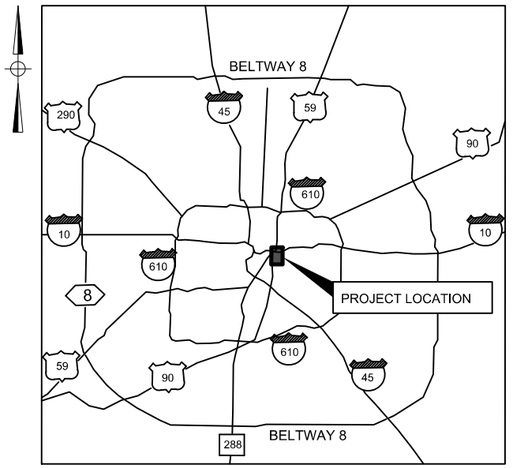
DIV. NO.	PROJECT NO.		SHEET NO.
6	STP 1902(308)MM		1
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0912	72	386	CS

SEE SHEET 2 FOR INDEX OF SHEETS



VICINITY MAP
NTS

REGISTERED ACCESSIBILITY (RAS) INSPECTION REQUIRED,
TDLR# TABS2022015573

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
ROUNDABOUT: NAVIGATION BOULEVARD AT S JENSEN DRIVE - RUNNELS STREET INTERSECTION RECONSTRUCTION

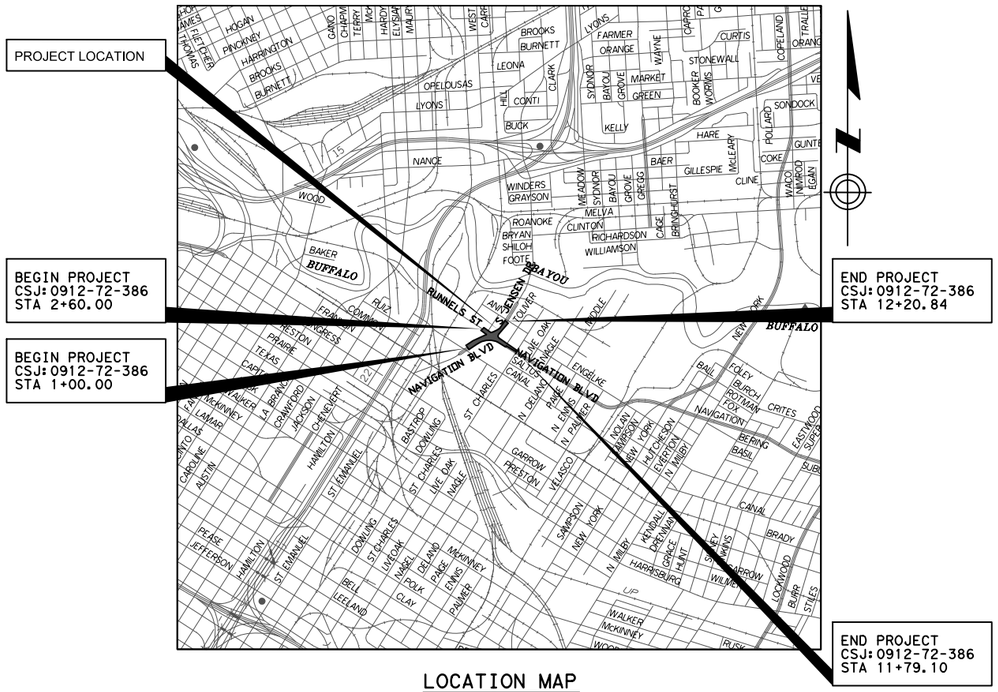
HARRIS COUNTY

PROJECT NO STP 1902(308)MM
CSJ: 0912-72-386
WBS NO: N-MD0110-0002-7

LENGTH OF PROJECT: ROADWAY: 1,265 FT = 0.240 MI
BRIDGE: 0 FT = 0.000 MI
NET LENGTH OF PROJECT: 1,265 FT = 0.240 MI

LIMITS: NAVIGATION BLVD TO JENSEN DR AND RUNNELS ST INTERSECTION FOR THE RECONSTRUCTION OF A NON-FREEWAY FACILITY, INCLUDING PAVEMENT, DRAINAGE, CURB & GUTTER, SIDEWALKS, LANDSCAPING, ADA RAMPS, AND STREET LIGHTING

DESIGN SPEED:
-CIRCULATORY ROADWAY: 25 MPH
-APPROACH LEGS: 35 MPH
FUNCTIONAL CLASS: ARTERIAL
ADT 2022: 7,521
ADT 2042: 10,471
ADT 2052: 11,946



LOCATION MAP
SCALE: 1:3000

EXCEPTIONS: NONE
EQUATIONS: NONE
RAILROAD CROSSINGS: NONE

NOTES:

ALL BEARINGS AND COORDINATES ARE BASED ON THE TEXAS COORDINATE SYSTEM, SOUTH CENTRAL ZONE, NORTH AMERICAN DATUM OF 1983, (2011) (EPOCH 2010.00).

ALL DISTANCES AND COORDINATES SHOWN ARE SURFACE AND MAY BE CONVERTED TO GRID BY DIVIDING BY A COMBINED ADJUSTMENT FACTOR OF 1.00013.

ALL ELEVATIONS ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88), 2001 ADJUSTMENT, GEOID '12A.

SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION ON NOVEMBER 1, 2014 AND THE SPECIFICATION ITEMS LISTED AND DATED AS FOLLOWS, SHALL GOVERN ON THIS PROJECT: REQUIRED CONTRACT PROVISIONS FOR FEDERAL-AID CONSTRUCTION CONTRACTS (FORM FHWA 1273, JULY 5, 2022).

COUNTY HARRIS PROJ. NO. STP 1902(308)MM
HWY. NO. CS LETTING DATE SEPTEMBER 2022
DATE ACCEPTED

Gauge ENGINEERING
11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

PUBLIC WORKS AND ENGINEERING
ACCEPTED AND FILED
73241
CITY DRAWING NUMBER
HOUSTON, TEXAS

7/5/22
DIRECTOR DATE
for HOUSTON PUBLIC WORKS

Texas Department of Transportation

SUBMITTED FOR LETTING: 07/012022
MZubair P.E.
PROJECT MANAGER

APPROVED FOR LETTING: 7/1/2022
DocuSigned by:
James Koch , P.E.
8A2ACFA465C24CC...
FOR DISTRICT ENGINEER

73241

INDEX OF SHEETS

STATE OF TEXAS
DAVID G. GREANEY
125563
LICENSED
PROFESSIONAL ENGINEER

GAUGE ENGINEERING TEXAS PE FIRM REG. # F-20017

* - THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ABOVE HAVE BEEN SELECTED BY ME AND ARE APPLICABLE TO THIS PROJECT.

DAVID G. GREANEY, PE 7/26/2022
NAME DATE

STATE OF TEXAS
KARAM M. QADDO
125611
LICENSED
PROFESSIONAL ENGINEER

GAUGE ENGINEERING TEXAS PE FIRM REG. # F-20017

** - THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ABOVE HAVE BEEN SELECTED BY ME AND ARE APPLICABLE TO THIS PROJECT.

KARAM M. QADDO, PE 7/26/2022
NAME DATE

STATE OF TEXAS
KEIJI ASAKURA
1170
REGISTERED
LANDSCAPE ARCHITECT

ASAKURA ROBINSON TBAE FIRM REG. # BR 1326

*** - THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ABOVE HAVE BEEN SELECTED BY ME AND ARE APPLICABLE TO THIS PROJECT.

KEIJI ASAKURA, PE 7/26/2022
NAME DATE

REV. NO.	DATE	DESCRIPTION	BY

Gauge ENGINEERING
11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

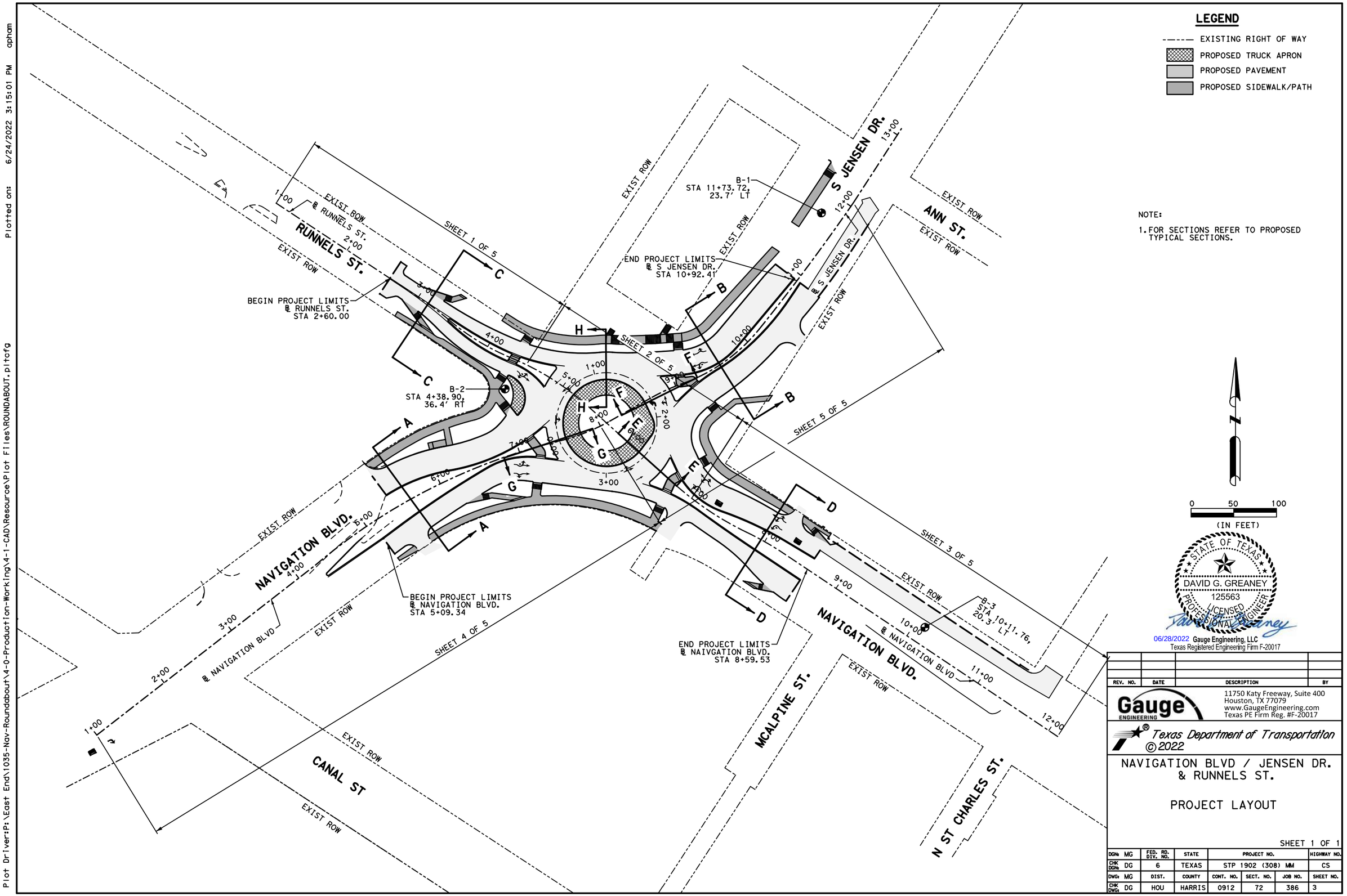
Texas Department of Transportation

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

INDEX OF SHEETS

SHEET 1 OF 1

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	2



REV. NO.	DATE	DESCRIPTION	BY

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Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

PROJECT LAYOUT

SHEET 1 OF 1

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	3

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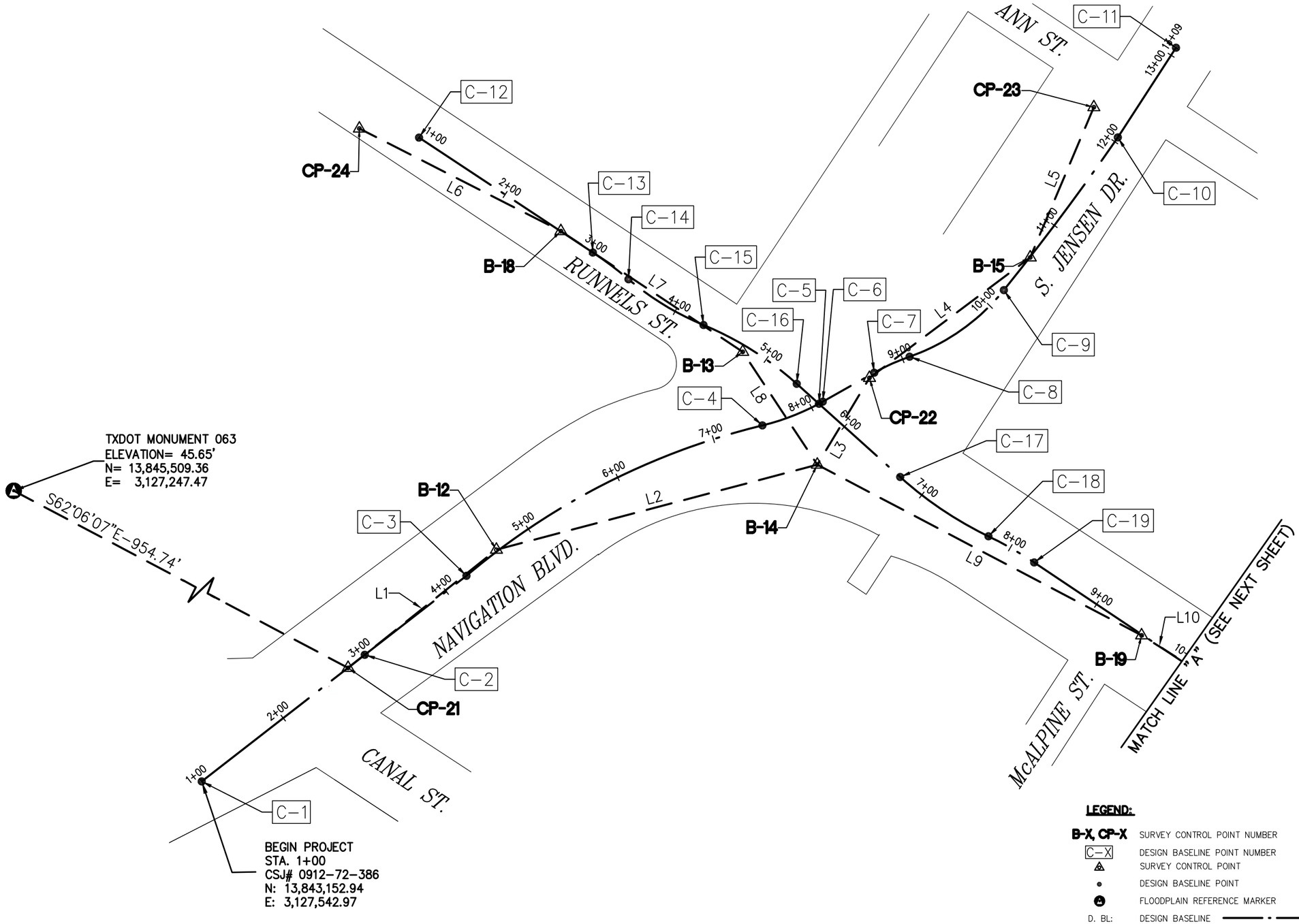

CONTROL NAME	PUBLISHED COORDINATES INFORMATION			MEASURED COORDINATES INFORMATION			DIFFERENCE		
POINT No.	N. COORD.	E. COORD.	ELEV.	N. COORD.	E. COORD.	ELEV.	N. COORD.	E. COORD.	ELEV.
063	13,843,709.64	3,126,840.91	45.65'	13,843,709.68	3,126,840.98	45.65'	-0.04	-0.07	0.00'

LEGEND:

B-X, CP-X	SURVEY CONTROL POINT NUMBER
C-X	DESIGN BASELINE POINT NUMBER
	SURVEY CONTROL POINT
	DESIGN BASELINE POINT
	FLOODPLAIN REFERENCE MARKER
D. BL:	DESIGN BASELINE
S. BL:	SURVEY BASELINE

VERTICAL DATUM ADJUSTMENT TO TXDOT REFERENCE DATUM:

THE ELEVATION DIFFERENCE IN BETWEEN THE FLOODPLAIN REFERENCE MARK'S (RM 210030) PUBLISHED DATUM NAVD 1988, 2001 ADJUSTMENT AND DATUM NAVD 1988, (2001 ADJUSTMENT)(GEOID '12A) IS 0.17'.

NAVD 1988, 2001 ADJ. ELEVATION = NAVD 1988, (2001 ADJ.)(GEOID '12A) ELEVATION – 0.17 FEET.

BENCHMARK:

TXDOT MONUMENT 063 (FORMERLY KNOWN AS H-22), AN ALUMINUM DISK IN CONCRETE, LOCATED AT EAST SIDE OF THE INTERSECTION OF CHARTRESS STREET AND CANAL STREET

ELEV. 45.65 FEET NAVD 1988 (2001 ADJUSTMENT)(GEOID '12A)

NOTE:

ALL BEARINGS AND COORDINATES ARE BASED ON THE TEXAS COORDINATE SYSTEM, SOUTH CENTRAL ZONE, NORTH AMERICAN DATUM OF 1983, (2011) (EPOCH 2010.00).

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ALL ELEVATIONS ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88), 2001 ADJUSTMENT, GEOID '12A

0 50 100
SCALE: 1" = 100'-0"

THE CONTROL POINTS SHOWN HEREIN WERE DETERMINED BY A SURVEY MADE ON THE GROUND UNDER MY SUPERVISION.

STATE OF TEXAS
REGISTERED
KUTUBUL A. M. MAINUDDIN
6404
PROFESSIONAL
LAND SURVEYOR

06/01/22

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

STATE OF TEXAS
DAVID G. GREANEY
125563
LICENSED
PROFESSIONAL ENGINEER

06/02/2022

Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

NO.	DATE	REVISION	APPROV.

KUO & associates, Inc.
Consulting Engineers & Surveyors
10300 Westoffice Drive, Suite 800
Houston, TX 77042
Tel: (713) 975-8769
Fax: (713) 975-0920
www.kuoassociates.com
TBPELS Firm Registration No. F-4578
TBPELS Firm Registration No. 10075600

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Texas PE Firm Reg. #F-20017

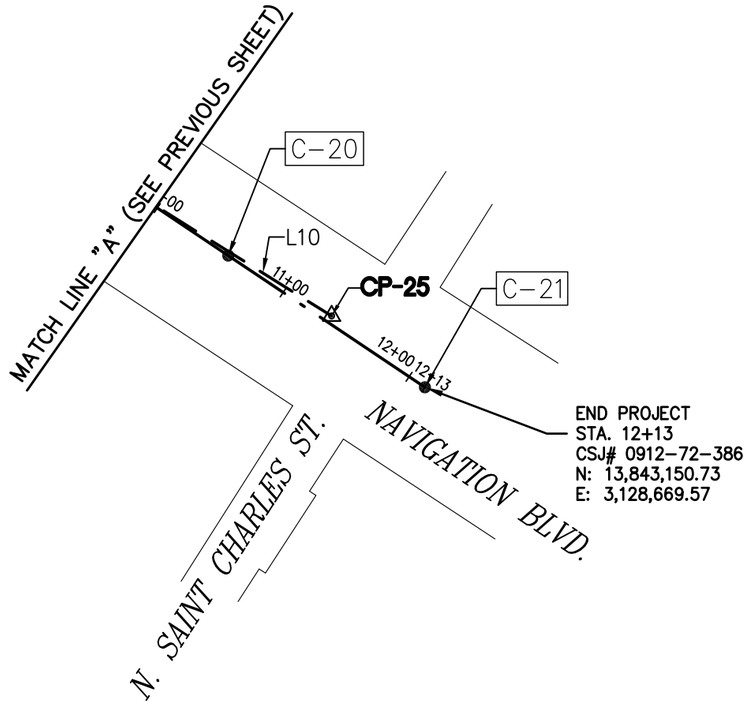
Texas Department of Transportation

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

SURVEY CONTROL INDEX SHEET

SHEET 1 OF 2

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1902 (308) MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	386	4



SURVEY BASELINE POINTS DATA (TEMPORARY BENCHMARK)						
POINT No.	NORTHING (SURFACE)	EASTING (SURFACE)	ELEVATION	D. BL STA.	OFFSET	DESCRIPTION
B-12	13,843,377.48	3,127,828.42	43.67'	4+63.17	1.60L	SET "X" CUT
B-13	13,843,569.22	3,128,067.03	39.94'	4+76.65	6.22R	FND. "X" CUT
B-14	13,843,459.86	3,128,139.28	39.51'	6+05.11	44.91R	FND. "X" CUT
B-15	13,843,660.74	3,128,345.54	35.70'	10+61.13	0.34R	SET "X" CUT
B-18	13,843,686.24	3,127,890.88	41.47'	2+64.60	0.24L	SET "X" CUT
B-19	13,843,294.47	3,128,453.41	36.90'	9+52.95	0.84R	SET 5/8" I.R. W/ CAP
CP-21	13,843,262.96	3,127,684.76	44.45'	2+79.47	0.14R	SET 5/8" I.R. W/ CAP
CP-22	13,843,543.92	3,128,189.81	38.01'	8+62.99	2.19R	SET 5/8" I.R. W/ CAP
CP-23	13,843,806.25	3,128,407.15	34.24'	12+16.96	35.39L	SET 5/8" I.R. W/ CAP
CP-24	13,843,785.60	3,127,695.70	43.80'	—	—	SET 5/8" I.R. W/ CAP
CP-25	13,843,197.80	3,128,607.98	36.53'	11+35.17	4.84L	SET 5/8" I.R. W/ CAP

DESIGN BASELINE: LINE TABLE			
POINTS	LINE #	BEARING	LENGTH
CP-21 TO B-12	L1	N51° 26' 11.17"E	183.72
B-12 TO B-14	L2	N75° 09' 28.32"E	321.59
CP-14 TO CP-22	L3	N31° 00' 43.23"E	98.08
CP-22 TO B-15	L4	N53° 07' 31.01"E	194.68
CP-15 TO CP-23	L5	N22° 56' 43.60"E	158.02
CP-24 TO B-18	L6	S63° 01' 14.98"E	219.02
B-18 TO B-13	L7	S56° 24' 07.96"E	211.47
B-13 TO B-14	L8	S33° 27' 09.88"E	131.07
B-14 TO B-19	L9	S62° 13' 59.18"E	355.01
B-19 TO CP-25	L10	S57° 58' 37.08"E	182.31

DESIGN BASELINE POINTS DATA			
POINT No.	D. BL STA.	NORTHING (SURFACE)	EASTING (SURFACE)
C-1	1+00.00	13,843,152.94	3,127,542.97
C-2	3+00.00	13,843,275.66	3,127,700.89
C-3	4+24.79	13,843,352.23	3,127,799.42
C-4	7+49.26	13,843,497.94	3,128,086.09
C-5	5+66.73	13,843,518.92	3,128,140.82
C-6	8+12.32	13,843,520.98	3,128,144.57
C-7	8+69.52	13,843,549.03	3,128,194.42
C-8	9+07.16	13,843,564.52	3,128,228.67
C-9	10+20.46	13,843,629.06	3,128,320.02
C-10	12+05.12	13,843,777.06	3,128,430.39
C-11	13+08.69	13,843,863.94	3,128,486.77
C-12	1+00.00	13,843,776.85	3,127,753.47
C-13	3+01.93	13,843,665.44	3,127,921.89
C-14	3+45.06	13,843,639.58	3,127,956.37
C-15	4+30.54	13,843,595.25	3,128,029.06
C-16	5+37.82	13,843,538.27	3,128,119.34
C-17	6+72.74	13,843,447.97	3,128,219.58
C-18	7+76.10	13,843,390.51	3,128,305.09
C-19	8+27.18	13,843,365.14	3,128,349.38
C-20	10+56.33	13,843,237.64	3,128,539.78
C-21	12+12.53	13,843,150.73	3,128,669.57

LEGEND:

- B-X, CP-X — SURVEY CONTROL POINT NUMBER
- C-X — DESIGN BASELINE POINT NUMBER
- SURVEY CONTROL POINT
- DESIGN BASELINE POINT
- FLOODPLAIN REFERENCE MARKER
- D. BL: — DESIGN BASELINE
- S. BL: — SURVEY BASELINE

VERTICAL DATUM ADJUSTMENT TO TXDOT REFERENCE DATUM:

THE ELEVATION DIFFERENCE IN BETWEEN THE FLOODPLAIN REFERENCE MARK'S (RM 210030) PUBLISHED DATUM NAVD 1988, 2001 ADJUSTMENT AND DATUM NAVD 1988, (2001 ADJUSTMENT)(GEOID '12A) IS 0.17'.

NAVD 1988, 2001 ADJ. ELEVATION = NAVD 1988, (2001 ADJ.)(GEOID '12A) ELEVATION – 0.17 FEET.

BENCHMARK:

TXDOT MONUMENT 063 (FORMERLY KNOWN AS H-22), AN ALUMINUM DISK IN CONCRETE, LOCATED AT EAST SIDE OF THE INTERSECTION OF CHARTRESS STREET AND CANAL STREET

ELEV. 45.65 FEET NAVD 1988 (2001 ADJUSTMENT)(GEOID '12A)

NOTE:

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0 50 100

SCALE: 1" = 100'-0"

THE CONTROL POINTS SHOWN HEREIN WERE DETERMINED BY A SURVEY MADE ON THE GROUND UNDER MY SUPERVISION.

STATE OF TEXAS
REGISTERED
KUTUBUL A. M. MAINUDDIN
6404
PROFESSIONAL
LAND SURVEYOR

06/01/22

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

STATE OF TEXAS
DAVID G. GREANEY
125563
LICENSED
PROFESSIONAL ENGINEER

06/02/2022

Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

NO.	DATE	REVISION	APPROV.

KUO & associates, Inc.
Consulting Engineers & Surveyors
10300 Westoffice Drive, Suite 800
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Fax: (713) 975-0920
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Texas PE Firm Reg. #F-20017

Texas Department of Transportation

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

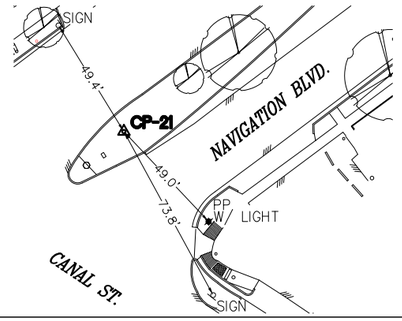
SURVEY CONTROL INDEX SHEET

SHEET 2 OF 2

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1902 (308) MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	386	5

SURVEY CONTROL PT.
CP–21

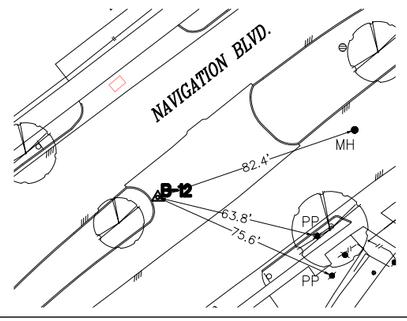
N= 13,843,262.96
E= 3,127,684.76
ELEVATION= 44.45'



CONTROL DESCRIPTION: SET 5/8" IRON ROD WITH TXDOT ALUMINUM CAP AT THE INTERSECTION OF CANAL ST. AND NAVIGATION BLVD.

SURVEY CONTROL PT.
B–12

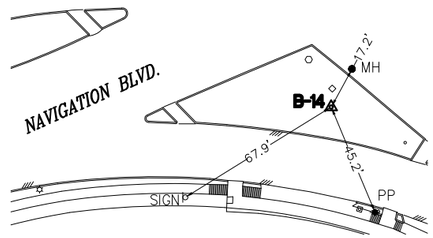
N= 13,843,377.48
E= 3,127,828.42
ELEVATION= 43.67'



CONTROL DESCRIPTION: SET "X" CUT APPROX. 245' EAST OF THE INTERSECTION OF CANAL ST. AND NAVIGATION BLVD.

SURVEY CONTROL PT.
B–14

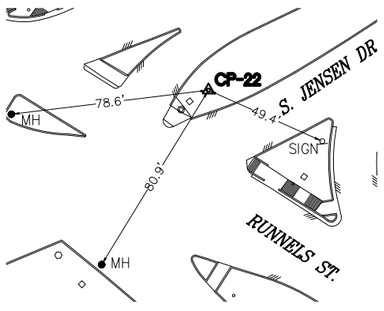
N= 13,843,459.86
E= 3,128,139.28
ELEVATION= 39.51'



CONTROL DESCRIPTION: SET "X" CUT APPROX. 340' WEST OF THE INTERSECTION MCALPINE ST. AND NAVIGATION BLVD.

SURVEY CONTROL PT.
CP–22

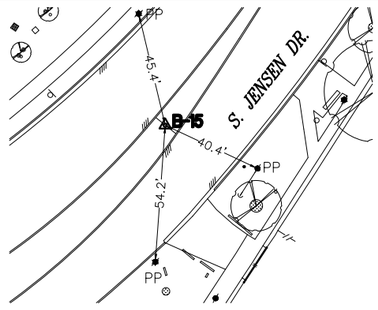
N= 13,843,543.92
E= 3,128,189.81
ELEVATION= 38.01'



CONTROL DESCRIPTION: SET "X" CUT APPROX. AT THE INTERSECTION OF S. JENSEN DR. AND RUNNELS ST.

SURVEY CONTROL PT.
B–15

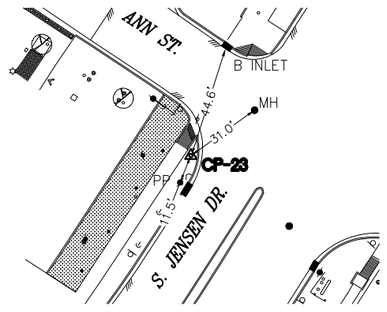
N= 13,843,660.74
E= 3,128,345.54
ELEVATION= 35.70'



CONTROL DESCRIPTION: SET "X" CUT APPROX. 215' SOUTH OF THE INTERSECTION OF S. JENSEN DR. AND NAVIGATION BLVD.

SURVEY CONTROL PT.
CP–23

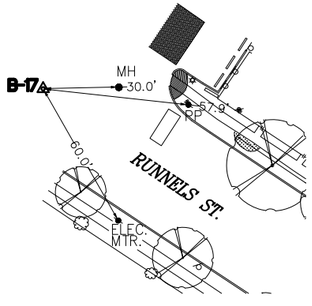
N= 13,843,806.25
E= 3,128,407.15
ELEVATION= 34.24'



CONTROL DESCRIPTION: SET 5/8" I.R. WITH TXDOT ALUMINUM CAP AT THE INTERSECTION OF S. JENSEN AND ANN ST.

SURVEY CONTROL PT.
B–17

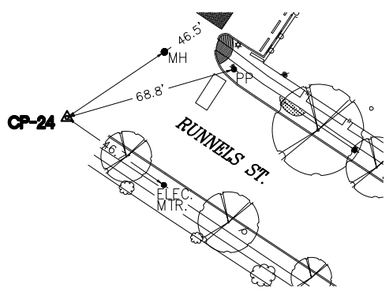
N= 13,843,811.01
E= 3,127,704.26
ELEVATION= 43.87'



CONTROL DESCRIPTION: SET "X" CUT APPROX. 475' WEST OF THE INTERSECTION OF RUNNELS ST. AND S. JENSEN ST.

SURVEY CONTROL PT.
CP–24

N= 13,843,785.60
E= 3,127,695.70
ELEVATION= 43.80'



CONTROL DESCRIPTION SET: 5/8" IRON ROD WITH TXDOT ALUMINUM CAP APPROX. 450' WEST OF THE INTERSECTION OF RUNNELS ST. AND NAVIGATION

EXIST. TOPOGRAPHIC LEGEND

- MANHOLE
- GRATE INLET
- B/BB INLET
- FIRE HYDRANT
- SIGNAL POLE
- FENCE
- BUSH
- BORE HOLE
- WATER VALVE
- HIGH BANK
- LIGHT
- SIGN
- POWER POLE
- POWER POLE W/LIGHT
- DOWN GUY
- TREE
- PLANTER
- BUILDING
- WATER METER
- HEDGE ROW

VERTICAL DATUM ADJUSTMENT TO TXDOT REFERENCE DATUM:

THE ELEVATION DIFFERENCE IN BETWEEN THE FLOODPLAIN REFERENCE MARK'S (RM 210030) PUBLISHED DATUM NAVD 1988, 2001 ADJUSTMENT AND DATUM NAVD 1988, (2001 ADJUSTMENT)(GEOID '12A) IS 0.17'.

NAVD 1988, 2001 ADJ. ELEVATION = NAVD 1988, (2001 ADJ.)(GEOID '12A) ELEVATION – 0.17 FEET.

BENCHMARK:

TXDOT MONUMENT 063 (FORMERLY KNOWN AS H–22), AN ALUMINUM DISK IN CONCRETE, LOCATED AT EAST SIDE OF THE INTERSECTION OF CHARTRESS STREET AND CANAL STREET

ELEV. 45.65 FEET NAVD 1988 (2001 ADJUSTMENT)(GEOID '12A)

NOTE:

ALL BEARINGS AND COORDINATES ARE BASED ON THE TEXAS COORDINATE SYSTEM, SOUTH CENTRAL ZONE, NORTH AMERICAN DATUM OF 1983, (2011) (EPOCH 2010.00).

ALL DISTANCES AND COORDINATES SHOWN ARE SURFACE AND MAY BE CONVERTED TO GRID BY DIVIDING BY A COMBINED ADJUSTMENT FACTOR OF 1.00013.

ALL ELEVATIONS ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88), 2001 ADJUSTMENT, GEOID '12A

0 30 60
SCALE: 1" = 60'–0"

THE CONTROL POINTS SHOWN HEREIN WERE DETERMINED BY A SURVEY MADE ON THE GROUND UNDER MY SUPERVISION.

STATE OF TEXAS
REGISTERED
KUTUBUL A. M. MAINUDDIN
6404
PROFESSIONAL
LAND SURVEYOR

06/01/22

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

STATE OF TEXAS
DAVID G. GREANEY
125563
LICENSED
PROFESSIONAL ENGINEER

06/02/2022

Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

NO.	DATE	REVISION	APPROV.

KUO & associates, Inc.
Consulting Engineers & Surveyors
10300 Westoffice Drive, Suite 800
Houston, TX 77042
Tel: (713) 975–8769
Fax: (713) 975–0920
www.kuoassociates.com
TBPELS Firm Registration No. F–4578
TBPELS Firm Registration No. 10075600

Gauge ENGINEERING
11750 Katy Fwy, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

Texas Department of Transportation

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

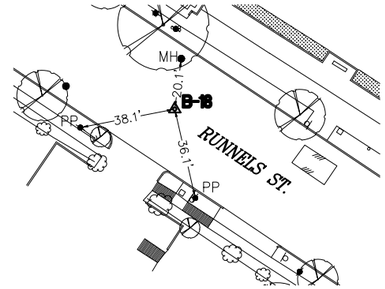
HORIZONTAL AND VERTICAL CONTROL SHEET

SHEET 1 OF 2

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1902 (308) MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	386	6

SURVEY CONTROL PT.
B–18

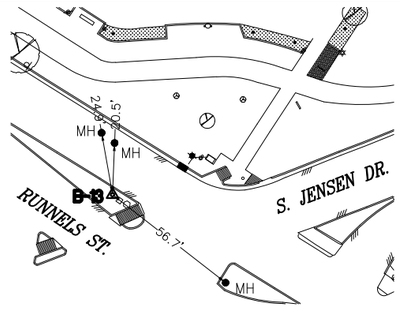
N= 13,843,686.24
E= 3,127,890.88
ELEVATION= 41.47'



CONTROL DESCRIPTION: SET "X" CUT APPROX. 235' WEST OF THE INTERSECTION OF RUNNELS ST. AND NAVIGATION BLVD.

SURVEY CONTROL PT.
B–13

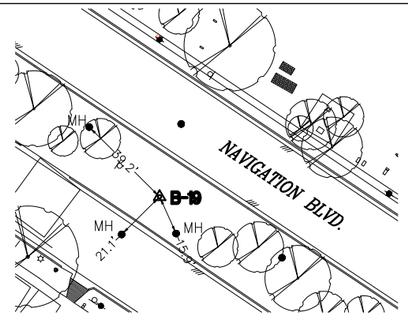
N= 13,843,569.22
E= 3,128,067.03
ELEVATION= 39.94'



CONTROL DESCRIPTION: FOUND "X" CUT AT THE INTERSECTION OF RUNNELS. ST. AND S. JENSEN ST.

SURVEY CONTROL PT.
B–19

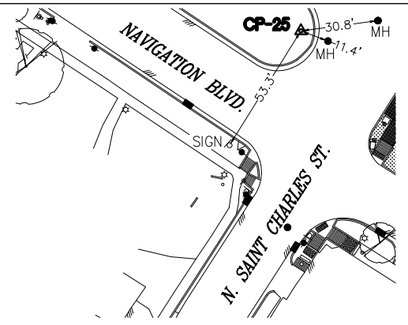
N= 13,843,294.47
E= 3,128,453.41
ELEVATION= 36.90'



CONTROL DESCRIPTION: SET 5/8" IRON ROD WITH CAP AT THE INTERSECTION OF MCALPINE ST. AND NAVIGATION BLVD.

SURVEY CONTROL PT.
CP–25

N= 13,843,197.80
E= 3,128,607.98
ELEVATION= 36.53'



CONTROL DESCRIPTION: SET 5/8" IRON ROD WITH TXDOT ALUMINUM CAP AT THE OF N. SAINT CHARLES ST. AND NAVIGATION ST.

BENCHMARK:

TXDOT MONUMENT 063 (FORMERLY KNOWN AS H–22), AN ALUMINUM DISK IN CONCRETE, LOCATED AT EAST SIDE OF THE INTERSECTION OF CHARTRESS STREET AND CANAL STREET

ELEV. 45.65 FEET NAVD 1988 (2001 ADJUSTMENT)(GEOID '12A)

NOTE:

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ALL ELEVATIONS ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88), 2001 ADJUSTMENT, GEOID '12A

0 30 60
SCALE: 1" = 60'–0"

THE CONTROL POINTS SHOWN HEREIN WERE DETERMINED BY A SURVEY MADE ON THE GROUND UNDER MY SUPERVISION.

STATE OF TEXAS
REGISTERED
KUTUBUL A. M. MAINUDDIN
6404
PROFESSIONAL
LAND SURVEYOR

06/01/22

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

STATE OF TEXAS
DAVID G. GREANEY
125563
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PROFESSIONAL ENGINEER

06/02/2022

Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

EXIST. TOPOGRAPHIC LEGEND

- MANHOLE
- GRATE INLET
- B/BB INLET
- FIRE HYDRANT
- SIGNAL POLE
- FENCE
- BUSH
- BORE HOLE
- WATER VALVE
- HIGH BANK
- LIGHT
- SIGN
- POWER POLE
- POWER POLE W/LIGHT
- DOWN GUY
- TREE
- PLANTER
- BUILDING
- WATER METER
- HEDGE ROW

VERTICAL DATUM ADJUSTMENT TO TXDOT REFERENCE DATUM:

THE ELEVATION DIFFERENCE IN BETWEEN THE FLOODPLAIN REFERENCE MARK'S (RM 210030) PUBLISHED DATUM NAVD 1988, 2001 ADJUSTMENT AND DATUM NAVD 1988, (2001 ADJUSTMENT)(GEOID '12A) IS 0.17'.

NAVD 1988, 2001 ADJ. ELEVATION = NAVD 1988, (2001 ADJ.)(GEOID '12A) ELEVATION – 0.17 FEET.

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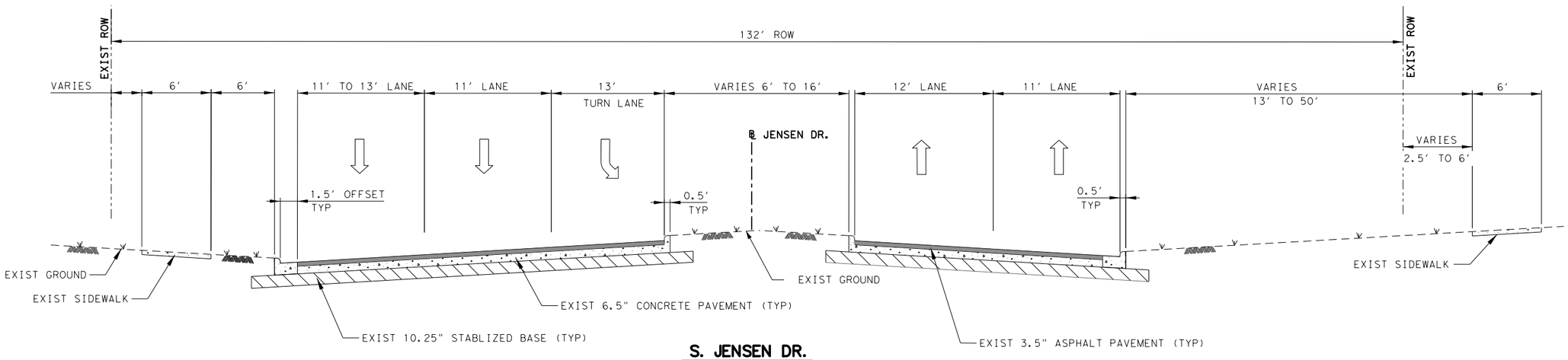
Texas Department of Transportation

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

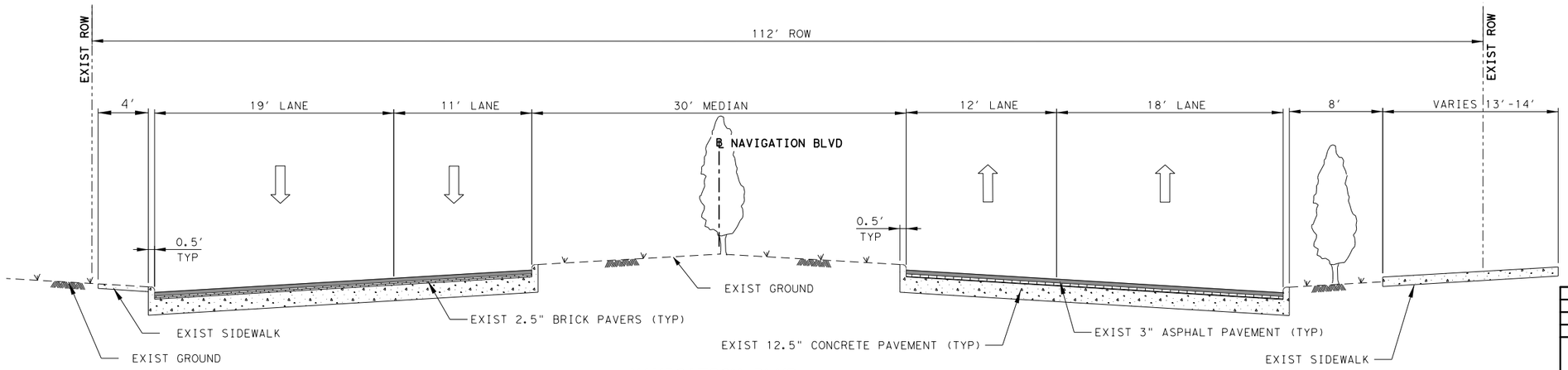
HORIZONTAL AND VERTICAL CONTROL SHEET

SHEET 2 OF 2

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1902 (308) MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	386	7



S. JENSEN DR.
NORTHEAST SIDE



NAVIGATION BLVD
SOUTHEAST SIDE

STATE OF TEXAS
DAVID G. GREANEY
125563
LICENSED
PROFESSIONAL ENGINEER

06/08/2022 Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

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Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

EXISTING TYPICAL SECTIONS

SHEET 1 OF 2

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	8

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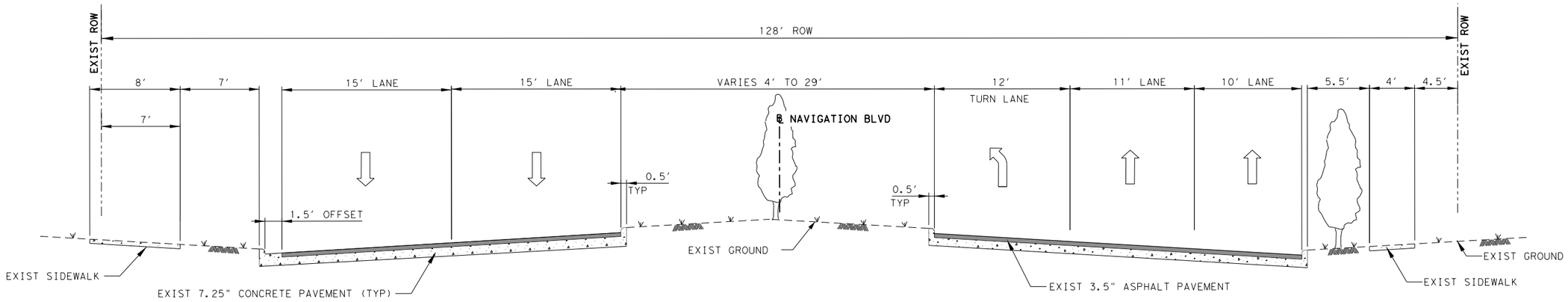
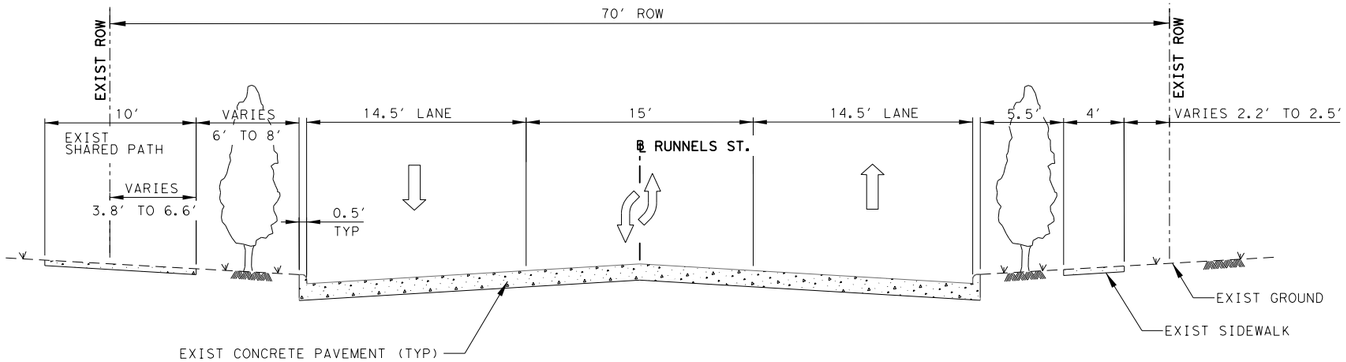
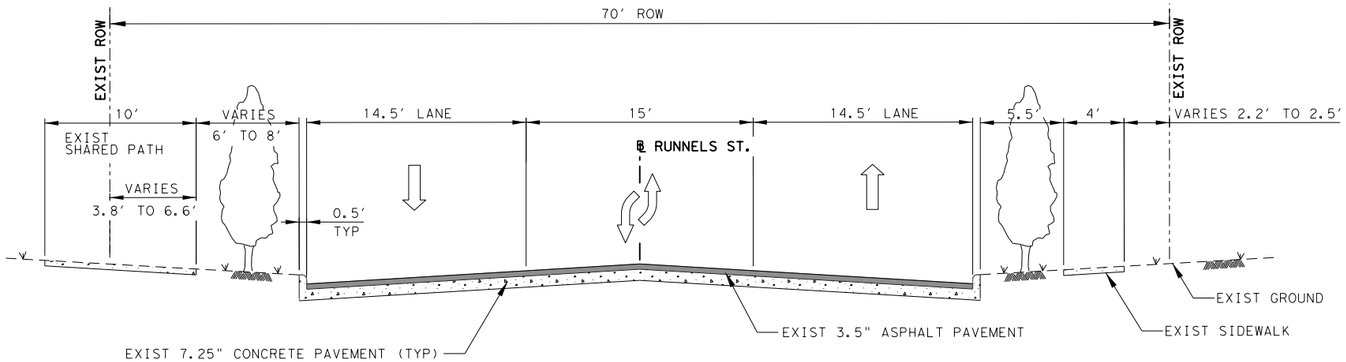


NAVIGATION BLVD
SOUTHWEST SIDE



RUNNELS ST.
NORTHWEST SIDE
STA 0+00 TO STA 4+05



RUNNELS ST.
NORTHWEST SIDE
STA 4+05 TO STA 4+83

STATE OF TEXAS
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www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

Texas Department of Transportation

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

EXISTING TYPICAL SECTIONS

SHEET 2 OF 2

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	9

Pen Table:ROUNDABOUT - Copy.txt
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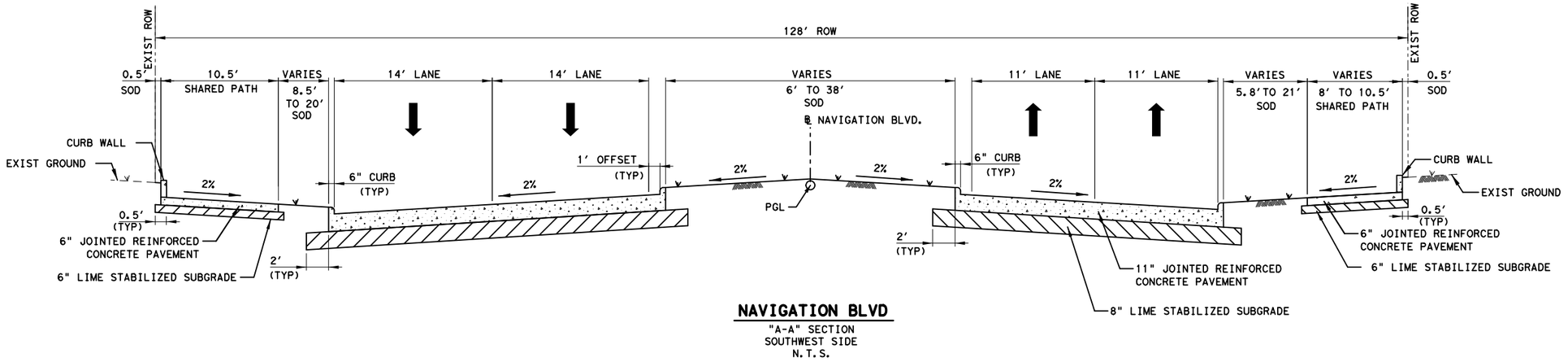
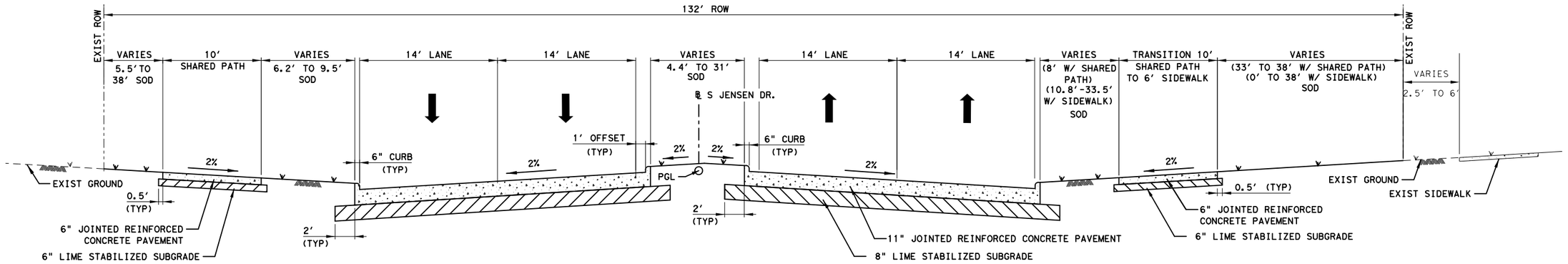
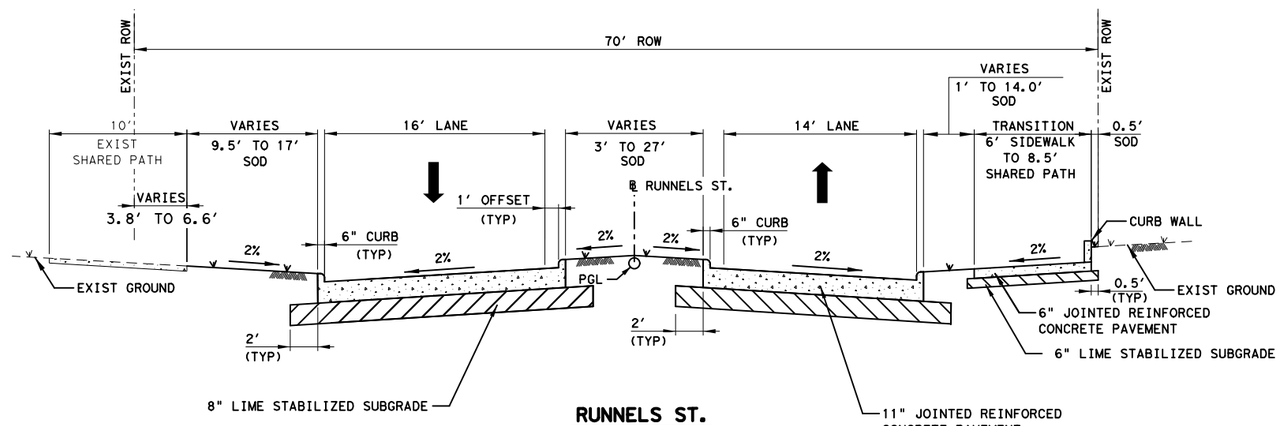


NAVIGATION BLVD
"A-A" SECTION
SOUTHWEST SIDE
N.T.S.



S. JENSEN DR.
"B-B" SECTION
NORTHEAST SIDE
N.T.S.



RUNNELS ST.
"C-C" SECTION
NORTHWEST SIDE
N.T.S.

NOTE:
1. FOR SECTIONS REFER TO PROJECT LAYOUT.

STATE OF TEXAS
DAVID G. GREANEY
125563
LICENSED
PROFESSIONAL ENGINEER

06/08/2022 Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

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NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

PROPOSED TYPICAL SECTIONS

SHEET 1 OF 3

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	10

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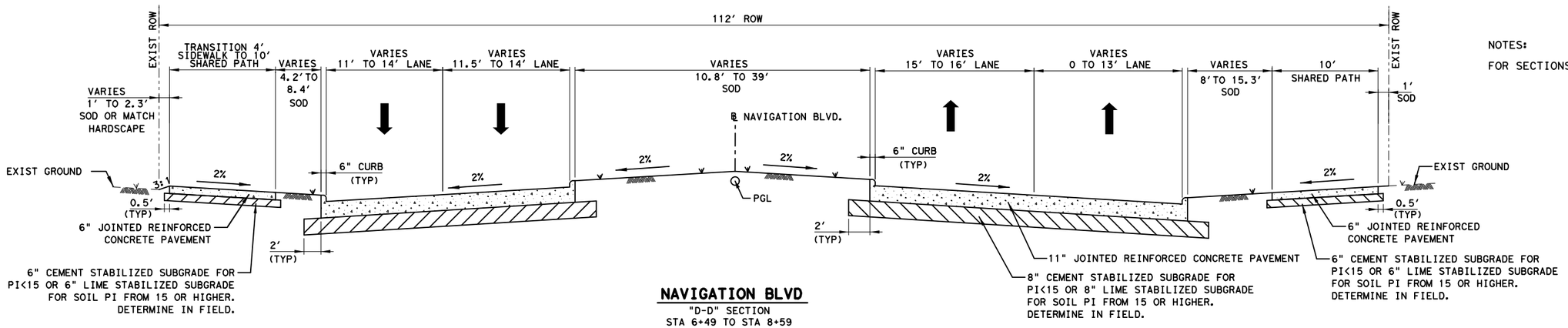
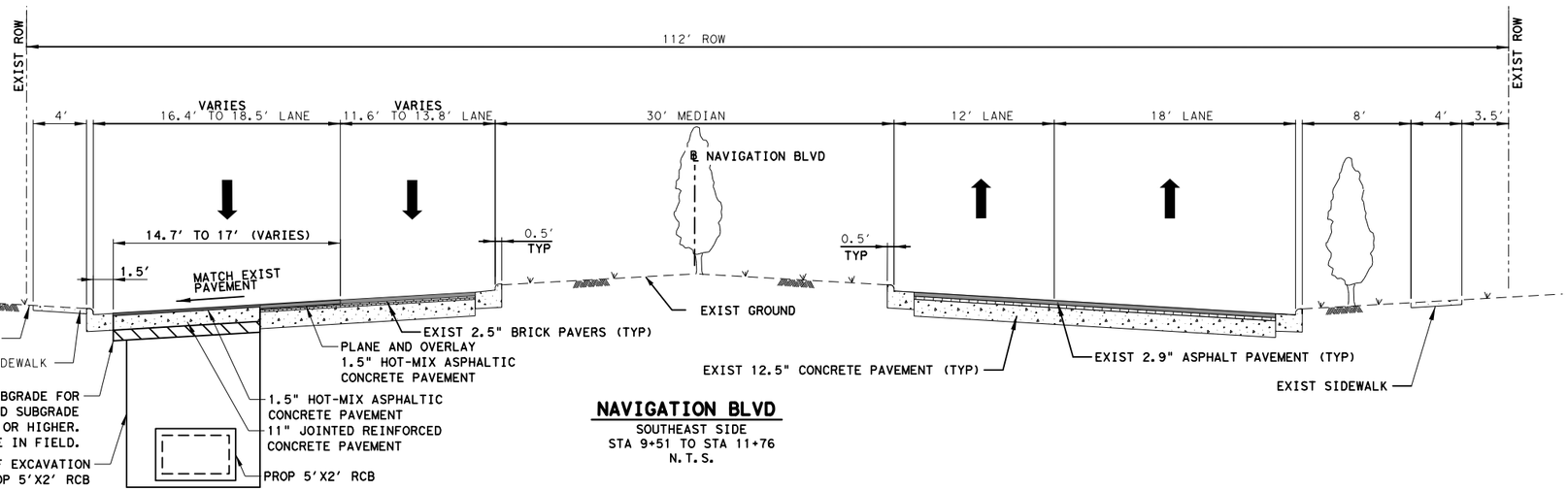


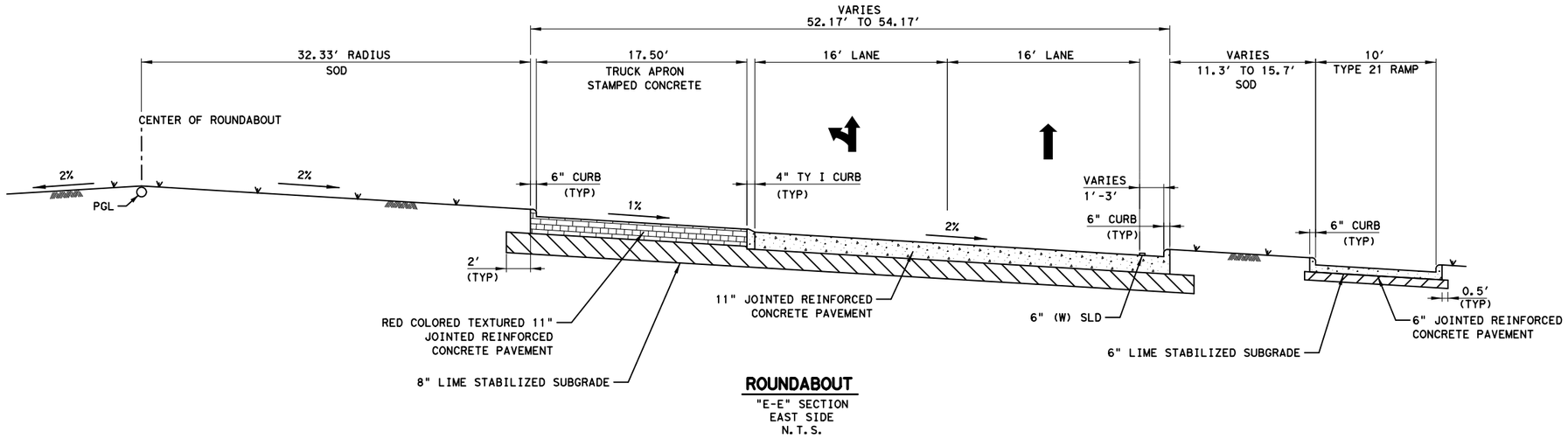
NAVIGATION BLVD
"D-D" SECTION
STA 6+49 TO STA 8+59
SOUTHEAST SIDE
N.T.S.

NOTES:

FOR SECTIONS REFER TO PROJECT LAYOUT.



NAVIGATION BLVD
SOUTHEAST SIDE
STA 9+51 TO STA 11+76
N.T.S.



ROUNDABOUT
"E-E" SECTION
EAST SIDE
N.T.S.

STATE OF TEXAS
DAVID G. GREANEY
125563
LICENSED
PROFESSIONAL ENGINEER

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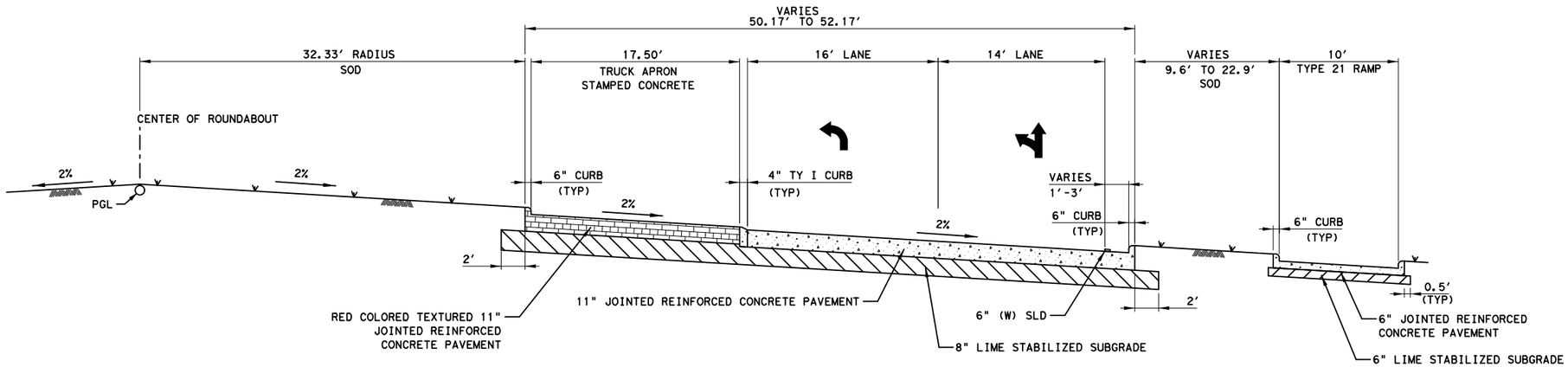
Texas Department of Transportation

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

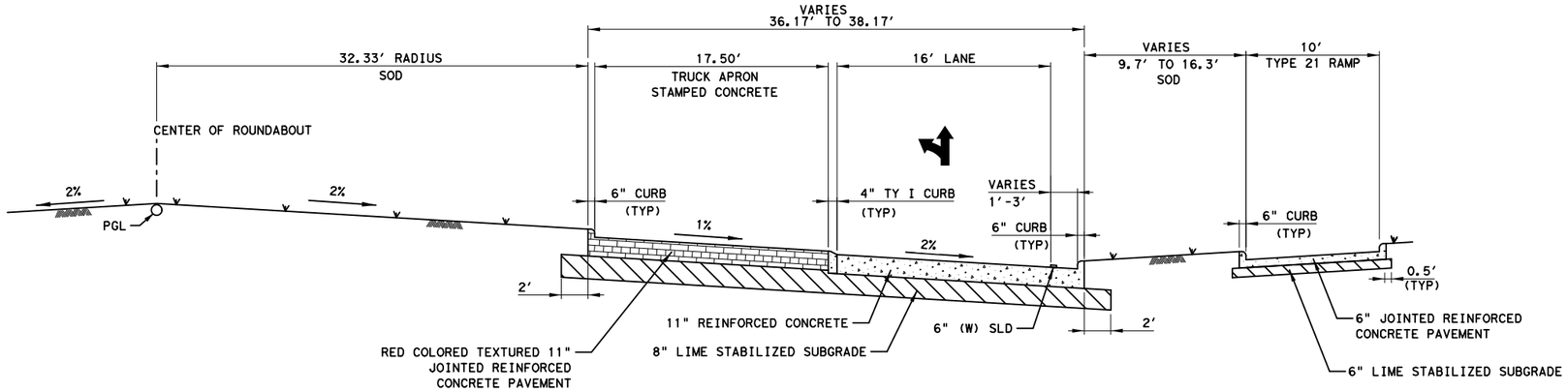
PROPOSED TYPICAL SECTIONS

SHEET 2 OF 3

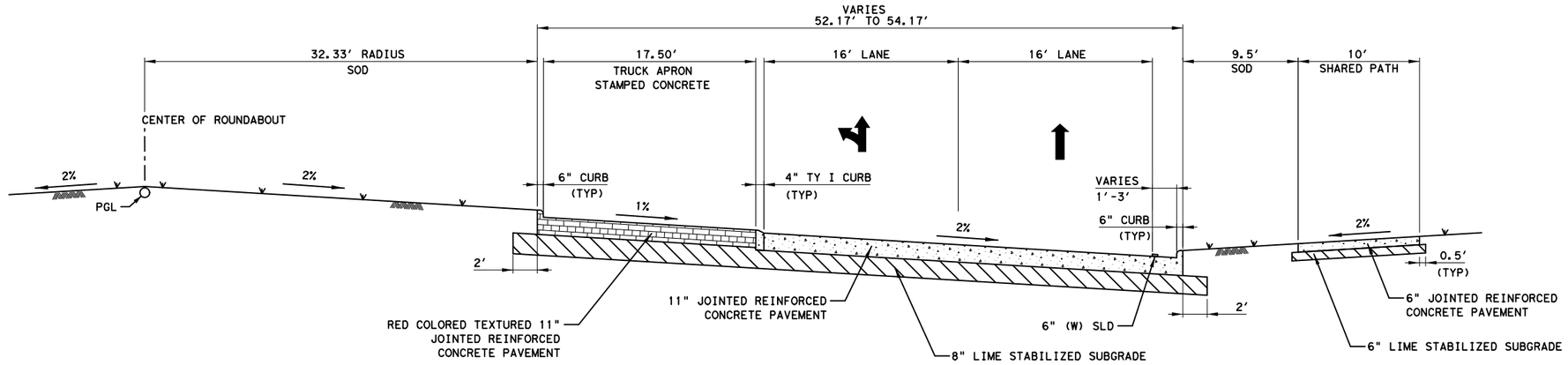
DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	11



ROUNDABOUT
"F-F" SECTION
NORTH SIDE
N.T.S.



ROUNDABOUT
"G-G" SECTION
SOUTH SIDE
N.T.S.



ROUNDABOUT
"H-H" SECTION
WEST SIDE
N.T.S.

NOTES:

FOR SECTIONS REFER TO PROJECT LAYOUT

STATE OF TEXAS
DAVID G. GREANEY
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PROPOSED TYPICAL SECTIONS

SHEET 3 OF 3

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	12

GENERAL CONSTRUCTION NOTES (WITHIN CITY OF HOUSTON ROW):

1. CONSTRUCT WASTEWATER COLLECTION SYSTEMS, WATER LINES, STORM DRAINAGE AND STREET PAVING IN ACCORDANCE WITH THE LATEST EDITION OF THE PUBLICATIONS "STANDARD CONSTRUCTION SPECIFICATIONS FOR WASTEWATER COLLECTION SYSTEMS, WATER LINES, STORM DRAINAGE, AND STREET PAVING" AND "STANDARD CONSTRUCTION DETAILS FOR WASTEWATER COLLECTION SYSTEMS, WATER LINES, STORM DRAINAGE, AND STREET PAVING" PUBLISHED BY THE CITY OF HOUSTON, DEPARTMENT OF PUBLIC WORKS AND ENGINEERING.
2. UTILITIES PRESENTED ON THESE DRAWINGS ARE SHOWN BASED ON THE BEST AVAILABLE INFORMATION. CONTRACTOR SHALL VERIFY THE EXACT LOCATIONS IN THE FIELD PRIOR TO COMMENCING CONSTRUCTION. CONTRACTOR SHALL NOTIFY TEXAS ONE CALL AT 713-223-4567/811 OR 800-344-8377 AND LONE STAR NOTIFICATION CENTER AT 800-669-8344 AT LEAST 48 HOURS BEFORE PROCEEDING WITH ANY EXCAVATION. UTILITIES MARKED WITHIN THE PUBLIC RIGHT OF WAY OR IN EASEMENTS SHALL COMPLY WITH TAC TITLE 16, PART 1, CHAPTER 18, RULE 18.6 AND THE AMERICAN PUBLIC WORKS ADMINISTRATION (APWA) UNIFORM COLOR CODE.
3. CONTRACTOR SHALL BE RESPONSIBLE FOR DAMAGES TO EXISTING WATER, WASTEWATER, STORM WATER LINES, AND TRAFFIC CONTROL DEVICES. DAMAGES SHALL BE REPAIRED IN ACCORDANCE WITH THE CITY OF HOUSTON, DEPARTMENT OF PUBLIC WORKS AND ENGINEERING'S "STANDARD CONSTRUCTION SPECIFICATIONS FOR WASTEWATER COLLECTION SYSTEM. WATER LINES, STORM DRAINAGE, AND STREET PAVING" AND "STANDARD CONSTRUCTION DETAILS FOR WASTEWATER COLLECTION SYSTEMS, WATER LINES, STORM DRAINAGE, AND STREET PAVING" REFERENCED ABOVE, AT NO ADDITIONAL COST.
4. CONTRACTOR SHALL NOTIFY THE OFFICE OF THE CITY ENGINEER, DEPARTMENT OF PUBLIC WORKS AND ENGINEERING AT 832-394-9098 OR VIA FAX AT 832-395-4424 FOR INSPECTION AT LEAST 48 HOURS PRIOR TO COMMENCING CONSTRUCTION.
5. ADEQUATE DRAINAGE SHALL BE MAINTAINED AT ALL TIME DURING CONSTRUCTION AND ANY DRAINAGE DITCH OR STRUCTURE DISTURBED DURING CONSTRUCTION SHALL BE RESTORED TO EXISTING CONDITIONS OR BETTER.
6. CONTRACTOR SHALL TAKE NECESSARY PRECAUTIONS TO PROTECT ROOT SYSTEMS OF SHRUBS, PLANTS AND TREES ALONG THE AREA OF EXCAVATION
7. CONTRACTOR SHALL COMPLY WITH LATEST EDITION OF OSHA REGULATIONS AND THE STATE OF TEXAS LAWS CONCERNING EXCAVATION.
8. CONTRACTOR SHALL MAINTAIN A SET OF REDLINE DRAWINGS RECORDING AS-BUILT CONDITIONS DURING CONSTRUCTION. THESE REDLINE MARKED UP DRAWINGS WILL BE SUBMITTED TO THE DESIGN CONSULTANT WHO WILL MAKE THE CHANGES ON THE ORIGINAL TRACINGS, LABEL EACH SHEET IN THE SET AS "RECORD DRAWINGS", AND RETURN IT TO THE CITY ENGINEER.

STREET AND BRIDGE NOTES (WITHIN CITY OF HOUSTON ROW):

1. HOUSTON PUBLIC WORKS "STANDARD CONSTRUCTION SPECIFICATIONS" AND "STANDARD CONSTRUCTION DETAILS FOR WASTEWATER COLLECTION SYSTEMS, WATER LINES, STORM DRAINAGE, AND STREET PAVING" UNLESS OTHERWISE NOTED AND APPROVED ON THESE PLANS. THE DESIGN IS CONSISTENT WITH THE MINIMUM STANDARDS ESTABLISHED IN THE "INFRASTRUCTURE DESIGN MANUAL" REFERENCED AT:

   HTTPS://WWW.HOUSTONPERMITTINGCENTER.ORG/MEDIA/2276/DOWNLOAD
2. FILL AREAS ON PLANS SHALL BE FILLED IN LAYERS NOT EXCEEDING 8" IN DEPTH AND EACH COMPACTED TO NOT LESS THAN 95% STANDARD PROCTOR DENSITY PRIOR TO INSTALLATION OF WATER LINE AND FILL AREA SHALL BE SEEDED AND FERTILIZED WITHIN 10 WORKING DAYS.
3. UTILITY CONTRACTOR SHALL PROVIDE TEMPORARY SILT BARRIER FENCE ON ALL NON-CURBED INLETS WHICH WILL REMAIN IN PLACE AFTER UNDERGROUND CONTRACT IS COMPLETE.
4. CONTRACTOR SHALL PROVIDE SILT BARRIER FENCE ON ALL STAGE 1 CURB INLETS.
5. EXISTING PAVEMENTS, CURBS, DRIVEWAYS, AND SIDEWALKS DAMAGED OR REMOVED DURING CONSTRUCTION SHALL BE REPLACED TO CITY OF HOUSTON STANDARDS, WITH LATEST ADDENDA AND AMENDMENTS THERETO.
6. CONDITION OF THE ROAD AND/OR RIGHT-OF-WAY UPON COMPLETION OF JOB SHALL BE AS GOOD AS OR BETTER THAN PRIOR TO STARTING WORK.
7. ADEQUATE DRAINAGE SHALL BE MAINTAINED AT ALL TIMES DURING CONSTRUCTION AND ANY DRAINAGE DITCH OR STRUCTURE DISTURBED DURING CONSTRUCTION SHALL BE RESTORED TO SATISFACTION OF THE OWNING AUTHORITY.
8. EXPOSED 15" OF REINFORCING STEEL AT PROPOSED SAWED JOINT IF NO REINFORCING STEEL EXISTS, USE HORIZONTAL DOWELS. HORIZONTAL DOWELS SHALL BE #6 BARS 24" LONG 24" C-C DRILLED AND EMBEDDED 8" INTO THE CENTER OF THE EXISTING SLAB WITH "PO ROC" OR EQUAL.
9. CONTRACTOR TO TAKE NECESSARY PRECAUTIONS TO PROTECT ROOT SYSTEMS OF SHRUBS, PLANTS AND TREES ALONG AREAS OF EXCAVATION.
10. CONTRACTOR SHALL COMPLY WITH OSHA REGULATIONS AND STATE OF TEXAS LAWS CONCERNING EXCAVATION, TRENCHING AND SHORING AS SPECIFIED IN CITY OF HOUSTON ORDINANCE #87-1457.
11. WHEEL CHAIR RAMPS SHALL BE INSTALLED IN ACCORDANCE WITH CITY OF HOUSTON STANDARDS AT ALL INTERSECTIONS WHERE SIDEWALKS EXIST AND THE EXISTING CURB OR SIDEWALK IS DAMAGED OR REMOVED DURING CONSTRUCTION.
12. WASTEWATER COLLECTION SYSTEMS, WATER LINES, STORM DRAINAGE AND STREET PAVING SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE HOUSTON PUBLIC WORKS "STANDARD CONSTRUCTION SPECIFICATIONS" AND "STANDARD CONSTRUCTION DETAILS FOR WASTEWATER COLLECTION SYSTEMS. WATER LINES, STORM DRAINAGE AND STREET PAVING" UNLESS OTHERWISE NOTED AND APPROVED ON THESE PLANS. THE DESIGN SHOULD BE CONSISTENT WITH THE MINIMUM STANDARD ESTABLISHED IN THE "DESIGN MANUAL FOR WASTEWATER COLLECTION SYSTEMS, WATER LINES, STORMS DRAINAGE AND STREET PAVING".
13. THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ANY DAMAGES TO EXISTING WATER, WASTEWATER, STORM SEWER AND TRAFFIC SIGNAL CONDUITS, ALL DAMAGES SHALL BE REPAIRED IN ACCORDANCE WITH THE HOUSTON PUBLIC WORKS "STANDARD CONSTRUCTION SPECIFICATIONS" WITH LATEST ADDENDA AND AMENDMENTS THERETO, AT NO COST TO THE CITY OF HOUSTON.
14. PRIOR TO STREET CONSTRUCTION, THE CONTRACTOR SHALL CONTACT HOUSTON PUBLIC WORKS AT (PHONE) 832-394-9578 AND COMPLY WITH ALL REQUIREMENTS FOR THE ISSUANCE OF NECESSARY PERMITS/WORK ORDERS FOR STREET CONSTRUCTION.
15. DOUBLE REFLECTORIZED BLUE TRAFFIC MARKERS SHALL BE PLACED 6-INCHES OFFSET OF THE CENTERLINE OF ALL FIRE HYDRANT LOCATIONS BY THE PAVING CONTRACTOR. HYDRANTS LOCATED AT INTERSECTIONS SHALL HAVE A BUTTON PLACED ON EACH STREET.

DRAINAGE NOTES (WITHIN CITY OF HOUSTON ROW):

1. STORM SEWER SHALL BE REINFORCED CONCRETE PIPE (C-76, CLASS II), AND SHALL BE INSTALLED, BEDDED, AND BACK FILLED IN ACCORDANCE WITH THE CITY OF HOUSTON DRAWING NOS. 2317-02, 02317-3, 02317-05, 02317-06, AND 02317-07 (OCT. 2002) AS APPLICABLE UNLESS OTHERWISE SHOWN ON THE DRAWINGS.
2. ALL STORM SEWER CONSTRUCTED IN SIDELOT EASMENT SHALL BE R.C.P (C-76, CLASSIII) AND SHALL BE EMBEDDED IN ACCORDANCE WITH THE CITY OF HOUSTON DRAWING NOS. 02317-02, 02317-03, 02317-05, 02317-06, AND 02317-07 AS APPLICABLE.
3. ALL SEWER UNDER PROPOSED OR FUTURE PAVEMENT AND TO A POINT ONE (1) FOOT BACK OF ALL PROPOSED OR FUTURE CURBS SHALL BE BACKFILLED WITH 1-1/2 SACK CEMENT/C.Y. STABLIZED SAND TO WITHIN ONE (1) FOOT OF SUBGRADE. THE REMAINING DEPTH OF TRENCH SHALL BE BACKFILLED WITH SUITABLE EARTH MATERIAL.
4. ALL TRENCH BACKFILL SHALL BE IN 8" LIFTS, WITH TESTS TAKEN AT 100 FOOT INTERVALS IN EACH LIFT, AND MECHNICALLY COMPACTED TO A DENSITY OF NOT LESS THAN 95% OF THE MAXIMUM DRY DENSITY AS DETERMINED BY THE STANDARD PROCTOR COMACTION TEST (ASTM D-698/AASHTO T99).
5. CIRCULAR AND ELLIPTICAL REINFORCED CONCRETE PIPE SHALL BE INSTALLED USING RUBBER GASKET JOINT CONFORMING TO ASTM C443 AND ASTM C877 RESPECTIVELY.
6. ALL STORM SEWER PIPES AND INLET LEADS SHALL BE 24" AND LARGER R.C.P. (C-76, CLASSIII).
7. ALL PROPOSED PIPE STUB-OUTS FROM MANHOLES AND INLET LEADS ARE TO BE PLUGGED WITH 8" BRICK WALLS UNLESS OTHERWISE NOTED.
8. MINIMUM HORIZONTAL CLEARANCE BETWEEN ANY STORM PIPE AND BOX SHALL BE AT LEAST 48-INCHES FROM EXTERIOR OF THE STORM PIPE OR BOX TO THE EXTERIOR OF THE EXISTING OR PROPOSED PUBLIC OR PRIVATE UTILITY AND OTHER APPURTENANCES. MINIMUM VERTICAL CLEARANCE BETWEEN ANY STORM PIPE AND BOX SHALL BE AT LEAST 18-INCHES FROM EXTERIOR OF THE STORM PIPE OR BOX TO THE EXTERIOR OF THE EXISTING OR PROPOSED PUBLIC OR PRIVATE UTILITY AND OTHER APPURTENANCES.
9. ADJUST MANHOLE COVERS TO GRADE CONFORMING TO REQUIREMENTS OF SECTION 02086-ADJUSTING MANHOLES, INLETS, AND VALVE BOXES TO GRADE.
10. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTING, MAINTAINING, AND RESTORING ANY BACK SLOPE DRAINAGE SYSTEM DISTURBED AS A RESULT OF THIS WORK.
11. ALL DITCHES SHALL BE GRADED TO PROPOSED ELEVATIONS TO INSURE PROPER DRAINAGE. ALL OUTFALLS SHALL BE PROPERLY BACKFILLED AND COMPACTED. ALL DISTURBED AREA SHALL BE REGRADED, SEEDED, AND FERTILIZED.
12. ALL DRIVEWAYS WILL BE LOCATED TO AVOID EXISTING CURB INLET STRUCTURES.

TRAFFIC NOTES:

CONTRACTOR OR OWNER SHALL SUBMIT TRAFFIC CONTROL PLANS WITH THE MOBILITY PERMIT APPLICATION. THE PLANS SHALL BE DRAWN TO SCALE AND SEALED BY A LICENSED PROFESSIONAL ENGINEER IN THE STATE OF TEXAS.

THE GENERAL NOTES THAT SHALL BE INCLUDED ON THE TRAFFIC CONTROL PLAN CAN BE FOUND IN CHAPTER 15 (15.12 TRAFFIC CONTROL PLAN) OF THE CITY OF HOUSTON'S (CITY) INFRASTRUCTURE DESIGN MANUAL (IDM). BELOW ARE SEVERAL KEY NOTES FROM THE IDM TO BE AWARE OF:

1. THE CONTRACTOR SHALL PROVIDE AND INSTALL TRAFFIC CONTROL DEVICES IN CONFORMANCE WITH PART VI OF THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD) LATEST EDITION WITH REVISIONS DURING THE ENTIRE CONSTRUCTION PERIOD.
2. NO WORK SHALL BE PERFORMED IN RESIDENTIAL AREAS FROM 7:00PM TO 7:00AM.
3. CONTRACTOR SHALL MAINTAIN APPROVED NUMBER OF LANES OF TRAFFIC IN EACH DIRECTION DURING CONSTRUCTION WORKING HOURS. TRAFFIC CONTROL PLANS SHALL INCLUDE ONE-WAY AND/OR DETOUR PLANS. CONTRACTOR SHALL MAINTAIN ADA COMPLAINT PEDESTRIAN ACCESS TO BUS STOPS AND ADEQUATE BUS ACCESS TO THE BUS STOP.
4. CONTRACTOR SHALL COVER OPEN PAVEMENT EXCAVATIONS FOR MINOR UTILITY WORK WITH ANCHORED STEEL PLATES DURING NON-WORKING HOURS, OPEN LANES FOR NORMAL TRAFFIC FLOW WHEN FEASIBLE.
5. CONTRACTOR SHALL SECURE LANE/SIDEWALK/BICYCLE FACILITY CLOSURE PERMITS FROM TRANSPORTATION & DRAINAGE OPERATIONS (MOBILITY PERMIT SECTION AT WWW.GIMS.HOUSTONTX.GOV) BEFORE IMPLEMENTING THE TRAFFIC CONTROL PLAN. THE APPLICATION MUST BE SUBMITTED AT LEAST TEN BUSINESS DAYS PRIOR TO THE IMPLEMENTATION OF THE TRAFFIC CONTROL PLAN AND/OR BEGINNING CONSTRUCTION WORK. THE CONTRACTOR SHALL PROVIDE TRAFFIC CONTROL PLANS, CONSTRUCTION SEQUENCING, AND CONSTRUCTION SCHEDULE WITH THE APPLICATION.
6. CONTRACTOR SHALL HAVE APPROVED TRAFFIC CONTROL PLAN AND PERMIT AT THE JOB SITE FOR INSPECTION AT ALL TIMES
7. ACCESS TO DRIVEWAYS ADJACENT TO THE CONSTRUCTION WORK ZONE SHALL BE MAINTAINED AT ALL TIMES AS MUCH AS POSSIBLE. ADDITIONAL CONES AND/OR DELINEATORS MAY BE REQUIRED TO DELINEATE THE DRIVEWAY ACCESS ROUTE THROUGH THE CONSTRUCTION WORK ZONE. A MINIMUM OF ONE TRAVEL LANE SHALL BE MAINTAINED ACROSS THE DRIVEWAY, UNLESS PRIOR WRITTEN APPROVAL IS OBTAINED FROM THE CITY OF HOUSTON.
8. ADDITIONAL OFF DUTY POLICE OFFICERS/FLAGGERS MAY BE REQUESTED TO DIRECT TRAFFIC WHEN LANES ARE BLOCKED AT THE DIRECTION OF THE CITY EVEN IF THEY ARE NOT SPECIFICALLY IDENTIFIED ON THE PROJECT PLANS.

SWPPP CONSTRUCTION NOTES:

1. CONTRACTOR SHALL IMPLEMENT INLET PROTECTION DEVICES AND REINFORCED FILTER FABRIC BARRIER ALONG ROAD AND SIDE DITCHES AT LOCATIONS SHOWN ON THE TYPICAL STORM WATER POLLUTION PREVENTION (SWPP) PLANS TO KEEP SILT AND OR EXCAVATED MATERIALS FROM ENTERING INTO THE STORM WATER INLETS AND DITCHES EVENTUALLY POLLUTING THE RECEIVING STORM.
2. DURING THE EXCAVATION PHASE OF THE PROJECT, CONTRACTOR SHALL SCHEDULE THE WORK IN SHORT SEGMENTS SO THAT EXCAVATION MATERIAL CAN BE QUICKLY HAULED AWAY FROM THE SITE AND TO PREVENT IT FROM STAYING UNCOLLECTED ON THE EXISTING PAVEMENT. ANY LOOSE EXCAVATED MATERIAL WHICH FALLS ON PAVEMENTS OR DRIVEWAYS SHALL BE SWEPT BACK INTO THE EXCAVATED AREA.
3. CONTRACTOR SHALL CLEAN UP THE EXISTING STREET INTERSECTIONS AND DRIVEWAYS DAILY, AS NECESSARY, TO REMOVE ANY EXCESS MUD, SILT OR ROCK TRACKED FROM THE EXCAVATED AREA.
4. CONTRACTOR SHALL FOLLOW GOOD HOUSEKEEPING PRACTICES DURING THE CONSTRUCTION OF THE PROJECT, ALWAYS CLEANING UP DIRT AND LOOSE MATERIAL AS CONSTRUCTION PROGRESSES.
5. CONTRACTOR TO INSPECT AND MAINTAIN THE AREAS LISTED BELOW AT LEAST ONCE EVERY FOURTEEN (14) CALENDAR DAYS AND WITHIN 24 HOURS OF THE END OF A STORM EVENT OF 0.5 INCHES OR GREATER.
   - DISTURBED AREAS OF THE CONSTRUCTION SITE THAT HAVE NOT BEEN FINALLY STABILIZED.
   - AREAS USED FOR STORAGE OF MATERIALS THAT ARE EXPOSED TO PRECIPITATION.
   - STRUCTURAL CONTROL MEASURES
   - LOCATIONS WHERE VEHICLES ENTER OR EXIT THE SITE
6. CONTRACTOR TO BE RESPONSIBLE TO MAINTAIN EXISTING DITCHES AND OR CULVERTS FOR UNOBSTRUCTED DRAINAGE AT ALL TIMES. WHERE SODDING IS DISTURBED BY EXCAVATION ON BACKFILLING OPERATIONS, SUCH AREAS SHALL BE REPLACED BY SEEDING OR SODDING. SLOPES 4:1 OR STEEPER SHALL BE REPLACED BY BLOCK SODDING

STATE OF TEXAS
DAVID G. GREANEY
125563
LICENSED
PROFESSIONAL ENGINEER

06/08/2022 Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

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11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

GENERAL NOTES

SHEET 1 OF 1

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	13

PRIVATE UTILITY NOTES:

AT&T TEXAS/ SWBT FACILITIES:

1. THE LOCATIONS OF AT&T TEXAS/SWBT FACILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION BEFORE COMMENCING WORK. HE AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THIS FAILURE TO EXACTLY LOCATE AND PRESERVE THESE UNDERGROUND UTILITIES.

2. THE CONTRACTOR SHALL CALL 1-800-344-8377 (TEXAS 811) A MINIMUM OF 48 HOURS PRIOR TO CONSTRUCTION TO HAVE UNDERGROUND LINES FIELD LOCATED.

3. WHEN EXCAVATING WITHIN EIGHTEEN INCHES (18") OF THE INDICATED LOCATION OF AT&T TEXAS/SWBT FACILITIES, ALL EXCAVATIONS MUST BE ACCOMPLISHED USING NON-MECHANIZED EXCAVATION PROCEDURES. WHEN BORING, THE CONTRACTOR SHALL EXPOSE THE AT&T TEXAS/SWBT FACILITIES.

4. WHEN AT&T TEXAS/SWBT FACILITIES ARE EXPOSED, THE CONTRACTOR WILL PROVIDE SUPPORT TO PREVENT DAMAGE TO THE CONDUIT DUCTS OR CABLES. WHEN EXCAVATING NEAR TELEPHONE POLES THE CONTRACTOR SHALL BRACE THE POLE FOR SUPPORT.

5. THE PRESENCE OR ABSENCE OF AT&T TEXAS/SWBT UNDERGROUND CONDUIT FACILITIES OR BURIED CABLE FACILITIES SHOWN ON THESE PLANS DOES NOT MEAN THAT THERE ARE NO DIRECT BURIED CABLES OR OTHER CABLES IN CONDUIT IN THE AREA.

6. PLEASE CONTACT THE AT&T TEXAS DAMAGE PREVENTION MANAGER ROOSEVELT LEE JR. AT (713) 567-4552 OR EMAIL HIM AT RL7259@ATT.COM, IF THERE ARE QUESTIONS ABOUT BORING OR EXCAVATING NEAR OUR AT&T TEXAS/SWBT FACILITIES.

CENTERPOINT ENERGY NOTES:

CAUTION: UNDERGROUND GAS FACILITIES

1. THE CONTRACTOR SHALL CONTACT THE UTILITY COORDINATING COMMITTEE AT 1-800-545-6005 OR 811 A MINIMUM OF 48 HOURS PRIOR TO CONSTRUCTION TO HAVE MAIN AND SERVICE LINES FIELD LOCATED.
   -WHEN CENTERPOINT ENERGY PIPE LINE MARKINGS ARE NOT VISIBLE, CALL 713-207-5463 OR 713-945-8037 (7:00 AM TO 4:30 PM) FOR STATUS OF LINE LOCATION REQUEST BEFORE EXCAVATION BEGINS.
   -WHEN EXCAVATING WITHIN EIGHTEEN INCHES (18") OF THE INDICATED LOCATION OF CENTERPOINT ENERGY FACILITIES, ALL EXCAVATION MUST BE ACCOMPLISHED USING NON-MECHANIZED EXCAVATION PROCEDURES.
   -WHEN CENTERPOINT ENERGY FACILITIES ARE EXPOSED, SUFFICIENT SUPPORT MUST BE PROVIDED TO THE FACILITIES TO PREVENT EXCESSIVE STRESS ON THE PIPING.
   -FOR EMERGENCIES REGARDING GAS LINES CALL 713-659-3552 OR 713-207-4200

2. THE CONTRACTOR IS FULLY RESPONSIBLE FOR ANY DAMAGES CAUSED BY HIS FAILURE TO EXACTLY LOCATE AND PRESERVE THESE UNDERGROUND FACILITIES.

WARNING: OVERHEAD ELECTRICAL LINES:

1. OVERHEAD LINES MAY EXIST ON THE PROPERTY. THE LOCATION OF OVERHEAD LINES HAS NOT BEEN SHOWN ON THESE DRAWINGS AS THE LINES ARE CLEARLY VISIBLE, BUT YOU SHOULD LOCATE THEM PRIOR TO BEGINNING ANY CONSTRUCTION. TEXAS LAW, SECTION 752, HEALTH & SAFETY CODE FORBIDS ACTIVITIES THAT OCCUR IN CLOSE PROXIMITY TO HIGH VOLTAGE LINES, SPECIFICALLY:

-ANY ACTIVITY WHERE PERSONS OR THINGS MAY COME WITHIN SIX (6) FEET OF LIVE OVERHEAD HIGH VOLTAGE LINES; AND

-OPERATING A CRANE, DERRICK, POWER SHOVEL, DRILLING RIG, PILE DRIVER, HOISTING EQUIPMENT, OR SIMILAR APPARATUS WITHIN 10 FEET OF LIVE OVERHEAD HIGH VOLTAGE LINES.

2. PARTIES RESPONSIBLE FOR THE WORK, INCLUDING CONTRACTORS, ARE LEGALLY RESPONSIBLE FOR THE SAFETY OF CONSTRUCTION WORKERS UNDER THIS LAW. THIS LAW CARRIES BOTH CRIMINAL AND CIVIL LIABILITY. TO ARRANGE FOR LINES TO BE TURNED OFF OR REMOVED CALL CENTERPOINT ENERGY AT 713-207-2222.

ACTIVITIES ON/OR ACROSS CENTERPOINT ENERGY FEE OR EASEMENT PROPERTY

1. NO APPROVAL TO USE, CROSS, OR OCCUPY NO CENTERPOINT FEE OR EASEMENT PROPERTY IS GIVEN. IF YOU NEED TO USE CENTERPOINT PROPERTY, PLEASE CONTACT OUR SURVEYING AND RIGHT OF WAY DIVISION AT (713) 207-6348 OR (713) 207-5769

METRO

1. THE CONTRACTOR SHALL CONTACT METRO BUS OPERATIONS BY EMAIL 10 BUSINESS DAYS IN ADVANCE OF WORK SCHEDULED THAT WOULD IMPACT A METRO BUS OR RAIL LINE. EMAILS SHALL BE SENT TO ZELMA.RIDLEY@RIDEMETRO.ORG, TANGEE.MOBLEY@RIDEMETRO.ORG AND CARL.TAYLOR@RIDEMETRO.ORG, CARBON COPIED TO COH PROJECT MANAGER, CALL METRO AT (713)635-4000 WITH QUESTIONS.

DETAILS

1. CITY OF HOUSTON STANDARD DETAILS FOR WASTEWATER COLLECTION SYSTEMS, WATERLINES, STORM DRAINAGE, AND STREET PAVING ARE INCORPORATED IN PLANS BY REFERENCE AS IF COPIED VERBATIM. STANDARD DETAILS ARE AVAILABLE FOR DOWNLOAD AT THE FOLLOWING WEB ADDRESS: http://edocs.publicworks.houstontx.gov/engineering-and-construction.html
2. DETAILS INCLUDED IN PLAN SET SUPERSEDE RELATED COH STANDARD DETAILS.

STATE OF TEXAS
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NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

PRIVATE UTILITY NOTES

SHEET 1 OF 1

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	14

County: Harris **Control:** 0912-72-386

Highway: CS

General Notes:

General:

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

Area Engineer: Hamoon Bahrami, PE; hamoon.bahrami@txdot.gov
Assistant Area Engineer: Brett H. McLeod, PE; brett.mcleod@txdot.gov

Contractor questions will be accepted through email, phone, and in person by the above individuals. Contractor questions will be reviewed by the Area Engineer or Assistant Area Engineer. Once a response is developed, it will be posted to TxDOT's Public FTP at the following address:

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

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

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

Superelevate the curves to match the existing surface.

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

The following standard detail sheets are modified:

Modified Standards

Tree Protection Details
Landscape Pavers
Landscaping Planting and Establishment (Sheet 1 of 8)
Landscaping Planting and Establishment (Sheet 3 of 8)
Landscaping Planting and Establishment (Sheet 7 of 8)
Irrigation Details and Materials (Sheet 1 of 3)
Irrigation Details and Materials (Sheet 2 of 3)
Irrigation Details and Materials (Sheet 3 of 3)

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

County: Harris **Control:** 0912-72-386

Highway: CS

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

Grade street intersections and median openings for surface drainage.

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

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

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

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

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

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

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

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

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

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

County: Harris **Control:** 0912-72-386

Highway: CS

General: Roadway Illumination and Electrical

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

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

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

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

General: Traffic Signals

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

General: Site Management

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

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

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

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

County: Harris **Control:** 0912-72-386

Highway: CS

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

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

General: Traffic Control and Construction

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

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

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

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

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

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

General: Utilities

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

If the Contractor damages or causes damage (breaks, leaks, nicks, dents, gouges, etc.) to the utility, contact the utility facility owner or operator immediately.
At least 72 hours before starting work, make arrangements for locating existing Department-owned above ground and underground fiber optic, communications, power, illumination, and traffic signal cabling and conduit. Do this by calling the Department's Houston District Traffic Signal Operations Office at 713-802-5662, or by e-mailing the Department's Houston District Traffic Signal Operations Office at HOU-LocateRequest@txdot.gov, to schedule marking of underground lines on the ground. Use caution if working in these areas to avoid damaging or interfering with existing facilities.

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

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

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

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

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

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

Item 5: Control of Work
Before contract letting, cross-section data for this project will be available to the prospective bidders in PDF format on the Department's Houston District website located at:

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

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

Submit shop drawings electronically for the fabrication of items as documented in Table 2 below. Information and requirements for electronic submittals can be viewed in the "Guide to Electronic Shop Drawing Submittal" which can be accessed through the following web link,

ftp://ftp.dot.state.tx.us/pub/txdot-info/library/pubs/bus/bridge/e_submit_guide.pdf. References to 11 in. x 17 in. sheets in individual specifications for structural items imply electronic CAD sheets.

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

Spec Item No.'s	Product	Submittal Required	Approval Required (Y/N)	Contractor/ Fabricator P.E. Seal Required	Reviewing Party	Shop or Working Drawing (Note 1)
7.16.1&.2	Construction Load Analyses	Y	Y	Y	D	WD
400	Excavation and Backfill for Structures (cofferdams)	Y	N	Y	D	WD
403	Temporary Special Shoring	Y	N	Y	D	WD
420	Formwork/Falsework	Y	N	Y	D	WD
423	Retaining Walls, (calcs req'd.)	Y	Y	Y	D	SD
425	Optional Design Calculations (Prstrs Bms)	Y	Y	Y	D	SD
425	Prestr Concr Sheet Piling	Y	Y	N	D	SD
425	Prestr Concr Beams	Y	Y	N	D	SD
425	Prestr Concr Bent	Y	Y	N	D	SD
426	Post Tension Details	Y	Y	N	D	SD
434	Elastomeric Bearing Pads (All)	Y	Y	N	D	SD
441	Bridge Protective Assembly	Y	Y	N	D	SD
441	Misc Steel (various steel assemblies)	Y	Y	N	D	SD
441	Steel Pedestals (bridge raising)	Y	Y	N	D	SD
441	Steel Bearings	Y	Y	N	D	SD
441	Steel Bent	Y	Y	N	D	SD
441	Steel Diaphragms	Y	Y	N	D	SD
441	Steel Finger Joint	Y	Y	N	D	SD
441	Steel Plate Girder	Y	Y	N	D	SD
441	Steel Tub-Girders	Y	Y	N	D	SD
441	Erection Plans, including Falsework	Y	N	Y	D	WD
449	Sign Structure Anchor Bolts	Y	Y	N	D	SD
450	Railing	Y	Y	N	D	SD
462	Concrete Box Culvert	Y	Y	N	D	SD
462	Concrete Box Culvert (Alternate Designs Only,calcs reqd.)	Y	Y	Y	D	SD
464	Reinforced Concrete Pipe (Jack and Bore only; ONLY when requested)	Y	Y	Y	D	SD
465	Pre-cast Junction Boxes, Grates, and Inlets	Y	Y	N	D	SD
465	Pre-cast Junction Boxes, Grates, and Inlets (Alternate Designs Only, calcs req'd.)	Y	Y	Y	D	SD
466	Pre-cast Headwalls and Wingwalls	Y	Y	N	D	SD
467	Pre-cast Safety End Treatments	Y	Y	N	D	SD
495	Raising Existing Structure (calcs reqd.)	Y	Y	Y	D	SD
610	Roadway Illumination Supports (Non-Standard only, calcs reqd.)	Y	Y	Y	D	SD
613	High Mast Illumination Poles (Non-	Y	Y	Y	D	SD

	standard only, calcs reqd.)					
627	Treated Timber Poles	Y	Y	N	D	SD
644	Special Non-Standard Supports (Bridge Mounts, Barrier Mounts, Etc.)	Y	Y	Y	D	SD
647	Large Roadside Sign Supports	Y	Y	Y	D	SD
650	Cantilever Sign Structure Supports - Alternate Design Calcs.	Y	Y	Y	D	SD
650	Sign Structures	Y	Y	N	D	SD
680	Installation of Highway Traffic Signals	Y	Y	N	D	SD
682	Vehicle and Pedestrian Signal Heads	Y	Y	N	D	SD
684	Traffic Signal Cables	Y	Y	N	D	SD
685	Roadside Flashing Beacon Assemblies	Y	Y	N	D	SD
686	Traffic Signal Pole Assemblies (Steel) (Non-Standard only)	Y	Y	Y	D	SD
687	Pedestal Pole Assemblies	Y	Y	N	D	SD
688	Detectors	Y	Y	N	D	SD
784	Repairing Steel Bridge Members	Y	Y	Y	D	WD
SS	Prestr Concr Crown Span	Y	Y	N	D	SD
SS	Sound Barrier Walls	Y	Y	Y	D	SD
SS	Camera Poles	Y	Y	Y	TMS	SD
SS	Pedestrian Bridge (Calcs req'd.)	Y	Y	Y	D	SD
SS	Screw-In Type Anchor Foundations	Y	Y	N	D	SD
SS	Fiber Optic/Communication Cable	Y	Y	N	TMS	SD
SS	Spread Spectrum Radios for Signals	Y	Y	N	D	SD
SS	VIVDS System for Signals	Y	Y	N	D	SD
SS	CTMS Equipment	Y	Y	N	TMS	SD

Notes:

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

Key to Reviewing Party

D – Consultant: Submit to Engineer of Record at *dgreaney@gaugeengineering.com*
TMS – Traffic Management System

Computerized Traffic Management Systems (CTMS)	HOU-CTMSShpDrwgs@txdot.gov

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

Item 7: Legal Relations and Responsibilities

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

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

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

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

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

The total area disturbed for this project is 3.1 acres. The disturbed area in this project, the project locations in the Contract, and Contractor project specific locations (PSLs) within 1 mile of the project limits for the Contract, will further establish the authorization requirements for storm water discharges. The Department will obtain an authorization to discharge storm water from the Texas Commission on Environmental Quality (TCEQ) for the construction activities shown on the plans. The Contractor is to obtain required authorization from the TCEQ for Contractor PSLs for construction support activities on or off the ROW. When the total area disturbed in the Contract and PSLs within 1 mile of the project limits exceeds 5 acres, provide a copy of the Contractor NOI for PSLs on the ROW to the Engineer (to the appropriate MS4 operator when on an off-state system route) and to the local government that operates a separate storm drain system.

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

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

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

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

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

No significant traffic generator events have been identified.

Item 8: Prosecution and Progress

The road-user cost liquidated damages are $15 per day. After the project is substantially complete, the liquidated damages become those based on contract administration costs.

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

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

The maximum number of days the time charges on this contract may be suspended due to contractor mobilization, and material fabrication/accumulation or processing delays is *60* days. The Engineer and the Contractor may mutually agree, in writing, to decrease this maximum number of days.

Item 100: Preparing Right of Way

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

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

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

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

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

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

Item 104: Removing Concrete

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

Item 105: Removing Treated and Untreated Base and Asphalt Pavement

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

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

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

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

Case 1 - ACP over asphalt treatment

Removing the Asphalt Concrete Pavement (ACP) and the asphalt treatment/asphalt stabilized base are paid for under the Item, "Salvaging, Hauling, and Stockpiling Reclaimable Asphalt Pavement."

Case 4 - ACP over concrete pavement over base
Removing the Asphalt Concrete Pavement (ACP) material is paid under the Item, "Salvaging, Hauling, and Stockpiling Reclaimable Asphalt Pavement."

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

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

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

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

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

Item 110: Excavation

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

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

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

Item 112: Subgrade Widening

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

Item 132: Embankment

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

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

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

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

Item 134: Backfilling Pavement Edges

Quantity by station includes both sides of the roadway.

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

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

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

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

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

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

Item 150: Blading

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

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

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

Item 156: Bulldozer Work

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

Item 161: Compost
Item 162: Sodding for Erosion Control

Item 166: Fertilizer
Item 168: Vegetative Watering

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

Item 204: Sprinkling

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

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

Item 210: Rolling

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

Item 247: Flexible Base

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

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

Furnish one type of the base material unless otherwise authorized.

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

Sandstone aggregate is not permitted.

Item 260: Lime Treatment (Road-Mixed)

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

The Engineer will observe the lime treatment that the Contractor elects to open to construction traffic immediately after compaction. If the construction traffic damages the subgrade, route the traffic off the damaged section in accordance with the standard specification. If the construction traffic does not damage the subgrade, cure the subgrade until other courses of material cover it. Apply these courses within 14 days with a maximum curing period of 7 days.

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

Use the type of lime at particular locations as directed.

Place the quicklime dry or as a slurry.

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

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

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

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

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

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

Item 360: Concrete Pavement

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

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

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

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

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

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

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

Do not use limestone dust of fracture as fine aggregate.

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

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

Complete the entire Fast Track Concrete construction process, from the time the Fast Track Work Area is closed to traffic, to the time the Fast Track Work Area is opened to traffic. The Fast Track operation includes, but is not limited to, traffic control, existing pavement and subgrade removal, preparation of subgrade, placement of steel, placement of Fast Track concrete pavement, cure time, striping, etc. Perform work in the Fast Track Work Area in an expeditious manner, within the allowable time period for any area shown below:

Fast Track Work Area	Allowable Duration
1. Use Fast Track pavement for driveways and immediately in front of driveways. Driveways shall remain open at all times.	

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

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

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

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

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

Items 360, 420, and 421: All Concrete Items

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

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

Item 400: Excavation and Backfill for Structures

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

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

1. Use only approved sand, crushed concrete, or salvaged base free from deleterious matter, as aggregate for cement-stabilized backfill.

2. Provide crushed concrete or salvaged base backfill material in accordance with the Item, "Cement Treatment (Plant-Mixed)(Type D)" (base or crushed concrete), except the recycled Type D material must not contain Reclaimed Asphalt Pavement (RAP).

3. For backfill material below the spring line of pipes, use cement-stabilized sand rather than Recycled Type D backfill material.

4. For the cement-stabilized sand backfill, use a minimum of 7 percent of hydraulic cement based on the dry weight of backfill material. The cement content for the crushed concrete and salvaged base is specified in the Item, "Cement Treatment (Plant-Mixed) (Type D)."

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

Item 420: Concrete Substructures

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

Item 421: Hydraulic Cement Concrete

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

Item 427: Surface Finishes for Concrete

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

County: Harris **Control:** 0912-72-386

Highway: CS

Item 442: Metal for Structures

Prestressed concrete panels will not be allowed on steel structures.

Item 462: Concrete Box Culverts and Drains

Item 464: Reinforced Concrete Pipe

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

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

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

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

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

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

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

Item 465: Junction Boxes, Manholes, and Inlets

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

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

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

Do not leave excavations or trenches open overnight.

County: Harris **Control:** 0912-72-386

Highway: CS

Items 496: Removing Structures
Items 497: Sale of Salvageable Material

Assume ownership and remove from the project site, items salvaged from the existing bridge decks and steel beams. The approximate weight of the steel beams is *XXX* tons.

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

Item 502: Barricades, Signs, and Traffic Handling

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Minimize the number of working days for street closures. The following table lists the maximum number of working days allowed for each street closure. The closure period for each intersection occurs only during the phase when constructing that street, unless otherwise directed. Reopen the street within the number of working days allowed; otherwise the Engineer may cease construction activities not affiliated with reopening the closed street, until it fully reopens to the traveling public. Time charges will not be suspended nor increased to compensate for this occurrence.

Street Name	Number of Working Days Allowed for Closure
N St. Charles Street	*7*

Use Uneven Lane Signs (CW 8-11) during resurfacing operations for elevation differences between adjacent lanes of greater than 1 in.

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

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

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

Item 506: Temporary Erosion, Sedimentation and Environmental Controls

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

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

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

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

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

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

Item 512: Portable Traffic Barrier

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

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

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

An air-entraining admixture is not required.

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

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

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

Item 585: Ride Quality for Pavement Surfaces

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

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

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

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

Item 628: Electrical Services

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

Item 618: Conduit

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

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

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

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

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

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

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

Do not use cast iron junction boxes in concrete traffic barriers and single slope traffic barriers. Use polymer concrete junction boxes in place of the cast iron junction boxes shown on standard sheets CTBI (3), CTBI (4), and SSCB (4). Mount the junction boxes flush (+ 0 in., - 1/2 in.) with the concrete surface of the concrete barrier.

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

Item 620: Electrical Conductors

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

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

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

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

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

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

fuse (slug). For grounded (neutral) conductors, install a breakaway connector with a white colored marking and a permanently installed dummy fuse (slug).

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

Item 624: Ground Boxes

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

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

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

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

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

Item 628: Electrical Services

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

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

Item 636: Signs

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

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

Item 644: Small Roadside Sign Assemblies

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

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

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

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

Provide and install the materials for speed limit signs. For speed limit signs that are indicated with "XX," the Area Engineer will request a speed study through the Director of Transportation Operations to determine the legal speeds to be posted. This request will be made as soon as possible after the roadway opens to traffic. After the speed limit to be posted is determined, this information will be provided to the Contractor by the Area Engineer.

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

Assume ownership of the removed existing signs.

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

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

Item 656: Foundations for Traffic Control Devices

Using ready mix concrete for sign foundations is optional.

Item 662: Work Zone Pavement Markings

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

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

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

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

Item 662: Work Zone Pavement Markings
Item 666: Reflectorized Pavement Markings
Item 668: Prefabricated Pavement Markings

County: Harris **Control:** 0912-72-386

Highway: CS

Item 6038: Multipolymer Pavement Markings (MPM)

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

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

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

If using paint and bead markings as described above, purchase the traffic paint from the open market.
If the Type II markings become dirty and require cleaning by washing, brushing, compressed air, or other approved methods before applying the Type I thermoplastic markings, this additional cleaning is subsidiary to the Item, "Reflectorized Pavement Markings."

Establish the alignment and layout for work zone striping and permanent striping.
Stripe all roadways before opening them to traffic.

Place pavement markings under these items in accordance with details shown on the plans, the latest "Texas Manual on Uniform Traffic Control Devices," or as directed.
When design details are not shown on the plans, provide pavement markings for arrows, words, and symbols conforming to the latest "Standard Highway Sign Designs for Texas" manual.

Item 672: Raised Pavement Markers

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

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

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

County: Harris **Control:** 0912-72-386

Highway: CS

Item 677: Eliminating Existing Pavement Markings and Markers

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

Item 678: Pavement Surface Preparation for Markings

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

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

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

Do not clean concrete pavement by grinding.

Item 680: Highway Traffic Signals

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

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

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

Staking in the field is subject to approval.

Adjust project construction, if needed, due to conflicts with underground utilities.

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

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

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

Bond the controller housing, signal poles, conduit, and spans to a minimum No. 6 AWG stranded copper conductor. An equipment grounding conductor is required in every conduit to form a continuous

grounding system. Effectively connect the grounding system to ground rods or concrete encased grounding electrodes as indicated in the plans.

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

Furnish signal heads from the same manufacturer.

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

The Contractor may use ready mix concrete.

Apply membrane curing on concrete work in accordance with Section 420.4.10.3, "Membrane Curing."

The standard 4.5-in. galvanized pipe type poles, except the breakaway type, are subject only to the Engineer's inspection for their acceptance. Mill test reports or documentation will not be required.

Item 682: Vehicle and Pedestrian Signal Heads

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

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

Item 730: Roadside Mowing
Item 734: Litter Removal
Item 735: Debris Removal
Item 738: Cleaning and Sweeping Highways

Mow areas of existing vegetation, collect and dispose of litter, and sweep the roadway within the project limits according to the following chart for the duration of the project or as directed. This work is paid for under their respective bid items.

Roadside Mowing	Litter Removal	Debris Removal	Cleaning and Sweeping Highways
3 cycles	*3* cycles	*18* cycles	*9* cycles

Item 3076: Dense-Graded Hot Mix Asphalt

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

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

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

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

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

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

Dilution of tack coat is not allowed.

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

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

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

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

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

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

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

Item 6306: Video Imaging Vehicle Detection System

Furnish the cable to operate the Video Imaging Vehicle Detection System (VIVDS) in accordance with the manufacturer's recommendations or purchase it from the same manufacturer as the VIVDS equipment.

Supply VIVDS equipment that can process up to a maximum of 6 camera inputs per intersection. Additional equipment to accommodate up to 6 camera inputs is subsidiary to the various bid items. No extra compensation will be allowed for additional equipment needed to make the VIVDS equipment fully operational under this Item.

Supply a laptop computer and a video monitor as described in this Special Specification Item.

Detector zone videotaping for this project will not be required.

Supply 2 video channel VIVDS processor cards equipped with a NEMA TS1 detector interface and a 332 cabinet detector interface for a minimum of 4 detector outputs that are compatible with the City of Houston COH 2070 traffic signal controller.

Special Specification 6306 Video Imaging Vehicle Detection System Requirements

Specification Items	**Description**	**Not Required**	**Required**	**State Supplied**
1	Description		X	
	Variable Focal Cameras		**X**	
	VIVDS Card Rack Processor System		**X**	
	Field Setup Computer (1 Required) (Laptop)	**X**		
	Field Setup Video Monitor (1 Ea. Controller)		**X**	
	Connectors and Camera Mounting Hardware		**X**	
3	**Functional Capabilities**			
	System Software		**X**	
4	**Vehicle Detection**			
	Detection Zone Video Taping	**X**		
5	**VIVDS Processor Unit**			
	Provide 2070 Environmental Requirements		**X**	
	12 Volt/5 Amp Power Supply		**X**	
6	**Camera Assembly**			

	Camera Interface Panel		**X**	
7	**Field Communications Link**			
	Lightning and Transient Surge Suppression Devices		**X**	
9	**Temporary Use and Retesting**		**X**	
10	**Operation from Central Control**	**X**		
	Telephone Interconnect	**X**		
	ISDN Interconnect	**X**		
11	**Installation and Training**		**X**	

Other items not specifically listed in this table are required. When shown in the plans, remove and deliver temporary VIVDS equipment to the Department's Signal Shop, 6810 Old Katy Rd., Houston, Texas, or as directed.

Item 7017: Sanitary Sewer

Provide a record of the locations of stacks, stubs, etc. to the owner of the sanitary sewer facility.

Maintain a 12-in. minimum vertical clearance at crossings between the sanitary sewers and culverts, unless otherwise noted.

Item 7049: Water Mains

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

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

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

County: Harris **Control:** 0912-72-386

Highway: CS

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

For projects involving City of Houston waterlines, use a shockwave-based pipe location system manufactured by Radiodetection Corporation, or equal, for non-metallic pipe detection in accordance with this specification.

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

Basis of Estimate

Item	Description	Limit and Rate	Unit
150	Blading	1 Hr. / Station	HR
260	Lime Treatment (Road-Mixed) For materials used as subgrade * • Lime(HYD, COM, or QK)(SLRY) or QK(DRY)	 6 % by weight based on 100 Lb. / Cu. Ft. subgrade	SY TON
275	Cement Treated (Road-Mixed) For materials used as subgrade * • Cement	 6% by weight based on 100 LB. / Cu. Ft. subgrade	SY TON
3076	Dense-Graded Hot Mix Asphalt • Asphalt • Aggregate Tack Coat • Applied on new HMA • Applied on Existing HMA • Applied on Milled HMA	110 Lb. / Sq. Yd.-In. 6 % by weight 94 % by weight 0.06 Gal. / Sq. Yd. 0.09 Gal. / Sq. Yd. 0.11 Gal. / Sq. Yd.	TON

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

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0912-72-386 **DISTRICT** Houston **COUNTY** Harris
HIGHWAY NAVIGATION

			CONTROL SECTION JOB		**0912-72-386**		**0912-72-648**		TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00123353**		**R00009075**			
			COUNTY		**Harris**					
			HIGHWAY		**NAVIGATION**					
ALT	**BID CODE**	**DESCRIPTION**		**UNIT**	EST.	FINAL	EST.	FINAL		
	100-6002	PREPARING ROW		STA	19.000				19.000	
	100-6006	PREP ROW (TREE)(LESS THAN 24" DIA)		EA	15.000				15.000	
	104-6001	REMOVING CONC (PAV)		SY	8,429.000				8,429.000	
	104-6011	REMOVING CONC (MEDIANS)		SY	397.000				397.000	
	104-6017	REMOVING CONC (DRIVEWAYS)		SY	202.000				202.000	
	104-6029	REMOVING CONC (CURB OR CURB & GUTTER)		LF	3,711.000				3,711.000	
	104-6036	REMOVING CONC (SIDEWALK OR RAMP)		SY	905.000				905.000	
	104-6040	REMOVING CONC (PAVERS)		SY	9.000				9.000	
	104-6067	REMOVING CONC (SAWCUT)		LF	1,287.000				1,287.000	
	110-6001	EXCAVATION (ROADWAY)		CY	9,228.000				9,228.000	
	132-6005	EMBANKMENT (FINAL)(ORD COMP)(TY C)		CY	261.000				261.000	
	161-6009	EROSION CONTROL COMPOST		CY	13.400				13.400	
	161-6012	GENERAL USE COMPOST		CY	6.600				6.600	
	162-6002	BLOCK SODDING		SY	4,641.000				4,641.000	
	166-6001	FERTILIZER		AC	0.960				0.960	
	168-6001	VEGETATIVE WATERING		MG	115.000				115.000	
	170-6002	IRRIGATION SYSTEM (TY I)		LS	1.000				1.000	
	192-6025	PLANT MATERIAL (45 GAL) (TREE)		EA	11.000				11.000	
	192-6027	PLANT MATERIAL (100 GAL) (TREE)		EA	19.000				19.000	
	193-6001	PLANT MAINTENANCE		MO	3.000				3.000	
	260-6012	LIME(HYD,COM OR QK)(SLRY)OR QK(DRY)		TON	187.000				187.000	
	260-6073	LIME TRT (SUBGRADE)(8")		SY	8,566.000				8,566.000	
	260-6079	LIME TRT (SUBGRADE)(6")		SY	1,969.000				1,969.000	
	275-6001	CEMENT		TON	27.000				27.000	
	275-6010	CEMENT TREAT (SUBGRADE) (8")		SY	1,634.000				1,634.000	
	275-6019	CEMENT TREAT (SUBGRADE)(6")		SY	160.000				160.000	
	354-6041	PLANE ASPH CONC PAV (1.5")		SY	384.000				384.000	
	360-6028	CONC PAV (JOINT REINF) (6")		SY	1,489.000				1,489.000	
	360-6050	CONC PAV (CONT REINF)(FAST TRK)(11")		SY	341.000				341.000	
	360-6086	CONC PAV (JOINT REINF) (11")		SY	6,352.000				6,352.000	
	400-6005	CEM STABIL BKFL		CY	1,080.000				1,080.000	
	400-6006	CUT & RESTORING PAV		SY	2,163.000				2,163.000	
	400-6009	CEMENT STAB BACKFILL (INLET OR MH)		CY	294.000				294.000	
	402-6001	TRENCH EXCAVATION PROTECTION		LF	2,074.000		374.000		2,448.000	
	420-6009	CL A CONC (COLLAR)		EA	2.000				2.000	
	420-6062	CL C CONC (RETAINING WALL)		CY	16.000				16.000	
	462-6006	CONC BOX CULV (5 FT X 2 FT)		LF	400.000				400.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0912-72-386 **DISTRICT** Houston **COUNTY** Harris
HIGHWAY NAVIGATION

				CONTROL SECTION JOB	0912-72-386		0912-72-648		TOTAL EST.	TOTAL FINAL
				PROJECT ID	A00123353		R00009075			
				COUNTY	Harris					
				HIGHWAY	NAVIGATION					
ALT	BID CODE	DESCRIPTION	UNIT		EST.	FINAL	EST.	FINAL		
	462-6099	CONC BOX CULV (6 FT X 2 FT)	LF		12.000				12.000	
	464-6005	RC PIPE (CL III)(24 IN)	LF		1,538.000				1,538.000	
	464-6032	RC PIPE (ARCH)(CL III)(DES 3)	LF		53.000				53.000	
	464-6033	RC PIPE (ARCH)(CL III)(DES 4)	LF		71.000				71.000	
	465-6002	MANH (COMPL)(PRM)(48IN)	EA		1.000				1.000	
	465-6004	MANH (COMPL)(PRM)(72IN)	EA		1.000				1.000	
	465-6173	MANH (COMPL)(TY A)	EA		6.000				6.000	
	465-6175	INLET (COMPL)(CURB)(TY C)	EA		17.000				17.000	
	465-6176	INLET (COMPL)(CURB)(TY C1)	EA		1.000				1.000	
	465-6177	INLET (COMPL)(TY AZ2G)	EA		2.000				2.000	
	465-6259	INLET (COMPL)(EXT TY C)	EA		7.000				7.000	
	479-6001	ADJUSTING MANHOLES	EA		5.000				5.000	
	496-6002	REMOV STR (INLET)	EA		5.000				5.000	
	496-6003	REMOV STR (MANHOLE)	EA		3.000				3.000	
	496-6007	REMOV STR (PIPE)	LF		726.000				726.000	
	496-6099	REMOVE STR (RAIL)	LF		20.000				20.000	
	500-6001	MOBILIZATION	LS		1.000				1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO		10.000				10.000	
	506-6020	CONSTRUCTION EXITS (INSTALL) (TY 1)	SY		450.000				450.000	
	506-6024	CONSTRUCTION EXITS (REMOVE)	SY		450.000				450.000	
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF		213.000				213.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF		213.000				213.000	
	506-6041	BIODEG EROSN CONT LOGS (INSTL) (12")	LF		251.000				251.000	
	506-6043	BIODEG EROSN CONT LOGS (REMOVE)	LF		251.000				251.000	
	508-6001	CONSTRUCTING DETOURS	SY		1,924.000				1,924.000	
	512-6009	PORT CTB (FUR & INST)(LOW PROF)(TY 1)	LF		400.000				400.000	
	512-6010	PORT CTB (FUR & INST)(LOW PROF)(TY 2)	LF		80.000				80.000	
	512-6033	PORT CTB (MOVE)(LOW PROF)(TY 1)	LF		340.000				340.000	
	512-6034	PORT CTB (MOVE)(LOW PROF)(TY 2)	LF		60.000				60.000	
	512-6057	PORT CTB (REMOVE)(LOW PROF)(TY 1)	LF		400.000				400.000	
	512-6058	PORT CTB (REMOVE)(LOW PROF)(TY 2)	LF		80.000				80.000	
	512-6080	PORT CTB CONNECT HARDWARE	EA		48.000				48.000	
	528-6004	LANDSCAPE PAVERS	SY		45.000				45.000	
	528-6013	COLORED TEXTURED CONC (6"-17")	SY		576.000				576.000	
	529-6001	CONC CURB (TY I)	LF		400.000				400.000	
	529-6008	CONC CURB & GUTTER (TY II)	LF		21.000				21.000	
	529-6011	CONC CURB (DOWEL)	LF		3,541.000				3,541.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0912-72-386 **DISTRICT** Houston **COUNTY** Harris
HIGHWAY NAVIGATION

			CONTROL SECTION JOB		**0912-72-386**		**0912-72-648**		TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00123353**		**R00009075**			
			COUNTY		**Harris**					
			HIGHWAY		**NAVIGATION**					
ALT	**BID CODE**	**DESCRIPTION**		**UNIT**	EST.	FINAL	EST.	FINAL		
	529-6045	CONC CURB (DOWEL)(9")		LF	28.000				28.000	
	530-6025	DRIVEWAYS (CONC) (FAST TRACK)		SY	236.000				236.000	
	531-6004	CURB RAMPS (TY 1)		EA	10.000				10.000	
	531-6010	CURB RAMPS (TY 7)		EA	6.000				6.000	
	531-6016	CURB RAMPS (TY 21)		EA	4.000				4.000	
	531-6048	CONC SIDEWALKS (9")		SY	13.000				13.000	
	536-6002	CONC MEDIAN		SY	4.000				4.000	
	618-6047	CONDT (PVC) (SCH 80) (2") (BORE)		LF	817.000				817.000	
	618-6053	CONDT (PVC) (SCH 80) (3")		LF	98.000				98.000	
	636-6001	ALUMINUM SIGNS (TY A)		SF	408.000				408.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)		EA	40.000				40.000	
	644-6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)		EA	3.000				3.000	
	644-6007	IN SM RD SN SUP&AM TY10BWG(1)SA(U)		EA	4.000				4.000	
	644-6040	IN SM RD SN SUP&AM TYS80(1)SB(P-BM)		EA	1.000				1.000	
	662-6048	WK ZN PAV MRK REMOV (REFL) TY I-C		EA	592.000				592.000	
	662-6050	WK ZN PAV MRK REMOV (REFL) TY II-A-A		EA	75.000				75.000	
	662-6057	WK ZN PAV MRK REMOV (TRAF BTN) TY W		LF	4,734.000				4,734.000	
	662-6059	WK ZN PAV MRK REMOV (TRAF BTN) TY Y		LF	8,527.000				8,527.000	
	662-6075	WK ZN PAV MRK REMOV (W)24"(SLD)		LF	290.000				290.000	
	662-6080	WK ZN PAV MRK REMOV (W)(ARROW)		EA	16.000				16.000	
	662-6081	WK ZN PAV MRK REMOV (W)(DBL ARROW)		EA	4.000				4.000	
	662-6088	WK ZN PAV MRK REMOV (W)(TPL ARROW)		EA	4.000				4.000	
	666-6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)		LF	89.000				89.000	
	666-6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)		LF	490.000				490.000	
	666-6138	REFL PAV MRK TY I (Y)8"(SLD)(100MIL)		LF	48.000				48.000	
	666-6306	RE PM W/RET REQ TY I (W)6"(BRK)(100MIL)		LF	238.000				238.000	
	666-6309	RE PM W/RET REQ TY I (W)6"(SLD)(100MIL)		LF	660.000				660.000	
	666-6321	RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)		LF	192.000				192.000	
	668-6077	PREFAB PAV MRK TY C (W) (ARROW)		EA	6.000				6.000	
	668-6078	PREFAB PAV MRK TY C (W) (DBL ARROW)		EA	8.000				8.000	
	668-6079	PREFAB PAV MRK TY C (W) (TPL ARROW)		EA	3.000				3.000	
	668-6085	PREFAB PAV MRK TY C (W) (WORD)		EA	3.000				3.000	
	668-6091	PREFAB PAV MRK TY C (W) (18")(YLD TRI)		EA	53.000				53.000	
	668-6096	PREFAB PAV MRK TY C (W)(BIKE SYMBOL)		EA	5.000				5.000	
	668-6128	PREFAB PAV MRK TY C (GRN)(SLD)(BLOCK)		SF	1,003.000				1,003.000	
	672-6007	REFL PAV MRKR TY I-C		EA	41.000				41.000	
	677-6001	ELIM EXT PAV MRK & MRKS (4")		LF	412.000				412.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0912-72-386 **DISTRICT** Houston **COUNTY** Harris
HIGHWAY NAVIGATION

				CONTROL SECTION JOB	0912-72-386		0912-72-648		TOTAL EST.	TOTAL FINAL
				PROJECT ID	A00123353		R00009075			
				COUNTY	Harris					
				HIGHWAY	NAVIGATION					
ALT	BID CODE	DESCRIPTION	UNIT		EST.	FINAL	EST.	FINAL		
	678-6002	PAV SURF PREP FOR MRK (6")	LF		4,182.000				4,182.000	
	678-6004	PAV SURF PREP FOR MRK (8")	LF		273.000				273.000	
	678-6008	PAV SURF PREP FOR MRK (24")	LF		1,843.000				1,843.000	
	678-6009	PAV SURF PREP FOR MRK (ARROW)	EA		6.000				6.000	
	678-6010	PAV SURF PREP FOR MRK (DBL ARROW)	EA		8.000				8.000	
	678-6011	PAV SURF PREP FOR MRK (TPL ARROW)	EA		3.000				3.000	
	678-6016	PAV SURF PREP FOR MRK (WORD)	EA		3.000				3.000	
	678-6022	PAV SURF PREP FOR MRK (18")(YLD TRI)	EA		53.000				53.000	
	678-6028	PAV SURF PREP FOR MRK (BIKE SYMBOL)	EA		5.000				5.000	
	680-6004	REMOVING TRAFFIC SIGNALS	EA		1.000				1.000	
	681-6001	TEMP TRAF SIGNALS	EA		1.000				1.000	
	730-6107	FULL - WIDTH MOWING	CYC		3.000				3.000	
	734-6002	LITTER REMOVAL	CYC		3.000				3.000	
	735-6001	DEBRIS REMOVAL (CNTR MEDIANS/MAINLANES)	CYC		18.000				18.000	
	738-6001	CLEANING / SWEEPING (CENTER MEDIAN)	CYC		9.000				9.000	
	1002-6001	LANDSCAPE AMENITY	EA		9.000				9.000	
	1002-6002	LANDSCAPE AMENITY (TY 1)	EA		9.000				9.000	
	1004-6001	TREE PROTECTION	EA		39.000				39.000	
	1006-6001	LANDSCAPE SOIL AMENDMENT (TYPE I)	SY		120.000				120.000	
	1006-6002	LANDSCAPE SOIL AMENDMENT (TYPE II)	SY		120.000				120.000	
	1006-6003	LANDSCAPE SOIL AMENDMENT (TYPE III)	SY		30.000				30.000	
	1006-6004	LANDSCAPE SOIL AMENDMENT (TYPE IV)	SY		90.000				90.000	
	3076-6035	D-GR HMA TY-D PG64-22	TON		73.000				73.000	
	3076-6066	TACK COAT	GAL		87.000				87.000	
	6001-6001	PORTABLE CHANGEABLE MESSAGE SIGN	DAY		1,080.000				1,080.000	
	6038-6004	MULTIPOLYMER PAV MRK (W)(6")(SLD)	LF		1,083.000				1,083.000	
	6038-6005	MULTIPOLYMER PAV MRK (W)(6")(BRK)	LF		112.000				112.000	
	6038-6006	MULTIPOLYMER PAV MRK (W)(6")(DOT)	LF		60.000				60.000	
	6038-6007	MULTIPOLYMER PAV MRK (W)(8")(SLD)	LF		54.000				54.000	
	6038-6009	MULTIPOLYMER PAV MRK (W)(8")(DOT)	LF		82.000				82.000	
	6038-6013	MULTIPOLYMER PAV MRK (W)(24")(SLD)	LF		350.000				350.000	
	6038-6017	MULTIPOLYMER PAV MRK (Y)(6")(SLD)	LF		1,837.000				1,837.000	
	6185-6002	TMA (STATIONARY)	DAY		40.000				40.000	
	6185-6003	TMA (MOBILE OPERATION)	HR		40.000				40.000	
	6306-6001	VIVDS PROSR SYS	EA		1.000				1.000	
	7017-6041	CASING (STEEL) (SANITARY SEWER) (12 IN)	LF				110.000		110.000	
	7017-6042	CASING (STEEL) (SANITARY SEWER) (16 IN)	LF				14.000		14.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0912-72-386 **DISTRICT** Houston **COUNTY** Harris
HIGHWAY NAVIGATION

			CONTROL SECTION JOB		**0912-72-386**		**0912-72-648**		TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00123353**		**R00009075**			
			COUNTY		**Harris**					
			HIGHWAY		**NAVIGATION**					
ALT	**BID CODE**	**DESCRIPTION**		**UNIT**	EST.	FINAL	EST.	FINAL		
	7017-6199	CASING (STEEL) (SAN SEWER) (36IN)		LF			16.000		16.000	
	7049-6020	WTR MAIN PIPE (PVC)(RESTRAINED JT) 8IN		LF			304.000		304.000	
	7049-6021	WTR MAIN PIPE (PVC)(RESTRAINED JT) 12IN		LF			53.000		53.000	
	7049-6052	FIRE HYDRANT BRANCH (LEAD) (6IN)		LF			17.000		17.000	
	7049-6097	TAPPING SLEEVE AND VALVE (24IN X 8IN)		EA			2.000		2.000	
	7049-6104	FIRE HYDRANT ASSEMBLY		EA			2.000		2.000	
	7049-6119	REMOVING AND SALVAGING FIRE HYDRANT		EA			10.000		10.000	
	7049-6126	CUT AND PLUG WATER MAIN (6IN)		EA			2.000		2.000	
	7049-6127	CUT AND PLUG WATER MAIN (8IN)		EA			5.000		5.000	
	7049-6129	CUT AND PLUG WATER MAIN (12IN)		EA			2.000		2.000	
	7049-6139	WET CONNECTION (6IN)		EA			2.000		2.000	
	7049-6140	WET CONNECTION (8IN)		EA			2.000		2.000	
	7049-6142	WET CONNECTION (12IN)		EA			2.000		2.000	
	7049-6158	WTR MAIN PIPE (PVC) (RESTRAINED JT) 6IN		LF			6.000		6.000	
	7049-6382	JK TN BR AG WTR MN(PVC)(8IN)(RESTR JNT)		LF			240.000		240.000	
	18	ELECTRICAL: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)		LS	1.000				1.000	
		SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)		LS	1.000				1.000	
		EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)		LS	1.000				1.000	
		LAW ENFORCEMENT: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)		LS	1.000				1.000	
	39	CITY FORCE ACCOUNT WORK (PARTICIPATING)		LS	1.000				1.000	

SPECIFICATION

FOR

INSTALLATION OF CONDUIT SYSTEM FOR THOROUGHFARE STREET LIGHTING

CenterPoint Energy
Distribution Engineering
P.O. Box 1700
Houston, Texas 77251

REFERENCE DRAWINGS:
004-237-16 Revision 4

REFERENCE STANDARDS:

CITY OF HOUSTON STREET LIGHT APPROVAL

By signing below, I acknowledge that I am the City of Houston's (COH)'s authorized representative of this project and that I have read and understand all statements, notes, detail drawings, and all attendant contracts and agreements (collectively the "materials") furnished to COH regarding street light construction indicated on conduit layout.

Signature _____ Title _____

Printed Name _____ Date _____

NO.	DATE	ITEMS REVISED	BY	CH	APP
5	7-25-07	Revised for practical application	KTN	JCD	MMG
4	2-23-99	Added conduit run for high density area	KTN	JCD	LHH

CenterPoint Energy HOUSTON, TEXAS		
WRITTEN	9-13-90	N.T. Khanh
CHECKED	9-13-90	JCD / RKM
APPROVED	9-14-90	Robert Boucher
Sheet 1 of 16		
SPEC ID.	007	371 08

Table of Contents

REV. NO. #5	SPEC. ID.		007	371	08	Sheet 2 of 16

STATE OF TEXAS
DAVID G. GREANEY
125563
LICENSED
PROFESSIONAL ENGINEER
06/08/2022 Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

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11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

CENTERPOINT CONDUIT SPECIFICATIONS

SHEET 1 OF 9

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	34

1.0 SCOPE

This Specification covers CenterPoint Energy (CNP) requirements concerning the installation of pull-boxes and conduits for underground electrical service to street lights. Number, size and direction of conduits to be specified on layout at CNP's discretion. Where there is a conflict between this specification and the CNP project drawing, the drawing will take precedence.

2.0 GENERAL

The following sub-articles state the general procedures to be followed for coordination of conduit system installation:

2.1 For City/County Contractor installed conduit: City/County Street Light Division shall approve proposed street light locations. City/County shall forward proposed locations to CNP. CNP shall design the conduit system and return design to City/County for contracting.

2.2 For Metro Contractor installed conduit: Metro shall forward construction drawings to COH Street Light Division for proposed street light locations. COH shall submit their approved locations to CNP. CNP shall design the conduit system and return design to COH. (For conduit to be located in utility or side lot easements, CNP will perform the work in conjunction with street light installation, with reimbursement from Metro).

2.3 CNP shall require, and note on drawings, when pull-boxes are required at the beginning and ending of each continuous conduit run, in addition to those areas where pull-boxes are currently required for crossings or distance.

2.4 CNP Street Light Engineering shall attend City/County/Metro utility coordinating meeting prior to the start of construction. The proposed conduit installation (as well as potential conflicts with existing CNP facilities) will be reviewed at that time.

2.5 In conjunction with the utility coordinating meeting, Contractor, CNP representative, Metro (if applicable) and City/County or other municipal representative shall review proposed light locations in the field.

2.6 Contractor will notify CNP Street Light Engineering, at least 2 (two) working days in advance, of Contractor's schedule for conduit installation. CNP Street Light Engineering will perform final inspections with Contractor present when all conduits had been installed.

2.7 Contractor shall attempt to determine if existing underground utilities or any other obstructions would prohibit CNP's installation of proposed new street lights. If such obstructions exist, Contractor may revise the proposed location of the light up to 5 feet in any direction within street right-of-way in order to avoid obstructions. For revised street light locations greater than 5 feet in any direction, Contractor must obtain prior approval as follows:

For projects being performed for City/County, Contractor shall notify the City Inspector, who will notify the City/County 's Public Works Department. Public Works will review the problem with the City's Street Light Division and CNP for approval of any changes. (In the case of municipalities other than City/County, Contractor shall notify City Inspector who shall notify appropriate Department of City. City shall consult with CNP for approval of any changes)

For projects being performed for Metro, Contractor must notify the Metro Inspector, who will in turn contact Metro's Utility Coordination Section. The Utility Coordination Section will review the problem with the COH's Street Light Division (or other municipality if applicable) and CNP for approval of any changes.

2.8 For any contractor-proposed changes to CNP's conduit system design, Contractor must obtain prior approval from CNP. Contractor shall first notify City/County or Metro Inspector of requested changes, who will in turn notify City/County Public Works, other municipality or Metro's Utility Coordination Section. City/County Public Works, other municipality or Metro Utility Coordination will review the requested changes with CNP for approval.

2.9 For proposed street lights on bridges or elevated roads, Contractor shall design and install foundations that meet the loading requirements of CNP Specification for Galvanized Street Light Standards 007-371-04. For information on pull-boxes and conduit, see Article 8.0.

3.0 MATERIAL FURNISHED BY CNP

CNP shall only furnish the pull-boxes (see Article 4.0) and the warning tape (see Article 5.0). Pull-boxes will not be furnished for installation on bridges or elevated roads.

3.1 The Customer's Contractor shall notify CNP Street Light Engineering when pull-boxes and warning tape are required, seven working days in advance of planned pick-up. Pull-boxes and tape can be obtained Tuesday through Friday, excluding holidays, from the South Houston Complex-Building D, located at 4500 South Shaver, Houston, Texas, 77034.

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www.GaugeEngineering.com
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NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

CENTERPOINT CONDUIT SPECIFICATIONS

SHEET 2 OF 9

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	35

3.2 After Contractor's notification, CNP will provide Contractor with a work order number for reference when picking up materials at the South Houston Complex-Building D.

4.0 PULL-BOX

The following sub-articles state the general requirements for pull-boxes:

4.1 The pull-boxes shall be furnished by CNP and shall be installed by the Customer's Contractor as a part of the conduit system.

4.2 Pull-boxes shall be installed in accordance with sheet 9 & 10 of this specification. The conduit layout will specify the type of pull-box to be installed.

4.3 At the point of entrance to the pull-box, the conduits shall always have a minimum ground cover as noted on pull-box drawing. Conduit shall run up a maximum of 5 inches into the pull-box. The bends to be used with the pull-box shall have a minimum radius as shown on pull-box drawing.

5.0 WARNING TAPE

5.1 Warning tape shall be furnished by CNP and installed by the Customer's Contractor (see sheet 11).

5.2 Warning tape shall be installed approximately 12 inches above the street light conduit.

6.0 MATERIAL FURNISHED BY THE CUSTOMER

The Customer or Customer's Contractor shall furnish the conduits (see Article 7.0), the conduits and pull-boxes installed in bridges or elevated roadways (see Artical 8.0), the conduit plugs (see Article 9.0), and all other materials not furnished by CNP.

7.0 CONDUIT

The following sub-articles state the general requirements, unless specifically stated otherwise on the layout, for the number, size and installation of the conduit system from the pull-box to the street light or terminal pole.

7.1 Conduit shall be PVC Nema Tc2 Schedule 40 or Schedule 80, U.L. label, US trade size, and meet the standards of the National Electrical Code (NEC). Size to be determined by layout.

7.2 A No. 14 Aluminum or Copper wire, and a fiber pulling cord of at least 1200 pounds breaking strength shall be installed in the conduit.
Pulling cord shall be installed in such a manner as to provide adequate access and be free to pull without hindrance. Pulling cord shall not be glued or permanently attached to conduit in any manner. The pulling cord and wire shall beviewable from outside the end of conduit run.

7.3 The conduit runs shall be made "continuous" with all sections connected from beginning to end, including the conduit crossing the street. Stub-out will be required at all conduit end and street light locations (see drawing #004-237-16).

7.4 The conduit shall be placed 3 feet behind curb unless sidewalk is to be installed. Where sidewalks exist, conduit shall be placed up to 6 inches behind the sidewalk (or in grassy area between the curb and the start of sidewalk, where 12 inches or more of grassy area exists) (see sheet 12). Even though sidewalks exist, CNP will install street light approximately 3 feet back of curb. City/County/Metro Contractor shall design a block-out area for the street light installation in concrete area (see sheet 16).

7.5 The conduit shall have a minimum cover of 36 inches from final grade except as noted on pull-box and manhole drawing, or where city, county or state regulators require a greater depth, and shall consist of PVC conduit.

7.6 For the burial of street light conduits crossing under driveways or sidewalks, schedule 40 PVC or better is required. When crossing under streets, the conduit shall be PVC conduit schedule 80.

7.7 For terminal pole source locations specified on the layout, the bend of the conduits at the terminal pole shall be 90 degrees, 24 inch radius bend, schedule 40 PVC conduit. This bend shall be brought to the face of the pole and stubbed out approximately 12 inches above the final grade (see sheet 14).

7.8 For pad mounted transformer source locations specified on the layout, conduit shall be brought to within 1 foot of transformer pad, opposite the small notch "V" on the pad, stubbed out approximately 12 inches above the final grade.

7.9 For secondary pedestal source locations specified on the layout, conduit shall be brought to within 1 foot of pedestal and stubbed out approximately 12 inches above the final grade.

7.10 For manhole source location, the conduit shall enter the manhole a minimum of 12 inches from the inside ceiling or as specified on the layout. A ductbell terminator will be installed in the manhole wall for conduit termination. CNP shall be notified 48 hours prior to the actual coring of the manhole wall so that CNP can verify the location in each manhole to be penetrated. CNP will stand-by only during the actual coring. The contractor shall do the coring and installation of the ductbell terminator. The contractor shall seal around the ductbell terminator with packaged, dry, rapid hardening cementitious material conforming to ASTM C928-80 specifications, to ensure a water

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CENTERPOINT CONDUIT SPECIFICATIONS

SHEET 3 OF 9

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	36

tight seal.

8.0 CONDUIT INSTALLED IN BRIDGE OR ELEVATED ROADWAY

Customer or Customer's Contractor shall be responsible for designing, furnishing and installing the conduits and pull-boxes. The pull-boxes should be located to provide CNP personnel safe and reasonable access, without using ladders or other special equipment, for cable installation, inspection and maintenance. Where there are junction-boxes in addition to the pull-boxes, reasonable access shall also be provided.

8.1 The conduit shall be at least 2 inches, in diameter and meet all requirements of the latest National Electrical Code (NEC) and National Electrical Safety Code (NESC).

8.2 The conduits shall run to each street light location. The conduits shall be arranged to allow the source conductor to be pulled in and out of each street light location or Contractor shall provide junction-boxes on main conduit run at each street light location and run tap conduit to the street light location (see sheet 15 for examples of conduit runs).

8.3 A #14 Aluminium or Copper wire, and a fiber pulling cord of at least 1200 pound breaking strength shall be installed in the conduit.

A toning wire and pulling cord shall be installed in such a manner as to provide adequate access and be free to pull without hindrance. Pulling cord shall not be glued or permanently attached to conduit in any manner. The wire and pulling cord shall be attached and viewable outside the end of conduit run.

8.4 The pull-boxes used to pull the main circuit cable through the conduit system shall have a minimum opening of 15" x 15" x 12".

8.5 Junction boxes used as tap location shall meet all requirements of the latest NEC.

9.0 CONDUIT PLUGS

Plugs shall be installed on all conduit terminator points at the time the conduits are installed, to prevent blockage, until the cable is installed.

10.0 LIABILITY

10.1 Upon completion of the conduit installation, the Customer (or Customer's Contractor) shall forward to CNP Street Light Engineering notification in writing from a City or County Inspector that the installation meets CNP Specifications. In addition, Customer shall provide CNP with as-built drawings (showing conduits, pull-box, blockout, etc.).

10.2 The Customer shall be responsible for either: (1) correcting any violations of said Specifications and clearing any blockage or repairing any breaks within the street light conduits prior to street lights and circuit installation by CNP, or (2) reimbursing CNP for correcting violation.

10.3 Upon installation of street lights, with the exception of street lights on bridges or elevated roadways, CNP shall furnish, install, own, and at all times have complete control over said street light service conduit system and shall be responsible for the location and maintenance thereof. Maintenance of conduit systems on bridges or elevated roadways will be the Customer's responsibility.

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Texas Department of Transportation

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

CENTERPOINT CONDUIT SPECIFICATIONS

SHEET 4 OF 9

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
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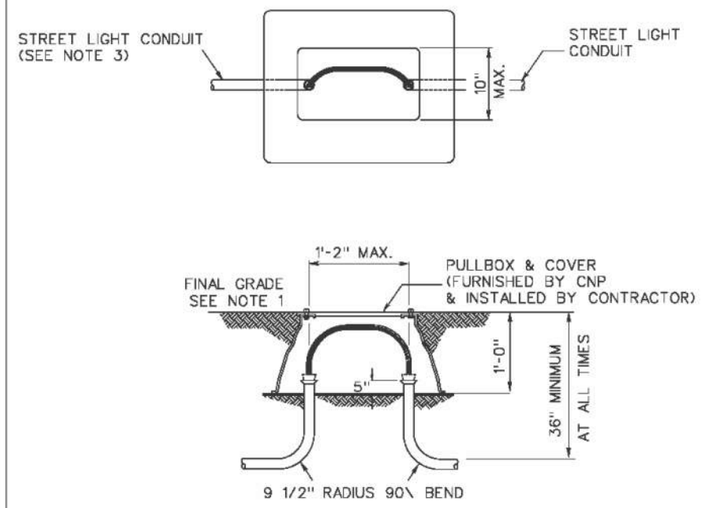
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	37

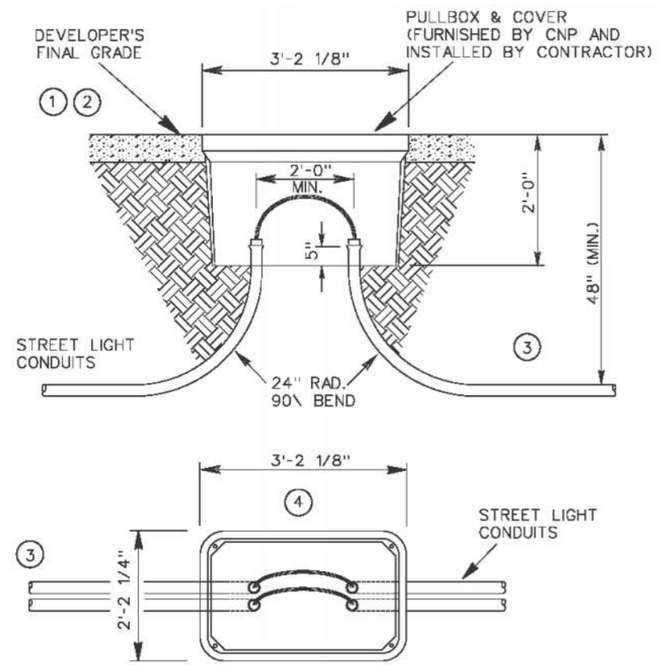


SMALL PULL BOX

NOTES:

1. GRADE AT TIME OF INSTALLATION SHALL BE CONSIDERD DEVELOPER'S FINAL GRADE.
2. THE SMALL CONCRETE PULL-BOX CAN BE INSTALLED IN DRIVEWAYS AND PARKING LOTS BUT NOT IN STREET.
3. THE NUMBER, SIZE AND DIRECTION OF CONDUITS TO BE SPECIFIED ON CNP CONDUIT LAYOUT.

REV. NO. #5	SPEC. ID.		007	371	08	Sheet 9 of 16



LARGE PULL BOX

1. GRADE AT TIME OF INSTALLATION SHALL BE CONSIDERED DEVELOPER'S FINAL GRADE.
2. WHEN INSTALLING PULL BOXES IN INCIDENTAL TRAFFIC LOADING AREA, DEVELOPER'S FINAL GRADE REFERS TO THE SURFACE OF THE PAVEMENT.
3. THE NUMBER, SIZE AND DIRECTION OF CONDUITS TO BE SPECIFIED ON CNP CONDUIT LAYOUT.
4. THIS PULL-BOX CAN BE INSTALLED IN DRIVEWAYS AND PARKING LOTS BUT NOT IN STREET.

REV. NO. #5	SPEC. ID.		007	371	08	Sheet 10 of 16

STATE OF TEXAS
DAVID G. GREANEY
125563
LICENSED
PROFESSIONAL ENGINEER

06/08/2022 Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

Gauge ENGINEERING
11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

CENTERPOINT CONDUIT SPECIFICATIONS

SHEET 5 OF 9

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	38

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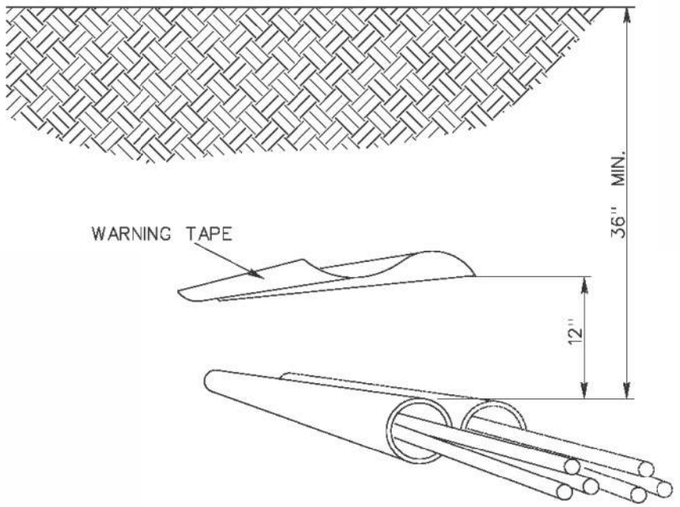
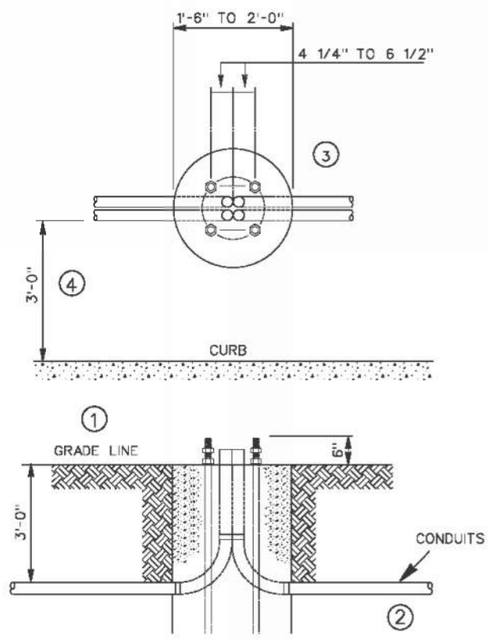


TYPICAL STREET LIGHT CONDUIT LAYOUT

REV. NO. #5	SPEC. ID.		007	371	08	Sheet 11 of 16



MULTIPLE CONDUIT RUN
IN STREET LIGHT FOUNDATION

1. GRADE AT TIME OF INSTALLATION SHALL BE CONSIDERED DEVELOPER'S FINAL GRADE.
2. THE QUANTITY, SIZE AND DIRECTION OF CONDUITS TO BE SPECIFIED BY ENGINEERING DEPARTMENT.
3. SEE ACCOMPANING CNP STANDARDS FOUNDATION FOR ACTUAL SIZE AND ANCHOR BOLT POSITION.
4. CNP STANDARD LOCATION OF STREET LIGHT IS 3' BEHIND THE 6" CURB, UNLESS SPECIFIED DIFFERENTLY BY CITY / COUNTY / METRO.

REV. NO. #5	SPEC. ID.		007	371	08	Sheet 12 of 16

STATE OF TEXAS
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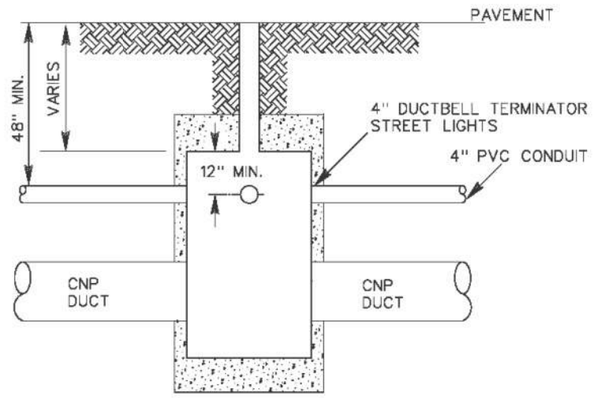
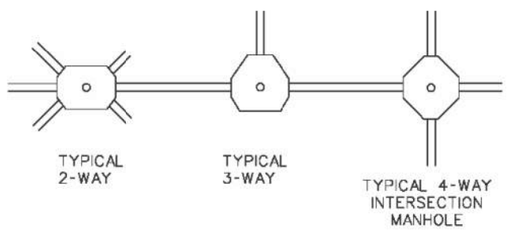
NAVIGATION BLVD / JENSEN DR.
& RUNNELS ST.

CENTERPOINT CONDUIT
SPECIFICATIONS

SHEET 6 OF 9

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	39





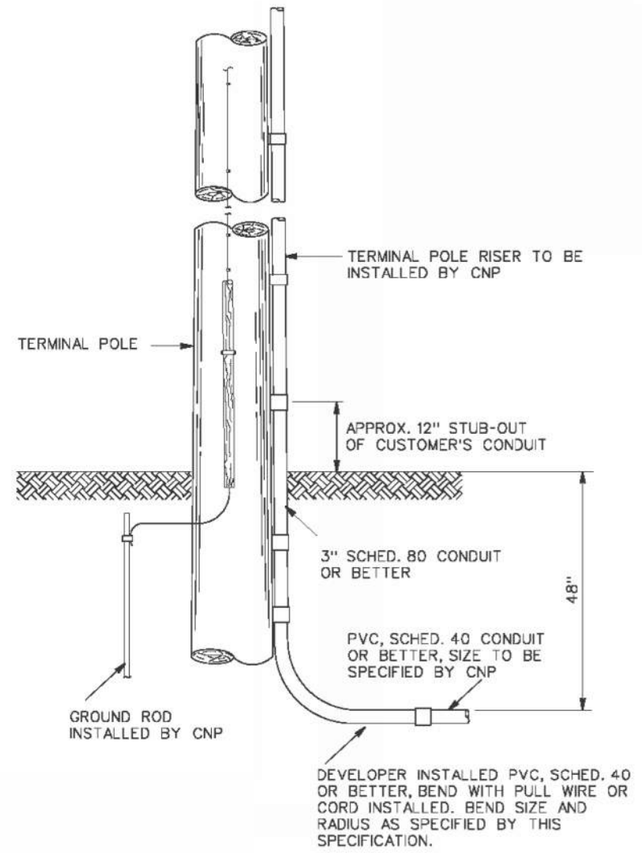
STREET LIGHT CONDUIT RUN FROM MANHOLE

① CONDUITS SHALL TYPICALLY ENTER THE MANHOLE THROUGH THE SHORT WALLS. CNP MUST APPROVE ENTRY THROUGH OTHER WALLS.

② THE NUMBER, SIZE AND DIRECTION OF CONDUITS TO BE SPECIFIED BY ENGINEERING DEPARTMENT.

③ CNP TO BE NOTIFIED 48 HOURS PRIOR TO THE ACTUAL CORING TO THE MANHOLE WALL.

REV. NO. #5	SPEC. ID.		007	371	08	Sheet 13 of 16



TYPICAL TERMINAL POLE LAYOUT

REV. NO. #5	SPEC. ID.		007	371	08	Sheet 14 of 16

STATE OF TEXAS
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06/08/2022 Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

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Texas PE Firm Reg. #F-20017

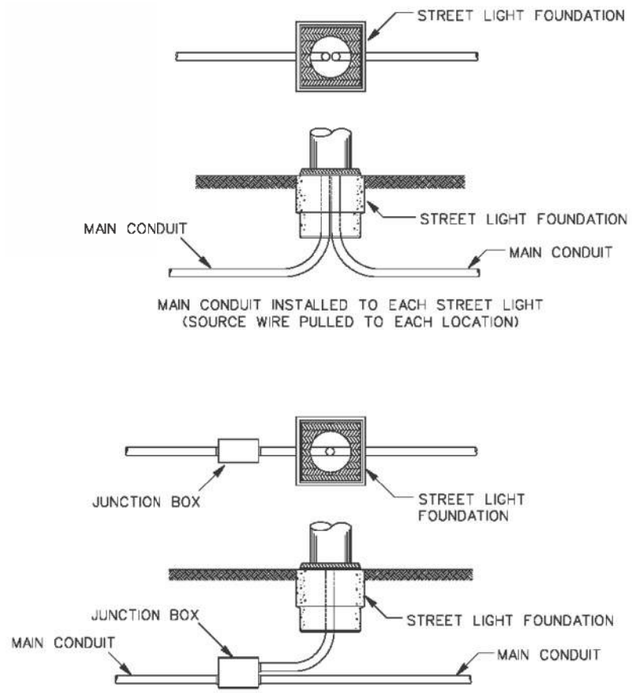
Texas Department of Transportation

NAVIGATION BLVD / JENSEN DR.
& RUNNELS ST.

CENTERPOINT CONDUIT
SPECIFICATIONS

SHEET 7 OF 9

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	40



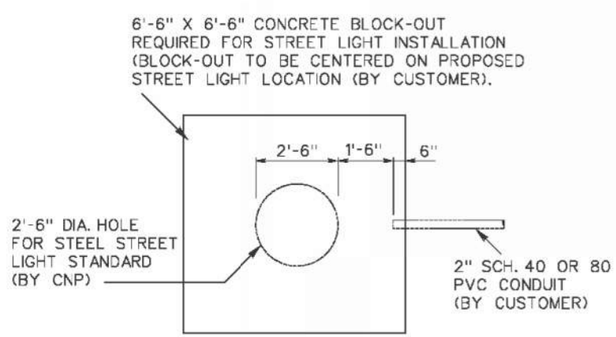
MAIN CONDUIT INSTALLED TO EACH STREET LIGHT
(SOURCE WIRE PULLED TO EACH LOCATION)

MAIN CONDUIT WITH TAPS FEEDING EACH LOCATION

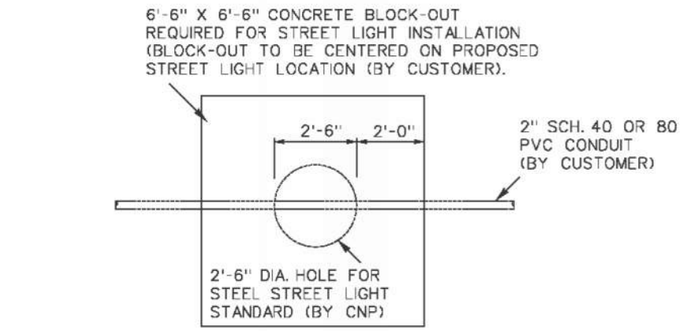
NOTE:
ALL MATERIAL INSTALLED IN BRIDGE OR ELEVATED ROADWAY CONSTRUCTION SHALL BE FURNISHED BY CUSTOMER.

CONDUIT INSTALLED IN BRIDGE OR ELEVATED ROADWAY

REV. NO. #5	SPEC. ID.		007	371	08	Sheet 15 of 16



STREET LIGHT @ END OF CIRCUIT



STREET LIGHT @ CONTINUOUS CIRCUIT

BLOCK-OUT DETAIL FOR STREET LIGHTS LOCATED IN CONCRETE AREAS

REV. NO. #5	SPEC. ID.		007	371	08	Sheet 16 of 16

STATE OF TEXAS
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Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR.
& RUNNELS ST.

CENTERPOINT CONDUIT
SPECIFICATIONS

SHEET 8 OF 9

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	41

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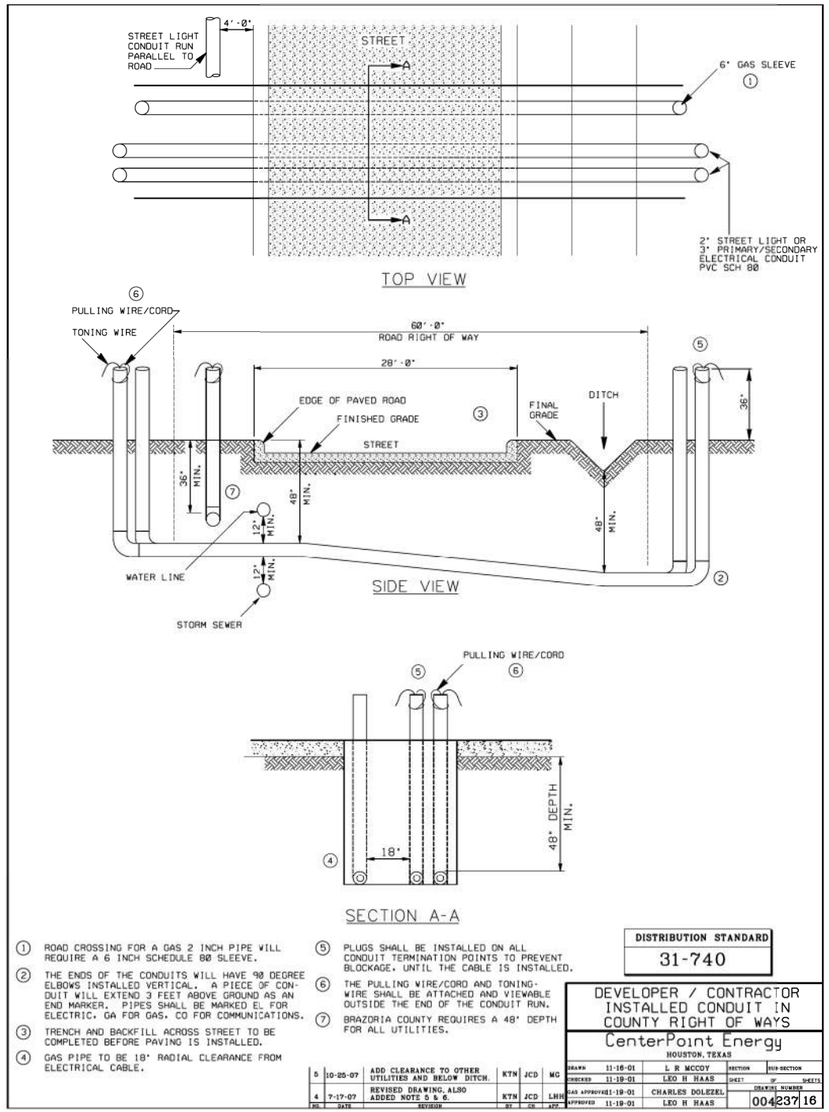

1. ROAD CROSSING FOR A GAS 2 INCH PIPE WILL REQUIRE A 6 INCH SCHEDULE 80 SLEEVE.
2. THE ENDS OF THE CONDUITS WILL HAVE 90 DEGREE ELBOWS INSTALLED VERTICAL. A PIECE OF CONDUIT WILL EXTEND 3 FEET ABOVE GROUND AS AN END MARKER. PIPES SHALL BE MARKED E, FOR ELECTRIC. GA FOR GAS. CO FOR COMMUNICATIONS.
3. TRENCH AND BACKFILL ACROSS STREET TO BE COMPLETED BEFORE PAVING IS INSTALLED.
4. GAS PIPE TO BE 18" RADIAL CLEARANCE FROM ELECTRICAL CABLE.
5. PLUGS SHALL BE INSTALLED ON ALL CONDUIT TERMINATION POINTS TO PREVENT BLOCKAGE. UNTIL THE CABLE IS INSTALLED.
6. THE PULLING WIRE/CORD AND TONING-WIRE SHALL BE ATTACHED AND VIEWABLE OUTSIDE THE END OF THE CONDUIT RUN.
7. BRAZORIA COUNTY REQUIRES A 48" DEPTH FOR ALL UTILITIES.

NO.	DATE	REVISION	BY	CK	APP'D
5	10-25-07	ADD CLEARANCE TO OTHER UTILITIES AND BELOW DITCH.	KTN	JCD	MG
4	7-17-07	REVISED DRAWING, ALSO ADDED NOTE 5 & 6	KTN	JCD	LHH

DISTRIBUTION STANDARD
31-740

DEVELOPER / CONTRACTOR INSTALLED CONDUIT IN COUNTY RIGHT OF WAYS

CenterPoint Energy
HOUSTON, TEXAS

DRAWN	11-16-01	L R MCCOY	SECTION
CHECKED	11-19-01	LEO H HAAS	SHEET OF SHEETS
GAS APPROVED	11-19-01	CHARLES DOLEZEL	DRAWING NUMBER
APPROVED	11-19-01	LEO H HAAS	004237 16

STATE OF TEXAS
DAVID G. GREANEY
125563
LICENSED
PROFESSIONAL ENGINEER

06/08/2022 Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

Gauge ENGINEERING
11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

CENTERPOINT CONDUIT SPECIFICATIONS

SHEET 9 OF 9

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	42

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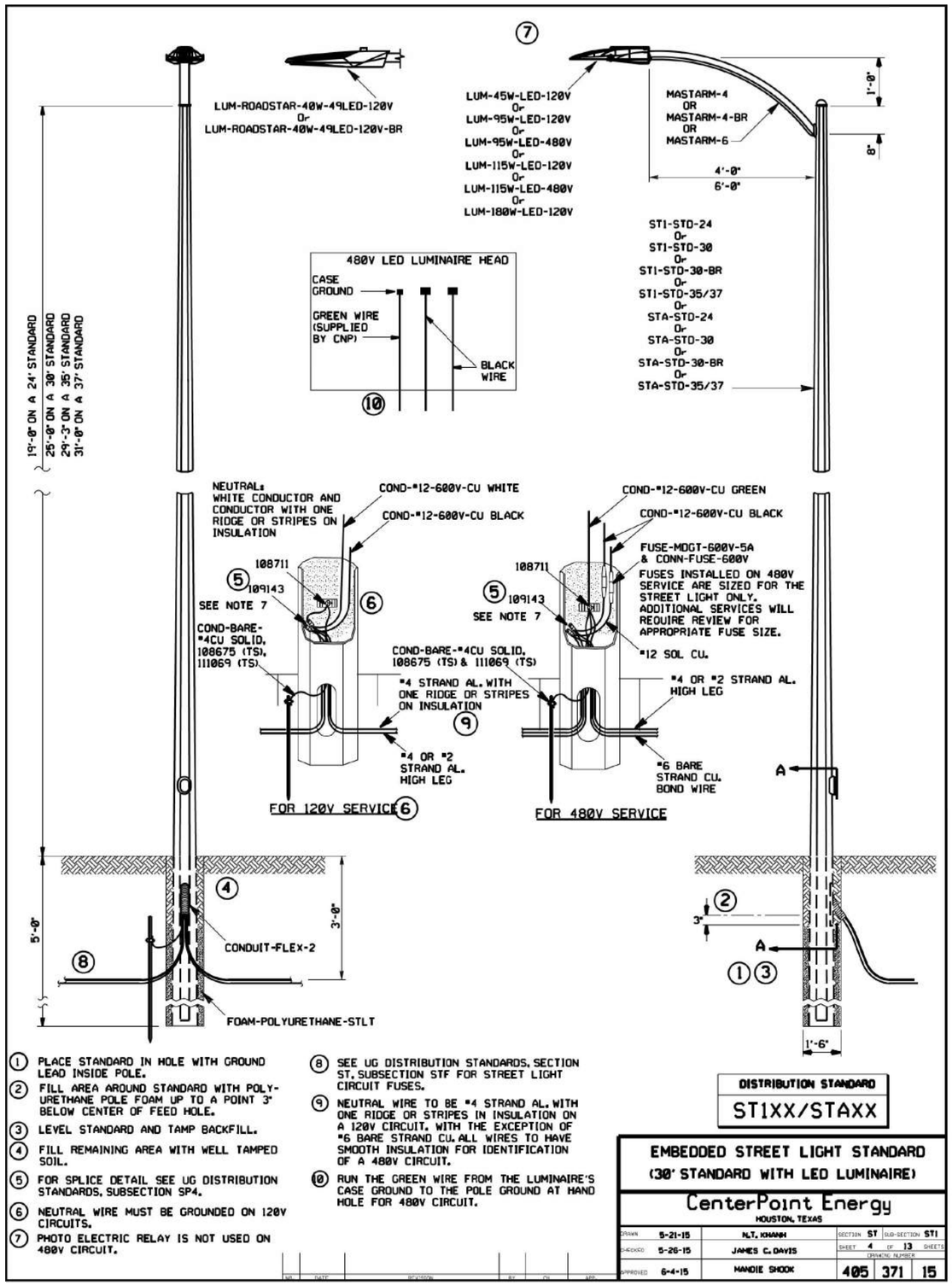

① PLACE STANDARD IN HOLE WITH GROUND LEAD INSIDE POLE.

② FILL AREA AROUND STANDARD WITH POLY-URETHANE POLE FOAM UP TO A POINT 3" BELOW CENTER OF FEED HOLE.

③ LEVEL STANDARD AND TAMP BACKFILL.

④ FILL REMAINING AREA WITH WELL TAMPED SOIL.

⑤ FOR SPLICE DETAIL SEE UG DISTRIBUTION STANDARDS, SUBSECTION SP4.

⑥ NEUTRAL WIRE MUST BE GROUNDED ON 120V CIRCUITS.

⑦ PHOTO ELECTRIC RELAY IS NOT USED ON 480V CIRCUIT.

