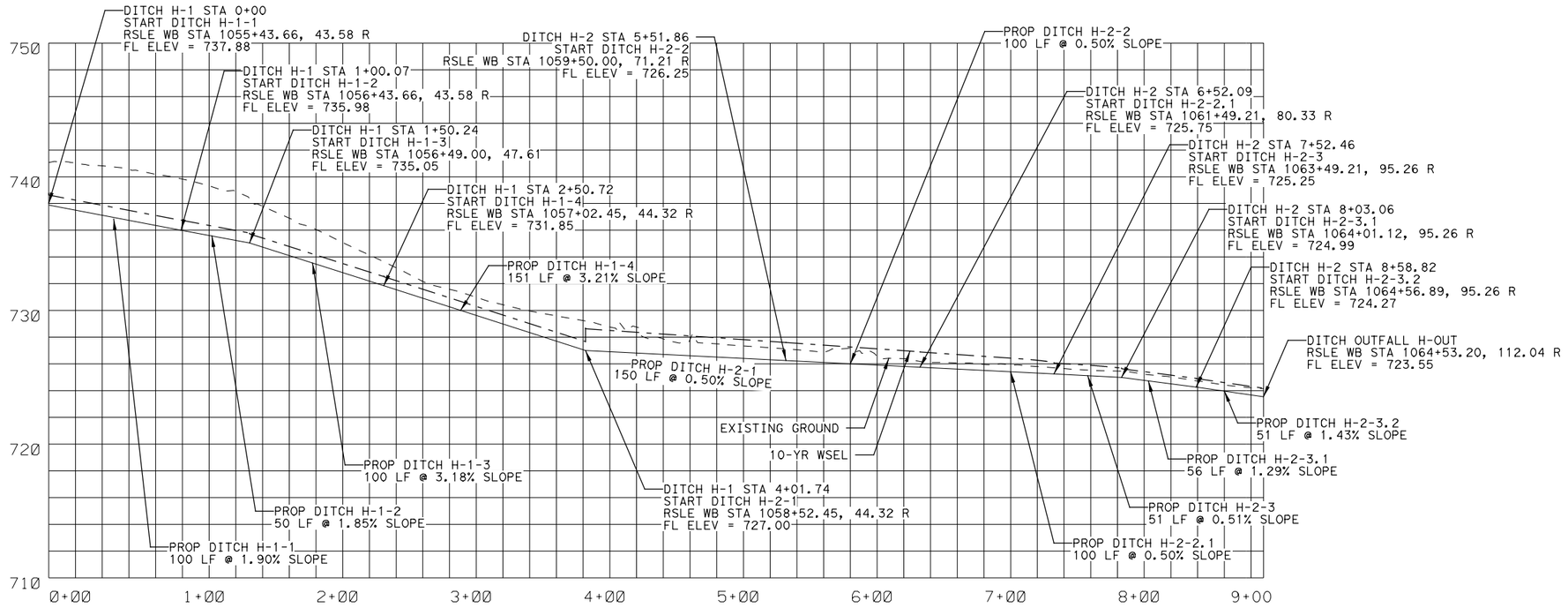
FM 2770
DITCH PROFILES

SCALE: 1"=100'-H
1"=10'-V

SHEET 7 OF 13

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	171
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
USER: DLAyala
FILE: $PWVARVAULTPATHDESC$
PENTABLE: 000000000214615
DATE: 1/19/2021
TIME: 3:55:36 PM
SCALE: 1:100

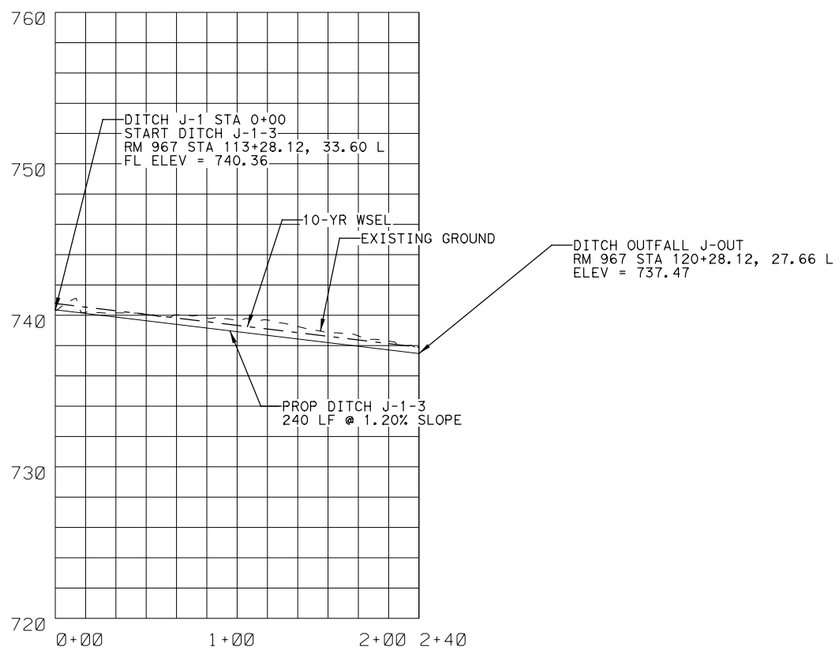


DITCH H (RSLE)

LEGEND

- EXISTING GROUND
- PROPOSED GROUND
- DITCH FLOWLINE
- PROP PIPE
- 10-YR HGL
- PROP STRUCTURE

NOTES:
1. REFER TO DITCH HYDRAULIC DATA SHEET FOR DITCH CALCULATIONS



DITCH J (RM 967)

1/19/2021

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ROBERT S. LIGHT EXTENSION

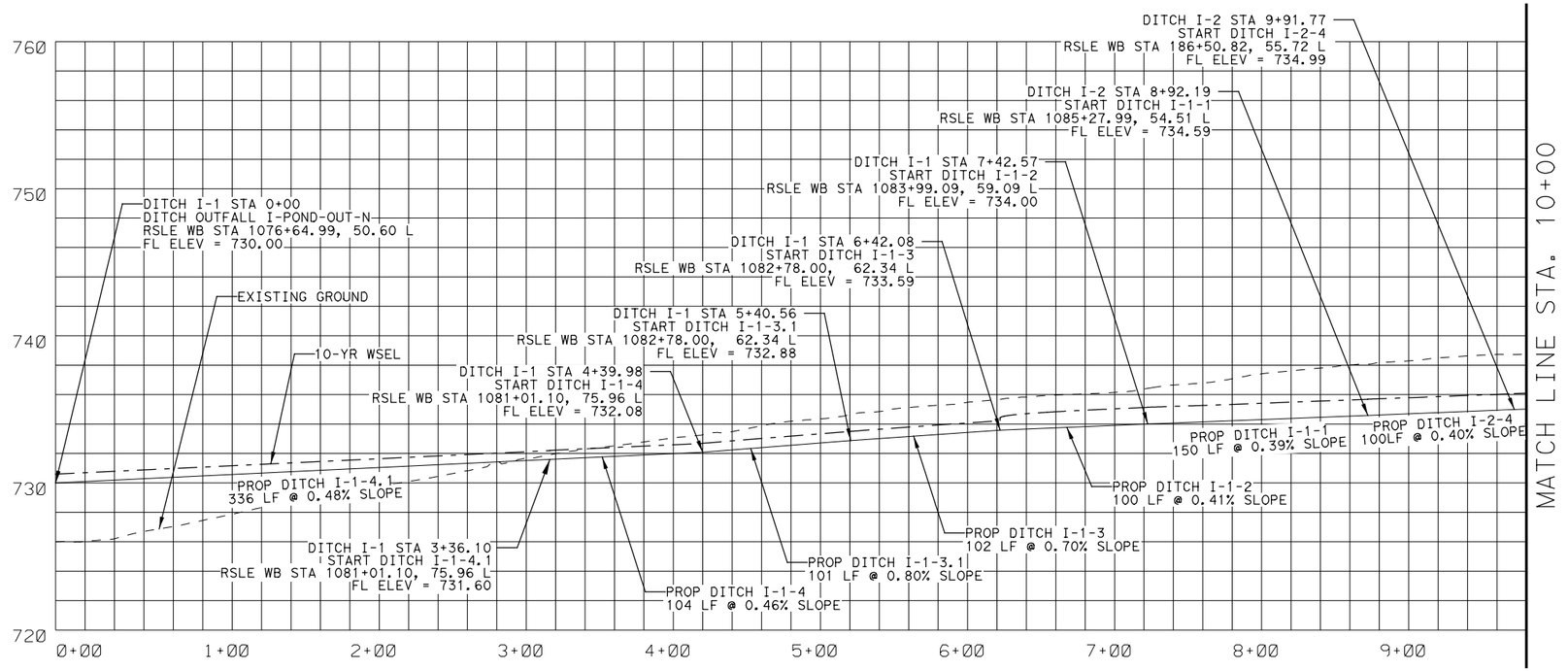
RSLE / RM 967 DITCH PROFILES

SCALE: 1"=100'-H
1"=10'-V

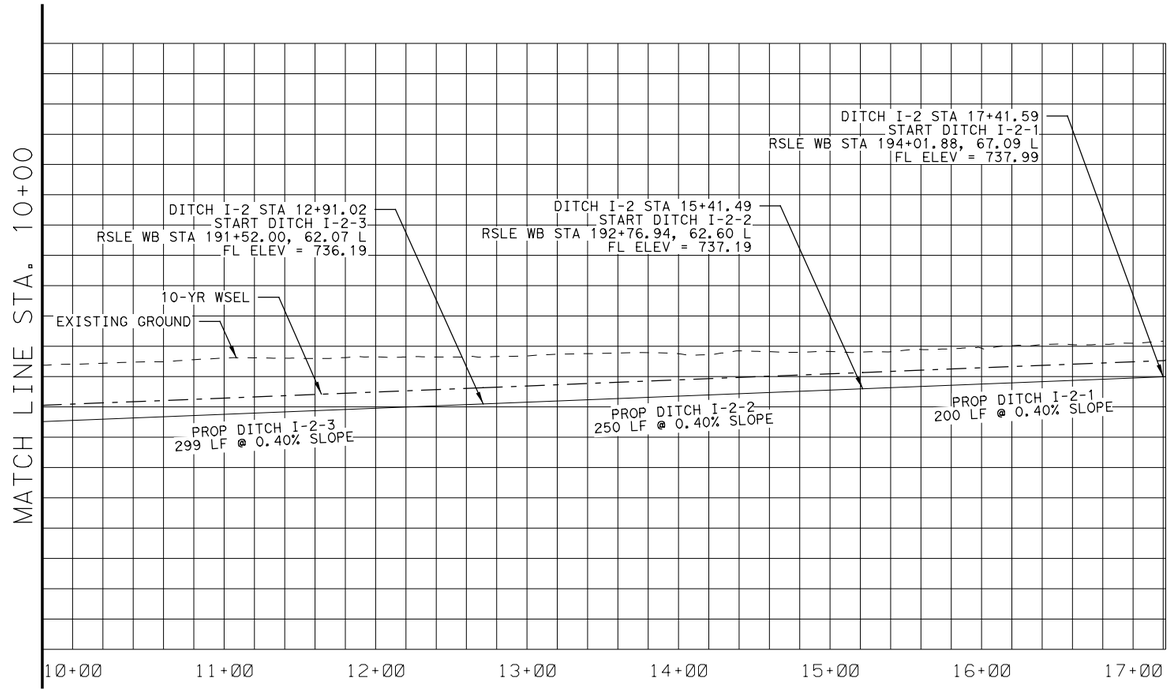
SHEET 8 OF 13

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	172
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
USER: DLAyala
FILE: $PWVAR/AULTPATHDESC$
PENTABLE: 000000000214615
DATE: 1/19/2021
TIME: 3:55:48 PM
SCALE: 1:100



DITCH I-NORTH (RSLE)



DITCH I-NORTH (RSLE) (CONT.)

LEGEND

- EXISTING GROUND
- PROPOSED GROUND
- DITCH FLOWLINE
- PROP PIPE
- 10-YR HGL
- PROP STRUCTURE

NOTES:
1. REFER TO DITCH HYDRAULIC DATA SHEET FOR DITCH CALCULATIONS

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ROBERT S. LIGHT EXTENSION

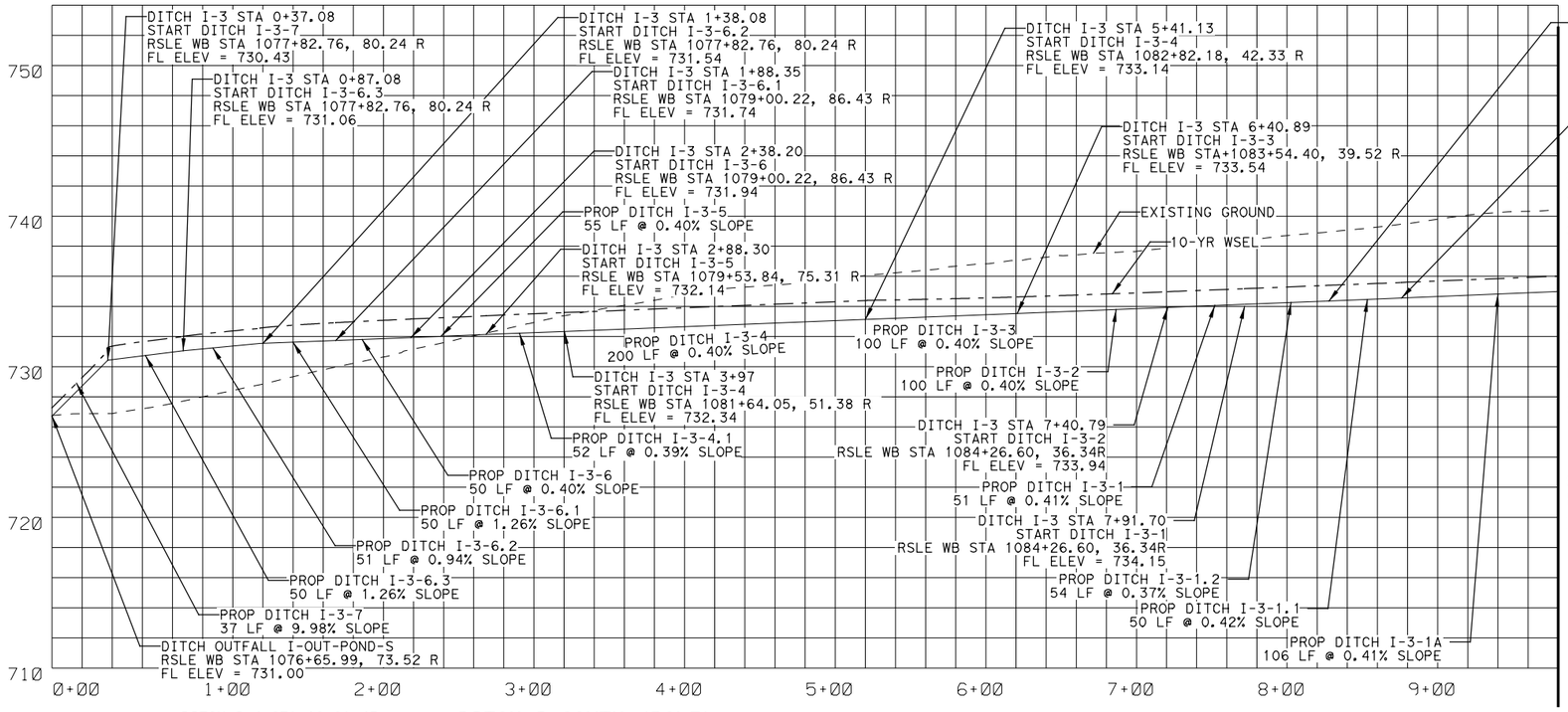
ROBERT S LIGHT DITCH PROFILES

SCALE: 1"=100'-H
1"=10'-V

SHEET 9 OF 13

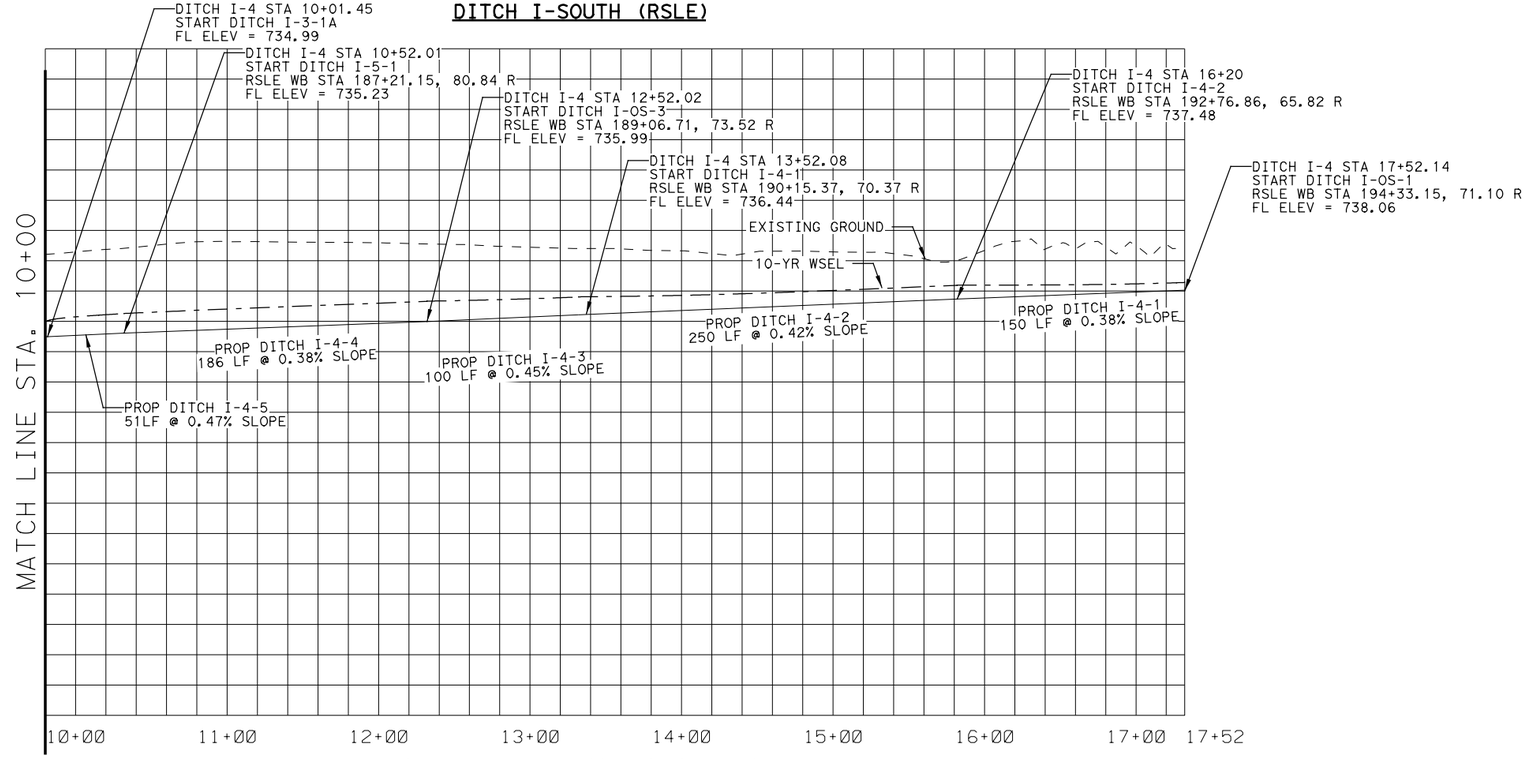
DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	173
CLH	0914	33	068	
CHECK				
CMC				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg PENTABLE: 000000000214615
USER: DLAyala DATE: 1/19/2021 TIME: 3:56:01 PM SCALE: 1:100
FILE: $PWVAR/AULTPATHDESC$



NOTES:
1. REFER TO DITCH HYDRAULIC DATA SHEET FOR DITCH CALCULATIONS

DITCH I-SOUTH (RSLE)



DITCH I-SOUTH (RSLE) (CONT.)

1/19/2021

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ROBERT S. LIGHT EXTENSION

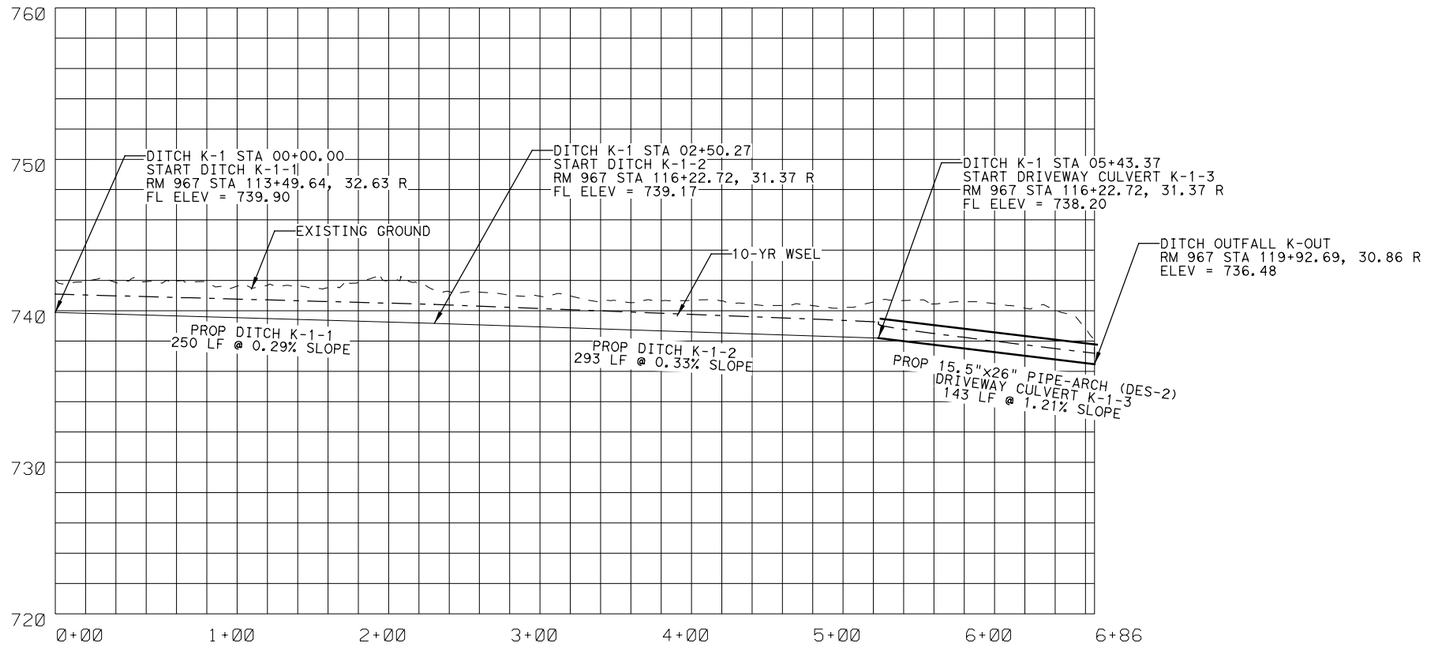
ROBERT S LIGHT DITCH PROFILES

SCALE: 1"=100'-H
1"=10'-V

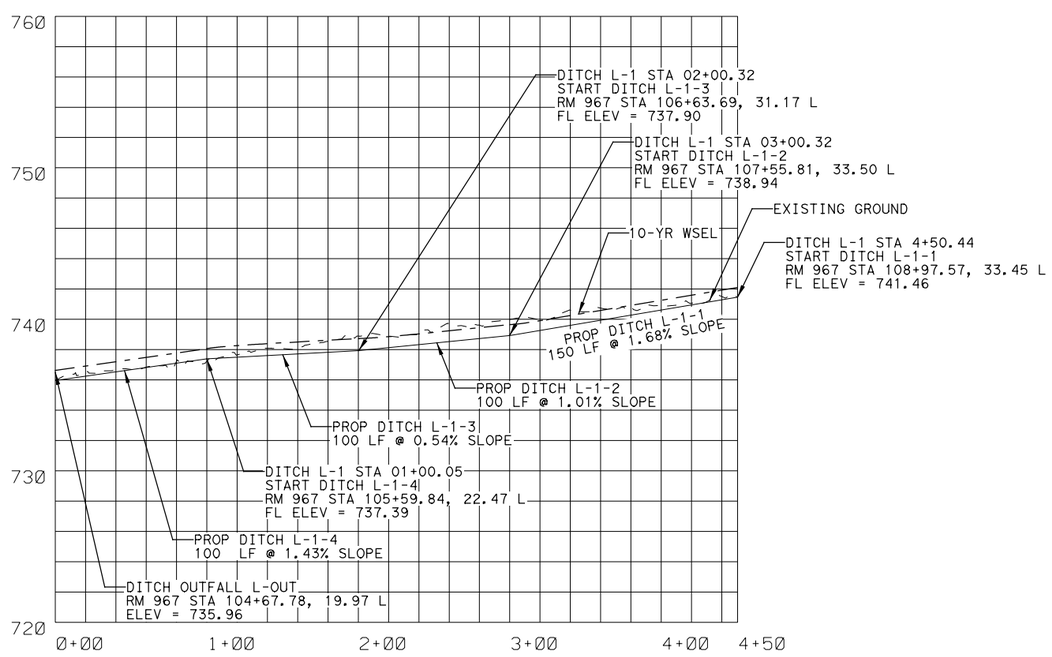
SHEET 10 OF 13

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	174
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
USER: DLAyala
FILE: $PWWARVAULTPATHDESC$
DATE: 1/19/2021
TIME: 3:56:13 PM
SCALE: 1:100
PENTABLE: 000000002146.15



DITCH K (RM 967)



DITCH L (RM 967)

LEGEND

- EXISTING GROUND
- PROPOSED GROUND
- DITCH FLOWLINE
- PROP PIPE
- 10-YR HGL
- PROP STRUCTURE

NOTES:
1. REFER TO DITCH HYDRAULIC DATA SHEET FOR DITCH CALCULATIONS

1/19/2021

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ROBERT S. LIGHT EXTENSION

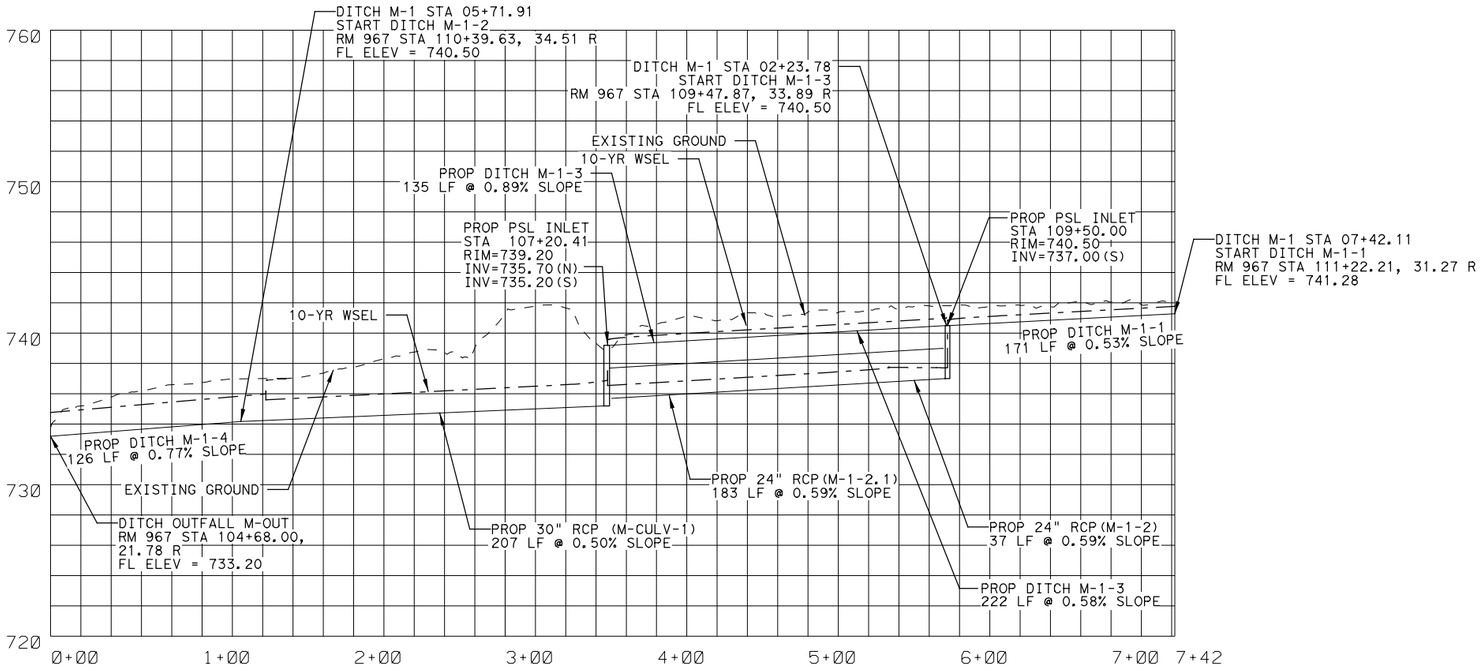
RM 967
DITCH PROFILES

SCALE: 1"=100'-H
1"=10'-V

SHEET 11 OF 13

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	175
CLH	0914	33	068	
CHECK				
CMC				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg PENTABLE: 000000000214615
USER: DLayala DATE: 1/19/2021 TIME: 3:56:26 PM SCALE: 1:100
FILE: $PWVAR/AULTPATHDESC$

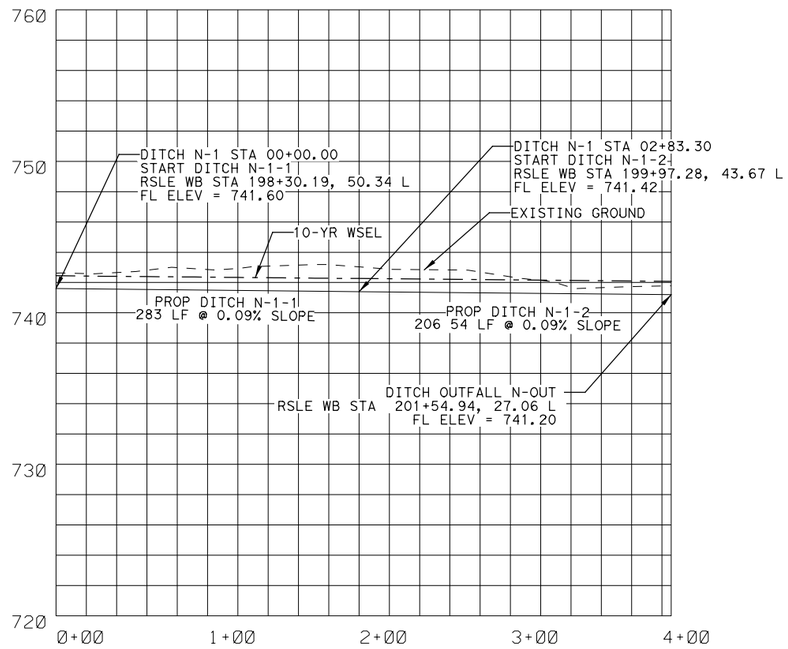


DITCH M (RM 967)

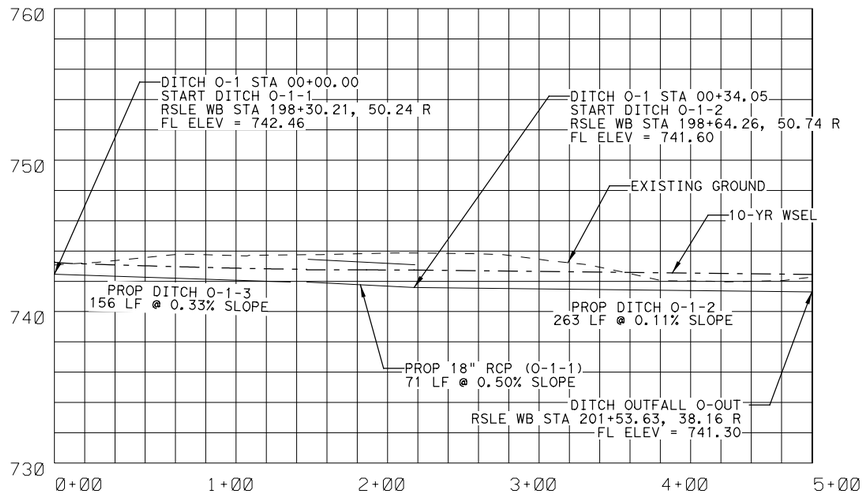
LEGEND

- EXISTING GROUND
- PROPOSED GROUND
- DITCH FLOWLINE
- PROP PIPE
- 10-YR HGL
- PROP STRUCTURE

NOTES:
1. REFER TO DITCH HYDRAULIC DATA SHEET FOR DITCH CALCULATIONS



DITCH N (RSLE)



DITCH O (RSLE)

1/19/2021

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ROBERT S. LIGHT EXTENSION

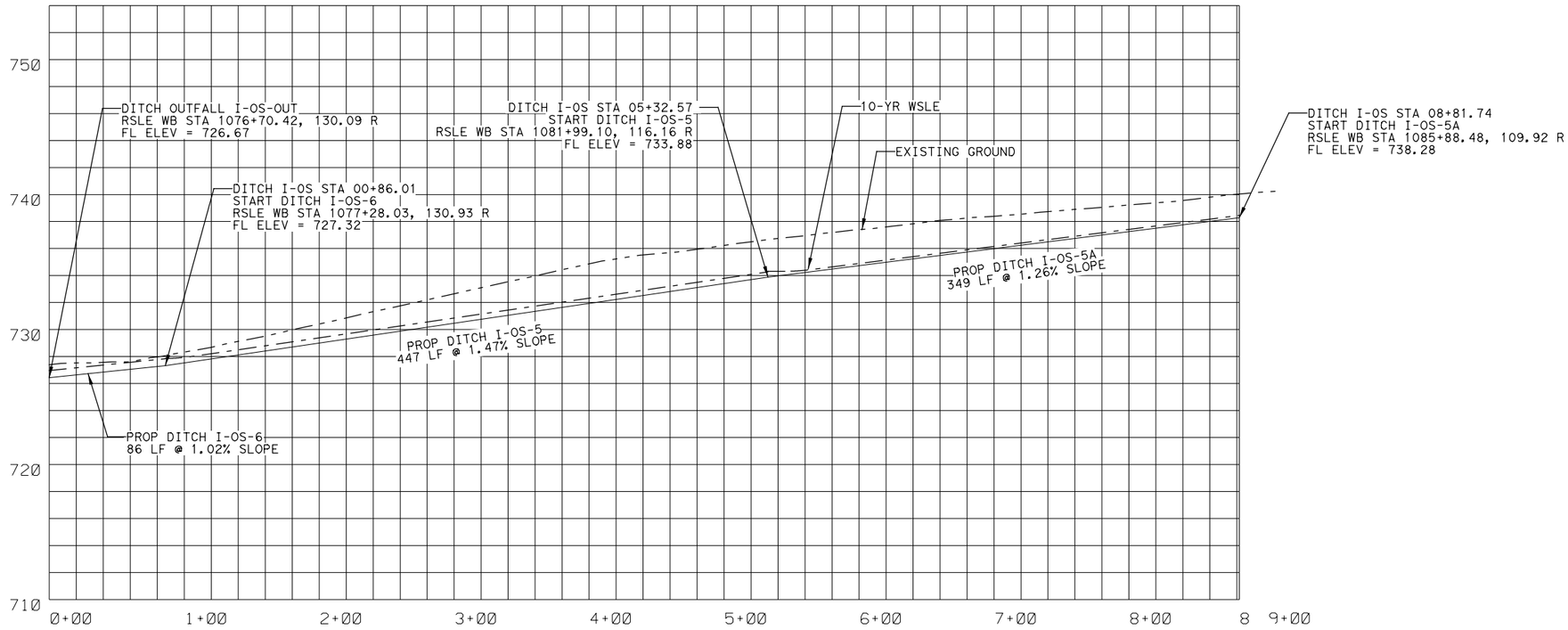
RSLE / RM 967
DITCH PROFILES

SCALE: 1"=100'-H
1"=10'-V

SHEET 12 OF 13

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	176
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg PENTABLE: 000000000214615
USER: DLAyala DATE: 1/19/2021 TIME: 3:56:49 PM SCALE: 1:00
FILE: $PWVAR/AULTPATHDESC$



DITCH I-OFFSITE (RSLE)

LEGEND

- EXISTING GROUND
- PROPOSED GROUND
- DITCH FLOWLINE
- PROP PIPE
- 10-YR HGL
- PROP STRUCTURE

NOTES:
1. REFER TO DITCH HYDRAULIC DATA SHEET FOR DITCH CALCULATIONS

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ROBERT S. LIGHT EXTENSION

ROBERT S LIGHT DITCH PROFILES

SCALE: 1"=100'-H
1"=10'-V

SHEET 13 OF 13

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	177
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
USER: DLAyala
FILE: $PWVARVAULTPATHDESC$
DATE: 1/19/2021
TIME: 3:57:02 PM
PENTABLE: 0000000002\4615
SCALE: 1\100

ROBERT S. LIGHT EXTENSION

℄ RSLE WB

1043+00

PROP DITCH (C-3-2)

PROP FW-S (3:1)
STA. 1043+16.43, 59.44 LT

℄ RSLE

PROP DITCH (C-7-1)

PROP FW-S (3:1)
STA. 1042+26.28, 30.71 RT

FLOW

PROP DITCH (C-6-2)

FLOWS TO
ONION CREEK
TRIBUTARY

RIPRAP (STONE
PROTECTION) (12IN)
6.30 CY

PROP DITCH (C-2-5)

CULVERT C
STA. 1042+56.99
PROP 2-3'X2' BOX CULVERTS
(45° SKEW)

45°

APRON LENGTH (L = 8 FT)
BEGINNING APRON WIDTH = 18 FT
END APRON WIDTH = 24 FT
APRON DEPTH (H = 3 FT)
SEE DETAIL THIS SHEET

PROP R.O.W.

PROP E.O.P.

1042+00

PROP E.O.P.

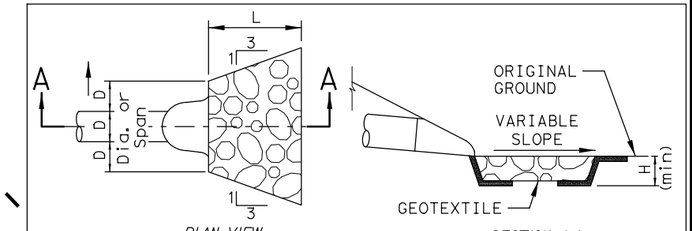
742 743 744 745 746 747 748

0 10 20
SCALE IN FEET

LEGEND

- PROP DITCH
- PROP STORM SEWER
- PROP INLET
- ROW

NOTE:
1. RIPRAP APRON DESIGN BASED ON HEC-14.
2. REFER TO ROBERT S. LIGHT BLVD. EXTENSION DRAINAGE REPORT FOR ADDITIONAL INFORMATION.

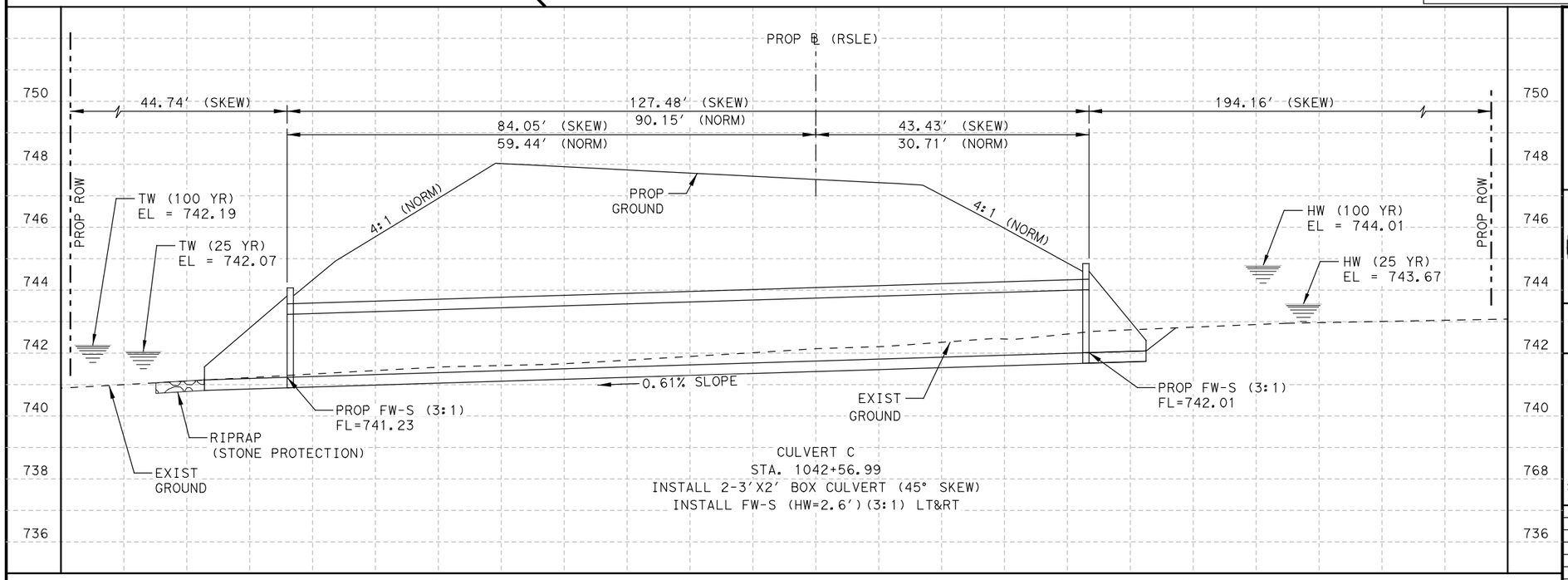


PLAN VIEW

SECTION A-A

CULVERT WITH STANDARD END SECTION

STONE RIPRAP DETAIL
N.T.S.



CULVERT C
STA. 1042+56.99
INSTALL 2-3'X2' BOX CULVERT (45° SKEW)
INSTALL FW-S (HW=2.6')(3:1) LT&RT

12/11/2020

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ROBERT S. LIGHT EXTENSION

CULVERT C LAYOUT & HYDRAULIC DATA

SCALE: 1"=20'-H
1"=4'-H

SHEET 1 OF 2

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	178
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

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FILE: $PWARVAULTPATHDESC$
PENTABLE: 000000002H615
TIME: 11:22:04 AM SCALE: 1:20

EXISTING CONDITIONS

Outfall C - Existing Conditions

Basin ID	Drainage Area (ac)	C Pervious	Pervious Area (ac)	C Impervious	Impervious Area (ac)	C Weighted	Tc (min)	I10 (in/hr)	I25 (in/hr)	I50 (in/hr)	I100 (in/hr)	Q10 (cfs)	Q25 (cfs)	Q50 (cfs)	Q100 (cfs)
Ex C	16.09	0.3	16.09	0.9	0.00	0.3	27	4.79	5.99	6.97	8.04	23.11	28.92	33.63	38.79

PROPOSED CONDITIONS

Outfall C - Post Project Conditions

Element	Q10 (cfs)	Q25 (cfs)	Q100 (cfs)
Ditch C-2-5*	13.45	16.62	22.01
Ditch C-3-2*	2.45	3.03	3.97
Cross Culvert C*	25.52	31.90	42.48

*Peak Discharges Calculated in GEOPAK

Total Discharge

Outfall ID	Discharge Per Storm Event		
	10-yr	25-yr	100-yr
C	41.42	51.55	68.47

PROPOSED RUNOFF CALCULATIONS

AREA ID	COMPOSITE C VALUE	COMPOSITE AREA (AC)	Tc USED (min)	10-YR INTENSITY (in/hr)	10-YR DISCHARGE (cfs)	25-YR INTENSITY (in/hr)	25-YR DISCHARGE (cfs)	50-YR INTENSITY (in/hr)	50-YR DISCHARGE (cfs)	100-YR INTENSITY (in/hr)	100-YR DISCHARGE (cfs)
C-1-1	0.43	1.93	12	7.09	5.94	8.68	7.27	9.96	8.34	11.29	9.46
C-2-1	0.43	2.99	12	7.09	9.14	8.68	11.19	9.96	12.83	11.29	14.56
C-3-1	0.3	0.71	10	7.57	1.60	9.24	1.96	10.58	2.24	11.96	2.53
C-4-1	0.37	0.41	10	7.57	1.16	9.24	1.41	10.58	1.62	11.96	1.83
*C-5-1	0.47	3.37	10	7.57	12.09	9.24	14.77	10.58	16.90	11.96	19.11
*C-6-1	0.48	2.35	10	7.57	8.59	9.24	10.49	10.58	12.00	11.96	13.58
*C-7-1	0.55	0.85	10	7.57	3.58	9.24	4.37	10.58	5.00	11.96	5.65
*C-8-1	0.63	1.25	10	7.57	5.98	9.24	7.30	10.58	8.36	11.96	9.45

Note: Peak Discharges Calculated in GEOPAK
*Flows contributing to design flow of Proposed Cross Culvert C

NOTES:
1. HYDROLOGIC ANALYSIS BASED ON RATIONAL METHOD. GEOPAK DRAINAGE UTILIZED TO CALCULATE PEAK DISCHARGE RATES.
2. DESIGN FREQUENCY BASED ON 25-YR CRITERIA.
3. HYDRAULIC ANALYSIS CONDUCTED WITH HY-8.
4. CULVERT SIZE BASED ON ULTIMATE RSLE IMPERVIOUS COVER.
5. DESIGN FLOWS BASED ON DITCH C-6-2 AND C-7-1 COMBINED DISCHARGES. SEE RUNOFF CALCULATION SHEET FOR MORE INFORMATION.
6. ELEVATIONS BASED ON PROJECT SURVEY BY SAM INC. JAN. 14, 2014. VERTICAL DATUM NAVD88.
7. ALLOWABLE HEADWATER DETERMINED BY EXISTING GROUND ELEVATIONS ALONG THE ROW.
8. RAINFALL INTENSITIES ARE BASED ON NOAA ATLAS 14 DATA.

12/11/2020

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ROBERT S. LIGHT EXTENSION

CULVERT C LAYOUT & HYDRAULIC DATA

SHEET 2 OF 2

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	179
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

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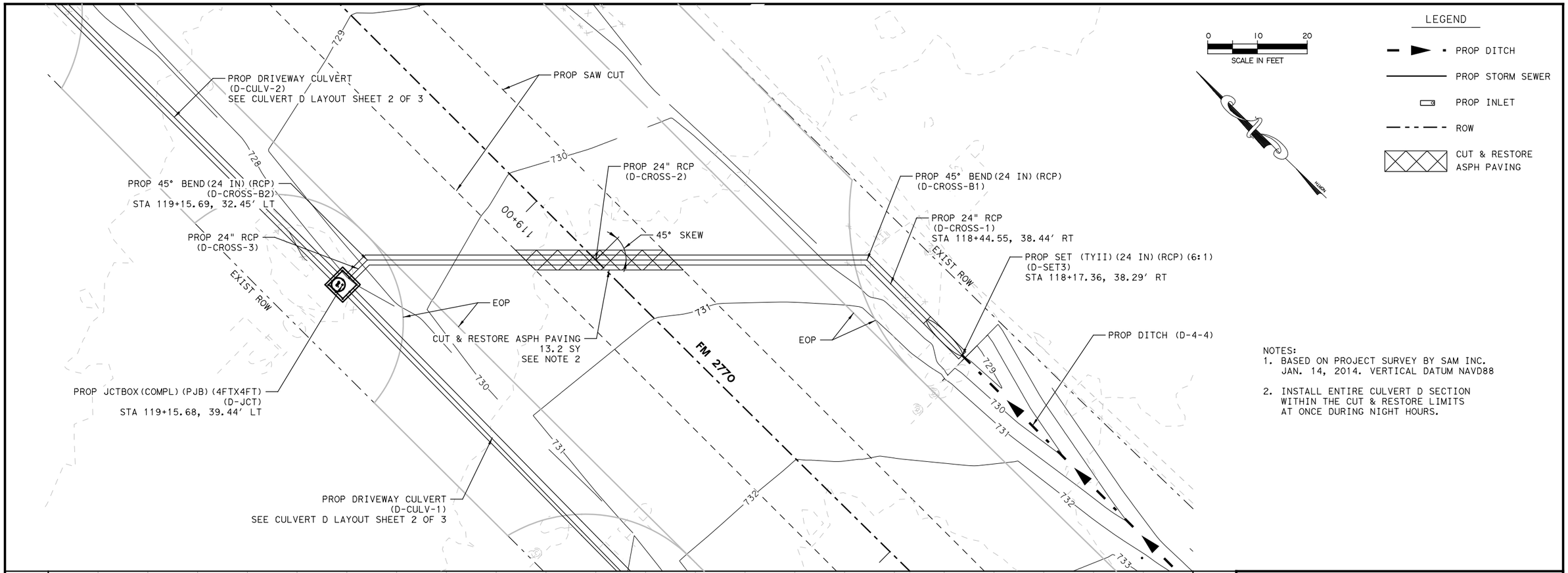
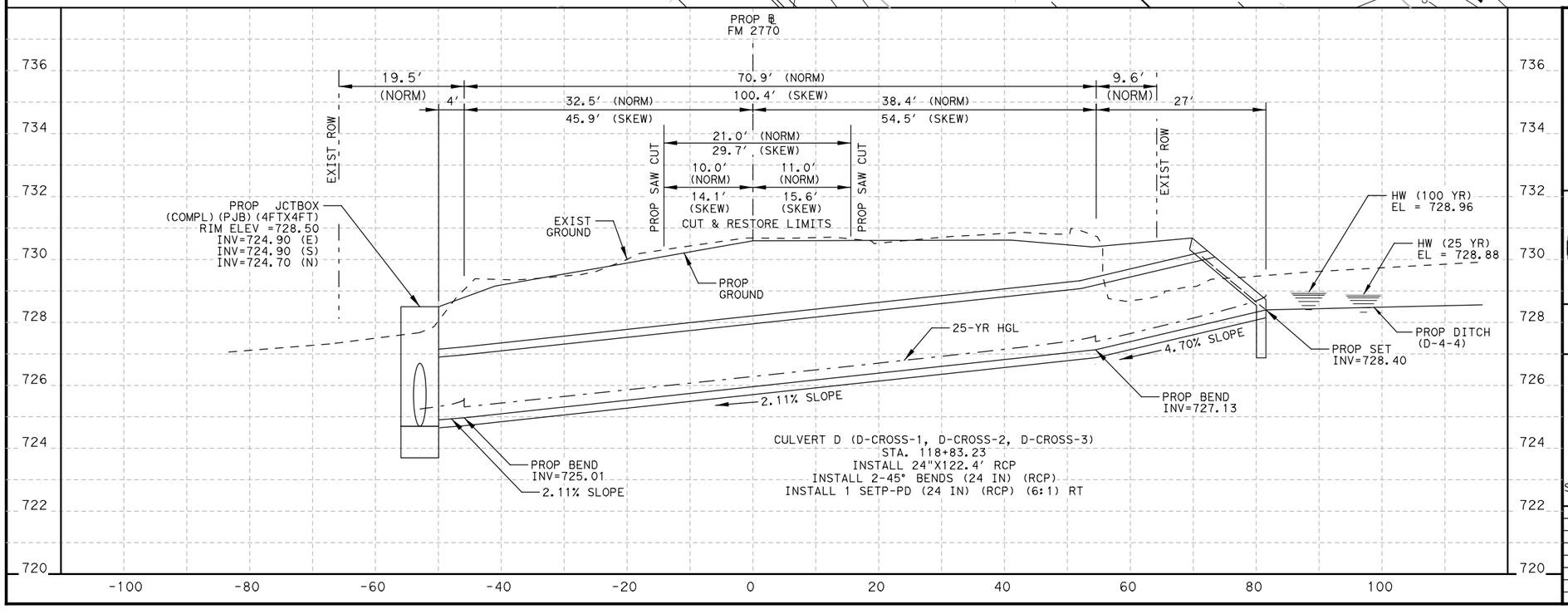


NOTES:
1. BASED ON PROJECT SURVEY BY SAM INC. JAN. 14, 2014. VERTICAL DATUM NAVD88
2. INSTALL ENTIRE CULVERT D SECTION WITHIN THE CUT & RESTORE LIMITS AT ONCE DURING NIGHT HOURS.



CULVERT D (D-CROSS-1, D-CROSS-2, D-CROSS-3)
STA. 118+83.23
INSTALL 24"X122.4' RCP
INSTALL 2-45° BENDS (24 IN) (RCP)
INSTALL 1 SETP-PD (24 IN) (RCP) (6:1) RT

12/11/ 2020

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CULVERT D LAYOUT & HYDRAULIC DATA

SCALE: 1"=20'-H
1"=4'-H

SHEET 1 OF 3

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	180
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CHECK				
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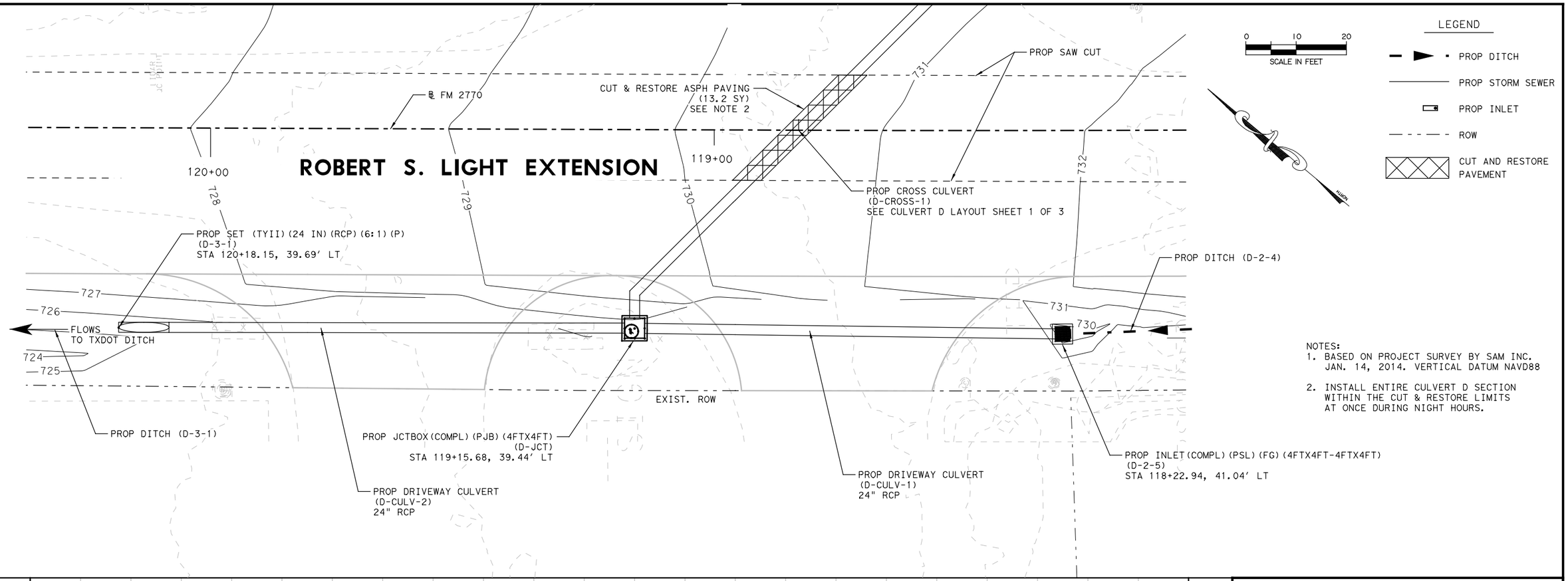
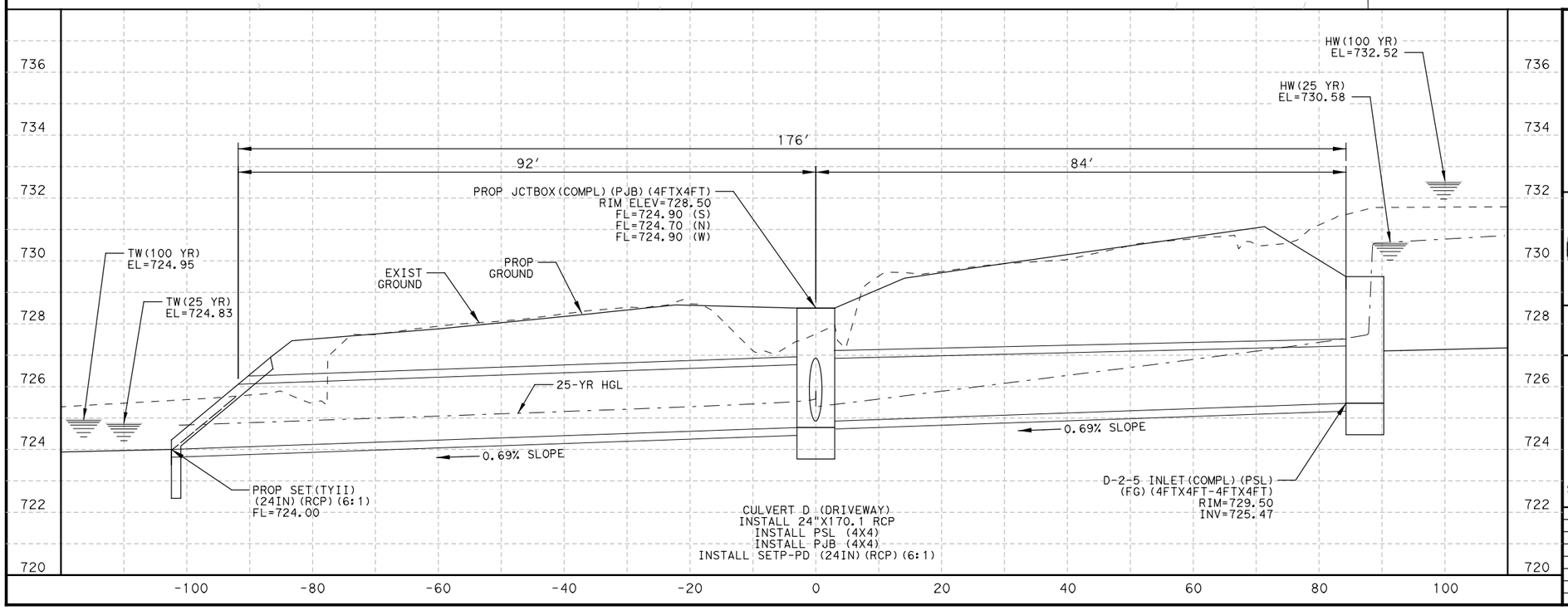
ROBERT S. LIGHT EXTENSION



NOTES:
1. BASED ON PROJECT SURVEY BY SAM INC. JAN. 14, 2014. VERTICAL DATUM NAVD88
2. INSTALL ENTIRE CULVERT D SECTION WITHIN THE CUT & RESTORE LIMITS AT ONCE DURING NIGHT HOURS.



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CULVERT D LAYOUT & HYDRAULIC DATA

SCALE: 1"=20'-H
1"=4'-H

SHEET 2 OF 3

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	181
CLH	0914	33	068	
CHECK				
CMC				

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GEOPAK PROPOSED CULVERT SYSTEM 25-YR DESIGN SUMMARY TABLE

Link ID	Link Upstream Node	Link Downstream Node	Link Length	Link Shape	Link Number of Barrels	Link Rise	Link Span	Link Manning's N Value	Link Slope	Link Invert Upstream	Link Invert Downstream	Link Discharge	Link Capacity	Link HGL Upstream	Link HGL Downstream	Link Uniform Velocity	Link Depth Upstream	Link Depth Downstream
D-CULV-1	D-2-5	D-JCT	82.974	Circular	1	2	n/a	0.012	0.691	725.473	724.9	3.011	21.908	726.398	725.421	4.63	0.925	0.521
D-CULV-2	D-JCT	D-3-1	90.437	Circular	1	2	n/a	0.012	0.693	724.696	724.069	6.044	21.947	725.892	725.732	5.637	1.196	1.663
D-CROSS-1	D-SET3	D-CROSS-B1	13.58	Circular	1	2	n/a	0.012	9.362	728.4	727.129	3.578	80.664	730.333	727.447	12.265	1.933	0.318
D-CROSS-2	D-CROSS-B1	D-CROSS-B2	100.378	Circular	1	2	n/a	0.012	2.11	727.129	725.011	3.578	38.294	727.791	725.44	7.26	0.662	0.429
D-CROSS-3	D-CROSS-B2	D-JCT	5.046	Circular	1	2	n/a	0.012	2.11	725.01	724.904	3.578	38.294	725.828	725.892	7.26	0.818	0.988

GEOPAK PROPOSED CULVERT SYSTEM 100-YR CHECK SUMMARY TABLE

Link ID	Link Upstream Node	Link Downstream Node	Link Length	Link Shape	Link Number of Barrels	Link Rise	Link Span	Link Manning's N Value	Link Slope	Link Invert Upstream	Link Invert Downstream	Link Discharge	Link Capacity	Link HGL Upstream	Link HGL Downstream	Link Uniform Velocity	Link Depth Upstream	Link Depth Downstream
D-CULV-1	D-2-5	D-JCT	82.974	Circular	1	2	n/a	0.012	0.691	725.473	724.9	3.939	21.908	729.844	729.788	5.039	2	2
D-CULV-2	D-JCT	D-3-1	90.437	Circular	1	2	n/a	0.012	0.693	724.696	724.069	7.958	21.947	729.788	729.596	6.11	2	2
D-CROSS-1	D-SET3	D-CROSS-B1	27.077	Circular	1	2	n/a	0.012	4.695	728.4	727.129	2.256	57.124	728.963	727.422	8.395	0.563	0.294
D-CROSS-2	D-CROSS-B1	D-CROSS-B2	100.378	Circular	1	2	n/a	0.012	2.11	727.129	725.011	2.256	38.294	727.652	725.353	6.342	0.523	0.342
D-CROSS-3	D-CROSS-B2	D-JCT	5.046	Circular	1	2	n/a	0.012	2.11	725.01	724.904	2.256	38.294	725.575	725.303	6.342	0.565	0.4

PROPOSED RUNOFF CALCULATIONS

AREA ID	COMPOSITE C VALUE	COMPOSITE AREA (AC)	Tc USED (min)	10-YR INTENSITY (in/hr)	10-YR DISCHARGE (cfs)	25-YR INTENSITY (in/hr)	25-YR DISCHARGE (cfs)	50-YR INTENSITY (in/hr)	50-YR DISCHARGE (cfs)	100-YR INTENSITY (in/hr)	100-YR DISCHARGE (cfs)
*D-2-1	0.65	0.55	10	7.57	2.67	9.24	3.26	10.58	3.73	11.96	4.22
*D-4-1	0.62	0.63	10	7.57	2.93	9.24	3.58	10.58	4.09	11.96	4.63

Note: Peak Discharges Calulated in GEOPAK
*Flow contributing to design flow of Proposed Cross Culvert D

NOTES:
1. HYDROLOGIC ANALYSIS BASED ON RATIONAL METHOD. GEOPAK DRAINAGE UTILIZED TO CALCULATE PEAK DISCHARGE RATES.
2. DESIGN FREQUENCY BASED ON 25-YR CRITERIA.
3. HYDRAULIC ANALYSIS CONDUCTED WITH GEOPAK DRAINAGE.
4. CULVERT SIZE BASED ON ULTIMATE RSLE IMPERVIOUS COVER.
5. ELEVATIONS BASED ON PROJECT SURVEY BY SAM INC. JAN. 14, 2014. VERTICAL DATUM NAVD88.
6. 25YR AND 100YR HEADWATERS DETERMINED BY HGL OF DITCH D-2-4.
7. RAINFALL INTENSITIES ARE BASED ON NOAA ATLAS 14.

12/18/ 2020

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ROBERT S. LIGHT EXTENSION

CULVERT D LAYOUT & HYDRAULIC DATA

SHEET 3 OF 3

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
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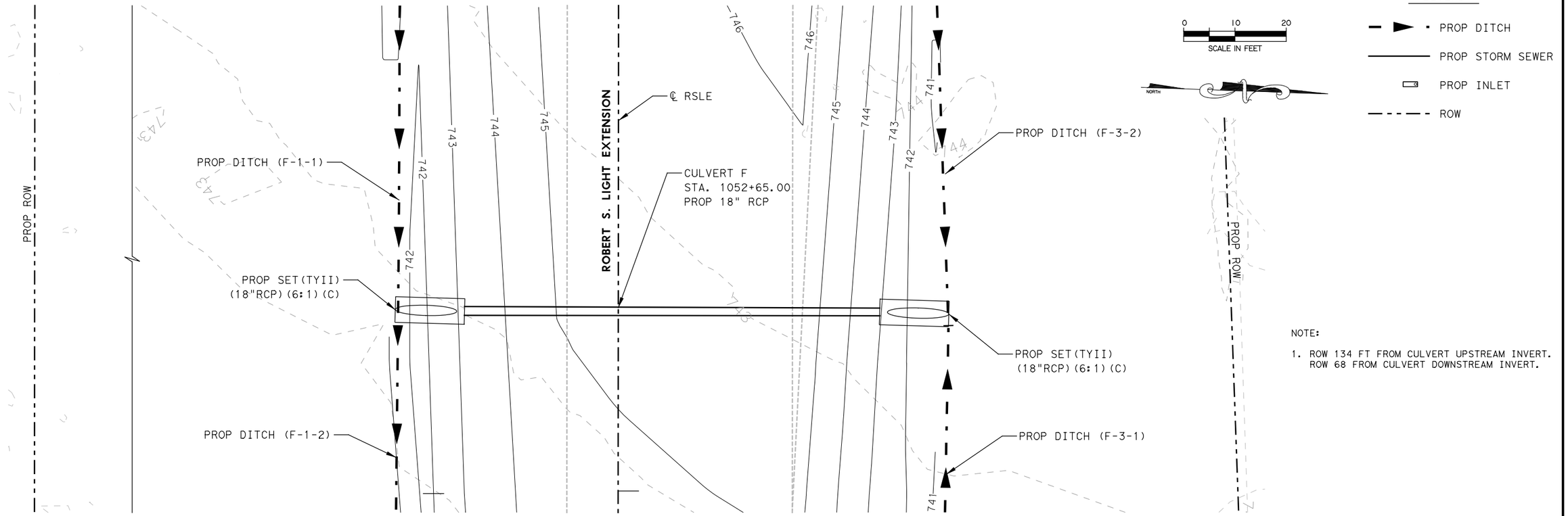

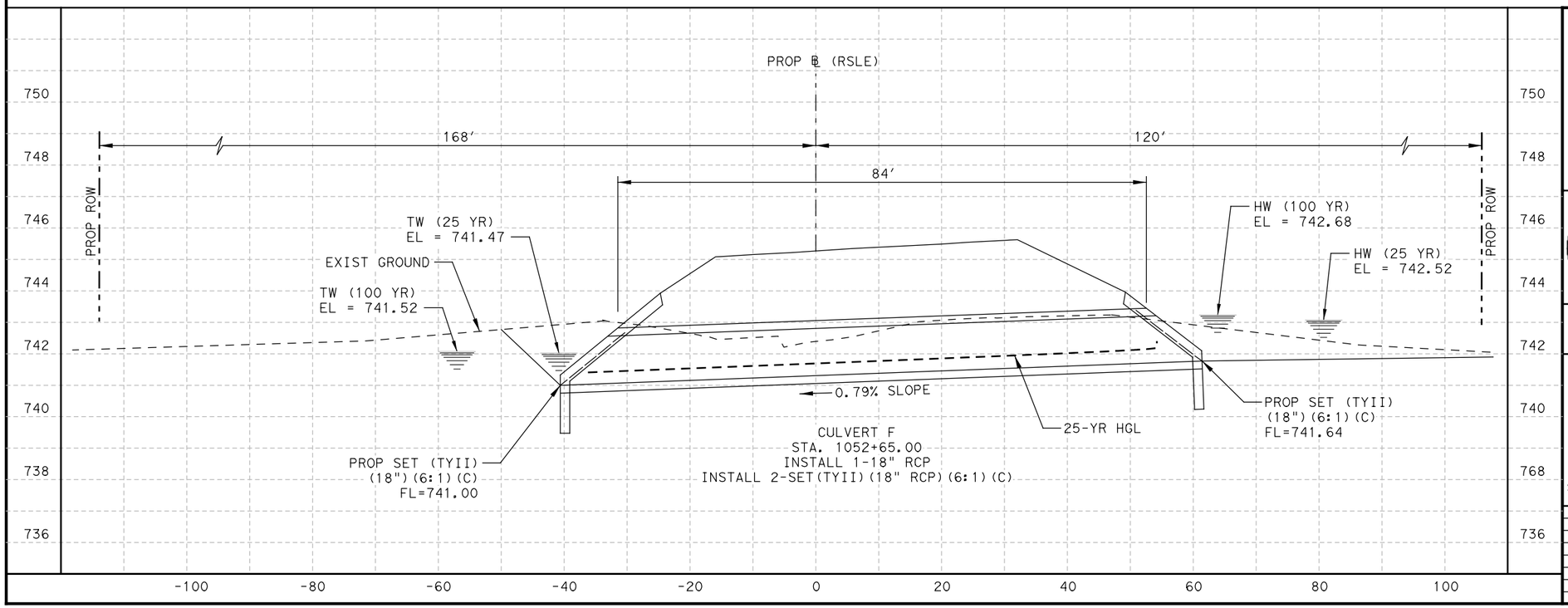

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ROBERT S. LIGHT EXTENSION

CULVERT F LAYOUT & HYDRAULIC DATA

SCALE: 1"=20′-H
1"=4′-H

SHEET 1 OF 2

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	183
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Table 1 - Summary of Culvert Flows at Crossing: CULVERT F STA 1052+65

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	CULVERT F Discharge (cfs)	Roadway Discharge (cfs)	Iterations
742.26	2-yr	1.45	1.45	0.00	1
742.42	10-yr	2.20	2.20	0.00	1
742.52	25-yr	2.70	2.70	0.00	1
742.68	100-yr	3.53	3.53	0.00	1
744.42	Overtopping	11.59	11.59	0.00	Overtopping

Table 2 - Culvert Summary Table: CULVERT F

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)
2-yr	1.45	1.45	742.26	0.618	0.0*	1-S2n	0.404	0.451	0.404	0.370	3.782
10-yr	2.20	2.20	742.42	0.777	0.0*	1-S2n	0.501	0.560	0.501	0.432	4.252
25-yr	2.70	2.70	742.52	0.885	0.093	1-S2n	0.559	0.623	0.559	0.467	4.501
100-yr	3.53	3.53	742.68	1.045	0.265	1-S2n	0.647	0.717	0.647	0.516	4.837

* Full Flow Headwater elevation is below inlet invert.

****

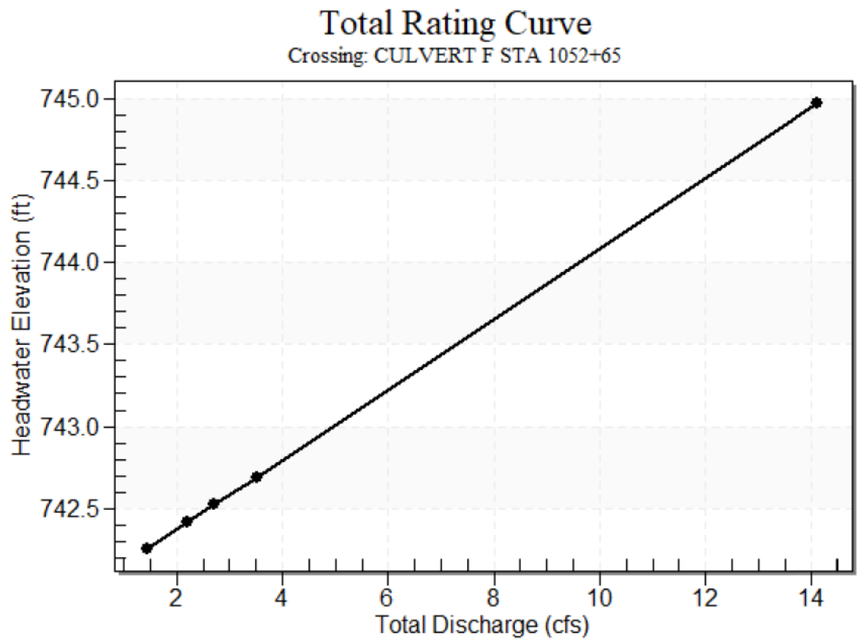
Straight Culvert

Inlet Elevation (invert): 741.64 ft, Outlet Elevation (invert): 741.00 ft

Culvert Length: 85.00 ft, Culvert Slope: 0.0075

****

Rating Curve Plot for Crossing: CULVERT F STA 1052+65



PROPOSED RUNOFF CALCULATIONS

AREA ID	COMPOSITE C VALUE	COMPOSITE AREA (AC)	Tc USED (min)	10-YR INTENSITY (in/hr)	10-YR DISCHARGE (cfs)	25-YR INTENSITY (in/hr)	25-YR DISCHARGE (cfs)	50-YR INTENSITY (in/hr)	50-YR DISCHARGE (cfs)	100-YR INTENSITY (in/hr)	100-YR DISCHARGE (cfs)
*F-3-1	0.39	0.35	10	7.57	1.03	9.24	1.25	10.58	1.43	11.96	1.62
*F-3-2	0.41	0.43	10	7.57	1.33	9.24	1.63	10.58	1.86	11.96	2.1

Note: Peak Discharges Calculated in GEOPAK
*Flows contributing to design flow of Proposed Cross Culvert F

Site Data - CULVERT F

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 741.64 ft
Outlet Station: 85.00 ft
Outlet Elevation: 741.00 ft
Number of Barrels: 1

Culvert Data Summary - CULVERT F

Barrel Shape: Circular
Barrel Diameter: 1.50 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0130
Culvert Type: Straight
Inlet Configuration: Square Edge with Headwall
Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: CULVERT F STA 1052+65)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
1.45	741.37	0.37	1.21	0.23	0.49
2.20	741.43	0.43	1.34	0.27	0.51
2.70	741.47	0.47	1.41	0.29	0.51
3.53	741.52	0.52	1.51	0.33	0.52

Tailwater Channel Data - CULVERT F STA 1052+65

Tailwater Channel Option: Irregular Channel

Roadway Data for Crossing: CULVERT F STA 1052+65

Roadway Profile Shape: Irregular Roadway Shape (coordinates)
Roadway Surface: Paved
Roadway Top Width: 44.00 ft

NOTES:
1. HYDROLOGIC ANALYSIS BASED ON RATIONAL METHOD. GEOPAK DRAINAGE UTILIZED TO CALCULATE PEAK DISCHARGE RATES.
2. DESIGN FREQUENCY BASED ON 25-YR CRITERIA.
3. HYDRAULIC ANALYSIS CONDUCTED WITH GEOPAK DRAINAGE.
4. CULVERT SIZE BASED ON ULTIMATE RSLE IMPERVIOUS COVER.
5. ELEVATIONS BASED ON PROJECT SURVEY BY SAM INC. JAN. 14, 2014. VERTICAL DATUM NAVD88.
6. ALLOWABLE HEADWATER DETERMINED BY EXISTING GROUND ELEVATIONS ALONG THE ROW.
7. RAINFALL INTENSITIES ARE BASED ON NOAA ATLAS 14.

12/11/2020

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CULVERT F LAYOUT & HYDRAULIC DATA

SHEET 2 OF 2

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	184
CLH	0914	33	068	
CHECK				
CMC				

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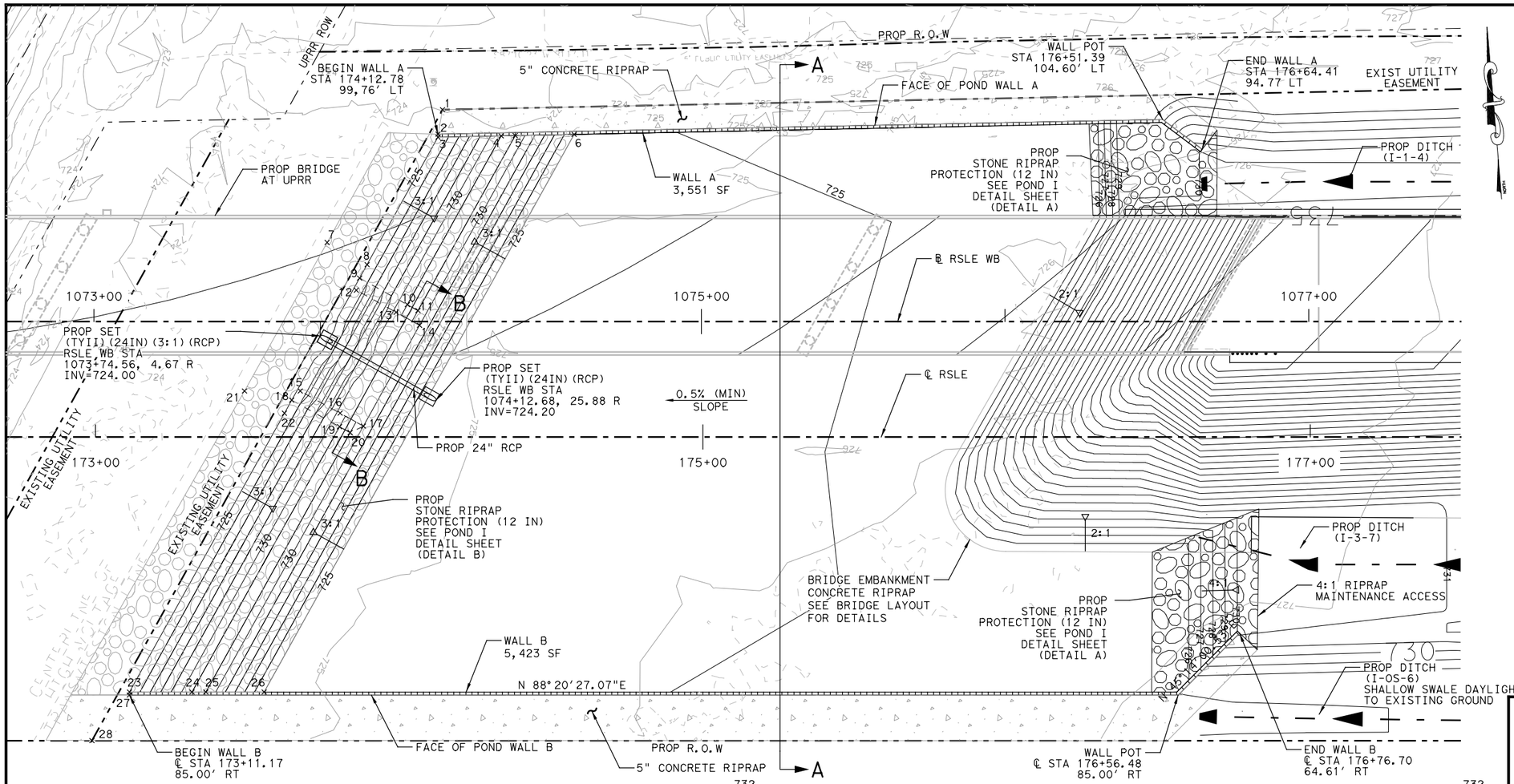


LEGEND

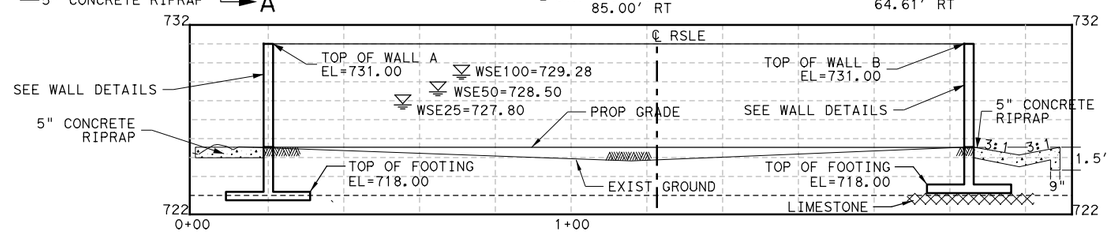
- PROP DITCH
- PROP STORM SEWER
- BL ALIGNMENT
- ROW
- FLOW ARROW

NOTES:
1. HEC-HMS 3.5 USED FOR DETENTION ANALYSIS.
2. SEE UPRR BRIDGE HYDROLOGY DATA AND DRAINAGE AREA MAPS FOR INFLOW CALCULATIONS TO THE POND FOR BOTH EXISTING AND PROPOSED CONDITIONS.
3. PER ANALYSIS 100 YR WSEL WITH EMERGENCY SPILLWAY ENGAGED WITH ASSUMED 24 IN RCP CLOGGED IS 729.97.
4. CONCRETE RIPRAP ON EMBANKMENT UP TO ELEV 727 TO PREVENT EROSION FROM ADJACENT CHANNEL.
5. STONE RIPRAP DETAIL SHOWN ON SHEET 180.
6. STONE PROTECTION RIPRAP D50 SIZED IN ACCORDANCE WITH HEC-23, DESIGN GUIDLINE 4 .

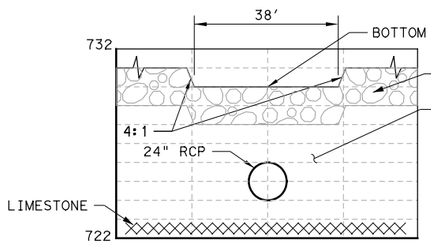
0 20 40
SCALE IN FEET

POINT LOCATION TABLE				
POINT NO.	X COORDINATE	Y COORDINATE	ELEVATION	DESCRIPTION
1	2332292.28	13938916.64	725.00	CONCRETE RIPRAP
2	2332290.99	13938908.56	725.00	CONCRETE RIPRAP
3	2332291.02	13938907.56	725.00	BOTTOM OF BERM
4	2332311.82	13938908.57	731.00	TOP OF BERM
5	2332316.42	13938908.81	731.00	TOP OF BERM
6	2332335.82	13938909.77	725.00	BOTTOM OF BERM
7	2332255.55	13938871.85	724.94	STONE RIPRAP
8	2332268.90	13938864.93	725.00	STONE RIPRAP
9	2332266.57	13938860.42	725.00	BOTTOM OF BERM
10	2332282.55	13938852.14	731.00	TOP OF BERM
11	2332286.10	13938850.30	731.00	TOP OF BERM
12	2332265.61	13938856.41	725.00	BOTTOM OF SPILLWAY
13	2332278.93	13938849.51	730.00	TOP OF SPILLWAY
14	2332286.74	13938845.46	730.00	TOP OF SPILLWAY
15	2332248.12	13938822.67	725.00	BOTTOM OF SPILLWAY
16	2332261.44	13938815.77	730.00	TOP OF SPILLWAY
17	2332269.25	13938811.72	730.00	TOP OF SPILLWAY
18	2332245.40	13938819.58	725.00	BOTTOM OF BERM
19	2332261.38	13938811.30	731.00	TOP OF BERM
20	2332264.93	13938809.46	731.00	TOP OF BERM
21	2332229.78	13938822.13	724.94	STONE RIPRAP
22	2332243.13	13938815.21	725.00	STONE RIPRAP
23	2332194.77	13938721.93	725.00	BOTTOM OF BERM
24	2332215.35	13938722.53	731.00	TOP OF BERM
25	2332219.93	13938722.66	731.00	TOP OF BERM
26	2332239.11	13938723.22	725.00	BOTTOM OF BERM
27	2332194.79	13938720.93	725.00	CONCRETE RIPRAP
28	2332182.87	13938705.58	725.00	CONCRETE RIPRAP

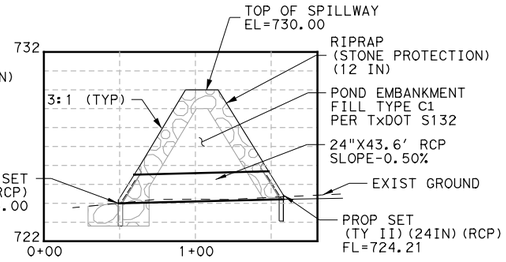
STONE RIPRAP LAYOUT 1
N.T.S.



POND CROSS SECTION A-A
SCALE N.T.S.



POND CROSS SECTION B-B
SCALE N.T.S.



POND OUTFALL PROFILE
SCALE N.T.S.

12/11/2020

STATE OF TEXAS
ASHLEY S. HANSON
107373
LICENSED
PROFESSIONAL ENGINEER

HAYS COUNTY TEXAS

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY
Texas Registered Engineering Firm F-2614

Texas Department of Transportation
℗2020

ROBERT S. LIGHT EXTENSION

DETENTION POND I
POND LAYOUT SHEET

SCALE: 1"=40'

SHEET 1 OF 2

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	185
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

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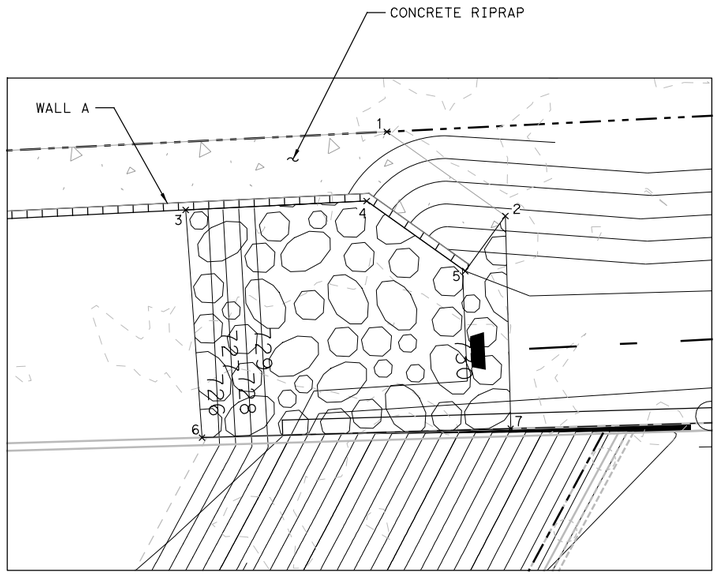
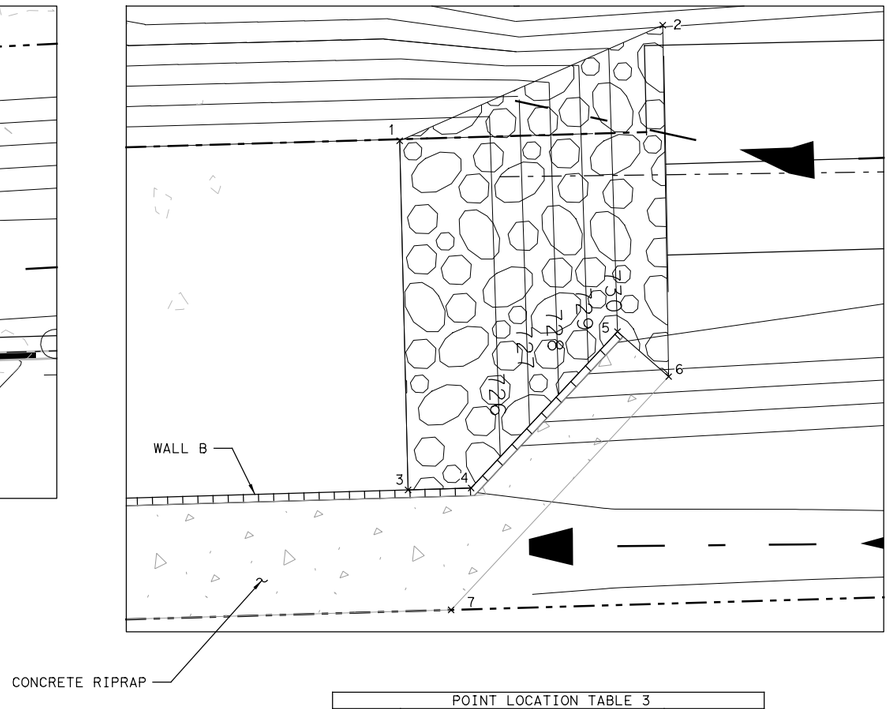
FILE: $PWARVAULTPATHDESC$
PENTABLE: 000000002/4615



POINT LOCATION TABLE 2			
POINT	X COORDINATE	Y COORDINATE	ELEVATION
1	2332585.04	13938262.12	725.90
2	2332600.68	13938251.00	729.40
3	2332558.48	13938251.80	725.90
4	2332582.37	13938252.98	729.50
5	2332595.38	13938243.73	730.00
6	2332560.63	13938221.74	725.90
7	2332601.39	13938222.92	732.00

STONE RIPRAP LAYOUT 2
N.T.S.



POINT LOCATION TABLE 3			
POINT	X COORDINATE	Y COORDINATE	ELEVATION
1	2332673.20	13938251.43	725.90
2	2332707.94	13938252.60	731.00
3	2332674.31	13938205.34	725.90
4	2332682.63	13938205.58	725.90
5	2332701.96	13938226.24	730.00
6	2332708.72	13938220.29	730.90
7	2332680.00	13938189.49	727.00

STONE RIPRAP LAYOUT 3
N.T.S.

POND DATA

POND I OUTLET DISCHARGE SUMMARY

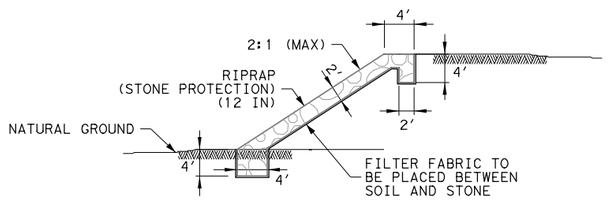
	DRAINAGE AREA (ACRES)	PEAK DISCHARGE AT OUTLET I (CFS)		
		25-YR	50-YR	100-YR
PRE-PROJECT	85.86	451	570	680
POST-PROJECT (NO POND)	91.73	494	622	741
POST-PROJECT POND)	91.73	450	565	672

POND I PERFORMANCE SUMMARY

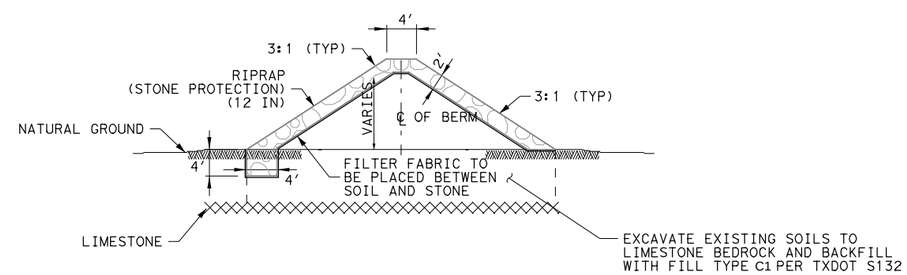
	25-YR	50-YR	100-YR
PEAK INFLOW (CFS)	93	112	131
PEAK OUTFLOW (CFS)	24	27	30
PEAK WSEL (FT)	727.80	728.52	729.28
PEAK STORAGE (AC-FT)	2.60	3.31	4.09

POND I ELEVATION-DISCHARGE-STORAGE CURVE

W.S. ELEV (FT)	AREA (AC)	PEAK DISCHARGE (CFS)	PEAK STORAGE (AC-FT)	
724.20	0.01	0.00	0.00	
725.00	0.59	2.21	0.16	
726.00	0.91	9.69	0.90	
726.81		17.70	1.66	10-YR
727.00	0.95	19.00	1.85	
727.80		24.00	2.60	25-YR
728.00	0.95	25.00	2.80	
728.52		27.00	3.31	50-YR
729.00	1.02	29.00	3.80	
729.28		30.43	4.09	100-YR
730.00	1.06			
731.00	1.07			



STONE RIPRAP DETAIL A
N.T.S.



STONE RIPRAP DETAIL B
N.T.S.

12/11/ 2020

STATE OF TEXAS
ASHLEY S. HANSON
107373
LICENSED
PROFESSIONAL ENGINEER

Lockwood, Andrews & Newnam, Inc.
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ROBERT S. LIGHT EXTENSION

DETENTION POND I DETAILS

SHEET 2 OF 2

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	186
CLH	0914	33	068	
CHECK				
CMC				

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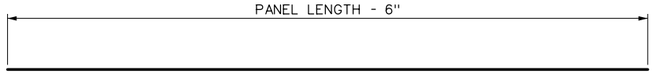
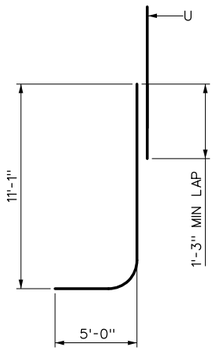
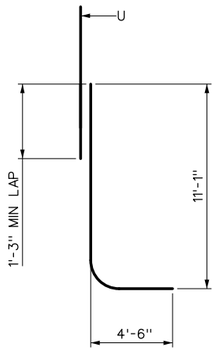


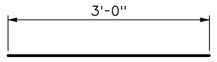
BARS D, T, X



BAR A1

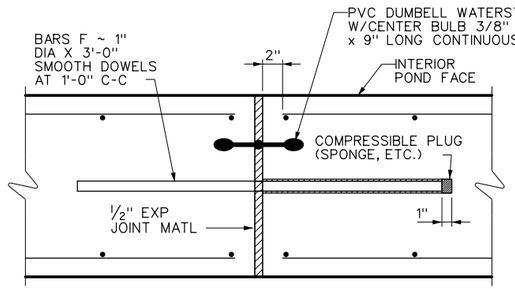


BAR A2

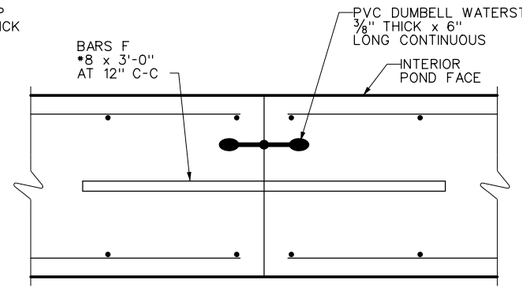


BAR F

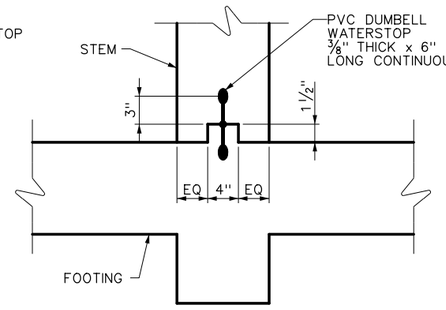
WALL HEIGHT "H"	REINFORCING STEEL																				WALL HEIGHT "H"
	A1 ~ 42 #6 AT 9" C-C		A2 ~ 42 #6 AT 9" C-C		C ~ 42 #6 AT 9" C-C		D ~ #5 AT 12" C-C		F ~ #8 AT 12" C-C		T ~ #5 AT 12" C-C		U ~ 42 #6 AT 9" C-C		X ~ #5 AT 12" C-C		Y ~ 32 #5 AT 12" C-C		QUANTITY FOR ONE 32' PANEL		
(FT)	LGTH	WT	LGTH	WT	LGTH	WT	NO	WT	NO	WT	NO	WT	LGTH	WT	NO	WT	LGTH	WT	CONC(CY)	REINF(LB)	(FT)
13	16'-1"	1015	15'-7"	983	9'-0"	568	24	789	12	96	18	591	13'-10"	873	1	33	2'-0"	67	31.70	5015	13
14	16'-1"	1015	15'-7"	983	9'-0"	568	26	854	13	104	18	591	13'-10"	873	1	33	2'-0"	67	32.9	5088	14
15	16'-1"	1015	15'-7"	983	9'-0"	568	28	920	14	112	18	591	13'-10"	873	1	33	2'-0"	67	34.1	5162	15
16	16'-1"	1015	15'-7"	983	9'-0"	568	30	986	15	120	18	591	13'-10"	873	1	33	2'-0"	67	35.5	5236	16
17	16'-1"	1015	15'-7"	983	9'-0"	568	32	1051	16	128	18	591	13'-10"	873	1	33	2'-0"	67	36.6	5309	17



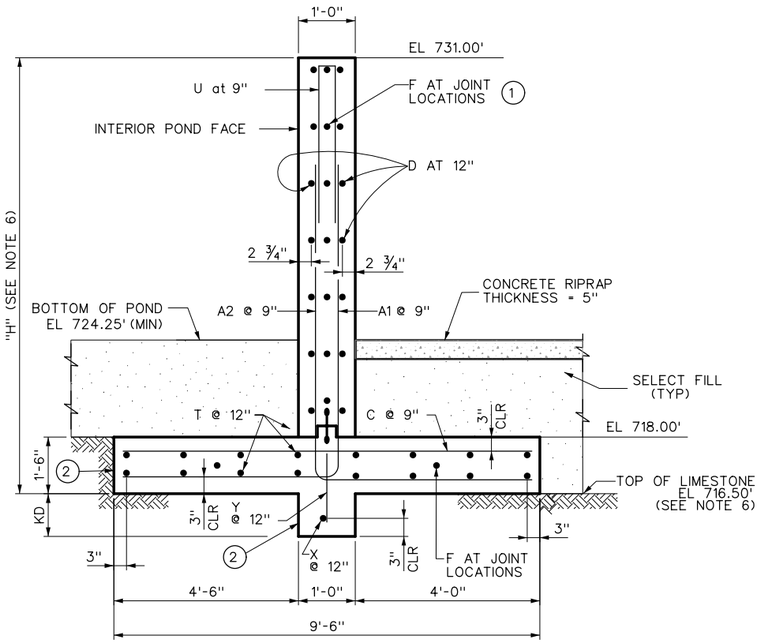
EXPANSION JOINT



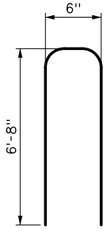
CONSTRUCTION JOINT



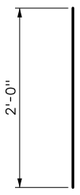
JOINT\WATERSTOP DETAIL



SECTION



BAR U



BAR Y

NOTES:

1. ALL CONCRETE TO BE CLASS "C", F'C = 3,600 PSI.
2. ALL REINFORCING STEEL TO BE GRADE 60.
3. CONSTRUCTION JOINTS TO BE PLACED EVERY 32' MAX OF WALL. PLACE AN EXPANSION JOINT AT EVERY THIRD CONSTRUCTION JOINT LOCATION.
4. FOR WALL DIMENSIONS, WALL HEIGHT "H" SHALL BE ROUNDED UP TO THE NEAREST HEIGHT SHOWN.
5. QUANTITIES SHOWN BASED ON 32' PANEL FOR ESTIMATE PURPOSED ONLY. ADJUST AS REQUIRED FOR SHORTER PANEL LENGTHS.
6. TOP OF LIMESTONE ELEVATION MAY VARY. FOUND FOOTING OF WALL AGAINST BEDROCK SUCH THAT KEY PENETRATES 1'-0" MIN INTO LIMESTONE.

(1) SEE JOINT DETAILS FOR SIZE.

(2) PLACE TOE & KEY AGAINST UNDISTURBED SOIL

STATE OF TEXAS
GODWIN A. ARTHUR
127720
LICENSED
PROFESSIONAL ENGINEER
11/16/2020

HAYS COUNTY TEXAS

Lockwood, Andrews & Newnam, Inc.
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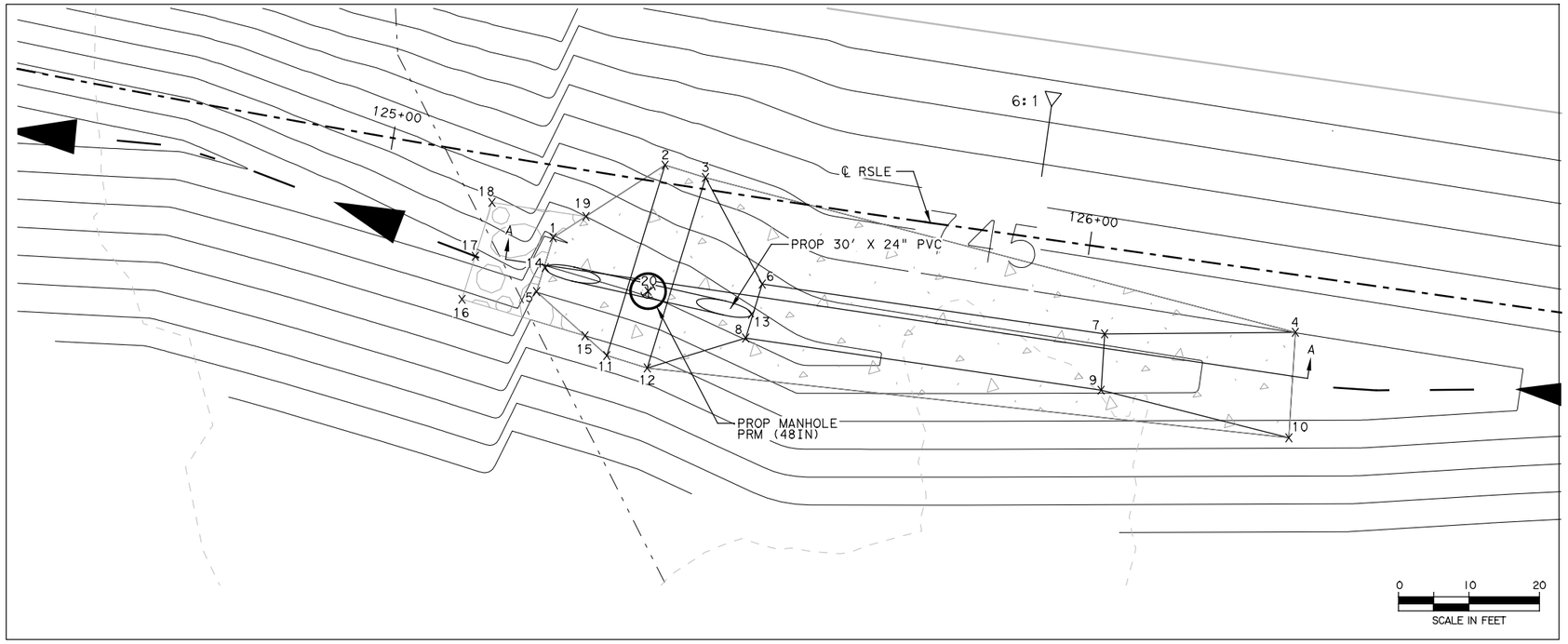
ROBERT S. LIGHT EXTENSION

DETENTION POND I WALL DETAILS

SCALE: NONE

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
GAA	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
GAA	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	187
JAM	0914	33	068	
CHECK				
JAM				

PLOT DRIVER: $PLTDRV$$
USER:
FILE: $PWVARVAULTPATHDESC$
PENTABLE: RSLE.tbl
DATE: $$DATE$$
TIME: 1:20:26 PM
SCALE: $$SCALESHORT$$

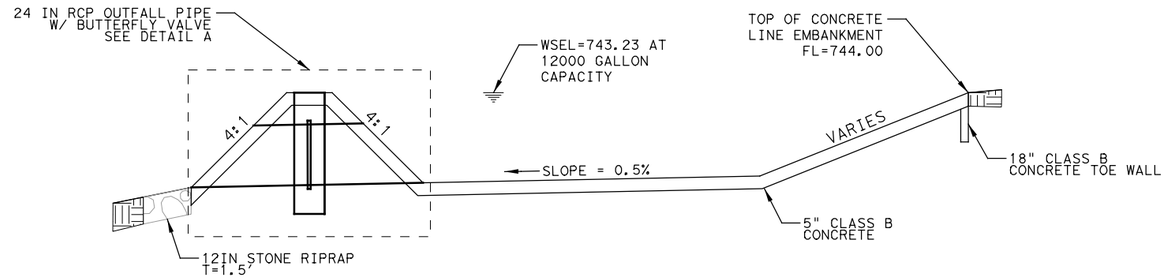


NOTES:
1. CONCRETE RIPRAP SHALL BE CLASS B.

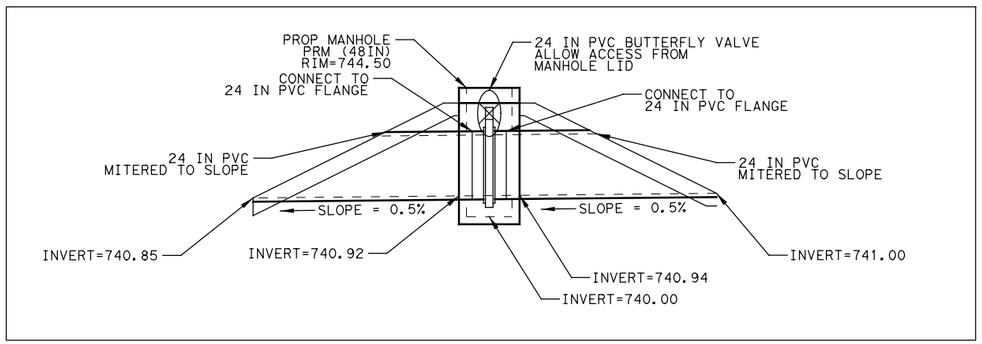
2. HAZ MAT TRAP CAPACITY MEETS OR EXCEEDS 12,000 GALLON REQUIREMENT.

POINT LOCATION TABLE				
POINT NO.	X COORDINATE	Y COORDINATE	ELEVATION	DESCRIPTION
1	2327487.03	13938266.23	741.00	EDGE OF CONC RIPRAP
2	2327491.82	13938282.37	744.00	EDGE OF CONC RIPRAP
3	2327497.42	13938284.63	744.00	EDGE OF CONC RIPRAP
4	2327575.87	13938316.35	744.00	EDGE OF CONC RIPRAP
5	2327487.44	13938263.05	741.00	EDGE OF CONC RIPRAP
6	2327514.41	13938278.72	741.00	BOTTOM OF POND
7	2327553.32	13938300.25	741.22	BOTTOM OF POND
8	2327518.57	13938271.19	741.00	BOTTOM OF POND
9	2327557.49	13938292.72	741.22	BOTTOM OF POND
10	2327583.29	13938302.94	744.00	EDGE OF CONC RIPRAP
11	2327509.30	13938250.77	744.00	EDGE OF CONC RIPRAP
12	2327514.23	13938254.26	744.00	EDGE OF CONC RIPRAP
13	2327514.84	13938277.82	741.00	24 IN PVC FL
14	2327487.24	13938264.64	740.85	24 IN PVC FL
15	2327495.02	13938258.79	742.00	12 IN STONE RIPRAP
16	2327481.01	13938255.29	742.00	12 IN STONE RIPRAP
17	2327480.02	13938263.51	740.62	12 IN STONE RIPRAP
18	2327479.02	13938271.72	742.00	12 IN STONE RIPRAP
19	2327488.62	13938271.57	742.00	12 IN STONE RIPRAP
20	2327501.34	13938271.34	744.50	CENTER OF MANHOLE RIM

LAYOUT



SECTION A-A
N.T.S.



DETAIL A
N.T.S.

NOTES:
1. VALVE TO BE CLOSED ONLY IN THE EVENT OF A SPILL

2. FREEBOARD PROVIDED IN HAZ-MAT TRAP AT 12,000 GALLONS CAPACITY = 0.87 FT

11/20/2020

STATE OF TEXAS
ASHLEY S. HANSON
107373
LICENSED
PROFESSIONAL ENGINEER

HAYS COUNTY TEXAS

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ROBERT S. LIGHT EXTENSION

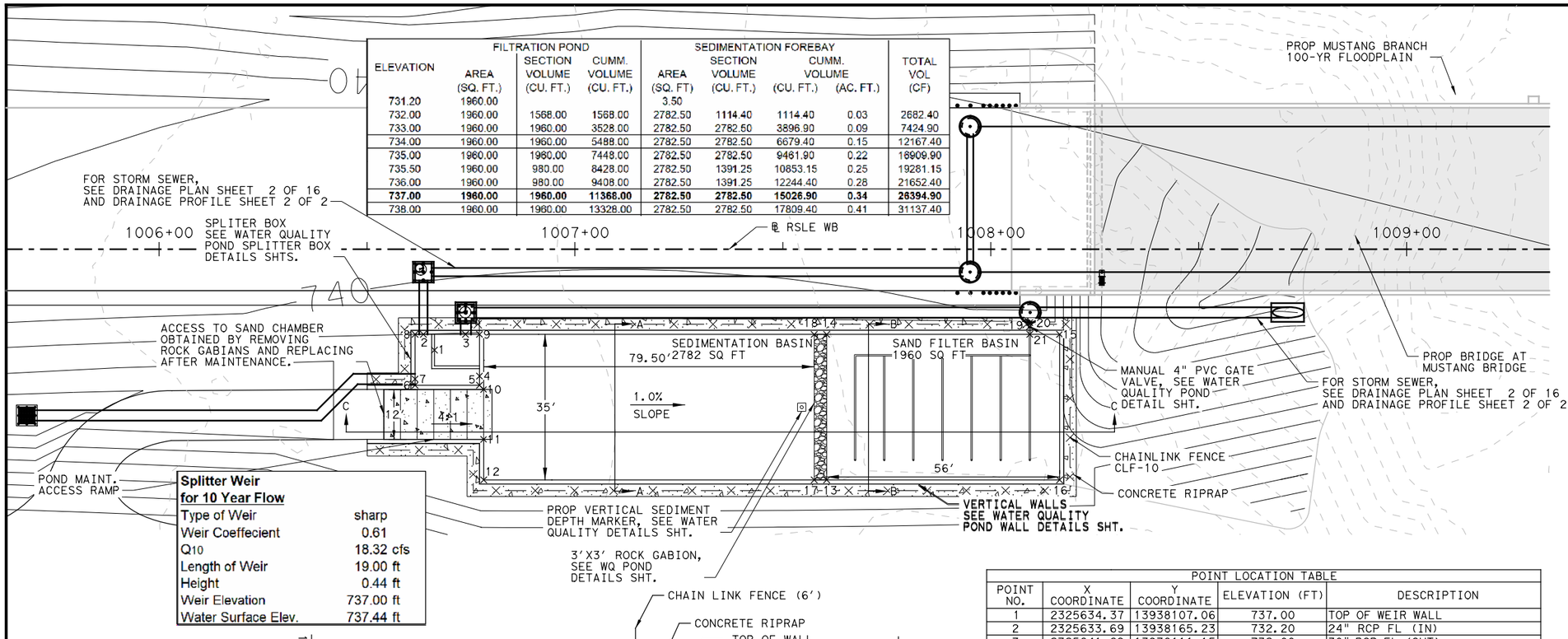
ROBERT S LIGHT
HAZ-MAT TRAP LAYOUT

SHEET 1 OF 1

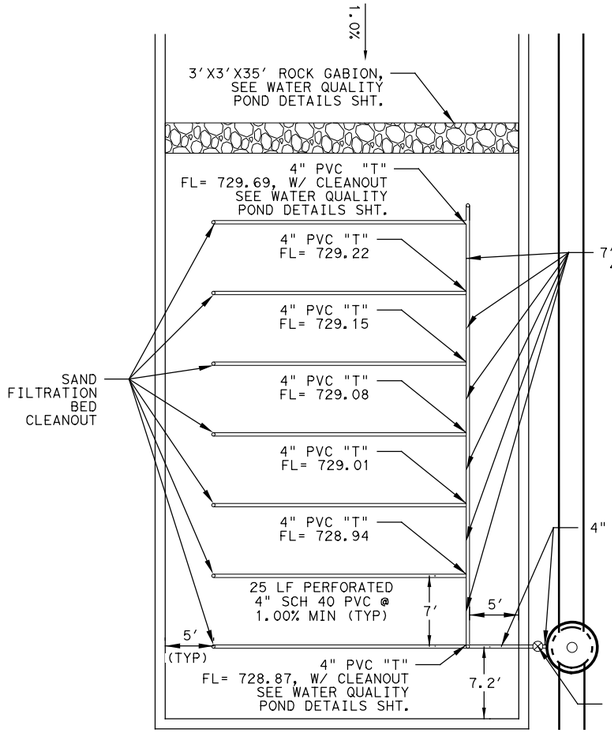
DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	188
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
USER: JLDangerfield
DATE: 11/20/2020
TIME: 12:57:16 PM
SCALE: 1:20
PENTABLE: 0000000002/4615
FILE: $PWVARVAULTPATHDESC$

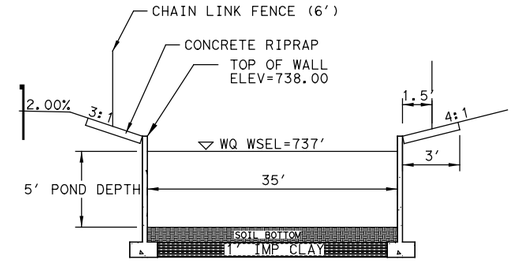
FILTRATION POND				SEDIMENTATION FOREBAY				
ELEVATION	AREA (SQ. FT.)	SECTION VOLUME (CU. FT.)	CUMM. VOLUME (CU. FT.)	AREA (SQ. FT)	SECTION VOLUME (CU. FT.)	CUMM. VOLUME (CU. FT.)	(AC. FT.)	TOTAL VOL (CF)
731.20	1960.00			3.50				
732.00	1960.00	1568.00	1568.00	2782.50	1114.40	1114.40	0.03	2682.40
733.00	1960.00	1960.00	3528.00	2782.50	2782.50	3896.90	0.09	7424.90
734.00	1960.00	1960.00	5488.00	2782.50	2782.50	6679.40	0.15	12167.40
735.00	1960.00	1960.00	7448.00	2782.50	2782.50	9461.90	0.22	16909.90
735.50	1960.00	980.00	8428.00	2782.50	1391.25	10853.15	0.25	19281.15
736.00	1960.00	980.00	9408.00	2782.50	1391.25	12244.40	0.28	21652.40
737.00	**1960.00**	**1960.00**	**11368.00**	**2782.50**	**2782.50**	**15026.90**	**0.34**	**26394.90**
738.00	1960.00	1960.00	13328.00	2782.50	2782.50	17809.40	0.41	31137.40



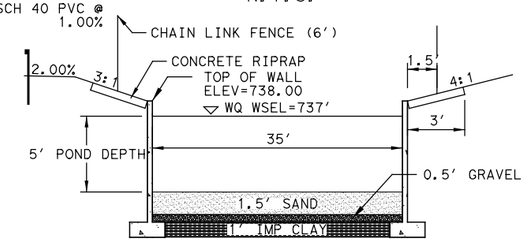
Splitter Weir for 10 Year Flow	
Type of Weir	sharp
Weir Coeffecient	0.61
Q_{10}	18.32 cfs
Length of Weir	19.00 ft
Height	0.44 ft
Weir Elevation	737.00 ft
Water Surface Elev.	737.44 ft



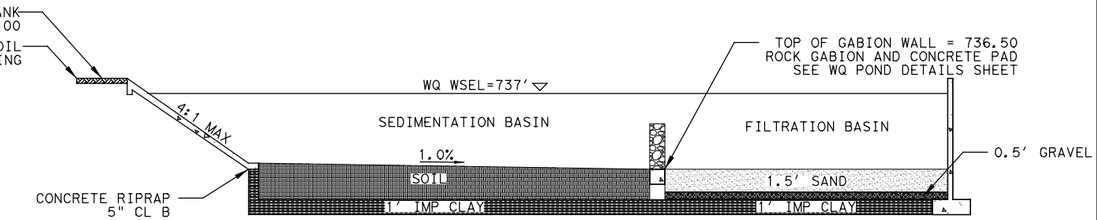
FILTRATION POND
PLAN
N.T.S.



SECTION A-A
N.T.S.



SECTION B-B
N.T.S.



SECTION C-C
N.T.S.

POINT LOCATION TABLE				
POINT NO.	X COORDINATE	Y COORDINATE	ELEVATION (FT)	DESCRIPTION
1	2325634.37	13938107.06	737.00	TOP OF WEIR WALL
2	2325633.69	13938165.23	732.20	24" RCP FL (IN)
3	2325641.69	13938111.15	732.00	30" RCP FL (OUT)
4	2325645.48	13938101.29	732.00	OPENING FL (OUT)
5a	2325645.58	13938099.08	732.00	BOTTOM OF SPLITTER BOX
5b	2325645.58	13938099.08	738.00	TOP OF WALL
6a	2325630.07	13938098.42	732.00	BOTTOM OF SPLITTER BOX
6b	2325630.07	13938098.42	738.00	TOP OF WALL
7	2325632.13	13938099.92	732.20	30" RCP FL (IN)
8a	2325629.55	13938110.63	732.00	BOTTOM OF SPLITTER BOX
8b	2325629.55	13938110.63	738.00	TOP OF WALL
9a	2325645.06	13938111.30	732.00	BOTTOM OF SPLITTER BOX
9b	2325645.06	13938111.30	738.00	TOP OF WALL
10a	2325646.60	13938098.12	732.00	BOTTOM OF POND (TOP OF SOIL)
10b	2325646.60	13938098.12	738.00	TOP OF WALL
11a	2325647.11	13938086.13	732.00	BOTTOM OF POND (TOP OF SOIL)
11b	2325647.11	13938086.13	738.00	TOP OF WALL
12a	2325647.53	13938076.37	732.00	BOTTOM OF POND (TOP OF SOIL)
12b	2325647.53	13938076.37	738.00	TOP OF WALL
13	2325729.95	13938079.89	738.00	TOP OF WALL
13a	2325729.95	13938079.89	731.20	TOP OF SAND BED
14	2325728.46	13938114.86	738.00	TOP OF WALL
14a	2325728.46	13938114.86	731.20	TOP OF SAND BED
15	2325784.41	13938117.25	738.00	TOP OF WALL
15a	2325784.41	13938117.25	731.20	TOP OF SAND BED
16	2325785.90	13938082.28	738.00	TOP OF WALL
16a	2325785.90	13938082.28	731.20	TOP OF SAND BED
17	2325726.96	13938079.76	731.20	BEGIN ROCK GABION
18	2325725.46	13938114.73	731.20	BEGIN ROCK GABION
19	2325777.15	13938118.84	728.80	4" GATE VALVE FL
20	2325777.06	13938119.73	78.79	4" OUTFALL FL
21	2325777.25	13938116.95	728.78	4" OUTFALL FL

LEGEND

- PROP DITCH
- PROP STORM SEWER
- ℄ ALIGNMENT
- ROW
- FLOW ARROW
- PROP BRIDGE

0 15 30
SCALE IN FEET

NOTES:
1. FOR SAND FILTER BED, SEE WATER QUALITY POND DETAILS SHT.
2. FOR MISCELLANEOUS DETAILS, SEE WATER QUALITY POND DETAILS SHT.
3. ACTUAL POND VOLUME IS 23,170.5 CU. FT., SAND FILTER AREA IS 1960 SQ. FT
4. SEE WATER QUALITY POND CALCULATION SHEET FOR METHODS, INPUTS, AND RESULTS
5. FOR STORM SEWER INFORMATION SEE DRAINAGE PLAN SHEET 2 OF 16 AND DRAINAGE PROFILE SHEET 2 OF 2.
6. GATE VALVE TO REMAIN OPEN AND TO BE CLOSED ONLY IN THE EVENT OF A SPILL.
7. POND ACCESS TO BE INSTALLED AT LOCATION SHOWN ON PLANS IN ACCORDANCE WITH CONSTRUCTION EXIT (TYPE 1) AS SHOWN ON EC(3)-16. PAYMENT IN ACCORDANCE WITH THE CONSTRUCTION EXIT ITEM.

12/11/2020

STATE OF TEXAS
ASHLEY S. HANSON
107373
LICENSED
PROFESSIONAL ENGINEER

HAYS COUNTY TEXAS

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ROBERT S. LIGHT EXTENSION

SAND FILTRATION WATER QUALITY POND POND LAYOUT SHEET

SHEET 1 OF 3

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	189
CLH	0914	33	068	
CHECK				
CMC				

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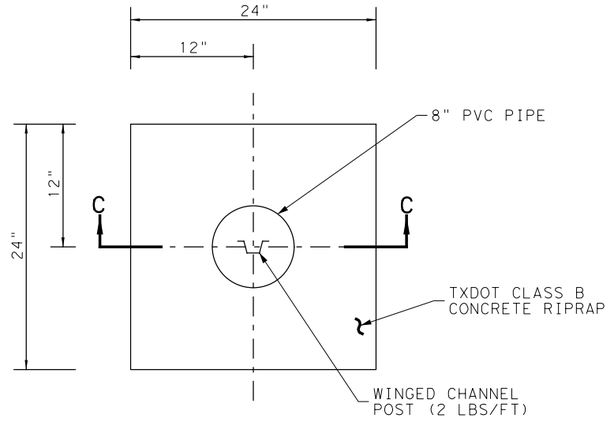
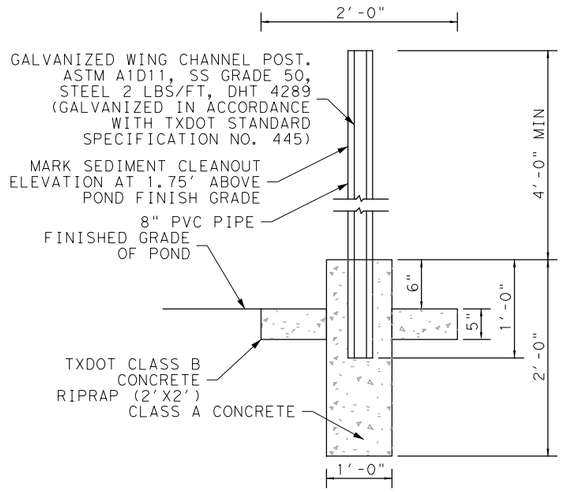


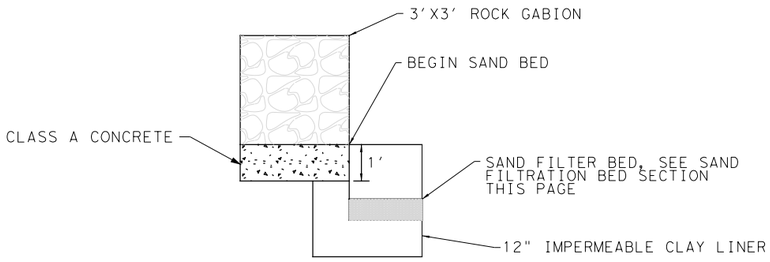
VERTICAL SEDIMENT DEPTH MARKER

N.T.S.



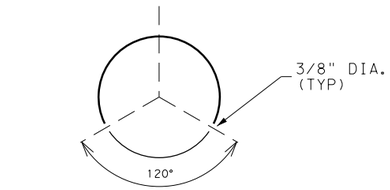
SECTION C-C

N.T.S.



ROCK GABION SECTION

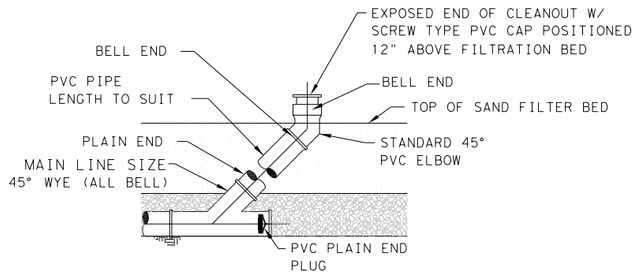
N.T.S.



NOTE: Set Perforations Down

PERFORATION LAYOUT

N.T.S.



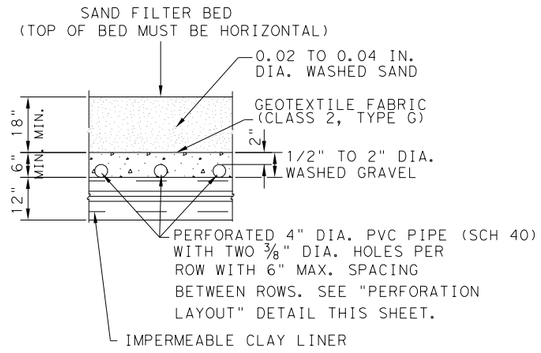
NOTE:
TO BE PLACED ON BEDDING MEETING SPECIFICATION FOR TYPE AND SIZE OF PIPE.

SAND FILTRATION BED CLEAN-OUT

N.T.S.

CLAY LINER SPECIFICATIONS (COA, 2004)

PROPERTY	TEST METHOD	UNIT	SPECIFICATION
PERMEABILITY	ASTM D-2434	CM/SEC	1.E-06
PLASTICITY INDEX OF CLAY	ASTM D-423 & D-424 (TEX-106-E)	%	NOT LESS THAN 15
LIQUID LIMIT OF CLAY	ASTM D-2216 (TEX-104-E)	%	NOT LESS THAN 30
CLAY PARTICLES PASSING	ASTM D-422 (TEX-111-E)	%	NOT LESS THAN 30
CLAY COMPACTION	ASTM D-2216	%	95% OF STANDARD PROCTOR DENSITY



SAND FILTRATION BED SECTION

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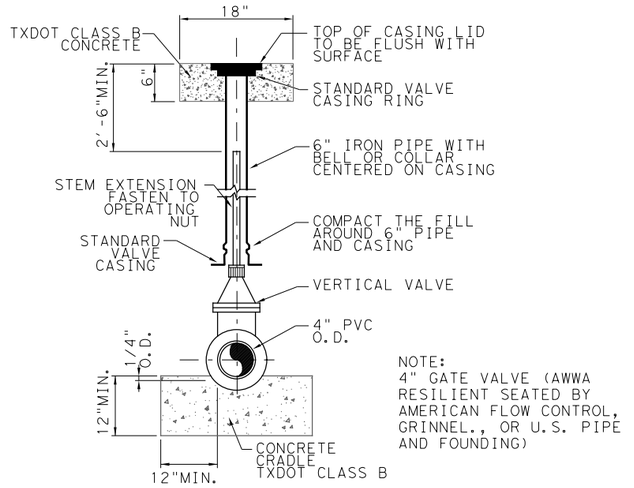

VERTICAL VALVE

TYP. VALVE INSTALLATION DETAIL

SCALE: N.T.S.

11/20/2020

STATE OF TEXAS
ASHLEY S. HANSON
107373
LICENSED
PROFESSIONAL ENGINEER

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ROBERT S. LIGHT EXTENSION

SAND FILTRATION WATER QUALITY POND DETAILS

SHEET 2 OF 3

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	190
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

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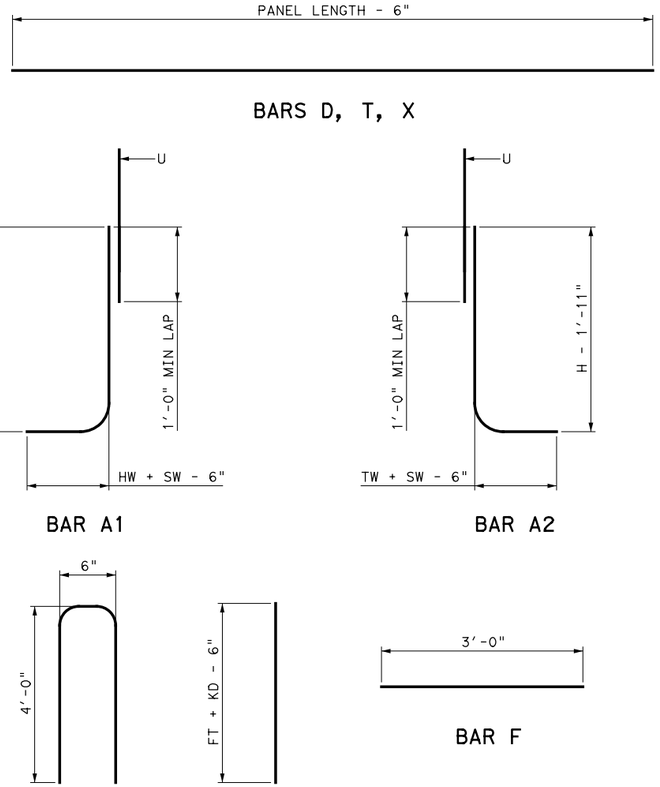
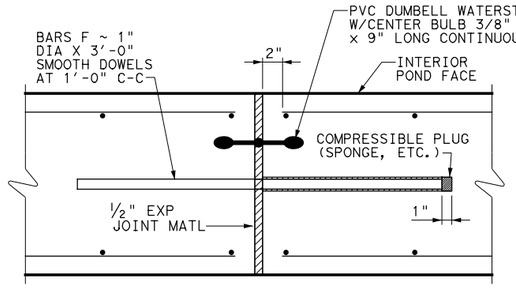
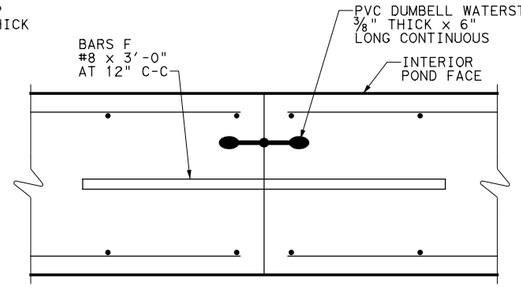


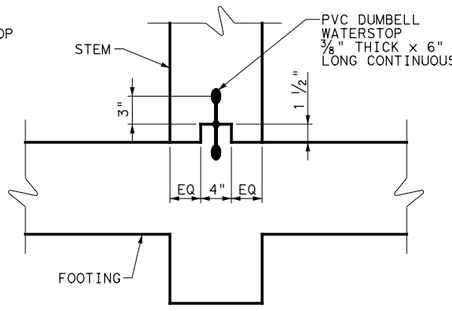
WALL HEIGHT "H"	PROPERTIES						REINFORCING STEEL																		WALL HEIGHT "H"
	WALL DIMENSIONS						A1 ~ 32 #5 AT 12" C-C		A2 ~ 32 #5 AT 12" C-C		C ~ 32 #5 AT 12" C-C		D ~ #5 AT 12" C-C		F ~ #8 AT 12" C-C		T ~ #5 AT 12" C-C		U ~ 32 #5 AT 12" C-C		X ~ #5 AT 12" C-C		Y ~ #5 AT 12" C-C		QUANTITY FOR ONE 32' PANEL		
(FT)	FW	TW	SW	HW	FT	KD	LGTH	WT	LGTH	WT	LGTH	WT	NO	WT	NO	WT	NO	WT	LGTH	WT	NO	WT	LGTH	WT	CONC (CY)	REINF (LB)	(FT)
7	5'-6"	2'-0"	1'-0"	2'-6"	1'-0"	1'-3"	8'-1"	251	7'-7"	268	5'-0"	167	14	460	9	72	10	329	8'-4"	278	1	33	1'-9"	59	15.1	1917	7
8	7'-0"	2'-6"	1'-0"	3'-6"	1'-0"	1'-6"	10'-1"	301	9'-1"	334	6'-6"	217	16	526	10	80	14	460	8'-4"	278	1	33	2'-0"	67	18.4	2296	8
9	7'-6"	3'-0"	1'-0"	3'-6"	1'-0"	2'-0"	11'-1"	351	10'-7"	368	7'-0"	234	18	591	11	88	14	460	8'-4"	278	1	33	2'-6"	83	20.8	2486	9



EXPANSION JOINT



CONSTRUCTION JOINT



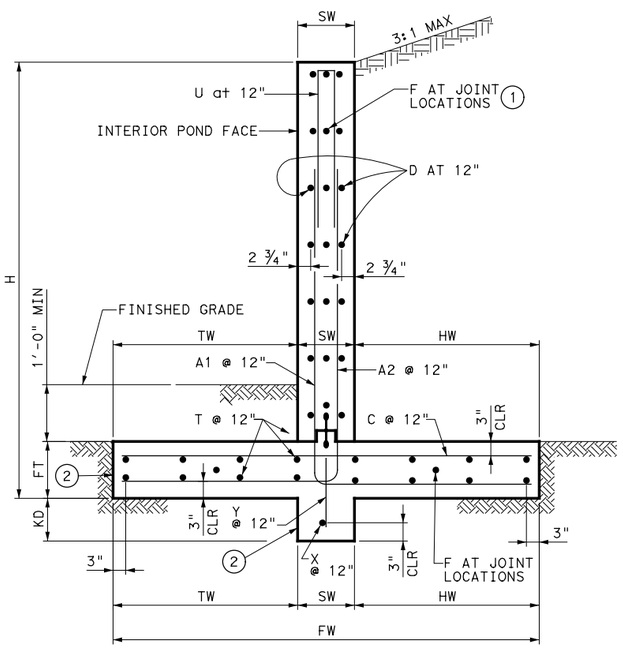
JOINT\WATERSTOP DETAIL

NOTES:

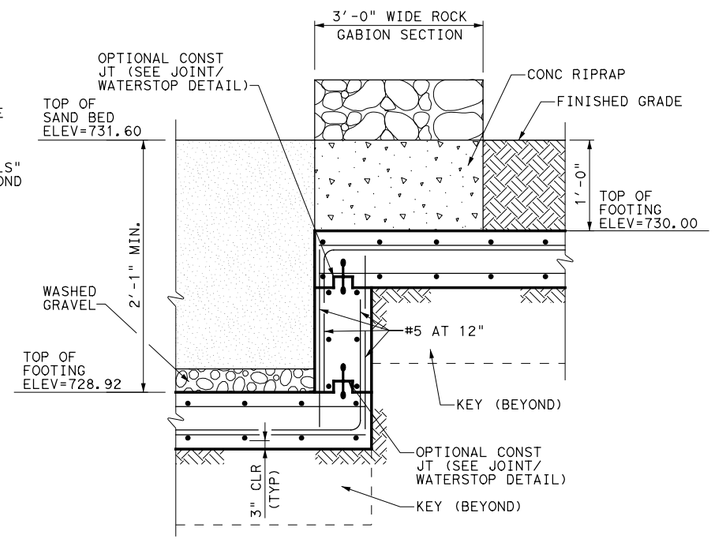
1. ALL CONCRETE TO BE CLASS "C", F'C = 3,600 PSI.
2. ALL REINFORCING STEEL TO BE GRADE 60.
3. SEE " WATER QUALITY POND LAYOUT" SHEET FOR LIMITS AND HEIGHTS OF WALLS.
4. CONSTRUCTION JOINTS TO BE PLACED EVERY 32' MAX OF WALL. PLACE AN EXPANSION JOINT AT EVERY THIRD CONSTRUCTION JOINT LOCATION.
5. FOR WALL DIMENSIONS, WALL HEIGHT "H" SHALL BE ROUNDED UP TO THE NEAREST FOOT.
6. QUANTITIES SHOWN BASED ON 32' PANEL FOR ESTIMATE PURPOSED ONLY. ADJUST AS REQUIRED FOR SHORTER PANEL LENGTHS.
7. REFER TO "WATER QUALITY POND SPLITTER BOX DETAILS" SHEETS FOR ADDITIONAL REINFORCING REQUIRED IN POND WALL STEM AND FOOTING.

(1) SEE JOINT DETAILS FOR SIZE.

(2) PLACE TOE & KEY AGAINST UNDISTURBED SOIL



SECTION



DEPTH TRANSITION DETAIL

(WALL STEMS NOT SHOWN FOR CLARITY, SEE "WATER QUALITY POND LAYOUT" SHEET FOR LOCATION OF APPLICATION)

STATE OF TEXAS
GODWIN A. ARTHUR
127720
LICENSED
PROFESSIONAL ENGINEER
11/16/2020

HAYS COUNTY TEXAS

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ROBERT S. LIGHT EXTENSION

WATER QUALITY POND WALL DETAILS

SCALE: NONE

SHEET 1 OF 1

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	191
CLH	0914	33	068	
CHECK				
CMC				

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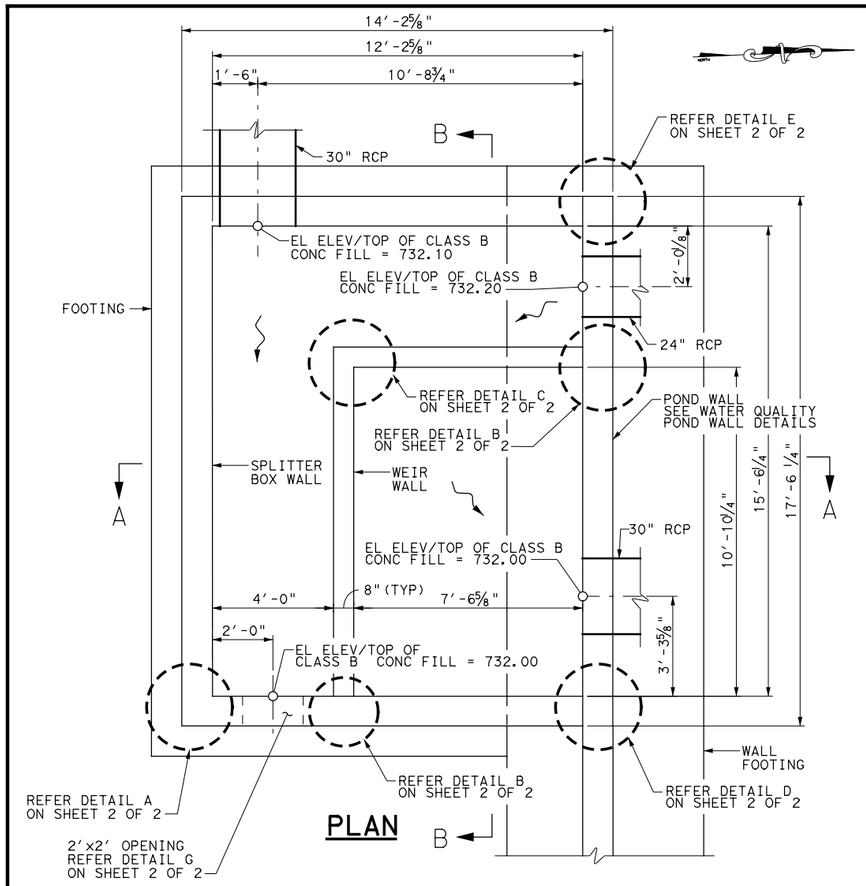
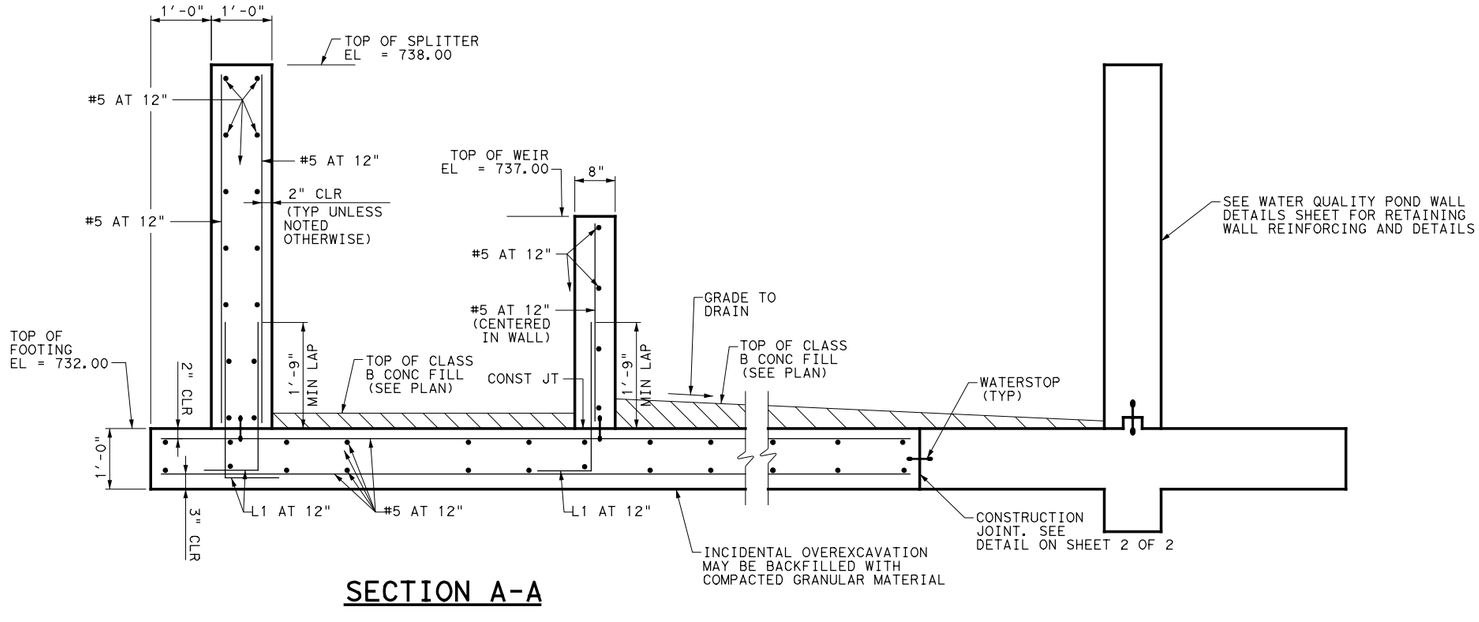


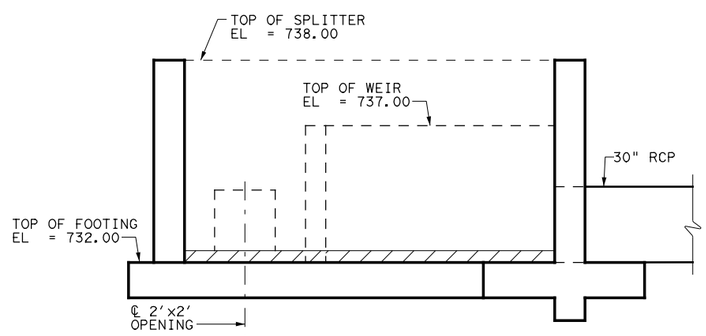
PLAN



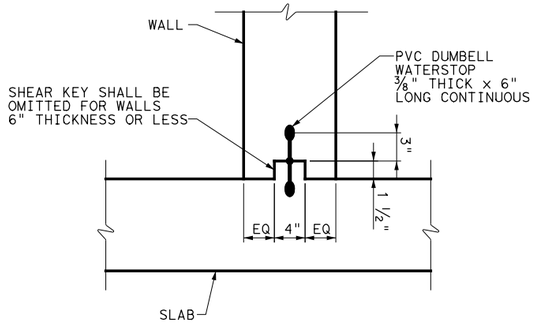
SECTION A-A

GENERAL NOTES:

1. SEE DRAINAGE SHEET "WATER QUALITY POND LAYOUT" FOR LOCATION AND ORIENTATION OF SPLITTER BOX AND LOCATION OF BOXES AND OPENINGS IN THE STRUCTURE. VERIFY ALL DIMENSIONS AND ELEVATIONS WITH DRAINAGE PLANS PRIOR TO CONSTRUCTION.
2. ALL CONCRETE SHALL BE CLASS "C" CONCRETE, F′C = 3,600 PSI, UNLESS NOTED OTHERWISE. CLASS "B" CONCRETE SHALL BE F′C = 2,000 PSI.
3. ALL REINFORCING STEEL SHALL BE GRADE 60.
4. PVC DUMBBELL WATERSTOP SHALL BE PROVIDED TO SLAB-AT-WALL AND WALL-TO-WALL CONSTRUCTION JOINT U.N.O.
5. BARS MAY BE ADJUSTED AT CONFLICTS WITH BOX PENETRATIONS OR OPENINGS.



ELEVATION



JOINT\WATERSTOP DETAIL

STATE OF TEXAS
GODWIN A. ARTHUR
127720
LICENSED
PROFESSIONAL ENGINEER
11/16/2020

HAYS COUNTY TEXAS

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WATER QUALITY POND SPLITTER BOX DETAILS

SCALE:

SHEET 1 OF 2

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	192
CLH	0914	33	068	
CHECK				
CMC				

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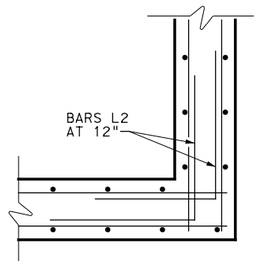
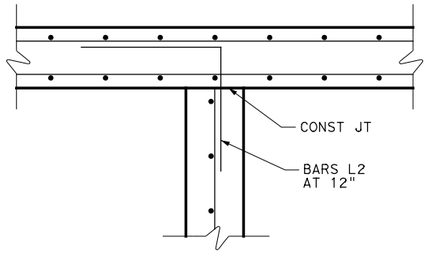
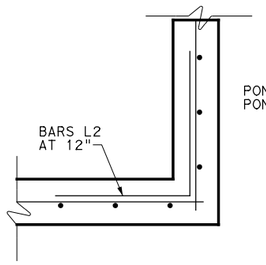


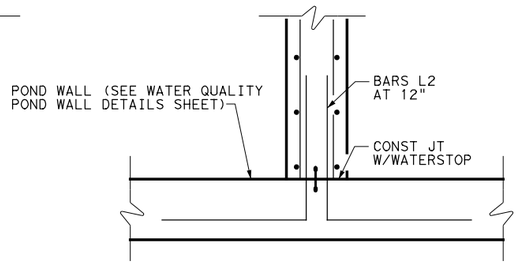
DETAIL A



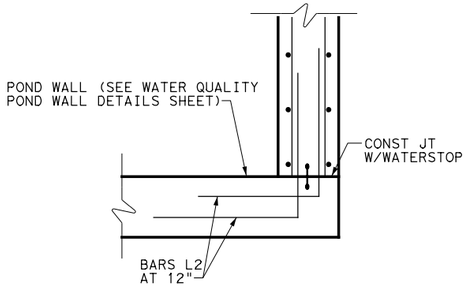
DETAIL B
(NO WATERSTOP REQUIRED)



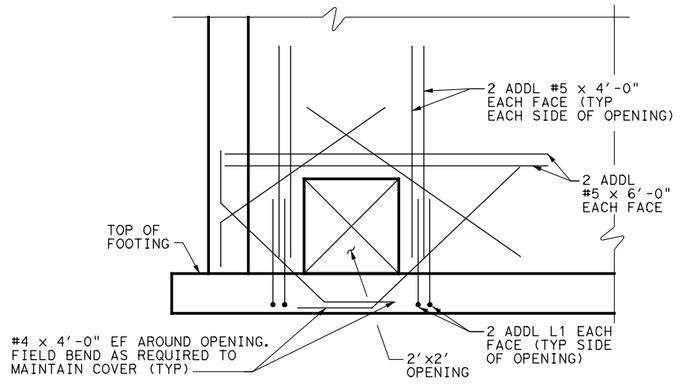
DETAIL C



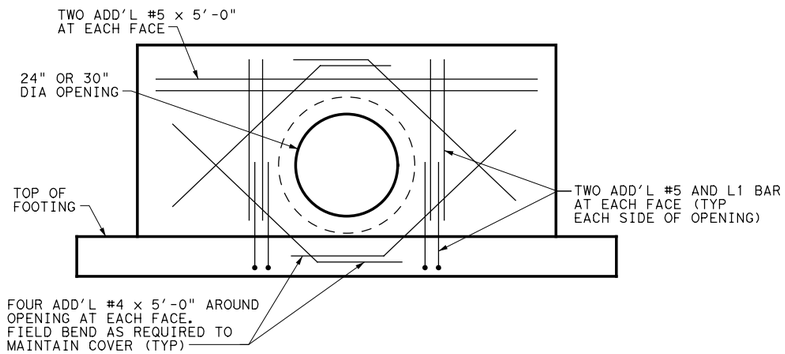
DETAIL D



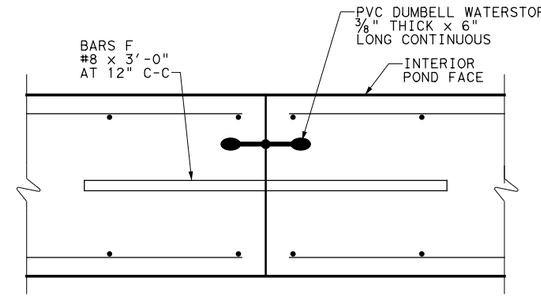
DETAIL E



DETAIL G

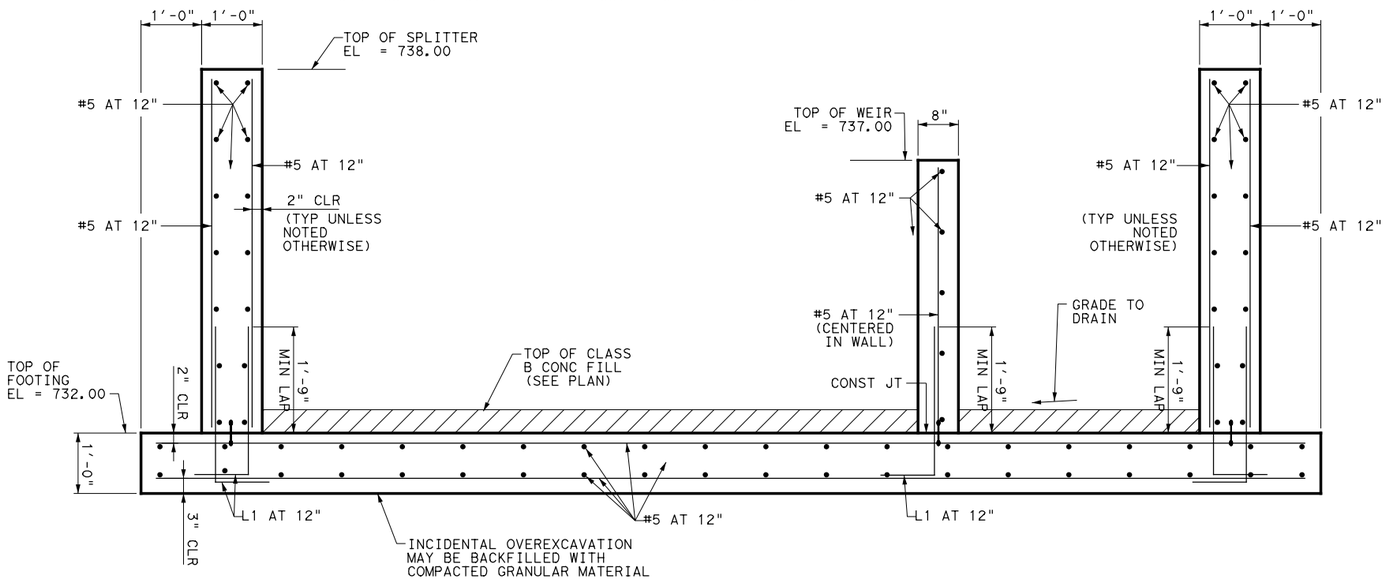


PIPE OPENING DETAIL

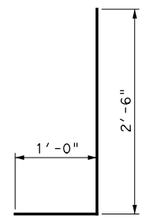


CONSTRUCTION JOINT

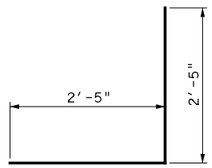
SEE SECTIONS A-A AND B-B FOR TYPICAL WALL AND FOOTING REINFORCEMENT. TYPICAL WALL REINFORCEMENT TO BE CUT TO PROVIDE 2" CLEAR COVER TO OPENING OR BOX



SECTION B-B



BARS L1 (#5)



BARS L2 (#5)

STATE OF TEXAS
GODWIN A. ARTHUR
127720
LICENSED
PROFESSIONAL ENGINEER
11/16/2020

HAYS COUNTY TEXAS

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WATER QUALITY POND SPLITTER BOX DETAILS

SCALE: NONE

SHEET 2 OF 2

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	193
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

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FILE: $PWWARVAULTPATHDESC$

100% PLANS

TCEQ WATER QUALITY CALCULATIONS - REQUIRED LOAD REDUCTION - PROPOSED BUILD-OUT

1. The Required Load Reduction for the total project:			Calculations from RG-348a Pages 21-24
	Page 21 Equation 4.3:	L_M =	27.7(A x P)
where:		$L_{M\ TOTAL\ PROJECT}$ =	Required TSS removal resulting from the proposed development = 80% of load
		A =	Impervious area for the project, acres
		P =	Average annual precipitation, inches
Site Data:	Determine Required Load Removal Based on the Entire Project		
		County =	Hays
		Total project area included in plan * =	19.70 acres
		Predevelopment impervious area within the limits of the plan * =	0.16 acres
		Total post-development impervious area within the limits of the plan* =	3.72 acres
		Total post-development impervious cover fraction * =	0.19
		P =	33 inches
		$L_{M\ TOTAL\ PROJECT}$ =	3,399lbs.
		Number of drainage basins / outfalls areas leaving the plan area =	2

Load Removal Summary

Contributing Drainage Areas	Method of Removal	Removal Efficiency (%)	Load Removed (lbs/yr)
Mustang Branch Bridge	Sand Filter Pond	89.00%	2465
Mustang Branch East	VFS	85.00%	934
		Total Load Removal	3399
		Required Load Reduction	3399

TCEQ WATER QUALITY CALCULATIONS - MUSTANG BRANCH BRIDGE - PROPOSED DESIGN

2. Drainage Basin Parameters:			
		Drainage Basin/Outfall Area No. =	1
		Total drainage basin/outfall area =	3.91 acres
		Predevelopment impervious area within drainage basin/outfall area =	0.16 acres
		Post-development impervious area within drainage basin/outfall area =	2.68 acres
		Post-development impervious fraction within drainage basin/outfall area =	0.69
		$L_{M\ THIS\ BASIN}$ =	2,454lbs.
3. Indicate the proposed BMP Code for this basin.			
		Proposed BMP =	Sand Filter
		Removal efficiency =	89 %
4. Calculate Maximum TSS Load Removed (L_R) for this Drainage Basin by the selected BMP Type.			
	RG-348a Page 22 Equation 4.5:	L_R =	(BMP efficiency) x P x (A_I x 34.6 + A_P x 0.54)
where:		A_C =	Total On-Site drainage area in the BMP catchment area
		A_I =	Impervious area proposed in the BMP catchment area
		A_P =	Pervious area remaining in the BMP catchment area
		L_R =	TSS Load removed from this catchment area by the proposed BMP
		A_C =	3.91 acres
		A_I =	2.68 acres
		A_P =	1.22 acres
		L_R =	2,747lbs
5. Calculate Fraction of Annual Runoff to Treat the drainage basin / outfall area			
		Desired $L_{M\ THIS\ BASIN}$ =	2,465lbs.
		F =	0.90
6. Calculate Capture Volume required by the BMP Type for this drainage basin / outfall area.			Calculations from RG-348a Pages 23-24
		Rainfall Depth =	1.82 inches
		Post Development Runoff Coefficient =	0.63
		On-site Water Quality Volume =	16,366 cubic feet
		Calculations from RG-348a Pages 23-34	
		Off-site area draining to BMP =	0.00 acres
		Off-site Impervious cover draining to BMP =	0.00 acres
		Impervious fraction of off-site area =	0
		Off-site Runoff Coefficient =	0.00
		Off-site Water Quality Volume =	0 cubic feet
		Storage for Sediment =	3,273 cubic feet
		Total Capture Volume (required water quality volume(s) x 1.20) =	19,640 cubic feet
9. Filter area for Sand Filters	Designed as Required in RG-348 Pages		3-58 to 3-63
	9B. Partial Sedimentation and Filtration System		
		Water Quality Volume for combined basins =	19,640 cubic feet
		Minimum filter basin area =	1,637 square feet
		Maximum sedimentation basin area =	6,547 square feet For minimum water depth of 2 feet
		Minimum sedimentation basin area =	409 square feet For maximum water depth of 8 feet

TCEQ WATER QUALITY CALCULATIONS - PROPOSED DESIGN

ID	Station	Drainage Basin/Outfall Area	Total Drainage Basin/Outfall Area	Pre Development Impervious Area within Drainage Basin	Post Development Impervious Area within Drainage Basin	Post Development Pervious Area	Post Development Impervious Fraction within Drainage Basin	Required TSS Load Removed $L_{M\ THIS\ BASIN}$	Maximum TSS Load Removed L_R	Desired TSS Load Removed $L_{M\ THIS\ BASIN}$
		No.	Ac	Ac	Ac	Ac	Unitless	Lbs	Lbs	Lbs
P-1	STA 1023+91 to STA 1027+62	2	0.37	0.00	0.37	0.00	1.00	343	364	364
P-2	STA 1027+62 to STA 1032+89	2	0.53	0.00	0.53	0.00	1.00	485	515	515
P-3	STA 1025+65 to STA 1026+81	2	0.06	0.00	0.06	0.00	1.00	51	54	54

Notes:
1. Proposed BMP = Vegetated Filter Strips
2. Removal Efficiency = 85%
3. RG-348a Page 22 Equation 4.3: $L_{M\ This\ Basin}$ = 27.7 x (A x P)
4. RG-348a Page 22 Equation 4.5: L_R = (BMP efficiency) x P x (A_I x 34.6 + A_P x 0.54)

NOTES:
1. ALL TCEQ WATER QUALITY CALCULATIONS ARE BASED ON PROPOSED DESIGN.
2. REFER TO DRAINAGE REPORT FOR DETAILED WATER QUALITY ANALYSIS AND CALCULATIONS.
3. WATER QUALITY POND SIZING IS BASED ON ULTIMATE BUILD-OUT CONDITIONS. SEE SHEET 2 OF 2

11/16/2020

STATE OF TEXAS
ASHLEY S. HANSON
107373
LICENSED
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HAYS COUNTY TEXAS

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WATER QUALITY TCEQ CALCULATION SHEET PROPOSED DESIGN

SHEET 1 OF 2

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	194
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

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100% PLANS

TCEQ WATER QUALITY CALCULATIONS - REQUIRED LOAD REDUCTION -ULTIMATE DESIGN

1. The Required Load Reduction for the total project:			Calculations from RG-348a Pages 21-24	
	Page 3-29 Equation 3.3:	L_M =	27.7(A x P)	
where:		$L_{M\ TOTAL\ PROJECT}$ =	Required TSS removal resulting from the proposed development = 80% of load	
		A =	Impervious area for the project	
		P =	Average annual precipitation, inches	
Site Data:	Determine Required Load Removal Based on the Entire Project			
		County =	Hays	
	Total project area included in plan * =		19.70	acres
	Predevelopment impervious area within the limits of the plan * =		0.16	acres
	Total post-development impervious area within the limits of the plan* =		6.81	acres
	Total post-development impervious cover fraction * =		0.35	
		P =	33	inches
		$L_{M\ TOTAL\ PROJECT}$ =	6,225	lbs.
	Number of drainage basins / outfalls areas leaving the plan area =		2	

Load Removal Summary

Contributing Drainage Areas	Method of Removal	Removal Efficiency (%)	Load Removed (lbs/yr)
Mustang Branch Bridge	Sand Filter Pond	89.00%	3300
Mustang Branch East	VFS	85.00%	2925
		Total Load Removal	6225
		Required Load Reduction	6225

TCEQ WATER QUALITY CALCULATIONS - MUSTANG BRANCH BRIDGE -ULTIMATE BUILD-OUT

2. Drainage Basin Parameters:				
		Drainage Basin/Outfall Area No. =	1	
	Total drainage basin/outfall area =		4.70	acres
	Post-development impervious area within drainage basin/outfall area =		3.70	acres
	Post-development impervious fraction within drainage basin/outfall area =		0.79	
		$L_{M\ THIS\ BASIN}$ =	3,385	lbs.
3. Indicate the proposed BMP Code for this basin.				
		Proposed BMP =	Sand Filter	
		Removal efficiency =	89	%
4. Calculate Maximum TSS Load Removed (L_R) for this Drainage Basin by the selected BMP Type.				
	RG-348a Page 22 Equation 4.5:	L_R =	(BMP efficiency) x P x (A_I x 34.6 + A_P x 0.54)	
where:		A_C =	Total On-Site drainage area in the BMP catchment area	
		A_I =	Impervious area proposed in the BMP catchment area	
		A_P =	Pervious area remaining in the BMP catchment area	
		L_R =	TSS Load removed from this catchment area by the proposed BMP	
		A_C =	4.70	acres
		A_I =	3.70	acres
		A_P =	1.00	acres
		L_R =	3,778	lbs
5. Calculate Fraction of Annual Runoff to Treat the drainage basin / outfall area				
		Desired $L_{M\ THIS\ BASIN}$ =	3,300	lbs.
		F =	0.87	
6. Calculate Capture Volume required by the BMP Type for this drainage basin / outfall area.			Calculations from RG-348a Pages 23-24	
		Rainfall Depth =	1.55	inches
		Post Development Runoff Coefficient =	0.72	
		On-site Water Quality Volume =	19,029	cubic feet
			Calculations from RG-348a Pages 23-24	
		Off-site area draining to BMP =	0.00	acres
		Off-site Impervious cover draining to BMP =	0.00	acres
		Impervious fraction of off-site area =	0	
		Off-site Runoff Coefficient =	0.00	
		Off-site Water Quality Volume =	0	cubic feet
		Storage for Sediment =	3,806	cubic feet
		Total Capture Volume (required water quality volume(s) x 1.20) =	22,835	cubic feet
9. Filter area for Sand Filters			Designed as Required in RG-348 Pages 3-58 to 3-63	
	9B. Partial Sedimentation and Filtration System			
		Water Quality Volume for combined basins =	22,835	cubic feet
		Minimum filter basin area =	1,903	square feet
		Maximum sedimentation basin area =	7,612	square feet For minimum water depth of 2 feet
		Minimum sedimentation basin area =	476	square feet For maximum water depth of 8 feet

TCEQ WATER QUALITY CALCULATIONS - ULTIMATE BUILD-OUT

ID	Station	Drainage Basin/Outfall Area	Total Drainage Basin/Outfall Area	Pre Development Impervious Area within Drainage Basin	Post Development Impervious Area within Drainage Basin	Post Development Impervious Fraction within Drainage Basin	Required TSS Load Removed $L_{M\ THIS\ BASIN}$	Maximum TSS Load Removed L_R	Desired TSS Load Removed $L_{M\ THIS\ BASIN}$
		No.	Ac	Ac	Ac	Unitless	Lbs	Lbs	Lbs
P-1	STA 1023+91 to STA 1027+62	2	0.37	0.00	0.37	1.00	343	364	364
P-2	STA 1027+62 to STA 1032+89	2	0.53	0.00	0.53	1.00	485	515	515
U-2	STA 1000+85 to STA 1000+61	1	0.61	0.00	0.61	1.00	559	594	594
U-1	STA 1000+75 to STA 1000+71	1	0.64	0.00	0.64	1.00	582	618	618
U-3	STA 1024+40 to STA 1032+89	2	0.86	0.00	0.86	1.00	786	834	834

Notes:
1. Proposed BMP = Vegetated Filter Strips
2. Removal Efficiency = 85%
3. RG-348a Page 22 Equation 4.3: $L_{M\ This\ Basin}$ = 27.7 x (A x P)
4. RG-348a Page 22 Equation 4.5: L_R = (BMP efficiency) x P x (A_I x 34.6 + A_P x 0.54)

NOTES:
1. TCEQ WATERQUALITY CALCULATIONS ARE BASED ON ULTIMATE BUILD-OUT.
2. WATER QUALITY POND SIZING IS BASED ON ULTIMATE BUILD-OUT CONDITIONS.
3. REFER TO DRAINAGE REPORT FOR DETAILED WATER QUALITY ANALYSIS AND CALCULATIONS.
4. PROP SAND FILTRATION POND WILL CONSIST OF PARTIAL SEDIMENTATION WITH 5' BASIN HEIGHT.

11/16/2020

STATE OF TEXAS
ASHLEY S. HANSON
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PROFESSIONAL ENGINEER

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WATER QUALITY TCEQ CALCULATION SHEET ULTIMATE-BUILD-OUT

SHEET 2 OF 2

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	195
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

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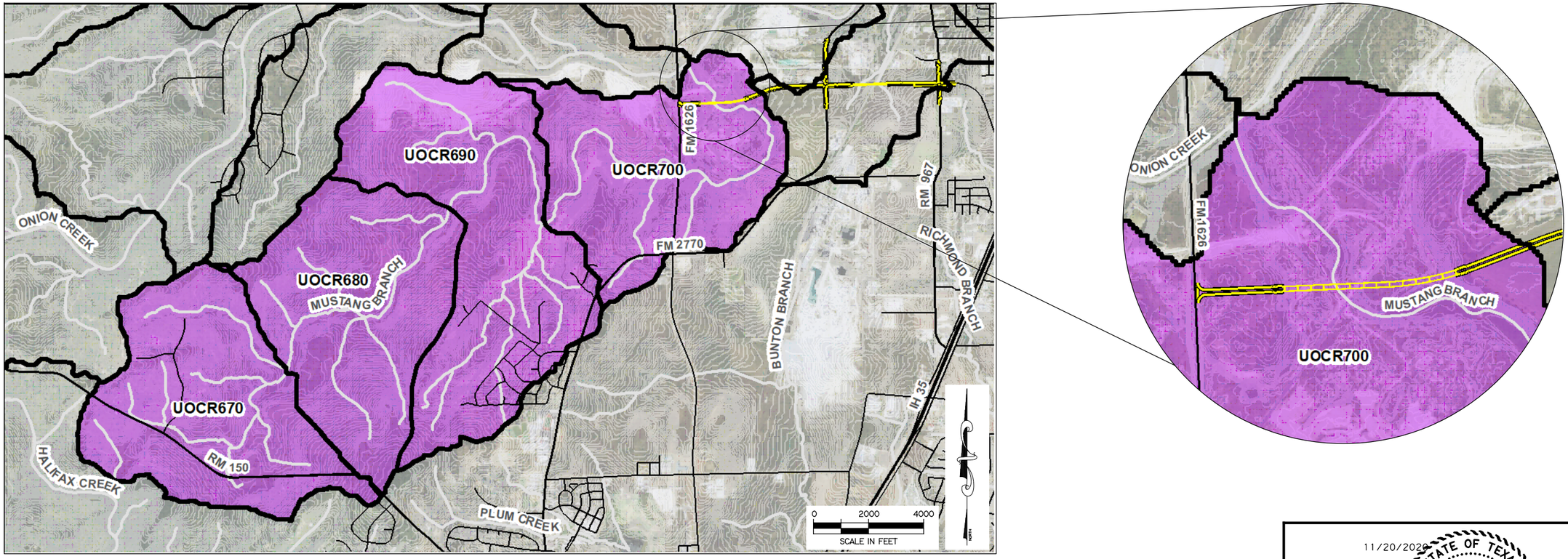
RSLE DRAINAGE AREA AT MUSTANG BRANCH



HYDROLOGIC PARAMETERS

ONION CREEK SUBBASIN	DRAINAGE AREA	DRAINAGE AREA	FREQUENCY EVENT			EXISTING CONDITIONS				PROPOSED CONDITIONS			
			INITIAL ABSTRACTION			SCS LOSS		SNYDER'S TRANSFORM		SCS LOSS		SNYDER'S TRANSFORM	
	(ACRES)	(SQ. MI)	25-YR	50-YR	100-YR	CURVE NUMBER	PERCENT IMPERVIOUS	LAG (HR)	PEAKING COEFFICIENT	CURVE NUMBER	PERCENT IMPERVIOUS	LAG (HR)	PEAKING COEFFICIENT
UOCR670	1299	2.03	1.5	1.0	0.5	83	5.00	0.50	0.75	83	5.00	0.50	0.75
UOCR680	1300	2.03	1.5	1.0	0.5	83	5.00	1.08	0.75	83	5.00	1.08	0.75
UOCR690	1630	2.55	1.5	1.0	0.5	83	15.00	0.80	0.75	83	15.00	0.80	0.75
UOCR700	1238	1.93	1.5	1.0	0.5	82	35.00	1.23	0.75	82	35.00	1.23	0.75

RUNOFF TABLE

FREQUENCY EVENT	24-HR RAINFALL DEPTH (IN)	EXISTING PEAK DISCHARGE (CFS)				PROPOSED PEAK DISCHARGE (CFS)			
		UOCR670	UOCR680	UOCR690	UOCR700	UOCR670	UOCR680	UOCR690	UOCR700
25-YR	9.10	4758	2981	4623	2779	4758	2981	4623	2779
50-YR	11.00	5938	3813	5781	3466	5938	3813	5781	3466
100-YR	13.20	7063	4617	6903	4159	7063	4617	6903	4159

DISCHARGE AT MUSTANG BRANCH

FREQUENCY EVENT	PEAK DISCHARGE AT BRIDGE (CFS)	
	EXISTING	PROPOSED
25-YR	8290	8290
50-YR	11090	11090
100-YR	13710	13710

NOTES:
1. PRE-PROJECT HYDROLOGY TAKEN FROM USACE ONION CREEK HYDROLOGIC STUDY.
2. CURVE NUMBERS USED TO ESTIMATE INFILTRATION LOSSES WITH CALIBRATED INITIAL ABSTRACTIONS PER FREQUENCY.
3. SNYDER'S UNIT HYDROGRAPH USED FOR UNIT HYDROGRAPH METHOD
4. POST-PROJECT PEAK DISCHARGES EQUAL TO OR LESS THAN PRE-PROJECT PEAK DISCHARGES.
5. NOAA ATLAS 14 RAINFALL DATA APPLIED FOR PEAK DISCHARGE CALCULATIONS.

11/20/2020

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MUSTANG BRANCH BRIDGE HYDROLOGY DATA AND DRAINAGE AREA MAP

SHEET 1 OF 1

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	196
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CLH	0914	33	068	
CHECK				
CMC				

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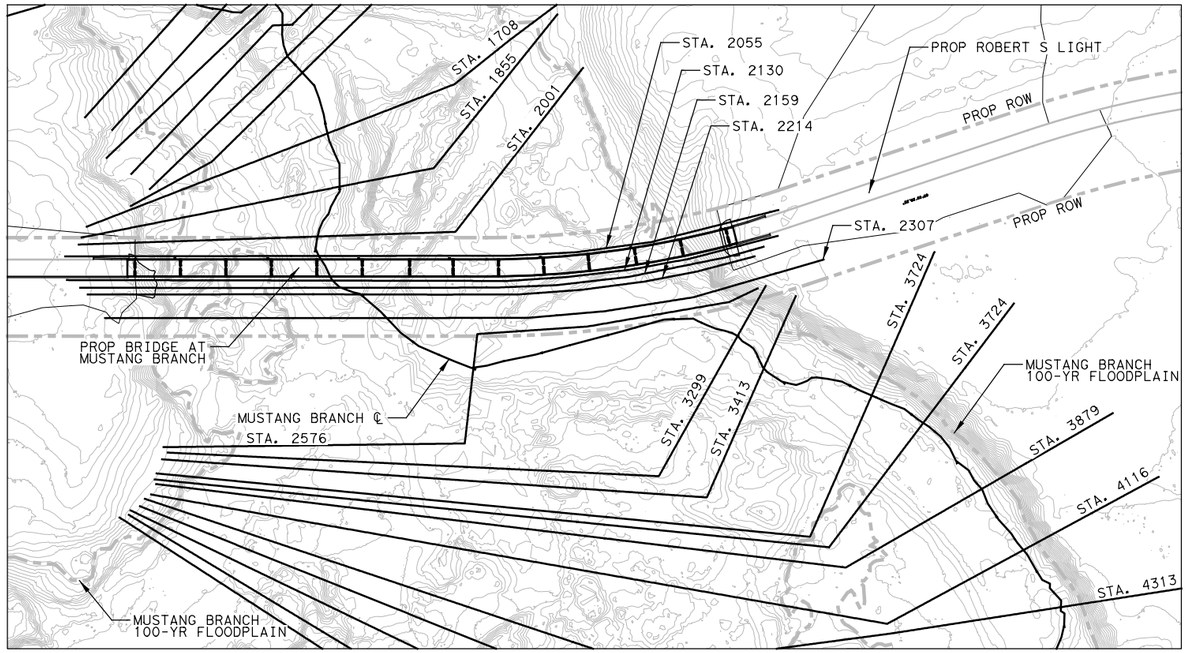
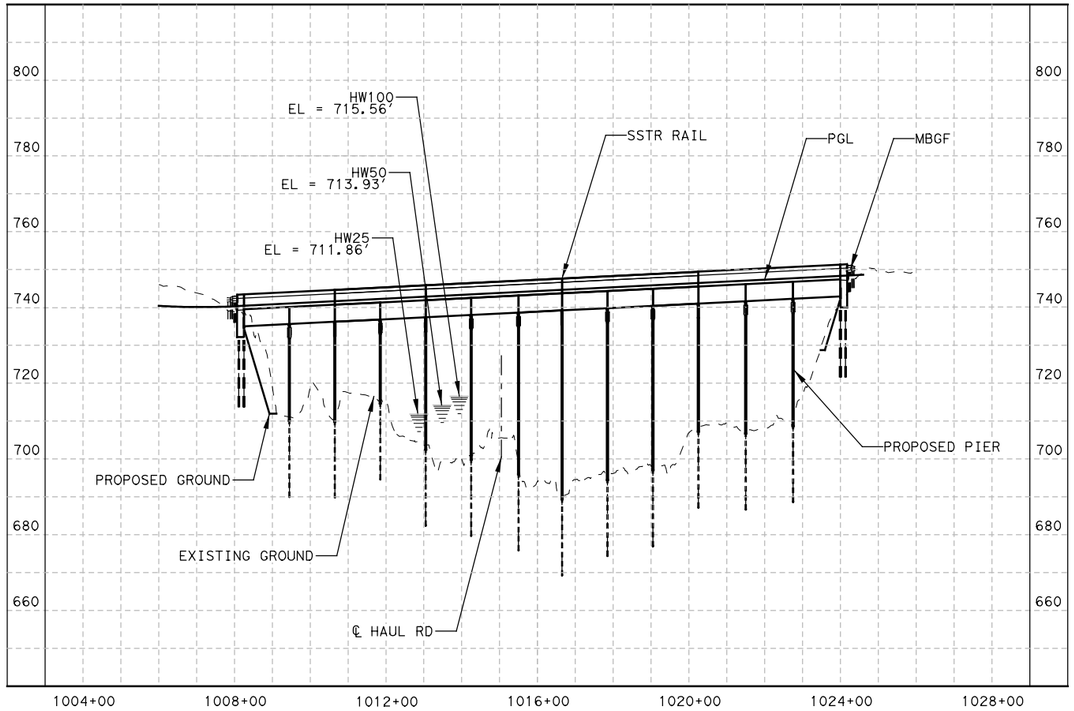
HYDRAULIC CROSS SECTION LAYOUT



BRIDGE SECTION



HYDRAULIC CALCULATIONS

STREAM STATION	DESC	FREQUENCY	EXISTING CONDITIONS				PROPOSED CONDITIONS				
			FLOWLINE ELEV	Q	CHANNEL VELOCITY	WS ELEV	FLOWLINE ELEV	Q	CHANNEL VELOCITY	WS ELEV	RISE FROM EXISTING
(FT)		(YR)	(FT)	(CFS)	(FT/S)	(FT)	(FT)	(CFS)	(FT/S)	(FT)	
3482		25	700.65	8290	4.82	712.65	700.65	8290	4.8	712.69	0.04
3482		50	700.65	11090	5.29	714.44	700.65	11090	5.28	714.47	0.03
3482		100	700.65	13710	5.66	715.96	700.65	13710	5.65	715.99	0.03
3413		25	700.49	8290	4.85	712.49	700.49	8290	4.83	712.53	0.04
3413		50	700.49	11090	5.4	714.27	700.49	11090	5.38	714.3	0.03
3413		100	700.49	13710	5.72	715.82	700.49	13710	5.7	715.85	0.03
3299		25	700.2	8290	3.91	712.39	700.2	8290	3.89	712.43	0.04
3299		50	700.2	11090	4.32	714.19	700.2	11090	4.31	714.23	0.04
3299		100	700.2	13710	4.63	715.75	700.2	13710	4.62	715.79	0.04
2576		25	699.11	8290	1.92	712.01	699.11	8290	1.9	712.05	0.04
2576		50	699.11	11090	1.68	714.04	699.11	11090	1.67	714.08	0.04
2576		100	699.11	13710	1.75	715.66	699.11	13710	1.74	715.7	0.04
2307		25	698.51	8290	1.66	711.92	698.51	8290	1.65	711.96	0.04
2307		50	698.51	11090	1.7	713.97	698.51	11090	1.69	714.01	0.04
2307		100	698.51	13710	1.77	715.59	698.51	13710	1.76	715.63	0.04
2214		25	698.64	8290	2.16	711.86	698.64	8290	2.14	711.91	0.05
2214		50	698.64	11090	2.14	713.92	698.64	11090	2.13	713.96	0.04
2214		100	698.64	13710	2.19	715.55	698.64	13710	2.18	715.59	0.04
2159		25	697.84	8290	2.15	711.83	697.84	8290	2.13	711.88	0.05
2159		50	697.84	11090	2.13	713.9	697.84	11090	2.12	713.94	0.04
2159		100	697.84	13710	2.19	715.54	697.84	13710	2.18	715.58	0.04
2130	10' US OF ML	25	697.84	8290	2.15	711.81	697.84	8290	2.13	711.86	0.05
2130		50	697.84	11090	2.12	713.89	697.84	11090	2.11	713.93	0.04
2130		100	697.84	13710	2.18	715.52	697.84	13710	2.17	715.56	0.04
2055	10' DS OF ML	25	697.89	8290	1.82	711.78	697.89	8290	1.82	711.78	0
2055		50	697.89	11090	1.9	713.87	697.89	11090	1.9	713.87	0
2055		100	697.89	13710	1.99	715.51	697.89	13710	1.99	715.51	0
2001		25	696.64	8290	2.38	711.75	696.64	8290	2.38	711.75	0
2001		50	696.64	11090	2.27	713.84	696.64	11090	2.27	713.84	0
2001		100	696.64	13710	2.22	715.49	696.64	13710	2.22	715.49	0

0 200 400
SCALE IN FEET

NOTES:
1. REFER TO DRAINAGE REPORT FOR DETAILED HYDROLOGIC AND HYDRAULIC ANALYSIS.
2. HYDRAULIC MODELING CONDUCTED IN HEC-RAS VERSION 4.1.0
3. H&H FILES WILL BE SENT TO THE LOCAL FLOODPLAIN ADMINISTRATOR TOM POPE, WHEN DESIGN IS COMPLETED.
4. ADDITIONAL XS SHOWN FOR REFERENCE ONLY.

11/20/2020

STATE OF TEXAS
ASHLEY S. HANSON
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HAYS COUNTY TEXAS

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ROBERT S. LIGHT EXTENSION

MUSTANG BRANCH BRIDGE HYDRAULIC DATA SHEET

SCALE: 1"=400'

SHEET 1 OF 1

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	197
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
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SCOUR CALCULATIONS

HEC-18 (5th Edition-2012)

Contraction Scour In Cohesive Materials

$$y_{s-ult} = 0.94 y_1 \left(\frac{1.83 V_2}{\sqrt{g y_1}} - \frac{K_u \sqrt{\tau_c / \rho_w}}{g n y_1^{1/3}} \right) \quad (6.6)$$

where:

- y_1 = Upstream average flow depth (ft, m)
- V_2 = Average flow velocity in the contracted section (ft/s, m/s)
- τ_c = Critical shear stress (lb/ft^2, N/m^2)
- n = Manning n
- K_u = 1.486 for U.S. Customary units and 1.0 for S.I.

Min		
y_1	10.83	ft
V_2	2.2	ft/s
τ_c	1.46	lb/ft^2
n	0.06	
K_u	1.486	

$Y_{s\text{-ult}}$ = 0.00

Max		
y_1	10.83	ft
V_2	2.2	ft/s
τ_c	0.02	lb/ft^2
n	0.06	
K_u	1.486	

$Y_{s\text{-ult}}$ = 1.83

HEC-18 (5th Edition-2012)

Pier Scour In Cohesive Materials

$$y_s = 2.2 K_1 K_2 a^{0.65} \left(\frac{2.6 V_1 - V_c}{\sqrt{g}} \right)^{0.7} \quad (7.35)$$

where y_s, K_1, K_2, a, and V_1 are in either US Customary or SI units defined as in Equation 7.1 and:

- V_c = Critical velocity for initiation of erosion of the cohesive material, ft/s (m/s)
- g = Acceleration due to gravity (32.2 ft/s^2, 9.81 m/s^2)

Table 7.1. Correction Factor, K_1, for Pier Nose Shape.

Shape of Pier Nose	K_1
(a) Square nose	1.1
(b) Round nose	1.0
(c) Circular cylinder	1.0
(d) Group of cylinders	1.0
(e) Sharp nose	0.9

Table 7.2. Correction Factor, K_2, for Angle of Attack, 2, of the Flow.

Angle	L/a=4	L/a=8	L/a=12
0	1.0	1.0	1.0
15	1.5	2.0	2.5
30	2.0	2.75	3.5
45	2.3	3.3	4.3
90	2.5	3.9	5.0

Angle = skew angle of flow
L = length of pier

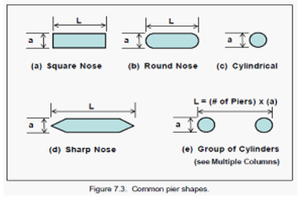


Figure 7.3. Common pier shapes.

Vc=
5.72
based on V1

Min		
K_1	1	Nose Shape
K_2	2.3	Angle Coef
a	3	Pier Width, (ft)
V_1	2.2	Velocity, (ft/s)
V_c	5.7	Critical Velocity, (ft/s)
g	32.2	

y_s = 0.00

Max		
K_1	1	Nose Shape
K_2	2.3	Angle Coef
a	3	Pier Width, (ft)
V_1	2.2	Velocity, (ft/s)
V_c	2.0	Critical Velocity, (ft/s)
g	32.2	

y_s = 7.74

shear stress converstion: 1 Pa = 0.0208 lb/ft^2

	(Low)		(High)	
Shear Range (τc)	1	_ TO _	70	(Pa)
Convertion -->	0.021	_ TO _	1.46	(lb/ft^2)

Velocity converstion: 1 m/s = 3.28 ft/s

	(Low)		(High)	
Velocity Range (V_c)	0.6	_ TO _	4	(M/s)
Convertion -->	2.0	_ TO _	13.1	(ft/s)

Half of ys: 3.87

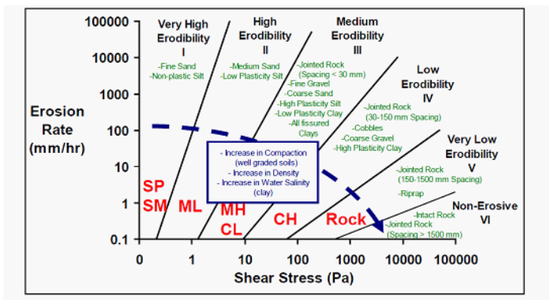


Figure 6.11. Generalized relationships for scour in cohesive materials (Briaud et al. 2011).

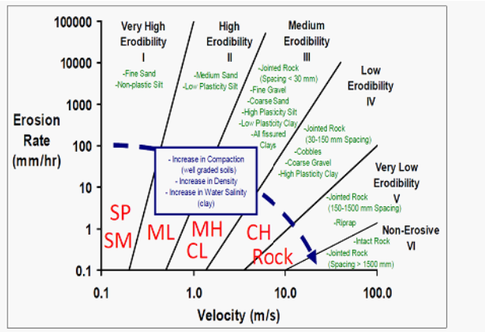


Figure 4.7. Erosion rate vs. velocity for a wide range of geomaterials (Briaud et al. 2011).

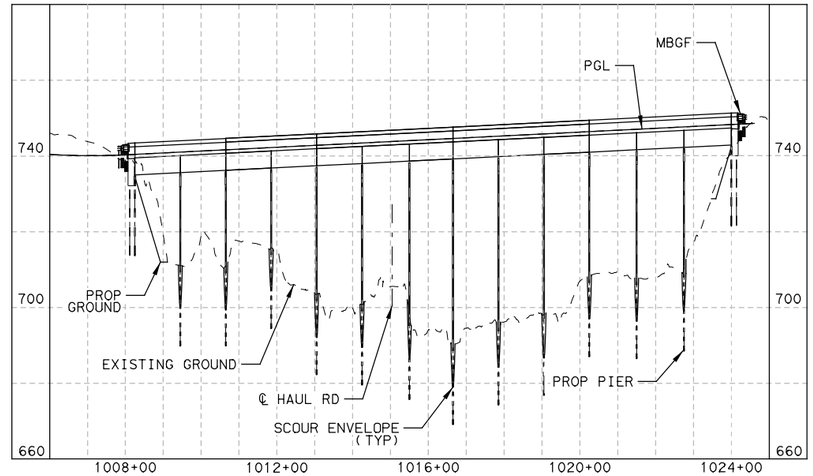
Boring Id**	Texas Cone Penetrometer		Soil Strata under Clays
	0-5 ft depth	5-10 ft depth	
B-4	5 (6), 7(6)	7 (6), 9 (6)	Limestone at -13.5 ft
B-5	9 (6), 8 (6)	7 (6), 10 (6)	Shale at -17 ft
B-6	6 (6), 8 (6)	6 (6), 8 (6)	Shale at -23 ft
B-7	50 (0.25) 50(0)	50 (0), 50(0)	Limestone at -7.5 ft

SCOUR RESULTS

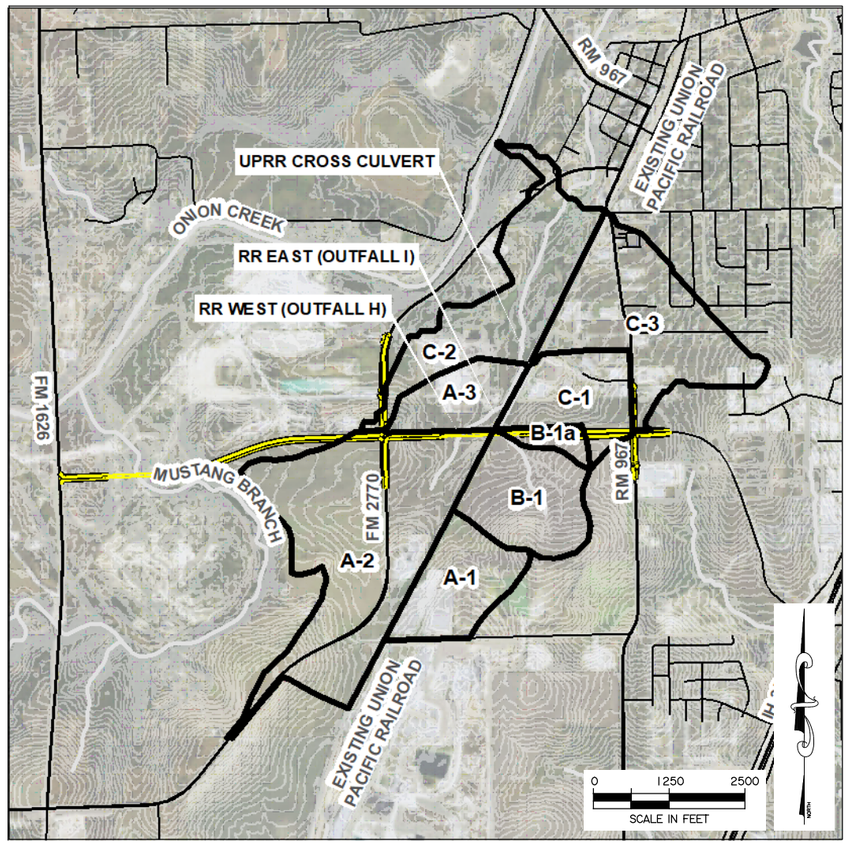
LOCATION	100-YR STORM FREQUENCY SCOUR RESULTS		
	CONTRACTION SCOUR (FT) (FOR LOWER BOUND Tc)	PIER SCOUR (FT) (FOR LOWER BOUND Tc)	TOTAL SCOUR (FT) (FOR LOWER BOUND Tc)
MUSTANG BRANCH	1.83	3.87	5.70

NOTE: REFER TO BRIDGE PROFILE SHEETS FOR DEPTH OF LIMESTONE.

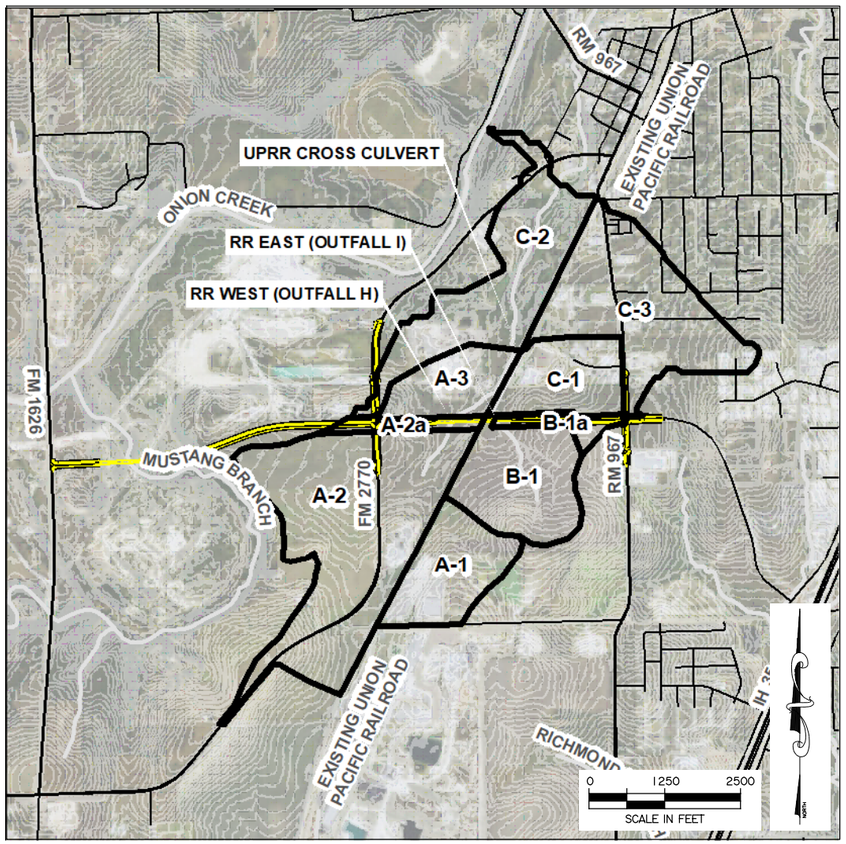
BRIDGE SECTION



RSLE EXISTING DRAINAGE AREAS AT UPRR



RSLE PROPOSED DRAINAGE AREAS AT UPRR



HYDROLOGIC PARAMETERS

EXISTING CONDITIONS						
DRAINAGE AREA ID	AREA (ACRE)	AREA (SQ. MI)	T_c (MIN)	LAG TIME (MIN)	BASE CN	PERCENT IMPERVIOUS
A-1	63.24	0.10	32.82	19.69	77	25.64
A-2	224.84	0.35	45.96	27.58	78	4.87
A-3	43.39	0.07	32.00	19.20	84	3.12
B-1	73.88	0.12	19.69	11.81	80	0.54
B-1a	11.94	0.02	25.61	15.37	80	0.01
C-1	59.64	0.09	39.12	23.47	80	16.19
C-2	116.42	0.18	58.20	34.92	76	2.88
C-3	134.73	0.21	44.50	26.70	80	7.94

HYDROLOGIC PARAMETERS

PROPOSED CONDITIONS						
DRAINAGE AREA ID	AREA (ACRE)	AREA (SQ. MI)	T_c (MIN)	LAG TIME (MIN)	BASE CN	PERCENT IMPERVIOUS
A-1	63.24	0.10	32.82	19.69	77.00	25.64
A-2	212.22	0.33	45.96	27.58	78.00	5.20
A-2a	12.62	0.02	7.32	4.39	80.00	44.86
A-3	43.39	0.07	32.00	19.20	84.00	3.16
B-1	81.12	0.13	19.69	11.81	80.00	0.40
B-1a	12.84	0.02	9.08	5.45	80.00	36.27
C-1	52.94	0.08	35.23	21.14	80.00	18.26
C-2	116.42	0.18	58.48	35.09	76.00	3.20
C-3	131.15	0.20	44.41	26.65	80.00	8.20

RUNOFF TABLE

FREQUENCY EVENT	24-HR RAIN (IN)	EXISTING PEAK DISCHARGE (CFS)								PROPOSED PEAK DISCHARGE (CFS)							
		A-1	A-2	A-3	B-1	B-1a	C-1	C-2	C-3	A-1	A-2	A-3	B-1	B-1a	C-1	C-2	C-3
25-YR	9.09	274	769	199	397	57	241	332	478	274	726	199	428	92	232	332	478
50-YR	11	341	986	246	500	72	301	434	602	341	931	246	539	112	288	433	603
100-YR	13.1	406	1,191	290	597	86	358	530	721	406	1,125	290	643	131	341	529	722

NOTES:
1. NRCS METHODS USED FOR HYDROLOGIC ANALYSIS.
2. CURVE NUMBERS USED TO ESTIMATE INFILTRATION LOSSES WITH CALIBRATED INITIAL ABSTRACTIONS PER FREQUENCY.
3. NRCS 24-HOUR DURATION UNIT HYDROGRAPH USED FOR UNIT HYDROGRAPH METHOD.
4. NOAA ATLAS 14 RAINFALL DATA APPLIED FOR PEAK DISCHARGE CALCULATION.

11/20/2020

STATE OF TEXAS
ASHLEY S. HANSON
107373
LICENSED
PROFESSIONAL ENGINEER

HAYS COUNTY TEXAS

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY
Texas Registered Engineering Firm F-2614

Texas Department of Transportation
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ROBERT S. LIGHT EXTENSION

UPRR BRIDGE HYDROLOGY DATA AND DRAINAGE AREA MAP

SHEET 1 OF 1

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	199
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

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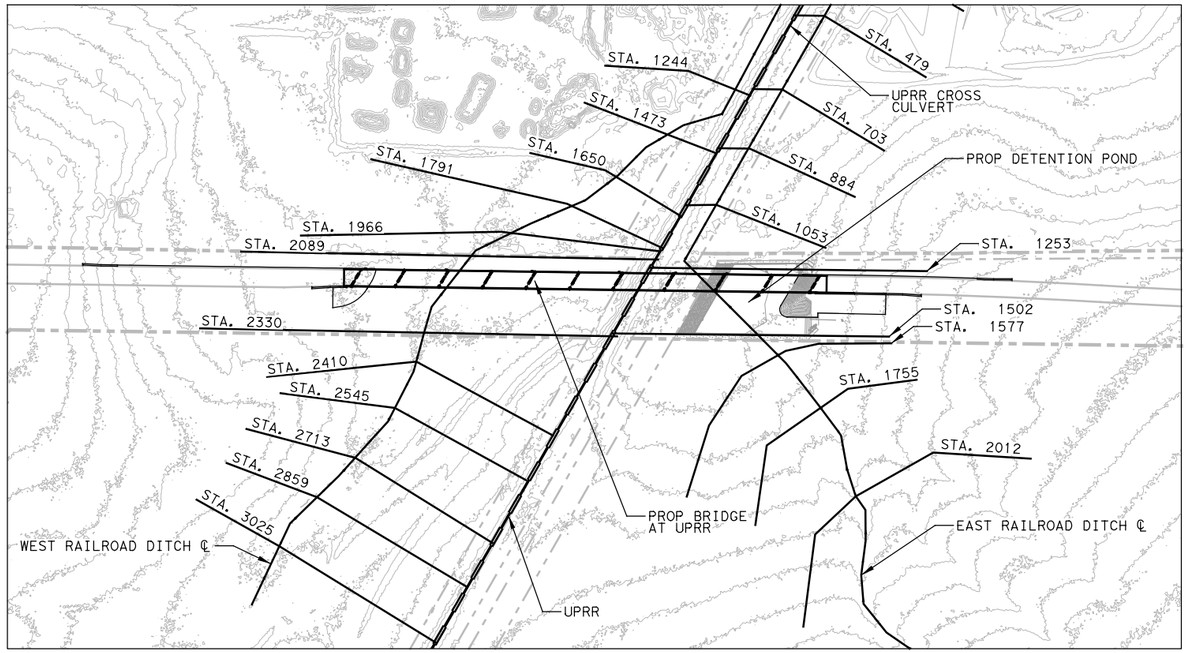
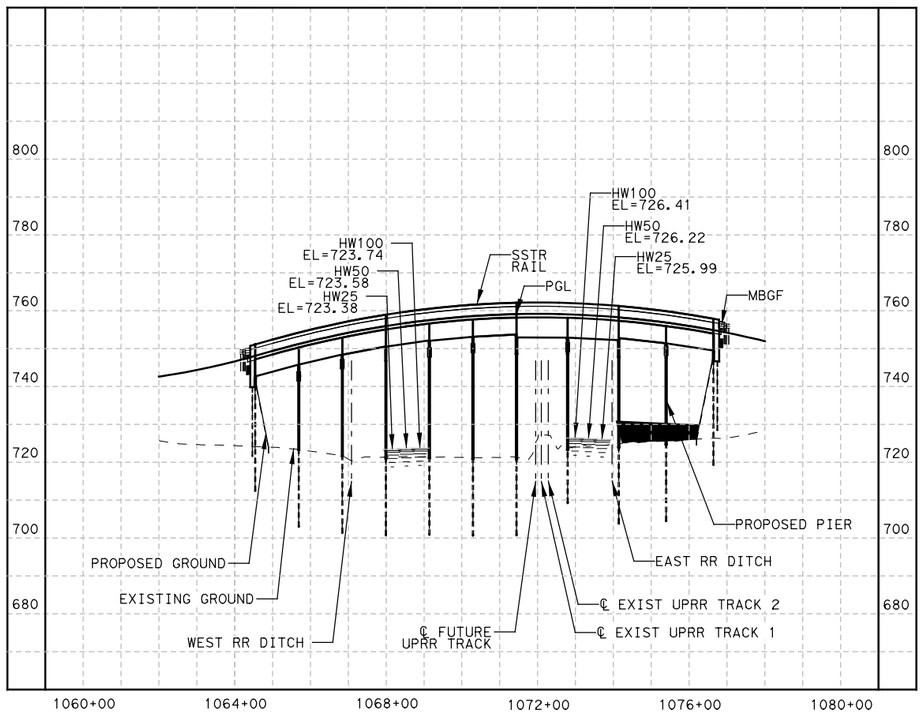
FILE: $PWVARVAULTPATHDESC$

HYDRAULIC CROSS SECTION LAYOUT



BRIDGE SECTION



HYDRAULIC CALCULATIONS (EAST RR DITCH)

STREAM STATION	DESC	FREQUENCY	EXISTING CONDITIONS				PROPOSED CONDITIONS				RISE FROM EXISTING
			FLOWLINE ELEV	Q	CHANNEL VELOCITY	WS ELEV	FLOWLINE ELEV	Q	CHANNEL VELOCITY	WS ELEV	
(FT)		(YR)	(FT)	(CFS)	(FT/S)	(FT)	(FT)	(CFS)	(FT/S)	(FT)	(FT)
2012		25	731.95	451	4.02	733.17	731.95	450	4.02	733.16	-0.01
2012		50	731.95	570	4.29	733.25	731.95	565	3.99	733.29	0.04
2012		100	731.95	680	4.57	733.32	731.95	672	3.87	733.42	0.1
1755		25	728.01	451	2.69	729.35	728.01	450	2.69	729.35	0
1755		50	728.01	570	2.95	729.42	728.01	565	3.17	729.38	-0.04
1755		100	728.01	680	3.15	729.49	728.01	672	3.76	729.38	-0.11
1577		25	725.59	451	4.05	726.5	725.59	450	4.05	726.5	0
1577		50	725.59	570	4.34	726.59	725.59	565	3.94	726.64	0.05
1577		100	725.59	680	4.6	726.66	725.59	672	3.36	726.87	0.21
1502		25	723.98	451	1.5	725.65	723.98	450	2.52	726.2	0.55
1502		50	723.98	570	1.67	725.79	723.98	565	2.81	726.42	0.63
1502		100	723.98	680	1.82	725.91	723.98	672	3.05	726.6	0.69
1253	20' US OF ML	25	723.24	451	4.18	724.63	723.24	450	5.52	724.69	0.06
1253		50	723.24	570	4.31	724.74	723.24	565	5.89	724.85	0.11
1253		100	723.24	680	4.44	724.83	723.24	672	6.17	724.99	0.16
1055		25	720.21	451	2.9	722.25	720.21	450	2.9	722.25	0
1055		50	720.21	570	3.16	722.39	720.21	565	3.15	722.38	-0.01
1055		100	720.21	680	3.41	722.49	720.21	672	3.39	722.49	0
884		25	719.39	451	3.39	721.09	719.39	450	3.39	721.09	0
884		50	719.39	570	3.58	721.26	719.39	565	3.57	721.25	-0.01
884		100	719.39	680	3.7	721.4	719.39	672	3.68	721.39	-0.01

HYDRAULIC CALCULATIONS (WEST RR DITCH)

STREAM STATION	DESC	FREQUENCY	EXISTING CONDITIONS				PROPOSED CONDITIONS				RISE FROM EXISTING
			FLOWLINE ELEV	Q	CHANNEL VELOCITY	WS ELEV	FLOWLINE ELEV	Q	CHANNEL VELOCITY	WS ELEV	
(FT)		(YR)	(FT)	(CFS)	(FT/S)	(FT)	(FT)	(CFS)	(FT/S)	(FT)	(FT)
2545		25	723.08	1016	3.39	724.7	723.08	999	3.49	724.65	-0.05
2545		50	723.08	1295	3.55	724.9	723.08	1270	3.66	724.85	-0.05
2545		100	723.08	1560	3.67	725.08	723.08	1530	3.83	725.01	-0.07
2410		25	722.11	1016	2.01	724.41	722.11	999	2.21	724.26	-0.15
2410		50	722.11	1295	2.2	724.62	722.11	1270	2.39	724.47	-0.15
2410		100	722.11	1560	2.35	724.81	722.11	1530	2.55	724.65	-0.16
2330*		25	721.64	1016	3.58	722.91	721.64	999	1.93	723.53	0.62
2330*		50	721.64	1295	4.02	723.02	721.64	1270	2.13	723.72	0.7
2330*		100	721.64	1560	4.33	723.12	721.64	1530	2.3	723.87	0.75
2089		25	719.34	1016	2.52	721.43	719.34	999	2.51	721.42	-0.01
2089	20' DS of ML	50	719.34	1295	2.72	721.58	719.34	1270	2.7	721.57	-0.01
2089		100	719.34	1560	2.9	721.7	719.34	1530	2.88	721.69	-0.01
1966		25	719.46	1016	2	721.02	719.46	999	1.99	721.01	-0.01
1966		50	719.46	1295	2.21	721.17	719.46	1270	2.19	721.16	-0.01
1966		100	719.46	1560	2.38	721.31	719.46	1530	2.36	721.29	-0.02
1791		25	718.57	1016	2.86	720.27	718.57	999	2.84	720.26	-0.01
1791		50	718.57	1295	3.02	720.45	718.57	1270	3.01	720.43	-0.02
1791		100	718.57	1560	3.14	720.6	718.57	1530	3.13	720.58	-0.02

* XS 2330 is located within the project ROW

DISCHARGE TABLE

ANALYSIS POINT		DRAINAGE AREA (SQ. MI)	PEAK DISCHARGE (CFS)			VOLUME (IN)		
			25-YR	50-YR	100-YR	25-YR	50-YR	100-YR
RR WEST (OUTFALL H)	PRE- PROJECT	0.4501	1015.98	1294.63	**1559.72**	5.85	8.08	**10.54**
	POST- PROJECT	0.4501	999.18	1269.68	1530.36	5.93	8.15	10.6
RR EAST (OUTFALL I)	PRE-PROJECT	0.1342	450.92	569.53	**680.12**	5.72	8.01	**10.52**
	POST- PROJECT	0.1434	494.00	621.93	741.38	5.88	8.15	10.64
	MITIGATED	0.1434	449.55	564.57	671.92	5.88	8.13	10.61
UPRR CROSS CULVERT *	PRE-PROJECT	0.7462	1751.18	2218.77	**2665.19**	5.91	8.16	10.63
	POST- PROJECT	0.7464	1748.84	2209.6	2652.6	5.99	8.23	10.69
	MITIGATED	0.7464	1737.45	2194.96	2630.09	5.99	8.22	10.68

*UPRR CROSS CULVERT LOCATED OUTSIDE OF ROW AND SHOWN ONLY TO DEMONSTRATE NO ADVERSE DOWNSTREAM IMPACTS EXIST.

