INDEX OF SHEETS

(SEE SHEET 2)

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

DESIGN SPEED - 35 MPH
FUNCTIONAL CLASSIFICATION - URBAN MINOR ARTERIAL
ADT - 22,516 (2020)
ADT - 30,855 (2040)

FEDERAL CONTROL	PROJECT NO.		SHEET NO.
6	STP 1802 (783) MM		1
STATE	STATE DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0912	72	391	CS

PLANS OF PROPOSED
STATE ROADWAY IMPROVEMENT

TxDOT-CSJ. 0912-72-391
City of Houston-WBS No. N-T17000-031B-7
STP 1802 (783) MM

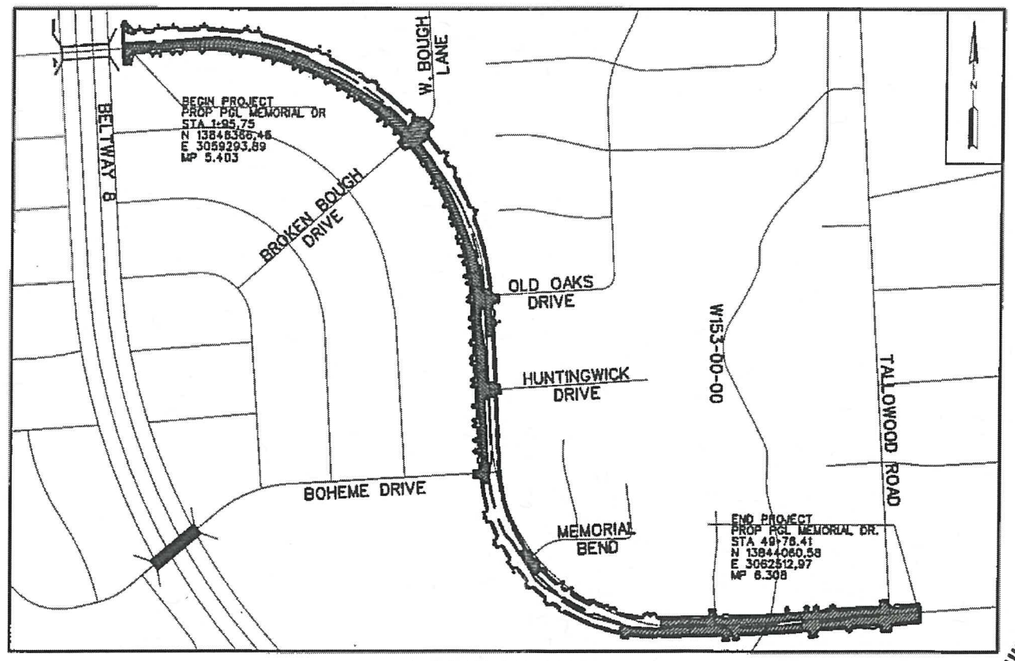
CS
MEMORIAL DR RECONSTRUCTION AND ACCESS MANAGEMENT
HARRIS COUNTY

LIMITS: FROM BELTWAY 8 TO EAST OF TALLOWOOD RD.

FOR THE CONSTRUCTION OF A NON-FREEWAY FACILITY CONSISTING OF WIDENING TO A 4-LANE DIVIDED ROADWAY, GRADING, CONCRETE PAVEMENT WITH CURB AND GUTTER, DRAINAGE STRUCTURES, SIGNING AND PAVEMENT MARKINGS, LIGHTING, ILLUMINATION & SIGNALS.

[TOTAL PROJECT LENGTH = 4,966.10 FT. = 0.905 MI]

VICINITY MAP
N.T.S



LOCATION MAP
SCALE: N.T.S.

REGISTERED ACCESSIBILITY SPECIALIST (RAS) INSPECTION REQUIRED

TDLR NO. TABS2019019010

TITLE SHEET CERTIFICATION FOR FEDERAL PROJECTS:
SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, NOV 1, 2014 AND THE SPECIFICATION ITEMS LISTED AND DATED AS FOLLOWS SHALL GOVERN ON THIS PROJECT: REQUIRED CONTRACT PROVISIONS FOR ALL FEDERAL-AID CONTRACTS (FORM FHWA 1273, MAY 2012).

NOTE:

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

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

COUNTY: HARRIS PROJ. NO. STP 1802(783) MM
HWY. NO. CS LETTING DATE MAY 2020
DATE ACCEPTED

EXCEPTIONS : NONE
NO EQUATIONS
NO RAILROAD CROSSING

TIRZ 17 REDEVELOPMENT AUTHORITY

CITY OF HOUSTON TEXAS

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED PROFESSIONAL ENGINEER
Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614
03/04/2020

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

Carol Haddock 9/9/20
DIRECTOR DATE
HOUSTON PUBLIC WORKS

PUBLIC WORKS AND ENGINEERING
ACCEPTED AND RELEASED
67862

Texas Department of Transportation
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SUBMITTED FOR LETTING: 03/06/20
Roger R. Gate, P.E.
PROJECT MANAGER
APPROVED FOR LETTING: 3/6/2020
for W. Koch, PE
DISTRICT ENGINEER

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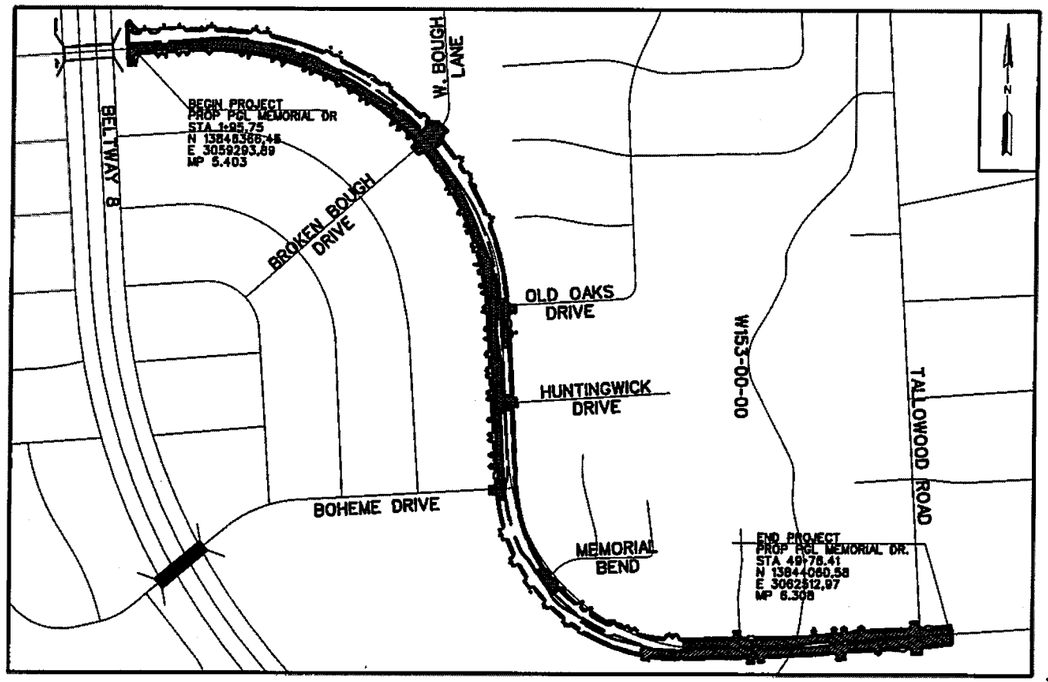

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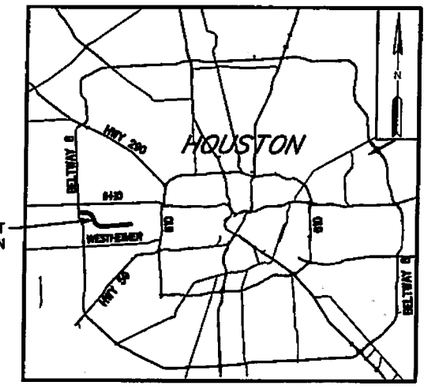
SCALE: N.T.S.



VICINITY MAP
N.T.S

TIRZ 17 REDEVELOPMENT AUTHORITY

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EXCEPTIONS : NONE
NO EQUATIONS
NO RAILROAD CROSSING

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED PROFESSIONAL ENGINEER
Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614
03/04/2020

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

DIRECTOR DATE
HOUSTON PUBLIC WORKS

PUBLIC WORKS
67862

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SUBMITTED FOR LETTING: 03/06/20
Roger R. Clotz, P.E.
PROJECT MANAGER

APPROVED FOR LETTING: 3/6/2020
for W. Koch
DISTRICT ENGINEER

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	SHEET	DESCRIPTION
		GENERAL
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	4 - 5	PROJECT LAYOUT SHEET
	6	EXIST TYPICAL SECTION
	7 - 9	PROPOSED TYPICAL SECTIONS
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	14 - 14H	PRIVATE UTILITY NOTES
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	19	SUMMARY OF ROADWAY QUANTITIES
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	22	SUMMARY OF SANITARY SEWER QUANTITIES
	23	SUMMARY OF PAVEMENT MARKINGS QUANTITES
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	26	SUMMARY OF PLANTING QUANTITIES
	27	SUMMARY OF PLANTING & IRRIGATION QUANTITIES
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PUBLIC WORKS AND ENGINEERING
ACCEPTED AND FILED
67862 -
CITY SECRETARY
HOUSTON, TEXAS

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED
PROFESSIONAL ENGINEER

X

LOCKWOOD, ANDREWS & NEWNAM, INC. ID NO. F-2614

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

NAME 02/12/2020 DATE

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED
PROFESSIONAL ENGINEER

O

LOCKWOOD, ANDREWS & NEWNAM, INC. ID NO. F-2614

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

02/12/2020

STATE OF TEXAS
ZINA I. SCHWARTZ
85814
LICENSED
PROFESSIONAL ENGINEER

T

CONSOR ENGINEERS, LLC ID NO. F-12040

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

NAME 02/12/2020 DATE

STATE OF TEXAS
WEIMIN LI
88740
LICENSED
PROFESSIONAL ENGINEER

H

LOCKWOOD, ANDREWS & NEWNAM, INC. ID NO. F-2614

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NAME 02/12/2020 DATE

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

INDEX SHEET

SHEET 1 OF 2

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	2

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Texas Department of Transportation
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CLERK
HARRIS COUNTY, TEXAS

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

INDEX SHEET

SHEET 2 OF 2

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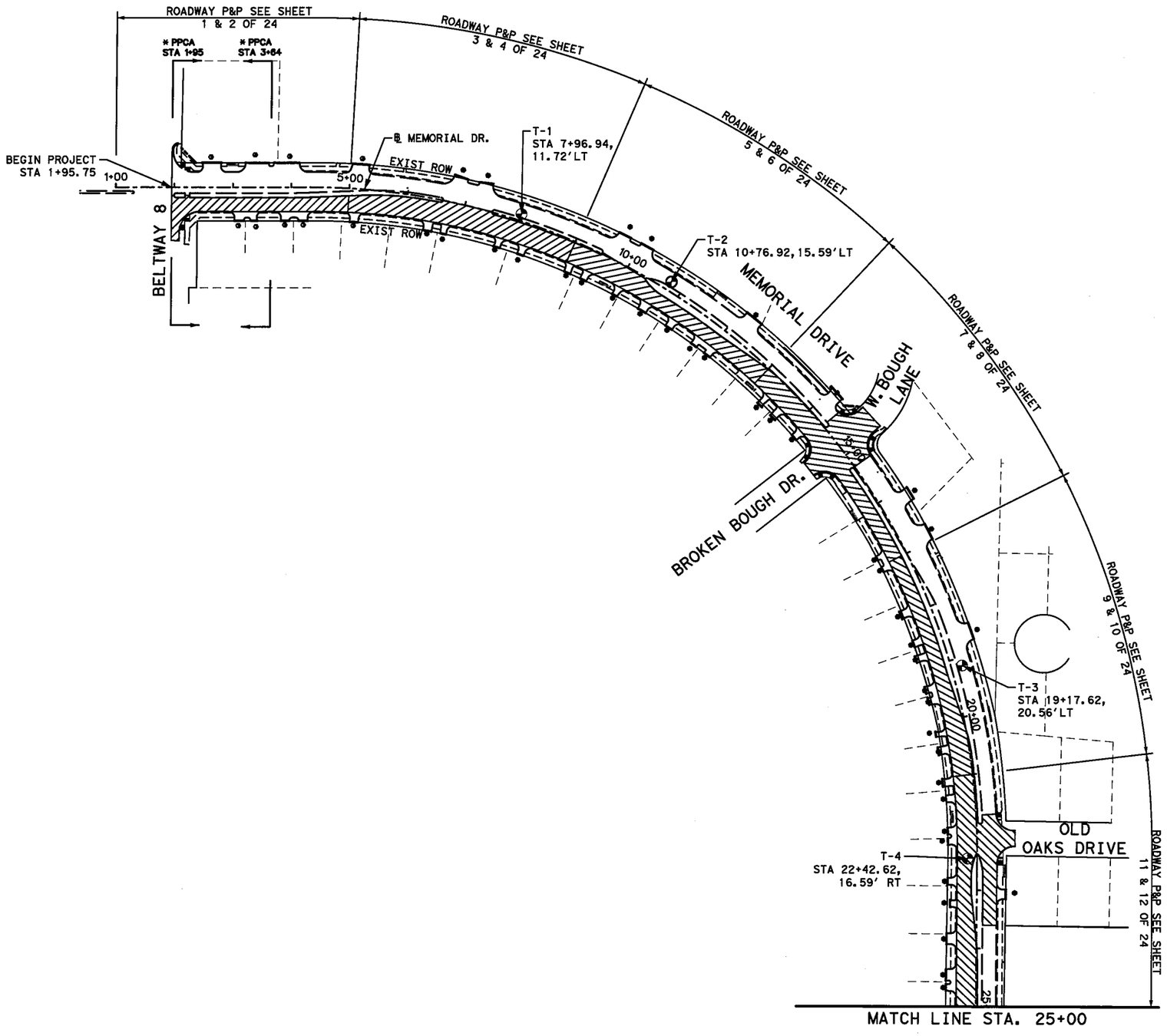

LEGEND

- BENCHMARKS
- SOIL BORING
- PARCEL BOUNDARY

* PPCA=POTENTIAL PETROLEUM CONTAMINATED AREAS

0 200 400

(IN FEET)

SCALE: PLAN 1":200'

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

PUBLIC WORKS AND ENGINEERING
ACCEPTED AND FILED
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Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY
FIRM REGISTATION NO. 2614

Texas Department of Transportation
©2020

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

PROJECT LAYOUT SHEET

SHEET 1 OF 2

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
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DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	4

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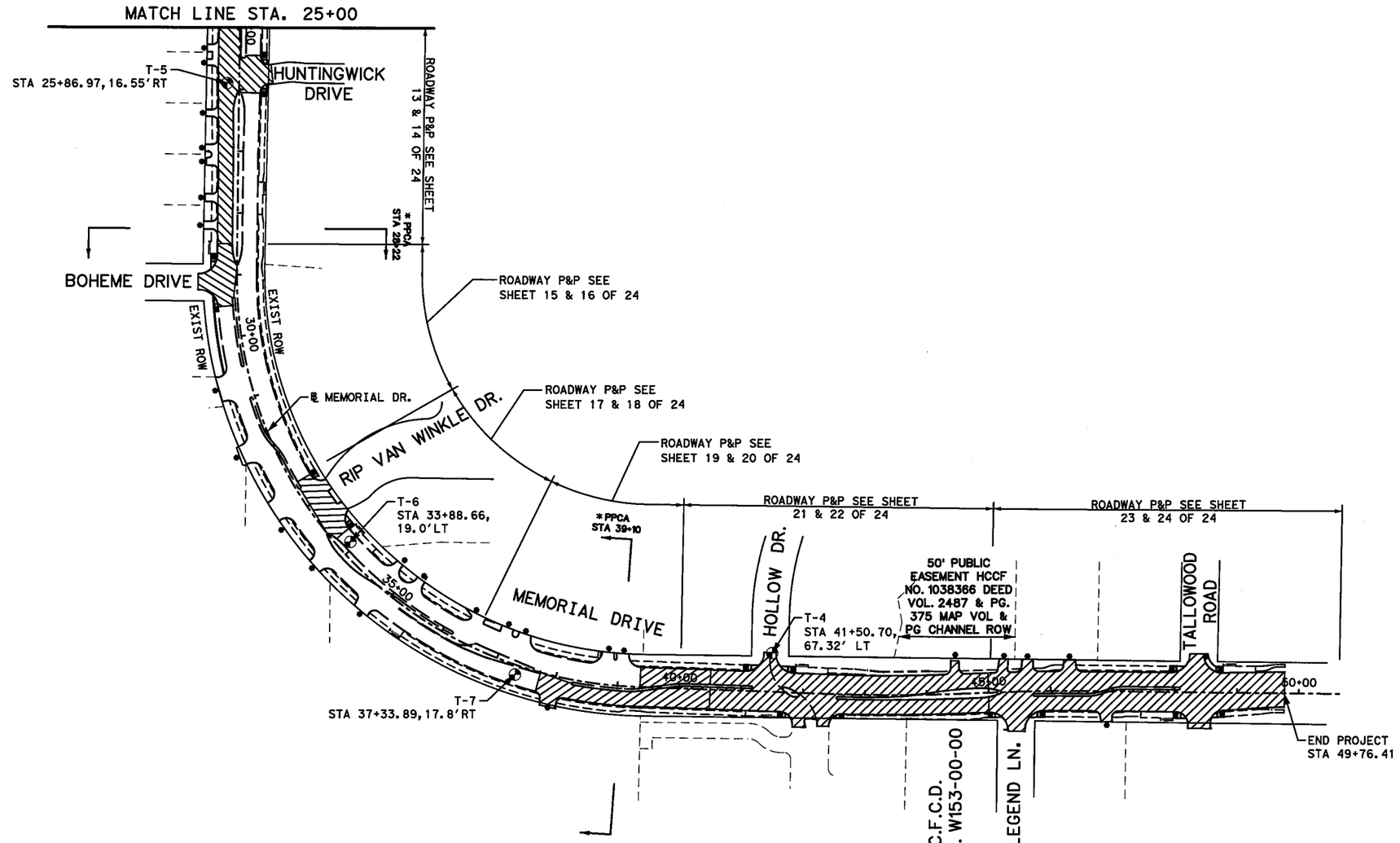

LEGEND

- BENCHMARKS
- SOIL BORING
- PARCEL BOUNDARY

*PPCA=POTENTIAL PETROLEUM CONTAMINATED AREAS

0 200 400

(IN FEET)

SCALE: PLAN 1"=200'

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED PROFESSIONAL ENGINEER
04/07/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

PROJECT LAYOUT SHEET

SHEET 2 OF 2

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	5

ACCEPTED AND FILED
PUBLIC WORKS AND ENGINEERING
67862

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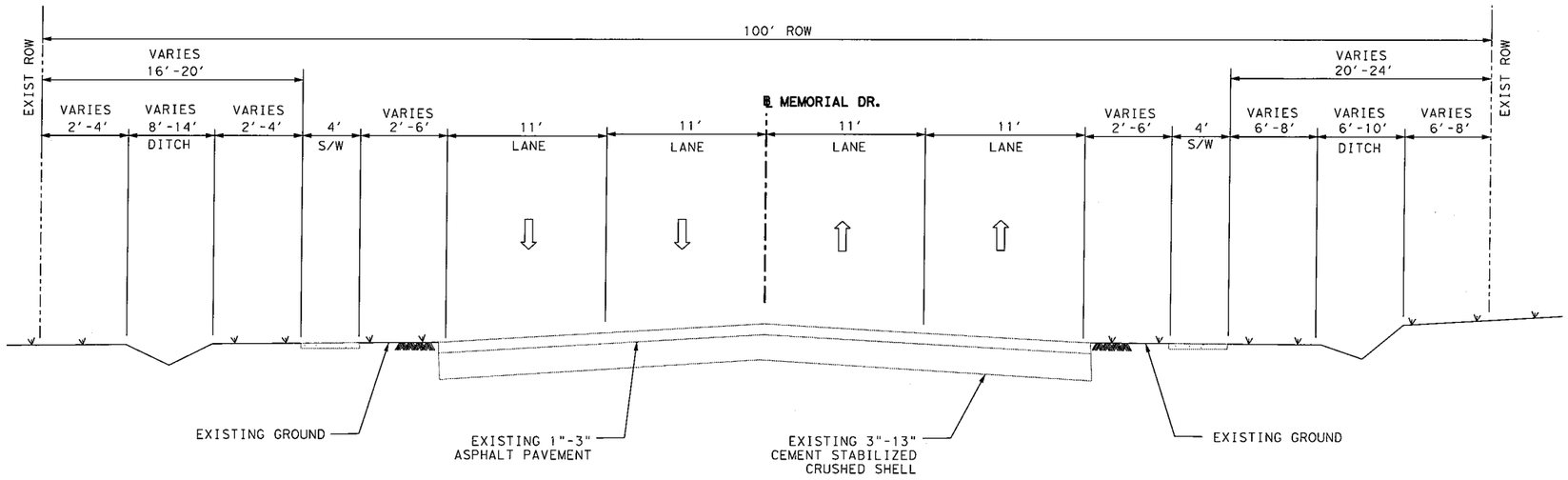
LEGEND

⇨ EXISTING TRAFFIC DIRECTION

S/W SIDEWALK



EXIST TYPICAL SECTION

N.T.S.

POSTED SPEED 35 MPH

STATE OF TEXAS
MARK WOODWARD
98672
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

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67862
CITY SECRETARY
HOUSTON, TEXAS

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

EXIST TYPICAL SECTION

SHEET 1 OF 1

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	6

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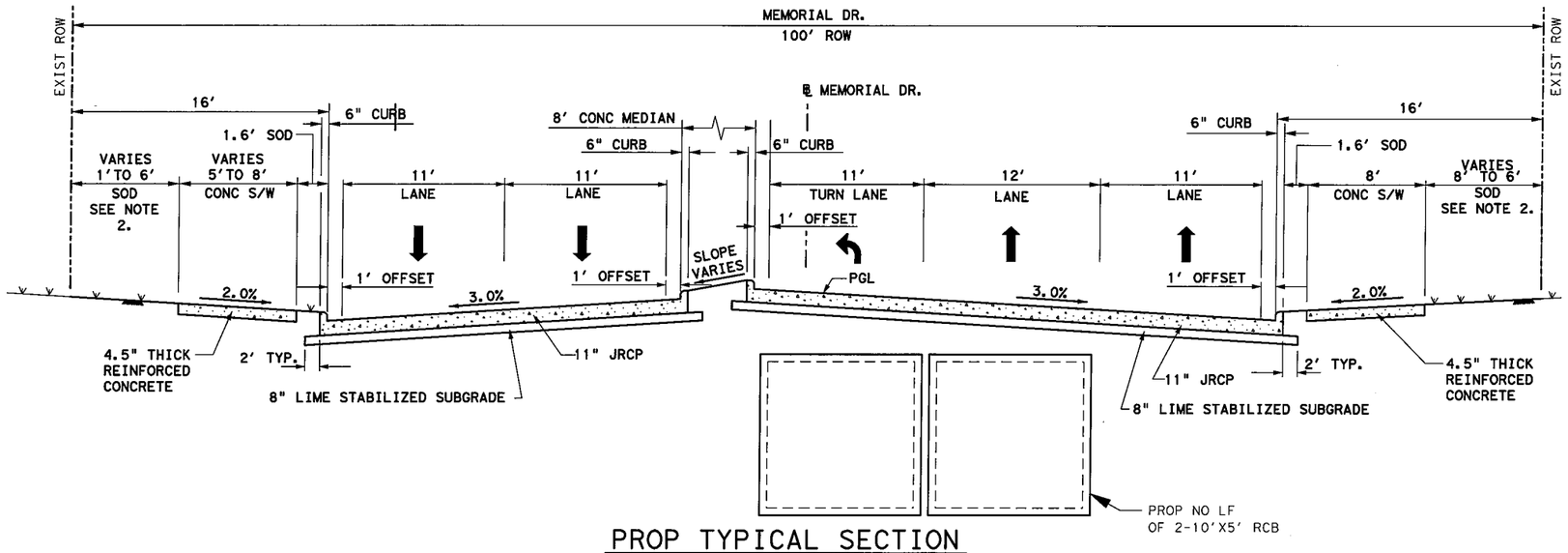
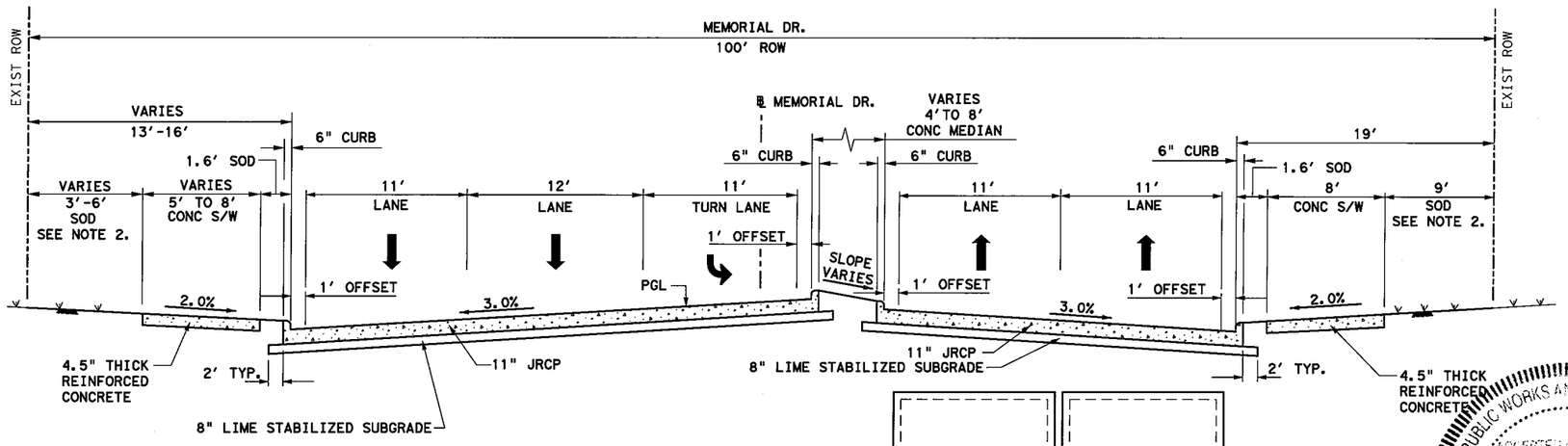


PROP TYPICAL SECTION

STA 07+48 TO STA 09+50
STA 16+82 TO STA 18+40
STA 31+20 TO STA 33+69
STA 39+65 TO STA 41+18
STA 46+88 TO END PROJECT



PROP TYPICAL SECTION

BEGIN TO STA 6+62
STA 15+24 TO STA 16+82
STA 29+37 TO STA 31+20
STA 38+27 TO STA 39+65
STA 45+72 TO STA 46+88

POSTED SPEED 35 MPH

LEGEND

➡	DIRECTION OF TRAVEL
▱	PROP CONC PAVEMENT
S/W	SIDEWALK
JRCP	JOINT REINFORCED CONCRETE PAVEMENT
PGL	PROFILE GRADE LINE

NOTES:

1. REFER TO DETAILS UNDER ROADWAY STANDARDS FOR PERTINENT INFORMATION.
2. BLOCK SOD, ITEM 162-6002; FERTILIZER, ITEM 166-6001; WATER, ITEM 168-6001: REFERENCE STANDARD TXDOT FERTILIZER, SEED, STRAW, COMPOST, AND WATER SHEET.
3. EXTEND CROSS SLOPES TO ADJOIN PAVEMENT IF NO MEDIAN IS PROPOSED.
4. ALL DISTURBED AREAS TO RECEIVE BLOCK SOD.
5. SEE SHT 460 (L4.18), PLANTING DETAIL SHEETS FOR REQUIREMENTS OF SOIL PROFILE, GRADING, MATERIALS, DEPTHS AND OTHER ITEMS.

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED
PROFESSIONAL ENGINEER

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614 03/04/2020

PUBLIC WORKS AND ENGINEERING
ACCEPTANCE
67862
CITY
HOUSTON, TEXAS

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

PROPOSED TYPICAL SECTIONS

SHEET 1 OF 3

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	7

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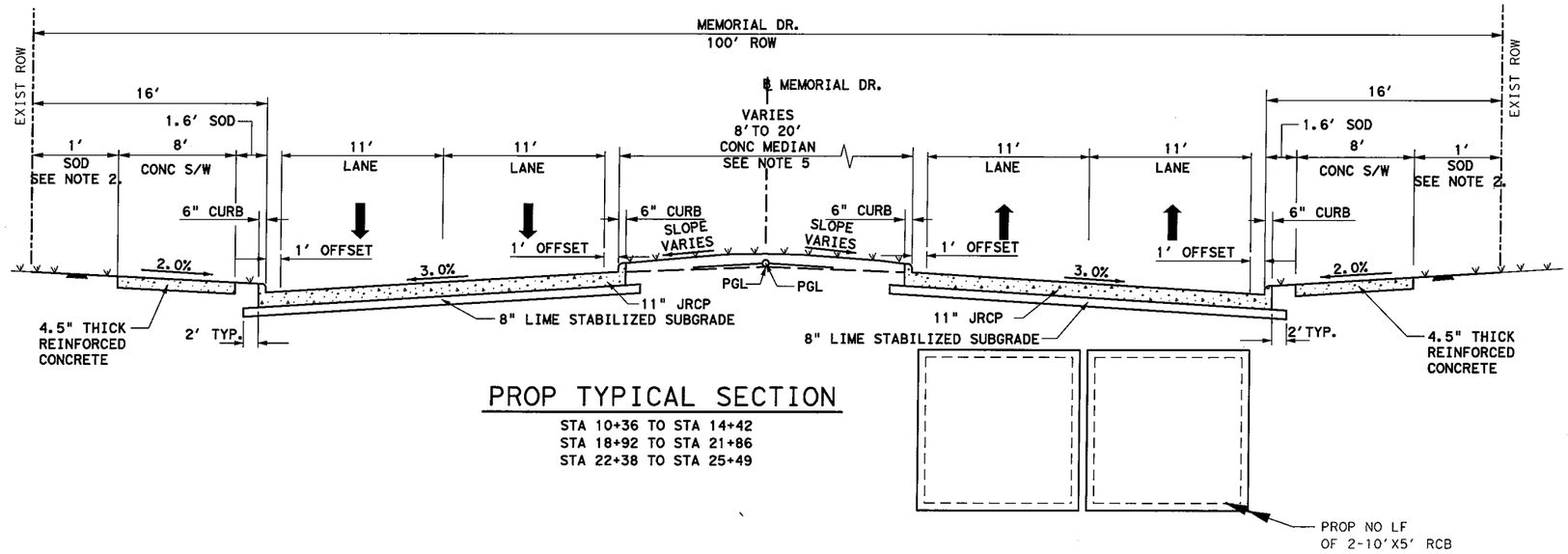
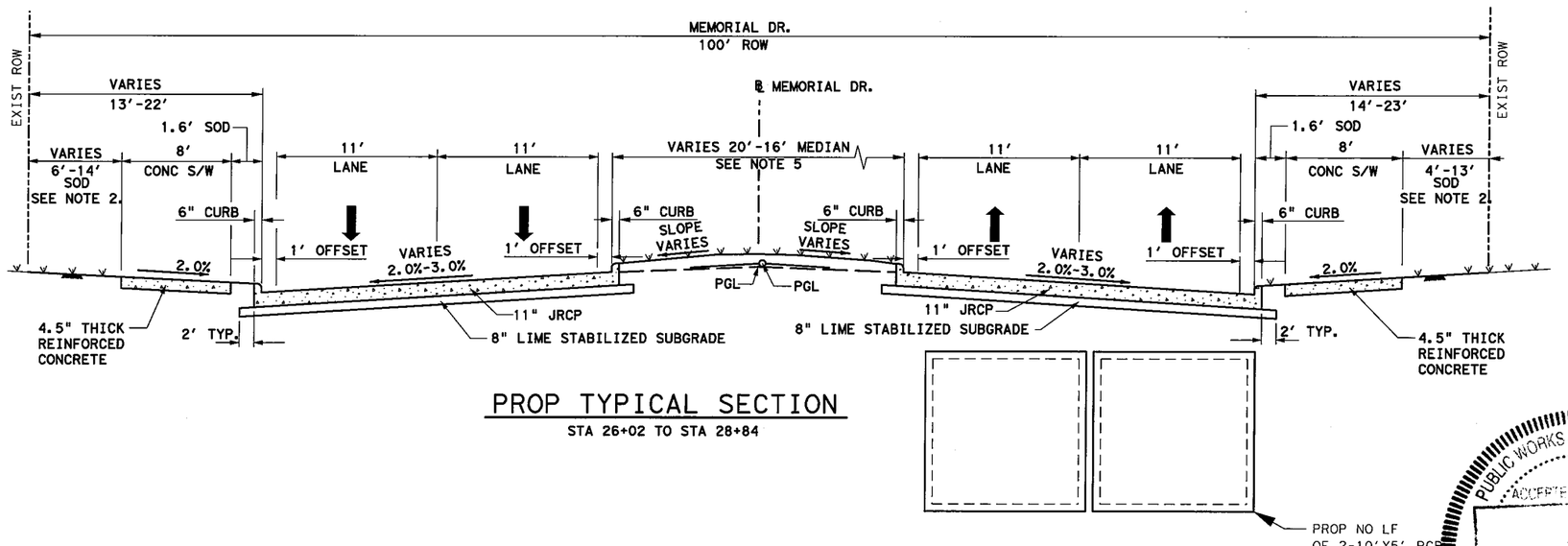


PROP TYPICAL SECTION

STA 10+36 TO STA 14+42
STA 18+92 TO STA 21+86
STA 22+38 TO STA 25+49



PROP TYPICAL SECTION

STA 26+02 TO STA 28+84

POSTED SPEED 35 MPH

LEGEND

➡	DIRECTION OF TRAVEL
▱	PROP CONC PAVEMENT
S/W	SIDEWALK
JRCP	JOINTED REINFORCED CONCRETE PAVEMENT
PGL	PROFILE GRADE LINE

NOTES:

1. REFER TO DETAILS UNDER ROADWAY STANDARDS FOR PERTINENT INFORMATION.
2. BLOCK SOD, ITEM 162-6002; FERTILIZER, ITEM 166-6001; WATER, ITEM 168-6001: REFERENCE STANDARD TXDOT FERTILIZER, SEED, STRAW, COMPOST, AND WATER SHEET.
3. EXTEND CROSS SLOPES TO ADJOIN PAVEMENT IF NO MEDIAN IS PROPOSED.
4. ALL DISTURBED AREAS TO RECEIVE BLOCK SOD.
5. SEE SHT 460 (L4.18), PLANTING DETAIL SHEETS FOR REQUIREMENTS OF SOIL PROFILE, GRADING, MATERIALS, DEPTHS AND OTHER ITEMS.

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED
PROFESSIONAL ENGINEER
03/04/2020
Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

PROPOSED TYPICAL SECTIONS

SHEET 2 OF 3

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	8

PUBLIC WORKS AND ENGINEERING
ACCEPTED
67862
CITY
HOUSTON, TEXAS

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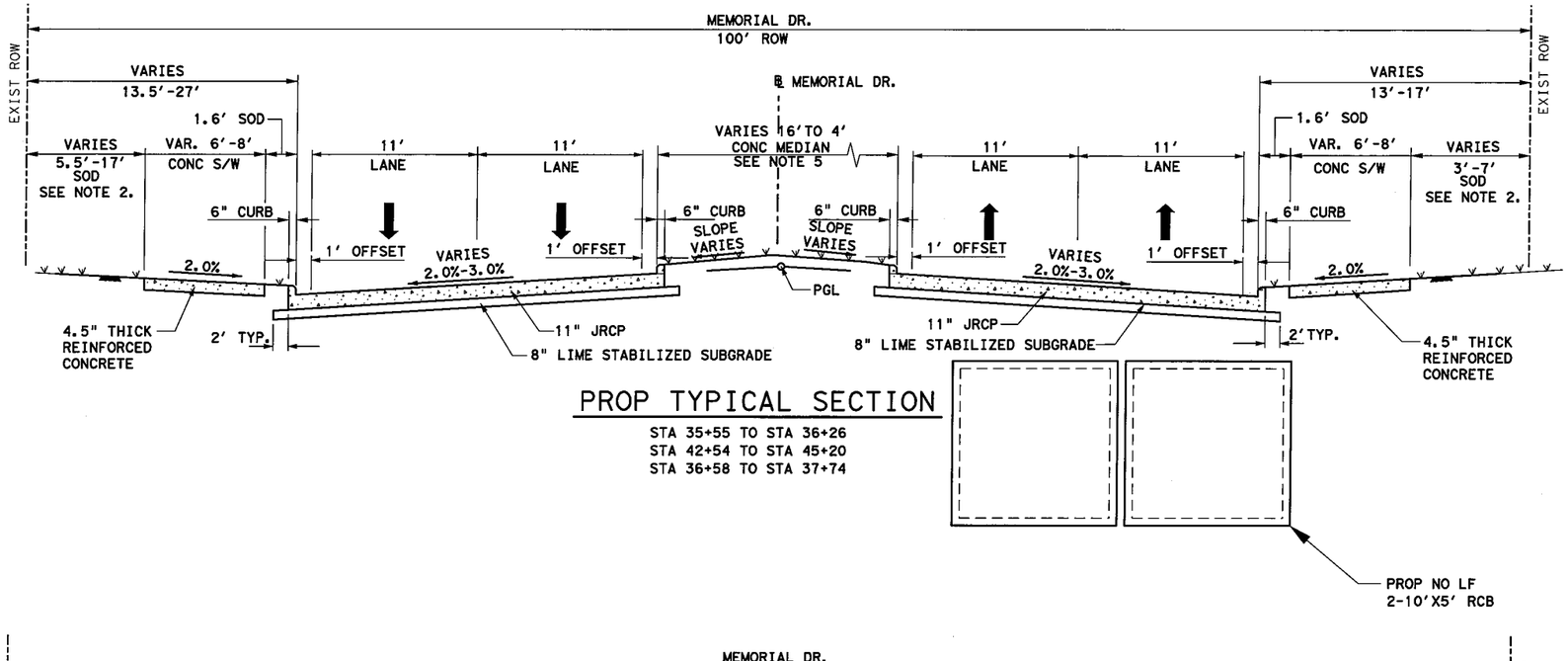
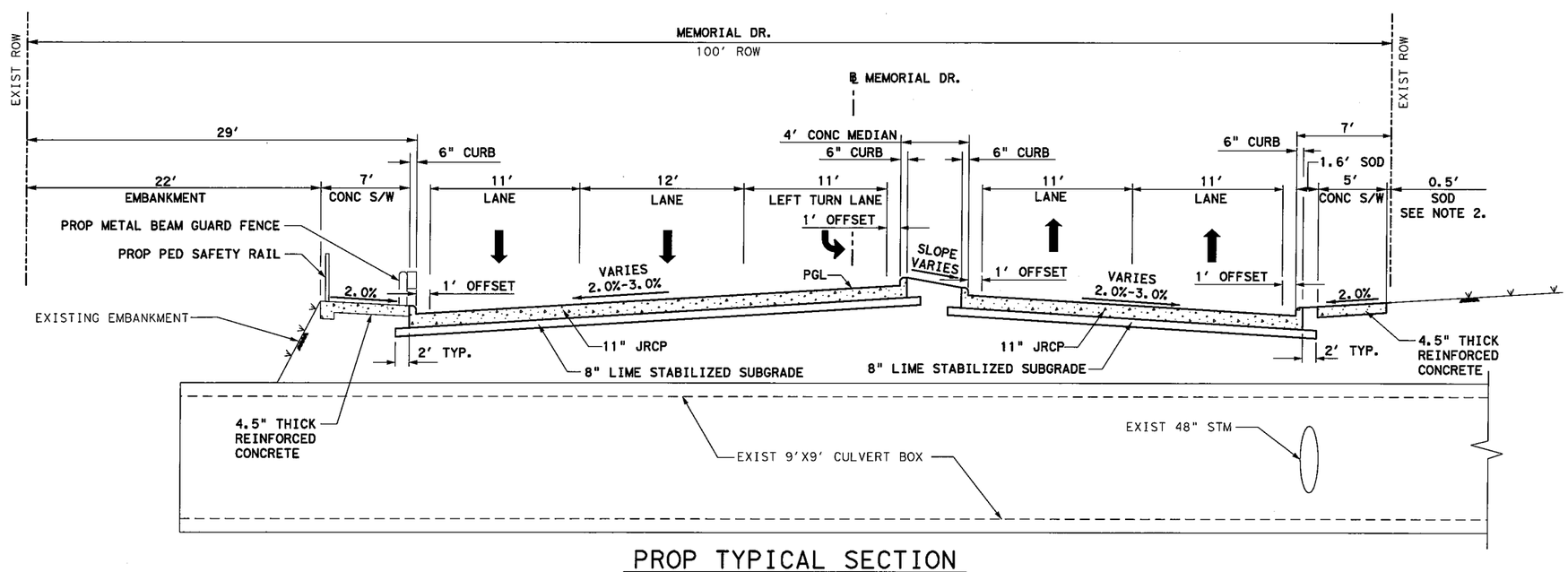


PROP TYPICAL SECTION

STA 35+55 TO STA 36+26
STA 42+54 TO STA 45+20
STA 36+58 TO STA 37+74



PROP TYPICAL SECTION

STA 43+41.28

POSTED SPEED 35 MPH

LEGEND

- DIRECTION OF TRAVEL
- PROP CONC PAVEMENT
- S/W SIDEWALK
- JRCP JOINTED REINFORCED CONCRETE PAVEMENT
- PGL PROFILE GRADE LINE

PUBLIC WORKS AND ENGINEERING
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67862
CITY OF HOUSTON, TEXAS

NOTES:

1. REFER TO DETAILS UNDER ROADWAY STANDARDS FOR PERTINENT INFORMATION.
2. BLOCK SOD, ITEM 162-6002; FERTILIZER, ITEM 166-6001; WATER, ITEM 168-6001: REFERENCE STANDARD TXDOT FERTILIZER, SEED, STRAW, COMPOST, AND WATER SHEET.
3. EXTEND CROSS SLOPES TO ADJOIN PAVEMENT IF NO MEDIAN IS PROPOSED.
4. ALL DISTURBED AREAS TO RECEIVE BLOCK SOD.
5. SEE SHT 460 (L4.18), PLANTING DETAIL SHEETS FOR REQUIREMENTS OF SOIL PROFILE, GRADING, MATERIALS, DEPTHS AND OTHER ITEMS.