⑧ SEE UG DISTRIBUTION STANDARDS, SECTION ST, SUBSECTION STF FOR STREET LIGHT CIRCUIT FUSES.

⑨ NEUTRAL WIRE TO BE #4 STRAND AL. WITH ONE RIDGE OR STRIPES IN INSULATION ON A 120V CIRCUIT. WITH THE EXCEPTION OF #6 BARE STRAND CU. ALL WIRES TO HAVE SMOOTH INSULATION FOR IDENTIFICATION OF A 480V CIRCUIT.

⑩ RUN THE GREEN WIRE FROM THE LUMINAIRE'S CASE GROUND TO THE POLE GROUND AT HAND HOLE FOR 480V CIRCUIT.

NO.	DATE	DESCRIPTION	BY	CH.	APP.

DISTRIBUTION STANDARD

ST1XX/STAXX

EMBEDDED STREET LIGHT STANDARD
(30' STANDARD WITH LED LUMINAIRE)

CenterPoint Energy
HOUSTON, TEXAS

DRAWN	5-21-15	N.T. KHANH	SECTION ST	SUB-SECTION ST1
CHECKED	5-26-15	JAMES C. DAVIS	SHEET 4 OF 13 SHEETS	
APPROVED	6-4-15	MANDIE SHOOK	DRAWING NUMBER 405 371 15	

STATE OF TEXAS
DAVID G. GREANEY
125563
LICENSED
PROFESSIONAL ENGINEER

06/08/2022 Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

Gauge ENGINEERING
11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

CENTERPOINT EMBEDDED STREET LIGHT STANDARD

SHEET 1 OF 1

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1902 (308) MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	386	43

SUMMARY OF DEMOLITION QUANTITIES

ITEM			0100	0104							0496			
DESC. CODE			6002	6001	6011	6017	6029	6036	6040	6067	6002	6003	6007	6099
DEMOLITION PLAN SHEETS	STA	STA	PREPARING ROW	REMOVING CONC (PAV)	REMOVING CONC (MEDIANS)	REMOVING CONC (DRIVEWAYS)	REMOVING CONC (CURB OR CURB & GUTTER)	REMOVING CONC (SIDEWALK OR RAMP)	REMOVING CONC (PAVERS)	REMOVING CONC (SAWCUT)	REMOVE STR (INLET)	REMOVE STR (MANHOLE)	REMOVE STR (PIPE)	REMOVE STR (RAIL)
			STA	SY	SY	SY	LF	SY	SY	LF	EA	EA	LF	LF
	NAVIGATION BLVD													
SHEET 1 OF 3	BEGIN	7+50	8	4647	397	31	2015	493	9	46	2	2	613	0
SHEET 2 OF 3	7+50	END	4	1283	0	21	479	48	0	706	2	0	79	20
SHEET 3 OF 3	BEGIN	END	7	2498	0	150	1217	363	0	535	1	1	34	0
TOTAL			19	8429	397	202	3711	905	9	1287	5	3	726	20

REV. NO.	DATE	DESCRIPTION	BY

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Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

SUMMARY OF DEMOLITION QUANTITIES

SHEET 1 OF 1

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	44

SUMMARY OF TRAFFIC CONTROL QUANTITIES

ITEM	0400	0500	0502	0508	0512	0512	0512	0512	0512	0512	0512	0662	0662	0662	0662	0662	0662	0662	0662	6001	6185	6185
DESC. CODE	6006	6001	6001	6001	6009	6010	6033	6034	6057	6058	6080	6057	6059	6080	6081	6048	6050	6075	6088	6001	6002	6003
TCP PLAN SHEETS	CUT & RESTORING PAV	MOBILIZATION	BARRICADES, SIGNS AND TRAFFIC HANDLING	CONSTRUCTION DETOURS	PORT CTB (FUR & INST) (LOW PROF) (TY 1)	PORT CTB (FUR & INST) (LOW PROF) (TY 2)	PORT CTB (MOVE) (LOW PROF) (TY 1)	PORT CTB (MOVE) (LOW PROF) (TY 2)	PORT CTB (REMOVE) (LOW PROF) (TY 1)	PORT CTB (REMOVE) (LOW PROF) (TY 2)	PORT CTB CONNECT HARDWARE	WK ZN PAV MRK REMOV (TRAF BTN) TY W	WK ZN PAV MRK REMOV (TRAF BTN) TY Y	WK ZN PAV MRK REMOV (W) (ARROW)	WK ZN PAV MRK REMOV (W) (DBL ARROW)	WK ZN PAV MRK REMOV (REFL) TY I-C	WK ZN PAV MRK REMOV (REFL) TY II-A-A	WK ZN PAV MRK REMOV (W) 24" (SLD)	WK ZN PAV MRK REMOV (W) (TPL ARROW)	PORTABLE CHANGEABLE MESSAGE SIGN	TMA (STATIONARY)	TMA (MOBILE OPERATION)
	SY	LS	MO	SY	LF	LF	LF	LF	LF	LF	EA	LF	LF	EA	EA	EA	EA	LF	EA	DAY	DAY	HR
PHASES 1																						
1 of 1	2087			1924																		
SUBTOTAL	2087																					
PHASE 2																						
STEP 1 - 1 of 1	0076				40	20			40	20	6	140				7						
STEP 2 - 1 of 2					360	60	40	20	360	60	42	1901	2223	4		179	28	41	1			
STEP 3 - 2 of 2							60	20				155	1455	1		81		71	1			
SUBTOTAL	0076				400	80	100	40	400	80	48	2196	3678	5		267	28	112	2			
PHASE 3																						
STEP 1 - 1 of 1												930	866	2	2	84	6	36	1			
STEP 2 - 2 of 2												199	666	3	1	41	3	63				
SUBTOTAL												1129	1532	5	3	125	9	99	1			
PHASE 4																						
1 of 1							240	20				909	1875	3		122	18	55	1			
SUBTOTAL							240	20				909	1875	3		122	18	55	1			
PHASE 5																						
1 of 1												500	1442	3	1	78	20	24				
SUBTOTAL												500	1442	3	1	78	20	24				
PHASE 6																						
1 of 1																						
SUBTOTAL																						
TOTAL	2,163	1	10	1,924	400	80	340	60	400	80	48	4,734	8,527	16	4	592	75	290	4	1,080	40	40

REV. NO.	DATE	DESCRIPTION	BY

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NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

SUMMARY OF TRAFFIC CONTROL PLAN QUANTITIES

SHEET 1 OF 1

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	45

SUMMARY OF TEMPORARY TRAFFIC SIGNAL AT NAVIGATION/RUNNELS/S. JENSEN

TXDOT SPEC		Description	Units	Quantity
680	6004	REMOVING TRAFFIC SIGNALS	EA	1
681	6001	TEMP TRAF SIGNALS	EA	1
	**	TRAY CABLE (4 CONDR) (12 AWG)	LF	1770
	**	TRF SIG CBL (TY A)(12 AWG)(7 CONDR)	LF	3110
	**	ZINC-COATED STEEL WIRE STRAND (5/16 IN)	LF	1650
	**	ZINC-COATED STEEL WIRE STRAND (1/4 IN, Horizontal)	LF	980
	**	CONDT (PVC) (SCH 80) (3")	LF	160
	**	ELEC CONDR (NO.8) BARE	LF	160
	**	GROUND BOX TY D	EA	3
	**	LED RDWY LUMINAIRE AND ARM	EA	6
	**	VEH SIG SEC (12")LED(GRN)	EA	8
	**	VEH SIG SEC (12")LED(GRN ARW)	EA	2
	**	VEH SIG SEC (12")LED(YEL)	EA	8
	**	VEH SIG SEC (12")LED(YEL ARW)	EA	2
	**	VEH SIG SEC (12")LED(RED)	EA	8
	**	VEH SIG SEC (12")LED(RED ARW)	EA	4
	**	BACK PLATE (12")(3 SEC)(VENTED)ALUM	EA	10
	**	45' TREATED TIMBER POLES ANSI CLASS 2	EA	5
	**	45' TREATED TIMBER POLES ANSI CLASS H1	EA	1
6306	6001	VIVDS PROSR SYS	EA	1

** SUBSIDIARY ITEMS

- ITEM 680 REMOVE TRAFFIC SIGNALS SHALL INCLUDE REMOVAL OF EXISTING GROUND BOXES. SEE MORE DETAILS FROM TXDOT SPEC 680

NOTE:

QUANTITIES ARE FOR CONTRACTOR'S INFORMATION ONLY. THE CONTRACTOR IS RESPONSIBLE FOR FURNISHING AND INSTALLING ALL MATERIALS AND LABOR TO COMPLETE THIS SIGNAL SYSTEM AS PER THE PLANS AND SPECIFICATIONS.

REV. NO.	DATE	DESCRIPTION	BY

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NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

QUANTITY SUMMARY

TEMPORARY TRAFFIC SIGNAL LAYOUT

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	46

SUMMARY OF ROADWAY QUANTITIES

ITEM			0110	0132	0260				0275		0354	0360			0420	0479	0528
DESC. CODE			6001	6005	6012	6073	6079	6001	6010	6019	6041	6028	6050	6086	6062	6001	6013
ROADWAY IMPROVEMENTS PLAN & PROFILE SHEETS	STA	STA	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL) (ORD COMP) (TY C)	LIME (HYD, COM OR QK) (SLRY) OR QK (DRY)	LIME TRT (SUBGRADE) (8")	LIME TRT (SUBGRADE) (6")	CEMENT	CEMENT TRT (SUBGRADE) (8")	CEMENT TRT (SUBGRADE) (6")	PLANE ASPH CONC PAV (1.5")	CONC PAV (JOINT REINF) (6")	CONC PAV (CONT REINF) (FAST TRK) (11")	CONC PAV (JOINT REINF) (11")	CL C CONC (RETAINING WALL)	ADJUSTING MANHOLES	COLORED TEXTURED CONC (6"-17")
			CY	CY	TON	SY	SY	SY	SY	SY	SY	SY	SY	SY	CY	EA	SY
NAVIGATION BLVD																	
SHEET 1 OF 5	BEGIN	4+50	0	0	20	815	304	0	0	0	0	228	0	634	4	0	11
SHEET 2 OF 5	4+50	7+00	0	0	65	3196	484	0	0	0	0	341	37	2357	5	4	566
SHEET 3 OF 5	7+00	END	0	0	33	1634	176	27	1634	176	218	145	85	1181	0	1	0
SHEET 4 OF 5	BEGIN	8+00	0	0	30	1245	482	0	0	0	0	370	100	986	6	0	0
SHEET 5 OF 5	8+00	END	0	0	39	1675	522	0	0	0	166	405	120	1194	1	0	0
TOTAL			9,228	261	187	8,566	1,969	27	1,634	176	384	1489	341	6352	16	5	576

SUMMARY OF ROADWAY QUANTITIES

ITEM			0529				0530	0531				0536	0618	3076	
DESC. CODE			6001	6008	6011	6045	6025	6004	6010	6016	6048	6002	6053	6035	6066
ROADWAY IMPROVEMENTS PLAN & PROFILE SHEETS	STA	STA	CONC CURB (TY I)	CONC CURB & GUTTER (TY II)	CONC CURB (DOWEL)	CONC CURB (DOWEL) (9")	DRIVEWAYS (CONC) (FAST TRK)	CURB RAMPS (TY 1)	CURB RAMPS (TY 7)	CURB RAMPS (TY 21)	CONC SIDEWALKS (9")	CONC MEDIAN	CONDT (PVC) (SCH 80) (3")	D-GR HMA (SQ) TY-D PG64-22	TACK COAT
			LF	LF	LF	LF	SY	EA	EA	EA	SY	SY	LF	TON	GAL
NAVIGATION BLVD															
SHEET 1 OF 5	BEGIN	4+50	17	0	510	0	0	2	2	1	0	2	0	0	0
SHEET 2 OF 5	4+50	7+00	383	0	885	0	34	6	0	2	0	0	98	0	0
SHEET 3 OF 5	7+00	END	0	21	564	0	78	0	2	0	0	0	0	51	62
SHEET 4 OF 5	BEGIN	8+00	0	0	802	28	75	0	1	0	13	2	0	0	0
SHEET 5 OF 5	8+00	END	0	0	780	0	50	2	1	1	0	0	0	22	26
TOTAL			400	21	3,541	28	236	10	6	4	13	4	98	73	87

REV. NO.	DATE	DESCRIPTION	BY

Gauge ENGINEERING
11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

SUMMARY OF ROADWAY QUANTITIES

SHEET 1 OF 1

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	47

SUMMARY OF DRAINAGE QUANTITIES

ITEM					0400				0402	0420	0462		0464			0465							
DESC. CODE					6002	6003	6005	6009	6001	6009	6006	6099	6005	6032	6033	6173	6175	6176	6259	6002	6004	6177
P&P SHEET NUMBER			STA	STA	STRUCT EXCAV (BOX)*	STRUCT EXCAV (PIPE)*	CEM STABIL BKFL	CEMENT STAB BACKFILL (INLET OR MH)	TRENCH EXCAVATION PROTECTION	CL A CONC (COLLAR)	CONC BOX CULV (5 FT X 2 FT)	CONC BOX CULV (6 FT X 2 FT)	RC PIPE (CL III)(24 IN)	RC PIPE (ARCH)(CL III)(DES 3)	RC PIPE (ARCH)(CL III)(DES 4)	MANH (COMPL)(TY A)	INLET (COMPL)(CUR B)(TY C)	INLET (COMPL)(CUR B)(TY C1)	INLET (COMPL)(EXT TY C)	MANH (COMPL)(PR M)(48IN)	MANH (COMPL)(PRM)(72IN)	INLET (COMPL) (AZ2G)
					CY	CY	CY	CY	LF	EA	LF	LF	LF	LF	LF	EA	EA	EA	EA	EA	EA	EA
NAVIGATION BLVD																						
1 & 2	OF	10	BEGIN	4+50	0	288	120	50	249	0	0	0	249	0	0	0	4	0	2	0	0	0
3 & 4	OF	10	4+50	7+00	0	488	203	58	412	0	0	0	364	0	48	2	3	0	1	0	0	1
5 & 6	OF	10	7+00	END	1,526	223	368	70	600	2	400	12	112	53	23	0	3	0	2	1	1	1
7 & 8	OF	10	BEGIN	8+00	0	406	168	66	351	0	0	0	351	0	0	2	3	1	2	0	0	0
9 & 10	OF	10	8+00	END	0	534	221	50	462	0	0	0	462	0	0	2	4	0	0	0	0	0
TOTAL					1,526	1,939	1,080	294	2,074	2	400	12	1,538	53	71	6	17	1	7	1	1	2

NOTE: QUANTITIES MARKED WITH "*" ARE FOR CONTRACTOR INFORMATION ONLY. COST IS INCIDENTAL TO STORM SEWERS.

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NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

SUMMARY OF DRAINAGE QUANTITIES

SHEET 1 OF 1

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	48

SUMMARY OF WATER LINE QUANTITIES																
ITEM			0402	7049												
DESC. CODE			6001	6158	6020	6021	6382	6052	6104	6119	6126	6127	6129	6097	6139	6140	6142
WATER LINE PLAN SHEETS	STA	STA	TRENCH EXCAVATION PROTECTION	WTR MAIN PIPE (PVC) (RESTRAINED JT) 6IN	WTR MAIN PIPE (PVC) (RESTRAINED JT) 8IN	WTR MAIN PIPE (PVC) (RESTRAINED JT) 12IN	JK TN BR AG WTR MN (PVC) (8 IN) (RESTR JNT)	FIRE HYDRANT BRANCH (LEAD) (6IN)	FIRE HYDRANT ASSEMBLY	REMOVING AND SALVAGING FIRE HYDRANT	CUT AND PLUG WATER MAIN (6IN)	CUT AND PLUG WATER MAIN (8IN)	CUT AND PLUG WATER MAIN (12IN)	TAPPING SLEEVE AND VALVE (24IN X 8 IN)	WET CONNECTION (6IN)	WET CONNECTION (8IN)	WET CONNECTION (12IN)
			LF	LF	LF	LF	LF	LF	EA	EA	EA	EA	EA	EA	EA	EA	EA
SHEET 1 OF 3	2+00	6+00	243	6	228	6	160	9	1	9	1	1	1	1	1	1	1
SHEET 2 OF 3	6+00	9+00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SHEET 3 OF 3	6+00	9+00	131	0	76	47	80	8	1	1	1	4	1	1	1	1	1
CSJ 0912-72-648 TOTAL			374	6	304	53	240	17	2	10	2	5	2	2	2	2	2

SUMMARY OF SANITARY SEWER QUANTITIES					
ITEM			7017		
DESC. CODE			6041	6042	6199
SANITARY SEWER PLAN SHEETS	STA	STA	CASING (STEEL) (SANITARY SEWER) (12 IN)	CASING (STEEL) (SANITARY SEWER) (16 IN)	CASING (STEEL) (SAN SEWER) (36IN)
			LF	LF	LF
SHEET 1 OF 4	2+00	6+00	30	14	0
SHEET 3 OF 4	6+00	9+00	70	0	0
SHEET 4 OF 4	9+00	12+00	10	0	16
CSJ 0912-72-648 TOTAL			110	14	16

REV. NO.	DATE	DESCRIPTION	BY

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NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

SUMMARY OF WATER LINE AND SANITARY SEWER QUANTITIES

SHEET 1 OF 1

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	49

SUMMARY OF PAVEMENT MARKINGS

ITEM	6038							0666							0668	
DESC. CODE	6005	6006	6004	6009	6007	6013	6017	6306	6309	6321	6036	6138	6048	6077	6078
PAVEMENT MARKING SHEETS	MULTIPOLYER PAV MRK (W) 6" (BRK)	MULTIPOLYER PAV MRK (W) 6" (DOT)	MULTIPOLYER PAV MRK (W) 6" (SLD)	MULTIPOLYER PAV MRK (W) 8" (DOT)	MULTIPOLYER PAV MRK (W) 8" (SLD)	MULTIPOLYER PAV MRK (W) 24" (SLD)	MULTIPOLYER PAV MRK (Y) 6" (SLD)	RE PM W/RET REQ TY I (W)6"(BRK)(100MIL)	RE PM W/RET REQ TY I (W) 6" (SLD)(100MIL)	RE PM W/RET REQ TY I (Y) 6" (SLD)(100MIL)	REFL PAV MARK TY I (W) 8" (SLD) (100MIL)	REFL PAV MARK TY I (Y) 8" (SLD) (100 MIL)	REFL PAV MARK TY I (W) 24" (SLD) (100MIL)	PREFAB PAV MRK TY C (W)(ARROW)	PREFAB PAV MRK TY C (W)(DBL ARROW)
	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	EA	EA
SHEET 1 OF 4	0	60	702	82	0	350	718	0	0	0	0	0	0	4	8
SHEET 2 OF 4	2	0	199	0	54	0	501	138	286	192	48	48	490	1	0
SHEET 3 OF 4	0	0	0	0	0	0	0	20	174	0	41	0	0	1	0
SHEET 4 OF 4	110	0	182	0	0	0	618	80	200	0	0	0	0	0	0
TOTAL	112	60	1,083	82	54	350	1,837	238	660	192	89	48	490	6	8

SUMMARY OF PAVEMENT MARKINGS

ITEM	0668					0672	0677	678								
DESC. CODE	6079	6085	6091	6096	6128	6007	6001	6002	6004	6008	6009	6010	6011	6016	6022	6028
PAVEMENT MARKING SHEETS	PREFAB PAV MRK TY C (W)(TPL ARROW)	PREFAB PAV MRK TY C (W)(WORD)	PREFAB PAV MRK TY C (W) (18")(YLD TRI)	PREFAB PAV MRK TY C (W)(BIKE SYMBOL)	PREFAB PAV MRK TY C (GRN)(SLD)(BLOCK)	REFL PAV MRKR TY I-C	ELIM EXT PAV MRK & MRKS (4")	PAV SURF PREP FOR MRK (6")	PAV SURF PREP FOR MRK (8")	PAV SURF PREP FOR MRK (24")	PAV SURF PREP FOR MRK (ARROW)	PAV SURF PREP FOR MRK (DBL ARROW)	PAV SURF PREP FOR MRK (TPL ARROW)	PAV SURF PREP FOR MRK (WORD)	PAV SURF PREP FOR MRK (18")(YLD TRI)	PAV SURF PREP FOR MRK (BIKE SYMBOL)
	EA	EA	EA	EA	SF	LF	LF	LF	LF	LF	EA	EA	EA	EA	EA	EA
SHEET 1 OF 4	2	1	53	0	276	0	0	1480	82	626	4	8	2	1	53	0
SHEET 2 OF 4	1	1	0	3	469	16	147	1318	150	959	1	0	1	1	0	3
SHEET 3 OF 4	0	1	0	0	0	2	62	194	41	0	1	0	0	1	0	0
SHEET 4 OF 4	0	0	0	2	258	23	203	1190	0	258	0	0	0	0	0	2
TOTAL	3	3	53	5	1,003	41	412	4,182	273	1,843	6	8	3	3	53	5

REV. NO.	DATE	DESCRIPTION	BY

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NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

SUMMARY OF PAVEMENT MARKING QUANTITIES

SHEET 1 OF 1

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	50

SUMMARY OF SMALL SIGNS

LAYOUT SHEET NO.	SIGN NO.	SIGN TYPE	SIGN TEXT	SIGN DIMENSIONS (IN)	PLYWOOD SIGNS	ALUMINUM SIGNS TYPE A	644 - INS SM RD SN SUP & AM TYPE OF MOUNT																		
							6001 10BWG (1) SA (P) EA	6002 10BWG (1) SA (P-BM) EA	6004 10BWG (1) SA (T) EA	6005 10BWG (1) SA (T-2EXT) EA	6007 10BWG (1) SA (U) EA	6017 10BWG (2) SA (P) EA	6019 10BWG (2) SA (T-2EXT) EA	6027 S80 (1) SA (P) EA	6040 S80 (1) SA (P-BM) EA	6030 S80 (1) SA (T) EA	6031 S80 (1) SA (T-2EXT) EA	6033 S80 (1) SA (U) EA	6034 S80 (1) SA (U-1EXT) EA	6035 S80 (1) SA (U-2EXT) EA	6036 S80 (1) SA (U-BM) EA	6037 S80 (1) SA (U-WC) EA	6050 S80 (2) SA (P) EA	6052 S80 (2) SA (T-2EXT) EA
1 OF 4	1	W11-15	BICYCLE/PEDESTRIAN	36"X36"		X	X																		
		W16-7PL	DIRECTIONAL ARROW	24"X12"		X																			
	2	D3-1G	RUNNELS ST	VARIESX12"		X			X																
	3	R1-2	YIELD	36"X36"X36"		X	X																		
	4	R1-2	YIELD	36"X36"X36"		X	X																		
	5	W11-15	BICYCLE/PEDESTRIAN	36"X36"		X	X																		
		W16-7PL	DIRECTIONAL ARROW	24"X12"		X	X																		
	6	S5-1	SCHOOL	24"X48"			SALVAGE EXISTING																		
			SPEED LIMIT 20 WHEN FLASHING				SALVAGE EXISTING																		
	7	W11-15	BICYCLE/PEDESTRIAN	36"X36"		X	X																		
		W16-7PR	DIRECTIONAL ARROW	24"X12"		X																			
	8	D11-1	BIKE ROUTE	24"X18"		X	X																		
		M6-1G	DIRECTIONAL ARROW	12"X9"		X																			
	9	S5-1	SCHOOL	24"X48"			SALVAGE EXISTING																		
			SPEED LIMIT 20 WHEN FLASHING				SALVAGE EXISTING																		
	10	M4-5B	TO	24"X12"		X									X										
		M1-1T	INTERSTATE TEXAS 10	24"X24"		X																			
		M3-1	NORTH	24"X12"		X																			
		M1-4	59	24"X24"		X																			
		M6-2R	DIRECTIONAL ARROW	21"X15"		X																			
		D3-1G	S JENSEN DR	VARIESX12"		X																			
	11	R1-2	YIELD	36"X36"X36"		X	X																		
	12	W11-15	BICYCLE/PEDESTRIAN	36"X36"		X	X																		
		W16-7PL	DIRECTIONAL ARROW	24"X12"		X																			
	13	R1-2	YIELD	36"X36"X36"		X	X																		
	14	W11-15	BICYCLE/PEDESTRIAN	36"X36"		X	X																		
		W16-7PL	DIRECTIONAL ARROW	24"X12"		X																			
	15	D3-1G	NAVIGATION BLVD	VARIESX12"		X			X																
	16	R1-2	YIELD	36"X36"X36"		X	X																		
	17	R1-2	YIELD	36"X36"X36"		X	X																		
	18	W11-15	BICYCLE/PEDESTRIAN	36"X36"		X	X																		
		W16-7PR	DIRECTIONAL ARROW	24"X12"		X																			
	19	W11-15	BICYCLE/PEDESTRIAN	36"X36"		X	X																		
		W16-7PR	DIRECTIONAL ARROW	24"X12"		X																			
	20	D3-1G	NAVIGATION BLVD	VARIESX12"		X			X																
	21	R1-2	YIELD	36"X36"X36"		X	X																		
	22	W11-15	BICYCLE/PEDESTRIAN	36"X36"		X	X																		
		W16-7PL	DIRECTIONAL ARROW	24"X12"		X																			
	23	R1-2	YIELD	36"X36"X36"		X	X																		
	24	R6-4a	3 CHEVRONS	48"X24"		X					X														
	25	R6-4a	3 CHEVRONS	48"X24"		X					X														
	26	R6-4a	3 CHEVRONS	48"X24"		X					X														
	27	R6-4a	3 CHEVRONS	48"X24"		X					X														
	27A	D11-1	BIKE ROUTE	24"X18"		X	X																		
		M6-1G	DIRECTIONAL ARROW	12"X9"		X																			
	27B	D11-1	BIKE ROUTE	24"X18"		X	X																		
		M6-1G	DIRECTIONAL ARROW	12"X9"		X																			
	27C	D11-1	BIKE ROUTE	24"X18"		X	X																		
		M6-6GL	DIRECTIONAL ARROW	12"X9"		X																			
	27D	D11-1	BIKE ROUTE	24"X18"		X	X																		
		M6-4G	DIRECTIONAL ARROW	12"X9"		X																			
	27E	D11-1	BIKE ROUTE	24"X18"		X	X																		
		M6-4G	DIRECTIONAL ARROW	12"X9"		X																			
2 OF 4	28	R8-3aTL	NO PARKING	24"X30"		X	X																		
	28A	D11-1	BIKE ROUTE	24"X18"		X	X																		
		M6-2GL	DIRECTIONAL ARROW	12"X9"		X																			
	29	W11-1	BICYCLE	30"X30"		X	X																		
		W16-1P	SHARE THE ROAD	18"X24"		X																			
	30	D11-1	BIKE ROUTE	24"X18"		X	X																		
		M6-2GR	DIRECTIONAL ARROW	12"X9"		X																			
	31	W2-6	CIRCULAR INTERSECTION	36"X36"		X	X																		
		W13-1P	25 MPH	18"X18"		X																			
	32	CUSTOM	DIRECTIONAL ARROWS	42"X36"		X	X																		
	33	D11-1	BIKE ROUTE	24"X18"		X	X																		
		M6-2GR	DIRECTIONAL ARROW	12"X9"		X																			
	34	W11-1	BICYCLE	30"X30"		X	X																		
		W16-1P	SHARE THE ROAD	18"X24"		X																			
	34A	D11-1	BIKE ROUTE	24"X18"		X	X																		
		M6-2GL	DIRECTIONAL ARROW	12"X9"		X																			
	35	W2-6	CIRCULAR INTERSECTION	36"X36"		X	X																		
		W13-1P	25 MPH	18"X18"		X																			
3 OF 4	36	R3-5R	RIGHT TURN ONLY	30"X36"		X	X																		
4 OF 4	37	D11-1	BIKE ROUTE	24"X18"		X	X																		
		M6-2GL	DIRECTIONAL ARROW	12"X9"		X																			
	38	W2-6	CIRCULAR INTERSECTION	36"X36"		X	X																		
		W13-1P	25 MPH	18"X18"		X																			
	39	D11-1	BIKE ROUTE	24"X18"		X	X																		
		M6-2GR	DIRECTIONAL ARROW	12"X9"		X																			
	40	S5-1	SCHOOL	24"X48"		X	X																		
			SPEED LIMIT 20 WHEN FLASHING																						
	41	W2-6	CIRCULAR INTERSECTION	36"X36"		X	X																		
		W13-1P	25 MPH	18"X18"		X																			
	42	D11-1	BIKE ROUTE	24"X18"		X	X																		
		M6-3G	DIRECTIONAL ARROW	12"X9"		X																			
			TOTAL			408	40	0	3		4				1										

GENERAL NOTES:

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

ALUMINUM SIGN BLANKS(TY A)

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

SHEET X OF X

SUMMARY OF SMALL SIGNS

DISTRICT	COUNTY	CONTROL	SECTION	JOB	SHEET
HOU	HARRIS	0912	72	386	GS

FEDERAL REGION 6 | PROJECT NO. STP 1902 (308) | MM 51

STD-N29

Plotted on: $DATE$ $TIME$ $USER$

SUMMARY OF SMALL SIGN QUANTITIES					
ITEM	0636	0644			
DESC. CODE	6001	6001	6004	6007	6040
SIGNING SHEETS	ALUMINUM SIGNS (TY A)	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	IN SM RD SN SUP&AM TY10BWG(1)SA(U)	IN SM RD SN SUP&AM TYS80(1)SB(P-BM)
	SF	EA	EA	EA	EA
SHEET 1 OF 4	268	23	3	4	1
SHEET 2 OF 4	89	10	0	0	0
SHEET 3 OF 4	2	1	0	0	0
SHEET 4 OF 4	49	6	0	0	0
TOTAL	408	40	3	4	1

REV. NO.	DATE	DESCRIPTION	BY

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www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

SUMMARY OF SMALL SIGN QUANTITIES

SHEET 1 OF 1

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	51A

Pen Table:$PENTBLS$
Plot Driver:$PLTDRVL$

Design Filename: $FILEL$

SUMMARY OF ILLUMINATION QUANTITIES			
ITEM			0618
DESC. CODE			6047
ILLUMINATION PLAN SHEETS	STA	STA	CONDT (PVC) (SCH 80) (2") (BORE)
			LF
	NAVIGATION BLVD		
SHEET 1 OF 3	4+00	7+50	602
SHEET 2 OF 3	BEGIN, 4+00	7+50, END	0
SHEET 3 OF 3	BEGIN, 7+00	9+40, END	215
TOTAL			817

REV. NO.	DATE	DESCRIPTION	BY

Gauge ENGINEERING
11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

SUMMARY OF ILLUMINATION QUANTITIES

SHEET 1 OF 1

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	52

Pen Table:ROUNDABOUT - Copy.txt
Plot Driver:P:\East End\1035-Nav-Roundabout\4-0-Production-Working\4-1-CAD\Resource\Plot Files\ROUNDABOUT.pltcfg
Plotted on: 6/20/2022 4:28:10 PM amendoza
Design Filename: P:\East End\1035-Nav-Roundabout\4-0-Production-Working\4-1-CAD\Quantity Summary\1035-ILLUM QTY.dgn

Plotted on: $DATE$ $TIME$ $USER$

SUMMARY OF LANDSCAPE AND IRRIGATION QUANTITIES

ITEM			0100	0161	0161	0162	0166	0168	0170	0192	0192	0193
DESC. CODE			6006	6009	6012	6002	6001	6001	6002	6027	6025	6001
			PREP ROW (TREE) (LESS THAN 24" DIA)	EROSION CONTROL COMPOST	GENERAL USE COMPOST	BLOCK SODDING	FERTILIZER	VEGETATIVE WATERING	IRRIGATION SYSTEM (TY I)	PLANT MATERIAL (100 GAL)(TREE)	PLANT MATERIAL (45 GAL)(TREE)	PLANT MAINTENANCE
			EA	CY	CY	SY	AC	MG	LS	EA	EA	MO
NAVIGATION BLVD												
L1.00 Tree Protection Plan			5									
L1.01 Tree Protection Plan			3									
L1.02 Tree Protection Plan												
L1.03 Tree Protection Plan			6									
L1.04 Tree Protection Plan			1									
L2.00 Planting Plan				2.7	1.3	1907	0.39	47.3		3	3	
L2.01 Planting Plan				2.7	1.3	432	0.09	10.7		2	4	
L2.02 Planting Plan				1.8	0.9	606	0.13	15.0			4	
L2.03 Planting Plan				4.9	2.4	941	0.19	23.3		11		
L2.04 Planting Plan				1.3	0.7	755	0.16	18.7		3		
TOTAL			15	13.4	6.6	4,641	0.96	115	1	19	11	3

SUMMARY OF LANDSCAPE AND IRRIGATION QUANTITIES

ITEM			0528	1002	1002	1004	1006	1006	1006	1006
DESC. CODE			6004	6001	6002	6001	6001	6002	6003	6004
			LANDSCAPE PAVERS	LANDSCAPE AMENITY	LANDSCAPE AMENITY (TY1)	TREE PROTECTION	LANDSCAPE SOIL AMENDMENT (TYPE I)	LANDSCAPE SOIL AMENDMENT (TYPE II)	LANDSCAPE SOIL AMENDMENT (TYPE III)	LANDSCAPE SOIL AMENDMENT (TYPE IV)
			SY	EA	EA	EA	SY	SY	SY	SY
NAVIGATION BLVD										
L1.00 Tree Protection Plan						11				
L1.01 Tree Protection Plan						4				
L1.02 Tree Protection Plan						12				
L1.03 Tree Protection Plan						2				
L1.04 Tree Protection Plan						10				
L2.00 Planting Plan			40	8	8		24	24	6	18
L2.01 Planting Plan							24	24	6	18
L2.02 Planting Plan			5	1	1		16	16	4	12
L2.03 Planting Plan							44	44	11	33
L2.04 Planting Plan							12	12	3	9
TOTAL			45	9	9	39	120	120	30	90

1 LANDSCAPE QUANTITIES

SCALE: NTS

Pen Table: $PENTBLS$
Plot Driver: $PLTDRVL$

ASAKURA ROBINSON
2500 Summer Street, Suite 3228
Houston Texas 77007
P: 713.337.5830
www.asakurarobinson.com

REV. NO.	DATE	DESCRIPTION	BY

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Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

Texas Department of Transportation

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

L0.01 – LANDSCAPE QUANTITIES

SHEET 1 OF 1

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	N/A	TEXAS	STP 1902 (308) MM			CS 1264957
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	53

Design Filename: $FILE$

SUMMARY OF SW3P QUANTITIES								
ITEM			0506					
DESC. CODE			6020	6024	6038	6039	6041	6043
STORMWATER POLLUTION PREVENTION PLAN SHEETS	STA	STA	CONSTRUCTION EXITS (INSTALL) (TY 1)	CONSTRUCTION EXITS (REMOVE)	TEMP SEDMT CONT FENCE (INSTALL)	TEMP SEDMT CONT FENCE (REMOVE)	BIODEG EROSN CONT LOGS (INSTL) (12")	BIODEG EROSN CONT LOGS (REMOVE)
			SY	SY	LF	LF	LF	LF
	NAVIGATION BLVD							
SHEET 1 OF 3	4+00	7+50	150	150	77	77	97	97
SHEET 2 OF 3	BEGIN, 4+00	7+50, END	150	150	88	88	63	63
SHEET 3 OF 3	BEGIN	END	150	150	48	48	91	91
TOTAL			450	450	213	213	251	251

REV. NO.	DATE	DESCRIPTION	BY

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NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

SUMMARY OF STORM WATER POLLUTION PREVENTION PLAN QUANTITIES

SHEET 1 OF 1

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	54

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Design Filename: P:\East End\1035-Nav-Roundabout\4-0-Production-Working\4-1-CAD\Quantity Summary\1035-SW3P QTY.dgn

TRAFFIC CONTROL NARRATIVE

PHASE 1 :

INSTALL TEMPORARY TRAFFIC SIGNAL. INSTALL PROPOSED WATER LINE. REMOVE MEDIANS, EXISTING TRAFFIC SIGNALS, AND ISLANDS AND INSTALL TEMPORARY ASPHALT. USE TYPICAL ONE LANE CLOSURE WITH FLAGGERS AS NEEDED.

PHASE 2 :

STEP 1: DETOUR NORTHBOUND AND SOUTHBOUND N ST CHARLES ST TO INSTALL THE PROPOSED STORM SEWER JUNCTION BOX, STORM SEWERS, AND PAVEMENT AT NAVIGATION BLVD - N ST CHARLES INTERSECTION.

STEP 2: REDUCE NAVIGATION WESTBOUND TRAFFIC LANES TO THE INNER LANE. MAINTAIN MIN 10 FT WIDE TRAFFIC LANE, INSTALL STORM SEWER AND PAVEMENT ALONG NAVIGATION BLVD. AND REDUCE NAVIGATION NORTHBOUND TRAFFIC LANES TO THE INNER LANE. INSTALL PROPOSED STORM SEWER, PAVEMENT, AND SIDEWALK ON THE NORTHEAST QUADRANT OF THE INNER SECTION. USE TEMP ASPHALT AS NEEDED FOR DRIVEWAY TO MAINTAIN ACCESS TO THE PROPERTIES DURING THE CONSTRUCTION.

STEP 3: SHIFT NAVIGATION WESTBOUND TRAFFIC TO THE OUTER NEWLY CONSTRUCTED LANE. INSTALL PROPOSED STORM SEWER AND PAVEMENT IN THE INNER LANE.

PHASE 3 :

STEP 1: THROUGH THE INTERSECTION, USE CAT-TRACKS TO SHIFT RUNNELS EASTBOUND TRAFFIC TO THE RECENTLY REMOVED MEDIAN OF NAVIGATION BLVD, ACHIEVE MIN 10 FT WIDE TRAFFIC LANES, REDUCE NORTHBOUND OF NAVIGATION BLVD TO ONE LANE AND SHIFT IT TO THE RECENTLY REMOVED MEDIAN. INSTALL PROPOSED STORM SEWER, PAVEMENT, AND SIDEWALK ON THE SOUTHEAST QUADRANT OF THE INTERSECTION. USE TEMP ASPHALT AS NEEDED FOR DRIVEWAYS TO MAINTAIN ACCESS TO THE PROPERTIES DURING CONSTRUCTION.

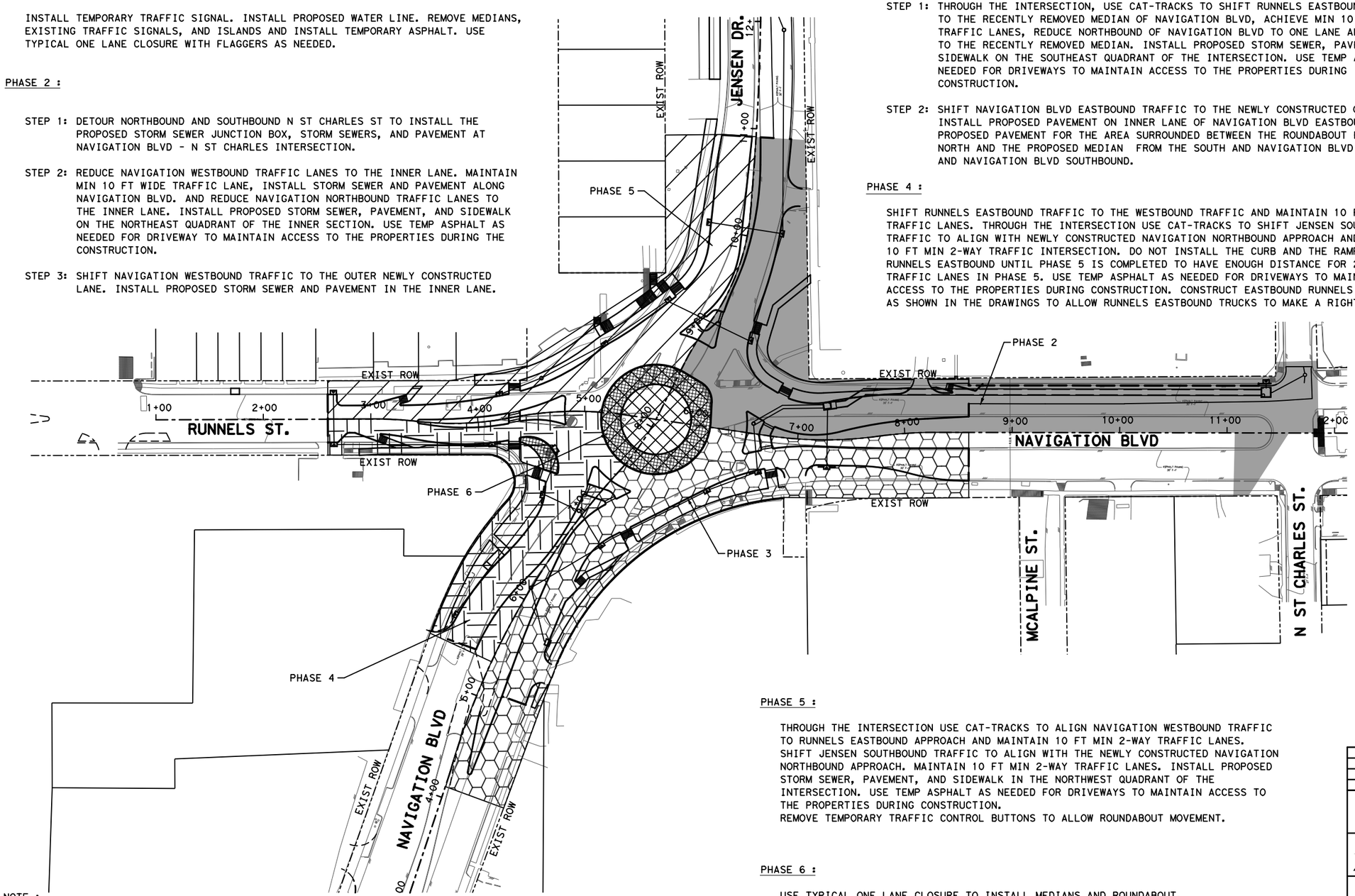
STEP 2: SHIFT NAVIGATION BLVD EASTBOUND TRAFFIC TO THE NEWLY CONSTRUCTED OUTER LANE. INSTALL PROPOSED PAVEMENT ON INNER LANE OF NAVIGATION BLVD EASTBOUND. INSTALL PROPOSED PAVEMENT FOR THE AREA SURROUNDED BETWEEN THE ROUNDABOUT FROM THE NORTH AND THE PROPOSED MEDIAN FROM THE SOUTH AND NAVIGATION BLVD NORTHBOUND AND NAVIGATION BLVD SOUTHBOUND.

PHASE 4 :

SHIFT RUNNELS EASTBOUND TRAFFIC TO THE WESTBOUND TRAFFIC AND MAINTAIN 10 FT MIN 2-WAY TRAFFIC LANES. THROUGH THE INTERSECTION USE CAT-TRACKS TO SHIFT JENSEN SOUTHBOUND TRAFFIC TO ALIGN WITH NEWLY CONSTRUCTED NAVIGATION NORTHBOUND APPROACH AND MAINTAIN 10 FT MIN 2-WAY TRAFFIC INTERSECTION. DO NOT INSTALL THE CURB AND THE RAMPS ON RUNNELS EASTBOUND UNTIL PHASE 5 IS COMPLETED TO HAVE ENOUGH DISTANCE FOR 2-WAY TRAFFIC LANES IN PHASE 5. USE TEMP ASPHALT AS NEEDED FOR DRIVEWAYS TO MAINTAIN ACCESS TO THE PROPERTIES DURING CONSTRUCTION. CONSTRUCT EASTBOUND RUNNELS IN 2 STEPS AS SHOWN IN THE DRAWINGS TO ALLOW RUNNELS EASTBOUND TRUCKS TO MAKE A RIGHT TURN.

LEGEND

- PHASE 2
- PHASE 3
- PHASE 4
- PHASE 5
- PHASE 6



PHASE 5 :

THROUGH THE INTERSECTION USE CAT-TRACKS TO ALIGN NAVIGATION WESTBOUND TRAFFIC TO RUNNELS EASTBOUND APPROACH AND MAINTAIN 10 FT MIN 2-WAY TRAFFIC LANES. SHIFT JENSEN SOUTHBOUND TRAFFIC TO ALIGN WITH THE NEWLY CONSTRUCTED NAVIGATION NORTHBOUND APPROACH. MAINTAIN 10 FT MIN 2-WAY TRAFFIC LANES. INSTALL PROPOSED STORM SEWER, PAVEMENT, AND SIDEWALK IN THE NORTHWEST QUADRANT OF THE INTERSECTION. USE TEMP ASPHALT AS NEEDED FOR DRIVEWAYS TO MAINTAIN ACCESS TO THE PROPERTIES DURING CONSTRUCTION.
REMOVE TEMPORARY TRAFFIC CONTROL BUTTONS TO ALLOW ROUNDABOUT MOVEMENT.

PHASE 6 :

USE TYPICAL ONE LANE CLOSURE TO INSTALL MEDIANS AND ROUNDABOUT.

NOTE :

1. TO ACCOUNT FOR THE DIFFERENCE IN PAVEMENT ELEVATIONS, CONTRACTOR SHALL USE TEMPORARY ASPHALT TO MAINTAIN A SMOOTH TRANSITION THROUGHOUT THE CONSTRUCTION DURATION.
2. TEMPORARY NO PARKING SIGN SHALL BE INSTALLED WITHIN THE BOUNDARIES OF THE WORK ZONE.
3. ADJUST TEMP. SIGNAL HEAD AS REQUIRED TO ALIGN WITH PHASING TRAVEL LANES.

0′ 100′ 200′
(IN FEET)
SCALE: PLAN 1"=100′

STATE OF TEXAS
KARAM M. QADDO
125611
LICENSED
PROFESSIONAL ENGINEER
06/08/2022

Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

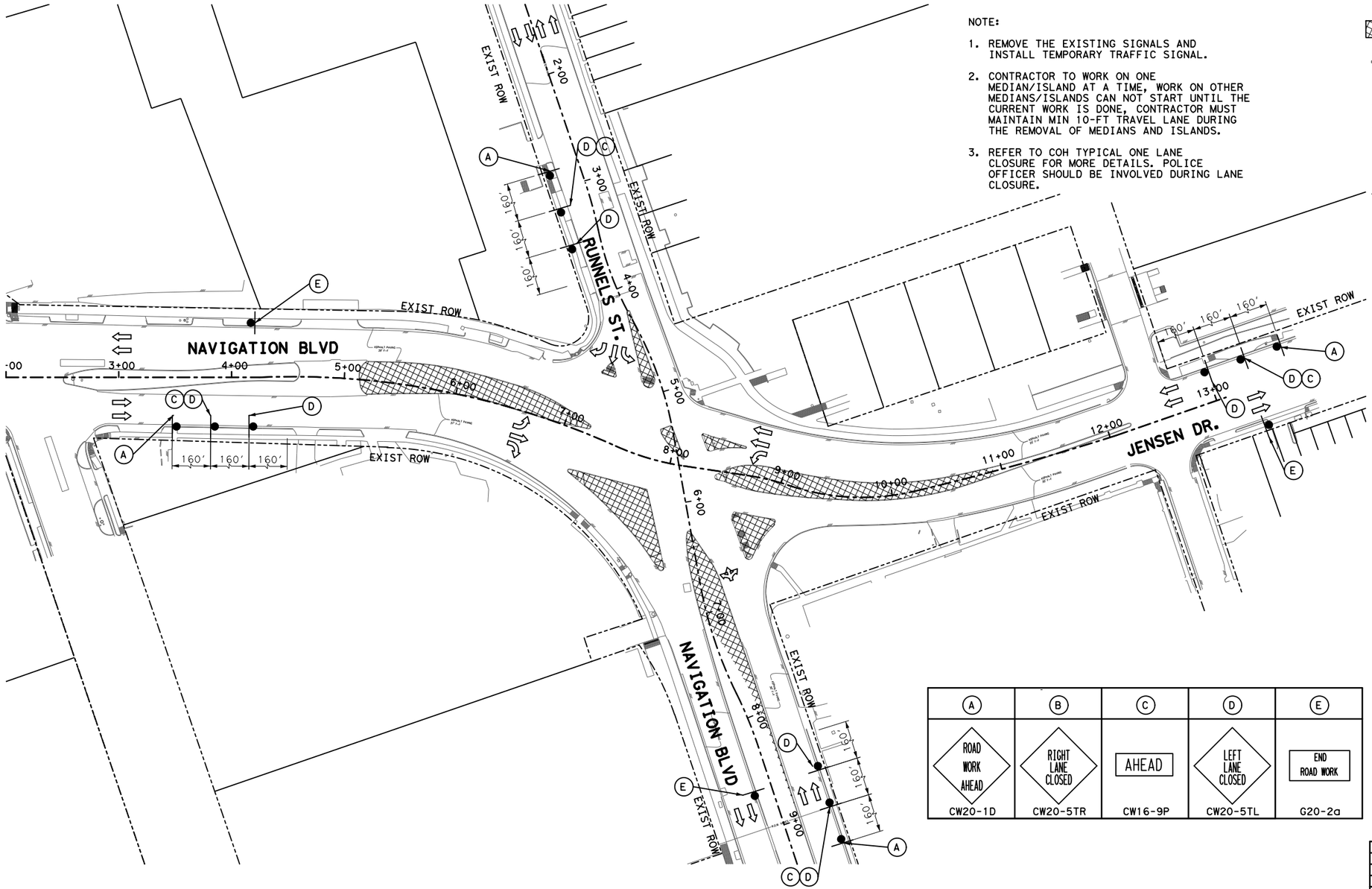
Gauge ENGINEERING
11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

SEQUENCE OF CONSTRUCTION AND NARRATIVE

SHEET 1 OF 1

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	55



NOTE:

1. REMOVE THE EXISTING SIGNALS AND INSTALL TEMPORARY TRAFFIC SIGNAL.
2. CONTRACTOR TO WORK ON ONE MEDIAN/ISLAND AT A TIME, WORK ON OTHER MEDIANS/ISLANDS CAN NOT START UNTIL THE CURRENT WORK IS DONE, CONTRACTOR MUST MAINTAIN MIN 10-FT TRAVEL LANE DURING THE REMOVAL OF MEDIANS AND ISLANDS.
3. REFER TO COH TYPICAL ONE LANE CLOSURE FOR MORE DETAILS. POLICE OFFICER SHOULD BE INVOLVED DURING LANE CLOSURE.

LEGEND

- PHASE 1 REMOVAL OF EXISTING MEDIAN AND TEMPORARY ASPHALT
- TY I WITH TY II END TREATMNET LPCB
- FLASHING ARROW BOARD
- DIRECTION OF TRAFFIC
- EXISTING DIRECTION OF TRAFFIC
- VERTICAL PANEL
- DRUM
- SIGNS
- TYPE III BARRICADE W/ROAD CLOSED SIGN
- (1) WRK ZN PAV MRK (REMOV) (TRAF BTN) TYP W
- (2) WRK ZN PAV MRK (REMOV) (TRAF BTN) TYP Y
- (3) WRK ZN PAV MRK (REMOV) 24" W SLD
- (4) WRK ZN PAV MRK (REMOV)(REFL) TY I-C
- (5) WRK ZN PAV MRK (REMOV)(REFL) TY II-A-A
- (6) WRK ZN PAV MRK (REMOV) ARROW
- (7) WRK ZN PAV MRK (REMOV) DBL ARROW
- (8) WRK ZN PAV MRK (REMOV) TRIPLE ARROW

A	B	C	D	E
ROAD WORK AHEAD	RIGHT LANE CLOSED	AHEAD	LEFT LANE CLOSED	END ROAD WORK
CW20-1D	CW20-5TR	CW16-9P	CW20-5TL	G20-2a

0′ 100′ 200′
(IN FEET)

SCALE: PLAN 1"=100′

STATE OF TEXAS
KARAM M. QADDO
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06/08/2022

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Texas Department of Transportation

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

TRAFFIC CONTROL PLAN PHASE 1

SHEET 1 OF 1

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	56

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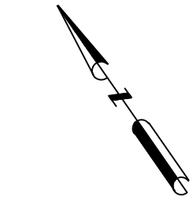
Design Filename: P:\East End\1035-Nav-Roundabout\4-0-Production-Working\4-1-CAD\Traffic Control\PR*TCP*PH1.dgn

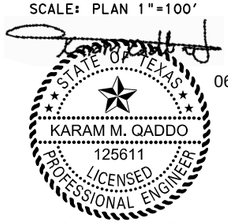
A	B	C	D
ROAD WORK AHEAD CW20-1D	DETOUR AHEAD CW20-2	DETOUR M4-9S	DETOUR M4-9
E	**F**	**G**	**H**
DETOUR M4-9	 R3-1	 R3-2	 R3-27
I		**J**	
N ST CHARLES ST NB M4-12T		N ST CHARLES ST SB M4-12T	
K			
ROAD CLOSED TO THRU TRAFFIC R11-4			

LEGEND

- PHASE 1 WORK ZONE
- FASTTRACK PAVEMENT
- TY I WITH TY II END TREATMNET LPCB
- FLASHING ARROW
- DIRECTION OF PROPOSED TRAFFIC
- DIRECTION OF EXISTING TRAFFIC
- VERTICAL PANEL
- DRUM
- SIGNS
- TYPE III BARRICADE W/ROAD CLOSED SIGN
- (1) WRK ZN PAV MRK (REMOV) (TRAF BTN) TYP W
- (2) WRK ZN PAV MRK (REMOV) (TRAF BTN) TYP Y
- (3) WRK ZN PAV MRK (REMOV) 24" W SLD
- (4) WRK ZN PAV MRK (REMOV)(REFL) TY I-C
- (5) WRK ZN PAV MRK (REMOV)(REFL) TY II-A-A
- (6) WRK ZN PAV MRK (REMOV) ARROW
- (7) WRK ZN PAV MRK (REMOV) DBL ARROW
- (8) WRK ZN PAV MRK (REMOV) TRIPLE ARROW



0′ 100′ 200′
(IN FEET)
SCALE: PLAN 1"=100′



06/08/2022

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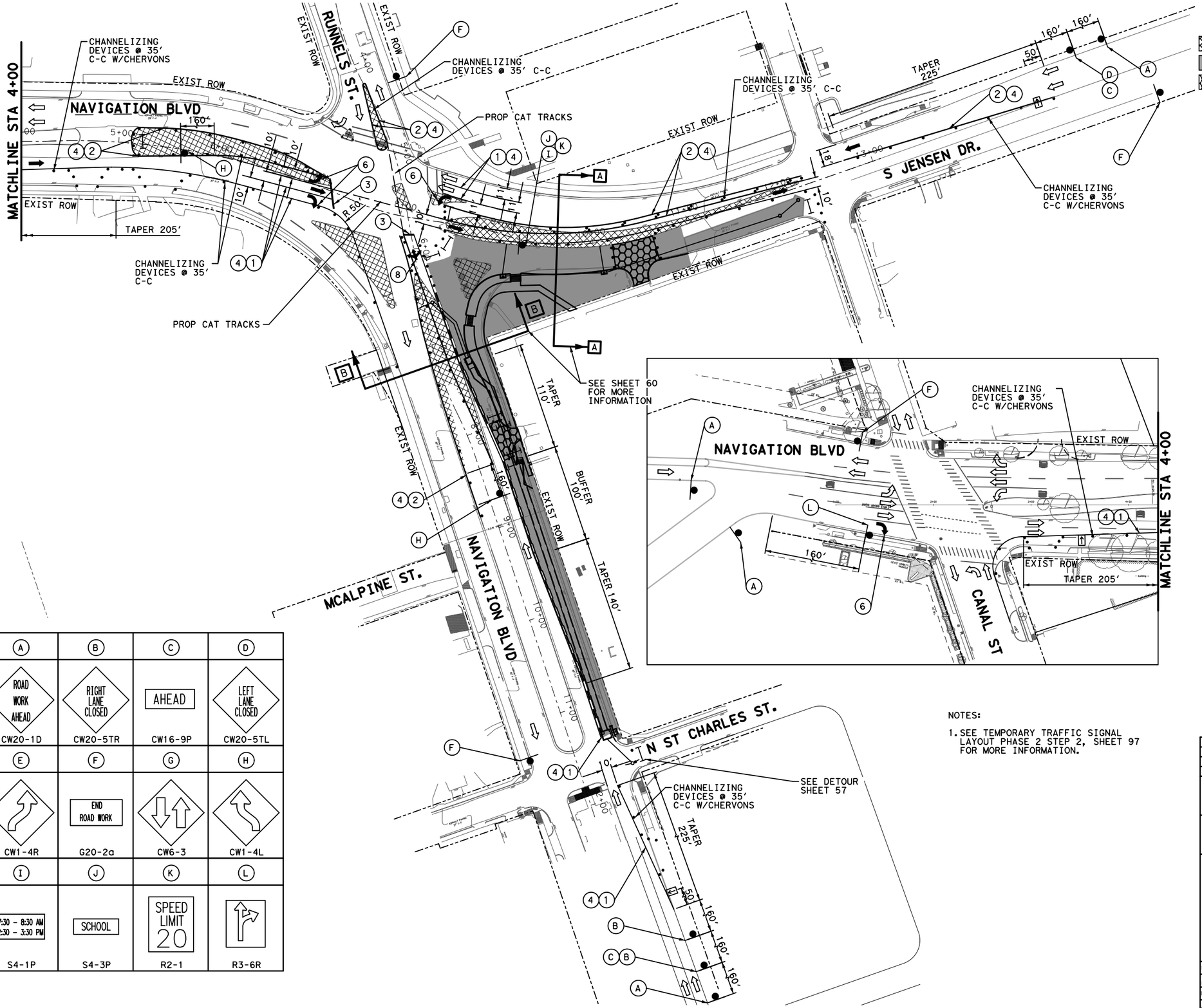
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

TRAFFIC CONTROL PLAN PHASE 2 - STEP 1 DETOUR PLAN

SHEET 1 OF 1

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	57



LEGEND

- PHASE 1 TEMP ASPHALT
- PHASE 2 WORK ZONE
- FASTTRACK PAVEMENT
- TY I WITH TY II END TREATMNET LPCB
- FLASHING ARROW
- DIRECTION OF PROPOSED TRAFFIC
- DIRECTION OF EXISTING TRAFFIC
- VERTICAL PANEL
- DRUM
- SIGNS
- TYPE III BARRICADE W/ROAD CLOSED SIGN
- (1) WRK ZN PAV MRK (REMOV) (TRAF BTN) TYP W
- (2) WRK ZN PAV MRK (REMOV) (TRAF BTN) TYP Y
- (3) WRK ZN PAV MRK (REMOV) 24" W SLD
- (4) WRK ZN PAV MRK (REMOV)(REFL) TY I-C
- (5) WRK ZN PAV MRK (REMOV)(REFL) TY II-A-A
- (6) WRK ZN PAV MRK (REMOV) ARROW
- (7) WRK ZN PAV MRK (REMOV) DBL ARROW
- (8) WRK ZN PAV MRK (REMOV) TRIPLE ARROW

(A)	(B)	(C)	(D)
ROAD WORK AHEAD	RIGHT LANE CLOSED	AHEAD	LEFT LANE CLOSED
CW20-1D	CW20-5TR	CW16-9P	CW20-5TL
(E)	(F)	(G)	(H)
CW1-4R	G20-2a	CW6-3	CW1-4L
(I)	(J)	(K)	(L)
7:30 - 8:30 AM 2:30 - 3:30 PM	SCHOOL	SPEED LIMIT 20	
S4-1P	S4-3P	R2-1	R3-6R

NOTES:

1. SEE TEMPORARY TRAFFIC SIGNAL LAYOUT PHASE 2 STEP 2, SHEET 97 FOR MORE INFORMATION.

0' 100' 200'
(IN FEET)
SCALE: PLAN 1"=100'

STATE OF TEXAS
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06/08/2022

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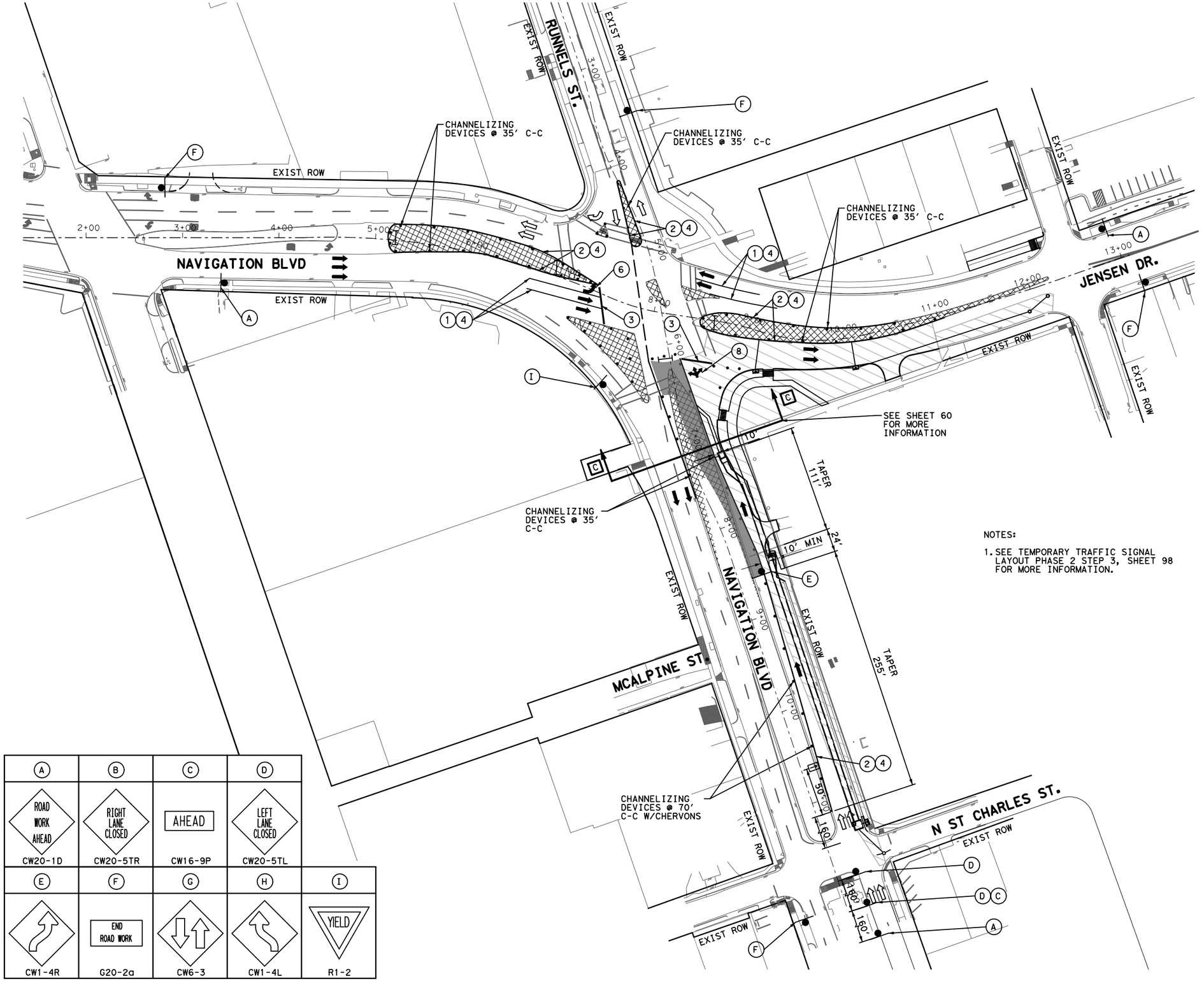
TRAFFIC CONTROL PLAN PHASE 2 - STEP 2

SHEET 1 OF 2

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	58



LEGEND

- PHASE 1 TEMP ASPHALT
- PREVIOUS PHASES
- PHASE 2 WORK ZONE
- FASTTRACK PAVEMENT
- TY I WITH TY II END TREATMNET LPCB
- FLASHING ARROW
- DIRECTION OF PROPOSED TRAFFIC
- DIRECTION OF EXISTING TRAFFIC
- VERTICAL PANEL
- DRUM
- SIGNS
- TYPE III BARRICADE W/ROAD CLOSED SIGN
- (1) WRK ZN PAV MRK (REMOV) (TRAF BTN) TYP W
- (2) WRK ZN PAV MRK (REMOV) (TRAF BTN) TYP Y
- (3) WRK ZN PAV MRK (REMOV) 24" W SLD
- (4) WRK ZN PAV MRK (REMOV)(REFL) TY I-C
- (5) WRK ZN PAV MRK (REMOV)(REFL) TY II-A-A
- (6) WRK ZN PAV MRK (REMOV) ARROW
- (7) WRK ZN PAV MRK (REMOV) DBL ARROW
- (8) WRK ZN PAV MRK (REMOV) TRIPLE ARROW

0' 100' 200'
(IN FEET)

SCALE: PLAN 1"=100'

NOTES:

1. SEE TEMPORARY TRAFFIC SIGNAL LAYOUT PHASE 2 STEP 3, SHEET 98 FOR MORE INFORMATION.

A	B	C	D
ROAD WORK AHEAD CW20-1D	RIGHT LANE CLOSED CW20-5TR	AHEAD CW16-9P	LEFT LANE CLOSED CW20-5TL

E	F	G	H	I
CW1-4R	END ROAD WORK G20-2a	CW6-3	CW1-4L	YIELD R1-2

STATE OF TEXAS
KARAM M. QADDO
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06/08/2022

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NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

TRAFFIC CONTROL PLAN PHASE 2 - STEP 3

SHEET 2 OF 2

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	59

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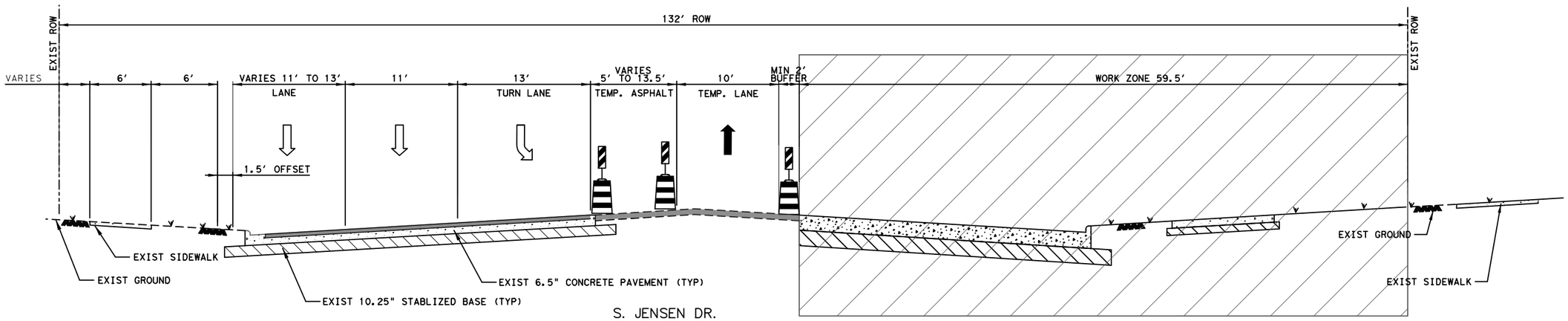
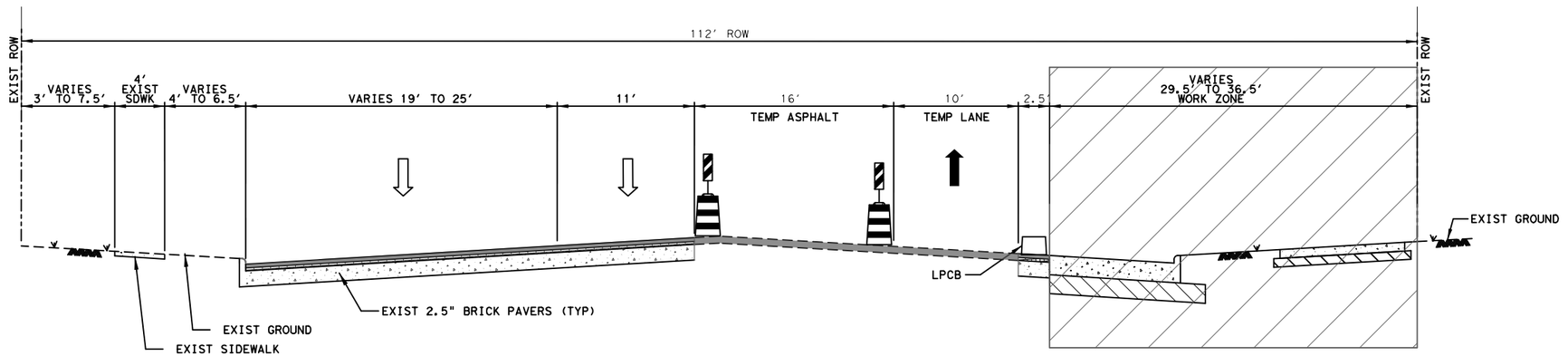


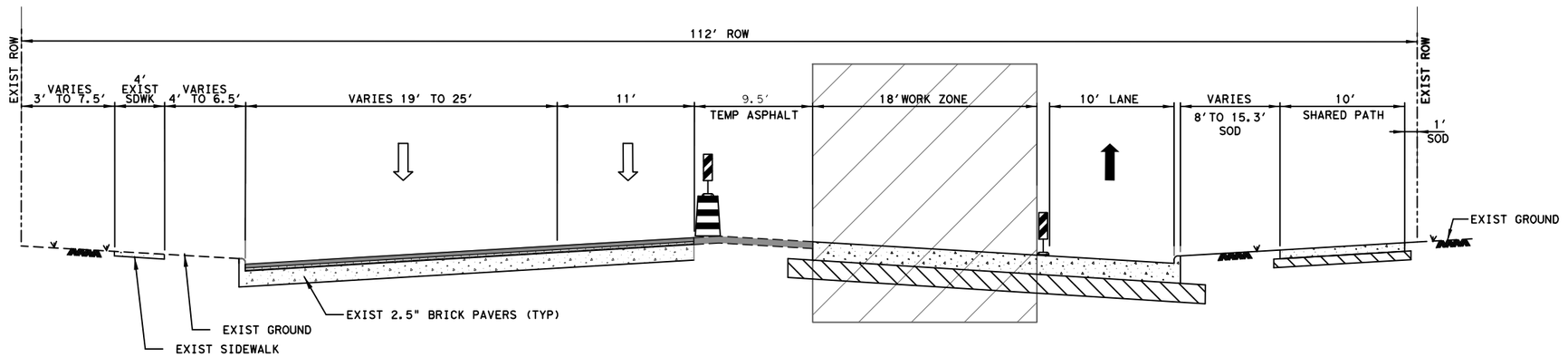
S. JENSEN DR.

PHASE 2 STEP 2 "A-A" SECTION
NORTHBOUND SIDE
N.T.S.



NAVIGATION BLVD

PHASE 2 - STEP 2 "B-B" SECTION
EASTBOUND SIDE
N.T.S.



NAVIGATION BLVD

PHASE 2 - STEP 3 "C-C" SECTION
EASTBOUND SIDE
N.T.S.

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125611
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06/08/2022

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Texas Registered Engineering Firm F-20017

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Texas PE Firm Reg. #F-20017

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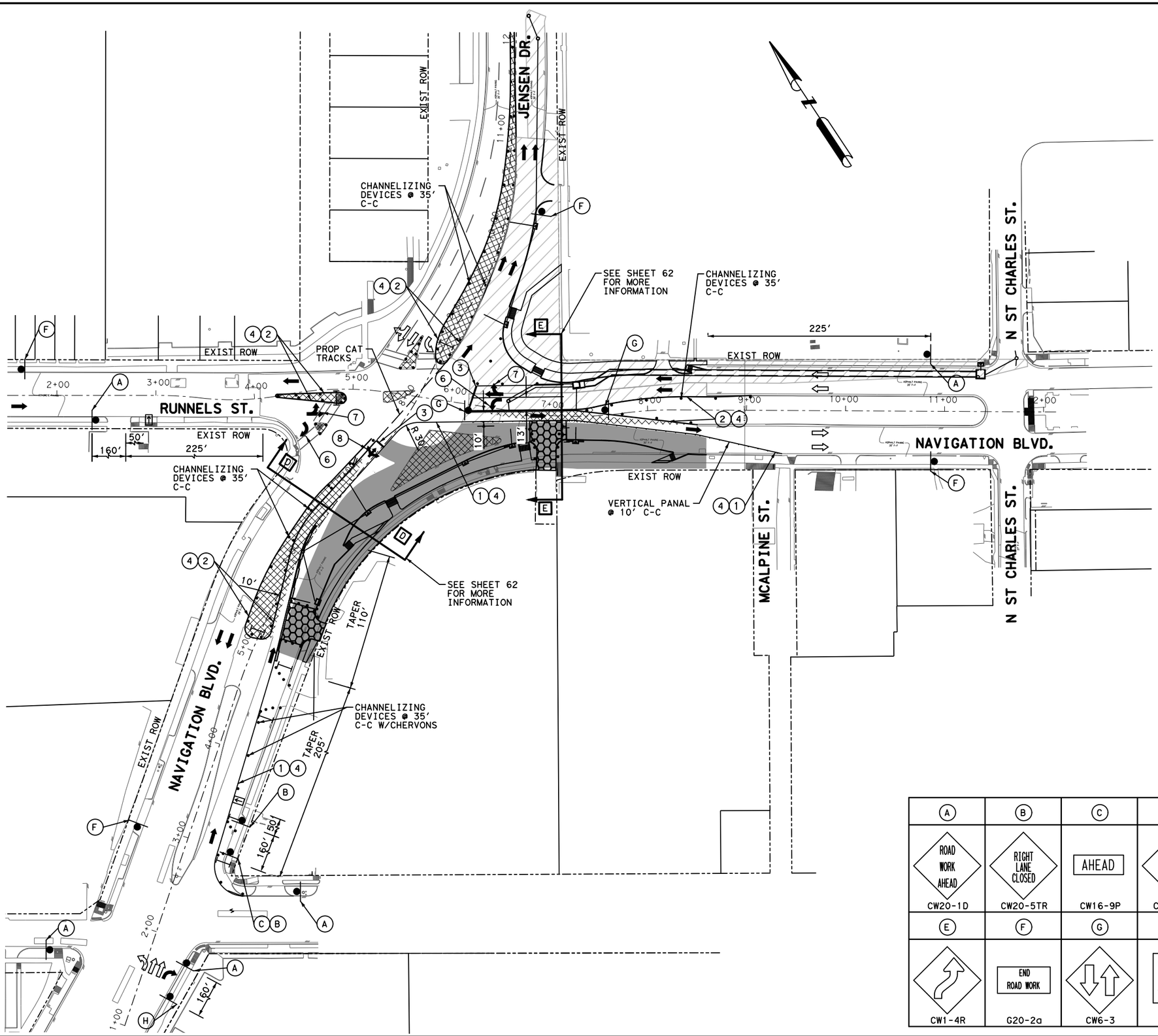
PROPOSED TRAFFIC CONTROL TYPICAL SECTIONS PHASE 2

SHEET 1 OF 1

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	60



LEGEND

- PHASE 1 TEMP ASPHALT
- PREVIOUS PHASES
- PHASE 3 WORK ZONE
- FASTTRACK PAVEMENT
- TY I WITH TY II END TREATMNET LPCB
- FLASHING ARROW
- DIRECTION OF PROPOSED TRAFFIC
- DIRECTION OF EXISTING TRAFFIC
- VERTICAL PANEL
- DRUM
- SIGNS
- TYPE III BARRICADE W/ROAD CLOSED SIGN
- (1) WRK ZN PAV MRK (REMOV) (TRAF BTN) TYP W
- (2) WRK ZN PAV MRK (REMOV) (TRAF BTN) TYP Y
- (3) WRK ZN PAV MRK (REMOV) 24" W SLD
- (4) WRK ZN PAV MRK (REMOV)(REFL) TY I-C
- (5) WRK ZN PAV MRK (REMOV)(REFL) TY II-A-A
- (6) WRK ZN PAV MRK (REMOV) ARROW
- (7) WRK ZN PAV MRK (REMOV) DBL ARROW
- (8) WRK ZN PAV MRK (REMOV) TRIPLE ARROW

NOTES:

1. SEE TEMPORARY TRAFFIC SIGNAL LAYOUT PHASE 3 STEP 1, SHEET 99 FOR MORE INFORMATION.

0′ 100′ 200′
(IN FEET)
SCALE: PLAN 1"=100′

(A)	(B)	(C)	(D)
ROAD WORK AHEAD CW20-1D	RIGHT LANE CLOSED CW20-5TR	AHEAD CW16-9P	LEFT LANE CLOSED CW20-5TL
(E)	(F)	(G)	(H)
CW1-4R	END ROAD WORK G20-2a	CW6-3	RIGHT LANE MUST TURN RIGHT R3-7R

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06/28/2022
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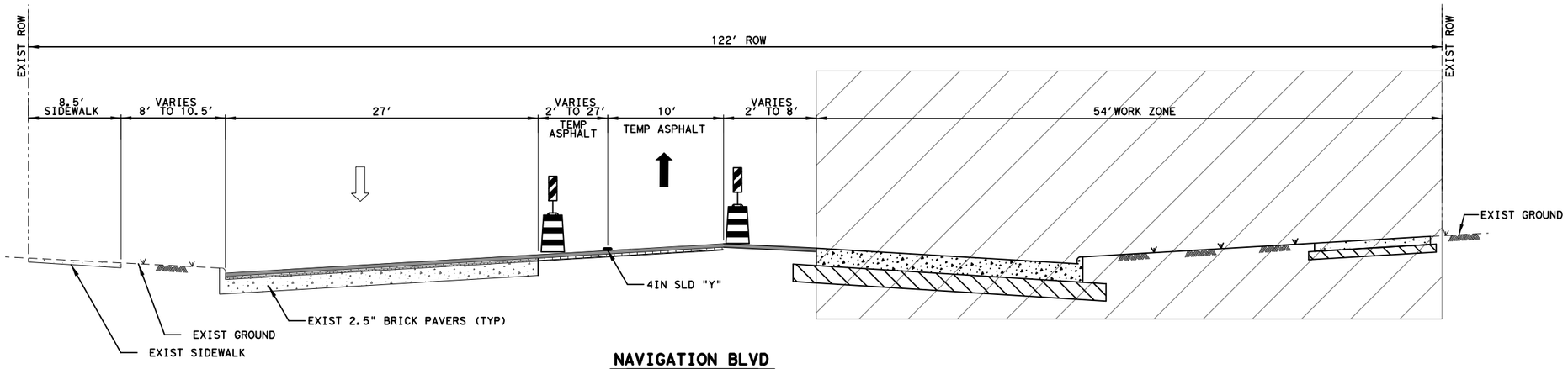
TRAFFIC CONTROL PLAN PHASE 3 - STEP 1

SHEET 1 OF 2

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	61



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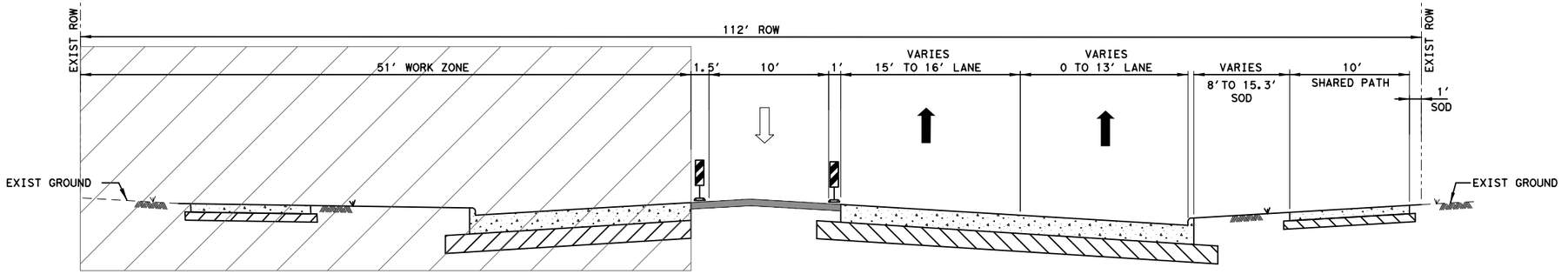
PHASE 3 - STEP 1 "D-D" SECTION
NORTHBOUND SIDE
N.T.S.



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PHASE 3 - STEP 1 "E-E" SECTION
WESTBOUND SIDE
N.T.S.

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NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

PROPOSED TRAFFIC CONTROL TYPICAL SECTIONS PHASE 3

SHEET 1 OF 1

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	62

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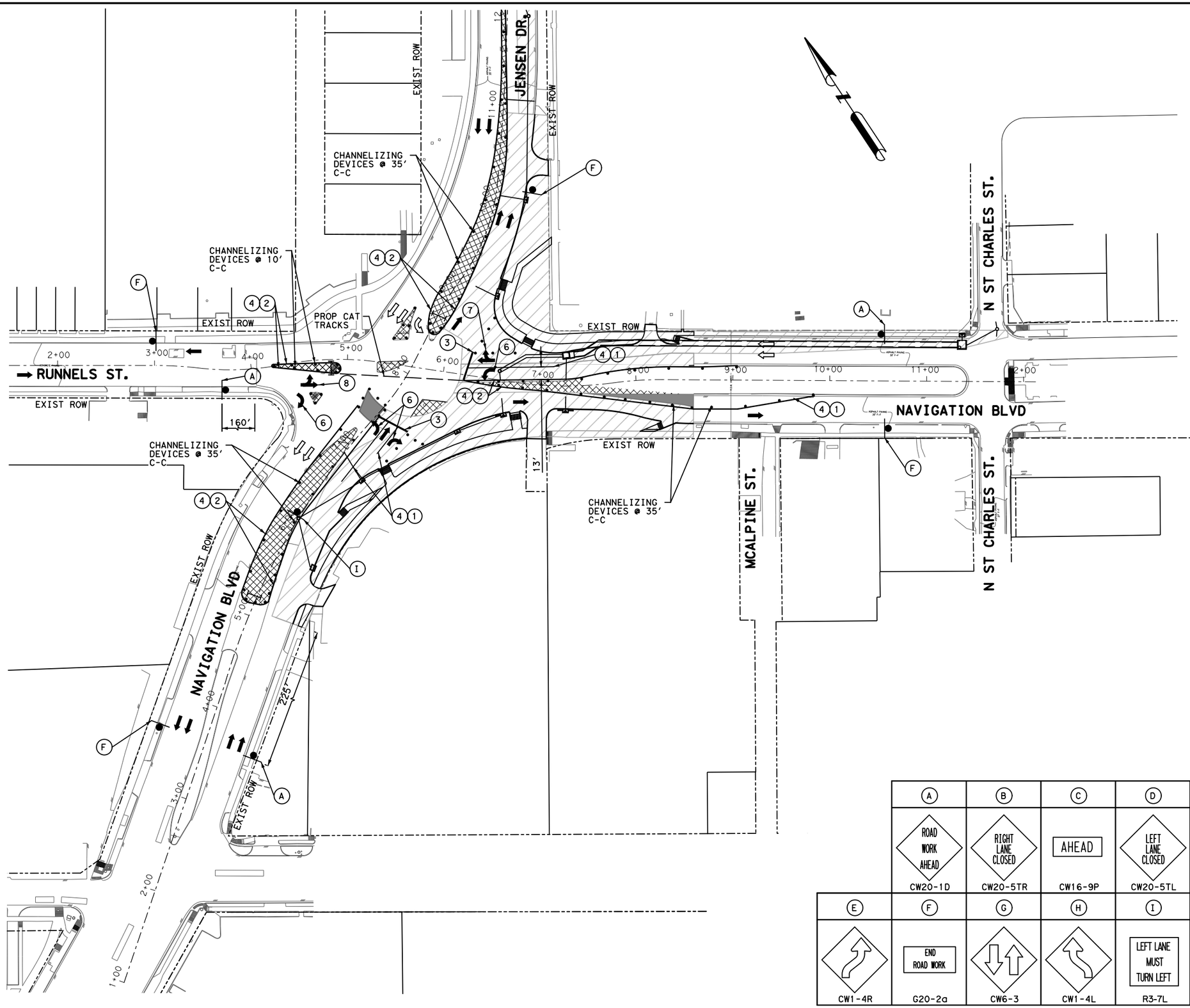

LEGEND

- PHASE 1 TEMP ASPHALT
- PREVIOUSE PHASES
- PHASE 3 WORK ZONE
- FASTTRACK PAVEMENT
- TY I WITH TY II END TREATMNET LPCB
- FLASHING ARROW
- DIRECTION OF PROPOSED TRAFFIC
- DIRECTION OF EXISTING TRAFFIC
- VERTICAL PANEL
- DRUM
- SIGNS
- TYPE III BARRICADE W/ROAD CLOSED SIGN
- (1) WRK ZN PAV MRK (REMOV) (TRAF BTN) TYP W
- (2) WRK ZN PAV MRK (REMOV) (TRAF BTN) TYP Y
- (3) WRK ZN PAV MRK (REMOV) 24" W SLD
- (4) WRK ZN PAV MRK (REMOV)(REFL) TY I-C
- (5) WRK ZN PAV MRK (REMOV)(REFL) TY II-A-A
- (6) WRK ZN PAV MRK (REMOV) ARROW
- (7) WRK ZN PAV MRK (REMOV) DBL ARROW
- (8) WRK ZN PAV MRK (REMOV) TRIPLE ARROW

NOTES:

1. SEE TEMPORARY TRAFFIC SIGNAL LAYOUT PHASE 3 STEP 2, SHEET 100 FOR MORE INFORMATION.

(A)	(B)	(C)	(D)
ROAD WORK AHEAD	RIGHT LANE CLOSED	AHEAD	LEFT LANE CLOSED
CW20-1D	CW20-5TR	CW16-9P	CW20-5TL

(E)	(F)	(G)	(H)	(I)
	END ROAD WORK			LEFT LANE MUST TURN LEFT
CW1-4R	G20-2a	CW6-3	CW1-4L	R3-7L

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TRAFFIC CONTROL PLAN PHASE 3 - STEP 2

SHEET 2 OF 2

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	63

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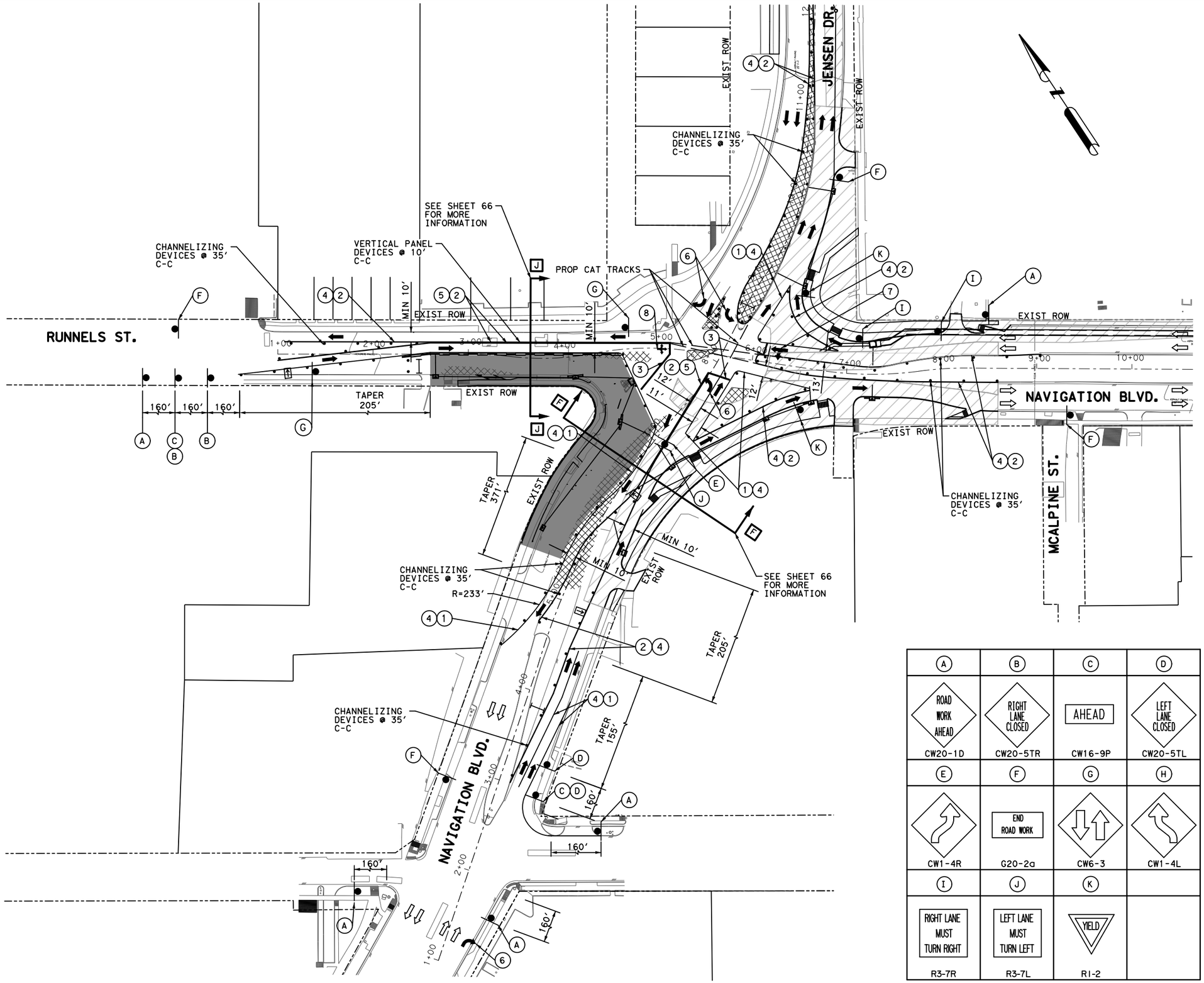

LEGEND

- PHASE 1 TEMP ASPHALT
- PREVIOUSE PHASES
- PHASE 4 WORK ZONE
- FASTTRACK PAVEMENT
- TY I WITH TY II END TREATMNET LPCB
- FLASHING ARROW
- DIRECTION OF PROPOSED TRAFFIC
- DIRECTION OF EXISTING TRAFFIC
- VERTICAL PANEL
- DRUM
- SIGNS
- TYPE III BARRICADE W/ROAD CLOSED SIGN
- (1) WRK ZN PAV MRK (REMOV) (TRAF BTN) TYP W
- (2) WRK ZN PAV MRK (REMOV) (TRAF BTN) TYP Y
- (3) WRK ZN PAV MRK (REMOV) 24" W SLD
- (4) WRK ZN PAV MRK (REMOV)(REFL) TY I-C
- (5) WRK ZN PAV MRK (REMOV)(REFL) TY II-A-A
- (6) WRK ZN PAV MRK (REMOV) ARROW
- (7) WRK ZN PAV MRK (REMOV) DBL ARROW
- (8) WRK ZN PAV MRK (REMOV) TRIPLE ARROW

NOTES:

1. SEE TEMPORARY TRAFFIC SIGNAL LAYOUT PHASE 4, SHEET 101 FOR MORE INFORMATION.

0′ 100′ 200′
(IN FEET)
SCALE: PLAN 1"=100′

(A)	(B)	(C)	(D)
ROAD WORK AHEAD CW20-1D	RIGHT LANE CLOSED CW20-5TR	AHEAD CW16-9P	LEFT LANE CLOSED CW20-5TL
(E)	(F)	(G)	(H)
CW1-4R	END ROAD WORK G20-2a	CW6-3	CW1-4L
(I)	(J)	(K)	
RIGHT LANE MUST TURN RIGHT R3-7R	LEFT LANE MUST TURN LEFT R3-7L	YIELD R1-2	

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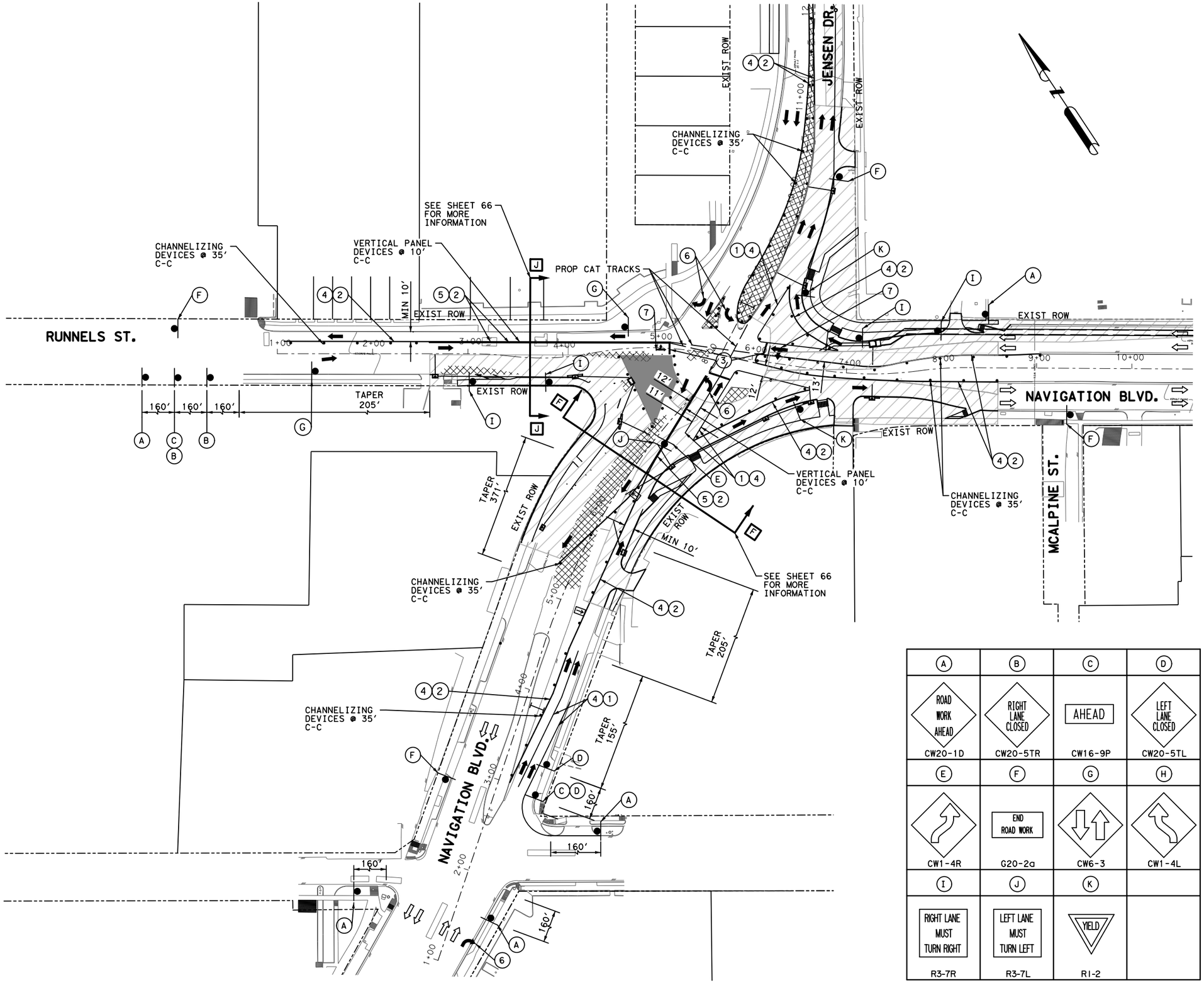
TRAFFIC CONTROL PLAN PHASE 4- STEP 1

SHEET 1 OF 2

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	64



LEGEND

- PHASE 1 TEMP ASPHALT
- PREVIOUSE PHASES
- PHASE 4 WORK ZONE
- FASTTRACK PAVEMENT
- TY I WITH TY II END TREATMNET LPCB
- FLASHING ARROW
- DIRECTION OF PROPOSED TRAFFIC
- DIRECTION OF EXISTING TRAFFIC
- VERTICAL PANEL
- DRUM
- SIGNS
- TYPE III BARRICADE W/ROAD CLOSED SIGN
- (1) WRK ZN PAV MRK (REMOV) (TRAF BTN) TYP W
- (2) WRK ZN PAV MRK (REMOV) (TRAF BTN) TYP Y
- (3) WRK ZN PAV MRK (REMOV) 24" W SLD
- (4) WRK ZN PAV MRK (REMOV)(REFL) TY I-C
- (5) WRK ZN PAV MRK (REMOV)(REFL) TY II-A-A
- (6) WRK ZN PAV MRK (REMOV) ARROW
- (7) WRK ZN PAV MRK (REMOV) DBL ARROW
- (8) WRK ZN PAV MRK (REMOV) TRIPLE ARROW

NOTES:

1. SEE TEMPORARY TRAFFIC SIGNAL LAYOUT PHASE 4, SHEET 101 FOR MORE INFORMATION.

0' 100' 200'
(IN FEET)
SCALE: PLAN 1"=100'

A	B	C	D
ROAD WORK AHEAD CW20-1D	RIGHT LANE CLOSED CW20-5TR	AHEAD CW16-9P	LEFT LANE CLOSED CW20-5TL
E	**F**	**G**	**H**
CW1-4R	END ROAD WORK G20-2a	CW6-3	CW1-4L
I	**J**	**K**	
RIGHT LANE MUST TURN RIGHT R3-7R	LEFT LANE MUST TURN LEFT R3-7L	YIELD R1-2	

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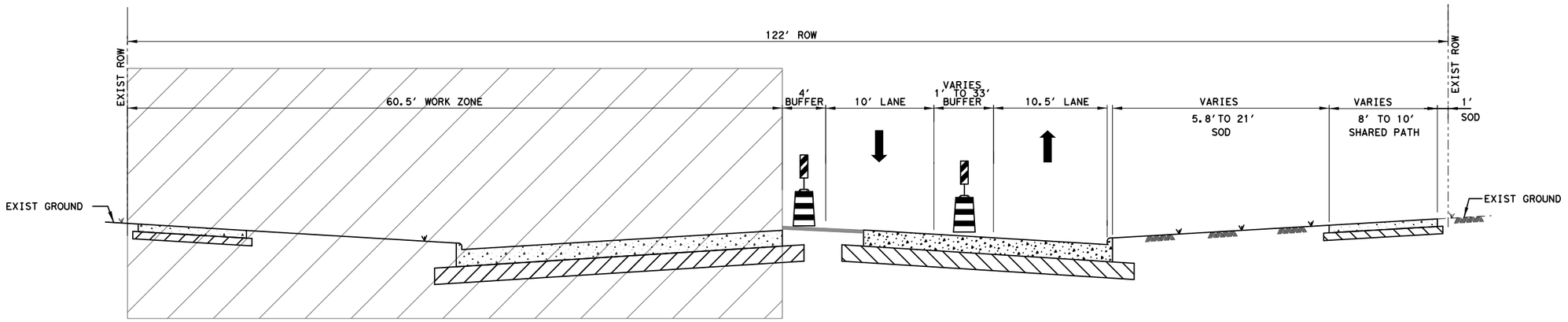
TRAFFIC CONTROL PLAN PHASE 4- STEP 2

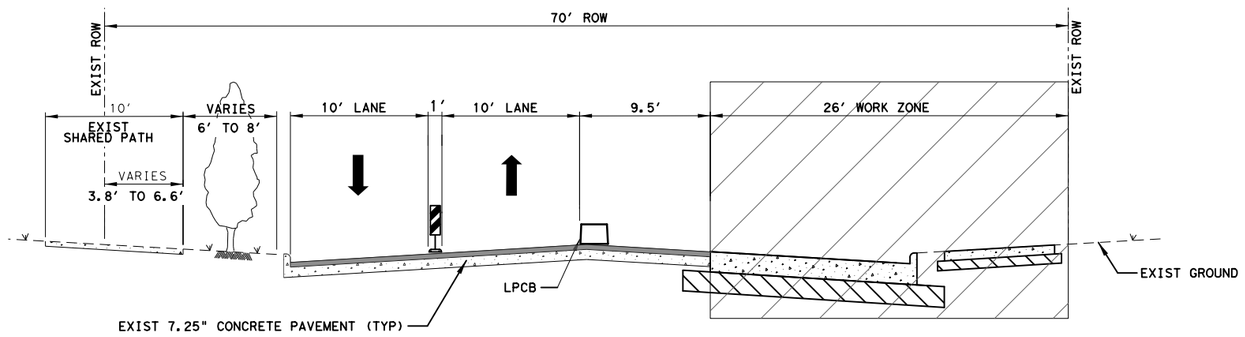
SHEET 2 OF 2

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	65



NAVIGATION BLVD

PHASE 4 - "F-F" SECTION
SOUTHBOUND SIDE
N.T.S.



RUNNELS ST.

PHASE 4 - "J-J" SECTION
EASTBOUND SIDE
N.T.S.

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PROPOSED TRAFFIC CONTROL TYPICAL SECTIONS PHASE 4

SHEET 1 OF 1

DGN:	MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	DG	6	TEXAS	STP 1902 (308) MM			CS
DWG:	MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	DG	HOU	HARRIS	0912	72	386	66

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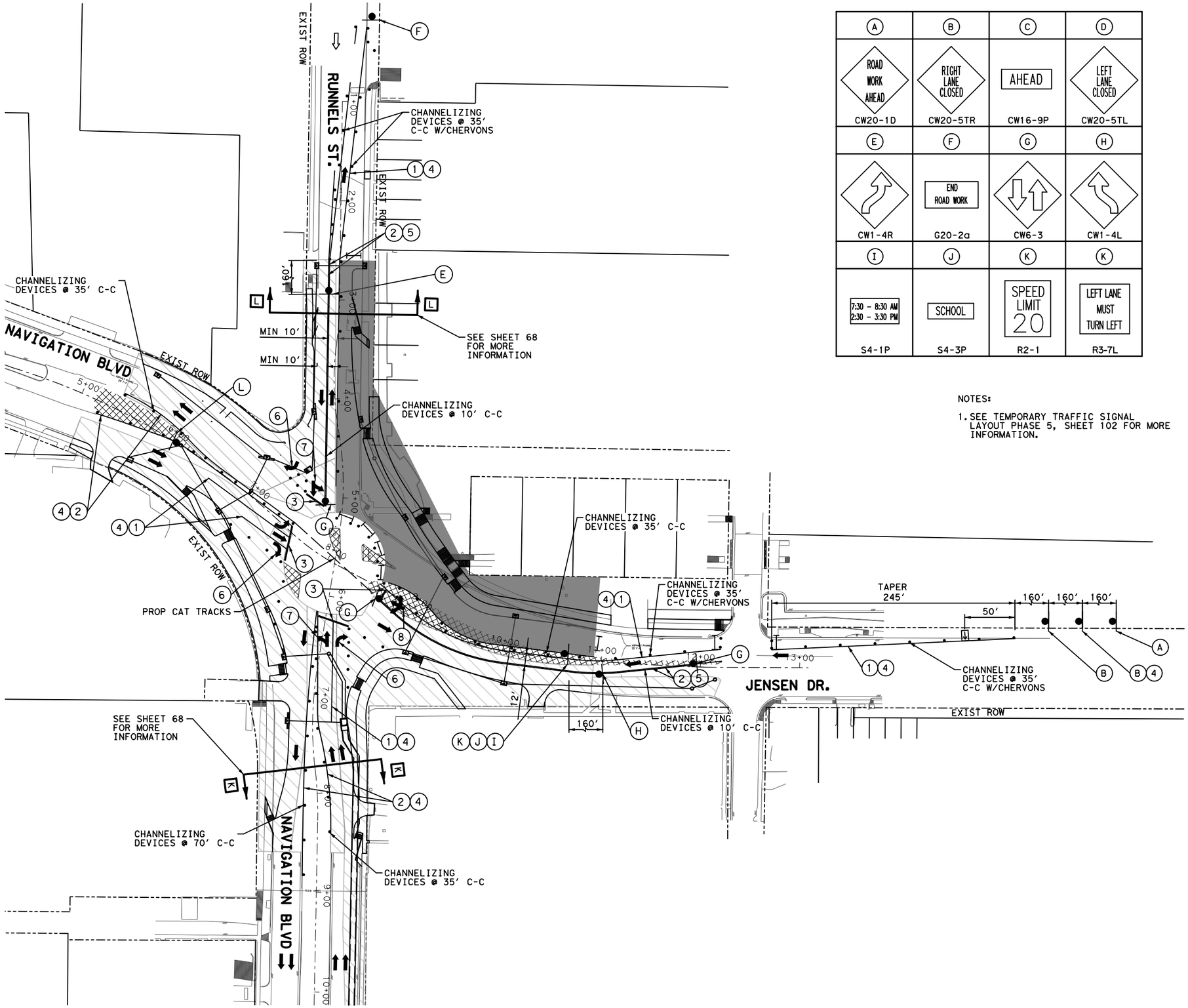

A	B	C	D
ROAD WORK AHEAD CW20-1D	RIGHT LANE CLOSED CW20-5TR	AHEAD CW16-9P	LEFT LANE CLOSED CW20-5TL
E	F	G	H
 CW1-4R	END ROAD WORK G20-2a	 CW6-3	 CW1-4L
I	J	K	K
7:30 - 8:30 AM 2:30 - 3:30 PM S4-1P	SCHOOL S4-3P	SPEED LIMIT 20 R2-1	LEFT LANE MUST TURN LEFT R3-7L

NOTES:

1. SEE TEMPORARY TRAFFIC SIGNAL LAYOUT PHASE 5, SHEET 102 FOR MORE INFORMATION.

LEGEND

- PHASE 1 TEMP ASPHALT
- PREVIOUSE PHASES
- PHASE 5 WORK ZONE
- FASTTRACK PAVEMENT
- TY I WITH TY II END TREATMNET LPCB
- FLASHING ARROW
- DIRECTION OF PROPOSED TRAFFIC
- DIRECTION OF EXISTING TRAFFIC
- VERTICAL PANEL
- DRUM
- SIGNS
- TYPE III BARRICADE W/ROAD CLOSED SIGN
- (1) WRK ZN PAV MRK (REMOV) (TRAF BTN) TYP W
- (2) WRK ZN PAV MRK (REMOV) (TRAF BTN) TYP Y
- (3) WRK ZN PAV MRK (REMOV) 24" W SLD
- (4) WRK ZN PAV MRK (REMOV)(REFL) TY I-C
- (5) WRK ZN PAV MRK (REMOV)(REFL) TY II-A-A
- (6) WRK ZN PAV MRK (REMOV) ARROW
- (7) WRK ZN PAV MRK (REMOV) DBL ARROW
- (8) WRK ZN PAV MRK (REMOV) TRIPLE ARROW

0' 100' 200'
(IN FEET)
SCALE: PLAN 1"=100'

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TRAFFIC CONTROL PLAN PHASE 5

SHEET 1 OF 1

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	67

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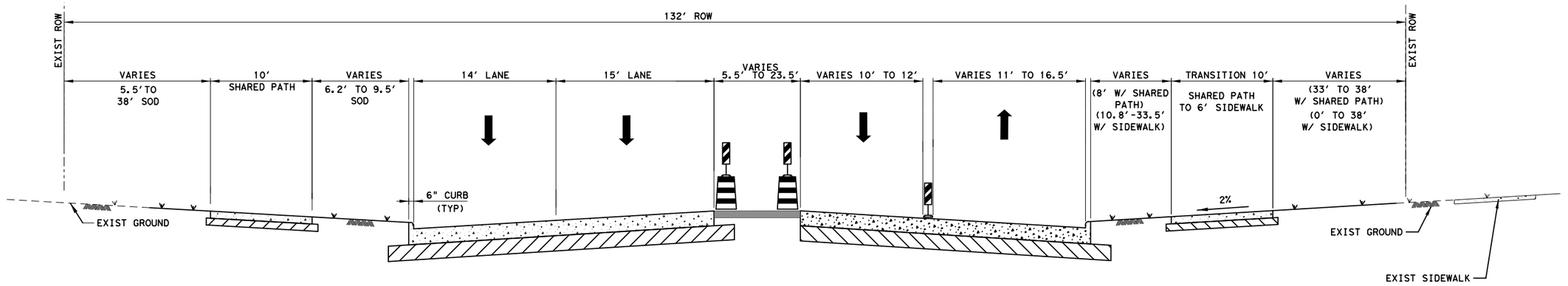
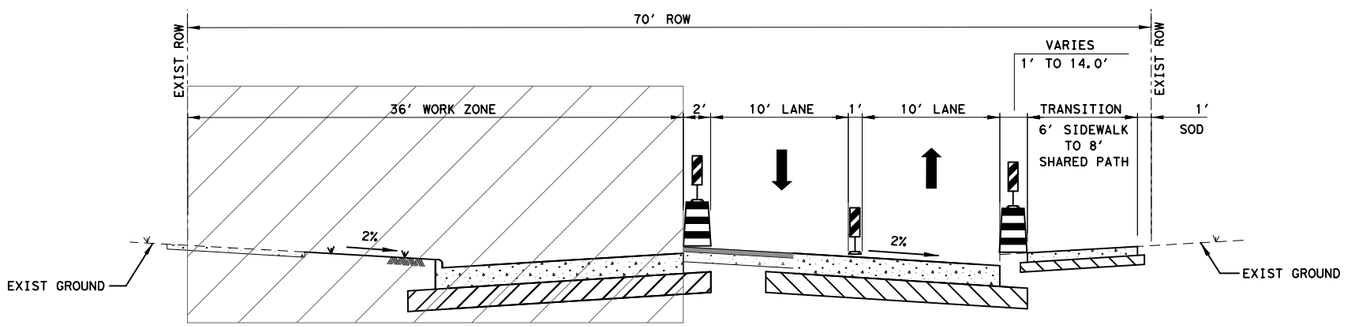


NAVIGATION BLVD.

PHASE 5 "K-K" SECTION
SOUTHBOUND SIDE
N.T.S.



RUNNELS ST.

PHASE 5 - "L-L" SECTION
WESTBOUND SIDE
N.T.S.

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PROPOSED TRAFFIC CONTROL TYPICAL SECTIONS PHASE 5

SHEET 1 OF 1

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	68

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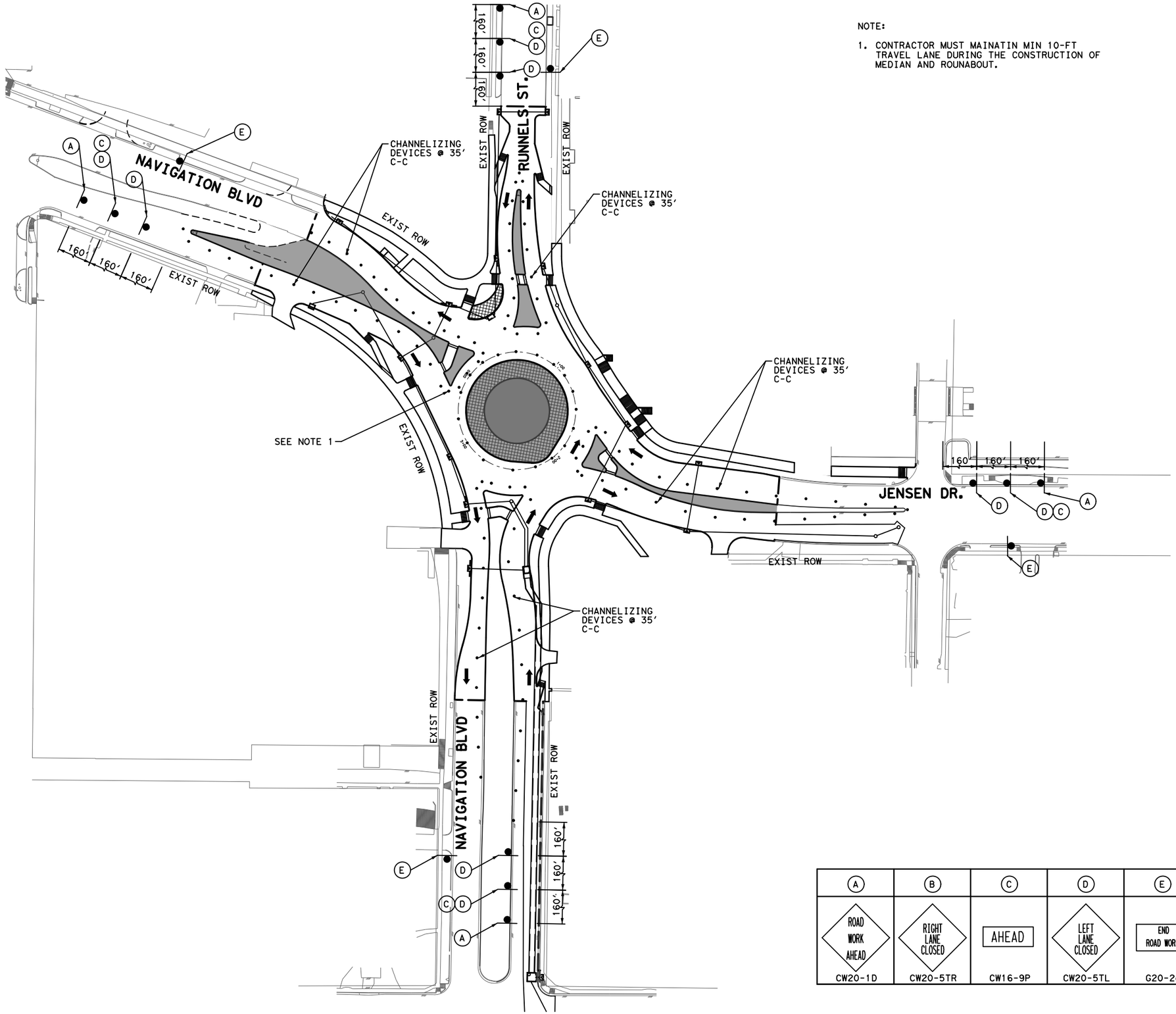

NOTE:

1. CONTRACTOR MUST MAINATIN MIN 10-FT TRAVEL LANE DURING THE CONSTRUCTION OF MEDIAN AND ROUNABOUT.

LEGEND

- PHASE 1 TEMP ASPHALT
- PREVIOUSE PHASES
- PHASE 6 WORK ZONE
- FASTTRACK PAVEMENT
- TY I WITH TY II END TREATMNET LPCB
- FLASHING ARROW
- DIRECTION OF PROPOSED TRAFFIC
- DIRECTION OF EXISTING TRAFFIC
- VERTICAL PANEL
- DRUM
- SIGNS
- TYPE III BARRICADE W/ROAD CLOSED SIGN
- (1) WRK ZN PAV MRK (REMOV) (TRAF BTN) TYP W
- (2) WRK ZN PAV MRK (REMOV) (TRAF BTN) TYP Y
- (3) WRK ZN PAV MRK (REMOV) 24" W SLD
- (4) WRK ZN PAV MRK (REMOV)(REFL) TY I-C
- (5) WRK ZN PAV MRK (REMOV)(REFL) TY II-A-A
- (6) WRK ZN PAV MRK (REMOV) ARROW
- (7) WRK ZN PAV MRK (REMOV) DBL ARROW
- (8) WRK ZN PAV MRK (REMOV) TRIPLE ARROW

0′ 100′ 200′
(IN FEET)
SCALE: PLAN 1"=100′

A	B	C	D	E
ROAD WORK AHEAD	RIGHT LANE CLOSED	AHEAD	LEFT LANE CLOSED	END ROAD WORK
CW20-1D	CW20-5TR	CW16-9P	CW20-5TL	G20-2a

STATE OF TEXAS
KARAM M. QADDO
125611
LICENSED
PROFESSIONAL ENGINEER
06/08/2022

Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

Gauge ENGINEERING
11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

TRAFFIC CONTROL PLAN PHASE 6

SHEET 1 OF 1

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	69

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Design Filename: P:\East End\1035-Nav-Roundabout\V4-0-Production-Working\V4-1-CAD\Traffic Control\PR*TCP*PH6.dgn

DATE:
FILE:

BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

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

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

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

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

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

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

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

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

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

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

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

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

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

WORKER SAFETY NOTES:

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

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

COMPLIANT WORKZONE TRAFFIC CONTROL DEVICES

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

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

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

Texas Department of Transportation

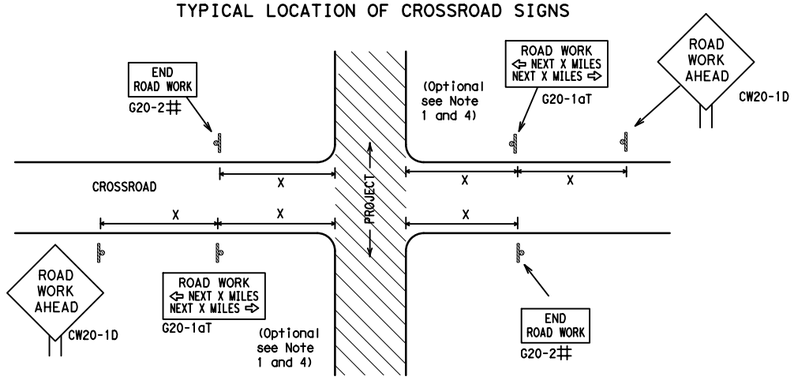
Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	72	386	CS
4-03 7-13	DIST	COUNTY		SHEET NO.
9-07 8-14	HOU	HARRIS		70
5-10 5-21				

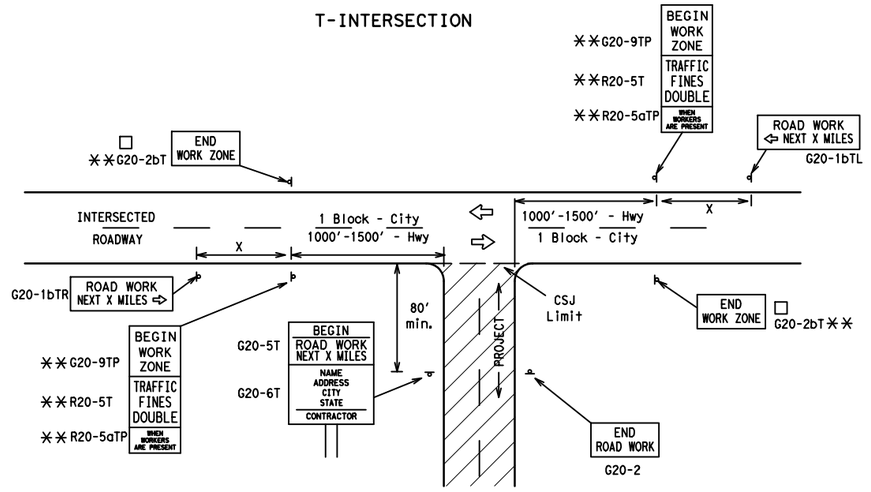
TYPICAL LOCATION OF CROSSROAD SIGNS



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

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

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

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

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

SIZE

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

SPACING

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

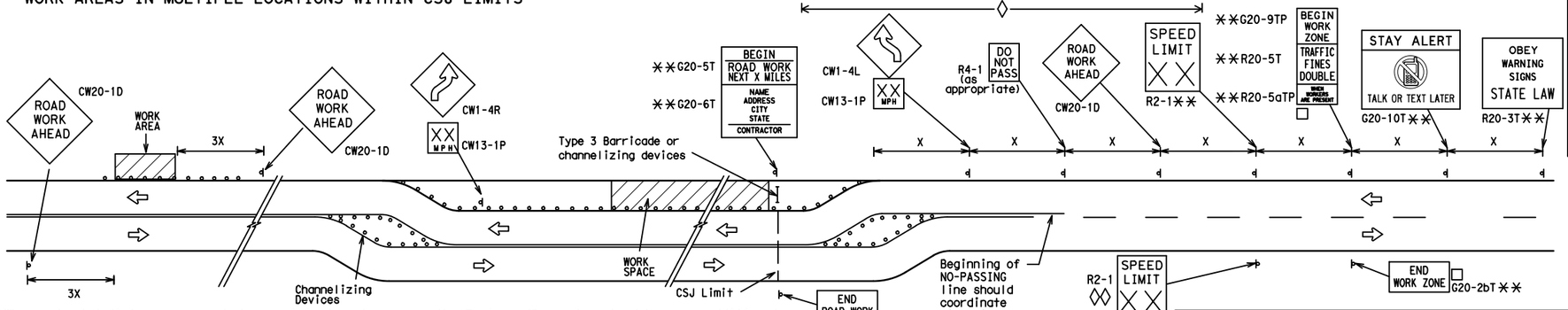
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

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

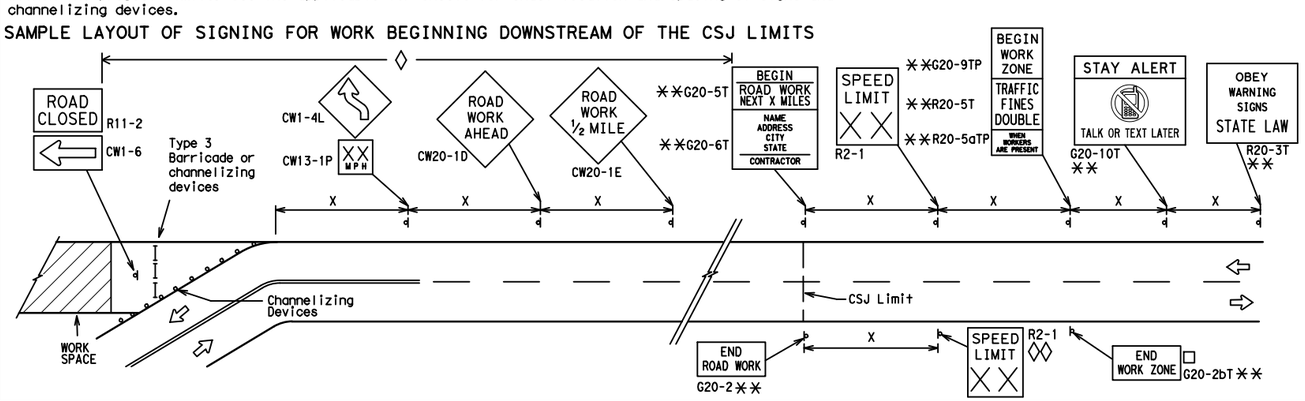
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



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

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS

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



NOTES

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

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

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	0912	72	386	CS
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7-13 5-21	HOU	HARRIS		71

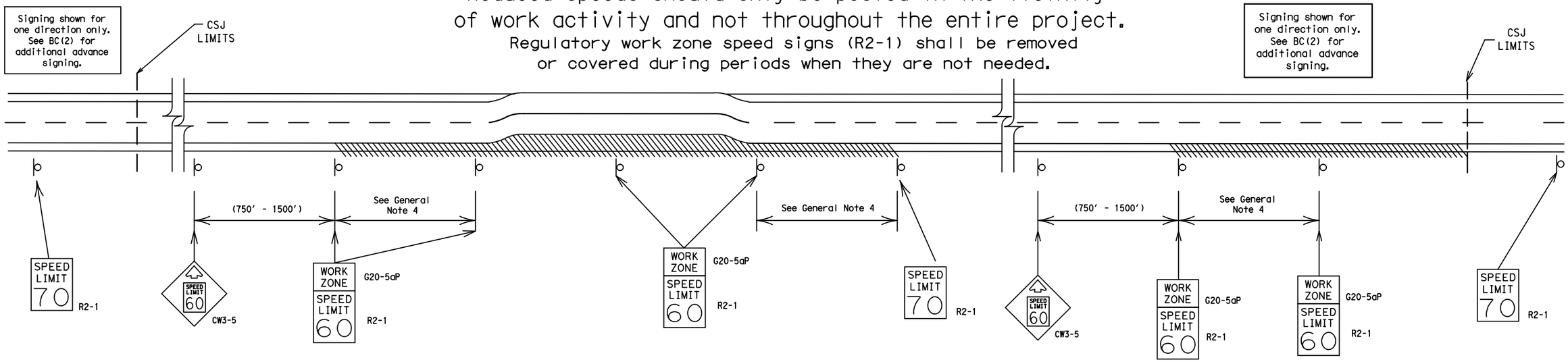
DATE:
FILE:

TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

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

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



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

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

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

SHORT TERM WORK ZONE SPEED LIMITS

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

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

GENERAL NOTES

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	72	386	CS
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	HOU	HARRIS		72

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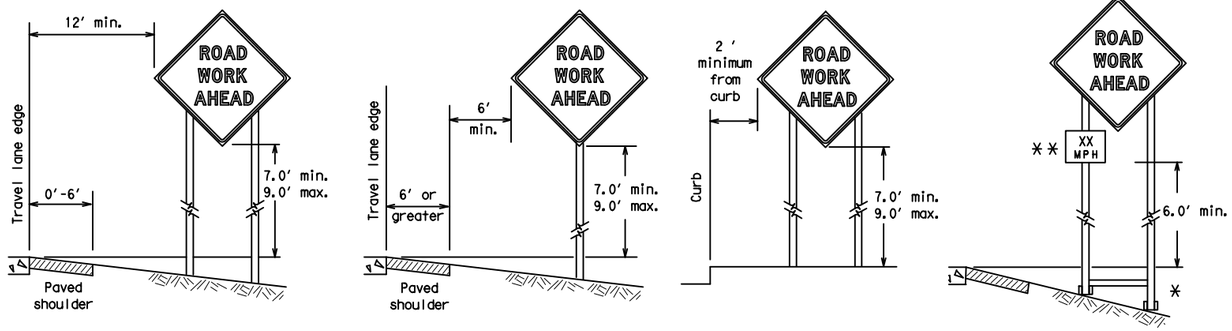
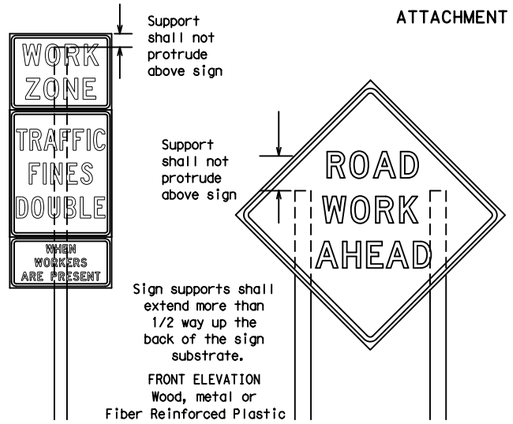
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

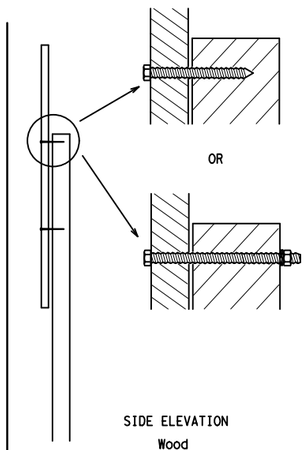


⁎ When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

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

ATTACHMENT FOR SIGN SUPPORTS





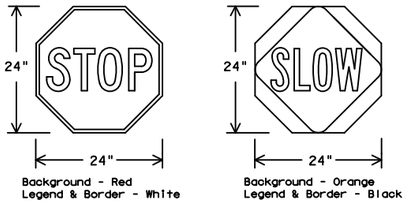
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

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

STOP/SLOW PADDLES

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



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

CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

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

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BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

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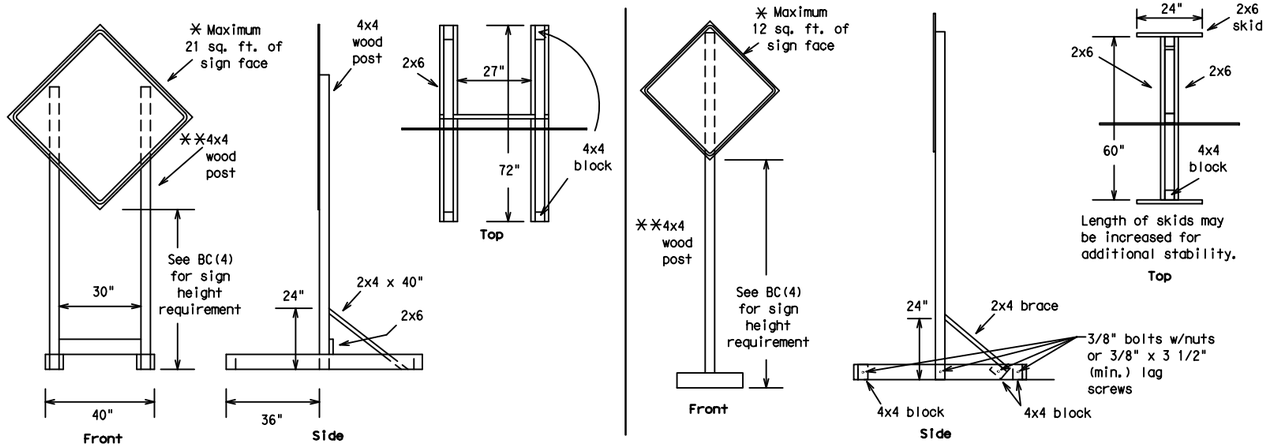
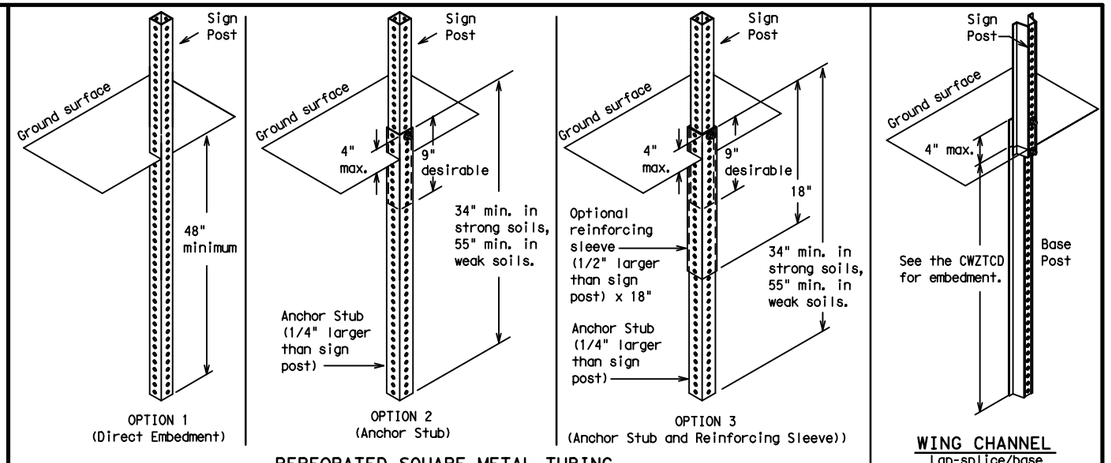


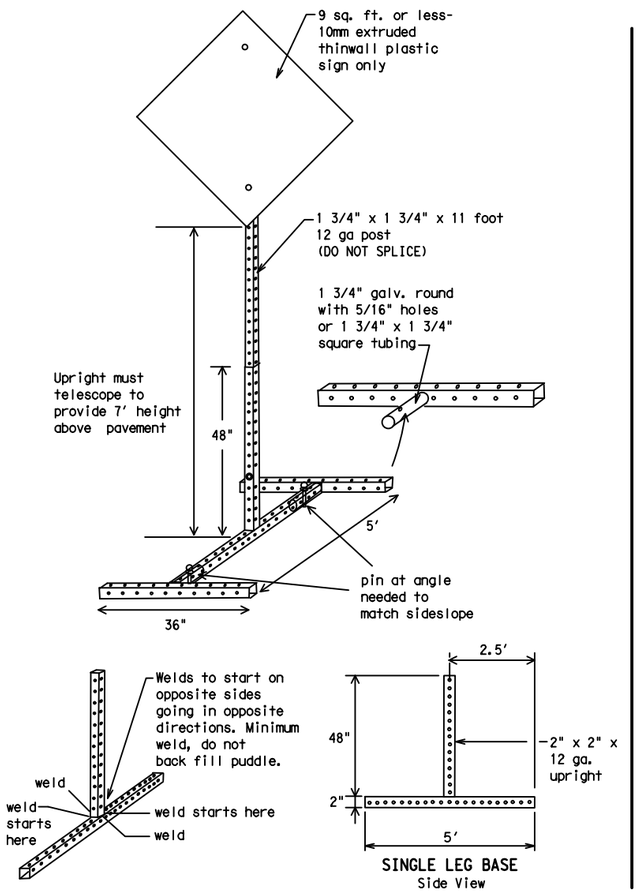
SKID MOUNTED WOOD SIGN SUPPORTS

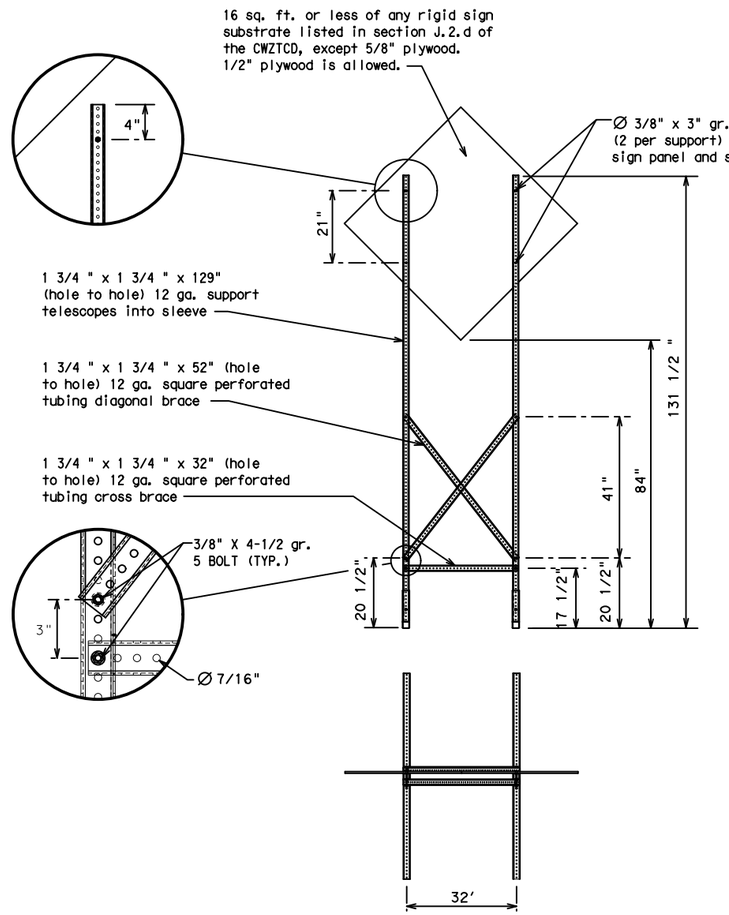
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS

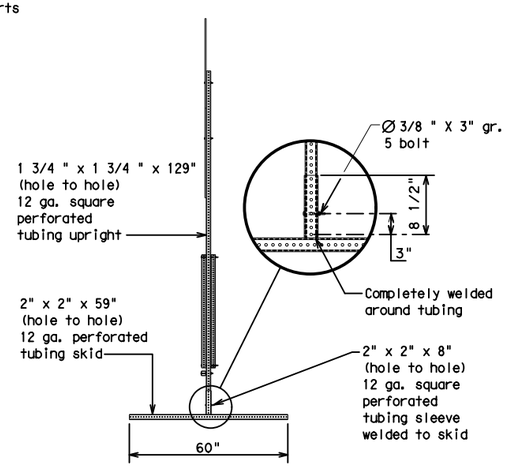


GROUND MOUNTED SIGN SUPPORTS

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







SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

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

WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-21

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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 Safety Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-21

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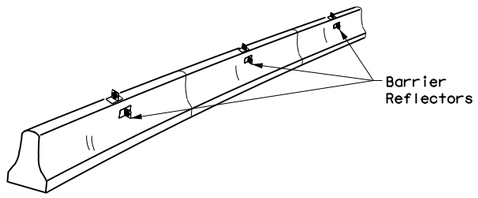
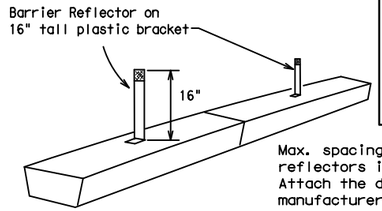
1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost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



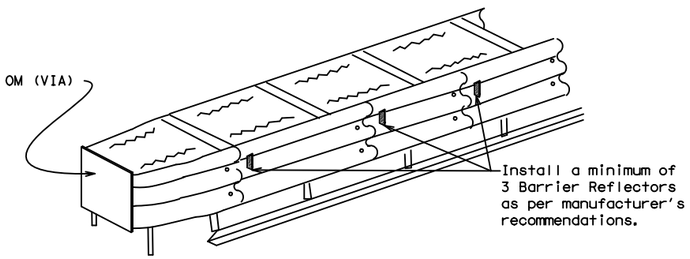
CONCRETE TRAFFIC BARRIER (CTB)

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



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

LOW PROFILE CONCRETE BARRIER (LPCB)



DELINEATION OF END TREATMENTS

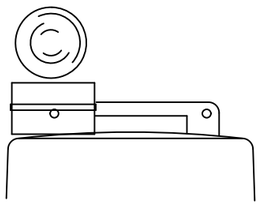
LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES

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

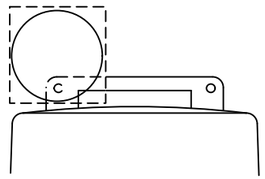
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



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



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

WARNING LIGHTS

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

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

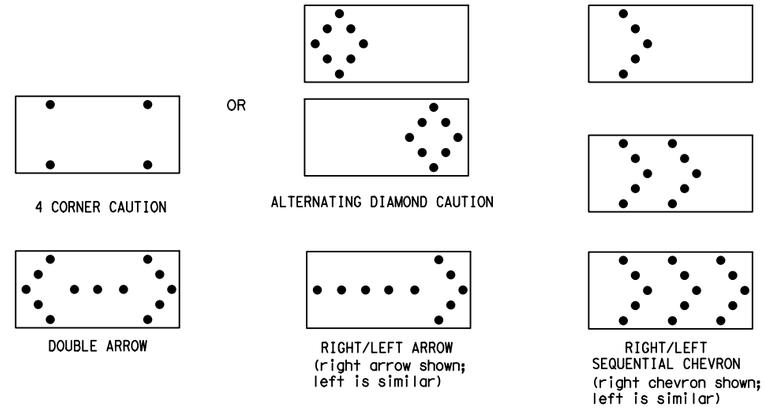
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

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

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

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

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



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

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

ATTENTION

Flashing Arrow Boards shall be equipped with automatic dimming devices.

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

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

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

SHEET 7 OF 12

Texas Department of Transportation

Traffic Safety Division Standard

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

BC(7)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	0912	72	386	CS
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FILE:

GENERAL NOTES

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

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

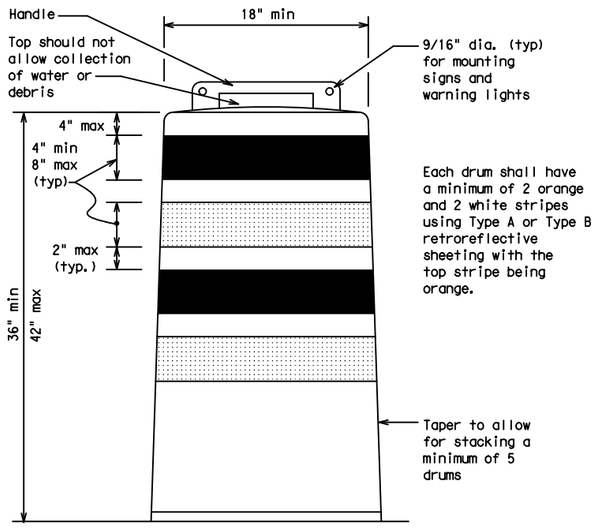
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

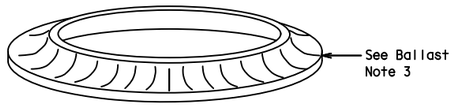
RETROREFLECTIVE SHEETING

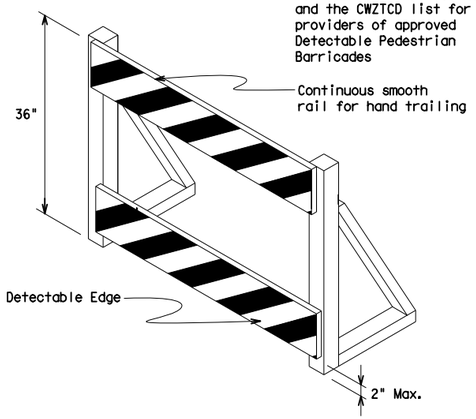
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall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

BALLAST

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

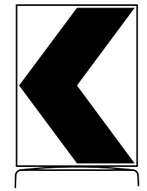




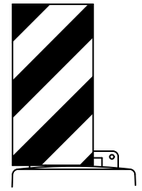


DETECTABLE PEDESTRIAN BARRICADES

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



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



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

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

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	0912	72	386	CS
4-03 8-14	DIST	COUNTY		SHEET NO.
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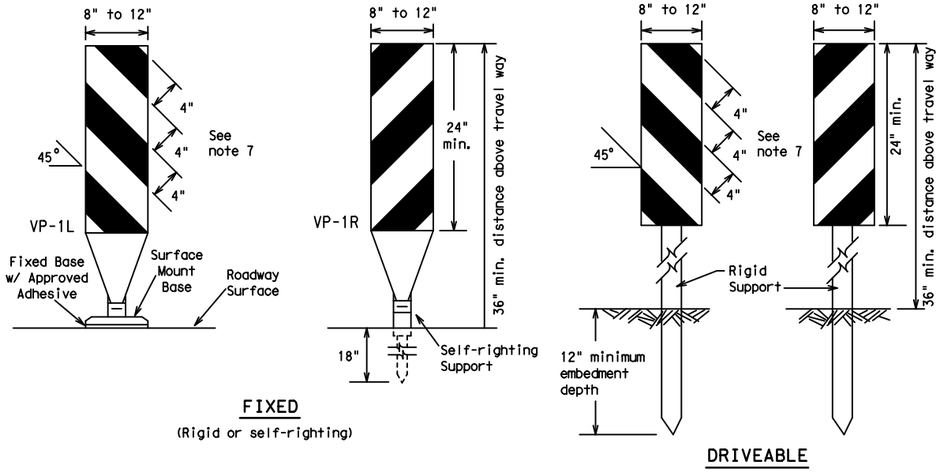
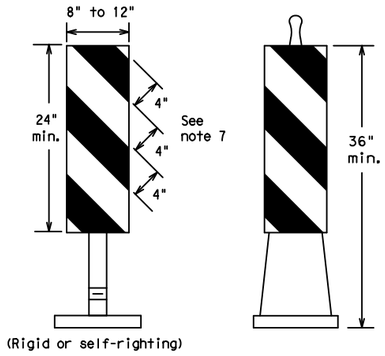


FIXED
(Rigid or self-righting)

DRIVEABLE

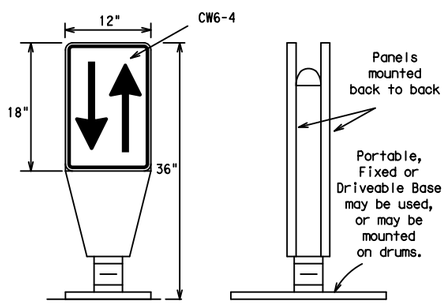


(Rigid or self-righting)

PORTABLE

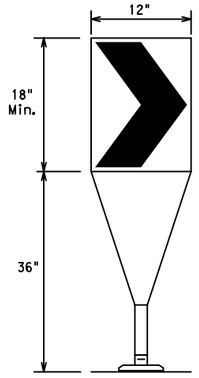
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is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

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_{FL} or Type C_{FL} conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.

OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



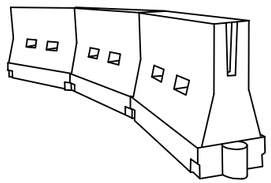
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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

CHEVRONS

GENERAL NOTES

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



LONGITUDINAL CHANNELIZING DEVICES (LCD)

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

WATER BALLASTED SYSTEMS USED AS BARRIERS

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

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

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

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

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

SHEET 9 OF 12

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-21

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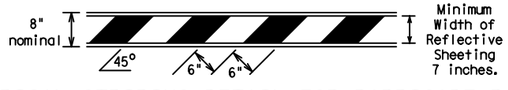
DATE:
FILE:

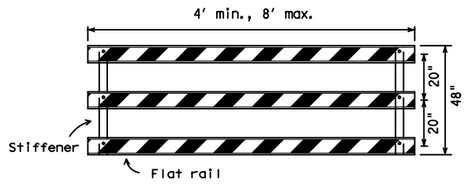
TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



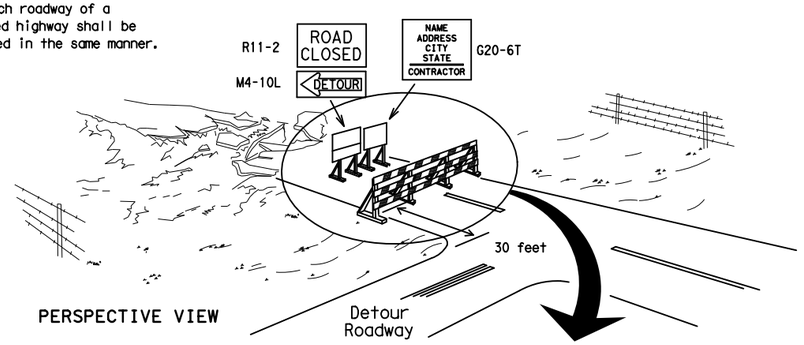
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

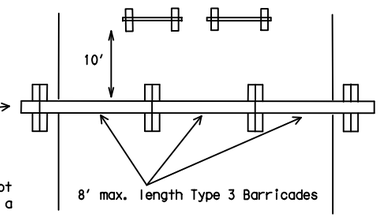
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

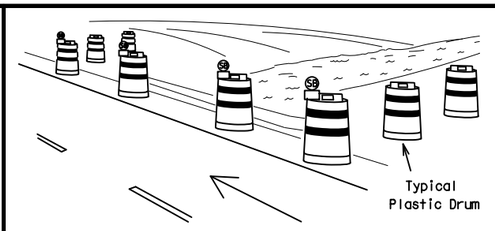
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

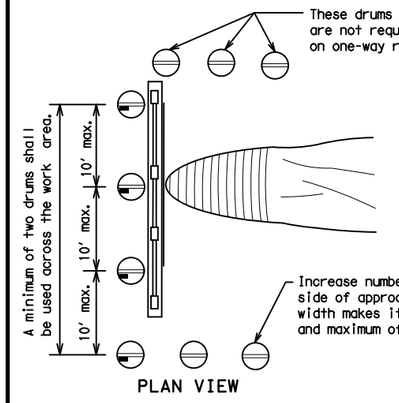
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

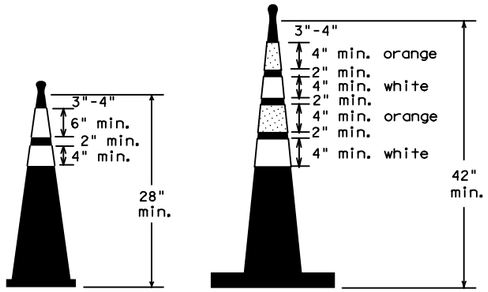
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



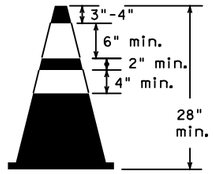
LEGEND	
	Plastic drum
	Plastic drum with steady burn light or yellow warning reflector
SB	Steady burn warning light or yellow warning reflector

PLAN VIEW

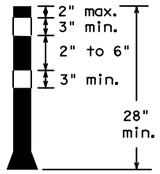
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



Two-Piece cones



One-Piece cones

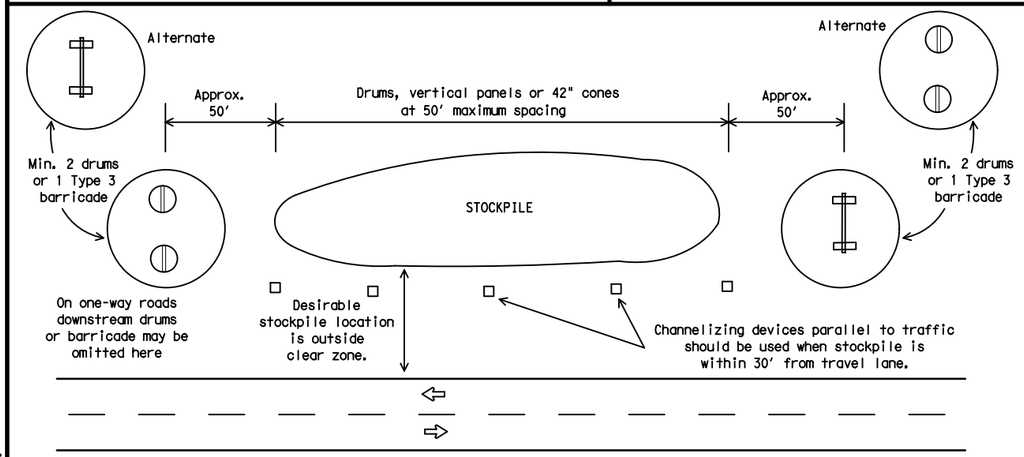


Tubular Marker

28" Cones shall have a minimum weight of 9 1/2 lbs.

42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

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



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

DATE:
FILE:

SHEET 10 OF 12

Texas Department of Transportation — Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	72	386	CS
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	HOU	HARRIS		79

DATE:
FILE:

WORK ZONE PAVEMENT MARKINGS

GENERAL

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

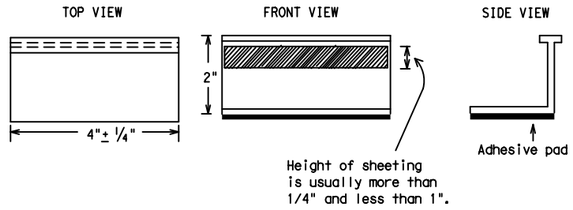
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

REMOVAL OF PAVEMENT MARKINGS

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

Temporary Flexible-Reflective Roadway Marker Tabs



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

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

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-21

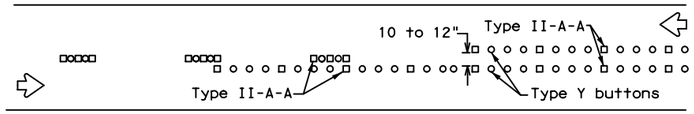
FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	72	386	CS
2-98 9-07 5-21	DIST	COUNTY		SHEET NO.
1-02 7-13	HOU	HARRIS		80
11-02 8-14				

105

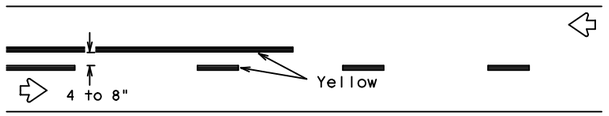
DATE:
FILE:

PAVEMENT MARKING PATTERNS

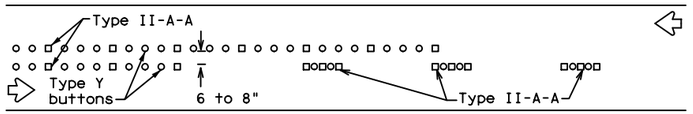
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



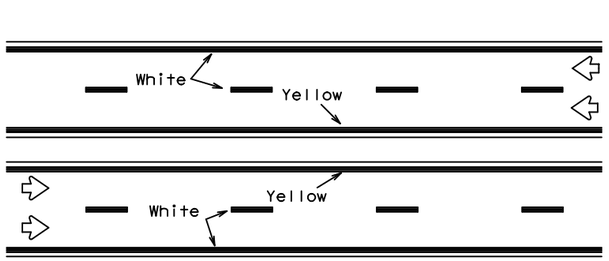
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



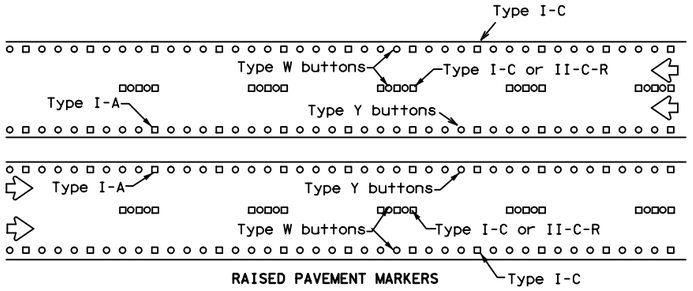
RAISED PAVEMENT MARKERS - PATTERN B

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

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



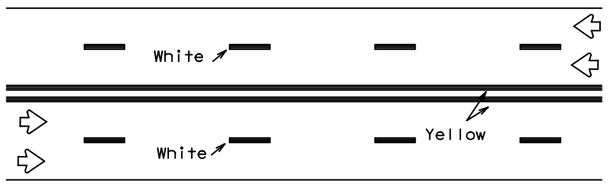
REFLECTORIZED PAVEMENT MARKINGS



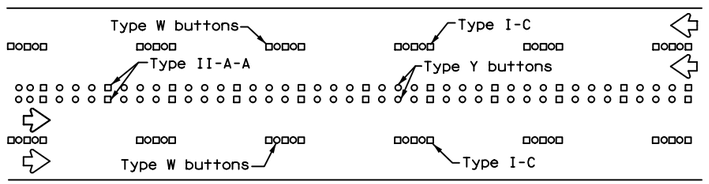
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



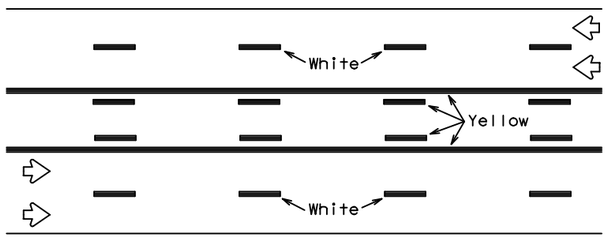
REFLECTORIZED PAVEMENT MARKINGS



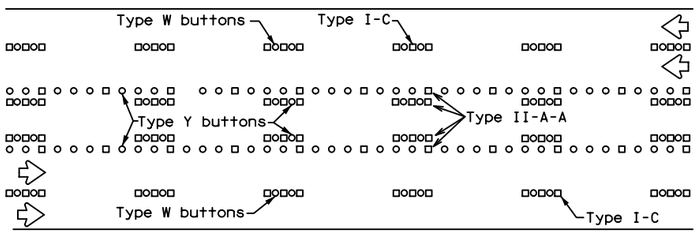
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

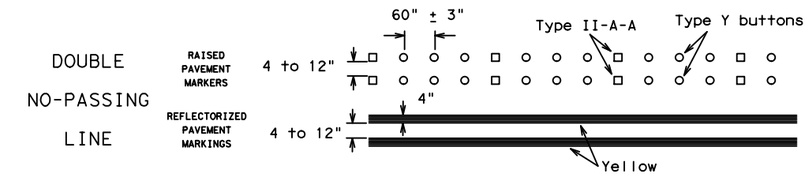
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

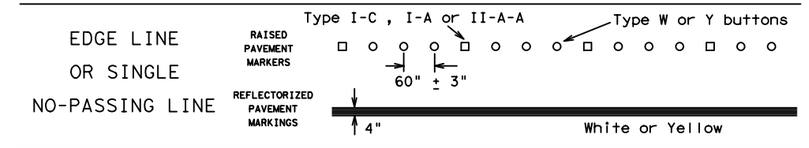
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

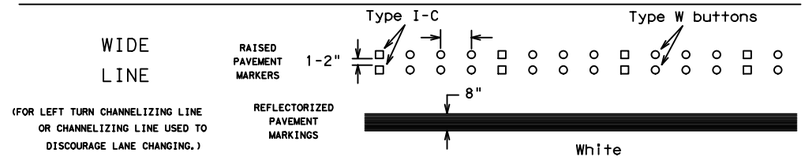


EDGE LINE OR SINGLE NO-PASSING LINE



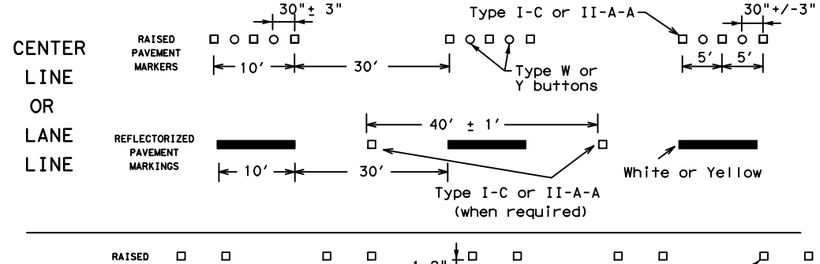
WIDE LINE

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

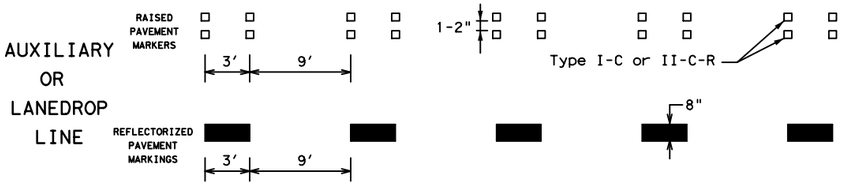


BROKEN LINES

CENTER LINE OR LANE LINE

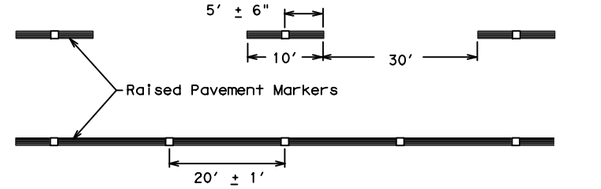


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

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



Centerline only - not to be used on edge lines

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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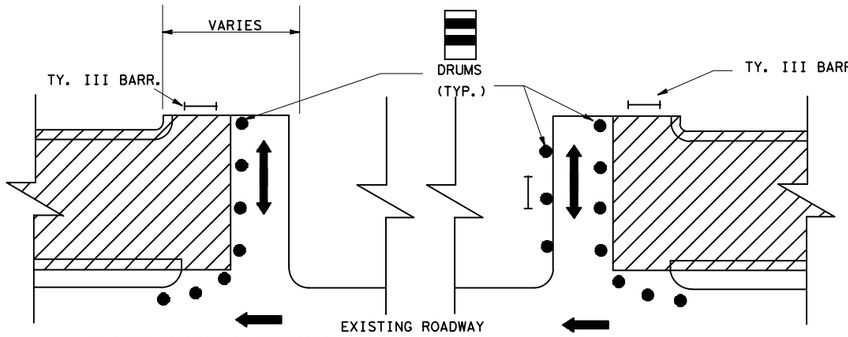
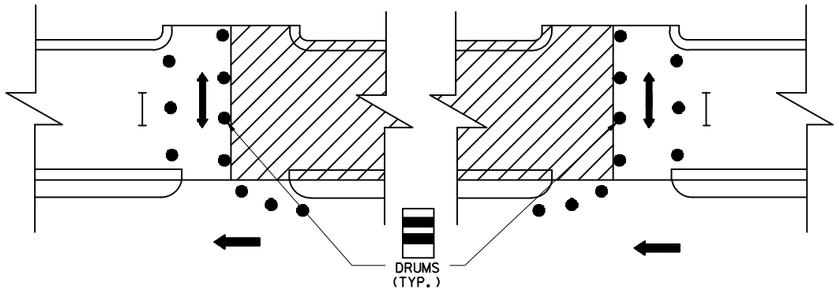
REVISIONS 1-97 9-07 5-21 2-98 7-13 11-02 8-14	0912	72	386	CS
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		81

106

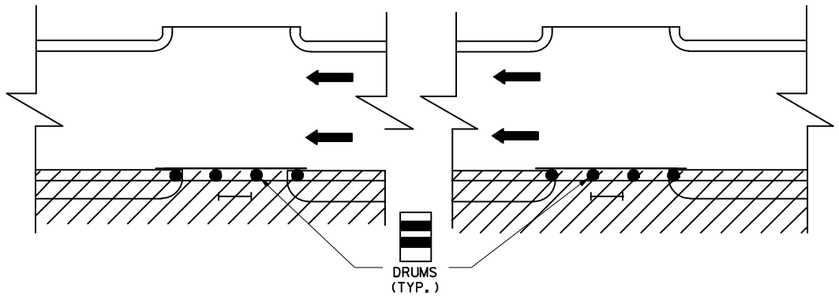


1) WITH TRAFFIC ON EXISTING
BUILD ONE-HALF OF DRIVE.

2) BUILD OTHER HALF OF DRIVE



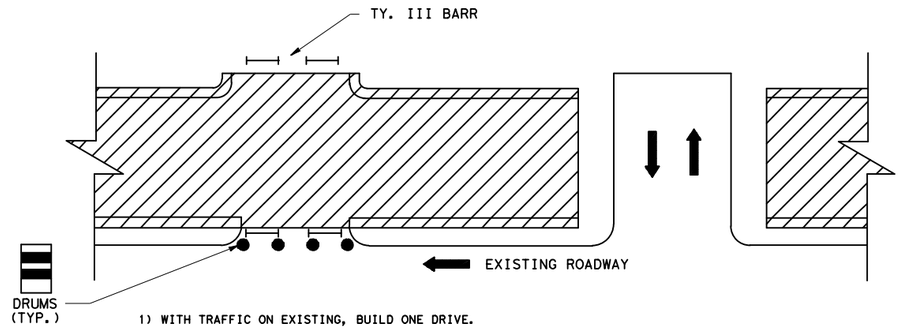
2) BUILD OTHER HALF OF DRIVE



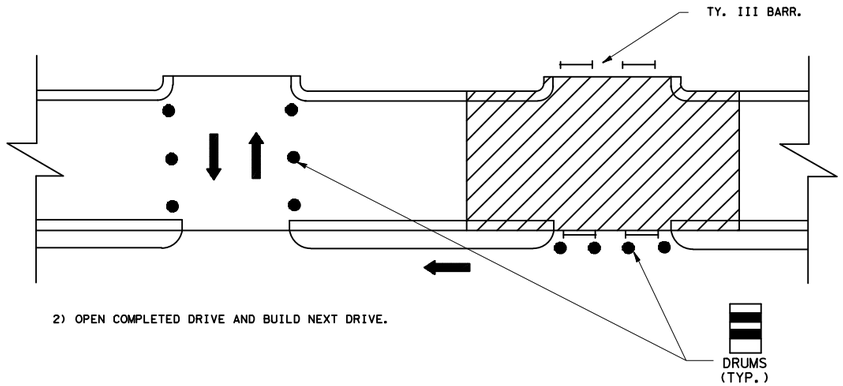
3) OPEN DRIVE

4) AFTER TRAFFIC MOVES TO NEW ROADWAY,
BUILD REMAINING CURB.

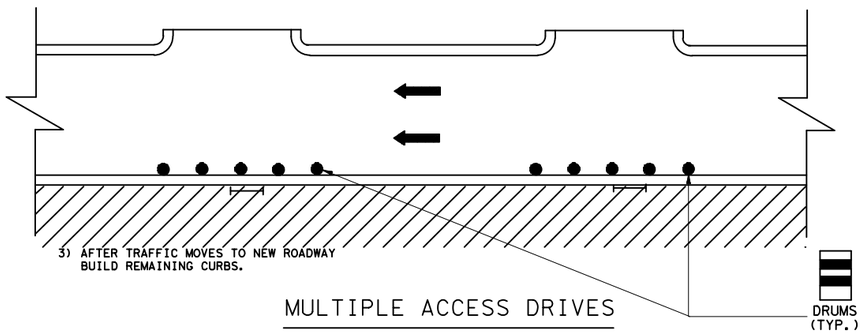
SINGLE ACCESS DRIVES



1) WITH TRAFFIC ON EXISTING, BUILD ONE DRIVE.



2) OPEN COMPLETED DRIVE AND BUILD NEXT DRIVE.



3) AFTER TRAFFIC MOVES TO NEW ROADWAY
BUILD REMAINING CURBS.

MULTIPLE ACCESS DRIVES

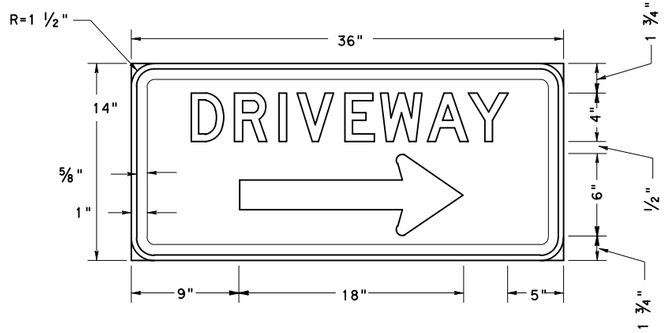
Texas Department of Transportation
Houston District

CONSTRUCTION SEQUENCE FOR MISCELLANEOUS DRIVES

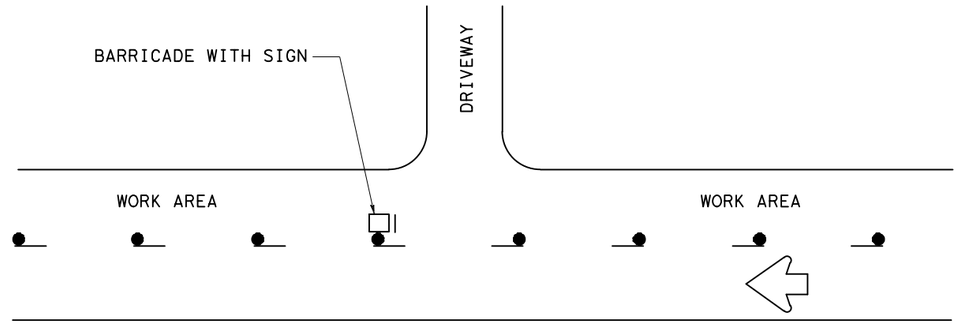
CSMD TC8010-2020

FILE:	DN:	CK:	DW:	CK:	
© TxDOT 2020	DIST	FED REG	PROJECT NO.		SHEET
REVISIONS	HOU	6	STP 1902 (308) MM		82
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	HARRIS		0912	72	386	CS

STD H-29



LETTERS: WHITE
BORDER: WHITE
BACKGROUND: BLUE



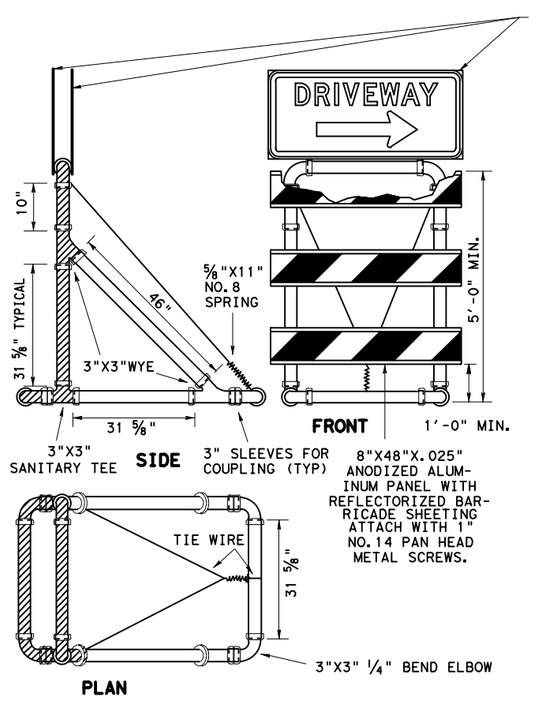
TYPICAL LOCATION OF DRIVEWAY SIGN

TYPE III PVC BARRICADES TYPICAL DESIGN DETAILS

MAY BE USED AT THE OPTION OF THE CONTRACTOR.

NOTES:

1. ALL PIPE SHALL BE POLYVINYL CHLORIDE (PVC) PRESSURE RATED PIPE SDR 21 OR SDR 26 ASTM D2241.
2. JOINT FITTINGS MAY BE PVC-ASTM D2665 OR ACRYLONITRILE BUTADIENE STYRENE (ABS) ASTM D2661 (DRAINAGE WASTE AND VENT).
3. ALL PIPE AND FITTINGS SHALL BE WHITE.
4. ALL JOINTS SHALL BE FREE TO SEPARATE UPON VEHICLE IMPACT.
5. CROSS HATCHED CONDUIT TO BE TIED TOGETHER WITH ROPE THREADED INTO PIPE INTERIOR. USE ⅜" NO. 6 SOLID BRAIDED NYLON OR EQUIVALENT.
6. A FIXED FRANGIBLE PAVEMENT CONNECTION IS PREFERRED. SAND BAGS MAY BE SUBSTITUTED.



CONSTRUCTION SIGN NOTES

MATERIALS

CONSTRUCTION SIGNS SHALL BE MADE FROM APPROVED FIBERGLASS OR HIGH IMPACT PLASTIC AS PRIMARY MATERIALS.

SIGN SHEETING

REFLECTORIZED SIGN SHALL BE CONSTRUCTED OF RETRO REFLECTIVE SHEETING MEETING THE COLOR AND REFLECTIVITY REQUIREMENTS OF MATERIAL SPECIFICATIONS, DMS-8300.

TYPE C SHEETING SHALL BE USED FOR THIS APPLICATION.

SIGN LETTERS

ALL SIGNS LETTERING SHALL BE CLEAR, OPEN ROUNDED TYPE CAPITAL LETTERS AS APPROVED BY AND AS PUBLISHED BY THE FEDERAL HIGHWAY ADMINISTRATION. SIGNS AND LETTERING SHALL BE OF FIRST CLASS WORKMANSHIP EQUIVALENT TO THAT OF THE DEPARTMENT'S STANDARD SIGNS.