0 200 400
SCALE IN FEET

NOTES:
1. REFER TO DRAINAGE REPORT FOR DETAILED HYDROLOGIC AND HYDRAULIC ANALYSIS.
2. HYDRAULIC MODELING CONDUCTED IN HEC-RAS VERSION 4.1.0.
3. REFER TO OFFSITE DRAINAGE AREA MAP.
4. HYDROLOGIC MODELING CONDUCTED IN HEC-HMS VERSION 3.5.
5. UPSTREAM RISE IN WSEL DUE TO PROPOSED DETENTION POND. RISE IS CONTAINED IN OPEN FIELD AND HAS NO IMPACT ON ANY STRUCTURES.

11/20/2020

STATE OF TEXAS
ASHLEY S. HANSON
107373
LICENSED
PROFESSIONAL ENGINEER

HAYS COUNTY TEXAS

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY
Texas Registered Engineering Firm F-2614

Texas Department of Transportation
R 2020

ROBERT S. LIGHT EXTENSION

UPRR BRIDGE HYDRAULIC DATA SHEET

SCALE: 1"=400'

SHEET 1 OF 1

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
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TJP	TEXAS	AUS	HAYS	200
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

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SCOUR CALCULATIONS

HEC-18 (5th Edition-2012)

Contraction Scour In Cohesive Materials

$$y_{s-ult} = 0.94 y_1 \left(\frac{1.83 V_2}{\sqrt{g y_1}} - \frac{K_u \sqrt{\tau_c / \rho_w}}{g n y_1^{1/3}} \right) \quad (6.6)$$

where:

- y_1 = Upstream average flow depth (ft, m)
- V_2 = Average flow velocity in the contracted section (ft/s, m/s)
- τ_c = Critical shear stress (lb/ft^2, N/m^2)
- n = Manning n
- K_u = 1.486 for U.S. Customary units and 1.0 for S.I.

HEC-18 (5th Edition-2012)

Pier Scour In Cohesive Materials

$$y_s = 2.2 K_1 K_2 a^{0.65} \left(\frac{2.6 V_1 - V_c}{\sqrt{g}} \right)^{0.7} \quad (7.35)$$

where y_s, K_1, K_2, a, and V_1 are in either US Customary or SI units defined as in Equation 7.1 and:

- V_c = Critical velocity for initiation of erosion of the cohesive material, ft/s (m/s)
- g = Acceleration due to gravity (32.2 ft/s^2, 9.81 m/s^2)

Table 7.1. Correction Factor, K_1, for Pier Nose Shape.

Shape of Pier Nose	K_1
(a) Square nose	1.1
(b) Round nose	1.0
(c) Circular cylinder	1.0
(d) Group of cylinders	1.0
(e) Sharp nose	0.9

Table 7.2. Correction Factor, K_2, for Angle of Attack, 2, of the Flow.

Angle	L/a=4	L/a=8	L/a=12
0	1.0	1.0	1.0
15	1.5	2.0	2.5
30	2.0	2.75	3.5
45	2.3	3.3	4.3
90	2.5	3.9	5.0

Angle = skew angle of flow
L = length of pier

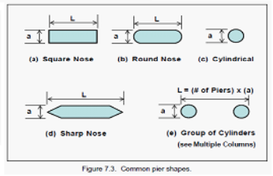


Figure 7.3. Common pier shapes.

WEST SIDE

Min		
y1	0.87	ft
V2	5.19	ft/s
τc	1.46	lb/ft^2
n	0.035	
Ku	1.486	

$Y_{s\ ult}$ = 0.49

Max		
y1	0.87	ft
V2	5.19	ft/s
τc	0.02	lb/ft^2
n	0.035	
Ku	1.486	

$Y_{s\ ult}$ = 1.35

shear stress converstion: 1 Pa = 0.0208 lb/ft^2

	(Low)		(High)	
Shear Range (τc)	1	_TO_	70	(Pa)
Convertion -->	0.021	_TO_	1.46	(lb/ft^2)

Min		
K1	1	Nose Shape
K2	1	Angle Coef
a	3	Pier Width, (ft)
V1	5.19	Velocity, (ft/s)
Vc	13.5	Critical Velocity, (ft/s)
g	32.2	

y_s = 0.00

Max		
K1	1	Nose Shape
K2	1	Angle Coef
a	3	Pier Width, (ft)
V1	5.19	Velocity, (ft/s)
Vc	2.0	Critical Velocity, (ft/s)
g	32.2	

y_s = 7.38

Velocity converstion: 1 m/s = 3.28 ft/s

	(Low)		(High)	
Velocity Range (V_c)	0.6	_TO_	5	(M/s)
Convertion -->	2.0	_TO_	16.4	(ft/s)

EAST SIDE

Min		
y1	1.51	ft
V2	4.5	ft/s
τc	1.46	lb/ft^2
n	0.035	
Ku	1.486	

$Y_{s\ ult}$ = 0.26

Max		
y1	1.51	ft
V2	4.5	ft/s
τc	0.02	lb/ft^2
n	0.035	
Ku	1.486	

$Y_{s\ ult}$ = 1.51

	(Low)		(High)	
Shear Range (τc)	1	_TO_	70	(Pa)
Convertion -->	0.021	_TO_	1.46	(lb/ft^2)

Min		
K1	1	Nose Shape
K2	1	Angle Coef
a	3	Pier Width, (ft)
V1	4.5	Velocity, (ft/s)
Vc	11.7	Critical Velocity, (ft/s)
g	32.2	

y_s = 0.00

Max		
K1	1	Nose Shape
K2	1	Angle Coef
a	3	Pier Width, (ft)
V1	4.5	Velocity, (ft/s)
Vc	2.0	Critical Velocity, (ft/s)
g	32.2	

y_s = 6.55

Velocity converstion: 1 m/s = 3.28 ft/s

	(Low)		(High)	
Velocity Range (V_c)	0.6	_TO_	5	(M/s)
Convertion -->	2.0	_TO_	16.4	(ft/s)

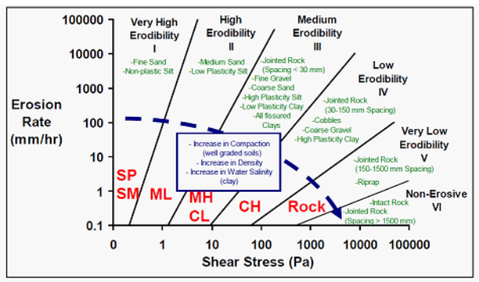


Figure 6.11. Generalized relationships for scour in cohesive materials (Briaud et al. 2011).

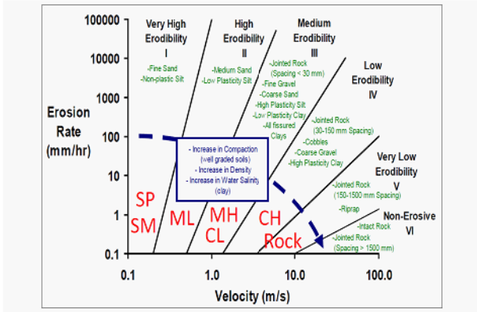
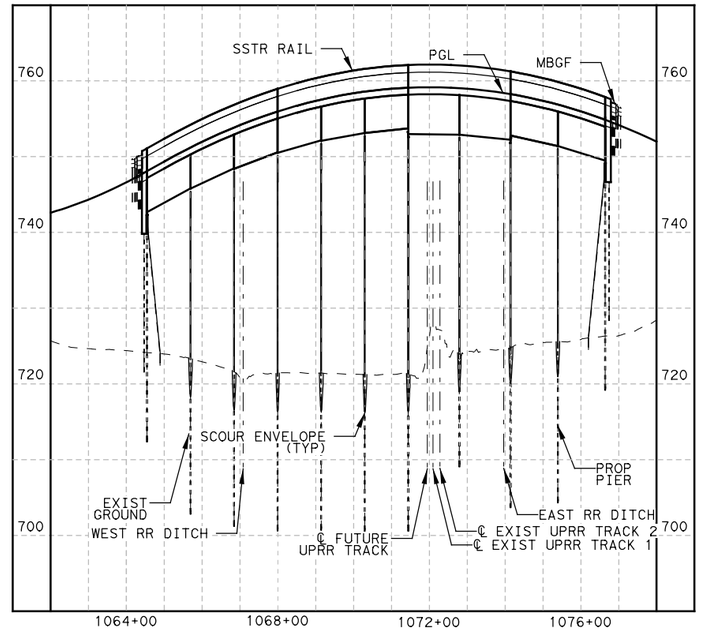


Figure 4.7. Erosion rate vs. velocity for a wide range of geomaterials (Briaud et al. 2011).

SCOUR RESULTS

LOCATION	CONTRACTION SCOUR (FT) (FOR LOWER BOUND Tc)	PIER SCOUR (FT) (FOR LOWER BOUND Tc)	TOTAL SCOUR (FT) (FOR LOWER BOUND Tc)
WEST OF RR	1.35	3.69	5.04
EAST OF RR	1.51	3.28	4.78

BRIDGE SECTION



NOTES:
1. FHWA HEC-18 (5TH EDITION-APRIL 2012) METHODOLOGY WAS USED TO PREDICT SCOUR FOR COHESIVE SOILS.
2. PROPOSED CONDITION HEC-RAS MODELS DEVELOPED FOR HYDRAULIC ANALYSIS WERE USED TO POPULATE HYDRAULIC VARIABLES.
3. REFER TO BRIDGE PROFILE SHEETS FOR DEPTH OF LIMESTONE.
4. SCOUR CALCULATIONS ARE BASED ON CLAY SOILS, CH AND CL, BASED ON BORING LOGS ON UPRR BRIDGE LAYOUT SHEETS.

Boring Id**	Texas Cone Penetrometer		Soil Strata under Clays
	0-5 ft depth	5-10 ft depth	
B-14	50 (0), 50(0.5)	50 (0.5), 50(1)	Limestone at -3.5 ft
B-15	4 (6), 4 (6)	50 (3.5), 50 (3)	Limestone at -8 ft

SCOUR RESULTS	ANTICIPATED SCOUR DEPTH* (FT)	TCP**	SOILS AT SCOUR DEPTH BASED ON BORINGS	SUSCEPTIBIITY TO SCOUR***
WEST UPRR	5.04	<4 in/100 blows	LIMESTONE (HARD)	NOT SUSCEPTIBLE
EAST UPRR	4.78	>12 in/100 blows	CLAY (SOFT TO MEDIUM)	MODERATE RATE

*CALCULATED USING METHODOLOGY IN HEC-18 DOCUMENT
**GEOTECHNICAL ENGINEERING STUDY, BUDA TRUCK BYPASS, BUDA, TEXAS PREPARED BY PAVETEX ENGINEERING AND TESTING, INC., MAY 2014
***BASED ON TXDOT GEOTECHNICAL MANUAL (JULY 2020) TABLE 5-4:MATERIAL SUSCEPTIBIILTY TO SCOUR

11/20/2020

STATE OF TEXAS
ASHLEY S. HANSON
107373
LICENSED
PROFESSIONAL ENGINEER

HAYS COUNTY TEXAS

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY
Texas Registered Engineering Firm F-2614

Texas Department of Transportation
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ROBERT S. LIGHT EXTENSION

UPRR BRIDGE SCOUR DATA SHEET

SHEET 1 OF 1

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	201
CLH	0914	33	068	
CHECK CMC				

Culvert Station and/or Creek Name followed by applicable end (Lt, Rt or Both)	Description of Box Culvert No. Spans ~ Span X Height	Max Fill Height (Ft)	Applicable Box Culvert Standard (4)	Applicable Wingwall or End Treatment Standard	Skew Angle (0°, 15°, 30° or 45°)	Side Slope or Channel Slope Ratio (SL:1)	T Culvert Top Slab Thickness (In)	U Culvert Wall Thickness (In)	C Estimated Curb Height (Ft)	Hw (1) Height of Wingwall (Ft)	A Curb to End of Wingwall (Ft)	B Offset of End of Wingwall (Ft)	Lw Length of Longest Wingwall (Ft)	Ltw Culvert Toewall Length (Ft)	Atw Anchor Toewall Length (Ft)	Riprap Apron (CY)	Class "C" Conc (Curb) (2) (CY)	Class "C" Conc (Wingwall) (3) (CY)	Total Wingwall Area (SF)
CULVERT C	2-3'X2'	7	SCP-3	FW-S	45°	3:1	4	4	0.25	2.33	6	10.39	12	N/A	N/A	3.2	0.2	4.4	48

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

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

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

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

C = Curb height

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

Hw = Height of wingwall

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

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

Lw = Length of longest wingwall.

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

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

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

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

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

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

SPECIAL NOTE:

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

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

11/20/2020

STATE OF TEXAS
ASHLEY S. HANSON
107373
LICENSED
PROFESSIONAL ENGINEER

Texas Department of Transportation

Bridge Division Standard

BOX CULVERT SUPPLEMENT
WINGS AND END TREATMENTS

BCS

FILE:	bcsstde1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT	February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS		0914	33	068, ETC	RSL
		DIST	COUNTY		SHEET NO.
		AUS	HAYS		202

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DATE: 1/28/2021 2:44:01 PM
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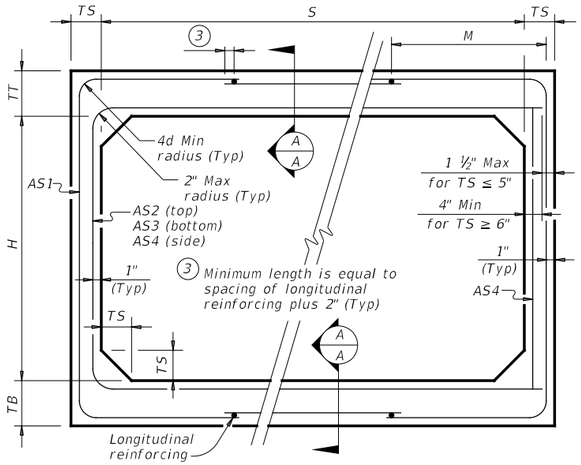
BOX DATA

SECTION DIMENSIONS					Fill Height	M (Min)	REINFORCING (sq. in. / ft.) (2)							(1) Lift Weight
S (ft.)	H (ft.)	TT (in.)	TB (in.)	TS (in.)	(ft.)	(in.)	AS1	AS2	AS3	AS4	AS5	AS7	AS8	(tons)
3	2	7	6	4	< 2	–	0.17	0.25	0.16	0.10	0.17	0.17	0.14	3.3
3	2	4	4	4	2 < 3	31	0.13	0.19	0.18	0.10	–	–	–	2.4
3	2	4	4	4	3 – 5	31	0.10	0.11	0.12	0.10	–	–	–	2.4
3	2	4	4	4	10	31	0.10	0.10	0.10	0.10	–	–	–	2.4
3	2	4	4	4	15	31	0.10	0.13	0.13	0.10	–	–	–	2.4
3	2	4	4	4	20	31	0.11	0.17	0.17	0.10	–	–	–	2.4
3	2	4	4	4	25	31	0.14	0.21	0.21	0.10	–	–	–	2.4
3	2	4	4	4	30	31	0.17	0.25	0.25	0.10	–	–	–	2.4
3	2	4	4	4	35	31	0.20	0.29	0.30	0.10	–	–	–	2.4
3	3	7	6	4	< 2	–	0.17	0.27	0.17	0.10	0.17	0.17	0.14	3.7
3	3	4	4	4	2 < 3	31	0.10	0.22	0.21	0.10	–	–	–	2.8
3	3	4	4	4	3 – 5	31	0.10	0.14	0.14	0.10	–	–	–	2.8
3	3	4	4	4	10	31	0.10	0.11	0.11	0.10	–	–	–	2.8
3	3	4	4	4	15	31	0.10	0.14	0.15	0.10	–	–	–	2.8
3	3	4	4	4	20	31	0.10	0.18	0.19	0.10	–	–	–	2.8
3	3	4	4	4	25	31	0.10	0.23	0.23	0.10	–	–	–	2.8
3	3	4	4	4	30	31	0.12	0.27	0.28	0.10	–	–	–	2.8
3	3	4	4	4	35	31	0.14	0.32	0.32	0.10	–	–	–	2.8

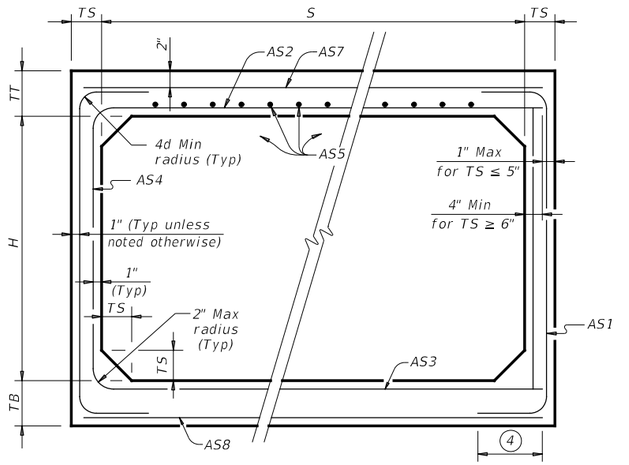
(1) For box length = 8'-0"

(2) AS1 thru AS4, AS7 and AS8 are minimum required areas of reinforcement per linear foot of box length. AS5 is minimum required area of reinforcement per linear foot of box width.



CORNER OPTION "A" CORNER OPTION "B"

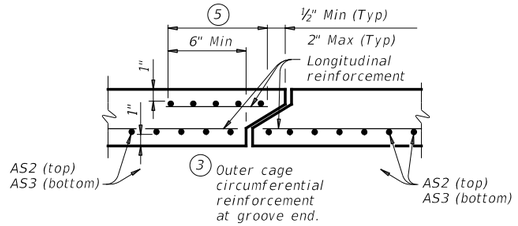
FILL HEIGHT 2 FT AND GREATER



CORNER OPTION "A" CORNER OPTION "B"

FILL HEIGHT LESS THAN 2 FT

(4) Length is equal to spacing of longitudinal reinforcing plus 2". (10" Min) (Typ)



SECTION A-A

(Showing top and bottom slab joint reinforcement.)

MATERIAL NOTES:

Provide 0.03 sq. in./ft. minimum longitudinal reinforcement at each face in slabs and walls. This minimum requirement may be met by the transverse wires when wire mesh reinforcement is used.

Provide Class H concrete (f`c = 5,000 psi).

GENERAL NOTES:

Designs shown conform to ASTM C1577. Refer to ASTM C1577 for information or details not shown.

See Box Culverts Precast Miscellaneous Details (SCP-MD) standard sheet for details and notes not shown.

In lieu of furnishing the designs shown on this sheet, the contractor may furnish an alternate design that is equal to or exceeds the box design for the design fill height in the table. Submit shop plans for alternate designs in accordance with Item "Precast Concrete Structural Members (Fabrication)".

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS PRECAST

3'-0" SPAN

SCP-3

FILE: scp03sts-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	33	068,ETC	RSL
	DIST	COUNTY		SHEET NO.
	AUS	HAYS		203

DATE: 1/28/2021 2:44:03 PM
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TABLE OF DIMENSIONS AND REINFORCING STEEL
(Wings for one structure end)

Dimensions					Variable Reinforcing				Estimated Quantities per ft of wing length (2~wings) (3)	
					Bars J1		Bars J2			
Maximum Wingwall Height Hw	W	X	Y	Z	Size	Spa	Size	Spa	Reinf (Lb/Ft)	Conc (CY/Ft)
2'-6"	2'-5"	1'-0"	9"	7"	#4	1'-0"	#4	1'-0"	33.73	0.248
3'-0"	2'-5"	1'-0"	9"	7"	#4	1'-0"	#4	1'-0"	37.07	0.261
3'-6"	2'-5"	1'-0"	9"	7"	#4	1'-0"	#4	1'-0"	37.74	0.273
4'-0"	2'-5"	1'-0"	9"	7"	#4	1'-0"	#4	1'-0"	38.41	0.285
4'-6"	3'-2"	1'-6"	1'-0"	7"	#4	1'-0"	#4	1'-0"	41.75	0.330
5'-0"	3'-2"	1'-6"	1'-0"	7"	#4	1'-0"	#4	1'-0"	45.09	0.343
5'-6"	3'-2"	1'-6"	1'-0"	7"	#4	1'-0"	#4	1'-0"	45.75	0.355
6'-0"	3'-2"	1'-6"	1'-0"	7"	#4	1'-0"	#4	1'-0"	46.42	0.367
7'-0"	3'-8"	1'-9"	1'-3"	7"	#4	1'-0"	#4	1'-0"	52.77	0.414
8'-0"	4'-2"	2'-0"	1'-6"	8"	#5	1'-0"	#4	1'-0"	60.19	0.486
9'-0"	4'-8"	2'-3"	1'-9"	8"	#4	6"	#4	6"	81.49	0.535
10'-0"	5'-2"	2'-6"	2'-0"	8"	#5	6"	#4	6"	97.25	0.584
11'-0"	5'-8"	2'-9"	2'-3"	8"	#6	6"	#5	6"	133.65	0.634
12'-0"	6'-2"	3'-0"	2'-6"	9"	#7	6"	#5	6"	162.29	0.721
13'-0"	6'-8"	3'-3"	2'-9"	11"	#7	6"	#5	6"	178.80	0.856
14'-0"	7'-2"	3'-6"	3'-0"	1'-0"	#8	6"	#5	6"	216.78	0.959
15'-0"	7'-8"	4'-0"	3'-0"	1'-1"	#9	6"	#6	6"	283.06	1.068
16'-0"	8'-2"	4'-6"	3'-0"	1'-3"	#9	6"	#6	6"	297.02	1.234

TABLE OF WINGWALL REINFORCING
(2~wings)

Bar	Size	No.	Spa
DL	#5	~	1'-0"
DS	#5	~	1'-0"
E	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	4	~
M	#4	4	~
P	#4	~	1'-0"
RS	#5	3	~
RL	#5	3	~
V	#4	~	1'-0"

TABLE OF ESTIMATED CULVERT TOEWALL QUANTITIES

Bar	Size	No.	Spa
L	#4	~	1'-6"
Q	#4	1	~
Reinf (Lb/Ft)			2.45
Conc (CY/Ft)			0.037

WING DIMENSION FORMULAS:

(All values are in feet.)

Hw = H + T + C - 0.250'
A = (Hw - 0.333')(Sc)
B = (A) [tanget (θ + 15°)]
Lw = (A) ÷ [cosine (θ + 15°)]

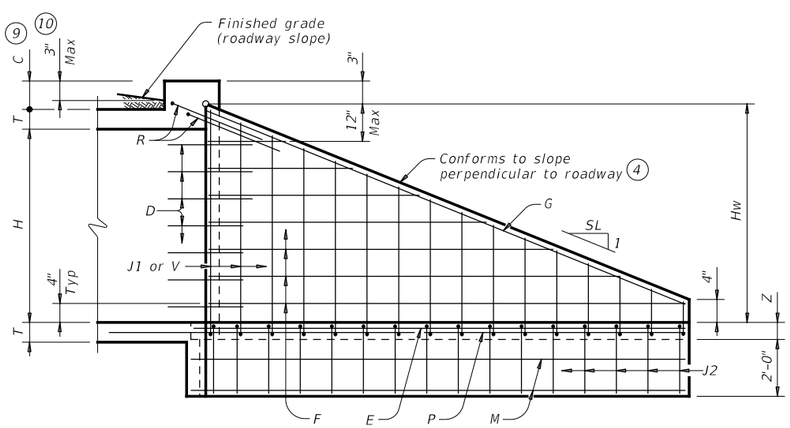
For cast-in-place culverts:
Ltw = [(N) (S) + (N + 1) (U)] ÷ cosine θ

For precast culverts:
Ltw = [(N) (2U + S) + (N - 1) (0.5')] ÷ cosine θ

Total wingwall area (two wings ~ SF) = 0.5 (Hw + 0.333') (Lw + A)

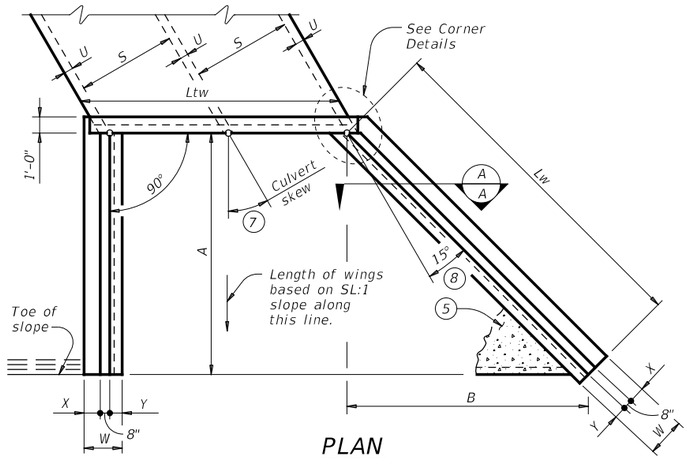
Hw = Height of wingwall
SL:1 = Side slope ratio (horizontal:1 vertical)
A = Length of short wingwalls
Lw = Length of long wingwall
Ltw = Culvert toewall length
N = Number of culvert spans
θ = Culvert skew

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



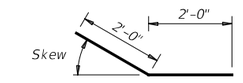
INSIDE ELEVATION

(Showing reinforcing. Culvert and culvert toewall reinforcing not shown for clarity.)

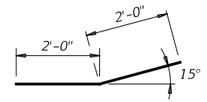


PLAN

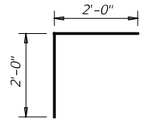
(Showing dimensions and 30° skew.)



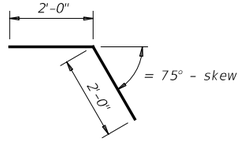
BARS DS
(Short wing)



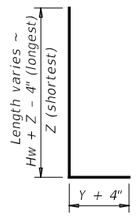
BARS DL
(Long wing)



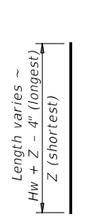
BARS RS
(Short wing)



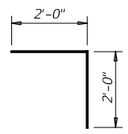
BARS RL
(Long wing)



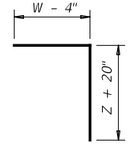
BARS J1



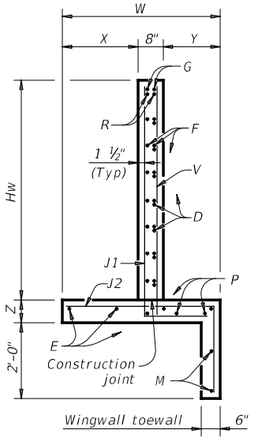
BARS V



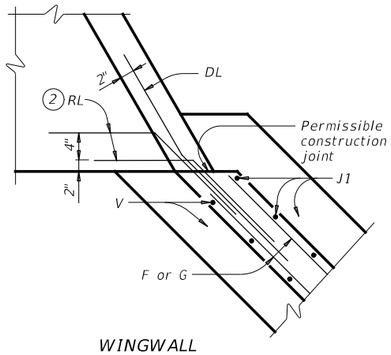
BARS L



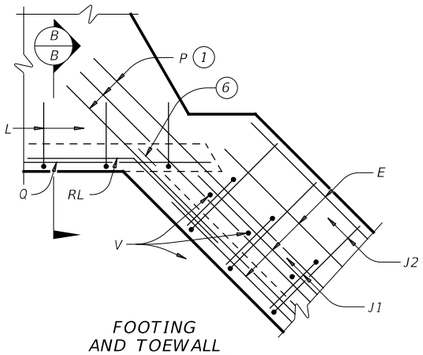
BARS J2



SECTION A-A



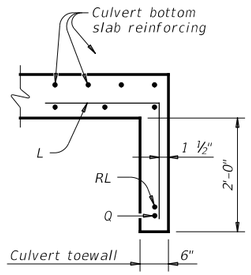
WINGWALL



FOOTING AND TOEWALL

CORNER DETAILS

(Culvert and culvert toewall reinforcing not shown for clarity.)



SECTION B-B 5

1. Extend Bars P 3'-0" minimum into bottom slab of box culvert.
2. Adjust as necessary to maintain 1 1#2" clear cover and 4" minimum between bars.
3. Quantities shown are based on an average wing height for two wings (one structure end). To determine total quantities for two wings, multiply the tabulated values by 0.5 x (A + Lw).
4. Recommended values of side slope are: 2:1, 3:1, 4:1, and 6:1.
5. When shown elsewhere on the plans, construct 5" deep concrete riprap. Payment for riprap is as required by Item 432, "Riprap". Unless otherwise shown on the plans or directed by the Engineer, provide a 6" wide by 1'-6" deep reinforced concrete toewall along all edges of the riprap adjacent to natural ground; reinforce the toewall by extending typical riprap reinforcing into the toewall; and extend construction joints or grooved joints oriented in the direction of flow across the full distance of the riprap at intervals of approximately 20'. When such riprap is provided, the culvert toewall shown in SECTION B-B will not be required.
6. At Contractor's option, culvert toewall may be ended flush with wingwall toewall. Adjust reinforcing as needed.
7. Applicable values of skew are: 15°, 30°, and 45°.
8. Typical wingwall angle for all skews.
9. 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0, refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Box Culvert Rail Mounting Details (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.
10. For vehicle safety, the following requirements must be met:
    - For structures without bridge rail, construct curbs no more than 3" above finished grade.
    - For structures with bridge rail, construct curbs flush with finished grade.

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

MATERIAL NOTES:

Provide Class C concrete (f'c=3,600 psi).
Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
In riprap concrete, synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
When structure is founded on solid rock, depth of toewalls for culverts and wingwalls may be reduced or eliminated as directed by the Engineer.
See Box Culvert Supplement (BCS) standard sheet for additional dimensions and information.
The quantities for concrete and reinforcing steel resulting from the formulas given on this sheet are for Contractor's information only.

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

Texas Department of Transportation

Bridge Division Standard

CONCRETE WINGWALLS WITH FLARED WINGS FOR SKEWED BOX CULVERTS

FW-S

FILE: fw-sstde-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020 REVISIONS	CONT	SECT	JOB	HIGHWAY
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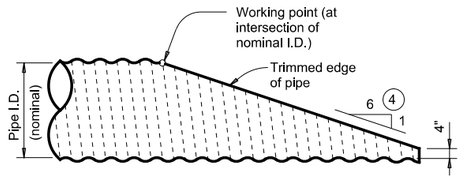
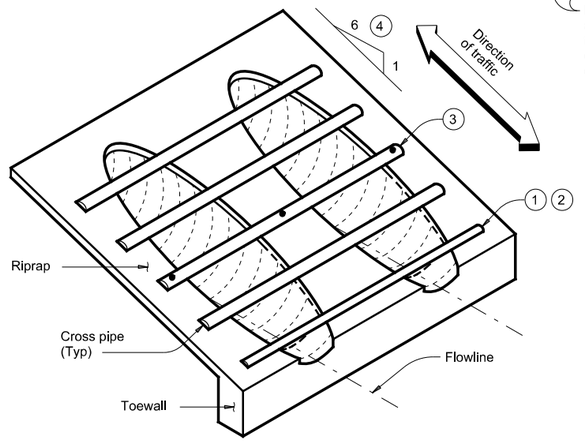
	DIST	COUNTY		SHEET NO.
	AUS	HAYS		204



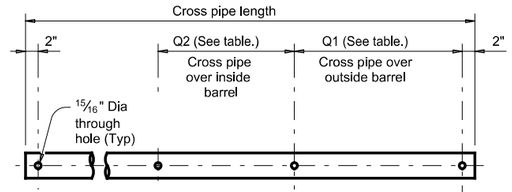
NOTE: All cross pipes, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

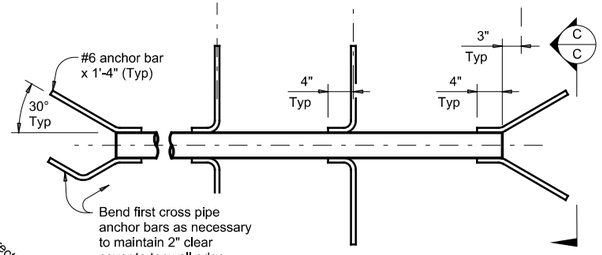
(Showing corrugated metal pipe (CMP) culvert Details at reinforced concrete pipe (RCP) culvert are similar.)



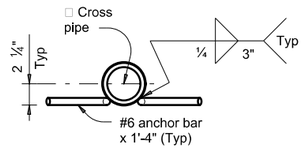
ISOMETRIC VIEW OF TYPICAL INSTALLATION



PIPE WITH BOLTED ANCHOR

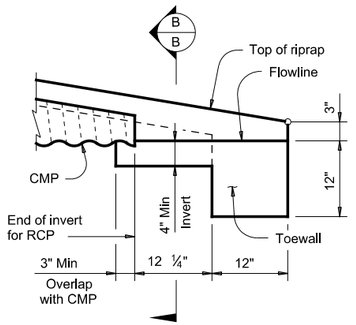


PIPE WITH ANCHOR BARS



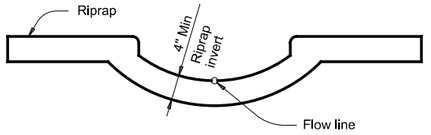
SECTION C-C

CROSS PIPE DETAILS



DETAIL "A"

(Showing invert with corrugated metal pipe (CMP) culvert. Reinforced concrete pipe (RCP) culvert details are similar. Cross pipes not shown for clarity.)



SECTION B-B

(Cross pipes not shown for clarity.)

CROSS PIPE LENGTHS, REQUIRED PIPE SIZES, AND RIPRAP QUANTITIES (2)

Nominal Culvert I.D.	Conc Riprap (CY) (6)	Pipe Culvert Spa ~ G	Single Barrel ~ Q1	Multi-Barrel ~ Q1	Q2	Conditions for Use of Cross Pipes	Cross Pipe Sizes
12"	0.6	0' - 9"	N/A	2' - 1"	1' - 9"	3 or more pipe culverts	3" Std (3.500" O.D.)
15"	0.7	0' - 11"	N/A	2' - 5"	2' - 2"		
18"	0.8	1' - 2"	N/A	2' - 10"	2' - 8"		
21"	0.9	1' - 4"	N/A	3' - 2"	3' - 1"		
24"	0.9	1' - 7"	N/A	3' - 6"	3' - 7"		
27"	1.0	1' - 8"	N/A	3' - 10"	3' - 11"	3 or more pipe culverts	3 ½" Std (4.000" O.D.)
30"	1.1	1' - 10"	N/A	4' - 2"	4' - 4"	2 or more pipe culverts	
33"	1.2	1' - 11"	4' - 2"	4' - 5"	4' - 8"	All pipe culverts	
36"	1.3	2' - 1"	4' - 5"	4' - 9"	5' - 1"	All pipe culverts	4" Std (4.500" O.D.)
42"	1.5	2' - 4"	4' - 11"	5' - 5"	5' - 10"		
48"	1.7	2' - 7"	5' - 5"	6' - 0"	6' - 7"	All pipe culverts	5" Std (5.563" O.D.)
54"	2.0	3' - 0"	5' - 11"	6' - 9"	7' - 6"		
60"	2.2	3' - 3"	6' - 5"	7' - 4"	8' - 3"		
66"	2.4	3' - 3"	6' - 11"	7' - 10"	8' - 9"		
72"	2.7	3' - 4"	7' - 5"	8' - 5"	9' - 4"		

(1) The proper installation of the first cross pipe is critical for vehicle safety. Place the top of the first cross pipe no more than 6" above the flow line.

(2) Provide cross pipes, except the first bottom pipe, of the size shown in the table. Provide a 3 1#2" standard pipe (4" O.D.) for the first bottom pipe.

(3) Install the third cross pipe from the bottom of the culvert using a bolted connection. Ensure that riprap concrete does not flow into the cross pipe so as to permit disassembly of the bolted connection to allow cleanout access. At the Contractor's option, install all other cross pipes using the bolted connection details.

(4) Match cross slope as shown elsewhere in the plans. Cross slope of 6:1 or flatter is required for vehicle safety.

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

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

MATERIAL NOTES:

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

Provide cross pipes that meet the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 (Gr B), or API 5LX52.

Provide ASTM A307 bolts and nuts.

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

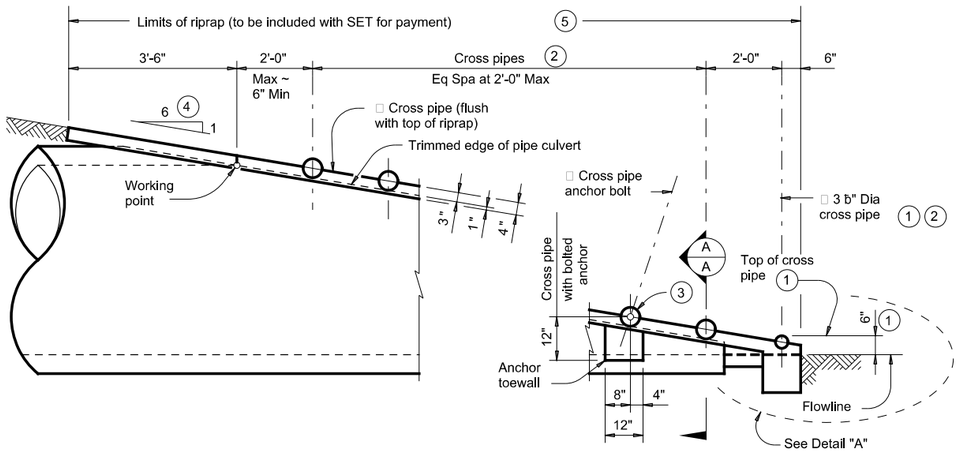
GENERAL NOTES:

Cross pipes are designed for a traversing load of 10,000 pounds at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.

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

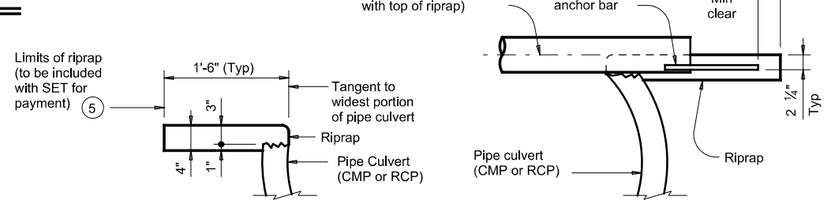
Construct concrete riprap and all necessary inverts in accordance with the requirements of Item 432, "Riprap".

Payment for riprap and toewall is included in the Price Bid for each Safety End Treatment.



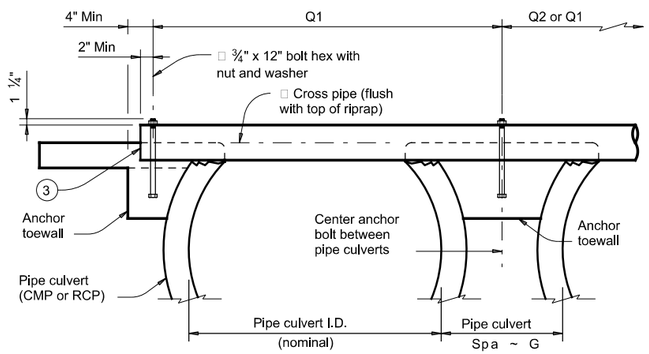
SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

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



SHOWING TYPICAL PIPE CULVERT AND RIPRAP

SHOWING CROSS PIPE WITH ANCHOR BAR



SHOWING CROSS PIPE WITH BOLTED ANCHOR

SECTION A-A

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

FOR 12" DIA TO 72" DIA
PIPE CULVERTS
TYPE II ~ PARALLEL DRAINAGE

SETP-PD

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©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
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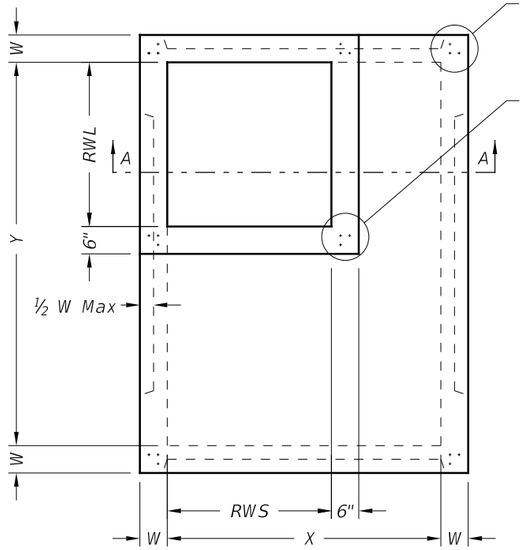
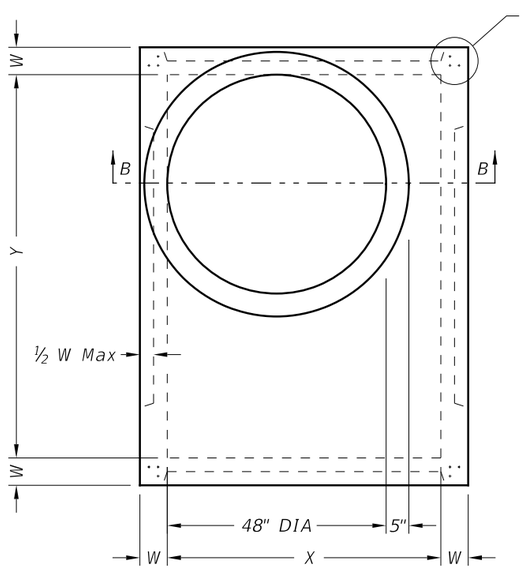


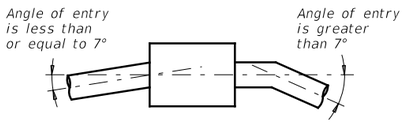
PLAN VIEW "A"

SQUARE REDUCED RISER OPTION



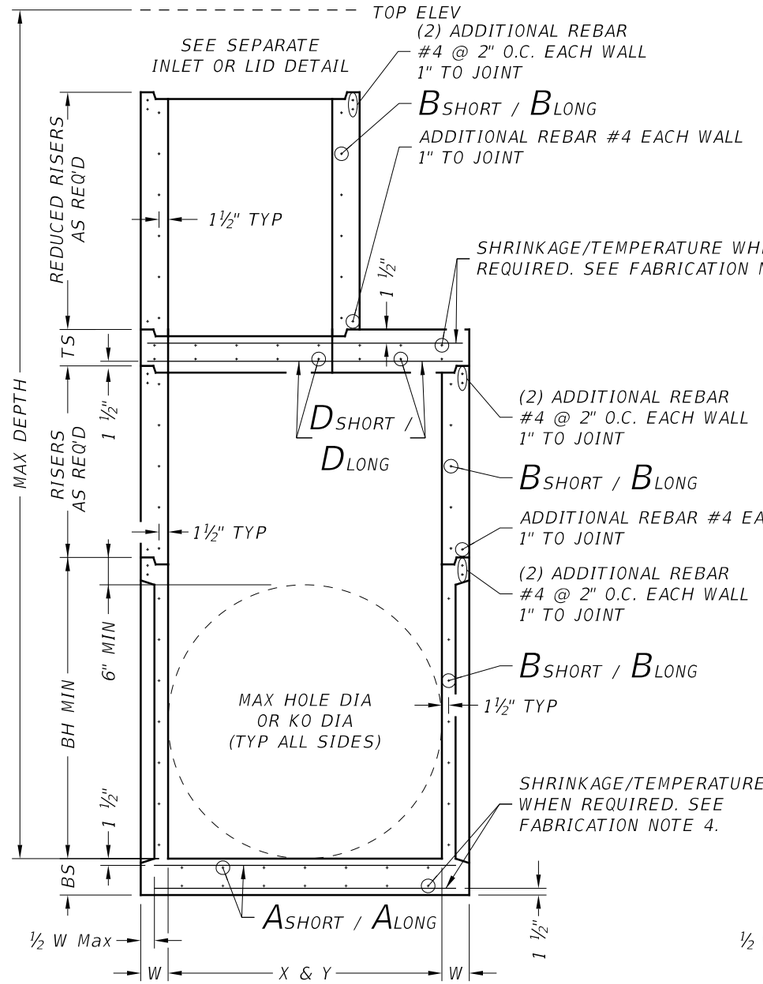
PLAN VIEW "B"

ROUND REDUCED RISER OPTION



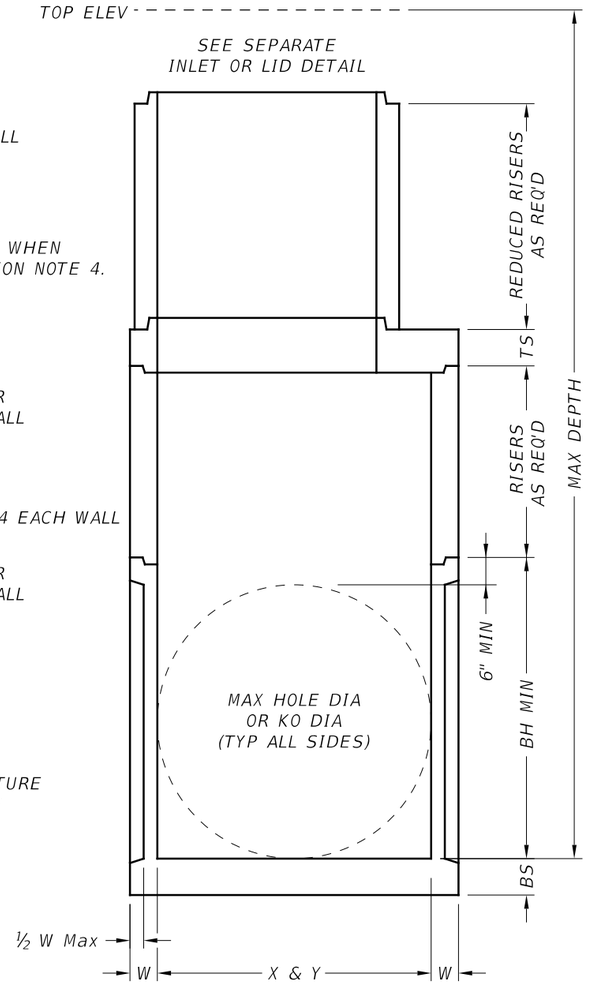
PIPE CONNECTION DETAIL

Connect pipes within 7° of normal to PB wall.
If necessary, use pipe elbow or curved approach alignment to stay within this limit.



SECTION A-A

SQUARE REDUCED RISER OPTION



SECTION B-B

ROUND REDUCED RISER OPTION

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 ½" 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^2/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 ¾".
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 ½ 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."

Cover dimensions are clear dimensions, unless noted otherwise.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

PRECAST BASE

PB

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©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	AUS	HAYS		206

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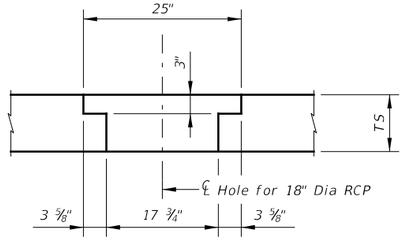
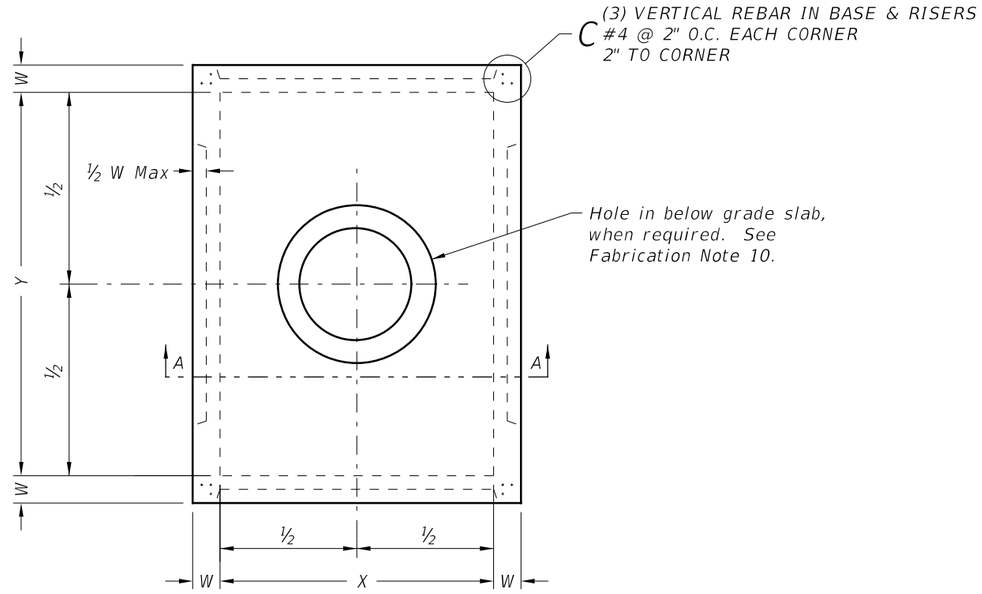
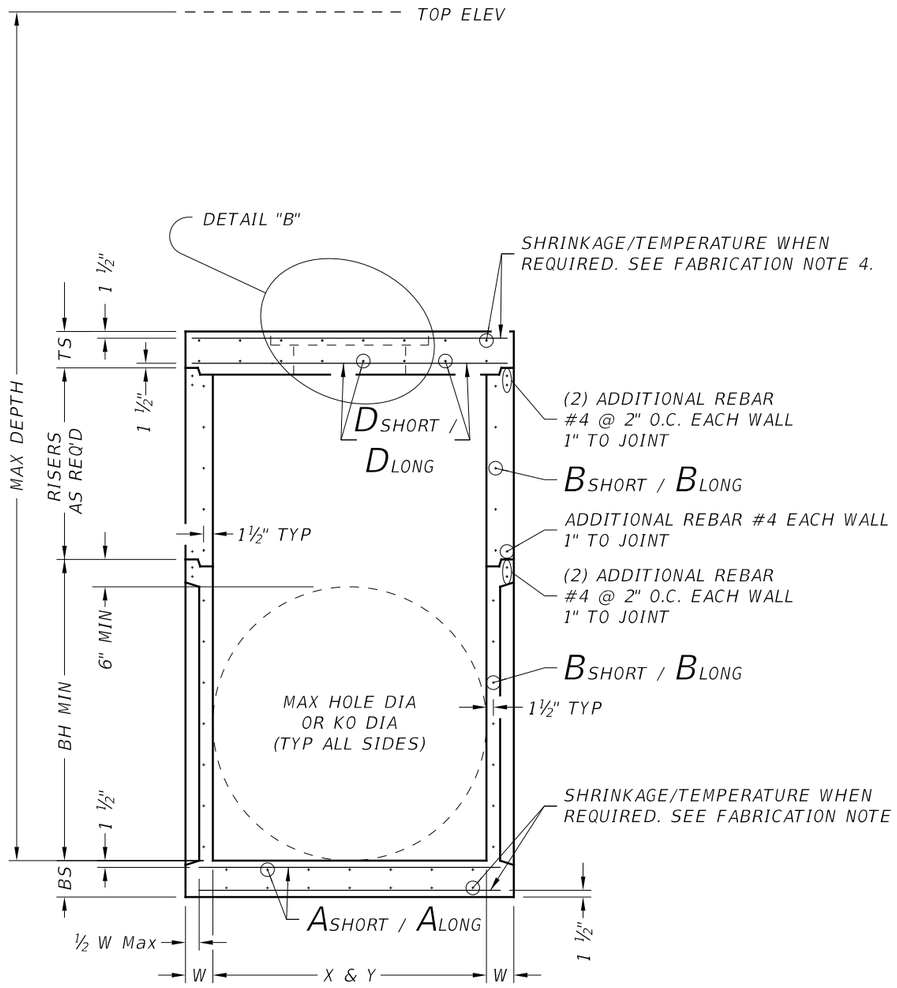


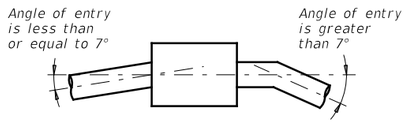
DETAIL "B"



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 WWR.
3. Provide typical clear cover of 1 ½" 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^2/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 ¾".
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 ½ 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.

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Texas Department of Transportation

Bridge Division Standard

PRECAST JUNCTION BOX

PJB

FILE: prestd09-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
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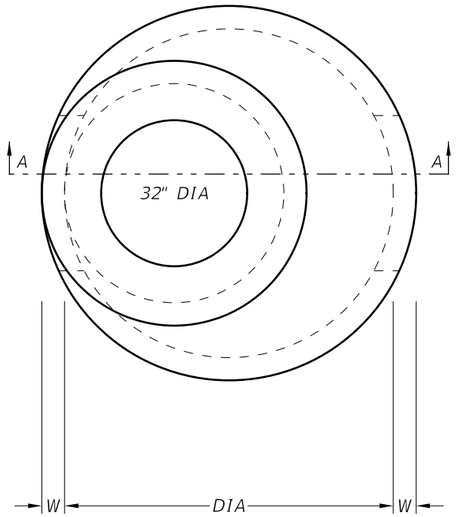
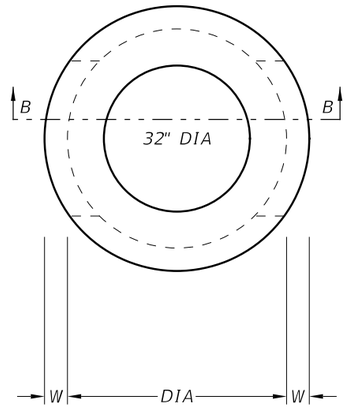
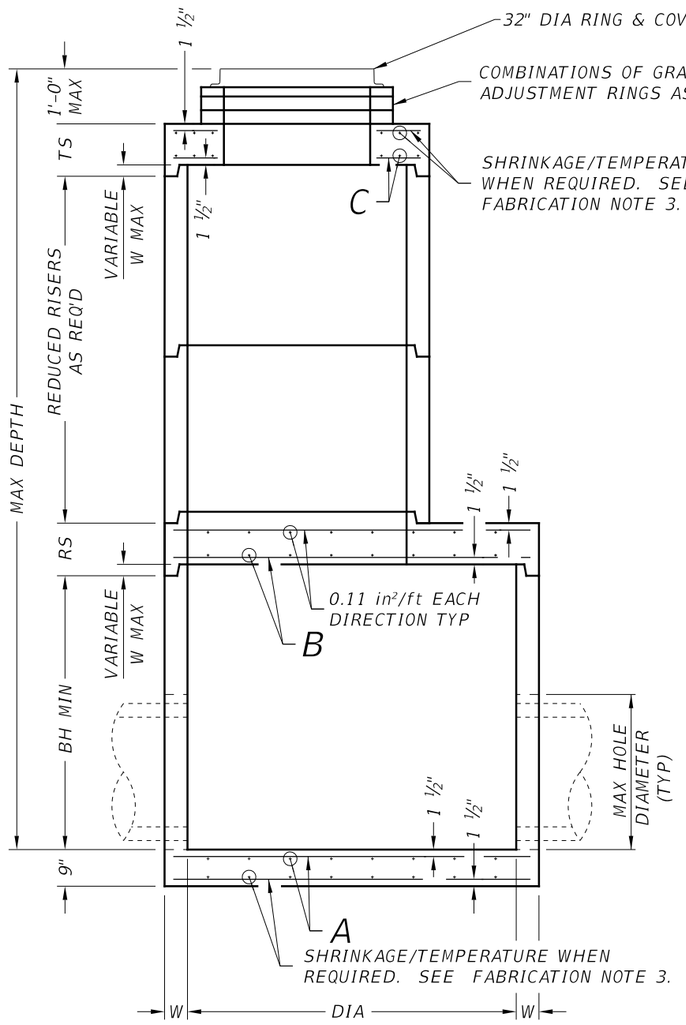


PLAN VIEW "A"

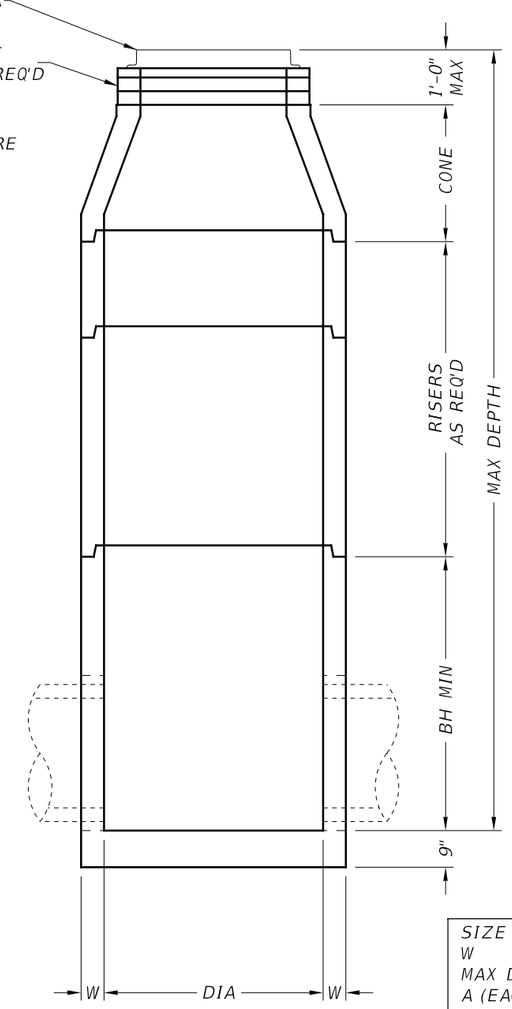


PLAN VIEW "B"



SECTION A-A

ROUND REDUCED RISER OPTION
SHOWING FLAT SLAB TOP



SECTION B-B

ROUND RISER OPTION
SHOWING CONE

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. Provide circumferential reinforcing steel in vertical walls of base, riser and cone in accordance with ASTM C478.
3. Slabs with a thickness of 8" or greater require shrinkage and temperature reinforcing steel. Provide steel area = 0.11 in²/ft each way.
4. Manufacture base and risers to nearest 3" increment.
5. Design tongue and groove joints for full closure on both shoulders. Minimum spigot depth is ¾".
6. Provide lifting devices in conformance with Manufacturer's recommendations.
7. Provide cast iron solid cover, unless noted otherwise elsewhere in the plans.

INSTALLATION NOTES:

1. Cones may be concentric or eccentric. Reduction cones are acceptable. See Manufacturer for cone dimensions.
2. Inverts (benching) to be provided by Contractor. Concrete or mortar used for invert is subsidiary to this item.
3. 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 ½ the joint depth, whichever is greater.
4. Do not grout rubber gasket joints without Manufacturer's recommendation.
5. Initial installation of grade adjustment rings is limited to 1'-0" Max as shown.
6. Grade adjustment rings 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 may be made up to the Max depth shown. Structure must be evaluated if Max depth will be exceeded.

GENERAL NOTES:

1. Designed according to ASTM C478.
2. Payment for manhole is per Item 465, "Junction Boxes, Manholes, and Inlets" by type and size.
3. Pipe OD + placement tolerance must be equal or less than Max hole diameter. For rigid pipe, placement tolerance is 4" Max, 2" Min. For flexible pipe, consult boot/seal manufacturer's specification for placement tolerance.

Cover dimensions are clear dimensions, unless noted otherwise.

SIZE (DIA)	48 in	60 in	72 in
W	5 in	6 in	7 in
MAX DEPTH	25 ft	25 ft	25 ft
A (EACH WAY)	0.22 in²/ft	0.30 in²/ft	0.45 in²/ft
B (EACH WAY)	N/A	0.37 in²/ft	0.62 in²/ft
C (EACH WAY)	0.24 in²/ft	0.46 in²/ft	0.46 in²/ft
BH MIN	12 in	36 in	36 in
TS	9 in	9 in	9 in
RS	N/A	9 in	12 in
REDUCED RISER DIA	N/A	48 in	48/60 in
MAX HOLE DIA	32 in	40 in	54 in

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Bridge Division Standard

PRECAST ROUND MANHOLE

PRM

FILE: prestd02-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	33	068,ETC	RSL
	DIST	COUNTY		SHEET NO.
	AUS	HAYS		208

DATE: 1/28/2021 2:44:06 PM
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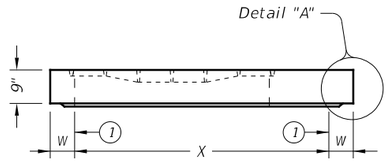
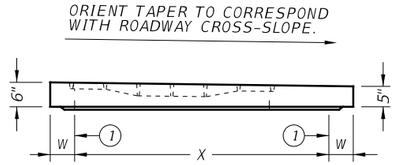
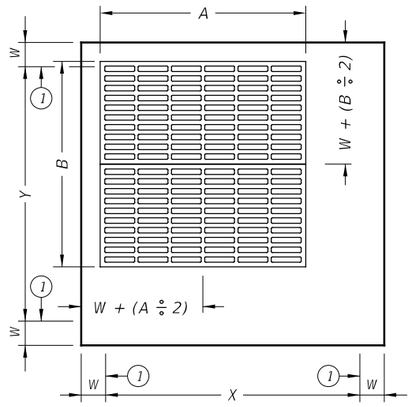


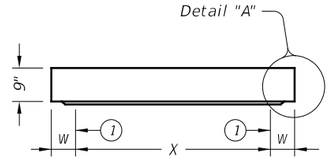
STYLE 'FG'



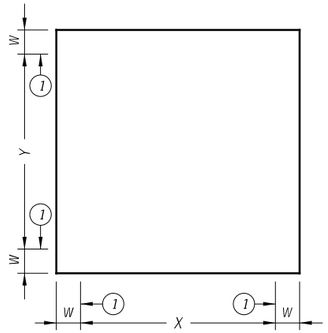
STYLE 'SFG'
ELEVATION VIEW



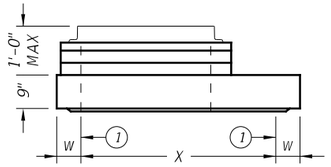
PLAN VIEW
CAST-IN FRAME & GRATE
STYLES 'FG' & 'SFG'



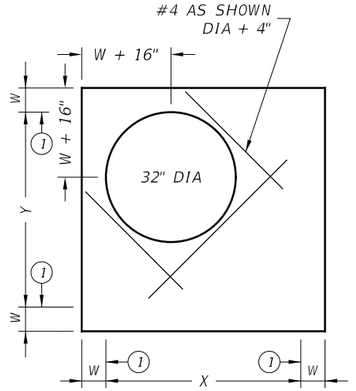
ELEVATION VIEW



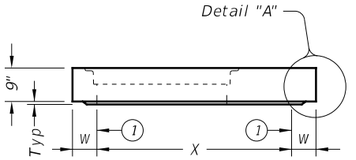
PLAN VIEW
NO OPENINGS
STYLE 'SL'



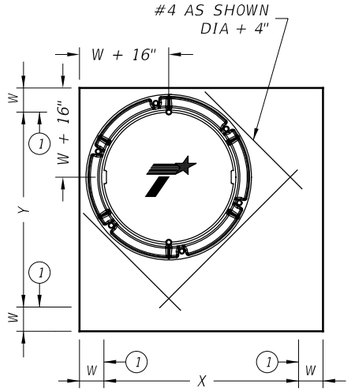
ELEVATION VIEW



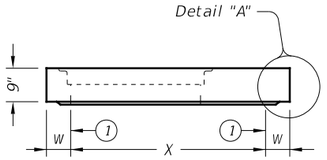
PLAN VIEW
SHIP LOOSE RING & COVER
STYLE 'RH'



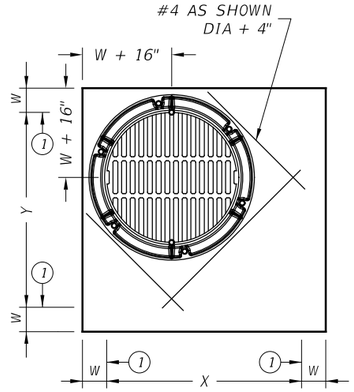
ELEVATION VIEW



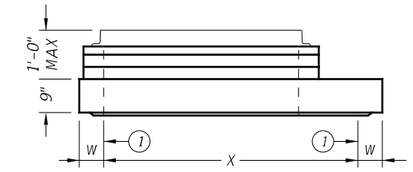
PLAN VIEW
32" DIA CAST-IN RING & COVER
STYLE 'RC'



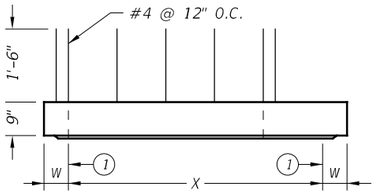
ELEVATION VIEW



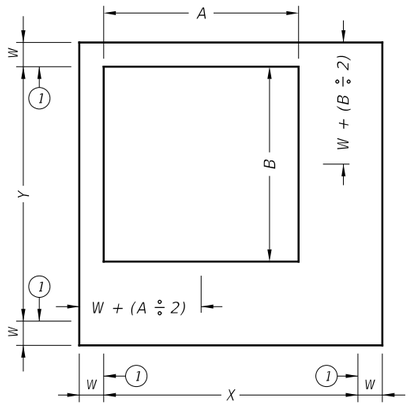
PLAN VIEW
32" DIA CAST-IN RING & GRATE
STYLE 'RG'



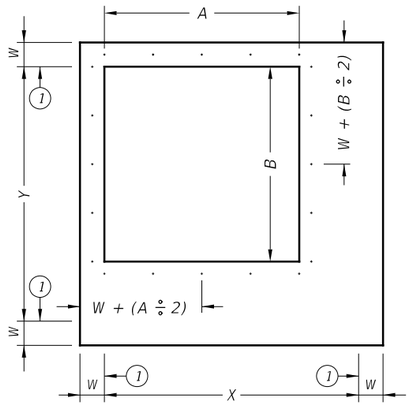
ELEVATION VIEW



ELEVATION VIEW



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

Texas Department of Transportation
Bridge Division Standard

PRECAST SLAB LID

PSL

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	AUS	HAYS		209

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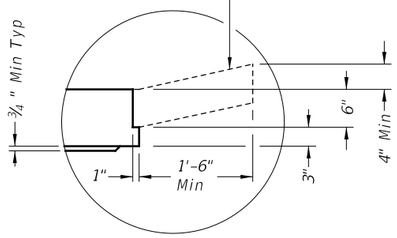
Style	Size (X x Y)	W (2)	A x B (nominal)	Short Span Reinf Steel Area	Long Span Reinf Steel Area
SL	3'x3'	6"	n/a	0.37 in²/ft	0.37 in²/ft
RH,RC,RG,SH,S1,FG	3'x3'	6"	3'x3' or 32" Dia	0.37 in²/ft	0.37 in²/ft
SFG	3'x3'	6"	3'x3'	0.32 in²/ft	0.32 in²/ft
SL	4'x4'	6"	n/a	0.34 in²/ft	0.34 in²/ft
RH,RC,RG,SH,S1,FG	4'x4'	6"	3'x3' or 32" Dia	0.41 in²/ft	0.41 in²/ft
SH,S1,FG	4'x4'	6"	4'x4'	0.41 in²/ft	0.41 in²/ft
SFG	4'x4'	6"	4'x4'	0.32 in²/ft	0.32 in²/ft
SL	3'x5'	6"	n/a	0.39 in²/ft	0.39 in²/ft
RH,RC,RG,SH,S1,FG	3'x5'	6"	3'x3' or 32" Dia	0.48 in²/ft	0.48 in²/ft
SH,S1,FG	3'x5'	6"	3'x5'	0.48 in²/ft	0.48 in²/ft
SFG	3'x5'	6"	3'x5'	0.32 in²/ft	0.32 in²/ft
SL	4'x5'	6"	n/a	0.42 in²/ft	0.42 in²/ft
RH,RC,RG,SH,S1,FG	4'x5'	6"	3'x3' or 32" Dia	0.42 in²/ft	0.42 in²/ft
SH,S1,FG	4'x5'	6"	4'x4'	0.63 in²/ft	0.63 in²/ft
SH,S1,FG	4'x5'	6"	3'x5'	0.66 in²/ft	0.66 in²/ft
SL	5'x5'	6"	n/a	0.36 in²/ft	0.36 in²/ft
RH,RC,RG,SH,S1,FG	5'x5'	6"	3'x3' or 32" Dia	0.43 in²/ft	0.43 in²/ft
SH,S1,FG	5'x5'	6"	4'x4'	0.63 in²/ft	0.63 in²/ft
SH,S1,FG	5'x5'	6"	3'x5'	0.63 in²/ft	0.63 in²/ft
SL	5'x6'	6"/8"	n/a	0.48 in²/ft	0.48 in²/ft
RH,RC,RG,SH,S1,FG	5'x6'	6"/8"	3'x3' or 32" Dia	0.48 in²/ft	0.48 in²/ft
SH,S1,FG	5'x6'	6"/8"	4'x4'	0.60 in²/ft	0.60 in²/ft
SH,S1,FG	5'x6'	6"/8"	3'x5'	0.60 in²/ft	0.60 in²/ft
SL	6'x6'	6"/8"	n/a	0.43 in²/ft	0.43 in²/ft
RH,RC,RG,SH,S1,FG	6'x6'	6"/8"	3'x3' or 32" Dia	0.56 in²/ft	0.56 in²/ft
SH,S1,FG	6'x6'	6"/8"	4'x4'	0.56 in²/ft	0.56 in²/ft
SH,S1,FG	6'x6'	6"/8"	3'x5'	0.59 in²/ft	0.59 in²/ft
SL	8'x8'	8"/10"	n/a	0.45 in²/ft	0.45 in²/ft
RH,RC,RG,SH,S1,FG	8'x8'	8"/10"	3'x3' or 32" Dia	0.45 in²/ft	0.45 in²/ft
SH,S1,FG	8'x8'	8"/10"	4'x4'	0.45 in²/ft	0.45 in²/ft
SH,S1,FG	8'x8'	8"/10"	3'x5'	0.45 in²/ft	0.45 in²/ft

(2) 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 ¾" 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 in²/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 ¾".
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 ½ 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.

Texas Department of Transportation — Bridge Division Standard

PRECAST SLAB LID

PSL

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	DIST	COUNTY		SHEET NO.
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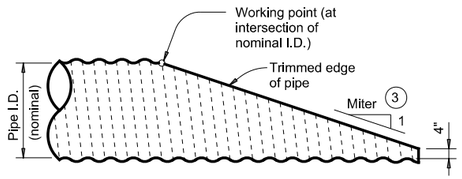
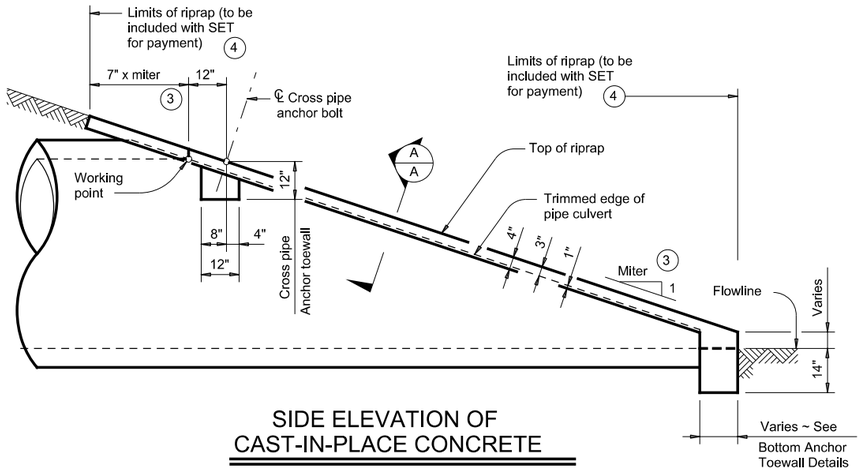


NOTE: All pipe runners, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

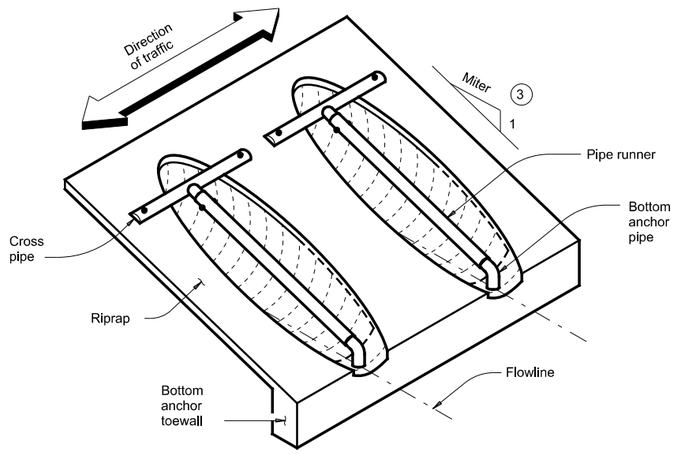
SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

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



SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

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



ISOMETRIC VIEW OF TYPICAL INSTALLATION

(Showing installation with no skew.)

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

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

TYPICAL PIPE CULVERT MITERS (3)

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

CONDITIONS WHERE PIPE RUNNERS ARE NOT REQUIRED (2)

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

STANDARD PIPE SIZES AND MAX PIPE RUNNER LENGTHS (1)

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

ESTIMATED CONCRETE RIPRAP QUANTITIES (CY) (5)

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

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

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

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

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

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

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

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

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SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

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

SETP-CD

FILE: setpcdse-20.dgn	DN: GAF	CK: CAT	DW: JRP	CK: GAF
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	DIST	COUNTY		SHEET NO.
	AUS	HAYS		211

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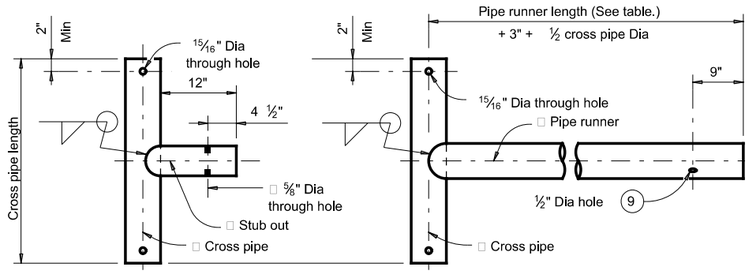
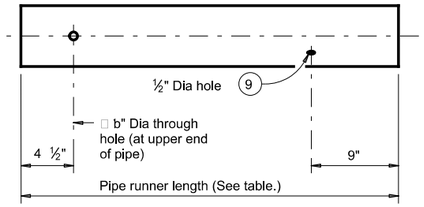


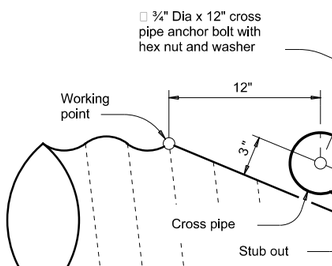
OPTION A1 OPTION A2

CROSS PIPE AND CONNECTIONS DETAILS



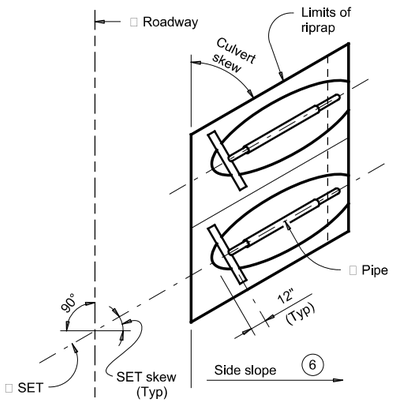
NOTE: The separate pipe runner shown is required when Cross Pipe Connection Option A1 is used.

PIPE RUNNER DETAILS

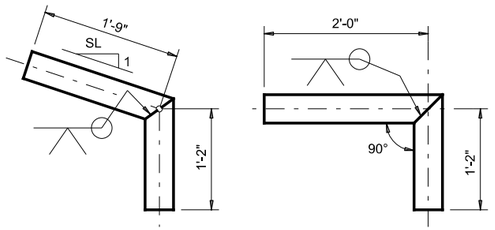


SIDE ELEVATION OF SAFETY END TREATMENT INSTALLATION

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

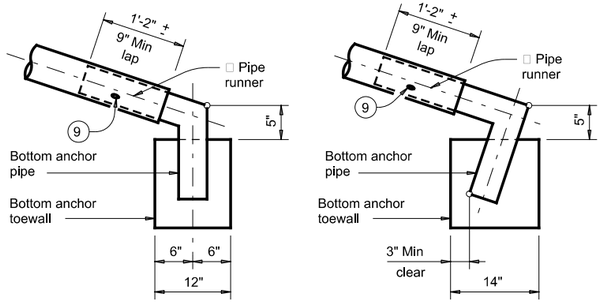


PLAN OF SKEWED INSTALLATION



OPTION B1 OPTION B2

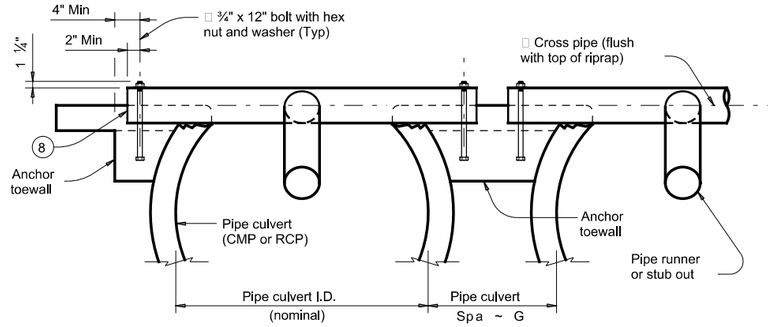
BOTTOM ANCHOR PIPE DETAILS (10)



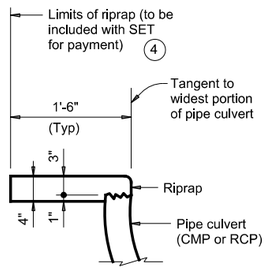
OPTION B1 OPTION B2

BOTTOM ANCHOR TOEWALL DETAILS

(Culvert and riprap not shown for clarity.)



SHOWING CROSS PIPE AND ANCHOR TOEWALL



SHOWING TYPICAL PIPE CULVERT AND RIPRAP

SECTION A-A

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

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

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

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

(9) After installation, inspect the ½" hole to ensure that the lap of the pipe runner with the bottom anchor pipe is adequate.

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

MATERIAL NOTES:
Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.
Provide pipe runners, cross pipes, and anchor pipes conforming to the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr B, or API 5LX52.
Provide ASTM A307 bolts and nuts.
Galvanize all steel components, except concrete reinforcing, after fabrication.
Repair galvanizing damaged during transport or construction in accordance with the specifications.

GENERAL NOTES:
Pipe runners are designed for a traversing load of 1,800 pounds at yield as recommended by Research Report 280-1, "Safety Treatment of Roadside Cross-Drainage Structures", Texas Transportation Institute, March 1981.
Safety end treatments (SET) shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the pipe runners.
Payment for riprap and toewall is included in the price bid for each safety end treatment.
Construct concrete riprap and all necessary inverts in accordance with the requirements of Item 432, "Riprap".

Texas Department of Transportation
Bridge Division Standard

SAFETY END TREATMENT

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

SETP-CD

FILE: setpcdse-20.dgn		DN: GAF		CK: CAT	DW: JRP		CK: GAF
©TxDOT February 2020		CONT	SECT	JOB		HIGHWAY	
REVISIONS		0914	33	068,ETC		RSL	
		DIST	COUNTY			SHEET NO.	
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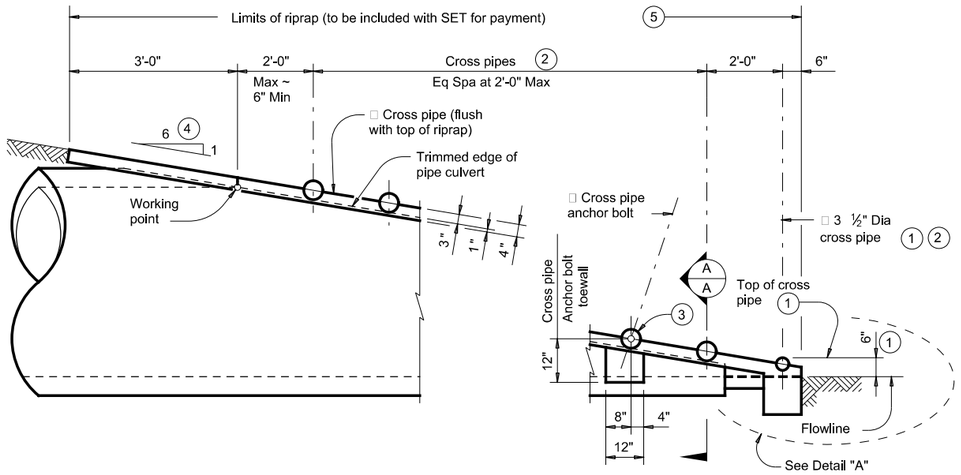
DATE: 11/20/2020 1:01:15 PM
FILE: c:\pwworking\dal\d0684122\setppase-20.dgn



SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

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

CROSS PIPE LENGTHS AND REQUIRED PIPE SIZES 2

Corrugated Metal Pipe (CMP) Culverts

Design	Conc Riprap (CY) 6	Pipe Culvert Span	Pipe Culvert Rise	Pipe Culvert Spa ~ G	Single Barrel ~ Q1	Multi-Barrel ~ Q1	Q2	Conditions for Use of Cross Pipes	Cross Pipe Sizes
1	0.6	17"	13"	1' - 0"	N/A	2' - 8"	2' - 5"	3 or more pipe culverts	3" Std (3.500" O.D.)
2	0.7	21"	15"	1' - 2"	N/A	3' - 1"	2' - 11"		
3	0.9	28"	20"	1' - 5"	N/A	3' - 9"	3' - 9"	3 or more pipe culverts	3 ½" Std (4.000" O.D.)
4	1.0	35"	24"	1' - 8"	4' - 4"	4' - 6"	4' - 7"	All pipe culverts	4" Std (4.500" O.D.)
5	1.2	42"	29"	1' - 11"	4' - 11"	5' - 2"	5' - 5"		
6	1.4	49"	33"	2' - 2"	5' - 6"	5' - 11"	6' - 3"	All pipe culverts	5" Std (5.563" O.D.)
7	1.6	57"	38"	2' - 5"	6' - 2"	6' - 8"	7' - 2"		
8	1.8	64"	43"	2' - 10"	6' - 9"	7' - 6"	8' - 2"		
9	1.9	71"	47"	3' - 2"	7' - 4"	8' - 3"	9' - 1"		

Reinforced Concrete Pipe (RCP) Culverts

Design	Conc Riprap (CY) 6	Pipe Culvert Span	Pipe Culvert Rise	Pipe Culvert Spa ~ G	Single Barrel ~ Q1	Multi-Barrel ~ Q1	Q2	Conditions for Use of Cross Pipes	Cross Pipe Sizes
1	0.6	22"	13 ½"	1' - 0"	N/A	3' - 1"	2' - 10"	3 or more pipe culverts	3" Std (3.500" O.D.)
2	0.7	26"	15 ½"	1' - 2"	N/A	3' - 6"	3' - 4"		
3	0.9	28 ½"	18"	1' - 5"	N/A	3' - 10"	3' - 9 ½"	3 or more pipe culverts	3 ½" Std (4.000" O.D.)
4	1.0	36 ¼"	22 ½"	1' - 8"	4' - 5"	4' - 7"	4' - 8 ¼"	All pipe culverts	4" Std (4.500" O.D.)
5	1.2	43 ¾"	26 b"	1' - 11"	5' - 1"	5' - 4"	5' - 6 ¾"		
6	1.4	51 Ь"	31 Ð"	2' - 2"	5' - 8"	6' - 1"	6' - 5 ¼"	All pipe culverts	5" Std (5.563" O.D.)
7	1.6	58 ½"	36"	2' - 5"	6' - 4"	6' - 10"	7' - 3 ½"		
8	1.8	65"	40"	2' - 10"	6' - 10"	7' - 7"	8' - 3"		
9	1.9	73"	45"	3' - 2"	7' - 6"	8' - 5"	9' - 3"		

1 The proper installation of the first cross pipe is critical for vehicle safety. Place the top of the first cross pipe no more than 6" above the flow line.

2 Provide cross pipes, except the first bottom pipe, of the size shown in the table. Provide a 3 1#2" standard pipe (4" O.D.) for the first bottom pipe.

3 Install the third Cross Pipe from the bottom of the culvert using a bolted connection. Ensure that riprap concrete does not flow into the cross pipe so as to permit disassembly of the bolted connection to allow cleanout access. At the Contractor's option, install all other cross pipes using the bolted connection details.

4 Match cross slope as shown elsewhere in the plans. Cross slope of 6:1 or flatter is required for vehicle safety.

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

6 Quantities shown are for one end of one pipe culvert. For multiple Pipe Culverts, quantities will need to be adjusted. Riprap quantities are for Contractor's information only.

MATERIAL NOTES:

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

Provide cross pipes that meet the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr B, or API 5LX52.

Provide ASTM A307 bolts and nuts.

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

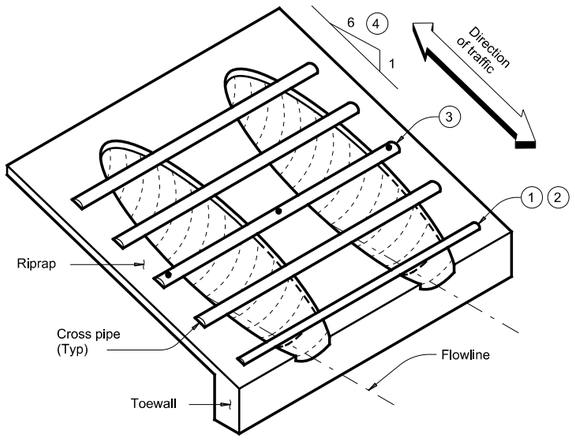
GENERAL NOTES:

Pipe runners are designed for a traversing load of 10,000 pounds at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.

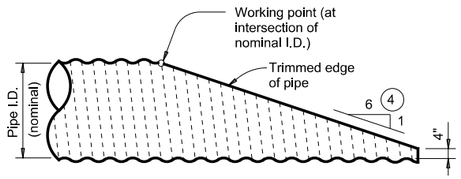
Safety end treatments (SET) shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the Pipe Runners.

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

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



ISOMETRIC VIEW OF TYPICAL INSTALLATION



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

SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

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

SHEET 1 OF 2

Texas Department of Transportation

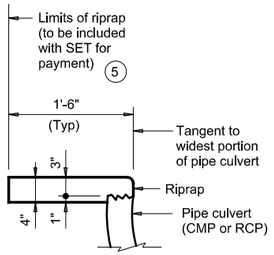
Bridge Division Standard

SAFETY END TREATMENT

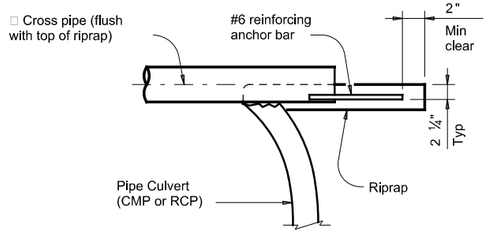
FOR DESIGN 1 TO 9
ARCH PIPE CULVERTS
TYPE II ~ PARALLEL DRAINAGE

SETP-PD-A

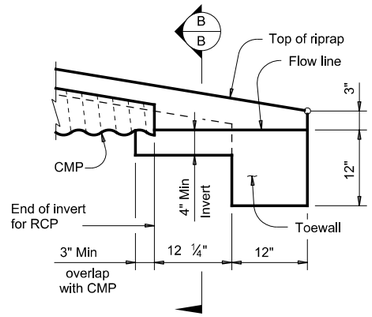
FILE: setppase-20.dgn	DN: GAF	CK: TxDOT	DW: JRP	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	33	068, ETC	RSL
	DIST	COUNTY		SHEET NO.
	AUS	HAYS		213



SHOWING TYPICAL PIPE CULVERT AND RIPRAP

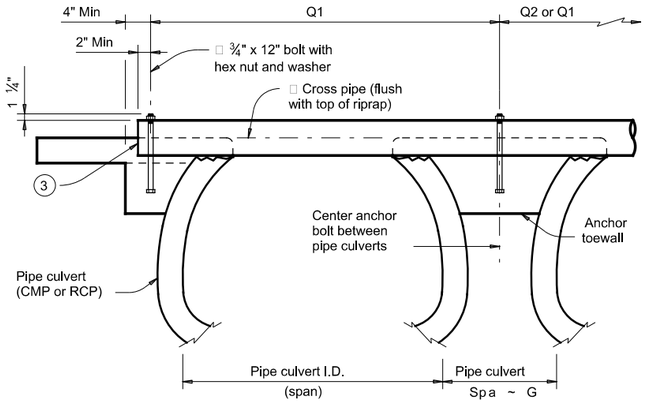


SHOWING CROSS PIPE WITH ANCHOR BAR



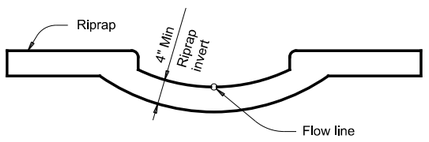
DETAIL "A"

(Showing invert with corrugated metal pipe (CMP) culvert. Reinforced concrete pipe (RCP) culvert details are similar. Cross pipes not shown for clarity.)



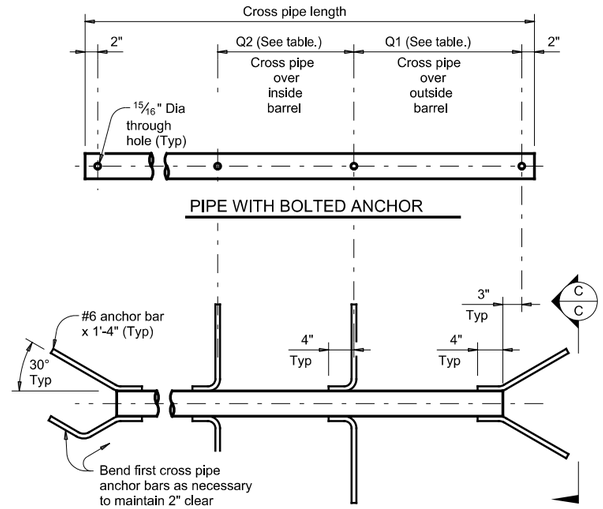
SHOWING CROSS PIPE WITH BOLTED ANCHOR

SECTION A-A

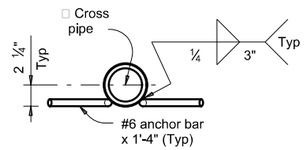


SECTION B-B

(Cross pipes not shown for clarity.)



PIPE WITH ANCHOR BARS



SECTION C-C

CROSS PIPE DETAILS

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SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

FOR DESIGN 1 TO 9
ARCH PIPE CULVERTS
TYPE II ~ PARALLEL DRAINAGE

SETP-PD-A

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©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
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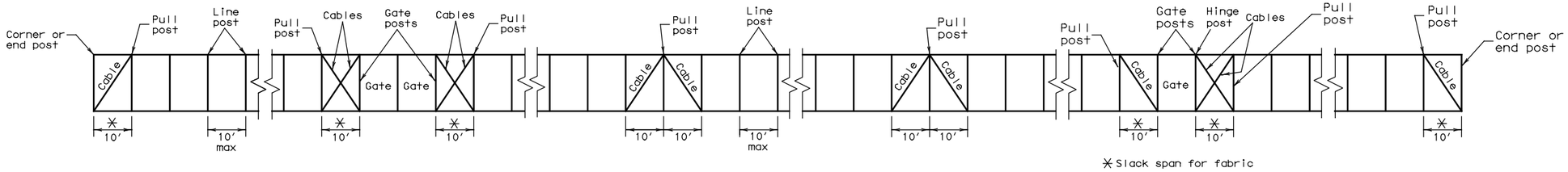
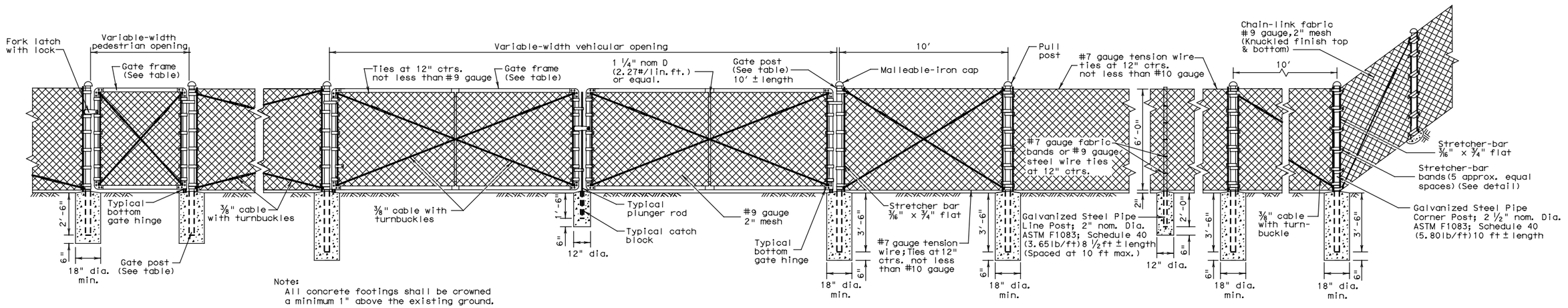


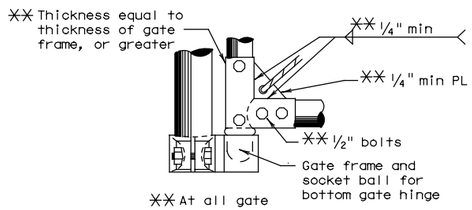
TYPICAL CABLE AND POST ARRANGEMENT



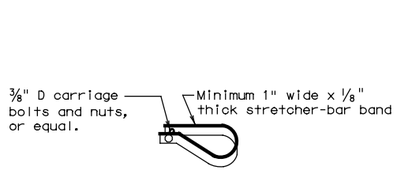
Note:
All concrete footings shall be crowned a minimum 1" above the existing ground.

CHAIN-LINK BARRIER FENCE (6 FT.)

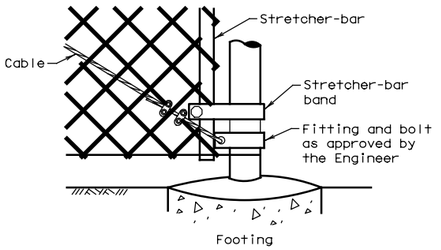
Foundation designs shown are "minimums" for a 6 ft. fence.
Taller fences may require larger foundation designs.



TYPICAL BOTTOM GATE HINGE



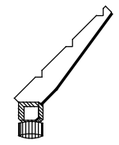
TYPICAL STRETCHER-BAR BAND



TERMINAL POST DETAIL

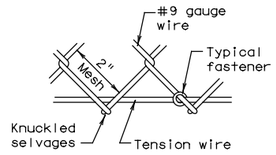
GATE (TYPES AND SIZES)	
Single Inclusive	Double Inclusive
Up to 6′ Over 6′ to 12′ Over 12′ to 18′ Over 18′	Up to 12′ Over 12′ to 26′ Over 26′ to 36′ Over 36′

GATE FRAME (WEIGHT)		GATE POST (WEIGHT)	
SIZE	WT./LIN. FT.	SIZE	WT./LIN. FT.
1 ½" nom dia. or equal	2.72 Lbs.	2 ½" nom dia. or equal	5.79 Lbs.
		3 ½" nom dia. or equal	9.11 Lbs.
		6" nom dia.	18.97 Lbs.
		8" nom dia.	24.70 Lbs.



"OPTIONAL" 3 WIRE 45° BARBED WIRE ARM

Barbed wire arm related items shall conform to Item 550, "Chain Link Fence."



FABRIC & TENSION WIRE DETAIL, TOP & BOTTOM

GENERAL NOTES

1. Items hereon shall conform to Item 550, "Chain Link Fence."
2. Typical installation plan may vary as shown elsewhere on the plans or as directed by the Engineer. Location of gates shown elsewhere on plans.
3. Gate-frame members shall be bolted, at frame corners, to joint fittings with four ½" bolts per joint.
4. All cable connections are to be made with two ⅜" cable clamps.
5. All pull posts and end posts and their foundations shall have the same respective dimensions as those shown for corner post.
6. All pull post shall be furnished with two stretcher bars.
7. One end of each turnbuckle may be attached directly to fittings with a clevis.
8. Concrete footings are to be crowned at the top to shed water.

Texas Department of Transportation

Design Division Standard

CHAIN LINK FENCE

CLF-10

FILE: clf10.dgn	DN: TxDOT	CK: AM	DW: BD	CK: VP
© TxDOT 1996	CONT	SECT	JOB	HIGHWAY
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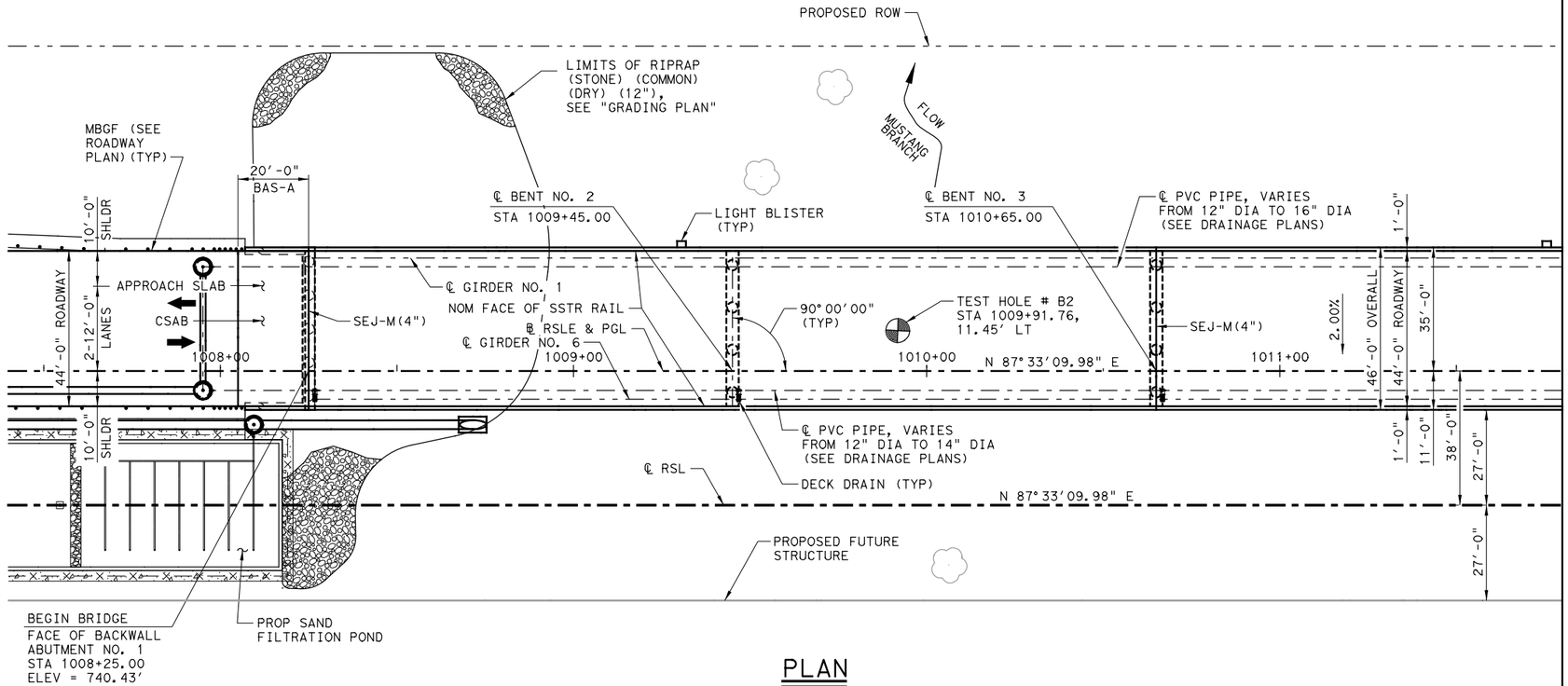
	DIST	COUNTY		SHEET NO.
	AUS	HAYS		215



PLAN

NBI NO: 14-106-0-AA01-32-003
DESIGN SPEED: 60 MPH
ADT (2035): 3,800 VPD
FUNCT CLASS: MINOR COLLECTOR

0 20 40
SCALE IN FEET

N

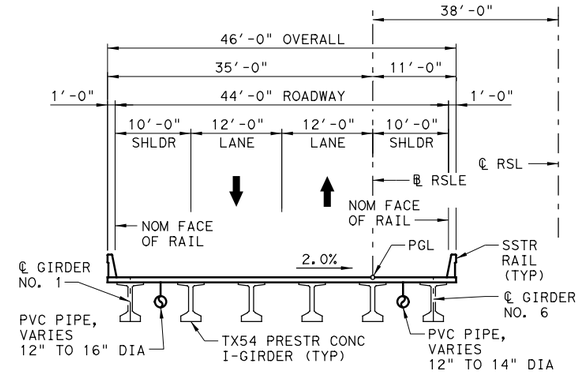
GENERAL NOTES:

DESIGNED IN ACCORDANCE WITH AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 8TH EDITION (2017) AND ALL CURRENT INTERIM REVISIONS.

D = DENOTES BENTS WITH DOWELS D AND SLOTTED HOLES AT EXTERIOR GIRDER ENDS.
H = COLUMN HEIGHT AT PGL

FOUND DRILLED SHAFTS AT THE LENGTHS SHOWN OR LONGER TO OBTAIN A MINIMUM 3 DRILLED SHAFT DIAMETER PENETRATION INTO LIMESTONE OR SHALE.

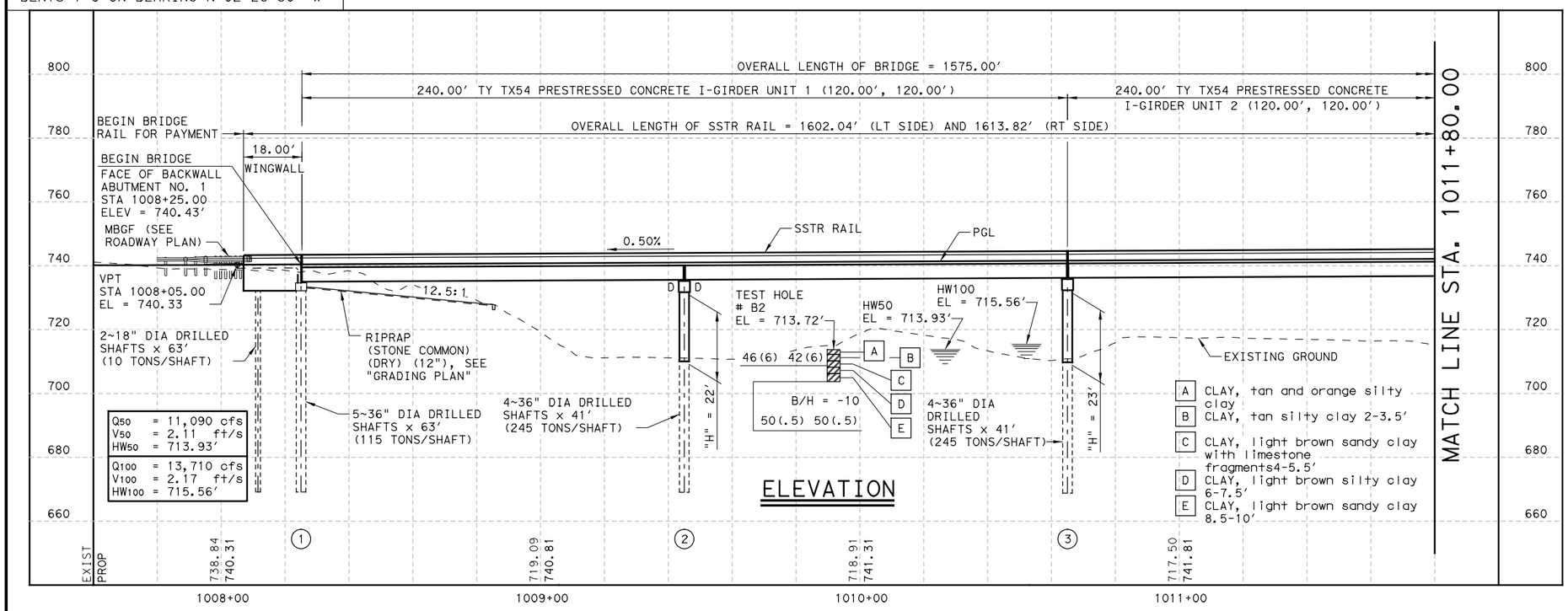
MAXIMUM PIER SCOUR POTENTIAL FOR 100 YR RETURN EVENT IS 3.87'.



TYPICAL TRANSVERSE SECTION

(STA 1008+25.00 TO 1014+25.00)

BENTS 1-8 ON BEARING N 02°26'50" W



ELEVATION

HL93 LOADING

STATE OF TEXAS
ALLEN R. CROZIER
81450
LICENSED PROFESSIONAL ENGINEER
11/19/2020

HAYS COUNTY TEXAS

HDR Engineering, Inc.
1290 Wonder World Drive
Building #1, Suite 1230
San Marcos, TX 78666-7969
Texas Registered Engineering Firm F-754

Texas Department of Transportation
℗ 2020

ROBERT S. LIGHT EXTENSION
MUSTANG BRANCH BRIDGE

BRIDGE LAYOUT

SHEET 1 OF 4

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
SDM	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
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CHECK	CONTROL	SECTION	JOB	216
ARC	0914	33	068,ETC	
CHECK				
SDM				

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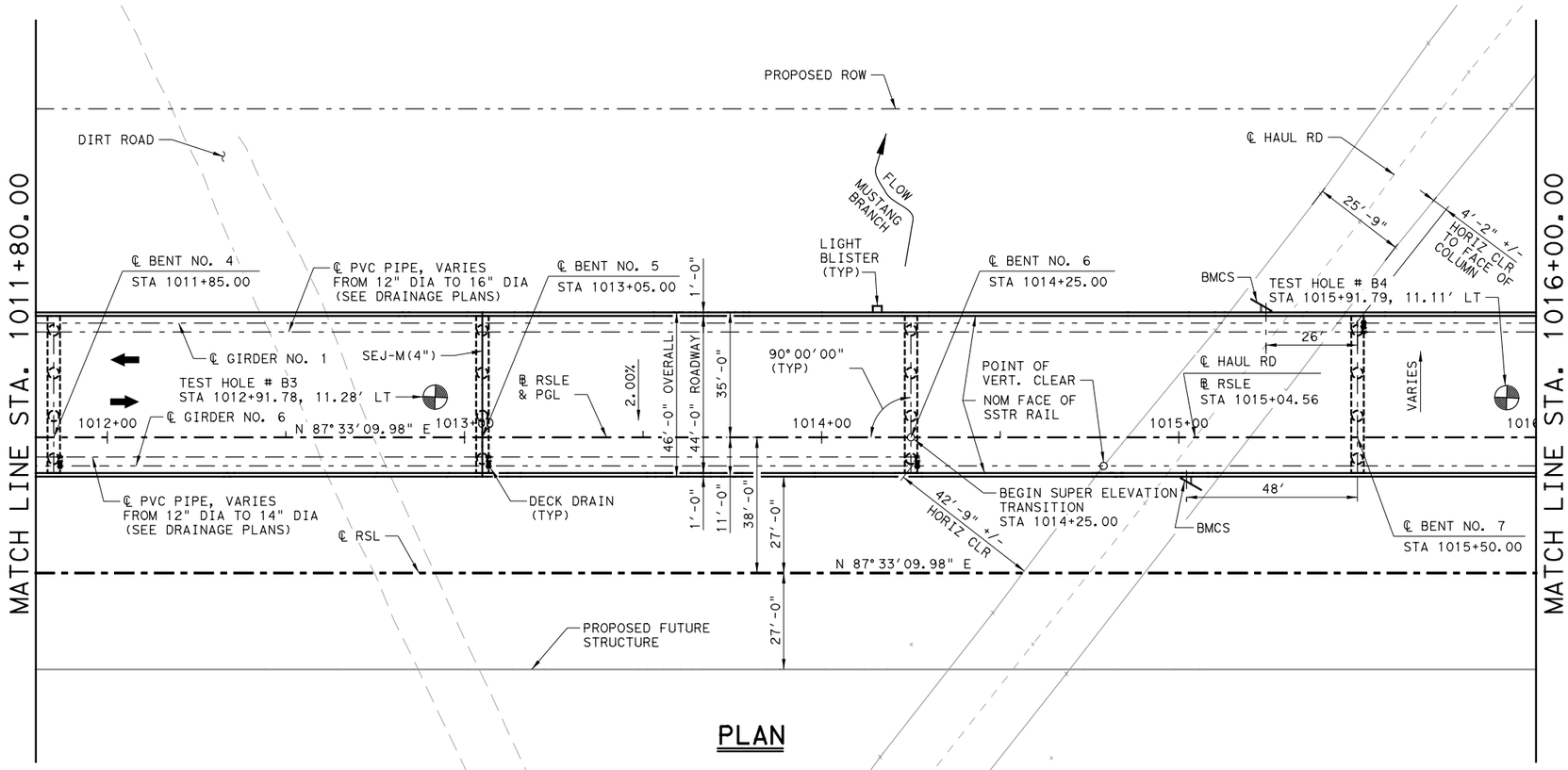
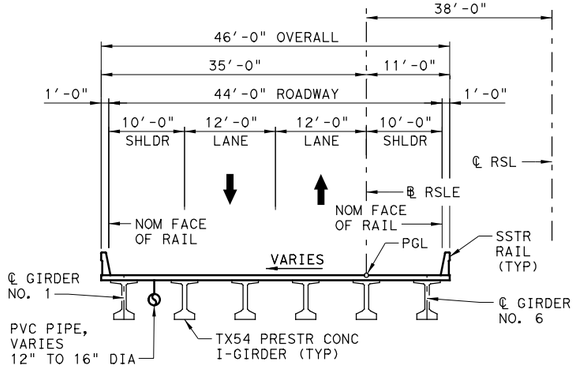


PLAN

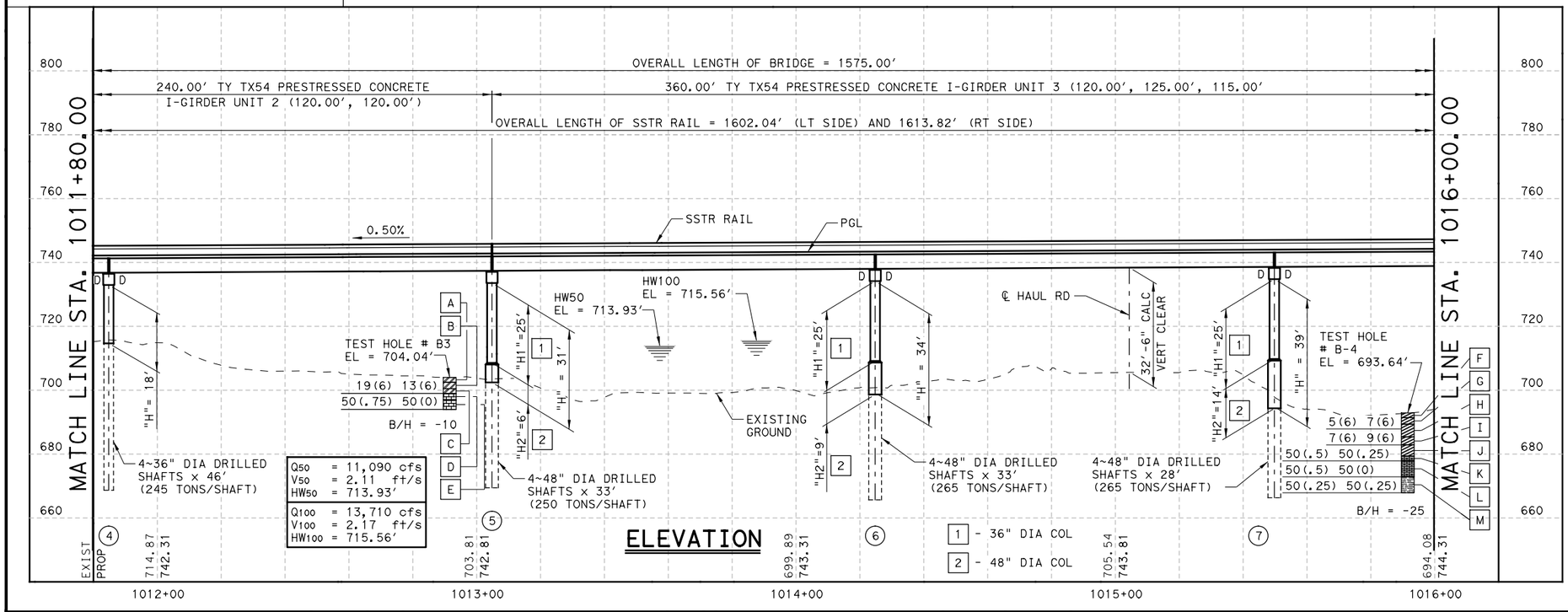
A	CLAY, no field sample taken
B	CLAY, tan sandy clay w/ limestone
C	CLAY, tan silty clay w/ rock fragments
D	LIMESTONE, white limestone fragments
E	LIMESTONE, no field sample taken
F	CLAY, tan moist sandy clay w/ gravel
G	CLAY, light brown silty clay w/ sandy gravel mix
H	CLAY, light brown & gray silty and sandy clay w/ small gravel
I	CLAY, dark & light brown silty and sandy clays w/ small gravel
J	CLAY, hit rock at 13.5 ft, no field sample taken
K	LIMESTONE, brown and gray wet clay and limestone
L	LIMESTONE, weathered and pitted limestone w/ high degree of fracturing throughout run
M	SHALE, alternating layers of limestone & shale, high degree of fracturing

0 20 40 N
SCALE IN FEET



TYPICAL TRANSVERSE SECTION
(STA 1014+25.00 TO 1017+85.00)

BENTS 1-8 ON BEARING N 02°26'50" W



ELEVATION

HL93 LOADING

STATE OF TEXAS
ALLEN R. CROZIER
81450
LICENSED
PROFESSIONAL ENGINEER
11/19/2020

HAYS COUNTY TEXAS

HDR Engineering, Inc.
1290 Wonder World Drive
Building #1, Suite 1230
San Marcos, TX 78666-7969
Texas Registered Engineering Firm F-754

Texas Department of Transportation
℗ 2020

ROBERT S. LIGHT EXTENSION
MUSTANG BRANCH BRIDGE

BRIDGE LAYOUT

SHEET 2 OF 4

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
SDM	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
MMF	TEXAS	AUS	HAYS	217
CHECK	CONTROL	SECTION	JOB	
ARC	0914	33	068,ETC	
CHECK				
SDM				

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TIME: 4:34:36 PM
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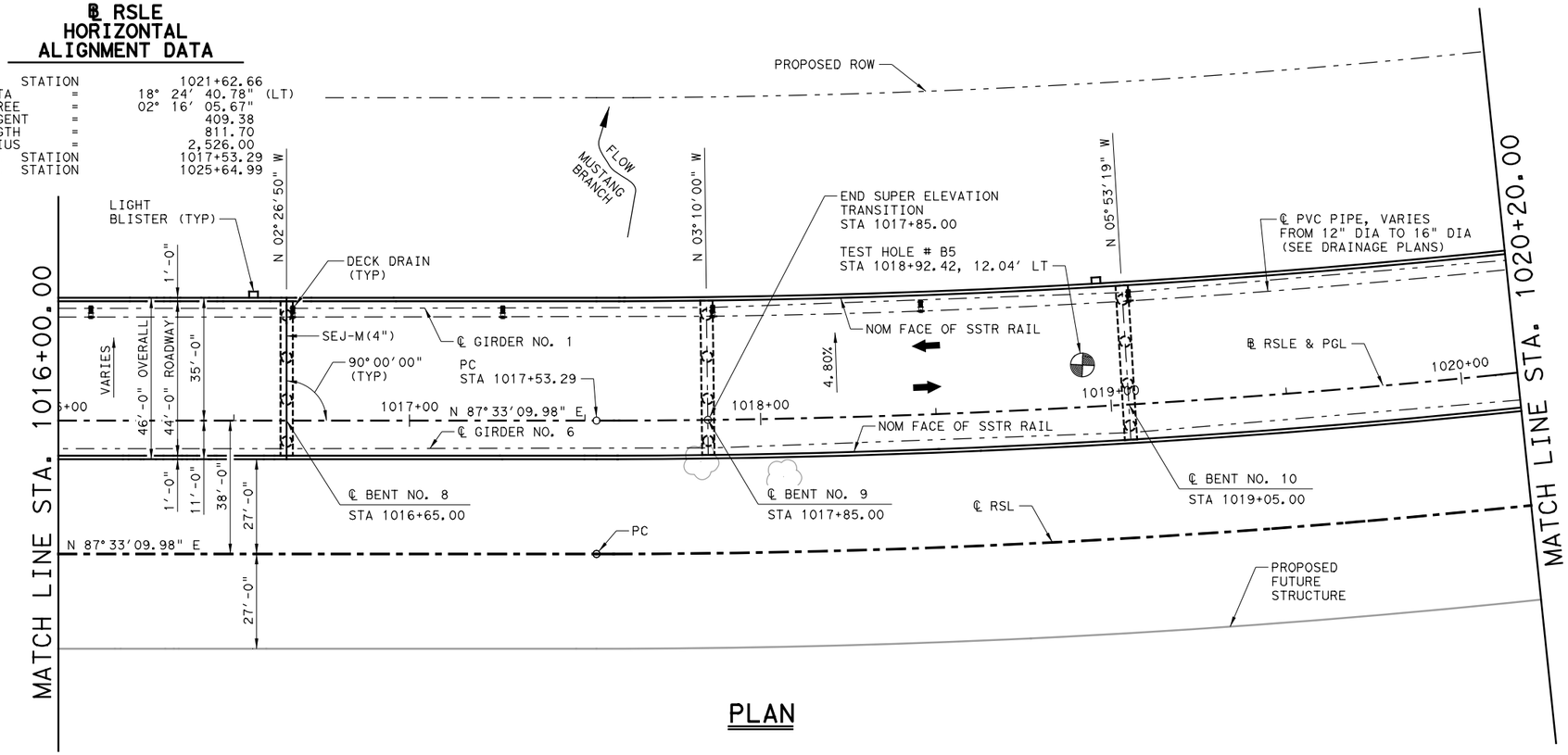
SCALE: 1:40

℄ RSLE HORIZONTAL ALIGNMENT DATA

P.I.	STATION	1021+62.66
DELTA	=	18° 24′ 40.78" (LT)
DEGREE	=	02° 16′ 05.67"
TANGENT	=	409.38
LENGTH	=	811.70
RADIUS	=	2,526.00
P.C.	STATION	1017+53.29
P.T.	STATION	1025+64.99

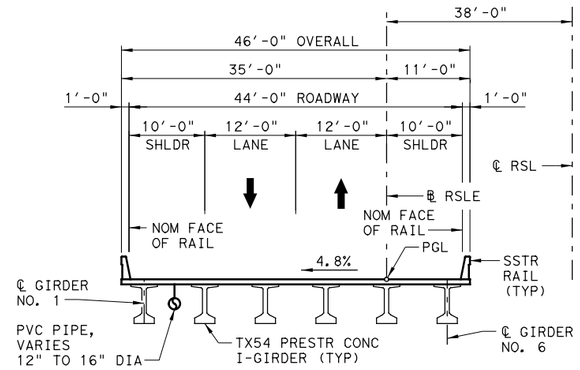


PLAN

A	CLAY, light brown and orange silty & sandy clay w/ gravel
B	CLAY, light brown and orange silty & sandy clay w/ gravel
C	CLAY, dark brown silty clay w/ med. size gravel (low recovery)
D	CLAY, dark brown & gray silty clay w/ gravel
E	CLAY, dark gray and brown wet compressed clays with small gravel
F	CLAY, hit rock at 17′ no field sample taken
G	SHALE, alternating layers of buda limestone and dark shale.
H	SHALE, alternating layers of buda limestone and dark grey shale

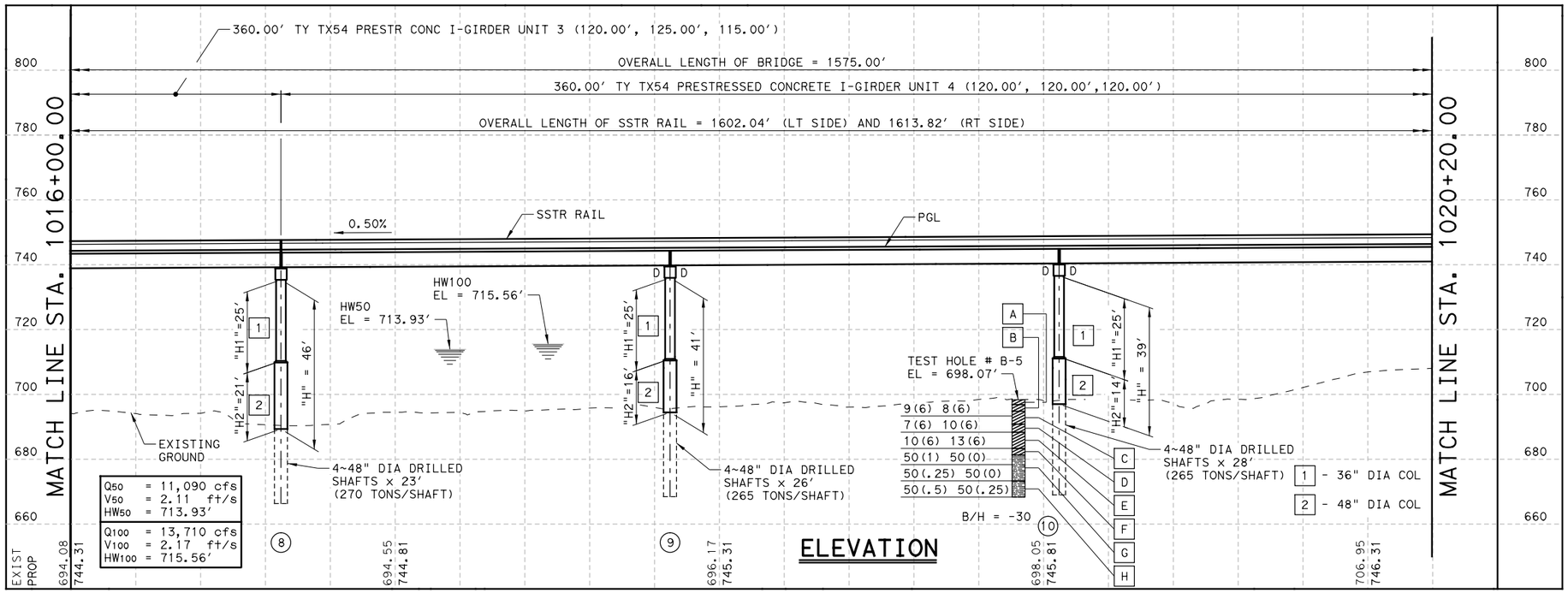
0 20 40
SCALE IN FEET

N



TYPICAL TRANSVERSE SECTION

(STA 1017+85.00 TO 1022+75.00)



ELEVATION

HL93 LOADING

STATE OF TEXAS
ALLEN R. CROZIER
81450
LICENSED
PROFESSIONAL ENGINEER

11/19/2020

HAYS COUNTY TEXAS

HDR Engineering, Inc.
1290 Wonder World Drive
Building #1, Suite 1230
San Marcos, TX 78666-7969
Texas Registered Engineering Firm F-754

Texas Department of Transportation

ROBERT S. LIGHT EXTENSION
MUSTANG BRANCH BRIDGE

BRIDGE LAYOUT

SHEET 3 OF 4

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
SDM	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
MMF	TEXAS	AUS	HAYS	218
CHECK	CONTROL	SECTION	JOB	
ARC	0914	33	068,ETC	
CHECK				
SDM				

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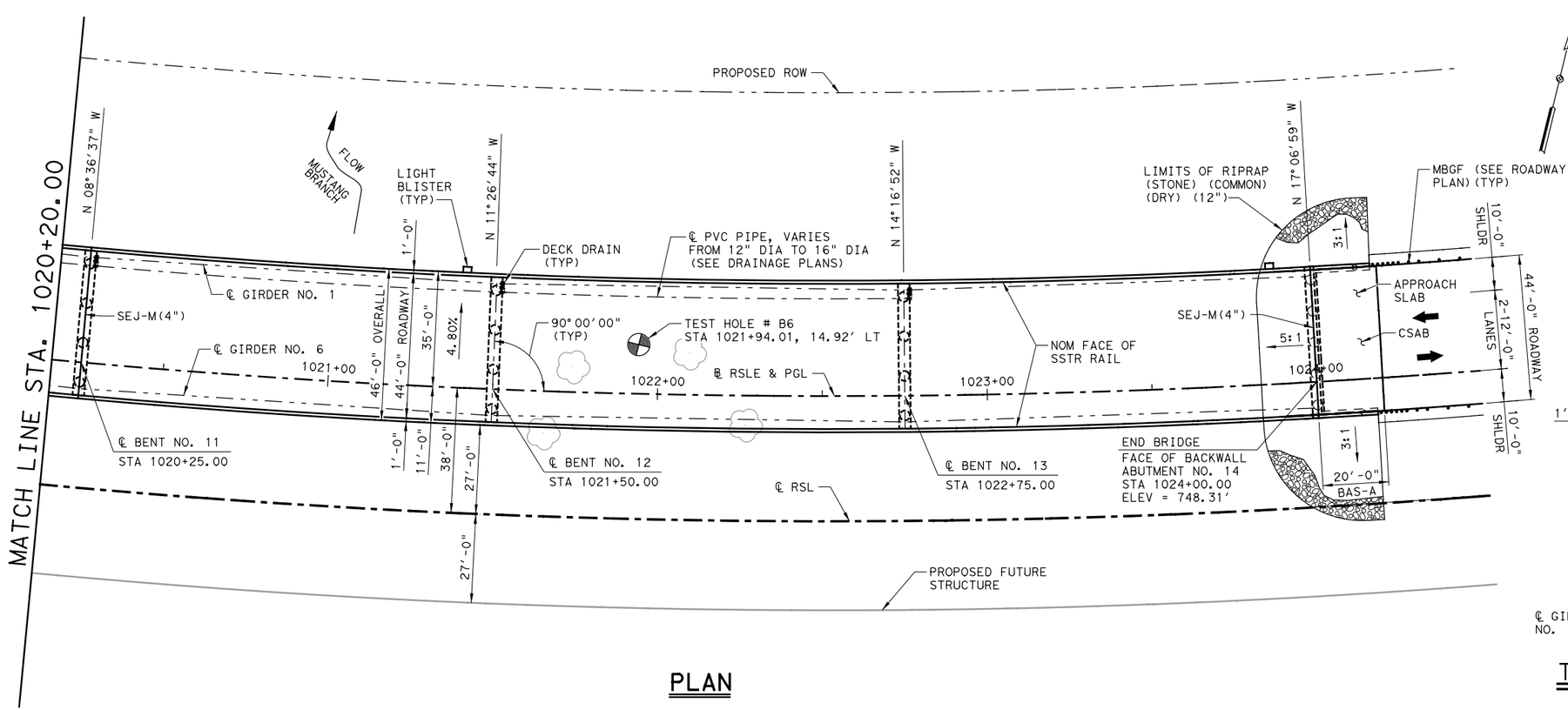
TIME: 4:34:39 PM
SCALE: 1:40



PLAN

A CLAY, dark brown silty clay with orange sandy clay

B CLAY, silty brown & orange clay w/ gravel

C CLAY, dark brown silty clayey w/ small gravel

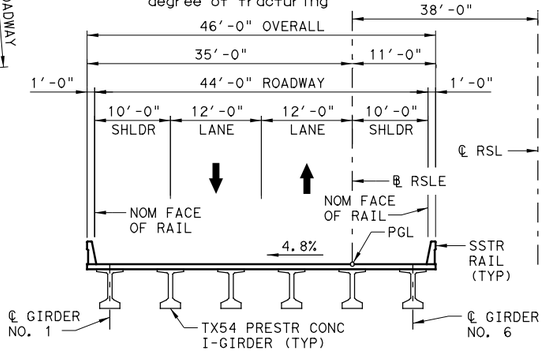
D CLAY, light brown silty sandy clayey w/ small rock

E CLAY, light brown silty sandy clayey, water at 14 ft

F CLAY, dark brown silty clay w/ gravel & shale

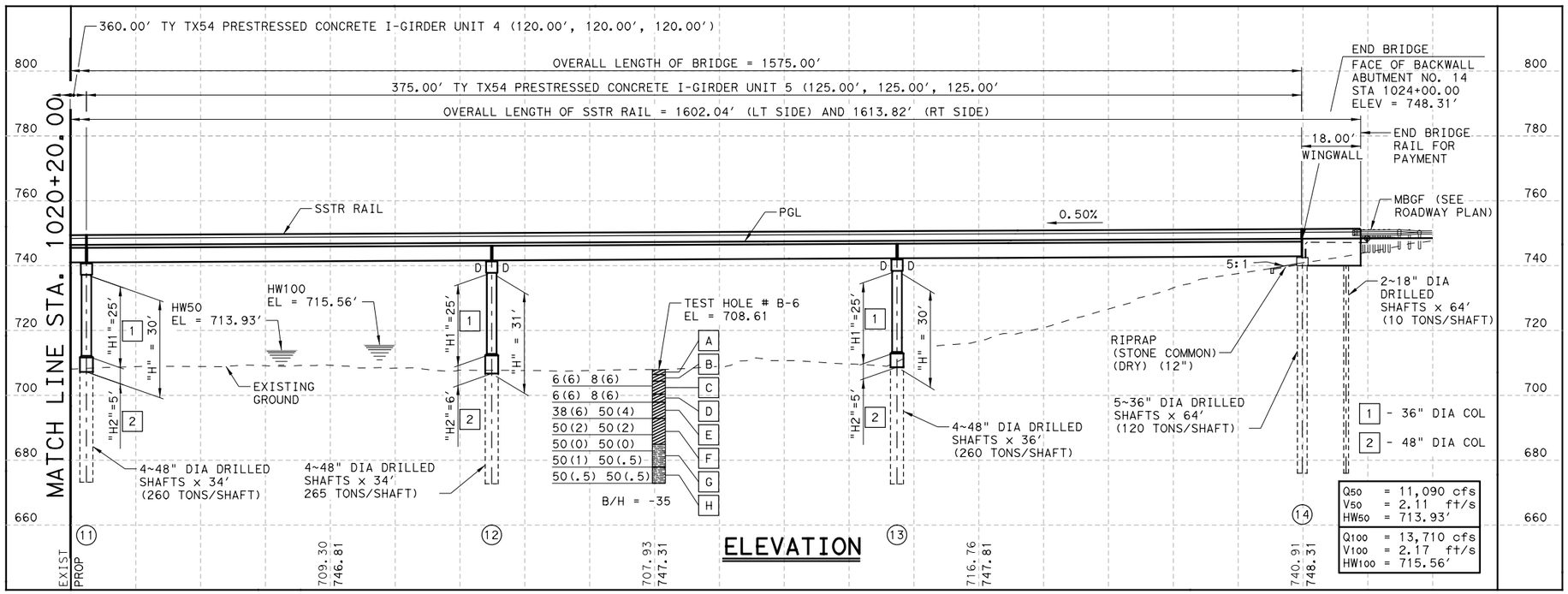
G SHALE, dark gray shaley w/ gray shale and buda limestone, rock at 23 ft

H SHALE, alternating layers of buda limestone and dark gray shale w/ high degree of fracturing



TYPICAL TRANSVERSE SECTION

(STA 1022+75.00 TO 1024+00.00)



ELEVATION

HL93 LOADING

STATE OF TEXAS
ALLEN R. CROZIER
81450
LICENSED
PROFESSIONAL ENGINEER
11/19/2020

HAYS COUNTY TEXAS

HDR Engineering, Inc.
1290 Wonder World Drive
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Texas Registered Engineering Firm F-754

Texas Department of Transportation
℗ 2020

ROBERT S. LIGHT EXTENSION
MUSTANG BRANCH BRIDGE

BRIDGE LAYOUT

SHEET 4 OF 4

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
SDM	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
MMF	TEXAS	AUS	HAYS	219
CHECK	CONTROL	SECTION	JOB	
ARC	0914	33	068,ETC	
CHECK				
SDM				

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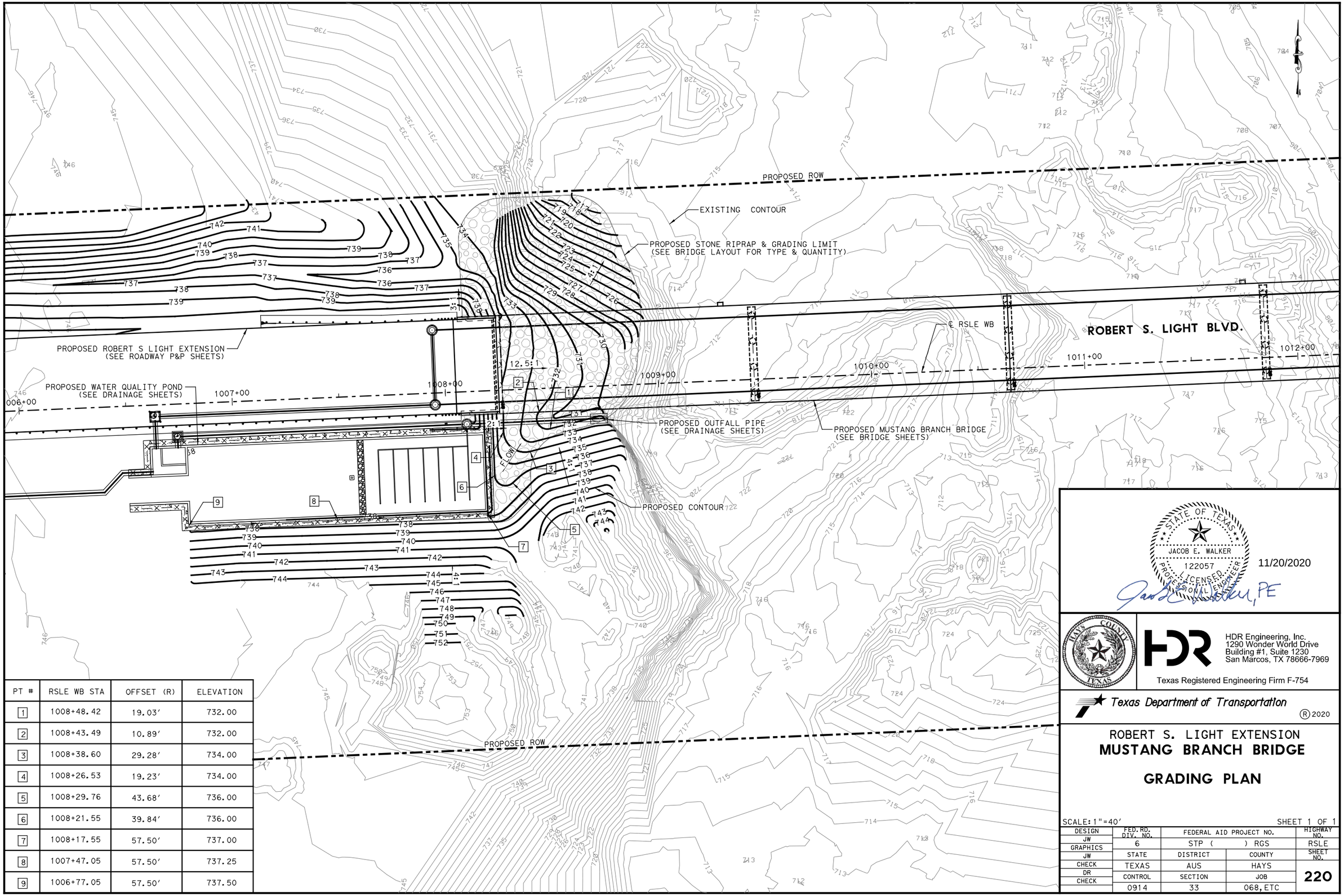

PT #	RSLE WB STA	OFFSET (R)	ELEVATION
1	1008+48.42	19.03′	732.00
2	1008+43.49	10.89′	732.00
3	1008+38.60	29.28′	734.00
4	1008+26.53	19.23′	734.00
5	1008+29.76	43.68′	736.00
6	1008+21.55	39.84′	736.00
7	1008+17.55	57.50′	737.00
8	1007+47.05	57.50′	737.25
9	1006+77.05	57.50′	737.50

STATE OF TEXAS
JACOB E. WALKER
122057
LICENSED PROFESSIONAL ENGINEER
11/20/2020

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San Marcos, TX 78666-7969
Texas Registered Engineering Firm F-754

Texas Department of Transportation
℗ 2020

ROBERT S. LIGHT EXTENSION
MUSTANG BRANCH BRIDGE

GRADING PLAN

SCALE: 1"=40′ SHEET 1 OF 1

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JW	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JW	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	220
DR	0914	33	068,ETC	
CHECK				

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USER: KBERGER DATE: 11/20/2020 TIME: 5:36:33 PM SCALE: 1:40
FILE: RSLE-MB ABUT 1-GRADING.dgn

SUMMARY OF BRIDGE QUANTITIES

LOCATION	401 6001 FLOWABLE BACKFILL ②	416 6001 DRILL SHAFT (18 IN)	416 6004 DRILL SHAFT (36 IN)	416 6006 DRILL SHAFT (48 IN)	420 6013 CL C CONC (ABUT) ①	420 6025 CL C CONC (BENT) ①	422 6001 REINF CONC SLAB	422 6015 APPROACH SLAB	425 6039 PRESTR CONC GIRDER (Tx54)	432 6024 RIP RAP (STONE COMMON) (DRY) (12")	442 6008 STR STEEL (MISCELLANEOUS BRIDGE)	450 6023 RAIL (TY SSTR)	454 6018 SEALED EXPANSION JOINT(4 IN) (SEJ-M)
	CY	LF	LF	LF	CY	CY	SF	CY	LF	CY	LB	LF	LF
2 - ABUTMENTS	248.7	254	635		73.9			70.6		161.6			
12 - INTERIOR BENTS			512	956		745.5							
											466	3,287.86	268.5
2 - 240.000' PRESTR CONC I-GIRDER UNITS							22,080		2,868.00				
2 - 360.000' PRESTR CONC I-GIRDER UNITS							33,061		4,294.14				
1 - 375.000' PRESTR CONC I-GIRDER UNIT							17,169		2,230.11				
TOTAL	248.7	254	1,147	956	73.9	745.5	72,310	70.6	9,392.25	161.6	466	3,287.86	268.5

① INCLUDES SHEAR KEY CONCRETE

② FLOWABLE BACKFILL IS TO BE PLACED TO THE LIMITS SHOWN ON CSAB STANDARD

BEARING SEAT ELEVATIONS

		GIRDER 1	GIRDER 2	GIRDER 3	GIRDER 4	GIRDER 5	GIRDER 6
ABUT	1 (FWD)	735.372	735.212	735.052	734.892	734.732	734.572
BENT	2 (BK)	735.962	735.802	735.642	735.482	735.322	735.162
	(FWD)	735.972	735.812	735.652	735.492	735.332	735.172
BENT	3 (BK)	736.562	736.402	736.242	736.082	735.922	735.762
	(FWD)	736.572	736.412	736.252	736.092	735.932	735.772
BENT	4 (BK)	737.162	737.002	736.842	736.682	736.522	736.362
	(FWD)	737.172	737.012	736.852	736.692	736.532	736.372
BENT	5 (BK)	737.762	737.602	737.442	737.282	737.122	736.962
	(FWD)	737.772	737.612	737.452	737.292	737.132	736.972
BENT	6 (BK)	738.362	738.202	738.042	737.882	737.722	737.562
	(FWD)	738.366	738.207	738.049	737.890	737.732	737.573
BENT	7 (BK)	738.237	738.265	738.292	738.319	738.347	738.374
	(FWD)	738.235	738.265	738.296	738.326	738.357	738.387
BENT	8 (BK)	738.117	738.318	738.519	738.721	738.922	739.123
	(FWD)	738.094	738.298	738.502	738.707	738.911	739.115
BENT	9 (BK)	737.970	738.353	738.735	739.118	739.500	739.883
	(FWD)	737.932	738.316	738.700	739.084	739.468	739.852
BENT	10 (BK)	738.522	738.906	739.290	739.674	740.058	740.442
	(FWD)	738.532	738.916	739.300	739.684	740.068	740.452
BENT	11 (BK)	739.122	739.506	739.890	740.274	740.658	741.042
	(FWD)	739.132	739.516	739.900	740.284	740.668	741.052
BENT	12 (BK)	739.747	740.131	740.515	740.899	741.283	741.667
	(FWD)	739.757	740.141	740.525	740.909	741.293	741.677
BENT	13 (BK)	740.372	740.756	741.140	741.524	741.908	742.292
	(FWD)	740.382	740.766	741.150	741.534	741.918	742.302
ABUT	14 (BK)	740.997	741.381	741.765	742.149	742.533	742.917

AS-BUILT DRILLED SHAFT TIP ELEVATIONS

BENT NO.	DS NO.	TIP ELEVATION
ABUT 1	1	
	2	
	3	
	4	
	5	
	WW1	
	WW2	
BENT 2	1	
	2	
	3	
	4	
BENT 3	1	
	2	
	3	
	4	
BENT 4	1	
	2	
	3	
	4	
BENT 5	1	
	2	
	3	
	4	
BENT 6	1	
	2	
	3	
	4	
BENT 7	1	
	2	
	3	
	4	
BENT 8	1	
	2	
	3	
	4	
BENT 9	1	
	2	
	3	
	4	
BENT 10	1	
	2	
	3	
	4	
BENT 11	1	
	2	
	3	
	4	
BENT 12	1	
	2	
	3	
	4	
BENT 13	1	
	2	
	3	
	4	
ABUT 14	1	
	2	
	3	
	4	
	5	
	WW1	
	WW2	

TABLE OF DECK DRAIN LOCATIONS

℄ RSLE STA	FT LT/RT	TYPE
1008+26.75	6.95 RT	BD-3
1009+46.75	6.95 RT	BD-3
1010+66.75	6.95 RT	BD-3
1011+86.75	6.95 RT	BD-3
1013+06.75	6.95 RT	BD-3
1014+26.75	6.95 RT	BD-3
1015+51.75	30.95 LT	BD-3
1016+09.25	30.95 LT	BD-3
1016+66.75	30.95 LT	BD-3
1017+26.55	30.95 LT	BD-3
1017+86.75	30.95 LT	BD-3
1018+46.75	30.95 LT	BD-3
1019+06.75	30.95 LT	BD-3
1020+26.75	30.95 LT	BD-3
1021+51.75	30.95 LT	BD-3
1022+76.75	30.95 LT	BD-3

NOTES:
1. SEE DRAINAGE SUMMARY SHEET FOR ITEM 481 "PIPE FOR DRAIN" AND ITEM 471 "GRATE AND FRAME (BRIDGE DRAIN)".

HL93 LOADING

STATE OF TEXAS
ALLEN R. CROZIER
81450
LICENSED
PROFESSIONAL ENGINEER
11/19/2020

HAYS COUNTY TEXAS

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Texas Registered Engineering Firm F-754

Texas Department of Transportation

ROBERT S. LIGHT EXTENSION
MUSTANG BRANCH BRIDGE

ESTIMATED QUANTITIES & BEARING SEAT ELEVATIONS

SHEET 1 OF 1

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
WJC	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JCS	TEXAS	AUS	HAYS	221
CHECK	CONTROL	SECTION	JOB	
SDM	0914	33	068,ETC	
CHECK				
ARC				

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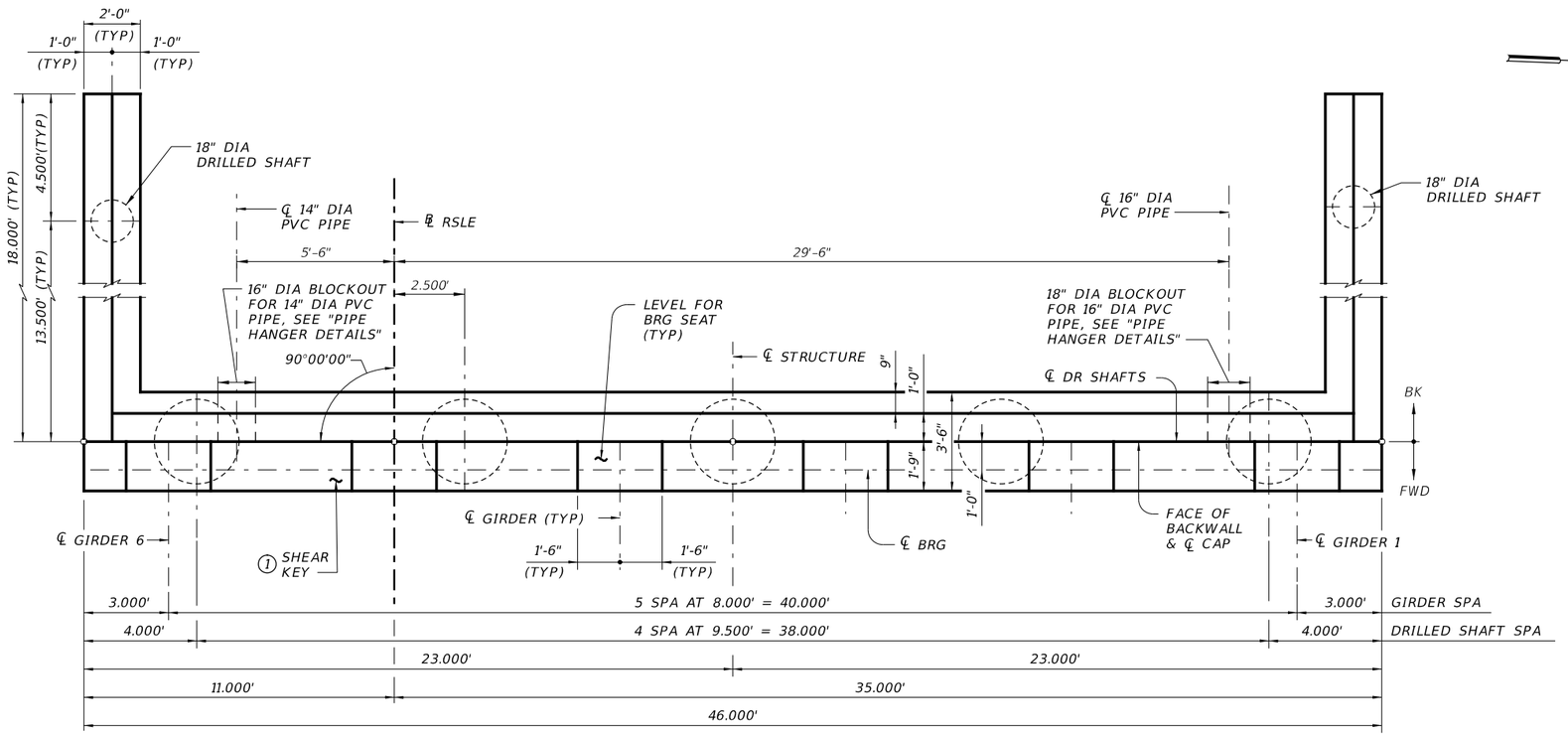
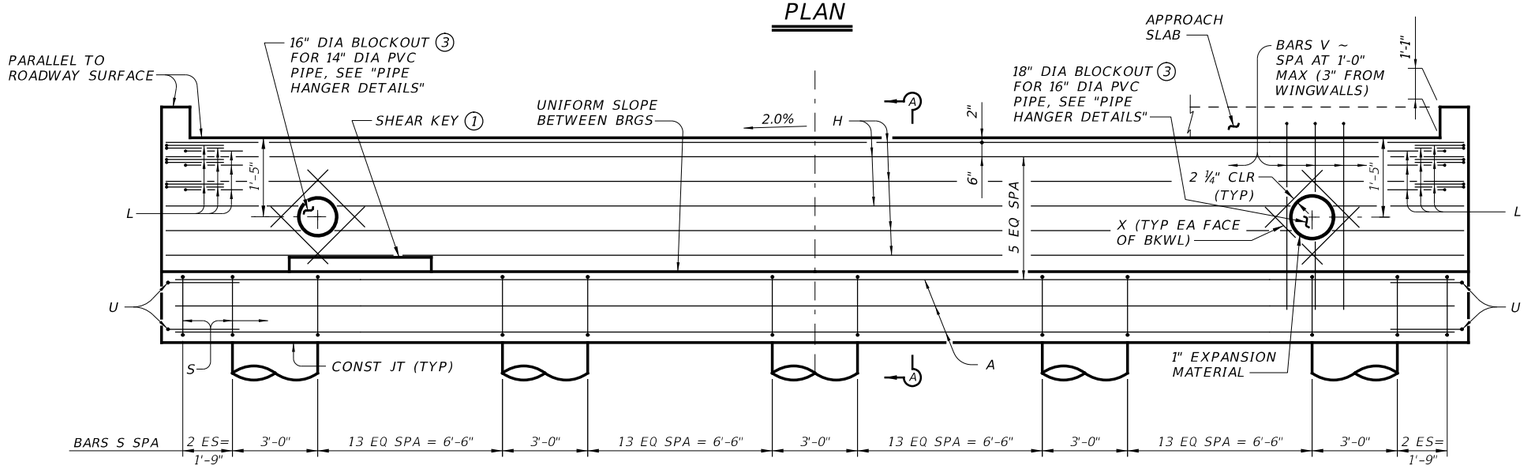


PLAN



ELEVATION

TABLE OF ESTIMATED QUANTITIES				
BAR	NO.	SIZE	LENGTH	WEIGHT
A	10	#11	45'-0"	2,391
H	12	#6	45'-8"	823
L	18	#6	4'-0"	108
S	62	#5	11'-6"	744
U	4	#6	8'-1"	49
V	45	#5	15'-10"	744
X	16	#4	2'-10"	30
wH 1	14	#6	19'-5"	408
wH 2	28	#6	17'-8"	743
wS	38	#4	7'-10"	199
wV	38	#5	15'-10"	628
REINFORCING STEEL			LB	6,867
CLASS "C" CONC (ABUT) 2			CY	36.8

2 INCLUDES SHEAR KEY CONCRETE

GENERAL NOTES:

DESIGNED ACCORDING TO AASHTO LRFD SPECIFICATIONS, 8TH EDITION (2017) AND ALL CURRENT INTERIMS.

CONCRETE STRENGTH F'C = 3,600 PSI.

ALL CAP AND WALL REINFORCING MUST BE GRADE 60.

SEE BRIDGE LAYOUT FOR HEADER SLOPE AND FOUNDATION TYPE, SIZE AND LENGTH.

SEE FOUNDATION DETAIL STANDARD SHEET, FD, FOR ALL FOUNDATION DETAILS AND NOTES.

SEE STONE RIPRAP STANDARD SHEET, SRR, FOR RIPRAP ATTACHMENT DETAILS, IF APPLICABLE.

SEE APPLICABLE RAIL DETAILS FOR RAIL ANCHORAGE IN WINGWALLS.

1 SHEAR KEY LOCATED BETWEEN GIRDER NO. 5 AND GIRDER NO. 6 ONLY. SEE "IGSK" STANDARD SHEET FOR NOTES, DIMENSIONS AND DETAILS NOT SHOWN.

3 FIELD CUT V & H BARS AS NEEDED TO CLEAR PIPE BLOCKOUTS.

HL93 LOADING

STATE OF TEXAS
ALLEN R. CROZIER
81450
LICENSED PROFESSIONAL ENGINEER
11/19/2020

HAYS COUNTY TEXAS

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San Marcos, TX 78666-7969
Texas Registered Engineering Firm F-754

Texas Department of Transportation
R 2020

ROBERT S. LIGHT EXTENSION
MUSTANG BRANCH BRIDGE

ABUTMENT 1

SHEET 1 OF 1

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
WJC	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JCS	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	222
SDM	0914	33	068,ETC	
CHECK				
ARC				

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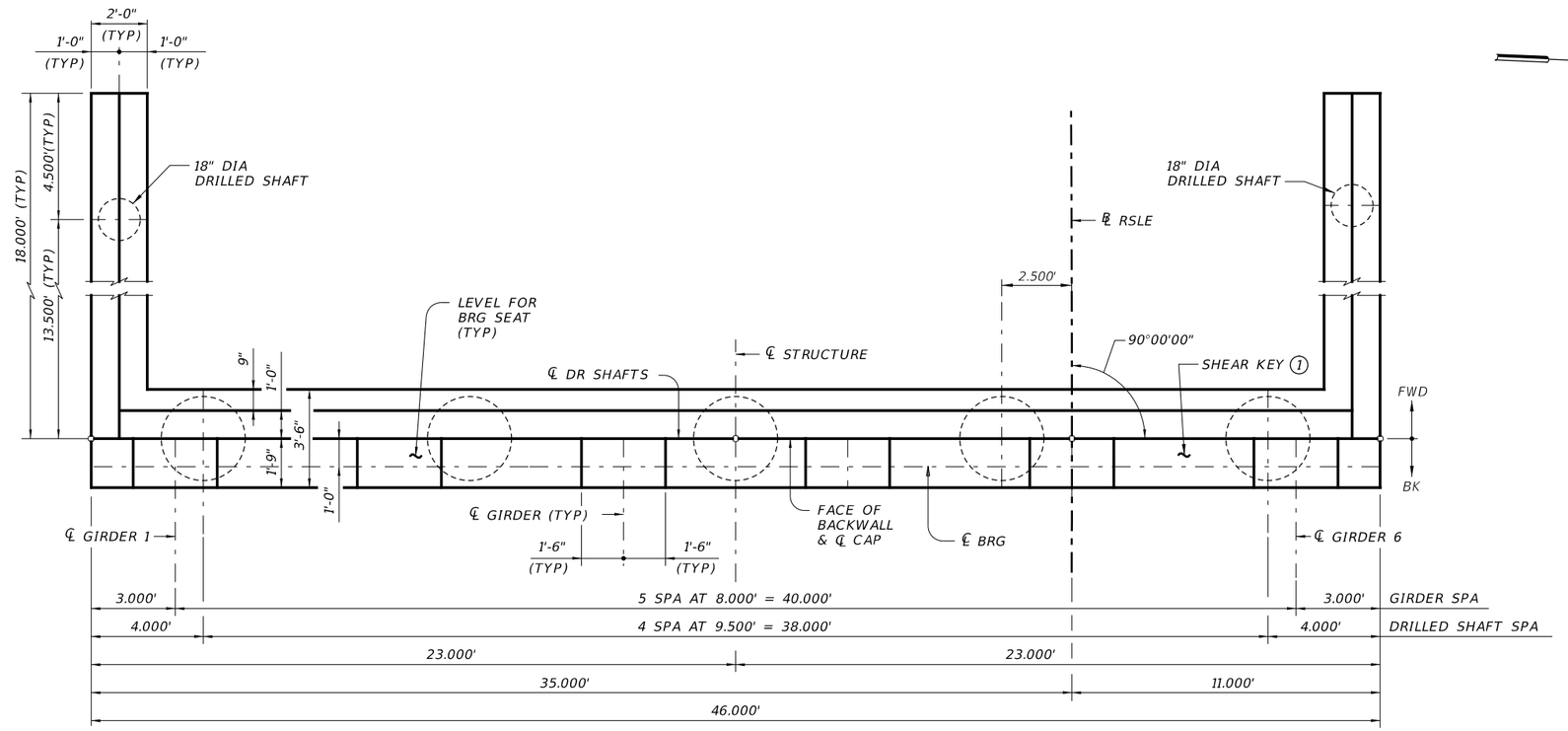
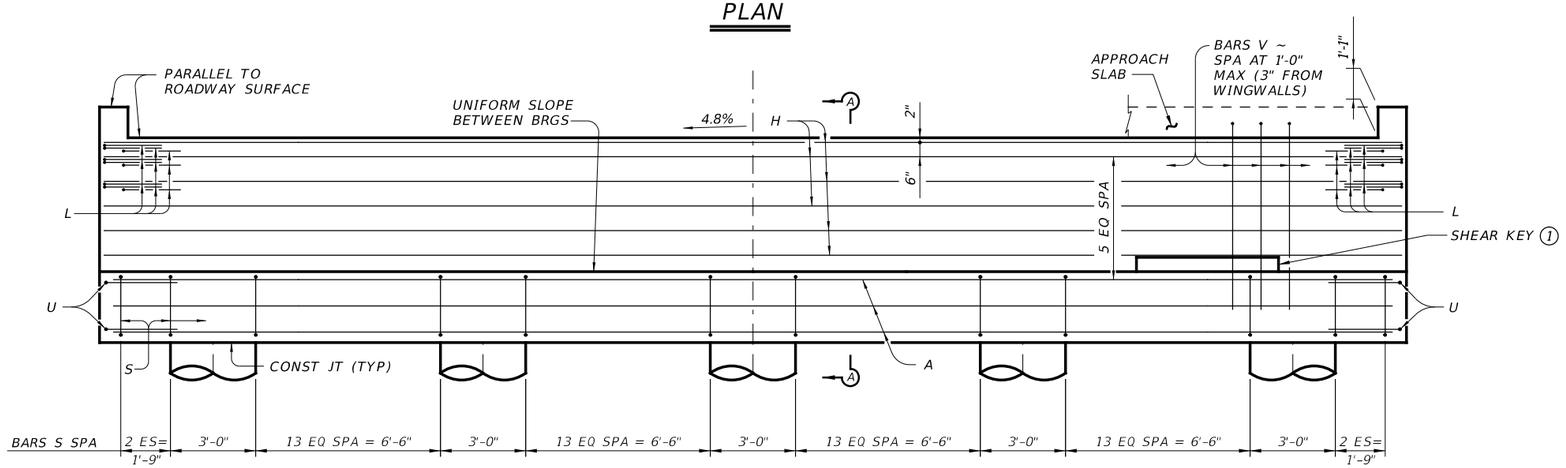


PLAN



ELEVATION

(1) SHEAR KEY LOCATED BETWEEN GIRDER NO. 5 AND GIRDER NO. 6 ONLY. SEE "IGSK" STANDARD SHEET FOR NOTES, DIMENSIONS AND DETAILS NOT SHOWN.

TABLE OF ESTIMATED QUANTITIES

BAR	NO.	SIZE	LENGTH	WEIGHT
A	10	#11	45'-0"	2,391
H	12	#6	45'-8"	823
L	18	#6	4'-0"	108
S	62	#5	11'-6"	744
U	4	#6	8'-1"	49
V	45	#5	15'-10"	743
wH 1	14	#6	19'-5"	408
wH 2	28	#6	17'-8"	743
wS	38	#4	7'-10"	199
wV	38	#5	15'-10"	628
REINFORCING STEEL			LB	6,836
CLASS "C" CONC (ABUT) (2)			CY	37.1

(2) INCLUDES SHEAR KEY CONCRETE

GENERAL NOTES:

DESIGNED ACCORDING TO AASHTO LRFD SPECIFICATIONS, 8TH EDITION (2017) AND ALL CURRENT INTERIMS.

CONCRETE STRENGTH F'C = 3,600 PSI.

ALL CAP AND WALL REINFORCING MUST BE GRADE 60.

SEE BRIDGE LAYOUT FOR HEADER SLOPE AND FOUNDATION TYPE, SIZE AND LENGTH.

SEE FOUNDATION DETAIL STANDARD SHEET, FD, FOR ALL FOUNDATION DETAILS AND NOTES.

SEE STONE RIPRAP STANDARD SHEET, SRR, FOR RIPRAP ATTACHMENT DETAILS, IF APPLICABLE.

SEE APPLICABLE RAIL DETAILS FOR RAIL ANCHORAGE IN WINGWALLS.

HL93 LOADING

STATE OF TEXAS
ALLEN R. CROZIER
81450
LICENSED PROFESSIONAL ENGINEER
11/19/2020

HAYS COUNTY TEXAS

HDR Engineering, Inc.
1290 Wonder World Drive
Building #1, Suite 1230
San Marcos, TX 78666-7969
Texas Registered Engineering Firm F-754

Texas Department of Transportation

ROBERT S. LIGHT EXTENSION
MUSTANG BRANCH BRIDGE

ABUTMENT 14

SHEET 1 OF 1

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
WJC	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JCS	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	223
SDM	0914	33	068,ETC	
CHECK				
ARC				

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USER: KBERGER DATE: 11/19/2020 TIME: 4:34:47 PM SCALE: 1:5.3333
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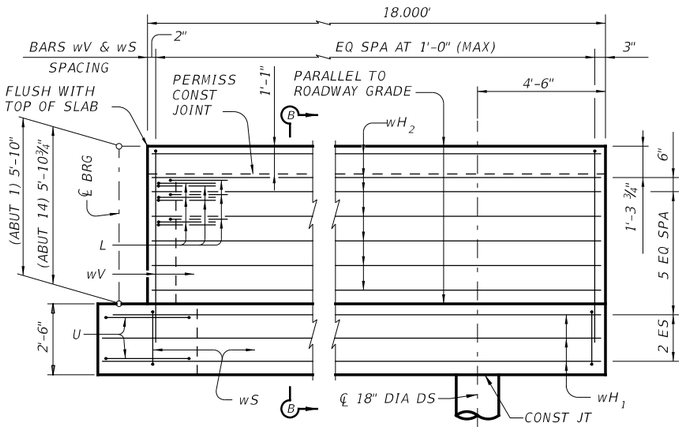
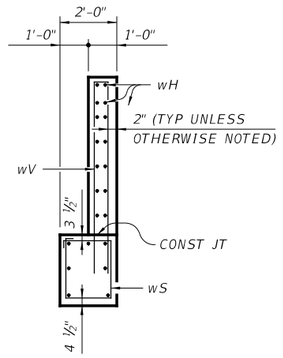
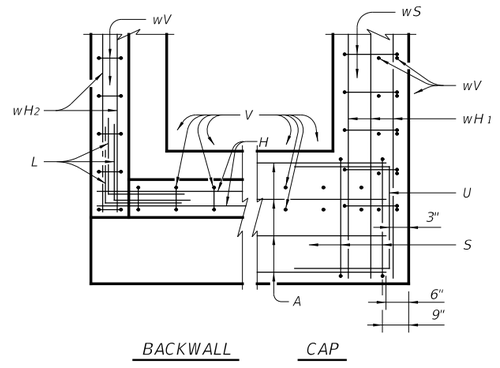
(1) INCREASE AS REQUIRED TO MAINTAIN 3" FROM FINISH GRADE.



WINGWALL ELEVATION

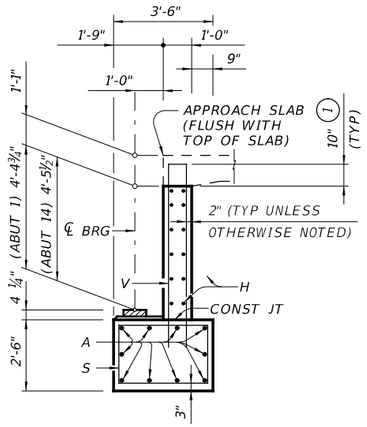


SECTION B-B

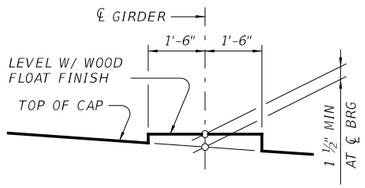


BACKWALL CAP

CORNER DETAILS

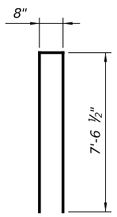


SECTION A-A

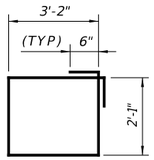


BEARING SEAT DETAIL

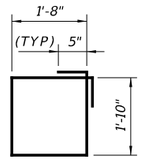
(BEARING SURFACE MUST BE CLEAN AND FREE OF ALL LOOSE MATERIAL BEFORE PLACING BEARING PAD.)



BARS V & wV



BARS S



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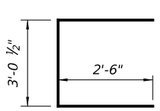
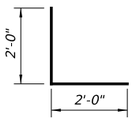


BARS U



BARS L

HL93 LOADING

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11/19/2020

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Texas Registered Engineering Firm F-754

Texas Department of Transportation
℗ 2020

ROBERT S. LIGHT EXTENSION
MUSTANG BRANCH BRIDGE

ABUTMENT DETAILS

SHEET 1 OF 1

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
WJC	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JCS	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	224
SDM	0914	33	068,ETC	
CHECK				
ARC				

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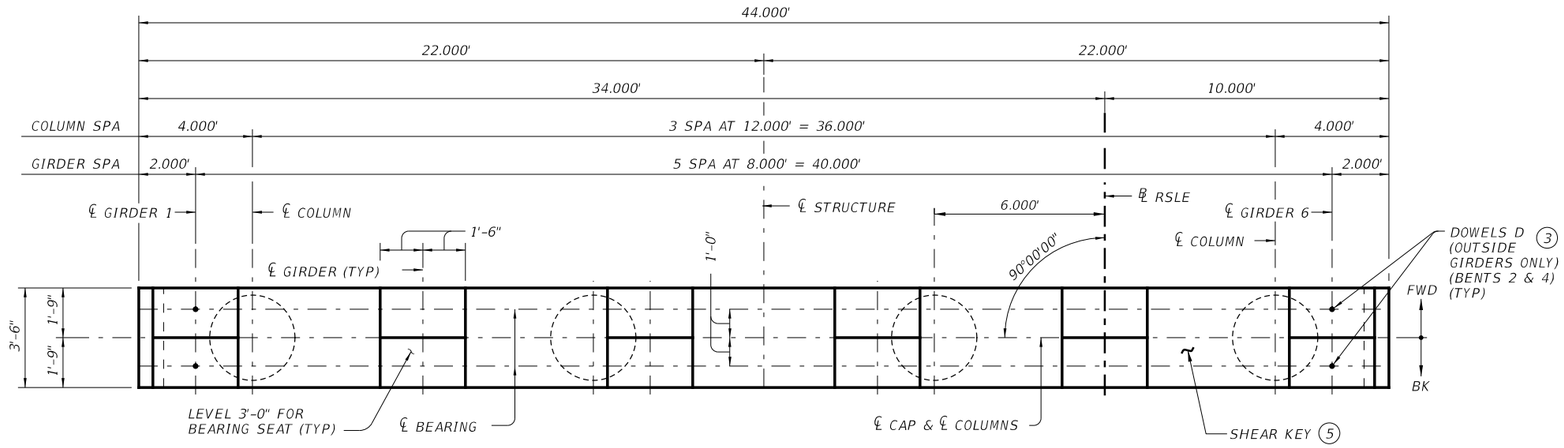
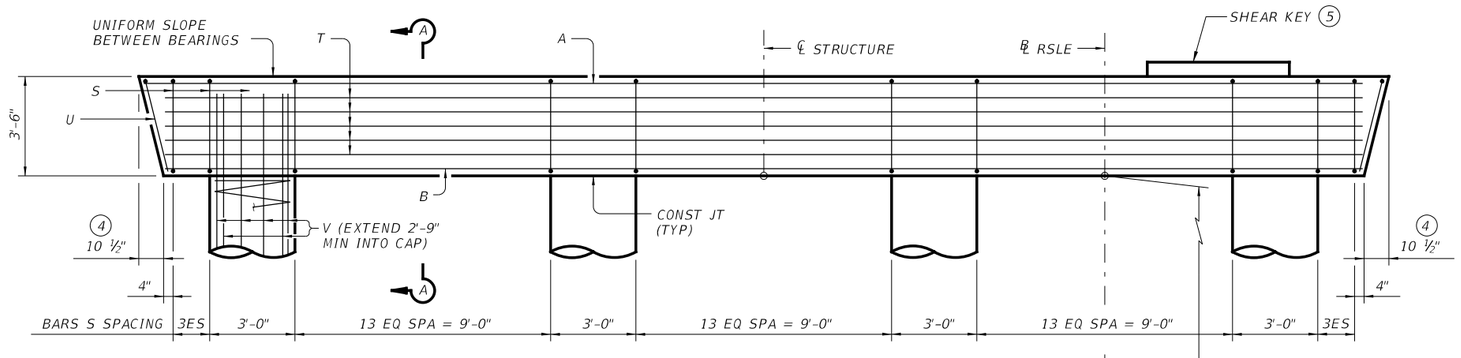
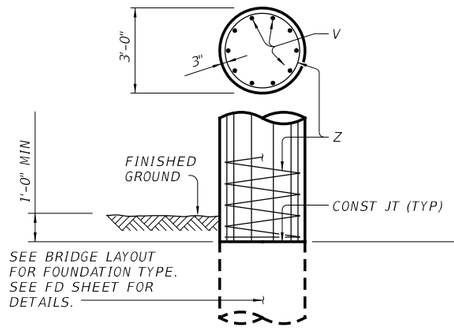
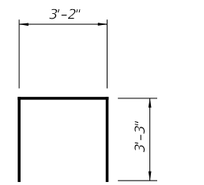


PLAN

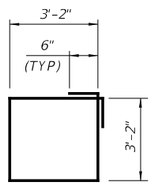




ELEVATION



BARS U



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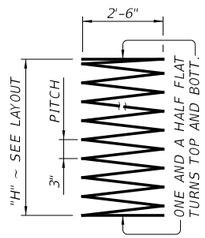
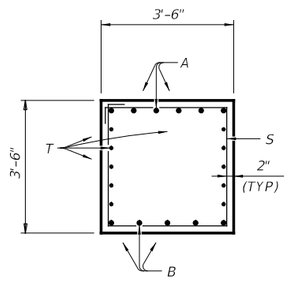


BARS Z



SECTION A-A

TABLE OF ESTIMATED QUANTITIES (1) (2)				
BAR	NO.	SIZE	LENGTH	WEIGHT
A	6	#11	43'- 6"	1,387
B	5	#11	42'- 0"	1,116
D (3)	4	#9	1'- 8"	23
S	50	#5	13'- 8"	713
T	10	#5	42'- 0"	438
U	2	#5	9'- 8"	20
V	40	#9	25'- 9"	3,502
Z	4	#4	746'-2"	1,994
REINFORCING STEEL			LB	9,193
CLASS "C" CONCRETE (CAP) (6)			CY	20.4
CLASS "C" CONCRETE (COL)			CY	24.1

GENERAL NOTES:
DESIGNED ACCORDING TO AASHTO LRFD SPECIFICATIONS, 8TH EDITION (2017) AND ALL CURRENT INTERIMS.
CONCRETE STRENGTH F'C = 3,600 PSI.
ALL CAP REINFORCING MUST BE GRADE 60.
COLUMN AND DRILLED SHAFT REINFORCING SHALL BE GRADE 60.
SEE BRIDGE LAYOUT FOR FOUNDATION TYPE, SIZE AND LENGTH.
SEE FOUNDATION DETAIL STANDARD FD FOR ALL FOUNDATION DETAILS AND NOTES.

(1) QUANTITIES SHOWN ARE FOR ONE BENT ONLY.

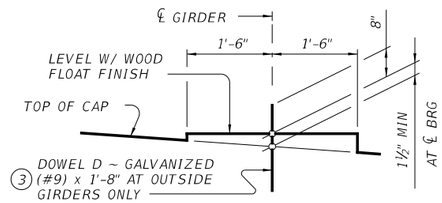
(2) QUANTITIES SHOWN ARE BASED ON AN "H" VALUE OF 23'. FOR EACH LINEAR FOOT VARIATION IN "H" VALUE, MAKE THE FOLLOWING ADJUSTMENTS:
BARS V LENGTH, 1'-0"
BARS Z LENGTH, 31.417'
REINFORCING STEEL, 220 LB
CLASS "C" CONC (COL), 1.047 CY

(3) OMIT DOWELS D AT BENT 3. ADJUST REINFORCING STEEL ACCORDINGLY.

(4) MEASURED PARALLEL TO TOP OF CAP CROSS-SLOPE.

(5) SHEAR KEY LOCATED BETWEEN GIRDER NO. 5 AND GIRDER NO. 6 ONLY. SEE "IGSK" STANDARD SHEET FOR NOTES, DIMENSIONS AND DETAILS NOT SHOWN.

(6) INCLUDES SHEAR KEY CONCRETE.



BEARING SEAT DETAIL

(BEARING SURFACE MUST BE CLEAN AND FREE OF ALL LOOSE MATERIAL BEFORE PLACING BEARING PAD.)

HL93 LOADING

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Texas Department of Transportation
(R) 2020

ROBERT S. LIGHT EXTENSION
MUSTANG BRANCH BRIDGE
INTERIOR BENTS 2 THROUGH 4

SHEET 1 OF 1

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
WJC	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JCS	TEXAS	AUS	HAYS	225
CHECK	CONTROL	SECTION	JOB	
SDM	0914	33	068,ETC	
CHECK				
ARC				

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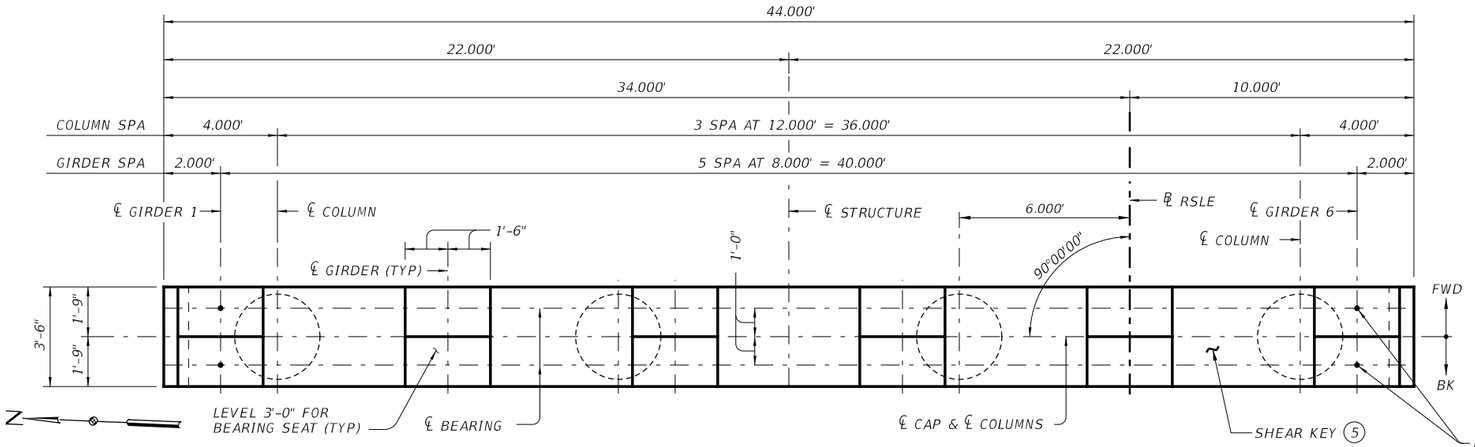
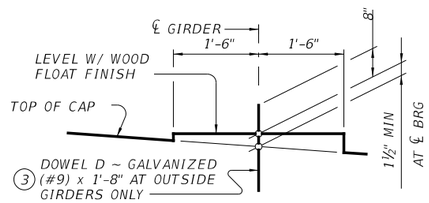


PLAN



BEARING SEAT DETAIL

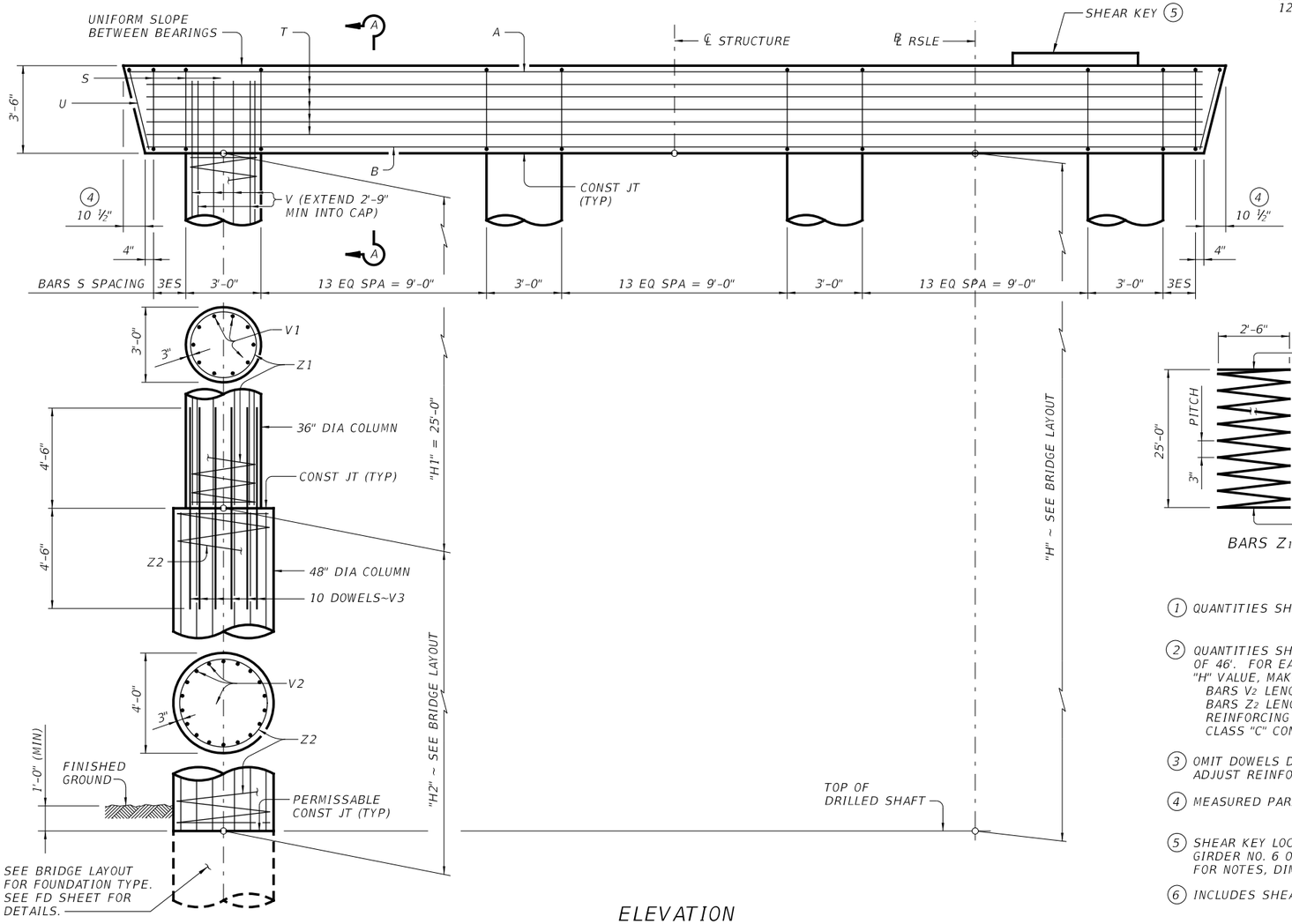
(BEARING SURFACE MUST BE CLEAN AND FREE OF ALL LOOSE MATERIAL BEFORE PLACING BEARING PAD.)

TABLE OF ESTIMATED QUANTITIES (1) (2)

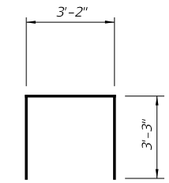
BAR	NO.	SIZE	LENGTH	WEIGHT
A	6	#11	43'- 6"	1,387
B	5	#11	42'- 0"	1,116
D (3)	4	#9	1'- 8"	23
S	50	#5	13'- 8"	713
T	10	#5	42'- 0"	438
U	2	#5	9'- 8"	20
V_1	40	#9	27'-9"	3,774
V_2	72	#9	21'-0"	5,141
V_3	40	#9	9'-0"	1,224
Z_1	4	#4	809'-0"	2,162
Z_2	4	#4	957'-0"	2,557
REINFORCING STEEL			LB	18,555
CLASS "C" CONCRETE (CAP) (6)			CY	20.4
CLASS "C" CONCRETE (COL)			CY	65.3

GENERAL NOTES:

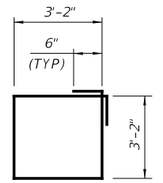
DESIGNED ACCORDING TO AASHTO LRFD SPECIFICATIONS, 8TH EDITION (2017) AND ALL CURRENT INTERIMS.
CONCRETE STRENGTH F'C = 3,600 PSI.
ALL CAP REINFORCING MUST BE GRADE 60.
COLUMN AND DRILLED SHAFT REINFORCING SHALL BE GRADE 60.
SEE BRIDGE LAYOUT FOR FOUNDATION TYPE, SIZE AND LENGTH.
SEE FOUNDATION DETAIL STANDARD FD FOR ALL FOUNDATION DETAILS AND NOTES.



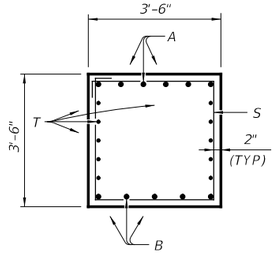
ELEVATION



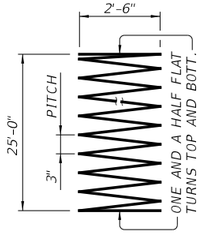
BARS U



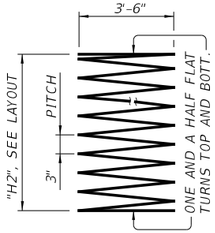
BARS S



SECTION A-A



BARS Z_1



BARS Z_2

(1) QUANTITIES SHOWN ARE FOR ONE BENT ONLY.

(2) QUANTITIES SHOWN ARE BASED ON AN "H" VALUE OF 46'. FOR EACH LINEAR FOOT VARIATION IN "H" VALUE, MAKE THE FOLLOWING ADJUSTMENTS:
BARS V_2 LENGTH, 1'-0"
BARS Z_2 LENGTH, 44.028'
REINFORCING STEEL, 362 LB
CLASS "C" CONC (COL), 1.862 CY

(3) OMIT DOWELS D AT BENTS 5, 8 & 11. ADJUST REINFORCING STEEL ACCORDINGLY.

(4) MEASURED PARALLEL TO TOP OF CAP CROSS-SLOPE.

(5) SHEAR KEY LOCATED BETWEEN GIRDER NO. 5 AND GIRDER NO. 6 ONLY. SEE "IGSK" STANDARD SHEET FOR NOTES, DIMENSIONS AND DETAILS NOT SHOWN.

(6) INCLUDES SHEAR KEY CONCRETE.

HL93 LOADING

STATE OF TEXAS
ALLEN R. CROZIER
81450
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11/19/2020

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ROBERT S. LIGHT EXTENSION
MUSTANG BRANCH BRIDGE

INTERIOR BENTS 5 THROUGH 13

SHEET 1 OF 1

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
WJC	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JCS	TEXAS	AUS	HAYS	226
CHECK	CONTROL	SECTION	JOB	
SDM	0914	33	068,ETC	
CHECK				
ARC				

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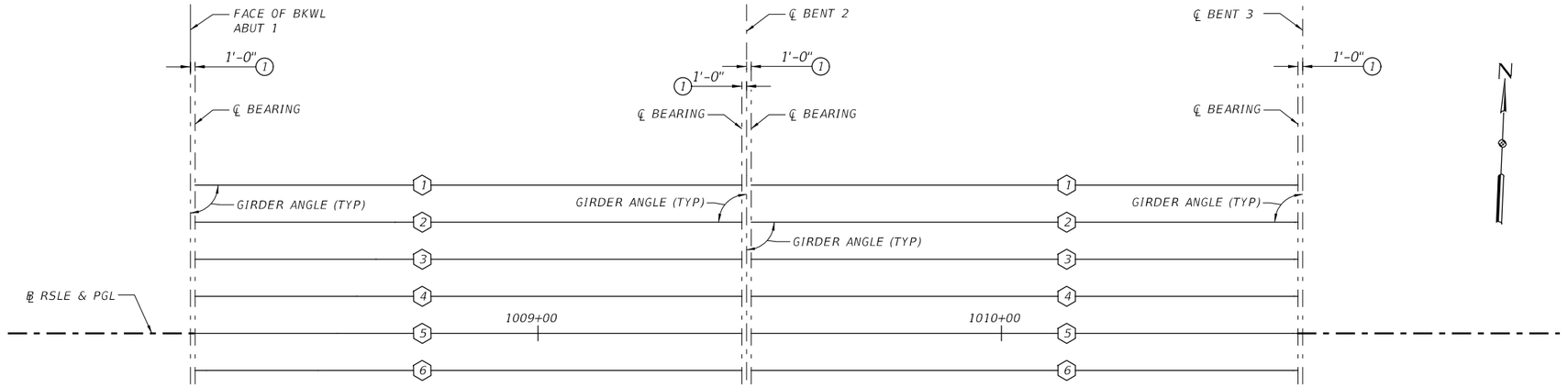

SPAN 1
(TYPE TX54 GIRDERS)

SPAN 2
(TYPE TX54 GIRDERS)

PLAN

BENT REPORT

BENT NO. 1 (S 2 26 50.02 E)
DISTANCE BETWEEN STATION LINE AND GIRDER 1 32.000 L

		GIRDER SPAC. (C.L. BENT)	GIRDER ANGLE D M S
SPAN 1	GIRDER 1	0.000	90 0 0
	GIRDER 2	8.000	90 0 0
	GIRDER 3	8.000	90 0 0
	GIRDER 4	8.000	90 0 0
	GIRDER 5	8.000	90 0 0
	GIRDER 6	8.000	90 0 0
	TOTAL	40.000	

BENT NO. 2 (S 2 26 50.02 E)
DISTANCE BETWEEN STATION LINE AND GIRDER 1 32.000 L

		GIRDER SPAC. (C.L. BENT)	GIRDER ANGLE D M S
SPAN 1	GIRDER 1	0.000	90 0 0
	GIRDER 2	8.000	90 0 0
	GIRDER 3	8.000	90 0 0
	GIRDER 4	8.000	90 0 0
	GIRDER 5	8.000	90 0 0
	GIRDER 6	8.000	90 0 0
	TOTAL	40.000	
SPAN 2	GIRDER 1	0.000	90 0 0
	GIRDER 2	8.000	90 0 0
	GIRDER 3	8.000	90 0 0
	GIRDER 4	8.000	90 0 0
	GIRDER 5	8.000	90 0 0
	GIRDER 6	8.000	90 0 0
	TOTAL	40.000	

BENT NO. 3 (S 2 26 50.02 E)
DISTANCE BETWEEN STATION LINE AND GIRDER 1 32.000 L

		GIRDER SPAC. (C.L. BENT)	GIRDER ANGLE D M S
SPAN 2	GIRDER 1	0.000	90 0 0
	GIRDER 2	8.000	90 0 0
	GIRDER 3	8.000	90 0 0
	GIRDER 4	8.000	90 0 0
	GIRDER 5	8.000	90 0 0
	GIRDER 6	8.000	90 0 0
	TOTAL	40.000	

GIRDER REPORT

GIRDER REPORT, SPAN 1

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BOT. GRD. FLG.	
GIRDER 1	120.000	118.000	119.50 (2)	0.0050
GIRDER 2	120.000	118.000	119.50	0.0050
GIRDER 3	120.000	118.000	119.50	0.0050
GIRDER 4	120.000	118.000	119.50	0.0050
GIRDER 5	120.000	118.000	119.50	0.0050
GIRDER 6	120.000	118.000	119.50	0.0050

GIRDER REPORT, SPAN 2

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BOT. GRD. FLG.	
GIRDER 1	120.000	118.000	119.50 (2)	0.0050
GIRDER 2	120.000	118.000	119.50	0.0050
GIRDER 3	120.000	118.000	119.50	0.0050
GIRDER 4	120.000	118.000	119.50	0.0050
GIRDER 5	120.000	118.000	119.50	0.0050
GIRDER 6	120.000	118.000	119.50	0.0050

LEGEND:

- (#) GIRDER NUMBER
- (1) SEE TXDOT STANDARD IGEB FOR ORIENTATION OF DIMENSION
- (2) GIRDER LENGTHS ARE BOTTOM GIRDER FLANGE LENGTHS WITH ADJUSTMENTS MADE FOR GIRDER SLOPES.

HL93 LOADING

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Texas Registered Engineering Firm F-754

Texas Department of Transportation

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ROBERT S. LIGHT EXTENSION
MUSTANG BRANCH BRIDGE

FRAMING PLAN

SHEET 1 OF 5

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
WJC	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JCS	TEXAS	AUS	HAYS	227
CHECK	CONTROL	SECTION	JOB	
SDM	0914	33	068,ETC	
CHECK				
ARC				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
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TIME: 4:34:55 PM
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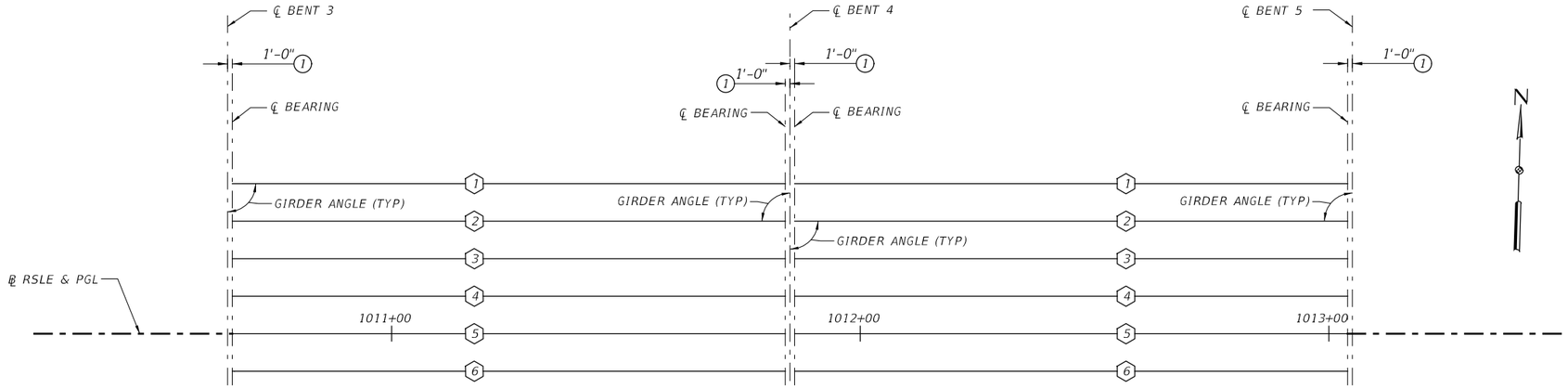

SPAN 3
(TYPE TX54 GIRDERS)

SPAN 4
(TYPE TX54 GIRDERS)

PLAN

BENT REPORT

BENT NO. 3 (S 2 26 50.02 E)
DISTANCE BETWEEN STATION LINE AND GIRDER 1 32.000 L

		GIRDER SPAC. (C.L. BENT)	GIRDER ANGLE D M S
SPAN 3	GIRDER 1	0.000	90 0 0
	GIRDER 2	8.000	90 0 0
	GIRDER 3	8.000	90 0 0
	GIRDER 4	8.000	90 0 0
	GIRDER 5	8.000	90 0 0
	GIRDER 6	8.000	90 0 0
	TOTAL	40.000	

BENT NO. 4 (S 2 26 50.02 E)
DISTANCE BETWEEN STATION LINE AND GIRDER 1 32.000 L

		GIRDER SPAC. (C.L. BENT)	GIRDER ANGLE D M S
SPAN 3	GIRDER 1	0.000	90 0 0
	GIRDER 2	8.000	90 0 0
	GIRDER 3	8.000	90 0 0
	GIRDER 4	8.000	90 0 0
	GIRDER 5	8.000	90 0 0
	GIRDER 6	8.000	90 0 0
	TOTAL	40.000	
SPAN 4	GIRDER 1	0.000	90 0 0
	GIRDER 2	8.000	90 0 0
	GIRDER 3	8.000	90 0 0
	GIRDER 4	8.000	90 0 0
	GIRDER 5	8.000	90 0 0
	GIRDER 6	8.000	90 0 0
	TOTAL	40.000	

BENT NO. 5 (S 2 26 50.02 E)
DISTANCE BETWEEN STATION LINE AND GIRDER 1 32.000 L

		GIRDER SPAC. (C.L. BENT)	GIRDER ANGLE D M S
SPAN 4	GIRDER 1	0.000	90 0 0
	GIRDER 2	8.000	90 0 0
	GIRDER 3	8.000	90 0 0
	GIRDER 4	8.000	90 0 0
	GIRDER 5	8.000	90 0 0
	GIRDER 6	8.000	90 0 0
	TOTAL	40.000	

GIRDER REPORT

GIRDER REPORT, SPAN 3

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BOT. GRD. FLG.	
GIRDER 1	120.000	118.000	119.50 (2)	0.0050
GIRDER 2	120.000	118.000	119.50	0.0050
GIRDER 3	120.000	118.000	119.50	0.0050
GIRDER 4	120.000	118.000	119.50	0.0050
GIRDER 5	120.000	118.000	119.50	0.0050
GIRDER 6	120.000	118.000	119.50	0.0050

GIRDER REPORT, SPAN 4

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BOT. GRD. FLG.	
GIRDER 1	120.000	118.000	119.50 (2)	0.0050
GIRDER 2	120.000	118.000	119.50	0.0050
GIRDER 3	120.000	118.000	119.50	0.0050
GIRDER 4	120.000	118.000	119.50	0.0050
GIRDER 5	120.000	118.000	119.50	0.0050
GIRDER 6	120.000	118.000	119.50	0.0050

LEGEND:

- (#) GIRDER NUMBER
- (1) SEE TXDOT STANDARD IGEB FOR ORIENTATION OF DIMENSION
- (2) GIRDER LENGTHS ARE BOTTOM GIRDER FLANGE LENGTHS WITH ADJUSTMENTS MADE FOR GIRDER SLOPES.