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED
PROFESSIONAL ENGINEER
03/04/2020
Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

PROPOSED TYPICAL SECTIONS

SHEET 3 OF 3

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
S:\K DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CK DWG:	HOU	HARRIS	0912	72	391	9

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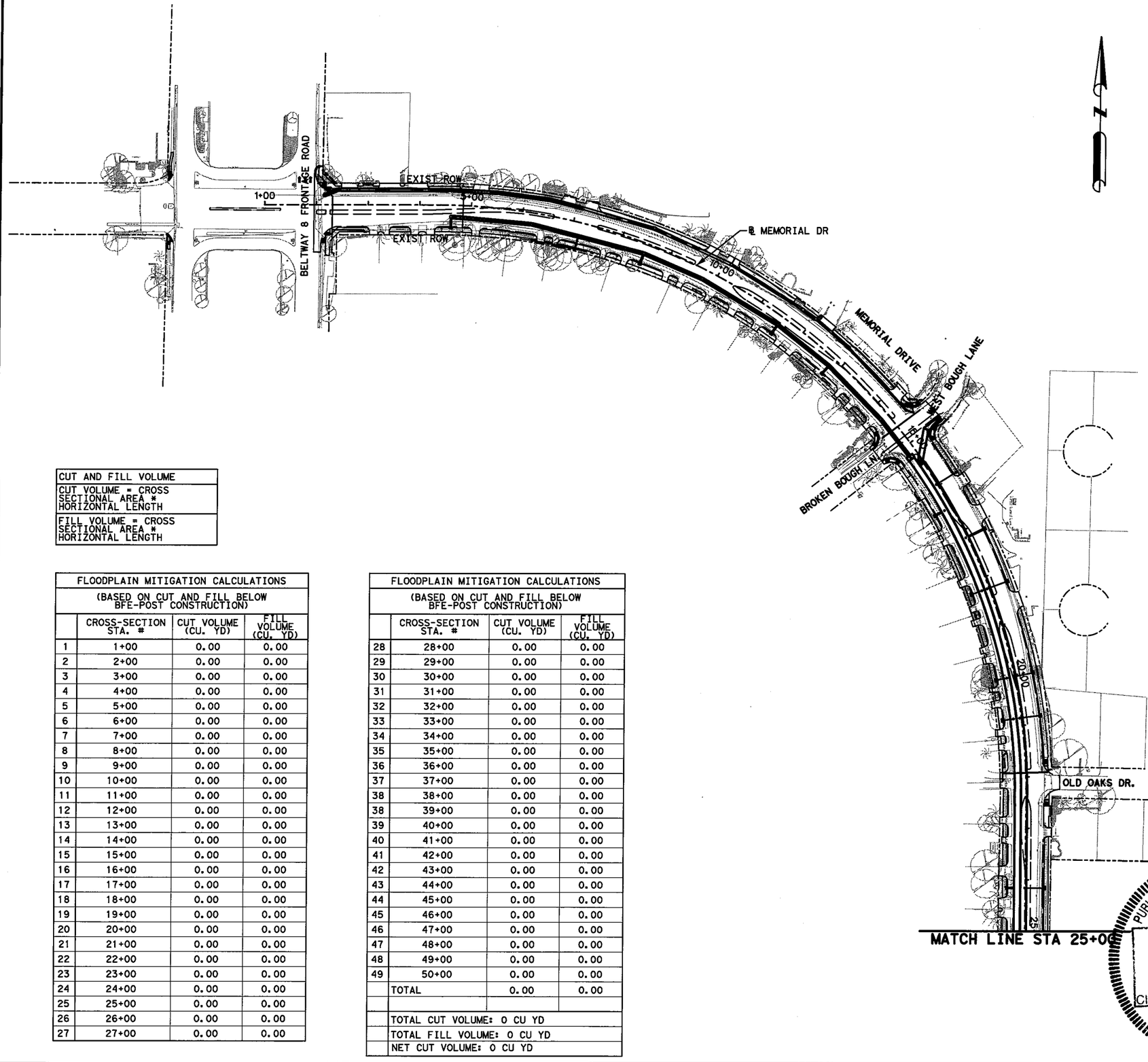

CUT AND FILL VOLUME
CUT VOLUME = CROSS SECTIONAL AREA * HORIZONTAL LENGTH
FILL VOLUME = CROSS SECTIONAL AREA * HORIZONTAL LENGTH

FLOODPLAIN MITIGATION CALCULATIONS (BASED ON CUT AND FILL BELOW BFE-POST CONSTRUCTION)			
	CROSS-SECTION STA. #	CUT VOLUME (CU. YD)	FILL VOLUME (CU. YD)
1	1+00	0.00	0.00
2	2+00	0.00	0.00
3	3+00	0.00	0.00
4	4+00	0.00	0.00
5	5+00	0.00	0.00
6	6+00	0.00	0.00
7	7+00	0.00	0.00
8	8+00	0.00	0.00
9	9+00	0.00	0.00
10	10+00	0.00	0.00
11	11+00	0.00	0.00
12	12+00	0.00	0.00
13	13+00	0.00	0.00
14	14+00	0.00	0.00
15	15+00	0.00	0.00
16	16+00	0.00	0.00
17	17+00	0.00	0.00
18	18+00	0.00	0.00
19	19+00	0.00	0.00
20	20+00	0.00	0.00
21	21+00	0.00	0.00
22	22+00	0.00	0.00
23	23+00	0.00	0.00
24	24+00	0.00	0.00
25	25+00	0.00	0.00
26	26+00	0.00	0.00
27	27+00	0.00	0.00

FLOODPLAIN MITIGATION CALCULATIONS (BASED ON CUT AND FILL BELOW BFE-POST CONSTRUCTION)			
	CROSS-SECTION STA. #	CUT VOLUME (CU. YD)	FILL VOLUME (CU. YD)
28	28+00	0.00	0.00
29	29+00	0.00	0.00
30	30+00	0.00	0.00
31	31+00	0.00	0.00
32	32+00	0.00	0.00
33	33+00	0.00	0.00
34	34+00	0.00	0.00
35	35+00	0.00	0.00
36	36+00	0.00	0.00
37	37+00	0.00	0.00
38	38+00	0.00	0.00
38	39+00	0.00	0.00
39	40+00	0.00	0.00
40	41+00	0.00	0.00
41	42+00	0.00	0.00
42	43+00	0.00	0.00
43	44+00	0.00	0.00
44	45+00	0.00	0.00
45	46+00	0.00	0.00
46	47+00	0.00	0.00
47	48+00	0.00	0.00
48	49+00	0.00	0.00
49	50+00	0.00	0.00
	TOTAL	0.00	0.00
	TOTAL CUT VOLUME: 0 CU YD		
	TOTAL FILL VOLUME: 0 CU YD		
	NET CUT VOLUME: 0 CU YD		

BENCHMARK:

CITY OF HOUSTON MONUMENT 4957-7713, A BRASS DISK IN CONCRETE, LOCATED ON MEMORIAL DRIVE APPROXIMATELY 150 FEET SOUTH OF OLD OAKS DRIVE INTERSECTION.

ELEV. 67.80 FEET NAVD 1988

NOTES:

1. FLOODPLAIN BOUNDARIES ARE OUTSIDE THE PROJECT LIMITS AND DETERMINED FROM FEMA FLOOD INSURANCE RATE MAP NO. 48201C0645L.
2. ELEVATIONS ABOVE THE BASE FLOOD ELEVATION WERE NOT CONSIDERED IN THESE CALCULATIONS.
3. THE CUT AND FILL VOLUMES WERE TABULATED USING AUTOCAD CIVIL3D 2014. PLEASE CONTACT PROJECT MANAGER FOR FURTHER DETAILS.
4. PER CITY OF HOUSTON SECTION 01576 - WASTE MATERIAL DISPOSAL, NO FILL IS TO BE PLACED WITHIN THE FLOODPLAIN. CONTACT THE CITY OF HOUSTON FLOODPLAIN MANAGEMENT OFFICE (713-535-7823) 48 HOURS PRIOR TO ANY WORK WITHIN THE FLOODPLAIN.
5. EXCESS SOIL TO BE HAULED OFF OF PROJECT SITE.

0 200 400

(IN FEET)

SCALE: PLAN 1": 200'

STATE OF TEXAS
WEIMIN LI
88740
LICENSED PROFESSIONAL ENGINEER

2-6-20

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

FLOODPLAIN MITIGATION PLAN

SHEET 1 OF 2

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	10

PUBLIC WORKS AND ENGINEERING
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67862
CITY
HOUSTON, TEXAS

ICCarrillo
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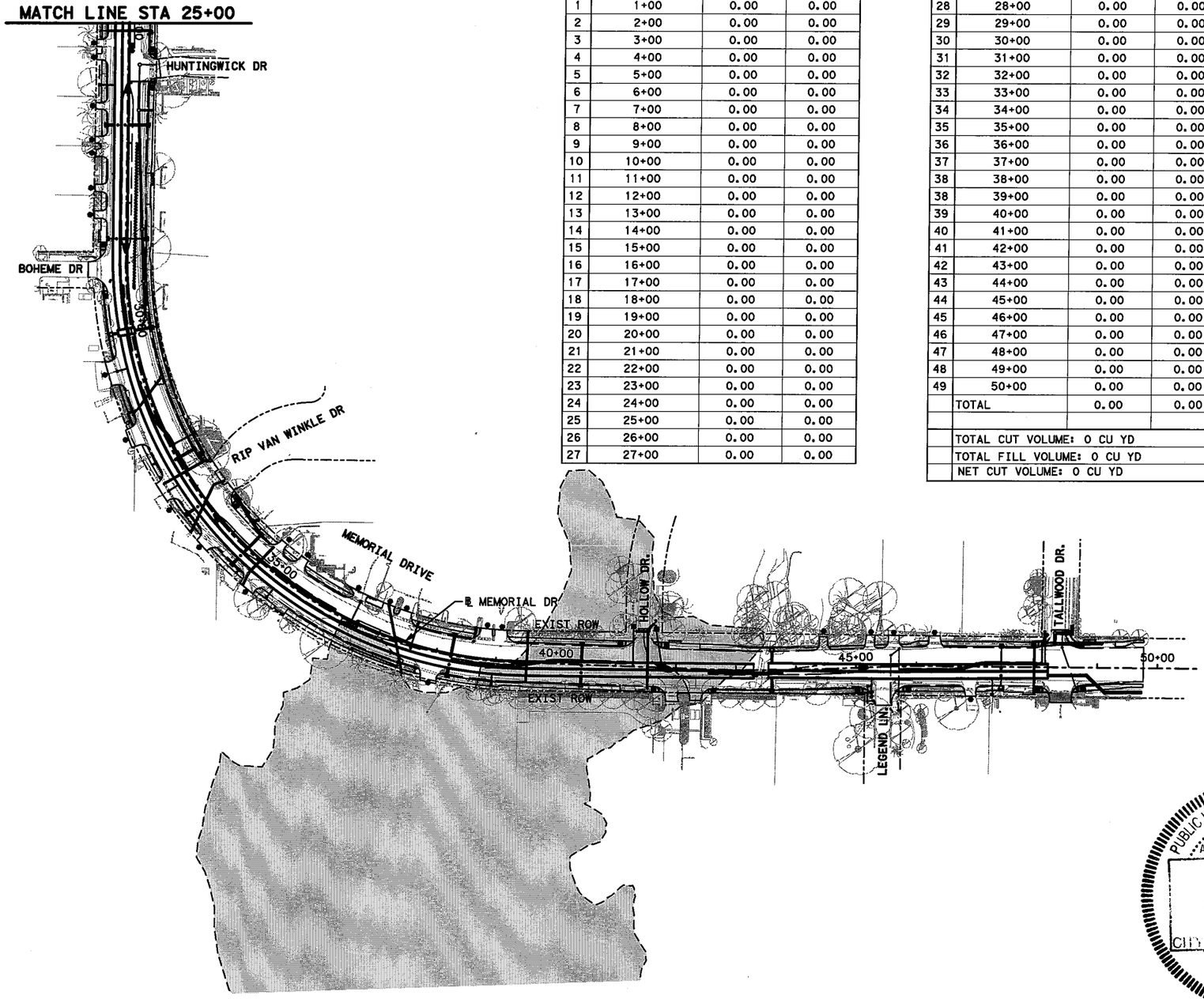

CUT AND FILL VOLUME
CUT VOLUME = CROSS SECTIONAL AREA * HORIZONTAL LENGTH
FILL VOLUME = CROSS SECTIONAL AREA * HORIZONTAL LENGTH

FLOODPLAIN MITIGATION CALCULATIONS (BASED ON CUT AND FILL BELOW BFE-POST CONSTRUCTION)			
	CROSS-SECTION STA. #	CUT VOLUME (CU. YD)	FILL VOLUME (CU. YD)
1	1+00	0.00	0.00
2	2+00	0.00	0.00
3	3+00	0.00	0.00
4	4+00	0.00	0.00
5	5+00	0.00	0.00
6	6+00	0.00	0.00
7	7+00	0.00	0.00
8	8+00	0.00	0.00
9	9+00	0.00	0.00
10	10+00	0.00	0.00
11	11+00	0.00	0.00
12	12+00	0.00	0.00
13	13+00	0.00	0.00
14	14+00	0.00	0.00
15	15+00	0.00	0.00
16	16+00	0.00	0.00
17	17+00	0.00	0.00
18	18+00	0.00	0.00
19	19+00	0.00	0.00
20	20+00	0.00	0.00
21	21+00	0.00	0.00
22	22+00	0.00	0.00
23	23+00	0.00	0.00
24	24+00	0.00	0.00
25	25+00	0.00	0.00
26	26+00	0.00	0.00
27	27+00	0.00	0.00

FLOODPLAIN MITIGATION CALCULATIONS (BASED ON CUT AND FILL BELOW BFE-POST CONSTRUCTION)			
	CROSS-SECTION STA. #	CUT VOLUME (CU. YD)	FILL VOLUME (CU. YD)
28	28+00	0.00	0.00
29	29+00	0.00	0.00
30	30+00	0.00	0.00
31	31+00	0.00	0.00
32	32+00	0.00	0.00
33	33+00	0.00	0.00
34	34+00	0.00	0.00
35	35+00	0.00	0.00
36	36+00	0.00	0.00
37	37+00	0.00	0.00
38	38+00	0.00	0.00
38	39+00	0.00	0.00
39	40+00	0.00	0.00
40	41+00	0.00	0.00
41	42+00	0.00	0.00
42	43+00	0.00	0.00
43	44+00	0.00	0.00
44	45+00	0.00	0.00
45	46+00	0.00	0.00
46	47+00	0.00	0.00
47	48+00	0.00	0.00
48	49+00	0.00	0.00
49	50+00	0.00	0.00
	TOTAL	0.00	0.00
	TOTAL CUT VOLUME: 0 CU YD		
	TOTAL FILL VOLUME: 0 CU YD		
	NET CUT VOLUME: 0 CU YD		

BENCHMARK:

CITY OF HOUSTON MONUMENT 4957-7713, A BRASS DISK IN CONCRETE, LOCATED ON MEMORIAL DRIVE APPROXIMATELY 150 FEET SOUTH OF OLD OAKS DRIVE INTERSECTION.

ELEV. 67.80 FEET NAVD 1988

LEGEND

500-YEAR FLOODPLAIN - FEMA FIRM NO. 48201C0645L (0.2% ANNUAL CHANGE FLOOD EVENT)

NOTES:

1. FLOODPLAIN BOUNDARIES ARE DETERMINED FROM FEMA FLOOD INSURANCE RATE MAP NO. 48201C0645L.
2. ELEVATIONS ABOVE THE BASE FLOOD ELEVATION WERE NOT CONSIDERED IN THESE CALCULATIONS.
3. THE CUT AND FILL VOLUMES WERE TABULATED USING AUTOCAD CIVIL3D 2014. PLEASE CONTACT PROJECT MANAGER FOR FURTHER DETAILS.
4. PER CITY OF HOUSTON SECTION 01576 - WASTE MATERIAL DISPOSAL, NO FILL IS TO BE PLACED WITHIN THE FLOODPLAIN. CONTACT THE CITY OF HOUSTON FLOODPLAIN MANAGEMENT OFFICE (713-535-7823) 48 HOURS PRIOR TO ANY WORK WITHIN THE FLOODPLAIN.
5. EXCESS SOIL TO BE HAULED OFF OF PROJECT SITE.

0 200 400
(IN FEET)
SCALE: PLAN 1":200'

STATE OF TEXAS
WEIMIN LI
88740
LICENSED PROFESSIONAL ENGINEER
2-6-20

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

PUBLIC WORKS AND ENGINEERING
ACCEPTED AND FILED
67862
CITY SECRETARY
HOUSTON, TEXAS

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

FLOODPLAIN MITIGATION PLAN

SHEET 2 OF 2

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CK DWG:	HOU	HARRIS	0912	72	391	11

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STANDARD HCFCD NOTES FOR PLANS

1. OBTAIN AND COMPLY WITH ALL APPLICABLE CITY, COUNTY, STATE, AND FEDERAL PERMITS AND APPROVALS, WITH ASSISTANCE FROM ENGINEER, IF NECESSARY. OBTAIN PERMIT(CERTIFICATION) FROM HARRIS COUNTY ENGINEER TO ENTER HARRIS COUNTY FLOOD CONTROL DISTRICT RIGHT-OF-WAY.

2. NOTIFY THE HARRIS COUNTY FLOOD CONTROL DISTRICT'S DEVELOPMENT COORDINATION AND INSPECTION DEPARTMENT IN WRITING AT LEAST 48 HOURS PRIOR TO CONSTRUCTION. SUBMIT THE HCFCD 48 HOUR PRE-CONSTRUCTION NOTIFICATION FORM, A COPY OF THE APPROVED CONSTRUCTION DRAWINGS, AND A COPY OF THE CORPS OF ENGINEER INDIVIDUAL SECTION 404 PERMIT OR COMPLIANCE WITH NATIONWIDE PERMIT, IF APPLICABLE, TO HCFCD, 9900 NORTHWEST FREEWAY, HOUSTON, TEXAS 77092, ATTN: DEVELOPEMENT COORDINATION AND INSPECTION DEPT. BY HAND DELIVERY, BY EMAIL DCID@HCFCD.ORG, OR FAX TO 713-684-4129(FAX NUMBER).

3. ENGINEER SHALL SUBMIT CERTIFICATION LETTER AND RECORD DRAWINGS TO THE HARRIS COUNTY FLOOD CONTROL DISTRICT'S DEVELOPMENT COORDINATION AND INSPECTION SECTION REQUESTING INSPECTION OF ITEMS CONSTRUCTED IN HARRIS COUNTY FLOOD CONTROL DISTRICT RIGHT-OF-WAY. PRIOR TO REQUESTING INSPECTION, THE DRAINAGE RIGHT-OF-WAY AND/OR EASEMENTS SHALL BE STAKED AND FLAGGED.

4. PROTECT, MAINTAIN, AND RESTORE EXISTING BACKSLOPE DRAINAGE SYSTEMS.

5. BACKSLOPE SWALE AND INTERCEPTOR STRUCTURE ELEVATIONS AND LOCATIONS SHOWN ON PLANS ARE APPROXIMATE. FINAL ELEVATIONS AND LOCATIONS SHALL BE FIELD VERIFIED BY THE ENGINEER PRIOR TO INSTALLATION.

6. ESTABLISH TURF GRASS ON ALL DISTURBED AREAS WITHIN THE CHANNEL OR DETENTION RIGHT-OF-WAY, EXCEPT THE CHANNEL BOTTOM AND WHERE STRUCTURAL EROSION MEASURES ARE USED. MINIMUM ACCEPTANCE CRITERIA ARE 75% COVERAGE OF LIVE BERMUDA GRASS AND NO EROSION OR RILLS DEEPER THAN 4".

7. PERFORM ALL ACTIVITIES WITHIN HARRIS COUNTY FLOOD CONTROL DISTRICT RIGHT-OF-WAY IN ACCORDANCE WITH THE MOST RECENT HARRIS COUNTY FLOOD CONTROL DISTRICT STANDARD SPECIFICATIONS BOOK.

8. EXCAVATE CHANNEL FLOWLINE TO DESIGN ELEVATION AS SHOWN ON PLANS AND DOWNSTREAM, AS NECESSARY, TO ENSURE NO WATER REMAINS IN THE FACILITY(STORM SEWER, LATERAL CHANNEL, OR DRY BOTTOM DETENTION BASIN) DURING NORMAL WATER SURFACE CONDITIONS IN THE CHANNEL, SO THE FACILITY WILL FUNCTION AS INTENDED. FOR WET BOTTOM DETENTION BASINS, ENSURE NO WATER IS ABOVE THE DESIGN LEVEL IN THE WET BOTTOM DURING NORMAL WATER SURFACE CONDITIONS IN THE CHANNEL.

9. MAINTAIN FLOW IN CHANNEL DURING CONSTRUCTION AND RESTORE CHANNEL TO ORIGINAL CONDITION.

10. REMOVE ALL EXCAVATED MATERIAL FROM THE HARRIS COUNTY FLOOD CONTROL DISTRICT OR DRAINAGE RIGHT-OF-WAY. NO FILL IS TO BE PLACED WITHIN A DESIGNATED FLOOD PLAIN AREA WITHOUT FIRST OBTAINING A FILL PERMIT FROM THE APPROPRIATE JURISDICTIONAL AUTHORITY.

STATE OF TEXAS
MARK WOODWARD
98572
LICENSED PROFESSIONAL ENGINEER
2-6-20

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation ©2020

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

HCFCD GENERAL NOTES

SHEET 1 OF 1

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	12

PUBLIC WORKS AND ENGINEERING
67862
CITY
HOUSTON, TEXAS

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1. PROPERTY DESCRIPTION

I. LOCATION INFORMATION

A. HARRIS COUNTY COMMISSIONER'S PRECINCT:
☐ 1 ☐ 2 ☐ 3 ☐ 4

B. KEY MAP: _____

C. ADDRESS: _____

II. LEGAL DESCRIPTION

A. ACREAGE: _____

B. ☐ SUBDIVISION: _____

☐ SURVEY & ABSTRACT: _____

C. ADJACENT ROADS: _____

III. PLATTING

A. SUBDIVISION PLAT
☐ PROPOSED PLAT / REPLAT
☐ RECORDED PLAT / REPLAT

B. STREETS PROPOSED
☐ PUBLIC
☐ PRIVATE
☐ PUBLIC & PRIVATE
☐ NONE

PLAT NAME: _____

IV. JURISDICTIONS

☐ CITY OF _____
☐ ETJ, CITY OF HOUSTON
☐ ETJ, CITY OF _____
☐ NO ETJ
☐ UTILITY DISTRICT (NAME) _____

V. HCAD ACCOUNT NOS. (ALL)

_____

2. SITE DETENTION DRAINAGE

I. PROPOSED DRAINAGE AREA

☐ NEW DEVELOPMENT AREA: _____
☐ RE-DEVELOPMENT AREA (AMOUNT INCREASED IMPERVIOUS AREA): _____
☒ LOW IMPACT DEVELOPMENT (LID)
METHOD/DESCRIPTION _____

II. METHODOLOGY

HCFCD PCPM DETENTION METHOD USED:
☐ METHOD 1 (LESS THAN 20 ACRES)
☐ METHOD 2 (20 ACRES TO 640 ACRES)
☐ METHOD 3 (GREATER THAN 640 ACRES)
☐ OTHER _____

III. DETENTION VOLUME & OUTFALL

OUTFALL TO:
☐ .65, H.C.F.C.D. CHANNEL, (H.C.F.C.D. UNIT NO.) _____
☐ .75, EXISTING STORM SEWER (OWNER & OPERATOR) _____
☐ 1.00, ROADSIDE DITCH, (OWNER & ROAD NAME) _____
☐ OTHER (OWNER & OPERATOR) _____

IV. STORMWATER DETENTION BASIN INFORMATION

A. HCFCD PCPM SUMMARY TABLE SEE SHEET _____ OF THESE PLANS.

DETENTION BASIN SERVICE AREA	acres		
STORM EVENT	50% EXCEEDANCE (2-YEAR)	10% EXCEEDANCE (10-YEAR)	1% EXCEEDANCE (100-YEAR)
MAXIMUM ALLOWABLE OUTFLOW (PRE-DEVELOPMENT PEAK FLOW)			
MAXIMUM OUTFLOW PROVIDED (PEAK FLOW FROM BASIN)			
LOWEST NATURAL/FINISHED GROUND OR FINISHED FLOOR ELEVATION ESTIMATE			
DESIGN WATER SURFACE ELEVATION			
MINIMUM STORAGE REQUIRED (ac-ft)			
DETENTION STORAGE PROVIDED (ac-ft)			
STORAGE RATE PROVIDED (ac-ft/ac)			
OUTFLOW VELOCITY INTO CHANNEL (ft/sec)			
DRAIN TIME – 1% ONLY (hours)			
EMERGENCY OVERFLOW (TYPE, SIZE, ELEVATION, ETC.)			

B. DETENTION BASIN TO BE MAINTAINED BY _____

C. DETENTION SERVICE AREA MAP ON SHEET _____

D. ADDITIONAL CRITERIA FOR PUMPED DETENTION BASINS
VOLUME OF PUMPED 1% EXCEEDANCE STORAGE VOLUME = _____ ACFT _____ % OF TOTAL VOLUME
MAXIMUM DESIGN OUTFLOW VELOCITY INTO HCFCD CHANNEL = _____ FT/SEC
DRAIN TIME FOR BASIN = _____ HOURS BASED ON _____ HEAD CONDITIONS

V. DETENTION PROVIDED IN OTHER PLANS:

HCFCD PROJECT No. _____ DATE SIGNED BY HCFCD: _____
PLAN TITLE _____
DETENTION POND SERVICE AREA MAP IS PROVIDED ON SHEET _____
ENGINEERING FIRM _____
DETENTION BASIN MAINTAINED BY: _____

VI. FLOW RESTRICTOR SIZE

OUTFALL PIPE SIZE: _____
RESTRICTOR PIPE SIZE: _____
RESTRICTOR PLATE DIMENSION: _____

VII. DETENTION PROVIDED BY

☐ REGIONAL DETENTION BASIN SYSTEM (APPROVED H.C. PRJ NO.): _____

FOR PROJECTS LOCATED IN ANY FLOODPLAIN

Development constructed or placed in accordance with these plans will comply with all provisions of the designated Floodplain Administrator.
No net fill is allowed in the flood plain and no fill is allowed in the floodway.

OFFSITE SHEET FLOW: (100 YEAR)

OFFSITE SHEET FLOW MAPPING, TOTAL DISCHARGE CALCULATIONS, AND DESIGN ACCOMODATIONS ARE SHOWN ON SHEET ____ OR, AS PRESENTED IN THE APPROVED DRAINAGE STUDY ENTITLED _____.

TOTAL ACREAGE = ____
TOTAL DISCHARGE = ____

NOTE: ALL OFFSITE SHEET FLOW FROM ADJACENT PROPERTIES MUST BE IDENTIFIED AND PROPERLY ACCOUNTED FOR IN THE PROJECT. THE SIGNING ENGINEER HEREBY CERTIFIES THAT THESE AREAS HAVE BEEN ADDRESSED.

3. SWQ DISCHARGE INTO FCD FACILITY

I. SWPPP: CONSTRUCTION MEASURES. (Must complete)

☒ DISTURBS >1AC. SITE PLAN & DETAILS ON SHEET(S) _____
☐ DISTURBS <1AC. N/A

*II. APPLICABILITY FOR PERMANENT FEATURES. (Must complete)

EXEMPT NEW DEVELOPMENT:
☐ PROJECT IS ON A PARCEL (A COMMON PLAN OF DEVELOPMENT) LESS THAN 5 ACRES. (Must be verified with plat)

EXEMPT REDEVELOPMENT:
☐ PROJECT DOES NOT MEET THE DEFINITION OF SIGNIFICANT REDEVELOPMENT (Part A,Sec. 2.39 of Regulations of Harris County, Texas for Stormwater Quality Management)

EXEMPT GRANDFATHERED:
☒ PROJECT'S DRAINAGE TIES DIRECTLY INTO AN EXISTING DRAINAGE SYSTEM PRIOR TO OCTOBER 1, 2001.
(FOR VERIFICATION: PROVIDE ORIGINAL DRAINAGE AREA MAP INCLUDING CALCULATIONS)

GENERAL:
☐ PROJECT'S SWQ REQUIREMENTS FALL WITHIN THE JURISDICTION OF: CITY OF HOUSTON
☐ STORMWATER QUALITY PERMIT REQUIREMENT IS COVERED BY AN EXISTING SWQMP WITHIN PROJECT TITLE: _____
HARRIS COUNTY PROJECT No _____ & SWQ PERMIT No.

STORMWATER QUALITY MANAGEMENT PLAN:
☒ SITE PLAN ON SHEET(S) 355-360

III. PERMANENT SWQ FEATURES. (COMPLETE IF NOT EXEMPT)

☐ VEGETATIVE CONTROLS USED: (FILTER STRIP, GRASSY SWALE, URBAN FORESTRY DETAILS AND CALCULATIONS APPEAR ON SHEET(S) _____
☐ POND STRUCTURE USED (WET, DRY, WETLANDS) DETAILS AND CALCULATIONSAPPEAR ON SHEET(S) _____
☐ HYDRODYNAMIC TYPE SEPARATOR MODEL: _____
☐ OTHER(S): _____

4. FLOOD PLAIN STATUS

I. GENERAL INFORMATION

FIRM PANEL(S) FOR PROPERTY: 840 & 845
FIRM PANEL(S) DATE: JUNE 18, 2007
STATUS OF PROPERTY ON MAP
☐ ENTIRELY LOCATED IN UNSHADED ZONE "X"
☒ LOCATED PARTIALLY OR ENTIRELY IN ANY "A" ZONE OR SHADED ZONE "X", DELINEATE FLOODPLAIN BOUNDARY ON CONSTRUCTION DRAWINGS (DRAINAGE LAYOUT PG. NO._____) (1% BASE FLOOD LEVEL_____) (0.2% BASE FLOOD LEVEL_____)
☐ SITE REMOVED FROM FLOODPLAIN BY LOMR, LOMR-F, LOMA CASE NO._____ REVISED FLOODPLAIN IS SHOWN ON SHEET____

ELEVATION INFORMATION
BENCHMARK USED
☒ HARRIS COUNTY FLOODPLAIN REFERENCE MARK
☐ HARRIS-GALVESTON COASTAL SUBSIDENCE DISTRICT BENCHMARK (FOR COASTAL AREAS)
DESCRIPTION OF BENCHMARK INCLUDING ELEVATION, DATUM AND YEAR OF ADJUSTMENT *(2001 ADJ.)* ELEV 70.12(NAVD88,2001 ADJ) FROM THE INTERSECTION OF BRIAR HILL DRIVE AND SAM HOUSTON TOLL ROAD, TRAVEL SAM HOUSTON TOLL ROAD FEEDER APPROX 150 FT TO BRIDGE MONUMENT IS LOCATED ON DOWNSTREAM CENTERLINE OF BRIDGE.

II. FLOOD PLAIN DETERMINATION BASED ON GROUND ELEVATION

☒ PROPERTY LIES ENTIRELY ABOVE THE BASE FLOOD LEVEL AND IN SHADED ZONE "X"
☐ PROPERTY LIES PARTIALLY OR ENTIRELY BELOW THE BASE FLOOD LEVEL

III. FLOODPLAIN STORAGE SUMMARY

(APPLIES ONLY TO PORTION OF LAND LOCATED WITHIN FEMA REGULATORY FLOODPLAIN).

A. TOTAL VOLUME OF MATERIAL PROPOSED TO BE MOVED OR PLACED WITHIN THE FIRM DELINEATED FLOODPLAIN (FILL, BASE, CONCRETE, ASPHALT, ETC.): BELOW 0.2% BASE FLOOD ELEVATION (2001 ADJ.) ____ CUBIC YARDS ____
B. TOTAL VOLUME OF MATERIAL PROPOSED TO BE REMOVED FROM THE FIRM DELINEATED FLOODPLAIN: BELOW 0.2% BASE FLOOD ELEVATION (2001 ADJ.) ____ CUBIC YARDS ____ INCLUDING CALCULATIONS)
C. FILL AREA & VOLUME CALCULATIONS ARE SHOWN ON SHEET ____

5. WORK IN HCFCD RIGHT-OF-WAY

I. TYPE OF WORK TO BE PERFORMED IN HCFCD HCFCD ROW

A. BOND/NOTIFICATION INFORMATION
☐ HCFCD WATERSHED _____
☐ HCFCD UNIT No. _____
☐ NUMBER OF OUTFALLS _____
☐ UTILITY CROSSING
☐ ROADWAY BRIDGE/CULVERT CROSSING
☐ FILL ACTIVITY
☐ REHABILITATION OF CHANNEL
☐ MAINTENANCE
☐ TEMPORARY CROSSING
☐ TRAIL (LENGTH) _____
☐ OTHER _____
COST OF WORK IN HCFCD ROW _____

II. USACE ENVIRONMENTAL PERMIT

☐ US ARMY CORPS OF ENGINEERS NATIONWIDE PERMIT NUMBER(S) _____
☐ US ARMY CORPS OF ENGINEERS INDIVIDUAL PERMITS
☐ OTHER
☐ NO PERMITS REQUIRED
EXPLAIN: _____

III. REFERENCE / BASIS OF DETERMINATION

☐ ENVIRONMENTAL CONSULTANT REPORT
BY _____
REPORT TITLE _____
REPORT DATE _____
☐ OTHER _____

NOTES:
I. – III. REQUIRED ON PROJECTS WITH WORK IN A HCFCD CHANNEL. PLEASE REFERENCE SECTION 17 OF THE FLOOD CONTROL DISTRICT POLICY, CRITERIA, AND PROCEDURE MANUAL FOR MORE INFORMATION.

IV. HCFCD STANDARD NOTES: SEE SHEET _____ OF THESE PLANS.

V. HCFCD STANDARD DETAILS: SEE SHEET _____ OF THESE PLANS.

VI. HCFCD ACCESS PLAN: SEE SHEET _____ OF THESE PLANS.

VII. REFER TO THE FOLLOWING PLAN SHEETS: _____
FOR EXISTING AND PROPOSED RIGHT(S) OF WAY INCLUDING DELINEATION AND RECORDING INFORMATION PER HCFCD POLICY, CRITERIA, & PROCEDURE MANUAL (i.e., DRAINAGE EASEMENT, FEE STRIP, ETC.) AND GRANTEE (e.g. COH, HCFCD, PUBLIC, TXDOT, ETC.)

6. REPORTS/AGREEMENTS

I. HCFCD ACCEPTED REPORTS (ALL)

STORMWATER DRAINAGE DESIGN REPORT
REPORT TITLE _____
HCFCD PROJECT # _____
ENGINEERING FIRM _____
REPORT ACCEPTANCE DATE _____

GEOTECHNICAL INVESTIGATION REPORT
REPORT TITLE _____
HCFCD PROJECT # _____
ENGINEERING FIRM _____
REPORT ACCEPTANCE DATE _____

HCFCD APPROVED VARIANCE
DESCRIPTION OF VARIANCE _____
DOCUMENT ID # _____
VARIANCE ACCEPTANCE DATE _____

II. AGREEMENT TYPE & No.:

☐ INTERLOCAL (ILA): _____
☑ HCFCD MAINTENANCE _____
☐ TURF ESTABLISHMENT _____
☐ OTHER _____

PUBLIC WORKS AND ENGINEERING
ACCEPTED AND FILED
67862
CITY SECRETARY
HOUSTON, TEXAS

HCFCD SIGNATURE BLOCK

PROJECT NAME: MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT
ADDRESS: 12625 MEMORIAL DRIVE, HOUSTON, TX 77024
WAS ACCEPTED BY HARRIS COUNTY FLOOD CONTROL DISTRICT FOR THE PURPOSES LISTED BELOW:

HARRIS COUNTY FLOOD CONTROL DISTRICT

INTERPOSE NO OBJECTION
BY _____
FOR ITEMS LOCATED OUTSIDE OF HCFCD RIGHT-OF-WAY

APPROVED:
BY _____
FOR ITEMS LOCATED WITHIN EXISTING HCFCD RIGHT-OF-WAY

APPROVED:
BY _____
FOR ITEMS LOCATED WITHIN PROPOSED HCFCD RIGHT-OF-WAY

NO REVIEW REQUIRED:
BY _____
FINAL PERMITTING BY OTHERS

ADDITIONAL COMMENTS:

THE PROJECT WAS REVIEWED, HOWEVER, THIS DOES NOT MEAN THE ENTIRE PROJECT, INCLUDING ALL SUPPORTING DATA AND CALCULATIONS HAVE BEEN COMPLETELY CHECKED AND VERIFIED. THESE DRAWINGS ARE SIGNED, DATED AND SEALED BY A PROFESSIONAL ENGINEER LICENSED TO PRACTICE IN THE STATE OF TEXAS, WHICH THEREFORE CONVEYS THE ENGINEER'S RESPONSIBILITY AND ACCOUNTABILITY. THIS DOES NOT RELIEVE ANY PARTY FROM COMPLYING WITH APPROPRIATE FEDERAL, STATE AND LOCAL ENVIRONMENTAL RULES, LAWS, AND REGULATIONS AND ANY OTHER LEGALLY ADOPTED REGULATION OR ORDINANCE RELATED TO LAND DEVELOPMENT. IF THE CITY SIGNATURES ARE REQUIRED BY ORDINANCE, COUNTY PERMITS WILL NOT BE ISSUED UNTIL SUCH SIGNATURES ARE OBTAINED. PLAN APPROVAL EXPIRATION TO BE IN ACCORDANCE WITH LOCAL GOVERNMENT CODE CH. 245.

ENGINEER'S CERTIFICATION

I, WEIMIN LI, A LICENSED PROFESSIONAL ENGINEER IN THE STATE OF TEXAS, DO HEREBY CERTIFY THAT THE INFORMATION PRESENTED ON THIS SHEET IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND THAT I AM NOT VIOLATING ANY PROVISION OF THE CURRENT TEXAS ENGINEERING PRACTICE ACT AND RULES CONCERNING THE PRACTICE OF ENGINEERING AND PROFESSIONAL ENGINEERING LICENSURE.

ANY VIOLATIONS WILL BE FORWARDED TO THE HARRIS COUNTY DISTRICT ATTORNEY'S OFFICE FOR PROSECUTION.

THE COMPLETED PROJECT CONSISTS OF DRAWING SHEETS 1 THRU 514.

SIGNATURE _____ DATE 4/10/2020

SEAL: STATE OF TEXAS, WEIMIN LI, 88740, LICENSED PROFESSIONAL ENGINEER, Lockwood, Andrews & Newnam, Inc. Texas Registered Engineering Firm F-2614

REVISIONS

NOTE: REVISION BLOCK IS TO BE USED ONLY FOR CHANGES MADE AFTER PLANS HAVE BEEN APPROVED BY HARRIS COUNTY FLOOD CONTROL.

DATE	SHEET NO.	DESCRIPTION	P.E. INITIAL	H.C.F.C.D APPROVED DATE

HARRIS COUNTY
FLOOD CONTROL DISTRICT
REVIEW SHEET

VERSION 1.0 OCTOBER 2019

HARRIS COUNTY FLOOD CONTROL PROJECT NO. 1907190146

SHEET NUMBER 13

CENTERPOINT ENERGY

CAUTION: UNDERGROUND GAS FACILITIES

1. LOCATIONS OF CENTERPOINT ENERGY MAIN LINES (TO INCLUDE CENTERPOINT ENERGY, INTRASTATE PIPELINE, LLC. WHERE APPLICABLE) ARE SHOWN IN AN APPROXIMATE LOCATION ONLY. SERVICE LINES ARE USUALLY NOT SHOWN. OUR SIGNATURE ON THESE PLANS ONLY INDICATES THAT OUR FACILITIES ARE SHOWN IN APPROXIMATE LOCATION. IT DOES NOT IMPLY THAT A CONFLICT ANALYSIS HAS BEEN MADE. THE CONTRACTOR SHALL CONTACT THE UTILITY COORDINATING COMMITTEE AT 1-800-545-6005 OR 811 A MINIMUM OF 48 HOURS PRIOR TO CONSTRUCTION TO HAVE MAIN AND SERVICE LINES FIELD LOCATED.