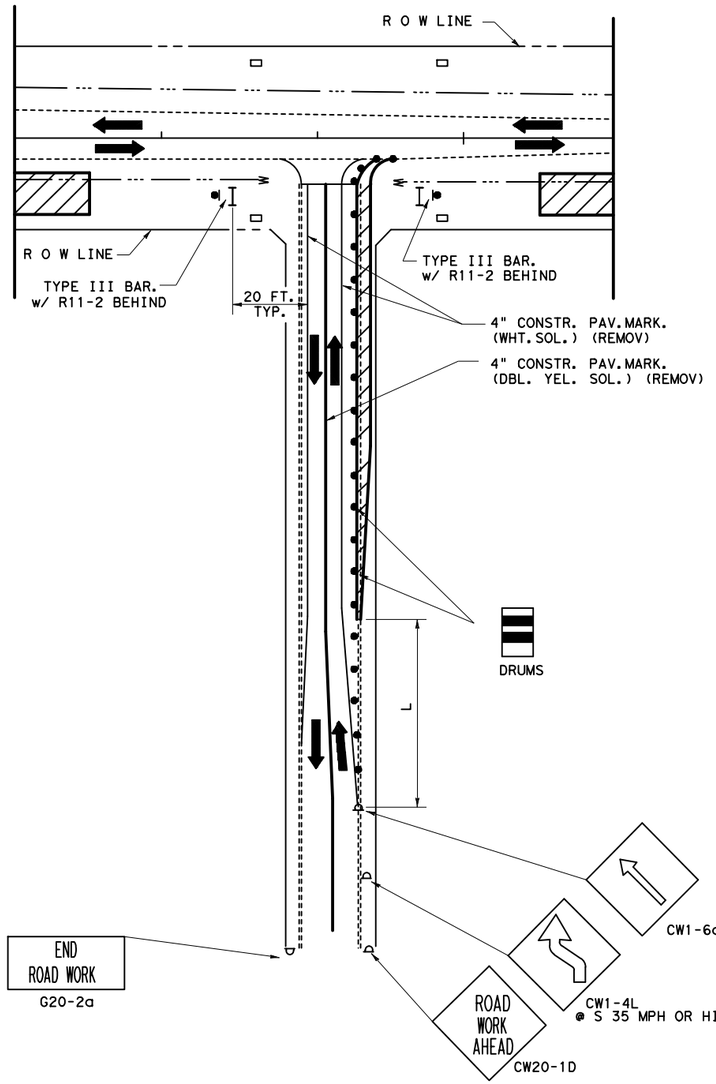
Texas Department of Transportation
Houston District

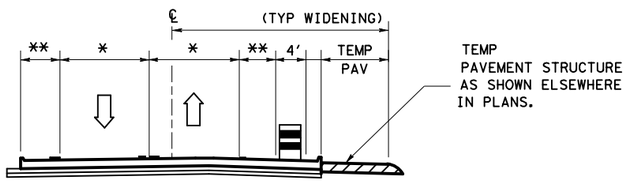
DRIVEWAY SIGNING

DS TC8020-04

FILE:	DN:	CK:	DW:	CK:
© TxDOT 2004	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS	HOU	6	STP 1902 (308) MM	83
	COUNTY	CONTROL	SECT JOB	HIGHWAY
	HARRIS	0912	72 386	CS

STD H-30



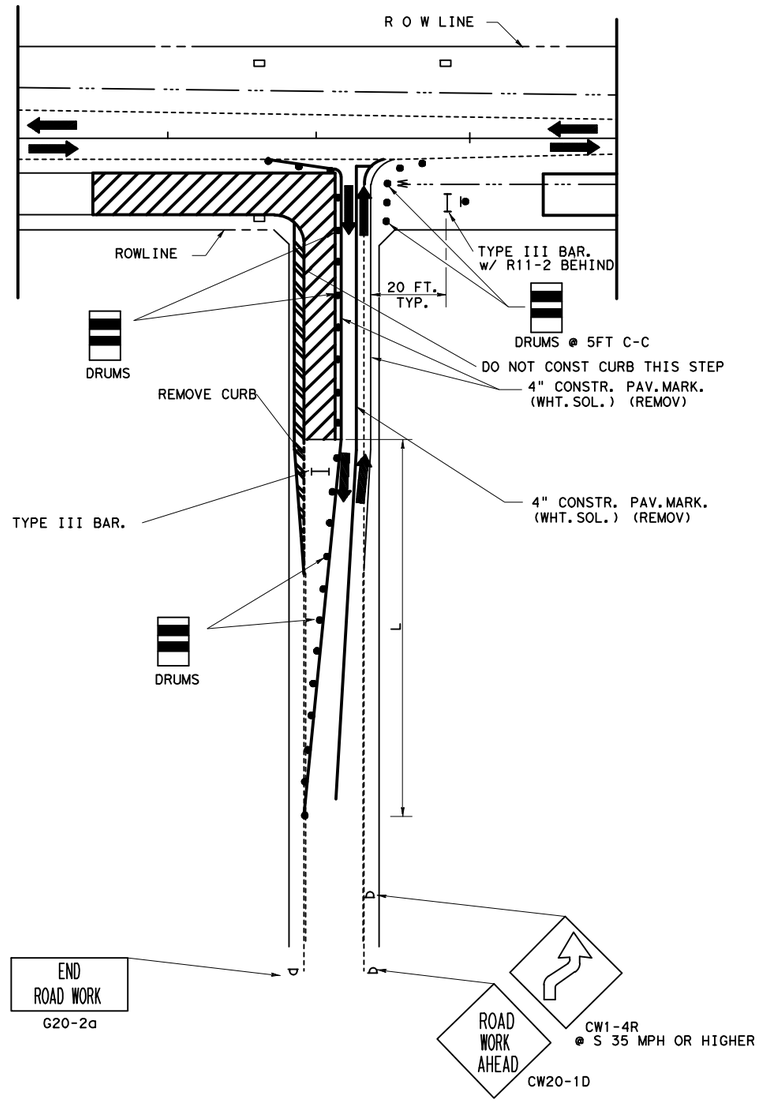


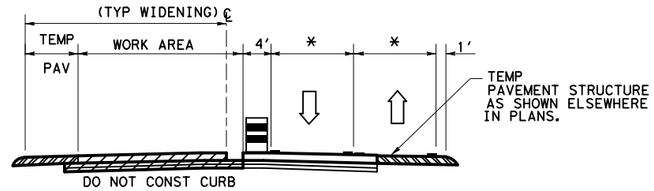
** MIN. 0 FT.
MAX. 10 FT.

STEP 1

* 10 FT. MIN.
12 FT. DESIRABLE IF SPACE AVAILABLE.

* IN CASES WHERE EXISTING SIDE STREETS HAVE LESS THAN 10 FT. LANE WIDTHS, PROVIDE LANE WIDTHS EQUAL OR GREATER THAN EXISTING.





STEP 2

TYPICAL ADVANCE SIGNING
TO REMAIN PLACE DURING ALL PHASES
OR AS DIRECTED BY ENGINEER

END
ROAD WORK
G20-2a

ROAD
WORK
AHEAD
CW20-1D

CONSTRUCTION WARNING
SIGN SPACING

POSTED SPEED (MPH)	"X" SIGN SPACINGS (FEET)
30 OR LESS	120
35	160
40	240
45	320
50	400
55	500
60	600
65	700
70	800

TYPICAL TRANSITION LENGTHS
AND
SUGGESTED MAXIMUM SPACING OF DEVICES

POSTED SPEED	FORMULA	MINIMUM DESIRABLE TAPER LENGTHS ⊛⊛ 10' OFFSET	11' OFFSET	12' OFFSET	SUGGESTED MAX. SPAC. OF DEVICE ON A TAPER	ON A TANGENT	MINIMUM SIGN SPACING x DISTANCE
30	$L=\frac{WS^2}{60}$	150'	165'	180'	30'	60'-75'	120'
35		205'	225'	245'	35'	70'-90'	160'
40		265'	295'	320'	40'	80'-100'	240'
45	L=WS	450'	495'	540'	45'	90'-110'	320'
50		500'	550'	600'	50'	100'-125'	400'
55		550'	605'	660'	55'	110'-140'	500'
60		600'	660'	720'	60'	120'-150'	⊛ 600'
65		650'	715'	780'	65'	130'-165'	⊛ 700'
70		700'	770'	840'	70'	140'-175'	⊛ 800'

⊛ CONVENTIONAL ROADS ONLY

⊛⊛ TAPER LENGTHS HAVE BEEN ROUNDED OFF.

LEGEND

- CONSTRUCTION AREA
- TEMPORARY PAVEMENT
- OPEN TO TRAFFIC

SHEET 1 OF 2

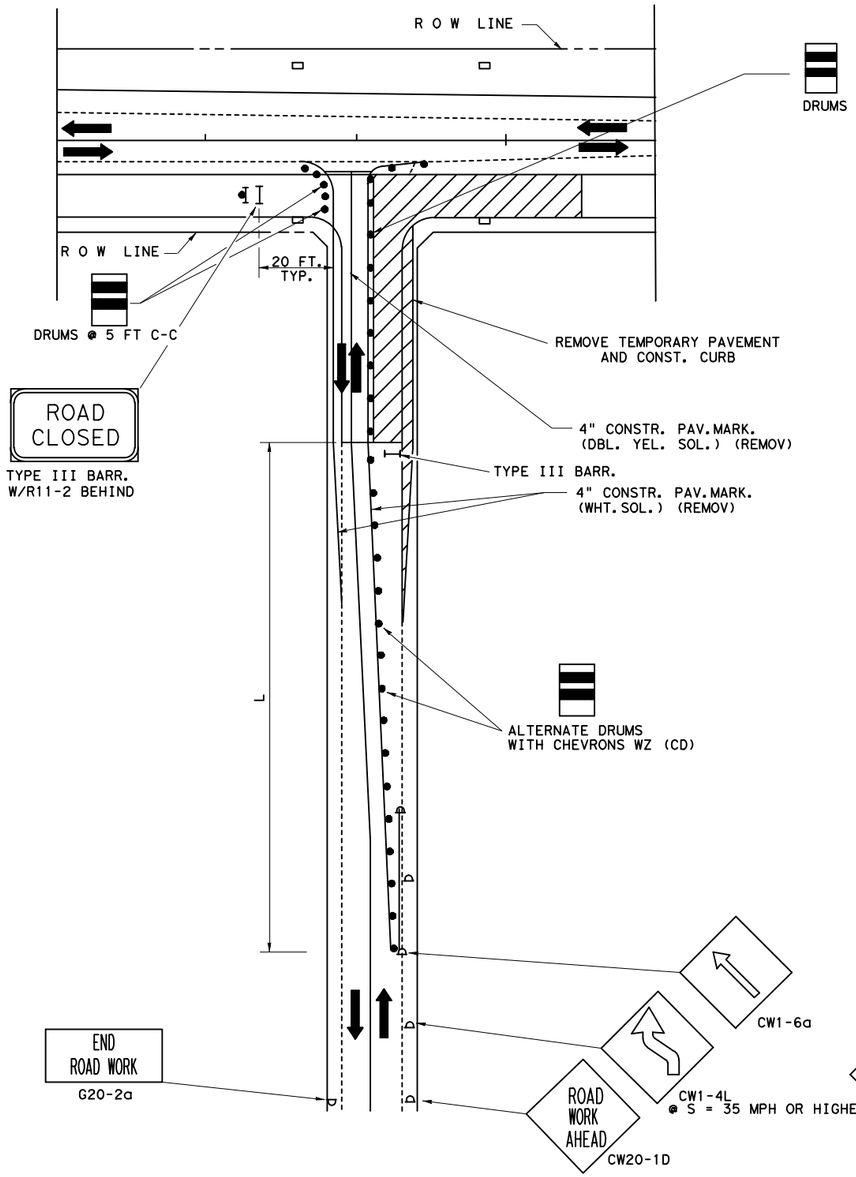
Texas Department of Transportation
Houston District

TWO WAY ROADWAY INTERSECTION PHASING

TWRIP(1) TC2010-09

FILE:	DN:	CK:	DW:	CK:
© TxDOT OCT 2009	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS	HOU	6	STP 1902 (308) MM	84
	COUNTY	CONTROL	SECT JOB	HIGHWAY
	HARRIS	0912	72 386	CS

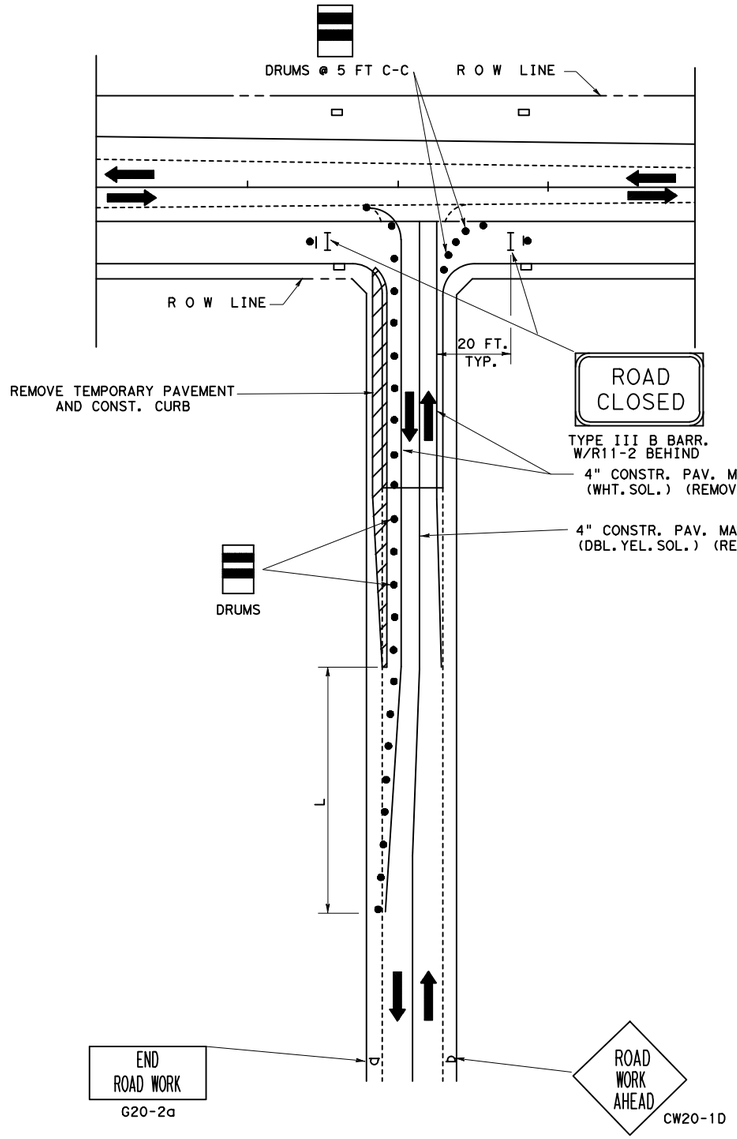
STD H-5A

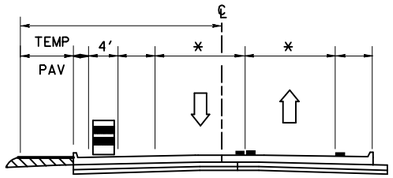


STEP 3

* 10 FT. MIN.
12 FT. DESIRABLE IF SPACE AVAILABLE.

* IN CASES WHERE EXISTING SIDE STREETS HAVE LESS THAN 10 FT. LANE WIDTHS, PROVIDE LANE WIDTHS EQUAL OR GREATER THAN EXISTING.





STEP 4

TYPICAL ADVANCE SIGNING
TO REMAIN PLACE DURING ALL PHASES
OR AS DIRECTED BY ENGINEER

END ROAD WORK
G20-2a

ROAD WORK AHEAD
CW20-1D

CONSTRUCTION WARNING
SIGN SPACING

POSTED SPEED (MPH)	"X" SIGN SPACINGS (FEET)
30 OR LESS	120
35	160
40	240
45	320
50	400
55	500
60	600
65	700
70	800

TYPICAL TRANSITION LENGTHS
AND
SUGGESTED MAXIMUM SPACING OF DEVICES

POSTED SPEED	FORMULA	MINIMUM DESIRABLE TAPER LENGTHS ⓧⓧ 10′ OFFSET	11′ OFFSET	12′ OFFSET	SUGGESTED MAX. SPAC. OF DEVICE ON A TAPER	ON A TANGENT	MINIMUM SIGN SPACING × DISTANCE
30	$L=\frac{WS^2}{60}$	150′	165′	180′	30′	60′-75′	120′
35		205′	225′	245′	35′	70′-90′	160′
40		265′	295′	320′	40′	80′-100′	240′
45	L=WS	450′	495′	540′	45′	90′-110′	320′
50		500′	550′	600′	50′	100′-125′	400′
55		550′	605′	660′	55′	110′-140′	500′
60		600′	660′	720′	60′	120′-150′	⊛ 600′
65		650′	715′	780′	65′	130′-165′	⊛ 700′
70		700′	770′	840′	70′	140′-175′	⊛ 800′

⊛ CONVENTIONAL ROADS ONLY

ⓧⓧ TAPER LENGTHS HAVE BEEN ROUNDED OFF.

LEGEND

CONSTRUCTION AREA

TEMPORARY PAVEMENT

OPEN TO TRAFFIC

Texas Department of Transportation
Houston District

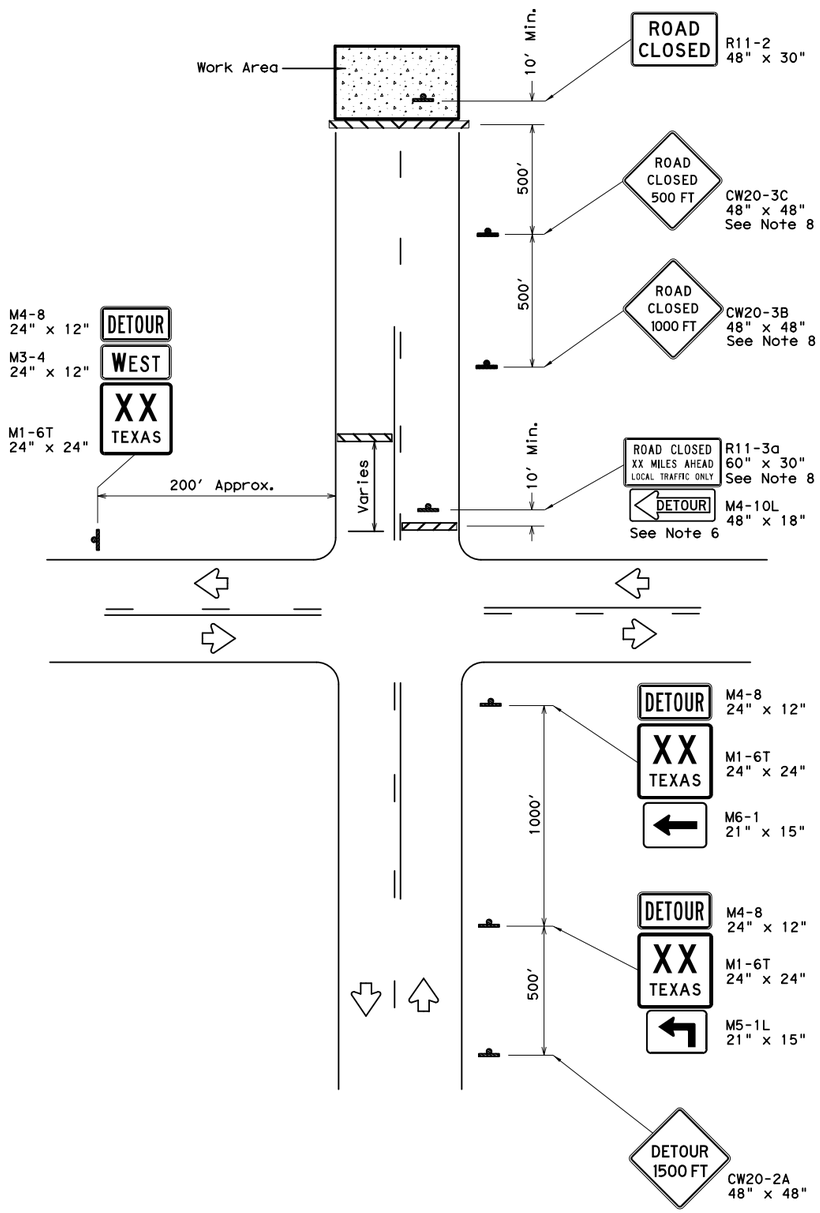
TWO WAY ROADWAY INTERSECTION PHASING

TWRIP(2) TC2010-09

FILE:	DN:	CK:	DW:	CK:
©TxDOT OCT 2009 REVISIONS	DIST: HOU	FED REG: 6	PROJECT NO.: STP 1902 (308) MM	SHEET: 85
	COUNTY: HARRIS	CONTROL: 0912	SECT: 72	JOB: 386	HIGHWAY: CS

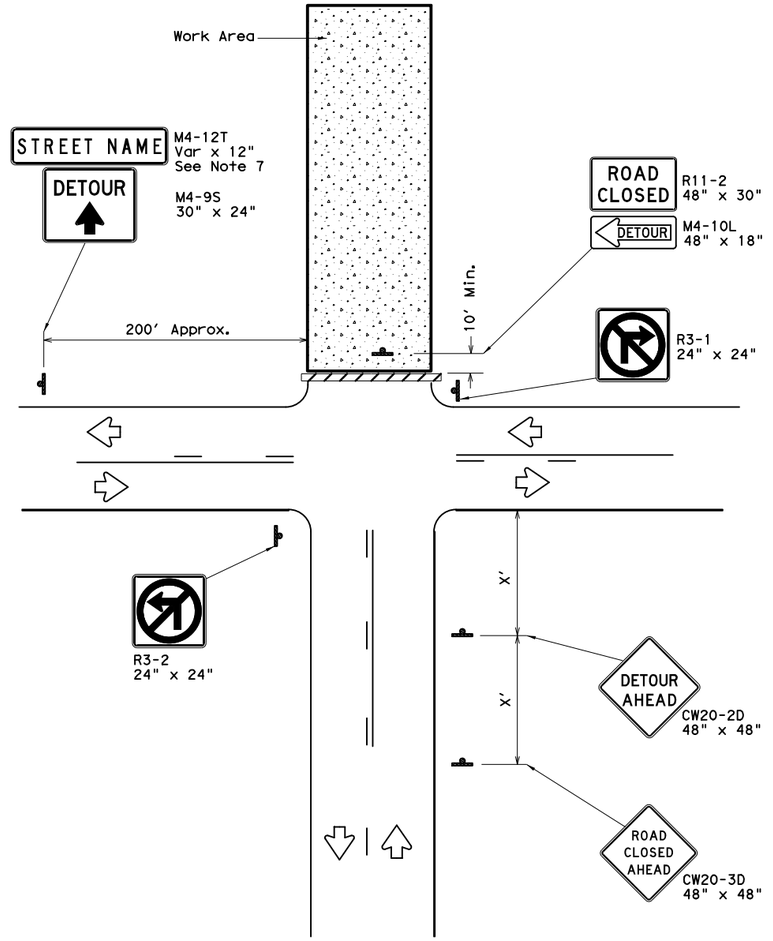
STD H-5B

DATE:
FILE:



ROAD CLOSURE BEYOND THE INTERSECTION

Signing for a Numbered Route with an Off-Site Detour



ROAD CLOSURE AT THE INTERSECTION

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

LEGEND	
	Type 3 Barricade
	Sign

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

* Conventional Roads Only

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

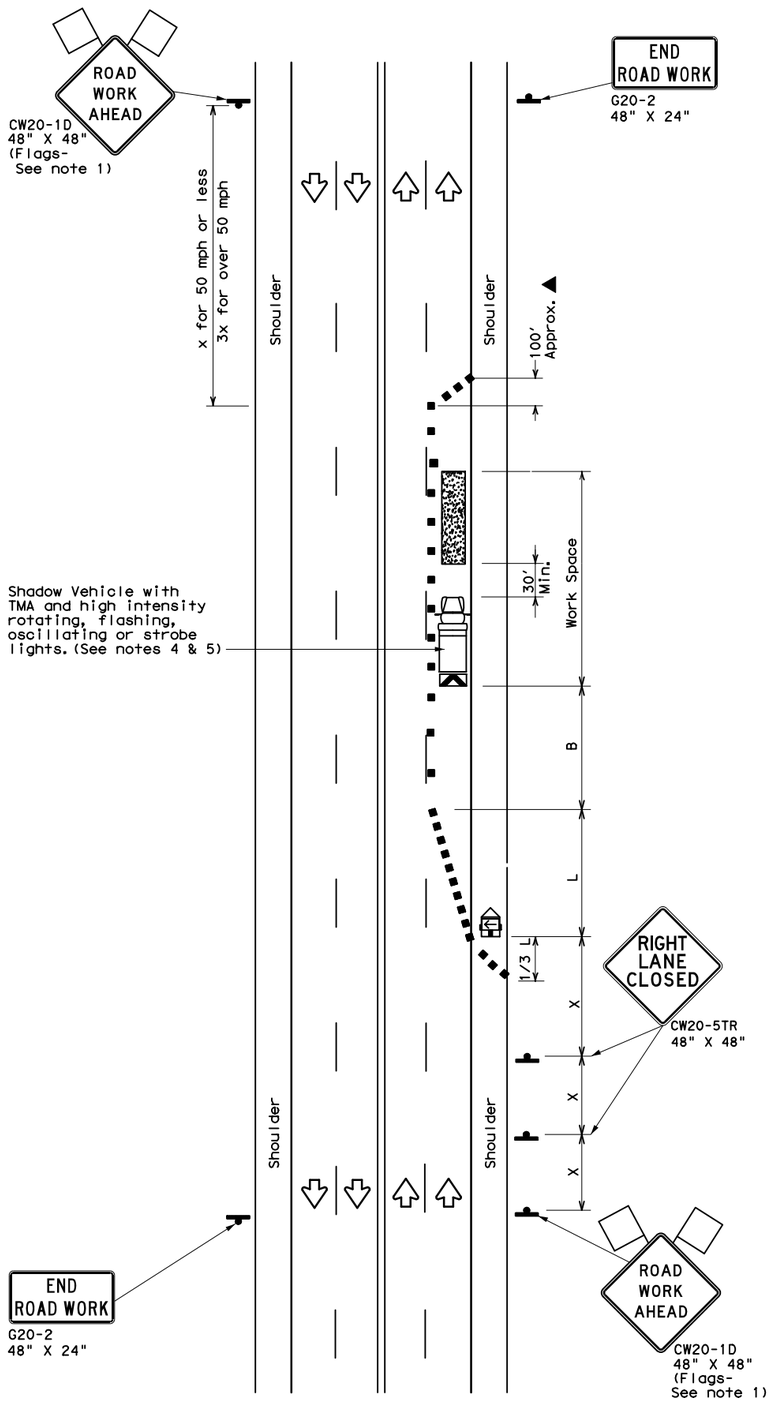
WORK ZONE ROAD CLOSURE DETAILS

WZ(RCD)-13

FILE: wzrcd-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 1995	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	72	386	CS
1-97 4-98 7-13	DIST	COUNTY		SHEET NO.
2-98 3-03	HOU	HARRIS		86

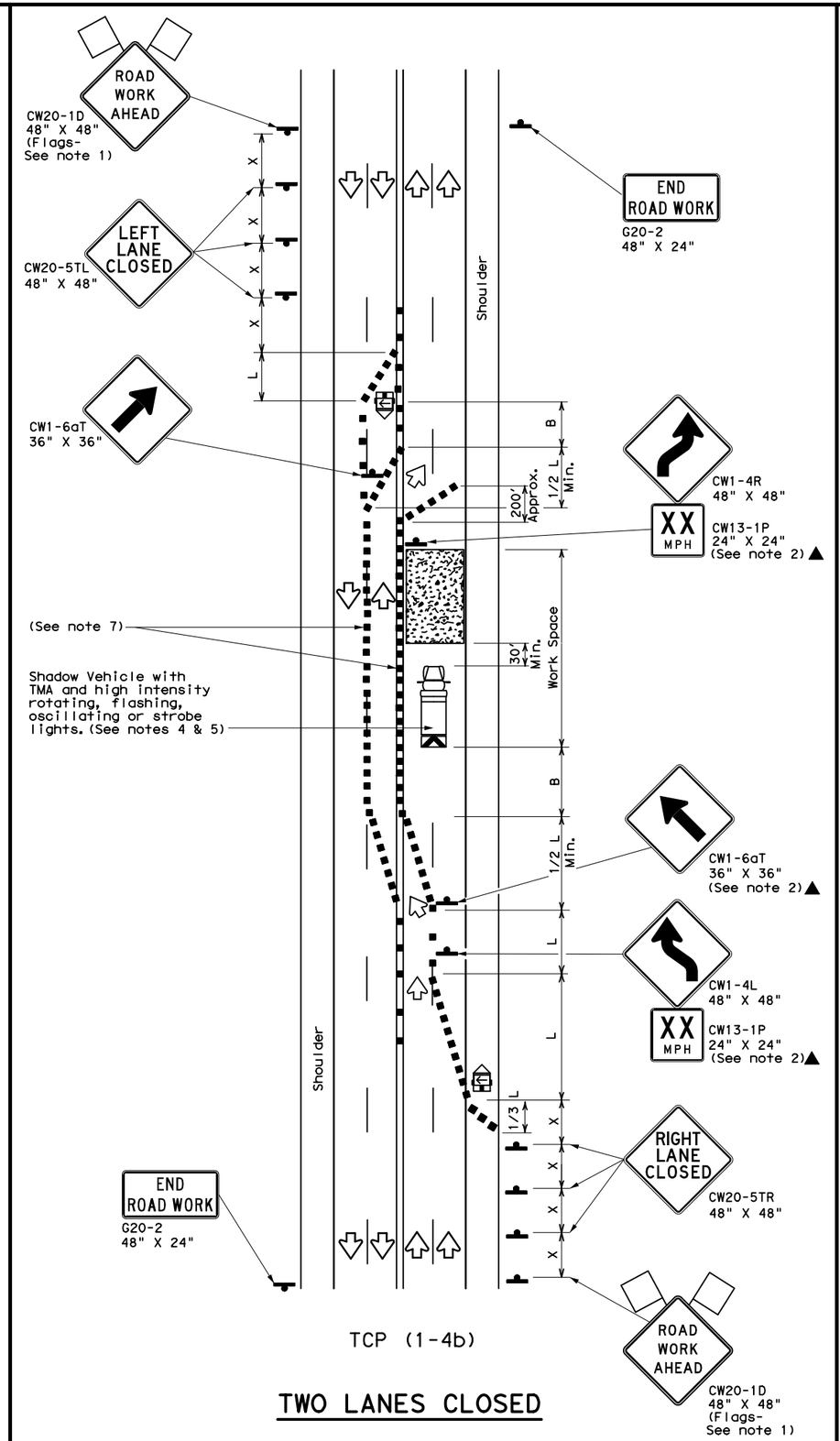
113

DATE:
FILE:



TCP (1-4a)

ONE LANE CLOSED



TCP (1-4b)

TWO LANES CLOSED

LEGEND			
	Type 3 Barricade	■■	Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board	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. The CW20-1D "ROAD WORK AHEAD" sign may be repeated if the visibility of the work zone is less than 1500 feet.
4. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
5. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.

TCP (1-4a)

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

TCP (1-4b)

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LANE CLOSURES ON MULTILANE CONVENTIONAL ROADS

TCP(1-4)-18

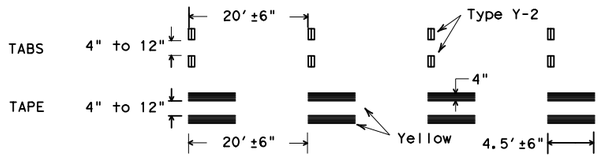
FILE: tcp1-4-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	72	386	CS
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	HOU	HARRIS		87
1-97 2-18				

DATE:
FILE:

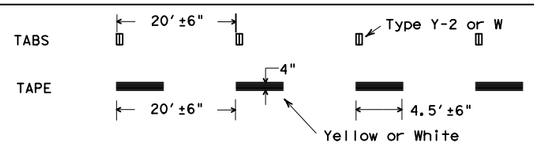
WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

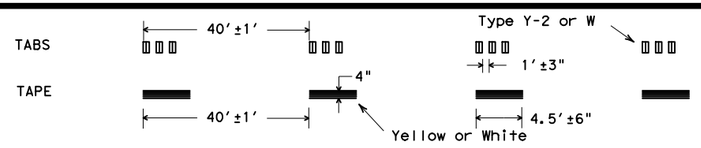


SINGLE NO-PASSING LINE or CHANNELIZATION LINE



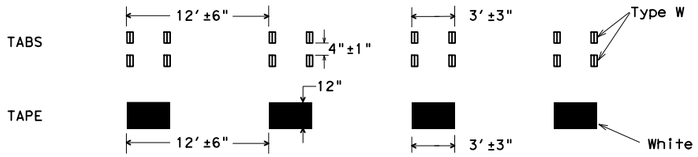
BROKEN LINES

(FOR CENTER LINE OR LANE LINE)

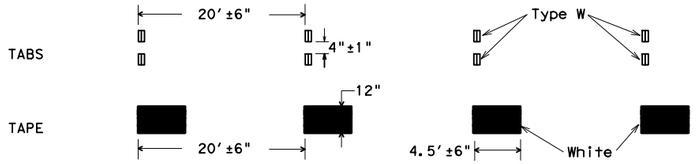


WIDE DOTTED LINES

(FOR LANE DROP LINES)



WIDE GORE MARKINGS



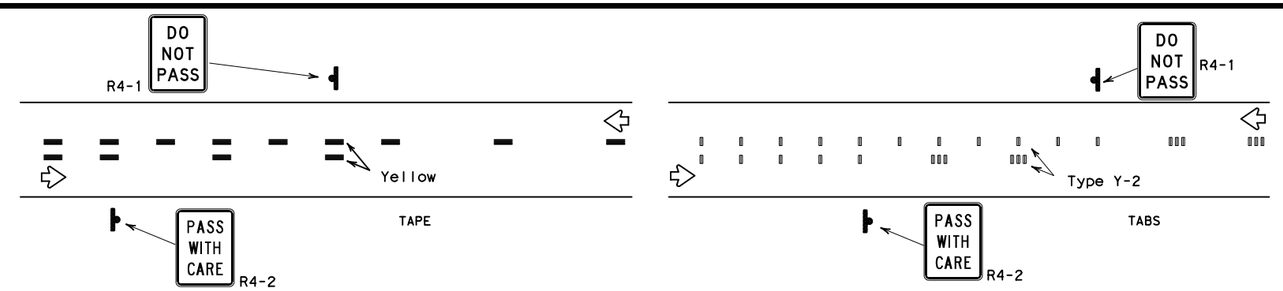
NOTES:

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.

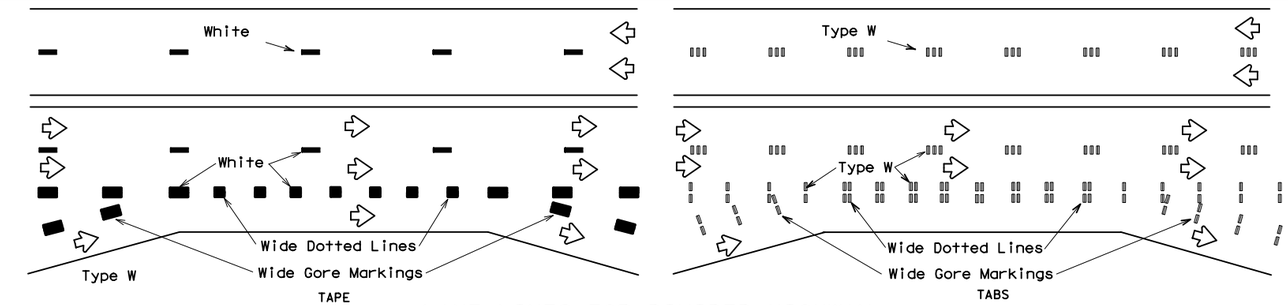
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS (TABS)

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.

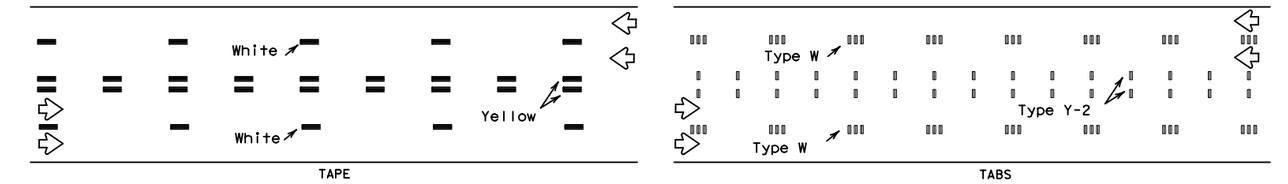
WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS



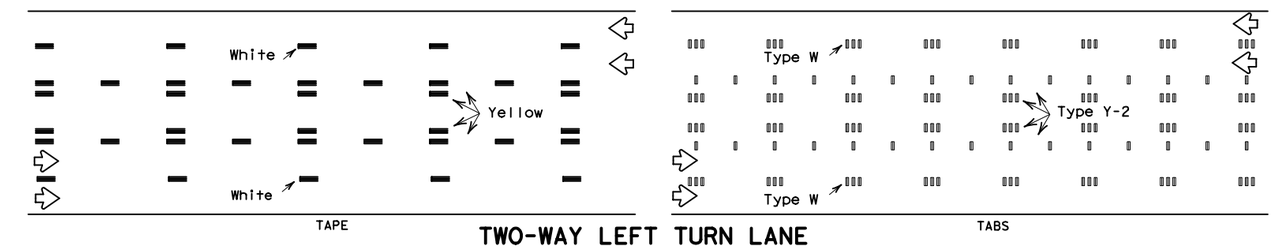
CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO LANE TWO-WAY HIGHWAYS



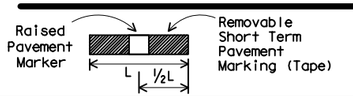
LANE LINES FOR DIVIDED HIGHWAY



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
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1-97		DIST	COUNTY		SHEET NO.
3-03		HOU	HARRIS		88
7-13					

111

DATE:
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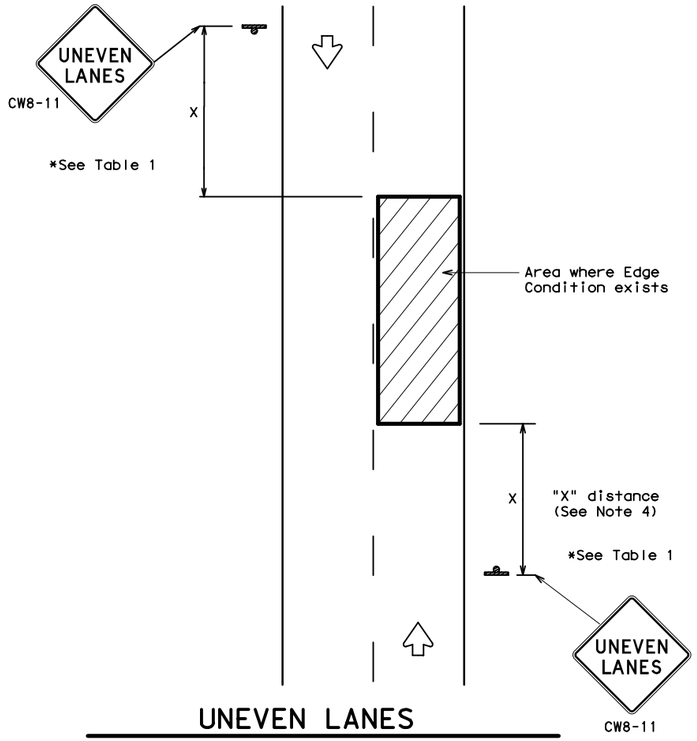
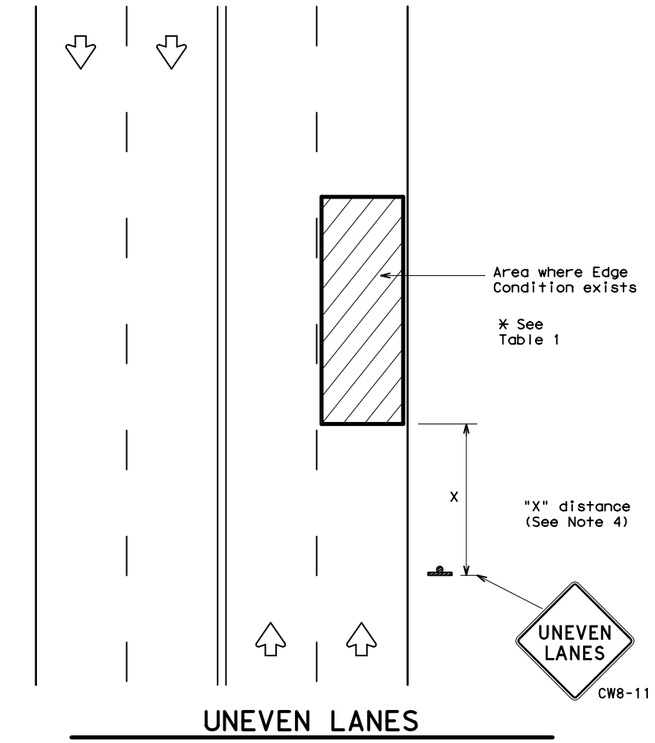
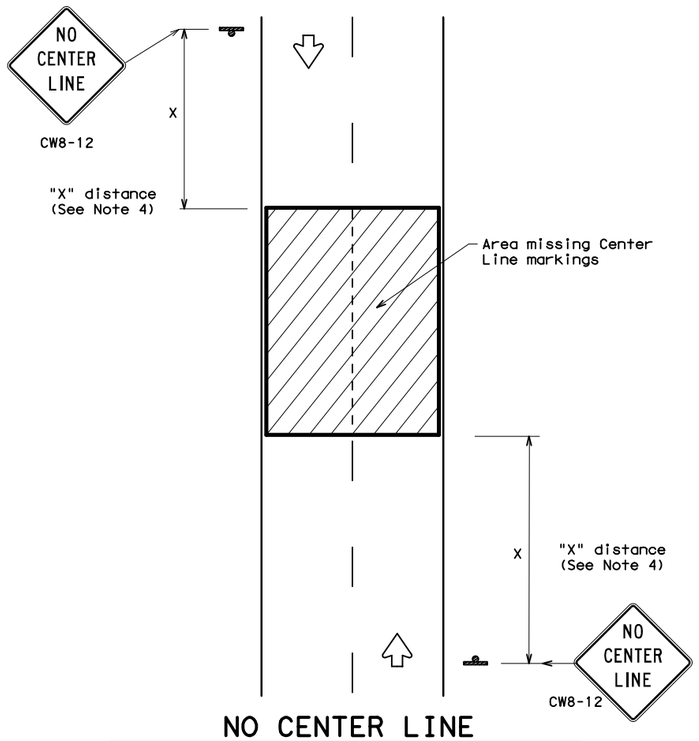


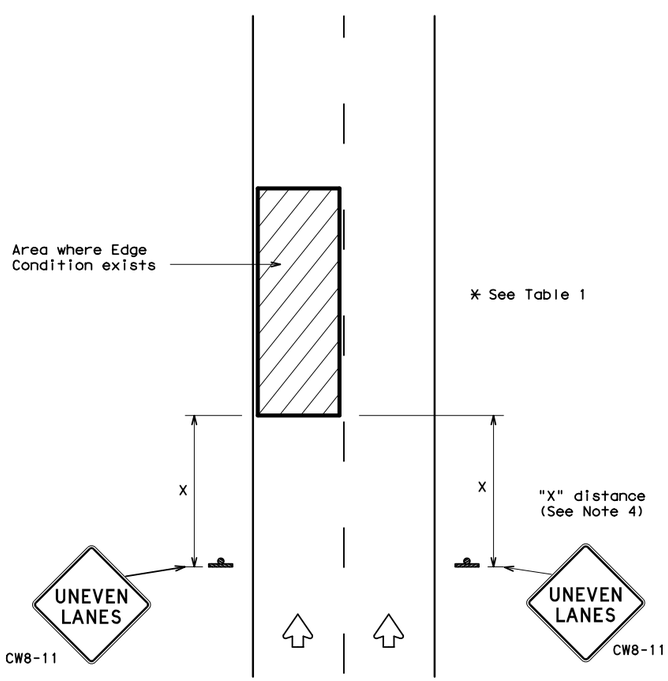
UNEVEN LANES
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
FOUR LANE CONVENTIONAL ROAD



NO CENTER LINE
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
DIVIDED ROADWAY

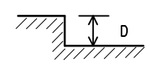
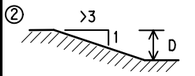
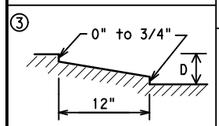
DEPARTMENTAL MATERIAL SPECIFICATIONS	
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY (REMOVABLE) PREFABRICATED PAVEMENT MARKINGS	DMS-8241
SIGN FACE MATERIALS	DMS-8300

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

GENERAL NOTES

1. If spalling or holes occur, ROUGH ROAD (CW8-8) signs should be placed in advance of the condition and be repeated every two miles where the condition persists.
2. UNEVEN LANES (CW8-11) signs shall be installed in advance of the condition and repeated every mile. Signs installed along the uneven lane condition may be supplemented with the NEXT XX MILES (CW7-3aP) plaque or Advisory Speed (CW13-1P) plaque.
3. NO CENTER LINE (CW8-12) signs and temporary pavement markings as per the WZ(STPM) standard shall be installed if yellow centerlines separating two way traffic are obscured or obliterated. Repeat NO CENTER LINE signs every two miles where the center line markings are not in place. The signs and markings shall remain in place until permanent pavement markings are installed.
4. Signs shall be spaced at the distances recommended as per BC standards.
5. Additional signs may be required as directed by the Engineer. Signs shall remain in place until final surface is applied. Signs shall be considered subsidiary to Item 502 "BARRICADES, SIGNS AND TRAFFIC HANDLING."
6. Signs shall be fabricated and mounted on supports as shown on the BC standards and/or listed on the "Compliant Work Zone Traffic Control Devices" list.
7. Short term markings shall not be used to simulate edge lines.
8. All signs shall be constructed in accordance with the details found in the "Standard Highway Sign Designs for Texas," latest edition.

TABLE 1

Edge Condition	Edge Height (D)	* Warning Devices
① 	Less than or equal to: 1¼" (maximum-planing) 1½" (typical-overlay)	Sign: CW8-11
	Distance "D" may be a maximum of 1 1/4 " for planing operations and 2" for overlay operations if uneven lanes with edge condition 1 are open to traffic after work operations cease.	
② 	Less than or equal to 3"	Sign: CW8-11
③  Notched Wedge Joint	Distance "D" may be a maximum of 3" if uneven lanes with edge condition 2 or 3 are open to traffic after work operations cease. Uneven lanes should not be open to traffic when "D" is greater than 3".	

TRAFFIC CONTROL DURING PLANING, OVERLAY AND LEVELING OPERATIONS ARE SHOWN ELSEWHERE IN THE PLANS.

MINIMUM WARNING SIGN SIZE	
Conventional roads	36" x 36"
Freeways/expressways, divided roadways	48" x 48"

Texas Department of Transportation

Traffic Operations Division Standard

SIGNING FOR UNEVEN LANES

WZ(UL)-13

FILE: wzul-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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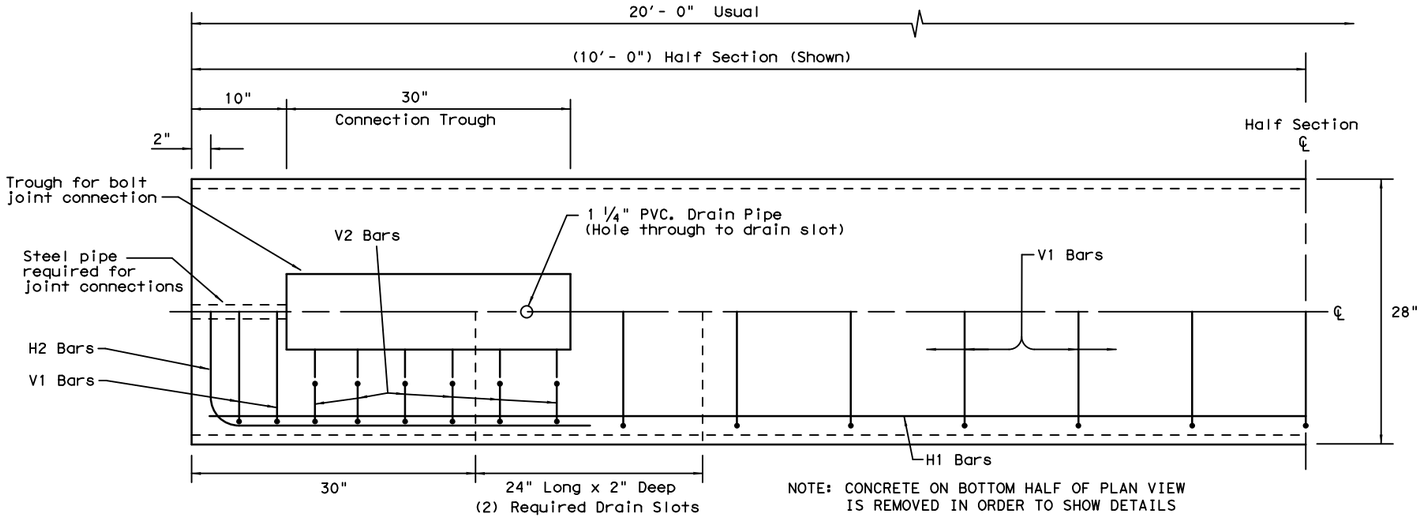
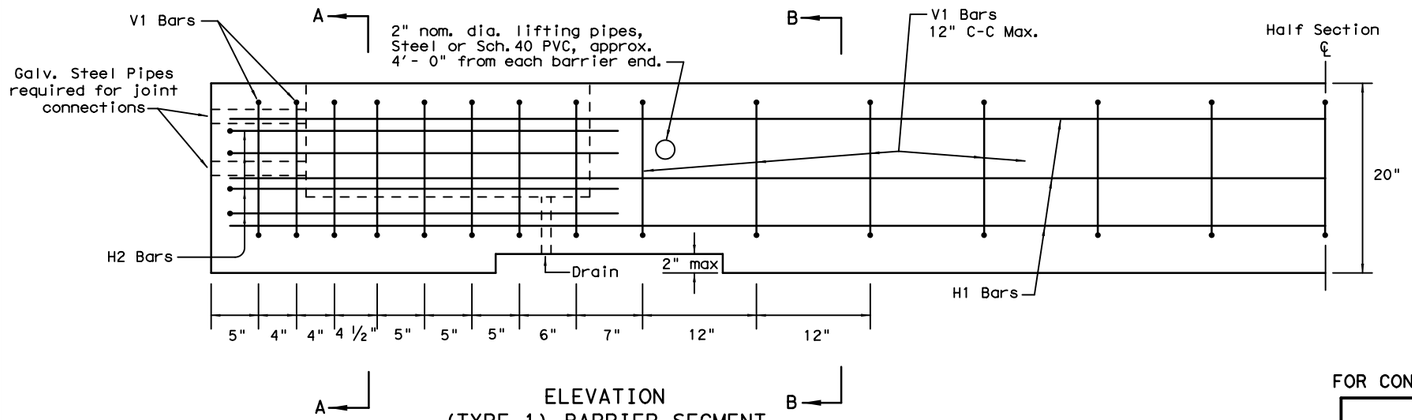
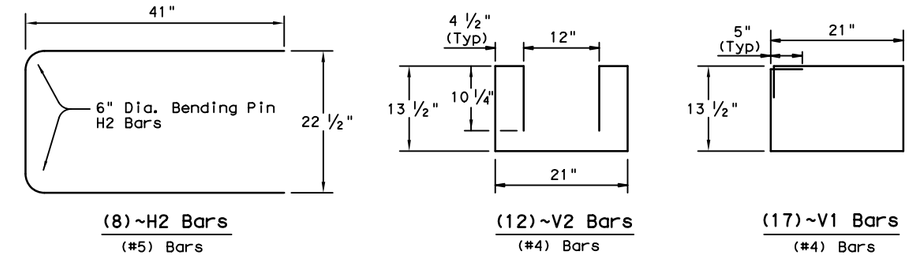


PLAN
(TYPE 1) BARRIER SEGMENT
(SYMMETRICAL ABOUT CENTER LINES)



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



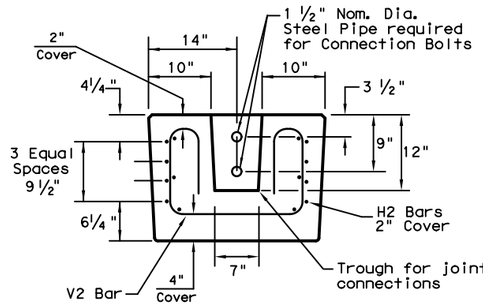
(8)~H2 Bars
(#5) Bars

(12)~V2 Bars
(#4) Bars

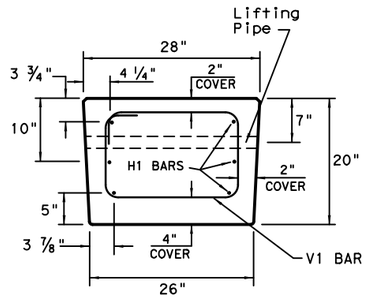
(17)~V1 Bars
(#4) Bars

REINFORCING STEEL DETAILS
TYPE 1 - BARRIER SEGMENT

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



SECTION A-A



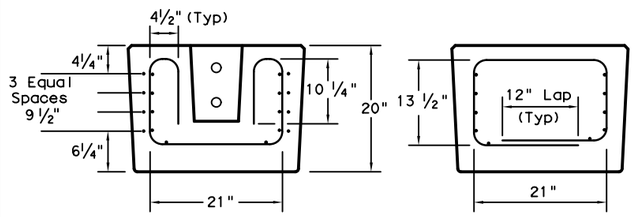
SECTION B-B

GENERAL NOTES

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

FOR CONTRACTORS INFORMATION ONLY

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



SECTION A-A

SECTION B-B

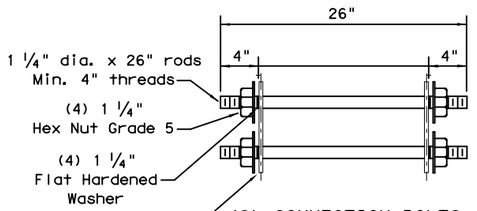
(WWR) GENERAL NOTES

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

REQUIRED (WWR) WIRE DESIGN

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

WELDED WIRE REINFORCEMENT (WWR)- OPTIONAL REINFORCING



(2) CONNECTION BOLTS
ASTM A36

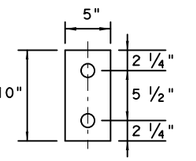


PLATE WASHER
5" x 10" x ⅜"

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

SHEET 1 OF 2

Texas Department of Transportation
Design Division Standard

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

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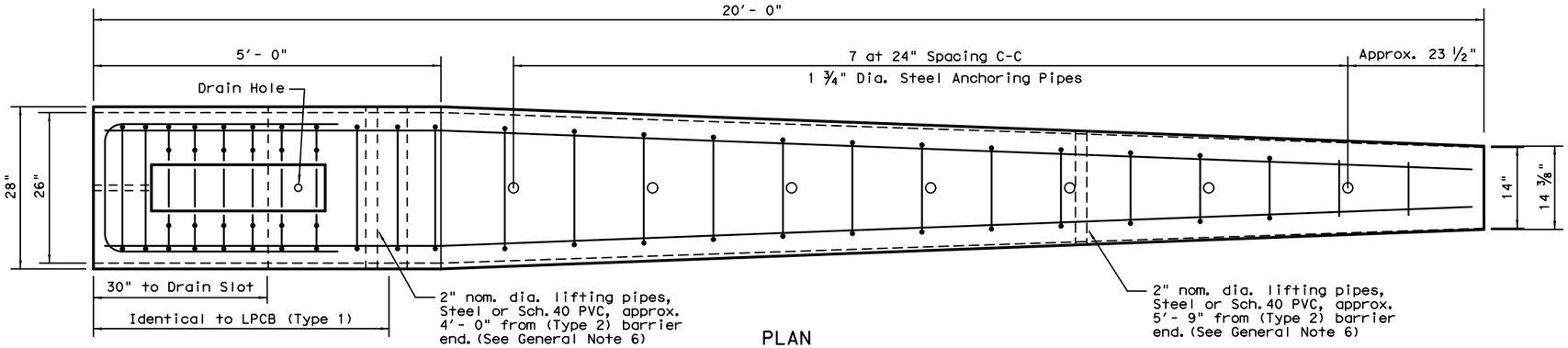
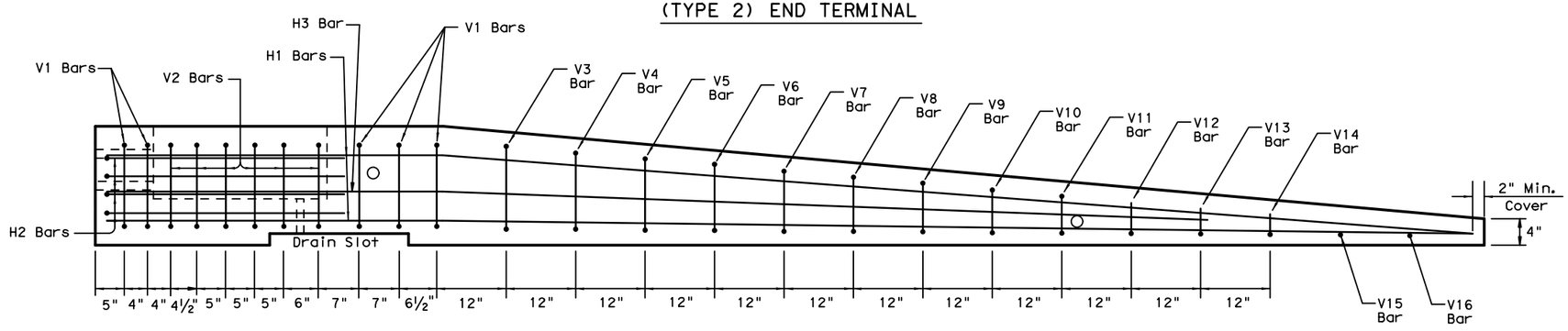
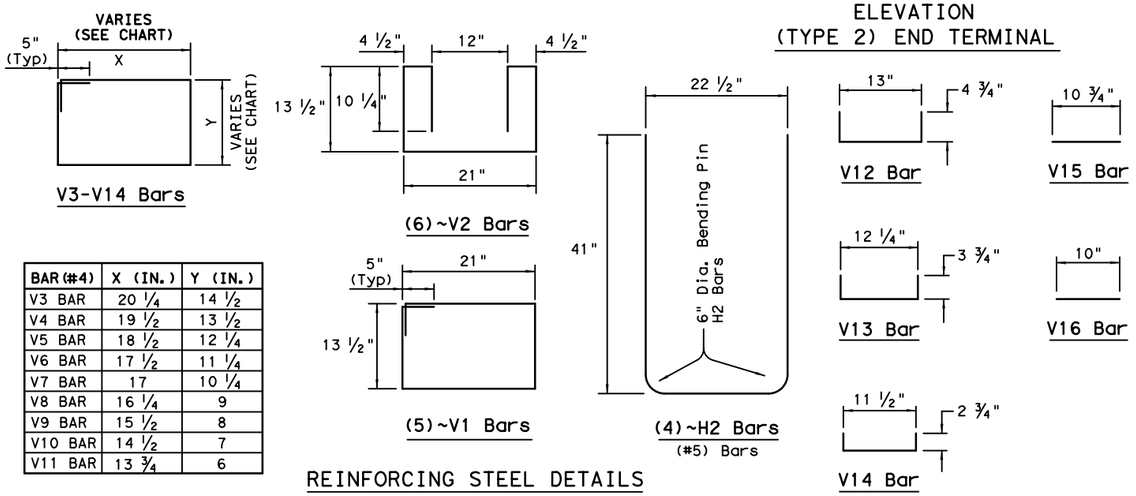


PLAN
(TYPE 2) END TERMINAL



ELEVATION
(TYPE 2) END TERMINAL

Note:
Anchoring pipes not shown in Elevation View



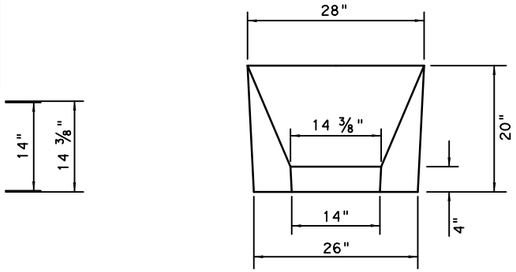
BAR (#4)	X (IN.)	Y (IN.)
V3 BAR	20 ¼	14 ½
V4 BAR	19 ½	13 ½
V5 BAR	18 ½	12 ¼
V6 BAR	17 ½	11 ¼
V7 BAR	17	10 ¼
V8 BAR	16 ¼	9
V9 BAR	15 ½	8
V10 BAR	14 ½	7
V11 BAR	13 ¾	6

REINFORCING STEEL DETAILS
TYPE 2 - END TERMINAL

Note: All V Bars are (#4)

Section A-A
(Head of Anchoring Pin)

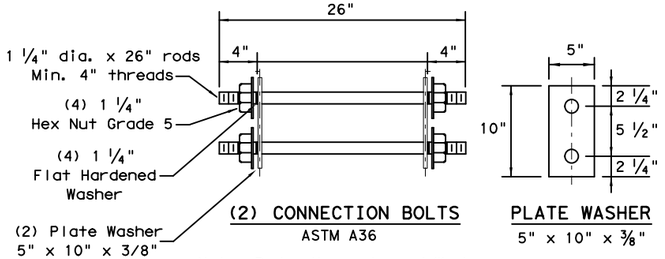
(7) Anchor Pins (See Note 3)
ASTM A36 Steel



APPROACH VIEW

TYPE 2 - NOTES

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

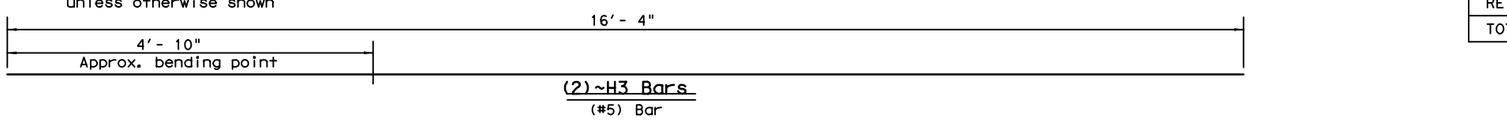


(2) CONNECTION BOLTS
ASTM A36

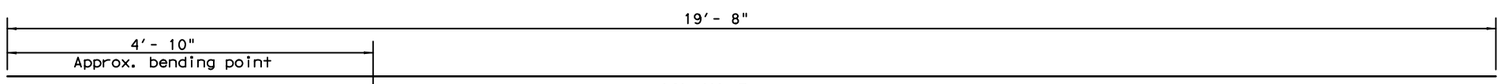
PLATE WASHER
5" x 10" x ⅜"

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

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



(2)~H3 Bars
(#5) Bar



(4)~H1 Bars
(#5) Bar

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

FOR CONTRACTORS INFORMATION ONLY

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

SHEET 2 OF 2

Texas Department of Transportation

Design Division Standard

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

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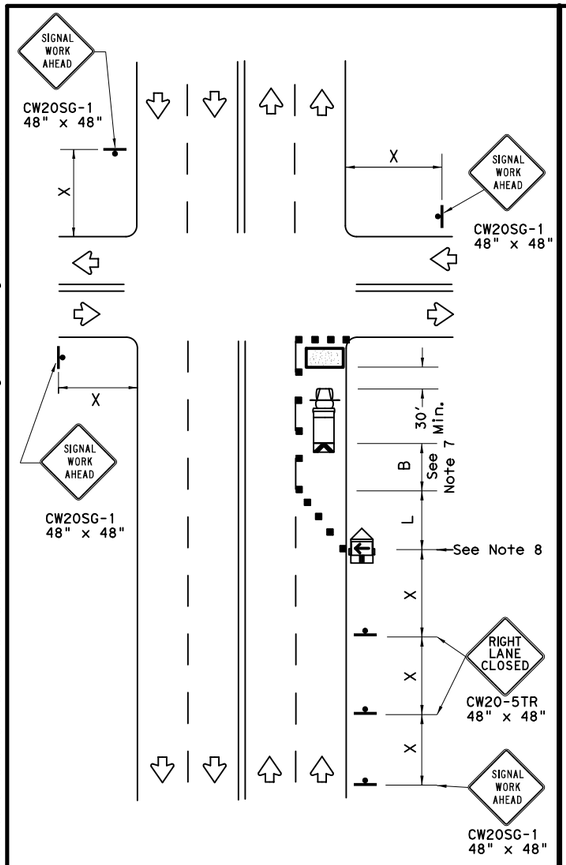
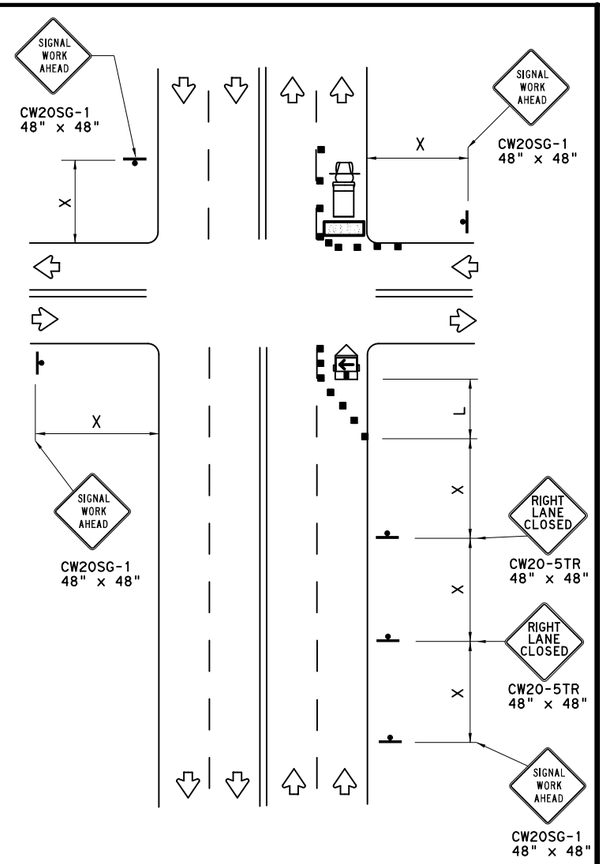


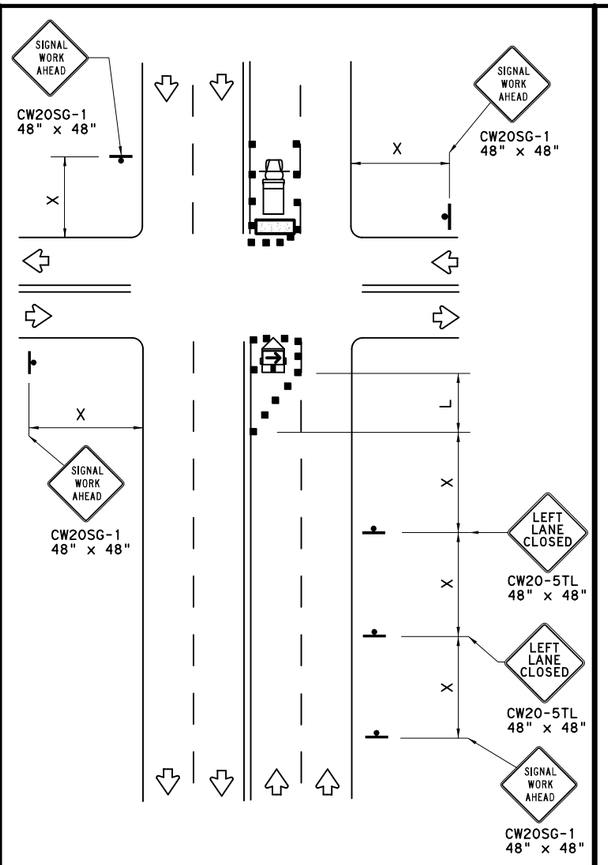
NEAR SIDE LANE CLOSURE

SHORT DURATION OR SHORT TERM STATIONARY



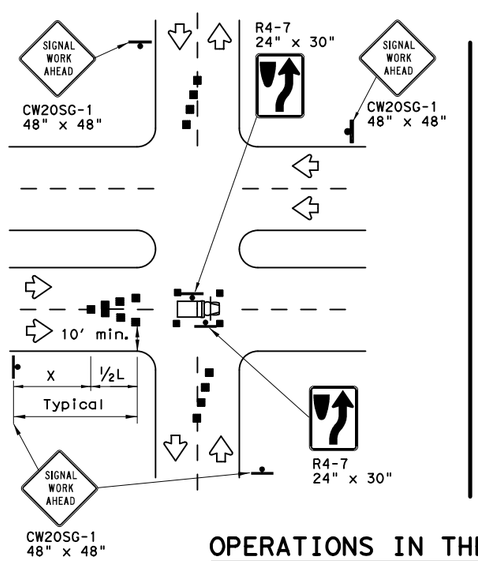
FAR SIDE RIGHT LANE CLOSURE

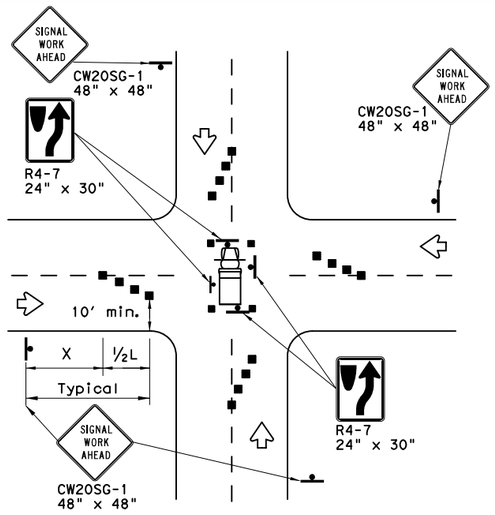
SHORT DURATION OR SHORT TERM STATIONARY



FAR SIDE LEFT LANE CLOSURE

SHORT DURATION OR SHORT TERM STATIONARY





OPERATIONS IN THE INTERSECTION

SHORT DURATION

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.

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.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC SIGNAL WORK TYPICAL DETAILS

WZ(BTS-1)-13

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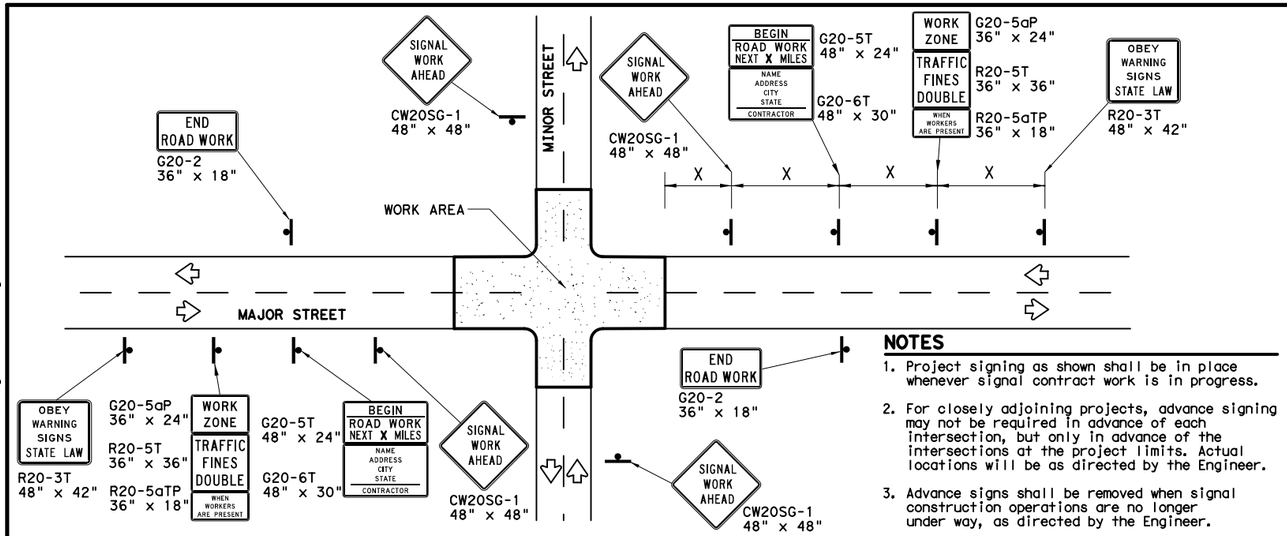


TYPICAL ADVANCE SIGNAL PROJECT SIGNING

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

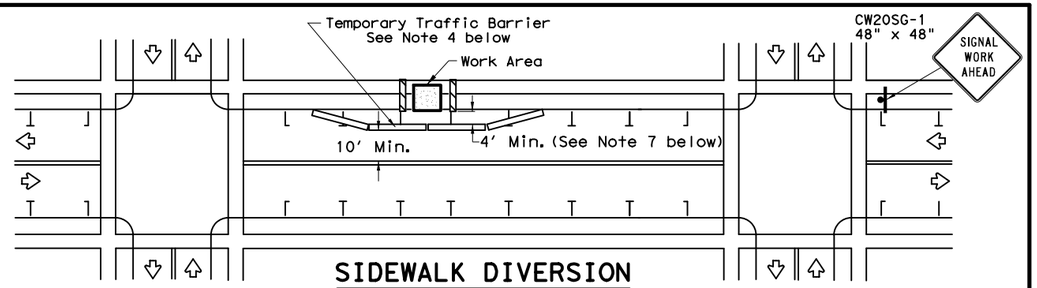
1. Weights used to keep signs from turning over should be sandbags filled with dry, cohesionless material.
2. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
3. Rock, concrete, iron, steel or other solid objects will not be permitted for use as sign support 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

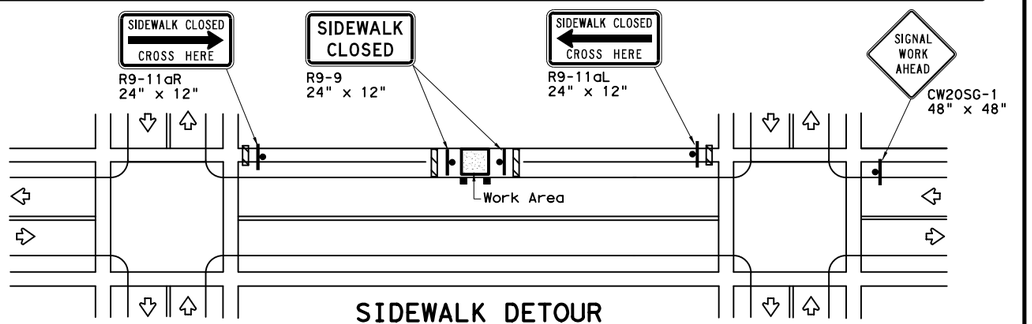
DEPARTMENTAL MATERIAL SPECIFICATIONS	
SIGN FACE MATERIALS	DMS-8300
FLEXIBLE ROLL-UP REFLECTIVE SIGNS	DMS-8310

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

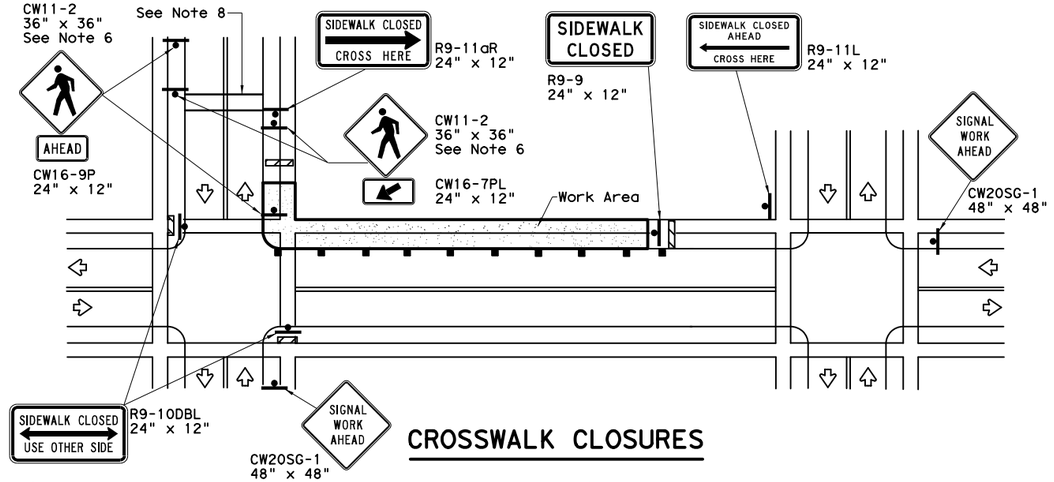
Only pre-qualified products shall be used. A copy of the "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources and may be found at the following web address:
http://www.txdot.gov/txdot_library/publications/construction.htm



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.

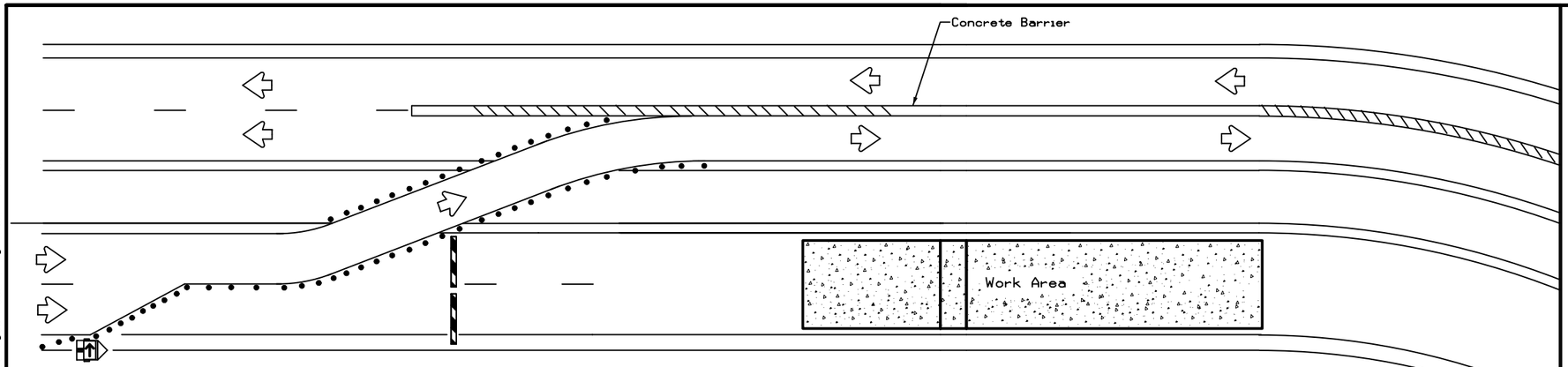
Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC SIGNAL WORK BARRICADES AND SIGNS

WZ(BTS-2)-13

FILE:	wzbts-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT	April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS		0912	72	386	CS
2-98 10-99 7-13		DIST	COUNTY		SHEET NO.
4-98 3-03		HOU	HARRIS		93



NOTES:

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

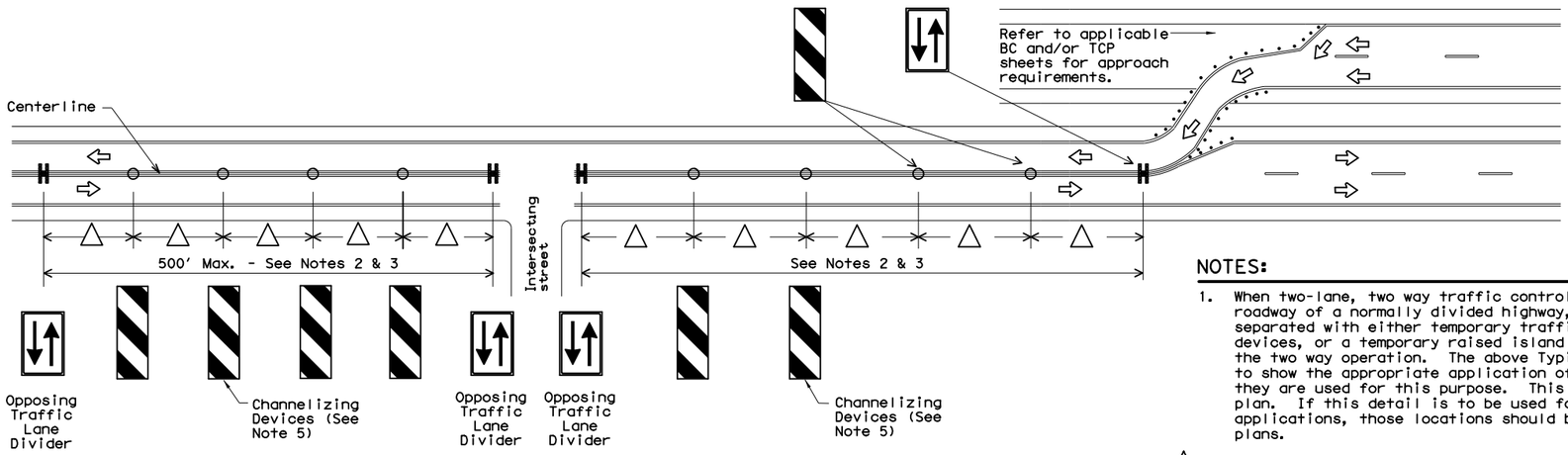
BARRIER DELINEATION WITH MODULAR GLARE SCREENS

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

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

Only pre-qualified products shall be used. A copy of the Compliant Work Zone Traffic Control Devices List" CWZTCD) describes pre-qualified products and their sources and may be found at the following web address:

http://www.txdot.gov/business/resources/producer-list.html



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

NOTES:

1. When two-lane, two way traffic control must be maintained on one roadway of a normally divided highway, opposing traffic shall be separated with either temporary traffic barriers, channelizing devices, or a temporary raised island throughout the length of the two way operation. The above Typical Application is intended to show the appropriate application of channelizing devices when they are used for this purpose. This is not a traffic control plan. If this detail is to be used for other types of roads or applications, those locations should be stated elsewhere in the plans.

△2. Space devices according to the Tangent Spacing shown on the Device Spacing table on BC(9) but not exceeding 100′.

3. Every fifth device should be an OTLD except when spaced closer to accommodate an intersection. An OTLD should be the first device on each side of intersecting streets or roads.
4. Locations where surface mount bases with adhesives or self-righting devices will be required in order to maintain them in their proper position should be noted elsewhere in the plans.
5. Channelizing devices are to be vertical panels, 42" cones or tubular markers that are at least 36" tall. Tubular markers used to separate traffic should have a rubber base weighing at least 30 pounds. Tubular markers that are 42" tall or more shall have four bands of reflective material as detailed for 42" cones on BC(10). Tubular markers less than 42" but at least 36" tall shall have three bands of 3" wide white reflective material spaced 2" apart. Reflective material shall meet DMS-8300, Type A.

Texas Department of Transportation

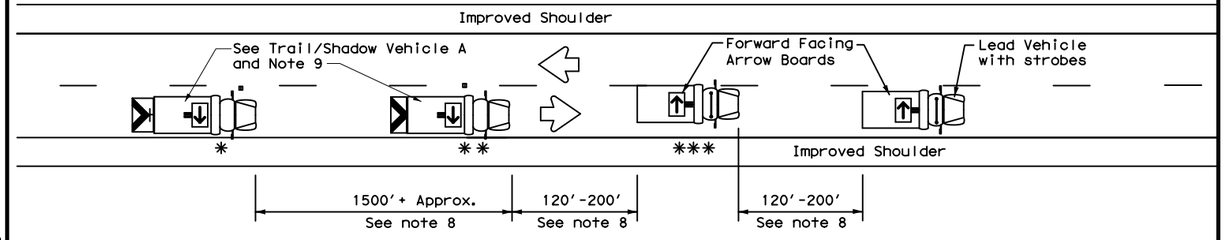
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN TYPICAL DETAILS

WZ(TD)-17

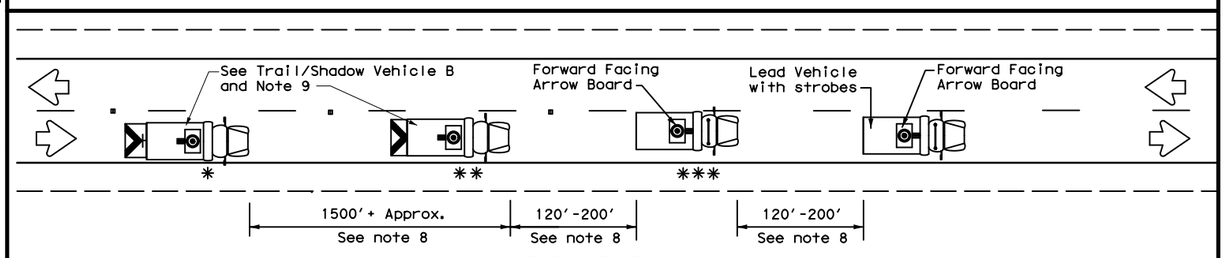
FILE: wztd-17.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-98 2-17 3-03 7-13	0912	72	386	CS
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		94

DATE:
FILE:



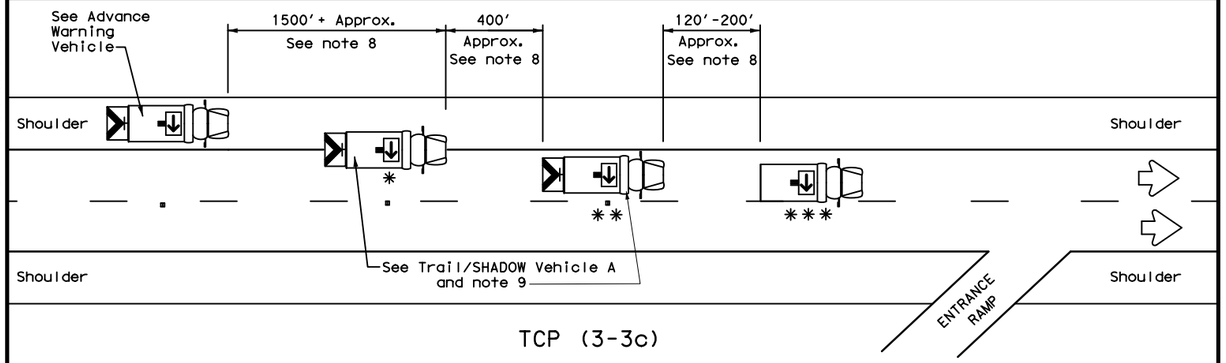
TCP (3-3a)

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



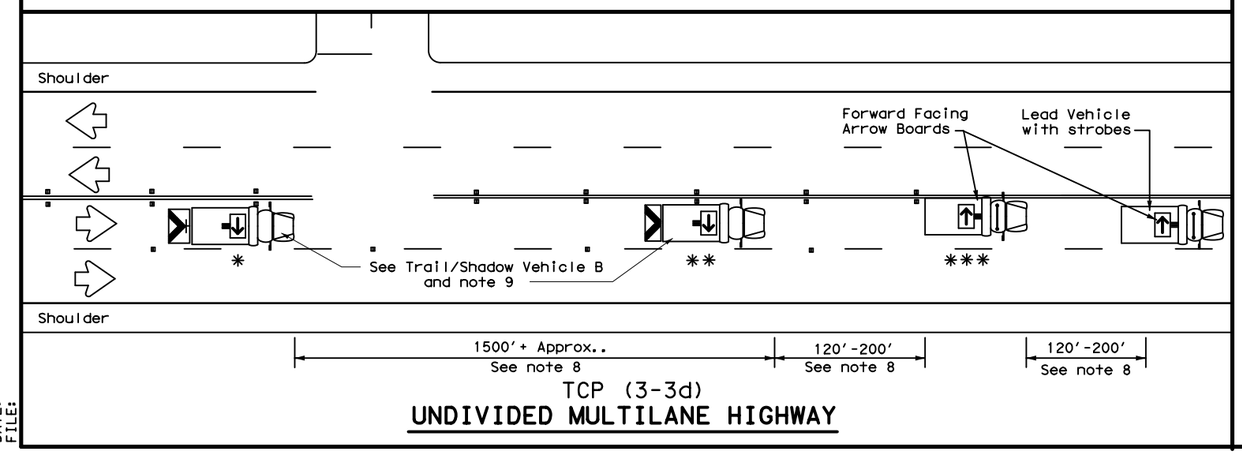
TCP (3-3b)

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



TCP (3-3c)

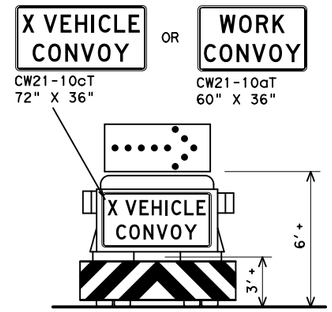
DIVIDED MULTILANE HIGHWAY



TCP (3-3d)

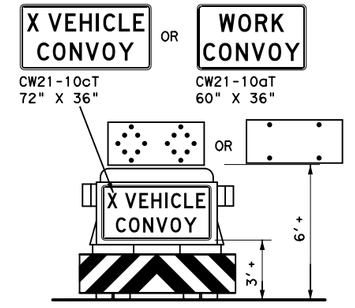
UNDIVIDED MULTILANE HIGHWAY

DATE:
FILE:



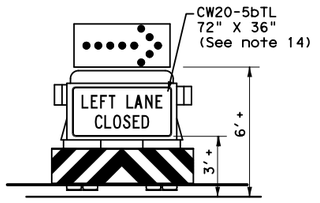
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display
Flashing Arrow Board

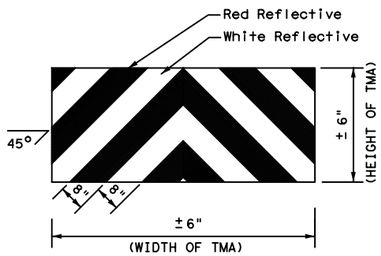


TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board
in Caution Mode



ADVANCE WARNING VEHICLE



STRIPING FOR TMA

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

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

GENERAL NOTES

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

Texas Department of Transportation

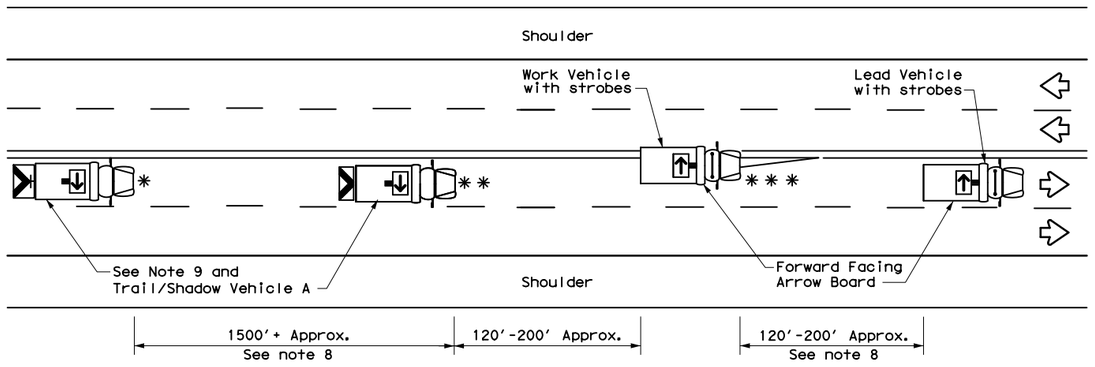
Traffic Operations Division Standard

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

FILE: tcp3-3.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT September 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	72	386	CS
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 7-13	HOU	HARRIS		95
1-97 7-14				

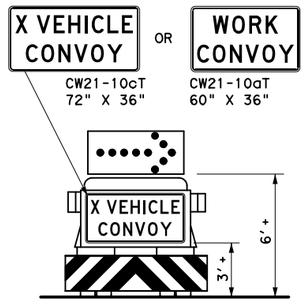
177

DATE:
FILE:



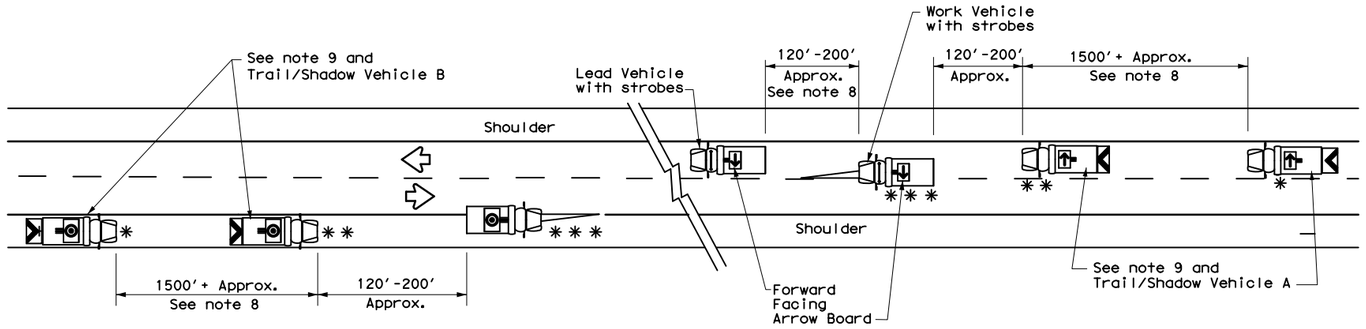
TCP (3-1a)

UNDIVIDED MULTILANE ROADWAY



TRAIL/SHADOW VEHICLE A

with RIGHT Directional display Flashing Arrow Board

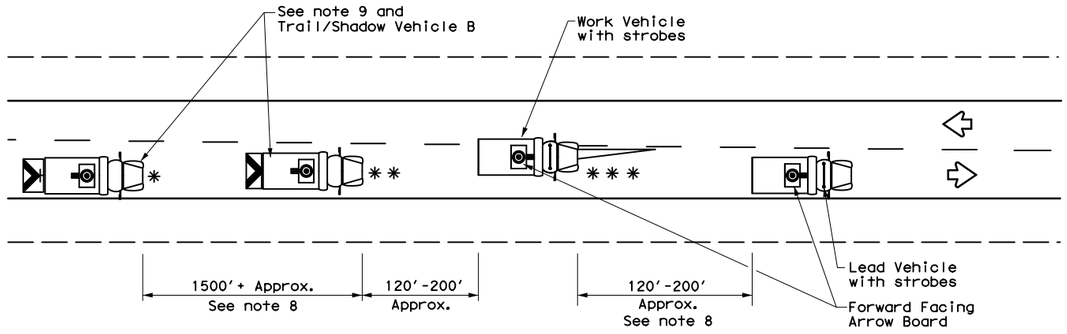


WORK ON SHOULDER

WORK ON TRAVEL LANE

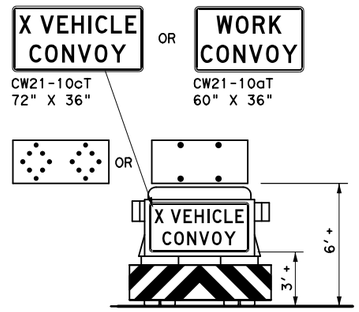
TCP (3-1b)

TWO-WAY ROADWAY WITH PAVED SHOULDERS



TCP (3-1c)

TWO-WAY ROADWAY WITHOUT PAVED SHOULDERS



TRAIL/SHADOW VEHICLE B

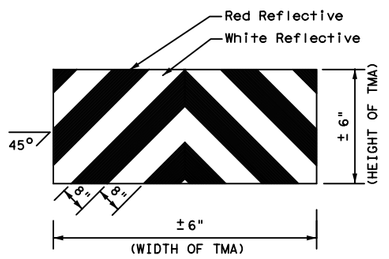
with Flashing Arrow Board in CAUTION display

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

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

GENERAL NOTES

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



STRIPING FOR TMA

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS UNDIVIDED HIGHWAYS

TCP (3-1)-13

FILE: tcp3-1.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	72	386	CS
2-94 4-98 8-95 7-13 1-97	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		96

Plotted on: 6/2/2022 3:30:37 PM $USER$

POLE & CONTROLLER LOCATIONS

POLE #	POLES	STATIONING
1	ANSI CLASS 2 TREATED 45' TIMBER POLE, VIVDS CAMERA ASSEMBLY	7+65.5 109.9' LEFT
2	ANSI CLASS 2 TREATED 45' TIMBER POLE, VIVDS CAMERA ASSEMBLY	6+81.9 61.5' LEFT
3	ANSI CLASS 2 TREATED 45' TIMBER POLE	6+71.4 58.1' RIGHT
4	ANSI CLASS 2 TREATED 45' TIMBER POLE, VIVDS CAMERA ASSEMBLY	7+77.6 97.6' RIGHT
5	ANSI CLASS H1 TREATED 45' TIMBER POLE, W/ 4 DOWN GUYS	9+04.0 64.2' RIGHT
6	ANSI CLASS 2 TREATED 45' TIMBER POLE, VIVDS CAMERA ASSEMBLY, W/ 4 DOWN GUYS	8+64.7 55.6' LEFT
CONTROLLER	EXIST. SIGNAL CABINET AND EXIST. SERVICE METER POLE	8+05.1 76.9' LEFT

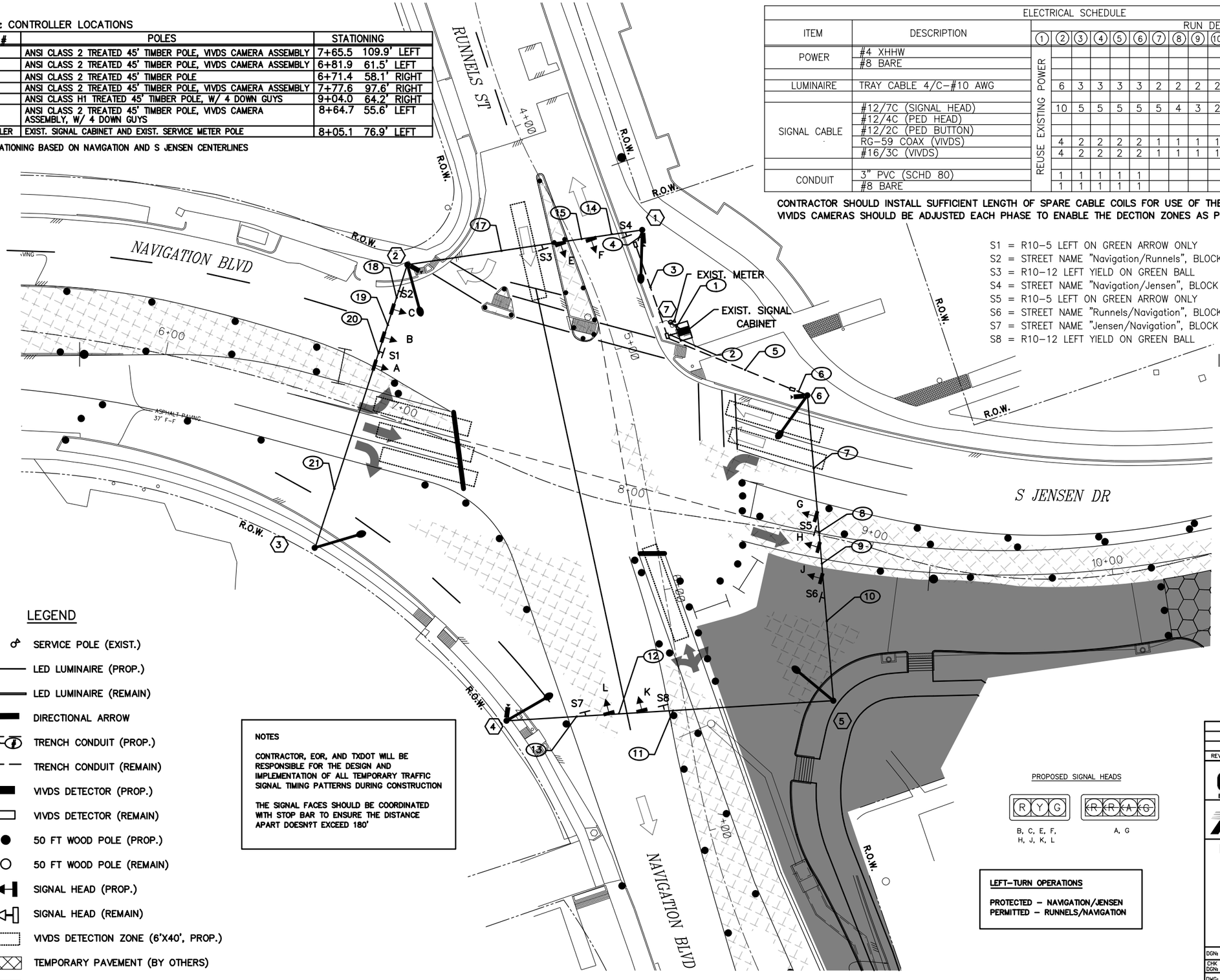
NOTE: STATIONING BASED ON NAVIGATION AND S JENSEN CENTERLINES

ELECTRICAL SCHEDULE

ITEM	DESCRIPTION	RUN DESIGNATION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
POWER	#4 XHHW	REUSE EXISTING POWER																					
	#8 BARE																						
LUMINAIRE	TRAY CABLE 4/C-#10 AWG		6	3	3	3	3	2	2	2	2	1	1	1	2	2		2	1	1	1	1
SIGNAL CABLE	#12/7C (SIGNAL HEAD)		10	5	5	5	5	5	4	3	2	2	1		5	4		3	3	2	1		
	#12/4C (PED HEAD)																						
	#12/2C (PED BUTTON)																						
	RG-59 COAX (VIVDS)		4	2	2	2	2	1	1	1	1	1	1	1	1	1		1					
	#16/3C (VIVDS)		4	2	2	2	2	1	1	1	1	1	1	1	1	1		1					
CONDUIT	3" PVC (SCHD 80)		1	1	1	1	1																
	#8 BARE		1	1	1	1	1																

CONTRACTOR SHOULD INSTALL SUFFICIENT LENGTH OF SPARE CABLE COILS FOR USE OF THE SAME CABLES FOR ALL LATER PHASES.
VIVDS CAMERAS SHOULD BE ADJUSTED EACH PHASE TO ENABLE THE DECTION ZONES AS PER DRAWINGS

S1 = R10-5 LEFT ON GREEN ARROW ONLY
S2 = STREET NAME "Navigation/Runnels", BLOCK NUMBERS 2400 AND 2300
S3 = R10-12 LEFT YIELD ON GREEN BALL
S4 = STREET NAME "Navigation/Jensen", BLOCK NUMBERS 100 AND 200
S5 = R10-5 LEFT ON GREEN ARROW ONLY
S6 = STREET NAME "Runnels/Navigation", BLOCK NUMBERS 2300 AND 2400
S7 = STREET NAME "Jensen/Navigation", BLOCK NUMBERS 200 AND 100
S8 = R10-12 LEFT YIELD ON GREEN BALL



0' 40' 80'
(IN FEET)
SCALE: PLAN 1"=40'

LEGEND

- SERVICE POLE (EXIST.)
- LED LUMINAIRE (PROP.)
- LED LUMINAIRE (REMAIN)
- DIRECTIONAL ARROW
- TRENCH CONDUIT (PROP.)
- TRENCH CONDUIT (REMAIN)
- VIVDS DETECTOR (PROP.)
- VIVDS DETECTOR (REMAIN)
- 50 FT WOOD POLE (PROP.)
- 50 FT WOOD POLE (REMAIN)
- SIGNAL HEAD (PROP.)
- SIGNAL HEAD (REMAIN)
- VIVDS DETECTION ZONE (6'X40', PROP.)
- TEMPORARY PAVEMENT (BY OTHERS)
- WORK AREA OF CURRENT PHASE

NOTES

CONTRACTOR, EOR, AND TXDOT WILL BE RESPONSIBLE FOR THE DESIGN AND IMPLEMENTATION OF ALL TEMPORARY TRAFFIC SIGNAL TIMING PATTERNS DURING CONSTRUCTION

THE SIGNAL FACES SHOULD BE COORDINATED WITH STOP BAR TO ENSURE THE DISTANCE APART DOESN?T EXCEED 180'

PROPOSED SIGNAL HEADS

B, C, E, F, H, J, K, L — A, G

LEFT-TURN OPERATIONS

PROTECTED - NAVIGATION/JENSEN
PERMITTED - RUNNELS/NAVIGATION

STATE OF TEXAS
XIAOMING CHEN
119339
REGISTERED PROFESSIONAL ENGINEER
6/2/2022
PhD PE PTOE

REV. NO.	DATE	DESCRIPTION	BY

Gauge ENGINEERING
11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

TEMPORARY TRAFFIC SIGNAL LAYOUT PHASE 2 STEP 2

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	97

Pen Table: $PENTBL$$
Plot Driver: $PLTDRVL$$

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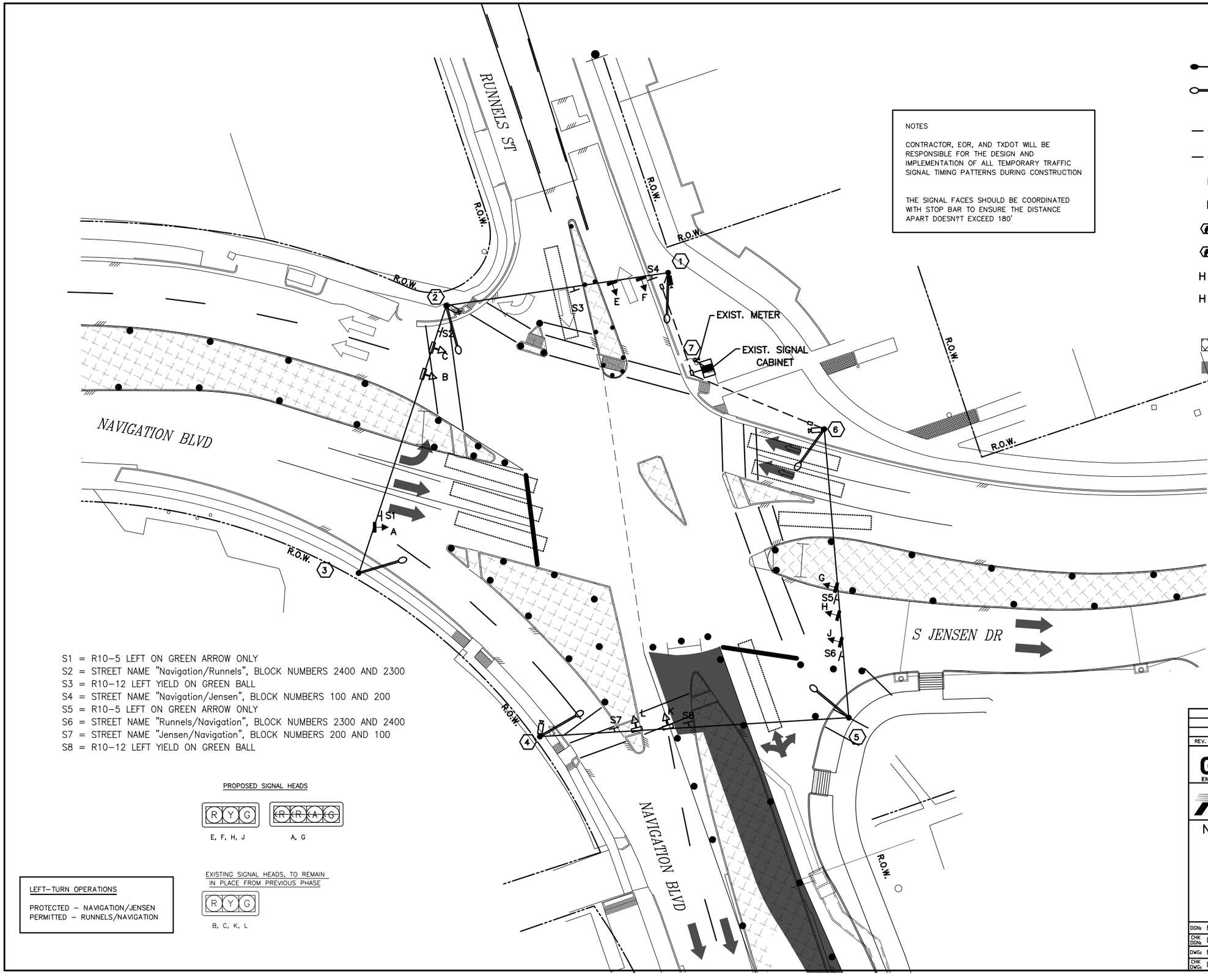

NOTES

CONTRACTOR, EOR, AND TXDOT WILL BE RESPONSIBLE FOR THE DESIGN AND IMPLEMENTATION OF ALL TEMPORARY TRAFFIC SIGNAL TIMING PATTERNS DURING CONSTRUCTION

THE SIGNAL FACES SHOULD BE COORDINATED WITH STOP BAR TO ENSURE THE DISTANCE APART DOESN?T EXCEED 180'

LEGEND

- SERVICE POLE (EXIST.)
- LED LUMINAIRE (PROP.)
- LED LUMINAIRE (REMAIN)
- DIRECTIONAL ARROW
- TRENCH CONDUIT (PROP.)
- TRENCH CONDUIT (REMAIN)
- VIVDS DETECTOR (PROP.)
- VIVDS DETECTOR (REMAIN)
- 50 FT WOOD POLE (PROP.)
- 50 FT WOOD POLE (REMAIN)
- H SIGNAL HEAD (PROP.)
- H SIGNAL HEAD (REMAIN)
- VIVDS DETECTION ZONE (6'X40', PROP.)
- TEMPORARY PAVEMENT (DONE IN PHASE 1)
- WORK AREA OF CURRENT PHASE

0' 40' 80'

(IN FEET)
SCALE: PLAN 1"=40'

S1 = R10-5 LEFT ON GREEN ARROW ONLY
S2 = STREET NAME "Navigation/Runnels", BLOCK NUMBERS 2400 AND 2300
S3 = R10-12 LEFT YIELD ON GREEN BALL
S4 = STREET NAME "Navigation/Jensen", BLOCK NUMBERS 100 AND 200
S5 = R10-5 LEFT ON GREEN ARROW ONLY
S6 = STREET NAME "Runnels/Navigation", BLOCK NUMBERS 2300 AND 2400
S7 = STREET NAME "Jensen/Navigation", BLOCK NUMBERS 200 AND 100
S8 = R10-12 LEFT YIELD ON GREEN BALL

PROPOSED SIGNAL HEADS

E, F, H, J A, G

EXISTING SIGNAL HEADS, TO REMAIN IN PLACE FROM PREVIOUS PHASE

B, C, K, L

LEFT-TURN OPERATIONS

PROTECTED – NAVIGATION/JENSEN
PERMITTED – RUNNELS/NAVIGATION

STATE OF TEXAS
XIAOMING CHEN
119339
REGISTERED PROFESSIONAL ENGINEER
6/2/2022
PRO PE PTOE

REV. NO.	DATE	DESCRIPTION	BY

Gauge ENGINEERING
11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

TEMPORARY TRAFFIC SIGNAL LAYOUT PHASE 2 STEP 3

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	98

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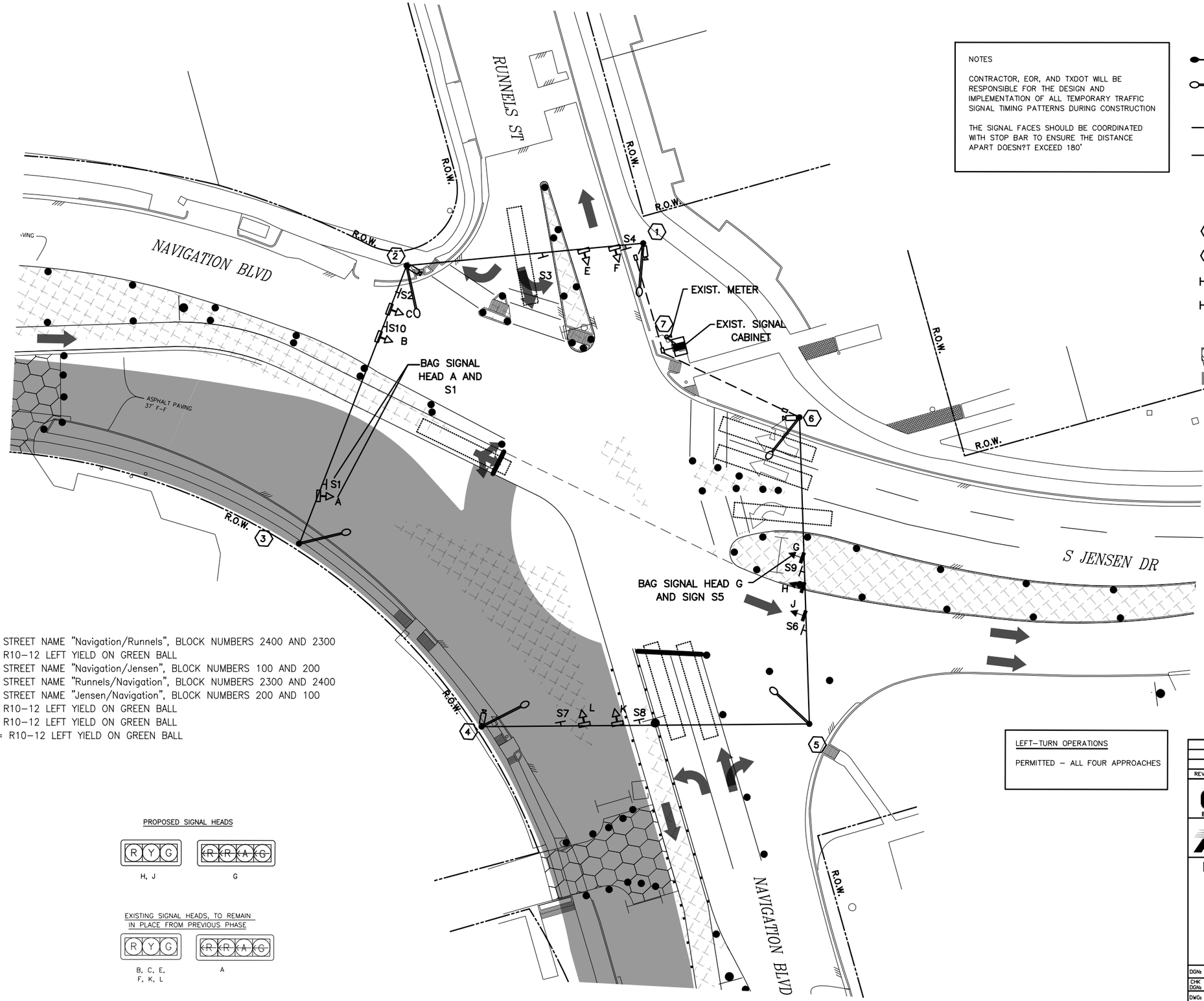

NOTES

CONTRACTOR, EOR, AND TXDOT WILL BE RESPONSIBLE FOR THE DESIGN AND IMPLEMENTATION OF ALL TEMPORARY TRAFFIC SIGNAL TIMING PATTERNS DURING CONSTRUCTION

THE SIGNAL FACES SHOULD BE COORDINATED WITH STOP BAR TO ENSURE THE DISTANCE APART DOESN?T EXCEED 180'

LEGEND

- SERVICE POLE (EXIST.)
- LED LUMINAIRE (PROP.)
- LED LUMINAIRE (REMAIN)
- DIRECTIONAL ARROW
- TRENCH CONDUIT (PROP.)
- TRENCH CONDUIT (REMAIN)
- VIVDS DETECTOR (PROP.)
- VIVDS DETECTOR (REMAIN)
- 50 FT WOOD POLE (PROP.)
- 50 FT WOOD POLE (REMAIN)
- H SIGNAL HEAD (PROP.)
- H SIGNAL HEAD (REMAIN)
- VIVDS DETECTION ZONE (6'X40', PROP.)
- TEMPORARY PAVEMENT (DONE IN PHASE 1)
- WORK AREA OF CURRENT PHASE

S2 = STREET NAME "Navigation/Runnels", BLOCK NUMBERS 2400 AND 2300
S3 = R10-12 LEFT YIELD ON GREEN BALL
S4 = STREET NAME "Navigation/Jensen", BLOCK NUMBERS 100 AND 200
S6 = STREET NAME "Runnels/Navigation", BLOCK NUMBERS 2300 AND 2400
S7 = STREET NAME "Jensen/Navigation", BLOCK NUMBERS 200 AND 100
S8 = R10-12 LEFT YIELD ON GREEN BALL
S9 = R10-12 LEFT YIELD ON GREEN BALL
S10 = R10-12 LEFT YIELD ON GREEN BALL

PROPOSED SIGNAL HEADS

H, J G

EXISTING SIGNAL HEADS, TO REMAIN IN PLACE FROM PREVIOUS PHASE

B, C, E, F, K, L A

LEFT-TURN OPERATIONS

PERMITTED - ALL FOUR APPROACHES

STATE OF TEXAS
XIAOMING CHEN
119339
REGISTERED PROFESSIONAL ENGINEER
6/2/2022
PhD PE PTOE

REV. NO.	DATE	DESCRIPTION	BY

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Houston, TX 77079
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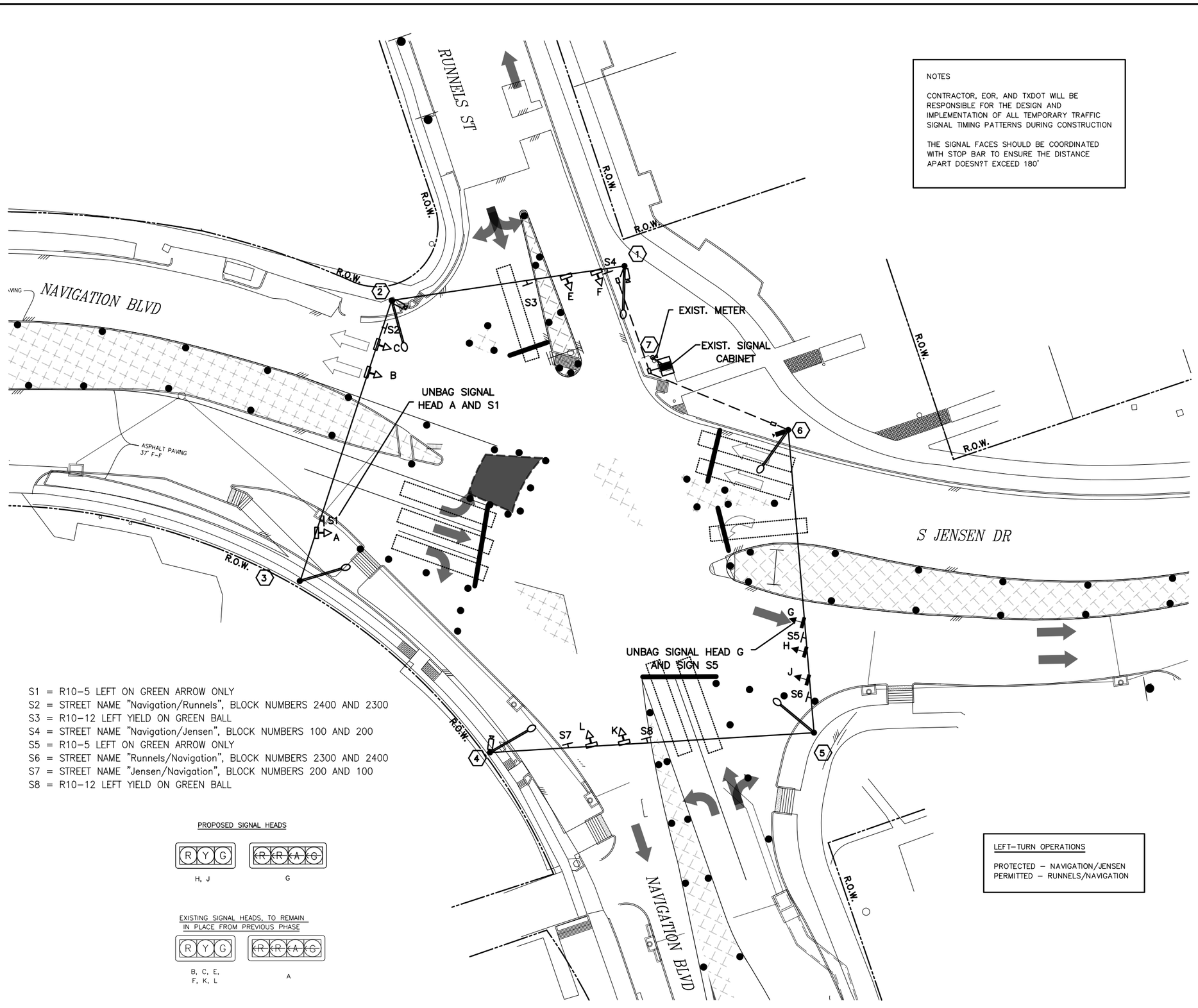
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

TEMPORARY TRAFFIC SIGNAL LAYOUT PHASE 3 STEP 1

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	99



NOTES

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THE SIGNAL FACES SHOULD BE COORDINATED WITH STOP BAR TO ENSURE THE DISTANCE APART DOESN?T EXCEED 180'

LEGEND

- SERVICE POLE (EXIST.)
- LED LUMINAIRE (PROP.)
- LED LUMINAIRE (REMAIN)
- DIRECTIONAL ARROW
- TRENCH CONDUIT (PROP.)
- TRENCH CONDUIT (REMAIN)
- VIVDS DETECTOR (PROP.)
- VIVDS DETECTOR (REMAIN)
- 50 FT WOOD POLE (PROP.)
- 50 FT WOOD POLE (REMAIN)
- H SIGNAL HEAD (PROP.)
- H SIGNAL HEAD (REMAIN)
- VIVDS DETECTION ZONE (6'X40', PROP.)
- TEMPORARY PAVEMENT (DONE IN PHASE 1)
- WORK AREA OF CURRENT PHASE

0' 40' 80'

(IN FEET)

SCALE: PLAN 1"=40'

S1 = R10-5 LEFT ON GREEN ARROW ONLY
S2 = STREET NAME "Navigation/Runnels", BLOCK NUMBERS 2400 AND 2300
S3 = R10-12 LEFT YIELD ON GREEN BALL
S4 = STREET NAME "Navigation/Jensen", BLOCK NUMBERS 100 AND 200
S5 = R10-5 LEFT ON GREEN ARROW ONLY
S6 = STREET NAME "Runnels/Navigation", BLOCK NUMBERS 2300 AND 2400
S7 = STREET NAME "Jensen/Navigation", BLOCK NUMBERS 200 AND 100
S8 = R10-12 LEFT YIELD ON GREEN BALL

PROPOSED SIGNAL HEADS

H, J G

EXISTING SIGNAL HEADS, TO REMAIN IN PLACE FROM PREVIOUS PHASE

B, C, E, F, K, L A

LEFT-TURN OPERATIONS

PROTECTED – NAVIGATION/JENSEN
PERMITTED – RUNNELS/NAVIGATION

STATE OF TEXAS
XIAOMING CHEN
119339
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6/2/2022
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Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

TEMPORARY TRAFFIC SIGNAL LAYOUT PHASE 3 STEP 2

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	100

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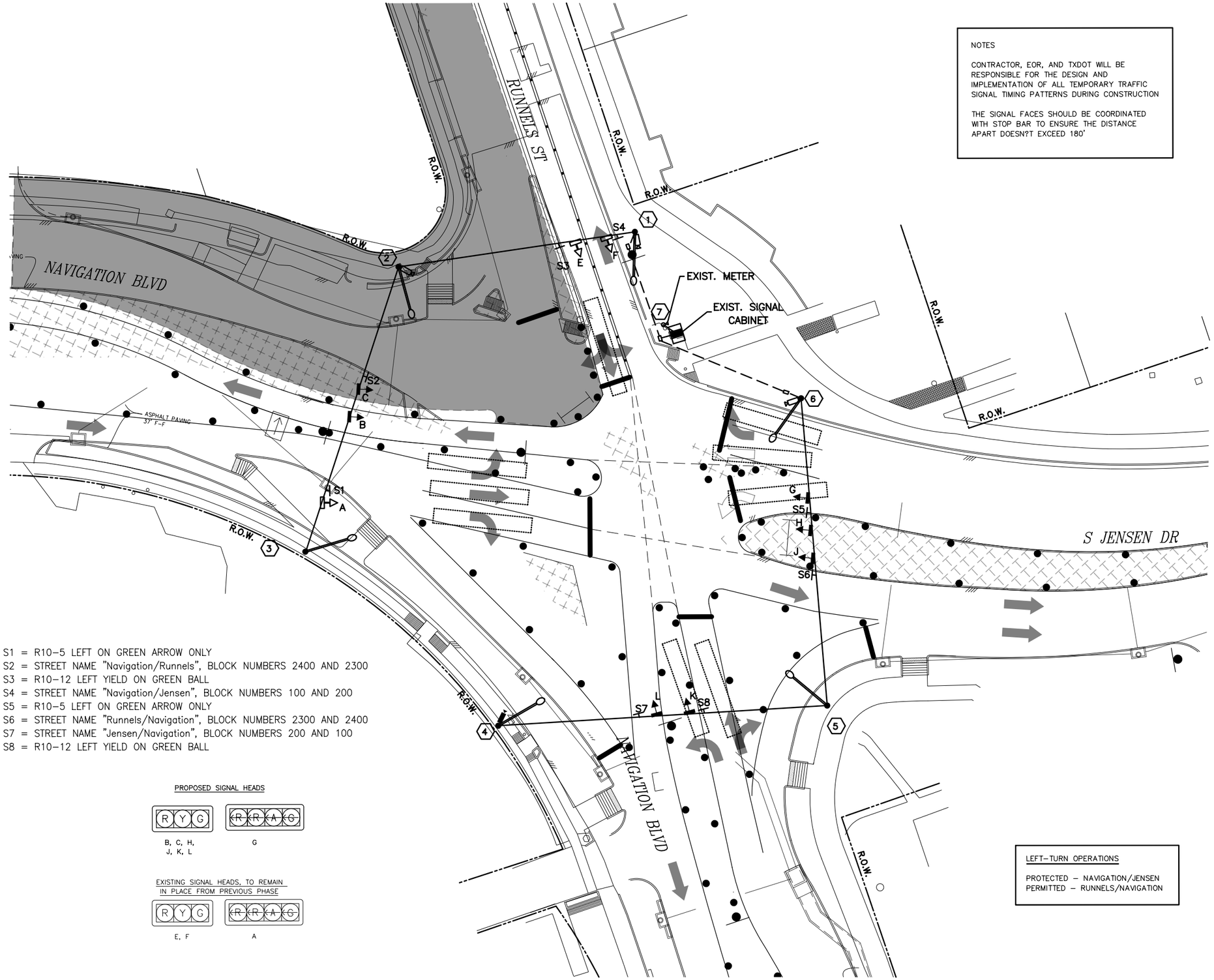

NOTES

CONTRACTOR, EOR, AND TXDOT WILL BE RESPONSIBLE FOR THE DESIGN AND IMPLEMENTATION OF ALL TEMPORARY TRAFFIC SIGNAL TIMING PATTERNS DURING CONSTRUCTION

THE SIGNAL FACES SHOULD BE COORDINATED WITH STOP BAR TO ENSURE THE DISTANCE APART DOESN?T EXCEED 180'

LEGEND

- SERVICE POLE (EXIST.)
- LED LUMINAIRE (PROP.)
- LED LUMINAIRE (REMAIN)
- DIRECTIONAL ARROW
- TRENCH CONDUIT (PROP.)
- TRENCH CONDUIT (REMAIN)
- VIVDS DETECTOR (PROP.)
- VIVDS DETECTOR (REMAIN)
- 50 FT WOOD POLE (PROP.)
- 50 FT WOOD POLE (REMAIN)
- H SIGNAL HEAD (PROP.)
- H SIGNAL HEAD (REMAIN)
- VIVDS DETECTION ZONE (6'X40', PROP.)
- TEMPORARY PAVEMENT (DONE IN PHASE 1)
- WORK AREA OF CURRENT PHASE

0' 40' 80'

(IN FEET)

SCALE: PLAN 1"=40'

S1 = R10-5 LEFT ON GREEN ARROW ONLY
S2 = STREET NAME "Navigation/Runnels", BLOCK NUMBERS 2400 AND 2300
S3 = R10-12 LEFT YIELD ON GREEN BALL
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S5 = R10-5 LEFT ON GREEN ARROW ONLY
S6 = STREET NAME "Runnels/Navigation", BLOCK NUMBERS 2300 AND 2400
S7 = STREET NAME "Jensen/Navigation", BLOCK NUMBERS 200 AND 100
S8 = R10-12 LEFT YIELD ON GREEN BALL

PROPOSED SIGNAL HEADS

B, C, H, J, K, L — G

EXISTING SIGNAL HEADS, TO REMAIN IN PLACE FROM PREVIOUS PHASE

E, F — A

LEFT-TURN OPERATIONS

PROTECTED – NAVIGATION/JENSEN
PERMITTED – RUNNELS/NAVIGATION

STATE OF TEXAS
XIAOMING CHEN
119339
REGISTERED PROFESSIONAL ENGINEER
6/2/2022
PhD PE PTOE

REV. NO.	DATE	DESCRIPTION	BY

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Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

TEMPORARY TRAFFIC SIGNAL LAYOUT PHASE 4

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	101

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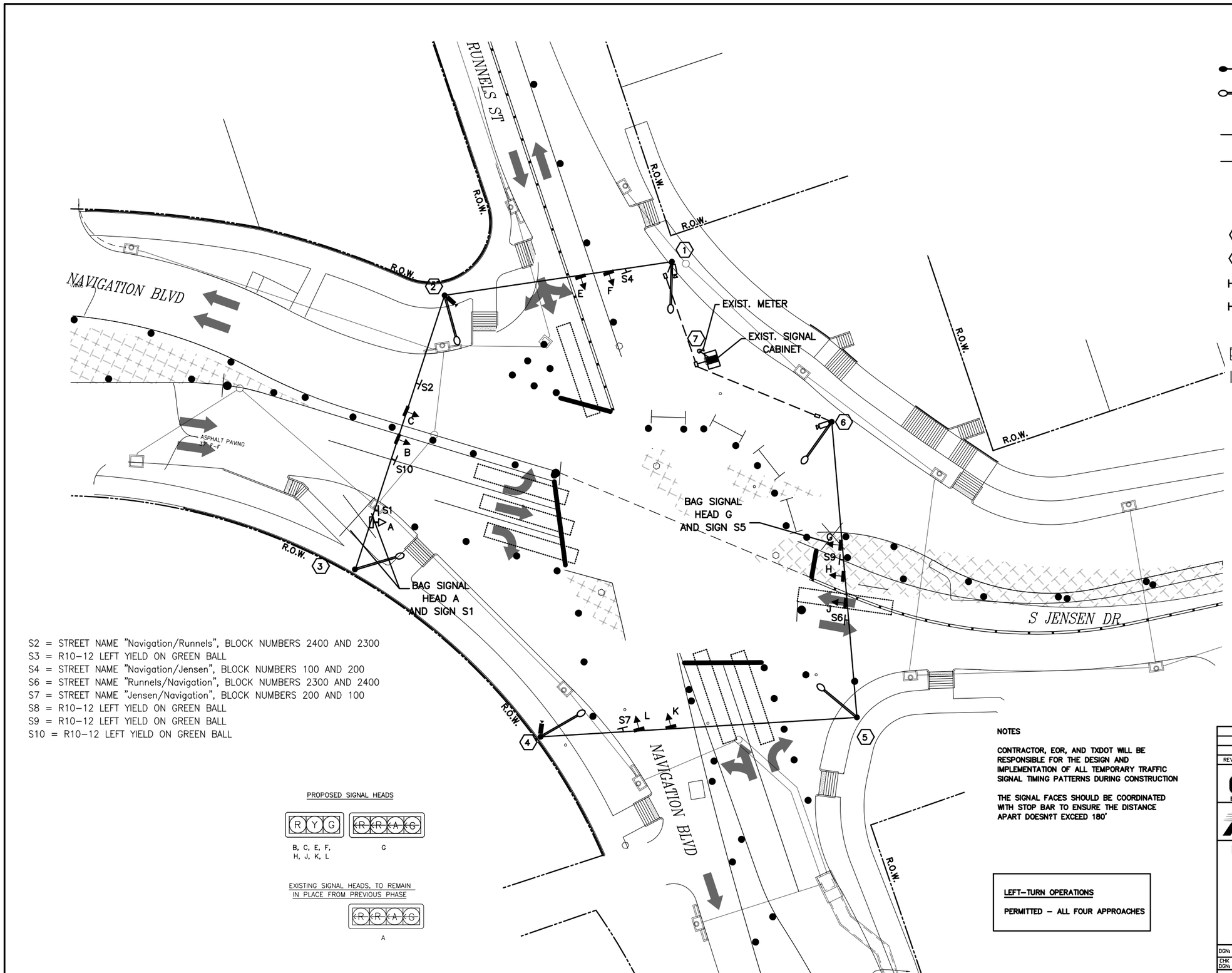

LEGEND

- SERVICE POLE (EXIST.)
- LED LUMINAIRE (PROP.)
- LED LUMINAIRE (REMAIN)
- DIRECTIONAL ARROW
- TRENCH CONDUIT (PROP.)
- TRENCH CONDUIT (REMAIN)
- VIVDS DETECTOR (PROP.)
- VIVDS DETECTOR (REMAIN)
- 50 FT WOOD POLE (PROP.)
- 50 FT WOOD POLE (REMAIN)
- H SIGNAL HEAD (PROP.)
- H SIGNAL HEAD (REMAIN)
- VIVDS DETECTION ZONE (6'X40', PROP.)
- TEMPORARY PAVEMENT (DONE IN PHASE 1)
- WORK AREA OF CURRENT PHASE

0' 40' 80'

(IN FEET)

SCALE: PLAN 1"=40'

S2 = STREET NAME "Navigation/Runnels", BLOCK NUMBERS 2400 AND 2300
S3 = R10-12 LEFT YIELD ON GREEN BALL
S4 = STREET NAME "Navigation/Jensen", BLOCK NUMBERS 100 AND 200
S6 = STREET NAME "Runnels/Navigation", BLOCK NUMBERS 2300 AND 2400
S7 = STREET NAME "Jensen/Navigation", BLOCK NUMBERS 200 AND 100
S8 = R10-12 LEFT YIELD ON GREEN BALL
S9 = R10-12 LEFT YIELD ON GREEN BALL
S10 = R10-12 LEFT YIELD ON GREEN BALL

PROPOSED SIGNAL HEADS

B, C, E, F, H, J, K, L — G

EXISTING SIGNAL HEADS, TO REMAIN IN PLACE FROM PREVIOUS PHASE

A

NOTES

CONTRACTOR, EOR, AND TXDOT WILL BE RESPONSIBLE FOR THE DESIGN AND IMPLEMENTATION OF ALL TEMPORARY TRAFFIC SIGNAL TIMING PATTERNS DURING CONSTRUCTION

THE SIGNAL FACES SHOULD BE COORDINATED WITH STOP BAR TO ENSURE THE DISTANCE APART DOESN?T EXCEED 180'

LEFT-TURN OPERATIONS

PERMITTED – ALL FOUR APPROACHES

STATE OF TEXAS
XIAOMING CHEN
119339
REGISTERED PROFESSIONAL ENGINEER
6/2/2022
PhD PE PTOE

REV. NO.	DATE	DESCRIPTION	BY

Gauge ENGINEERING
11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

Texas Department of Transportation

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

TEMPORARY TRAFFIC SIGNAL LAYOUT PHASE 5

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	102

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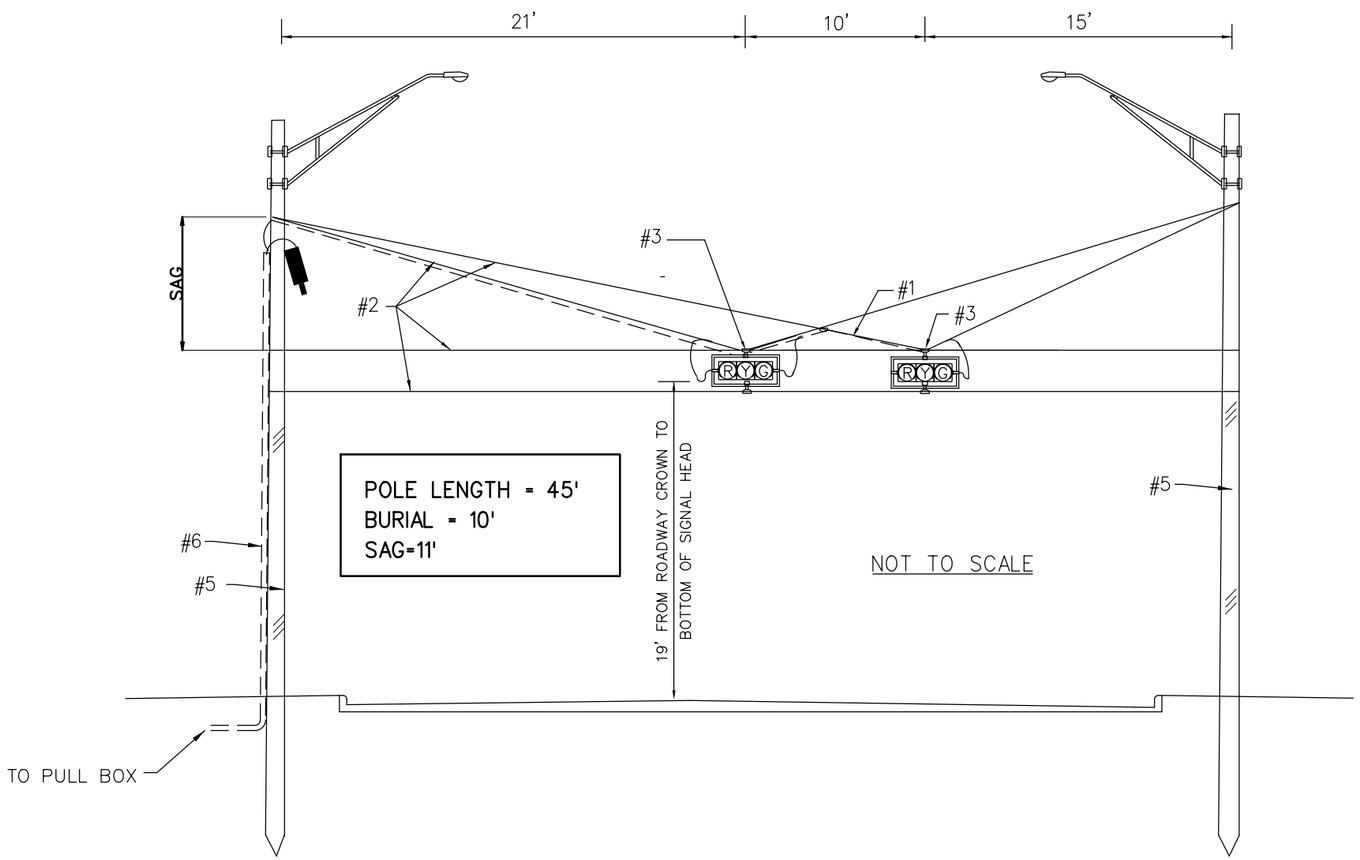
ELEVATION - FOR DIMENSION INFORMATION ONLY
NOT TO SCALE



SEE DOWN GUYS DETAILS ON NEXT PAGE

ELEVATION LEGEND

*1. SIGNAL CABLE LASHED TO MESSENGER WIRE WITH STAINLESS STEEL SUPPORTS (2 EVERY 18" C-C), PANDUIT CATALOG * MLT 4H-LP OR APPROVED EQUAL.

*2. ONE (1) 5/16" - 7 WIRE STRAND GALVANIZED STEEL CATENARY SYSTEM (ONE PER SIGNAL) AND TWO (2) - ¼" 7 WIRE STRAND GALVANIZED STEEL CATENARY SYSTEM (HORIZONTAL).

*3. SADDLE TYPE CLAMP (TYPICAL FOR ALL SIGNAL CONNECTION AND MESSENGER CROSSINGS).

*4. LED LUMINAIRE ON 8' ARM.

*5. ANSI CLASS 2 OR A1 TREATED TIMBER POLES

*6. CONDUIT ATTACHED TO THE POLE

STATE OF TEXAS
XIAOMING CHEN
119339
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6/2/2022
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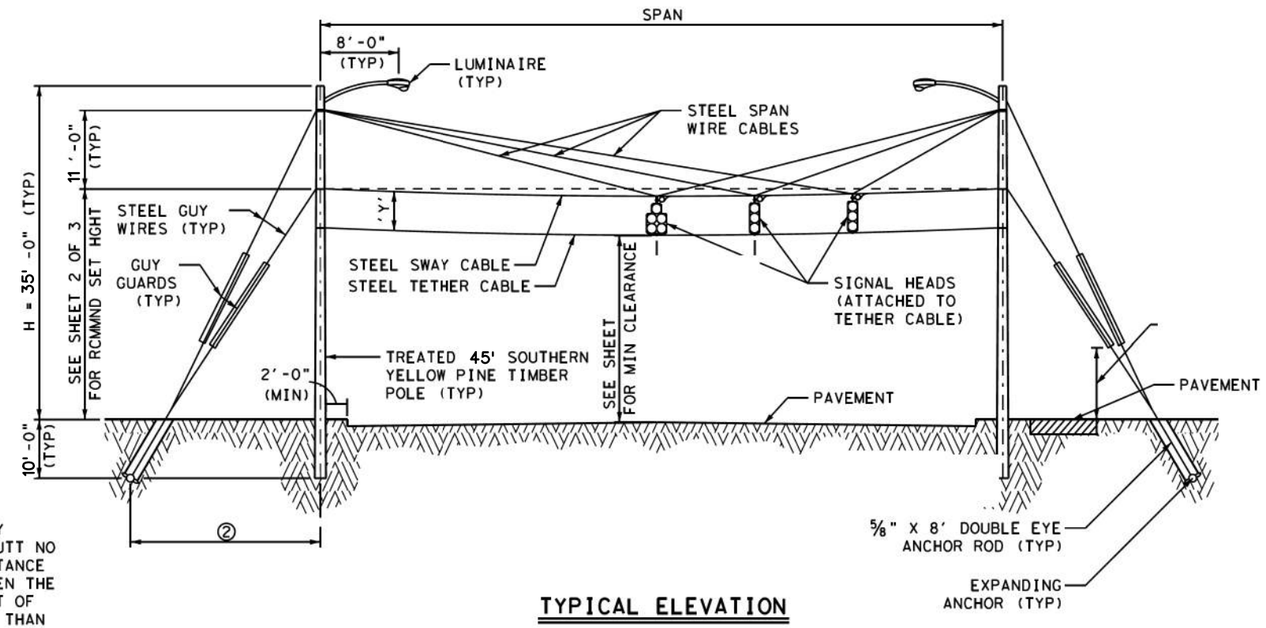
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

ELEVATION

TEMPORARY TRAFFIC SIGNAL LAYOUT

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	103



② LOCATE THE EMBEDDED TIP OF GUY ANCHOR A DISTANCE FROM PILE BUTT NO GREATER THAN THE VERTICAL DISTANCE MEASURED ALONG THE POLE BETWEEN THE GROUND LINE AND THE ATTACHMENT OF LOWEST GUY AND NEVER ANY LESS THAN 1/3 OF THAT DISTANCE.

TYPICAL ELEVATION

(VERTICAL SIGNALS SHOWN, HORIZONTAL SIGNALS SIMILAR)

NOT TO SCALE

EXPANDING ANCHOR NOTES:

1. HOLE SHALL BE DRILLED AT AN ANGLE INLINE WITH THE GUY (45° TO 60° TYPICAL).
2. OTHER ANCHOR TYPES (DISC OR SCREW TYPE) MAY BE USED WITH ENGINEER'S APPROVAL.
3. HOLE SIZE SHALL BE SLIGHTLY LARGER THAN THE UNEXPANDED ANCHOR, PER MANUFACTURER'S SPECIFICATIONS.
4. ALL ANCHORS SHALL BE INSTALLED PER MANUFACTURER'S SPECIFICATIONS. ALL BLADES SHALL BE WEDGED INTO UNDISTURBED SOIL.
5. FOLLOWING INSTALLATION OF THE ANCHOR AND ANCHOR ROD, BACKFILL HOLE AND THOROUGHLY TAMP.

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DOWN GUYS / ELEVATION

TEMPORARY TRAFFIC SIGNAL LAYOUT

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	104

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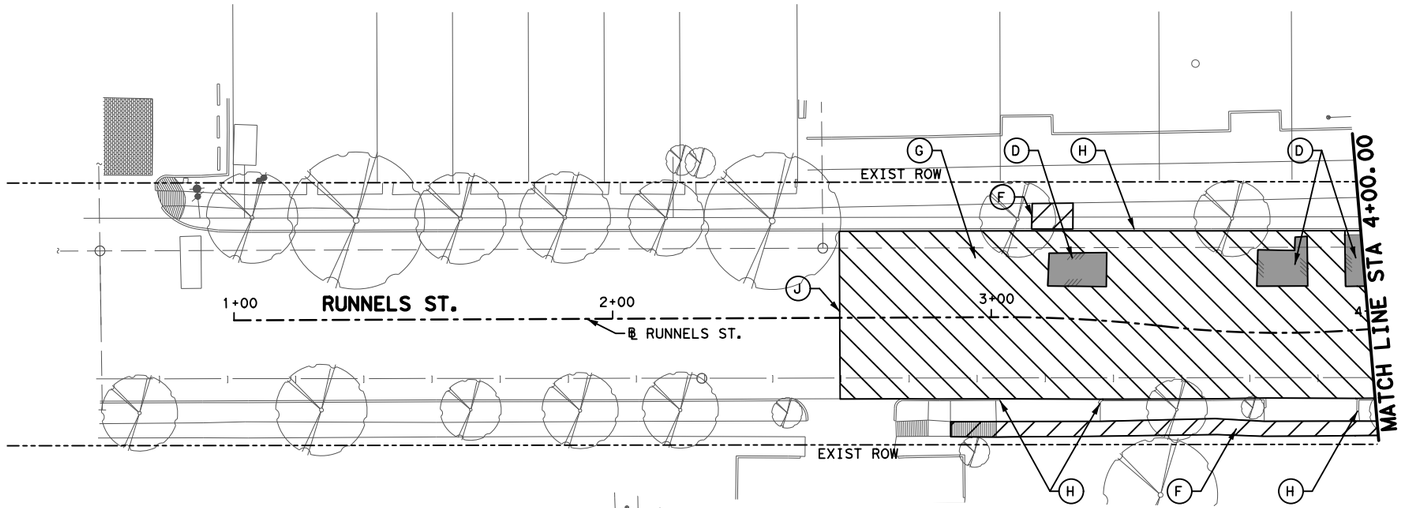

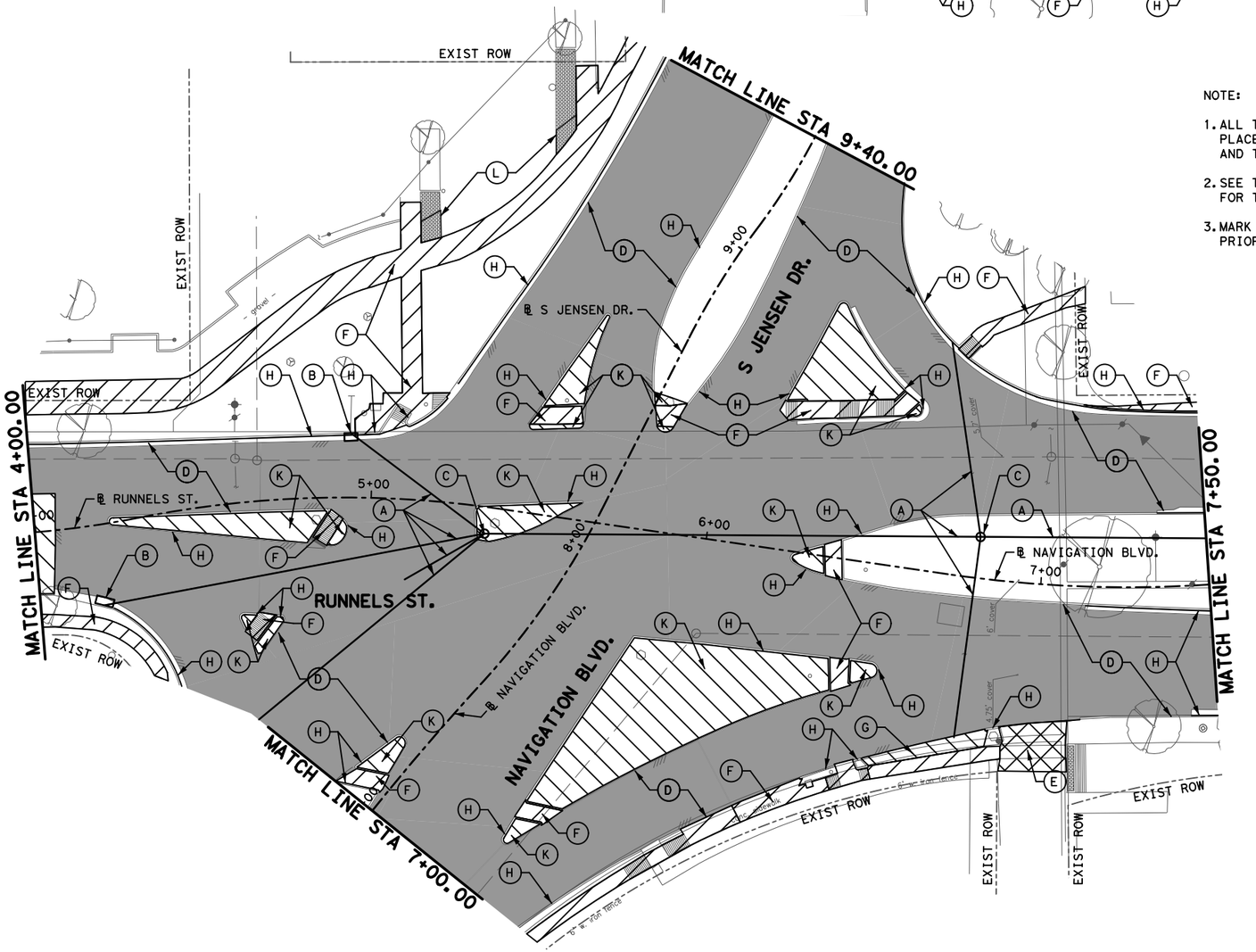

LEGEND:

- (A) REMOVE PIPE(RCP OR CMP)
- (B) REMOVE INLET
- (C) REMOVE MH
- (D) REMOVE ASPH PAV OVER CONC PAV & BASE
- (E) REMOVE CONC DRWY
- (F) REMOVE CONC SIDEWALK
- (G) REMOVE CONC PAV
- (H) REMOVE CURB
- (I) REMOVE CURB STOP
- (J) SAWCUT
- (K) REMOVE CONC MEDIAN
- (L) REMOVE CONC PAVERS

NOTE:

1. ALL TREE PROTECTION MUST BE IN PLACE PRIOR TO DEMOLITION WORK AND TREE REMOVALS.
2. SEE TREE PROTECTION PLAN SHEETS FOR TREE REMOVALS.
3. MARK TREE REMOVALS FOR APPROVAL PRIOR TO WORK.

0′ 40′ 80′
(IN FEET)
SCALE: PLAN 1"=40′

STATE OF TEXAS
DAVID G. GREANEY
125563
LICENSED
PROFESSIONAL ENGINEER

06/28/2022 Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

Gauge ENGINEERING
11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

Texas Department of Transportation

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

DEMOLITION PLAN
BEGIN PROJECT TO STA 7+50

SHEET 1 OF 3

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	105

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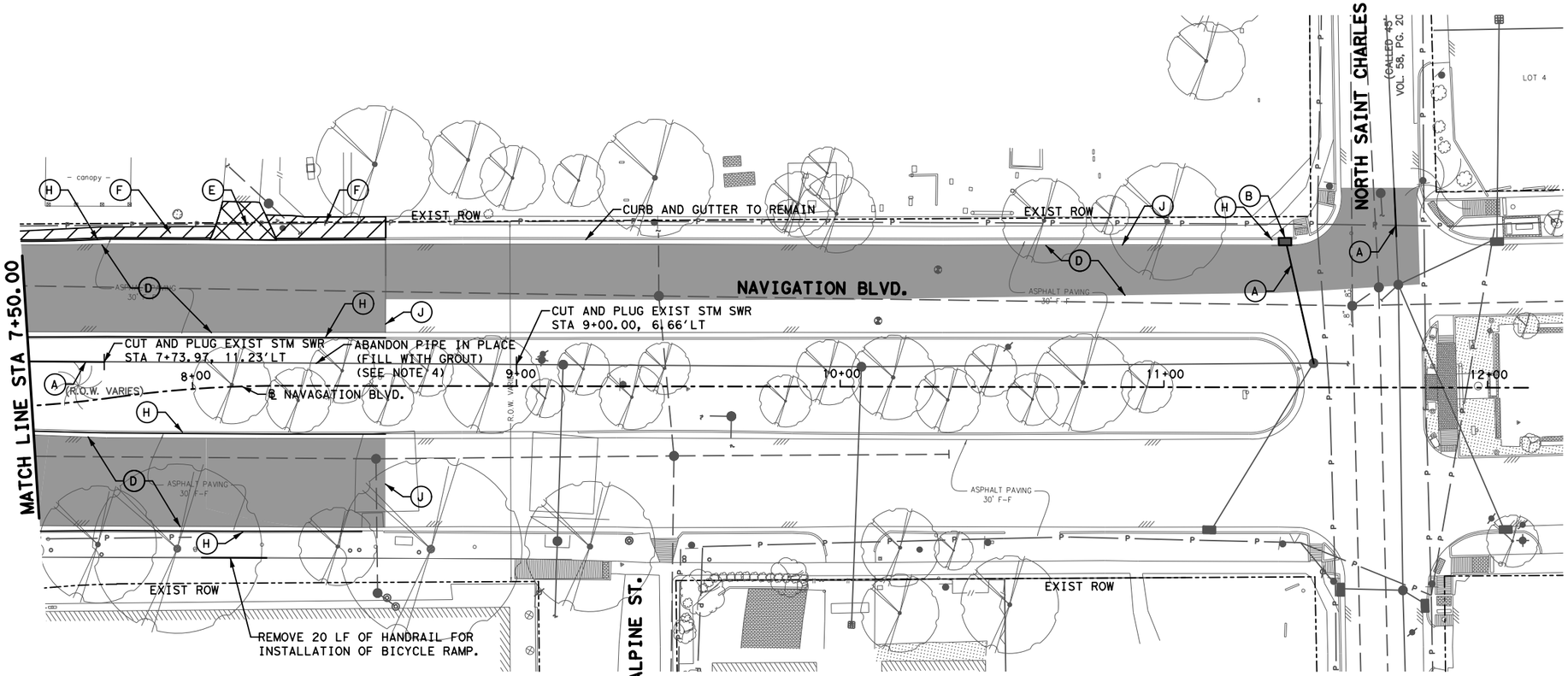

LEGEND:

- (A) REMOVE PIPE(RCP OR CMP)
- (B) REMOVE INLET
- (C) REMOVE MH
- (D) REMOVE ASPH PAV OVER CONC PAV & BASE
- (E) REMOVE CONC DRWY
- (F) REMOVE CONC SIDEWALK
- (G) REMOVE CONC PAV
- (H) REMOVE CURB
- (I) REMOVE CURB STOP
- (J) SAWCUT
- (K) REMOVE CONC MEDIAN
- (L) REMOVE CONC PAVERS

0' 40' 80'
(IN FEET)

SCALE: PLAN 1"=40'

NOTE:

1. ALL TREE PROTECTION MUST BE IN PLACE PRIOR TO DEMOLITION WORK AND TREE REMOVALS.
2. SEE TREE PROTECTION PLAN SHEETS FOR TREE REMOVALS.
3. MARK TREE REMOVALS FOR APPROVAL PRIOR TO WORK.
4. GROUT FILLING AND PLUGS ARE INCIDENTAL TO ROW PREPARATION. NO SEPARATE PAY.

STATE OF TEXAS
DAVID G. GREANEY
125563
LICENSED
PROFESSIONAL ENGINEER

06/28/2022 Gauge Engineering, LLC
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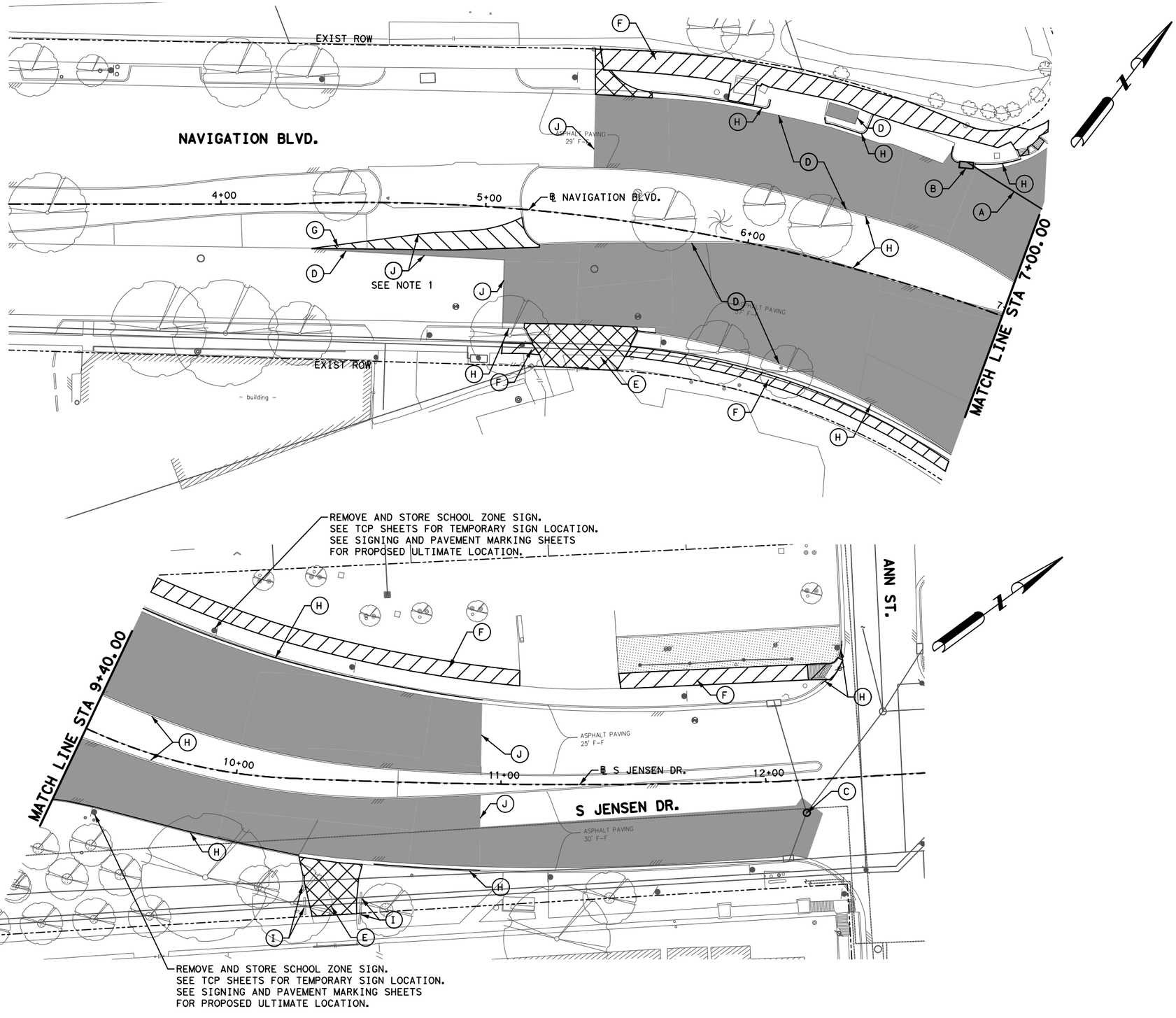
NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

DEMOLITION PLAN
STA 7+50 TO END PROJECT

SHEET 2 OF 3

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	106



LEGEND:

- (A) REMOVE PIPE(RCP OR CMP)
- (B) REMOVE INLET
- (C) REMOVE MH
- (D) REMOVE ASPH PAV OVER CONC PAV & BASE
- (E) REMOVE CONC DRWY
- (F) REMOVE CONC SIDEWALK
- (G) REMOVE CONC PAV
- (H) REMOVE CURB
- (I) REMOVE CURB STOP
- (J) SAWCUT
- (K) REMOVE CONC MEDIAN
- (L) REMOVE CONC PAVERS

NOTE:

1. SAWCUT 2 FEET BEHIND PROPOSED BACK OF CURB SO THAT THERE IS ENOUGH ASPHALT TO DOWEL IN THE PROPOSED CURB.
2. ALL TREE PROTECTION MUST BE IN PLACE PRIOR TO DEMOLITION WORK AND TREE REMOVALS.
3. SEE TREE PROTECTION PLAN SHEETS FOR TREE REMOVALS.
4. MARK TREE REMOVALS FOR APPROVAL PRIOR TO WORK.

0′ 40′ 80′
(IN FEET)
SCALE: PLAN 1"=40′

STATE OF TEXAS
DAVID G. GREANEY
125563
LICENSED
PROFESSIONAL ENGINEER

06/28/2022 Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

Gauge ENGINEERING
11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

DEMOLITION PLAN
BEGIN PROJECT TO END PROJECT

SHEET 3 OF 3

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.				HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM				CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.		SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386		107

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Design Filename: P:\East End\1035-Nav-Roundabout\4-0-Production-Working\4-1-CAD\Roadway\PR-DEMO*03.dgn

NAVIGATION BLVD (SW) AND JENSEN DR

Beginning chain NAVIGATION description

Point NAVIGATION1 N 13,843,152.9360 E 3,127,542.9662 Sta 1+00.00

Course from NAVIGATION1 to PC NAVIGATION_3 N 52° 08′ 53.43" E Dist 324.7885

Curve Data

Curve NAVIGATION_1

P.I. Station	5+90.00	N	13,843,458.9368	E	3,127,925.5498
Delta =	26° 34′ 36.69" (RT)				
Degree =	8° 11′ 26.57"				
Tangent =	165.2106				
Length =	324.4755				
Radius =	699.5212				
External =	19.2447				
Long Chord =	321.5744				
Mid. Ord. =	18.7295				
P.C. Station	4+24.79	N	13,843,352.2332	E	3,127,799.4193
P.T. Station	7+49.26	N	13,843,497.9350	E	3,128,086.0917
C.C.		N	13,842,818.1819	E	3,128,251.2147
Back = N	49° 46′ 10.31" E				
Ahead = N	76° 20′ 46.99" E				
Chord Bear = N	63° 03′ 28.65" E				

Curve Data

Curve NAVIGATION_2

P.I. Station	7+80.99	N	13,843,505.4242	E	3,128,116.9219
Delta =	15° 42′ 28.53" (LT)				
Degree =	24° 54′ 40.35"				
Tangent =	31.7268				
Length =	63.0557				
Radius =	230.0000				
External =	2.1779				
Long Chord =	62.8584				
Mid. Ord. =	2.1575				
P.C. Station	7+49.26	N	13,843,497.9350	E	3,128,086.0917
P.T. Station	8+12.32	N	13,843,520.9804	E	3,128,144.5732
C.C.		N	13,843,721.4353	E	3,128,031.7998
Back = N	76° 20′ 46.99" E				
Ahead = N	60° 38′ 18.46" E				
Chord Bear = N	68° 29′ 32.73" E				

Course from PT NAVIGATION_4 to PC NAVIGATION_7 N 60° 38′ 18.46" E Dist 57.1981

Curve Data

Curve NAVIGATION_3

P.I. Station	8+88.39	N	13,843,558.2768	E	3,128,210.8675
Delta =	10° 01′ 49.29" (RT)				
Degree =	26° 38′ 57.12"				
Tangent =	18.8675				
Length =	37.6385				
Radius =	215.0000				
External =	0.8263				
Long Chord =	37.5904				
Mid. Ord. =	0.8231				
P.C. Station	8+69.52	N	13,843,549.0257	E	3,128,194.4237
P.T. Station	9+07.16	N	13,843,564.5224	E	3,128,228.6713
C.C.		N	13,843,361.6439	E	3,128,299.8423
Back = N	60° 38′ 18.46" E				
Ahead = N	70° 40′ 07.75" E				
Chord Bear = N	65° 39′ 13.10" E				

Curve Data

Curve NAVIGATION_4

P.I. Station	9+65.31	N	13,843,583.7726	E	3,128,283.5452
Delta =	31° 49′ 17.82" (LT)				
Degree =	28° 05′ 10.20"				
Tangent =	58.1525				
Length =	113.3000				
Radius =	204.0000				
External =	8.1267				
Long Chord =	111.8494				
Mid. Ord. =	7.8153				
P.C. Station	9+07.16	N	13,843,564.5224	E	3,128,228.6713
P.T. Station	10+20.46	N	13,843,629.0630	E	3,128,320.0211
C.C.		N	13,843,757.0211	E	3,128,161.1416
Back = N	70° 40′ 07.75" E				
Ahead = N	38° 50′ 49.93" E				
Chord Bear = N	54° 45′ 28.84" E				

Beginning chain NAVIGATION description

Point NAVIGATION1 N 13,843,152.9360 E 3,127,542.9662 Sta 1+00.00

Course from NAVIGATION1 to PC NAVIGATION_3 N 52° 08′ 53.43" E Dist 324.7885

Curve Data

Curve NAVIGATION_5

P.I. Station	11+12.83	N	13,843,701.0048	E	3,128,377.9615
Delta =	4° 15′ 50.01" (LT)				
Degree =	2° 18′ 32.58"				
Tangent =	92.3726				
Length =	184.6600				
Radius =	2,481.3578				
External =	1.7188				
Long Chord =	184.6174				
Mid. Ord. =	1.7176				
P.C. Station	10+20.46	N	13,843,629.0630	E	3,128,320.0211
P.T. Station	12+05.12	N	13,843,777.0553	E	3,128,430.3926
C.C.		N	13,845,185.4839	E	3,126,387.4864
Back = N	38° 50′ 49.93" E				
Ahead = N	34° 34′ 59.92" E				
Chord Bear = N	36° 42′ 54.93" E				

Course from PT NAVIGATION_9 to NAVIGATION11 N 32° 58′ 33.17" E Dist 103.5734

Point NAVIGATION11 N 13,843,863.9430 E 3,128,486.7661 Sta 13+08.69

Ending chain NAVIGATION description

ROUNDABOUT

Beginning chain RNDBT description

Curve Data

Curve RNDBT_1

P.I. Station	4+72.91	N	13,843,056.0489	E	3,128,254.4410
Delta =	194° 13′ 22.73" (RT)				
Degree =	97° 06′ 41.37"				
Tangent =	472.9070				
Length =	200.0000				
Radius =	59.0000				
External =	535.5732				
Long Chord =	117.0922				
Mid. Ord. =	66.3042				
P.C. Station	0+00.00	N	13,843,497.8402	E	3,128,085.7357
P.T. Station	2+00.00	N	13,843,525.7482	E	3,128,199.4535
C.C.		N	13,843,518.8879	E	3,128,140.8537
Back = N	20° 54′ 00.63" W				
Ahead = S	6° 40′ 37.90" E				
Chord Bear = N	76° 12′ 40.74" E				

Curve Data

Curve RNDBT_2

P.I. Station	6+72.91	N	13,843,056.0489	E	3,128,254.4410
Delta =	165° 46′ 37.27" (RT)				
Degree =	97° 06′ 41.37"				
Tangent =	472.9070				
Length =	170.7079				
Radius =	59.0000				
External =	417.5732				
Long Chord =	117.0922				
Mid. Ord. =	51.6958				
P.C. Station	2+00.00	N	13,843,525.7482	E	3,128,199.4535
P.T. Station	3+70.71	N	13,843,497.8402	E	3,128,085.7357
C.C.		N	13,843,518.8879	E	3,128,140.8537
Back = S	6° 40′ 37.90" E				
Ahead = N	20° 54′ 00.63" W				
Chord Bear = S	76° 12′ 40.74" W				

Ending chain RNDBT description

STATE OF TEXAS
DAVID G. GREANEY
125563
LICENSED
PROFESSIONAL ENGINEER

06/08/2022 Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

Gauge ENGINEERING
11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR.
& RUNNELS ST.

HORIZONTAL CURVE DATA

SHEET 1 OF 2

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.				HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM				CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.		SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386		108

RUNNELS ST. AND NAVIGATION BLVD (SE)

Beginning chain RUNNELS description

Point 352 N 13,843,776.8472 E 3,127,753.4678 Sta 1+00.00

Course from 352 to PC RUNNELS1 S 56° 30′ 57.25" E Dist 201.9332

Curve Data

Curve RUNNELS1					
P.I. Station	3+23.52	N	13,843,653.5292	E	3,127,939.8935
Delta =	6° 46′ 11.07" (RT)				
Degree =	15° 41′ 50.91"				
Tangent =	21.5883				
Length =	43.1263				
Radius =	365.0000				
External =	0.6379				
Long Chord =	43.1012				
Mid. Ord. =	0.6368				
P.C. Station	3+01.93	N	13,843,665.4396	E	3,127,921.8880
P.T. Station	3+45.06	N	13,843,639.5794	E	3,127,956.3694
C.C.		N	13,843,361.0153	E	3,127,720.5155
Back = S	56° 30′ 57.25" E				
Ahead = S	49° 44′ 46.18" E				
Chord Bear = S	53° 07′ 51.72" E				

Curve Data

Curve RUNNELS2					
P.I. Station	3+88.15	N	13,843,611.7381	E	3,127,989.2524
Delta =	17° 45′ 09.06" (LT)				
Degree =	20° 46′ 03.00"				
Tangent =	43.0864				
Length =	85.4822				
Radius =	275.8916				
External =	3.3442				
Long Chord =	85.1407				
Mid. Ord. =	3.3041				
P.C. Station	3+45.06	N	13,843,639.5794	E	3,127,956.3694
P.T. Station	4+30.54	N	13,843,595.2487	E	3,128,029.0587
C.C.		N	13,843,850.1369	E	3,128,134.6437
Back = S	49° 44′ 46.18" E				
Ahead = S	67° 29′ 55.25" E				
Chord Bear = S	58° 37′ 20.72" E				

Curve Data

Curve RUNNELS3					
P.I. Station	4+84.70	N	13,843,574.5202	E	3,128,079.0984
Delta =	19° 30′ 46.07" (RT)				
Degree =	18° 11′ 20.89"				
Tangent =	54.1631				
Length =	107.2772				
Radius =	315.0000				
External =	4.6227				
Long Chord =	106.7595				
Mid. Ord. =	4.5558				
P.C. Station	4+30.54	N	13,843,595.2487	E	3,128,029.0587
P.T. Station	5+37.82	N	13,843,538.2681	E	3,128,119.3405
C.C.		N	13,843,304.2295	E	3,127,908.5067
Back = S	67° 29′ 55.25" E				
Ahead = S	47° 59′ 09.17" E				
Chord Bear = S	57° 44′ 32.21" E				

Course from PT RUNNELS3 to PC RUNNELS4 S 47° 59′ 09.18" E Dist 134.9182

Curve Data

Curve RUNNELS4					
P.I. Station	7+24.77	N	13,843,413.1420	E	3,128,258.2383
Delta =	16° 13′ 30.34" (LT)				
Degree =	15° 41′ 50.91"				
Tangent =	52.0287				
Length =	103.3612				
Radius =	365.0000				
External =	3.6896				
Long Chord =	103.0162				
Mid. Ord. =	3.6526				
P.C. Station	6+72.74	N	13,843,447.9655	E	3,128,219.5820
P.T. Station	7+76.10	N	13,843,390.5064	E	3,128,305.0851
C.C.		N	13,843,719.1532	E	3,128,463.8815
Back = S	47° 59′ 09.17" E				
Ahead = S	64° 12′ 39.52" E				
Chord Bear = S	56° 05′ 54.35" E				

Curve Data

Curve RUNNELS5					
P.I. Station	8+01.68	N	13,843,379.3758	E	3,128,328.1212
Delta =	8° 01′ 08.47" (RT)				
Degree =	15° 41′ 50.91"				
Tangent =	25.5842				
Length =	51.0848				
Radius =	365.0000				
External =	0.8955				
Long Chord =	51.0431				
Mid. Ord. =	0.8934				
P.C. Station	7+76.10	N	13,843,390.5064	E	3,128,305.0851
P.T. Station	8+27.18	N	13,843,365.1405	E	3,128,349.3792
C.C.		N	13,843,061.8596	E	3,128,146.2887
Back = S	64° 12′ 39.52" E				
Ahead = S	56° 11′ 31.05" E				
Chord Bear = S	60° 12′ 05.29" E				

Course from PT RUNNELS5 to 353 S 56° 11′ 31.05" E Dist 385.3487

Point 353 N 13,843,150.7277 E 3,128,669.5679 Sta 12+12.53

Ending chain RUNNELS description

STATE OF TEXAS
DAVID G. GREANEY
125563
LICENSED
PROFESSIONAL ENGINEER

06/08/2022 Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

Gauge ENGINEERING
11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

Texas Department of Transportation

NAVIGATION BLVD / JENSEN DR.
& RUNNELS ST.