HL93 LOADING

STATE OF TEXAS
ALLEN R. CROZIER
81450
LICENSED
PROFESSIONAL ENGINEER

11/19/2020

HAYS COUNTY TEXAS

HDR Engineering, Inc.
1290 Wonder World Drive
Building #1, Suite 1230
San Marcos, TX 78666-7969
Texas Registered Engineering Firm F-754

Texas Department of Transportation

ROBERT S. LIGHT EXTENSION
MUSTANG BRANCH BRIDGE

FRAMING PLAN

SHEET 2 OF 5

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
WJC	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JCS	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	228
SDM	0914	33	068,ETC	
CHECK				
ARC				

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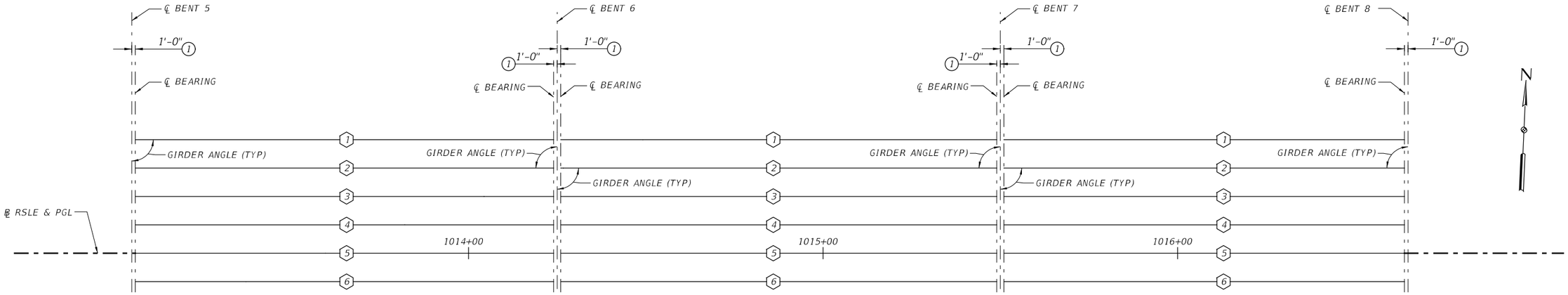

SPAN 5
(TYPE TX54 GIRDERS)

SPAN 6
(TYPE TX54 GIRDERS)

SPAN 7
(TYPE TX54 GIRDERS)

PLAN

BENT REPORT

BENT NO. 5 (S 2 26 50.02 E)
DISTANCE BETWEEN STATION LINE AND GIRDER 1 32.000 L

		GIRDER SPAC. (C.L. BENT)	GIRDER ANGLE D M S
SPAN 5	GIRDER 1	0.000	90 0 0
	GIRDER 2	8.000	90 0 0
	GIRDER 3	8.000	90 0 0
	GIRDER 4	8.000	90 0 0
	GIRDER 5	8.000	90 0 0
	GIRDER 6	8.000	90 0 0
	TOTAL	40.000	

BENT NO. 6 (S 2 26 50.02 E)
DISTANCE BETWEEN STATION LINE AND GIRDER 1 32.000 L

		GIRDER SPAC. (C.L. BENT)	GIRDER ANGLE D M S
SPAN 5	GIRDER 1	0.000	90 0 0
	GIRDER 2	8.000	90 0 0
	GIRDER 3	8.000	90 0 0
	GIRDER 4	8.000	90 0 0
	GIRDER 5	8.000	90 0 0
	GIRDER 6	8.000	90 0 0
	TOTAL	40.000	
SPAN 6	GIRDER 1	0.000	90 0 0
	GIRDER 2	8.000	90 0 0
	GIRDER 3	8.000	90 0 0
	GIRDER 4	8.000	90 0 0
	GIRDER 5	8.000	90 0 0
	GIRDER 6	8.000	90 0 0
	TOTAL	40.000	

BENT NO. 7 (S 2 26 50.02 E)
DISTANCE BETWEEN STATION LINE AND GIRDER 1 32.000 L

		GIRDER SPAC. (C.L. BENT)	GIRDER ANGLE D M S
SPAN 6	GIRDER 1	0.000	90 0 0
	GIRDER 2	8.000	90 0 0
	GIRDER 3	8.000	90 0 0
	GIRDER 4	8.000	90 0 0
	GIRDER 5	8.000	90 0 0
	GIRDER 6	8.000	90 0 0
	TOTAL	40.000	
SPAN 7	GIRDER 1	0.000	90 0 0
	GIRDER 2	8.000	90 0 0
	GIRDER 3	8.000	90 0 0
	GIRDER 4	8.000	90 0 0
	GIRDER 5	8.000	90 0 0
	GIRDER 6	8.000	90 0 0
	TOTAL	40.000	

BENT NO. 8 (S 2 26 50.02 E)
DISTANCE BETWEEN STATION LINE AND GIRDER 1 32.000 L

		GIRDER SPAC. (C.L. BENT)	GIRDER ANGLE D M S
SPAN 7	GIRDER 1	0.000	90 0 0
	GIRDER 2	8.000	90 0 0
	GIRDER 3	8.000	90 0 0
	GIRDER 4	8.000	90 0 0
	GIRDER 5	8.000	90 0 0
	GIRDER 6	8.000	90 0 0
	TOTAL	40.000	

GIRDER REPORT

GIRDER REPORT, SPAN 5

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BOT. GRD. FLG.		
GIRDER 1	120.000	118.000	119.50	(2)	0.0050
GIRDER 2	120.000	118.000	119.50		0.0050
GIRDER 3	120.000	118.000	119.50		0.0050
GIRDER 4	120.000	118.000	119.50		0.0050
GIRDER 5	120.000	118.000	119.50		0.0050
GIRDER 6	120.000	118.000	119.50		0.0050

GIRDER REPORT, SPAN 6

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BOT. GRD. FLG.		
GIRDER 1	125.000	123.000	124.50	(2)	-0.0010
GIRDER 2	125.000	123.000	124.50		0.0005
GIRDER 3	125.000	123.000	124.50		0.0020
GIRDER 4	125.000	123.000	124.50		0.0035
GIRDER 5	125.000	123.000	124.50		0.0050
GIRDER 6	125.000	123.000	124.50		0.0065

GIRDER REPORT, SPAN 7

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BOT. GRD. FLG.		
GIRDER 1	115.000	113.000	114.50	(2)	-0.0010
GIRDER 2	115.000	113.000	114.50		0.0005
GIRDER 3	115.000	113.000	114.50		0.0020
GIRDER 4	115.000	113.000	114.50		0.0035
GIRDER 5	115.000	113.000	114.50		0.0050
GIRDER 6	115.000	113.000	114.50		0.0065

LEGEND:

- (#) GIRDER NUMBER
- (1) SEE TXDOT STANDARD IGEB FOR ORIENTATION OF DIMENSION
- (2) GIRDER LENGTHS ARE BOTTOM GIRDER FLANGE LENGTHS WITH ADJUSTMENTS MADE FOR GIRDER SLOPES.

HL93 LOADING

STATE OF TEXAS
ALLEN R. CROZIER
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11/19/2020

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Texas Department of Transportation

ROBERT S. LIGHT EXTENSION
MUSTANG BRANCH BRIDGE

FRAMING PLAN

SHEET 3 OF 5

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
WJC	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JCS	TEXAS	AUS	HAYS	229
CHECK	CONTROL	SECTION	JOB	
SDM	0914	33	068,ETC	
CHECK				
ARC				

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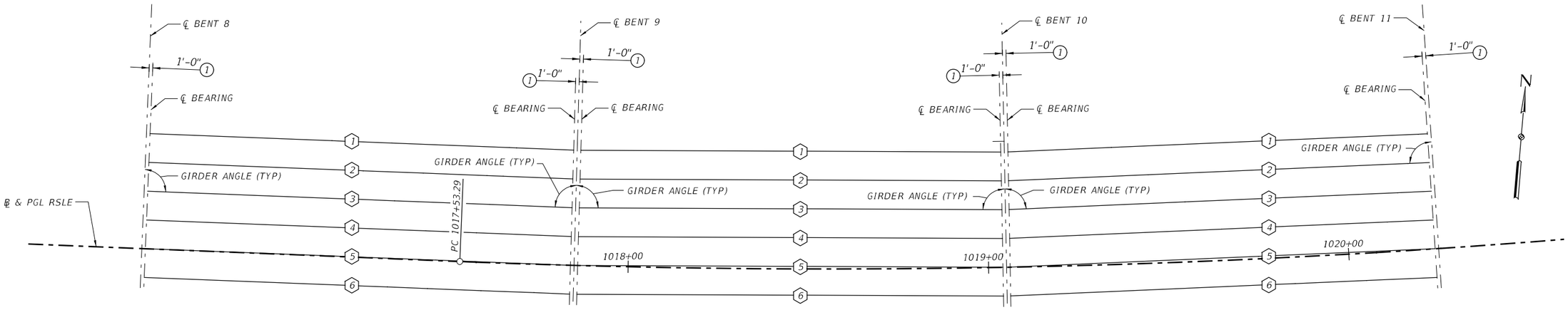

SPAN 8
(TYPE TX54 GIRDERS)

SPAN 9
(TYPE TX54 GIRDERS)

SPAN 10
(TYPE TX54 GIRDERS)

PLAN

LEGEND:

- (#) GIRDER NUMBER
- (1) SEE TXDOT STANDARD IGEB FOR ORIENTATION OF DIMENSION
- (2) GIRDER LENGTHS ARE BOTTOM GIRDER FLANGE LENGTHS WITH ADJUSTMENTS MADE FOR GIRDER SLOPES.

BENT REPORT

BENT NO. 8 (S 2 26 50.02 E)
DISTANCE BETWEEN STATION LINE AND GIRDER 1 32.000 L

		GIRDER SPAC. (C.L. BENT)	GIRDER ANGLE D M S
SPAN 8	GIRDER 1	0.000	89 54 21
	GIRDER 2	8.000	89 54 20
	GIRDER 3	8.000	89 54 19
	GIRDER 4	8.000	89 54 18
	GIRDER 5	8.000	89 54 17
	GIRDER 6	8.000	89 54 17
	TOTAL	40.000	

BENT NO. 9 (S 3 9 59.66 E)
DISTANCE BETWEEN STATION LINE AND GIRDER 1 32.000 L

		GIRDER SPAC. (C.L. BENT)	GIRDER ANGLE D M S
SPAN 8	GIRDER 1	0.000	89 22 29
	GIRDER 2	8.000	89 22 30
	GIRDER 3	8.000	89 22 30
	GIRDER 4	8.000	89 22 31
	GIRDER 5	8.000	89 22 32
	GIRDER 6	8.000	89 22 33
	TOTAL	40.000	
SPAN 9	GIRDER 1	0.000	88 38 20
	GIRDER 2	8.000	88 38 20
	GIRDER 3	8.000	88 38 20
	GIRDER 4	8.000	88 38 20
	GIRDER 5	8.000	88 38 20
	GIRDER 6	8.000	88 38 20
	TOTAL	40.000	

BENT NO. 10 (S 5 53 18.46 E)
DISTANCE BETWEEN STATION LINE AND GIRDER 1 32.000 L

		GIRDER SPAC. (C.L. BENT)	GIRDER ANGLE D M S
SPAN 9	GIRDER 1	0.000	88 38 20
	GIRDER 2	8.000	88 38 20
	GIRDER 3	8.000	88 38 20
	GIRDER 4	8.000	88 38 20
	GIRDER 5	8.000	88 38 20
	GIRDER 6	8.000	88 38 20
	TOTAL	40.000	
SPAN 10	GIRDER 1	0.000	88 38 20
	GIRDER 2	8.000	88 38 20
	GIRDER 3	8.000	88 38 20
	GIRDER 4	8.000	88 38 20
	GIRDER 5	8.000	88 38 20
	GIRDER 6	8.000	88 38 20
	TOTAL	40.000	

BENT NO. 11 (S 8 36 37.26 E)
DISTANCE BETWEEN STATION LINE AND GIRDER 1 32.000 L

		GIRDER SPAC. (C.L. BENT)	GIRDER ANGLE D M S
SPAN 10	GIRDER 1	0.000	88 38 20
	GIRDER 2	8.000	88 38 20
	GIRDER 3	8.000	88 38 20
	GIRDER 4	8.000	88 38 20
	GIRDER 5	8.000	88 38 20
	GIRDER 6	8.000	88 38 20
	TOTAL	40.000	

GIRDER REPORT

GIRDER REPORT, SPAN 8

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BOT. GRD. FLG.	
GIRDER 1	119.598	117.598	119.10	(2) -0.0011
GIRDER 2	119.698	117.698	119.20	(2) 0.0005
GIRDER 3	119.798	117.798	119.30	0.0020
GIRDER 4	119.899	117.899	119.40	0.0035
GIRDER 5	119.999	117.999	119.50	0.0050
GIRDER 6	120.100	118.100	119.60	0.0065

GIRDER REPORT, SPAN 9

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BOT. GRD. FLG.	
GIRDER 1	118.469	116.469	117.97	(2) 0.0051
GIRDER 2	118.849	116.849	118.35	(2) 0.0050
GIRDER 3	119.229	117.229	118.73	0.0050
GIRDER 4	119.609	117.609	119.11	0.0050
GIRDER 5	119.989	117.989	119.49	0.0050
GIRDER 6	120.369	118.369	119.87	0.0050

GIRDER REPORT, SPAN 10

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BOT. GRD. FLG.	
GIRDER 1	118.469	116.469	117.97	(2) 0.0051
GIRDER 2	118.849	116.849	118.35	(2) 0.0050
GIRDER 3	119.229	117.229	118.73	0.0050
GIRDER 4	119.609	117.609	119.11	0.0050
GIRDER 5	119.989	117.989	119.49	0.0050
GIRDER 6	120.369	118.369	119.87	0.0050

HL93 LOADING

STATE OF TEXAS
ALLEN R. CROZIER
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LICENSED
PROFESSIONAL ENGINEER
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Texas Registered Engineering Firm F-754

Texas Department of Transportation

ROBERT S. LIGHT EXTENSION
MUSTANG BRANCH BRIDGE

FRAMING PLAN

SHEET 4 OF 5

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
WJC	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JCS	TEXAS	AUS	HAYS	230
CHECK	CONTROL	SECTION	JOB	
SDM	0914	33	068,ETC	
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ARC				

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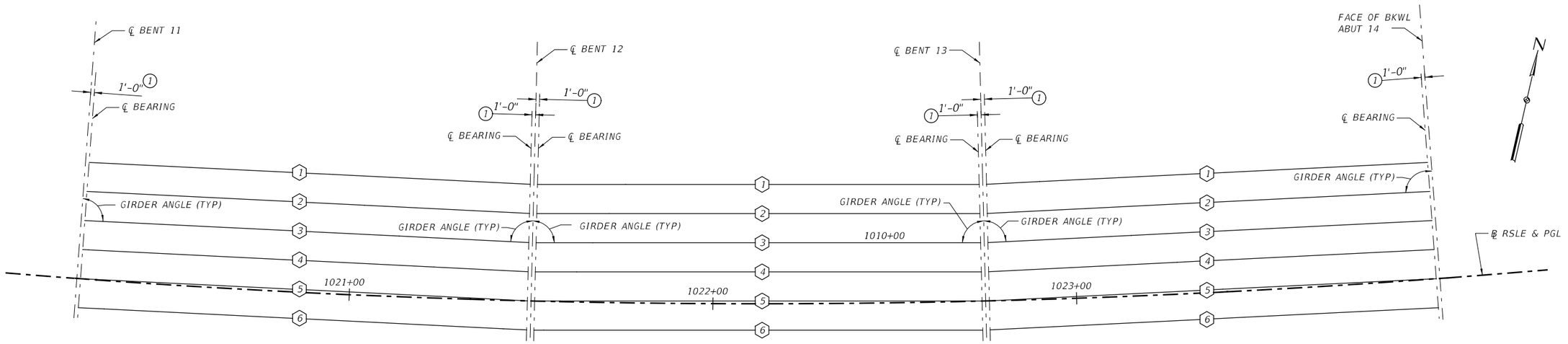

SPAN 11
(TYPE TX54 GIRDERS)

SPAN 12
(TYPE TX54 GIRDERS)

SPAN 13
(TYPE TX54 GIRDERS)

PLAN

BENT REPORT

BENT NO. 11 (S 8 36 37.26 E)
DISTANCE BETWEEN STATION LINE AND GIRDER 1 32.000 L

		GIRDER SPAC. (C.L. BENT)	GIRDER ANGLE D M S
SPAN 11	GIRDER 1	0.000	88 34 56
	GIRDER 2	8.000	88 34 56
	GIRDER 3	8.000	88 34 56
	GIRDER 4	8.000	88 34 56
	GIRDER 5	8.000	88 34 56
	GIRDER 6	8.000	88 34 56
	TOTAL	40.000	

BENT NO. 12 (S 11 26 44.35 E)
DISTANCE BETWEEN STATION LINE AND GIRDER 1 32.000 L

		GIRDER SPAC. (C.L. BENT)	GIRDER ANGLE D M S
SPAN 11	GIRDER 1	0.000	88 34 56
	GIRDER 2	8.000	88 34 56
	GIRDER 3	8.000	88 34 56
	GIRDER 4	8.000	88 34 56
	GIRDER 5	8.000	88 34 56
	GIRDER 6	8.000	88 34 56
	TOTAL	40.000	
SPAN 12	GIRDER 1	0.000	88 34 56
	GIRDER 2	8.000	88 34 56
	GIRDER 3	8.000	88 34 56
	GIRDER 4	8.000	88 34 56
	GIRDER 5	8.000	88 34 56
	GIRDER 6	8.000	88 34 56
	TOTAL	40.000	

BENT NO. 13 (S 14 16 51.44 E)
DISTANCE BETWEEN STATION LINE AND GIRDER 1 32.000 L

		GIRDER SPAC. (C.L. BENT)	GIRDER ANGLE D M S
SPAN 12	GIRDER 1	0.000	88 34 56
	GIRDER 2	8.000	88 34 56
	GIRDER 3	8.000	88 34 56
	GIRDER 4	8.000	88 34 56
	GIRDER 5	8.000	88 34 56
	GIRDER 6	8.000	88 34 56
	TOTAL	40.000	
SPAN 13	GIRDER 1	0.000	88 34 56
	GIRDER 2	8.000	88 34 56
	GIRDER 3	8.000	88 34 56
	GIRDER 4	8.000	88 34 56
	GIRDER 5	8.000	88 34 56
	GIRDER 6	8.000	88 34 56
	TOTAL	40.000	

BENT NO. 14 (S 17 6 58.52 E)
DISTANCE BETWEEN STATION LINE AND GIRDER 1 32.000 L

		GIRDER SPAC. (C.L. BENT)	GIRDER ANGLE D M S
SPAN 13	GIRDER 1	0.000	88 34 56
	GIRDER 2	8.000	88 34 56
	GIRDER 3	8.000	88 34 56
	GIRDER 4	8.000	88 34 56
	GIRDER 5	8.000	88 34 56
	GIRDER 6	8.000	88 34 56
	TOTAL	40.000	

GIRDER REPORT

GIRDER REPORT, SPAN 11

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BOT. GRD. FLG.	
GIRDER 1	123.404	121.404	122.91	(2) 0.0051
GIRDER 2	123.800	121.800	123.30	(2) 0.0050
GIRDER 3	124.196	122.196	123.70	0.0050
GIRDER 4	124.591	122.591	124.09	0.0050
GIRDER 5	124.987	122.987	124.49	0.0050
GIRDER 6	125.383	123.383	124.88	0.0050

GIRDER REPORT, SPAN 12

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BOT. GRD. FLG.	
GIRDER 1	123.404	121.404	122.91	(2) 0.0051
GIRDER 2	123.800	121.800	123.30	(2) 0.0050
GIRDER 3	124.196	122.196	123.70	0.0050
GIRDER 4	124.591	122.591	124.09	0.0050
GIRDER 5	124.987	122.987	124.49	0.0050
GIRDER 6	125.383	123.383	124.88	0.0050

GIRDER REPORT, SPAN 13

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BOT. GRD. FLG.	
GIRDER 1	123.404	121.404	122.91	(2) 0.0051
GIRDER 2	123.800	121.799	123.30	(2) 0.0050
GIRDER 3	124.196	122.195	123.70	0.0050
GIRDER 4	124.591	122.591	124.09	0.0050
GIRDER 5	124.987	122.987	124.49	0.0050
GIRDER 6	125.383	123.383	124.88	0.0050

LEGEND:

- (#) GIRDER NUMBER
- (1) SEE TXDOT STANDARD IGEB FOR ORIENTATION OF DIMENSION
- (2) GIRDER LENGTHS ARE BOTTOM GIRDER FLANGE LENGTHS WITH ADJUSTMENTS MADE FOR GIRDER SLOPES.

HL93 LOADING

STATE OF TEXAS
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ROBERT S. LIGHT EXTENSION
MUSTANG BRANCH BRIDGE

FRAMING PLAN

SHEET 5 OF 5

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
WJC	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JCS	TEXAS	AUS	HAYS	231
CHECK	CONTROL	SECTION	JOB	
SDM	0914	33	068,ETC	
CHECK				
ARC				

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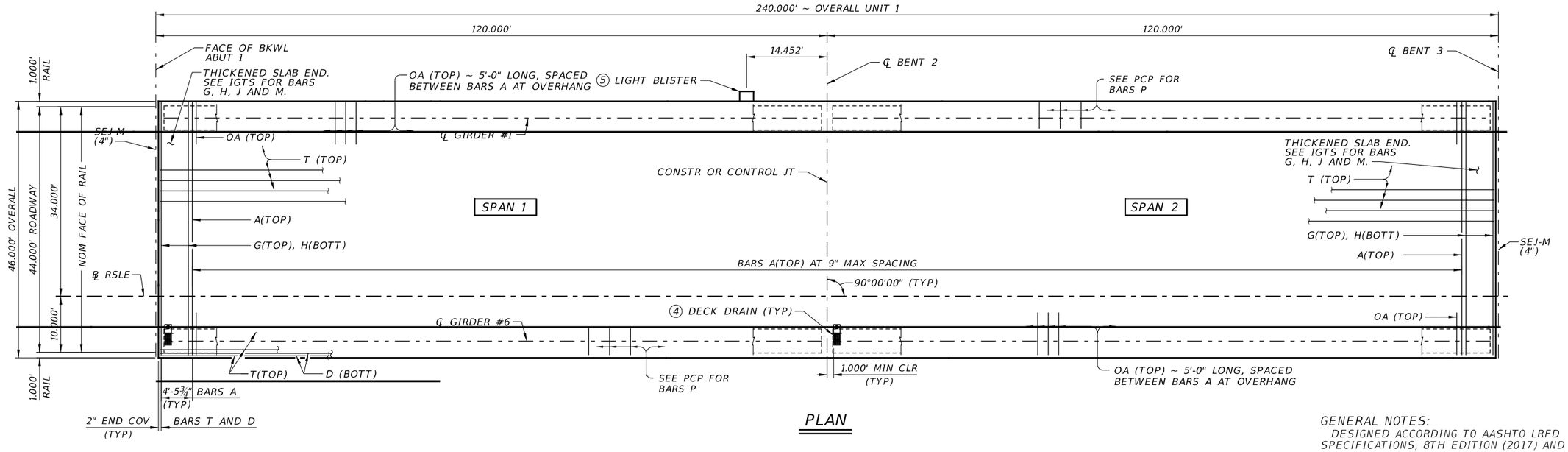
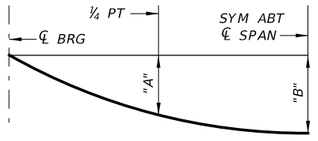


PLAN



DEAD LOAD DEFLECTION DIAGRAM

CALCULATED DEFLECTIONS SHOWN ARE DUE TO THE CONCRETE SLAB ON INTERIOR GIRDERS ONLY (EC = 5000 KSI). ADJUST VALUES AS REQUIRED FOR EXTERIOR GIRDERS AND IF OPTIONAL SLAB FORMING IS USED. THESE VALUES MAY REQUIRE FIELD VERIFICATION.

TABLE OF SECTION DEPTHS

GIRDER	"Y" AT ℄ BRG ③
	FT/IN
ALL	5'-5 ¾"

TYPE Tx54 GIRDERS

SPAN	"A"	"B"
NO.	FT	FT
1-2	0.145	0.206

TABLE OF ESTIMATED QUANTITIES

SPAN	REINF CONCRETE SLAB	PRESTR CONC GIRDERS (Tx54)	TOTAL REINF STEEL ②
NO.	SF	LF	LB
1	5,520	717.00	12,696
2	5,520	717.00	12,696
TOTAL	11,040	1,434.00	25,392

① SEE RAILING STANDARD FOR RAIL ANCHORAGE IN SLAB.

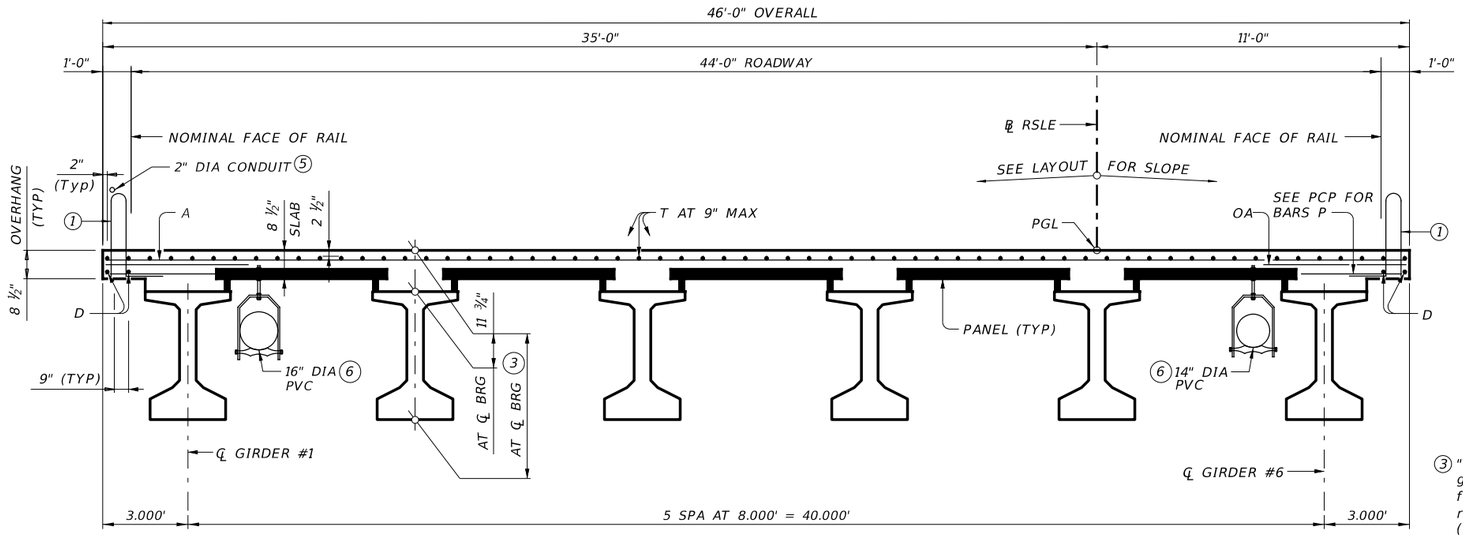
② REINFORCING STEEL WEIGHT IS CALCULATED USING AN APPROXIMATE FACTOR OF 2.3 LBS/SF.

COVER DIMENSIONS ARE CLEAR DIMENSIONS UNLESS NOTED OTHERWISE.

④ SEE "BRIDGE DRAIN DETAILS (WELDED)-BD-3 (MOD)" SHEETS FOR DIMENSIONS, NOTES AND DETAILS NOT SHOWN HERE. SEE "ESTIMATED QUANTITIES AND BEARING SEAT ELEVATIONS" SHEET FOR LOCATIONS OF DECK DRAINS.

⑤ SEE BL STANDARD FOR DIMENSIONS, NOTES AND DETAILS NOT SHOWN HERE. INSTALL JUNCTION BOX AS SHOWN IN BL STANDARD. INSTALL PULL WIRE WITHIN ALL CONDUITS FOR FUTURE WIRING INSTALLATION.

⑥ SEE PIPE HANGER DETAILS SHEET FOR DETAILS NOT SHOWN. SEE DRAINAGE PLANS FOR DRAINAGE INFORMATION NOT SHOWN.



TYPICAL TRANSVERSE SECTION

(GIRDER TYPE Tx54)

BAR TABLE

BAR	SIZE
A	#4
D	#4
G	#4
H	#4
J	#4
M	#4
OA	#5
P	#4
T	#4

③ "Y" value shown is based on theoretical girder camber, dead load deflection from an 8½" concrete slab, a constant roadway grade, and using precast panels (PCP). The Contractor will adjust this value as necessary for any roadway vertical curve and/or if the precast overhang panel (PCP(O)) option is used.

GENERAL NOTES:

DESIGNED ACCORDING TO AASHTO LRFD SPECIFICATIONS, 8TH EDITION (2017) AND ALL CURRENT INTERIMS.

SEE IGTS STANDARD FOR THICKENED SLAB END DETAILS AND QUANTITY ADJUSTMENTS.

SEE PCP OR PMDF STANDARDS FOR DETAILS AND QUANTITY ADJUSTMENTS IF EITHER OF THESE OPTIONS ARE USED.

SEE IGMS STANDARD FOR MISCELLANEOUS DETAILS.

ALL REINFORCING MUST BE GRADE 60.

CONCRETE STRENGTH F'C = 4,000 PSI.

BAR LAPS, WHERE REQUIRED, WILL BE AS FOLLOWS:

UNCOATED ~ #4 = 1'-7"

~ #5 = 2'-0"

HL93 LOADING

STATE OF TEXAS
ALLEN R. CROZIER
81450
LICENSED PROFESSIONAL ENGINEER
12/09/2020

HAYS COUNTY TEXAS

HDR Engineering, Inc.
1290 Wonder World Drive
Building #1, Suite 1230
San Marcos, TX 78666-7969
Texas Registered Engineering Firm F-754

Texas Department of Transportation

ROBERT S. LIGHT EXTENSION

MUSTANG BRANCH BRIDGE
240.000' PRESTR CONC GIRDER UNIT 1

SHEET 1 OF 1

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
WJC	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JCS	TEXAS	AUS	HAYS	232
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CHECK				
ARC				

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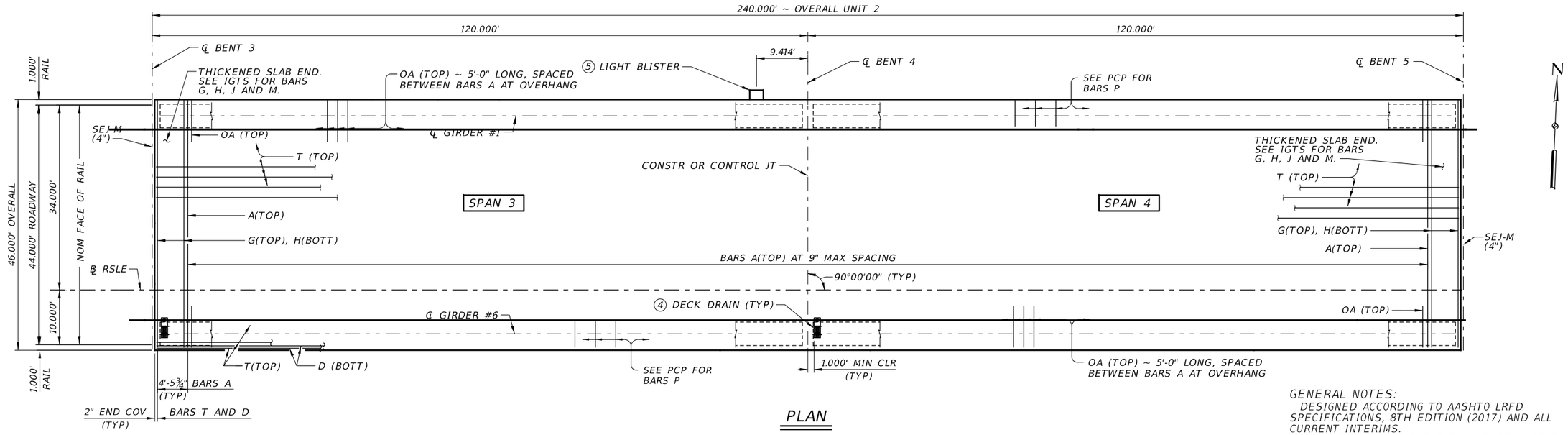

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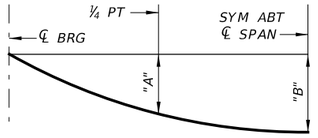

DEAD LOAD DEFLECTION DIAGRAM

CALCULATED DEFLECTIONS SHOWN ARE DUE TO THE CONCRETE SLAB ON INTERIOR GIRDERS ONLY (EC = 5000 KSI). ADJUST VALUES AS REQUIRED FOR EXTERIOR GIRDERS AND IF OPTIONAL SLAB FORMING IS USED. THESE VALUES MAY REQUIRE FIELD VERIFICATION.

TABLE OF SECTION DEPTHS

GIRDER	"Y" AT ℄ BRG ③
	FT/IN
ALL	5'-5 ¾"

TYPE Tx54 GIRDERS

SPAN	"A"	"B"
NO.	FT	FT
3-4	0.145	0.206

TABLE OF ESTIMATED QUANTITIES

SPAN	REINF CONCRETE SLAB	PRESTR CONC GIRDERS (Tx54)	TOTAL REINF STEEL ②
NO.	SF	LF	LB
3	5,520	717.00	12,696
4	5,520	717.00	12,696
TOTAL	11,040	1,434.00	25,392

① SEE RAILING STANDARD FOR RAIL ANCHORAGE IN SLAB.

② REINFORCING STEEL WEIGHT IS CALCULATED USING AN APPROXIMATE FACTOR OF 2.3 LBS/SF.

COVER DIMENSIONS ARE CLEAR DIMENSIONS UNLESS NOTED OTHERWISE.

④ SEE "BRIDGE DRAIN DETAILS (WELDED)-BD-3 (MOD)" SHEETS FOR DIMENSIONS, NOTES AND DETAILS NOT SHOWN HERE. SEE "ESTIMATED QUANTITIES AND BEARING SEAT ELEVATIONS" SHEET FOR LOCATIONS OF DECK DRAINS.

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GENERAL NOTES:

DESIGNED ACCORDING TO AASHTO LRFD SPECIFICATIONS, 8TH EDITION (2017) AND ALL CURRENT INTERIMS.

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SEE PCP OR PMDF STANDARDS FOR DETAILS AND QUANTITY ADJUSTMENTS IF EITHER OF THESE OPTIONS ARE USED.

SEE IGMS STANDARD FOR MISCELLANEOUS DETAILS.

ALL REINFORCING MUST BE GRADE 60.

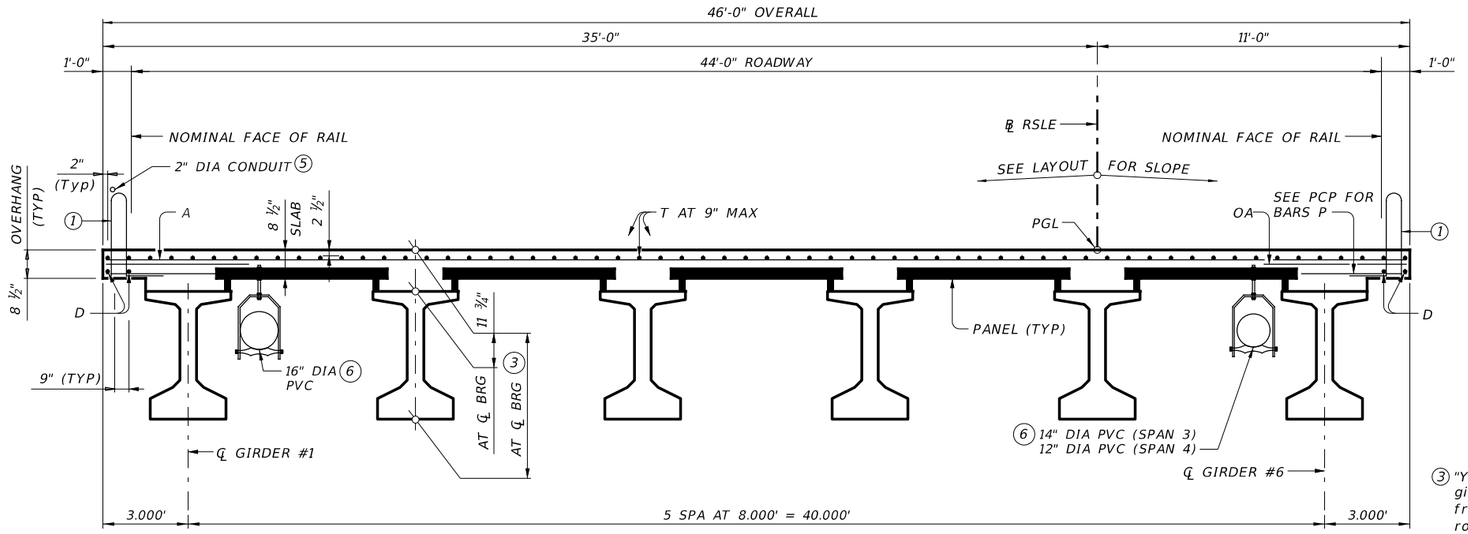
CONCRETE STRENGTH F'C = 4,000 PSI.

BAR LAPS, WHERE REQUIRED, WILL BE AS FOLLOWS:

UNCOATED ~ #4 = 1'-7"

~ #5 = 2'-0"

HL93 LOADING



TYPICAL TRANSVERSE SECTION

(GIRDER TYPE Tx54)

BAR TABLE

BAR	SIZE
A	#4
D	#4
G	#4
H	#4
J	#4
M	#4
OA	#5
P	#4
T	#4

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12/09/2020

HAYS COUNTY TEXAS

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Texas Registered Engineering Firm F-754

Texas Department of Transportation

ROBERT S. LIGHT EXTENSION

MUSTANG BRANCH BRIDGE
240.000' PRESTR
CONC GIRDER UNIT 2

SHEET 1 OF 1

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
WJC	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
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CHECK	CONTROL	SECTION	JOB	
SDM	0914	33	068,ETC	
CHECK				
ARC				

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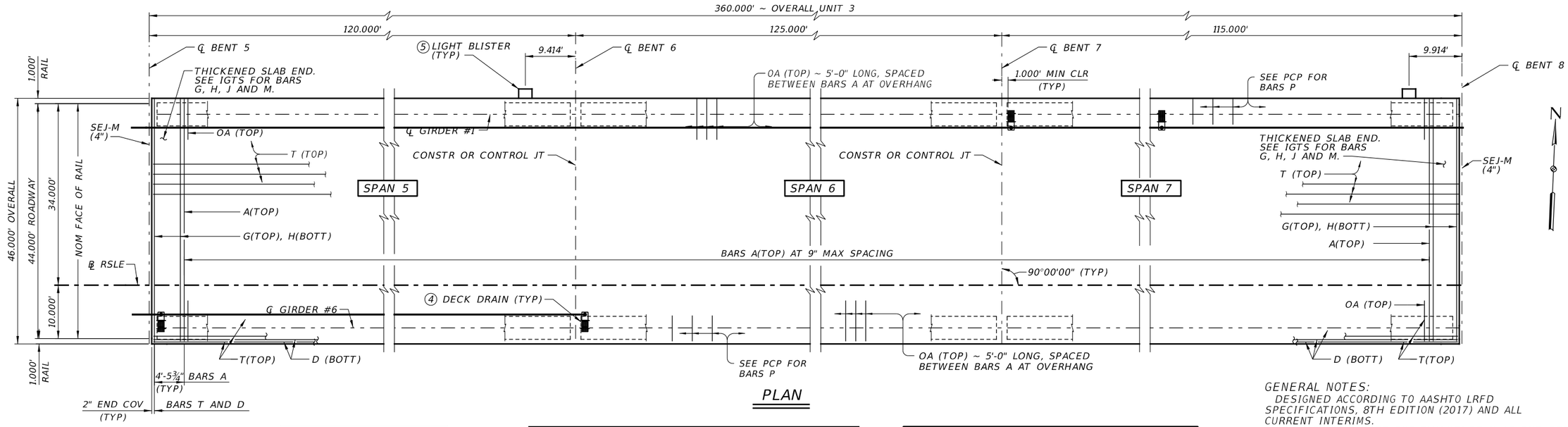
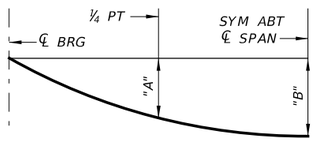


PLAN



DEAD LOAD DEFLECTION DIAGRAM

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TABLE OF SECTION DEPTHS

GIRDER	"Y" AT ℄ BRG ③
	FT/IN
ALL	5'-5 ¾"

TYPE Tx54 GIRDERS

SPAN	"A"	"B"
NO.	FT	FT
5	0.145	0.206
6	0.171	0.243
7	0.122	0.173

TABLE OF ESTIMATED QUANTITIES

SPAN	REINF CONCRETE SLAB	PRESTR CONC GIRDERS (Tx54)	TOTAL REINF STEEL ②
NO.	SF	LF	LB
5	5,520	717.00	12,696
6	5,750	747.00	13,225
7	5,290	687.00	12,167
TOTAL	16,560	2,151.00	38,088

① SEE RAILING STANDARD FOR RAIL ANCHORAGE IN SLAB.

② REINFORCING STEEL WEIGHT IS CALCULATED USING AN APPROXIMATE FACTOR OF 2.3 LBS/SF.

COVER DIMENSIONS ARE CLEAR DIMENSIONS UNLESS NOTED OTHERWISE.

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GENERAL NOTES:

DESIGNED ACCORDING TO AASHTO LRFD SPECIFICATIONS, 8TH EDITION (2017) AND ALL CURRENT INTERIMS.

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ALL REINFORCING MUST BE GRADE 60.

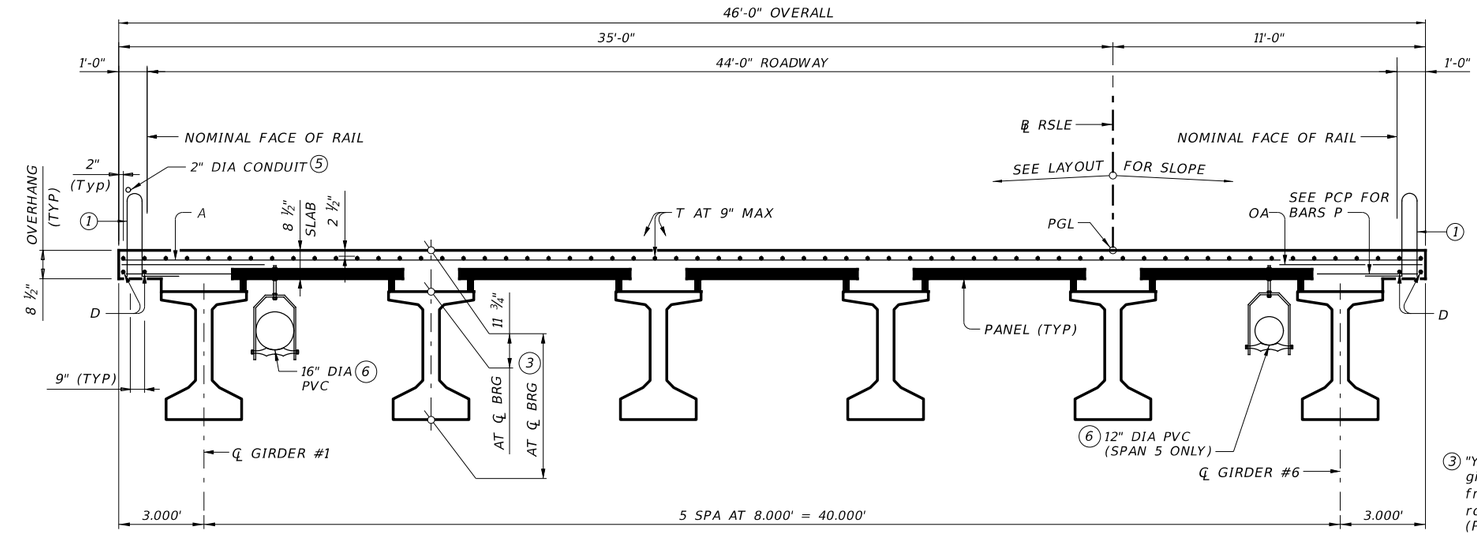
CONCRETE STRENGTH F'C = 4,000 PSI.

BAR LAPS, WHERE REQUIRED, WILL BE AS FOLLOWS:

UNCOATED ~ #4 = 1'-7"

~ #5 = 2'-0"

HL93 LOADING



TYPICAL TRANSVERSE SECTION

(GIRDER TYPE Tx54)

BAR TABLE

BAR	SIZE
A	#4
D	#4
G	#4
H	#4
J	#4
M	#4
OA	#5
P	#4
T	#4

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STATE OF TEXAS
ALLEN R. CROZIER
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LICENSED PROFESSIONAL ENGINEER
12/09/2020

HAYS COUNTY TEXAS

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San Marcos, TX 78666-7969
Texas Registered Engineering Firm F-754

Texas Department of Transportation
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ROBERT S. LIGHT EXTENSION

MUSTANG BRANCH BRIDGE
360.000' PRESTR CONC GIRDER UNIT 3

SHEET 1 OF 1

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
WJC	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
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CHECK	CONTROL	SECTION	JOB	234
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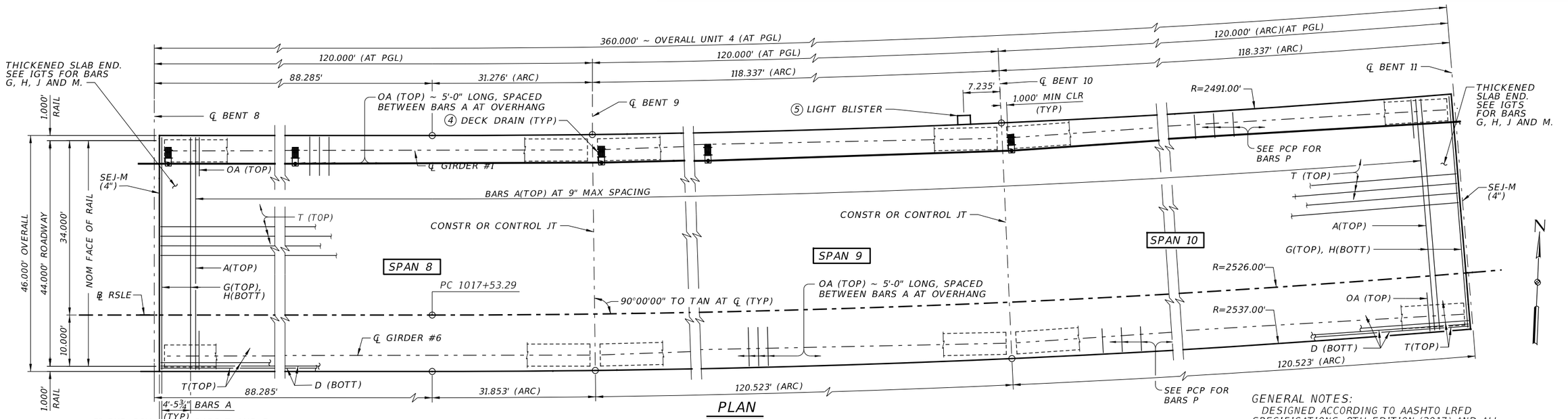
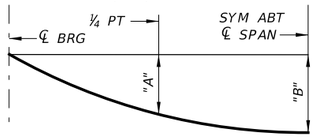


PLAN



DEAD LOAD DEFLECTION DIAGRAM

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TABLE OF SECTION DEPTHS

SPAN	GIRDER	"X" AT ℄ SPAN	"Y" AT ℄ BRG ③
		FT/IN	FT/IN
8	ALL	12"	5'-6"
9-10	ALL	12 ½"	5'-6 ½"

TYPE Tx54 GIRDERS

SPAN	"A"	"B"
NO.	FT	FT
8-10	0.145	0.206

TABLE OF ESTIMATED QUANTITIES

SPAN	REINF CONCRETE SLAB	PRESTR CONC GIRDERS (Tx54)	TOTAL REINF STEEL ②
NO.	SF	LF	LB
8	5,513	716.10	12,680
9	5,494	713.52	12,637
10	5,494	713.52	12,637
TOTAL	16,501	2,143.14	37,954

① SEE RAILING STANDARD FOR RAIL ANCHORAGE IN SLAB.

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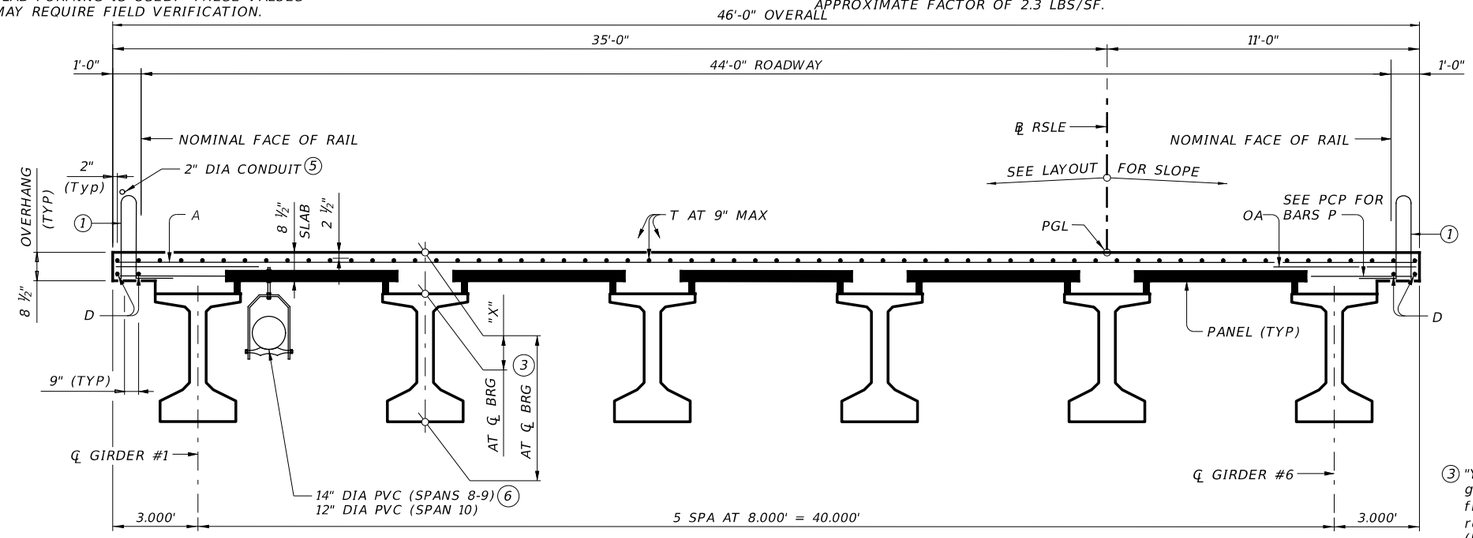

TYPICAL TRANSVERSE SECTION

(GIRDER TYPE Tx54)

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BAR TABLE

BAR	SIZE
A	#4
D	#4
G	#4
H	#4
J	#4
M	#4
OA	#5
P	#4
T	#4

GENERAL NOTES:

DESIGNED ACCORDING TO AASHTO LRFD SPECIFICATIONS, 8TH EDITION (2017) AND ALL CURRENT INTERIMS.

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HL93 LOADING

STATE OF TEXAS
ALLEN R. CROZIER
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12/09/2020

HAYS COUNTY TEXAS

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Texas Registered Engineering Firm F-754

Texas Department of Transportation
℗ 2020

ROBERT S. LIGHT EXTENSION
MUSTANG BRANCH BRIDGE
360.000' PRESTR
CONC GIRDER UNIT 4

SHEET 1 OF 1

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
WJC	6	STP ( ) RGS		RSLE
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CHECK				
ARC				

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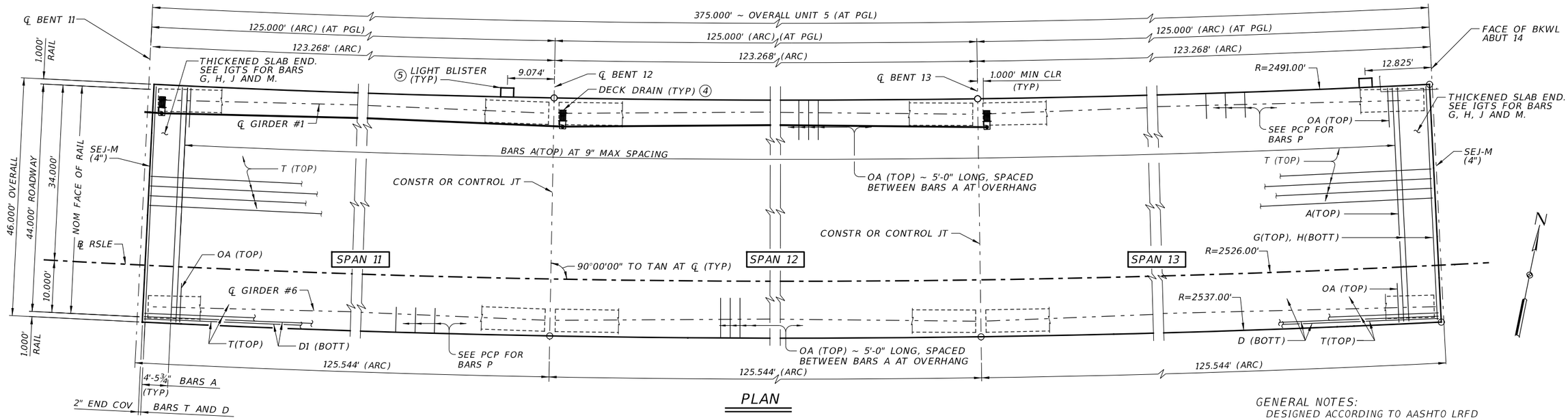

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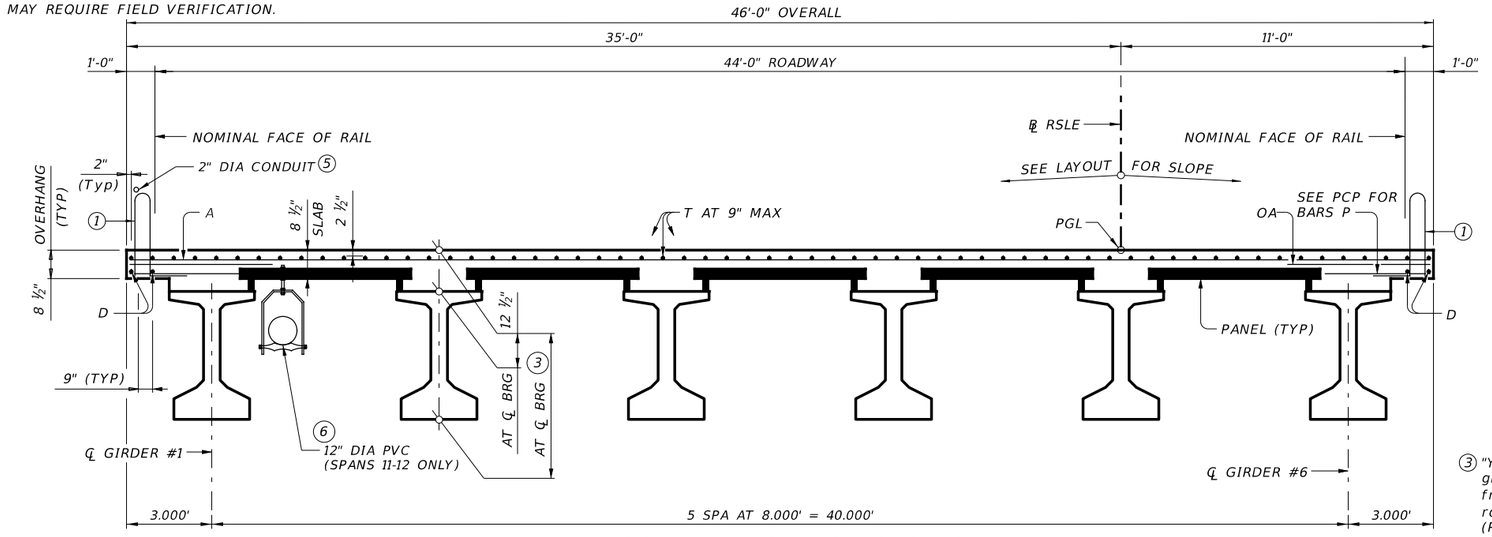

TYPICAL TRANSVERSE SECTION

(GIRDER TYPE Tx54)

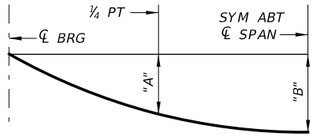

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TABLE OF SECTION DEPTHS

GIRDER	"Y" AT ℄ BRG ③
	FT/IN
ALL	5'-6 ½"

TYPE Tx54 GIRDERS

SPAN	"A"	"B"
NO.	FT	FT
11-13	0.171	0.243

TABLE OF ESTIMATED QUANTITIES

SPAN	REINF CONCRETE SLAB	PRESTR CONC GIRDERS (Tx54)	TOTAL REINF STEEL ②
NO.	SF	LF	LB
11	5,723	743.37	13,163
12	5,723	743.37	13,163
13	5,723	743.37	13,163
TOTAL	17,169	2,230.11	39,489

① SEE RAILING STANDARD FOR RAIL ANCHORAGE IN SLAB.

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BAR TABLE

BAR	SIZE
A	#4
D	#4
G	#4
H	#4
J	#4
M	#4
OA	#5
P	#4
T	#4

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ALL REINFORCING MUST BE GRADE 60.

CONCRETE STRENGTH F'C = 4,000 PSI.

BAR LAPS, WHERE REQUIRED, WILL BE AS FOLLOWS:

UNCOATED ~ #4 = 1'-7"

~ #5 = 2'-0"

HL93 LOADING

STATE OF TEXAS
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LICENSED
PROFESSIONAL ENGINEER
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Texas Department of Transportation

ROBERT S. LIGHT EXTENSION

MUSTANG BRANCH BRIDGE
375.000' PRESTR
CONC GIRDER UNIT 5

SHEET 1 OF 1

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
WJC	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
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ARC				

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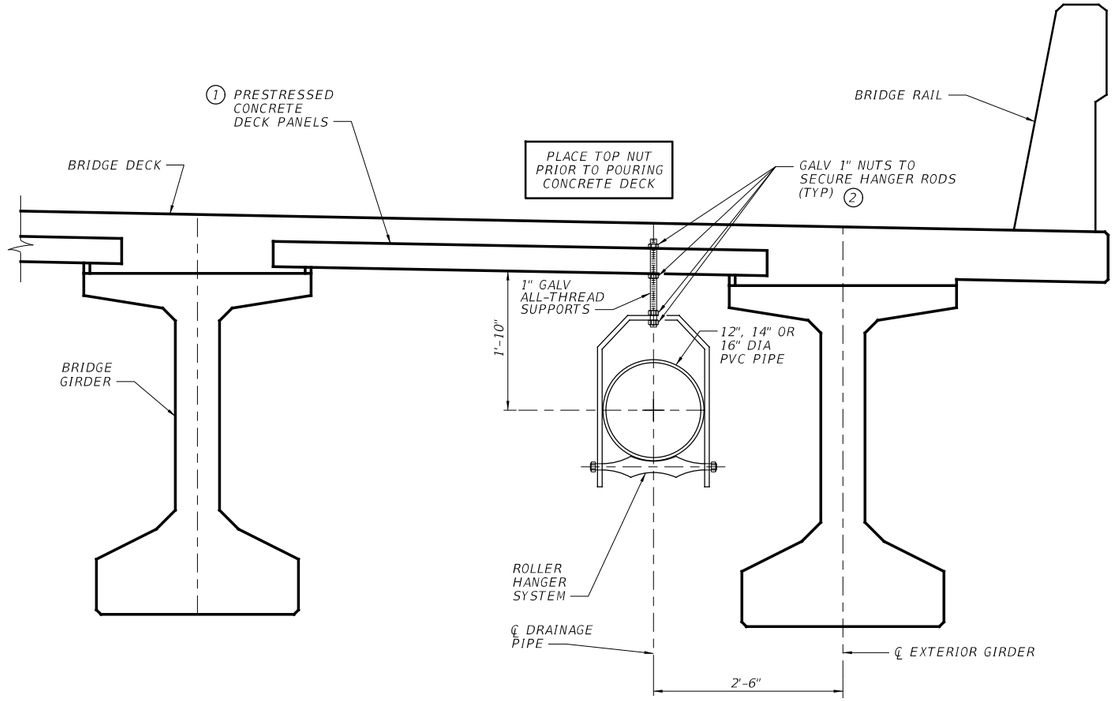
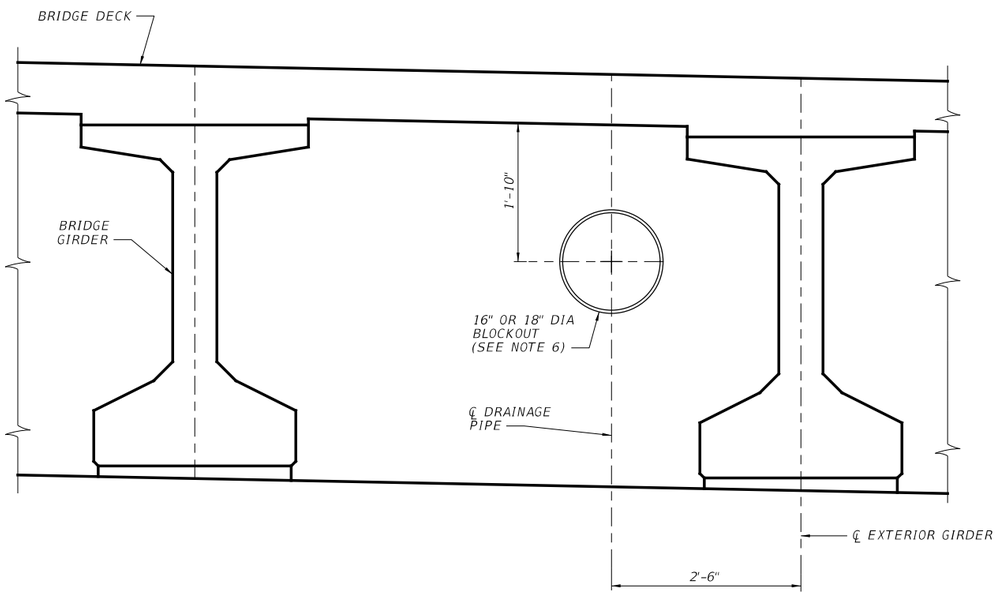
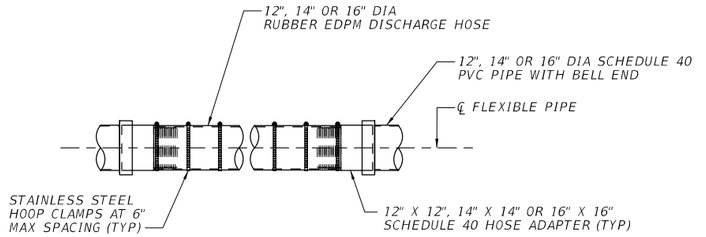


PIPE HANGER DETAILS



ABUTMENT ELEVATION

(SHOWING CONTROL DIMENSIONS FOR PIPES THROUGH ABUTMENT BACKWALL) (SEE NOTE 6)



FLEXIBLE PIPE DETAIL

(REQUIRED AT WITHIN 10' OF EACH ℄ BENT) (SEE NOTE 3)

NOTES:

1. ROLLER HANGERS ARE SPACED AT 5'-0" O.C. PIPE HANGER ASSEMBLIES SHALL BE NATIONAL PIPE HANGER CORPORATION, ADJUSTABLE ROLLER HANGER, HOT DIP GALVANIZED CARBON STEEL, FIGURE 250 FOR 12", 14" AND 16" SCHEDULE 40 PVC PIPE OR APPROVED EQUAL.
2. THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS SHOWING COMPETE DETAILSOF THE DRAINAGE SYSTEM TO THE ENGINEER OF RECORD FOR APPROVAL PRIOR TO COMMENCING WORK. THE SHOP DRAWINGS SHALL SHOW THE VARIOUS COMPONENTS OF THE BRIDGE DECK DRAINAGE SYSTEM, INCLUDING BUT NOT LIMITED TO PLANS, ELEVATIONS, DETAIL SECTIONS, PIPE SUPPORT AND HANGER DETAILS, PIPE SUPPORT LAYOUT, MATERIAL PROPRIETARY ITEMS, ETC.
3. FLEXIBLE PIPE SHALL BE ABLE TO ACCOMODATE A MINIMUM OF 4" OF SUPERSTRUCTURE MOVEMENT IN ANY DIRECTION. SPACING OF FLEXIBLE PIPE LOCATIONS SHALL NOT EXCEED 135' MAX ALONG LENGTH OF PVC PIPE.
4. THESE DETAILS TO BE USED IN CONJUNCTION WITH "BRIDGE DRAIN DETAILS (WELDED) BD-3 (MOD)" SHEETS. SEE DRAINAGE PLANS FOR ADDITIONAL INFORMATION.
5. HANGER SYSTEM SHALL BE SUBSIDIARY TO ITEM 481, "PIPE FOR DRAINS".
6. THESE DETAILS TO BE USED IN CONJUNCTION WITH "MUSTANG BRANCH BRIDGE ABUTMENT 1" SHEET.

(1) LOCATE STEEL/PRESTRESSED STRANDS IN PRESTRESSED CONCRETE DECK PANELS PRIOR TO DRILLING HOLES FOR PIPE HANGER RODS.

(2) TACK WELD NUTS ONCE PIPE ASSEMBLY AND PVC PIPES ARE IN PLACE.

HL93 LOADING

STATE OF TEXAS
ALLEN R. CROZIER
81450
LICENSED PROFESSIONAL ENGINEER
11/19/2020

HAYS COUNTY TEXAS

HDR Engineering, Inc.
1290 Wonder World Drive
Building #1, Suite 1230
San Marcos, TX 78666-7969
Texas Registered Engineering Firm F-754

Texas Department of Transportation

ROBERT S. LIGHT EXTENSION
MUSTANG BRANCH BRIDGE
PIPE HANGER DETAILS

SHEET 1 OF 1

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
WJC	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JCS	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	237
SDM	0914	33	068,ETC	
CHECK				
ARC				

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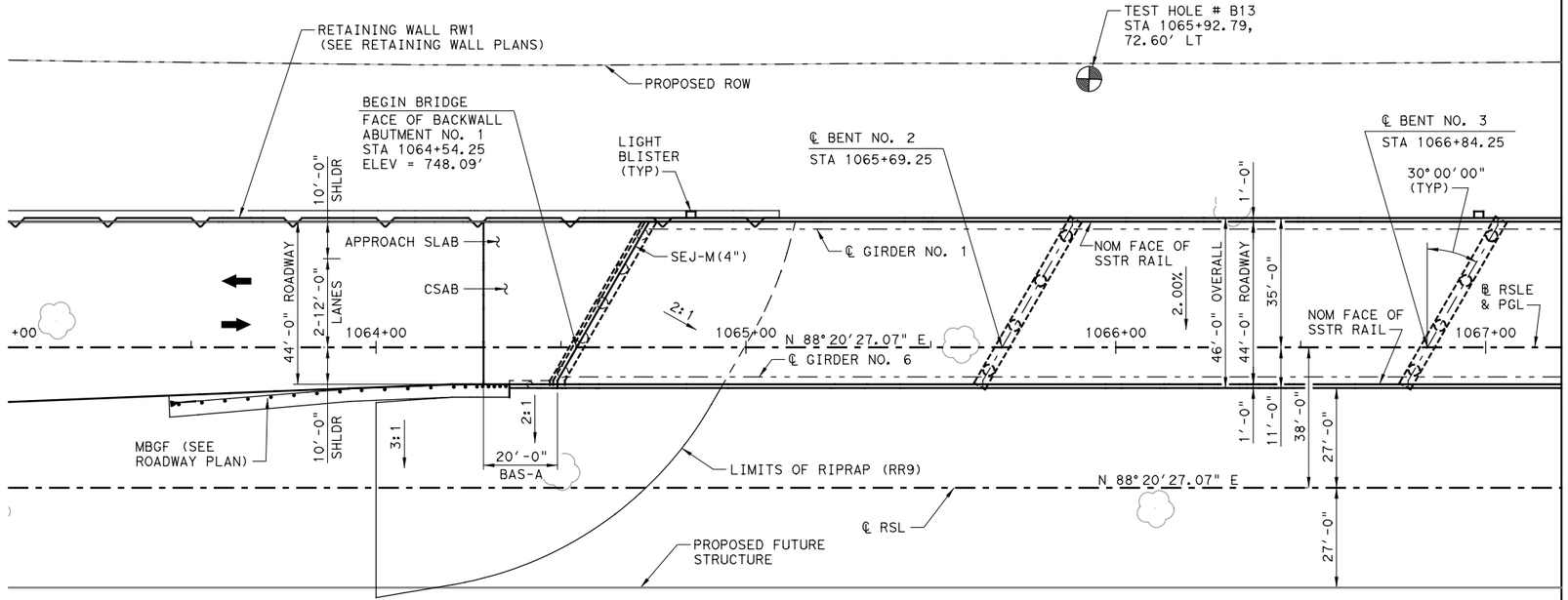


PLAN

MATCH LINE STA. 1067+20.00

NBI NO: 14-106-0-AA01-32-002
DESIGN SPEED: 60 MPH
ADT (2035): 3,800 VPD
FUNCT CLASS: MINOR COLLECTOR

0 20 40
SCALE IN FEET

N

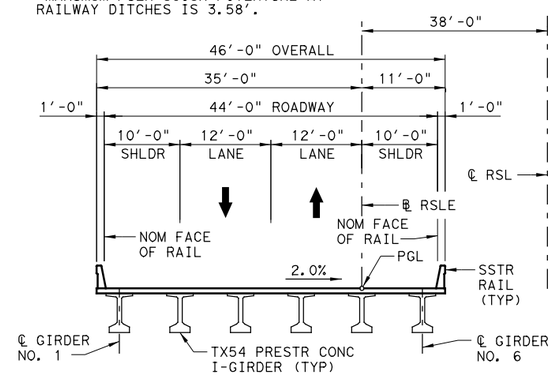
GENERAL NOTES:

DESIGNED IN ACCORDANCE WITH AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 8TH EDITION (2017) AND ALL CURRENT INTERIM REVISIONS.

D = DENOTES BENTS WITH DOWELS D AND SLOTTED HOLES AT EXTERIOR GIRDER ENDS.
H = COLUMN HEIGHT AT PGL

FOUND DRILLED SHAFTS AT THE LENGTHS SHOWN OR LONGER TO OBTAIN A MINIMUM 3 DRILLED SHAFT DIAMETER PENETRATION INTO LIMESTONE OR SHALE.

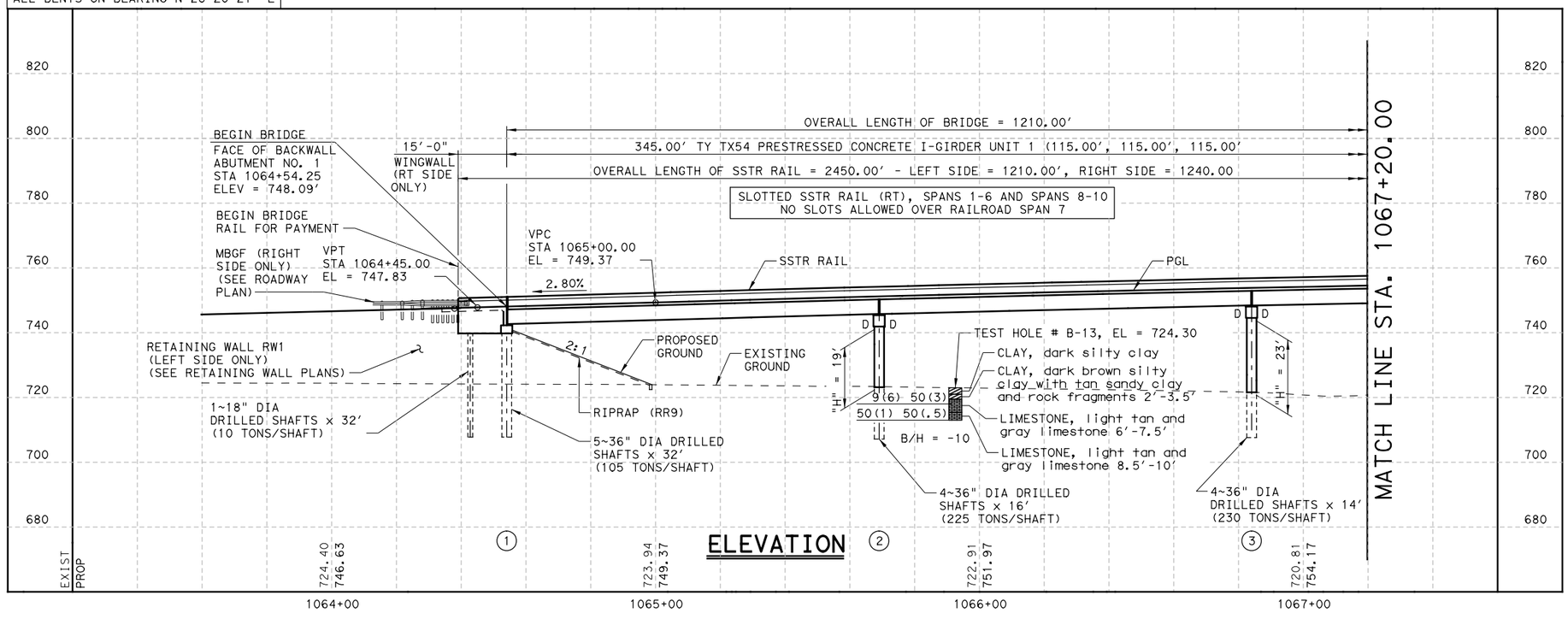
MAXIMUM PIER SCOUR POTENTIAL AT RAILWAY DITCHES IS 3.58'.



TYPICAL TRANSVERSE SECTION

(STA 1064+54.25 TO 1071+44.25)

ALL BENTS ON BEARING N 28°20'27" E



ELEVATION

HL93 LOADING

STATE OF TEXAS
ALLEN R. CROZIER
81450
LICENSED
PROFESSIONAL ENGINEER
11/19/2020

HAYS COUNTY TEXAS

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Texas Department of Transportation
℗ 2020

ROBERT S. LIGHT EXTENSION
RSLE OVERPASS AT UPRR

BRIDGE LAYOUT

SHEET 1 OF 4

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
SDM	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
MMF	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	238
ARC	0914	33	068,ETC	
CHECK				
SDM				

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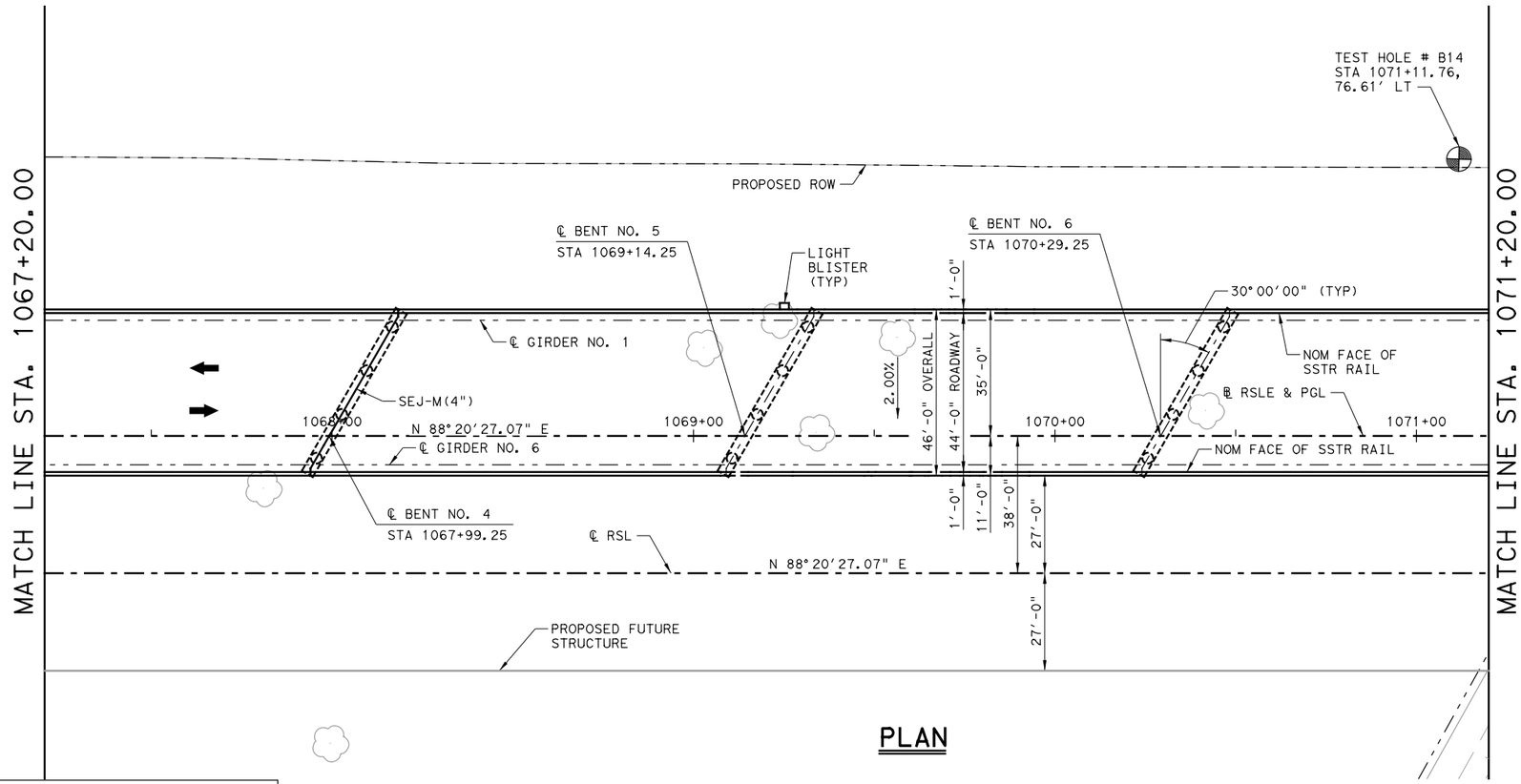


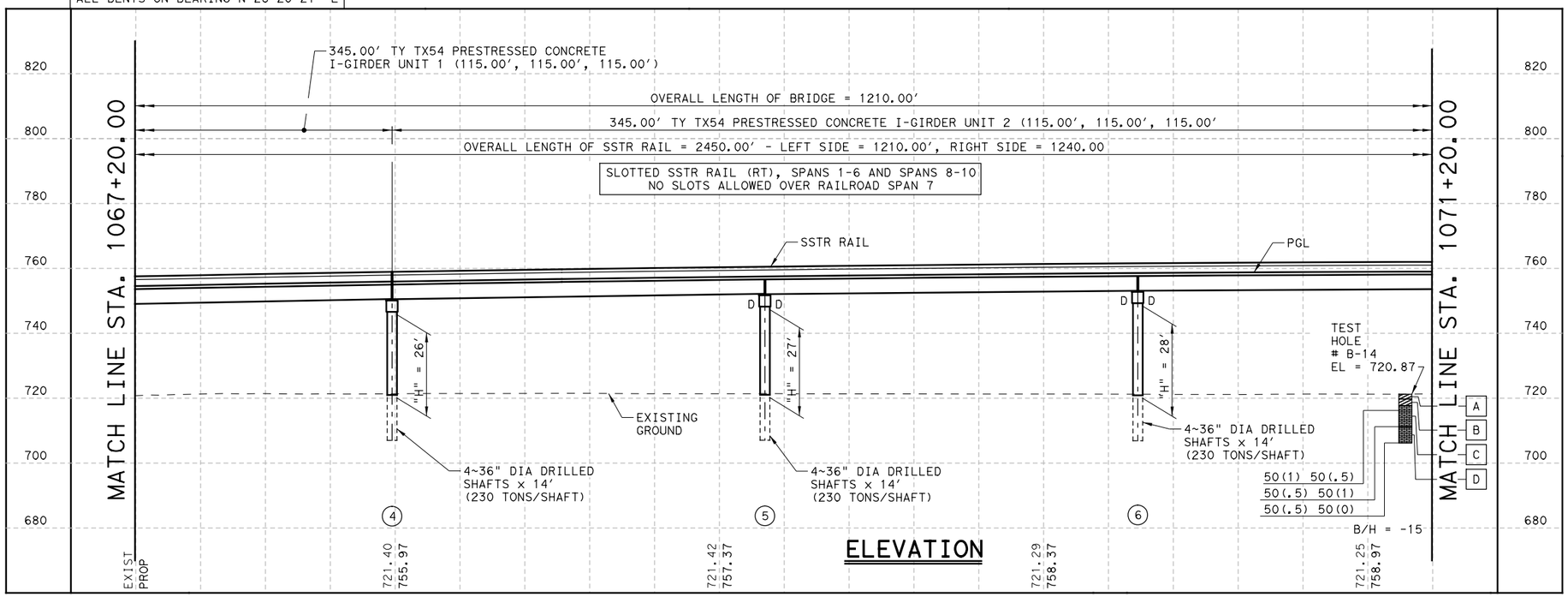
A CLAY, dark brown silty clay w/ organics

B CLAY, dark brown silty and tan sandy clays with organic matter and small gravel 2'-3.5' hit rock at 4'CLAY, tan and orange silty clay

C LIMESTONE, white limestone with moderate degree of fracturing 5-10'

D LIMESTONE, light tan limestone with light gray and orange clay seams 10-15'

ALL BENTS ON BEARING N 28°20'27" E



ELEVATION

HL93 LOADING

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ROBERT S. LIGHT EXTENSION
RSLE OVERPASS AT UPRR

BRIDGE LAYOUT

SHEET 2 OF 4

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
SDM	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
MMF	TEXAS	AUS	HAYS	239
CHECK	CONTROL	SECTION	JOB	
ARC	0914	33	068,ETC	
CHECK				
SDM				

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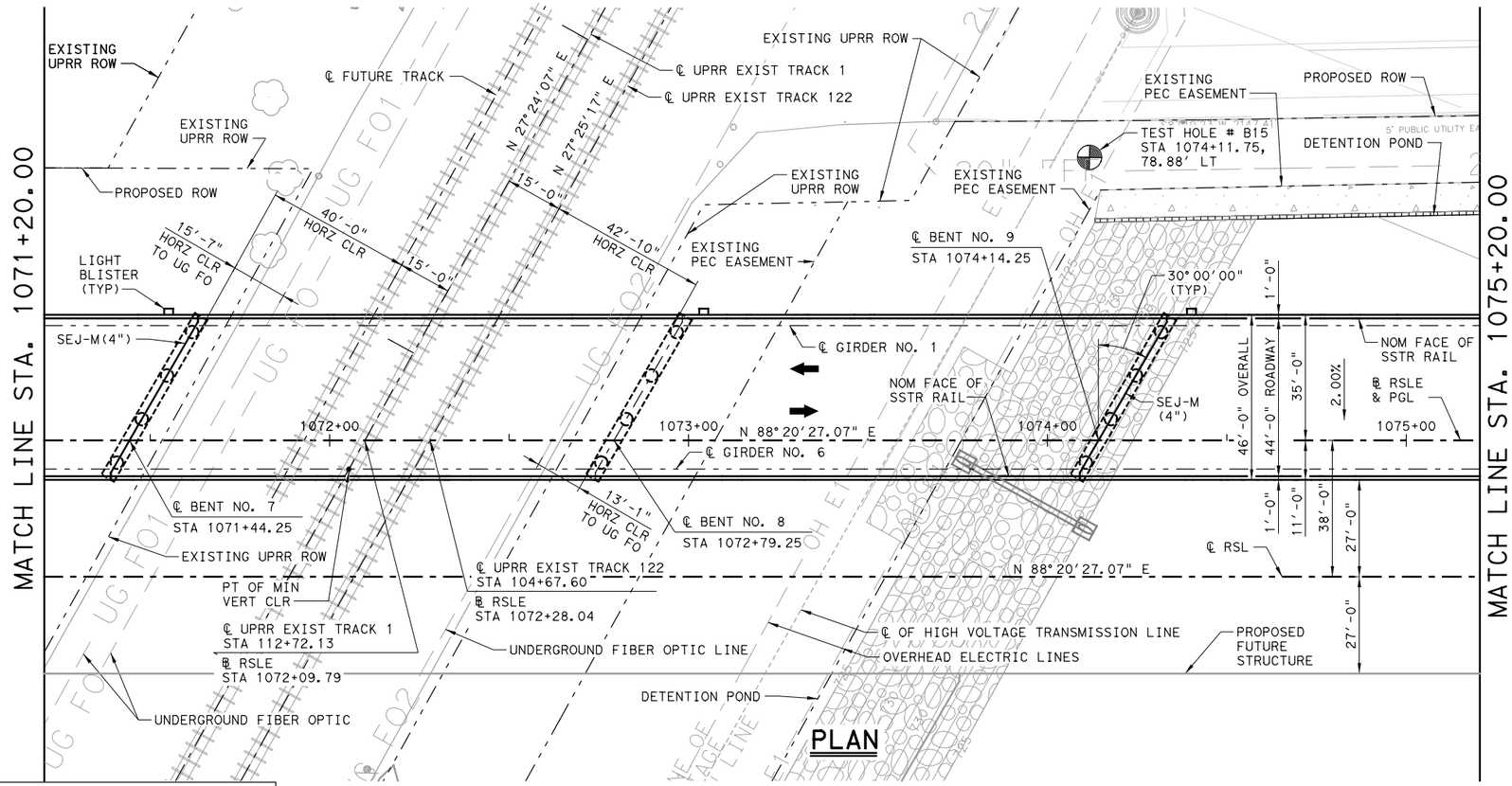


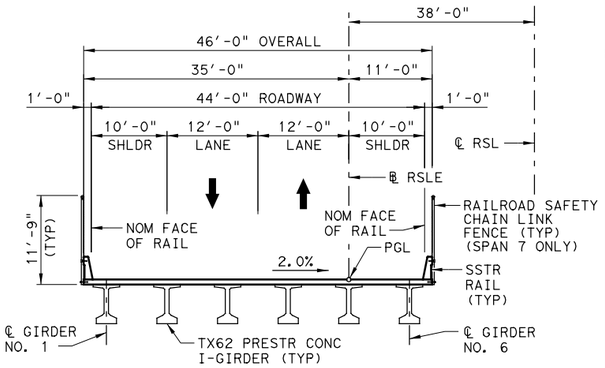
PLAN

NOTES:

1. DRAINAGE FROM OVERPASS WILL BE DIVERTED AWAY FROM THE UPRR ROW AND WILL NOT BE ALLOWED TO DRAIN DIRECTLY FROM THE BRIDGE ONTO UPRR ROW.
2. THE PROPOSED BRIDGE WILL NOT CHANGE THE QUANTITY OR CHARACTER OF THE FLOW IN THE RAILWAY'S DITCHES AND/OR DRAINAGE STRUCTURE.
3. DRILLED SHAFTS WITHIN THE INFLUENCE OF TRACK SURCHARGE SHALL BE DESIGNED WITH TEMPORARY CASING TO PROTECT TRACK AGAINST CAVE-IN, SUBSIDENCE, AND/OR DISPLACEMENT OF SURROUNDING GROUND. CASING SHALL BE DESIGNED FOR LIVE LOAD DUE TO RAILROAD SURCHARGE IN ADDITION TO ALL OTHER LOADS.

0 20 40
SCALE IN FEET

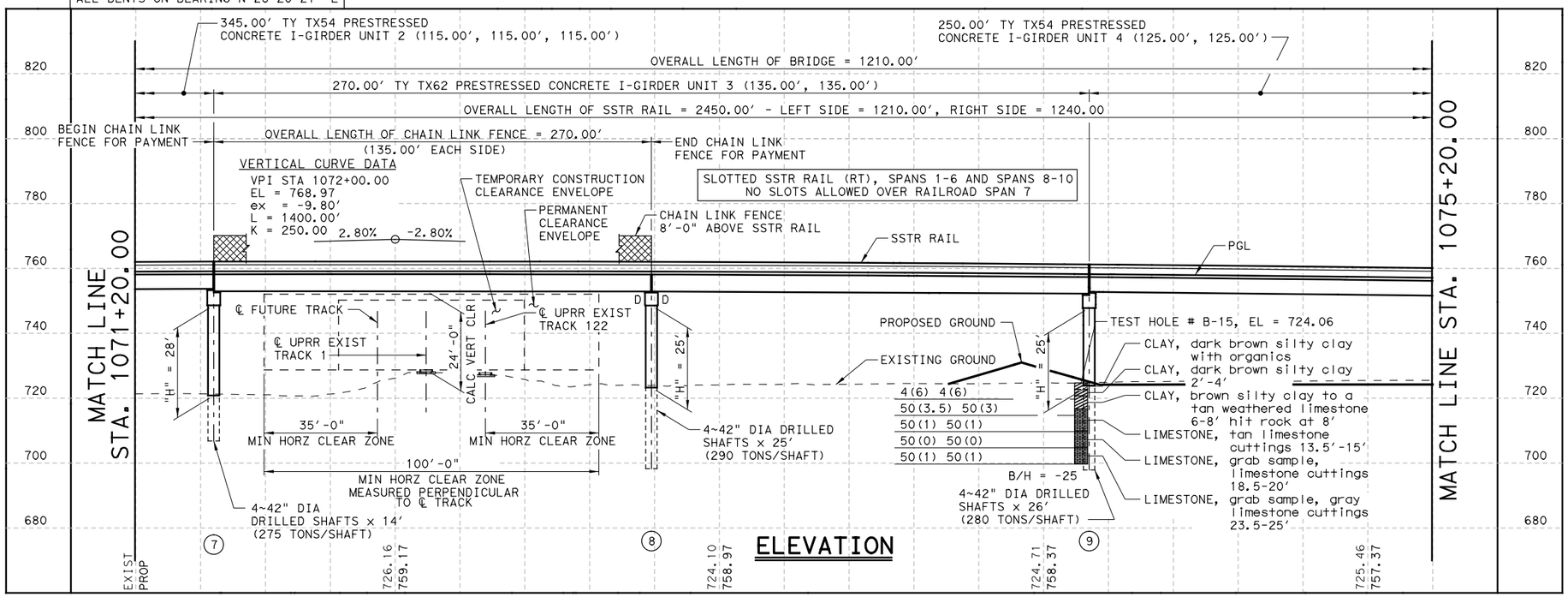
N



TYPICAL TRANSVERSE SECTION

(STA 1071+44.25 TO 1074+14.25)

ALL BENTS ON BEARING N 28°20'27" E



ELEVATION

HL93 LOADING

STATE OF TEXAS
ALLEN R. CROZIER
81450
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11/19/2020

HAYS COUNTY TEXAS

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Texas Department of Transportation

ROBERT S. LIGHT EXTENSION
RSLE OVERPASS AT UPRR

BRIDGE LAYOUT

SHEET 3 OF 4

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
SDM	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
MMF	TEXAS	AUS	HAYS	240
CHECK	CONTROL	SECTION	JOB	
ARC	0914	33	068,ETC	
CHECK				
SDM				

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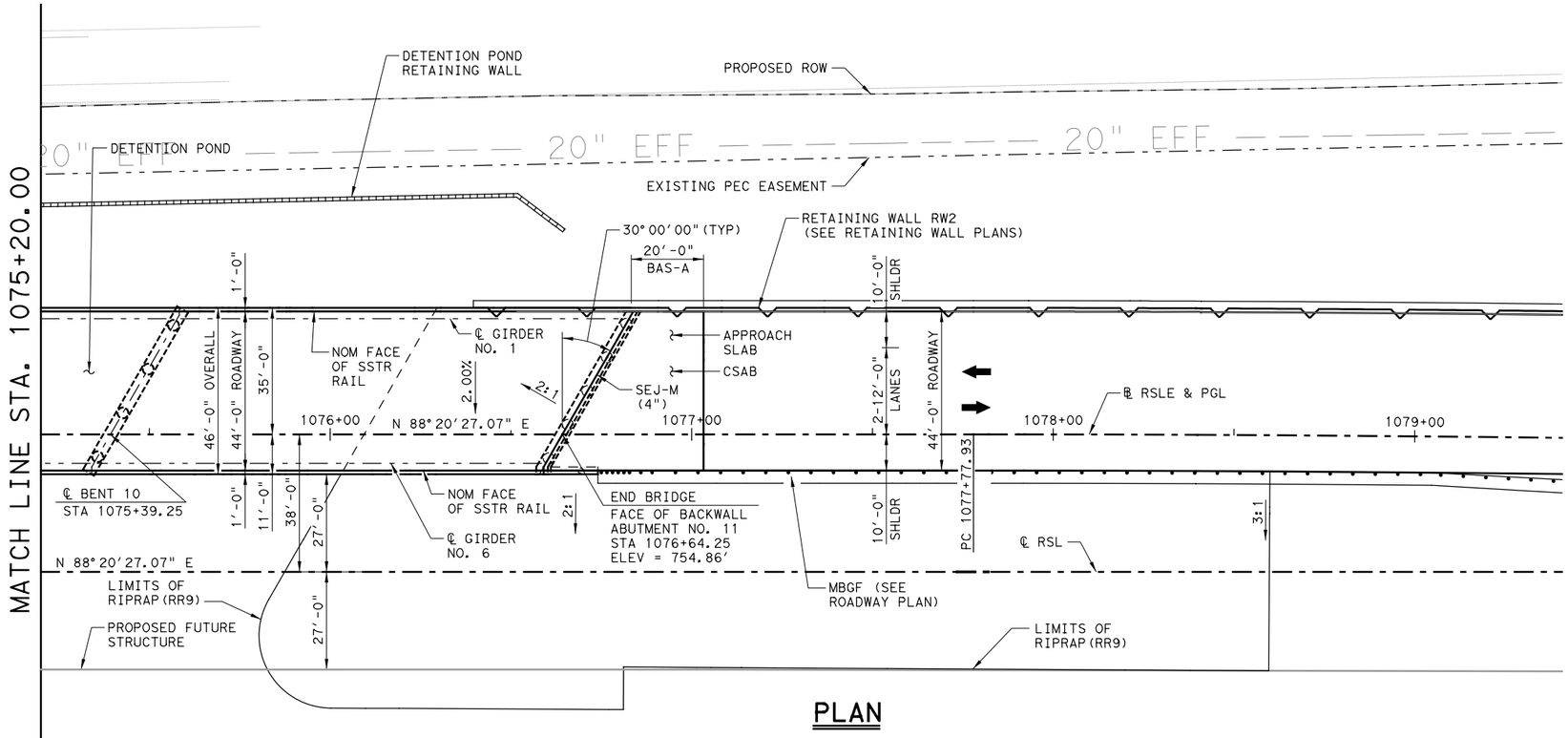
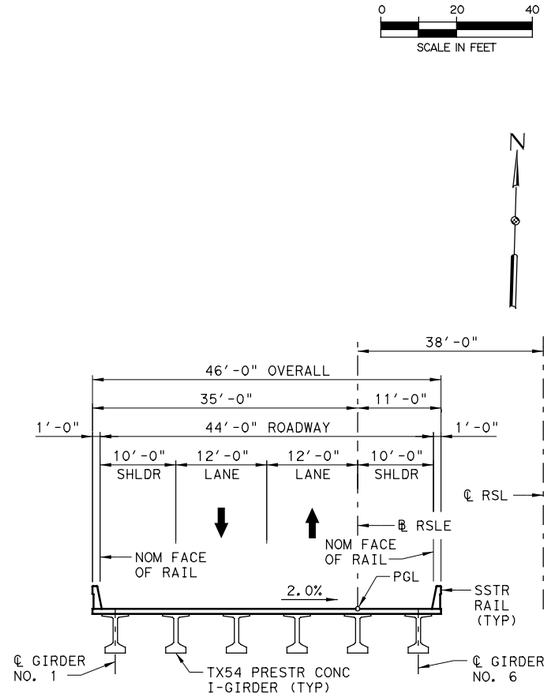


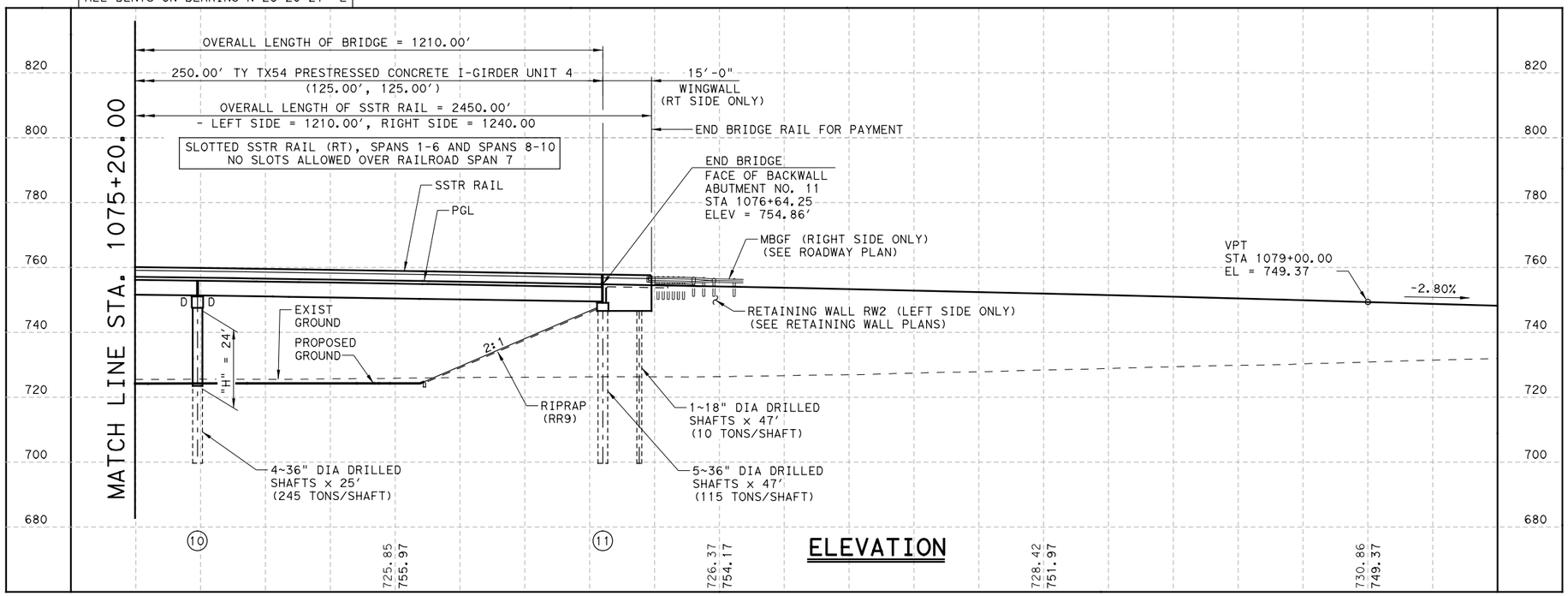
PLAN



TYPICAL TRANSVERSE SECTION

(STA 1074+14.25 TO 1076+64.25)

ALL BENTS ON BEARING N 28°20'27" E



ELEVATION

HL93 LOADING

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11/19/2020

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ROBERT S. LIGHT EXTENSION
RSLE OVERPASS AT UPRR

BRIDGE LAYOUT

SHEET 4 OF 4

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
SDM	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
MMF	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	241
ARC CHECK	0914	33	068,ETC	
SDM				

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SUMMARY OF BRIDGE QUANTITIES

LOCATION	401 6001 FLOWABLE BACKFILL ①	416 6001 DRILL SHAFT (18 IN)	416 6004 DRILL SHAFT (36 IN)	416 6005 DRILL SHAFT (42 IN)	420 6013 CL C CONC (ABUT)	420 6025 CL C CONC (BENT)	422 6001 REINF CONC SLAB	422 6015 APPROACH SLAB	425 6039 PRESTR CONC GIRDER (Tx54)	425 6040 PRESTR CONC GIRDER (Tx62)	432 6001 RIPRAP (CONC) (4 IN)	450 6023 RAIL (TY SSTR)	454 6018 SEALED EXPANSION JOINT(4 IN) (SEJ-M)	550 6008 CHAIN LINK FENCE (INSTALL) (8') ②
	CY	LF	LF	LF	CY	CY	SF	CY	LF	LF	CY	LF	LF	LF
2 - ABUTMENTS	208.4	79	395		62.2			113.4			448.3			
9 - INTERIOR BENTS			388	260		528.0								
												2,480.00	257	270
2 - 345.000' PRESTR CONC TX54 GIRDER UNIT							31,740		4,122.36					
1 - 270.000' PRESTR CONC TX62 GIRDER UNIT							12,420			1,614.00				
1 - 250.000' PRESTR CONC TX54 GIRDER UNIT							11,500		1,493.94					
TOTAL	208.4	79	783	260	62.2	528.0	55,660	113.4	5,616.30	1,614.00	448.3	2,480.00	257	270

① FLOWABLE BACKFILL IS TO BE PLACED TO THE LIMITS SHOWN ON CSAB STANDARD

② FOR CONTRACTOR'S INFORMATION ONLY. SUBSIDIARY TO ITEM 450.

BEARING SEAT ELEVATIONS

	GIRDER 1	GIRDER 2	GIRDER 3	GIRDER 4	GIRDER 5	GIRDER 6
ABUT 1 (FWD)	743.549	743.260	742.971	742.681	742.392	742.103
BENT 2 (BK)	746.559	746.285	746.010	745.735	745.459	745.182
(FWD)	746.608	746.334	746.060	745.785	745.509	745.232
BENT 3 (BK)	749.115	748.863	748.609	748.355	748.100	747.844
(FWD)	749.155	748.903	748.650	748.396	748.141	747.886
BENT 4 (BK)	751.143	750.912	750.680	750.447	750.213	749.978
(FWD)	751.173	750.943	750.711	750.478	750.245	750.011
BENT 5 (BK)	752.641	752.431	752.221	752.009	751.796	751.583
(FWD)	752.663	752.453	752.243	752.031	751.819	751.606
BENT 6 (BK)	753.611	753.422	753.233	753.042	752.851	752.659
(FWD)	753.623	753.435	753.246	753.055	752.865	752.673
BENT 7 (BK)	754.051	753.884	753.715	753.546	753.376	753.205
(FWD)	753.388	753.221	753.053	752.884	752.715	752.544
BENT 8 (BK)	753.227	753.084	752.941	752.797	752.652	752.506
(FWD)	753.219	753.077	752.934	752.790	752.645	752.500
BENT 9 (BK)	752.342	752.224	752.106	751.986	751.866	751.745
(FWD)	752.987	752.870	752.752	752.633	752.513	752.392
BENT 10(BK)	751.536	751.441	751.346	751.250	751.153	751.055
(FWD)	751.507	751.413	751.318	751.222	751.125	751.028
ABUT 11(BK)	749.443	749.371	749.299	749.226	749.152	749.077

AS-BUILT DRILLED SHAFT TIP ELEVATIONS		
BENT NO.	DS NO.	TIP ELEVATION
ABUT 1	1	
	2	
	3	
	4	
	5	
	WW1	
BENT 2	1	
	2	
	3	
	4	
BENT 3	1	
	2	
	3	
	4	
BENT 4	1	
	2	
	3	
	4	
BENT 5	1	
	2	
	3	
	4	
BENT 6	1	
	2	
	3	
	4	
BENT 7	1	
	2	
	3	
	4	
BENT 8	1	
	2	
	3	
	4	
BENT 9	1	
	2	
	3	
	4	
BENT 10	1	
	2	
	3	
	4	
ABUT 11	1	
	2	
	3	
	4	
	5	
	WW1	

HL93 LOADING

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ROBERT S. LIGHT EXTENSION
RSLE OVERPASS AT UPRR

ESTIMATED QUANTITIES & BEARING SEAT ELEVATIONS

SHEET 1 OF 1

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
WJC	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JCS	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	242
SDM	0914	33	068,ETC	
CHECK				
ARC				

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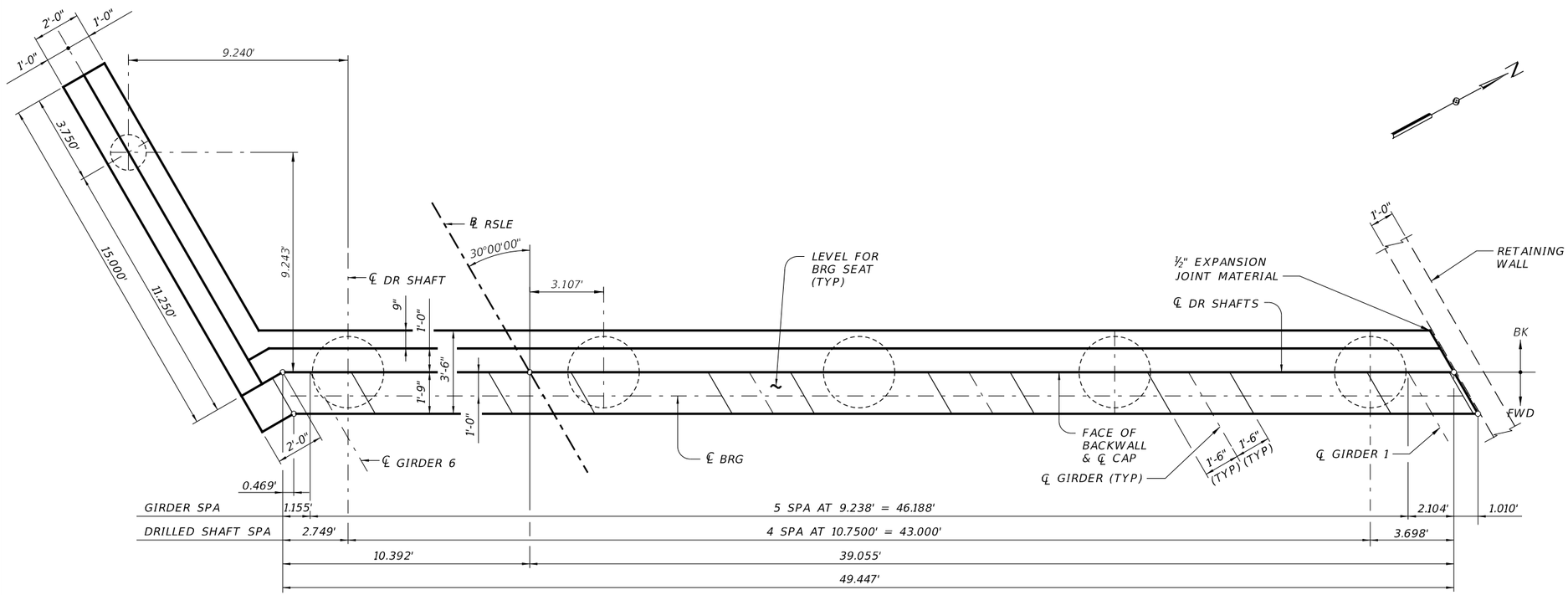
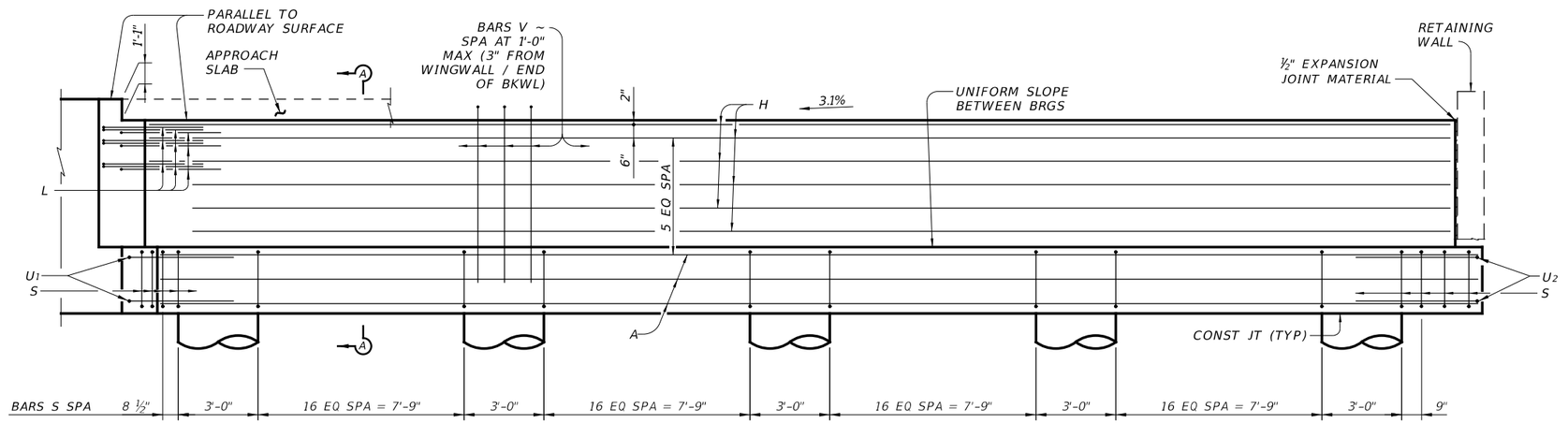


PLAN



ELEVATION

TABLE OF ESTIMATED QUANTITIES				
BAR	NO.	SIZE	LENGTH	WEIGHT
A	10	#11	49'-5"	2,626
H	12	#6	49'-5"	891
L	9	#6	5'-10"	79
S	76	#5	11'-6"	912
U_1	2	#6	11'-7"	35
U_2	2	#6	8'-6"	26
V	51	#5	15'-9"	838
wH_1	7	#6	16'-5"	173
wH_2	14	#6	14'-8"	308
wS	16	#4	7'-10"	84
wV	16	#5	15'-9"	262
REINFORCING STEEL			LB	6,234
CLASS "C" CONC (ABUT)			CY	31.1

GENERAL NOTES:

DESIGNED ACCORDING TO AASHTO LRFD SPECIFICATIONS, 8TH EDITION (2017) AND ALL CURRENT INTERIMS.

CONCRETE STRENGTH f'c = 3,600 PSI.

ALL CAP AND WALL REINFORCING MUST BE GRADE 60.

SEE BRIDGE LAYOUT FOR HEADER SLOPE AND FOUNDATION TYPE, SIZE AND LENGTH.

SEE FOUNDATION DETAIL STANDARD SHEET, FD, FOR ALL FOUNDATION DETAILS AND NOTES.

SEE CONCRETE RIPRAP STANDARD SHEET, CRR, FOR RIPRAP ATTACHMENT DETAILS, IF APPLICABLE.

SEE APPLICABLE RAIL DETAILS FOR RAIL ANCHORAGE IN WINGWALL.

HL93 LOADING

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ROBERT S. LIGHT EXTENSION
RSLE OVERPASS AT UPRR
ABUTMENT 1

SHEET 1 OF 2

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
WJC	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JCS	TEXAS	AUS	HAYS	243
CHECK	CONTROL	SECTION	JOB	
SDM	0914	33	068,ETC	
CHECK				
ARC				

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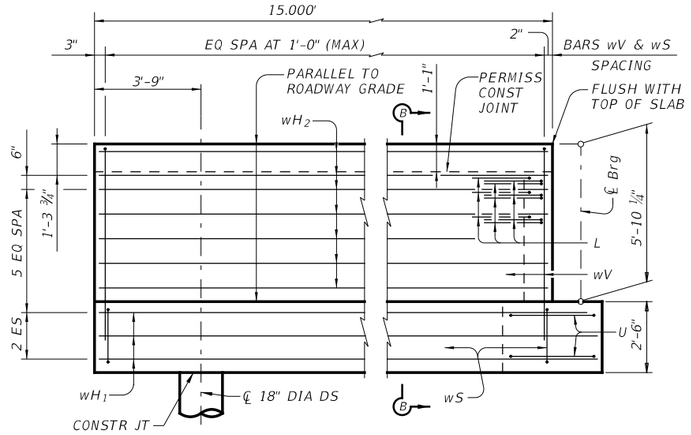
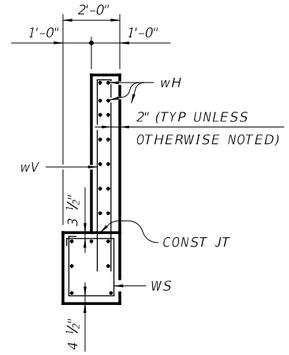
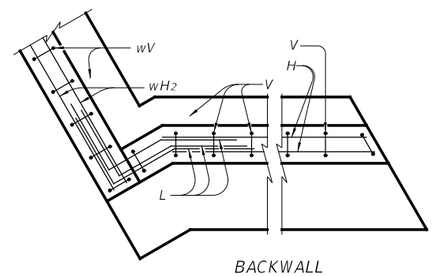


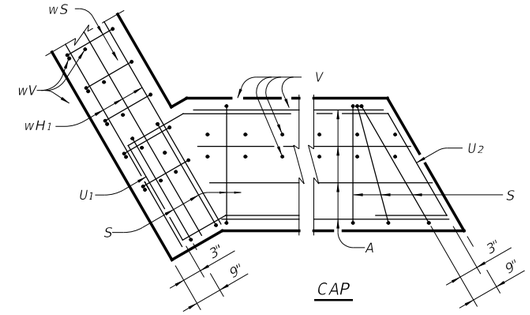
WINGWALL ELEVATION



SECTION B-B

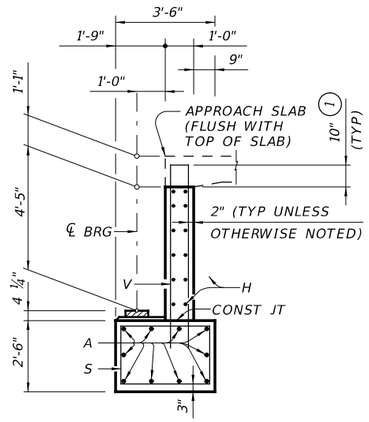


BACKWALL

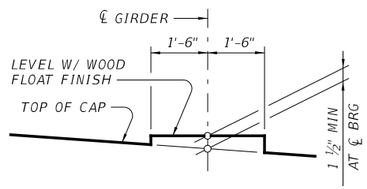


CAP

CORNER DETAILS



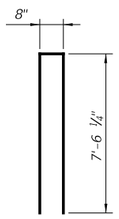
SECTION A-A



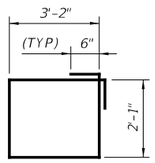
BEARING SEAT DETAIL

(BEARING SURFACE MUST BE CLEAN AND FREE OF ALL LOOSE MATERIAL BEFORE PLACING BEARING PAD.)

1 INCREASE AS REQUIRED TO MAINTAIN 3" FROM FINISH GRADE.



BARS V & wV



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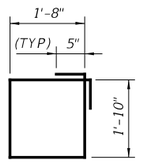

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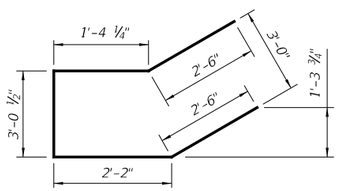

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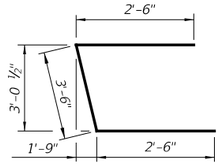

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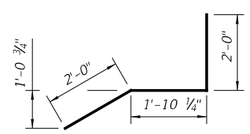
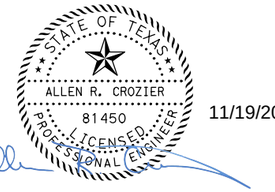


BARS L

HL93 LOADING



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ROBERT S. LIGHT EXTENSION

RSLE OVERPASS AT UPRR

ABUTMENT 1 DETAILS

SHEET 2 OF 2

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
WJC	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JCS	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	244
SDM	0914	33	068,ETC	
CHECK				
ARC				

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USER: KBERGER DATE: 11/19/2020 TIME: 4:36:00 PM SCALE: 1:5.3333
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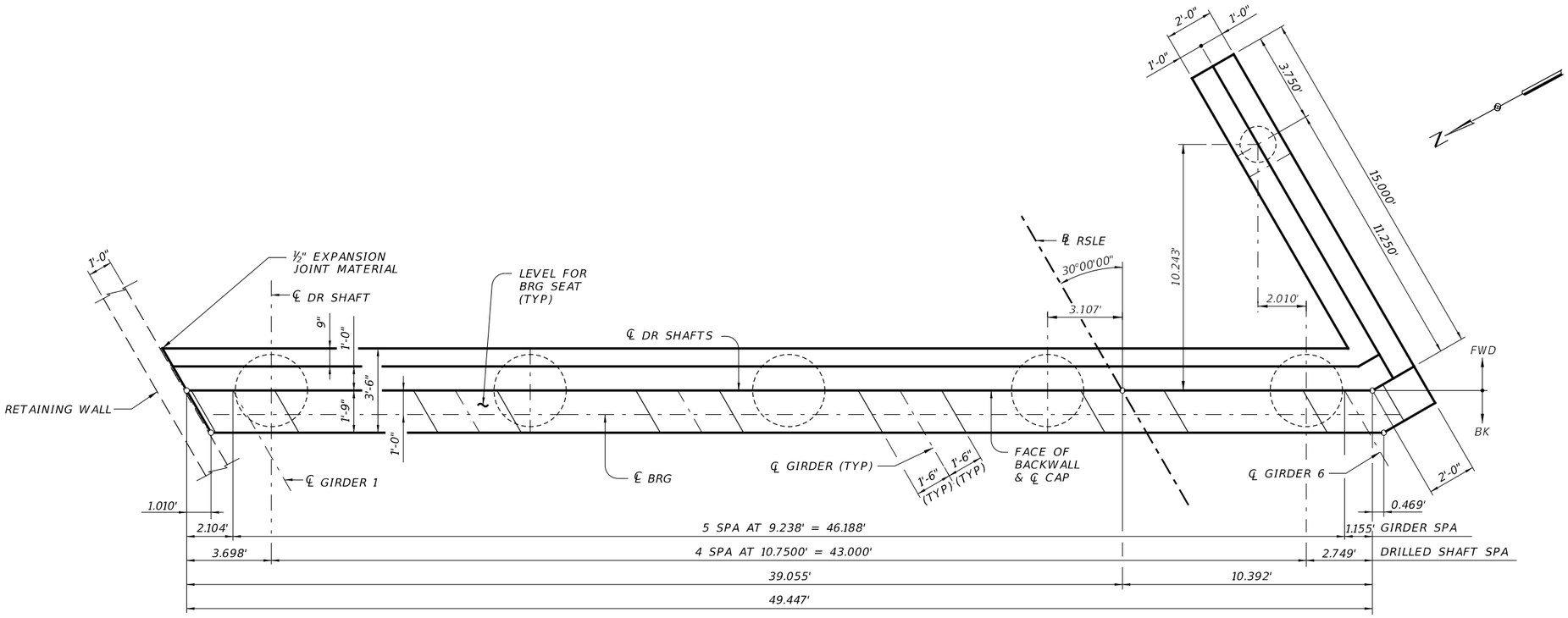
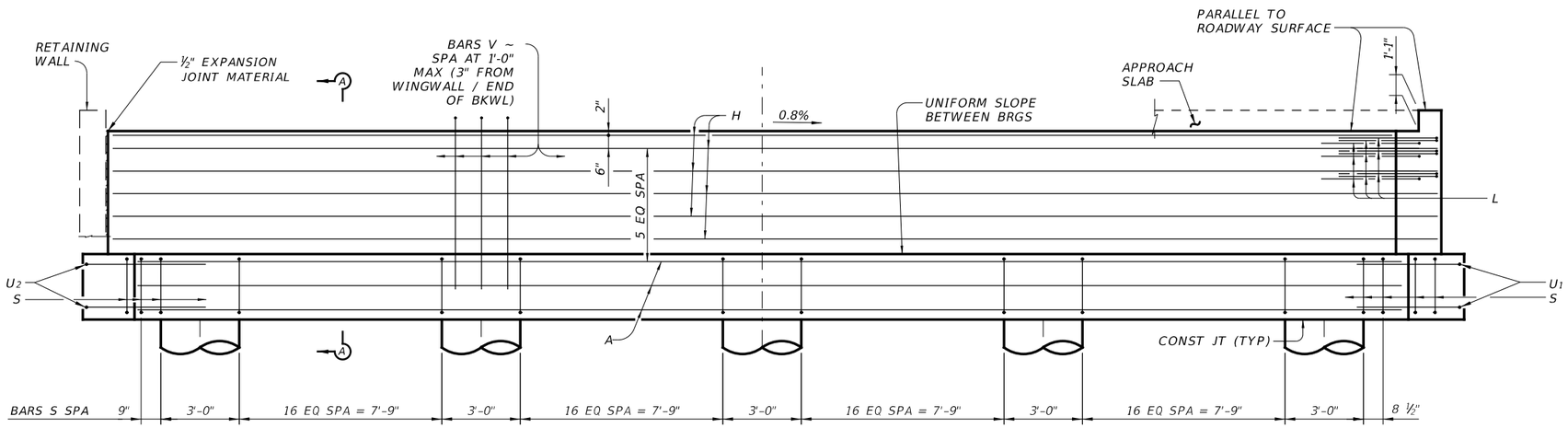
TABLE OF ESTIMATED QUANTITIES

BAR	NO.	SIZE	LENGTH	WEIGHT
A	10	#11	49'-5"	2,626
H	12	#6	49'-5"	891
L	9	#6	5'-10"	79
S	76	#5	11'-6"	912
U_1	2	#6	11'-7"	35
U_2	2	#6	8'-6"	26
V	51	#5	15'-9"	838
wH_1	7	#6	16'-5"	173
wH_2	14	#6	14'-8"	308
wS	16	#4	7'-10"	84
wV	16	#5	15'-9"	262
REINFORCING STEEL			LB	6,234
CLASS "C" CONC (ABUT)			CY	31.1



PLAN



ELEVATION

GENERAL NOTES:

DESIGNED ACCORDING TO AASHTO LRFD SPECIFICATIONS, 8TH EDITION (2017) AND ALL CURRENT INTERIMS.

CONCRETE STRENGTH f'c = 3,600 PSI.

ALL CAP AND WALL REINFORCING MUST BE GRADE 60.

SEE BRIDGE LAYOUT FOR HEADER SLOPE AND FOUNDATION TYPE, SIZE AND LENGTH.

SEE FOUNDATION DETAIL STANDARD SHEET, FD, FOR ALL FOUNDATION DETAILS AND NOTES.

SEE CONCRETE RIPRAP STANDARD SHEET, CRR, FOR RIPRAP ATTACHMENT DETAILS, IF APPLICABLE.

SEE APPLICABLE RAIL DETAILS FOR RAIL ANCHORAGE IN WINGWALL.

HL93 LOADING

STATE OF TEXAS
ALLEN R. CROZIER
81450
LICENSED
PROFESSIONAL ENGINEER
11/19/2020

HAYS COUNTY TEXAS

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Texas Department of Transportation

ROBERT S. LIGHT EXTENSION
RSLE OVERPASS AT UPRR

ABUTMENT 11

SHEET 1 OF 2

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
WJC	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JCS	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	245
SDM	0914	33	068,ETC	
CHECK				
ARC				

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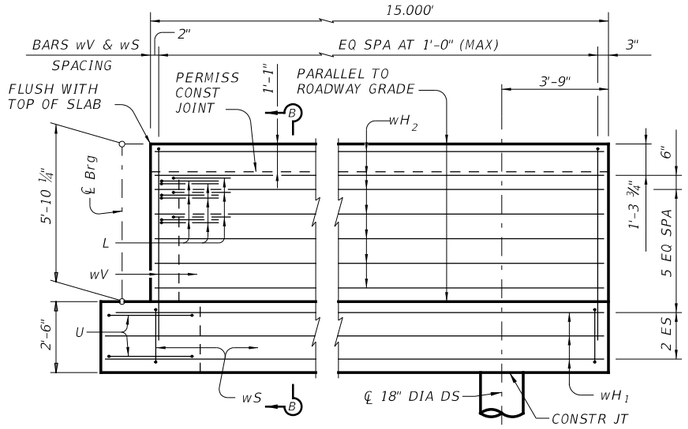
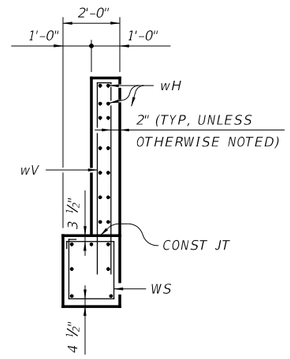
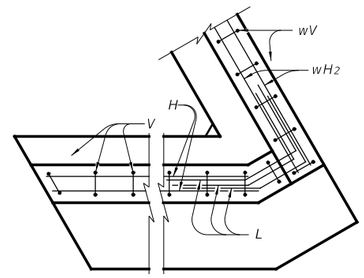


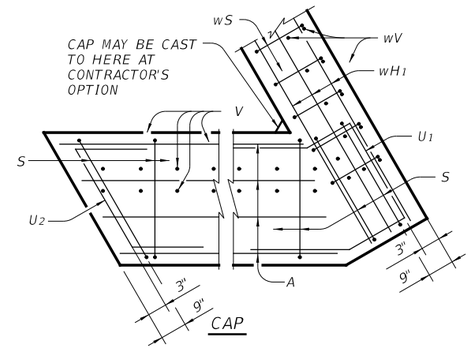
WINGWALL ELEVATION



SECTION B-B

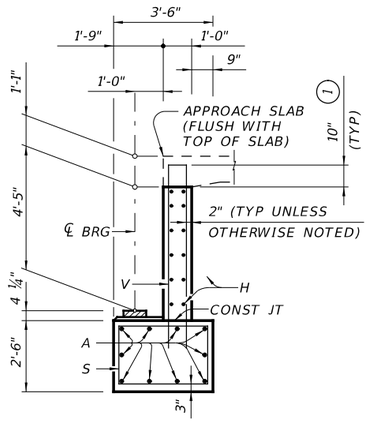


BACKWALL

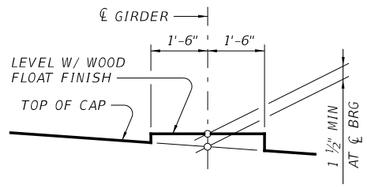


CAP

CORNER DETAILS



SECTION A-A

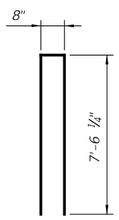


BEARING SEAT DETAIL

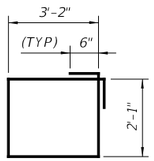
(BEARING SURFACE MUST BE CLEAN AND FREE OF ALL LOOSE MATERIAL BEFORE PLACING BEARING PAD.)

(1) INCREASE AS REQUIRED TO MAINTAIN 3" FROM FINISH GRADE.

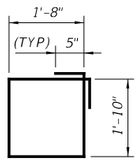
HL93 LOADING



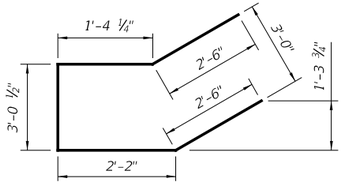
BARS V & wV



BARS S



BARS wS



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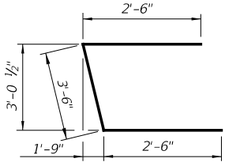

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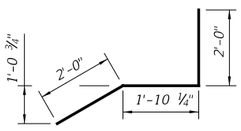

BARS L

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STATE OF TEXAS
11/19/2020

HAYS COUNTY TEXAS

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Texas Registered Engineering Firm F-754

Texas Department of Transportation

ROBERT S. LIGHT EXTENSION

RSLE OVERPASS AT UPRR

ABUTMENT 11 DETAILS

SHEET 2 OF 2

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
WJC	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JCS	TEXAS	AUS	HAYS	246
CHECK	CONTROL	SECTION	JOB	
SDM	0914	33	068,ETC	
CHECK				
ARC				

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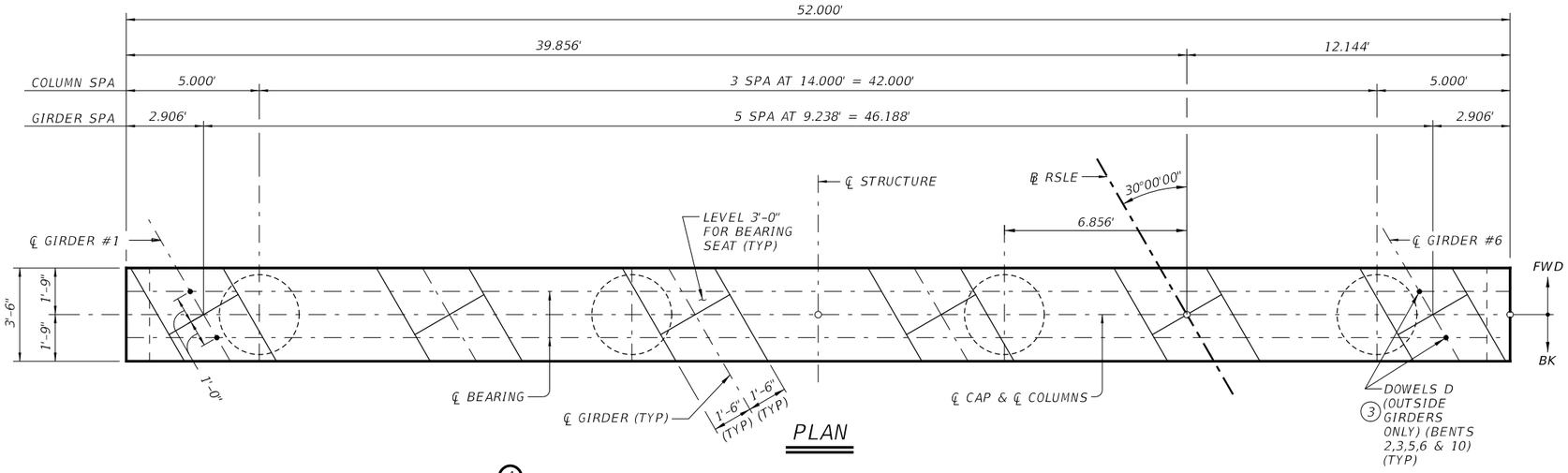
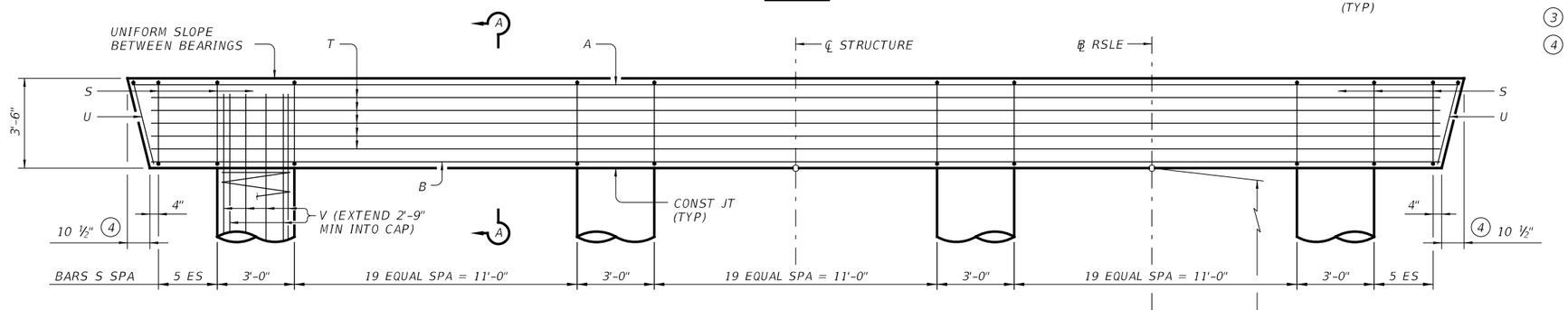
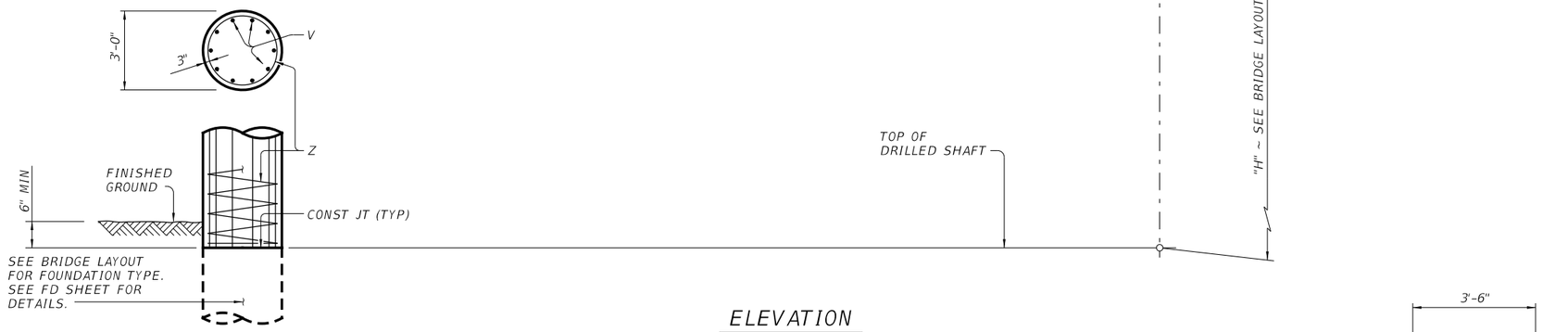
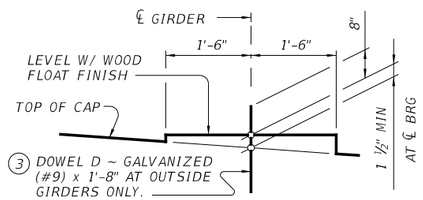




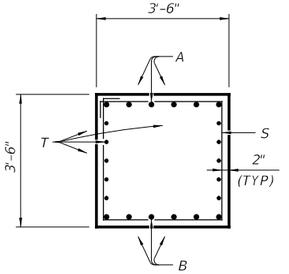


ELEVATION



BEARING SEAT DETAIL

(BEARING SURFACE MUST BE CLEAN AND FREE OF ALL LOOSE MATERIAL BEFORE PLACING BEARING PAD.)



SECTION A-A

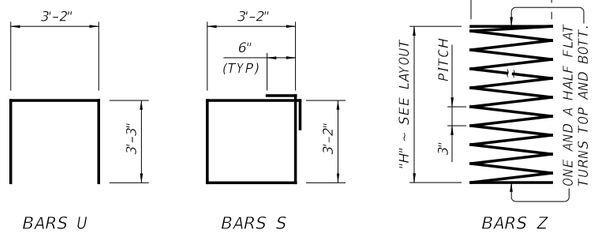


TABLE OF ESTIMATED QUANTITIES (1) (2)

Bar	No.	Size	Length	Weight
A	6	#11	51'- 6"	1,642
B	6	#11	50'- 0"	1,594
D (3)	4	#9	1'- 8"	23
S	72	#5	13'- 8"	1,026
T	10	#5	50'- 0"	522
U	2	#5	9'- 8"	20
V	40	#9	30'- 9"	4,182
Z	4	#4	903'-3"	2,414
REINFORCING STEEL			LB	11,423
CLASS "C" CONCRETE (CAP)			CY	23.5
CLASS "C" CONCRETE (COL)			CY	29.3

(1) QUANTITIES SHOWN ARE BASED ON AN "H" VALUE OF 28'. FOR EACH LINEAR FOOT VARIATION IN "H" VALUE, MAKE THE FOLLOWING ADJUSTMENTS:
BARS V LENGTH, 1'-0"
BARS Z LENGTH, 31.417'
REINFORCING STEEL, 220 LB
CLASS "C" CONC (COL), 1.047 CY

(2) QUANTITIES SHOWN ARE FOR ONE BENT ONLY.

(3) OMIT DOWELS D AT BENT 4. ADJUST REINFORCING STEEL TOTAL ACCORDINGLY.

(4) MEASURED PARALLEL TO TOP OF CAP CROSS-SLOPE.

GENERAL NOTES:

DESIGNED ACCORDING TO AASHTO LRFD SPECIFICATIONS, 8TH EDITION (2017) AND ALL CURRENT INTERIMS.
CONCRETE STRENGTH F'C = 3,600 PSI.
ALL CAP REINFORCING MUST BE GRADE 60.
COLUMN AND DRILLED SHAFT REINFORCING SHALL BE GRADE 60.
SEE BRIDGE LAYOUT FOR FOUNDATION TYPE, SIZE AND LENGTH.
SEE FOUNDATION DETAIL STANDARD FD FOR ALL FOUNDATION DETAILS AND NOTES.

HL93 LOADING

STATE OF TEXAS
ALLEN R. CROZIER
81450
LICENSED PROFESSIONAL ENGINEER
11/19/2020

HAYS COUNTY TEXAS

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Building #1, Suite 1230
San Marcos, TX 78666-7969
Texas Registered Engineering Firm F-754

Texas Department of Transportation
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ROBERT S. LIGHT EXTENSION
RSLE OVERPASS AT UPRR

INTERIOR BENTS 2 - 6 & 10 DETAILS

SHEET 1 OF 1

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
WJC	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JCS	TEXAS	AUS	HAYS	247
CHECK	CONTROL	SECTION	JOB	
SDM	0914	33	068,ETC	
CHECK				
ARC				

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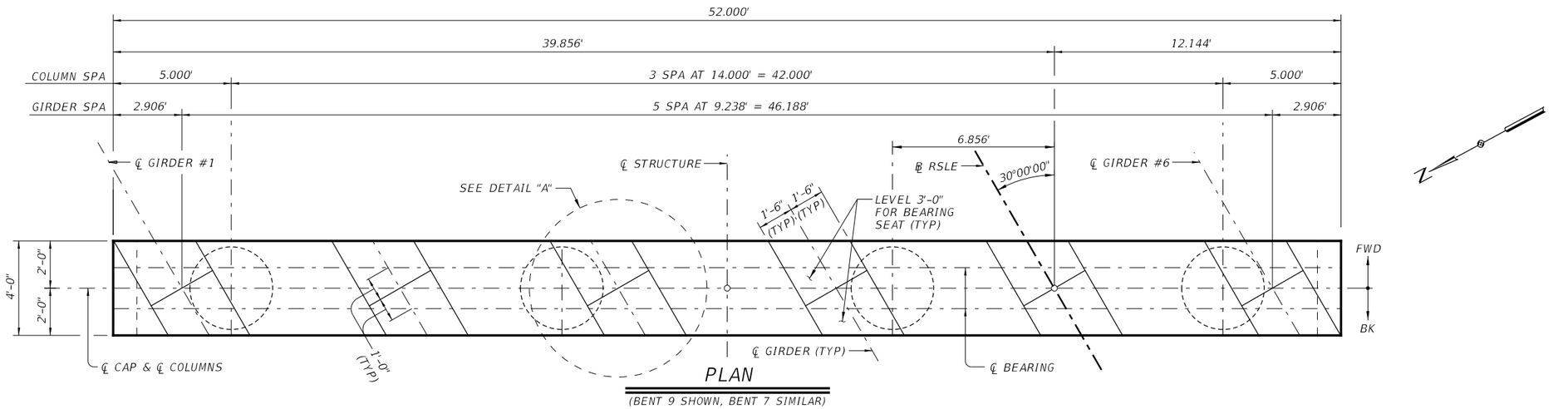
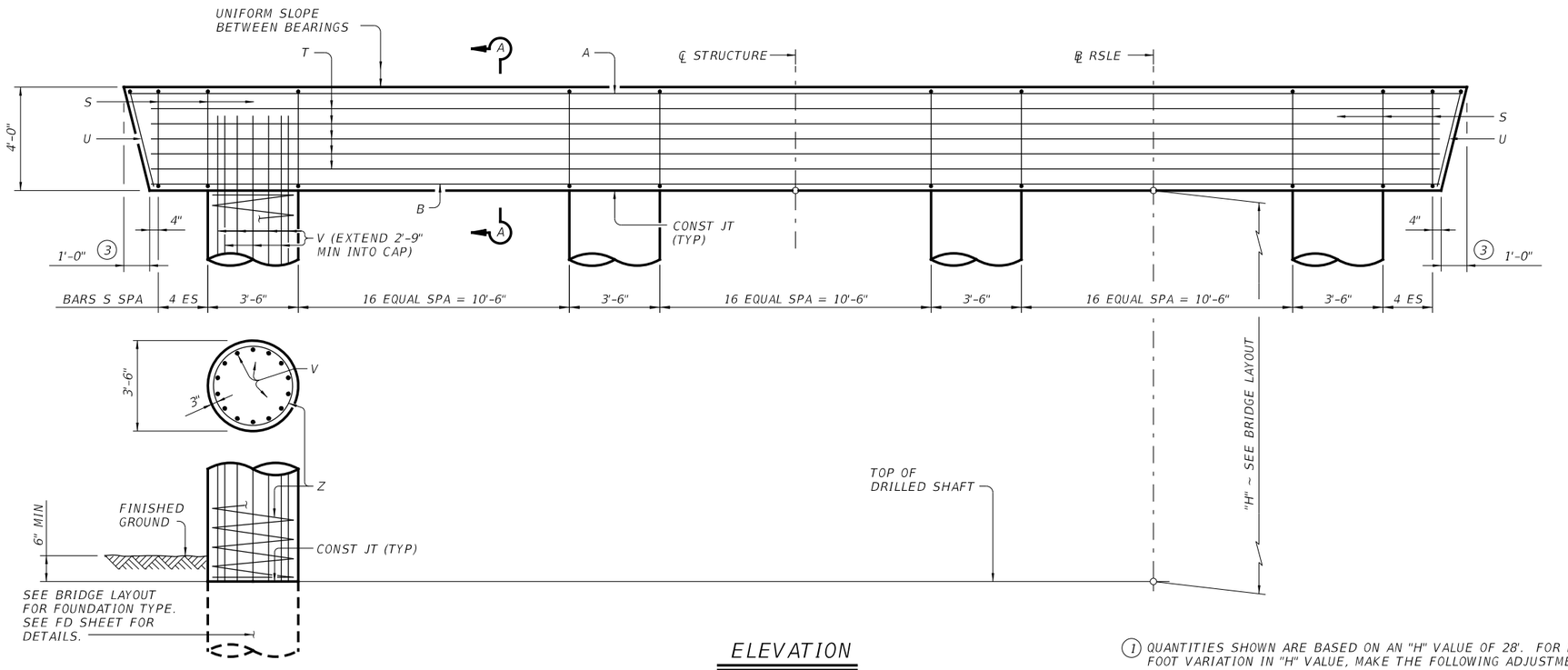


PLAN

(BENT 9 SHOWN, BENT 7 SIMILAR)

TABLE OF ESTIMATED QUANTITIES (1) (2)				
BAR	NO.	SIZE	LENGTH	WEIGHT
A	6	#11	51'- 6"	1,642
B	6	#11	49'- 9"	1,586
P1	6	#4	5'-7"	22
P2	6	#4	5'-3"	21
P3	6	#4	4'-9"	19
P4	6	#4	4'-5"	18
R1	6	#4	6'-1"	24
R2	6	#4	5'-10"	23
R3	6	#4	5'-9"	23
S	61	#5	15'- 8"	997
T	10	#5	49'- 9"	519
U	2	#5	11'- 2"	23
V	56	#9	30'- 9"	5,856
Z	4	#4	1085'-3"	2,900
REINFORCING STEEL			LB	13,673
CLASS "C" CONCRETE (CAP)			CY	32.6
CLASS "C" CONCRETE (COL)			CY	39.9



ELEVATION

GENERAL NOTES:

DESIGNED ACCORDING TO AASHTO LRFD SPECIFICATIONS, 8TH EDITION (2017) AND ALL CURRENT INTERIMS.
CONCRETE STRENGTH F'C = 3,600 PSI.
ALL CAP REINFORCING MUST BE GRADE 60.
COLUMN AND DRILLED SHAFT REINFORCING SHALL BE GRADE 60.
SEE BRIDGE LAYOUT FOR FOUNDATION TYPE, SIZE AND LENGTH.
SEE FOUNDATION DETAIL STANDARD FD FOR ALL FOUNDATION DETAILS AND NOTES.

ERECTION NOTES:

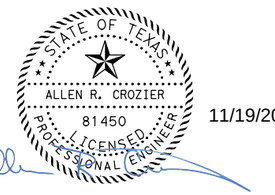
THE Tx54 SPAN SHALL BE PLACED BEFORE PLACING THE Tx62 SPAN TO AVOID EXCESSIVE BENDING STRESS IN THE COLUMNS IN TRANSITION BENT.

HL93 LOADING

(1) QUANTITIES SHOWN ARE BASED ON AN "H" VALUE OF 28'. FOR EACH LINEAR FOOT VARIATION IN "H" VALUE, MAKE THE FOLLOWING ADJUSTMENTS:
BARS V LENGTH, 1'-0"
BARS Z LENGTH, 37.750'
REINFORCING STEEL, 291 LB
CLASS "C" CONC (COL), 1.425 CY

(2) QUANTITIES SHOWN ARE FOR ONE BENT ONLY.

(3) MEASURED PARALLEL TO TOP OF CAP CROSS-SLOPE.



11/19/2020

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ROBERT S. LIGHT EXTENSION

RSLE OVERPASS AT UPRR

INTERIOR BENTS 7 & 9 DETAILS

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
WJC	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JCS	TEXAS	AUS	HAYS	248
CHECK	CONTROL	SECTION	JOB	
SDM	0914	33	068,ETC	
CHECK				
ARC				

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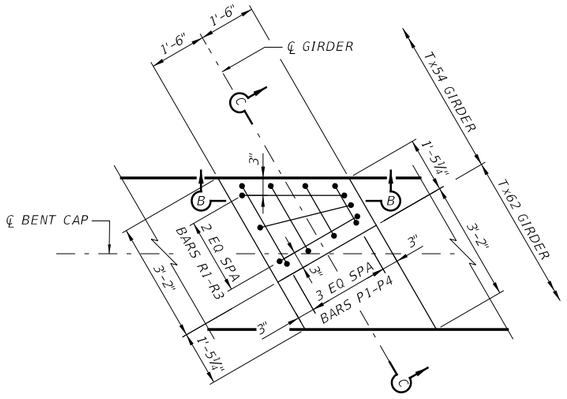
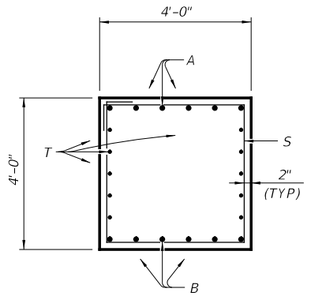
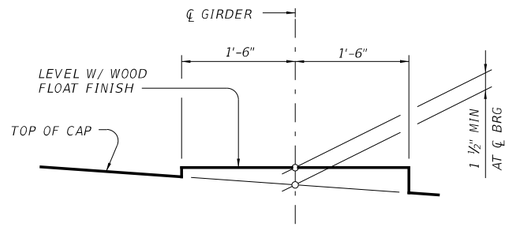


DETAIL A

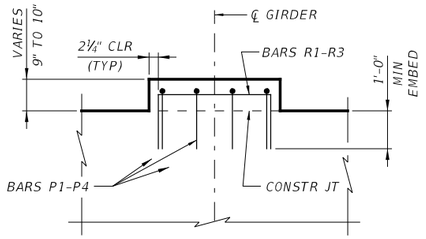


SECTION A-A



BEARING SEAT DETAIL

(BEARING SURFACE MUST BE CLEAN AND FREE OF ALL LOOSE MATERIAL BEFORE PLACING BEARING PAD.)



SECTION B-B

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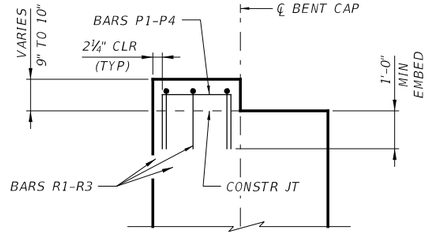
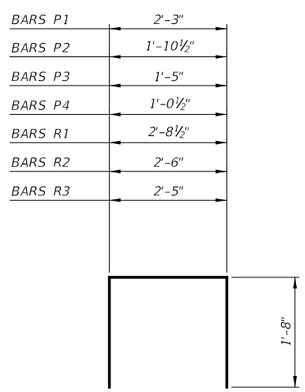
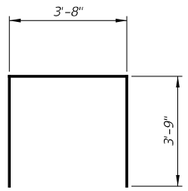


SECTION C-C

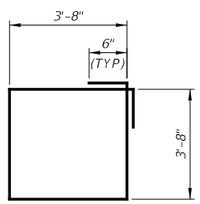
(MAIN BENTCAP REINF. NOT SHOWN FOR CLARITY)



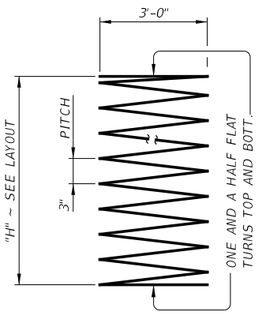
BARS P AND R



BARS U



BARS S



BARS Z

HL93 LOADING

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ALLEN R. CROZIER
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Building #1, Suite 1230
San Marcos, TX 78666-7969

Texas Registered Engineering Firm F-754

Texas Department of Transportation

ROBERT S. LIGHT EXTENSION

RSLE OVERPASS AT UPRR

INTERIOR BENTS 7 & 9 DETAILS

SHEET 2 OF 2

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
WJC	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JCS	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	249
SDM	0914	33	068,ETC	
CHECK				
ARC				

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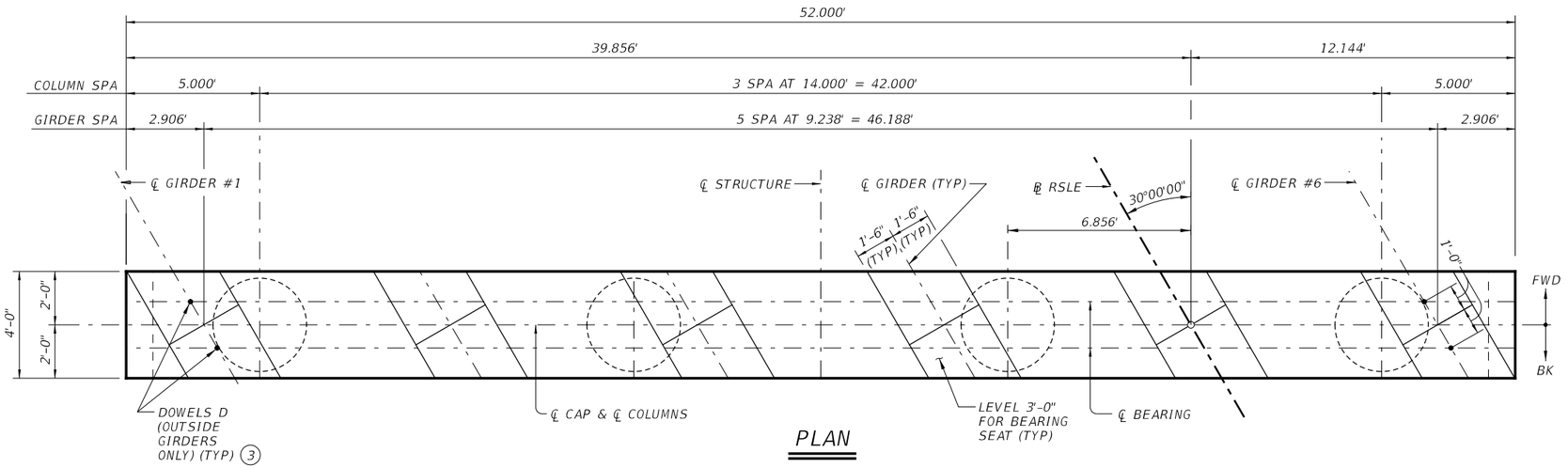
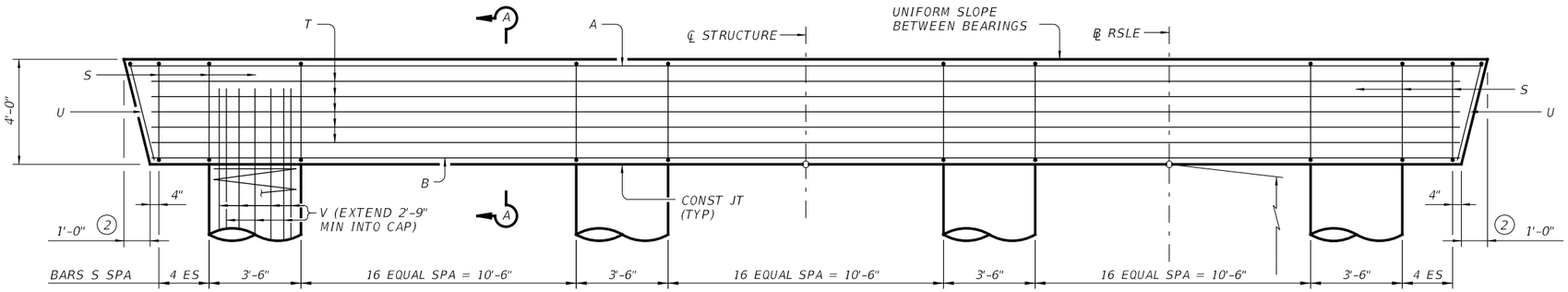
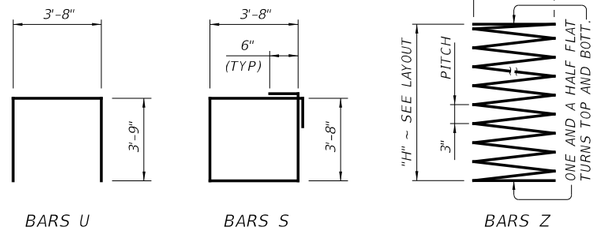
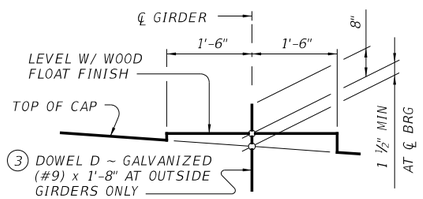


PLAN



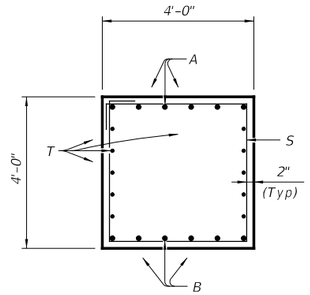
ELEVATION





BEARING SEAT DETAIL

(BEARING SURFACE MUST BE CLEAN AND FREE OF ALL LOOSE MATERIAL BEFORE PLACING BEARING PAD.)



SECTION A-A

TABLE OF ESTIMATED QUANTITIES (1)

Bar	No.	Size	Length	Weight
A	6	#11	51'- 6"	1,642
B	6	#11	49'- 9"	1,586
D	4	#9	1'- 8"	23
S	61	#5	15'- 8"	997
T	10	#5	49'- 9"	519
U	2	#5	11'- 2"	23
V	56	#9	27'- 9"	5,284
Z	4	#4	972'-0"	2,597
REINFORCING STEEL		LB		12,671
CLASS "C" CONCRETE (CAP)		CY		30.6
CLASS "C" CONCRETE (COL)		CY		35.6

(1) QUANTITIES SHOWN ARE BASED ON AN "H" VALUE OF 25'. FOR EACH LINEAR FOOT VARIATION IN "H" VALUE, MAKE THE FOLLOWING ADJUSTMENTS:
BARS V LENGTH, 1'-0"
BARS Z LENGTH, 37.750'
REINFORCING STEEL, 291 LB
CLASS "C" CONC (COL), 1.425 CY

(2) MEASURED PARALLEL TO TOP OF CAP CROSS-SLOPE.

GENERAL NOTES:

DESIGNED ACCORDING TO AASHTO LRFD SPECIFICATIONS, 8TH EDITION (2017) AND ALL CURRENT INTERIMS.
CONCRETE STRENGTH F'C = 3,600 PSI.
ALL CAP REINFORCING MUST BE GRADE 60.
COLUMN AND DRILLED SHAFT REINFORCING SHALL BE GRADE 60.
SEE BRIDGE LAYOUT FOR FOUNDATION TYPE, SIZE AND LENGTH.
SEE FOUNDATION DETAIL STANDARD FD FOR ALL FOUNDATION DETAILS AND NOTES.

HL93 LOADING

STATE OF TEXAS
ALLEN R. CROZIER
81450
LICENSED
PROFESSIONAL ENGINEER
11/19/2020

HAYS COUNTY TEXAS

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Texas Registered Engineering Firm F-754

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ROBERT S. LIGHT EXTENSION
RSLE OVERPASS AT UPRR

INTERIOR BENT 8 DETAILS

SHEET 1 OF 1

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
WJC	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JCS	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	250
SDM	0914	33	068,ETC	
CHECK				
ARC				

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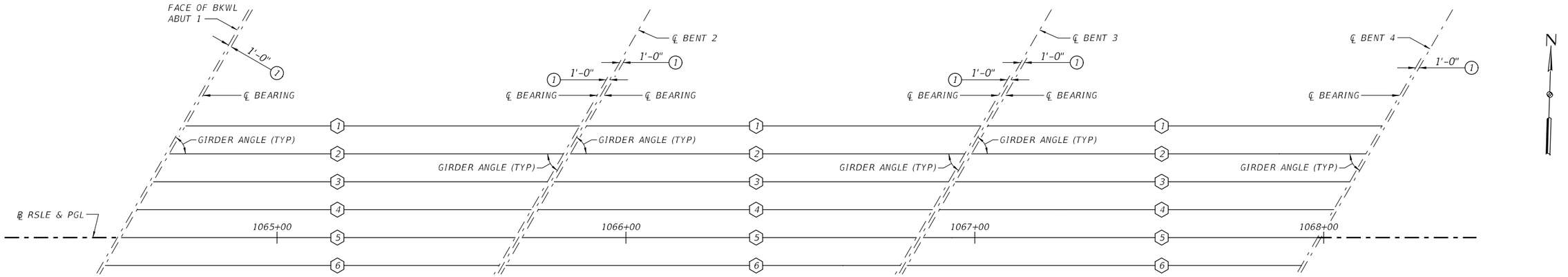

SPAN 1
(TYPE TX54 GIRDERS)

SPAN 2
(TYPE TX54 GIRDERS)

SPAN 3
(TYPE TX54 GIRDERS)

PLAN

LEGEND:

- (#) GIRDER NUMBER
- (1) SEE TXDOT STANDARD IGEB FOR ORIENTATION OF DIMENSION
- (2) GIRDER LENGTHS ARE BOTTOM GIRDER FLANGE LENGTHS WITH ADJUSTMENTS MADE FOR GIRDER SLOPES.

BENT REPORT

BENT NO. 2 (N 28 20 27.04 E)
DISTANCE BETWEEN STATION LINE AND GIRDER 1 36.950 L

		GIRDER SPAC. (C.L. BENT)	GIRDER ANGLE D M S
SPAN 1	GIRDER 1	0.000	60 0 0
	GIRDER 2	9.238	60 0 0
	GIRDER 3	9.238	60 0 0
	GIRDER 4	9.238	60 0 0
	GIRDER 5	9.238	60 0 0
	GIRDER 6	9.238	60 0 0
	TOTAL	46.188	
SPAN 2	GIRDER 1	0.000	60 0 0
	GIRDER 2	9.238	60 0 0
	GIRDER 3	9.238	60 0 0
	GIRDER 4	9.238	60 0 0
	GIRDER 5	9.238	60 0 0
	GIRDER 6	9.238	60 0 0
	TOTAL	46.188	

BENT NO. 3 (N 28 20 27.04 E)
DISTANCE BETWEEN STATION LINE AND GIRDER 1 36.950 L

		GIRDER SPAC. (C.L. BENT)	GIRDER ANGLE D M S
SPAN 2	GIRDER 1	0.000	60 0 0
	GIRDER 2	9.238	60 0 0
	GIRDER 3	9.238	60 0 0
	GIRDER 4	9.238	60 0 0
	GIRDER 5	9.238	60 0 0
	GIRDER 6	9.238	60 0 0
	TOTAL	46.188	
SPAN 3	GIRDER 1	0.000	60 0 0
	GIRDER 2	9.238	60 0 0
	GIRDER 3	9.238	60 0 0
	GIRDER 4	9.238	60 0 0
	GIRDER 5	9.238	60 0 0
	GIRDER 6	9.238	60 0 0
	TOTAL	46.188	

BENT NO. 4 (N 28 20 27.04 E)
DISTANCE BETWEEN STATION LINE AND GIRDER 1 36.950 L

		GIRDER SPAC. (C.L. BENT)	GIRDER ANGLE D M S
SPAN 3	GIRDER 1	0.000	60 0 0
	GIRDER 2	9.238	60 0 0
	GIRDER 3	9.238	60 0 0
	GIRDER 4	9.238	60 0 0
	GIRDER 5	9.238	60 0 0
	GIRDER 6	9.238	60 0 0
	TOTAL	46.188	

GIRDER REPORT

GIRDER REPORT, SPAN 1

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BOT. GRD. FLG.		
GIRDER 1	115.000	112.845	114.50	(2)	0.0267
GIRDER 2	115.000	112.845	114.50		0.0268
GIRDER 3	115.000	112.845	114.50		0.0269
GIRDER 4	115.000	112.845	114.50		0.0271
GIRDER 5	115.000	112.845	114.50		0.0272
GIRDER 6	115.000	112.845	114.50		0.0273

GIRDER REPORT, SPAN 2

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BOT. GRD. FLG.		
GIRDER 1	115.000	113.000	114.53	(2)	0.0222
GIRDER 2	115.000	113.000	114.53		0.0224
GIRDER 3	115.000	113.000	114.53		0.0226
GIRDER 4	115.000	113.000	114.53		0.0227
GIRDER 5	115.000	113.000	114.53		0.0229
GIRDER 6	115.000	113.000	114.53		0.0231

GIRDER REPORT, SPAN 3

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BOT. GRD. FLG.		
GIRDER 1	115.000	113.000	114.52	(2)	0.0176
GIRDER 2	115.000	113.000	114.52		0.0178
GIRDER 3	115.000	113.000	114.52		0.0180
GIRDER 4	115.000	113.000	114.52		0.0181
GIRDER 5	115.000	113.000	114.52		0.0183
GIRDER 6	115.000	113.000	114.52		0.0185

HL93 LOADING

STATE OF TEXAS
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HAYS COUNTY TEXAS

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Texas Registered Engineering Firm F-754

Texas Department of Transportation

ROBERT S. LIGHT EXTENSION
RSLE OVERPASS AT UPRR

FRAMING PLAN

SHEET 1 OF 4

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
WJC	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JCS	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	251
SDM	0914	33	068,ETC	
CHECK				
ARC				

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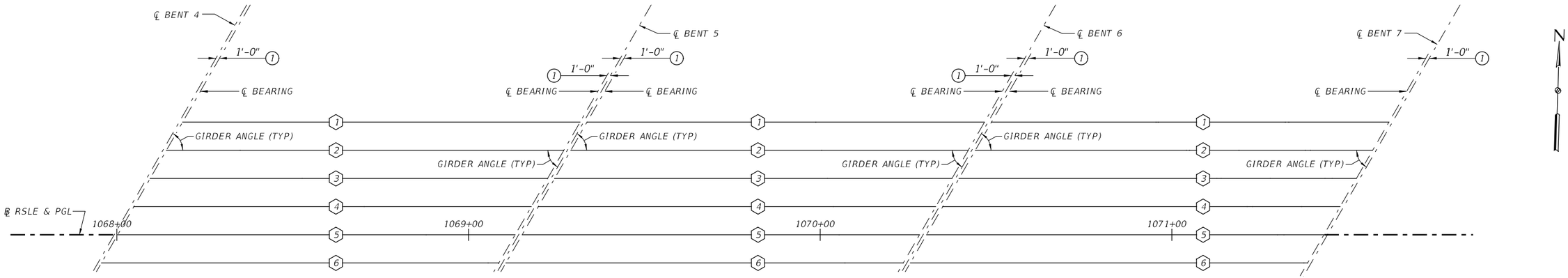

SPAN 4
(TYPE TX54 GIRDERS)

SPAN 5
(TYPE TX54 GIRDERS)

SPAN 6
(TYPE TX54 GIRDERS)

PLAN

BENT REPORT

BENT NO. 4 (N 28 20 27.04 E)
DISTANCE BETWEEN STATION LINE AND GIRDER 1 36.950 L

		GIRDER	SPAC. (C.L. BENT)	GIRDER ANGLE D	M	S
SPAN 4	GIRDER	1	0.000	60	0	0
	GIRDER	2	9.238	60	0	0
	GIRDER	3	9.238	60	0	0
	GIRDER	4	9.238	60	0	0
	GIRDER	5	9.238	60	0	0
	GIRDER	6	9.238	60	0	0
	TOTAL		46.188			

BENT NO. 5 (N 28 20 27.04 E)
DISTANCE BETWEEN STATION LINE AND GIRDER 1 36.950 L

		GIRDER	SPAC. (C.L. BENT)	GIRDER ANGLE D	M	S
SPAN 4	GIRDER	1	0.000	60	0	0
	GIRDER	2	9.238	60	0	0
	GIRDER	3	9.238	60	0	0
	GIRDER	4	9.238	60	0	0
	GIRDER	5	9.238	60	0	0
	GIRDER	6	9.238	60	0	0
	TOTAL		46.188			
SPAN 5	GIRDER	1	0.000	60	0	0
	GIRDER	2	9.238	60	0	0
	GIRDER	3	9.238	60	0	0
	GIRDER	4	9.238	60	0	0
	GIRDER	5	9.238	60	0	0
	GIRDER	6	9.238	60	0	0
	TOTAL		46.188			

BENT NO. 6 (N 28 20 27.04 E)
DISTANCE BETWEEN STATION LINE AND GIRDER 1 36.950 L

		GIRDER	SPAC. (C.L. BENT)	GIRDER ANGLE D	M	S
SPAN 5	GIRDER	1	0.000	60	0	0
	GIRDER	2	9.238	60	0	0
	GIRDER	3	9.238	60	0	0
	GIRDER	4	9.238	60	0	0
	GIRDER	5	9.238	60	0	0
	GIRDER	6	9.238	60	0	0
	TOTAL		46.188			
SPAN 6	GIRDER	1	0.000	60	0	0
	GIRDER	2	9.238	60	0	0
	GIRDER	3	9.238	60	0	0
	GIRDER	4	9.238	60	0	0
	GIRDER	5	9.238	60	0	0
	GIRDER	6	9.238	60	0	0
	TOTAL		46.188			

BENT NO. 7 (N 28 20 27.04 E)
DISTANCE BETWEEN STATION LINE AND GIRDER 1 36.950 L

		GIRDER	SPAC. (C.L. BENT)	GIRDER ANGLE D	M	S
SPAN 6	GIRDER	1	0.000	60	0	0
	GIRDER	2	9.238	60	0	0
	GIRDER	3	9.238	60	0	0
	GIRDER	4	9.238	60	0	0
	GIRDER	5	9.238	60	0	0
	GIRDER	6	9.238	60	0	0
	TOTAL		46.188			

GIRDER REPORT

GIRDER REPORT, SPAN 4

		HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BOT. GRD. FLG.		
GIRDER	1	115.000	113.000	114.51	(2)	0.0130
GIRDER	2	115.000	113.000	114.51		0.0132
GIRDER	3	115.000	113.000	114.51		0.0134
GIRDER	4	115.000	113.000	114.51		0.0135
GIRDER	5	115.000	113.000	114.51		0.0137
GIRDER	6	115.000	113.000	114.51		0.0139

GIRDER REPORT, SPAN 5

		HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BOT. GRD. FLG.		
GIRDER	1	115.000	113.000	114.50	(2)	0.0084
GIRDER	2	115.000	113.000	114.50		0.0086
GIRDER	3	115.000	113.000	114.50		0.0088
GIRDER	4	115.000	113.000	114.50		0.0089
GIRDER	5	115.000	113.000	114.50		0.0091
GIRDER	6	115.000	113.000	114.50		0.0093

GIRDER REPORT, SPAN 6

		HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BOT. GRD. FLG.		
GIRDER	1	115.000	113.000	114.50	(2)	0.0038
GIRDER	2	115.000	113.000	114.50		0.0040
GIRDER	3	115.000	113.000	114.50		0.0042
GIRDER	4	115.000	113.000	114.50		0.0043
GIRDER	5	115.000	113.000	114.50		0.0045
GIRDER	6	115.000	113.000	114.50		0.0047

LEGEND:

- (#) GIRDER NUMBER
- (1) SEE TXDOT STANDARD IGEB FOR ORIENTATION OF DIMENSION
- (2) GIRDER LENGTHS ARE BOTTOM GIRDER FLANGE LENGTHS WITH ADJUSTMENTS MADE FOR GIRDER SLOPES.

HL93 LOADING

STATE OF TEXAS
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Texas Department of Transportation

ROBERT S. LIGHT EXTENSION
RSLE OVERPASS AT UPRR

FRAMING PLAN

SHEET 2 OF 4

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
WJC	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JCS	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	252
SDM	0914	33	068,ETC	
CHECK				
ARC				

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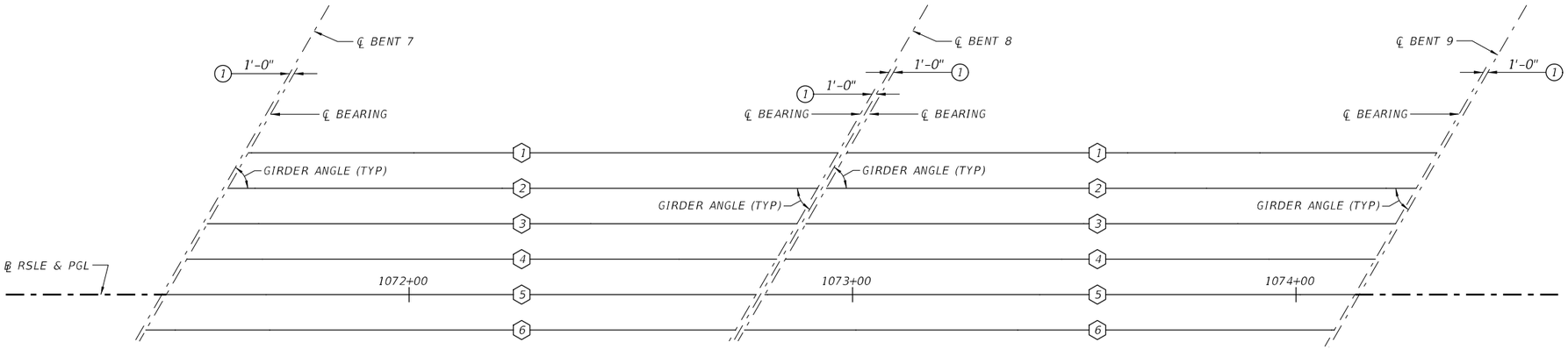

SPAN 7
(TYPE TX62 GIRDERS)

SPAN 8
(TYPE TX62 GIRDERS)

PLAN

BENT REPORT

BENT NO. 7 (N 28 20 27.04 E)
DISTANCE BETWEEN STATION LINE AND GIRDER 1 36.950 L

		GIRDER SPAC. (C.L. BENT)	GIRDER ANGLE D M S
SPAN 7	GIRDER 1	0.000	60 0 0
	GIRDER 2	9.238	60 0 0
	GIRDER 3	9.238	60 0 0
	GIRDER 4	9.238	60 0 0
	GIRDER 5	9.238	60 0 0
	GIRDER 6	9.238	60 0 0
	TOTAL	46.188	

BENT NO. 8 (N 28 20 27.04 E)
DISTANCE BETWEEN STATION LINE AND GIRDER 1 36.950 L

		GIRDER SPAC. (C.L. BENT)	GIRDER ANGLE D M S
SPAN 7	GIRDER 1	0.000	60 0 0
	GIRDER 2	9.238	60 0 0
	GIRDER 3	9.238	60 0 0
	GIRDER 4	9.238	60 0 0
	GIRDER 5	9.238	60 0 0
	GIRDER 6	9.238	60 0 0
	TOTAL	46.188	
SPAN 8	GIRDER 1	0.000	60 0 0
	GIRDER 2	9.238	60 0 0
	GIRDER 3	9.238	60 0 0
	GIRDER 4	9.238	60 0 0
	GIRDER 5	9.238	60 0 0
	GIRDER 6	9.238	60 0 0
	TOTAL	46.188	

BENT NO. 9 (N 28 20 27.04 E)
DISTANCE BETWEEN STATION LINE AND GIRDER 1 36.950 L

		GIRDER SPAC. (C.L. BENT)	GIRDER ANGLE D M S
SPAN 8	GIRDER 1	0.000	60 0 0
	GIRDER 2	9.238	60 0 0
	GIRDER 3	9.238	60 0 0
	GIRDER 4	9.238	60 0 0
	GIRDER 5	9.238	60 0 0
	GIRDER 6	9.238	60 0 0
	TOTAL	46.188	

GIRDER REPORT

GIRDER REPORT, SPAN 7

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BOT. GRD. FLG.	
GIRDER 1	135.000	133.000	134.50	(2) -0.0012
GIRDER 2	135.000	133.000	134.50	-0.0010
GIRDER 3	135.000	133.000	134.50	-0.0008
GIRDER 4	135.000	133.000	134.50	-0.0007
GIRDER 5	135.000	133.000	134.50	-0.0005
GIRDER 6	135.000	133.000	134.50	-0.0003

GIRDER REPORT, SPAN 8

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BOT. GRD. FLG.	
GIRDER 1	135.000	133.000	134.50	(2) -0.0066
GIRDER 2	135.000	133.000	134.50	-0.0064
GIRDER 3	135.000	133.000	134.50	-0.0062
GIRDER 4	135.000	133.000	134.50	-0.0061
GIRDER 5	135.000	133.000	134.50	-0.0059
GIRDER 6	135.000	133.000	134.50	-0.0057

LEGEND:

- (#) GIRDER NUMBER
- (1) SEE TXDOT STANDARD IGEB FOR ORIENTATION OF DIMENSION
- (2) GIRDER LENGTHS ARE BOTTOM GIRDER FLANGE LENGTHS WITH ADJUSTMENTS MADE FOR GIRDER SLOPES.

HL93 LOADING

STATE OF TEXAS
ALLEN R. CROZIER
81450
LICENSED
PROFESSIONAL ENGINEER

11/19/2020

HAYS COUNTY TEXAS

HDR Engineering, Inc.
1290 Wonder World Drive
Building #1, Suite 1230
San Marcos, TX 78666-7969
Texas Registered Engineering Firm F-754

Texas Department of Transportation
© 2020

ROBERT S. LIGHT EXTENSION
RSLE OVERPASS AT UPRR

FRAMING PLAN

SHEET 3 OF 4

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
WJC	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JCS	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	253
SDM	0914	33	068,ETC	
CHECK				
ARC				

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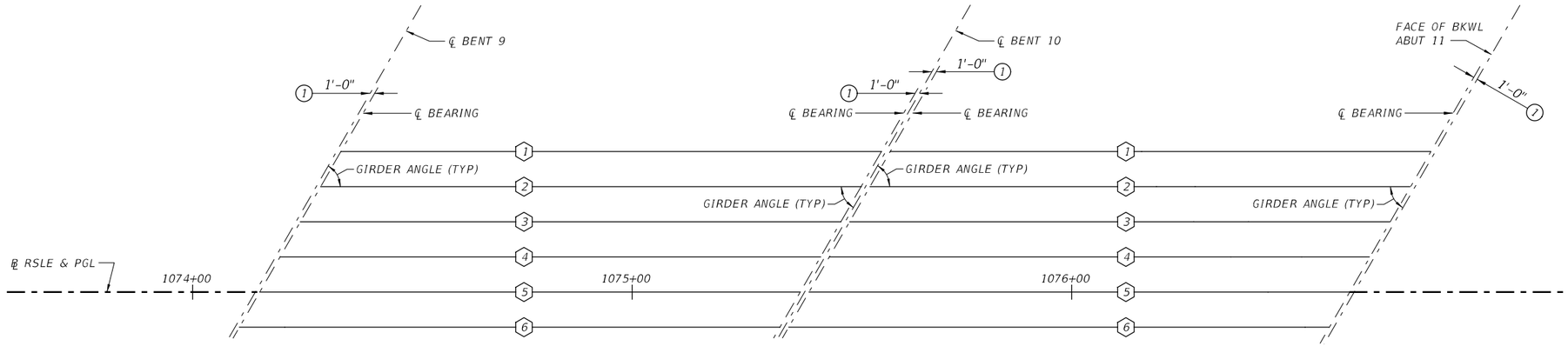

N

SPAN 9
(TYPE TX54 GIRDERS)

SPAN 10
(TYPE TX54 GIRDERS)

PLAN

LEGEND:

- (#) GIRDER NUMBER
- (1) SEE TXDOT STANDARD IGEB FOR ORIENTATION OF DIMENSION
- (2) GIRDER LENGTHS ARE BOTTOM GIRDER FLANGE LENGTHS WITH ADJUSTMENTS MADE FOR GIRDER SLOPES.

BENT REPORT

BENT NO. 9 (N 28 20 27.04 E)
DISTANCE BETWEEN STATION LINE AND GIRDER 1 36.950 L

		GIRDER SPAC. (C.L. BENT)	GIRDER ANGLE D M S
SPAN 9	GIRDER 1	0.000	60 0 0
	GIRDER 2	9.238	60 0 0
	GIRDER 3	9.238	60 0 0
	GIRDER 4	9.238	60 0 0
	GIRDER 5	9.238	60 0 0
	GIRDER 6	9.238	60 0 0
	TOTAL	46.188	

BENT NO. 10 (N 28 20 27.04 E)
DISTANCE BETWEEN STATION LINE AND GIRDER 1 36.950 L

		GIRDER SPAC. (C.L. BENT)	GIRDER ANGLE D M S
SPAN 9	GIRDER 1	0.000	60 0 0
	GIRDER 2	9.238	60 0 0
	GIRDER 3	9.238	60 0 0
	GIRDER 4	9.238	60 0 0
	GIRDER 5	9.238	60 0 0
	GIRDER 6	9.238	60 0 0
	TOTAL	46.188	
SPAN 10	GIRDER 1	0.000	60 0 0
	GIRDER 2	9.238	60 0 0
	GIRDER 3	9.238	60 0 0
	GIRDER 4	9.238	60 0 0
	GIRDER 5	9.238	60 0 0
	GIRDER 6	9.238	60 0 0
	TOTAL	46.188	

BENT NO. 11 (N 28 20 27.04 E)
DISTANCE BETWEEN STATION LINE AND GIRDER 1 36.950 L

		GIRDER SPAC. (C.L. BENT)	GIRDER ANGLE D M S
SPAN 10	GIRDER 1	0.000	60 0 0
	GIRDER 2	9.238	60 0 0
	GIRDER 3	9.238	60 0 0
	GIRDER 4	9.238	60 0 0
	GIRDER 5	9.238	60 0 0
	GIRDER 6	9.238	60 0 0
	TOTAL	46.188	

GIRDER REPORT

GIRDER REPORT, SPAN 9

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BOT. GRD.	FLG.
GIRDER 1	125.000	123.000	124.51	(2) -0.0118
GIRDER 2	125.000	123.000	124.51	-0.0116
GIRDER 3	125.000	123.000	124.51	-0.0114
GIRDER 4	125.000	123.000	124.51	-0.0113
GIRDER 5	125.000	123.000	124.51	-0.0111
GIRDER 6	125.000	123.000	124.51	-0.0109

GIRDER REPORT, SPAN 10

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BOT. GRD.	FLG.
GIRDER 1	125.000	122.845	124.48	(2) -0.0168
GIRDER 2	125.000	122.845	124.48	-0.0166
GIRDER 3	125.000	122.845	124.48	-0.0164
GIRDER 4	125.000	122.845	124.48	-0.0163
GIRDER 5	125.000	122.845	124.48	-0.0161
GIRDER 6	125.000	122.845	124.48	-0.0159

HL93 LOADING

STATE OF TEXAS
ALLEN R. CROZIER
81450
LICENSED
PROFESSIONAL ENGINEER
11/19/2020

HAYS COUNTY TEXAS

HDR Engineering, Inc.
1290 Wonder World Drive
Building #1, Suite 1230
San Marcos, TX 78666-7969
Texas Registered Engineering Firm F-754

Texas Department of Transportation

ROBERT S. LIGHT EXTENSION
RSLE OVERPASS AT UPRR

FRAMING PLAN

SHEET 4 OF 4

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
WJC	6	STP ( ) RGS		RSLE
GRAPHICS				
JCS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	AUS	HAYS	
SDM	CONTROL	SECTION	JOB	254
CHECK	0914	33	068,ETC	
ARC				

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TIME: 4:36:29 PM
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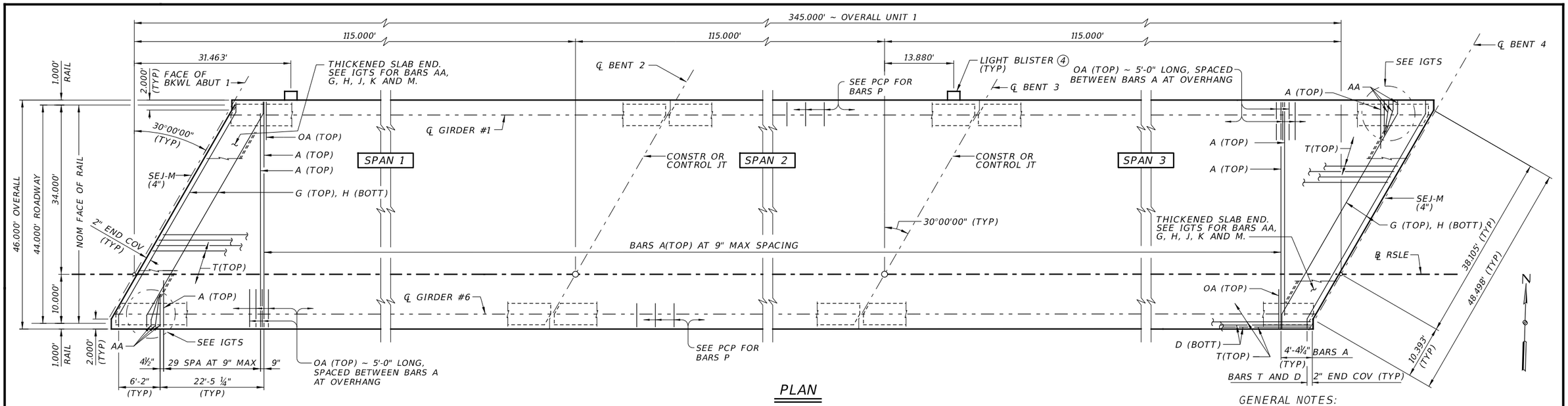
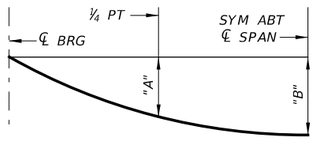


PLAN



DEAD LOAD DEFLECTION DIAGRAM

CALCULATED DEFLECTIONS SHOWN ARE DUE TO THE CONCRETE SLAB ON INTERIOR GIRDERS ONLY (EC = 5000 KSI). ADJUST VALUES AS REQUIRED FOR EXTERIOR GIRDERS AND IF OPTIONAL SLAB FORMING IS USED. THESE VALUES MAY REQUIRE FIELD VERIFICATION.

TABLE OF SECTION DEPTHS

GIRDER	"Y" AT ℄ BRG (3)
	FT/IN
ALL	5'-6"

TYPE Tx54 GIRDERS

SPAN	"A"	"B"
NO.	FT	FT
1-3	0.123	0.173

TABLE OF ESTIMATED QUANTITIES

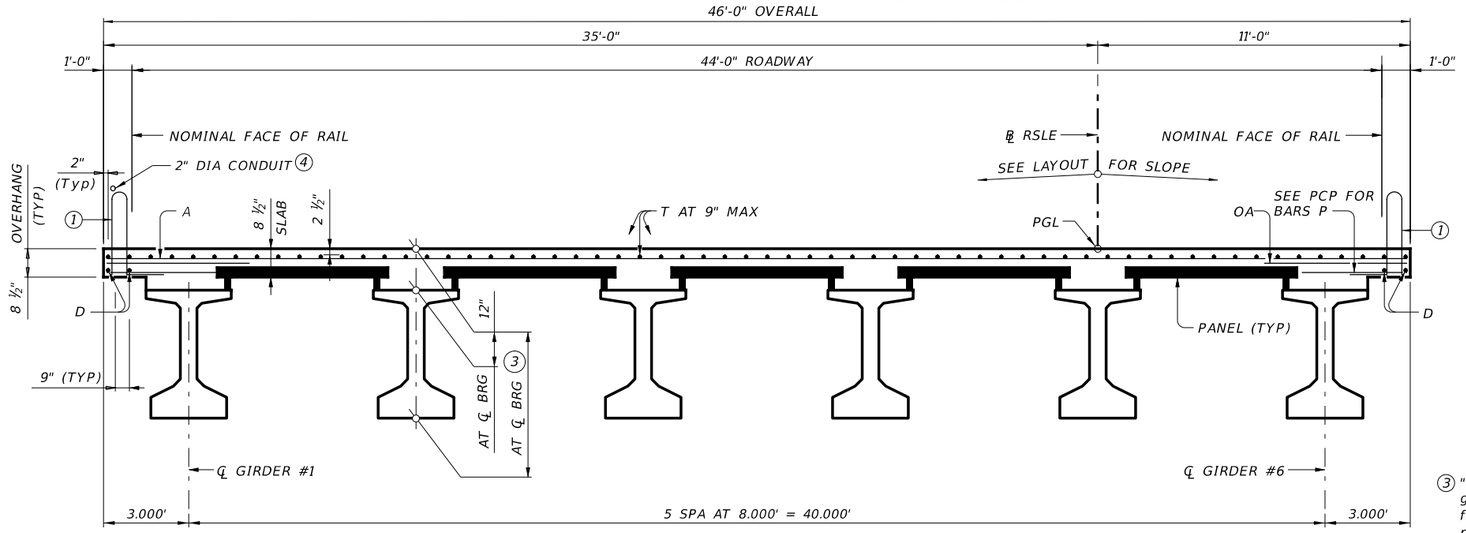
SPAN	REINF CONCRETE SLAB	PRESTR CONC GIRDERS (Tx54)	TOTAL REINF STEEL (2)
NO.	SF	LF	LB
1	5,290	687.00	12,167
2	5,290	687.18	12,167
3	5,290	687.12	12,167
TOTAL	15,870	2,061.30	36,501

(1) SEE RAILING STANDARD FOR RAIL ANCHORAGE IN SLAB.

(2) REINFORCING STEEL WEIGHT IS CALCULATED USING AN APPROXIMATE FACTOR OF 2.3 LBS/SF.

COVER DIMENSIONS ARE CLEAR DIMENSIONS UNLESS NOTED OTHERWISE.

(4) SEE BL STANDARD FOR DIMENSIONS, NOTES AND DETAILS NOT SHOWN HERE. INSTALL JUNCTION BOX AS SHOWN IN BL STANDARD. INSTALL PULL WIRE WITHIN ALL CONDUITS FOR FUTURE WIRING INSTALLATION.



TYPICAL TRANSVERSE SECTION

(GIRDER TYPE Tx54)

BAR TABLE

BAR	SIZE
A	#4
AA	#5
D	#4
G	#4
H	#4
J	#4
K	#4
M	#4
T	#4
OA	#5
P	#4

(3) "Y" value shown is based on theoretical girder camber, dead load deflection from an 8½" concrete slab, a constant roadway grade, and using precast panels (PCP). The Contractor will adjust this value as necessary for any roadway vertical curve and/or if the precast overhang panel (PCP(O)) option is used.

GENERAL NOTES:

DESIGNED ACCORDING TO AASHTO LRFD SPECIFICATIONS, 8TH EDITION (2017) AND ALL CURRENT INTERIMS.
SEE IGTS STANDARD FOR THICKENED SLAB END DETAILS AND QUANTITY ADJUSTMENTS.
SEE PCP OR PMDF STANDARDS FOR DETAILS AND QUANTITY ADJUSTMENTS IF EITHER OF THESE OPTIONS ARE USED.
SEE IGMS STANDARD FOR MISCELLANEOUS DETAILS.
ALL REINFORCING MUST BE GRADE 60.
CONCRETE STRENGTH F'C = 4,000 PSI.
BAR LAPS, WHERE REQUIRED, WILL BE AS FOLLOWS:
UNCOATED ~ #4 = 1'-7"
~ #5 = 2'-0"

HL93 LOADING

STATE OF TEXAS
ALLEN R. CROZIER
81450
LICENSED
PROFESSIONAL ENGINEER
11/19/2020

HAYS COUNTY TEXAS
HDR Engineering, Inc.
1290 Wonder World Drive
Building #1, Suite 1230
San Marcos, TX 78666-7969
Texas Registered Engineering Firm F-754

Texas Department of Transportation

ROBERT S. LIGHT EXTENSION

RSLE OVERPASS AT UPRR
345.000' PRESTR
CONC GIRDER UNIT 1

SHEET 1 OF 1

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
WJC	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JCS	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	255
SDM	0914	33	068,ETC	
CHECK				
ARC				

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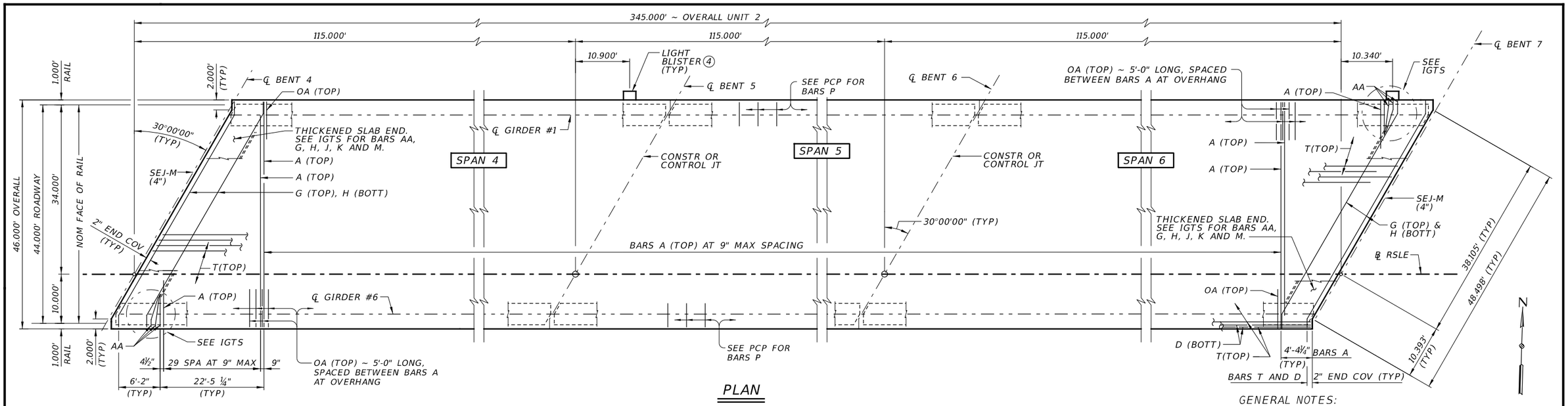
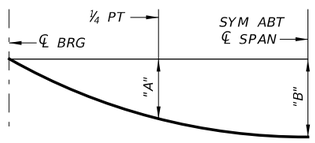


PLAN



DEAD LOAD DEFLECTION DIAGRAM

CALCULATED DEFLECTIONS SHOWN ARE DUE TO THE CONCRETE SLAB ON INTERIOR GIRDERS ONLY (EC = 5000 KSI). ADJUST VALUES AS REQUIRED FOR EXTERIOR GIRDERS AND IF OPTIONAL SLAB FORMING IS USED. THESE VALUES MAY REQUIRE FIELD VERIFICATION.

TABLE OF SECTION DEPTHS

GIRDER	"Y" AT ℄ BRG (3)
	FT/IN
ALL	5'-6"

TYPE Tx54 GIRDERS

SPAN	"A"	"B"
NO.	FT	FT
4-5	0.123	0.173

TABLE OF ESTIMATED QUANTITIES

SPAN	REINF CONCRETE SLAB	PRESTR CONC GIRDERS (Tx54)	TOTAL REINF STEEL (2)
NO.	SF	LF	LB
4	5,290	687.06	12,167
5	5,290	687.00	12,167
6	5,290	687.00	12,167
TOTAL	15,870	2,061.06	36,501

(1) SEE RAILING STANDARD FOR RAIL ANCHORAGE IN SLAB.

(2) REINFORCING STEEL WEIGHT IS CALCULATED USING AN APPROXIMATE FACTOR OF 2.3 LBS/SF.

COVER DIMENSIONS ARE CLEAR DIMENSIONS UNLESS NOTED OTHERWISE.

(4) SEE BL STANDARD FOR DIMENSIONS, NOTES AND DETAILS NOT SHOWN HERE. INSTALL JUNCTION BOX AS SHOWN IN BL STANDARD. INSTALL PULL WIRE WITHIN ALL CONDUITS FOR FUTURE WIRING INSTALLATION.

GENERAL NOTES:

DESIGNED ACCORDING TO AASHTO LRFD SPECIFICATIONS, 8TH EDITION (2017) AND ALL CURRENT INTERIMS.

SEE IGTS STANDARD FOR THICKENED SLAB END DETAILS AND QUANTITY ADJUSTMENTS.

SEE PCP OR PMDF STANDARDS FOR DETAILS AND QUANTITY ADJUSTMENTS IF EITHER OF THESE OPTIONS ARE USED.

SEE IGMS STANDARD FOR MISCELLANEOUS DETAILS.

ALL REINFORCING MUST BE GRADE 60.

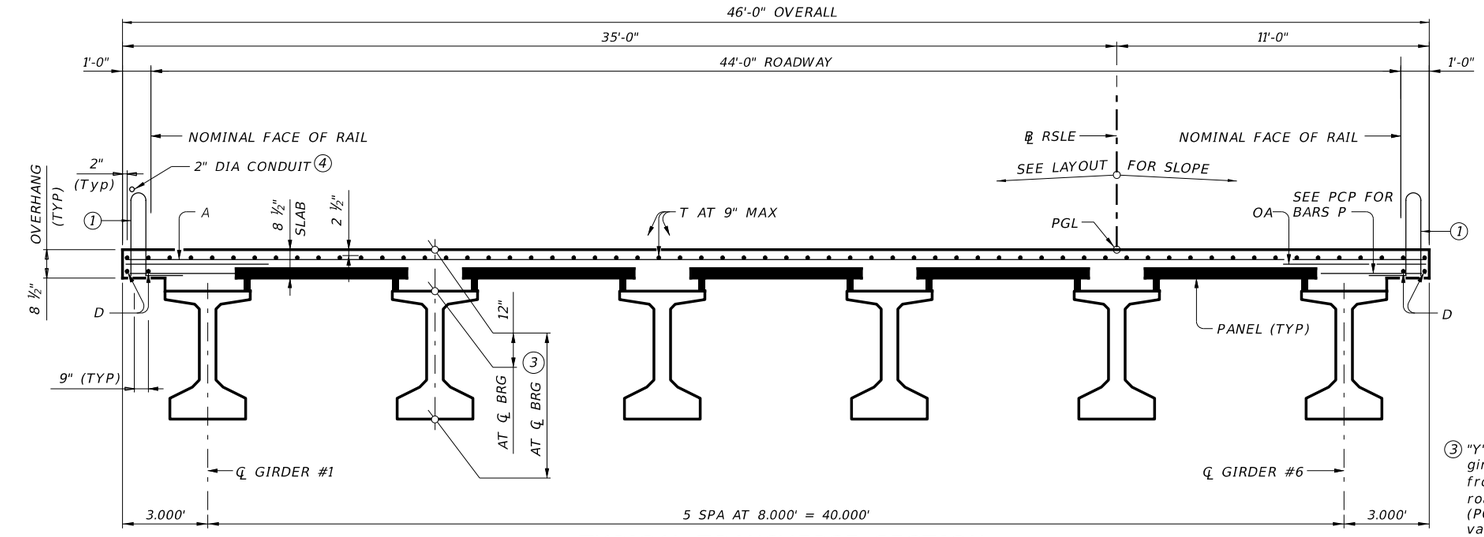
CONCRETE STRENGTH F'C = 4,000 PSI.

BAR LAPS, WHERE REQUIRED, WILL BE AS FOLLOWS:

UNCOATED ~ #4 = 1'-7"

~ #5 = 2'-0"

HL93 LOADING



TYPICAL TRANSVERSE SECTION

(GIRDER TYPE Tx54)

BAR TABLE

BAR	SIZE
A	#4
AA	#5
D	#4
G	#4
H	#4
J	#4
K	#4
M	#4
T	#4
OA	#5
P	#4

(3) "Y" value shown is based on theoretical girder camber, dead load deflection from an 8½" concrete slab, a constant roadway grade, and using precast panels (PCP). The Contractor will adjust this value as necessary for any roadway vertical curve and/or if the precast overhang panel (PCP(O)) option is used.

STATE OF TEXAS
ALLEN R. CROZIER
81450
LICENSED
PROFESSIONAL ENGINEER
11/19/2020

HAYS COUNTY TEXAS

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1290 Wonder World Drive
Building #1, Suite 1230
San Marcos, TX 78666-7969
Texas Registered Engineering Firm F-754

Texas Department of Transportation

ROBERT S. LIGHT EXTENSION

RSLE OVERPASS AT UPRR
345.000' PRESTR
CONC GIRDER UNIT 2

SHEET 1 OF 1

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
WJC	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JCS	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	256
SDM	0914	33	068,ETC	
CHECK				
ARC				

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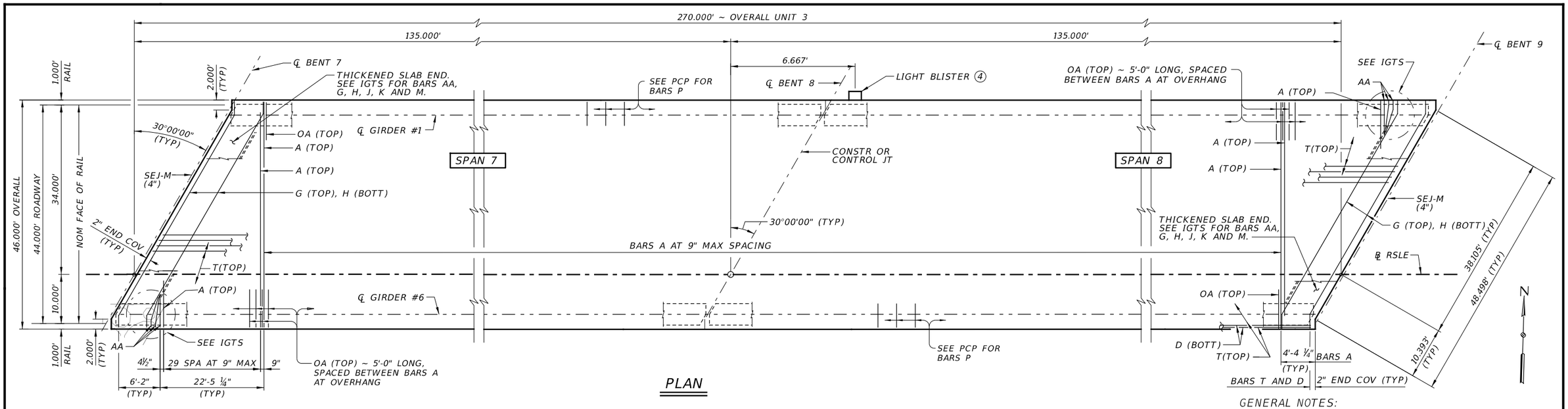

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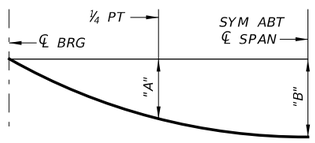


DEAD LOAD DEFLECTION DIAGRAM

CALCULATED DEFLECTIONS SHOWN ARE DUE TO THE CONCRETE SLAB ON INTERIOR GIRDERS ONLY (EC = 5000 KSI). ADJUST VALUES AS REQUIRED FOR EXTERIOR GIRDERS AND IF OPTIONAL SLAB FORMING IS USED. THESE VALUES MAY REQUIRE FIELD VERIFICATION.