2. *** WHEN CENTERPOINT ENERGY PIPE LINE MARKINGS ARE NOT VISIBLE, CALL (713)945-8036 OR (713)945-8037 (7:00 A.M. TO 4:30 P.M.) 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.

3. 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 PERSON OR THINGS MAY COME WITHIN SIX(6) FEET OF LIVE OVERHEAD HIGH VOLTAGE LINES; AND

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

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

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

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 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 E-MAIL HIM AT RL7259@ATT.COM, IF THERE ARE QUESTIONS ABOUT BORING OR EXCAVATING NEAR OUR AT&T TEXAS/SWBT FACILITIES.

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
MARK WOODWARD
96672
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

PUBLIC WORKS AND ENGINEERING
ACCEPTANCE PLAN
67862
CITY OF HOUSTON, TEXAS

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

PRIVATE UTILITY NOTES

SHEET 1 OF 1

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	14

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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:

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

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PROFESSIONAL ENGINEER

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614
03/04/2020

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

PRIVATE UTILITY NOTES

SHEET 1 OF 8

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
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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 <u>any</u> 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 <u>MATERIAL FURNISHED BY CNP</u>

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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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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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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PRIVATE UTILITY NOTES

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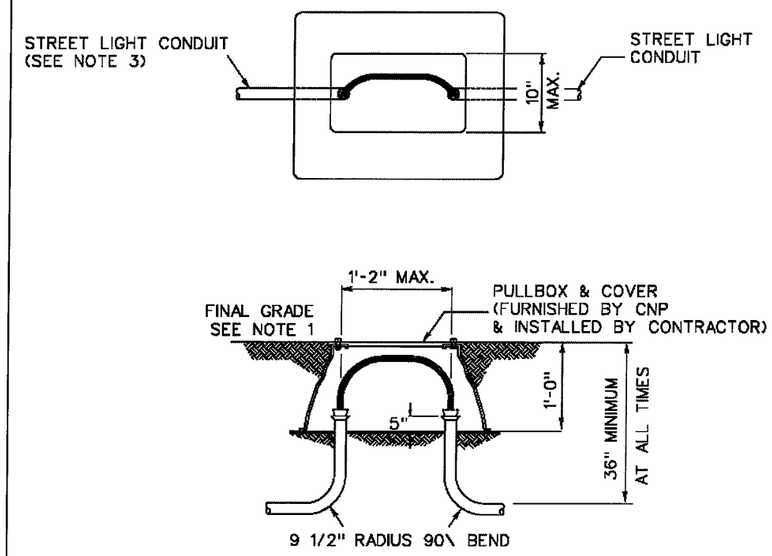
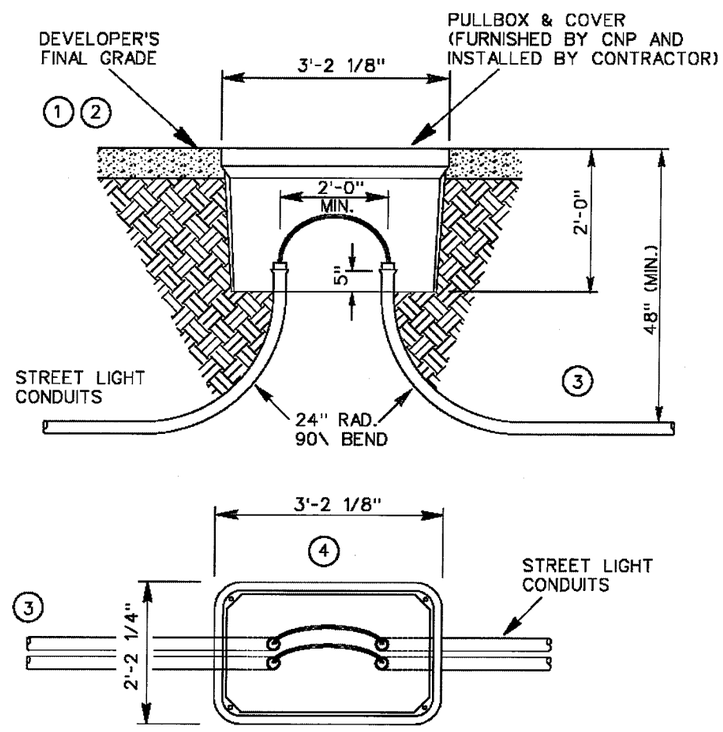


SMALL PULL BOX

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.



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.

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PRIVATE UTILITY NOTES

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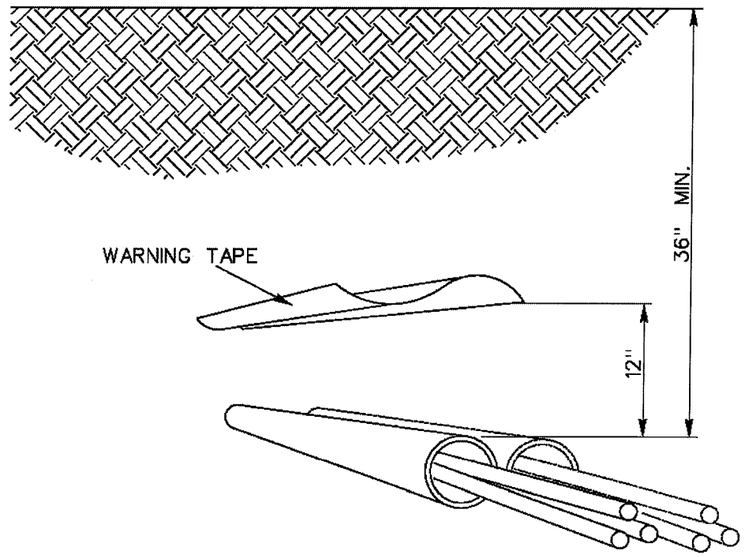

TYPICAL STREET LIGHT CONDUIT LAYOUT

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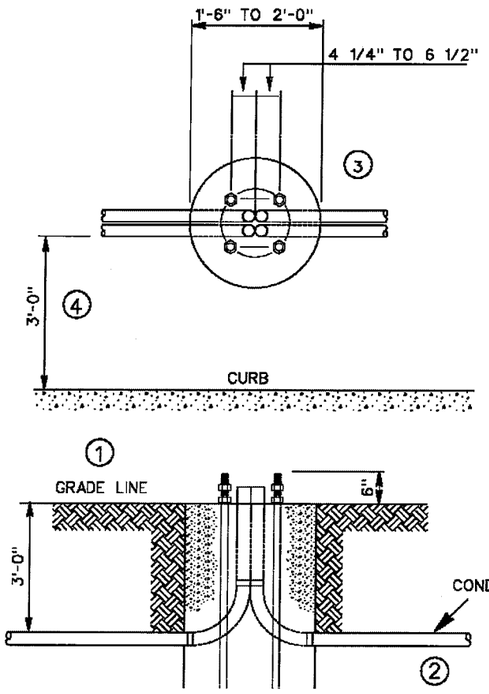

MULTIPLE CONDUIT RUN IN STREET LIGHT FOUNDATION

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.

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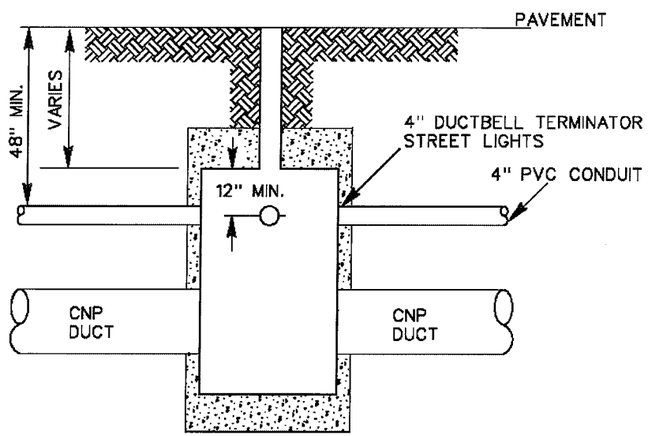

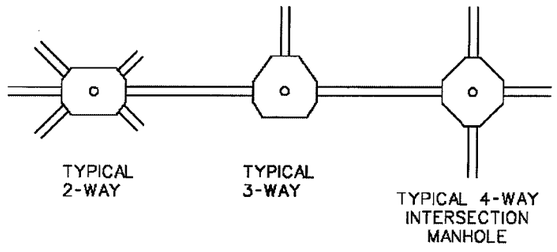

STREET LIGHT CONDUIT RUN FROM MANHOLE

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.

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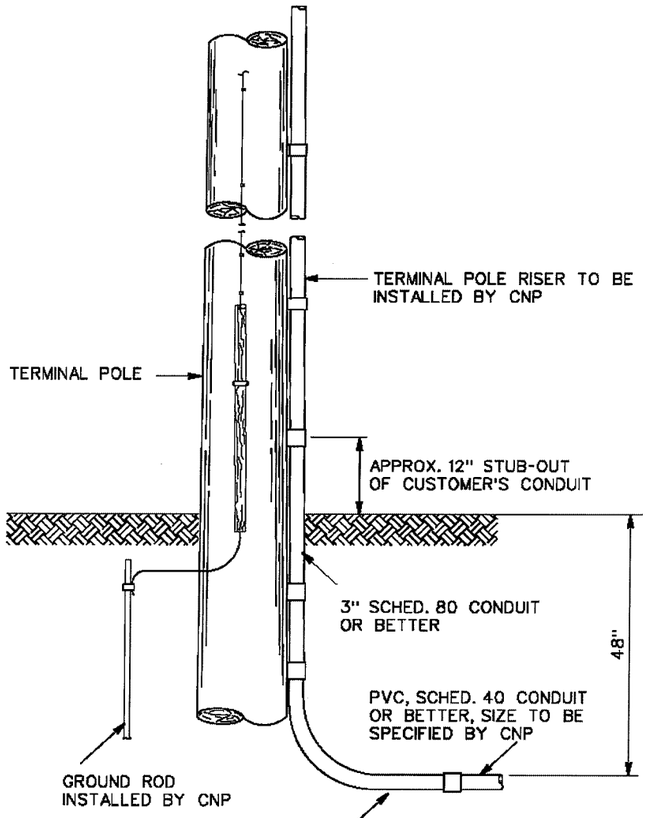

TYPICAL TERMINAL POLE LAYOUT

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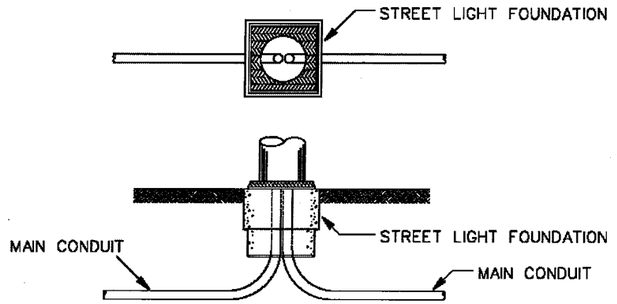
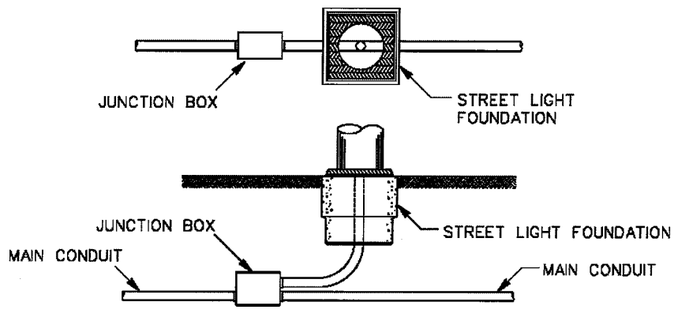


MAIN CONDUIT INSTALLED TO EACH STREET LIGHT
(SOURCE WIRE PULLED TO EACH LOCATION)



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

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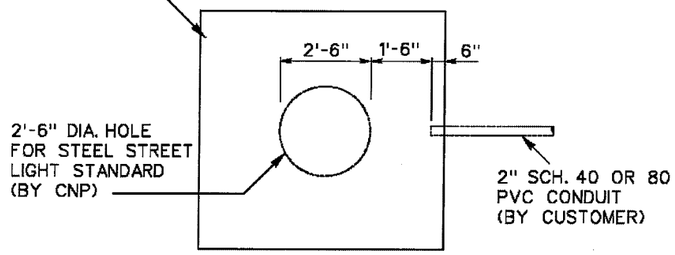
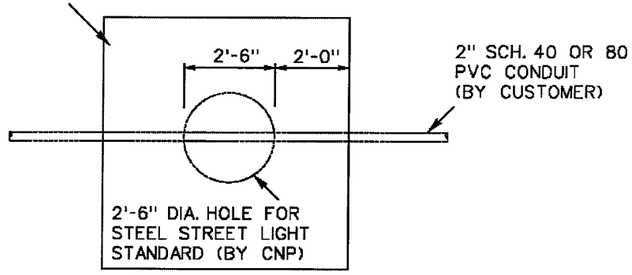
6'-6" X 6'-6" CONCRETE BLOCK-OUT
REQUIRED FOR STREET LIGHT INSTALLATION
(BLOCK-OUT TO BE CENTERED ON PROPOSED
STREET LIGHT LOCATION (BY CUSTOMER).



STREET LIGHT @ END OF CIRCUIT

6'-6" X 6'-6" CONCRETE BLOCK-OUT
REQUIRED FOR STREET LIGHT INSTALLATION
(BLOCK-OUT TO BE CENTERED ON PROPOSED
STREET LIGHT LOCATION (BY CUSTOMER).



STREET LIGHT @ CONTINUOUS CIRCUIT

BLOCK-OUT DETAIL FOR STREET LIGHTS LOCATED IN CONCRETE AREAS

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General Notes:

General:

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

Area Engineer: Frank Leong, P.E. Email: frank.leong@txdot.gov
Assistant Area Engineer: Hamon Bahrami, P.E., Email: Hamoon.bahrami@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.

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

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

Superelevate the curves to match the existing surface.

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

The following standard detail sheets are modified:

Modified Standards

Modification of Jointed Reinforced Concrete Pavement Details Sheet 1 of 2 and 2 of 2 (HOU DIST)

Modification of Manholes Type A & B MH-A/B(MOD)(HOU DIST)
Modification of Curb Inlet Type C1-HIL-C1(MOD)(HOU DIST)

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

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

Grade street intersections and median openings for surface drainage.

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

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

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

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

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

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

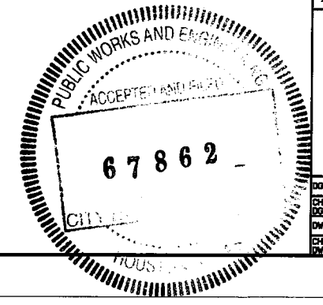
Unless otherwise shown on the plans or otherwise directed, commence work after sunrise and ensure construction equipment is off the road by sunset.

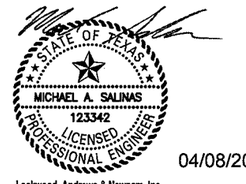
Procure permits and licenses, which are to be issued by the City, County, or Municipal Utility District.

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

General: Roadway Illumination and Electrical

For roadway illumination and electrical items, use materials from pre-qualified producers as shown on the Construction Division (CST) of the Department's material producers list. Check the latest link on the Department's website for this list. The category/item is "Roadway





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Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

GENERAL NOTES

SHEET 1 OF 18

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	15

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.

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

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

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

Tricycle Type	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.

PUBLIC ENGINEERING FIRM
67862

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED
PROFESSIONAL ENGINEER
04/08/20

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

GENERAL NOTES

SHEET 2 OF 18

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DW:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DW:	HOU	HARRIS	0912	72	391	15A

County: Harris **Control: 0912-72-391**

Highway: CS (Memorial Dr.)

At least 48 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 713-802-5663 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 1 or Table 2 below. Information and requirements for electronic submittals can be viewed in the "Guide to Electronic Shop Drawing Submittal" which can be accessed through the following web link, ftp://ftp.dot.state.tx.us/pub/txdot-info/library/pubs/bus/bridge/e_submit_guide.pdf.

County: Harris **Control: 0912-72-391**

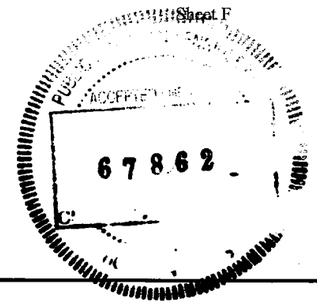
Highway: CS (Memorial Dr.)

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-standard only, calcs reqd.)	Y	Y	Y	D	SD



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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

GENERAL NOTES

SHEET 3 OF 18

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	15B

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 *email@host.xxx*
TMS – Traffic Management System
Computerized Traffic Management Systems (CTMS) — HOU-CTMSShpDrwgs@txdot.gov

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 11.5 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

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED
PROFESSIONAL ENGINEER
04/08/20

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PUBLIC WORKS
67862
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

GENERAL NOTES

SHEET 4 OF 18

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CK: DWG:	HOU	HARRIS	0912	72	391	15C

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

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

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

The Department will supply bidders, upon written request, one electronic copy of the time determination schedule. The time determination schedule provided is for informational use only and is not intended for bidding or construction purposes.

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

Working days will be computed and charged based on a *6-day* workweek in accordance with Section 8.3.1.2.

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

The Lane Closure Assessment Fee is $ *500*. This fee applies to the Contractor for closures or obstructions that overlap into restricted hour traffic for each hour or portion thereof, per lane, regardless of the length of lane closure or obstruction. For Restricted Hours subject to Lane Assessment Fee refer to the Item, "Barricades, Signs, and Traffic Handling."

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.

Removing all abandoned utilities that are in conflicts with installing new utilities will not be paid directly and is subsidiary to Item 100 (Prep ROW).

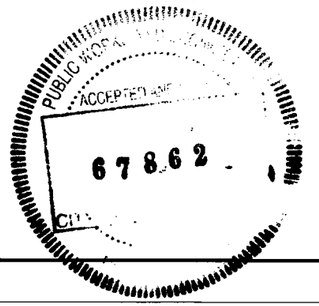
Reestablish and maintain right of way stakes after completing the right of way preparation activities and until the new utilities are in place.

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



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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

GENERAL NOTES

SHEET 5 OF 18

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
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CHK DWG:	HOU	HARRIS	0912	72	391	15D

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

Item 104: Removing Concrete
Item 105: 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. Topsoil work is paid under the Item, "Topsoil."

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

Item 134: Backfilling Pavement Edges

Quantity by station includes both sides of the roadway.

Item 161: Compost
Item 162: Sodding for Erosion Control
Item 164: Seeding for Erosion Control
Item 166: Fertilizer
Item 168: Vegetative Watering

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

Item 204: Sprinkling

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

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

Item 210: Rolling

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

Item 247: Flexible Base

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

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

Furnish one type of the base material unless otherwise authorized.

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

Sandstone aggregate is not permitted.

Item 260: Lime Treatment (Road-Mixed)

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

The Engineer will observe the lime treatment that the Contractor elects to open to construction traffic immediately after compaction. If the construction traffic damages the subgrade, route the traffic off the damaged section in accordance with the standard specification. If the construction

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123342
LICENSED
PROFESSIONAL ENGINEER
04/08/20

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Texas Registered Engineering Firm F-2614

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

GENERAL NOTES

SHEET 6 OF 18

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
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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.

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

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

Item 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 High Early Strength Concrete construction process, from the time the Early Strength Work Area is closed to traffic, to the time the Early Strength Work Area is opened to traffic. The Early Strength 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 Early Strength Work Area in an expeditious manner, within the allowable time period for any area shown below:

High Early Strength Work Area	Allowable Duration
As identified on plans:	*3* days maximum for intersections

Failure to perform any High Early Strength 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 Early Strength operation. This shutdown will remain in force until the Early Strength 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.

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

GENERAL NOTES

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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 416: Drilled Shaft Foundations

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

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

Item 420: Concrete Substructures

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

Item 423: Retaining Walls

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

Item 427: Surface Finishes for Concrete

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

Item 449: Anchor Bolts

Pipe joint compound, as used in this Item, is an electrically conducting protective thread lubricant compound to be used on the foundation anchor bolts for illuminations poles (Crouse-Hinds TL-2, 0z/Gedney Stl, or Thomas & Betts Kopr-Shield).

Item 462: Concrete Box Culverts and Drains
Item 464: Reinforced Concrete Pipe

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.

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

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

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

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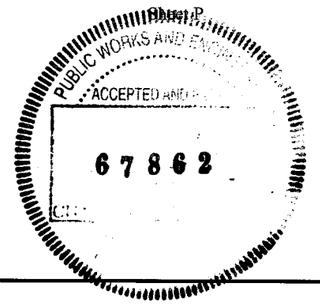

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

GENERAL NOTES

SHEET 8 OF 18

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

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

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

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

Item 465: Junction Boxes, Manholes, and Inlets

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

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

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

Do not leave excavations or trenches open overnight.

Items 496: 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.

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GENERAL NOTES

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

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

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
Broken Bough Ln	*3 days*
W. Bough Ln	*3 days*
Old Oaks Dr	*7 days*
Huntingwick Dr	*7 days*
Boheme Dr.	*3 days*
Rip Van Winkle Dr	*7 days*
Hollow Dr	*7 days*
Somerset Pl	*7 days*
Legend Ln	*7 days*
Tallowood Rd	*7 days*

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 504: Field Office and Laboratory

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

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

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

If an asphalt mix plant is located at the project site, provide a Type D structure with the dimensions of a Type C structure, at the project site to perform the asphalt mix quality control tests.

If a commercial source is used for the asphalt mix, provide a Type D structure with the dimensions of a Type C structure, at the commercial source site to perform the asphalt mix quality control tests.

Equip each lab with a first aid kit and at least a 20 lb. ABC type fire extinguisher. Also equip the labs with an eye wash station. Provide equipment that meets the minimum OSHA requirements.

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

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

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GENERAL NOTES

SHEET 10 OF 18

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DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
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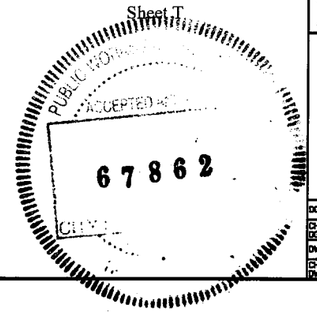


1. Three desks with 3 swivel chairs, two 5-drawer file cabinets and 3 straight back chairs.
2. Telephone service and equipment consisting of a minimum of one telephone with one extension. Include the call-waiting feature in the service.
3. Potable water with an electric water cooler, a cup dispenser,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

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

The above requirements are subsidiary to the various bid items.

Assume ownership of temporary chain link security fences.

Equip each field office with a first aid kit and at least a 20 lb. ABC type fire extinguisher.

Item 506: Temporary Erosion, Sedimentation and Environmental Controls

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

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

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

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

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

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

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

Item 512: Portable Traffic Barrier

Provide Low Profile Concrete Barriers (LPCB) used for traffic handling.

Where required by the Engineer, provide anchor pins for Type 2 Low Profile Concrete Barriers (LPCB) as shown on the current LPCB standard. Anchor pins are subsidiary to the Low Profile Concrete Barrier.

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

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

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

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

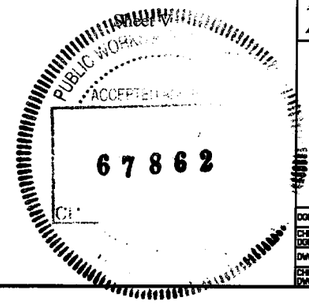
If placing the portable traffic barrier on pre-stressed concrete box beams with exposed reinforcing steel, protect the reinforcing steel by supporting the portable traffic barrier on 4 in. by 4 in. timbers. Place the timbers transversely and space them on 4 ft. centers. The cost of the labor and materials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

Item 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.



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

Item 540: Metal Beam Guard Fence

Painting the timber posts is not required.

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

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

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

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

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

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

Item 542: Removing Metal Beam Guard Fence

Remove and assume ownership of unsalvageable metal beam guard fence rail elements and posts.

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

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).

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

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

Item 613: High Mast Illumination Poles

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

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

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

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

Item 616: Performance Testing of Lighting Systems

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

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

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

Item 618: Conduit
Item 620: Electrical Conductors
Item 628: Electrical Services

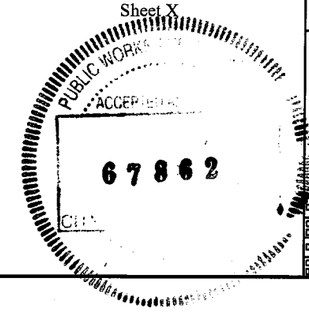
If the specifications for electrical items require UL-listed products, this means UL-listed or CSA-listed.

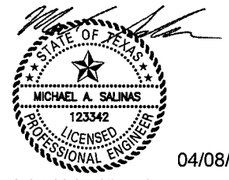
Item 618: Conduit

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

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

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





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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

GENERAL NOTES

SHEET 12 OF 18

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	15K

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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.

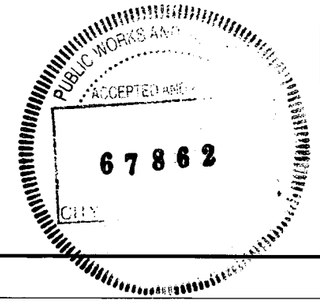
Item 628: Electrical Services

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

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



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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

GENERAL NOTES

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DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	15L

Item 644: Small Roadside Sign Assemblies

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

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

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

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

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

Assume ownership of the removed existing signs.

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

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

Item 656: Foundations for Traffic Control Devices

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

Using ready mix concrete for sign foundations is optional.

Item 662: Work Zone Pavement Markings

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

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

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

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

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

Item 672: Raised Pavement Markers

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

GENERAL NOTES

SHEET 14 OF 18

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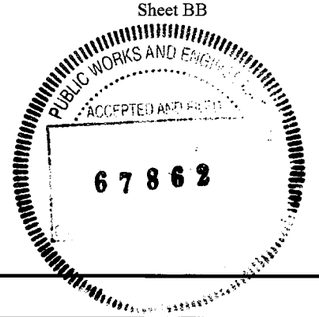
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	15M



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.

Item 677: Eliminating Existing Pavement Markings and Markers

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

Item 678: Pavement Surface Preparation for Markings

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

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

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

Do not clean concrete pavement by grinding.

Item 680: Highway Traffic Signals

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

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

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

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

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

Staking in the field is subject to approval.

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

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

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

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

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

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

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

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

Furnish signal heads from the same manufacturer.

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

Furnish solid conductors for traffic signal cable.

The Contractor may use ready mix concrete.

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

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LICENSED PROFESSIONAL ENGINEER
04/08/20

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Texas Department of Transportation

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

GENERAL NOTES

SHEET 15 OF 18

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DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK:	HOU	HARRIS	0912	72	391	15N

County: Harris **Control: 0912-72-391**

Highway: CS (Memorial Dr.)

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

Item 685: Roadside Flashing Beacon Assemblies

When shown on the plans, provide solar powered flasher controller assemblies in accordance with Departmental Material Specifications DMS-11150, "Solar Power Flasher Controller Assembly."

When solar powered school zone signs are shown on the plans, provide solar powered flasher controller assemblies capable of 24 hour operations.

Item 686: Traffic Signal Pole Assemblies (Steel)

For a steel mast arm or steel strain pole assembly, hold the anchor bolts and conduits rigidly in place with a welded steel template.

Leave a minimum of one full diameter thread exposed on each anchor bolt securing a signal pole.

Set the anchor bolts for the steel strain poles so that two are in compression and two are in tension.

Use a Texas Cone Penetrometer reading of 10. The drilled shaft length is from the surface elevation to the bottom of the drilled shaft. Provide an additional length of the pole foundation from the surface level to the roadway level, if required for unusual locations. Provide the drilled shaft depth regardless of the length of the pole foundation. The pole foundation depth from the surface level to the roadway level is a maximum of 4 ft., or as approved.

Locate traffic signal pole assembly foundations a minimum of 4 ft. from the roadway curb or pavement edge, or as shown on the plans.

Place steel strain poles at a 10 ft. desirable minimum distance from the roadway curb or pavement edge.

After the traffic signal pole assembly is plumb and the nuts are tight, tack-weld each anchor bolt nut in two places to its washer. Tack-weld each washer to the base plate in two places. Do not

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weld components to the bolt. Perform tack-welding in accordance with the Item, "Steel Structures." After tack-welding, repair galvanizing damage on bolts, nuts, and washers in accordance with Section 445.3.5, "Repairs."

The Department may test the anchor bolts using ultrasonic methods for traffic signal poles after they are installed. Replace faulty anchor bolts as directed. Do not weld the anchor bolts.

Item 687: Pedestal Pole Assemblies

Item 688: Pedestrian Detectors and Vehicle Loop Detectors

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

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

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

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

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

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

If the loop sealant supplied by the Contractor is not on the Department's pre-qualified product list, before applying the sealant provide a 5-gal. container of loop sealant for testing.

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	*3* cycles	*As needed*

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GENERAL NOTES

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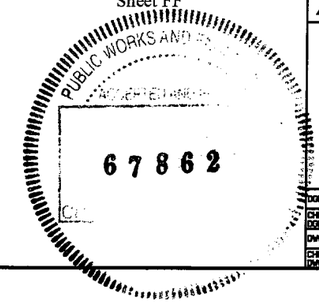
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK:	HOU	HARRIS	0912	72	391	150



Item 6004: Communication Cable

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

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

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

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 both TS1 and TS2 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.

Critical Locate for water line shall be vacuum excavated. Water lines shall be located as shown on drawings and within 4 horizontal feet of any proposed structure upon 30 days of the project being Let. Notify the Project Manager in writing immediately upon identifying an obstruction. Critical Locate is subsidiary to Items 462, 464, 465 and 7017.

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."

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

GENERAL NOTES

SHEET 17 OF 18

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
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County: Harris

Control: 0912-72-391

Highway: CS (Memorial Dr.)

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
134	Backfilling Pavement Edges • Asphalt Emulsion	 0.25 Gal. / Sq. Yd.	STA
247	Flexible Base • Crushed Stone	 138 Lb. / Cu. Ft.	TON
260	Lime Treatment (Road-Mixed) For materials used as subgrade * • Lime(HYD, COM, or QK)(SLRY) or QK(DRY)	 6 % by weight based on 100 Lb. / Cu. Ft. subgrade	SY TON

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

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FED. RD. DWG:	HOU	HARRIS	0912	72	391	15Q

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HOUSTON, TEXAS

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QUANTITY SHEET

Texas Department of Transportation

CONTROLLING PROJECT ID 0912-72-391 **DISTRICT** Houston **COUNTY** Harris
HIGHWAY CS

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**0912-72-391**			
		PROJECT ID		**A00123439**			
		COUNTY		**Harris**			
		HIGHWAY		**CS**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	100-6002	PREPARING ROW	STA	47.720		47.720	
	100-6003	PREPARING ROW(TREE)(5" TO 12" DIA)	EA	108.000		108.000	
	100-6004	PREPARING ROW(TREE)(12" TO 24" DIA)	EA	47.000		47.000	
	100-6029	PREP ROW (ROOT PRUNING TO 12" DEPTH)	LF	2,925.000		2,925.000	
	104-6001	REMOVING CONC (PAV)	SY	298.000		298.000	
	104-6011	REMOVING CONC (MEDIANS)	SY	372.000		372.000	
	104-6017	REMOVING CONC (DRIVEWAYS)	SY	4,491.000		4,491.000	
	104-6029	REMOVING CONC (CURB OR CURB & GUTTER)	LF	4,608.000		4,608.000	
	104-6036	REMOVING CONC (SIDEWALK OR RAMP)	SY	4,030.000		4,030.000	
	105-6061	REMOV STAB BASE & ASPH PAV (8"-20")	SY	28,153.000		28,153.000	
	110-6001	EXCAVATION (ROADWAY)	CY	38,630.000		38,630.000	
	112-6001	SUBGRADE WIDENING (ORD COMP)	STA	47.000		47.000	
	132-6006	EMBANKMENT (FINAL)(DENS CONT)(TY C)	CY	4,640.000		4,640.000	
	162-6002	BLOCK SODDING	SY	9,565.000		9,565.000	
	162-6003	STRAW OR HAY MULCH	SY	1,000.000		1,000.000	
	164-6009	BROADCAST SEED (TEMP) (WARM)	SY	1,000.000		1,000.000	
	166-6001	FERTILIZER	AC	2.250		2.250	
	168-6001	VEGETATIVE WATERING	MG	262.000		262.000	
	170-6001	IRRIGATION SYSTEM	LS	1.000		1.000	
	192-6001	PLANT MATERIAL (4" CNTR)	EA	1,512.000		1,512.000	
	192-6002	PLANT MATERIAL (1-GAL)	EA	3,529.000		3,529.000	
	192-6003	PLANT MATERIAL (3-GAL)	EA	1,758.000		1,758.000	
	192-6012	MULCH	CY	74.000		74.000	
	192-6016	PLANT BED PREPARATION	SY	1,333.000		1,333.000	
	192-6026	PLANT MATERIAL (65 GAL) (TREE)	EA	47.000		47.000	
	192-6027	PLANT MATERIAL (100 GAL) (TREE)	EA	124.000		124.000	
	192-6081	PLANT SOIL MIX (PLANTING SOIL)	CY	1,066.000		1,066.000	
	192-6082	PLANT SOIL MIX (TURF SOIL)	CY	2,782.000		2,782.000	
	260-6012	LIME(HYD,COM OR QK)(SLRY)OR QK(DRY)	TON	916.000		916.000	
	260-6027	LIME TRT (EXST MATL)(8")	SY	39,354.000		39,354.000	
	360-6086	CONC PAV (JOINT REINF) (11")	SY	13,630.000		13,630.000	
	360-6091	CONC PAV (JOINT REINF) (HES) (11")	SY	19,885.000		19,885.000	
	400-6005	CEM STABIL BKFL	CY	11,701.000		11,701.000	
	400-6009	CEMENT STAB BACKFILL (INLET OR MH)	CY	1,020.000		1,020.000	
	402-6001	TRENCH EXCAVATION PROTECTION	LF	15,489.000		15,489.000	
	403-6001	TEMPORARY SPL SHORING	SF	320.000		320.000	
	416-6003	DRILL SHAFT (30 IN)	LF	240.000		240.000	

PUBLIC WORKS AND ENGINEERING
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DISTRICT	COUNTY	CCSJ	SHEET
Houston	Harris	0912-72-391	16

QUANTITY SHEET

Texas Department of Transportation

CONTROLLING PROJECT ID 0912-72-391 **DISTRICT** Houston **COUNTY** Harris
HIGHWAY CS

		CONTROL SECTION JOB		**0912-72-391**		TOTAL EST.	TOTAL FINAL
		PROJECT ID		**A00123439**			
		COUNTY		**Harris**			
		HIGHWAY		**CS**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	423-6008	RETAINING WALL (CAST - IN - PLACE)	SF	366.000		366.000	
	432-6006	RIPRAP (CONC)(CL B)	CY	123.000		123.000	
	450-6052	RAIL (HANDRAIL)(TY F)	LF	100.000		100.000	
	462-6002	CONC BOX CULV (3 FT X 3 FT)	LF	267.000		267.000	
	462-6005	CONC BOX CULV (4 FT X 4 FT)	LF	795.000		795.000	
	462-6020	CONC BOX CULV (8 FT X 5 FT)	LF	111.000		111.000	
	462-6029	CONC BOX CULV (10 FT X 5 FT)	LF	2,930.000		2,930.000	
	462-6034	CONC BOX CULV (10 FT X 10 FT)	LF	3,566.000		3,566.000	
	464-6005	RC PIPE (CL III)(24 IN)	LF	2,390.000		2,390.000	
	464-6007	RC PIPE (CL III)(30 IN)	LF	650.000		650.000	
	464-6008	RC PIPE (CL III)(36 IN)	LF	228.000		228.000	
	464-6009	RC PIPE (CL III)(42 IN)	LF	57.000		57.000	
	464-6010	RC PIPE (CL III)(48 IN)	LF	1,106.000		1,106.000	
	464-6037	RC PIPE (ELLIP)(CL III)(DES 6)	LF	33.000		33.000	
	465-6166	INLET (COMPL)(TY AAD)	EA	2.000		2.000	
	465-6168	INLET (COMPL)(TY A)	EA	17.000		17.000	
	465-6173	MANH (COMPL)(TY A)	EA	34.000		34.000	
	465-6176	INLET (COMPL)(CURB)(TY C1)	EA	32.000		32.000	
	465-6177	INLET (COMPL)(TY AZ2G)	EA	1.000		1.000	
	465-6344	INLET (COMPL)(TY C1)(MOD)	EA	5.000		5.000	
	465-6412	MANH (COMPL)(TY A)(MOD)	EA	30.000		30.000	
	465-6555	JCT BOX 10'x28'(COMPL)(SPL)	EA	1.000		1.000	
	465-6556	JCT BOX 8'x14'(COMPL)(SPL)	EA	1.000		1.000	
	467-6423	SET (TY II) (30 IN) (RCP) (6: 1) (P)	EA	1.000		1.000	
	467-6454	SET (TY II) (36 IN) (RCP) (6: 1) (P)	EA	1.000		1.000	
	479-6001	ADJUSTING MANHOLES	EA	2.000		2.000	
	481-6009	PIPE (PVC) (SCH 40) (2 IN)	LF	11.000		11.000	
	481-6011	PIPE (PVC) (SCH 40) (4 IN)	LF	31.000		31.000	
	481-6014	PIPE (PVC) (SCH 40) (8 IN)	LF	14.000		14.000	
	481-6015	PIPE (PVC) (SCH 40) (10 IN)	LF	10.000		10.000	
	496-6002	REMOV STR (INLET)	EA	97.000		97.000	
	496-6003	REMOV STR (MANHOLE)	EA	9.000		9.000	
	496-6005	REMOV STR (WINGWALL)	EA	6.000		6.000	
	496-6006	REMOV STR (HEADWALL)	EA	17.000		17.000	
	496-6007	REMOV STR (PIPE)	LF	9,196.000		9,196.000	
	496-6040	REMOV STR (RET WALL)	LF	21.000		21.000	
	496-6041	REMOV STR (LARGE)	EA	2.000		2.000	

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DISTRICT	COUNTY	CCSJ	SHEET
Houston	Harris	0912-72-391	16A

QUANTITY SHEET

Texas Department of Transportation

CONTROLLING PROJECT ID 0912-72-391

DISTRICT Houston
HIGHWAY CS

COUNTY Harris

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**0912-72-391**			
		PROJECT ID		**A00123439**			
		COUNTY		**Harris**			
		HIGHWAY		**CS**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	496-6043	REMOV STR (SMALL FENCE)	LF	120.000		120.000	
	496-6093	REMOV STR (MASONARY)	LF	14.000		14.000	
	500-6001	MOBILIZATION	LS	100.00%		100.00%	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	27.000		27.000	
	506-6002	ROCK FILTER DAMS (INSTALL) (TY 2)	LF	176.000		176.000	
	506-6011	ROCK FILTER DAMS (REMOVE)	LF	176.000		176.000	
	506-6040	BIODEG EROSN CONT LOGS (INSTL) (8")	LF	2,160.000		2,160.000	
	506-6041	BIODEG EROSN CONT LOGS (INSTL) (12")	LF	18,081.000		18,081.000	
	506-6043	BIODEG EROSN CONT LOGS (REMOVE)	LF	20,241.000		20,241.000	
	508-6001	CONSTRUCTING DETOURS	SY	13,985.000		13,985.000	
	512-6009	PORT CTB (FUR & INST)(LOW PROF)(TY 1)	LF	2,900.000		2,900.000	
	512-6010	PORT CTB (FUR & INST)(LOW PROF)(TY 2)	LF	320.000		320.000	
	512-6033	PORT CTB (MOVE)(LOW PROF)(TY 1)	LF	660.000		660.000	
	512-6034	PORT CTB (MOVE)(LOW PROF)(TY 2)	LF	180.000		180.000	
	512-6057	PORT CTB (REMOVE)(LOW PROF)(TY 1)	LF	2,900.000		2,900.000	
	512-6058	PORT CTB (REMOVE)(LOW PROF)(TY 2)	LF	320.000		320.000	
	528-6004	LANDSCAPE PAVERS	SY	724.000		724.000	
	529-6011	CONC CURB (DOWEL)	LF	17,655.000		17,655.000	
	529-6045	CONC CURB (DOWEL)(9")	LF	480.000		480.000	
	530-6025	DRIVEWAYS (CONC) (FAST TRACK)	SY	3,585.000		3,585.000	
	531-6002	CONC SIDEWALKS (5")	SY	5,962.000		5,962.000	
	531-6004	CURB RAMPS (TY 1)	EA	8.000		8.000	
	531-6008	CURB RAMPS (TY 5)	EA	4.000		4.000	
	531-6010	CURB RAMPS (TY 7)	EA	12.000		12.000	
	531-6013	CURB RAMPS (TY 10)	EA	6.000		6.000	
	531-6016	CURB RAMPS (TY 21)	EA	1.000		1.000	
	531-6048	CONC SIDEWALKS (9")	SY	160.000		160.000	
	536-6002	CONC MEDIAN	SY	345.000		345.000	
	536-6005	CONCRETE MEDIAN (NOSE)	SY	128.000		128.000	
	540-6001	MTL W-BEAM GD FEN (TIM POST)	LF	126.000		126.000	
	540-6016	DOWNSTREAM ANCHOR TERMINAL SECTION	EA	1.000		1.000	
	542-6001	REMOVE METAL BEAM GUARD FENCE	LF	126.000		126.000	
	544-6001	GUARDRAIL END TREATMENT (INSTALL)	EA	1.000		1.000	
	618-6040	CONDT (PVC) (SCH 80) (1")	LF	228.000		228.000	
	618-6042	CONDT (PVC) (SCH 80) (1 1/4")	LF	15.000		15.000	
	618-6046	CONDT (PVC) (SCH 80) (2")	LF	23,920.000		23,920.000	
	618-6047	CONDT (PVC) (SCH 80) (2") (BORE)	LF	696.000		696.000	