HORIZONTAL CURVE DATA

SHEET 2 OF 2

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	109

NAVIGATION BLVD (SW) AND JENSEN DR

Beginning profile NAV-P description:

		STATION	ELEV	GRADE	TOTAL L	BACK L	AHEAD L
VPI	1	5+07.53	43.6900				
VPC		5+35.93	43.4458	-0.8600	K = 29.3	SSD = 265.3	
VPI	2	5+80.00	43.0668		88.1393	44.0696	44.0696
VPT		6+24.07	41.3641	-3.8637			
VPC		6+64.65	39.7962	-3.8637	K = 19.2		
VPI	3	7+05.00	38.2372		80.7000	40.3500	40.3500
Low Point		7+38.65	38.3667				
VPT		7+45.35	38.3784	0.3500			
VPI	4	7+56.95	38.4190	0.3500			
VPI	5	7+75.03	38.5998	1.0000			
VPI	6	8+08.04	37.9400	-1.9988			
VPI	7	8+59.42	36.9124	-2.0000			
VPC		8+88.32	36.2187	-2.4000	K = 49.4		
VPI	8	9+60.00	34.4984		143.3520	71.6760	71.6760
Low Point		10+06.96	34.7950				
VPT		10+31.68	34.8568	0.5000			
VPI	9	10+70.00	35.0484	0.5000			
VPI	10	10+92.41	34.9700	-0.3500			

Ending profile NAV-P description

RUNNELS ST. AND NAVIGATION BLVD (SE)

Beginning profile RUNN-P description:

		STATION	ELEV	GRADE	TOTAL L	BACK L	AHEAD L
VPI	1	2+60.00	41.5300				
VPC		4+15.82	38.6081	-1.8752	K = 35.1		
VPI	2	4+54.82	37.8767		78.0016	39.0008	39.0008
Low Point		4+81.55	37.9917				
VPT		4+93.82	38.0132	0.3500			
VPI	3	5+15.76	38.0900	0.3500			
VPI	4	5+33.77	38.2700	0.9994			
VPI	5	5+66.73	37.9400	-1.0012			
VPI	6	6+17.77	37.4296	-1.0000			
VPI	7	6+92.25	36.9455	-0.6500			
VPI	8	8+59.53	36.3600	-0.3500			

Ending profile RUNN-P description

ROUNDABOUT

Beginning profile RNDBT-P description:

		STATION	ELEV	GRADE	TOTAL L	BACK L	AHEAD L
VPI	1	0+00.00	38.3900				
VPI	2	0+63.35	38.0600	-0.5209			
VPC		1+30.38	37.0689	-1.4786	K = 31.3		
VPI	3	1+67.88	36.5144		75.0000	37.5000	37.5000
Low Point		1+76.64	36.7269				
VPT		2+05.38	36.8588	0.9186			
VPI	4	2+50.14	37.2700	0.9186			
VPI	5	3+70.71	38.3900	0.9289			

Ending profile RNDBT-P description

STATE OF TEXAS
DAVID G. GREANEY
125563
LICENSED
PROFESSIONAL ENGINEER

06/08/2022 Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

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Gauge ENGINEERING
11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

VERTICAL CURVE DATA

SHEET 1 OF 1

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	110

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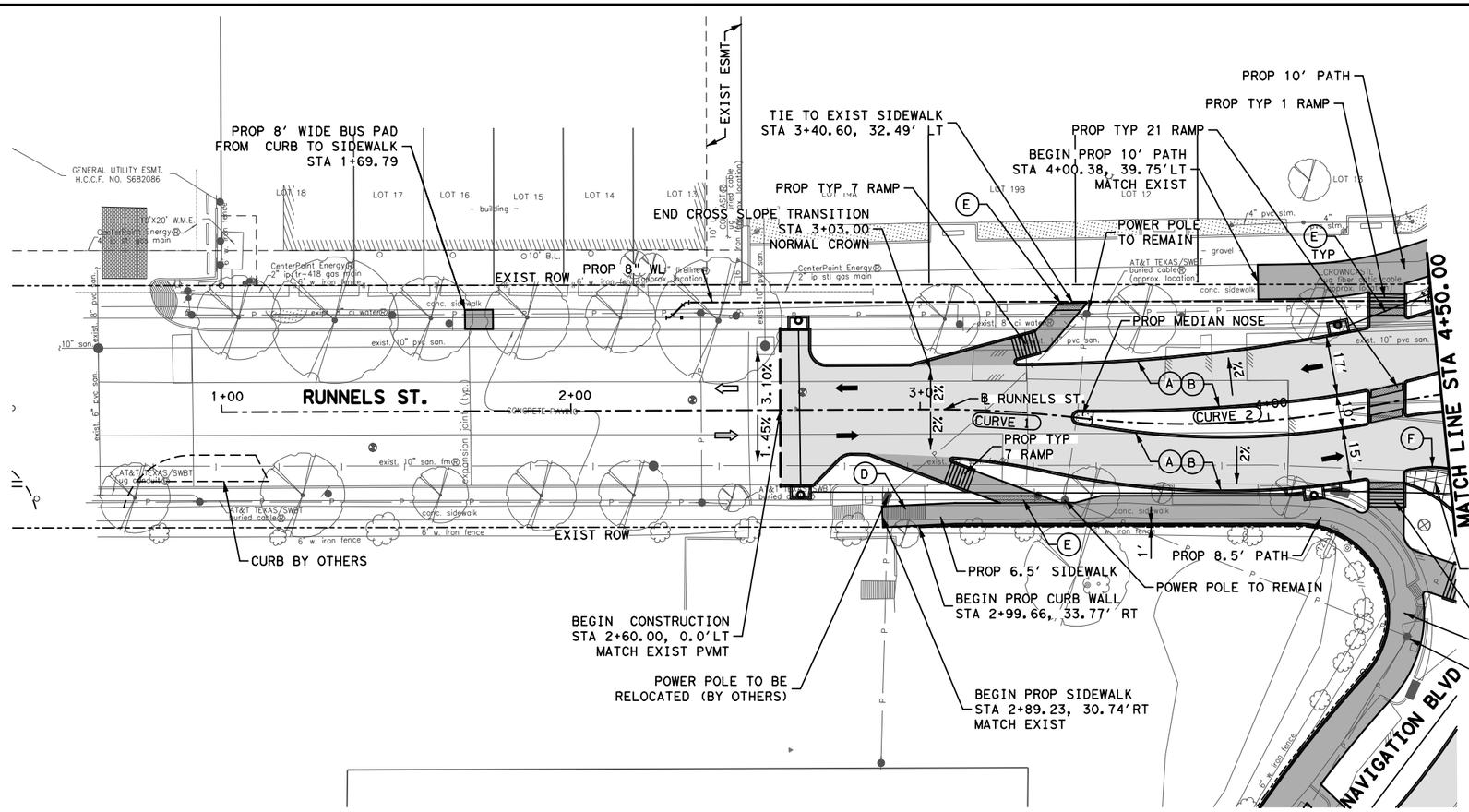

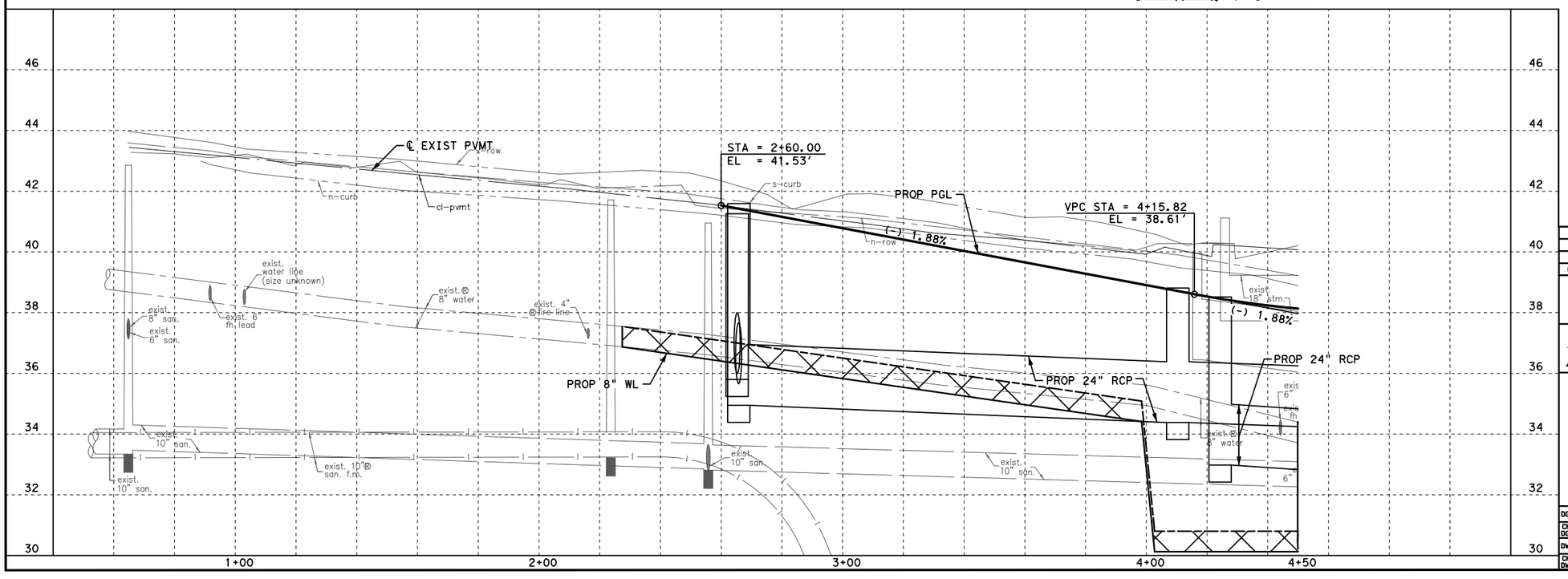

CURVE 1

PI STATION	= 3+23.52
DELTA	= 6° 46' 11.07" (RT)
DEGREE OF CURVE	= 15° 41' 50.91"
TANGENT	= 21.59
LENGTH	= 43.13
RADIUS	= 365.00
PC STATION	= 3+01.93
PT STATION	= 3+45.06

CURVE 2

PI STATION	= 3+88.15
DELTA	= 17° 45' 09.06" (LT)
DEGREE OF CURVE	= 20° 46' 03.00"
TANGENT	= 43.09
LENGTH	= 85.48
RADIUS	= 275.89
PC STATION	= 3+45.06
PT STATION	= 4+30.54

LEGEND

- PROPOSED LANE
- EXISTING LANE
- (CURVE) HORIZONTAL ALIGNMENT CURVE
- EXISTING PARCEL LINES
- PROP CURB
- (A) 11" JRCP
- (B) 6" CONC CURB
- (C) CONC DRIVEWAY
- (D) 6' WIDE CONC SIDEWALK
- (E) TRUNCATED DOMES
- (F) 4" TY I CURB
- (G) 5-3/4" TY II CURB
- (H) 1.5" HMAC & 11" JRCP
- (X) PROP DRIVEWAY

NOTES:

1. REFER TO DRAINAGE PLAN & PROFILE FOR ADDITIONAL INFORMATION.
2. REFER TO ROADWAY HORIZONTAL GEOMETRY LAYOUTS SHEETS FOR ADDITIONAL INFORMATION.
3. REFER TO SIGNING & PAVEMENT MARKING SHEETS FOR ADDITIONAL INFORMATION.
4. ROADWAY PROFILE SHOWN WITHIN ROUNDABOUT IS APPROXIMATE. ROUNDABOUT GRADING SHOULD BE DONE IN ACCORDANCE WITH ROUNDABOUT GEOMETRY LAYOUTS.
5. ALL DIMENSION ARE MEASURED FROM FACE OF CURB.
6. CONTRACTOR TO ADJUST ALL MANHOLES, VAULT AND BOXES TO PROPOSED GRADE. CONTACT AT&T FOR MANHOLE ADJUSTMENTS
7. REFER TO WATERLINE PLAN & PROFILE FOR ADDITIONAL INFORMATION.

0' 40' 80'
(IN FEET)
SCALE: PLAN 1"=40'
PROFILE 1"=4'

STATE OF TEXAS
DAVID G. GREANEY
125563
LICENSED
PROFESSIONAL ENGINEER
06/08/2022 Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

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11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

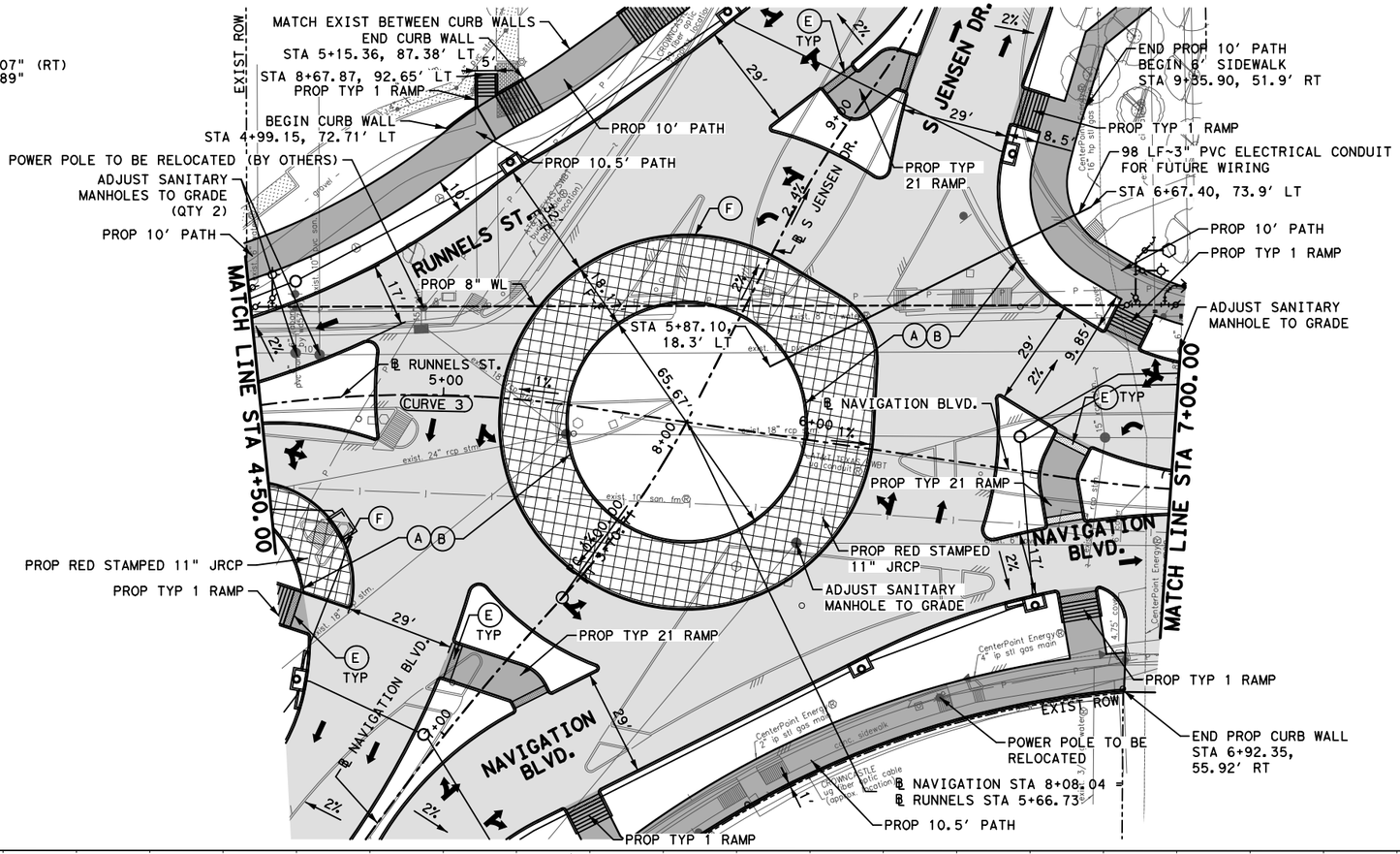
ROADWAY PLAN & PROFILE BEGIN PROJECT TO STA 4+50 (NORTHWEST APPROACH)

SHEET 1 OF 5

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	111

CURVE 3

PI STATION = 4+84.70
DELTA = 19° 30' 46.07" (RT)
DEGREE OF CURVE = 18° 11' 20.89"
TANGENT = 54.16
LENGTH = 107.28
RADIUS = 315.00
PC STATION = 4+30.54
PT STATION = 5+37.82



LEGEND

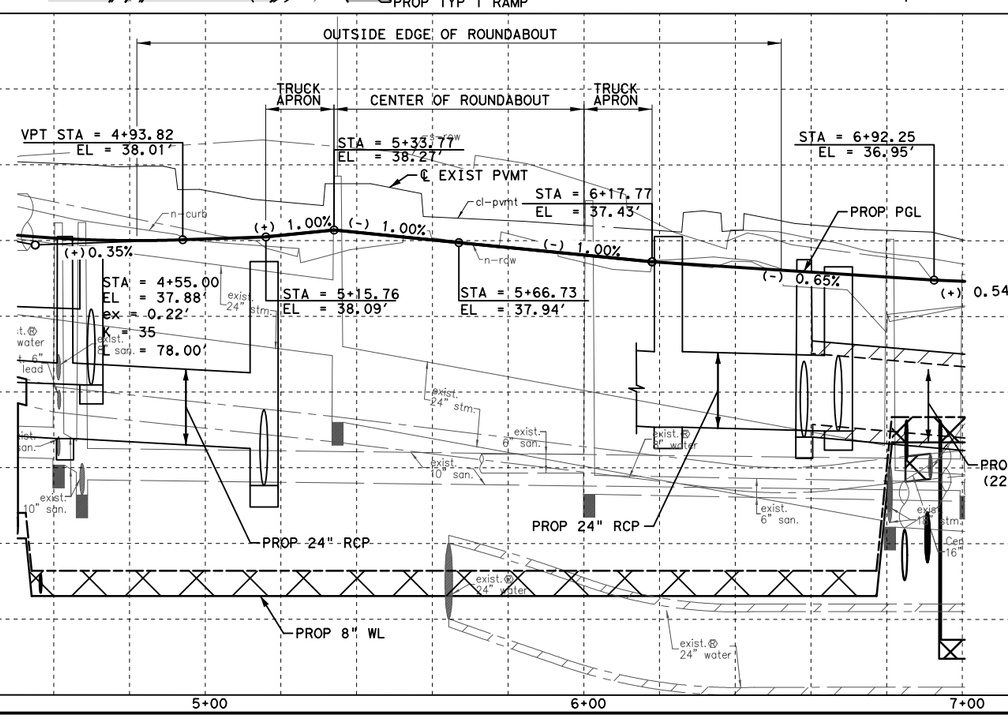
- PROPOSED LANE
- EXISTING LANE
- (CURVE) HORIZONTAL ALIGNMENT CURVE
- EXISTING PARCEL LINES
- PROP CURB
- (A) 11" JRCP
- (B) 6" CONC CURB
- (C) CONC DRIVEWAY
- (D) 6' WIDE CONC SIDEWALK
- (E) TRUNCATED DOMES
- (F) 4" TY I CURB
- (G) 5-3/4" TY II CURB
- (H) 1.5" HMAC & 11" JRCP
- (X) PROP DRIVEWAY

NOTES:

1. REFER TO DRAINAGE PLAN & PROFILE FOR ADDITIONAL INFORMATION.
2. REFER TO ROADWAY HORIZONTAL GEOMETRY LAYOUTS SHEETS FOR ADDITIONAL INFORMATION.
3. REFER TO SIGNING & PAVEMENT MARKING SHEETS FOR ADDITIONAL INFORMATION.
4. ROADWAY PROFILE SHOWN WITHIN ROUNDABOUT IS APPROXIMATE. ROUNDABOUT GRADING SHOULD BE DONE IN ACCORDANCE WITH ROUNDABOUT GEOMETRY LAYOUTS.
5. ALL DIMENSION ARE MEASURED FROM FACE OF CURB.
6. CONTRACTOR TO ADJUST ALL MANHOLES, VAULT AND BOXES TO PROPOSED GRADE. CONTACT AT&T FOR MANHOLE ADJUSTMENTS
7. REFER TO WATERLINE PLAN & PROFILE FOR ADDITIONAL INFORMATION.

0' 40' 80'
(IN FEET)

SCALE: PLAN 1"=40'
PROFILE 1"=4'



STATE OF TEXAS
DAVID G. GREANEY
125563
LICENSED
PROFESSIONAL ENGINEER
06/08/2022 Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

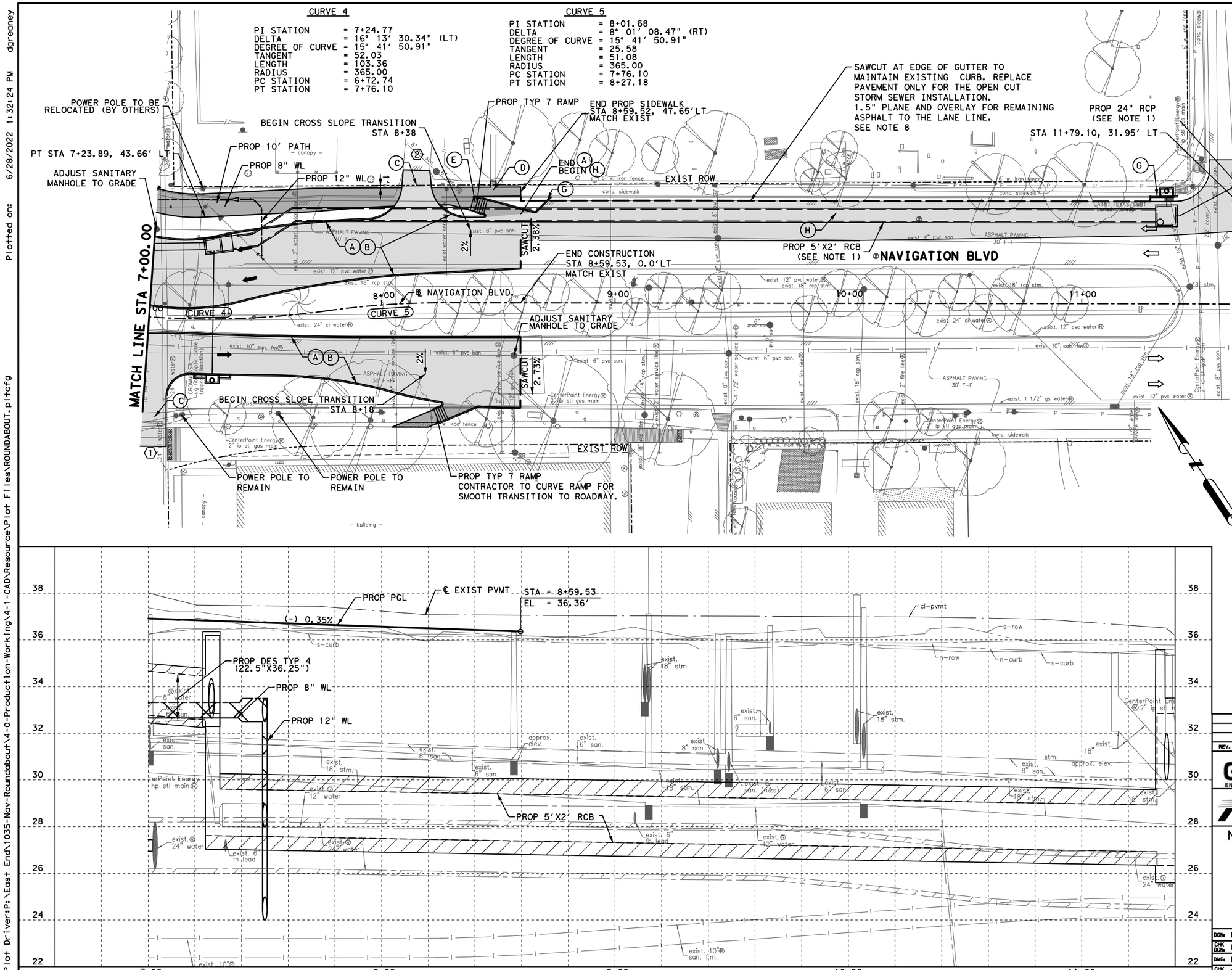
Gauge ENGINEERING
11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

ROADWAY PLAN & PROFILE STA 4+50 TO STA 7+00 (NORTHWEST AND SOUTHEAST APPROACHES)

SHEET 2 OF 5

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	112



LEGEND

- PROPOSED LANE
- EXISTING LANE
- (CURVE) HORIZONTAL ALIGNMENT CURVE
- EXISTING PARCEL LINES
- PROP CURB
- (A) 11" JRCP
- (B) 6" CONC CURB
- (C) CONC DRIVEWAY
- (D) 6' WIDE CONC SIDEWALK
- (E) TRUNCATED DOMES
- (F) 4" TY I CURB
- (G) 5-3/4" TY II CURB
- (H) 1.5" HMAC & 11" JRCP
- (X) PROP DRIVEWAY

NOTES:

1. REFER TO DRAINAGE PLAN & PROFILE FOR ADDITIONAL INFORMATION.
2. REFER TO ROADWAY HORIZONTAL GEOMETRY LAYOUTS SHEETS FOR ADDITIONAL INFORMATION.
3. REFER TO SIGNING & PAVEMENT MARKING SHEETS FOR ADDITIONAL INFORMATION.
4. ROADWAY PROFILE SHOWN WITHIN ROUNDABOUT IS APPROXIMATE. ROUNDABOUT GRADING SHOULD BE DONE IN ACCORDANCE WITH ROUNDABOUT GEOMETRY LAYOUTS.
5. ALL DIMENSION ARE MEASURED FROM FACE OF CURB.
6. CONTRACTOR TO ADJUST ALL MANHOLES, VAULT AND BOXES TO PROPOSED GRADE. CONTACT AT&T FOR MANHOLE ADJUSTMENTS
7. REFER TO WATERLINE PLAN & PROFILE FOR ADDITIONAL INFORMATION.
8. REFER TO STREET PAVING STANDARDS SHEETS 4 AND 5 OF 5 FOR PAVEMENT REPAIR DETAILS.

0' 40' 80'
(IN FEET)

SCALE: PLAN 1"=40'
PROFILE 1"=4'

STATE OF TEXAS
DAVID G. GREANEY
125563
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PROFESSIONAL ENGINEER

06/28/2022 Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

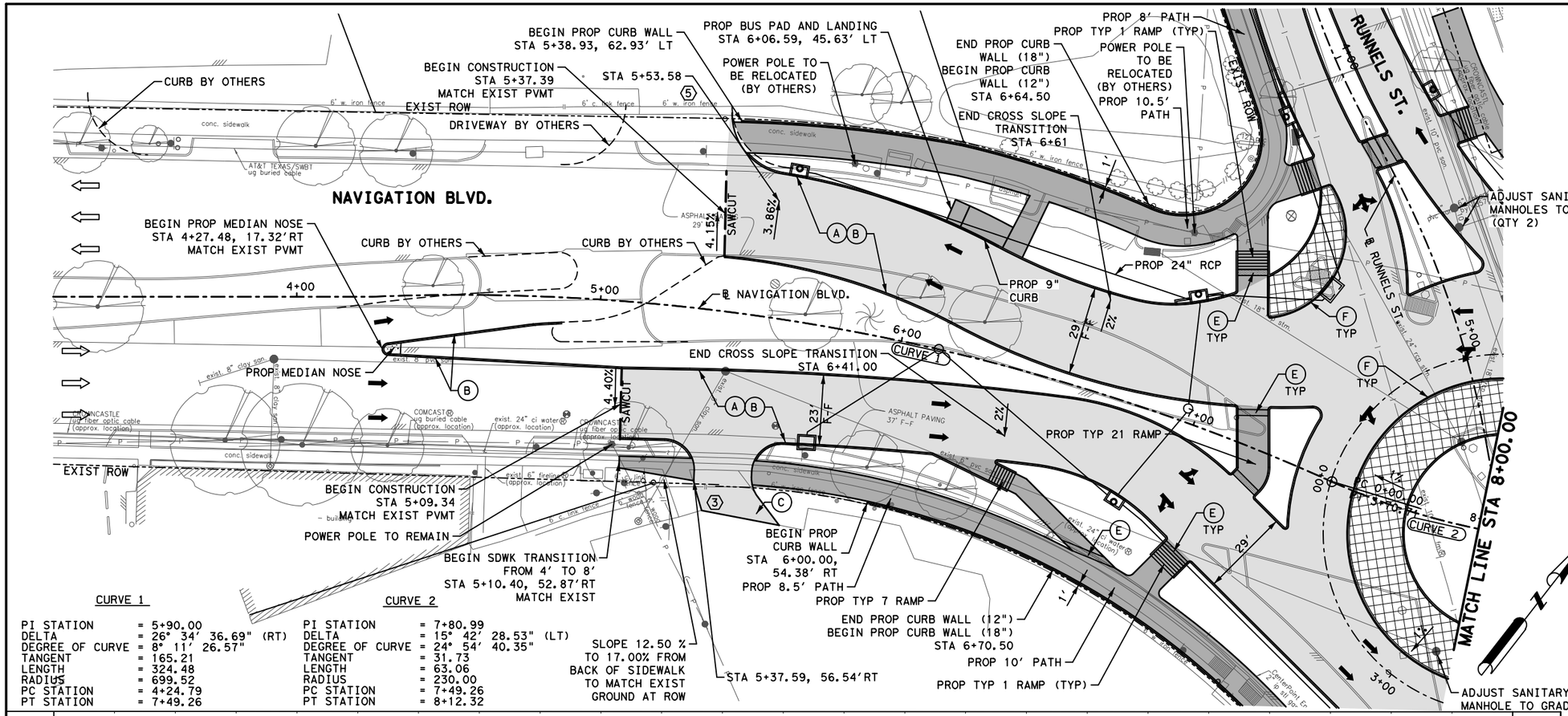
Gauge ENGINEERING
11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

ROADWAY PLAN & PROFILE STA 7+00 TO END PROJECT (SOUTHEAST APPROACH)

SHEET 3 OF 5

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	113



CURVE 1

PI STATION	= 5+90.00
DELTA	= 26° 34' 36.69" (RT)
DEGREE OF CURVE	= 8° 11' 26.57"
TANGENT	= 165.21
LENGTH	= 324.48
RADIUS	= 699.52
PC STATION	= 4+24.79
PT STATION	= 7+49.26

CURVE 2

PI STATION	= 7+80.99
DELTA	= 15° 42' 28.53" (LT)
DEGREE OF CURVE	= 24° 54' 40.35"
TANGENT	= 31.73
LENGTH	= 63.06
RADIUS	= 230.00
PC STATION	= 7+49.26
PT STATION	= 8+12.32

LEGEND

- PROPOSED LANE
- EXISTING LANE
- (CURVE) HORIZONTAL ALIGNMENT CURVE
- EXISTING PARCEL LINES
- PROP CURB
- (A) 11" JRCP
- (B) 6" CONC CURB
- (C) CONC DRIVEWAY
- (D) 6' WIDE CONC SIDEWALK
- (E) TRUNCATED DOMES
- (F) 4" TY I CURB
- (G) 5-3/4" TY II CURB
- (H) 1.5" HMAC & 11" JRCP
- (X) PROP DRIVEWAY

NOTES:

1. REFER TO DRAINAGE PLAN & PROFILE FOR ADDITIONAL INFORMATION.
2. REFER TO ROADWAY HORIZONTAL GEOMETRY LAYOUTS SHEETS FOR ADDITIONAL INFORMATION.
3. REFER TO SIGNING & PAVEMENT MARKING SHEETS FOR ADDITIONAL INFORMATION.
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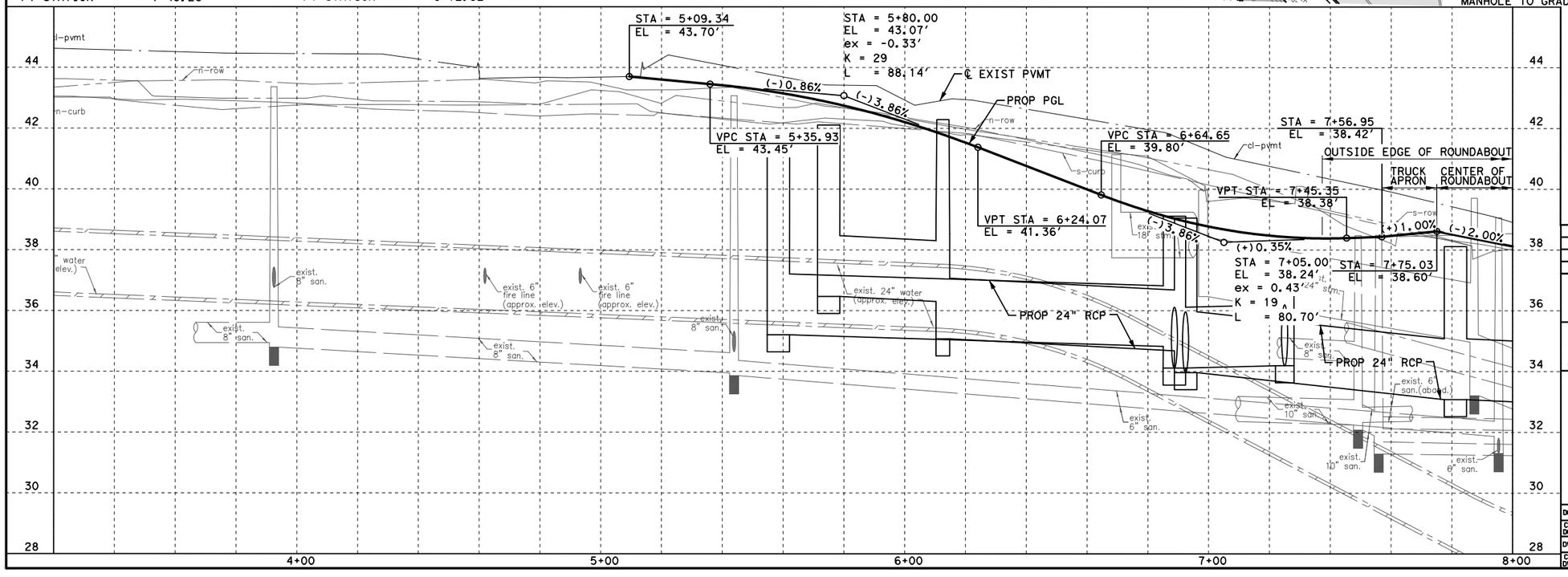
5. ALL DIMENSION ARE MEASURED FROM FACE OF CURB.
6. CONTRACTOR TO ADJUST ALL MANHOLES, VAULT AND BOXES TO PROPOSED GRADE. CONTACT AT&T FOR MANHOLE ADJUSTMENTS

0' 40' 80'
(IN FEET)
SCALE: PLAN 1"=40'
PROFILE 1"=4'



STATE OF TEXAS
DAVID G. GREANEY
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11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

ROADWAY PLAN & PROFILE BEGIN PROJECT TO STA 8+00.00 (NORTHWEST APPROACH)

SHEET 4 OF 5

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	114

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Design Filename: P:\East End\1035-Nav-Roundabout\4-0-Production-Working\4-1-CAD\Roadway\PR-RWDY*04.dgn

CURVE 3

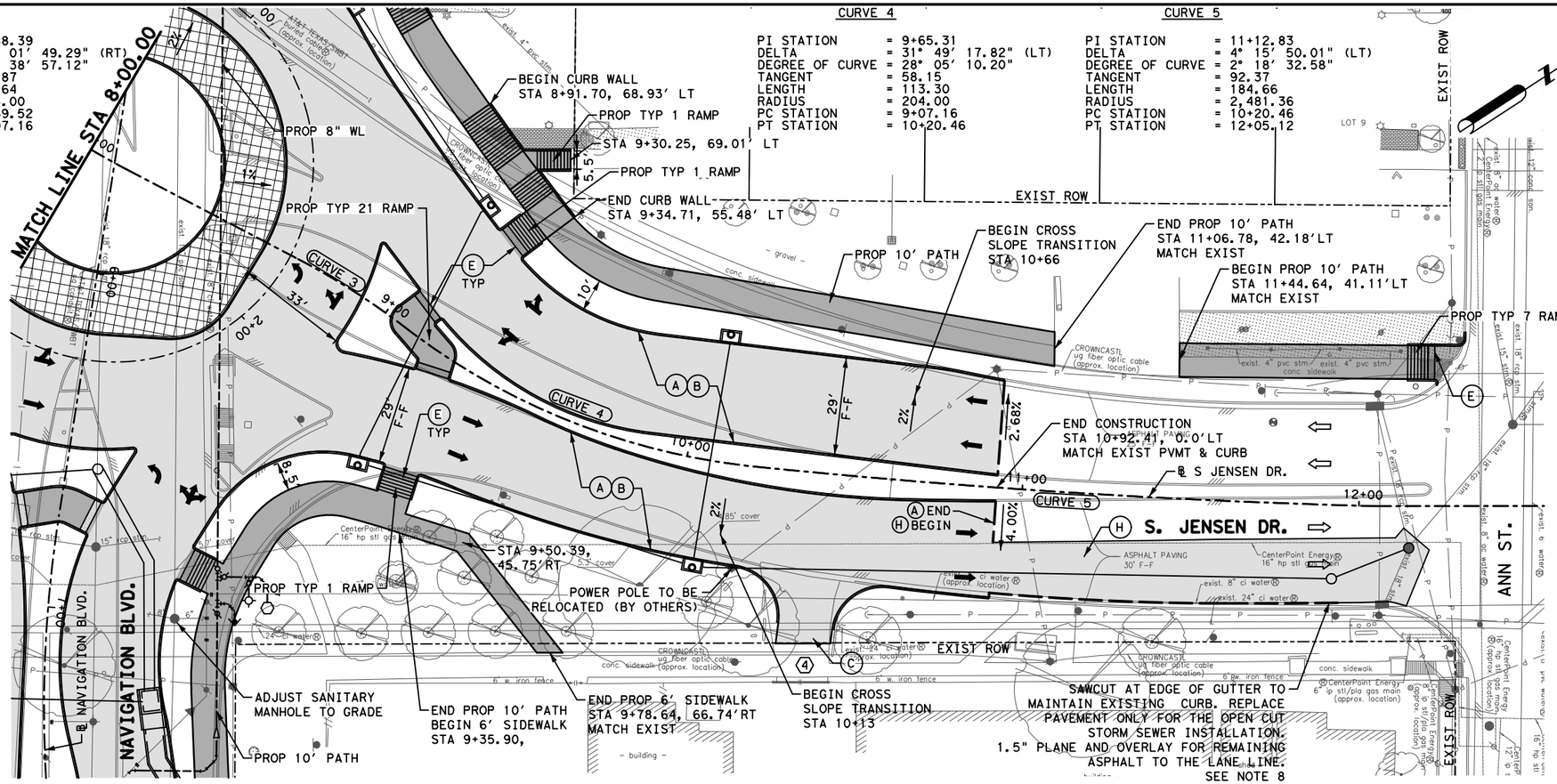
PI STATION = 8+88.39
DELTA = 10° 01' 49.29" (RT)
DEGREE OF CURVE = 26° 38' 57.12"
TANGENT = 18.87
LENGTH = 37.64
RADIUS = 215.00
PC STATION = 8+69.52
PT STATION = 9+07.16

CURVE 4

PI STATION = 9+65.31
DELTA = 31° 49' 17.82" (LT)
DEGREE OF CURVE = 28° 05' 10.20"
TANGENT = 58.15
LENGTH = 113.30
RADIUS = 204.00
PC STATION = 9+07.16
PT STATION = 10+20.46

CURVE 5

PI STATION = 11+12.83
DELTA = 4° 15' 50.01" (LT)
DEGREE OF CURVE = 2° 18' 32.58"
TANGENT = 92.37
LENGTH = 184.66
RADIUS = 2,481.36
PC STATION = 10+20.46
PT STATION = 12+05.12



LEGEND

- PROPOSED LANE
- EXISTING LANE
- (CURVE) HORIZONTAL ALIGNMENT CURVE
- EXISTING PARCEL LINES
- PROP CURB
- (A) 11" JRCP
- (B) 6" CONC CURB
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- (D) 6' WIDE CONC SIDEWALK
- (E) TRUNCATED DOMES
- (F) 4" TY I CURB
- (G) 5-3/4" TY II CURB
- (H) 1.5" HMAC & 11" JRCP
- (X) PROP DRIVEWAY

NOTES:

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2. REFER TO ROADWAY HORIZONTAL GEOMETRY LAYOUTS SHEETS FOR ADDITIONAL INFORMATION.
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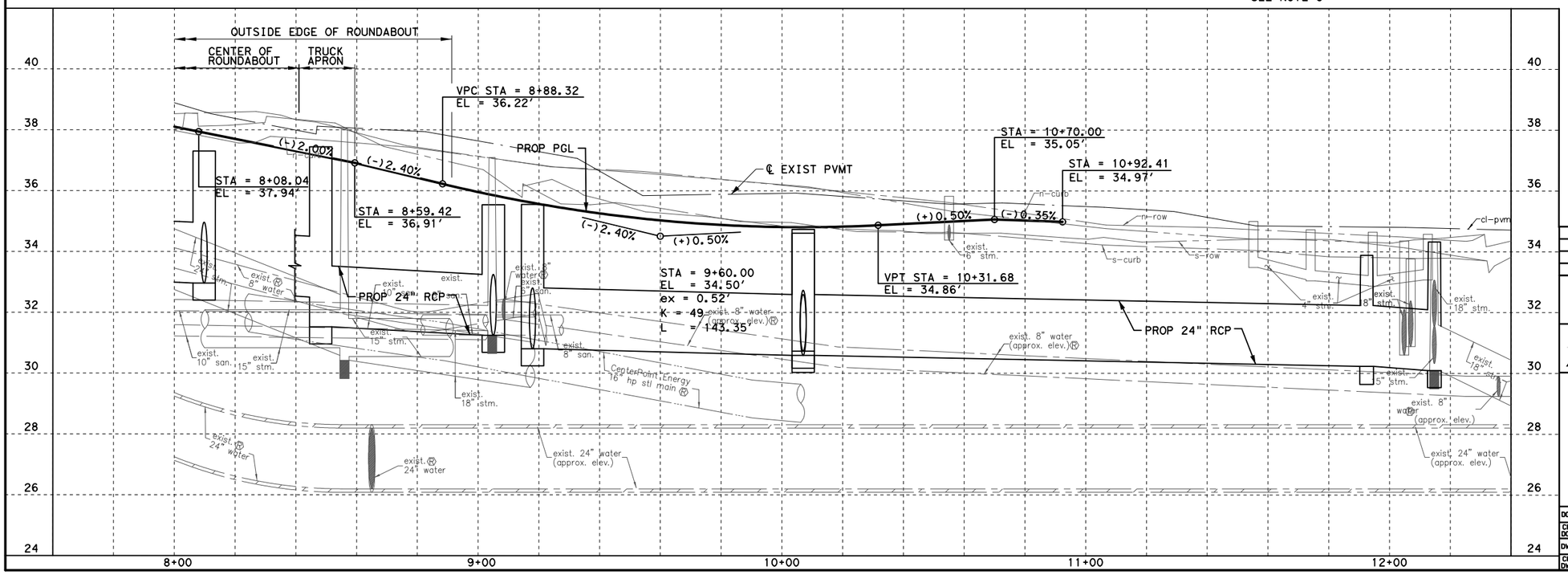
8. REFER TO STREET PAVING STANDARDS SHEETS 4 AND 5 OF 5 FOR PAVEMENT REPAIR DETAILS.

0' 40' 80'
(IN FEET)

SCALE: PLAN 1"=40'
PROFILE 1"=4'



STATE OF TEXAS
DAVID G. GREANEY
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06/08/2022 Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

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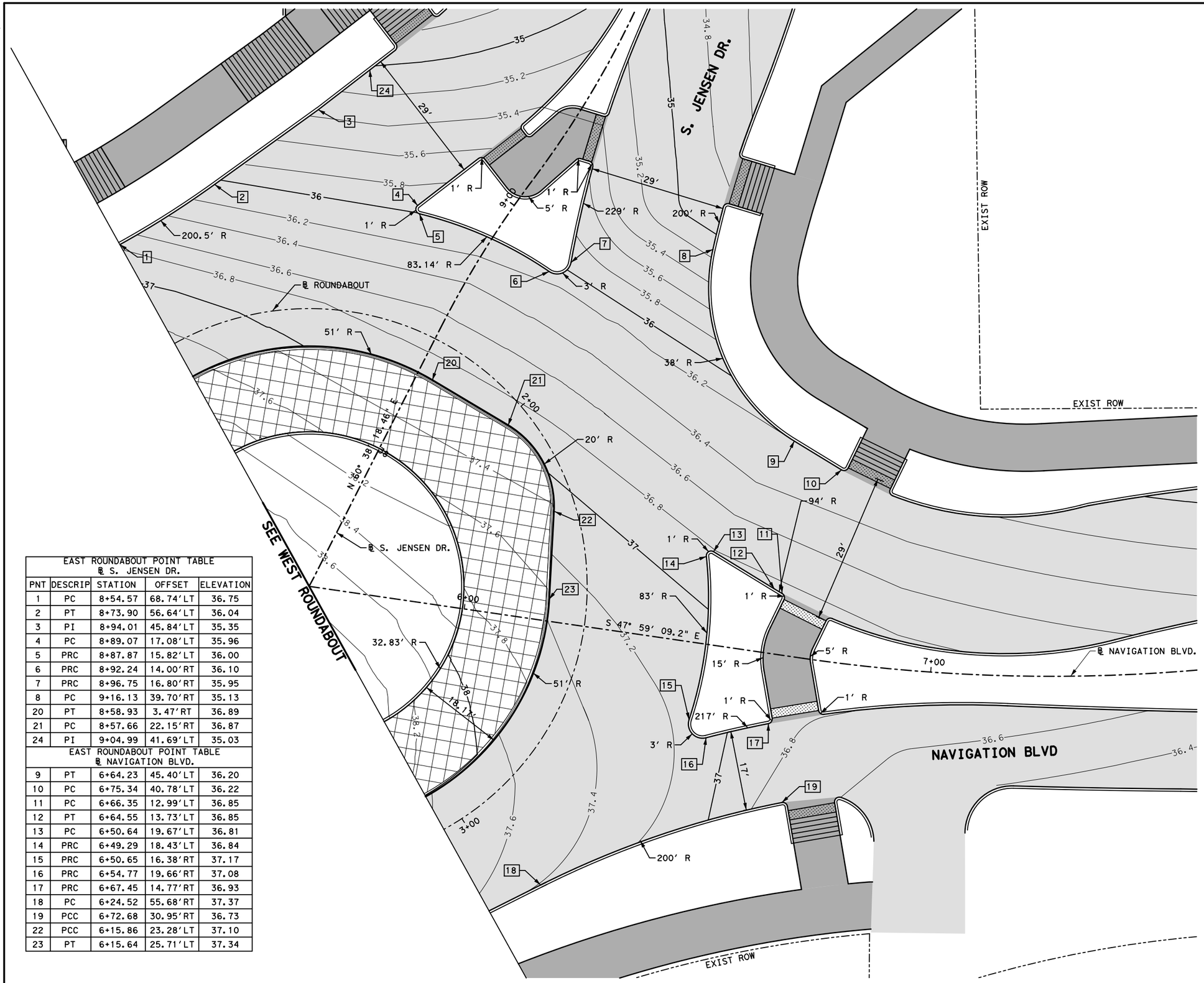
11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

ROADWAY PLAN & PROFILE STA 8+00 TO END PROJECT (NORTHEAST APPROACH)

SHEET 5 OF 5

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	115



LEGEND

- PROPOSED CURB
- EXISTING ROW
- —XX.X— MINOR CONTOURS
- —XX— MAJOR CONTOURS

NOTES:

1. CONTOURS WITHIN ROUNDABOUT AND CONNECTIONS TO APPROACH LEGS SUPERCEDE THE PROFILES SHOWN ON THE ROADWAY PLAN AND PROFILE SHEETS.
2. DIMENSIONS ARE MEASURED TO FACE OF CURB UNLESS OTHERWISE NOTED.
3. SEE HORIZONTAL ALIGNMENT DATA SHEET FOR CURVE INFORMATION.
4. ALL STA/OFFSET CALLOUTS ARE FROM BL UNLESS OTHERWISE NOTED.

0′ 20′ 40′
(IN FEET)
SCALE: PLAN 1"=20′

EAST ROUNDABOUT POINT TABLE ℄ S. JENSEN DR.				
PNT	DESCRIP	STATION	OFFSET	ELEVATION
1	PC	8+54.57	68.74′LT	36.75
2	PT	8+73.90	56.64′LT	36.04
3	PI	8+94.01	45.84′LT	35.35
4	PC	8+89.07	17.08′LT	35.96
5	PRC	8+87.87	15.82′LT	36.00
6	PRC	8+92.24	14.00′RT	36.10
7	PRC	8+96.75	16.80′RT	35.95
8	PC	9+16.13	39.70′RT	35.13
20	PT	8+58.93	3.47′RT	36.89
21	PC	8+57.66	22.15′RT	36.87
24	PI	9+04.99	41.69′LT	35.03
EAST ROUNDABOUT POINT TABLE ℄ NAVIGATION BLVD.				
9	PT	6+64.23	45.40′LT	36.20
10	PC	6+75.34	40.78′LT	36.22
11	PC	6+66.35	12.99′LT	36.85
12	PT	6+64.55	13.73′LT	36.85
13	PC	6+50.64	19.67′LT	36.81
14	PRC	6+49.29	18.43′LT	36.84
15	PRC	6+50.65	16.38′RT	37.17
16	PRC	6+54.77	19.66′RT	37.08
17	PRC	6+67.45	14.77′RT	36.93
18	PC	6+24.52	55.68′RT	37.37
19	PCC	6+72.68	30.95′RT	36.73
22	PCC	6+15.86	23.28′LT	37.10
23	PT	6+15.64	25.71′LT	37.34

STATE OF TEXAS
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125563
LICENSED
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06/08/2022 Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

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Gauge ENGINEERING
11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

ROUNDABOUT GEOMETRY LAYOUT
EAST ROUNDABOUT

SHEET 1 OF 2

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	116

Pen Table:ROUNDABOUT - Copy.txt
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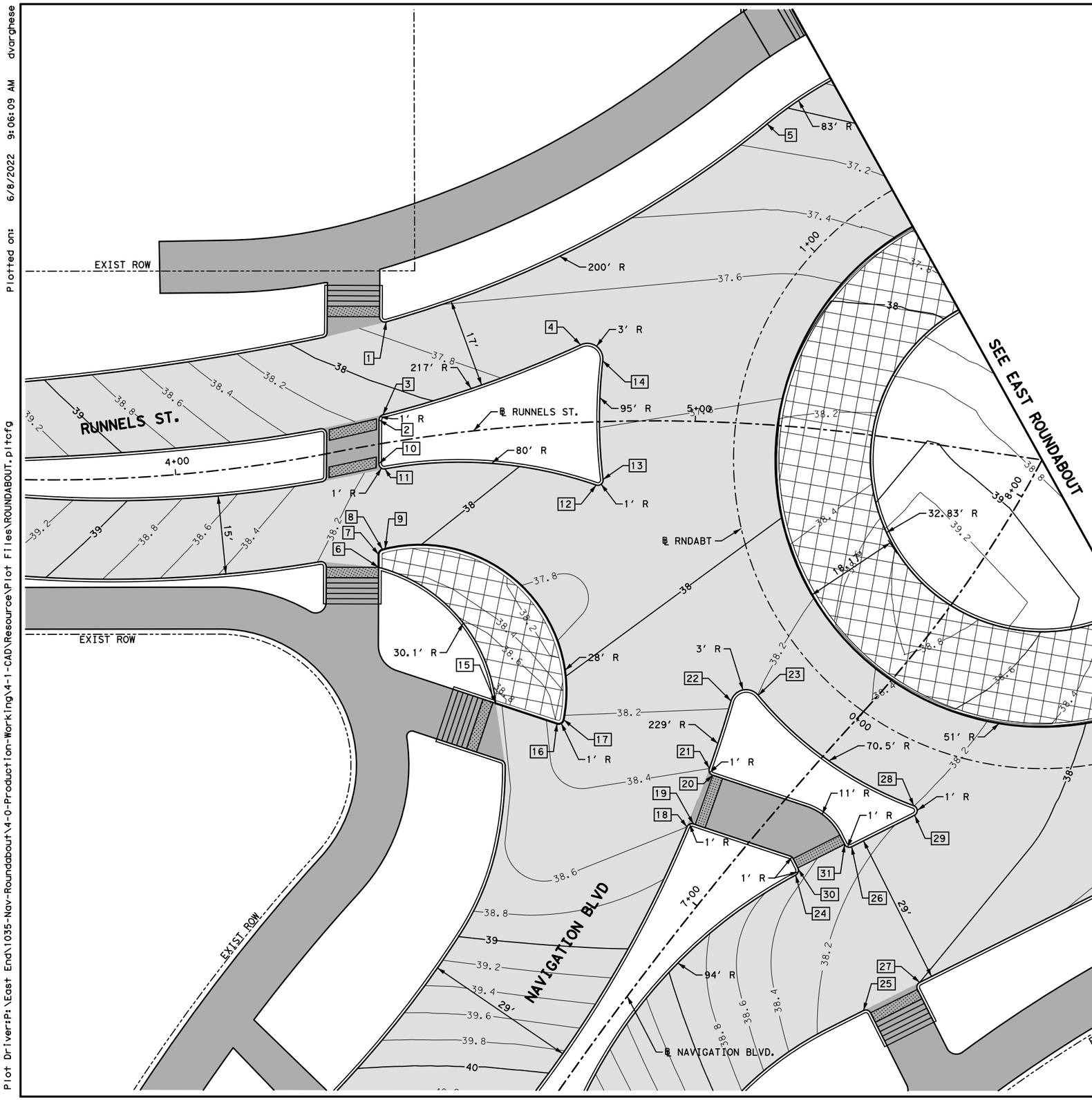

WEST ROUNDABOUT POINT TABLE ℄ RUNNELS ST.				
PNT	DESCRIP	STATION	OFFSET	ELEVATION
1	PCC	4+44.22	22.82'LT	37.74
2	PC	4+40.09	4.56'LT	38.21
3	PRC	4+40.98	5.38'LT	38.13
4	PRC	4+78.73	14.84'LT	37.72
5	PRC	5+10.43	57.37'LT	37.09
6	PI	4+34.98	23.20'RT	38.10
7	PC	4+35.45	20.80'RT	38.08
8	PT	4+36.42	19.99'RT	38.07
9	PC	4+36.99	19.99'RT	38.07
10	PC	4+38.65	3.70'RT	38.28
11	PRC	4+39.66	4.87'RT	38.17
12	PRC	4+80.63	12.07'RT	37.88
13	PRC	4+82.03	11.05'RT	37.88
14	PRC	4+82.68	11.61'LT	37.71
WEST ROUNDABOUT POINT TABLE ℄ NAVIGATION BLVD.				
15	PT	7+05.80	54.25'LT	38.60
16	PC	7+09.91	42.72'LT	38.32
17	PCC	7+11.24	42.20'LT	38.24
18	PRC	7+10.42	11.00'LT	38.60
19	PT	7+11.63	10.40'LT	38.59
20	PC	7+20.97	13.56'LT	38.42
21	PRC	7+21.53	14.87'LT	38.40
22	PRC	7+33.70	20.17'LT	38.19
23	PRC	7+37.84	17.00'LT	38.20
24	PRC	7+16.63	10.87'RT	38.47
25	PC	7+04.45	37.35'RT	38.11
26	PT	7+27.88	15.50'RT	38.30
27	PT	7+16.09	42.21'RT	38.00
28	PRC	7+41.97	19.21'RT	38.20
29	PT	7+27.88	20.51'RT	38.19
30	PT	7+17.82	10.54'RT	38.46
31	PT	7+27.33	14.20'RT	38.32

LEGEND

- PROPOSED CURB
- EXISTING ROW
- —XX.X— MINOR CONTOURS
- —XX— MAJOR CONTOURS

NOTES:

1. CONTOURS WITHIN ROUNDABOUT AND CONNECTIONS TO APPROACH LEGS SUPERCEDE THE PROFILES SHOWN ON THE ROADWAY PLAN AND PROFILE SHEETS.
2. DIMENSIONS ARE MEASURED TO FACE OF CURB UNLESS OTHERWISE NOTED.
3. SEE HORIZONTAL ALIGNMENT DATA SHEET FOR CURVE INFORMATION.
4. ALL STA/OFFSET CALLOUTS ARE FROM BL UNLESS OTHERWISE NOTED.

0' 20' 40'
(IN FEET)
SCALE: PLAN 1"=20'

STATE OF TEXAS
DAVID G. GREANEY
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LICENSED
PROFESSIONAL ENGINEER

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www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

Texas Department of Transportation

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

ROUNDABOUT GEOMETRY LAYOUT
WEST ROUNDABOUT

SHEET 2 OF 2

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	117

Plotted on: 6/8/2022 9:06:09 AM dvarghese
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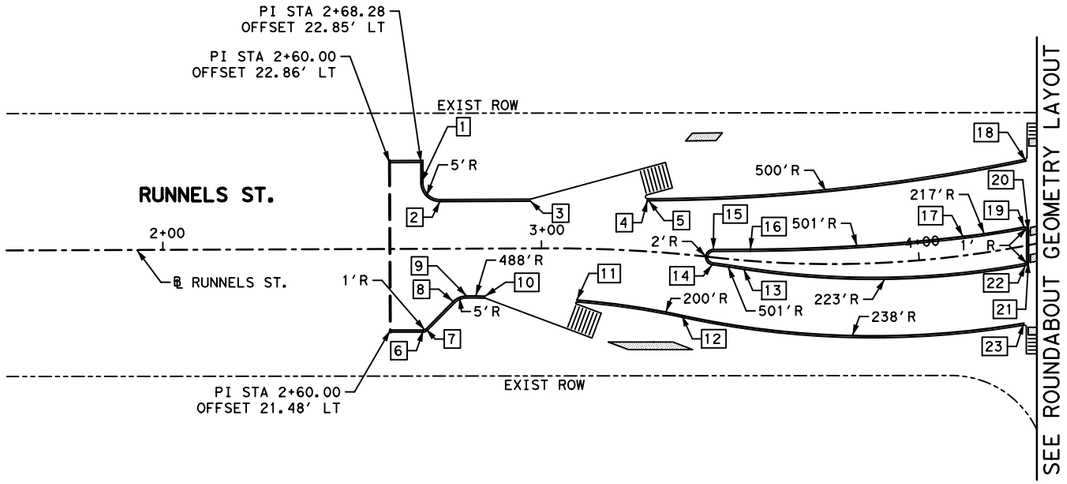
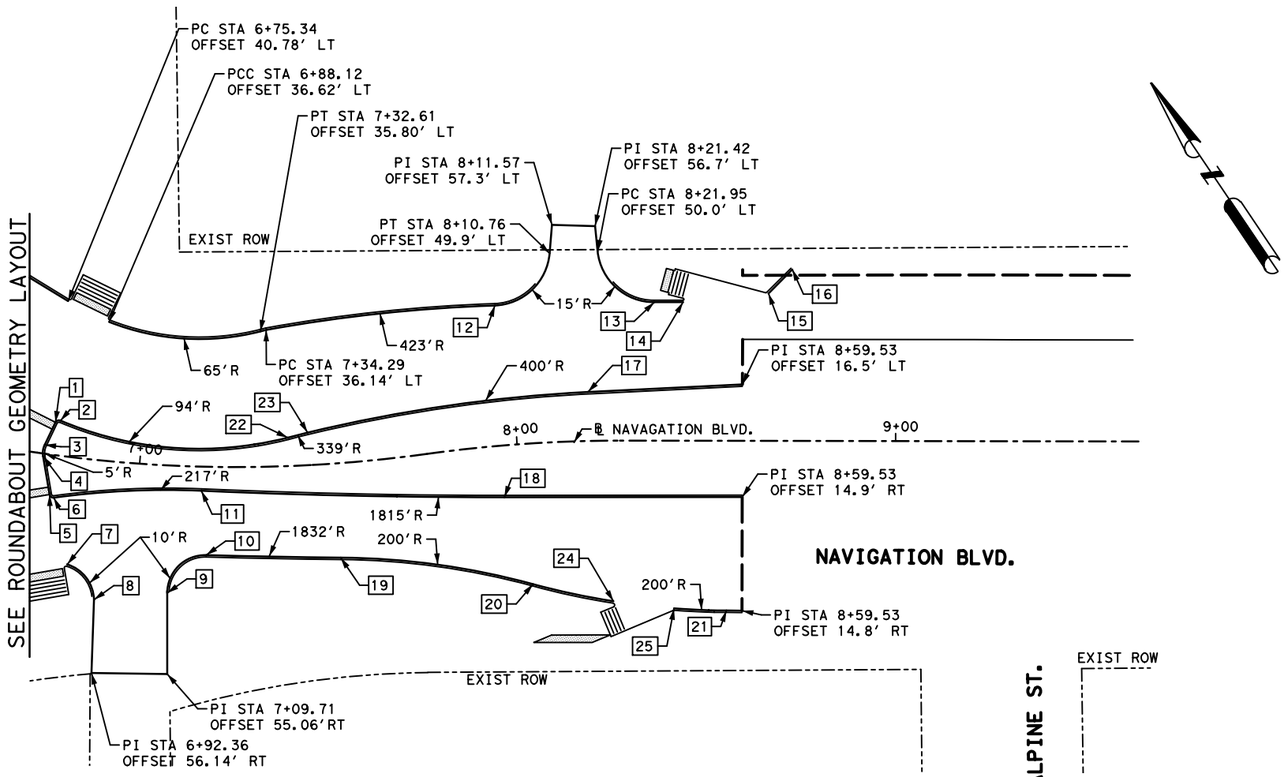


HORIZONTAL GEOMETRY DATA			
PNT	DESCRIP	STATION	OFFSET
1	PC	2+68.27	17.51'LT
2	PT	2+73.27	12.50'LT
3	PC	2+97.11	12.50'LT
4	PT	3+27.12	13.40'LT
5	PC	3+27.46	13.43'LT
6	PC	2+68.73	21.51'RT
7	PT	2+69.44	21.22'RT
8	PC	2+76.66	14.00'RT
9	PCC	2+80.25	12.53'RT
10	PC	2+85.03	12.61'RT
11	PCC	3+09.61	13.66'RT
12	PRC	3+38.68	16.10'RT
13	PCC	3+53.77	2.30'RT
14	PCC	3+45.47	1.90'RT
15	PT	3+45.28	2.09'LT
16	PC	3+55.09	3.06'LT
17	PCC	4+12.29	5.00'LT
18	PCC	4+32.63	21.93'LT
19	PRC	4+28.87	4.91'LT
20	PT	4+29.87	3.71'LT
21	PT	4+28.29	4.27'RT
22	PCC	4+27.32	5.08'RT
23	PRC	4+24.36	20.07'RT



HORIZONTAL GEOMETRY DATA			
PNT	DESCRIP	STATION	OFFSET
1	PC	6+76.50	8.58'LT
2	PRC	6+77.75	9.23'LT
3	PT	6+74.43	2.33'LT
4	PT	6+74.42	0.73'RT
5	PC	6+77.47	10.51'RT
6	PRC	6+78.65	11.19'RT
7	PC	6+83.99	28.25'RT
8	PT	6+91.35	36.81'RT
9	PC	7+08.84	33.70'RT
10	PRC	7+18.06	23.36'RT
11	PRC	7+16.48	6.37'RT
12	PRC	7+97.13	37.02'LT
13	PT	8+36.22	36.57'LT
14	PC	8+43.80	36.61'LT
15	PT	8+66.35	38.93'RT
16	PI	8+72.67	45.26'LT
17	PT	8+19.01	12.90'LT
18	PT	7+95.46	13.66'RT
19	PRC	7+51.38	24.89'RT
20	PRC	8+01.67	37.12'RT
21	PT	8+55.37	44.84'RT
22	PRC	7+39.41	7.51'RT
23	PCC	7+44.85	8.58'RT
24	PRC	8+25.31	42.44'RT
25	PCC	7+41.58	44.29'RT

0' 40' 80'
(IN FEET)
SCALE: PLAN 1"=40'

STATE OF TEXAS
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125563
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www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

Texas Department of Transportation

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

HORIZONTAL GEOMETRY LAYOUT NAVIGATION BLVD & RUNNELS ST

SHEET 1 OF 2

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	118

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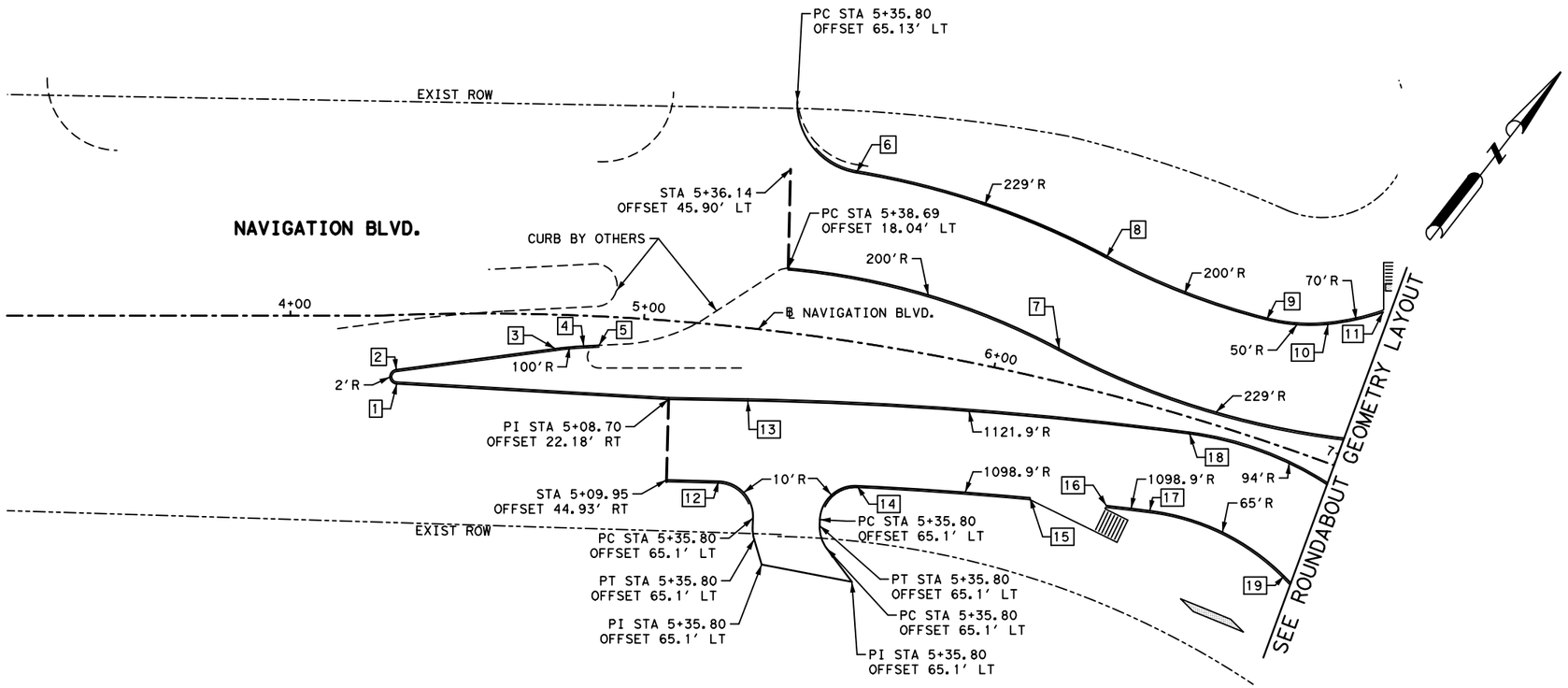

HORIZONTAL GEOMETRY DATA			
PNT	DESCRIP	STATION	OFFSET
1	PC	4+29.34	19.45'RT
2	PT	4+29.33	15.47'RT
3	PC	4+75.16	9.62'RT
4	PT	4+83.22	8.60'RT
5	PC	4+87.60	8.18'RT
6	PRC	5+53.56	47.38'LT
7	PRC	6+16.65	9.15'LT
8	PRC	6+23.34	37.32'LT
9	PCC	6+69.40	32.75'LT
10	PCC	6+85.47	37.00'LT
11	PCC	6+98.23	45.40'LT
12	PC	5+25.67	43.97'RT
13	PC	4+29.33	15.47'RT
14	PCC	5+67.08	40.04'RT
15	PCC	6+18.39	33.75'RT
16	PCC	6+40.89	30.52'RT
17	PCC	6+53.69	28.55'RT
18	PCC	6+58.35	4.50'RT
19	PT	6+97.44	34.29'RT
20	PRC	9+16.15	8.75'RT
21	PRC	9+27.25	5.47'RT
22	PC	9+42.63	32.16'RT
23	PRC	9+53.80	2.73'RT
24	PCC	9+78.80	3.29'RT
25	PT	9+87.70	4.33'LT
26	PT	9+82.81	32.99'LT
27	PRC	10+18.06	29.81'RT
28	PRC	10+62.88	31.69'RT
29	PCC	10+66.88	5.88'RT
30	PC	10+71.08	33.87'LT
31	PRC	10+79.55	33.18'LT

0' 40' 80'
(IN FEET)
SCALE: PLAN 1"=40'

STATE OF TEXAS
DAVID G. GREANEY
125563
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PROFESSIONAL ENGINEER
06/08/2022 Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

Gauge ENGINEERING
11750 Katy Freeway, Suite 400
Houston, TX 77079
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Texas PE Firm Reg. #F-20017

Texas Department of Transportation

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

HORIZONTAL GEOMETRY LAYOUT NAVIGATION BLVD & S JENSEN DR

SHEET 2 OF 2

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	119

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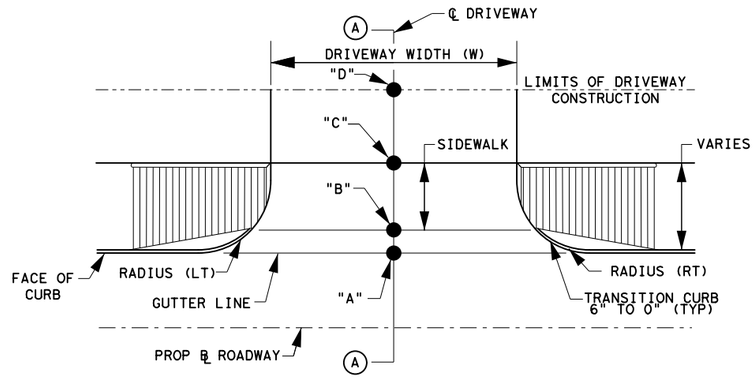
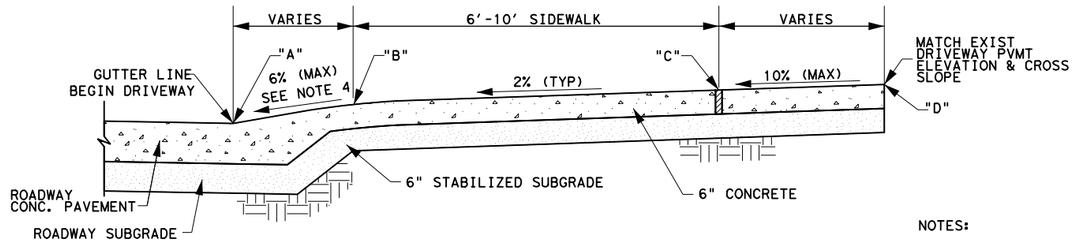
DRIVEWAY NO.	STREET	DRIVEWAY CL STATION	EXIST DRWY WIDTH	EXIST DRWY MATERIAL	PROP DRWY WIDTH (ft)	PROP DRWY MATERIAL	PROP RADIUS	OFFSET *				ELEVATION				Slope			DRIVEWAY CONCRETE	SIDEWALK WIDTH THRU DRIVEWAY	DRIVEWAY TYPE
								POINT "A"	POINT "B"	POINT "C"	POINT "D"	POINT "A"	POINT "B"	POINT "C"	POINT "D"	A-B	B-C	C-D			
1	NAVIGATION BLVD	5+46.45	18.9	CONCRETE	18.9	CONCRETE	10	42.19	48.45	56.10	66.33	41.77	42.14	42.29	42.85	6.0%	2.0%	5.4%	6" CONC	7.65' SIDEWALK	COMMERCIAL
2	NAVIGATION BLVD	6+99.56	20.0	CONCRETE	20.0	CONCRETE	10	25.53	44.77	54.76	55.48	36.41	37.28	37.48	37.50	4.5%	2.0%	3.5%	6" CONC	10' SIDEWALK	COMMERCIAL
3	NAVIGATION BLVD	8+16.1	12.6	CONCRETE	12.6	CONCRETE	15	36.32	41.91	49.50	57.01	35.78	36.12	36.27	36.42	6.0%	2.0%	2.0%	6" CONC	7.59' SIDEWALK	CHURCH
4	JENSEN DR	10+40.22	16.1	CONCRETE	16.1	CONCRETE	15	30.74	N/A	N/A	50.80	34.08			34.62	2.7%			6" CONC	N/A	CHURCH



TYPICAL DRIVEWAY LAYOUT
N.T.S



SECTION A
TYPICAL DRIVEWAY SECTION
N.T.S

NOTES:

1. REFER TO CONCRETE SIDEWALK & DRIVEWAY DETAILS FOR ADDITIONAL INFORMATION.
2. ELEVATION AT POINT "D" IS(+/-) AS SHOWN IN DRIVEWAY TABLE. MATCH EXISTING ELEVATION AT ROW.
3. REFER TO PLAN & PROFILE SHEETS FOR ADDITIONAL INFORMATION.
4. CHANGE IN GRADE IS 8% MAXIMUM.

STATE OF TEXAS
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DRIVEWAY TABULATION

SHEET 1 OF 1

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
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DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	120

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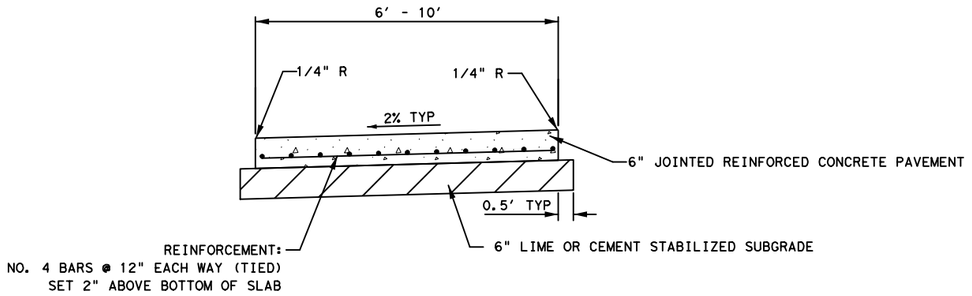
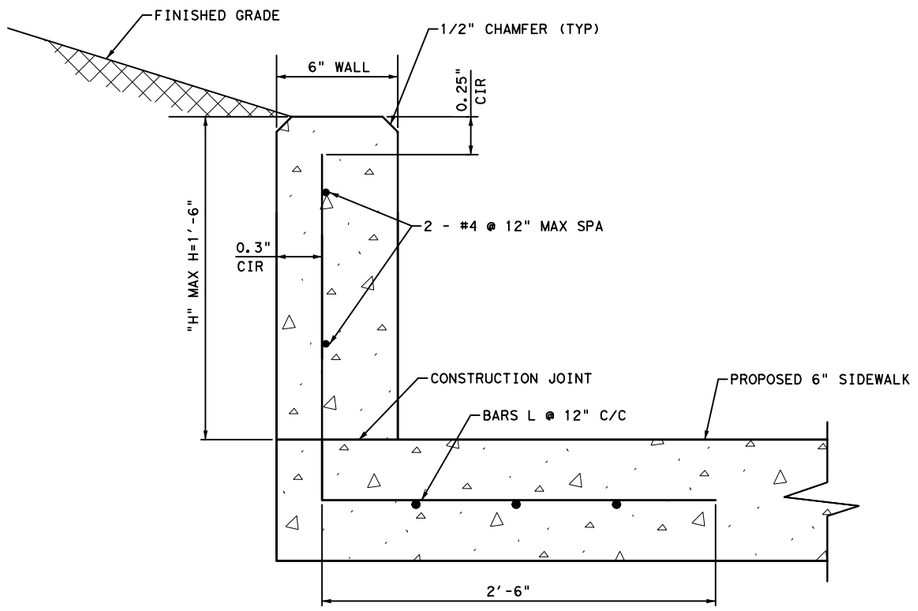


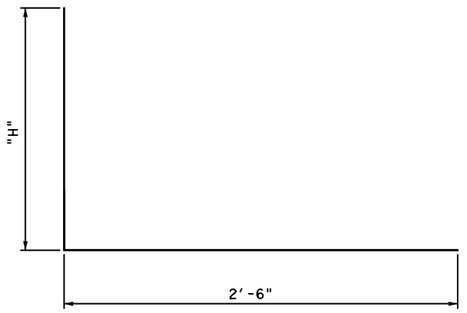
6" SIDEWALK/SHARED USE PATH DETAIL

N.T.S.



CONCRETE CURB WALL

N.T.S.



BAR L (#5)

N.T.S.

NOTE:

1. CONTRACTOR TO PROVIDE EXPANSION JOINTS IN RETAINING WALL AT 8' O.C. MAX SPACING SHALL BE DETERMINED BY WALL LENGTH TO achieve EQUAL SPACING RECEIVED 1/2" VERTICAL CHAMFERS, TYP.
2. PLACEMENT OF DIFFERENT WALL TYPES AND HEIGHTS ARE SPECIFIED IN THE ROADWAY PLAN SHEETS.
3. CONCRETE STRENGTH F C=4,000 PSI.
4. ALL STRUCTURAL STEEL SHALL BE GRADE 60.

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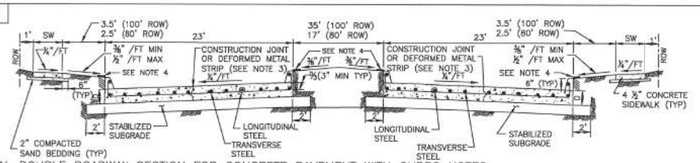
SIDEWALK AND CURB WALL DETAILS

SHEET 1 OF 1

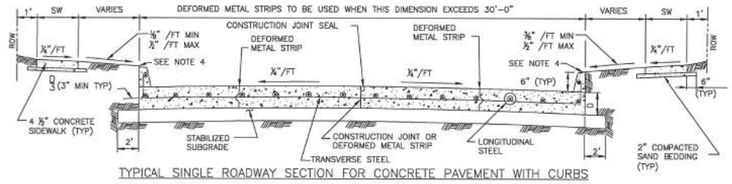
DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	121

02751-01



TYPICAL DOUBLE ROADWAY SECTION FOR CONCRETE PAVEMENT WITH CURBS NOTES:

1. THE MAXIMUM WIDTH BETWEEN LONGTUDINAL JOINTS SHALL NOT EXCEED 15'-0".
2. ALL EARTHEN AREAS ARE TO BE HYDROMULCHED UNLESS SHOWN OTHERWISE ON DRAWINGS.
3. CONTRACTOR MAY SAW CUT IN LIEU OF DEFORMED METAL STRIP.
4. USE STRIP OF SOD GRASS TO PREVENT EROSION UNTIL STAND OF GRASS IS ESTABLISHED.
5. AN EQUAL OR LARGER AREA OF WELDED REINFORCEMENT BAR CONFORMING TO ASTM A497, MAY BE SUBSTITUTED FOR REBARS LISTED IN TABLE 1.
6. IF AVAILABLE ROW IS NOT SUFFICIENT TO ACCOMMODATE SIDEWALK WIDTH (SW) ACCORDING TO IDM REQUIREMENTS, ENGINEER SHALL OBTAIN A VARIANCE FROM THE CITY ENGINEER.



TYPICAL SINGLE ROADWAY SECTION FOR CONCRETE PAVEMENT WITH CURBS

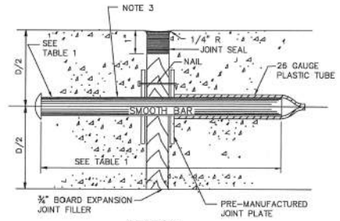
TABLE 1
REINFORCING STEEL BAR SIZES AND SPACINGS FOR VARIOUS PAVEMENT THICKNESSES (D) WITH:
MAXIMUM TRANSVERSE CONTROL JOINT SPACING = 20'-0"
MAXIMUM EXPANSION JOINT SPACING = 80'-0"
f_c' = 4,000 PSI/28 DAYS AND FY = 60,000 PSI

PAVEMENT THICKNESS D (IN)	PAVEMENT WIDTH (FT)	LONGITUDINAL STEEL # 4 BARS NUMBER OF BARS	# 4 BARS SPACING (IN)	# 4 BARS END BAR SPACING (IN)	# 5 BARS NUMBER OF BARS	# 5 BARS SPACING (IN)	# 5 BARS END BAR SPACING (IN)	# 6 BARS NUMBER OF BARS	# 6 BARS SPACING (IN)	# 6 BARS END BAR SPACING (IN)	TRANSVERSE STEEL # 4 BARS SPACING (IN)	# 5 BARS SPACING (IN)	# 6 BARS SPACING (IN)
6	28	17	20.50	4	–	–	–	–	–	–	36	–	–
7	25	17	18.25	4	–	–	–	–	–	–	36	–	–
7	35	24	18.00	3	–	–	–	–	–	–	36	–	–
7	36	25	17.75	3	–	–	–	–	–	–	36	–	–
7	37	25	18.25	3	–	–	–	–	–	–	36	–	–
7	41	28	18.00	3	–	–	–	–	–	–	36	–	–
7	45	31	17.75	3.75	–	–	–	–	–	–	36	–	–
8	25	20	15.50	2.75	13	24.50	3	–	–	–	36	36	–
8	34	27	15.50	2.50	17	25.00	4	–	–	–	36	36	–
8	35	27	16.00	2	18	24.25	4	–	–	–	36	36	–
8	36	28	15.75	3.25	18	25.00	3	–	–	–	30	36	–
8	44	24	15.75	4	22	24.75	4	–	–	–	30	36	–
8	45	35	15.75	2.25	23	24.25	3	–	–	–	30	36	–
9	25	22	14.00	3	14	22.50	4	–	–	–	36	36	–
9	34	31	13.50	2	19	22.25	3.50	–	–	–	30	36	–
9	35	31	13.75	3.75	20	21.75	3.50	–	–	–	30	36	–
9	36	32	13.75	3	21	21.25	3.50	–	–	–	30	36	–
9	44	39	13.75	2.75	25	21.75	3	–	–	–	24	36	–
9	45	39	14.00	4	26	21.25	4.50	–	–	–	24	36	–
10	25	24	12.75	3.5	17	18.25	4	–	–	–	36	36	36
10	34	33	12.50	4	21	20.00	4	–	–	–	30	36	36
10	35	34	12.50	3.75	23	18.75	4	–	–	–	30	36	36
10	36	35	12.50	3.5	24	18.50	3	–	–	–	30	36	36
10	44	44	12.00	4	29	18.50	4.50	–	–	–	24	36	36
10	45	44	12.50	3	29	19.00	3	–	–	–	24	36	36
11	25	27	11.25	3	17	18.25	4	12	26.75	3	36	36	36
11	34	36	11.50	2.75	24	17.50	2.5	17	25.00	4	24	36	36
11	35	37	11.50	3	24	18.00	3	17	25.75	4	24	36	36
11	36	40	11.00	2	25	17.75	3	17	26.50	4	24	36	36
11	44	48	11.125	2.5	30	18.00	3	21	26.00	4	24	36	36
11	45	49	11.125	3	31	17.75	4	22	25.50	3	24	36	36
12	25	–	–	–	19	16.25	4	13	24.50	3	36	36	36
12	34	–	–	–	26	16.00	4	18	23.50	4	24	36	36
12	35	–	–	–	26	16.50	4	19	23.00	3	24	36	36
12	36	–	–	–	27	16.25	4.5	20	22.25	4.5	24	36	36
12	44	–	–	–	33	16.25	4	24	22.50	5	24	30	36
12	45	–	–	–	35	15.75	3	25	22.25	3	24	30	36

MINIMUM LAP LENGTH (L):
A. # 4 BARS ; L = 22 INCHES
B. # 5 BARS ; L = 27 INCHES
C. # 6 BARS ; L = 32 INCHES

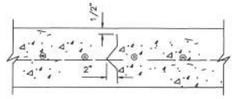
CONCRETE PAVEMENT DETAILS
NTS

02752-01

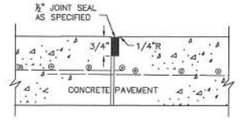


SECTION
DOWEL TYPE EXPANSION JOINT
N.T.S.

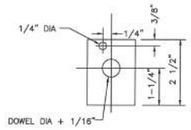
PLAN – JOINT PLATE



SECTION
DEFORMED METAL STRIP
N.T.S.



SECTION
CONSTRUCTION JOINT SEAL
N.T.S.



ELEVATION – JOINT PLATE
N.T.S.

NOTES:
1. STEEL TO MEET ASTM STANDARD SPECIFICATIONS FOR CONCRETE REINFORCING BARS. UNITS TO BE SPACED ON 12" CENTRS.
2. EXPANSION JOINT TO BE PLACED AT THE END OF EACH CURB RADIUS.
3. CENTER DOWEL HORIZONTALLY ON JOINT.
4. CENTER DOWEL VERTICALLY IN CONCRETE BASE. EXTEND THICKENED CONCRETE AS NEEDED TO MAINTAIN 3" MIN COVER.
5. CITY OF HOUSTON APPROVED PRODUCTS MAY BE USED AS JOINT PLATE ALTERNATIVE.

TABLE 1

PAVEMENT THICKNESS (IN)	DOWEL SIZES AND SPACINGS DIAMETER (IN)	LENGTH (IN)	SPACING (IN)
6	3/4	18	12
7	1	18	12
8	1	18	12
9	1 1/4	18	12
10	1 1/4	18	12
11	1 1/4	18	12
12	1 1/4	18	12

PAVEMENT EXPANSION AND CONSTRUCTION JOINT DETAILS
NTS

CITY OF HOUSTON
HOUSTON PUBLIC WORKS

STREET PAVING AND SIDEWALK
02751-01 THROUGH 02752-01

APPROVED BY: _____ CITY ENGINEER
APPROVED BY: _____ DEPUTY DIRECTOR
APPROVED BY: _____ DIRECTOR OF HOUSTON PUBLIC WORKS
EFFECTIVE DATE: JUL-01-2020
FOR CITY OF HOUSTON USE ONLY

SHEET NO.

STATE OF TEXAS
DAVID G. GREANEY
125563
LICENSED
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& RUNNELS ST.

STREET PAVING AND SIDEWALK
STANDARDS

SHEET 1 OF 5

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
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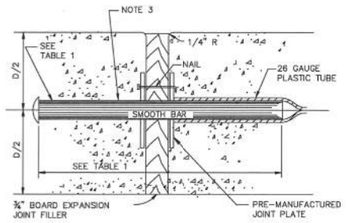
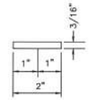
CHK DWG: DG	HOU	HARRIS	0912	72	386	122

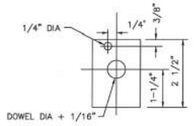
02752-02



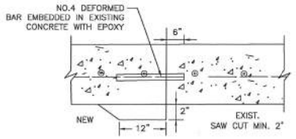
SECTION
DOWEL TYPE EXPANSION JOINT
N.T.S



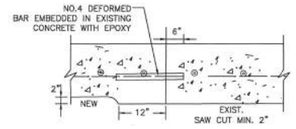
PLAN – JOINT PLATE
N.T.S.



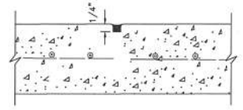
ELEVATION – JOINT PLATE
N.T.S.



SECTION
SIDEWALK TO EXISTING SIDEWALK
N.T.S



SECTION
SIDEWALK TO EXISTING DRIVEWAY
N.T.S.



SECTION
CONTROL JOINT
N.T.S.

NOTES:

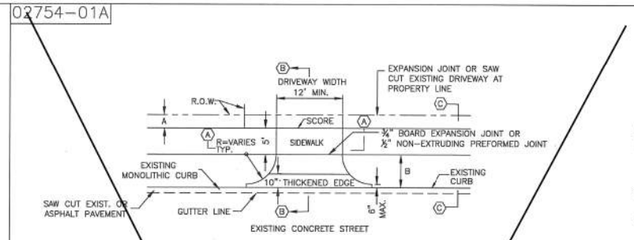
1. STEEL TO MEET ASTM STANDARD SPECIFICATIONS FOR CONCRETE REINFORCING BARS.
2. EXPANSION JOINT TO BE PLACED AT THE END OF EACH CURB RADIUS AND SPACED AT A MAXIMUM DISTANCE OF 3 FEET MAXIMUM SPACING FOR CONTROL JOINTS SHALL BE 5 FEET.
3. CENTER DOWEL HORIZONTALLY ON JOINT.
4. CENTER DOWEL VERTICALLY IN CONCRETE AS NEEDED TO MAINTAIN A 2 INCH MINIMUM COVER.

TABLE 1

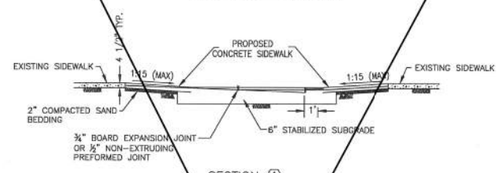
PAVEMENT THICKNESS (IN)	DOWEL SIZES AND SPACINGS		
	DIAMETER (IN)	LENGTH (IN)	SPACING (IN)
4 1/2	1/2	18	12
5	1/2	18	12
6	3/4	18	12
7	1	18	12

SIDEWALK EXPANSION AND CONSTRUCTION JOINT DETAILS
NTS

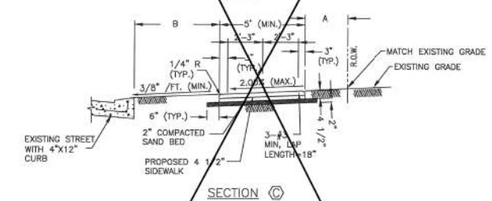
02754-01A



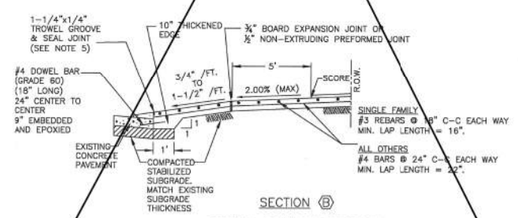
PLAN VIEW – DRIVEWAY



SECTION Ⓐ
PROPOSED SIDEWALK, THROUGH DRIVEWAY WITH EXCESSIVE GRADES
N.T.S.



SECTION Ⓒ
TYPICAL SIDEWALKS SECTION
N.T.S.



SECTION Ⓑ
TYPICAL DRIVEWAY SECTION
N.T.S.

DRIVEWAY / LOCAL RESIDENTIAL STREETS
NTS

NOTES:

1. IF AVAILABLE ROW IS NOT SUFFICIENT TO ACCOMMODATE SIDEWALK WIDTH (SW) ACCORDING TO IDM REQUIREMENT, ENGINEER SHALL OBTAIN A VARIANCE FROM THE CITY ENGINEER.
2. DRIVEWAYS SHALL BE 6" THICK FOR SINGLE FAMILY.
3. DRIVEWAYS AND SIDEWALKS SHALL BE CONSTRUCTED WITH PORTLAND CEMENT CONCRETE AND INCLUDE 5 1/2 SACKS OF CEMENT PER CUBIC YARD OF CONCRETE.
4. THE OUTER DOWEL BARS ARE TO BE LOCATED 12" FROM END OF PROPOSED EDGE OF DRIVEWAY RETURN. EXTEND DOWEL 3" INCHES INTO PROPOSED DRIVEWAY AND BEND REMAINING BAR TO EXTEND TO RADIUS RETURN BOTH SIDES.
5. TROWEL GROOVE SEALANT SHALL BE LOW MODULUS SILICONE OR POLYURETHANE SEALANT.
6. EXPANSION & CONSTRUCTION JOINTS ALONG SIDEWALK SHALL BE ACCORDING TO DRAWING No. 02752-02.
7. REFER CHAPTER 17 DESIGN REQUIREMENTS FOR A AND B.
8. CEMENT STABILIZED SAND 1.5 SACKS OF CEMENT PER TON OF DRY SAND.
9. ALL RAMPS AND SIDEWALKS/WALKWAYS SHALL BE CONSTRUCTED IN ACCORDANCE WITH AGENCY STANDARD DETAILS, TEXAS ACCESSIBILITY STANDARDS (TAS) AND AMERICANS WITH DISABILITIES ACT (ADA) REQUIREMENTS. IF THERE IS A CONFLICT IN THE REQUIREMENTS, THE STRICTEST REQUIREMENTS SHALL GOVERN.
10. CURB RAMPS THAT ARE STEEPER THAN A 1:15 MAX SLOPE WILL NOT BE ACCEPTED BY THE CITY OF HOUSTON

CITY OF HOUSTON
HOUSTON PUBLIC WORKS

STREET PAVING AND SIDEWALK
02752-02 THROUGH 02754-01A

APPROVED BY: _____ CITY ENGINEER
APPROVED BY: _____ DEPUTY DIRECTOR
APPROVED BY: _____ DIRECTOR OF HOUSTON PUBLIC WORKS
EFFECTIVE DATE: JUL-01-2020
FOR CITY OF HOUSTON USE ONLY

SHEET NO.

STATE OF TEXAS
DAVID G. GREANEY
125563
LICENSED
PROFESSIONAL ENGINEER

06/08/2022 Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

Gauge ENGINEERING
11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

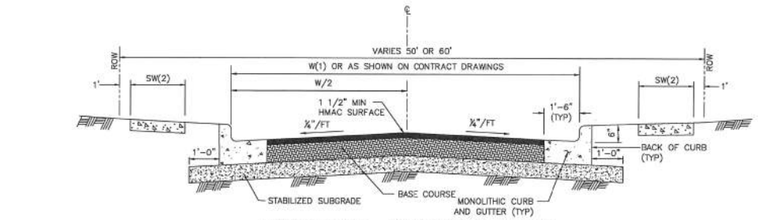
NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

STREET PAVING AND SIDEWALK STANDARDS

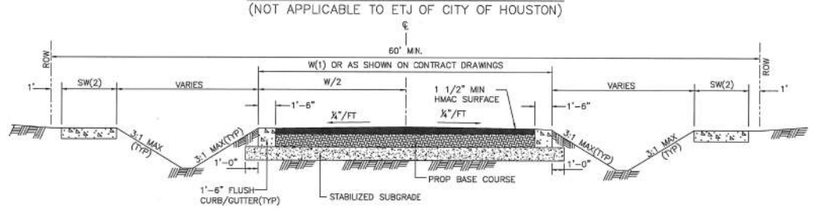
SHEET 2 OF 5

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	123

02741-01



HMAC PAVEMENT – CURB & GUTTER SECTION
(NOT APPLICABLE TO ETJ OF CITY OF HOUSTON)



HMAC PAVEMENT – DITCH SECTION
(NOT APPLICABLE TO ETJ OF CITY OF HOUSTON)

HOT-MIX ASPHALTIC CONCRETE PAVEMENT DETAILS
NTS

NOTES:
1. FOR TRAVEL WAY WIDTH (W) REFER TO IDM SECTION 10.3.03.A
2. FOR SIDEWALK (SW) DESIGN GUIDANCE REFER TO IDM SECTION 17.06: PEDESTRIAN DESIGN REQUIREMENTS.
3. BASE COURSE SHALL BE:
   ALTERNATES: A) 6" (MIN) HOT MIX ASPHALTIC CONCRETE.
   B) 8" (MIN) CRUSHED CONCRETE.

02741-04

PUBLIC USE ALLEY REMOVED
ANY PUBLIC USE ALLEY ROW SHOULD MEET CITY ROADWAY STANDARDS

CITY OF HOUSTON
HOUSTON PUBLIC WORKS

STREET PAVING AND SIDEWALK
02632-11 THROUGH 02741-04

APPROVED BY: CITY ENGINEER
APPROVED BY: DEPUTY DIRECTOR
APPROVED BY: DIRECTOR OF HOUSTON PUBLIC WORKS
EFFECTIVE DATE: JUL-01-2020
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Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR.
& RUNNELS ST.

STREET PAVING AND SIDEWALK
STANDARDS

SHEET 3 OF 5

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	124

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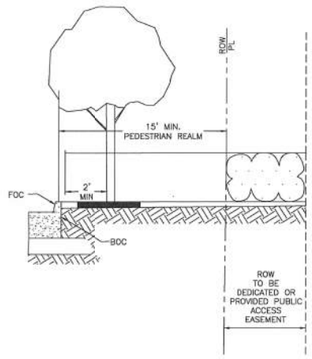
02775-08



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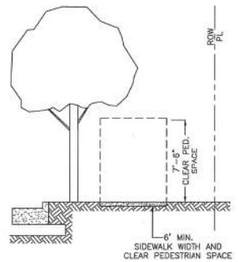

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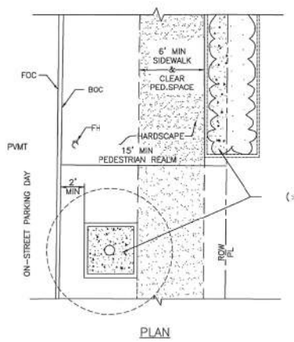
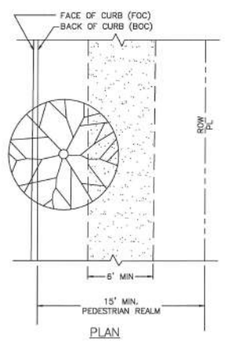


PLAN

PEDESTRIAN REALM PERFORMANCE STANDARD

SOFTSCAPE (~20% OF SURFACE AREA OF PEDESTRIAN REALM)



PLAN

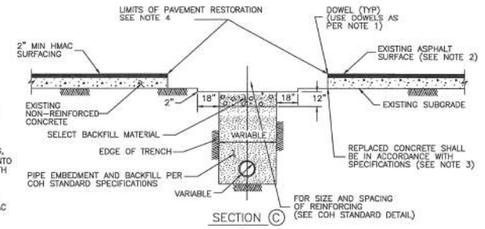
SIDEWALK & CLEAR PEDESTRIAN ZONE MANDATORY MINIMUM REQUIREMENT

NOTES
1. REFER TO CHAPTER 42 OF THE CODE OF ORDINANCES, ARTICLE IV – TRANSIT CORRIDOR DEVELOPMENT.

SIDEWALKS AND CLEAR ZONE TRANSIT CORRIDOR STREET
NTS

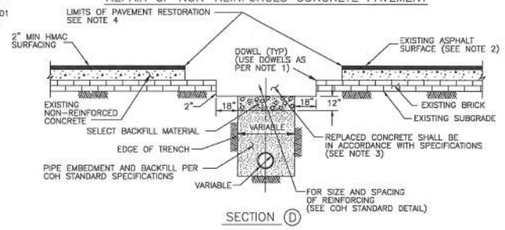
02902-02

NOTE:
1. EXPOSE 15" OF REINFORCING STEEL AT PROPOSED SAWED JOINT. IF NO REINFORCING STEEL EXISTS, USE HORIZONTAL DOWELS. HORIZONTAL DOWELS SHALL BE # 6 BARS, 24" LONG, 24" C-C, DRILLED AND EMBEDDED 8" INTO THE CENTER OF THE EXISTING SLAB. WITH "PO ROC" OR EQUAL.
2. IF REINFORCED CONCRETE IS OVERLAYED REPLACE WITH SAME THICKNESS OF HMAC SURFACING.
3. REFER TO STANDARD DETAIL 02751-01 FOR REINFORCING STEEL REQUIREMENT
4. REFER TO STANDARD DETAIL 02951-01 FOR PAVEMENT RESTORATION LIMITS.



SECTION (C)

REPAIR OF NON-REINFORCED CONCRETE PAVEMENT

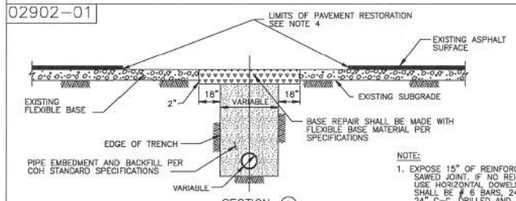


SECTION (D)

REPAIR OF NON-REINFORCED CONCRETE PAVEMENT WITH BRICK

PAVEMENT REPAIR DETAILS FOR STREET CUTS – NON REINFORCED CONCRETE AND BRICK PAVEMENT
NTS

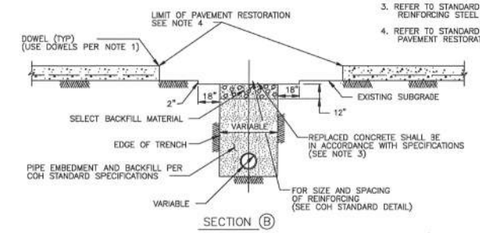
02902-01



SECTION (A)

REPAIR OF FLEXIBLE BASE PAVEMENT

NOTE:
1. EXPOSE 15" OF REINFORCING STEEL AT PROPOSED SAWED JOINT. IF NO REINFORCING STEEL EXISTS, USE HORIZONTAL DOWELS. HORIZONTAL DOWELS SHALL BE # 6 BARS, 24" LONG, 24" C-C, DRILLED AND EMBEDDED 8" INTO THE CENTER OF THE EXISTING SLAB. WITH "PO ROC" OR EQUAL.
2. IF REINFORCED CONCRETE IS OVERLAYED WITH ASPHALT, REPLACE WITH 2" MIN HMAC SURFACING.
3. REFER TO STANDARD DETAIL 02751-01 FOR REINFORCING STEEL REQUIREMENTS
4. REFER TO STANDARD DETAIL 02951-01 FOR PAVEMENT RESTORATION LIMITS.



SECTION (B)

REPAIR OF REINFORCED CONCRETE PAVEMENT

PAVEMENT REPAIR DETAILS FOR STREET CUTS
NTS

CITY OF HOUSTON
HOUSTON PUBLIC WORKS

STREET PAVING AND SIDEWALK
02775-08 THROUGH 02902-02

APPROVED BY:	APPROVED BY:
CITY ENGINEER	DEPUTY DIRECTOR
APPROVED BY:	
DIRECTOR OF HOUSTON PUBLIC WORKS	
EFFECTIVE DATE: JUL-01-2020	
FOR CITY OF HOUSTON USE ONLY	

SHEET NO.

STATE OF TEXAS
DAVID G. GREANEY
125563
LICENSED
PROFESSIONAL ENGINEER

06/08/2022 Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

Gauge ENGINEERING
11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

Texas Department of Transportation

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

STREET PAVING AND SIDEWALK STANDARDS

SHEET 4 OF 5

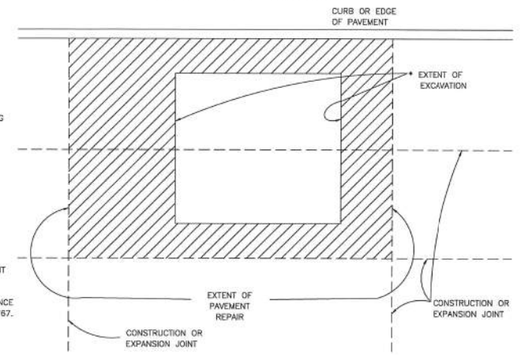
DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	125

02951-01

CONCRETE PAVEMENT RESTORATION
AGE OF PAVEMENT
LESS THAN OR EQUAL TO 5 YEARS

NOTES:

1. EXTENT OF PAVEMENT REPAIR SHALL BE PERPENDICULAR AND PARALLEL TO TRAVEL WAY.
2. REPLACE ENTIRE PANEL WIDTH AND LENGTH TO NEAREST CONSTRUCTION OR EXPANSION JOINT BEYOND EDGE OF EXCAVATION.
3. SAW CUT AND EXPOSE 15" OF REINFORCING STEEL WITHIN EXISTING PAVEMENT. PROVIDE HORIZONTAL DOWELS (PER SPECIFICATION SECTION 02902-01) IF EXISTING REINFORCING IS BROKEN OFF.
4. REPLACE CURB WHEN ADJACENT LANE IS REPLACED.
5. MAINTAIN EXPANSION JOINTS AT EXISTING LOCATIONS UNLESS OTHERWISE DIRECTED BY CITY ENGINEER.
6. SPECIALTY PAVEMENTS (IE: BRICK PAVERS) TO BE REPLACED WITH MATCHING PAVEMENT IN ALL CASES.
7. REPLACE PAVEMENT MARKINGS IN ACCORDANCE WITH CITY SPECIFICATIONS 02764 AND 02767.
8. (*) EXTENT OF EXCAVATION INCLUDES 18" OVERCUT AS SHOWN ON STANDARD DETAIL 02902-01.



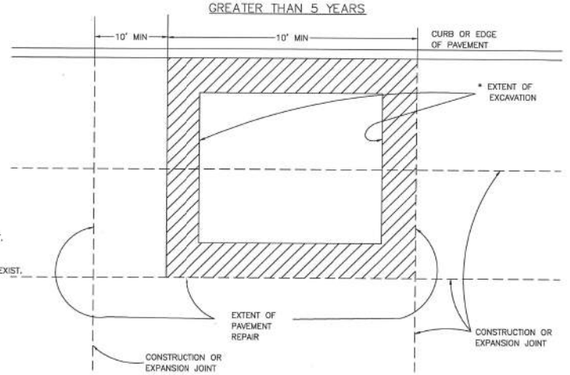
STREET CUT PAVEMENT REPLACEMENT – CONCRETE PAVEMENT LESS THAN 5 YEARS IN AGE
NTS

02951-02

CONCRETE PAVEMENT RESTORATION
AGE OF PAVEMENT
GREATER THAN 5 YEARS

NOTES:

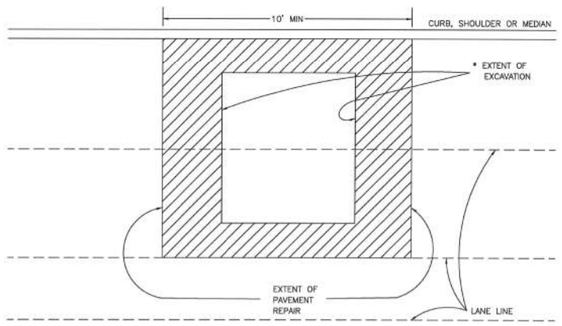
1. EXTENT OF PAVEMENT REPAIR SHALL BE PERPENDICULAR AND PARALLEL TO TRAVEL WAY.
2. WIDTH:
   REPLACE PANEL WIDTH TO NEAREST CONSTRUCTION OR EXPANSION JOINT BEYOND EDGE OF EXCAVATION.
3. LENGTH:
   a. MINIMUM LENGTH OF PAVEMENT REPAIR ALONG TRAVEL WAY IS 10' FROM THE NEAREST JOINT.
   b. IF EDGE OF EXCAVATION IS LESS THAN 10' FROM EXISTING CONSTRUCTION OR EXPANSION JOINT, REPLACE PAVEMENT TO EXISTING JOINT.
4. SAW CUT AND EXPOSE 15" OF REINFORCING STEEL AROUND EDGE OF PANEL REPLACEMENT. PROVIDE HORIZONTAL DOWELS (PER SPECIFICATION SECTION 02902-01) IF REINFORCING IS BROKEN OFF OR DOES NOT EXIST.
5. REPLACE CURB WHEN ADJACENT LANE IS REPLACED.
6. MAINTAIN EXPANSION JOINTS AT EXISTING LOCATIONS UNLESS OTHERWISE DIRECTED BY CITY ENGINEER.
7. SPECIALTY PAVEMENTS (IE: BRICK PAVERS) TO BE REPLACED WITH MATCHING PAVEMENT IN ALL CASES.
8. REPLACE PAVEMENT MARKINGS IN ACCORDANCE WITH CITY SPECIFICATIONS 02764 AND 02767
9. (*) EXTENT OF EXCAVATION INCLUDES 18" OVERCUT AS SHOWN ON STANDARD DETAIL 02902-01.



STREET CUT PAVEMENT REPLACEMENT – CONCRETE PAVEMENT OVER THAN 5 YEARS IN AGE
NTS

02951-03

ASPHALT PAVEMENT RESTORATION
PAVEMENT OF ALL AGES



NOTES:

1. EXTENT OF PAVEMENT REPAIR SHALL BE PERPENDICULAR AND PARALLEL TO TRAVEL WAY.
2. FLEXIBLE BASE:
   REPLACE BASE TO SAME THICKNESS PLUS TWO INCHES (2") FOR EXTENT OF EXCAVATION. USE APPROVED BASE MATERIAL TYPE.*
3. SURFACE COURSE:
   A. WIDTH:
      SURFACE MILL AND OVERLAY FULL WIDTH OF LANE(S) TO NEAREST LANE DIVIDER BEYOND EDGE OF EXCAVATION.
   B. LENGTH:
      MINIMUM LENGTH OF SURFACE MILL ALONG TRAVEL WAY IS 10'.
   C. REPLACE PAVEMENT MARKINGS IN ACCORDANCE WITH CITY SPECIFICATION 02764 & 02767.
4. (*) EXTENT OF EXCAVATION INCLUDES 18" OVERCUT AS SHOWN ON STANDARD DETAIL 02902-01.

ADDITIONAL REQUIREMENTS FOR ASPHALT OVERLAY ON CONCRETE PAVEMENT:

1. REPLACE CONCRETE FOR EXTENT OF EXCAVATION. REPLACE TO SAME THICKNESS PLUS TWO INCHES (2").
2. WIDTH:
   IF EXCAVATION EXTENDS MORE THAN HALF OF A LANE, REPLACE ENTIRE LANE OF CONCRETE. OTHERWISE USE STANDARD DETAIL 02902-01.
3. SAW CUT AND EXPOSE 15" OF REINFORCING STEEL AROUND EDGE OF CONCRETE REPLACEMENT. IF NO REINFORCING STEEL EXISTS, USE HORIZONTAL DOWELS PER SPECIFICATIONS SECTION 02902.
4. REPLACE CURB WHEN ADJACENT LANE IS REPLACED.
5. MAINTAIN CONCRETE EXPANSION JOINTS AT EXISTING LOCATIONS UNLESS OTHERWISE APPROVED BY CITY ENGINEER.

STREET CUT PAVEMENT REPLACEMENT – ASPHALT PAVEMENT FOR PAVEMENT OF ALL AGES
NTS

CITY OF HOUSTON
HOUSTON PUBLIC WORKS

STREET PAVING AND SIDEWALK
02951-01 THROUGH 02951-03

APPROVED BY:	APPROVED BY:
CITY ENGINEER	DEPUTY DIRECTOR
APPROVED BY:	
DIRECTOR OF HOUSTON PUBLIC WORKS	
EFFECTIVE DATE: JUL-01-2020	
FOR CITY OF HOUSTON USE ONLY	

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Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

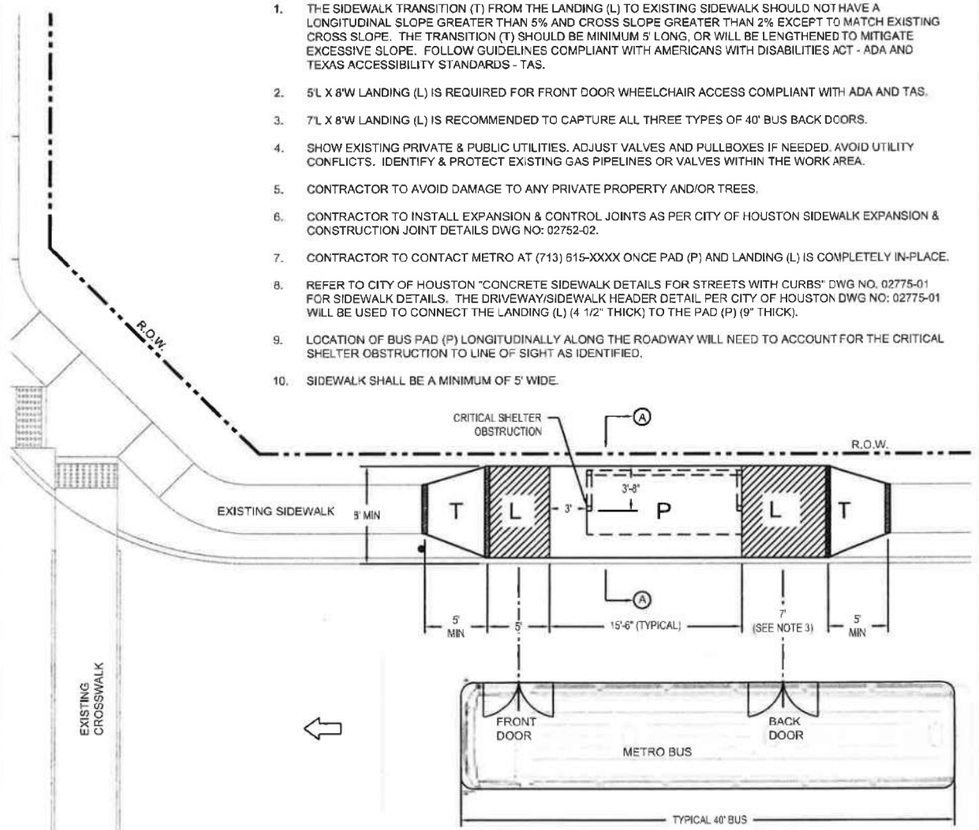
STREET PAVING AND SIDEWALK STANDARDS

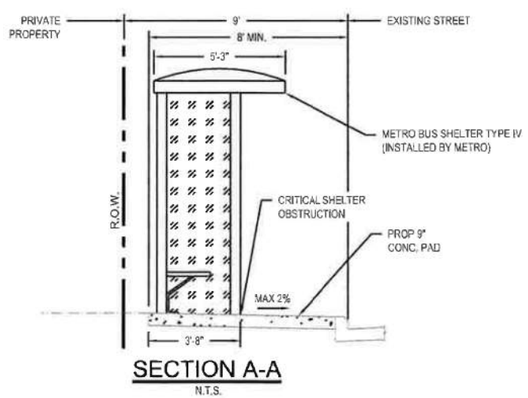
SHEET 5 OF 5

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	126

NOTES:

1. THE SIDEWALK TRANSITION (T) FROM THE LANDING (L) TO EXISTING SIDEWALK SHOULD NOT HAVE A LONGITUDINAL SLOPE GREATER THAN 5% AND CROSS SLOPE GREATER THAN 2% EXCEPT TO MATCH EXISTING CROSS SLOPE. THE TRANSITION (T) SHOULD BE MINIMUM 5' LONG, OR WILL BE LENGTHENED TO MITIGATE EXCESSIVE SLOPE. FOLLOW GUIDELINES COMPLIANT WITH AMERICANS WITH DISABILITIES ACT - ADA AND TEXAS ACCESSIBILITY STANDARDS - TAS.
2. 5'L X 8'W LANDING (L) IS REQUIRED FOR FRONT DOOR WHEELCHAIR ACCESS COMPLIANT WITH ADA AND TAS.
3. 7'L X 8'W LANDING (L) IS RECOMMENDED TO CAPTURE ALL THREE TYPES OF 40' BUS BACK DOORS.
4. SHOW EXISTING PRIVATE & PUBLIC UTILITIES. ADJUST VALVES AND PULLBOXES IF NEEDED. AVOID UTILITY CONFLICTS. IDENTIFY & PROTECT EXISTING GAS PIPELINES OR VALVES WITHIN THE WORK AREA.
5. CONTRACTOR TO AVOID DAMAGE TO ANY PRIVATE PROPERTY AND/OR TREES.
6. CONTRACTOR TO INSTALL EXPANSION & CONTROL JOINTS AS PER CITY OF HOUSTON SIDEWALK EXPANSION & CONSTRUCTION JOINT DETAILS DWG NO: 02752-02.
7. CONTRACTOR TO CONTACT METRO AT (713) 615-XXXX ONCE PAD (P) AND LANDING (L) IS COMPLETELY IN-PLACE.
8. REFER TO CITY OF HOUSTON "CONCRETE SIDEWALK DETAILS FOR STREETS WITH CURBS" DWG NO. 02775-01 FOR SIDEWALK DETAILS. THE DRIVEWAY/SIDEWALK HEADER DETAIL PER CITY OF HOUSTON DWG NO: 02775-01 WILL BE USED TO CONNECT THE LANDING (L) (4 1/2" THICK) TO THE PAD (P) (9" THICK).
9. LOCATION OF BUS PAD (P) LONGITUDINALLY ALONG THE ROADWAY WILL NEED TO ACCOUNT FOR THE CRITICAL SHELTER OBSTRUCTION TO LINE OF SIGHT AS IDENTIFIED.
10. SIDEWALK SHALL BE A MINIMUM OF 5' WIDE.





SECTION A-A
N.T.S.

LEGEND:

- P — 9" THICK BUS PAD (ALL SLOPES MAX 2%)
- L — 4 1/2" THICK BUS LANDING AREAS (ALL SLOPES MAX 2%)
- T — 4 1/2" THICK TRANSITION TO EXISTING SIDEWALK
- BUS STOP SIGN
- DIRECTION OF TRAFFIC
- EXPANSION JOINT

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

STANDARD BUS PAD AND LANDINGS

(NOT TO SCALE)

APPROVED BY:	APPROVED BY:
CITY ENGINEER	DIRECTOR OF PUBLIC WORKS AND ENGINEERING
EFF DATE: JAN-04-2017	DWG NO: 10.06-15

STATE OF TEXAS
DAVID G. GREANEY
125563
LICENSED
PROFESSIONAL ENGINEER

06/08/2022 Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

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Texas PE Firm Reg. #F-20017

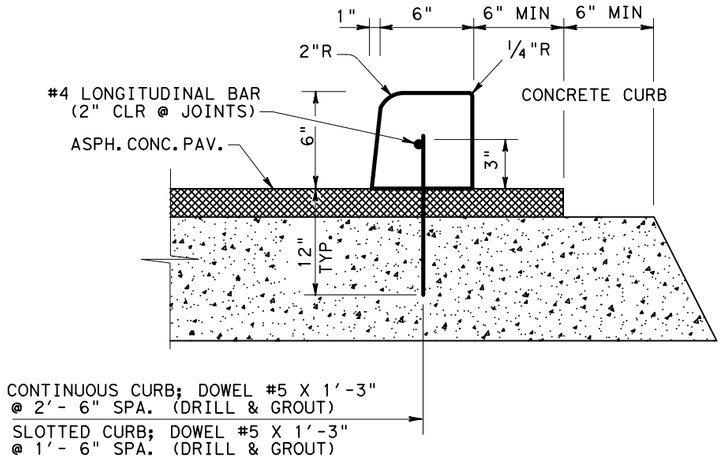
Texas Department of Transportation

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

STANDARD BUS PAD AND LANDINGS

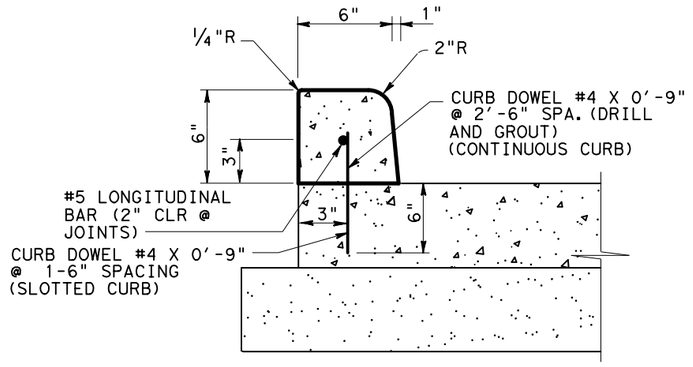
SHEET 1 OF 1

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	127



SHOWN ON EXISTING OR PROPOSED ACP PAVEMENT

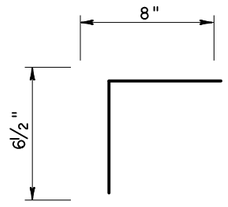
(PAY ITEM 529-6011) - FOR CONTINUOUS



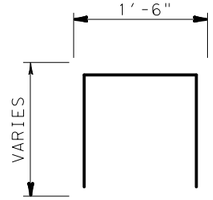
SHOWN ON EXISTING OR PROPOSED CONCRETE PAVEMENT

(PAY ITEM 529-6011) - FOR CONTINUOUS

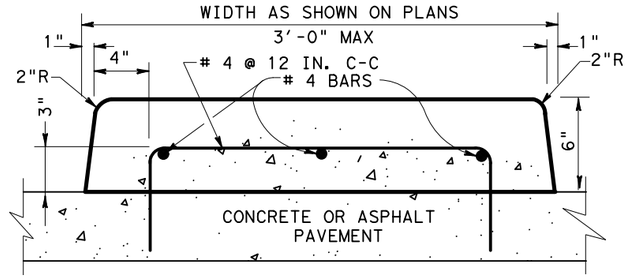
CONCRETE CURB (DOWEL) (6 IN.)



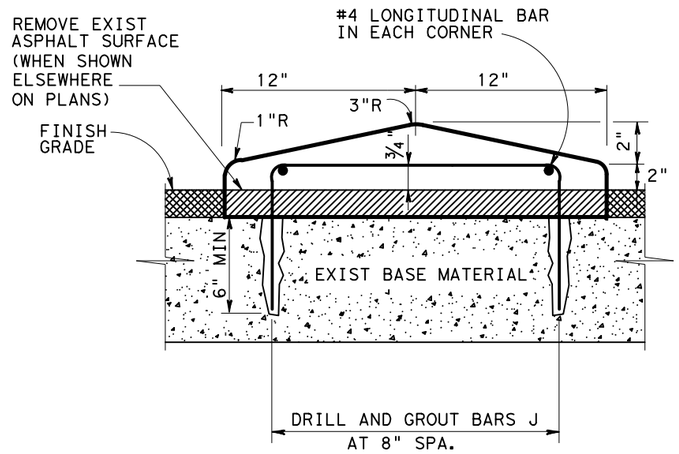
BAR K
#4



BAR J
#4

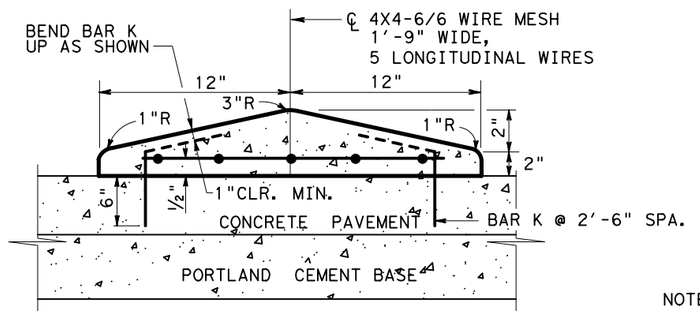


ITEM 536-6001 CONCRETE MEDIAN
SEE NOTE 2



SHOWN ON EXISTING ACP PAVEMENT

SEE NOTE 2 - ITEM 536-6003 CONC DIRECTIONAL ISLAND

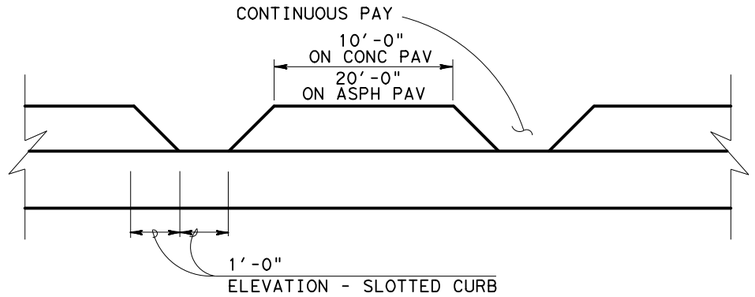


SHOWN ON EXISTING OR PROPOSED

CONCRETE PAVEMENT

SEE NOTE 2 - ITEM 536-6003 CONC DIRECTIONAL ISLAND

CONCRETE DIRECTIONAL ISLAND



ITEM 529-6012 CONCRETE CURB (SLOTTED) - ON CONC.

ITEM 529-6009 CONC CURB (DOWEL)(SLOTTED) - ON ASPH.

NOTES:

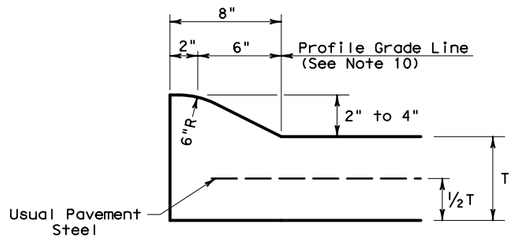
1. DRILL AND GROUT BARS SHOWN AS PER ITEM 420.4.7.10, 6" EMBEDMENT, MINIMUM ON CONC.
2. INSTALL A 2 INCH DRAINAGE OPENING AT 10 FT C-C WHEN CURB/ISLAND IS NOT ON TOP OF CROSS SECTION. (LOCATED ON A 2 OR 3 PERCENT TRANSVERSE GRADE, OR SUPERELEVATION.)

Texas Department of Transportation
Houston District

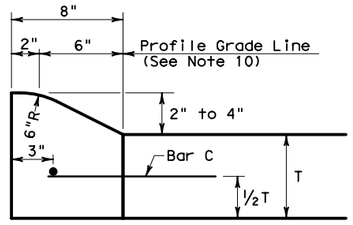
CONCRETE CURB AND DIRECTIONAL ISLAND DETAILS
CC & DID

FILE: STDB-9.dgn	DN:	CK:	DW:	CK:	
©TxDOT 2014	DIST	FED REG	PROJECT NO.		SHEET
REVISIONS	HOU	6	STP 1902 (308) MM		128
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	HARRIS		0912	72	386	CS

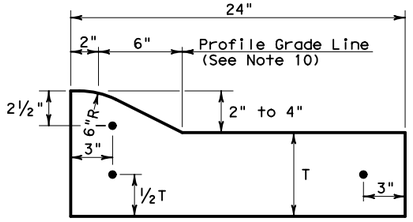
DATE:
FILE:



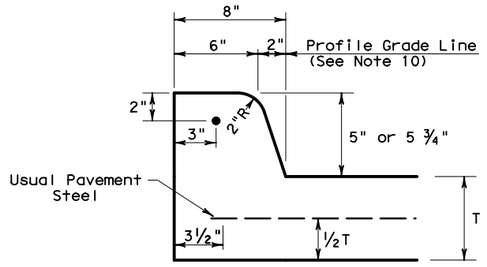
TYPE I CURB (MONOLITHIC)
2" - 4" HEIGHT



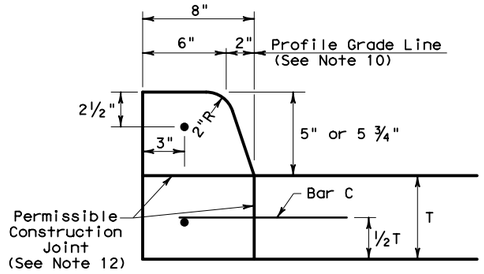
TYPE I CURB
2" - 4" HEIGHT



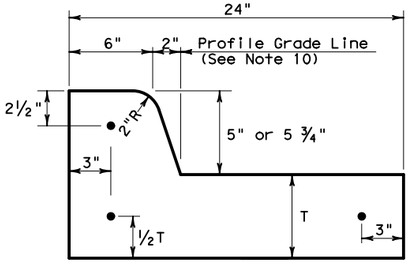
TYPE I CURB AND GUTTER
2" - 4" HEIGHT



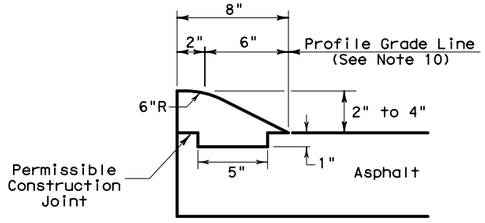
TYPE II CURB (MONOLITHIC)
5" - 5 ¾" HEIGHT



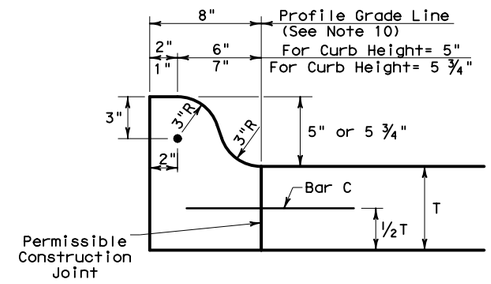
TYPE II CURB
5" - 5 ¾" HEIGHT



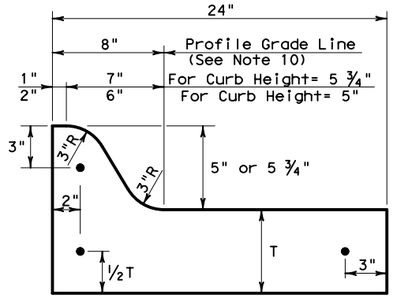
TYPE II CURB AND GUTTER
5" - 5 ¾" HEIGHT



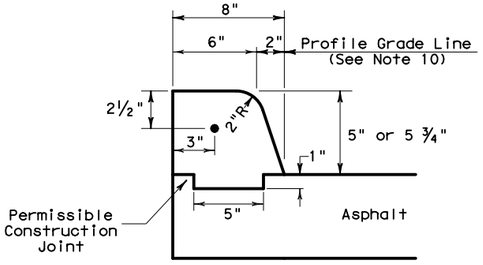
TYPE III CURB (KEYED)
2" - 4" HEIGHT



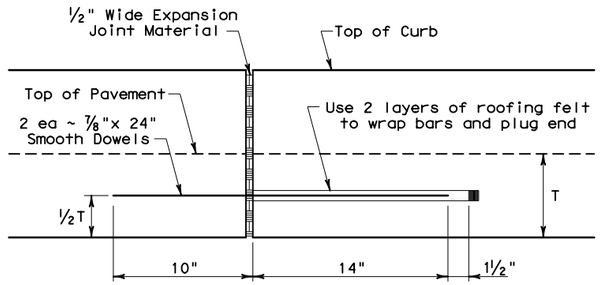
TYPE IIa CURB
5" - 5 ¾" HEIGHT



TYPE IIa CURB AND GUTTER
5" - 5 ¾" HEIGHT

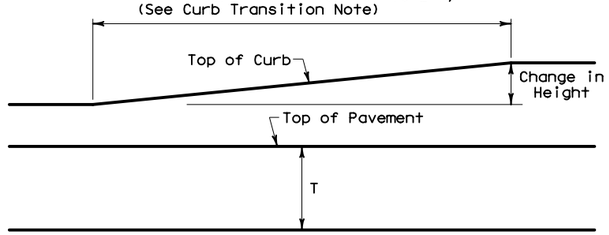


TYPE IV CURB (KEYED)
5" - 5 ¾" HEIGHT



EXPANSION JOINT DETAIL

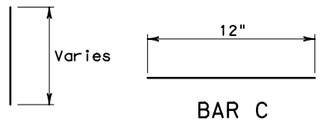
CURB TRANSITION NOTE:
Field conditions may require a longer or shorter transition, and shall be shown elsewhere in the plans, or as directed by the Engineer.



CURB TRANSITION
Note: To be paid for as Highest Curb

GENERAL NOTES

1. All materials and construction shall be in accordance with Item 529, "Concrete Curb, Gutter, and Combined Curb and Gutter."
2. Concrete shall be Class A.
3. When reinforcing bars are used, they shall be No. 4 unless otherwise shown. The use of fiber reinforced concrete in lieu of reinforcing steel is acceptable. Use fibers meeting the requirements of DMS 4550, "Fibers for Concrete," and dose fibers in accordance with Material Producers List (MPL) "Fibers for Class A and B Concrete Applications."
4. Round exposed sharp edges with a rounding tool, to a minimum radius of ¼ inch.
5. All existing curbs and driveways to be removed shall be sawed or removed at existing joints.
6. Where concrete curb is to be placed on existing concrete pavement, Bar B may be drilled and 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.



BAR B

BAR C

Texas Department of Transportation

Design Division Standard

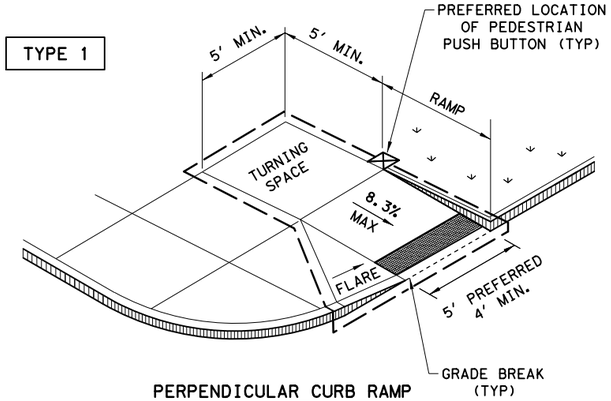
CONCRETE CURB AND CURB AND GUTTER

CCCG-21

FILE: cccg21.dgn	DN: TXDOT	CK: AN	DW: SS	CK: KM
©TxDOT: FEBRUARY 2021	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	72	386	CS
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		129

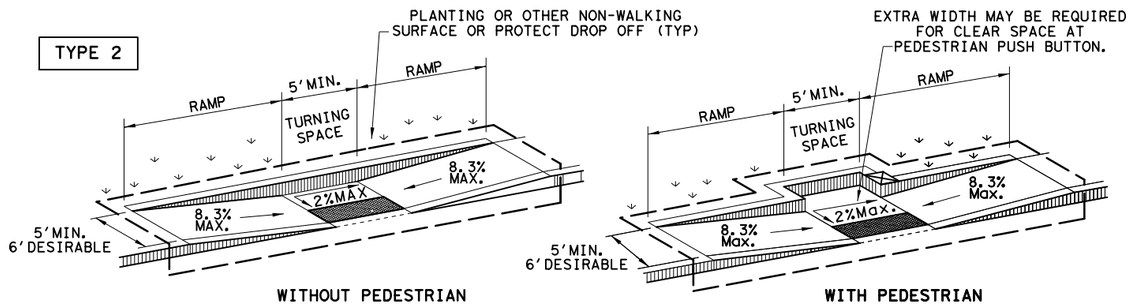
DATE:
FILE:

TYPE 1



PERPENDICULAR CURB RAMP

TYPE 2

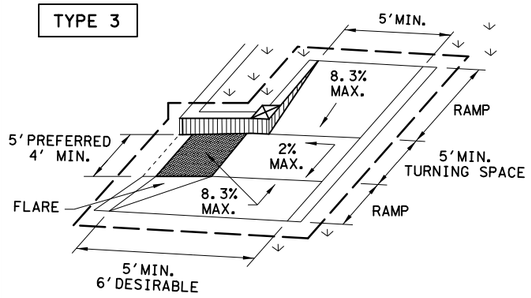


WITHOUT PEDESTRIAN PUSH BUTTON

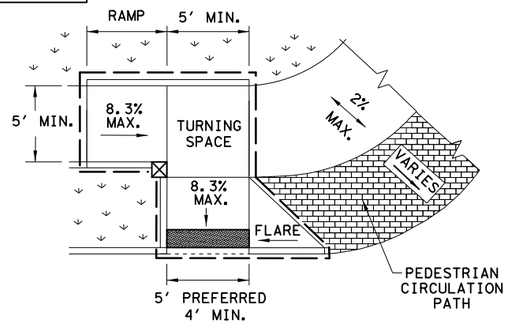
WITH PEDESTRIAN PUSH BUTTON

PARALLEL CURB RAMP

TYPE 3

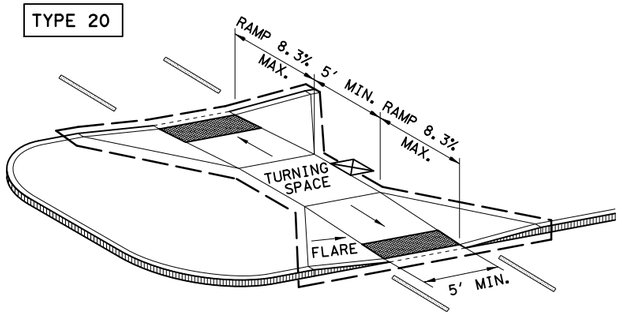


TYPE 6



COMBINATION CURB RAMPS

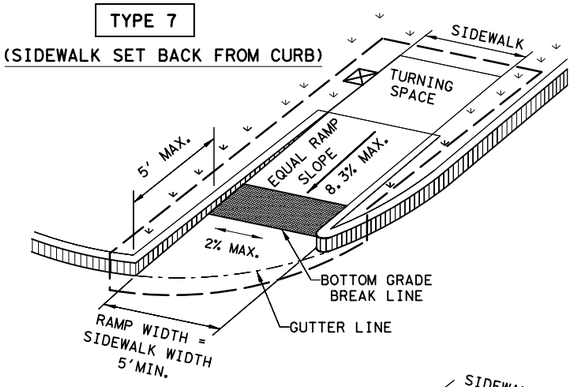
TYPE 20



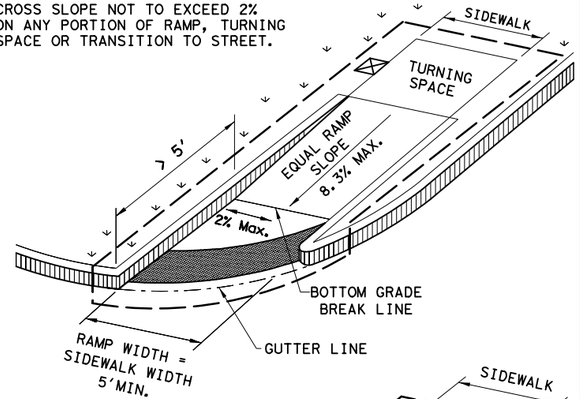
CURB RAMPS AT MEDIAN ISLANDS

TYPE 7

(SIDEWALK SET BACK FROM CURB)

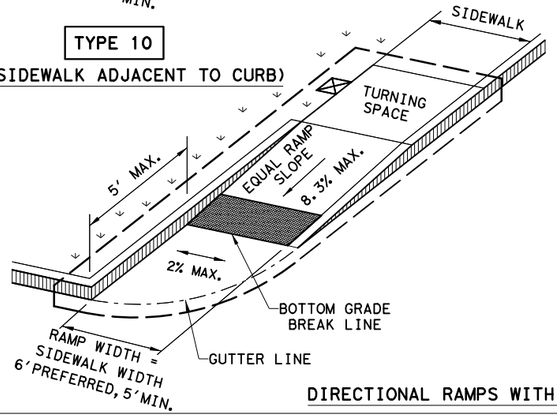


CROSS SLOPE NOT TO EXCEED 2% ON ANY PORTION OF RAMP, TURNING SPACE OR TRANSITION TO STREET.

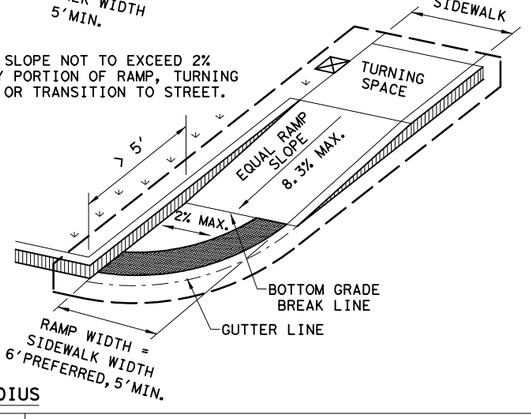


TYPE 10

(SIDEWALK ADJACENT TO CURB)

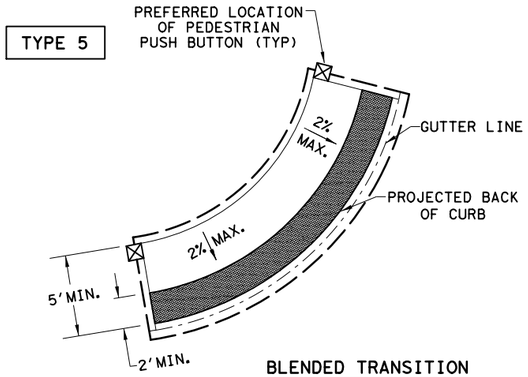


CROSS SLOPE NOT TO EXCEED 2% ON ANY PORTION OF RAMP, TURNING SPACE OR TRANSITION TO STREET.



DIRECTIONAL RAMPS WITHIN RADIUS

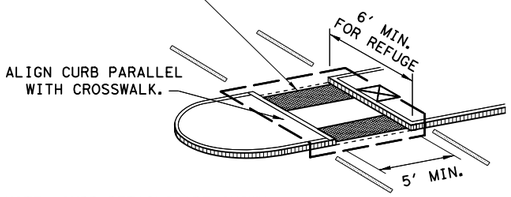
TYPE 5



BLENDED TRANSITION
(FLUSH LANDING)

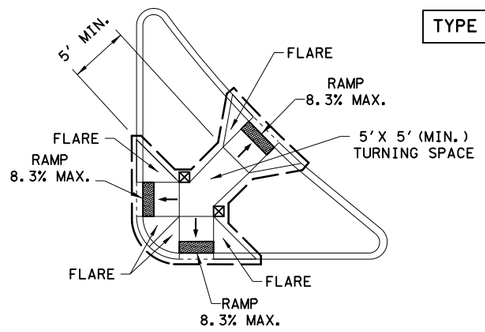
TYPE 21

INSTALL DETECTABLE WARNING SURFACE AT EACH END OF THE CUT-THROUGH RAMP WITH A MINIMUM 2' USUAL SIDEWALK SURFACE BETWEEN. IF MEDIAN IS LESS THAN 6' WIDE, ELIMINATE DETECTABLE WARNING SURFACES.



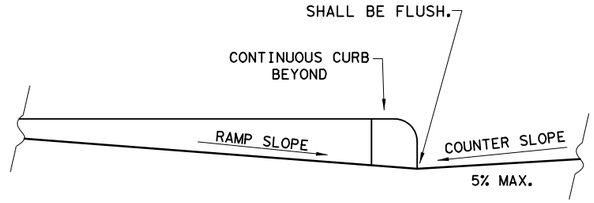
NOTE: CURB DETAILS ARE SHOWN ELSEWHERE IN THE PLANS.

TYPE 22



COMBINATION ISLAND RAMPS

BOTTOM GRADE BREAK OF CURB RAMP WILL NORMALLY BE AT GUTTER LINE. SURFACE SLOPES AT GRADE BREAKS SHALL BE FLUSH.



TYPICAL SECTION OF PERPENDICULAR CURB RAMP AT CONNECTION TO ROADWAY

NOTES / LEGEND:

SEE GENERAL NOTES ON SHEET 2 OF 4 FOR MORE INFORMATION.

DENOTES PLANTING OR NON-WALKING SURFACE NOT PART OF PEDESTRIAN CIRCULATION PATH.

DETECTABLE WARNING SURFACE

DENOTES PREFERRED LOCATION OF PEDESTRIAN PUSH BUTTON IF APPLICABLE.

GUTTER LINE

GRADE BREAK

RAMP LIMITS OF PAYMENT

Texas Department of Transportation

Design Division Standard

PEDESTRIAN FACILITIES CURB RAMPS

PED-18

FILE: ped18	DN: TxDOT	DW: VP	CK: KM	CK: PK & JG
© TxDOT: MARCH, 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	72	386	CS
REVISED 08,2005 REVISED 06,2012 REVISED 01,2018	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		130

DATE:
FILE:

GENERAL NOTES

CURB RAMPS

1. Install a curb ramp or blended transition at each pedestrian street crossing.
2. All slopes shown are maximum allowable. Cross slopes of 1.5% and lesser running should be used. Adjust curb ramp length or grade of approach sidewalks as directed.
3. Maximum allowable cross slope on sidewalk and curb ramp surfaces is 2%.
4. The minimum sidewalk width is 5′. Where the sidewalk is adjacent to the back of curb, a 6′ sidewalk width is desirable. Where a 5′ sidewalk cannot be provided due to site constraints, sidewalk width may be reduced to 4′ for short distances. 5′x 5′ passing areas at intervals not to exceed 200′ are required.
5. Turning Spaces shall be 5′x 5′ minimum. Cross slope shall be maximum 2%.
6. Clear space at the bottom of curb ramps shall be a minimum of 4′x 4′ wholly contained within the crosswalk and wholly outside the parallel vehicular travel path.
7. Provide flared sides where the pedestrian circulation path crosses the curb ramp. Flared sides shall be sloped at 10% maximum, measured parallel to the curb. Returned curbs may be used only where pedestrians would not normally walk across the ramp, either because the adjacent surface is planted, substantially obstructed, or otherwise protected.
8. Additional information on curb ramp location, design, light reflective value and texture may be found in the latest draft of the Proposed Guidelines for Pedestrian Facilities in the Public Right of Way (PROWAG) as published by the U.S. Architectural and Transportation Barriers Compliance Board (Access Board).
9. To serve as a pedestrian refuge area, the median should be a minimum of 6′ wide, measured from back of curbs. Medians should be designed to provide accessible passage over or through them.
10. Small channelization islands, which do not provide a minimum 5′x 5′ landing at the top of curb ramps, shall be cut through level with the surface of the street.
11. Crosswalk dimensions, crosswalk markings and stop bar locations shall be as shown elsewhere in the plans. At intersections where crosswalk markings are not required, curb ramps shall align with theoretical crosswalks unless otherwise directed.
12. Provide curb ramps to connect the pedestrian access route at each pedestrian street crossing. Handrails are not required on curb ramps.
13. Curb ramps and landings shall be constructed and paid for in accordance with Item 531 "Sidewalks".
14. Place concrete at a minimum depth of 5" for ramps, flares and landings, unless otherwise directed.
15. Furnish and install No. 3 reinforcing steel bars at 18" o.c. both ways, unless otherwise directed.
16. Provide a smooth transition where the curb ramps connect to the street.
17. Curbs shown on sheet 1 within the limits of payment are considered part of the curb ramp for payment, whether it is concrete curb, gutter, or combined curb and gutter.
18. Existing features that comply with applicaible standards may remain in place unless otherwise shown on the plans.

DETECTABLE WARNING MATERIAL

19. Curb ramps must contain a detectable warning surface that consists of raised truncated domes complying with PROWAG. The surface must contrast visually with adjoining surfaces, including side flares. Furnish and install an approved cast-in-place dark brown or dark red detectable warning surface material adjacent to uncolored concrete, unless specified elsewhere in the plans.
20. Detectable Warning Materials must meet TxDOT Departmental Materials Specification DMS 4350 and be listed on the Material Producer List. Install products in accordance with manufacturer's specifications.
21. Detectable warning surfaces must be firm, stable and slip resistant.
22. Detectable warning surfaces shall be a minimum of 24 inches in depth in the direction of pedestrian travel, and extend the full width of the curb ramp or landing where the pedestrian access route enters the street.
23. Detectable warning surfaces shall be located so that the edge nearest the curb line is at the back of curb and neither end of that edge is greater than 5 feet from the back of curb. Detectable warning surfaces may be curved along the corner radius.
24. Shaded areas on Sheet 1 of 4 indicate the approximate location for the detectable warning surface for each curb ramp type.

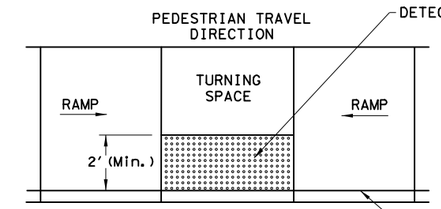
DETECTABLE WARNING PAVERS (IF USED)

25. Furnish detectable warning paver units meeting all requirements of ASTM C-936, C-33. Lay in a two by two unit basket weave pattern or as directed.
26. Lay full-size units first followed by closure units consisting of at least 25 percent (25%) of a full unit. Cut detectable warning paver units using a power saw.

SIDEWALKS

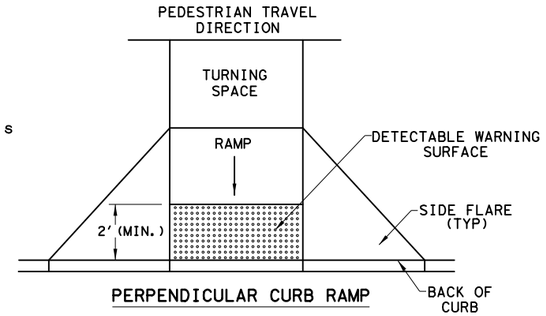
27. Provide clear ground space at operable parts, including pedestrian push buttons. Operable parts shall be placed within unobstructed reach range specified in PROWAG section R406.
28. Place traffic signal or illumination poles, ground boxes, controller boxes, signs, drainage facilities and other items so as not to obstruct the pedestrian access route or clear ground space.
29. Street grades and cross slopes shall be as shown elsewhere in the plans.
30. Changes in level greater than 1/4 inch are not permitted.
31. The least possible grade should be used to maximize accessibility. The running slope of sidewalks and crosswalks within the public right of way may follow the grade of the parallel roadway. Where a continuous grade greater than five percent (5%) must be provided, handrails may be desirable to improve accessibility. Handrails may also be needed to protect pedestrians from potentially hazardous conditions. If provided, handrails shall comply with PROWAG R409.
32. Handrail extensions shall not protrude into the usable landing area or into intersecting pedestrian routes.
33. Driveways and turnouts shall be constructed and paid for in accordance with Item "Intersections, Driveways and Turnouts". Sidewalks shall be constructed and paid for in accordance with Item, "Sidewalks".
34. Sidewalk details are shown elsewhere in the plans.

DETECTABLE WARNING SURFACE DETAILS



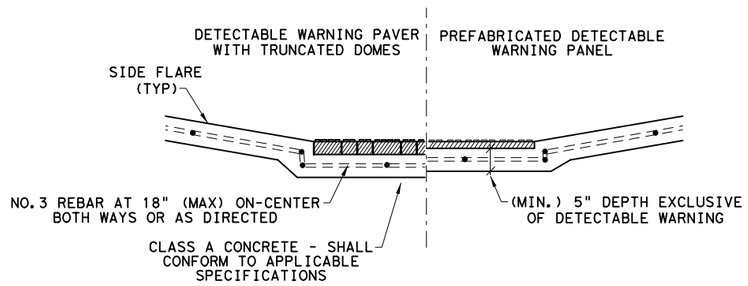
PARALLEL CURB RAMP

TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON LANDING AT STREET EDGE.

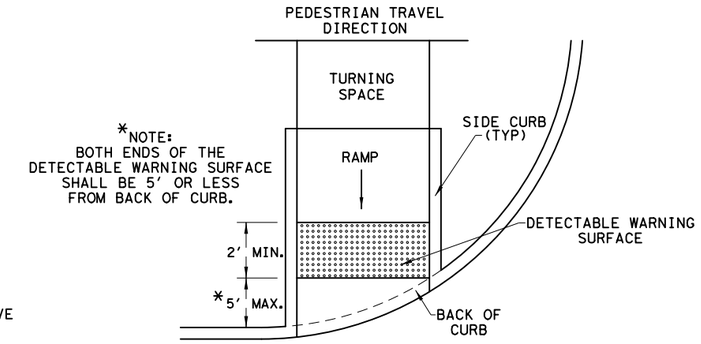


PERPENDICULAR CURB RAMP

TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON SLOPING RAMP RUN.



SECTION VIEW DETAIL
CURB RAMP AT DETECTIBLE WARNINGS



DIRECTIONAL CURB RAMP

TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON SLOPING RAMP RUN.

Texas Department of Transportation

Design Division Standard

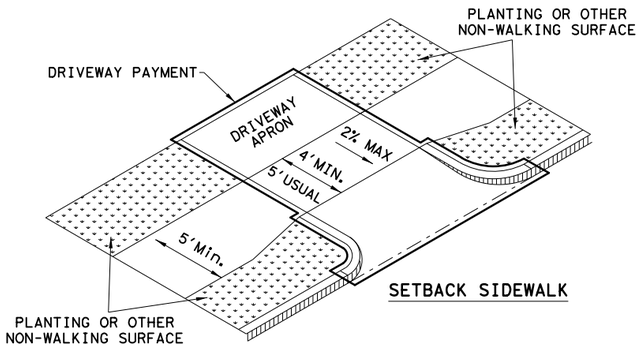
PEDESTRIAN FACILITIES CURB RAMPS

PED-18

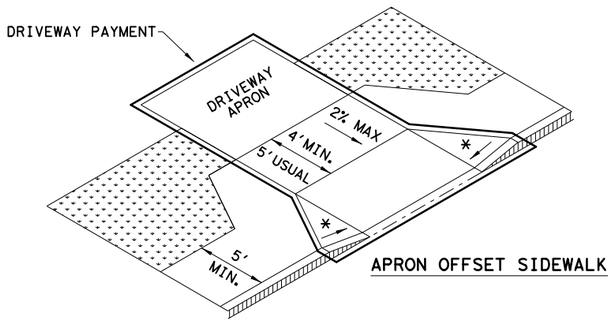
FILE: ped18	DN: TxDOT		DW: VP	CK: KM	CK: PK & JG
© TxDOT: MARCH, 2002	CONT	SECT	JOB		HIGHWAY
REVISIONS	0912	72	386		CS
REVISED 08, 2005 REVISED 06, 2012 REVISED 01, 2018	DIST	COUNTY			SHEET NO.
	HOU	HARRIS			131

DATE:
FILE:

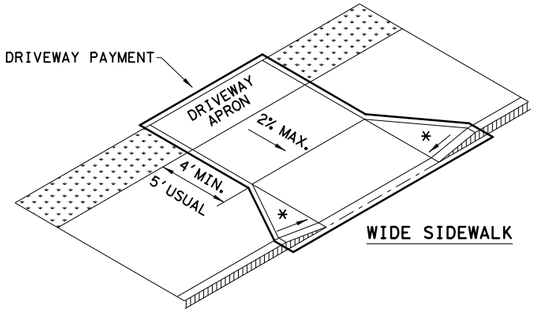
SIDEWALK TREATMENT AT DRIVEWAYS



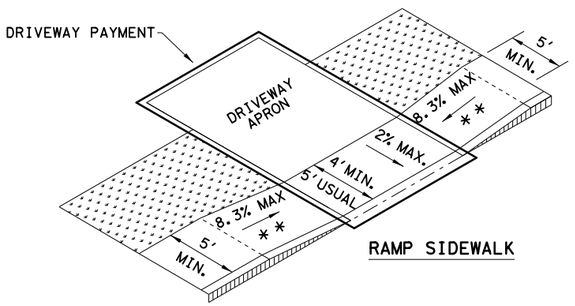
SETBACK SIDEWALK



APRON OFFSET SIDEWALK



WIDE SIDEWALK

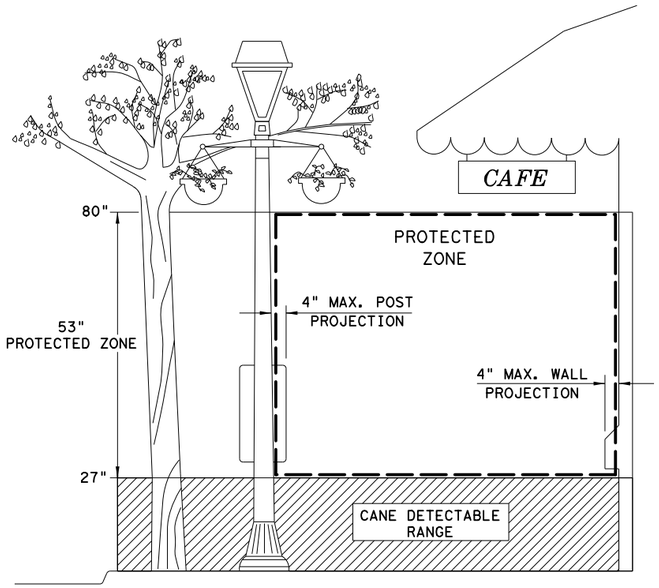


RAMP SIDEWALK

NOTES:

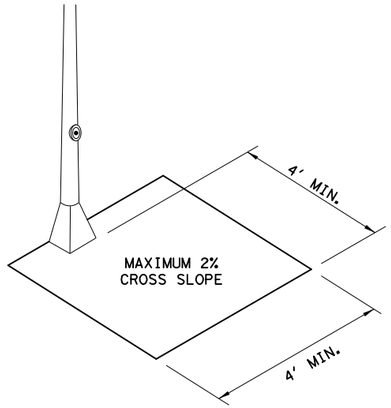
* WHERE DRIVEWAYS CROSS THE PEDESTRIAN ROUTE, SIDES SHALL BE FLARED AT 10% MAX SLOPE.

* * IF CURB HEIGHT IS GREATER THAN 6 INCHES, USE GRADE LESS THAN OR EQUAL TO 5%. HANDRAIL AND DETECTABLE WARNING ARE NOT REQUIRED.

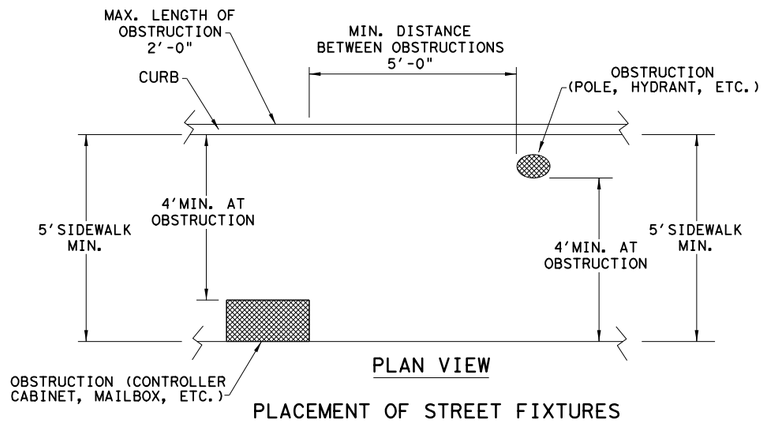


PROTECTED ZONE

NOTE: IN PEDESTRIAN CIRCULATION AREA, MAXIMUM 4" PROJECTION FOR POST OR WALL MOUNTED OBJECTS BETWEEN 27" AND 80" ABOVE THE SURFACE.



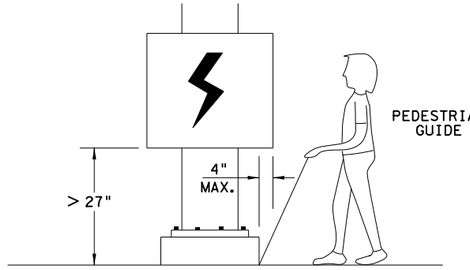
CLEAR SPACE ADJACENT TO PEDESTRIAN PUSH BUTTON



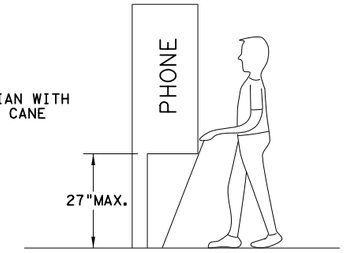
PLAN VIEW

PLACEMENT OF STREET FIXTURES

NOTE: ITEMS NOT INTENDED FOR PUBLIC USE. MINIMUM 4' X 4' CLEAR GROUND SPACE REQUIRED AT PUBLIC USE FIXTURES.



WHEN AN OBSTRUCTION OF A HEIGHT GREATER THAN 27" FROM THE SURFACE WOULD CREATE A PROTRUSION OF MORE THAN 4" INTO THE PEDESTRIAN CIRCULATION AREA, CONSTRUCT ADDITIONAL CURB OR FOUNDATION AT THE BOTTOM TO PROVIDE A MAXIMUM 4" OVERHANG.



PROTRUDING OBJECTS OF A HEIGHT ≤27" ARE DETECTABLE BY CANE AND DO NOT REQUIRE ADDITIONAL TREATMENT.

DETECTION BARRIER FOR VERTICAL CLEARANCE < 80"

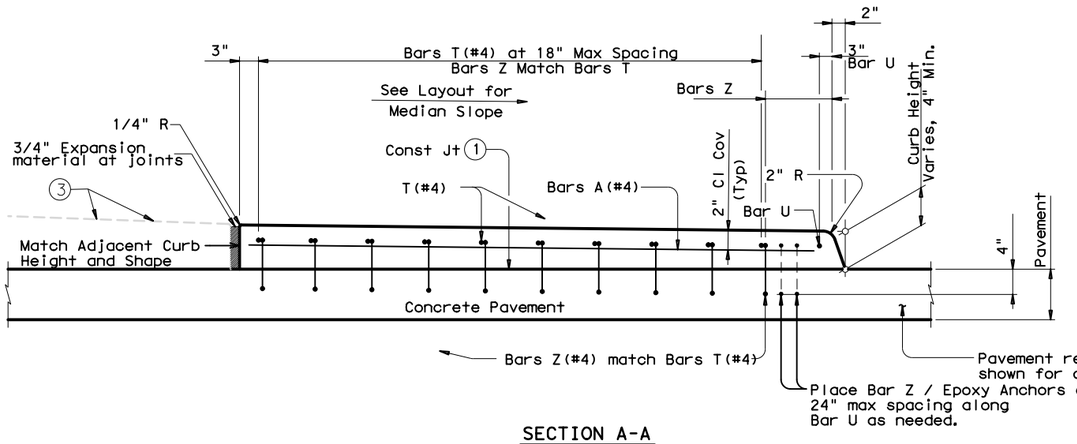
Texas Department of Transportation

Design Division Standard

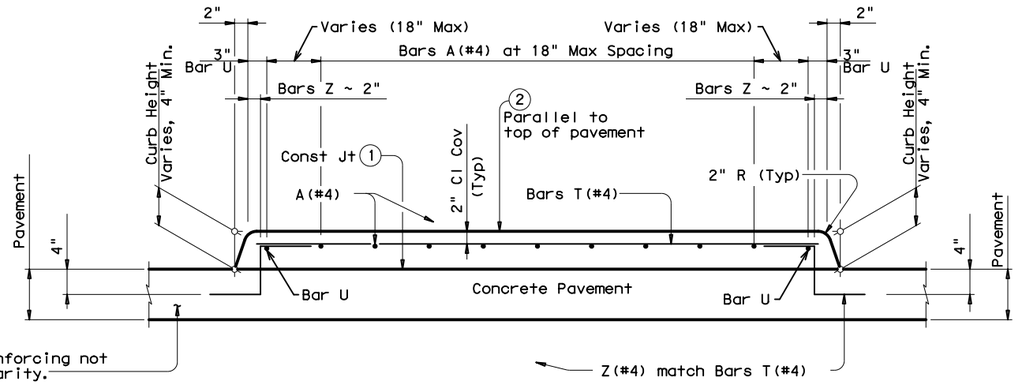
PEDESTRIAN FACILITIES CURB RAMPS

PED-18

FILE: ped18	DN: TxDOT	DW: VP	CK: KM	CK: PK & JG	
© TxDOT: MARCH, 2002	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0912	72	386	CS	
REVISED 08,2005 REVISED 06,2012 REVISED 01,2018	DIST	COUNTY		SHEET NO.	
	HOU	HARRIS		132	

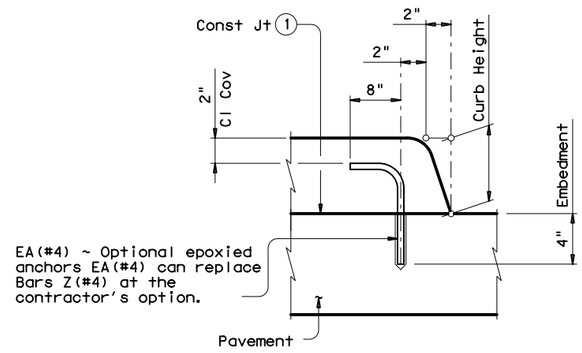


SECTION A-A



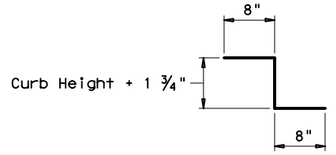
SECTION B-B

1. (1) Provide broom finish to top of pavement where raised median area is defined.
2. (2) Unless noted otherwise on the pavement details.
3. (3) Unless otherwise directed, place concrete riprap over pavement or base. If not over pavement or base, place sod or seed.

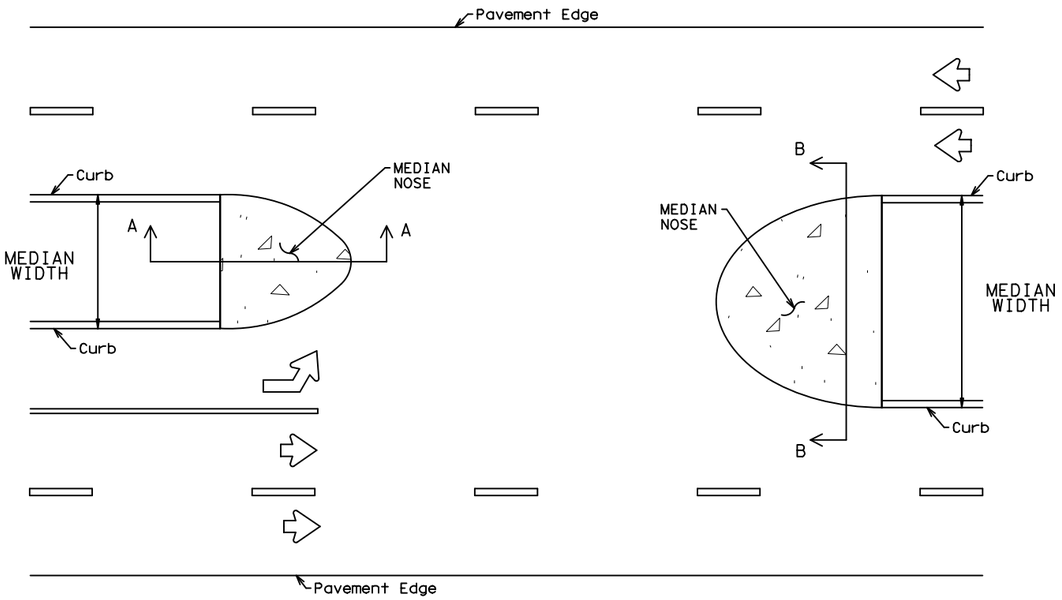


OPTIONAL
EPOXY ANCHORS

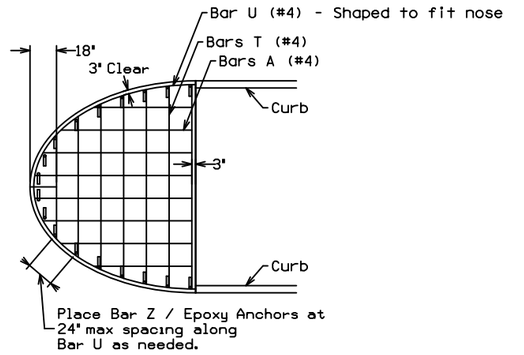
Embed EA(#4) bar into concrete with a Type III (Class C) epoxy meeting the requirements of DMS-6100,"Epoxies and Adhesives". Follow manufacturer's directions for installing the epoxied anchor bars.



BARS Z(#4)



PLAN



REINFORCING

MATERIAL NOTES:
Provide Grade 60 reinforcement. Welded wire reinforcement (WWR) meeting ASTM A497 of equivalent size and spacing may be substituted for Bars A and Bars T.

Epoxy coat reinforcement if pavement reinforcement is required to be epoxy coated.

DESIGNER NOTES:
Provide Median Slope in Design Layouts.