TABLE OF SECTION DEPTHS

GIRDER	"Y" AT ℄ BRG ③
	FT/IN
ALL	6'-2"

TYPE Tx62 GIRDERS

SPAN	"A"	"B"
NO.	FT	FT
7-8	0.153	0.215

TABLE OF ESTIMATED QUANTITIES

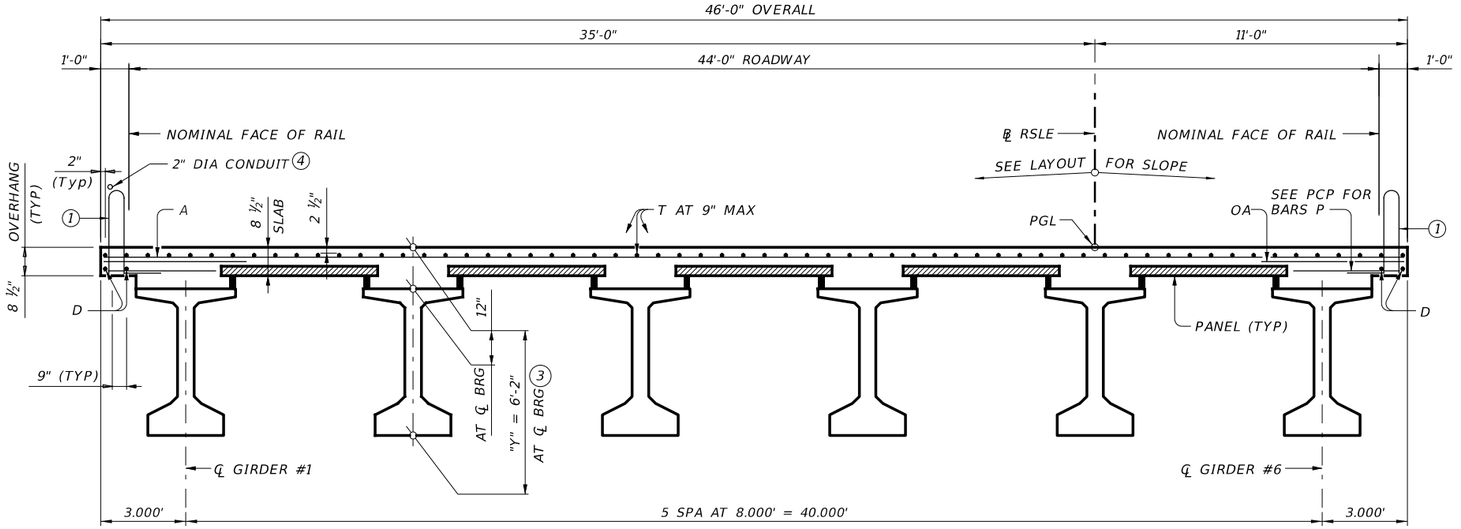
SPAN	REINF CONCRETE SLAB	PRESTR CONC GIRDERS (Tx62)	TOTAL REINF STEEL ②
NO.	SF	LF	LB
7	6,210	807.00	14,283
8	6,210	807.00	14,283
TOTAL	12,420	1614.00	28,566

① SEE RAILING STANDARD FOR RAIL ANCHORAGE IN SLAB.

② REINFORCING STEEL WEIGHT IS CALCULATED USING AN APPROXIMATE FACTOR OF 2.3 LBS/SF.

COVER DIMENSIONS ARE CLEAR DIMENSIONS UNLESS NOTED OTHERWISE.

④ SEE BL STANDARD FOR DIMENSIONS, NOTES AND DETAILS NOT SHOWN HERE. INSTALL JUNCTION BOX AS SHOWN IN BL STANDARD. INSTALL PULL WIRE WITHIN ALL CONDUITS FOR FUTURE WIRING INSTALLATION.



TYPICAL TRANSVERSE SECTION

(GIRDER TYPE Tx62)

BAR TABLE

BAR	SIZE
A	#4
AA	#5
D	#4
G	#4
H	#4
J	#4
K	#4
M	#4
T	#4
OA	#5
P	#4

③ "Y" value shown is based on theoretical girder camber, dead load deflection from an 8½" concrete slab, a constant roadway grade, and using precast panels (PCP). The Contractor will adjust this value as necessary for any roadway vertical curve and/or if the precast overhang panel (PCP(O)) option is used.

GENERAL NOTES:

DESIGNED ACCORDING TO AASHTO LRFD SPECIFICATIONS, 8TH EDITION (2017) AND ALL CURRENT INTERIMS.
SEE IGTS STANDARD FOR THICKENED SLAB END DETAILS AND QUANTITY ADJUSTMENTS.
SEE PCP OR PMDF STANDARDS FOR DETAILS AND QUANTITY ADJUSTMENTS IF EITHER OF THESE OPTIONS ARE USED.
SEE IGMS STANDARD FOR MISCELLANEOUS DETAILS.
ALL REINFORCING MUST BE GRADE 60.
CONCRETE STRENGTH F'C = 4,000 PSI.
BAR LAPS, WHERE REQUIRED, WILL BE AS FOLLOWS:
UNCOATED ~ #4 = 1'-7"
~ #5 = 2'-0"

HL93 LOADING

STATE OF TEXAS
ALLEN R. CROZIER
81450
LICENSED PROFESSIONAL ENGINEER
11/19/2020

HAYS COUNTY TEXAS
HDR Engineering, Inc.
1290 Wonder World Drive
Building #1, Suite 1230
San Marcos, TX 78666-7969
Texas Registered Engineering Firm F-754

Texas Department of Transportation
℗ 2020

ROBERT S. LIGHT EXTENSION
RSLE OVERPASS AT UPRR
270.000' PRESTR CONC GIRDER UNIT 3

SHEET 1 OF 1

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
WJC	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JCS	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	257
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CHECK				
ARC				

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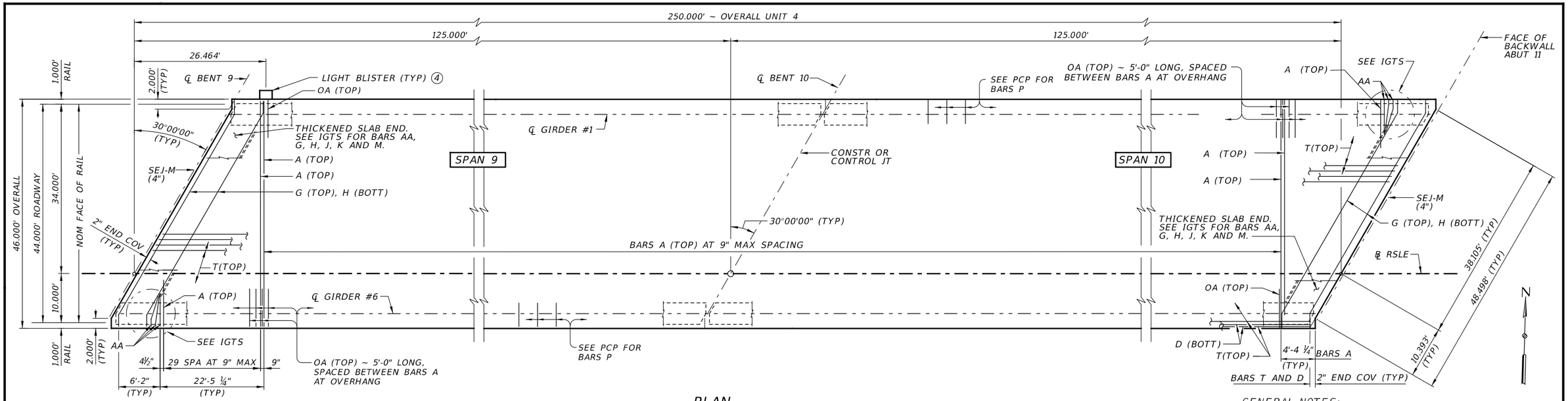
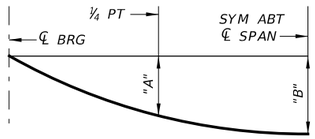


PLAN



DEAD LOAD DEFLECTION DIAGRAM

CALCULATED DEFLECTIONS SHOWN ARE DUE TO THE CONCRETE SLAB ON INTERIOR GIRDERS ONLY (EC = 5000 KSI). ADJUST VALUES AS REQUIRED FOR EXTERIOR GIRDERS AND IF OPTIONAL SLAB FORMING IS USED. THESE VALUES MAY REQUIRE FIELD VERIFICATION.

TABLE OF SECTION DEPTHS

GIRDER	"Y" AT ℄ BRG ③
	FT/IN
ALL	5'-6"

TYPE Tx54 GIRDERS

SPAN	"A"	"B"
NO.	FT	FT
9-10	0.173	0.243

TABLE OF ESTIMATED QUANTITIES

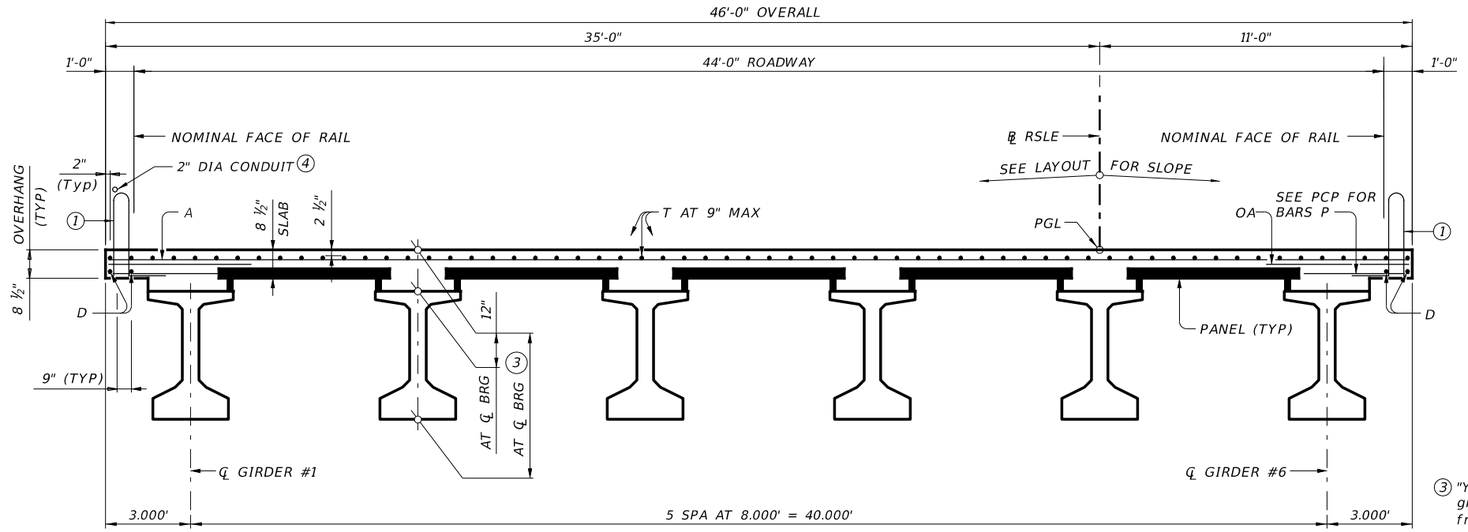
SPAN	REINF CONCRETE SLAB	PRESTR CONC GIRDERS (Tx54)	TOTAL REINF STEEL ②
NO.	SF	LF	LB
9	5,750	747.06	13,225
10	5,750	746.88	13,225
TOTAL	11,500	1,493.94	26,450

① SEE RAILING STANDARD FOR RAIL ANCHORAGE IN SLAB.

② REINFORCING STEEL WEIGHT IS CALCULATED USING AN APPROXIMATE FACTOR OF 2.3 LBS/SF.

COVER DIMENSIONS ARE CLEAR DIMENSIONS UNLESS NOTED OTHERWISE.

④ SEE BL STANDARD FOR DIMENSIONS, NOTES AND DETAILS NOT SHOWN HERE. INSTALL JUNCTION BOX AS SHOWN IN BL STANDARD. INSTALL PULL WIRE WITHIN ALL CONDUITS FOR FUTURE WIRING INSTALLATION.



TYPICAL TRANSVERSE SECTION

(GIRDER TYPE Tx54)

BAR TABLE

BAR	SIZE
A	#4
AA	#5
D	#4
G	#4
H	#4
J	#4
K	#4
M	#4
T	#4
OA	#5
P	#4

③ "Y" value shown is based on theoretical girder camber, dead load deflection from an 8½" concrete slab, a constant roadway grade, and using precast panels (PCP). The Contractor will adjust this value as necessary for any roadway vertical curve and/or if the precast overhang panel (PCP(O)) option is used.

GENERAL NOTES:

DESIGNED ACCORDING TO AASHTO LRFD SPECIFICATIONS, 8TH EDITION (2017) AND ALL CURRENT INTERIMS.

SEE IGTS STANDARD FOR THICKENED SLAB END DETAILS AND QUANTITY ADJUSTMENTS.

SEE PCP OR PMDF STANDARDS FOR DETAILS AND QUANTITY ADJUSTMENTS IF EITHER OF THESE OPTIONS ARE USED.

SEE IGMS STANDARD FOR MISCELLANEOUS DETAILS.

ALL REINFORCING MUST BE GRADE 60.

CONCRETE STRENGTH F'C = 4,000 PSI.

BAR LAPS, WHERE REQUIRED, WILL BE AS FOLLOWS:
UNCOATED ~ #4 = 1'-7"
~ #5 = 2'-0"

HL93 LOADING

STATE OF TEXAS
ALLEN R. CROZIER
81450
LICENSED PROFESSIONAL ENGINEER
11/19/2020

HAYS COUNTY TEXAS

HDR Engineering, Inc.
1290 Wonder World Drive
Building #1, Suite 1230
San Marcos, TX 78666-7969
Texas Registered Engineering Firm F-754

Texas Department of Transportation

ROBERT S. LIGHT EXTENSION

RSLE OVERPASS AT UPRR 250.000' PRESTR CONC GIRDER UNIT 4

SHEET 1 OF 1

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
WJC	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
JCS	TEXAS	AUS	HAYS	258
CHECK	CONTROL	SECTION	JOB	
SDM	0914	33	068,ETC	
CHECK				
ARC				

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USER: KBERGER DATE: 11/19/2020 TIME: 4:36:35 PM SCALE: 1:20.0028
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STRUCTURE	DESIGNED GIRDERS									DEPRESSED STRAND PATTERN		CONCRETE		OPTIONAL DESIGN				
	SPAN NO.	GIRDER NO.	GIRDER TYPE	PRESTRESSING STRANDS						NO.	TO END (in)	RELEASE STRGTH (1) f'ci (ksi)	MINIMUM 28 DAY COMP STRGTH f'c (ksi)	DESIGN LOAD COMP STRESS (TOP ℄) (SERVICE I) fct(ksi)	DESIGN LOAD TENSILE STRESS (BOTT ℄) (SERVICE III) fcb(ksi)	REQUIRED MINIMUM ULTIMATE MOMENT CAPACITY (STRENGTH I) (kip-ft)	LIVE LOAD DISTRIBUTION FACTOR (2)	
				NON-STD STRAND PATTERN	TOTAL NO.	SIZE (in)	STRGTH fpu (ksi)	"e" ℄ (in)	"e" END (in)								Moment	Shear
Mustang Branch	1-5	1-6	Tx54		42	0.6	270	19.01	12.72	6	50.5	5.600	6.600	4.331	-4.239	8202	0.623	0.814
	6	1-6	Tx54		46	0.6	270	18.66	11.36	8	50.5	5.800	7.200	4.690	-4.565	8767	0.616	0.814
	7	1-6	Tx54		38	0.6	270	19.22	12.90	6	46.5	5.100	6.000	3.987	-3.925	7655	0.630	0.814
	8	1-6	Tx54		42	0.6	270	19.01	12.72	6	50.5	5.600	6.600	4.310	-4.220	8169	0.623	0.814
	9-10	1	Tx54		38	0.6	270	19.22	12.27	6	50.5	5.000	5.800	4.033	-3.932	7710	0.625	0.814
	9-10	2-6	Tx54		44	0.6	270	18.83	11.55	8	48.5	5.600	6.500	4.341	-4.317	8637	0.714	0.814
	11-13	1	Tx54		42	0.6	270	19.01	12.72	6	50.5	5.600	6.600	4.353	-4.221	8219	0.618	0.814
	11-13	2-5	Tx54		46	0.6	270	18.66	11.36	8	50.5	5.800	7.200	4.676	-4.516	8665	0.616	0.814
	11-13	6	Tx54	*	48	0.6	270	18.42	10.09	10	50.5	6.000	7.500	4.714	-4.678	9329	0.722	0.814
RSLE Overpass at UPRR	1-6	1-6	Tx54		38	0.6	270	19.22	12.27	6	50.5	5.000	5.900	3.980	-3.910	7680	0.650	0.940
	7-8	1-6	Tx62		46	0.6	270	23.43	14.73	8	58.5	5.500	6.400	4.180	-4.324	10345	0.640	0.940
	9-10	1-6	Tx54		46	0.6	270	18.66	11.36	8	50.5	5.800	4.100	4.665	-4.539	8796	0.640	0.940

NON-STANDARD STRAND PATTERNS

PATTERN	STRAND ARRANGEMENT AT ℄ OF GIRDER
*	2.5(ABCDEFG), 4.5(ABCDEFG), 6.5(ABCDEFG), 8.5(AB), 10.5(A)

(1) Based on the following allowable stresses (ksi):

Compression = 0.65 f'ci

Tension = $0.24\sqrt{f'ci}$

Optional designs must likewise conform.

(2) Portion of full HL93.

DESIGN NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

Optional designs for girders 120 feet or longer must have a calculated residual camber equal to or greater than that of the designed girder.

Prestress losses for the designed girders have been calculated for a relative humidity of 60 percent. Optional designs must likewise conform.

FABRICATION NOTES:

Provide Class H concrete.

Provide Grade 60 reinforcing steel bars.

Use low relaxation strands, each pretensioned to 75 percent of fpu.

Strand debonding must comply with Item 424.4.2.2.2.4. Full-length debonded strands are only permitted in positions marked △. Double wrap full-length debonded strands in outer most position of each row.

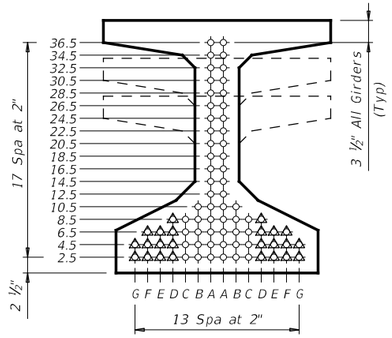
When shown on this sheet, the Fabricator has the option of furnishing either the designed girder or an approved optional design. All optional design submittals must be signed, sealed and dated by a Professional Engineer registered in the State of Texas.

Seal cracks in girder ends exceeding 0.005" in width as directed by the Engineer. The fabricator is permitted to decrease the spacing of Bars R and S by providing additional bars to help limit crack width provided the decreased spacing results in no less than 1" clear between bars. The fabricator must take an approved corrective action if cracks greater than 0.005" form on a repetitive basis.

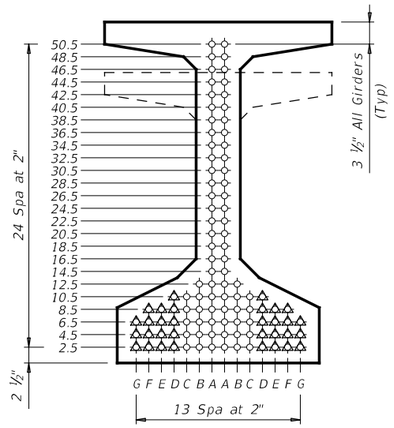
DEPRESSED STRAND DESIGNS:

Locate strands for the designed girder as low as possible on the 2" grid system unless a non-standard strand pattern is indicated. Fill row "2.5", then row "4.5", then row "6.5", etc., beginning each row in the "A" position and working outward until the required number of strands is reached. All strands in the "A" position must be depressed, maintaining the 2" spacing so that, at the girder ends, the upper two strands are in the position shown in the table.

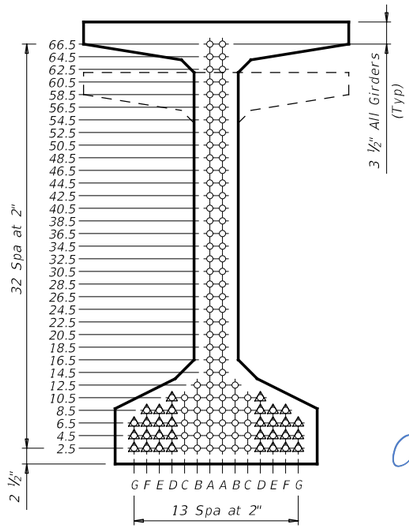
To complete this sheet input the girder designs in the table and the relative humidity under Design Notes. In all cases, remove this block. This sheet must be signed, sealed, and dated by a registered Professional Engineer.



TYPE Tx28, Tx34 & Tx40



TYPE Tx46 & Tx54



TYPE Tx62 & Tx70

11/19/2020

HL93 LOADING

Texas Department of Transportation | Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER DESIGNS (NON-STANDARD SPANS)

IGND

FILE: igndsts1-19.dgn	DN: TxDOT	CK: TxDOT	DW: EFC	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS 10-19: Modified for depressed strands only.	0914	33	068, ETC	RSL
	DIST	COUNTY		SHEET NO.
	AUS	HAYS		259

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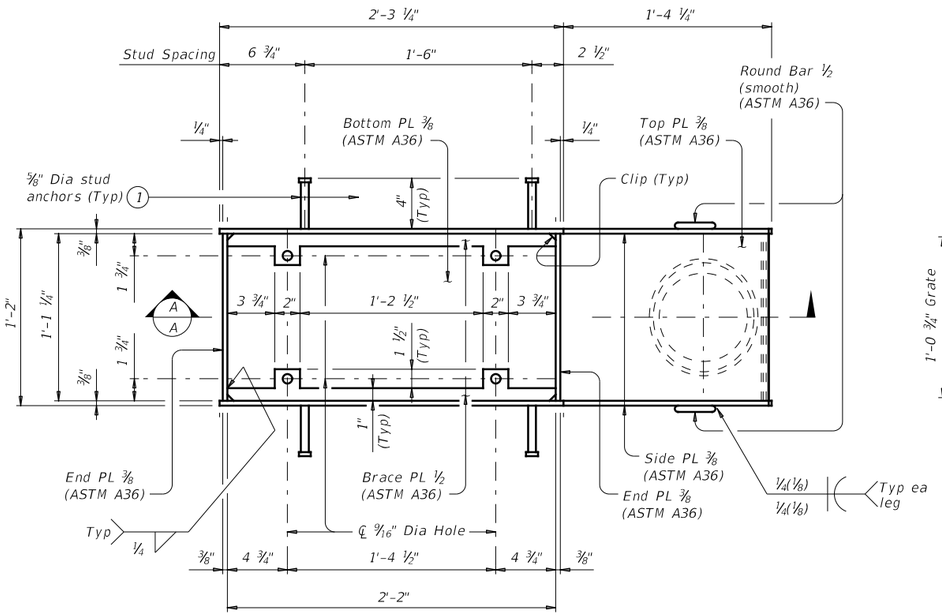
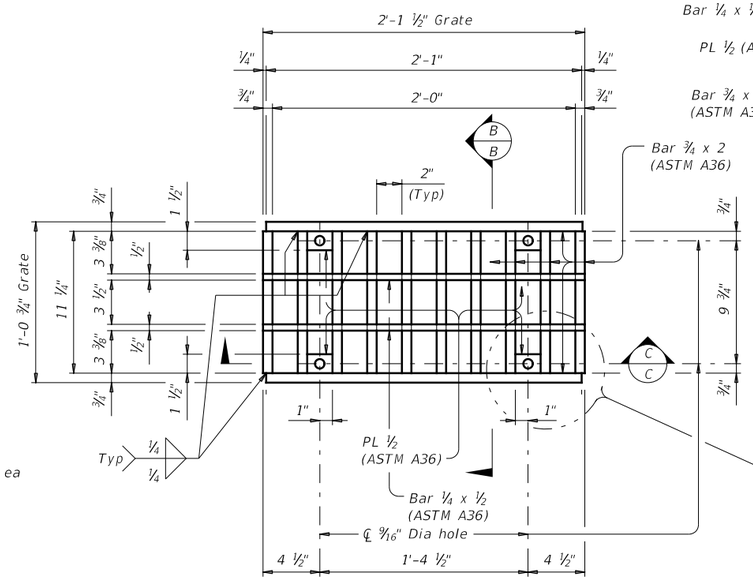
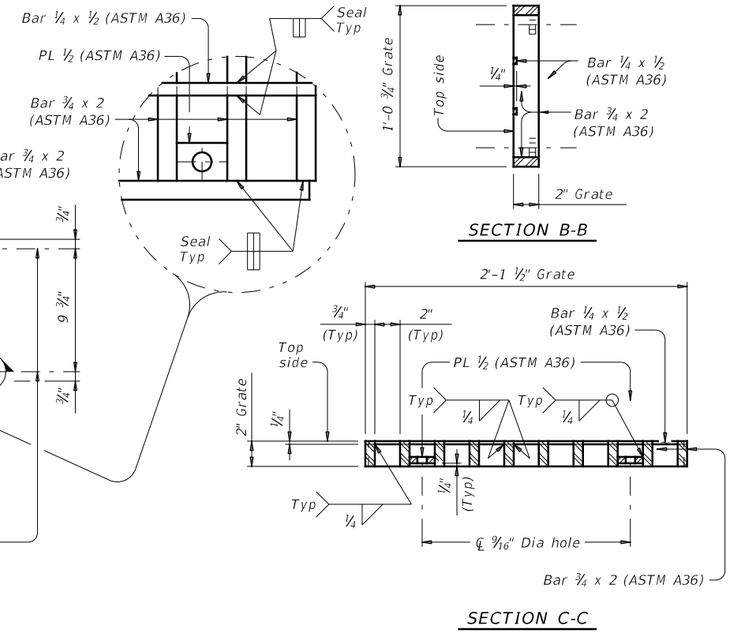


PLAN

(Grate not shown for clarity)

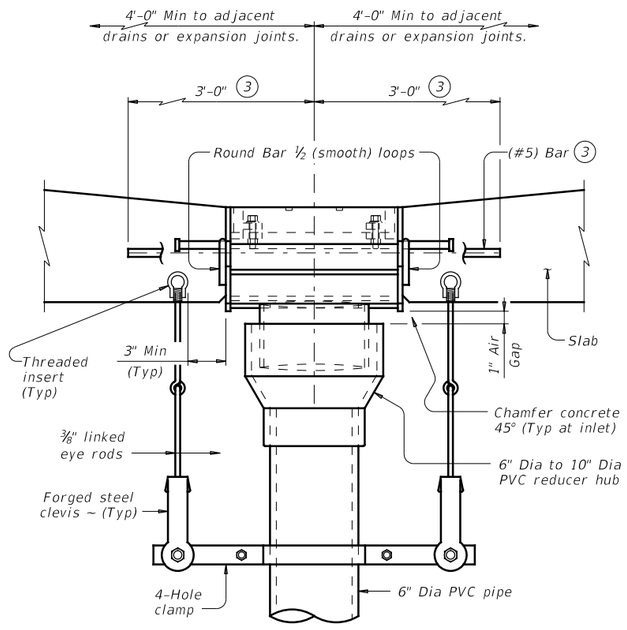


PLAN

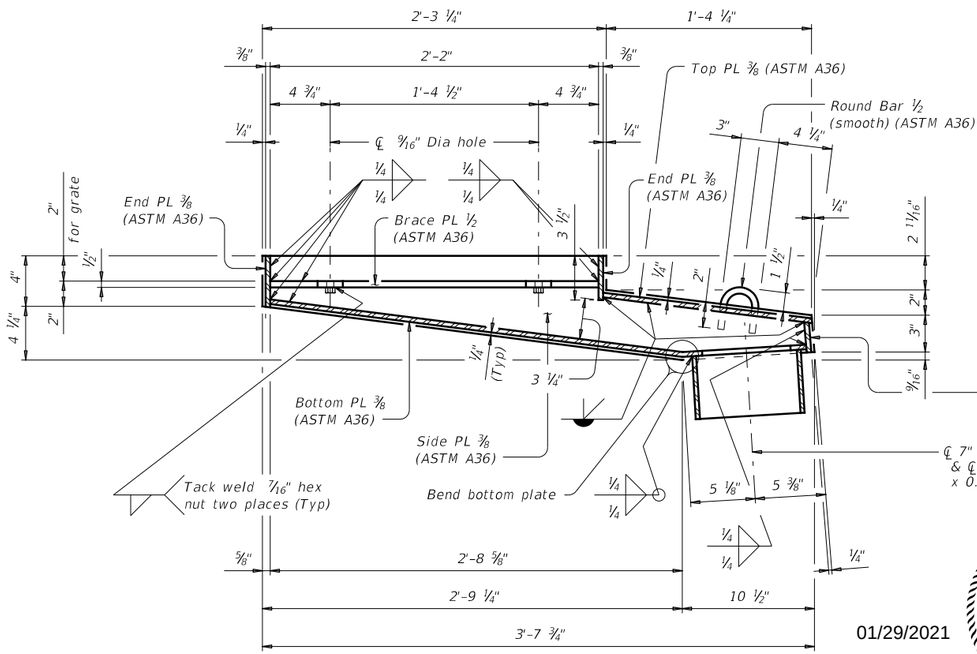


GRATE DETAILS

(1) Electric arc end-weld stud anchors to plates with complete fusion.

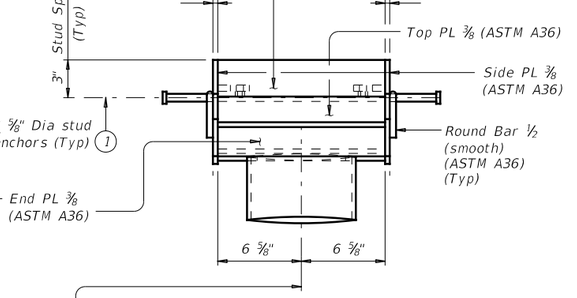


HOOK-UP TO INLET WITH VERTICAL PIPE SUPPORT



SECTION A-A

(Grate and studs not shown for clarity)



END VIEW OF DRAIN

HL93 LOADING

SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

BRIDGE DRAIN DETAILS (WELDED OR CAST)

BD-3(MOD)

FILE: bdstde03-20.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TAR
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	33	068, ETC	RSL
1/21 ~ Rotated orientation of drain inlet/outlet Edited notes	DIST	COUNTY		SHEET NO.
	AUS	HAYS		260

01/29/2021

STATE OF TEXAS
ALLEN R. CROZIER
81450
LICENSED PROFESSIONAL ENGINEER

DATE: 1/29/2021 9:09:45 AM
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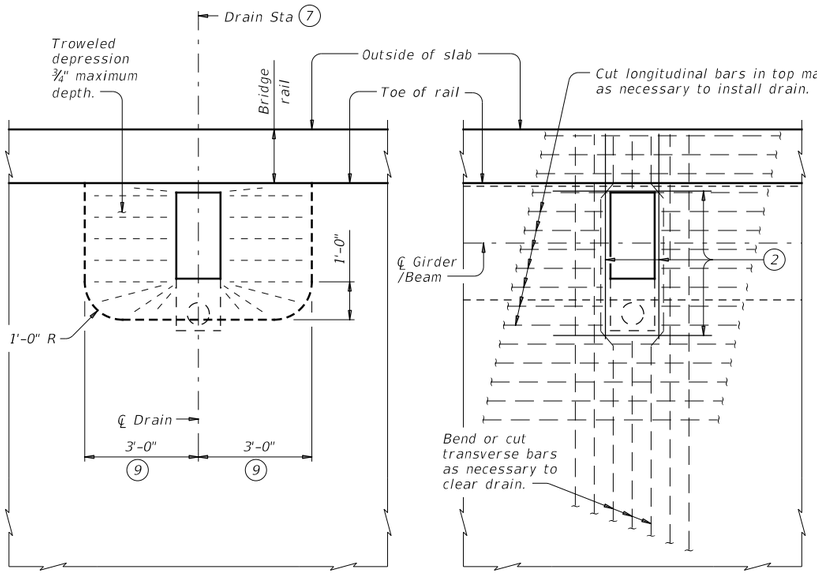
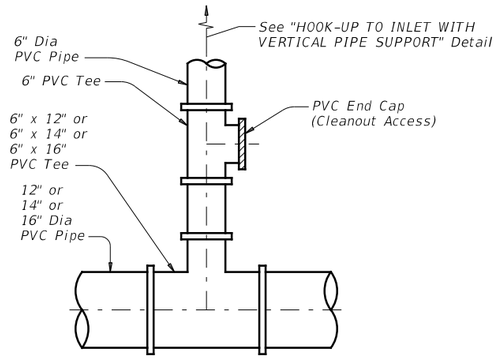


TROWELED DEPRESSION

SHOWING TYPICAL SLAB REINFORCING

Showing top reinforcing only, bottom reinforcing not shown for clarity.



PIPE CLEANOUT

(Typical at all Deck Drains)

(2) Provide 4 additional (#5) bars around perimeter in top mat of reinforcing and 4 additional (#5) bars around perimeter in bottom mat of reinforcing. Extend bars 1'-6" from edges of drain.

(3) Place one 6'-0" long (#5) bar threaded thru loops on round bar ½ (smooth), centered with drain. Contractor must provide 6'-0" long (#5) bar for each drain.

(4) After nuts have been tack welded to the frame, test the assembly for fit of frame and grate with hex bolt assembly.

(5) During fabrication, test fit grate to ensure grate can be rotated in either direction of 180° to accommodate assembly in the field.

(6) Provide 2 additional (#5) bars around perimeter in bottom mat of reinforcing. Extend bars 1'-6" from edges of drain.

(7) See Prestr Conc Girder Unit sheets, for min clr dimension to ℄ Bent. See "Estimated Quantities and Bearing Seat Elevations" sheet for deck drain locations.

(8) Edge of Bridge Drain shall be placed close to the toe of rail and all plumbing shall be placed behind outside beam and inside Abutments as practicable to hide from view.

(9) Prestressed Panels shall be placed 3' min from edges of casting. This portion of cast-in-place slab shall be conventially reinforced as detailed on the unit sheets.

WELDED BRIDGE DRAIN NOTES:

Galvanize all steel components in accordance with Item 445 "Galvanizing" unless noted otherwise.

Round or chamfer exposed edges of Grate and Frame to approximately 1/16" by grinding, unless otherwise noted.

Provide 7/16" Dia x 2" ASTM A307 Grade A hex head bolt with one hex nut, one plain washer and one lock washer, each.

Approximate drain opening area = 173 sq in.

CAST BRIDGE DRAIN NOTES:

During fabrication, test fit grate to ensure grate can be rotated in either direction of 180° to accommodate assembly in the field.

Provide iron castings conforming to Item 471, "Frames, Grates, Rings, and Covers".

Take care to ensure uniform bearing between contact surface of grate and frame.

Irregularities may be removed by grinding. Provide 3° minimum drafts.

All fillets ⅛" radius unless otherwise shown.

Alternate cast bridge drains may be substituted for the bridge drain shown on this sheet provided they are approved by the Engineer prior to fabrication and installation. Alternate drains must have an approximately equal grate opening area and an 8" diameter outfall. Grate should be of a similar configuration.

Approved manufacturer, Neenah Foundry Company. Product R-3941 (TxDOT BD-3) with an opening area of 183 sq in.

Provide frame material with ASTM A48, Class 35-B gray iron. Provide grate material with ASTM A536, Grade 65-45-12 ductile iron. Galvanization of these materials will not be required.

Provide ⅜" Dia x 1 ¾" stainless steel ASTM F593 hex head bolts for grate with one stainless steel narrow washer, each.

Provide ⅝" Dia x 4 ½" stainless steel ASTM F593 hex head bolts in lieu of ⅝" Dia electric arc end-weld stud anchors. ⅝" Dia x 4 ½" stainless steel hex head bolts thread in approximate location into iron frame as shown on welded drain.

Approved manufacturer, East Jordan Iron Works, Inc. Product EJ-5837 (TxDOT BD-3) with an opening area of 173 sq in.

Provide frame material with ASTM A48, Class 35-B gray iron. Provide grate material with ASTM A536, Grade 70-50-05 ductile iron. Galvanization of these materials will not be required.

Provide 7/16" Dia x 3" stainless steel ASTM F593 hex head bolt for grate with one stainless steel narrow washer, each.

GENERAL NOTES:

These drain details are intended for I-Girders with drain outfall on bridge interior for Mustang Branch Bridge.

Bend slab reinforcing bars to clear drain by 1". When bending is not possible reinforcing bars may be stopped or cut to clear drain as shown. Additional slab reinforcing is considered subsidiary to "Reinforced Concrete Slab". When placing concrete, take care to prevent honeycombing or air pockets around and beneath the drain.

Provide Schedule 40 DWV PVC pipe conforming to ASTM D2665. Minimum wall thickness: 0.280" ~ 6" Dia, 0.322" ~ 8" Dia. Use fittings as directed by the Engineer. Attach pipe securely to the superstructure. Provide pipe and supports that accommodate anticipated longitudinal movements of pipe and bridge slab. For long pipe runs, match pipe grade to roadway grade. Galvanize metallic pipe support hardware and fasteners in accordance with Item 445 "Galvanizing". Include the cost of attachment devices in the unit price bid for "Grate and Frame".

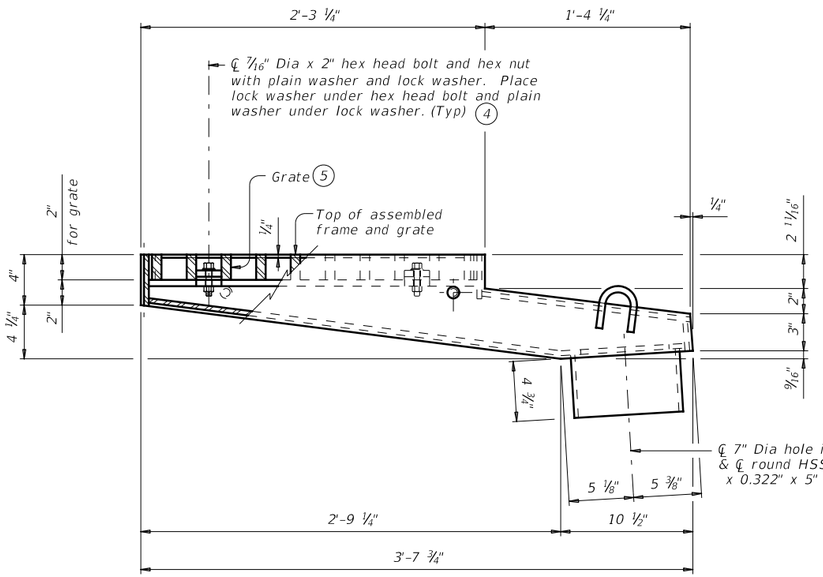
Payment will be by the each complete Grate and Frame (Bridge Drain).

See Bridge Layout for location of drains.

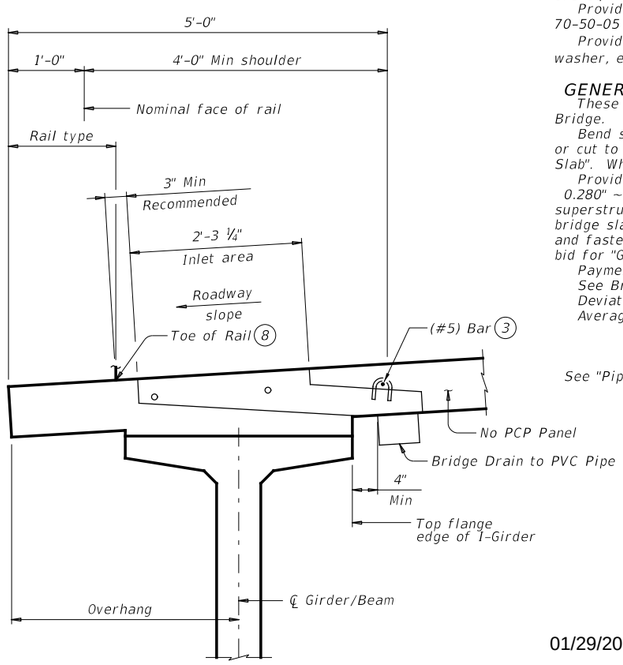
Deviation from these details is not permitted without prior approval from the Engineer.

Average weight of Grate and Frame: 240 Lb total
73 Lb (Grate)
167 Lb (Frame).

See "Pipe Hanger Details" and drainage plans for additional information.



SIDE VIEW OF ASSEMBLED FRAME AND GRATE



EXAMPLE OF INLET ON BRIDGE DECK (MUSTANG BRANCH BRIDGE)

Shown without troweled depression. With troweled depression similar.

HL93 LOADING

SHEET 2 OF 2

01/29/2021

STATE OF TEXAS
ALLEN R. CROZIER
81450
LICENSED PROFESSIONAL ENGINEER

Texas Department of Transportation

Bridge Division Standard

BRIDGE DRAIN DETAILS (WELDED OR CAST)

BD-3(MOD)

FILE: bdste03-20.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TAR
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	33	068, ETC	RSL
1/21 ~ Rotated orientation of drain inlet/outlet Edited notes	DIST	COUNTY		SHEET NO.
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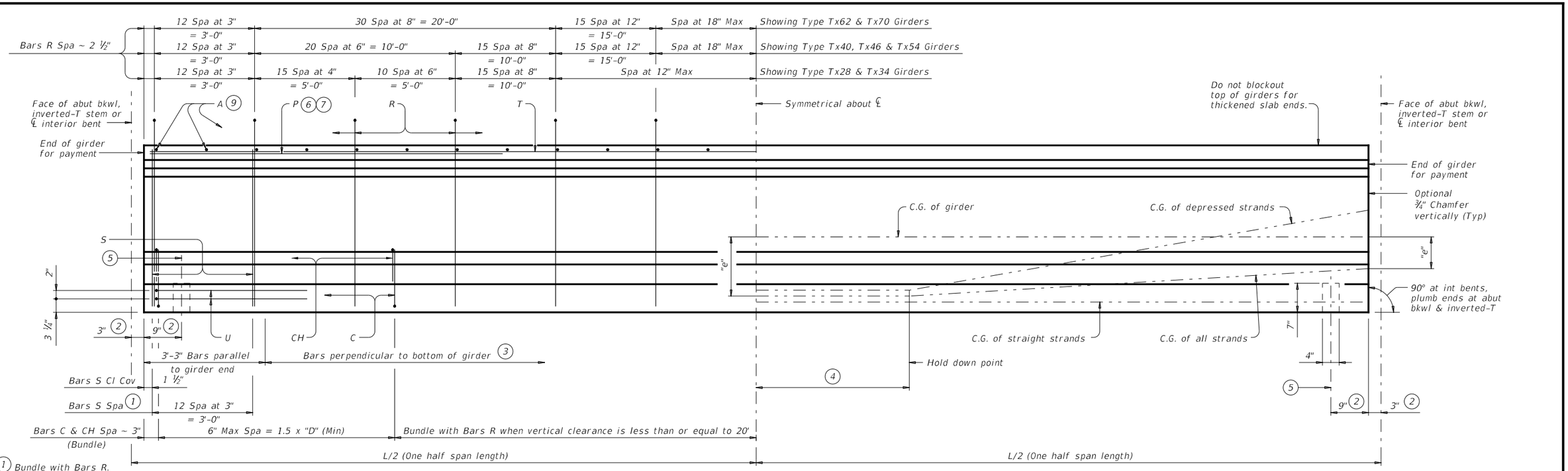


(1) Bundle with Bars R.

(2) Measured along ℄ Girder at interior bents; perpendicular to abutment bkwl or inverted-T stem.

(3) The average of the top and bottom spacing of Bars R cannot exceed the required spacing.

(4) L/20, but not less than 5'-0" (-0,+2').

(5) ℄ 4" x 1 ½" Vertical Slotted Hole at doweled girder end [labeled (D) on Bridge Layout]. Required for outside girder only or as shown on substructure details. Anchorage holes may be tapered (4 ¾" x 1 ⅝") at base. If holes are formed with sheet metal, forms may be left in place.

GIRDER ELEVATION

(6) Bars P (#6 x 15'-0") required in Tx62 and Tx70 girders. At the fabricator's option bars larger than #6 may be used. When L is less than 50 ft, Bars P are to be the same length as Bars T.

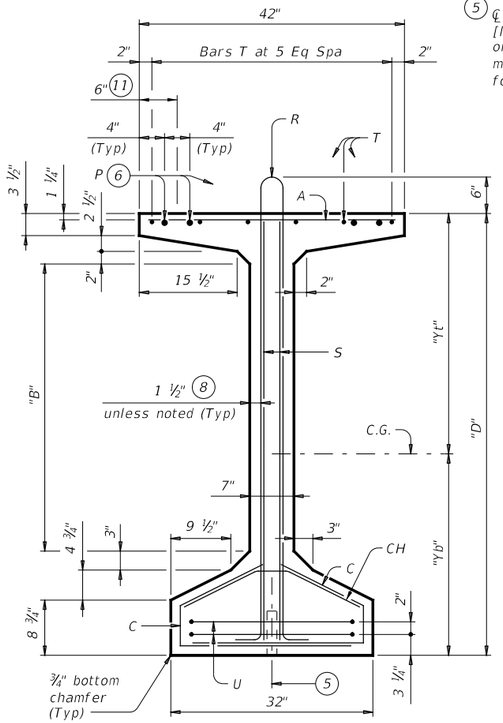
(7) Bars P (#6 x 15'-0") are only required in Tx28, Tx34, Tx40, Tx46, and Tx54 girders when "e" at girder ends exceeds 0.25 x "D". At the fabricator's option bars larger than #6 may be used. When L is less than 50 ft, Bars P are to be the same length as Bars T.

(8) 1 ⅜" Clear Cover to Bars S.

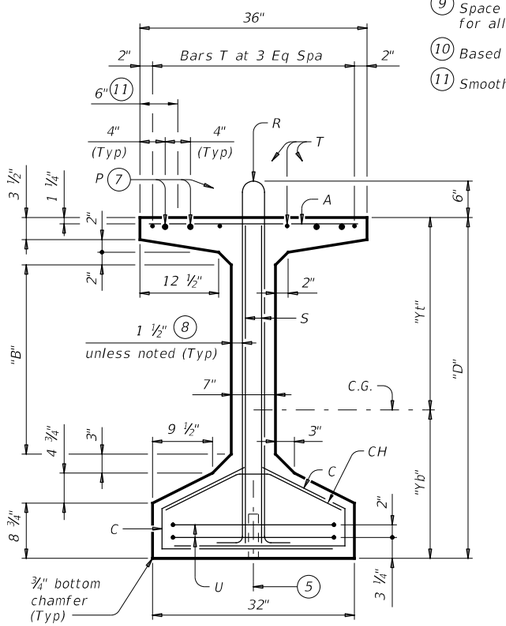
(9) Space Bars A at 6" Max for girders requiring overhang bracket hangers. Space at 12" Max for all other girders. Tie to Bars R as necessary. See standard IGMS for "Deck Forming Notes".

(10) Based on 155 pcf total weight of concrete and reinforcing steel.

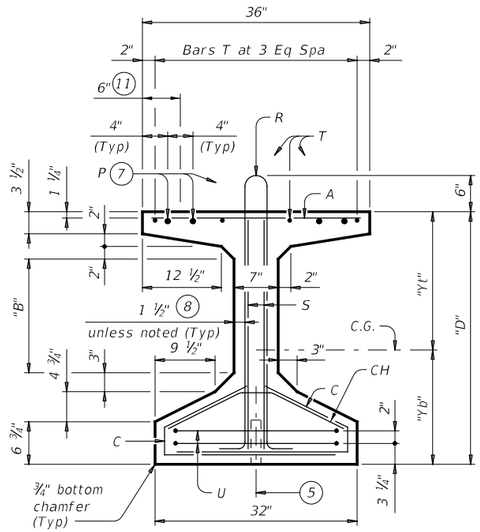
(11) Smooth trowel finish on the slab overhang side of exterior girder.



TYPE Tx62 & Tx70



TYPE Tx46 & Tx54



TYPE Tx28, Tx34 & Tx40

GIRDER DIMENSIONS AND SECTION PROPERTIES

Girder Type	"D" (in.)	"B" (in.)	"Yt" (in.)	"Yb" (in.)	Area (in.²)	"Ix" (in.⁴)	"Iy" (in.⁴)	Weight (10) (plf)
Tx28	28	6	15.02	12.98	585	52,772	40,559	630
Tx34	34	12	18.49	15.51	627	88,355	40,731	675
Tx40	40	18	21.90	18.10	669	134,990	40,902	720
Tx46	46	22	25.90	20.10	761	198,089	46,478	819
Tx54	54	30	30.49	23.51	817	299,740	46,707	880
Tx62	62	37 ½"	33.72	28.28	910	463,072	57,351	980
Tx70	70	45 ½"	38.09	31.91	966	628,747	57,579	1,040

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
Provide Class H concrete.
Provide Grade 60 reinforcing steel.
An equal area of deformed Welded Wire Reinforcement (WWR) (ASTM A1064) may be substituted for Bars A, C, R or T unless otherwise noted.
It is permissible for bars or strands to come in contact with materials used in forming anchor holes.

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

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER DETAILS

IGD

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©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
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10-19: Added Bars C and CH full length for VC<= 20'	DIST	COUNTY		SHEET NO.
	AUS	HAYS		262

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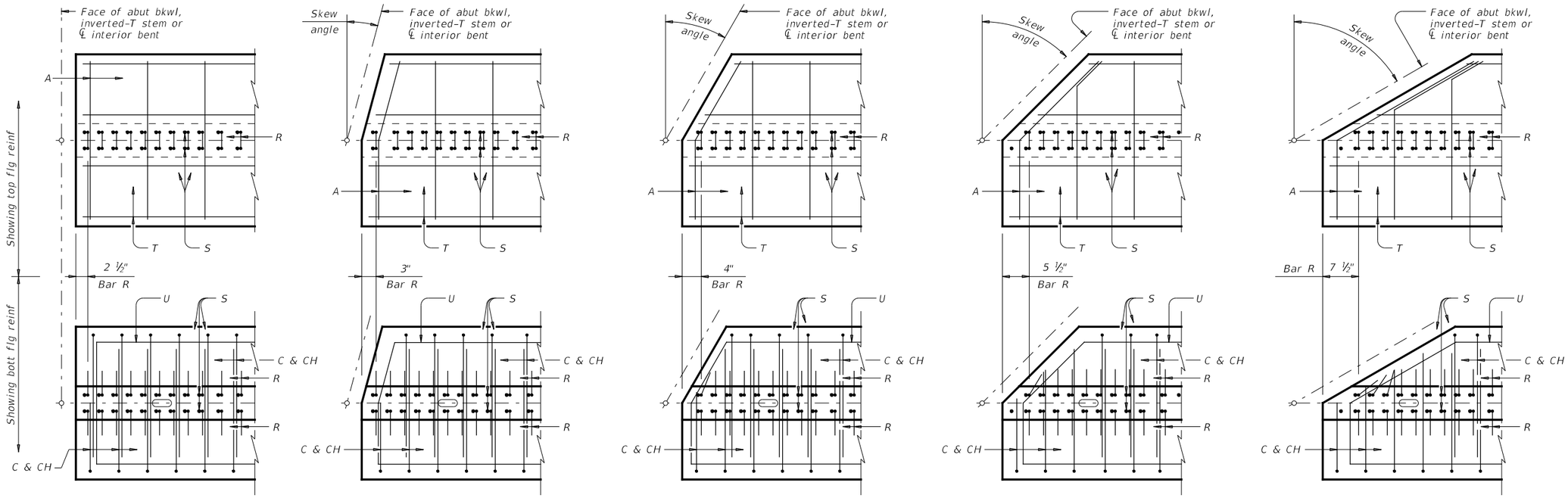
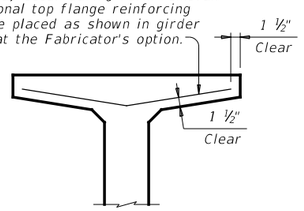
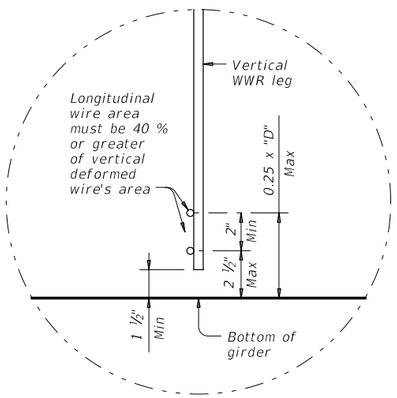


PLAN OF GIRDER ENDS (12)

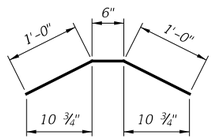
To control top flange cracking that may occur during form removal, additional top flange reinforcing may be placed as shown in girder ends at the Fabricator's option.



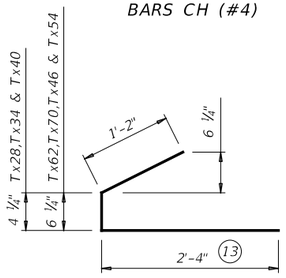
OPTIONAL TOP FLANGE REINFORCING DETAIL



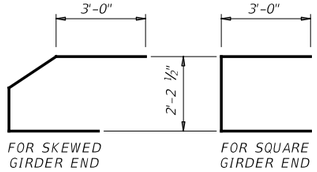
OPTIONAL WELDED WIRE REINFORCEMENT (WWR) DETAIL



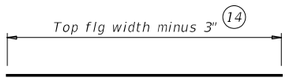
BARS CH (#4)



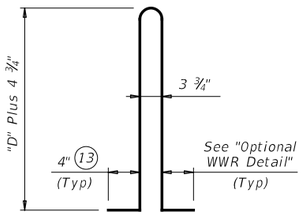
BARS C (#4)



BARS U (#5)

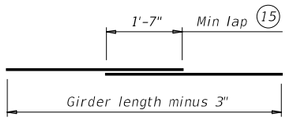


BARS A (#3)



BARS R (#4) (16)

BARS S (#6)



BARS T (#4)

(12) Reinforcing patterns shown are provided as guides to determine reinforcement placement in skewed ends. Place Bars S as close to girder end as cover requirements permit, which may prevent them to be bundled with Bars R.

(13) Bars may be cut or bent at skewed end as required.

(14) Increase as necessary for bars at skewed end.

(15) No portion of bar less than 10 ft.

(16) For Welded Wire Reinforcement (WWR) option, area of Bars R may be reduced in proportion to the increase in reinforcement yield strength over 60 ksi. Yield strength of WWR is limited to 75 ksi.

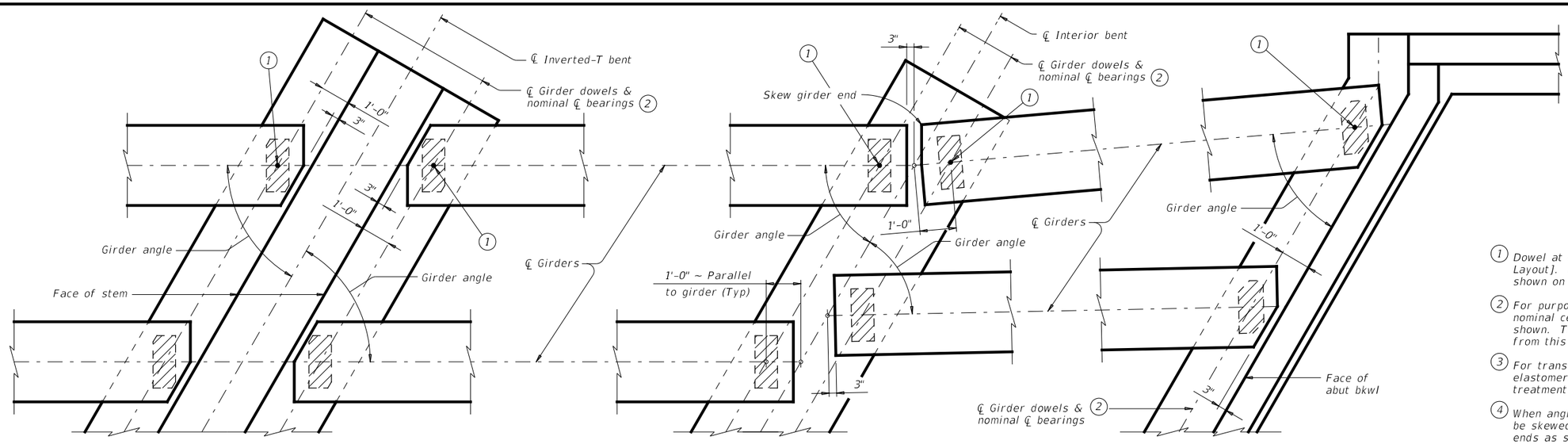
HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation — Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER DETAILS

IGD

FILE: igdstds1-19.dgn	DN: TxDOT	CK: JMH	DW: JTR	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	33	068,ETC	RSL
10-19: Added Bars C and CH full length for VC<= 20'	DIST	COUNTY		SHEET NO.
	AUS	HAYS		263



AT INVERTED-T BENT W/SKEW

AT CONVENTIONAL INTERIOR BENT W/SKEW

AT ABUTMENT W/SKEW (3)

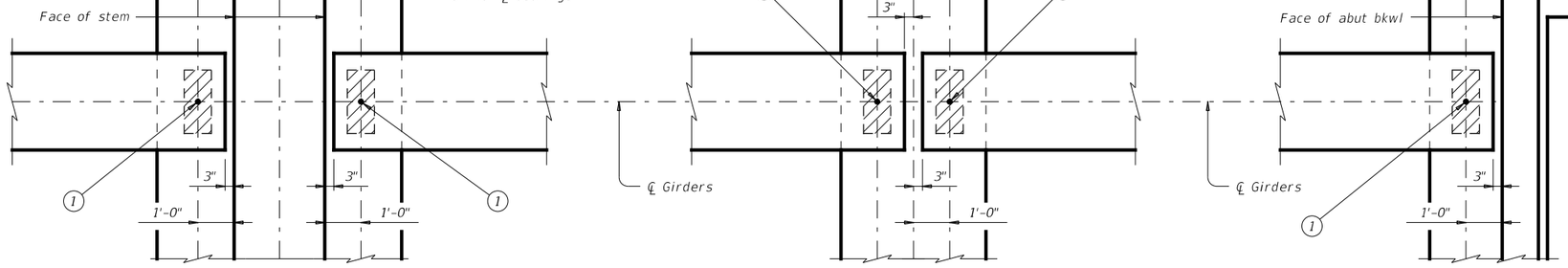
(1) Dowel at doweled girder end [labeled (D) on Bridge Layout]. Required for outside girder only or as shown on substructure details.

(2) For purposes of computing bearing seat elevations, nominal centerline of bearing must be defined as shown. The actual center of bearing pad may vary from this line.

(3) For transition bents with backwall, girder and elastomeric bearings must receive the same treatment as shown for abutments.

(4) When angle exceeds 0°, one or both girders ends must be skewed to maintain the clearance between girder ends as shown in view.

(5) See Table of Bearing Pad Dimensions for bearing size. Girder end skew angles in Table not applicable for this situation. Table reflects girder conflicts of this type on radial bents only.

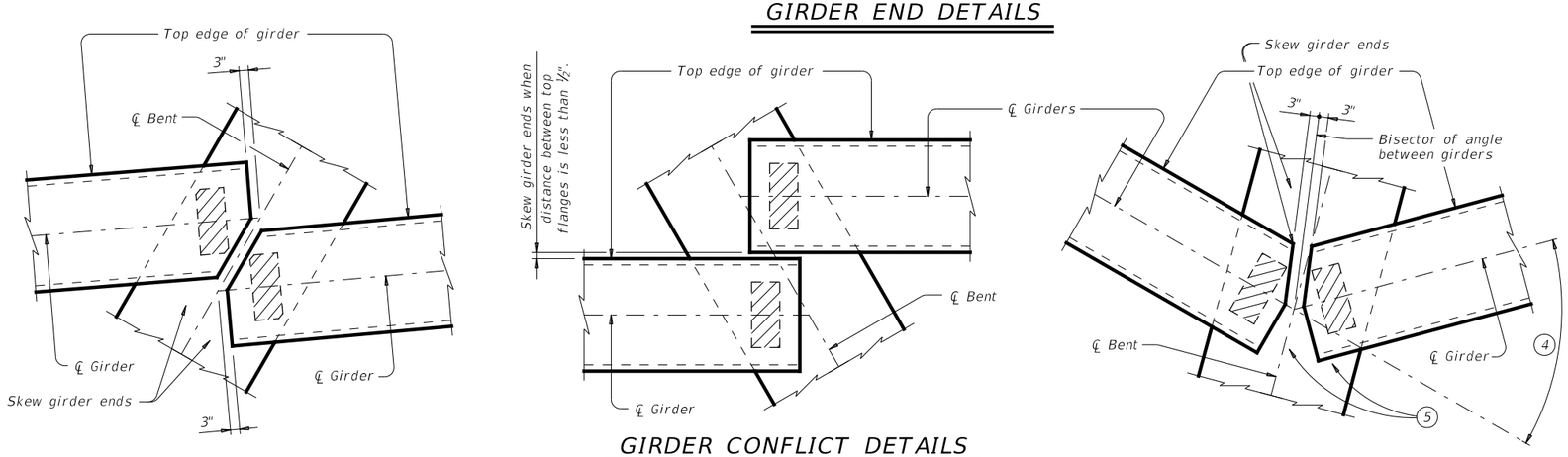


AT INVERTED-T BENT

AT CONVENTIONAL INTERIOR BENT

AT ABUTMENT (3)

GIRDER END DETAILS



GIRDER CONFLICT DETAILS

GENERAL NOTES:

These details accommodate skew angles up to 60°.

Shop drawings for approval are required.

A bearing layout which identifies location and orientation of all bearings must be developed by the bearing fabricator. Permanently mark each bearing in accordance with the bearing layout. A copy of the bearing layout is to be provided to the Engineer.

Cost of furnishing and installing elastomeric bearings, including beveled and embedded steel plates, must be included in unit price bid for "Prestressed Concrete Girders".

HL93 LOADING SHEET 1 OF 3

Texas Department of Transportation

Bridge Division Standard

ELASTOMERIC BEARING AND GIRDER END DETAILS

PRESTR CONCRETE I-GIRDERS

IGEB

FILE: igebsts1-17.dgn	DN: AEE	CK: JMH	DW: JTR	CK: TxDOT
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
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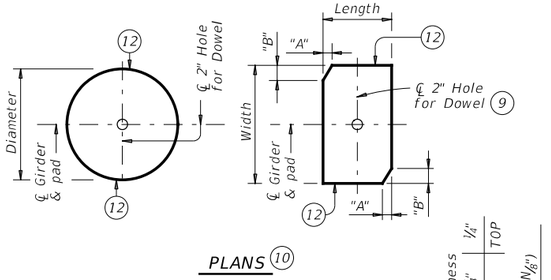
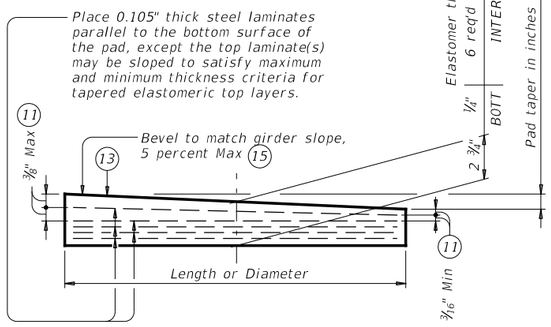


PLANS (10)



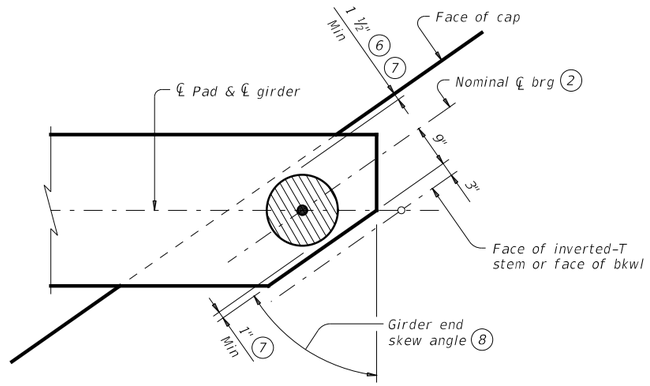
ELEVATION

LAMINATED ELASTOMERIC BEARING PAD

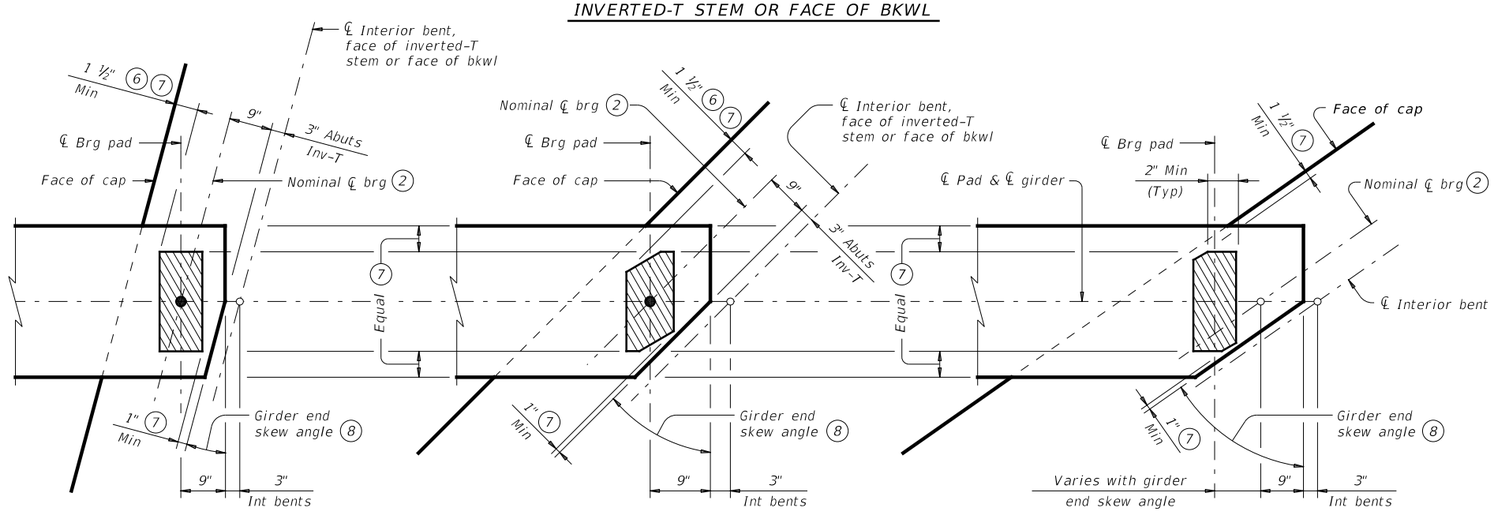
(50 DUROMETER)

TABLE OF MINIMUM SUBSTRUCTURE DIMENSIONS (14)			
Girder Type	Abutments	Int Bents	Inv-T Bents
	Face of Bkwl to Face of Cap	Overall Cap Width	Corbel Width
Tx28 thru Tx54	1'-9"	3'-6"	1'-10 ½"
Tx62 & Tx70	2'-0"	4'-0"	2'-1 ½"

TABLE OF BEARING PAD DIMENSIONS						
Bent Type	Girder Type	Bearing Type (13)	Girder End Skew Angle Range	Pad Size Lgth x Wdth	Pad Clip Dimensions "A"	Pad Clip Dimensions "B"
ABUTMENTS, INVERTED-T AND TRANSITION BENTS WITH BACKWALLS	Tx28,Tx34, Tx40,Tx46 & Tx54	G-1-"N"	0° thru 21°	8" x 21"	---	---
		G-2-"N"	21°+ thru 30°	8" x 21"	1 ½"	2 ½"
		G-3-"N"	30°+ thru 45°	9" x 21"	4 ½"	4 ½"
		G-4-"N"	45°+ thru 60°	15" Dia	---	---
	Tx62 & Tx70	G-5-"N"	0° thru 21°	9" x 21"	---	---
		G-6-"N"	21°+ thru 30°	9" x 21"	1 ½"	2 ½"
		G-7-"N"	30°+ thru 45°	10" x 21"	4 ½"	4 ½"
		G-8-"N"	45°+ thru 60°	10" x 21"	7 ¼"	4 ¼"
CONVENTIONAL INTERIOR BENTS	Tx28,Tx34, Tx40,Tx46 & Tx54	---	---	---	---	---
		---	---	---	---	---
		G-1-"N"	0° thru 60°	8" x 21"	---	---
	Tx62 & Tx70	G-5-"N"	0° thru 60°	9" x 21"	---	---
CONVENTIONAL INTERIOR BENTS WITH SKEWED GIRDER ENDS (GIRDER CONFLICTS) (16)	Tx28,Tx34, Tx40,Tx46 & Tx54	G-1-"N"	0° thru 18°	8" x 21"	---	---
		G-2-"N"	18°+ thru 30°	8" x 21"	1 ½"	2 ½"
		G-9-"N"	30°+ thru 45°	8" x 21"	3"	3"
		G-10-"N"	45°+ thru 60°	9" x 21"	6"	3 ½"
	Tx62 & Tx70	G-5-"N"	0° thru 18°	9" x 21"	---	---
		G-5-"N"	18°+ thru 30°	9" x 21"	---	---
		G-11-"N"	30°+ thru 45°	9" x 21"	1 ½"	1 ½"
		G-12-"N"	45°+ thru 60°	9" x 21"	3"	1 ¾"



ROUND BEARINGS FOR SKEWED GIRDER ENDS AT FACE OF INVERTED-T STEM OR FACE OF BKWL



SKEWED GIRDER ENDS AT INT BENTS, FACE OF INVERTED-T STEM OR FACE OF BKWL

SKEWED GIRDER ENDS AT CONVENTIONAL INTERIOR BENTS (16)

(NO GIRDER DOWELS)

BEARING PAD PLACEMENT DIAGRAMS

(2) For purposes of computing bearing seat elevations, nominal centerline of bearing must be defined as shown. The actual center of bearing pad may vary from this line.

(6) 3" for inverted-T.

(7) Place centerline pad as near nominal centerline bearing as possible between limits shown.

(8) Girder end skew angle is equal to 90° minus the girder angle except at some conflicting girders.

(9) Provide 2" dia hole only at locations required. See Substructure details for location.

(10) See Table of Bearing Pad Dimensions for dimensions.

(11) Maximum and minimum layer thicknesses shown are for elastomer only, on tapered layers.

(12) Locate Permanent Mark here.

(13) Indicate BEARING TYPE on all pads. For tapered pads, locate BEARING TYPE on the high side. The Fabricator must include the value of "N" (amount of taper in ⅛" increments) in this mark.
Examples: N=0, (for 0" taper)
N=1, (for ⅛" taper)
N=2, (for ¼" taper)
(etc.)
Fabricated pad top surface slope must not vary from plan girder slope by more than $\left(\frac{0.0625"}{\text{Length or Dia}}\right)$ IN/IN.

(14) Substructure dimensions must satisfy the minimums provided to accommodate the elastomeric bearings shown on this standard.

(15) See sheet 3 of 3 for beveled plate use when slopes exceed 5 percent.

(16) If girder end is skewed for a girder conflict at an interior bent and a beveled sole plate is required, use bearing type for abutments at this location. Location of bearing centerline is to be set as for abutments in this case.

HL93 LOADING SHEET 2 OF 3

Texas Department of Transportation

Bridge Division Standard

ELASTOMERIC BEARING AND GIRDER END DETAILS

PRESTR CONCRETE I-GIRDERS

IGEB

FILE: igebsts1-17.dgn	DN: AEE	CK: JMH	DW: JTR	CK: TxDOT
©TxDOT August 2017 REVISIONS	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
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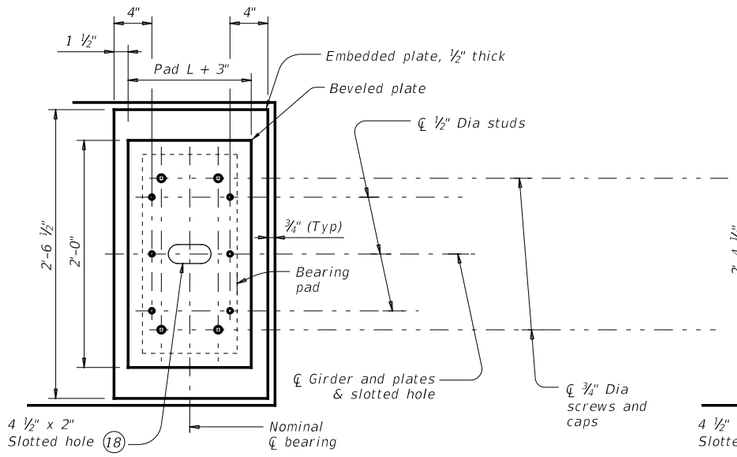
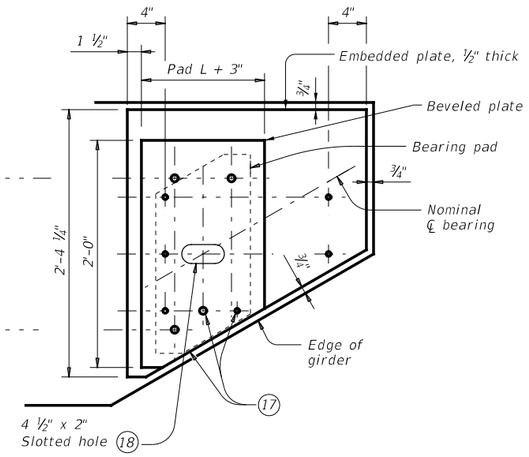
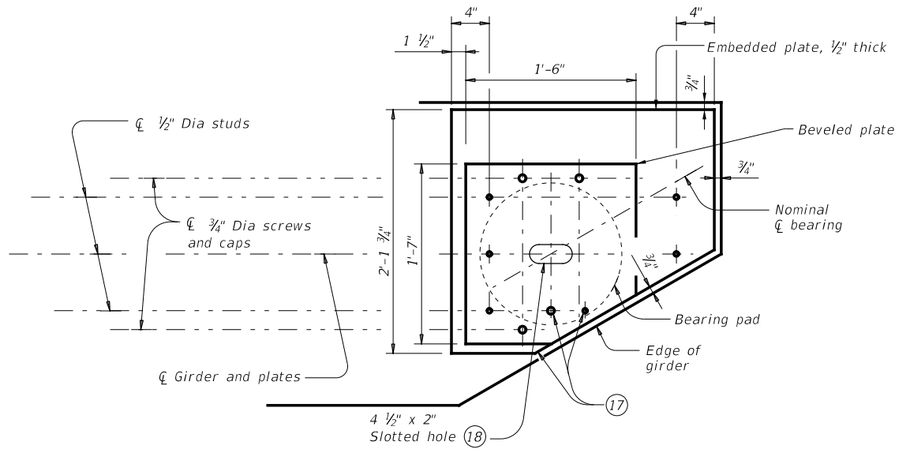


NORMAL GIRDER END
RECTANGULAR BEARING PAD

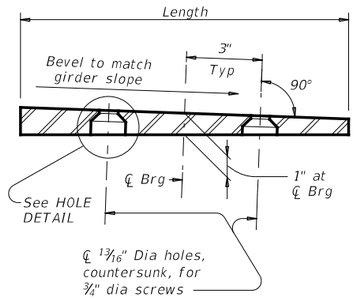


SKEWED GIRDER END
CLIPPED RECTANGULAR BEARING PAD

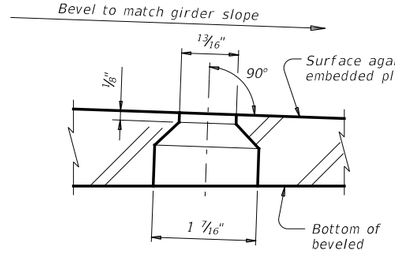


SKEWED GIRDER END
15" DIA BEARING PAD

PLAN VIEW OF SOLE PLATE DETAILS

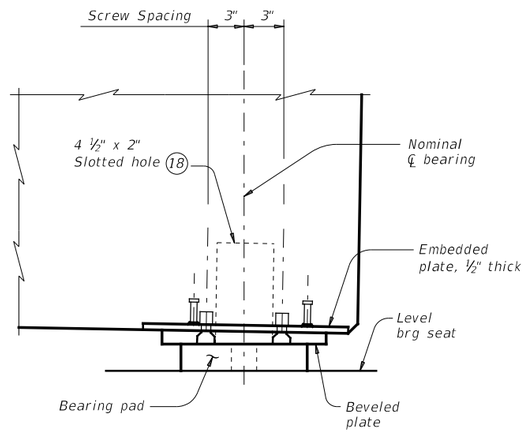


SECTION

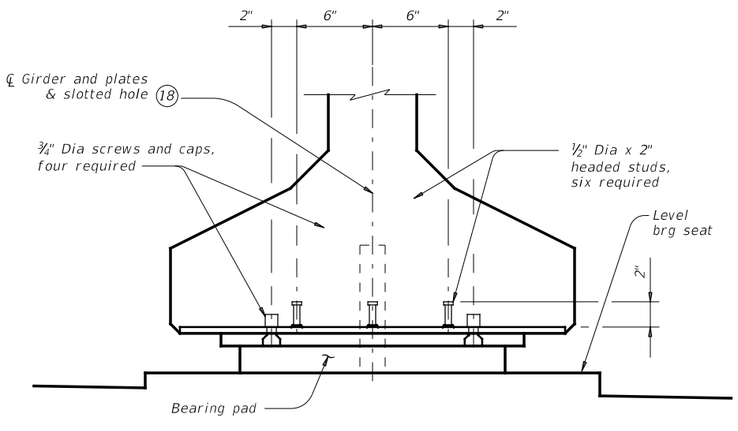


HOLE DETAIL

BEVELED PLATE DETAILS



SIDE ELEVATION



END ELEVATION
Showing normal girder end.

GIRDER DETAILS

(17) Cut beveled and embedded plates to match girder end skew. Adjust location of screw and stud as shown when necessary.

(18) Slotted hole is required at doweled girder end locations.

SOLE PLATE NOTES:

Provide constant thickness elastomeric bearings with beveled and embedded steel sole plates in accordance with these details when the girder slope exceeds 5 percent or if otherwise required in the plans. Provide for all girders in the span.

On the shop drawings, dimension sole plates to the nearest 1/16" based on required thickness at centerline of bearing and slope of girder. Thickness tolerance variation from the approved shop drawings is 1/16"+/-, except variation from a plane parallel to the theoretical top surface can not exceed 1/16" total. Bearing surface tolerances listed in Item 424 apply to embedded and beveled plates.

Steel plate must conform to ASTM A36, A572 Gr 50, or A709 Gr 36 or Gr 50. Hot dip galvanize both the embedded plate and beveled sole plate after fabrication. Seal weld caps to embedded plate before galvanizing.

When determining if relocation of screw holes and studs are necessary for skewed girder ends, minimum clearance from screw or stud centerline to plate edge is 1.25".

Tap threads in the embedded plate only. Drill and tap prior to galvanizing.

¾" Dia screws must be electroplated, socket flat head countersunk cap screws conforming to ASTM F835. Electroplating must conform to ASTM B633, SC 2, Type I. Provide screws long enough to maintain a ¾" minimum embedment into the embedded plate and galvanized cap. Provide galvanized steel caps (16 ga Min) with a nominal 1" inside diameter and deep enough to accommodate the screws, but not less than ½" deep or deeper than 1".

Install beveled sole plates prior to shipping girders. Installed screw heads must not protrude below the bottom of the beveled plate.

HL93 LOADING SHEET 3 OF 3

Texas Department of Transportation | Bridge Division Standard

ELASTOMERIC BEARING AND GIRDER END DETAILS
PRESTR CONCRETE I-GIRDERS

IGEB

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©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
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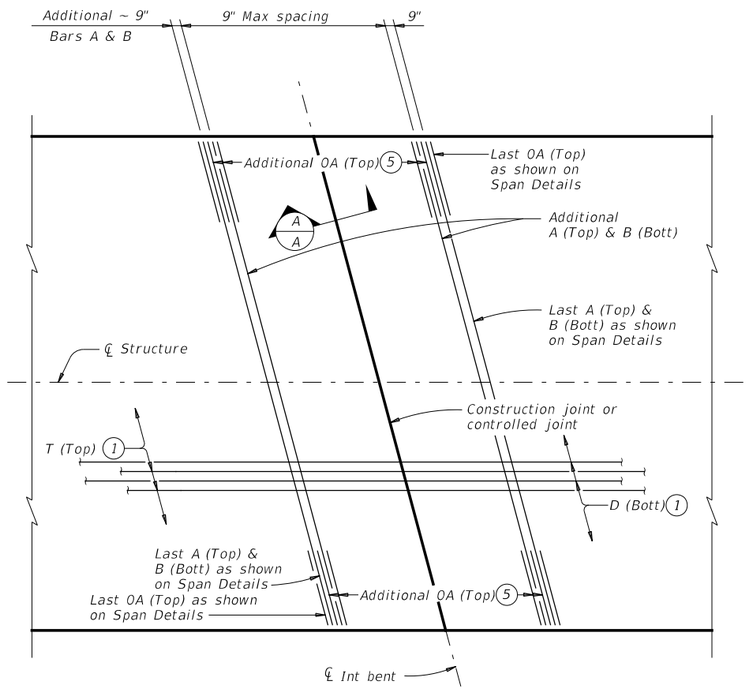
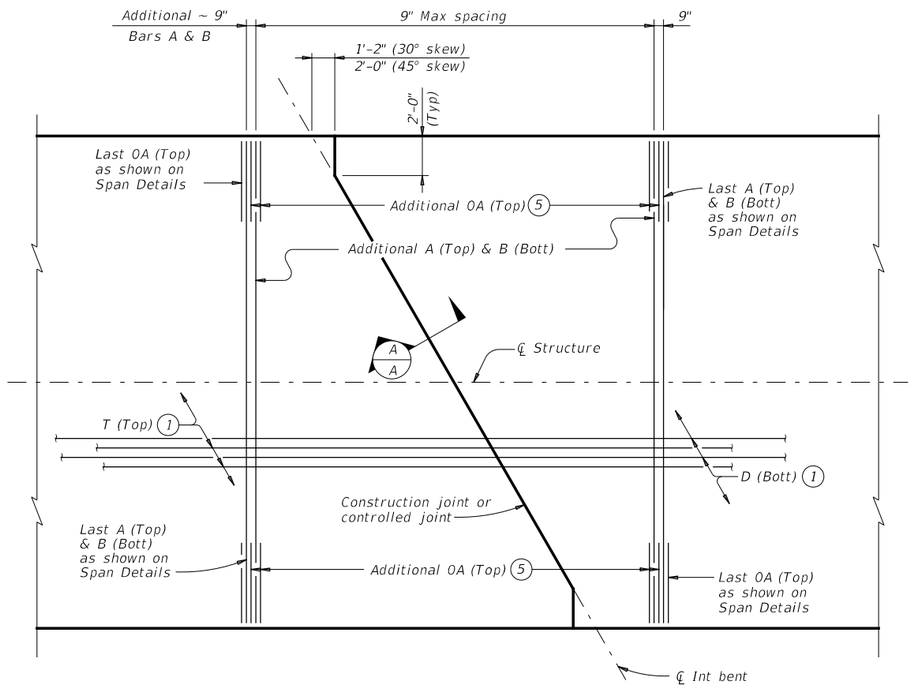


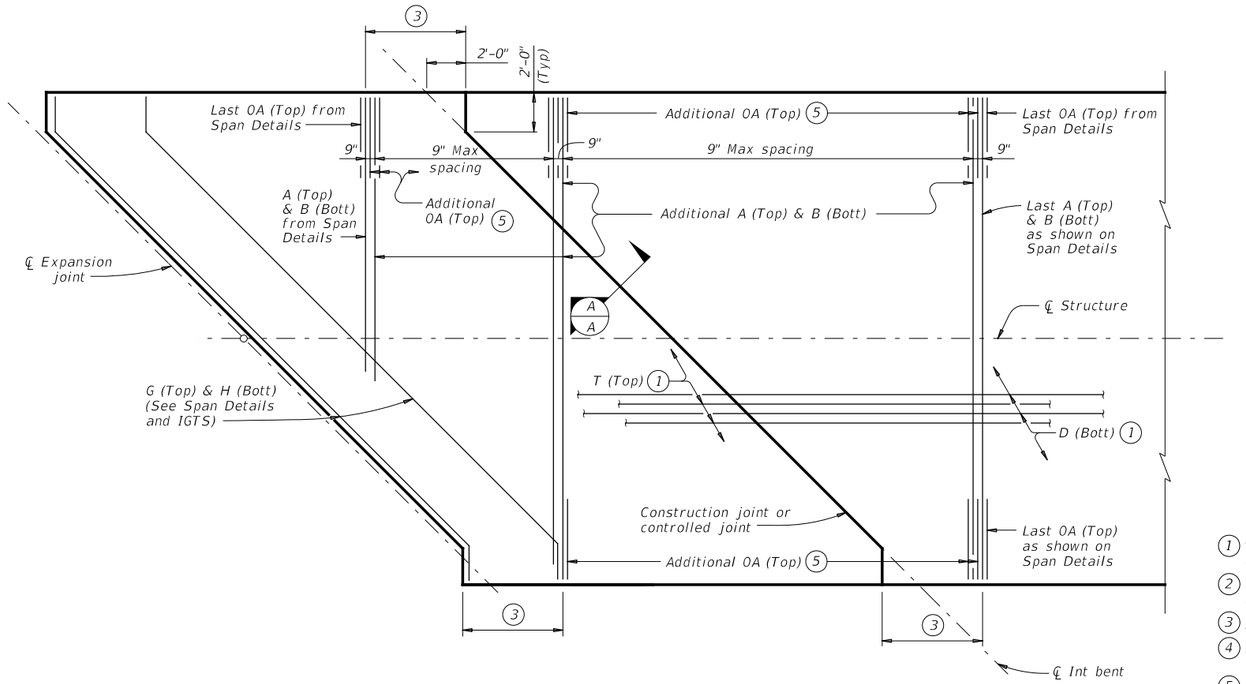
PLAN FOR 0° OR 15° SKEW

(Showing 15° skew)



PLAN FOR 30° OR 45° SKEW

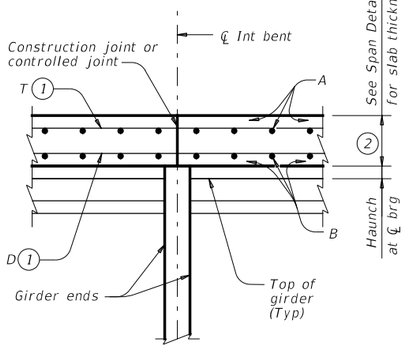
(Showing 30° skew)



PLAN FOR 45° SKEW (4)

(Showing short span condition.)

BARS OA (#5)



SECTION A-A

Bars 0A (Top) not shown for clarity.

1. Top and bottom mats must be continuous through joint.
2. Maintain a constant slab thickness over the bent.
3. 5'-4" as shown on Span Details.
4. Use these details when no full slab width bars A and B are shown on Span Details.
5. Bars 0A (Top) at 9" Max spacing between Bars A (Top).
6. Values in table assume a temperature change of 70° F after erection when calculating thermal movement in one direction (not total).

TABLE OF (6) ALLOWABLE UNIT LENGTH

Max Rdwy Grade, Percent	Unit Length Factor
0.00	4.1
1.00	3.9
2.00	3.7
3.00	3.5
4.00	3.3
5.00	3.1

Unit length must not exceed the length of the shortest end span times the Unit Length Factor shown in table or 400', whichever is less.

BAR TABLE

BAR	SIZE
A	#4
B	#4
D	#4
T	#4
0A	#5

The details shown on this sheet are applicable for two and three span units comprised of the same girder type.
Units may be comprised of different span lengths. See "Table of Allowable Unit Length".

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

This standard is drawn showing right forward skew. See Bridge Layout for actual skew direction.

CONSTRUCTION NOTES:

Where multi-span units are indicated on the Bridge Layout, the thickened slab end details and reinforcement shown on IGTS standard (Bars AA, G, H, J, K, and M) and on the Span Details will be omitted where slabs are continuous over interior bents. At these locations, the slab details and reinforcement will be as shown on this sheet or on PCP standard (if using this option).

Thickened slab end reinforcement and details still apply at expansion joint locations (ends of units).

See Span Details for remainder of slab reinforcement and details.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.

Provide Class "S" concrete (f'c = 4,000 psi). Provide Class "S" (HPC) if shown elsewhere on the plans.

Provide bar laps, where required, as follows:
Uncoated ~ #4 = 1'-7"
Epoxy Coated ~ #4 = 2'-5"

The details shown on this sheet are applicable for use only with the Prestressed Concrete I-Girder Standard Designs shown on standards IGSD-24, IGSD-28, IGSD-30, IGSD-32, IGSD-38, IGSD-40 and IGSD-44.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

CONTINUOUS SLAB DETAILS

PRESTR CONC I-GIRDER SPANS

IGCS

FILE: igcs1sts-19.dgn	DN: JMH	CK: TxDOT	DW: JTR	CK: TxDOT
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
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10-19: Added bubble note 6.	DIST	COUNTY		SHEET NO.
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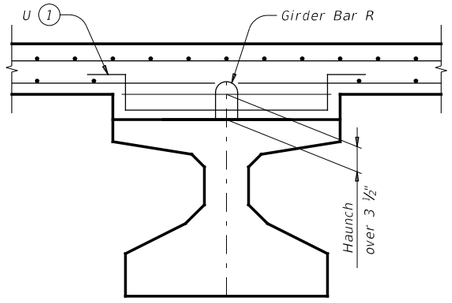
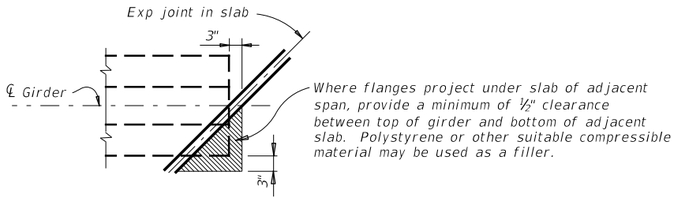
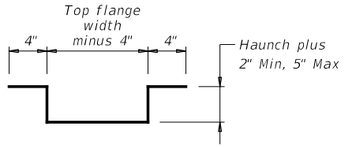


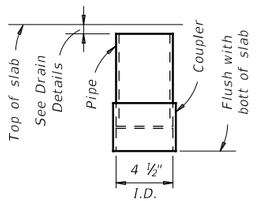
HAUNCH REINFORCING DETAIL



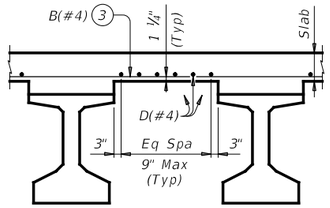
TREATMENT AT GIRDER END FOR SKEWED SPANS



BARS U (#4)

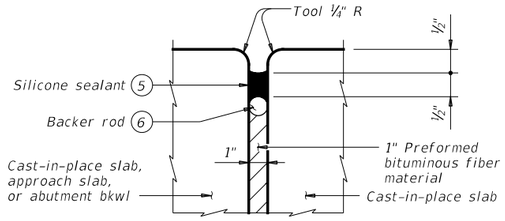


C-I-P DRAIN DETAIL (2)

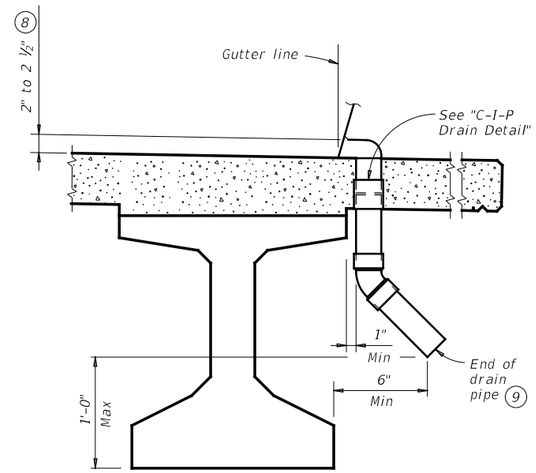


TYPICAL PART TRANSVERSE SLAB SECTION WITHOUT PCP (4)

Top reinforcing steel not shown for clarity.



TYPE A JOINT DETAIL (7)



DRAIN DETAIL (10)

(1) Space Bars U with girder Bars R in all areas where measured haunch exceeds 3 ½".

(2) Roughen outside of PVC with coarse rasp or equal to ensure bond with cast-in-place concrete.

(3) Bars B(#4) spaced at 9" Max with 2" end cover. Overhang option, Contractor's may end alternating bars B(#4) at centerline outside girder.

(4) Provide Grade 60 reinforcing steel. Provide bar laps, where required, as follows:
Uncoated ~ #4 = 1'-7"
Epoxy coated ~ #4 = 2'-5"

(5) Class 7 silicone sealant that conforms to DMS-6310. Install when ambient temperature is between 55°F and 85°F and rising. Engineer to determine allowable hours for sealant application.

(6) 1 ¼" backer rod must be compatible with joint sealant. Use of multiple pieces to create a backer rod cross section is not permitted. Top of backer rod must be convex as shown.

(7) The maximum distance between Type A expansion joints is 100'. See Bridge Layout for location of joints.

(8) Drain entrance formed in rail or sidewalk.

(9) Water may not be discharged onto girders.

(10) All drain pipe and fittings to be 4" diameter (Sch 40) PVC. See Item 481 "Pipe for Drains" for pipe, connections and solvent welding. Bend reinforcing steel to clear PVC 1". Drain length and location is as directed by the Engineer. Drains are not permitted over roadways or railways, or within 10'-0" of bent caps. Degrease outside of exposed PVC, apply acrylic water base primer, then coat with same surface finishing material as used for outside girder face. Variations of the above designs, as required for the type of rail used and its location on the structure, may be installed with the approval and direction of the Engineer.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

Payment for Type A joint will be as per Item 454, "Bridge Expansion Joints."

All other items (reinforcing steel, drains, etc.) shown on this sheet are subsidiary to other bid items.

Cover dimensions are clear dimensions, unless noted otherwise.

Reinforcing bar dimensions shown are out-to-out of bar.

DECK FORMWORK NOTES:

Overhang bracket hangers are limited to a safe working load of 3,600 lbs, applied to and along the axis of a coil rod at 45 degrees from vertical, regardless of higher loads permitted by hanger manufacturers. Do not place a hanger less than 12" from girder end. Space hangers accordingly.

Texas Department of Transportation

Bridge Division Standard

MISCELLANEOUS SLAB DETAILS

PRESTR CONCRETE I-GIRDERS

IGMS

FILE: igmssts1-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TxDOT
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	33	068,ETC	RSL
10-19: Modified Note 7. Type A now a pay item.	DIST	COUNTY		SHEET NO.
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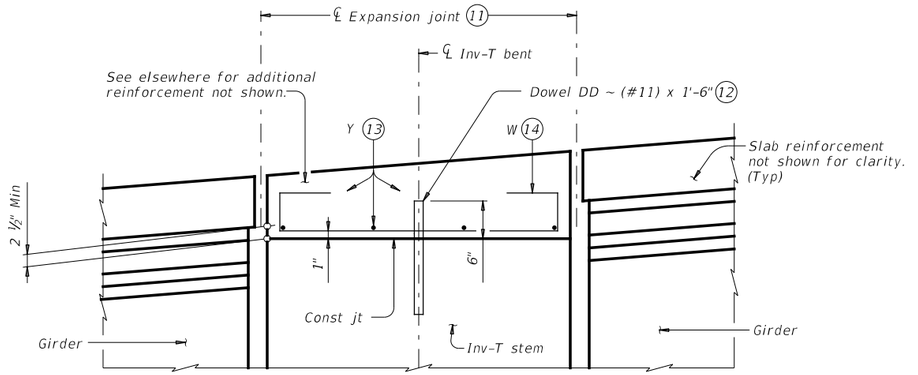
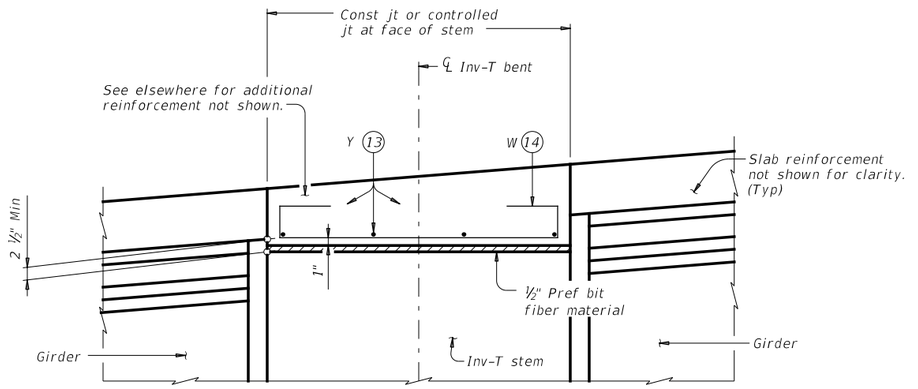
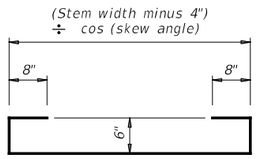


SHOWING EXPANSION JOINTS

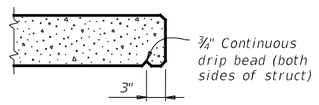


SHOWING CONST JTS OR CONTROLLED JTS

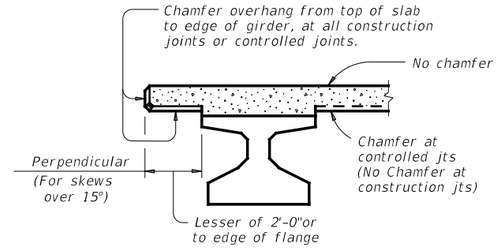
REINFORCEMENT OVER INV-T BENTS



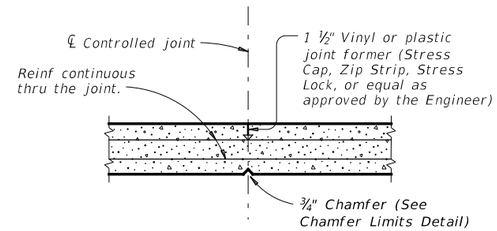
BARS W (#4)



DRIP BEAD DETAIL



CHAMFER LIMITS DETAIL (15)



CONTROLLED JOINT DETAIL

(Saw-cutting is not allowed)

(11) See Layout for joint type.

(12) Dowels DD (#11) spaced at 5 Ft Max. See Inv-T bents for quantity and location.

(13) Space Bars Y (#4) at 12" Max. Use 2" end cover. Number of Bars Y must satisfy spacing limit. Place parallel to bent.

(14) Space Bars W at 12" Max (3" from end of cap). Tilt if necessary to maintain cover requirements. Place parallel to longitudinal slab reinforcement.

(15) See Span details for type of joint and joint locations.

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SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

MISCELLANEOUS SLAB DETAILS

PRESTR CONCRETE I-GIRDERS

IGMS

FILE: igmsstS1-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TxDOT
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
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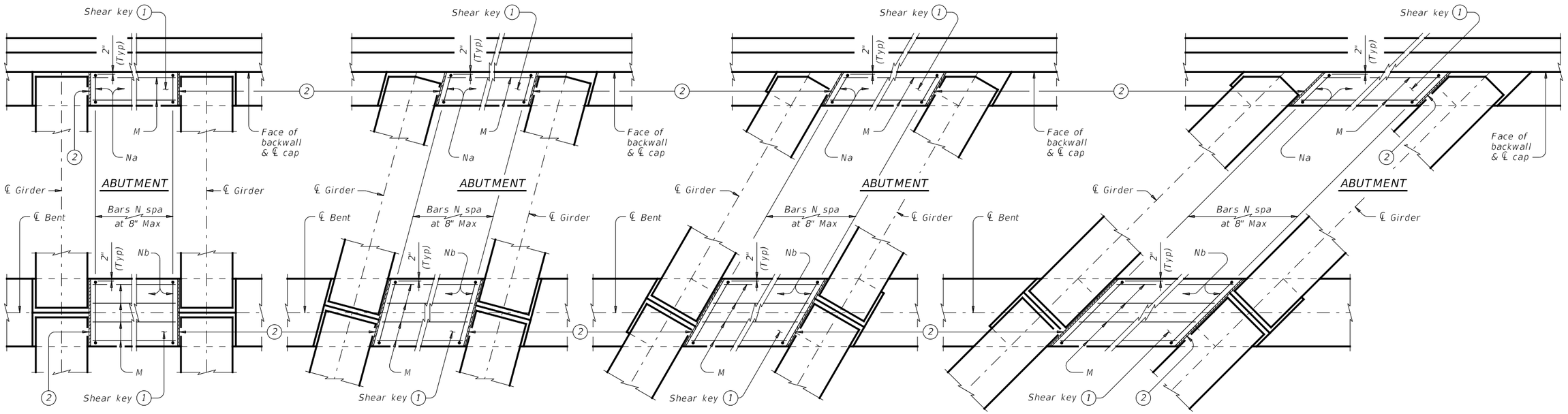


INTERIOR BENT

PARTIAL PLANS WITH NO SKEW

Showing shear keys on 3'-6" wide caps. 4'-0" caps similar.

INTERIOR BENT

PARTIAL PLANS WITH 15° SKEW

Showing shear keys on 3'-6" wide caps. 4'-0" caps similar.

INTERIOR BENT

PARTIAL PLANS WITH 30° SKEW

Showing shear keys on 3'-6" wide caps. 4'-0" caps similar.

INTERIOR BENT

PARTIAL PLANS WITH 45° SKEW

Showing shear keys on 3'-6" wide caps. 4'-0" caps similar.

(1) Place shear keys on the upstream side of structure between outside girder and next adjacent girder, unless shown otherwise on plans.

(2) UHMW polyethylene wear pad. (Typ)

(3) Leave a ¼" gap plus or minus between girder and face of wear pad. Cast wear pad with shear key, smooth side facing girder. Care must be taken to keep concrete from flowing under girder. Slope top of shear keys in accordance with Item 420.4.9, "Treatment and Finishing of Horizontal Surfaces."

(4) Measure at higher bearing seat elevation forward or back. Dimension based on typical bearing pad and bearing seat. Increase as necessary to maintain 5" overlap.

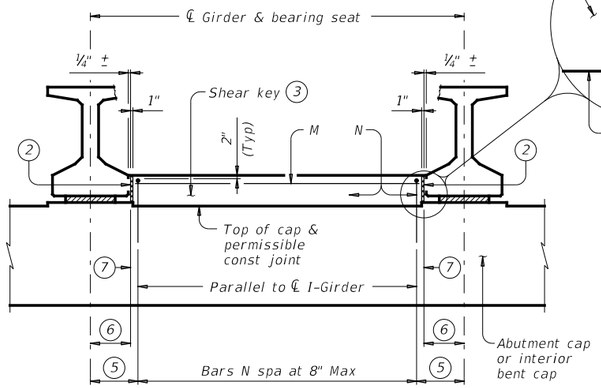
(5) With No Skew = 1'-8 ¼", measured along ℄ cap.
With Skew = 1'-8 ¼" ✣ Cos Skew, measured along ℄ cap.

(6) With No Skew = 1'-4 ¼", measured along ℄ cap.
With Skew = 1'-4 ¼" ✣ Cos Skew, measured along ℄ cap.

(7) Face of UHMW polyethylene wear pad. Smooth side of pad facing girder.

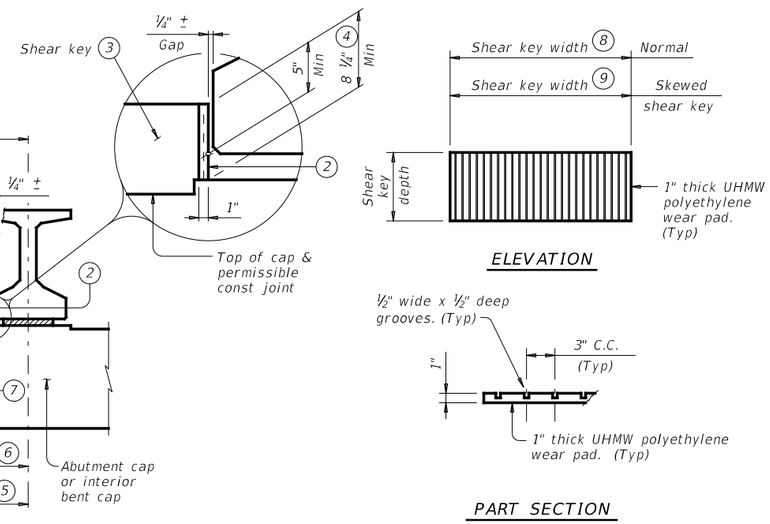
(8) Abutments = ½ Cap width.
Interior bents = Cap width.

(9) Abutments = ½ Cap width ✣ Cos Skew.
Interior bents = Cap width ✣ Cos Skew.

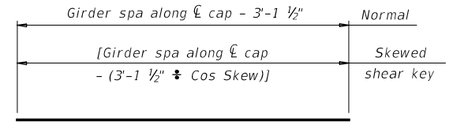


PARTIAL ELEVATION OF ABUTMENT OR INTERIOR BENT CAP (1)

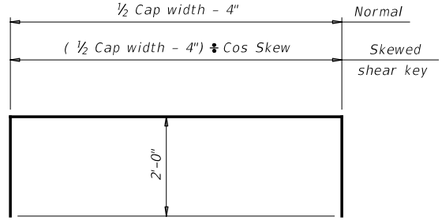
Showing shear key with girder Type Tx46. Other I-Girder types similar.



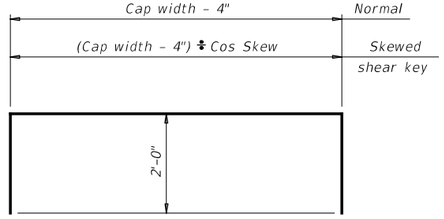
ULTRA HIGH MOLECULAR WEIGHT (UHMW) POLYETHYLENE WEAR PAD DETAILS



BARS M (#5)



BARS Na (#5)
(For abutments)



BARS Nb (#5)
(For interior bents)

CONSTRUCTION NOTES:

Provide Class "C" concrete (f'c = 3,600 psi). Provide Class "C" (HPC) if shown elsewhere on the plans.
Provide Grade 60 reinforcing steel.
Provide epoxy coated reinforcing steel for shear key if abutment or interior bent reinforcing steel is epoxy coated.
Provide Ultra High Molecular Weight (UHMW) polyethylene wear pads in accordance with ASTM D6712.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
Details showing skew are drawn showing right forward skew. See Bridge Layout for actual skew direction.
These details are limited to bridges skewed 45 degrees and less.
This standard is only applicable for I-Girders.
Modify details for bearing conditions, and girder spacing not shown on this standard. Details do not account for sole plate or pedestal bearing seat.
Include shear key concrete in abutment or bent concrete for payment.
UHMW polyethylene wear pads are subsidiary to Class "C" concrete.

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

Texas Department of Transportation

Bridge Division Standard

SHEAR KEY DETAILS
PRESTR CONCRETE I-GIRDERS

IGSK

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©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
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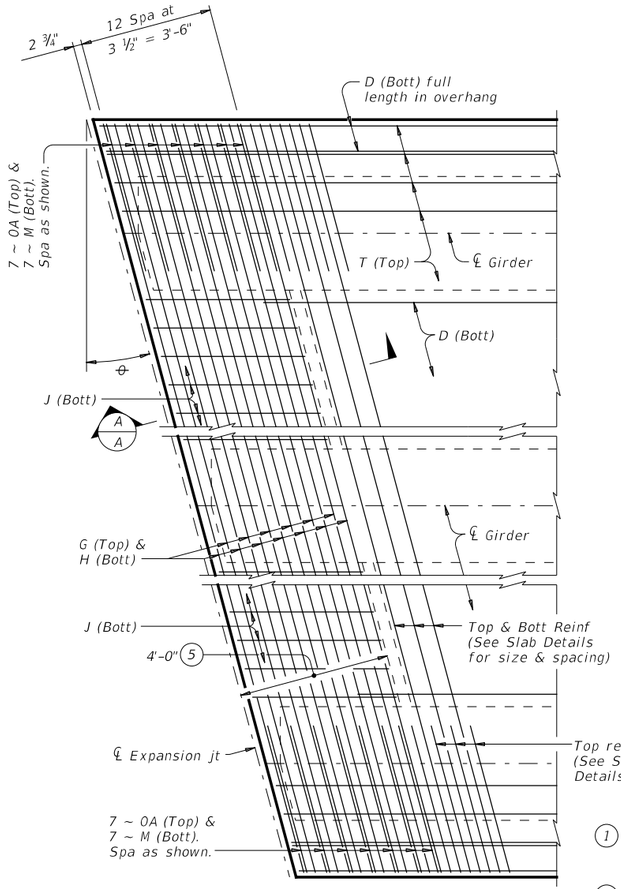
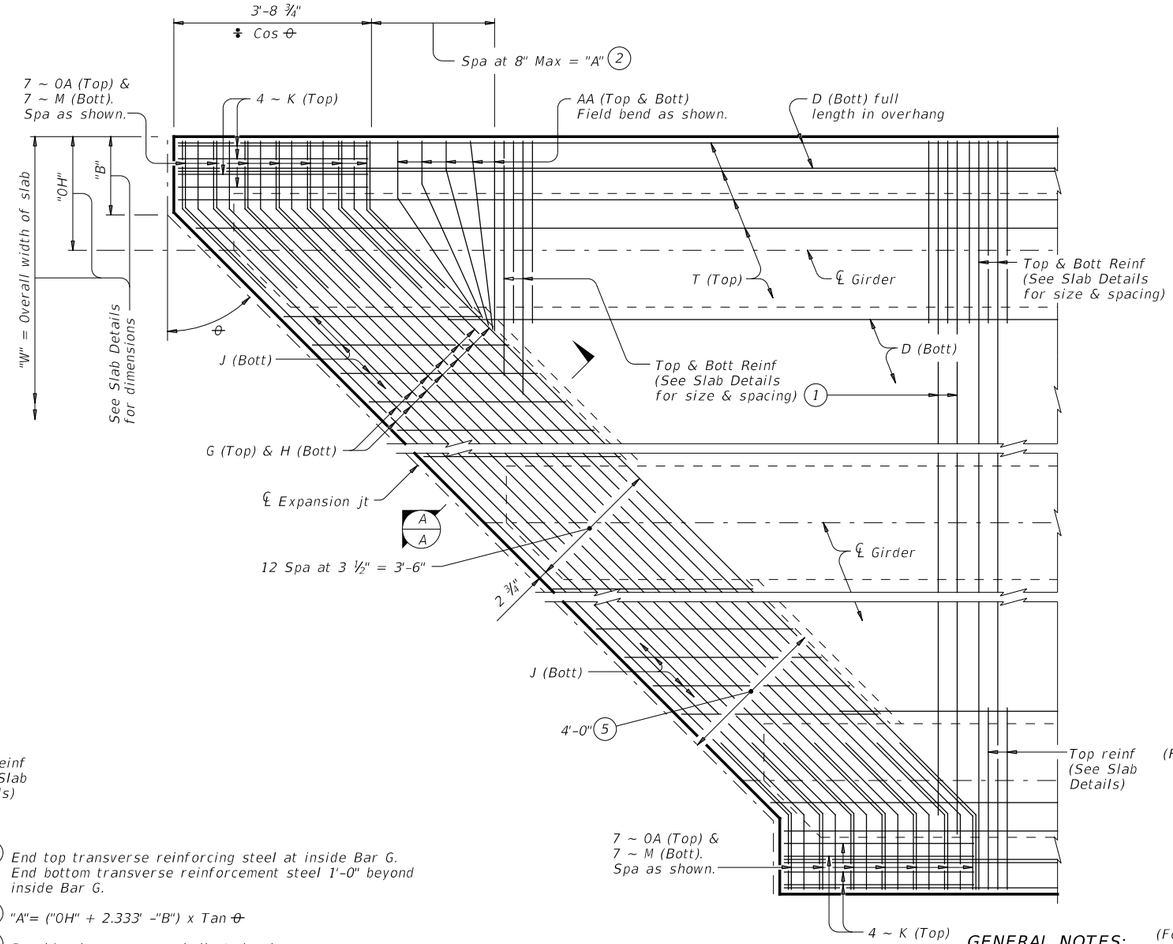
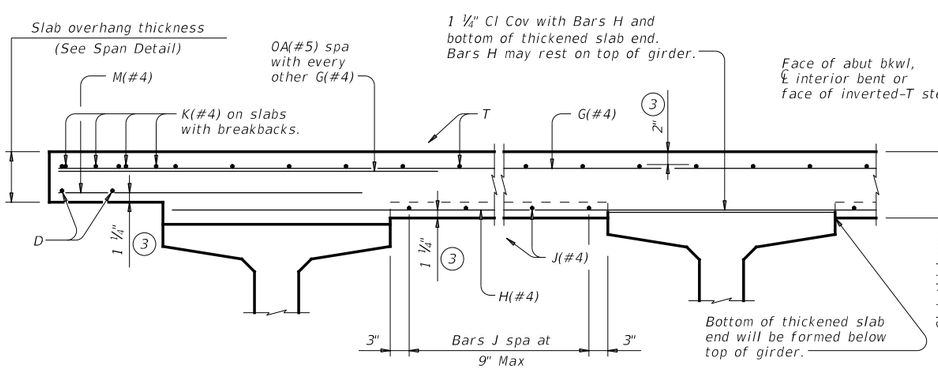


PARTIAL PLAN FOR SLABS WITHOUT BREAKBACK



PARTIAL PLAN FOR SLABS WITH BREAKBACK

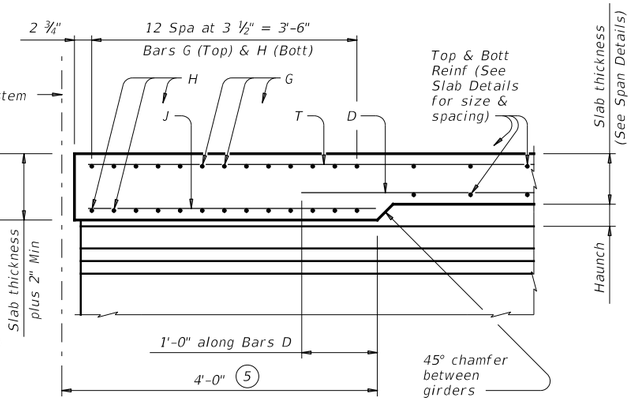
1. End top transverse reinforcing steel at inside Bar G. End bottom transverse reinforcement steel 1'-0" beyond inside Bar G.
2. "A"= ("0H" + 2.333' -"B") x Tan θ
3. Provide clear cover as indicated unless otherwise shown on Span Details.
4. Only required on slabs with breakbacks.
5. Thickened slab end dimensioned perpendicular to face of bkwl, centerline interior bent or face of inverted-T stem.



2" AND MORE OF HAUNCH — LESS THAN 2" OF HAUNCH

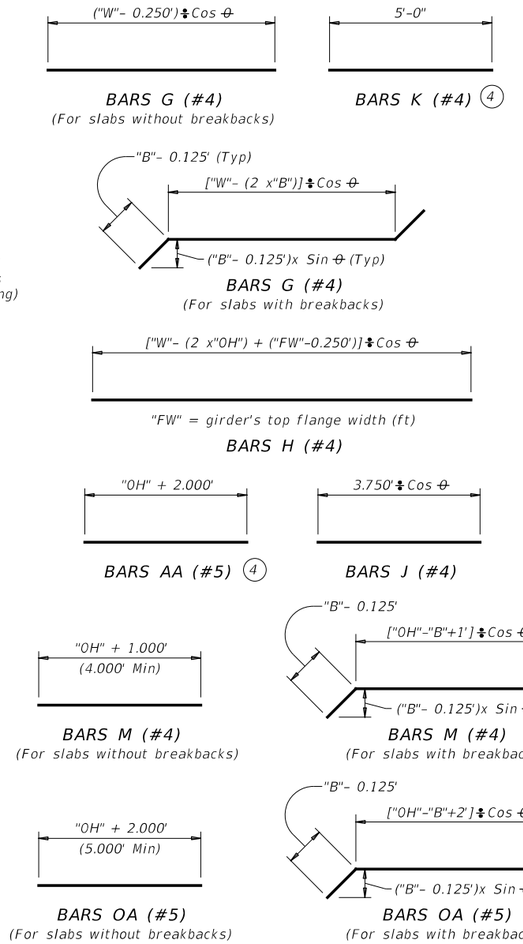
TYPICAL TRANSVERSE SECTION

(Showing Prestressed Conc I-Girders at ℄ Brg)



SECTION A-A

(Showing with 2" and more of haunch)



GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
These details are restricted to Prestressed Concrete I-Girder Spans.
These details are to be used in conjunction with the Span Details and PCP standard (if prestressed concrete panels are used).
When Option 2 from PCP standard is used, provide Bars AA, G, K and 0A in the slab.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
If slab reinforcing steel is shown on the Slab Details to be epoxy coated, then Bars AA, G, K, H, J, M and 0A must be epoxy coated.
Provide bar laps, where required, as follows:
Uncoated ~ #4 = 1'-7"
Epoxy Coated ~ #4 = 2'-5"

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

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

THICKENED SLAB END DETAILS

PRESTRESSED CONCRETE I-GIRDER SPANS

IGTS

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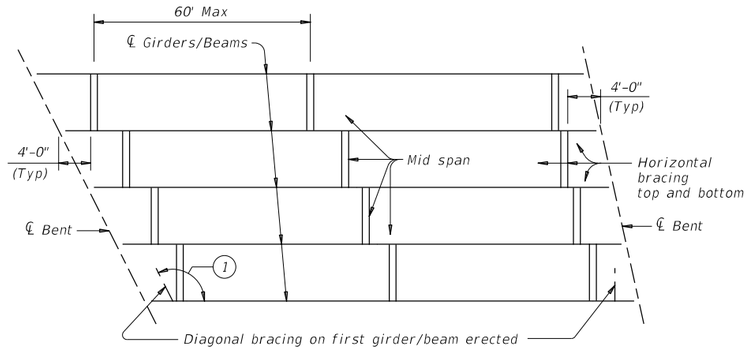
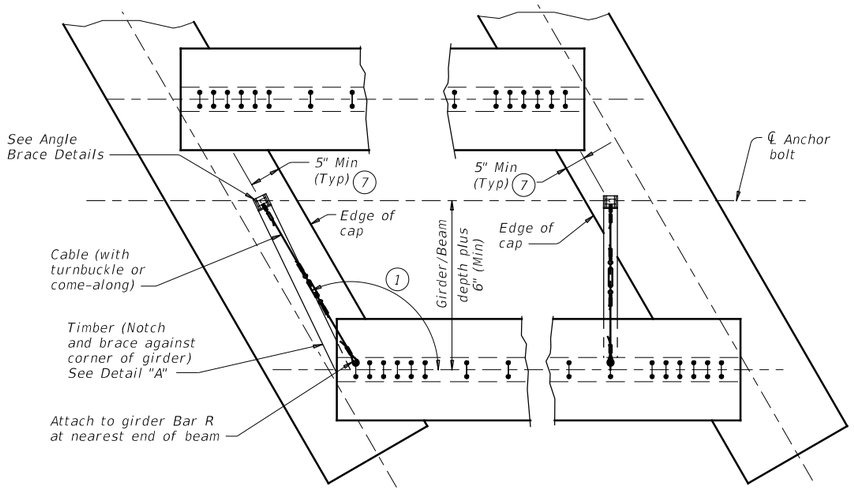
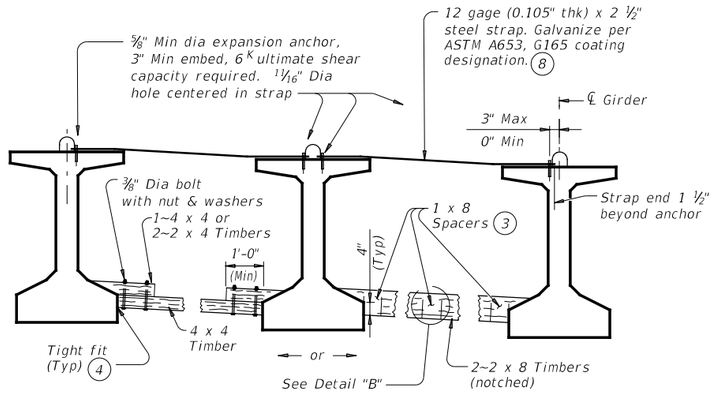


ERECTION BRACING

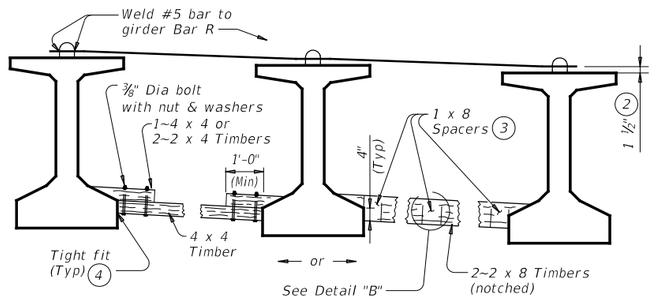


PLAN



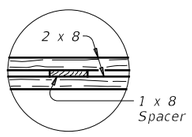
FOR ERECTION BRACING, OPTION 1

(This option is not allowed when slab is formed with PMDF or plywood.)



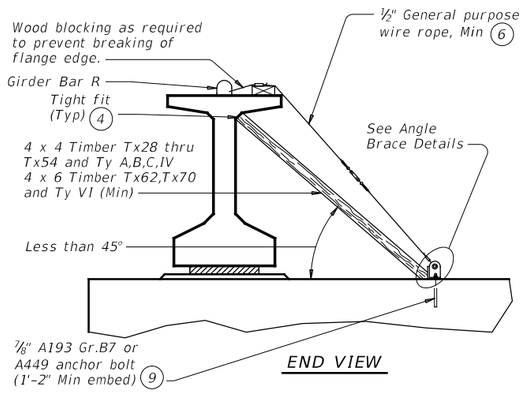
FOR ERECTION BRACING, OPTION 2

HORIZONTAL BRACING DETAILS 5



PLAN

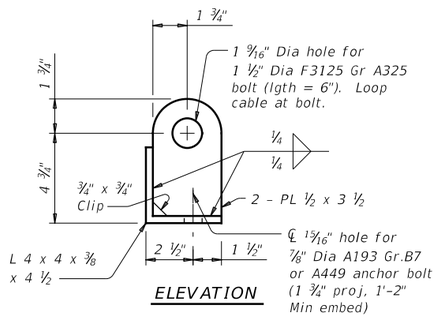
DETAIL "B"



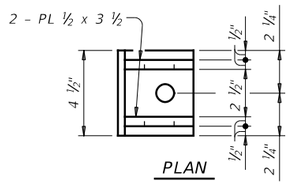
END VIEW

DIAGONAL BRACING DETAILS 5

(To be used on both ends of the first girder/beam erected in the span in each phase.)



ELEVATION



PLAN

ANGLE BRACE DETAILS

HAULING & ERECTION:

The Contractor's attention is directed to the possible lateral instability of prestressed concrete girders and beams over 130' long, especially during hauling and erection. The use of the following methods to improve stability is encouraged: Locate lifting devices at the maximum practical distance from girder ends; use external lateral stiffening devices during hauling and erection; lift with vertical lines using two machines; and take care in handling to minimize inertial and impact forces.

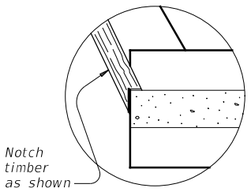
ERECTION BRACING:

Erection bracing details shown are considered the minimum for fulfilling the bracing requirements of Item 425.

Required erection bracing must be placed immediately after erection of each girder and remain in place until additional bracing as required for slab placement is in place. This standard is needed in all cases to meet requirements for Slab Placement Bracing.

PHASED CONSTRUCTION:

Place erection and slab placement bracing for all girders in a phase as shown in these details. For phases after first, also place erection and slab placement bracing between outer girder of completed phase and adjacent girder of current phase. When the phase construction joint is between girders, top bracing can be omitted.



DETAIL "A"

(1) If angle shown exceeds 120 degrees, move diagonal brace to other side of girder/beam and place square to girder/beam. This may prevent exterior girder from being erected first.

(2) Place and weld #5 bars as shown during erection. If forming deck with prestressed panels, bars can be temporarily removed, one at a time, during panel erection. Re-install bar prior to additional panel erection. Bars can rest on panels and be bent down and welded to girder Bars R (See Sheet 2 of 2).

(3) Clear distance between spacers must not exceed 3'. Nail together with 16d nails.

(4) Use wedges as necessary to obtain tight fit. Nail wedges to timbers.

(5) Pressure treated landscape timbers can not be used.

(6) All hardware used with cable must be able to develop a minimum 25 kips breaking strength. Use thimbles at all loops in cable. Install cable clamps with saddles bearing against the live end and U-bolts bearing aginst the dead end.

(7) It is acceptable to tie anchor bolts to cap reinforcement.

(8) Prior to installing, field bend strap to lay flush on both girders' top flange and slope between flange tips.

(9) Anchor bolt may be drilled and epoxied in place. Provide 25k minimum pullout. Core drill hole.

Texas Department of Transportation

Bridge Division Standard

MINIMUM ERECTION AND BRACING REQUIREMENTS
PRESTRESSED CONCRETE I-GIRDERS AND I-BEAMS

MEBR(C)

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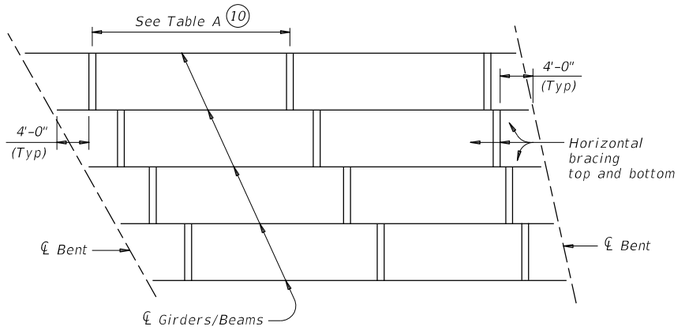


SLAB PLACEMENT BRACING

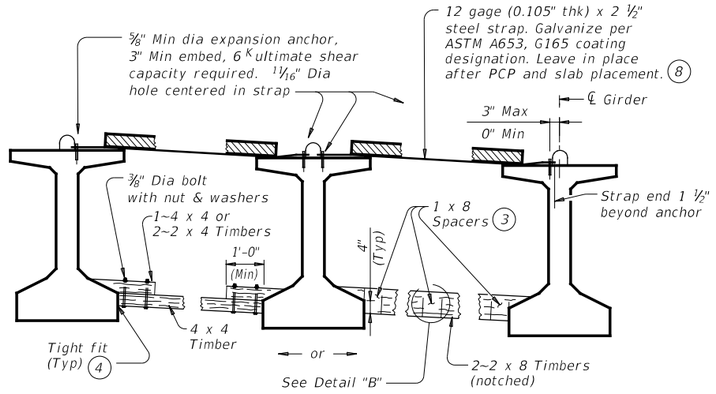
TABLE A

OPTION 1-RIGID BRACING (STEEL STRAP)

Girder or Beam Type	Maximum Bracing Spacing	
	Slab Overhang less than 4'-0" (11)	Slab Overhang 4'-0" and greater (11)
Tx28	¼ points	¼ points
Tx34	¼ points	¼ points
Tx40	¼ points	⅛ points
Tx46	¼ points	⅛ points
Tx54	¼ points	⅛ points
Tx62	¼ points	⅛ points
Tx70	¼ points	⅛ points
A	⅛ points	⅛ points
B	⅛ points	⅛ points
C	⅛ points	⅛ points
IV	¼ points	⅛ points
VI	¼ points	⅛ points

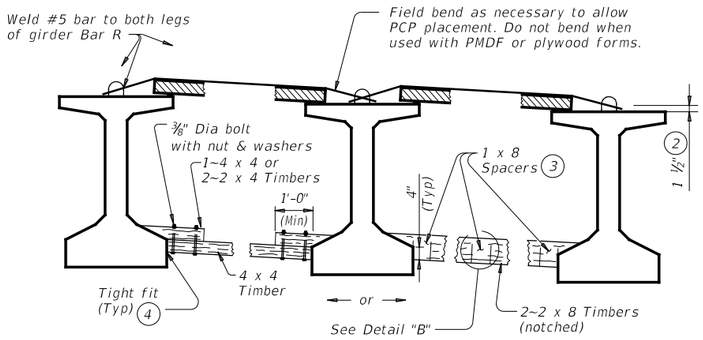
OPTION 2-FLEXIBLE BRACING (NO. 5 OVER PCP)

Girder or Beam Type	Maximum Bracing Spacing	
	Slab Overhang less than 4'-0" (11)	Slab Overhang 4'-0" and greater (11)
Tx28	¼ points	⅛ points
Tx34	¼ points	⅛ points
Tx40	¼ points	⅛ points
Tx46	¼ points	⅛ points
Tx54	¼ points	⅛ points
Tx62	¼ points	⅛ points
Tx70	¼ points	⅛ points
A	2.0 ft	1.5 ft
B	3.0 ft	2.0 ft
C	4.5 ft	2.0 ft
IV	¼ points	4.0 ft
VI	¼ points	4.0 ft



FOR SLAB PLACEMENT BRACING, OPTION 1 - RIGID

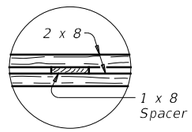
(Showing slab formed with PCP. This option is not allowed when slab is formed with PMDF or plywood.)



FOR SLAB PLACEMENT BRACING, OPTION 2 - FLEXIBLE

(Showing slab formed with PCP.)

HORIZONTAL BRACING DETAILS (5)



PLAN

DETAIL "B"

(2) Place and weld #5 bars as shown during erection. If forming deck with prestressed panels, bars can be temporarily removed, one at a time, during panel erection. Re-install bar prior to additional panel erection. Bars can rest on panels and be bent down and welded to girder Bars R.

(3) Clear distance between spacers must not exceed 3'. Nail together with 16d nails.

(4) Use wedges as necessary to obtain tight fit. Nail wedges to timbers.

(5) Pressure treated landscape timbers can not be used.

(8) Prior to installing, field bend strap to lay flush on both girders' top flange and slope between flange tips.

(10) Bracing spacing (¼ and ⅛ points) measured between first and last typical brace location.

(11) Measure slab overhang from centerline of girder or beam. When overhang varies in span, determine bracing spacing based on largest overhang.

SLAB PLACEMENT BRACING:

The details for slab placement bracing are considered minimum for fulfilling the requirements of Specification Items 422 and 425.

Required slab placement bracing must remain in place until slab concrete has attained a compressive strength of 3000 psi.

GENERAL NOTES:

Bracing details for spans longer than 150' are not provided. The Contractor must submit proposed bracing details for such conditions to the Engineer for approval prior to erection.

Systems equal to or better than those shown may be used provided details of such systems are submitted to and approved by the Engineer prior to erection.

Use of these systems or details does not relieve the Contractor of the responsibility for the adequacy of the bracing and the safety of the structure.

Removal of bracing for short periods of time to align girders and beams is permissible.

All turn-buckles, come-alongs, anchors and other connections must be capable of developing the full strength of the cable shown.

Furnish anchor bolts and nuts in accordance with Item 449, "Anchor Bolts".

Texas Department of Transportation — Bridge Division Standard

MINIMUM ERECTION AND BRACING REQUIREMENTS
PRESTRESSED CONCRETE I-GIRDERS AND I-BEAMS

MEBR(C)

FILE: mebcsts1-17.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	AUS	HAYS		273

DATE: 11/19/2020 4:37:32 PM
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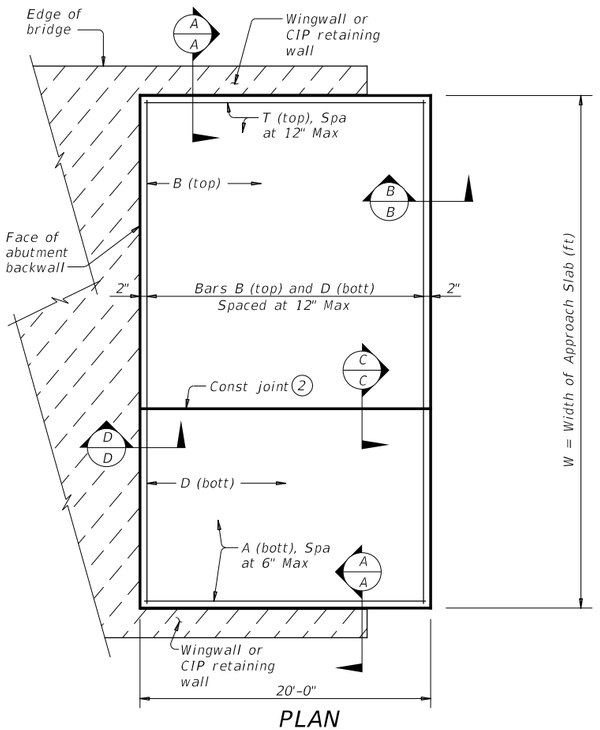
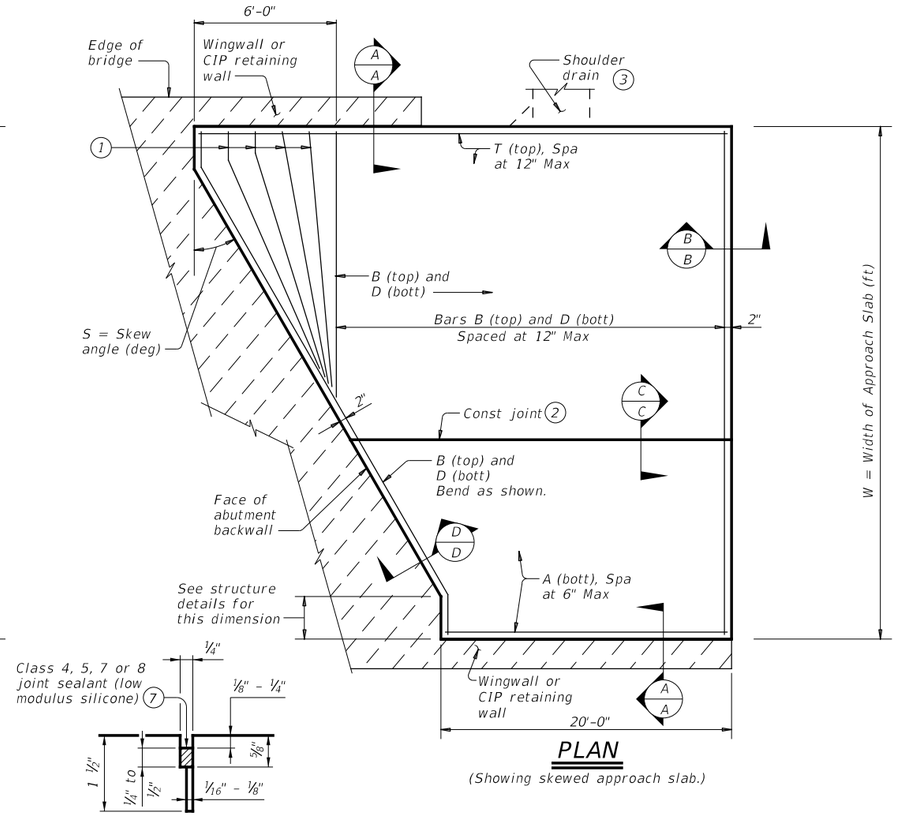


PLAN

(Showing non-skewed approach slab.)



PLAN

(Showing skewed approach slab.)

BAR TABLE

BAR	SIZE
A	#8
B	#5
D	#5
T	#5

APPROXIMATE QUANTITIES (4)

Reinf steel weight = 8.5 Lbs/SF of Approach Slab

Volume of Appr Slab Conc (CY) = $0.802W + 0.02W^2 \tan S$

W = Width of Approach Slab (ft)

S = Skew Angle (deg)

(1) Flare Bars B and D in this region (1'-6" Max Spa, 3" Min Spa). Minimum flared bar length = 2'-6". Bend bars as necessary.

(2) Provide longitudinal construction joints that align with longitudinal construction joints in the bridge slab with bridges built in stages. Other longitudinal construction joints must receive approval of the Engineer.

(3) See details elsewhere in plans for shoulder drain location and details.

(4) For Contractor's information only. Quantities shown are for one approach slab.

(5) Multiple piece tie bars are acceptable at longitudinal construction joints provided minimum laps shown are achieved.

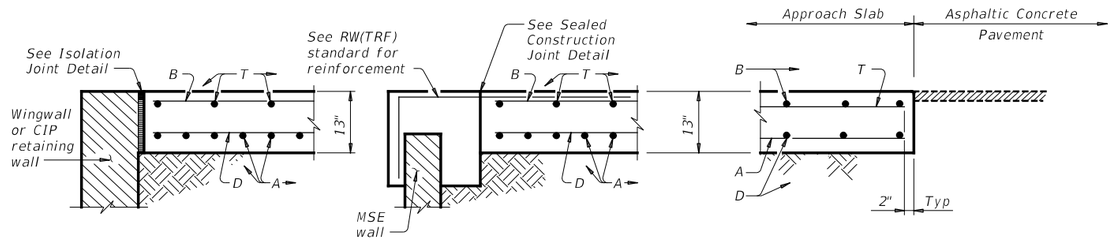
(6) See details elsewhere in plans for required cross-slope.

(7) Place in accordance with Item 438.

(8) Provide backer rod that is 25% larger than joint opening and compatible with the sealant.

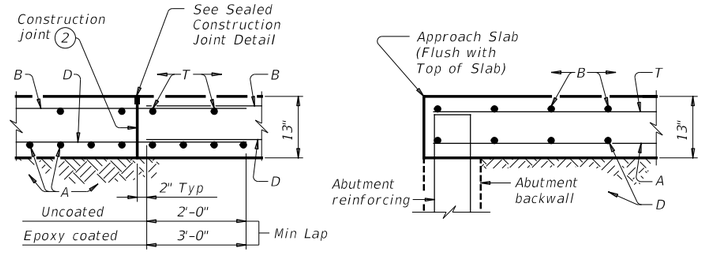
(9) If bridge rail is present at the wingwall or CIP retaining wall, place ½" rebonded recycled tire rubber between concrete railing and top of approach slab as shown when concrete railing projects over the approach slab.

LONGITUDINAL SAW CUT JOINT DETAIL



SHOWING WINGWALL OR CIP RETAINING WALL

SHOWING MSE WALL

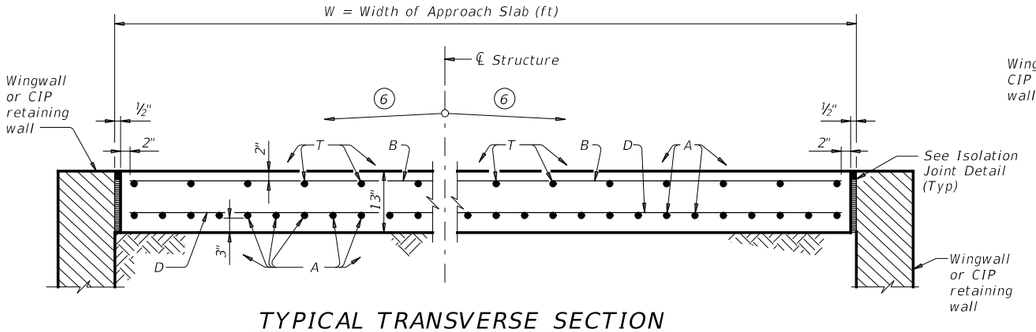


SECTION A-A

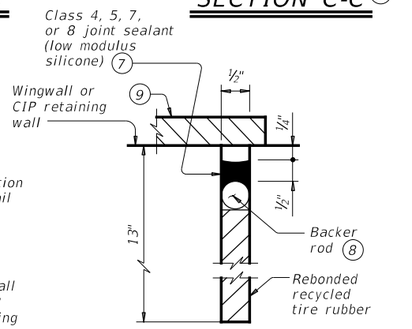
SECTION B-B

SECTION C-C (5)

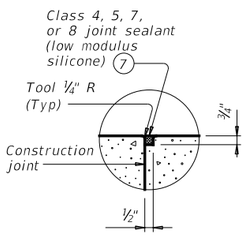
SECTION D-D



TYPICAL TRANSVERSE SECTION



ISOLATION JOINT DETAIL



SEALED CONSTRUCTION JOINT DETAIL

GENERAL NOTES:

Construct approach slab in accordance with Item 422.

Provide Class "S" concrete with a minimum compressive strength of 4,000 psi.

Provide Grade 60 reinforcing steel.

Provide longitudinal joints as shown on the Longitudinal Saw Cut Joint Detail at lane lines and shoulders when width between longitudinal construction joints or edges of approach slab exceeds 16 feet. Saw cut joints within 24 hours of concrete placement to a depth of 1 ½" and seal in accordance with Item 438. Alternately, provide a controlled joint consisting of 1 ½" vinyl or plastic joint former (Stress Cap, Zip Strip, Stress Lock, or equal as approved by the Engineer.)

Provide rebonded recycled tire rubber joint filler that meets the requirements of DMS-6310. "Joint Sealants and Fillers."

Construct the subgrade or subbase away from the bridge for a minimum distance of 100 feet prior to the approach slab, unless otherwise indicated on the plans.

Compact and finish the subgrade or foundation for the approach slab to the typical cross-section and to the lines and grades shown on the plans.

Cure for 4 days using water or membrane curing per Item 422.

All details shown herein are subsidiary to bridge approach slab.

Cover dimensions are clear dimensions, unless noted otherwise.

Texas Department of Transportation

Bridge Division Standard

BRIDGE APPROACH SLAB

ASPHALTIC CONCRETE PAVEMENT

BAS-A

FILE: basaste1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	33	068,ETC	RSL
02-20: Removed stress relieving pad.	DIST	COUNTY		SHEET NO.
	AUS	HAYS		274

DATE: 11/19/2020 4:37:34 PM
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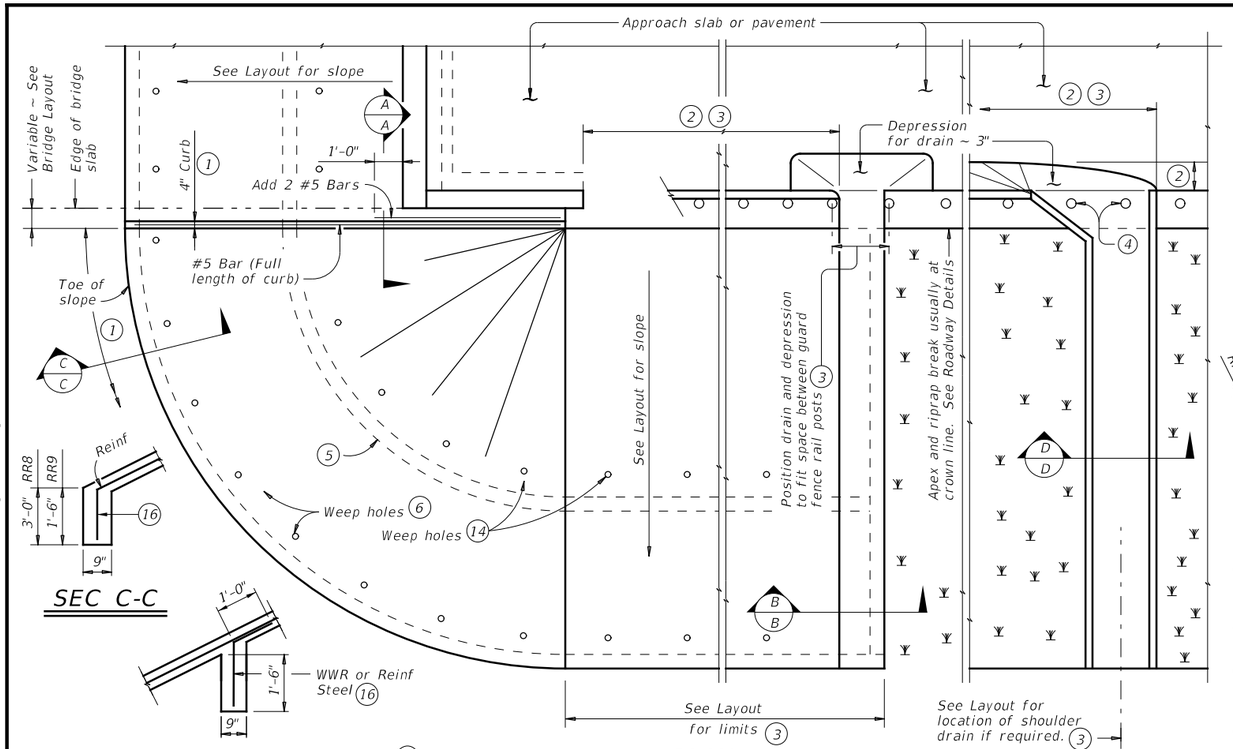
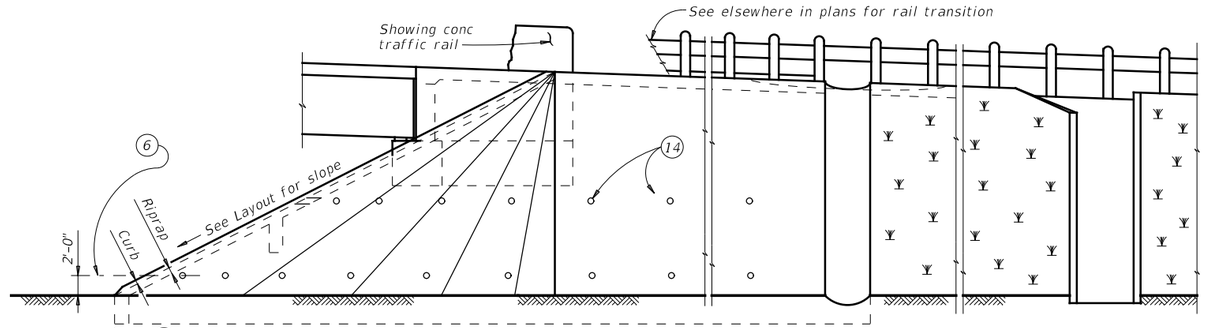


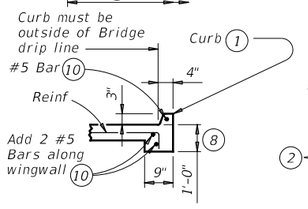
PLAN

SEC C-C

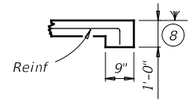
INTERMEDIATE TOEWALL (5)



ELEVATION

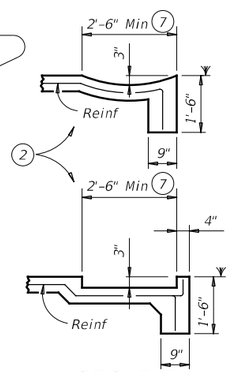


SEC A-A



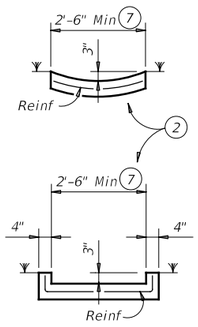
SEC B-B

(No drain)



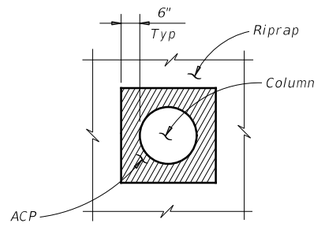
SEC B-B

(Shoulder drain integral with riprap)



SEC D-D

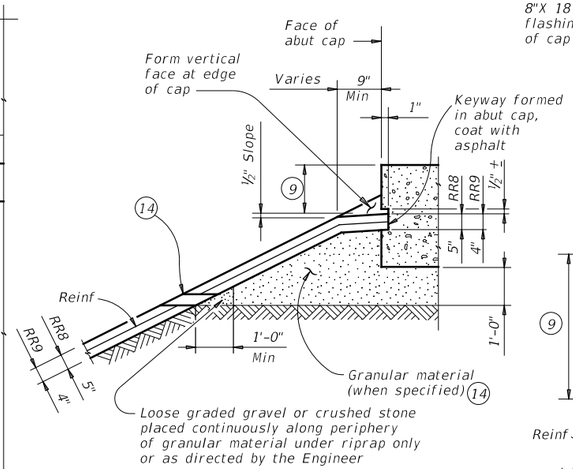
(Shoulder drain)



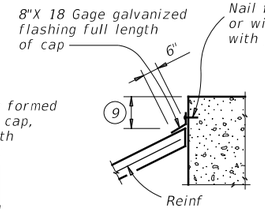
Riprap blockout to be filled with ACP. (Subsidiary to riprap)

RIPRAP DETAIL AT COLUMNS

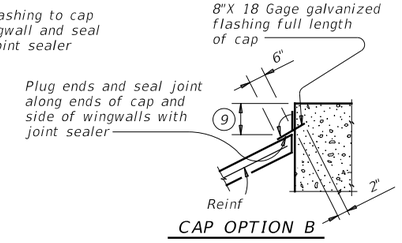
(As directed by the Engineer)



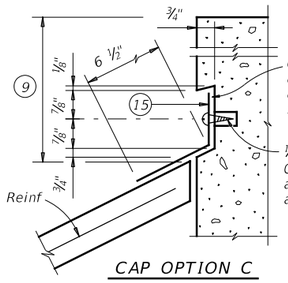
SHOWING KEYWAY OPTION



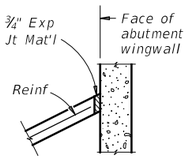
CAP OPTION A



CAP OPTION B

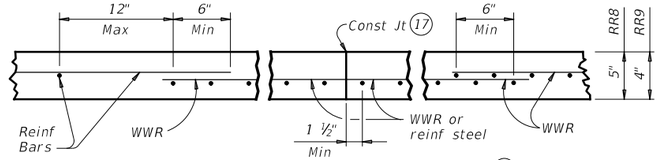


CAP OPTION C



SECT THRU RIPRAP AT WINGWALL (12)

SECTIONS THRU RIPRAP AT CAP (11)



REINFORCEMENT DETAILS (13)

See General Notes for optional synthetic fiber reinforcement.

1. When riprap is shown extended around header on layout, extend slab and toewall as shown and eliminate 4" curb.
2. Limits and configuration of drains and depressions are as shown elsewhere in plans or as directed by the Engineer.
3. Location of shoulder drain must consider limitations imposed by rail transition. Do not locate shoulder drains at expansion joints between approach slab and concrete pavement.
4. See details elsewhere in plans for installation of guard fence posts through concrete riprap.
5. Provide intermediate toewall only when designated elsewhere in the plans or included in the specifications.
6. Provide lower level of 2" Dia weep holes at 10' c-c backed by 1 CF packet of gravel and galvanized hardware cloth at all locations unless directed by the Engineer to eliminate.
7. Use wider or other drain configurations if shown elsewhere in plans or if directed by the Engineer.
8. Wall extension may be reduced or modified if approved by the Engineer. Increase wall extension to 1'-6" whenever the optional intermediate toewall is called for in the plans.
9. Top of cap to top of riprap dimension varies as directed by the Engineer. Should be 9" Min for beam/slab type bridges and 1'-6" for slab span, box beam, or slab beam bridges.
10. #5 bars shown are required even when synthetic fiber reinforcing option is selected.
11. Provide sealing option for joint between the face of cap and riprap as designated by the Engineer or as shown elsewhere on plans.
12. Flashing (shown in Cap Option A) may be used at wingwall in addition to Exp Jt Mat'l if shown on plans or directed by the Engineer.
13. Provide #3 reinforcing bars at 18" Spa c-c. Provide Welded Wire Reinforcement (WWR) as 6x6-D2.9xD2.9 or D3xD3. Combinations of WWR and reinforcing bars may be used if both are permitted. Use lap splices of a minimum 6 inches, measured from the transverse wire of WWR, and the ends of reinforcing bars.
14. If granular material is specified, provide upper level of 2" Dia weep holes at 10' c-c backed by galvanized hardware cloth.
15. 8" x 18 Gage Galv Sheet Metal
16. Provide WWR or #3 bars, with 1'-0" extension into slope.
17. WWR or reinforcing steel is continuous through riprap construction joints. Provide WWR or reinforcing steel that extends 1'-1" minimum into adjacent riprap on each side of construction joint even if synthetic reinforcing fiber is utilized.

FOR CONTRACTOR'S INFORMATION ONLY:
5" of RR8 = 0.015 CY/SF
4" of RR9 = 0.012 CY/SF
#3 Reinf at 18" c-c = 0.501 Lbs/SF
6x6-D3xD3 = 0.408 Lbs/SF

GENERAL NOTES:

Provide Class "B" concrete (f'c = 2,000 psi) unless noted elsewhere in plans.

Provide Grade 60 reinforcing steel.

Provide deformed welded wire reinforcement (WWR) meeting ASTM A1064, unless otherwise shown.

Provide reinforcing bars, deformed WWR, or any suitable combination of both types for riprap reinforcing, unless specified elsewhere in the plans.

Optionally synthetic fibers may be used if approved by the Engineer. Provide synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) in lieu of steel reinforcing in riprap concrete.

Install construction joints or grooved joints extending the full slant slope height at intervals of approximately 20 feet unless otherwise directed by the Engineer.

Hardware cloth, loose grade stone behind weep holes, flashing, or other sealing material are subsidiary to the bid item "Riprap".

See Layout for limits of riprap.

RR8 is to be used on stream crossings.

RR9 is to be used on other embankments.

Texas Department of Transportation

Bridge Division Standard

CONCRETE RIPRAP AND SHOULDER DRAINS
EMBANKMENTS AT BRIDGE ENDS (TYPES RR8 & RR9)

CRR

FILE: crrstde1-19.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
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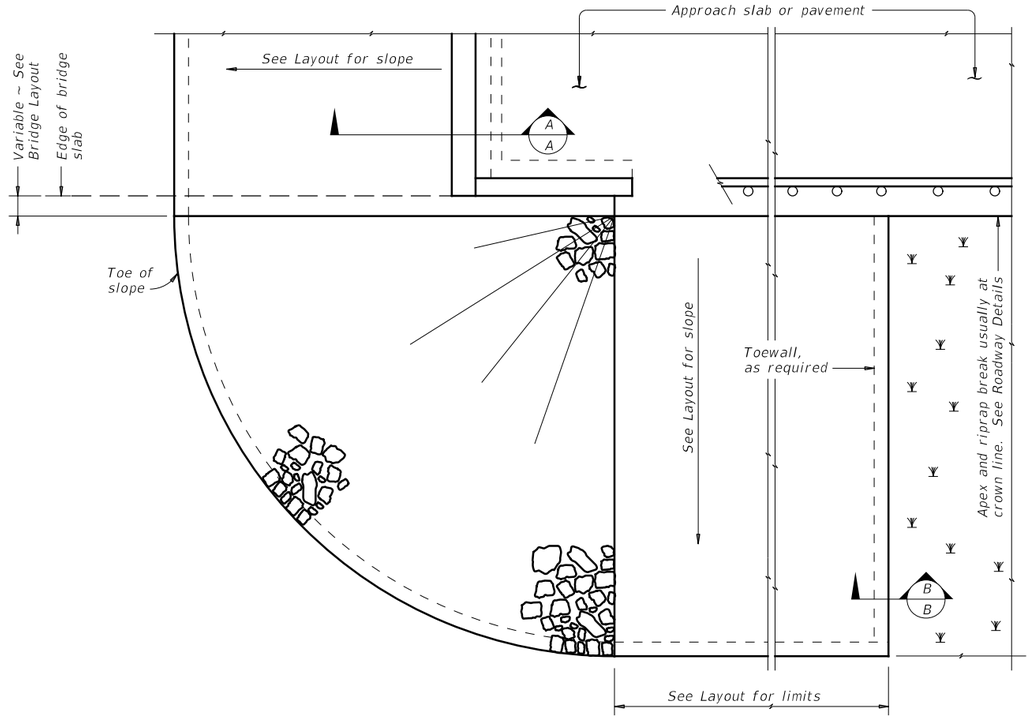
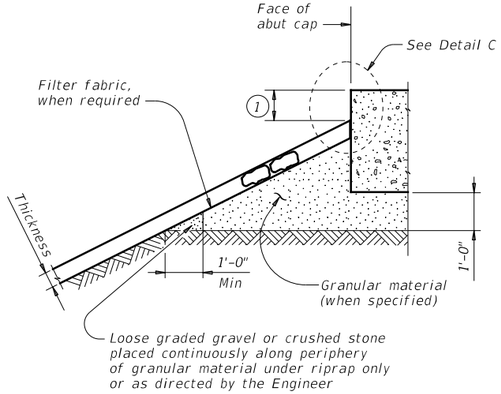
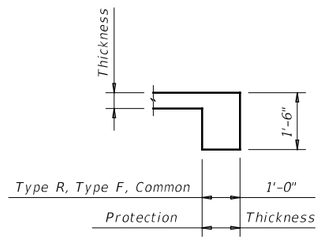


PLAN

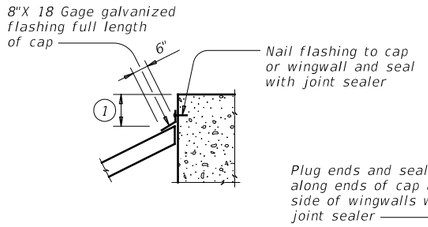


SECTION A-A AT CAP

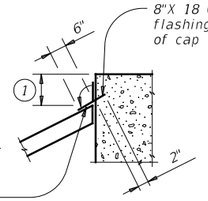


SECTION B-B

Provide toewall when shoulder drain is located adjacent to limits of stone riprap. Omit toewall when thickness of protection riprap is greater than 18".

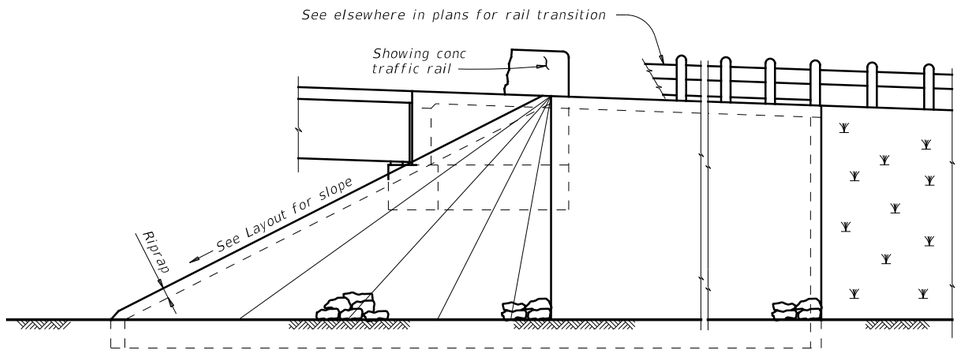


CAP OPTION A



CAP OPTION B

DETAIL C



ELEVATION

(1) Top of cap to top of riprap dimension varies as directed by the Engineer. Provide 9" Min for beam/slab type bridges and 1'-6" for slab span, box beam, or slab beam bridges.

GENERAL NOTES:
Refer to Item 432, "Riprap" for stone size and gradation, and construction details. See Layout for limits and thickness of riprap specified.
See elsewhere in plans for locations and details of shoulder drains.

Texas Department of Transportation

Bridge Division Standard

STONE RIPRAP

SRR

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©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
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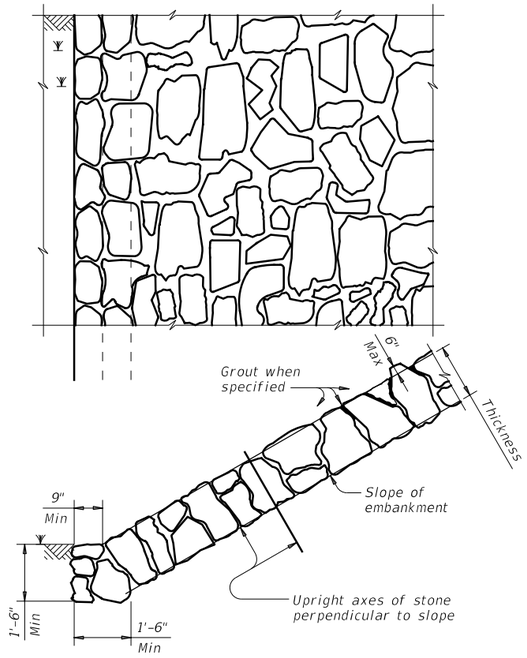


FIGURE 1 ~ TYPE R STONE RIPRAP
dry or grouted

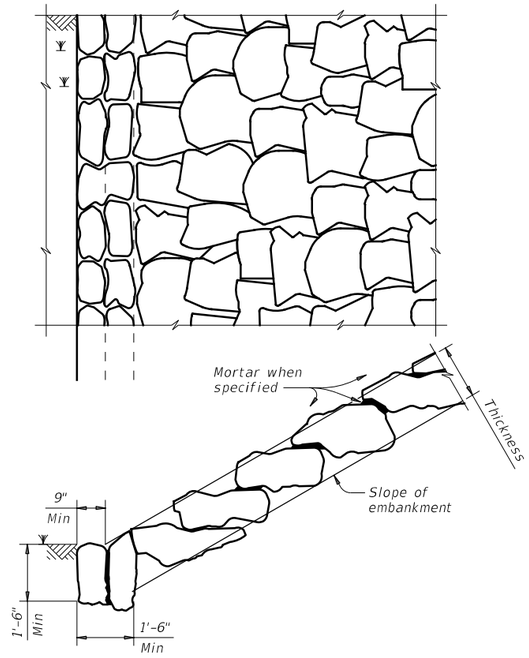


FIGURE 2 ~ TYPE F STONE RIPRAP
dry or mortared

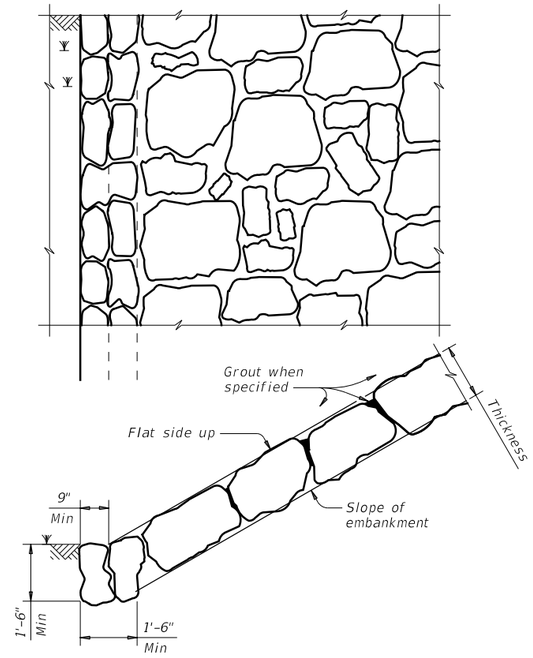


FIGURE 3 ~ TYPE F STONE RIPRAP
grouted

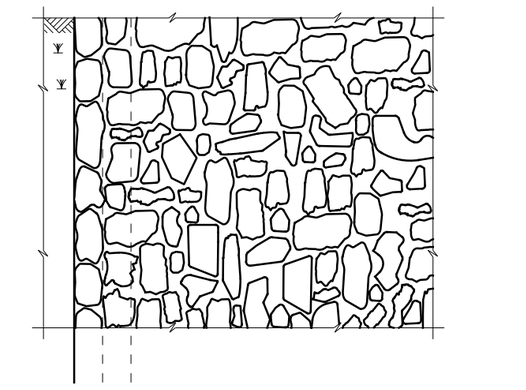


FIGURE 4 ~ COMMON STONE RIPRAP
dry or grouted

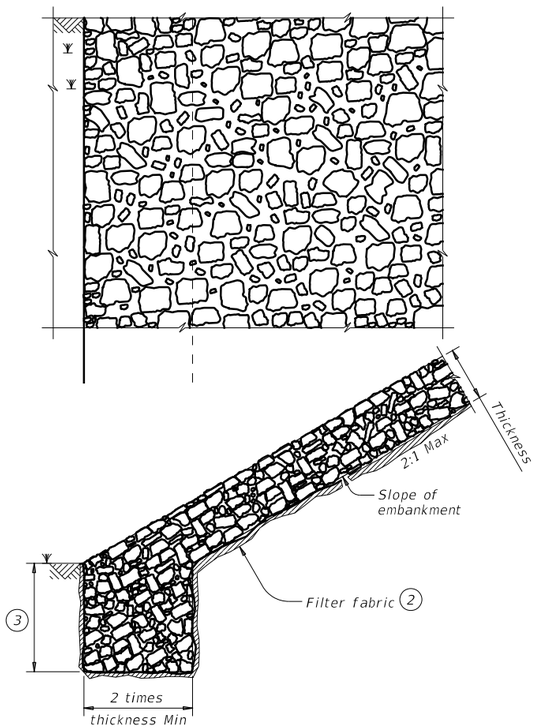


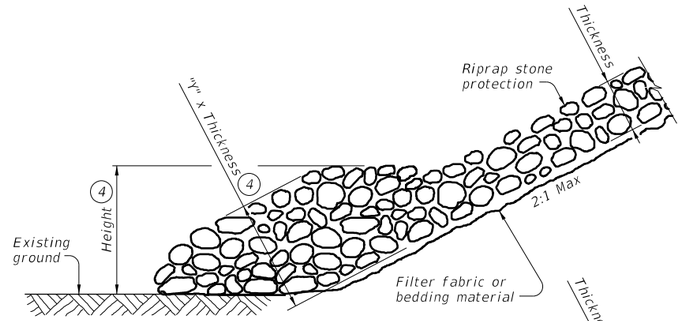
FIGURE 5 ~ PROTECTION STONE RIPRAP (5)

(2) Provide bedding material instead of filter fabric if shown elsewhere in plans. See Layout for thickness of bedding material.

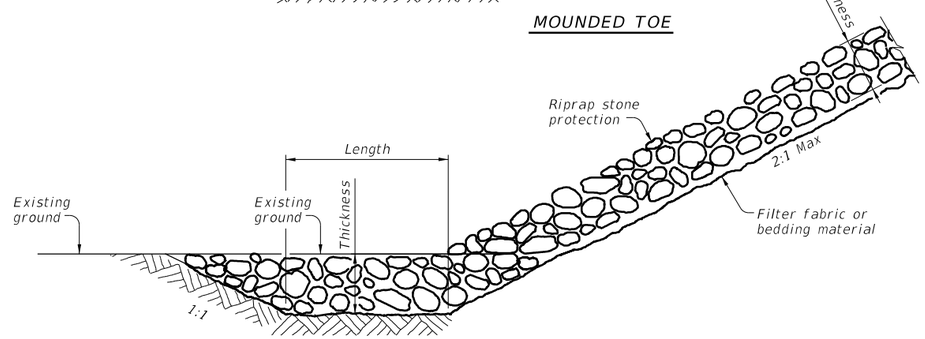
(3) Minimum toe depth is the larger of the maximum scour depth or 2 times the riprap thickness.

(4) "Y" and Height need to be defined. See layout or detail sheet for values if this option is used.

(5) List Stone Protection as size (XX inch) and thickness (YY inch) on the layout.
Example: Riprap (Stone Protection) XX inch, Thickness = YY inch.



MOUNDED TOE



EXTENDED ROCK FILLED TRENCH

PROTECTION STONE RIPRAP TOE OPTIONS (5)

SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

STONE RIPRAP

SRR

FILE: srrstde1-19.dgn	DN: AES	CK: JGD	DW: BWH	CK: AES
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	33	068,ETC	RSL
	DIST	COUNTY		SHEET NO.
	AUS	HAYS		277

DATE: 11/19/2020 4:37:37 PM
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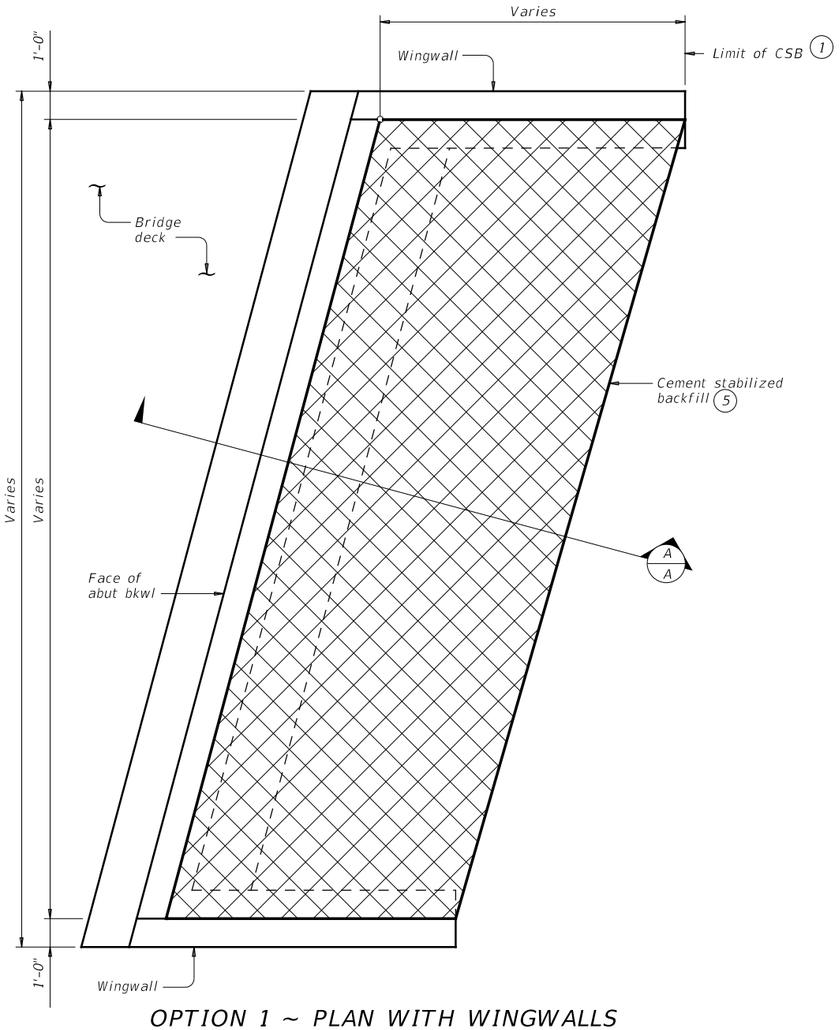
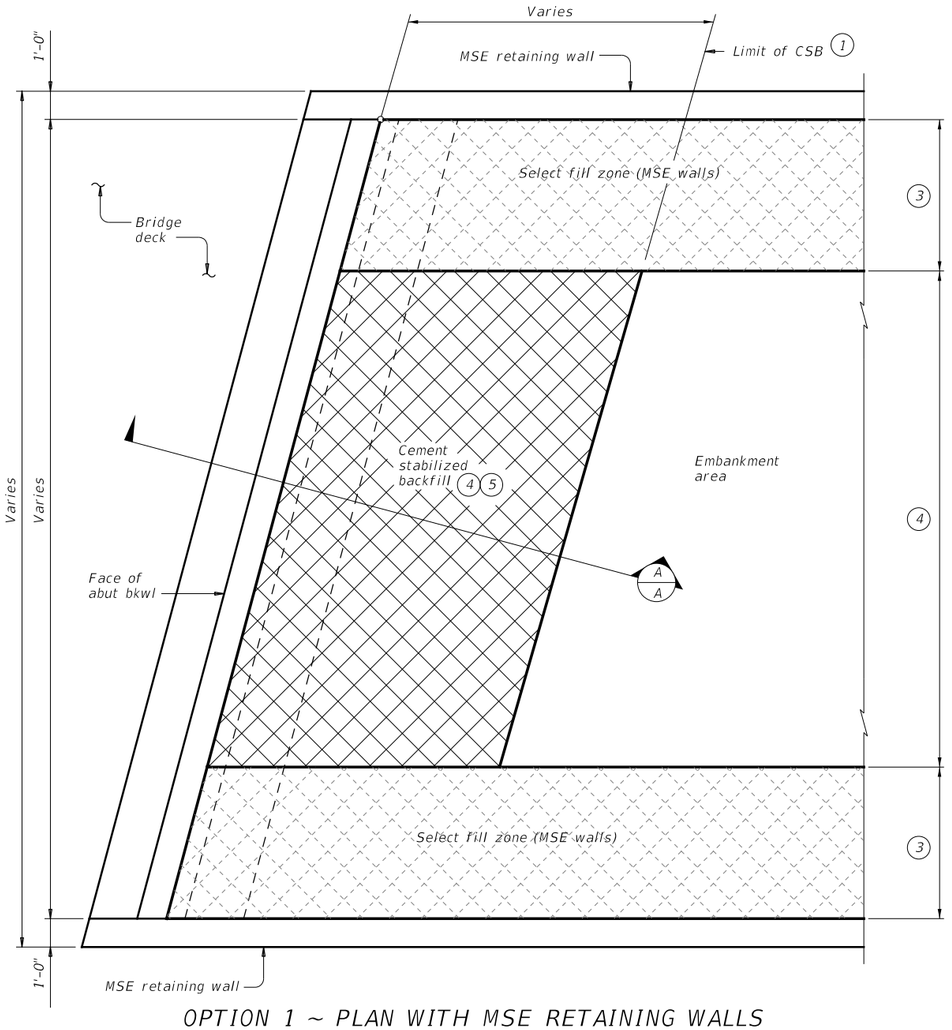
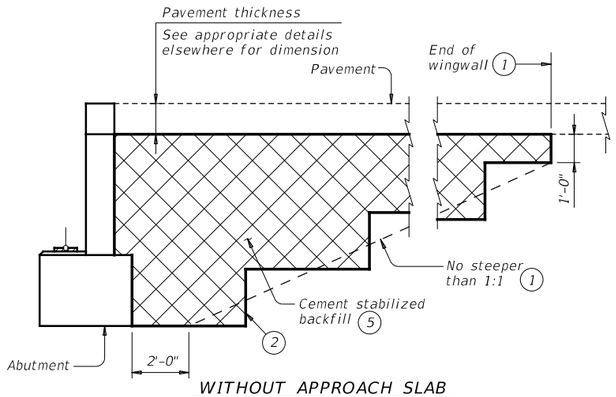


OPTION 1 ~ PLAN WITH WINGWALLS

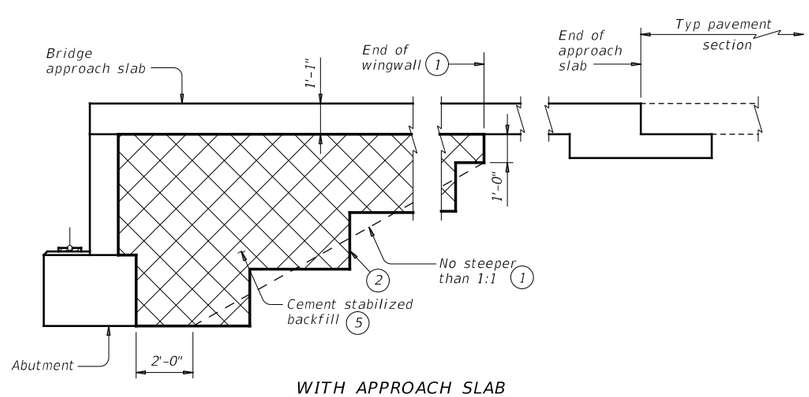
Cast-in-place retaining walls similar.



OPTION 1 ~ PLAN WITH MSE RETAINING WALLS



WITHOUT APPROACH SLAB



WITH APPROACH SLAB

(Showing BAS-C, BAS-A similar.)

SECTION A-A

(1) Usual limit of Cement Stabilized Backfill is at end of wingwall. Extend CSB limits as required to maintain a slope no steeper than 1:1 at bottom of backfill.

(2) Bench backfill as shown with 12" (approximate) bench depths.

(3) Where MSE retaining walls are present, adjust CSB limits to accommodate the select fill zone. See retaining wall details for additional information.

(4) When distance between select fill zones is less than 5'-0", MSE select fill may be substituted for cement stabilized backfill with approval from the Engineer.

(5) If shown in the plans flowable backfill can be used as a substitute for cement stabilized backfill with the following constraints:
a). If flowable backfill is to be placed over MSE backfill then a filter fabric will be placed over the MSE backfill prior to placement of the flowable fill; and
b). Place flowable fill in lifts not exceeding 2 feet in height, place each successive lift when the previous lift has stiffened/hardened (i.e. has lost its flowability).

GENERAL NOTES:

See the Bridge Layout for selected Option. Option 2 is intended for new construction requiring high plasticity embankment fill with a plasticity index (PI) greater than 30 or pavement built in poor native soil. Poor soils are defined as high plasticity clays or expansive clays. Option 1 is intended for construction only requiring PI controlled embankment fill or excavation in competent soils/rocks in order to construct the abutment.

Provide Cement Stabilized Backfill (CSB) meeting the requirements of Item 400, "Excavation and Backfill for Structures", to the limits shown at bridge abutments.

If required elsewhere in the plans, provide Flowable Backfill meeting the requirements of Item 401, "Flowable Backfill", to the limits shown at bridge abutments.

Details are drawn showing left forward skew. See Bridge Layout for actual skew direction.

These details do not apply when Concrete Block retaining walls are used in lieu of wingwalls.

Texas Department of Transportation

Bridge Division Standard

CEMENT STABILIZED ABUTMENT BACKFILL

BRIDGE ABUTMENT

CSAB

FILE: csabste1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	33	068,ETC	RSL
02-20: Added Option 2.	DIST	COUNTY		SHEET NO.
	AUS	HAYS		278

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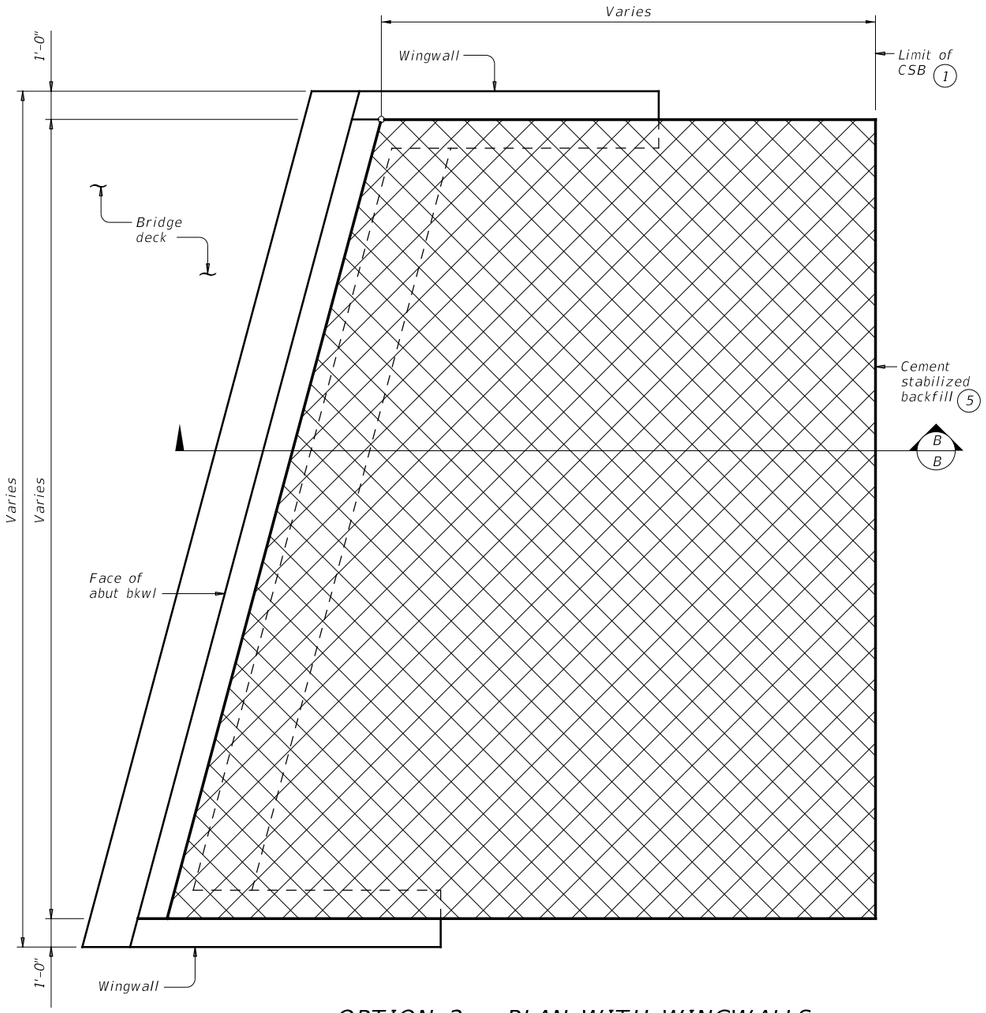
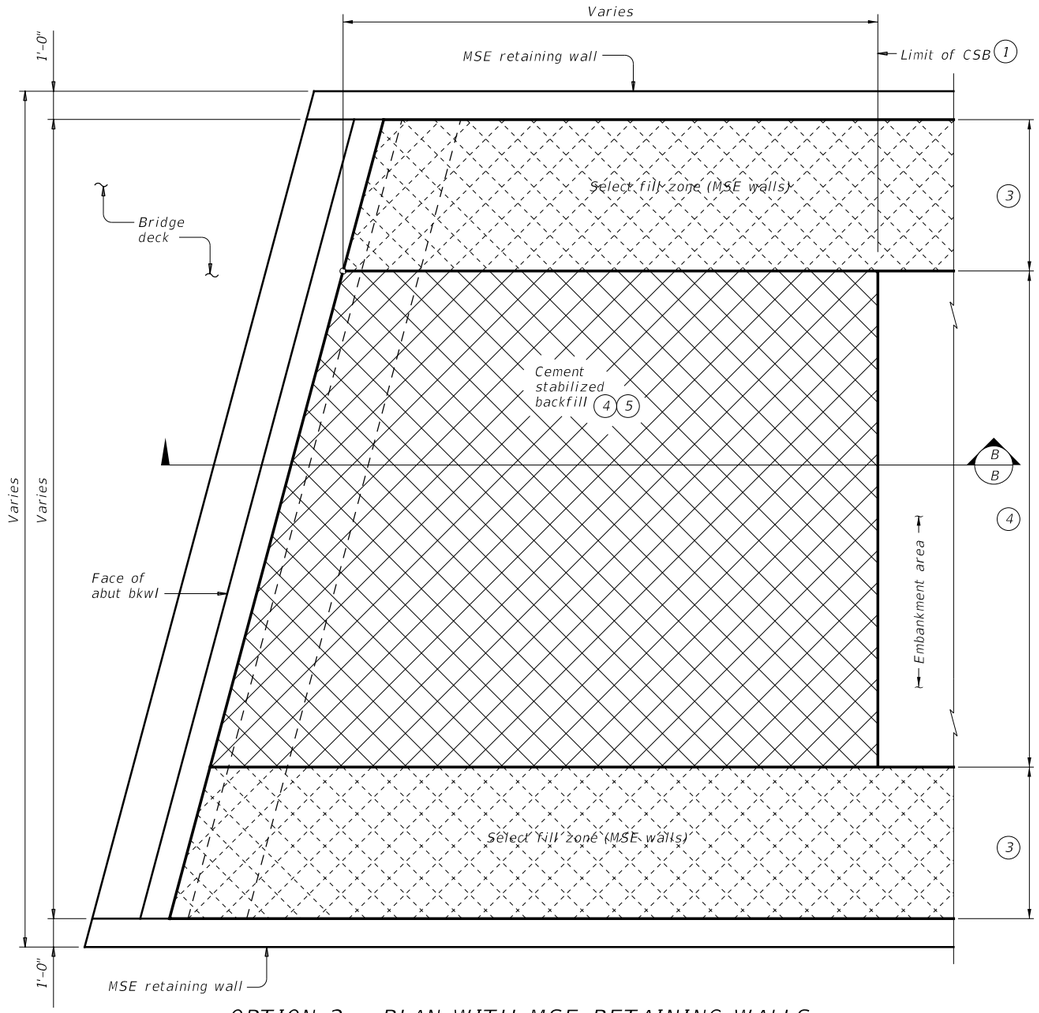


OPTION 2 ~ PLAN WITH WINGWALLS

Cast-in-place retaining walls similar.



OPTION 2 ~ PLAN WITH MSE RETAINING WALLS

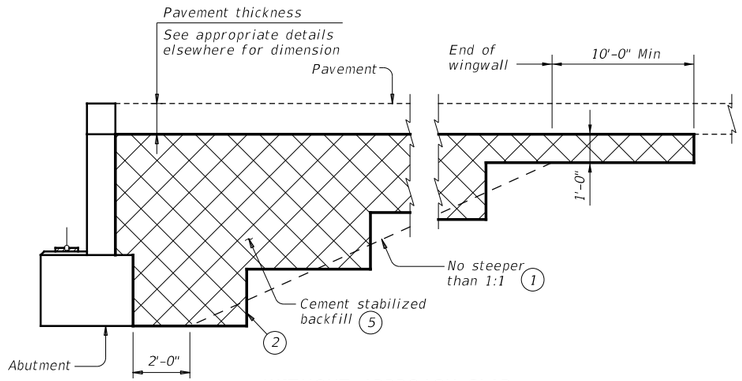
(1) Usual limit of Cement Stabilized Backfill is at end of wingwall. Extend CSB limits as required to maintain a slope no steeper than 1:1 at bottom of backfill.

(2) Bench backfill as shown with 12" (approximate) bench depths.

(3) Where MSE retaining walls are present, adjust CSB limits to accommodate the select fill zone. See retaining wall details for additional information.

(4) When distance between select fill zones is less than 5'-0", MSE select fill may be substituted for cement stabilized backfill with approval from the Engineer.

(5) If shown in the plans flowable backfill can be used as a substitute for cement stabilized backfill with the following constraints:
a). If flowable backfill is to be placed over MSE backfill then a filter fabric will be placed over the MSE backfill prior to placement of the flowable fill; and
b). Place flowable fill in lifts not exceeding 2 feet in height, place each successive lift when the previous lift has stiffened/hardened (i.e. has lost its flowability).



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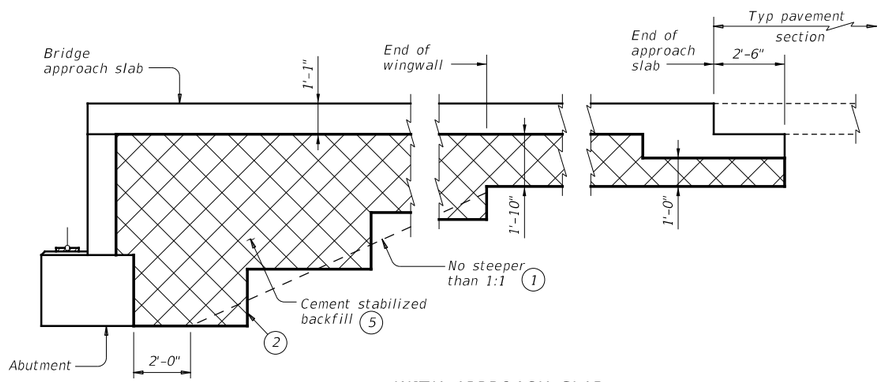

WITH APPROACH SLAB
(Showing BAS-C, BAS-A similar.)

SECTION B-B

SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

CEMENT STABILIZED ABUTMENT BACKFILL

BRIDGE ABUTMENT

CSAB

FILE: csabste1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	33	068,ETC	RSL
02-20: Added Option 2.	DIST	COUNTY		SHEET NO.
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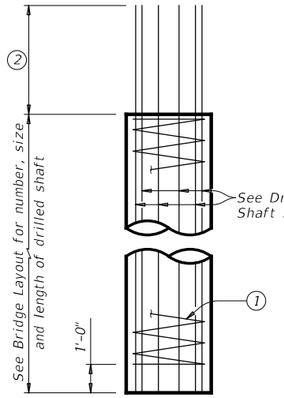
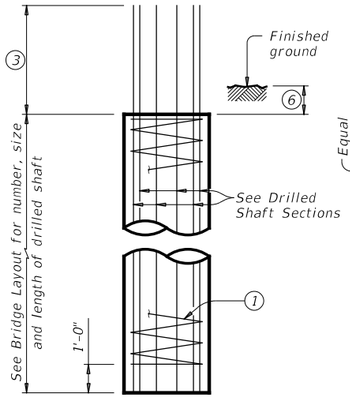
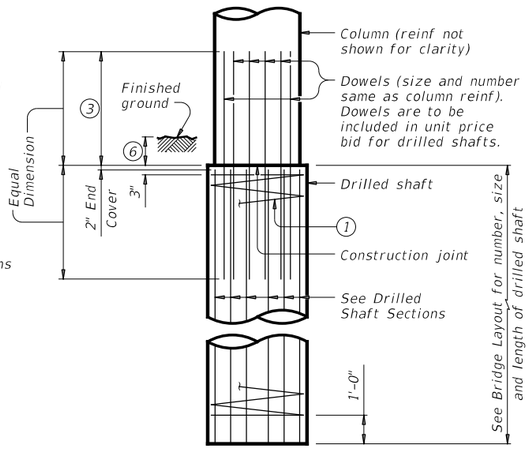


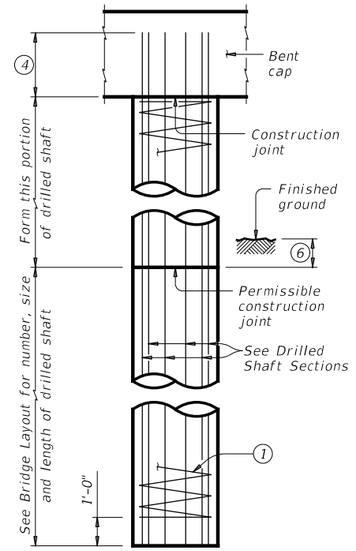
ABUTMENTS, WINGWALLS AND MULTI-DRILLED SHAFT FOOTINGS



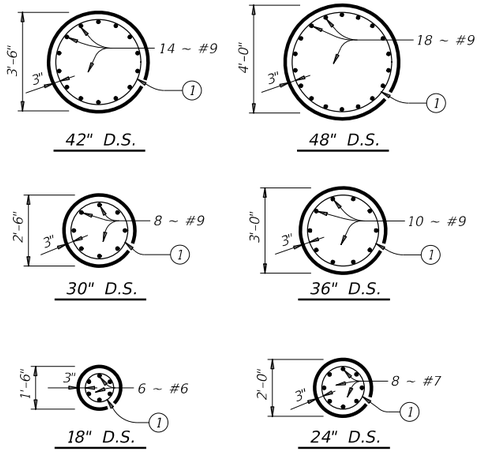
INTERIOR BENTS DRILLED SHAFT DIA EQUAL TO COLUMN DIA



INTERIOR BENTS DRILLED SHAFT DIA GREATER THAN COLUMN DIA



OPTIONAL INTERIOR BENT DRILLED SHAFT DETAIL (5)

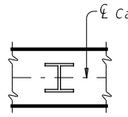


DRILLED SHAFT SECTIONS

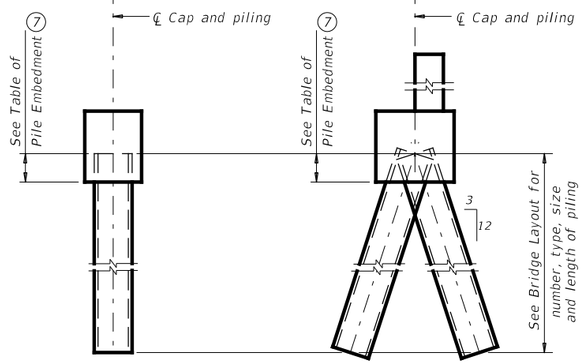
DRILLED SHAFT DETAILS

TABLE OF PILE EMBEDMENT	
Pile Type	Embedment Depth (Ft)
16" Sq Concrete 18" Sq Concrete HP14 Steel HP16 Steel	1'-0"
20" Sq Concrete 24" Sq Concrete HP18 Steel	1'-6"

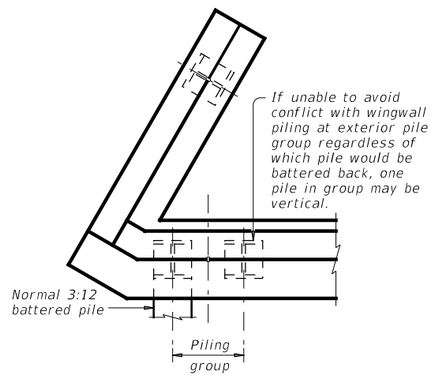
See Prestressed Concrete Piling (CP) standard for additional details on concrete pile embedment.



ORIENTATION OF STEEL H-PILING



PILING DETAILS
(Concrete or steel H)



DETAIL "A"
(Showing plan view of a 30° skewed abutment)

(1) #3 spiral at 6" pitch (one and a half flat turns top and bottom).

(2) Min extension into supported element:
#6 Bars = 1'-11"
#7 Bars = 2'-0"
#9 Bars = 2'-3"

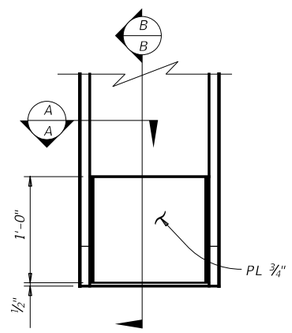
(3) Min lap with column reinf:
#7 Bars = 2'-11"
#9 Bars = 3'-9"
#11 Bars = 4'-8"

(4) Min extension into supported element:
#6 Bars = 1'-11"
#7 Bars = 2'-3"
#9 Bars = 2'-9"

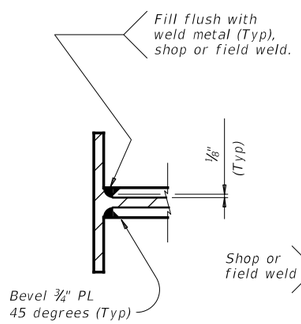
(5) Drilled shafts may extend to the bottom of bent caps for "H" heights of 6 ft and less (as shown on the Bridge Layout), if approved. This option can only be used when the drilled shaft diameter equals the column diameter. Obtain approval of the forming method above the ground line prior to construction. No adjustments in payment will be made if this option is used.

(6) 1'-0" Min, unless shown otherwise on plans.

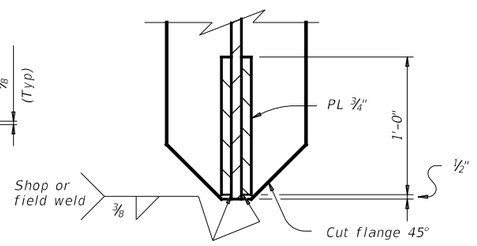
(7) Or as shown on plans.



ELEVATION



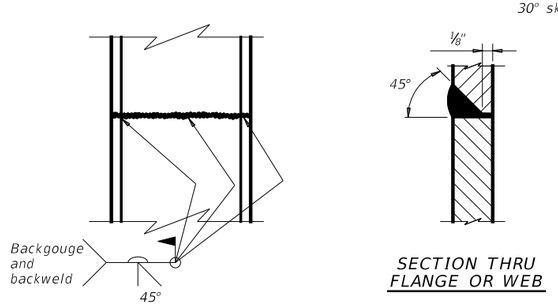
SECTION A-A



SECTION B-B

STEEL H-PILE TIP REINFORCEMENT

See Item 407 "Steel Piling" to determine when tip reinforcement is required and for options to the details shown.



SECTION THRU FLANGE OR WEB

STEEL H-PILE SPLICE DETAIL

Use when required.

SHEET 1 OF 2

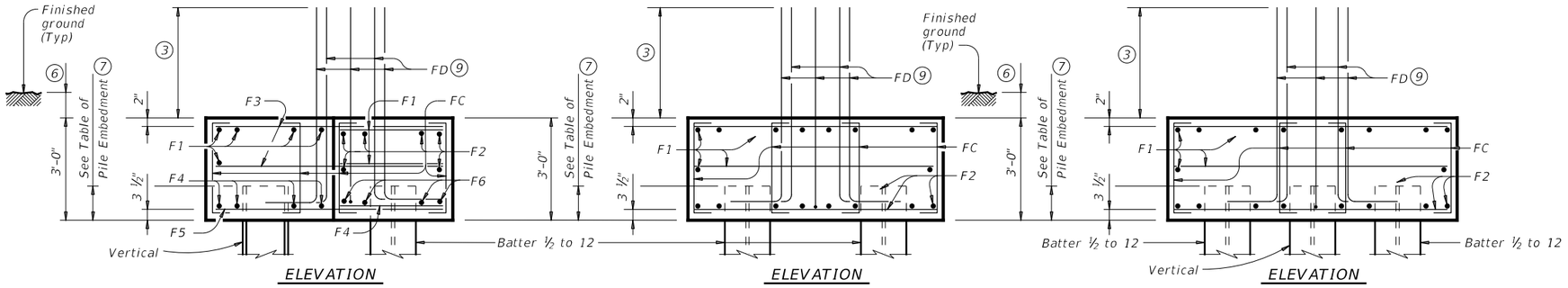
Texas Department of Transportation

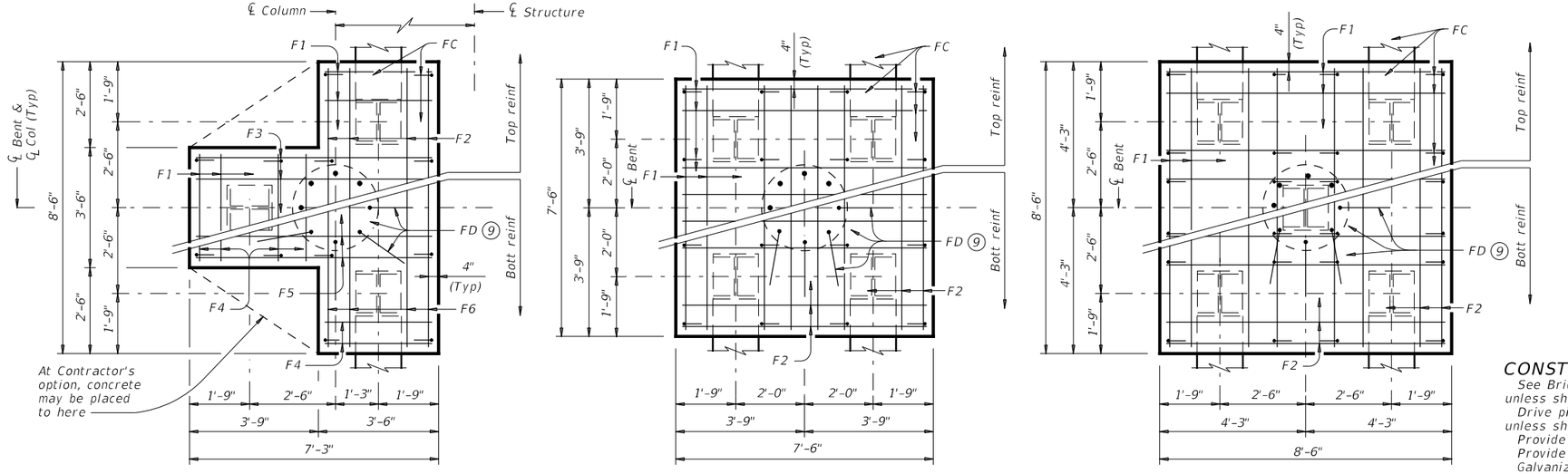
Bridge Division Standard

COMMON FOUNDATION DETAILS

FD

FILE: fdstde01-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	33	068,ETC	RSL
01-20: Added #11 bars to the FD bars.	DIST	COUNTY		SHEET NO.
	AUS	HAYS		280





THREE PILE FOOTING (8)

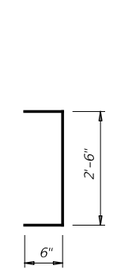
For 36" Dia and smaller columns.