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DISTRICT	COUNTY	CCSJ	SHEET
Houston	Harris	0912-72-391	16B

QUANTITY SHEET

Texas Department of Transportation

CONTROLLING PROJECT ID 0912-72-391 **DISTRICT** Houston **COUNTY** Harris
HIGHWAY CS

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**0912-72-391**			
		PROJECT ID		**A00123439**			
		COUNTY		**Harris**			
		HIGHWAY		**CS**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	618-6053	CONDT (PVC) (SCH 80) (3")	LF	324.000		324.000	
	618-6054	CONDT (PVC) (SCH 80) (3") (BORE)	LF	846.000		846.000	
	618-6058	CONDT (PVC) (SCH 80) (4")	LF	689.000		689.000	
	618-6059	CONDT (PVC) (SCH 80) (4") (BORE)	LF	677.000		677.000	
	618-6070	CONDT (RM) (2")	LF	126.000		126.000	
	620-6003	ELEC CONDR (NO.12) BARE	LF	1,580.000		1,580.000	
	620-6006	ELEC CONDR (NO.10) INSULATED	LF	3,084.000		3,084.000	
	620-6008	ELEC CONDR (NO.8) INSULATED	LF	30,165.000		30,165.000	
	620-6010	ELEC CONDR (NO.6) INSULATED	LF	20,715.000		20,715.000	
	620-6012	ELEC CONDR (NO.4) INSULATED	LF	608.000		608.000	
	624-6002	GROUND BOX TY A (122311)W/APRON	EA	18.000		18.000	
	624-6009	GROUND BOX TY D (162922)	EA	3.000		3.000	
	628-6002	REMOVE ELECTRICAL SERVICES	EA	18.000		18.000	
	628-6189	ELC SRV TY D 120/240 070(NS)SS(E)SP(U)	EA	2.000		2.000	
	628-6344	Electrical Service Type D 120/240 100 (NS)SS(E) OC(U)	EA	1.000		1.000	
	636-6001	ALUMINUM SIGNS (TY A)	SF	366.000		366.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	51.000		51.000	
	644-6027	IN SM RD SN SUP&AM TYS80(1)SA(P)	EA	1.000		1.000	
	644-6068	RELOCATE SM RD SN SUP&AM TY 10BWG	EA	29.000		29.000	
	644-6076	REMOVE SM RD SN SUP&AM	EA	49.000		49.000	
	662-6057	WK ZN PAV MRK REMOV (TRAF BTN) TY W	LF	6,035.000		6,035.000	
	662-6059	WK ZN PAV MRK REMOV (TRAF BTN) TY Y	LF	21,037.000		21,037.000	
	662-6075	WK ZN PAV MRK REMOV (W)24"(SLD)	LF	320.000		320.000	
	662-6080	WK ZN PAV MRK REMOV (W)(ARROW)	EA	15.000		15.000	
	662-6090	WK ZN PAV MRK REMOV (W)(WORD)	EA	16.000		16.000	
	666-6212	REFL PAV MRK TY II (Y) 12" (SLD)	LF	4,680.000		4,680.000	
	666-6438	REFL PAV MRK TY II (R) 12"(FIRE LANE)	LF	12.000		12.000	
	668-6077	PREFAB PAV MRK TY C (W) (ARROW)	EA	33.000		33.000	
	668-6085	PREFAB PAV MRK TY C (W) (WORD)	EA	11.000		11.000	
	672-6007	REFL PAV MRKR TY I-C	EA	106.000		106.000	
	672-6009	REFL PAV MRKR TY II-A-A	EA	12.000		12.000	
	672-6010	REFL PAV MRKR TY II-C-R	EA	217.000		217.000	
	678-6001	PAV SURF PREP FOR MRK (4")	LF	3,127.000		3,127.000	
	678-6002	PAV SURF PREP FOR MRK (6")	LF	32.000		32.000	
	678-6004	PAV SURF PREP FOR MRK (8")	LF	1,987.000		1,987.000	
	678-6006	PAV SURF PREP FOR MRK (12")	LF	6,526.000		6,526.000	
	678-6008	PAV SURF PREP FOR MRK (24")	LF	698.000		698.000	

DISTRICT	COUNTY	CCSJ	SHEET
Houston	Harris	0912-72-391	16C

QUANTITY SHEET

Texas Department of Transportation

CONTROLLING PROJECT ID 0912-72-391 **DISTRICT** Houston **COUNTY** Harris
HIGHWAY CS

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**0912-72-391**			
		PROJECT ID		**A00123439**			
		COUNTY		**Harris**			
		HIGHWAY		**CS**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	678-6009	PAV SURF PREP FOR MRK (ARROW)	EA	33.000		33.000	
	678-6016	PAV SURF PREP FOR MRK (WORD)	EA	11.000		11.000	
	678-6033	PAV SURF PREP FOR MRK (RPM)	EA	335.000		335.000	
	680-6003	INSTALL HWY TRF SIG (SYSTEM)	EA	2.000		2.000	
	680-6004	REMOVING TRAFFIC SIGNALS	EA	2.000		2.000	
	681-6001	TEMP TRAF SIGNALS	EA	2.000		2.000	
	682-6001	VEH SIG SEC (12")LED(GRN)	EA	34.000		34.000	
	682-6002	VEH SIG SEC (12")LED(GRN ARW)	EA	10.000		10.000	
	682-6003	VEH SIG SEC (12")LED(YEL)	EA	32.000		32.000	
	682-6004	VEH SIG SEC (12")LED(YEL ARW)	EA	8.000		8.000	
	682-6005	VEH SIG SEC (12")LED(RED)	EA	32.000		32.000	
	682-6006	VEH SIG SEC (12")LED(RED ARW)	EA	8.000		8.000	
	682-6018	PED SIG SEC (LED)(COUNTDOWN)	EA	22.000		22.000	
	682-6023	BACK PLATE (12")(3 SEC)	EA	34.000		34.000	
	682-6024	BACK PLATE (12")(4 SEC)	EA	2.000		2.000	
	684-6029	TRF SIG CBL (TY A)(14 AWG)(3 CONDR)	LF	5,410.000		5,410.000	
	684-6031	TRF SIG CBL (TY A)(14 AWG)(5 CONDR)	LF	5,929.000		5,929.000	
	684-6033	TRF SIG CBL (TY A)(14 AWG)(7 CONDR)	LF	10,548.000		10,548.000	
	686-6305	INS TRF PL AM HOU-1-25(LUM)	EA	1.000		1.000	
	686-6306	INS TRF PL AM HOU-1-35(LUM)	EA	3.000		3.000	
	686-6307	INS TRF PL AM HOU-2-40(LUM)	EA	4.000		4.000	
	687-6001	PED POLE ASSEMBLY	EA	11.000		11.000	
	687-6002	PEDESTRIAN PUSH BUTTON POLE	EA	1.000		1.000	
	688-6001	PED DETECT PUSH BUTTON (APS)	EA	21.000		21.000	
	688-6003	PED DETECTOR CONTROLLER UNIT	EA	2.000		2.000	
	1002-6002	LANDSCAPE AMENITY (TY 1)	EA	114.000		114.000	
	1004-6001	TREE PROTECTION	EA	136.000		136.000	
	6038-6001	MULTIPOLYMER PAV MRK (W)(4")(SLD)	LF	89.000		89.000	
	6038-6002	MULTIPOLYMER PAV MRK (W)(4")(BRK)	LF	2,340.000		2,340.000	
	6038-6006	MULTIPOLYMER PAV MRK (W)(6")(DOT)	LF	32.000		32.000	
	6038-6007	MULTIPOLYMER PAV MRK (W)(8")(SLD)	LF	1,987.000		1,987.000	
	6038-6011	MULTIPOLYMER PAV MRK (W)(12")(SLD)	LF	1,834.000		1,834.000	
	6038-6013	MULTIPOLYMER PAV MRK (W)(24")(SLD)	LF	698.000		698.000	
	6038-6014	MULTIPOLYMER PAV MRK (Y)(4")(SLD)	LF	618.000		618.000	
	6038-6015	MULTIPOLYMER PAV MRK (Y)(4")(BRK)	LF	80.000		80.000	
	6306-6001	VIVDS PROSR SYS	EA	1.000		1.000	
	6306-6002	VIVDS CAM ASSY FXD LNS	EA	2.000		2.000	

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DISTRICT	COUNTY	CCSJ	SHEET
Houston	Harris	0912-72-391	16D

QUANTITY SHEET

Texas Department of Transportation

CONTROLLING PROJECT ID 0912-72-391 **DISTRICT** Houston **COUNTY** Harris
HIGHWAY CS

				CONTROL SECTION JOB	0912-72-391		TOTAL EST.	TOTAL FINAL
				PROJECT ID	A00123439			
				COUNTY	Harris			
				HIGHWAY	CS			
ALT	BID CODE	DESCRIPTION	UNIT		EST.	FINAL		
	6306-6004	VIVDS CAM ASSY 360	EA		2.000		2.000	
	6306-6005	VIVDS CNTRL SOFTWARE	EA		1.000		1.000	
	6306-6006	VIVDS TEMPORARY	EA		2.000		2.000	
	6306-6007	VIVDS CABLING	LF		653.000		653.000	
	7017-6004	SANITARY SEWER (6IN) (PVC) (C900)	LF		6.000		6.000	
	7017-6017	SANITARY SEWER (8 IN) (PVC) (SDR 26)	LF		15.000		15.000	
	7017-6018	SANITARY SEWER (10 IN) (PVC) (SDR 26)	LF		102.000		102.000	
	7017-6028	SANITARY SEWER (24 IN) (PVC) (SDR 35)	LF		30.000		30.000	
	7017-6030	SANITARY SEWER (4 IN) (DI)	LF		5.000		5.000	
	7017-6041	CASING (STEEL) (SANITARY SEWER) (12 IN)	LF		18.000		18.000	
	7017-6042	CASING (STEEL) (SANITARY SEWER) (16 IN)	LF		61.000		61.000	
	7017-6051	MANHOLE (SAN SEWER) (4' DIA)	EA		13.000		13.000	
	7017-6053	MANHOLE (SAN SEWER) (5' DIA)	EA		4.000		4.000	
	7017-6073	SERVICE CONNECTION (SANITARY SEWER)	EA		3.000		3.000	
	7017-6087	AIR AND VACUUM RELIEF VALVE (2IN)	EA		2.000		2.000	
	7017-6094	REMOVE EXISTING MANHOLE(SANITARY SEWER)	EA		13.000		13.000	
	7017-6106	ABAND/FILL EXIST SAN SEWER PIPE (6")	LF		140.000		140.000	
	7017-6113	REMOVE EXIST SAN SWR PIPE (10")	LF		100.000		100.000	
	7017-6114	REMOVE EXIST SAN SWR PIPE (12")	LF		406.000		406.000	
	7017-6124	MANHOLE DROP (SAN SWR)(6IN)	EA		2.000		2.000	
	7017-6125	MANHOLE DROP (SAN SWR)(8IN)	EA		5.000		5.000	
	7017-6126	MANHOLE DROP (SAN SWR)(10IN)	EA		2.000		2.000	
	7017-6127	MANHOLE DROP (SAN SWR)(12IN)	EA		3.000		3.000	
	7017-6128	REMOVE EXIST SAN SWR PIPE (6IN)	LF		122.000		122.000	
	7017-6129	REMOVE EXIST SAN SWR PIPE (8IN)	LF		530.000		530.000	
	7017-6134	ABAND/FILL EXIST SAN SWR PIPE (10IN)	LF		370.000		370.000	
	7017-6140	PRE-CONSTRUCTION TELEVISION INSPECTION	LF		1,688.000		1,688.000	
	7017-6141	SAN SEWER (8IN) (DI) (RESTRAINED JT)	LF		450.000		450.000	
	7017-6148	SAN SEWER (12IN) (DI) (RESTRAINED JT)	LF		125.000		125.000	
	7017-6151	SANSWR(15IN)(PVC)(SDR35)(RESJT)	LF		30.000		30.000	
	7017-6159	SAN SEWER (6IN) (DI) (RESTRAINED JT)	LF		52.000		52.000	
	7017-6165	MANHOLE(DISCHARGE)CMPL IN PLACE (4'DIA)	EA		1.000		1.000	
	7017-6166	SAN SWR FORCE MAIN CONNECTION (6 IN)	EA		3.000		3.000	
	7017-6167	SAN SWR FORCE MAIN CONNECTION(10 IN)	EA		2.000		2.000	
	7017-6168	MANHOLE DROP (SAN SWR)(24 IN)	EA		1.000		1.000	
	7017-6169	ABANDON MANHOLE	EA		2.000		2.000	
	7017-6170	REMOVE EXIST SAN SWR PIPE (4 IN)	LF		45.000		45.000	

PUBLIC WORKS
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CITY
HOUSTON, TEXAS

QUANTITY SHEET

Texas Department of Transportation

CONTROLLING PROJECT ID 0912-72-391

DISTRICT Houston
HIGHWAY CS

COUNTY Harris

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**0912-72-391**			
		PROJECT ID		**A00123439**			
		COUNTY		**Harris**			
		HIGHWAY		**CS**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	7017-6171	BYPASS PUMPING	LS	1.000		1.000	
	7017-6173	JCK BOR OR TUN SANSWR (FM)(DI)(6IN)(RJ)	LF	255.000		255.000	
	7017-6174	JCK BOR OR TUN SANSWR(FM)(DI)(10IN)(RJ)	LF	150.000		150.000	
	7017-6175	SAN SWR (24 IN)(DI)(RESTR JT)	LF	410.000		410.000	
	7017-6176	REMOVE EXIST FM PIPE (6 IN)	LF	130.000		130.000	
	7017-6177	REMOVE EXIST FM PIPE (10 IN)	LF	50.000		50.000	
	7017-6184	MANHOLE DROP (SAN SWR) (15 IN)	EA	1.000		1.000	
	7049-6049	CASING STEEL (30IN)	LF	18.000		18.000	
	7049-6052	FIRE HYDRANT BRANCH (LEAD) (6IN)	LF	85.000		85.000	
	7049-6064	ADJUST WATER VALVE BOX	EA	21.000		21.000	
	7049-6093	TAPPING SLEEVE AND VALVE (16IN X 12IN)	EA	1.000		1.000	
	7049-6104	FIRE HYDRANT ASSEMBLY	EA	9.000		9.000	
	7049-6116	REMOVING AND RELOCATING METER AND BOX	EA	4.000		4.000	
	7049-6119	REMOVING AND SALVAGING FIRE HYDRANT	EA	7.000		7.000	
	7049-6126	CUT AND PLUG WATER MAIN (6IN)	EA	10.000		10.000	
	7049-6127	CUT AND PLUG WATER MAIN (8IN)	EA	14.000		14.000	
	7049-6129	CUT AND PLUG WATER MAIN (12IN)	EA	1.000		1.000	
	7049-6131	CUT AND PLUG WATER MAIN (16IN)	EA	8.000		8.000	
	7049-6139	WET CONNECTION (6IN)	EA	3.000		3.000	
	7049-6140	WET CONNECTION (8IN)	EA	6.000		6.000	
	7049-6142	WET CONNECTION (12IN)	EA	1.000		1.000	
	7049-6144	WET CONNECTION (16IN)	EA	13.000		13.000	
	7049-6188	WATER MAIN PIPE (DI)(6IN)(RESTR JT)	LF	105.000		105.000	
	7049-6189	WATER MAIN PIPE (DI)(12IN)(RESTR JT)	LF	230.000		230.000	
	7049-6190	WATER MAIN PIPE (DI)(16IN)(RESTR JT)	LF	395.000		395.000	
	7049-6208	WATER MAIN PIPE (8 IN) (DI) (RESTR JT)	LF	454.000		454.000	
	7049-6209	TAPPING SLEEVE AND VALVE (16 IN X 6 IN)	EA	3.000		3.000	
	7049-6210	TAPPING SLEEVE AND VALVE (16 IN X 8 IN)	EA	4.000		4.000	
	01	OTHER: STATE FORCE ACCOUNT WORK (NON-PARTICIPATING)		1.000		1.000	
	04	PUBLIC UTILITY FORCE ACCT WORK (NON-PARTICIPATING)		1.000		1.000	
	18	LAW ENFORCEMENT: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)		1.000		1.000	

PUBLIC WORKS
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TxDOTCONNECT

Report Generated By: txdotconnect_internal_ext

Report Created On: Apr 29, 2020 12:44:58 PM

DISTRICT	COUNTY	CCSJ	SHEET
Houston	Harris	0912-72-391	16F

SUMMARY OF DEMOLITION QUANTITIES

ITEM			0100	0100	0100	0100	0104	0104	0104	0104	0104	0105	0496							
DESC. CODE			6002	6003	6004	6029	6001	6011	6017	6029	6036	6061	6002	6003	6005	6006	6007	6040	6041	6043
DEMOLITION PLAN SHEETS	STA	STA	PREPARING ROW [3]	PREPARING ROW (TREE) (5" TO 12" DIA)	PREPARING ROW (TREE) (12" TO 24" DIA)	PREPARING ROW (ROOT PRUNING TO 12" DEPTH)	REMOVING CONC (PAV)	REMOVING CONC (MEDIANS)	REMOVING CONC (DRIVEWAYS) [1]	REMOVING CONC (CURB OR CURB & GUTTER)	REMOVING CONC (SIDEWALK OR RAMP)	REMOVE STAB BASE & ASPH PAV (8"-20") [1,2]	REMOVE STR (INLET)	REMOVE STR (MANHOLE)	REMOVE STR (WINGWALL)	REMOVE STR (HEADWALL)	REMOVE STR (PIPE)	REMOV STR (RET WALL)	REMOV STR (LARGE)	REMOV STR (SMALL FENCE)
			STA	EA	EA	LF	SY	SY	SY	LF	SY	SY	EA	EA	EA	EA	LF	LF	EA	LF
SHEET 1 OF 1	BELTWAY 8							58		279	331									
SHEET 1 OF 6	BEGIN	9+00	7	8	11	560	128	55	765	795	649	4328	9	3			1316			
SHEET 2 OF 6	9+00	17+00	8	25	3	520	44	55	844	1236	708	5113	17	4		3	1556		1	
SHEET 3 OF 6	17+00	25+00	8	19	6	395	47		882	0	600	4543	14			6	1227			105
SHEET 4 OF 6	25+00	33+00	8	37	11	660	60		559	384	437	4640	33		4	8	1896		1	15
SHEET 5 OF 6	33+00	41+00	8	19	16	790	19	204	804	1298	575	4249	13		2		1786			
SHEET 6 OF 6	41+00	END	8.72						637	616	730	5280	11	2			1415	21		
TOTAL			47.72	108	47	2925	298	372	4491	4608	4030	28153	97	9	6	17	9,196	21	2	120

[1] ASPHALT DRIVEWAYS REMOVAL IS INCLUDED IN BID ITEM 0105 6061
[2] MAILBOX AND KEYPAD REMOVAL, ALL TYPES, SHALL BE INCIDENTAL TO THE BID ITEM 104 6017 AND 105 6061
[3] FOR CONTRACTOR INFORMATION ONLY. WATER LINE REMOVAL IS INCLUDED IN BID ITEM 100 6002 REGARDLESS OF SIZE AND MATERIAL

SUMMARY OF DEMOLITION QUANTITIES

			0496	0542	0644	1004	7017								7049	
			6093	6001	6076	6001	6094	6113	6114	6128	6129	6170	6176	6177	6119	6216
DEMOLITION PLAN SHEETS	STA	STA	REMOV STR (MASONRY)	REMOVE METAL BEAM GUARD FENCE	REMOVE SM RD SN SUP&AM	TREE PROTECTION	REMOVE EXISTING MANHOLE (SAN SWR)	REMOVE EXIST SAN SWR PIPE (10 IN)	REMOVE EXIST SAN SWR PIPE (12 IN)	REMOVE EXIST SAN SWR PIPE (6 IN)	REMOVE EXIST SAN SWR PIPE (8 IN)	REMOVE EXIST SAN SWR PIPE (4 IN)	REMOVE EXIST FM PIPE (6 IN)	REMOVE EXIST FM PIPE (10 IN)	REMOVING AND SALVAGING FIRE HYDRANT	REMOVE EXIST WATER PIPE (VAR) (SIZE) (MTL) [3]
			LF	LF	EA	EA	EA	LF	LF	LF	LF	LF	LF	LF	EA	LF
SHEET 1 OF 1	BELTWAY 8															
SHEET 1 OF 6	BEGIN	9+00	14		9	21									1	20
SHEET 2 OF 6	9+00	17+00			8	29							55	50	2	10
SHEET 3 OF 6	17+00	25+00			5	17										
SHEET 4 OF 6	25+00	33+00			9	27	7	100	373		91	10			2	20
SHEET 5 OF 6	33+00	41+00			3	42	4			52	359	10			1	40
SHEET 6 OF 6	41+00	END		126	15		2		33	70	80	25	75		1	40
TOTAL			14	126	49	136	13	100	406	122	530	45	130	50	7	130

[1] ASPHALT DRIVEWAYS REMOVAL IS INCLUDED IN BID ITEM 0105 6061
[2] MAILBOX AND KEYPAD REMOVAL, ALL TYPES, SHALL BE INCIDENTAL TO THE BID ITEM 104 6017 AND 105 6061
[3] FOR CONTRACTOR INFORMATION ONLY. WATER LINE REMOVAL IS INCLUDED IN BID ITEM 100 6002 REGARDLESS OF SIZE AND MATERIAL

67862

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

SUMMARY OF DEMOLITION QUANTITIES

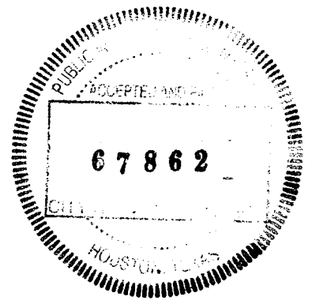
SHEET 1 OF 1

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	17

SUMMARY OF TRAFFIC CONTROL QUANTITIES

ITEM			0400	0508	0512	0512	0512	0512	0512	0512	0662	0662	0662	0662	0662
DESC. CODE			6006	6001	6009	6010	6033	6034	6057	6058	6057	6059	6075	6080	6090
TCP PLAN SHEETS	STA	STA	[1]CUT & RESTORING PAV	[2]CONSTRUCTING 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)	WK ZN PAV MRK REMOV (TRAF BTN) TY W	WK ZN PAV MRK REMOV (TRAF BTN) TY Y	WK ZN PAV MRK REMOV (W) 24" (S LD)	WK ZN PAV MRK REMOV (W) (ARROW)	WK ZN PAV MRK REMOV (W) (WORD)
			SY	SY	LF	LF	LF	LF	LF	LF	LF	LF	LF	EA	EA
PHASE 1															
1 of 3	BEGIN	24+00	173	2,330	100	40									
2 of 3	24+00	43+00	290	3,060			100	40							
3 of 3	43+00	END	149	72			100	40							
PHASE 2 STEP 1															
1 of 1	BOHEME ER (EAST)	END		3691	1,580	120	200	40			1,794	4,267			
PHASE 2 BOHEME INT															
1 of 1	CL OF BOHEME	BOHEME ER (EAST)			20	20									
PHASE 2 STEP 2															
1 of 2	BOHEME ER (WEST)	17+00		2,228	900	100	200	40			1,151	2,611			
2 of 2	17+00	BROKEN BOUGH DR (EAST)		380	180	20	40				390	1,108		2	2
PHASE 2 BROKEN BOUGH DR INT															
1 of 1	CL OF BROKEN BOUGH	BROKEN BOUGH ER (EAST)			50		20	20				1,104			
PHASE 2 STEP 3															
1 of 2	BOHEME ER (WEST)	3+00		2,050					2,830	300	1,250	2,640		2	2
2 of 2	3+00	BEGIN		174							100	250	44	2	2
PHASE 2 STEP 4															
1 of 1	BOHEME ER (WEST)	3+00									380	400	44	1	1
PHASE 3 STEP 1															
1 of 3	BEGIN	24+00									570		44	2	2
2 OF 3	24+00	43+00										2,524	44		
3 OF 3	43+00	END									200	270	44	2	2
PHASE 3 W. BOUGH LN INT															
1 of 1	CL OF W. BOUGH LN	W. BOUGH LN ER (EAST)			70	20			70	20			44	1	2
PHASE 3 STEP 2															
1 of 2	W. BOUGH LN ER (EAST)	24+00									200	2,180	44	1	1
2 OF 2	24+00	BOHEME ER (EAST)										1,270	12		
PHASE 3 STEP 3															
1 of 2	BOHEME ER (EAST)	43+00										1,270			
2 OF 2	43+00	END										1,143			
PHASE 4 STEP 1															
1 of 2	BEGIN	14+00												2	2
2 OF 2	14+00	W. BOUGH LN ER (WEST)													
PHASE 4 STEP 2															
1 of 2	W. BOUGH LN ER (EAST)	24+00													
2 OF 2	24+00	BOHEME ER (WEST)													
PHASE 4 STEP 3															
1 of 2	W. BOUGH LN ER (WEST)	40+00													
2 of 2	40+00	END													
TOTAL			612	13,985	2,900	320	660	180	2,900	320	6,035	21,037	320	15	16

[1] ITEM 0400 6006 "CUT & RESTORING PAV" IS FOR CONTRACTOR INFORMATION ONLY. ITEM IS SUBSIDIARY TO UTILITY CONSTRUCTION.
TEMPORARY ASPHALT PAVEMENT(6" THICK) REQUIRED FOR TEMPORARY ROADWAY RESTORATION DURING ALL SANITARY SEWER AND WATER LINE INSTALLATION LOCATIONS ARE NOT SHOWN ON PLANS. QUANTITIES ARE BASED ON LIMITS OF UTILITY INSTALLATION.
[2] THE FOLLOWING WORK ARE PAID UNDER ITEM 0502 6001 "CONSTRUCTING DETOURS".
TEMPORARY ASPHALT REQUIRED FOR TEMP PAVEMENT(6" THICK) AND TEMP SIDEWALKS.



REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

SUMMARY OF TRAFFIC CONTROL QUANTITIES

SHEET 1 OF 1

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	18

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SUMMARY OF ROADWAY QUANTITIES

ITEM			0110	0112	0132	0260	0260	0360	0360	0423	0450	0529	0529	0530	0531						
DESC. CODE			6001	6001	6006	6012	6027	6086	6091	6008	6052	6011	6045	6025	6002	6004	6008	6010	6013	6016	6048
ROADWAY IMPROVEMENTS PLAN & PROFILE SHEETS	STA	STA	EXCAVATION (ROADWAY)	SUBGRADE WIDENING (ORD COMP)	EMBANKMENT (FINAL) (DENS CONT) (TY C)	LIME (HYD, COM OR QK) (SLRY) OR QK (DRY)	LIME TRT (EXST MATL) (8")	CONC PAV (JOINT REINF) (11")	CONC PAV (JOINT REINF) (HES) (11")	RETAINING WALL (CAST-IN-PLACE)	RAIL (HANDRAIL) (TY F)	CONC CURB (DOWEL)	CONC CURB (DOWEL) (9")	DRIVEWAYS (CONC) (FAST TRK)	CONC SIDEWALKS (5")	CURB RAMPS (TY 1)	CURB RAMPS (TY 5)	CURB RAMPS (TY 7)	CURB RAMPS (TY 10)	CURB RAMPS (TY 21)	CONC SIDEWALKS (9")
			CY	STA	CY	TON	SY	SY	SY	SF	LF	LF	LF	SY	SY	EA	EA	EA	EA	EA	SY
MEMORIAL DR																					
SHEET 1 OF 24	BEGIN	5+00		3		61	2,630	1,250	940			1,214	32	398	350	4				1	9
SHEET 3 OF 24	5+00	9+00		4		75	3,225	1,150	1,570			1,509		359	544						
SHEET 5 OF 24	9+00	13+00		4		75	3,235	1,165	1,290	18		1,452	96	460	532						23
SHEET 7 OF 24	13+00	17+00		4		85	3,665	1,070	2,060	318		1,248	32	320	466	4	4				12
SHEET 9 OF 24	17+00	21+00		4		75	3,245	1,150	1,450	30		1,643		331	573						
SHEET 11 OF 24	21+00	25+00		4		79	3,390	587	2,155			1,625	64	365	491			2			18
SHEET 13 OF 24	25+00	28+50		4		60	2,560	760	1,345			1,414	32	256	457			2			11
SHEET 15 OF 24	28+50	32+50		4		73	3,126	2,400	465			1,498	32	210	512				2		7
SHEET 17 OF 24	32+50	36+50		4		73	3,128	2,343	500			1,379	64	347	463			2			18
SHEET 19 OF 24	36+50	40+50		4		75	3,215	1,755	1,290			1,538		297	532						27
SHEET 21 OF 24	40+50	45+00		5		87	3,735		3,180		100	1,607	64	41	509			2	2		17
SHEET 23 OF 24	45+00	END		4		98	4,200		3,640			1,528	64	201	533			4	2		18
TOTAL			38,630	47	4,640	916	39,354	13,630	19,885	366	100	17,655	480	3,585	5,962	8	4	12	6	1	160

SUMMARY OF ROADWAY QUANTITIES

ITEM			0536		0540		0544
DESC. CODE			6002	6005	6001	6016	6001
ROADWAY IMPROVEMENTS PLAN & PROFILE	STA	STA	CONCRETE MEDIAN	CONCRETE MEDIAN (NOSE)	MTL W-BEAM GD FEN (TIM POST)	DOWNSTREAM ANCHOR TERMINAL SECTION	GUARDRAIL END TREATMENT
			SY	SY	LF	EA	EA
MEMORIAL DR							
SHEET 1 OF 24	BEGIN	5+00	14	20			
SHEET 3 OF 24	5+00	9+00	0	12			
SHEET 5 OF 24	9+00	13+00	0	11			
SHEET 7 OF 24	13+00	17+00	0	12			
SHEET 9 OF 24	17+00	21+00	0	11			
SHEET 11 OF 24	21+00	25+00	0	11			
SHEET 13 OF 24	25+00	28+50	0	11			
SHEET 15 OF 24	28+50	32+50	89	6			
SHEET 17 OF 24	32+50	36+50	43	5			
SHEET 19 OF 24	36+50	40+50	76	3			
SHEET 21 OF 24	40+50	45+00	45	21			1
SHEET 23 OF 24	45+00	END	78	5	126	1	
				0			
TOTAL			345	128	126	1	1

ACCEPTED AND FILED
PUBLIC RECORDS
67862
CITY SECRETARY
HOUSTON, TEXAS

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

SUMMARY OF ROADWAY QUANTITIES

SHEET 1 OF 1

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	19

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SUMMARY OF DRAINAGE QUANTITIES

ITEM						0400				0402	0403	0462					0464			
DESC. CODE						6002	6003	6005	6009	6001	6001	6002	6005	6020	6029	6034	6005	6007	6008	6009
P&P SHEET NUMBER			STATION TO STATION			STRUCT EXCAV (BOX) *	STRUCT EXCAV (PIPE) *	CEM STABIL BKFL	CEMENT STAB BACKFILL (INLET OR MH)	TRENCH EXCAVATION PROTECTION	TEMPORARY SHORING	CONC BOX CULV (3 FT X 3 FT)	CONC BOX CULV (4 FT X 4 FT)	CONC BOX CULV (8 FT X 5 FT)	CONC BOX CULV (10 FT X 5 FT)	CONC BOX CULV (10 FT X 10 FT)	RC PIPE (CL III) (24 IN)	RC PIPE (CL III) (30 IN)	RC PIPE (CL III) (36 IN)	RC PIPE (CL III) (42 IN)
						CY	CY	CY	CY	LF	SF	LF	LF	LF	LF	LF	LF	LF	LF	LF
STORM SEWER PLAN & PROFILE																				
1	OF	24	BEGIN	TO	5+00	502	248	299	42	391			285					23		
3	OF	24	5+00	TO	9+00	701	1,653	957	83	993			398				79	18		
5	OF	24	9+00	TO	13+00	526	1,353	893	75	945		267	112				25	45		
7	OF	24	13+00	TO	17+00	1,259	2,143	1,010	75	942				111	290		80	154		
9	OF	24	17+00	TO	21+00	3,473	3,722	979	116	1,286					800		312	34		
11	OF	24	21+00	TO	25+00	3,603	3,801	972	33	(1) 1,144 ⚠					830		245	29		
13	OF	24	25+00	TO	28+50	3,039	3,326	906	50	1,155					700		363	36		
15	OF	24	28+50	TO	32+50	4,635	5,006	1,138	116	1,431					310	470	455	58		
17	OF	24	32+50	TO	36+50	5,669	5,929	1,150	116	(2) 1,268 ⚠						810	204	130		
19	OF	24	36+50	TO	40+50	5,599	5,853	1,137	116	1,271	160					800	274	69		
21	OF	24	40+50	TO	45+00	5,949	6,175	1,176	66	(3) 1,229 ⚠						850	260	40		7
23	OF	24	45+00	TO	END	4,451	4,945	1,084	116	(4) 1,186 ⚠	160					636	93	14	228	(50) ⚠
TOTAL						39,406	44,154	11,701	1,004	(13,241) ⚠	320	267	795	111	2,930	3,566	2,390	650	228	(57) ⚠

*FOR CONTRACTOR INFORMATION ONLY.

SUMMARY OF DRAINAGE QUANTITIES (CONT)

ITEM						0464			0465								
DESC. CODE						6010	6037	6166	6168	6173	6176	6177	6344	6412	6556	6555
P&P SHEET NUMBER			STATION TO STATION			RC PIPE (CL III) (48 IN)	RC PIPE (ELLIP) (CL III)	INLET (COMPL) (AAD INLET)	INLET (COMPL) (TY A)	MANH (COMPL) (TY A)	INLET (COMPL) (CURB) (TY C1)	INLET (COMPL) (AZ2G)	INLET (COMPL) (TY C1) (MOD)	MANH (COMPL) (TY A) (MOD)	JCT BOX 8'X14' (COMPL) (SPL)	JCT BOX 10'X28' (COMPL) (SPL)
						LF	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA
STORM SEWER PLAN & PROFILE																
1	OF	24	BEGIN	TO	5+00	39				3	1		1			
3	OF	24	5+00	TO	9+00	398	16		(4) ⚠	3	1		2			
5	OF	24	9+00	TO	13+00	399	17			5	2		2			
7	OF	24	13+00	TO	17+00	225				4	1			3	1	
9	OF	24	17+00	TO	21+00						7			7		
11	OF	24	21+00	TO	25+00				(1) ⚠		2			1		
13	OF	24	25+00	TO	28+50				1	1	2			2		
15	OF	24	28+50	TO	32+50				2	2	5	1		3		1
17	OF	24	32+50	TO	36+50				(2) ⚠	5	3			4		
19	OF	24	36+50	TO	40+50				1	4	4			5		
21	OF	24	40+50	TO	45+00				(3) ⚠		2			3		
23	OF	24	45+00	TO	END	45		2	3	7	2			2		
TOTAL						1,106	33	2	(17) ⚠	34	32	1	5	30	1	1

SUMMARY OF DRAINAGE QUANTITIES (CONT)

ITEM						0467		0479	0481			
DESC. CODE						6423	6454	6001	6009	6011	6014	6015
P&P SHEET NUMBER			STATION TO STATION			SET (TY II) (30 IN) (RCP) (6:1) (P)	SET (TY II) (36 IN) (RCP) (6:1) (P)	ADJUSTING MANHOLES	PIPE (PVC) (SCH 40) (2 IN)	PIPE (PVC) (SCH 40) (4 IN)	PIPE (PVC) (SCH 40) (8 IN)	PIPE (PVC) (SCH 40) (10 IN)
						EA	EA	EA	LF	LF	LF	LF
STORM SEWER PLAN & PROFILE												
1	OF	24	BEGIN	TO	5+00			1				
3	OF	24	5+00	TO	9+00							
5	OF	24	9+00	TO	13+00				11	15		
7	OF	24	13+00	TO	17+00			1				
9	OF	24	17+00	TO	21+00							
11	OF	24	21+00	TO	25+00							
13	OF	24	25+00	TO	28+50							
15	OF	24	28+50	TO	32+50							
17	OF	24	32+50	TO	36+50						14	10
19	OF	24	36+50	TO	40+50					16		
21	OF	24	40+50	TO	45+00							
23	OF	24	45+00	TO	END	1	1					
TOTAL						1	1	2	11	31	14	10

1 SHEET MODIFIED ON 04/23/20

ACCEPTED
67862

REV. NO.	DATE	DESCRIPTION	BY
⚠	04/23/20	ADDENDUM NO. 1- REPLACE ENTIRE SHEET	MAS

Lockwood, Andrews & Newnam, Inc. A LEO A DALY COMPANY — FIRM REGISTATION NO. 2614

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

SUMMARY OF DRAINAGE QUANTITIES

SHEET 1 OF 1

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	20

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MASalinas

SUMMARY OF WATERLINE QUANTITIES

ITEM						0402	7049									
DESC. CODE						6001	6049	6052	6064	6093	6104	6116	6126	6127	6129	6131
P&P SHEET NUMBER			STATION TO STATION			TRENCH EXCAVATION PROTECTION	CASING STEEL (30 IN)	FIRE HYDRANT BRANCH (LEAD) (6 IN)	ADJUST WATER VALVE BOX	TAPPING SLEEVE AND VALVE (16 IN X 12 IN)	FIRE HYDRANT ASSEMBLY	REMOVING AND RELOCATING METER AND BOX	CUT AND PLUG WATER MAIN (6 IN)	CUT AND PLUG WATER MAIN (8 IN)	CUT AND PLUG WATER MAIN (12 IN)	CUT AND PLUG WATER MAIN (16 IN)
						LF	LF	LF	EA	EA	EA	EA	EA	EA	EA	EA
WATER LINE & SAN SWR PLAN & PROFILE																
1	OF	12	BEGIN	TO	5+00	246		8	1		1		4	1		2
2	OF	12	5+00	TO	9+00	20		8	0		1		1			
3	OF	12	9+00	TO	13+00	20		8	0				1			
4	OF	12	13+00	TO	17+00	20		6	3	1	1		1	1		
5	OF	12	17+00	TO	21+00	25		6	0		1	2				2
6	OF	12	21+00	TO	25+00	70			0						1	2
7	OF	12	25+00	TO	28+50	20		6	4		1		1	3		
8	OF	12	28+50	TO	32+50	36	18	8	5		1		1			
9	OF	12	32+50	TO	36+50	20		8	2		1		1	3		
10	OF	12	36+50	TO	40+50	20		7	1		1	2				2
11	OF	12	40+50	TO	45+00	20		20	3		1			3		
12	OF	12	45+00	TO	END	20			2					3		
TOTAL						537	18	85	21	1	9	4	10	14	1	8

SUMMARY OF WATER LINE QUANTITIES

ITEM						7049									
DESC. CODE						6139	6140	6142	6144	6188	6189	6190	6208	6209	6210
P&P SHEET NUMBER			STATION TO STATION			WET CONNECTION (6 IN)	WET CONNECTION (8 IN)	WET CONNECTION (12 IN)	WET CONNECTION (16 IN)	WATER MAIN PIPE (DI) (6 IN) (RESTR JT)	WATER MAIN PIPE (DI) (12 IN) (RESTR JT)	WATER MAIN PIPE (DI) (16 IN) (RESTR JNT)	WATER MAIN PIPE (DI) (8 IN) (RESTR JT)	TAPPING SLEEVE AND VALVE (16 IN X 6 IN)	TAPPING SLEEVE AND VALVE (16 IN X 8 IN)
						EA	EA	EA	EA	LF	LF	LF	LF	EA	EA
WATER LINE & SAN SWR PLAN & PROFILE															
1	OF	12	BEGIN	TO	5+00	1	1		2	105		235	12	2	
2	OF	12	5+00	TO	9+00				2			10			
3	OF	12	9+00	TO	13+00	2			2			11			
4	OF	12	13+00	TO	17+00		1		1		130		10		
5	OF	12	17+00	TO	21+00				2			25			
6	OF	12	21+00	TO	25+00			1	2		100	60			
7	OF	12	25+00	TO	28+50		1						100		1
8	OF	12	28+50	TO	32+50				1			36			
9	OF	12	32+50	TO	36+50		1						92	1	1
10	OF	12	36+50	TO	40+50				1			18			
11	OF	12	40+50	TO	45+00		1						120		1
12	OF	12	45+00	TO	END		1						120		1
TOTAL						3	6	1	13	105	230	395	454	3	4

ACCEPTED AND FILED
PUBLIC WORKS
67862
CITY SECRETARY
HOUSTON, TEXAS

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

SUMMARY OF WATER LINE QUANTITIES

SHEET 1 OF 1

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	21

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SUMMARY OF SANITARY SEWER ITEMS

ITEM						0402	7017														
DESC. CODE						6001	6004	6017	6018	6028	6030	6041	6042	6051	6053	6073	6087	6106	6110	6124	6125	6126
P&P SHEET NUMBER			STATION TO STATION			TRENCH EXCAVATION PROTECTION	SANITARY SEWER (6 IN) (PVC) (C900)	SAN SWR (8 IN) (PVC) (SDR 26)	SAN SWR (10 IN) (PVC) (SDR 26)	SAN SWR (24 IN) (PVC) (SDR 35)	SANITARY SEWER (4 IN) (DI)	CASING (STEEL) (SANITARY SEWER) (12 IN)	CASING (STEEL) (SANITARY SEWER) (16 IN)	MANHOLE (SAN SEWER) (4' DIA)	MANHOLE (SAN SEWER) (5' DIA)	SERVICE CONNECTION (SANITARY SEWER)	AIR AND VACUUM RELIEF VALVE (2IN)	ABAND/FILL EXIST SAN SWR PIPE (6 IN)	*POST CONSTRUCTION TELEVISION INSPECTION	MANHOLE DROP (SAN SWR) (6 IN)	MANHOLE DROP (SAN SWR) (8 IN)	MANHOLE DROP (SAN SWR) (10 IN)
						LF	LF	LF	LF	LF	LF	LF	LF	EA	EA	EA	EA	LF	LF	EA	EA	EA
WATER LINE & SAN SWR PLAN & PROFILE																						
1	OF	12	BEGIN	TO	5+00	0													0			
2	OF	12	5+00	TO	9+00	0													0			
3	OF	12	9+00	TO	13+00	0													0			
4	OF	12	13+00	TO	17+00	315								2			2	140	305			
5	OF	12	17+00	TO	21+00	0													0			
6	OF	12	21+00	TO	25+00	0													0			
7	OF	12	25+00	TO	28+50	350			30	30				3					(335)Δ			1
8	OF	12	28+50	TO	32+50	270		( )Δ					36	3	1				250		1	
9	OF	12	32+50	TO	36+50	215		( )Δ				18		2	2				(195)Δ		3	
10	OF	12	36+50	TO	40+50	(222)Δ					(5)Δ		25	1					(222)Δ	1	1	
11	OF	12	40+50	TO	45+00	0													0			
12	OF	12	45+00	TO	END	(339)Δ	6	15	72					2	1				(206)Δ	1		1
TOTAL						(1,711)Δ	6	(15)Δ	102	30	(5)Δ	18	61	13	4	3	2	140	(1,513)Δ	2	5	2

SUMMARY OF SANITARY SEWER ITEMS

ITEM						7017															
DESC. CODE						6127	6134	6140	6141	6148	6151	6159	6165	6166	6167	6168	6169	6171	6173	6174	6175	6184
P&P SHEET NUMBER			STATION TO STATION			MANHOLE DROP (SAN SWR) (12 IN)	ABAND/FILL EXIST SAN SWR PIPE (10 IN)	PRE-CONSTRUCTION TELEVISION INSPECTION	SAN SWR (8 IN) (DI) (RESTRAINED JT)	SAN SEWER (12 IN) (DI) (RESTRAINED JT)	SAN SWR (15 IN) (PVC) (SDR 35) (RESJT)	SAN SWR (6 IN) (DI) (RESTRAINED JT)	MANHOLE (DISCHARGE) CMPL IN PLACE (4' DIA)	SAN SWR FORCE MAIN CONNECTION (6 IN)	SAN SWR FORCE MAIN CONNECTION (10 IN)	MANHOLE DROP (SAN SWR) (24 IN)	ABANDON MANHOLE	BYPASS PUMPING	JCK BOR OR TUN SAN SWR (FM) (DI) (6 IN) (RJ)	JCK BOR OR TUN SAN SWR (FM) (10 IN) (DI) (RJ)	SAN SWR (24 IN) (DI) (RESTR JT)	MANHOLE DROP (SAN SWR) (15 IN)
						EA	LF	LF	LF	LF	LF	LF	EA	EA	EA	EA	EA	LS	LF	LF	LF	EA
WATER LINE & SAN SWR PLAN & PROFILE																						
1	OF	12	BEGIN	TO	5+00			0														
2	OF	12	5+00	TO	9+00			0														
3	OF	12	9+00	TO	13+00			0														
4	OF	12	13+00	TO	17+00		140	305						2	2				155	150		
5	OF	12	17+00	TO	21+00			0														
6	OF	12	21+00	TO	25+00			0														
7	OF	12	25+00	TO	28+50	2	135	(335)Δ		25											250	
8	OF	12	28+50	TO	32+50		95	278	(90)Δ							1	1				160	
9	OF	12	32+50	TO	36+50			(230)Δ	195								1					
10	OF	12	36+50	TO	40+50			(217)Δ	(165)Δ				(52)Δ									
11	OF	12	40+50	TO	45+00			0														
12	OF	12	45+00	TO	END	1		(323)Δ		(100)Δ	30		1	1					100			1
TOTAL						3	370	(1,688)Δ	(450)Δ	(125)Δ	30	(52)Δ	1	3	2	1	2	1	255	150	410	1

*FOR CONTRACTOR INFORMATION ONLY. ITEM IS SUBSIDIARY TO PERTINENT ITEMS.