SHEET 1 OF 1

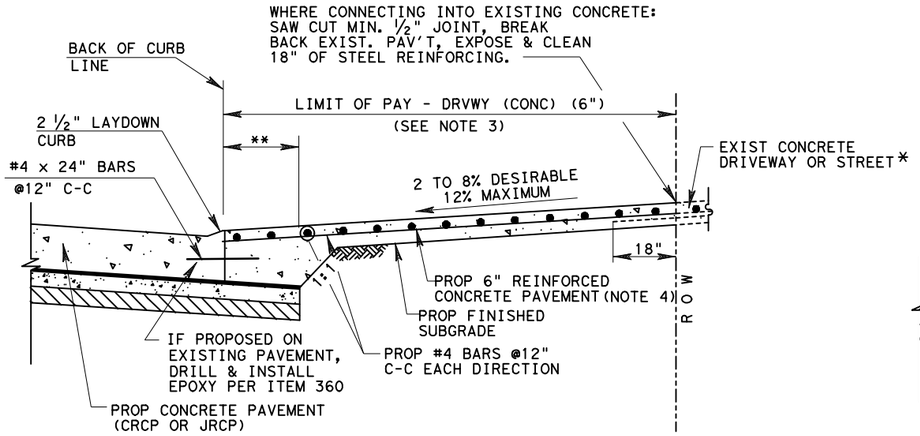
Texas Department of Transportation
Houston District

MEDIAN NOSE DETAILS

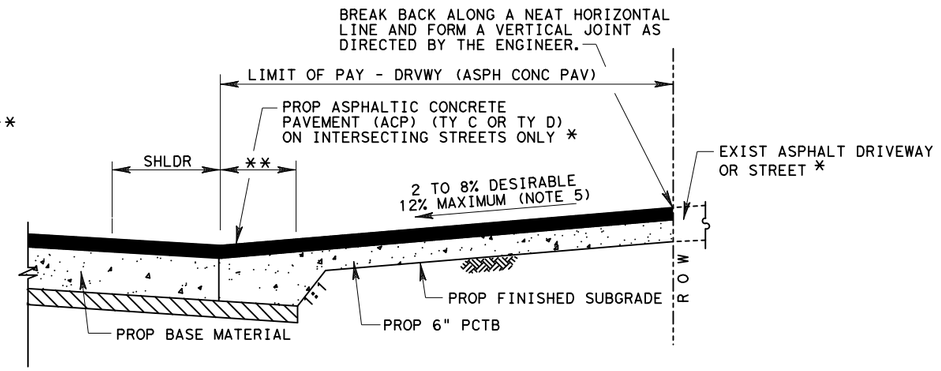
HOU-MEDNS-22

FILE: stdB13.dgn	DN: NHEB	CK: TxDOT	DW: NHEB	CK: TxDOT
© TxDOT FEBRUARY 2022	DISTRICT	PROJECT		SHEET
REVISIONS	HOU	STP 1902 (308) MM		133
03/15 FOR 2014 SPECS 02/23 ADDED NOTE FOR FINISH BEHIND MEDIAN NOSE	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	HARRIS	0912	72	386	CS

PATH:
LEVELS DISPLAYED
60
1



PROPOSED DRIVEWAY DETAIL
REINFORCED CONCRETE AT CONCRETE
CURB AND GUTTER ROADWAY



PROPOSED DRIVEWAY DETAIL
ASPHALT W/ PCTB AT ASPHALT ROADWAY

NOTES:

1. ALSO SEE SHEET 2 OF 2 FOR DRIVEWAY SLOPES WITH PROPOSED SIDEWALKS.
2. FOR INTERSECTIONS BUILT WITH CRCP PAVEMENT SEE CRCP DETAIL.
3. FAST TRACK CONCRETE IS PAID AS DRVWY (CONC) (FAST TRACK).
4. THICKNESS OF DRIVEWAY IS 6 INCHES FOR REGULAR AND FAST TRACK CONCRETE.
5. MAXIMUM SLOPE IS: 12% RESIDENTIAL
   8% OTHERS

LEGEND:

PCTB- PORTLAND CEMENT TREATED BASE

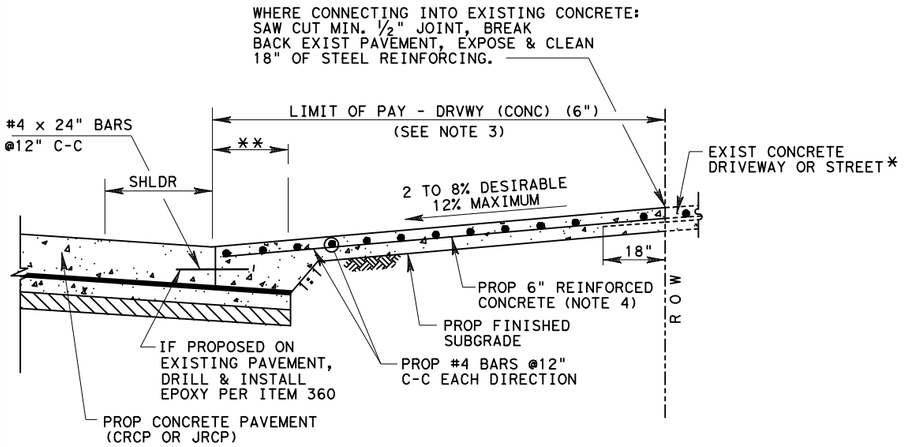
JRCP- JOINTED REINFORCED CONCRETE PAVEMENT

CRCP- CONTINUOUSLY REINFORCED CONCRETE PAVEMENT

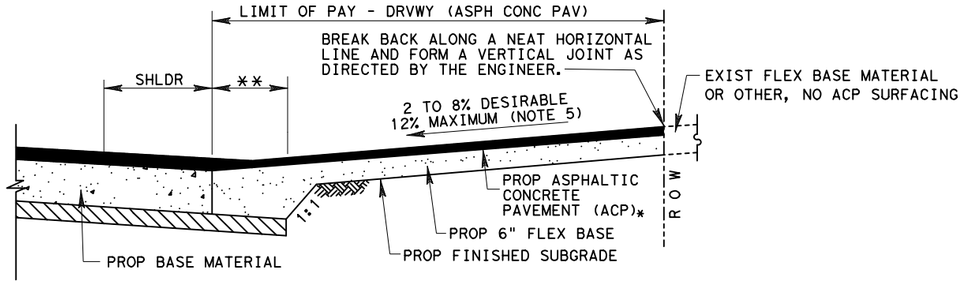
ACP- ASPHALTIC CONCRETE PAVEMENT

* FOR STREET INTERSECTIONS REFER TO PAVING DETAILS AND INTERSECTION DETAILS FOR REINFORCING STEEL AND SECTION REQUIREMENTS.

** PROPOSED LIMIT OF ROADWAY BASE AND/OR SUBGRADE



PROPOSED DRIVEWAY DETAIL
REINFORCED CONCRETE AT CONCRETE ROADWAY



PROPOSED DRIVEWAY DETAIL
ASPHALT W/ FLEX BASE AT ASPHALT ROADWAY

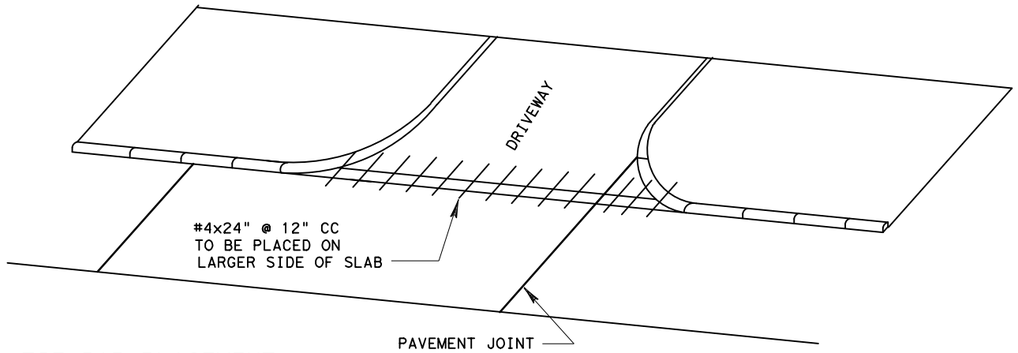
Texas Department of Transportation
Houston District

DRIVEWAY DETAILS

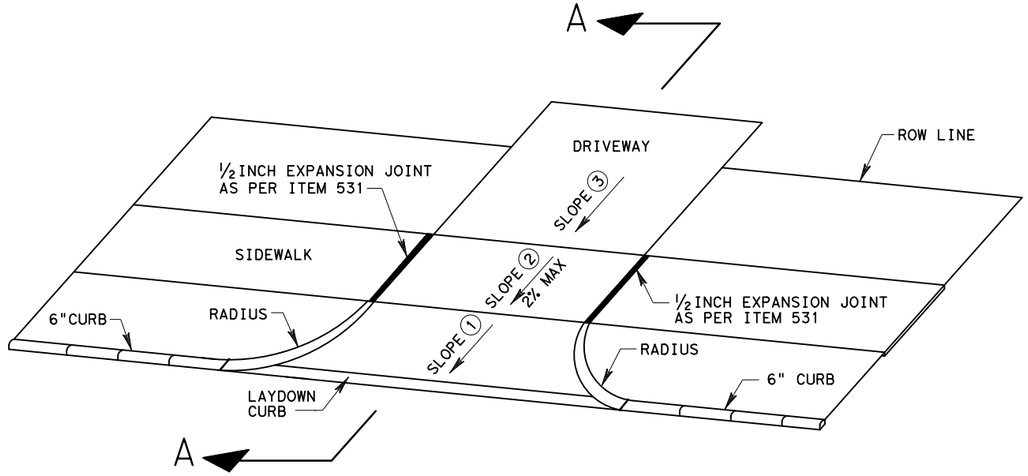
DD

FILE: STDB-8a.dgn	DN:	CK:	DW:	CK:		
© TxDOT SEPT. 2004	DIST	FED REG	PROJECT NO.			SHEET
REVISIONS 11/15 ADDED NOTE FOR PCTB 3/17 MODIFIED PAVEMENT SLOPES	HOU	6	STP 1902 (308) MM			134
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	HARRIS		0912	72	386	CS

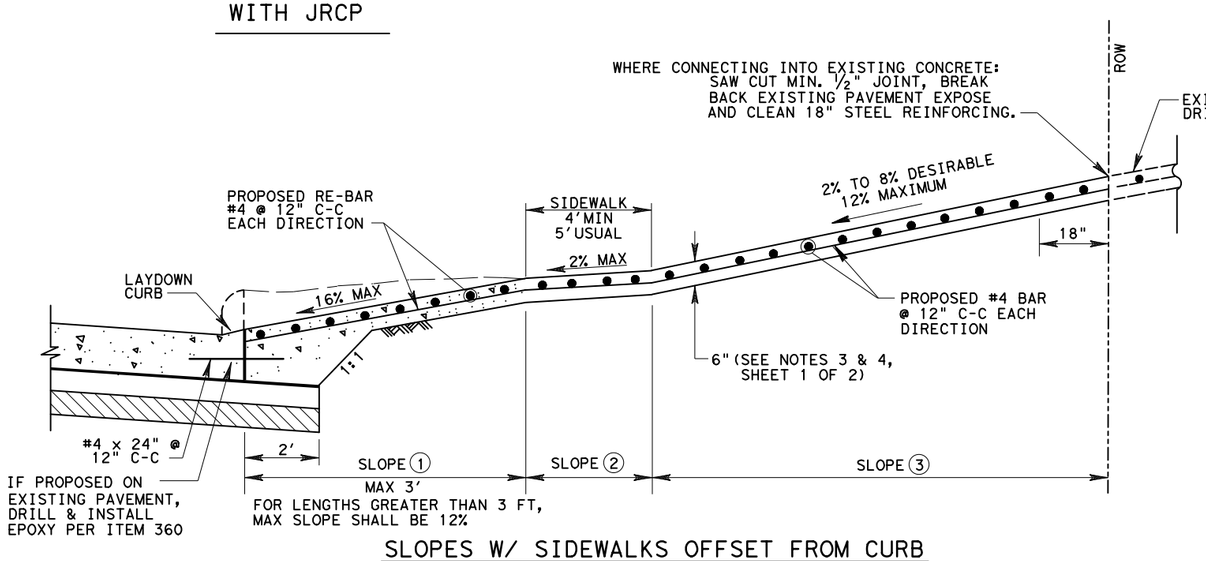
STDB8A



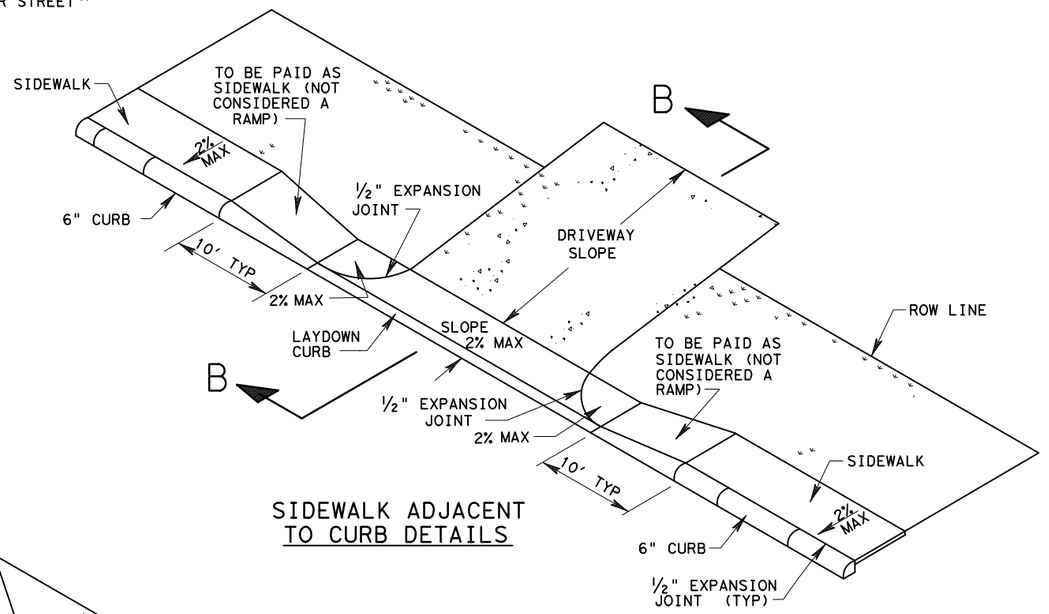
TIE BAR PLACEMENT WITH JRCP



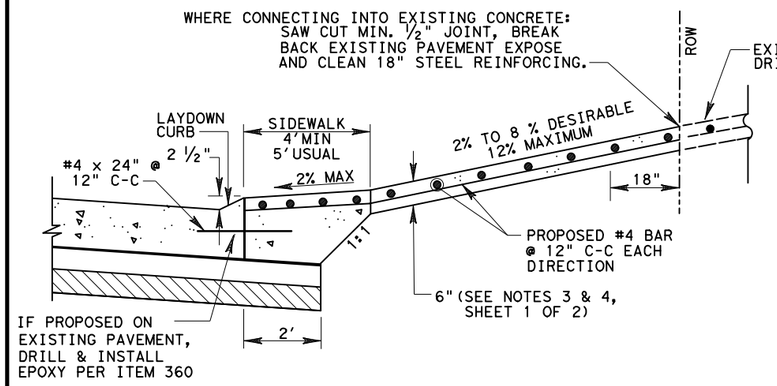
SIDEWALK OFFSET FROM CURB DETAILS



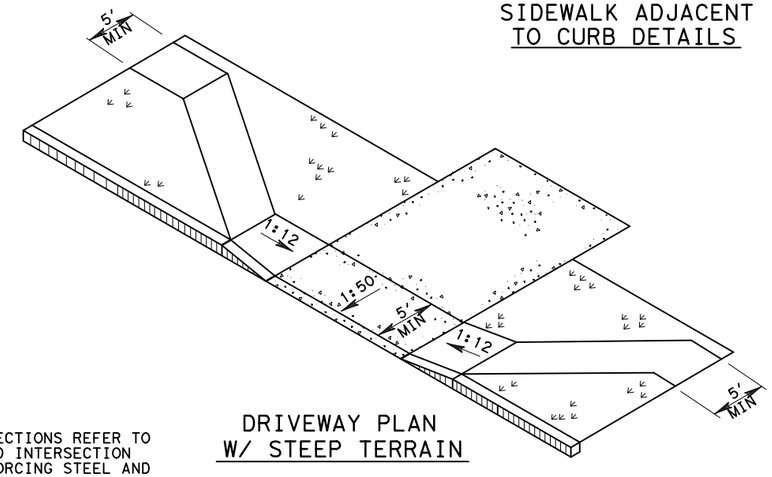
SLOPES W/ SIDEWALKS OFFSET FROM CURB (SECTION A-A)



SIDEWALK ADJACENT TO CURB DETAILS



DRIVEWAY SLOPES W/ SIDEWALKS ADJACENT TO CURB (SECTION B-B)



DRIVEWAY PLAN W/ STEEP TERRAIN

* FOR STREET INTERSECTIONS REFER TO PAVING DETAILS AND INTERSECTION DETAILS FOR REINFORCING STEEL AND SECTION REQUIREMENTS.

SHEET 2 OF 3

Texas Department of Transportation
Houston District

DRIVEWAY DETAILS

DD

FILE: STDB-8b.dgn	DN:	CK:	DW:	CK:	
©TxDOT SEPT. 2004	DIST	FED REG	PROJECT NO.		SHEET
REVISIONS 9/09 ADDED NOTE FOR ITEM 360. 11/15 ADDED NOTE FOR PCTB	HOU	6	STP 1902 (308) MM		135
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	HARRIS		0912	72	386	CS

STDB8B

NOTES:

1. DA AND PIPES NOT INCLUDED IN GEOPAK DRAINAGE MODEL, ONLY IN SWMM ANALYSIS, SO THAT MORE ACCURATE HGL CAN BE CALCULATED.
2. SEE DRAINAGE IMPACT ANALYSIS, APRIL 2022, FOR SWMM ANALYSIS.
3. SEE 2-YEAR STORM SEWER COMPUTATION SHEETS FOR CALCULATION SUMMARIES.
4. FEMA FIRM 48201C0690N SHOWS PROJECT AREA IN AREA OF MINIMAL FLOOX HAZARD, UNSHADED ZONE X.

LEGEND

- EXIST DRAINAGE AREA
- (ID) DRAINAGE AREA ID
- EXIST ROW
- PARCELS
- EXIST STORM SEWER
- PROP STORM SEWER
- FLOW ARROW
- ID / AREA / FLOW — MANHOLE NUMBER; CUMULATIVE AREA (AC); 2-YR (CFS)

0′ 200′ 400′
(IN FEET)
SCALE: PLAN 1"=200′

RUNNELS ST.
NAVAGATION BLVD.
COMMERCE ST.
CANAL ST
MCALPINE ST.
ANN ST.
NORTH SAINT CHARLES ST.
LIVE OAK ALLEY
LIVE OAK ST.
NAVIGATION BLVD.
N LIVE OAK ST.
S JENSEN DR.
BUFFALO BAYOU

N07A, N07B, N07C, N01A, N01B, N02, N05, N06, N07, N12, N13, N13A, N14, N14A, N15, N17, N18, N19, N22, N23, N24, N25, N26, N27, N28, N29, N30, N31, N32, N33, N34, N35, N44, J01, J02

N24 — 4.46 / 14.35
N26 — 0.14 / 0.55
N31 — 1.08 / 4.52
J03 — 3.17 / 12.78
N29 — 6.82 / 23.83
N42 — 10.70 / 32.82

PROP 24" RCP (TYP)
PROP DES TYP 3 (18" X 28.5")
PROP DES TYP 4 (22.5" X 36.25")
PROP 5′X2′ RCB
EXIST 18" RCP
PROP 24" RCP
OUTFALL J
OUTFALL N
SWMM OUTFALL N
SEE NOTE 1
36" CMP
24" RCP
18" RCP

Patrick W. Phillips 6/8/2022

STATE OF TEXAS
PATRICK W. PHILLIPS
92917
LICENSED PROFESSIONAL ENGINEER

Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

Gauge ENGINEERING
11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

Texas Department of Transportation
© 2022

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

PROPOSED DRAINAGE AREA MAP

SHEET 1 OF 1

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	136

Pen Table:ROUNDABOUT - Copy.txt
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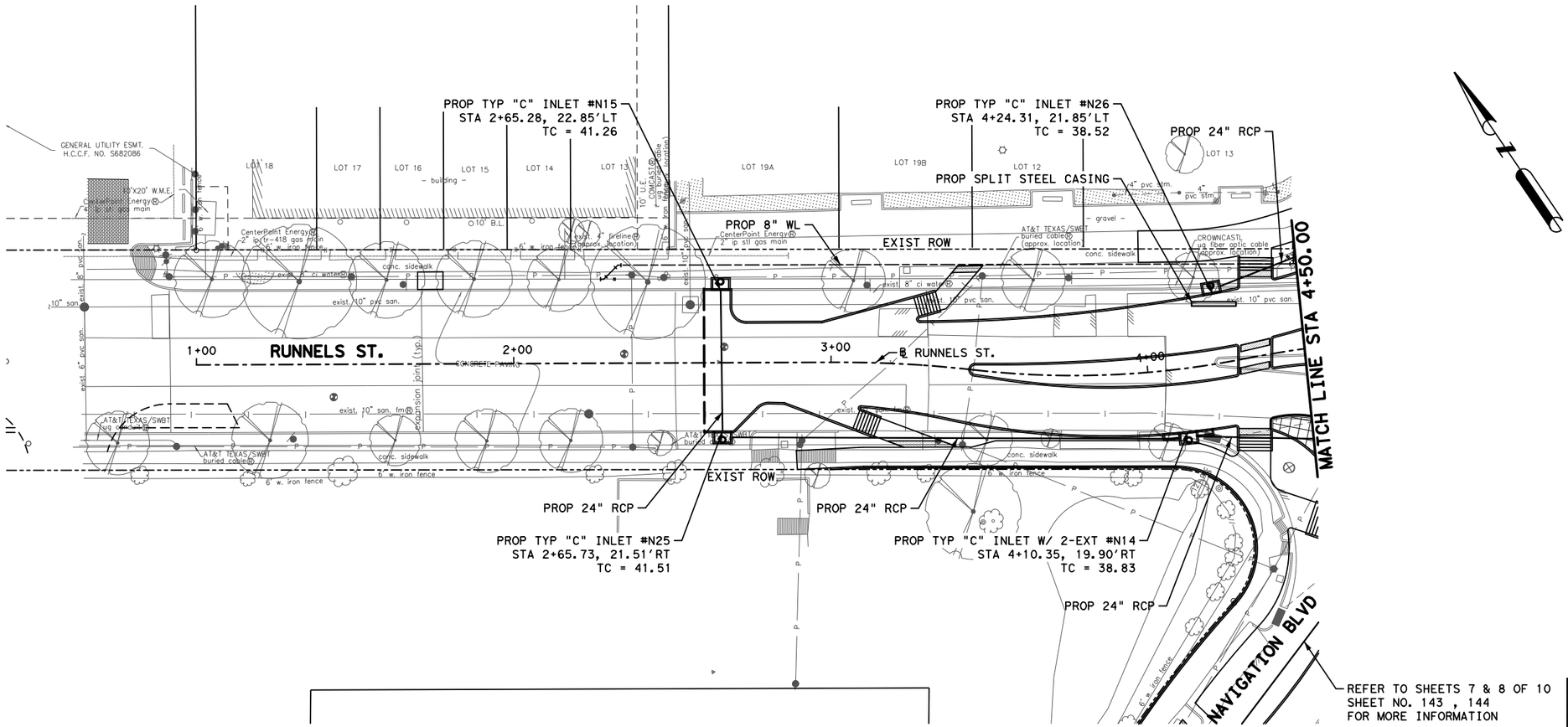

REFER TO SHEETS 7 & 8 OF 10
SHEET NO. 143 , 144
FOR MORE INFORMATION

LEGEND:

- PROP STORM SEWER
- EXIST STORM SEWER
- PROP ROADWAY FACE OF CURB
- PROPOSED INLET OR JCT BOX
- PROP MANHOLE
- EXIST INLET OR JUNCTION BOX
- EXIST MANHOLE

NOTES:

1. ALL RCP ARE CLASS III UNLESS OTHERWISE NOTED.
2. CONTRACTOR TO MAINTAIN POSITIVE DRAINAGE DURING CONSTRUCTION AND FIELD VERIFY FLOWLINES OF CONNECTIONS TO EXISTING DRAINAGE STRUCTURES TO VERIFY POSITIVE DRAINAGE TO PROPOSED STORM SEWER PRIOR TO CONSTRUCTION.
3. REFER TO MISCELLANEOUS SEWER DETAILS FOR PIPE BEND DETAILS.
4. REFER TO DRAINAGE PROFILE & LATERAL SHEETS FOR ADDITIONAL INFORMATION.
5. REFER TO ROADWAY PLAN & PROFILE, WATER LINE PLAN & PROFILE, & SIGNING AND PAVEMENT MARKING PLAN SHEETS FOR ADDITIONAL INFORMATION.
6. ALL OFFSETS ARE TO CENTER OF RIM/GRATE OR FACE OF CURB.
7. REFER TO WATER LINE PLAN & PROFILE SHEETS FOR ADDITIONAL INFORMATION.

0′ 40′ 80′
(IN FEET)
SCALE: PLAN 1"=40′
PROFILE 1"=4′

STATE OF TEXAS
DAVID G. GREANEY
125563
LICENSED PROFESSIONAL ENGINEER

06/28/2022 Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

Gauge ENGINEERING
11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

DRAINAGE PLAN
BEGIN PROJECT TO STA 4+50
(NORTHWEST APPROACH)

SHEET 1 OF 10

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	137

Pen Table:ROUNDABOUT - Copy.txt
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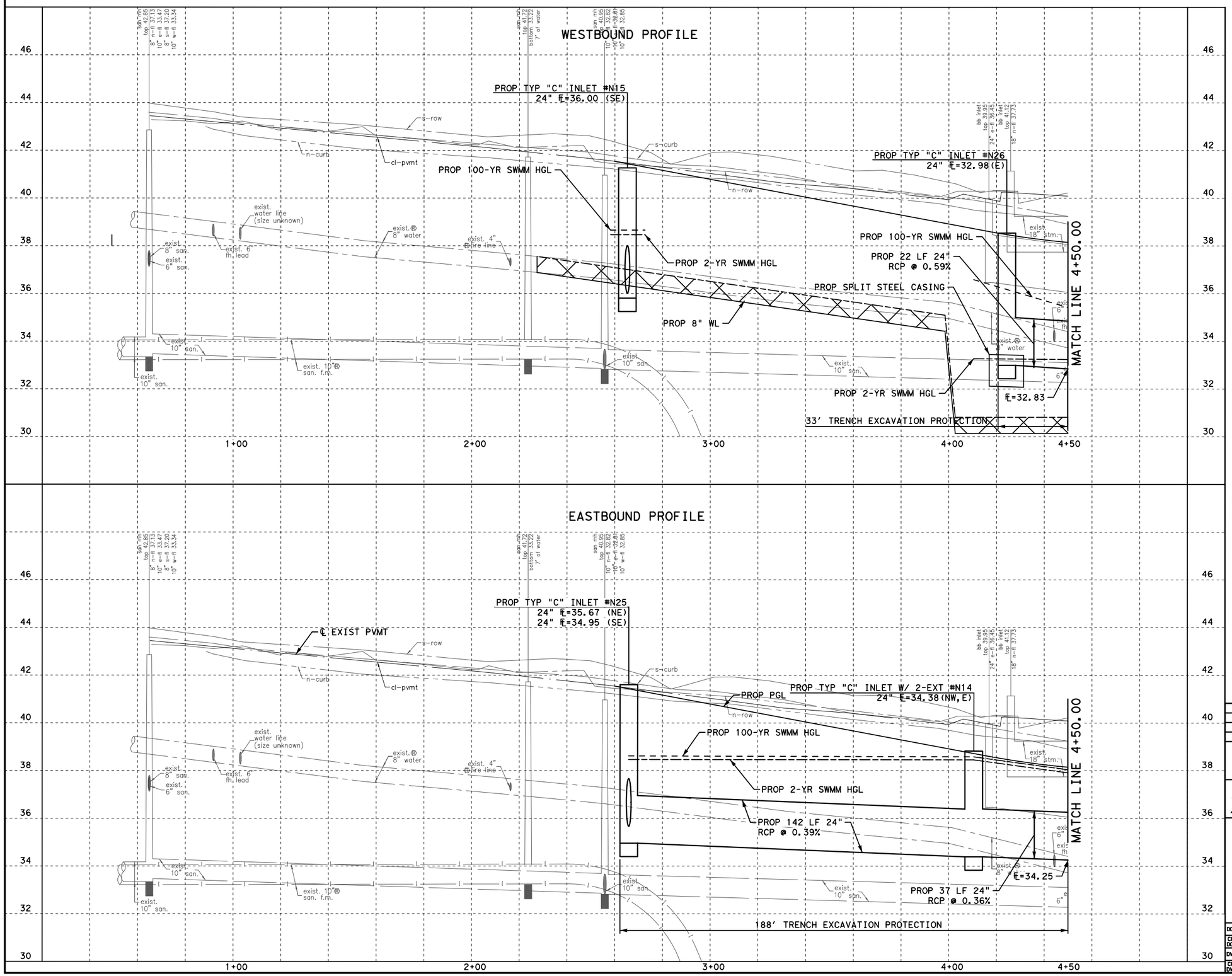

LEGEND:

- PROP STORM SEWER
- EXIST STORM SEWER
- PROP ROADWAY FACE OF CURB
- PROPOSED INLET OR JCT BOX
- PROP MANHOLE
- EXIST INLET OR JUNCTION BOX
- EXIST MANHOLE

NOTES:

1. ALL RCP ARE CLASS III UNLESS OTHERWISE NOTED.
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0′ 40′ 80′
(IN FEET)
SCALE: PLAN 1"=40′
PROFILE 1"=4′

STATE OF TEXAS
DAVID G. GREANEY
125563
LICENSED
PROFESSIONAL ENGINEER
06/28/2022

Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

Gauge ENGINEERING
11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

DRAINAGE PROFILE
BEGIN PROJECT TO STA 4+50
(NORTHWEST APPROACH)

SHEET 2 OF 10

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	138

Plotted on: 6/28/2022 10:33:34 AM sshariffian
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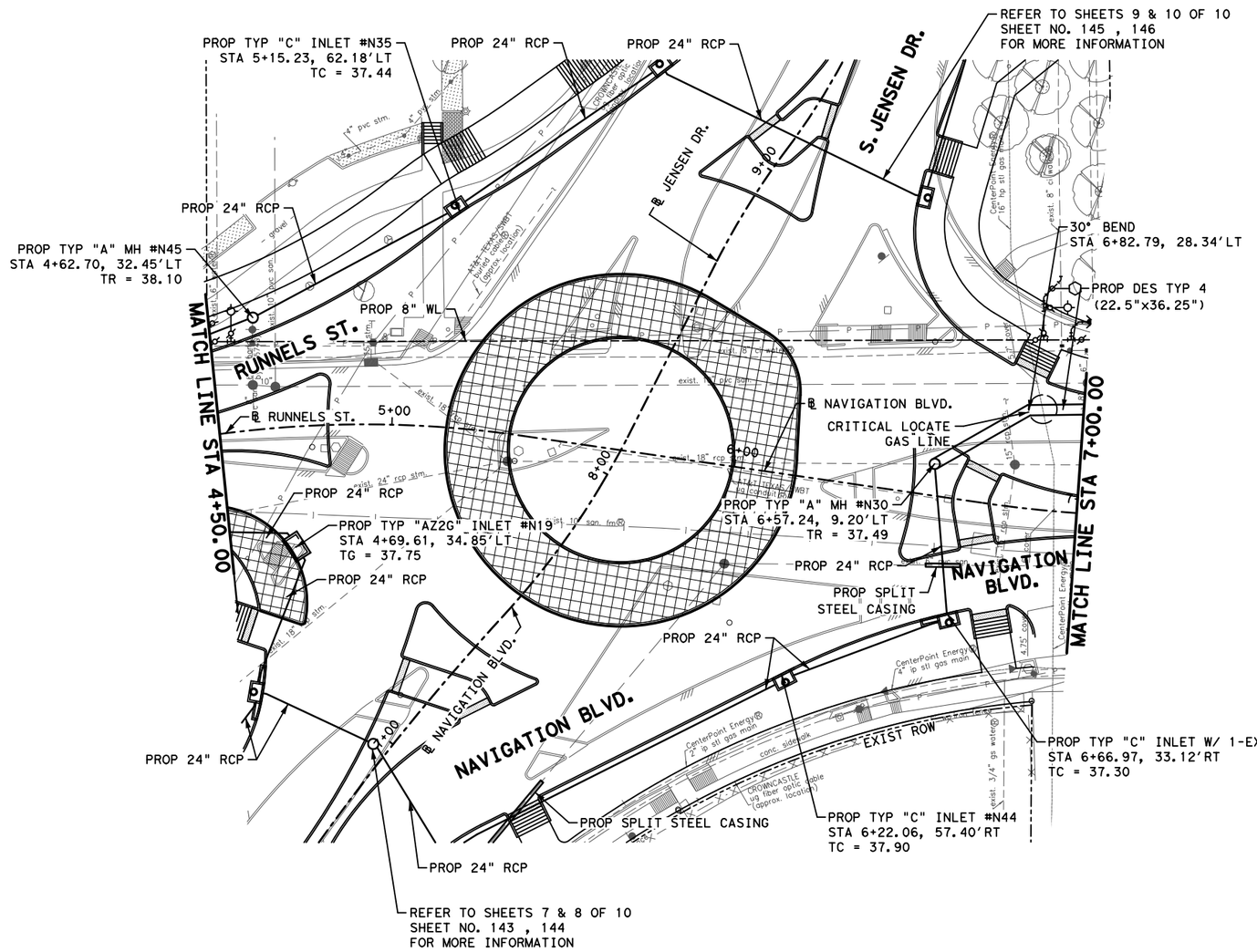

LEGEND:

- PROP STORM SEWER
- EXIST STORM SEWER
- PROP ROADWAY FACE OF CURB
- PROPOSED INLET OR JCT BOX
- PROP MANHOLE
- EXIST INLET OR JUNCTION BOX
- EXIST MANHOLE

NOTES:

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0′ 40′ 80′
(IN FEET)
SCALE: PLAN 1"=40′

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NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

DRAINAGE PLAN STA 4+50 TO STA 7+00 (NORTHWEST AND SOUTHEAST APPROACHES) SHEET 3 OF 10

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	139

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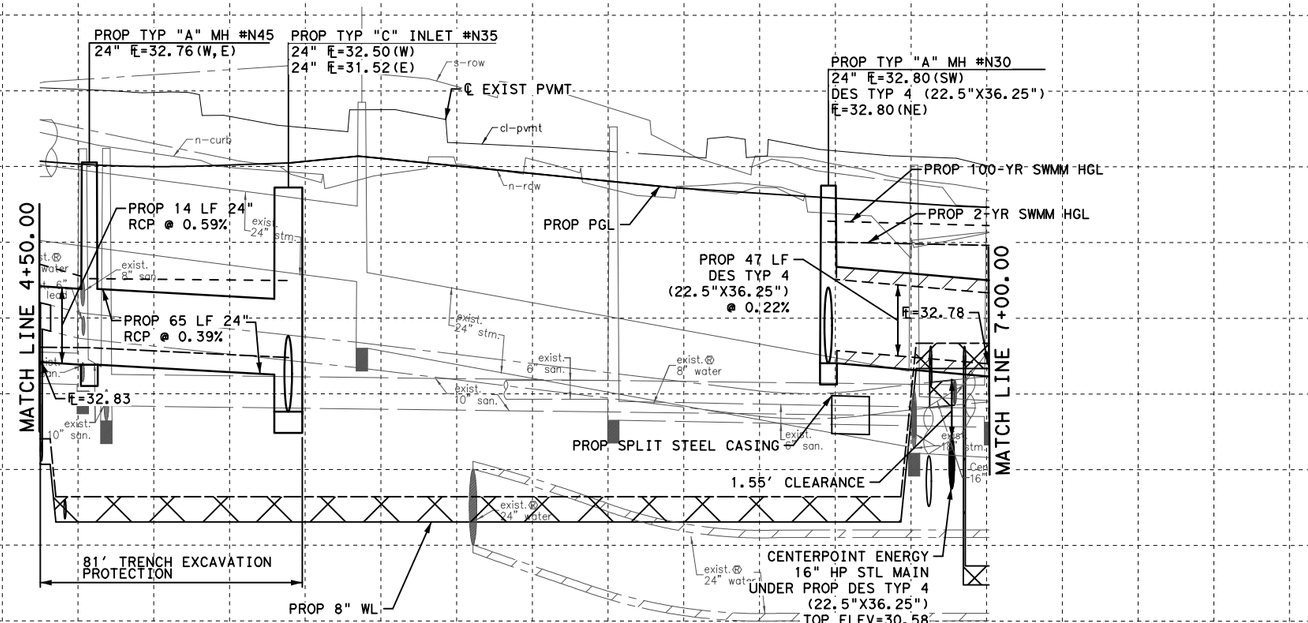
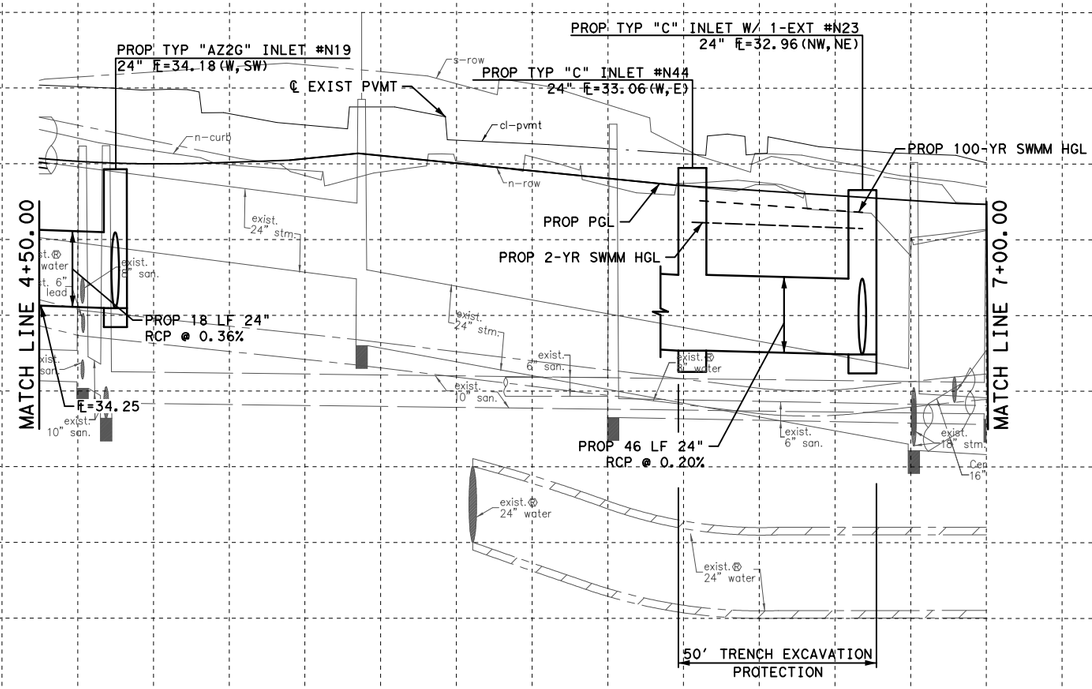
NORTHBOUND PROFILE



SOUTHBOUND PROFILE



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0' 40' 80'
(IN FEET)
SCALE: PLAN 1"=40'
PROFILE 1"=4'

STATE OF TEXAS
DAVID G. GREANEY
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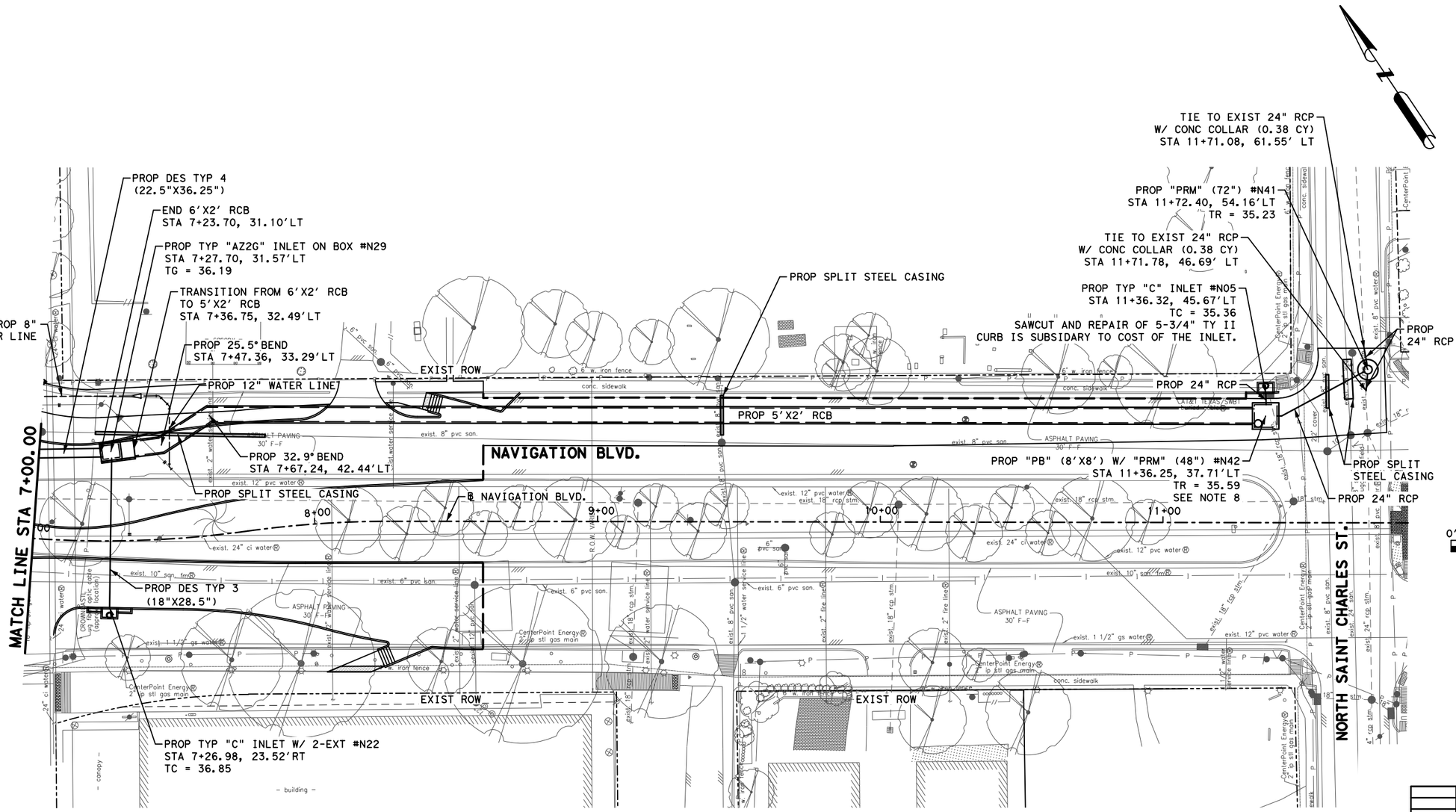
NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

DRAINAGE PROFILE STA 4+50 TO STA 7+00 (NORTHWEST AND SOUTHEAST APPROACHES) SHEET 4 OF 10

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	140



LEGEND:

- PROP STORM SEWER
- EXIST STORM SEWER
- PROP ROADWAY FACE OF CURB
- PROPOSED INLET OR JCT BOX
- PROP MANHOLE
- EXIST INLET OR JUNCTION BOX
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NOTES (CONT.):

8. PRECAST BASE HEIGHT IS 6.5' FROM ℄ OF BASE SLAB TO TOP SLAB.

0' 40' 80'
(IN FEET)
SCALE: PLAN 1"=40'

STATE OF TEXAS
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NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

DRAINAGE PLAN
STA 7+00 TO END PROJECT
(SOUTHEAST APPROACH)

SHEET 5 OF 10

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	141

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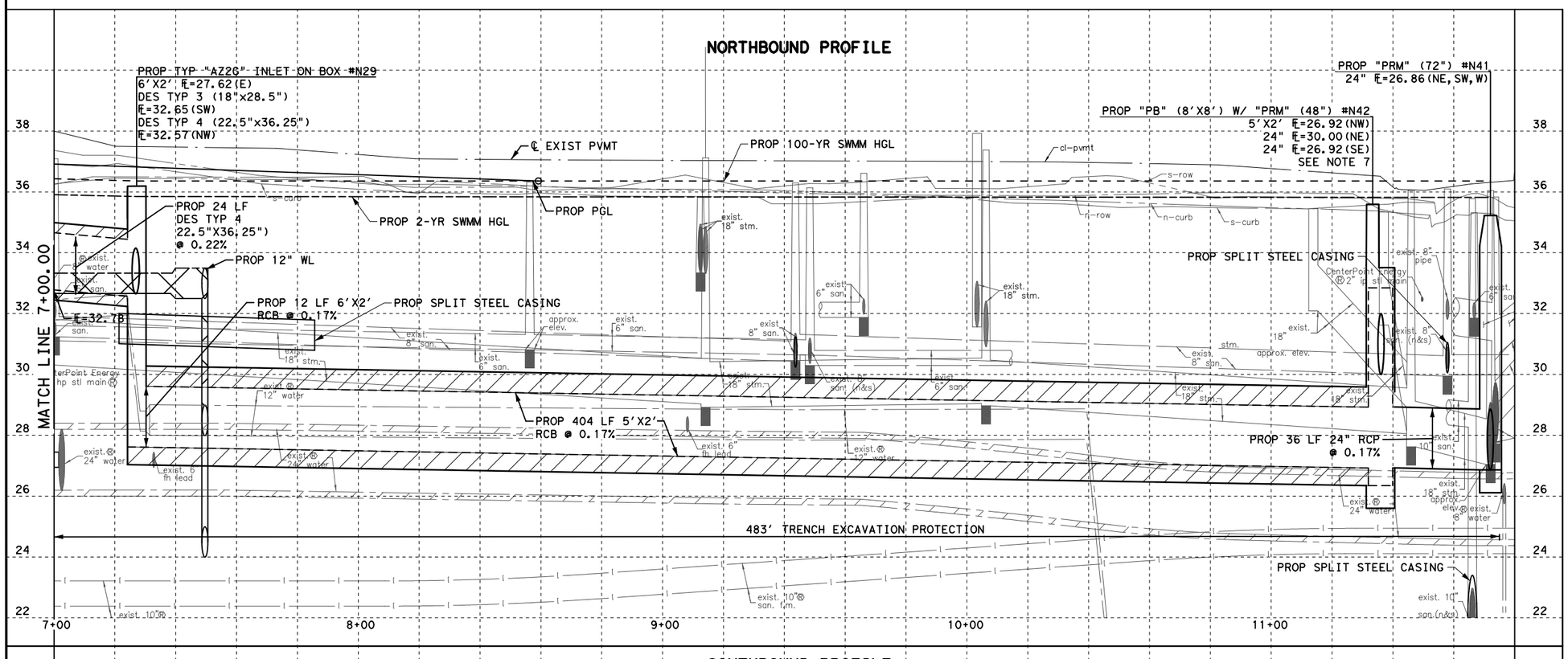
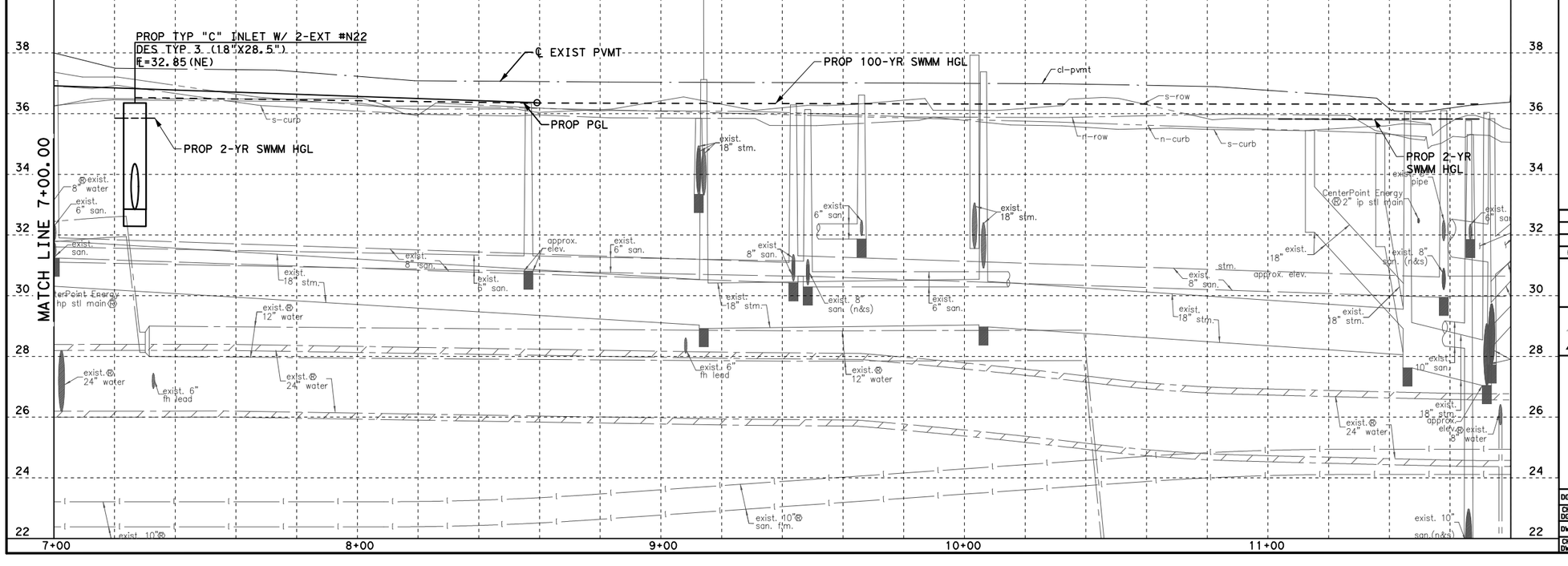
NORTHBOUND PROFILE



SOUTHBOUND PROFILE



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(IN FEET)
SCALE: PLAN 1"=40'
PROFILE 1"=4'

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Texas PE Firm Reg. #F-20017

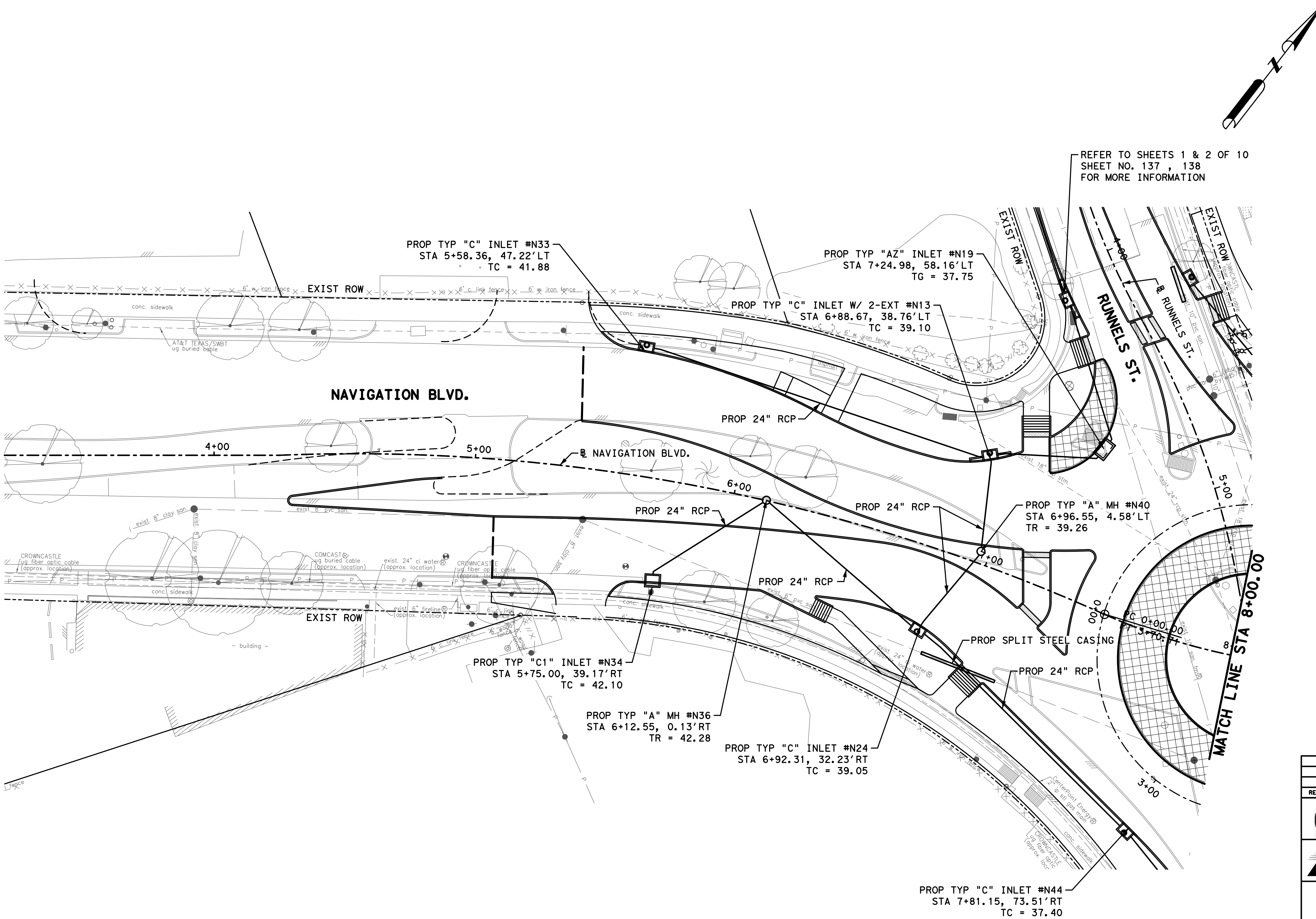
NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

DRAINAGE PROFILE
STA 7+00 TO END PROJECT
(SOUTHEAST APPROACH)

SHEET 6 OF 10

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	142

Plotted on: 6/28/2022 10:33:39 AM ssharifian



LEGEND:

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Texas PE Firm Reg. #F-20017

Texas Department of Transportation © 2022

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

DRAINAGE PLAN & PROFILE
BEGIN PROJECT TO STA 8+00
(SOUTHWEST APPROACH)

SHEET 7 OF 10

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	143

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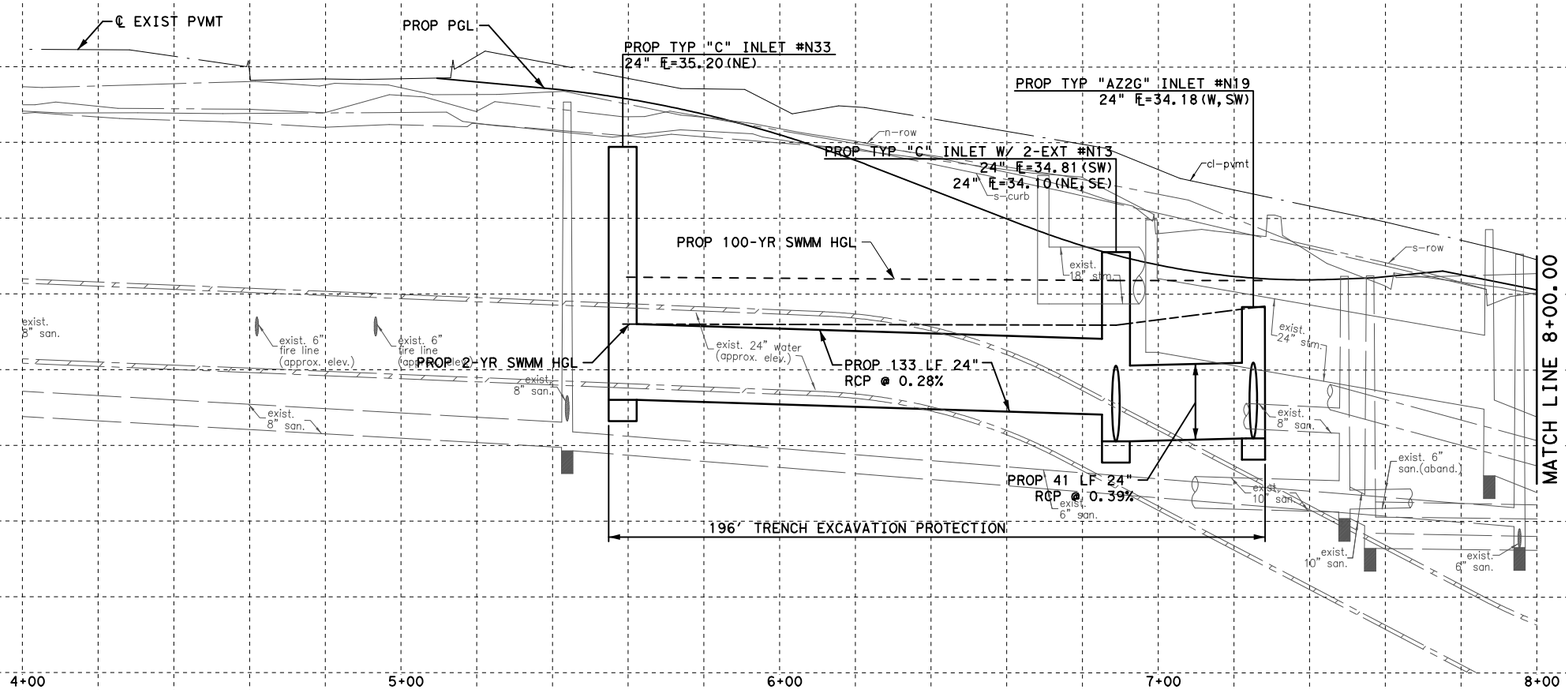
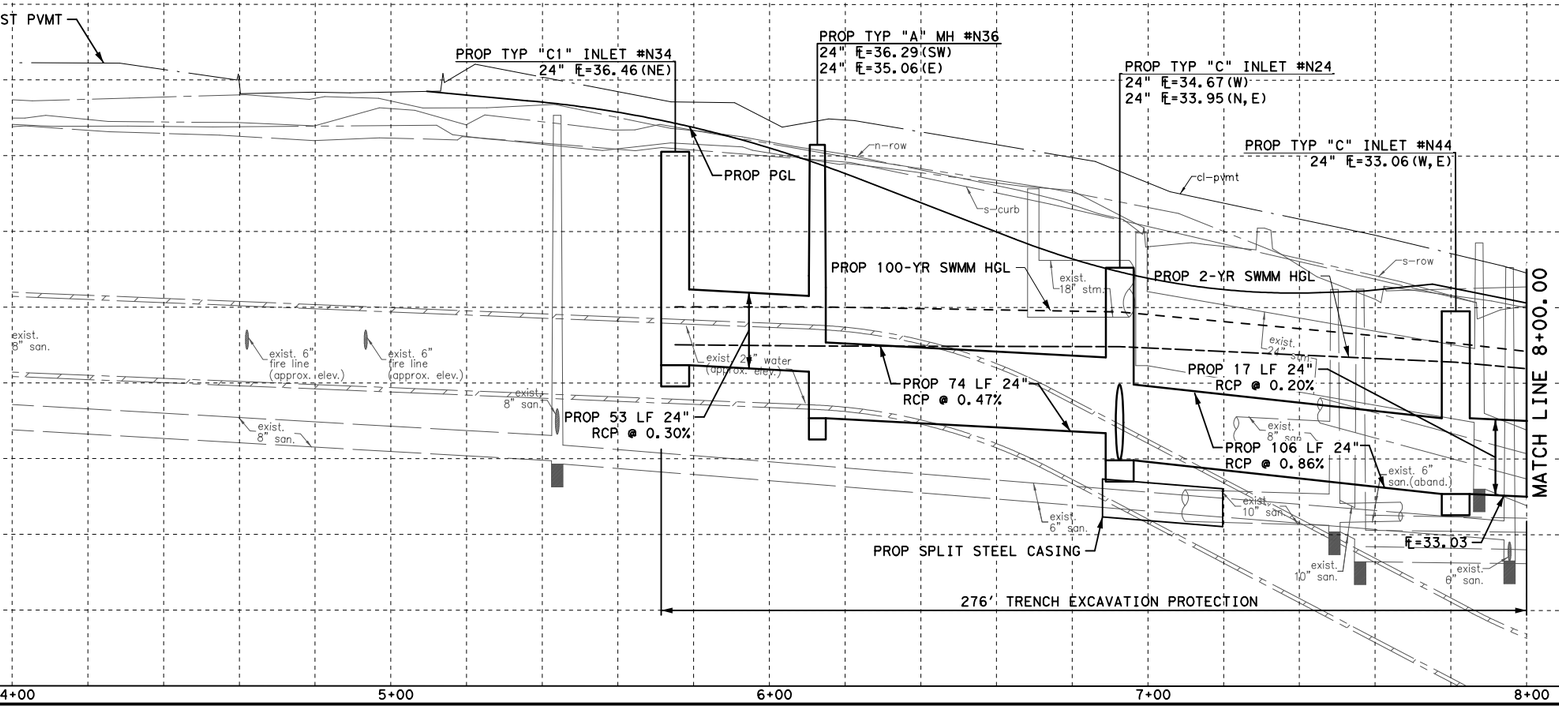
WESTBOUND PROFILE



EASTBOUND PROFILE



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SCALE: PLAN 1"=40′
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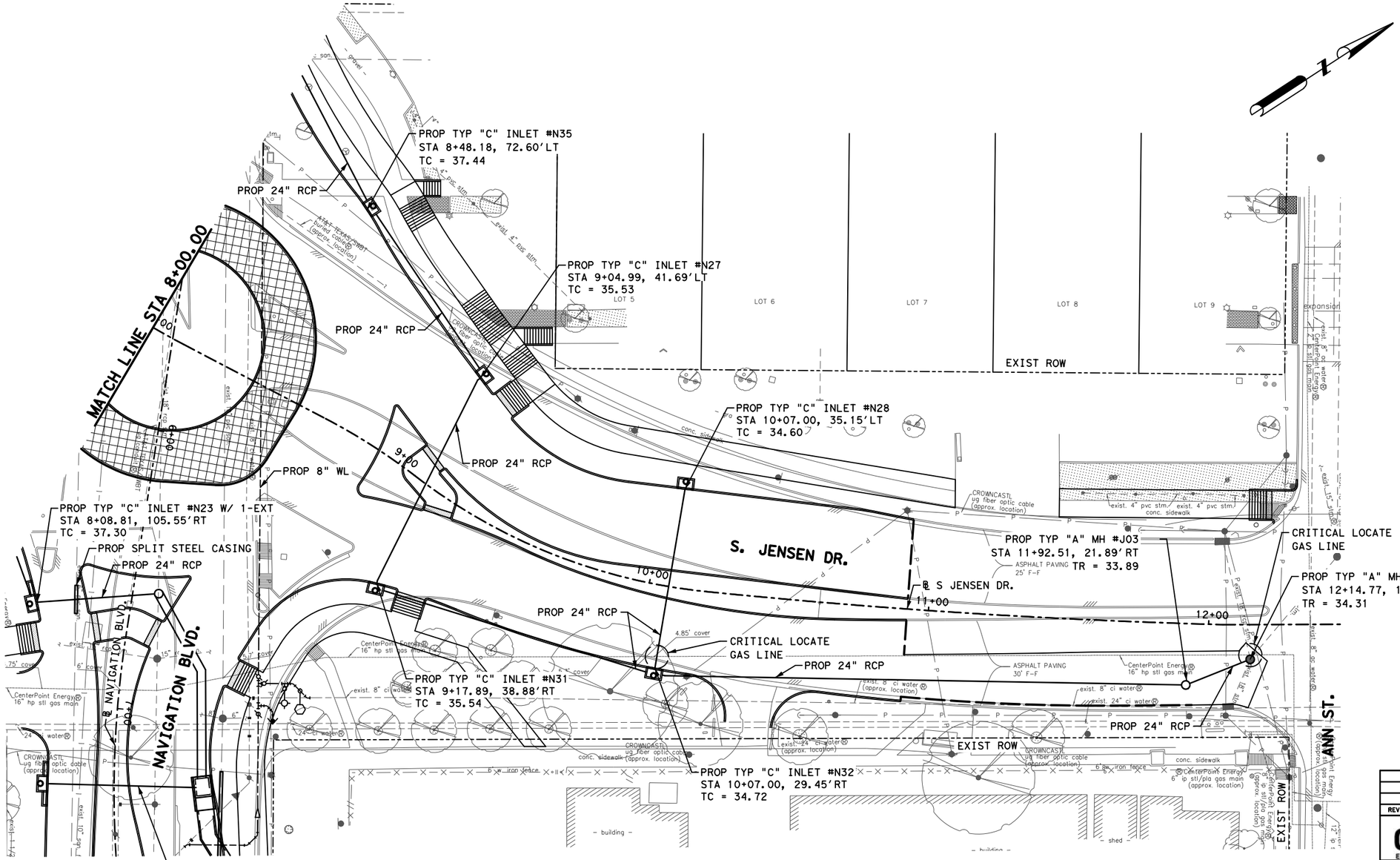
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

DRAINAGE PROFILE
BEGIN PROJECT TO STA 8+00.00 (SOUTHWEST APPROACH)

SHEET 8 OF 10

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	144



LEGEND:

- PROP STORM SEWER
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NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

DRAINAGE PLAN
STA 8+00 TO END PROJECT
(NORTHEAST APPROACH)

SHEET 9 OF 10

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	145

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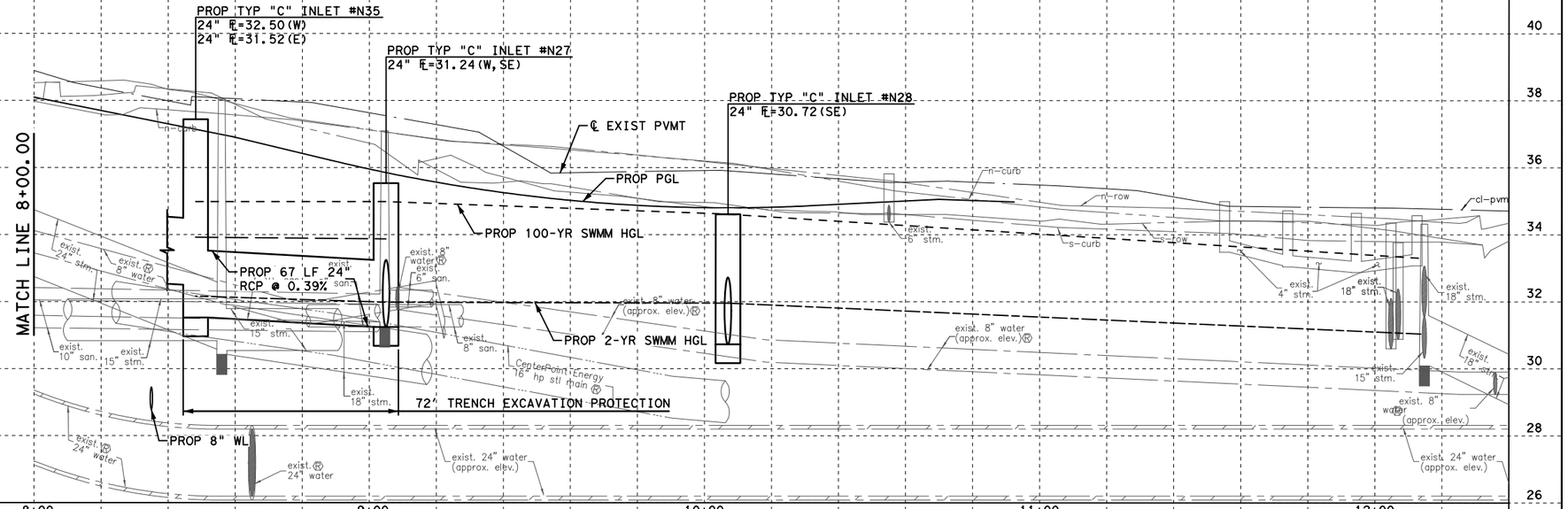
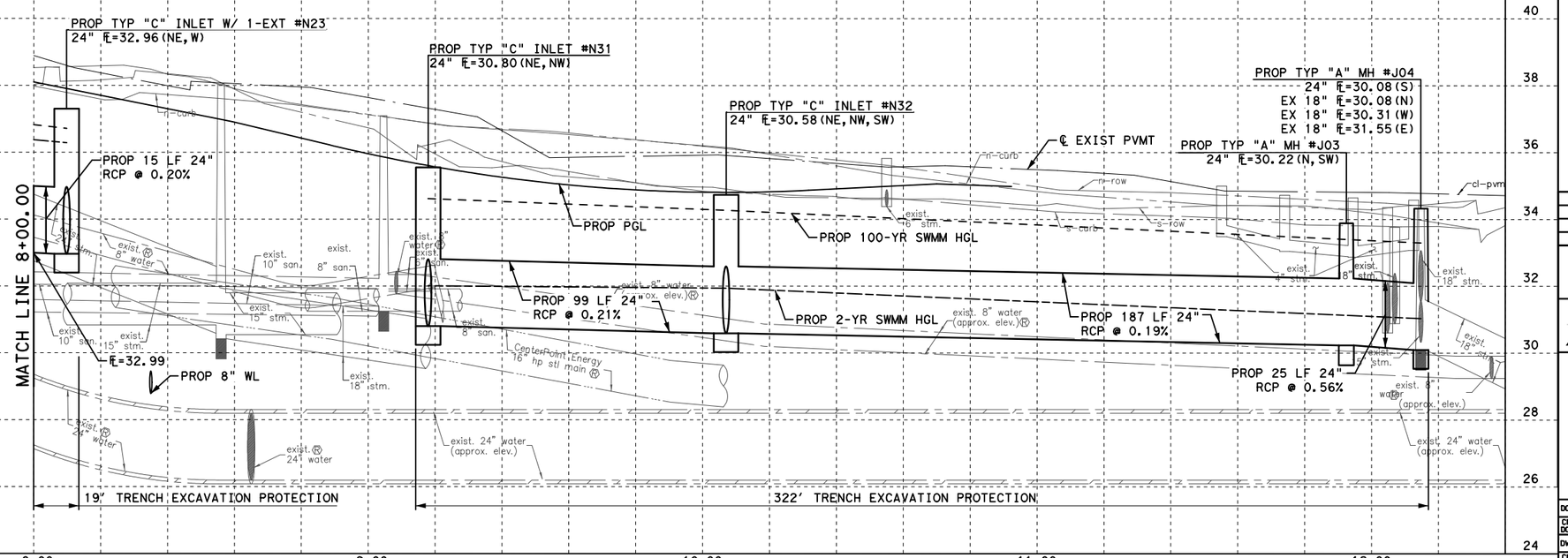
WESTBOUND PROFILE



EASTBOUND PROFILE



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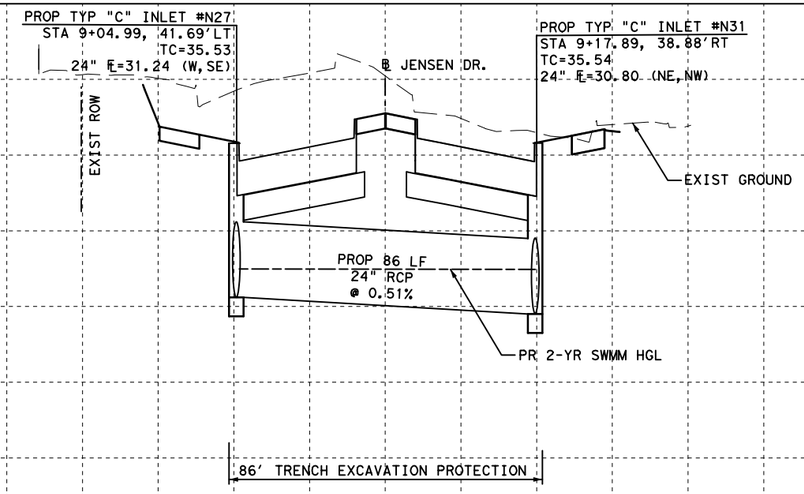
Texas Department of Transportation

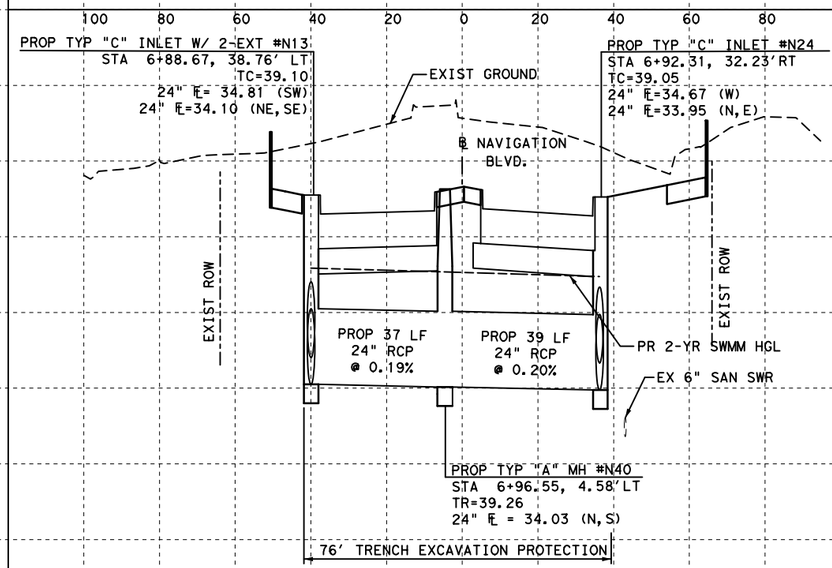
NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

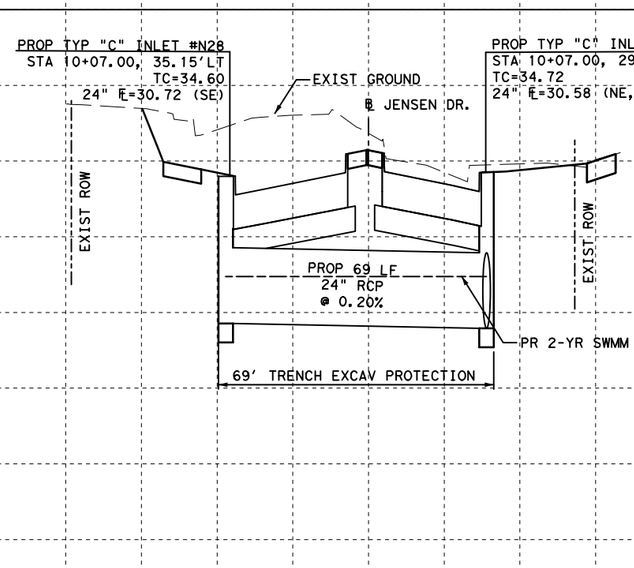
DRAINAGE PROFILE
STA 8+00 TO END PROJECT
(NORTHEAST APPROACH)

SHEET 10 OF 10

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	146







0' 20' 40'
(IN FEET)
SCALE: PLAN 1"=20'
PROFILE 1"=10'

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125563
LICENSED
PROFESSIONAL ENGINEER

06/08/2022 Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

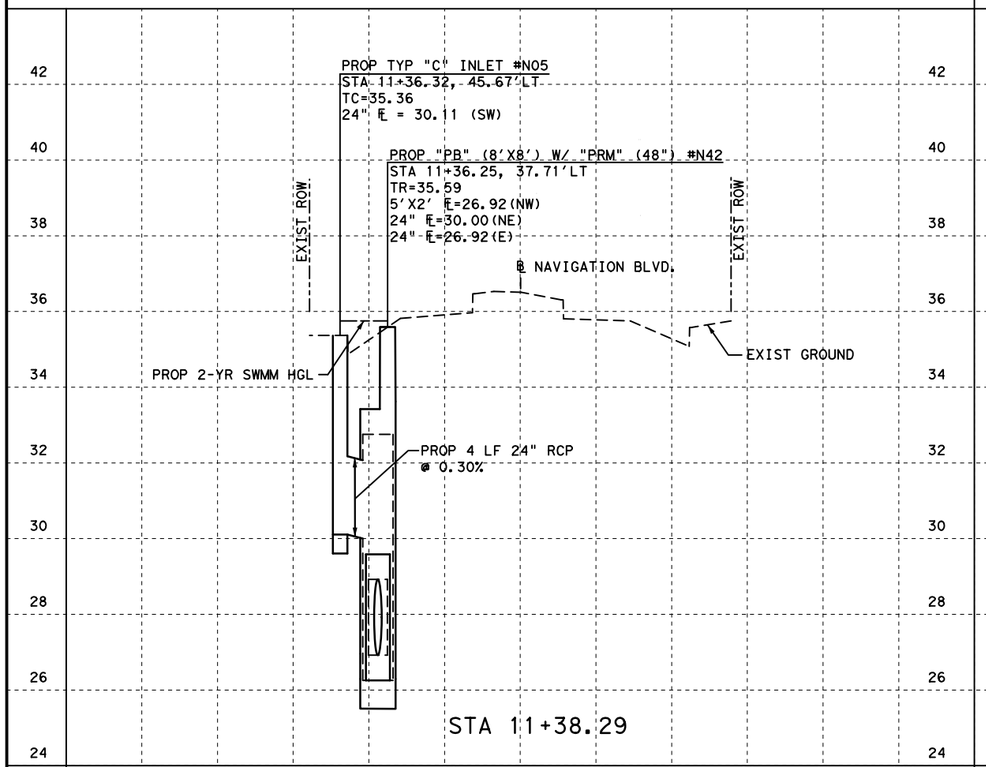
Gauge ENGINEERING
11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

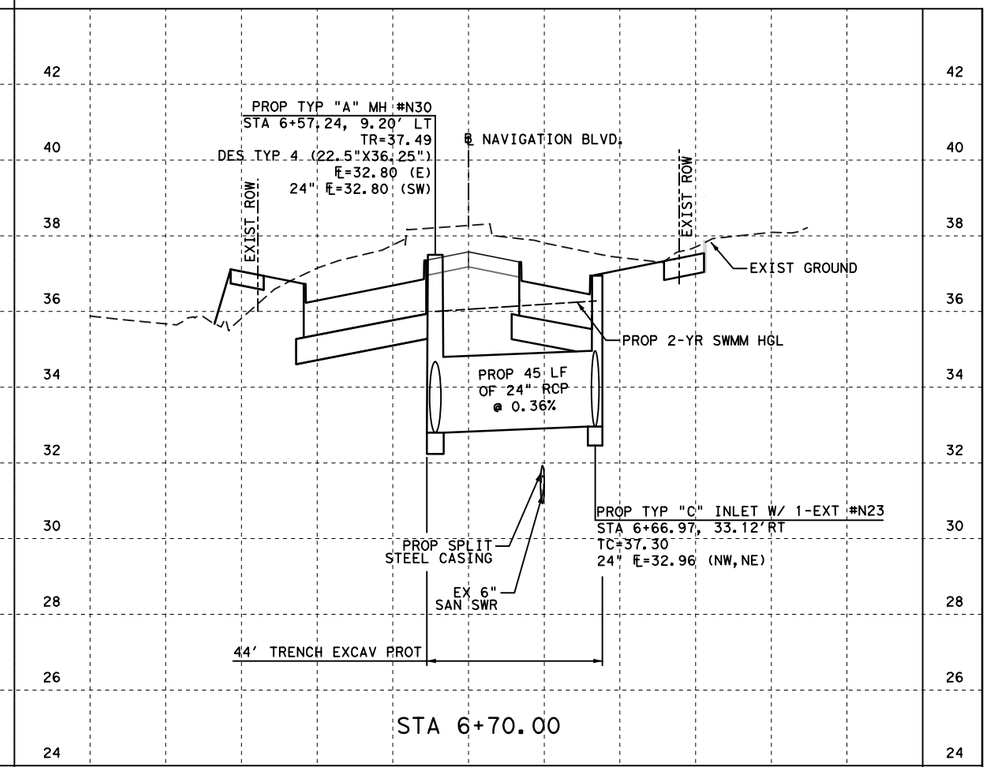
NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

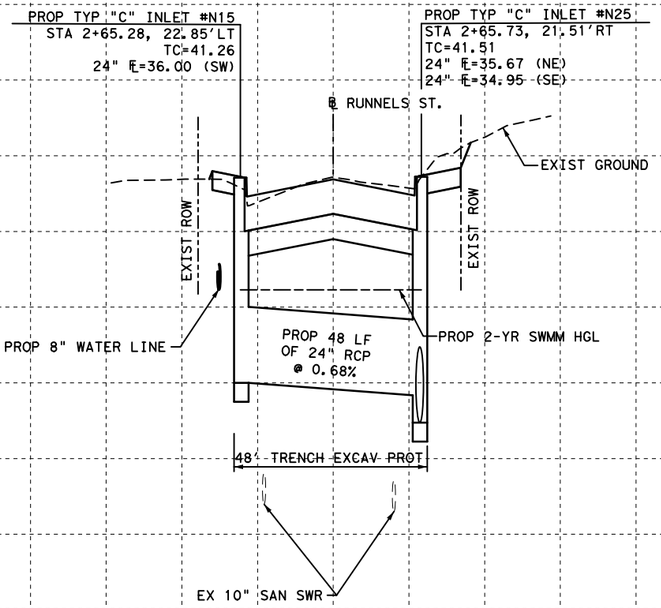
NAVIGATION BLVD. & JENSEN DR. STORM SEWER LATERALS

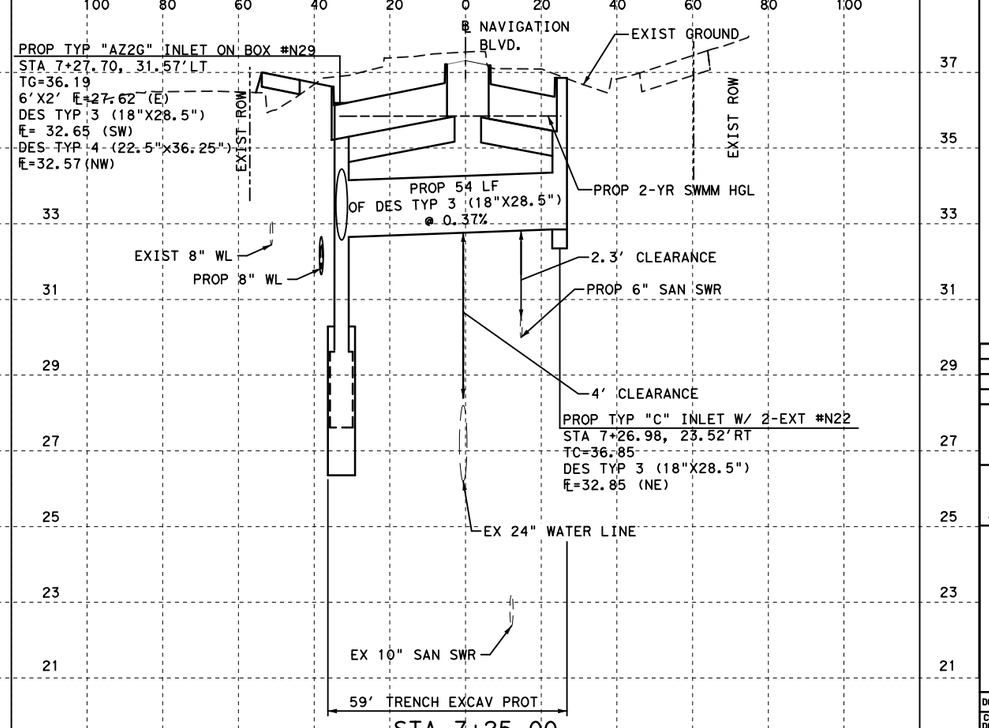
SHEET 1 OF 2

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	147









0' 20' 40'
(IN FEET)
SCALE: PLAN 1"=20'
PROFILE 1"=10'

STATE OF TEXAS
DAVID G. GREANEY
125563
LICENSED
PROFESSIONAL ENGINEER

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NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

RUNNELS ST. & NAVIGATION BLVD. STORM SEWER LATERALS

SHEET 2 OF 2

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	148

SYSTEM 1

2-YR RUNOFF COMPUTATIONS

ID	C	AREA (AC)	Tc (MIN)	Tc USED (MIN)	I (IN/HR)	Q (CFS)
J01	0.73	0.46	10.00	10.00	5.74	1.92
J02	0.89	0.31	10.00	10.00	5.74	1.56
N32	0.75	0.43	10.00	10.00	5.74	1.84
N28	0.57	0.90	11.00	11.00	5.55	2.84
N31	0.75	0.17	10.00	10.00	5.74	0.75
N27	0.75	0.20	10.00	10.00	5.74	0.86
N35	0.78	0.36	10.00	10.00	5.74	1.62
N12	0.83	0.20	10.00	10.00	5.74	0.97
N26	0.68	0.14	10.00	10.00	5.74	0.55

2-YR NODE CUMULATIVE RUNOFF COMPUTATIONS

ID	TYPE		CUMULATIVE DR. AREA (AC)	CUMULATIVE C VALUE	CUMULATIVE Tc (HR)	CUMULATIVE I (IN/HR)	CUMULATIVE DISCHARGE (CFS)
N26	Curb	TYCCI5	0.14	0.68	12.27	Hydrograph - N/A	0.55
N12	Junction	MH4D	0.35	0.77	12.15	Hydrograph - N/A	0.97
N45	Junction	MH4D	0.35	0.77	12.16	Hydrograph - N/A	1.56
N35	Curb	TYCCI5	0.71	0.77	12.16	Hydrograph - N/A	3.01
N27	Curb	TYCCI5	0.91	0.77	12.18	Hydrograph - N/A	3.84
N31	Curb	TYCCI5	1.08	0.77	12.18	Hydrograph - N/A	4.52
N28	Curb	TYCCI5	1.98	0.68	12.19	Hydrograph - N/A	2.84
N32	Curb	TYCCI5	2.41	0.69	12.19	Hydrograph - N/A	9.28
J01	Curb	TYCC5	2.86	0.70	12.19	Hydrograph - N/A	1.92
J02	Grate	TYCC5	3.17	0.72	12.19	Hydrograph - N/A	1.56
J03	Junction	MH4D	3.17	0.72	12.19	Hydrograph - N/A	10.77
J04	Junction	MH4D	3.17	0.72	12.19	Hydrograph - N/A	12.62
J-04	Outfall	MH4D	3.17	0.72	12.19	Hydrograph - N/A	12.62

RAINFALL FRQUENCY	B	D(MIN.)	E
2-YEAR	66.7210	12.7018	0.7854

HARRIS COUNTY ZONE 1 ATLAS 14 RAINFALL FROM TXDOT 2019
EBDLKUP-2019-VC6.2.10.XLSM
10 MINUTE MINIMUM TIME OF CONCENTRATION

ON GRADE INLET CONFIGURATION DATA

ID	INLET TYPE	INLET LENGTH (FT)	GRATE LENGTH	CURB LENGTH	LONGITUDINAL SLOPE (FT/FT)	TRANSVERSE SLOPE (FT/FT)	GUTTER N	GUTTER DEPR. (FT)	GRATE WIDTH	GRATE TYPE	PONDED WIDTH ALLOWED (FT)
N31	Curb	5.0	n/a	5	0.022	0.0228	0.015	0.25	n/a	n/a	12
N27	Curb	5.0	n/a	5	0.019	0.0200	0.015	0.25	n/a	n/a	12
N35	Curb	5.0	n/a	5	0.025	0.0144	0.015	0.25	n/a	n/a	12
N26	Curb	5.0	n/a	5	0.019	0.0200	0.015	0.25	n/a	n/a	12

2 - YEAR ON GRADE INLET COMPUTATION DATA

ID	TYPE	TOTAL Q (CFS)	INTERCEPT CAPACITY (CFS)	BYPASS FLOW (CFS)	TO INLET ID	ACTUAL LENGTH	PONDED WIDTH (FT)
N31	Curb	0.774	0.774	0.00	N32	5.0	1.5
N27	Curb	1.105	1.105	0.00	N28	5.0	3.2
N35	Curb	1.088	1.086	0.00	N27	5.0	2.9
N26	Curb	0.569	0.569	0.00	N35	5.0	1.3

SAG INLET CONFIGURATION DATA

ID	INLET TYPE	LENGTH (FT)	GRATE		LEFT-SLOPE		RIGHT-SLOPE		GUTTER		HEAD ALLOWED (FT)
			PERIMETER (FT)	AREA (SF)	LONG (FT/FT)	TRANSV (FT/FT)	LONG (FT/FT)	TRANSV (FT/FT)	N	DEPR WIDTH (FT)	
J01	Curb	5.0	n/a	n/a	0.0023	0.0390	0.0142	0.0390	0.015	1.5	0.50
J02	Curb	5.0	n/a	n/a	0.0073	0.0420	0.0030	0.0420	0.015	1.5	0.50
N32	Curb	5.0	n/a	n/a	0.0240	0.0200	0.0050	0.0200	0.015	1.5	0.50
N28	Curb	5.0	n/a	n/a	0.0240	0.0200	0.0050	0.0200	0.015	1.5	0.50

2 - YEAR SAG INLET COMPUTATION DATA

ID	TYPE	LENGTH (FT)	GRATE		TOTAL Q (CFS)	INLET CAPACITY	ACTUAL HEAD (FT)	PONDED WIDTH
			PERIMETER (FT)	AREA (SF)				
J01	Curb	5.0	n/a	n/a	1.98	6.26	0.23	7.75**
J02	Curb	5.0	n/a	n/a	1.59	6.26	0.20	6.36**
N32	Curb	5.0	n/a	n/a	1.82	6.26	0.22	6.07
N28	Curb	5.0	n/a	n/a	2.49	6.26	0.27	5.28

**NOTE: EXIST INLET TO REMAIN

PIPE CONFIGURATION

ID	US NODE	DS NODE	US FLOWLINE	DS FLOWLINE	SHAPE	#	SPAN (FT)	RISE (FT)	LENGTH (FT)	SLOPE (%)	N VALUE
J04-OUT	J-04	J-OUT	30.08	28.71	Circular	1	n/a	1.5	47.9	2.86	0.013
J01	J01	J-04	30.29	30.19	Circular	1	n/a	1.5	40.4	0.25	0.013
J02	J02	J-04	30.21	30.19	Circular	1	n/a	1.5	15.8	0.13	0.013
J03	J03	J-04	30.22	30.08	Circular	1	n/a	2.0	21.7	0.64	0.013
N32	N32	J03	30.58	30.22	Circular	1	n/a	2.0	187.1	0.19	0.013
N28	N28	N32	30.72	30.58	Circular	1	n/a	2.0	68.6	0.20	0.013
N31	N31	N32	30.80	30.58	Circular	1	n/a	2.0	103.7	0.21	0.013
N27	N27	N31	31.24	30.80	Circular	1	n/a	2.0	85.7	0.51	0.013
N35	N35	N27	31.52	31.24	Circular	1	n/a	2.0	72.1	0.39	0.013
N45	N45	N35	32.76	32.50	Circular	1	n/a	2.0	67.6	0.38	0.013
N12	N12	N45	36.50	36.00	Circular	1	n/a	1.0	129.3	0.39	0.011
N26	N26	N45	32.98	32.76	Circular	1	n/a	2.0	39.9	0.55	0.013

HYDRAULIC COMPUTATIONS - 2 YEAR

TAILWATER = 29.67

ID	HYD GRADE LINE		CRIT ELEV (FT)	FR SLOPE (FT/FT)	DEPTH		VELOCITY		Q (CFS)	CAP (CFS)	JUNC LOSS (FT)
	US (FT)	DS (FT)			UNIF (FT)	ACTUAL (FT)	UNIF (FT/S)	ACTUAL (FT/S)			
N26	33.26	33.26	38.39	0.0050	0.26	0.45	2.42	1.48	0.6	17.4	0.00
N12	36.72	36.72	41.70	0.0040	0.43	0.51	3.11	2.07	1.0	2.8	0.00
N45	33.21	33.21	40.70	0.0040	0.46	0.48	2.88	2.37	1.6	14.6	0.00
N35	32.16	32.16	35.20	0.0040	0.59	1.50	3.42	1.16	2.7	15.1	0.00
N27	31.98	31.98	35.00	0.0050	0.66	1.82	4.17	1.37	3.8	17.4	0.00
N31	31.99	31.99	34.10	0.0020	0.92	2.00	3.20	1.45	4.5	11.2	0.00
N28	31.95	31.95	34.10	0.0020	0.68	2.00	2.67	0.79	2.5	11.0	0.00
N32	31.93	31.93	34.21	0.0020	1.47	1.98	3.37	2.65	8.3	10.2	0.00
J01	31.00	31.00	33.84	0.0020	0.66	1.50	2.64	1.12	2.0	5.4	0.00
J02	31.08	31.08	33.49	0.0010	0.70	1.50	1.96	0.90	1.6	3.7	0.00
J03	31.02	31.02	33.25	0.0020	1.29	1.93	3.88	2.66	8.3	12.2	0.00
J04-OUT	31.97	31.97	33.25	0.0290	0.86	1.21	10.63	6.34	11.2	19.1	0.00

NOTE:

1. SEE DRAINAGE IMPACT ANALYSIS, APRIL 2022, FOR SWMM ANALYSIS AND ADDITIONAL INFORMATION.
2. SEE PROPOSED DRAINAGE AREA MAP, DRAINAGE PLAN & PROFILE SHEETS, AND STORM SEWER LATERALS FOR ADDITIONAL INFORMATION.

6/8/2022

STATE OF TEXAS
PATRICK W. PHILLIPS
92917
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NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

2-YR STORM SEWER COMPUTATIONS

SHEET 1 OF 3

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	149

SYSTEM 2

2-YR RUNOFF COMPUTATIONS

ID	C	AREA (AC)	Tc (MIN)	Tc USED (MIN)	I (IN/HR)	Q (CFS)
N05	0.81	0.68	10.00	10.00	5.74	3.16
N30	0.76	0.19	10.00	10.00	5.74	0.82
N06	0.71	1.15	10.00	10.00	5.74	4.71
N22	0.86	1.11	10.00	10.00	5.74	5.47
N18	0.76	0.36	10.00	10.00	5.74	1.59
N23	0.81	0.54	10.00	10.00	5.74	2.53
N44	0.87	0.44	10.00	10.00	5.74	2.20
N17	0.76	1.58	10.00	10.00	5.74	6.91
N24	0.70	0.22	10.00	10.00	5.74	0.88
N34	0.84	0.36	10.00	10.00	5.74	1.74
N13	0.71	0.21	10.00	10.00	5.74	0.86
N33	0.83	0.58	10.00	10.00	5.74	2.76
N14	0.76	0.10	10.00	10.00	5.74	0.44
N19	0.78	0.13	3.21	10.00	5.30	0.53
N25	0.90	0.19	10.00	10.00	5.74	0.97
N15	0.89	0.19	10.00	10.00	5.74	0.96

2-YR NODE CUMULATIVE RUNOFF COMPUTATIONS

ID	TYPE		CUMULATIVE DR. AREA (AC)	CUMULATIVE C VALUE	CUMULATIVE Tc (HR)	CUMULATIVE I (IN/HR)	CUMULATIVE DISCHARGE (CFS)
N15	Curb	TYCCI5	0.19	0.89	12.15	Hydrograph - N/A	0.96
N25	Curb	TYCCI5	0.38	0.89	12.22	Hydrograph - N/A	2.01
N14	Curb	TYCCI15	1.41	0.85	12.21	Hydrograph - N/A	6.41
N19	Grate	TYPE A	1.41	0.85	12.24	Hydrograph - N/A	4.89
N13	Curb	C1CI15	4.06	0.84	12.29	Hydrograph - N/A	12.23
N33	Curb	TYCCI5	0.58	0.83	12.22	Hydrograph - N/A	2.76
N40	Junction	MH4D	4.06	0.84	12.21	Hydrograph - N/A	12.21
N34	Curb	C1CI5	0.36	0.84	12.15	Hydrograph - N/A	1.74
N36	Junction	MH4D	0.36	0.84	12.21	Hydrograph - N/A	1.74
N24	Curb	TYCCI5	4.64	0.83	12.23	Hydrograph - N/A	14.34
N44	Curb	TYCCI5	5.08	0.84	12.23	Hydrograph - N/A	16.14
N23	Curb	TYCCI10	5.62	0.83	12.23	Hydrograph - N/A	18.23
MH-N30	Junction	MH4D	5.62	0.83	12.23	Hydrograph - N/A	18.27
N30	Curb	TYCCI15	6.92	0.82	12.23	Hydrograph - N/A	23.83
N22	Curb	TYCCI15	1.11	0.86	12.23	Hydrograph - N/A	5.47
N06	Curb	TYCCI15	1.15	0.71	12.23	Hydrograph - N/A	4.71
N21	Junction	MH4D	3.10	0.81	12.23	Hydrograph - N/A	19.98
N05	Curb	TYCCI5	0.68	0.81	12.23	Hydrograph - N/A	3.16
N42	Junction	MH4D	7.41	0.82	12.23	Hydrograph - N/A	32.82
N04	Junction	MH4D	33.96	0.18	12.23	Hydrograph - N/A	32.82
N41	Junction	MH4D	41.38	0.79	12.23	Hydrograph - N/A	35.82
N03	Junction	MH4D	41.38	0.79	12.23	Hydrograph - N/A	33.81
N02	Junction	MH4D	47.52	0.79	12.38	Hydrograph - N/A	50.78
N01B	Junction	MH4D	52.98	0.76	12.38	Hydrograph - N/A	62.58
N01A	Junction	MH4D	56.33	0.75	12.38	Hydrograph - N/A	69.23
N00.1	Junction	MH4D	56.33	0.76	12.38	Hydrograph - N/A	69.23
N-OUT	Outlet	OUTLET	56.33	0.75	12.38	Hydrograph - N/A	69.23

NOTE:

1. SEE DRAINAGE IMPACT ANALYSIS, APRIL 2022, FOR SWMM ANALYSIS AND ADDITIONAL INFORMATION.
2. SEE PROPOSED DRAINAGE AREA MAP, DRAINAGE PLAN & PROFILE SHEETS, AND STORM SEWER LATERALS FOR ADDITIONAL INFORMATION.

ON GRADE INLET CONFIGURATION DATA

ID	INLET TYPE	INLET LENGTH (FT)	GRATE LENGTH	CURB LENGTH	LONGITUDINAL SLOPE (FT/FT)	TRANSVERSE SLOPE (FT/FT)	GUTTER N	GUTTER DEPR. (FT)	GRATE WIDTH	GRATE TYPE	PONDED WIDTH ALLOWED (FT)
N29	Grate	6.0	6	n/a	0.004	0.0200	0.015	n/a	2.83	Parallel 1 7/8 - 4	12
N22	Curb	15.0	n/a	15	0.004	0.0200	0.015	0.25	n/a	n/a	12
N18	Grate	2.5	2.5	n/a	0.110	0.0010	0.015	n/a	2.5	Reticuline	12
N23	Curb	10.0	n/a	10	0.018	0.0118	0.015	0.25	n/a	n/a	12
N44	Curb	5.0	n/a	5	0.009	0.0122	0.015	0.25	n/a	n/a	14
N24	Curb	5.0	n/a	5	0.039	0.0104	0.015	0.25	n/a	n/a	12
N34	Curb	5.0	n/a	5	0.009	0.0200	0.015	0.25	n/a	n/a	12
N13	Curb	15.0	n/a	15	0.016	0.0084	0.015	0.25	n/a	n/a	12
N33	Curb	5.0	n/a	5	0.009	0.0300	0.015	0.25	n/a	n/a	12
N14	Curb	15.0	n/a	15	0.019	0.0200	0.015	0.25	n/a	n/a	12
N25	Curb	5.0	n/a	5	0.019	0.0145	0.015	0.25	n/a	n/a	12
N15	Curb	5.0	n/a	5	0.019	0.0310	0.015	0.25	n/a	n/a	12

2 - YEAR ON GRADE INLET COMPUTATION DATA

ID	TYPE	TOTAL Q (CFS)	INTERCEPT CAPACITY (CFS)	BYPASS FLOW (CFS)	TO INLET ID	ACTUAL LENGTH	PONDED WIDTH (FT)
N29	Curb	0.862	0.857	0.01	N05	6.0	5.8
N22	Curb	5.35	5.35	0.00	N06	15.0	15.11*
N18	Curb	1.796	0.324	1.47	N06	2.5	36.51**
N23	Curb	2.553	2.553	0.00	N22	10.0	9.8
N44	Curb	2.444	2.275	0.17	N23	5.0	11.6
N24	Curb	0.674	0.674	0.00	N44	5.0	1.3
N34	Curb	2.145	2.081	0.06	N24	5.0	7.8
N13	Curb	1.113	1.113	0.00	N35	15.0	6.2
N33	Curb	2.934	2.712	0.22	N13	5.0	7.2
N14	Curb	0.556	0.556	0.00	N19	15.0	1.3
N25	Curb	1.032	1.032	0.00	N14	5.0	3.4
N15	Curb	1.024	1.024	0.00	N26	5.0	2.4

NOTES:
* UTILITIES CONSTRAIN LOCATION OF INLET LOCATION. CANNOT REDUCE PONDING WIDTH.
** EXIST INLET TO REMAIN

SAG INLET CONFIGURATION DATA

ID	INLET TYPE	LENGTH (FT)	GRATE		LEFT-SLOPE		RIGHT-SLOPE		GUTTER		HEAD ALLOWED (FT)
			PERIMETER (FT)	AREA (SF)	LONG (FT/FT)	TRANSV (FT/FT)	LONG (FT/FT)	TRANSV (FT/FT)	N	DEPR WIDTH (FT)	
N05	Curb	5.0	n/a	n/a	0.0038	0.0500	0.0220	0.0500	0.015	1.5	0.50
N06	Curb	5.0	n/a	n/a	0.0087	0.0318	0.0043	0.0318	0.015	1.5	0.50
N19	Grate	0.0	17.7	9.083	0.0102	0.0112	0.0200	0.0112	0.015	n/a	0.50

2 - YEAR SAG INLET COMPUTATION DATA

ID	TYPE	LENGTH (FT)	GRATE		TOTAL Q (CFS)	INLET CAPACITY	ACTUAL HEAD (FT)	PONDED WIDTH
			PERIMETER (FT)	AREA (SF)				
N05	Curb	5.0	n/a	n/a	3.24	6.26	0.32	7.26
N06	Curb	5.0	n/a	n/a	6.34	5.13	0.51	16.06**
N19	Grate	0.0	17.66	9.08	0.62	9.64	0.08	7.14

**NOTE: EXIST INLET TO REMAIN

6/8/2022

PATRICK W. PHILLIPS 92917 LICENSED PROFESSIONAL ENGINEER STATE OF TEXAS

Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

Gauge ENGINEERING
11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

2-YR STORM SEWER COMPUTATIONS

SHEET 2 OF 3

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	150

SYSTEM 2 (CONT)

PIPE CONFIGURATION

ID	US NODE	DS NODE	US FLOWLINE	DS FLOWLINE	SHAPE	#	SPAN (FT)	RISE (FT)	LENGTH (FT)	SLOPE (%)	N VALUE
N41	N41	N-OUT	26.86	24.65	Circular	1	n/a	2.0	20.0	11.05	0.013
N04	N04	N41	27.04	26.86	Circular	1	n/a	2.0	18.3	0.98	0.013
N42	N42	N41	26.92	26.86	Circular	1	n/a	2.0	34.6	0.17	0.013
N21	N21	N04	28.97	28.94	Circular	1	n/a	1.5	31.7	0.09	0.013
N05	N05	N42	27.00	26.92	Circular	1	n/a	2.0	8.2	0.98	0.013
N29	N29	N42	27.62	27.57	Box	1	5	2.0	445.5	0.01	0.015
N06	N06	N21	29.12	28.97	Circular	1	n/a	1.5	62.2	0.24	0.013
N20	N20	N21	28.97	28.05	Circular	1	n/a	1.5	135.7	0.68	0.013
N22	N22	N29	32.85	32.65	Pipe-Arch	1	2.375	1.5	52.8	0.38	0.013
N30	N30	N29	32.80	32.59	Pipe-Arch	1	3.021	1.9	69.7	0.30	0.013
N10	N10	N20	29.03	28.97	Circular	1	n/a	1.5	88.1	0.07	0.013
N18	N18	N20	31.56	30.91	Circular	1	n/a	1.5	76.6	0.85	0.013
N23	N23	N30	32.96	32.80	Circular	1	n/a	2.0	43.4	0.37	0.013
N16	N16	N10	33.34	33.32	Circular	1	n/a	1.5	50.5	0.04	0.013
N44	N44	N23	33.06	32.96	Circular	1	n/a	2.0	50.6	0.20	0.013
N17	N17	N16	33.60	33.44	Circular	1	n/a	1.5	21.4	0.75	0.013
N24	N24	N44	33.95	33.06	Circular	1	n/a	2.0	104.7	0.85	0.013
N36	N36	N24	35.06	34.67	Circular	1	n/a	2.0	71.8	0.54	0.013
N40	N40	N24	34.03	33.95	Circular	1	n/a	2.0	35.1	0.23	0.013
N34	N34	N36	36.46	36.29	Circular	1	n/a	2.0	50.6	0.34	0.013
N13	N13	N40	34.10	34.03	Circular	1	n/a	2.0	37.2	0.19	0.013
N14	N19	N13	34.18	34.10	Circular	1	n/a	2.0	38.6	0.21	0.013
N33	N33	N13	35.20	34.81	Circular	1	n/a	2.0	138.3	0.28	0.013
N19	N14	N19	34.38	34.18	Circular	1	n/a	2.0	55.4	0.36	0.013
N25	N25	N14	34.95	34.38	Circular	1	n/a	2.0	146.9	0.39	0.013
N15	N15	N25	36.00	35.67	Circular	1	n/a	2.0	48.4	0.68	0.013

NOTE:

1. SEE DRAINAGE IMPACT ANALYSIS, APRIL 2022, FOR SWMM ANALYSIS AND ADDITIONAL INFORMATION.
2. SEE PROPOSED DRAINAGE AREA MAP, DRAINAGE PLAN & PROFILE SHEETS, AND STORM SEWER LATERALS FOR ADDITIONAL INFORMATION.

HYDRAULIC COMPUTATIONS - 2 YEAR — TAILWATER = 35.53

ID	HYD GRADE LINE US (FT)	HYD GRADE LINE DS (FT)	CRIT ELEV (FT)	FR SLOPE (FT/FT)	DEPTH UNIF (FT)	DEPTH ACTUAL (FT)	VELOCITY UNIF (FT/S)	VELOCITY ACTUAL (FT/S)	Q (CFS)	CAP (CFS)	JUNC LOSS (FT)
N15	38.46	38.46	40.76	0.0070	0.32	2.00	3.17	0.33	1.0	20.0	0.00
N25	38.46	38.46	41.01	0.0040	0.51	2.00	3.23	0.65	2.1	15.1	0.00
N14	38.44	38.44	38.31	0.0020	0.79	2.00	2.79	1.03	3.2	10.3	0.00
N19	37.75	37.75	41.75	0.0030	0.68	2.00	3.15	0.93	3.2	10.3	0.00
N33	37.20	37.20	41.75	0.0030	0.68	2.00	3.15	0.93	2.9	12.9	0.00
N13	37.16	37.16	38.23	0.0020	1.26	2.00	3.38	2.25	7.1	10.4	0.00
N40	37.05	37.05	39.26	0.0010	2.00	2.00	2.30	2.25	7.1	6.6	0.00
N34	37.00	37.00	41.60	0.0030	0.56	2.00	3.00	0.68	2.1	13.5	0.00
N36	36.97	36.97	38.29	0.0050	0.49	2.00	3.58	0.68	2.1	17.4	0.00
N24	36.95	36.95	38.28	0.0080	0.98	2.00	6.39	3.12	9.8	21.8	0.00
N44	36.54	36.54	38.00	0.0030	2.00	2.00	4.00	3.90	12.3	10.8	0.00
N23	36.28	36.28	35.92	0.0040	1.88	2.00	4.78	4.66	14.6	14.5	0.00
N22	35.85	35.85	35.24	0.0010	1.22	1.50	2.45	2.06	5.4	5.9	0.00
N30	35.84	35.84	34.21	0.0020	1.88	1.88	3.45	3.45	14.6	10.4	0.00
N29	35.84	35.84	35.55	0.0000	2.00	2.00	2.11	2.09	20.8	10.6	0.00
N05	35.74	35.74	34.95	0.0100	0.51	2.00	5.07	1.03	3.2	24.1	0.00
N42	35.75	35.75	35.24	0.0080	2.00	2.00	7.29	7.11	22.3	9.6	0.00
N17	36.00	36.00	37.66	0.0060	1.05	1.50	5.29	3.93	7.0	9.0	0.00
N16	35.90	35.90	35.84	0.0040	1.50	1.50	4.04	3.93	7.0	2.2	0.00
N10	35.88	35.88	37.12	0.0040	1.50	1.50	4.04	3.93	7.0	2.9	0.00
N18	35.87	35.87	37.91	0.0080	0.44	1.50	4.12	1.02	1.8	10.2	0.00
N20	35.86	35.86	37.38	0.0070	1.21	1.50	5.49	4.75	8.4	9.2	0.00
N06	35.82	35.82	34.94	0.0020	1.14	1.50	3.36	2.75	4.9	5.5	0.00
N21	35.78	35.78	36.05	0.0120	1.50	1.50	7.25	7.07	12.5	3.3	0.00
N04	35.82	35.82	36.04	0.0080	1.13	2.00	6.83	3.97	12.5	21.9	0.00
N41	35.76	35.76	35.24	0.1000	0.96	2.00	22.37	10.55	33.2	77.1	0.00

Patrick W. Phillips 6/8/2022

STATE OF TEXAS
PATRICK W. PHILLIPS
92917
LICENSED
PROFESSIONAL ENGINEER

Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

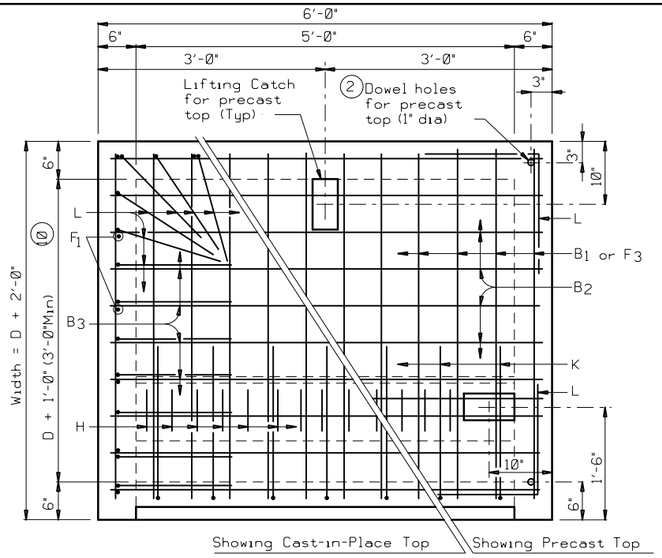
Gauge ENGINEERING
11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

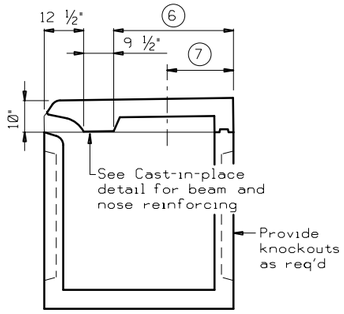
2-YR STORM SEWER COMPUTATIONS

SHEET 3 OF 3

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	151

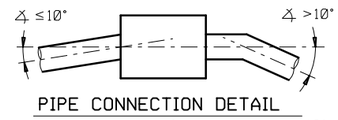


PLAN



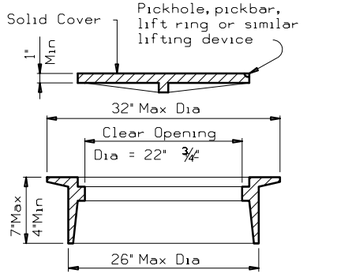
PREFABRICATED INLET

(6) For reinforcing steel and dimensions not shown, see fabricators shop drawings. Structure shall be of the size required to accommodate size of pipe shown elsewhere in the plans. Length of inlet = 6'-0"



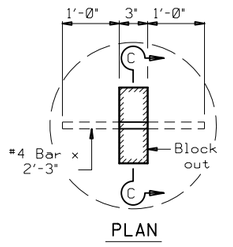
PIPE CONNECTION DETAIL

Connecting pipes should enter within 10° of normal to inlet wall. If necessary, pipe elbow or curved approach alignment should be used to stay within this limit.

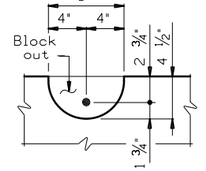


RING AND COVER DETAILS

EJIW No V-1814 or Neenah No R5900-FTX

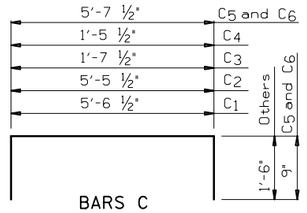


PLAN

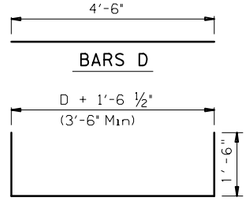


SECTION C-C

LIFTING CATCH



BARS C

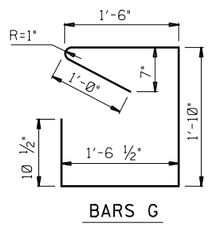


BARS D

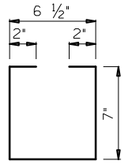
BARS E

REINF STEEL		
Bar	Size	Spacing
B1	#4	6"
B2	#5	6"
B3	#4	6"
C1-2	#4	12"
C3-4	#4	(9)
C5	#6	(9)
C6	#4	(9)
D	#4	(9)
E	#4	12"
F1-3	#4	12"
G	#4	6"
H	#3	4"
K	#4	9"
L	#4	6"

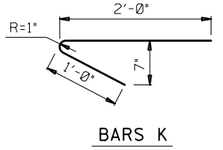
(9) As shown



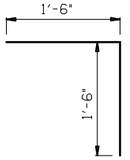
BARS G



BARS H



BARS K



BARS L

GENERAL NOTES:

No alternate designs nor alternate details shall be permitted for precast or cast in place inlets.

Quantities shown herein are for Contractor's information only. Unless otherwise shown in the plans, payment will be made for each inlet of the type specified and for each extension. Each five foot curb opening of extension is considered "one extension" regardless of whether placed monolithically or precast. Extension length shall be in multiples of 5 feet.

Engineer has the option of specifying cast-in-place top with ring and cover or removable precast top as specified elsewhere in plans. Shop drawings are required for Precast Inlets.

In areas of conflict between reinforcing steel, blockouts, pipes, anchor bolts or other reinforcing steel, the reinforcement shall be bent or adjusted to clear as directed by the Engineer.

Ring and cover shall conform to the requirements of AASHTO M306, "Standard Specification for Drainage Structure Castings". Materials shall conform to ASTM A48, Class 35B for gray iron castings or ASTM A536, Grade 65-45-12 for ductile iron castings. Aluminum alloy castings shall not be permitted.

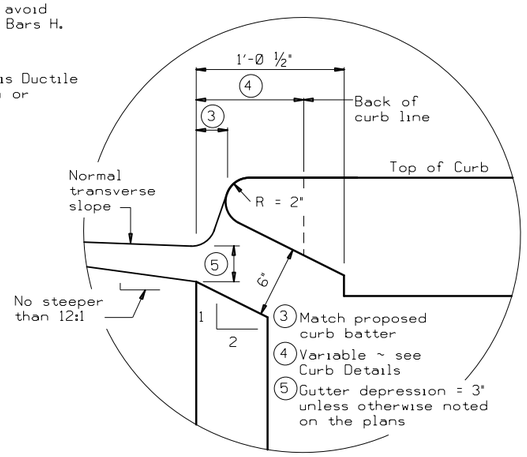
ELEVATION

(2) If precast top is used, provide 4 ~ ⅝" dia x 1'-6" smooth bars in inlet walls for 1" dia holes

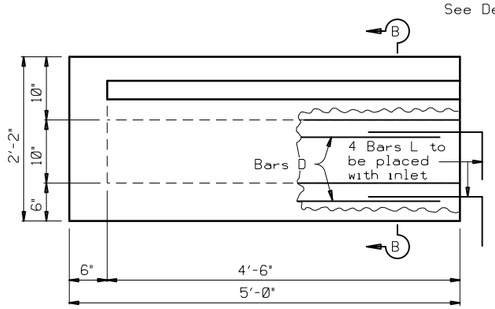
SECTION A-A

(7) 1'-6" Min, 1'-9" Max Adjust placement of Ring and Cover as necessary to avoid conflict with Bars H.

(8) Ladder rung is Ductile Iron, Aluminum or Cast Iron.

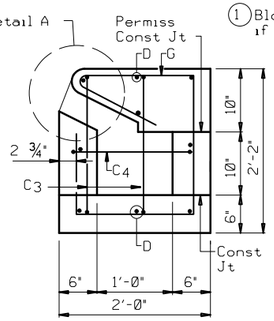


DETAIL A

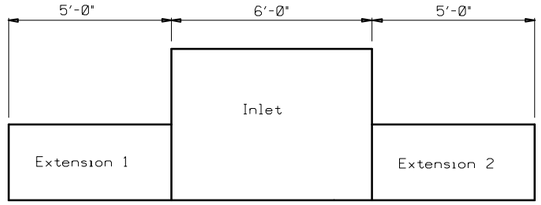


EXTENSION ELEVATION

(1) Block out to accommodate extension if used and to place 4 Bars L



SECTION B-B



Note: If more than one extension is required, they should be located as indicated above. No slope is required in flowline of extension.

EXTENSION PLACEMENT

INSTALL A 3 FT.(HORIZ.) x 6 IN.(VERT.) OPENING ON THE BACK OF THE INLET WHEN SPECIFIED ELSEWHERE ON THE PLANS. MOVE STEPS AS NEEDED. NO REINFORCING ON OPENING/ON 2 IN. ADJACENT TO OPENING.

DESIGNERS: CLARIFY FLOWLINE OF OPENING AND INCLUDE OPENING IN HYDRAULIC CALCULATIONS.

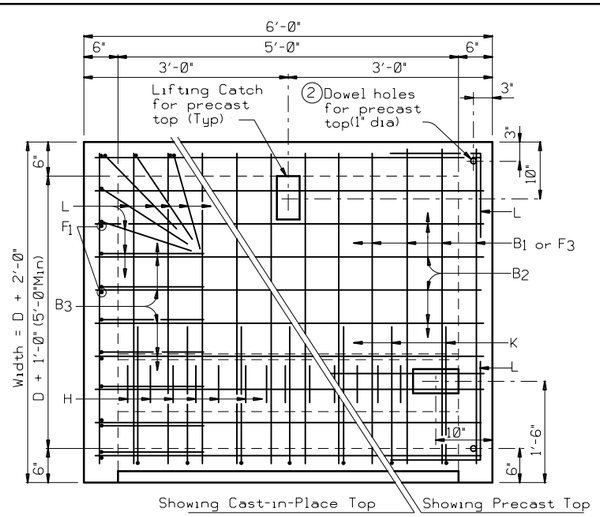
D = Diameter
R = Radius

Texas Department of Transportation
Houston District

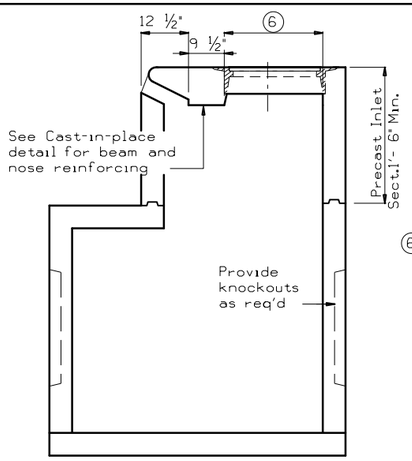
CURB INLET TYPE C
(WITH OR WITHOUT EXTENSION)

HIL-C

FILE: STDD1.DGN	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT	STD:	
© TxDOT Feb 2010	DIST	FED REG	PROJECT NO.			SHEET
REVISIONS 2/2010 Added note concerning opening on the back of inlet. 10/2014 Removed Note 10	HOUS	6	STP 1902 (308) MM			152
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	HARRIS		0912	72	386	CS

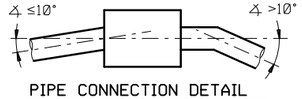


PLAN



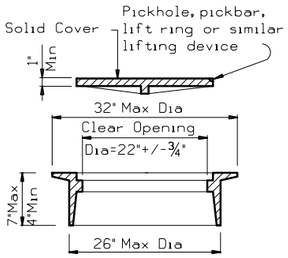
PREFABRICATED INLET

⑥ For reinforcing steel and dimensions not shown, see fabricator's shop drawings. Structure shall be of the size required to accommodate size of pipe shown elsewhere in the plans. Length of inlet = 5'-0"



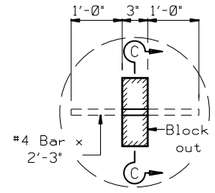
PIPE CONNECTION DETAIL

Connecting pipes should enter within 10° of normal to inlet wall. If necessary, pipe elbow or curved approach alignment should be used to stay within this limit.

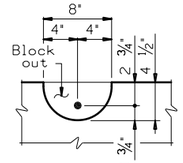


RING AND COVER DETAILS

EJIW No V-1814 or Neenah No R5900 FTX



PLAN

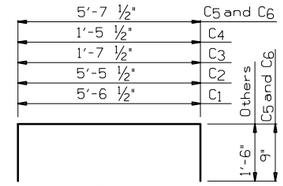


SECTION C-C

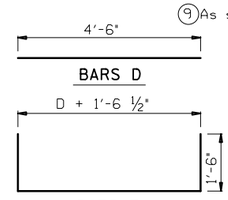
LIFTING CATCH

REINF STEEL		
Bar	Size	Spacing
B_1	#4	6"
B_2	#5	6"
B_3	#4	6"
C_{1-2}	#4	12"
C_{3-4}	#4	⑨
C_5	#6	⑨
C_6	#4	⑨
D	#4	⑨
E	#4	12"
F_{1-5}	#4	12"
G	#4	6"
H	#3	4"
K	#4	9"
L	#4	6"

⑨ As shown

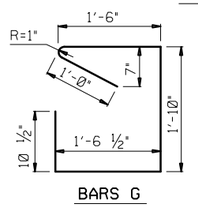


BARS C

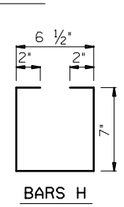


BARS D

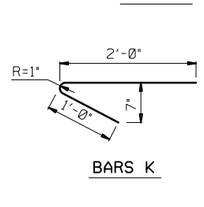
BARS E



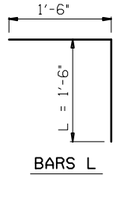
BARS G



BARS H



BARS K



BARS L

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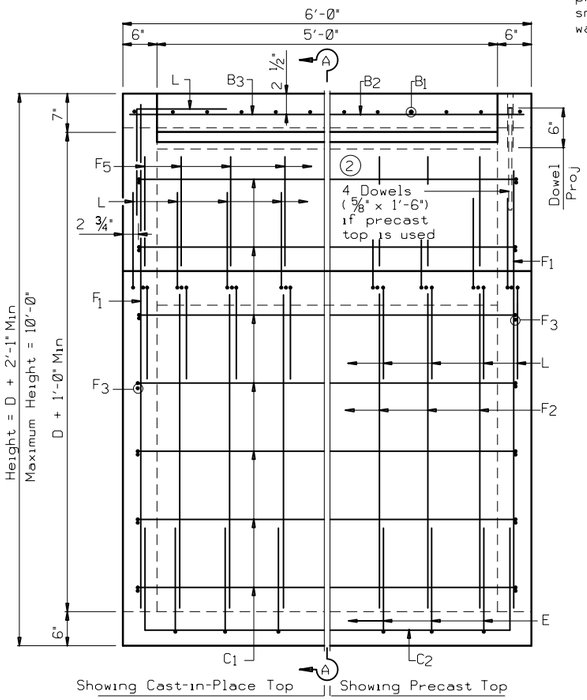
Shop drawings will be required for precast construction of inlets.

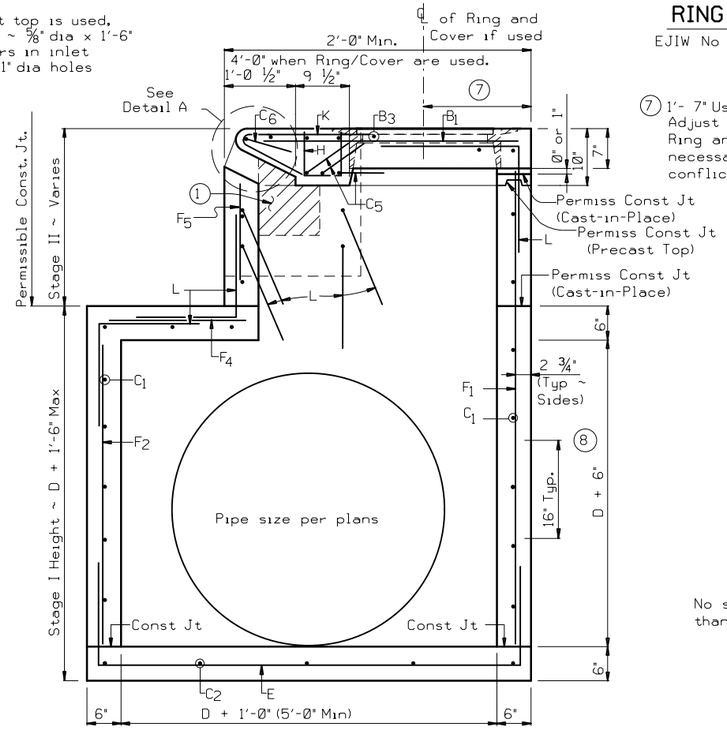
In areas of conflict between reinforcing steel, blockouts, pipes, anchor bolts or other reinforcing steel, the reinforcement shall be bent or adjusted to clear as directed by the Engineer.

Ring and cover shall conform to the requirements of AASHTO M306, "Standard Specification for Drainage Structure Castings". Materials shall conform to ASTM A48, Class 35B for gray iron castings or ASTM A536, Grade 65-45-12 for ductile iron castings. Aluminum alloy castings shall not be permitted.



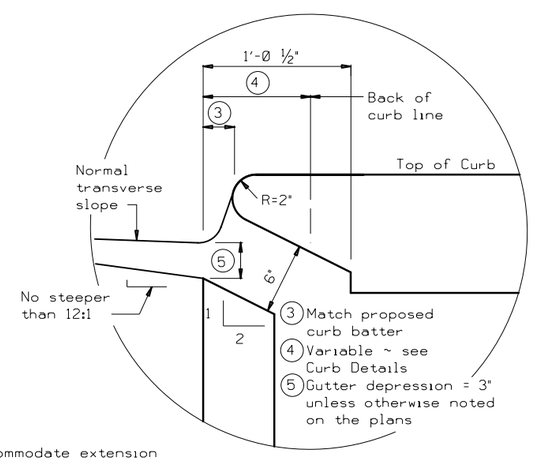
ELEVATION

② If precast top is used, provide 4 ~ ⅝" dia x 1'-6" smooth bars in inlet walls for 1" dia holes

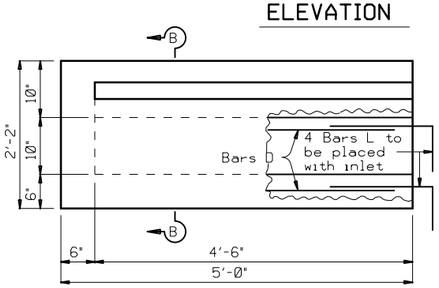


SECTION A-A

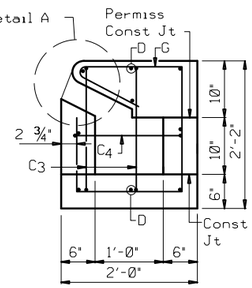
⑦ 1'- 7" Usual, Adjust placement of Ring and Cover as necessary to avoid conflict with Bars H.



DETAIL A

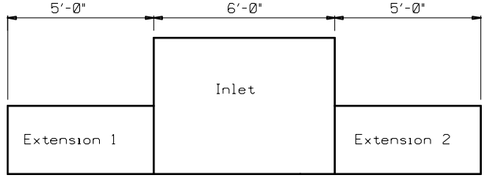


EXTENSION ELEVATION



SECTION B-B

① Block out to accommodate extension if used and to place 4 Bars L



Note: If more than one extension is required, they should be located as indicated above. No slope is required in flowline of extension.

EXTENSION PLACEMENT

INSTALL A 3 FT.(HORIZ.) x 6 IN.(VERT.) OPENING ON THE BACK OF THE INLET WHEN SPECIFIED ELSEWHERE ON THE PLANS. MOVE STEPS AS NEEDED. NO REINFORCING ON OPENING/ON 2 IN. ADJACENT TO OPENING.

DESIGNERS:
CLARIFY FLOWLINE OF OPENING AND INCLUDE OPENING IN HYDRAULIC CALCULATIONS.

D = Diameter
R = Radius

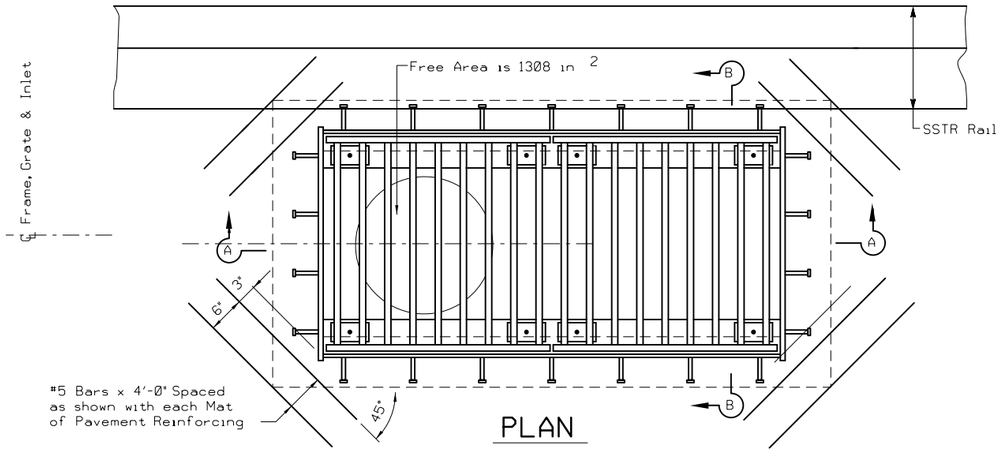
Texas Department of Transportation
Houston District

CURB INLET TYPE C1
(WITH OR WITHOUT EXTENSION)

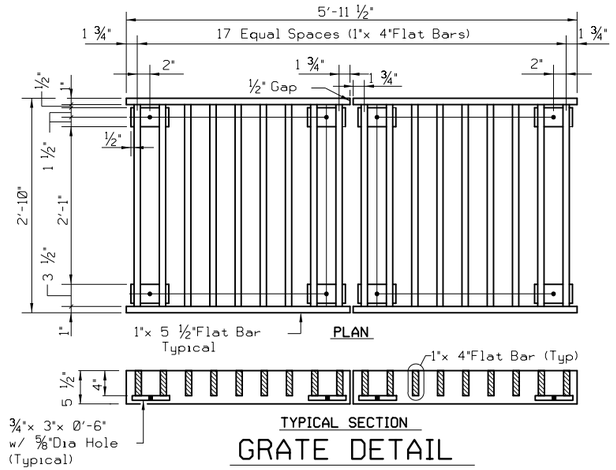
HIL-C1

FILE: STDD2.DGN	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT	STD:	
© TxDOT Feb 2010	DIST	FED REG	PROJECT NO.			SHEET
REVISIONS 2/2010 Note for alternate design and opening on the back of inlet. 10/2016 Removed ladder rung and wordings.	HOUS	6	STP 1902 (308) MM			153
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	HARRIS		0912	72	386	CS

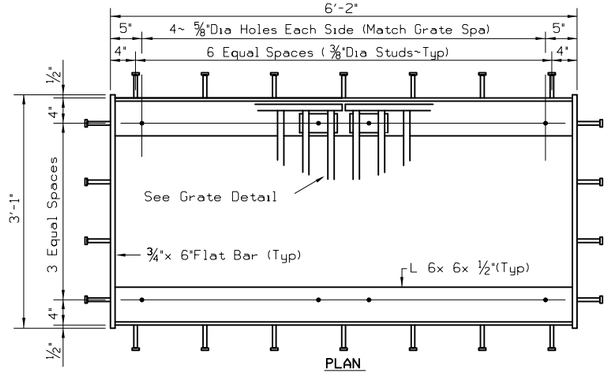
STDD2.DGN



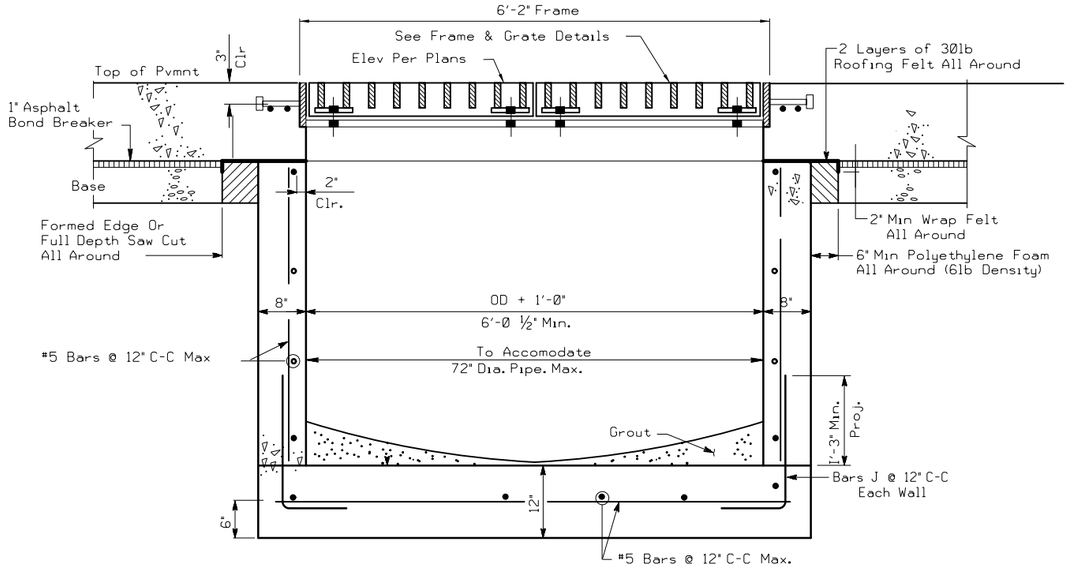
PLAN

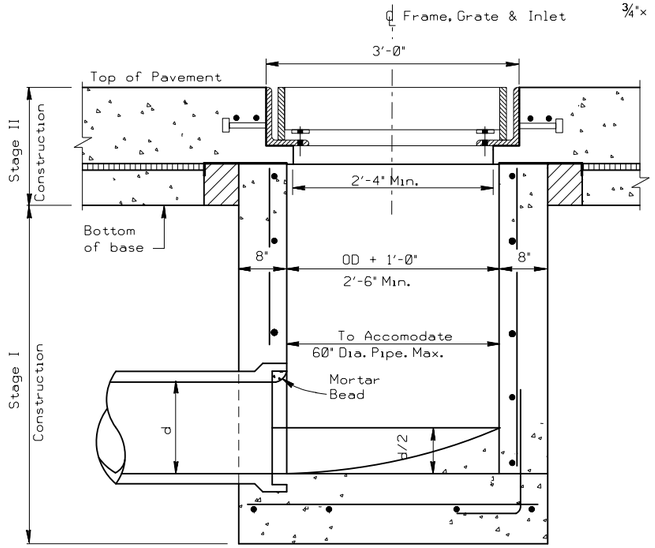


GRATE DETAIL

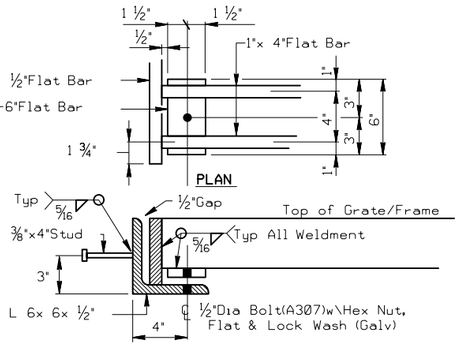


FRAME DETAIL

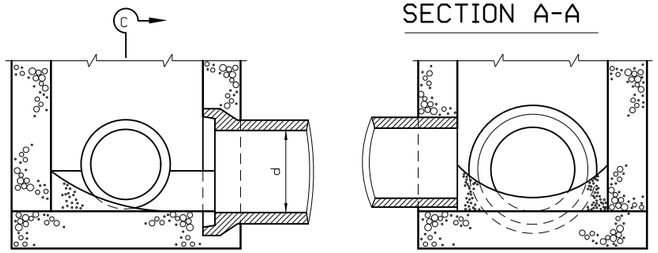




SECTION B-B



WELDMENT DETAIL

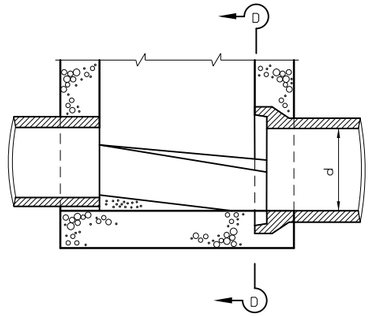


PART SECTION AT INVERT

Showing Shaping Of Invert, Pipe Entering From Adjacent Sides

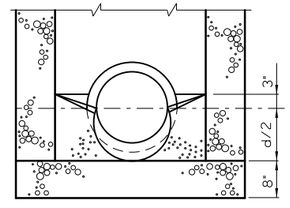
SECTION A-A

SECTION C-C

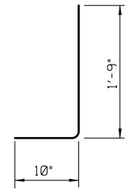


PART SECTION AT INVERT

Showing Shaping Of Invert, Pipe Entering From Opposite Sides



SECTION D-D



BARS J (#5)

d = Diameter

GENERAL NOTES:

All steel is ASTM-A36 and shall be galvanized after fabrication.

Cost Of Furnishing And Installing Frames, Grates, Additional Pavement Reinforcing, Roofing Felt And Polyethylene Foam Shall Be Included In The Unit Price Bid For The Type Of Inlet Selected.

All Concrete Shall Be Class C.

Shop Drawings Will Be Required For Precast Construction Of Inlets.

FOR TRAFFIC LOADS

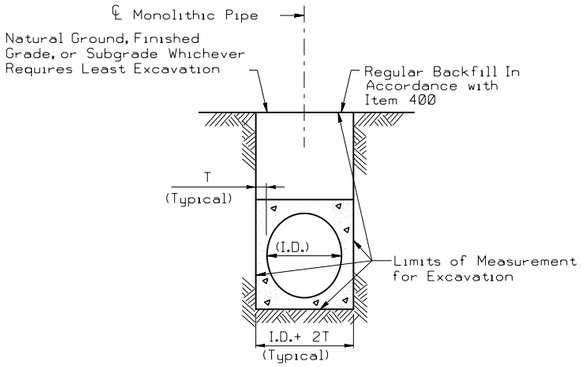
Texas Department of Transportation
Houston District

INLET TYPE AZ2G

HIL-AZ2G

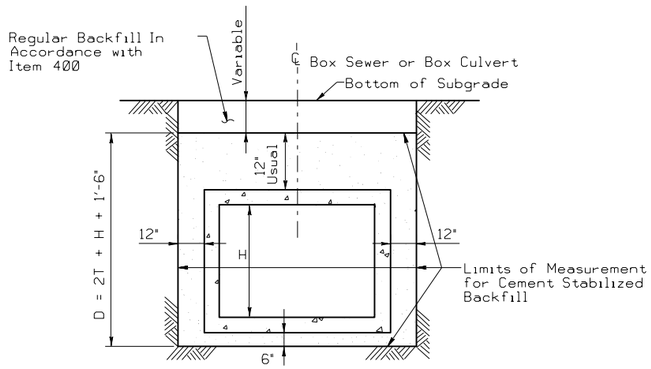
FILE: STDD7.DGN	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT	STD:	
©TxDOT Feb 2010	DIST	FED REG	PROJECT NO.			SHEET
REVISIONS	HOUS	6	STP 1902 (308) MM			154
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	HARRIS		0912	72	386	CS

STDD7.DGN



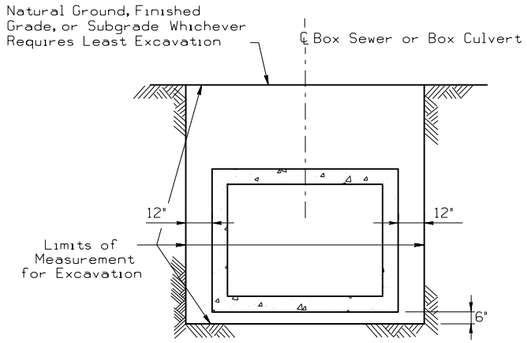
EXCAVATION DETAIL

MONOLITHIC PIPE
IN A PAVED OR GRADED AREA



BACKFILL DETAIL

BOX CULVERTS
IN A GRADED OR PAVED AREA
INCLUDING DETOURS *



EXCAVATION DETAIL

BOX CULVERTS
IN A GRADED AREA

REINFORCED CONCRETE PIPE

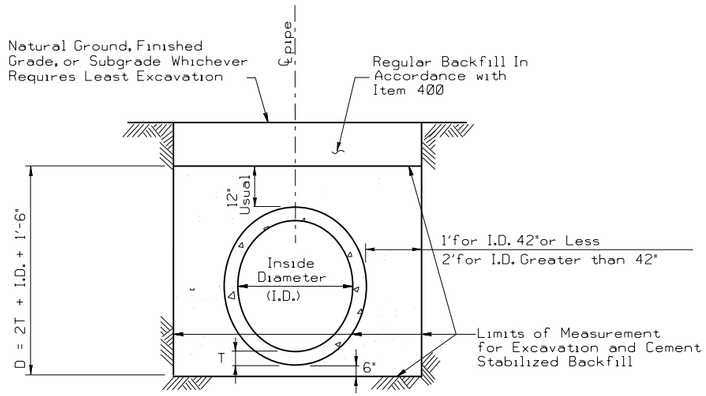
EXCAVATION AND BACKFILL QUANTITIES

PIPE DIA. IN.	T FT.	CULVERT OR SEWER EXCAVATION IN A PAVED OR GRADED AREA C.Y.PER L.F.PER FT.OF DEPTH	CEMENT STABILIZED BACKFILL IN A PAVED OR GRADED AREA C.Y.PER L.F. OF PIPE
18	0.19	0.144	0.383
24	0.23	0.165	0.478
30	0.29	0.188	0.586
36	0.33	0.210	0.692
42	0.38	0.231	0.808
48	0.42	0.327	1.394
54	0.46	0.349	1.560
60	0.50	0.370	1.731
66	0.54	0.392	1.907
72	0.58	0.414	2.088
78	0.62	0.435	2.275
84	0.67	0.457	2.474

MONOLITHIC PIPE

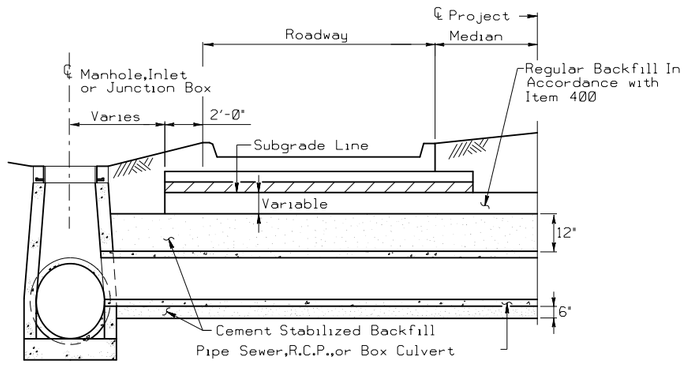
EXCAVATION QUANTITIES

PIPE DIA. IN.	T FT.	EXCAVATION C.Y.PER L.F.PER FT.OF DEPTH
36	0.417	0.142
42	0.458	0.164
48	0.458	0.182
54	0.500	0.204
60	0.583	0.228
66	0.583	0.247
72	0.625	0.269
78	0.625	0.287
84	0.625	0.306



EXCAVATION & BACKFILL DETAIL

REINFORCED CONCRETE PIPE
IN A GRADED OR PAVED AREA
INCLUDING DETOURS



BACKFILL DETAIL

AT MANHOLE, INLET OR JUNCTION BOX

D = Depth
H = Height
T = Thickness
R = Radius
Dia = Diameter

NOTE:

Cement stabilized backfill may be omitted in private driveways as indicated elsewhere in the plans.

Rubber gaskets shall be required for all joints on proposed cross drainage, pipe culverts and proposed storm sewer systems, unless otherwise shown in the plans.

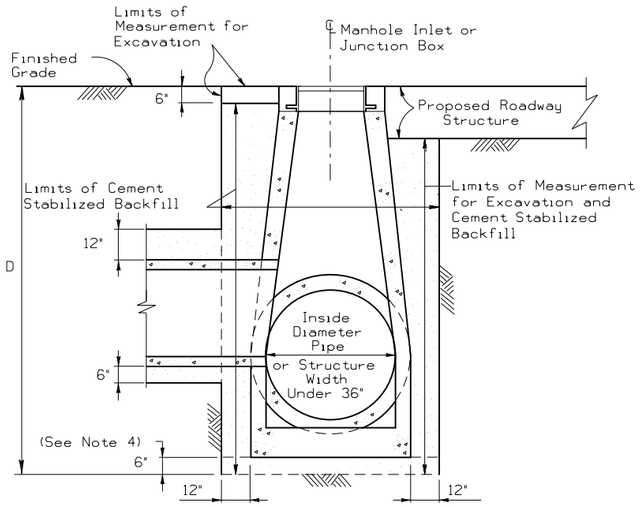
* Backfill with cement stabilized material will be required for all structures under detours unless noted otherwise in the General Notes.

Texas Department of Transportation
Houston District

EXCAVATION AND BACKFILL DIAGRAMS

E&BD

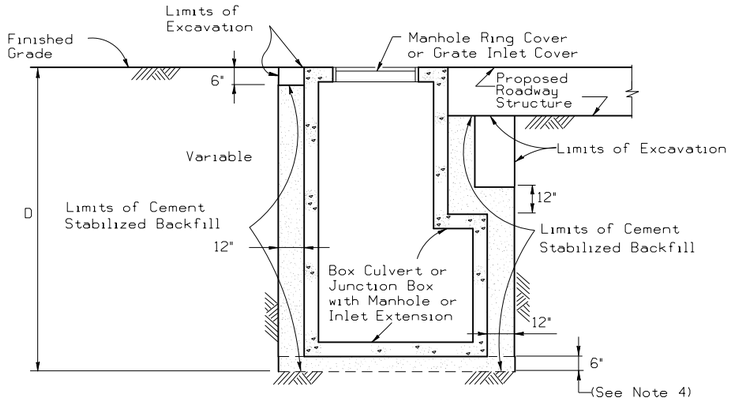
FILE: STDE1.DGN	DN: TxDot	CK: TxDot	DW: TxDot	CK: TxDot
© TxDOT FEB 2010	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS	HOUSTON	6	STP 1902 (308) MM	155
REVISED 11/05 REVISED 2/2010 Added note to Table 1,Sht 2 of 2. REVISED 6/12 REVISED 9/14	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	HARRIS	0912	72	386	CS



EXCAVATION AND BACKFILL DETAIL

MANHOLES SMALLER THAN 36 IN.
IN A PAVED OR GRADED AREAS

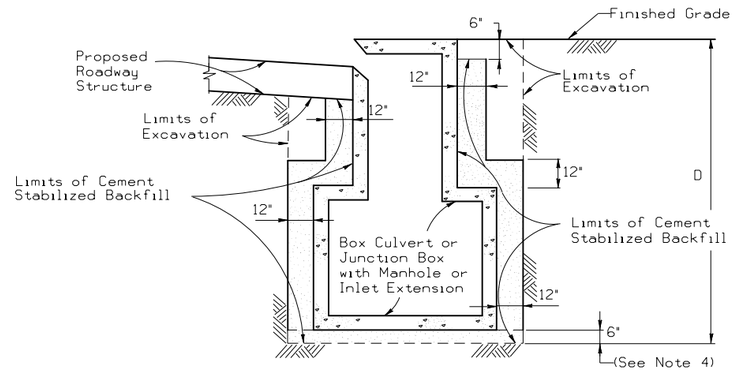
N.T.S.



EXCAVATION AND BACKFILL DETAIL

JUNCTION BOXES IN A
PAVED OR GRADED AREA

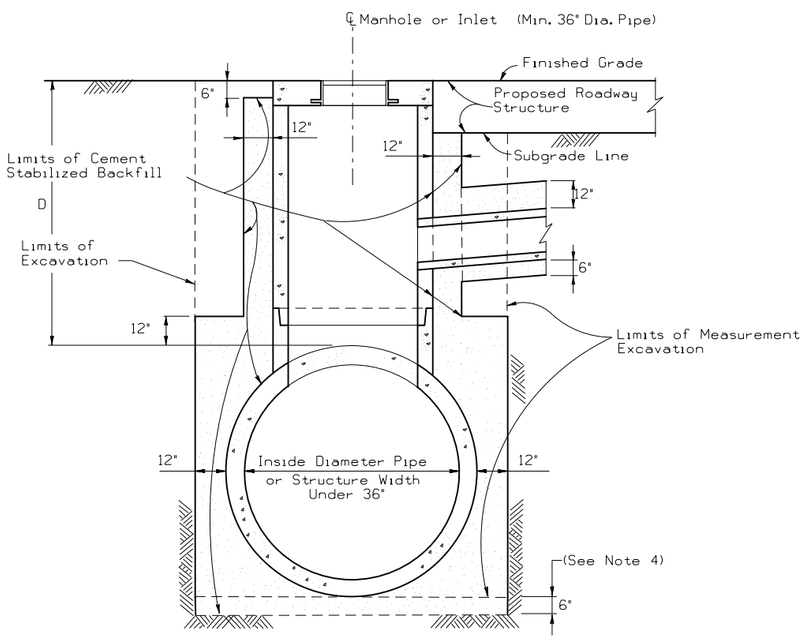
N.T.S.



EXCAVATION AND BACKFILL DETAIL

INLET EXTENSIONS ON A BOX CULVERT
IN A PAVED OR GRADED AREA

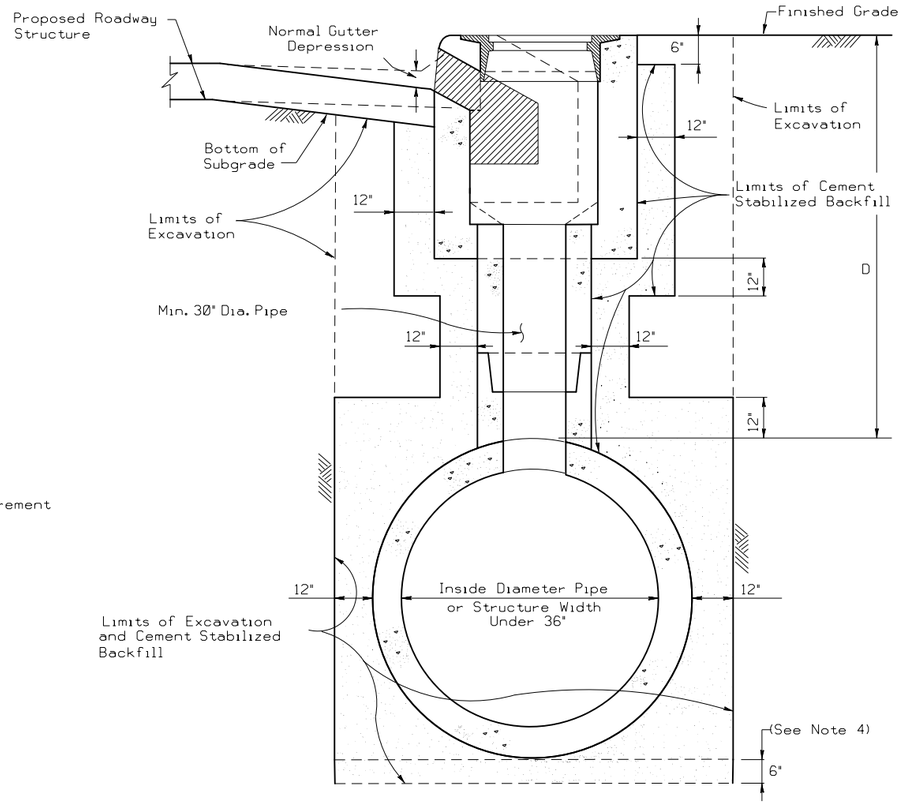
N.T.S.



EXCAVATION AND BACKFILL DETAIL

MANHOLES 36 IN. AND GREATER
IN A PAVED OR GRADED AREA

N.T.S.



EXCAVATION AND BACKFILL DETAIL

CURB INLETS IN A PAVED OR GRADED AREA

N.T.S.

D = Depth
H = Height
T = Thickness
R = Radius
Dia = Diameter

TABLE I

SCHEDULE FOR PAY QUANTITIES OF CEMENT STABILIZED BACKFILL (SEE NOTE 1)

MANHOLE OR INLET DEPTH (D) IN FEET	CEMENT STABILIZED BACKFILL IN CUBIC YARDS
Ø through 5	5.75
> 5 through 10	8.25
greater than 10	12.75

TO BE PAID UNDER ITEM 400-6009 CEMENT STABILIZED BACKFILL (INLET OR MANHOLE)

NOTES:

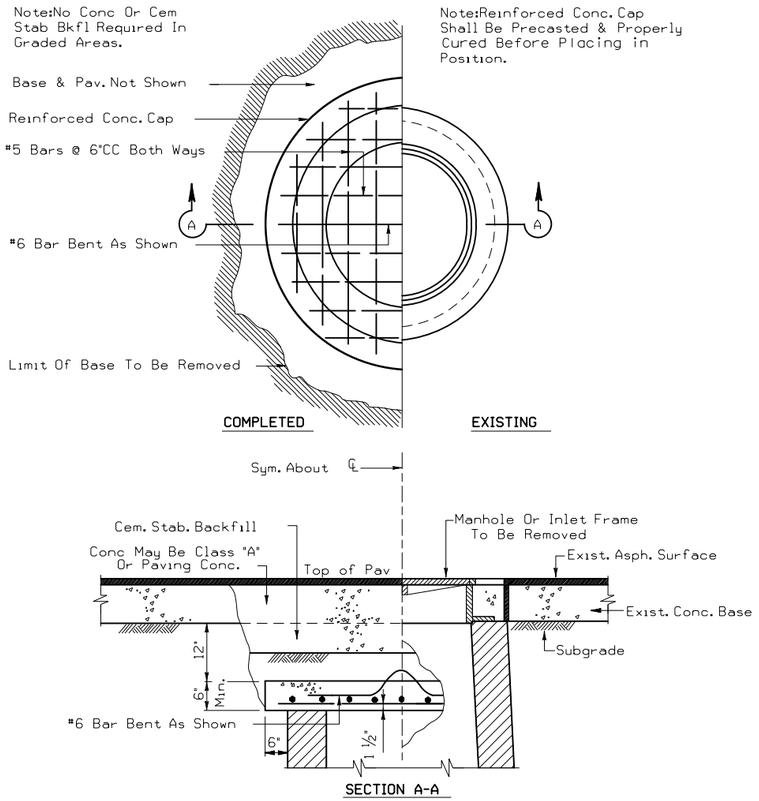
1. The Contractor is paid a fixed estimated amount for cement stabilized backfill based on depth (D) and Table. 1.
2. Proposed roadway structure includes pavement, base and any subgrade.
3. For backfill of intersecting pipes and box culverts, see "Excavation and Backfill Diagram for Pipes and Box Culverts."
4. 6" cement stabilized backfill will be required only for precast units.

Texas Department of Transportation
Houston District

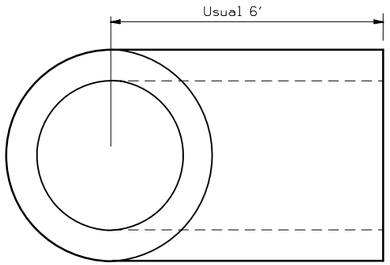
EXCAVATION AND BACKFILL DIAGRAMS

E&BD

FILE: STDE1.DGN	DN: TxDot	CK: TxDot	DW: TxDot	CK: TxDot
© TxDOT FEB 2010	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS REVISED 2/2010 Added note to Table 1. REVISED 6/12 REVISED 9/14 REVISED 3/15	HOUSTON	6	STP 1902 (308) MM	156
	COUNTY		CONTROL SECT JOB	HIGHWAY
	HARRIS		0912 72 386	CS

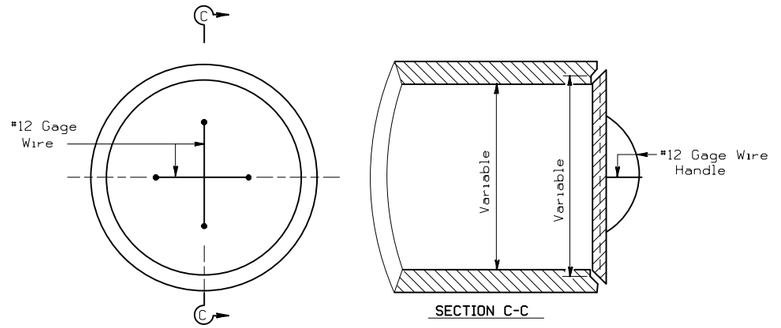


DETAIL SHOWING METHOD OF CAPPING ABANDONED MANHOLES OR INLETS (GRADED OR PAVED AREAS)



Note: Jointing Material Shall Conform To Requirements Of Item "Reinforced Concrete Pipe." Material For Tees Shall Conform To Requirements Of Item "Reinforced Concrete Pipe." Payment For Tee To Be In Accordance With Item "Reinforced Concrete Pipe."

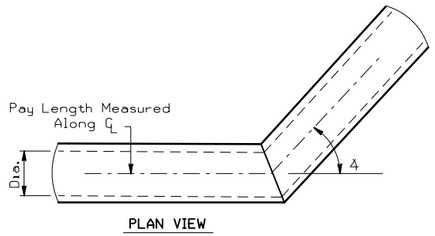
PRECAST STORM SEWER TEE



Note: The Price Of Plug Shall Be Subsidiary To The Unit Bid Price For Pipe Sewer Or RCP. Mortar Joints To Be Used As Directed By The Engineer. Removal Of The Existing Plugs For Storm Sewer Or RCP Conns. Shall Be Considered Incidental To Item "Excavation And Backfill For Structures."

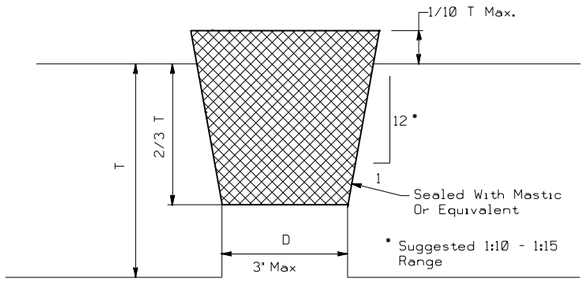
Concrete Plug For End Of Pipe Culvert Or Sewer

CONCRETE PLUG FOR PIPE



BENDING DETAIL

Note: Bending Of Proposed Pipe Sewer Or RCP In A Vertical & /Or Horizontal Plane Shall Be Accomplished By The Use Of A "Pipe Collar" Or A "Precast Elbow", As Approved By The Engineer. Price Of "Pipe Collar" Or "Precast Elbow" Shall Be Subsidiary To The Unit Prices Bid For Item Reinforced Concrete Pipe. Pay Length Measurement To Be Along Horizontal ℄ & Horizontal Plane Of Pipes.

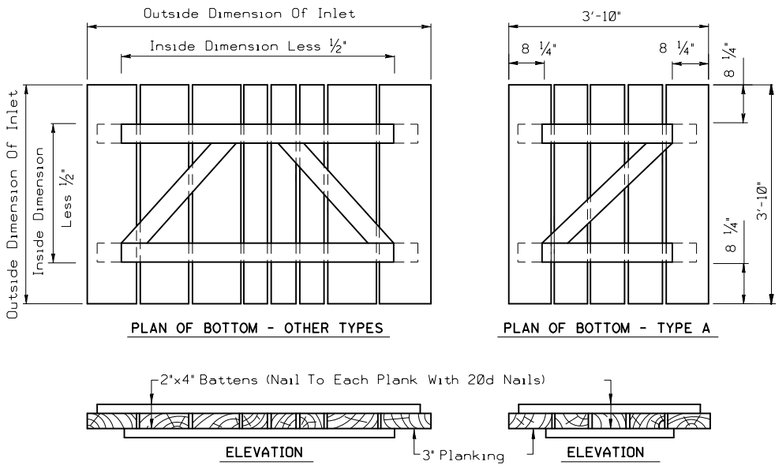


T = Wall Thickness On Top Of Box Or Pipe
D = Diameter Of Lifting Hole

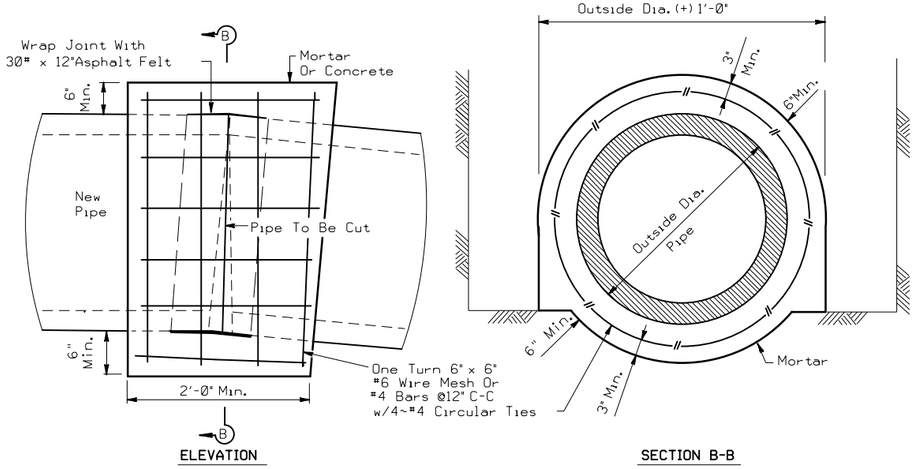
Minimum Length Of Plug Is 2/3 T +/-
Minimum Diameter At Bottom Of Plug = D - ⅛"
Maximum 1/10 T Of Plug Not Seated In Lifting Hole

Note: The Plug Shall Be Cast With The Same Taper As The Lifting Hole.

DETAIL OF PLUG FOR LIFTING HOLES IN RCB AND RCP



TEMPORARY COVERS FOR ALL TYPES OF INLETS



PIPE COLLAR DETAIL

For Horizontal Or Vertical Placement

d = Diameter
R = Radius

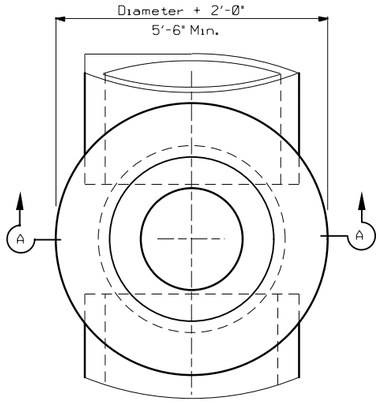
Texas Department of Transportation
Houston District (Bridge)

MISCELLANEOUS SEWER DETAILS

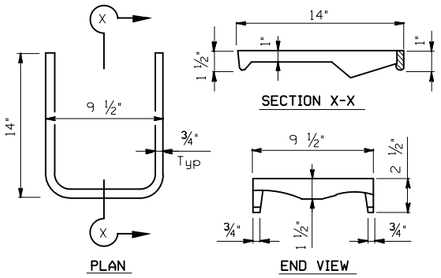
MSD

FILE: STDD11.DGN	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK:	
© TxDOT Mar 2004	DISTRICT	FED REG	PROJECT NO.		SHEET
REVISIONS 3/2015 2014 Specs	HOU	6	STP 1902 (308) MM		157
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	HARRIS		0912	72	386	CS

STDD11.DGN

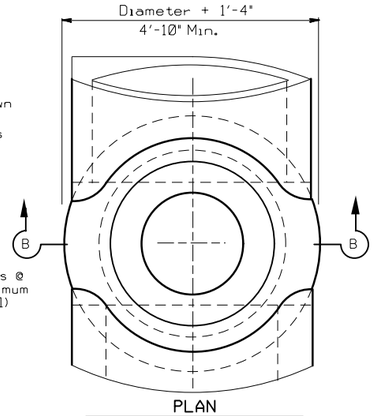


PLAN
OVER 12' HEIGHT

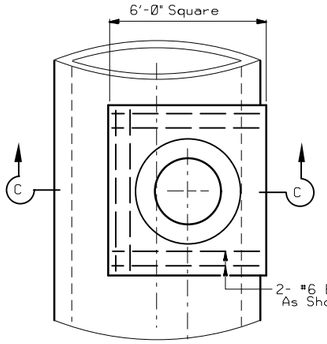


PLAN | END VIEW

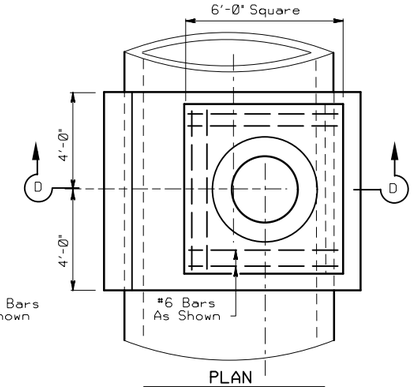
CAST IRON MANHOLE STEPS
(In Stock Locally)



PLAN
12' HEIGHT & UNDER



PLAN
MONOLITHIC SEWERS



PLAN
PRECAST PIPE SEWERS

GENERAL NOTES:

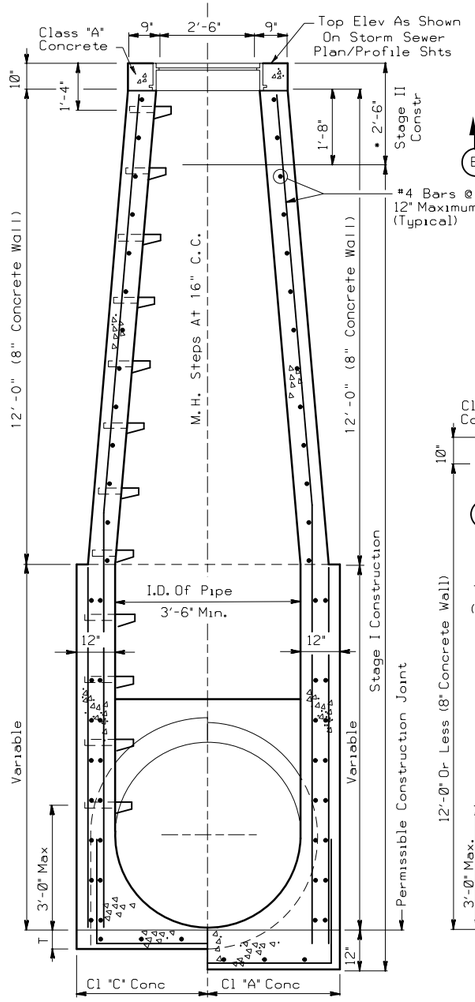
See Standard or Detail Sheet For Excavation And Backfill Diagrams.

All Manholes In Graded Areas Shall Be Built To Stage I And Finished After All Grading Operations Are Substantially Completed.

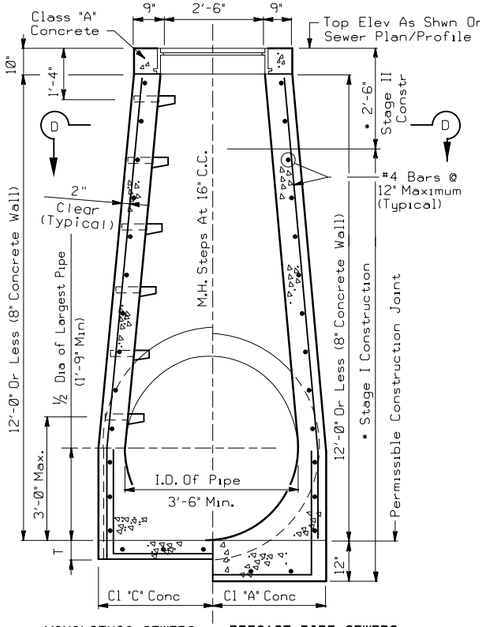
- But Not Less Than 6 Inches Above Highest Pipe.

"T" Thickness Of Shell Equals That Of Larger Diameter Pipe.

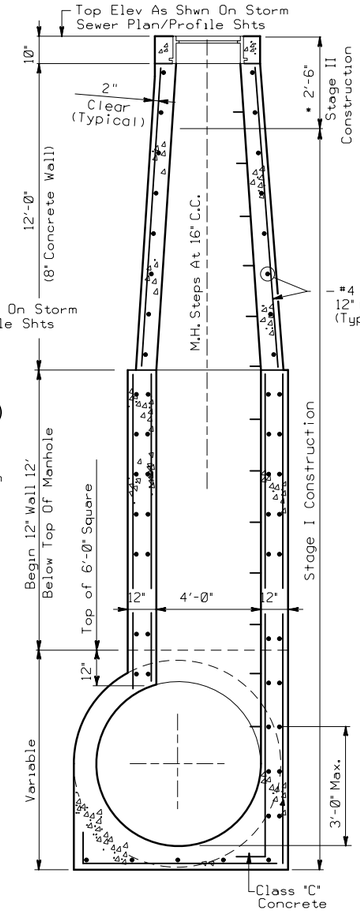
Optional Monolithic Or Precast Designs Permitted. Optional Designs Shall Be Signed & Sealed By A Registered Professional Engineer.