FOUR PILE FOOTING (8)

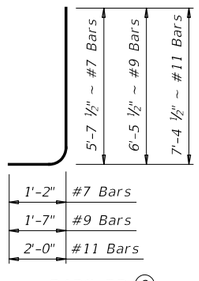
For 42" Dia and smaller columns.

FIVE PILE FOOTING (8)

For 42" Dia and smaller columns.



BARS FC



BARS FD (9)

(3) Min lap with column reinforcing:
#7 Bars = 2'-11"
#9 Bars = 3'-9"
#11 Bars = 4'-8"

(6) 1'-0" Min, unless shown otherwise on plans.

(7) Or as shown on plans.

(8) See Bridge Layout for type, size and length of piling.

(9) Number and size of FD bars must match column reinforcing. Tie FD bars to the top of the bottom reinforcing mat.

(10) Adjust FD quantity, size and weight as needed to match column reinforcing.

TABLE OF FOOTING QUANTITIES FOR 30" COLUMNS

ONE 3 PILE FOOTING				
Bar	No.	Size	Length	Weight
F1	11	#4	3'- 2"	23
F2	6	#4	8'- 2"	33
F3	6	#4	6'- 11"	28
F4	8	#9	3'- 2"	86
F5	4	#9	6'- 11"	94
F6	4	#9	8'- 2"	111
FC	12	#4	3'- 6"	28
FD (10)	8	#9	8'- 1"	220
Reinforcing Steel			Lb	623
Class "C" Concrete			CY	4.8

ONE 4 PILE FOOTING				
Bar	No.	Size	Length	Weight
F1	20	#4	7'- 2"	96
F2	16	#8	7'- 2"	306
FC	16	#4	3'- 6"	37
FD (10)	8	#9	8'- 1"	220
Reinforcing Steel			Lb	659
Class "C" Concrete			CY	6.3

ONE 5 PILE FOOTING				
Bar	No.	Size	Length	Weight
F1	20	#4	8'- 2"	109
F2	16	#9	8'- 2"	444
FC	24	#4	3'- 6"	56
FD (10)	8	#9	8'- 1"	220
Reinforcing Steel			Lb	829
Class "C" Concrete			CY	8.0

CONSTRUCTION NOTES:

See Bridge Layout for foundation type required. Use these foundation details unless shown otherwise.

Drive piling under abutment wingwalls to a minimum resistance of 10 Tons/Pile unless shown otherwise.

Provide Class C Concrete (f'c = 3,600 psi), unless shown otherwise.

Provide Grade 60 reinforcing steel.

Galvanize reinforcing if shown elsewhere in the plans.

Provide bar laps for drilled shaft reinforcing, where required, as follows:

Uncoated or galvanized (#6) ~ 2'-6"
Uncoated or galvanized (#7) ~ 2'-11"
Uncoated or galvanized (#9) ~ 3'-9"

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

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

DESIGNER NOTES:

Do not use the drilled shaft details shown on this standard for retaining wall, noise wall, barrier, or sign foundations without structural evaluation.

Do not use the footings shown on this standard in direct contact with salt water or exposed to salt water spray.

Maximum allowable pile loads for the footings shown are:

72 Tons/Pile with 24" Dia Columns
80 Tons/Pile with 30" Dia Columns
100 Tons/Pile with 36" Dia Columns
120 Tons/Pile with 42" Dia Columns

Texas Department of Transportation

Bridge Division Standard

COMMON FOUNDATION DETAILS

FD

FILE: fdstde01-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	33	068,ETC	RSL
01-20: Added #11 bars to the FD bars.	DIST	COUNTY		SHEET NO.
	AUS	HAYS		281

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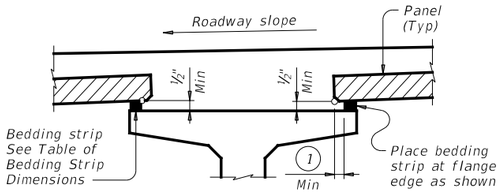
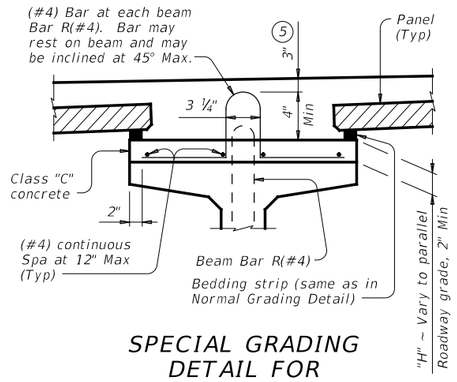


NORMAL GRADING DETAIL (3)

Showing prestressed concrete I-girders.
(Other beam types similar)



SPECIAL GRADING DETAIL FOR CONCRETE BEAMS

Showing prestressed concrete I-girders.
(Other beam types similar)

TABLE OF BEDDING STRIP DIMENSIONS		
WIDTH	HEIGHT (4)	
	Min	Max
1" (Min)	½"	2"
1 ¼"	½"	2 ½"
1 ½"	½"	3"
1 ¾"	½"	3 ½"
2"	½"	4"
2 ¼"	½"	4 ½" (2)
2 ½"	½"	5" (2)
2 ¾"	½"	5 ½" (2)
3" (Max)	½"	6" (2)

(1) *2" Min for I-giders, 1 ½" Min for all other beam types.*

(2) *Allowed for I-girders, not allowed on other beam types.*

(3) *To reduce the quantity of cast-in-place concrete, bedding strip thickness may be increased in ¼" increments. Bedding strips must be comprised of one layer. Bond bedding strips to the beams with an adhesive compatible with bedding strips. Bedding strips over 2.5" high may need to be bonded to panels. The same thickness strip must be used under any one panel edge and the maximum change in thickness between adjacent panels is ¼". Alternatively, bedding strips may be cut to grade. Panels may be supported by an alternate method, using a commercial product, if approved by the Engineer of Bridge Design, Bridge Division. If bedding strips exceed 6" high for I-Girders, 4" high for all other beam types, use Special Grading Detail for Concrete Beams or submit an alternate method to the Bridge Division for approval.*

(4) *Height must not exceed twice the width.*

(5) *Provide clear cover as indicated unless otherwise shown on Span Details.*

(6) *See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.*

(7) *Space Bars UP(#4) with Beam Bars R(#4) in all areas where measured haunch exceeds 3 ½" with I-girders, and 3" for all other beam types. Epoxy coating for Bars UP is not required.*

(8) *Do not locate construction joints on top of a panel.*

(9) *Butt adjacent bedding strips together with adhesive. Cut v-notches, approx ¼" deep, in the top of the bedding strips at 8' o.c..*

CONSTRUCTION NOTES:

Erected panels must bear uniformly on bedding strips of extruded polystyrene placed along top flange edges.

Placing panels to minimize joint openings is recommended.

If additional blocking is needed, special grading details for supporting the panels and extra reinforcing between beam and slab will be considered subsidiary to deck construction.

Bars U, shown on PCP-FAB, may be bent over or cut off if necessary.

Care must be taken to ensure proper cleaning of construction debris and consolidation of concrete material under the edges of the panels. Bedding strips must be placed at beam flange edges so that adequate space is provided for the mortar to flow a minimum of 1 ½" under the panels as the slab concrete is placed.

To allow the proper amount of mortar to flow between beam and panel, the minimum vertical opening must be at least ½". Roadway cross-slope reduces the opening available for entry of the mortar. Bedding strips varying in thickness across the beam are therefore required.

For clear span between U-beams less than or equal to 18", see Permissible Slab Forming Detail on Miscellaneous Slab Detail sheets, UBMS.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel in the cast-in-place slab. See Table of Reinforcing Steel for size and spacing of reinforcement.

If the top and bottom layer of reinforcing steel is shown on the Span Details to be epoxy coated, then the D, E, P, & Z bars must be epoxy coated.

Provide bar Laps, where required, as follows:

Uncoated ~ #4 = 1'-7"
Epoxy Coated ~ #4 = 2'-5"

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

Panel placement may follow either Option 1 or Option 2 except Option 1 must be used if the skew exceeds 45 degrees.

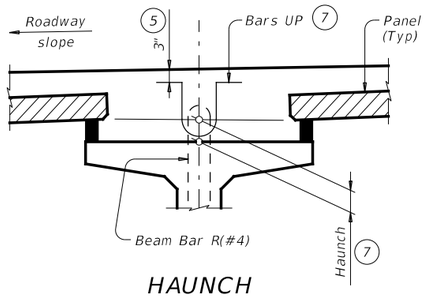
Use of Prestressed Concrete Panels is not permitted for horizontally curved steel plate or tub girders. See Span Details for other possible restrictions on their use.

These details are to be used in conjunction with the Span Details, PCP-FAB and other applicable standard drawings.

When panel support (bedding strips) deviates from what is shown herein, provide details signed and sealed by a professional Engineer.

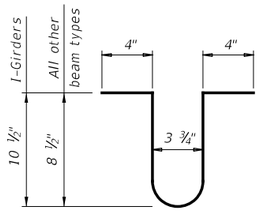
Any additional reinforcement or concrete required on this standard is considered subsidiary to the bid Item "Reinforced Concrete Slab".

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

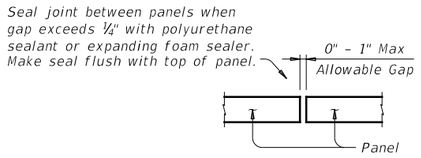


HAUNCH REINFORCING DETAIL

Showing prestressed concrete I-girders.
(Other beam types similar)

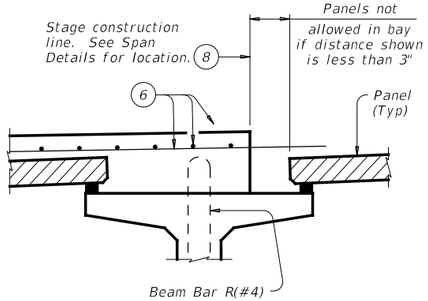


BARS UP (#4) (7)

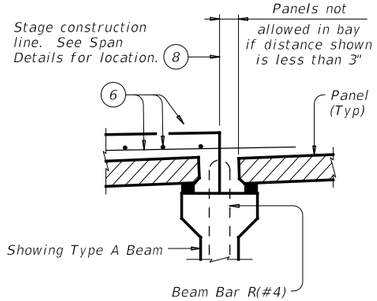


PANEL JOINTS

(Panel reinforcing not shown for clarity.
The gap cannot be considered as a panel fabrication tolerance. Adjust panel placement to minimize joint openings.)



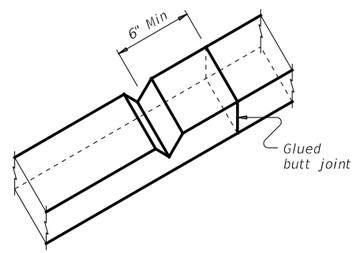
PRESTR CONC I-GIRDERS



PRESTR CONC I-BEAMS

STAGE CONSTRUCTION LIMITATIONS

(Other beam types similar)



BEDDING STRIP DETAIL (9)

HL93 LOADING SHEET 1 OF 4

Texas Department of Transportation | Bridge Division Standard

PRESTRESSED CONCRETE PANELS DECK DETAILS

PCP

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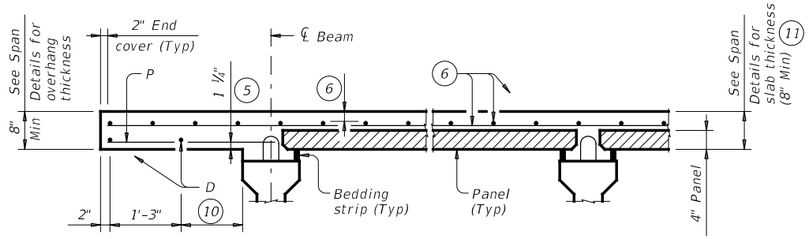
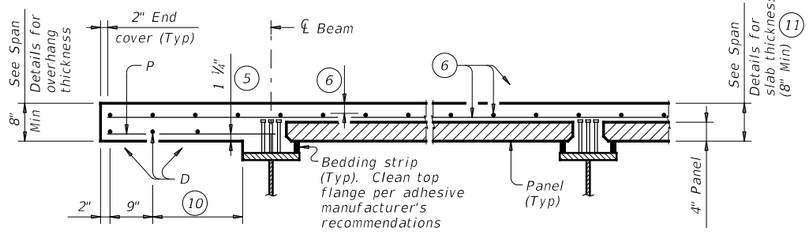
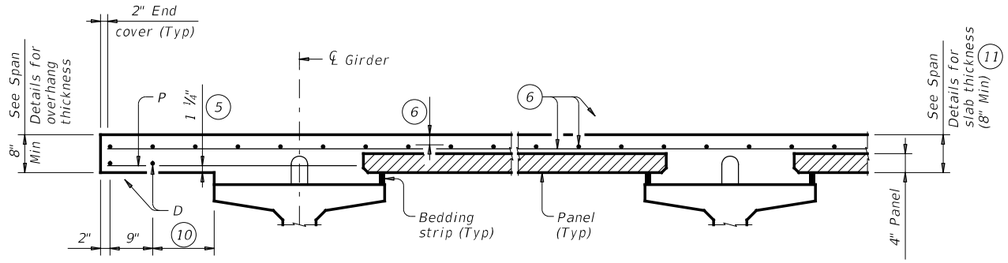


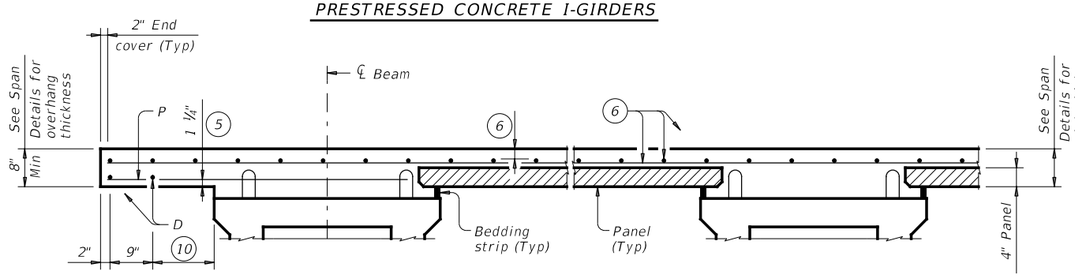
PRESTRESSED CONCRETE I-BEAMS



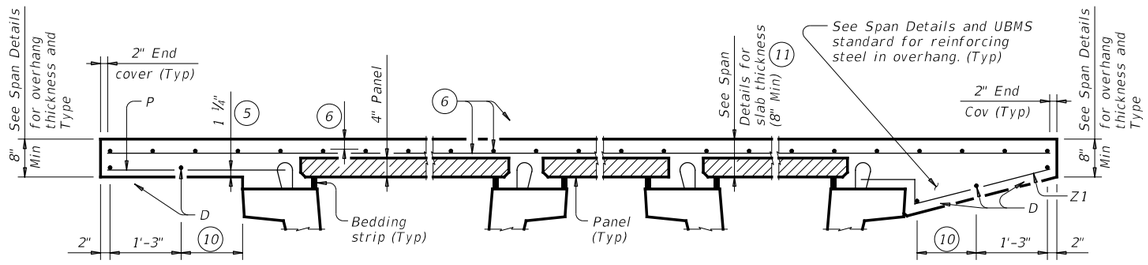
STEEL BEAMS



PRESTRESSED CONCRETE I-GIRDERS



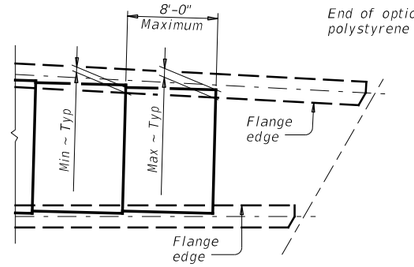
PRESTRESSED CONCRETE X-BEAMS



NORMAL OVERHANG WITH PRESTR CONC U-BEAMS

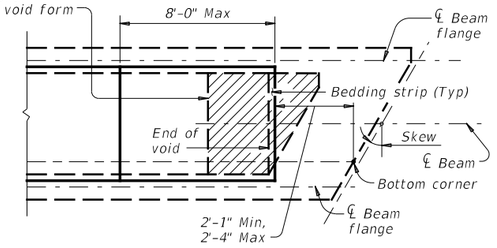
SLOPED OVERHANG WITH PRESTR CONC U-BEAMS

TYPICAL PART TRANSVERSE SECTIONS

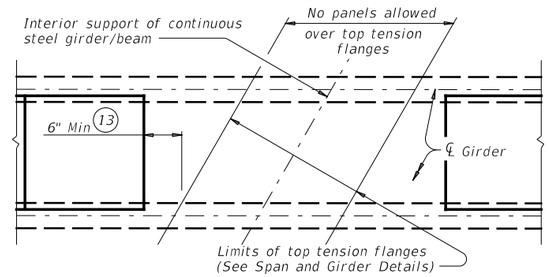


AT FLARED BEAMS OR GIRDERS

See PCP-FAB standard for Min and Max dimensions based on bemm/girder type.



OVER CONC U-BEAMS



AT INT SUPPORTS OF CONTINUOUS STEEL GIRDERS

PART PLANS OF PANEL PLACEMENT

(5) Provide clear cover as indicated unless otherwise shown on Span Details.

(6) See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.

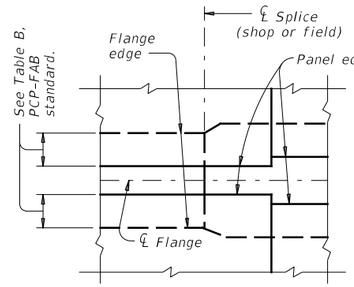
(9) Butt adjacent bedding strips together with adhesive. Cut v-notches, approx ¼" deep, in the top of the bedding strips at 8' o.c..

(10) Equally space additional bar if more than 1'-3" Max.

(11) The actual thickness constructed may exceed the slab thickness shown on the Span Details but the extra thickness may be no more than 2" (1" for prestressed concrete U-beams and steel beams). Bearing seat elevations or finished grade may be adjusted.

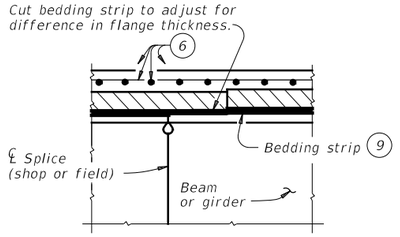
(12) Field adjust Bars Z1(#4) to match actual slope of slab overhangs. Width of slab overhang will vary along span with curved slab edges. Adjust Bar Z1(#4) dimensions to maintain proper cover. Bars Z2(#4) are located at Inverted-Tee stems only.

(13) Location of concrete placement sequence boundaries and bolted field splices should be considered by the contractor in determining panel limits.



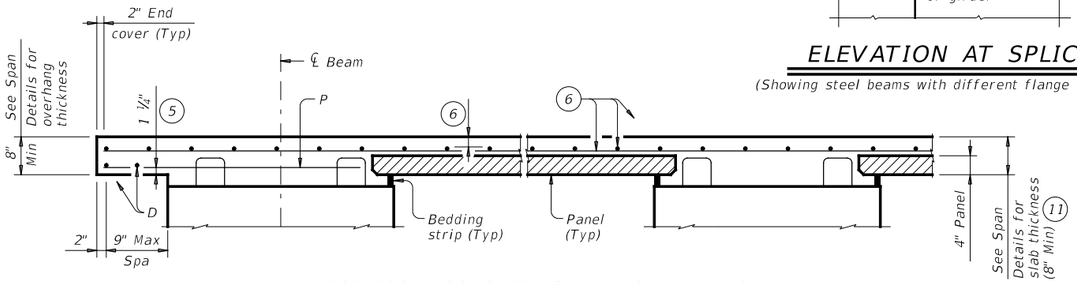
PLAN AT SPLICE

(Showing steel beams with flange width transition)



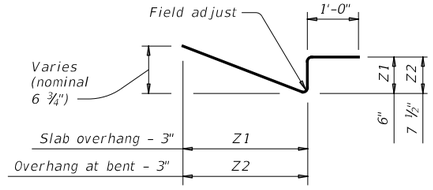
ELEVATION AT SPLICE

(Showing steel beams with different flange thickness)



PRESTRESSED CONCRETE SPREAD SLAB BEAMS

Bars P over exterior beams are still required when no overhang is used. In this case, only one Bar D, 2" from slab edge, is required.



BARS Z (#4) (12)

HL93 LOADING SHEET 2 OF 4

Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE PANELS
DECK DETAILS

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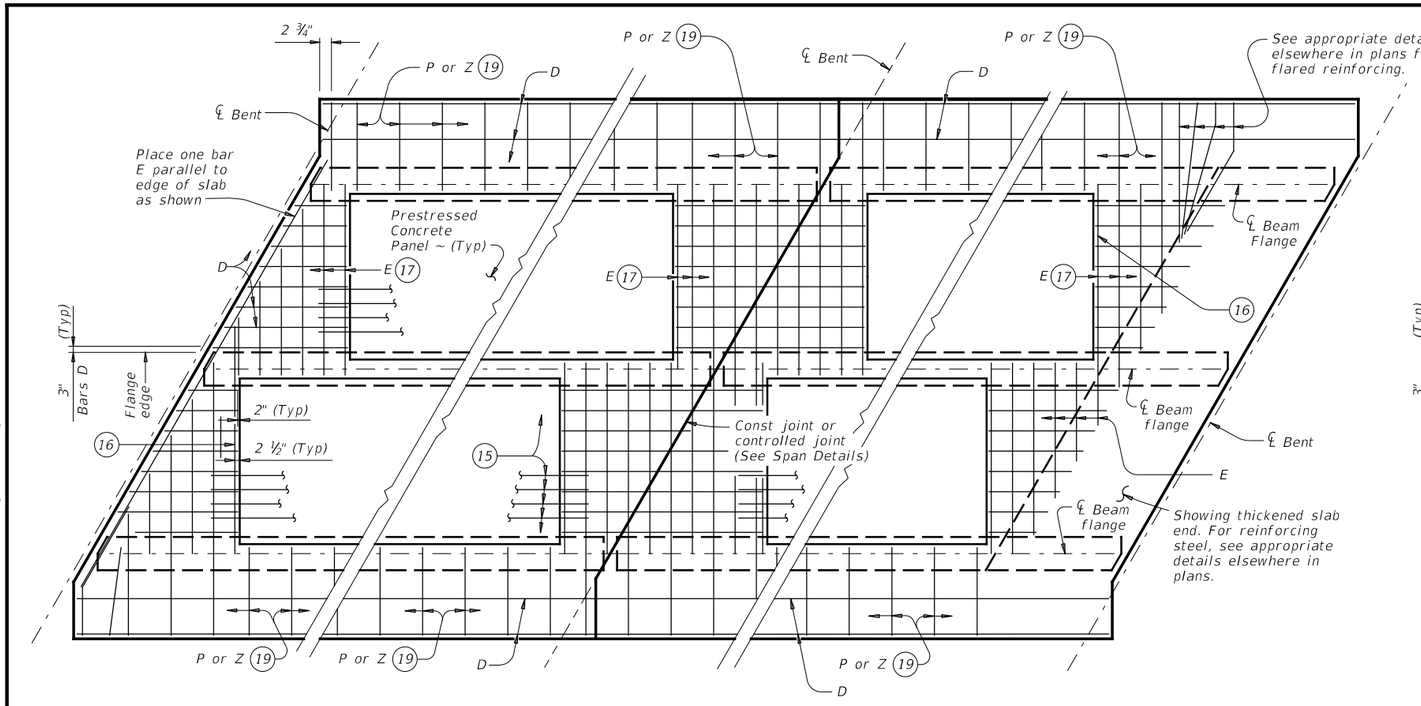
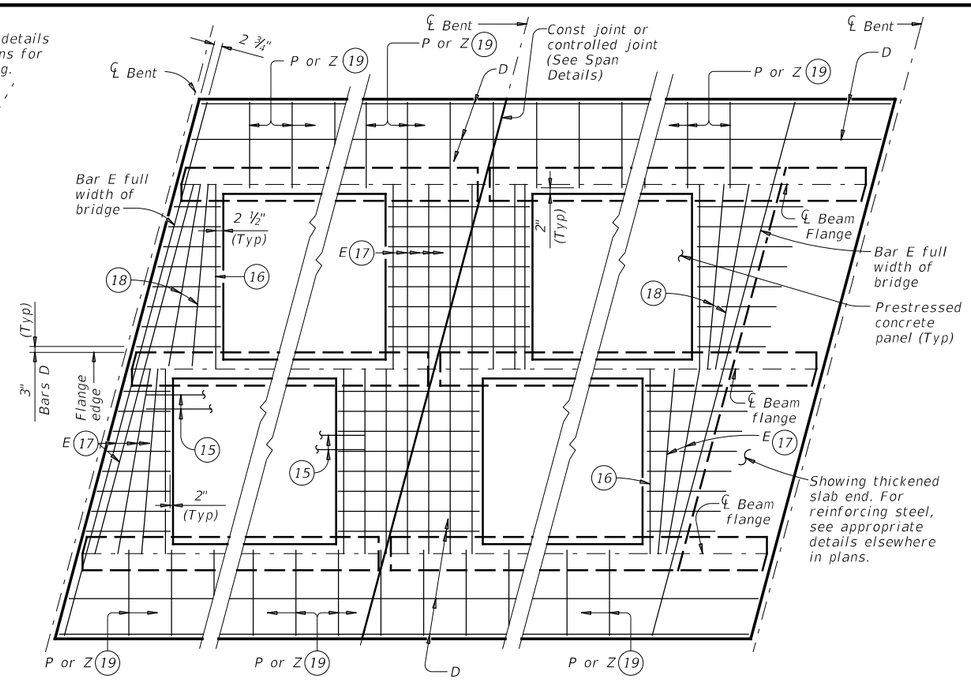


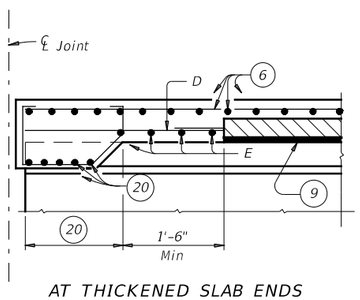
AT ALL SPAN ENDS UNLESS NOTED OTHERWISE | AT INTERIOR BENTS | AT THICKENED END SLABS

OPTION 1 ~ PLAN OF SLABS WITH NORMAL REINFORCEMENT

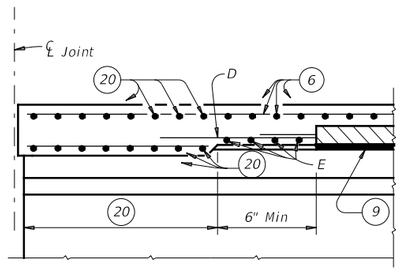


AT ALL SPAN ENDS UNLESS NOTED OTHERWISE | AT INTERIOR BENTS | AT THICKENED END SLABS

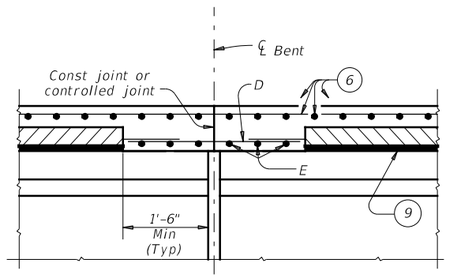
OPTION 1 ~ PLAN OF SLABS WITH SKEWED REINFORCEMENT



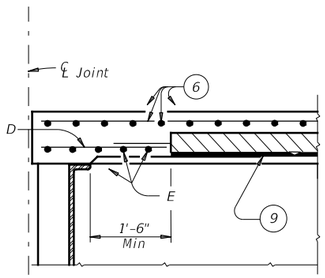
AT THICKENED SLAB ENDS FOR PRESTR CONC U-BMS



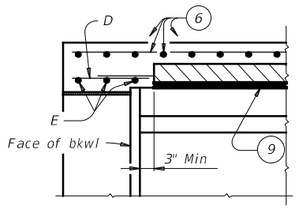
AT THICKENED SLAB ENDS FOR PRESTR CONC I-BMS AND STEEL BMS



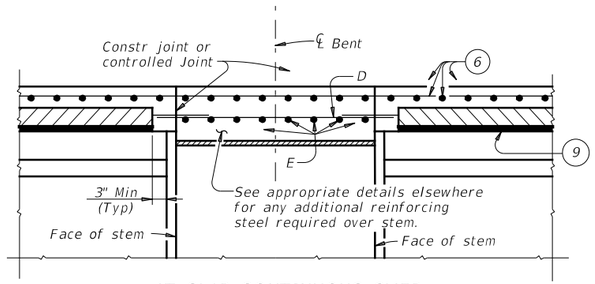
AT SLAB CONTINUOUS OVER CONVENTIONAL INTERIOR BENTS FOR ALL SIMPLE SPAN BMS



AT CONVENTIONAL END DIAPHRAGMS FOR STEEL BMS



AT SLAB OVER ABUTMENT BACKWALL FOR ALL BMS



AT SLAB CONTINUOUS OVER INVERTED-T BENTS FOR ALL BMS

OPTION 1 ~ ELEVATIONS AT BEAM ENDS

(6) See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.

(9) Butt adjacent bedding strips together with adhesive. Cut v-notches, approx ¼" deep, in the top of the bedding strips at 8' o.c.

(14) Max Spacing as listed unless otherwise shown.

(15) At connection with cast-in-place slab, extend longitudinal panel reinforcement. See PCP-FAB for details.

(16) Maintain one Bar E(#4) parallel to panel ends (Typ).

(17) Bars E(#4) not continuous over beam flanges must overlap beam flange 6" Min.

(18) Add flared Bars E(#4) (Min Spa = 6", Max Spa = 12") as required at panel ends.

(19) Where possible, Bars E(#4) may be extended into overhangs to replace Bars P(#4). Bars Z(#4) are required for sloped overhangs with U-Beams.

(20) See appropriate thickened slab end details for reinforcing and limits of thickened slab end.

TABLE OF REINFORCING STEEL (14)

BAR	SIZE	Max Spa (in.)
D	#4	9
E	#4	9
P	#4	18
UP	#4	~
Z	#4	18

HL93 LOADING

SHEET 3 OF 4

Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE PANELS
DECK DETAILS

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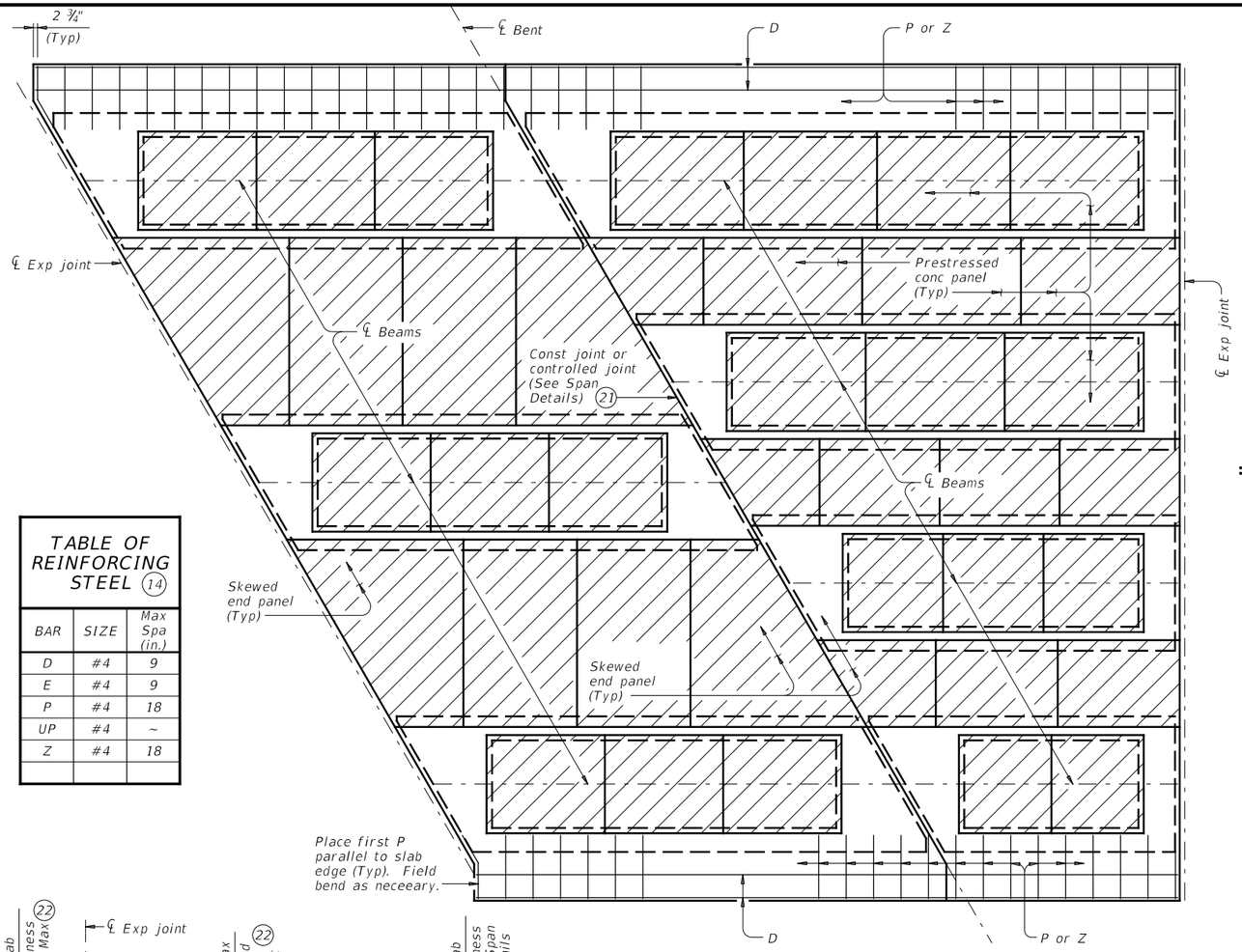
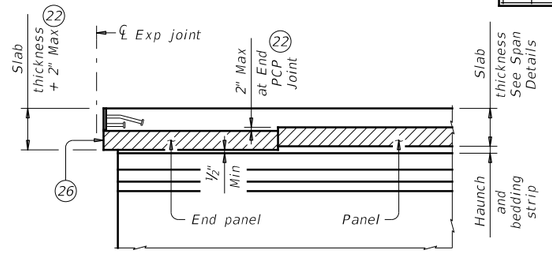


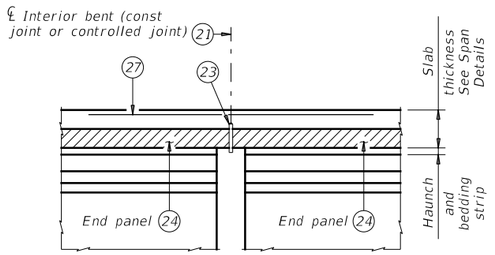
OPTION 2 ~ PLAN OF SLAB

(Showing U-Beams; other beams similar)



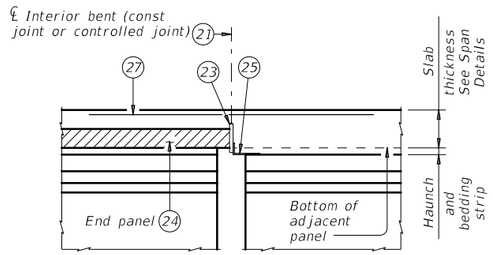
JOINTS (BETWEEN BEAMS/GIRDERS OR AT INV-T STEM)

For SEJ-A, SEJ-S(0), AJ, and Type A expansion joints only.



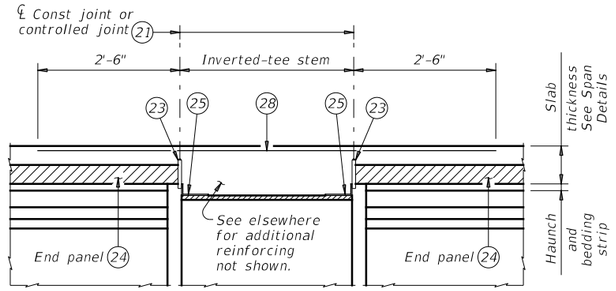
CONVENTIONAL INTERIOR BENT

Panel against panel between beams/girders.



CONVENTIONAL INTERIOR BENT

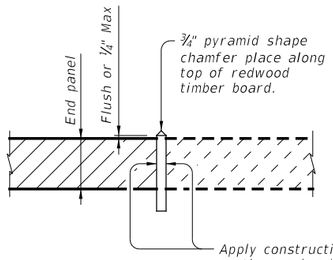
Panel against beam/girder end in adacent span.



INVERTED-T BENT

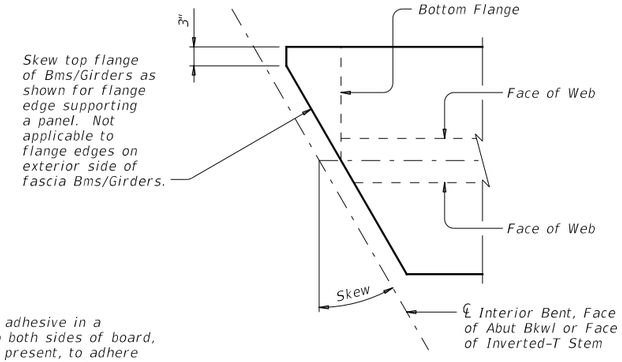
Panels against inverted-tee stem

OPTION 2 ~ ELEVATIONS AT BEAM ENDS (6)



ELEVATION EXAMPLE OF END PANEL AND TIMBER BOARD (23)

See "Option 2 ~ Elevation At Beam Ends".



OPTION 2 ~ SHOWING MODIFICATION TO BEAM/GIRDER TOP FLANGE FOR SKEWS OVER 5°

Showing I-Bm/I-Girder, U-Bms and Steel Bms similar.

TABLE OF REINFORCING STEEL (14)

BAR	SIZE	Max Spa (in.)
D	#4	9
E	#4	9
P	#4	18
UP	#4	~
Z	#4	18

(6) See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Transverse top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.

(14) Max Spacing as listed unless otherwise shown.

(21) 1 ½" Vinyl or plastic joint former at controlled joints (Stress Cap, Zip Strip, Stress Lock, or equal as approved by the Engineer.)

(22) End panel may be set up to 2" lower to accommodate expansion joint hardware, provided bedding strip is not less than ½" thick.

(23) ¾" thick redwood timber board, leave in place. Redwood timber board placed flush with top of panel or within ¼" Max above panel. Place ¾" pyramid shape chamfer along top of timber board. See "Elevation Example of End Panel and Timber Board". Place straight, within ¼" of centerline of bent or face of inverted-tee, across bridge width and end board at exterior flange edge of fascia beams/girders. Do not extend into overhang.

(24) Place panel within ½" of ¾" thick board.

(25) Permanent galvanized steel sheet form. Removable formwork is acceptable.

(26) Place end panel within ½" of expansion joint opening. End panel cannot encroach on required expansion joint opening.

(27) Place additional (#4) bar 5'-0" in length between every slab bars T. Center (#4) bar on Joint.

(28) Place additional (#4) bar continuous 2'-6" beyond each side of Inverted-T Stem between every slab bars T.

SPECIAL OPTION 2 CONSTRUCTION NOTES:

When Option 2 is chosen bottom mat of thickened end slab reinforcing is not required. Use the same top mat as shown on the Thickened Slab End Details sheet.

Placing panels adjacent to expansion joints and bent centerlines prior to completing interior panel placement is recommended. Saw cutting panels to fit is acceptable when approved by the Engineer. Minimum distance from a saw cut edge to a panel strand is 1 ½".

Do not extend the longitudinal panel reinforcement into the cast-in-place slab.

Top flanges of beams and girders on skewed bridges must be modified as shown on this drawing. The Contractor is responsible for coordinating this modification with the beam fabricator prior to submitting shop drawings for approval.

Fabricator may optionally skew the whole end. When electing to skew whole end, girder end details and bearing type at conventional interior bent must be changed to use condition at abutment. Fabricator must coordinate change in bearing type, bearing centerline location, and dowel location with Engineer and Contractor. Show appropriate changes on girder and bearing shop drawings.

Bending of anchor studs of expansion joints shown on standards AJ, SEJ-A and SEJ-S(0) is permissible if necessary to clear top of end panels. The Contractor is responsible for coordinating modifications with the joint fabricator. Submit shop drawings for approval when modifications to expansion joint hardware are made.

Bedding strips under skewed end panels must conform to the requirements of Item 422 except their minimum compressive strength must be 60 psi.

Provide Bars AA, G, K and 0A from standard IGTS in the slab.

HL93 LOADING SHEET 4 OF 4

Texas Department of Transportation — Bridge Division Standard

PRESTRESSED CONCRETE PANELS
DECK DETAILS

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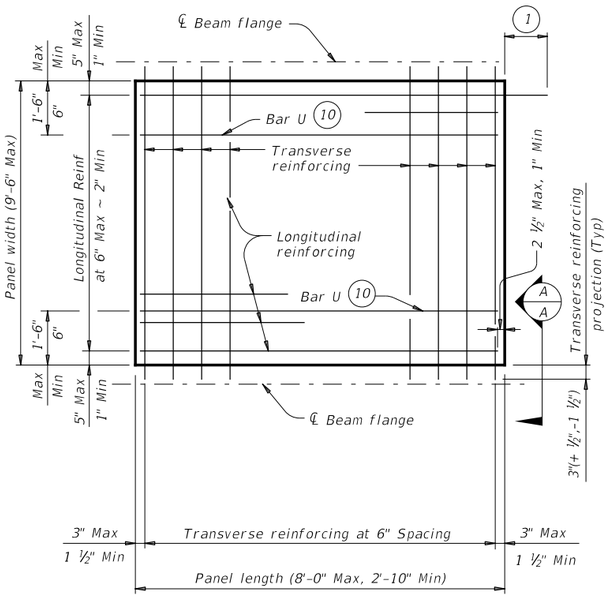
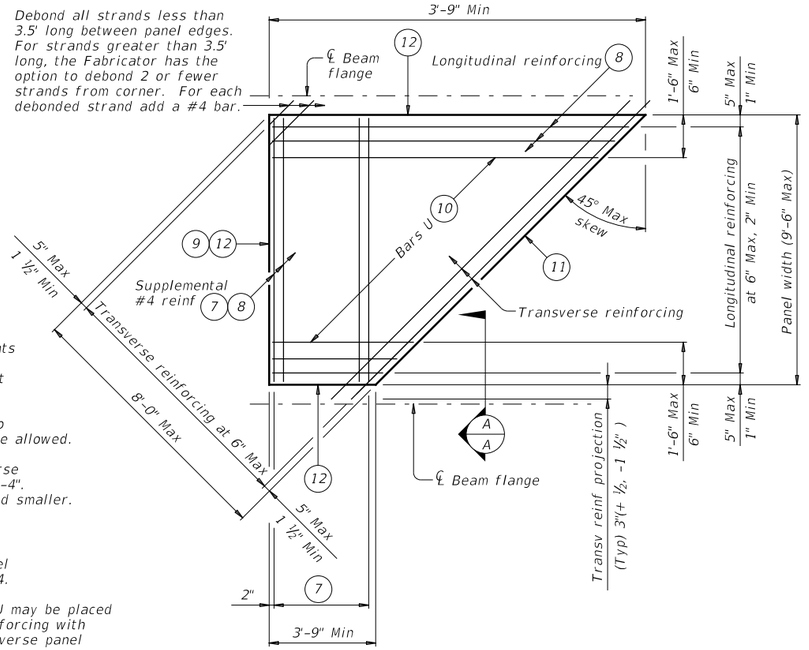


TYPICAL NON-SKEWED PANEL PLAN



TYPICAL SKEWED END PANEL PLAN

(Only to be used with details shown elsewhere in the plans.)

TABLE A (4) (5)			
Beam Type	Normal (In.)	Min (In.)	Max (In.)
A	3	2 ½	3 ½
B	3	2 ½	3 ½
C	4	3	4 ½
IV	6	4	7 ½
VI	6 ½	4 ½"	8 ½
U40 – 54	5 ½	5 ½	7
Tx28–70	6	5	7 ½
XB20 – 40	4	3	4 ½
XSB12 – 15	4	3	4 ½

TABLE B (4) (5)			
Top Flange Width	Normal (In.)	Min (In.)	Max (In.)
11" to 12"	2 ¾	2 ½	2 ¾
Over 12" to 15"	3 ¼	3	3 ¼
Over 15" to 18"	4	3	4 ¾
Over 18"	5	3 ½	6 ¼

1. At connection with cast-in-place slab, extend longitudinal panel reinforcement 1'-0" (+2",-0") past panel end. Alternatively, provide (#3) x 2'-0" dowels at 6" Max Spacing and extend dowels 1'-0" past panel end.
2. Four loops required per panel.
3. Four loops required per panel. ⅜" or ½" strands may be used.
4. Normal dimensions must be used on spans with parallel beams. Maximum and Minimum dimensions apply only to spans with flared beams.
5. See Normal Grading Detail on PCP standard for lap requirements and bedding strip dimensions. Some laps shown in tables cannot utilize all bedding strip widths.
6. One Splice allowed per panel. No more than two sheets of WWR are allowed.
7. Provide (#4) bars under transverse reinforcing, 10 Spaces at 4" = 3'-4". Omit for 5 degree (1:12) skew and smaller.
8. End Cover 2 ½" Max, 1" Min.
9. Recess strands on indicated panel edge in accordance with Item 424.
10. At the fabricator's option, Bars U may be placed parallel to transverse panel reinforcing with horizontal legs in plane of transverse panel reinforcing.
11. Use length of indicated panel edge as panel width for purpose of determining type of transverse reinforcing.
12. Timber form work permissible this edge.

GENERAL NOTES:

Provide Class H concrete for panels. Release strength f'ci=3,500 psi. Minimum 28 day strength f'c=5,000 psi.

Provide ¾" chamfer along bottom edge of panel on beam side.

Do not use epoxy-coated reinforcing steel bar or strand in panels.

Remove laitance from top panel surface.

Finish top of panel to a roughness between a No. 6 and No. 9 concrete surface profile, inclusive, as specified by the International Concrete Repair Institute (ICRI).

Shop drawings for the fabrication of panels will not require the Engineer's approval if fabrication is in accordance with the details shown on this standard.

A panel layout which identifies location of each panel must be developed by the Fabricator. Permanently mark each panel in accordance with the panel layout. A copy of the layout is to be provided to the Engineer.

TRANSVERSE PANEL REINFORCEMENT:

For panel widths over 5', use ⅜" or ½" Dia (270k) prestressing strands with a tension of 14.4 kips per strand.

For panel widths over 3'-6" up to and including 5', use ⅜" or ½" Dia (270k) prestressing strands with a tension of 14.4 kip per strand. Optionally, (#4) Grade 60 reinforcing bars may be used in lieu of prestressed strands.

For panel widths up to 3'-6", use (#4) Grade 60 reinforcing bars (prestressed strands alone are not allowed).

Place transverse panel reinforcement at panel centroid and space at 6" Max.

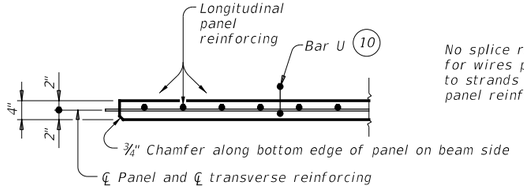
LONGITUDINAL PANEL REINFORCEMENT:

Any of the following options may be used for longitudinal panel reinforcement:

1. (#3) Grade 60 reinforcing steel at 6" Max Spacing. No splices allowed.
2. ⅜" Dia prestressing strands at 4 ½" Max Spacing (unstressed). No splices allowed.
3. ½" Dia prestressing strands at 6" Max Spacing (unstressed). No splices allowed.
4. Deformed Welded Wire Reinforcement (WWR) (ASTM A1064) providing 0.22 sq in per foot of panel width. Wires larger than D11 not permitted. Provide transverse wires to ensure proper handling of reinforcing. One splice per panel is allowed. See WWR Splice Detail.

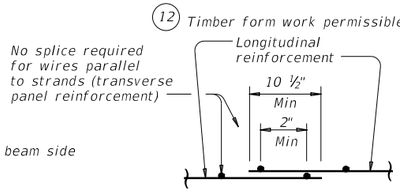
No combination of longitudinal reinforcement options in a panel is allowed.

Place longitudinal panel reinforcement above or below transverse panel reinforcement. Must be placed above transverse panel reinforcement for skewed end panels with supplemental (#4) reinforcement.

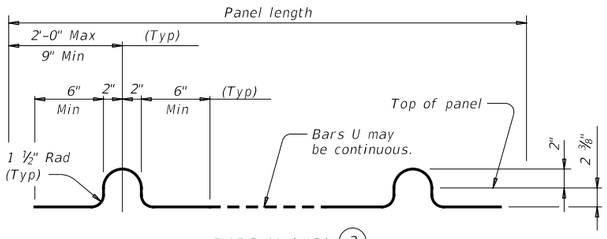


SECTION A-A

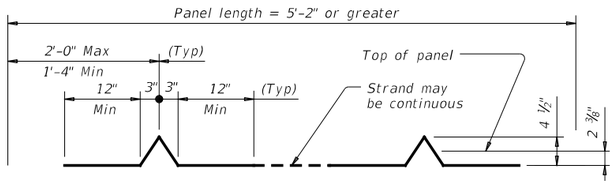
(Not showing supplemental #4 bars for skewed end panels.)



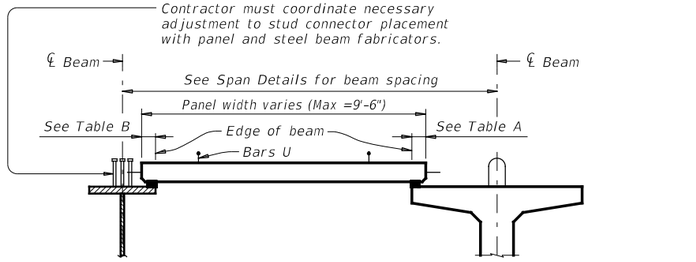
WELDED WIRE REINFORCEMENT (WWR) SPLICE DETAIL (6)



BARS U (#3) (2)



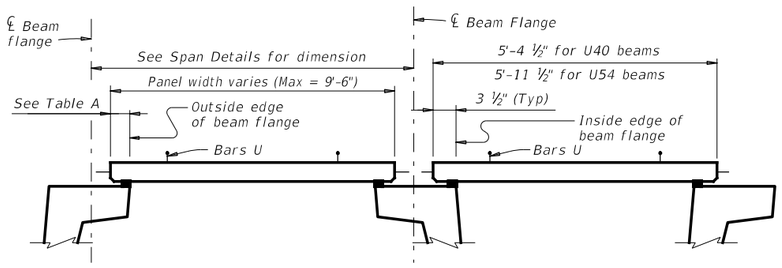
OPTIONAL STRAND FOR BARS U (3)



STEEL BEAMS

PRESTRESSED CONCRETE BEAMS OR GIRDERS

Typ unless noted otherwise



PRESTRESSED CONCRETE U-BEAMS

TYPICAL SECTIONS FOR DETERMINING PANEL WIDTH

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE PANEL FABRICATION DETAILS

PCP-FAB

FILE: pcpstde2-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: AES
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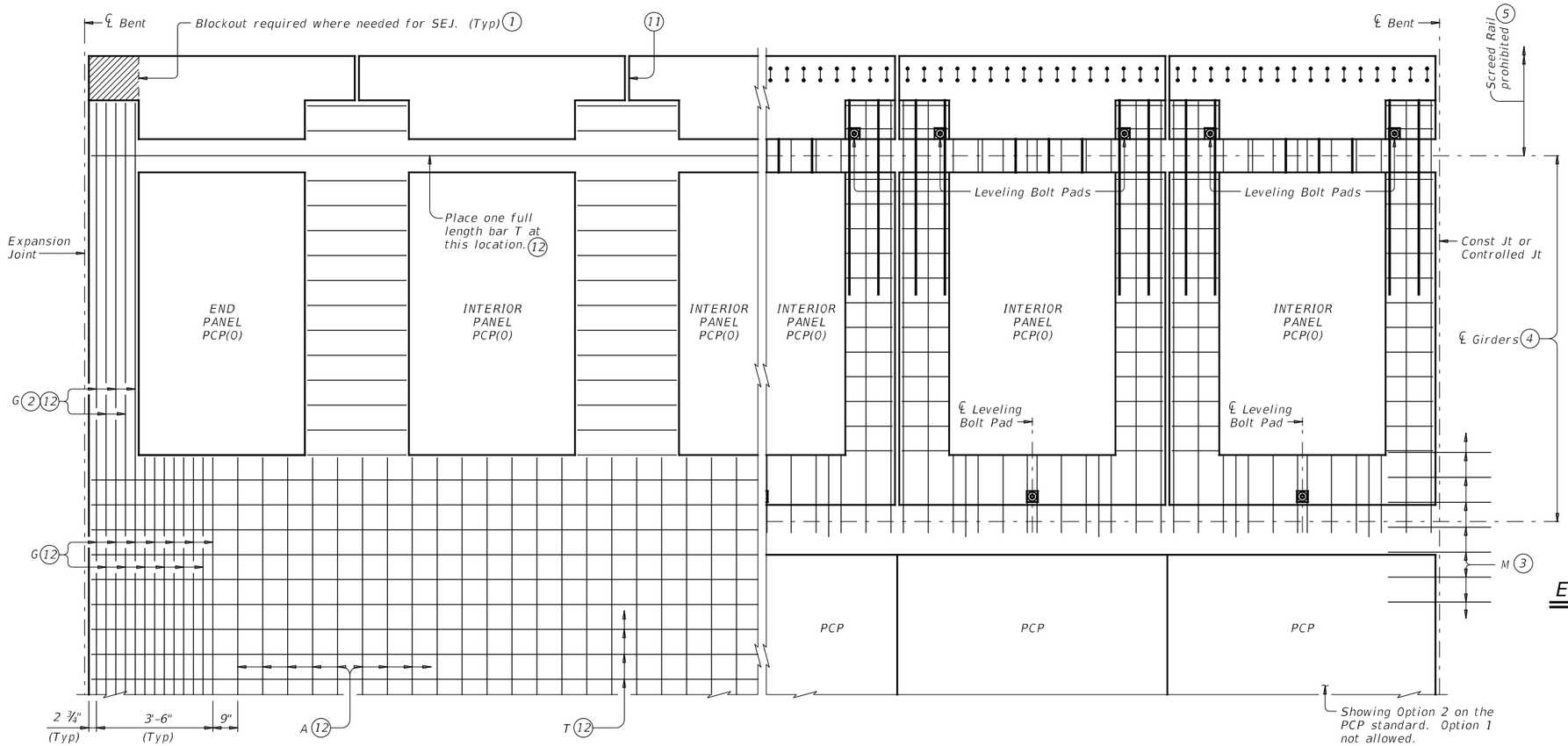


SHOWING FIELD PLACEMENT OF TOP REINFORCING STEEL

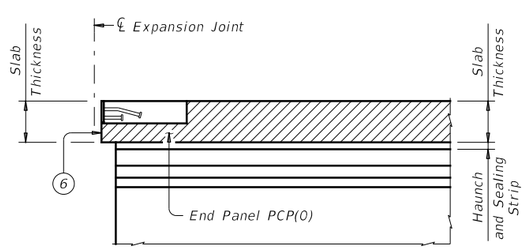
SHOWING PCP(0) EXPOSED REINFORCING STEEL

Field placed bars M shown for clarity.

PANEL LAYOUT

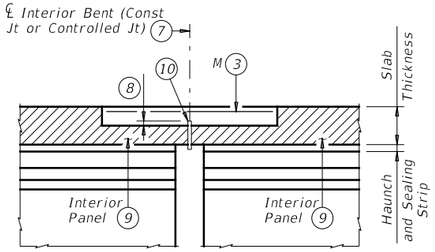
PCP(0) shown with gaps between panels for clarity.
The gap cannot be considered as a panel fabrication tolerance.

1. 1'-4" x 1'-6" x 4 ½" blockout to accommodate SEJ that require an upturn. Contractor to communicate with fabricator the location and type of SEJ to be utilized.
2. When blockout is required, extend bars G into blockout.
3. Place additional bars M 2'-11" in length on top of bars A and between every bar T. Center bars M at center of bent. Located at bents with construction joints or controlled joints only. Bars M may replace additional (#4) bars 5'-0" in length as shown on PCP standard in Option 2 ~ Elevations At Beam Ends. Option 1 not allowed.
4. It is recommended to profile every 4 ft by surveying each girder under PCP(0) for proper grading of panels.
5. Screed rail used to set grade for paving machine is not allowed past exterior girder as shown.
6. Place end panel PCP(0) within ½" of expansion joint opening. Do not encroach on required expansion joint opening.
7. Top Plastic Joint Former at Controlled Joints (Stress Cap, Zip Strip, Stress Lock, etc.) is not required with these Details.
8. 0" Min, ¾" Max, support as necessary.
9. Place panel within ½" of ¾" thick board.
10. ¾" thick wood/timber board, leave in place. Place straight, within ¼" of Centerline of Bent, across bridge width and end board at exterior flange edge of fascia girders. Do not extend into overhang.
11. Seal top of panel only, with a Class 4 sealant prior to rail construction. Typical between panels. Do not seal at Expansion Joints.
12. 1 ½" End Cover. (Typ)



EXPANSION JOINT

For SEJ-A, SEJ-S(0), AJ and Type A Expansion Joints only.

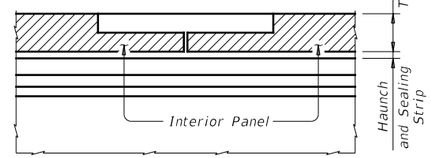


CONST JT OR CONTROLLED JT

Panel against Panel between Bms/Girders.

ELEVATIONS AT GIRDER ENDS WITH PCP(O)

Reinforcing steel not shown for clarity.



ELEVATION BETWEEN PCP(O)

The gap cannot be considered as a panel fabrication tolerance.
Reinforcing steel not shown for clarity.

HL93 LOADING

SHEET 1 OF 2

Texas Department of Transportation

Bridge Division

PRECAST CONCRETE PANELS FOR OVERHANGS

PCP(O)

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	AUS	HAYS		287

DATE: 11/19/2020 4:37:47 PM
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BAR TABLE		
BAR	SIZE	MAX SPA (IN)
A (12)(17)	#4	9"
G (12)(17)	#4	3½"
M	#4	9"
T (12)(17)	#4	9"

(4) It is recommended to profile every 4 ft by surveying each girder under PCP(0) for proper grading of panels.

(5) Screed rail used to set grade for paving machine is not allowed past exterior girder as shown.

(12) 1 ½" End Cover on bars. (Typ)

(13) Space bars UP(#4) with girder bars R(#4) in all areas where measured haunch exceeds 3 ½" with Prestressed Concrete I-Girders. Epoxy coating for Bars UP is not required.

(14) 6" plus or minus.

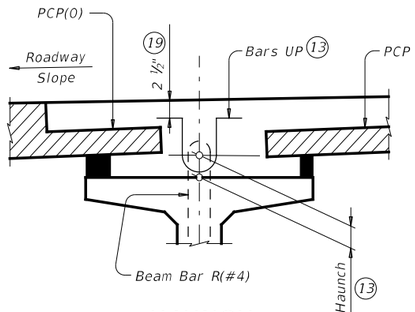
(15) Place sealing strip at flange edge as shown. Butt adjacent sealing strips longitudinally together with adhesive. Use pencil vibrators with concrete placement over girder and between sealing strips to avoid rupturing sealing strips. Cut sealing strips 2" higher than anticipated haunch thickness and compress to grade.

(16) (#3) Panel bars F must be field bent and welded to the R bars in girder. Two bars F per panel.

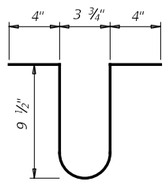
(17) Field placed bars that are allowed to be lapped. Reinforcing steel that protrudes from panels are not considered bars to be lapped. See "Material Notes" for applicable bar laps.

(18) ℄ Leveling Bolt Pad. 1" Dia Coil Rod or 1" Dia Coil Bolt shown, are furnished by the contractor. After grading each PCP(0) panel with the 1" Dia coil rods or coil bolts, secure each panel in its final resting position (plastic shims, welding, etc) and remove all 1" Dia coil rods or coil bolts for the cast-in-place concrete. Coil rods/bolts may be left in place at contractor's option. If coil rods/bolts are left in place, coil rods/bolts must have at least 2 ½" of cover to top of finish grade. Grading bolts are inadequate to carry all conceivable screed/construction loads. Panel support method must be calculated, location identified, and placed on shop drawings. Method chosen to support panels must be adequate for all construction loads. Panel support method must be placed/constructed after final grading and before screed rail placement.

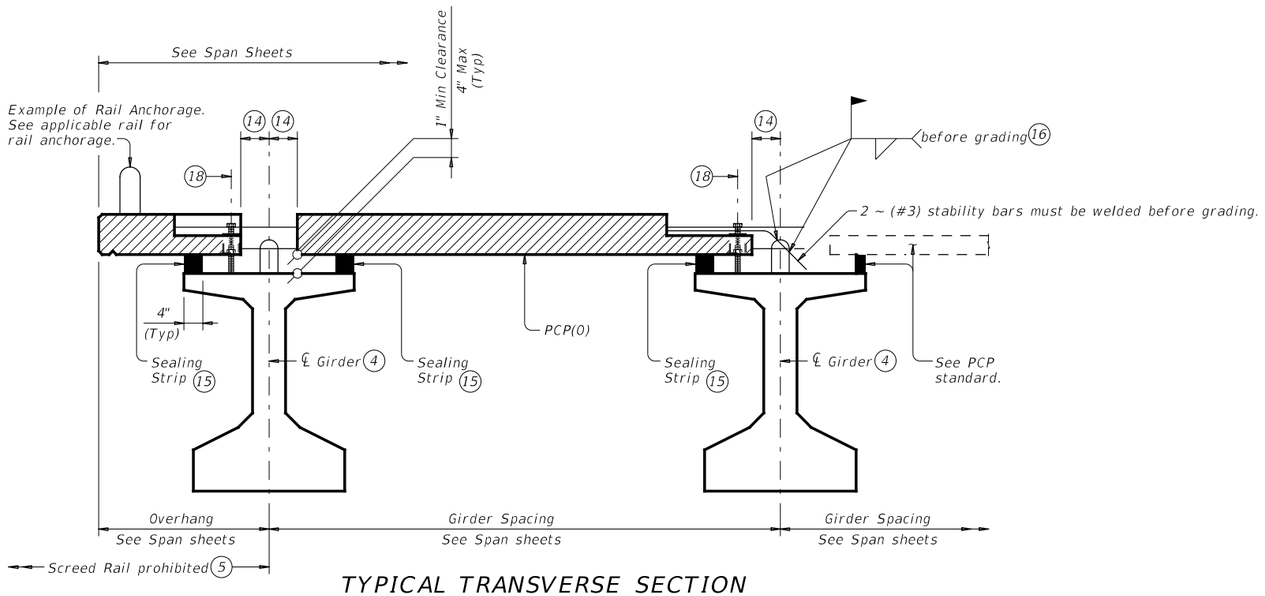
(19) Unless shown otherwise on Span Details.



HAUNCH REINFORCING DETAIL (4)



BARS UP (#4) (13)



TYPICAL TRANSVERSE SECTION

(Showing Girder Type Tx46)

CONSTRUCTION NOTES:

Placing panels adjacent to expansion joints and bent centerlines prior to completing interior panel placement is recommended.

Ensure proper cleaning of construction debris and consolidation of concrete mortar under the edges of the panels. Place sealing strips at girder flange edges so that adequate space is provided for the mortar to flow a minimum of 8" transversely under the panels as the slab concrete is placed.

Panel placement with Option 1 on the PCP standard is not allowed.

It is recommended to profile every 4 ft by surveying each girder under PCP(0) for proper grading of panels.

To allow the proper amount of mortar to flow between girder and panel, maintain a minimum vertical opening of 1". Roadway cross-slope reduces the opening available for entry of the mortar. Sealing strips vary in thickness along girder are therefore required.

Seal the top panel with a Class 4 sealant as shown in the Panel Layout.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel in cast-in-place slab. See Table of Reinforcing Steel for size and spacing of reinforcement.

If the reinforcing steel is shown on the Span Details to be epoxy coated, then epoxy coat bars A, G, M, & T.

Provide bar laps, where required, as follows:

Uncoated ~ #4 = 1'-7"
Epoxy Coated ~ #4 = 2'-5"

Provide sealing strips comprised of one layer low density polyurethane (1.0 Lbs density) foam sealing strips or equivalent. Oversize the height of sealing strips by 2". Bond sealing strips to the girder with 3M Scotch ® 4693 or equivalent adhesive compatible with sealing strips.

GENERAL NOTES:

Designed according to AASHTO LRFD Specifications.

These details can be used as an option to construct the deck overhang when noted on the Span details and in conjunction with the PCP(0)-FAB, PCP and applicable Standard sheets.

These details are only applicable for Prestr Conc I-Girders.

Any additional reinforcement or concrete required on these details is subsidiary to the bid Item "Reinforced Concrete Slab".

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

HL93 LOADING

Texas Department of Transportation | Bridge Division

PRECAST CONCRETE PANELS FOR OVERHANGS

PCP(O)

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	AUS	HAYS		288

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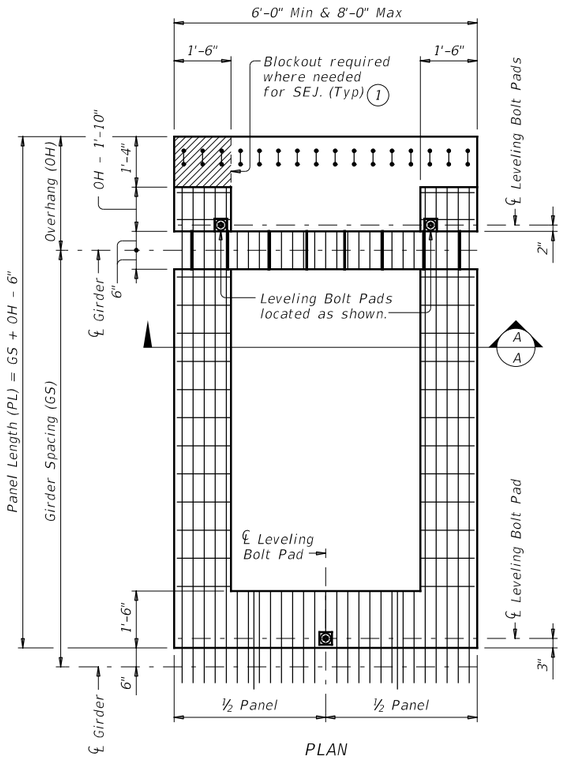
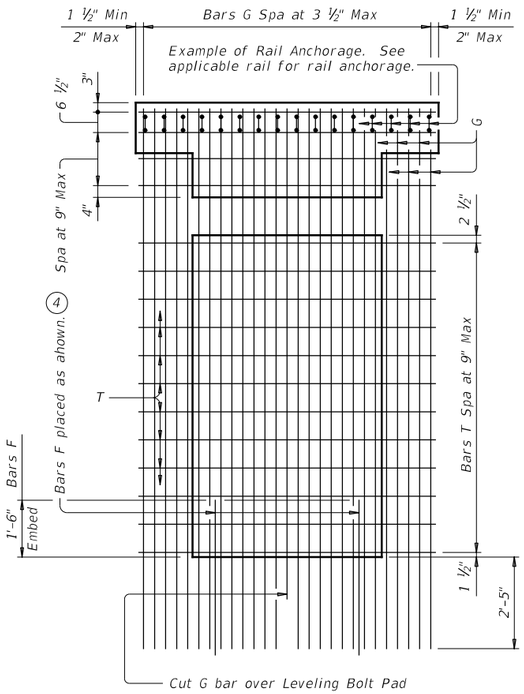
BAR TABLE	
BAR	SIZE
A (2)	#4
B (2)	#4
D (2) (3)	#4
F (3)	#3
G (2)	#4
H (2)	#4
K (2) (3)	#8
T (2) (3)	#4

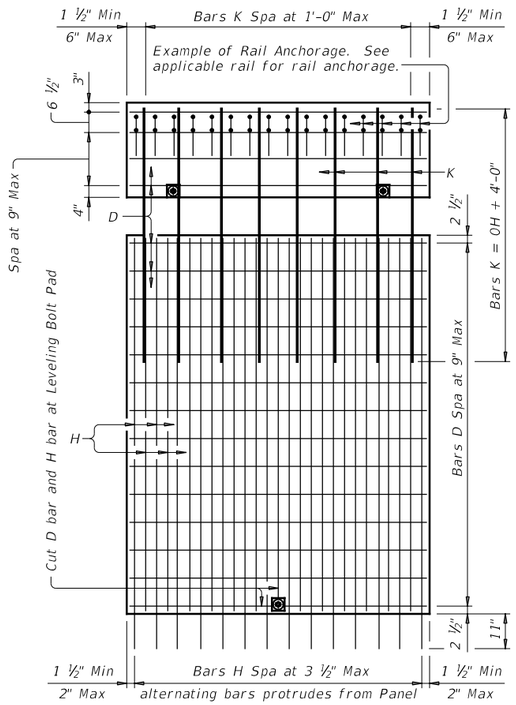


PLAN



TOP REINFORCING STEEL

END PANEL



BOTTOM REINFORCING STEEL

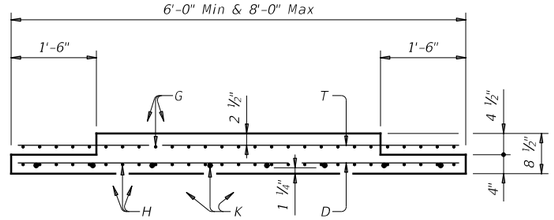
(1) 1'-4" x 1'-6" x 4 ½" blockout to accommodate SEJ that require an upturn. Contractor to communicate with fabricator the location and type of SEJ to be utilized.

(2) 1 ½" End Cover on bars. (Typ)

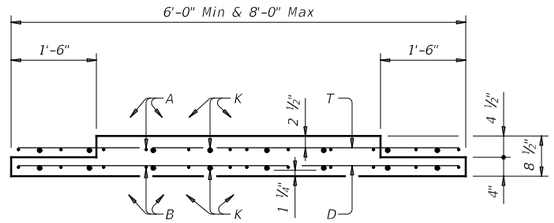
(3) Bars that are not allowed to have lap splices.

(4) Place F bars under bars T and against bars G.

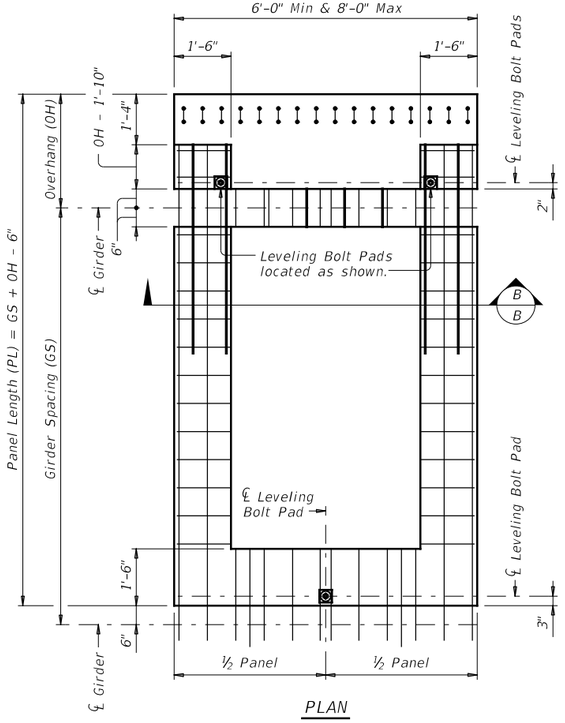
(5) Place F bars under bars T and between bars A.



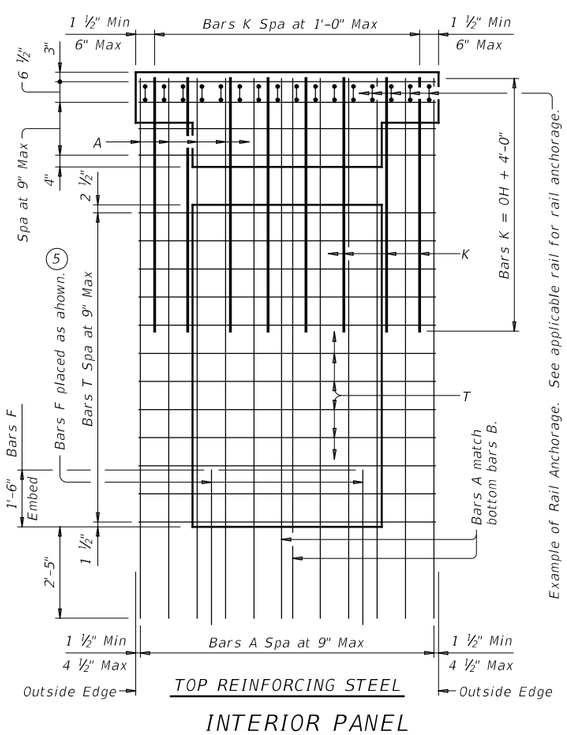
SECTION A-A



SECTION B-B

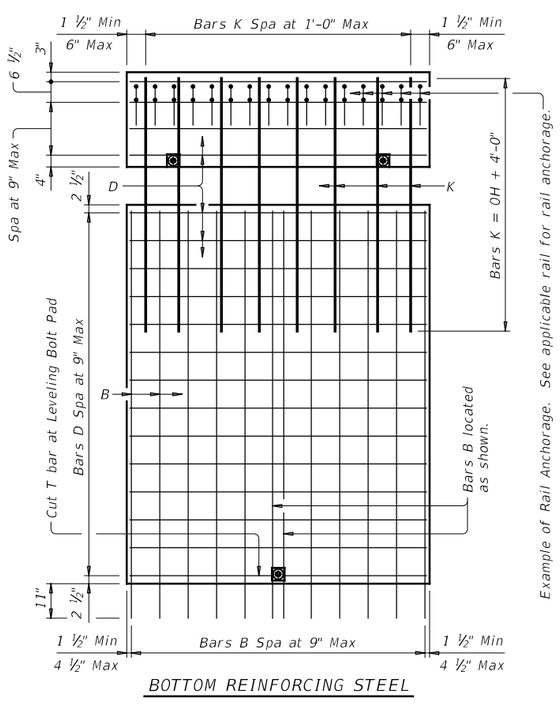


PLAN



TOP REINFORCING STEEL

INTERIOR PANEL



BOTTOM REINFORCING STEEL

HL93 LOADING

Texas Department of Transportation

Bridge Division

PRECAST CONCRETE PANELS FOR OVERHANGS FABRICATION DETAILS

PCP(O)-FAB

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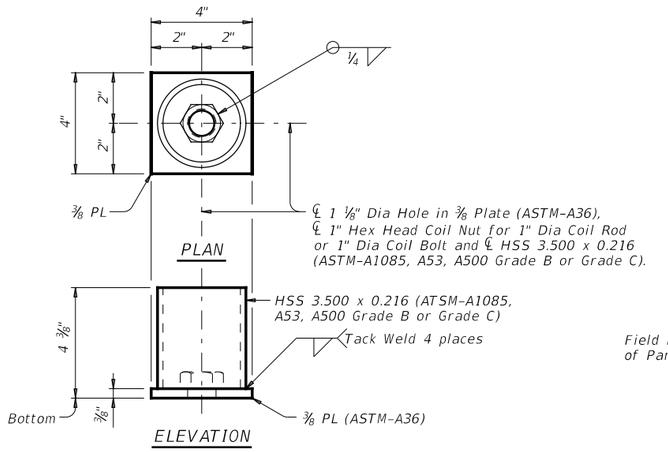
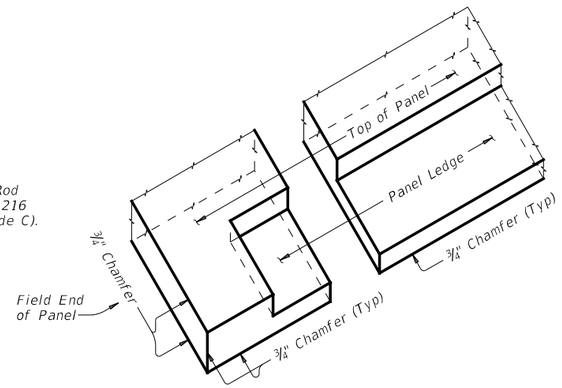


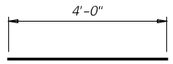
LEVELING BOLT PAD DETAILS

Galvanize if epoxy coated reinforcing steel is used in slab. Do not oil this assembly.

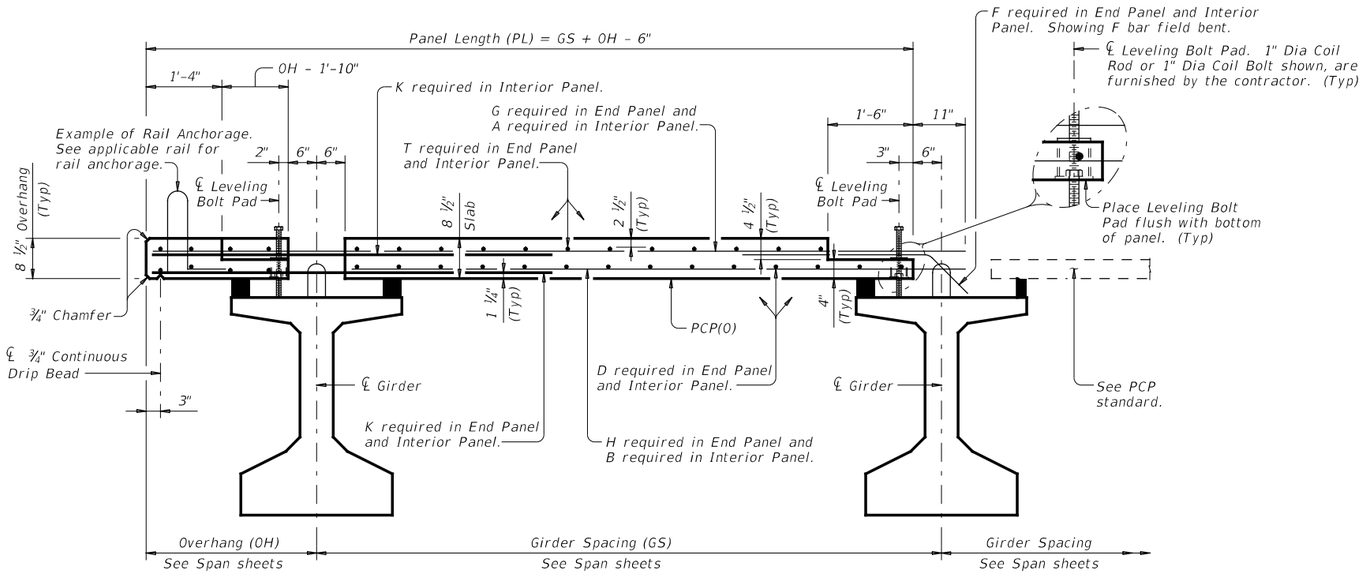


ISOMETRIC VIEW AT CORNER OF PANEL

Showing Typical Chamfers on Panel. Drip Bead and reinforcing steel not shown for clarity.



BARS F



TYPICAL TRANSVERSE SECTION

(Showing Girder Type Tx46)

CONSTRUCTION/FABRICATION NOTES:

Remove laitance from top panel surface.

Finish top surface area of panel with a broom finish. Finish top ledge of panel to a roughness between a No. 6 and No. 9 concrete surface profile, inclusive, as specified by the International Concrete Repair Institute (ICRI).

Provide ¾" concrete chamfers as shown on these details.

Do not lap splice bars D, F, K & T. Bars A, B, G & H, may be spliced with only one lap splice allowed on each bar.

Panels must be fabricated by a fabricator meeting the requirements of DMS 7300 for Multi-Project Nonstressed Member Fabrication Plant.

MATERIAL NOTES:

Provide Class H concrete (f'c=4000 psi) in panels. Provide Class H (HPC) concrete for panels if required elsewhere in plans. Maximum large aggregate size is 1".

Provide material as shown on this standard for the Leveling Bolt Pad.

Provide Grade 60 conventional reinforcing steel.

Provide epoxy coated reinforcement for bars A, B, D, G, H, K & T if slab reinforcement is epoxy coated.

An equal area and spacing of deformed Welded Wire Reinforcement (WWR) ASTM-A1064 may be substituted for bars A, B, D, G, H & T, unless otherwise noted. Bars F and K can not be replaced with WWR.

Galvanize leveling bolt pad assembly if epoxy-coated reinforcing steel is used in slab.

GENERAL NOTES:

Designed according to AASHTO LRFD Specifications.

These details are only applicable for Prestr Conc I-Girders.

Any additional reinforcement, lifting devices or epoxy coated reinforcement required on these details are subsidiary to the bid Item "Reinforced Concrete Slab".

See railing details for rail anchorage in panel overhang.

A panel layout which identifies location of each panel must be developed by the fabricator. Permanently mark each panel in accordance with the panel layout. A copy of the layout is to be provided to the Engineer.

Submit stable lifting methods and devices to the Engineer for approval.

Shop drawings for the fabrication of panels will require the Engineer's approval.

Cover dimensions are clear dimensions, unless noted otherwise.

Reinforcing bar dimensions shown are out-to-out of bar.

HL93 LOADING

SHEET 2 OF 2

Texas Department of Transportation

Bridge Division

PRECAST CONCRETE PANELS FOR OVERHANGS FABRICATION DETAILS

PCP(O)-FAB

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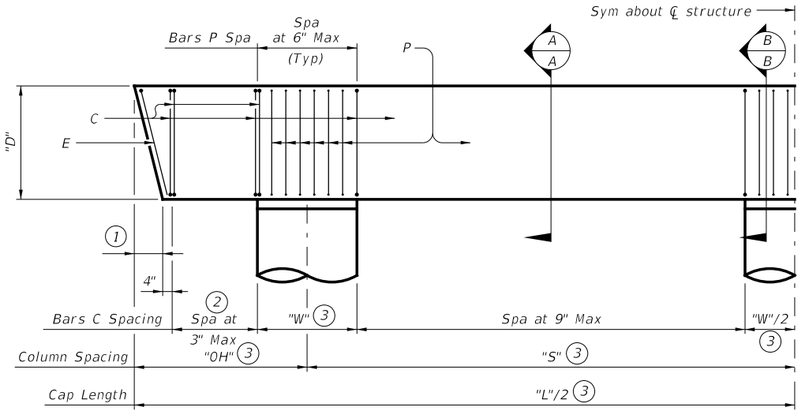
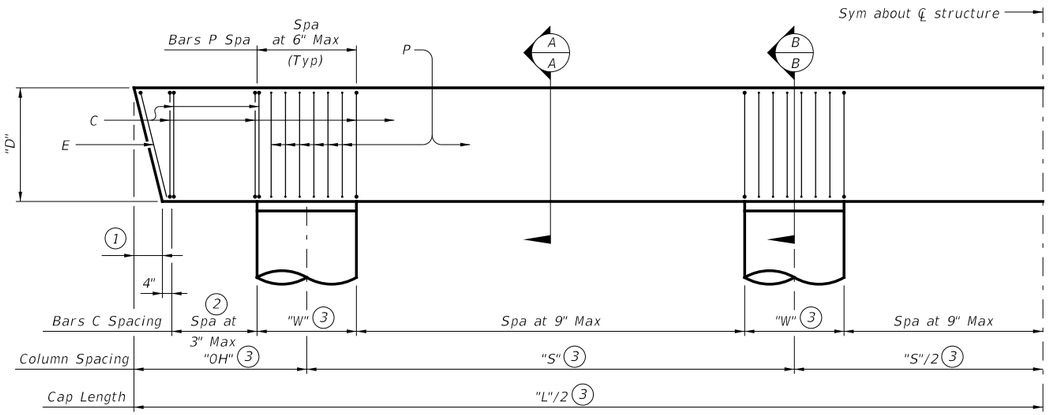


SHOWING 3 COLUMN BENT

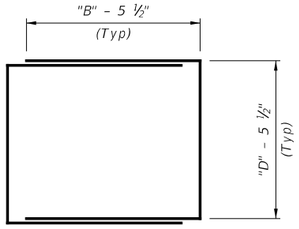


SHOWING 4 COLUMN BENT

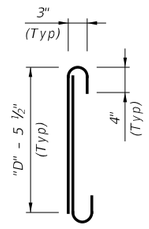
TABLE OF CAP DESIGNS

OPTIONAL DESIGN

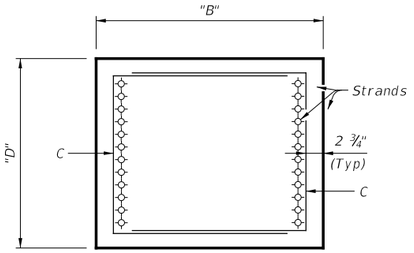
SUPERSTRUCTURE TYPE	CAP DIMENSIONS			CONCRETE		PRESTRESSING STRANDS				REQUIRED MINIMUM ULTIMATE MOMENT CAPACITY (STRENGTH I)
	CAP WIDTH "B" (ft-in)	CAP DEPTH "D" (ft-in)	CORRUGATED PIPE INSIDE DIAMETER (ft-in)	RELEASE STRENGTH f'_{ci} (ksi)	MINIMUM 28 DAY COMP STRENGTH f'_c (ksi)	LAYERS OF PS STRANDS	TOTAL NO. PS STRANDS	SIZE (in)	STRENGTH (ksi)	(ft-kips)
Slab Beams	3'-0"	2'-6"	1'-6"	4.0	5.0	12	24	0.6	270	1,201
Decked Slab Beams	3'-6"	3'-0"	2'-0"	4.0	5.0	15	30	0.6	270	1,886
Box Beams	3'-6"	3'-0"	2'-0"	4.0	5.0	15	30	0.6	270	1,886
X-Beams	4'-0"	3'-6"	2'-6"	5.2	6.5	16	32	0.6	270	2,671
I-Girders (Tx28-Tx54)	4'-0"	3'-6"	2'-6"	4.0	5.0	16	32	0.6	270	2,484
I-Girders (Tx62)	4'-6"	4'-0"	3'-0"	4.0	5.0	20	40	0.6	270	3,634



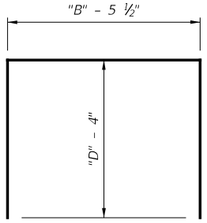
BARS C(#5)
Showing one complete bar.



BARS P(#3)
Showing one complete bar.

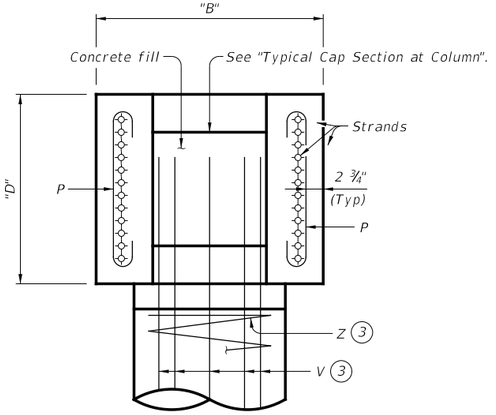


SECTION A-A



BARS E(#5)

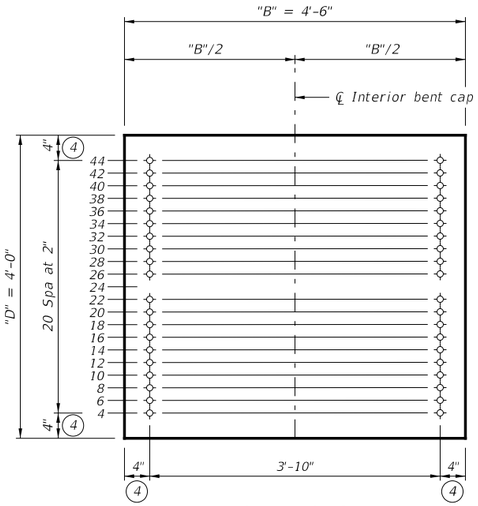
1. Variable. See Interior Bents sheet for dimension. When dimension is 0", omit Bars E and reduce end cover to Bars C to 3". Measured parallel to top of cap cross-slope.
2. Double Bars C. (Typ)
3. See Interior Bents sheet for details not shown.
4. Dimensioned to center of strand.



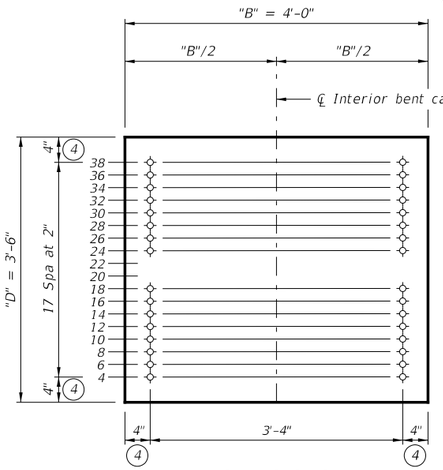
SECTION B-B

INTERIOR BENT HALF ELEVATION

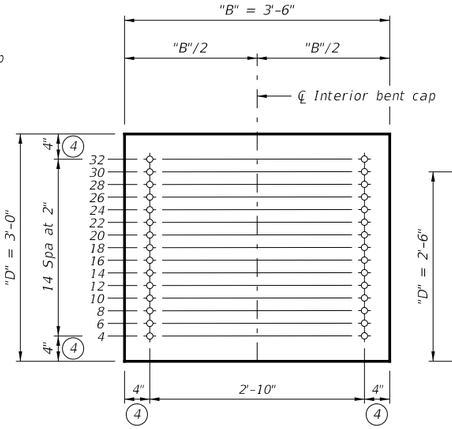
(Strands not shown for clarity.)



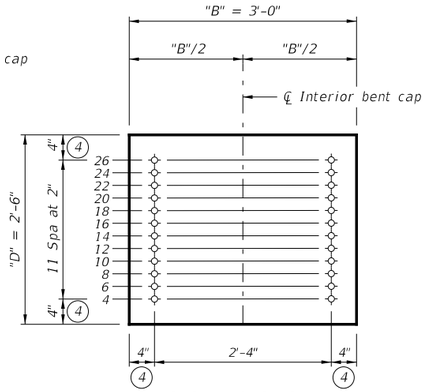
4'-6" x 4'-0" CAP
Used with I-girders (Tx62)



4'-0" x 3'-6" CAP
Used with I-girders (Tx28-Tx54)
and X-beams



3'-6" x 3'-0" CAP
Used with decked slab beams
and box beams



3'-0" x 2'-6" CAP
Used with slab beams

INTERIOR BENT CAP SECTIONS

(Showing strands only.)

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation
Bridge Division Standard

PRESTRESSED, PRECAST BENT CAP OPTION FOR ROUND COLUMNS

PPBC-RC

FILE: ppbcstd1-19.dgn	DN: CPM	CK: AJF	DW: JTR	CK: CPM
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
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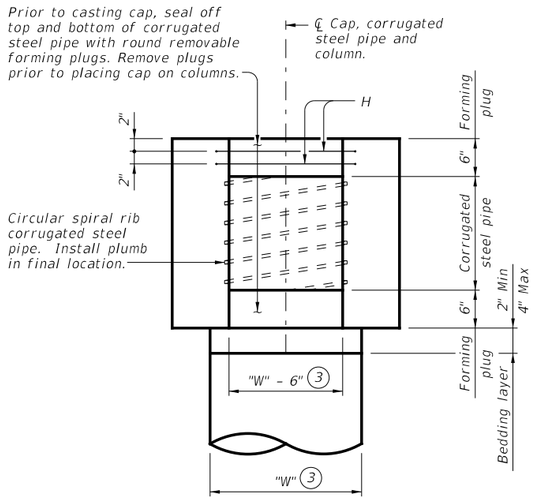


TYPICAL CAP SECTION AT COLUMN

Showing example of cap and corrugated steel pipe at column. Cap and column reinforcing not shown for clarity.

(3) See Interior Bents sheet for details not shown.

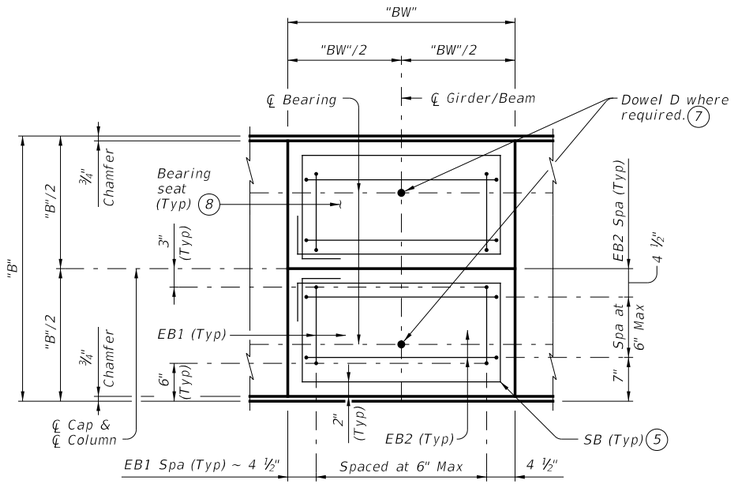
(5) Omit bars SB for pedestal heights ("PH") under 1'-0".

(6) Shown for structures without skew. Details are for "PH" heights greater than 3" and less than 18". Details are shown for standard X-Beams and I-Girders. Submit details as part of the shop drawing submittal for skewed structures and for pedestals greater than 18" in height.

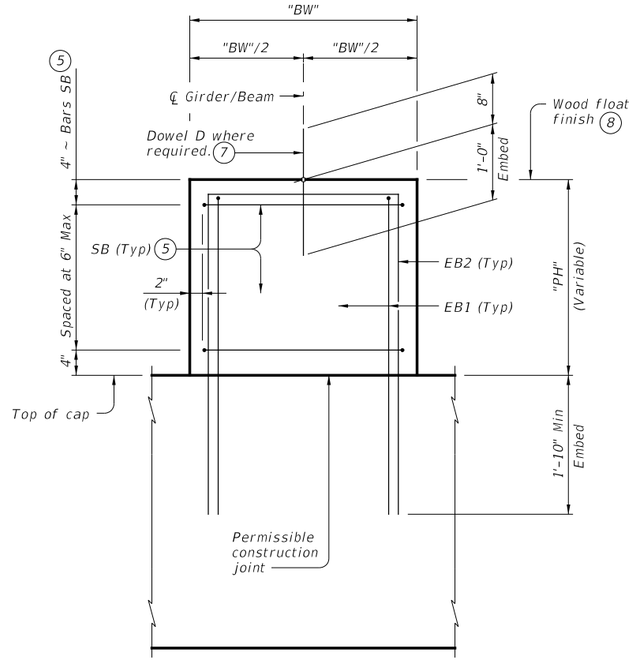
(7) See Interior Bents sheet for placement of dowels. Place dowels plumb.

(8) See Interior Bents sheet, Bearing Seat Detail for slope.

SUPERSTRUCTURE TYPE	BEARING DIMENSIONS "BW" (ft-in)
X-Beams	6'-0"
I-Girders (Tx28-Tx54)	3'-0"
I-Girders (Tx62)	3'-0"



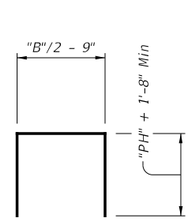
PLAN



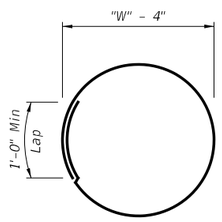
ELEVATION

PEDESTAL DETAILS (6)

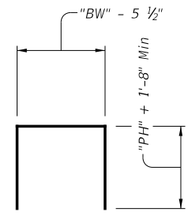
Clean bearing surface and all loose material before placing bearing pad. Reinforce bearing seats/pedestals over 3" in height as shown.



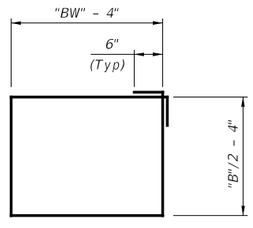
BARS EB1(#5) (6)



BARS H(#4)



BARS EB2(#5) (6)



BARS SB(#5) (5) (6)

CONSTRUCTION NOTES:

Cap Fabrication:

Fabricate in accordance with Item 425, "Precast Prestressed Concrete Structural Members". Secure corrugated metal pipes to prevent their movement during concrete placement. Location tolerance of pipes is ¼" from plan location, transversely and longitudinally. Seal pipes to prevent intrusion of concrete.

Chamfer or round all exposed corners ¾".

Repair cracks exceeding 0.005 in. in width as directed. The fabricator must take approved corrective actions if cracks greater than 0.005 in. form. All work, material, and engineering related to these cracks will be at the Contractor's expense.

Caps can be set level or at grade. If required or needed, build bearing seats/pedestals to achieve final grade. Bearing seats/pedestals may be precast with the initial cast. Bearing seats/pedestals that conflict with column locations may not be precast with cap. Do not locate lift points at bearing seats/pedestals if bearing seats/pedestals are precast. If bearing seats/pedestals are not precast, cast in accordance with Item 420.4.9, "Treatment and Finishing of Horizontal Surfaces". Do not slope the top of caps between bearing areas from the center slightly towards the edge. If pedestals are not precast, drill and epoxy anchor bars EB1 and EB2 into top of cap in accordance with Item 420.7.10, "Installation of Dowels and Anchor Bolts".

If earwalls are required, see Interior Bents sheet for details.

If shear keys are required elsewhere in plans, submit details. Shear keys may not be precast. Drill and epoxy shear key anchor reinforcement into top of cap in accordance with Item 420.4.7.10 "Installation of Dowels and Anchor Bolts".

Limit flexural stress in cap to 250 psi during handling and storage. Store and handle caps in accordance with Item 425, "Precast Prestressed Concrete Structural Members". Do not stack caps.

Cap-to-Column Connection:

Construct a mock-up of the column-to-cap connection that must demonstrate the ability of the Contractor to provide a connection free of voids. In the presence of the Engineer, use trial batch of concrete fill using the same material, equipment, and personnel to be used for actual concrete operations and fill the mock-up at least one week before casting concrete. Field test the trial batch of concrete fill to the same levels required for the actual concrete fill depth.

Caps may be placed on columns/drilled shafts after column/drilled shaft concrete has achieved a flexural stress of 355 psi (or 2,500 psi compressive strength). Use plastic shims or friction collars to support the cap at the proper elevation prior to concrete fill depth. Total area of plastic shims used on top of each column may not exceed 6 percent of the column area. Column/drilled shaft curing may be interrupted a maximum of 2 hours for placement of plastic shims or friction collars and cap placement.

Provide mortar tight forms. Ensure the top of the column is in a saturated surface dry (SSD) condition just before placing concrete fill. Deposit concrete such that all voids in the bedding layer and bent cap are completely filled. Deposit concrete through the top opening of the cap pocket in a manner that deposits concrete from the bedding layer on the bottom of the connection upward. Vibrate concrete in the pocket in accordance with Item 420.4.7.9, "Consolidation". Trowel finish top surface of cap pockets flush with top of cap. Wet mat cure these locations for at least 48 hours. Recess lifting loops 1-inch minimum using exothermic cutting rods. Do not overheat or damage the surrounding concrete. Abrade the concrete surfaces of excavation and end of the lifting loop to remove all slag with a needle gun, steel brush, or other suitable means. Coat the inside of the recessed area, including the lifting loops, with 10 mils (minimum) of neat, Type VIII epoxy and patch the recess with epoxy mortar.

MATERIAL NOTES:

Provide 12 gage, Type I, lock-seam, helical corrugated pipe conforming to Item 460, "Corrugated Metal Pipe".

Provide Grade 60 reinforcing steel. Do not epoxy coat reinforcement even if column reinforcement is epoxy coated.

Provide Class "H" (HPC) concrete for cap concrete.

Provide Class "C" or "S" concrete for cap-to-column connection concrete fill.

Use low relaxation strands, each pretensioned to 75% of fpu.

GENERAL NOTES:

Designed in accordance with AASHTO LRFD Bridge Design Specifications.

Prestress loss calculated according to Research Report FHWA/TX-12/0-6374-2 Table 6.6 using a relative humidity of 60 percent.

The Contractor has the option to provide prestressed, precast bent caps in accordance with the details shown. No additional payment will be made if the Contractor uses prestressed, precast bent caps.

Submit shop drawings of prestressed, precast bent caps for approval prior to construction. Indicate lifting attachments and locations on the shop drawings.

Corrugated pipe and concrete fill are subsidiary to Item 425, "Precast Prestressed Concrete Structural Members".

See standard Interior Bents sheet for details and notes not shown.

These details can only be used as an alternate to standard Interior Bents with round columns for slab beams, decked slab beams, box beams, X-beams, and I-girder standard designed structures.

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

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

PRESTRESSED, PRECAST BENT CAP OPTION FOR ROUND COLUMNS

PPBC-RC

FILE: ppbcstd1-19.dgn	DN: CPM	CK: AJF	DW: JTR	CK: CPM
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	AUS	HAYS		292

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See Interior Bent sheet for cap reinforcing not shown.

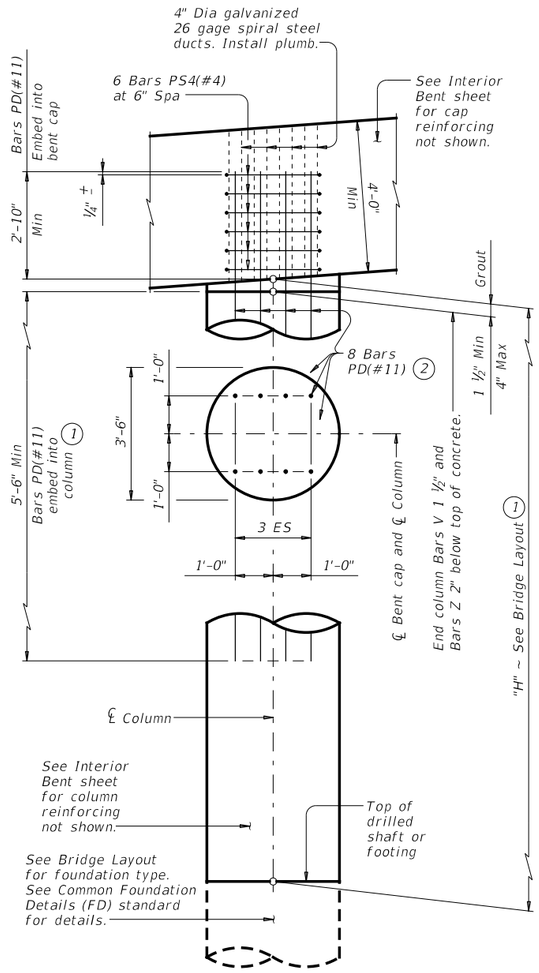
℄ Bent & ℄ Column

6 Bars PS4(#4) — 8 Bars PD(#11) (2)

4'-0" Min

4" Dia galvanized 26 Gage spiral steel ducts. Install plumb.

PART PLAN
(42" Dia Column)



PART ELEVATION
(42" Dia Column)

See Interior Bent sheet for cap reinforcing not shown.

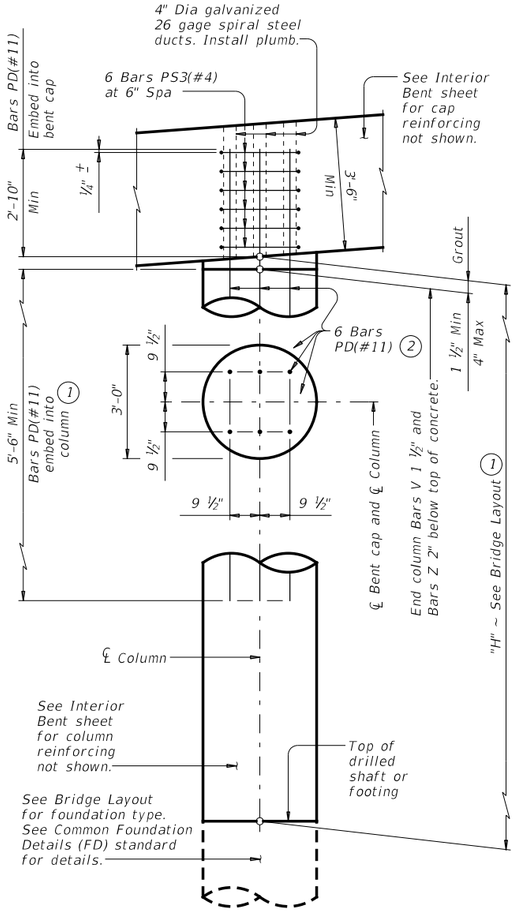
℄ Bent & ℄ Column

6 Bars PS3(#4) — 6 Bars PD(#11) (2)

3'-3" Min

4" Dia galvanized 26 gage spiral steel ducts. Install plumb.

PART PLAN
(36" Dia Column)



PART ELEVATION
(36" Dia Column)

See Interior Bent sheet for cap reinforcing not shown.

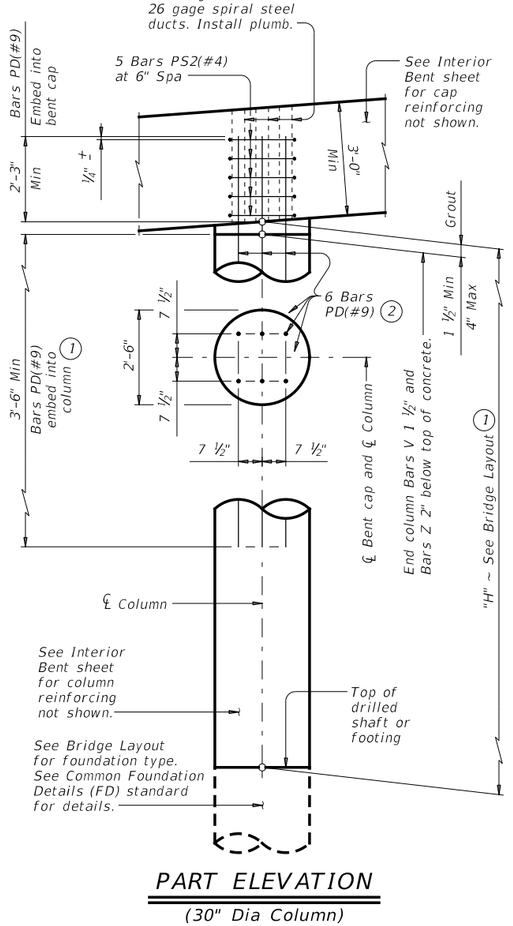
℄ Bent & ℄ Column

5 Bars PS2(#4) — 6 Bars PD(#9) (2)

2'-9" Min

4" Dia galvanized 26 gage spiral steel ducts. Install plumb.

PART PLAN
(30" Dia Column)



PART ELEVATION
(30" Dia Column)

See Interior Bent sheet for cap reinforcing not shown.

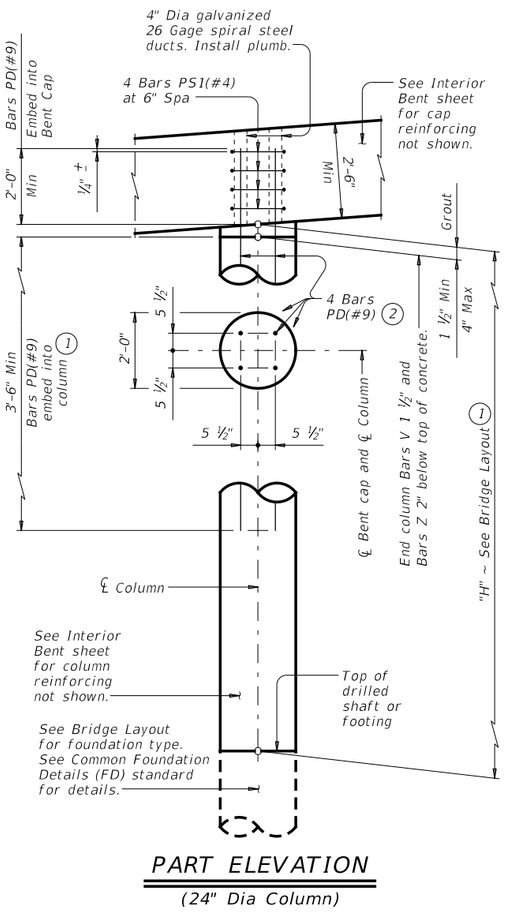
℄ Bent & ℄ Column

4 Bars PS1(#4) — 4 Bars PD(#9) (2)

2'-6" Min

4" Dia galvanized 26 gage spiral steel ducts. Install plumb.

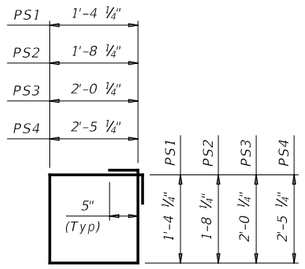
PART PLAN
(24" Dia Column)



PART ELEVATION
(24" Dia Column)

(1) Bars PD may need to be embedded in footing or drilled shaft for short columns.

(2) Location tolerance of dowels in columns/drilled shafts is ¼" from plan location, transversely and longitudinally.



BARS PS (#4)

HL93 LOADING — SHEET 1 OF 2

Texas Department of Transportation — Bridge Division Standard

PRECAST CONCRETE BENT CAP OPTION FOR ROUND COLUMNS

PBC-RC

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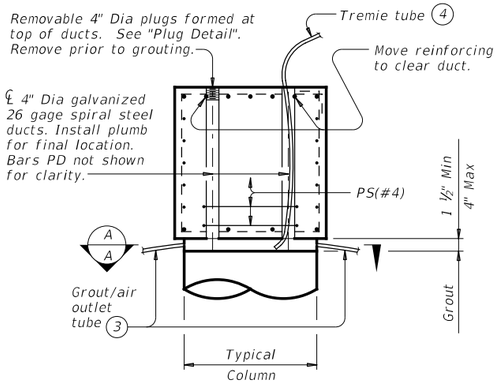
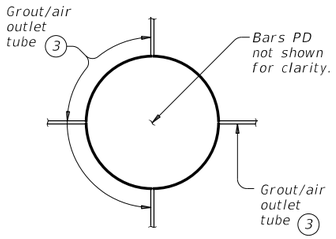
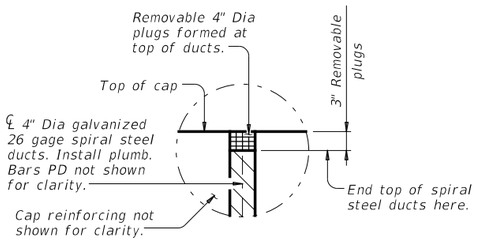


TYPICAL SECTION THRU CAP

(Showing example of ducts and cap reinforcing.)

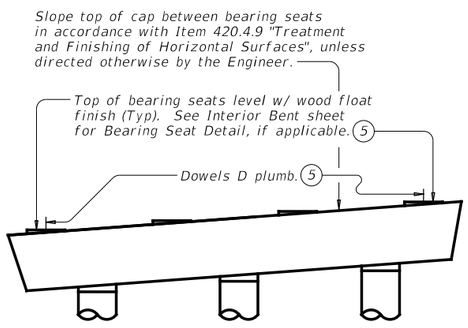


SECTION A-A

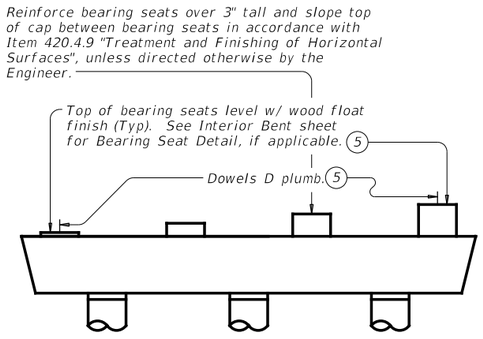


PLUG DETAIL

(To keep concrete out of ducts during concrete placement. Remove prior to grouting)



CAP SET AT SLOPE



CAP SET LEVEL

EXAMPLES OF PRECAST BENTS WITH DOWELS D

(3) Provide at least 4 grout/air outlet tubes equally spaced around the perimeter of the column. Install at bottom of cap to avoid air entrapment. Seal off tubes sequentially when a steady flow of grout without air occurs. Secondary tubes to help drain water, located at top of column, may also be installed.

(4) Continuous gravity-flow grouting through a tremie tube is recommended. With this method, lower a flexible tremie tube through one of the vertical ducts to the bottom of the bedding layer and fill the connection from the bottom upward with a continuous flow of grout. This method requires a sufficient amount of grout to be mixed prior to grouting and that the funnel connected to the tremie tube have adequate volume capacity (4 quarts Min is recommended). A valve may be used to stop the flow during grouting to allow refilling the funnel or to tamp the grout. The tube should remain within the grout and gradually withdraw as the level of the grout rises in the ducts. It is critical to ensure a continuous flow of grout to avoid air entrapment. Alternative methods, including pressure grouting with low pressure pumps, may be used provided they are proved effective in providing void-free connections during the mock-up phase.

(5) Unless otherwise shown.

CONSTRUCTION NOTES:

Cap Fabrication:

Construct and cure cap in accordance with Item 420, "Concrete Substructures". Secure ducts to prevent their movement during concrete placement. Location tolerance of ducts is ¼" from plan location, transversely and longitudinally. Seal ducts to prevent intrusion of concrete.

Bearing seats may be precast with the cap. Bearing seats over 3" in height must be reinforced as per Item 420.4.9. Do not locate lift points at bearing seats if bearing seats are precast.

Cap concrete must achieve a compressive strength of 2,500 psi prior to lifting. Limit flexural stress in cap to 250 psi during handling and storage. Store and handle caps in accordance with Item 424, "Precast Concrete Structural Members (Fabrication)". Do not stack caps. Caps that become cracked or otherwise damaged may be rejected.

Cap-to-Column Connection:

Make a trial batch of grout using the same material, equipment and personnel to be used for actual grouting operations and grout a mock-up of the connection at least one week before grouting and in the presence of the Engineer. This mock-up test must demonstrate the reliability of the Contractor's grouting procedures to provide a connection free of voids. Field test the trial batch grout to the same level required for the actual grouting.

Caps may be placed on columns/drilled shafts after column/drilled shaft concrete has achieved a flexural stress of 355 psi (or 2,500 psi compressive strength). Use plastic shims or friction collars to support the cap at the proper elevation prior to grouting. Total area of plastic shims used on top of each column may not exceed 6 percent of the column area. Column/drilled shaft curing may be interrupted a maximum of 2 hours for placement of plastic shims or friction collars and cap placement.

Surfaces in contact with grout must be clean and in a saturated, surface-dry condition, immediately prior to grouting. Provide water tight forms. Fill the forms with water and drain just prior to grouting. Ponding or free-standing water is not permitted. Use compressed air to blow out excess water.

Mix grout in accordance with the manufacturer's directions. Evidence of frothing, foaming, or segregation is cause for rejection. Transport grout from mixer to final location by wheel barrow, bucket or pumping.

Perform sampling and testing of grout by trained personnel at the Contractor's expense and while witnessed by the Engineer. Grouted connections must be free of voids.

Trowel finish top surface of cap anchorage ducts flush with top of cap. Wet mat cure these locations for at least 48 hours. Recess lifting loops 1-inch minimum using exothermic cutting rods. Do not overheat or damage the surrounding concrete. Abrade the concrete surfaces of excavation and end of the lifting loop to remove all slag with a needle gun, steel brush, or other suitable means. Coat the inside of the recessed area, including the lifting loops, with 10 mils (minimum) of neat, Type VIII epoxy and patch the recess with epoxy mortar.

Friction collars may be removed, if used, and beams placed on the cap after the grout obtains a compressive strength of 2,500 psi. Subsequent loading can occur when the grout reaches its final required 28 day compressive strength.

MATERIAL NOTES:

Provide a pre-qualified grout from TxDOT's Material Producer List "Cementitious Grouts and Mortars for Miscellaneous Applications", conforming to DMS-4675.

Provide semi-rigid spirally crimped, corrugated duct of galvanized, cold rolled steel conforming to ASTM A653. Corrugations must have a minimum amplitude of 0.094".

Grout tubes and forms must be approved prior to grouting.

Provide Grade 60 reinforcing steel. Epoxy coat or galvanize all reinforcement if column reinforcement is epoxy coated or galvanized.

GENERAL NOTES:

Designed in accordance with AASHTO LRFD Bridge Design Specifications.

The Contractor has the option to provide precast bent caps in accordance with the details shown. No additional payment will be made if the Contractor uses precast caps.

Submit shop drawings of precast caps for approval prior to construction. Indicate lifting attachments and locations on the shop drawings.

Precast Concrete Bent Cap Option shown on this standard may require modification for select structure types. See appropriate details elsewhere in plans for these modifications.

See Interior Bent sheet for details and notes not shown.

Reinforcing bar dimensions shown are out-to-out of bar.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

PRECAST CONCRETE BENT CAP OPTION FOR ROUND COLUMNS

PBC-RC

FILE: pbcstd01-19.dgn	DN: TxDOT	CK: JMH	DW: JTR	CK: TxDOT
©TxDOT April 2019 REVISIONS	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
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DATE: 11/19/2020 4:37:57 PM
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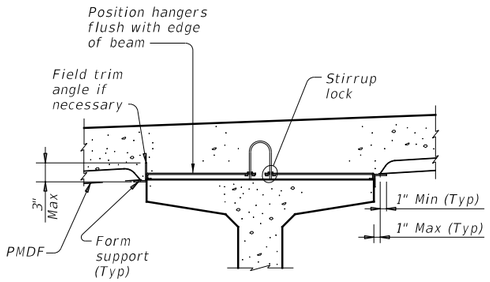
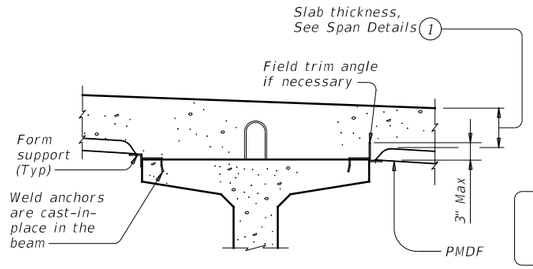
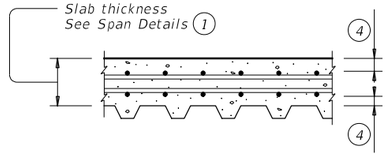


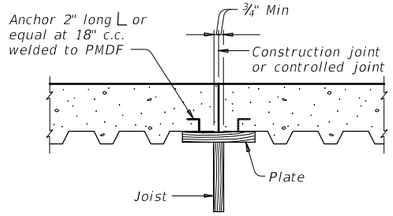
PRESTR CONC I-BEAMS AND I-GIRDERS WITH STIRRUP LOCKS



PRESTR CONC I-BEAMS AND I-GIRDERS WITH WELD ANCHORS

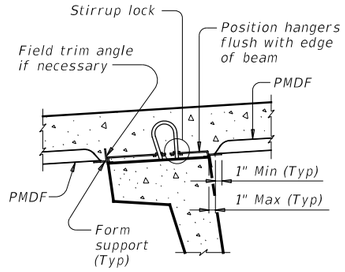


TYP LONGITUDINAL SLAB SECTION

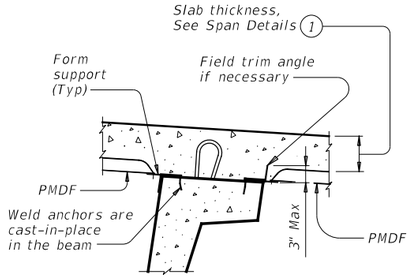


Note: In spans where PMD forms are used, timber forms must be used at construction joints. Adequate provision must be made to support edge of metal form and to provide anchorage of metal form to slab concrete where joined to wood forms.

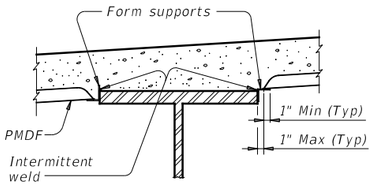
SECTION THRU CONSTRUCTION JOINT



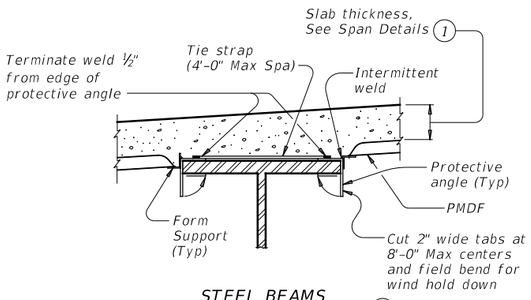
U-BEAMS WITH STIRRUP LOCKS



U-BEAMS WITH WELD ANCHORS

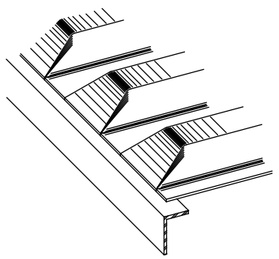


STEEL BEAMS AT COMPRESSION FLANGES



STEEL BEAMS AT TENSION FLANGES (2)

TYPICAL TRANSVERSE SECTIONS



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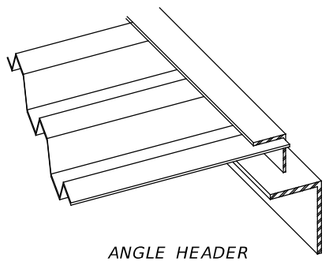
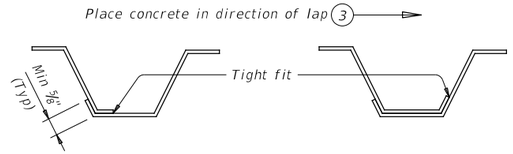


ANGLE HEADER

NOTE: This type is to be used for skewed ends only.

TYPES OF END CLOSURES



SIDE LAP DETAILS

(1) Slab thickness minus 5/8" if corrugations match reinforcing bars.

(2) Welding of form supports to tension flanges will not be permitted. Other methods of providing wind hold down resistance for PMDF in tension flange zones will be considered. At least one layer of sheet metal must be provided between the flange and the weld joint.

(3) The direction of concrete placement will be such that the upper layer of the form overlap is loaded first.

(4) See Span details for cover requirements.

GENERAL NOTES:

Steel for Permanent Metal Deck Forms (PMDF) and support angles shall conform to ASTM A653, structural steel (SS), with coating designation G165. Steel must have a minimum yield strength of 33 ksi. Minimum thickness of PMDF is 20 gage and that of support angles and protective angles is 12 gage.

Submit two copies of forming plans for PMDF to the Engineer. These plans must show all essential details of proposed form sheets, closures, fasteners, supports, connectors, special conditions and size and location of welds. These plans must clearly show areas of tension flanges for steel beams and provisions for protecting the tension flanges from welding notch effects by inclusion of separating sheet metal or other positive method. These plans must be designed, signed, and sealed by a licensed professional engineer. Department approval of these plans is not required, but the Department reserves the right to require modifications to the plans. The Contractor is responsible for the adequacy of these plans.

The details and notes shown on this standard are to be used as a guide in preparation of the forming plans.

All material, labor, tools and incidentals necessary to form a bridge deck with Permanent Metal Deck Forms is considered subsidiary to Item 422, "Concrete Superstructures".

FOR PRESTR CONC U-BEAM AND STEEL GIRDER BRIDGES:
Unless shown elsewhere in the plans, size, spacing, and orientation of bottom mat of slab reinforcement must match the top mat of reinforcing shown on the span details except all bottom mat bars are to be #5. Bottom mat reinforcement and additional concrete is subsidiary to Item 422 "Concrete Superstructures."

FOR PRESTR CONC TX-GIRDER BRIDGES:
See Miscellaneous Slab Details, Prestr Concrete I-Girders (IGMS) standard sheet for bottom mat reinforcing.

DESIGN NOTES:

As a minimum, PMDF and support angles must be designed for the dead load of the form, reinforcement and concrete plus 50 psf for construction loads. Flexural stresses due to these design loads must not exceed 75 percent of the yield strength of the steel. Allowable stress for weld metal must be 12,400 psi.

Maximum deflection under the weight of forms, reinforcement and concrete or 120 psf, whichever is greater, shall not exceed the following:

1/180 of the form design span, but not more than 0.50", for design spans of 10' or less.

1/240 of the form design span, but not more than 0.75", for design spans greater than 10'.

The form design span must not be less than the clear distance between beam flanges, measured parallel to the form flutes, minus 2".

CONSTRUCTION NOTES:

Form sheets must not be permitted to rest directly on the top of beam flanges. Form sheets must be securely fastened to form supports and must have a minimum bearing length of one inch at each end. Form supports must be placed in direct contact with beam flanges.

All attachments must be made by permissible welds, screws, bolts, clips or other means shown on the the forming plans. All sheet metal assembly screws must be installed with torque-limiting devices to prevent stripping. Only welds or bolts must be used to support vertical loads.

Welding and welds must be in accordance with the provisions of Item 448, "Structural Field Welding", pertaining to fillet welds. All welds must be made by a qualified welder in accordance with Item 448.

All permanently exposed form metal, where the galvanized coating has been damaged, must be thoroughly cleaned and repaired in accordance with Item 445, "Galvanizing". Minor heat discoloration in areas of welds need not be touched up.

Flutes must line up uniformly across the entire width of the structure where main reinforcing steel is located in the flute.

Construction joints will not be permitted unless shown on the plans. The location of and forming details for any construction joint used must be shown on the forming plans. Forms below a construction joint must be removed after curing of the slab.

A sequence for uniform vibration of concrete must be approved by the Engineer prior to concrete placement. Attention must be given to prevent damage to the forms, yet provide proper vibration to prevent voids or honeycomb in the flutes and at headers and/or construction joints.

Texas Department of Transportation

Bridge Division Standard

PERMANENT METAL DECK FORMS

PMDF

FILE: pmdfste1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	33	068,ETC	RSL
02-20: Modified box note by adding steel beams/girders and subsidiary.	DIST	COUNTY		SHEET NO.
	AUS	HAYS		295

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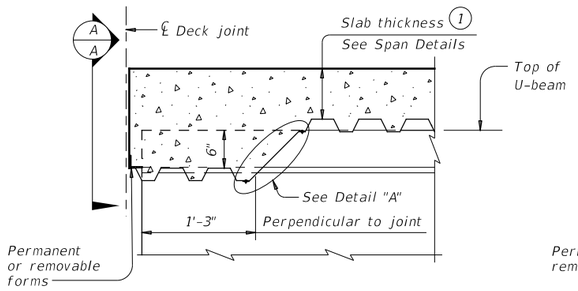
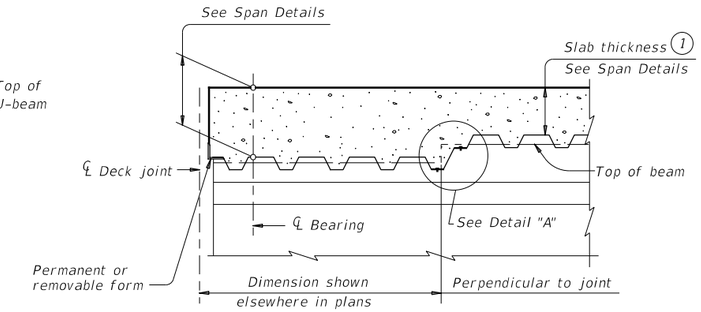
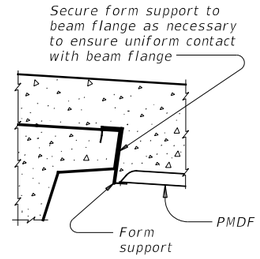


AT THICKENED SLAB END FOR U-BEAMS

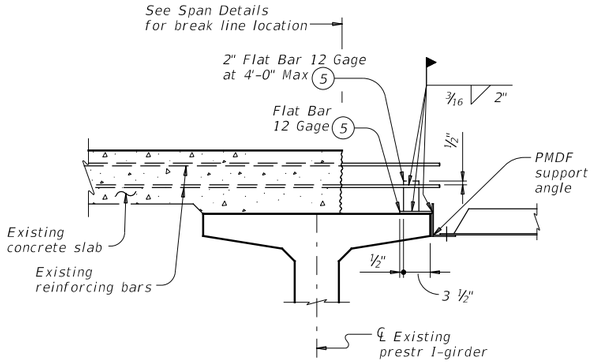


AT THICKENED SLAB END FOR PRESTRESSED I-BEAMS, I-GIRDERS AND STEEL BEAMS

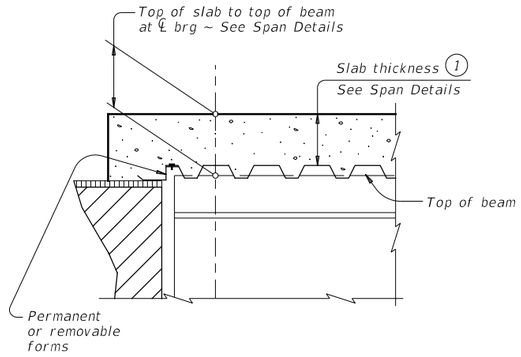
Showing I-beam block-out. No block-out for I-girders or steel beams.



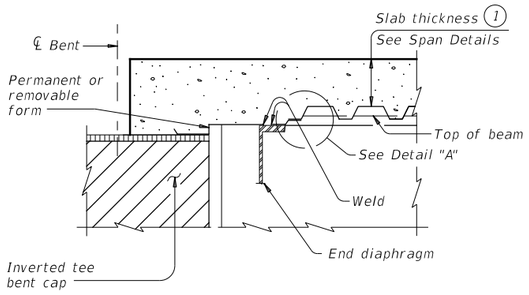
SECTION A-A



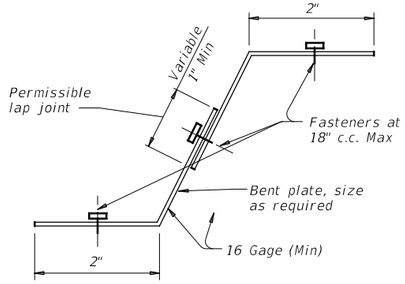
SHOWING PRESTRESSED CONCRETE I-BEAMS, I-GIRDERS AND U-BEAMS



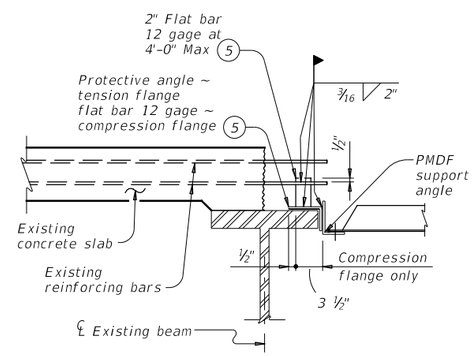
AT SLAB OVER ABUT BKWL OR INV TEE STEM FOR CONC BEAMS WITHOUT THICKENED SLAB END



AT SLAB OVER INV TEE STEM FOR STEEL BEAMS WITHOUT THICKENED SLAB END

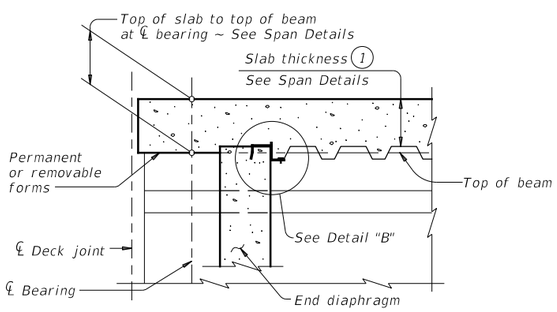


DETAIL "A"

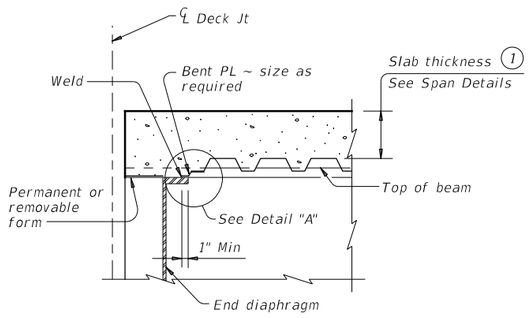


SHOWING STEEL BEAMS

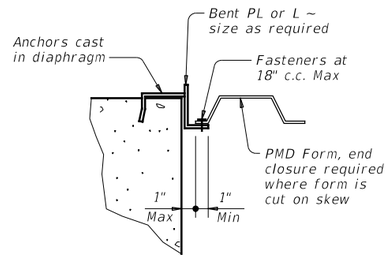
WIDENING DETAILS



AT CONC END DIAPHRAGM FOR PRESTRESSED I-BEAMS AND STEEL BEAMS



AT END DIAPHRAGM FOR STEEL BEAMS WITHOUT THICKENED SLAB END



DETAIL "B"

(1) Slab thickness minus 3/8" if corrugations match reinforcing bars

(5) Minimum yield stress of 12 gage bars shall be 40 ksi

DETAILS AT ENDS OF BEAMS

SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

PERMANENT METAL DECK FORMS

PMDF

FILE: pmdfste1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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02-20: Modified box note by adding steel beams/girders and subsidiary.	DIST	COUNTY		SHEET NO.
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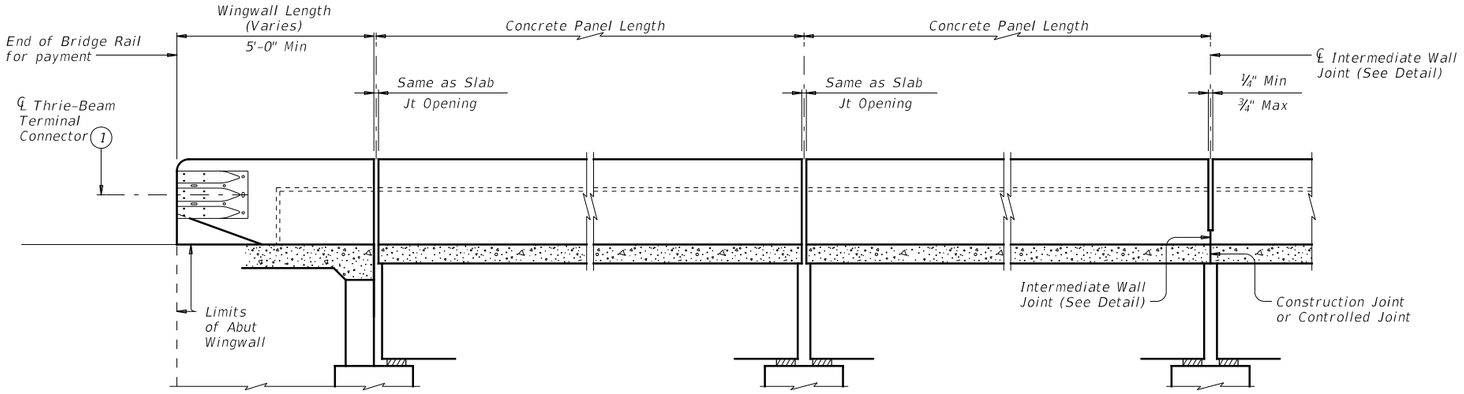
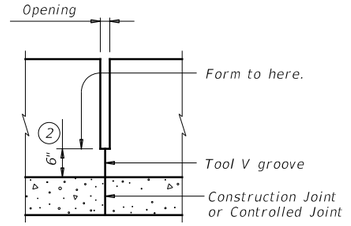


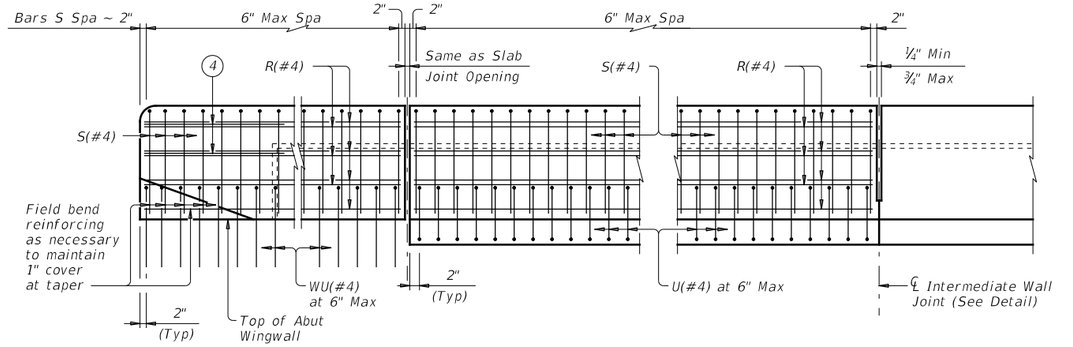
AT ABUTMENTS | AT BENTS WITH SLAB EXP JOINTS | AT BENTS WITHOUT SLAB EXP JOINTS

ROADWAY ELEVATION OF RAIL

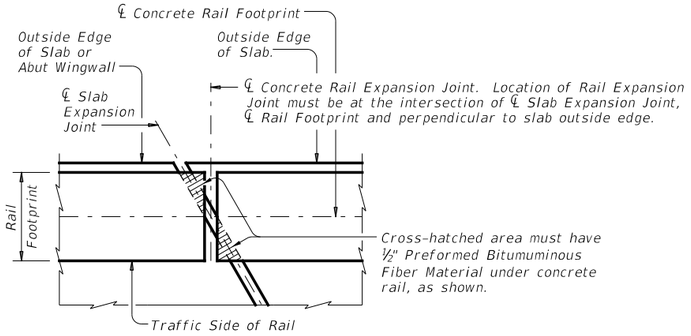


INTERMEDIATE WALL JOINT DETAIL

Provide at all interior bents without slab expansion joints.



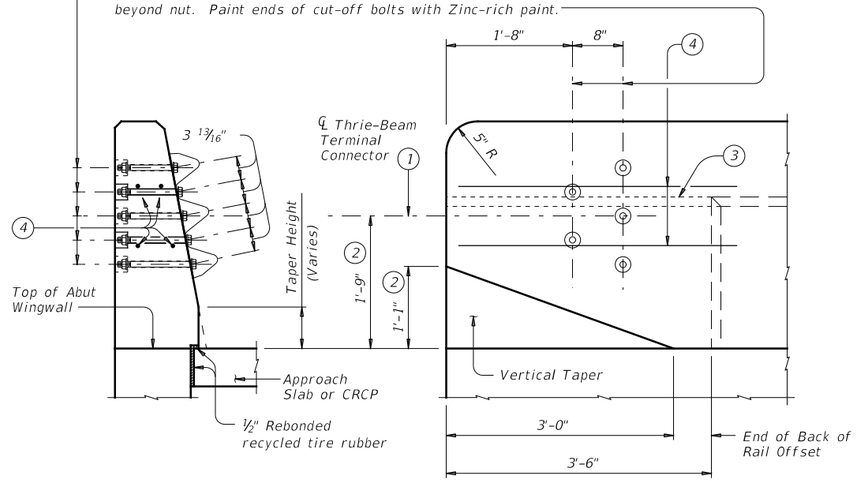
ELEVATION SHOWING TYPICAL REINFORCING PLACEMENT



PLAN OF RAIL AT EXPANSION JOINTS

Example showing Slab Expansion Joints without breakbacks.

℄ 5 ~ 1" Dia holes and 2 ½" Dia x 2" deep recesses. Form or core holes and recesses. Percussion drilling is not permitted. Adjust placement of reinforcing steel as necessary to avoid bolt holes and recesses. Bolt recesses are only required when pedestrian sidewalks are adjacent to back of rail. Tighten the 5 Terminal Connection Bolts in a well distributed pattern so to prevent damage or distortion of the Thrie-Beam Connection and the MBGF Transition. Cut bolts off after installation so as to extend no more than ¾" beyond nut. Paint ends of cut-off bolts with Zinc-rich paint.



SECTION | ELEVATION

TERMINAL CONNECTION DETAILS

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.

Texas Department of Transportation | Bridge Division Standard

TRAFFIC RAIL
SINGLE SLOPE

TYPE SSTR

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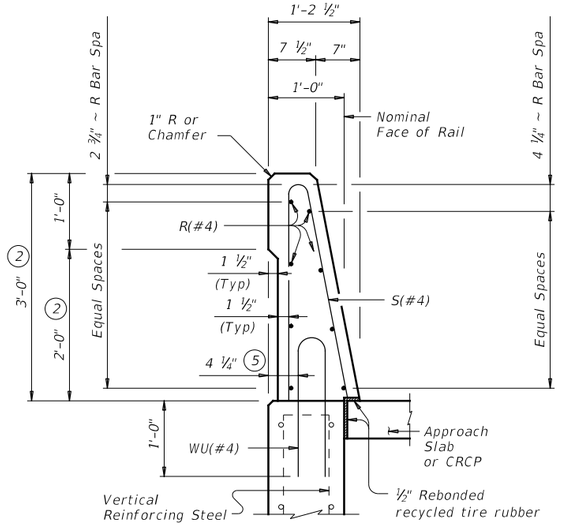
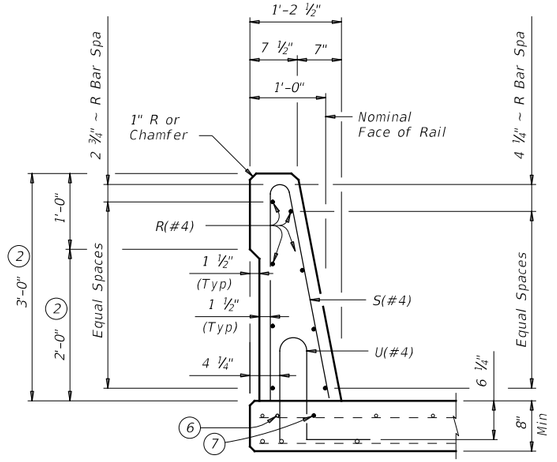


ON ABUTMENT WINGWALLS OR CIP RETAINING WALLS



ON BRIDGE SLAB

SECTIONS THRU RAIL

(2) Increase 2" for structures with Overlay.

(5) 5 ¼" 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 greator to side slot drain.

CONSTRUCTION NOTES:

This railing may be constructed by the slipform process when approved by the Engineer, with equipment approved by the Engineer. Provide sensor control for both line and grade. Tack welding to provide bracing for slipform operations is acceptable. Welding may be performed at a minimum spacing of 3 ft between the cage and the anchorage. It is permissible to weld to bars U, WU and S at any location on the cage. If increased bracing is needed, provide additional anchorage devices and weld in the upper two thirds of the cage. Paint welded areas on epoxy coated and/or galvanized reinforcing with an organic zinc rich paint in accordance with Item 445 "Galvanizing".

If rail is slipformed, apply an heavy epoxy bead 1" behind toe of traffic side of rail to concrete deck just prior to slip forming. Provide a ⅜" width x ¼" tall heavy epoxy bead with Type III, Class C or a Type V epoxy.

The back of railing must be vertical unless otherwise shown in the plans or approved by the Engineer.

MATERIAL NOTES:

Provide Class "C" concrete. Provide Class "C" (HPC) if required elsewhere.

Provide Grade 60 reinforcing steel.

Epoxy coat or galvanize all reinforcing steel if slab bars are epoxy coated or galvanized.

Deformed Welded Wire Reinforcement (WWR) (ASTM A1064) of equal size and spacing may be substituted for Bars U and WU unless noted otherwise. Deformed WWR (ASTM A1064) may be substituted for Bars R and S, as shown. Combinations of reinforcing steel and WWR or configurations of WWR other than shown are permitted if conditions in the table are satisfied. Provide the same laps as required for reinforcing bars.

Provide bar laps, where required, as follows:

Uncoated or galvanized ~ #4 = 1'-7"

Epoxy coated ~ #4 = 2'-5"

GENERAL NOTES:

This rail has been successfully evaluated by full-scale crash test to meet MASH TL-4 criteria. This rail can be used for speeds of 50 mph and greater when a TL-3 rated guard fence transition is used. When a TL-2 rated guard fence transition is used, this rail can only be used for speeds of 45 mph and less.

Do not use this railing on bridges with expansion joints providing more than 5" movement.

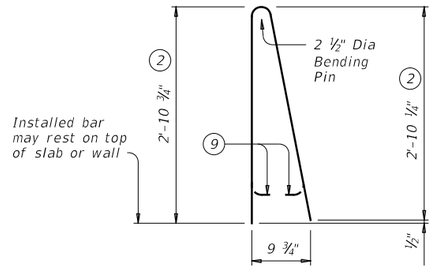
Rail anchorage details shown on this standard may require modification for select structure types. See appropriate details elsewhere in plans for these modifications.

Shop drawings will not be required for this rail.

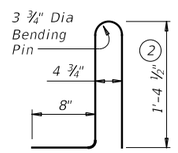
Average weight of railing with no overlay is 376 plf.

Cover dimensions are clear dimensions, unless noted otherwise.

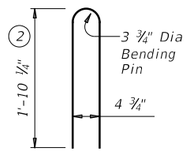
Reinforcing bar dimensions shown are out-to-out of bar.



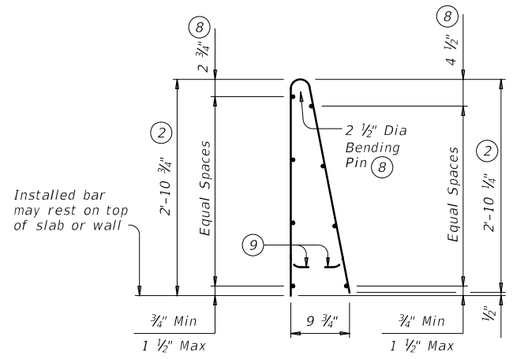
BARS S (#4)



BARS U (#4)

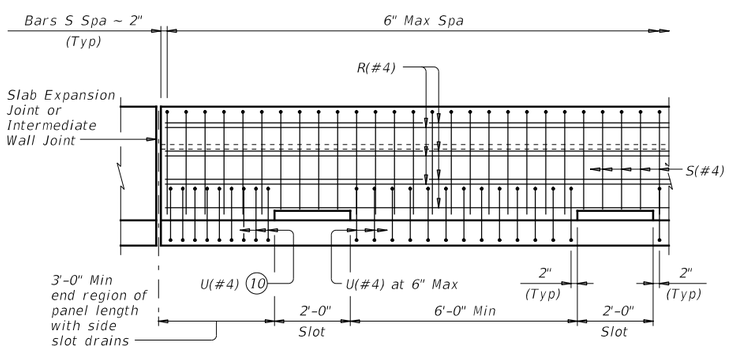


BARS WU (#4)



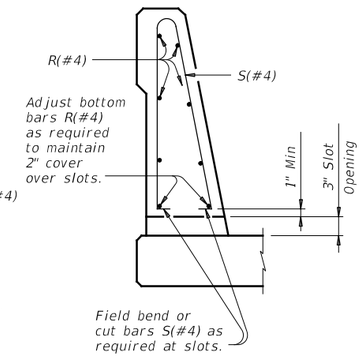
OPTIONAL WELDED WIRE REINFORCEMENT (WWR)

DESCRIPTION	LONGITUDINAL WIRES	VERTICAL WIRES
Minimum (Cumulative Total) Wire Area	1.067 Sq In.	0.267 Sq In. per Ft
	No. of Wires	Spacing
Minimum	8	4"
Maximum	10	8"
Maximum Wire Size Differential	The smaller wire must have an area of 40% or more of the larger wire.	



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

Texas Department of Transportation

Bridge Division Standard

TRAFFIC RAIL SINGLE SLOPE

TYPE SSTR

FILE: rlstd014-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TxDOT
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	33	068,ETC	RSL
	DIST	COUNTY		SHEET NO.
	AUS	HAYS		298

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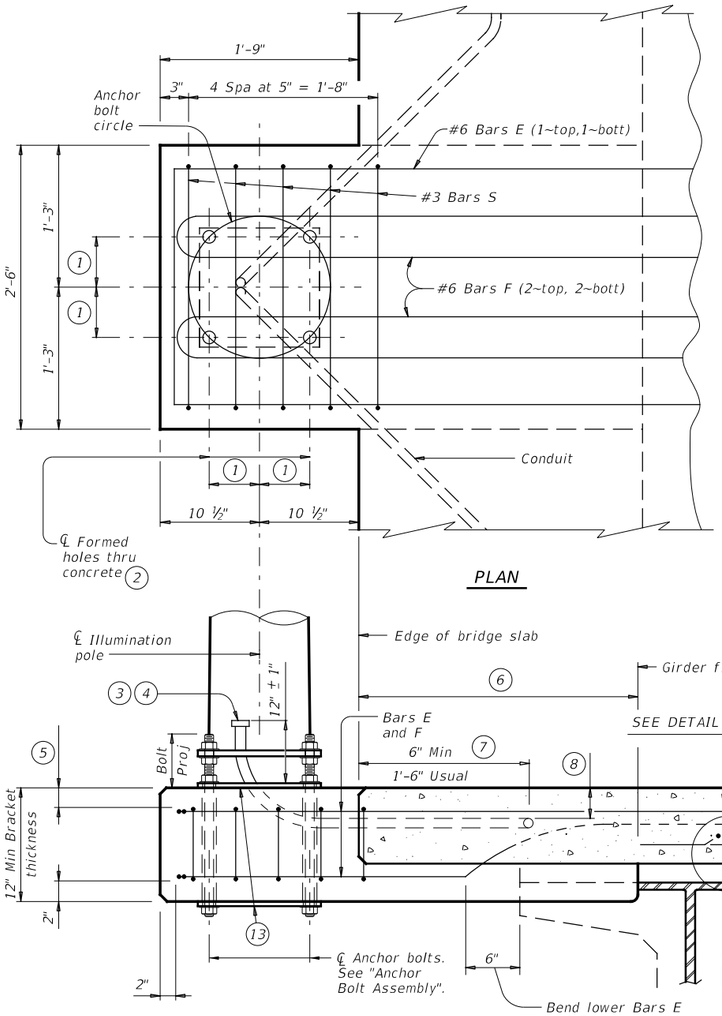
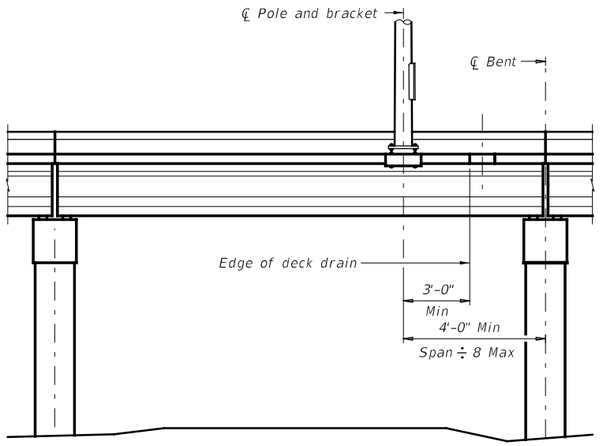


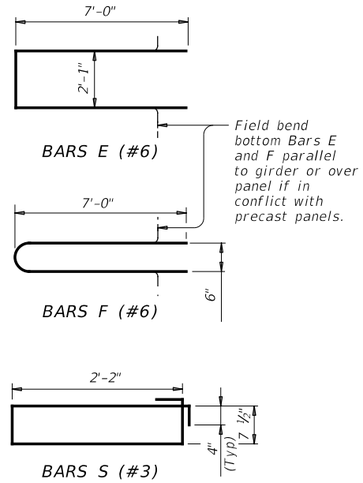
ILLUMINATION POLE BRACKET LOCATION AND REINFORCING

TABLE OF ANCHOR BOLT AND ANCHOR BOLT PLATE INFORMATION						
ANCHOR BOLT CIRCLE DIAMETER	ANCHOR BOLT OFFSET	ANCHOR BOLT DIAMETER	ANCHOR BOLT HOLE SIZE		TOP AND BOTTOM ANCHOR BOLT PLATE SIZE	CENTER HOLE DIAMETER IN TOP ANCHOR BOLT PLATE
			CONCRETE	STEEL		
IN	IN	IN	IN	IN	IN	IN
13	4 ⅝	1	1 ¼	1 ¼	PL ½ X 13 X 1'-1"	9 ½
15	5 5/16	1 ¼	1 ½	1 ½	PL ½ X 15 ½ X 1'-3 ½"	10 ½

ESTIMATED QUANTITIES~ONE BRACKET			
ITEM		UNIT	QUANT
CONCRETE	(9) (10)	CY	0.2
REINFORCING STEEL	(10)	LB	146
STRUCTURAL STEEL	(10) (11)	LB	112
CONDUIT	(12)	LF	4



TYPICAL BRIDGE ELEVATION



1. See table for anchor bolt offset dimension.
2. See table for hole diameter size.
3. If lighting is to be placed on future contract, extend conduit only 6" and provide water tight cap.
4. Ream burrs and install bell ends or bushings on all conduit ends.
5. Provide same clear cover required for bridge slab. Place Bars E and F beneath top slab reinforcing only if necessary to provide this cover.
6. If slab edge to girder flange edge exceeds 3'-11", lengthen Bars E and F proportionally to ensure Bars E and F extend 1'-6" Min beyond girder flange edge.
7. Clear rail anchors, drains, etc 1 ½" Min.
8. 1 ½" Min cover and always beneath top layer slab reinforcing.
9. Variation due to slab thickness is insignificant.
10. For Contractor's information only.
11. Anchor bolts, nuts, washers, and 2 plates. Verify anchor bolt lengths prior to ordering.
12. Additional to main run (size and type as shown elsewhere on the plans).
13. See "Anchor Bolt Assembly", "Anchor Bolt Plate", and table for anchor bolt, and anchor bolt plate information.

MATERIAL NOTES:

Galvanize anchor bolts, nuts, washers, and anchor bolt plates. Repair galvanizing damage from tack welding per Item 445, "Galvanizing".

Provide Grade 60 reinforcing steel.

Epoxy coat or galvanize all reinforcing steel if slab bars are epoxy coated or galvanized.

Concrete for Illumination Pole Brackets must be of the same type and placed monolithically with the bridge slab. The bracket quantity is considered subsidiary to the Item "Reinforced Concrete Slab".

GENERAL NOTES:

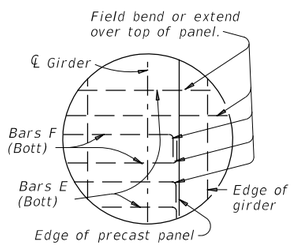
Designed for up to 50 ft light pole with one 12 ft arm, 60 lb luminaire with 1.6 sq ft EPA at maximum design wind speed of 110 mph (3 second gusts). A special design is required if luminaire mounting height exceeds 100 ft above average surrounding terrain.

The anchor bolts, nuts, washers, and anchor bolt plates are subsidiary to the Item "Roadway Illumination Assemblies".

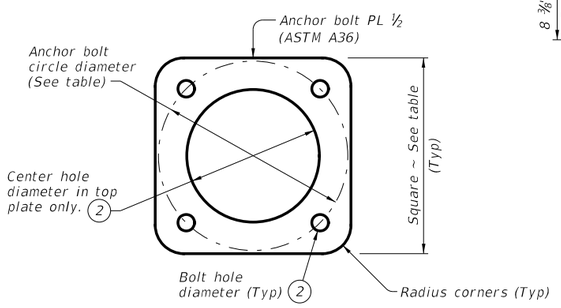
The type and size of conduit, the anchor bolt circle diameter, and the number and location of brackets is shown elsewhere on the plans. Brackets found to conflict with other components of the bridge may be relocated as necessary.

See Roadway Illumination Poles standard for details and notes not shown.

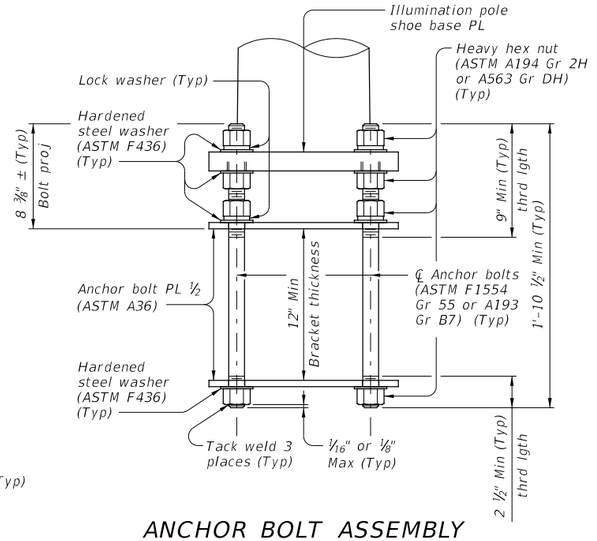
Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.



DETAIL "A"



ANCHOR BOLT PLATE



ANCHOR BOLT ASSEMBLY

(See table for anchor bolt diameter)

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SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

BRIDGE LIGHTING DETAILS

BL

FILE: blstde01-19.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	33	068,ETC	RSL
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	AUS	HAYS		299

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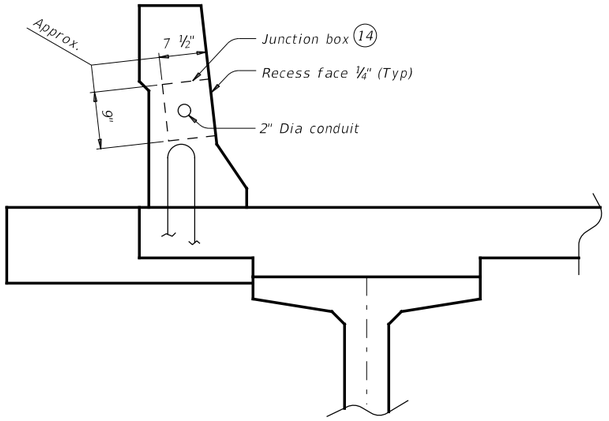
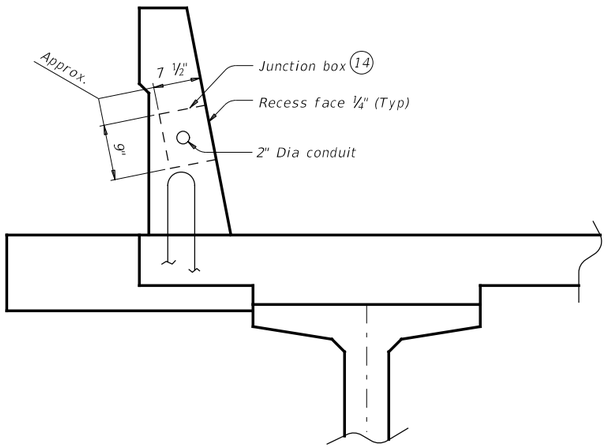


SHOWING T551, T552, AND T80HT



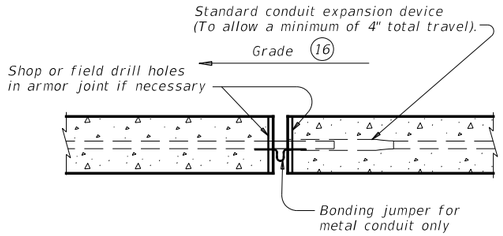
SHOWING SSTR AND T80SS

(4) Ream burrs and install bell ends or bushings on all conduit ends.

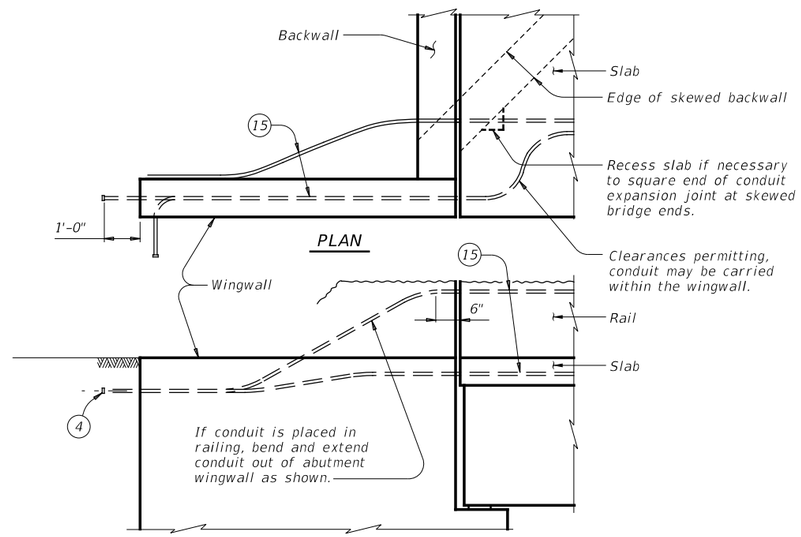
(14) Provide polymer concrete junction boxes meeting the requirements of DMS 11030.

(15) Position of conduit shown elsewhere on the plans or as directed by the Engineer.

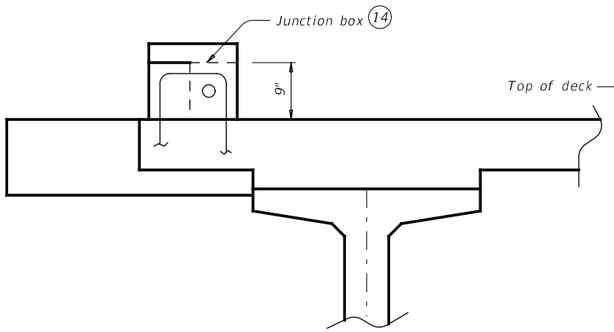
(16) Place conduit expansion device on high side of expansion joint.



CONDUIT EXPANSION JOINT

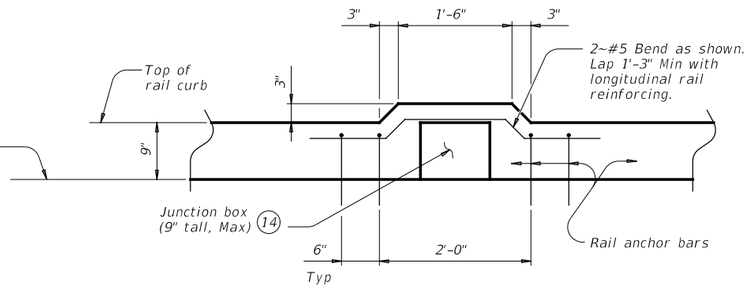


TREATMENT AT END OF BRIDGE



SHOWING T1F, T2P, T1W, T66, C2P, AND C1W CURB

See Elevation View for curb modifications



ELEVATION VIEW

For Rail Types T1F, T2P, T1W, T66, C2P, and C1W, center junction box between posts. Additional reinforcing and concrete required for this rail modification is considered subsidiary to the rail. Do not locate junction box in the same bay as a drain slot in rail curb.

JUNCTION BOX LOCATION

Use these details as a guide in locating junction boxes in rail types not shown.

Texas Department of Transportation

Bridge Division Standard

BRIDGE LIGHTING DETAILS

BL

FILE: blstde01-19.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
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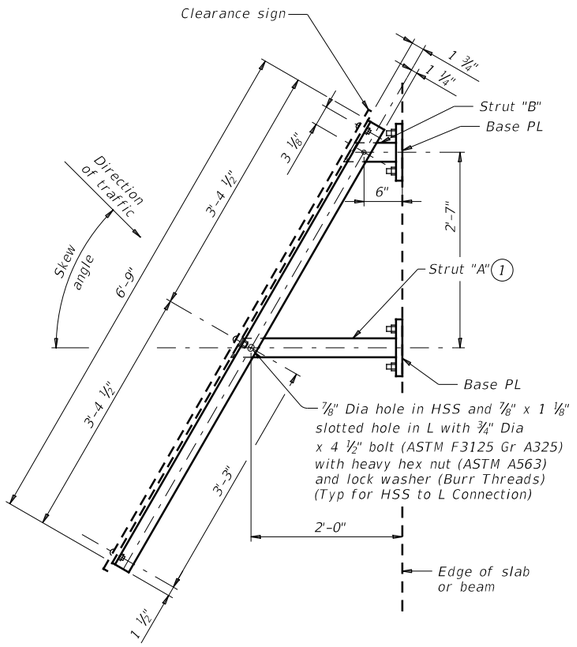
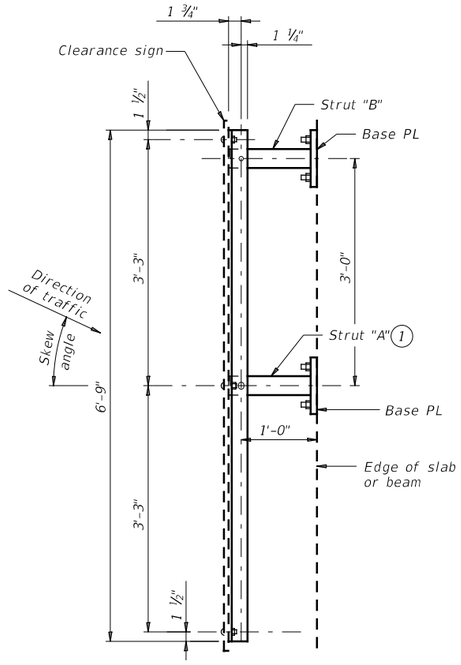


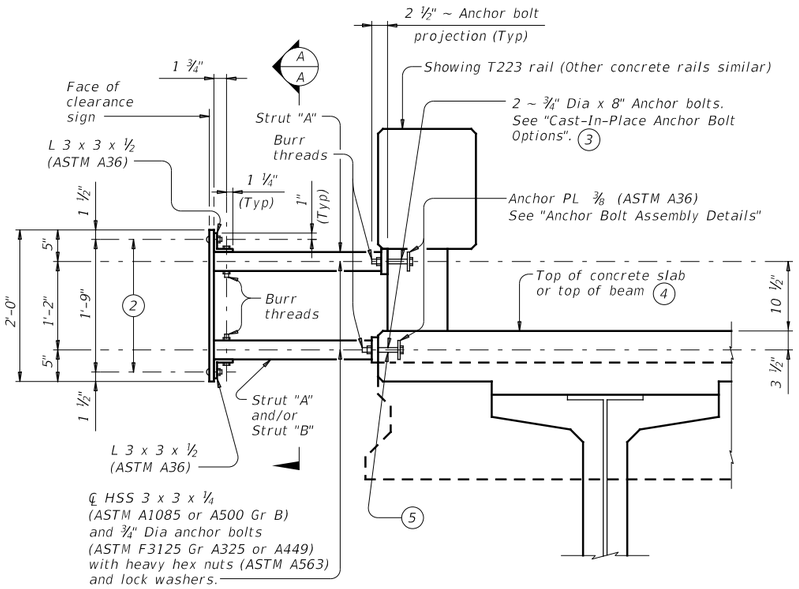
PLAN OF TYPE S MOUNT

(Used for skews over 30°)

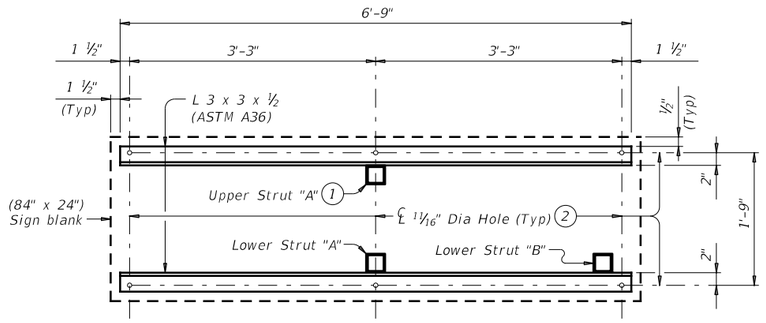


PLAN OF TYPE N MOUNT

(Used for 0° to 30° skews)



SECTION



SECTION A-A

1. Locate centerline of Strut A no closer than 12" from a vertical concrete edge.
2. ℄ ⅝" Dia x 2" Hexagon socket button head cap screws (ASTM A574) with hex nuts. Attach hex nuts to L 3 x 3 x ½ by tack welding in two places. Threads must have Class 3A fit tolerance in accordance ASME B1.1. Six screws required.
3. At the Contractor's option fully threaded adhesive anchors may be use instead of cast-in-place anchor bolts. Expansion anchors are not allowed. Provide adhesive anchors that are ¾" Dia ASTM A193 Gr B7 or F1554 Gr 105 fully threaded rods with one hardened steel washer (ASTM F436) and one regular lock washer placed under heavy hex nut (ASTM A563). Embed fully threaded rods using a Type III, Class C, D, E, or F anchor adhesive. Adhesive anchor embedment depth is 8". Anchor adhesive chosen must be able to achieve a factored bond strength in tension of 2.2 kips per anchor (edge distance and spacing must be accounted for). Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use. Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing".
4. For decked slab beams topped with a 2 course surface treatment and ACP overlay.
5. Anchor bolts to be cast into decked slab beams topped with a 2 course surface treatment or ACP overlay. Anchor bolts with heavy hex nuts, regular lock washers, hardened washers and anchor plate that is embedded in the beam will be provided by the beam Fabricator.

CONSTRUCTION NOTES:

Install the vertical face of clearance sign plumb unless otherwise approved by the Engineer.

Test adhesive anchors in accordance with Item 450.3.3, "Tests". Test 1 anchor per bridge mounted clearance sign installed. Perform corrective measures to provide adequate capacity if any of the tests do not meet the required test load. Repair damage from testing as directed.

MATERIAL NOTES:

Galvanize all steel components after fabrication unless otherwise noted.

GENERAL NOTES:

This standard provides details to mount a vertical clearance sign (84" x 24") to bridges. Rail Types T631, T631LS, PR11, PR22 and PR3 are not accommodated.

The Engineer will furnish the clearance to be shown on the sign.

See Bridge Layout for sign location and mounting type (Type N or S).

Cost of furnishing, installing, relocating or removing a clearance sign, including structural steel for sign mount, is included in unit price bid for Item 644, "Small Roadside Sign Assemblies".

One Sign Blank (84" x 24") is 14 SF.

Average steel weight for one complete Type N Mount is 219 Lb.

Average steel weight for one complete Type S Mount is 233 Lb.

SHEET 1 OF 3

Texas Department of Transportation

Bridge Division Standard

BRIDGE MOUNTED CLEARANCE SIGN ASSEMBLY

BMCS

FILE: bmcsste1-19.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	33	068, ETC	RSL
	DIST	COUNTY		SHEET NO.
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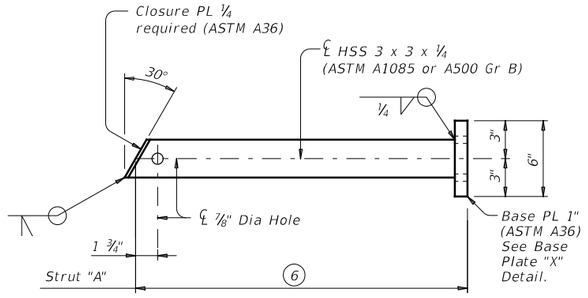
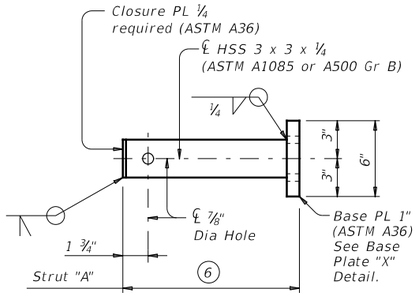
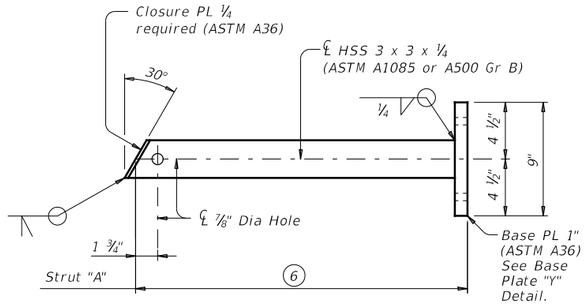


FOR T411 AND C411 RAIL TYPES



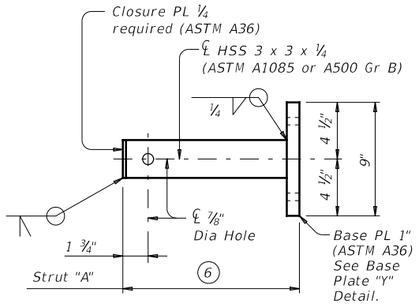
FOR T411 AND C411 RAIL TYPES



FOR T221, C221, T222, T223, C223, T401, T402, C402, T551, T552, T80HT, T80SS AND SSTR RAIL TYPES

UPPER STRUT DETAIL FOR (TYPE S MOUNT)

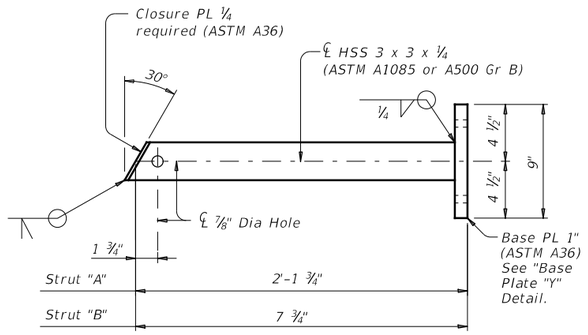
(Used for skews over 30°)



FOR T221, C221, T222, T223, C223, T401, T402, C402, T551, T552, T80HT, T80SS AND SSTR RAIL TYPES

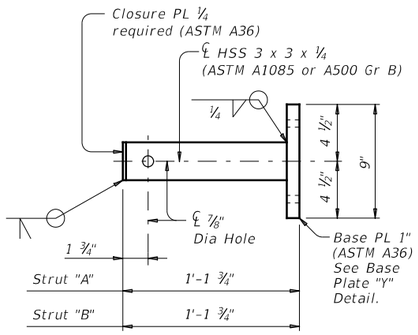
UPPER STRUT DETAIL FOR (TYPE N MOUNT)

(Used for 0° to 30° skews)



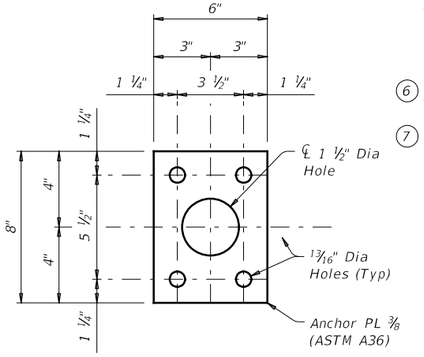
LOWER STRUT DETAILS FOR (TYPE S MOUNT)

(Used for skews over 30°)

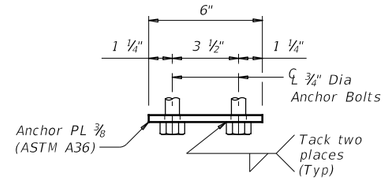


LOWER STRUT DETAILS FOR (TYPE N MOUNT)

(Used for 0° to 30° skews)



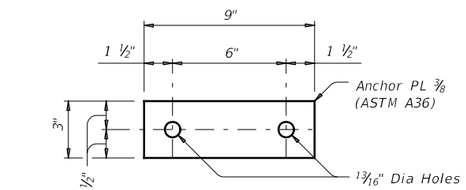
PLAN OF ANCHOR PLATE



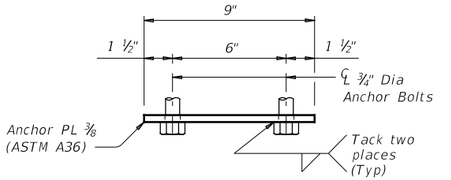
ELEVATION

ANCHOR BOLT ASSEMBLY DETAILS (3)

(Used on Base Plate "X" with T411 and C411 rail types.)



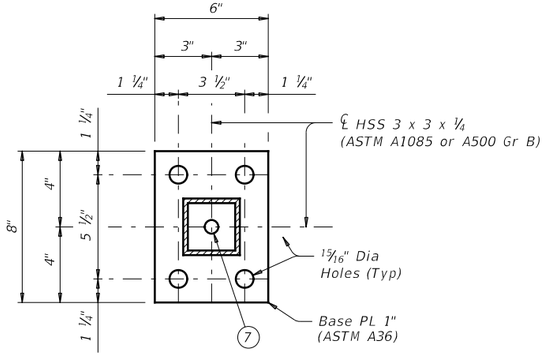
PLAN OF ANCHOR PLATE



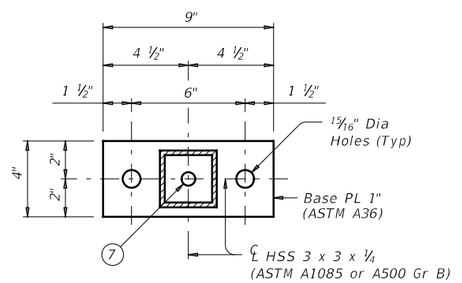
ELEVATION

ANCHOR BOLT ASSEMBLY DETAILS (3)

(Used on Base Plate "Y" and with T1F, T2P, C2P, T1W, C1W, T66 and C66 rail types.)

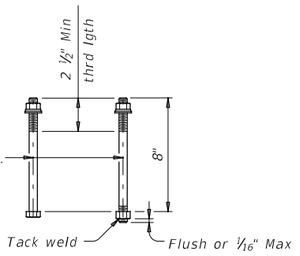


BASE PLATE "X" DETAIL



BASE PLATE "Y" DETAIL

℄ ¾" Dia heavy hex head anchor bolt (ASTM F3125 Gr A325 or A449) or threaded rod (ASTM A193 Gr B7 or F1554 Gr 105) with one hardened washer and one regular lock washer placed under heavy hex nut (ASTM A563). Furnish one additional heavy hex nut for each threaded rod.



CAST-IN-PLACE ANCHOR BOLT OPTIONS (3)

(3) At the Contractor's option fully threaded adhesive anchors may be use instead of cast-in-place anchor bolts. Expansion anchors are not allowed. Provide adhesive anchors that are ¾" Dia ASTM A193 Gr B7 or F1554 Gr 105 fully threaded rods with one hardened steel washer (ASTM F436) and one regular lock washer placed under heavy hex nut (ASTM A563). Embed fully threaded rods using a Type III, Class C, D, E, or F anchor adhesive. Adhesive anchor embedment depth is 8". Anchor adhesive chosen must be able to achieve a factored bond strength in tension of 2.2 kips per anchor (edge distance and spacing must be accounted for). Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use. Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing".

(6) Adjust length to accommodate edge of slab to back of rail for specific project conditions and to help plumb the vertical face of clearance sign.

(7) Hole required to drain zinc from base plate during galvanizing.

Texas Department of Transportation

Bridge Division Standard

BRIDGE MOUNTED CLEARANCE SIGN ASSEMBLY

BMCS

FILE: bmcsste1-19.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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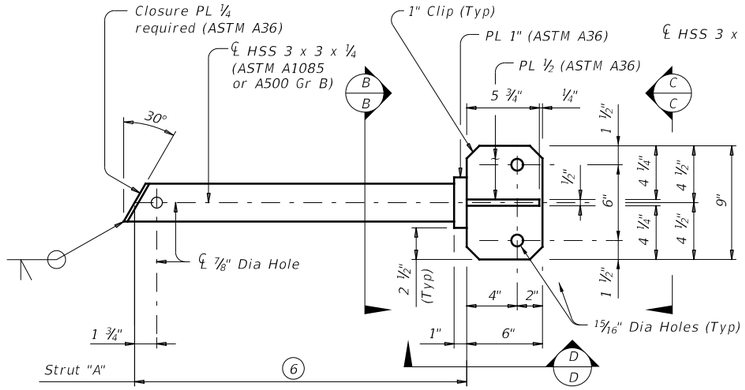
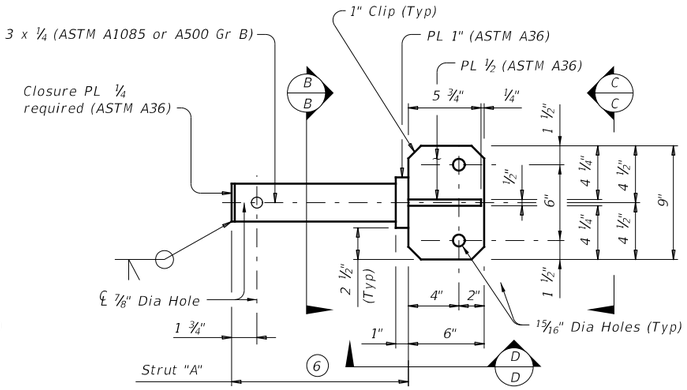


FOR T1F, T2P, C2P, T1W, C1W, T66 AND C66 RAIL TYPES

UPPER STRUT DETAIL FOR (TYPE S MOUNT)

(Used for skews over 30°)



FOR T1F, T2P, C2P, T1W, C1W, T66 AND C66 RAIL TYPES

UPPER STRUT DETAIL FOR (TYPE N MOUNT)

(Used for 0° to 30° skews)

(2) ℄ ⅜" Dia x 2" Hexagon socket button head cap screws (ASTM A574) with hex nuts. Attach hex nuts to L 3 x 3 x ½ by tack welding in two places. Threads must have Class 3A fit tolerance in accordance ASME B1.1. Six screws required.

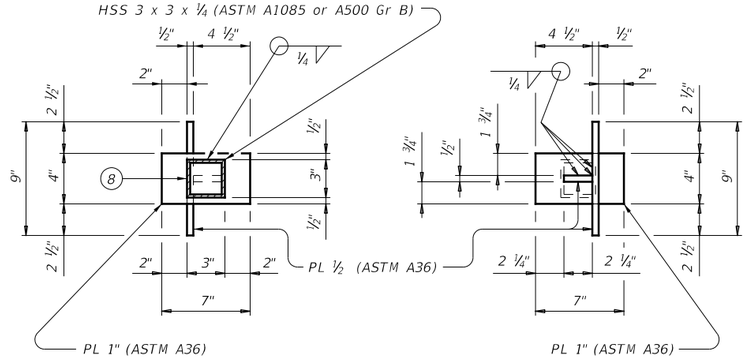
(3) At the Contractor's option fully threaded adhesive anchors may be use instead of cast-in-place anchor bolts. Expansion anchors are not allowed. Provide adhesive anchors that are ¾" Dia ASTM A193 Gr B7 or F1554 Gr 105 fully threaded rods with one hardened steel washer (ASTM F436) and one regular lock washer placed under heavy hex nut (ASTM A563). Embed fully threaded rods using a Type III, Class C, D, E, or F anchor adhesive. Adhesive anchor embedment depth is 8". Anchor adhesive chosen must be able to achieve a factored bond strength in tension of 2.2 kips per anchor (edge distance and spacing must be accounted for). Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use. Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing".

(4) For decked slab beams topped with a 2 course surface treatment and ACP overlay.

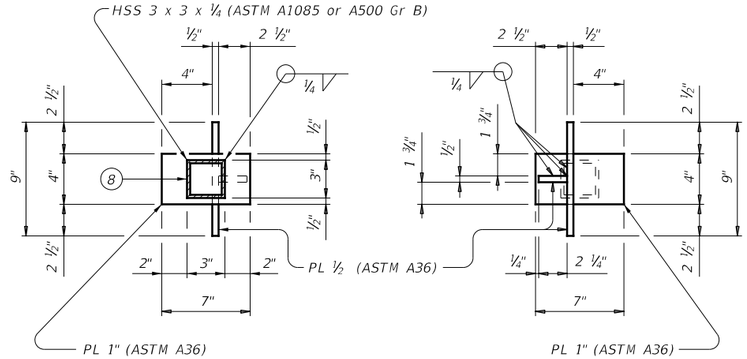
(6) Adjust length to accommodate edge of slab to back of rail for specific project conditions and to help plumb the vertical face of clearance sign.

(8) Hole required in bottom of HSS to drain zinc during galvanizing.

(9) 11" curb is for structures with 2" ACP overlay.

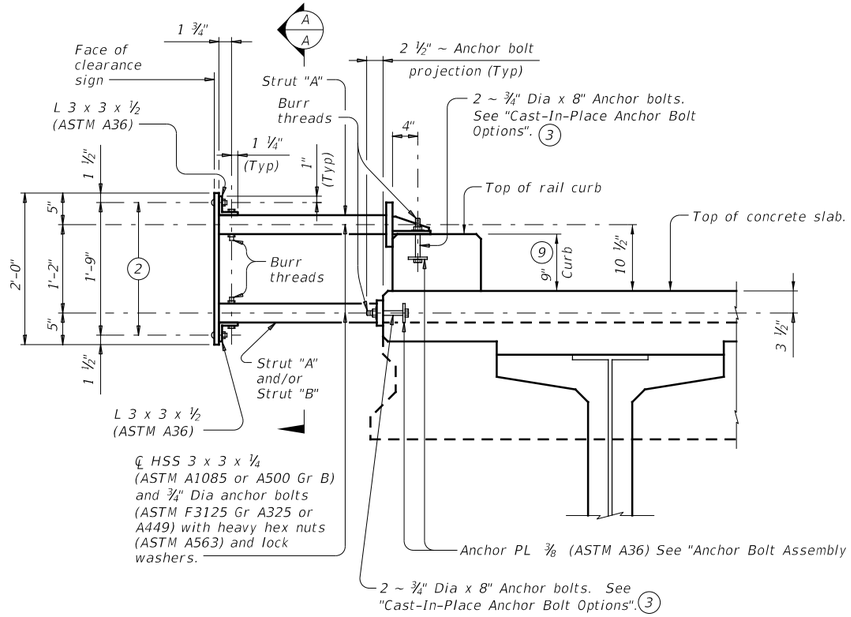


FOR 9" HIGH CURBS



FOR 11" HIGH CURBS

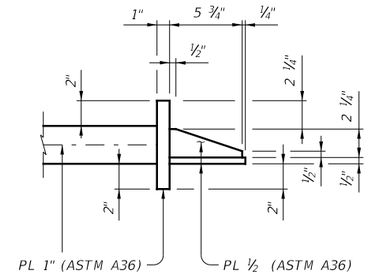
SECTION B-B



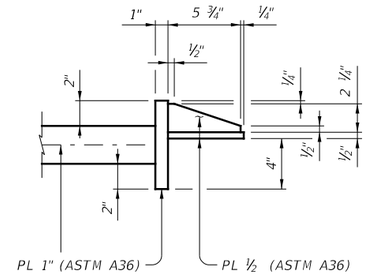
SECTION THRU T1F, T2P, C2P, T1W, C1W, T66 AND C66 RAIL CURB

Showing sign mount on a 9" high curb, 11" high curb similar.

VIEW C-C



FOR 9" HIGH CURBS



FOR 11" HIGH CURBS

VIEW D-D

Texas Department of Transportation

Bridge Division Standard

BRIDGE MOUNTED CLEARANCE SIGN ASSEMBLY

BMCS

FILE: bmcsste1-19.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	33	068, ETC	RSL
	DIST	COUNTY		SHEET NO.
	AUS	HAYS		303

DATE: 11/19/2020 4:38:09 PM
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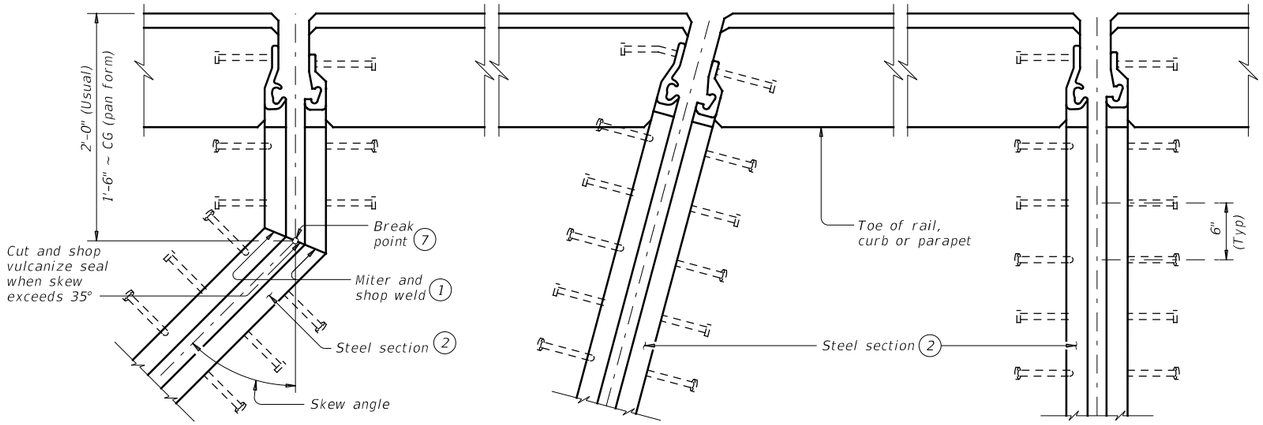
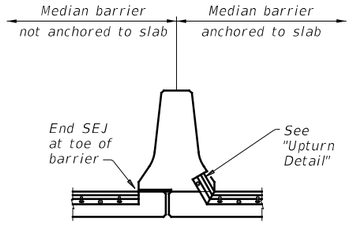


SHOWING SKEWS WITH SLAB BREAKBACKS

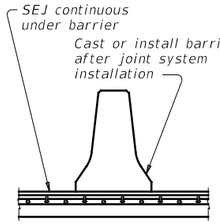
SHOWING SKEWS WITHOUT SLAB BREAKBACKS

SHOWING WITHOUT SKEWS AND SLAB BREAKBACKS

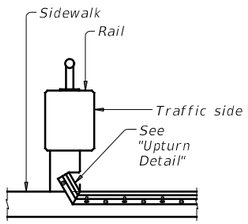
PLANS OF END CONDITIONS



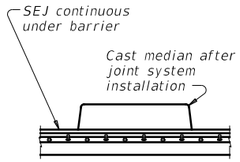
WITH OPEN DECK JOINT BELOW MEDIAN BARRIER



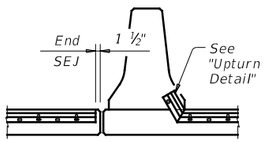
AT MEDIAN BARRIER



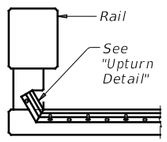
AT SIDEWALK BEHIND BRIDGE RAIL



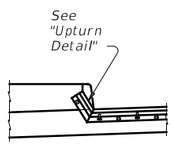
AT RAISED MEDIAN



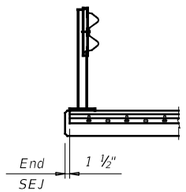
WITH OPEN DECK JOINT ADJACENT TO MEDIAN BARRIER



AT CONCRETE BRIDGE RAIL

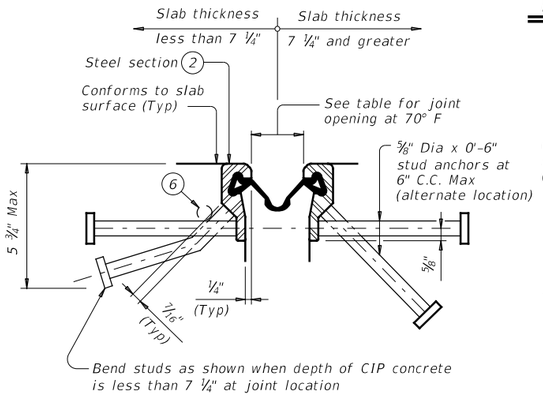


AT SIDEWALK

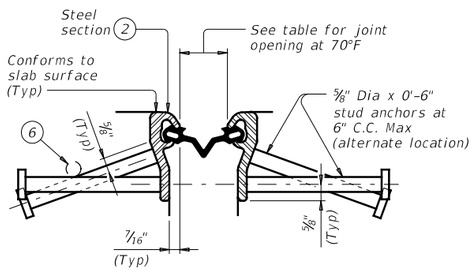


AT STEEL POST BRIDGE RAIL

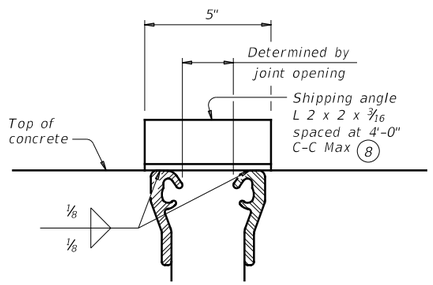
TYPICAL SECTIONS (5)



SECTION THRU WATSON BOWMAN ACME (SE-400 OR SE-500) JOINTS



SECTION THRU D.S. BROWN (A2R-400 OR A2R-XTRA) JOINTS



SHOWING D.S. BROWN (Ty SSCM2)
(All joints are similar.) (Studs are not shown for clarity.)

SHIPPING ANGLE

An alternate method of securing joint sections may be used if approved by the Bridge Division. Erection bolts are not allowed.

TABLE OF SEALED EXPANSION JOINT INFORMATION

MANUFACTURER	STEEL SECTION (2)	STRIP SEAL			
		4" JOINT		5" JOINT	
		Seal Type	Joint Opening (3)	Seal Type	Joint Opening (3)
D.S. Brown	Type SSCM2	A2R-400	1 ¾"	A2R-XTRA	2"
Watson Bowman Acme	Type R	SE-400	1 ¾"	SE-500	2"

REDUCED LONGITUDINAL MOVEMENT RANGE

SKEW (deg)	JOINT SIZE	
	4"	5"
0	4.0"	5.0"
15	4.0"	5.0"
30	3.5"	4.3"
45	2.8"	3.5"

DESIGN NOTES:

Joints installed on a skew have reduced ability to accommodate longitudinal movement. Use table values to determine the correct joint size for skewed installations.

For other skews over 25 degrees, calculate reduced movement range by multiplying joint size by cosine (skew).

(1) Remove all burrs which will be in contact with seal prior to making splice.

(2) Shape of steel section shown is typical. Variations in sections must be approved by the Engineer.

(3) These openings are also the recommended minimum installation openings.

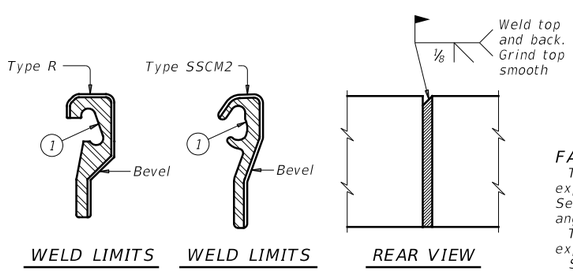
(4) Reduce for sidewalk or parapet heights less than 6".

(5) Other conditions affecting the joint profile should be noted elsewhere.

(6) Move transverse bars that are in conflict with SEJ studs, in either the bridge slab or approach slab, to rest at the junction of the studs.

(7) See Span details for location of break point.

(8) Align shipping angle perpendicular to joint.



WELD LIMITS WELD LIMITS REAR VIEW

FIELD SPLICE DETAIL

FABRICATION NOTES:

Temporarily shop assemble corresponding sections of sealed expansion joints (SEJ), check for fit, and match mark for shipment. Secure corresponding sections together for shipment with shipping angle. Do not use erection bolts.

The seal must be continuous and included in the price bid for sealed expansion joint.

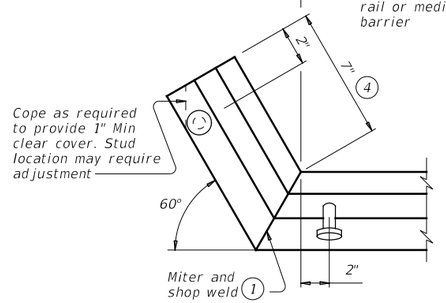
Ship steel sections in convenient lengths of 10'-0" Min and 24'-0" Max unless necessary for staged construction or widenings. One shop splice is permitted in each shipping length provided no piece is less than 2'-0" long and sufficient studs are added to limit the stud to shop splice distance to 2" Min and 4" Max.

Weld studs in accordance with AWS D1.1.

Butt weld all shop and field splices and grind smooth areas in contact with seal. Make all necessary field splice joint preparations in the shop.

Paint the entire steel section with System II or IV primer in accordance with Item 446, "Feild Cleaning and Painting Steel", unless required to galvanize when shown in the plans. Provide galvanizing in accordance with Item 445, "Galvanizing". Provide paints in accordance with Item 446.2. Prepare steel and apply paint in accordance with Item 446.4.7.3 and 446.4.7.4.

Shop drawings for the fabrication of sealed expansion joints will not require the Engineer's approval if fabrication is in accordance with the details shown on this standard.



UPTURN DETAIL

CONSTRUCTION NOTES:

Secure the sealed expansion joint in position and place to the proper grade and alignment by welding braces to adjacent reinforcing steel, to prestressed beam stirrups, or to anchors cast in concrete diaphragms. Include cost of temporary bracing in the price bid for sealed expansion joint.

Remove shipping angle immediately after each joint half is secured in place. Grind smooth, and touch up with organic zinc-rich paint.

Clean and prepare seal cavity for seal installation as per the Manufacturer's installation procedures.

GENERAL NOTES:

Provide sealed expansion joints in the size and at locations shown on the plans.

Minimum slab and overhang thickness required for the use of SEJ-M is 6 ½".

Texas Department of Transportation

Bridge Division Standard

SEALED EXPANSION JOINT TYPE M WITHOUT OVERLAY

SEJ-M

FILE: sejmste1-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: JMH
©TxDOT April 2019 REVISIONS	CONT	SECT	JOB	HIGHWAY
	0914	33	068,ETC	RSL
	DIST	COUNTY		SHEET NO.
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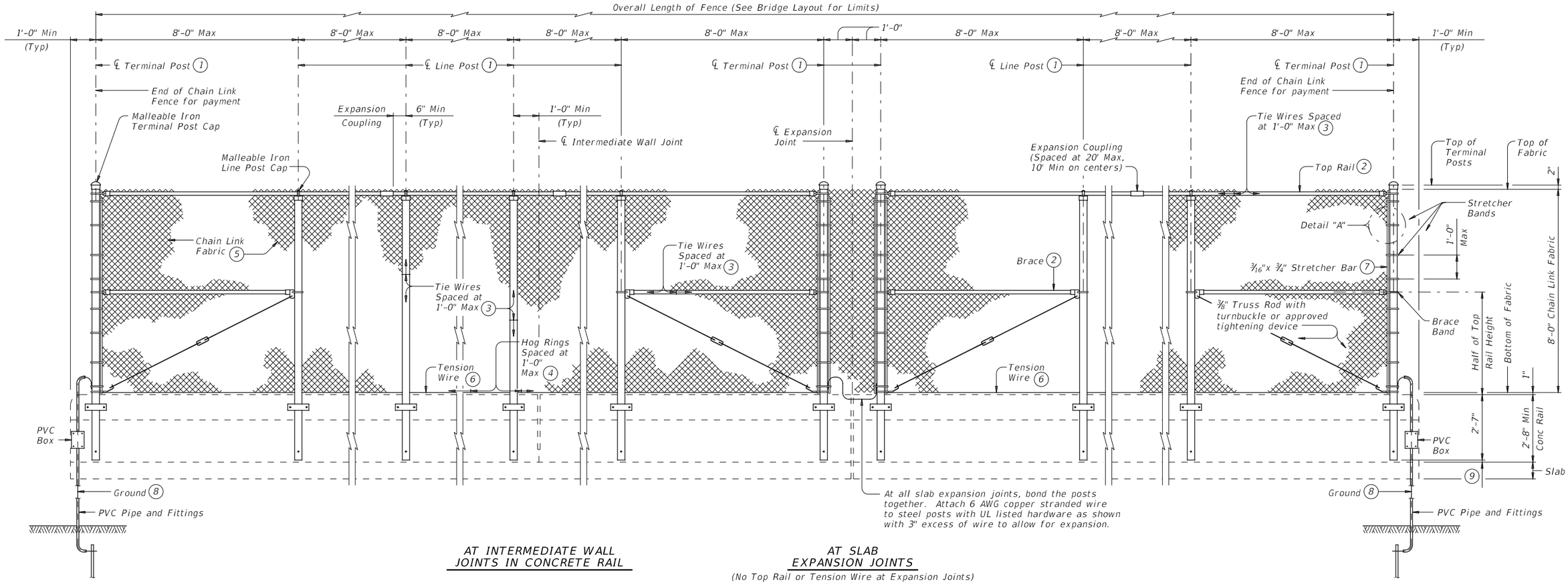
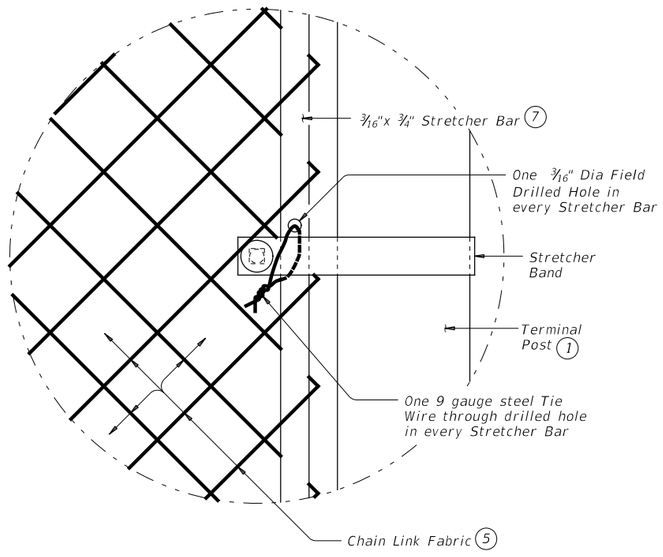


AT INTERMEDIATE WALL JOINTS IN CONCRETE RAIL

AT SLAB EXPANSION JOINTS
(No Top Rail or Tension Wire at Expansion Joints)

OUTSIDE ELEVATION OF CHAIN LINK FENCE



DETAIL "A"

(1) HSS 3.500 x 0.216 ASTM A1085 or A500 Gr B.