REV. NO.	DATE	DESCRIPTION	BY
Δ	04/23/20	ADDENDUM NO. 1- REPLACE ENTIRE SHEET	MAS

Lockwood, Andrews & Newnam, Inc. — A LEO A DALY COMPANY — FIRM REGISTATION NO. 2614

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1 SHEET MODIFIED ON 04/23/20

PUBLIC WORKS ENGINEER — ACCEPTED — 67862 — CITY OF HOUSTON

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

SUMMARY OF SANITARY SEWER QUANTITIES

SHEET 1 OF 1

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	22

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Working\4-1-BIM-CAD\Summarys\QTY SAN 01.dgn

SUMMARY OF PAVEMENT MARKING QUANTITIES									
ITEM			0666	0666	0668	0668	0672	0672	0672
DESC. CODE			6212	6438	6077	6085	6007	6009	6010
DESCRIPTION	STA	STA	REFL PAV MRK TY II (Y) 12" (SLD)	REFL PAV MRK TY II (R) 12" (FIRE LANE)	PREFAB PAV MRK TY C (W) (ARROW)	PREFAB PAV MRK TY C (W) (WORD)	REFL PAV MRKR TY I-C	REFL PAV MRKR TY II A-A	REFL PAV MRKR TY II C-R
UNIT			LF	LF	EA	EA	EA	EA	EA
SHEET 1 OF 7	E BWY 8	503+20	280		4	4	20		
SHEET 2 OF 7	1+00	9+00	877		4	4	21		33
SHEET 3 OF 7	9+00	17+00	630		5	1	16	6	36
SHEET 4 OF 7	17+00	25+00	796		4	1	13		38
SHEET 5 OF 7	25+00	33+00	580	6	5	0	14		37
SHEET 6 OF 7	33+00	41+00	808	6	3	1	9		38
SHEET 7 OF 7	41+00	END	709		8	0	13	6	35
TOTAL			4,680	12	33	11	106	12	217

SUMMARY OF PAVEMENT MARKING QUANTITIES									
ITEM			0678	0678	0678	0678	0678	0678	0678
DESC. CODE			6001	6002	6004	6006	6008	6009	6016	6033
DESCRIPTION	STA	STA	PAV SURF PREP FOR MRK (4")	PAV SURF PREP FOR MRK (6")	PAV SURF PREP FOR MRK (8")	PAV SURF PREP FOR MRK (12")	PAV SURF PREP FOR MRK (24")	PAV SURF PREP FOR MRK (ARROW)	PAV SURF PREP FOR MRK (WORD)	PAV SURF PREP FOR MRK (RPM)
UNIT			LF	LF	LF	LF	LF	EA	EA	EA
SHEET 1 OF 7	E BWY 8	503+00	100	0	296	639	160	4	4	20
SHEET 2 OF 7	1+00	9+00	340	0	403	1,209	164	4	4	54
SHEET 3 OF 7	9+00	17+00	831	0	345	1,093	164	5	1	58
SHEET 4 OF 7	17+00	25+00	390	0	246	901	14	4	1	51
SHEET 5 OF 7	25+00	33+00	370	0	273	805	46	5	0	51
SHEET 6 OF 7	33+00	41+00	410	0	169	979	59	3	1	47
SHEET 7 OF 7	41+00	END	686	32	255	900	91	8	0	54
TOTAL			3,127	32	1,987	6,526	698	33	11	335

SUMMARY OF PAVEMENT MARKING QUANTITIES										
ITEM			6038	6038	6038	6038	6038	6038	6038	6038
DESC. CODE			6001	6002	6006	6007	6011	6013	6014	6015
DESCRIPTION	STA	STA	MULTIPOLYMER PAV MRK (W) (4") (SLD)	MULTIPOLYMER PAV MRK (W) (4") (BRK)	MULTIPOLYMER PAV MRK (W) (6") (DOT)	MULTIPOLYMER PAV MRK (W) (8") (SLD)	MULTIPOLYMER PAV MRK (W) (12") (SLD)	MULTIPOLYMER PAV MRK (W) (24") (SLD)	MULTIPOLYMER PAV MRK (Y) (4) (SLD)	MULTIPOLYMER PAV MRK (Y) (4) (BRK)
UNIT			LF	LF	LF	LF	LF	LF	LF	LF
SHEET 1 OF 7	E BWY 8	503+00		100		296	359	160		
SHEET 2 OF 7	1+00	9+00		340		403	332	164		
SHEET 3 OF 7	9+00	17+00	89	360		345	463	164	382	
SHEET 4 OF 7	17+00	25+00		390		246	105	14		
SHEET 5 OF 7	25+00	33+00		370		273	219	46		
SHEET 6 OF 7	33+00	41+00		410		169	165	59		
SHEET 7 OF 7	41+00	END		370	32	255	191	91	236	80
TOTAL			89	2,340	32	1,987	1,834	698	618	80

PUBLIC WORKS
ACCEPTED
67862
CITY
HOUSTON

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

SUMMARY OF PAVEMENT MARKINGS QUANTITIES

SHEET 1 OF 1

FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
6	TEXAS	STP 1802(783)MM			CS
DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
HOU	HARRIS	0912	72	391	23

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SUMMARY OF SMALL SIGNS

LAYOUT SHEET NO.	SIGN NO.	SIGN TYPE	SIGN TEXT	SIGN DIMENSION (IN)	PLYWOOD SIGNS	ALUMINUM SIGNS TYPE A	644 - INS SM RD SN SUP & AM TYPE OF MOUNT: 6001 1OBWG (1) SA (P) (EA)	6002 1OBWG (1) SA (P-BM) (EA)	6004 1OBWG (1) SA (T) (EA)	6005 1OBWG (1) SA (T-2EXT) (EA)	6006 1OBWG (1) SA (U) (EA)	6017 1OBWG (2) SA (P) (EA)	6019 1OBWG (2) SA (T-2EXT) (EA)	6027 S80 (1) SA (P) (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)
2 OF 7	1	M3-3	SOUTH	24x12		X								X										
		M1-6B	BELTWAY 8	24x24		X																		
		M6-3	ARROW	24x15		X																		
		M3-3	SOUTH	24x12		X																		
		SID N-16	SAM HOUSTON TOLLWAY	X		X																		
		M6-3	ARROW	21x15		X																		
	2	M3-1	NORTH	24x24		X																		
		M1-6B	BELTWAY 8	24x24		X																		
		M6-1	ARROW	21x15		X																		
		M3-1	NORTH	24x12		X																		
		SID N-16	SAM HOUSTON TOLLWAY	X		X																		
		M6-1	ARROW	21x15		X																		
	3		METRO 161 162	EXISTING		X	X																	
		M6-1	ARROW	21x15		X	X																	
	4		STOP	EXISTING		X	X																	
	5	W1-2R	HORIZONTAL ALIGNMENT	36x36		X	X																	
		W13-1P	SPEED LIMIT 25	18x18		X	X																	
	6	R2-1	SPEED LIMIT 35	30x36		X	X																	
	7		MASEL LANE	EXISTING		X	X																	
	8	D3-2	SAM HOUSTON N PKWY NEXT SIGN	VARIES X 30		X	X																	
	9		STOP	EXISTING		X	X																	
	10		STOP	EXISTING		X	X																	
	11		KIM'S LANE	EXISTING		X	X																	
	12		INTERSTATE 10 HOV LANE	EXISTING		X	X																	
		R4-7A	KEEP RIGHT	24x30		X	X																	
3 OF 7	13		STOP	EXISTING		X	X																	
	14		STOP	EXISTING		X	X																	
	15		DANIELLE LANE	EXISTING		X	X																	
	16		METRO 161 162	EXISTING		X	X																	
	17		STOP	EXISTING		X	X																	
	18		METRO 161 162	EXISTING		X	X																	
	19		METRO 161 162	EXISTING		X	X																	
	20		METRO 161 162	EXISTING		X	X																	
4 OF 7	21	D3-1	OLD OAKS DR 12700	VARIES X 9		X	X																	
		D3-1	MEMORIAL DR 12700	VARIES X 9		X	X																	
		R1-1	STOP	36x36		X	X																	
	22	R5-2(2)	NO THRU TRUCKS	24x30		X	X																	
	23		METRO 161 162	EXISTING		X	X																	
	24	W1-2L	HORIZONTAL ALIGNMENT	36x36		X	X																	
	25		AREA PATROLLED BY CONSTABLE PCT 5 HARRIS COUNTY CONSTABLE	EXISTING		X	X																	
	26		METRO 161 162	EXISTING		X	X																	
5 OF 7	27	D3-1	HUNTINGWICK DR 12700	VARIES X 9		X	X																	
		D3-1	MEMORIAL DR 12700	VARIES X 9		X	X																	
		R1-1	STOP	36x36		X	X																	
	28		METRO 161 162	EXISTING		X	X																	
	29	W1-2L	HORIZONTAL ALIGNMENT	36x36		X	X																	
		W13-1P	SPEED LIMIT 25	18x18		X	X																	
	30		METRO 161 162	EXISTING		X	X																	
	31	D3-1	MEMORIAL MINKLE DR 12600	VARIES X 9		X	X																	
		D3-1	MEMORIAL DR 12600	VARIES X 9		X	X																	
		R1-1	STOP	36x36		X	X																	
	32	D3-1	BOHEME DR 12600	VARIES X 9		X	X																	
		D3-1	MEMORIAL DR 12600	VARIES X 9		X	X																	
		R1-1	STOP	36x36		X	X																	
	33		METRO 161 162	EXISTING		X	X																	
6 OF 7	34		STOP	36x36		X	X																	
	35		METRO 161 162	EXISTING		X	X																	
	36	W1-2R	HORIZONTAL ALIGNMENT	36x36		X	X																	
		W13-1P	SPEED LIMIT 25	18x18		X	X																	
7 OF 7	37	D3-1	HOLLOW DR 12600	VARIES X 9		X	X																	
		D3-1	MEMORIAL DR 400	VARIES X 9		X	X																	
		R1-1	STOP	36x36		X	X																	
	38	R5-2(2)	NO THRU TRUCKS	24x30		X	X																	
			AREA PATROLLED BY CONSTABLE PCT 5 HARRIS COUNTY CONSTABLE	EXISTING		X																		
	39		METRO 161 162	EXISTING		X	X																	
	40		METRO 161 162	EXISTING		X	X																	
	41	R2-1	SPEED LIMIT 35	30x36		X	X																	
	42	D3-1	SALLOWOOD DR 400	30x36		X	X																	
	43	D3-1	MEMORIAL DR 12600	VARIES X 9		X	X																	
		R1-1	STOP	36x36		X	X																	
	44	R5-2(2)	NO THRU TRUCKS	24x30		X	X																	
	45		METRO 161 162	EXISTING		X	X																	
	46	R3-9aP	END	30x12		X	X																	
		R3-9B	CENTER LANE	24x36		X	X																	
	47	W17-1	SPEED HUMP	36x36		X	X																	
		W13-1P	SPEED LIMIT 35	18x18		X	X																	
	48	W14-2	NO SOLICITING	EXISTING		X																		
	49	D3-1	LEGEND LN 300	36x36		X	X																	
		D3-1	MEMORIAL DR 12600	VARIES X 9		X	X																	
		R1-1	STOP	36x36		X	X																	
	50		METRO 161 162	EXISTING		X	X																	
	51	R3-9aP	BEGIN	30x12		X	X																	
		R3-9B	CENTER LANE	24x36		X	X																	

SUMMARY OF SIGNING QUANTITIES						
ITEM			0636	0644	0644	0644
DESC. CODE			6001	6001	6027	6068
DESCRIPTION	STA	STA	ALUMINUM SIGNS (TY A)	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	IN SM RD SN SUP&AM	RELOCATE SM RD SN SUP&AM TY 10BWG
UNIT			SF	EA	EA	EA
SHEET 1 OF 7	E BWY 8	503+00				
SHEET 2 OF 7	1+00	9+00	75	11	1	8
SHEET 3 OF 7	9+00	17+00	21	8		8
SHEET 4 OF 7	17+00	25+00	41	6		3
SHEET 5 OF 7	25+00	33+00	77	7		2
SHEET 6 OF 7	33+00	41+00	19	3		2
SHEET 7 OF 7	41+00	END	133	16		6
TOTAL			366	51	1	29

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"

ACCEPTED AS NOTED
67862 -

SUMMARY OF SMALL SIGNS

SHEET 1 OF 1

STATE DISTRICT	FEDERAL REGION	PROJECT NO.			SHEET
HOU	6	STP 2017 (407) MM			24
COUNTY		CONTROL	SECTION	JOB	HIGHWAY NO.
HARRIS		0912	72	363	CS

STD-N29

SUMMARY OF LIGHTING QUANTITIES						
ITEM			416	0618	0624	0628
DESC. CODE			6003	6046	6009	6002
SHEET NO.	STATION TO STATION		DRILL SHAFT (30IN)	CONDT (PVC) (SCH 80) (2")	GROUND BOX TY D (162922)	REMOVE ELECTRICAL SERVICES
			LF	LF	EA	EA
Memorial Dr.						
SHEET 1 OF 6	BEGIN	9+00	56	1,192		4
SHEET 2 OF 6	9+00	17+00	48	2,030	3	7
SHEET 3 OF 6	17+00	25+00	40	1,055		2
SHEET 4 OF 6	25+00	33+00	24	323		1
SHEET 5 OF 6	33+00	41+00	32	895		
SHEET 6 OF 6	41+00	END	40	611		4
TOTAL			240	6,106	3	18

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CITY
RO

REV. NO.	DATE	DESCRIPTION	BY

Lockwood, Andrews & Newnam, Inc.
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FIRM REGISTATION NO. 2614

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

SUMMARY OF LIGHTING QUANTITIES

SHEET 1 OF 1

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	25

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SUMMARY OF PLANTING QUANTITIES

Item	192	192	192	192	192	192	192	192	192
Code	6001	6002	6003	6012	6016	6026	6027	6081	6082
Description	PLANT MATERIAL (4" CNTR)	PLANT MATERIAL (1 - GAL)	PLANT MATERIAL (3 - GAL)	MULCH	PLANT BED PREPARATION	PLANT MATERIAL (65 GAL) (TREE)	PLANT MATERIAL (100 GAL) (TREE)	PLANT SOIL MIX (PLANTING SOIL)	PLANT SOIL MIX (TURF SOIL)
Unit of Measure	EA	EA	EA	CY	SY	EA	EA	CY	CY
Notes				2" THICK MULCH LAYER OVER ALL PLANTED AREA		REFERENCE PLANS FOR TREE SPECIES & LAYOUT	REFERENCE PLANS FOR TREE SPECIES & LAYOUT		
Detail Drawing No. Location									
Detail Drawing Sheet No.									
L4.02	332	396	422	14	253	-	10	202	83
L4.03	474	566	209	11	200	-	7	160	94
L4.04	508	445	237	10	188	2	8	150	191
L4.05	198	166	92	4	71	8	11	57	294
L4.06	-	253	119	5	88	-	8	70	58
L4.07	-	-	-	0	0	10	6	0	50
L4.08	-	225	85	4	69	9	13	55	372
L4.09	-	550	233	10	180	4	16	144	251
L4.10	-	553	212	9	168	6	11	135	357
L4.11	-	-	-	-	-	-	7	-	95
L4.12	-	184	72	3	57	2	10	46	171
L4.13	-	-	-	-	-	2	5	-	120
L4.14	-	-	-	-	-	1	6	-	156
L4.15	-	-	-	-	-	-	3	-	140
L4.16	-	191	77	3	59	3	3	47	239
L4.17	-	-	-	-	-	-	-	-	112
TOTAL	**1512**	**3529**	**1758**	**74**	**1333**	**47**	**124**	**1066**	**2782**

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TEXAS BOARD OF ARCHITECTURAL EXAMINERS
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ARCHITECT #10417
FEB 27 2020

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

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

SUMMARY OF PLANTING QUANTITIES

SHEET 01 OF 01

DGN	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN	6	TEXAS	STP 1802 (783) MM			CS
DWG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG	HOU	HARRIS	0912	72	391	26

PUBLIC WORKS
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HOUSTON, TEXAS

SUMMARY OF IRRIGATION QUANTITIES

Item	170
Code	6001
Description	IRRIGATION SYSTEM
Unit of Measure	LS
Notes	REFERENCE IRRIGATION SHEETS
Detail Drawing No. Location	-
Detail Drawing Sheet No.	-
L3.01	-
L3.02	-
L3.03	-
L3.04	-
L3.05	-
L3.06	-
L3.07	-
L3.08	-
L3.09	-
L3.10	-
L3.11	-
L3.12	-
L3.13	-
L3.14	-
L3.15	-
L3.16	-
TOTAL	**1**

SUMMARY OF SOD QUANTITIES

Item	162	166	168
Code	6002	6001	6001
Description	BLOCK SODDING	FERTILIZER	VEGETATIVE WATERING
Unit of Measure	SY	AC	MG
Notes	-	4000 LBS / ACRE	20 CONSECUTIVE WORKING DAYS AFTER INSTALLATION
Detail Drawing No. Location			
Detail Drawing Sheet No.			
L4.02	417	0.09	10
L4.03	468	0.10	12
L4.04	548	0.11	14
L4.05	617	0.13	15
L4.06	329	0.07	8
L4.07	596	0.12	15
L4.08	830	0.17	21
L4.09	659	0.14	16
L4.10	933	0.19	23
L4.11	474	0.10	12
L4.12	542	0.11	13
L4.13	416	0.09	10
L4.14	608	0.13	15
L4.15	698	0.14	17
L4.16	816	0.17	20
L4.17	615	0.13	15
TOTAL	**9565**	**2**	**237**

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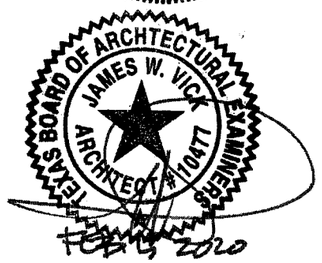

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REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

SUMMARY OF PLANTING & IRRIGATION QUANTITIES

SHEET 01 OF 01

DGN	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DWN	6	TEXAS	STP 1802 (783) MM			CS
CHK DWG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
	HOU	HARRIS	0912	72	391	27

SUMMARY OF SW3P QUANTITIES

ITEM						0162	0164	0166	0168	0506				
DESC. CODE						6003	6009	6001	6001	6002	6011	6040	6041	6043
SWPPP SHEET NUMBER			STATION TO STATION			STRAW OR HAY MULCH	BROADCAST SEED (TEMP WARM)	FERTILIZER	VEGETATIVE WATERING	ROCK FILTER DAMS (INSTALL) (TY 2)	ROCK FILTER DAMS (REMOVE)	BIODEG EROSN CONT LOGS (INSTL) (8")	BIODEG EROSN CONT LOGS (INSTL) (12")	BIODEG EROSN CONT LOGS (REMOVE)
						SY	SY	AC	MG	LF	LF	LF	LF	LF
1	OF	1	BELTWAY 8										138	138
1	OF	6	BEGIN	TO	9+00							410	2,839	3,249
2	OF	6	9+00	TO	17+00							300	3,130	3,430
3	OF	6	17+00	TO	25+00							525	3,304	3,829
4	OF	6	25+00	TO	33+00					44	44	375	3,179	3,554
5	OF	6	33+00	TO	41+00							350	2,796	3,146
6	OF	6	41+00	TO	END					132	132	200	2,833	3,033
TOTAL						1000	1000	0.25	25	176	176	2,160	18,081	20,241

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HOUSTON, TEXAS

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

SUMMARY OF SW3P QUANTITIES

SHEET 1 OF 1

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	28

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SUMMARY OF HARDSCAPE QUANTITIES

Item	432	528
Code	6006	6004
Description	RIPRAP (CONC)(CL B)	LANDSCAPE PAVERS
Unit of Measure	CY	SY
Notes	4 1/2" THICK, STEEL REINFORCED CONCRETE PAVEMENT AND EDGE AS SHOWN ON L2.01	REFERENCE MATERIALS SCHEDULE
Detail Drawing No. Location	01	01
Detail Drawing Sheet No.	L2.01	L2.01
L1.01	2.5	16
L1.02	4.5	25
L1.03	5.0	27
L1.04	2.0	13
L1.05	2.0	13
L1.06	-	-
L1.07	2.0	13
L1.08	5.0	27
L1.09	7.5	42
L1.10	14.5	85
L1.11	6.5	37
L1.12	14.0	82
L1.13	15.5	92
L1.14	19.0	116
L1.15	14.5	86
L1.16	8.5	51
TOTAL	**123**	**724**

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ARCHITECT 21047
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

SUMMARY OF HARDSCAPE QUANTITIES

SHEET 01 OF 01

	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
	6	TEXAS	STP 1802 (783) MM			CS
DWG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG	HOU	HARRIS	0912	72	391	29

PUBLIC WORKS AND ENGINEERING
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SUMMARY OF PEDESTRIAN ELECTRICAL QUANTITIES

Item	618	618	620	620	624	628	1002
Code	6042	6046	6008	6010	6002	6344	6002
Description	CONDT (PVC) (SCHD 80)(1 1/4")	CONDT (PVC) (SCHD 80)(2")	ELEC CONDR (NO.8) INSULATED	ELEC CONDR (NO.6) INSULATED	Ground Box TY A (122311) W/Apron	ELC SRV TY D 120/240 100 (NS)SS(E)OC(U)	Landscape Amenity (TYP 1)
Unit of Measure	LF	LF	LF	LF	EA	EA	EA
Notes							Memorial City Redevelopment Authority Standard Pedestrian Light
Detail Drawing No. Location							01
Detail Drawing Sheet No.							E-18
335		650	2100				7
336		750	2400				8
337		900	2760				8
338		1200	3900		2		8
339		1080	3330		2		4
340		850	2610		2		4
341	15	1725	4110	2040	1	1	8
342		1640	2520	2520	4		8
343		1750	2775	2775	3		10
344		1010	1575	1575	2		6
345		1130	1710	1800	2		6
346		625	375	1575			6
347		690		2130			7
348		775		2460			8
349		780		2460			10
350		430		1380			6
TOTAL	**15**	**15985**	**30165**	**20715**	**18**	**1**	**114**

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Electrical Engineer
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TBPE Firm No. F-3446

STATE OF TEXAS
AYOUB FAHMI YOUSEF ODEH
125040
REGISTERED PROFESSIONAL ENGINEER
02-03-2020

REV. NO.	DATE	DESCRIPTION	BY

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

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

SUMMARY OF PEDESTRIAN ELECTRICAL QUANTITIES

SHEET 1 OF 1

DGN: AO	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: AO	6	TEXAS	STP 1802 (783) MM			CS
DWG: AH	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: LH	HOU	HARRIS	0912	72	391	30

SUMMARY OF PERMANENT TRAFFIC SIGNAL QUANTITIES

ITEM NO.	DESC. CODE	DESCRIPTION		UNIT	MEMORIAL DR AT WEST SAM HOUSTON PKWY N QTY	MEMORIAL DR AT WEST BOUGH LN/BROKEN BOUGH DR QTY	TOTAL
618	6040	CONDT (PVC) (SCH 80) (1")		LF	103	125	228
618	6046	CONDT (PVC) (SCH 80) (2")		LF	1156	673	1829
618	6047	CONDT (PVC) (SCH 80) (2") (BORE)		LF	326	370	696
618	6053	CONDT (PVC) (SCH 80) (3")		LF	288	36	324
618	6054	CONDT (PVC) (SCH 80) (3") (BORE)		LF	611	235	846
618	6058	CONDT (PVC) (SCH 80) (4")		LF	675	14	689
618	6059	CONDT (PVC) (SCH 80) (4") (BORE)		LF	518	159	677
618	6070	CONDT (RM) (2")		LF	63	63	126
620	6003	ELEC CONDR (NO.12) BARE		LF	1137	443	1580
620	6006	ELEC CONDR (NO.10) INSULATED		LF	2370	714	3084
620	6012	ELEC CONDR (NO.4) INSULATED		LF	492	116	608
628	6189	ELC SRV TY D 120/240 070(NS)SS(E)SP(U)		EA	1	1	2
680	6003	INSTALL HWY TRF SIG (SYSTEM)		EA	1	1	2
	**	SIGNAL POLE ASSEMBLY WITH FOUNDATION (20 FT. HEIGHT POLE) ONLY	COH SPEC 02582	EA	1	1	2
	**	45 FT. MAST ARM POLE ASSEMBLY WITH FOUNDATION(INCLUDING LUMINAIRE AND 106 WATT LED LUMINAIRE)	COH SPEC 02582	EA		1	1
	**	50 FT. MAST ARM POLE ASSEMBLY WITH FOUNDATION(INCLUDING LUMINAIRE AND 106 WATT LED LUMINAIRE)	COH SPEC 02582	EA	1		1
	**	OVERHEAD STREET NAME SIGNS (MEMORIAL DIST. STYLE, INSTALL ONLY)	COH SPEC 02893	EA		3	3
	**	OVERHEAD SIGNS(ALL SIZES)	COH SPEC 02893	EA	12	5	17
	**	OVERHEAD STREET NAME SIGNS	COH SPEC 02893	EA	6	3	9
	**	TYPE "A" PULL BOX WITH APRON, GRAVEL AND GROUND ROD	COH SPEC 16710	EA	9	8	17
	**	TYPE "B" PULL BOX WITH APRON, GRAVEL AND GROUND ROD	COH SPEC 16710	EA	17	9	26
	**	TYPE "C" PULL BOX WITH APRON, GRAVEL AND GROUND ROD	COH SPEC 16710	EA	1	1	2
	**	PRE-FORMED LOOPS WITH LOOP WIRE	COH SPEC 16713	EA	8	23	31
	**	TRAFFIC SIGNAL CABLES, DETECTOR LEAD-IN CABLE 2/C-14 AWG IMSA 50-2-1984	COH SPEC 16720	LF	14808	5502	20310
	**	EMERGENCY VEHICLE PREEMPTION SYSTEM	COH SPEC 16724	EA	1	1	2
	**	LOOP DETECTOR (SAWCUT IN PAVEMENT) (INCLUDING LOOP WIRE, SEALANT AND CONNECTIONS)	COH SPEC 16727	LF	1834	681	2515
	**	ITS CONTROLLER CABINET ASSEMBLY (MODEL 340) (TYPE 2070L)	COH SPEC 16730	EA	1	1	2
	**	CONTROLLER CABINET FOUNDATION WITH APRON	COH SPEC 02893-10C	EA	1	1	2
	**	UNINTERRUPTED POWER SUPPLY	COH SPEC 16732	EA	1	1	2
	**	GPS SERIAL COMMUNICATIONS MODULE	COH SPEC 16785	EA	1	1	2
	**	FIELD HARDENED ETHERNET SWITCH	COH SPEC 16733	EA	1	1	2
	**	WIMAX (INCLUDES 150 LF OF CAT-5E CABLE FOR INSTALLATION)	COH SPEC 16734	EA	1	1	2
	**	DETECTOR CARD RACK (8 SLOT & 4 SLOT)		EA	1	1	2
680	6004	REMOVING TRAFFIC SIGNALS		EA	1	1	2
682	6001	VEH SIG SEC (12")LED(GRN)		EA	18	16	34
682	6002	VEH SIG SEC (12")LED(GRN ARW)		EA	4	6	10
682	6003	VEH SIG SEC (12")LED(YEL)		EA	18	14	32
682	6004	VEH SIG SEC (12")LED(YEL ARW)		EA	4	4	8
682	6005	VEH SIG SEC (12")LED(RED)		EA	18	14	32
682	6006	VEH SIG SEC (12")LED(RED ARW)		EA	4	4	8
682	6018	PED SIG SEC (LED)(COUNTDOWN)		EA	14	8	22
682	6023	BACK PLATE (12")(3 SEC)		EA	22	12	34
682	6024	BACK PLATE (12")(4 SEC)		EA		2	2
684	6029	TRF SIG CBL (TY A)(14 AWG)(3 CONDR)		LF	4347	1063	5410
684	6031	TRF SIG CBL (TY A)(14 AWG)(5 CONDR)		LF	4866	1063	5929
684	6033	TRF SIG CBL (TY A)(14 AWG)(7 CONDR)		LF	8110	2438	10548
686	6305	INS TRF PL AM HOU-1-25(LUM)		EA		1	1
686	6306	INS TRF PL AM HOU-1-35(LUM)		EA	3		3
686	6307	INS TRF PL AM HOU-2-40(LUM)		EA	2	2	4
687	6001	PED POLE ASSEMBLY		EA	7	4	11
	++	SCREW IN ANCHOR FOUNDATION		EA	3		3
687	6002	PEDESTRIAN PUSH BUTTON POLE		EA	1		1
688	6001	PED DETECT PUSH BUTTON (APS)		EA	13	8	21
688	6003	PED DETECTOR CONTROLLER UNIT		EA	1	1	2
6306	6001	VIVDS PROSR SYS		EA	1		1
6306	6002	VIVDS CAM ASSY FXD LNS		EA	2		2
6306	6004	VIVDS CAM ASSY 360		EA	2		2
6306	6005	VIVDS CNTRL SOFTWARE		EA	1		1
6306	6007	VIVDS CABLING		LF	653		653

** INCIDENTAL ITEMS, FOR CONTRACTOR'S INFORMATION ONLY
++SUBSIDIARY TO ITEM (FOR CONTRACTOR INFORMATION ONLY)
ALL SIGNAL HEADS HAVE YELLOW HOUSING AND BLACK BACK PLATES

REV. NO.	DATE	DESCRIPTION	BY

CONSOR
F-12040

Texas Department of Transportation

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT
SUMMARY OF PERMANENT SIGNAL QUANTITES

SHEET 1 OF 1

DGN: CONSOR	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: CONSOR	6	TEXAS	STP 1802(783)MM			CS
DWG: CONSOR	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: CONSOR	HOU	HARRIS	0912	72	391	31

SUMMARY OF TEMPORARY TRAFFIC SIGNAL QUANTITIES

ITEM NO.	DESC. CODE	DESCRIPTION	UNIT	MEMORIAL DR AT W SAM HOUSTON PKWY N EST.	MEMORIAL DR AT WEST BOUGH LN/ BROKEN BOUGH DR EST.	TOTAL
0681	6001	TEMP TRAF SIGNALS	EA	1	1	2
	**	TRAFFIC SIGNAL CONTROLLER (POLE MOUNTED)	EA	1	1	2
	**	GROUND BOX TY D (162922) W/APRON	EA	1	1	2
	**	CONDUIT 2" PVC (SCHD 80)	LF	57	27	84
	**	ELEC CONDUCTOR (NO.6) (BARE)	LF	105	174	279
	**	ELEC CONDUCTOR (NO.6) (INSULATED)	LF	210	174	384
	**	TRF SIG CBL (TY A)(12 AWG)(7 CONDR)	LF	3467	1032	4499
	**	LUMINAIRE ON ARM (250W HPS OR EQ LED)	EA	8	4	12
	**	LUMINAIRE TRAY CABLE (4 CONDR) (12 AWG)	LF	3061	718	3779
	**	WIRE 1/4" GALV GUY (HIGH STRENGTH)	LF	791	357	1148
	**	WIRE 3/8" GALV GUY (HIGH STRENGTH)	LF	640	320	960
	**	TRAF SIG POLE, 40 FT TIMBER	EA	8	4	12
	**	ROD, 5/8"X8' COPPER GROUND	EA	8	4	12
	**	NO. 6 ARMORED CABLE	LF	640	320	960
	**	GUARD, GUY WIRE	EA	16	8	24
	**	SCREW ANCHORS, 8'-10"	EA	16	8	24
	**	TEMP ELECTRICAL SERVICE	EA	1	1	2
	**	VEH SIG SEC (12")LED(GRN)	EA	15	8	23
	**	VEH SIG SEC (12")LED(YEL)	EA	15	8	23
	**	VEH SIG SEC (12")LED(RED)	EA	15	8	23
	**	VEH SIG SEC (12")LED(GRN ARW)	EA	2	2	4
	**	VEH SIG SEC (12")LED(YEL ARW)	EA	2	2	4
	**	VEH SIG SEC (12")LED(RED ARW)	EA	2	2	4
	**	BACK PLATE (12")(3 SEC)	EA	17	10	27
	**	CONTROL, PHOTOELECTRIC	EA	1	1	2
	**	SIGN, "<-- ONE WAY"	EA	2		2
	**	SIGN, "ONE WAY -->"	EA	2		2
	**	SIGN, "(R10-10L LEFT TURN SIGNAL)" (30"X36")	EA	2	2	4
	**	SIGN, "(R10-12 LEFT TURN YIELD ON GREEN)" (30"X36")	EA		4	4
	**	SIGN, "(R3-6L)", (30"X36")	EA		2	2
	**	RELOCATED EXISTING OVERHEAD STREET NAME SIGNS	EA	4	6	10
	**	TEMPORARY OVERHEAD STREET NAME SIGN "w Sam Houston pkwy" (156"x18")	EA	1		1
6306	6006	VIVDS TEMPORARY	EA	1	1	2
	**	VIDEO MONITOR	EA	1	1	2
	**	VIVDS PROCESSOR SYSTEM	EA	1	1	2
	**	VIVDS SETUP	EA	1	1	2
	**	VIVDS CAMERA ASSEMBLY	EA	7	4	11
	**	VIVDS COMMUNICATION CABLE (COAXIAL)	LF	2187	488	2675
	**	(3/C#16-VIVDS POWER CABLE)	LF	2187	488	2675

** INCIDENTAL ITEMS, FOR CONTRACTOR'S INFORMATION ONLY

PUBLIC WORKS AND [illegible]
67862

REV. NO.	DATE	DESCRIPTION	BY

CONSOR
F-12040

Texas Department of Transportation

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT
SUMMARY OF TEMPORARY SIGNAL QUANTITES

SHEET 1 OF 1

DGN: CONSOR	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: CONSOR	6	TEXAS	STP 1802(783)MM			CS
DWG: CONSOR	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: CONSOR	HOU	HARRIS	0912	72	391	32

PHASE	DESCRIPTION
PHASE 1	INSTALL TEMPORARY ASPHALT ALONG THE NORTHERN/EASTERN SIDE OF MEMORIAL DRIVE FROM APPROXIMATELY STA 4+20 TO 45+00. INSTALL TEMPORARY 24-INCH RCP UNDER PROPOSED TEMPORARY ASPHALT AS NEEDED TO MAINTAIN DRAINAGE AT ALL TIMES. CONSTRUCT WATER LINE AND SANITARY SEWER IMPROVEMENTS ON EITHER SIDE OF THE ROADWAY. MAINTAIN MINIMUM 1~11-FT WIDE LANE IN EACH DIRECTION AT ALL TIMES IMPLEMENTING A TYPICAL LANE REDUCTION/CLOSURE OR TRAFFIC SHIFT LANE DETAIL. WATER LINE METER BOXES MAY REQUIRE ADJUSTMENTS AS WORK PROGRESSES (NO SEPARATE PAY). INSTALL TEMPORARY ASPHALT AT ALL DISTURBED AREAS AS NEEDED TO MAINTAIN EITHER 2-WAY WITH OR WITHOUT A CONTINUOUS LEFT TURN FOR TRAFFIC FOR FUTURE TCP PHASES. CONSTRUCT 4' WIDE TEMPORARY SIDEWALK. MAINTAIN DRAINAGE AT ALL TIMES. INSTALL TEMPORARY TRAFFIC SIGNALS AT INTERSECTION OF BROKEN BOUGH DRIVE AND MEMORIAL DRIVE DURING THIS STEP.
PHASE 2 STEP 1	CONSTRUCT STORM SEWER, ROADWAY AND MISCELLANEOUS IMPROVEMENTS SOUTH/WEST OF PROPOSED BASELINE FROM APPROX. STA 28+70 (ER NORTH OF BOHEME DR) TO STA 49+73. MAINTAIN MINIMUM 1~11-FT WIDE LANE IN EACH DIRECTION AND A CONTINUOUS LEFT TURN LANE AT ALL TIMES. SHIFT TRAFFIC ACCORDINGLY BY IMPLEMENTING A TYPICAL TRAFFIC SHIFT LANE DETAIL. MAINTAIN EXISTING TRAFFIC LANES CONFIGURATION ON AREAS NOT WITHIN STEP 1 LIMITS. INSTALL TEMPORARY ASPHALT ALONG THE MIDDLE SECTION OF MEMORIAL DRIVE AS NEEDED TO MAINTAIN FUTURE TRAFFIC LANES CONFIGURATIONS.
PHASE 2 BOHEME DR INTERSECTION	IMPLEMENT BOHEME DR TCP AND DETOURS WHEN CONSTRUCTING INTERSECTION. CONSTRUCT STORM SEWER, ROADWAY AND MISCELLANEOUS IMPROVEMENTS AT INTERSECTION. INSTALL TEMPORARY ASPHALT ALONG THE MIDDLE SECTION OF MEMORIAL DRIVE AS NEEDED TO MAINTAIN FUTURE TRAFFIC LANES CONFIGURATIONS.
PHASE 2 STEP 2	CONSTRUCT STORM SEWER, ROADWAY AND MISCELLANEOUS IMPROVEMENTS SOUTH/WEST OF PROPOSED BASELINE FROM APPROX. STA 14+32 (ER NORTH OF BROKEN BOUGH DR) TO STA 28+70 (ER NORTH OF BOHEME DR) TO STA 49+73. MAINTAIN EXISTING PHASE 2 STEP 1 LANE CONFIGURATION. MAINTAIN MINIMUM 1~11-FT WIDE LANE IN EACH DIRECTION AND A CONTINUOUS LEFT TURN LANE AT ALL TIMES. SHIFT TRAFFIC ACCORDINGLY BY IMPLEMENTING A TYPICAL TRAFFIC SHIFT LANE DETAIL. CONCRETE PAVING AT BROKEN BOUGH DR INTERSECTION SHALL BE COMPLETED OVER A 3 DAY PERIOD. INSTALL TEMPORARY ASPHALT ALONG THE MIDDLE SECTION OF MEMORIAL DRIVE AS NEEDED TO MAINTAIN FUTURE TRAFFIC LANES CONFIGURATIONS.
PHASE 2 STEP 3	CONSTRUCT STORM SEWER, ROADWAY AND MISCELLANEOUS IMPROVEMENTS SOUTH/WEST OF PROPOSED BASELINE FROM BEGINNING OF PROJECT TO STA 14+32 (ER NORTH OF BROKEN BOUGH DR). MAINTAIN EXISTING PHASE 2 STEP 1 & STEP 2 LANE CONFIGURATION. MAINTAIN MINIMUM 1~11-FT WIDE LANE IN EACH DIRECTION AND A CONTINUOUS LEFT TURN LANE AT ALL TIMES. SHIFT TRAFFIC ACCORDINGLY BY IMPLEMENTING A TYPICAL TRAFFIC SHIFT LANE DETAIL. INSTALL TEMPORARY ASPHALT ALONG THE MIDDLE SECTION OF MEMORIAL DRIVE AS NEEDED TO MAINTAIN FUTURE TRAFFIC LANES CONFIGURATIONS. INSTALL TEMPORARY TRAFFIC SIGNAL POLES ALONG THE SOUTHERN RIGHT OF WAY AT THE SAM HOUSTON PARKWAY INTERSECTIONS. REMOVE EXIST TRAFFIC SIGNAL POLES IN THE MEDIAN BY INCORPORATING PHASE 4 STEP 1 TCP.
PHASE 2 STEP 4	CONSTRUCT ROADWAY FOR THE NORTHERNMOST EASTBOUND LANE FROM BEGINNING OF PROJECT TO STA 3+80. MAINTAIN EXISTING PHASE 2 STEP 3 LANE CONFIGURATION. MAINTAIN MINIMUM 1~11-FT WIDE LANE IN EACH DIRECTION AND A CONTINUOUS LEFT TURN LANE AT ALL TIMES. SHIFT TRAFFIC ACCORDINGLY BY IMPLEMENTING A TYPICAL TRAFFIC SHIFT LANE DETAIL. INSTALL TEMPORARY ASPHALT ALONG THE MIDDLE SECTION OF MEMORIAL DRIVE AS NEEDED TO MAINTAIN FUTURE TRAFFIC LANES CONFIGURATIONS.