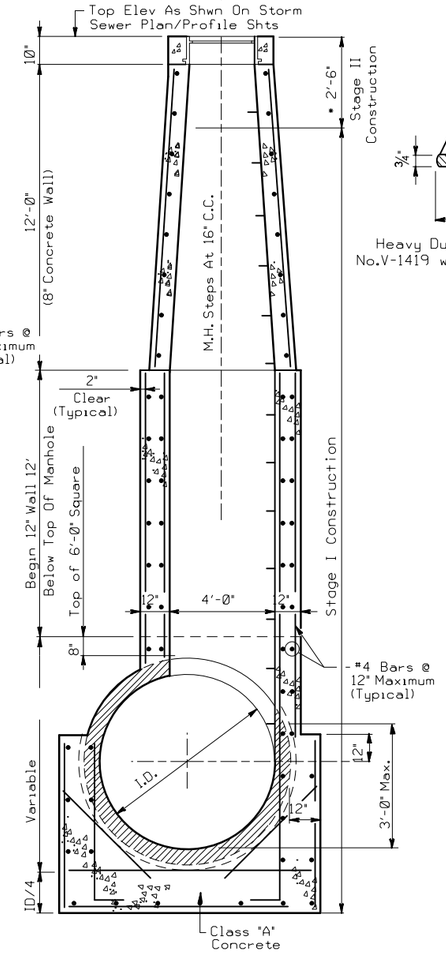
MONOLITHIC SEWERS | PRECAST PIPE SEWERS
SECTION A-A



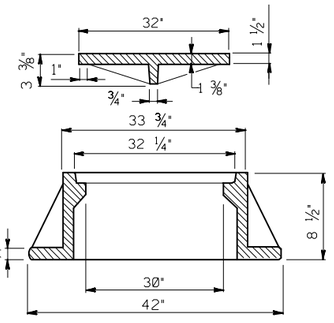
MONOLITHIC SEWERS | PRECAST PIPE SEWERS
SECTION B-B



SECTION C-C

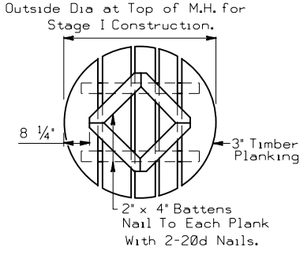


SECTION D-D



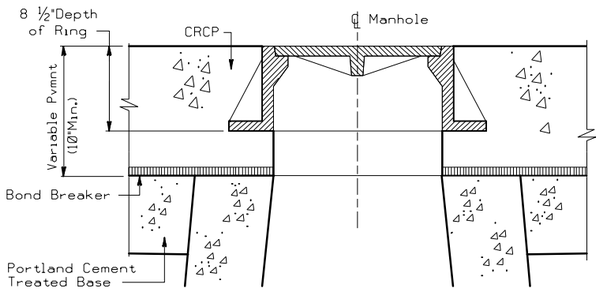
Heavy Duty 30"ID Ring as Required. Vulcan No.V-1419 w/ribbed cover, Neenah No.R1740-BTX

RING AND COVER



PLAN

TEMPORARY TIMBER COVER



RING AND COVER CAST
MONOLITHICALLY WITH PAVEMENT

FOR DIRECT TRAFFIC

Texas Department of Transportation
Houston District

MANHOLES TYPE A & B

MH-A/B

FILE: STDD10.DGN	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT	STD:	
© TxDOT December 2006	DIST	FED REG	PROJECT NO.			SHEET
REVISIONS 3/15 MINOR CORRECTIONS	HOU	6	STP 1902 (308) MM			158
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	HARRIS		0912	72	386	CS

STD-D10

MANHOLE - TYPE A
FOR PIPES 54" AND SMALLER

MANHOLE - TYPE B
FOR PIPES 60" AND LARGER

d = Diameter
R = Radius

P:\East End\1035-Nav-Roundabout\4-0-Production-Working\4-1-CAD\Drainage\STANDARDS\6MH-AB.dgn

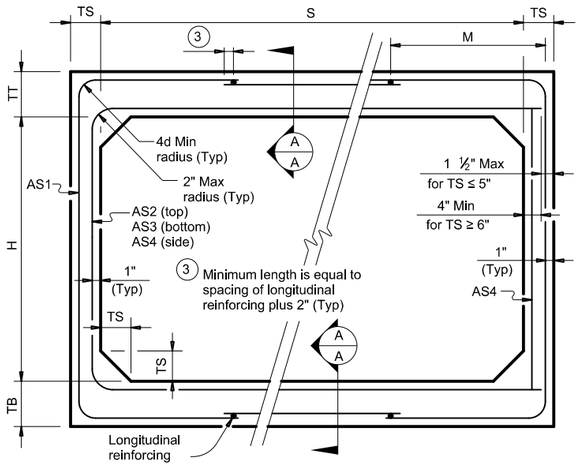
DATE:
FILE:

BOX DATA

SECTION DIMENSIONS					Fill Height	M (Min)	REINFORCING (sq. in. / ft.) (2)							(1) Lift Weight
S (ft.)	H (ft.)	TT (in.)	TB (in.)	TS (in.)	(ft.)	(in.)	AS1	AS2	AS3	AS4	AS5	AS7	AS8	(tons)
5	2	8	7	6	< 2	-	0.19	0.27	0.18	0.14	0.19	0.19	0.17	6.0
5	2	6	6	6	2 < 3	44	0.22	0.20	0.16	0.14	-	-	-	5.1
5	2	6	6	6	3 - 5	44	0.16	0.14	0.14	0.14	-	-	-	5.1
5	2	6	6	6	10	36	0.15	0.14	0.14	0.14	-	-	-	5.1
5	2	6	6	6	15	36	0.20	0.18	0.18	0.14	-	-	-	5.1
5	2	6	6	6	20	36	0.26	0.23	0.24	0.14	-	-	-	5.1
5	2	6	6	6	25	36	0.33	0.29	0.29	0.14	-	-	-	5.1
5	2	6	6	6	30	36	0.39	0.34	0.35	0.14	-	-	-	5.1
5	3	8	7	6	< 2	-	0.19	0.31	0.21	0.14	0.19	0.19	0.17	6.6
5	3	6	6	6	2 < 3	45	0.18	0.24	0.19	0.14	-	-	-	5.7
5	3	6	6	6	3 - 5	36	0.14	0.17	0.16	0.14	-	-	-	5.7
5	3	6	6	6	10	36	0.14	0.16	0.17	0.14	-	-	-	5.7
5	3	6	6	6	15	35	0.16	0.21	0.22	0.14	-	-	-	5.7
5	3	6	6	6	20	35	0.21	0.27	0.28	0.14	-	-	-	5.7
5	3	6	6	6	25	35	0.26	0.34	0.34	0.14	-	-	-	5.7
5	3	6	6	6	30	35	0.31	0.41	0.41	0.14	-	-	-	5.7
5	4	8	7	6	< 2	-	0.19	0.33	0.24	0.14	0.19	0.19	0.17	7.2
5	4	6	6	6	2 < 3	45	0.16	0.27	0.22	0.14	-	-	-	6.3
5	4	6	6	6	3 - 5	45	0.14	0.19	0.18	0.14	-	-	-	6.3
5	4	6	6	6	10	36	0.14	0.18	0.18	0.14	-	-	-	6.3
5	4	6	6	6	15	35	0.14	0.23	0.24	0.14	-	-	-	6.3
5	4	6	6	6	20	35	0.17	0.30	0.31	0.14	-	-	-	6.3
5	4	6	6	6	25	35	0.21	0.37	0.38	0.14	-	-	-	6.3
5	4	6	6	6	30	35	0.25	0.44	0.45	0.14	-	-	-	6.3
5	5	8	7	6	< 2	-	0.19	0.35	0.26	0.14	0.19	0.19	0.17	7.8
5	5	6	6	6	2 < 3	45	0.14	0.29	0.24	0.14	-	-	-	6.9
5	5	6	6	6	3 - 5	45	0.14	0.21	0.20	0.14	-	-	-	6.9
5	5	6	6	6	10	45	0.14	0.19	0.20	0.14	-	-	-	6.9
5	5	6	6	6	15	36	0.14	0.24	0.25	0.14	-	-	-	6.9
5	5	6	6	6	20	35	0.15	0.31	0.32	0.14	-	-	-	6.9
5	5	6	6	6	25	35	0.18	0.38	0.39	0.14	-	-	-	6.9
5	5	6	6	6	30	35	0.21	0.46	0.47	0.14	-	-	-	6.9

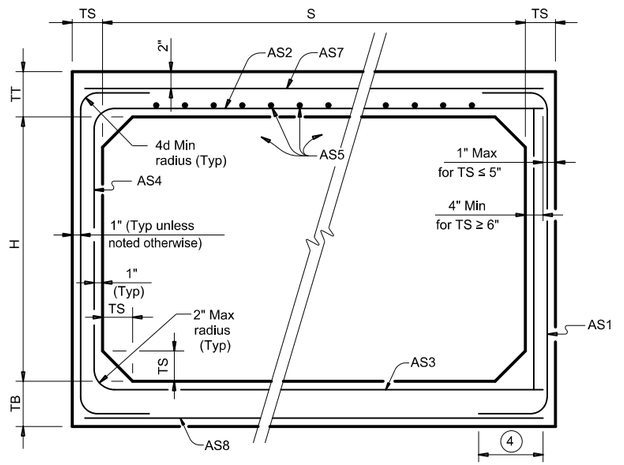
(1) For box length = 8'-0"

(2) AS1 thru AS4, AS7 and AS8 are minimum required areas of reinforcement per linear foot of box length. AS5 is minimum required area of reinforcement per linear foot of box width.



CORNER OPTION "A" CORNER OPTION "B"

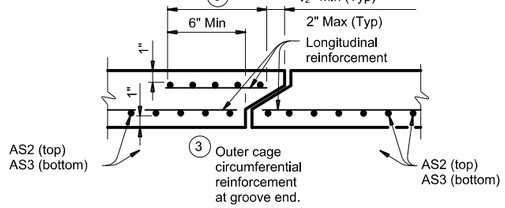
FILL HEIGHT 2 FT AND GREATER



CORNER OPTION "A" CORNER OPTION "B"

FILL HEIGHT LESS THAN 2 FT

(4) Length is equal to spacing of longitudinal reinforcing plus 2". (10" Min) (Typ)



SECTION A-A

(Showing top and bottom slab joint reinforcement.)

MATERIAL NOTES:

Provide 0.03 sq. in./ft. minimum longitudinal reinforcement at each face in slabs and walls. This minimum requirement may be met by the transverse wires when wire mesh reinforcement is used.

Provide Class H concrete (f'c = 5,000 psi).

GENERAL NOTES:

Designs shown conform to ASTM C1577. Refer to ASTM C1577 for information or details not shown.

See Box Culverts Precast Miscellaneous Details (SCP-MD) standard sheet for details and notes not shown.

In lieu of furnishing the designs shown on this sheet, the contractor may furnish an alternate design that is equal to or exceeds the box design for the design fill height in the table. Submit shop plans for alternate designs in accordance with Item "Precast Concrete Structural Members (Fabrication)".

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS PRECAST

5'-0" SPAN

SCP-5

FILE:	scp05sts-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK:
©TxDOT	February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS		0912	72	386	CS
		DIST	COUNTY		SHEET NO.
		HOU	HARRIS		159

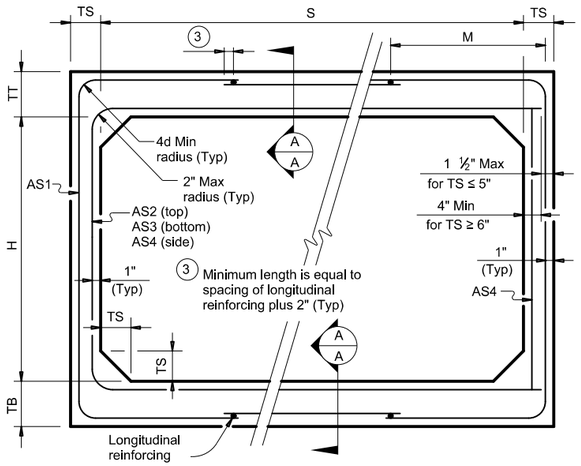
DATE:
FILE:

BOX DATA

SECTION DIMENSIONS					Fill Height	M (Min)	REINFORCING (sq. in. / ft.) (2)							(1) Lift Weight
S (ft.)	H (ft.)	TT (in.)	TB (in.)	TS (in.)	(ft.)	(in.)	AS1	AS2	AS3	AS4	AS5	AS7	AS8	(tons)
6	2	8	7	7	< 2	-	0.23	0.27	0.19	0.17	0.19	0.19	0.17	7.2
6	2	7	7	7	2 < 3	43	0.25	0.21	0.17	0.17	-	-	-	6.8
6	2	7	7	7	3 - 5	43	0.20	0.17	0.17	0.17	-	-	-	6.8
6	2	7	7	7	10	39	0.20	0.17	0.17	0.17	-	-	-	6.8
6	2	7	7	7	15	39	0.26	0.20	0.20	0.17	-	-	-	6.8
6	2	7	7	7	20	39	0.34	0.26	0.26	0.17	-	-	-	6.8
6	2	7	7	7	25	39	0.43	0.32	0.32	0.17	-	-	-	6.8
6	2	7	7	7	30	39	0.52	0.38	0.39	0.17	-	-	-	6.8
6	3	8	7	7	< 2	-	0.20	0.31	0.22	0.17	0.19	0.19	0.17	7.9
6	3	7	7	7	2 < 3	43	0.21	0.24	0.19	0.17	-	-	-	7.5
6	3	7	7	7	3 - 5	39	0.17	0.18	0.17	0.17	-	-	-	7.5
6	3	7	7	7	10	39	0.17	0.18	0.19	0.17	-	-	-	7.5
6	3	7	7	7	15	38	0.22	0.24	0.24	0.17	-	-	-	7.5
6	3	7	7	7	20	38	0.28	0.31	0.31	0.17	-	-	-	7.5
6	3	7	7	7	25	38	0.35	0.38	0.39	0.17	-	-	-	7.5
6	3	7	7	7	30	38	0.42	0.46	0.46	0.17	-	-	-	7.5
6	4	8	7	7	< 2	-	0.19	0.34	0.25	0.17	0.19	0.19	0.17	8.6
6	4	7	7	7	2 < 3	43	0.19	0.27	0.21	0.17	-	-	-	8.2
6	4	7	7	7	3 - 5	39	0.17	0.21	0.19	0.17	-	-	-	8.2
6	4	7	7	7	10	39	0.17	0.20	0.21	0.17	-	-	-	8.2
6	4	7	7	7	15	38	0.18	0.27	0.27	0.17	-	-	-	8.2
6	4	7	7	7	20	38	0.24	0.34	0.35	0.17	-	-	-	8.2
6	4	7	7	7	25	38	0.29	0.43	0.42	0.17	-	-	-	8.2
6	4	7	7	7	30	38	0.35	0.51	0.52	0.17	-	-	-	8.2
6	5	8	7	7	< 2	-	0.19	0.37	0.28	0.17	0.19	0.19	0.17	9.3
6	5	7	7	7	2 < 3	43	0.17	0.30	0.24	0.17	-	-	-	8.9
6	5	7	7	7	3 - 5	43	0.17	0.23	0.21	0.17	-	-	-	8.9
6	5	7	7	7	10	39	0.17	0.22	0.23	0.17	-	-	-	8.9
6	5	7	7	7	15	38	0.17	0.28	0.29	0.17	-	-	-	8.9
6	5	7	7	7	20	38	0.20	0.37	0.38	0.17	-	-	-	8.9
6	5	7	7	7	25	38	0.25	0.45	0.46	0.17	-	-	-	8.9
6	5	7	7	7	30	38	0.30	0.54	0.55	0.17	-	-	-	8.9
6	6	8	7	7	< 2	-	0.19	0.38	0.30	0.17	0.19	0.19	0.17	10
6	6	7	7	7	2 < 3	52	0.17	0.32	0.26	0.17	-	-	-	9.6
6	6	7	7	7	3 - 5	52	0.17	0.24	0.22	0.17	-	-	-	9.6
6	6	7	7	7	10	43	0.17	0.23	0.24	0.17	-	-	-	9.6
6	6	7	7	7	15	39	0.17	0.29	0.31	0.17	-	-	-	9.6
6	6	7	7	7	20	39	0.18	0.38	0.39	0.17	-	-	-	9.6
6	6	7	7	7	25	38	0.23	0.46	0.48	0.17	-	-	-	9.6
6	6	7	7	7	30	38	0.27	0.55	0.57	0.17	-	-	-	9.6

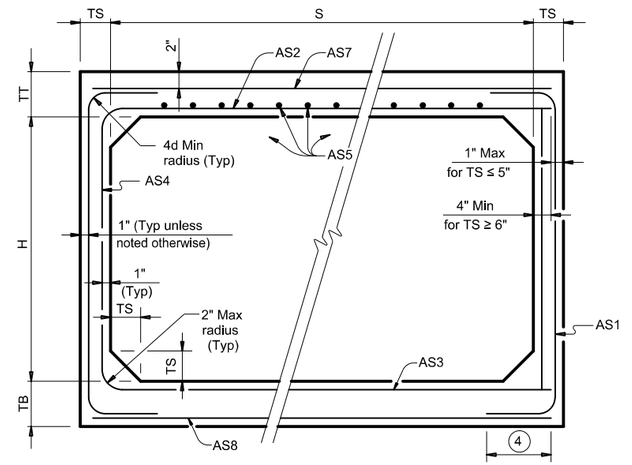
(1) For box length = 8'-0"

(2) AS1 thru AS4, AS7 and AS8 are minimum required areas of reinforcement per linear foot of box length. AS5 is minimum required area of reinforcement per linear foot of box width.



CORNER OPTION "A" CORNER OPTION "B"

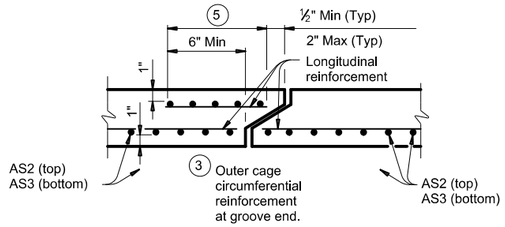
FILL HEIGHT 2 FT AND GREATER



CORNER OPTION "A" CORNER OPTION "B"

FILL HEIGHT LESS THAN 2 FT

(4) Length is equal to spacing of longitudinal reinforcing plus 2". (10" Min) (Typ)



SECTION A-A

(Showing top and bottom slab joint reinforcement.)

MATERIAL NOTES:
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GENERAL NOTES:
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HL93 LOADING

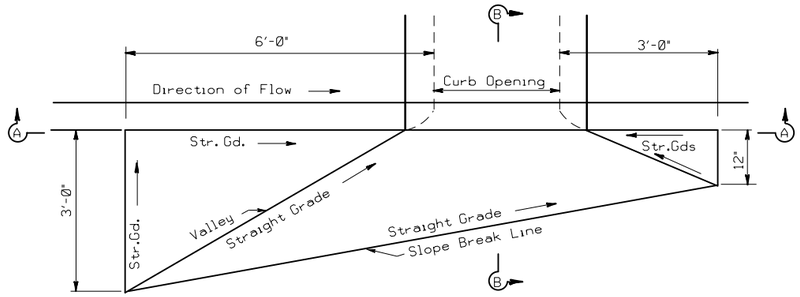
Texas Department of Transportation | Bridge Division Standard

SINGLE BOX CULVERTS PRECAST

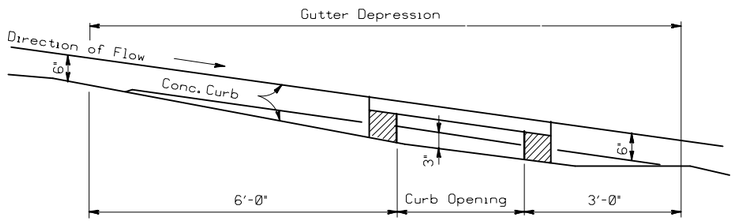
6'-0" SPAN

SCP-6

FILE: scp06sts-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	72	386	CS
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		160

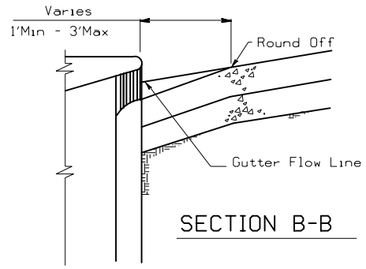


PLAN

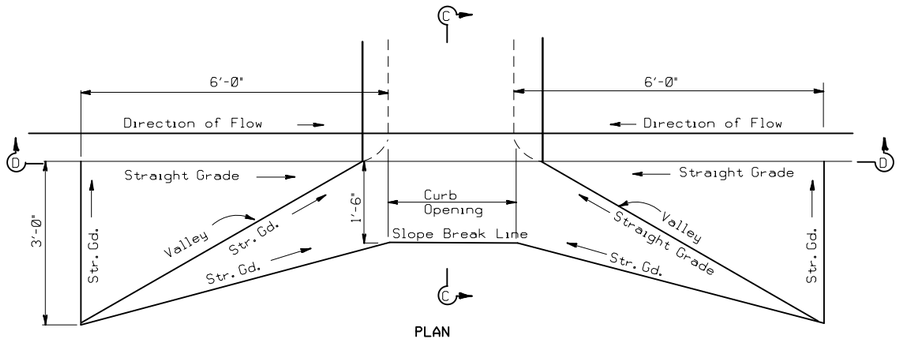


SECTION A-A

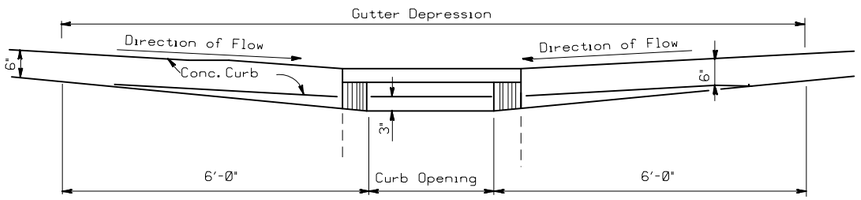
CURB INLET ON GRADE



SECTION B-B

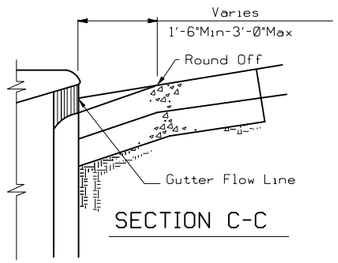


PLAN



SECTION D-D

CURB INLET AT SAG



SECTION C-C

GENERAL NOTES:

Base Course under Concrete Pavement shall be full depth and shall conform to surface depression details.

Texas Department of Transportation
Houston District

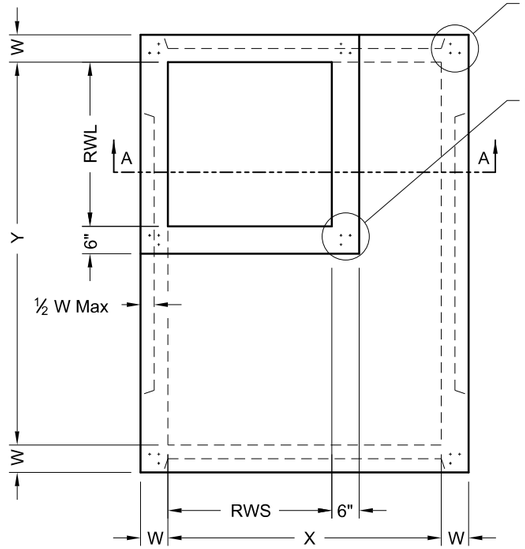
GUTTER DEPRESSION DETAILS FOR CURB INLETS

GD

FILE: STDD12.DGN	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT	STD:	
© TxDOT Mar 2004	DIST	FED REG	PROJECT NO.			SHEET
REVISIONS	HOUS	6	STP 1902 (308) MM			161
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	HARRIS		0912	72	386	CS

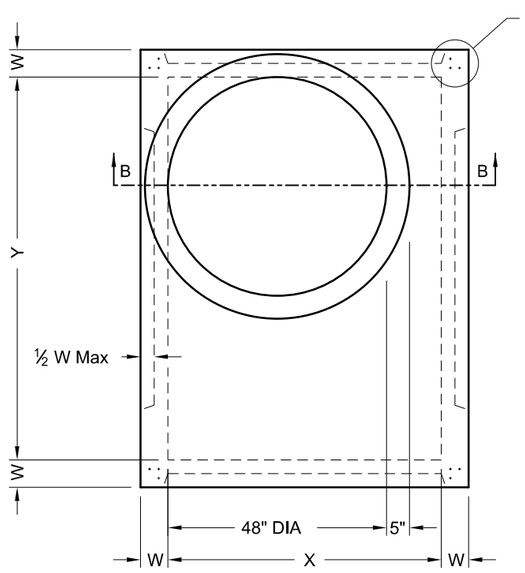
STDD12.DGN

DATE:
FILE:



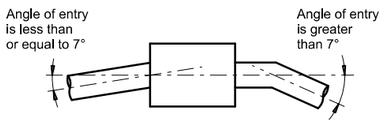
PLAN VIEW "A"

SQUARE REDUCED RISER OPTION



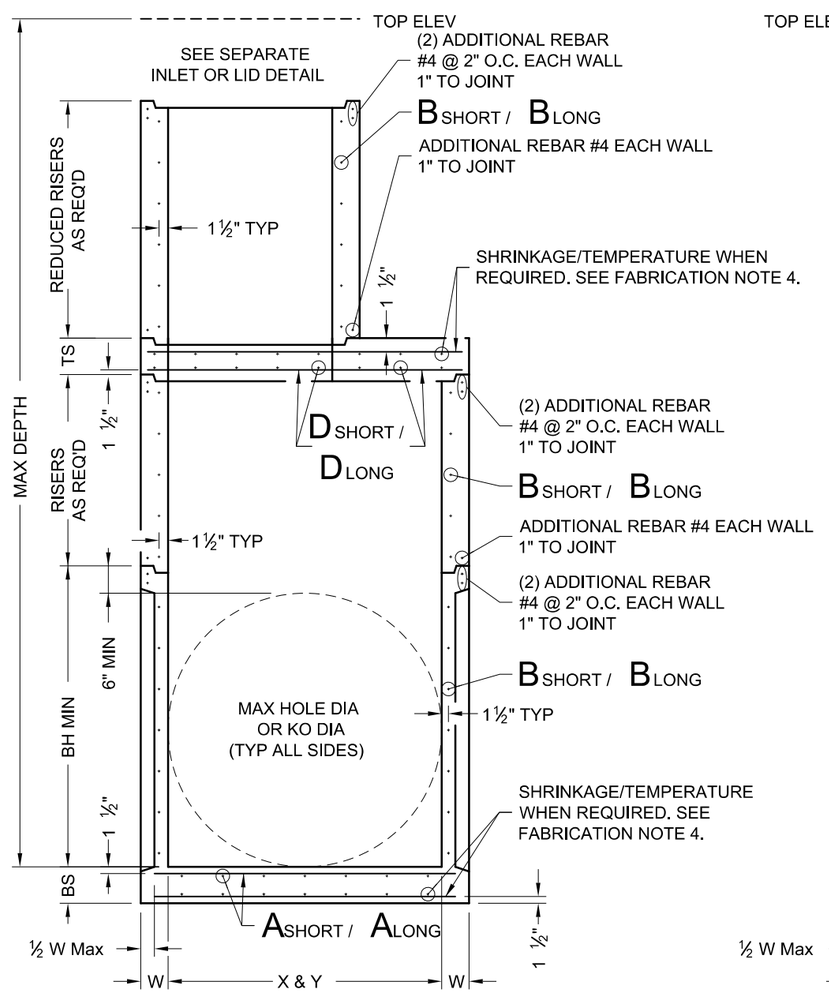
PLAN VIEW "B"

ROUND REDUCED RISER OPTION



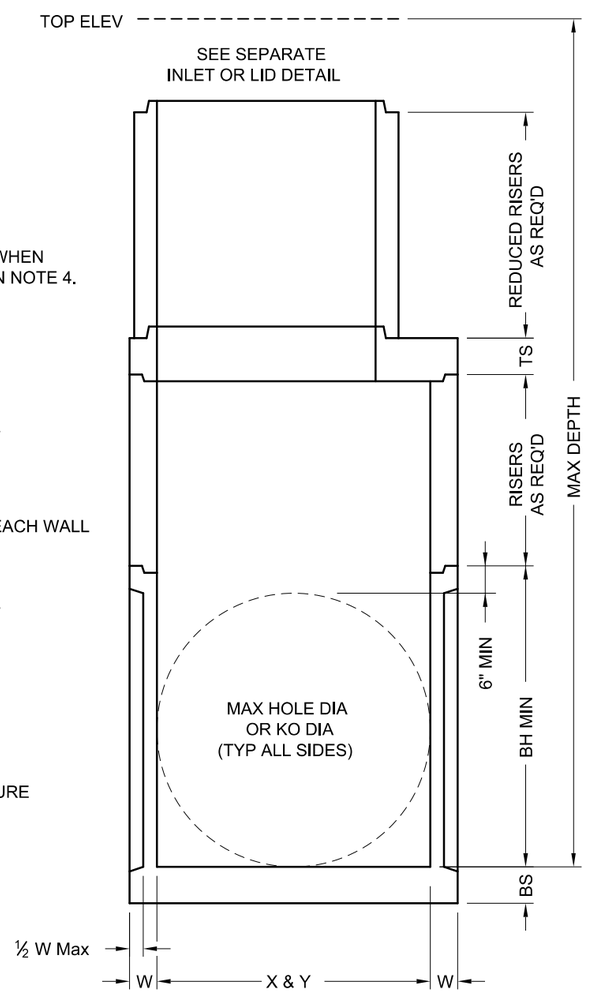
PIPE CONNECTION DETAIL

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 in²/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

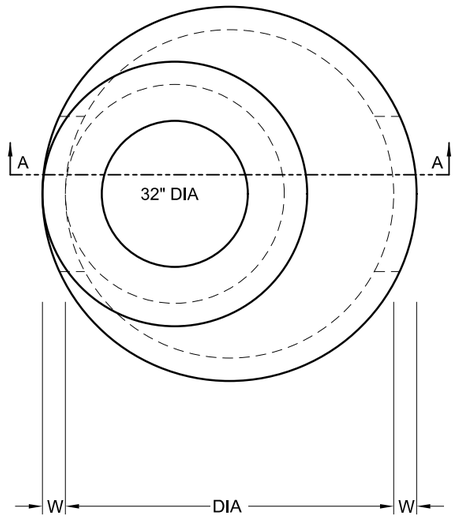
Texas Department of Transportation

Bridge Division Standard

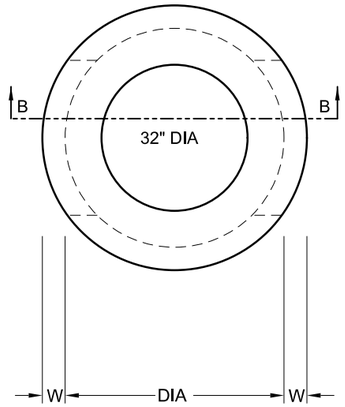
PRECAST BASE

PB

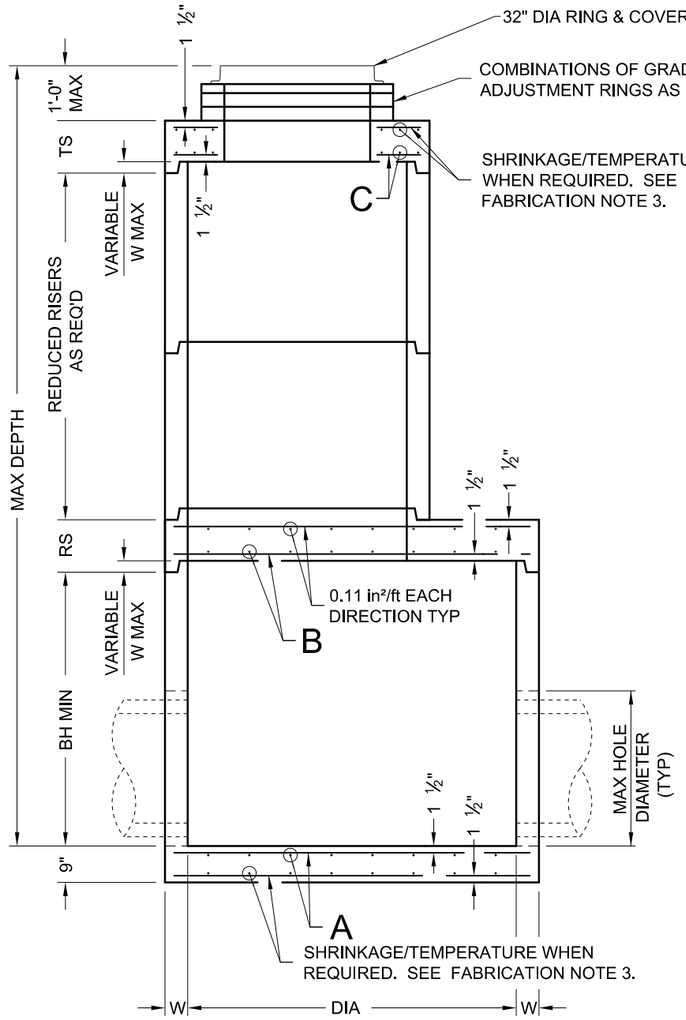
FILE: prestd01-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	72	386	CS
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		162



PLAN VIEW "A"

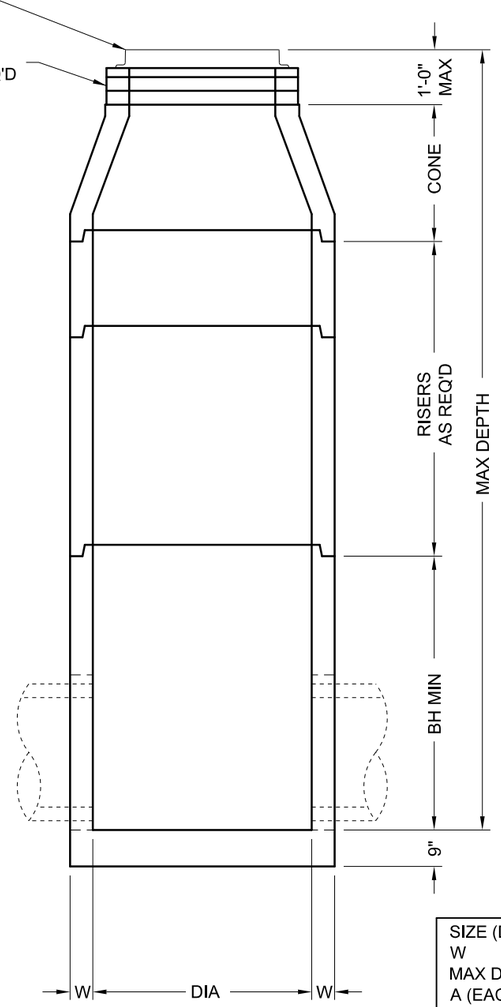


PLAN VIEW "B"



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

HL93 LOADING

Texas Department of Transportation

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	0912	72	386	CS
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		163

DATE:
FILE:

	Size	MAX DEPTH = 15 ft. to top of BASE SLAB										MAX DEPTH = 25 ft. to top of BASE SLAB										Min Height (See Gen Note 3)	Max HOLE DIA (See Fab Note 2)	Max KO DIA (See Fab Note 2)
		Base Slab			Base Unit or Riser Walls			Below Grade Slab (w/PJB) Reducing Slab (w/PB)				Base Slab			Base Unit or Riser Walls			Below Grade Slab (w/PJB) Reducing Slab (w/PB)						
		Short Span Reinf Steel Area	Long Span Reinf Steel Area	Thickness	Short Span Reinf Steel Area	Long Span Reinf Steel Area	Thickness	Reduced Riser Size	Short Span Reinf Steel Area	Long Span Reinf Steel Area	Thickness	Short Span Reinf Steel Area	Long Span Reinf Steel Area	Thickness	Short Span Reinf Steel Area	Long Span Reinf Steel Area	Thickness	Reduced Riser Size	Short Span Reinf Steel Area	Long Span Reinf Steel Area	Thickness			
	X x Y	Ashort	Along	BS	Bshort	Blong	W	RWSxRWL or ID	Dshort	Dlong	TS	Ashort	Along	BS	Bshort	Blong	W	RWSxRWL or ID	Dshort	Dlong	TS	BH MIN	HOLE DIA	KO DIA
	ft.	in^2/ft	in^2/ft	in.	in^2/ft	in^2/ft	in.	ft. **	in^2/ft	in^2/ft	in.	in^2/ft	in^2/ft	in.	in^2/ft	in^2/ft	in.	ft. **	in^2/ft	in^2/ft	in.	ft.	in.	in.
Precast Junction Box (PJB)	3x3	0.23	0.23	6	0.19	0.19	6	N/A	0.37	0.37	9	0.29	0.29	6	0.24	0.24	6	N/A	0.37	0.37	9	3.5	36	36
	4x4	0.29	0.29	6	0.24	0.24	6	N/A	0.41	0.41	9	0.47	0.47	6	0.38	0.38	6	N/A	0.41	0.41	9	4.5	48	48
	3x5	0.29	0.18	6	0.19	0.35	6	N/A	0.48	0.48	9	0.39	0.18	6	0.23	0.59	6	N/A	0.48	0.48	9	3.5	36/60	36/60
	4x5	0.36	0.18	6	0.22	0.34	6	N/A	0.42	0.42	9	0.53	0.26	6	0.39	0.59	6	N/A	0.42	0.42	9	4.5	48/60	48/60
	5x5	0.36	0.36	6	0.34	0.34	6	N/A	0.43	0.43	9	0.62	0.62	6	0.59	0.59	6	N/A	0.43	0.43	9	5.5	60	60
	5x6	0.27	0.27	9	0.34	0.45	6	N/A	0.48	0.48	9	0.47	0.45	9	0.38	0.54	8	N/A	0.48	0.48	9	5.5	60/72	60/72
	6x6	0.27	0.27	9	0.45	0.45	6	N/A	0.56	0.56	9	0.52	0.52	9	0.54	0.54	8	N/A	0.56	0.56	9	6.5	72	72
	8x8	0.46	0.46	9	0.51	0.51	8	N/A	0.45	0.45	12	0.87	0.87	9	0.59	0.59	10	N/A	0.45	0.45	12	8.5	96	72
Precast Base (PB)	3x3	0.23	0.23	6	0.19	0.19	6	N/A	N/A	N/A	N/A	0.29	0.29	6	0.24	0.24	6	N/A	N/A	N/A	N/A	3.5	36	36
	4x4	0.29	0.29	6	0.24	0.24	6	N/A	N/A	N/A	N/A	0.47	0.47	6	0.38	0.38	6	N/A	N/A	N/A	N/A	4.5	48	48
	3x5	0.29	0.18	6	0.19	0.35	6	3x3	0.30	0.34	9	0.39	0.18	6	0.23	0.59	6	3x3	0.40	0.40	9	3.5	36/60	36/60
	4x5	0.36	0.18	6	0.22	0.34	6	3x3	0.30	0.30	9	0.53	0.26	6	0.39	0.59	6	3x3	0.46	0.37	9	4.5	48/60	48/60
	4x5	0.36	0.18	6	0.22	0.34	6	4x4	0.30	0.30	9	0.53	0.26	6	0.39	0.59	6	4x4	0.39	0.39	9	4.5	48/60	48/60
	4x5	0.36	0.18	6	0.22	0.34	6	48"	0.39	0.39	9	0.53	0.26	6	0.39	0.59	6	48"	0.47	0.47	9	4.5	48/60	48/60
	4x5	0.36	0.18	6	0.22	0.34	6	3x5	0.33	0.40	9	0.53	0.26	6	0.39	0.59	6	3x5	0.48	0.48	9	4.5	48/60	48/60
	5x5	0.36	0.36	6	0.34	0.34	6	3x3	0.34	0.34	9	0.62	0.62	6	0.59	0.59	6	3x3	0.53	0.53	9	5.5	60	60
	5x5	0.36	0.36	6	0.34	0.34	6	4x4	0.36	0.36	9	0.62	0.62	6	0.59	0.59	6	4x4	0.64	0.64	9	5.5	60	60
	5x5	0.38	0.38	6	0.34	0.34	6	48"	0.36	0.36	9	0.62	0.62	6	0.59	0.59	6	48"	0.64	0.64	9	5.5	60	60
	5x5	0.36	0.36	6	0.34	0.34	6	3x5	0.34	0.40	9	0.62	0.62	6	0.59	0.59	6	3x5	0.53	0.53	9	5.5	60	60
	5x6	0.31	0.31	9	0.34	0.45	6	3x3	0.34	0.34	9	0.47	0.45	9	0.38	0.54	8	3x3	0.61	0.50	9	5.5	60/72	60/72
	5x6	0.27	0.27	9	0.34	0.45	6	4x4	0.36	0.45	9	0.47	0.45	9	0.38	0.54	8	4x4	0.74	0.57	9	5.5	60/72	60/72
	5x6	0.29	0.29	9	0.34	0.45	6	48"	0.36	0.45	9	0.47	0.45	9	0.38	0.54	8	48"	0.74	0.57	9	5.5	60/72	60/72
	5x6	0.29	0.29	9	0.34	0.45	6	3x5	0.45	0.45	9	0.47	0.45	9	0.38	0.54	8	3x5	0.61	0.61	9	5.5	60/72	60/72
	6x6	0.29	0.29	9	0.45	0.45	6	3x3	0.41	0.41	9	0.52	0.52	9	0.54	0.54	8	3x3	0.74	0.74	9	6.5	72	72
	6x6	0.27	0.27	9	0.45	0.45	6	4x4	0.45	0.45	9	0.52	0.52	9	0.54	0.54	8	4x4	0.87	0.87	9	6.5	72	72
	6x6	0.29	0.29	9	0.45	0.45	6	48"	0.45	0.45	9	0.52	0.52	9	0.54	0.54	8	48"	0.87	0.87	9	6.5	72	72
	6x6	0.29	0.29	9	0.45	0.45	6	3x5	0.45	0.45	9	0.52	0.52	9	0.54	0.54	8	3x5	0.87	0.87	9	6.5	72	72
	8x8	0.52	0.52	9	0.51	0.51	8	3x3	0.61	0.61	12	0.91	0.91	9	0.70	0.70	10	3x3	0.85	0.85	12	8.5	96	72
	8x8	0.52	0.52	9	0.51	0.51	8	4x4	0.70	0.70	12	0.87	0.87	9	0.70	0.70	10	4x4	1.01	1.01	12	8.5	96	72
	8x8	0.52	0.52	9	0.51	0.51	8	48"	0.70	0.70	12	0.87	0.87	9	0.70	0.70	10	48"	1.01	1.01	12	8.5	96	72
	8x8	0.52	0.52	9	0.51	0.51	8	3x5	0.70	0.85	12	0.87	0.87	9	0.70	0.70	10	3x5	1.01	1.01	12	8.5	96	72

** Unless otherwise indicated.

FABRICATION NOTES:
1. Maximum spacing of reinforcement is 8".
2. At manufacturer's option, provide cast or cored holes or thin wall panels (KO) to the maximum diameter shown for each. When no penetration is required, it is acceptable to provide a wall with no sectional reduction.

GENERAL NOTES:
1. Precast Junction Box consists of base slab, base unit, risers (as required), and below grade slab. See sheet PJB for details.
2. Precast Base consists of base slab, base unit, risers (as required), reducing slab (as required), and reduced risers (as required). See sheet PB for details.
3. Min Height shown is for stock base units. Use stock base units whenever practical. Smaller height base units can be used in special installation circumstances, when noted elsewhere in the plans. Absolute minimum height of base units is 2'-6".

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Bridge Division Standard

DESIGN DATA FOR PRECAST BASE AND JUNCTION BOX

PDD

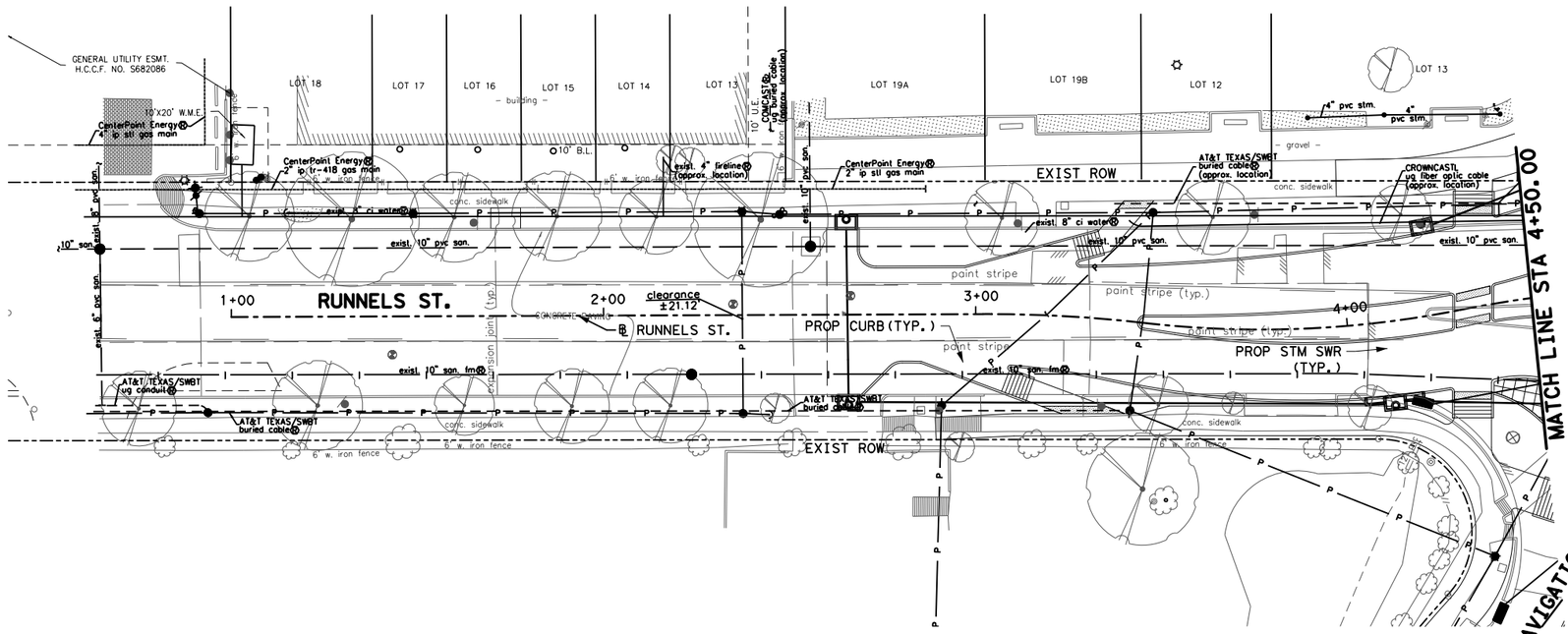
FILE: prestd10-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	72	386	CS
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		164

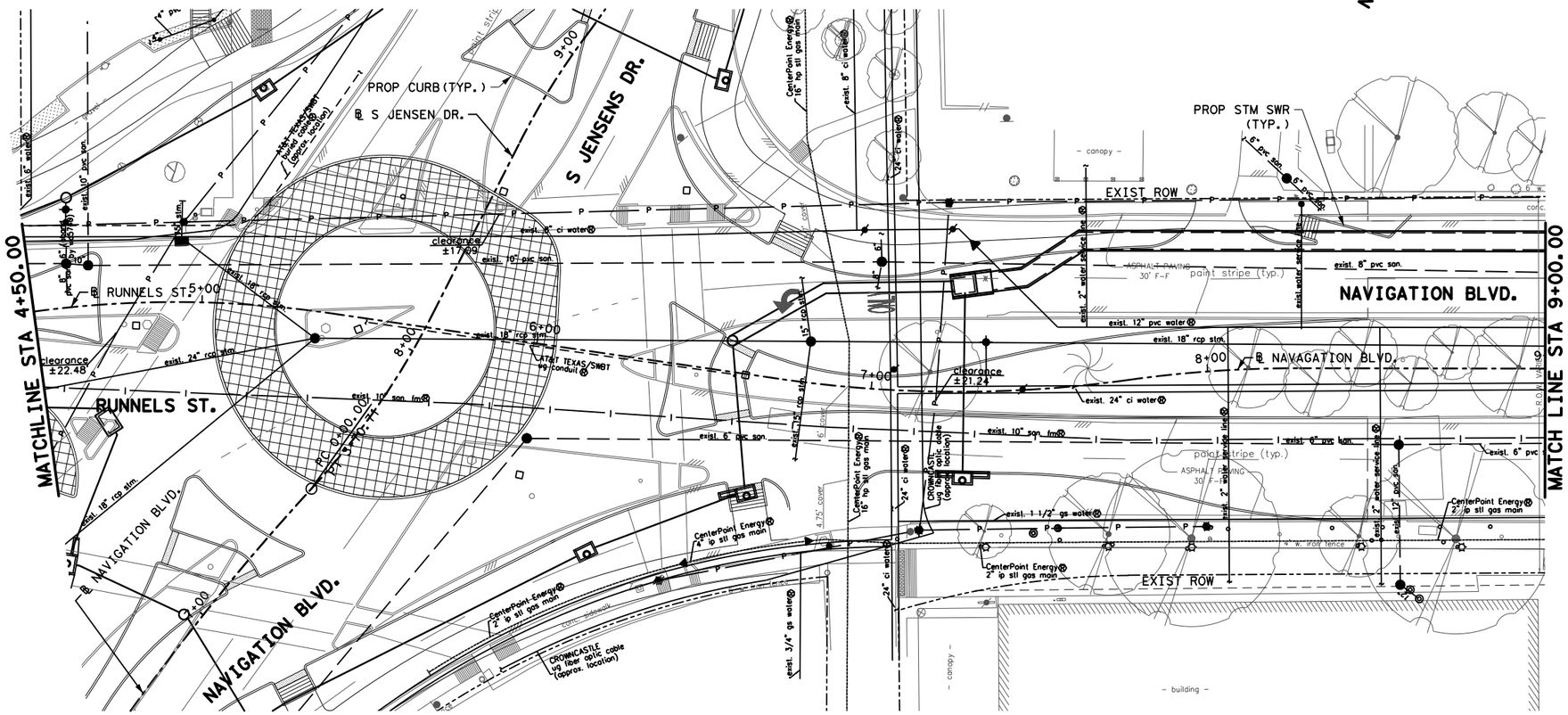
DATE:
FILE:

LEGEND

EXISTING PARCEL LINES

PROP CURB





NOTES:

1. THE LOCATIONS OF UTILITIES SHOW ARE APPROXIMATE. CONTRACTOR SHALL VERIFY ELEVATION & LOCATION PRIOR TO ANY EXCAVATION.

0′ 40′ 80′

(IN FEET)

SCALE: PLAN 1"=40′

STATE OF TEXAS
DAVID G. GREANEY
125563
LICENSED
PROFESSIONAL ENGINEER

06/08/2022 Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

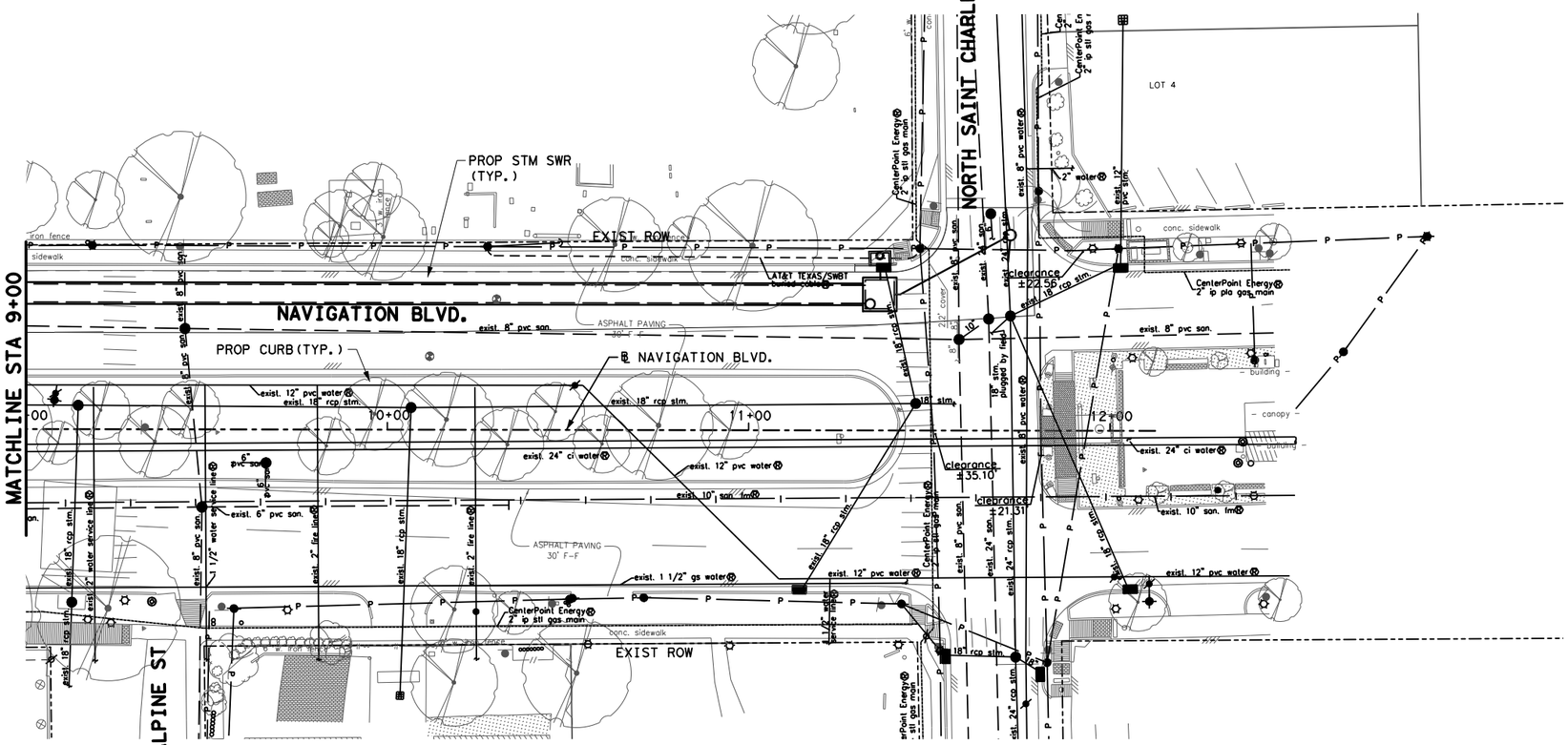
Gauge ENGINEERING
11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

EXISTING UTILITIES BEGIN PROJECT TO STA 9+00

SHEET 1 OF 3

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	165



LEGEND

EXISTING PARCEL LINES

PROP CURB

NOTES:

1. THE LOCATIONS OF UTILITIES SHOW ARE APPROXIMATE. CONTRACTOR SHALL VERIFY ELEVATION & LOCATION PRIOR TO ANY EXCAVATION.

0′ 40′ 80′

(IN FEET)

SCALE: PLAN 1"=40′

STATE OF TEXAS
DAVID G. GREANEY
125563
LICENSED
PROFESSIONAL ENGINEER

06/08/2022 Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

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11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

Texas Department of Transportation

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

EXISTING UTILITIES STA 9+00 TO END PROJECT

SHEET 2 OF 3

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	166

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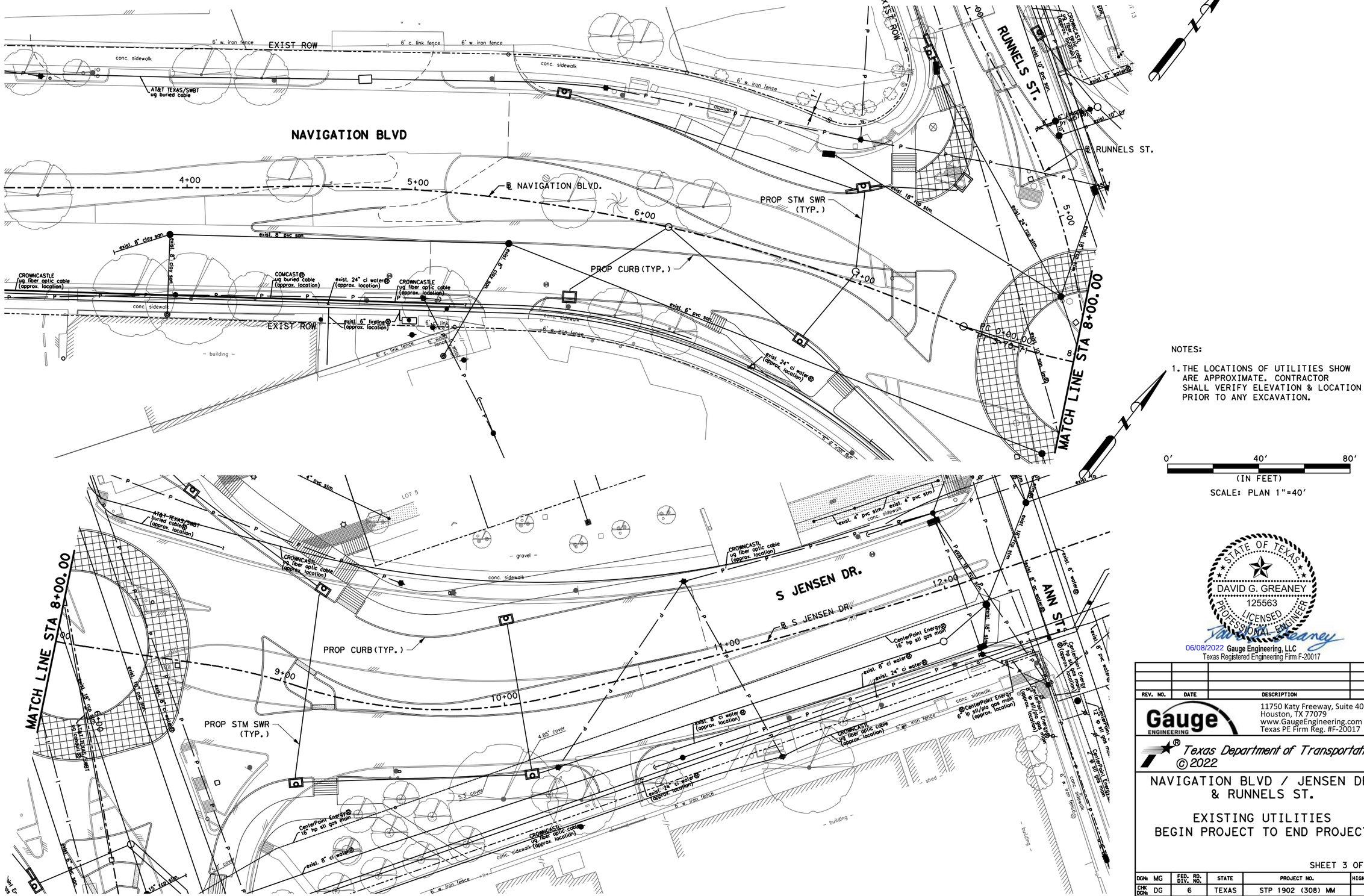

NOTES:

1. THE LOCATIONS OF UTILITIES SHOW ARE APPROXIMATE. CONTRACTOR SHALL VERIFY ELEVATION & LOCATION PRIOR TO ANY EXCAVATION.

0′ 40′ 80′
(IN FEET)
SCALE: PLAN 1"=40′

STATE OF TEXAS
DAVID G. GREANEY
125563
LICENSED
PROFESSIONAL ENGINEER

06/08/2022 Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

Gauge ENGINEERING
11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

EXISTING UTILITIES
BEGIN PROJECT TO END PROJECT

SHEET 3 OF 3

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	167

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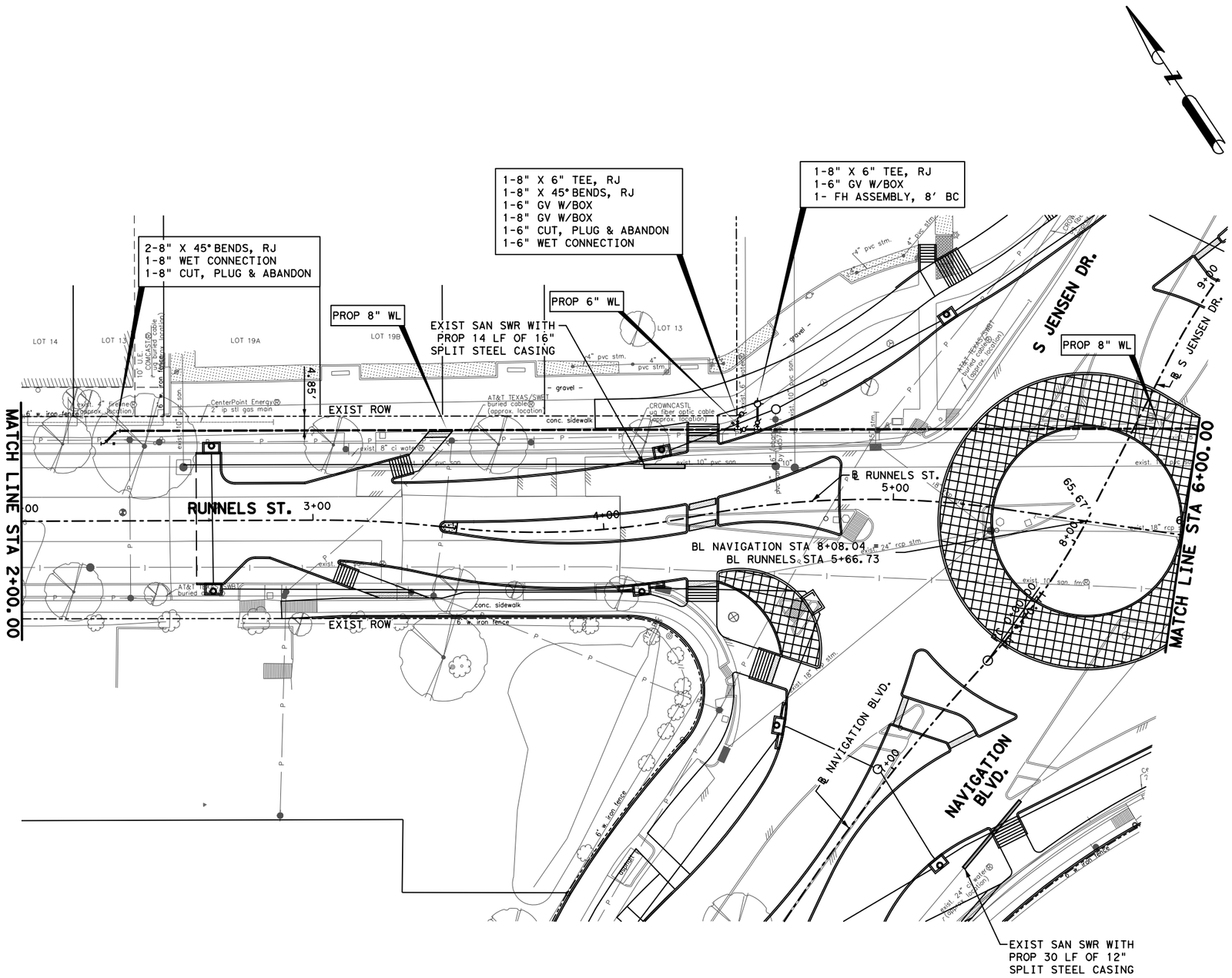

LEGEND:

- PROP WATER LINE
- PROP SANITARY SEWER

NOTES:

1. MAINTAIN WATER SERVICES TO ALL CUSTOMER, FIRE HYDRANTS, AND INTERCONNECTIONS AT ALL TIME PROVIDE TEMPORARY CONNECTION AS NECESSARY FOR CONSTRUCTIONS.
2. ALL CONNECTIONS TO EXISTING WATER LINES TO BE MADE WITHIN ROW LIMITS.
3. REFER TO STM SWR SHEETS FOR MORE INFORMATION.
4. CONNECTION TO PROPOSED WATER LINE OF EXISTING SERVICES LESS THAN 3" ARE NOT SHOWN GRAPHICALLY, HOWEVER SHALL BE PREFORMED BY CONTRACTOR.
5. ALL WATER METER BOXES WITHIN SIDEWALK SHALL BE REPLACED WITH CONCRETE BOX PER CITY STANDARDS.
6. REMOVE AND REPLACE ONE FULL SECTION OF EXISTING SANITARY SEWER WITH PRESSURE RATED PIPE CENTERED AT STORM SEWER CROSSING. PROVIDE RESTRAINED JOINTS.
7. PLACE ONE FULL SECTION (MIN. 18') OF PROPOSED SAN SWR/WL CENTERED AT WL/SAN SWR CROSSING PROVIDE RESTRAINED JOINTS ON SS/WL SPACED AT LEAST 9 FT HORIZONTALLY FROM CL OF WL/SS.

0' 40' 80'
(IN FEET)
SCALE: PLAN 1"=40'

STATE OF TEXAS
KARAM M. QADDO
125611
LICENSED PROFESSIONAL ENGINEER
06/08/2022

Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

Gauge ENGINEERING
11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

WATER LINE PLAN STA 2+00 TO STA 6+00

SHEET 1 OF 4

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	168

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Plotted on: 6/7/2022 11:39:52 AM sharifian
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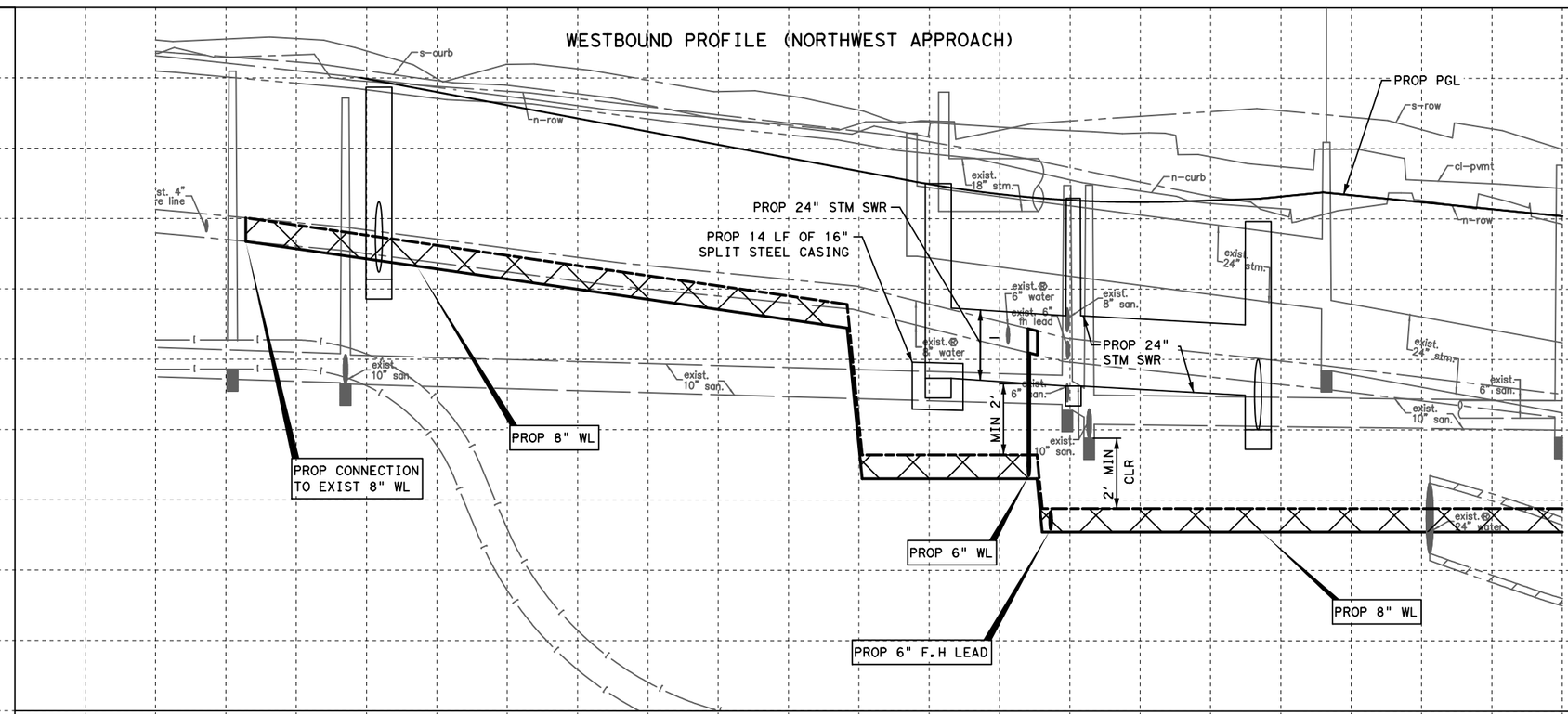
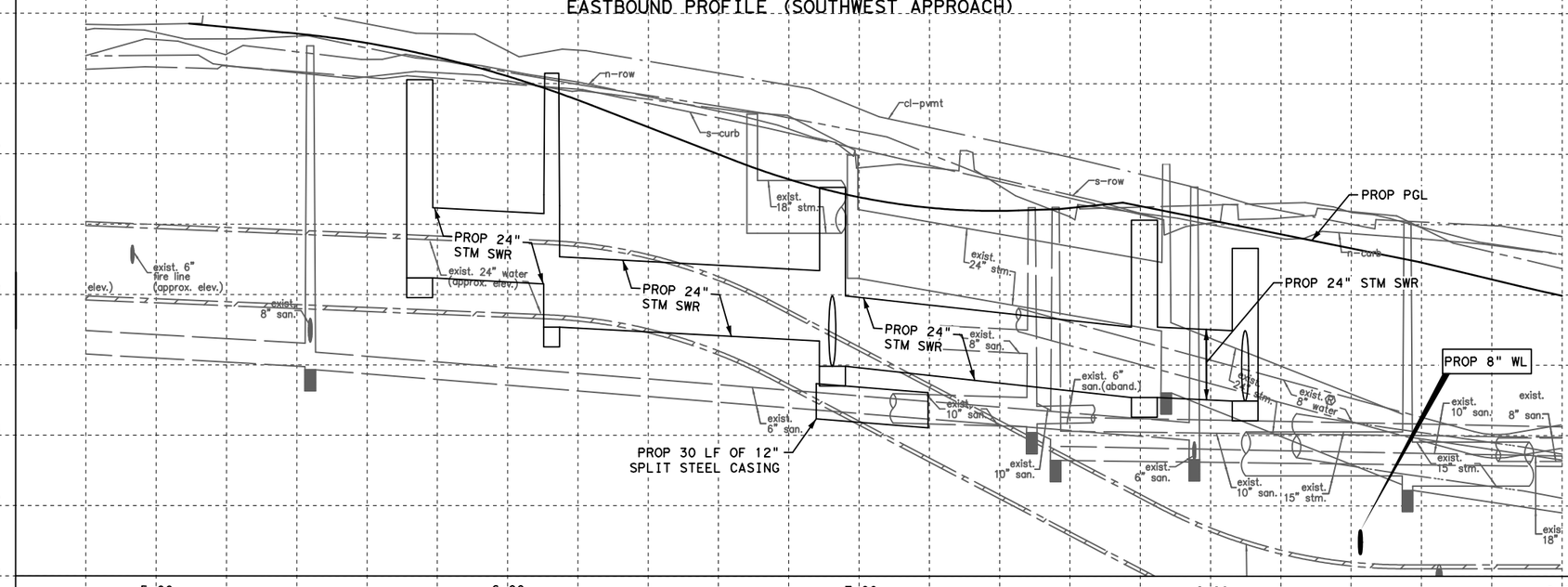
WESTBOUND PROFILE (NORTHWEST APPROACH)



EASTBOUND PROFILE (SOUTHWEST APPROACH)



LEGEND:

- PVC WITH RESTRAINED JOINTS
- SPLIT STEEL CASING

NOTES:

1. MAINTAIN WATER SERVICES TO ALL CUSTOMER, FIRE HYDRANTS, AND INTERCONNECTIONS AT ALL TIME PROVIDE TEMPORARY CONNECTION AS NECESSARY FOR CONSTRUCTIONS.
2. ALL CONNECTIONS TO EXISTING WATER LINES TO BE MADE WITHIN ROW LIMITS.
3. REFER TO STM SWR SHEETS FOR MORE INFORMATION.
4. CONNECTION TO PROPOSED WATER LINE OF EXISTING SERVICES LESS THAN 3" ARE NOT SHOWN GRAPHICALLY, HOWEVER SHALL BE PREFORMED BY CONTRACTOR.
5. ALL WATER METER BOXES WITHIN SIDEWALK SHALL BE REPLACED WITH CONCRETE BOX PER CITY STANDARDS.
6. REMOVE AND REPLACE ONE FULL SECTION OF EXISTING SANITARY SEWER WITH PRESSURE RATED PIPE CENTERED AT STORM SEWER CROSSING. PROVIDE RESTRAINED JOINTS.
7. PLACE ONE FULL SECTION (MIN. 18') OF PROPOSED SAN SWR/WL CENTERED AT WL/SAN SWR CROSSING PROVIDE RESTRAINED JOINTS ON SS/WL SPACED AT LEAST 9 FT HORIZONTALLY FROM CL OF WL/SS.

H: 0' 40' 80'
V: 0' 4' 8'
(IN FEET)
SCALE: PLAN 1"=40'
PROFILE 1"=4'

STATE OF TEXAS
KARAM M. QADDO
125611
LICENSED PROFESSIONAL ENGINEER
06/08/2022
Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

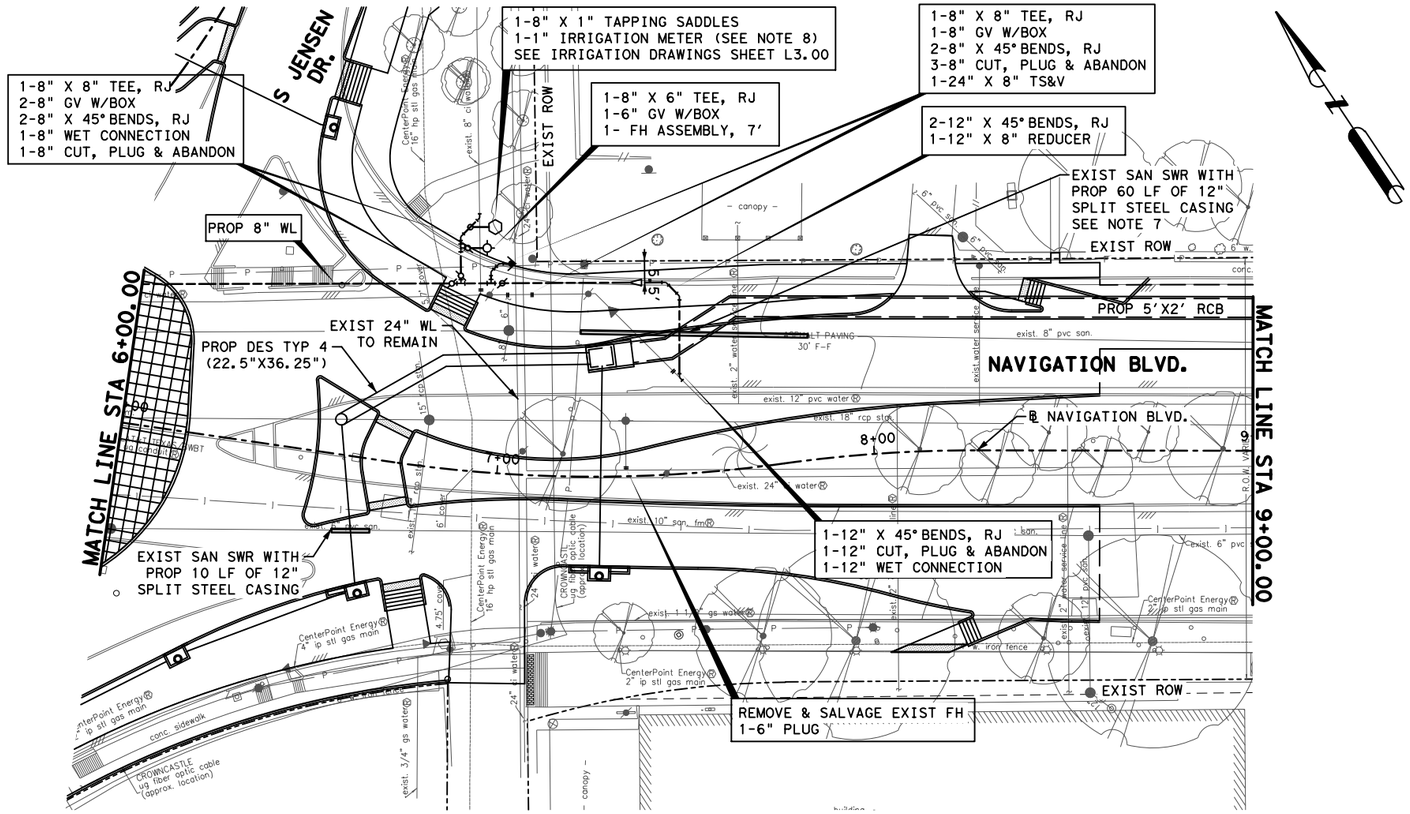
Gauge ENGINEERING
11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

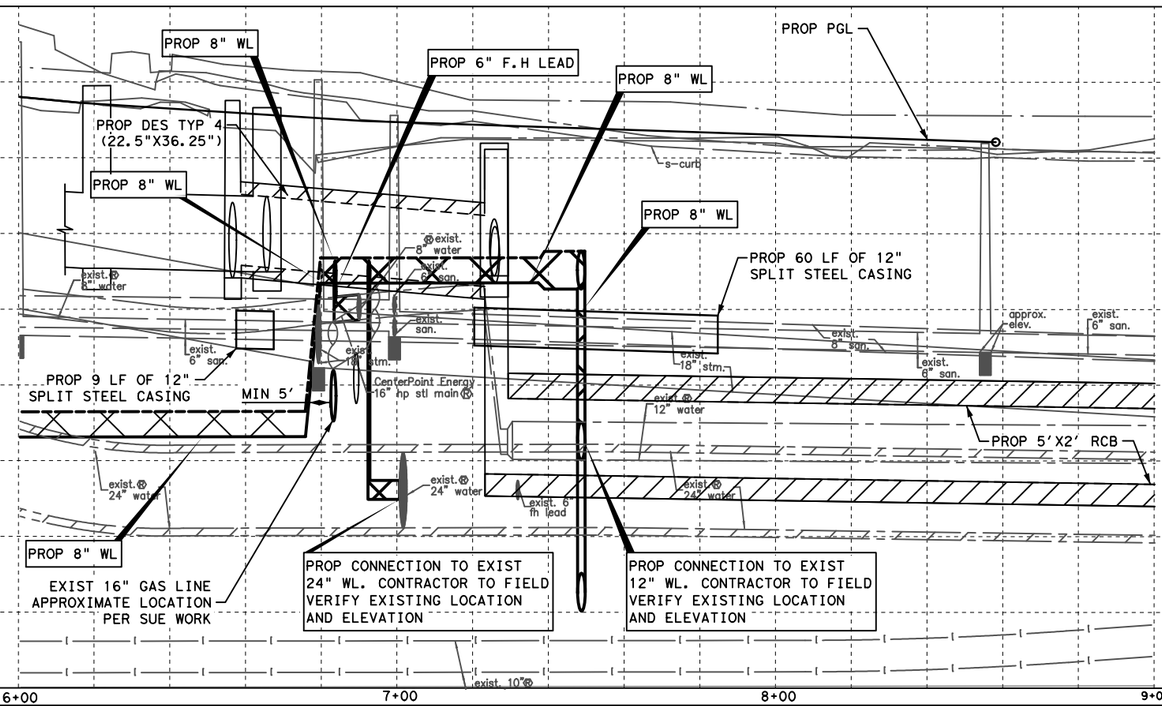
NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

WATER LINE PROFILE
NW APPROACH STA 2+00 TO STA 6+00
SW APPROACH STA 5+00 TO STA 9+00

SHEET 2 OF 4

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	169





LEGEND:

- PROP WATER LINE
- PROP SANITARY SEWER
- PVC WITH RESTRAINED JOINTS
- SPLIT STEEL CASING

NOTES:

1. MAINTAIN WATER SERVICES TO ALL CUSTOMER, FIRE HYDRANTS, AND INTERCONNECTIONS AT ALL TIME PROVIDE TEMPORARY CONNECTION AS NECESSARY FOR CONSTRUCTIONS.
2. ALL CONNECTIONS TO EXISTING WATER LINES TO BE MADE WITHIN ROW LIMITS.
3. REFER TO STM SWR SHEETS FOR MORE INFORMATION.
4. CONNECTION TO PROPOSED WATER LINE OF EXISTING SERVICES LESS THAN 3" ARE NOT SHOWN GRAPHICALLY, HOWEVER SHALL BE PREFORMED BY CONTRACTOR.
5. ALL WATER METER BOXES WITHIN SIDEWALK SHALL BE REPLACED WITH CONCRETE BOX PER CITY STANDARDS.
6. PLACE ONE FULL SECTION (MIN. 18') OF PROPOSED SAN SWR/WL CENTERED AT WL/SAN SWR CROSSING PROVIDE RESTRAINED JOINTS ON SS/WL SPACED AT LEAST 9 FT HORIZONTALLY FROM CL OF WL/SS.
7. REMOVE AND REPLACE ONE FULL SECTION OF EXISTING SANITARY SEWER WITH PRESSURE RATED PIPE CENTERED AT WATERLINE CROSSING. PROVIDE RESTRAINED JOINTS.
8. METER BOX SHALL BE LOCATED WITHIN THE CITY RIGHT OF WAY LIMITS. BOX SHALL BE CAST IRON OR CONCRETE IF IT IS LOCATED WITHIN SIDEWALK.

0' 40' 80'
(IN FEET)

SCALE: PLAN 1"=40'
PROFILE 1"=4'

STATE OF TEXAS
KARAM M. QADDO
125611
LICENSED
PROFESSIONAL ENGINEER
06/28/2022
Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

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11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

WATER LINE PLAN & PROFILE STA 6+00 TO STA 9+00

SHEET 3 OF 4

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	170

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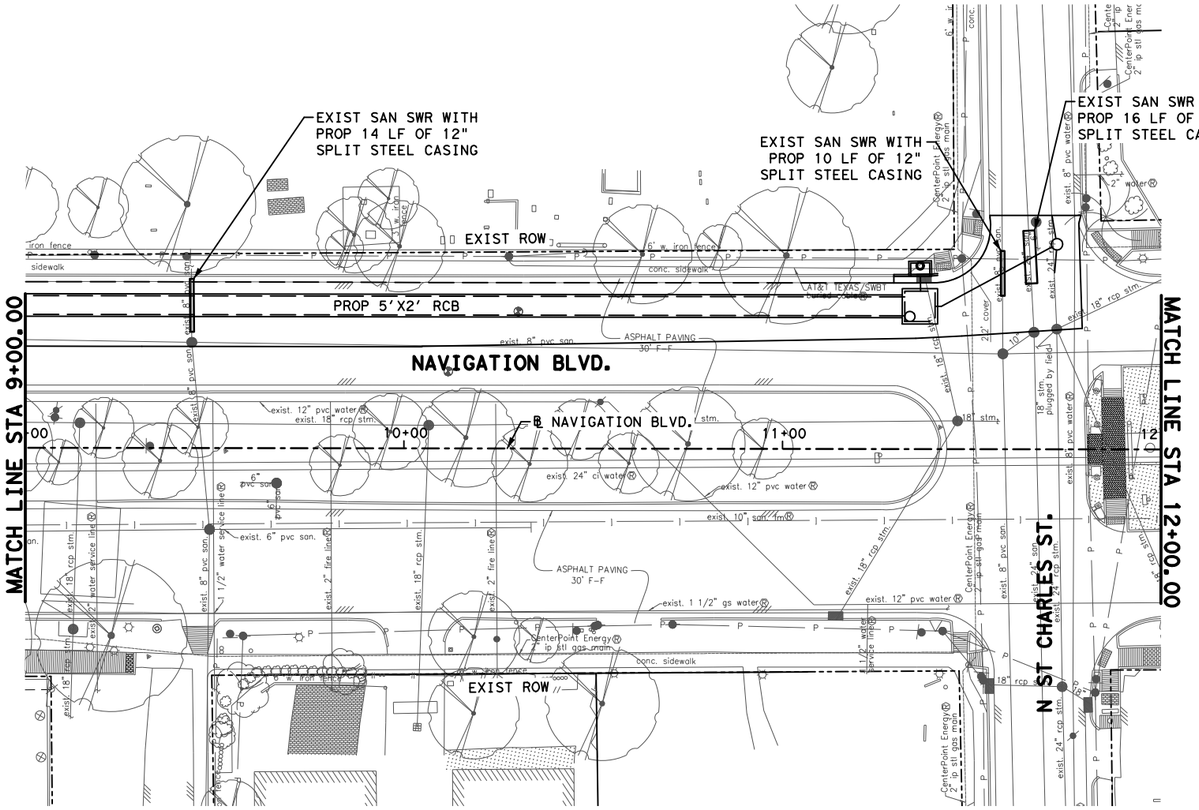

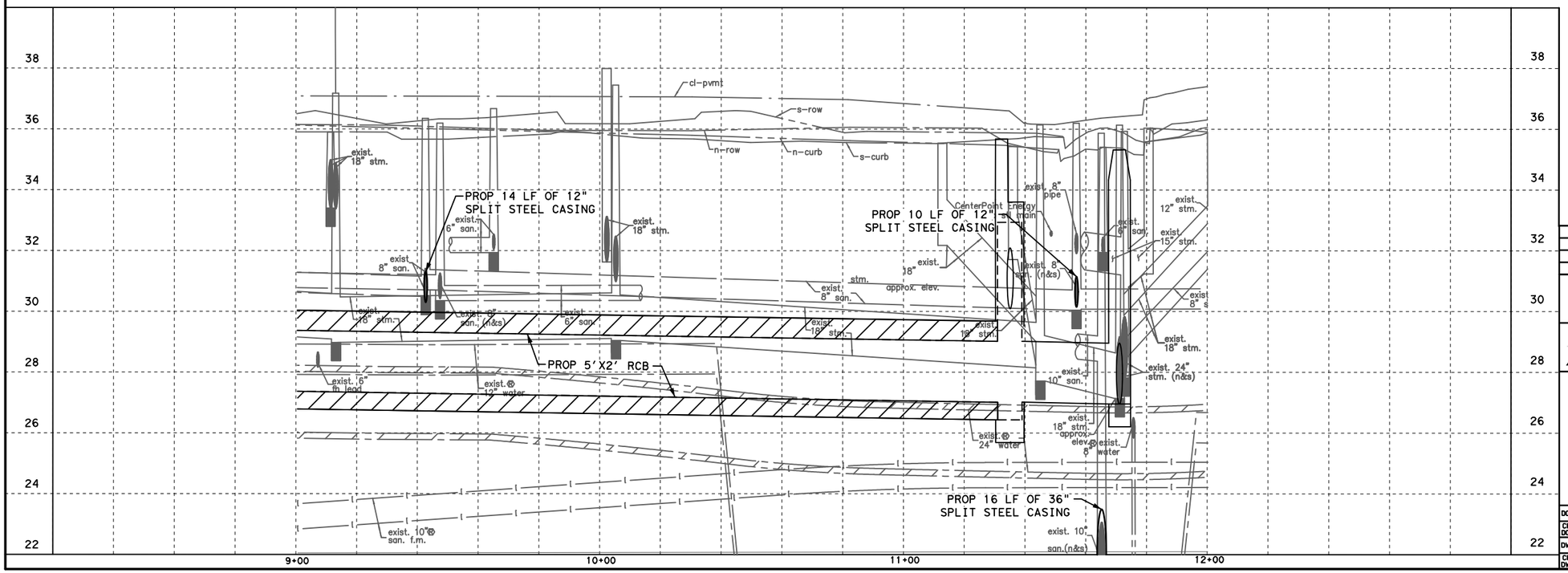

LEGEND:

- PROP WATER LINE
- PROP SANITARY SEWER
- PVC WITH RESTRAINED JOINTS
- SPLIT STEEL CASING

NOTES:

1. MAINTAIN WATER SERVICES TO ALL CUSTOMER, FIRE HYDRANTS, AND INTERCONNECTIONS AT ALL TIME PROVIDE TEMPORARY CONNECTION AS NECESSARY FOR CONSTRUCTIONS.
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7. REMOVE AND REPLACE ONE FULL SECTION OF EXISTING SANITARY SEWER WITH PRESSURE RATED PIPE CENTERED AT WATERLINE CROSSING. PROVIDE RESTRAINED JOINTS.
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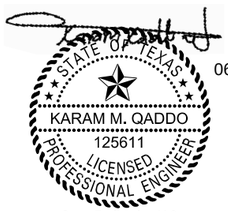
0' 40' 80'
(IN FEET)

SCALE: PLAN 1"=40'
PROFILE 1"=4'



Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

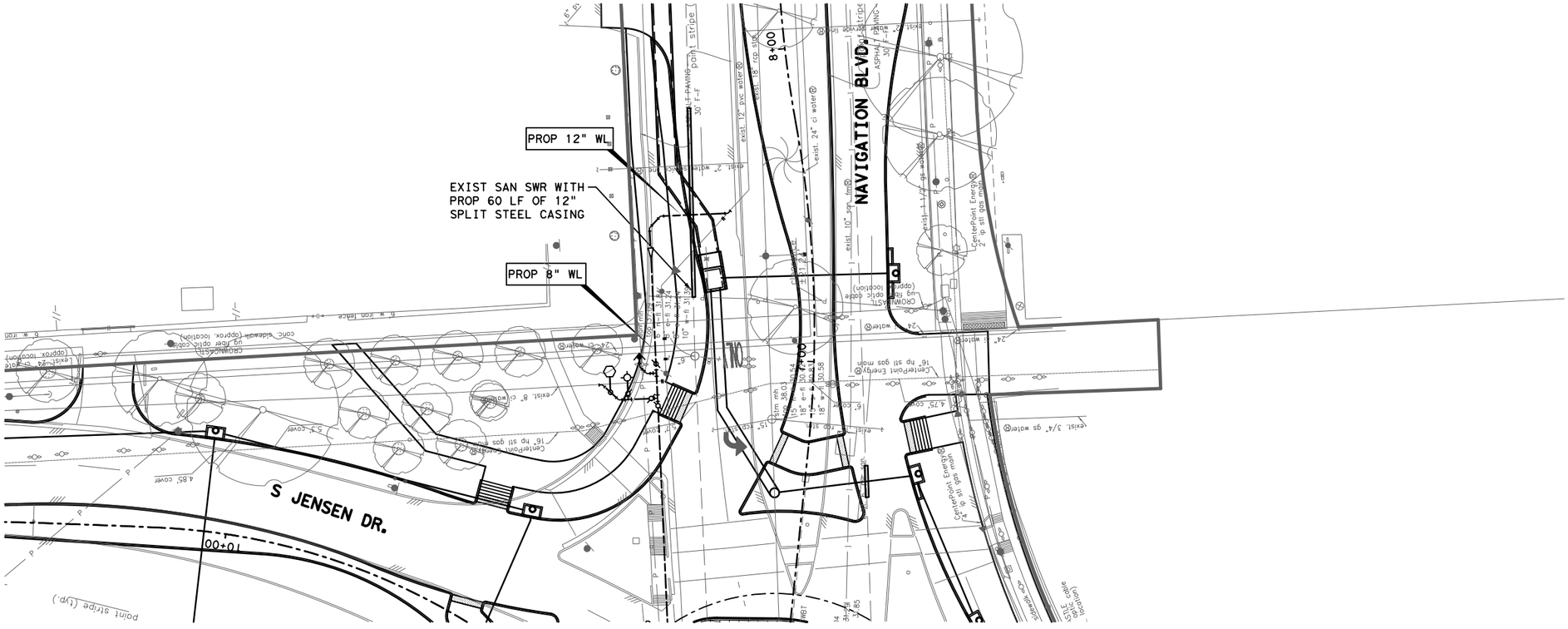
Gauge ENGINEERING
11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

WATER LINE PLAN & PROFILE STA 9+00 TO STA 12+00

SHEET 4 OF 4

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	171



LEGEND:

PROP WATER LINE

PROP SANITARY SEWER

NOTES:

1. MAINTAIN WATER SERVICES TO ALL CUSTOMER, FIRE HYDRANTS, AND INTERCONNECTIONS AT ALL TIME PROVIDE TEMPORARY CONNECTION AS NECESSARY FOR CONSTRUCTIONS.
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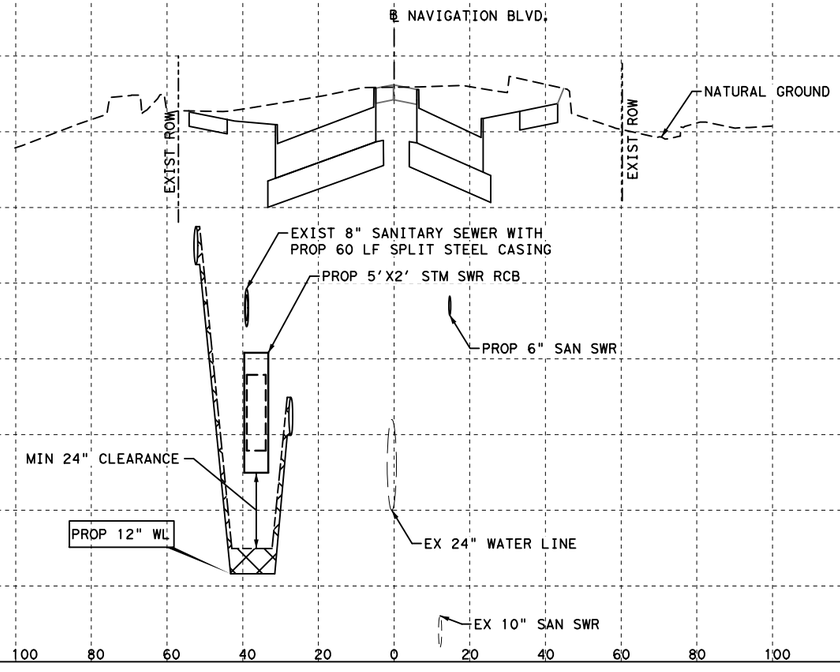

0′ 20′ 40′

(IN FEET)
SCALE: PLAN 1"=20′
PROFILE 1"=10′

STATE OF TEXAS
KARAM M. QADDO
125611
LICENSED
PROFESSIONAL ENGINEER
06/08/2022

Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

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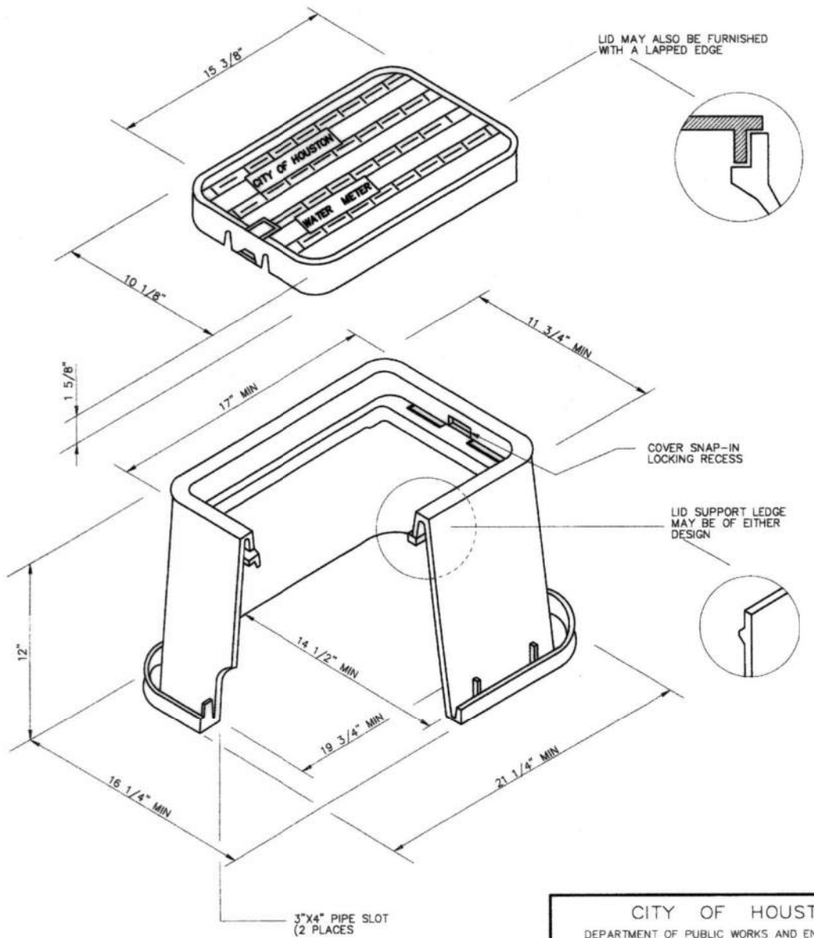
11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

RUNNELS ST. & NAVIGATION BLVD. WATER LINE LATERAL STA 7+50.00

SHEET 1 OF 1

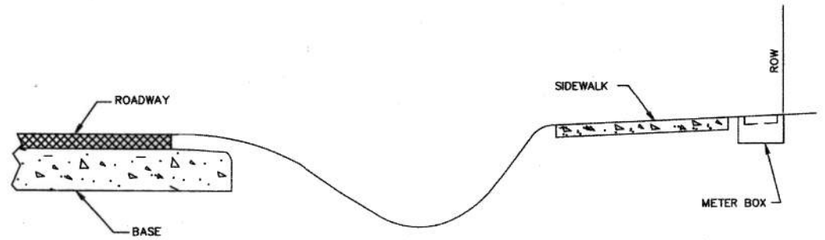
DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	172



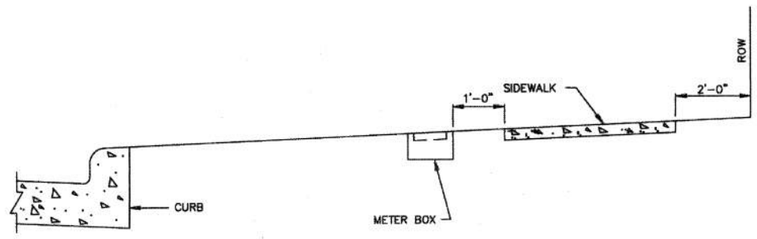
NOTE

1. LID MUST BE ABLE TO ACCEPT THE CITY'S AMR TRANSMITTING ENDPOINT.

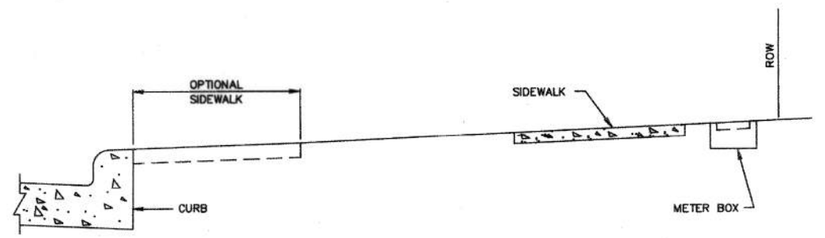
CITY OF HOUSTON DEPARTMENT OF PUBLIC WORKS AND ENGINEERING	
STANDARD PLASTIC METER BOX FOR 5/8" AND 1" METERS (NOT TO SCALE)	
APPROVED BY CITY ENGINEER	APPROVED BY DIRECTOR OF PUBLIC WORKS AND ENGINEERING
EFF DATE: JUL-01-2010	DWG NO: 02085-01



OPEN DITCH STREET



CURB STREET



CURB STREET

CITY OF HOUSTON DEPARTMENT OF PUBLIC WORKS AND ENGINEERING	
LOCATION OF WATER METER BOX FOR 2" DIAMETER AND LESS	
APPROVED BY CITY ENGINEER	APPROVED BY DIRECTOR OF PUBLIC WORKS AND ENGINEERING
EFF DATE: JUL-01-2010	DWG NO: 02085-02

STATE OF TEXAS
KARAM M. QADDO
125611
LICENSED PROFESSIONAL ENGINEER
06/08/2022

Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

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11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

Texas Department of Transportation

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

WATER LINE STANDARD

SHEET 1 OF 6

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	173

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Plotted on: 6/7/2022 11:39:56 AM sshariffian
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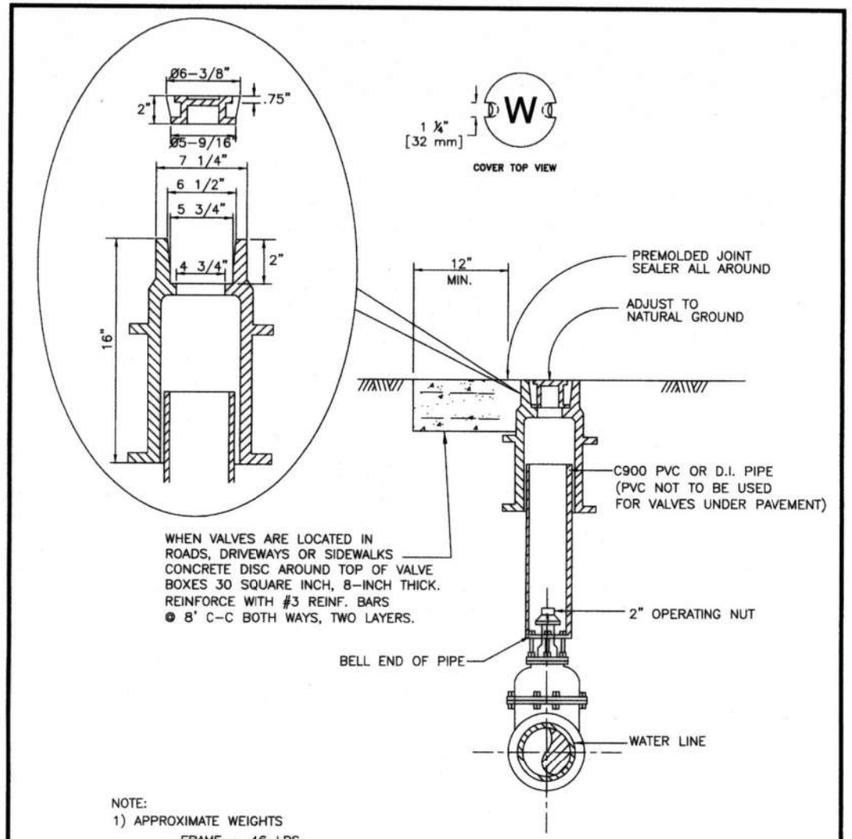
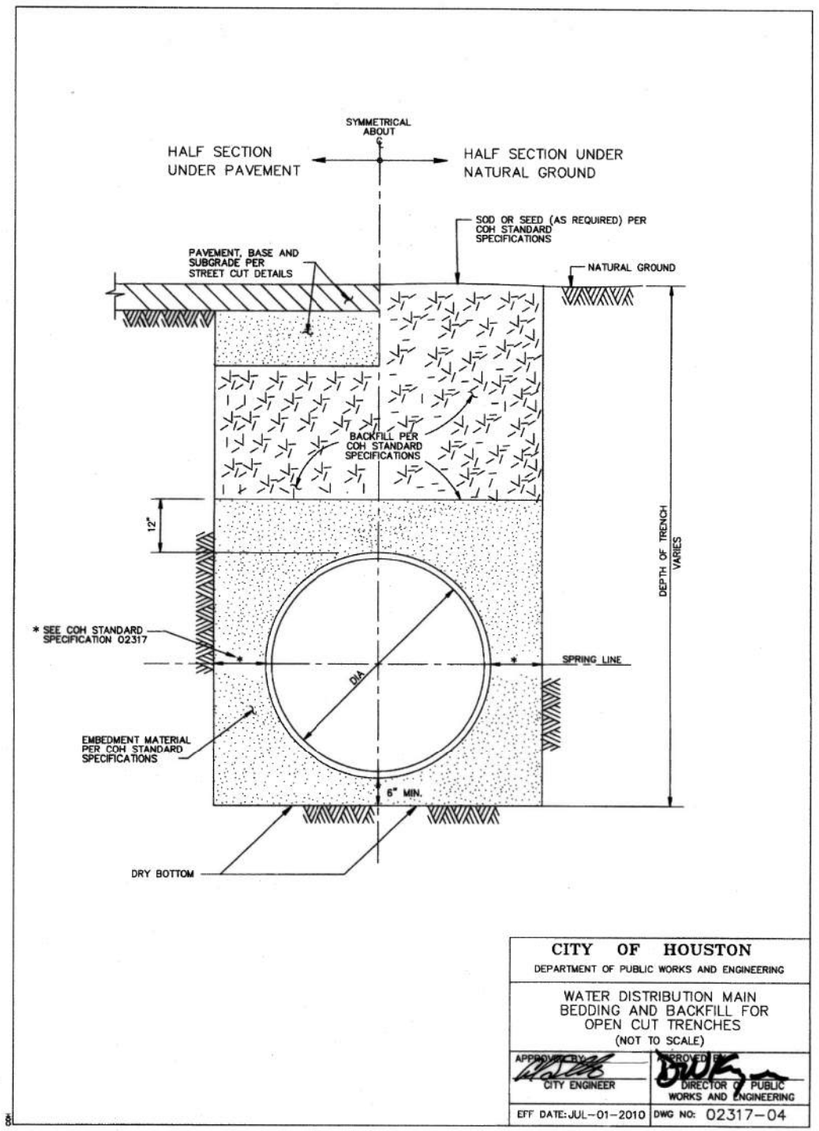


NOTE:
1) APPROXIMATE WEIGHTS
FRAME – 46 LBS
COVER – 10 LBS
2) MATERIAL – GRAY IRON ASTM A48 CL35B

CITY OF HOUSTON DEPARTMENT OF PUBLIC WORKS AND ENGINEERING	
VALVE BOX DETAIL (NOT TO SCALE)	
APPROVED BY: CITY ENGINEER	APPROVED BY: DIRECTOR OF PUBLIC WORKS AND ENGINEERING
EFF. DATE: JULY 01, 2010	DWG. NO: 02085-03



CITY OF HOUSTON DEPARTMENT OF PUBLIC WORKS AND ENGINEERING	
WATER DISTRIBUTION MAIN BEDDING AND BACKFILL FOR OPEN CUT TRENCHES (NOT TO SCALE)	
APPROVED BY: CITY ENGINEER	APPROVED BY: DIRECTOR OF PUBLIC WORKS AND ENGINEERING
EFF DATE: JUL-01-2010	DWG NO: 02317-04

Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

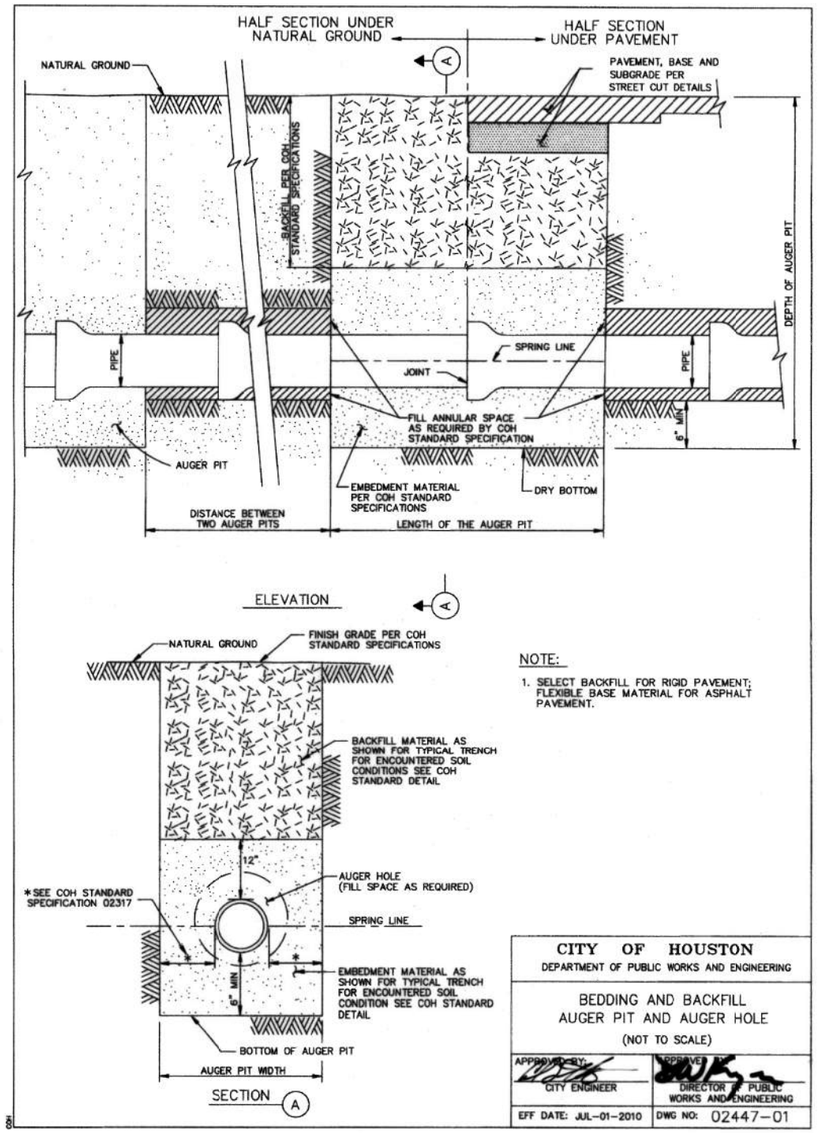
Gauge ENGINEERING
11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

WATER LINE STANDARD

SHEET 2 OF 6

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	174



NOTE:

1. SELECT BACKFILL FOR RIGID PAVEMENT; FLEXIBLE BASE MATERIAL FOR ASPHALT PAVEMENT.

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

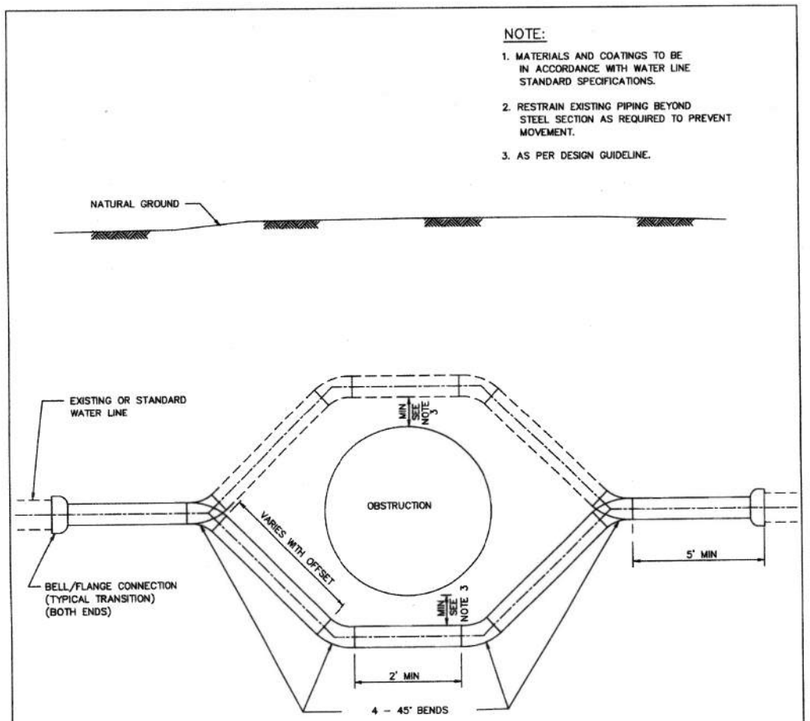
BEDDING AND BACKFILL
AUGER PIT AND AUGER HOLE
(NOT TO SCALE)

APPROVED BY: CITY ENGINEER | APPROVED BY: DIRECTOR OF PUBLIC WORKS AND ENGINEERING

EFF DATE: JUL-01-2010 | DWG NO: 02447-01

NOTE:

1. MATERIALS AND COATINGS TO BE IN ACCORDANCE WITH WATER LINE STANDARD SPECIFICATIONS.
2. RESTRAIN EXISTING PIPING BEYOND STEEL SECTION AS REQUIRED TO PREVENT MOVEMENT.
3. AS PER DESIGN GUIDELINE.



PIPE OFFSET ALTERNATES

1. DUCTILE IRON PIPE PRESSURE 250 PSI WITH APPROVED RESTRAINED JOINTS.
2. PVC PIPE WITH INTEGRAL RESTRAINED JOINT SYSTEM, OR DUCTILE - IRON RESTRINED JOINT FITTINGS, EPOXY LINED AND COATED. USE 250 PSI AWWA C900 DR 14 FOR PVC RESTRAINED JOINTS.
3. PVC NOT ALLOWED FOR GREATER THAN 20 FT OF COVER OR FOR DIAMETER LARGER THAN 20 IN.
4. USE ONLY DUCTILE IRON AND PVC PRODUCTS LISTED ON OCE DIVISION APPROVED PRODUCTS LIST AND IN ACCORDANCE WITH CITY STANDARD SPECIFICATIONS.

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

TYPICAL STEEL PIPE OFFSET
SECTION FOR WATER LINES
(NOT TO SCALE)

APPROVED BY: CITY ENGINEER | APPROVED BY: DIRECTOR OF PUBLIC WORKS AND ENGINEERING

EFF DATE: JULY-01-2010 | DWG NO: 02511-01

STATE OF TEXAS
KARAM M. QADDO
125611
LICENSED PROFESSIONAL ENGINEER
06/08/2022

Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

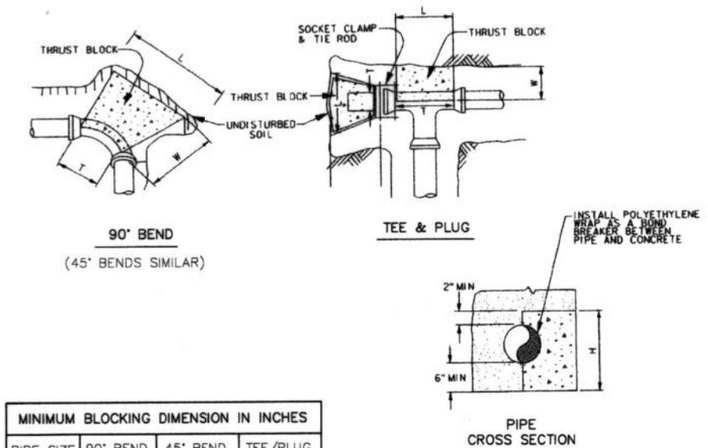
Gauge ENGINEERING
11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

WATER LINE STANDARD

SHEET 3 OF 6

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	175



90° BEND

(45° BENDS SIMILAR)

TEE & PLUG

PIPE
CROSS SECTION

MINIMUM BLOCKING DIMENSION IN INCHES												
PIPE SIZE	90° BEND				45° BEND				TEE/PLUG			
	W	H	L	T	W	H	L	T	W	H	L	T
4"	6	12	14	10	6	8	11	8	6	10	12	12
6"	8	14	26	12	8	14	14	12	8	14	19	19
8"	10	16	40	16	10	18	20	16	10	18	26	26
10"	12	24	42	18	12	22	25	18	12	24	30	30
12"	14	36	40	30	14	26	30	22	14	26	40	40

CORRECTION FACTORS		
SOIL TYPE	SOIL BEARING STRENGTH S_b (lb/ft²)	MULTIPLY "L" AND "H" BY
SOFT CLAY	1000	1.73
SILT	1500	1.41
SANDY SILT	3000	1.00
SAND	4000	0.87
SANDY CLAY	6000	0.71
HARD CLAY	9000	0.58

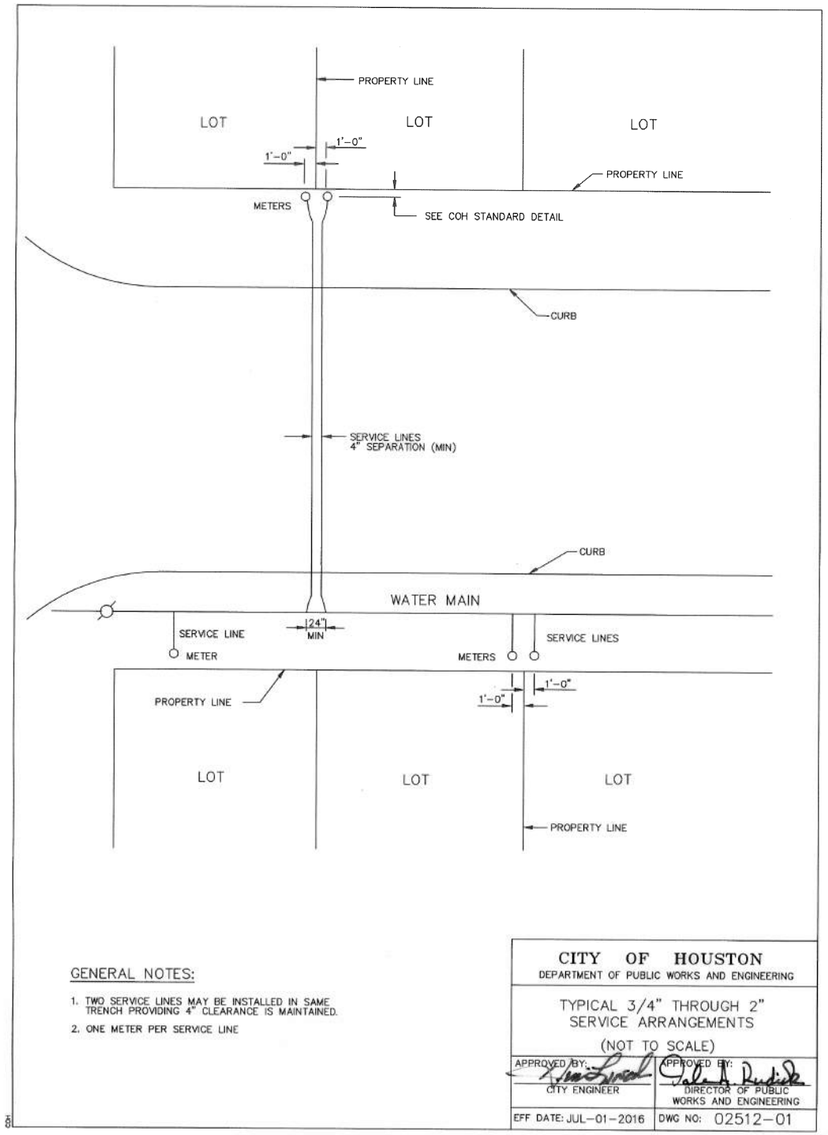
NOTES:

1. DEPTH "W" MAY BE GREATER THAN SPECIFIED TO ALLOW WORKING SPACE.
2. BLOCKING MUST BE PLACED AGAINST UNDISTURBED EARTH. WHERE THIS IS NOT POSSIBLE, THE FILL BETWEEN THE BEARING SURFACE AND UNDISTURBED SOIL MUST BE COMPACTED TO AT LEAST 90% STANDARD PROCTOR DENSITY.
3. PROVIDE CONCRETE IN ACCORDANCE WITH STANDARD SPECIFICATION SECTION 03315 – CONCRETE FOR UTILITY CONSTRUCTION.
4. BLOCKING DIMENSIONS SHOWN ARE BASED ON 3000 PSI SOIL BEARING STRENGTH AND 125 PSI INTERNAL WATER PRESSURE. FOR OTHER SOIL CONDITIONS, MULTIPLY DIMENSIONS "L" AND "H" BY THE APPROPRIATE CORRECTION FACTOR.

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

THRUST BLOCK DETAIL
FOR WATER LINES
(4–INCH TO 12 INCH)
(NOT TO SCALE)

APPROVED BY: CITY ENGINEER	APPROVED BY: DIRECTOR OF PUBLIC WORKS AND ENGINEERING
EFF DATE: JULY–01–2010	DWG NO: 02511–02



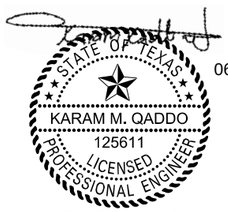
GENERAL NOTES:

1. TWO SERVICE LINES MAY BE INSTALLED IN SAME TRENCH PROVIDING 4" CLEARANCE IS MAINTAINED.
2. ONE METER PER SERVICE LINE

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

TYPICAL 3/4" THROUGH 2"
SERVICE ARRANGEMENTS
(NOT TO SCALE)

APPROVED BY: CITY ENGINEER	APPROVED BY: DIRECTOR OF PUBLIC WORKS AND ENGINEERING
EFF DATE: JUL–01–2016	DWG NO: 02512–01



06/08/2022

Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

Gauge ENGINEERING
11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

Texas Department of Transportation
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NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

WATER LINE STANDARD

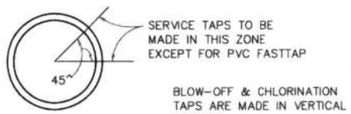
SHEET 4 OF 6

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	176

PIPE TAPPING SCHEDULE

WATER MAIN TYPE AND DIAMETER	SERVICE SIZE			
	3/4"	1"	1 1/2"	2"
4" CAST IRON OR DUCTILE IRON	DSS, WBSS	DSS, WBSS	DSS, WBSS	DSS, WBSS
4" ASBESTOS (EXISTING) CEMENT	WBSS	WBSS	DSS, WBSS	DSS, WBSS
4" PVC (AWWA C900)	DSS, WBSS	DSS, WBSS	DSS, WBSS	DSS, WBSS
6" AND 8" CAST IRON OR DUCTILE IRON	DSS, WBSS	DSS, WBSS	DSS, WBSS	DSS, WBSS
6" AND 8" ASBESTOS (EXISTING) CEMENT	DSS, WBSS	DSS, WBSS	DSS, WBSS	DSS, WBSS
6" AND 8" CAST IRON OR DUCTILE IRON	DSS, WBSS	DSS, WBSS	DSS, WBSS	DSS, WBSS
6" AND 8" PVC (AWWA C900)	DSS, WBSS	DSS, WBSS	DSS, WBSS	DSS, WBSS
12" CAST IRON OR DUCTILE IRON	DSS, WBSS	DSS, WBSS	DSS, WBSS	DSS, WBSS
12" ASBESTOS (EXISTING) CEMENT	DSS, WBSS	DSS, WBSS	DSS, WBSS	DSS, WBSS
12" PVC (AWWA C900)	DSS, WBSS	DSS, WBSS	DSS, WBSS	DSS, WBSS
16" AND UP CAST IRON OR DUCTILE IRON	DWBSS	DWBSS	DWBSS	DWBSS
16" AND UP ASBESTOS (EXISTING) CEMENT	DWBSS	DWBSS	DWBSS	DWBSS
16" AND UP PVC (AWWA C900)	DWBSS	DWBSS	DWBSS	DWBSS

DSS – DUAL STRAP SADDLES
WBSS – WIDE BAND STRAP SADDLES
DWBSS – DUAL WIDE BAND STRAP SADDLES




WIDE BAND SINGLE SADDLE OR DUAL SADDLES

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

SERVICE TAPS

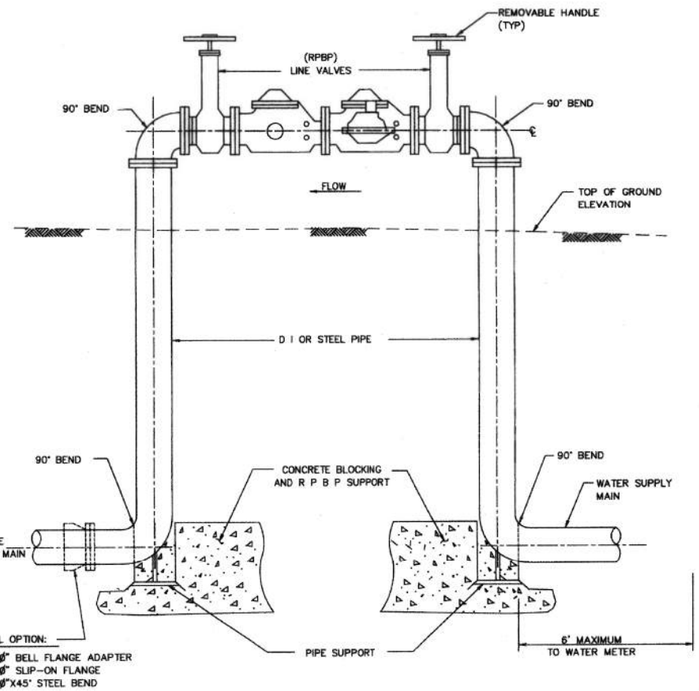
(NOT TO SCALE)

APPROVED BY: CITY ENGINEER | APPROVED BY: DIRECTOR OF PUBLIC WORKS AND ENGINEERING

EFF DATE: JUL-01-2010 | DWG NO: 02512-02

GENERAL NOTES:

1. INSULATE REDUCED PRESSURE BACKFLOW PREVENTER TO AVOID FREEZING.
2. REDUCED PRESSURE BACKFLOW PREVENTER'S DISCHARGE OPENING IS TO BE A MINIMUM OF 12 INCHES ABOVE GROUND ELEVATION OR 100 YEAR FLOOD ELEVATION WHICHEVER IS GREATER.



CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

REDUCED PRESSURE BACKFLOW – PREVENTER (R P B P)

(NOT TO SCALE)

APPROVED BY: CITY ENGINEER | APPROVED BY: DIRECTOR OF PUBLIC WORKS AND ENGINEERING

EFF DATE: JULY-01-2010 | DWG NO: 02523-01

STATE OF TEXAS
KARAM M. QADDO
125611
LICENSED PROFESSIONAL ENGINEER
06/08/2022

Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

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Houston, TX 77079
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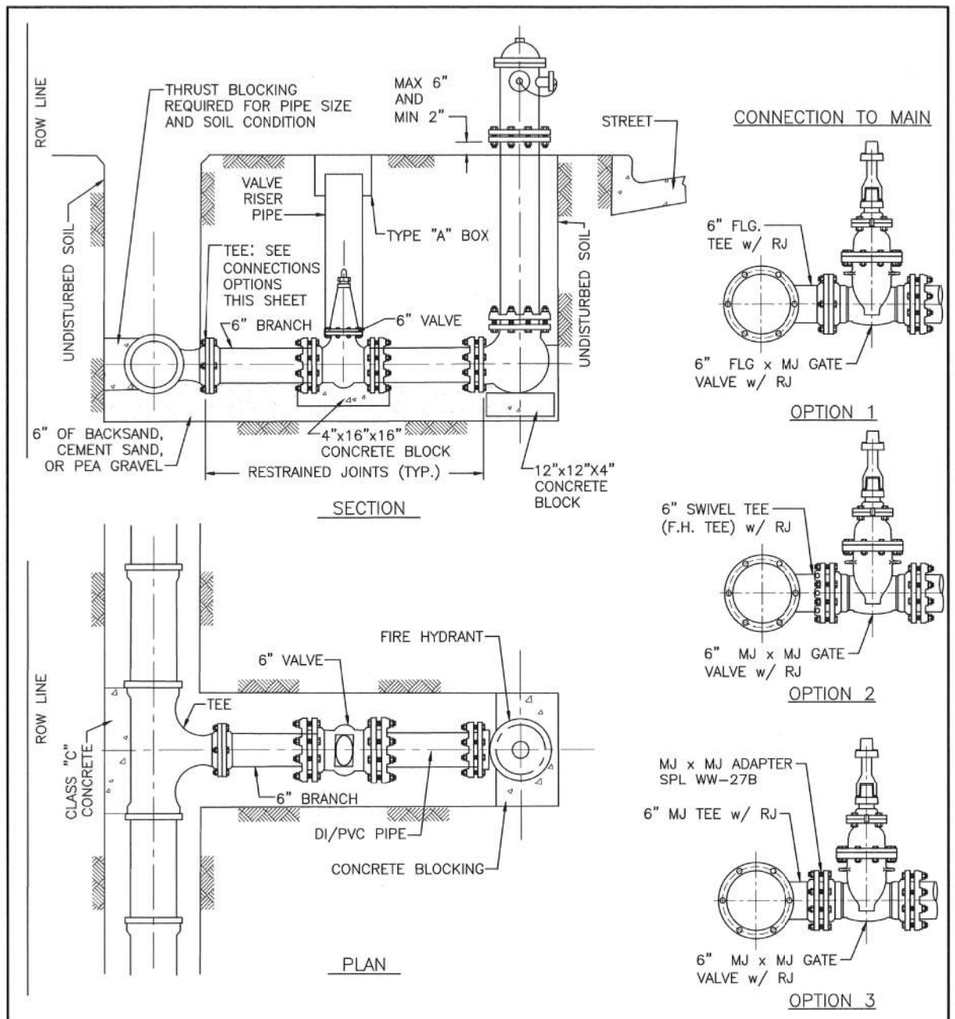
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

WATER LINE STANDARD

SHEET 5 OF 6

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	177

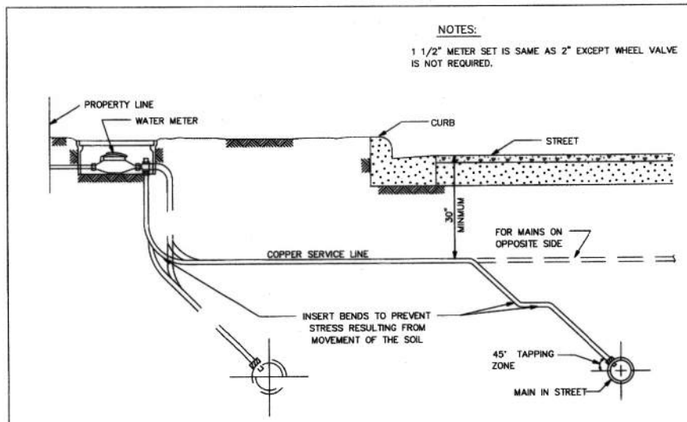


NOTES:

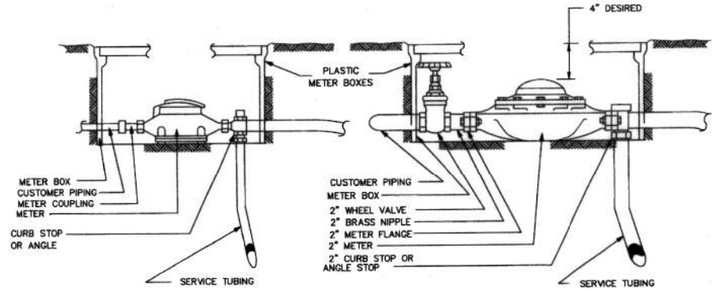
1. LOCATE FIRE HYDRANTS AT POINT OF CURVATURE (PC) OR POINT OF TANGENCY (PT) OF THE INTERSECTION CURB RADIUS, 3 FEET BEHIND CURB OR PROJECTED FUTURE CURB.
2. ON OPEN-DITCH ROADWAYS, SET THE FIRE HYDRANTS WITH IN 5 FEET OF RIGHT-OF-WAY LINES.
3. FIRE HYDRANT STEAMER NOZZLE SHALL FACE THE STREET.
4. LOCATE HYDRANT VALVE IMMEDIATELY ADJACENT TO WATER LINE.
5. ALL PIPING TO BE RESTRAINED JOINTS.

CITY OF HOUSTON HOUSTON PUBLIC WORKS	
STANDARD FIRE HYDRANT DETAIL (NOT TO SCALE)	
APPROVED BY: CITY ENGINEER	APPROVED BY: DIRECTOR OF HOUSTON PUBLIC WORKS
EFF DATE: JUL-01-2021	DWG NO: 02520-01

NOTES:
1 1/2" METER SET IS SAME AS 2" EXCEPT WHEEL VALVE IS NOT REQUIRED.



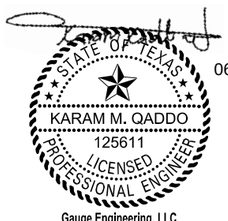
TYPICAL SECTION SERVICE LINE



5/8", 3/4" AND 1" METER SET

2" METER SET

CITY OF HOUSTON DEPARTMENT OF PUBLIC WORKS AND ENGINEERING	
TYPICAL METER SETTINGS (NOT TO SCALE)	
APPROVED BY: CITY ENGINEER	APPROVED BY: DIRECTOR OF PUBLIC WORKS AND ENGINEERING
EFF DATE: JULY-01-2010	DWG NO: 02526-01



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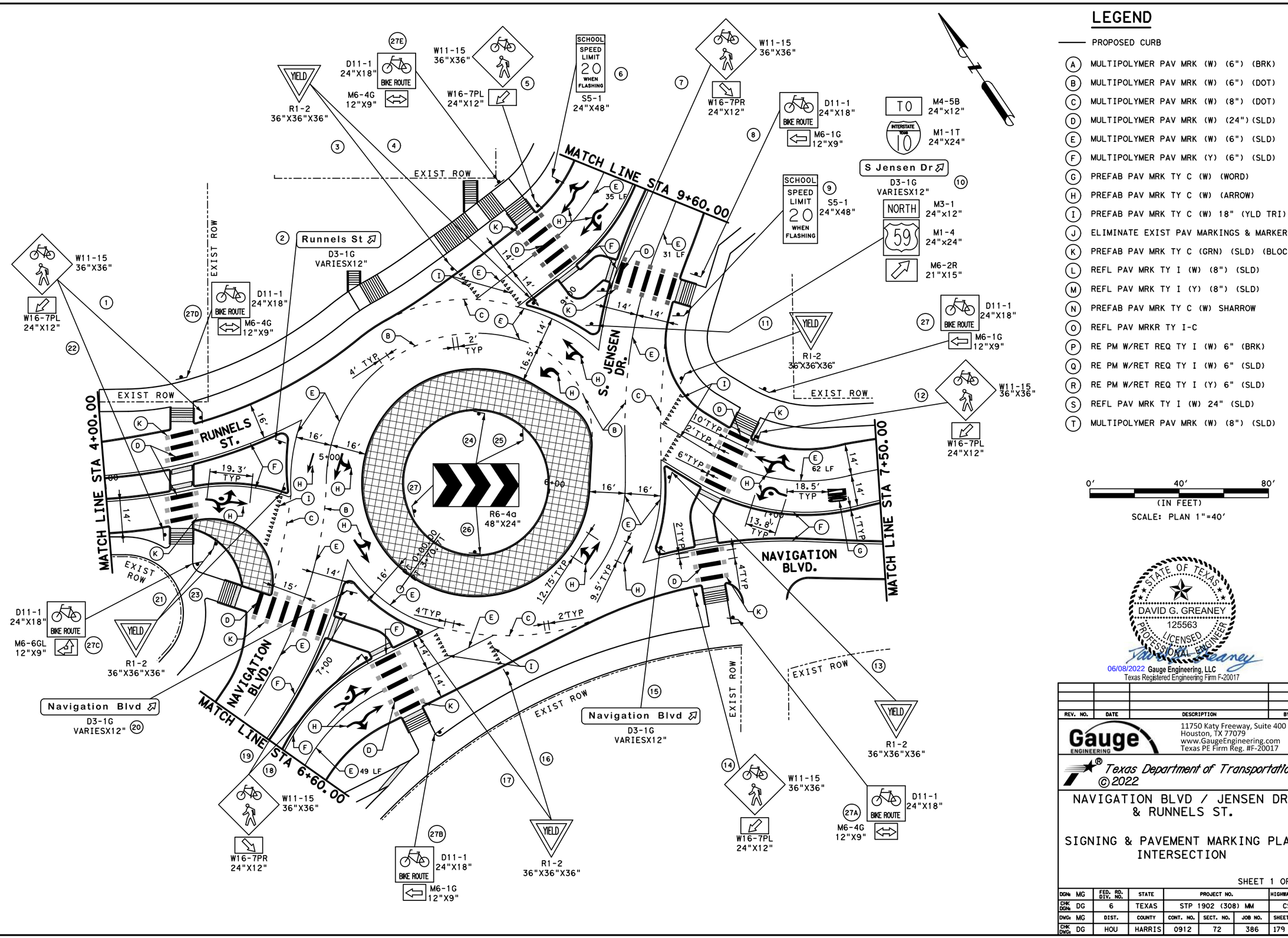
NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

WATER LINE STANDARD

SHEET 6 OF 6

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	178



LEGEND

PROPOSED CURB

- (A) MULTIPOLYMER PAV MRK (W) (6") (BRK)
- (B) MULTIPOLYMER PAV MRK (W) (6") (DOT)
- (C) MULTIPOLYMER PAV MRK (W) (8") (DOT)
- (D) MULTIPOLYMER PAV MRK (W) (24")(SLD)
- (E) MULTIPOLYMER PAV MRK (W) (6") (SLD)
- (F) MULTIPOLYMER PAV MRK (Y) (6") (SLD)
- (G) PREFAB PAV MRK TY C (W) (WORD)
- (H) PREFAB PAV MRK TY C (W) (ARROW)
- (I) PREFAB PAV MRK TY C (W) 18" (YLD TRI)
- (J) ELIMINATE EXIST PAV MARKINGS & MARKERS
- (K) PREFAB PAV MRK TY C (GRN) (SLD) (BLOCK)
- (L) REFL PAV MRK TY I (W) (8") (SLD)
- (M) REFL PAV MRK TY I (Y) (8") (SLD)
- (N) PREFAB PAV MRK TY C (W) SHARROW
- (O) REFL PAV MRKR TY I-C
- (P) RE PM W/RET REQ TY I (W) 6" (BRK)
- (Q) RE PM W/RET REQ TY I (W) 6" (SLD)
- (R) RE PM W/RET REQ TY I (Y) 6" (SLD)
- (S) REFL PAV MRK TY I (W) 24" (SLD)
- (T) MULTIPOLYMER PAV MRK (W) (8") (SLD)

0′ 40′ 80′
(IN FEET)
SCALE: PLAN 1"=40′

STATE OF TEXAS
DAVID G. GREANEY
125563
LICENSED
PROFESSIONAL ENGINEER
06/08/2022 Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

Gauge ENGINEERING
11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

SIGNING & PAVEMENT MARKING PLAN INTERSECTION

SHEET 1 OF 4

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	179

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NOTE:

1. PLACE 24"X24" GREEN SOLID BLOCKS TO CREATE THE 24" GREEN STRIPES AND RAMPS FOR BICYCLES.
2. AIR BLAST OR BROOM EXISTING PAVEMENT MARKINGS BEFORE RETRACING.

LEGEND

PROPOSED CURB

- (A) MULTIPOLYMER PAV MRK (W) (6") (BRK)
- (B) MULTIPOLYMER PAV MRK (W) (6") (DOT)
- (C) MULTIPOLYMER PAV MRK (W) (8") (DOT)
- (D) MULTIPOLYMER PAV MRK (W) (24") (SLD)
- (E) MULTIPOLYMER PAV MRK (W) (6") (SLD)
- (F) MULTIPOLYMER PAV MRK (Y) (6") (SLD)
- (G) PREFAB PAV MRK TY C (W) (WORD)
- (H) PREFAB PAV MRK TY C (W) (ARROW)
- (I) PREFAB PAV MRK TY C (W) 18" (YLD TRI)
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- (K) PREFAB PAV MRK TY C (GRN) (SLD) (BLOCK)
- (L) REFL PAV MRK TY I (W) (8") (SLD)
- (M) REFL PAV MRK TY I (Y) (8") (SLD)
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- (P) RE PM W/RET REQ TY I (W) 6" (BRK)
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- (S) REFL PAV MRK TY I (W) 24" (SLD)
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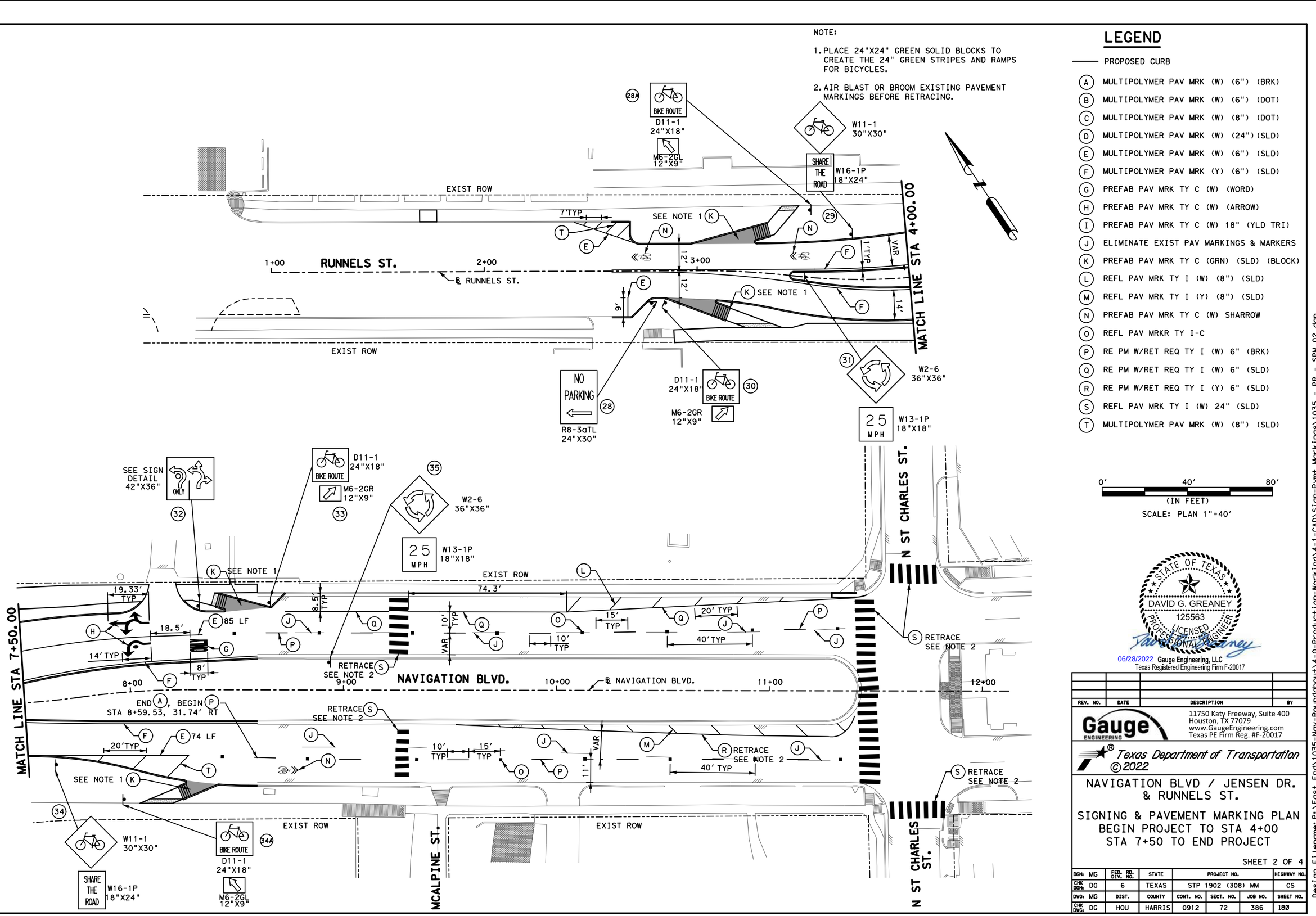
0′ 40′ 80′
(IN FEET)
SCALE: PLAN 1"=40′



STATE OF TEXAS
DAVID G. GREANEY
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06/28/2022 Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

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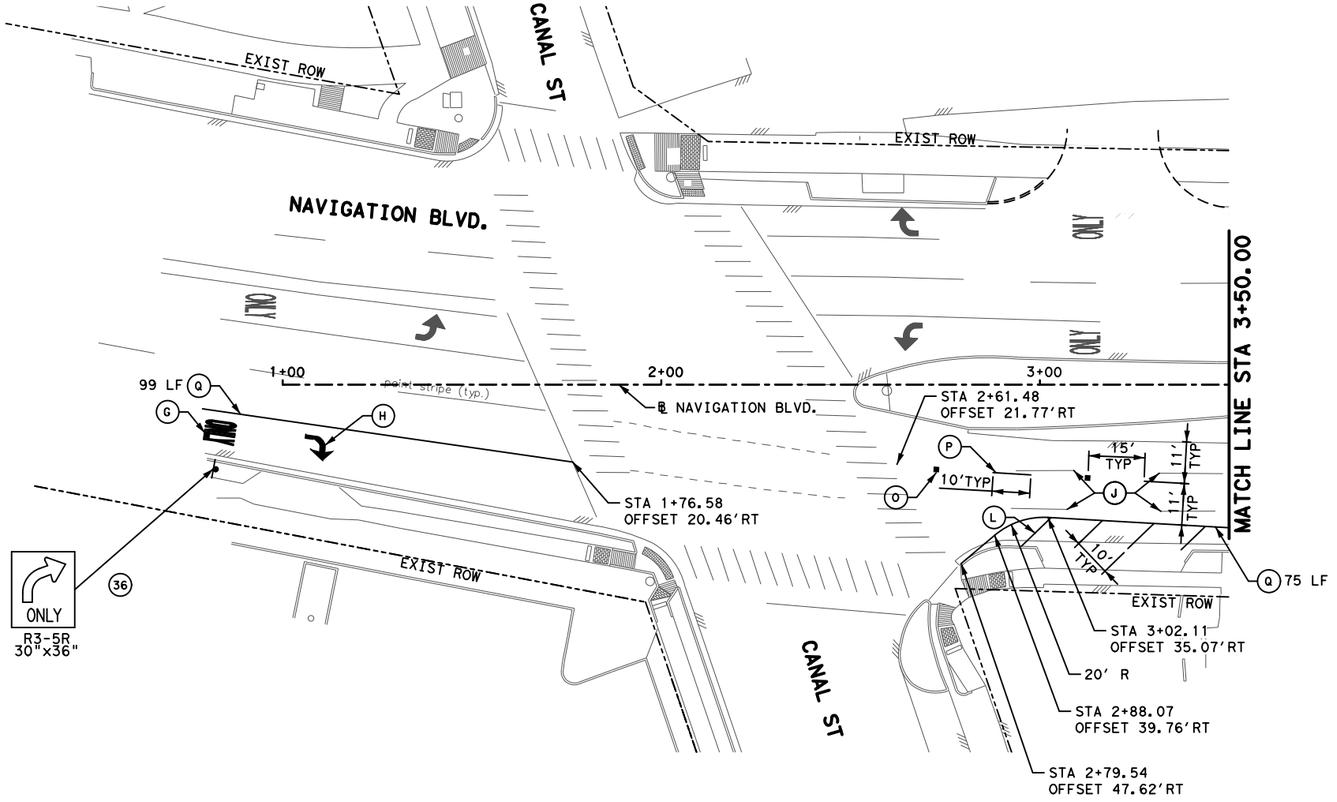
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

SIGNING & PAVEMENT MARKING PLAN BEGIN PROJECT TO STA 4+00 STA 7+50 TO END PROJECT

SHEET 2 OF 4

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	180



LEGEND

PROPOSED CURB

- (A) MULTIPOLYMER PAV MRK (W) (6") (BRK)
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- (H) PREFAB PAV MRK TY C (W) (ARROW)
- (I) PREFAB PAV MRK TY C (W) 18" (YLD TRI)
- (J) ELIMINATE EXIST PAV MARKINGS & MARKERS
- (K) PREFAB PAV MRK TY C (GRN) (SLD) (BLOCK)
- (L) REFL PAV MRK TY I (W) (8") (SLD)
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- (P) RE PM W/RET REQ TY I (W) 6" (BRK)
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- (R) RE PM W/RET REQ TY I (Y) 6" (SLD)
- (S) REFL PAV MRK TY I (W) 24" (SLD)
- (T) MULTIPOLYMER PAV MRK (W) (8") (SLD)

0' 40' 80'
(IN FEET)
SCALE: PLAN 1"=40'

STATE OF TEXAS
DAVID G. GREANEY
125563
LICENSED
PROFESSIONAL ENGINEER

06/08/2022 Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

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Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

SIGNING & PAVEMENT MARKING PLAN BEGIN OF PROJECT TO STA 3+50

SHEET 3 OF 4

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	181

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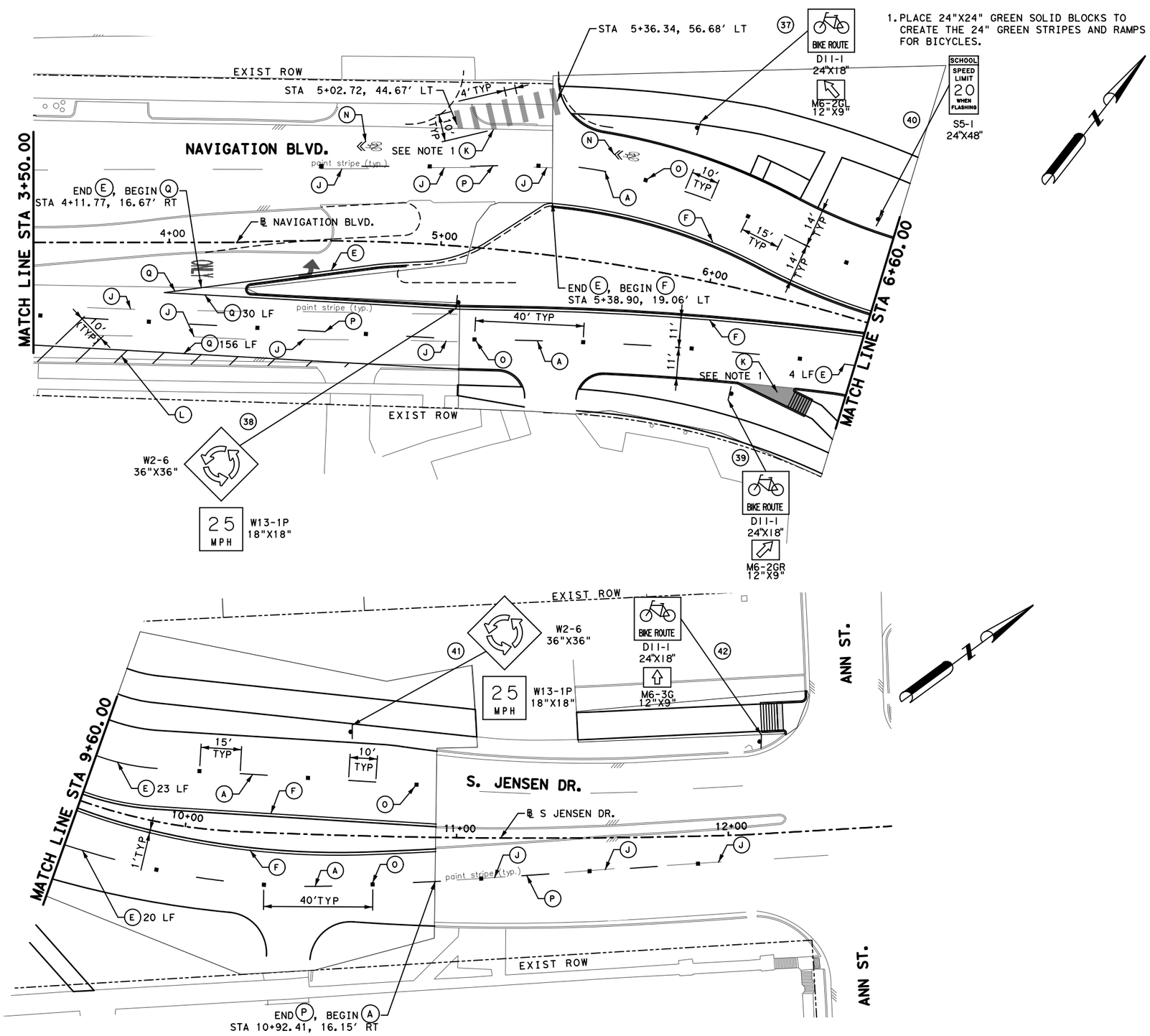

LEGEND

- PROPOSED CURB
- (A) MULTIPOLYMER PAV MRK (W) (6") (BRK)
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- (I) PREFAB PAV MRK TY C (W) 18" (YLD TRI)
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0' 40' 80'
(IN FEET)
SCALE: PLAN 1"=40'

STATE OF TEXAS
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06/28/2022 Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

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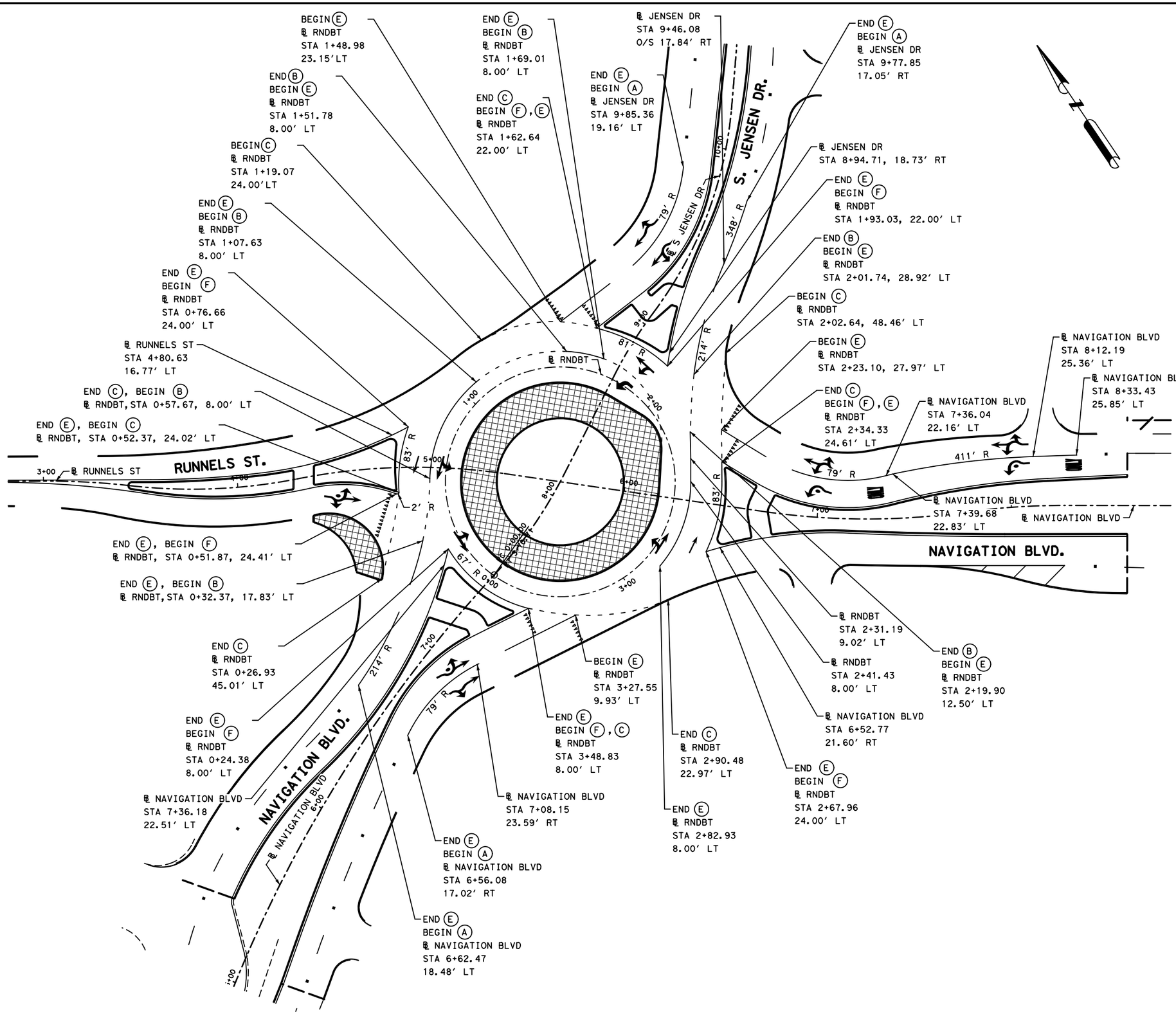
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

SIGNING & PAVEMENT MARKING PLAN
STA 3+50 TO STA 7+00
STA 9+40 TO END PROJECT

SHEET 4 OF 4

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	182



LEGEND

- PROPOSED CURB
- (A) MULTIPOLYMER PAV MRK (W) (6") (BRK)
- (B) MULTIPOLYMER PAV MRK (W) (6") (DOT)
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- (F) MULTIPOLYMER PAV MRK (Y) (6") (SLD)
- (G) PREFAB PAV MRK TY C (W) (WORD)
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- (P) RE PM W/RET REQ TY I (W) 6" (BRK)
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- (R) RE PM W/RET REQ TY I (Y) 6" (SLD)
- (S) REFL PAV MRK TY I (W) 24" (SLD)
- (T) MULTIPOLYMER PAV MRK (W) (8") (SLD)

0′ 40′ 80′
(IN FEET)
SCALE: PLAN 1"=40′

STATE OF TEXAS
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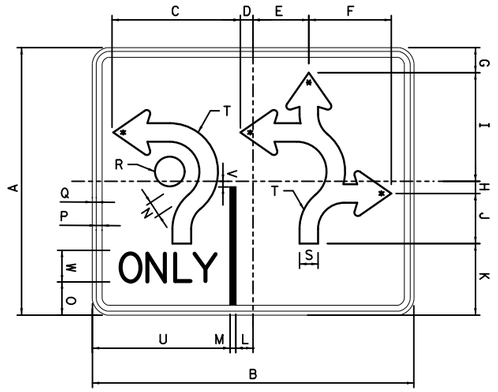
NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

PAVEMENT MARKING HORIZONTAL GEOMETRY

SHEET 1 OF 1

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	183

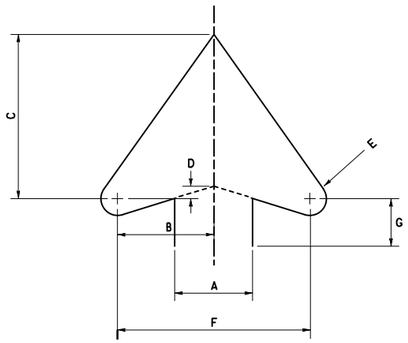


A (IN)	B (IN)	C (IN)	D (IN)	E (IN)	F (IN)	G (IN)	H (IN)	I (IN)	J (IN)	K (IN)	L (IN)	M (IN)
36	42	16.25	2.25	7.25	11.5	3	1.75	15	6.75	9.5	1.25	0.875

N (IN)	O (IN)	P (IN)	Q (IN)	R (IN)	S (IN)	T (IN)	U (IN)	V (IN)	W (IN)
2	3	0.75	0.5	2	2.5	6	19	1	8

COLORS
ARROW - BLACK
BACKGROUND - WHITE (REFLECTIVE)

* SEE TYPICAL ARROW HEAD DETAIL
** REDUCED SPACING 50%



A (IN)	B (IN)	C (IN)	D (IN)	E (IN)	F (IN)	G (IN)
2.5	2.875	5.063	0.375	0.5	6.75	1.5 MIN

TYPICAL
ARROWHEAD DETAIL

STATE OF TEXAS
DAVID G. GREANEY
125563
LICENSED
PROFESSIONAL ENGINEER

06/08/2022 Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

Gauge ENGINEERING
11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

Texas Department of Transportation

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

REGULATORY SIGN DETAIL

SHEET 1 OF 1

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	184

Pen Table:ROUNDABOUT - Copy.txt
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Plotted on: 6/7/2022 2:23:45 PM ssharifian
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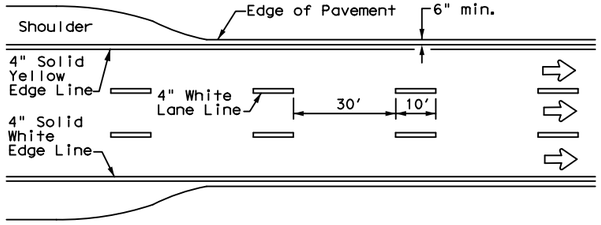
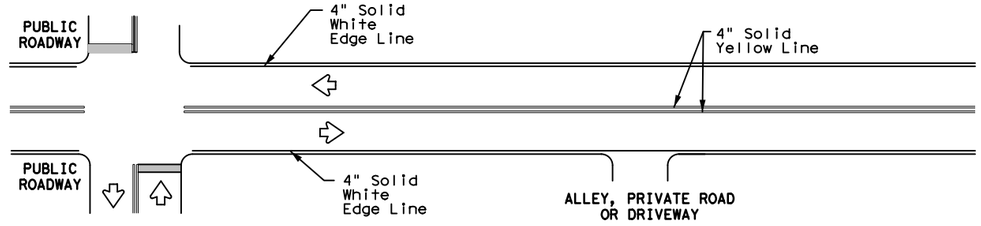
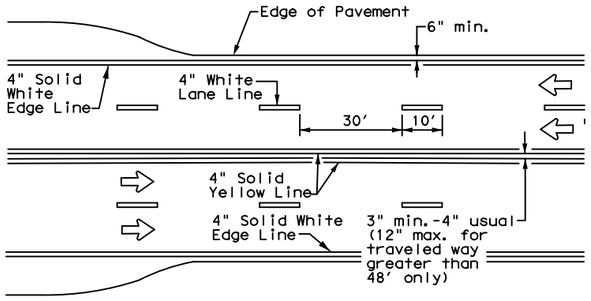
DATE:
FILE:



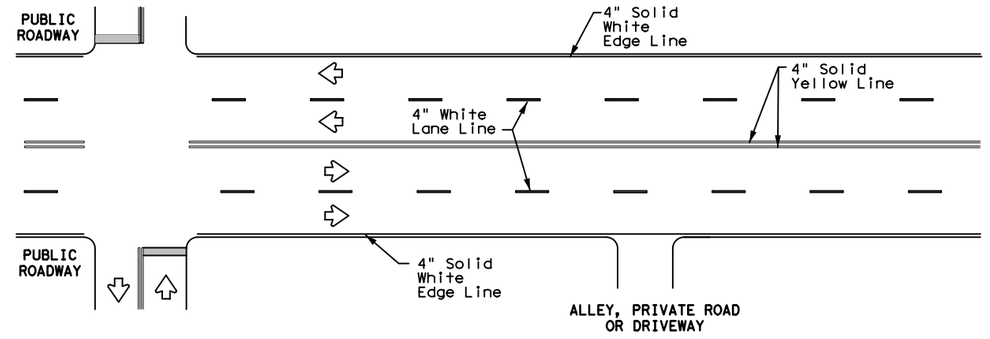
EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



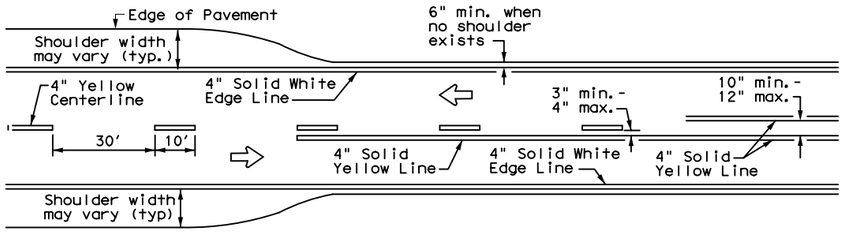
TYPICAL TWO-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



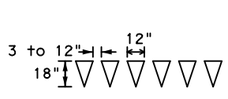
CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



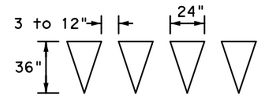
TYPICAL MULTI-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS

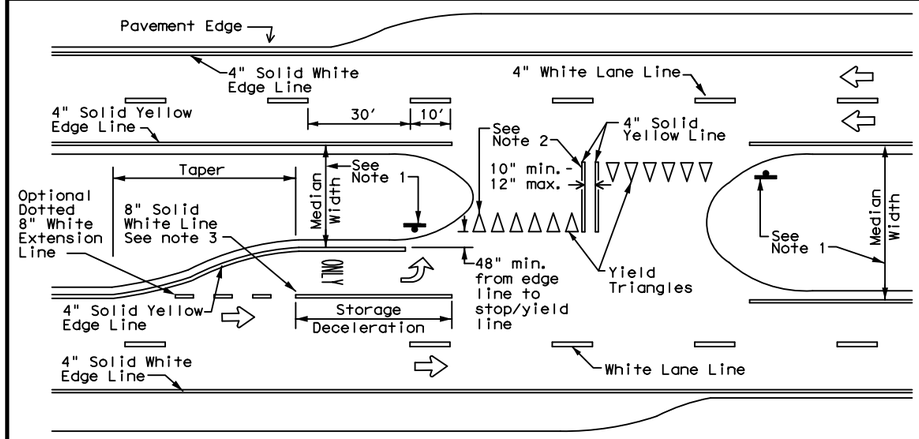


For posted speed on road being marked equal to or less than 40 MPH.



For posted speed on road being marked equal to or greater than 45 MPH.

YIELD LINES



FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTE:

1. Irrespective of shoulder, use 6in width lines (edge lines).
2. Use 4 in. width lines (edge and lane lines) when lane width is 10 ft. or less; and 6 in. width lines when lane width is greater than 10 ft.

NOTES

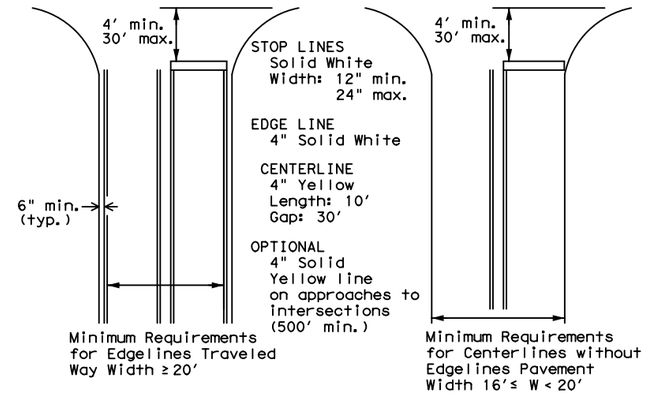
1. Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections. Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling width to determine if signs are required. Yield signs are the typical intersection control. Stop signs are optional as determined by the Engineer.
2. Install median striping (double yellow centerlines and stop bars/yield triangles) when a 50' or greater median centerline can be placed. Stop bars shall only be used with stop signs. Yield 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
HOUSTON DISTRICT STANDARD

TYPICAL STANDARD PAVEMENT MARKINGS

PM-20

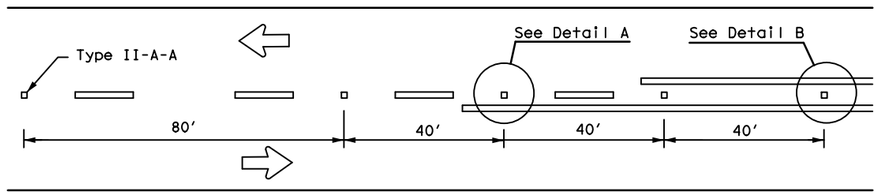
DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS
8-95 2-12
5-00 8-16
8-00 7-20
3-03

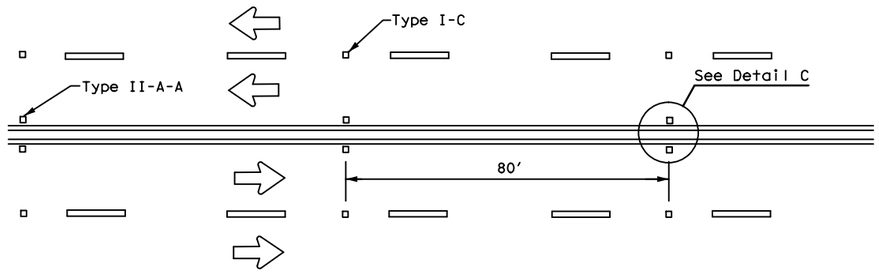
CONT	SECT	JOB	HIGHWAY
0912	72	386	CS
DIST	COUNTY		SHEET NO.
HOU	HARRIS		185

STD N-5a

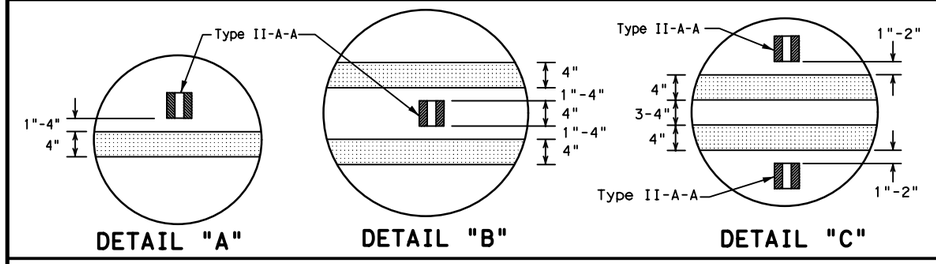
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE



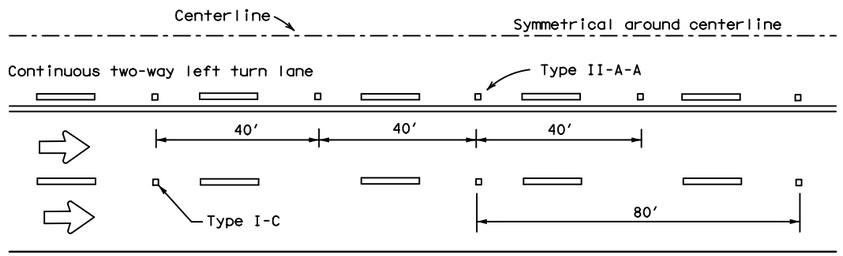
CENTERLINE FOR ALL TWO LANE ROADWAYS



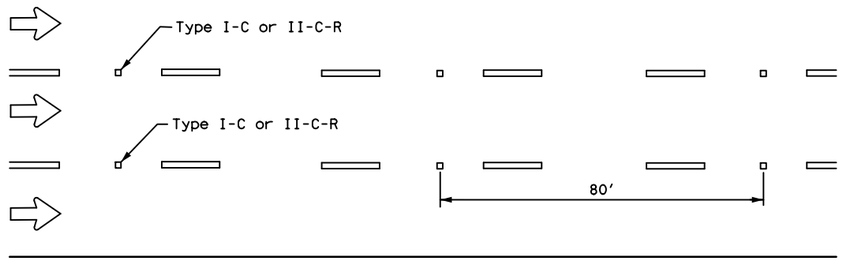
CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY HIGHWAYS



DETAIL "A" **DETAIL "B"** **DETAIL "C"**

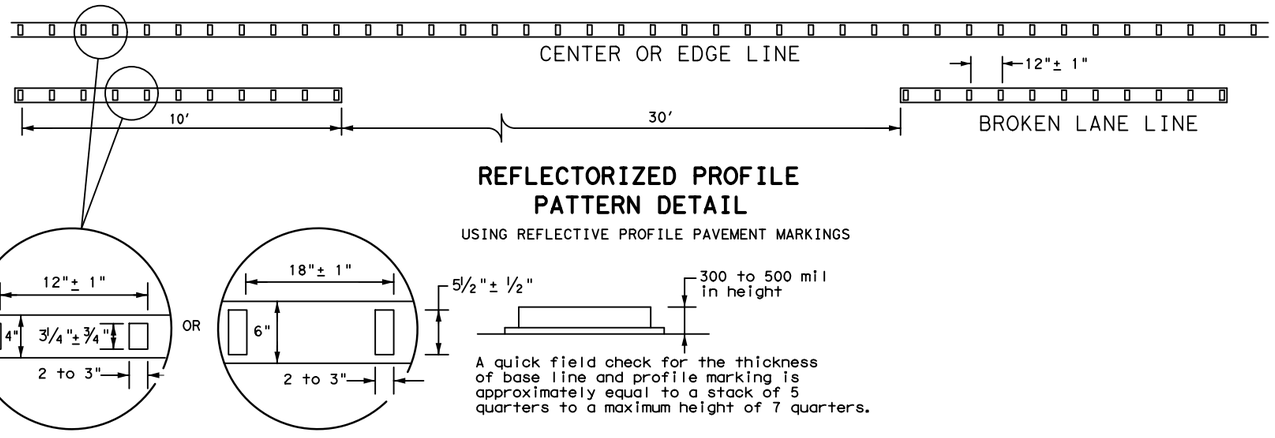


CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

Raised pavement markers Type II-C-R shall have clear face toward normal traffic and red face toward wrong-way traffic.



REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS

A quick field check for the thickness of base line and profile marking is approximately equal to a stack of 5 quarters to a maximum height of 7 quarters.

4" EDGE LINE, CENTER LINE OR LANE LINE

OPTIONAL 6" EDGE LINE, CENTER LINE OR LANE LINE

NOTE

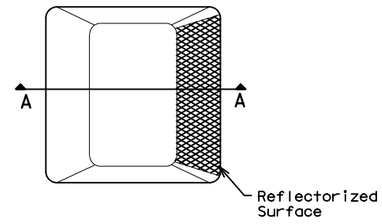
Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

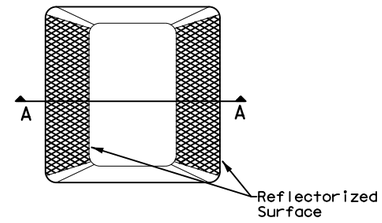
1. All raised pavement markers placed in broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

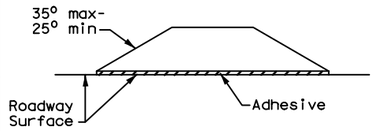
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)



Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS

Texas Department of Transportation — Traffic Safety Division Standard

POSITION GUIDANCE USING RAISED MARKERS RELECTORIZED PROFILE MARKINGS PM(2)-20

FILE: pm2-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT April 1977	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-92 2-10	0912	72	386	CS
5-00 2-12	DIST	COUNTY		SHEET NO.
8-00 6-20	HOU	HARRIS		186

22B

Plotted on: 6/7/2022 2:23:46 PM ssharifian

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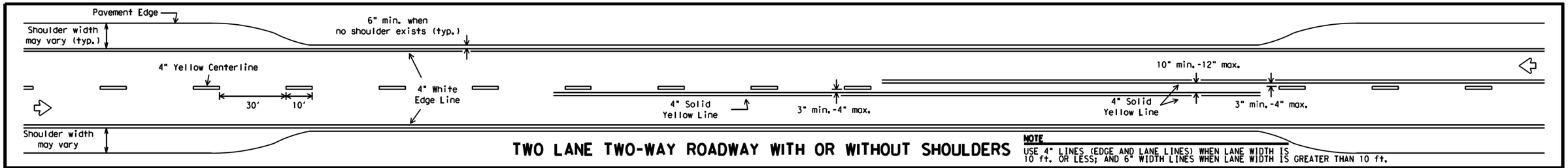
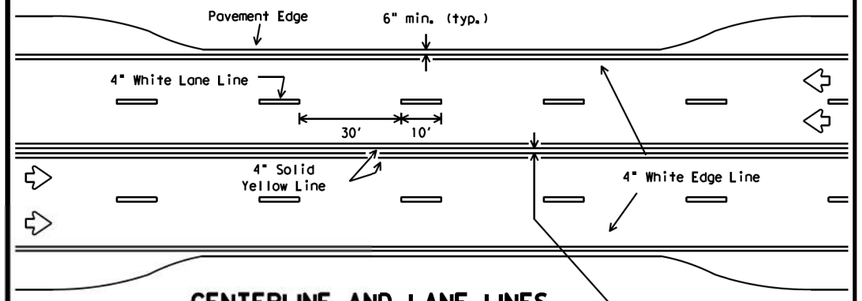
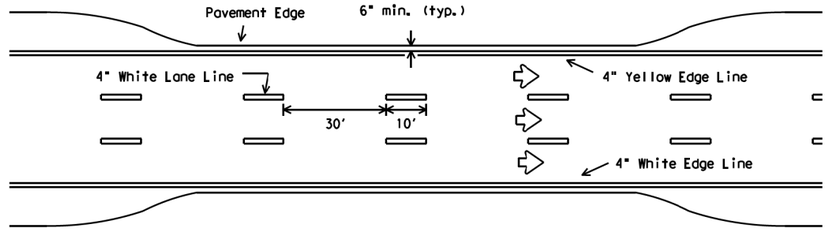


TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS

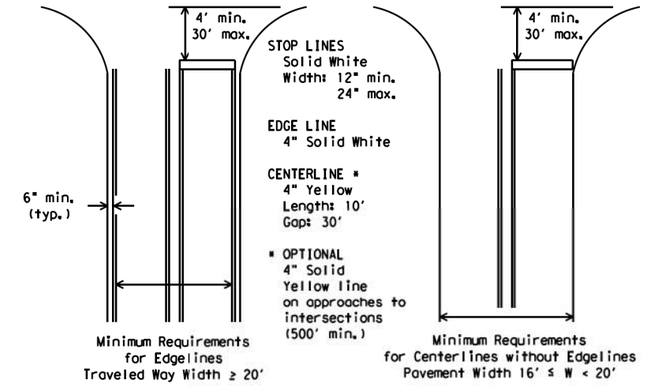
NOTE
USE 4" LINES (EDGE AND LANE LINES) WHEN LANE WIDTH IS 10 ft. OR LESS; AND 6" WIDTH LINES WHEN LANE WIDTH IS GREATER THAN 10 ft.



CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS

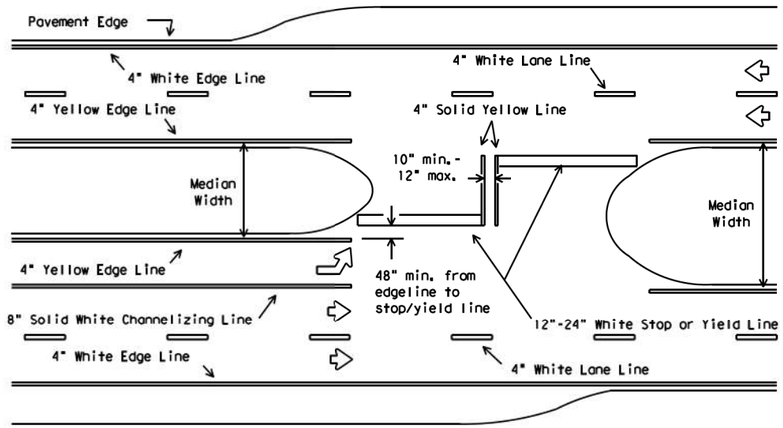


EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



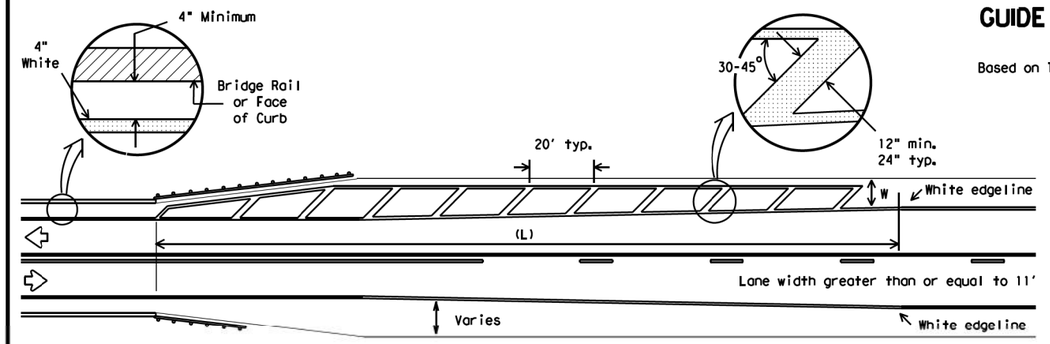
GUIDE FOR PLACEMENT OF STOP LINES, EDGE LINE & CENTERLINE

Based on Traveled Way and Pavement Widths for Undivided Highways



All medians shall be field measured to determine the location of necessary striping. Stop/Yield bars and centerlines shall be placed when the median width is greater than 30 ft. The median width is defined as the area between two roadways of a divided highway measured from edge of traveled way to edge of traveled way. The median excludes turn lanes. The median width might be different between intersections, interchanges and of opposite approaches of the same intersection. The narrow median width will be the controlling width to determine if markings are required.

FOUR LANE DIVIDED ROADWAY INTERSECTIONS



NOTES:

1. No-passing zone on bridge approach is optional but if used, it shall be a minimum 500 feet long.
2. For crosshatching length (L) see Table 1.
3. The width of the offset (W) and the required crosshatching width is the full shoulder width in advance of the bridge.
4. The crosshatching is not required if delineators or barrier reflectors are used along the structure.
5. For guard fence details, refer elsewhere in the plans.

ROADWAYS WITH REDUCED SHOULDER WIDTHS ACROSS BRIDGE OR CULVERT

TABLE 1 - TYPICAL LENGTH (L)

Posted Speed *	Formula
≤ 40	$L = \frac{WS^2}{60}$
≥ 45	L=WS

* 85th Percentile Speed may be used on roads where traffic speeds normally exceed the posted speed limit. Crosshatching length should be rounded up to nearest 5 foot increment.

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

EXAMPLES:

An 8 foot shoulder in advance of a bridge reduces to 4 feet on a 70 MPH roadway. The length of the crosshatching should be:

$L = 8 \times 70 = 560$ ft.

A 4 foot shoulder in advance of a bridge reduces to 2 feet on a 40 MPH roadway. The length of the crosshatching should be:

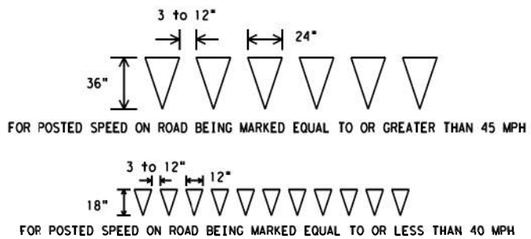
$L = 4(40)^2 / 60 = 106.67$ ft. rounded to 110 ft.

GENERAL NOTES

1. Edgeline striping shall be as shown in the plans or as directed by the Engineer. The edgeline should typically be placed a minimum of 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 and not the parking lanes, sidewalks, berms and shoulders. The traveled ways shall be measured from the inside of edgeline to 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.



YIELD LINES

Texas Department of Transportation
HOUSTON DISTRICT STANDARD

TYPICAL STANDARD PAVEMENT MARKINGS

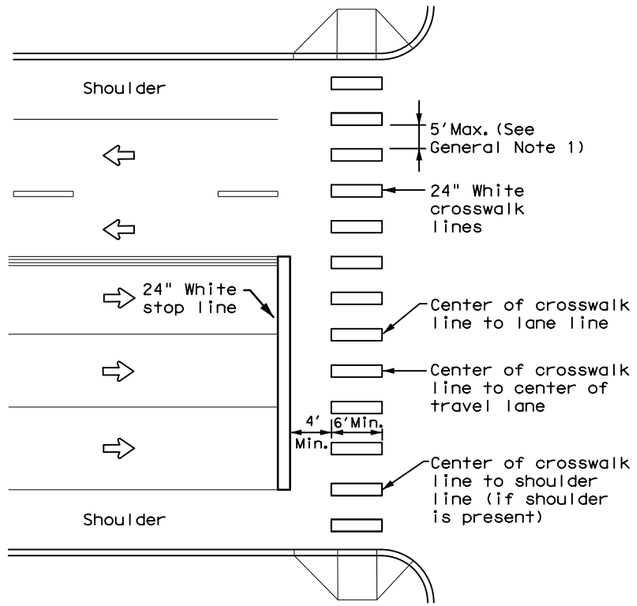
PM-16

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

CONT	SECT	JOB	HIGHWAY
0912	72	386	CS
DIST	COUNTY		SHEET NO.
HOU	HARRIS		187

STD N-5a

DATE: $DATE$ $TIME$
FILE: $FILE$



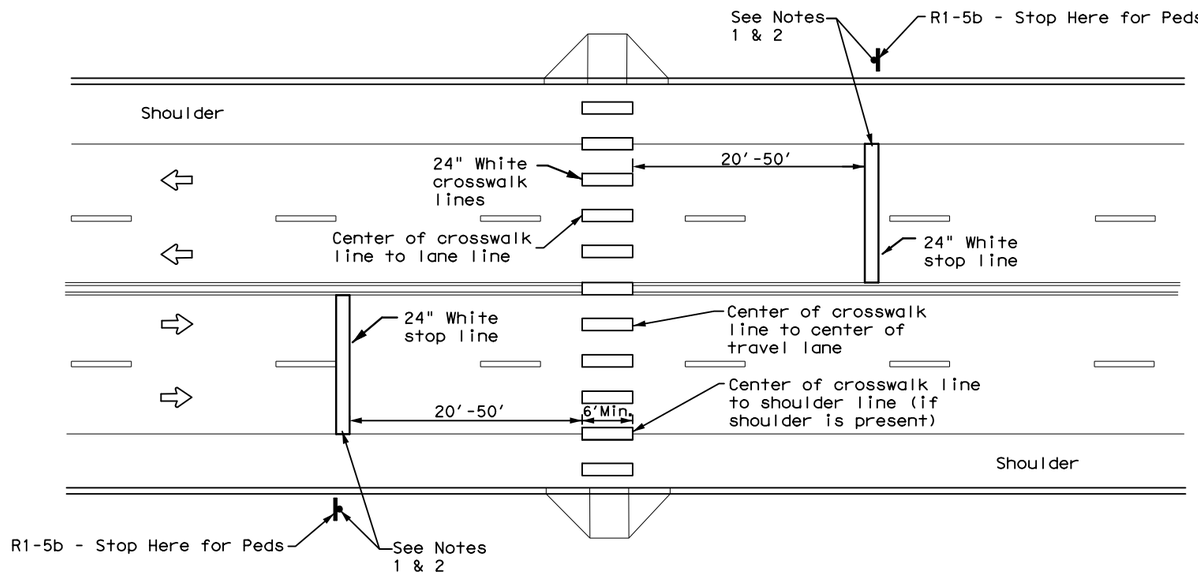
HIGH-VISIBILITY LONGITUDINAL CROSSWALK AT CONTROLLED APPROACH

GENERAL NOTES

1. Longitudinal crosswalk lines should not be placed in the wheel path of vehicles. Center the crosswalk lines on travel lanes, lane lines, and shoulder lines (if present).
2. A minimum 6" clear distance shall be provided to the curb face. If the last crosswalk line falls into this distance it must be omitted.
3. For divided roadways, adjustments in spacing of the crosswalk lines should be made in the median so that the crosswalk lines are maintained in their proper location across the travel portion of the roadway.
4. At skewed crosswalks, the crosswalk lines are to remain parallel to the lane lines.
5. Each crosswalk shall be a minimum of 6' wide.
6. The High-Visibility Longitudinal Crosswalk is the preferred crosswalk pattern on State Highways. Other crosswalk patterns as shown in the "Texas Manual on Uniform Traffic Control Devices" may be used. All crosswalk designs and dimension shall comply with the "Texas Manual on Uniform Traffic Control Devices."
7. Final placement of Stop Bar and Crosswalk shall be approved by the Engineer in the field.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



UNSIGNALIZED MID BLOCK HIGH-VISIBILITY LONGITUDINAL CROSSWALK

NOTES:

1. Use stop bars with "Stop Here for Pedestrians" signs at unsignalized mid block cross walks.
2. Use stop bars with "Stop Here on Red" signs at mid block crosswalks controlled by traffic signals or pedestrian hybrid beacons.

Texas Department of Transportation

Traffic Safety Division Standard

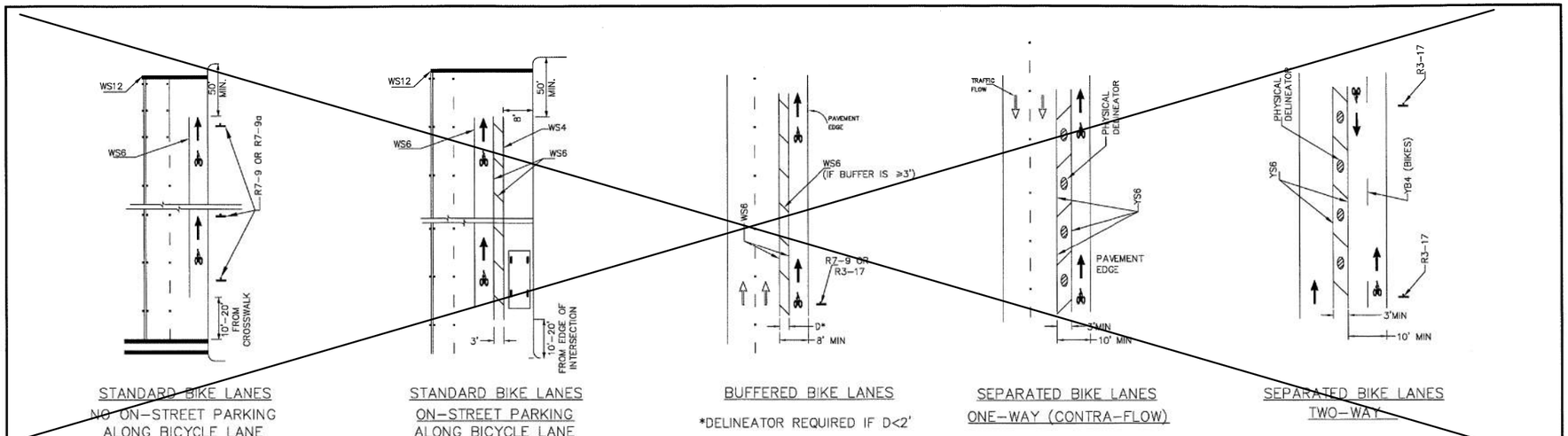
CROSSWALK PAVEMENT MARKINGS

PM(4)-22

FILE: pm4-22.dgn	DN:	CK:	DW:	CK:
© TxDOT June 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	72	386	CS
3-22	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		188

DATE:
FILE:

22D



STANDARD BIKE LANES
NO ON-STREET PARKING
ALONG BICYCLE LANE

STANDARD BIKE LANES
ON-STREET PARKING
ALONG BICYCLE LANE

BUFFERED BIKE LANES

*DELINEATOR REQUIRED IF D<2'

SEPARATED BIKE LANES
ONE-WAY (CONTRA-FLOW)

SEPARATED BIKE LANES
TWO-WAY

TWO-WAY SIDE PATH

SIDEPATH WITH DEDICATED SIDEWALK

ROADWAY WITH SHARED LANE

- NEIGHBORHOOD BIKEWAY
- COLLECTOR/ THOROUGHFARE
- NO ON-STREET PARKING

* CASE 1: LANE STRIPING
CASE 2: ROADWAY CENTERLINE

ROADWAY WITH SHARED LANE

- NEIGHBORHOOD STREET
- NO CENTER LINE OR LANE MARKING
- ON STREET PARKING

NOTES:

1. ALL PAVEMENT MARKINGS SHALL BE WHITE EXCEPT WHEN NOTED OTHERWISE ON PLANS.
2. PAVEMENT MARKINGS SHALL BE OF THE MATERIALS SPECIFIED AND SHALL BE IN CONFORMANCE WITH MATERIAL SPECIFICATIONS AS SPECIFIED BY CITY OF HOUSTON STANDARD SPECIFICATIONS.
3. EXACT SIGN PLACEMENT AND DETAILS ARE SHOWN ELSEWHERE IN THE PLANS.
4. ADDITIONAL REFERENCES: TMUTCD (TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL) GUIDE FOR THE DEVELOPMENT OF BICYCLES FACILITIES, AASHTO, LATEST EDITION.
5. SHARED LANE MARKING SHALL BE IMPLEMENTED ONLY ON ROADWAY SEGMENT BUT NOT WITHIN THE FUNCTIONAL LIMITS OF AN INTERSECTION.

CITY OF HOUSTON
HOUSTON PUBLIC WORKS

BICYCLE LANE
PAVEMENT MARKINGS

(NOT TO SCALE)

CITY TRAFFIC ENGINEER
CITY ENGINEER

DIRECTOR OF
HOUSTON PUBLIC WORKS

EFF DATE: JUL-01-2018

DWG NO: 01510-09

STATE OF TEXAS
DAVID G. GREANEY
125563
LICENSED
PROFESSIONAL ENGINEER

06/08/2022 Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

Gauge ENGINEERING
11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR.
& RUNNELS ST.

BICYCLE LANE
PAVEMENT MARKINGS

SHEET 1 OF 1

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	189

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CITY OF HOUSTON
HOUSTON PUBLIC WORKS

STANDARD PAVEMENT MARKING - (WORDS)

(NOT TO SCALE)

CITY TRAFFIC ENGINEER
CITY ENGINEER

DIRECTOR OF HOUSTON PUBLIC WORKS

EFF DATE: JUL-01-2018

DWG NO: 01510-03

STATE OF TEXAS
DAVID G. GREANEY
125563
LICENSED
PROFESSIONAL ENGINEER

06/08/2022 Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

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11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

STANDARD PAVEMENT MARKINGS - (WORDS)

SHEET 1 OF 1

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	190

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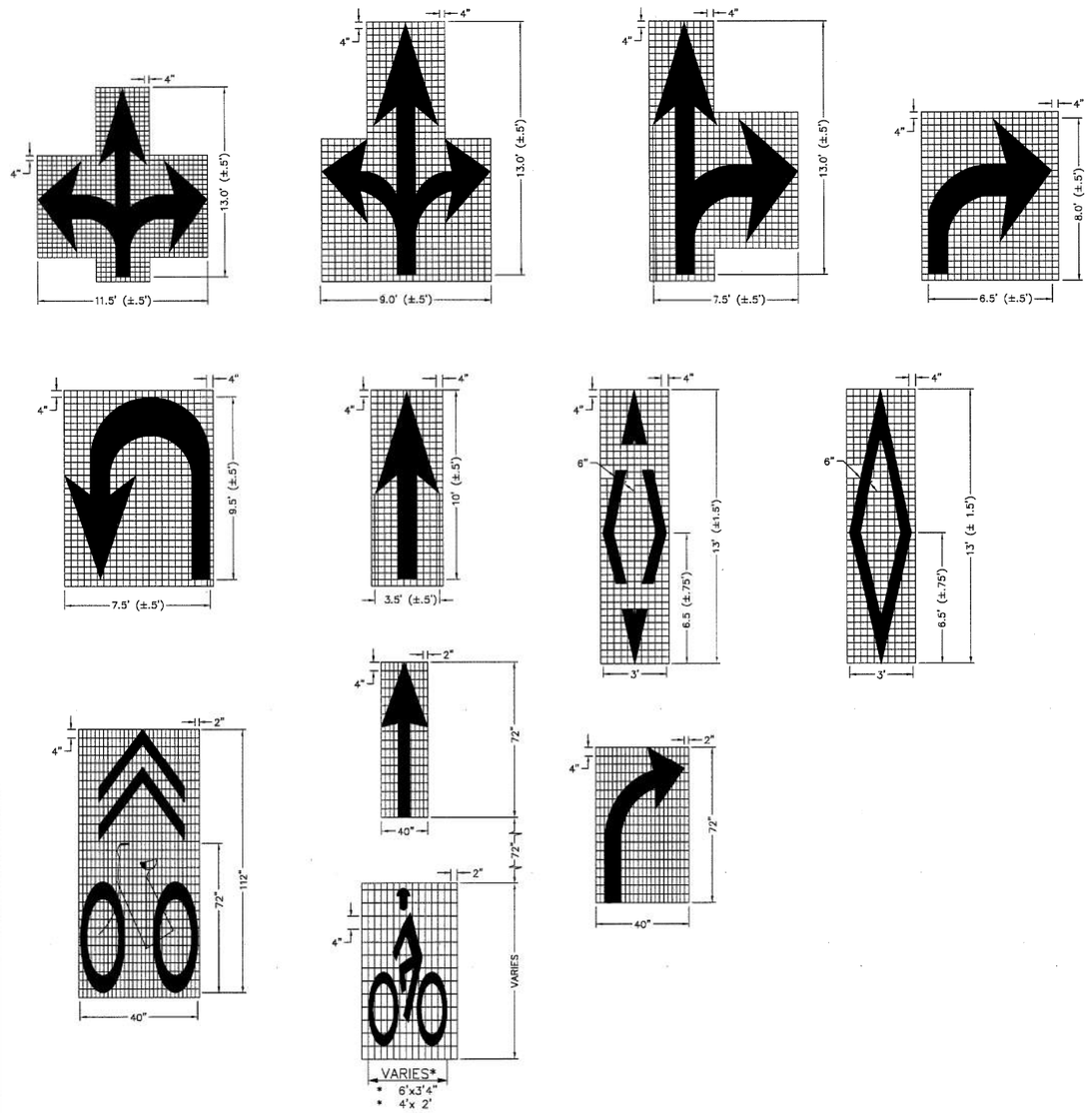


NOTES FOR PAVEMENT MARKINGS "SYMBOLS" AND "ARROWS":

1. MINIMUM 8 FOOT WHITE MARKINGS SHALL BE USED, UNLESS OTHERWISE NOTED. IF MESSAGE CONSISTS OF MORE THAN ONE WORD, IT SHOULD BE PLACED WITH FIRST WORD NEAREST THE DRIVER.

2. THESE DETAILS ARE STANDARD SIZE FOR NORMAL INSTALLATION; SIZES MAY BE REDUCED APPROXIMATELY ONE-THIRD DEPENDING ON CONDITIONS. SPECIAL PERMISSION NEEDED BY CITY TRAFFIC ENGINEER FOR REDUCTION BELOW ONE-THIRD OF STANDARD SIZES.

3. THE LONGITUDINAL SPACE BETWEEN MARKINGS SHOULD BE 30 FEET, OR AS INDICATED ON THE PLANS.

4. MARKINGS CONSIDERED APPROPRIATE FOR USE WHEN WARRANTED INCLUDE THE FOLLOWING:

   A. REGULATORY
      STOP
      RIGHT (LEFT) TURN ONLY, SYMBOL ARROWS.

   B. WARNING
      STOP AHEAD
      SIGNAL AHEAD
      SCHOOL
      SCHOOL X-ING
      PED X-ING
      R X R (SEE SHEET 01510-08 DETAILS)
      OTHER WORDS OR SYMBOLS MAY BE NECESSARY UNDER CERTAIN CONDITIONS. SPECIAL PERMISSION NEEDED BY CITY TRAFFIC ENGINEER FOR SPECIAL CONDITIONS.

5. UNCONTROLLED USE OF PAVEMENT MARKINGS CAN RESULT IN DRIVER CONFUSION. WORD AND SYMBOL MARKINGS SHOULD BE NO MORE THAN THREE LINES.

6. THE WORD "STOP" SHALL NOT BE USED ON THE PAVEMENT UNLESS ACCOMPANIED BY A STOP LINE AND STOP SIGN. THE WORD "STOP" SHALL NOT BE PLACED ON THE PAVEMENT IN ADVANCE TO A STOP LINE, UNLESS EVERY VEHICLE IS REQUIRED TO STOP AT ALL TIMES (ALL-WAY STOP).

7. PAVEMENT MARKINGS SHOULD GENERALLY BE NO MORE THAN ONE LANE IN WIDTH, WITH SCHOOL MESSAGES BEING THE EXCEPTION. FOR DETAILS OF SCHOOL AND SCHOOL CROSSING PAVEMENT MARKINGS, REFER TO PART VII OF THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES".

8. SPACING BETWEEN STANDARD SIZE LETTERS SHOULD BE 4 INCHES (MIN). THE WIDTH OF NON-STANDARD SIZE LETTERS MAY VARY DEPENDING ON THE WIDTH OF THE TRAVEL LANES. APPROVAL BY CITY TRAFFIC ENGINEER. SPECIAL PERMISSION NEEDED FOR NON-STANDARD SIZE "LETTER" AND/OR "ARROWS".

9. LANE-USE ARROW MARKINGS MAY BE USED TO CONVEY EITHER GUIDANCE OR MANDATORY MESSAGES. SINGLE TURN ARROWS USED TO CONVEY A MANDATORY MOVEMENT MUST BE ACCOMPANIED STANDARD SIGNS AND THE PAVEMENT MARKING WORD "ONLY".

10. PAVEMENT MARKINGS ARE TO BE LOCATED AS SPECIFIED IN THE DESIGN PLANS.

CITY OF HOUSTON
HOUSTON PUBLIC WORKS

STANDARD PAVEMENT MARKING - SYMBOLS

(NOT TO SCALE)

CITY TRAFFIC ENGINEER
CITY ENGINEER

DIRECTOR OF HOUSTON PUBLIC WORKS

EFF DATE: JUL-01-2018

DWG NO: 01510-04

STATE OF TEXAS
DAVID G. GREANEY
125563
LICENSED
PROFESSIONAL ENGINEER

06/08/2022 Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

Gauge ENGINEERING
11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

Texas Department of Transportation

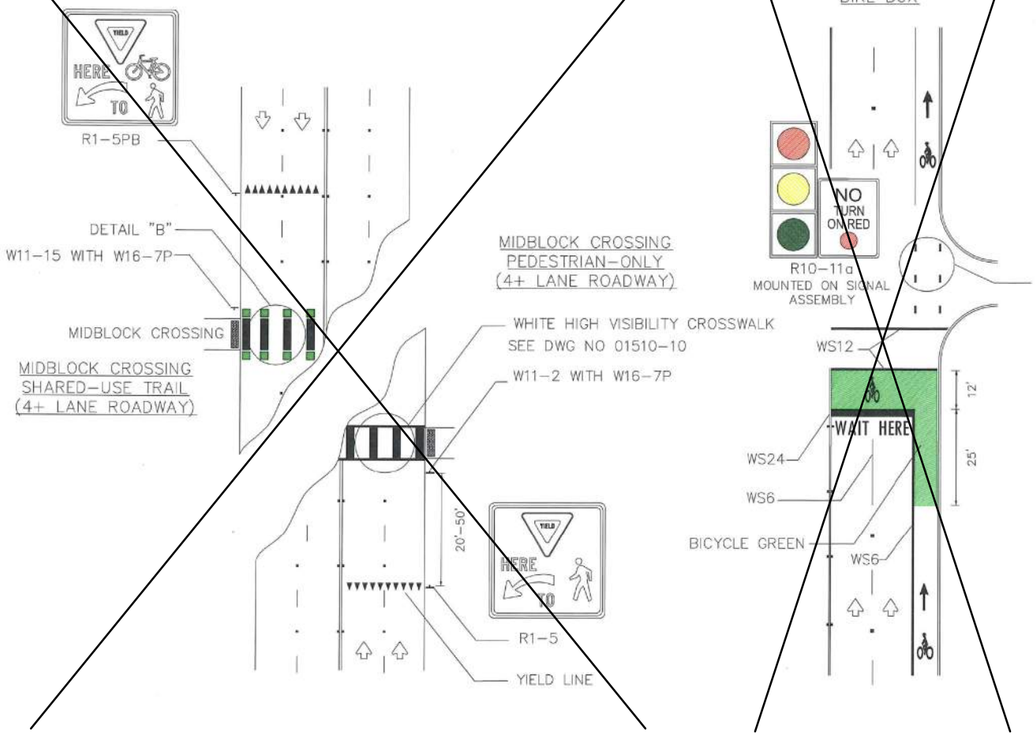
NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

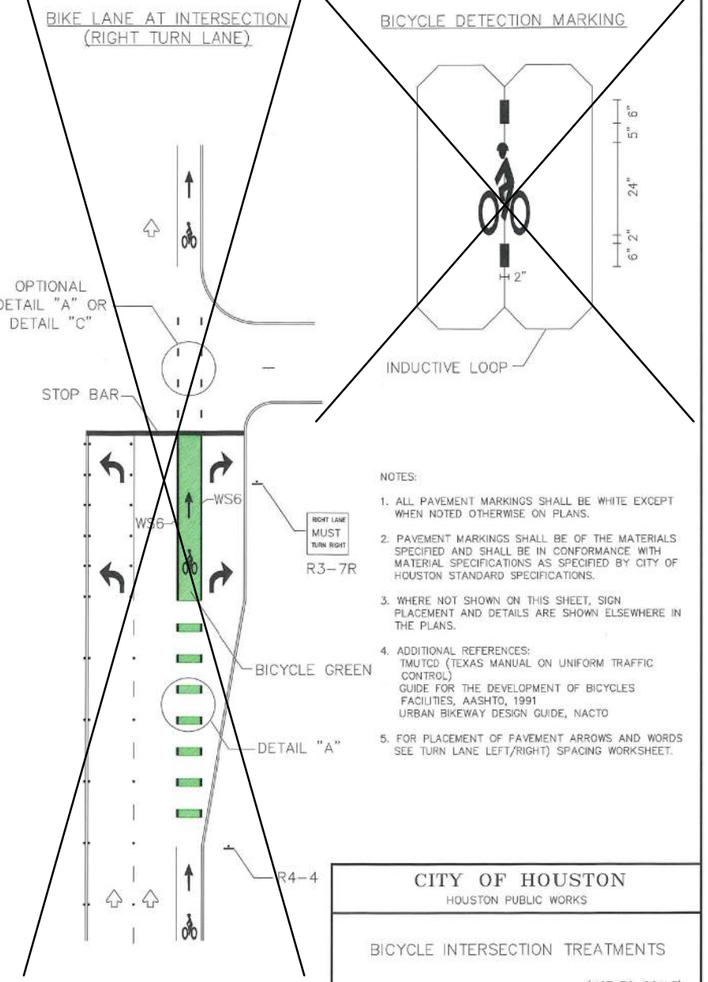
STANDARD PAVEMENT MARKING - SYMBOLS

SHEET 1 OF 1

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	191

USE OF TREATMENTS ON THIS SHEET MUST BE PRE-APPROVED BY THE CITY TRAFFIC ENGINEER

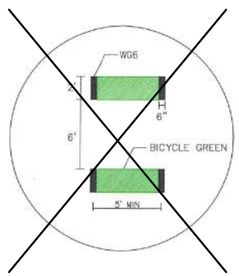




NOTES:

1. ALL PAVEMENT MARKINGS SHALL BE WHITE EXCEPT WHEN NOTED OTHERWISE ON PLANS.
2. PAVEMENT MARKINGS SHALL BE OF THE MATERIALS SPECIFIED AND SHALL BE IN CONFORMANCE WITH MATERIAL SPECIFICATIONS AS SPECIFIED BY CITY OF HOUSTON STANDARD SPECIFICATIONS.
3. WHERE NOT SHOWN ON THIS SHEET, SIGN PLACEMENT AND DETAILS ARE SHOWN ELSEWHERE IN THE PLANS.
4. ADDITIONAL REFERENCES:
   TMUTCD (TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL)
   GUIDE FOR THE DEVELOPMENT OF BICYCLES FACILITIES, AASHTO, 1991
   URBAN BIKEWAY DESIGN GUIDE, NACTO
5. FOR PLACEMENT OF PAVEMENT ARROWS AND WORDS SEE TURN LANE LEFT/RIGHT) SPACING WORKSHEET.

DETAIL "A"



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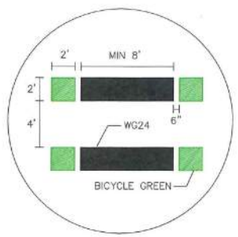

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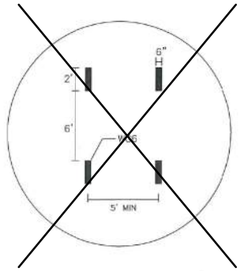

CITY OF HOUSTON
HOUSTON PUBLIC WORKS

BICYCLE INTERSECTION TREATMENTS

(NOT TO SCALE)

CITY TRAFFIC ENGINEER
CITY ENGINEER

DIRECTOR OF HOUSTON PUBLIC WORKS

EFF DATE: JUL-01-2018

DWG NO: 01510-09A

STATE OF TEXAS
DAVID G. GREANEY
125563
LICENSED
PROFESSIONAL ENGINEER

06/08/2022 Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

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11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

Texas Department of Transportation

NAVIGATION BLVD / JENSEN DR.
& RUNNELS ST.

BICYCLE INTERSECTION TREATMENTS

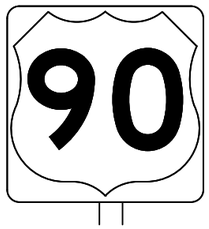
SHEET 1 OF 1

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	192

DATE:
FILE:

REQUIREMENTS FOR INDEPENDENT MOUNTED ROUTE SIGNS

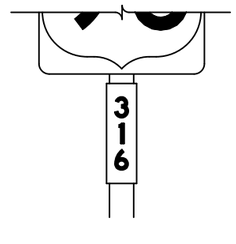
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE A SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & BORDERS	ALL OTHERS	TYPE B or C SHEETING

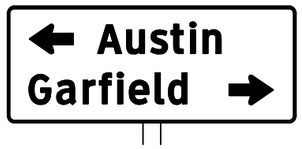


TYPICAL EXAMPLES

REQUIREMENTS FOR BLUE, BROWN & GREEN D AND I SERIES GUIDE SIGNS

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	ALL	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE D SHEETING
LEGEND, SYMBOLS & BORDERS	ALL OTHERS	TYPE B OR C SHEETING





TYPICAL EXAMPLES

GENERAL NOTES

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

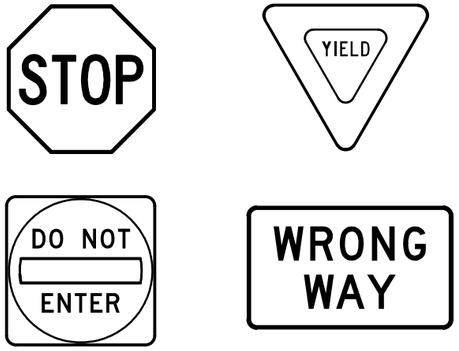
Traffic Operations Division Standard

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	0912	72	386	CS
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	HOU	HARRIS		193

REQUIREMENTS FOR RED BACKGROUND REGULATORY SIGNS
(STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)



REQUIREMENTS FOR FOUR SPECIFIC SIGNS ONLY

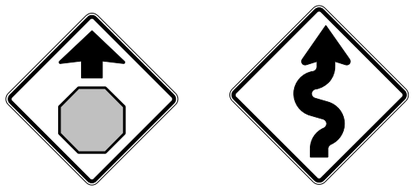
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	WHITE	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE B OR C SHEETING
LEGEND	RED	TYPE B OR C SHEETING

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	0912	72	386	CS
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	HOU	HARRIS		194

DATE:
FILE:

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

SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

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

Post Type

- FRP = Fiberglass Reinforced Plastic Pipe (see SMD(FRP))
- TWT = Thin-Walled Tubing (see SMD(TWT))
- 10BWG = 10 BWG Tubing (see SMD(SLIP-1) to (SLIP-3))
- S80 = Schedule 80 Pipe (see SMD(SLIP-1) to (SLIP-3))

Number of Posts (1 or 2)

Anchor Type

- UA = Universal Anchor - Concreted (see SMD(FRP) and (TWT))
- UB = Universal Anchor - Bolted down (see SMD(FRP) and (TWT))
- WS = Wedge Anchor Steel - (see SMD(TWT))
- WP = Wedge Anchor Plastic (see SMD(TWT))
- SA = Slipbase - Concreted (see SMD(SLIP-1) to (SLIP-3))
- SB = Slipbase - Bolted Down (see SMD(SLIP-1) to (SLIP-3))

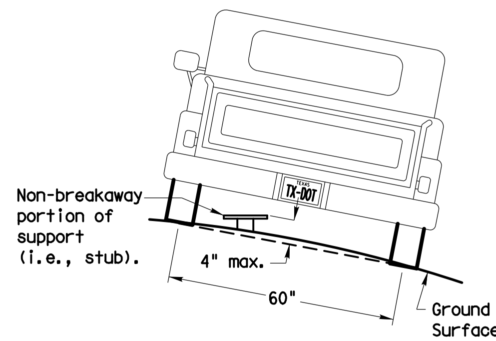
Sign Mounting Designation

- P = Prefab. "Plain" (see SMD(SLIP-1) to (SLIP-3), (TWT), (FRP))
- T = Prefab. "T" (see SMD(SLIP-1) to (SLIP-3), (TWT))
- U = Prefab. "U" (see SMD(SLIP-1) to (SLIP-3))

IF REQUIRED

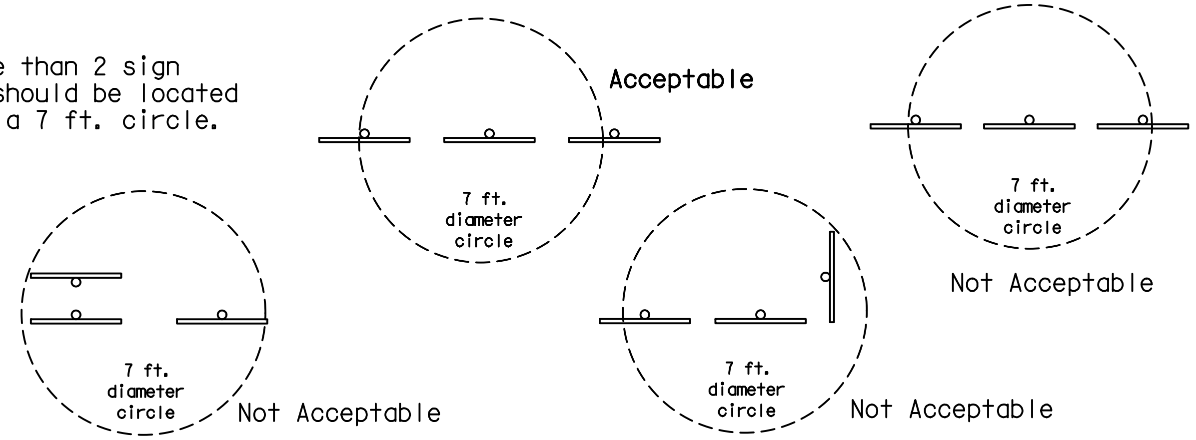
- 1EXT or 2EXT = Number of Extensions (see SMD(SLIP-1) to (SLIP-3), (TWT))
- BM = Extruded Wind Beam (see SMD(SLIP-1) to (SLIP-3))
- WC = 1.12 #/ft Wing Channel (see SMD(SLIP-1) to (SLIP-3))
- EXAL = Extruded Aluminum Sign Panels (see SMD(SLIP-3))

REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



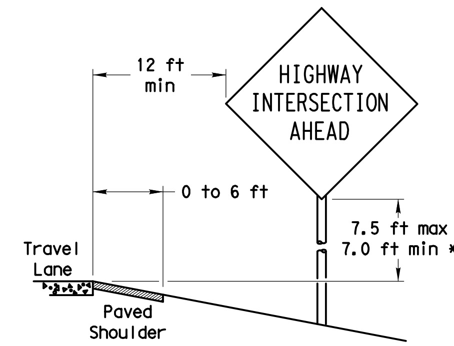
To avoid vehicle undercarriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).

No more than 2 sign posts should be located within a 7 ft. circle.



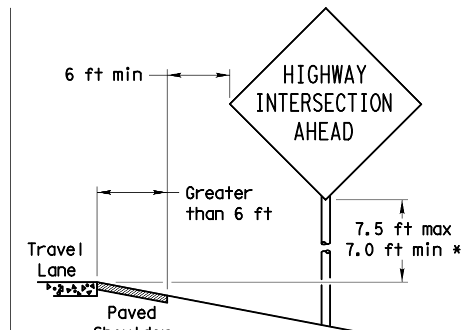
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

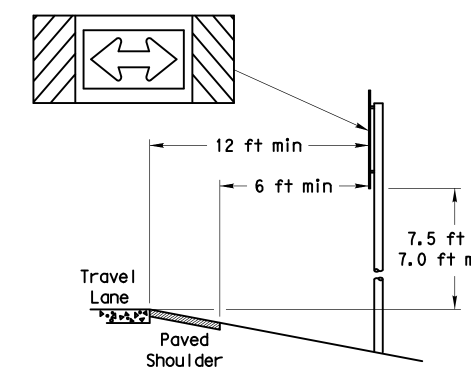
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



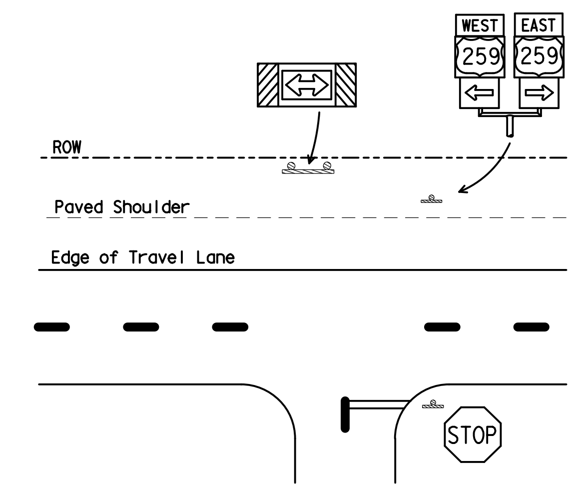
GREATER THAN 6 FT. WIDE

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.

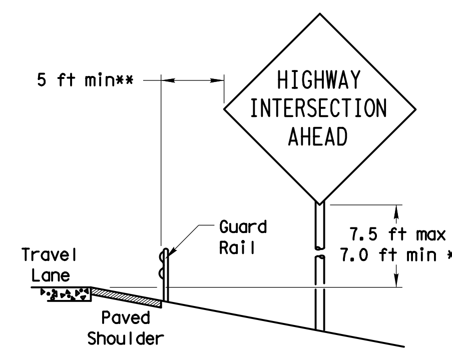
T-INTERSECTION



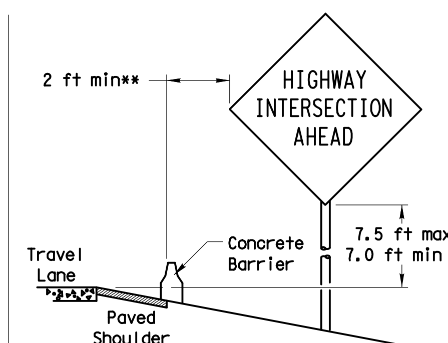
When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.



BEHIND BARRIER



BEHIND GUARDRAIL



BEHIND CONCRETE BARRIER

**Sign clearance based on distance required for proper guard rail or concrete barrier performance.

* Signs shall be mounted using the following condition that results in the greatest sign elevation:

(1) a minimum of 7 to a maximum of 7.5 feet above the edge of the travel lane or

(2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.

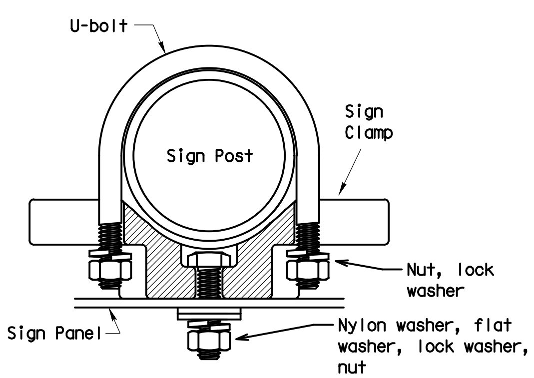
The maximum values may be increased when directed by the Engineer.

See the Traffic Operations Division website for detailed drawings of sign clamps, Triangular Slipbase System components and Wedge Anchor System components.

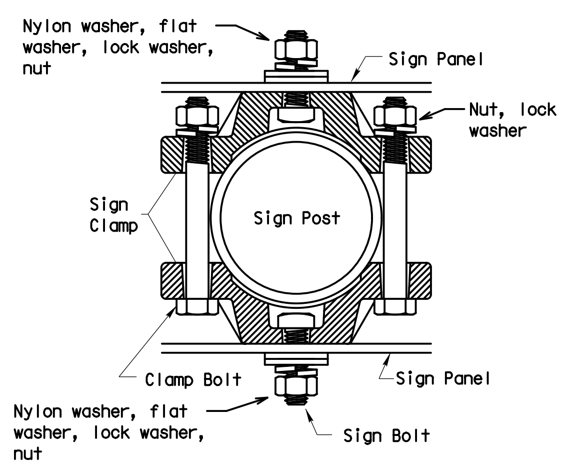
The website address is:
http://www.txdot.gov/publications/traffic.htm

TYPICAL SIGN ATTACHMENT DETAIL

Single Signs



Back-to-Back Signs



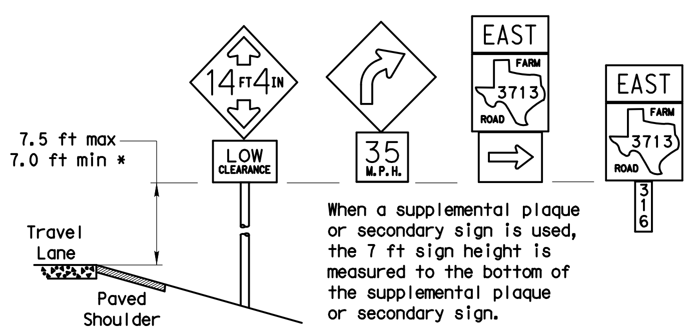
Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

When two sign clamps are used to mount signs back-to-back, use a 5/16-18 UNC galvanized hex head per ASTM A307 with nut and helical-spring lock washer. The approximate bolt lengths for various post sizes and sign clamp types are given in the table at right. The bolt length may need to be adjusted depending upon field conditions.

Sign clamps may be either the specific size clamp or the universal clamp.

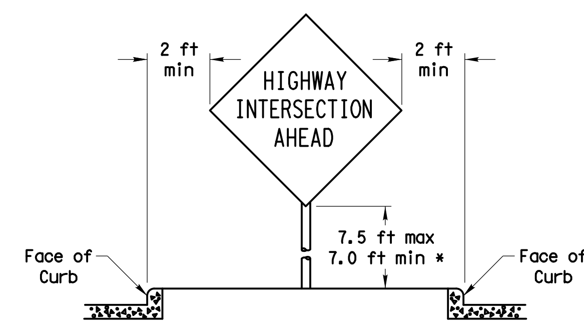
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



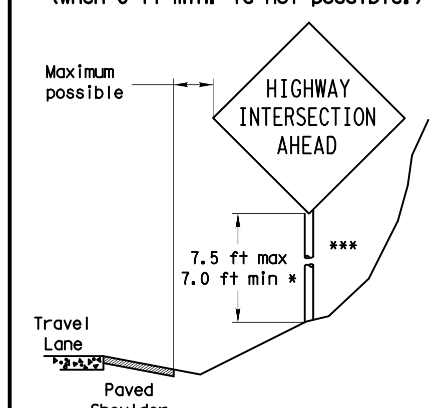
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

CURB & GUTTER OR RAISED ISLAND



RESTRICTED RIGHT-OF-WAY

(When 6 ft min. is not possible.)



Right-of-way restrictions may be created by rocks, water, vegetation, forest, buildings, a narrow island, or other factors.

In situations where a lateral restriction prevents the minimum horizontal clearance from the edge of the travel lane, signs should be placed as far from the travel lane as practical.

*** Post may be shorter if protected by guardrail or if Engineer determines the post could not be hit due to extreme slope.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

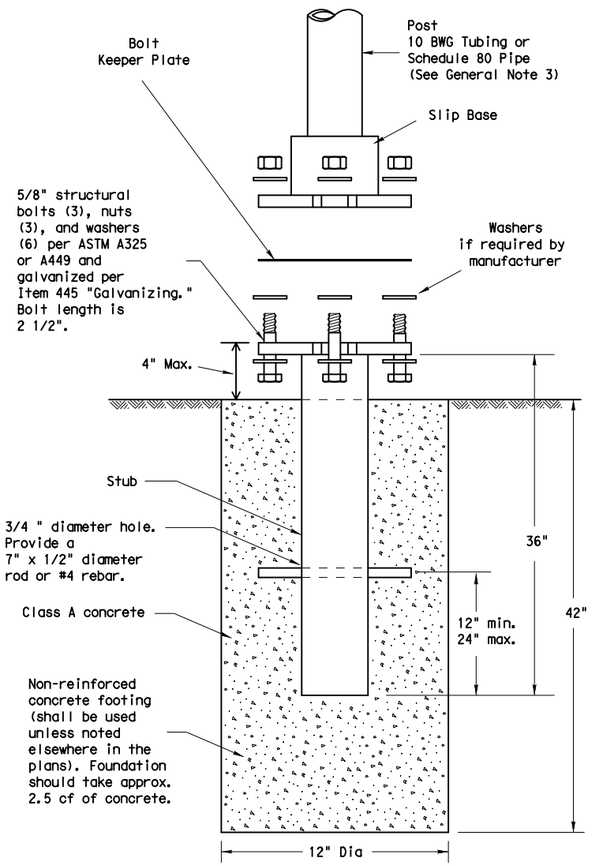
SMD(GEN)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT	
9-08 REVISIONS	CONT	SECT	JOB	HIGHWAY
	0912	72	386	CS
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		195

26A

DATE:
FILE:

TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS



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

NOTE

There are various devices approved for the Triangular Slipbase System. Please reference the Material Producer List for approved slip base systems. http://www.txdot.gov/business/producer_list.htm The devices shall be installed per manufacturers' recommendations. Installation procedures shall be provided to the Engineer by Contractor.

GENERAL NOTES:

1. Slip base shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to approval of the TxDOT Traffic Standards Engineer.
2. Material used as post with this system shall conform to the following specifications:
   10 BWG Tubing (2.875" outside diameter)
   - 0.134" nominal wall thickness
   - Seamless or electric-resistance welded steel tubing or pipe
   - Steel shall be HSLAS Gr 55 per ASTM A1011 or ASTM A1008
   - Other steels may be used if they meet the following:
     - 55,000 PSI minimum yield strength
     - 70,000 PSI minimum tensile strength
     - 20% minimum elongation in 2"
   - Wall thickness (uncoated) shall be within the range of 0.122" to 0.138"
   - Outside diameter (uncoated) shall be within the range of 2.867" to 2.883"
   - Galvanization per ASTM A123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.

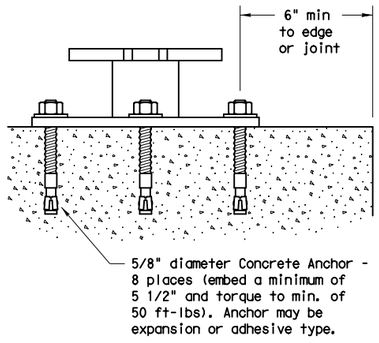
   Schedule 80 Pipe (2.875" outside diameter)
   - 0.276" nominal wall thickness
   - Steel tubing per ASTM A500 Gr C
   - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
     - 46,000 PSI minimum yield strength
     - 62,000 PSI minimum tensile strength
     - 21% minimum elongation in 2"
   - Wall thickness (uncoated) shall be within the range of 0.248" to 0.304"
   - Outside diameter (uncoated) shall be within the range of 2.855" to 2.895"
   - Galvanization per ASTM A123
3. See the Traffic Operations Division website for detailed drawings of sign clamps and Texas Universal Triangular Slipbase System components. The website address is: http://www.txdot.gov/publications/traffic.htm
4. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.

ASSEMBLY PROCEDURE

Foundation
1. Prepare 12-inch diameter by 42-inch deep hole. If solid rock is encountered, the depth of the foundation may be reduced such that it is embedded a minimum of 18 inches into the solid rock.
2. The Engineer may permit batches of concrete less than 2 cubic yards to be mixed with a portable, motor-driven concrete mixer. For small placements less than 0.5 cubic yards, hand mixing in a suitable container may be allowed by Engineer. Concrete shall be Class A.
3. Push the pipe end of the slip base stub into the center of the concrete. Rotate the stub back and forth while pushing it down into the concrete to assure good contact between the concrete and stub. Continue to work the stub into the concrete until it is between 2 to 4 inches above the ground.
4. Plumb the stub. Allow a minimum of 4 days to set, unless otherwise directed by the Engineer.
5. The triangular slipbase system is multidirectional and is designed to release when struck from any direction.

Support
1. Cut support so that the bottom of the sign will be 7 to 7.5 feet above the edge of the travelway (i.e., edge of the closest lane) when slip plate is below the edge of pavement or 7 to 7.5 feet above slip plate when the slip plate is above the edge of the travelway. The cut shall be plumb and straight.
2. Attach sign to support using connections shown. When multiple signs are installed on the same support, ensure the minimum clearance between each sign is maintained. See SMD(SLIP-2) for clearances based on sign types.

CONCRETE ANCHOR



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

Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. Heavy hex nut per ASTM A563, and hardened washer per ASTM F436. The stud bolt shall have a minimum yield and ultimate tensile strength of 50 and 75 KSI, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Adhesive type anchors shall have stud bolts installed with Type III epoxy per DMS-6100, "Epoxies and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations. Top of bolt shall extend at least flush with top of the nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 5 1/2" minimum embedment, shall have a minimum allowable tension and shear of 3900 and 3100 psi, respectively.

Texas Department of Transportation
Traffic Operations Division

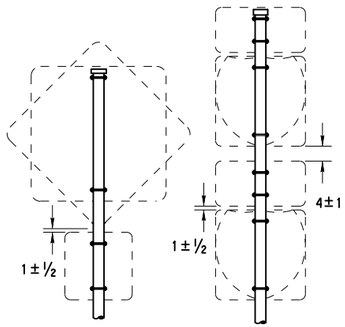
SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-1)-08

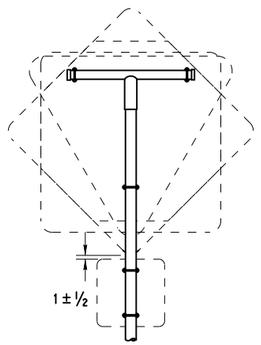
DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
REVISIONS			
9-08			

CONT	SECT	JOB	HIGHWAY
0912	72	386	CS
DIST	COUNTY		SHEET NO.
HOU	HARRIS		196

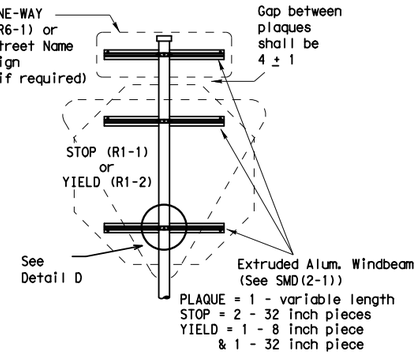
DATE:
FILE:



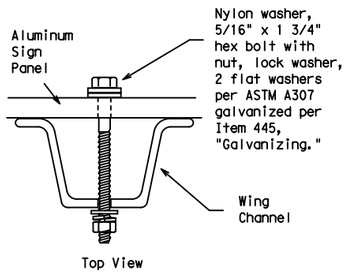
SM RD SGN ASSM TY XXXXX(1)XX(P)



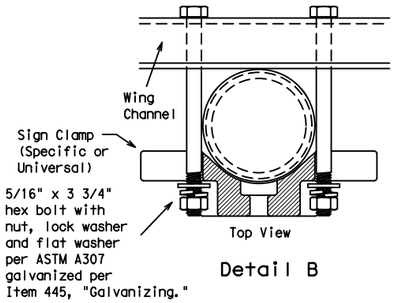
SM RD SGN ASSM TY XXXXX(1)XX(T)



SM RD SGN ASSM TY XXXXX(1)XX(P-BM)



Detail A



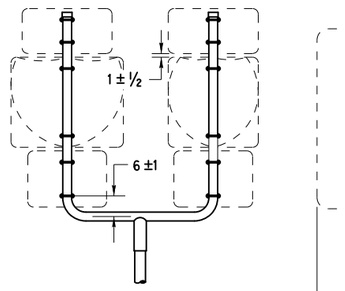
Detail B

GENERAL NOTES:

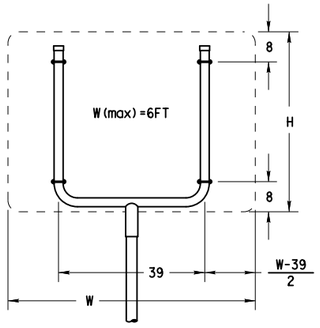
1.

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

2. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
3. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
4. Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
5. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
6. For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
7. When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
8. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
9. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
10. Additional route markers may be added vertically, provided the total sign area does not exceed the maximum allowable amount per Note 1.
11. Additional sign clamp required on the "T-bracket" post for 24 inch height signs. Place the clamp 3 inches above bottom of sign when possible.
12. Post open ends shall be fitted with Friction Caps.
13. Sign blanks shall be the sizes and shapes shown on the plans.



SM RD SGN ASSM TY XXXXX(1)XX(U)



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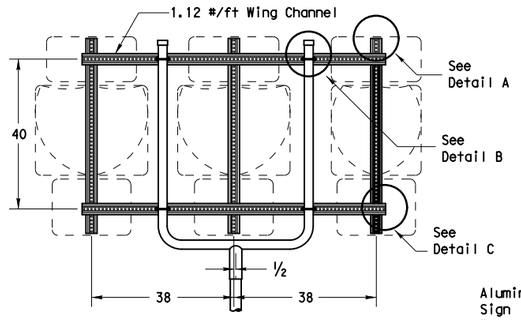
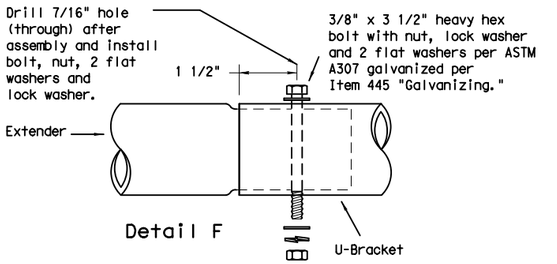
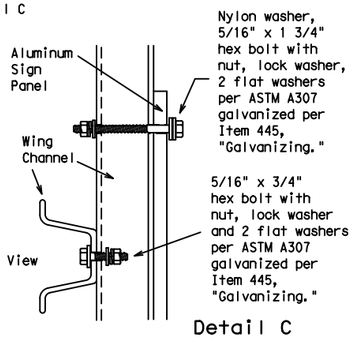


SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)

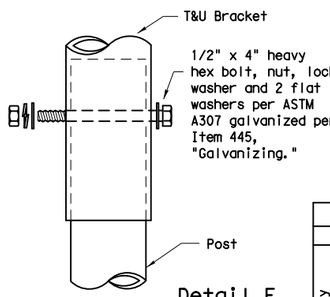


Detail F

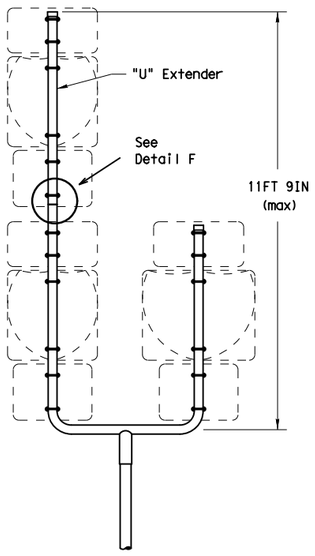
Splices shall only be allowed behind the sign substrate.



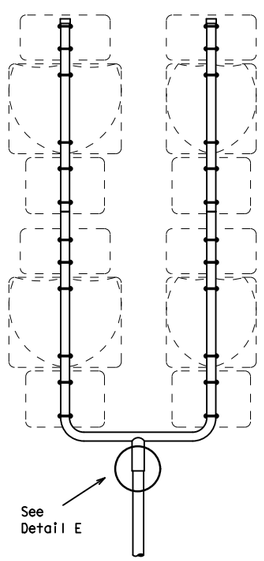
Detail C



Detail E



SM RD SGN ASSM TY S80(1)XX(U-1EXT)



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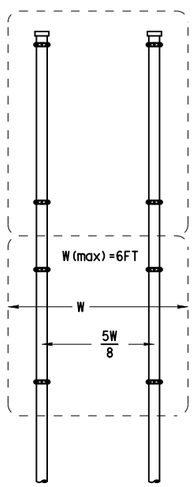
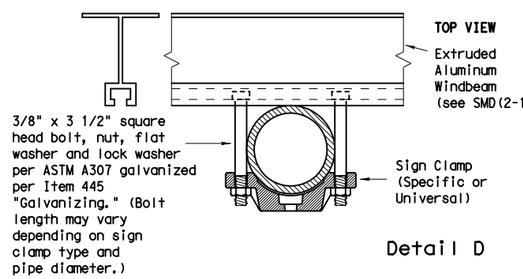
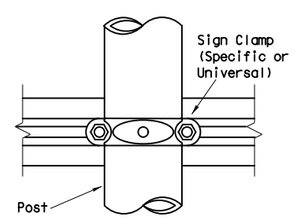


SM RD SGN ASSYM TY XXXXX(2)XX(P)

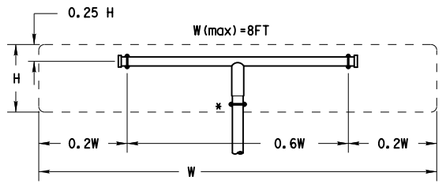
SIDE VIEW



Detail D



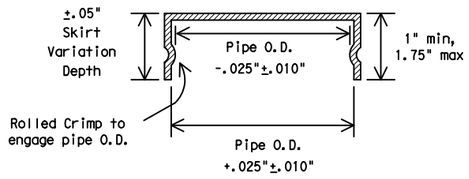
REQUIRED SUPPORT		
	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
Warning	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)



SM RD SGN ASSM TY XXXXX(1)XX(T)
(* - See Note 12)

All dimensions are in english unless detailed otherwise.

FRICTION CAP DETAIL



Friction caps may be manufactured from hot rolled or cold rolled steel sheets. The minimum sheet metal thickness shall be 24 gauge for all cap sizes.

The rim edges shall be reasonably straight and smooth. Caps shall be sized and formed in such a manner as to produce a drive-on friction fit and have no tendency to rock when seated on the pipe. The depth shall be sufficient to give positive protection against entrance of rainwater. They shall be free of sharp creases or indentations and show no evidence of metal fracture.

Caps shall have an electrodeposited coating of zinc in accordance with the requirements of ASTM B633 Class FE/ZN 8.

DATE:
FILE:

Texas Department of Transportation
Traffic Operations Division

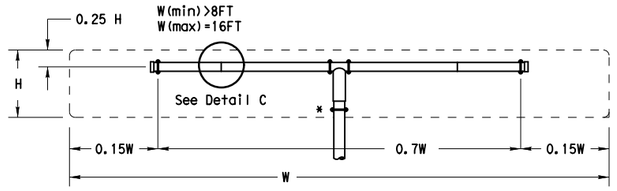
SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-2)-08

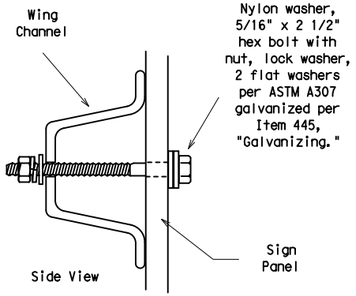
DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS	CONT	SECT	JOB	HIGHWAY
9-08	0912	72	386	CS
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		197

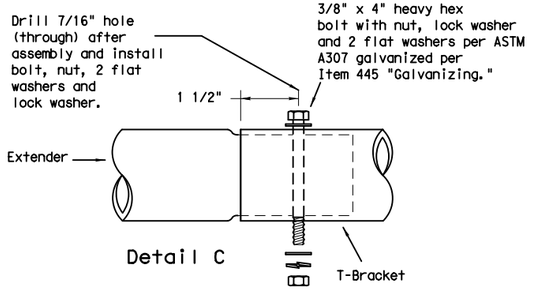
DISCLAIMER:
The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.



SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)
(* - See Note 12)

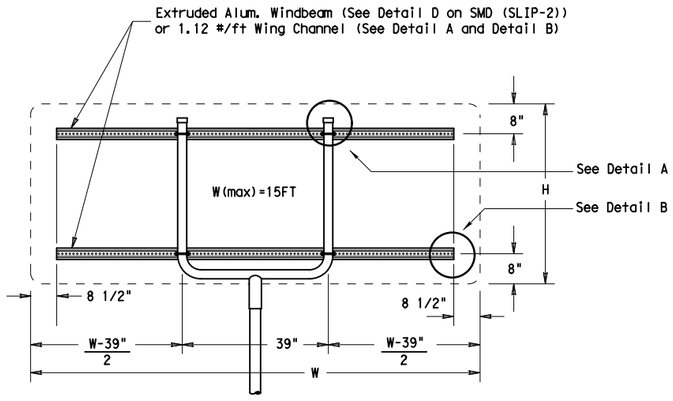


Detail B

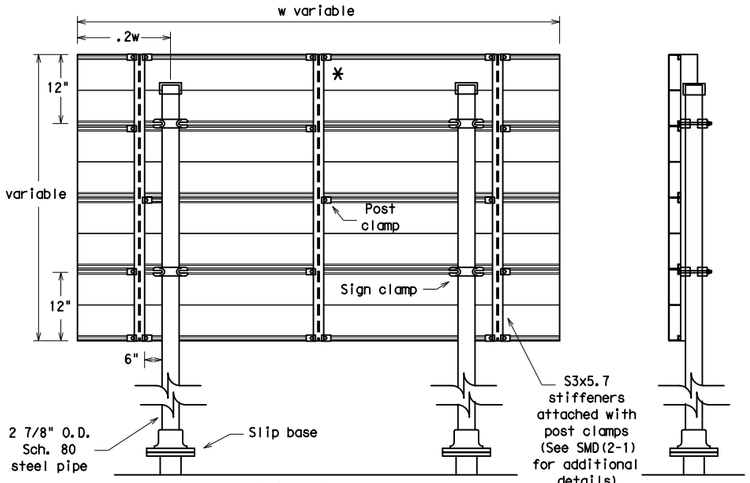


Detail C

Splices shall only be allowed behind the sign substrate.



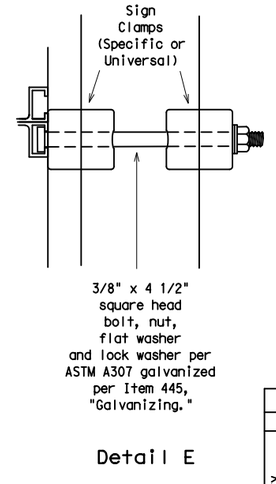
SM RD SGN ASSM TY XXXXX(1)XX(U-XX)



Typical Sign Mount

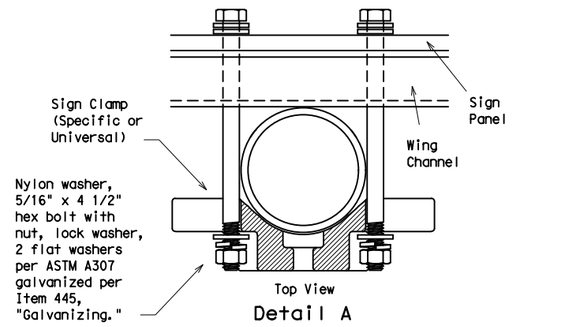
SM RD SGN ASSM TY S80(2)XX(P-EXAL)

* Additional stiffener placed at approximate center of signs when sign width is greater than 10'.

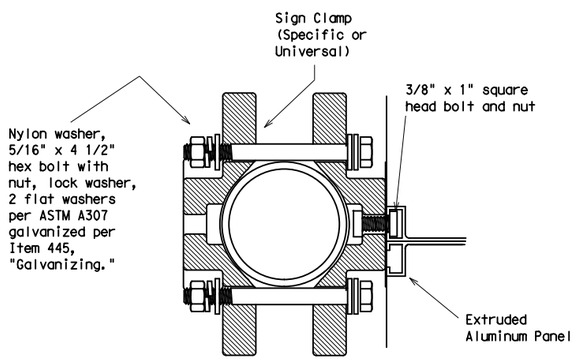


Detail E

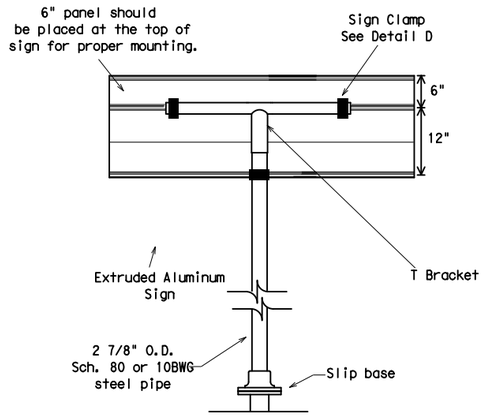
See Detail E
for clamp installation



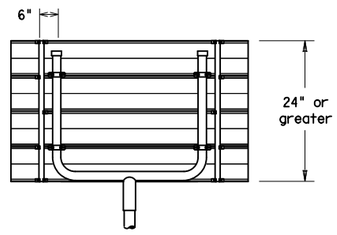
Detail A



Detail D
EXTRUDED ALUMINUM SIGN WITH T BRACKET



Extruded Aluminum Sign
With T Bracket



Use Extruded Alum. Windbeam as stiffeners
See SMD (2-1) for additional details

See Detail E
for clamp installation

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

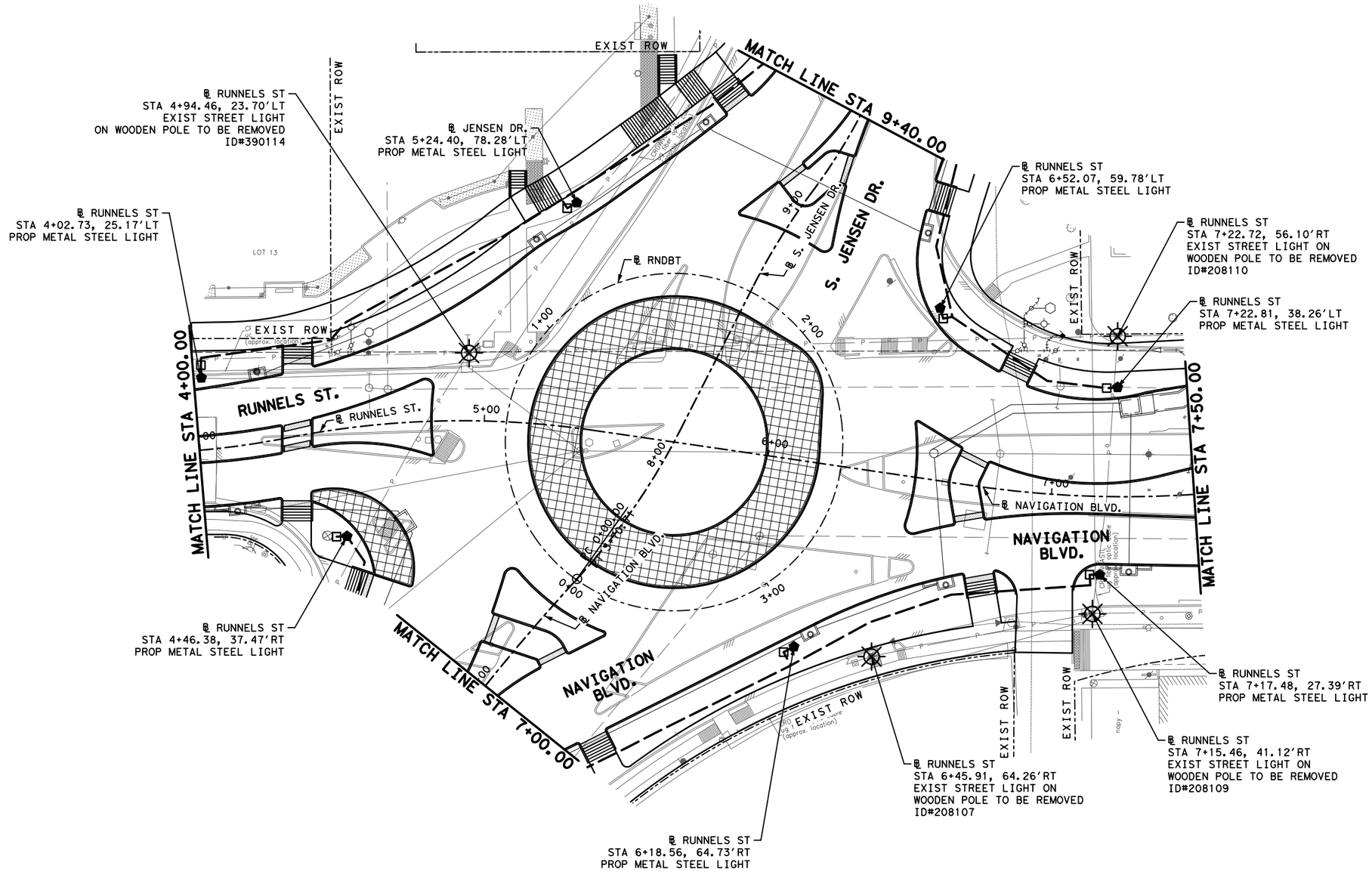
SMD(SLIP-3)-08

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

REVISIONS	CONT	SECT	JOB	HIGHWAY
9-08	0912	72	386	CS
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		198

26D

DATE:
FILE:



LEGEND

- EXIST STREET LIGHT ON WOODEN POLE (TO REMAIN)
- EXIST STREET LIGHT ON WOODEN POLE (TO BE REMOVED)
- EXIST STREET LIGHT ON METAL POLE (TO REMAIN)
- EXIST STREET LIGHT ON METAL POLE (TO BE REMOVED)
- PROP 35' EMBEDDED COBRA POLE WITH 6' ARM AND 115 WATT LED FIXTURE (TO BE INSTALLED BY CNP)
- PROP GROUND BOX
- PROP PVC CONDUIT (BORED) (2-INCH PVC, SCHEDULE 40, SHEDULE 80 UNDER PVMT)

NOTE:

1. COORDINATE WITH CNP FOR DE-ENERGIZING AND POLE REMOVAL/DISPOSAL.
2. CONTRACTOR TO INSTALL CONDUIT & PULL BOXES. CABLING AND LIGHT POLES TO BE INSTALLED BY CNP.

0' 40' 80'
(IN FEET)
SCALE: PLAN 1"=40'

STATE OF TEXAS
KARAM M. QADDO
125611
LICENSED
PROFESSIONAL ENGINEER
06/08/2022

Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

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11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

ILLUMINATION LAYOUT INTERSECTION

SHEET 1 OF 3

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	199

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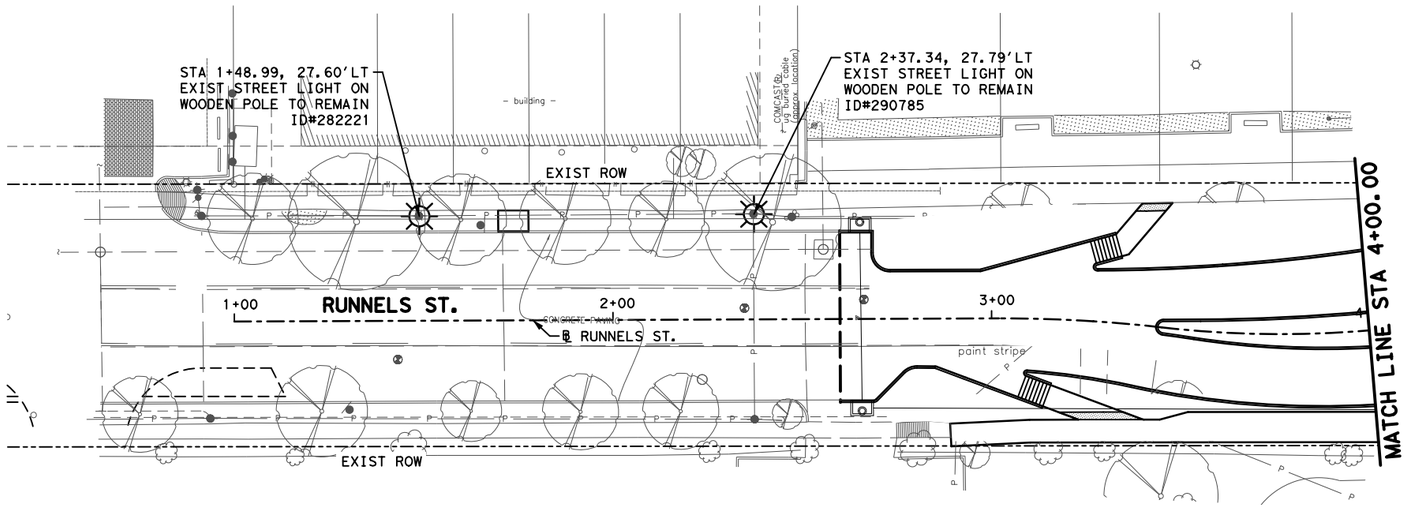

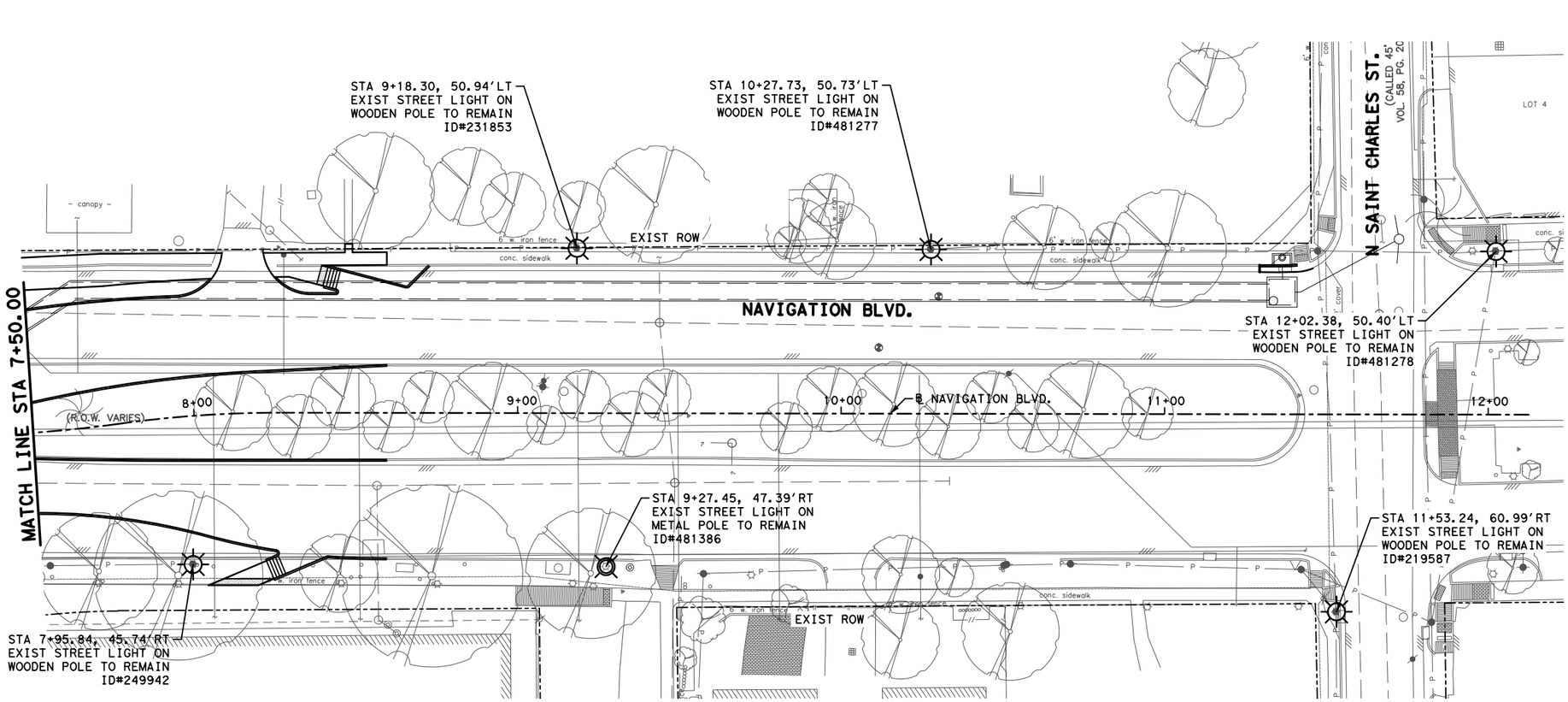

LEGEND

- EXIST STREET LIGHT ON WOODEN POLE (TO REMAIN)
- EXIST STREET LIGHT ON WOODEN POLE (TO BE REMOVED)
- EXIST STREET LIGHT ON METAL POLE (TO REMAIN)
- EXIST STREET LIGHT ON METAL POLE (TO BE REMOVED)
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- PROP GROUND BOX
- PROP PVC CONDUIT (BORED) (2-INCH PVC, SCHEDULE 40, SHEDULE 80 UNDER PVMT)

NOTE:

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0' 40' 80'
(IN FEET)

SCALE: PLAN 1"=40'

STATE OF TEXAS
KARAM M. QADDO
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06/28/2022

Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

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Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

ILLUMINATION LAYOUT
BEGIN OF PROJECT TO STA 4+00
STA 7+50 TO END OF PROJECT

SHEET 2 OF 3

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	200

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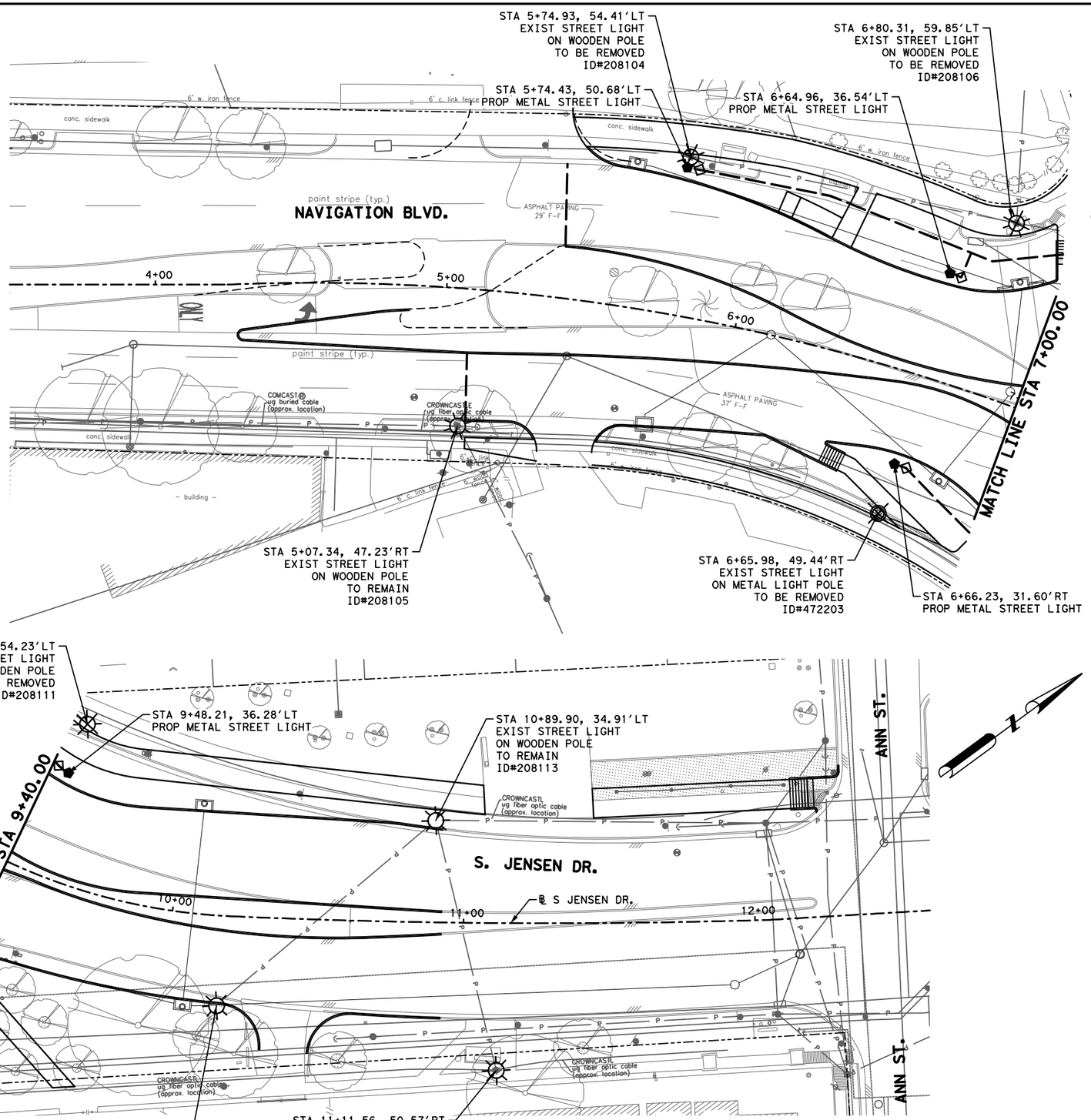

LEGEND

- EXIST STREET LIGHT ON WOODEN POLE (TO REMAIN)
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- PROP PVC CONDUIT (BORED) (2-INCH PVC, SCHEDULE 40, SHEDULE 80 UNDER PVMT)

NOTE:

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(IN FEET)
SCALE: PLAN 1"=40'

STATE OF TEXAS
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NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

ILLUMINATION LAYOUT
BEGIN OF PROJECT TO STA 7+00
STA 9+40 TO END OF PROJECT

SHEET 3 OF 3

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	201

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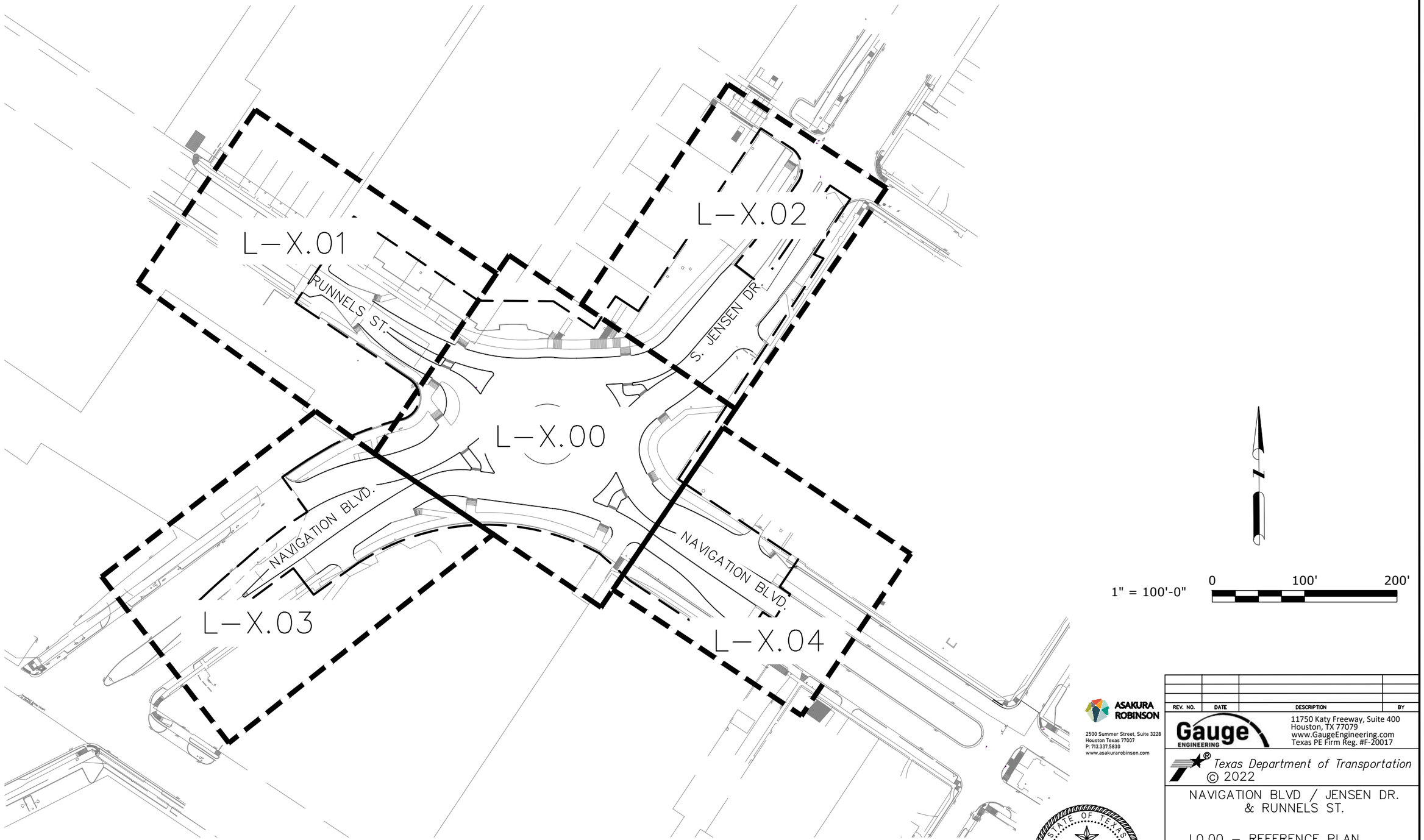

1 REFERENCE PLAN

SCALE: 1" = 100'-0"

REV. NO.	DATE	DESCRIPTION	BY

ASAKURA ROBINSON
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11750 Katy Freeway, Suite 400
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www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

L0.00 – REFERENCE PLAN

SHEET 1 OF 1

STATE OF TEXAS
KEIJI ASAKURA
1170
LANDSCAPE REGISTERED ARCHITECT
06.03.2022

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	N/A	TEXAS	STP 1902 (308) MM			cs
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	202

Pen Table: $PENTBLS$
Plot Driver: $PLTDRVL$
Design Filename: $FILEL$

MATCH LINE B – SEE L1.02

ROW

LIMIT OF LANDSCAPE WORK

S. JENSEN DR.

RUNNELS ST.

LIMIT OF LANDSCAPE SCOPE

ROW

ROOT PRUNING

TREE PROTECTION FENCING

MATCH LINE C – SEE L1.04

MATCH LINE A – SEE L1.01

EXISTING TREE TO BE REMOVED

NAVIGATION BLVD.

NAVIGATION BLVD.

ROW

LIMIT OF LANDSCAPE SCOPE

ROW

MATCH LINE D – SEE L1.03

LEGEND:

- LIMIT OF LANDSCAPE SCOPE
- EXISTING TREE TO REMAIN
- EXISTING TREE TO BE REMOVED
- ROOT PRUNING
- TREE PROTECTION FENCING
- 1 TREE NUMBER

1 TREE PROTECTION PLAN

SCALE: 1" = 30'-0"

1" = 30'-0"

0 30' 60'

STATE OF TEXAS
KEIJI ASAKURA
1170
LANDSCAPE REGISTERED ARCHITECT

06.03.2022

KEY MAP (N.T.S.)

L-1.01 L-1.02 L-1.00 L-1.03 L-1.04

REV. NO.	DATE	DESCRIPTION	BY

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NAVIGATION BLVD / JENSEN DR.
& RUNNELS ST.

L1.00 – TREE PROTECTION PLAN

SHEET 1 OF 5

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	N/A	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	203

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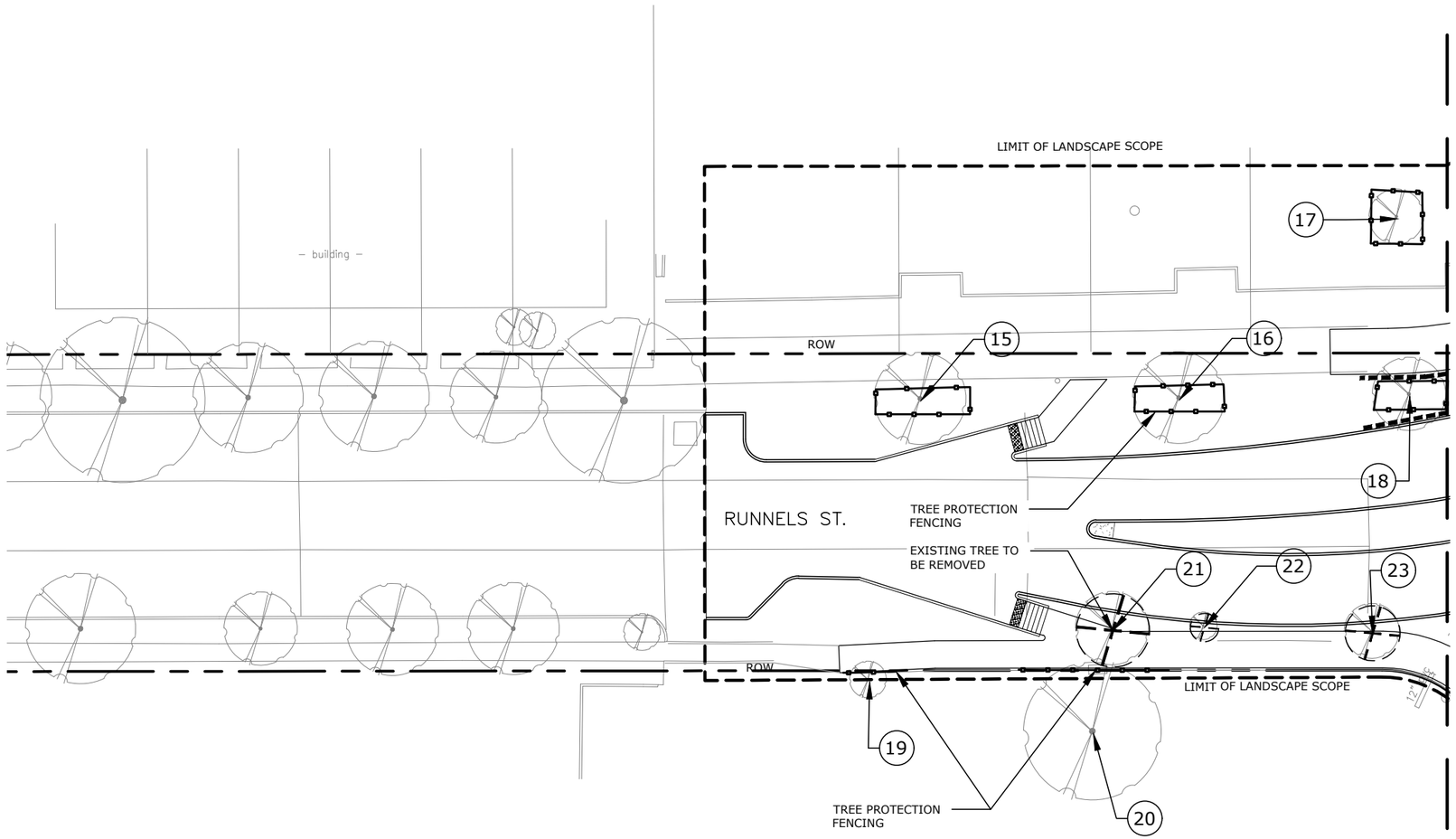

LEGEND:

- LIMIT OF LANDSCAPE SCOPE
- EXISTING TREE TO REMAIN
- EXISTING TREE TO BE REMOVED
- ROOT PRUNING
- TREE PROTECTION FENCING
- 1 — TREE NUMBER

1" = 30'-0"

0 30' 60'

1 TREE PROTECTION PLAN

SCALE: 1" = 30'-0"

ASAKURA ROBINSON
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Texas Department of Transportation

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

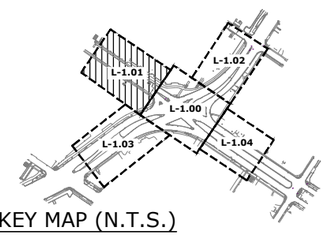
L1.01 – TREE PROTECTION PLAN

SHEET 2 OF 5

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	N/A	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	204

STATE OF TEXAS
KEIJI ASAKURA
1170
REGISTERED
06.03.2022

KEY MAP (N.T.S.)



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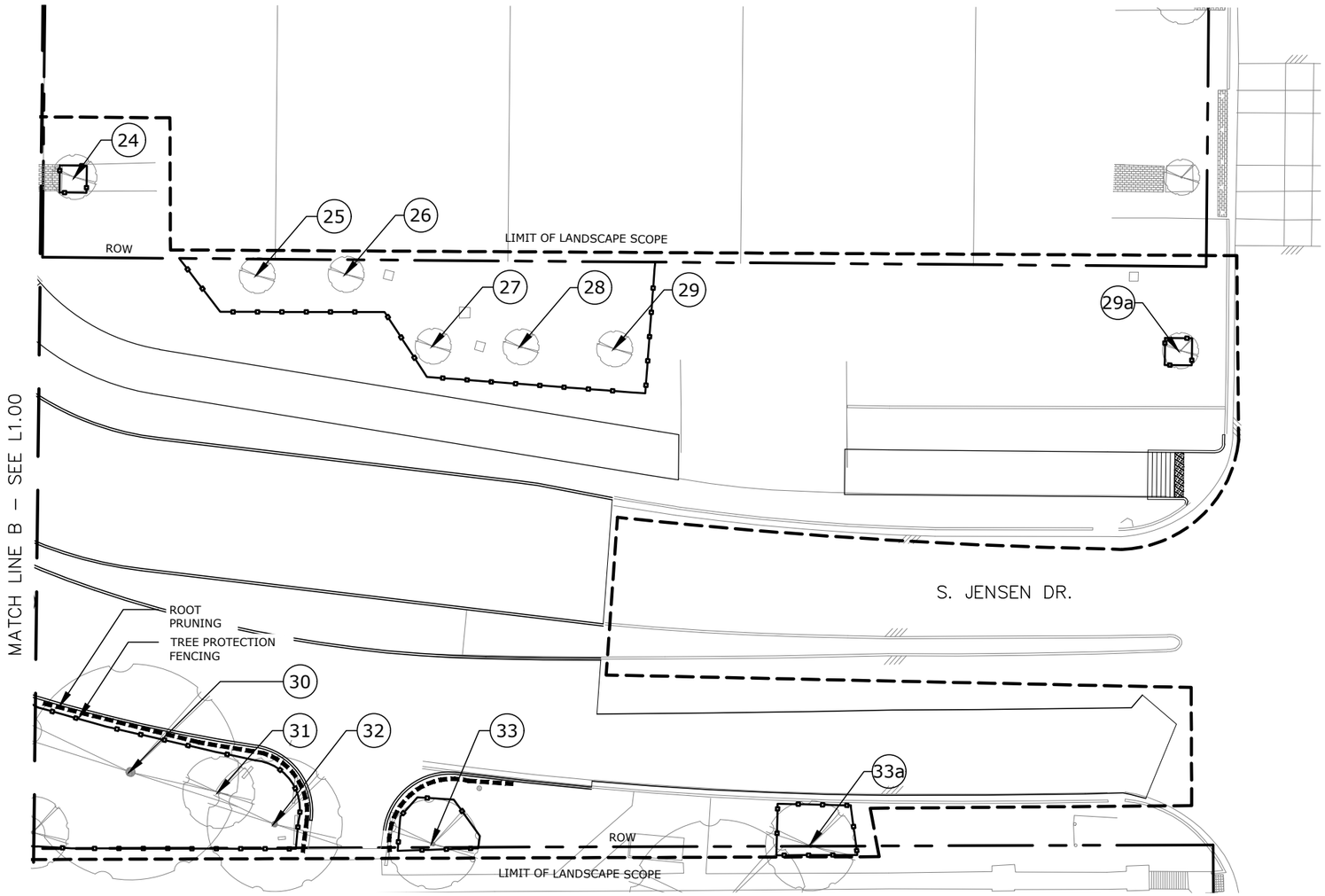

LEGEND:

- LIMIT OF LANDSCAPE SCOPE
- EXISTING TREE TO REMAIN
- EXISTING TREE TO BE REMOVED
- ROOT PRUNING
- TREE PROTECTION FENCING
- 1 — TREE NUMBER

1" = 30'-0"

0 30' 60'

1 TREE PROTECTION PLAN

SCALE: 1" = 30'-0"

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STATE OF TEXAS
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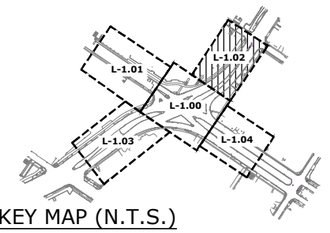
06.03.2022



KEY MAP (N.T.S.)

NAVIGATION BLVD / JENSEN DR.
& RUNNELS ST.

L1.02 – TREE PROTECTION PLAN

SHEET 3 OF 5

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	N/A	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	205

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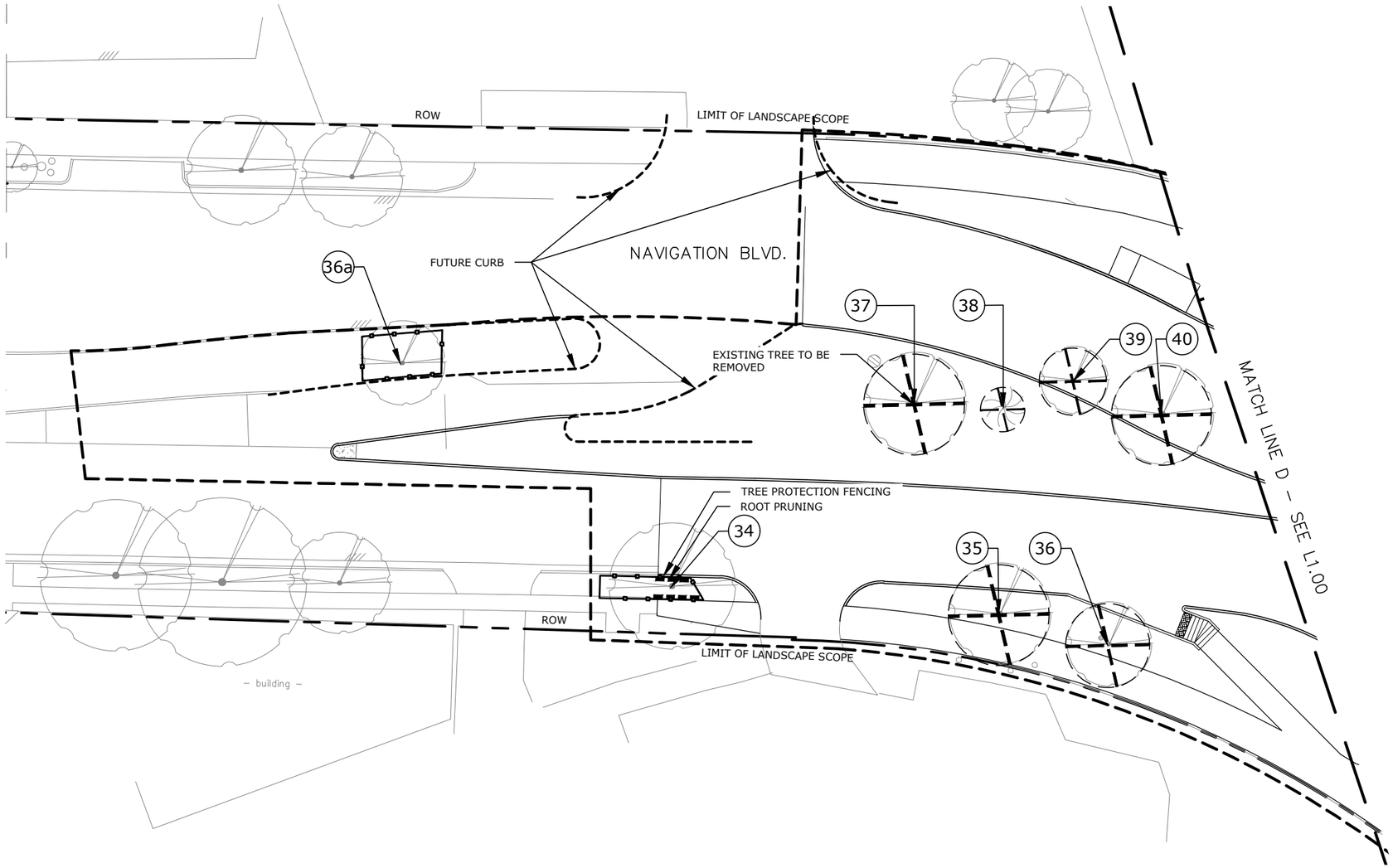

LEGEND:

- LIMIT OF LANDSCAPE SCOPE
- EXISTING TREE TO REMAIN
- EXISTING TREE TO BE REMOVED
- ROOT PRUNING
- TREE PROTECTION FENCING
- 1 — TREE NUMBER

1" = 30'-0"

0 30' 60'

1 TREE PROTECTION PLAN

SCALE: 1" = 30'-0"

REV. NO.	DATE	DESCRIPTION	BY

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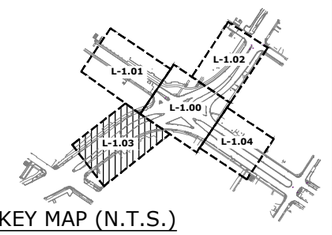
L1.03 – TREE PROTECTION PLAN

SHEET 4 OF 5

STATE OF TEXAS
KEIJI ASAKURA
1170
REGISTERED LANDSCAPE ARCHITECT
06.03.2022

KEY MAP (N.T.S.)



DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	N/A	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	206

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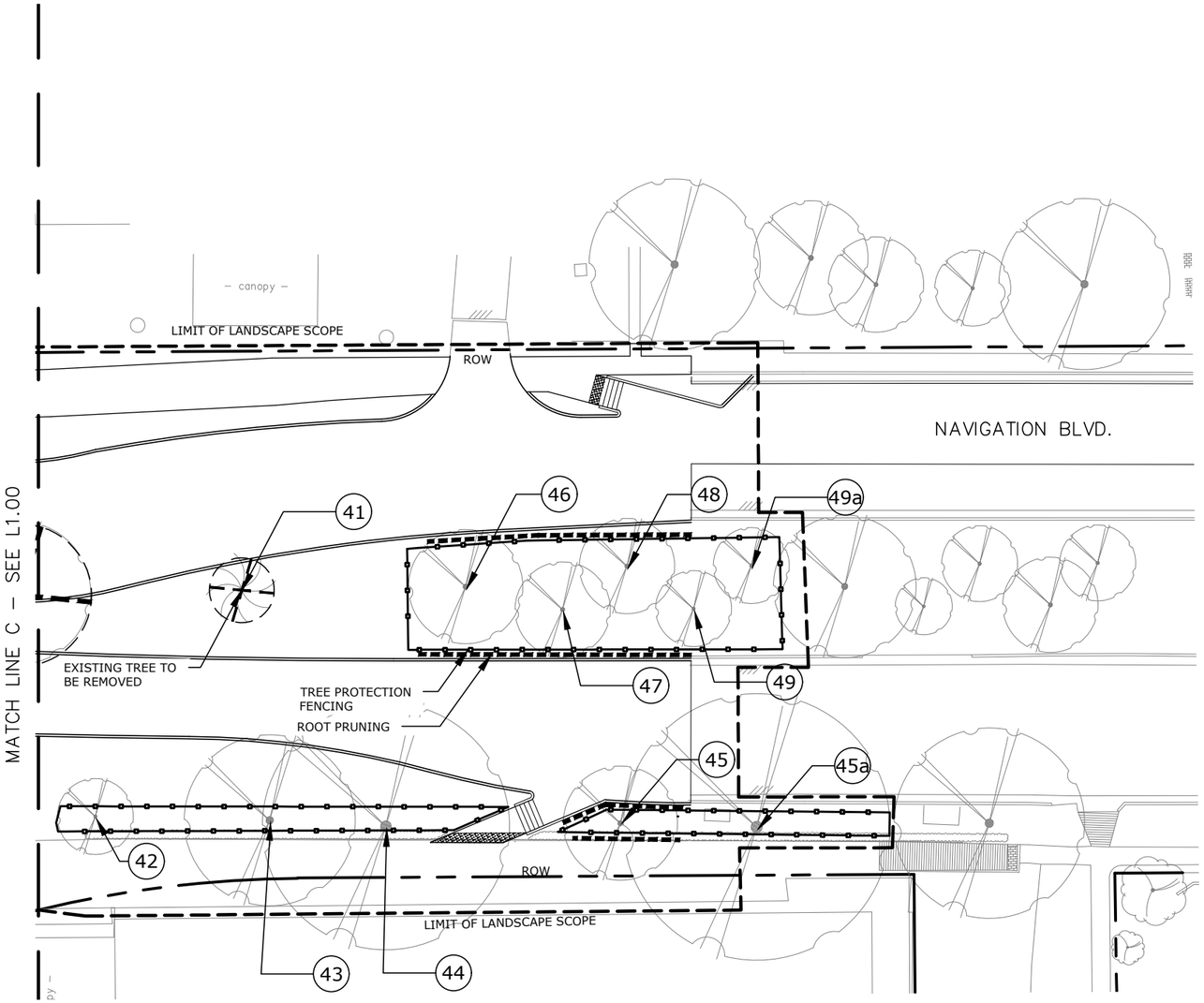

LEGEND:

- LIMIT OF LANDSCAPE SCOPE
- EXISTING TREE TO REMAIN
- EXISTING TREE TO BE REMOVED
- ROOT PRUNING
- TREE PROTECTION FENCING
- 1 — TREE NUMBER

1" = 30'-0" 0 30' 60'

1 TREE PROTECTION PLAN

SCALE: 1" = 30'-0"

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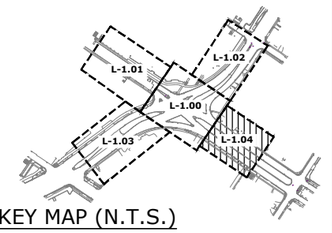
STATE OF TEXAS
KEIJI ASAKURA
1170
REGISTERED
06.03.2022

KEY MAP (N.T.S.)



NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

L1.04 – TREE PROTECTION PLAN

SHEET 5 OF 5

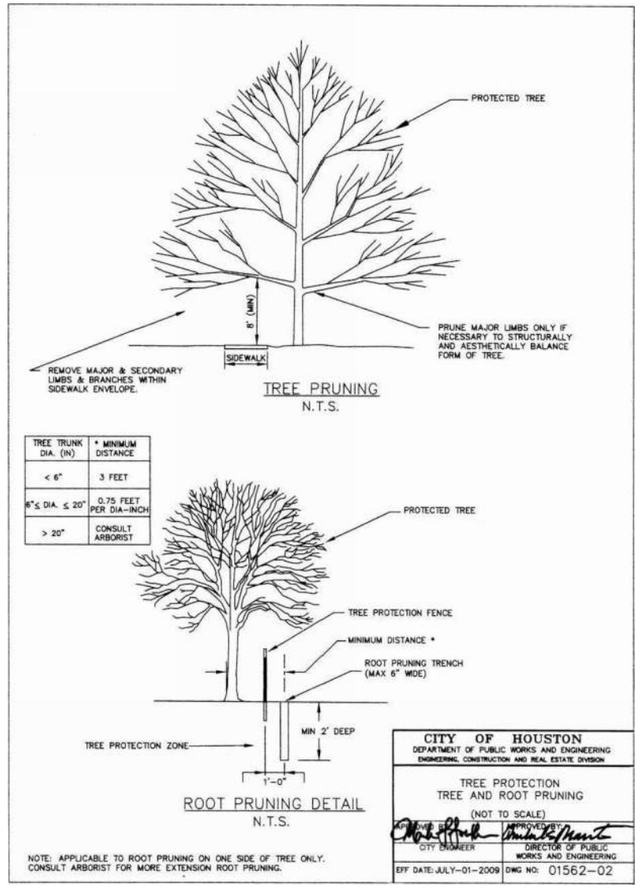
DGN:	MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	DG	N/A	TEXAS	STP 1902 (308) MM			CS
DWG:	MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	DG	HOU	HARRIS	0912	72	386	207

Plotted on: $DATE$ $TIME$ $USER$
Pen Table: $PENTBL$
Plot Driver: $PLTDRVL$
Design Filename: $FILE$

Tree Number	Caliper (Inches)	Species	Status/ Condition	Action	Mitigation Required	Mitigation Inches	Additional Recommendations
1	3	Tree	Dead	Remove	No		
1a	2	Crepe Myrtle	Poor	Remove	No		
1b	2	Crepe Myrtle	Dead	Remove	No		
2	6	Tree	Fair	Protect			Tree protection fence and root prune
3	8	Oak	Good	Protect			Tree protection fence and root prune
4	8	Oak	Good	Protect			Tree protection fence and root prune
5	8	Oak	Good	Protect			Tree protection fence and root prune
6	8	Oak	Good	Protect			Tree protection fence and root prune
7	8	Oak	Good	Remove	Yes	8	
8	6	Pecan	Good	Protect			Tree protection fence
9	6	Pecan	Good	Protect			Tree protection fence
10	8	Oak	Good	Protect			Tree protection fence
11	8	Oak	Good	Protect			Tree protection fence
12	8	Oak	Good	Protect			Tree protection fence and root prune
13	8	Oak	Good	Protect			Tree protection fence
14	15	Oak	Good	Remove	Yes	15	
15	10	Oak	Poor	Protect			Tree protection fence
16	10	Oak	Good	Protect			Tree protection fence
17	6	Tree	Good	Protect			Tree protection fence
18	8	Oak	Fair	Protect			Tree protection fence and root prune
19	4	Oak	Fair	Protect			Tree protection fence
20	15	Oak	Fair	Protect			Tree protection fence
21	8	Oak	Poor	Remove	Yes	8	Thinning canopy
22	3	Oak	Poor	Remove	Yes	3	Stunted growth, damaged limbs
23	6	Oak	Poor	Remove	Yes	6	Thinning canopy
24	6	Oak	Fair	Protect			Tree protection fence
25	4	Elm	Good	Protect			Tree protection fence
26	4	Elm	Good	Protect			Tree protection fence
27	4	Elm	Good	Protect			Tree protection fence
28	4	Elm	Good	Protect			Tree protection fence
29	4	Elm	Good	Protect			Tree protection fence
29a	4	Elm	Good	Protect			Tree protection fence
30	24	Chinese Tallow	Good	Protect			Tree protection fence and root prune
31	8	Oak	Good	Protect			Tree protection fence and root prune
32	15	Chinese Tallow	Good	Protect			Tree protection fence and root prune
33	10	Oak	Good	Protect			Tree protection fence and root prune
33a	10	Oak	Good	Protect			Tree protection fence
34	15	Oak	Fiar	Protect			Tree protection fence and root prune
35	12	Oak	Fair	Remove	No		Limbs damaged, roots damaged
36	10	Oak	Fair	Remove	Yes	10	Limbs damaged, roots damaged
36a	10	Oak	Good	Protect			Tree protection fence
37	12	Oak	Good	Remove	Yes	12	
38	8	Pine	Good	Remove	Yes	8	
39	8	Oak	Good	Remove	Yes	8	
40	12	Oak	Good	Remove	Yes	12	
41	12	Pine	Good	Remove	Yes	12	
42	8	Oak	Good	Protect			
43	18	Oak	Good	Protect			
44	26	Oak	Good	Protect			
45	12	Oak	Good	Protect			
45a	28	Oak	Good	Protect			Tree protection fence
46	12	Oak	Good	Protect			Tree protection fence and root prune
47	10	Oak	Good	Protect			Tree protection fence and root prune
48	10	Oak	Good	Protect			Tree protection fence and root prune
49	8	Oak	Good	Protect			Tree protection fence and root prune
49a	8	Oak	Good	Protect			Tree protection fence

Tree Replacement				
Quantity	Caliper Size	Species*	Container Size	Inches
7	2.5	Sycamore*	45 gal.	17.5
4	2.5	Elm*	45 gal.	10
19	4	Oak*	100 gal.	76
Total Replacement Required (Inches)				102
Total Replacement Provided (Inches)				103.5

* **SEE PLANT SPECIFICATIONS SHEET FOR REQUIRED TREE SPECIES AND VARIETIES.**



1 TREE PROTECTION - TREE AND ROOT PRUNING

SCALE: NTS

ROOT PRUNING

1. Install root pruning trenching where designated in tree treatment schedule and shown on the tree protection drawings. Trees scheduled for root pruning are called out specifically in the treatment schedule. Trench shall be located 2 ft. from the edge of proposed waterline or sanitary sewer for trees called out for root pruning for water or fittings, or sanitary sewer in the treatment schedule, 2 ft. from edge of proposed storm sewer pipe for trees called out for root pruning for storm in the treatment schedule, 30" back of proposed curb for trees called out for root pruning for street, and at edge of sidewalk for trees called out for root pruning for sidewalk. Root pruning shall not be performed where there is not adequate space to be located sufficiently away from tree to prevent damage. All pruning must be evaluated by Contractor's Certified Arborist and reviewed and approved by City Forester before being performed. Trench locations shown on tree preservation plan are drawn to scale and should be located in field as drawn on plan. Exact locations shall be approved in the field by engineer and/or project urban forester prior to installation. Trenching depth shall be a minimum of 2 ft. deep and a maximum of 6 inches wide for water, fittings, sanitary sewer, storm, and street. Trenching depth shall be to the anticipated bottom of sidewalk and base material for sidewalk root pruning, roots lower than sidewalk shall not be pruned. All roots shall be cut by trencher, chainsaw, or handsaw to the specified depth. Roots shall be cut cleanly, and or not ripped, torn, or chopped. Trench shall be backfilled and compacted immediately after trenching. Trench shall be installed prior to any clearing and grubbing, excavation for underground, or any other site work.

CANOPY PRUNNING

1. Trees shall be pruned in accordance with the American National Standard for tree pruning, ANSI A300 (Part 1) – 2001 Pruning Revision of ANSI A300–1995 Tree, Shrub and Other Woody Plant Maintenance – Standard Practices. Pruning shall be completed by professional arborists who has received training in proper pruning techniques.
2. Clearance prune designated trees for public streets, sidewalks, and construction areas. Provide minimum 14 feet and maximum of 18 feet of vertical clearance over proposed water trunk lines. Provide minimum of 14 feet and maximum of 16 feet of vertical clearance over proposed street construction, from 24" back of curb on one side to 24" back of curb on the other side. Provide 20' of vertical clearance over proposed storm sewer up to 38" in size, and 30' of vertical clearance for storm sewer larger than 38" in size. Pruning to be installed prior to any construction activity. Contractor shall notify property owner prior to trimming or pruning any trees with trunks located on private property. Exceptions will be made for trees determined to be arboriculturally significant by City of Houston Urban Forestry. Pruning of trees identified will be completed with approval and supervision of City of Houston Urban Forestry.
3. All cuts should be made sufficiently close to the parent limb or trunk without cutting into the branch collar or leaving a protruding stub, so that closure can readily start under normal conditions. All lateral cuts shall be made to a lateral that is least 1/3 the diameter of the parent limb. Clean cuts shall be made at all times.
4. Trees shall be pruned in a manner that will not destroy or alter the natural shape and character of the tree. Apply black latex paint to all fresh wounds on Oak (Quercus) species immediately after each cut is made.
5. Crown cleaning prune designated trees shall include selective removal of dead, diseased, and/or broken limbs.

ROOT AND CANOPY PRUNING SHALL BE INCIDENTAL TO ITEM 1004-6001 TREE PROTECTION EA; SEE NEXT SHEET FOR ADDITIONAL REQUIREMENTS.

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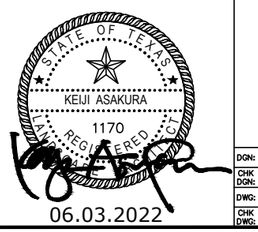
NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

L1.05 – TREE MITIGATION

SHEET 1 OF 2



DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	N/A	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	208

Plotted on: $DATE$ $TIME$ $USER$

Pen Table: $PENTBLS$
Plot Driver: $PLTDRVL$

Design Filename: $FILE$

GENERAL TREE PROTECTION NOTES:

1. Protect and ensure the continued good health of existing trees identified on the plans or directed by the Engineer. Protective measures include providing, installing, maintaining and removing protective fences, bound wood planking, compost, berm pruning, boring, and watering.
2. Install tree protection before any heavy equipment arrives on the site and remains in place for the duration of the project.

PROTECTIVE FENCE

1. Critical Root Zone (CRZ)= 1 foot radius per 1 caliper inch of trunk diameter.
2. Place protective fence at the edge of the critical root zone of trees to be protected. Use 4 feet high orange plastic mesh or approved equivalent supported on steel T–posts. Use steel T–posts minimum of 6 feet long, spaced at intervals sufficient to keep fence pulled tight. Stretch smooth galvanized wire from post to post across the top of fence and draw tight. Attach plastic mesh to posts and top wire with aluminum tie wire or nylon ties.
3. No excavation, grading, filling, soil compaction, parking, or equipment storage is allowed within the fenced area.
4. When a construction zone overlaps the root zone due to lack of space, place fence within 2 feet of construction zone.
5. Install protective compost filter berm at base of protective fence as shown in detail and described in these notes under "Root Zone Protection". Compost filter berm functions as a protective filter from runoff associated with construction activities such as: concrete wash, erosion, fill, chemicals, cement and lime work and other activities.

VEGETATIVE WATERING FOR TREE PROTECTION

1. Water trees at a rate of 30 gallons per week for every week during construction activities. Watering is paid for separately under Item 168–6001 Vegetative Watering.

TRUNK PROTECTION

1. Where protective fence is located closer than 6 feet from a tree trunk from any direction, protect the tree trunk with bound wood planking. Wood planks may be construction grade lumber a minimum of 1 inch by 6 inch nominal. Band planks together with rope, band, or strap of sufficient gauge and quality to keep protective planking in place around tree trunk for the duration of the project. Install wood planks of sufficient length to protect the trunk to a height of 10 feet, or the height of the lowest major branching, whichever is less. Do not use nails, screws or other damaging attachment methods.

ROOT ZONE PROTECTION AND PRUNING

1. Cover entire area of critical root zone with 4" depth of erosion control compost. Erosion control compost is paid for separately under Item 161–6009 Erosion Control Compost. See standard specification for compost requirements.
2. Install protective compost filter berm at base of protective fence along entire edge of critical root zone as shown on detail this sheet. Dimensions of compost filter berm are 1 foot tall, and 2 feet wide at base. Use erosion control compost for berm paid for under Item 161–6009 Erosion Control Compost. Maintain berm throughout project.
3. Vehicular traffic, stockpiling or storage of materials, parking of equipment and refueling equipment is prohibited in protected areas.
4. See previous sheet for root pruning requirements.

BORING, TRENCHING, GRADING, AND PRUNING

1. Where shown in plans, underground utilities crossing under protected areas will be bored beneath critical root zones. Avoid boring directly beneath root flare. Bore depth is 4 feet below existing grade.
2. No trenching, excavating, filling, or compaction is allowed within the critical root zone except as specifically identified in the plans and approved by the Engineer.
3. When existing grade must be cut within the critical root zone, contact the Engineer prior to beginning work. Before grading or excavation work, saw cut roots to the depth of the proposed disturbance along the edge of the proposed disturbance before excavation is begun.
4. Prune flush with soil any roots exposed by construction. Backfill root areas with good quality topsoil as soon as possible. If exposed root areas are not to be backfilled within two days, then cover with a minimum of six inches of erosion control compost. Erosion compost is paid for separately under Item 161–6009 Erosion Control Compost.
5. When grading within the critical root zone, use hand or small equipment and alter grade no more than two inches. No soil disturbance is allowed on the root flare under any circumstances.
6. Perform any pruning to provide clearance for structures, vehicular traffic, and construction equipment before construction damage might occur. Prune any limb damage within two hours of occurrence and according with ANSI A300–1995 standard.
7. Canopy pruning is required as described on previous sheet.

MAINTENANCE OF TREE PROTECTION MATERIALS

1. Maintain all tree protection materials throughout entire length of project. Repair damaged or affected tree protection materials. Additional erosion control compost may be required during the project and will be paid for separately.

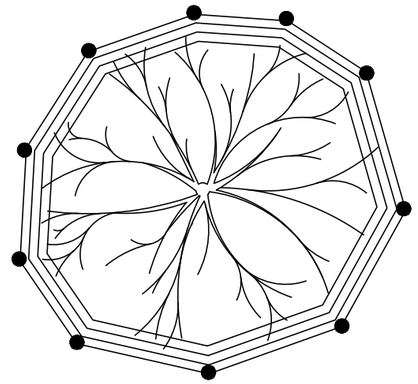
REMOVAL OF TREE PROTECTION MATERIALS

1. Remove and dispose of all protective fencing and trunk protection at end of project.

NOTE: SEE PREVIOUS SHEET FOR ADDITIONAL DETAILS

REQUIRED ITEMS:

- Item 1004–6001 Tree Protection EA
- Item 1004–6002 Tree Protection AC
- Item 161–6009 Erosion Control Compost CY
- Item 168–6001 Vegetative Watering MG

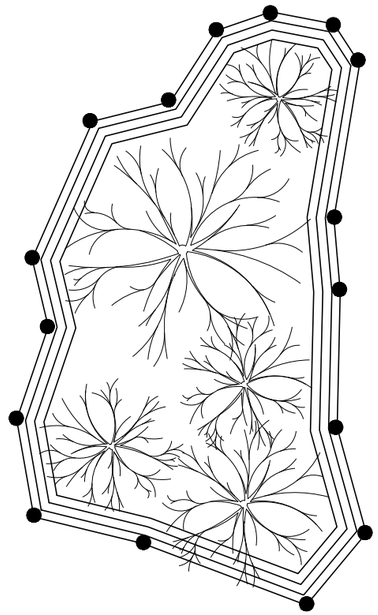


PLAN VIEW OF INDIVIDUAL TREE AND PROTECTIVE FENCE

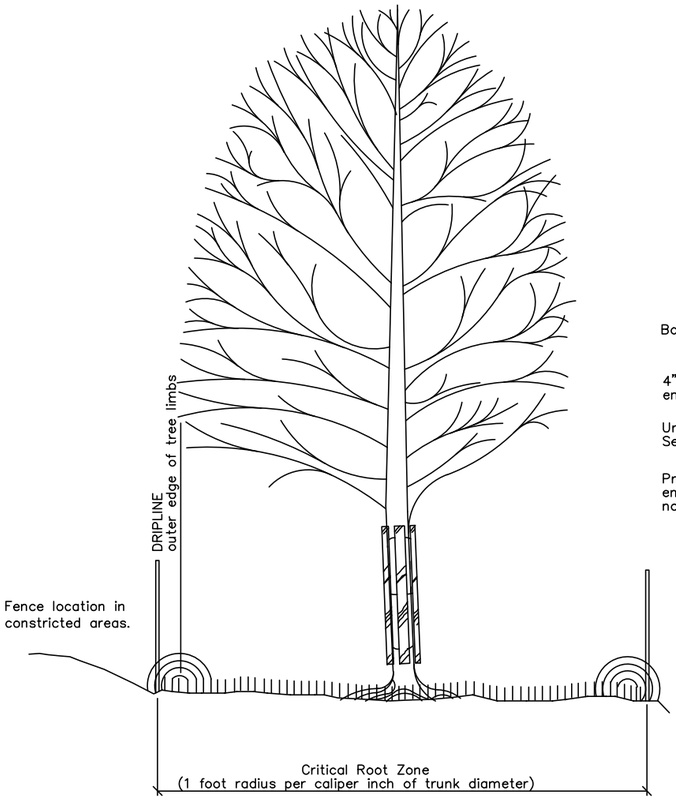
4" thick layer erosion control compost over entire critical root zone. See notes this sheet.

Protective fence and posts located at the edge of the critical root zone. See notes this sheet.

Protective filter berm. Completely enclose critical root zone. See notes and detail this sheet.



PLAN VIEW OF TREE GROUP AND PROTECTIVE FENCE



TYPICAL TREE PROTECTION

Bound wood planking, see notes this sheet.

4" thick layer erosion control compost over entire critical root zone. See notes this sheet.

Undisturbed grade to protective fence. See notes this sheet.

Protective filter berm. Completely enclose critical root zone. See notes and detail this sheet.

Preferred fence location. Protective fence and posts located at the edge of the critical root zone. See notes this sheet.

STATE OF TEXAS
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1170
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06.03.2022

Texas Department of Transportation

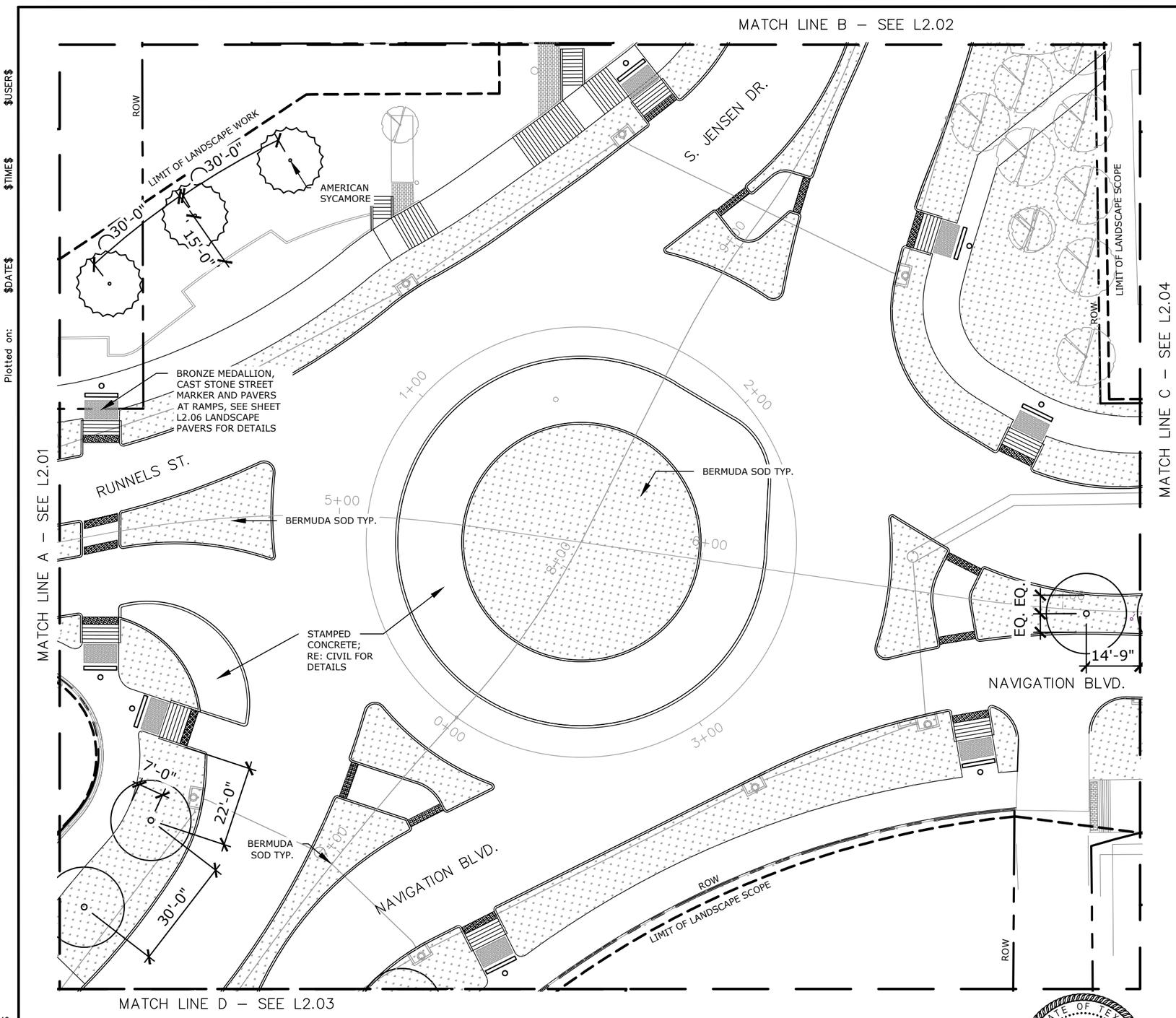
L1.06 – TREE PROTECTION DETAILS – MOD
SHEET 1 OF 1

Details not to scale

SHEET 2 OF 2

FILE:	FED DIV	STATE	PROJECT NUMBER			SHEET
	6	TEXAS	STP 1902 (308) MM			209
REVISED: FEB 2015 FOR 2014 SPECS	DIST	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	12	HARRIS	0912	72	386	CS

STD K–3



LEGEND:

- LIMIT OF LANDSCAPE SCOPE
- EXISTING TREE TO REMAIN
- CATHEDRAL LIVE OAK
- CEDAR ELM
- AMERICAN SYCAMORE
- BERMUDA SOD
- BRONZE MEDALLION, CAST STONE STREET MARKER AND PAVERS AT RAMPS, SEE SHEET L2.06 LANDSCAPE PAVERS FOR DETAILS

NOTE:

1. MARK ALL PROPOSED PLANT AND AMENITY LOCATIONS FOR APPROVAL BY GEEMD, TXDOT, AND CITY PRIOR TO WORK.
2. COORDINATE WITH PROPERTY OWNER, CITY OF HOUSTON, AND TXDOT FOR ALL TREES PLANTED OUTSIDE RIGHT OF WAY PRIOR TO PLANTING.

1 LANDSCAPE PLAN

SCALE: 1" = 30'-0"

1" = 30'-0" 0 30' 60'

STATE OF TEXAS
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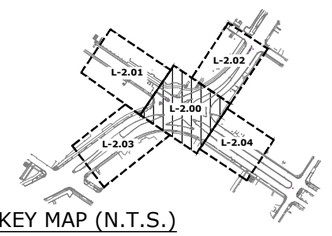
1170
REGISTERED
LANDSCAPE ARCHITECT
06.03.2022



KEY MAP (N.T.S.)

REV. NO.	DATE	DESCRIPTION	BY

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L2.00 – PLANTING PLAN

SHEET 1 OF 5

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	N/A	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	210

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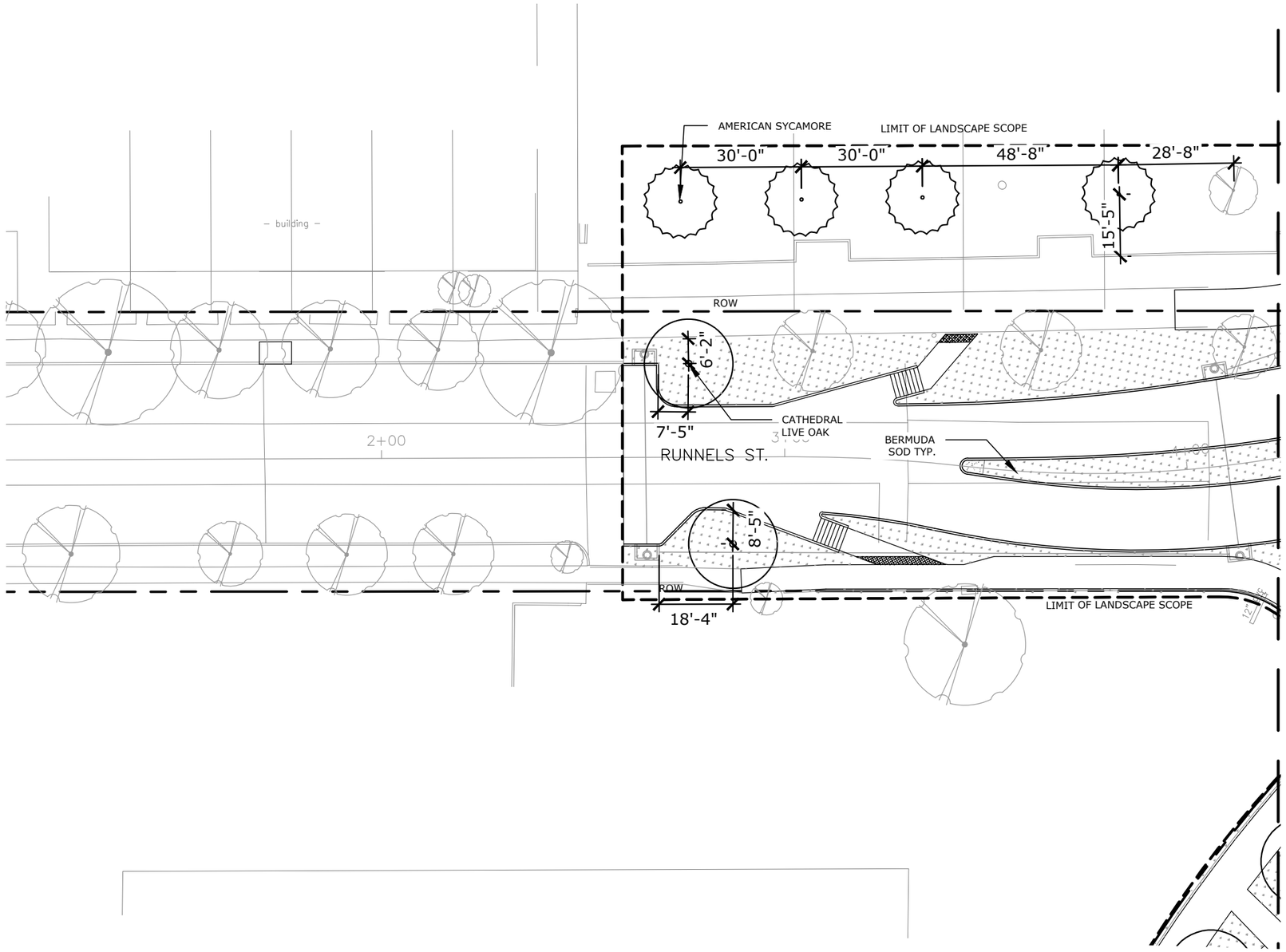

LEGEND:

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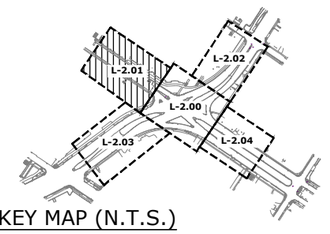
06.03.2022



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L2.01 – PLANTING PLAN

SHEET 2 OF 5

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	N/A	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	211

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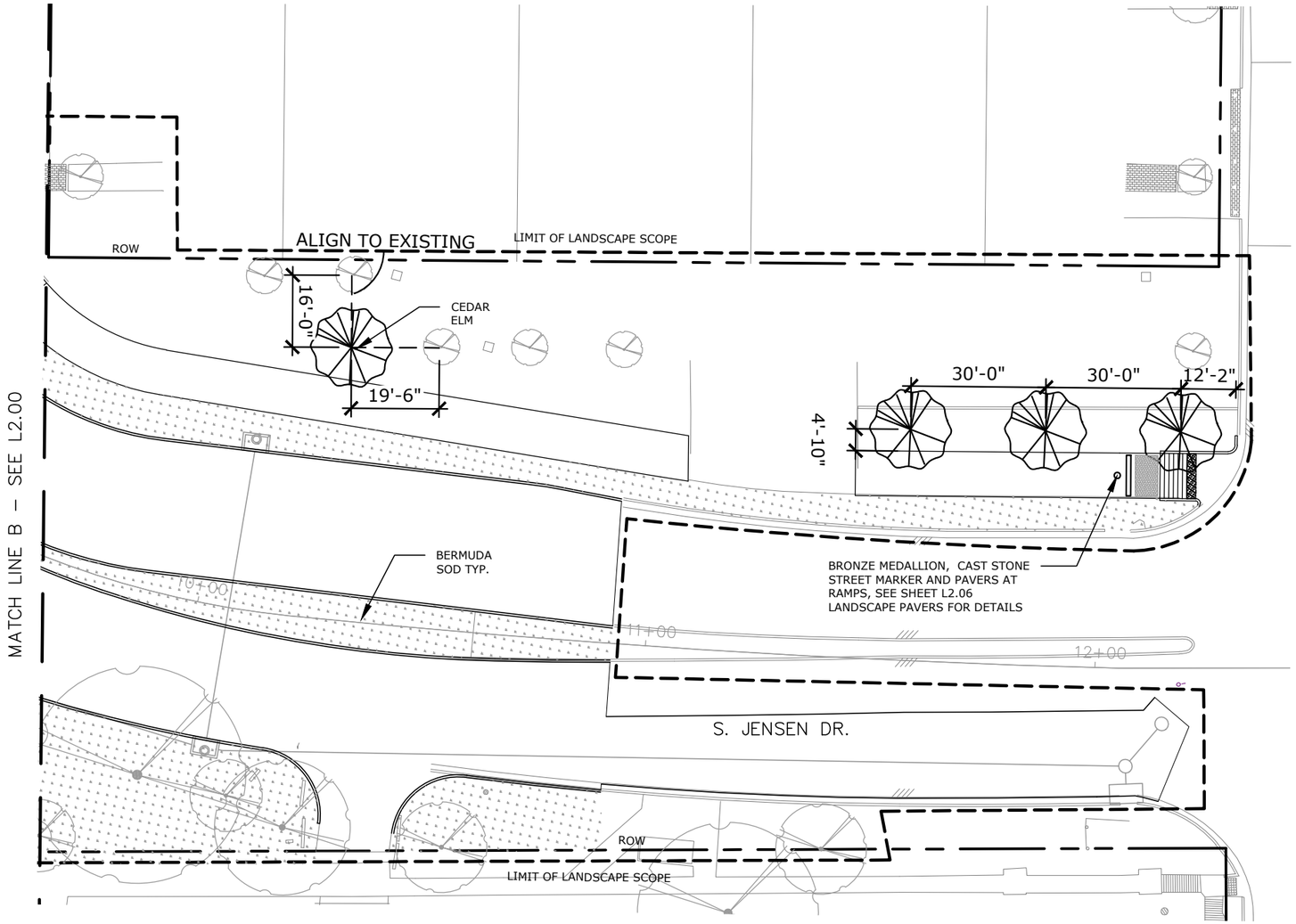

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1 LANDSCAPE PLAN

SCALE: 1" = 30'-0"

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STATE OF TEXAS
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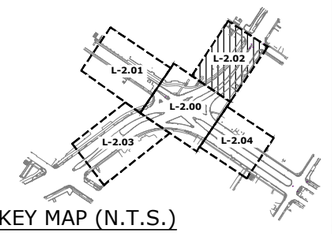

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L2.02 – PLANTING PLAN

SHEET 3 OF 5

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	N/A	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
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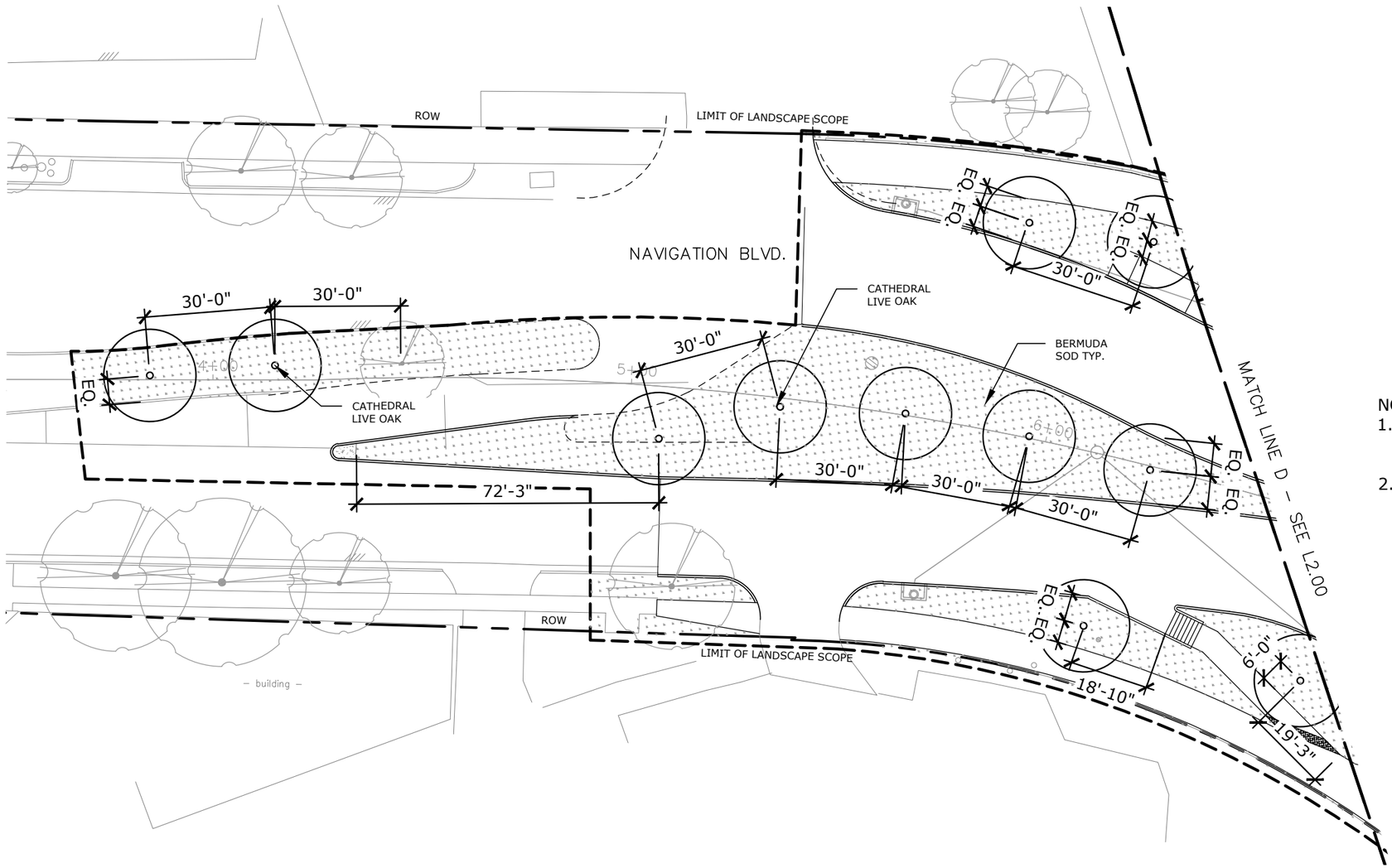

LEGEND:

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1" = 30'-0"

0 30' 60'

1 LANDSCAPE PLAN

SCALE: 1" = 30'-0"

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L2.03 – PLANTING PLAN

SHEET 4 OF 5

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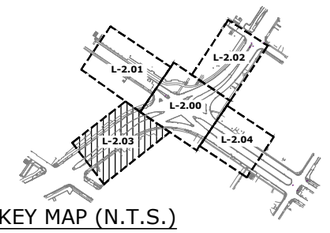

KEY MAP (N.T.S.)

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DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	213

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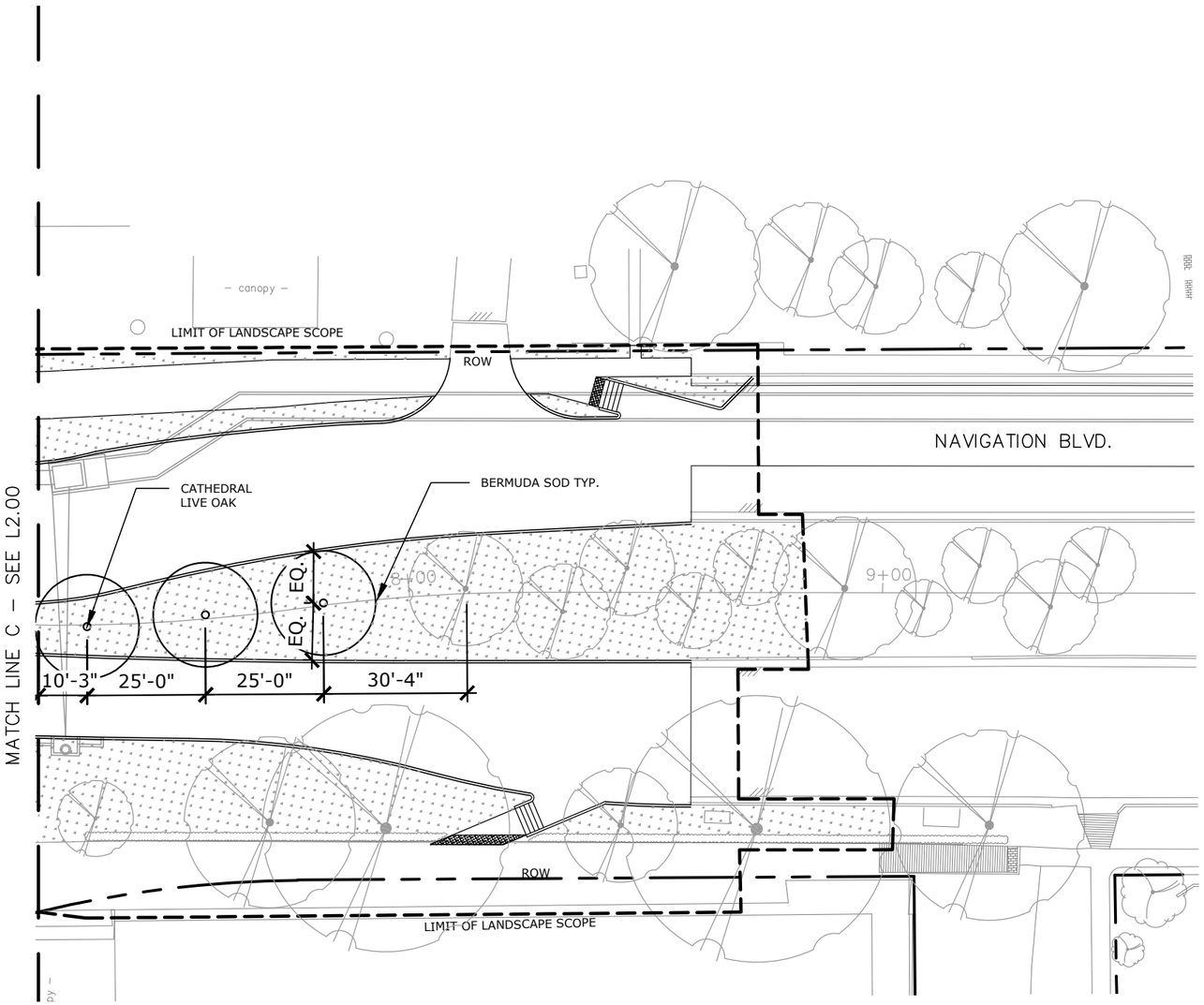

1 LANDSCAPE PLAN

SCALE: 1" = 30'-0"

LEGEND:

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NOTE:
1. MARK ALL PROPOSED PLANT AND AMENITY LOCATIONS FOR APPROVAL BY GEEMD, TXDOT, AND CITY PRIOR TO WORK.
2. COORDINATE WITH PROPERTY OWNER, CITY OF HOUSTON, AND TXDOT FOR ALL TREES PLANTED OUTSIDE RIGHT OF WAY PRIOR TO PLANTING.

1" = 30'-0"

0 30' 60'

ASAKURA ROBINSON
2500 Summer Street, Suite 3228
Houston Texas 77007
P: 713.337.5830
www.asakurarobinson.com

REV. NO.	DATE	DESCRIPTION	BY

Gauge ENGINEERING
11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

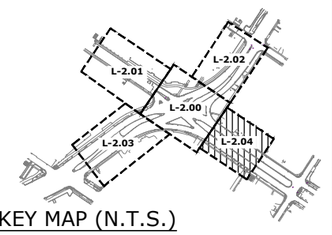
NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

L2.04 – PLANTING PLAN

SHEET 5 OF 5

STATE OF TEXAS
KEIJI ASAKURA
1170
LANDSCAPE REGISTERED ARCHITECT
06.03.2022

KEY MAP (N.T.S.)



DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	N/A	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	214

Plotted on: $DATE$ $TIME$ $USER$
Pen Table: $PENTBL$
Plot Driver: $PLTDRVL$
Design Filename: $FILEL$

TYPE OF WORK — ITEMS AND REQUIREMENTS FOR EACH TYPE OF WORK

SODDING	PERMANENT SEEDING	TEMPORARY SEEDING	Reference Item 161, 162, 164, 166, 168 of the Texas Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges 2014 for specifications, dimensions, volumes and measurements that are not shown. Use latest Houston District, Special Provisions for those items indicated.		
			161–6017 COMPOST MANUF TOPSOIL (BIP)(4") SY MEDIANS SHALL HAVE 8" DEPTH TOPSOIL FOR PERMANENT SEEDING	APPLICATION RATE Item 161.2.1. Compost Manufactured Topsoil (CMT)	Item 161.2. Materials. Submit quality control (QC) documentation to the Engineer. Compost producer's STA certification must be dated to meet STA requirements (certification must be within 30 or 90 days per STA requirements). Lab analysis performed by an STA–certified lab must be dated within 30 days before delivery of the compost.
✓			162–6002 BLOCK SODDING SY	GRASS SPECIES Item 162.2. Materials. Common Bermuda (Cynodon Dactylon)	Item 162.2.1. Block Sod. Use block palletized or roll type sod. REMOVE PLASTIC BACKING FROM ROLL TYPE SOD. Place sod within 48 hours of delivery to site. No exceptions. Place sod with joints alternating on each row to prevent continuous joint lines. Peg sod as needed with wood pegs to hold sod in place. Pegging sod is subsidiary to Item 162.
			164–6066 DRILL SEEDING(PERM)(WARM OR COOL) SY Item 164.1. Description Provide and install seeding as shown on District Standard	PLANTING MONTH / SEED MIX March, April, May, June, July, August, September, October: Hulled – Bermudagrass (Cynodon dactylon) – 40.0 lbs PLS/acre; Foxtail Millet (Setaria italica) – 34.0 lbs PLS/acre; Green Sprangletop (Leptochloa dubia) – 4.0 lbs PLS/acre; Sideoats Grama (Bouteloua curtipendula) – 3.2 lbs PLS/acre; Little Bluestem (Schizachyrium scoparium) – 1.4 lbs PLS/acre November, December, January, February,: Unhulled – Bermudagrass (Cynodon dactylon)– 40.0 lbs PLS/acre; Oats (Avena sativa) – 72.0 lbs PLS/acre; Green Sprangletop (Leptochloa dubia) – 4.0 lbs PLS/acre; Sideoats Grama (Bouteloua curtipendula) – 3.2 lbs PLS/acre; Little Bluestem (Schizachyrium scoparium) – 1.4 lbs PLS/acre	PLS (Pure Live Seed) Provide documentation of PLS requirements per Item 164.2.1. CONSTRUCTION. Cultivate the area to a depth of 4 inches before placing the seed unless otherwise directed. When performing permanent seeding after an established temporary seeding, cultivate the seedbed to a depth of 4 inches or mow the area before placement of the permanent seed. Plant the seed and place the straw or hay mulch after the area has been completed to lines and grades as shown on the plans. Drill Seeding. Plant seed or seed mixture uniformly over the area shown on the plans at a depth of 1/4 to 1/3 inch using a cultipacker(turfgrass) type seeder. Plant seed along the contour of the slopes. Use broadcast seeding method where site conditions prevent drill seeding method. Broadcast Seeding. Distribute the dry seed or dry seed mixture uniformly over the areas shown on the plans using hand or mechanical distribution on top of soil.
			164–6052 BROADCAST SEED(PERM)(SPECIAL MIX) SY Item 164.1. Description Provide and install seeding as shown on District Standard		
		✓	164–6051 DRILL SEED(TEMP)(WARM OR COOL) SY Item 164.1. Description Provide and install seeding as shown on District Standard	PLANTING MONTH / SEED MIX March, April, May, June, July, August, September, October: Foxtail Millet (Setaria italica) – 34.0 lbs PLS/acre November, December, January, February,: Oats (Avena sativa – 72.0 lbs PLS/acre	
		✓	164–6009 BROADCAST SEED(TEMP)(WARM) SY Item 164.1. Description Provide and install seeding as shown on District Standard		
		✓	162–6003 STRAW OR HAY MULCH SY	APPLICATION RATE Immediately after planting the seed or seed mixture, apply straw or hay mulch uniformly over the seeded area. Apply straw or hay mulch at 2 tons per acre. Use tacking agent with straw or hay mulch as described on this sheet.	Use straw or hay mulch in conformance with Article 162.2.5, "Mulch." Use biodegradable tacking agents only applied at a rate in accordance with manufacturer's recommendations. Use the following products or an approved equal(see note this sheet): Conweb/Contac Guar Gum, Profile Products Corporation, (307) 655–9565, Ramtec/Procol/Viscol Guar Gum, Ramtec Corporation, (800) 366–1180
✓		✓	166–6001 FERTILIZER AC Item 166.2. Materials Use fertilizer as shown on District Standard	APPLICATION RATE Deliver and evenly distribute fertilzer at a rate of 4000 lbs/acre.	NON–CHEMICAL Use a NON–CHEMICAL fertilizer which meets all the following criteria: (1) BRAND NAME must be registered with the Texas State Chemist as a commercial fertilizer. (2) Meets USEPA guidelines for unrestricted use. (3) Derived from biological sources such as, but not limited to: sewage sludge, manures, vegetation, etc. (4) In granular form and essentially dust free. Submit proof of registration and nutrient source to Engineer. Use the following products or an approved equal(see note this sheet): Sigma, SIGMA AgriScience, 281–851–6749 Sustanite–standard grade, Automation Nation, Inc., 713–675–4999 Milorganite, MMSD, 800–287–9645 Agricultural Organic P/L, Ag Org, INC., 713–523–4396
✓		✓	168–6001 VEGETATIVE WATERING MG	APPLICATION RATE Item 168.3 Construction. 6000 gallons/acre per working day X 20 consecutive working days = 120,000 gallons total/acre	Begin watering immediately after installation of seed or sod. Replace, fertilize, and water any seed or sod in poor condition due to the failure to apply the specified amount of water within the time allowed at no expense to the Department.

SEQUENCE OF WORK

BLOCK SOD	PERMANENT SEEDING	TEMPORARY SEEDING
1.FERTILIZER 2.CULTIVATE SOIL (ITEM 162.3) 3.SOD 4.VEGETATIVE WATERING	1.FERTILIZER 2.COMPOST MANUFACTURED TOPSOIL 3.CULTIVATE SOIL (ITEMS 164.3 AND 161.3.1) 4.PERMANENT SEEDING 5.STRAW OR HAY MULCH 6.VEGETATIVE WATERING	1.FERTILIZER 2.CULTIVATE SOIL (PER ITEM 164.3) 3.TEMPORARY SEEDING 4.STRAW OR HAY MULCH 5.VEGETATIVE WATERING

Texas Department of Transportation
HOUSTON DISTRICT

L2.05 – FERTILIZER, SEED, SOD, STRAW, COMPOST, AND WATER

SHEET 1 OF 1

REVISIONS
10/2014 UPDATED TO 2014 SPECS 3/2015 MINOR CORRECTIONS

FILE: OCT 2014	FED DIV	STATE	PROJECT NUMBER			SHEET
	6	TEXAS	STP 1902 (308) MM			215
ORIGINAL:	DIST	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	12	HARRIS	0912	72	386	CS

STD K–1

GENERAL PAVER NOTES:
1. Reference Item 528, Colored Textured Concrete and Landscape Pavers, of the Texas Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges 2014 for specifications, dimensions, volumes and measurements not shown. NOTE: Item 528 references several ASTM standard specifications required as part of this Item.
2. Locate and stake all underground conduits and utilities associated with but not limited to: CTMS, CTMS power supply, lighting, signal wires and detectors, gas, electrical, telephone, fiber optics, etc.
3. Locate and stake existing ground boxes, inlets, culverts, manholes, etc. within the project area with a 4' wooden stake, painted orange. Maintain the stakes in place for duration of construction period of the contract. Remove stakes when directed by Engineer.
4. Repair and/or replacement of any damaged underground conduits or utilities, structures, pavement, riprap, equipment, materials, slopes, vegetation, surfaces, etc. at no expense to the Department.

MATERIALS:
1. Use "Class B" concrete for concrete edge for pavers shown in detail. Concrete edge is paid for separately under Item 432–6003 RIPRAP(CONC)(6 IN) CY.
2. Use portland cement treated base which meets the requirements of Item 276, Strength L. Portland cement treated base is subsidiary to Item 528.
3. Use bedding sand described in Item 528.2.2.2. Bedding sand is subsidiary to Item 528.
4. Use paver unit type and color type as shown. Submit sample units for approval by Engineer prior to construction with manufacturer's information certifying that paver units: a. Meet the requirements of Item 528.2.2.1. Pavers. including:
   1) Portland cements conform to ASTM C 150 2) Fly ash conforms to ASTM C 618
   3) Aggregates conform to ASTM C 33 – 07 4) Color pigments conform to ASTM C 979
   b. Are manufactured so all grey cement products are produced with a concrete mix design that contains a pigment loading that represents, by weight, 3% of the total cementitious weight of the batch. White cement products will contain sufficient pigment to achieve the specified color. Pigment dispensing will be accomplished by automated equipment designed to meter pigment granules accurately to the concrete mixer within +/– 1/2 ounce per 10 pounds of pigment.
   c. Are manufactured using accelerating plasticizer and an efflorescence reducer. Follow manufacturer's application rates, but in no case dose admixture less than 8 ounces per 100 pounds of cementitious material. d. Are manufactured by a standard process on equipment capable of creating a four color blend with a full range of colors to occur on each pallet.
5. Use polymeric sand, as per detail 1/L2.06.

SUBMITTALS
1. The following submittals are required to ensure conformance with specifications:
   a. Certification from the manufacturer stating that the pavers have been tested and meet all the requirements of ASTM C 936.
   b. Mix design, including information indicating percentage of fly ash to be used as cementitious material = less than or equal to 20%.
   c. Current mill certificate from cement supplier for grey cement. Meets all requirements of ASTM C 150.
   d. Current mill certificate from cement supplier for white cement. Meets requirements of ASTM C 150.
   e. Material certification information for fly ash. Meets requirements of ASTM C 618.
   f. Current quality test reports and gradation results of stockpiles from aggregate supplier for sand and gravel products.
   g. Pigment suppliers information.
   h. Complete technical data for admixtures including information relating to percentage of total cementitious material in mix design.
   i. Technical data and specifications for equipment used in dispensing pigment to mixing equipment.

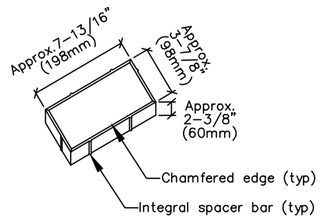
SUBMITTALS RECEIVED FROM CONTRACTOR?	
YES	NO

FOR ENGINEER'S USE TO ENSURE ALL SUBMITTALS ARE RECEIVED

CONSTRUCTION METHODS:
1. Provide a minimum 10'X10' (100SF) mock–up within project site, location to be approved by engineer. Remove mock–up as directed by Engineer. Locate and stake all items and/or limits of landscape pavers and related work in the field. Receive approval from Engineer prior to continuing.
2. Item 528.3.2.2, receive approval from Engineer before covering base material.
3. Maintain a straight joint line orientation both directions in pattern with no deviation more than 1/8 inch in a ten foot horizontal dimension.
4. Maintain vertical elevation of paver units with no surface elevation deviation greater than 3/8 inch under a ten foot straight edge.
5. Item 528.3.2.5, complete a minimum of two sweepings of joint sand, complete additional sweepings to fill the joints to the approval of the
6. Engineer. Leave surplus sand on the surface during construction period. Sweep and clean all excess joint sand, soil, foreign material, and/or stains from pavers as directed by Engineer.
7. Immediately remove and replace paver units damaged during installation.

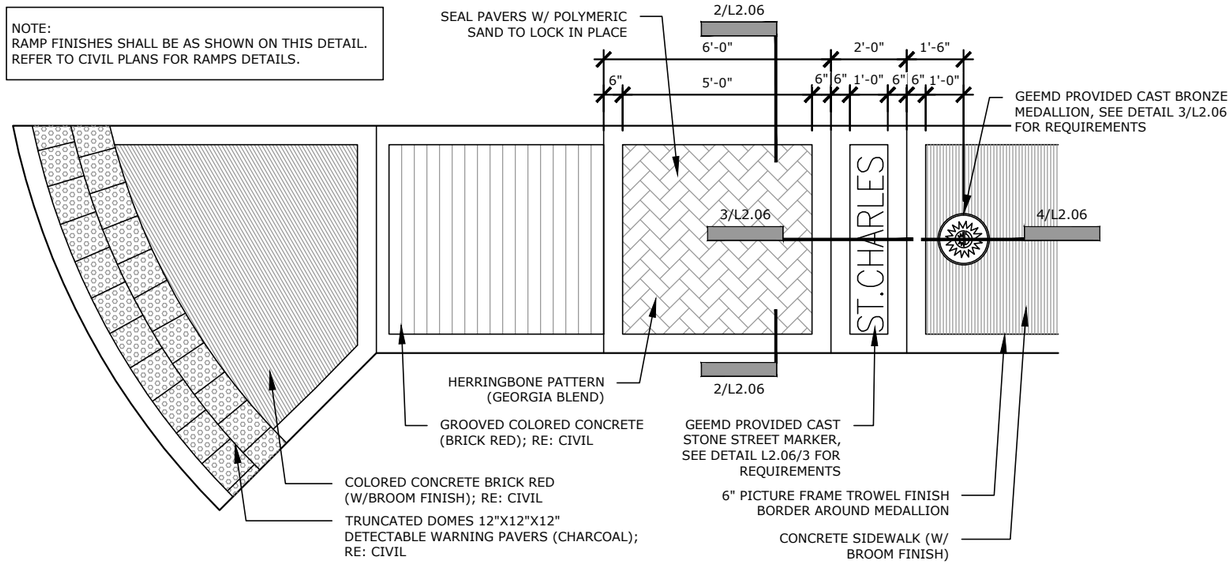
PAVER UNIT

"Holland Stone"
as manufactured by
Keystone Hardscapes,
or
approved equal
Color: Georgia Blend

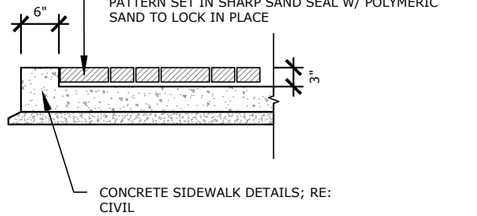


REQUIRED ITEMS:
- Item 432–6003 RIPRAP(CONC)(6 IN) CY
- Item 528–6004 LANDSCAPE PAVERS SY
- ITEM 1002–6001 LANDSCAPE AMENITY (BRONZE MEDALLION) EA
- ITEM 1002–6002 LANDSCAPE AMENITY – TYPE 1 (CAST STONE STREET MARKER) EA

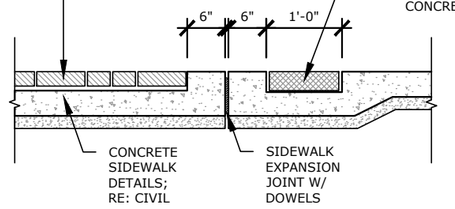
NOTE:
RAMP FINISHES SHALL BE AS SHOWN ON THIS DETAIL.
REFER TO CIVIL PLANS FOR RAMPS DETAILS.