(2) HSS 1.660 x 0.140 ASTM A500 Gr B or A53 Gr B.

(3) 9 gauge steel Tie Wires attach chain link fabric to HSS.

(4) 9 gauge steel Hog Rings attach chain link fabric to tension wire.

(5) 9 gauge steel Chain Link Fabric, 2" Mesh, knuckle selvage top and bottom.

(6) 7 gauge steel Tension Wire.

(7) Contractor must field drill one 3/16" Dia hole in every stretcher bar and use a 9 gauge steel tie wire to tie one stretcher band and chain link fabric together. Locate drilled hole for tie wire at approximate mid-height of fence.

(8) Ground terminal post at the beginning and end of fence and down the nearest bent. Attach 6 AWG copper stranded wire to steel post with UL listed hardware and run other end of copper stranded wire to 5/8" Dia minimum copper-clad steel rod 8 ft in length. Install ground rod as per Item 550 and this sheet. The 6 AWG copper stranded wire must run through 1/2" Schedule 40 PVC pipe, fittings and PVC box attached to the back of rail.

(9) Dimension varies on rail types and superstructure type. T551, T221 and C221 Rails = 1" with no overlay, T222 Rail and SSTR Rail = 5" with no overlay, increased 2" for overlay. On bridges with significant beam camber variable length in dimension may be anticipated.

Texas Department of Transportation

Bridge Division Standard

8 FT CHAIN LINK FENCE FOR RAILROAD OVERPASS

CLF-RO

FILE: rlstd032-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: JMH
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	33	068,ETC	RSL
	DIST	COUNTY		SHEET NO.
	AUS	HAYS		305

DATE: 1/28/2021 2:58:08 PM
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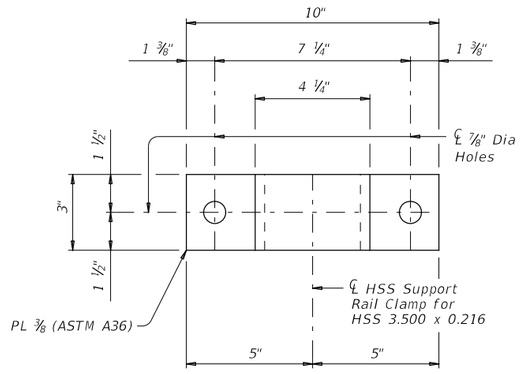
(1) HSS 3.500 x 0.216 ASTM A1085 or A500 Gr B.

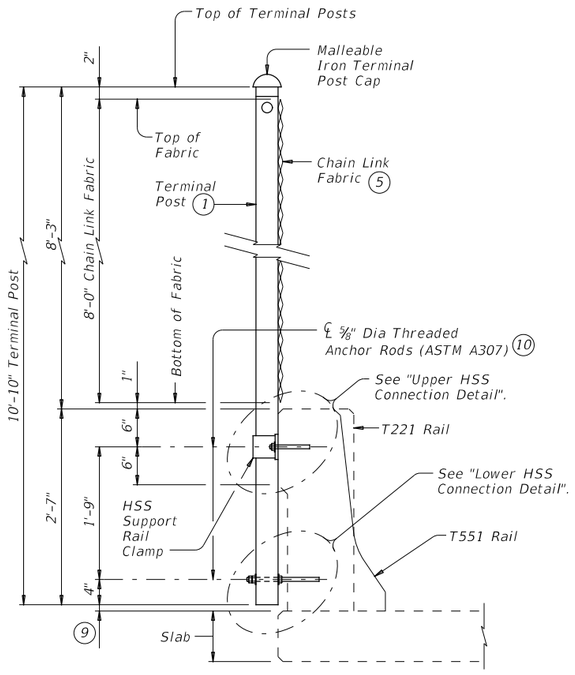
(5) 9 gauge steel Chain Link Fabric, 2" Mesh, knuckle selvage top and bottom.

(9) Dimension varies on rail types and superstructure type. T551, T221 and C221 Rails = 1" with no overlay, T222 Rail and SSTR Rail = 5" with no overlay, increased 2" for overlay. On bridges with significant beam camber variable length in dimension may be anticipated.

(10) See "Material Notes" for threaded anchor rod information.

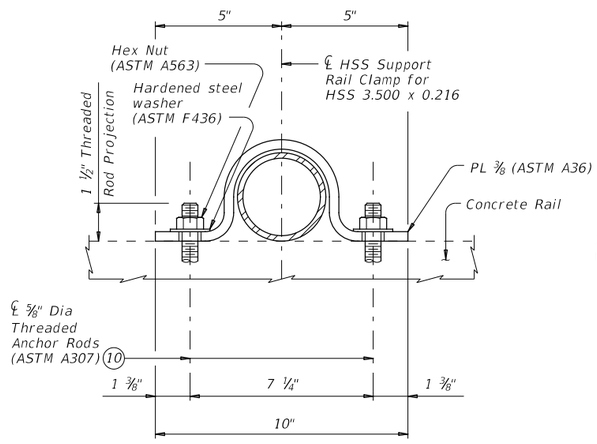


PIPE SUPPORT
RAIL CLAMP ELEVATION



CHAIN LINK FENCE SECTION

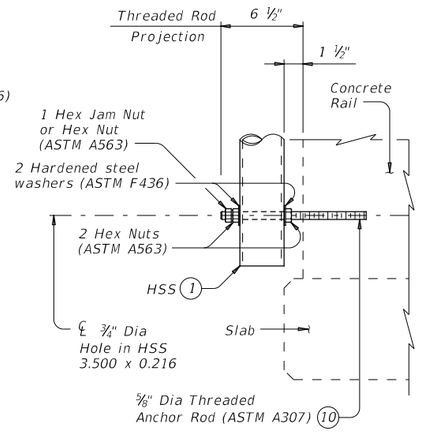
(Showing Terminal Post on a T551 or T221 Rail, Line Post, T222 Rail and SSTR Rail similar.)



HSS SUPPORT
RAIL CLAMP ASSEMBLY

UPPER HSS
CONNECTION DETAIL

(Dimensions may vary according to Manufacturer's specifications.)



LOWER HSS
CONNECTION DETAIL

(Showing Terminal Post or Line Post)

CONSTRUCTION NOTES:

Chain link fence post must be plumb unless otherwise approved.

Test adhesive anchors in accordance with Item 450.3.3, "Tests". Test 3 anchors per 100 anchors installed. Perform corrective measures to provide adequate capacity if any of the tests do not meet the required test load. Repair damage from testing as directed.

MATERIAL NOTES:

All Chain Link Fence materials must conform to standard specifications, Item "Chain Link Fence" unless shown otherwise.

Galvanize all steel components unless noted otherwise.

Provide ASTM A1085, A500 Gr B for HSS 3.500 x 0.216. Provide ASTM A500 Gr B or A53 Gr B for HSS 1.660 x 0.140.

Provide ASTM A36 for steel plates.

Anchor bolts must be ⅝" Dia ASTM A307 Gr A fully threaded rods. Hex nuts must conform to ASTM A563 requirements. Embed fully threaded rods into parapet wall with a Type III, Class C, D, E, or F anchor adhesive. Minimum adhesive anchor embedment depth is 5". Anchor adhesive chosen must be able to achieve a factored bond strength in tension of 6 kips each anchor (edge distance and anchor spacing must be accounted for). Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use. Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing".

GENERAL NOTES:

This sheet must be used with a concrete Traffic or Combination Rail. Rails that can be used with this sheet are T551, SSTR, T221, T222, and C221 Rails. Chain link fence details shown on this standard are adequate for all speeds. If used, optional side slot drains shown on rail standards must not be any closer than 6" from chain link post to edge of side slot drains.

This railing cannot be used on bridges with expansion joints providing more than 5" movement.

Payment for materials, fabrication, and installation of this assembly are to be included in unit price bid in accordance with Item 450, "Rail (CLF-RO)".

Approximate weight of fence = 20 plf.

Texas Department of Transportation

Bridge Division Standard

8 FT CHAIN LINK FENCE FOR RAILROAD OVERPASS

CLF-RO

FILE: r1std032-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: JMH
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	33	068,ETC	RSL
	DIST	COUNTY		SHEET NO.
	AUS	HAYS		306

GENERAL NOTES

1. CONTRACTOR TO COORDINATE WITH BEN PEREZ OF PEDERNALES ELECTRIC COOPERATIVE AT 512-644-2193 WITH AT LEAST FOUR WEEKS ADVANCE NOTICE TO VERIFY SERVICE POLE LOCATIONS AND POWER SERVICE HOOK UPS.

2. ALL ELECTRICAL WORK SHALL MEET NEC.

3. STATIONING IS BASED ON WESTBOUND ROBERT S LIGHT EXTENSION (RSLE WB) ALIGNMENT UNLESS OTHERWISE NOTED.

4. ALL GROUND BOXES WILL HAVE A CONCRETE APRON PER TXDOT DETAILS AND SPECIFICATIONS.

5. GROUND BOXES AND CONDUITS WITH PULL WIRES WILL BE INSTALLED IN ACCORDANCE WITH TXDOT'S STANDARDS AND SPECIFICATIONS AND TXDOT HIGHWAY ILLUMINATION MANUAL.

6. REFER TO TXDOT STANDARDS ED(1)-14 AND ED(7)-14 FOR ELECTRICAL DETAILS.

7. ALL LUMINAIRES WILL BE ON A 240/480V SYSTEM.

8. ALL LUMINAIRES WILL BE 250W HPS EQUIVALENT LED (TYPE III DISTRIBUTION, MEDIUM CUTOFF) PER TXDOT STANDARDS AND SPECIFICATIONS.

9. ALL LIGHT POLES WILL HAVE 1-2" CONDUIT EXTENDING FROM THE NEAREST GROUND BOX TO THE POLE BASE. THE POLES WILL HAVE 2-#10 XHHW AND 1-#8 INSULATED GREEN BOND EXTENDING FROM THE GROUND BOX TO THE LUMINAIRE FIXTURE THROUGH THE POLE.

10. ANY AND ALL COSTS ASSOCIATED WITH THE INSTALLATION AND CONNECTIONS OF SERVICE POLE TO UTILITY COMPANY WILL BE CONSIDERED INCIDENTAL TO THE SERVICE POLE. THIS INCLUDES CONDUIT, CONDUIT FITTINGS, AND ELECTRICAL CONDUCTORS.

11/19/2020

HDR Engineering, Inc.
1290 Wonder World Drive
Building #1, Suite 1230
San Marcos, TX 78666-7969
Texas Registered Engineering Firm F-754

Texas Department of Transportation

ROBERT S. LIGHT EXTENSION

ROBERT S LIGHT BLVD ROADWAY ILLUMINATION GENERAL NOTES

SHEET 1 OF 1

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
MSW	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
MSW	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	307
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CHECK				
KK				

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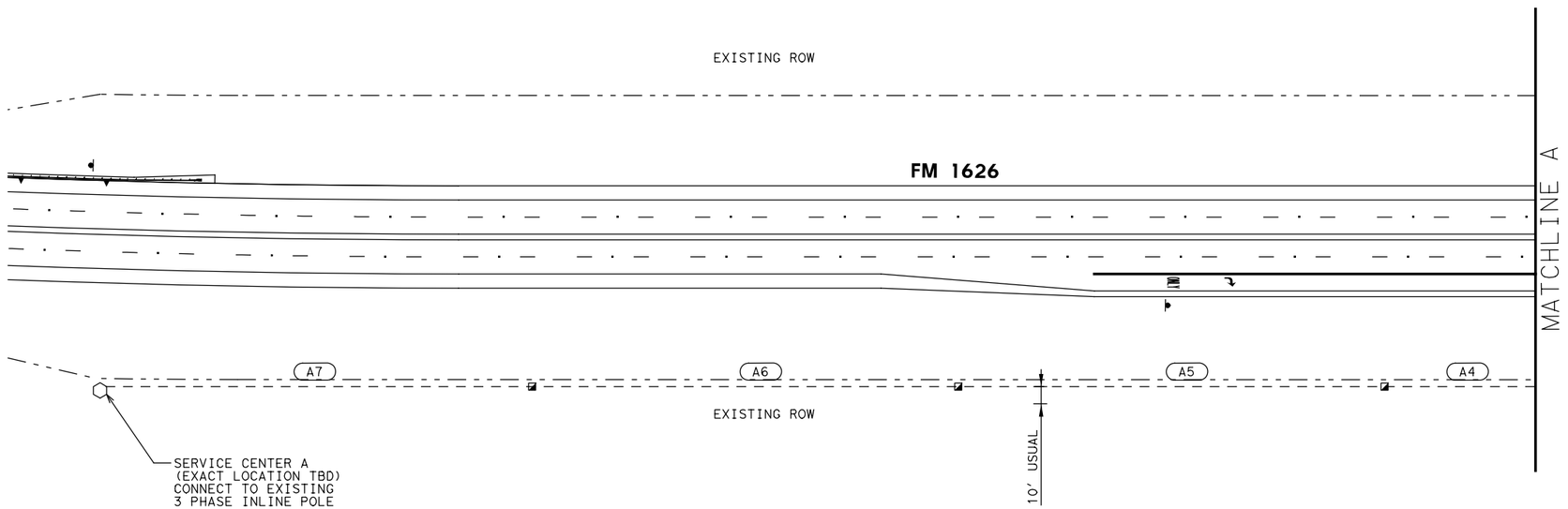
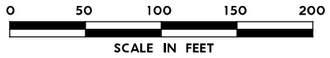
ELECTRICAL SERVICES DATA												
ELEC SERVICE NO.	SHEET NO.	ELECTRICAL SERVICE DESCRIPTION (SEE ED(5)-14)	SERVICE CONDUIT SIZE	SERVICE CONDUCTORS NO./SIZE	SAFETY SWITCH AMPS	MAIN CKT. BKR. POLE/AMPS	LIGHTING CONTACTOR AMPS	PANELBD/ LOADCENTER AMP RATING	CIRCUIT NO.	BRANCH CKT. BKR. POLE/AMPS	BRANCH CIRCUIT AMPS	KVA LOAD
A	1	ELC SRV TY A 240/480 060(NS)SS(E)SP(O)	1 1/2"	3/#6	N/A	2P/60	2P/60	N/A	1	2P/20	1.05	0.5

CABLE AND CONDUIT SUMMARY					
CIRCUIT NO.	RUN NO.	CONDUIT SIZE AND LENGTH (FT)		GROUND SIZE AND LENGTH (FT)	CONDUCTOR SIZE AND LENGTH (FT)
		2" PVC SCHD 40	2" PVC SCHD 40 (BORE)	#8 BARE	#8 XHHW
A	4	110		110	220
A	5	300		300	600
A	6	300		300	600
A	7	300		300	600





LEGEND

- EXISTING RD IL AM TO REMAIN
- EXISTING RD IL AM TO BE REMOVED
- PROPOSED ELECTRICAL SERVICE
- EXISTING CONDUIT TO REMAIN
- EXISTING GROUND BOX TO REMAIN
- PROPOSED RD IL AM (SHOE BASE)
- PROPOSED RD IL AM (BREAKAWAY BASE)
- CONDT (2") (SCHD 40 PVC)
- CONDT (2") (SCHD 40 PVC) (BORE)
- PROPOSED BARRIER JUNCTION BOX
- PROPOSED TY D GROUND BOX W/ APRON
- (##) RUN NO.
- EXISTING ROW
- PROPOSED ROW

SHEET TOTALS				
ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
618	6023	CONDT (PVC) (SCH 40) (2")	LF	1010
620	6007	ELEC CONDR (NO.8) BARE	LF	1010
620	6008	ELEC CONDR (NO.8) INSULATED	LF	2020
628	6045	ELC SRV TY A 240/480 060(NS)SS(E)SP(O)	EA	1
624	6010	GROUND BOX TY D (162922)W/APRON	EA	3

11/19/2020

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Texas Registered Engineering Firm F-754

Texas Department of Transportation

ROBERT S. LIGHT EXTENSION

ROBERT S LIGHT BLVD ROADWAY ILLUMINATION LAYOUT BEGIN TO MATCHLINE A

SCALE: 1"=100'

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
MSW	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
MSW	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	308
KK	0914	33	068,ETC	
CHECK				
KK				

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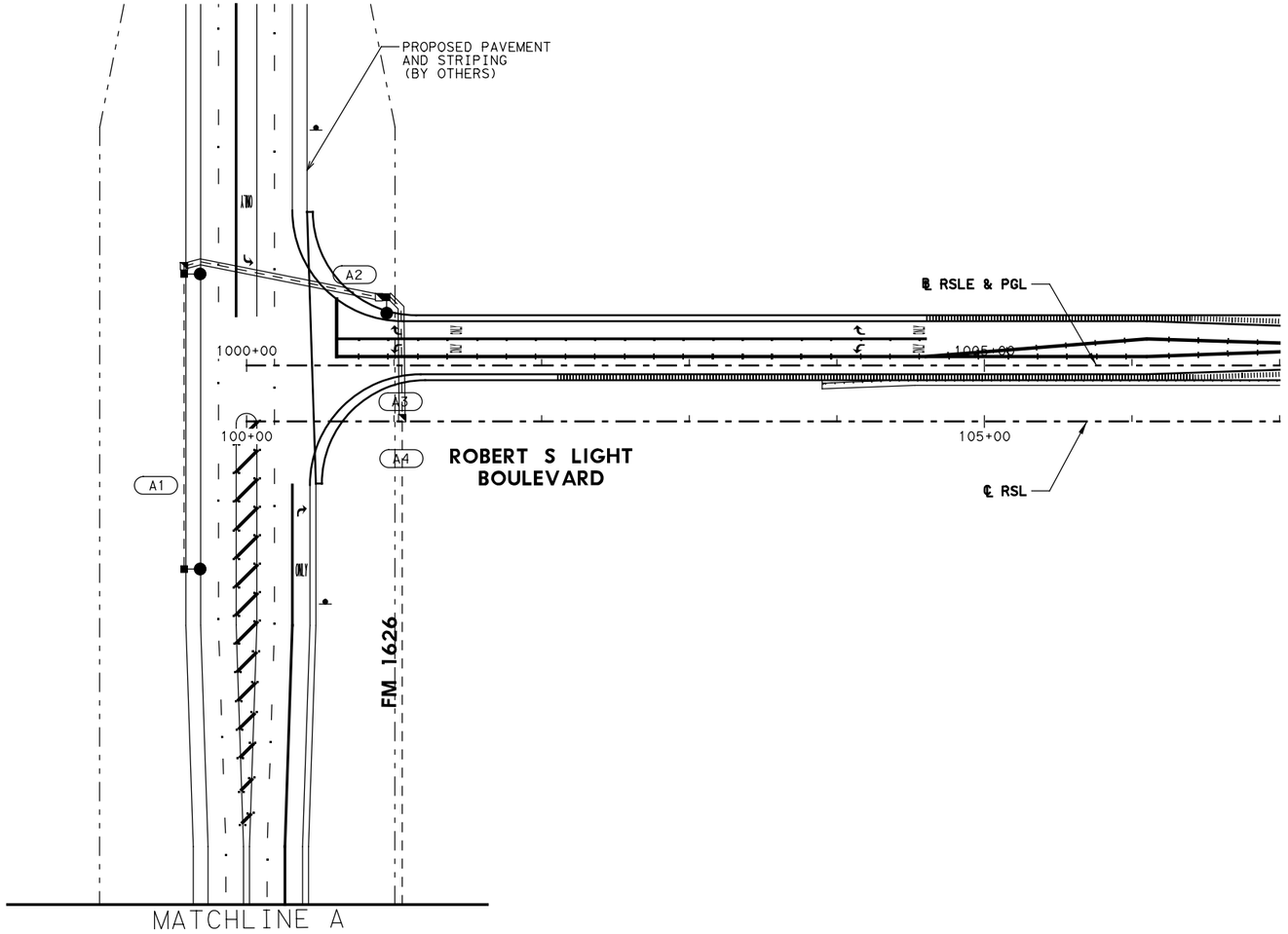
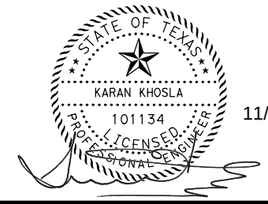
CABLE AND CONDUIT SUMMARY					
CIRCUIT NO.	RUN NO.	CONDUIT SIZE AND LENGTH (FT)		GROUND SIZE AND LENGTH (FT)	CONDUCTOR SIZE AND LENGTH (FT)
		2" PVC SCHD 40	2" PVC SCHD 40 (BORE)	#8 BARE	#8 XHHW
A	1	205		255	510
A	2		135	185	370
A	3		80	130	260
A	4	330		330	660



LEGEND

- EXISTING RD IL AM TO REMAIN
- EXISTING RD IL AM TO BE REMOVED
- PROPOSED ELECTRICAL SERVICE
- EXISTING CONDUIT TO REMAIN
- EXISTING GROUND BOX TO REMAIN
- PROPOSED RD IL AM (SHOE BASE)
- PROPOSED RD IL AM (BREAKAWAY BASE)
- CONDT (2") (SCHD 40 PVC)
- CONDT (2") (SCHD 40 PVC) (BORE)
- PROPOSED BARRIER JUNCTION BOX
- PROPOSED TY D GROUND BOX W/ APRON
- (##) RUN NO.
- EXISTING ROW
- PROPOSED ROW



11/19/2020

SHEET TOTALS				
ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
416	6029	DRILL SHAFT (RDWY ILL POLE) (30 IN)	LF	24
610	6214	IN RD IL (TY SA) 40T-8 (250W EQ) LED	EA	3
618	6023	CONDT (PVC) (SCH 40) (2")	LF	535
618	6024	CONDT (PVC) (SCH 40) (2") (BORE)	LF	215
620	6007	ELEC CONDR (NO.8) BARE	LF	900
620	6008	ELEC CONDR (NO.8) INSULATED	LF	1800
624	6010	GROUND BOX TY D (162922)W/APRON	EA	3

ROADWAY ILLUMINATION ASSEMBLY SUMMARY			
STD.	STATION	LOCATION	TYPE
1	1000+95.00	RSLB FR, 46.25', LT, GROUND MOUNTED	INS RD IL AM (TY SA) 40T-8(250W EQ) LED
2	999+58.00	RSLB FR, 138', RT, GROUND MOUNTED	INS RD IL AM (TY SA) 40T-8(250W EQ) LED
3	999+58.00	RSLB FR, 62', LT, GROUND MOUNTED	INS RD IL AM (TY SA) 40T-8(250W EQ) LED

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Texas Department of Transportation

ROBERT S. LIGHT EXTENSION

ROBERT S LIGHT BLVD ROADWAY ILLUMINATION LAYOUT MATCHLINE A TO STA 107+00

SCALE: 1"=100'

SHEET 2 OF 4

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
MSW	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
MSW	TEXAS	AUS	HAYS	309
CHECK	CONTROL	SECTION	JOB	
KK	0914	33	068,ETC	
CHECK				
KK				

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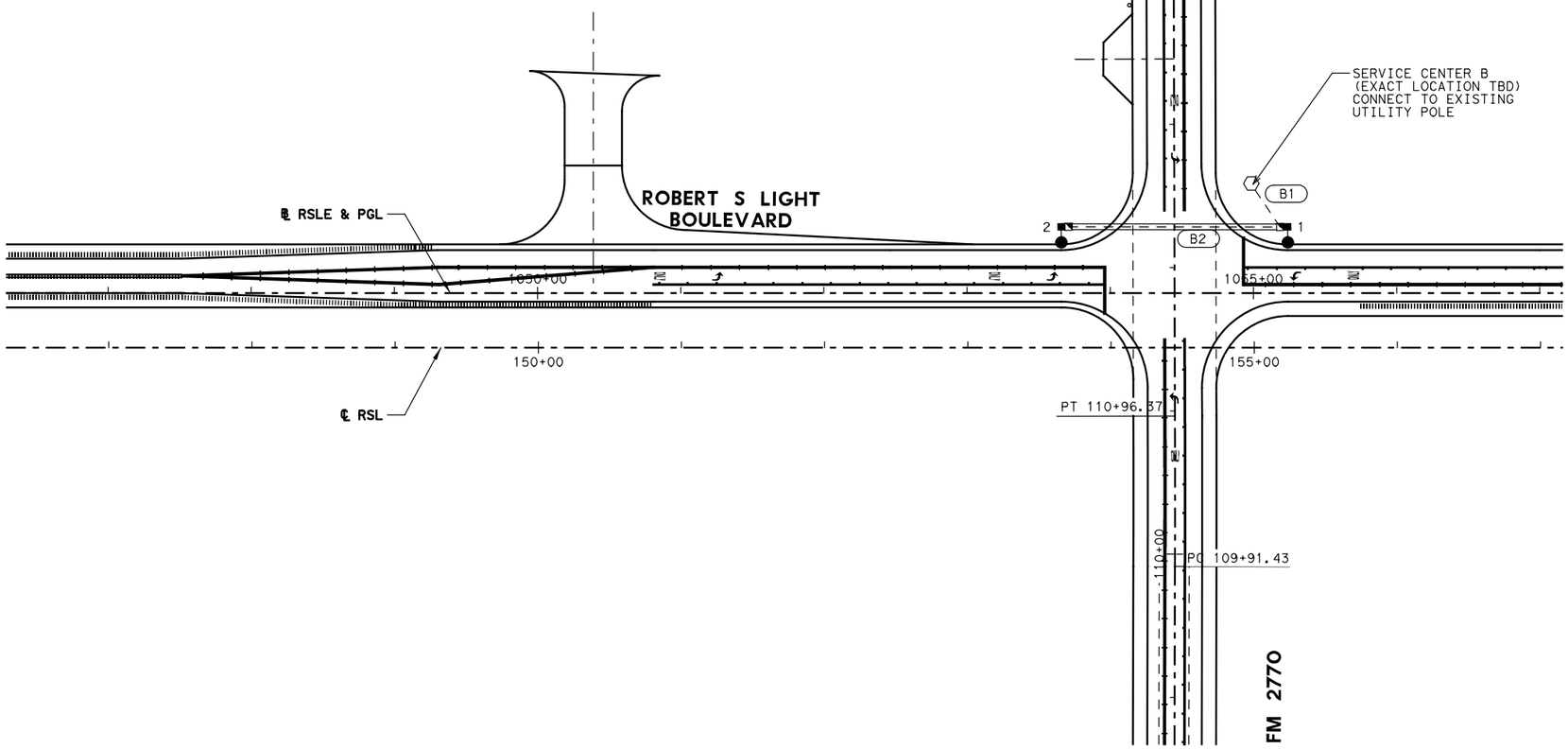
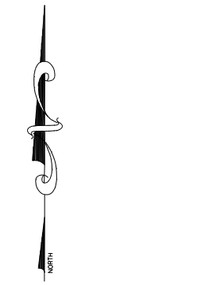
SHEET TOTALS				
ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
416	6029	DRILL SHAFT (RDWY ILL POLE) (30 IN)	LF	16
610	6214	IN RD IL (TY SA) 40T-8 (250W EQ) LED	EA	2
618	6023	CONDT (PVC) (SCH 40) (2")	LF	40
618	6024	CONDT (PVC) (SCH 40) (2") (BORE)	LF	150
620	6007	ELEC CONDR (NO.8) BARE	LF	290
620	6008	ELEC CONDR (NO.8) INSULATED	LF	580
628	6045	ELC SRV TY A 240/480 060(NS)SS(E)SP(O)	EA	1
624	6010	GROUND BOX TY D (162922)W/APRON	EA	2

ROADWAY ILLUMINATION ASSEMBLY SUMMARY			
STD.	STATION	LOCATION	TYPE
1	1053+65.00	RSLB FR, 42', LT, GROUND MOUNTED	INS RD IL AM (TY SA) 40T-8(250W EQ) LED
2	1055+24.00	RSLB FR, 42', LT, GROUND MOUNTED	INS RD IL AM (TY SA) 40T-8(250W EQ) LED

CABLE AND CONDUIT SUMMARY					
CIRCUIT NO.	RUN NO.	CONDUIT SIZE AND LENGTH (FT)		GROUND SIZE AND LENGTH (FT)	CONDUCTOR SIZE AND LENGTH (FT)
		2" PVC SCHD 40	2" PVC SCHD 40 (BORE)	#8 BARE	#8 XHHW
B	1	40		90	180
B	2		150	200	400

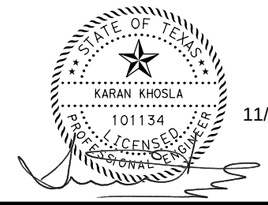




LEGEND

- EXISTING RD IL AM TO REMAIN
- EXISTING RD IL AM TO BE REMOVED
- PROPOSED ELECTRICAL SERVICE
- EXISTING CONDUIT TO REMAIN
- EXISTING GROUND BOX TO REMAIN
- PROPOSED RD IL AM (SHOE BASE)
- PROPOSED RD IL AM (BREAKAWAY BASE)
- CONDT (2") (SCHD 40 PVC)
- CONDT (2") (SCHD 40 PVC) (BORE)
- PROPOSED BARRIER JUNCTION BOX
- PROPOSED TY D GROUND BOX W/ APRON
- ## RUN NO.
- EXISTING ROW
- PROPOSED ROW

ELECTRICAL SERVICES DATA												
ELEC SERVICE NO.	SHEET NO.	ELECTRICAL SERVICE DESCRIPTION (SEE ED(5)-14)	SERVICE CONDUIT SIZE	SERVICE CONDUCTORS NO./SIZE	SAFETY SWITCH AMPS	MAIN CKT. BKR. POLE/AMPS	LIGHTING CONTACTOR AMPS	PANELBD/ LOADCENTER AMP RATING	CIRCUIT NO.	BRANCH CKT. BKR. POLE/AMPS	BRANCH CIRCUIT AMPS	KVA LOAD
B	3	ELC SRV TY A 240/480 060(NS)SS(E)SP(O)	1 1/2"	3/#6	N/A	2P/60	2P/60	N/A	1	2P/20	0.7	0.2



11/19/2020

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San Marcos, TX 78666-7969
Texas Registered Engineering Firm F-754

Texas Department of Transportation

ROBERT S. LIGHT EXTENSION

ROBERT S LIGHT BLVD ROADWAY ILLUMINATION LAYOUT STA 147+00 TO STA 157+00

SCALE: 1"=100'

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
MSW	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
MSW	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	310
KK	0914	33	068,ETC	
CHECK				
KK				

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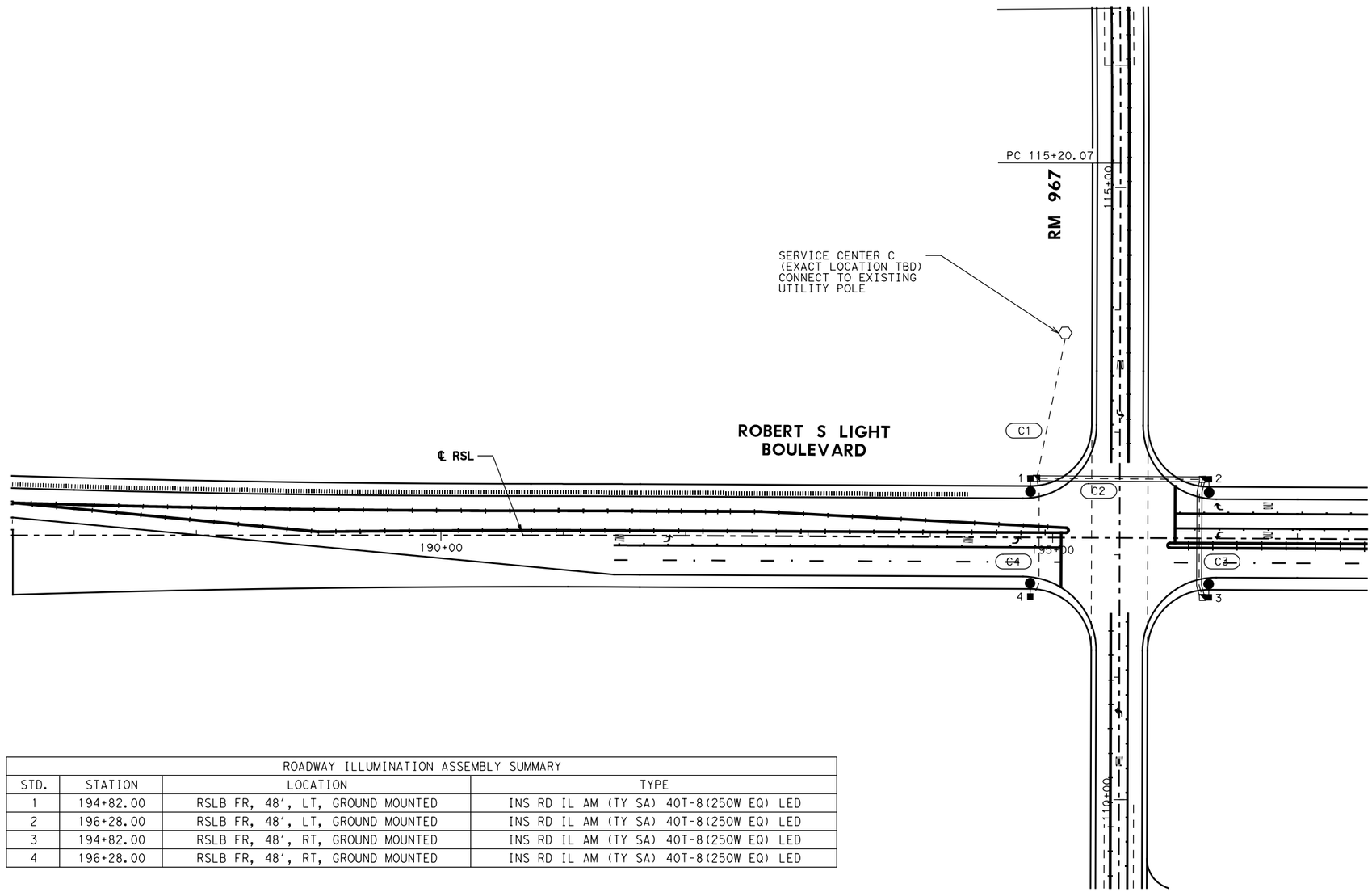
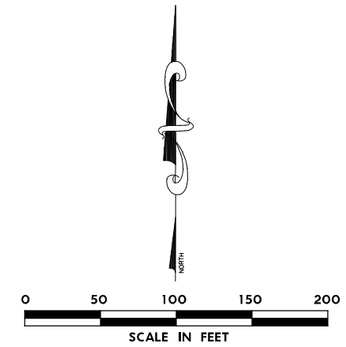
SHEET TOTALS				
ITEM	CODE	DESCRIPTION	UNIT	QUANTITY
416	6029	DRILL SHAFT (RDWY ILL POLE) (30 IN)	LF	16
610	6214	IN RD IL (TY SA) 40T-8 (250W EQ) LED	EA	2
618	6023	CONDT (PVC) (SCH 40) (2")	LF	40
618	6024	CONDT (PVC) (SCH 40) (2") (BORE)	LF	150
620	6007	ELEC CONDR (NO.8) BARE	LF	290
620	6008	ELEC CONDR (NO.8) INSULATED	LF	580
628	6045	ELC SRV TY A 240/480 060(NS)SS(E)SP(O)	EA	1
624	6010	GROUND BOX TY D (162922)W/APRON	EA	2

CABLE AND CONDUIT SUMMARY					
CIRCUIT NO.	RUN NO.	CONDUIT SIZE AND LENGTH (FT)		GROUND SIZE AND LENGTH (FT)	CONDUCTOR SIZE AND LENGTH (FT)
		2" PVC SCHD 40	2" PVC SCHD 40 (BORE)	#8 BARE	#8 XHHW
C	1	140		190	380
C	2		135	185	370
C	3		100	150	300
C	4	100		150	300





LEGEND

- EXISTING RD IL AM TO REMAIN
- EXISTING RD IL AM TO BE REMOVED
- PROPOSED ELECTRICAL SERVICE
- EXISTING CONDUIT TO REMAIN
- EXISTING GROUND BOX TO REMAIN
- PROPOSED RD IL AM (SHOE BASE)
- PROPOSED RD IL AM (BREAKAWAY BASE)
- CONDT (2") (SCHD 40 PVC)
- CONDT (2") (SCHD 40 PVC) (BORE)
- PROPOSED BARRIER JUNCTION BOX
- PROPOSED TY D GROUND BOX W/ APRON
- (##) RUN NO.
- EXISTING ROW
- PROPOSED ROW

ROADWAY ILLUMINATION ASSEMBLY SUMMARY			
STD.	STATION	LOCATION	TYPE
1	194+82.00	RSLB FR, 48', LT, GROUND MOUNTED	INS RD IL AM (TY SA) 40T-8(250W EQ) LED
2	196+28.00	RSLB FR, 48', LT, GROUND MOUNTED	INS RD IL AM (TY SA) 40T-8(250W EQ) LED
3	194+82.00	RSLB FR, 48', RT, GROUND MOUNTED	INS RD IL AM (TY SA) 40T-8(250W EQ) LED
4	196+28.00	RSLB FR, 48', RT, GROUND MOUNTED	INS RD IL AM (TY SA) 40T-8(250W EQ) LED

ELECTRICAL SERVICES DATA												
ELEC SERVICE NO.	SHEET NO.	ELECTRICAL SERVICE DESCRIPTION (SEE ED(5)-14)	SERVICE CONDUIT SIZE	SERVICE CONDUCTORS NO./SIZE	SAFETY SWITCH AMPS	MAIN CKT. BKR. POLE/AMPS	LIGHTING CONTACTOR AMPS	PANELBD/ LOADCENTER AMP RATING	CIRCUIT NO.	BRANCH CKT. BKR. POLE/AMPS	BRANCH CIRCUIT AMPS	KVA LOAD
C	4	ELC SRV TY A 240/480 060(NS)SS(E)SP(O)	1 1/2"	3/#6	N/A	2P/60	2P/60	N/A	1	2P/20	1.4	0.7

KARAN KHOSLA
101134
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS
11/19/2020

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Texas Registered Engineering Firm F-754

Texas Department of Transportation

ROBERT S. LIGHT EXTENSION

ROBERT S LIGHT BLVD ROADWAY ILLUMINATION LAYOUT STA 187+00 TO STA 197+00

SCALE: 1"=100'

SHEET 4 OF 4

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
MSW	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
MSW	TEXAS	AUS	HAYS	311
CHECK	CONTROL	SECTION	JOB	
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CHECK				
KK				

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GENERAL NOTES FOR ALL ELECTRICAL WORK

1. The location of all conduits, junction boxes, ground boxes, and electrical services is diagrammatic and may be shifted to accommodate field conditions.

2. Provide new and unused materials. Ensure that all materials and installations comply with the applicable articles of the National Electrical Code (NEC), TxDOT standards and specifications, National Electrical Manufacturers Association (NEMA), and are listed by Underwriters Laboratories (UL) or a Nationally Recognized Testing Lab (NRTL). NRTLs such as Canadian Standard Association (CSA), Intertek Testing Services NA Inc., or FM Approvals LLC can be considered equivalent to UL. Where reference is made to NEMA listed devices, International Electrotechnical Commission (IEC) listed devices will not be considered an acceptable equal to a NEMA listed device. Acceptable devices may have both a NEMA and IEC listing. Faulty fabrication or poor workmanship in any material, equipment, or installation is justification for rejection. Replace or reinstall rejected material or equipment at no additional cost to the Department.

3. Miscellaneous nuts, bolts and hardware, except for high strength bolts, may be stainless steel when plans specify galvanized, provided the bolt size is ½ in. or less in diameter.

4. Provide the following test equipment as required by the Engineer to confirm compliance with the contract and the NEC: voltmeter, ammeter, megohm meter (1000 volt DC), ground resistance tester, torque wrenches, and torque screwdrivers. Ensure all equipment has been properly calibrated within the last year. Provide calibration certification to the Engineer upon request. Operate test equipment during inspection as requested by the Engineer.

5. Install grounding as shown on the plans and in accordance with the NEC. Ensure all metallic conduits; metal poles; luminaires; and metal enclosures are bonded to the equipment grounding conductor. Provide stranded bare copper or green insulated grounding conductors. Ground rods, connectors, and bonding jumpers are subsidiary to the various bid items.

6. When required by the Engineer, notify the Department in writing of materials from the Material Producers List (MPL) intended for use on each project. Prequalified materials are listed on the MPL on TxDOT's website under "Roadway Illumination and Electrical Supplies." No substitutions will be allowed for materials on this list.

CONDUIT

A. MATERIALS

1. Provide conduit, junction boxes, fittings, and hardware as per TxDOT Departmental Material Specification (DMS) 11030 "Conduit" and Item 618 "Conduit" of TxDOT's "Standard Specifications For Construction And Maintenance Of Highways, Streets, And Bridges," latest edition. Provide conduits listed under Item 618 on the MPL under "Roadway Illumination and Electrical Supplies." Provide conduit types according to the descriptive code or as shown on the plans. Do not substitute other types of conduits for those shown. Provide liquidtight flexible metal conduit (LFMC) when flexible conduit is called for on galvanized steel rigid metallic conduit (RMC) systems. Provide liquidtight flexible nonmetallic conduit (LFNC) when flexible conduit is called for on polyvinyl chloride (PVC) systems.

2. Provide galvanized steel RMC for all exposed conduits, unless otherwise shown on the plans. Properly bond all metal conduits.

3. Unless otherwise shown on the plans, provide junction boxes with a minimum size as shown in the following table, which applies to the greatest number of conductors entering the box through one conduit with no more than four conduits per box. When a mixture of conductor sizes is present, count the conductors as if all are of the larger size. For situations not applicable to the table, size junction boxes in accordance with NEC.

AWG	3 CONDUCTORS	5 CONDUCTORS	7 CONDUCTORS
#1	10" x 10" x 4"	12" x 12" x 4"	16" x 16" x 4"
#2	8" x 8" x 4"	10" x 10" x 4"	12" x 12" x 4"
#4	8" x 8" x 4"	10" x 10" x 4"	10" x 10" x 4"
#6	8" x 8" x 4"	8" x 8" x 4"	10" x 10" x 4"
#8	8" x 8" x 4"	8" x 8" x 4"	8" x 8" x 4"

4. Junction boxes with an internal volume of less than 100 cu. in. and supported by entering raceways must have threaded entries or hubs identified for the intended purpose and supported by connection of two or more rigid metal conduits. Secure conduit within 3 ft. of the enclosure or within 18 in. of the enclosure if all conduit entries are on the same side. Mechanically secure all junction boxes with an internal volume greater than 100 cu. inches.

5. Provide hot dipped galvanized cast iron or sand cast aluminum outlet boxes for junction boxes containing only 10 AWG or 12 AWG conductors. Do not use die cast aluminum boxes. Size outlet boxes according to the NEC.

6. Do not use intermediate metal conduit (IMC) or electrical metallic tubing (EMT) unless specifically required by the plan sheets. When EMT is called for, provide junction boxes made from galvanized steel sheeting, listed and approved for outdoor use, unless otherwise noted on the plans. Size all galvanized steel junction boxes in accordance with the NEC. Provide junction boxes for IMC conduit systems that meet the same requirements for junction boxes used with RMC systems.

7. Provide PVC junction boxes intended for outdoor use on PVC conduit systems, unless otherwise noted on the plans.

8. Provide PVC elbows in PVC conduit systems, unless otherwise shown on the plans. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the PVC conduit system. When galvanized steel RMC elbows are specifically called for in the plans and any portion of the RMC elbow is buried less than 18 in., ground the RMC elbow by means of a grounding bushing on a rigid metal extension. Grounding of the rigid metal elbow is not required if the entire RMC elbow is encased in a minimum of 2 in. of concrete. PVC extensions are allowed on these concrete encased rigid metal elbows. RMC or PVC elbows are subsidiary to various bid items.

9. When required, provide High-Density Polyethylene (HDPE) conduit with factory installed internal conductors according to Item 622 "Duct Cable." At the Contractor's request and with approval by the Engineer, substitute HDPE conduit with no conductors for bored schedule 40 or schedule 80 PVC conduit bid under Item 618. Ensure bored HDPE substituted for PVC is schedule 40 and of the same size PVC called for in the plans. Ensure the substituted HDPE meets the requirements of Item 622, except that the conduit is supplied without factory-installed conductors. Make the transition of the HDPE conduit to PVC (or RMC elbow when required) at the bore pit. Provide conduit of the size and schedule as shown on the plans. Do not extend substituted conduit into ground boxes or foundations. Provide PVC or galvanized steel RMC elbows as called for at all ground boxes and foundations.

10. Use two-hole straps when supporting 2 in. and larger conduits. On electrical service poles, properly sized stainless steel or hot dipped galvanized one-hole standoff straps are allowed on the service riser conduit.

B. CONSTRUCTION METHODS

1. Provide and install expansion joint conduit fittings on all structure-mounted conduits at the structure's expansion joints to allow for movement of the conduit. In addition, provide and install expansion joint fittings on all continuous runs of galvanized steel RMC conduit externally exposed on structures such as bridges at maximum intervals of 150 ft. When requested by the project Engineer, supply manufacturer's specification sheet for expansion joint conduit fittings. Repair or replace expansion joint fittings that do not allow for movement at no additional cost to the Department. Provide the method of determining the amount of expansion to the Engineer upon request. Do not use LFMC or LFNC as a substitute for the required expansion conduit fittings.

2. Space all conduit supports at maximum intervals of 5 ft. Install conduit spacers when attaching metal conduit to surface of concrete structures. See "Conduit Mounting Options" on ED(2). Install conduit support within 3 ft. of all enclosures and conduit terminations.

3. Do not attach conduit supports directly to pre-stressed concrete beams except as shown specifically in the plans or as approved by the Engineer.

4. Unless otherwise shown on the plans, jack or bore conduit placed beneath existing roadways, driveways, sidewalks, or after the base or surfacing operation has begun. Backfill and compact the bore pits below the conduit per Item 476 "Jacking, Boring, or Tunneling Pipe or Box" prior to installing conduit or duct cable to prevent bending of the connections.

5. When placing conduit in the sub-grade of new roadways, backfill all trenches with excavated material unless otherwise noted on the plans. When placing conduit in the sub-base of new roadways, backfill all trenches with cement-stabilized base as per requirements of Items 110 "Excavation", 400 "Excavation and Backfill for Structures", 401 "Flowable Backfill", 402 "Trench Excavation Protection", and 403 "Temporary Special Shoring."

6. Provide and place warning tape approximately 10 in. above all trenched conduit as per Item 618.

7. During construction, temporarily cap or plug open ends of all conduit and raceways immediately after installation to prevent entry of dirt, debris and animals. Temporary caps constructed of durable duct tape are allowed. Tightly fix the tape to the conduit opening. Clean out the conduit and prove it clear in accordance with Item 618 prior to installing any conductors.

8. Ensure conduit entry into the top of any enclosure is waterproof by installing conduit sealing hubs or using boxes with threaded bosses. This includes surface mounted safety switches, meter cans, service enclosures, auxiliary enclosures and junction boxes. Grounding bushings on water tight sealing hubs are not required.

9. Fit the ends of all PVC conduit terminations with bushings or bell end fittings. Provide and install a grounding type bushing on all metal conduit terminations.

10. Install a bonding jumper from each grounding bushing to the nearest ground rod, grounding lug, or equipment grounding conductor. Ensure all bonding jumpers are the same size as the equipment grounding conductor. Bonding of conduit used as a casing under roadways for duct cable is not required, if the duct extends the full length through the casing.

11. At all electrical services, install a 6 AWG solid copper grounding electrode conductor.

12. Place conduits entering ground boxes so that the conduit openings are between 3 in. and 6 in. from the bottom of the box. See the ground box detail on sheet ED(4).

13. Seal ends of all conduits with duct seal, expandable foam, or by other methods approved by the Engineer. Seal conduit immediately after completion of conductor installation and pull tests. Do not use duct tape as a permanent conduit sealant. Do not use silicone caulk as a conduit sealant.

14. File smooth the cut ends of all mounting strut and conduit. Before installing, paint the field cut ends of all mounting strut and RMC (threaded or non-threaded) with zinc rich paint (94% or more zinc content) to alleviate overspray. Use zinc rich paint to touch up galvanized material as allowed under Item 445 "Galvanizing." Do not paint non-galvanized material with a zinc rich paint as an alternative for materials required to be galvanized.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS CONDUITS & NOTES

ED(1)-14

FILE:	ed1-14.dgn	DN:	CK:	DW:	CK:
© TxDOT	October 2014	CONT	SECT	JOB	HIGHWAY
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		DIST	COUNTY		SHEET NO.
		AUS	HAYS		312

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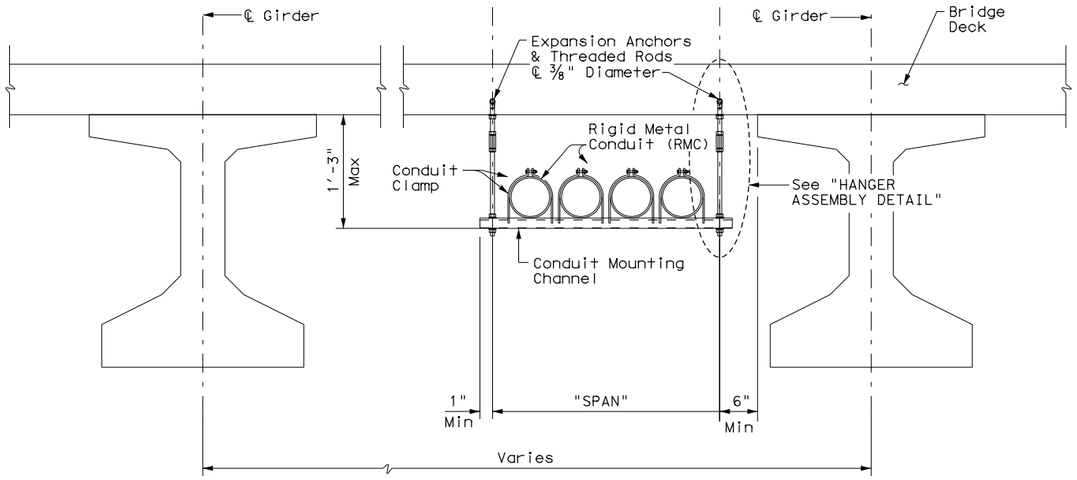
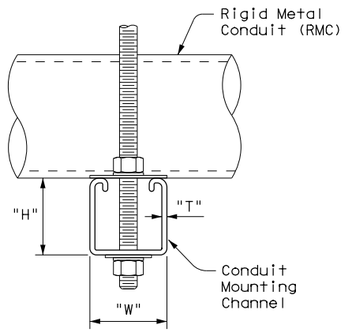
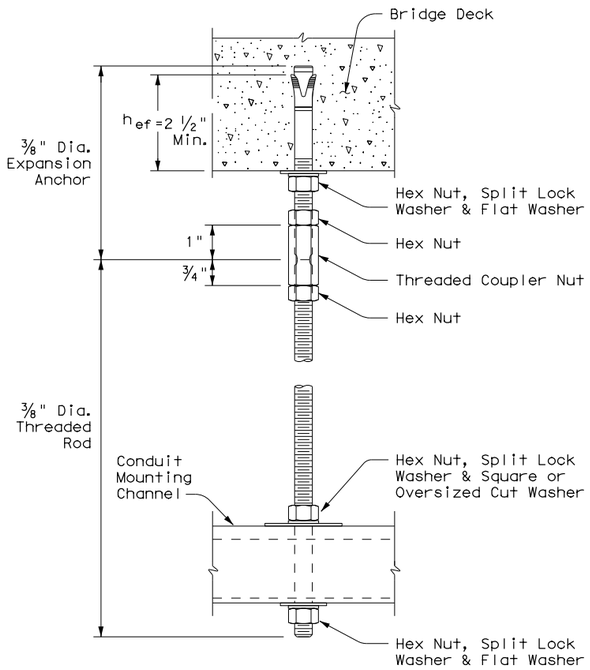


CONDUIT HANGING DETAIL

CONDUIT MOUNTING CHANNEL		
"SPAN"	"W" x "H"	"T"
less than 2'	1 5/8" x 1 3/8"	12 Ga.
2'-0" to 2'-6"	1 5/8" x 1 5/8"	12 Ga.
>2'-6" to 3'-0"	1 5/8" x 2 7/16"	12 Ga.

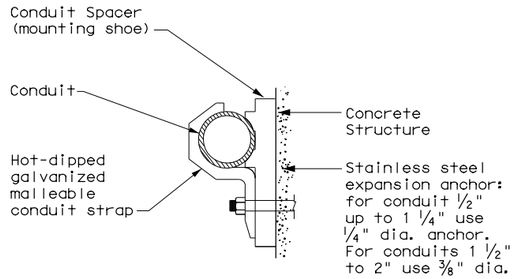
Channels with round or short slotted hole patterns are allowed, if the load carrying capacity is not reduced by more than 15%.

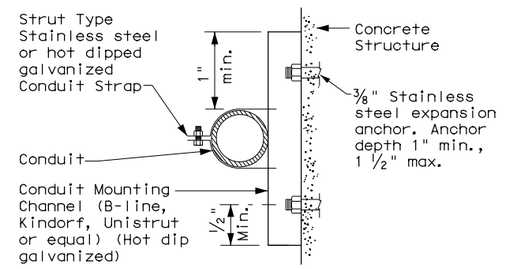




HANGER ASSEMBLY DETAIL

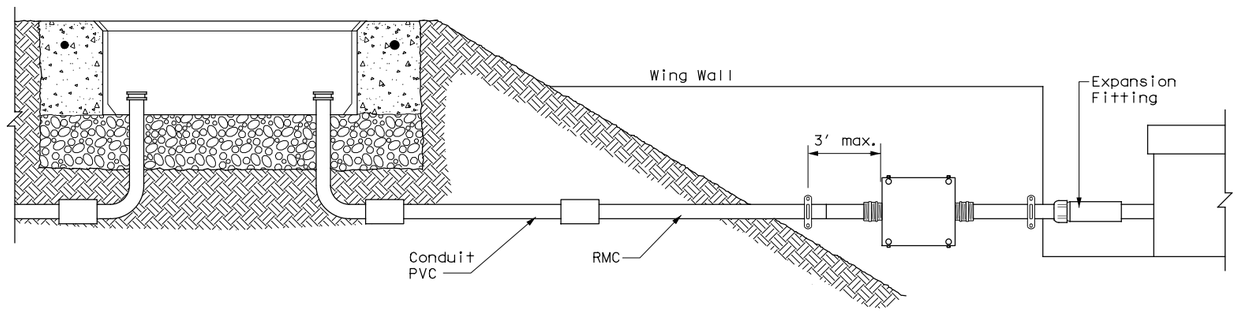
ELECTRIC CONDUIT TO BRIDGE DECK ATTACHMENT





CONDUIT MOUNTING OPTIONS

Attachment to concrete surfaces
See ED(1)B.2



TYPICAL CONDUIT ENTRY TO BRIDGE STRUCTURE DETAIL

EXPANSION ANCHOR NOTES FOR BRIDGE DECK ATTACHMENT

1. Use torque controlled mechanical expansion anchors that are approved for use in cracked concrete by the International Code Council, Evaluation Service (ICC-ES). The chosen anchor product shall have a designated ICC-ES Evaluation Report number, and its approval status shall be maintained on the ICC-ES website under Division 031600 for Concrete Anchors.

2. Unless otherwise approved by the Engineer: do not use adhesive anchors; do not use expansion anchors that are not included in the ICC-ES approval list; and do not use expansion anchors that are only approved for use in uncracked concrete.

3. Use anchors manufactured with stainless steel expansion wedges. Anchors manufactured with carbon steel expansion wedges are not allowed. Anchor bodies can be either zinc-plated carbon steel or stainless steel. For application in marine environment, both the anchor body and expansion wedge shall be stainless steel.

4. Install anchors as shown on the plans and in accordance with the anchor manufacturer's published installation instructions. Arrange a field demonstration test to evaluate the procedures and tools. The test shall be witnessed and approved by the Engineer prior to furnishing anchors on the structure.

5. Prior to hole drilling, use rebar locator to ensure clearing of existing deck strands or reinforcement. Install anchors to ensure a minimum effective embedment depth, (h_{ef}), as shown. Increase (h_{ef}) as needed to ensure sufficient thread length for proper torqueing and tightening of anchors.

6. Use anchors of minimum 1600 Lbs tensile capacity (minimum of steel, concrete breakout, and concrete pullout strengths as determined by ACI 318 Appendix D) at the required minimum embedment depth (h_{ef}). No lateral loads shall be introduced after conduit installation.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS
CONDUIT SUPPORTS

ED(2)-14

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REVISIONS	0914	33	068,ETC	RSL
	DIST	COUNTY		SHEET NO.
	AUS	HAYS		313

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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.

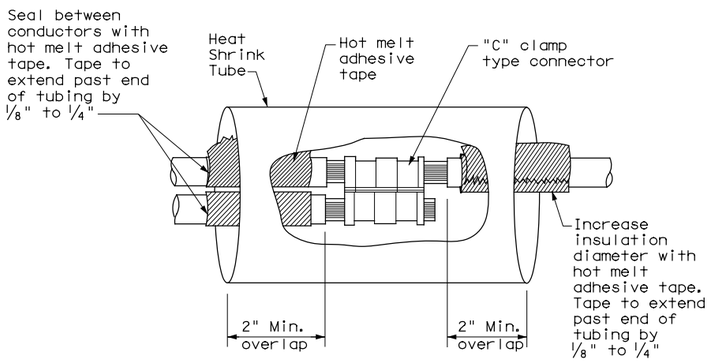
GROUND RODS & GROUNDING ELECTRODES

A. MATERIAL INFORMATION

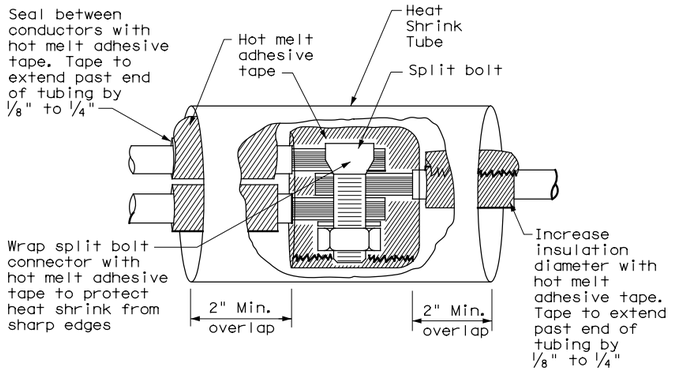
1. Provide and install a grounding electrode at electrical services. Provide ground rods according to DMS 11040 and the plans. Larger diameter or longer length rods may be called for in some specific locations, see the individual plans sheets. Concrete encased grounding electrodes may be called for in specific locations including electrical service, see individual plan sheets.

B. CONSTRUCTION METHODS

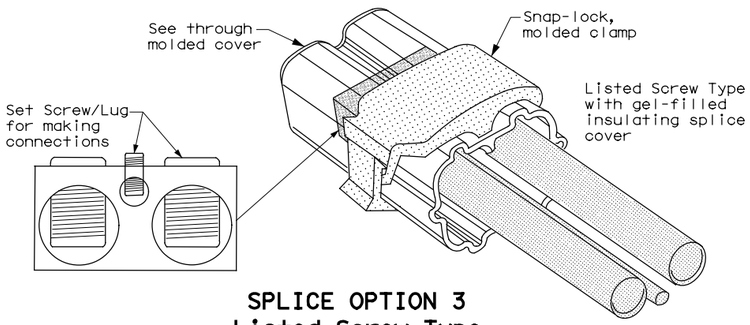
1. Furnish auxiliary ground rods for lightning protection and install in soil, concrete, or both, as called for in the plans. For ground rods installed in concrete, ensure the connection of the conductor to the ground rod is readily accessible for inspection or repairs. For ground rods installed in soil, 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

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS CONDUCTORS

ED(3)-14

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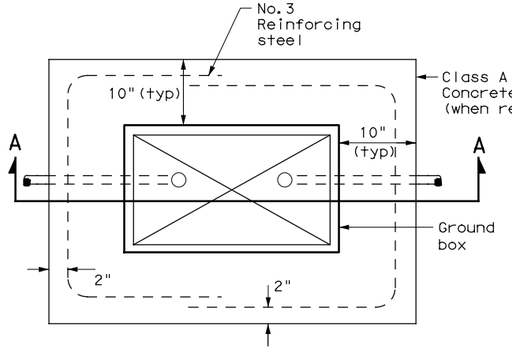
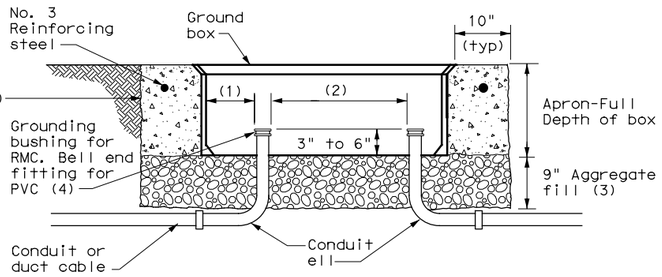


PLAN VIEW



SECTION A - A

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.

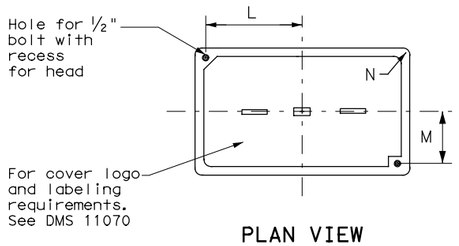
(2) Maintain sufficient space between conduits to allow for proper installation of bushing.

(3) Place aggregate under the box, not in the box. Aggregate should not encroach on the interior volume of the box.

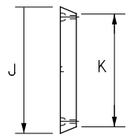
(4) Install a grounding bushing on the upper end of all RMC terminating in a ground box. Ground RMC elbows when any part of the elbow is less than 18 in. below the bottom of the ground box. Install a PVC bushing or bell end fitting on the upper end of all PVC conduits terminating in a ground box.

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

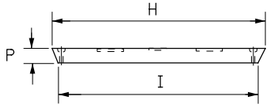
GROUND BOX COVER DIMENSIONS								
TYPE	DIMENSIONS (INCHES)							
	H	I	J	K	L	M	N	P
A, B & E	23 1/4	23	13 3/4	13 1/2	9 7/8	5 1/8	1 3/8	2
C & D	30 1/2	30 1/4	17 1/2	17 1/4	13 1/4	6 3/4	1 3/8	2



PLAN VIEW



END



SIDE

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.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS
GROUND BOXES

ED(4)-14

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ELECTRICAL SERVICES NOTES

1. Provide new materials. Ensure installation and materials comply with the applicable provisions of the National Electrical Code (NEC) and National Electrical Manufacturers Association (NEMA) standards. Ensure material is Underwriters Laboratories (UL) listed. Provide and install electrical service conduits, conductors, disconnects, contactors, circuit breaker panels, and branch circuit breakers as shown on the Electrical Service Data chart in the plans. Faulty fabrication or poor workmanship in material, equipment, or installation is justification for rejection. Where manufacturers provide warranties and guarantees as a customary trade practice, furnish these to the State.

2. Provide electrical services in accordance with Electrical Details standard sheets, Departmental Material Specification (DMS) 11080 "Electrical Services,"DMS 11081 "Electrical Services-Type A," DMS 11082 "Electrical Services-Type C," DMS 11083 "Electrical Services-Type D," DMS 11084 "Electrical Services-Type T," DMS 11085 "Electrical Services-Pedestal (PS)", and Item 628 "Electrical Services" of the Standard Specifications. Provide electrical service types A, C, and D, as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies," Item 628. Provide other service types as detailed on the plans.

3. Provide all work, materials, services, and any incidentals needed to install a complete electrical service as specified in the plans.

4. Coordinate with the Engineer and the utility provider for metering and compliance with utility requirements. Primary line extensions, connection charges, meter charges, and other charges by the utility company to provide power to the location are paid for in accordance with Item 628. Get approval for the costs associated with these charges prior to engaging the utility company to do the work. Consult with the utility provider to determine costs and requirements, and coordinate the work as approved.

5. The enclosure manufacturer will provide Master Lock Type 2 with brass tumblers keyed #2195 for all custom electrical enclosures. Installing Contractor is to provide Master Lock #2195 Type 2 with brass tumblers for "off the shelf" enclosures. Master Lock #2195 keys and locks become property of the State. Unless otherwise approved, do not energize electrical service equipment until locks are installed.

6. Enclosures with external disconnects that de-energize all equipment inside the enclosure do not need a dead front trim. Protect incoming line terminations from incidental contact as required by the NEC.

7. When galvanized is specified for nuts, screws, bolts or miscellaneous hardware, stainless steel may be used.

8. Provide wiring and electrical components rated for 75°C. Provide red, black, and white colored XHHW service entrance conductors of minimum size 6 American Wire Gauge (AWG). Identify size 6 AWG conductors by continuous color jacket. Identify electrical conductors sized 4 AWG and larger by continuous color jacket or by colored tape. Mark at least 6 inches of the conductor's insulation with half laps of colored tape, when identifying conductors. Ensure each service entrance conductor exits through a separately bushed non-metallic opening in the weatherhead. The lengths of the conductors outside the weatherhead are to be 12 inches minimum, 18 inches maximum, or as required by utility.

9. All electrical service conduit and conductors attached to the electrical service including the riser or the elbow below ground are subsidiary to the electrical service. For an underground utility feed, all service conduit and conductors after the elbow, including service conduit and conductors for the utility pole riser when furnished by the Contractor, will be paid for separately.

10. Provide rigid metal conduit (RMC) for all conduits on service, except for the ½ in. PVC conduit containing the electrical service grounding electrode conductor. Size the service entrance conduit as shown in the plans. Ensure conduit for branch circuit entry to enclosure is the same size as that shown on the layout sheets for branch circuit conduit. Extend all rigid metal conduits a minimum of 6 inches underground and then couple to the type and schedule of the conduit shown on the layout for that particular branch circuit. Install a grounding bushing on the RMC where it terminates in the service enclosure.

11. Use of liquidtight flexible metal conduit (LFMC) is allowed between the meter and service enclosure when they are mounted 90 to 180 degrees to each other. Size the LFMC the same size as service entrance conduit. LFMC must not exceed 3 feet in length. Strap LFMC within 1 foot of each end. LFMC less than 12 inches in length need not be strapped. Each end of LFMC must have a grounding bushing or be terminated with a grounding fitting. The LFMC must contain a grounded (neutral) conductor. Ensure any bend in LFMC never exceeds 180 degrees. A pull test is required on all installed conductors, with at least six inches of free conductor movement demonstrated to the satisfaction of the Engineer.

12. Ensure all mounting hardware and installation details of services conform to utility company specifications.

13. For all electrical service enclosures listed under Item 628 on the MPL, the UL 508 enclosure manufacturers will prepare and submit a schematic drawing unique to each service. Before shipment to the job site, place the applicable laminated schematic drawings and the laminated plan sheet showing the electrical service data chart used to build the enclosure in the enclosure's data pocket. The installing contractor will copy and laminate the actual project plan sheets detailing all equipment and branch circuits supplied by that service. The laminated plan sheets are to be placed in the service enclosure's document pocket. Reduce 11 in. x 17 in. plan sheets to 8 ½ in. x 11 in. before laminating. If the installation differs from the plan sheets, the installing contractor is to redline plan sheets before laminating.

14. When providing an "Off The Shelf" Type D or Type T service, provide laminated plan sheets detailing equipment and branch circuits supplied by that service. Reduce 11 in. x 17 in. plan sheets to 8 ½ in. x 11 in before laminating. Deliver these drawings before completion of the work to the Engineer, instead of placing in enclosure that has no door pocket.

15. Do not install conduit in the back wall of a service enclosure where it would penetrate the equipment mounting panel inside the enclosure. Provide grounding bushings on all metal conduits, and terminate bonding jumpers to grounding bus. Grounding bushings are not required when the end of the metal conduit is fitted with a conduit sealing hub or threaded boss, such as a meter base hub.

SERVICE ASSEMBLY ENCLOSURE

1. Provide threaded hub for all conduit entries into the top of enclosure.

2. Type galvanized steel (GS) enclosures may be used for Type C panelboards and for Type D and T services that do not use an enclosure mounted photocell or lighting contactor. Provide GS enclosures in accordance with DMS 11080, 11082, 11083, and 11084.

3. Provide aluminum (AL) and stainless steel (SS) enclosures for Types A, C, and D in accordance with DMS 11080, 11081, 11082, 11083, and 11084. Do not paint stainless steel.

4. Provide pedestal service (PS) enclosures in accordance with ED(9) and DMS 11080 and 11085. Do not provide GS pedestal services. If GS is shown in the PS descriptive code, provide an AL enclosure.

MAIN DISCONNECT & BRANCH CIRCUIT BREAKERS

1. Field drill flange-mounted remote operator handle if needed, to ensure handle is lockable in both the "On" and "Off" positions.

2. When the utility company provides a transformer larger than 50 KVA, verify that the available fault current is less than the circuit breaker's ampere interrupting capacity (AIC) rating and provide documentation from the electric utility provider to the Engineer.

PHOTOELECTRIC CONTROL

1. Provide photocell as listed on the MPL. Move, adjust, or shield the photocell from stray or ambient night time light to ensure proper operation. Mount photocell facing north when practical. Mount top of pole photocells as shown on Top Mounted Photocell Detail.

* ELECTRICAL SERVICE DATA

Elec. Service ID	Plan Sheet Number	Electrical Service Description	Service Conduit **Size	Service Conductors No./Size	Safety Switch Amps	Main Ckt. Bkr. Pole/Amps	Two-Pole 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 ¼"	3/#6	N/A	2P/60		100	Sig. Controller	1P/30	23	5.3
							30		Luminaires	2P/20	9	
									CCTV	1P/20	3	
2nd & Main	58	ELC SRV TY T 120/240 000(NS)GS(N)SP(O)	1 ¼"	3/#6	N/A	N/A	N/A	70	Flashing Beacon 1	1P/20	4	1.0
									Flashing Beacon 2	1P/20	4	

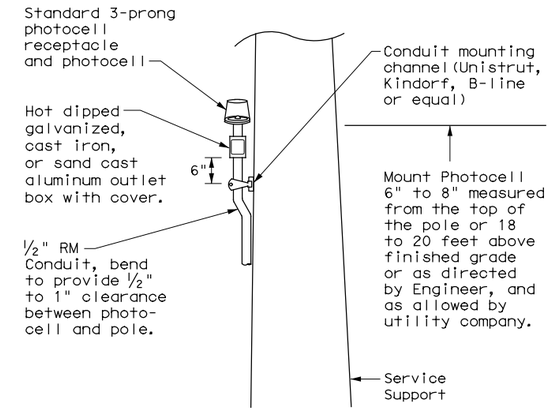
* Example only, not for construction. All new electrical services must have electrical service data chart specific to that service as shown in the plans.

** 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

ELEC SERV TY X XXX/XXX XXX (XX) XX (X) XX (X)

- Schematic Type
- Service Voltage V / V
- Disconnect Amp Rating
  000 indicates main lug only/
  Typically Type T
- (SS)= Safety Switch Ahead of Meter-Check with Utility
  (NS)= No safety Switch Ahead of Meter-Check with Utility
- Enclosure Type
  GS= Galvanized steel("off the shelf")
  SS= Stainless steel(Custom Enclosure)See MPL
  AL= Aluminum (Custom Enclosure)See MPL
- Photocell Mounting Location
  (E)= Inside Service/Enclosure Mounted
  (T)= Top of pole
  (L)= Luminaire mounted
  (N)= None/No Photocell or Lighting Contactor Required
- Service Support Type
  GC= Granite concrete
  OC= Other concrete
  TP= Timber pole
  SP= Steel pole
  SF= Steel frame
  OT= Pole by others or paid for separately
  EX= Existing pole
  TS= Service on traffic signal pole
  PS= Pedestal Service
- O= Overhead Service Feed from Utility
  U= Underground Service Feed from Utility



TOP MOUNTED PHOTOCELL

Install conduit strap maximum 3 feet from box. 5 foot maximum spacing between straps supporting conduit.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE NOTES & DATA

ED(5)-14

FILE: ed5-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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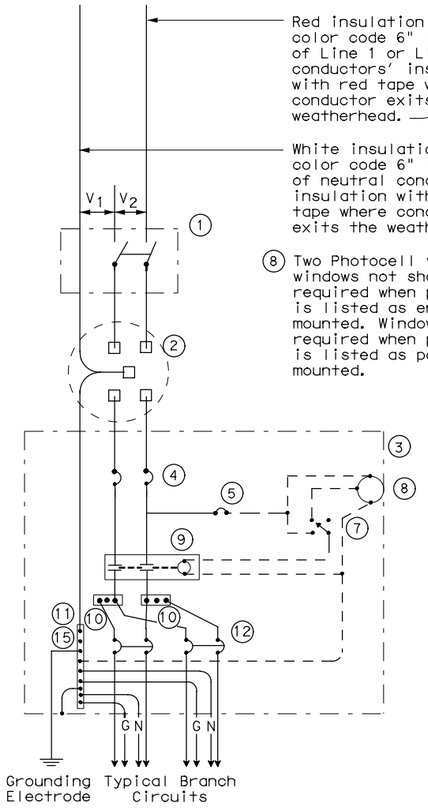
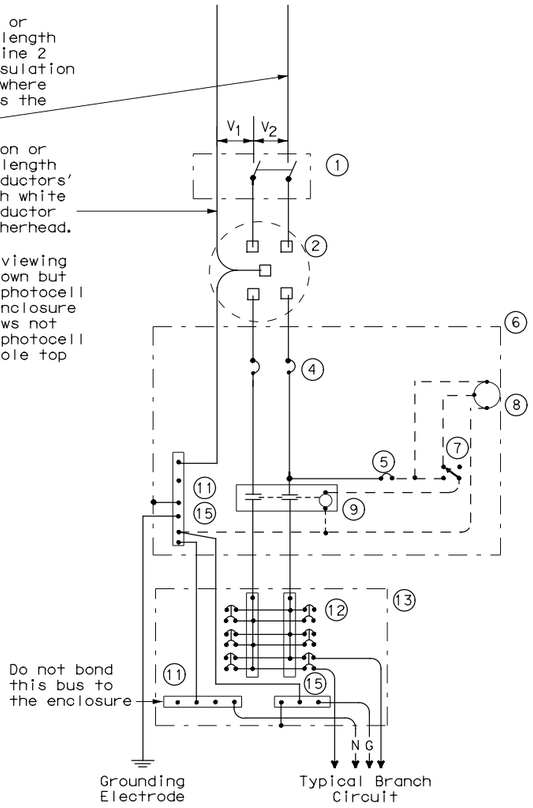
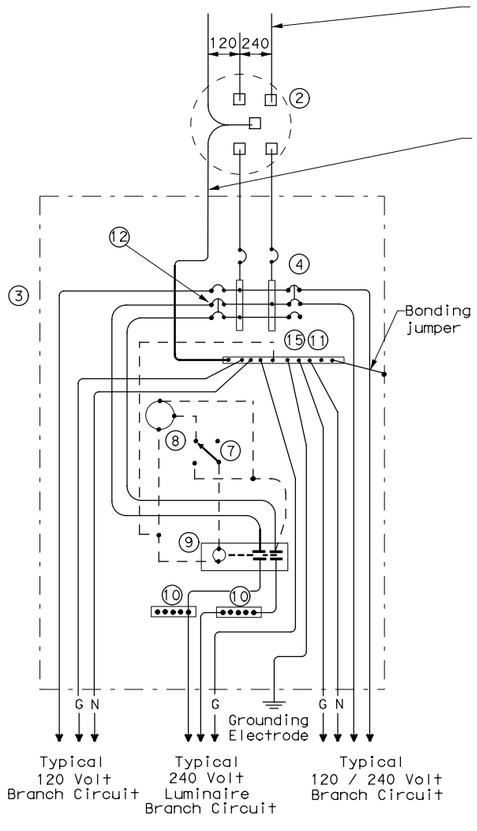


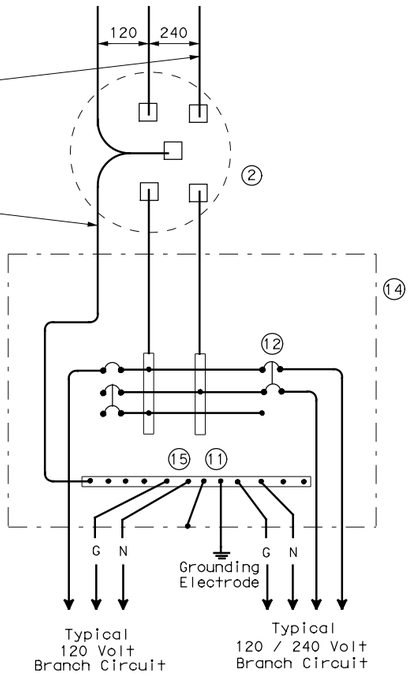
SCHEMATIC TYPE A
THREE WIRE



SCHEMATIC TYPE C
THREE WIRE



SCHEMATIC TYPE D - CUSTOM
120/240 VOLTS - THREE WIRE



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.

WIRING LEGEND	
———	Power Wiring
- - - -	Control Wiring
—N—	Neutral Conductor
—G—	Equipment grounding conductor-always required

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

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE ENCLOSURE AND NOTES

ED(6)-14

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	AUS	HAYS		317

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SUPPORT TYPE STEEL POLE (SP) AND STEEL FRAME (SF)

1. Provide steel pole and steel frame supports as per TxDOT Departmental Material Specification (DMS)11080 "Electrical Services." Mount all equipment and conduit on 12 gauge galvanized steel or stainless steel channel strut, 1 ½ in. or 1 ⅝ in. wide by 1 in. up to 3 ¾ in. deep Unistrut, Kindorf, B-line or equal. Bolt or weld all channel and hardware to vertical members as approved. Do not stack channel. File smooth and paint field cut ends of all channel with zinc-rich paint before installing.

2. Provide poles for overhead service with an eyebolt or similar fitting for attachment of the service drop to the pole in conformance with the electric utility provider's specifications.

3. Provide and install galvanized ¾ in. x 18 in. x 4 in. (dia. x length x hook length) anchor bolts for underground service supports. Provide and install galvanized ¾ in. x 56 in. x 4 in. anchor bolts for overhead service supports. Ensure anchor bolts have 3 in of thread, with 3 ¼ in. to 3 ½ in. of the exposed anchor bolt projecting above finished foundation. Provide and install leveling nuts for all anchor bolts.

4. Bond one of the anchor bolts to the rebar cage with 6 AWG bare stranded copper conductor. Use listed mechanical connectors rated for embedment in concrete. See Inset B.

5. Furnish and install rigid metallic ells in all steel pole and steel frame foundations for all conduits entering the service from underground.

6. Use class C concrete for foundations. Ensure reinforcing steel is Grade 60 with 3" of unobstructed concrete cover.

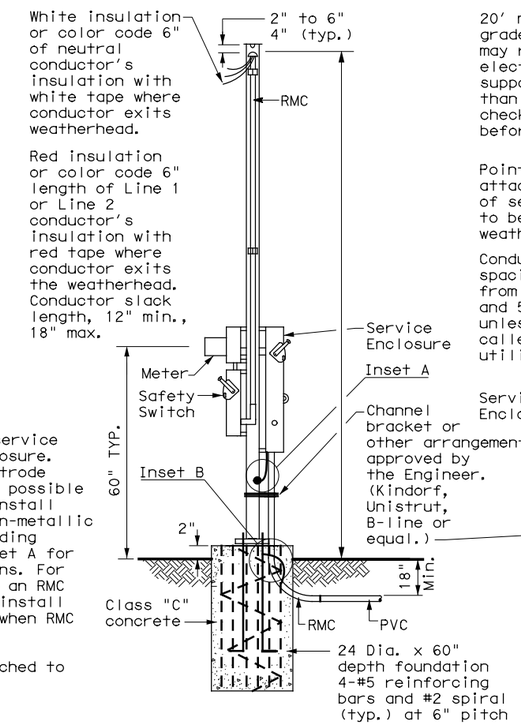
7. Drill and tap steel poles and frames for ½ in. X 13 UNC tank ground fitting. For steel pole service supports, provide and install tank ground fitting 4 in. to 6 in. below electrical service enclosure. Provide properly sized hole through the bottom of the enclosure for the service grounding electrode conductor. Ensure electrical service grounding electrode conductor is as short and straight as possible from the enclosure to the tank ground fitting. For steel frame service supports, provide and install tank ground fitting on steel frame post. Install service grounding electrode conductor in a non-metallic conduit or tubing from the enclosure to the steel frame post. Connect electrical service grounding electrode conductor to the tank ground fitting. See steel frame and steel pole details and Inset A for more information. Size service entrance conduit and branch circuit conduit as shown in the plans. For underground conduit runs from the electrical service, extend RMC from the service enclosure to an RMC elbow, and then connect the schedule type and size of conduit shown in the plans. Provide and install grounding bushings where RMC terminates in the enclosure. Grounding bushings are not required when RMC is fitted into a sealing hub or threaded boss.

8. If Steel pole or frame is painted, bond each separate painted piece with a bonding jumper attached to a tapped hole.

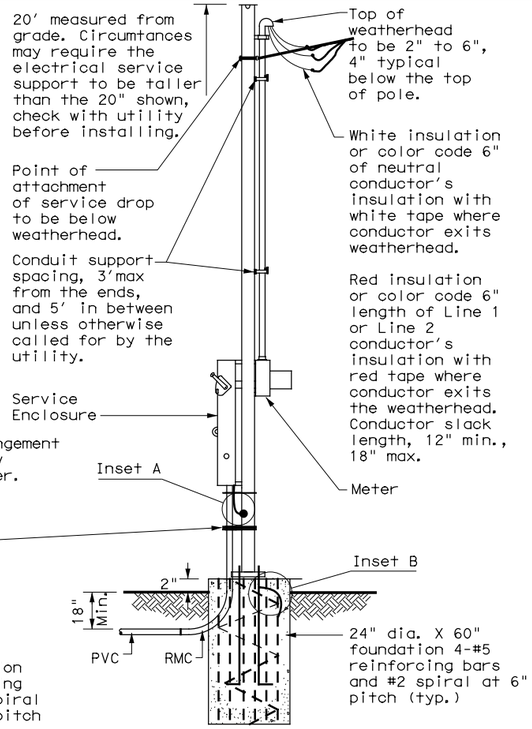
9. Provide ¼" - 20 machine screws for bonding. Do not use sheet metal screws. Remove all non-conductive material at contact points. Terminate bonding jumpers with listed devices. Install minimum size 6 AWG stranded copper bonding jumpers. Make up all threaded bonding connections wrench tight.

10. Avoid contact of the service drop and service entrance conductors with the metal pole to prevent abrasion of the insulated conductors.

11. Shop drawings are not required for service support structure unless specifically stated elsewhere or directed by the Engineer.

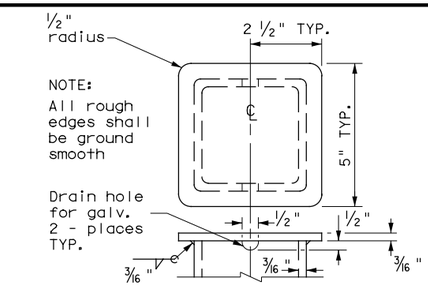


WITH SAFETY SWITCH

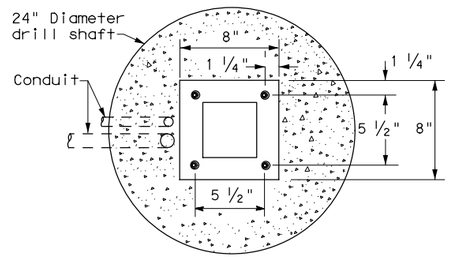


WITHOUT SAFETY SWITCH

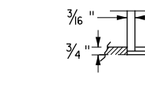
SERVICE SUPPORT TYPE SP (O) - OVERHEAD SERVICE



POLE TOP PLATE

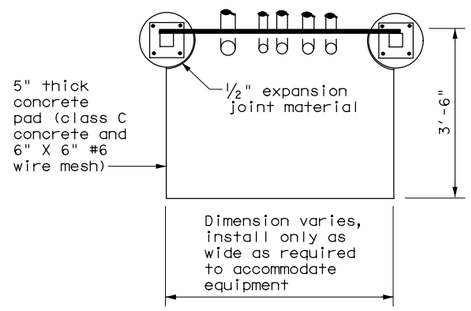


BASE PLATE DETAIL



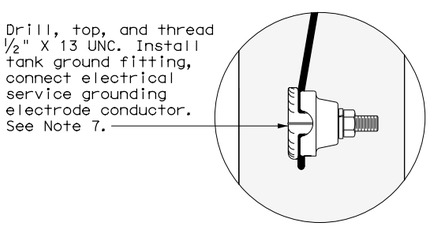
BOTTOM OF POLE

SERVICE SUPPORT TYPE SF & SP



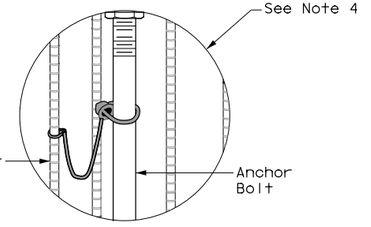
TOP VIEW

SERVICE SUPPORT TY SF (O) & SF (U)

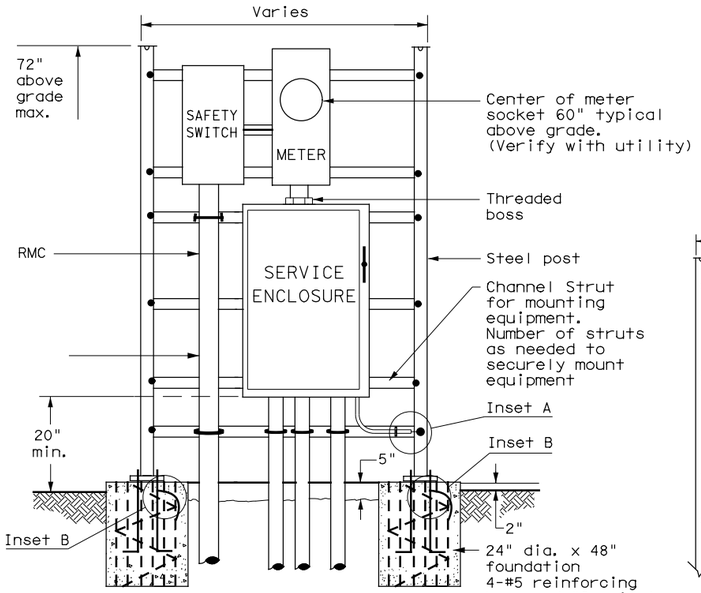


FRONT VIEW

INSET A

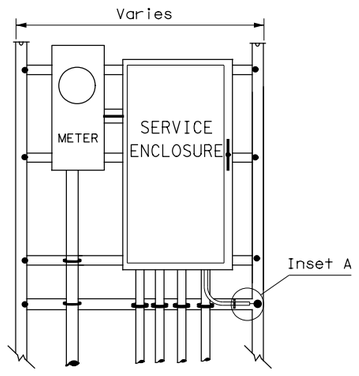


INSET B



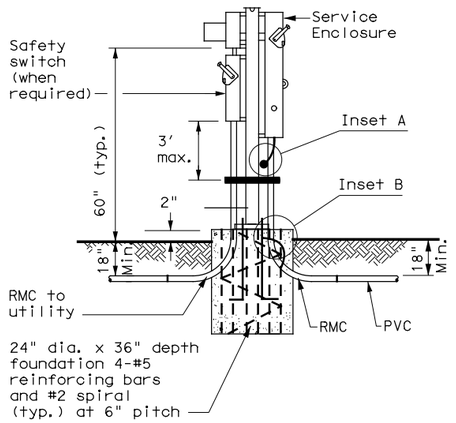
WITH SAFETY SWITCH

FRONT VIEW

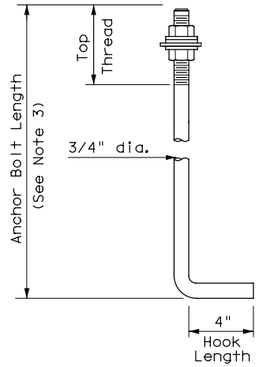


WITHOUT SAFETY SWITCH

SERVICE SUPPORT TYPE SF(U) - UNDERGROUND SERVICE



WITH SAFETY SWITCH



HOOKED ANCHOR DETAIL

SERVICE SUPPORT TYPE SP(U) - UNDERGROUND SERVICE

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE SUPPORT TYPES SF & SP

ED(7)-14

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ROADWAY ILLUMINATION ASSEMBLY NOTES

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.

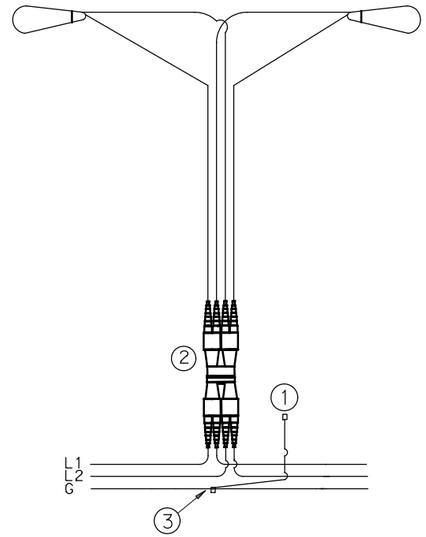
12. Orient luminaires perpendicular to the roadway intended to be lit unless otherwise shown on the plans.

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.



L1,L2 = Hot Conductors
G = Grounding Conductor

TYPICAL WIRING DIAGRAM

LUMINAIRES SERVED AT 480V ON 240/480 VOLT SERVICE OR LUMINAIRES SERVED AT 240V FOR 120/240 VOLT SERVICE.

Decorative LED Lighting Notes:

1. LED Drivers in Remote Outdoor enclosures (for drivers that do not include an enclosure as part of a factory assembly):

   a. Provide NEMA 3R outdoor enclosure or as approved.

   b. Install enclosure at least 12" above ground or other horizontal surface. Mount vertically or on ceiling, and avoid direct sun where possible.

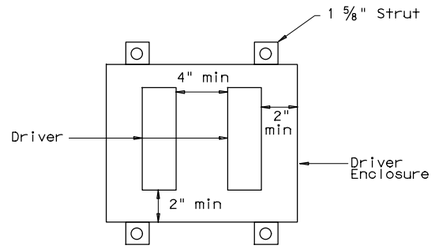
   c. Install drivers with at least 2 inches of space from enclosure walls.

   d. For multiple drivers in an enclosure, provide at least 4 inches side to side and 1 inch end to end from other drivers or electronic equipment

   e. For drivers mounted on back wall of enclosure, mount enclosure on 1 5/8" strut or other standoff to dissipate heat, or mount driver to side of the enclosure or to the metal cover.

   f. Provide remote drivers with a maximum of 100 watts

   g. Provide drivers with documentation of 100,000 hr lifetime at Tcase of 65C or higher.



Driver Spacing In Remote Enclosure

Texas Department of Transportation

Traffic Safety Division Standard

ROADWAY ILLUMINATION DETAILS

RID(1)-20

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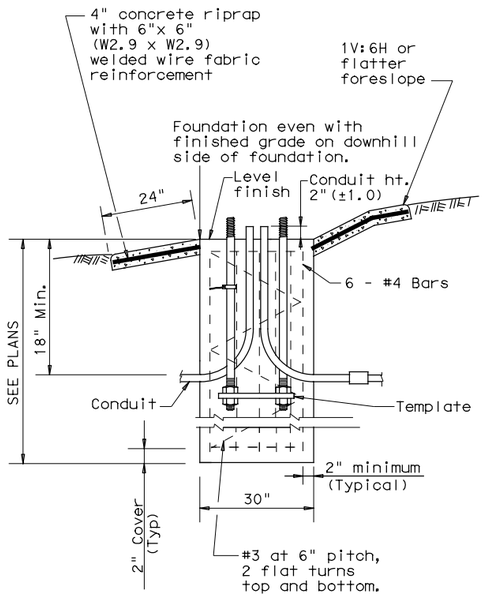
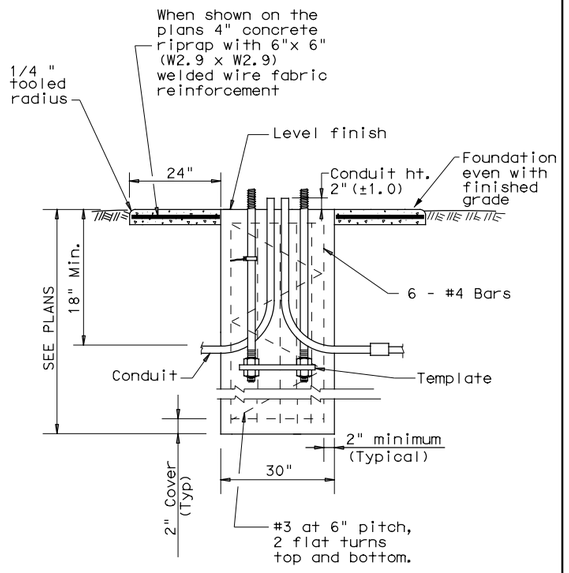


SECTION A-A
SHOWING SLOPED GRADE



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.	1in.x 30in.
40-50 ft.	15 in.	17 ¼in.	1 ¼in. x 30in.

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′

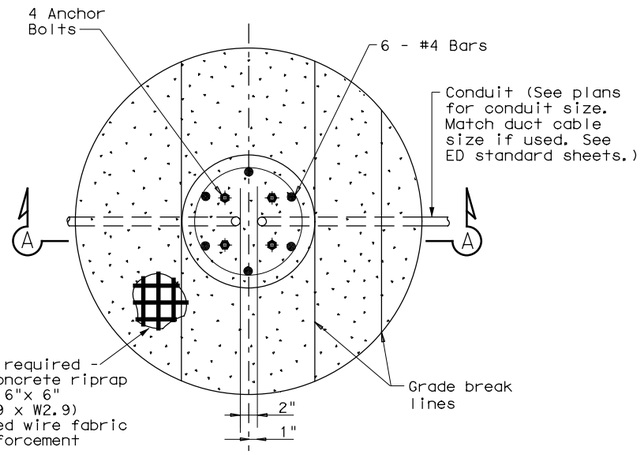
TABLE 3

PAY QUANTITY OF RIPRAP PER FOUNDATION (Install only when shown on the plans)

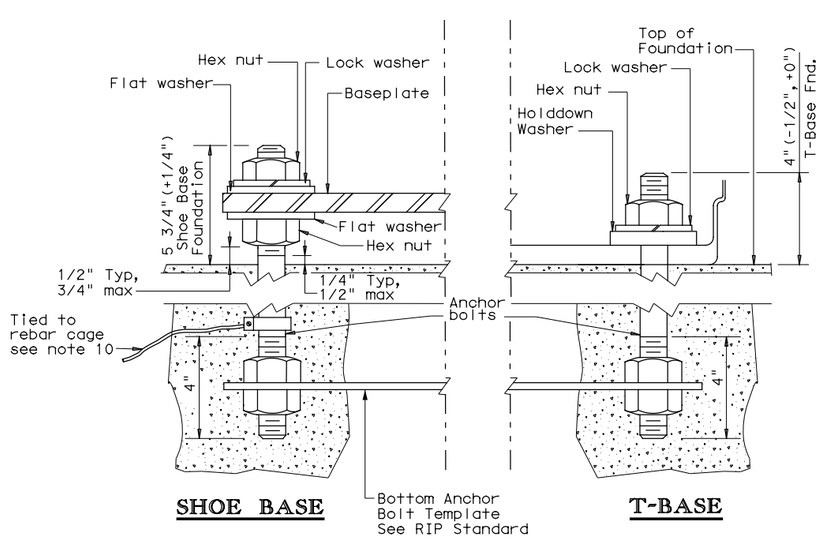
Foundation Diameter	RIPRAP DIAMETER	RIPRAP (CONC) (CL B)
30 in.	78 in.	0.35 CY

GENERAL NOTES:

1. "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.
2. 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.
3. 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.
4. 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.
5. Place riprap around the foundation when called for elsewhere in the plans. Riprap will be paid for under Item 432.
6. 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.
7. Use 4 hold down and 4 connecting washers on transformer base poles as recommended by the manufacturer and supplied with base.
8. 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.
9. Conduit location in foundations is critical for breakaway devices. Place conduits 2 in. apart on centerline as shown.
10. 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.
11. 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

FILE: rid2-20.dgn	DN:	CK:	DW:	CK:
© TxDOT January 2007	CONT	SECT	JOB	HIGHWAY
REVISIONS 1-11 7-17 12-20	0914	33	068,ETC	RSL
	DIST	COUNTY		SHEET NO.
	AUS	HAYS		320

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SHIPPING PARTS LIST - POLES AND LUMINAIRE ARMS

Nominal Mounting Ht. (ft)	Shoe Base Designation				Quantity	T-Base Designation				Quantity	CSB/SSCB Mounted Designation				Quantity
	Pole	A1	A2	Luminaire		Pole	A1	A2	Luminaire		Pole	A1	A2	Luminaire	
20	(Type SA 20 S - 4)			(150W EQ) LED		(Type SA 20 T - 4)			(150W EQ) LED						
	(Type SA 20 S - 4 - 4)			(150W EQ) LED		(Type SA 20 T - 4 - 4)			(150W EQ) LED						
30	(Type SA 30 S - 4)			(250W EQ) LED		(Type SA 30 T - 4)			(250W EQ) LED		(Type SP 28 S - 4)			(250W EQ) LED	
	(Type SA 30 S - 4 - 4)			(250W EQ) LED		(Type SA 30 T - 4 - 4)			(250W EQ) LED		(Type SP 28 S - 4 - 4)			(250W EQ) LED	
	(Type SA 30 S - 8)			(250W EQ) LED		(Type SA 30 T - 8)			(250W EQ) LED		(Type SP 28 S - 8)			(250W EQ) LED	
	(Type SA 30 S - 8 - 8)			(250W EQ) LED		(Type SA 30 T - 8 - 8)			(250W EQ) LED		(Type SP 28 S - 8 - 8)			(250W EQ) LED	
40	(Type SA 40 S - 4)			(250W EQ) LED		(Type SA 40 T - 4)			(250W EQ) LED		(Type SP 38 S - 4)			(250W EQ) LED	
	(Type SA 40 S - 4 - 4)			(250W EQ) LED		(Type SA 40 T - 4 - 4)			(250W EQ) LED		(Type SP 38 S - 4 - 4)			(250W EQ) LED	
	(Type SA 40 S - 8)			(250W EQ) LED		(Type SA 40 T - 8)			(250W EQ) LED	9	(Type SP 38 S - 8)			(250W EQ) LED	
	(Type SA 40 S - 8 - 8)			(250W EQ) LED		(Type SA 40 T - 8 - 8)			(250W EQ) LED		(Type SP 38 S - 8 - 8)			(250W EQ) LED	
	(Type SA 40 S - 10)			(250W EQ) LED		(Type SA 40 T - 10)			(250W EQ) LED		(Type SP 38 S - 10)			(250W EQ) LED	
	(Type SA 40 S - 10 - 10)			(250W EQ) LED		(Type SA 40 T - 10 - 10)			(250W EQ) LED		(Type SP 38 S - 10 - 10)			(250W EQ) LED	
	(Type SA 40 S - 12)			(250W EQ) LED		(Type SA 40 T - 12)			(250W EQ) LED		(Type SP 38 S - 12)			(250W EQ) LED	
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50	(Type SA 50 S - 4)			(400W EQ) LED		(Type SA 50 T - 4)			(400W EQ) LED		(Type SP 48 S - 4)			(400W EQ) LED	
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	(Type SA 50 S - 8)			(400W EQ) LED		(Type SA 50 T - 8)			(400W EQ) LED		(Type SP 48 S - 8)			(400W EQ) LED	
	(Type SA 50 S - 8 - 8)			(400W EQ) LED		(Type SA 50 T - 8 - 8)			(400W EQ) LED		(Type SP 48 S - 8 - 8)			(400W EQ) LED	
	(Type SA 50 S - 10)			(400W EQ) LED		(Type SA 50 T - 10)			(400W EQ) LED		(Type SP 48 S - 10)			(400W EQ) LED	
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	(Type SA 50 S - 12 - 12)			(400W EQ) LED		(Type SA 50 T - 12 - 12)			(400W EQ) LED		(Type SP 48 S - 12 - 12)			(400W EQ) LED	

OTHER Designation				Quantity
Pole	A1	A2	Luminaire	

GENERAL NOTES:

1. All work, materials and services not shown on the plans which may be necessary for complete and proper construction shall be performed, furnished and installed by the Contractor. Faulty fabrication or poor workmanship in any material, equipment or installation will be considered justification for rejection. Where manufacturers provide warranties or guarantees as a customary trade practice, furnish to the Department such warranties or guarantees.

2. The location of poles and fixtures are diagrammatic only and 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. Standard Steel Pole Designs. Steel poles fabricated in accordance with the details and dimensions shown herein, shall be considered standard designs. Submission of shop drawings and design calculations for standard designs is not required.

4. Optional Steel Pole Designs. Multi-sided steel poles may be allowed as optional designs, if steel poles are permitted or required, pending approval by the Department as outlined below.

   a. Shop Drawings. Optional designs require submission of shop drawings and design calculations bearing the seal of an engineer licensed in the State of Texas, in accordance with Item 441, "Steel Structures." The Department may elect to pre-approve some shop drawings for optionally designed poles. Submission of shop drawings and design calculations is not required for structures fabricated in accordance with the details of shop drawings on the pre-approved list maintained by the TxDOT Traffic Operations Division. Any deviation from the pre-approved shop drawings will require submission of shop drawings of the complete assembly and design calculations as described above.
   b. Structural Support Design for Luminaires. Lighting support structures shall be designed for a 25 year design life in accordance with the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 6th Edition (2013) and Interim Revisions thereto. All poles shall be designed for 110 mph 3-second gust wind speeds. The Gust Factor, G, and Wind Importance Factor, Ir, shall be applied as per the AASHTO Specifications assuming a 25-year design life. The design wind pressure for hurricane wind velocities greater than 100 mph shall not be less than the design wind pressure using 100 mph with the non-hurricane Wind Importance Factor, Ir, value. For transformer base poles, fabricator shall include transformer base and connecting hardware in design calculations and shop drawing submittals. All transformer bases shall have been structurally tested to resist the theoretical plastic moment capacity of the pole. Certification of the plastic moment load test and FHWA breakaway requirement test of the model of base being furnished shall be submitted with the shop drawings. Shop drawings shall show breakaway base model number, and manufacturer's name and logo. Manufacturer's shop drawings shall include the ASTM designations for all materials to be used.
   c. Mast Arm Attachments. All poles and attachments shall be structurally designed to support two 12-foot mast arms and luminaires. Poles shall be supplied with mast arm combinations as shown in the plans. All mast arms shall be designed for a 60-pound luminaire having an effective projected area of 1.6 square feet.
   d. Anchor Bolt Assembly. Anchor bolt assemblies for optionally designed poles shall be the same as those shown herein.

5. Aluminum Pole Designs. Aluminum pole designs may be allowed, if aluminum poles are permitted or required, pending approval by the Department as outlined below.

   a. Meet all of the requirements stated above for optional steel pole designs and the following:
      1. Aluminum poles shall be fabricated in accordance with "Structural Welding Code-Aluminum" AWS D1.2.
      2. Aluminum pole designs shall use the same anchor bolt assembly and be subject to the same geometric restraints and other requirements for steel poles specified herein.
      3. Aluminum poles shall be equipped with vibration mitigation devices, as approved by the engineer.
      4. Pole components shall be constructed using the following material:
         Shaft: ASTM B221 or B241 Alloy 6063-T6, ASTM B209 Alloy 5086-H34, ASTM B221 Alloy 6005-T5.
         Base Flange: ASTM B26 Alloy 356.0-T6 or ASTM B108 Alloy 356.0-T6 (Yield strength test required).
         Mast Arm Fitting: ASTM B209 Alloy 6061-T6 or ASTM B221 Alloy 6005-T5.
         Mast Arms: ASTM B241 Alloy 6061-T6 or Alloy 6063-T6.
         Pole Cap: ASTM B209 Alloy 5086-H32 or ASTM B108 or B26 Alloy 356.0-T6.
         Bolts: Stainless Steel AISI 300 series. Bolts threading into aluminum threads shall be treated with anti-seize compound, Never-Seez Compound, Permatex 133K or equal.

6. Special Designs. Poles with architectural treatments shall meet the requirements shown elsewhere in the plans.

7. Luminaire Mounting Height. Actual luminaire mounting height shall be the nominal mounting height given on RIP(2) for all pole-arm combinations except for poles with 4 ft. luminaire arms, which shall be 3'-0" lower than the nominal height, unless otherwise shown or directed.

EXPLANATION OF ROADWAY ILLUMINATION ASSEMBLY DESIGNATIONS

(TYPE SA 50 T - X - X) (400W EQ) LED

SA: Pole and mast arm may be steel or aluminum.
ST: Pole and mast arm must be steel.
AL: Pole and mast arm must be aluminum.
SP: Special (ovalized) steel or aluminum pole for installing on CSB or SSCB. See standard sheet CSB (4), or SSCB (4).

Two numerical digits denote nominal mounting height in feet.

Next letter denotes type of base, (S-Shoe Base, T-Transformer Base, or B-Bridge/Ret.Wall Mount)

First number denotes length of mast arm in feet.

Use of second mast arm is indicated by second dashed number which denotes length in feet.

Luminaire rating in watts (i.e. 400W). Equivalent wattage LED fixtures will include EQ (i.e. 400W EQ)

Last letters indicate light source (S - High Pressure Sodium; LED - LED luminaire)

SHEET 1 OF 4

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ROADWAY ILLUMINATION POLES

RIP(1)-19

FILE: rip-19.dgn	DN:	CK:	DW:	CK:
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REVISIONS 7-17 12-19	0914	33	068,ETC	RSL
	DIST	COUNTY		SHEET NO.
	AUS	HAYS		321

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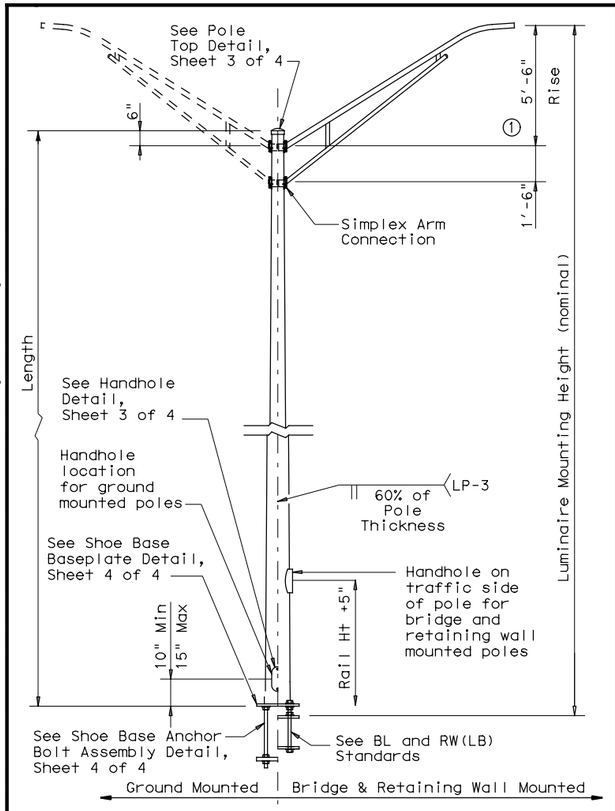
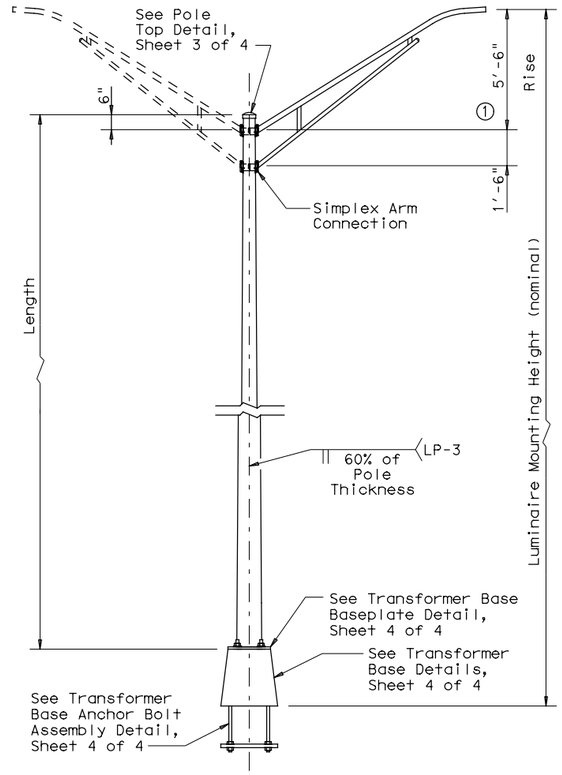


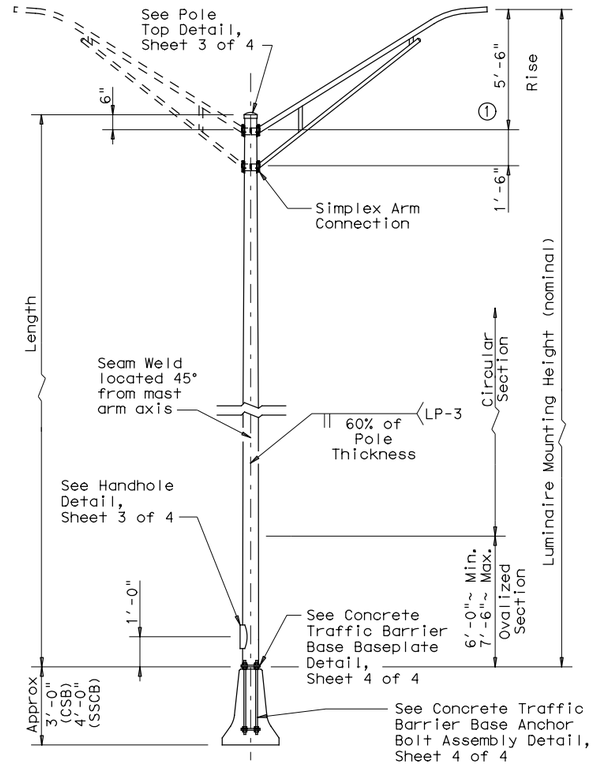
SHOE BASE POLE

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 ② Diameter (in)	Top Diameter (in)	Length (ft)	Pole Thickness (in)	Design Moment (K-ft)	
					About ℄ 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

MATERIAL DATA		
COMPONENT	ASTM DESIGNATION	MIN. YIELD (ksi)
Pole Shaft (0.14"/ft. Taper)	A572 Gr 50, A595 Gr A, A1011 HSLAS Gr 50 Cl 2 ③, or A1008 HSLAS Gr 50 Cl 2	50
Base Plate and Handhole Frame	A572 Gr.50, or A36	36
T-Base Connecting Bolts	F3125 Gr A325	92
Anchor Bolts	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:

① 2'-6" rise for 4 ft. luminaire arms.

② Before ovalized as shown on Concrete Traffic Barrier Base Baseplate details, Sheet 4 of 4.

③ 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"

GENERAL NOTES:

1. 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.
2. 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.
3. 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.
4. For mounting heights between values shown in the tables, use base diameter and thickness values for the larger height.
5. Unless otherwise noted, all steel parts shall be galvanized in accordance with Item 445, "Galvanizing."
6. 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.
7. 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.
8. Alternate material equal to or better than material specified may be substituted with the approval of the Engineer.
9. Lubricate and tighten anchor bolts, when erecting shoe base poles and concrete traffic barrier base poles, in accordance with Item 449, "Anchor Bolts."
10. 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.
11. 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."
12. 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.
13. Erect transformer base poles in accordance with sheet RID(1).

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ROADWAY ILLUMINATION POLES

RIP(2)-19

FILE: rip-19.dgn	DN:	CK:	DW:	CK:
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7-17	DIST	COUNTY		SHEET NO.
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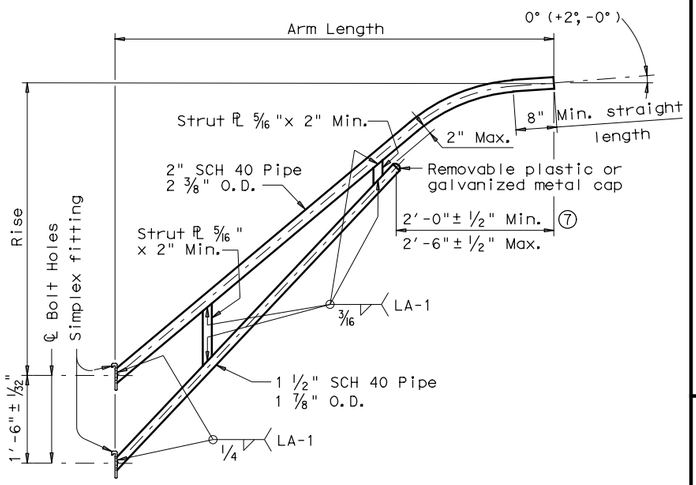
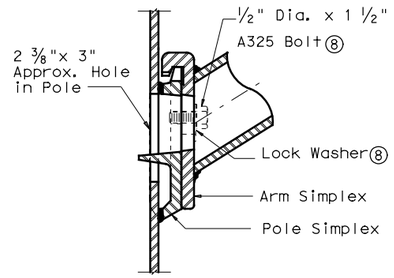


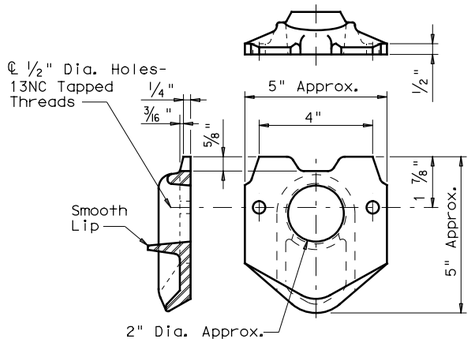
LUMINAIRE ARM

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"

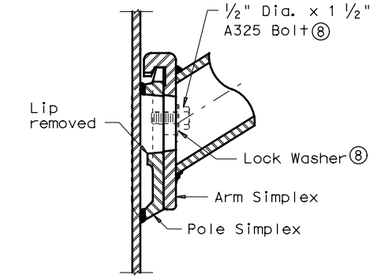
ARM ASSEMBLY FABRICATION TOLERANCES TABLE	
DIMENSION	TOLERANCE
Arm Length	±1"
Arm Rise	±1"
Deviation from flat	1/8" in 12"
Spacing between holes	±1/32"



UPPER SIMPLEX FITTING
(Gusset not shown for clarity)

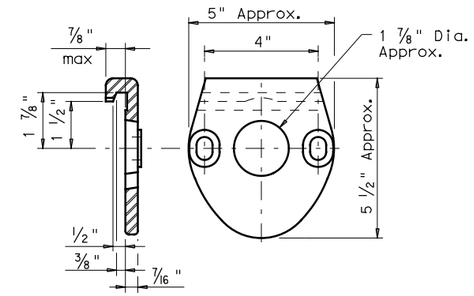


POLE SIMPLEX DETAIL ⑨



LOWER SIMPLEX FITTING
(Gusset not shown for clarity)

SECTION B-B



ARM SIMPLEX DETAIL ⑨

NOTES:

④ Any of the materials listed for plates may be used where the drawings do not specify a particular ASTM designation.

⑤ A576 must be suitable for forging and also meet minimum tensile strength of 65 ksi, minimum yield of 35 ksi, and elongation in 2 inches of 22 percent.

⑥ A572, A1008 HSLAS-F, and A1011 HSLAS-F materials may have higher yield strengths but shall not have less elongation than the grade indicated.

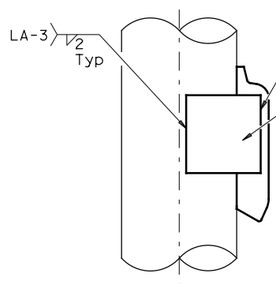
⑦ Dimensional limits are given to show acceptable variation in design. All of a Fabricator's production of a particular arm length shall have the same dimensions within specified tolerances.

⑧ Each pole simplex fitting shall be supplied with 2 bolts and 2 lock washers of the size specified. The bolts and lock washers shall be secured to the pole with the other hardware items called for in the plans.

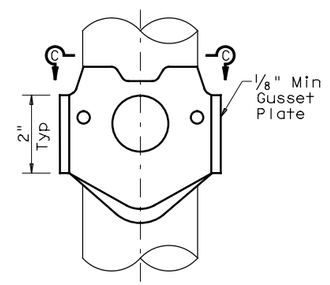
⑨ Proposed deviations in arm simplex dimensions or materials must be submitted to the Department for approval.

⑩ A welded handhole frame is permissible. Maximum of two (2) CJP weld splices is allowed.

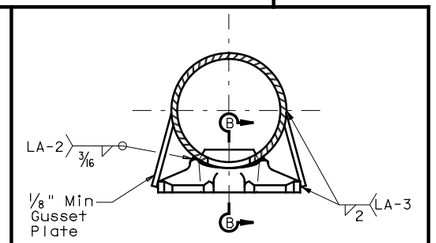
MATERIALS	
Pole or Arm Simplex	ASTM A27 Gr 65-35 or Gr 70-36, A148 Gr 80-50, A576 Gr 1021 ⑤, or A36 (Arm only)
Arm Pipes	ASTM A53 Gr A or B, A500 Gr B, A501, A 1008 HSLAS-F Gr 50 ⑥, or A1011 HSLAS-F Gr 50 ⑥
Arm Struts and Gusset Plates ④	ASTM A36, A572 Gr 50 ⑥, or A588
Misc.	ASTM designations as noted



SIDE

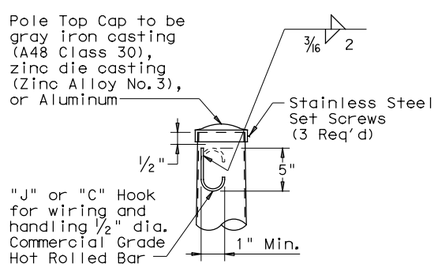


ELEVATION

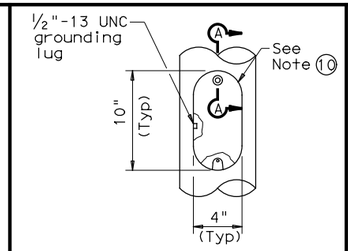


SECTION C-C

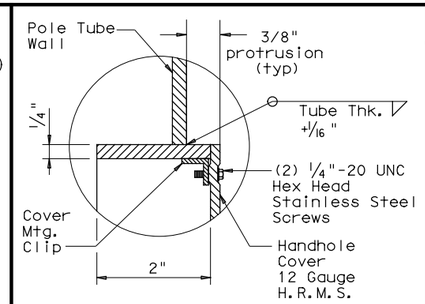
SIMPLEX ATTACHMENT DETAIL



POLE TOP



ELEVATION



SECTION A-A

HANDHOLE

SHEET 3 OF 4

Texas Department of Transportation

Traffic Safety Division Standard

ROADWAY ILLUMINATION POLES

RIP(3)-19

FILE: rip-19.dgn	DN:	CK:	DW:	CK:
©TxDOT January 2007	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	33	068,ETC	RSL
7-17	DIST	COUNTY		SHEET NO.
12-19	AUS	HAYS		323

73C

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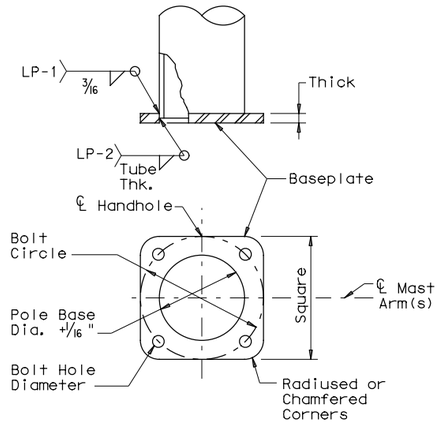
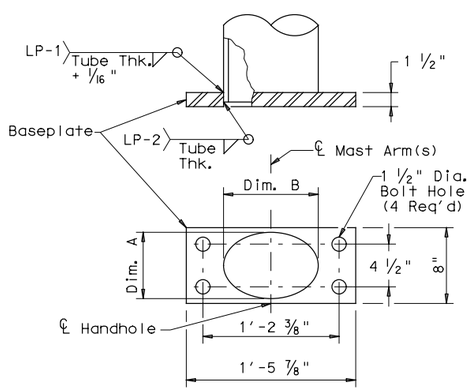


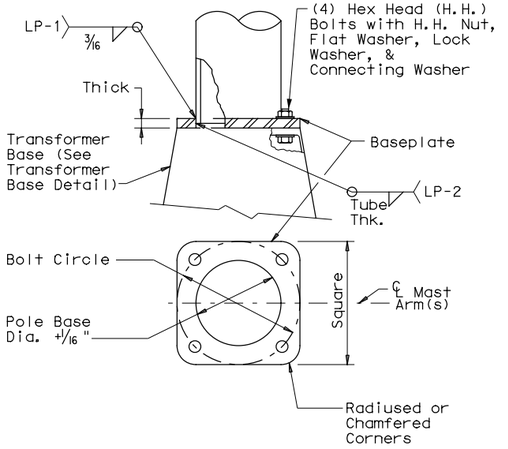
SHOE BASE BASEPLATE

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

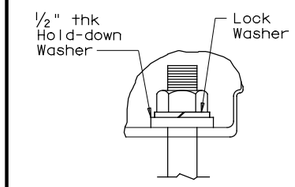
CONCRETE TRAFFIC BARRIER BASE BASEPLATE TABLE			
MOUNTING HEIGHTS (nominal)	POLE DIA.(12)	DIM. A	DIM. B
28′- 38′	9"	7"± 1/4"	10"± 1/4"
48′	10 1/2"	7"± 1/4"	13"± 1/4"



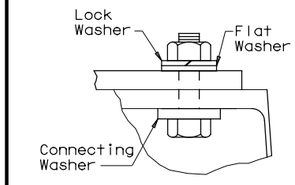
TRANSFORMER BASE BASEPLATE

TRANSFORMER BASE BASEPLATE TABLE						
MOUNTING HEIGHTS (nominal)	BOLT CIRCLE	SQUARE	THICK	CONNECTING BOLT DIA.	BOLT HOLE DIAMETER	TRANSFOMER BASE TYPE
20′- 39′	13"	13"	1 1/4"	1"	1 1/4"	A
40′	15"	15"	1 1/4"	1 1/4"	1 1/2"	B
50′	15"	15"	1 1/2"	1 1/4"	1 1/2"	B

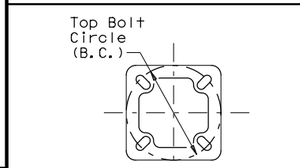
TRANSFORMER BASE TABLE		
TYPE	TOP B.C.	BTM. B.C.
A	13"	14"
B	15"	17 1/4"



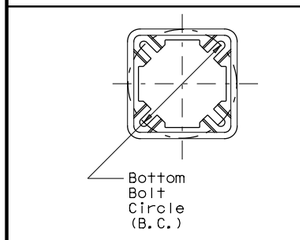
DETAIL A



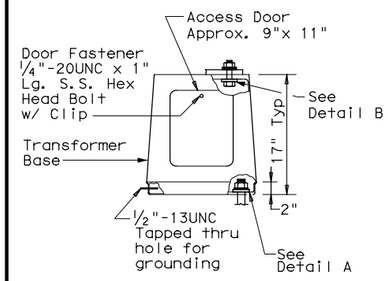
DETAIL B



TOP PLAN



BOTTOM PLAN



ELEVATION

TRANSFORMER BASE DETAILS

GENERAL NOTES:

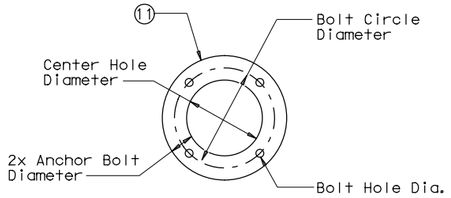
1. For mounting heights between those shown in the table, use the values in the table for the larger mounting height.
2. All breakaway bases shall meet the breakaway requirements of the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 6th Edition (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.
3. 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.
4. 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.
5. 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:

(11) Anchor Bolt Templates do not need to be galvanized.

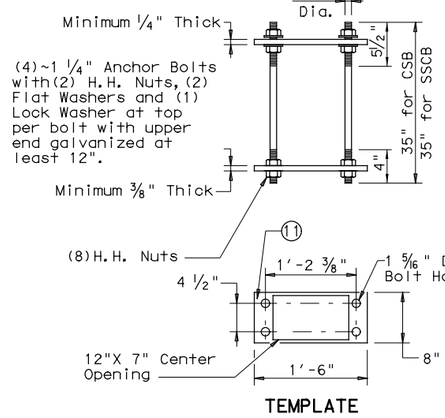
(12) Pole diameter before ovalized.

ANCHOR BOLT FABRICATION TOLERANCES TABLE	
DIMENSION	TOLERANCE
Length	± 1/2"
Threaded length	± 1/2"
Galvanized length (if required)	- 1/4"



SHOE BASE ANCHOR BOLT ASSEMBLY

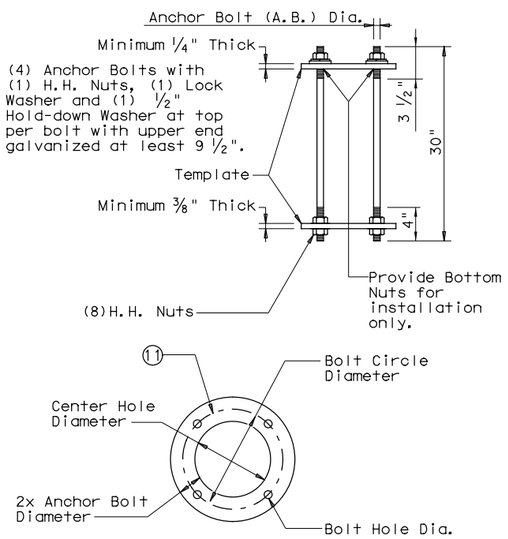
SHOE BASE ANCHOR BOLT ASSEMBLY TABLE				
MOUNTING HEIGHTS (nominal)	A.B. Dia.	BOLT CIRCLE DIAMETER	CTR. HOLE DIAMETER	BOLT HOLE DIAMETER
20′-39′	1"	13"	11"	1 1/16"
40′-50′	1 1/4"	15"	12 1/2"	1 5/16"



TEMPLATE

CONCRETE TRAFFIC BARRIER BASE ANCHOR BOLT ASSEMBLY

TRANSFORMER BASE ANCHOR BOLT ASSEMBLY TABLE				
MOUNTING HEIGHTS (nominal)	A.B. Dia.	BOLT CIRCLE DIAMETER	CTR. HOLE DIAMETER	BOLT HOLE DIAMETER
20′- 39′	1"	14"	12"	1 1/16"
40′- 50′	1 1/4"	17 1/4"	14 3/4"	1 5/16"



TRANSFORMER BASE ANCHOR BOLT ASSEMBLY

SHEET 4 OF 4

Texas Department of Transportation

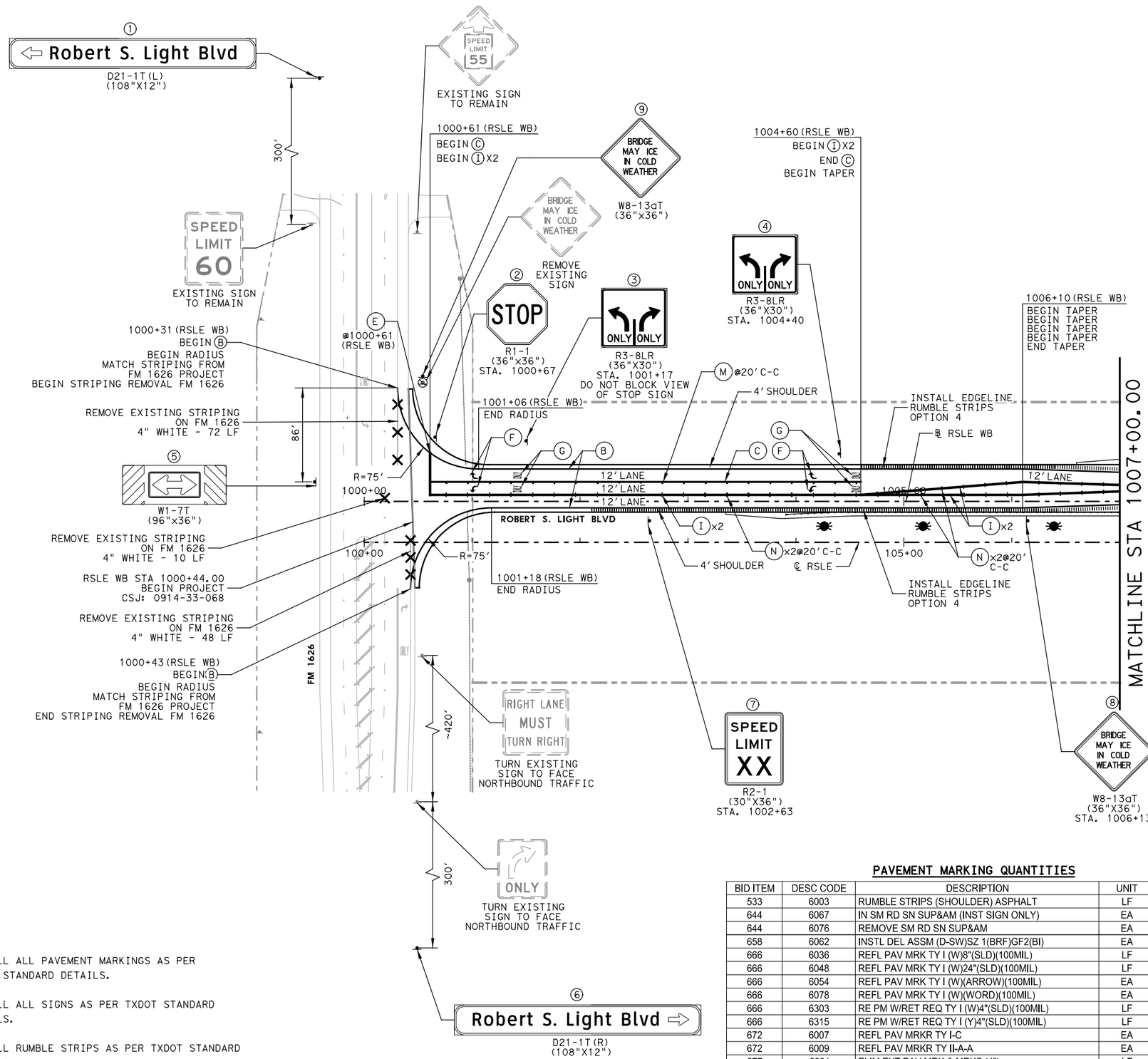
Traffic Safety Division Standard

ROADWAY ILLUMINATION POLES

RIP(4)-19

FILE: rip-19.dgn	DN:	CK:	DW:	CK:
©TxDOT January 2007	CONT	SECT	JOB	HIGHWAY
REVISIONS 7-17 12-19	0914	33	068,ETC	RSL
	DIST	COUNTY		SHEET NO.
	AUS	HAYS		324

730



LEGEND

- Ⓐ REFL PAV MRK TY I (W) 4" (BRK)(100MIL)
- Ⓑ REFL PAV MRK TY I (W) 4" (SLD)(100MIL)
- Ⓒ REFL PAV MRK TY I (W) 8" (SLD)(100MIL)
- Ⓓ REFL PAV MRK TY I (W) 8" (LNDP)(100MIL)
- Ⓔ REFL PAV MRK TY I (W) 24"(SLD)(100MIL)
- Ⓕ REFL PAV MRK TY I (W) (ARROW)(100MIL)
- Ⓖ REFL PAV MRK TY I (W) (WORD)(100MIL)
- Ⓗ REFL PAV MRK TY I (Y) 4" (BRK)(100MIL)
- Ⓘ REFL PAV MRK TY I (Y) 4" (SLD)(100MIL)
- Ⓙ PROF PAV MRK TY I W/ TY II (W) 4" (SLD)
- Ⓚ PREFAB PAV MRK CONTRAST (Y) 4" (BRK)
- Ⓛ PREFAB PAV MRK CONTRAST (Y) 4" (SLD)
- Ⓜ REFL PAV MRKR TY I-C
- Ⓝ REFL PAV MRKR TY II-A-A
- Ⓞ REFL PAV MRK TY I (W) (TWLTARROW)(100MIL)
- Ⓟ PROPOSED SIGN CALLOUTS
- RIGHT OF WAY
- EXISTING SIGNS
- PROPOSED SIGNS
- Ⓟ EXISTING SIGN REMOVAL
- (D-SW) (BRF)CTB(BI)
- (D-SW) SZ 1(BRF)GF2(BI)
- (D-SW) SZ 2(WC)(GND)(BI)
- OM-2Y (WC)(GND)(BI)
- OM-3R (TWT)GND
- PAVEMENT MARKING REMOVAL
- RUMBLE STRIPS

NORTH

0 50 100 150 200
SCALE IN FEET

NOTES

1. INSTALL ALL PAVEMENT MARKINGS AS PER TXDOT STANDARD DETAILS.
2. INSTALL ALL SIGNS AS PER TXDOT STANDARD DETAILS.
3. INSTALL RUMBLE STRIPS AS PER TXDOT STANDARD DETAILS.

PAVEMENT MARKING QUANTITIES

BID ITEM	DESC CODE	DESCRIPTION	UNIT	QTY
533	6003	RUMBLE STRIPS (SHOULDER) ASPHALT	LF	730
644	6067	IN SM RD SN SUP&AM (INST SIGN ONLY)	EA	2
644	6076	REMOVE SM RD SN SUP&AM	EA	1
658	6062	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	EA	3
666	6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF	400
666	6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF	40
666	6054	REFL PAV MRK TY I (W)(ARROW)(100MIL)	EA	4
666	6078	REFL PAV MRK TY I (W)(WORD)(100MIL)	EA	4
666	6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	LF	1440
666	6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	LF	1760
672	6007	REFL PAV MRKR TY I-C	EA	20
672	6009	REFL PAV MRKR TY II-A-A	EA	88
677	6001	ELIM EXT PAV MRK & MRKS (4")	LF	130

STATE OF TEXAS
TIMOTHY GRIMES
100107
LICENSED
PROFESSIONAL ENGINEER
12/03/2020

HAYS COUNTY TEXAS

HDR Engineering, Inc.
1290 Wonder World Drive
Building #1, Suite 1230
San Marcos, TX 78666-7969
Texas Registered Engineering Firm F-754

Texas Department of Transportation
Ⓡ 2020

ROBERT S. LIGHT EXTENSION
ROBERT S LIGHT BLVD SIGNING AND STRIPING LAYOUT BEGIN TO STA 1007+00

SCALE: 1"=100' SHEET 1 OF 11

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
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GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
SF	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	325
PF	0914	33	068,ETC	
CHECK				
BP				

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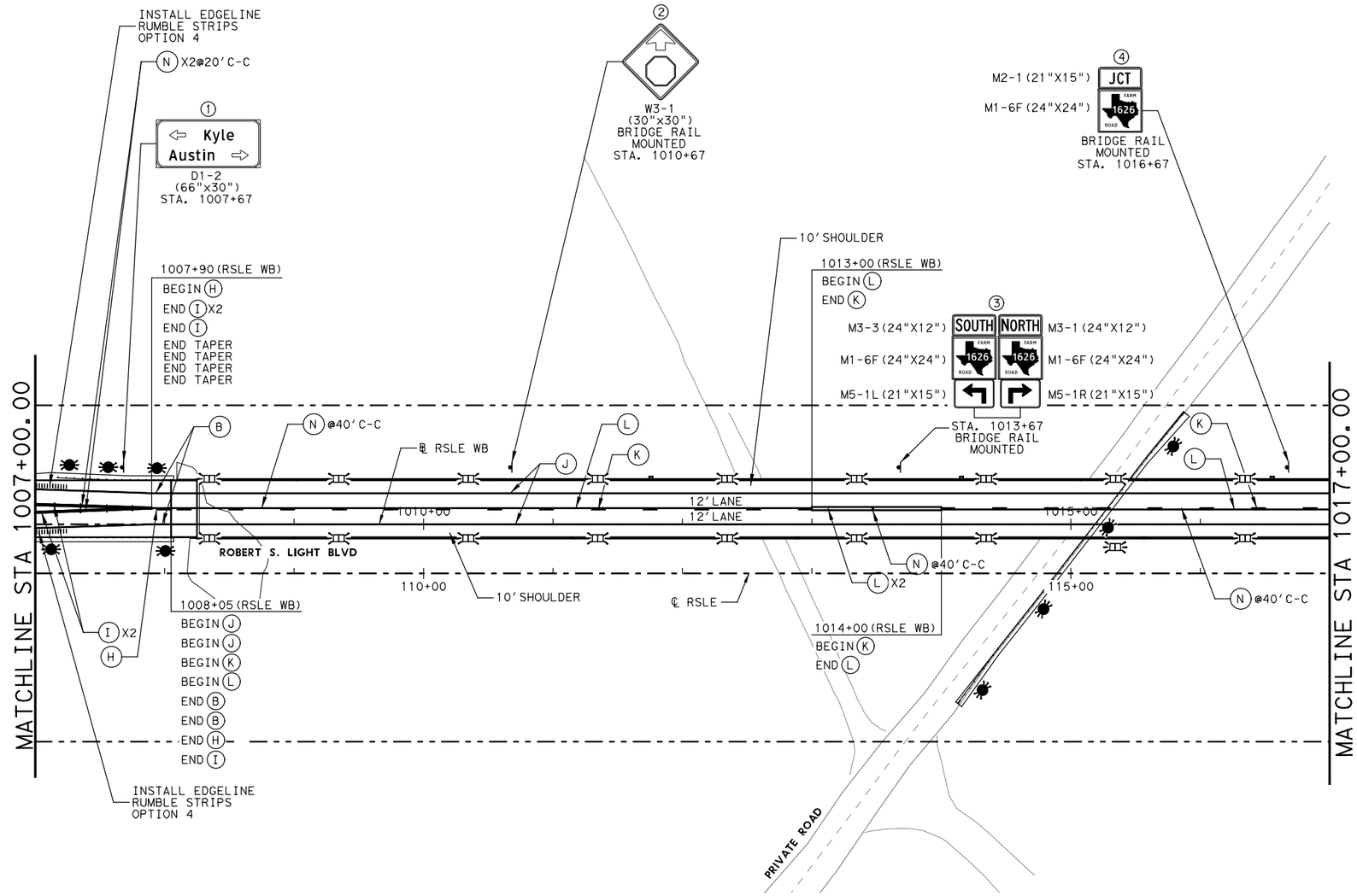

LEGEND

- (A) REFL PAV MRK TY I (W) 4" (BRK)(100MIL)
- (B) REFL PAV MRK TY I (W) 4" (SLD)(100MIL)
- (C) REFL PAV MRK TY I (W) 8" (SLD)(100MIL)
- (D) REFL PAV MRK TY I (W) 8" (LNDP)(100MIL)
- (E) REFL PAV MRK TY I (W) 24"(SLD)(100MIL)
- (F) REFL PAV MRK TY I (W) (ARROW)(100MIL)
- (G) REFL PAV MRK TY I (W) (WORD)(100MIL)
- (H) REFL PAV MRK TY I (Y) 4" (BRK)(100MIL)
- (I) REFL PAV MRK TY I (Y) 4" (SLD)(100MIL)
- (J) PROF PAV MRK TY I W/ TY II (W) 4" (SLD)
- (K) PREFAB PAV MRK CONTRAST (Y) 4" (BRK)
- (L) PREFAB PAV MRK CONTRAST (Y) 4" (SLD)
- (M) REFL PAV MRKR TY I-C
- (N) REFL PAV MRKR TY II-A-A
- (O) REFL PAV MRK TY I (W) (TWLTARROW)(100MIL)
- (#) PROPOSED SIGN CALLOUTS
- RIGHT OF WAY
- EXISTING SIGNS
- PROPOSED SIGNS
- (P) EXISTING SIGN REMOVAL
- (D-SW) (BRF)CTB(BI)
- (D-SW) SZ 1(BRF)GF2(BI)
- (D-SW) SZ 2(WC)(GND)(BI)
- OM-2Y (WC)(GND)(BI)
- OM-3R (TWT)GND
- PAVEMENT MARKING REMOVAL
- RUMBLE STRIPS

NORTH

0 50 100 150 200

SCALE IN FEET

NOTES

1. INSTALL ALL PAVEMENT MARKINGS AS PER TXDOT STANDARD DETAILS.
2. INSTALL ALL SIGNS AS PER TXDOT STANDARD DETAILS.
3. INSTALL RUMBLE STRIPS AS PER TXDOT STANDARD DETAILS.

PAVEMENT MARKING QUANTITIES

BID ITEM	DESC CODE	DESCRIPTION	UNIT	QTY
533	6003	RUMBLE STRIPS (SHOULDER) ASPHALT	LF	52
658	6014	INSTL DEL ASSM (D-SW)SZ (BRF)CTB (BI)	EA	18
658	6062	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	EA	9
666	6170	REFL PAV MRK TY II (W) 4" (SLD)	LF	1790
666	6283	REF PROF PAV MRK TY 1(W)4"(SLD)(090MIL)	LF	1790
666	6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	LF	210
666	6312	RE PM W/RET REQ TY I (Y)4"(BRK)(100MIL)	LF	10
666	6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	LF	375
672	6009	REFL PAV MRKR TY II-A-A	EA	41
6019	6011	PREFB PV MK W/WNTY TY B(Y)4"(BRK)CNTST	LF	220
6019	6012	PREFB PV MK W/WNTY TY B(Y)4"(SLD)CNTST	LF	1010

STATE OF TEXAS
TIMOTHY GRIMES
100107
LICENSED
PROFESSIONAL ENGINEER

12/03/2020

HDR Engineering, Inc.
1290 Wonder World Drive
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San Marcos, TX 78666-7969
Texas Registered Engineering Firm F-754

Texas Department of Transportation

ROBERT S. LIGHT EXTENSION

ROBERT S LIGHT BLVD SIGNING AND STRIPING LAYOUT STA 1007+00 TO STA 1017+00

SCALE: 1"=100' SHEET 2 OF11

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
TG	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
SF	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	326
PF	0914	33	068,ETC	
CHECK				
BP				

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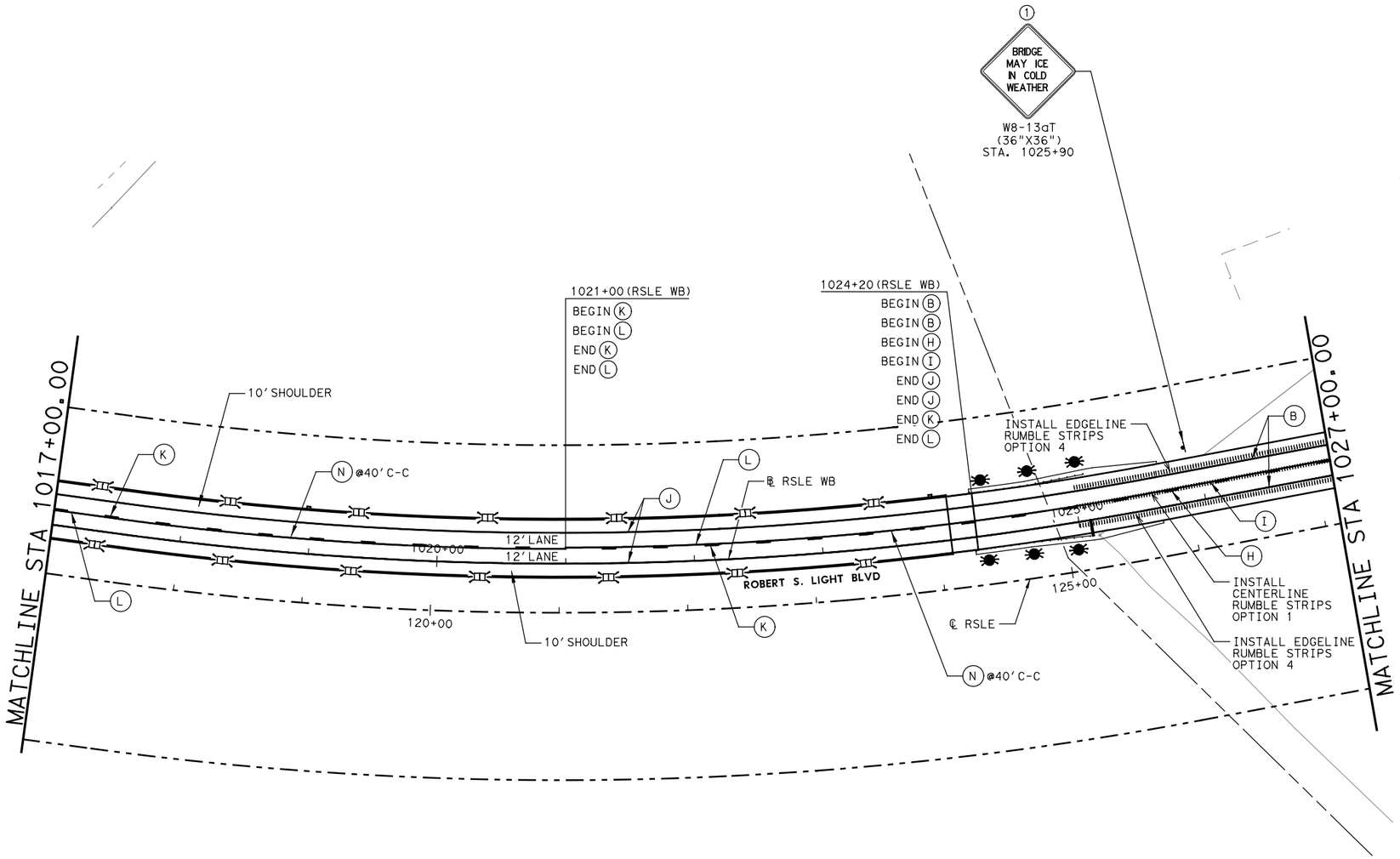

LEGEND

- (A) REFL PAV MRK TY I (W) 4" (BRK)(100MIL)
- (B) REFL PAV MRK TY I (W) 4" (SLD)(100MIL)
- (C) REFL PAV MRK TY I (W) 8" (SLD)(100MIL)
- (D) REFL PAV MRK TY I (W) 8" (LNDP)(100MIL)
- (E) REFL PAV MRK TY I (W) 24"(SLD)(100MIL)
- (F) REFL PAV MRK TY I (W) (ARROW)(100MIL)
- (G) REFL PAV MRK TY I (W) (WORD)(100MIL)
- (H) REFL PAV MRK TY I (Y) 4" (BRK)(100MIL)
- (I) REFL PAV MRK TY I (Y) 4" (SLD)(100MIL)
- (J) PROF PAV MRK TY I W/ TY II (W) 4" (SLD)
- (K) PREFAB PAV MRK CONTRAST (Y) 4" (BRK)
- (L) PREFAB PAV MRK CONTRAST (Y) 4" (SLD)
- (M) REFL PAV MRKR TY I-C
- (N) REFL PAV MRKR TY II-A-A
- (O) REFL PAV MRK TY I (W) (TWLTARROW)(100MIL)
- (#) PROPOSED SIGN CALLOUTS
- RIGHT OF WAY
- EXISTING SIGNS
- PROPOSED SIGNS
- (P) EXISTING SIGN REMOVAL
- (D-SW) (BRF)CTB(BI)
- (D-SW) SZ 1(BRF)GF2(BI)
- (D-SW) SZ 2(WC)(GND)(BI)
- OM-2Y (WC)(GND)(BI)
- OM-3R (TWT)GND
- PAVEMENT MARKING REMOVAL
- RUMBLE STRIPS

NORTH

0 50 100 150 200

SCALE IN FEET

NOTES

1. INSTALL ALL PAVEMENT MARKINGS AS PER TXDOT STANDARD DETAILS.
2. INSTALL ALL SIGNS AS PER TXDOT STANDARD DETAILS.
3. INSTALL RUMBLE STRIPS AS PER TXDOT STANDARD DETAILS.

PAVEMENT MARKING QUANTITIES

BID ITEM	DESC CODE	DESCRIPTION	UNIT	QTY
533	6003	RUMBLE STRIPS (SHOULDER) ASPHALT	LF	400
533	6004	RUMBLE STRIPS (CENTERLINE) ASPHALT	LF	200
658	6014	INSTL DEL ASSM (D-SW)SZ (BRF)CTB (BI)	EA	14
658	6062	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	EA	6
666	6170	REFL PAV MRK TY II (W) 4" (SLD)	LF	1434
666	6283	REF PROF PAV MRK TY 1(W)4"(SLD)(090MIL)	LF	1434
666	6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	LF	559
666	6312	RE PM W/RET REQ TY I (Y)4"(BRK)(100MIL)	LF	70
666	6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	LF	280
672	6009	REFL PAV MRKR TY II-A-A	EA	25
6019	6011	PREFB PV MK W/WNTY TY B(Y)4"(BRK)CNTST	LF	180
6019	6012	PREFB PV MK W/WNTY TY B(Y)4"(SLD)CNTST	LF	717

STATE OF TEXAS
TIMOTHY GRIMES
100107
LICENSED PROFESSIONAL ENGINEER

12/03/2020

HAYS COUNTY TEXAS

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San Marcos, TX 78666-7969
Texas Registered Engineering Firm F-754

Texas Department of Transportation

ROBERT S. LIGHT EXTENSION

ROBERT S LIGHT BLVD SIGNING AND STRIPING LAYOUT STA 1017+00 TO STA 1027+00

SCALE: 1"=100'

SHEET 3 OF 11

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
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BP				

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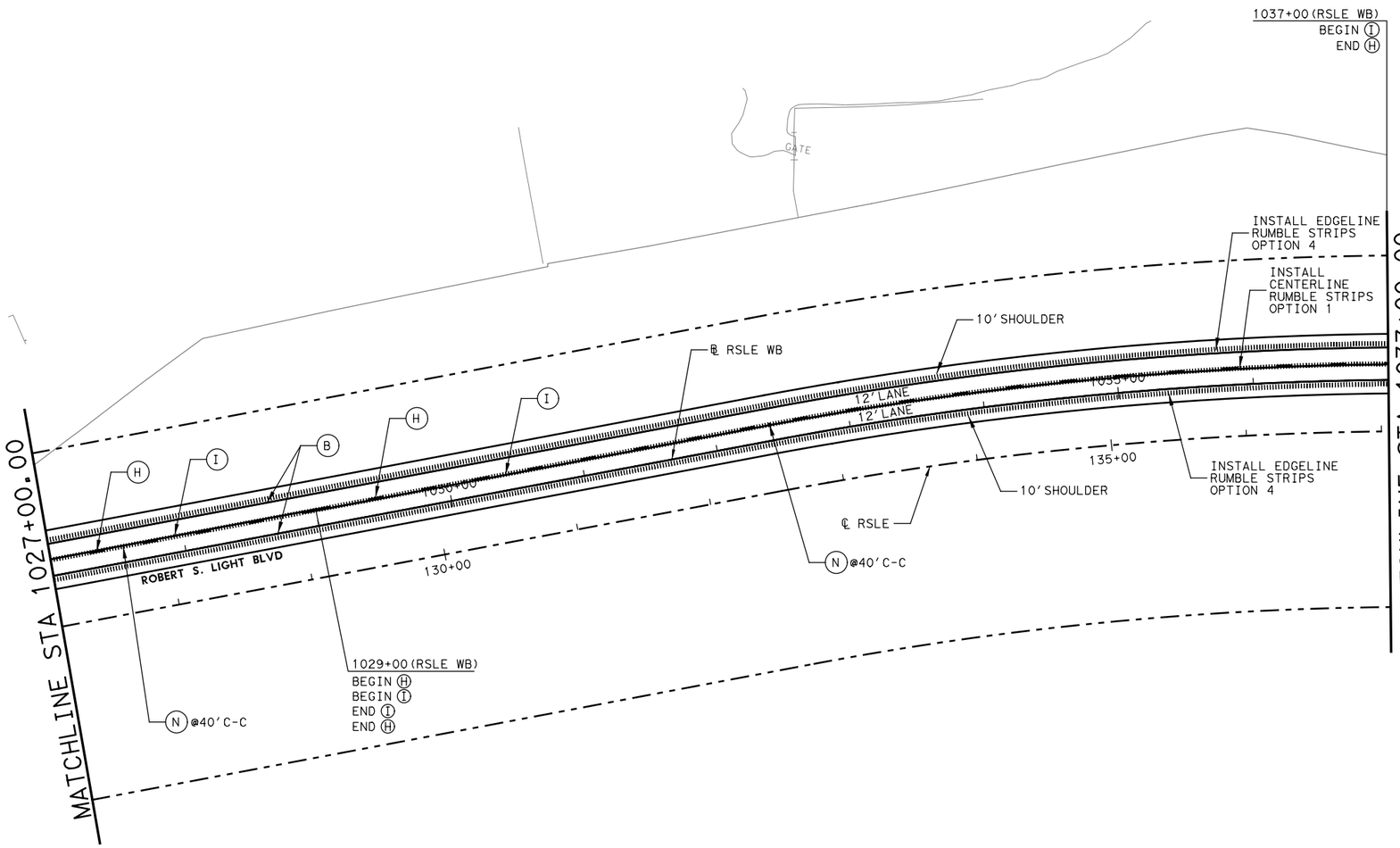

LEGEND

- (A) REFL PAV MRK TY I (W) 4" (BRK)(100MIL)
- (B) REFL PAV MRK TY I (W) 4" (SLD)(100MIL)
- (C) REFL PAV MRK TY I (W) 8" (SLD)(100MIL)
- (D) REFL PAV MRK TY I (W) 8" (LNDP)(100MIL)
- (E) REFL PAV MRK TY I (W) 24"(SLD)(100MIL)
- (F) REFL PAV MRK TY I (W) (ARROW)(100MIL)
- (G) REFL PAV MRK TY I (W) (WORD)(100MIL)
- (H) REFL PAV MRK TY I (Y) 4" (BRK)(100MIL)
- (I) REFL PAV MRK TY I (Y) 4" (SLD)(100MIL)
- (J) PROF PAV MRK TY I W/ TY II (W) 4" (SLD)
- (K) PREFAB PAV MRK CONTRAST (Y) 4" (BRK)
- (L) PREFAB PAV MRK CONTRAST (Y) 4" (SLD)
- (M) REFL PAV MRKR TY I-C
- (N) REFL PAV MRKR TY II-A-A
- (O) REFL PAV MRK TY I (W) (TWLTARROW)(100MIL)
- (#) PROPOSED SIGN CALLOUTS
- RIGHT OF WAY
- EXISTING SIGNS
- PROPOSED SIGNS
- (P) EXISTING SIGN REMOVAL
- (D-SW) (BRF)CTB(BI)
- (D-SW) SZ 2(WC)(GND)(BI)
- OM-2Y (WC)(GND)(BI)
- OM-3R (TWT)GND
- PAVEMENT MARKING REMOVAL
- RUMBLE STRIPS

North

0 50 100 150 200

SCALE IN FEET

NOTES

1. INSTALL ALL PAVEMENT MARKINGS AS PER TXDOT STANDARD DETAILS.
2. INSTALL ALL SIGNS AS PER TXDOT STANDARD DETAILS.
3. INSTALL RUMBLE STRIPS AS PER TXDOT STANDARD DETAILS.

PAVEMENT MARKING QUANTITIES

BID ITEM	DESC CODE	DESCRIPTION	UNIT	QTY
533	6003	RUMBLE STRIPS (SHOULDER) ASPHALT	LF	2005
533	6004	RUMBLE STRIPS (CENTERLINE) ASPHALT	LF	1003
666	6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	LF	2004
666	6312	RE PM W/RET REQ TY I (Y)4"(BRK)(100MIL)	LF	250
666	6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	LF	1002
672	6009	REFL PAV MRKR TY II-A-A	EA	25

STATE OF TEXAS
TIMOTHY GRIMES
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11/19/2020

HAYS COUNTY TEXAS

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Texas Department of Transportation
(R) 2020

ROBERT S. LIGHT EXTENSION

ROBERT S LIGHT BLVD SIGNING AND STRIPING LAYOUT STA 1027+00 TO STA 1037+00

SCALE: 1"=100' SHEET 4 OF 11

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
TG	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
SF	TEXAS	AUS	HAYS	328
CHECK	CONTROL	SECTION	JOB	
PF	0914	33	068,ETC	
CHECK				
BP				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
USER: KBERGER DATE: 11/19/2020
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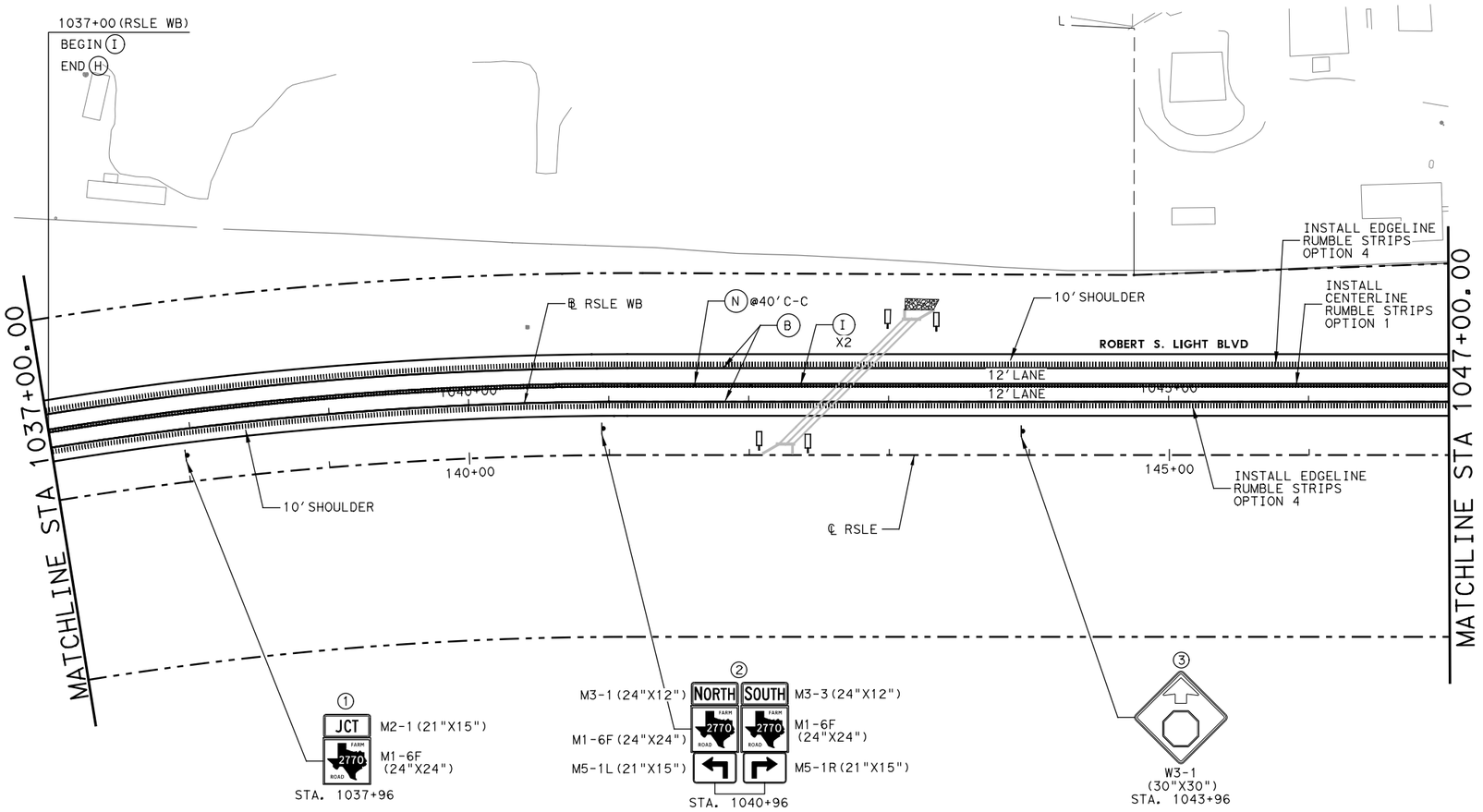
PENTABLE: 000000000214615.tbl
TIME: 12:46:56 PM SCALE: 1:100

PAVEMENT MARKING QUANTITIES

BID ITEM	DESC CODE	DESCRIPTION	UNIT	QTY
533	6003	RUMBLE STRIPS (SHOULDER) ASPHALT	LF	2004
533	6004	RUMBLE STRIPS (CENTERLINE) ASPHALT	LF	1002
658	6073	INSTL OM ASSM (OM-2Y)(WC)GND(BI)	EA	4
666	6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	LF	2004
666	6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	LF	2004
672	6009	REFL PAV MRKR TY II-A-A	EA	25

LEGEND

- (A) REFL PAV MRK TY I (W) 4" (BRK)(100MIL)
- (B) REFL PAV MRK TY I (W) 4" (SLD)(100MIL)
- (C) REFL PAV MRK TY I (W) 8" (SLD)(100MIL)
- (D) REFL PAV MRK TY I (W) 8" (LNDP)(100MIL)
- (E) REFL PAV MRK TY I (W) 24"(SLD)(100MIL)
- (F) REFL PAV MRK TY I (W) (ARROW)(100MIL)
- (G) REFL PAV MRK TY I (W) (WORD)(100MIL)
- (H) REFL PAV MRK TY I (Y) 4" (BRK)(100MIL)
- (I) REFL PAV MRK TY I (Y) 4" (SLD)(100MIL)
- (J) PROF PAV MRK TY I W/ TY II (W) 4" (SLD)
- (K) PREFAB PAV MRK CONTRAST (Y) 4" (BRK)
- (L) PREFAB PAV MRK CONTRAST (Y) 4" (SLD)
- (M) REFL PAV MRKR TY I-C
- (N) REFL PAV MRKR TY II-A-A
- (O) REFL PAV MRK TY I (W) (TWLTARROW)(100MIL)
- (#) PROPOSED SIGN CALLOUTS
- RIGHT OF WAY
- EXISTING SIGNS
- PROPOSED SIGNS
- (P) EXISTING SIGN REMOVAL
- (D-SW) (BRF)CTB(BI)
- (D-SW) SZ 2(WC)(GND)(BI)
- OM-2Y (WC)(GND)(BI)
- OM-3R (TWT)GND
- PAVEMENT MARKING REMOVAL
- RUMBLE STRIPS



0 50 100 150 200
SCALE IN FEET

NOTES

1. INSTALL ALL PAVEMENT MARKINGS AS PER TXDOT STANDARD DETAILS.
2. INSTALL ALL SIGNS AS PER TXDOT STANDARD DETAILS.
3. INSTALL RUMBLE STRIPS AS PER TXDOT STANDARD DETAILS.

STATE OF TEXAS
TIMOTHY GRIMES
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ROBERT S. LIGHT EXTENSION
ROBERT S LIGHT BLVD SIGNING AND STRIPING LAYOUT
STA 1037+00 TO STA 1047+00

SCALE: 1"=100' SHEET 5 OF 11

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
TG	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
SF	TEXAS	AUS	HAYS	329
CHECK	CONTROL	SECTION	JOB	
PF	0914	33	068,ETC	
CHECK				
BP				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
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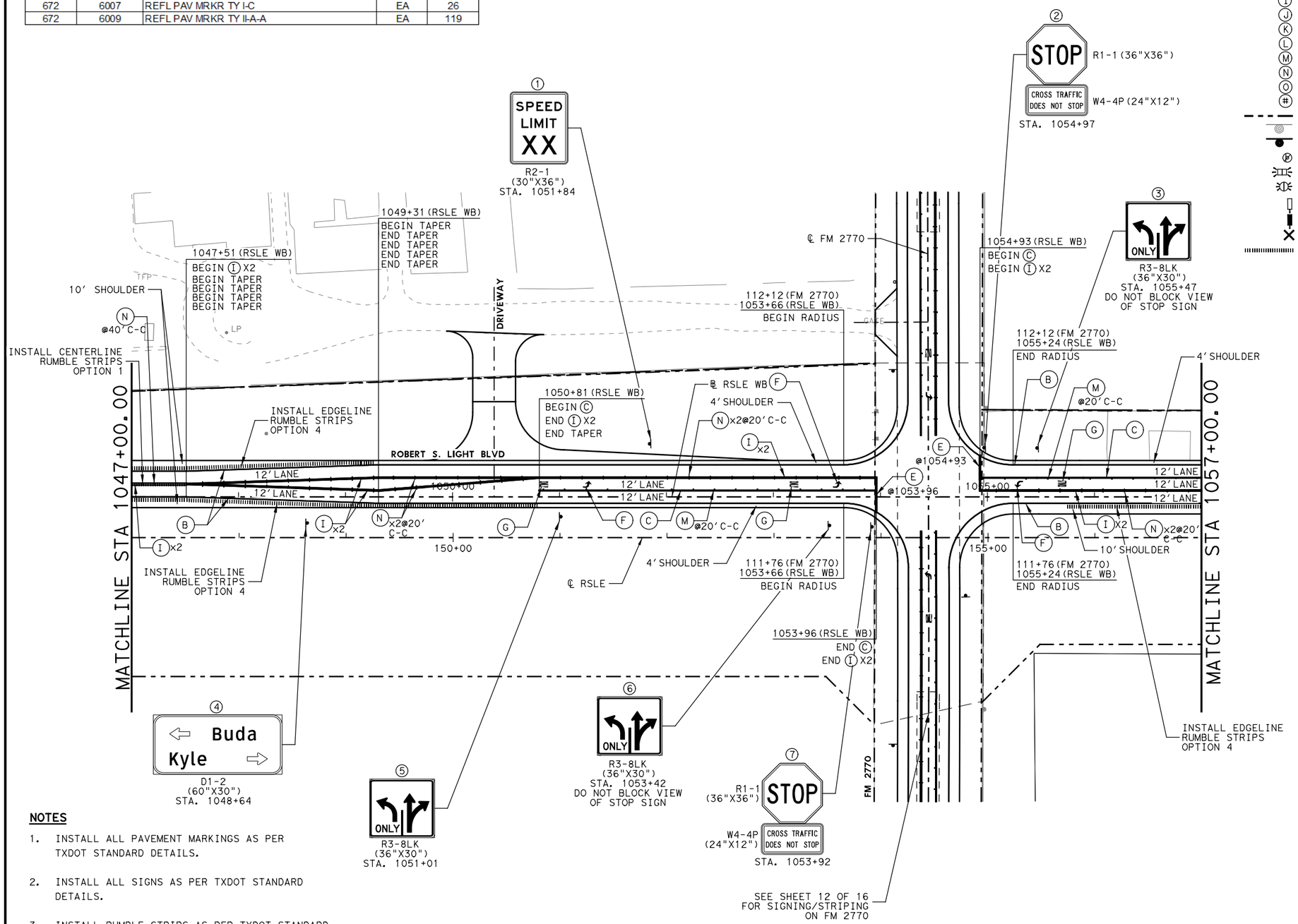
PAVEMENT MARKING QUANTITIES

BID ITEM	DESC CODE	DESCRIPTION	UNIT	QTY
533	6003	RUMBLE STRIPS (SHOULDER) ASPHALT	LF	734
533	6004	RUMBLE STRIPS (CENTERLINE) ASPHALT	LF	52
666	6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF	522
666	6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF	65
666	6054	REFL PAV MRK TY I (W)(ARROW)(100MIL)	EA	3
666	6078	REFL PAV MRK TY I (W)(WORD)(100MIL)	EA	3
666	6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	LF	1684
666	6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	LF	2468
672	6007	REFL PAV MRKR TY I-C	EA	26
672	6009	REFL PAV MRKR TY II-A-A	EA	119

LEGEND

- (A) REFL PAV MRK TY I (W) 4" (BRK)(100MIL)
- (B) REFL PAV MRK TY I (W) 4" (SLD)(100MIL)
- (C) REFL PAV MRK TY I (W) 8" (SLD)(100MIL)
- (D) REFL PAV MRK TY I (W) 8" (LNDP)(100MIL)
- (E) REFL PAV MRK TY I (W) 24"(SLD)(100MIL)
- (F) REFL PAV MRK TY I (W) (ARROW)(100MIL)
- (G) REFL PAV MRK TY I (W) (WORD)(100MIL)
- (H) REFL PAV MRK TY I (Y) 4" (BRK)(100MIL)
- (I) REFL PAV MRK TY I (Y) 4" (SLD)(100MIL)
- (J) PROF PAV MRK TY I W/ TY II (W) 4" (SLD)
- (K) PREFAB PAV MRK CONTRAST (Y) 4" (BRK)
- (L) PREFAB PAV MRK CONTRAST (Y) 4" (SLD)
- (M) REFL PAV MRKR TY I-C
- (N) REFL PAV MRKR TY II-A-A
- (O) REFL PAV MRK TY I (W) (TWLTARROW)(100MIL)
- (#) PROPOSED SIGN CALLOUTS
- RIGHT OF WAY
- EXISTING SIGNS
- PROPOSED SIGNS
- (P) EXISTING SIGN REMOVAL
- (D-SW) (BRF)CTB(BI)
- (D-SW) SZ 2(WC)(GND)(BI)
- OM-2Y (WC)(GND)(BI)
- OM-3R (TWT)GND
- PAVEMENT MARKING REMOVAL
- RUMBLE STRIPS



0 50 100 150 200
SCALE IN FEET

NOTES

1. INSTALL ALL PAVEMENT MARKINGS AS PER TXDOT STANDARD DETAILS.
2. INSTALL ALL SIGNS AS PER TXDOT STANDARD DETAILS.
3. INSTALL RUMBLE STRIPS AS PER TXDOT STANDARD DETAILS.

STATE OF TEXAS
TIMOTHY GRIMES
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11/19/2020

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ROBERT S. LIGHT EXTENSION
ROBERT S LIGHT BLVD SIGNING AND STRIPING LAYOUT
STA 1047+00 TO STA 1057+00

SCALE: 1"=100' SHEET 6 OF 11

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
TG	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
SF	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	330
PF	0914	33	068, ETC	
CHECK				
BP				

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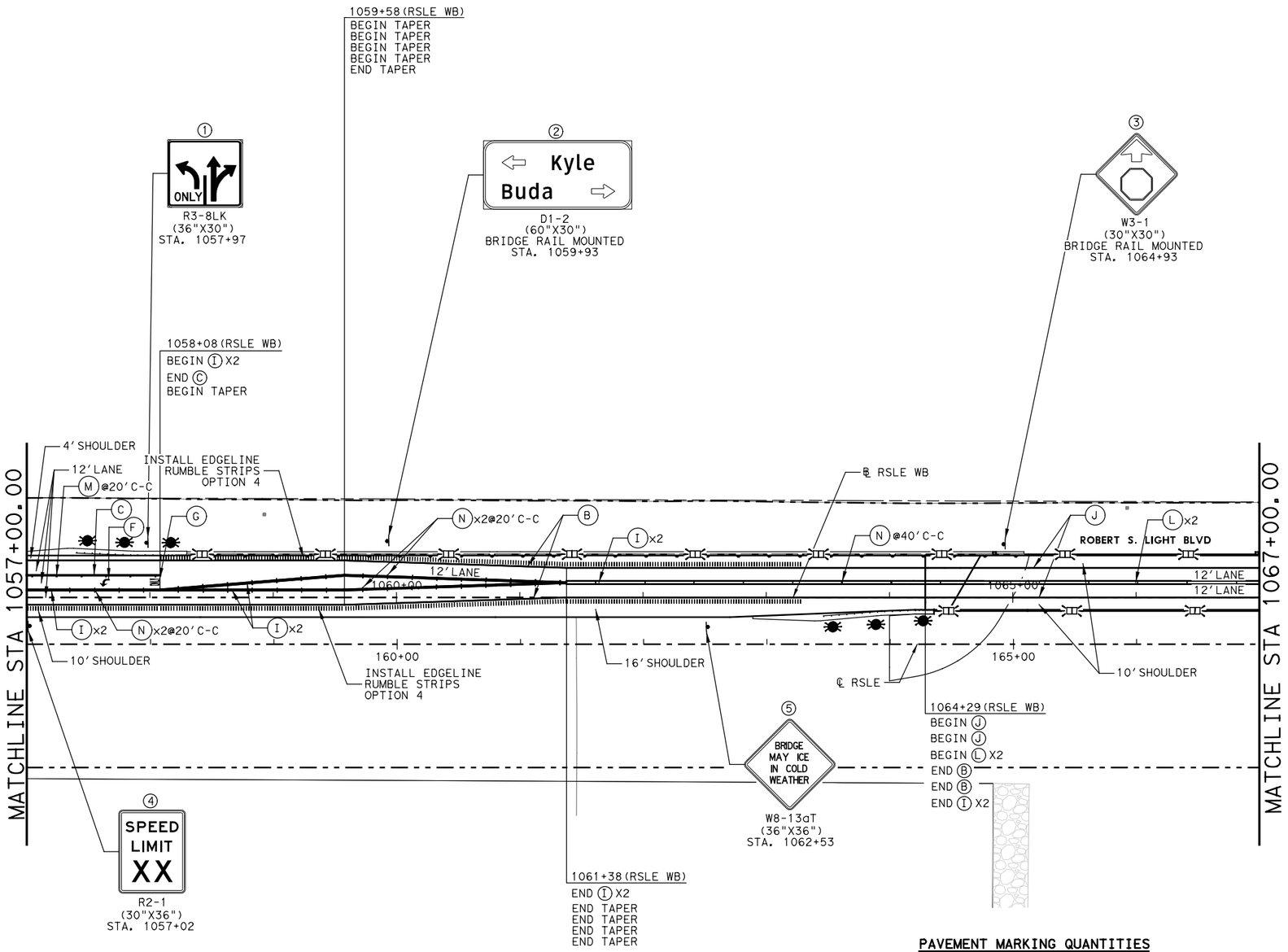

LEGEND

- (A) REFL PAV MRK TY I (W) 4" (BRK)(100MIL)
- (B) REFL PAV MRK TY I (W) 4" (SLD)(100MIL)
- (C) REFL PAV MRK TY I (W) 8" (SLD)(100MIL)
- (D) REFL PAV MRK TY I (W) 8" (LNDP)(100MIL)
- (E) REFL PAV MRK TY I (W) 24"(SLD)(100MIL)
- (F) REFL PAV MRK TY I (W) (ARROW)(100MIL)
- (G) REFL PAV MRK TY I (W) (WORD)(100MIL)
- (H) REFL PAV MRK TY I (Y) 4" (BRK)(100MIL)
- (I) REFL PAV MRK TY I (Y) 4" (SLD)(100MIL)
- (J) PROF PAV MRK TY I W/ TY II (W) 4" (SLD)
- (K) PREFAB PAV MRK CONTRAST (Y) 4" (BRK)
- (L) PREFAB PAV MRK CONTRAST (Y) 4" (SLD)
- (M) REFL PAV MRKR TY I-C
- (N) REFL PAV MRKR TY II-A-A
- (O) REFL PAV MRK TY I (W) (TWLTARROW)(100MIL)
- (#) PROPOSED SIGN CALLOUTS
- RIGHT OF WAY
- EXISTING SIGNS
- PROPOSED SIGNS
- (P) EXISTING SIGN REMOVAL
- (D-SW) (BRF)CTB(BI)
- (D-SW) SZ 1(BRF)GF2(BI)
- (D-SW) SZ 2(WC)(GND)(BI)
- OM-2Y (WC)(GND)(BI)
- OM-3R (TWT)GND
- PAVEMENT MARKING REMOVAL
- RUMBLE STRIPS

NORTH

0 50 100 150 200

SCALE IN FEET

NOTES

1. INSTALL ALL PAVEMENT MARKINGS AS PER TXDOT STANDARD DETAILS.
2. INSTALL ALL SIGNS AS PER TXDOT STANDARD DETAILS.
3. INSTALL RUMBLE STRIPS AS PER TXDOT STANDARD DETAILS.

PAVEMENT MARKING QUANTITIES

BID ITEM	DESC CODE	DESCRIPTION	UNIT	QTY
533	6003	RUMBLE STRIPS (SHOULDER) ASPHALT	LF	1151
658	6014	INSTL DEL ASSM (D-SW)SZ (BRF)CTB (BI)	EA	12
658	6062	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	EA	6
666	6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF	108
666	6054	REFL PAV MRK TY I (W)(ARROW)(100MIL)	EA	1
666	6078	REFL PAV MRK TY I (W)(WORD)(100MIL)	EA	1
666	6170	REFL PAV MRK TY II (W) 4" (SLD)	LF	542
666	6283	REF PROF PAV MRK TY 1(W)4"(SLD)(090MIL)	LF	542
666	6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	LF	1458
666	6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	LF	2118
672	6007	REFL PAV MRKR TY I-C	EA	6
672	6009	REFL PAV MRKR TY II-A-A	EA	94
6019	6012	PREFB PV MK W/WNTY TY B(Y)4"(SLD)CNTST	LF	542

STATE OF TEXAS
TIMOTHY GRIMES
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PROFESSIONAL ENGINEER

12/03/2020

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ROBERT S. LIGHT EXTENSION

ROBERT S LIGHT BLVD SIGNING AND STRIPING LAYOUT STA 1057+00 TO STA 1067+00

SCALE: 1"=100' SHEET 7 OF 11

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
TG	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
SF	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	331
PF	0914	33	068,ETC	
CHECK				
BP				

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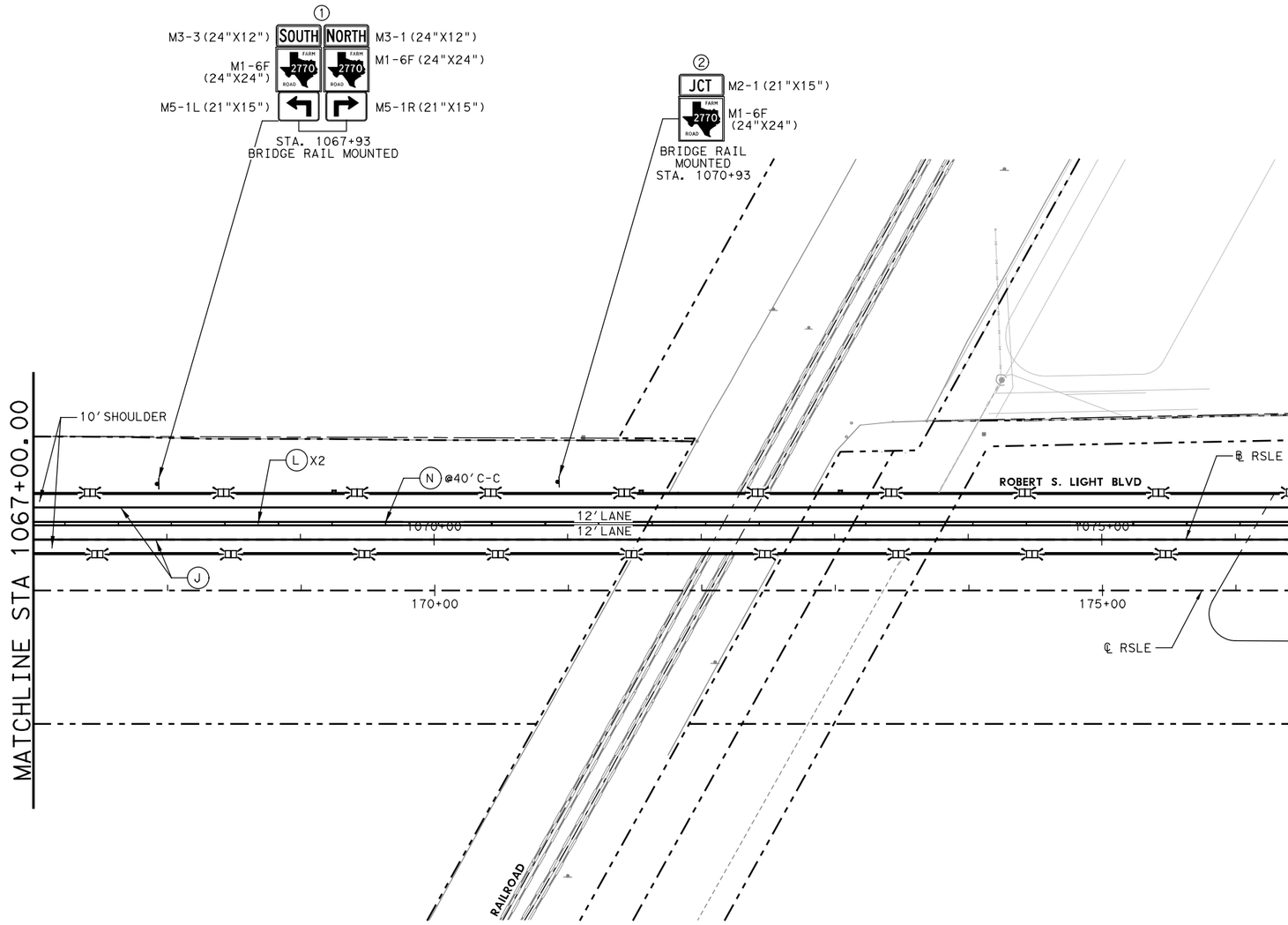
PAVEMENT MARKING QUANTITIES

BID ITEM	DESC CODE	DESCRIPTION	UNIT	QTY
658	6014	INSTL DEL ASSM (D-SW)SZ (BRF)CTB (BI)	EA	20
658	6062	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	EA	1
666	6170	REFL PAV MRK TY II (W) 4" (SLD)	LF	2000
666	6283	REF PROF PAV MRK TY 1(W)4"(SLD)(090MIL)	LF	2000
672	6009	REFL PAV MRKR TY II-A-A	EA	25
6019	6012	PREFB PV MK W/WNTY TY B(Y)4"(SLD)CNTST	LF	2000



LEGEND

- (A) REFL PAV MRK TY I (W) 4" (BRK)(100MIL)
- (B) REFL PAV MRK TY I (W) 4" (SLD)(100MIL)
- (C) REFL PAV MRK TY I (W) 8" (SLD)(100MIL)
- (D) REFL PAV MRK TY I (W) 8" (LNDP)(100MIL)
- (E) REFL PAV MRK TY I (W) 24"(SLD)(100MIL)
- (F) REFL PAV MRK TY I (W) (ARROW)(100MIL)
- (G) REFL PAV MRK TY I (W) (WORD)(100MIL)
- (H) REFL PAV MRK TY I (Y) 4" (BRK)(100MIL)
- (I) REFL PAV MRK TY I (Y) 4" (SLD)(100MIL)
- (J) PROF PAV MRK TY I W/ TY II (W) 4" (SLD)
- (K) PREFAB PAV MRK CONTRAST (Y) 4" (BRK)
- (L) PREFAB PAV MRK CONTRAST (Y) 4" (SLD)
- (M) REFL PAV MRKR TY I-C
- (N) REFL PAV MRKR TY II-A-A
- (O) REFL PAV MRK TY I (W) (TWLTARROW)(100MIL)
- (#) PROPOSED SIGN CALLOUTS
- RIGHT OF WAY
- EXISTING SIGNS
- PROPOSED SIGNS
- (P) EXISTING SIGN REMOVAL
- (D-SW) (BRF)CTB(BI)
- (D-SW) SZ 1(BRF)GF2(BI)
- (D-SW) SZ 2(WC)(GND)(BI)
- OM-2Y (WC)(GND)(BI)
- OM-3R (TWT)GND
- PAVEMENT MARKING REMOVAL
- RUMBLE STRIPS

NORTH

0 50 100 150 200

SCALE IN FEET

NOTES

1. INSTALL ALL PAVEMENT MARKINGS AS PER TXDOT STANDARD DETAILS.
2. INSTALL ALL SIGNS AS PER TXDOT STANDARD DETAILS.
3. INSTALL RUMBLE STRIPS AS PER TXDOT STANDARD DETAILS.

STATE OF TEXAS
TIMOTHY GRIMES
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Texas Department of Transportation

ROBERT S. LIGHT EXTENSION

ROBERT S LIGHT BLVD SIGNING AND STRIPING LAYOUT STA 1067+00 TO STA 1077+00

SCALE: 1"=100' SHEET 8 OF11

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
TG	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
SF	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	332
PF	0914	33	068,ETC	
CHECK				
BP				

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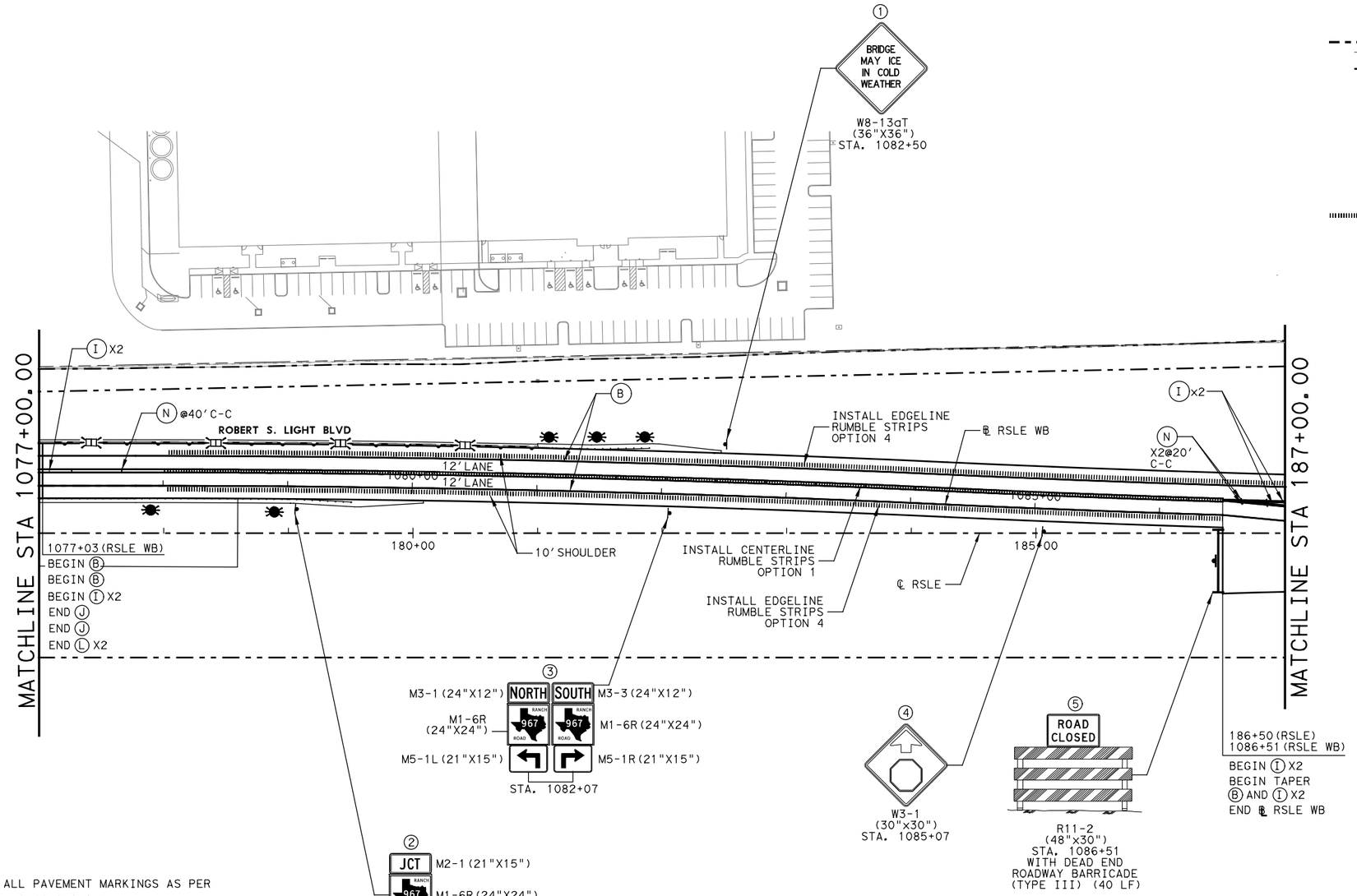
DATE: 12/2/2020 TIME: 1:36:22 PM PENTABLE: 000000002146I5.tbl SCALE: 1:100

PAVEMENT MARKING QUANTITIES

BID ITEM	DESC CODE	DESCRIPTION	UNIT	QTY
533	6003	RUMBLE STRIPS (SHOULDER) ASPHALT	LF	1746
533	6004	RUMBLE STRIPS (CENTERLINE) ASPHALT	LF	849
658	6014	INSTL DEL ASSM (D-SW)SZ (BRF)CTB (BI)	EA	4
658	6062	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	EA	5
666	6170	REFL PAV MRK TY II (W) 4" (SLD)	LF	6
666	6283	REF PROF PAV MRK TY 1(W)4"(SLD)(090MIL)	LF	6
666	6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	LF	2005
666	6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	LF	2094
672	6009	REFL PAV MRKR TY II-A-A	EA	34
6019	6012	PREFB PV MK W/WNTY TY B(Y)4"(SLD)CNTST	LF	6
6120	6001	DEAD END ROADWAY BARRICADE	LF	40

LEGEND

- (A) REFL PAV MRK TY I (W) 4" (BRK)(100MIL)
- (B) REFL PAV MRK TY I (W) 4" (SLD)(100MIL)
- (C) REFL PAV MRK TY I (W) 8" (SLD)(100MIL)
- (D) REFL PAV MRK TY I (W) 8" (LNDP)(100MIL)
- (E) REFL PAV MRK TY I (W) 24"(SLD)(100MIL)
- (F) REFL PAV MRK TY I (W) (ARROW)(100MIL)
- (G) REFL PAV MRK TY I (W) (WORD)(100MIL)
- (H) REFL PAV MRK TY I (Y) 4" (BRK)(100MIL)
- (I) REFL PAV MRK TY I (Y) 4" (SLD)(100MIL)
- (J) PROF PAV MRK TY I W/ TY II (W) 4" (SLD)
- (K) PREFAB PAV MRK CONTRAST (Y) 4" (BRK)
- (L) PREFAB PAV MRK CONTRAST (Y) 4" (SLD)
- (M) REFL PAV MRKR TY I-C
- (N) REFL PAV MRKR TY II-A-A
- (O) REFL PAV MRK TY I (W) (TWLTARROW)(100MIL)
- (#) PROPOSED SIGN CALLOUTS
- RIGHT OF WAY
- EXISTING SIGNS
- PROPOSED SIGNS
- (P) EXISTING SIGN REMOVAL
- (D-SW) (BRF)CTB(BI)
- (D-SW) SZ 1(BRF)GF2(BI)
- (D-SW) SZ 2(WC)(GND)(BI)
- OM-2Y (WC)(GND)(BI)
- OM-3R (TWT)GND
- PAVEMENT MARKING REMOVAL
- RUMBLE STRIPS



0 50 100 150 200
SCALE IN FEET

NOTES

1. INSTALL ALL PAVEMENT MARKINGS AS PER TXDOT STANDARD DETAILS.
2. INSTALL ALL SIGNS AS PER TXDOT STANDARD DETAILS.
3. INSTALL RUMBLE STRIPS AS PER TXDOT STANDARD DETAILS.

STATE OF TEXAS
TIMOTHY GRIMES
100107
LICENSED PROFESSIONAL ENGINEER
12/03/2020

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Texas Registered Engineering Firm F-754

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ROBERT S. LIGHT EXTENSION

ROBERT S LIGHT BLVD SIGNING AND STRIPING LAYOUT STA 1077+00 TO STA 187+00

SCALE: 1"=100' SHEET 9 OF 11

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
TG	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
SF	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	333
PF	0914	33	068,ETC	
CHECK				
BP				

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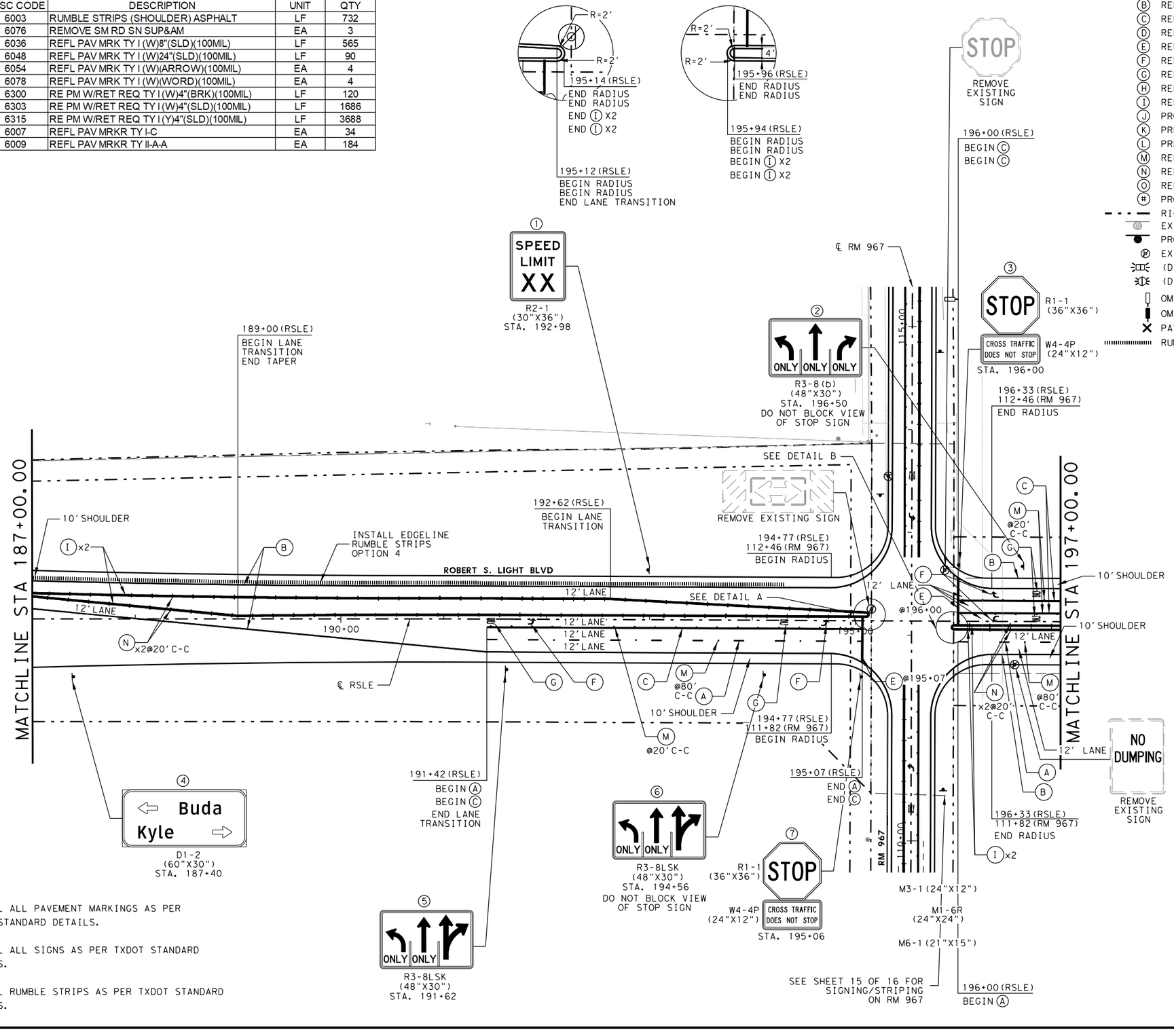
USER: KBERGER DATE: 12/2/2020 TIME: 1:37:38 PM SCALE: 1:100
FILE: RSLE-SS09.dgn

PAVEMENT MARKING QUANTITIES

BID ITEM	DESC CODE	DESCRIPTION	UNIT	QTY
533	6003	RUMBLE STRIPS (SHOULDER) ASPHALT	LF	732
644	6076	REMOVE SM RD SN SUP&AM	EA	3
666	6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF	565
666	6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF	90
666	6054	REFL PAV MRK TY I (W)(ARROW)(100MIL)	EA	4
666	6078	REFL PAV MRK TY I (W)(WORD)(100MIL)	EA	4
666	6300	RE PM W/RET REQ TY I (W)4"(BRK)(100MIL)	LF	120
666	6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	LF	1686
666	6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	LF	3688
672	6007	REFL PAV MRKR TY I-C	EA	34
672	6009	REFL PAV MRKR TY II-A-A	EA	184

LEGEND

- (A) REFL PAV MRK TY I (W) 4" (BRK)(100MIL)
- (B) REFL PAV MRK TY I (W) 4" (SLD)(100MIL)
- (C) REFL PAV MRK TY I (W) 8" (SLD)(100MIL)
- (D) REFL PAV MRK TY I (W) 8" (LNDP)(100MIL)
- (E) REFL PAV MRK TY I (W) 24"(SLD)(100MIL)
- (F) REFL PAV MRK TY I (W) (ARROW)(100MIL)
- (G) REFL PAV MRK TY I (W) (WORD)(100MIL)
- (H) REFL PAV MRK TY I (Y) 4" (BRK)(100MIL)
- (I) REFL PAV MRK TY I (Y) 4" (SLD)(100MIL)
- (J) PROF PAV MRK TY I W/ TY II (W) 4" (SLD)
- (K) PREFAB PAV MRK CONTRAST (Y) 4" (BRK)
- (L) PREFAB PAV MRK CONTRAST (Y) 4" (SLD)
- (M) REFL PAV MRKR TY I-C
- (N) REFL PAV MRKR TY II-A-A
- (O) REFL PAV MRK TY I (W) (TWLTARROW)(100MIL)
- (#) PROPOSED SIGN CALLOUTS
- RIGHT OF WAY
- EXISTING SIGNS
- PROPOSED SIGNS
- (P) EXISTING SIGN REMOVAL
- (D-SW) (BRF)CTB(BI)
- (D-SW) SZ 2(WC)(GND)(BI)
- OM-2Y (WC)(GND)(BI)
- OM-3R (TWT)GND
- PAVEMENT MARKING REMOVAL
- RUMBLE STRIPS



NOTES

1. INSTALL ALL PAVEMENT MARKINGS AS PER TXDOT STANDARD DETAILS.
2. INSTALL ALL SIGNS AS PER TXDOT STANDARD DETAILS.
3. INSTALL RUMBLE STRIPS AS PER TXDOT STANDARD DETAILS.