PHASE	DESCRIPTION
PHASE 3 STEP 1	CONSTRUCT STORM SEWER, ROADWAY AND MISCELLANEOUS IMPROVEMENTS NORTH/EAST OF PROPOSED BASELINE FROM BEGINNING OF PROJECT TO STA 14+72 (ER NORTH OF BROKEN BOUGH DR). MAINTAIN LEFT TURN AT BELTWAY AT ALL TIMES MAINTAIN MINIMUM 1~11-FT WIDE LANE IN EACH DIRECTION AND A CONTINUOUS LEFT TURN LANE AT ALL TIMES. SHIFT TRAFFIC ACCORDINGLY BY IMPLEMENTING A TYPICAL TRAFFIC SHIFT LANE DETAIL. DO NOT CONSTRUCT MEDIAN, MEDIAN TO BE CONSTRUCTED DURING PHASE 4. INSTALL TEMPORARY ASPHALT AS NEEDED TO MAINTAIN CURRENT/FUTURE TRAFFIC LANES CONFIGURATIONS. INSTALL TEMPORARY TRAFFIC SIGNAL POLES ALONG THE NORTHERN RIGHT OF WAY AT THE SAM HOUSTON PARKWAY INTERSECTIONS.
PHASE 3 STEP 2	CONSTRUCT STORM SEWER, ROADWAY AND MISCELLANEOUS IMPROVEMENTS NORTH/EAST OF PROPOSED BASELINE FROM STA 14+72 TO 29+42(ER SOUTH OF BOHEME DR). MAINTAIN MINIMUM 1~11-FT WIDE LANE IN EACH DIRECTION AND A CONTINUOUS LEFT TURN LANE AT ALL TIMES. SHIFT TRAFFIC ACCORDINGLY BY IMPLEMENTING A TYPICAL TRAFFIC SHIFT LANE DETAIL. INSTALL TEMPORARY ASPHALT AS NEEDED TO MAINTAIN CURRENT/FUTURE TRAFFIC LANES CONFIGURATIONS.
PHASE 3 STEP 3	CONSTRUCT STORM SEWER, ROADWAY AND MISCELLANEOUS IMPROVEMENTS NORTH/EAST OF PROPOSED BASELINE FROM STA 29+42(ER SOUTH OF BOHEME DR)TO END OF PROJECT. MAINTAIN MINIMUM 1~11-FT WIDE LANE IN EACH DIRECTION AND A CONTINUOUS LEFT TURN LANE AT ALL TIMES. SHIFT TRAFFIC ACCORDINGLY BY IMPLEMENTING A TYPICAL TRAFFIC SHIFT LANE DETAIL. INSTALL TEMPORARY ASPHALT AS NEEDED TO MAINTAIN CURRENT/FUTURE TRAFFIC LANES CONFIGURATIONS.
PHASE 4	REMOVE TEMPORARY TRAFFIC SIGNALS. CONSTRUCT NEW TRAFFIC SIGNALS AT W. BOUGH LN AND BELTWAY 8. CONSTRUCT ROADWAY AND MISCELLANEOUS IMPROVEMENTS IN THE MIDDLE SECTION OF ROADWAY FROM BEGIN TO END OF PROJECT.

PEDESTRIAN CLOSURE NOTE(ALL PHASES)

MAINTAIN PEDESTRIAN FACILITIES ON EITHER SIDE OF MEMORIAL DRIVE AT ALL TIMES UNLESS OTHERWISE NOTED ON PLANS.

OFF-DUTY POLICE OFFICERS

OFF-DUTY POLICE OFFICERS ARE PAID UNDER THE CONTRACTOR FORCE ACCOUNT WORK. CONTRACTOR IS TO COORDINATE WITH CM WHEN POLICE OFFICERS ARE REQUIRED.

TEMPORARY ASPHALT

TEMPORARY ASPHALT FOR TRAVEL LANES SHALL BE 8" HOT MIX ASPHALT BASE COURSE OVER 6" CEMENT STABILIZED SAND SUBGRADE. TEMPORARY ASPHALT FOR SIDEWALKS SHALL BE 2" OVER THE EXISTING IN-SITU SOIL. BOTH ITEMS ARE PAID UNDER ITEM 508 "CONSTRUCTING DETOURS."

TEMPORARY DRAINAGE ⚠

MAINTAIN DRAINAGE AT ALL TIMES. TEMP 24" RCP SHALL BE PLACED WHERE DITCHES ARE FILLED IN AND PAID FOR UNDER ITEM 464. TEMP TRAFFIC RATED INLETS SHALL BE PROVIDED AND BE PLACED WITHIN 500 FEET OF AN ADJACENT INLET. TEMP INLETS ARE PAID FOR UNDER ITEM 465. TEMPORARY ADJUSTMENTS OF INLETS ARE INCIDENTAL TO THE PROJECT. REMOVAL OF TEMP RCP AND INLETS ARE SUBSIDIARY TO ITEMS 464 AND 465.

DRIVEWAYS

PRIOR TO CONSTRUCTION ACROSS DRIVEWAYS, COORDINATE WITH PROPERTY OWNERS TO PROVIDE ACCESS TO BUSINESS AND RESIDENTS AT ALL TIMES.

PUBLIC WORKS APPROVAL
ACCEPTED AND FILED
67862
CITY
HARRIS COUNTY, TEXAS

⚠1 SHEET MODIFIED ON 04/23/20

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED
PROFESSIONAL ENGINEER
04/23/2020
Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY
1 ⚠	04/23/20	ADDENDUM NO. 1- REPLACE ENTIRE SHEET	MAS

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

TRAFFIC CONTROL PLAN SEQUENCE OF CONSTRUCTION

SHEET 1 OF 3

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	33

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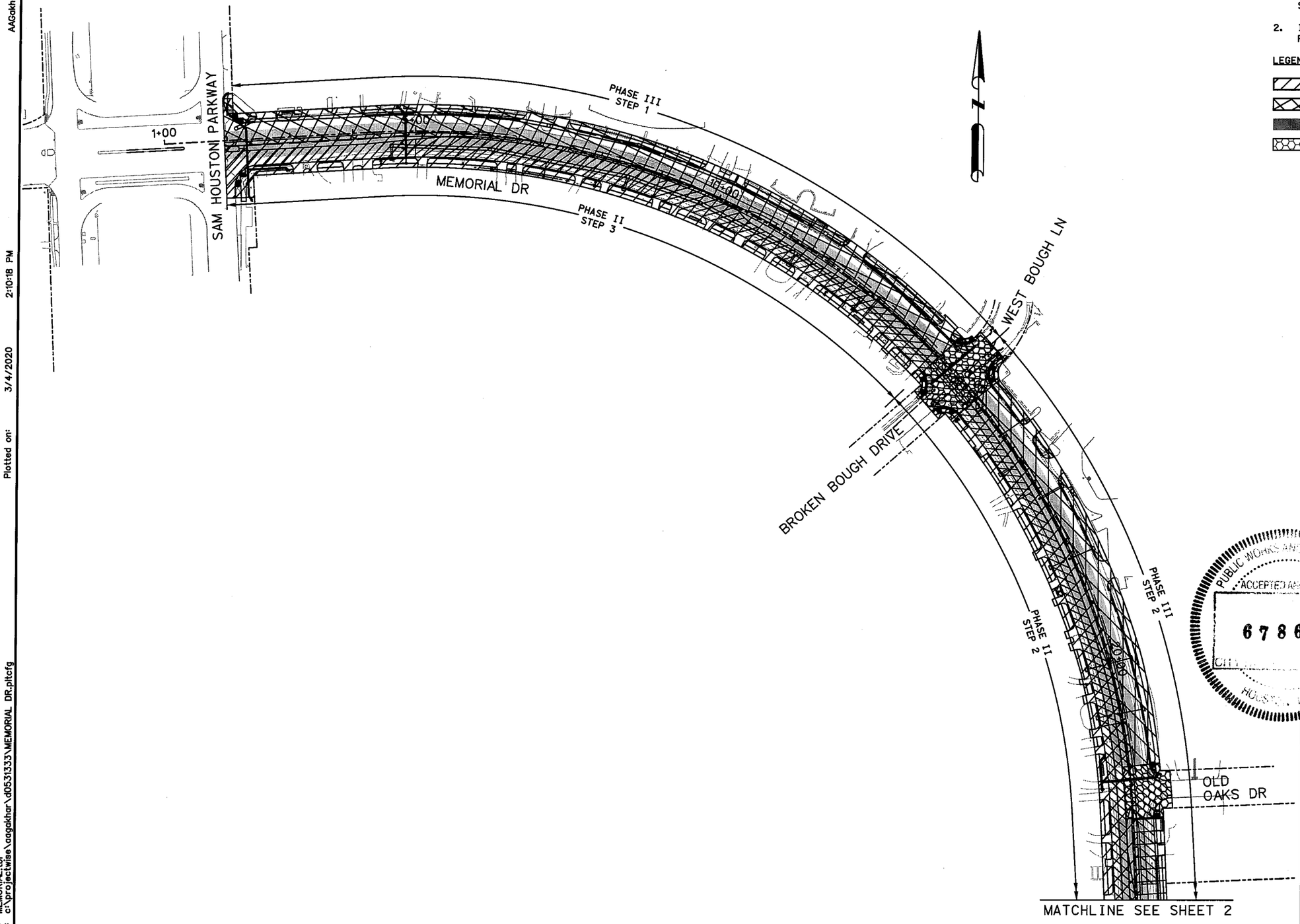

NOTE:

1. TCP PHASE I CONSIST OF TEMPORARY ASPHALT ALONG NORTH/EAST SIDE OF MEMORIAL, WATER LINE AND SANITARY SEWER INSTALLATION.
2. INTRSECTIONS TO BE CONSTRUCTED IN SECTIONS, REFER TO INTERSECTIONS TCP.

LEGEND

- PHASE II
- PHASE III
- PHASE IV
- INTERSECTIONS

0 160 320

(IN FEET)

SCALE: PLAN 1":160'

PUBLIC WORKS AND ... ACCEPTED AS ... 67862 ... CITY ... HOUSTON ... TX

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

TRAFFIC CONTROL PLAN SEQUENCE OF CONSTRUCTION

SHEET 2 OF 3

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CSK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CSK DWG:	HOU	HARRIS	0912	72	391	34

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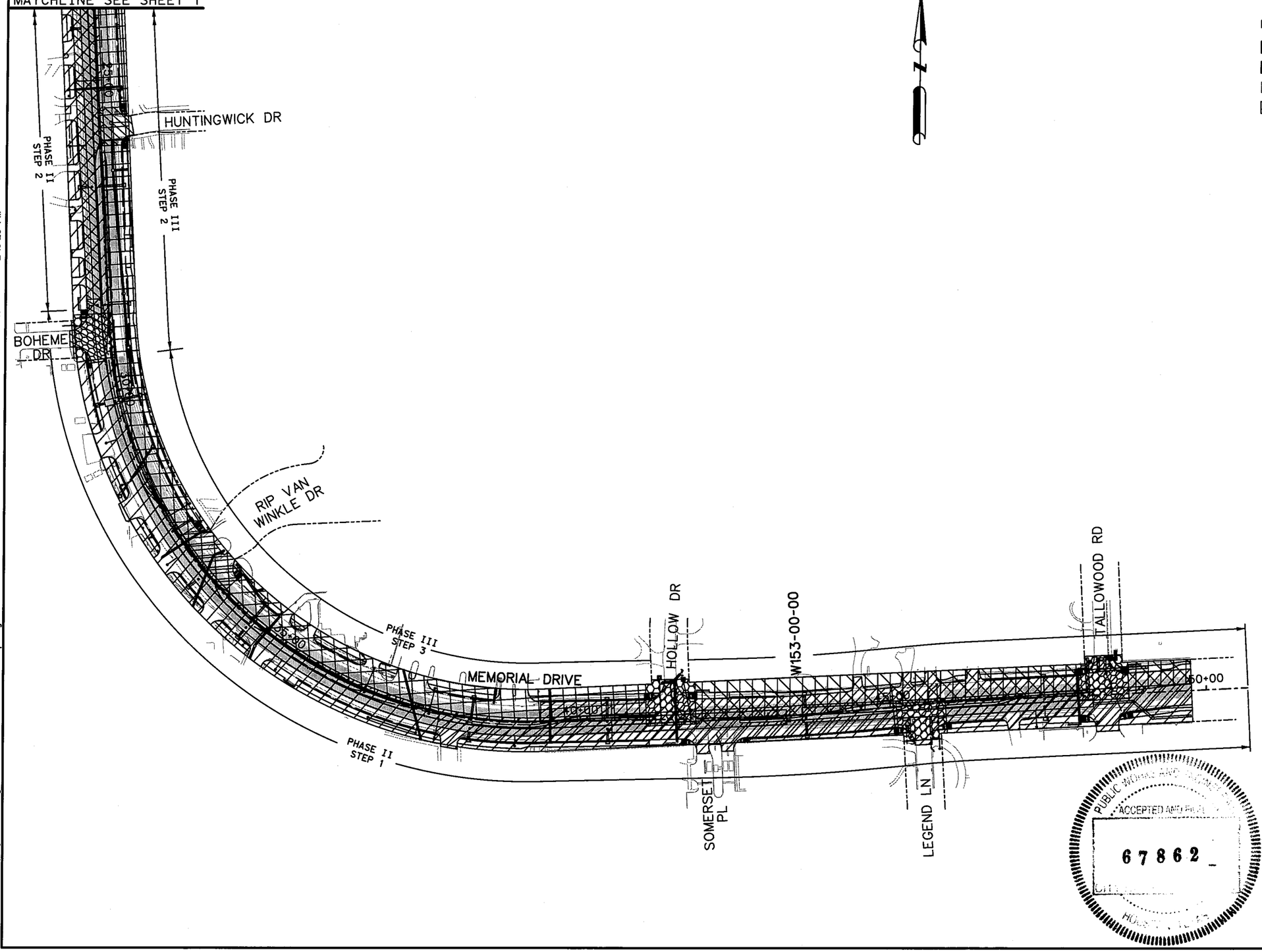

NOTE:

1. TCP PHASE I CONSIST OF TEMPORARY ASPHALT ALONG NORTH/EAST SIDE OF MEMORIAL, WATER LINE AND SANITARY SEWER INSTALLATION.
2. INTERSECTIONS TO BE CONSTRUCTED IN SECTIONS, REFER TO INTERSECTIONS TCP.

LEGEND

- PHASE II
- PHASE III
- PHASE IV
- INTERSECTIONS

EXIST METAL POLE LIGHT TO BE REMOVED (BY OTHERS)
EXIST WOOD POLE LIGHT
EXIST WOOD POLE
PROPOSED METAL POLE LIGHT
PROPOSED WOOD POLE LIGHT
PROPOSED PULL BOX
PROPOSED TRAFFIC SIGNAL POLE W/ STREET LIGHT
PROPOSED PVC CONDUIT AND CONDUCTORS
PROPOSED BORED CONDUIT AND CONDUCTORS

NOTES:

1. EXISTING STREET LIGHTS POLES, CONDUITS AND WIRING TO BE REMOVED.
2. COORDINATE WITH UTILITY COMPANY FOR DE-ENERGIZING AND POLE REMOVAL/DISPOSAL.
3. ALL WOOD POLES TO REMAIN IN PLACE UNLESS OTHERWISE NOTED.
4. ALL PROP LIGHTS TO BE 115W LED UNLESS NOTED DIFFERENTLY ON PLANS.
5. ALL PROP METAL POLE LIGHTS SHALL BE 35' BASE TYPE COBRA POLES W/ 10' TRUSS ARMS UNLESS NOTED DIFFERENTLY ON PLANS.
6. ALL STREET LIGHT FOUNDATIONS TO BE INSTALLED BY CONTRACTOR.

0 160 320
(IN FEET)
SCALE: PLAN 1":160'

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED
PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

Lockwood, Andrews & Newnam, Inc.
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FIRM REGISTATION NO. 2614

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

TRAFFIC CONTROL PLAN SEQUENCE OF CONSTRUCTION

SHEET 3 OF 3

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	35

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67862
HOUSTON, TEXAS

AAGakhar
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	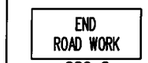	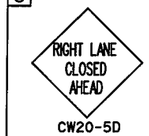			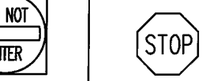		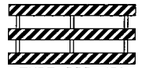
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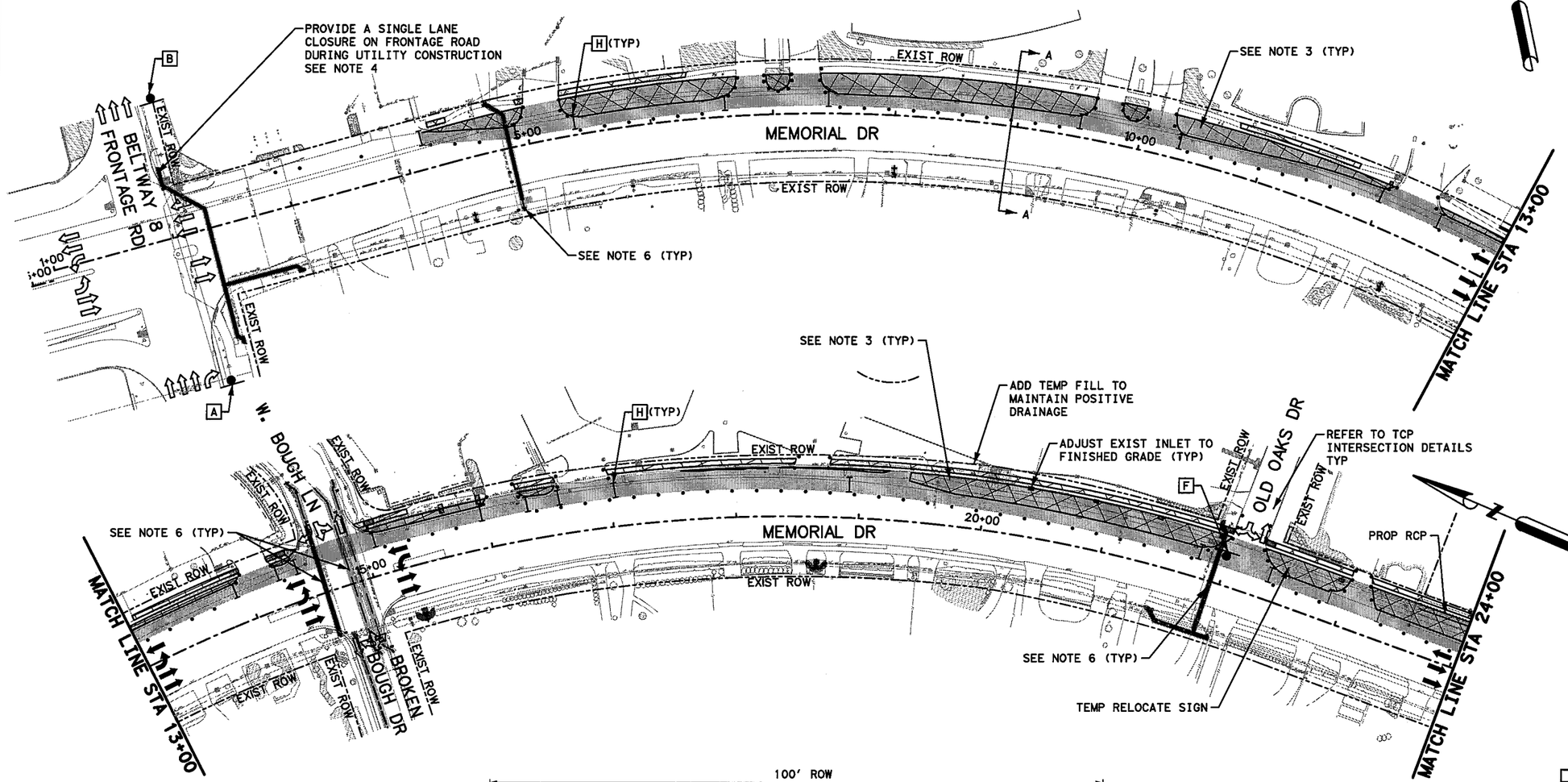

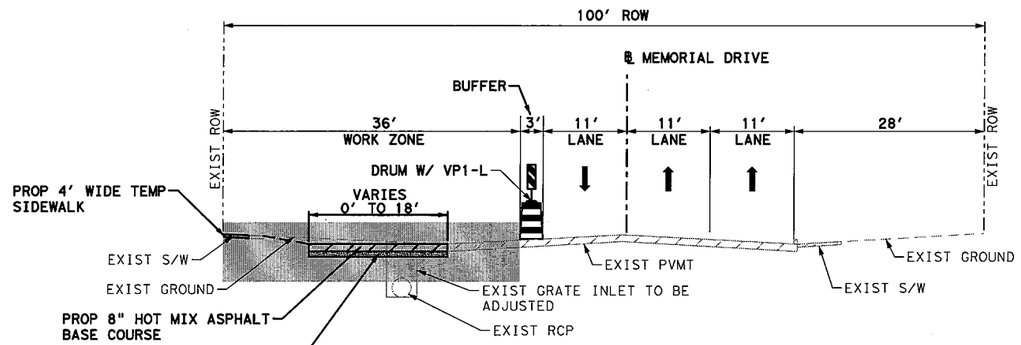

TYPICAL TRAFFIC CONTROL SECTION
SECTION A-A
(SEE NOTE 3)
N.T.S.

LEGEND

- WORK ZONE
- TEMP PAVEMENT
- EXIST DIRECTION OF TRAFFIC
- PROP DIRECTION OF TRAFFIC
- BARRELS OR DRUMS
- SIGN
- TYPE III BARRICADE W/ ROAD CLOSED SIGN (R11-2)
- LOW PROFILE CONCRETE BARRIER
- (A) WK ZN PAV MRK REMOV(TRAF BTN) TY W
- (B) WK ZN PAV MRK REMOV(TRAF BTN) TY Y
- (C) WK ZN PAV MRK REMOV(W)(ARROW)
- (D) WK ZN PAV MRK REMOV(W)(WORD)

NOTES:

1. PRIOR TO CONSTRUCTION ACROSS DRIVEWAY COORDINATE WITH CM. CONTRACTOR TO MAINTAIN ACCESS TO RESIDENTS AND BUSINESSESS AT ALL TIMES.
2. MAINTAIN MINIMUM 11-FEET LANE WIDTH IN EACH DIRECTION AT ALL TIMES.
3. INSTALL TEMPORARY ASPHALT (8-INCH)ROADWAY USING A TYPICAL ONE LANE CLOSURE DETAILS.
4. REFER TO TCP STANDARD DETAILS FOR MORE INFORMATION.
5. TEMPORARY ASPHALT SHALL BE CONSTRUCTED BETWEEN THE HOURS OF 9 AM TO 3 PM. ALL CHANNELIZING DEVICES SHALL BE REMOVED OFF THE ROADWAY AFTER WORKING HOURS. PLACE DRUMS AND BARRICADES ALONG THE TEMPORARY ASPHALT LIMITS.
6. INSTALL ALL WATER LINES AND SANITARY SEWER LINES IN THIS PHASE.
7. REMOVE ALL TEMPORARY PAVEMENT AND BASE FULL DEPTH TO NATURAL SOIL PRIOR TO INSTALLATION OF TOP SOIL FOR FINAL GRADING

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

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED
PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

TRAFFIC CONTROL PLAN PHASE 1

SHEET 1 OF 3

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	36

ACCEPTED FOR PUBLIC MAINTENANCE
67862
CITY OF HOUSTON, TEXAS

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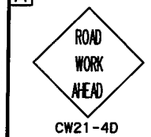
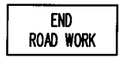
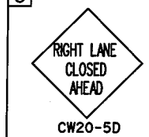
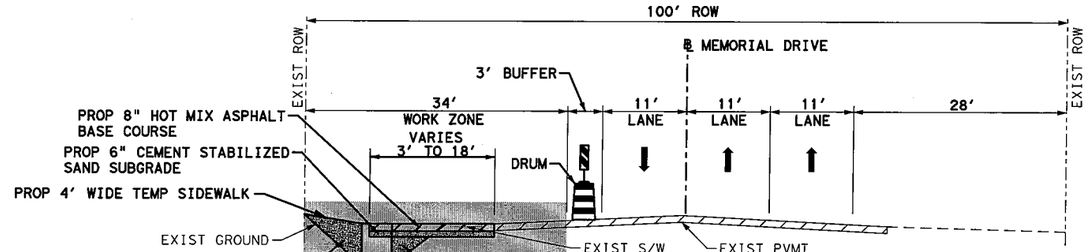
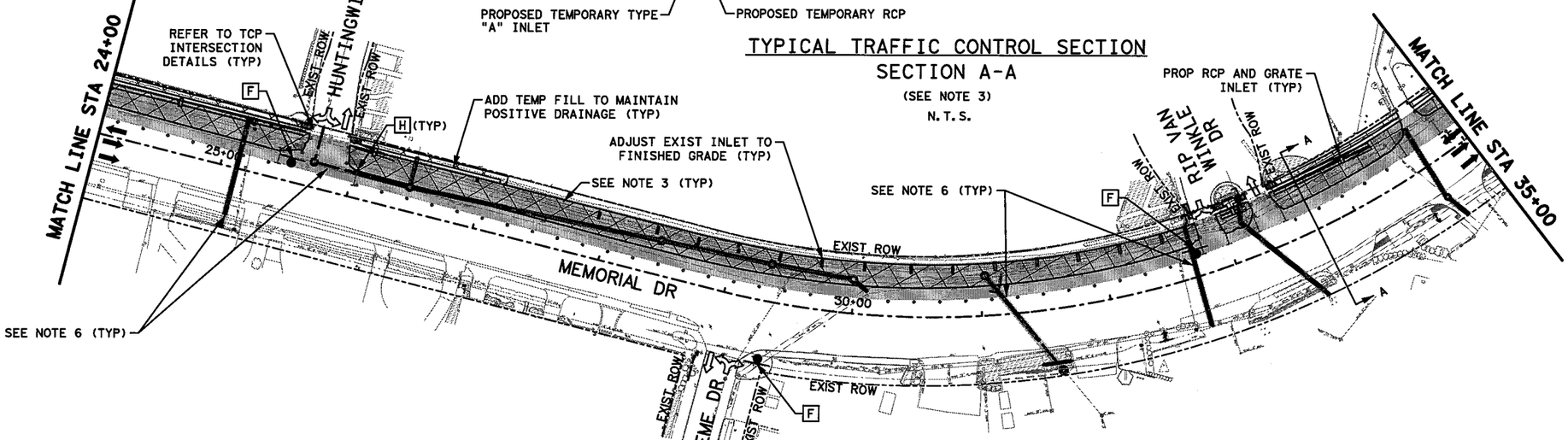
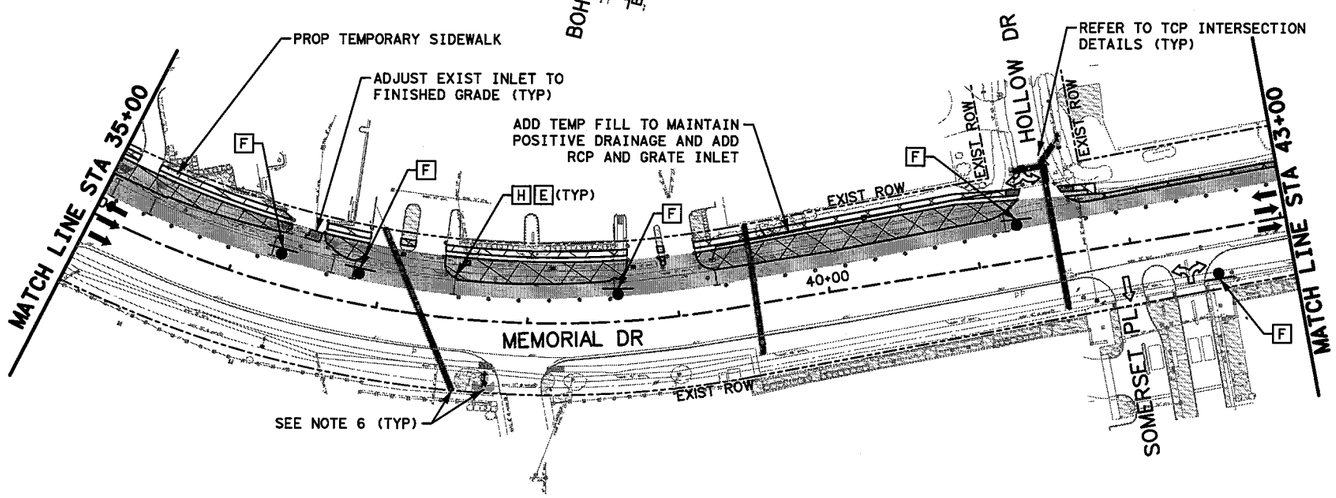
AAGakhar

A	B	C	D	E	F	G	H
							
CW21-4D	G20-2	CW20-5D	CW20-5DL	R5-1	R1-1	R3-9b	TYPE III (B) BARRICADE



TYPICAL TRAFFIC CONTROL SECTION
SECTION A-A
(SEE NOTE 3)
N.T.S.





LEGEND

- WORK ZONE
- TEMP PAVEMENT
- EXIST DIRECTION OF TRAFFIC
- PROP DIRECTION OF TRAFFIC
- BARRELS OR DRUMS
- SIGN
- TYPE III BARRICADE W/ ROAD CLOSED SIGN (R11-2)
- LOW PROFILE CONCRETE BARRIER
- (A) WK ZN PAV MRK REMOV(TRAF BTN) TY W
- (B) WK ZN PAV MRK REMOV(TRAF BTN) TY Y
- (C) WK ZN PAV MRK REMOV(W) (ARROW)
- (D) WK ZN PAV MRK REMOV(W) (WORD)

NOTES:

1. PRIOR TO CONSTRUCTION ACROSS DRIVEWAY COORDINATE WITH CM. CONTRACTOR TO MAINTAIN ACCESS TO RESIDENTS AND BUSINESSESS AT ALL TIMES.
2. MAINTAIN MINIMUM 11-FEET LANE WIDTH IN EACH DIRECTION AT ALL TIMES.
3. INSTALL TEMPORARY ASPHALT ROADWAY (8-INCH) AND SIDEWALK (2-INCH) USING A TYPICAL ONE LANE CLOSURE DETAILS.
4. REFER TO TCP STANDARD DETAILS FOR MORE INFORMATION.
5. TEMPORARY ASPHALT SHALL BE CONSTRUCTED BETWEEN THE HOURS OF 9 AM TO 3 PM. ALL CHANNELIZING DEVICES SHALL BE REMOVED OFF THE ROADWAY AFTER WORKING HOURS. PLACE DRUMS AND BARRICADES ALONG THE TEMPORARY ASPHALT LIMITS.
6. INSTALL ALL WATER LINES AND SANITARY SEWER LINES IN THIS PHASE.
7. REMOVE ALL TEMPORARY PAVEMENT AND BASE FULL DEPTH TO NATURAL SOIL PRIOR TO INSTALLATION OF TOP SOIL FOR FINAL GRADING.

0 200 400
(IN FEET)
SCALE: PLAN 1" = 200'

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

Lockwood, Andrews & Newnam, Inc.
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FIRM REGISTATION NO. 2614

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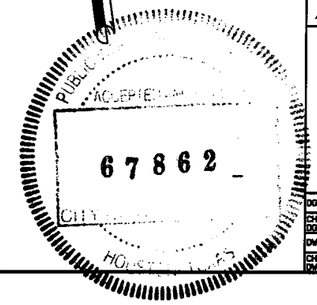
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

TRAFFIC CONTROL PLAN PHASE 1

SHEET 2 OF 3

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	37



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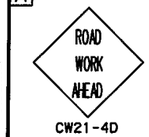
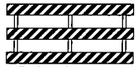
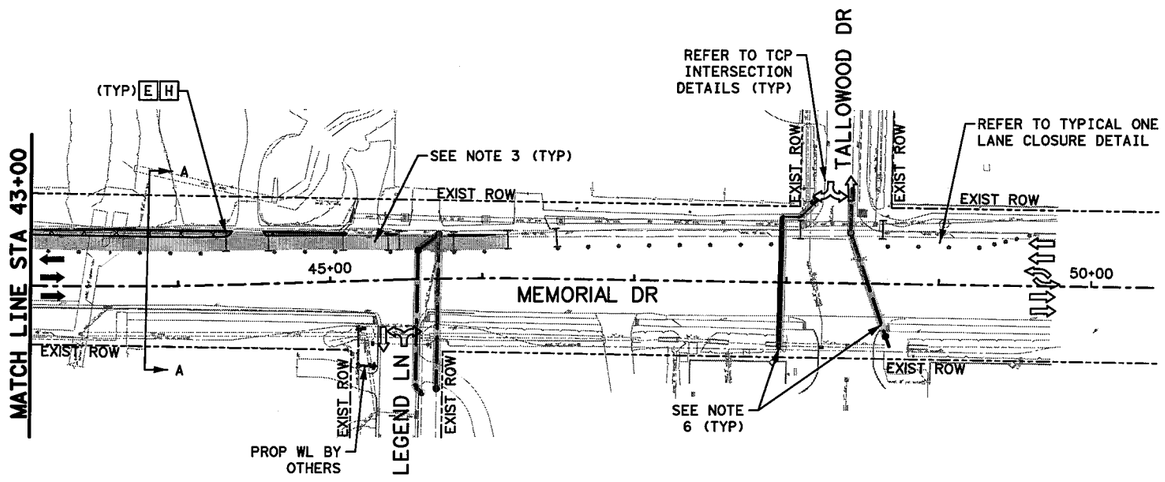
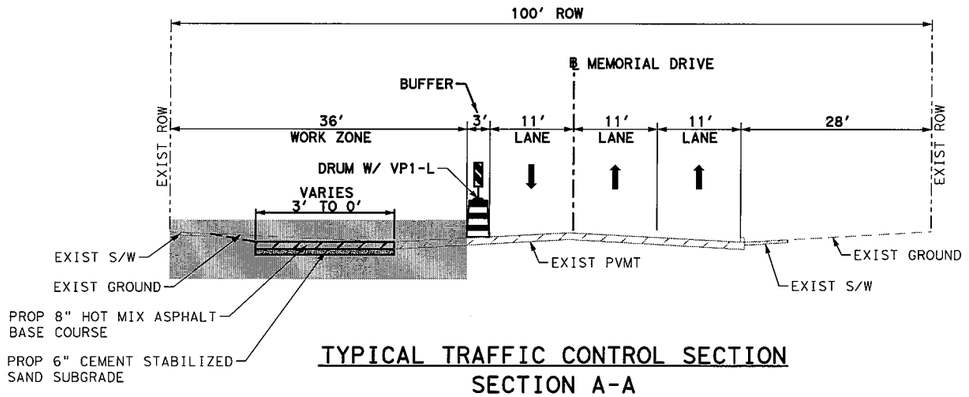
							
CW21-4D	G20-2	CW20-5D	CW20-5DL	R5-1	R1-1	R3-9b	TYPE III (B) BARRICADE





TYPICAL TRAFFIC CONTROL SECTION
SECTION A-A
(SEE NOTE 3)
N.T.S.

LEGEND

- WORK ZONE
- TEMP PAVEMENT
- EXIST DIRECTION OF TRAFFIC
- PROP DIRECTION OF TRAFFIC
- BARRELS OR DRUMS
- SIGN
- TYPE III BARRICADE W/ ROAD CLOSED SIGN (R11-2)
- LOW PROFILE CONCRETE BARRIER
- Ⓐ 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) (WORD)

NOTES:

1. PRIOR TO CONSTRUCTION ACROSS DRIVEWAY COORDINATE WITH CM. CONTRACTOR TO MAINTAIN ACCESS TO RESIDENTS AND BUSINESSESS AT ALL TIMES.
2. MAINTAIN MINIMUM 11-FEET LANE WIDTH IN EACH DIRECTION AT ALL TIMES.
3. INSTALL TEMPORARY ASPHALT (8-INCH) ROADWAY USING A TYPICAL ONE LANE CLOSURE DETAILS.
4. REFER TO TCP STANDARD DETAILS FOR MORE INFORMATION.
5. TEMPORARY ASPHALT SHALL BE CONSTRUCTED BETWEEN THE HOURS OF 9 AM TO 3 PM. ALL CHANNELIZING DEVICES SHALL BE REMOVED OFF THE ROADWAY AFTER WORKING HOURS. PLACE DRUMS AND BARRICADES ALONG THE TEMPORARY ASPHALT LIMITS.
6. INSTALL ALL WATER LINES AND SANITARY SEWER LINES IN THIS PHASE.
7. REMOVE ALL TEMPORARY PAVEMENT AND BASE FULL DEPTH TO NATURAL SOIL PRIOR TO INSTALLATION OF TOP SOIL FOR FINAL GRADING.