1 SIDEWALK LANDING PAD (TYPE III)
SCALE: 1/4" = 1'-0"

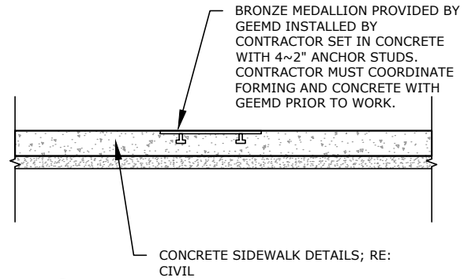


2 BRICK PAVER FIELD EDGE
SCALE: 1/2" = 1'-0"



STREET NAME MARKERS SHALL BE PAID UNDER PAY ITEM 1002-6002 LANDSCAPE AMENITY TYPE 1. INSTALLATION SHALL BE COMPLETE IN PLACE AND INCLUDE ALL LABOR AND MATERIALS INCIDENTAL TO A COMPLETE INSTALLATION.

3 STREET NAME MARKER
SCALE: 1/2" = 1'-0"



4 BRONZE MEDALLION
SCALE: 1/2" = 1'-0"

STREET NAME MARKERS SHALL BE PAID UNDER PAY ITEM 1002-6001 LANDSCAPE AMENITY. INSTALLATION SHALL BE COMPLETE IN PLACE AND INCLUDE ALL LABOR AND MATERIALS INCIDENTAL TO A COMPLETE INSTALLATION.

STATE OF TEXAS
KEIJI ASAKURA
1170
LICENSED LANDSCAPE ARCHITECT
06.27.2022

APPROVED EQUAL NOTE:
Reference to manufacturer's trade name or product is for the purpose of identificatin only, Contractor is permitted to furnish like materials of other manufacturers provided they are of equal quality and comply with specifications for this project. All materials for consideration as an "approved equal" must be submitted to the Engineer at the preconstruction meeting. Consideration for late submittals will only be for any materials, shown in plans, which become unavailable as required.

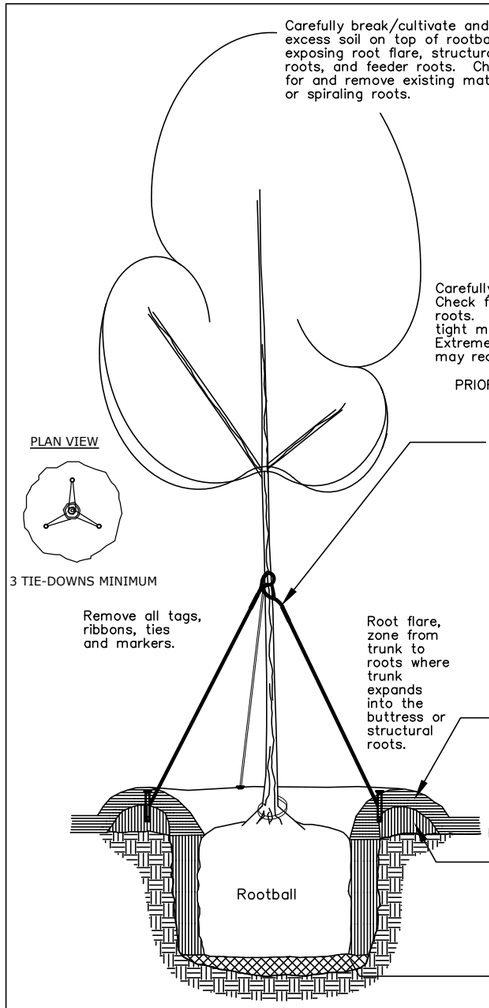
Texas Department of Transportation
HOUSTON DISTRICT

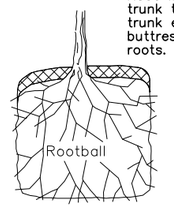
L2.06 – LANDSCAPE PAVERS –MOD

SHEET 1 OF 1

Details not to scale

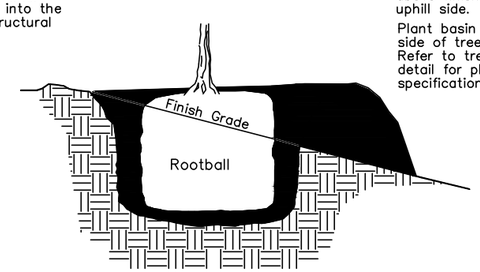
FILE:	FED DIV	STATE	PROJECT NUMBER			SHEET
	6	TEXAS	STP 1902 (308) MM			216
REVISED: DCT 2014 for 2014 specs	DIST	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	12	HARRIS	0912	72	386	CS





Carefully remove from container. Check for tightly bound or compressed roots. Carefully pull roots away from the tight mass and spread prior to planting. Extremely woody compacted roots may require cutting to open root system.

PRIOR TO PLACING ROOTBALL IN HOLE



Item 192.3.4
Set tree plumb, downhill shoulder of rootball should be approx. 1 inch above finished grade on uphill side.

Plant basin on downhill side of tree only. Refer to tree planting detail for planting specifications.

FOR SLOPE PLANTING

Plant Support Installation, Item 192.3.10
Plant support system shall be twister tie downs (3 per tree) or approved equal, submit detail to engineer for approval. Replace approved plant support system if fails or if causes any damage to plant material. Stake in the direction of the prevailing winds, multiple ties may be required.

Plant Installation, Item 192.3.5
Set tree plumb, root flare should be approximately 2 inches above finished grade. Remove all soil and rootmass above root flare per ANSI Z60.1, Section 1.5.3 Root Ball Depths. Unless otherwise shown on plans, use backfill consisting of 70% existing soil removed from the plant pit, and 30% General Use Compost (GUC) as described in Item 161.2.3. When used as backfill under Item 192, GUC is incidental to this item and not paid for separatly.

DO NOT PLACE BACKFILL OVER TOP OF ROOTBALL.

Root stimulator, see INITIAL WATERING AND ROOT STIMULATOR REQUIREMENTS this sheet, root stimulator is incidental to this item and not paid for separately.

Mulching, Item 192.3.14
Four (4) inch layer of Erosion Control Compost as described in Item 161.2.2. When used as mulch under Item 192, Erosion Control Compost is incidental to this item and not paid for separately unless Item 161-6009 is shown in the plans.

DO NOT PLACE EROSION CONTROL COMPOST OVER TOP OF ROOTBALL, EXPOSE ROOT FLARE PER DETAIL THIS SHEET.

Plant Basin Construction, Item 192.3.6

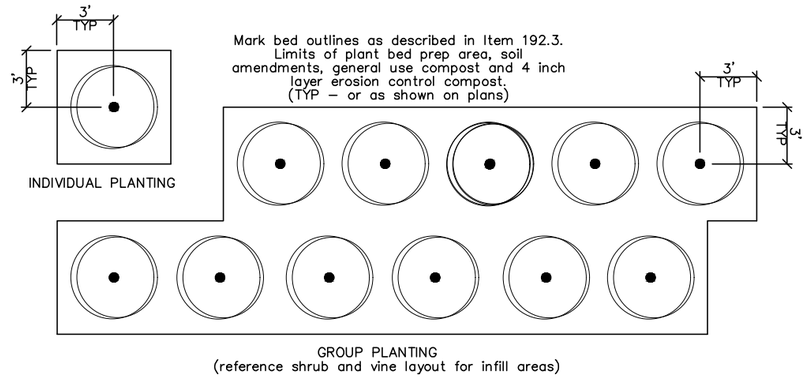
Plant Pit Excavation, Item 192.3.4
Complete planting bed preparation before excavation.

Existing soil, see planting bed preparation detail sheet.

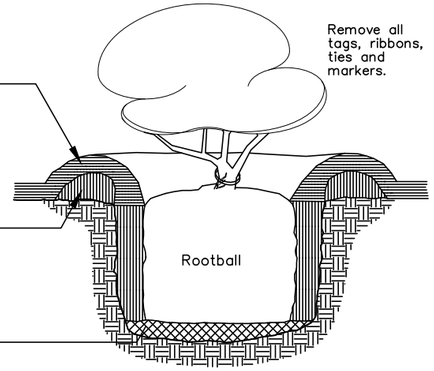
One (1) inch layer of compacted backfill, see "Plant Installation" this detail.

TREE PLANTING DETAIL

FOR PALM TREE PLANTING DETAIL SEE PLANTING AND ESTABLISHMENT SHEET 2 of 8

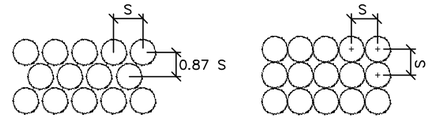


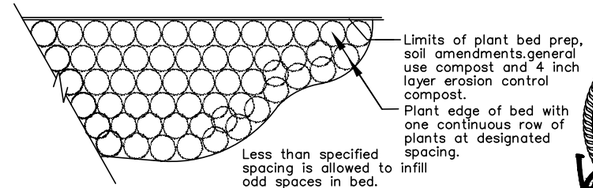
TREE PLACEMENT WITHIN PLANTING BED PREP AREA, LAYOUT AND SPACING SHOWN ON PLANS



SHRUB AND VINE PLANTING DETAIL

S= Spacing as indicated on the plans. Square or triangular spacing will be shown by the placement of the plants on the drawing and/or be called out in the plant label.





SHRUB AND VINE PLACEMENT WITHIN PLANTING BED PREP AREA LAYOUT AND SPACING SHOWN ON PLANS

VEGETATIVE WATERING SCHEDULE FOR TREES, SHRUBS, VINES

FOR VEGETATIVE WATERING FOR PALMS ONLY SEE PLANTING AND ESTABLISHMENT SHEET 2 of 8

PHASE	ITEM DESCRIPTION	FREQUENCY	RATE / PLANT
Item 192.3 Construction	Item 192.3.7. Watering is incidental to Item 192 and is not paid for seperately See Initial Watering note	Begin same day as planting then: 3 times per week with 1 day minimum between waterings See Initial Watering note	CNTR SIZE / WATER QTY 30 GAL = 16 gallons 15 GAL = 10 gallons 5 GAL = 4 gallons 3 GAL = 2 gallons 1 GAL = 2 gallons (1/2 X plant CNTR gallon size per plant for sizes not shown, one (1) gallon minimum) See Initial Watering Note
Item 192.3.15 Maintenance	Item 192.3.15.1. Watering is incidental to Item 192 and is not paid for seperately		
Item 193 Landscape Establishment (When Shown In Plans)	Item 193.3.3. Watering is incidental to Item 193 and is not paid for seperately	2 times per week with 2 days minimum between waterings	

NOTES:
Apply water over the rootball within the tree well only, unless otherwise shown on plans. Adjust rate and frequency to meet site conditions and weather as approved or directed by engineer.

Plant material in poor condition due to the failure to apply the specified amount of water within the time allowed or overwatering will be replaced at contractor's expense.

PROVIDE MONTHLY METER READINGS OF WATER APPLIED.

Prior to arrival at project or storage area, provide watering plan(s) of plants to be installed or stored. Watering plan(s) must be approved by engineer prior to delivery to project or storage area.

INITIAL WATERING AND ROOT STIMULATOR REQUIREMENTS

PHASE	Item 192.3 Construction. Initial watering.
ITEM DESCRIPTION	Item 192.3.5. Plant Installation. Root stimulator material is incidental to Item 192 and is not paid for seperately.
MATERIALS and SOLUTION	Two (2) ounces of root stimulator concentrate per one (1) gallon water. Root stimulator must be commercially available and labeled as an all organic/non-chemical liquid concentrate Bio-Stimulant and Root Stimulator. Use the following product or an approved equal: Super Seaweed, San Jacinto Environmental Supplies, 713-957-0909.
FREQUENCY and RATE	At the time of planting, provide initial watering at rate shown in Vegetative Watering Schedule this sheet. Use root stimulator solution for initial watering.

GENERAL NOTES:
1. Reference Item 192 of the Texas Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges 2014 for specifications, dimensions, volumes, and measurements not shown.
2. Reference Item 192.3, mark plant locations and bed outlines.
3. Verify that all planting meets the following clear zone minimum distance requirements from the edge of the travel lane: Trees: 32' unless protected by a barrier, Shrubs: 16' unless protected by a barrier, Groundcovers and vines: no minimum distance. Engineer has final authority over all clear zone related issues.
4. Locate and stake all underground conduits and utilities associated with but not limited to: CTMS, CTMS power supply, lighting, signal wires and detectors, gas, electric, telephone, fiber optics, etc.
5. Locate and stake existing ground boxes, inlets, culverts, manholes, etc. within the project area with a 4' wooden stake painted orange. Maintain the stakes in place for duration of the contract. Remove stakes when directed by engineer.
6. Reference Item 5.10 Inspection of the Texas Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges 2014. At any time during all phases of the contract, any materials or work performed not in accordance with the plans and specifications will be replaced and/or reworked until in compliance.
7. Any adjustments due to the failure to comply with plans andspecifications shown will be at contractors expense.

Texas Department of Transportation
HOUSTON DISTRICT

L2.07 – PLANTING AND ESTABLISHMENT – MOD

SHEET 1 of 6

STATE OF TEXAS
KEIJI ASAKURA
1170
LICENSED LANDSCAPE ARCHITECT
06.27.2022

Details not to scale

TREE & SHRUB

FILE:	FED DIV	STATE	PROJECT NUMBER			SHEET
	6	TEXAS	STP 1902 (308) MM			217
REVISIONS: FEB 2015 for 2014 specs	DIST	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	12	HARRIS	0912	72	386	N/A

STD K-4

PLANT SPECIFICATIONS (PLANT MATERIAL MUST CONFORM TO ALL SPECIFICATIONS)

Botanical Name	Common Name	Color	Quantity	MINIMUM SPECIFICATIONS				
				Root Condition	Caliper	Height	Spread	Remarks
TREES								
Platanus occidentalis	American Sycamore		7	45 GAL.	2.5"	12'–14'	8'–10'	Container grown, full & well rooted, single dominant straight leader
Ulmus crassifolia	Cedar Elm		4	45 GAL.	2.5"	8'–10'	5'–6'	Container grown, full & well rooted, single dominant straight leader
Quercus virginiana 'Cathedral'	Cathedral Live Oak		19	100 GAL.	4"	12'–14'	6'–8'	Container grown, full & well rooted, single dominant straight leader
PALM TREES								
SHRUBS								
VINE/GROUND COVER								

PLANT SPECIFICATION NOTES:

1. Reference Item 5.10 INSPECTION of the Texas Standard Specifications for Construction of Highways, Streets and Bridges 2014. Inspection or lack of inspection will not relieve the contractor from obligation to provide materials or perform the work in accordance with the contract.
2. Reference Item 192 of the Texas Standard Specifications for Construction of Highways, Streets and Bridges 2014 for specifications, dimensions, volumes and measurements that are not shown.
3. All plants must be nursery grown in containers unless otherwise shown on plans.
4. Provide photographs of plant material when requested by engineer and landscape architect.
5. REJECTION OF PLANTS. Reference Item 192.2 for rejection of plants and unacceptable characteristics.
6. MEASURING CALIPER. Reference Item 192.2 and ANSI Z60.1, Section 1.2.1, American Standard For Nursery Stock, for caliper measuring procedures. Caliper measurement shall be taken 6 inches above the soil line for container grown stock less than 4.5 inches in caliper. If caliper measured at 6 inches is 4.5 inches or more, caliper shall be measured at 12 inches above ground level, soil line, or root flare as appropriate.
7. ROOT BALL DEPTH. Reference ANSI Z60.1, Section 1.5.3 for rootball depth measurement procedures. Depth of root ball is measured from the top of the ball, which in all cases shall begin in the root flare.
8. HANDLING AND CARE. Properly handle and maintain plants during delivery, handling, storage, and planting. The engineer and landscape architect may inspect any phase of work and may reject any plant material improperly handled and/or maintained.
9. DELIVERY NOTICE. Reference Item 192.3.2 plant delivery. Provide 48 hour notice of proposed plant material delivery prior to arrival at project or storage area.
10. DELIVERY TICKETS. For each plant material shipment, provide invoice showing the number, size, and name (common and botanical) of each of the species of plant material.
11. WATERING PLAN(S). Prior to arrival at project or storage area, provide watering plan(s) of plants to be installed or stored. Watering plan(s) must be approved by engineer and landscape architect prior to delivery to project or storage area.

STATE OF TEXAS
KEIJI ASAKURA
1170
LICENSED LANDSCAPE ARCHITECT
06.27.2022

Texas Department of Transportation
HOUSTON DISTRICT

L2.08 – PLANTING AND ESTABLISHMENT – MOD
SHEET 2 of 6

PLANT SPECIFICATIONS

FILE:	FED DIV	STATE	PROJECT NUMBER			SHEET
	6	TEXAS	STP 1902 (308) MM			218
REVISIONS: FEB 2015 for 2014 specs	DIST	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	12	HARRIS	0912	72	386	N/A

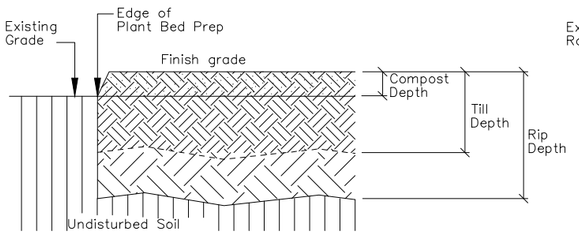
TYPE OF WORK

ITEMS AND REQUIREMENTS FOR EACH TYPE OF WORK

192–6063 PLANT BED PREP (TYPE I) SY	192–6064 PLANT BED PREP (TYPE II) SY	192–6065 PLANT BED PREP (TYPE III) SY	192–6066 PLANT BED PREP (TYPE IV) SY	Reference Item 161, 192 of the Texas Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges 2014 for specifications, dimensions, volumes and measurements that are not shown. Reference Special Specification Item 1006.		
✓	✓	✓		161–6012 GENERAL USE COMPOST CY	APPLICATION RATE Item 161.2.3. General Use Compost. Apply 2 in. uniform layer over bed preparation area.	Item 161.2. Materials. Compost producer's STA certification must be dated to meet STA requirements (certification must be within 30 or 90 days). Lab analysis performed by an STA–certified lab must be dated within 30 days before delivery of the compost.
✓	✓	✓	✓	1006–6001 LANDSCAPE SOIL AMENDMENT (TYPE I) SY	APPLICATION RATE Apply 0.30 lbs/SY. Each application is paid for separately. See timeline for multiple applications.	Use a non–chemical fertilizer with the following requirements: (1)Is OMRI Listed or certified by Washington State Department of Agriculture meeting USDA National Organic Program Rules, provide current certification. (2)Is registered with Texas State Chemist as a commercial fertilizer. (3)Meets USEPA guidelines for unrestricted use. (4)Derived from the following biological source: processed poultry manure. (5)Contains 3.0% nitrogen and 2.2% of nitrogen is water insoluble, 4% phosphate, 3% soluble potash, 10% calcium. (6)Use the following product or an approved equal: Plant Vigor 3–4–3 Plus 10% Calcium manufactured by Natural Resources Group, Inc., Tomball, Texas 800–279–9567.
✓	✓	✓	✓	1006–6002 LANDSCAPE SOIL AMENDMENT (TYPE II) SY	APPLICATION RATE Apply 0.25 lbs/SY.	Humate containing 2.25% iron in the raw material and greater than 45% humic acid, dextrose 2.5% to 5% on weight basis. Pelletized humate without added binders and pass #16 mesh. Use the following product or an approved equal: San Jacinto Humate, San Jacinto Environmental Supplies, 713–957–0909.
	✓	✓	✓	1006–6003 LANDSCAPE SOIL AMENDMENT (TYPE III) SY	See PLANTING AND ESTABLISHMENT SHEET 4 of 6 For Requirements	
				1006–6004 LANDSCAPE SOIL AMENDMENT (TYPE IV) SY	See PLANTING AND ESTABLISHMENT SHEET 4 of 6 For Requirements	
✓	✓	✓	✓	1006–6005 LANDSCAPE SOIL AMENDMENT (TYPE V) SY	APPLICATION RATE Apply 0.30 lbs/SY. Each application is paid for separately. See timeline for multiple applications.	Use a non–chemical fertilizer with the following requirements: (1)Is OMRI Listed or certified by Washington State Department of Agriculture meeting USDA National Organic Program Rules, provide current certification. (2)Is registered with Texas State Chemist as a commercial fertilizer. (3)Meets USEPA guidelines for unrestricted use. (4)Derived from the following biological source: worm castings. (5)Contains 0.02% humic acid derived from humate, 1.0% nitrogen and 0.9% of nitrogen is water insoluble, 0.5% phosphate, 0.2% soluble potash, 1.0% calcium, 0.02% iron. (6)Use the following product or an approved equal: Black Castings manufactured by Vermi–Technology Unlimited available from Earth's Outlet 866–504–1139.
✓				RIPPING/TRENCHING Incidental to Item 192 Plant Bed Preparation.	RIP/TRENCH DEPTH Rip/Trench to a depth of 18 inches (+/– 2"). Distance between each rip/trench is 24 inches.	
✓	✓	✓		ROTOR TILLING Incidental to Item 192 Plant Bed Preparation.	ROTOR TILL DEPTH After application of compost and amendments and rip/trench (when required), rotor till to a depth of 8 inches (+/– 2").	
		✓	✓	HERBICIDE and MOWING Incidental to Item 192 Plant Bed Preparation. Scalp mow 15 days after final herbicide treatment.	APPLICATION RATE Prior to all other work, apply two applications of an approved herbicide with 15 days between the applications. Apply herbicide during weather conditions and at a rate per manufacturer's recommendations.	

GENERAL BED PREPARATION NOTES:

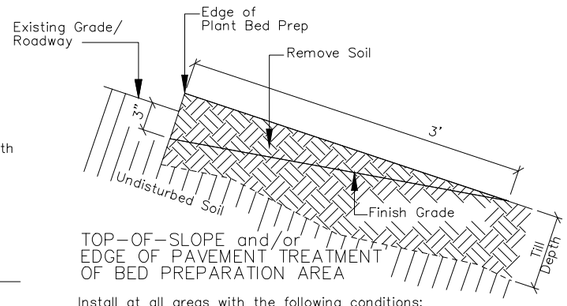
1. Reference Item 192 of the Texas Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges 2014 for specifications, dimensions, volumes and measurements not shown.
2. Reference Item 192.3 mark plant locations and bed outlines.
3. Locate and stake all underground conduits and utilities associated with but not limited to: CTMS, CTMS power supply, lighting, signal wires and detectors, gas, electric, telephone, fiber optics, etc.
4. Locate and stake existing ground boxes, inlets, culverts, manholes, etc. within the project area with a 4' wooden stake painted orange. Maintain the stakes in place for duration of the project. Remove stakes when directed by engineer.
5. Repair any damage within right of way caused by contractor at no additional expense to the Department.
6. Provide a 1000 SF "mock up" of soil amendment, general use compost, and bed preparation complete and in place within an approved area for approval by engineer.
7. Pick–up litter prior to scalp mow and bed preparation.
8. All concrete, steel, trash, and other debris uncovered during bed preparation work which the engineer determines as detrimental to the project will become the responsibility of the contractor and disposed of in an approved manner. Debris removal will occur daily and will be incidental to bed preparation and will not be paid for separately.
9. Reference Item 5.10 Inspection of the Texas Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges 2014. At any time during all phases of the contract, any materials or work performed not in accordance with the plans and specifications will be replaced and/or reworked until in compliance.
10. Any adjustments due to the failure to comply with plans and specifications shown will be at contractors expense.
11. Clean and clear bed prep areas and nearby inlets of existing tall vegetation and any piles or layers of dead grass and weeds caused by drought or mowing operations by others.



PLANTING BED PREPARATION SECTION

SEE ITEMS AND REQUIREMENTS THIS SHEET FOR DIMENSIONS, RATES, AND SPECIFICATIONS

(See Top–of–Slope detail this sheet when applicable)



TOP–OF–SLOPE and/or EDGE OF PAVEMENT TREATMENT OF BED PREPARATION AREA

Install at all areas with the following conditions: Within the bed preparation areas at top–of–slope (adjacent to shoulder sections and areas with slotted barrier/curb) and/or at edge of roadway, remove tilled or untilled (TYPE IV) soil as shown. Evenly distribute removed soil in a thin layer over adjacent existing tilled or untilled (TYPE IV) soil being careful not to create a mound. This work is incidental to Item 192 Plant Bed Prep Preparation.

Texas Department of Transportation

HOUSTON DISTRICT

L2.09 – PLANTING AND ESTABLISHMENT

SHEET 3 of 6

Details not to scale

BED PREPARATION

FILE:	FED DIV	STATE	PROJECT NUMBER			SHEET
	6	TEXAS	STP 1902 (308) MM			219
REVISIONS: FEB 2015 for 2014 specs	DIST	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	12	HARRIS	0912	72	386	CS

STD K–4

USE COMPOST TEA OR EXTRACT AS SHOWN ON THIS SHEET

COMPOST EXTRACT

ITEM 1006–6003 LANDSCAPE SOIL AMENDMENT (TYPE III) and
ITEM 1006–6004 LANDSCAPE SOIL AMENDMENT (TYPE IV) requirements.

MATERIALS REQUIREMENTS

Compost for use in liquid compost/extract must contain the following (per gram dry weight of compost):
1. Test within range of Soil Food Web standards using a full bio–assay to include the following:
   a) 15–25 micrograms of active bacteria,
   b) 100– 3000 micrograms total bacterial biomass,
   c) 15–25 micrograms active fungal biomass,
   d) 100–300 micrograms total fungal biomass,
   e) 10,000 each of flagellates and amoebae,
   f) 20–100 ciliates, and
   g) 20 to 30 beneficial nematodes.
2. Meet the Solvita Compost Maturity test of 6.0 or higher.

Liquid compost/extract must contain the following (per gram dry weight):
1. 150–3000 micrograms total bacterial biomass,
2. 2–20 micrograms total fungal biomass,
3. 1000 each of flagellates and amoebae,
4. 20–50 ciliates, and
5. 2–10 beneficial nematodes.

Liquid compost must be verified, with time and date, for content to have minimum activity and meet minimum standards as specified above using a 100x and 400x microscope with camera attachment by a Soil Foodweb Certified Advisor or their representative. This verification must be within 30 minutes of material leaving premises on the day of manufacture. Picture will be kept on file for each 500 gallons manufactured.

Liquid compost/extract additives include the following:
1. Mycorrhizal fungi endo/ecto blend sourced with a minimum potency of 100,000 propagules per pound with NO Tricoderma included in the innoculum.
2. Humate, low sodium, naturally processed 70% humate that has been liquefied to 12% humic–fulvic as available from Mesa Verde Resources at 877–418–8776 or approved equal.
3. Fulvic acid derived from natural shale ore as available from Sustainable Growth Texas at 936–232–5738 or approved equal.
4. Soluable kelp seaweed, dehydrated liquid extract made from the seaplant Ascophyllum nodosom as available from Sustainable Growth Texas at 936–232–5738, or approved equal.
5. Naturally derived blackstrap non–sulfured molasses (for foliar application only).

Liquid compost/extract with additives solution must sit on air for 3–4 hours and monitored every 1/2 hour with a Dissolved Oxygen Meter to assure the material does not drop below 6ppm oxygen content during full activation period.

EQUIPMENT REQUIREMENTS

For each batch use a delivery tank verified for overall cleanliness, to be free of residue, soil, compost or stains. Tank shall then be rinsed with clean non–chlorinated or non–chloramines treated well water before filling with Liquid Compost. All equipment used for application of liquid compost must have never been used or will not be used with any non organic conventional inorganic fertilizers or chemical herbicides or pesticides, owner must submit written verification to this.

Tank shall be equipped with two, 2 inch quick coupler type fittings capable of coupling, without leaks. All lines and fittings should have quick couplers at every junction. Ninety (90) degree bend fittings should be avoided for quick clean out and verification of cleanliness.

Delivery tank must be equipped with an operating circulation pump of a low velocity, high volume pump of diaphragm or centrifugal design.

Injectors capable of penetrating four (4) inches into soil and/or root balls as manufactured by LESCO Deeproot Feeder at 713–466–6730 or approved equal.

Delivery tank must be equipped with an operating aeration system.

Dissolved oxygen meter.

TRANSPORT, STORAGE AND APPLICATION REQUIREMENTS

Liquid compost/extract with additives solution must be circulated for five (5) minutes per five hundred (500) gallons of material every three (3) hours. Liquid compost/extract with additives solution must be continuously aerated from time of manufacture through complete application. All solution must be applied within 24 hours, or new material must be sourced. Materials not applied within 24 hours is not allowed.

CONSTRUCTION METHODS AND APPLICATION RATES

1006–6003 LANDSCAPE SOIL AMENDMENT (TYPE III) SY
Installation date: Install root injection 14 calendar days minimum to 30 calendar days maximum after plant installation.
Limits: Each injected tree and woody shrub equals one square yard of Landscape Soil Amendment (Type III).
Inject 1/2 gallon liquid compost/extract with additives solution four (4) inches into the root zone and/or rootball of each tree and woody shrub only. Mix additives with liquid compost/extract using the following rates:
1. Mycorrhizal fungi endo/ecto blend: 30 lbs per 500 gallons of liquid compost/extract,
2. Humate: 30 lbs per 500 gallons of liquid compost/extract,
3. Fulvic acid: 32 oz per 500 gallons of liquid compost/extract,
4. Soluable kelp seaweed: 2 lbs per 500 gallons of liquid compost/extract.

1006–6004 LANDSCAPE SOIL AMENDMENT (TYPE IV) SY
Installation date: Install first foliar application 30 calendar days minimum to 60 calendars days maximum after root injection described on this sheet. Additional foliar applications as described on following sheets.
Limits/measurement: Each SY of foliar spray equals each tree or woody shrub. Spray foliar application over all trees and woody shrubs.
Solution must be sprayed targeting the full surface of the plant including leaves (top and bottom), limbs and trunk.
Spray foliar application at the following rates:
1. Liquid compost/extract: 500 gallons per acre,
2. Humate: 2 lbs per acre,
3. Fulvic acid: 32 oz per acre,
4. Soluable kelp seaweed: 2 lbs per acre,
5. Blackstrap molasses: 16 oz per acre.

Soil Foodweb Certified Advisor:

Sustainable Growth Texas
103 Sherbrook Circle
Conroe, TX 77385
936–232–5738
sustainablegrowthtexas.com

Soil Foodweb Oregon, LLC
728 SW Wake Robin Ave.
Corvallis, Oregon 97333–1612
541–752–5066
soilfoodweb.com

Soil Foodweb New York, Inc.
555–7 Hallock Ave.
Port Jefferson Station, NY 11776
631–474–8848
soilfoodwebny.com

COMPOST TEA

ITEM 1006–6003 LANDSCAPE SOIL AMENDMENT (TYPE III) and
ITEM 1006–6004 LANDSCAPE SOIL AMENDMENT (TYPE IV) requirements.

MATERIALS REQUIREMENTS

Compost for use in liquid compost tea must contain the following (per gram dry weight of compost):
Test within range of Soil Food Web standards using a full bio–assay to include the following:
   a) 15–25 micrograms of active bacteria,
   b) 100– 300 micrograms total bacterial biomass,
   c) 15–25 micrograms active fungal biomass,
   d) 100–300 micrograms total fungal biomass,
   e) 10,000 each of flagellates and amoebae,
   f) Less than 50 ciliates, and
   g) No root feeding nematodes present.

Actively aerated compost tea must contain the following per milliliter as applied (measured after having passed through the actual application apparatus):
1. Meet the minimum desired ranges by Soil Food Web for:
   a. Active bacteria 10–150
   b. Total bacteria 150–3000
   c. Active Fungi 2–10
   d. Total Fungi 2–20
   e. Flagellages and amoebae 2000 combined
   f. Ciliates 50 or less
   g. No root feeding nematodes present

Tea is to be tested from application device a minimum once per month during each application cycle. Each batch of actively aerated compost tea must be qualitatively assessed using light microscope methods as established by Soil Food Web. Photographs of microscopy must be kept on file with a qualitative assay report.

If the following additives are used in tea brewing to meet the minimum biological standards, the aditives must meet these standards.
   a) Fish Hydrolysate – certified organic manufacturers documentation verifying no oil extraction has occurred.
   b) Kelp – must be certified organic soluble extract.
   c) Humic Acid – certified organic water extracted.
   d) Molasses – certified organic blackstrap molasses.

Actively aerated compost tea must maintain dissolved oxygen level above 6 mg/l until application. Use a dissolved oxygen meter to monitor.

EQUIPMENT REQUIREMENTS

For each batch use a delivery tank verified for overall cleanliness, to be free of residue, soil, compost or stains. Tank shall then be rinsed with clean non–chlorinated or non–chloramines treated well water before filling with Liquid Compost Tea. All equipment used for application of liquid compost must have never been used or will not be used with any non organic conventional inorganic fertilizers or chemical herbicides or pesticides, owner must submit written verification to this nature.

Application pump must be high volume (greater than 3.0 gpm) and low pressure (less than 60 psi). Application pump must be a diaphragm type pump. Foliar application device must be capable of adequately covering front and backs of leaves. Foliar application device shall be Gunjet AA18–AL or approved equal.

Delivery tank must be equipped with an operating aeration system capable of maintaining 6 mg/l oxygen content.

Injectors capable of penetrating four (4) inches into soil and/or root balls as manufactured by LESCO Deeproot Feeder at 713–466–6730 or approved equal.

Dissolved oxygen meter.

TRANSPORT, STORAGE AND APPLICATION REQUIREMENTS

Actively aerated compost tea must be continuously aerated from time of manufacture through complete application. Materials not applied within 24 hours are not allowed.

CONSTRUCTION METHODS AND APPLICATION RATES

1006–6003 LANDSCAPE SOIL AMENDMENT (TYPE III) SY
Installation date: Install root injection 14 calendar days minimum to 30 calendar days maximum after plant installation.
Limits: Each injected tree and woody shrub equals one square yard of Landscape Soil Amendment (Type III).
Inject 1/2 gallon liquid compost tea with additives solution four (4) inches into the root zone and/or rootball of each tree and woody shrub only. Mix additives with compost tea using the following rates:
1. 8 ox/ Fish Hydrolysate per gallon.

1006–6004 LANDSCAPE SOIL AMENDMENT (TYPE IV) SY
Installation date: Install first foliar application 30 calendar days minimum to 60 calendar maximum after root injection described on this sheet. Additional foliar applications as described on following sheets.
Limits/measurement: Each SY of foliar spray equals each tree or woody shrub. Spray foliar application over all trees and woody shrubs.
Solution must be sprayed targeting the full surface of the plant including leaves (top and bottom), limbs and trunk.
Spray foliar application at the following rate:
1. Liquid compost tea: 500 gallons per acre.

Soil Foodweb Certified Advisor:

Sustainable Growth Texas
103 Sherbrook Circle
Conroe, TX 77385
936–232–5738
sustainablegrowthtexas.com

Soil Foodweb New York, Inc.
555–7 Hallock Ave.
Port Jefferson Station, NY 11776
631–474–8848
soilfoodwebny.com

Soil Foodweb Oregon, LLC
728 SW Wake Robin Ave.
Corvallis, Oregon 97333–1612
541–752–5066
oregonfoodweb.com

Texas Department of Transportation
HOUSTON DISTRICT

L2.10 – PLANTING AND ESTABLISHMENT

SHEET 4 of 6

Details not to scale — COMPOST TEA/EXTRACT

FILE:	FED DIV	STATE	PROJECT NUMBER			SHEET
	6	TEXAS	STP 1902 (308) MM			220
REVISIONS: FEB 2015 for 2014 specs	DIST	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	12	HARRIS	0912	72	386	CS

STD K–4

PROJECT CONDITIONS DURING INSTALLATION AND SUSPENSION

During project installation and suspension periods, project site conditions are contractor's responsibility. Contractor will maintain project site conditions as shown on plans.
All project site maintenance work is incidental and is not paid for separately unless otherwise shown on plans.
Reference pertinent items of the Texas Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges 2014 for specifications, dimensions, volumes and measurements that are not shown.
Notify engineer prior to each site visit, determination of the completeness of work will be done in the presence of the engineer same day as work activity.

DESCRIPTION OF WORK	TIMELINE	
	BEGINNING OF PROJECT CONSTRUCTION OR SUSPENSION	END OF CONSTRUCTION/INSTALLATION
WATERING (See PLANTING AND ESTABLISHMENT SHEET 1 of 8, VEGETATIVE WATERING SCHEDULE FOR TREES, SHRUBS, VINES) and/or (See PLANTING AND ESTABLISHMENT SHEET 2 of 8 VEGETATIVE WATERING SCHEDULE FOR PALMS ONLY)	FOLLOW SAME REQUIREMENTS AND FREQUENCY SHOWN ON PLANTING AND ESTABLISHMENT SHEET 6 of 6.	
MOWING, TRIMMING, AND EDGING (From back of curb, retaining wall, barrier, and riprap to bed preparation areas, otherwise 6' width around outside edge of bed preparation areas, around and between planting bed preparation areas, including areas around any structures within the outer limits adjacent to the roadway) DO NOT MOW, TRIM, OR EDGE WITHIN 3' of ANY TREE	FOLLOW SAME REQUIREMENTS AND FREQUENCY SHOWN ON PLANTING AND ESTABLISHMENT SHEET 6 of 6.	
PLANT BASIN, BED, AND WORKSITE MAINTENANCE (Includes keeping all inlets within or near the bed preparation areas free of compost. Maintain bed preparation areas as shown below and reshape beds every 30 days or as site conditions and weather require. If no requirement is selected, maintain per Item 192.3.15.3) WEED CONTROL REQUIREMENT ☑ See PLANTING AND ESTABLISHMENT SHEET 6 of 6 For Requirements	FOLLOW SAME REQUIREMENTS AND FREQUENCY SHOWN ON PLANTING AND ESTABLISHMENT SHEET 6 of 6.	
PLANT SUPPORTS See PLANTING AND ESTABLISHMENT SHEET 4 of 6 For Requirements	FOLLOW SAME REQUIREMENTS AND FREQUENCY SHOWN ON PLANTING AND ESTABLISHMENT SHEET 6 of 6.	
PRUNING (Includes palm plant material and dead, diseased, or damaged palm fronds.)	FOLLOW SAME REQUIREMENTS AND FREQUENCY SHOWN ON PLANTING AND ESTABLISHMENT SHEET 6 of 6.	
INSECT, DISEASE, AND ANIMAL INSPECTION AND TREATMENT (Exterminate all active ant colonies in bed preparation areas)	FOLLOW SAME REQUIREMENTS AND FREQUENCY SHOWN ON PLANTING AND ESTABLISHMENT SHEET 6 of 6.	
LITTER AND DEBRIS COLLECTION AND DISPOSAL (Includes planting bed preparation areas and designated mowing limits. In addition, keep all inlets within or near planting bed preparation areas free of debris and litter)	FOLLOW SAME REQUIREMENTS AND FREQUENCY SHOWN ON PLANTING AND ESTABLISHMENT SHEET 6 of 6.	
TREE TRUNK WRAP AND PROTECTION GUARD REMOVAL AND DISPOSAL (Not applicable)	FOLLOW SAME REQUIREMENTS AND FREQUENCY SHOWN ON PLANTING AND ESTABLISHMENT SHEET 6 of 6.	
PLANT REPLACEMENT *	FOLLOW SAME REQUIREMENTS AND FREQUENCY SHOWN ON PLANTING AND ESTABLISHMENT SHEET 6 of 6.	
1006-6004 SOIL AMENDMENT (TYPE IV) (PLANTING AND ESTABLISHMENT SHEETS 3 AND 4 of 6, each application will be paid for separately)	FOLLOW SAME REQUIREMENTS AND FREQUENCY SHOWN ON PLANTING AND ESTABLISHMENT SHEET 6 of 6.	
1006-6005 SOIL AMENDMENT (TYPE V) (PLANTING AND ESTABLISHMENT SHEETS 3 AND 4 of 6, each application will be paid for separately)	FOLLOW SAME REQUIREMENTS AND FREQUENCY SHOWN ON PLANTING AND ESTABLISHMENT SHEET 6 of 6.	
FERTILIZER	FOLLOW SAME REQUIREMENTS AND FREQUENCY SHOWN ON PLANTING AND ESTABLISHMENT SHEET 6 of 6.	
IRRIGATION SYSTEM (Only when Item 170 Irrigation System or a temporary irrigation system is part of the contract, see IRRIGATION DETAILS AND MATERIALS SHEET 1 OF 3, GUARANTEE AND ACCEPTANCE)	FOLLOW SAME REQUIREMENTS AND FREQUENCY SHOWN ON PLANTING AND ESTABLISHMENT SHEET 6 of 6.	

* Remove any materials damaged by actions described in Item 7.17.
Removal and disposal of damaged materials is incidental to Item 192.
Contracter may be reimbursed for plant replacement in accordance with Item 7.17.1.
Theft is not a reimbursable repair.

Texas Department of Transportation
HOUSTON DISTRICT

L2.11 – PLANTING AND ESTABLISHMENT

SHEET 5 of 6

PROJECT CONDITIONS

FILE:	FED DIV	STATE	PROJECT NUMBER			SHEET
	6	TEXAS	STP 1902 (308) MM			221
REVISIONS: FEB 2015 for 2014 specs	DIST	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	12	HARRIS	0912	72	386	CS

STD K-4

ITEM 192 LANDSCAPE PLANTING MAINTENANCE REQUIREMENTS

After completion of the project installation, as shown in the plans and approved by the engineer, begin maintenance activities for a period of 90 calendar days as described in ITEM 192.3.15.
Payment in accordance with ITEM 192.5. is subject to completion of all scheduled maintenance activities, timeline may also be suspended for failure to complete scheduled maintenance activities.
All maintenance work is incidental and is not paid for separately unless otherwise shown on plans.
Reference Item 170 and 192 of the Texas Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges 2014 for specifications, dimensions, volumes and measurements that are not shown.
Notify engineer prior to each site visit, determination of the completeness of work will be done in the presence of the engineer same day as work activity.

DESCRIPTION OF WORK	TIMELINE (Days) 0 30 60 90											
	1 Thru 7	8 Thru 15	16 Thru 22	23 Thru 30	31 Thru 37	38 Thru 45	46 Thru 52	53 Thru 60	61 Thru 67	68 Thru 75	76 Thru 82	83 Thru 90
192.3.15.1. WATERING (See PLANTING AND ESTABLISHMENT SHEET 1 OF 6, VEGETATIVE WATERING SCHEDULE FOR TREES, SHRUBS, VINES) and/or	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
192.3.15.2. MOWING, TRIMMING, AND EDGING (From back of curb, retaining wall, barrier, and riprap to bed preparation areas, otherwise 6' width around outside edge of bed preparation areas, around and between planting bed preparation areas, including areas around any structures within the outer limits adjacent to the roadway) DO NOT MOW, TRIM, OR EDGE WITHIN 3' of ANY TREE				✓				✓				✓
192.3.15.3. PLANT BASIN, BED, AND WORKSITE MAINTENANCE (Includes keeping all inlets within or near the bed preparation areas free of compost. Maintain bed preparation areas as shown below and reshape beds every 30 days or as site conditions and weather require. If no requirement is selected, maintain per Item 192.3.15.3)												
WEED CONTROL REQUIREMENT												
✓ Maintain weed-free per Item 192.3.15.3. Cord trimmers are not allowed. Replace damaged plants per Item 192.15.9. INVASIVE VINES MUST BE CHEMICALLY TREATED, NOT MANUALLY REMOVED.		✓		✓		✓		✓		✓		✓
☐ Maintain grasses and weeds at 24" maximum height. Eradicate all vines regardless of height, VINES MUST BE CHEMICALLY TREATED, NOT MANUALLY REMOVED. Eradicate invasive shrubs and trees as directed. Method must be either a spot-treatment chemical application such as a wick applicator or manual hand pulling of weeds. Hand-pull previously treated dead plants over 24" tall.												
192.3.15.4. PLANT SUPPORTS (Remove plant stakes and all appurtenances within last 10 days of this schedule unless this Item 192 maintenance period is followed by Item 193 establishment period, unless otherwise directed by engineer)		✓		✓		✓		✓		✓		✓
192.3.15.5. PRUNING (Includes palm plant material and dead, diseased, or damaged palm fronds.)		✓				✓				✓		
192.3.15.6. INSECT, DESEASE, AND ANIMAL INSPECTION AND TREATMENT (Exterminate all active ant colonies in bed preparation areas)		✓		✓		✓		✓		✓		✓
192.3.15.7. LITTER AND DEBRIS COLLECTION AND DISPOSAL (Includes planting bed preparation areas and designated mowing limits. In addition, keep all inlets within or near planting bed preparation areas free of debris and litter)		✓		✓		✓		✓		✓		✓
192.3.15.8. TREE TRUNK WRAP AND PROTECTION GUARD REMOVAL AND DISPOSAL (Not applicable)												
192.3.15.9. PLANT REPLACEMENT *				✓				✓				✓
1006-6004 SOIL AMENDMENT (TYPE IV) (PLANTING AND ESTABLISHMENT SHEETS 3 AND 4 of 6, each application will be paid for separately)				✓				✓				✓
1006-6005 SOIL AMENDMENT (TYPE V) (PLANTING AND ESTABLISHMENT SHEETS 3 AND 4 of 6, each application will be paid for separately)				✓				✓				✓
IRRIGATION SYSTEM (Only when Item 170 Irrigation System or a temporary irrigation system is part of the contract, see IRRIGATION DETAILS AND MATERIALS SHEETS L3.00-L3.08, GUARANTEE AND ACCEPTANCE)		✓		✓		✓		✓		✓		✓
0193-6001 PLANT MAINTENANCE (All existing and proposed landscape, irrigation systems, grass, and trees within project limits must be maintained. Work includes mowing, edging all grass area edges, litter removal, insect treatment (exterminate all active ant colonies), and debris removal.)		✓		✓		✓		✓		✓		✓

* Remove any materials damaged by actions described in Item 7.17.
Removal and disposal of damaged materials is incidental to Item 192.
Contracter may be reimbursed for plant replacement in accordance with Item 7.17.1.
Theft is not a reimbursable repair.

✓ = Work required during defined period of timeline.
All work must be completed for entire project.

NOTES:
1. Reference Item 5.10 Inspection of the Texas Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges 2014. At any time during all phases of the contract, any materials or work performed not in accordance with the plans and specifications will be replaced and/or reworked until in compliance.

2. Any adjustments due to the failure to comply with plans andspecifications shown will be at contractors expense.

STATE OF TEXAS
KEIJI ASAKURA
1170
LANDSCAPE REGISTERED ARCHITECT
06.03.2022

Texas Department of Transportation
HOUSTON DISTRICT

L2.12 – PLANTING AND ESTABLISHMENT – MOD

SHEET 6 OF 6

MAINTENANCE

FILE:	FED DIV	STATE	PROJECT NUMBER			SHEET
	6	TEXAS	STP 1902 (308) MM			222
REVISIONS: FEB 2015 for 2014 specs	DIST	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	12	HARRIS	0912	72	386	CS

STD K-4

MATCH LINE B – SEE L3.02

MATCH LINE A – SEE L3.01

MATCH LINE C – SEE L3.04

MATCH LINE D – SEE L3.03

LIMIT OF LANDSCAPE WORK

ROW

S. JENSEN DR.

RUNNELS ST.

NAVIGATION BLVD.

LIMIT OF LANDSCAPE SCOPE

1" WATER METER
1" BALL VALVE
1" RP DEVICE
1" MASTER VALVE

B5 1" / 15 / 1500

B4 1" / 14 / TREE

B6 1200 1" / 12

B7 1" / 900 / 9

B8 1" / 12 / 1200

B3 1" / 1200 / 12

A12 1" / 1200 / 12

A11 1400 1" / 14

A7 1" / 16 / TREE

A8 1600 1" / 16

C3 1" / 15 / 1500

C4 1" / 10 / 900

C5 1" / 15 / 1500

C11 1" / 11 / 1100

1 1/2

1" = 30'-0"

0 30' 60'

IRRIGATION IN TEXAS IS REGULATED BY
THE TEXAS COMMISSION ON ENVIRONMENTAL
QUALITY (TCEQ) (MC-178) P.O. BOX 13087
T.C.E.Q.'S WEB SITE IS: WWW.TCEQ.STATE.TX.US

STATE OF TEXAS
CHRISTOPHER DIGGS
11031
LICENSED IRRIGATOR

06 / 03 / 2022

James Pole
IRRIGATION CONSULTANTS
IRRIGATION DESIGN, CONSULTING, AND
LANDSCAPE WATER MANAGEMENT

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FAX: 940.382.2475
james@jamespoleirrigation.com

REV. NO.	DATE	DESCRIPTION	BY

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www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

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www.asakurarobinson.com

KEY MAP (N.T.S.)

L-3.01 L-3.02 L-3.00 L-3.03 L-3.04

NAVIGATION BLVD / JENSEN DR.
& RUNNELS ST.

L3.00 – IRRIGATION PLAN

SHEET 1 OF 10

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	N/A	TEXAS	STP 1902 (308) MM			cs
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	223

1 **IRRIGATION PLAN**

SCALE: 1" = 30'-0"

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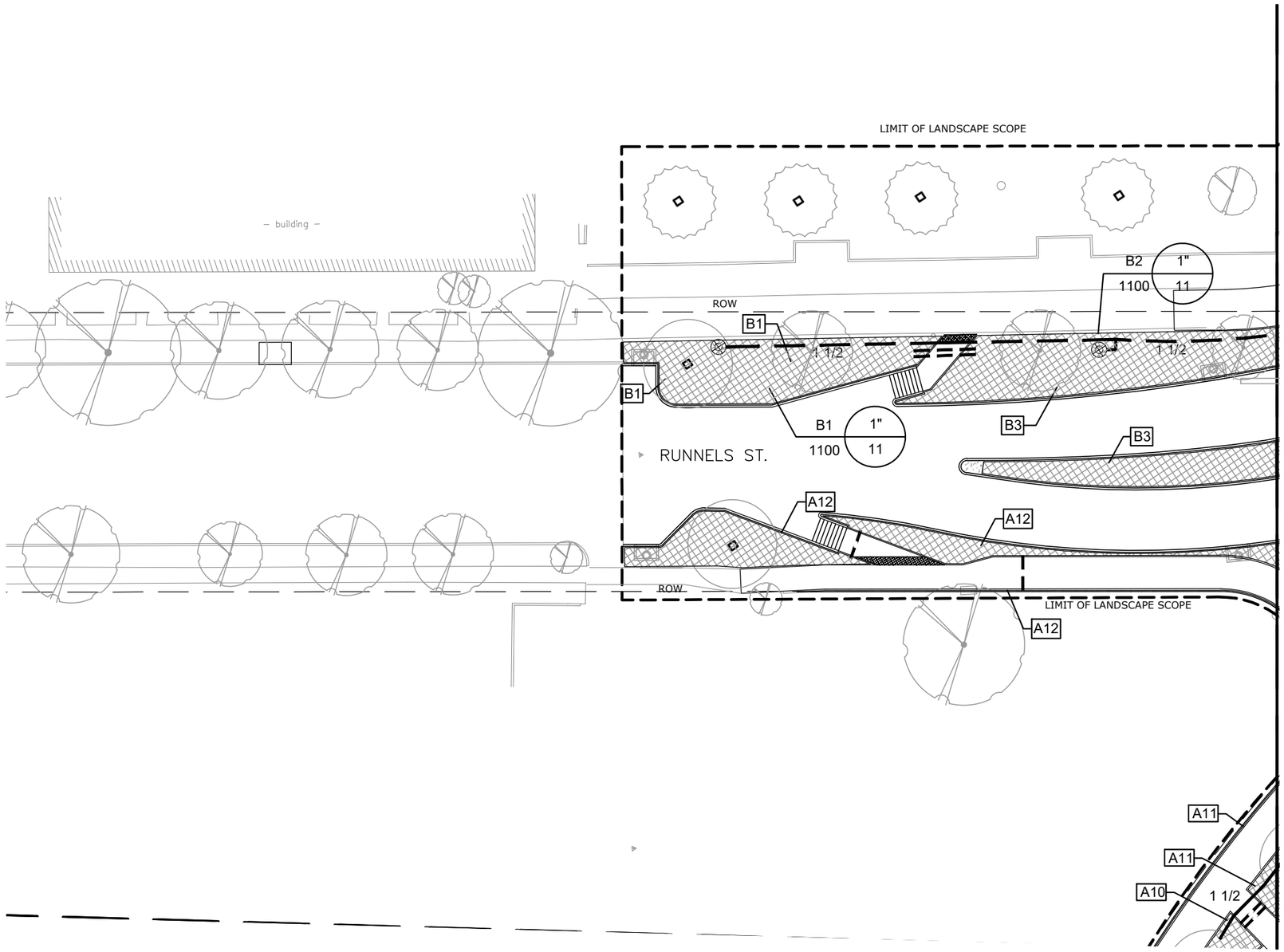
Pen Table: $PENTBL$
Plot Driver: $PLTDRVL$

Design Filename: $FILE$



MATCH LINE A – SEE L3.00

1" = 30'-0"

0 30' 60'

1 IRRIGATION PLAN

SCALE: 1" = 30'-0"

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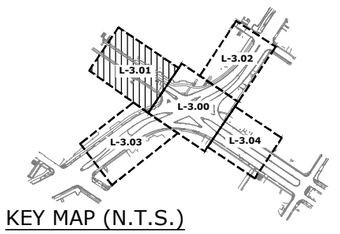

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Texas Department of Transportation

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

L3.01 – IRRIGATION PLAN

SHEET 2 OF 10

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	N/A	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	224

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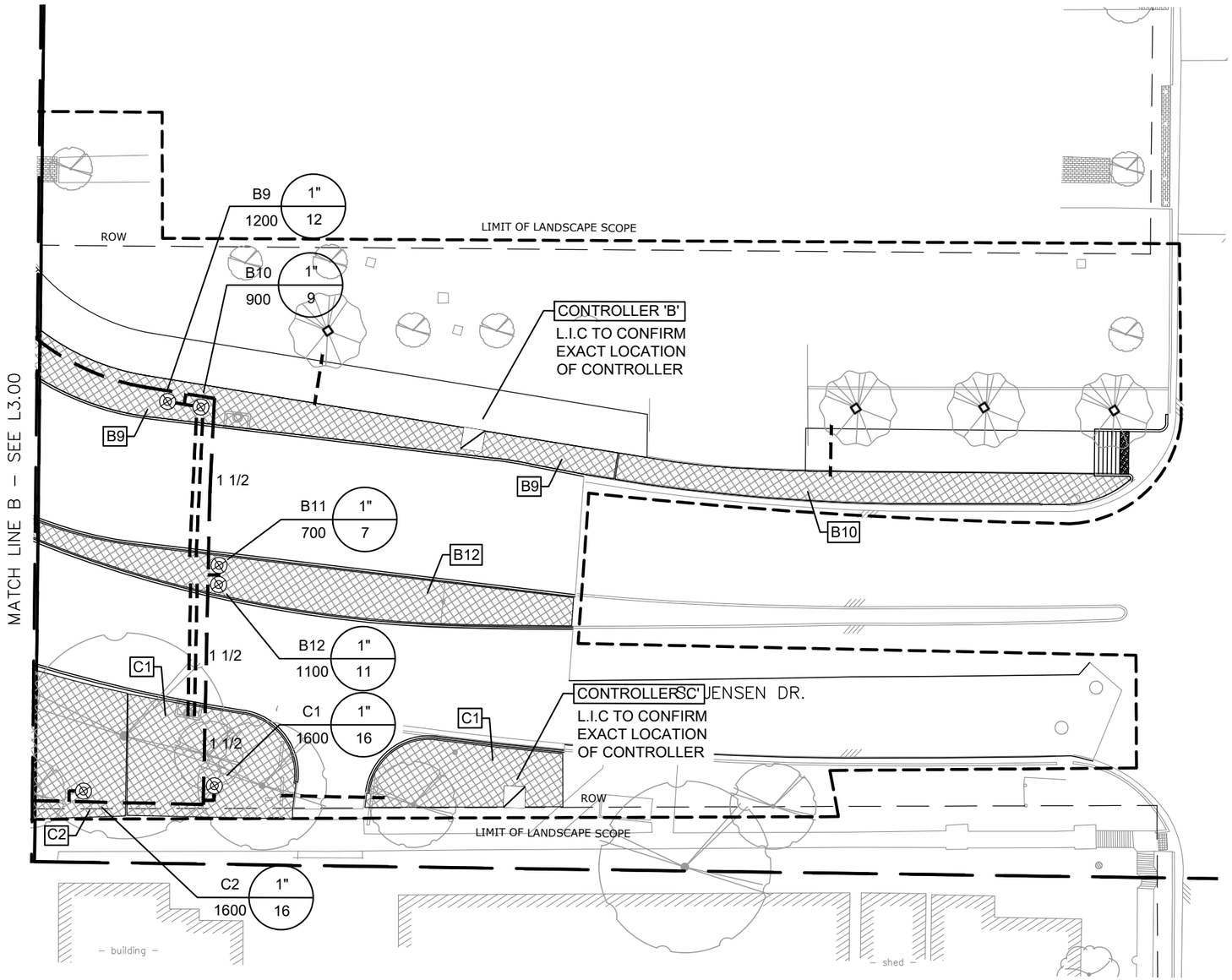

1" = 30'-0"

0 30' 60'

1 IRRIGATION PLAN

SCALE: 1" = 30'-0"

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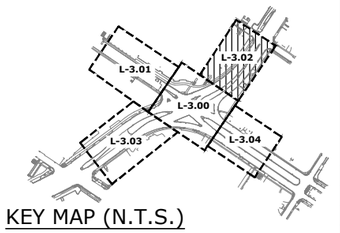

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L3.02 – IRRIGATION PLAN

SHEET 3 OF 10

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	N/A	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	225

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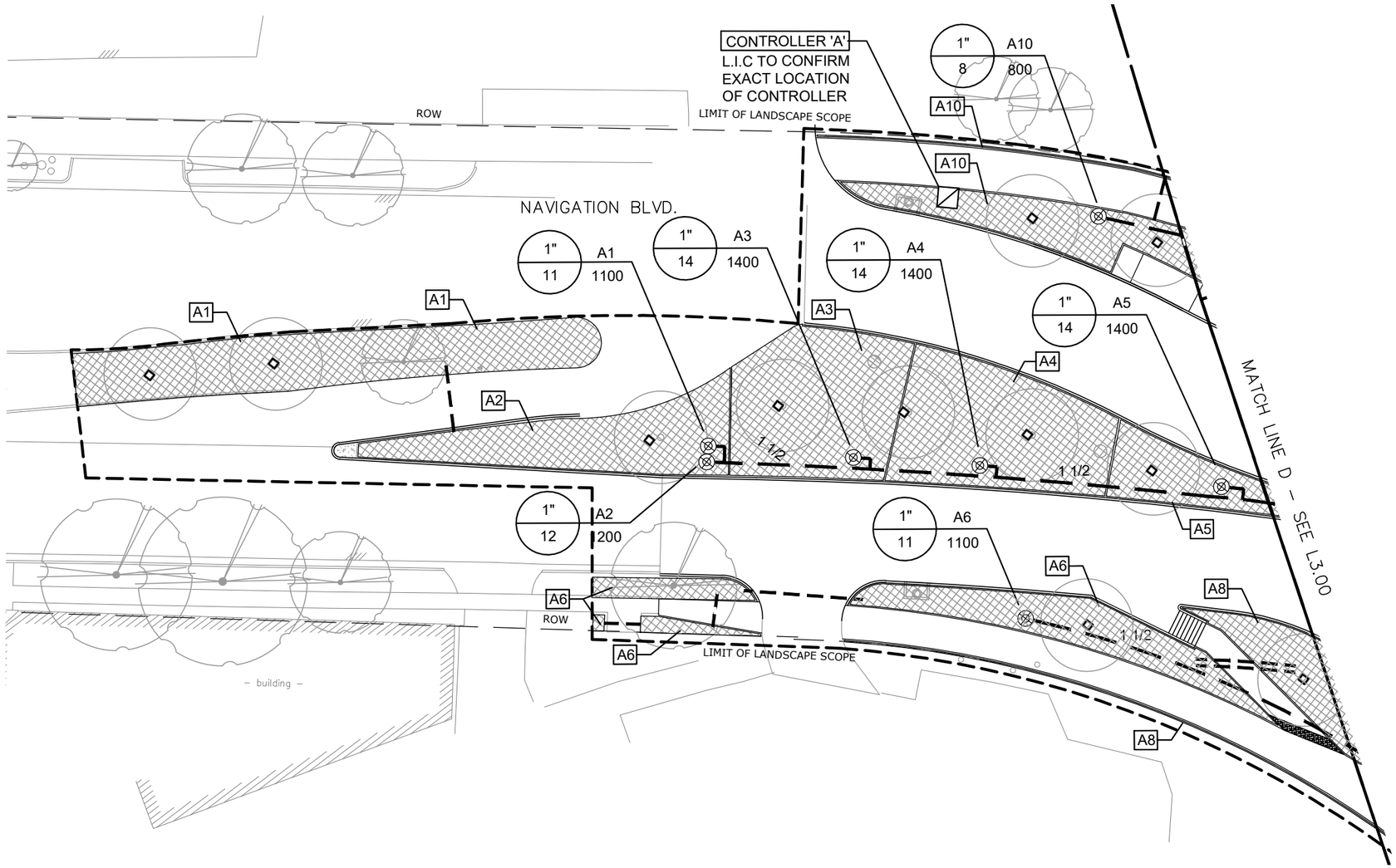

1" = 30'-0" 0 30' 60'

1 IRRIGATION PLAN

SCALE: 1" = 30'-0"

IRRIGATION IN TEXAS IS REGULATED BY THE TEXAS COMMISSION ON ENVIRONMENTAL QUALITY (TCEQ) (MC-178) P.O. BOX 13087 T.C.E.Q.'S WEB SITE IS: WWW.TCEQ.STATE.TX.US

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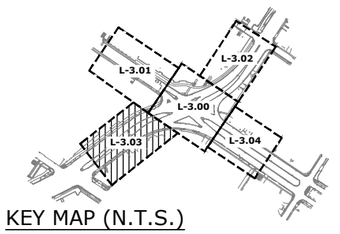

KEY MAP (N.T.S.)

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LICENSED IRRIGATOR

06 / 03 / 2022

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NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

L3.03 – IRRIGATION PLAN

SHEET 4 OF 10

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	N/A	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	226

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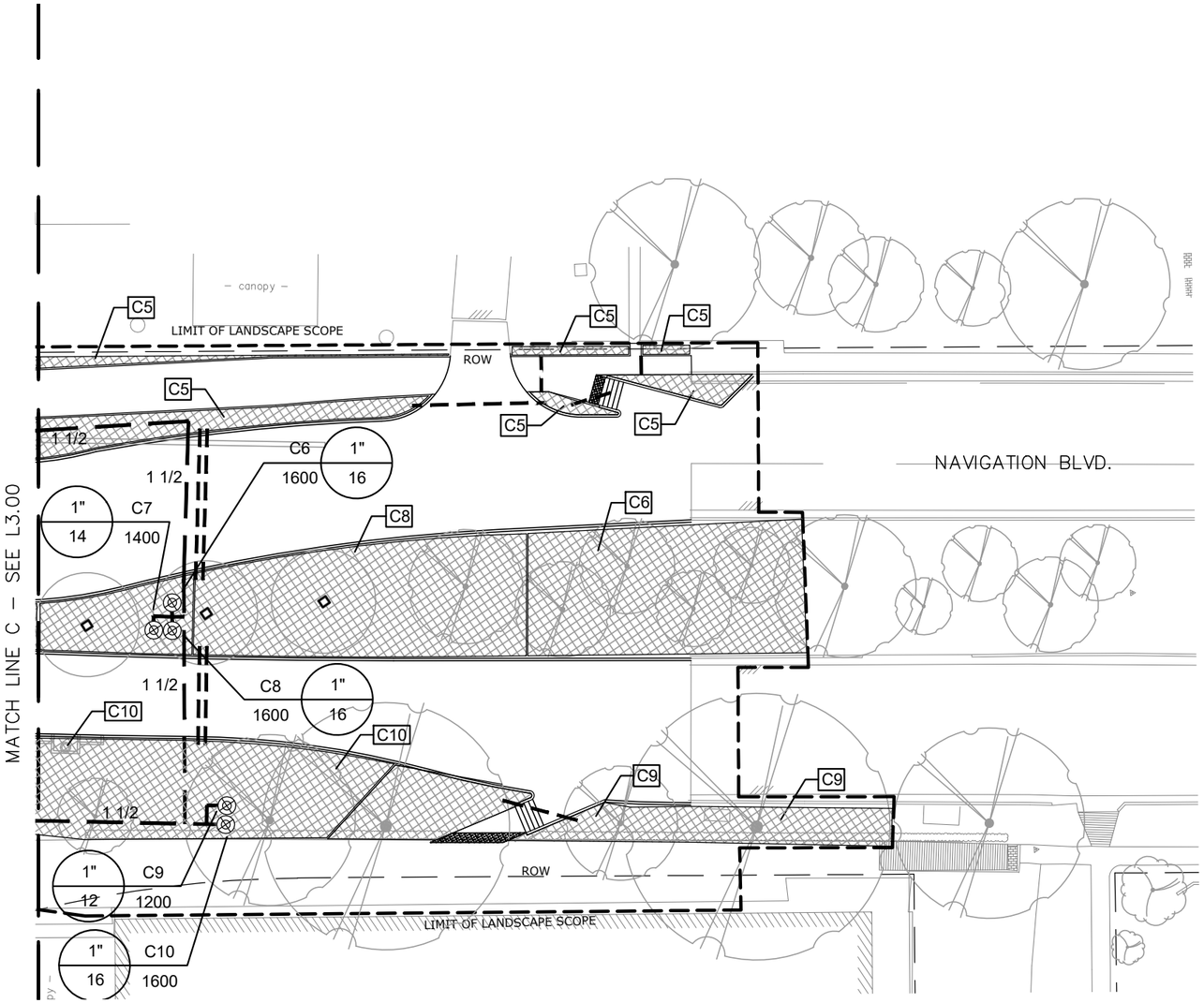

1 IRRIGATION PLAN

SCALE: 1" = 30'-0"

1" = 30'-0"

0 30' 60'

STATE OF TEXAS
CHRISTOPHER DIGGS
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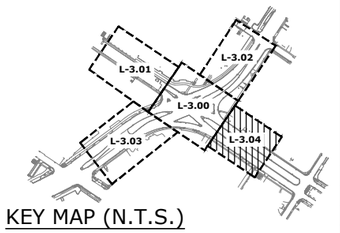

NAVIGATION BLVD / JENSEN DR.
& RUNNELS ST.

L3.04 – IRRIGATION PLAN

SHEET 5 OF 10

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	N/A	TEXAS	STP 1902 (308) MM			CS 1264957
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	227

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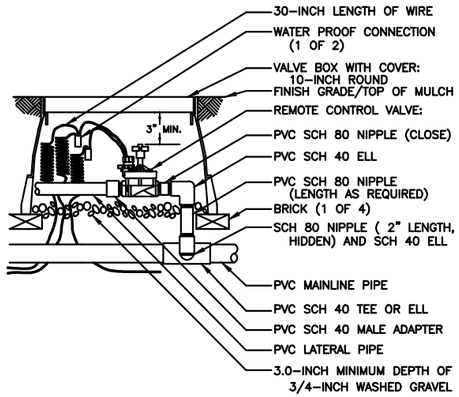
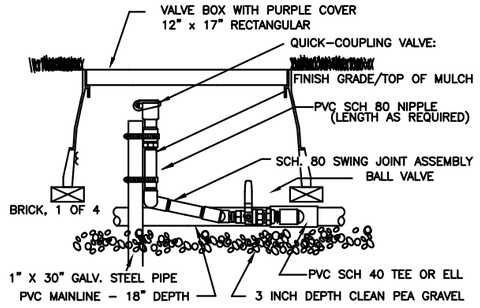
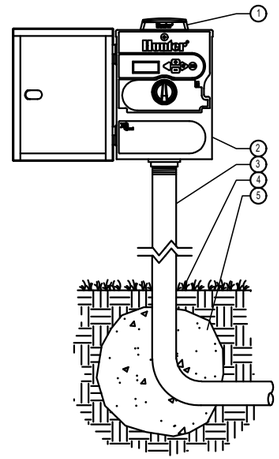


REMOTE CONTROL VALVE



QUICK COUPLER VALVE
WITH PVC BALL VALVE

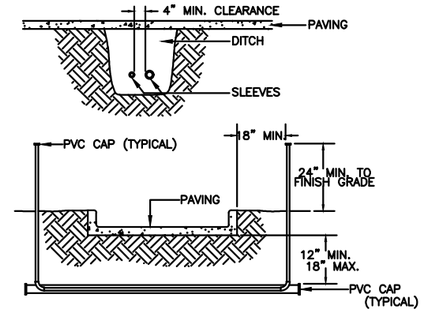


LEGEND:

1. SOLAR PANEL
2. IRRIGATION CONTROLLER (XCH-SS) PER PLAN
3. STAINLESS STEEL POLE AND MOUNTING BRACKET
4. FINISHED GRADE
5. CONCRETE

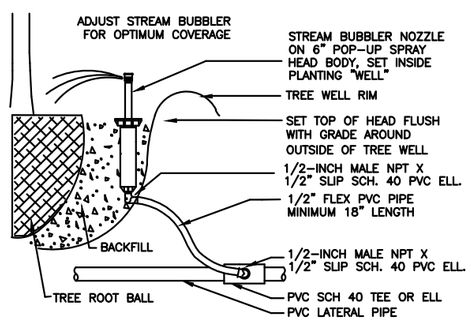
NOTE
CONTROLLER SHALL BE HARD-WIRED TO GROUNDED
110 VAC POWER SOURCE

XCH - STAINLESS STEEL ON MOUNTING POLE WITH SOLAR PANEL



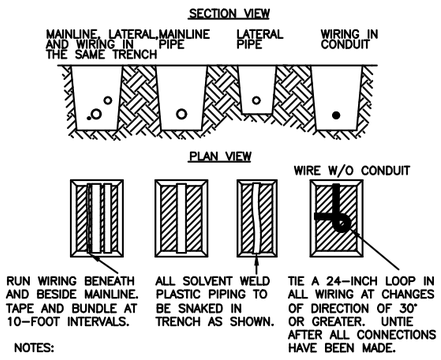
NOTES:
1. ALL PVC IRRIGATION SLEEVES TO BE CLASS 200 PIPE.
2. ALL JOINTS TO BE SOLVENT WELDED AND WATERTIGHT.
3. WHERE THERE IS MORE THAN ONE SLEEVE, EXTEND THE SMALLER SLEEVE TO 24–INCHES MINIMUM ABOVE FINISH GRADE.
4. MECHANICALLY TAMP TO 95% PROCTOR.

SLEEVING



INCLUDE TWO BUBBLER HEADS, SET ON OPPOSITE SIDES OF ROOT BALL

TREE BUBBLER



NOTES:
1. SLEEVE BELOW ALL HARDSCAPE ELEMENTS WITH CLASS 200 PVC TWICE THE DIAMETER OF THE PIPE OR WIRE BUNDLE WITHIN.
2. FOR PIPE AND WIRE BURIAL DEPTHS SEE SPECIFICATIONS.

TRENCH DETAIL

IRRIGATION IN TEXAS IS REGULATED BY THE TEXAS COMMISSION ON ENVIRONMENTAL QUALITY (TCEQ) (MC-178) P.O. BOX 13087 T.C.E.Q.'S WEB SITE IS: WWW.TCEQ.STATE.TX.US

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STATE OF TEXAS
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NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

L3.05 – IRRIGATION DETAILS

SHEET 6 OF 10

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	N/A	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	228

Plotted on: $DATE$ $TIME$ $USER$
Pen Table: $PENTBL$
Plot Driver: $PLTDRVL$
Design Filename: $FILE$

Plotted on: $DATE$ $TIME$ $USER$

INSTALLATION NOTES

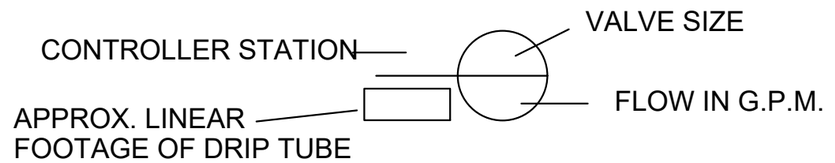
1. COORDINATE IRRIGATION INSTALLATION WITH PLANTING PLAN AND SITE CONDITIONS TO PROVIDE COMPLETE COVERAGE WITH MINIMUM OVERSPRAY. THE IRRIGATION CONTRACTOR SHALL MAKE MINOR ADJUSTMENTS TO ENSURE PROPER COVERAGE AT NO ADDITIONAL COST TO THE OWNER. THE IRRIGATION CONTRACTOR SHALL COMPLY WITH ALL LOCAL AND STATE MANDATED IRRIGATION ORDINANCES AND CODES, AND WILL SECURE ALL REQUIRED PERMITS. L.I.C. SHALL PAY ANY ASSOCIATED FEES UNLESS OTHERWISE NOTED. ALL LOCAL CODES SHALL PREVAIL OVER ANY DISCREPANCIES HEREIN AND SHALL BE ADDRESSED BEFORE ANY CONSTRUCTION BEGINS.
2. NO MACHINE TRENCHING SHALL BE PERMITTED WITHIN THE ROOT ZONE OF EXISTING TREES. HAND-DIG ONLY, WITHIN THE ROOT ZONES OF EXISTING TREES. NO ROOTS OVER 1" DIAMETER SHALL BE CUT. STAKE ALL PROPOSED TRENCH ROUTES NEAR EXISTING TREES FOR APPROVAL BY THE LANDSCAPE ARCHITECT BEFORE DIGGING BEGINS.
3. CONFIRM MINIMUM STATIC WATER PRESSURE OF 65 PSI AT THE HIGHEST ELEVATION OF THE SYSTEM LIMITS, AND MAXIMUM STATIC WATER PRESSURE OF 90 P.S.I. AT THE LOWEST ELEVATION OF THE SYSTEM LIMITS AT LEAST 7 DAYS BEFORE BEGINNING WORK. IF STATIC WATER PRESSURE IS OUTSIDE THE RANGE STATED ABOVE, DO NOT PROCEED UNTIL DIRECTED BY THE LANDSCAPE ARCHITECT.
4. LATERAL PIPE SHALL BE INSTALLED AT A MINIMUM DEPTH OF 12 INCHES. MAINLINE PIPE AND WIRES SHALL BE INSTALLED AT A MINIMUM DEPTH OF 18 INCHES. NO MACHINE TRENCHING SHALL BE PERMITTED WITHIN EXISTING TREE ROOT ZONES. WHEN HAND - TRENCHING WITHIN EXISTING TREE ROOT ZONES, NO ROOTS LARGER THAN 1" DIAMETER SHALL BE CUT.
5. UNSLEEVED PIPES MAY BE SHOWN UNDER PAVEMENT FOR GRAPHIC CLARITY ONLY. INSTALL THESE PIPES IN ADJACENT LANDSCAPED AREAS.
6. ELECTRIC POWER SHALL BE PROVIDED WITHIN FIVE FEET OF CONTROLLER LOCATION BY GENERAL CONTRACTOR. L.I.C. TO PROVIDE FINAL HARD-WIRE TO CONTROLLER.
7. 24 VOLT VALVE WIRE SHALL BE A MINIMUM OF #14 GAUGE, U.F. APPROVED FOR DIRECT BURIAL, SINGLE CONDUCTOR "IRRIGATION WIRE". WIRE SPLICES SHALL INCLUDE DBY CONNECTORS AS MANUFACTURED BY 3M COMPANY. ALL FIELD SPLICES SHALL BE LOCATED IN A ROUND VALVE BOX OF SUFFICIENT SIZE TO ALLOW INSPECTION.
8. VALVE BOXES SHALL BE INSTALLED FLUSH WITH GRADE, SUPPORTED BY BRICKS IF NEEDED, WITH 3 INCHES OF CLEAN PEA GRAVEL LOCATED BELOW THE VALVE. USE 12" x 17" RECTANGULAR VALVE BOXES WITH PURPLE LID FOR QUICK COUPLING VALVES, AND 10" ROUND BOXES FOR ELECTRIC VALVES UNLESS NOTED OTHERWISE.
9. USE RIGID SCH. 80 PVC SWING JOINT ASSEMBLIES TO CONNECT ALL QUICK COUPLERS.
10. ALL SPRAY HEADS SHALL BE CONNECTED WITH A 12" MINIMUM LENGTH OF 1/2" FLEX PVC. THE FLEX PVC SHALL BE SOLVENT WELDED TO SCHEDULE 40 PVC FITTINGS WITH WELD-ON #795 SOLVENT AND #P-70 PRIMER.
11. PROVIDE ONE QUICK COUPLER KEY WITH SWIVEL HOSE ELL FOR EVERY SIX Q.C. VALVES. (MINIMUM ONE SET).
12. CONTRACTOR IS TO CONTACT APPROPRIATE AUTHORITIES AND LOCATE ALL UTILITIES PRIOR TO CONSTRUCTION.
13. LATERAL PIPE TO TREE STREAM BUBBLER HEADS IS OMITTED FOR GRAPHIC CLARITY. CONNECT TREE BUBBLER HEADS TO VALVES AS SHOWN WITH CLASS 200 PVC PIPE SIZED TO ALLOW A MAXIMUM FLOW VELOCITY OF 5 FEET PER SECOND
14. THE PROPOSED LOCATIONS OF ALL ABOVE- GROUND EQUIPMENT INCLUDING BACKFLOW PREVENTORS, CONTROLLERS AND WEATHER SENSORS SHALL BE STAKED BY THE CONTRACTOR FOR APPROVAL BY THE LANDSCAPE ARCHITECT OR OWNER'S REPRESENTATIVE BEFORE THESE ITEMS ARE INSTALLED.
15. ALL HEADS SHALL BE INSTALLED A MINIMUM OF 4" FROM PAVEMENT EDGES. (6" OR GREATER WHERE REQUIRED BY LOCAL CODE) FINAL HEAD ADJUSTMENTS BY THE CONTRACTOR SHALL INCLUDE THE ADDITION OF CHECK VALVES WHERE NEEDED TO PREVENT EXCESSIVE LOW HEAD DRAINAGE. THE CONTRACTOR SHALL BUDGET FOR, AND INSTALL CHECK VALVES FOR UP 10 % OF THE TOTAL NUMBER OF HEADS WHEN NEEDED, WITH NO ADDITIONAL COST TO THE OWNER.
16. WHERE SHOWN ON THE PLANS, MASS SHRUB / GROUNDCOVER BEDS SHALL INCLUDE NETAFIM TECHLINE TLHCVXR SERIES DRIP TUBE WITH PRE-INSTALLED .55 GPH DRIP EMITTERS AT 12" INTERVALS (TLHCVXR5-12), INSTALLED IN CENTER-FED GRIDS WITH ROWS SPACED 18" APART. INDIVIDUAL DRIP TUBE RUNS SHALL NOT EXCEED 150 L.F. PVC LATERAL "TRUNK" LINES SHALL BE INSTALLED 10" DEEP. DRIP TUBE SHALL BE SET 2" BELOW FINISHED SOIL GRADE (NOT INCLUDING MULCH LAYER), SECURELY STAKED EVERY 18". NETAFIM #TL050MFV-1 FLUSH VALVES SHALL BE INSTALLED AT THE FARTHEST POINTS FROM THE ZONE VALVE. USE 17 MM BARBED FITTINGS FOR DRIP LINE CONNECTIONS, SET THE MAXIMUM OPERATING PRESSURE AT 50 PSI. TECHLINE CV SHALL BE INSTALLED PERPENDICULAR TO SLOPE FACE. INSTALL TLCV IN-LINE CHECK VALVES FOR EVERY 4.5 FEET OF DRIP LINE ELEVATION CHANGE WITHIN THE ZONE. USE NETAFIM STAPLES (#TLS6) TO SECURE TUBING EVERY 18" EACH DRIP ZONE SHALL INCLUDE ONE MAINTENANCE "FLAG" WHICH SHALL CONSIST OF A 12" POP-UP SPRAY HEAD AND COMPLETELY CLOSED SPRAY NOZZLE. THE POP-UP HEAD SHALL BE CONNECTED TO THE DRIP ZONE PIPE, SET FLUSH WITH GRADE, AND LOCATED AT THE FARTHEST DISTANCE FROM THE DRIP VALVE ASSEMBLY. INSTALL THE "FLAG" HEAD ADJACENT TO EDGING OR IN LOW PLANTINGS FOR EASE OF VIEWING. SPARSLEY SPACED, INDIVIDUAL SHRUB PLANTINGS MAY INCLUDE RAINBIRD #XBT-10 SINGLE-OUTLET EMITTERS OR RAINBIRD #XBT-10-6 MULTI-OUTLET EMITTERS INSTALLED AS DETAILED. PROVIDE MINIMUM TWO, 1 G.P.H. OUTLETS PER INDIVIDUAL SHRUB. SINGLE / MULTI-OUTLET EMITTERS MAY BE CONNECTED TO THE SAME DRIP ZONE VALVE WHICH SERVES ADJACENT DRIP TUBE GRIDS, UNLESS NOTED OTHERWISE.
17. WHERE SHOWN ON THE PLANS, SPECIFIC TURF AREAS SHALL INCLUDE NETAFIM TECHLINE TLHCVXR SERIES DRIP TUBE WITH PRE-INSTALLED .6 GPH DRIP EMITTERS AT 12" INTERVALS (TLHCVR5-12), INSTALLED IN CENTER-FED GRIDS WITH ROWS SPACED 12" APART. INDIVIDUAL DRIP TUBE RUNS SHALL NOT EXCEED 150 L.F. PVC LATERAL "TRUNK" LINES SHALL BE INSTALLED 10" DEEP. DRIP TUBE SHALL BE SET 4" BELOW FINISHED SOIL GRADE. NETAFIM #TLO5OMF-1 FLUSH FLUSH VALVES SHALL BE INSTALLED AT THE FARTHEST POINTS FROM THE ZONE VALVE. USE 17 MM BARBED FITTINGS FOR DRIP LINE CONNECTIONS, SET THE MAXIMUM OPERATING PRESSURE AT 50 PSI. TECHLINE CV SHALL BE INSTALLED PERPENDICULAR TO SLOPE FACE. INSTALL TLCV IN-LINE CHECK VALVES FOR EVERY 4.5 FEET OF DRIP LINE ELEVATION CHANGE WITHIN THE ZONE. EACH DRIP ZONE SHALL INCLUDE ONE MAINTENANCE "FLAG" WHICH SHALL CONSIST OF A 12" POP-UP SPRAY HEAD AND COMPLETELY CLOSED SPRAY NOZZLE. THE POP-UP HEAD SHALL BE CONNECTED TO THE DRIP ZONE PIPE, SET FLUSH WITH GRADE, AND LOCATED AT THE FARTHEST DISTANCE FROM THE DRIP VALVE ASSEMBLY. INSTALL THE "FLAG" HEAD ADJACENT TO EDGING OR IN LOW PLANTINGS FOR EASE OF VIEWING. TEMPORARY SUPPLEMENTAL OVERHEAD WATERING MAY BE REQUIRED FOR INITIAL ESTABLISHMENT OF NEW SOD, SEEDED TURF, OR SEEDED NATIVE MIX AREAS SERVED BY SUB-SURFACE DRIP EQUIPMENT.

IRRIGATION LEGEND

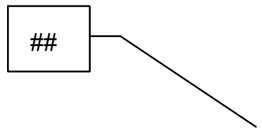
- HUNTER PROS-06-PRS30 SERIES POP UP SPRAY HEADS WITH HUNTER MSBN-50H STREAM BUBBLER NOZZLES. (TWO PER TREE) SEE INSTALLATION NOTE #13 REGARDING TREE BUBBLER LATERAL PIPE
- NETAFIM TECHLINE TLHCVXR5-12 SERIES DRIP TUBE IN NARROW TURF AREAS INSTALLED AT 4" DEPTH SEE INSTALLATION NOTE #17 REGARDING DRIP TUBE LAYOUT IN TURF.
- HUNTER ICV SERIES ELECTRIC REMOTE CONTROL, "TREE BUBBLER ZONE" VALVE 458200 DC LATCHING SOLENOID SEE INSTALLATION NOTE #13 REGARDING TREE BUBBLER LATERAL PIPE
- NETAFIM CONTROL ZONE KIT MODEL #NCZ-1S SERIES WITH DC LATCHING SOLENOID, 50 PSI PRESSURE REGULATOR, AND SCREEN FILTER
- HUNTER HQ-33DLRC-R QUICK COUPLING VALVE WITH LOCKING PURPLE COVER AND 3/4" PVC BALL VALVE
- ZURN / WILKINS 375XLB SERIES REDUCED PRESSURE TYPE BACKFLOW PREVENTOR INSTALLED PER CITY CODE WITH HEATED / INSULATED ALUMINUM AND SAME SIZE BRONZE BALL VALVE INSTALLED ON THE UP-STREAM SIDE. G.C. TO COORDINATE POWER TO BACKFLOW ENCLOSURE LOCATION PRIOR TO CONSTRUCTION
- IRRIGATION WATER METER AND TAP, SIZE AS NOTED ON THE PLAN

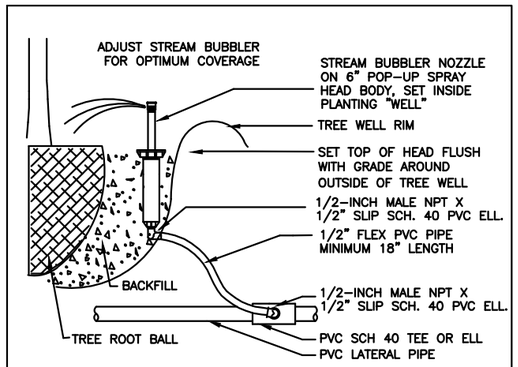
CONTROLLERS 'A', 'B', AND 'C'

- HUNTER XC HYBRID SERIES XCH-1200-SSP SOLAR POWERED CONTROLLER WITH XCHSPOLE SERIES MOUNTING POLE, XCHSPB MOUNTING BRACKET, AND RAIN / FREEZE CLIK SENSORS. LOCATE SENSOR AS FIELD DIRECTED BY THE LANDSCAPE ARCHITECT
- SCHEDULE 40 PVC MAINLINE PIPE
- SCHEDULE 40 PVC LATERAL PIPE
- ONE 4" SCHEDULE 40 SLEEVE PIPES
- TWO 4" SCHEDULE 40 SLEEVE PIPES



DRIP VALVE TAG





INCLUDE TWO BUBBLER HEADS, SET ON OPPOSITE SIDES OF ROOT BALL

TREE BUBBLER

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Texas PE Firm Reg. #F-20017

Texas Department of Transportation

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CHRISTOPHER DIGGS
10311
LICENSED IRRIGATOR

06 / 03 / 2022

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

L3.06 – IRRIGATION DETAILS

SHEET 7 OF 10

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	N/A	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	229

Pen Table: $PENTBLS$
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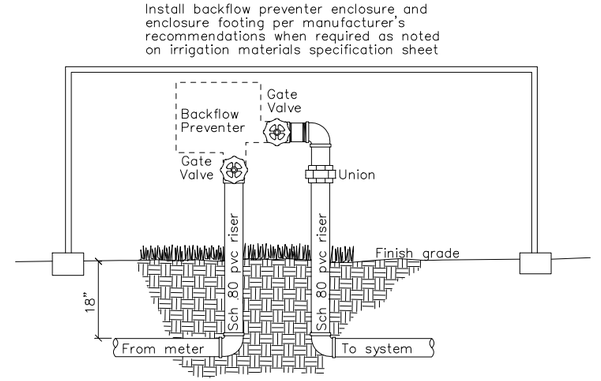
TYPE OF WORK				REQUIREMENTS
170-6002 IRRIGATION SYSTEM (TY I) LS	170-6003 IRRIGATION SYSTEM (TY II) LS	170-6004 IRRIGATION SYSTEM (TY III) LS	170-6005 IRRIGATION SYSTEM (TY IV) LS	FOR ALL IRRIGATION SYSTEM TYPES, THE DESIGN, FURNISH, INSTALLATION, REMOVAL, AND MAINTENANCE OF IRRIGATION SYSTEMS IS INCIDENTAL TO ITEM 170 AND WILL NOT BE PAID FOR SEPARATELY UNLESS OTHERWISE SHOWN.
✓				Furnish and install irrigation system in accordance with Item 170 of the Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges 2014, plans, details, and notes.
	✓			Design, furnish, and install irrigation system in accordance with Item 170 of the Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges 2014, plans, details, and notes. Design is incidental to this item and not paid for separately.
		✓		Design, furnish, install, and remove irrigation system in accordance with Item 170 of the Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges 2014, and notes. Power supply must not involve the purchase of electricity. Water distribution must utilize a drip system. Design and removal are incidental to this item and not paid for separately.
	✓	✓		Provide shop drawings with layout, details, and specifications for approval prior to work.
		✓		Remove all above ground components at end of contract.
✓	✓	✓		Provide as-built drawings at completion of irrigation system. As-built drawings must be sealed by Licensed Irrigator. See additional notes this sheet for requirements.

IRRIGATION SYSTEM NOTES

GENERAL
1. Reference Item 170 of the Texas Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges 2014 for specifications, dimensions, volumes and measurements not shown.
2. Locate and stake all underground conduits and utilities associated with but not limited to: CTMS, CTMS power supply, lighting, signal wires and detectors, gas, electrical, telephone, fiber optics, etc.
3. Locate and stake existing ground boxes, inlets, culverts, manholes, etc. within the project area with a 4' wooden stake painted orange. Maintain the stakes in place for duration of contract. Remove stakes as directed by engineer.
4. The drawings are diagramatic of the work to be performed. Changes may be required due to varying conditions or as directed by the engineer.
5. Conduct a complete inventory and analysis of site conditions, incidental construction such as boring, mainline adjustment, sidewalk removal and replacement, utility adjustments, etc. will not be paid for seperately unless shown on plans.
6. See IRRIGATION DETAILS AND MATERIALS SHEET 3 of 3 for materials specifications, sizes, and requirements.
7. Reference Item 5.10 Inspection of the Texas Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges 2014. At any time during all phases of the contract, any materials or work performed not in accordance with the plans and specifications will be replaced and/or reworked until in compliance.
8. Any adjustments due to the failure to comply with plans and specifications shown will be at contractors expense.

CONSTRUCTION METHODS
1. Locate and stake irrigation system and related work in the field. Locate all irrigation valves, mainlines, dripline, etc., for approval by the engineer prior to installation. Any adjustments to work performed prior to approval will be incidental.
2. Obtain all permits, licenses, tests, and approvals. Pay any fees and deposits and install or arrange for all water meters and taps for installation and operation as applicable. Deposits will not be refunded by TxDOT.
3. Install water meter(s). WATER METERS WILL BE PLACED IN NAME OF THE CONTRACTOR THROUGHOUT ENTIRE CONTRACT. The contractor will pay for monthly water charges. Ensure water meter(s) remain operational and turned on for duration of the contract. Upon completion of the contract transfer water meter(s) into name of entity provided by the engineer.
4. Install backflow preventer(s). BACKFLOW PREVENTERS WILL BE PLACED IN NAME OF THE CONTRACTOR THROUGHOUT ENTIRE CONTRACT. Pay all charges, fees, tests, and coordination for any backflow preventer(s) testing at installation or annual inspection required by local entity for duration of the contract. Upon completion of the contract transfer backflow preventer(s) into name of entity provided by the engineer.
5. Excavation and Trenching Item 170.3.2. Exercise care when excavating near trees. No mechanical trenching is permitted below the canopy of existing trees. Adjust trench path, bore, and/or excavate by hand to avoid damage to existing tree root system. Keep trench bottom clean and smooth with all organic debris and sharp objects removed.
6. Boring Item 170.3.3. Stake boring and sleeve locations for engineer's approval. Bore pit will be minimum of 5 feet from edge of base material or pavement unless otherwise approved by engineer. The size of the bore will not exceed the diameter of the encasement by more than 1 inch. Cover or fill bore pit during non-scheduled work hours.
7. Encasement 170.3.5 Depth is minimum 36 inches below roadway pavement surface. All encasement is continuous and will extend the full width of the pavement and 5' on each side thereof. Encasement is incidental to irrigation system. Install encasement same day as boring.
8. Pipe and Valve Assembly 170.3.6. Do not install pipe when air temperature is below 40 degrees fahrenheit. Cut pipe in a manner that will ensure a square cut. Remove burs prior to installation for a clean, smooth unobstructed flow. Install pipe to an even grade and support pipe continuously on bottom of trench. Snake pipe in trench to allow for contraction and expansion.
9. Sprinkler Heads and Drip Tubing 170.3.7. See note 10 before installing dripline.
10. Closing and Flushing of PVC Pipe 170.3.10. Thoroughly flush all water lines before installing dripline.
11. Hydrostatic Tests 170.3.11. Engineer must be present.
12. Backfill and Compaction 170.3.12. Backfill to correct soil settlement is incidental.

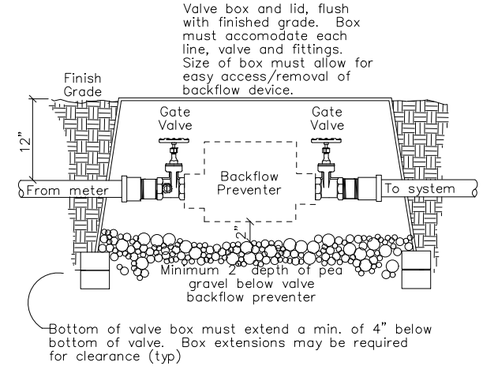
GUARANTEE AND ACCEPTANCE
1. Maintenance period. Inspect irrigation system concurrently with, and subject to the same maintenance requirement period under Items 192 and 193. During the installation and maintenance perid perform the following activities as a minimum and to the satisfaction of the engineer:
   A) Install and maintain the controller program to ensure the proper distribution of water (includes replacement of any batteries).
   B) Inspect, repair, and/or replace any equipment that is found defective, damaged or stolen.
   C) Make any adjustments that may become necessary to ensure the proper delivery of water to the plant material.
2. As-built drawings. Furnish the engineer a set of as-built drawings on reproducible 11x17 sheets upon completion of the installation of the irrigation system. The as-built drawings will be verified that they are a true record of the project conditions. Show all valve locations on drawings by triangulation from a fixed object. Show actual location of main and lateral lines from a fixed object. As-built drawings must be sealed by Licensed Irrigator.
3. Operating and maintenance data. Provide instructions covering full operation, care and maintenance of the equipment, including a schedule showing time each valve is open to provide determined amount of water, and instruct personnel designated by engineer in proper operation of the system.



BACKFLOW PREVENTER ABOVE GROUND INSTALLATION

Type shall meet local code. Local code will have precedence over this detail.

OR



BACKFLOW PREVENTER IN GROUND INSTALLATION

Type shall meet local code. Local code will have precedence over this detail.

SECTION – PIPING TO/FROM REMOTE CONTROL VALVE ASSEMBLY

PLAN – PIPING TO/FROM REMOTE CONTROL VALVE ASSEMBLY

REMOTE CONTROL VALVE ASSEMBLY

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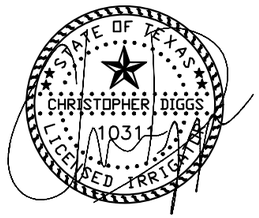

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L3.07 – IRRIGATION DETAILS – MOD

SHEET 8 OF 10

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	N/A	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	230

Pen Table: $PENTBLS$
Plot Driver: $PLTDRVL$
Design Filename: $FILE$

Plotted on: $DATE$ $TIME$ $USER$

IRRIGATION MATERIALS SPECIFICATIONS

DESCRIPTION	* EXAMPLE OR EQUAL	SIZE	REMARKS
TAP/METER	LOCAL CODE	1 1/2 inch minimum	LOCAL CODE MAY REQUIRE LARGER METER
BACKFLOW PREVENTER	APPROVED BY LOCAL CODE	1 inch	
BACKFLOW PREVENTER ENCLOSURE REQUIRED FOR THE FOLLOWING IRRIGATION SYSTEM TYPES: ☒TYPE I ☐TYPE III ☒TYPE II ☐TYPE IV Enclosure will be approved by the engineer. Enclosure will be manufactured specifically for purpose of protecting backflow preventor. Enclosure will be vandal–resistant, lockable with the ability to be anchored to the ground. Enclosure will be completely removable. Enclosure size will provide access and clearance on all sides of backflow preventer. Locking Locking mechanism will be approved by the engineer. Provide locks and keys. All locks will use same keys unless otherwise directed by the engineer. Keys will match master key provided by engineer or landscape architect. Locks may be integrated into enclosure.	APPROVED BY ENGINEER	APPROVED BY ENGINEER	PROVIDE FOUR(4) KEYS TO ENGINEER IF ENCLOSURE IS REQUIRED
VALVE APPURTENANCES: INCLUDES: Netafim control zone kit Model NCZ–1S with DC Latching Solenoid Hunter ICV remote control valve with DC Latching Solenoid	Netafim NCZ–1S with DC Latching Solenoid Hunter ICV with DC Latching Solenoid	1 inch 1 inch	
Hunter XC Hybrid series XCH–1200–SSP solar powered controller with XHSPOLE series mounting pole, XCHSPB mounting bracket, and rain / freeze clik sensors.	Hunter XC Hybrid series XCH–1200–SSP solar powered controller with XHSPOLE series mounting pole, XCHSPB mounting bracket, and rain / freeze clik sensors.		
BORING		4 inch	OVERCUTTING WILL NOT BE ALLOWED
PVC SCH 40 ENCASEMENT PIPE FOR SLEEVES AND BORES Pressure rated with slip type solvent welded joints		4 inch	REFERENCE ITEM 170.2.C
PVC SCH 80 above ground at backflow device		2 inch	PIPE RATED FOR DIRECT SUNLIGHT EXPOSURE
PVC SCH 40 MAINLINE Pressure rated with twin gasket couplings and fittings or slip type solvent welded joints		2 inch	
PVC SCH 40 LATERALS AND HEADERS		3/4 inch	
PVC SCH 80 ABOVE GROUND PIPE			PIPE RATED FOR DIRECT SUNLIGHT EXPOSURE
BURIED RISERS AND SWING–JOINT COMPONENTS SCH 80			
PVC FITTINGS All fittings incorporated into system will be of the same type, size and class material as the pipe			
Dripline as noted in legend	NETAFIM TECHLINE TLHCVXR5	Driptube spacing shall be as noted in notes	
DRIPLINE FITTINGS Use fittings specifically manufactured for all dripline connections, no bending/crimping allowed.			
CONTROL WIRE All low voltage control wire will be color coded. Wire sizes will conform to the controller manufacturer specifications for maximum distances for specific wire sizes. All wire will be specifically manufactured for direct burial. All wire connections and splices will be made in ground boxes. The splice will be completely waterproof and will be completely encapsulated within a King Safety Sealed Irrigation Connector/Splice enclusure or an approved equal			
SOLVENT CEMENT Solvent cement will be the type recommended by the pipe manufacturer			
VALVE BOXES Boxes for section valves, below–ground backflow preventors, and quick coupling valves will be as shown on detail sheet			
VALVE BOX RISERS			

IRRIGATION SYSTEM NOTES:
1. Reference IRRIGATION DETAILS AND MATERIALS sheets 1,2 and 3 for details and requirements.
2. Reference to manufacturer's trade name or catalog number is for the purpose of identificatin only, contractor is permitted to furnish like materials of other manufacturer's provided they are of equal quality and comply with specifications for this project.

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06 / 03 / 2022

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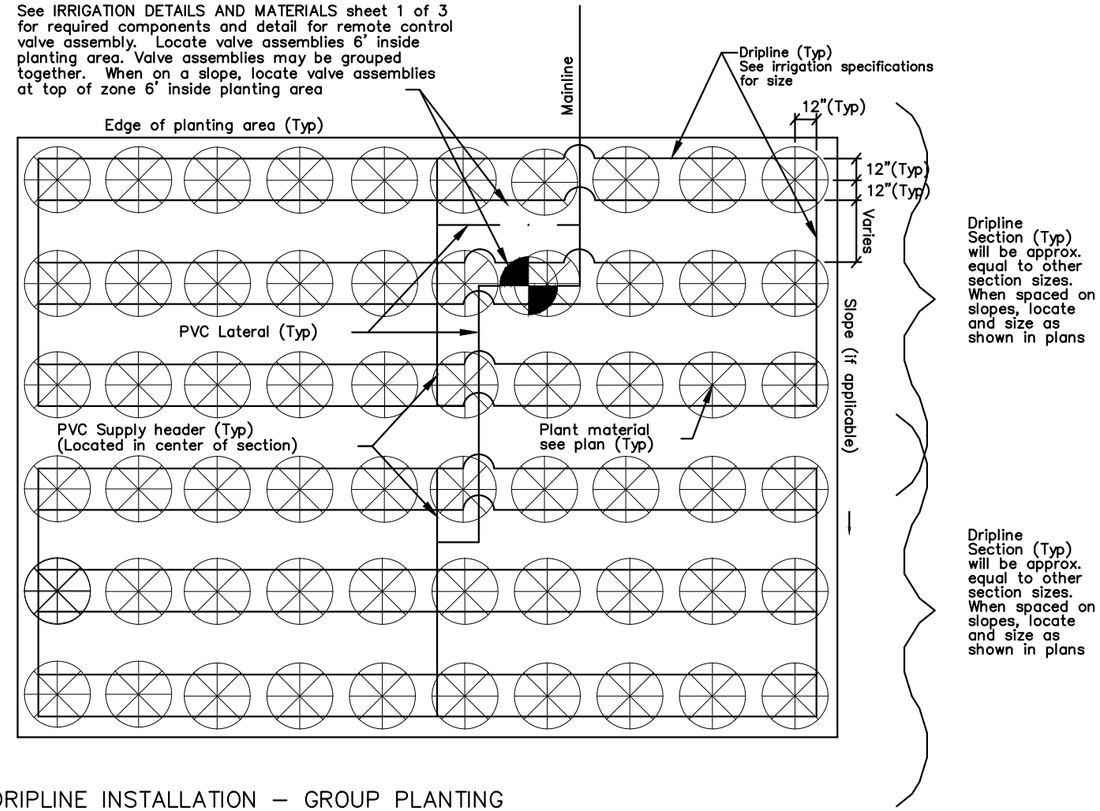
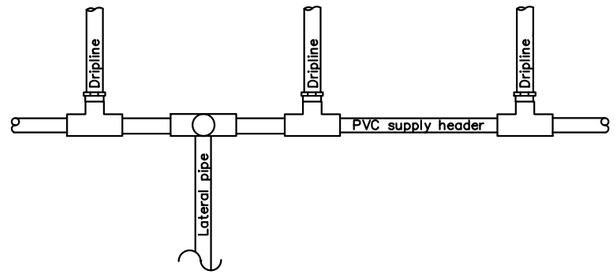
L3.08 – IRRIGATION DETAILS – MOD

SHEET 9 OF 10

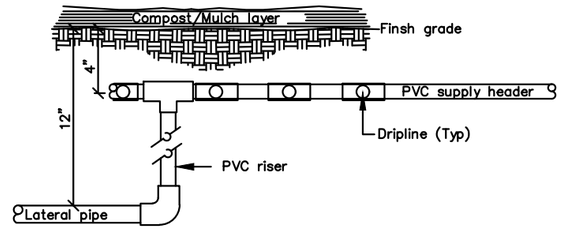
DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	N/A	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	231

Pen Table: $PENTBLS$
Plot Driver: $PLTDRVL$
Design Filename: $FILEL$





PLAN – RISER/SUPPLY HEADER TO DRIP TUBING



SECTION – RISER/SUPPLY HEADER TO DRIP TUBING

DRIPLINE INSTALLATION – GROUP PLANTING

Note: When dripline sections are installed on slopes, schedule controller such that lower sections on slope are operating for shorter lengths of time. Contact engineer and landscape architect for setting length of timed dripline section operation. Total number of emitters and laterals will not allow for section GPM (gallons per minute) to exceed 20 GPM

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L3.09 – IRRIGATION DETAILS – MOD

SHEET 10 OF 10

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	N/A	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
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Design Filename: $FILE$

I. STORMWATER POLLUTION PREVENTION

Texas Pollutant Discharge Elimination System (TPDES) TXR 150000: Stormwater Discharge Permit or Construction General Permit is required for projects with 1 or more acres disturbed soil. Projects with any disturbed soil must protect for erosion and sedimentation in accordance with Item 506. Refer to Storm Water Pollution Prevention Plan (SWP3) Houston District standard plan.

No Additional Comments

II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS

United States Army Corps of Engineers (USACE) Permit is required for filling, dredging, excavating or other work in water bodies, rivers, creeks, streams, wetlands or wet areas. The Contractor must adhere to all of the terms and general conditions associated with the following permit(s). If additional work not represented in the plans is required, contact the Engineer immediately.

☒ No United States Army Corps (USACE) Permit Required

☐ Work is authorized by the United States Army Corps of Engineers (USACE) under a Nationwide Permit (NWP) without a Pre-Construction Notification (PCN). Project specific permit was not issued by USACE, therefore is not in the plan set. The USACE general conditions are in the “General Notes."

☐ Work is authorized by the United States Army Corps of Engineers (USACE) under a Nationwide Permit (NWP) with a Pre-Construction Notification (PCN). The project specific permit issued by the United States Army Corps of Engineers (USACE) is included in the plan set. The USACE general conditions are in the “General Notes."

☐ Work is authorized by the United States Army Corps of Engineers (USACE) under a Individual Permit (IP). The project specific permit issued by the United States Army Corps of Engineers (USACE) is included in the plan set.

☐ Work would be authorized by the United States Army Corps of Engineers (USACE) permit. The project specific permit issued by the USACE will be provided to the contractor.

United States Coast Guard (USCG) Permit is required for projects that involve the construction or modification (including changes to lighting) of a bridge or causeway across a water body determined to be navigable by the United States Coast Guard (USCG) under Section 9 of the Rivers and Harbors Act. If additional work not represented in the plans is required, contact the Engineer immediately.

☒ No United States Coast Guard (USCG) Coordination Required

☐ United States Coast Guard (USCG) Permit

☐ United States Coast Guard (USCG) Exemption

No Additional Comments

III. CULTURAL RESOURCES

Refer to TxDOT Standard Specifications in the event historical issues or archeological artifacts are found during construction. Upon discovery of archeological artifacts (bones, burnt rock, flint, pottery, etc.) cease work in the area and contact the Engineer immediately.

No Additional Comments

IV. VEGETATION RESOURCES

Preserve native vegetation to the extent practical. Refer to TxDOT Standard Specifications in order to comply with requirements for invasive species, beneficial landscaping and tree/brush removal.

No Additional Comments

V. FEDERAL LISTED, PROPOSED THREATENED, ENDANGERED SPECIES, CRITICAL HABITAT, STATE LISTED SPECIES, CANDIDATE SPECIES AND MIGRATORY BIRDS

If any of the listed species below are observed, cease work in the area, do not disturb species or habitat and contact the Engineer immediately.

The work may not remove active nests (from bridges, structures, or vegetation adjacent to the roadway, etc.) during nesting season (February 15 to October 1). If removal of structures or vegetation is necessary during the nesting season, the Contractor shall conduct a bird survey no more than 3 days in advance of the clearing/demolish start date. All bird surveys shall be conducted by a Field Biologist and adhere to the guidance document “Avoiding Migratory Birds and Handling Potential Violations” found in the TxDOT Environmental Compliance Toolkits at the time of the survey. (See below for Field Biologist and Ornithologist qualifications)

No Additional Comments

Field Biologist, Ornithologist – a field biologist is defined as an individual qualified to perform field investigations, presence/absence surveys and habitat surveys for protected avian species or species of concern. A mandatory bachelor’s degree in biology or a related science is required. At a minimum, the Field Biologist, Ornithologist, shall have completed and reported a minimum of three presence/absence and habitat surveys for protected avian species in the past five years. A minimum of three projects must have been conducted in Texas. Surveys shall have been performed for documentation of species in accordance with a protocol approved by USFWS or TPWD, or following generally accepted methodologies.

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

Refer to TxDOT Standard Specifications in the event potentially contaminated materials are observed, such as dead or distressed vegetation, trash disposal areas, drums, canisters, barrels, leaching or seepage of substances, unusual smells or odors, or stained soil, cease work in the area and contact the Engineer immediately.

No Additional Comments

VII. OTHER ENVIRONMENTAL ISSUES

Comments:

DATE: Jun 29, 2022
FILE:

Version 2.1

Texas Department of Transportation

TxDOT Houston District

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

EPIC

FILE: EPIC Sheet.dgn	DN:	CK:	DW:	CK:
© TxDOT: March 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	72	386	CS
UPDATED section V. text and added definition (10/17) ADDED USCG and USACE notes in Section VII (04/18)	DIST	COUNTY		SHEET NO.
	HOU	Harris		233

SITE DESCRIPTION

PROJECT LIMITS: IMPROVEMENTS CONFINED TO INTERSECTION AND IMPROVED APPROACHES.

PROJECT DESCRIPTION: CONSTRUCTION OF A ROUNDABOUT AT THE INTERSECTION OF NAVIGATION BLVD AND SOUTH JENSEN DRIVE/RUNNELS STREET IN THE EAST END DISTRICT. SIDEWALK IMPROVEMENTS WILL EXTEND TO ANN STREET FROM THE SOUTH JENSEN DRIVE APPROACH LEG. STORMWATER LINE AND TRENCHING WILL EXTEND TO THE INTERSECTION OF NAVIGATION BLVD AND ST CHARLES STREET. APPROACH LEGS HAVE ONE TO TWO LANES IN EACH DIRECTION THAT RANGE FROM 11-FEET TO 16-FEET IN WIDTH. SIDEWALKS AND SHARED USE PATHS ARE PRESENT ON BOTH SIDES OF THE ROAD AND RANGE FROM 6-FEET TO 10-FEET IN WIDTH.

MAJOR SOIL DISTURBING ACTIVITIES: THERE IS NO MAJOR SOIL DISTURBANCE AT THIS PROJECT LOCATION EXCEPT FOR ROADWAY REGRADING AND TRENCHING TO INSTALL PIPES.

TOTAL PROJECT AREA: 3.10 A.C.

TOTAL AREA TO BE DISTURBED: 3.10 A.C.

WEIGHTED RUNOFF COEFFICIENT: 0.90
(AFTER CONSTRUCTION): 0.90

EXISTING CONDITION OF SOIL & VEGETATIVE
COVER AND % OF EXISTING VEGETATIVE COVER: THERE ARE SMALL AREAS OF SHORT GRASS LESS THAN 20% OF VEGETATIVE COVER MOSTLY IMPERVIOUS PAVEMENT WITH TREE LANDSCAPING FOR ADJACENT PROPERTIES.

NAME OF RECEIVING WATERS: THE STORM WATER RUNOFF FROM THE PROJECT SITE EVENTUALLY OUTFALLS INTO BUFFALO BAYOU.

EROSION AND SEDIMENT CONTROLS

SOIL STABILIZATION PRACTICES:

- ____ TEMPORARY SEEDING
- _X_ PERMANENT PLANTING, SODDING, OR SEEDING
- ____ MULCHING
- ____ SOIL RETENTION BLANKET
- ____ BUFFER ZONES
- ____ PRESERVATION OF NATURAL RESOURCES

OTHER: ____

STRUCTURAL PRACTICES:

- _X_ SILT FENCES
- ____ HAY BALES
- ____ ROCK BERMS
- ____ DIVERSION, INTERCEPTOR, OR PERIMETER DIKES
- ____ DIVERSION, INTERCEPTOR, OR PERIMETER SWALES
- ____ DIVERSION DIKE AND SWALE COMBINATIONS
- ____ PIPE SLOPE DRAINS
- ____ PAVED FLUMES
- _X_ ROCK BEDDING AT CONSTRUCTION EXIT
- ____ TIMBER MATTING AT CONSTRUCTION EXIT
- ____ CHANNEL LINERS
- ____ SEDIMENT TRAPS
- ____ SEDIMENT BASINS
- ____ STORM INLET SEDIMENT TRAP
- ____ STONE OUTLET STRUCTURES
- _X_ CURBS AND GUTTERS
- _X_ STORM SEWERS
- ____ VELOCITY CONTROL DEVICES
- _X_ EROSION CONTROL LOGS

OTHER: ____

NARRATIVE - SEQUENCE OF CONSTRUCTION (STORM WATER MANAGEMENT) ACTIVITIES: ____

((Provide narrative of construction sequencing))

STORM WATER MANAGEMENT: THE TRAFFIC CONTROL CONSTRUCTION PHASE IS DEVELOPED IN A MANNER WHICH ALLOWS FOR THE CONTINUAL USE OF THE EXISTING STORMWATER SYSTEM IN CONJUNCTION WITH THE PROPOSED STORMWATER LINES THROUGHOUT THE CONSTRUCTION PHASE OF THE THE PROJECT.

OTHER EROSION AND SEDIMENT CONTROLS:

MAINTENANCE: All erosion and sediment controls will be maintained in good working order. If a repair is necessary it will be done at the earliest date possible, but no later than 7 calendar days after the surrounding exposed ground has dried sufficiently to prevent further damage from heavy equipment. The area adjacent to creeks and drainageways shall have priority followed by devices protecting storm sewer inlets.

INSPECTION: All inspections will be performed by a TxDOT inspector per one of the options below as directed by the Area Engineer
1. At least every 7 calendar days
2. At least every 14 days or after 0.5 inches or more of rainfall
An inspection and maintenance report should be made for each inspection. Based on the inspection results, the controls shall be revised according to the inspection report.

WASTE MATERIALS: The dumpster used to store all waste material will meet all state and local city solid waste management regulations. All trash and construction debris will be deposited in the dumpster. The dumpster will be emptied as necessary or as required by local regulation and the trash will be hauled to a local dump. No construction waste material will be buried on site.

HAZARDOUS WASTE (INCLUDING SPILL REPORTING): In the event of a spill which may be considered hazardous, the Houston District Safety Office shall be contacted immediately at 713-802-5962.

SANITARY WASTE: All Sanitary Waste will be collected from the portable units as necessary or as required by local regulations by a licensed sanitary waste management contractor.

OFFSITE VEHICLE TRACKING:

- _X_ HAUL ROADS DAMPENED FOR DUST CONTROL
- _X_ LOADED HAUL TRUCKS TO BE COVERED WITH TARPAULIN
- _X_ EXCESS DIRT ON ROAD REMOVED DAILY
- _X_ STABILIZED CONSTRUCTION ENTRANCE

OTHER: ____

REMARKS: Disposal areas, stockpiles, and haul roads shall be constructed in a manner that will minimize and control the sediment that may enter receiving waterways. Disposal areas shall not be located in any waterway, waterbody or streambed. Construction staging areas and vehicle maintenance areas shall be constructed by the contractor in a manner which minimizes the runoff of all pollutants. All waterways shall be cleared as soon as practical of temporary embankments, temporary bridges, matting, falsework, piling, debris, and other obstructions placed during construction operations that are not part of the finished work.

STATE OF TEXAS
DAVID G. GREANEY
125563
LICENSED
PROFESSIONAL ENGINEER

06/08/2022 Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

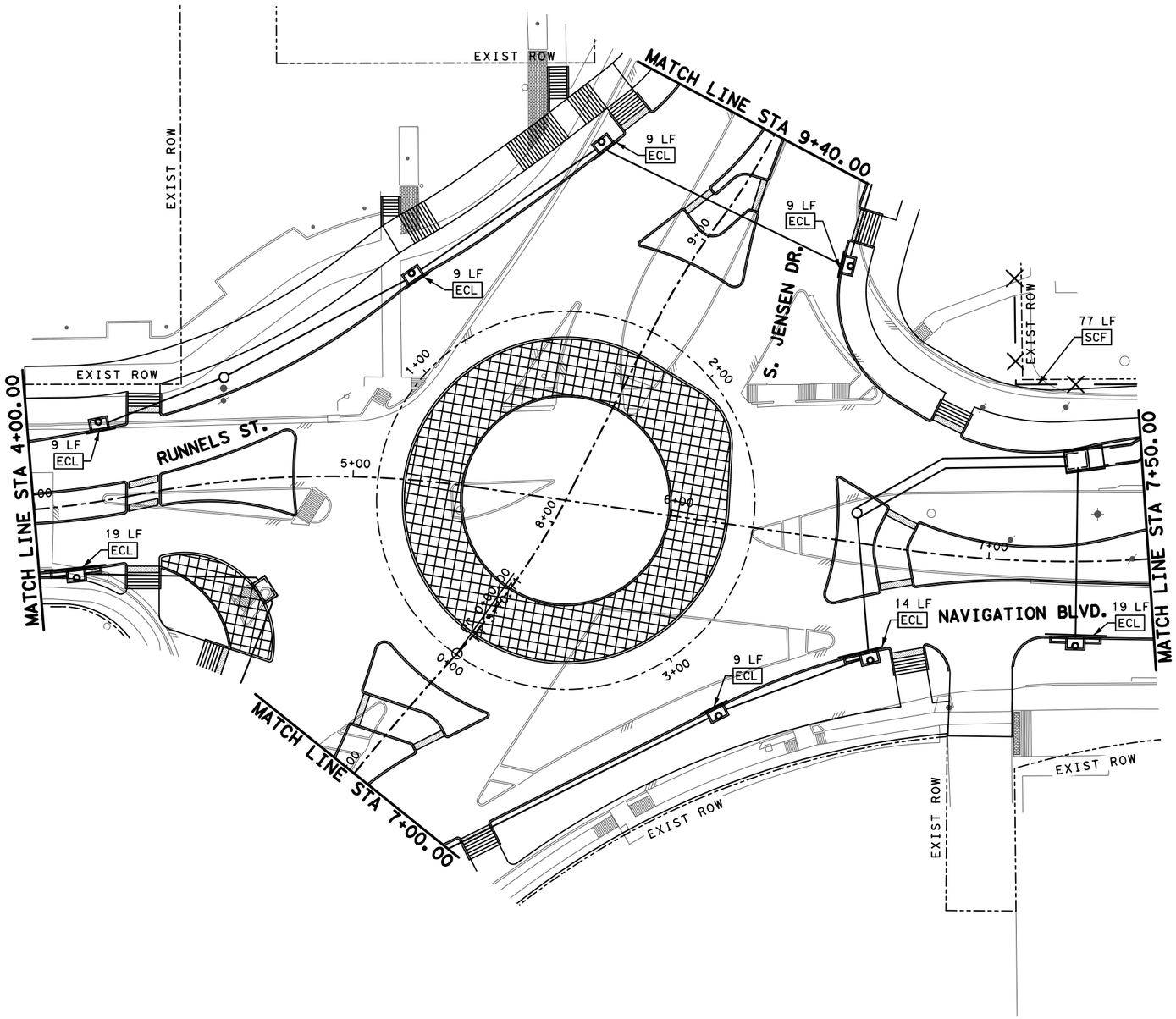
Texas Department of Transportation
Houston District

TxDOT STORM WATER POLLUTION PREVENTION PLAN

SWP3

FILE: STDG1.DGN	DN: TxDot	CK: TxDot	DW: TxDot	CK: TxDot
© TxDOT JANUARY 2007	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS 9/2010 INSPECTION NOTE 9/2013 INSPECTION NOTE 11/2013 SW3P TO SWP3 03/2015 2014 SPECS	HOU	6	STP 1902 (308) MM	234
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	HARRIS	0912	72	386	CS

STD G-1



LEGEND

- SCF — SEDIMENT CONTROL FENCE
- ECL — EROSION CONTROL LOG
- PROP BOX STM SEWER
- PROP STM SEWER

NOTES:

1. REFER TO TXDOT STORM WATER POLLUTION PREVENTION PLAN STANDARD SHEETS FOR DETAILS.
2. INSTALLED MEASURES SHALL REMAIN IN PLACE AND BE INSPECTED WEEKLY. ALL ITEMS SHALL BE MAINTAINED AND REPAIRED THROUGHOUT DURATION OF USE.
3. STORM WATER POLLUTION PREVENTION PLAN MEASURES WILL BE SHOWN AND MODIFIED TO ACCOMMODATE ACTUAL FIELD CONDITIONS.
4. CONSTRUCTION EXITS SHALL BE FIELD LOCATED BY THE CONTRACTOR AND APPROVED BY THE ENGINEER.
5. TEMPORARY SEDIMENT CONTROL FENCE TO BE PLACED ON ROW. SHOWN OFFSET FOR CLARITY.

0′ 40′ 80′
(IN FEET)
SCALE: PLAN 1"=40′

STATE OF TEXAS
DAVID G. GREANEY
125563
LICENSED
PROFESSIONAL ENGINEER

06/08/2022 Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

Gauge ENGINEERING
11750 Katy Freeway, Suite 400
Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

STORM WATER POLLUTION PREVENTION PLAN

SHEET 1 OF 3

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	235

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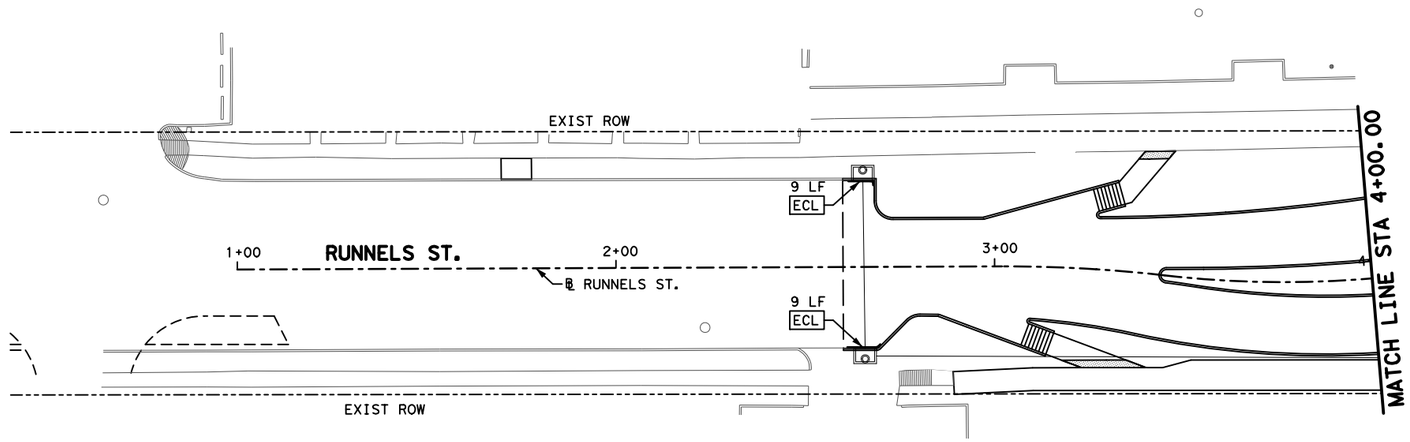

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(IN FEET)
SCALE: PLAN 1"=40′

STATE OF TEXAS
DAVID G. GREANEY
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06/28/2022 Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

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www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

STORM WATER POLLUTION PREVENTION PLAN

SHEET 2 OF 3

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	236

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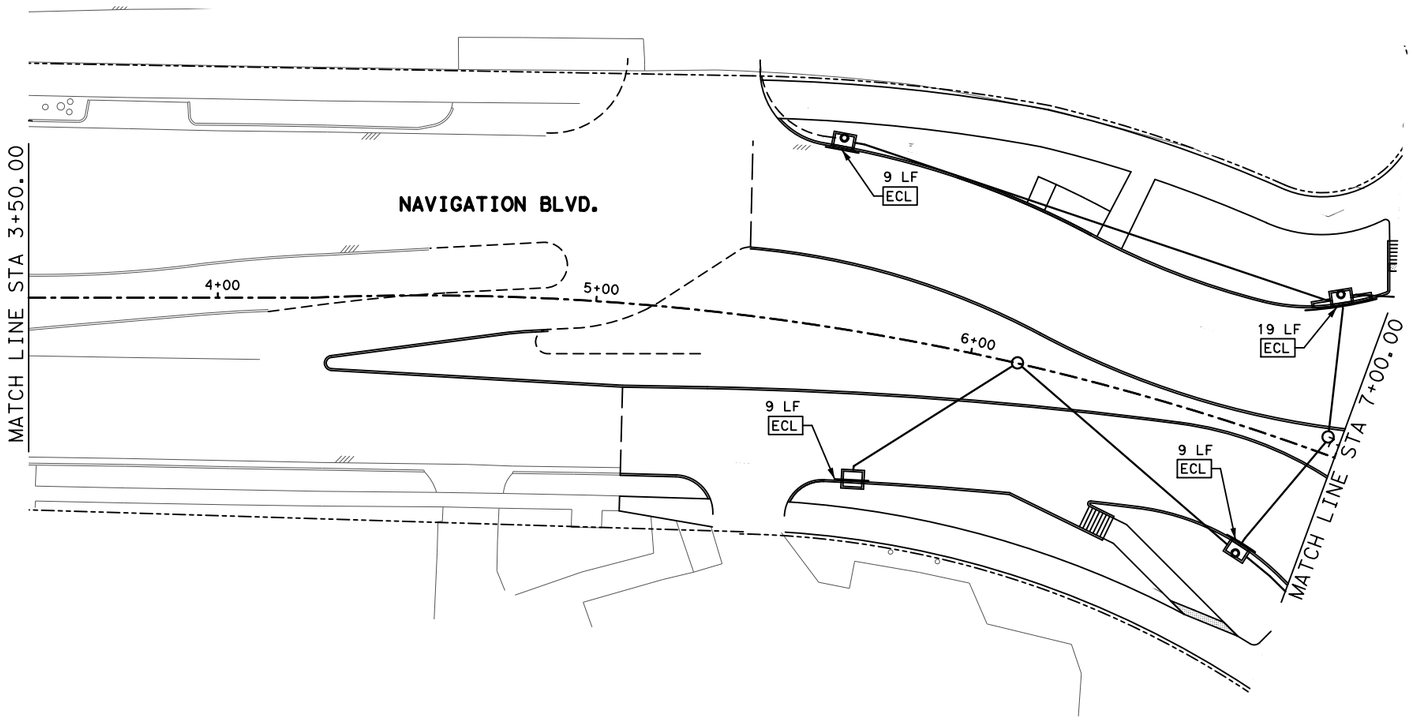

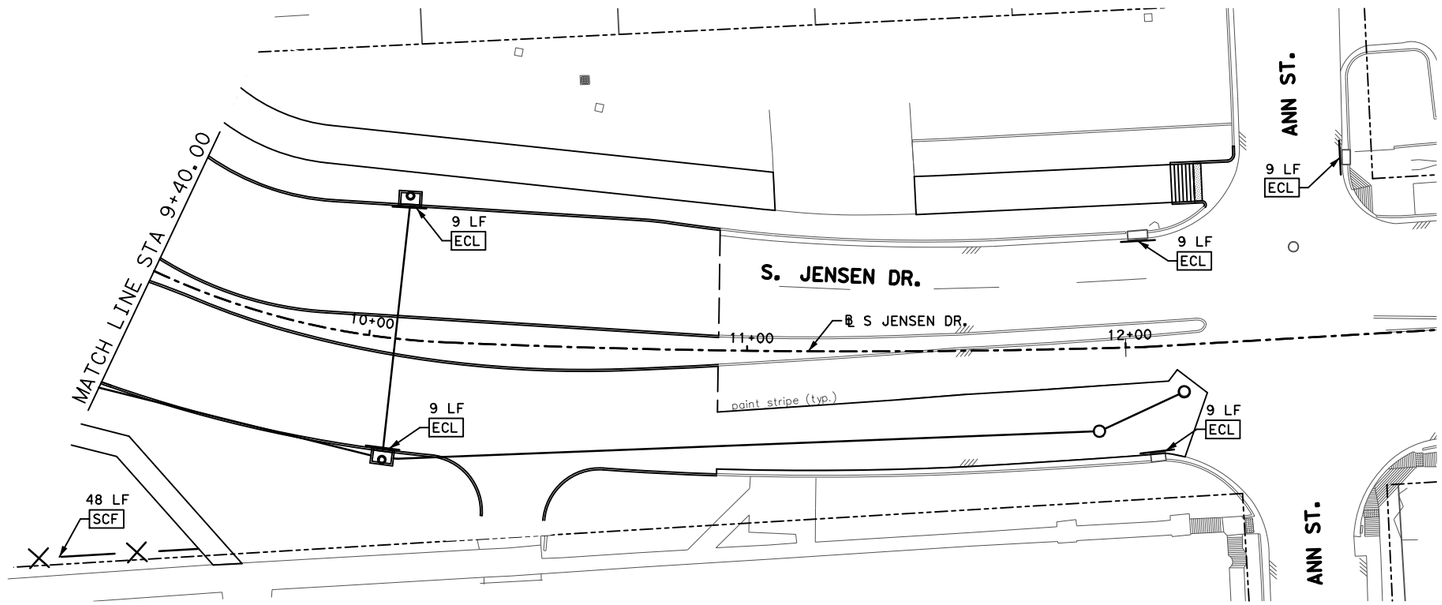

LEGEND

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- ECL — EROSION CONTROL LOG
- PROP BOX STM SEWER
- PROP STM SEWER

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(IN FEET)
SCALE: PLAN 1"=40′

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06/08/2022 Gauge Engineering, LLC
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Houston, TX 77079
www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

Texas Department of Transportation

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

STORM WATER POLLUTION PREVENTION PLAN

SHEET 3 OF 3

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	237

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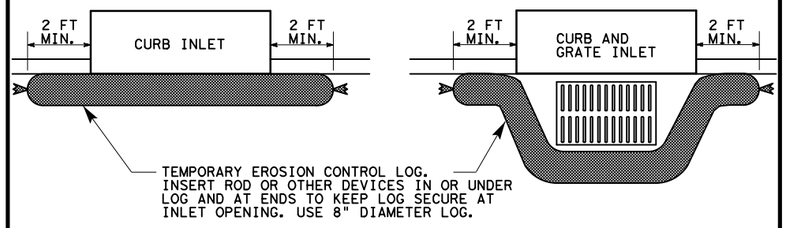
CURB INLETS
8" DIAMETER LOGS

ITEM 506-6040 BIODEG EROSN CONT LOGS (INSTL) (8")



MATERIAL REQUIREMENTS

FILL:

Use 100% shredded mulch or other non-compost biodegradable material as fill for logs. No compost or fines.

DO NOT USE MATERIAL WHICH PROHIBITS WATER INFILTRATION.

LOG MESH:
Use mesh with 1/4" openings or larger. Mesh must allow water infiltration but also hold fill material in place.

SEDIMENT BASIN & TRAP USAGE GUIDELINES

A sediment trap (erosion control log) may be used to filter sediment out of runoff draining from an unstabilized area.

Traps: The drainage area for a sediment trap should not exceed 5 acres. The trap capacity should be 1800 CF/Acre (0.5" over the drainage area).

Sediment traps should be placed in the following locations:

1. Within drainage ditches spaced as needed or min. 500' on center
2. Immediately preceding ditch inlets
3. Just before the drainage enters a water course
4. Just before the drainage leaves the right of way

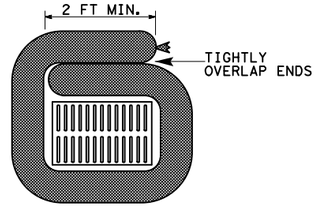
The trap should be cleaned when the capacity has been reduced by 1/2 or the sediment has accumulated to a depth of 1', whichever is less.

REQUIRED ITEMS:

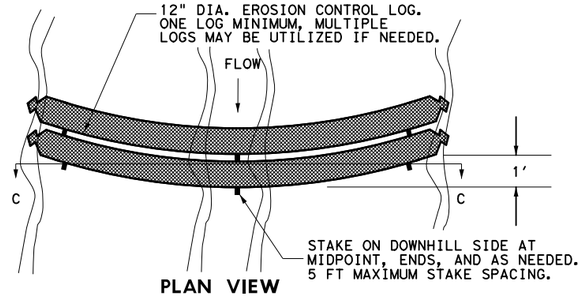
- ITEM 506-6040 BIODEG EROSN CONT LOGS (INSTL) (8") LF
- ITEM 506-6041 BIODEG EROSN CONT LOGS (INSTL) (12") LF
- ITEM 506-6043 BIODEG EROSN CONT LOGS (REMOVE) LF

DROP INLETS AND OTHER LOCATIONS
12" DIAMETER LOGS

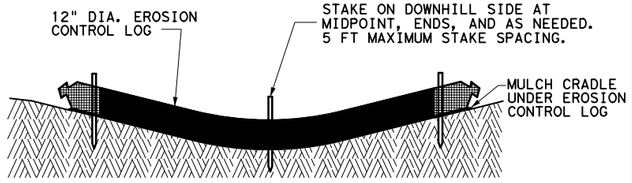
ITEM 506-6041 BIODEG EROSN CONT LOGS (INSTL)(12")



DROP INLETS

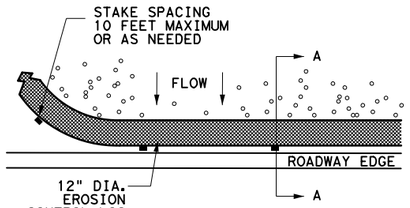


PLAN VIEW



SECTION C-C

DRAINAGE SWALE OR DITCH



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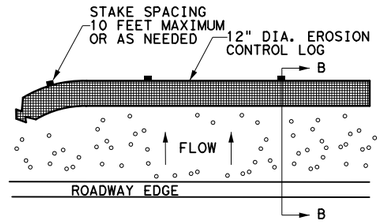

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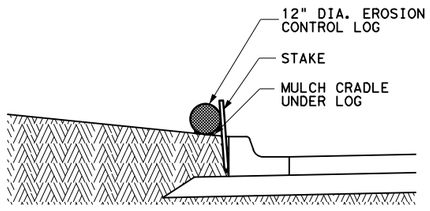
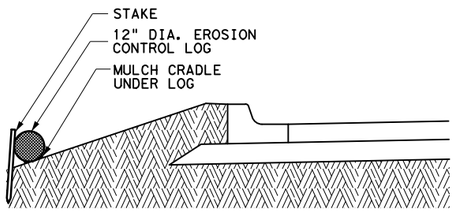


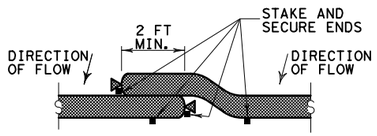
SECTION A-A

SLOPE TO ROADWAY EDGE

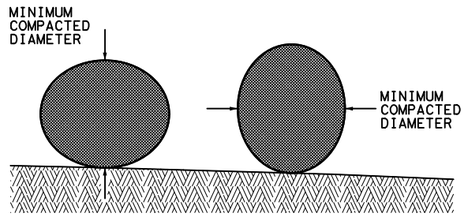


SECTION B-B

SLOPE AWAY FROM ROADWAY EDGE



END OF LOG OVERLAP



DIAMETER MEASUREMENTS OF EROSION CONTROL LOGS SPECIFIED IN PLANS

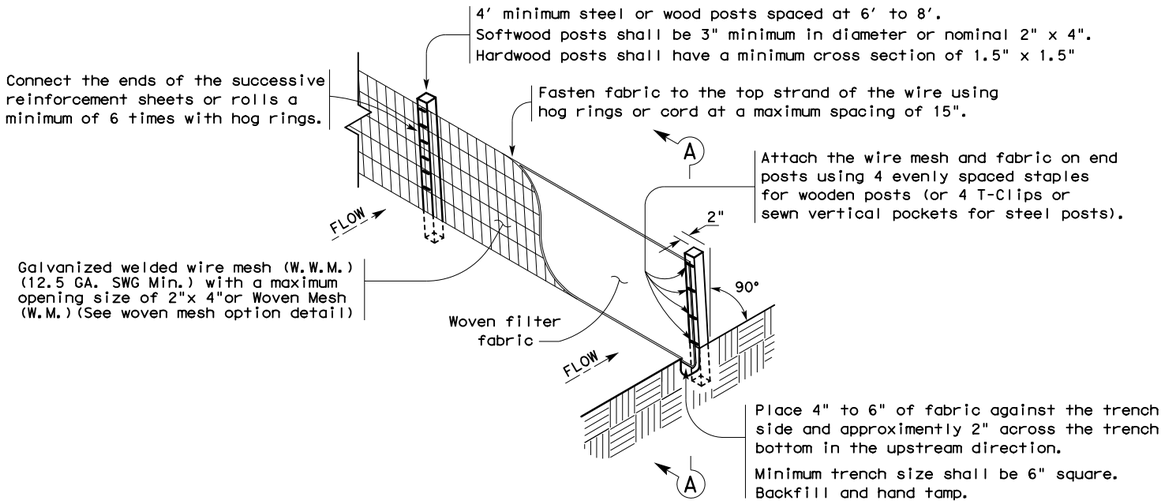
Texas Department of Transportation
Houston District

EROSION CONTROL LOG

ECL-12

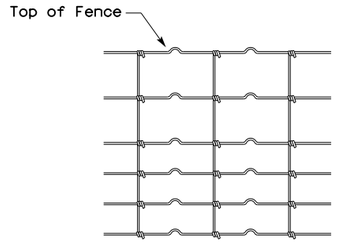
FILE: STDG4a.DGN	DN: TxDot	CK: TxDot	DW: TxDot	CK: TxDot			
©TxDOT 2014	DISTRICT	FED REG	PROJECT NUMBER				SHEET
REVISIONS 3/15 MINOR CORRECTIONS	HOU	6	STP 1902 (308) MM				238
	COUNTY		CONTROL	SECT	JOB	HIGHWAY	
	HARRIS		0912	72	386	CS	

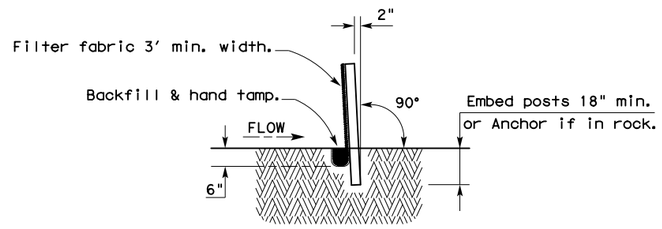
STD G-4A



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.

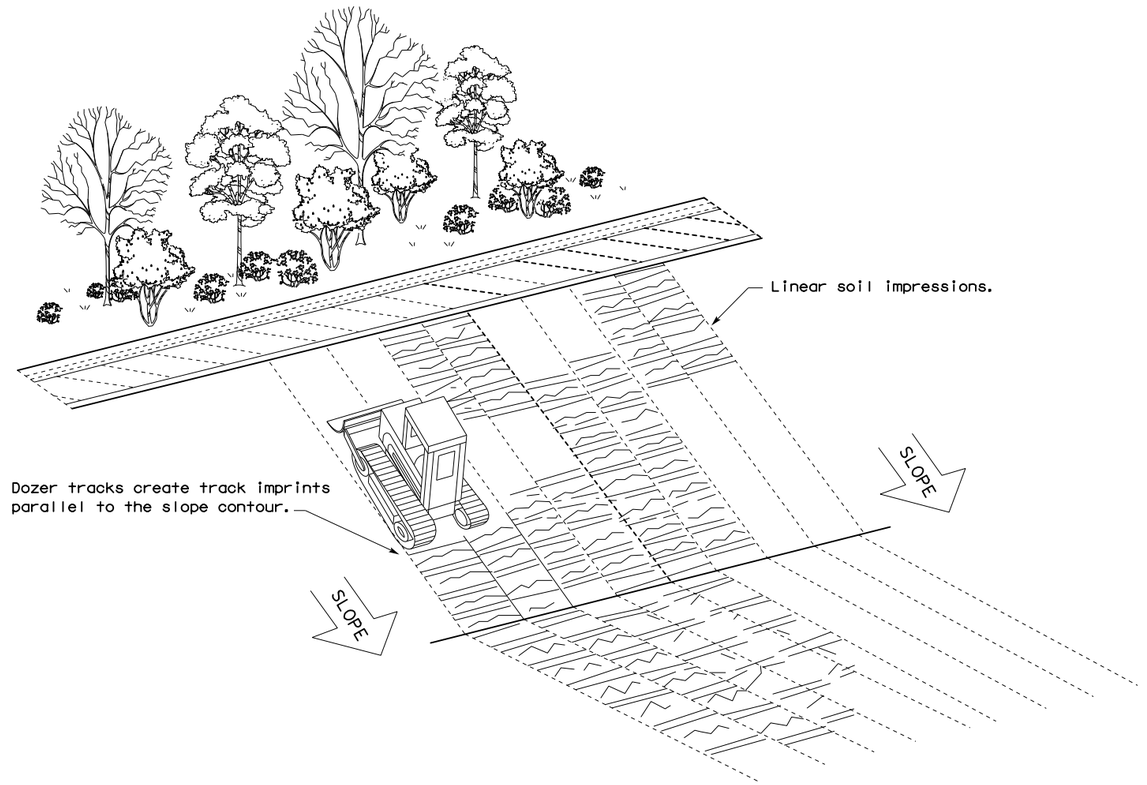
LEGEND

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

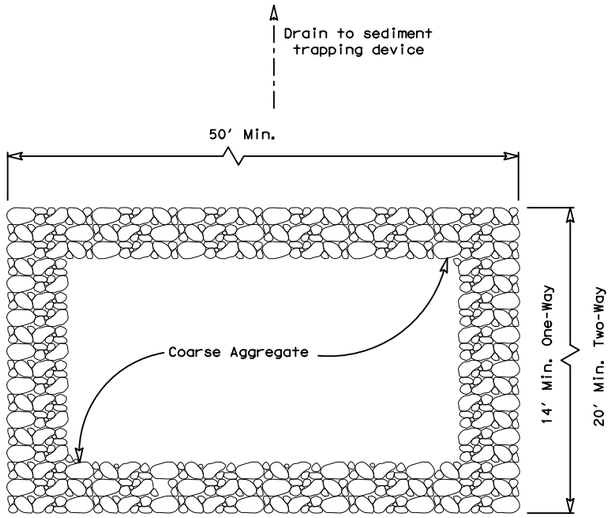
FENCE & VERTICAL TRACKING

EC(1)-16

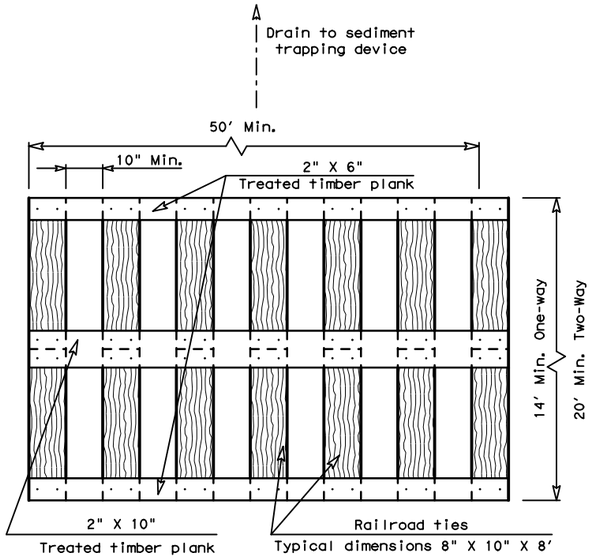
FILE: ec116	DN: TxDOT		CK: KM	DW: VP		DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY	
REVISIONS	0912	72	386		CS	
	DIST	COUNTY				SHEET NO.
	HOU	HARRIS				239

DATE
FILE

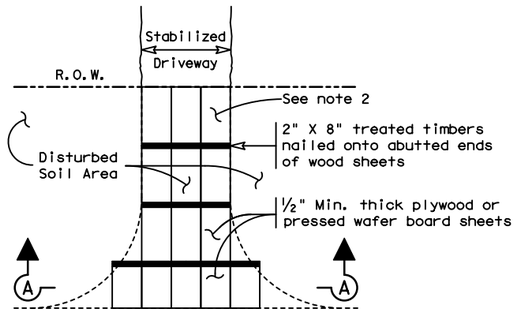
DATE: 6/8/2022
FILE: P:\East End\1035-Nav-Roundabout\4-0-Production-Working\4-1-CAD\SW3P\STANDARDS\EC (3) - 16.dgn



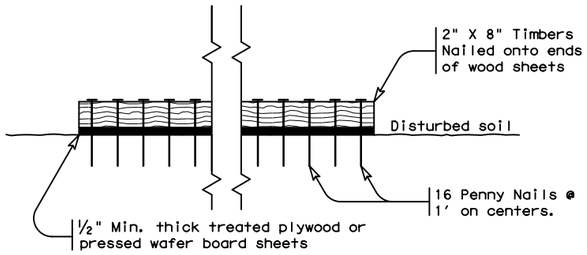
PLAN VIEW



PLAN VIEW



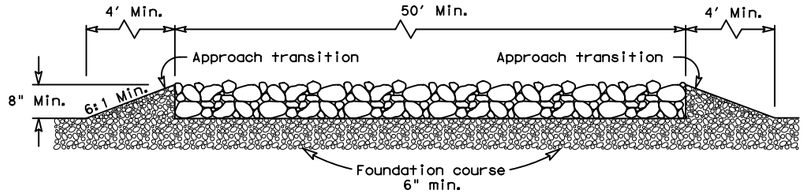
PLAN VIEW



SECTION A-A

CONSTRUCTION EXIT (TYPE 3)

SHORT TERM



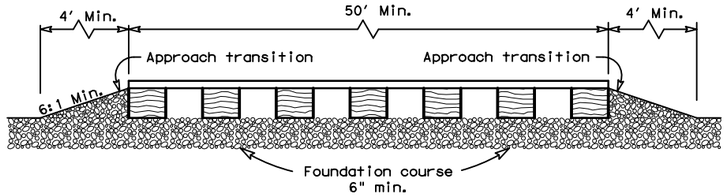
ELEVATION VIEW

CONSTRUCTION EXIT (TYPE 1)

ROCK CONSTRUCTION (LONG TERM)

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.



ELEVATION VIEW

CONSTRUCTION EXIT (TYPE 2)

TIMBER CONSTRUCTION (LONG TERM)

GENERAL NOTES (TYPE 2)

1. The length of the type 2 construction exit shall be as indicated on the plans, but not less than 50′.
2. The treated timber planks shall be attached to the railroad ties with ½"x 6" min. lag bolts. Other fasteners may be used as approved by the Engineer.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The approach transitions shall be no steeper than 6:1 and constructed as directed by the Engineer.
5. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other material as approved by the Engineer.
6. The construction exit should be graded to allow drainage to a sediment trapping device.
7. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
8. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.

GENERAL NOTES (TYPE 3)

1. The length of the type 3 construction exit shall be as shown on the plans, or as directed by the Engineer.
2. The type 3 construction exit may be constructed from open graded crushed stone with a size of two to four inches spread a min. of 4" thick to the limits shown on the plans.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

Texas Department of Transportation

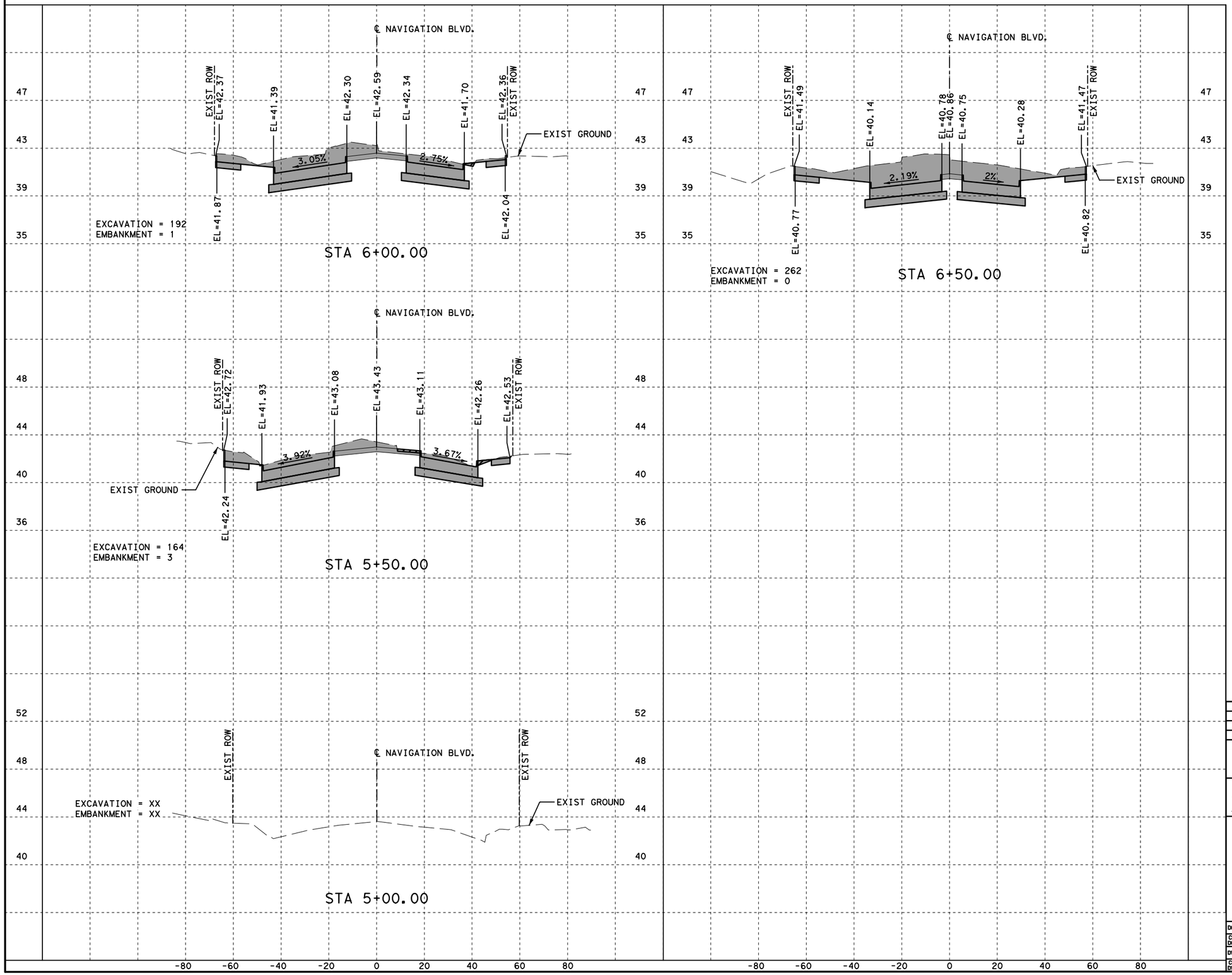
Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

CONSTRUCTION EXITS

EC(3)-16

FILE: ec316	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	72	386	CS
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		240



LEGEND

EXCAVATION = XX

EMBANKMENT = XX

H: 0′ 40′ 80′

V: 0′ 8′ 16′

(IN FEET)

SCALE: PLAN 1"=40′
PROFILE 1"=8′

STATE OF TEXAS
DAVID G. GREANEY
125563
LICENSED
PROFESSIONAL ENGINEER

06/08/2022 Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

REV. NO.	DATE	DESCRIPTION	BY

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11750 Katy Freeway, Suite 400
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Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

NAVIGATION BLVD. (SOUTHWEST) PROPOSED CROSS SECTIONS

SHEET 1 OF 4

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	241

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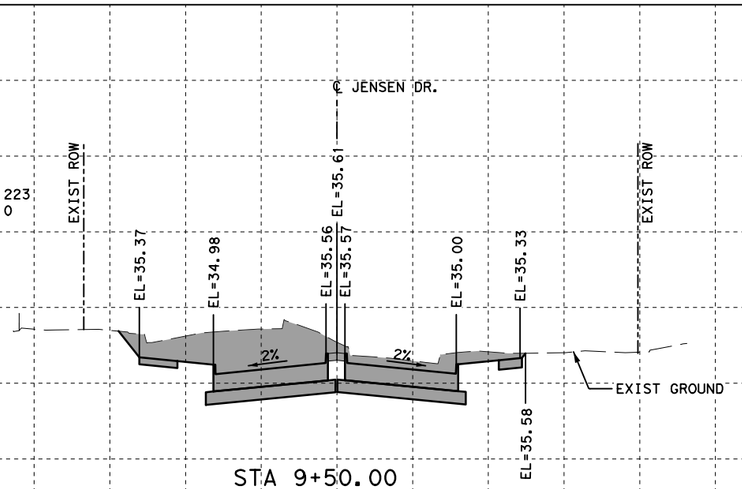

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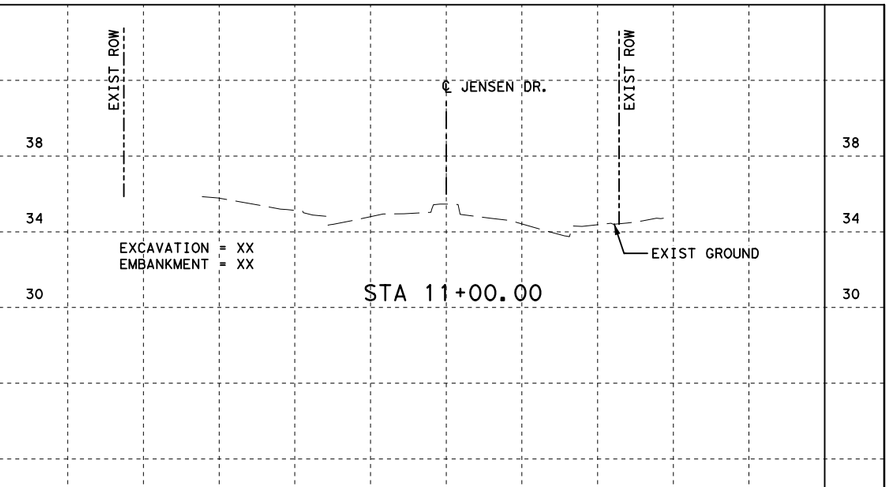

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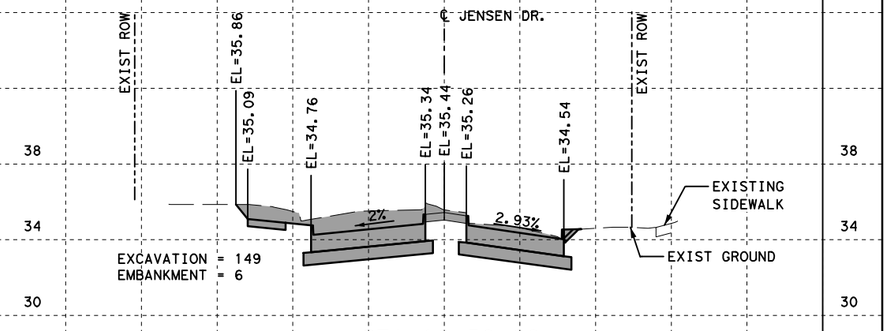

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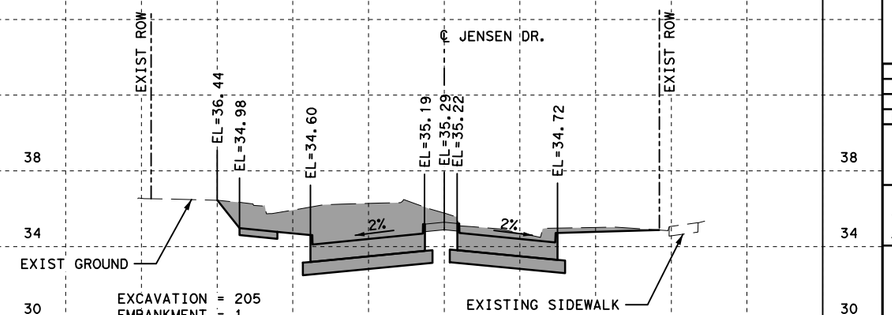

STA 10+00.00

-80 -60 -40 -20 0 20 40 60 80 -80 -60 -40 -20 0 20 40 60 80

LEGEND

EXCAVATION = XX

EMBANKMENT = XX

H: 0′ 40′ 80′

V: 0′ 8′ 16′

(IN FEET)

SCALE: PLAN 1"=40′
PROFILE 1"=8′

STATE OF TEXAS
DAVID G. GREANEY
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06/08/2022 Gauge Engineering, LLC
Texas Registered Engineering Firm F-20017

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Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

JENSEN DR. (NORTHEAST) PROPOSED CROSS SECTIONS

SHEET 2 OF 4

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	242

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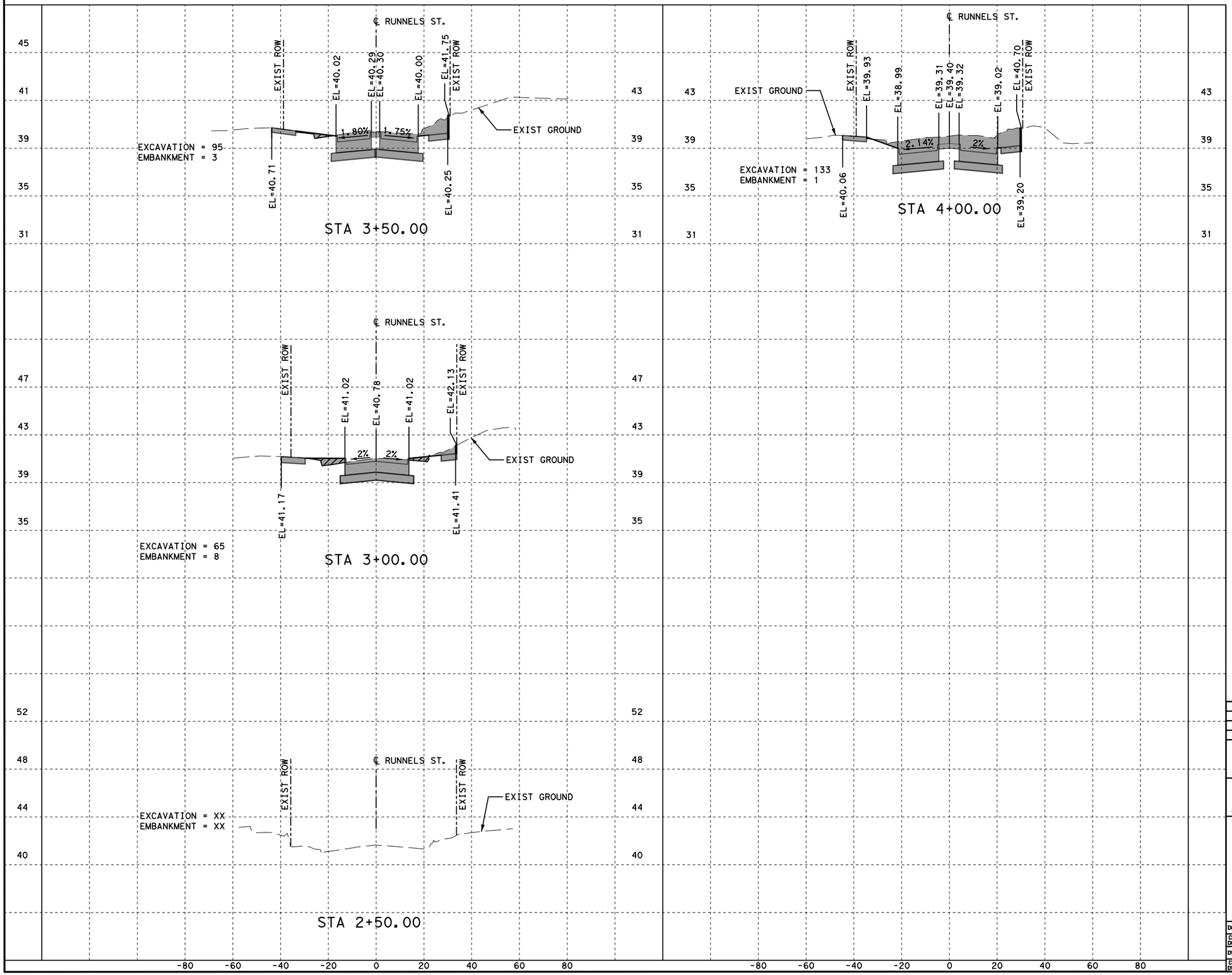

LEGEND

EXCAVATION = XX

EMBANKMENT = XX

H: 0′ 40′ 80′

V: 0′ 8′ 16′

(IN FEET)

SCALE: PLAN 1"=40′
PROFILE 1"=8′

STATE OF TEXAS
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Texas PE Firm Reg. #F-20017

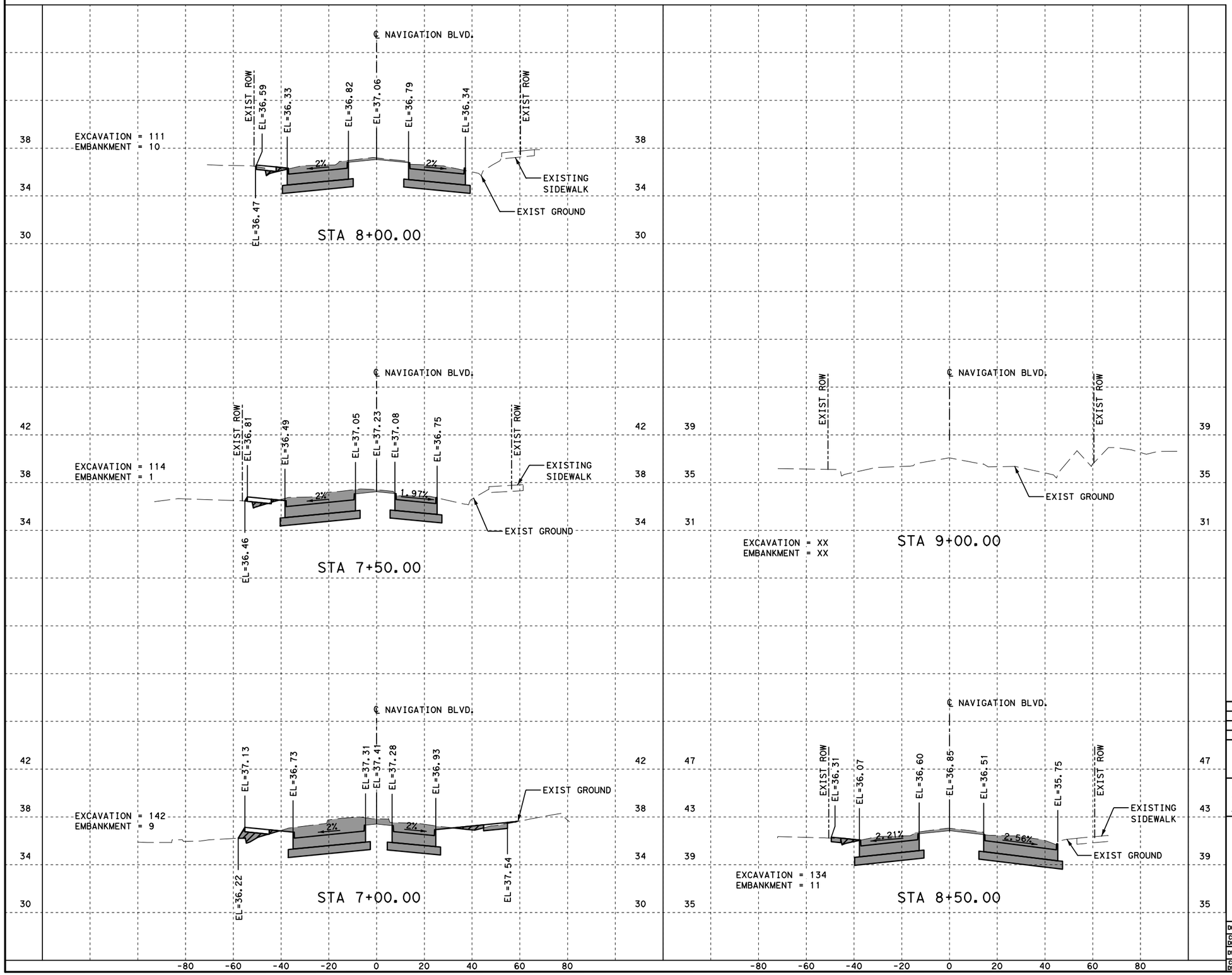
Texas Department of Transportation

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

RUNNELS ST. (NORTHWEST) PROPOSED CROSS SECTIONS

SHEET 3 OF 4

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	243



LEGEND

EXCAVATION = XX

EMBANKMENT = XX

H: 0′ 40′ 80′

V: 0′ 8′ 16′

(IN FEET)

SCALE: PLAN 1"=40′
PROFILE 1"=8′

STATE OF TEXAS
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REV. NO.	DATE	DESCRIPTION	BY

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www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

NAVIGATION BLVD. (SOUTHEAST) PROPOSED CROSS SECTIONS

SHEET 4 OF 4

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	244

DRILLING LOG

WinCore Version 3.3

County	HARRIS	Hole	B-1	District	HOUSTON
Highway	S JENSEN DR.	Structure	PAVEMENT	Date	10/15/2020
CSJ	0912-72-386	Station	11+73.80	Grnd. Elev.	34.19 ft
		Offset	23.82 LT	GW Elev.	N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test Lateral Press. (psi)	Triaxial Test Deviator Stress (psi)	Properties MC	LL	PI	Wet Den. (pcf)	Additional Remarks
32.5			PVMT, 3.5" AC + 6.5" PCC + 10.25" stabilized base							
		7 (6) 10 (6)	CLAY, LEAN, WITH SAND, soft, gray and tan -with ferrous nodules and stains 2'-12', calcareous nodules 5'-7', and silty sand seams and pockets 7'-12' (CL)	0	26.9	21	48	32	130	P=2.5, -#200=85%
5						14				P=4.5+
						15				P=3.75
		8 (6) 9 (6)								
10				0	22.8	18	41	29	131	P=2.25
				9	17.4	17			133	P=2.0
20.2		12 (6) 23 (6)	SAND, CLAYEY, loose to slightly compact, gray and tan -with fat clay pockets 17'-19' (SC)							
15						14				N=42, -#200=15% D50=0.154mm
						21				N=33
		6 (6) 7 (6)								
14.2	20									Termination Depth = 20 feet.
25										
30										
35										
40										

Remarks: Groundwater was not encountered during drilling. Survey Coordinates (TSPC, Grid, Zone 4204): Easting: 3,127,986.379; Northing: 13,841,965.600

The ground water elevation was not determined during the course of this boring.

Driller: V&S **Logger: JS** **Organization: AVILES ENGINEERING CORP.**

Z:\Engineering\Reports\2020\G145-20 East End District Navigation Roundabout - Gauge Engineering\Wincore\B-1.CLG

DRILLING LOG

WinCore Version 3.3

County	HARRIS	Hole	B-2	District	HOUSTON
Highway	RUNNELS ST.	Structure	PAVEMENT	Date	10/15/2020
CSJ	0912-72-386	Station	4+38.90	Grnd. Elev.	39.98 ft
		Offset	36.36 RT	GW Elev.	N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test Lateral Press. (psi)	Triaxial Test Deviator Stress (psi)	Properties MC	LL	PI	Wet Den. (pcf)	Additional Remarks
39.1			PVMT, 3.5" AC + 7.25" PCC							
38.			FILL, SANDY LEAN CLAY, stabilized, gray, with shell fragments (CL)			28	49	15		P=4.5+,-#200=67%
		9 (6) 11 (6)	CLAY, LEAN, soft to stiff, gray and tan, with slickensides -with calcareous nodules 5'-9' and gasoline odor 7'-9' (CL)	0	32.9	22			127	P=3.0
5				0	29.6	25			126	P=3.75
						22	47	28		P=4.5+
31.		9 (6) 10 (6)								
10			CLAY, SANDY LEAN, soft to stiff, gray and tan -with ferrous stains and nodules 10'-12' and 15'-19', fat clay pockets 10'-14', gasoline odor 10'-17', and calcareous nodules 12'-19' (CL)			17				P=4.25
				9	27.5	18			131	P=1.75
		9 (6) 12 (6)								
15						15				P=3.0
						16	35	21		P=3.5, -#200=66%
		15 (6) 20 (6)								
20.	20									Termination Depth = 20 feet.
25										
30										
35										
40										

Remarks: Groundwater was not encountered during drilling. Survey Coordinates (TSPC, Grid, Zone 4204): Easting: 3,127,615.349; Northing: 13,841,759.307

The ground water elevation was not determined during the course of this boring.

Driller: V&S **Logger: JS** **Organization: AVILES ENGINEERING CORP.**

Z:\Engineering\Reports\2020\G145-20 East End District Navigation Roundabout - Gauge Engineering\Wincore\B-2.CLG

STATE OF TEXAS
DAVID G. GREANEY
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REV. NO.	DATE	DESCRIPTION	BY

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Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

BORING LOGS

SHEET 1 OF 2

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.				HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM				CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.		SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386		245

DRILLING LOG

WinCore Version 3.3

County	HARRIS	Hole	B-3	District	HOUSTON
Highway	NAVIGATION BLVD.	Structure	PAVEMENT	Date	10/15/2020
CSJ	0912-72-386	Station	10+11.76	Grnd. Elev.	36.18 ft
		Offset	20.30 LT	GW Elev.	N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test: Lateral Press. (psi)	Triaxial Test: Deviator Stress (psi)	Properties: MC	LL	PI	Wet Den. (pcf)	Additional Remarks
34.7			PVMT, 2.9" AC + 2.5" brick pavers + 12.5" PCC							
			CLAY, SANDY SILTY, tan and gray, with ferrous stains (CL-ML)			7	20	5		P=4.5+,-#200=52%
32.2		11 (6) 15 (6)	CLAY, LEAN, WITH SAND, stiff, tan (CL)							
5				0	130.3	12			138	P=4.5+
				0	191.1	12	43	29	139	P=4.5+
27.2		8 (6) 9 (6)	SAND, SILTY, loose to compact, light tan -with clayey sand pockets 10'-12' (SM)							
10						9				N=29
						10				N=34
		14 (6) 27 (6)								
15						16				N=20, -#200=34% D50=0.097mm
19.2			SAND, SILTY CLAYEY, loose to slightly compact, light gray and tan (SC-SM)							
						20				N=21
		9 (6) 11 (6)								
16.2 20										Termination Depth = 20 feet.
25										
30										
35										
40										

Remarks: Groundwater was not encountered during drilling. Survey Coordinates (TSPC, Grid, Zone 4204): Easting:3,128,107.394; Northing: 13,841,479.914

The ground water elevation was not determined during the course of this boring.

Driller: V&S **Logger: JS** **Organization: AVILES ENGINEERING CORP.**

Z:\Engineering\Reports\2020\G145-20 East End District Navigation Roundabout - Gauge Engineering\Wincore\B-3.CLG

PLATE A-5

STATE OF TEXAS
DAVID G. GREANEY
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LICENSED
PROFESSIONAL ENGINEER

06/08/2022 Gauge Engineering, LLC
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www.GaugeEngineering.com
Texas PE Firm Reg. #F-20017

NAVIGATION BLVD / JENSEN DR. & RUNNELS ST.

BORING LOGS

SHEET 2 OF 2

DGN: MG	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: DG	6	TEXAS	STP 1902 (308) MM			CS
DWG: MG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: DG	HOU	HARRIS	0912	72	386	246