STATE OF TEXAS
TIMOTHY GRIMES
100107
LICENSED
PROFESSIONAL ENGINEER

11/19/2020

HAYS COUNTY TEXAS

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Texas Registered Engineering Firm F-754

Texas Department of Transportation
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ROBERT S. LIGHT EXTENSION

ROBERT S LIGHT BLVD SIGNING AND STRIPING LAYOUT STA 187+00 TO STA 197+00

SCALE: 1"=100' SHEET 10 OF 11

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
TG	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
SF	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	334
PF	0914	33	068,ETC	
CHECK				
BP				

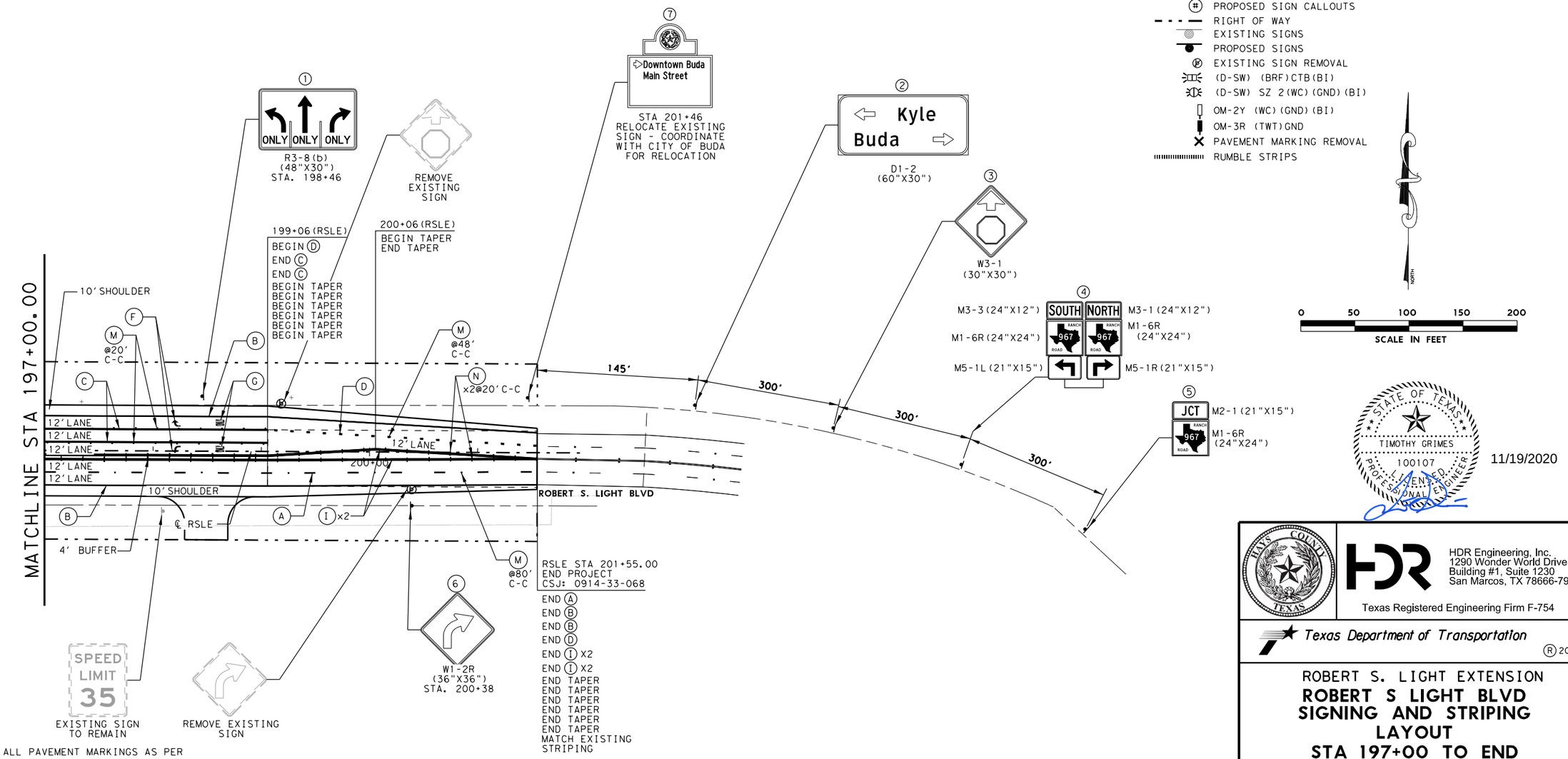
PLOT DRIVER: TXDOT_PDF_BW - llxlf.plt PENTABLE: 000000000246l5
USER: SEFITZPA DATE: 11/19/2020 TIME: 3:15:10 PM SCALE: H:00
FILE: Signing and Striping Sheet 10

PAVEMENT MARKING QUANTITIES

BID ITEM	DESC CODE	DESCRIPTION	UNIT	QTY
644	6076	REMOVE SM RD SN SUP&AM	EA	2
666	6033	REFL PAV MRK TY I (W)8"(LNDP)(100MIL)	LF	63
666	6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF	412
666	6054	REFL PAV MRK TY I (W)(ARROW)(100MIL)	EA	2
666	6078	REFL PAV MRK TY I (W)(WORD)(100MIL)	EA	2
666	6300	RE PM W/RET REQ TY I (W)4"(BRK)(100MIL)	LF	110
666	6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	LF	912
666	6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	LF	1824
672	6007	REFL PAV MRKR TY I-C	EA	32
672	6009	REFL PAV MRKR TY II-A-A	EA	91

LEGEND

- (A) REFL PAV MRK TY I (W) 4" (BRK)(100MIL)
- (B) REFL PAV MRK TY I (W) 4" (SLD)(100MIL)
- (C) REFL PAV MRK TY I (W) 8" (SLD)(100MIL)
- (D) REFL PAV MRK TY I (W) 8" (LNDP)(100MIL)
- (E) REFL PAV MRK TY I (W) 24"(SLD)(100MIL)
- (F) REFL PAV MRK TY I (W) (ARROW)(100MIL)
- (G) REFL PAV MRK TY I (W) (WORD)(100MIL)
- (H) REFL PAV MRK TY I (Y) 4" (BRK)(100MIL)
- (I) REFL PAV MRK TY I (Y) 4" (SLD)(100MIL)
- (J) PROF PAV MRK TY I W/ TY II (W) 4" (SLD)
- (K) PREFAB PAV MRK CONTRAST (Y) 4" (BRK)
- (L) PREFAB PAV MRK CONTRAST (Y) 4" (SLD)
- (M) REFL PAV MRKR TY I-C
- (N) REFL PAV MRKR TY II-A-A
- (O) REFL PAV MRK TY I (W) (TWLTARROW)(100MIL)
- (#) PROPOSED SIGN CALLOUTS
- RIGHT OF WAY
- EXISTING SIGNS
- PROPOSED SIGNS
- (P) EXISTING SIGN REMOVAL
- (D-SW) (BRF)CTB(BI)
- (D-SW) SZ 2(WC)(GND)(BI)
- OM-2Y (WC)(GND)(BI)
- OM-3R (TWT)GND
- PAVEMENT MARKING REMOVAL
- RUMBLE STRIPS



NOTES

1. INSTALL ALL PAVEMENT MARKINGS AS PER TXDOT STANDARD DETAILS.
2. INSTALL ALL SIGNS AS PER TXDOT STANDARD DETAILS.
3. INSTALL RUMBLE STRIPS AS PER TXDOT STANDARD DETAILS.

STATE OF TEXAS
TIMOTHY GRIMES
100107
LICENSED PROFESSIONAL ENGINEER
11/19/2020

HDR Engineering, Inc.
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Texas Registered Engineering Firm F-754

Texas Department of Transportation

ROBERT S. LIGHT EXTENSION

ROBERT S LIGHT BLVD SIGNING AND STRIPING LAYOUT STA 197+00 TO END

SCALE: 1"=100' SHEET 11 OF 11

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
TG	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
SF	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	335
PF	0914	33	068,ETC	
CHECK				
BP				

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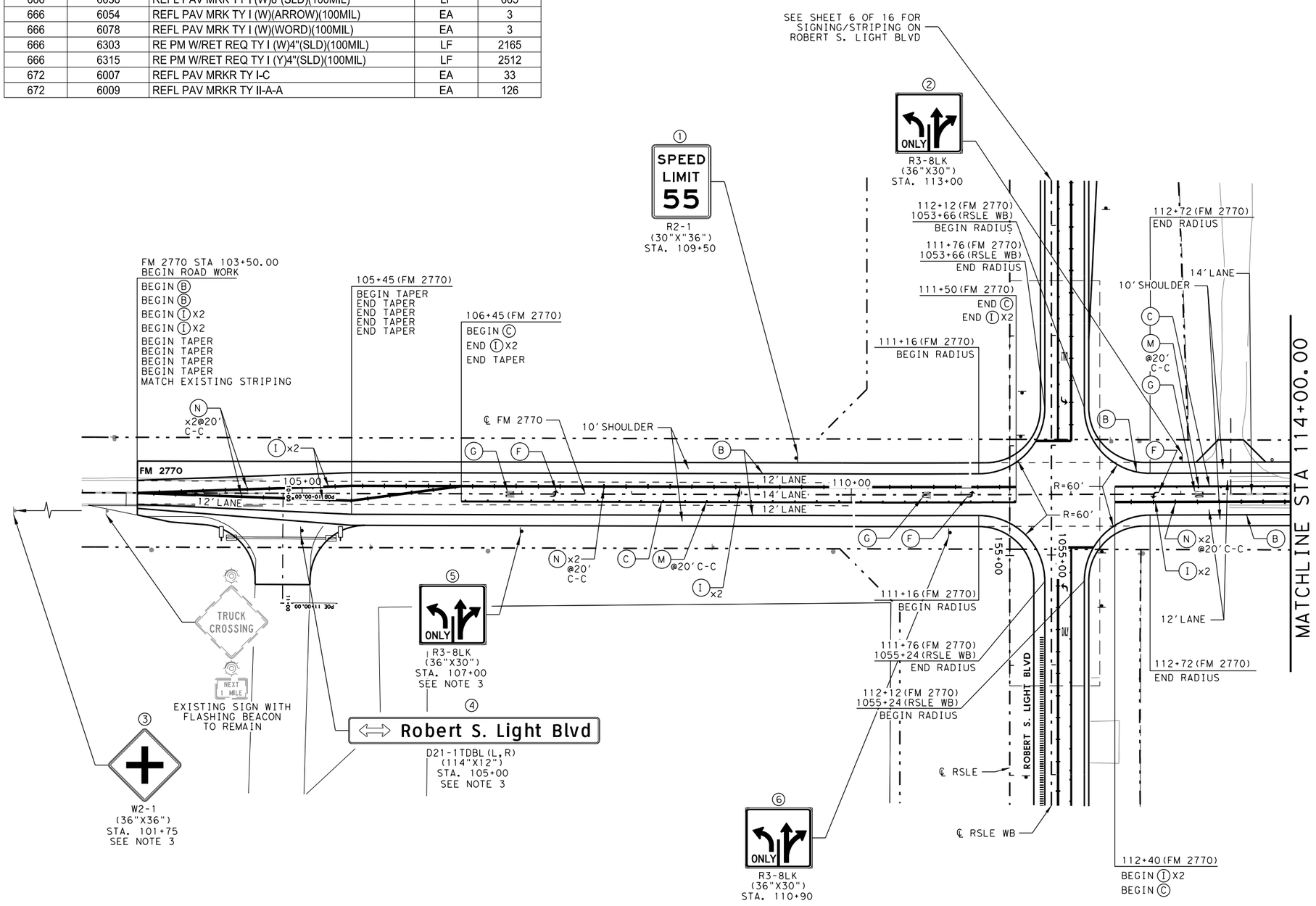
FILE: Signing and Striping Sheet 11

PAVEMENT MARKING QUANTITIES

BID ITEM	DESC CODE	DESCRIPTION	UNIT	QTY
658	6073	INSTL OM ASSM (OM-2Y)(WC)GND(BI)	EA	2
666	6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF	665
666	6054	REFL PAV MRK TY I (W)(ARROW)(100MIL)	EA	3
666	6078	REFL PAV MRK TY I (W)(WORD)(100MIL)	EA	3
666	6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	LF	2165
666	6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	LF	2512
672	6007	REFL PAV MRKR TY I-C	EA	33
672	6009	REFL PAV MRKR TY II-A-A	EA	126



LEGEND

- (A) REFL PAV MRK TY I (W) 4" (BRK)(100MIL)
- (B) REFL PAV MRK TY I (W) 4" (SLD)(100MIL)
- (C) REFL PAV MRK TY I (W) 8" (SLD)(100MIL)
- (D) REFL PAV MRK TY I (W) 8" (LNDP)(100MIL)
- (E) REFL PAV MRK TY I (W) 24"(SLD)(100MIL)
- (F) REFL PAV MRK TY I (W) (ARROW)(100MIL)
- (G) REFL PAV MRK TY I (W) (WORD)(100MIL)
- (H) REFL PAV MRK TY I (Y) 4" (BRK)(100MIL)
- (I) REFL PAV MRK TY I (Y) 4" (SLD)(100MIL)
- (J) PROF PAV MRK TY I W/ TY II (W) 4" (SLD)
- (K) PREFAB PAV MRK CONTRAST (Y) 4" (BRK)
- (L) PREFAB PAV MRK CONTRAST (Y) 4" (SLD)
- (M) REFL PAV MRKR TY I-C
- (N) REFL PAV MRKR TY II-A-A
- (O) REFL PAV MRK TY I (W) (TWLTARROW)(100MIL)
- (#) PROPOSED SIGN CALLOUTS
- RIGHT OF WAY
- EXISTING SIGNS
- PROPOSED SIGNS
- (P) EXISTING SIGN REMOVAL
- (D-SW) (BRF)CTB(BI)
- (D-SW) SZ 2(WC)(GND)(BI)
- OM-2Y (WC)(GND)(BI)
- OM-3R (TWT)GND
- PAVEMENT MARKING REMOVAL
- RUMBLE STRIPS

NORTH

0 50 100 150 200

SCALE IN FEET

NOTES

1. INSTALL ALL PAVEMENT MARKINGS AS PER TXDOT STANDARD DETAILS.
2. INSTALL ALL SIGNS AS PER TXDOT STANDARD DETAILS.
3. ADJUST SIGN LOCATION AS NEEDED TO MAINTAIN 200' SPACING FROM ALL OTHER SIGNS AND TO AVOID DRIVEWAYS.

STATE OF TEXAS
TIMOTHY GRIMES
100107
LICENSED PROFESSIONAL ENGINEER

11/19/2020

HAYS COUNTY TEXAS

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Texas Registered Engineering Firm F-754

Texas Department of Transportation

ROBERT S. LIGHT EXTENSION

FM 2770 SIGNING AND STRIPING LAYOUT BEGIN TO STA 114+00

SCALE: 1"=100'

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
TG	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
SF	TEXAS	AUS	HAYS	336
CHECK	CONTROL	SECTION	JOB	
PF	0914	33	068,ETC	
CHECK				
BP				

PLOT DRIVER: TXDOT_PDF_BW - 11x17.plt PENTABLE: 000000000214615
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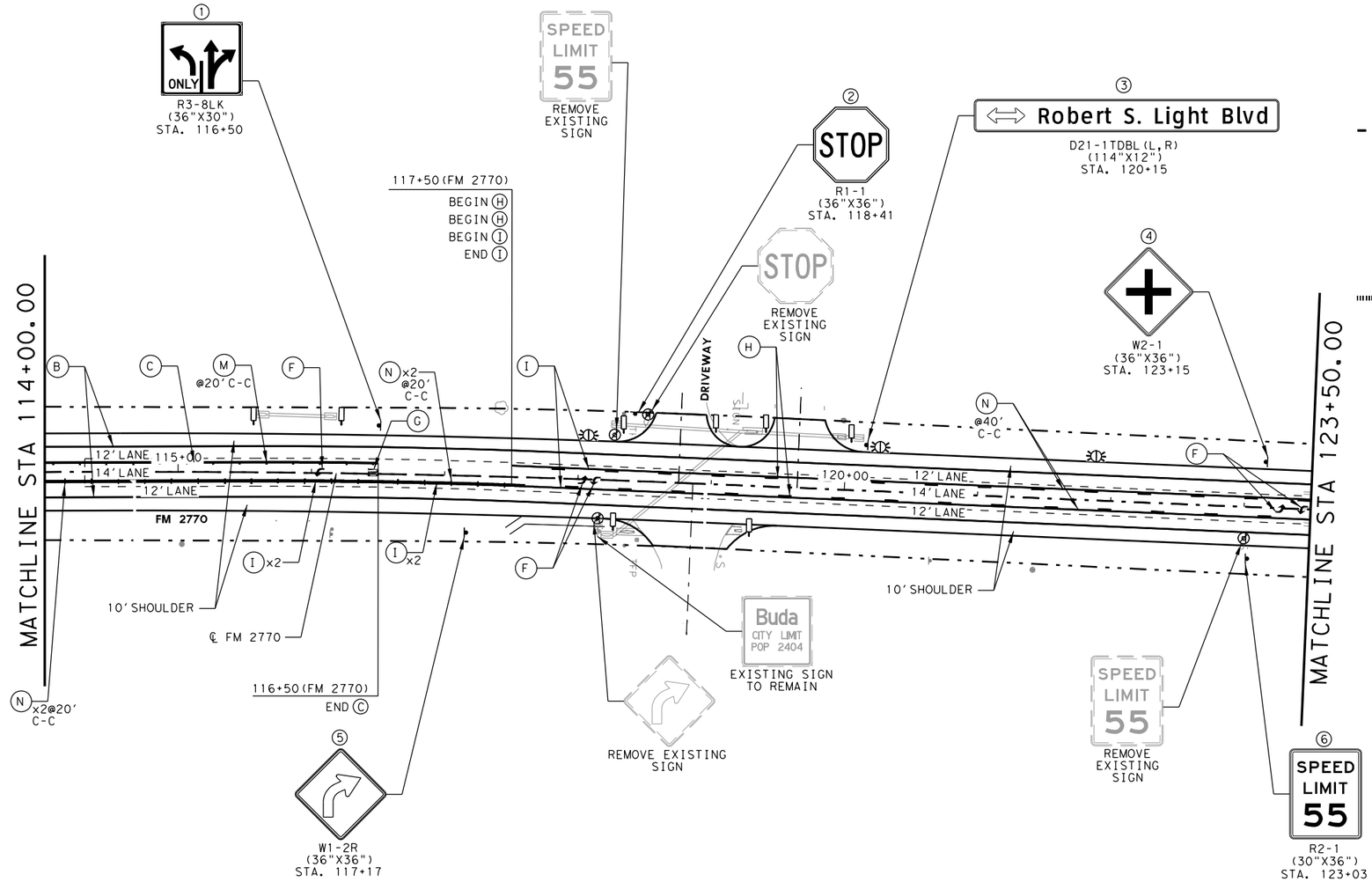

LEGEND

- (A) REFL PAV MRK TY I (W) 4" (BRK)(100MIL)
- (B) REFL PAV MRK TY I (W) 4" (SLD)(100MIL)
- (C) REFL PAV MRK TY I (W) 8" (SLD)(100MIL)
- (D) REFL PAV MRK TY I (W) 8" (LNDP)(100MIL)
- (E) REFL PAV MRK TY I (W) 24"(SLD)(100MIL)
- (F) REFL PAV MRK TY I (W) (ARROW)(100MIL)
- (G) REFL PAV MRK TY I (W) (WORD)(100MIL)
- (H) REFL PAV MRK TY I (Y) 4" (BRK)(100MIL)
- (I) REFL PAV MRK TY I (Y) 4" (SLD)(100MIL)
- (J) PROF PAV MRK TY I W/ TY II (W) 4" (SLD)
- (K) PREFAB PAV MRK CONTRAST (Y) 4" (BRK)
- (L) PREFAB PAV MRK CONTRAST (Y) 4" (SLD)
- (M) REFL PAV MRKR TY I-C
- (N) REFL PAV MRKR TY II-A-A
- (O) REFL PAV MRK TY I (W) (TWLTARROW)(100MIL)
- (#) PROPOSED SIGN CALLOUTS
- RIGHT OF WAY
- EXISTING SIGNS
- PROPOSED SIGNS
- (P) EXISTING SIGN REMOVAL
- (D-SW) (BRF)CTB(BI)
- (D-SW) SZ 2(WC)(GND)(BI)
- OM-2Y (WC)(GND)(BI)
- OM-3R (TWT)GND
- PAVEMENT MARKING REMOVAL
- RUMBLE STRIPS

NORTH

0 50 100 150 200

SCALE IN FEET

PAVEMENT MARKING QUANTITIES

BID ITEM	DESC CODE	DESCRIPTION	UNIT	QTY
644	6076	REMOVE SM RD SN SUP&AM	EA	4
658	6011	INSTL DEL ASSM (D-SW)SZ 2(WC)GND(BI)	EA	3
658	6073	INSTL OM ASSM (OM-2Y)(WC)GND(BI)	EA	8
666	6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF	250
666	6054	REFL PAV MRK TY I (W)(ARROW)(100MIL)	EA	5
666	6078	REFL PAV MRK TY I (W)(WORD)(100MIL)	EA	1
666	6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	LF	1900
666	6312	RE PM W/RET REQ TY I (Y)4"(BRK)(100MIL)	LF	300
666	6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	LF	1900
672	6007	REFL PAV MRKR TY I-C	EA	13
672	6009	REFL PAV MRKR TY II-A-A	EA	66

NOTES

1. INSTALL ALL PAVEMENT MARKINGS AS PER TXDOT STANDARD DETAILS.
2. INSTALL ALL SIGNS AS PER TXDOT STANDARD DETAILS.

STATE OF TEXAS
TIMOTHY GRIMES
100107
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11/19/2020

HAYS COUNTY TEXAS

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Texas Registered Engineering Firm F-754

Texas Department of Transportation

ROBERT S. LIGHT EXTENSION
FM 2770
SIGNING AND STRIPING LAYOUT
STA 114+00 TO STA 123+50

SCALE: 1"=100' SHEET 2 OF 3

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
TG	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
SF	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	337
PF	0914	33	068,ETC	
CHECK				
BP				

PLOT DRIVER: TXDOT_PDF_BW - IlxIT.plt PENTABLE: 000000000246I5
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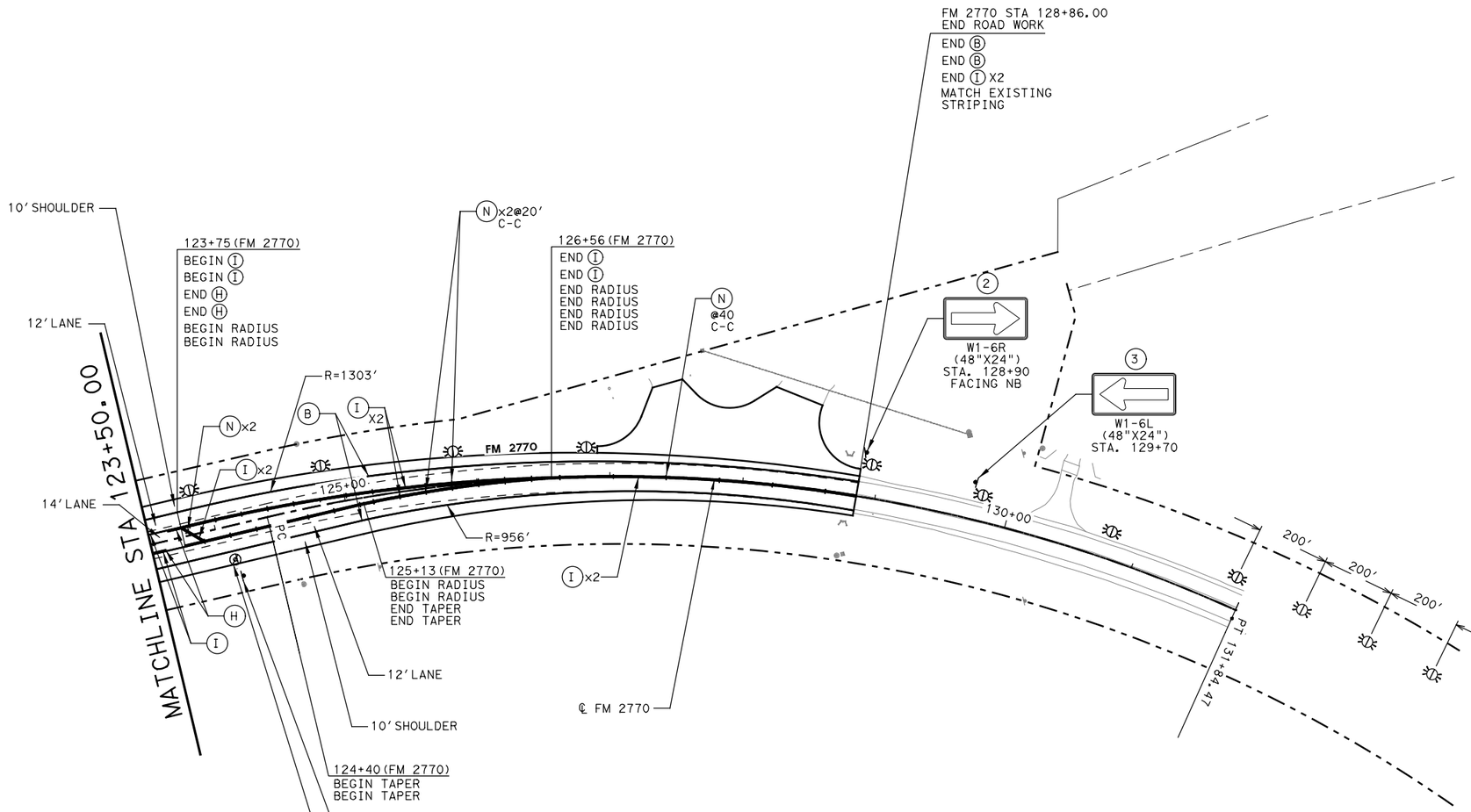
FILE: Signing and Striping Sheet 13



LEGEND

- (A) REFL PAV MRK TY I (W) 4" (BRK)(100MIL)
- (B) REFL PAV MRK TY I (W) 4" (SLD)(100MIL)
- (C) REFL PAV MRK TY I (W) 8" (SLD)(100MIL)
- (D) REFL PAV MRK TY I (W) 8" (LNDP)(100MIL)
- (E) REFL PAV MRK TY I (W) 24"(SLD)(100MIL)
- (F) REFL PAV MRK TY I (W) (ARROW)(100MIL)
- (G) REFL PAV MRK TY I (W) (WORD)(100MIL)
- (H) REFL PAV MRK TY I (Y) 4" (BRK)(100MIL)
- (I) REFL PAV MRK TY I (Y) 4" (SLD)(100MIL)
- (J) PROF PAV MRK TY I W/ TY II (W) 4" (SLD)
- (K) PREFAB PAV MRK CONTRAST (Y) 4" (BRK)
- (L) PREFAB PAV MRK CONTRAST (Y) 4" (SLD)
- (M) REFL PAV MRKR TY I-C
- (N) REFL PAV MRKR TY II-A-A
- (O) REFL PAV MRK TY I (W) (TWLTARROW)(100MIL)
- (#) PROPOSED SIGN CALLOUTS
- RIGHT OF WAY
- EXISTING SIGNS
- PROPOSED SIGNS
- (P) EXISTING SIGN REMOVAL
- (D-SW) (BRF)CTB(BI)
- (D-SW) SZ 2(WC)(GND)(BI)
- OM-2Y (WC)(GND)(BI)
- OM-3R (TWT)GND
- PAVEMENT MARKING REMOVAL
- RUMBLE STRIPS

NORTH

0 50 100 150 200

SCALE IN FEET

NOTES

1. INSTALL ALL PAVEMENT MARKINGS AS PER TXDOT STANDARD DETAILS.
2. INSTALL ALL SIGNS AS PER TXDOT STANDARD DETAILS.

PAVEMENT MARKING QUANTITIES

BID ITEM	DESC CODE	DESCRIPTION	UNIT	QTY
644	6076	REMOVE SM RD SN SUP&AM	EA	1
658	6011	INSTL DEL ASSM (D-SW)SZ 2(WC)GND(BI)	EA	11
666	6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	LF	1072
666	6312	RE PM W/RET REQ TY I (Y)4"(BRK)(100MIL)	LF	20
666	6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	LF	1680
672	6009	REFL PAV MRKR TY II-A-A	EA	62

STATE OF TEXAS
TIMOTHY GRIMES
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LICENSED PROFESSIONAL ENGINEER

11/19/2020

HAYS COUNTY TEXAS

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Texas Registered Engineering Firm F-754

Texas Department of Transportation
(R) 2020

ROBERT S. LIGHT EXTENSION
FM 2770
SIGNING AND STRIPING LAYOUT
STA 123+50 TO END

SCALE: 1"=100′ SHEET 3 OF 3

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
TG	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
SF	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	338
PF	0914	33	068,ETC	
CHECK				
BP				

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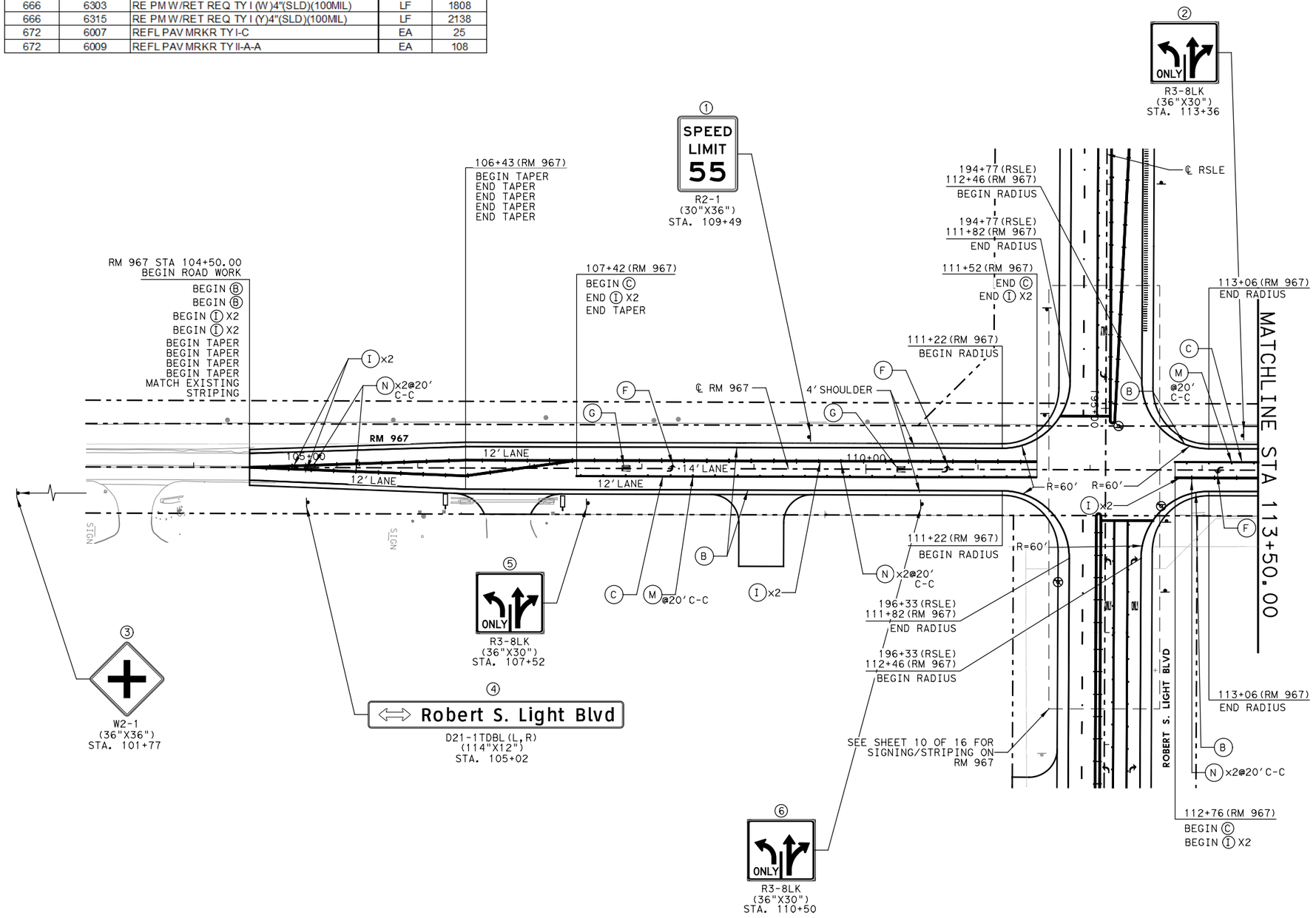
USER: KBERGER DATE: 11/19/2020
FILE: RSLE-SS014.dgn
PENTABLE: 000000002f4615.tbl
TIME: 12:47:24 PM SCALE: 1:100

PAVEMENT MARKING QUANTITIES

BID ITEM	DESC CODE	DESCRIPTION	UNIT	QTY
658	6073	INSTL OM ASSM (OM-2Y)(WC)GND(BI)	EA	2
666	6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF	484
666	6054	REFL PAV MRK TY I (W)(ARROW)(100MIL)	EA	3
666	6078	REFL PAV MRK TY I (W)(WORD)(100MIL)	EA	2
666	6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	LF	1808
666	6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	LF	2138
672	6007	REFL PAV MRKR TY I-C	EA	25
672	6009	REFL PAV MRKR TY II-A-A	EA	108

LEGEND

- (A) REFL PAV MRK TY I (W) 4" (BRK)(100MIL)
- (B) REFL PAV MRK TY I (W) 4" (SLD)(100MIL)
- (C) REFL PAV MRK TY I (W) 8" (SLD)(100MIL)
- (D) REFL PAV MRK TY I (W) 8" (LNDP)(100MIL)
- (E) REFL PAV MRK TY I (W) 24"(SLD)(100MIL)
- (F) REFL PAV MRK TY I (W) (ARROW)(100MIL)
- (G) REFL PAV MRK TY I (W) (WORD)(100MIL)
- (H) REFL PAV MRK TY I (Y) 4" (BRK)(100MIL)
- (I) REFL PAV MRK TY I (Y) 4" (SLD)(100MIL)
- (J) PROF PAV MRK TY I W/ TY II (W) 4" (SLD)
- (K) PREFAB PAV MRK CONTRAST (Y) 4" (BRK)
- (L) PREFAB PAV MRK CONTRAST (Y) 4" (SLD)
- (M) REFL PAV MRKR TY I-C
- (N) REFL PAV MRKR TY II-A-A
- (O) REFL PAV MRK TY I (W) (TWLTARROW)(100MIL)
- (#) PROPOSED SIGN CALLOUTS
- RIGHT OF WAY
- EXISTING SIGNS
- PROPOSED SIGNS
- (P) EXISTING SIGN REMOVAL
- (D-SW) (BRF)CTB(BI)
- (D-SW) SZ 2(WC)(GND)(BI)
- OM-2Y (WC)(GND)(BI)
- OM-3R (TWT)GND
- PAVEMENT MARKING REMOVAL
- RUMBLE STRIPS



NORTH

0 50 100 150 200

SCALE IN FEET

STATE OF TEXAS
TIMOTHY GRIMES
100107
LICENSED
PROFESSIONAL ENGINEER

11/19/2020

HAYS COUNTY TEXAS

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Texas Registered Engineering Firm F-754

Texas Department of Transportation

(R) 2020

NOTES

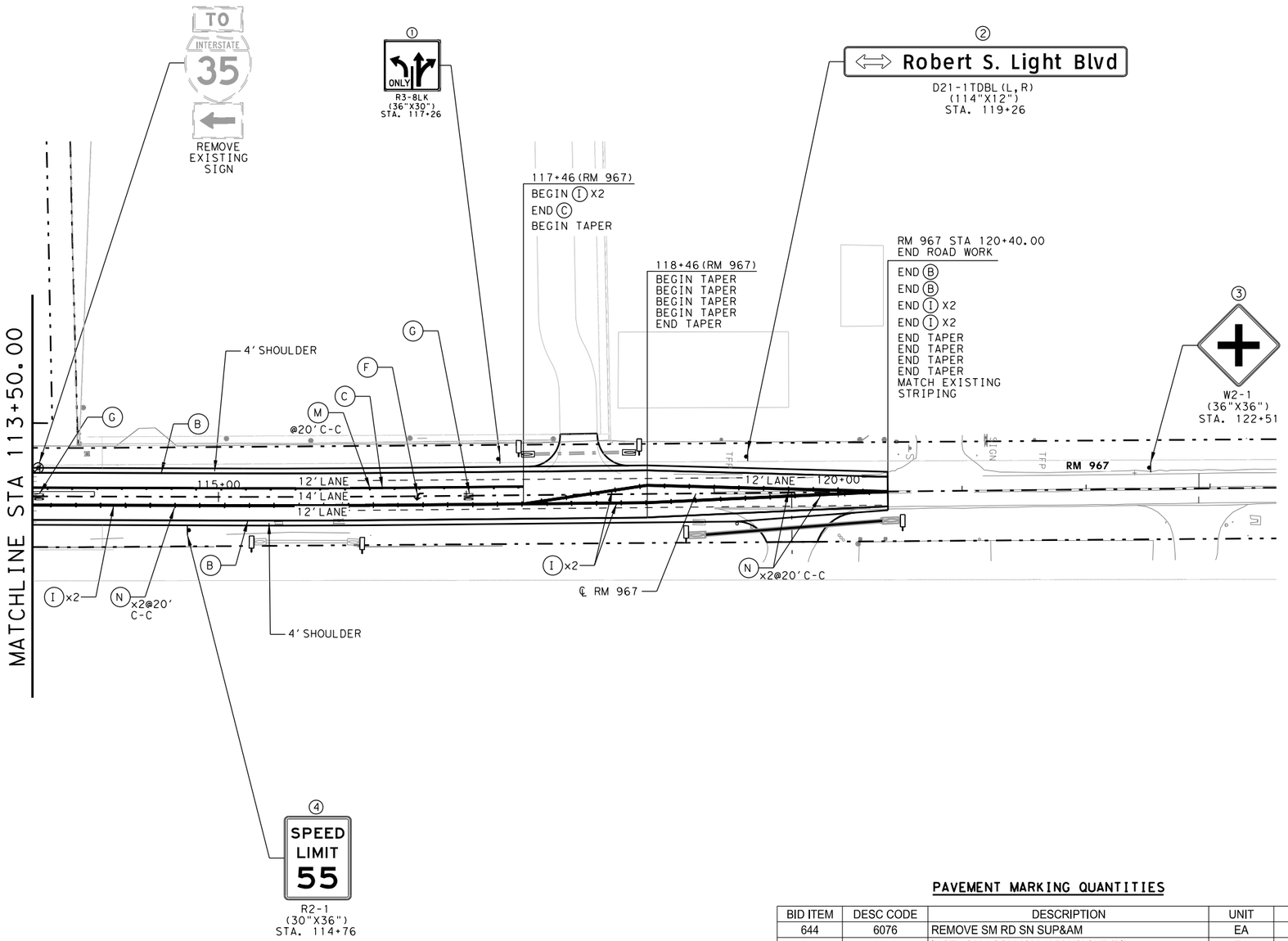
1. INSTALL ALL PAVEMENT MARKINGS AS PER TXDOT STANDARD DETAILS.
2. INSTALL ALL SIGNS AS PER TXDOT STANDARD DETAILS.

ROBERT S. LIGHT EXTENSION
RM 967
SIGNING AND STRIPING LAYOUT
BEGIN TO STA 113+50

SCALE: 1"=100' SHEET 1 OF 2

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
TG	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
SF	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	339
PF	0914	33	068,ETC	
CHECK				
BP				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
USER: KBERGER DATE: 11/19/2020
FILE: RSLE-SSD15.dgn
PENTABLE: 000000000246I5.tbl
TIME: 12:47:27 PM SCALE: 1:00



LEGEND

- (A) REFL PAV MRK TY I (W) 4" (BRK)(100MIL)
- (B) REFL PAV MRK TY I (W) 4" (SLD)(100MIL)
- (C) REFL PAV MRK TY I (W) 8" (SLD)(100MIL)
- (D) REFL PAV MRK TY I (W) 8" (LNDP)(100MIL)
- (E) REFL PAV MRK TY I (W) 24"(SLD)(100MIL)
- (F) REFL PAV MRK TY I (W) (ARROW)(100MIL)
- (G) REFL PAV MRK TY I (W) (WORD)(100MIL)
- (H) REFL PAV MRK TY I (Y) 4" (BRK)(100MIL)
- (I) REFL PAV MRK TY I (Y) 4" (SLD)(100MIL)
- (J) PROF PAV MRK TY I W/ TY II (W) 4" (SLD)
- (K) PREFAB PAV MRK CONTRAST (Y) 4" (BRK)
- (L) PREFAB PAV MRK CONTRAST (Y) 4" (SLD)
- (M) REFL PAV MRKR TY I-C
- (N) REFL PAV MRKR TY II-A-A
- (O) REFL PAV MRK TY I (W) (TWLTARROW)(100MIL)
- (#) PROPOSED SIGN CALLOUTS
- RIGHT OF WAY
- EXISTING SIGNS
- PROPOSED SIGNS
- (R) EXISTING SIGN REMOVAL
- (D-SW) (BRF)CTB(BI)
- (D-SW) SZ 2(WC)(GND)(BI)
- OM-2Y (WC)(GND)(BI)
- OM-3R (TWT)GND
- PAVEMENT MARKING REMOVAL
- RUMBLE STRIPS

NORTH

0 50 100 150 200

SCALE IN FEET

PAVEMENT MARKING QUANTITIES

BID ITEM	DESC CODE	DESCRIPTION	UNIT	QTY
644	6076	REMOVE SM RD SN SUP&AM	EA	1
658	6073	INSTL OM ASSM (OM-2Y)(WC)GND(BI)	EA	6
666	6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF	396
666	6054	REFL PAV MRK TY I (W)(ARROW)(100MIL)	EA	1
666	6078	REFL PAV MRK TY I (W)(WORD)(100MIL)	EA	2
666	6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	LF	1380
666	6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	LF	1970
672	6007	REFL PAV MRKR TY I-C	EA	20
672	6009	REFL PAV MRKR TY II-A-A	EA	100

NOTES

1. INSTALL ALL PAVEMENT MARKINGS AS PER TXDOT STANDARD DETAILS.
2. INSTALL ALL SIGNS AS PER TXDOT STANDARD DETAILS.

STATE OF TEXAS
TIMOTHY GRIMES
100107
LICENSED PROFESSIONAL ENGINEER

11/19/2020

HAYS COUNTY TEXAS

HDR Engineering, Inc.
1290 Wonder World Drive
Building #1, Suite 1230
San Marcos, TX 78666-7969
Texas Registered Engineering Firm F-754

Texas Department of Transportation

ROBERT S. LIGHT EXTENSION

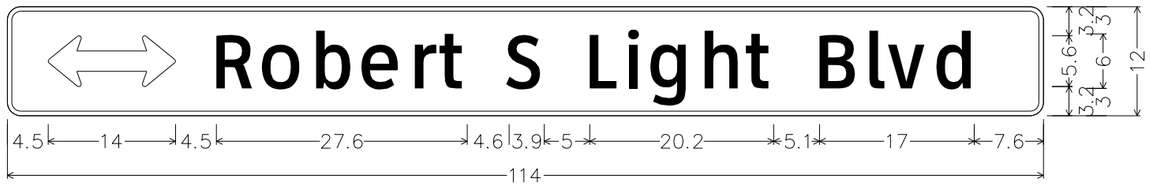
RM 967 SIGNING AND STRIPING LAYOUT STA 113+50 TO END

SCALE: 1"=100' SHEET 2 OF 2

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
TG	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
SF	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	340
PF	0914	33	068,ETC	
CHECK				
BP				

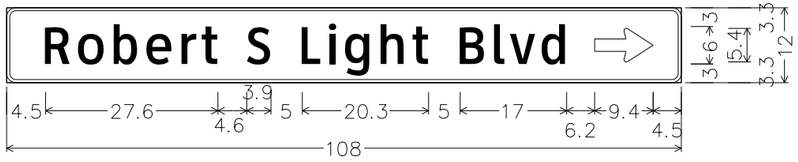
PLOT DRIVER: TXDOT_PDF_BW - 11x17.pit PENTABLE: 000000000214615
USER: SEFITZPA DATE: 11/19/2020 TIME: 3:48:25 PM SCALE: 1:100
FILE: Signing and Striping Sheet 16

SIGN (4) SHEET 1 OF 3
SIGN (3) SHEET 2 OF 3
SIGN (4) SHEET 1 OF 2
SIGN (2) SHEET 2 OF 2



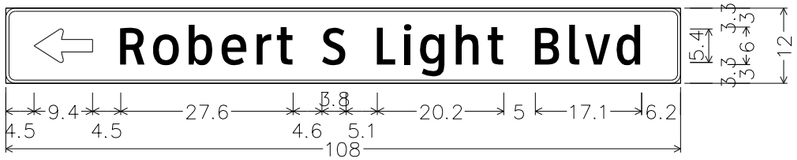
1.5" Radius, 0.5" Border, White on Green;
Double Headed Arrow Custom – 14.0" 0°; [Robert S Light Blvd] ClearviewHwy–3–W;

SIGN (6) SHEET 1 OF 11



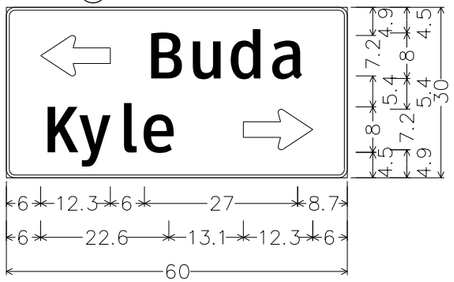
1.5" Radius, 0.5" Border, White on, Green;
"Robert S Light Blvd", ClearviewHwy–3–W;
Standard Arrow Custom 9.4" X 5.4" 0°;

SIGN (1) SHEET 1 OF 11



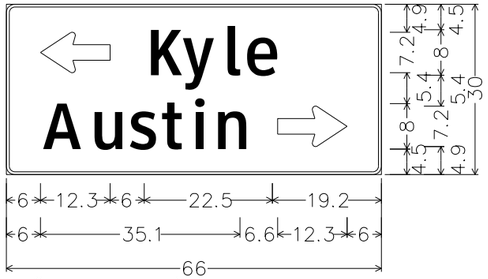
1.5" Radius, 0.5" Border, White on, Green;
Standard Arrow Custom 9.4" X 5.4" 180°;
"Robert S Light Blvd", ClearviewHwy–3–W;

SIGN (4) SHEET 6 OF 11
SIGN (4) SHEET 10 OF 11



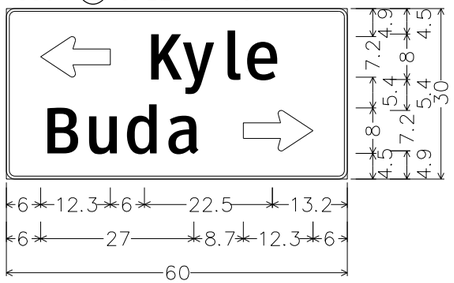
1.9" Radius, 0.8" Border, White on Green;
Standard Arrow Custom 12.3" X 7.1" 180°;
[Buda] ClearviewHwy–3–W;
[Kyle] ClearviewHwy–3–W;
Standard Arrow Custom 12.3" X 7.1" 0°;

SIGN (1) SHEET 2 OF 11



1.9" Radius, 0.8" Border, White on Green;
Standard Arrow Custom 12.3" X 7.1" 180°;
[Kyle] ClearviewHwy–3–W;
[Austin] ClearviewHwy–3–W;
Standard Arrow Custom 12.3" X 7.1" 0°;

SIGN (2) SHEET 7 OF 11
SIGN (2) SHEET 11 OF 11



1.9" Radius, 0.8" Border, White on Green;
Standard Arrow Custom 12.3" X 7.1" 180°;
[Kyle] ClearviewHwy–3–W;
[Buda] ClearviewHwy–3–W;
Standard Arrow Custom 12.3" X 7.1" 0°;

11/19/2020

HDR Engineering, Inc.
1290 Wonder World Drive
Building #1, Suite 1230
San Marcos, TX 78666-7969
Texas Registered Engineering Firm F-754

Texas Department of Transportation
(R) 2020

ROBERT S. LIGHT EXTENSION

SIGN DETAILS

NO SCALE

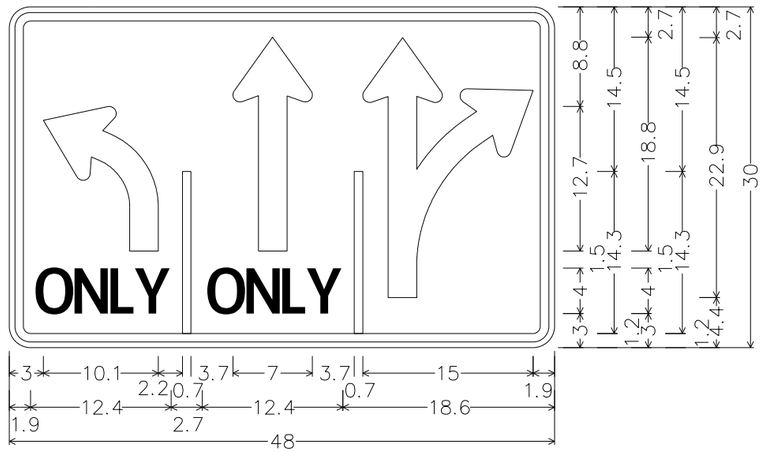
SHEET 1 OF 2

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
TG	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
SF	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	341
PF	0914	33	068,ETC	
CHECK				
BP				

PLOT DRIVER: TXDOT_PDF_BW - ilxl7.plt PENTABLE: 000000000214615
USER: SEFITZPA DATE: 11/19/2020 TIME: 4:45:10 PM SCALE: 1:100
FILE: SIGN DETAILS 1

SIGN (5) SHEET 10 OF 11

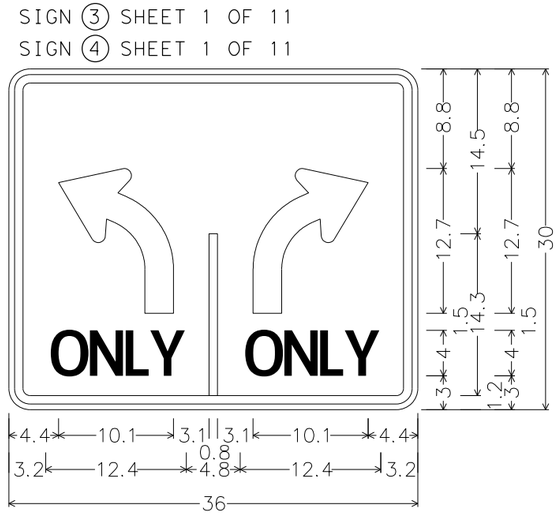
SIGN (5) SHEET 10 OF 11



R3-8LSK_48X30;
1.9" Radius, 0.8" Border, 0.5" Indent, Black on White;
AL ir=4.5, s=2.5; [ONLY] D 50% spacing;
C h=18.875, s=2.5; [ONLY] D 50% spacing;
BR ir=13.25, s=2.5;

SIGN (3) SHEET 1 OF 11

SIGN (4) SHEET 1 OF 11



R3-8LR_36X30;
1.9" Radius, 0.8" Border, 0.5" Indent, Black on White;
AL ir=4.5, s=2.5; [ONLY] D 50% spacing;
AR ir=4.5, s=2.5; [ONLY] D 50% spacing;

STATE OF TEXAS
TIMOTHY GRIMES
100107
LICENSED
PROFESSIONAL ENGINEER

11/19/2020

HAYS COUNTY TEXAS

HDR Engineering, Inc.
1290 Wonder World Drive
Building #1, Suite 1230
San Marcos, TX 78666-7969
Texas Registered Engineering Firm F-754

Texas Department of Transportation
(R) 2020

ROBERT S. LIGHT EXTENSION

SIGN DETAILS

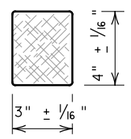
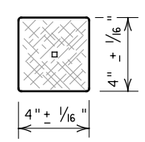
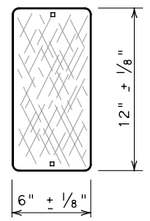
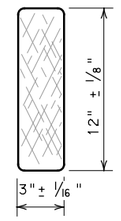
NO SCALE

SHEET 2 OF 2

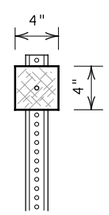
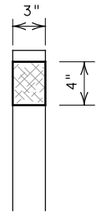
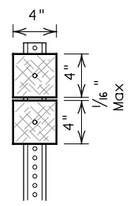
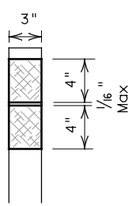
DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
TG	6	STP ( ) RGS		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
SF	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	342
PF	0914	33	068,ETC	
CHECK				
BP				

PLOT DRIVER: TXDOT_PDF_BW - llxlf.plt PENTABLE: 000000002l4615
USER: SEFITZPA DATE: 11/19/2020 TIME: 4:47:33 PM SCALE: 1:00.004
FILE: SIGN DETAILS 2

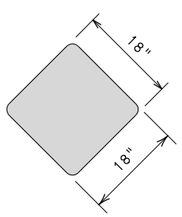
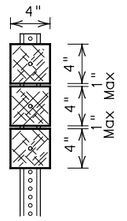
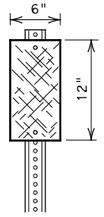
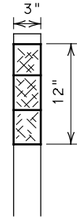
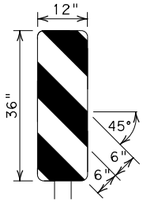
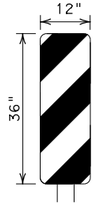
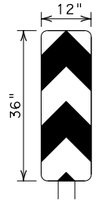
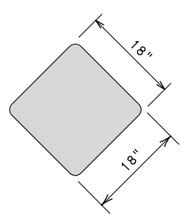
REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

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

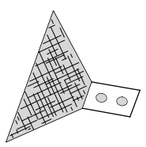
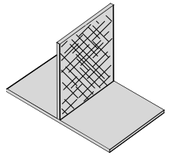
DELINEATORS

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

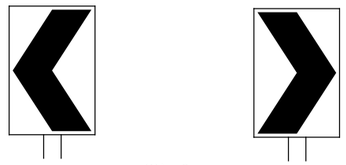
OBJECT MARKERS

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

BARRIER REFLECTORS (BRF)

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

CHEVRONS

DEVICE	 W1-8			
SIZE (W x L)	18"x 24" (Conventional)	24"x 30" (Conventional Oversize)	30"x 36" (Expressway)	36" x 48" (Freeway)
MOUNTING HEIGHT	4′-0" or 7′-0"		7′-0" Only	
NOTE	1. CHEVRON (W1-8) signs and ONE DIRECTION LARGE ARROW (W1-6) Signs shall be installed per Sign Mounting Details (SMD) Standard Sheets and paid under Item 644 (Small Roadside Sign Assemblies). 2. When there is a need to increase conspicuity, the Texas version of the ONE DIRECTION LARGE ARROW sign (W1-9T) may be used instead of the ONE DIRECTION LARGE ARROW (W1-6).			

ONE DIRECTION LARGE ARROW

DEVICE	 W1-6	
SIZE (W x L)	48" x 24" (Conventional)	60" x 30" (Expressway & Freeway)
MOUNTING HEIGHT	7′-0"	

D & OM DESCRIPTIVE CODES

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

NUMBER OF REFLECTORS
S = Single
D = Double

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

REFLECTOR UNIT SIZE
1 or 2

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

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

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

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

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

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

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

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

DIRECTION
If Required
BI = Bi-Directional

DEPARTMENTAL MATERIAL SPECIFICATIONS

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

NOTE:

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

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION

D & OM(1)-20

FILE: dom1-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	33	068,ETC	RSL
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	AUS	HAYS		343

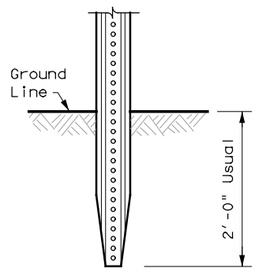
20A

DATE: 11/19/2020 12:47:38 PM
FILE: c:\pwworking\dal\d0685174\dom1-20.dgn

POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

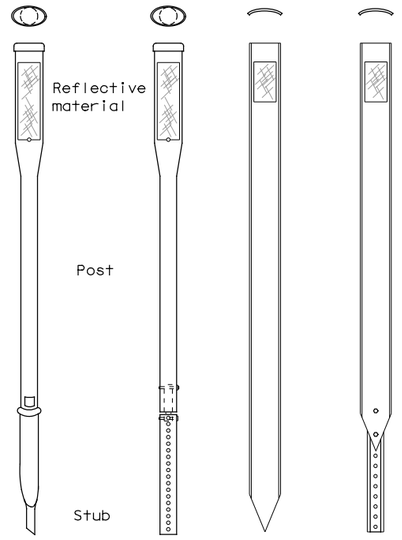


NOTES

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

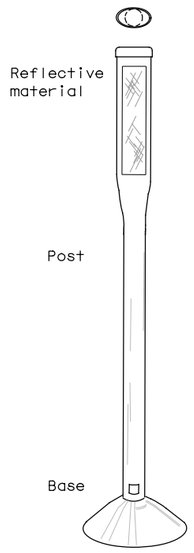
FLEXIBLE POSTS (YFLX, WFLX)

GND



EMBEDDED

SRF



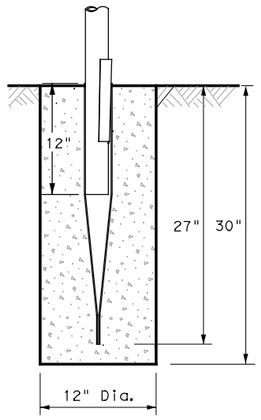
SURFACE MOUNT

NOTES

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

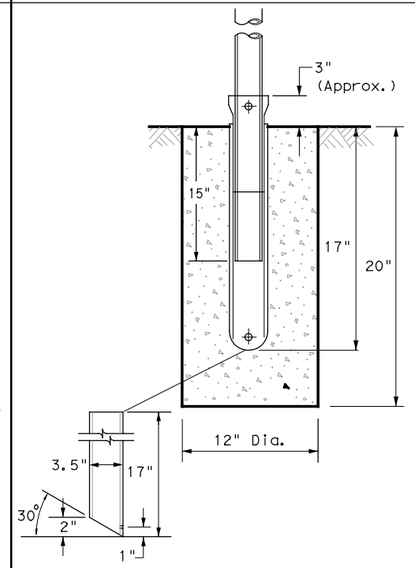
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

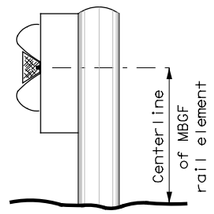
NOTE

1. Install per manufacturer's recommendations.

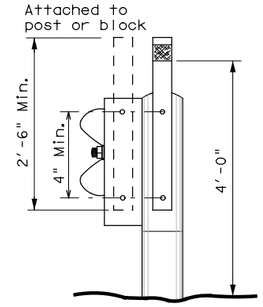
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

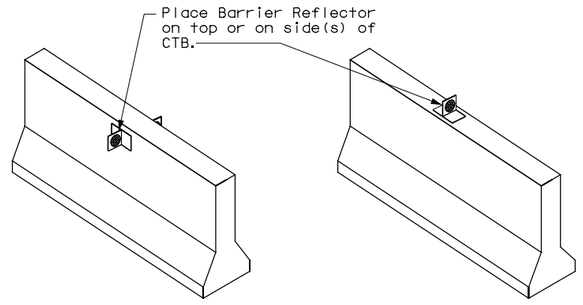
GF1



GF2



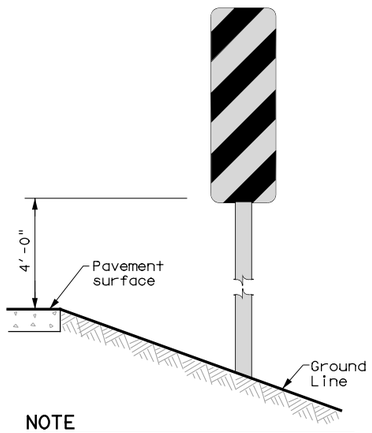
CONCRETE TRAFFIC BARRIER (CTB)



GENERAL NOTES

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

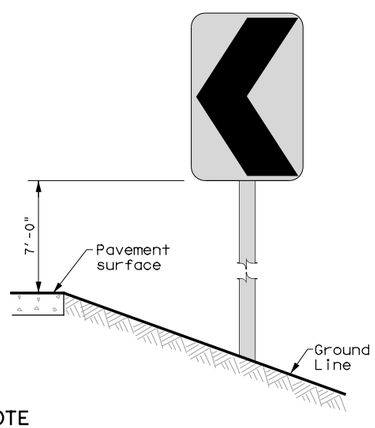
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



NOTE

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

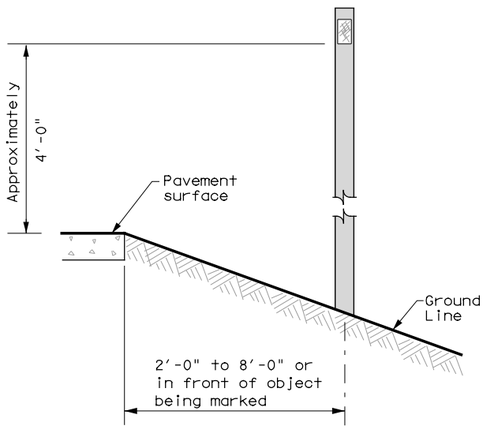
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



NOTE

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

DELINEATORS AND TYPE 2 OBJECT MARKERS



See general notes 1, 2 and 3.

Texas Department of Transportation — Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER INSTALLATION

D & OM(2)-20

FILE: dom2-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	33	068,ETC	RSL
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	AUS	HAYS		344

20B

DATE: 11/19/2020 12:47:39 PM
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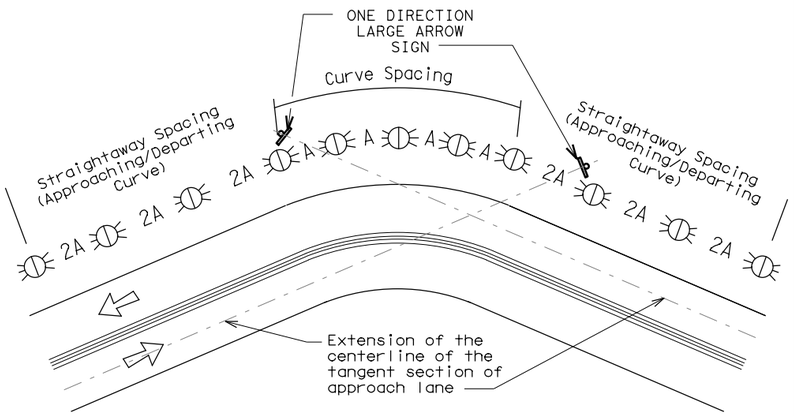
MINIMUM WARNING DEVICES AT CURVES WITH ADVISORY SPEEDS

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

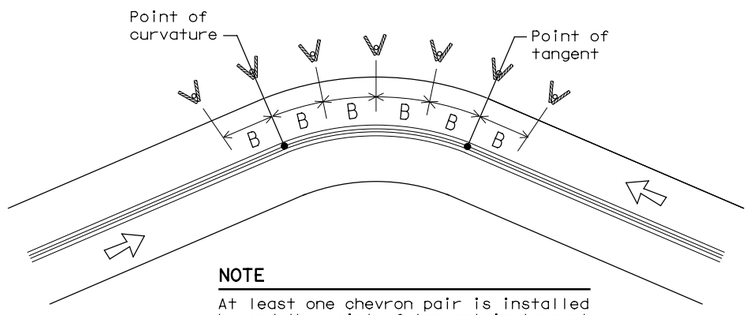
SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



NOTE

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

SUGGESTED SPACING FOR CHEVRONS ON HORIZONTAL CURVES



NOTE

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

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS KNOWN

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

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

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS NOT KNOWN

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

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

DELINEATOR AND OBJECT MARKER APPLICATION AND SPACING

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

NOTES

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

LEGEND	
	Bi-directional Delineator
	Delineator
	Sign

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(3)-20

FILE: dom3-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	33	068,ETC	RSL
3-15 8-15 8-15 7-20	DIST	COUNTY		SHEET NO.
	AUS	HAYS		345

20C

DATE: 11/19/2020 12:47:40 PM
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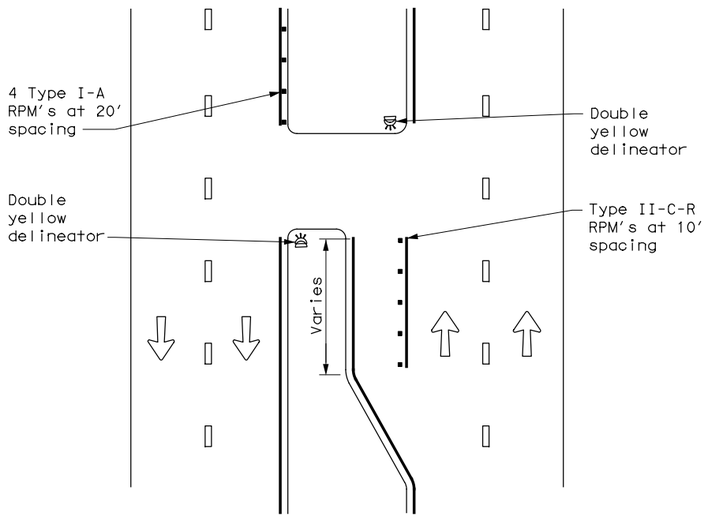
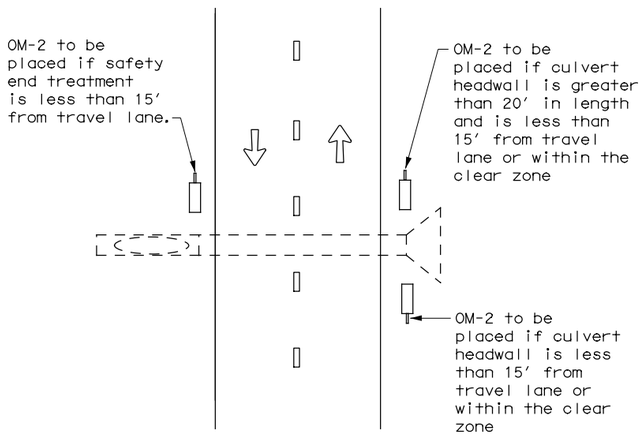
CROSSOVERS



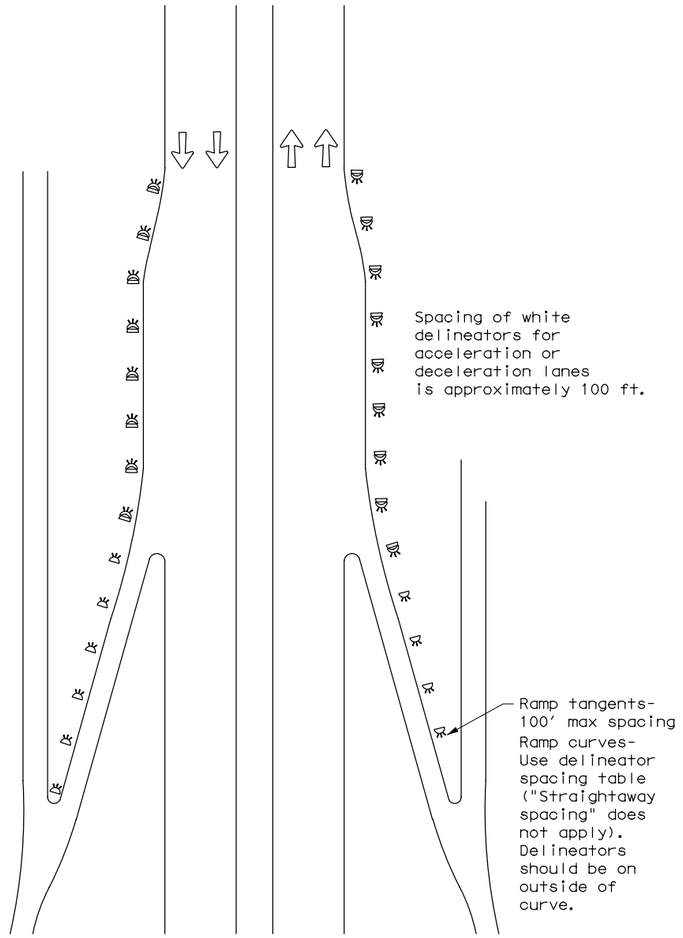
DETAIL 1

FOR CULVERTS WITHOUT MBGF



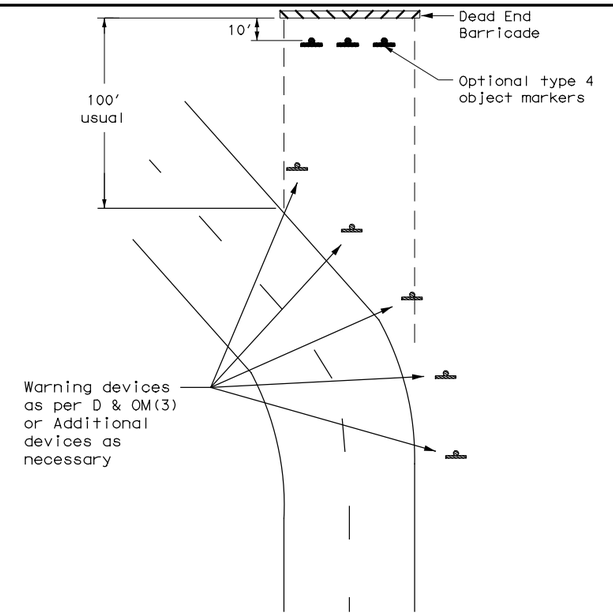
DETAIL 2

FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES



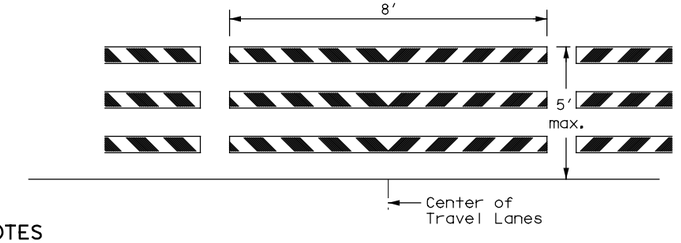
DETAIL 3

TYPICAL APPLICATION OF DEAD END BARRICADE



DETAIL 4

TYPICAL DEAD END BARRICADE INSTALLATION



NOTES

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

DETAIL 5

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

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(4)-20

FILE: dom4-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	33	068,ETC	RSL
3-15 7-20	DIST	COUNTY		SHEET NO.
	AUS	HAYS		346

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DATE: 11/19/2020 12:47:42 PM
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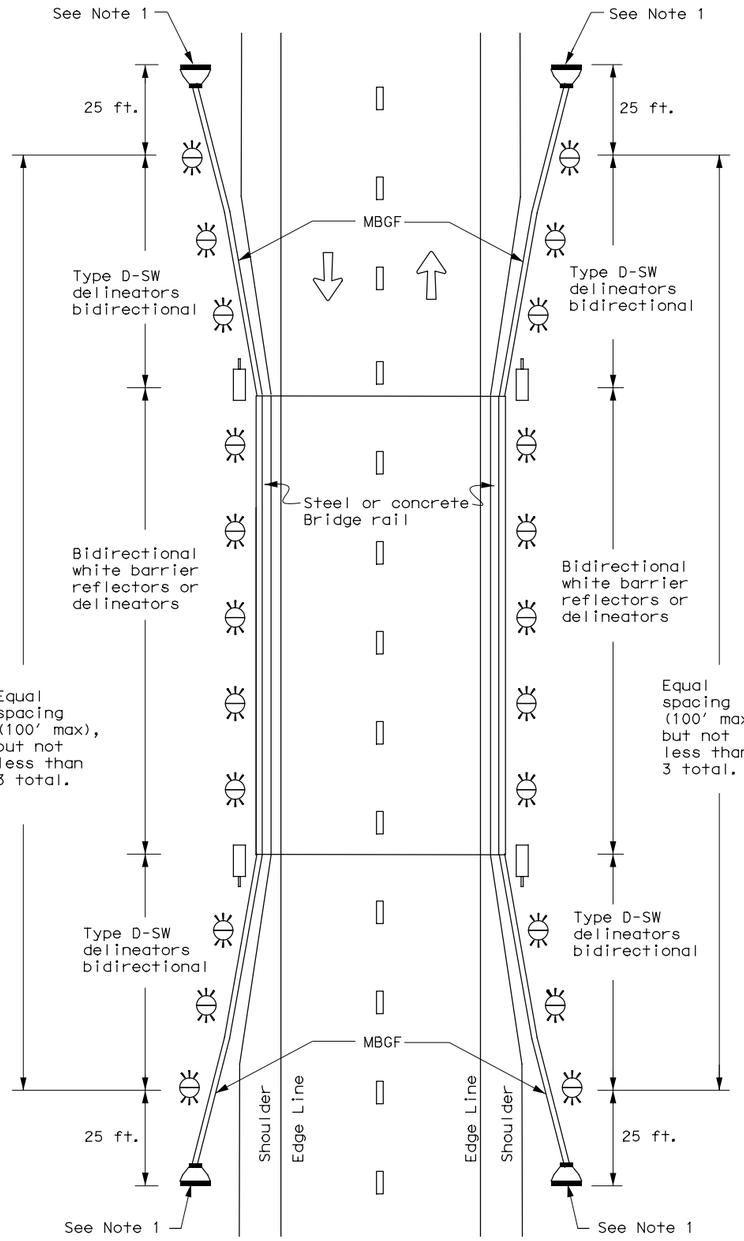
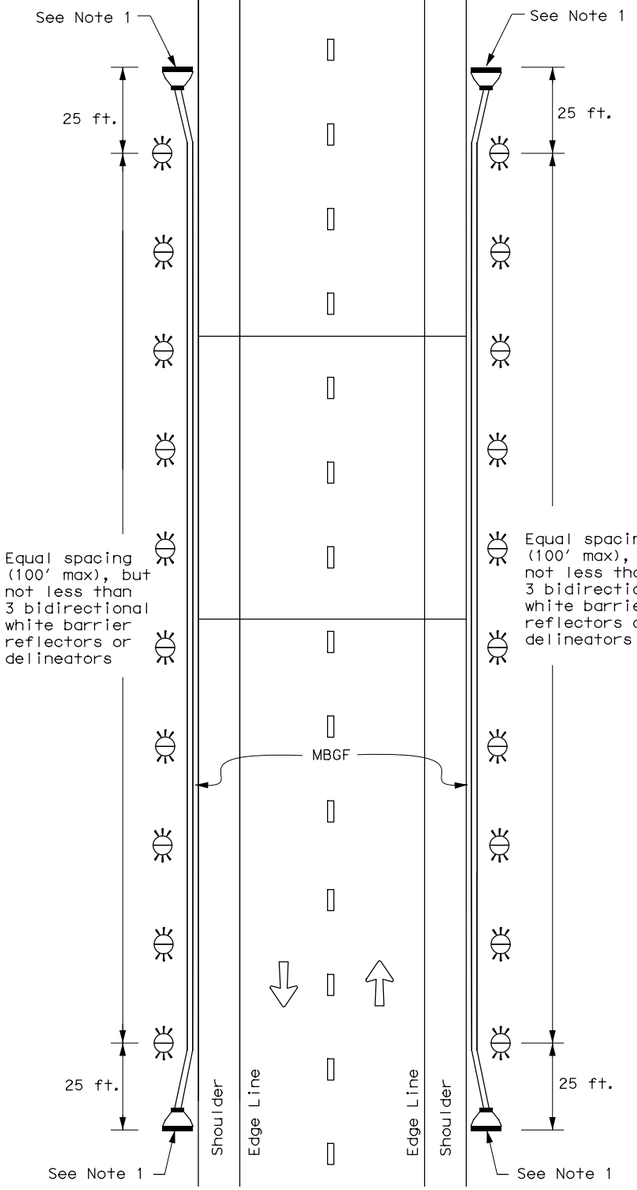
TWO-WAY, TWO LANE ROADWAY WITH REDUCED WIDTH APPROACH RAIL



NOTE:

1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

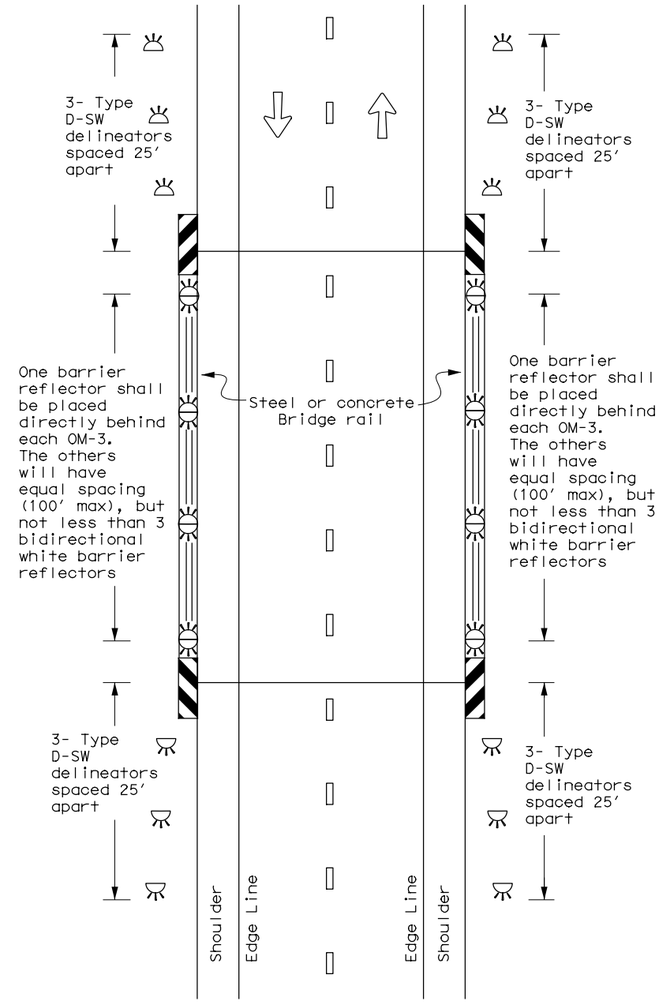
TWO-WAY, TWO LANE ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



NOTE:

1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

TWO-WAY, TWO LANE ROADWAY BRIDGE WITH NO APPROACH RAIL



LEGEND

	Bidirectional Delineator
	Delineator
	OM-3
	OM-2
	Terminal End
	Traffic Flow

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(5)-20

FILE: dom5-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT August 2015	CONT	SECT	JOB	HIGHWAY
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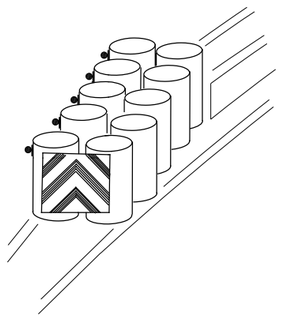
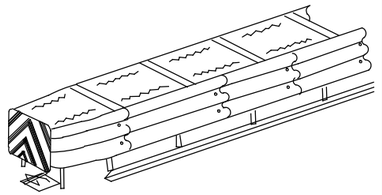
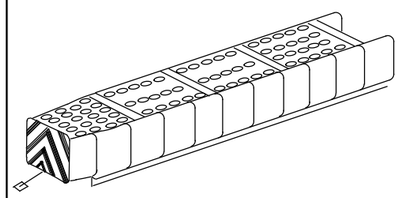
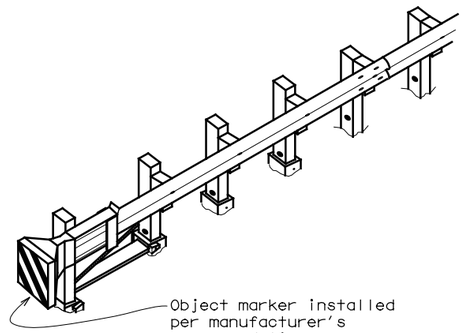
7-20	DIST	COUNTY		SHEET NO.
	AUS	HAYS		347

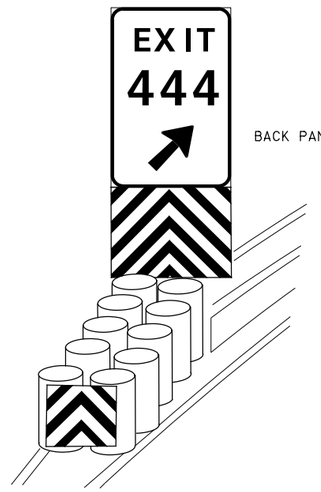
20E

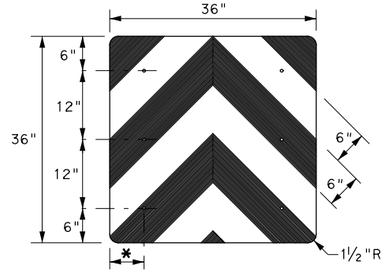


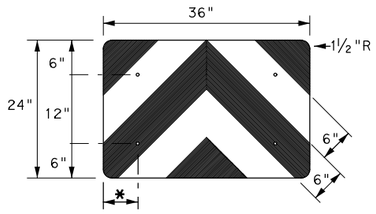




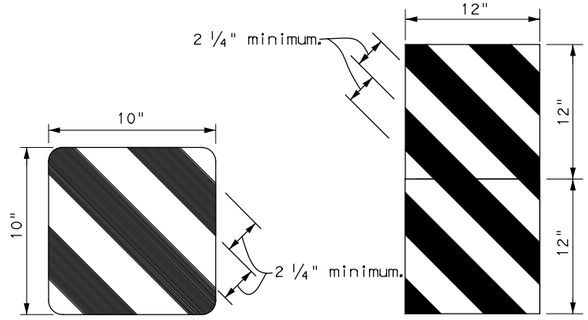




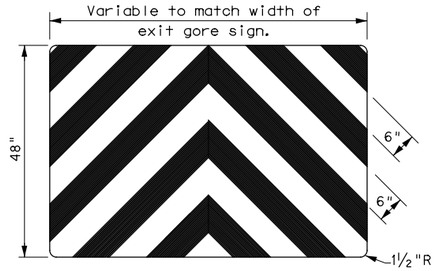


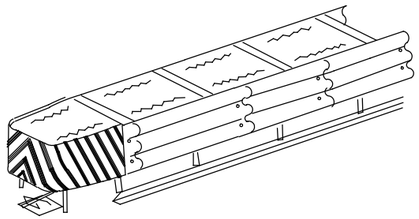


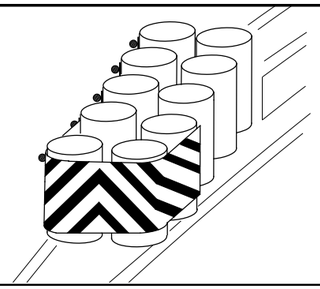
* Adjust to fit attenuator per manufacturer's recommendation, or as directed by the Engineer

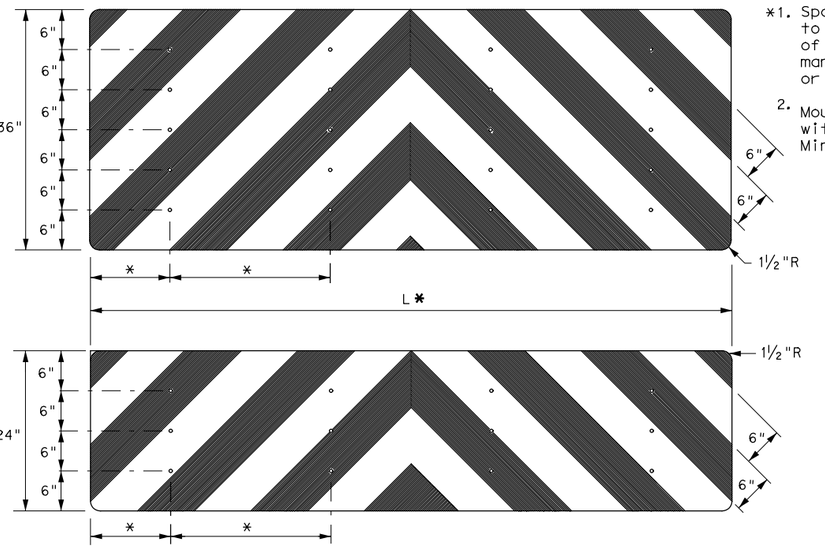


OBJECT MARKERS SMALLER THAN 3 FT^2









NOTES

*1. Spacing should be adjusted to attach through centerline of drum, per attenuator manufacturers recommendation, or as directed by the Engineer.

2. Mounting should be flush with top of attenuator. Minimum size 96" x 24".

NOTES

1. Object Markers shall conform to the Texas MUTCD and meet the color and reflectivity requirement of Department Material Specification DMS 8300. Background shall be yellow reflective sheeting (Type B or C) and Chevron shall be black.

2. Object Markers may be fabricated from adhesive backed reflective sheeting applied directly to guardrail end treatment, or applied directly to an "end cap" as per the manufacturer's recommendation. Direct applied sheeting shall provide a smooth surface and have no wrinkles, air bubbles, cuts or tears. A radius at the corners is not required for direct applied sheeting.

3. Object Marker size may be reduced to fit smaller devices. Width of alternating black and yellow stripes are typically 6". Object Markers smaller than 3ft may have reduced width stripes of a minimum of 2 ¼".

4. Pop rivets, screws, or nuts and bolts may be used to attach object markers and reflectors. Holes, slots or other openings may be cut or drilled through object markers to allow cable or other attachments.

5. Object Marker at nose of attenuator is subsidiary to the attenuator.

6. See D & OM (1-4) for required barrier reflectors.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS

D & OM(VIA)-20

FILE: domvia20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT December 1989	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	33	068,ETC	RSL
4-92 8-04	DIST	COUNTY		SHEET NO.
8-95 3-15	AUS	HAYS		348
4-98 7-20				

20G

DATE: 11/19/2020 12:47:43 PM
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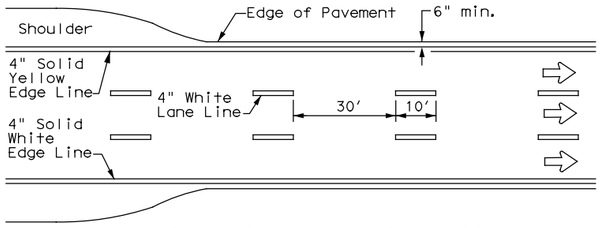
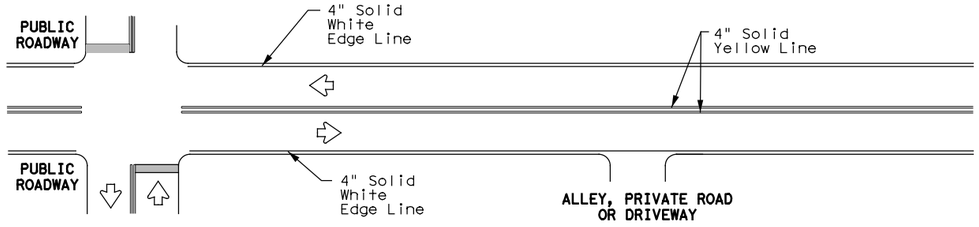
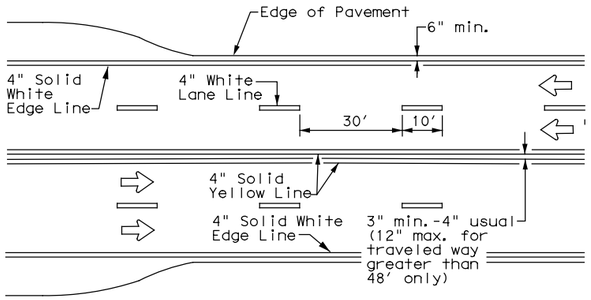


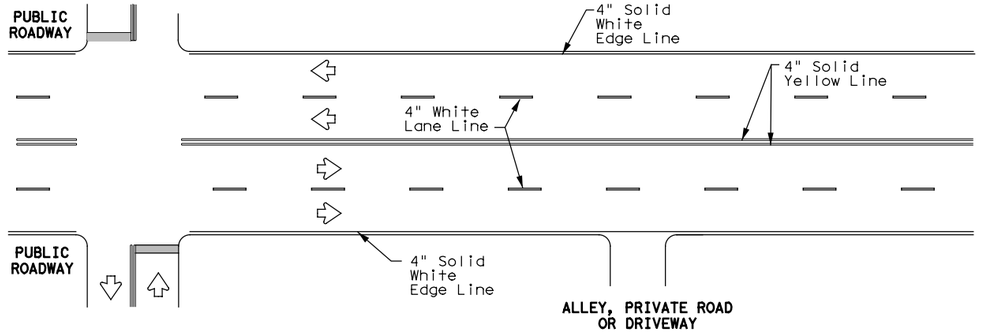
EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



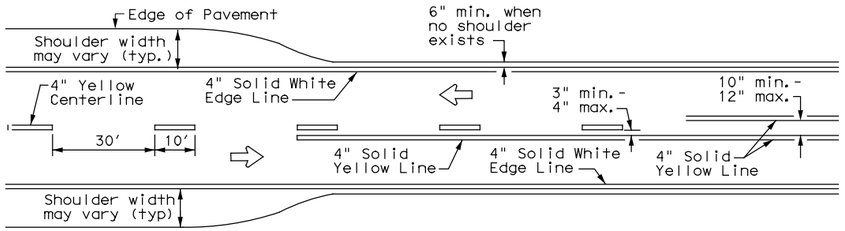
TYPICAL TWO-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



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

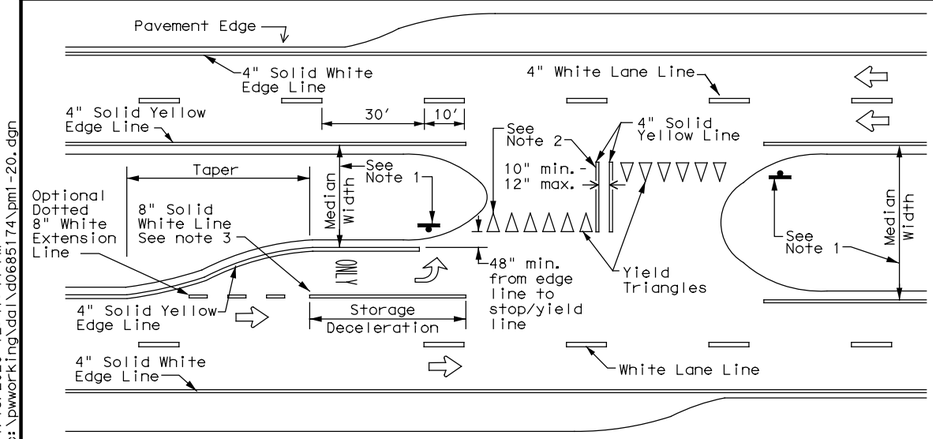


TYPICAL MULTI-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS

YIELD LINES



FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTES

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

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

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

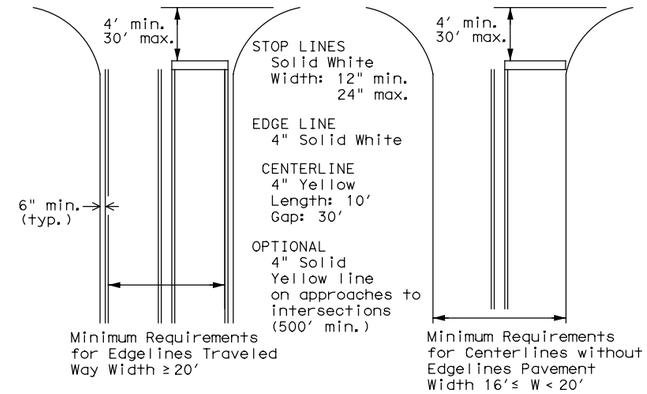
GENERAL NOTES

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

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

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

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



GUIDE FOR PLACEMENT OF STOP LINES, EDGE LINE & CENTERLINE

Based on Traveled Way and Pavement Widths for Undivided Highways

Texas Department of Transportation

Traffic Safety Division Standard

TYPICAL STANDARD PAVEMENT MARKINGS

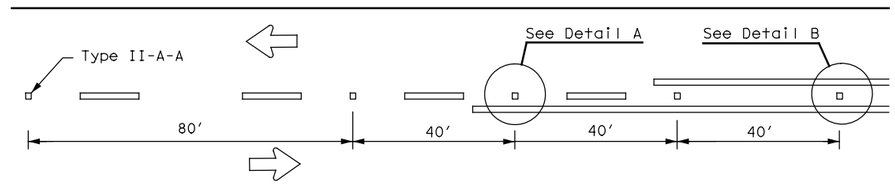
PM(1)-20

FILE: pm1-20.dgn	DN:	CK:	DW:	CK:
©TxDOT November 1978	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03	0914	33	068,ETC	RSL
5-00 2-12	DIST	COUNTY		SHEET NO.
8-00 6-20	AUS	HAYS		349

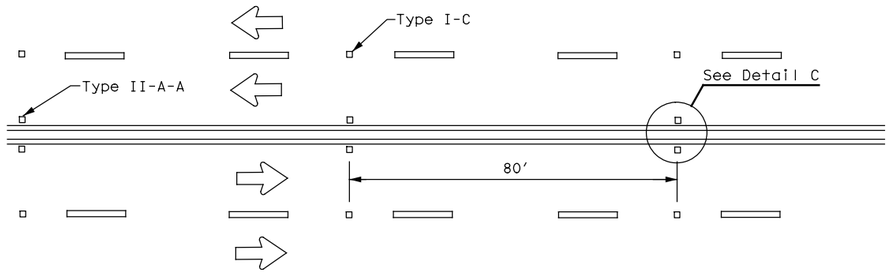
22B

DATE: 11/19/2020 12:47:44 PM
FILE: c:\pwworking\ddi\d0685174\pm1-20.dgn

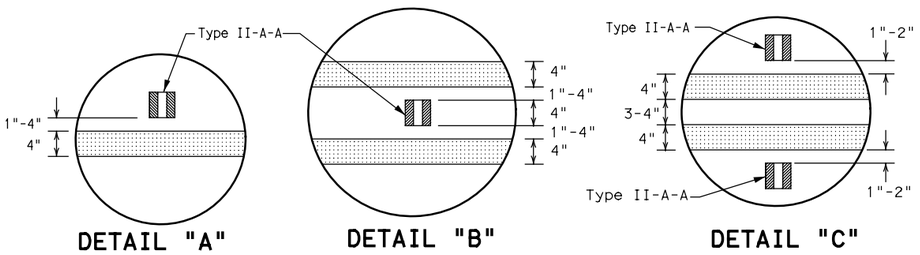
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE



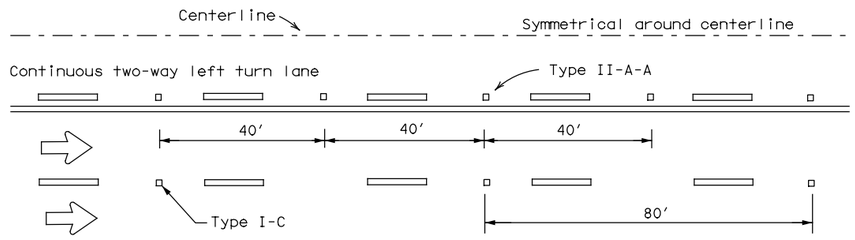
CENTERLINE FOR ALL TWO LANE ROADWAYS



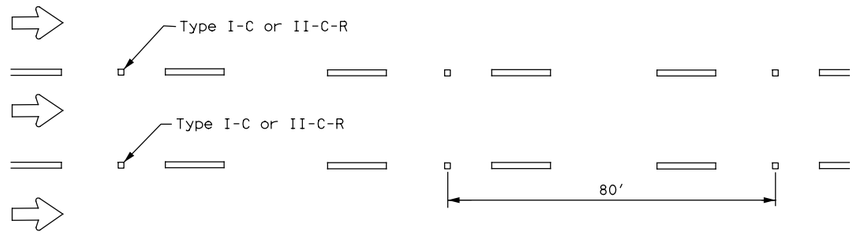
CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY HIGHWAYS



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

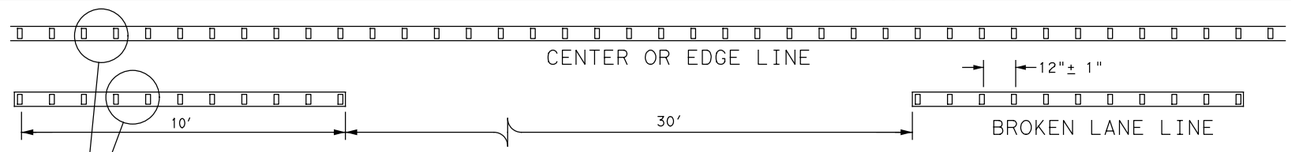


CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



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

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



4" EDGE LINE, CENTER LINE OR LANE LINE

OPTIONAL 6" EDGE LINE, CENTER LINE OR LANE LINE

REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS

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

NOTE

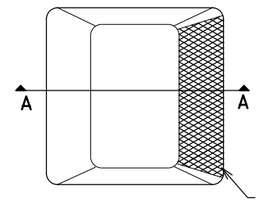
Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

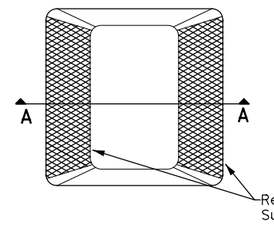
1. All raised pavement markers placed in broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.

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

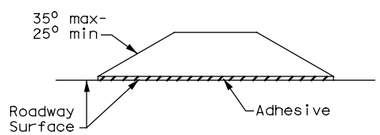
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)



Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS

Texas Department of Transportation

Traffic Safety Division Standard

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

FILE: pm2-20.dgn	DN:	CK:	DW:	CK:
©TxDOT April 1977	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-92 2-10	0914	33	068,ETC	RSL
5-00 2-12	DIST	COUNTY		SHEET NO.
8-00 6-20	AUS	HAYS		350

22B

DATE: 11/19/2020 12:47:45 PM
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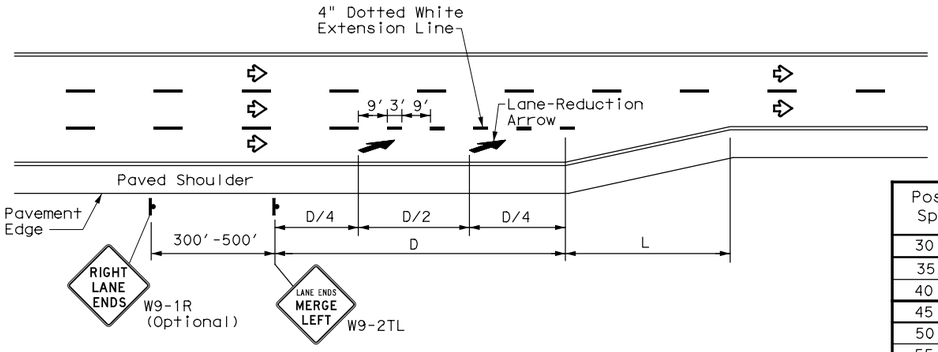
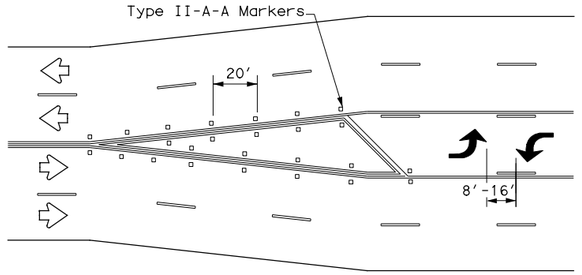


LANE REDUCTION

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

NOTES

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



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

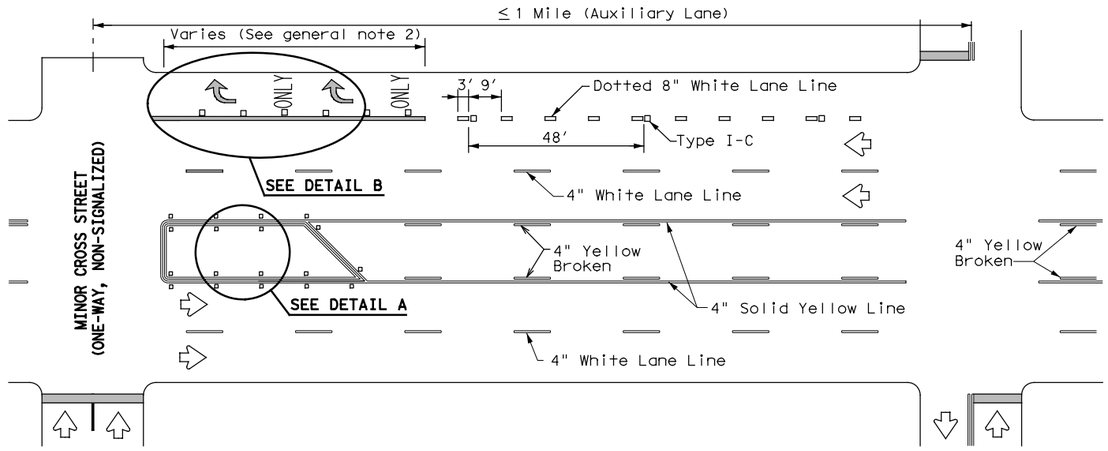
TYPICAL TRANSITION FOR TWLTL AND DIVIDED HIGHWAY

GENERAL NOTES

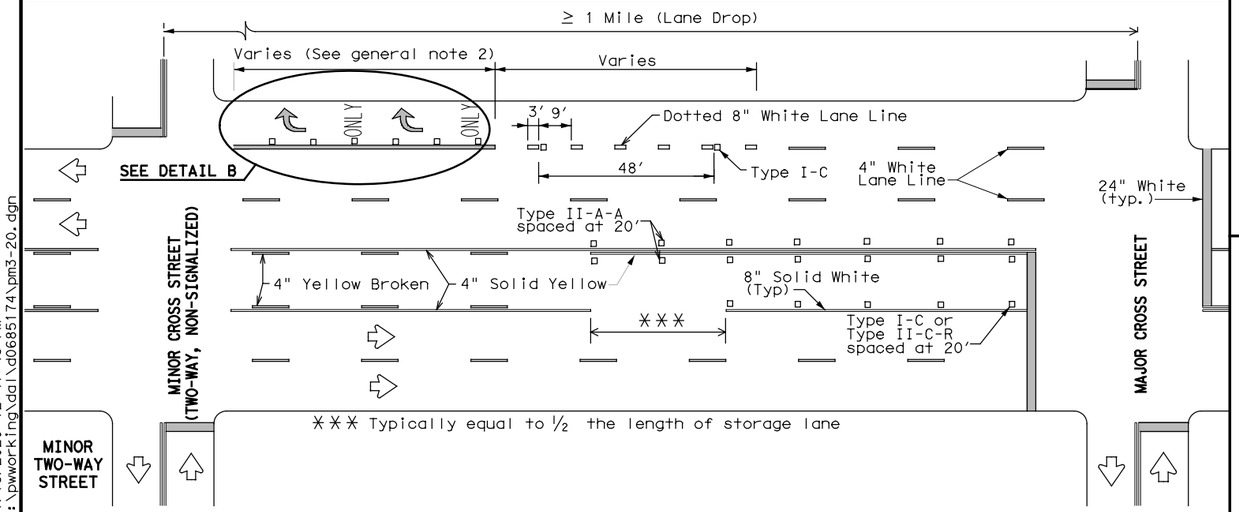
1. Lane use word and arrow markings shall be used where through lanes approaching an intersection become mandatory turn lanes. Lane use word and arrow markings should be used in auxiliary lanes of substantial length. Lane use arrow markings or word and arrow markings may be used in other lanes and turn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

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

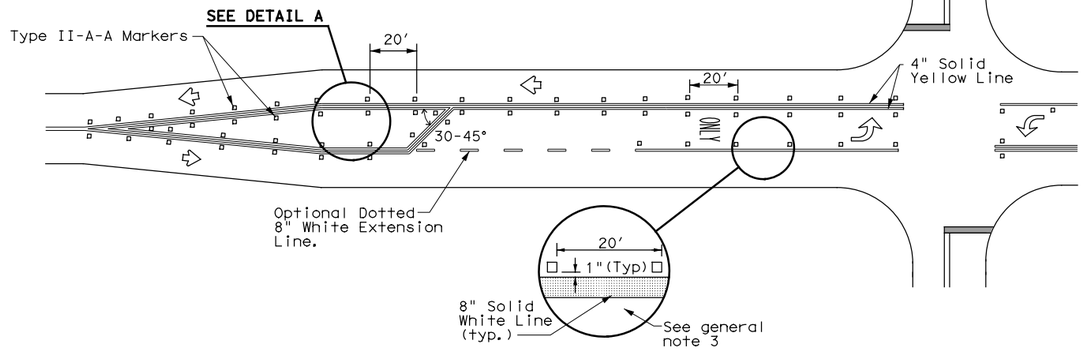
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



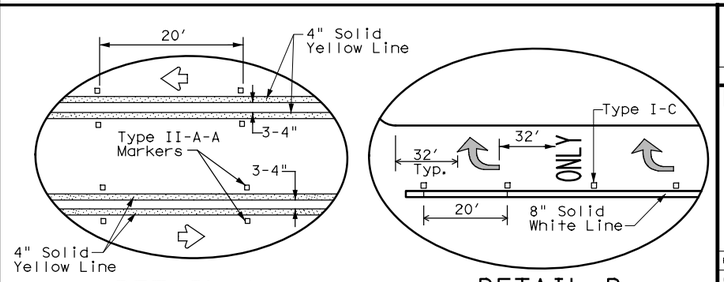
TYPICAL TWLTL AT ONE-WAY STREET AND RIGHT TURN AUXILIARY LANE



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



TYPICAL TWO-LANE HIGHWAY INTERSECTION WITH LEFT TURN BAYS



Texas Department of Transportation — Traffic Safety Division Standard

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

FILE: pm3-20.dgn	DN:	CK:	DW:	CK:
©TxDOT April 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 5-00 2-10 8-00 2-12 3-03 6-20	0914	33	068,ETC	RSL
	DIST	COUNTY		SHEET NO.
	AUS	HAYS		351

22D

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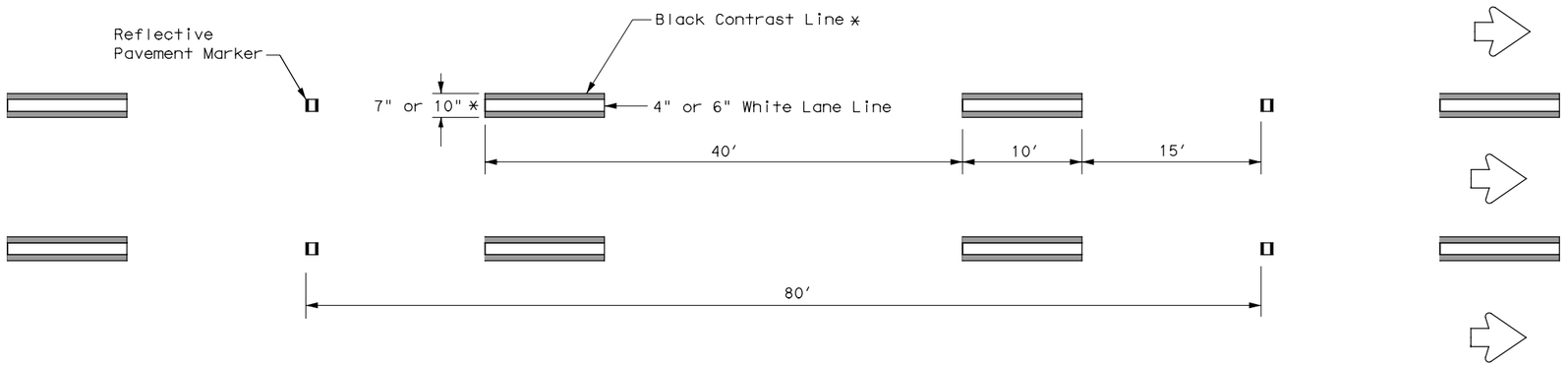


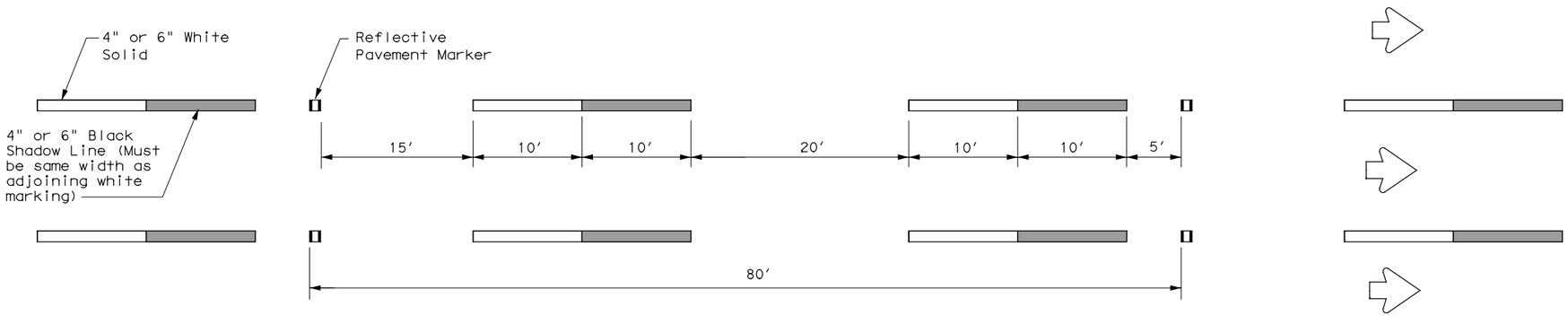
CONTRAST LANE LINE DESIGN

* See contrast line dimensions table for width of black line.

CONTRAST LINE DIMENSIONS		
White	Black (per side)	Total Width
4"	1.5"	7"
6"	2"	10"

GENERAL NOTES

1. Contrast and Shadow markings may only be used on concrete pavements.
2. Contrast and Shadow markings shall not be used on edge lines.
3. Contrast lane lines shall be permanent prefabricated pavement markings meeting DMS 8240.
4. Shadow lane line designs shall be a liquid markings system approved by TxDOT.
5. All raised reflective pavement markers placed in broken lines shall be placed in line with and midway between the white stripes.
6. See PM(2) for raised reflective pavement markings installation details.



SHADOW LANE LINE DESIGN

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

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

Texas Department of Transportation

Traffic Operations Division Standard

CONTRAST AND SHADOW PAVEMENT MARKINGS

CPM(1)-14

FILE: CPM(1)14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT May 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	33	068,ETC	RSL
	DIST	COUNTY		SHEET NO.
	AUS	HAYS		352

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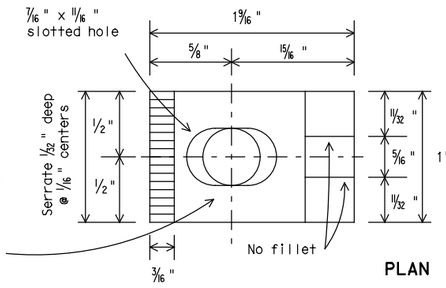
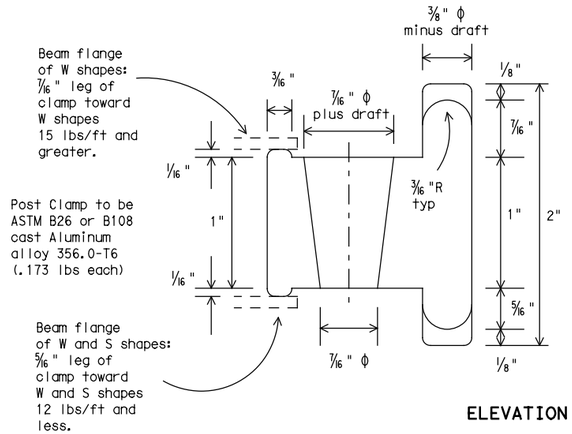


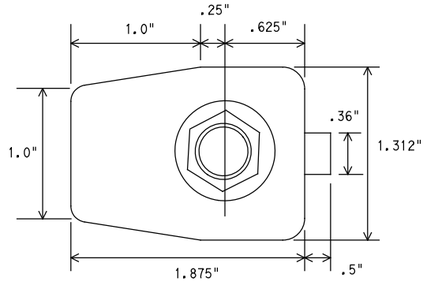
NOTE: centerline of hole for 3/8" diameter squarehead bolt x 2 1/4" long with a flat washer and self-locking nut, or lock washer and hex. nut. Bolt head dimensions shall be in accordance with ANSI B 18.2.1 as referred to in the AISC Manual of steel construction. Bolt assembly shall be galvanized.

PLAN

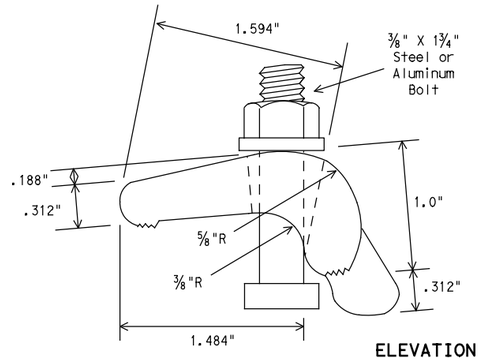


ELEVATION

POST CLAMP DETAIL

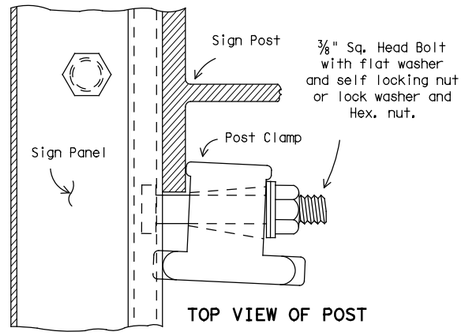


PLAN

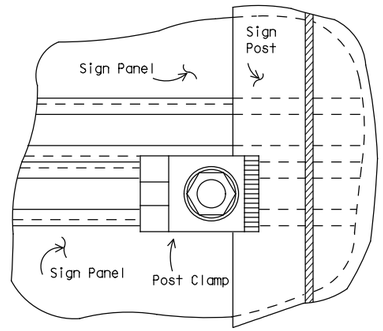


ELEVATION

ALTERNATE POST CLAMP DETAIL



TOP VIEW OF POST



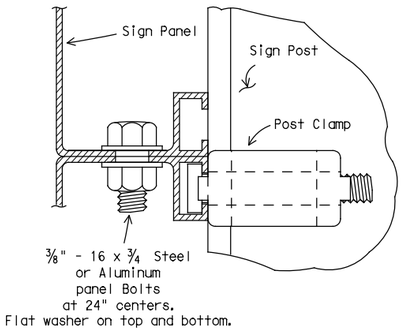
TOP VIEW OF CLAMP

DEPARTMENTAL MATERIAL SPECIFICATIONS

SIGN HARDWARE DMS-7120

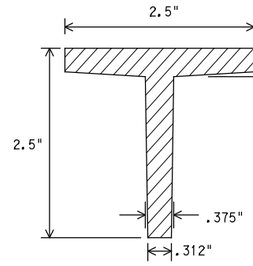
GENERAL NOTES:

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.



SIDE VIEW OF PANELS

CONNECTION DETAILS

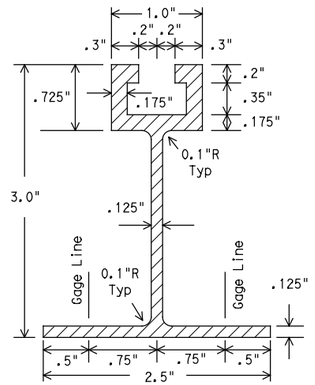


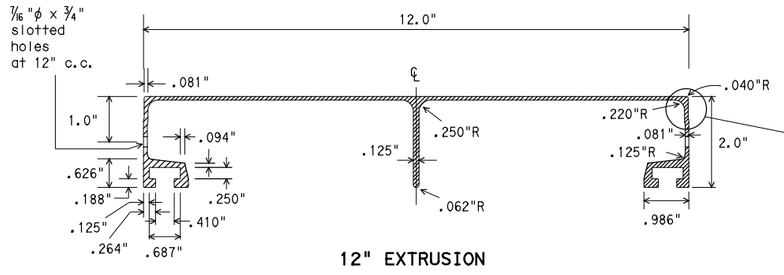
1.912 lbs/ft

ALUMINUM T SECTION OR APPROVED ALTERNATIVE

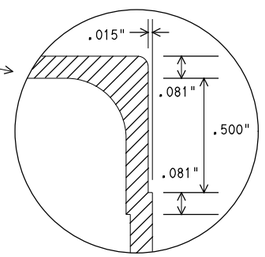
WINDBEAM CROSS SECTION

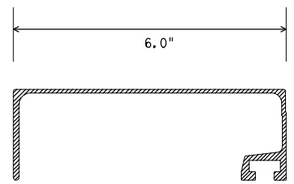
Windbeam to be extruded aluminum (1.175 lbs/ft) or approved alternative





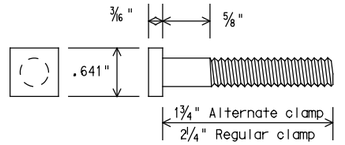
12" EXTRUSION





6" EXTRUSION

ALUMINUM SIGN PANEL EXTRUSION DETAILS



POST CLAMP BOLT DETAIL

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS- EXTRUDED ALUMINUM SIGN PANELS & HARDWARE

SMD(2-1)-08

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

REVISIONS	CONT	SECT	JOB	HIGHWAY
9-08	0914	33	068,ETC	RSL
	DIST	COUNTY		SHEET NO.
	AUS	HAYS		353

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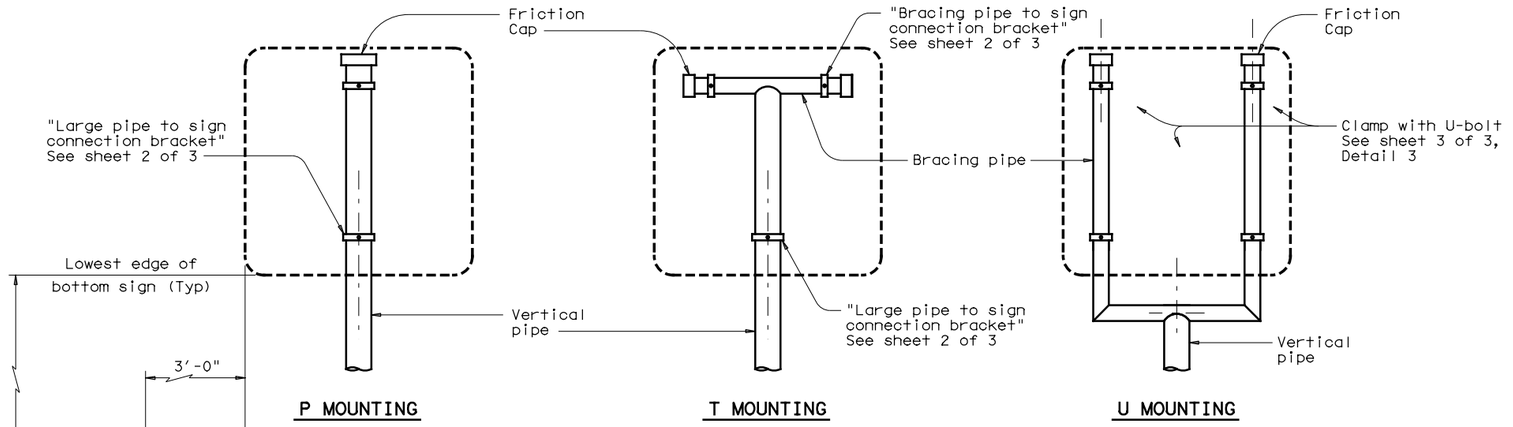
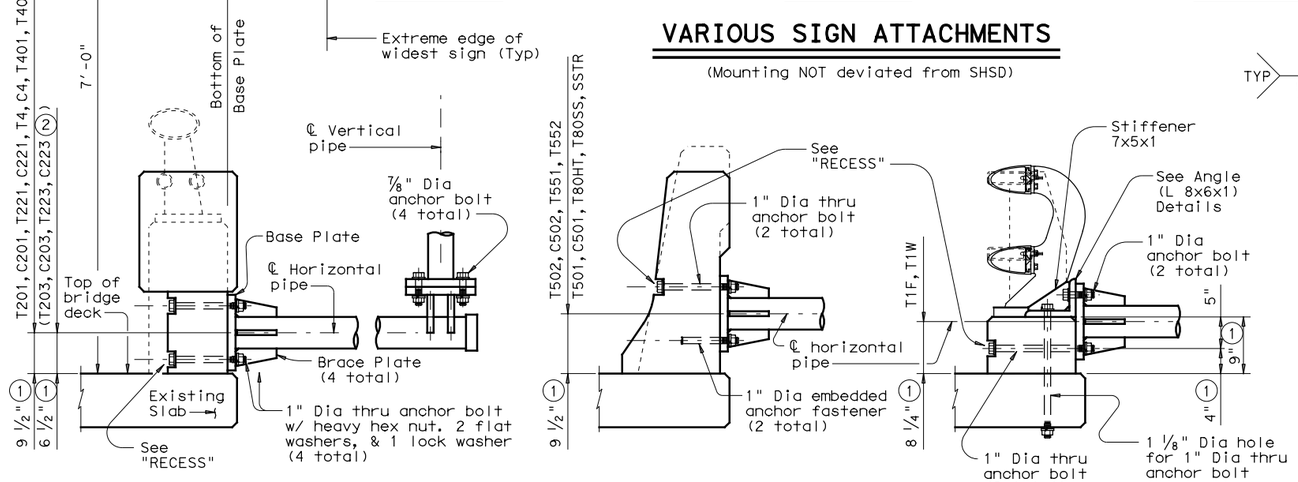
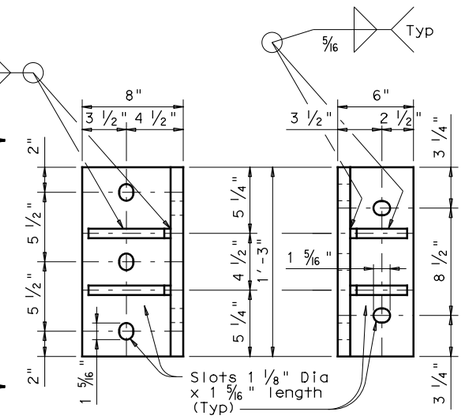


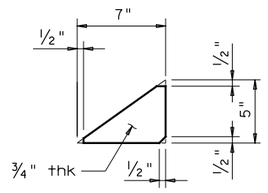
VARIOUS SIGN ATTACHMENTS

(Mounting NOT deviated from SHSD)



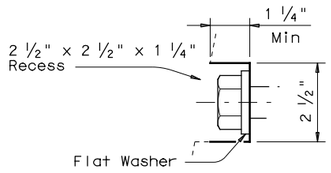
LONGITUDINAL SECTION THROUGH RAILING & SIGN MOUNT





STIFFENER

ANGLE (L 8x6x1) DETAILS



RECESS

(1) Increase 2" for structure with overlay.

(2) Attached at ℄ post.

PIPE SIZE AND THICKNESS			
Pipe Placement / Design Wind Speed	Horizontal	Vertical	Bracing
90 mph	5" X-Strong (.375")	4" X-Strong (.337")	2 ½" Standard (.203")
130 mph	6" X-Strong (.432")	5" X-Strong (.375")	3" X-Strong (.300")

GENERAL NOTES:

Design conforms to 2013 AASHTO Standard Specifications for Highway Signs, Luminaires, and Traffic Signals and Interim Specifications thereto. Design 3-second gust wind speeds of 90 mph and 130 mph with a 1.14 gust factor, and a wind importance factor of 1.0 (50-year mean recurrence interval) for the supporting structures. For mounting connection between sign panel and pipe, wind importance factors of 0.71 and 0.54, for 90 mph and 130 mph winds, respectively, are applied to adjust the wind speeds to a 10-year mean recurrence interval.

See standard sheet WV & IZ(LTS2013) for the boundaries of each design wind zone. All mounting shall be based on 130 mph wind speed design except when located in 90 mph wind zone. Maximum panel area is 30 sq. ft. Maximum design height is 50 ft, with design height defined as the distance between natural ground (average elevation of surrounding terrain) and the center of sign(s) at the mounting location.

Material for pipe shall be ASTM A53 Grade B, or A501. Structural steel plates shall be ASTM A36, A572 Grade 50, or A588. Bolts used to connect pipe and mounting bracket, and wind beam to sign panel shall be ASTM A307. Anchor bolts shall be ASTM A325 or A193 B7. Each anchor bolt shall be provided with 2 flat washers, 1 lock washer, and 1 heavy hex nut. All parts shall be galvanized in accordance with Standard Specifications Item 445, "Galvanizing".

Attach horizontal pipe at least 2'-0" from the edge of any nearby drain slot.

Contractor shall verify applicable field dimensions before fabrication. Holes drilled through the railing parapet wall shall be drilled with rotary (coring or masonry drill) type equipment. Percussion (star) drilling shall not be allowed. Anchorage for pipe attached to rail shall be placed using an anchoring system approved by the engineer. Installation of anchor fasteners including hole depth, diameter and material shall be in accordance with the manufacturers' recommendation.

Each embedded anchor fastener shall resist an allowable design loading (after applying the reduction factors of bolt spacing and bolt edge distance) of:

	130 mph	90 mph
Tension	12.5 kips	7.5 kips
Shear	9.0 kips	5.0 kips

Each anchoring system shall provide a capacity to resist the required tension and shear acting simultaneously.

For sign connection to mounting, shop drill holes on sign blank in accordance with the current Standard Highway Sign Designs for Texas (SHSD). Additional hole(s) needed to meet a stipulated-type mounting may be field drilled. For multi-sign or back-to-back signs mounting, the engineer shall determine the proper type which ensures each individual mounting meets requirements.

Refer to Standard sheets SMD(GEN), SMD(SLIP-2 and SMD(2-1) for details not covered here.

Texas Department of Transportation

Traffic Operations Division Standard

BRIDGE RAILING SIGN MOUNT DETAILS

SMD(BR-1)-14

FILE: smdbr-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT August 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	33	068,ETC	RSL
	DIST	COUNTY		SHEET NO.
	AUS	HAYS		354

DATE: 11/19/2020 12:47:49 PM
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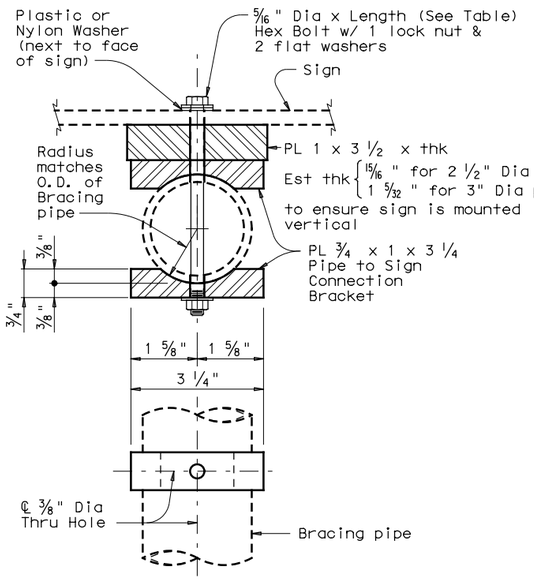
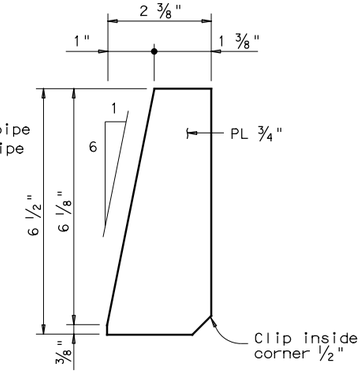
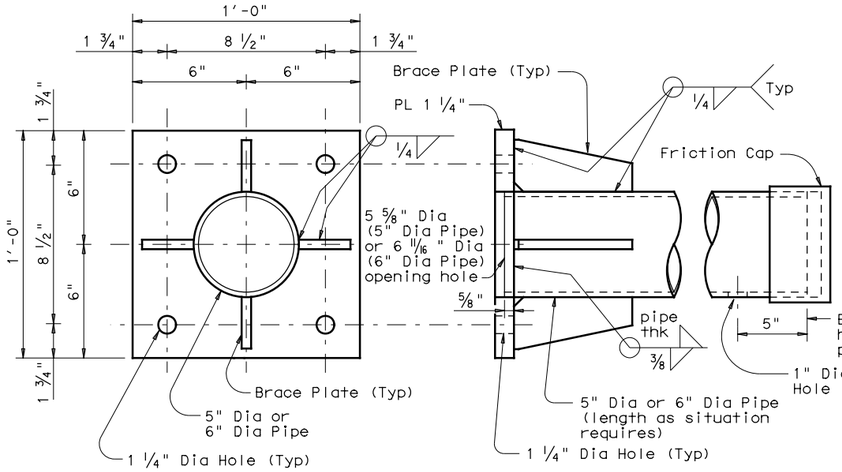


BRACING PIPE TO SIGN CONNECTION BRACKET DETAILS

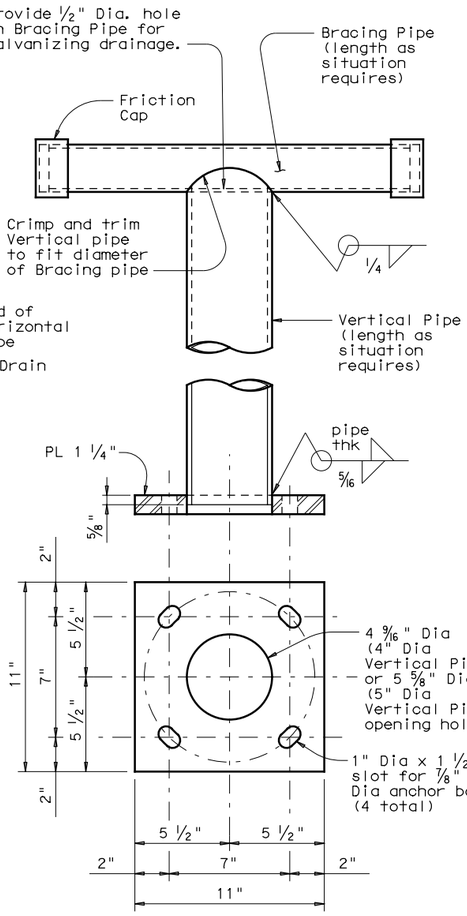
(Showing T Mounting)



BRACE PLATE DETAILS

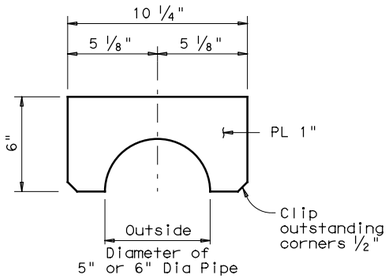


BASE PLATE DETAILS

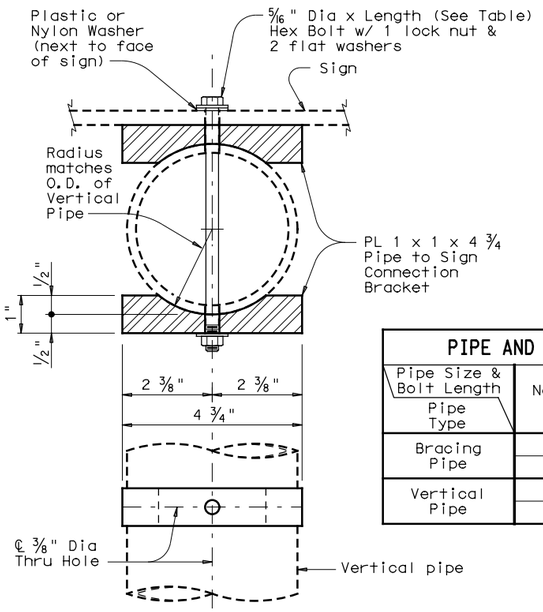


SIGN POLE & POLE BASE PLATE DETAILS

(Showing only T Mounting)



SIGN POLE SUPPORT PLATE BRACKET DETAILS



LARGE PIPE TO SIGN CONNECTION BRACKET DETAILS

(Showing P or T Mounting)

PIPE AND BOLT SPECIFICATIONS		
Pipe Size & Bolt Length / Pipe Type	Nominal Pipe Dia (in.)	Bolt Length (in.)
Bracing Pipe	2 1/2	6
	3	7
Vertical Pipe	4	7
	5	8

SIGN POLE SUPPORT PLATE DETAILS

SHEET 2 OF 3

Texas Department of Transportation

Traffic Operations Division Standard

BRIDGE RAILING SIGN MOUNT DETAILS

SMD(BR-2)-14

FILE: smdbr-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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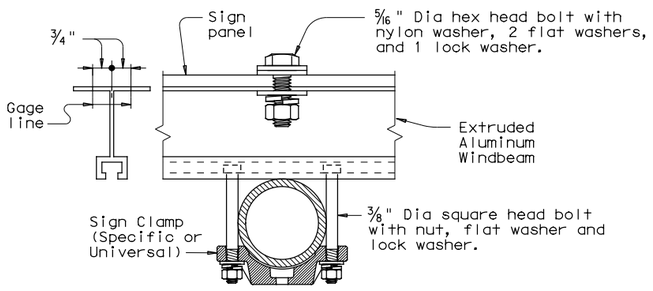
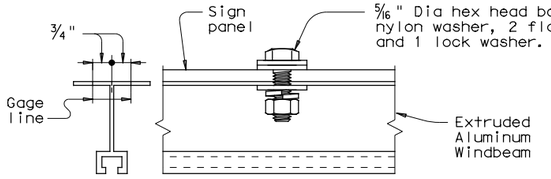
	DIST	COUNTY		SHEET NO.
	AUS	HAYS		355

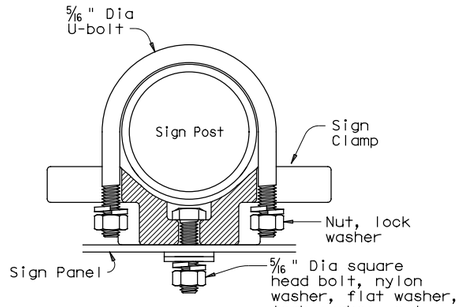
26H



DETAIL 1



DETAIL 2

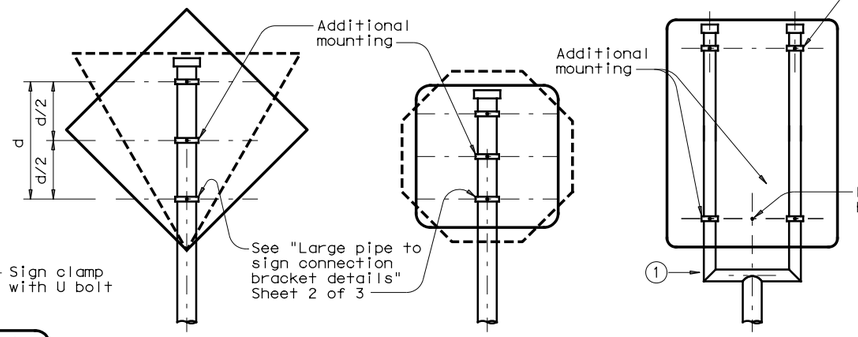


DETAIL 3

SIGN SHAPE	SQUARE			HORIZONTAL RECTANGLE			VERTICAL RECTANGLE			DIAMOND			OCTAGON			EQUILATERAL TRIANGLE			INTERSTATE SHIELD	PENTAGON (SCHOOL)	
Type of Sign Mounting on SHSD / Design Wind Speed	P	T	U	P	T	U	P	T	U	P	T	U	P	T	U	P	T	U	P	P	T
90 mph					(Type 23) 60"x48"	(Type 3) 72"x36" 78"x36" (Type 23) 72"x30" 84"x24"		(Type 2) 36"x48" (Type 32) 36"x60" 36"x72" 42"x60" 48"x54" 48"x60" 48"x72" (Type 3) 48"x84"			(Type 3) 60"x60"									(Type Special) 45"x36"		
130 mph	(Type 1) 30"x30" 36"x36"	(Type 3) 48"x48"		(Type 1) 36"x24" 36"x30"	(Type 23) 48"x42" 54"x42" 60"x30" 66"x36" 84"x24" (Type 3) 60"x48"	(Type 3) 72"x36" 78"x36" (Type 23) 72"x30" 84"x24"	(Type 1) 30"x36" 30"x42"	(Type 3) 36"x48" 36"x60" 36"x72" 42"x60" 48"x54" 48"x60" (Type 4) 48"x72" 48"x84"	(Type 3) 48"x60"	(Type 1) 36"x36"	(Type 3) 48"x48" 60"x60"		(Type 1) 48"x48"						(Type Special) 36"x36" 45"x36"		

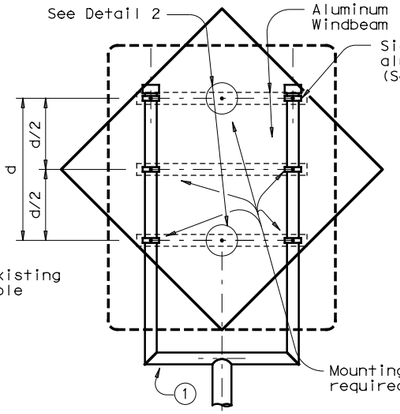
Notes:
1. Drill holes in addition to the hole pattern of the Standard Highway Sign Designs for Texas (SHSD) at specified locations to meet a stipulated-type mounting indicated in the parenthesis ( ).
2. "Blank" in the above table indicates all other signs excluded from stipulated mounting shall be mounted in accordance with SHSD.

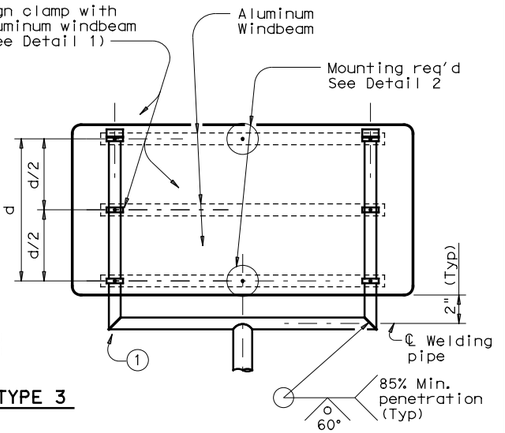
(1) In lieu of welding, the Fabricator may bend bracing pipe elbows if the following conditions are met:
a. Spacing between vertical bracing pipes is equal to or greater than 2'-6".
b. Bending radius is 12".
c. The distance between the lowest clamp and centerline of horizontal bent pipe is 13" max.



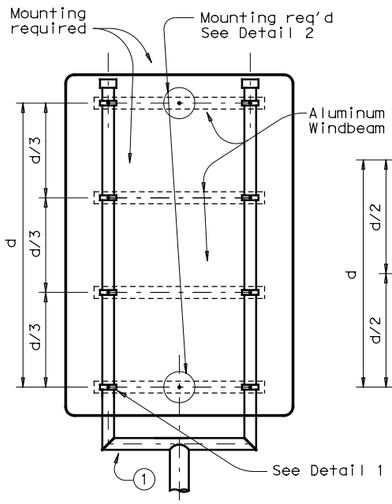
TYPE 1

TYPE 2





TYPE 3



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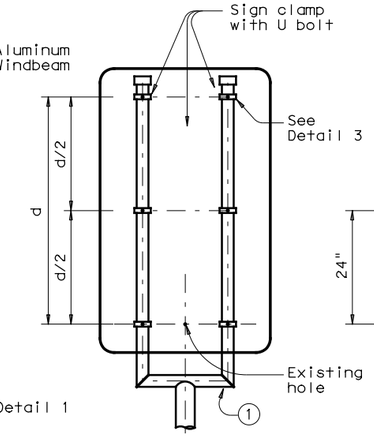
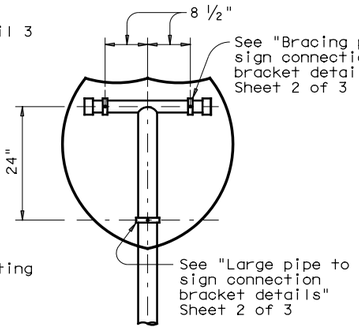
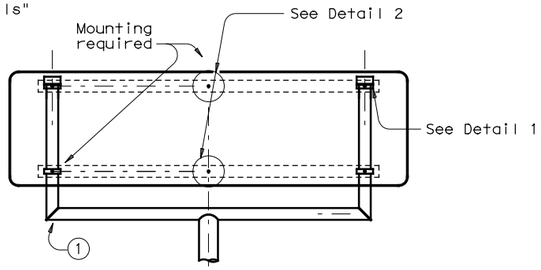


TYPE 32



TYPE SPECIAL



TYPE 23

SHEET 3 OF 3

Texas Department of Transportation

Traffic Operations Division Standard

BRIDGE RAILING SIGN MOUNT DETAILS

SMD(BR-3)-14

FILE: smdbr-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	33	068,ETC	RSL
	DIST	COUNTY		SHEET NO.
	AUS	HAYS		356

DATE: 11/19/2020 12:47:49 PM
FILE: c:\pwworking\dal\d0685174\smdbr-14.dgn

SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

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

Post Type

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

Number of Posts (1 or 2)

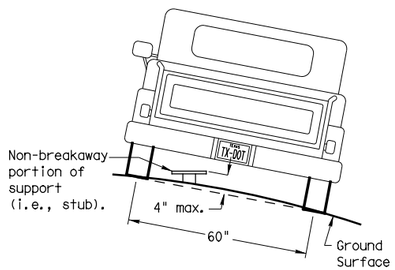
Anchor Type

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

Sign Mounting Designation

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

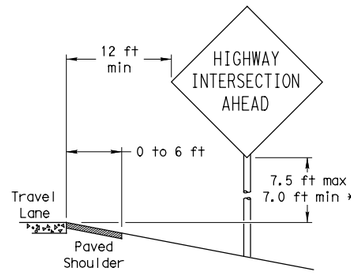
REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



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

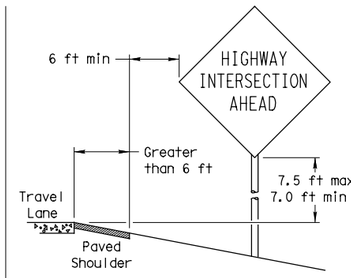
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

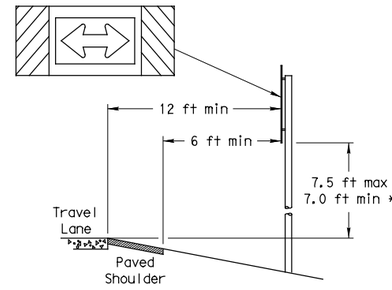
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



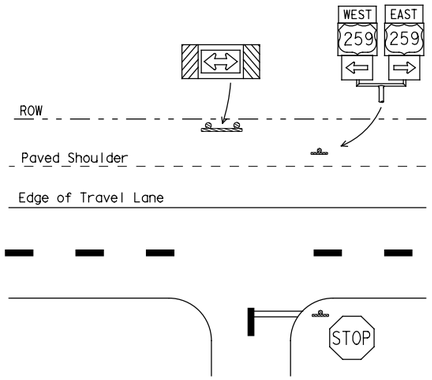
GREATER THAN 6 FT. WIDE

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

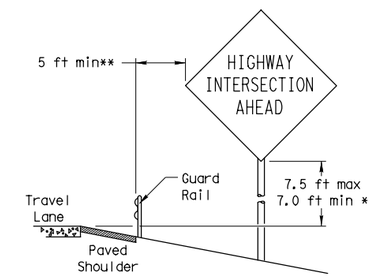
T-INTERSECTION



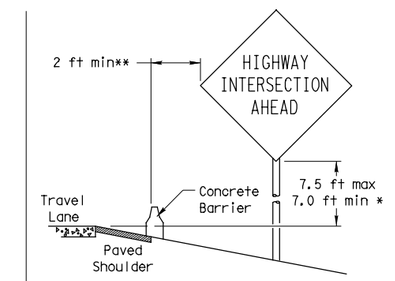
When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.



BEHIND BARRIER



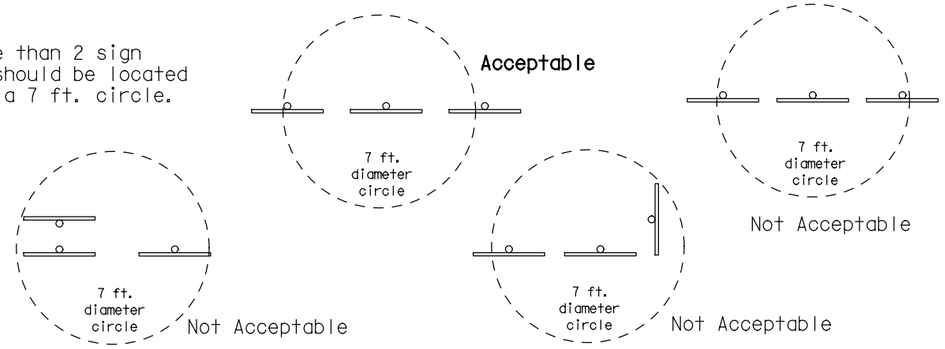
BEHIND GUARDRAIL



BEHIND CONCRETE BARRIER

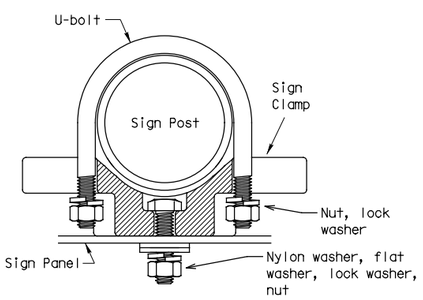
**Sign clearance based on distance required for proper guard rail or concrete barrier performance.

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



TYPICAL SIGN ATTACHMENT DETAIL

Single Signs

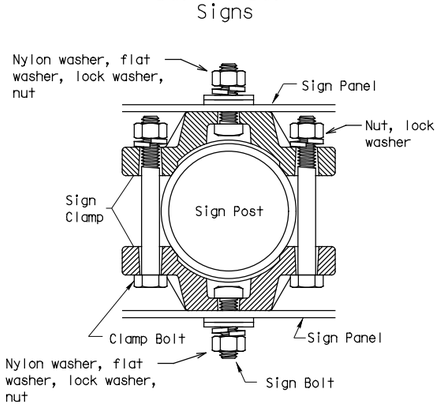


Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

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

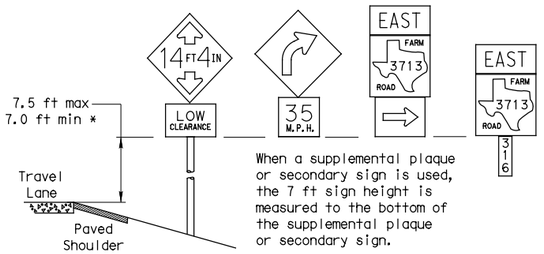
Sign clamps may be either the specific size clamp or the universal clamp.

Back-to-Back Signs



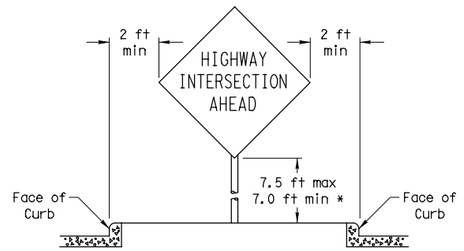
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



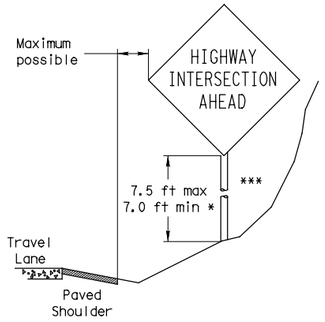
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

CURB & GUTTER OR RAISED ISLAND



RESTRICTED RIGHT-OF-WAY

(When 6 ft min. is not possible.)



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

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

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

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

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

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

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

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

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

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD(GEN)-08

9-08 REVISIONS

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

CONT	SECT	JOB	HIGHWAY
0914	33	068,ETC	RSL

DIST	COUNTY	SHEET NO.
AUS	HAYS	357

DATE: 11/19/2020 12:47:50 PM
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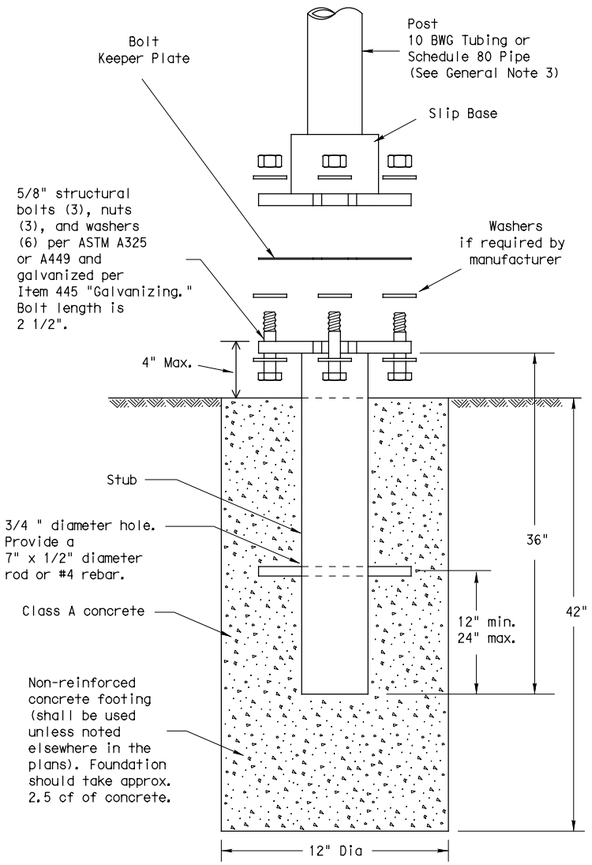
TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS



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

NOTE

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

GENERAL NOTES:

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

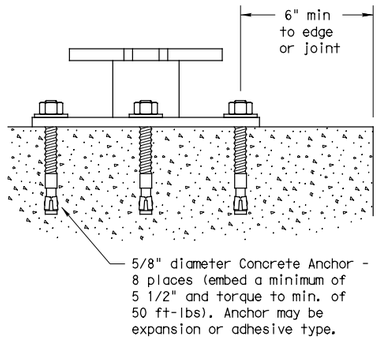
   Schedule 80 Pipe (2.875" outside diameter)
   - 0.276" nominal wall thickness
   - Steel tubing per ASTM A500 Gr C
   - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
     - 46,000 PSI minimum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

ASSEMBLY PROCEDURE

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

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

CONCRETE ANCHOR



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

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

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-1)-08

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

REVISIONS
9-08

CONT	SECT	JOB	HIGHWAY
0914	33	068,ETC	RSL

DIST	COUNTY	SHEET NO.
AUS	HAYS	358

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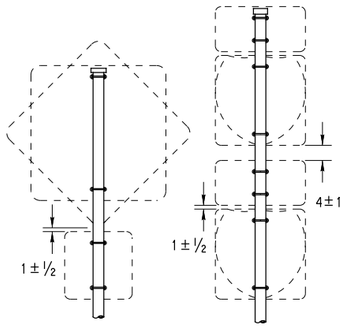
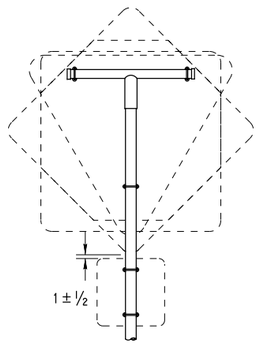


SM RD SGN ASSM TY XXXXX(1)XX(P)



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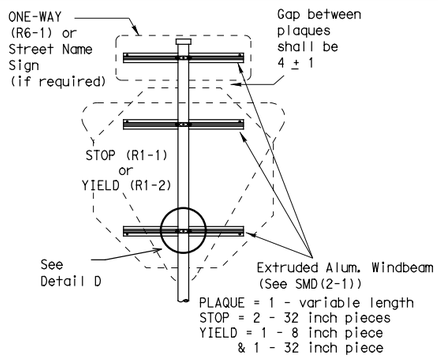
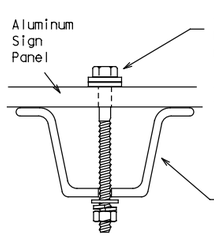
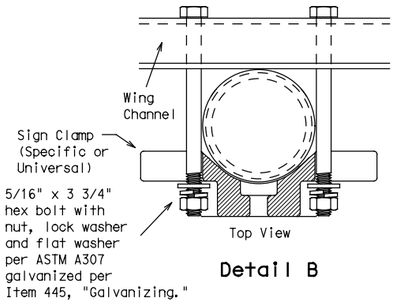


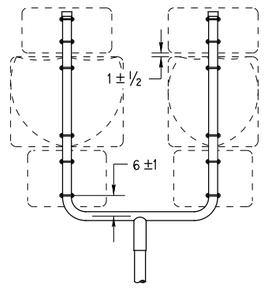
SM RD SGN ASSM TY XXXXX(1)XX(P-BM)



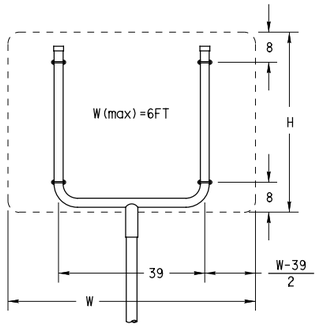
Detail A



Detail B



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



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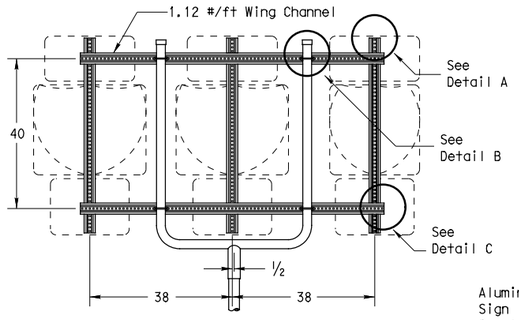
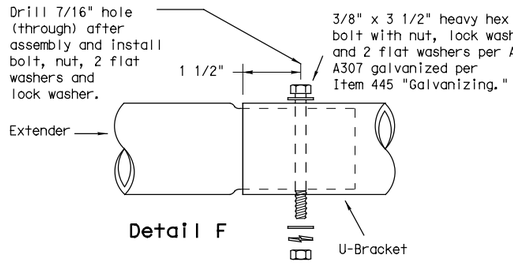
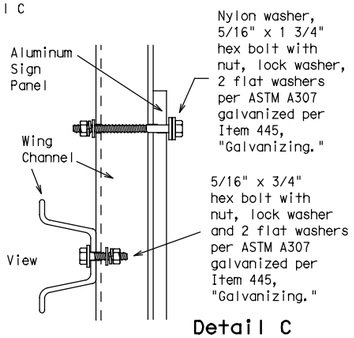


SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)

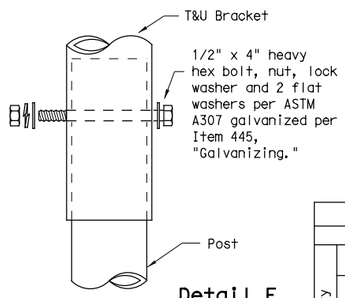


Detail F

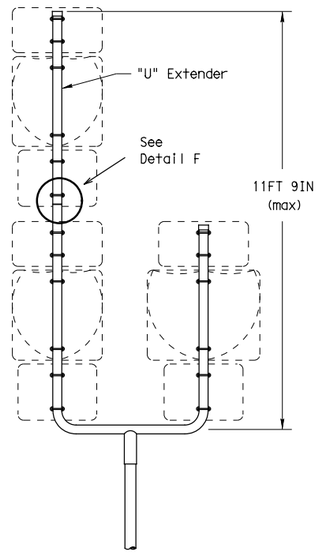
Splices shall only be allowed behind the sign substrate.



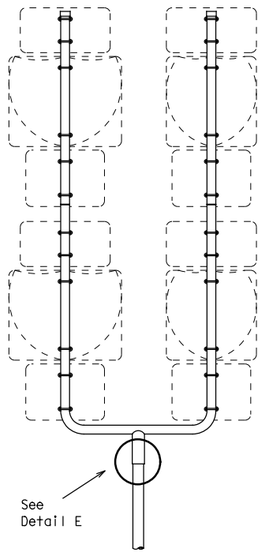
Detail C



Detail E



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



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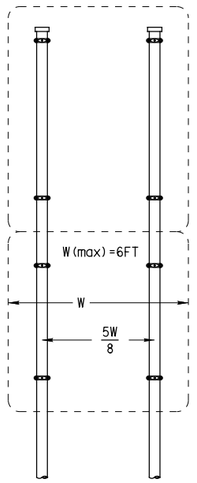
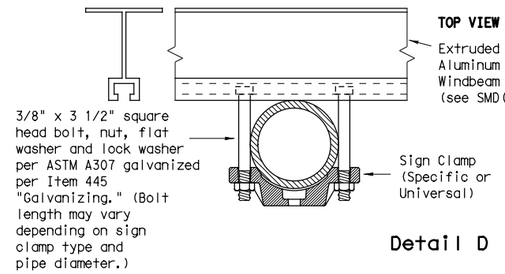
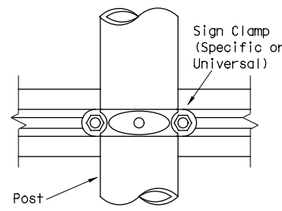


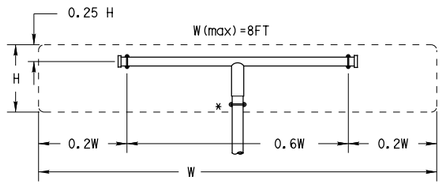
SM RD SGN ASSYM TY XXXXX(2)XX(P)

SIDE VIEW



Detail D

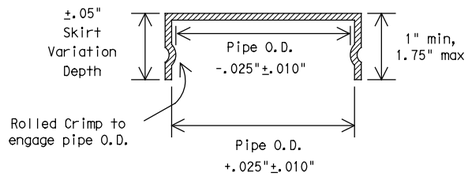




SM RD SGN ASSM TY XXXXX(1)XX(T)
(* - See Note 12)

All dimensions are in english unless detailed otherwise.

FRICTION CAP DETAIL



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

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

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

GENERAL NOTES:

1.

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

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

REQUIRED SUPPORT

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

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-2)-08

REVISIONS	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
9-08	CONT	SECT	JOB	HIGHWAY
	0914	33	068,ETC	RSL
	DIST	COUNTY		SHEET NO.
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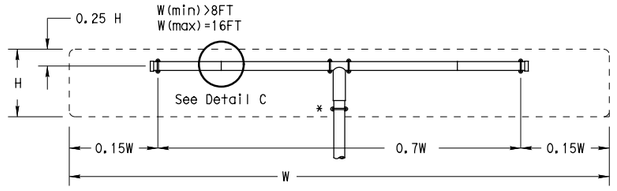
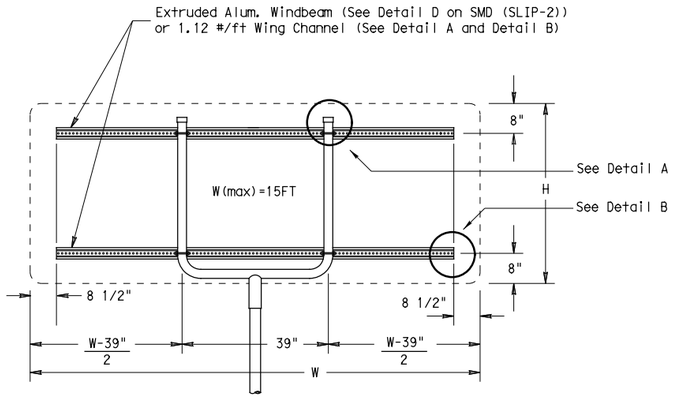
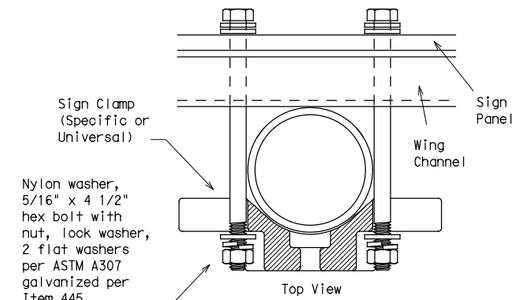


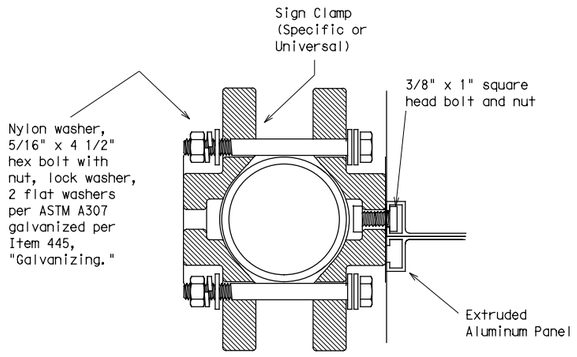
SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)
(* - See Note 12)



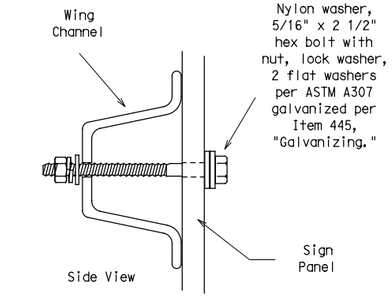
SM RD SGN ASSM TY XXXXX(1)XX(U-XX)



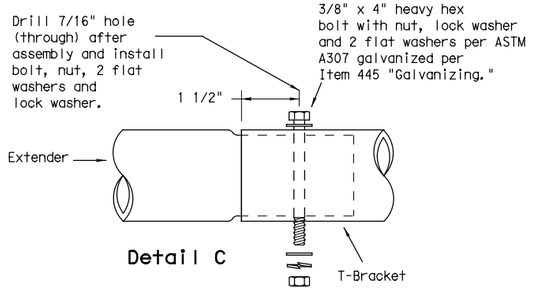
Detail A



Detail D
EXTRUDED ALUMINUM SIGN WITH T BRACKET

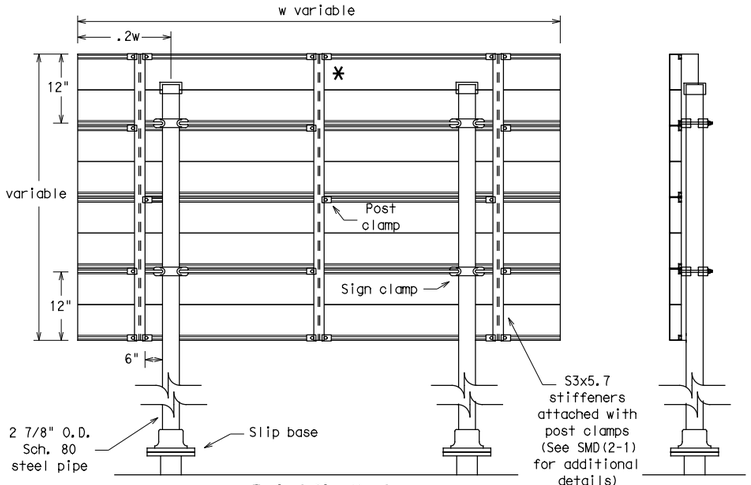


Detail B



Detail C

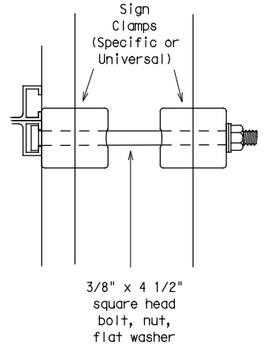
Splices shall only be allowed behind the sign substrate.



Typical Sign Mount

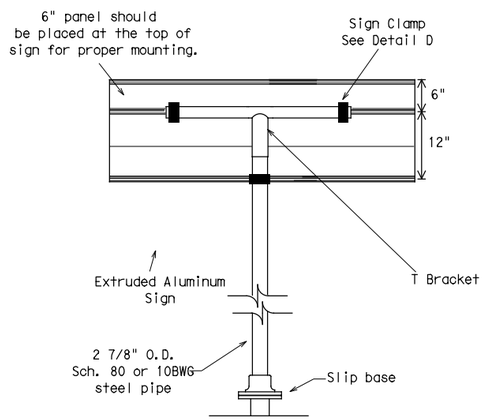
SM RD SGN ASSM TY S80(2)XX(P-EXAL)

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

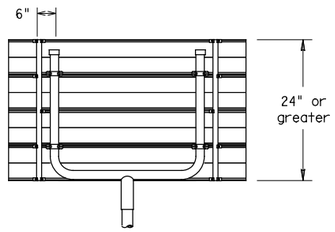


Detail E

See Detail E
for clamp installation



Extruded Aluminum Sign
With T Bracket



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

See Detail E
for clamp installation

GENERAL NOTES:

1.

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

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

REQUIRED SUPPORT

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

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-3)-08

REVISIONS	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
9-08	CONT	SECT	JOB	HIGHWAY
	0914	33	068,ETC	RSL
	DIST	COUNTY		SHEET NO.
	AUS	HAYS		360

DATE: 11/19/2020 12:47:53 PM
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DATE: 11/19/2020 12:47:54 PM
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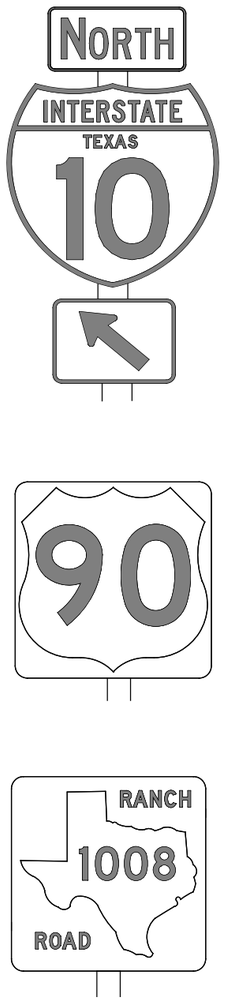
REQUIREMENTS FOR INDEPENDENT MOUNTED ROUTE SIGNS

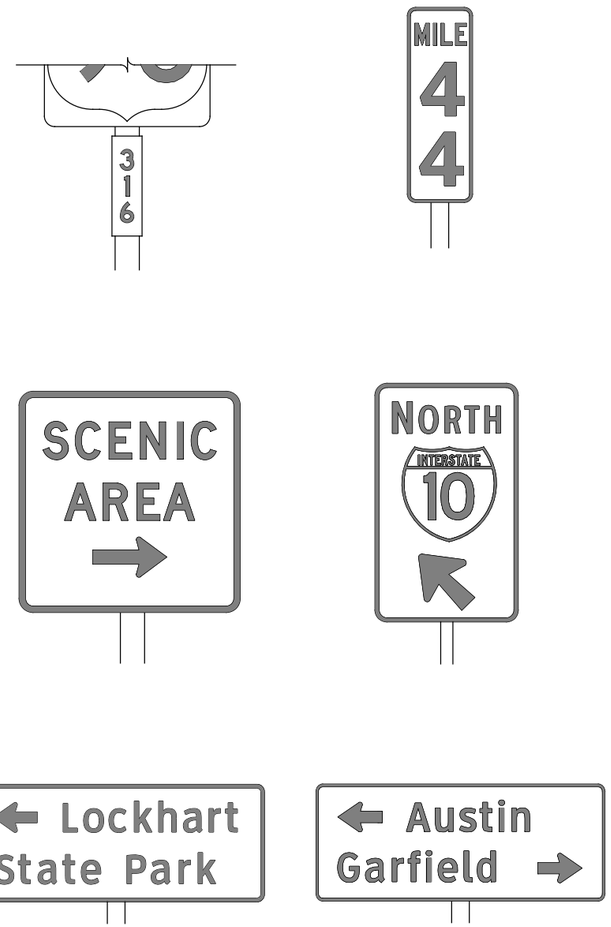
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE A SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & BORDERS	ALL OTHERS	TYPE B or C SHEETING



TYPICAL EXAMPLES

REQUIREMENTS FOR BLUE, BROWN & GREEN D AND I SERIES GUIDE SIGNS

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	ALL	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE D SHEETING
LEGEND, SYMBOLS & BORDERS	ALL OTHERS	TYPE B OR C SHEETING



TYPICAL EXAMPLES

GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).

2. White legend shall use the Clearview Alphabet. The following Clearview fonts shall be used to replace the existing white Federal Highway Administration (FHWA) Standard Highway Alphabets, when not specified in the SHSD, or in the plans.

B	CV-1W
C	CV-2W
D	CV-3W
E	CV-4W
Emod	CV-5WR
F	CV-6W

3. Route sign legend (ie. IH, US, SH and FM shields) shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets B, C, D, E, Emod or F).

4. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.

5. Independent mounted route sign with white or colored legend and borders shall be applied by screening process with transparent color ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof. White legend, symbols and borders on all other signs shall be cut-out white sheeting applied to colored background sheeting.

6. Information regarding borders and radii for signs is found in the "Standard Highway Sign Designs for Texas". Dimensions shown and described for borders and corner radii on parent sign are nominal. Borders may vary in width as much as 1/2 inch. Corner radii above 3 inches may vary in width as much as 1 inch. Borders and corner radii within a parent sign must be of matching widths. The sign area outside the corner radius should be trimmed or rounded.

7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.

8. Mounting details of roadside signs are shown in the "SMD series" Standard Plan Sheets.

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

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

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

http://www.txdot.gov/

Texas Department of Transportation

Traffic Operations Division Standard

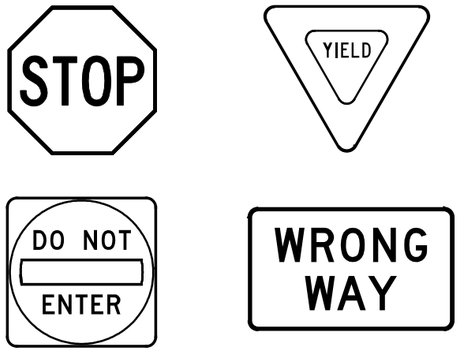
TYPICAL SIGN REQUIREMENTS

TSR(3)-13

FILE: tsr3-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	33	068,ETC	RSL
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	AUS	HAYS		361

REQUIREMENTS FOR RED BACKGROUND REGULATORY SIGNS

(STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)



REQUIREMENTS FOR FOUR SPECIFIC SIGNS ONLY

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	WHITE	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE B OR C SHEETING
LEGEND	RED	TYPE B OR C SHEETING

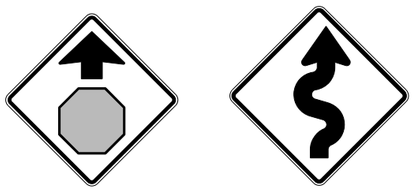
REQUIREMENTS FOR WHITE BACKGROUND REGULATORY SIGNS

(EXCLUDING STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)

TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND, BORDERS AND SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

REQUIREMENTS FOR WARNING SIGNS



TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	FLOURESCENT YELLOW	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

REQUIREMENTS FOR SCHOOL SIGNS

TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	FLOURESCENT YELLOW GREEN	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
SYMBOLS	RED	TYPE B OR C SHEETING

GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).
2. Sign legend shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets (B, C, D, E, Emod or F).
3. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.
4. Black legend and borders shall be applied by screening process or cut-out acrylic non-reflective black film to background sheeting, or combination thereof.
5. White legend and borders shall be applied by screening process with transparent colored ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof.
6. Colored legend shall be applied by screening process with transparent colored ink, transparent colored overlay film or colored sheeting to background sheeting, or combination thereof.
7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.
8. Mounting details for roadside mounted signs are shown in the "SMD series" Standard Plan Sheets.

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

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

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

http://www.txdot.gov/

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(4)-13

FILE: tsr4-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS 12-03 7-13 9-08	0914	33	068,ETC	RSL
	DIST	COUNTY		SHEET NO.
	AUS	HAYS		362

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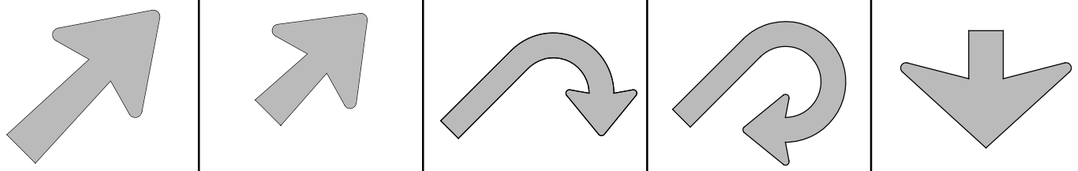
ARROW DETAILS

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

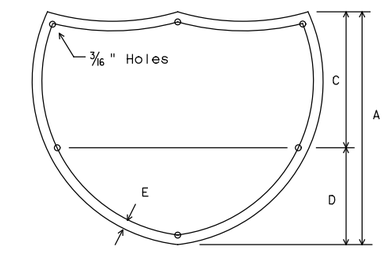
NOTE

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.

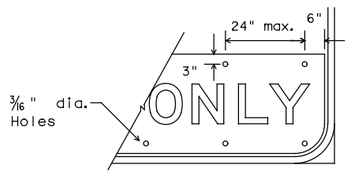
http://www.txdot.gov/

SIGN BLANK PUNCHING DETAILS FOR ATTACHMENTS WHEN SPECIFIED TO BE TYPE A ALUMINUM SIGNS (FOR MOUNTING TO GUIDE SIGN FACE)

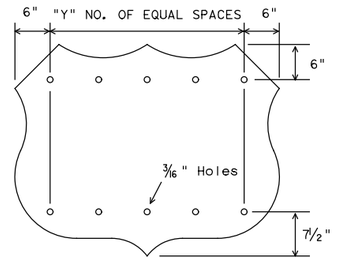


INTERSTATE ROUTE MARKERS

A	C	D	E
36	21	15	1 1/2
48	28	20	1 3/4

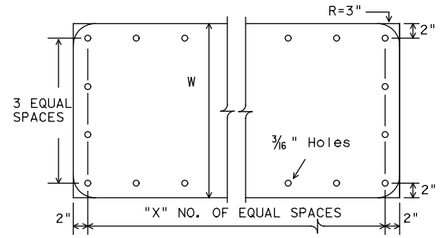


EXIT ONLY PANEL



U.S. ROUTE MARKERS

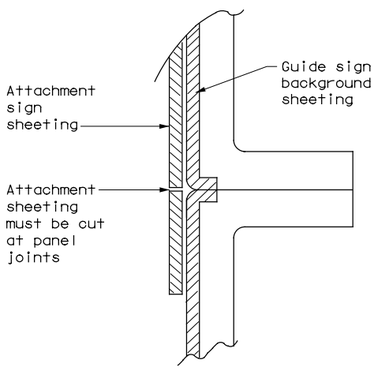
Sign Size	"Y"
24x24	2
30x24	3
36x36	3
45x36	4
48x48	4
60x48	5



STATE ROUTE MARKERS

No. of Digits	W	X
4	24	4
4	36	5
4	48	6
3	24	3
3	36	4
3	48	5

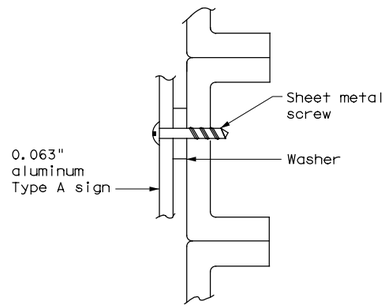
MOUNTING DETAILS OF ATTACHMENTS TO GUIDE SIGN FACE ("EXIT ONLY" AND "LEFT EXIT" PANELS, ROUTE MARKERS AND OTHER ATTACHMENTS)



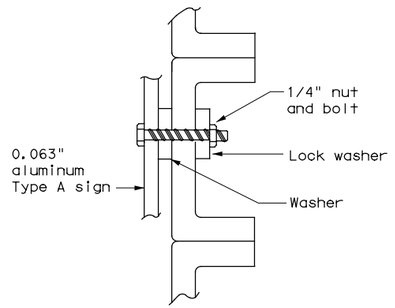
DIRECT APPLIED ATTACHMENT

NOTE:

1. Sheeting for legend, symbols, and borders must be cut at panel joints.
2. Direct applied attachment signs will be subsidiary to "Aluminum Signs" or "Fiberglass Signs".



SCREW ATTACHMENT



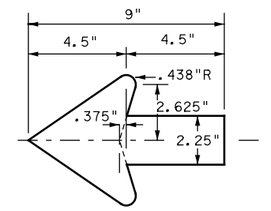
NUT/BOLT ATTACHMENT

NOTE:

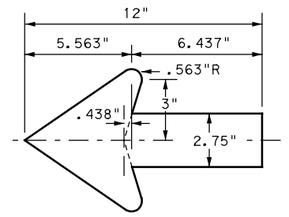
Furnish Type A aluminum sign attachments only when specified in the plans. These signs will be paid for under "Aluminum Signs".

ARROW DETAILS

for Destination Signs (Type D)



Standard arrow to be used with 6 inch letters.



Standard arrow to be used with 8 inch letters.

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(5)-13

FILE: tsr5-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	33	068,ETC	RSL
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	AUS	HAYS		363

5

DATE: 11/19/2020 12:47:57 PM
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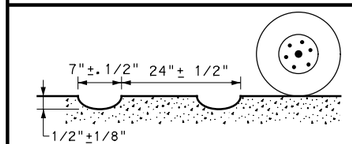
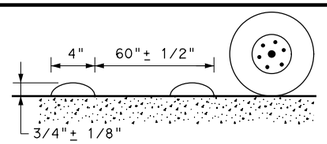
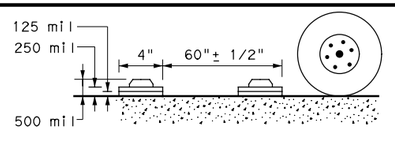
CENTERLINE RUMBLE STRIPS



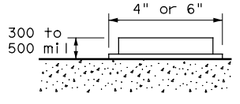
MILLED RUMBLE STRIPS



RAISED TRAFFIC BUTTONS

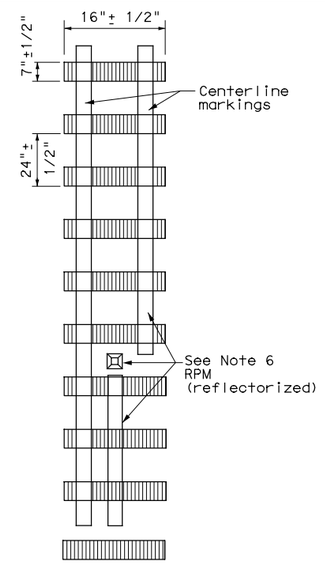


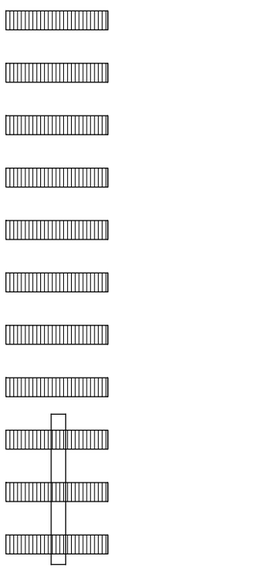
PREFORMED THERMOPLASTIC STRIPS



PROFILE MARKINGS

PROFILE VIEW

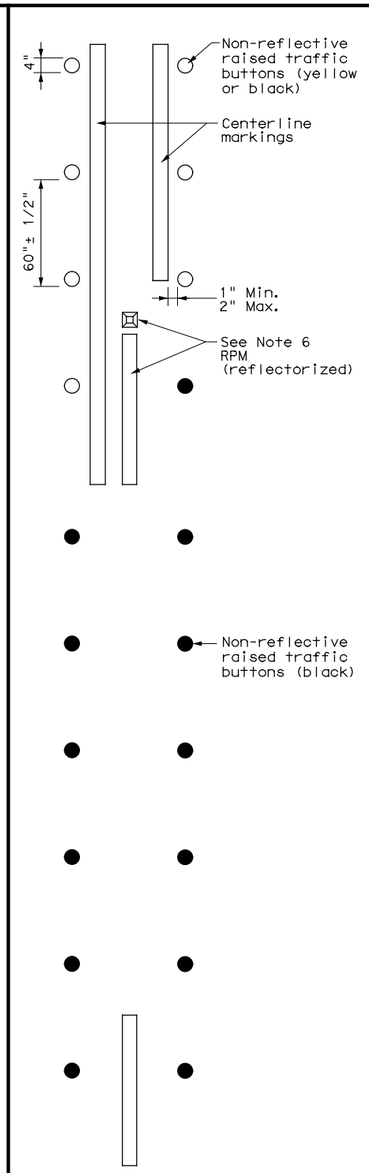




PLAN VIEW
OPTION 1

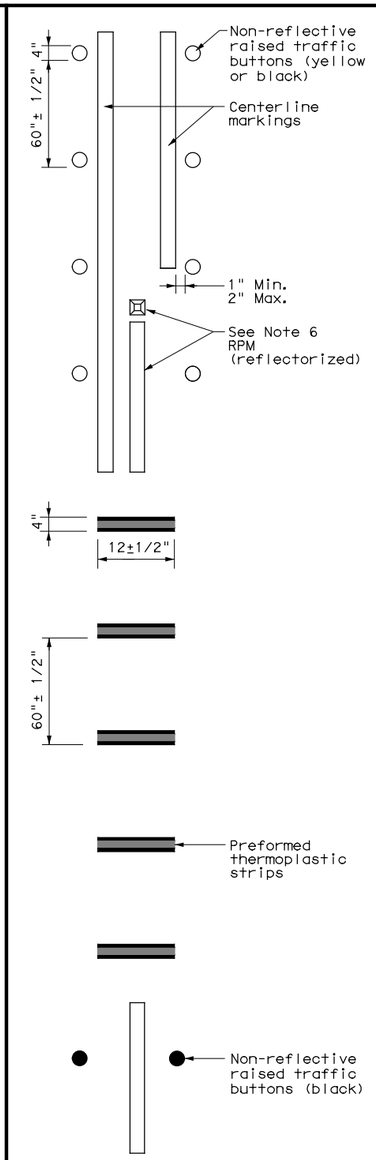
TWO LANE TWO-WAY ROADWAYS

MILLED CENTERLINE RUMBLE STRIPS



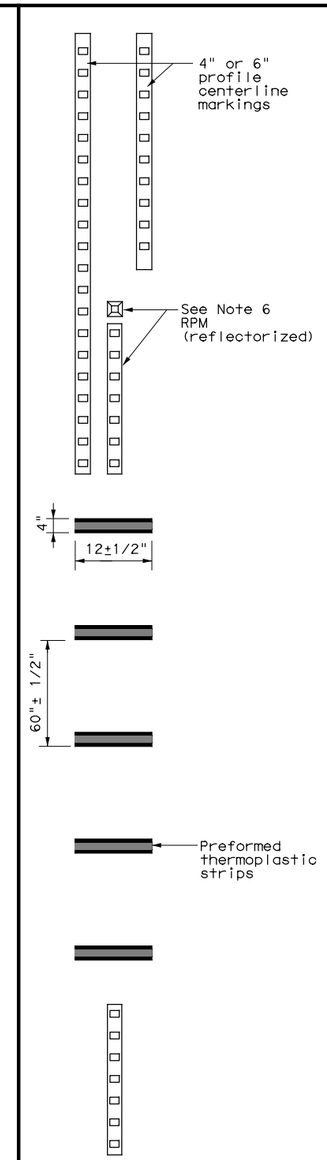
PLAN VIEW
OPTION 2

RAISED CENTERLINE RUMBLE STRIPS



PLAN VIEW
OPTION 3

RAISED CENTERLINE RUMBLE STRIPS AND PREFORMED THERMOPLASTIC STRIPS



PLAN VIEW
OPTION 4

PROFILE CENTERLINE MARKINGS AND PREFORMED THERMOPLASTIC STRIPS

GENERAL NOTES

1. This standard sheet provides guidelines for installing centerline rumble strips on two-lane highways with or without shoulders.
2. Centerline and edgeline rumble strips or profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
3. Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
4. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Operations Division.
5. Breaks in milled centerline rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections and driveways with high usage of large trucks.
6. Use Standard Sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, and dimensions pavement markings and profile markings.
7. Consideration should be given to noise levels when centerline rumble strips are installed near residential areas, schools, churches, etc. A minimum of 3/8 inch depth of milled rumble strip may be considered in these areas.
8. Pavement markings must be applied over milled centerline rumble strips.

WHEN INSTALLING CENTERLINE RUMBLE STRIPS:

9. Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per manufacturer's recommendations.
10. When using non-reflective raised traffic buttons as a centerline rumble strip, the button shall be placed adjacent to the pavement marking delineating the centerline. The buttons will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
11. The color of the button should be yellow for a continuous no passing roadway. Black buttons should be used in areas where passing is allowed.

WHEN INSTALLING EDGELINE RUMBLE STRIPS WITH OR WITHOUT CENTERLINE RUMBLE STRIPS ON UNDIVIDED HIGHWAYS:

12. See standard sheet RS(4).

Texas Department of Transportation®
Traffic Operations Division Standard

CENTERLINE RUMBLE STRIPS ON TWO LANE TWO-WAY HIGHWAYS

RS(3)-13

FILE: rs(3)-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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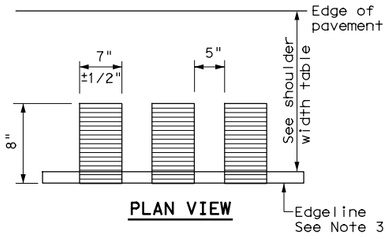
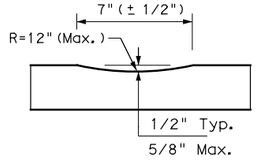
REVISIONS	0914	33	068,ETC	RSL
	DIST	COUNTY		SHEET NO.
	AUS	HAYS		364

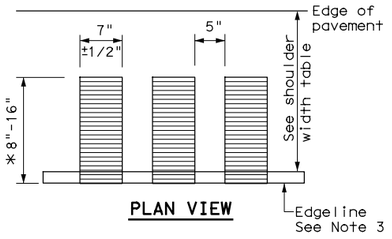


PLAN VIEW

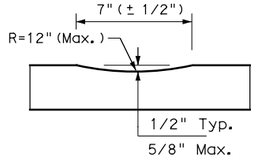


PROFILE VIEW
OPTION 1

CONTINUOUS MILLED DEPRESSIONS
(Rumble Stripes)



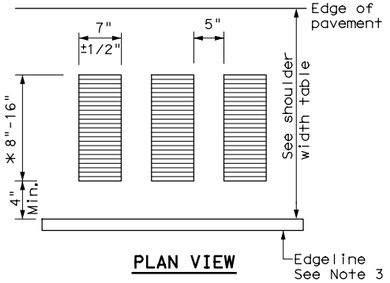
PLAN VIEW



* This distance may vary based on width of shoulder

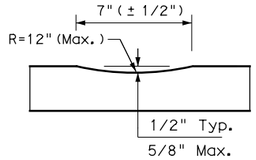
PROFILE VIEW
OPTION 2

CONTINUOUS MILLED DEPRESSIONS
(Rumble Stripes)



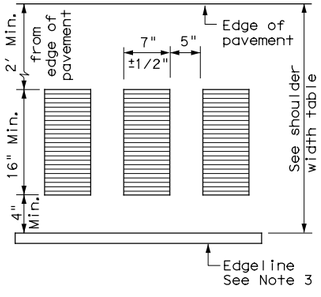
PLAN VIEW

* This distance may vary based on width of shoulder

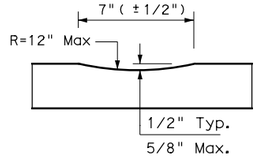


PROFILE VIEW
OPTION 3

CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)

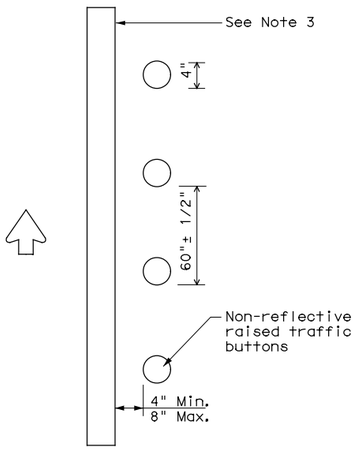


PLAN VIEW



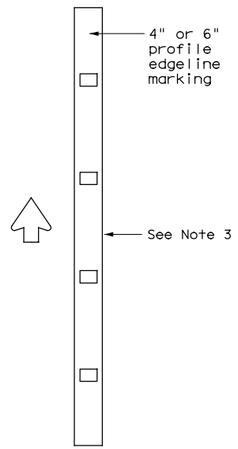
PROFILE VIEW
OPTION 4

CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)



PLAN VIEW
OPTION 5

RAISED EDGELINE RUMBLE STRIPS



PLAN VIEW
OPTION 6

PROFILE EDGELINE MARKINGS

SHOULDER WIDTH TABLE		
EQUAL TO OR LESS THAN 2 FEET	GREATER THAN 2 FEET LESS THAN 4 FEET	EQUAL TO OR GREATER THAN 4 FEET
Option 1, 5 OR 6	Option 1, 2, 3 5 OR 6	Option 2, 4, 5 OR 6

GENERAL NOTES

1. Rumble strips and profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
2. Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
3. Use Standard Sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, pavement markings, and profile markings.
4. See the table below for determining what options may be used for edgeline rumble strips.

WHEN INSTALLING MILLED DEPRESSION EDGELINE RUMBLE STRIPS:

5. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Operations Division.
6. Pavement markings can be applied over milled shoulder rumble strips to create an edgeline rumble stripe.
7. Breaks in edgeline rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections and driveways with high usage of large trucks when installed on conventional highways.
8. Rumble strips shall not be placed across exit or entrance ramps, acceleration and deceleration lanes, crossovers, gore areas or intersections with other roadways.
9. Consideration should be given to noise levels when edgeline rumble strips are installed near residential areas, schools, churches, etc. A minimum of 3/8 inches depth of milled rumble strip may be considered in these areas.
10. On roadways with high bicycle activity, consideration should be given before the installation of edgeline rumble strips. Things to consider include size of rumble strips, rumble strip material and location of rumble strips on the shoulder. If the designer determines that gaps are needed in the rumble strips due to bicycle use of the road, then follow the requirement shown in FHWA Technical Advisory T5040.39, or latest version. A detail of the spacing shall be included in the plans.

WHEN INSTALLING RAISED OR PROFILE EDGELINE RUMBLE STRIPS:

11. Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per the manufacturer's recommendations.
12. Non-reflective traffic buttons shall be placed adjacent to the pavement marking delineating the edgeline when used as a rumble strip. The color of the button should match the color of the adjacent edgeline marking (white or yellow). The buttons will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
13. Non-reflective traffic buttons shall not be placed across exit or entrance ramps, acceleration and deceleration lanes, crossovers, gore areas or intersections with other roadways.
14. Breaks in edgeline rumble strips using raised traffic buttons shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossing, intersections and driveways with high usage of large trucks when installed on conventional highways.
15. The minimum distance between the edgeline and the buttons should be used if the shoulder is less than 8 feet in width.
16. Raised profile thermoplastic markings used as edgelines may substitute for buttons.

Texas Department of Transportation

Traffic Operations Division Standard

EDGELINE RUMBLE STRIPS ON UNDIVIDED OR TWO LANE HIGHWAYS RS(4)-13

FILE: rs(4)-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2013	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	33	068,ETC	RSL
	DIST	COUNTY		SHEET NO.
	AUS	HAYS		365

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:

I. STORMWATER POLLUTION PREVENTION-CLEAN WATER ACT SECTION 402

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

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

1. City of Buda - ADDRESS: P.O. BOX 1380 BUDA, TX 78610 PHONE: (512) 312-2876
2.

☐ No Action Required ☒ Required Action

Action No.

1. Prevent stormwater pollution by controlling erosion and sedimentation in accordance with TPDES Permit TXR 150000
2. Comply with the SW3P and revise when necessary to control pollution or required by the Engineer.
3. Post Construction Site Notice (CSN) with SW3P information on or near the site, accessible to the public and TCEQ, EPA or other inspectors.
4. When Contractor project specific locations (PSL's) increase disturbed soil area to 5 acres or more, submit NOI to TCEQ and the Engineer.

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

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

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

☐ No Permit Required
☒ Nationwide Permit 14 - PCN not Required (less than 1/10th acre waters or wetlands affected)
☐ Nationwide Permit 14 - PCN Required (1/10 to <1/2 acre, 1/3 in tidal waters)
☐ Individual 404 Permit Required
☐ Other Nationwide Permit Required: NWP# _____

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

1. Mustang Branch
2.
3.
4.

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

Best Management Practices:

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

III. CULTURAL RESOURCES

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

☒ No Action Required ☐ Required Action

Action No.

IV. VEGETATION RESOURCES

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

☐ No Action Required ☒ Required Action

Action No.

1. AVOID AND MINIMIZE CONSTRUCTION-RELATED VEGETATION AND SOIL DISTURBANCE TO THE MAXIMUM EXTENT PRACTICABLE, ESPECIALLY IN AREAS WITHIN THE ROW, BUT OUTSIDE THE CONSTRUCTION LIMITS.
2. REVEGETATE ALL AREAS DISTURBED DURING CONSTRUCTION ACCORDING TO TXDOT SPECIFICATIONS AS SOON AS IT BECOMES PRACTICABLE.
3. CONSTRUCT PERMANENT EROSION CONTROLS AS SOON AS FEASIBLE DURING EARLY CONSTRUCTION THROUGH PROPER SODDING AND/OR SEEDING TECHNIQUES.
4. RESTORE AND STABILIZE DISTURBED AREAS AS SOON AS THE CONSTRUCTION SCHEDULE PERMITS. CONSIDER TEMPORARY SODDING WHERE LARGE AREAS OF DISTURBED GROUND ARE BARE FOR A CONSIDERABLE LENGTH OF TIME.

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

☒ No Action Required ☐ Required Action

Action No.

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

LIST OF ABBREVIATIONS

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

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

General (applies to all projects):

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

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

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

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

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

☐ Yes ☒ No

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

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

☐ Yes ☒ No

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

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

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

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

☒ No Action Required ☐ Required Action

Action No.

1.
2.
3.

2/3/2021
STATE OF TEXAS
ASHLEY S. HANSON
107373
LICENSED
PROFESSIONAL ENGINEER

VII. OTHER ENVIRONMENTAL ISSUES

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

☐ No Action Required ☒ Required Action

Action No.

1. A portion of the project is located on the Edwards Aquifer recharge zone and contributing zone within the transition zone.
2. A Water Pollution Abatement Plan (WPAP) was obtained for the project. Comply with the WPAP and WPAP approval letter.
3. Maintain a copy of the WPAP and WPAP approval letter onsite or have immediately available.
4. If a void is encountered during construction, follow the Void Mitigation Plan Sheet.

Texas Department of Transportation — Design Division Standard

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

EPIC

FILE: epic.dgn	DN: TxDOT	CK: RG	DW: VP	CK: AR	
©TxDOT: February 2015	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0914	33	068	RSLE	
12-12-2011 (DS)	DIST	COUNTY		SHEET NO.	
05-07-14 ADDED NOTE SECTION IV.	AUS	HAYS		366	
01-23-2015 SECTION I (CHANGED ITEM 1122 TO ITEM 506, ADDED GRASSY SWALES.					

A. GENERAL SITE DATA

1. PROJECT LIMITS: *APPROXIMATELY 1.8 MILES OF NEWLY PROPOSED ROADWAY RUNNING EAST/WEST FROM RM 967 TO FM 1626. ALSO INCLUDES WIDENING OF EXISTING RM 967 AND FM 2770.*

2. PROJECT SITE MAPS:

- *Project Latitude* 30.066667 N *Project Longitude* -97.856944 W
- *Project Location Map: Shown on Title Sheet*
- *Drainage Patterns: Shown on Drainage Area Maps*
- *Approx. Slopes Anticipated After Major Gradings and Areas of Soil Disturbance: Shown on Typical Sections*
- *Major Controls and Locations of Stabilization Practices: Shown on EROSION CONTROL Sheets*
- *Project Specific Locations: Off-site waste, borrow, or storage areas are not part of this SW3P.*
- *Surface Waters and Discharge Locations: Shown on Drainage and Culvert Layout Sheets*

3. PROJECT DESCRIPTION:

THIS PROJECT WILL CONSIST OF THE CONSTRUCTION OF ROBERT S. LIGHT EXTENSION CONSISTING OF GRADING, DRAINAGE, FLEX BASE, ASPHALT & CONCRETE PAVEMENT, RETAINING WALLS, BRIDGES, CULVERTS, UTILITIES, SIGNING AND PAVEMENT MARKINGS.