0 200 400
(IN FEET)
SCALE: PLAN 1":200'

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

Lockwood, Andrews & Newnam, Inc. A LEO A DALY COMPANY — FIRM REGISTATION NO. 2614

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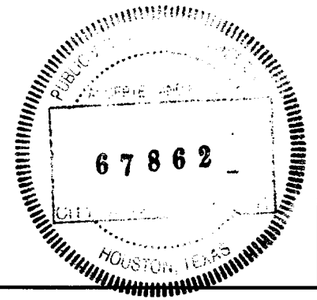
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

TRAFFIC CONTROL PLAN
PHASE 1

SHEET 3 OF 3

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	38



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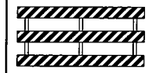
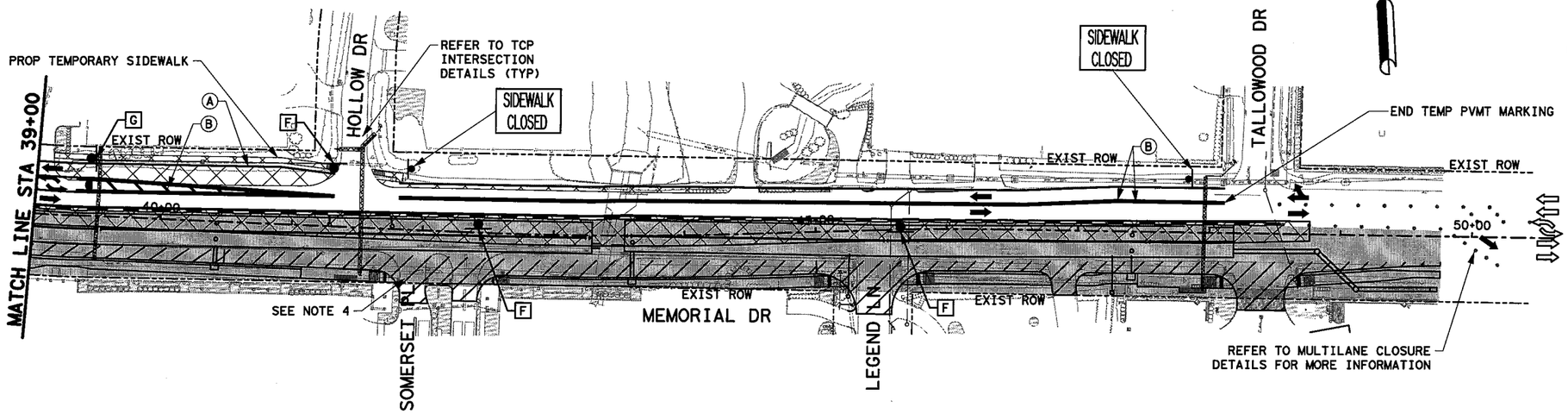
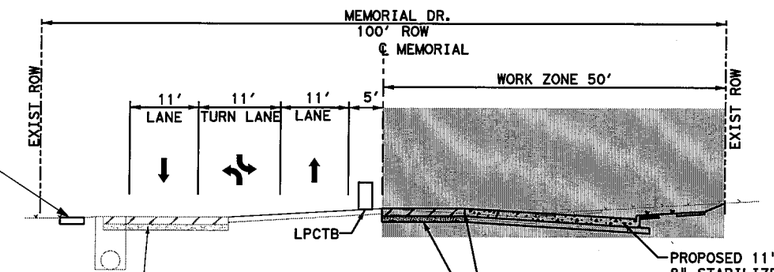
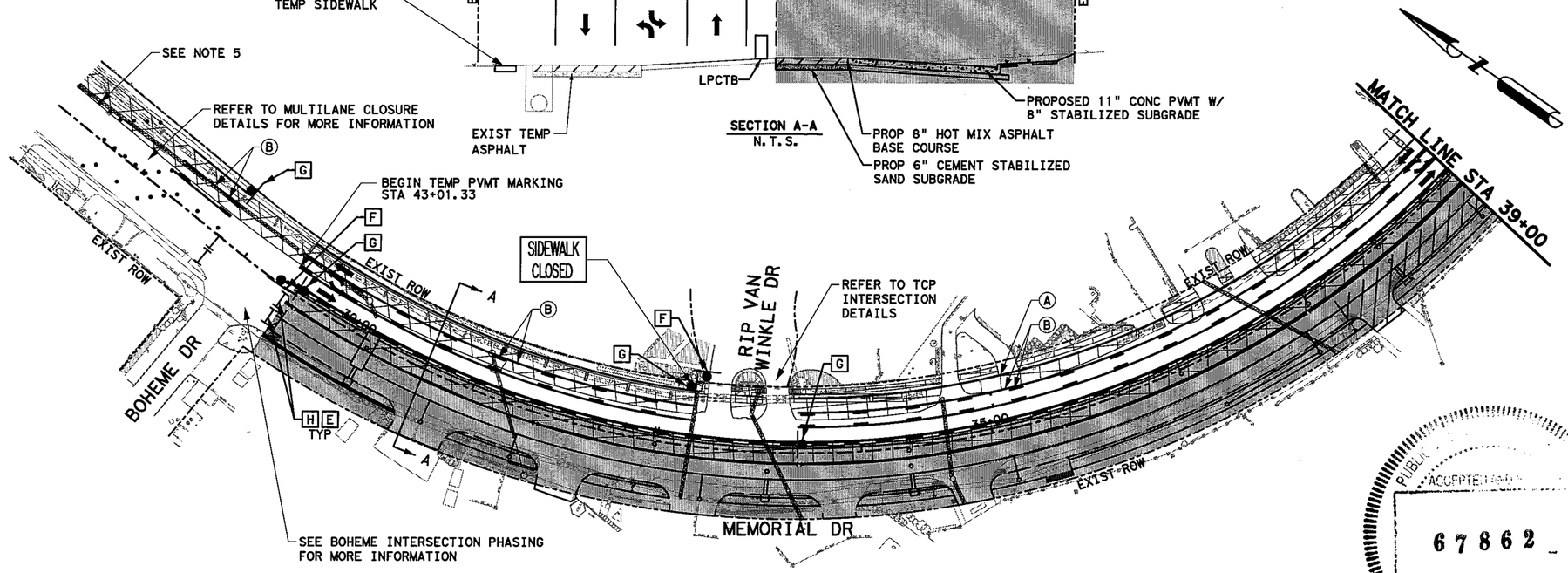
							
CW21-4D	G20-2	CW20-5D	CW20-5DL	R5-1	R1-1	R3-9b	TYPE III (B) BARRICADE







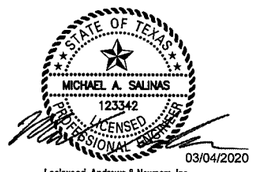
LEGEND

- WORK ZONE
- TEMP PAVEMENT
- EXIST DIRECTION OF TRAFFIC
- PROP DIRECTION OF TRAFFIC
- BARRELS OR DRUMS
- SIGN
- TYPE III BARRICADE W/ ROAD CLOSED SIGN (R11-2)
- LOW PROFILE CONCRETE BARRIER
- (A) WK ZN PAV MRK REMOV(TRAF BTN) TY W
- (B) WK ZN PAV MRK REMOV(TRAF BTN) TY Y
- (C) WK ZN PAV MRK REMOV(W) (ARROW)
- (D) WK ZN PAV MRK REMOV(W) (WORD)

NOTES:

1. PRIOR TO CONSTRUCTION ACROSS DRIVEWAY COORDINATE WITH CM. CONTRACTOR TO MAINTAIN ACCESS TO RESIDENTS AND BUSINESSESS AT ALL TIMES.
2. MAINTAIN MINIMUM 11-FEET LANE WIDTH IN EACH DIRECTION AT ALL TIMES.
3. REFER TO TCP STANDARED DETAILS FOR MORE INFORMATION.
4. REFER TO TYPICAL 3-WAY INTERSECTION CITY DETAIL FOR PHASING ALONG SIDE STREETS.
5. PROVIDE DRUMS ALONG TEMPORARY ASPHALT NOT INCORPORATED INTO THIS PHASE.
6. MAINTAIN ACCESS TO BUS STOPS AND PEDESTRIANS AT ALL TIMES.

0 200 400
(IN FEET)
SCALE: PLAN 1":200'



Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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FIRM REGISTATION NO. 2614

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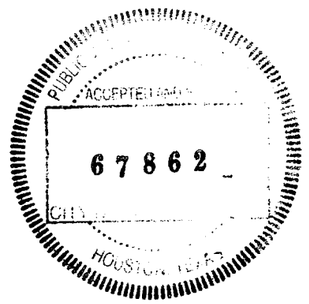
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

TRAFFIC CONTROL PLAN PHASE 2 STEP 1

SHEET 1 OF 1

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	39



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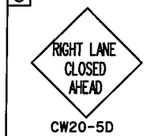
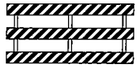
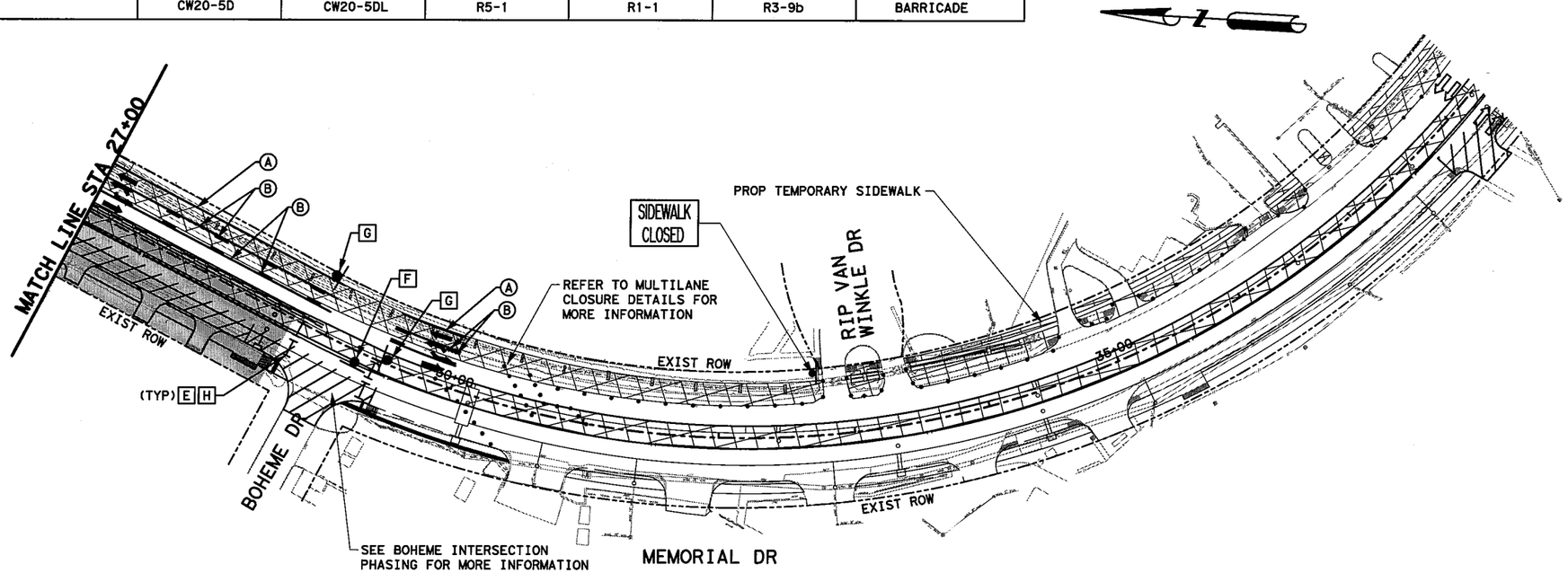
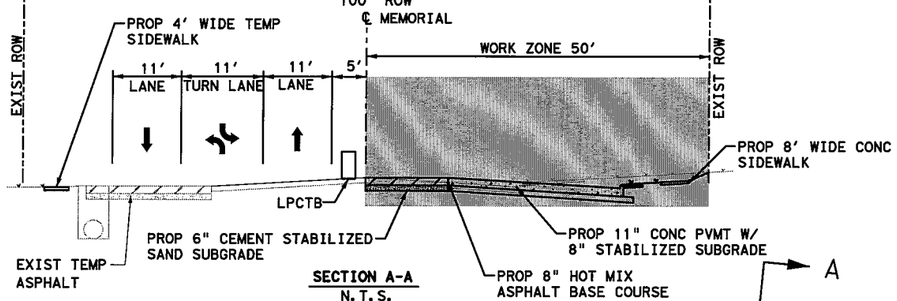
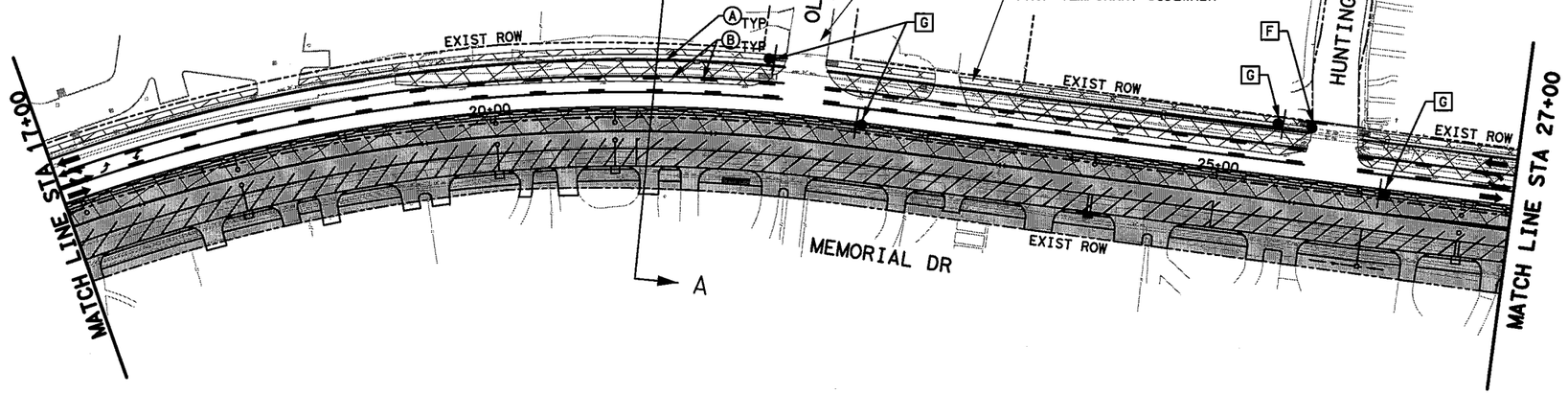
							
CW21-4D	G20-2	CW20-5D	CW20-5DL	R5-1	R1-1	R3-9b	TYPE III (B) BARRICADE





SECTION A-A
N. T. S.



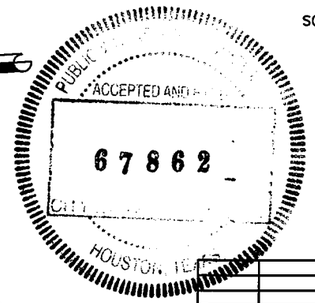
LEGEND

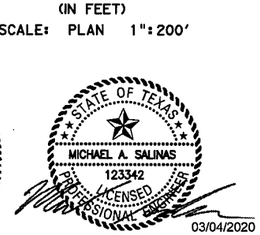
- WORK ZONE
- TEMP PAVEMENT
- EXIST DIRECTION OF TRAFFIC
- PROP DIRECTION OF TRAFFIC
- BARRELS OR DRUMS
- SIGN
- TYPE III BARRICADE W/ ROAD CLOSED SIGN (R11-2)
- LOW PROFILE CONCRETE BARRIER
- (A) WK ZN PAV MRK REMOV(TRAF BTN) TY W
- (B) WK ZN PAV MRK REMOV(TRAF BTN) TY Y
- (C) WK ZN PAV MRK REMOV(W) (ARROW)
- (D) WK ZN PAV MRK REMOV(W) (WORD)

NOTES:

1. PRIOR TO CONSTRUCTION ACROSS DRIVEWAY COORDINATE WITH CM. CONTRACTOR TO MAINTAIN ACCESS TO RESIDENTS AND BUSINESSESS AT ALL TIMES.
2. MAINTAIN MINIMUM 11-FEET LANE WIDTH IN EACH DIRECTION AT ALL TIMES.
3. REFER TO TCP STANDARED DETAILS FOR MORE INFORMATION.
4. REFER TO TYPICAL 3-WAY INTERSECTION CITY DETAIL FOR PHASING ALONG SIDE STREETS.
5. MAINTAIN ACCESS TO BUS STOP AND PEDESTRIANS AT ALL TIMES.

0 200 400
(IN FEET)
SCALE: PLAN 1":200'





Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

TRAFFIC CONTROL PLAN PHASE 2 STEP 2

SHEET 1 OF 2

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	40

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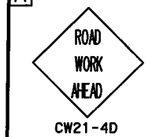
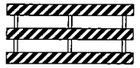
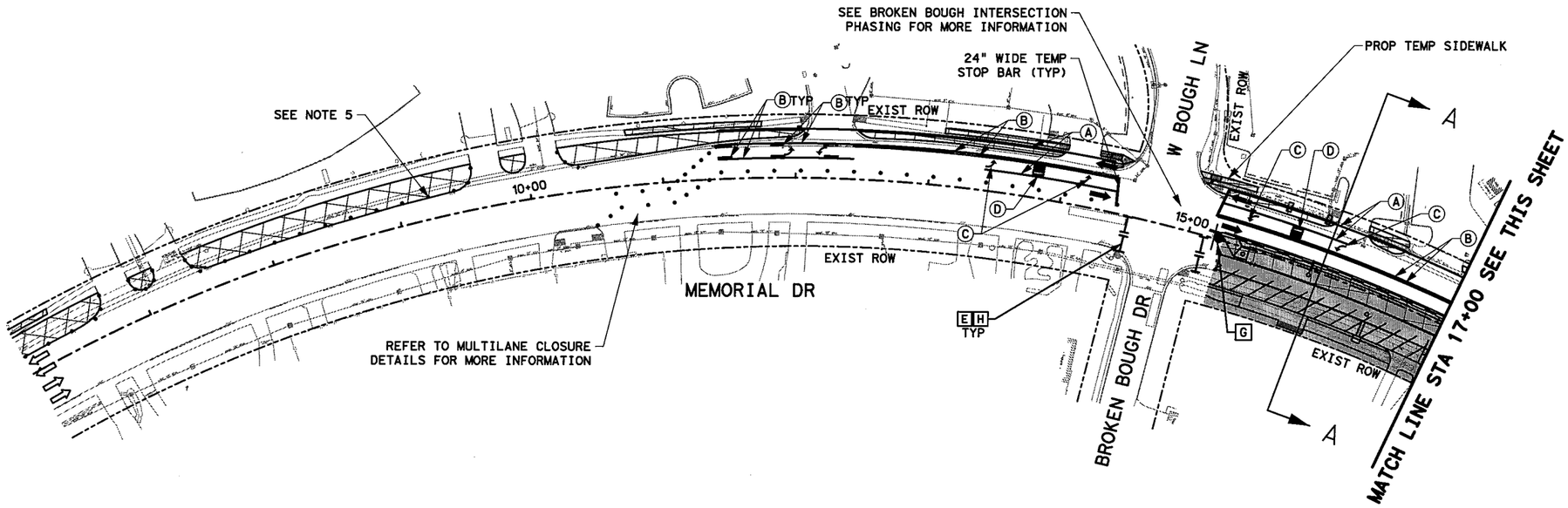
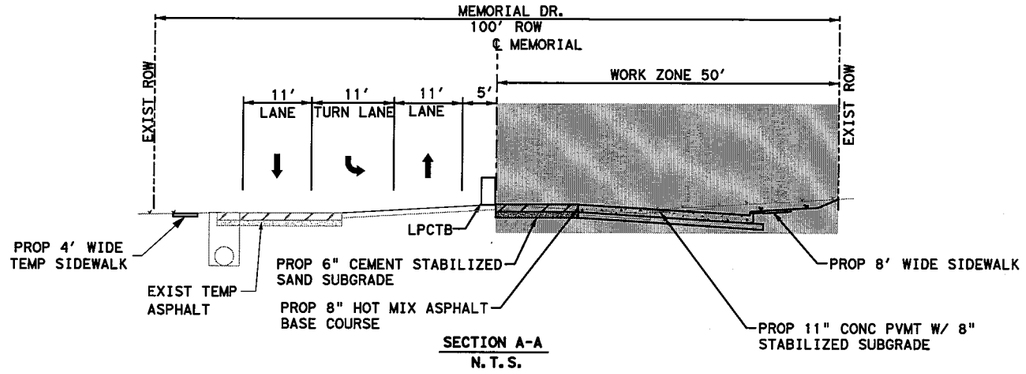
							
CW21-4D	G20-2	CW20-5D	CW20-5DL	R5-1	R1-1	R3-9b	TYPE III (B) BARRICADE

LEGEND

- WORK ZONE
- TEMP PAVEMENT
- EXIST DIRECTION OF TRAFFIC
- PROP DIRECTION OF TRAFFIC
- BARRELS OR DRUMS
- SIGN
- TYPE III BARRICADE W/ ROAD CLOSED SIGN (R11-2)
- LOW PROFILE CONCRETE BARRIER
- (A) WK ZN PAV MRK REMOV(TRAF BTN) TY W
- (B) WK ZN PAV MRK REMOV(TRAF BTN) TY Y
- (C) WK ZN PAV MRK REMOV(W) (ARROW)
- (D) WK ZN PAV MRK REMOV(W) (WORD)





SECTION A-A
N.T.S.

NOTES:

1. PRIOR TO CONSTRUCTION ACROSS DRIVEWAY COORDINATE WITH CM, CONTRACTOR TO MAINTAIN ACCESS TO RESIDENTS AND BUSINESSESS AT ALL TIMES.
2. MAINTAIN MINIMUM 11-FEET LANE WIDTH IN EACH DIRECTION AT ALL TIMES.
3. REFER TO TCP STANDARD DETAILS FOR MORE INFORMATION.
4. REFER TO TYPICAL 3-WAY INTERSECTION CITY DETAIL FOR PHASING ALONG SIDE STREETS.
5. PROVIDE DRUMS ALONG TEMPORARY ASPHALT NOT INCORPORATED INTO THIS PHASE.
6. MAINTAIN ACCESS TO BUS STOPS AND PEDESTRIANS AT ALL TIMES.

0 200 400
(IN FEET)
SCALE: PLAN 1":200'

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
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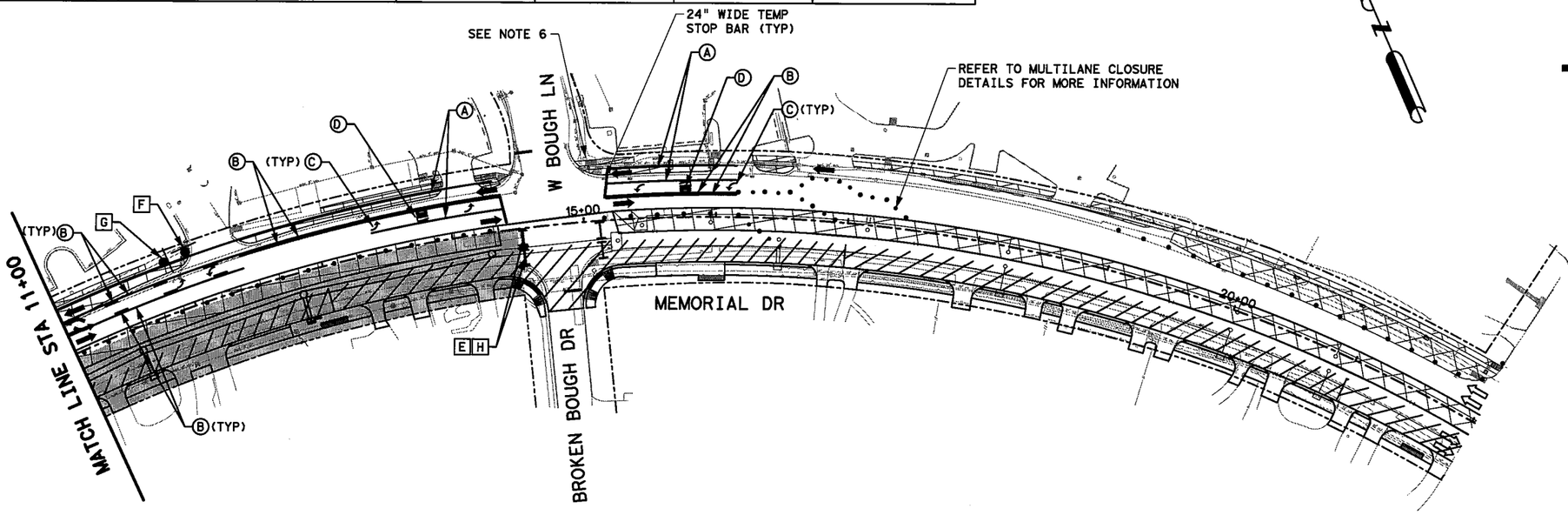
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

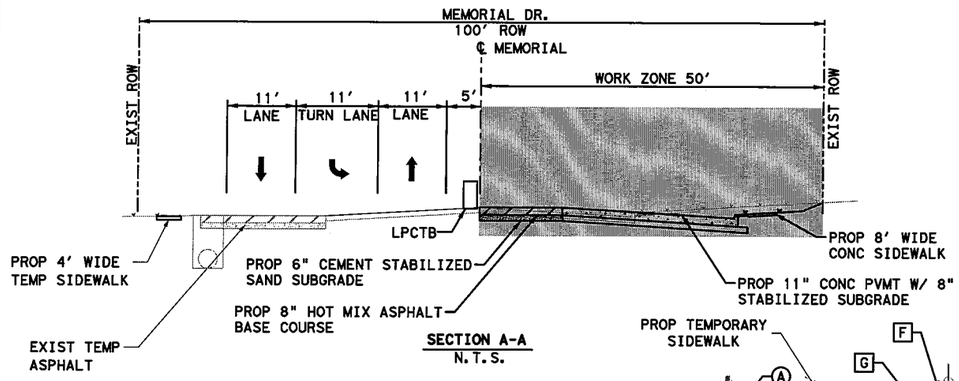
TRAFFIC CONTROL PLAN PHASE 2 STEP 2

SHEET 2 OF 2

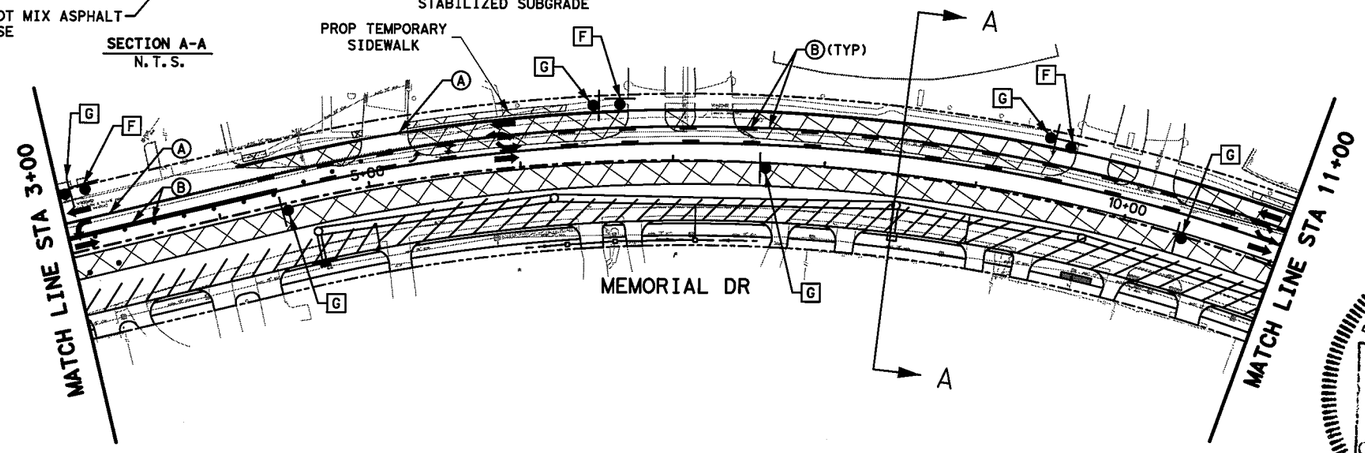
DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	41

A	B	C	D	E	F	G	H
ROAD WORK AHEAD CW21-4D	END ROAD WORK G20-2	RIGHT LANE CLOSED AHEAD CW20-5D	LEFT LANE CLOSED AHEAD CW20-5DL	DO NOT ENTER R5-1	STOP R1-1	CENTER LANE ONLY R3-9b	TYPE III (B) BARRICADE





SECTION A-A
N. T. S.



LEGEND

- WORK ZONE
- TEMP PAVEMENT
- EXIST DIRECTION OF TRAFFIC
- PROP DIRECTION OF TRAFFIC
- BARRELS OR DRUMS
- SIGN
- TYPE III BARRICADE W/ ROAD CLOSED SIGN (R11-2)
- LOW PROFILE CONCRETE BARRIER
- (A) WK ZN PAV MRK REMOV(TRAF BTN) TY W
- (B) WK ZN PAV MRK REMOV(TRAF BTN) TY Y
- (C) WK ZN PAV MRK REMOV(W) (ARROW)
- (D) WK ZN PAV MRK REMOV(W) (WORD)

NOTES:

1. PRIOR TO CONSTRUCTION ACROSS DRIVEWAY COORDINATE WITH CM. CONTRACTOR TO MAINTAIN ACCESS TO RESIDENTS AND BUSINESSESS AT ALL TIMES.
2. MAINTAIN MINIMUM 11-FEET LANE WIDTH IN EACH DIRECTION AT ALL TIMES.
3. REFER TO TCP STANDARED DETAILS FOR MORE INFORMATION.
4. REFER TO TYPICAL 3-WAY INTERSECTION CITY DETAIL FOR PHASING ALONG SIDE STREETS.
5. SEE BROKEN BOUGH INTERSECTION PHASING FOR MORE INFORMATION.
6. REFER TO THE TEMPORARY SIGNAL PLAN FOR MORE INFORMATION.
7. MAINTAIN ACCESS TO BUS STOPS AND PEDESTRIANS AT ALL TIMES.

0 200 400
(IN FEET)
SCALE: PLAN 1":200'

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED
PROFESSIONAL ENGINEER
03/04/2020
Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

Lockwood, Andrews & Newnam, Inc.
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FIRM REGISTATION NO. 2614

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

TRAFFIC CONTROL PLAN PHASE 2 STEP 3

SHEET 1 OF 2

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	42

PUBLIC WORKS
67862
CITY
HOUSTON

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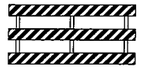
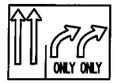
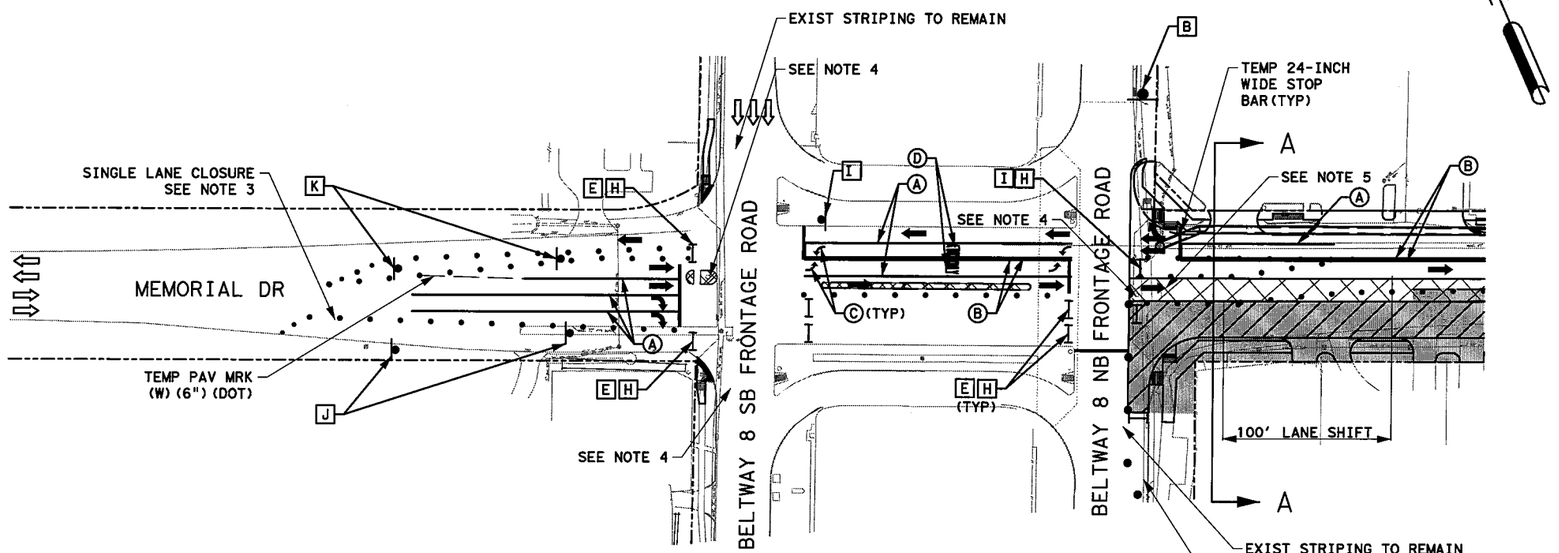
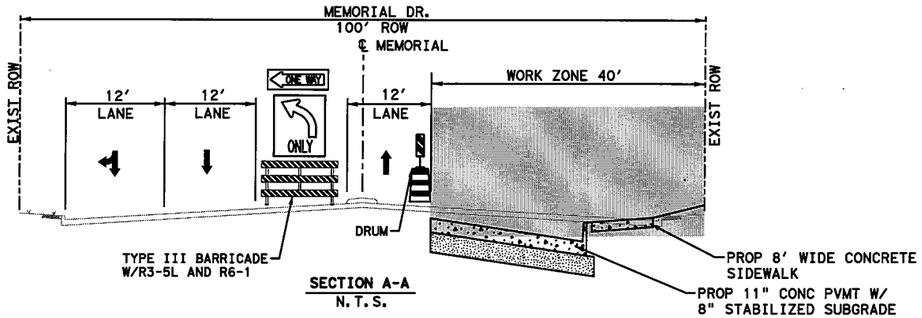
										
CW21-4D	G20-2	CW20-5D	CW20-5DL	R5-1	R1-1	R3-9b	TYPE III (B) BARRICADE	R3-5L		





SECTION A-A
N. T. S.

LEGEND

- WORK ZONE
- TEMP PAVEMENT
- EXIST DIRECTION OF TRAFFIC
- PROP DIRECTION OF TRAFFIC
- BARRELS OR DRUMS
- SIGN
- TYPE III BARRICADE W/ ROAD CLOSED SIGN (R11-2)
- LOW PROFILE CONCRETE BARRIER
- (A) WK ZN PAV MRK REMOV (TRAF BTN) TY W
- (B) WK ZN PAV MRK REMOV (TRAF BTN) TY Y
- (C) WK ZN PAV MRK REMOV (W) (ARROW)
- (D) WK ZN PAV MRK REMOV (W) (WORD)

NOTES:

1. PRIOR TO CONSTRUCTION ACROSS DRIVEWAY COORDINATE WITH CM. CONTRACTOR TO MAINTAIN ACCESS TO RESIDENTS AND BUSINESSESS AT ALL TIMES.
2. MAINTAIN MINIMUM 11-FEET LANE WIDTH IN EACH DIRECTION AT ALL TIMES.
3. REFER TO TCP STANDARED DETAILS FOR MORE INFORMATION.
4. REFER TO TEMPORARY SIGNAL PLANS FOR MORE INFORMATION.
5. REFER TO STEP 4 FOR ADDITIONAL INFORMATION.
6. MAINTAIN ACCESS TO BUS STOPS AT ALL TIMES.
7. MULTILANE CLOSURE WILL BE REQUIRED FOR PAVEMENT RECONSTRUCTION AT INTERSECTION. MULTILANE CLOSURE SHALL ONLY BE IN PLACE FOR A MAXIMUM OF 7 DAYS.

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

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

Lockwood, Andrews & Newnam, Inc.
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

TRAFFIC CONTROL PLAN PHASE 2 STEP 3

SHEET 2 OF 2

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	43

ACCEPTED
PUBLIC WORKS
67862

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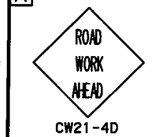
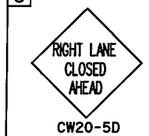
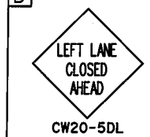
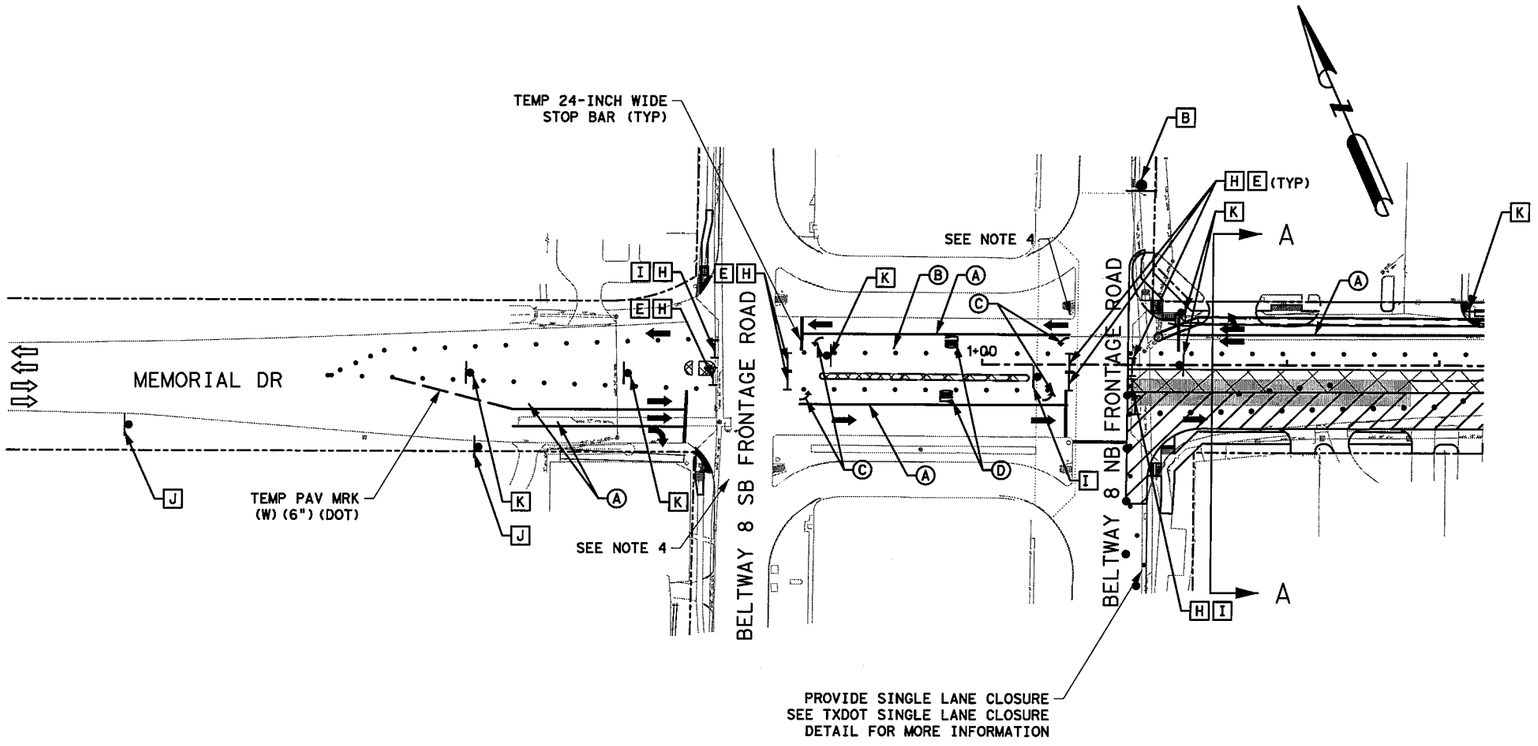
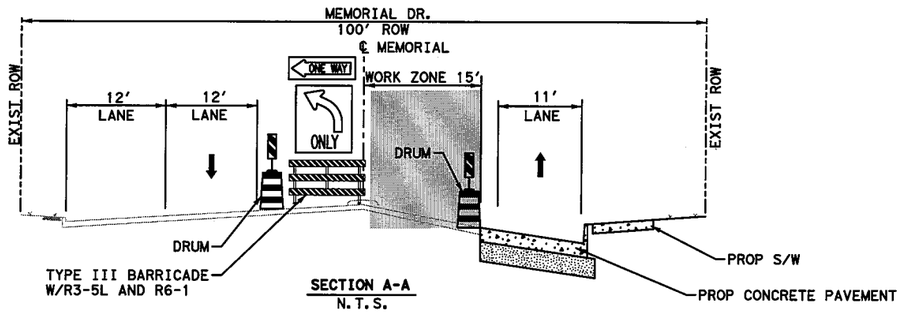
 CW21-4D	 G20-2	 CW20-5D	 CW20-5DL	 R5-1	 R1-1	 R3-9b	 TYPE III (B) BARRICADE	 R6-1L R3-5L	 R3-H8CB	LEFT LANE MUST TURN LEFT AHEAD





SECTION A-A
N.T.S.

LEGEND

- WORK ZONE
- TEMP PAVEMENT
- EXIST DIRECTION OF TRAFFIC
- PROP DIRECTION OF TRAFFIC
- BARRELS OR DRUMS
- SIGN
- TYPE III BARRICADE W/ ROAD CLOSED SIGN (R11-2)
- LOW PROFILE CONCRETE BARRIER
- (A) WK ZN PAV MRK REMOV (TRAF BTN) TY W
- (B) WK ZN PAV MRK REMOV (TRAF BTN) TY Y
- (C) WK ZN PAV MRK REMOV (W) (ARROW)
- (D) WK ZN PAV MRK REMOV (W) (WORD)

NOTES:

1. PRIOR TO CONSTRUCTION ACROSS DRIVEWAY COORDINATE WITH CM. CONTRACTOR TO MAINTAIN ACCESS TO RESIDENTS AND BUSINESSESS AT ALL TIMES.
2. MAINTAIN MINIMUM 11-FEET LANE WIDTH IN EACH DIRECTION AT ALL TIMES.
3. REFER TO TCP STANDARED DETAILS FOR MORE INFORMATION.
4. REFER TO TEMPORARY SIGNAL PLANS FOR MORE INFORMATION.
5. MAINTAIN ACCESS TO BUST STOPS AND PEDESTRIANS AT ALL TIMES.