4. FOR MAJOR SOIL DISTURBING ACTIVITIES SEQUENCE OF EVENTS:

1. *Install controls down-slope of work area and initiate inspection and maintenance activities.*
2. *Begin phased construction with interim stabilization practices. Adjust erosion and sedimentation controls during construction to meet requirements and changing conditions and as directed/approved by the Engineer.*
3. *Major soil disturbing activities may include but are not limited to: right-of-way preparation, cut and/or fill to improve roadway profile, final grading and placement of topsoil and the following (if marked):*

   X *Placement of road base*
   X *Extensive ditch grading*
   X *Placement of culverts and bridges*
   ____ *Temporary detour road(s)*
   ____ *Other:* _____

5. EXISTING AND PROPOSED CONDITIONS:

Description of existing vegetative cover: TYPICAL GRASS SPECIES: LITTLE BLUESTEM, BIG BLUESTEM, YELLOW INDIANGRASS, SWITCHGRASS, SIDEOATS GRAMMA, TALL DROPSEED, TEXAS WINTERGRASS

TYPICAL PLANT SPECIES: TEXAS OAK, SHIN OAK, CEDAR ELM, NETLEAF HACKBERRY, TEXAS PRICKLYPEAR, SAW GREENBRIAR, AGARITA

Percentage of existing vegetative cover: 90%

Existing vegetative cover: (mark one)
X *Thick or uniformly established*
____ *Thin and Patchy*
____ *None or minimal cover*

Description of soils: BRANYON CLAY, GRUENE CLAY, HEIDEN CLAY, HOUSTON BLACK CLAY, LEWISVILLE SILTY CLAY, ORIF SOILS, PITS

Site Acreage: 66.07 AC *Acreage disturbed:* 30.98 AC

Site runoff coefficient (pre-construction): 0.34 *Site runoff coefficient (post-construction):* 0.45

6. RECEIVING WATERS: *(Mark all that apply)*

X *A classified stream does not pass through project.*

____ *A classified stream passes through project. Name* _____ *Segment Number* _____

Name of receiving waters that will receive discharges from disturbed areas of the project: ONION CREEK (SEGMENT 1427)
COLORADO RIVER (SEGMENT 1428)

Site is in a Municipal Separate Storm Sewer System (MS4).
MS4 Operator (name): CITY OF BUDA
P.O. BOX 1380
BUDA, TX 78610
(512) 312-2876
TXDOT - AUSTIN DISTRICT
P.O. DRAWER 15426
AUSTIN, TX 78761
512-832-7000

B. BEST MANAGEMENT PRACTICES

General timing or sequence for implementation of BMPs shall be as required and/or as directed/approved by the Engineer to provide adequate controls. BMPs shown on plan sheets are to be considered "proposed" unless/until Install date is shown. BMPs are to reduce sediments from road construction activities.

1. SOIL STABILIZATION PRACTICES: (Select T = Temporary or P = Permanent, as applicable)

P/T	SEEDING	____	PRESERVATION OF NATURAL RESOURCES
____	MULCHING (Hay or Straw)	____	FLEXIBLE CHANNEL LINER
____	BUFFER ZONES	____	RIGID CHANNEL LINER
____	PLANTING	____	SOIL RETENTION BLANKET
____	COMPOST/MULCH FILTER BERM	____	COMPOST MANUFACTURED TOPSOIL
____	SODDING	____	OTHER: (Specify Practice)

2. STRUCTURAL PRACTICES: (Select T = Temporary or P = Permanent, as applicable)

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

3. STORM WATER MANAGEMENT:

The proposed facility was designed in consideration of hydraulic design standards to convey stormwater in a manner that is protective of public safety and property. The control of erosion from the facility is inherent to the design. Additional factors affecting post-construction stormwater at the project location include: (mark all that apply)

X *Existing or new vegetation provides natural filtration.*
X *The design includes provisions for permanent erosion controls provided by strategically placed pervious and impervious surfaces.*
X *Project includes permanent sedimentation controls (other than grass).*
____ *Velocities do not require dissipation devices.*
____ *Velocity-dissipation devices included in the design.*
____ *Other :* _____

4. NON-STORM WATER DISCHARGES:

Filter non-storm water discharges, before being allowed to mix with storm water. These discharges consist of non-polluted groundwater, spring water, foundation and/or footing drain water; and water used for dust control, and pavement washing.

Stormwater or groundwater accumulation must be routed through appropriately selected BMPs prior to discharge offsite, into ditch, stormsewer, or any natural drainage feature. Use of vegetative filter strip alone is not adequate. Dewatering shall pass through a minimum of one BMP listed for sedimentation on the EPIC.
BMPs shall be installed in accordance with the Erosion Control standards. Use of BMPs not shown on the Erosion Control standards or "alternate BMPs" shall be approved by the Department.

Off-site discharges are prohibited except as follows:

1. *Discharges from fire fighting activities and/or fire hydrant flushings.*
2. *Vehicle, external building, and pavement wash water where detergents and soaps are not used and where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled material has been removed).*
3. *Plain water originating from potable water sources.*
4. *Uncontaminated groundwater or spring water.*
5. *Other:* _____

Concrete truck wash water discharges on the site should be prohibited or minimized. If allowed by the Engineer, they must be managed in a manner so as not to contaminate surface water. They must not be located in areas of concentrated flow. Concrete truck wash-out locations shall be field located as needed or as directed by the engineer, added to the SW3P Layout and included in the inspections.

Hazardous material spill/leak shall be prevented or minimized. At a minimum, this includes asphalt products, fuels, oils, lubricants, solvents, paints, acids, concrete curing compounds and chemical additives for soil stabilization. BMPs shall be implemented to the storage areas of these products. All spills must be cleaned and disposed properly and reported to the Engineer. Report any release at or above the reportable quantity during a 24 hour period to the National Response Center at 1-800-424-8802.

C. OTHER REQUIREMENTS & PRACTICES

1. MAINTENANCE:
   All erosion and sediment controls shall be maintained in good working order. If a repair is necessary, it shall be performed before the next anticipated storm event but no later than 7 calendar days after the surrounding exposed ground has dried sufficiently to prevent further damage from equipment. If maintenance prior to the next anticipated storm event is impracticable, maintenance must be scheduled and accomplished as soon as practicable. Disturbed areas on which construction activities have ceased, temporarily or permanently, shall be stabilized within 14 calendar days unless they are scheduled to and do resume within 21 calendar days. The areas adjacent to creeks and drainageways shall have priority followed by protecting storm sewer inlets.
2. INSPECTION:
   For areas of the construction site that have not been finally stabilized, areas used for storage of materials, structural control measures, and locations where vehicles enter or exit the site, personnel provided by the permittee and familiar with the SW3P must inspect disturbed areas at least once every fourteen (14) calendar days and within twenty four (24) hours of the end of a storm of 0.5 inches or greater. As an alternative to the above-described inspection schedule of once every fourteen (14) calendar days and within twenty four (24) hours of a storm of 0.5 inches or greater, the SW3P may be developed to require that these inspections will occur at least once every seven (7) calendar days. If this alternative schedule is developed, the inspection must occur on a specifically defined day, regardless of whether or not there has been rainfall since the previous inspection. An Inspection and Maintenance Report shall be prepared for each inspection and the controls shall be revised on the SW3P within seven (7) calendar days following the inspection.
3. WASTE MATERIALS:
   All non-hazardous municipal waste materials such as litter, rubbish, trash and garbage located on or originating from the project shall be collected and stored in a securely lidded metal dumpster, provided by the Contractor. The dumpster shall be emptied as necessary or as required by local regulation and the trash shall be hauled to a permitted disposal facility. The burying of non-hazardous municipal waste on the project shall not be permitted. Construction material waste sites, stockpiles and haul roads shall be constructed to minimize and control the amount of sediment that may enter receiving waters. Construction material waste sites shall not be located in any wetland, water body or stream bed. Construction staging areas and vehicle maintenance areas shall be constructed in a manner to minimize the runoff of pollutants.
4. OFFSITE VEHICLE TRACKING:
   Off-site vehicle tracking of sediments and the generation of dust must be minimized. Excess sediments on road shall be removed on a regular basis as directed/approved by the Engineer.
5. OTHER:
   1. *The contractor may not store fuels and hazardous substances on-site during construction operations.*
6. HAZARDOUS WASTE (INCLUDING SPILL REPORTING):
   Hotline 1-800-832-8224.
   Reportable quantities (RQ):
   (RQ) For petroleum / hydrocarbon liquids: 25 GAL - on land
   (RQ) For petroleum / hydrocarbon liquids: "creating a sheen" - on water
7. SANITARY WASTE:
   All sanitary waste will be collected from the portable units as necessary or as required by a licensed sanitary waste management contractor.

2/3/2021
STATE OF TEXAS
ASHLEY S. HANSON
107373
LICENSED
PROFESSIONAL ENGINEER

HAYS COUNTY TEXAS

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY
Texas Registered Engineering Firm F-2614

Texas Department of Transportation
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ROBERT S. LIGHT EXTENSION

STORMWATER POLLUTION PREVENTION PLAN (SW3P)

SHEET X OF X

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	367
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

PLOT DRIVER: TXDOT_PDF_BW.pltdrg
USER: JLDangerfield DATE: 2/3/2021 TIME: 5:44:48 PM SCALE: 1:1
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The following TCEQ requirements (Form TCEQ-0592, Rev. 7/15/15) are applicable to all work in the recharge zone of the Edwards Aquifer in Hays, Travis and/or Williamson Counties and must be adhered to by the Contractor and all Subcontractors:

1. A written notice of construction must be submitted to the TCEQ regional office at least 48 hours prior to the start of any regulated activities. This notice must include:
   - the name of the approved project;
   - the activity start date; and
   - the contact information of the prime contractor.

2. All contractors conducting regulated activities associated with this project must be provided with complete copies of the approved Water Pollution Abatement Plan (WPAP) and the TCEQ letter indicating the specific conditions of its approval. During the course of these regulated activities, the contractors are required to keep on-site copies of the approved plan and approval letter.

3. If any sensitive feature(s) (caves, solution cavity, sink hole, etc.) is discovered during construction, all regulated activities near the sensitive feature must be suspended immediately. The appropriate TCEQ regional office must be immediately notified of any sensitive features encountered during construction. Construction activities may not be resumed until the TCEQ has reviewed and approved the appropriate protective measures in order to protect any sensitive feature and the Edwards Aquifer from potentially adverse impacts to water quality.

4. No temporary or permanent hazardous substance storage tank shall be installed within 150 feet of a water supply source, distribution system, well, or sensitive feature.

5. Prior to beginning any construction activity, all temporary erosion and sedimentation (E&S) control measures must be properly installed and maintained in accordance with the approved plans and manufacturers specifications. If inspections indicate a control has been used inappropriately, or incorrectly, the applicant must replace or modify the control for site situations. These controls must remain in place until the disturbed areas have been permanently stabilized.

6. Any sediment that escapes the construction site must be collected and properly disposed of before the next rain event to ensure it is not washed into surface streams, sensitive features, etc.

7. Sediment must be removed from the sediment traps or sedimentation basins not later thanwhen it occupies 50% of the basin's design capacity.

8. Litter, construction debris, and construction chemicals exposed to stormwater shall be prevented from being discharged offsite.

9. All spoils (excavated material) generated from the project site must be stored on-site with proper E&S controls. For storage or disposal of spoils at another site on the Edwards Aquifer Recharge Zone, the owner of the site must receive approval of a water pollution abatement plan for the placement of fill material or mass grading prior to the placement of spoils at the other site.

10. If portions of the site will have a temporary or permanent cease in construction activity lasting longer than 14 days, soil stabilization in those areas shall be initiated as soon as possible prior to the 14th day of inactivity. If activity will resume prior to the 21st day, stabilization measures are not required. If drought conditions or inclement weather prevent action by the 14th day, stabilization measures shall be initiated as soon as possible.

11. The following records shall be maintained and made available to the TCEQ upon request:
    - the dates when major grading activities occur;
    - the dates when construction activities temporarily or permanently cease on a portion of the site; and
    - the dates when stabilization measures are initiated.

12. The holder of any approved Edward Aquifer protection plan must notify the appropriate regional office in writing and obtain approval from the executive director prior to initiating any of the following:

    A. any physical or operational modification of any water pollution abatement structure(s), including but not limited to ponds, dams, berms, sewage treatment plants, and diversionary structures;
    B. any change in the nature or character of the regulated activity from that which was originally approved or a change which would significantly impact the ability of the plan to prevent pollution of the Edwards Aquifer;
    C. any development of land previously identified as undeveloped in the original water pollution abatement plan.

TCEQ REGIONAL OFFICE

Austin Regional Office
12100 Park 35 Circle
Bldg A, Room 179
Austin, Texas 78753
Phone: (512) 339-2929
Fax: (512) 339-3795

Texas Department of Transportation | Austin District Standard

TCEQ REQUIREMENTS FOR THE RECHARGE ZONE OF THE EDWARDS AQUIFER

TCEQ-RZ-19(AUS)

REVISIONS
01/10/14: REQUIREMENTS AND ADDRESS UPDATED
01/21/16: REQUIREMENTS UPDATED
09/24/19: UPDATED RELEASE YEAR

CONT	SECT	JOB	HIGHWAY
0914	33	068,ETC	RSL
DIST	COUNTY		SHEET NO.
AUS	HAYS		368

DATE: 2/3/2021 3:13:08 PM
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VOIDS DEFINITION

- VOID GREATER THAN SIX INCHES ACROSS IN ANY DIRECTION AND/OR
- VOID IS GREATER THAN ONE SQUARE FOOT ALONG ANY PLANE AND/OR
- VOID BLOWS AIR AND/OR
- VOID CONTINUALLY RECEIVES WATER DURING A RAIN EVENT AND/OR
- VOID HAS WATER FLOWING THROUGH OR OUT OF IT AND/OR

GENERAL NOTES

1. USING EXPLOSIVES IS NOT ALLOWED.
2. THE PROJECT AREA IS A KNOWN KARST AREA. FRACTURED MATERIAL, BOULDERS,UNDERGROUND VOIDS, GROUNDWATER, UNSTABLE MATERIAL, AND DRASTICALLY VARYING STRATA CAN BE EXPECTED. THE CONTRACTOR SHALL WORK WITH TXDOT AND TXDOT'S PARTNERS TO ALLOW ACCESS AND ON-SITE MONITORING OF EXCAVATION.
3. THE VOID MITIGATION DETAILS ARE EXAMPLES. IMPLEMENTATION OF THE APPROVED MITIGATION PLAN SHOULD USE THE REFERENCED BID ITEMS.
4. CONCRETE USED FOR VOID MITIGATION SHALL BE 3,000 PSI IN ACCORDANCE WITH ITEM 420 CLASS A CONC (MISC). QUANTITIES UNDER 4 CY MAY BE HAND MIXED ON SITE USING 5,000 PSI RATED BAG MIX CONCRETE.
5. 3 IN. x 5 IN. ROCK SHALL BE IN ACCORDANCE WITH ITEM 506. LARGE ROCK > 1 FT. SHALL BE IN ACCORDANCE WITH 12 IN. ROCK PER ITEM 432.
6. FILTER FABRIC AND EROSION LOGS WILL BE IN ACCORDANCE WITH ITEM 506.
7. IMPERMEABLE LINER WILL BE IN ACCORDANCE WITH ITEM 5056. THE EDGE OF THE LINER SHALL BE ANCHORED IN A 6 IN. WIDE BY 18 IN. DEEP TRENCH.
8. STEEL CASING, USED FOR DRILL SHAFT CONSTRUCTION, SHALL BE IN ACCORDANCE WITH ITEM 416.
9. AGGREGATE OR OTHER BACKFILL WILL BE PAID FOR BY OVERRUN OF EXISTING EMBANKMENT ITEM. FILTER FABRIC OVER THE AGGREGATE IS SUBSIDIARY. SANDBAGS SHALL BE PAID USING SANDBAGS FOR EROSION CONTROL. THE SANDBAGS SHALL BE POLYPROPYLENE AND FILLED WITH PEA GRAVEL. CONNECTOR PIPE SHALL BE PAID USING PIPE(PVC)(SCH 80)(6 IN).
10. IF A SINGLE VOID IMPACT CAUSES DELAYS BY MORE THAN 20 WORKING DAYS, DELAY WILL BE CONSIDERED FOR THE IMPACT BEYOND THE INITIAL 20 DAYS. IF THE ACCUMULATION OF VOID IMPACTS CAUSE DELAYS BY MORE 40 WORKING DAYS, DELAY WILL BE CONSIDERED FOR THE IMPACT BEYOND THE 40 DAYS . OVERHEAD, BARRICADES AND DELAYS WILL BE EVALUATED AND PAID IN ACCORDANCE WITH THE CONTRACT. IMPACTS WILL NOT BE CONSIDERED IMPACT AFTER A RESPONSE PROCEDURE IS PROVIDED. ALL DELAYS CAUSED BY A VOID AND THE DURATION FOR IMPLEMENTATION OF A RESPONSE ARE NON-COMPENSABLE FOR LABOR, EQUIPMENT, STANDBY, MOBILIZATIONS, AND COST ESCALATIONS.

VOID MITIGATION AND PROTECTION MEASURES

REFER TO VOID MITIGATION DETAILS FOR ADDITIONAL INFORMATION. VOID MITIGATION DETAILS ARE TO BE APPROVED BY GEOSCIENTIST AND THE TCEQ (IF APPLICABLE) PRIOR TO IMPLEMENTATION.

1. IN THE EVENT THAT UNKNOWN KARST VOIDS ARE ENCOUNTERED, WORK AT THAT LOCATION WILL BE HALTED IMMEDIATELY AND THE FEATURE WILL BE INSPECTED PROMPTLY BY TXDOT.
2. WHEN REQUIRED, TXDOT WILL INSPECT ALL VOIDS TO DETERMINE THE POTENTIAL OF THE FEATURES TO PROVIDE SUITABLE HABITAT FOR ENDANGERED KARST INVERTEBRATES. WORK AT THAT LOCATION WILL NOT RESUME UNTIL AUTHORIZATION TO DISTURB THE FEATURE HAS BEEN OBTAINED. REFER TO THE EPIC SHEET FOR ADDITIONAL INFORMATION FOR THREATENED OR ENDANGERED SPECIES.

   TXDOT WILL INSPECT ALL VOIDS TO DETERMINE THE APPROPRIATE VOID MITIGATION PLAN.
3. ADDITIONAL EXCAVATION OF THE VOID MAY BE REQUIRED BY TXDOT OR THE GEOSCIENTIST TO FULLY EVALUATE THE VOID AND/OR MITIGATION PLAN PREPERATION. TXDOT APPROVAL IS REQUIRED PRIOR THE EXCAVATION. THIS WORK IS SUBSIDIARY.

VOID DISCOVERY PROTOCOL

IF A VOID IS DISCOVERED, THE FOLLOWING PROTOCOL WILL BE FOLLOWED:

1. ALL VOIDS REQUIRE AN EMAIL NOTIFICATION TO TXDOT DESIGNATED REPRESENTATIVE WITHIN 2 HOURS OF DISCOVERY. THE EMAIL WILL REQUIRE LOCATION INFORMATION (STATION, LATITUDE & LONGITUDE), DATES OF DISCOVERY, VIDEO/PICTURE DOCUMENTATION, SIZE, ETC. CONTRACTOR SHALL SUPPLY A CAMERA AND DIGITAL PICTURE/VIDEO DOCUMENTATION OF ALL VOIDS AND PROVIDE A MEASUREMENT OF THE SIZE OF THE VOID. FOR VOIDS THAT CANNOT BE SAFELY EXPLORED, ANOTHER DEVICE SHALL BE PROVIDED TO DOCUMENT THE VOID. CONTACT THE DISTRICT CONSTRUCTION OFFICE FOR AN EXAMPLE EMAIL THAT SHALL BE FOLLOWED. THIS WORK IS SUBSIDIARY.
2. ALL ACTIVITY WITHIN A 50-FOOT RADIUS OF THE VOID SHALL STOP. BLOCK TRAFFIC FROM DRIVING NEAR THE VOID AND PREVENT CONSTRUCTION EQUIPMENT FROM OPERATING IN THE VICINITY OF THE VOID USING BARRELS, ORANGE CONSTRUCTION FENCE OR OTHER APPROVED HIGHLY VISIBLE BARRIER.
3. A DRY VOID THAT IS LESS THAN 1 CF IN VOLUME OR LESS THAN 6 IN. IN ALL DIRECTIONS WILL NOT REQUIRE ACTION BEYOND NOTIFICATION. TXDOT SHALL BE NOTIFIED IMMEDIATELY VIA EMAIL AND PHONE WHEN A VOID IS FOUND THAT REQUIRES ACTION. TXDOT WILL RESPOND WITHIN 6 BUSINESS DAYS FROM TIME OF EMAIL NOTIFICATION TO PROVIDE GUIDANCE TO THE CONTRACTOR.
4. COVER THE VOID TO PREVENT CONTAMINATION AND CHANGES IN AMBIENT CONDITIONS (TARPS AND PLYWOOD, OR SIMILAR MATERIALS ARE APPROPRIATE AS AVAILABLE). WHERE COVERING THE VOID IS NOT FEASIBLE, CONTRACTOR SHALL OBTAIN APPROVAL FROM TXDOT OF ALTERNATE TEMPORARY PROTECTION MEASURES. BIODEGRADABLE EROSION CONTROL LOG (BECL) SHOULD WRAP THE SURFACE PERIMETER OF THE VOID. TEMPORARY PROTECTIONS SHOULD REMAIN IN PLACE UNTIL FINAL MITIGATION AND PROTECTION MEASURES ARE APPROVED AND IN PLACE. AN EARTHEN BERM WILL BE MAINTAINED ON THE UP-GRADIENT SIDE OF VOID TO PREVENT ANY CONSTRUCTION RUNOFF FROM ENTERING ANY PART OF THE FEATURE WHICH MAY REMAIN.THIS WORK IS SUBSIDIARY.
5. WHEN REQUIRED TXDOT SHALL IMMEDIATELY NOTIFY THE TEXAS COMMISSION ON ENVIRONMENTAL QUALITY (TCEQ) AUSTIN REGIONAL OFFICE.
6. TXDOT WILL PROVIDE FOR THE EVALUATION OF THE VOID A QUALIFIED GEOSCIENTIST LICENSED BY THE TEXAS BOARD OF PROFESSIONAL GEOSCIENTISTS OR BY A PROFESSIONAL ENGINEER WHO QUALIFIES TO PRACTICE GEOSCIENCE ACCORDING TO THE TEXAS BOARD OF PROFESSIONAL GEOSCIENTISTS.
7. WHEN REQUIRED TXDOT WILL SUBMIT AND OBTAIN APPROVAL OF AN ENCOUNTERED FEATURE MITIGATION PLAN TO THE TCEQ AUSTIN REGION OFFICE.
8. WORK SHOULD CEASE IN THE AREA UNTIL ASSESSMENT OF THE VOID CAN BE COMPLETED, TCEQ APPROVES THE ENCOUNTERED FEATURE MITIGATION PLAN AND MITIGATION IS COMPLETED. WHEN THE VOID IS OUTSIDE TCEQ JURISDICTION, TXDOT WILL APPROVE THE ENCOUNTERED FEATURE MITIGATION PLAN.

VOIDS RELATED TO DRILLED SHAFTS, SOIL NAILS, ROCK NAILS AND OTHER SIMILAR FUNCTIONS

1. SUBMIT INSTALLATION PLAN FOR REVIEW NO LATER THAN 2 MONTHS BEFORE CONSTRUCTION.
2. THE USE OF DRILLING FLUIDS, UNDERWATER PLACEMENT, OR SLURRY METHOD WILL NOT BE ALLOWED IF A VOID IS EXPOSED DURING DRILLING OF SHAFTS OR NAILS. THE CONTRACTOR SHALL USE APPROPRIATE INDUSTRY APPROVED METHODS TO PROVIDE A PRODUCT IN COMPLIANCE WITH THE SPECIFICATIONS. ADDITIONAL TIME OR COMPENSATION WILL NOT BE ALLOWED FOR USE OF ALTERNATE METHODS OR CASING INSTALLATION.
3. DURING NON-WORK HOURS OPEN HOLES SHALL BE PROTECTED FOR SAFETY AND COVERED. SHAFTS SHALL BE SURROUNDED BY EROSION CONTROL LOGS AT AN OFFSET OF 10' FROM THE EDGE OF THE OPENING. THIS WORK IS SUBSIDIARY
4. VIDEO DOCUMENTATION SHALL BE CONDUCTED OF A DRILL SHAFT ONCE EXCAVATION IS COMPLETE AND PRIOR TO PLACING REINFORCEMENT. SUFFICIENT LIGHTING SHALL ACCOMPANY THE VIDEO CAMERA TO ENSURE THE SHAFT AND VOIDS ARE VISIBLE. THIS WORK IS SUBSIDIARY.
5. CONCRETE USED TO FILL THE VOIDS WILL BE PAID USING CLASS A CONC (MISC) ITEM BUT WILL USE THE CLASS OF CONCRETE AS REQUIRED BY THE SPECIFICATION. QUANTITY OF CONCRETE WILL BE BASED ON VISUAL INSPECTION PROVIDED BY THE CONTRACTOR. IF VISUAL INSPECTION IS UNABLE TO DETERMINE THE SIZE OF THE VOID THE CONCRETE FOR PAYMENT WILL BE MEASURED AS THE ADDITIONAL CONCRETE BEYOND THE AMOUNT REQUIRED TO PLACE A CLEAN SHAFT PLUS 10 PERCENT WASTE.
6. THE USE OF PERMANENT CASING SHALL BE IN ACCORDANCE WITH ITEM 416. MATERIAL COST FOR CASING THAT REMAINS WILL BE PAID BY INVOICE FROM SUPPLIER WITH MARK UP IN ACCORDANCE WITH MATERIAL FOR ITEM 9.7. ADDITIONAL LABOR, EQUIPMENT, TIME, ETC. FOR INSTALLATION OF THE CASING WILL NOT BE COMPENSABLE.
7. ADDITIONAL NAIL LENGTH WILL BE PAID BY OVERRUN OF EXISTING BID ITEM. ALTERNATE NAIL TYPE COST WILL BE PAID BY INVOICE FROM SUPPLIER WITH MARK UP IN ACCORDANCE WITH MATERIAL FOR ITEM 9.7. LABOR, EQUIPMENT, ADDITIONAL TIME, ETC. WILL NOT BE COMPENSABLE.
8. CORE HOLES ARE REQUIRED FOR ALL DRILLED SHAFTS.

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VOID MITIGATION NOTES

VMD-18(AUS)

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©TxDOT®YEAR®	CONT	SECT	JOB	HIGHWAY
	0914	33	068,ETC	RSL
	DIST	COUNTY		SHEET NO.
	AUS	HAYS		369

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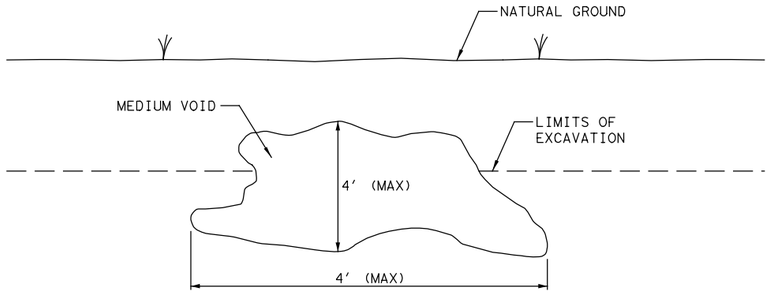
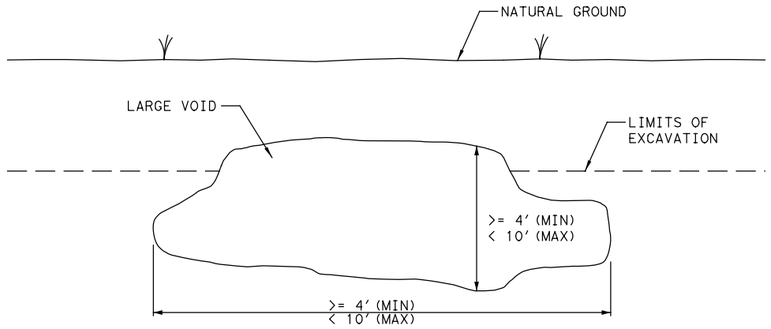
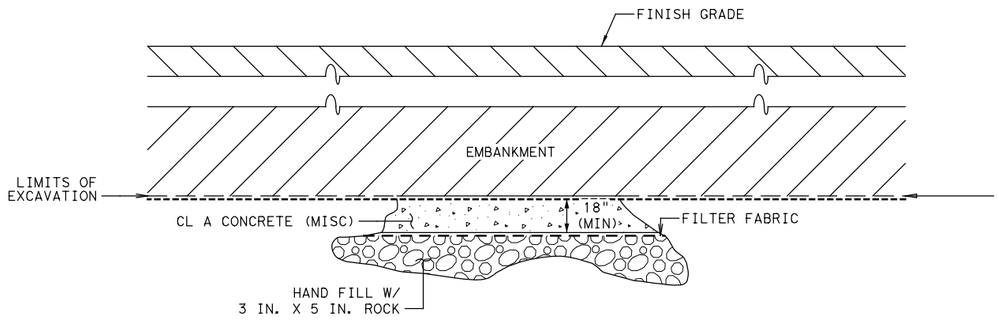
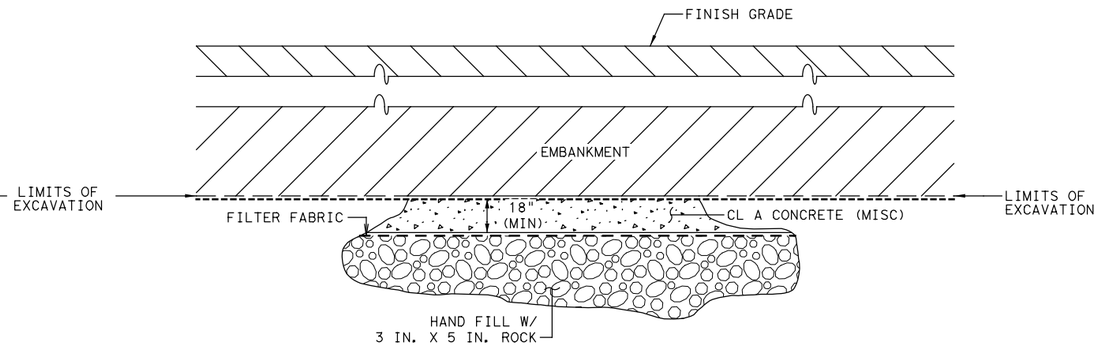






ROADWAY/S.U.P. GRADING OPERATIONS

MEDIUM (DRY VOID)
(<4′ IN ANY DIRECTION)
(1 CF < 64 CF)



ROADWAY/S.U.P. GRADING OPERATIONS

LARGE (DRY VOID)
(>=4′ <10′ ANY DIRECTION)
(64 CF < 1000 CF)

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VOID MITIGATION DETAILS

VMD-18(AUS)

SHEET 2 OF 7

©TxDOT$YEAR$	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	AUS	HAYS		370

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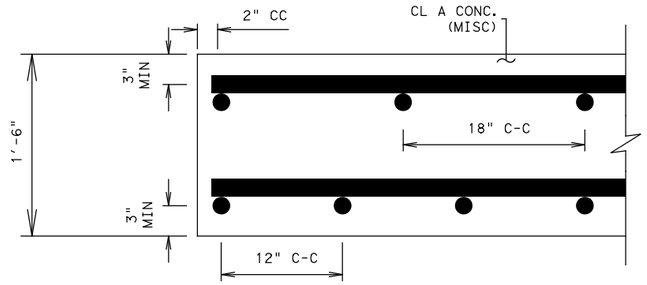
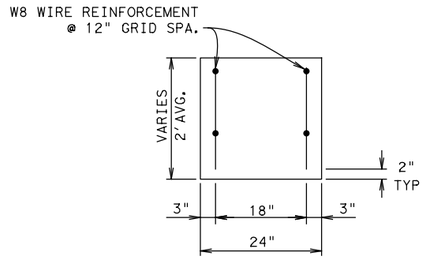


REINFORCING DETAIL



VARIABLE DEPTH CONCRETE WALL

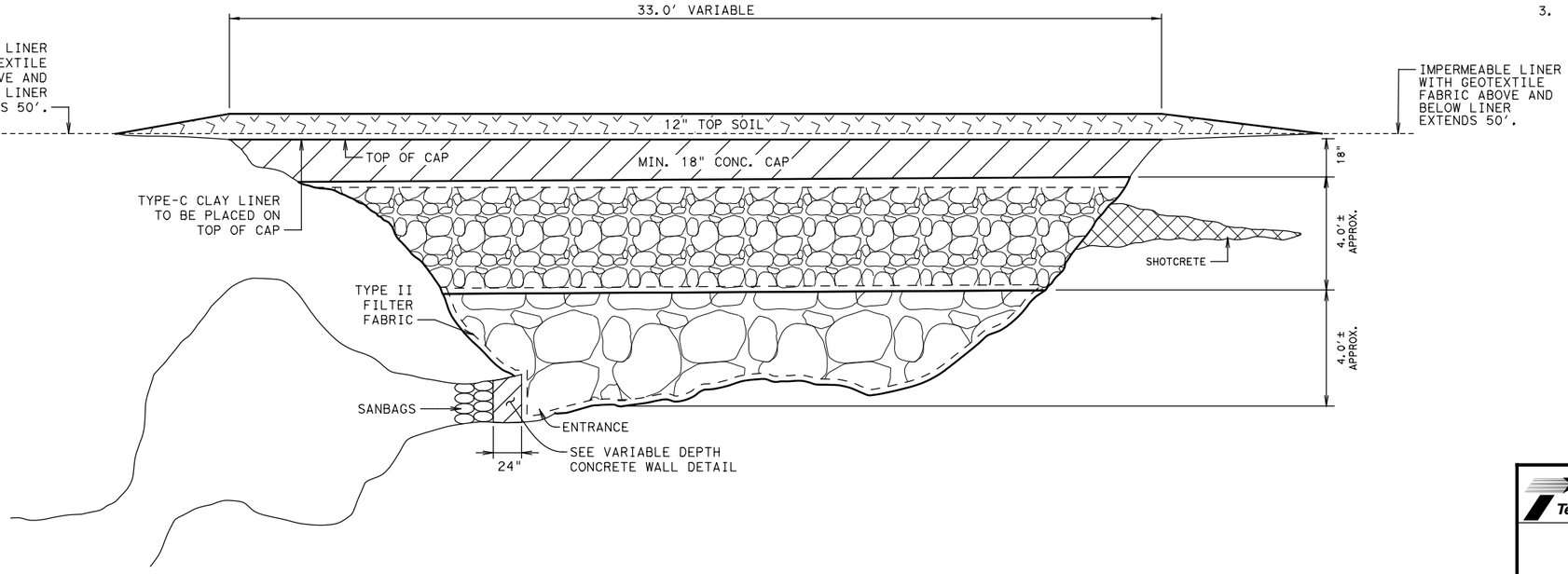
SCALE (IN FEET):
0 5

LEGEND

- CLASS A CONC. (MISC)
- 3 IN. x 5 IN. ROCK
- LARGE ROCK (≥ 1 FT)
- SHOTCRETE

NOTE:

1. CONCRETE WALL AND CONCRETE CAP SHALL BE PAID USING CLASS A CONC. (MISC).
2. SHOTCRETE WILL BE PAID USING CLASS A CONC. (MISC).
3. THE 12 IN. TOPSOIL AND LINER MAY NOT BE APPLICABLE IF THE VOID IS NOT IN A POND.



ELEVATION OF VOID IN A POND

Texas Department of Transportation | Austin District Standard

VOID MITIGATION DETAILS

VMD-18(AUS)

CONT	SECT	JOB	HIGHWAY
0914	33	068,ETC	RSL
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AUS	HAYS		371

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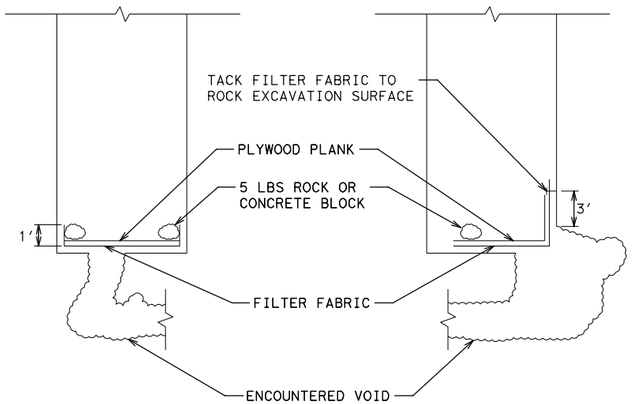

TEMPORARY PROTECTION
VOID AT BOTTOM OF TRENCH

NOTES:

1. PLACE TEMPORARY PROTECTION WITHIN TRENCH TO COVER VOID AS INDICATED. FABRIC SHALL EXTEND A MINIMUM OF 3 IN. BEYOND EDGE OF VOID. PLACE A PLYWOOD PLANK (MINIMUM 0.75 IN. THICK) OVER FABRIC. PLANK AND FABRIC SHALL BE WEIGHTED AS REQUIRED BY 5 LBS ROCK OR CONCRETE BLOCK TO SECURE FILTER FABRIC.

2. TEMPORARY PROTECTION SHALL BE IN PLACE AT ALL TIMES THAT CONSTRUCTION OPERATIONS ARE NOT IN ACTUAL PROGRESS.

3. CONSTRUCTION OPERATIONS WITHIN 50' SHALL NOT PROGRESS DURING OCCURRENCE OF RAIN TO ALLOW FOR PROTECTION OF VOID DURING A RAIN EVENT.

4. LOCALIZED EROSION MEASURES (SILT FENCE, EROSION CONTROL LOG OR TRIANGULAR FILTER DIKES) SHALL BE INSTALLED ALONG THE TRENCH TO ENSURE THAT LOOSE SPOILS OR RUNOFF DO NOT ENTER THE TRENCH OR AFFECT PERFORMANCE OF TEMPORARY PROTECTION. USE EARTHEN BERN TO DIVERT WATER AWAY FROM THE TRENCH.

5. SPECIAL CARE SHALL BE TAKEN TO ENSURE THAT EROSION CONTROL MEASURES REQUIRED ALONG THE TRENCH ARE MAINTAINED, CLEANED AND FULLY FUNCTIONAL.

6. FILTER FABRIC AND ROCK OR CONCRETE BLOCKS AND PLYWOOD PLANK SHALL BE REMOVED FROM THE TRENCH WHEN PERMANENT VOID MITIGATION MEASURES ARE INSTALLED.

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VOID MITIGATION DETAILS

VMD-18(AUS)

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AUS	HAYS		372

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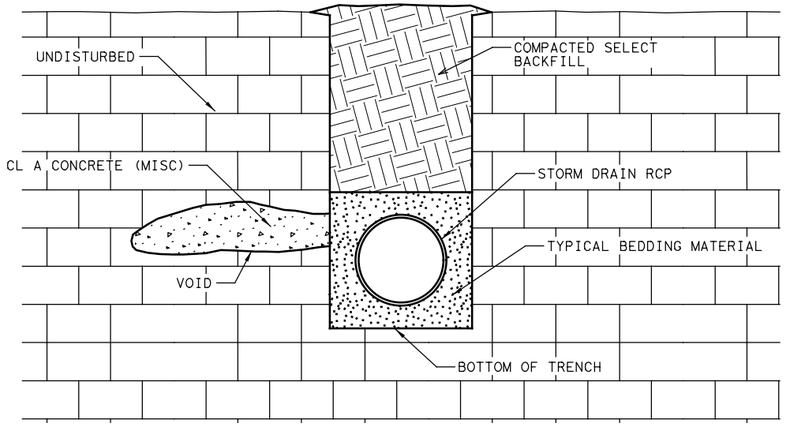
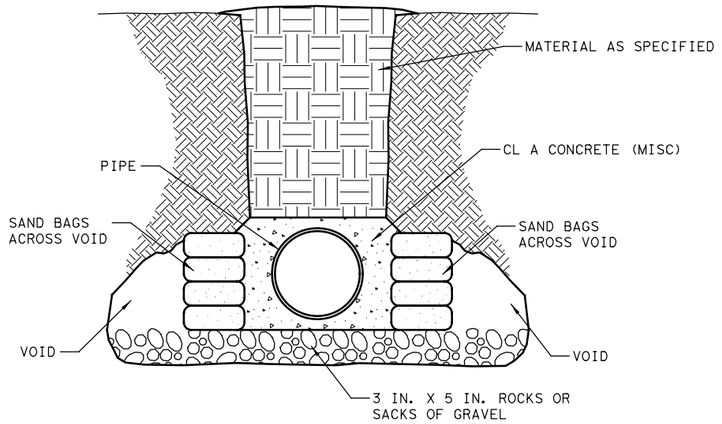


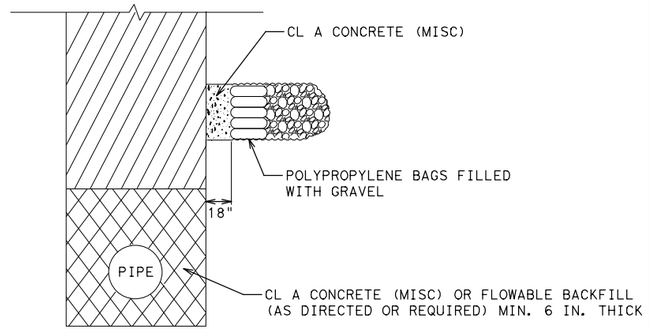
TRENCHING OPERATIONS
SMALL/MEDIUM (DRY VOID)
(<64 CF)

VOID IS EITHER LARGER THAN SIX (6) INCHES IN AT LEAST ONE DIRECTION OR IS LOCATED WITHIN THE LEVEL OF THE PIPE EMBEDMENT. ALL ROCK WITHIN AND SURROUNDING THE VOID IS SOUND.



TRENCHING OPERATIONS
LARGE (DRY VOID)
(64 CF < 1,000 CF)

VOID INTERSECTS THE PLANE OF THE TRENCH FLOOR AND ANY OPENING IN TRENCH FLOOR IS GREATER THAN FOUR (4) FEET IN ANY DIRECTION, OR THE TRENCH FLOOR IS UNSTABLE.

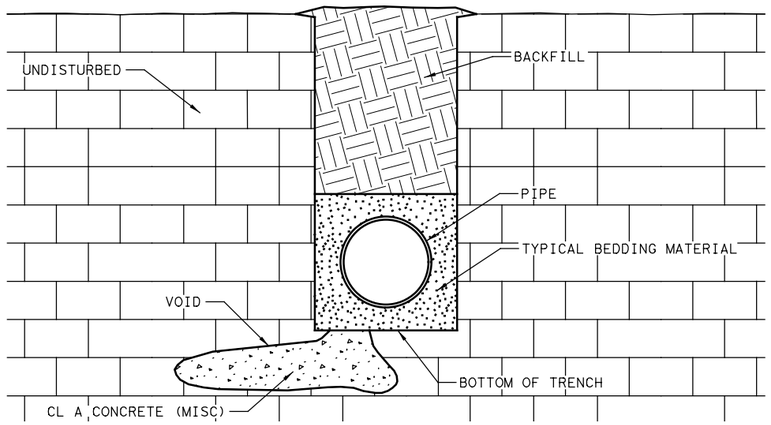


TRENCHING OPERATIONS
LARGE (DRY VOID)
(64 CF < 1,000 CF)

VOID IS ABOVE THE PLANE OF THE TRENCH FLOOR

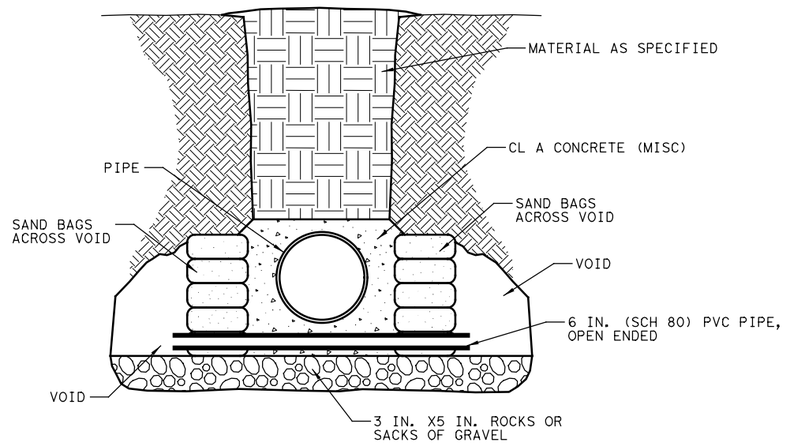
GENERAL NOTE:

1. ALL PIPES SHALL BE ENCASED WITH CLASS A CONCRETE THAT EXTENDS 5' BEYOND THE EDGE OF THE VOIDIN ALL DIRECTIONS. THE CONCRETE SHALL PROVIDE 6 IN. COVER AROUND THE PIPE.



TRENCHING OPERATIONS
SMALL/MEDIUM (DRY VOID)
(<64 CF)

VOID INTERSECTS THE PLANE OF THE TRENCH FLOOR AND IS LESS THAN FOUR (4) FEET IN ANY DIRECTION. ALL ROCK WITHIN AND SURROUNDING THE VOID IS SOUND.



TRENCHING OPERATIONS
LARGE (WET VOID)
(64 CF < 1,000 CF)

VOID INTERSECTS THE PLANE OF THE TRENCH FLOOR AND ANY OPENING IN TRENCH FLOOR IS GREATER THAN FOUR (4) FEET IN ANY DIRECTION, OR THE TRENCH FLOOR IS UNSTABLE.

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VOID MITIGATION DETAILS

VMD-18(AUS)

SHEET 5 OF 7

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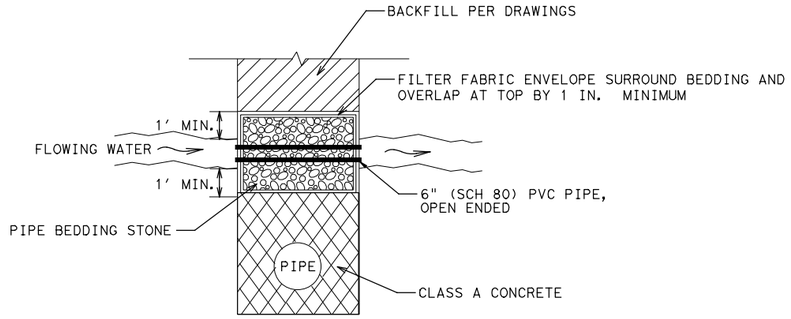

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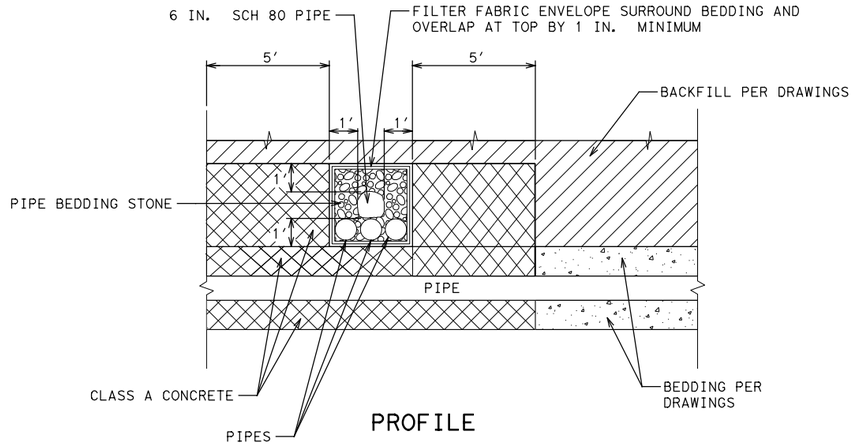

PROFILE

TRENCHING OPERATIONS
GROUNDWATER ABOVE
BEDDING MATERIAL

GENERAL NOTE:

1. ALL PIPES SHALL BE ENCASED WITH CLASS A CONCRETE THAT EXTENDS 5′ BEYOND THE EDGE OF THE VOID IN ALL DIRECTIONS. THE CONCRETE SHALL PROVIDE 6 IN. COVER AROUND THE PIPE.

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VOID MITIGATION DETAILS

VMD-18(AUS)

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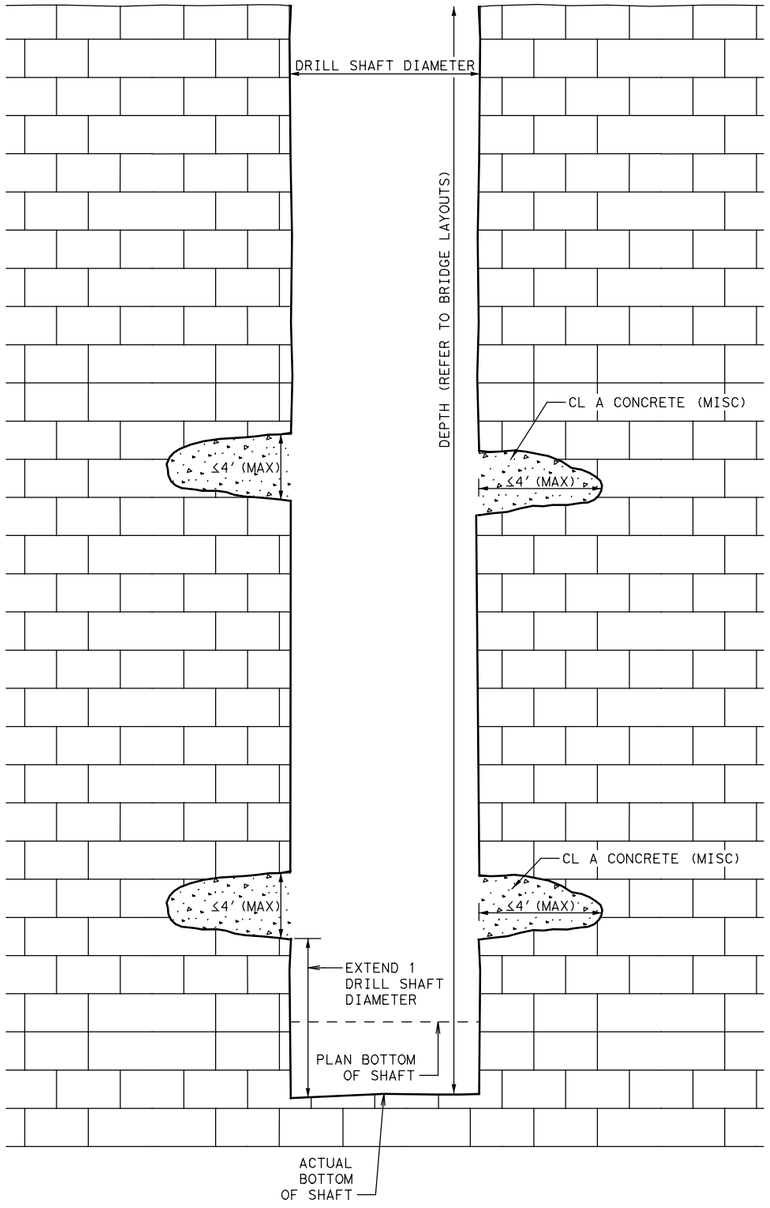
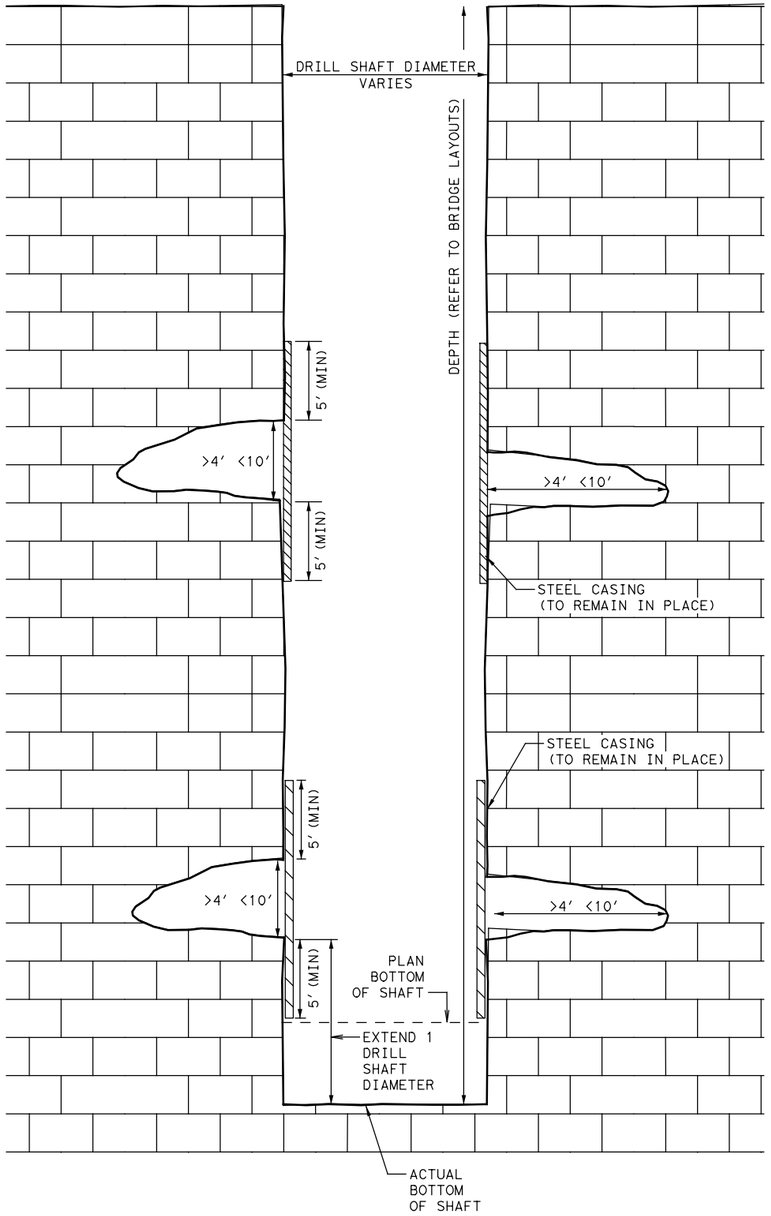


DRILL SHAFT OPERATIONS
SMALL/MEDIUM (DRY VOID)
(≤4′ IN ANY DIRECTION)

CONCRETE FOR THE VOID SHALL BE PLACED CONTINUOUSLY WITH THE SHAFT

WHERE VOIDS ARE ENCOUNTERED, DRILL SHAFT LENGTHS MAY NEED TO BE INCREASED. APPROVAL FROM THE ENGINEER OF RECORD IS REQUIRED TO COMPLETE CONSTRUCTION OF THE DRILLED SHAFT.



DRILL SHAFT OPERATIONS
LARGE (DRY VOID)
(>4′ <10′ IN ANY DIRECTION)

WHERE VOIDS ARE ENCOUNTERED, DRILL SHAFT LENGTHS MAY NEED TO BE INCREASED. APPROVAL FROM THE ENGINEER OF RECORD IS REQUIRED TO COMPLETE CONSTRUCTION OF THE DRILL SHAFT.

NOTES:

1. STEEL CASING WILL BE USED FOR DRILL SHAFT CONSTRUCTION THAT ENCOUNTERS LARGE VOIDS, SO AS TO ALLOW A MINIMUM AMOUNT OF CONCRETE TO ENTER THE VOID.
2. STEEL CASING SHOULD EXTEND A MINIMUM OF FIVE FEET FROM THE EDGE OF THE VOID.
3. AS PART OF THE DRILL SHAFT INSTALLATION PLAN, CONTRACTOR SHALL PROVIDE MEANS AND METHODS FOR ANCHORING THE CASING.
4. REFER TO GENERAL NOTES FOR ADDITIONAL INFORMATION.
5. STEEL CASING MAYBE EXTENDED TO THE TOP OF THE SHAFT. THE ENTIRE LENGTH OF CASING INSTALLED IN A SHAFT WILL BE COMPENSATED IN ACCORDANCE WITH THE VOID MITIITGATION NOTES.

Texas Department of Transportation

Austin District Standard

VOID MITIGATION DETAILS

VMD-18(AUS)

©TxDOT$YEAR$	CONT	SECT	JOB	HIGHWAY
	0914	33	068,ETC	RSL
	DIST	COUNTY		SHEET NO.
	AUS	HAYS		375

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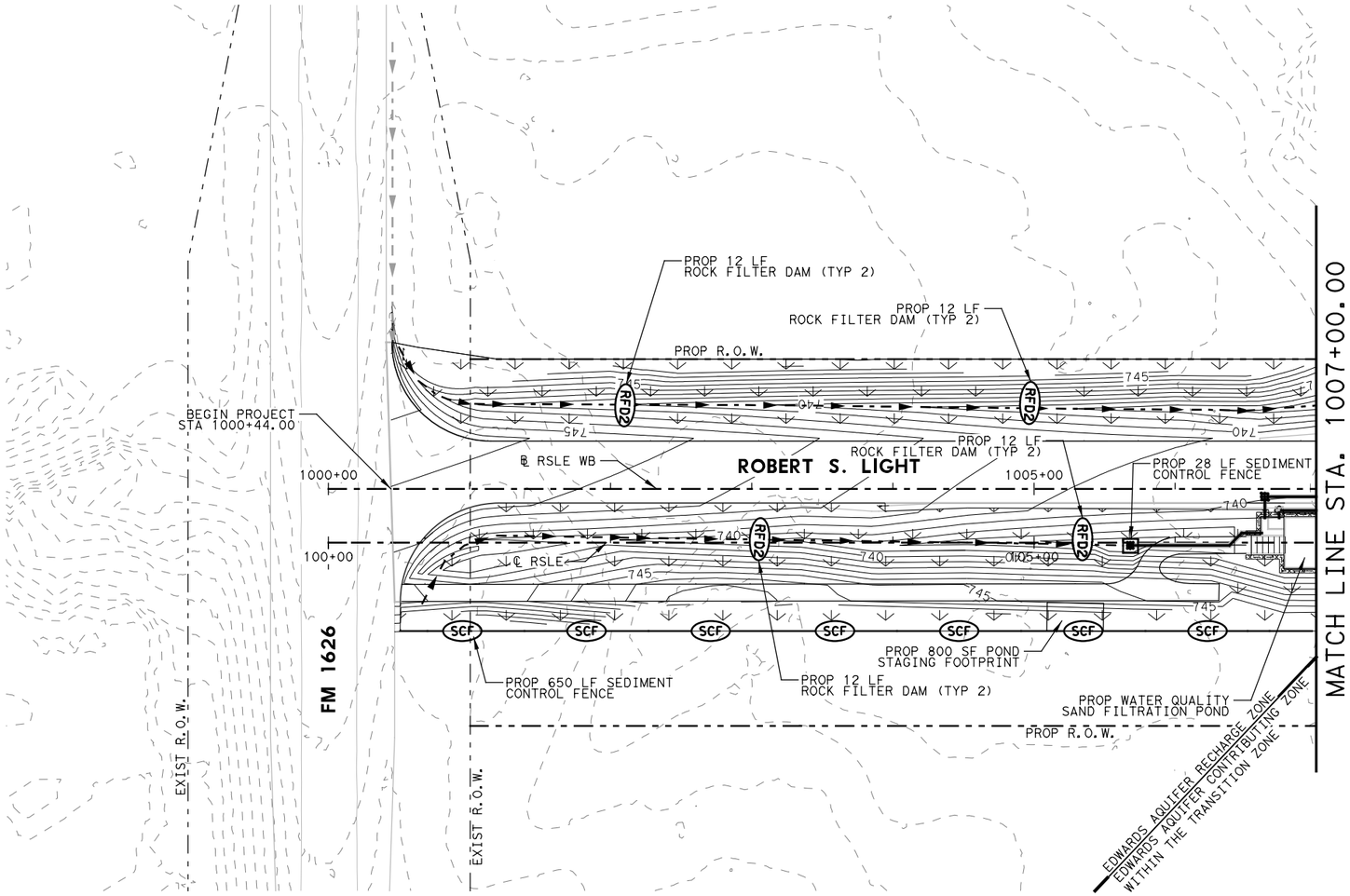

0 50 100
SCALE IN FEET

LEGEND

- PROP DITCH
- ROW
- RFD2 — PROP ROCK FILTER DAM (RFD)
- SCF — PROP SEDIMENT CONTROL FENCE (SCF)
- TOPSOIL & SEEDING WITH SOIL RETENTION BLANKET
- PROP CONTOURS
- EXIST CONTOUR

NOTES:

1. PERIMETER CONTROLS SHALL BE IN PLACE PRIOR TO COMMENCING ANY SOIL DISTURBING ACTIVITIES. PERIMETER DEVICES TO BE PLACED AT ROW OR EASEMENT UNLESS OTHERWISE NOTED.
2. THE LOCATION OF EROSION CONTROL AND OTHER SOIL STABILIZATION PRACTICES WILL BE BASED ON SITE SPECIFIC FIELD CONDITIONS AS NEEDED. QUANTITIES SHOWN ARE APPROXIMATE AND MAY BE ADJUSTED TO MEET FIELD CONDITIONS.
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2/3/2021

STATE OF TEXAS
ASHLEY S. HANSON
107373
LICENSED
PROFESSIONAL ENGINEER

HAYS COUNTY TEXAS

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ROBERT S. LIGHT EXTENSION

ROBERT S LIGHT
SW3P
BEGIN PROJECT TO STA 1007+00

SCALE: 1"=100'-H

SHEET 1 OF 16

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	376
CLH	0914	33	068	
CHECK				
CMC				

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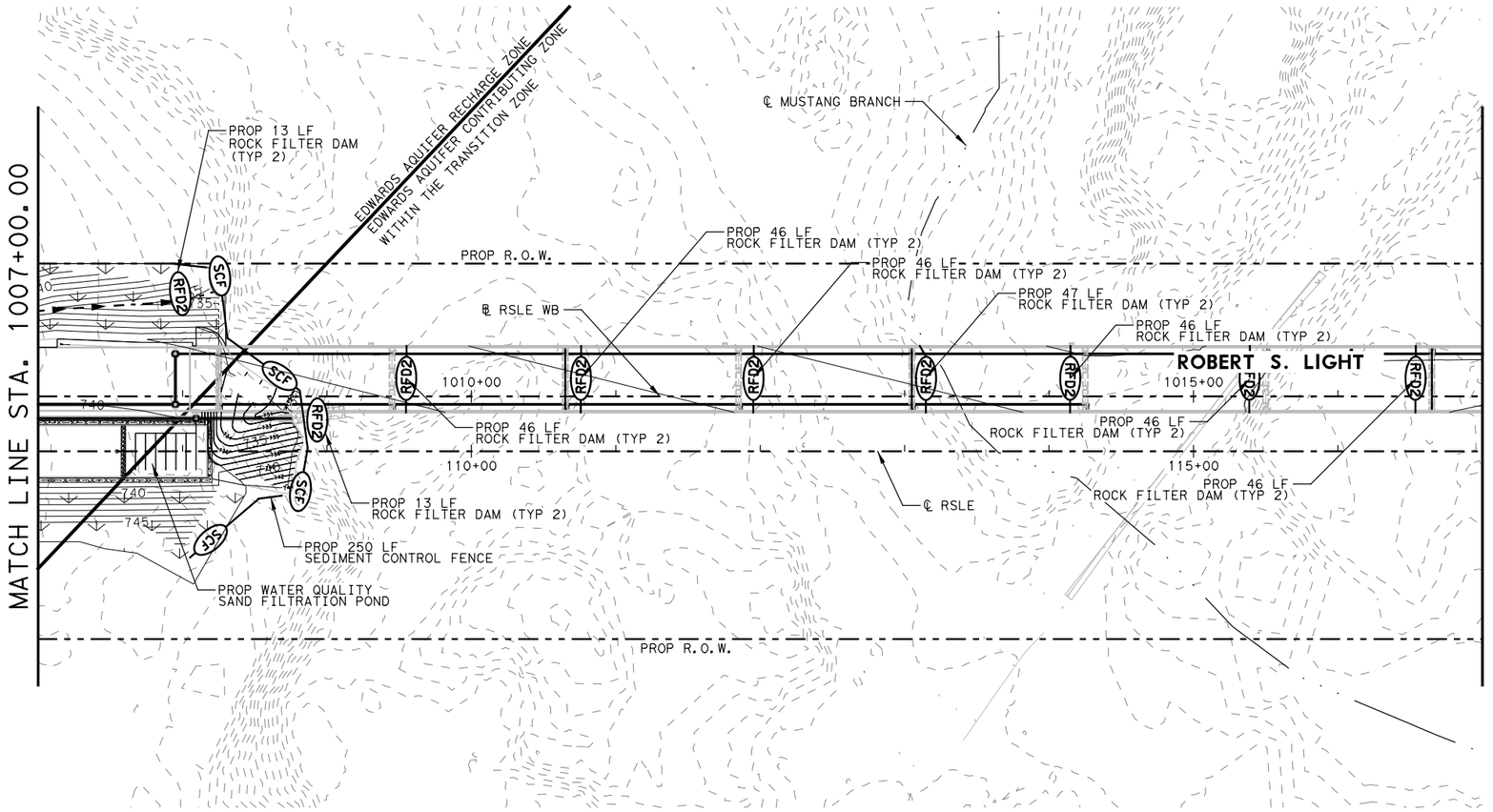

0 50 100
SCALE IN FEET

NORTH

LEGEND

- PROP DITCH
- ROW
- PROP ROCK FILTER DAM (RFD)
- PROP SEDIMENT CONTROL FENCE (SCF)
- TOPSOIL & SEEDING WITH SOIL RETENTION BLANKET
- PROP CONTOURS
- EXIST CONTOUR

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2/3/2021
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HAYS COUNTY TEXAS

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ROBERT S. LIGHT EXTENSION

ROBERT S LIGHT
SW3P
STA 1007+00 TO STA 1017+00

SCALE: 1"=100'-H

SHEET 2 OF 16

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
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CHECK CLH	CONTROL	SECTION	JOB	
CHECK CMC	0914	33	068	

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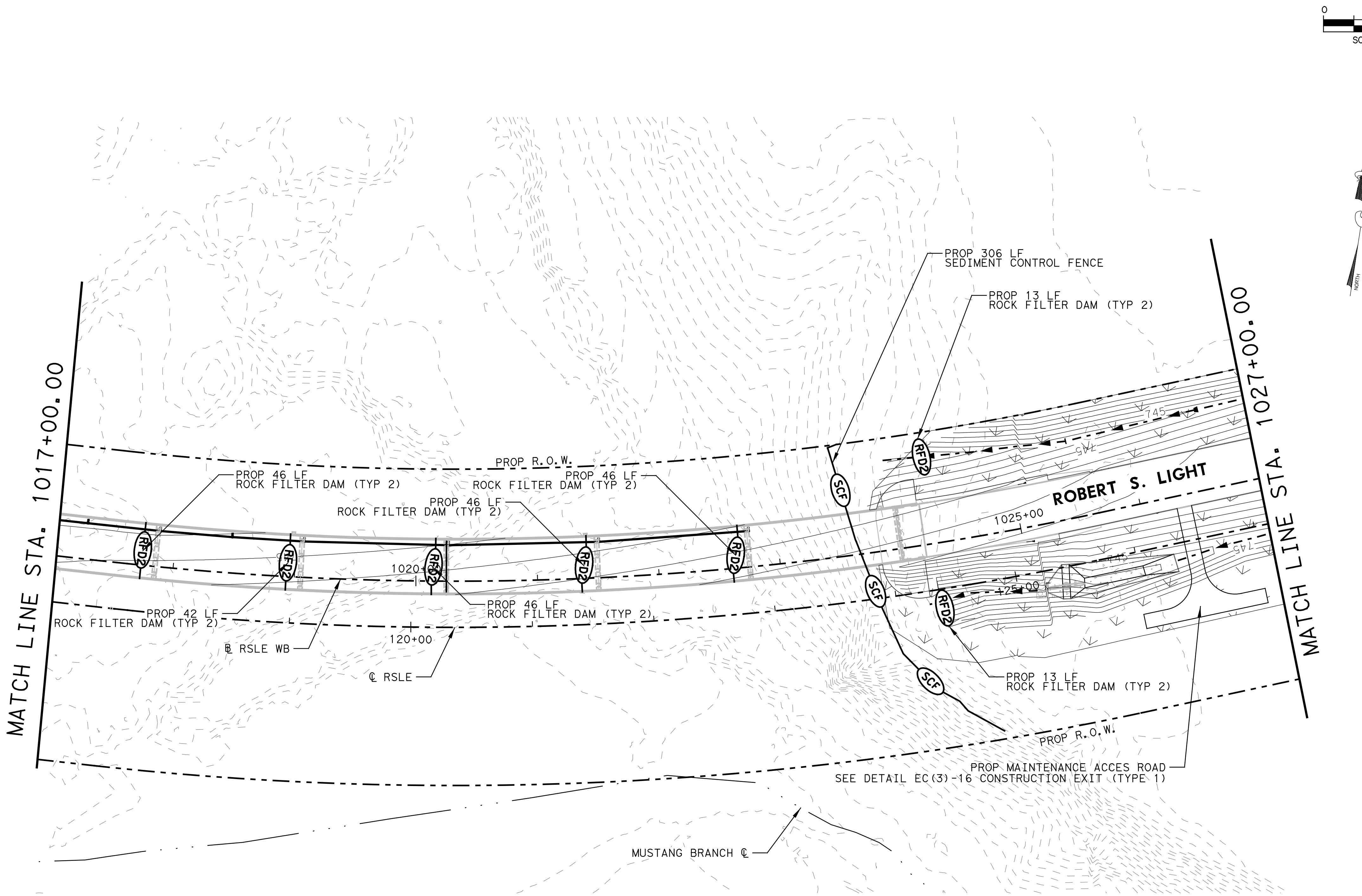

LEGEND

- PROP DITCH
- ROW
- (RFD2) PROP ROCK FILTER DAM (RFD)
- (SCF) PROP SEDIMENT CONTROL FENCE (SCF)
- TOPSOIL & SEEDING WITH SOIL RETENTION BLANKET
- PROP CONTOURS
- EXIST CONTOUR

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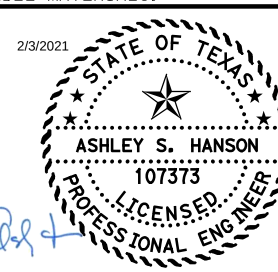
2/3/2021



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ROBERT S. LIGHT EXTENSION

ROBERT S LIGHT
SW3P
STA 1017+00 TO STA 1027+00

SCALE: 1"=100'-H

SHEET 3 OF 16

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP				
CHECK	TEXAS	AUS	HAYS	378
CLH	CONTROL	SECTION	JOB	
CHECK				
CMC	0914	33	068	

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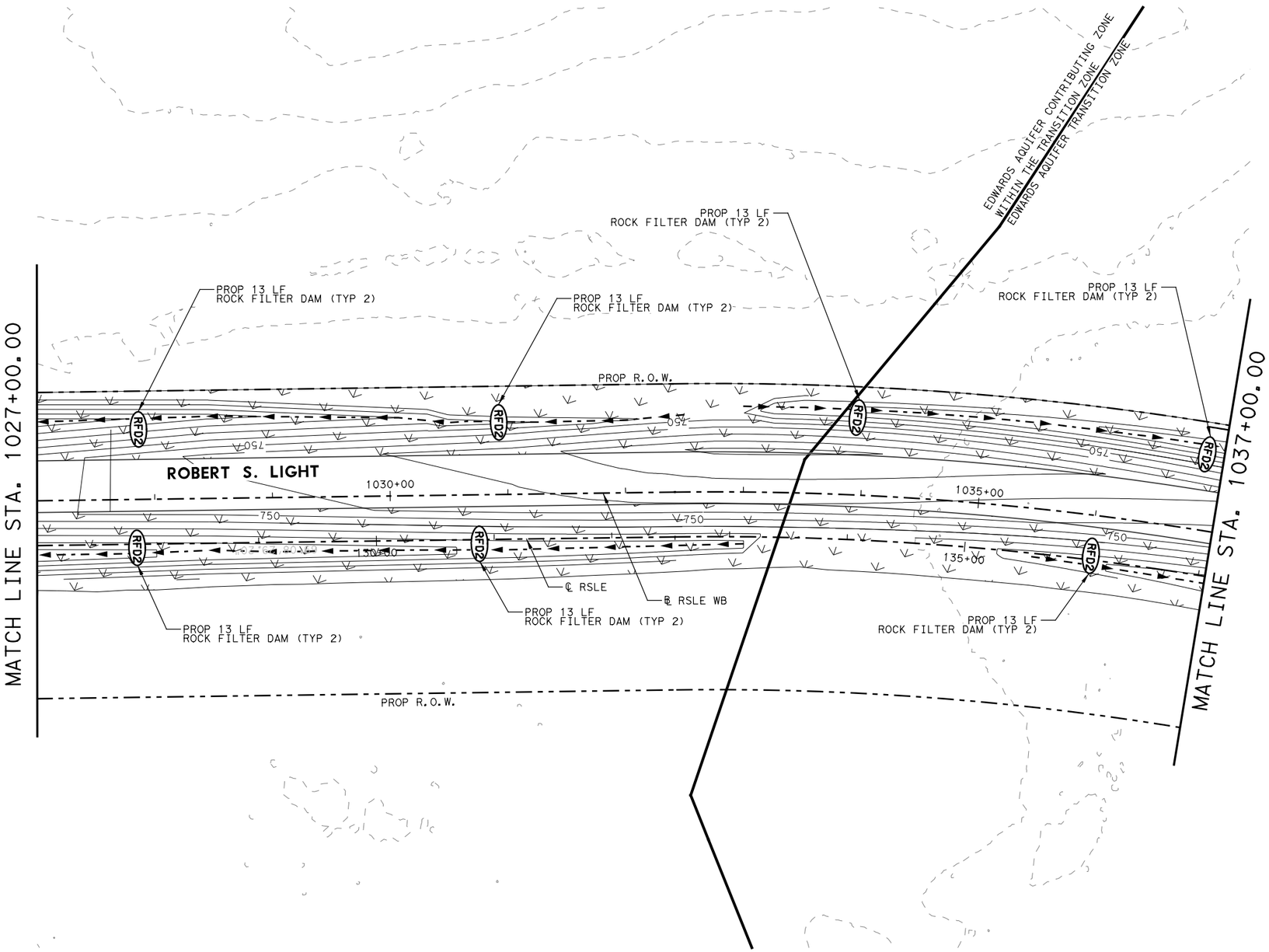

0 50 100
SCALE IN FEET

LEGEND

- PROP DITCH
- ROW
- RFD2 — PROP ROCK FILTER DAM (RFD)
- SCF — PROP SEDIMENT CONTROL FENCE (SCF)
- TOPSOIL & SEEDING WITH SOIL RETENTION BLANKET
- PROP CONTOURS
- EXIST CONTOUR

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2/3/2021
STATE OF TEXAS
ASHLEY S. HANSON
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HAYS COUNTY TEXAS

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ROBERT S. LIGHT EXTENSION

ROBERT S LIGHT
SW3P
STA 1027+00 TO STA 1037+00

SCALE: 1"=100'-H

SHEET 4 OF 16

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
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GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
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CHECK	CONTROL	SECTION	JOB	379
CLH	0914	33	068	
CHECK				
CMC				

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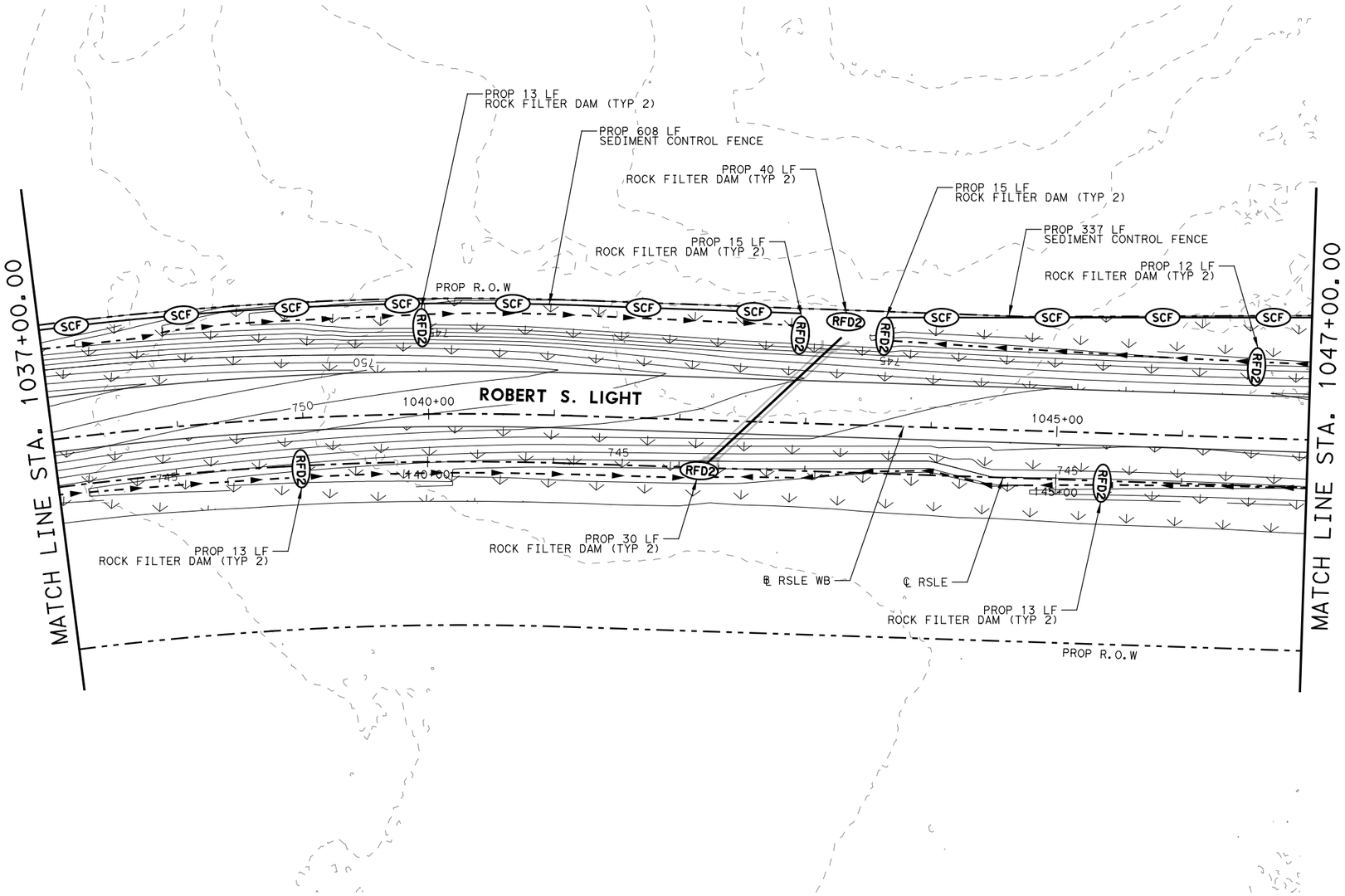

0 50 100
SCALE IN FEET

NORTH

LEGEND

- PROP DITCH
- ROW
- RFD2 — PROP ROCK FILTER DAM (RFD)
- SCF — PROP SEDIMENT CONTROL FENCE (SCF)
- TOPSOIL & SEEDING WITH SOIL RETENTION BLANKET
- PROP CONTOURS
- EXIST CONTOUR

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2/3/2021

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ROBERT S. LIGHT EXTENSION

ROBERT S LIGHT
SW3P
STA 1037+00 TO STA 1047+00

SCALE: 1"=100'-H

SHEET 5 OF 16

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	380
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
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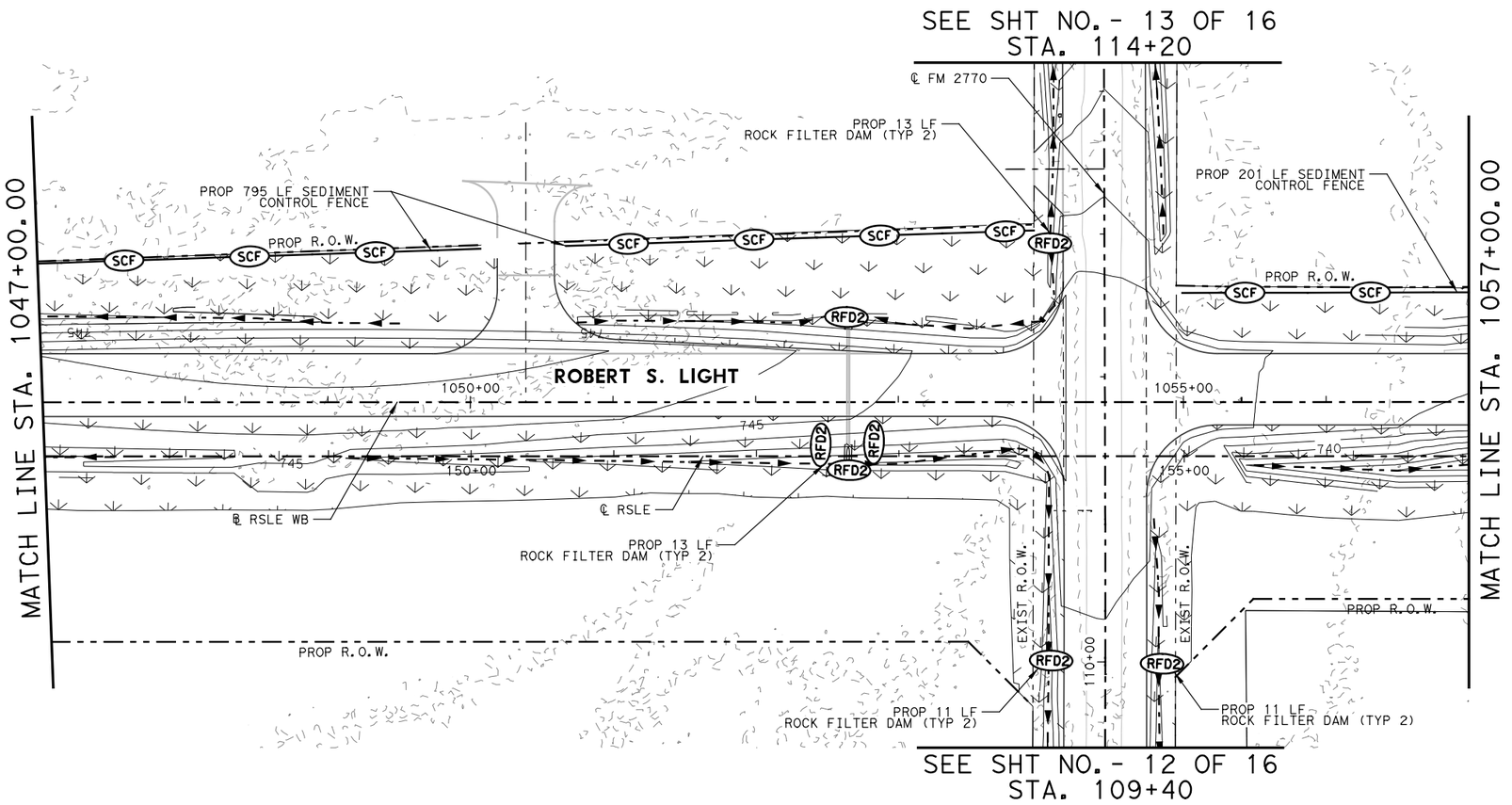

0 50 100
SCALE IN FEET

LEGEND

- PROP DITCH
- ROW
- RFD2 — PROP ROCK FILTER DAM (RFD)
- SCF — PROP SEDIMENT CONTROL FENCE (SCF)
- TOPSOIL & SEEDING WITH SOIL RETENTION BLANKET
- PROP CONTOURS
- EXIST CONTOUR

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ROBERT S. LIGHT EXTENSION

ROBERT S LIGHT
SW3P
STA 1047+00 TO STA 1057+00

SCALE: 1"=100'-H

SHEET 6 OF 16

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
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CHECK	CONTROL	SECTION	JOB	
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CHECK				
CMC				

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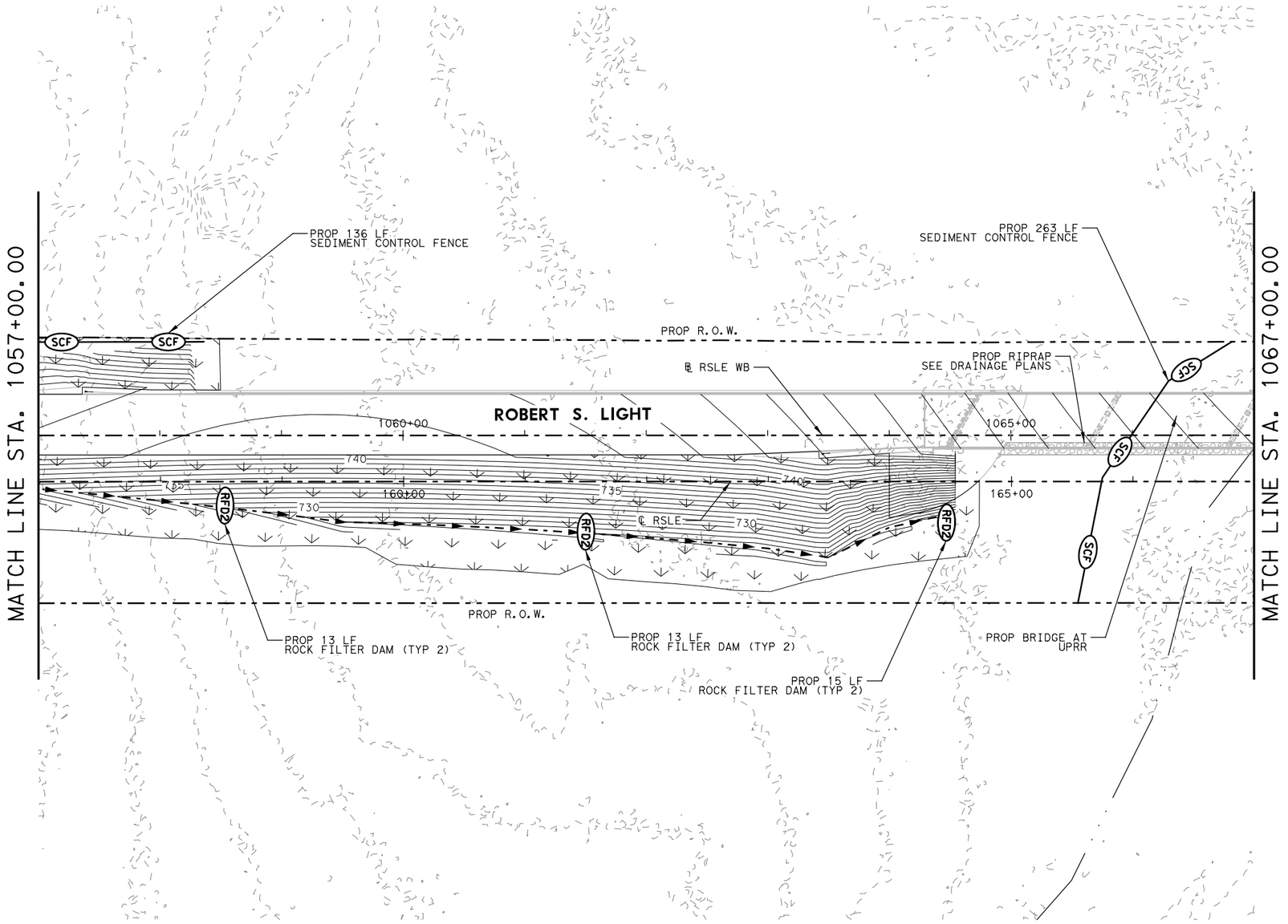

0 50 100
SCALE IN FEET

NORTH

LEGEND

- PROP DITCH
- ROW
- PROP ROCK FILTER DAM (RFD)
- PROP SEDIMENT CONTROL FENCE (SCF)
- TOPSOIL & SEEDING WITH SOIL RETENTION BLANKET
- PROP CONTOURS
- EXIST CONTOUR

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ROBERT S. LIGHT EXTENSION

ROBERT S LIGHT
SW3P
STA 1057+00 TO STA 1067+00

SCALE: 1"=100'-H

SHEET 7 OF 16

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	382
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CHECK				
CMC				

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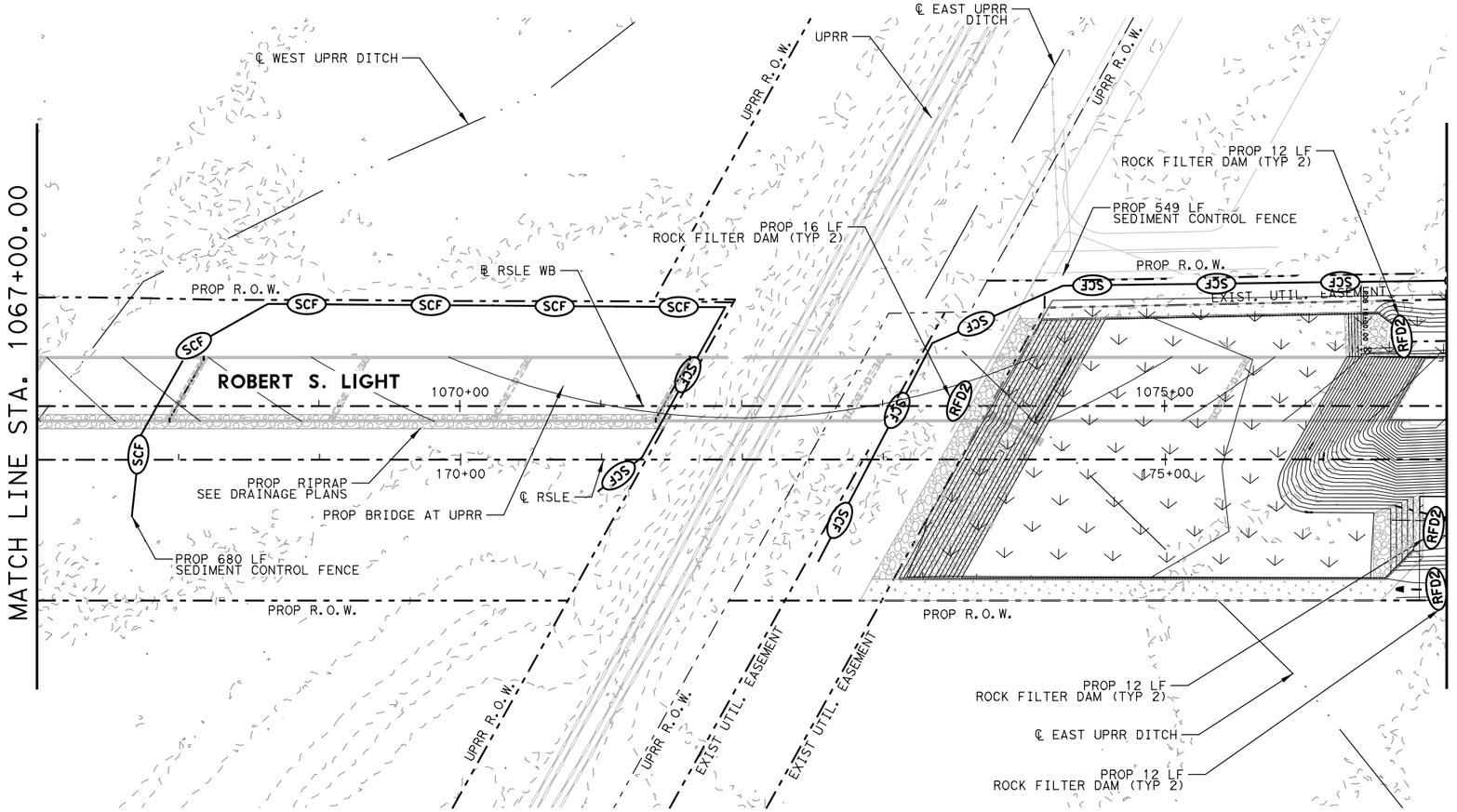

0 50 100
SCALE IN FEET

LEGEND

- PROP DITCH
- ROW
- PROP ROCK FILTER DAM (RFD)
- PROP SEDIMENT CONTROL FENCE (SCF)
- TOPSOIL & SEEDING WITH SOIL RETENTION BLANKET
- PROP CONTOURS
- EXIST CONTOUR

NOTES:

1. PERIMETER CONTROLS SHALL BE IN PLACE PRIOR TO COMMENCING ANY SOIL DISTURBING ACTIVITIES. PERIMETER DEVICES TO BE PLACED AT ROW OR EASEMENT UNLESS OTHERWISE NOTED.
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2/3/2021

STATE OF TEXAS
ASHLEY S. HANSON
107373
LICENSED
PROFESSIONAL ENGINEER

HAYS COUNTY TEXAS

Lockwood, Andrews & Newnam, Inc.
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ROBERT S. LIGHT EXTENSION

ROBERT S LIGHT
SW3P
STA 1067+00 TO STA 1077+00

SCALE: 1"=100'-H

SHEET 8 OF 16

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	383
CLH	0914	33	068	
CHECK				
CMC				

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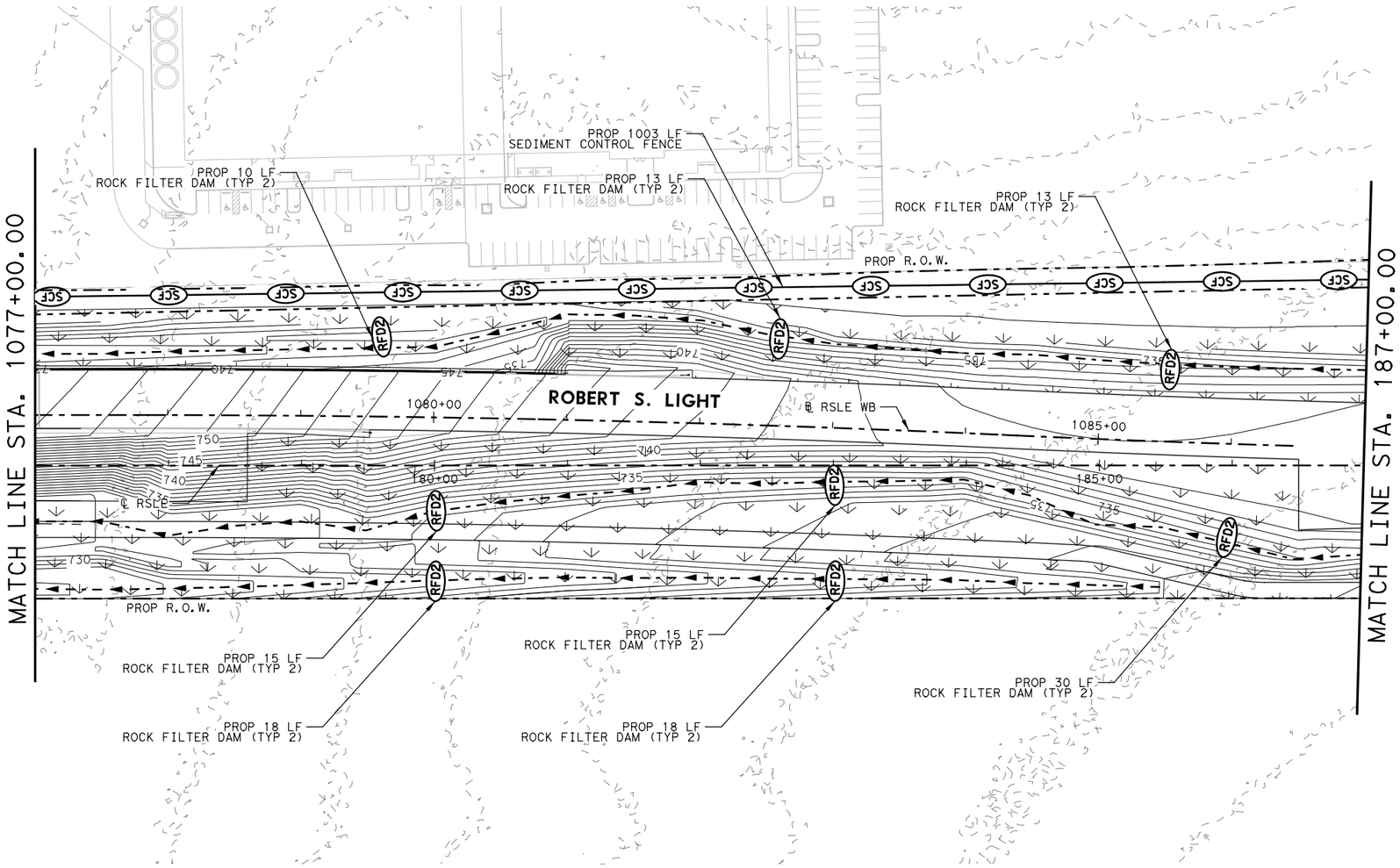

0 50 100
SCALE IN FEET

LEGEND

- PROP DITCH
- ROW
- PROP ROCK FILTER DAM (RFD)
- PROP SEDIMENT CONTROL FENCE (SCF)
- TOPSOIL & SEEDING WITH SOIL RETENTION BLANKET
- PROP CONTOURS
- EXIST CONTOUR

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2/3/2021

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HAYS COUNTY TEXAS

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ROBERT S. LIGHT EXTENSION

ROBERT S LIGHT
SW3P
STA 1077+00 TO STA 187+00

SCALE: 1"=100'-H

SHEET 9 OF 16

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	
CHECK CLH	CONTROL	SECTION	JOB	384
CHECK CMC	0914	33	068	

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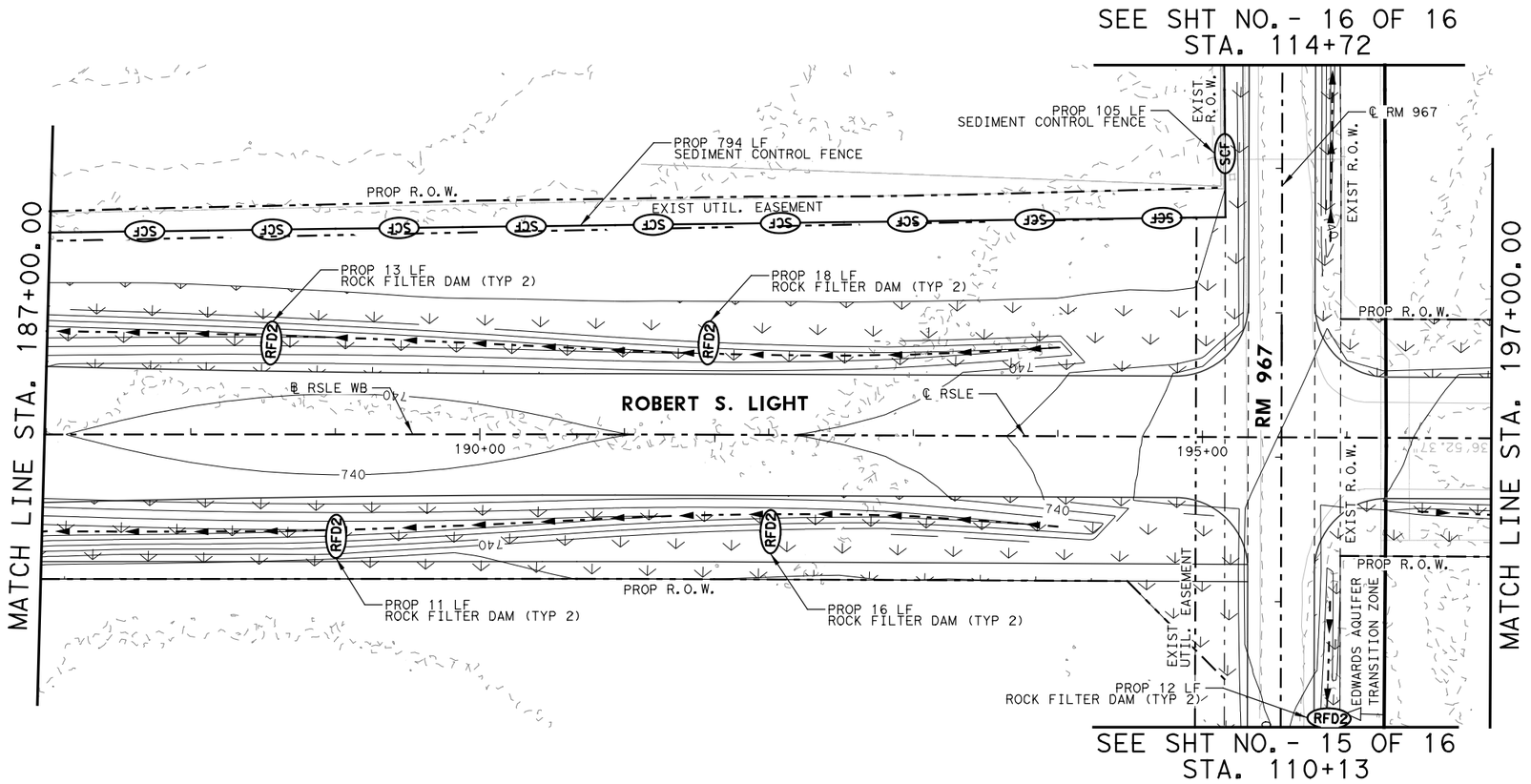

0 50 100
SCALE IN FEET

NORTH

LEGEND

- PROP DITCH
- ROW
- PROP ROCK FILTER DAM (RFD)
- PROP SEDIMENT CONTROL FENCE (SCF)
- TOPSOIL & SEEDING WITH SOIL RETENTION BLANKET
- PROP CONTOURS
- EXIST CONTOUR

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2/3/2021

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HAYS COUNTY TEXAS

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ROBERT S. LIGHT EXTENSION

ROBERT S LIGHT
SW3P
STA 187+00 TO STA 197+00

SCALE: 1"=100'-H

SHEET 10 OF 16

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	385
CHECK CLH	CONTROL	SECTION	JOB	
CHECK CMC	0914	33	068	

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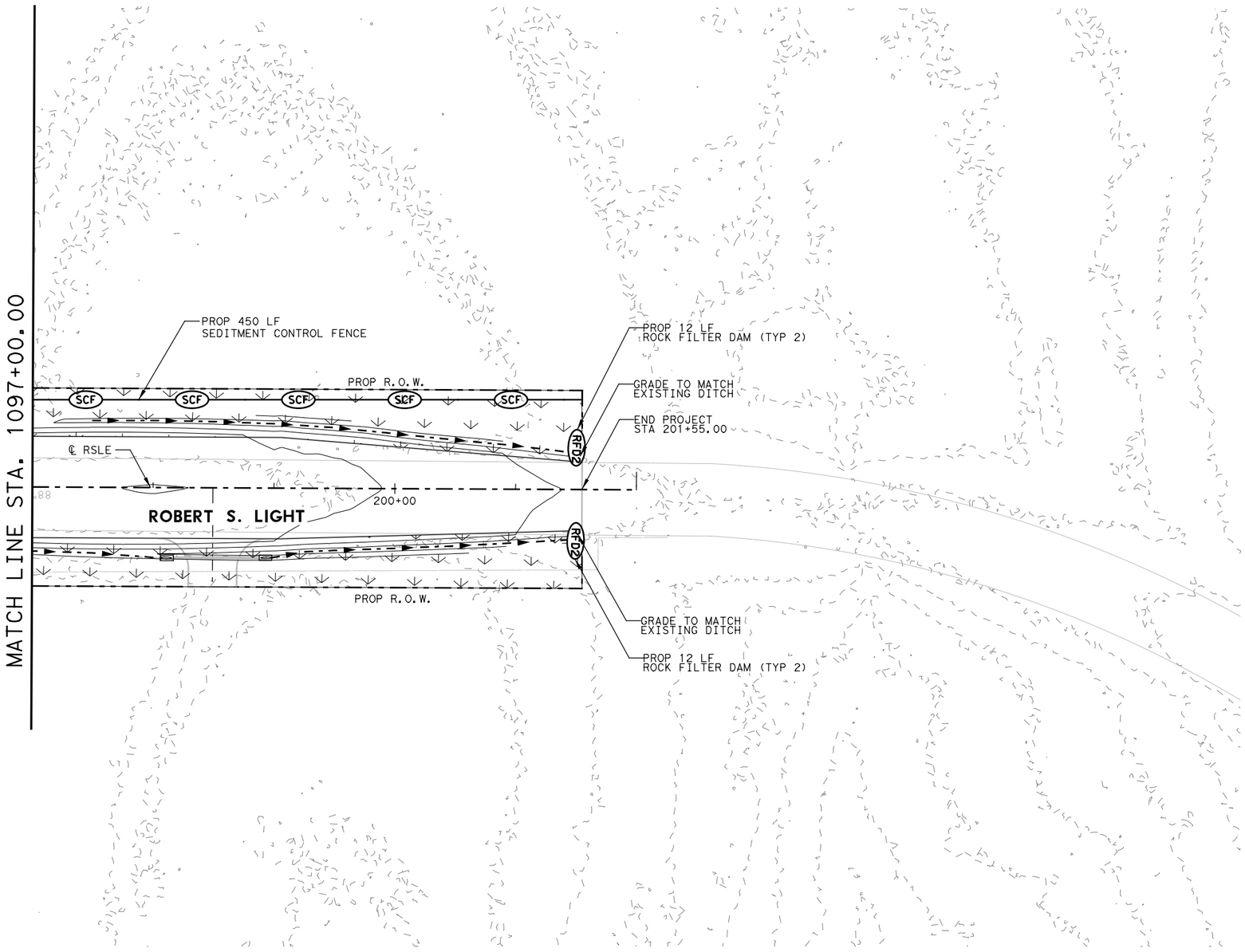

0 50 100
SCALE IN FEET

LEGEND

- PROP DITCH
- ROW
- RFD2 — PROP ROCK FILTER DAM (RFD)
- SCF — PROP SEDIMENT CONTROL FENCE (SCF)
- TOPSOIL & SEEDING WITH SOIL RETENTION BLANKET
- PROP CONTOURS
- EXIST CONTOUR

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2/3/2021

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ROBERT S. LIGHT EXTENSION

ROBERT S LIGHT
SW3P
STA 197+00 TO END PROJECT

SCALE: 1"=100'-H

SHEET 11 OF 16

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	386
CLH	0914	33	068	
CHECK				
CMC				

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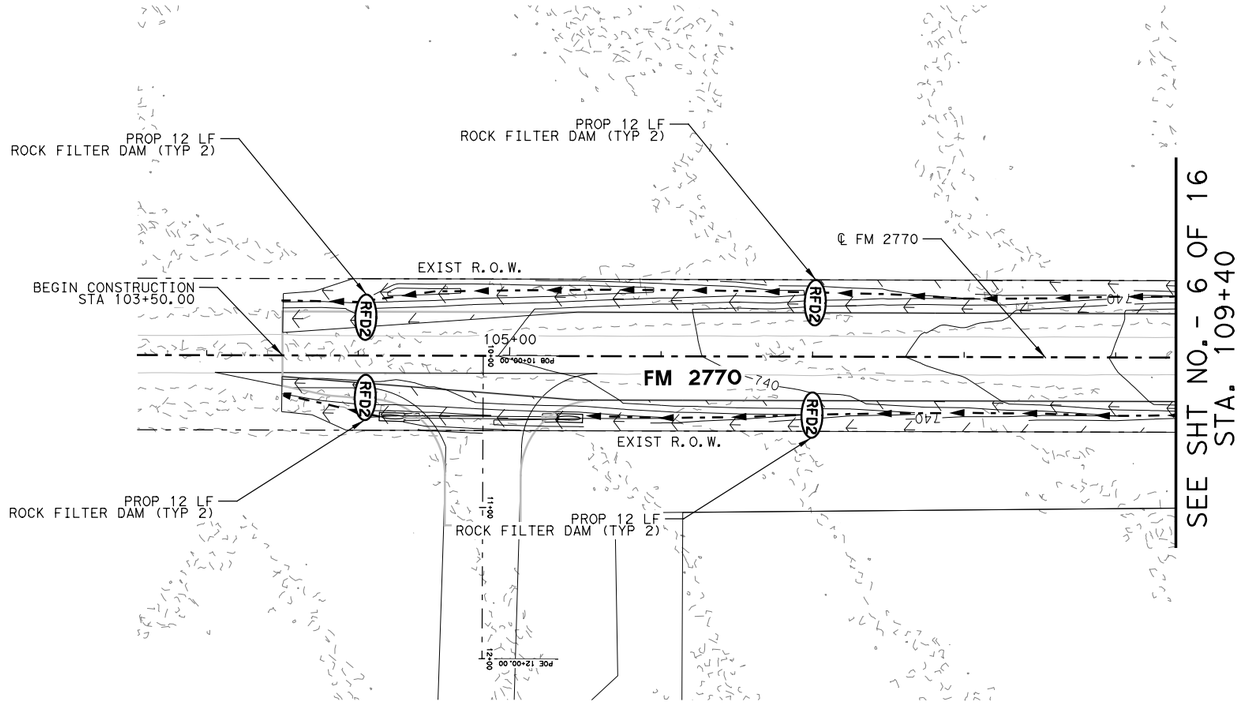

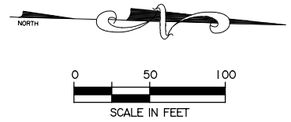

LEGEND

- PROP DITCH
- ROW
- (RFD2) PROP ROCK FILTER DAM (RFD)
- (SCF) PROP SEDIMENT CONTROL FENCE (SCF)
- TOPSOIL & SEEDING WITH SOIL RETENTION BLANKET
- PROP CONTOURS
- EXIST CONTOUR

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2/3/2021

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HAYS COUNTY TEXAS

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ROBERT S. LIGHT EXTENSION

FM 2770
SW3P
BEGIN PROJECT TO STA 109+40

SCALE: 1"=100'-H

SHEET 12 OF 16

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	387
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

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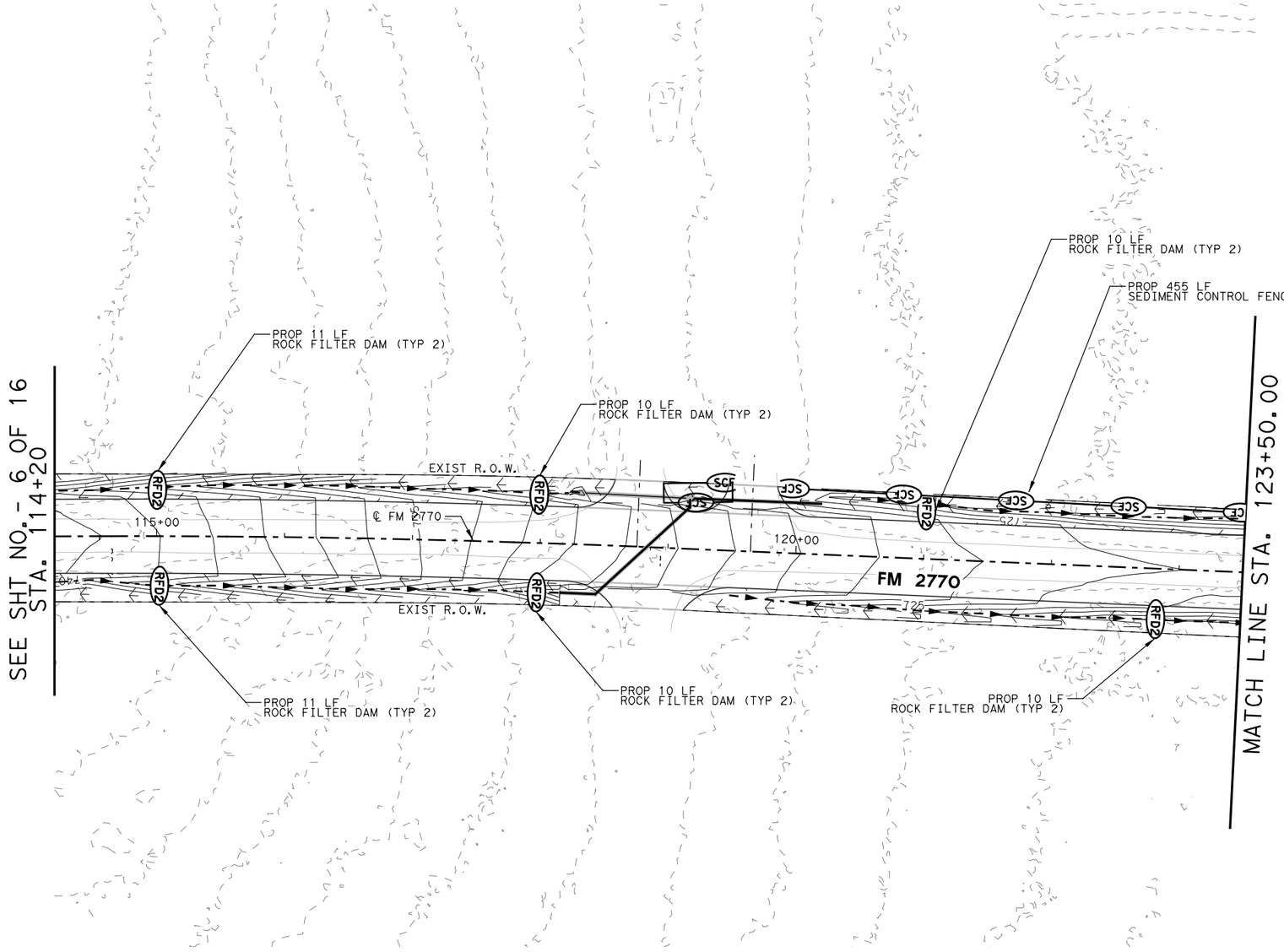

NORTH

0 50 100

SCALE IN FEET

LEGEND

- PROP DITCH
- ROW
- RFD2 — PROP ROCK FILTER DAM (RFD)
- SCF — PROP SEDIMENT CONTROL FENCE (SCF)
- TOPSOIL & SEEDING WITH SOIL RETENTION BLANKET
- PROP CONTOURS
- EXIST CONTOUR

NOTES:

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ROBERT S. LIGHT EXTENSION

FM 2770
SW3P
STA 114+20 TO STA 123+50

SCALE: 1"=100'-H

SHEET 13 OF 16

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	388
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

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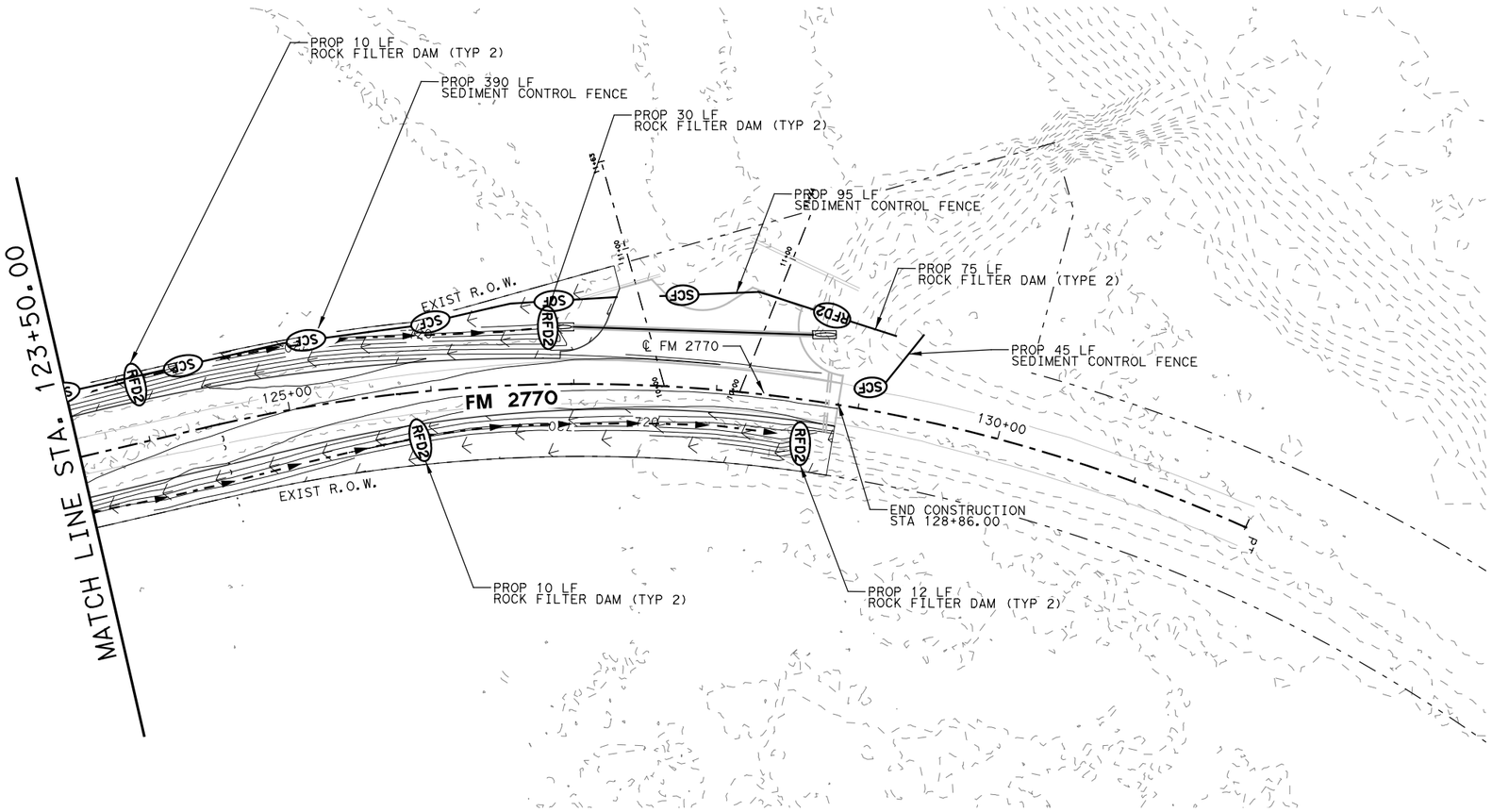

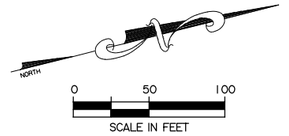

LEGEND

- PROP DITCH
- ROW
- RFD2 — PROP ROCK FILTER DAM (RFD)
- SCF — PROP SEDIMENT CONTROL FENCE (SCF)
- TOPSOIL & SEEDING WITH SOIL RETENTION BLANKET
- PROP CONTOURS
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ROBERT S. LIGHT EXTENSION

FM 2770
SW3P
STA 123+50 TO END PROJECT

SCALE: 1"=100'-H

SHEET 14 OF 16

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	389
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

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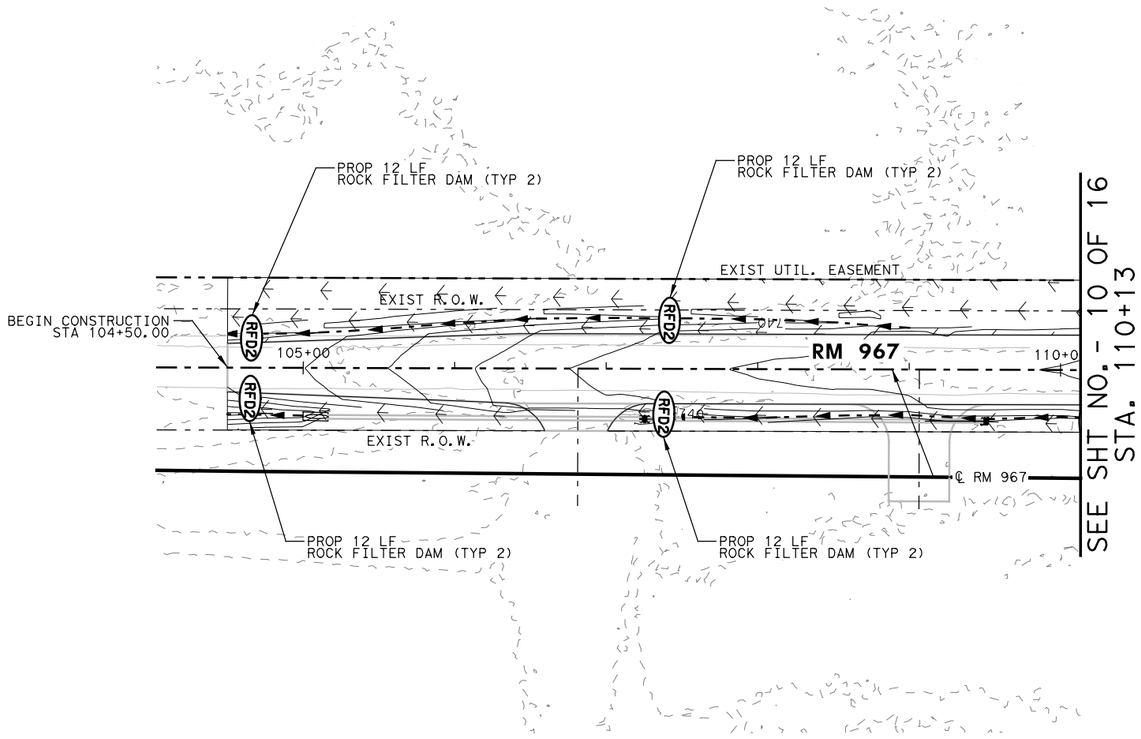

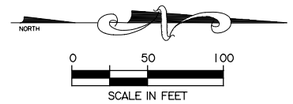

LEGEND

- PROP DITCH
- ROW
- PROP ROCK FILTER DAM (RFD)
- PROP SEDIMENT CONTROL FENCE (SCF)
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6. DEWATERING OPERATIONS SHALL BE USED AS DIRECTED BY THE ENGINEER FOR THE PROTECTION OF THE RECEIVING STREAM FROM NON-STORMWATER DISCHARGE ASSOCIATED WITH DRILLED SHAFT/COLUMN PLACEMENT. THIS INCLUDES ROUTING STORMWATER OR GROUNDWATER ACCUMULATION THROUGH SELECT BMPS PRIOR TO DISCHARGE.
7. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PREPARING A DEWATERING PLAN THAT WILL DESCRIBE HOW THE DEWATERING OPERATION WILL BE COMPLETED AND HOW THE PUMP EFFLUENT WILL BE MANAGED. NON-STORMWATER DISCHARGE WILL BE MANAGED SO AS TO NOT CAUSE EROSION OR OTHER DAMAGE AND SUCH THAT WATER TO BE DISPOSED OF IS FREE FROM SILT AND OTHER OBJECTIONABLE MATERIALS.

2/3/2021

STATE OF TEXAS
ASHLEY S. HANSON
107373
LICENSED
PROFESSIONAL ENGINEER

HAYS COUNTY TEXAS

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY

Texas Registered Engineering Firm F-2614

Texas Department of Transportation

ROBERT S. LIGHT EXTENSION

RM 967
SW3P
BEGIN PROJECT TO STA 110+13

SCALE: 1"=100'-H

SHEET 15 OF 16

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TJP	TEXAS	AUS	HAYS	390
CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

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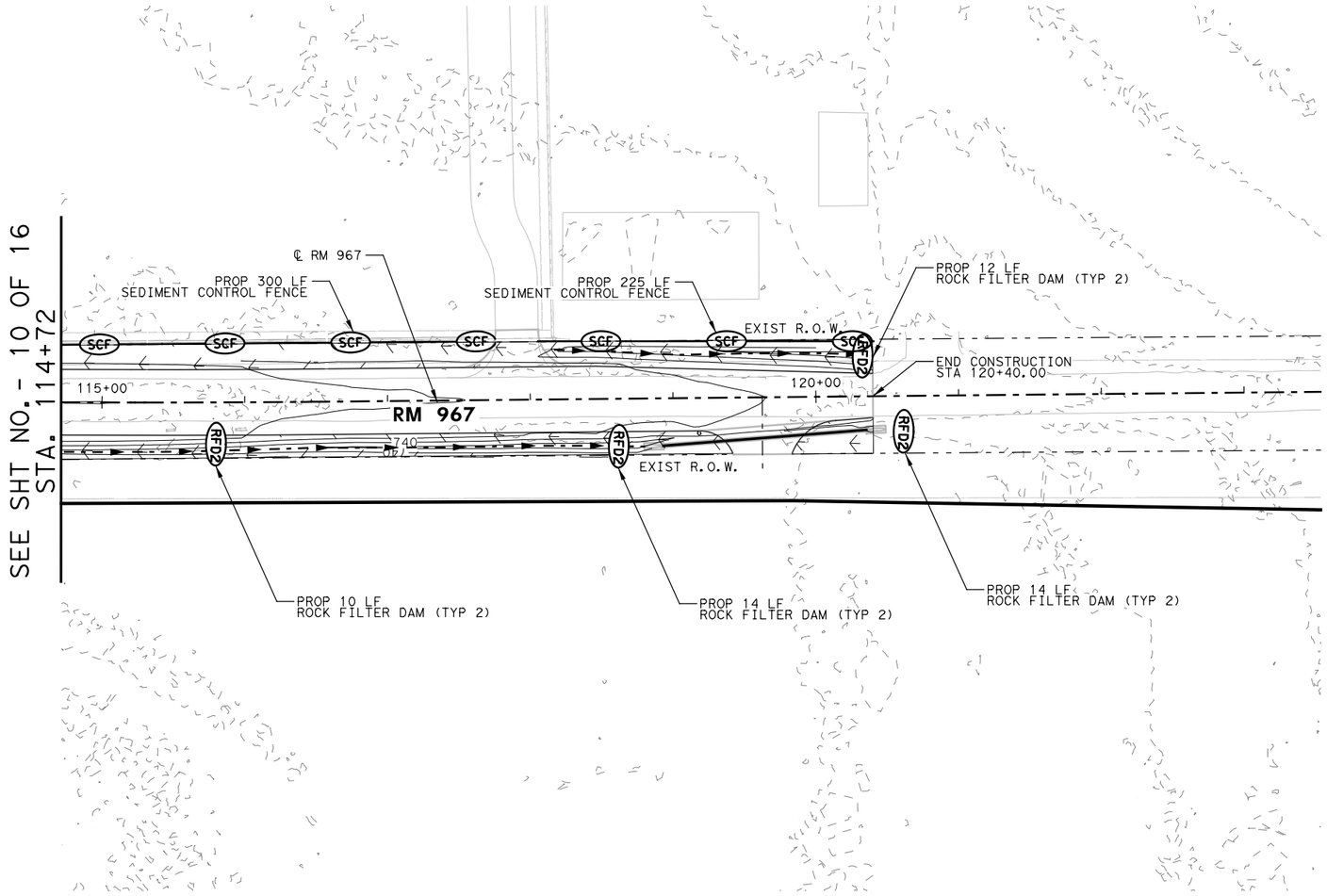

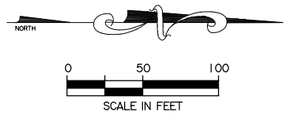

LEGEND

- PROP DITCH
- ROW
- RFD2 — PROP ROCK FILTER DAM (RFD)
- SCF — PROP SEDIMENT CONTROL FENCE (SCF)
- TOPSOIL & SEEDING WITH SOIL RETENTION BLANKET
- PROP CONTOURS
- EXIST CONTOUR

NOTES:

1. PERIMETER CONTROLS SHALL BE IN PLACE PRIOR TO COMMENCING ANY SOIL DISTURBING ACTIVITIES. PERIMETER DEVICES TO BE PLACED AT ROW OR EASEMENT UNLESS OTHERWISE NOTED.
2. THE LOCATION OF EROSION CONTROL AND OTHER SOIL STABILIZATION PRACTICES WILL BE BASED ON SITE SPECIFIC FIELD CONDITIONS AS NEEDED. QUANTITIES SHOWN ARE APPROXIMATE AND MAY BE ADJUSTED TO MEET FIELD CONDITIONS.
3. CONSTRUCTION EXITS SHALL BE FIELD LOCATED AS NEEDED OR AS DIRECTED BY THE ENGINEER. SEE EC(3)-93 STANDARD.
4. EROSION CONTROL DEVICES SHALL BE USED AS DIRECTED BY THE ENGINEER FOR THE PROTECTION OF SOILS ASSOCIATED WITH DRILLED SHAFT/COLUMN PLACEMENT.
5. USE CLASS 2 TYPE E SOIL RETENTION BLANKETS IN DISTURBED AREAS TO BE REVEGETATED WITH TOPSOIL & SEEDING.
6. DEWATERING OPERATIONS SHALL BE USED AS DIRECTED BY THE ENGINEER FOR THE PROTECTION OF THE RECEIVING STREAM FROM NON-STORMWATER DISCHARGE ASSOCIATED WITH DRILLED SHAFT/COLUMN PLACEMENT. THIS INCLUDES ROUTING STORMWATER OR GROUNDWATER ACCUMULATION THROUGH SELECT BMPS PRIOR TO DISCHARGE.
7. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PREPARING A DEWATERING PLAN THAT WILL DESCRIBE HOW THE DEWATERING OPERATION WILL BE COMPLETED AND HOW THE PUMP EFFLUENT WILL BE MANAGED. NON-STORMWATER DISCHARGE WILL BE MANAGED SO AS TO NOT CAUSE EROSION OR OTHER DAMAGE AND SUCH THAT WATER TO BE DISPOSED OF IS FREE FROM SILT AND OTHER OBJECTIONABLE MATERIALS.

2/3/2021

STATE OF TEXAS
ASHLEY S. HANSON
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Texas Registered Engineering Firm F-2614

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ROBERT S. LIGHT EXTENSION

RM 967
SW3P
STA 114+72 TO END PROJECT

SCALE: 1"=100'-H

SHEET 16 OF 16

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
YWU	6	SEE TITLE SHEET		RSLE
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
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CHECK	CONTROL	SECTION	JOB	
CLH	0914	33	068	
CHECK				
CMC				

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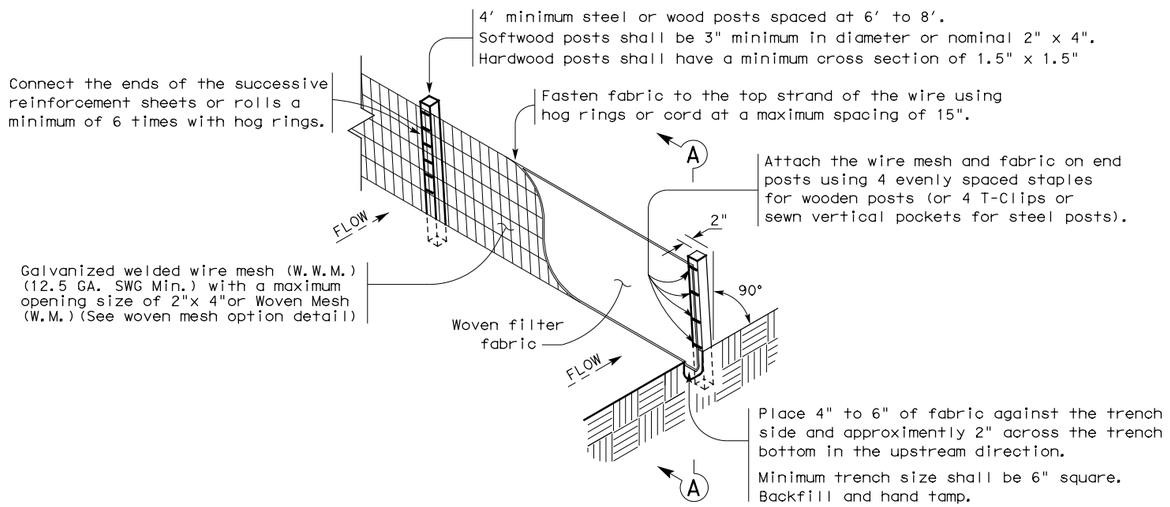
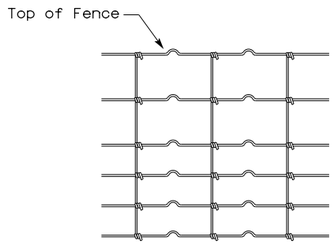
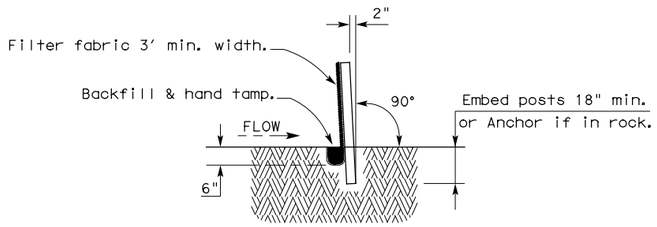


TEMPORARY SEDIMENT CONTROL FENCE

SCF





SECTION A-A

HINGE JOINT KNOT WOVEN MESH (OPTION) DETAIL

Galvanized hinge joint knot woven mesh (12.5 GA.SWG Min.) requires a minimum of five horizontal wires spaced at a maximum of 12 inches apart and all vertical wires spaced at a maximum of 12 inches apart.

SEDIMENT CONTROL FENCE USAGE GUIDELINES

A sediment control fence may be constructed near the downstream perimeter of a disturbed area along a contour to intercept sediment from overland runoff. A 2 year storm frequency may be used to calculate the flow rate to be filtered.

Sediment control fence should be sized to filter a maximum flow through rate of 100 GPM/FT^2. Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.

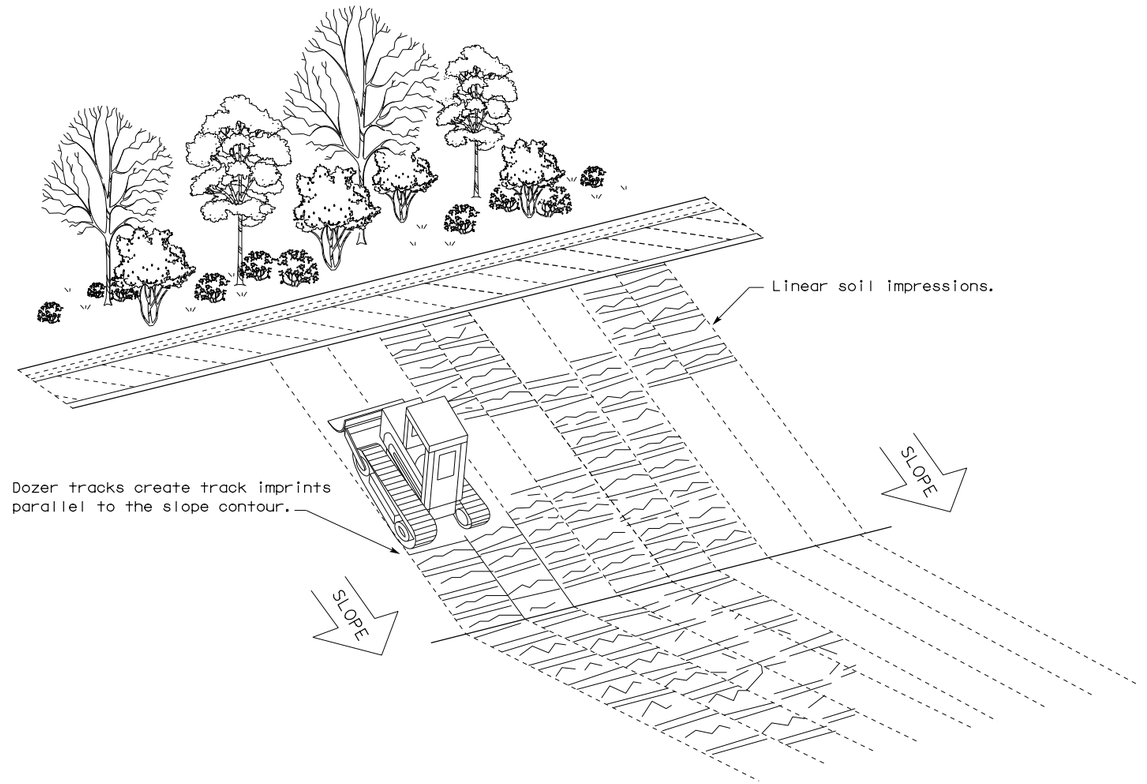
LEGEND

Sediment Control Fence

SCF

GENERAL NOTES

1. Vertical tracking is required on projects where soil distributing activities have occurred unless otherwise approved.
2. Perform vertical tracking on slopes to temporarily stabilize soil.
3. Provide equipment with a track undercarriage capable of producing linear soil impressions measuring a minimum of 12" in length by 2" to 4" in width by 1/2" to 2" in depth.
4. Do not exceed 12" between track impressions.
5. Install continous linear track impressions where the minimum 12" length impressions are perpendicular to the slope or direction of water flow.



VERTICAL TRACKING

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

FENCE & VERTICAL TRACKING

EC(1)-16

FILE: ec116	DN: TxDOT		CK: KM	DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY
REVISIONS	0914	33	068, ETC		RSL
	DIST	COUNTY			SHEET NO.
	AUS	HAYS			392

DATE 2/3/2021
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DATE: 2/3/2021
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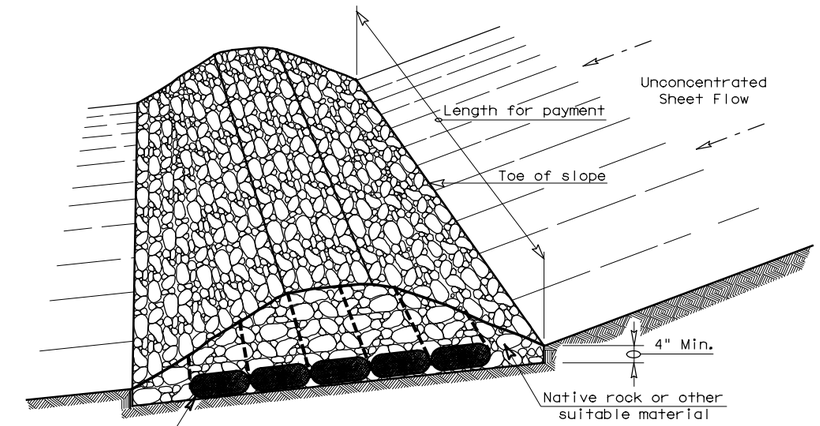
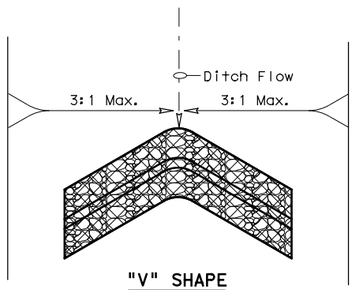
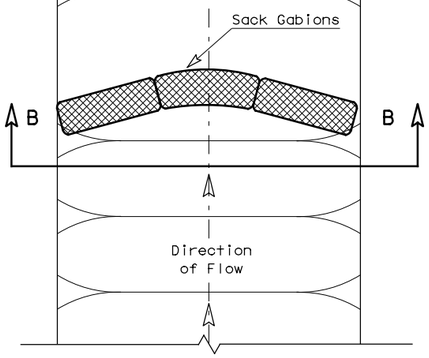


FILTER DAM AT TOE OF SLOPE

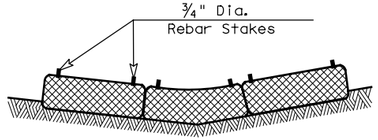
RFD1



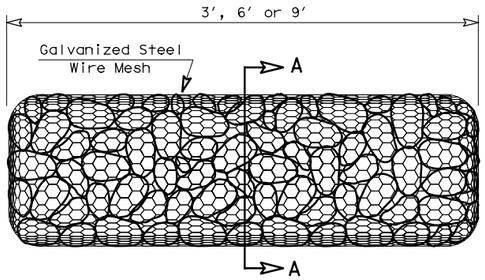
"V" SHAPE PLAN VIEW



PLAN VIEW

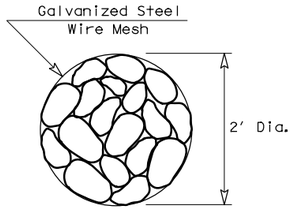


SECTION B-B

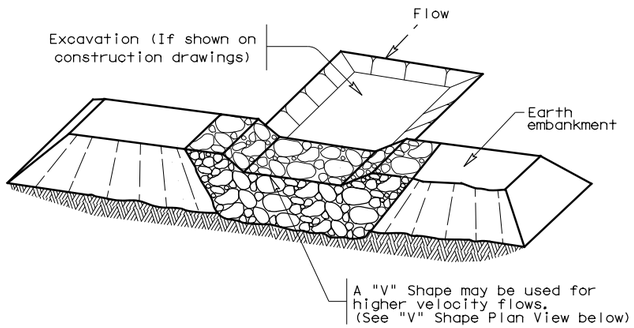


TYPE 4 (SACK GABIONS)

RFD4

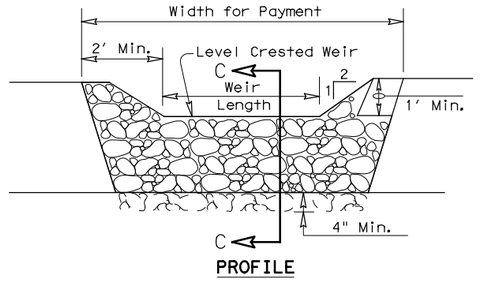


SECTION A-A

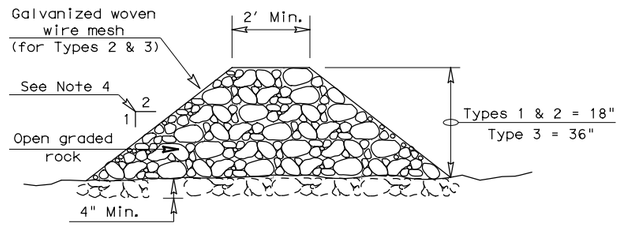


FILTER DAM AT SEDIMENT TRAP

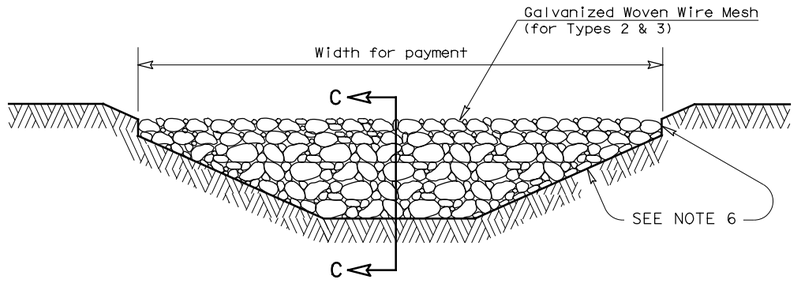
RFD1 — OR — RFD2



PROFILE



SECTION C-C



FILTER DAM AT CHANNEL SECTIONS

RFD1 — OR — RFD2 — OR — RFD3

ROCK FILTER DAM USAGE GUIDELINES

Rock Filter Dams should be constructed downstream from disturbed areas to intercept sediment from overland runoff and/or concentrated flow. The dams should be sized to filter a maximum flow through rate of 60 GPM/FT^2 of cross sectional area. A 2 year storm frequency may be used to calculate the flow rate.

Type 1 (18" high with no wire mesh) (3" to 6" aggregate): Type 1 may be used at the toe of slopes, around inlets, in small ditches, and at dike or swale outlets. This type of dam is recommended to control erosion from a drainage area of 5 acres or less. Type 1 may not be used in concentrated high velocity flows (approximently 8 Ft/Sec or more) in which aggregate wash out may occur. Sandbags may be used at the embedded foundation (4" deep min.) for better filtering efficiency of low flows if called for on the plans or directed by the Engineer.

Type 2 (18" high with wire mesh) (3" to 6" aggregate): Type 2 may be used in ditches and at dike or swale outlets.

Type 3 (36" high with wire mesh) (4" to 8" aggregate): Type 3 may be used in stream flow and should be secured to the stream bed.

Type 4 (Sack gabions) (3" to 6" aggregate): Type 4 May be used in ditches and smaller channels to form an erosion control dam.

Type 5: Provide rock filter dams as shown on plans.

GENERAL NOTES

1. If shown on the plans or directed by the Engineer, filter dams should be placed near the toe of slopes where erosion is anticipated, upstream and/or downstream at drainage structures, and in roadway ditches and channels to collect sediment.
2. Materials (aggregate, wire mesh, sandbags, etc.) shall be as indicated by the specification for "Rock Filter Dams for Erosion and Sedimentation Control".
3. The rock filter dam dimensions shall be as indicated on the SW3P plans.
4. Side slopes should be 2:1 or flatter. Dams within the safety zone shall have sideslopes of 6:1 or flatter.
5. Maintain a minimum of 1' between top of rock filter dam weir and top of embankment for filter dams at sediment traps.
6. Filter dams should be embedded a minimum of 4" into existing ground.
7. The sediment trap for ponding of sediment laden runoff shall be of the dimensions shown on the plans.
8. Rock filter dam types 2 & 3 shall be secured with 20 gauge galvanized woven wire mesh with 1" diameter hexagonal openings. The aggregate shall be placed on the mesh to the height & slopes specified. The mesh shall be folded at the upstream side over the aggregate and tightly secured to itself on the downstream side using wire ties or hog rings. For in stream use, the mesh should be secured or staked to the stream bed prior to aggregate placement.
9. Sack Gabions should be staked down with ¾" dia. rebar stakes, and have a double-twisted hexagonal weave with a nominal mesh opening of 2 ½" x 3 ¼"
10. Flow outlet should be onto a stabilized area (vegetation, rock, etc.).
11. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

PLAN SHEET LEGEND

Type 1 Rock Filter Dam	RFD1
Type 2 Rock Filter Dam	RFD2
Type 3 Rock Filter Dam	RFD3
Type 4 Rock Filter Dam	RFD4

Texas Department of Transportation — Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

ROCK FILTER DAMS

EC(2)-16

FILE: ec216	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0914	33	068,ETC	RSL
	DIST	COUNTY		SHEET NO.
	AUS	HAYS		393

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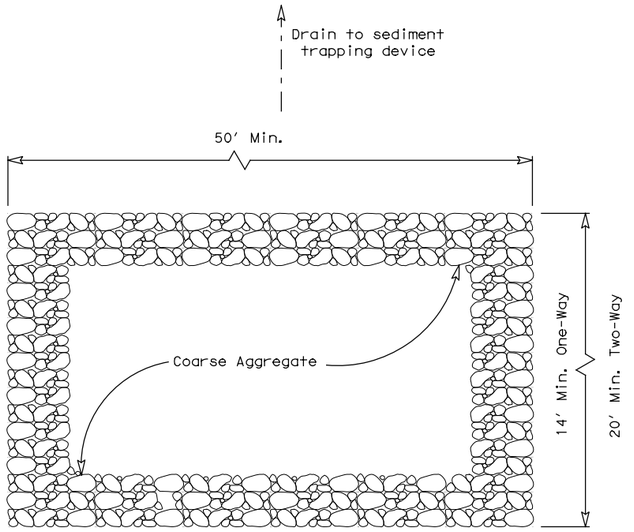
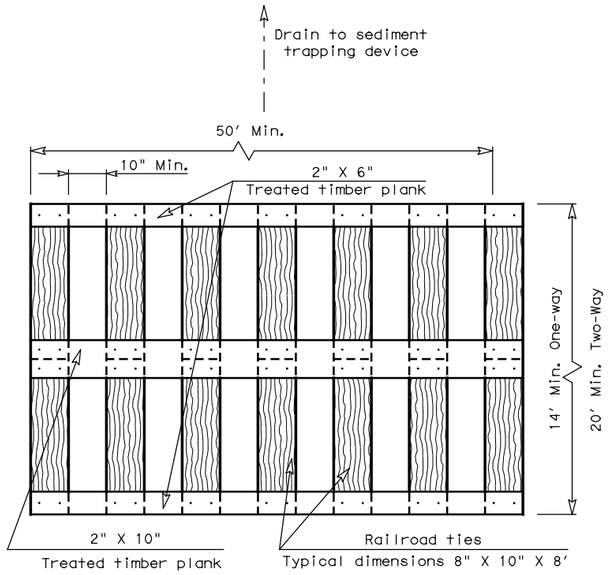


PLAN VIEW



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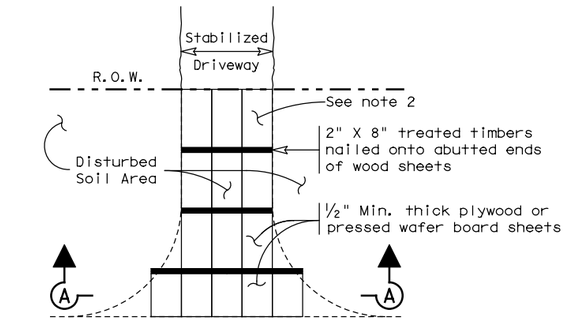
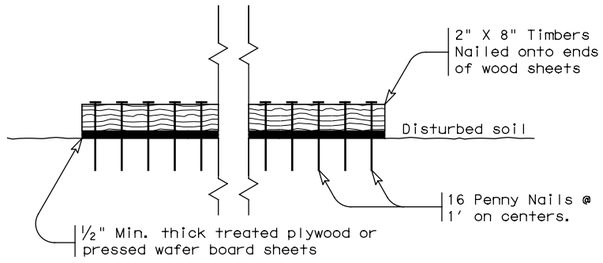


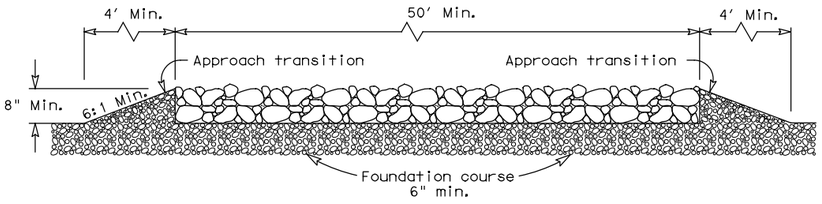
PLAN VIEW



SECTION A-A

CONSTRUCTION EXIT (TYPE 3)

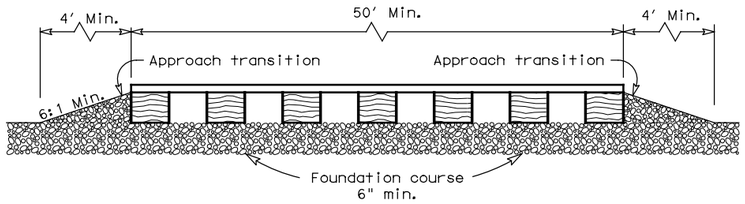
SHORT TERM



ELEVATION VIEW

CONSTRUCTION EXIT (TYPE 1)

ROCK CONSTRUCTION (LONG TERM)



ELEVATION VIEW

CONSTRUCTION EXIT (TYPE 2)

TIMBER CONSTRUCTION (LONG TERM)

GENERAL NOTES (TYPE 1)

1. The length of the type 1 construction exit shall be as indicated on the plans, but not less than 50′.
2. The coarse aggregate should be open graded with a size of 4" to 8".
3. The approach transitions should be no steeper than 6:1 and constructed as directed by the Engineer.
4. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other materialas approved by the Engineer.
5. The construction exit shall be graded to allow drainage to a sediment trapping device.
6. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
7. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.

GENERAL NOTES (TYPE 2)

1. The length of the type 2 construction exit shall be as indicated on the plans, but not less than 50′.
2. The treated timber planks shall be attached to the railroad ties with ½"x 6" min. lag bolts. Other fasteners may be used as approved by the Engineer.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The approach transitions shall be no steeper than 6:1 and constructed as directed by the Engineer.
5. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other material as approved by the Engineer.
6. The construction exit should be graded to allow drainage to a sediment trapping device.
7. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
8. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.

GENERAL NOTES (TYPE 3)

1. The length of the type 3 construction exit shall be as shown on the plans, or as directed by the Engineer.
2. The type 3 construction exit may be constructed from open graded crushed stone with a size of two to four inches spread a min. of 4" thick to the limits shown on the plans.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

CONSTRUCTION EXITS

EC(3)-16

FILE: ec316	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
©TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
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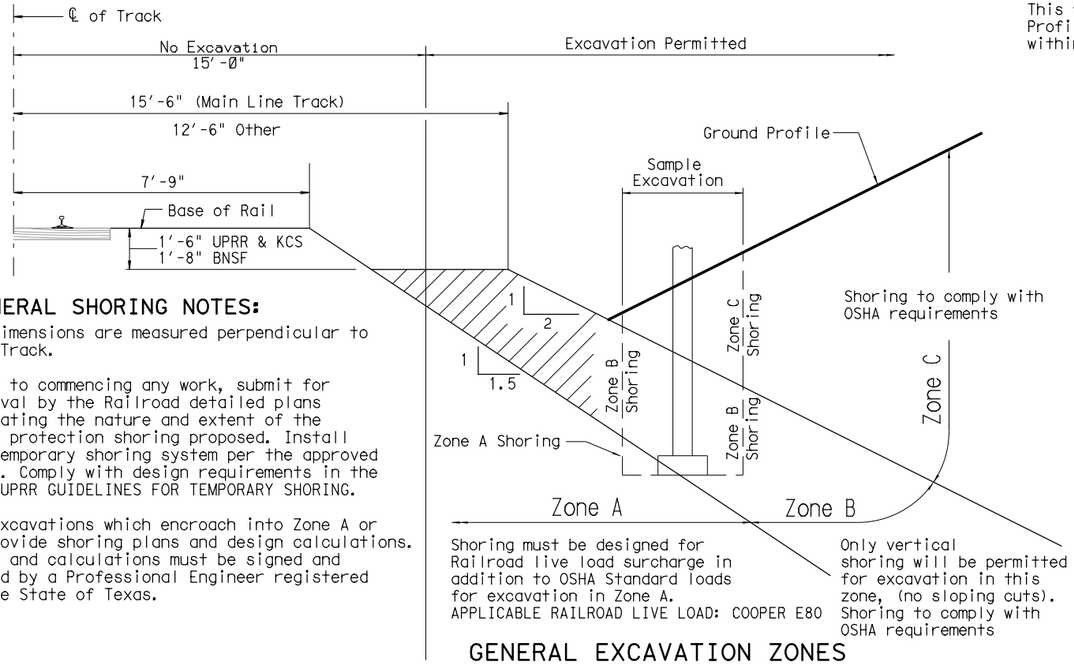
	DIST	COUNTY		SHEET NO.
	DAL	HOOD		394



GENERAL EXCAVATION ZONES

GENERAL SHORING NOTES:

1. All dimensions are measured perpendicular to ℄ of Track.
2. Prior to commencing any work, submit for approval by the Railroad detailed plans indicating the nature and extent of the track protection shoring proposed. Install the temporary shoring system per the approved plans. Comply with design requirements in the BNSF/UPRR GUIDELINES FOR TEMPORARY SHORING.
3. For excavations which encroach into Zone A or B, provide shoring plans and design calculations. Plans and calculations must be signed and sealed by a Professional Engineer registered in the State of Texas.

GENERAL SHORING REQUIREMENTS ‡

RAILROAD GENERAL NOTES:

1. Railroad review and approval of shoring, erection, demolition, and falsework is required. Allow a minimum of four weeks for the review and approval of each submittal.
2. The proposed grade separation project shall not increase the quantity and/or characteristics of the flow in the Railroad's ditches and/or drainage structures. In the rare event that a grade separation project will increase the quantity and/or characteristics of flow in such elements, such a design must be reviewed and approved by the Railroad.
3. Verify the elevation of the existing top-of-rail profile before beginning construction. Bring all discrepancies to the attention of the Railroad prior to construction.
4. Submit a proposed method of erosion and sediment control for approval by the Railroad.
5. Design and construct all shoring systems that impact the Railroad's operations and/or support the Railroad's embankment per current Railroad Guidelines for Temporary Shoring.
6. Comply with Railroad Demolition Guidelines for all demolitions within the Railroad's right of way and/or demolition that may impact the Railroad's tracks or operations.
7. Design erection methods over the Railroad's right of way to cause no interruption to the Railroad's operation, enabling the track(s) to remain open to traffic per the Railroad's requirements. Coordinate construction work windows with the Railroad's Designated Representative.
8. Design all construction phasing that may impact the Railroad operations to cause no interruption to the Railroad's operations, enabling the track(s) to remain open to traffic per the Railroad's requirements. Coordinate construction work windows with the Railroad's Designated Representative.
9. Comply with minimum construction clearances for falsework outlined in the Railroad's Guidelines.
10. Verify all permanent clearances before project closing.
11. For Railroad coordination please refer to Sheets 2 and 3 and the TxDOT Standard Specifications.

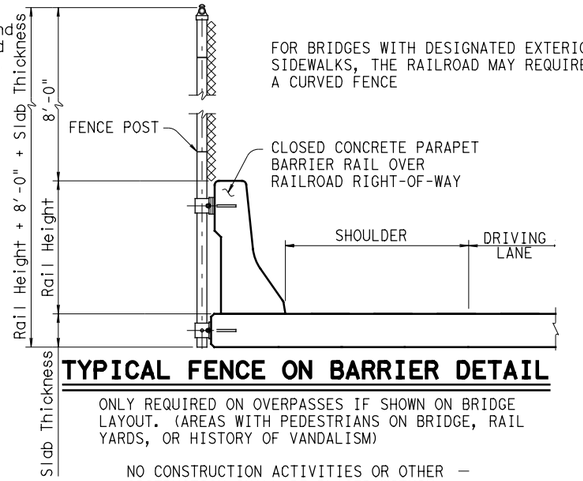
For shoring/excavations in Zone A or B, TxDOT requires a predesigned and approved shoring design in the PS&E. If this is the case no Contractor submittal is required.

‡ This table is primarily required for overpass projects. This table is not required for underpass projects if the provided Plan and Profile sheets indicate this information at a minimum of every 100 ft and within bounds including 1500 ft before and after the limits of trackwork.

TABLE OF TOP OF RAIL PROFILE ‡

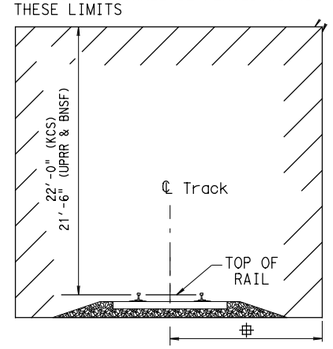
(STATIONS INCREASE WITH MILEPOST INCREASE)

	MAIN LINE			
	ALIGNMENT: 100′ STATIONS	LEFT RAIL ELEVATION	ALIGNMENT: 100′ STATIONS	RIGHT RAIL ELEVATION
1000′ PRIOR TO PROJECT				
WITHIN PROJECT	SEE EXISTING TRACK PROFILE SHEETS			
1000′ AFTER PROJECT				



TYPICAL FENCE ON BARRIER DETAIL

ONLY REQUIRED ON OVERPASSES IF SHOWN ON BRIDGE LAYOUT. (AREAS WITH PEDESTRIANS ON BRIDGE, RAIL YARDS, OR HISTORY OF VANDALISM)



MINIMUM CONSTRUCTION CLEARANCE ENVELOPE

(NORMAL TO RAILROAD)
15′-0"(UPRR),(BNSF)and14′-0" (KCS)

GENERAL NOTES:

Design and Construction for Railroad Projects shall be in accordance with the AREMA Manual for Railway Engineering and BNSF/UPRR Guidelines for Railroad Grade Separation Projects or Kansas City Southern Guidelines for the Design and Construction of Overpasses and Underpasses, or DART Light Rail Project Design Criteria Manual, and the TxDOT Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges AS APPLICABLE TO THE RAILROAD COMPANY INVOLVED.

See BNSF/UPRR Guidelines for Grade Seperation Projects Plan No. 711100 and TxDOT Railroad Fence Details Sheet for additional information. A curved top fence extending 8′-0" above top of sidewalk is acceptable only where there is a traffic rail between roadway and sidewalk.

See Kansas City Southern Guidelines for the Design and Construction of Overpasses and Underpasses for corresponding BNSF/UPRR sheets referenced.

FOR THE FOLLOWING INFORMATION PLEASE REFER TO THE PLAN AND ELEVATION DRAWINGS OF THE BRIDGE PLANS. THE PLAN AND ELEVATION DRAWINGS SHALL SHOW ALL REQUIRED INFORMATION PER BNSF/UPRR GUIDELINES FOR RAILROAD GRADE SEPARATION PROJECT PLAN NO. 711100 SHEET 2.

1. Centerline of bridge and/or centerline of project.
2. Track layout and limits of Railroad right of way with respect to centerline of main lines.
3. Future tracks, access roadways and existing tracks as main line, siding, spur, etc.
4. Point of minumum vertical clearance and distance, Measured perpendicular, from the centerline of nearest track.
5. Horizontal clearance at right angle from centerline of nearest existing or future track to the face of obstruction such as substructure above grade.
6. Horizontal clearance at right angle from centerline of nearest existing or future track to the face of nearest foundation below grade.
7. Horizontal spacing at right angle between centerlines of existing and/or future tracks.
8. Limits of shoring and minimum distance at right angle from centerline of nearest track.
9. All existing facilities and utilities and their proposed relocation, if required.
10. Toe of riprap or earth slope and/or limits of retaining wall.
11. Existing and proposed contours. (not required if the existing groundlines or drainage characteristics in Railroad ROW will not be altered).
12. Railroad Milepost and direction of increasing Milepost.
13. Direction of flow for all drainage systems within project limits.
14. Limits of barrier rail and fence with respect to centerline of track.
15. Depth of foundation below bottom of tie. (for footings only)
16. Top and bottom of pier protection wall elevation relative to top of rail elevation.
17. Controlling dimensions of drainage ditches and/or drainage structures.
18. Top of rail elevations for all tracks.
19. Minimum permanent vertical clearance above top of high rail to the lowest point under the bridge.
20. Existing and proposed groundline & roadway profile.
21. Type of riprap slope paving.
22. Location of deck drains.
23. Total width of superstructure.
24. Width of shoulder and/or sidewalk.

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11/19/2020

RAILROAD REQUIREMENTS FOR BRIDGE CONSTRUCTION.dgn

SHEET 1 OF 3

Texas Department of Transportation — Rail Division

RAILROAD REQUIREMENTS FOR BRIDGE CONSTRUCTION

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	AUS	HAYS		395

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PART 1 - GENERAL

1.01 DESCRIPTION

This project includes construction work within the right of way and/or properties of the Railroad Company and adjacent to its tracks, wire lines and other facilities. These sheets describe the minimum special requirements for coordination with the Railroad when working upon, over or under Railroad Right of Way or when impacting current or future railroad operations. Coordinate with the Railroad while performing the work outlined herein, and afford the same cooperation with the Railroad as with TxDOT. Complete all submittals and work in accordance with TxDOT Standard Specifications, Railroad Guidelines and AREMA recommendations as modified by these minimum special requirements or as directed in writing by the Railroad Designated Representative.

For purposes of this project, the Railroad Designated Representative is the person or persons designated by the Railroad Manager of Industry and Public Projects to handle specific tasks related to the project.

1.02 REQUEST FOR INFORMATION / CLARIFICATION

Submit Requests for Information ("RFI") involving work within any Railroad Right of Way to the TxDOT Engineer. The TxDOT Engineer will submit the RFI to the Railroad Designated Representative for review and approval for RFI's corresponding to work within Railroad Right of Way. Allow six (6) weeks total time for review and approval, which includes four (4) weeks for review and approval by the Railroad.

1.03 PLANS / SPECIFICATIONS

TxDOT has received written Railroad approval of the plans and specifications for this project. Any revisions or changes in the plans after award of the Contract must have the approval of TxDOT and the Railroad.

PART 2 - UTILITIES AND FIBER OPTIC

Construct all utility installations in accordance with current AREMA recommendations, Railroad, TxDOT and owning utility specifications and requirements. Railroad general guidelines can be found on the Railroad's website or by contacting the Railroad Designated Representative.

PART 3 - CONSTRUCTION

3.01 GENERAL

A. Perform all work in compliance with all applicable Railroad, FRA (Federal Railway Administration) and TxDOT rules and regulations. Arrange and conduct work in a manner that does not endanger or interfere with the safe operation of the tracks and property of the Railroad and the traffic moving on such tracks, or the wires, signals and other property of the Railroad, its tenants or licensees, at or in the vicinity of the Work. The safe operation of Railroad's train movements takes precedence over any work to be performed by the Contractor. The Contractor is responsible for train delay cost and lost revenue claims due to any delays or interruption of train operations resulting from Contractor's construction or other activities.

B. Construction activities within 15 feet of the operational tracks will only be allowed if absolutely necessary and the Railroad's Designated Representative grants approval. Construction activities within 15 feet of the operational track(s) preferably allow the tracks to stay operational. In such cases, coordination and approval by the Railroad Track Manager is required with regard to schedule, flagging, and slow orders. See Sections 3.07 and 3.08 for additional information.

C. Provide track protection for all work equipment (including rubber tired equipment) operating within 25 feet from nearest rail. When not in use, keep Contractor's machinery and materials at least 50 feet from the Railroad's nearest track.

D. Vehicular crossings of railroad track are allowed only at existing crossings, or haul road crossings developed with railroad approval.

E. The Contractor is also advised that new railroad facilities within the project may be built by the Railroad. If applicable, these facilities are delineated in the plans. Be aware of the limits of responsibilities and coordinate efforts with the Railroad and TxDOT.

3.02 RAILROAD OPERATIONS

A. Trains and/or equipment are expected on any track, at any time, in either direction. Become familiar with the train schedules in this location and structure bid assuming intermittent track windows in this period, as defined in Paragraph B that follows.

B. All railroad tracks within and adjacent to the contract site are active, and rail traffic over these facilities shall be maintained throughout the Project. Activities may include both through moves and switching moves to local customers. Railroad traffic and operations will occur continuously throughout the day and night on these tracks and shall be maintained at all times as defined herein. Coordinate and schedule the work so that construction activities do not interfere with railroad operations.

C. Coordinate work windows with TxDOT and the Railroad's Designated Representative. Types of work windows include Conditional Work Windows and Absolute Work Windows, as defined below:

1. Conditional Work Window: A Conditional Work Window is a period of time that railroad operations have priority over construction activities. When construction activities may occur on and/or adjacent to the railroad tracks within 25 feet of the nearest track, a railroad flag person will be required. At the direction of the Railroad's flag person, upon approach of a train, and when trains are present on the tracks, the tracks must be cleared (i.e., no construction equipment, materials or personnel within 25 feet, or as directed by the Railroad Designated Representative, from the tracks). Conditional Work Windows are available for the Project.

2. Absolute Work Window: An Absolute Work Window is a period of time that construction activities are given priority over railroad operations. During this time frame, the designated railroad track(s) will be inactive for train movements and may be fouled by the Contractor. At the end of an Absolute Work Window, the railroad tracks and/or signals must be completely operational for train operations and all Railroad, Public Utilities Commission (PUC) and FRA requirements, codes and regulations for operational tracks must be satisfied. In the situation where the operating tracks and/or signals have been affected, the Railroad will perform inspections of the work prior to placing that track back into service. A railroad flag person will be required for construction activities requiring an Absolute Work Window. Absolute Work Windows will not generally be granted. Any request will require a detailed explanation for Railroad review.

3.03 RIGHT OF ENTRY, ADVANCE NOTICE AND WORK STOPPAGES

A. Do not perform any work within Railroad Right of Way without a valid executed Right of Entry Agreement if required on this project.

B. Give advance notice to the Railroad as required in the "Contractor's Right of Entry Agreement" before commencing work in connection with construction upon or over Railroad Right of Way and observe the Railroad's rules and regulations with respect thereto.

C. Perform all work upon Railroad Right of Way in a manner to avoid interference with or endanger the operations of the Railroad. Whenever work may affect the operations or safety of trains, submit the work method to the Railroad Designated Representative for approval. Approval does not relieve the Contractor from liability. Do not commence any work which requires flagging service or inspection service until the flagging protection required by the Railroad is available at the job site. See Section 3.18 for railroad flagging requirements.

D. Make requests in writing for both Absolute and Conditional Work Windows, at least 30 days in advance of any work. Include in the written request:
1. Exactly what the work entails.
2. The days and hours that work will be performed.
3. The exact location of work, and proximity to the tracks.
4. The type of window requested and the amount of time requested.
5. The designated contact person.

Provide a written confirmation notice to the Railroad at least 48 hours before commencing work in connection with approved work windows when work is within 25 feet of nearest rail. Perform all work in accordance with previously approved work plans.

E. Make provisions to protect operations and property of the Railroad should a condition arising from, or in connection with the work, require immediate and unusual action. If in the judgment of the Railroad Designated Representative such provisions are insufficient, the Railroad Designated Representative may require or provide such provisions as deemed necessary. In any event, such provisions shall be at the Contractor's expense and without cost to the Railroad or TxDOT. The Railroad or TxDOT shall have the right to order the Contractor to temporarily cease operations in the event of an emergency or, if in the opinion of the Railroad Designated Representative, the Contractor's operations could endanger railroad operations. In the event of such an order, immediately notify TxDOT of the order.

3.04 INSURANCE

Do not begin work upon or over Railroad Right of Way until furnishing the Railroad with the insurance policies, binders, certificates and endorsements required by the "Contractor's Right of Entry Agreement", and until the Railroad Designated Representative has advised TxDOT that such insurance is in accordance with the Agreement.

3.05 RAILROAD SAFETY ORIENTATION

A. Complete the Railroad's course "Orientation for Contractor's Safety", and maintain current registration prior to working on the Railroad's property. This course is required to be completed annually by Contractor and Subcontractor personnel working on site.

"UPRR, BNSF, KCS/TEXMEX will not accept on-track safety training certificates from other Railroads. Refer to each Railroad's specific contractor right of entry for training information."

B. Know and follow the "Contractor's Right of Entry Agreement" EXHIBIT D, MINIMUM SAFETY REQUIREMENTS regarding clothing, personal protective equipment, and general safety requirements.

3.06 COOPERATION

The Railroad will cooperate with Contractor so that work may be conducted in an efficient manner, and will cooperate with Contractor in enabling use of Railroad Right of Way in performing the work.

3.07 MINIMUM CONSTRUCTION CLEARANCES FOR FALSEWORK AND OTHER TEMPORARY STRUCTURES

Abide by the following minimum temporary clearances during the course of construction:
A. 15' - 0" (BNSF)(UPRR), and 14' - 0" (KCS) horizontal from centerline of track
B. 22' - 0" (KCS) and 21' - 6" (UPRR & BNSF) vertically above top of rail.

For construction clearance less than listed above, obtain local Railroad Operating Unit review and approval.

3.08 APPROVAL OF REDUCED CLEARANCES

A. Maintain minimum track clearances during construction as specified in Section 3.07.

B. Submit any proposed infringement on the specified minimum clearances to the Railroad Designated Representative through TxDOT at least 30 days in advance of the work. Do not proceed with such infringement without written approval by the Railroad Designated Representative.

C. Do not commence work involving an approved infringement until receiving written assurance from the Railroad Designated Representative that arrangements have been made for any necessary flagging service.

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RAILROAD REQUIREMENTS FOR FOR BRIDGE CONSTRUCTION

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3.09 CONSTRUCTION AND AS-BUILT SUBMITTALS

A. Provide TxDOT submittals for construction materials and procedures as outlined below and indicated in TxDOT Standard Specifications. A summary of most TxDOT submittal requirements can be found at: www.dot.state.tx.us/publications/bridge/items reviewed.pdf

B. The tables below provide the Railroad's minimum submittal requirements for the construction items noted. Submittal requirements are in addition to those specified elsewhere in these bid documents. The review times indicated below represent the total time, including the Railroad's required four (4) weeks.

C. TxDOT will forward relevant submittals to the Railroad Manager of Industry and Public Projects unless otherwise directed by the Railroad. TxDOT and the Engineer of Record will review and include comments prior to forwarding to the Railroad. Submit items in Table 1 for both railroad overpass and underpass projects, as applicable. Submit items in Table 2 for railroad underpass projects only.

TABLE 1 - RAILROAD SUBMITTAL REQUIREMENTS FOR OVERPASS & UNDERPASS PROJECTS

ITEM	DESCRIPTION	SETS	REVIEW TIME
1	Shoring design and details	6	6 weeks
2	Falsework design and details	6	6 weeks
3	Drainage design provisions	6	6 weeks
4	Erection diagrams and sequence	6	6 weeks
5	Demolition diagram and sequence	6	6 weeks

TABLE 2 - RAILROAD SUBMITTAL REQUIREMENTS FOR UNDERPASS PROJECTS

ITEM	DESCRIPTION	SETS	NOTES	REVIEW TIME
1	Shop drawings	6	Steel and Concrete members	6 weeks
2	Bearings	6	For all structures	6 weeks
3	Concrete Mix Designs	6	For all structures	6 weeks
4	Rebar & Strand certifications	6	For superstructure only	6 weeks
5	28 day concrete strength	6	For superstructure only	6 weeks
6	Waterproofing material certifications and installation procedure	6	Waterproofing & protective boards	6 weeks
7	Structural steel certifications	6	All fracture critical members & other members requiring improved notch toughness	6 weeks
8	Fabrication and Test reports	6	All fracture critical members & other members requiring improved notch toughness	6 weeks
9	Welding Procedures and Welder Certification	6	AWS requirements	6 weeks
10	Foundation Construction Reports or Notes	6	Pile driving, drilled shaft construction, bearing pressure test reports for spread footings	6 weeks
11	Compaction testing reports for backfill at abutments	6	Must meet 95% maximum dry density, Modified Procter ASTM D1557	6 weeks

D. TxDOT shall submit As-Built Records to the Railroad when TxDOT has processed the final project plans. These records shall consist of the following items:

Overpass Projects

1. Electronic files of all structure design drawings with as constructed modifications shown, in Microstation J or Acrobat .PDF format.
2. Hard copies of all structure design drawings with as constructed modifications shown.

Underpass Projects

1. Electronic files of all structure design drawings with as constructed modifications shown, in Microstation J or Acrobat .PDF format.
2. Hard copies of all structure design drawings with as constructed modifications shown.
3. Final approved copies of shop drawings for concrete and steel members.
4. Foundation Construction Reports
5. Compaction testing reports for backfill at abutments

3.10 APPROVAL OF DETAILS

Submit details of the construction affecting Railroad's tracks and property not already included in the Contract Plans to the Railroad Designated Representative through TxDOT for the Railroad's review and written approval before such work is undertaken. Allow a total six (6) weeks for review and approval of these submittals, which includes the Railroad's four (4) week review time.

3.11 MAINTENANCE OF RAILROAD FACILITIES

A. Maintain all ditches and drainage structures free of silt or other obstructions resulting from Contractor's operations. Repair eroded areas and any other damage within Railroad Right of Way and repair any other damage to the property of the Railroad, or its tenants.

B. Perform all such maintenance and repair of damages due to the Contractor's operations at Contractor's expense.

C. Submit a proposed method of erosion control for review by the Railroad prior to beginning any grading on the Project Site. Comply with all applicable local, state and federal regulations when developing and implementing such erosion control.

3.12 SITE INSPECTIONS BY RAILROAD's DESIGNATED REPRESENTATIVE

A. In addition to the office reviews of construction submittals, site inspections may be performed by the Railroad Designated Representative at significant points during construction, including the following if applicable:
1. Pre-construction meetings.
2. Pile driving/drilling of caissons or drilled shafts.
3. Reinforcement and concrete placement for railroad bridge substructure and/or superstructure.
4. Erection of precast concrete or steel bridge superstructure.
5. Placement of waterproofing (prior to placing ballast on bridge deck).
6. Completion of the bridge structure.

B. Site inspection is not limited to the milestone events listed above. Site visits to check progress of the work may be performed at any time throughout the construction as deemed necessary by the Railroad.

C. Provide a detailed construction schedule, including the proposed temporary horizontal and vertical clearances and construction sequence for all work to TxDOT for submittal to the Railroad Designated Representative for review prior to commencement of work. Include the anticipated dates when the above listed events will occur. Update this schedule for the above listed events as necessary and each month at a minimum to allow the Railroad to schedule site inspections.

3.13 RAILROAD REPRESENTATIVES

Railroad representatives, conductors, flag person or watch person will be provided by the Railroad, at expense of TxDOT, to protect Railroad's facilities, property and movements of its trains or engines. In general, the Railroad will furnish such personnel or other protective services as follows:

A. When any part of any equipment is standing or being operated within 25 feet, measured horizontally, from nearest rail of any track on which trains may operate, or when any object is off the ground and any dimension thereof could extend inside the 25 foot limit, or when any erection or construction activities are in progress within such limits, regardless of elevation above or below track.

B. For any excavation below elevation of track subgrade if, in the opinion of the Railroad Designated Representative, track or other railroad facilities may be subject to settlement or movement.

C. During any clearing, grubbing, excavation or grading in proximity to Railroad's facilities, which, in the opinion of the Railroad Designated Representative, may endanger railroad facilities or operations.

D. During any contractor's operations when, in the opinion of the Railroad Designated Representative, Railroad facilities, including, but not limited to, tracks, buildings, signals, wire lines, or pipe lines, may be endangered.

E. Arrange with the Railroad Designated Representative to provide the adequate number of flag persons to accomplish the work.

3.14 WALKWAYS REQUIRED

Maintain along the outer side of each exterior track of multiple operated track, and on each side of single operated track, an unobstructed continuous space suitable for trainman's use in walking along trains, extending to a line not less than twelve feet (12') from centerline of track. Remove any temporary impediments to walkways and track drainage encroachments or obstructions allowed during work hours before the close of each work day. Construct walkways with railings over open excavation areas when in close proximity of track. Do not violate allowable clearances of these railings to centerline of track: 8' - 6" horizontally for tangent track or 9' - 6" horizontally for curved track.

3.15 COMMUNICATIONS AND SIGNAL LINES

If required, the Railroad will rearrange its communications and signal lines, its grade crossing warning devices, train signals and tracks, and facilities that are in use and maintained by the Railroad's forces in connection with its operation at expense of TxDOT. This work by the Railroad, will be done by its own forces and it is not a part of the Work under this Contract.

3.16 TRAFFIC CONTROL

Coordinate any operations that control traffic across or around railroad facilities with the Railroad Designated Representative.

3.17 CONSTRUCTION EXCAVATIONS AND BORING ACTIVITIES UNDER TRACK

A. Take special precaution and care in connection with excavating and shoring. Excavations for construction of footings, piers, columns, walls or other facilities that require shoring shall comply with requirements of TxDOT, OSHA, AREMA and Railroad "Guidelines for Temporary Shoring".

B. The project plans indicate whether there are fiber optic lines or other such telecommunications systems that require consideration. Regardless, contact the necessary call center to determine if such cable systems are present:

UPRR 1-800-336-9193
7:00 AM to 9:00 PM CST Monday-Friday except holidays,
staffed 24 hrs/day for emergencies
48 hrs notice required

BNSF 1-800-533-2891
24 hour number
5 working days notice required

KCS 1-800-344-8377
Texas One Call, a 24 hour number
48 hrs notice required, excluding weekends and holidays

If a telecommunications system is buried anywhere on or near Railroad's property, coordinate with TxDOT, the Railroad and the Telecommunication Company(ies) to arrange for relocation or protective measures prior to beginning work on or near railroad property. Refer to the project General Notes for additional information.

C. Projects involving a boring or jack and bore operation under track such as drainage pipes or culverts and utilities require an installation plan reviewed and approved by the Railroad and TxDOT prior to proceeding with such construction. A railroad inspector and contractor-assisted monitoring of ground and track movement is required to maintain safe passage of rail traffic. Stop installation and do not allow passage of trains if movements in excess of 1/4 inch vertical or horizontal is detected in the tracks. Immediately repair the damage to the satisfaction of TxDOT and the Railroad before proceeding.

3.18 RAILROAD FLAGGING

Per the RIGHT OF ENTRY agreement for flagging, notify the Railroad Representative at least 10 working days in advance of Contractor work and at least 30 working days in advance of any Contractor work in which any person or equipment will be within 25 feet of nearest rail or as specified in the Contractor Right of Entry (CROE).

3.19 CLEANING OF RIGHT-OF-WAY

When work is complete, remove all tools, implements, and other materials brought into Railroad Right of Way and leave the Right of Way in a clean and presentable condition to the satisfaction of TxDOT and the Railroad.

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RAILROAD REQUIREMENTS FOR BRIDGE CONSTRUCTION

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	DIST	COUNTY		SHEET NO.
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I. WORK AT CROSSING LOCATIONS (AT GRADE, HIGHWAY OVERPASS, HIGHWAY UNDERPASS, PEDESTRIAN, OR CLOSED/ABANDONED)

DOT #: 414987E
Crossing Type: **Highway Overpass
RR Company Owning Track at Crossing: UPRR
Operating RR Company at Track: UPRR
RR MP: 195.30
RR Subdivision: Austin
City: Buda
County: Hays
CSJ at this Crossing: 0914-33-068
Highway/Roadway name crossing the railroad: Robert S. Light Blvd.
# of regularly scheduled trains per day at this crossing: 21
# of switching movements per day at this crossing: None
% of estimated contract cost of work within railroad ROW: None

Scope of Work at this Crossing to Be Performed by State Contractor:
Construct bridge over UPRR ROW. Includes placement of drilled shafts; construction of columns, bent caps and abutments; set prestressed concrete beams; and pour concrete slab. Drilled shafts, columns and caps will be outside UPRR ROW.

Scope of Work at this Crossing to Be Performed by Railroad Company:
Flagging only.

** Choose: Highway Overpass, Highway Underpass, At Grade, Pedestrian, or Closed/Abandoned

II. OTHER PROJECT WORK WITHIN RAILROAD RIGHTS-OF-WAY (ROW)

None

III. FLAGGING & INSPECTION

of Days of Railroad Flagging Expected: 30

On this project, night or weekend flagging is:

☒ Expected
☐ Not Expected

Flagging services will be provided by:

☒ Railroad Company: TxDOT will pay flagging invoices
☐ Outside Party: Contractor will pay flagging invoices, to be reimbursed by TxDOT

Contractor must incorporate flaggers into anticipated construction schedule. The Railroad requires a 30 day notice if their flaggers are to be utilized. If Contractor falls behind schedule due to their own negligence and is not ready for scheduled flaggers, any flagging charges will be paid by Contractor.

Contact Information for Flagging:

☒ UPRR - UP.info@railpros.com
Call Center 877-315-0513, Select #1 for flagging

☐ BNSF - BNSF.info@railpros.com
Call Center 877-315-0513, Select #1 for flagging

☐ KCS - KCS.info@railpros.com
Call Center 877-315-0513, Select #1 for flagging
- Bottom Line On-Track Safety Services
bottomline076@aol.com, 903-767-7630

☐ OTHERS _____

Contractor must incorporate Construction Inspection into anticipated construction schedule.

☒ Not Required

☐ Required: Contact Information for Construction Inspection:

IV. CONSTRUCTION WORK TO BE PERFORMED BY THE RAILROAD

On this project, construction work to be performed by a railroad company is:

☐ Required
☒ Not Required

Coordinate with TxDOT for any work to be performed by the Railroad Company. TxDOT must issue a work order for any work done by the Railroad Company prior to the work being performed.

V. RAILROAD INSURANCE REQUIREMENTS

Railroad reference number shall be provided by TxDOT CST or DO.

The Contractor shall confirm the insurance requirements with the Railroad as the insurance limits are subject to change without notice.

Insurance policies must be issued for and on behalf of the Railroad. Where more than one Railroad Company is operating on the same right of way or where several Railroad Companies are involved and operate on their own separate rights of way, provide separate insurance policies in the name of each Railroad Company.

No direct compensation will be made to the Contractor for providing the insurance coverages shown below or any deductibles. These costs are incidental to the various bid items.

Type of Insurance	Amount of Coverage (Minimum)
Workers Compensation	$500,000 / $500,000 / $500,000
Commercial General Liability	$2,000,000 / $4,000,000
Business Automobile	$2,000,000 combined single limit
Railroad Protective Liability	
☐ Not Required	
☐ Non - Bridge Projects	$2,000,000 / $6,000,000
☒ Bridge Projects	$5,000,000 / $10,000,000
☐ Other	

VI. CONTRACTOR'S RIGHT OF ENTRY (ROE) AGREEMENT

On this project, an ROE agreement is:

☐ Not Required
☒ Required: TxDOT CST to assist in obtaining with the UPRR (see Item 5, Article 8.3)
☐ Required: Contractor to obtain (see Item 5, Article 8.4)

With the following railroad companies: _____

To view previously approved ROE Agreement templates agreed upon between the State and Railroad, see:

http://www.txdot.gov/inside-txdot/division/rail/samples.html

Approved ROE Agreement templates are not to be modified by the Contractor.

Contractor shall not operate within Railroad Right of Way without an executed Construction & Maintenance Agreement between the State and the Railroad and an executed ROE agreement between the Contractor and the Railroad if required on project.

VII. RAILROAD COORDINATION MEETING

On this project, a Railroad Coordination Meeting is:

☐ Not Required
☒ Required

See Item 5, Article 8.1 for more details.

VIII. SUBCONTRACTORS

Contractor shall not subcontract work without written consent of TxDOT. Subcontractors are required to maintain the same insurance coverage as required of the Contractor.

IX. EMERGENCY NOTIFICATION

In Case of Railroad Emergency
Call Union Pacific Railroad
Railroad Emergency Line at 888-877-7267
Location: DOT #414987E
RR Milepost 195.30
Subdivision Austin

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RAILROAD SCOPE OF WORK

PROJECT SPECIFIC DETAILS

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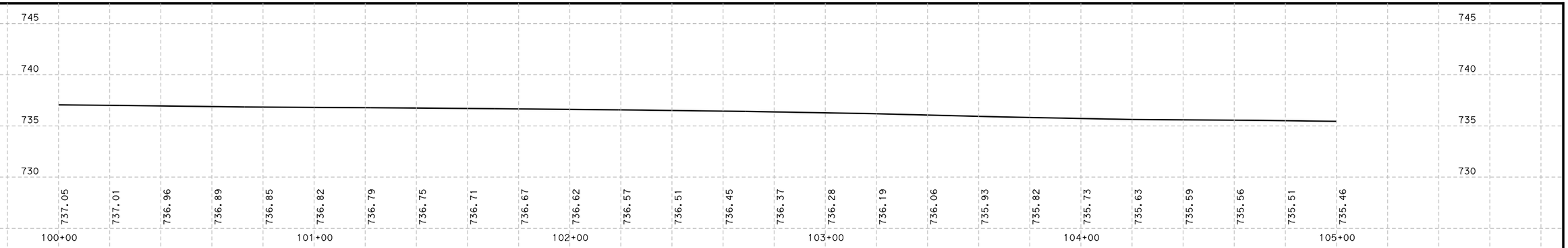
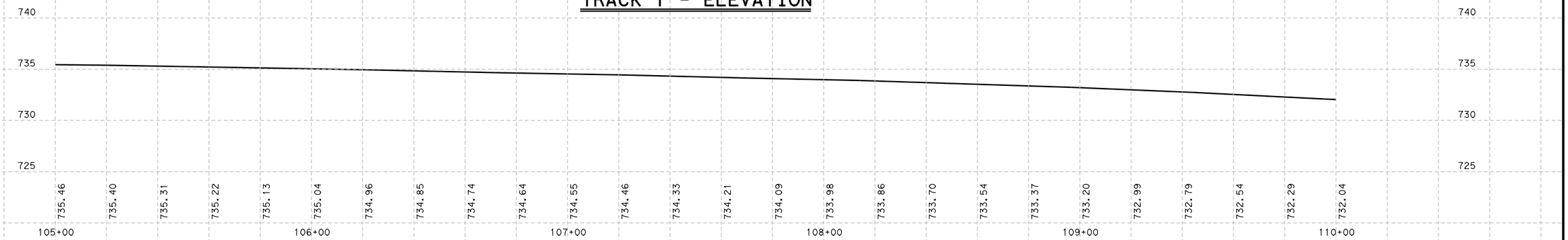
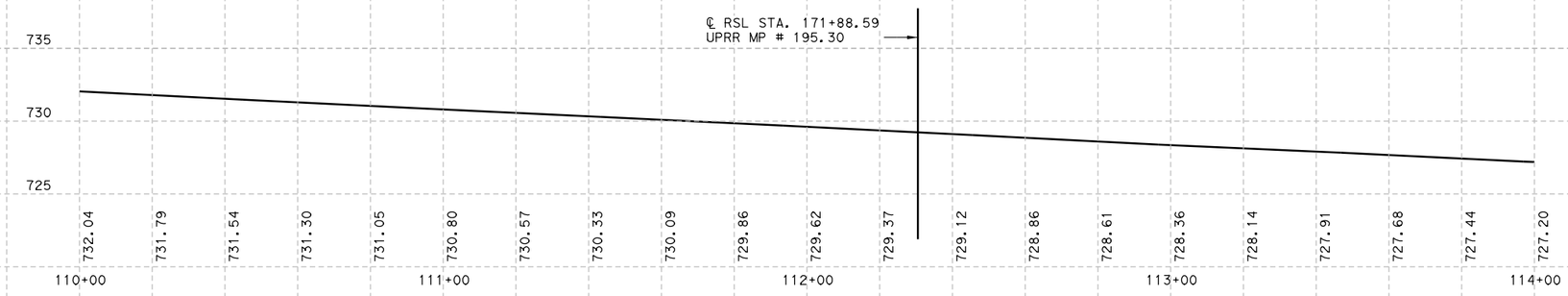


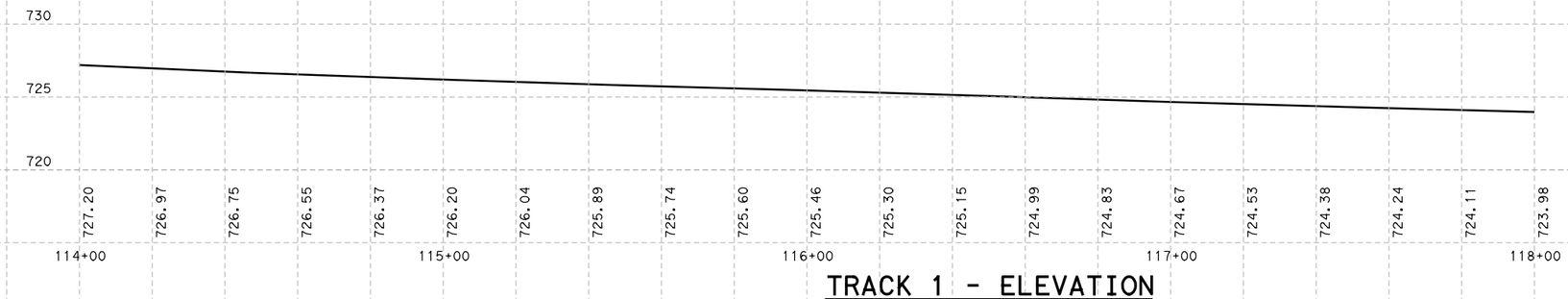
TRACK 1 - ELEVATION



TRACK 1 - ELEVATION



TRACK 1 - ELEVATION



TRACK 1 - ELEVATION

ALLEN R. CROZIER
81450
LICENSED
PROFESSIONAL ENGINEER
STATE OF TEXAS
11/19/2020

HDR Engineering, Inc.
4401 West Gate Blvd, Suite 400
Austin, Texas 78745
Texas Registered Engineering Firm F-754

Texas Department of Transportation

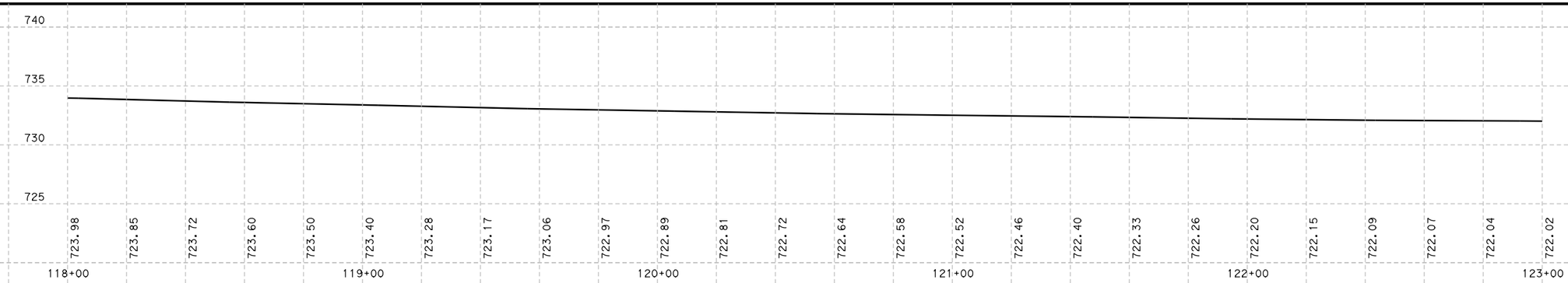
ROBERT S LIGHT EXTENSION

EXHIBIT "A"
UPRR MP 195.30
AUSTIN SUBDIVISION
DOT #414987E
EXISTING TRACK PROFILE

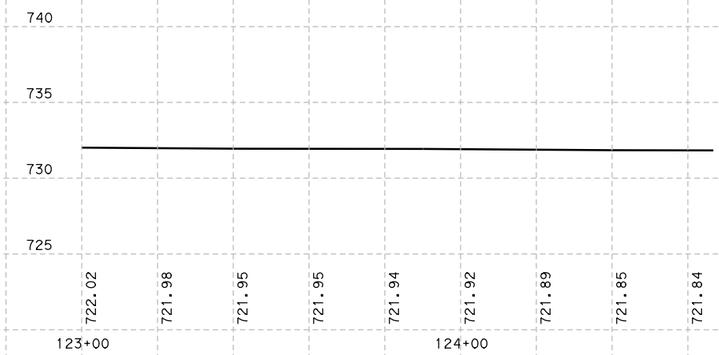
SHEET 1 OF 3

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		
SDM	6			
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
PQ	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	399
ARC CHECK	0914	33	068	
SDM				

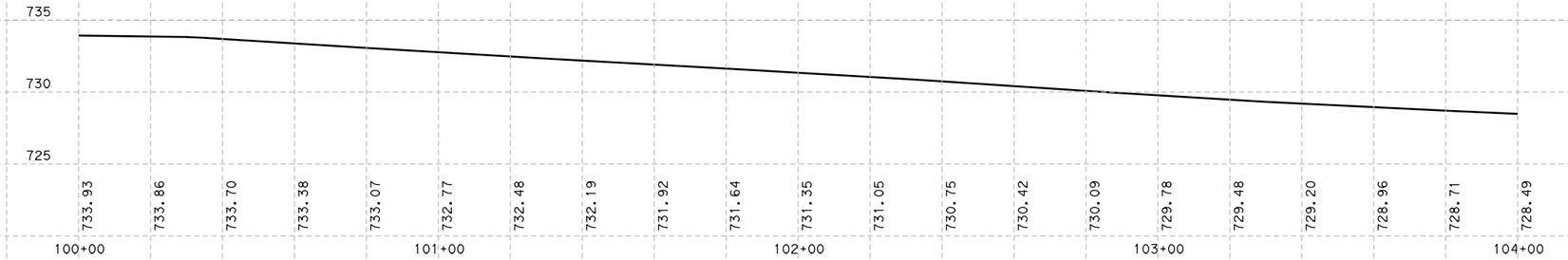
PLOT DRIVER: TXDOT_PDF_BW.pltcfg
USER: KBERGER DATE: 11/19/2020 TIME: 5:01:25 PM SCALE: 1:40
FILE: $PWWARVAULTPATHDESC$ PENTABLE: 000000000246I5.tbl



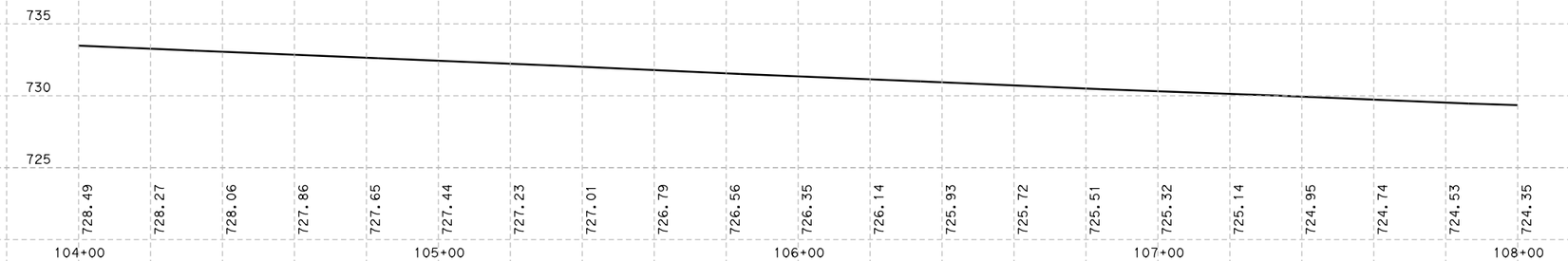
TRACK 1 - ELEVATION



TRACK 1 - ELEVATION



TRACK 122 - ELEVATION



TRACK 122 - ELEVATION

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
USER: KBERGER DATE: 11/19/2020
FILE: $PWWARVAULTPATHDESC$
PENTABLE: 000000000246l5.tbl
TIME: 5:01:26 PM SCALE: 1:40

STATE OF TEXAS
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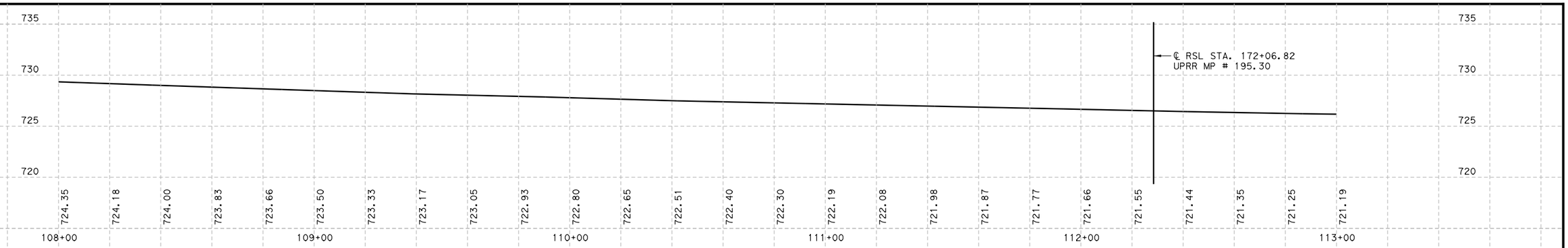
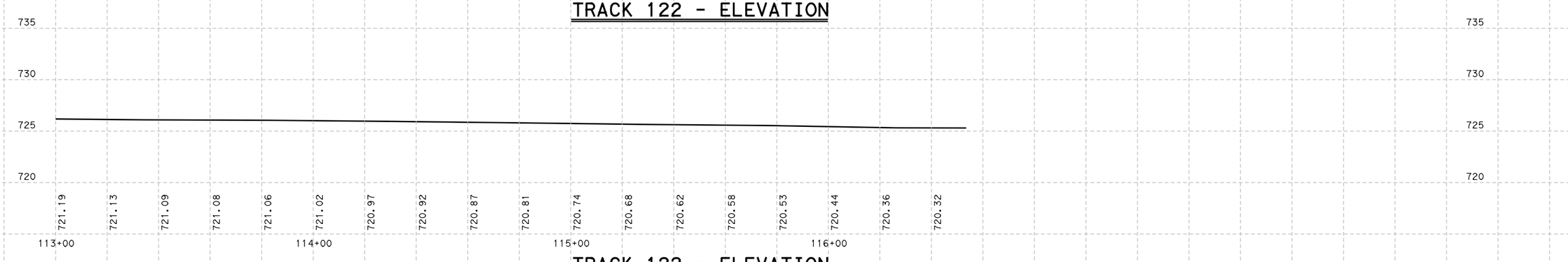
DOT #414987E
EXISTING TRACK PROFILE

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		
SDM	6			
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
PQ	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	400
ARC	0914	33	068	
CHECK				
SDM				



TRACK 122 - ELEVATION



TRACK 122 - ELEVATION

STATE OF TEXAS
ALLEN R. CROZIER
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ROBERT S LIGHT EXTENSION

EXHIBIT "A"
UPRR MP 195.30
AUSTIN SUBDIVISION
DOT #414987E
EXISTING TRACK PROFILE

SHEET 3 OF 3

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		
SDM	6			
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
PQ	TEXAS	AUS	HAYS	
CHECK	CONTROL	SECTION	JOB	401
ARC	0914	33	068	
CHECK				
SDM				

PLOT DRIVER: TXDOT_PDF_BW.pltcfg
USER: KBERGER
FILE: $PWVARVAULTPATHDESC$
PENTABLE: 000000000246l5.tbl
TIME: 5:01:27 PM
DATE: 11/19/2020
SCALE: 1:40