0 200 400
(IN FEET)
SCALE: PLAN 1":200'

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

TRAFFIC CONTROL PLAN PHASE 2 STEP 4

SHEET 1 OF 1

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	44

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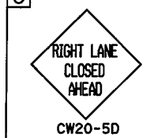
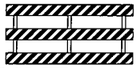
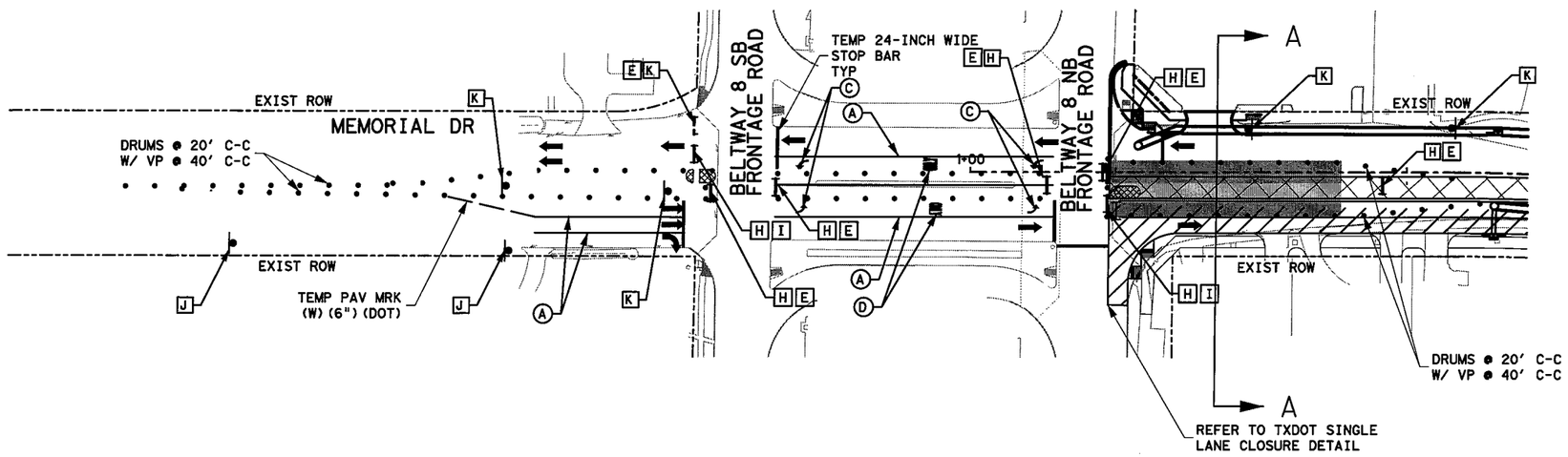
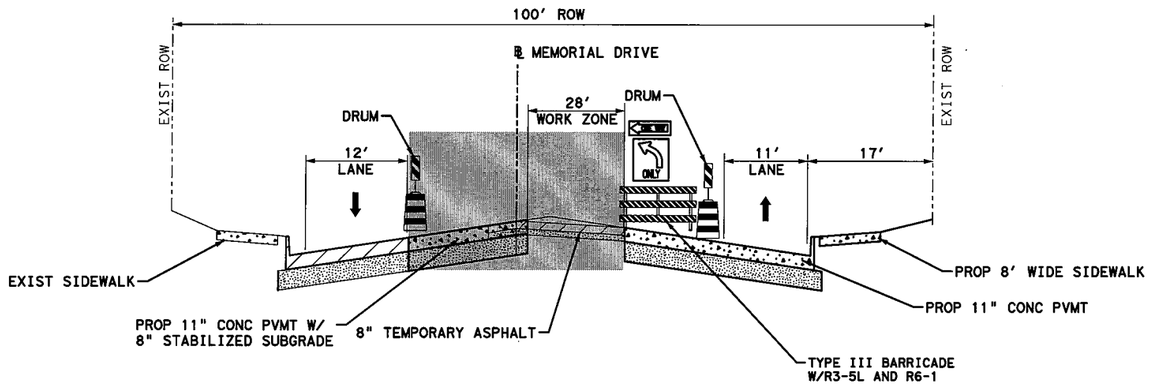
A	B	C	D	E	F	G	H	I	J	K
 CW21-4D	 G20-2	 CW20-5D	 CW20-5DL	 R5-1	 R1-1	 R3-9b	 TYPE III (B) BARRICADE	 R3-5L		LEFT LANE MUST TURN LEFT AHEAD





TYPICAL TRAFFIC CONTROL SECTION
SECTION A-A
N.T.S.

LEGEND

- WORK ZONE
- TEMP PAVEMENT
- EXIST DIRECTION OF TRAFFIC
- PROP DIRECTION OF TRAFFIC
- BARRELS OR DRUMS
- SIGN
- TYPE III BARRICADE W/ ROAD CLOSED SIGN (R11-2)
- LOW PROFILE CONCRETE BARRIER
- (A) WK ZN PAV MRK REMOV(TRAF BTN) TY W
- (B) WK ZN PAV MRK REMOV(TRAF BTN) TY Y
- (C) WK ZN PAV MRK REMOV(W) (ARROW)
- (D) WK ZN PAV MRK REMOV(W) (WORD)

NOTES:

1. PRIOR TO CONSTRUCTION ACROSS DRIVEWAY COORDINATE WITH CM. CONTRACTOR TO MAINTAIN ACCESS TO RESIDENTS AND BUSINESSESS AT ALL TIMES.
2. MAINTAIN MINIMUM 11-FEET LANE WIDTH IN EACH DIRECTION AT ALL TIMES.
3. REFER TO TCP STANDARD DETAILS FOR MORE INFORMATION.
4. ACCESS TO TOWN & COUNTRY VILLAGE SHALL BE MAINTAINED AT ALL TIMES. CONSECUTIVE DRIVEWAYS SHALL NOT BE CLOSED AT THE SAME TIME.
5. MAINTAIN DRAINAGE AT ALL TIMES.
6. MEDIAN SHALL BE REMOVED AND REPLACED WITH TEMP ASPHALT.

0 200 400
(IN FEET)
SCALE: PLAN 1": 200'

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED
PROFESSIONAL ENGINEER
03/04/2020
Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
©2020

ACCEPTED
67862

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

TRAFFIC CONTROL PLAN
PHASE 3 STEP 1

SHEET 1 OF 3

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CSK DGN:	6	TEXAS	STP 1802(783)MM			CS
DW:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CSK CKD:	HOU	HARRIS	0912	72	391	45

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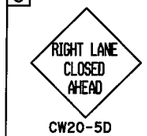
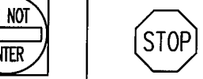
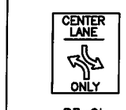
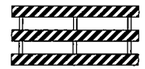
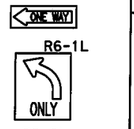
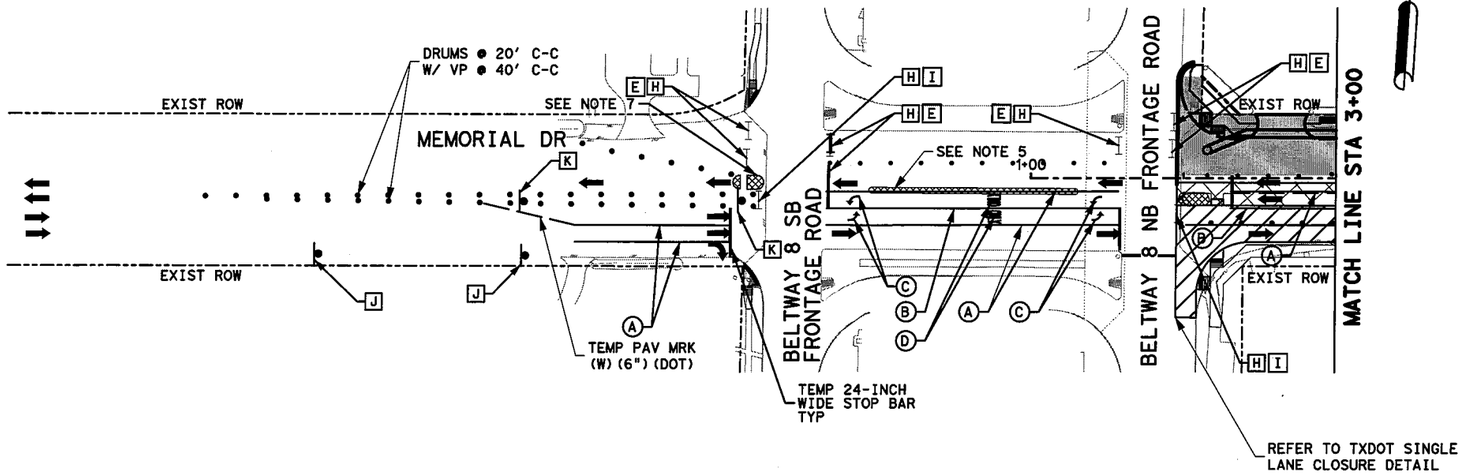
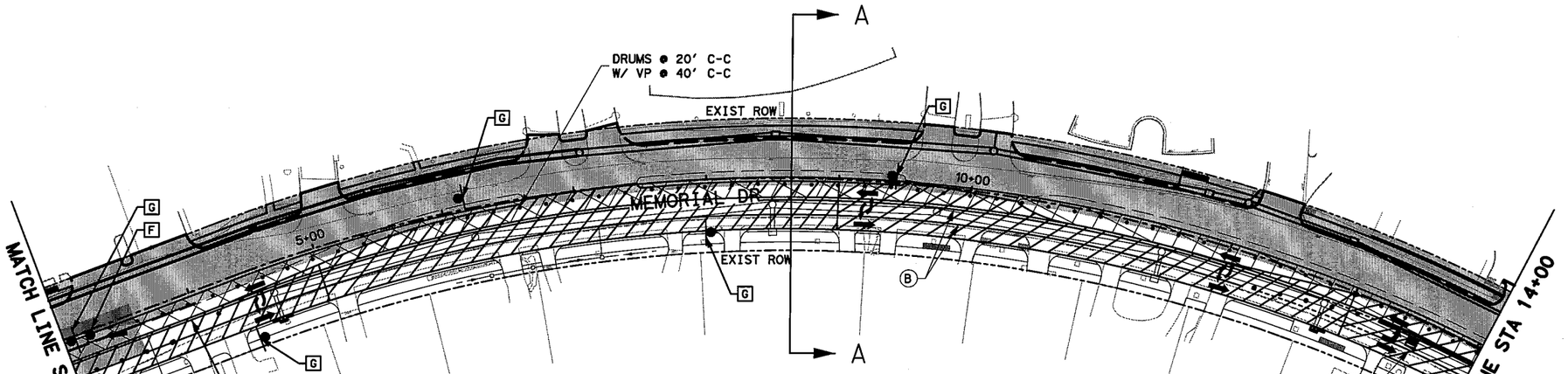
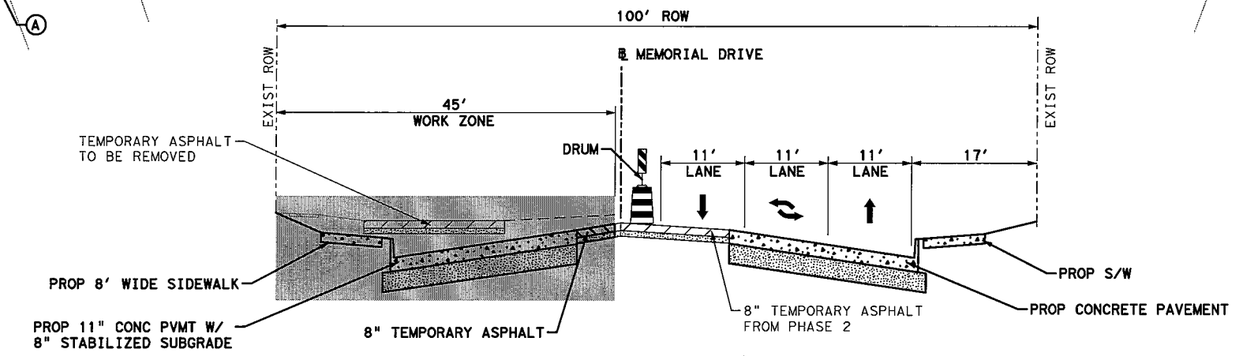
A	B	C	D	E	F	G	H	I	J	K
										
ROAD WORK AHEAD	END ROAD WORK	RIGHT LANE CLOSED AHEAD	LEFT LANE CLOSED AHEAD	DO NOT ENTER	STOP	CENTER LANE ONLY	TYPE III (B) BARRICADE	ONE WAY R6-1L ONLY	ONLY	LEFT LANE MUST TURN LEFT AHEAD
CW21-4D	G20-2	CW20-5D	CW20-5DL	R5-1	R1-1	R3-9b		R3-5L		







TYPICAL TRAFFIC CONTROL SECTION
SECTION A-A
N.T.S.

LEGEND

- WORK ZONE
- TEMP PAVEMENT
- EXIST DIRECTION OF TRAFFIC
- PROP DIRECTION OF TRAFFIC
- BARRELS OR DRUMS
- SIGN
- TYPE III BARRICADE W/ ROAD CLOSED SIGN (R11-2)
- LOW PROFILE CONCRETE BARRIER
- (A) WK ZN PAV MRK REMOV(TRAF BTN) TY W
- (B) WK ZN PAV MRK REMOV(TRAF BTN) TY Y
- (C) WK ZN PAV MRK REMOV(W) (ARROW)
- (D) WK ZN PAV MRK REMOV(W) (WORD)

NOTES:

1. PRIOR TO CONSTRUCTION ACROSS DRIVEWAY COORDINATE WITH CM. CONTRACTOR TO MAINTAIN ACCESS TO RESIDENTS AND BUSINESSESS AT ALL TIMES.
2. MAINTAIN MINIMUM 11-FEET LANE WIDTH IN EACH DIRECTION AT ALL TIMES.
3. REFER TO TCP STANDARD DETAILS FOR MORE INFORMATION.
4. MAINTAIN DRAINAGE AT ALL TIMES.
5. MEDIAN SHALL BE REMOVED AND REPLACED WITH TEMP ASPHALT.
6. MAINTAIN ACCESS TO BUS STOPS AND PEDESTRIANS AT ALL TIMES.
7. REFER TO TEMP SIGNAL PLANS FOR MORE INFORMATION.

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

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
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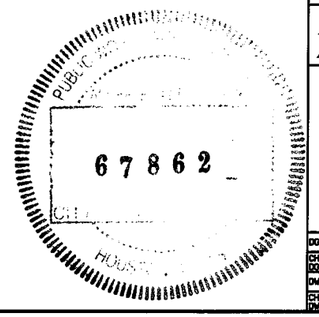
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

TRAFFIC CONTROL PLAN PHASE 3 STEP 1

SHEET 2 OF 3



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CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	46

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	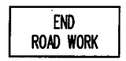	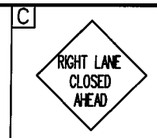					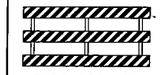	
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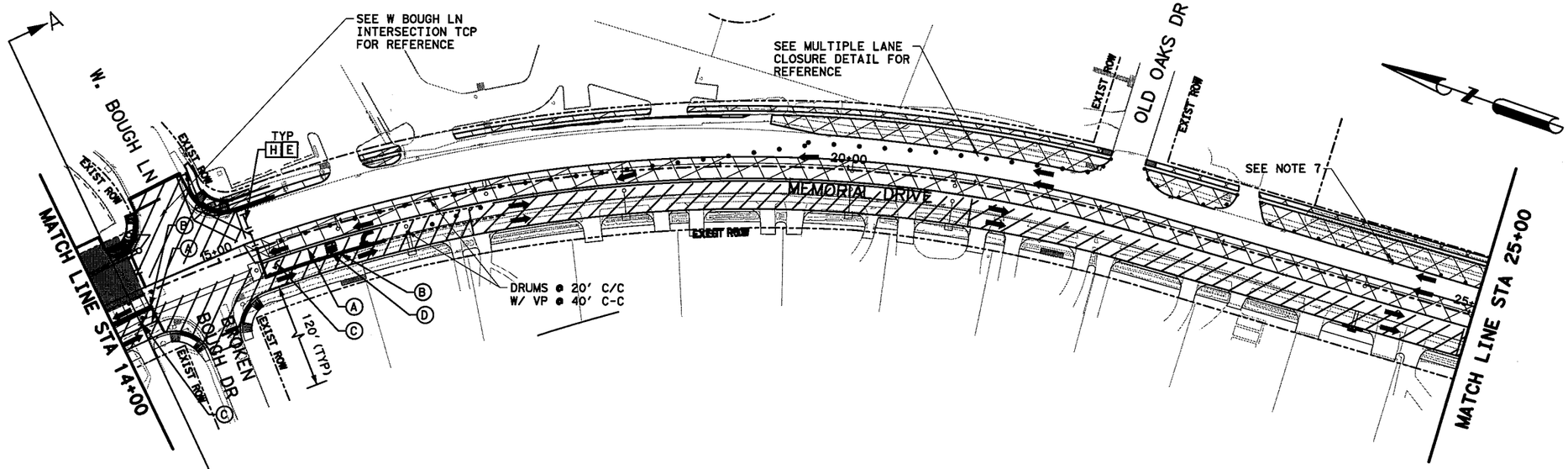

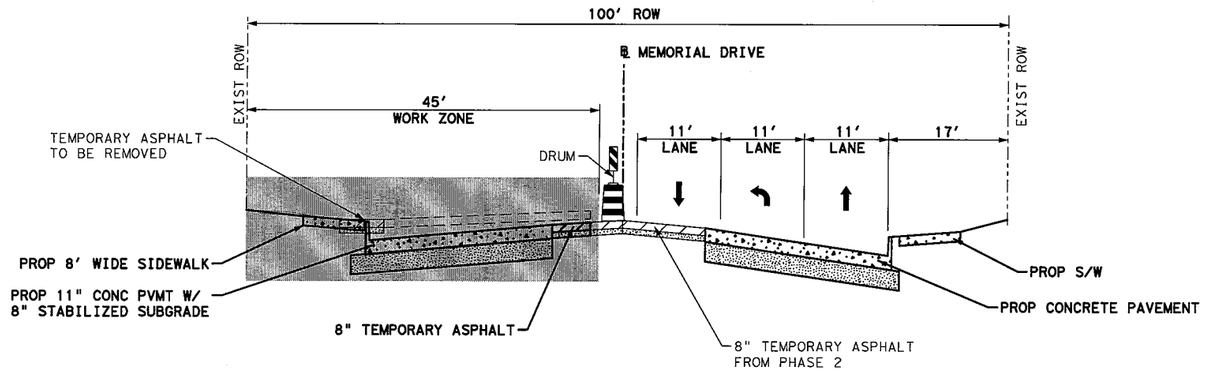

TYPICAL TRAFFIC CONTROL SECTION
SECTION A-A
N.T.S.

LEGEND

- WORK ZONE
- TEMP PAVEMENT
- EXIST DIRECTION OF TRAFFIC
- PROP DIRECTION OF TRAFFIC
- BARRELS OR DRUMS
- SIGN
- TYPE III BARRICADE W/ ROAD CLOSED SIGN (R11-2)
- LOW PROFILE CONCRETE BARRIER
- (A) WK ZN PAV MRK REMOV(TRAF BTN) TY W
- (B) WK ZN PAV MRK REMOV(TRAF BTN) TY Y
- (C) WK ZN PAV MRK REMOV(W) (ARROW)
- (D) WK ZN PAV MRK REMOV(W) (WORD)

NOTES:

1. PRIOR TO CONSTRUCTION ACROSS DRIVEWAY COORDINATE WITH CM. CONTRACTOR TO MAINTAIN ACCESS TO RESIDENTS AND BUSINESSESS AT ALL TIMES.
2. MAINTAIN MINIMUM 11-FEET LANE WIDTH IN EACH DIRECTION AT ALL TIMES.
3. REFER TO TCP STANDARD DETAILS FOR MORE INFORMATION.
4. MAINTAIN DRAINAGE AT ALL TIMES.
5. SEE TEMPORARY SIGNAL PLAN FOR MORE INFORMATION.
6. MAINTAIN ACCESS TO BUS STOPS AT ALL TIMES.
7. PROVIDE DRUMS ALONG TEMPORARY ASPHALT NOT INCORPORATED INTO THIS PHASE.

0 200 400
(IN FEET)
SCALE: PLAN 1":200'

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

Lockwood, Andrews & Newnam, Inc. A LEO A DALY COMPANY — FIRM REGISTATION NO. 2614

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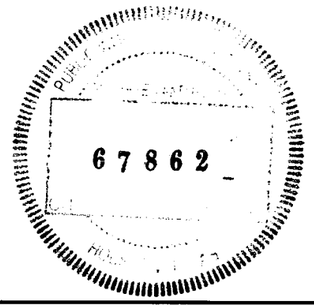
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

TRAFFIC CONTROL PLAN
PHASE 3 STEP 1

SHEET 3 OF 3

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	47



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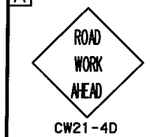
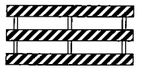
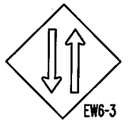
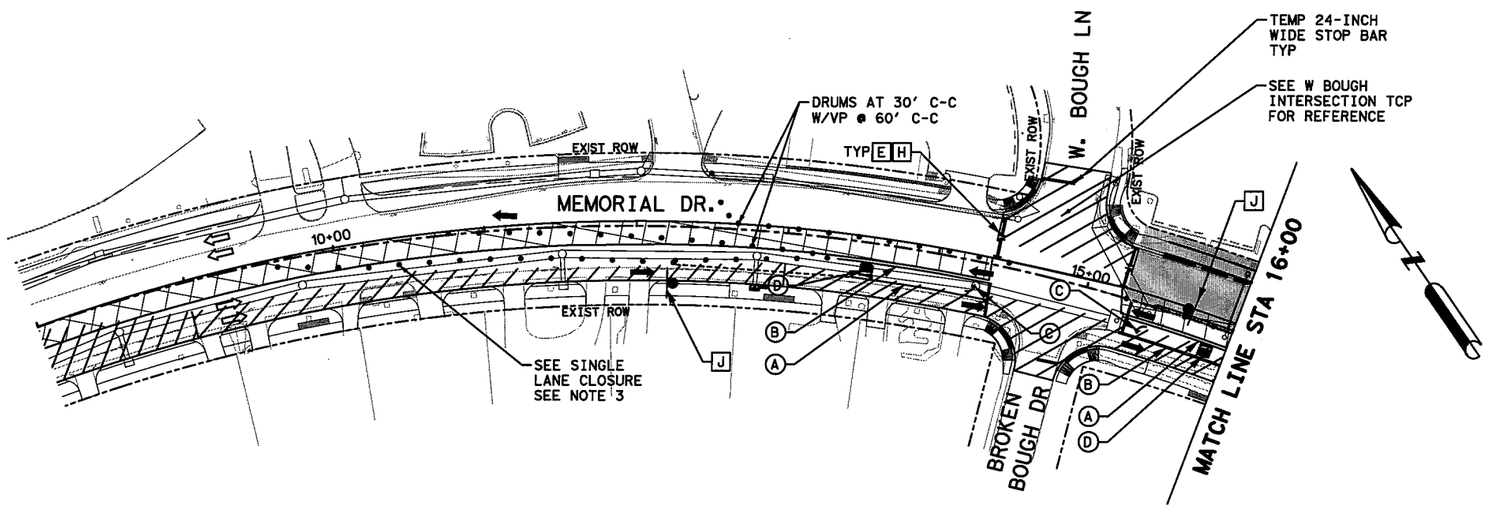
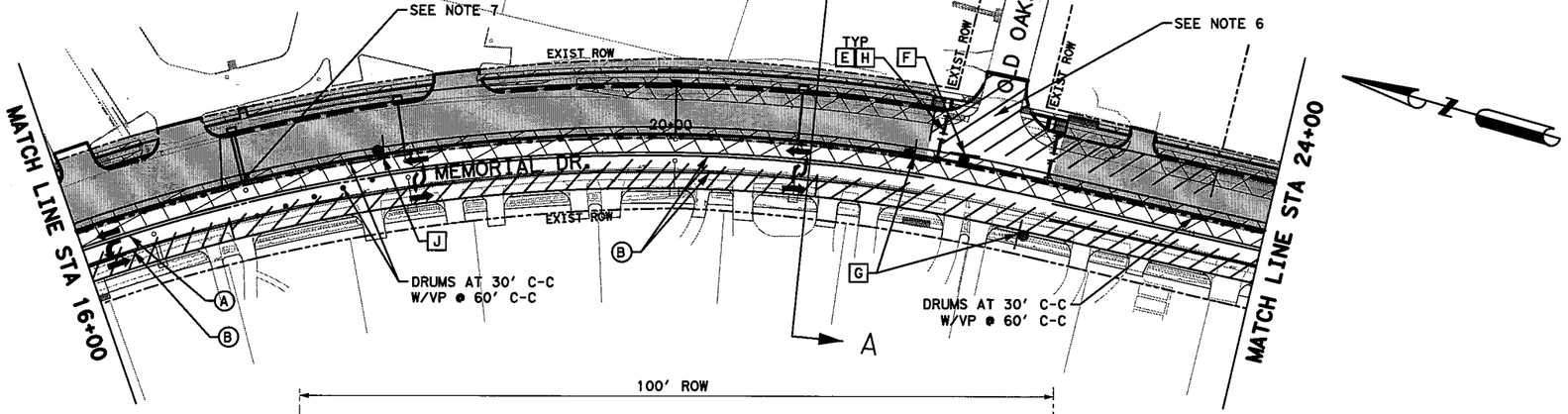
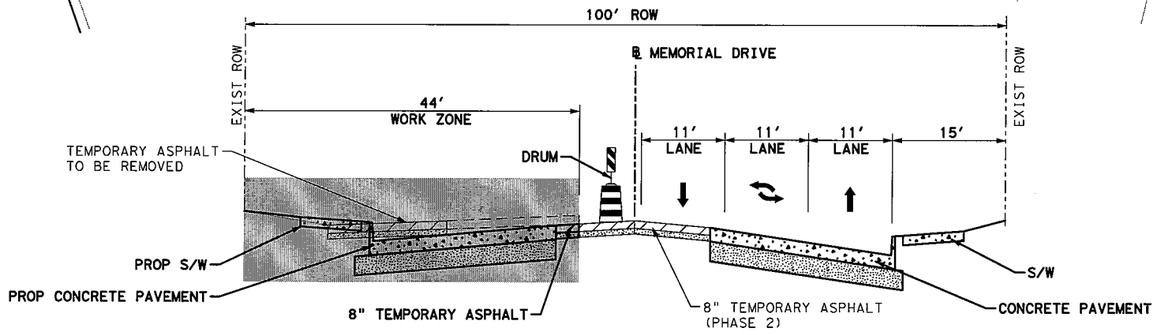
									
CW21-4D	G20-2	CW20-5D	CW20-5DL	R5-1	R1-1	R3-9b	TYPE III (B) BARRICADE W/R11-2	EW6-3	R3-7L







TYPICAL TRAFFIC CONTROL SECTION
SECTION A-A
N.T.S.

LEGEND

- WORK ZONE
- TEMP PAVEMENT
- EXIST DIRECTION OF TRAFFIC
- PROP DIRECTION OF TRAFFIC
- BARRELS OR DRUMS
- SIGN
- TYPE III BARRICADE W/ ROAD CLOSED SIGN (R11-2)
- LOW PROFILE CONCRETE BARRIER
- (A) WK ZN PAV MRK REMOV(TRAF BTN) TY W
- (B) WK ZN PAV MRK REMOV(TRAF BTN) TY Y
- (C) WK ZN PAV MRK REMOV(W) (ARROW)
- (D) WK ZN PAV MRK REMOV(W) (WORD)

NOTES:

1. PRIOR TO CONSTRUCTION ACROSS DRIVEWAY COORDINATE WITH CM. CONTRACTOR TO MAINTAIN ACCESS TO RESIDENTS AND BUSINESSESS AT ALL TIMES.
2. MAINTAIN MINIMUM 11-FEET LANE WIDTH IN EACH DIRECTION AT ALL TIMES.
3. REFER TO TCP STANDARD DETAILS FOR MORE INFORMATION.
4. MAINTAIN DRAINAGE AT ALL TIMES.
5. SEE TEMPORARY SIGNAL PLAN FOR MORE INFORMATION.
6. SEE CITY INTERSECTION PHASING FOR RECONSTRUCTION OF PAVEMENT ACROSS SIDE STREETS.
7. PROVIDE LPCTB WHILE STORM SEWER LEADS ARE BEING CONSTRUCTED.

0 200 400
(IN FEET)
SCALE: PLAN 1"=200'

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED
PROFESSIONAL ENGINEER
03/04/2020
Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

TRAFFIC CONTROL PLAN PHASE 3 STEP 2

SHEET 1 OF 2

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	48

67862

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		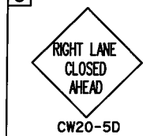					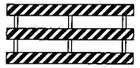	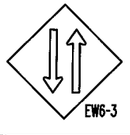
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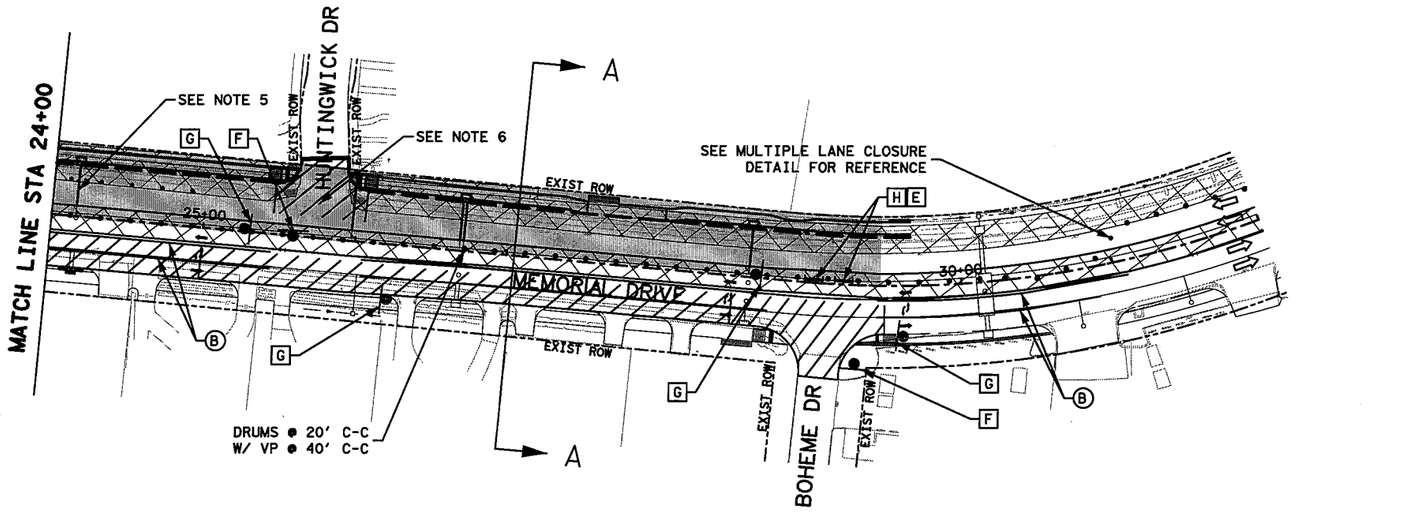

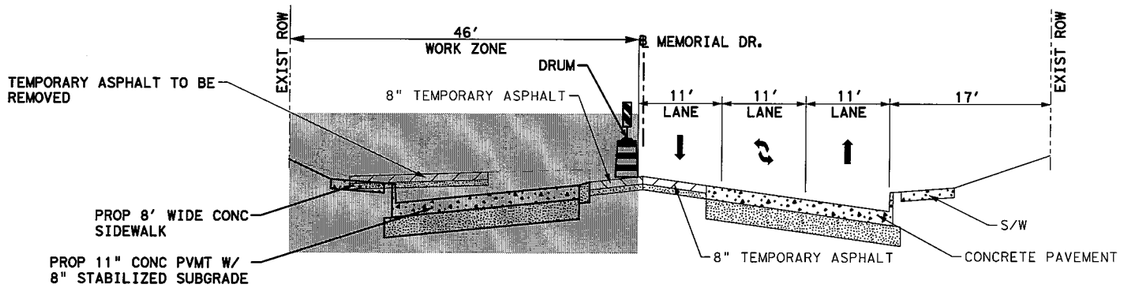

TYPICAL TRAFFIC CONTROL SECTION
SECTION A-A
N. T. S.

LEGEND

- WORK ZONE
- TEMP PAVEMENT
- EXIST DIRECTION OF TRAFFIC
- PROP DIRECTION OF TRAFFIC
- BARRELS OR DRUMS
- SIGN
- TYPE III BARRICADE W/ ROAD CLOSED SIGN (R11-2)
- LOW PROFILE CONCRETE BARRIER
- (A) WK ZN PAV MRK REMOV(TRAF BTN) TY W
- (B) WK ZN PAV MRK REMOV(TRAF BTN) TY Y
- (C) WK ZN PAV MRK REMOV(W) (ARROW)
- (D) WK ZN PAV MRK REMOV(W) (WORD)

NOTES:

1. PRIOR TO CONSTRUCTION ACROSS DRIVEWAY COORDINATE WITH CM. CONTRACTOR TO MAINTAIN ACCESS TO RESIDENTS AND BUSINESSESS AT ALL TIMES.
2. MAINTAIN MINIMUM 11-FEET LANE WIDTH IN EACH DIRECTION AT ALL TIMES.
3. REFER TO TCP STANDARD DETAILS FOR MORE INFORMATION.
4. MAINTAIN DRAINAGE AT ALL TIMES.
5. PROVIDE LPCTB WHILE STORM SEWER LEADS ARE BEING CONSTRUCTED.
6. SEE CITY INTERSECTION PHASING FOR RECONSTRUCTION OF PAVEMENT ACROSS SIDE STREETS.
7. MAINTAIN ACCESS TO BUS STOPS AT ALL TIMES.

0 200 400
(IN FEET)
SCALE: PLAN 1":200'

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
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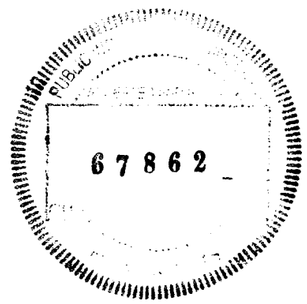
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

TRAFFIC CONTROL PLAN
PHASE 3 STEP 2

SHEET 2 OF 2

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	49



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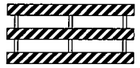
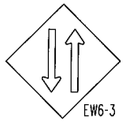
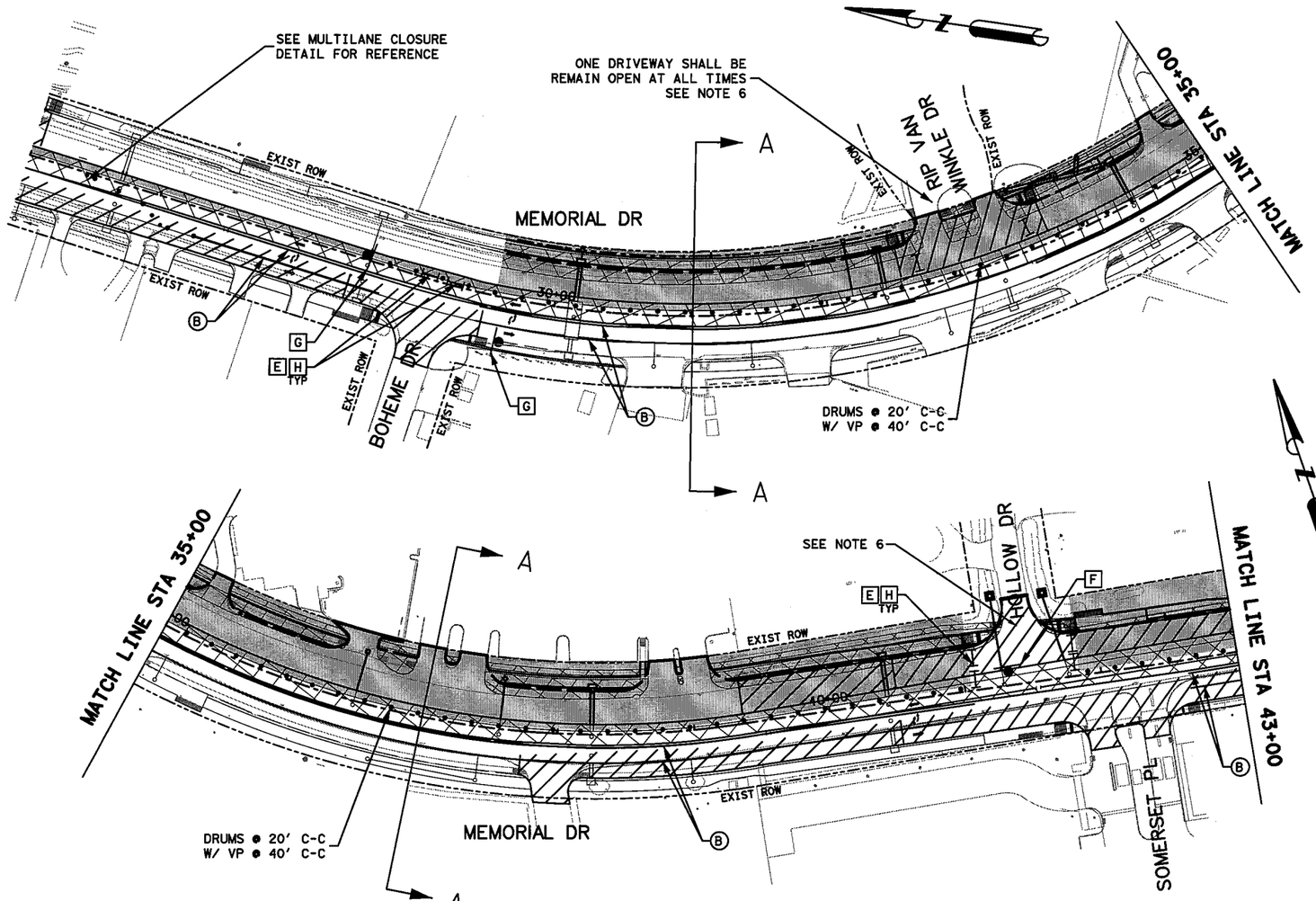
								
CW21-4D	G20-2	CW20-5D	CW20-5DL	R5-1	R1-1	R3-9b	TYPE III (B) BARRICADE	EW6-3



TYPICAL TRAFFIC CONTROL SECTION
SECTION A-A
N.T.S.

LEGEND

- WORK ZONE
- TEMP PAVEMENT
- EXIST DIRECTION OF TRAFFIC
- PROP DIRECTION OF TRAFFIC
- BARRELS OR DRUMS
- SIGN
- TYPE III BARRICADE W/ ROAD CLOSED SIGN (R11-2)
- LOW PROFILE CONCRETE BARRIER
- (A) WK ZN PAV MRK REMOV(TRAF BTN) TY W
- (B) WK ZN PAV MRK REMOV(TRAF BTN) TY Y
- (C) WK ZN PAV MRK REMOV(W) (ARROW)
- (D) WK ZN PAV MRK REMOV(W) (WORD)

NOTES:

1. PRIOR TO CONSTRUCTION ACROSS DRIVEWAY COORDINATE WITH CM. CONTRACTOR TO MAINTAIN ACCESS TO RESIDENTS AND BUSINESSESS AT ALL TIMES.
2. MAINTAIN MINIMUM 11-FEET LANE WIDTH IN EACH DIRECTION AT ALL TIMES.
3. REFER TO TCP STANDARD DETAILS FOR MORE INFORMATION.
4. MAINTAIN DRAINAGE AT ALL TIMES.
5. PROVIDE LPCTB WHILE STORM SEWER LEADS ARE BEING CONSTRUCTED.
6. SEE CITY INTERSECTION PHASING FOR RECONSTRUCTION OF PAVEMENT ACROSS SIDE STREETS.
7. MAINTAIN ACCESS TO BUS STOPS AT ALL TIMES.

0 200 400
(IN FEET)
SCALE: PLAN 1":200'

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

Lockwood, Andrews & Newnam, Inc. A LEO A DALY COMPANY — FIRM REGISTATION NO. 2614

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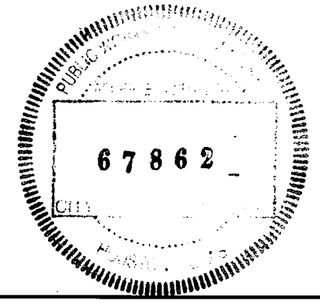
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

TRAFFIC CONTROL PLAN PHASE 3 STEP 3

SHEET 1 OF 2

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CSK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CSK DWG:	HOU	HARRIS	0912	72	391	50



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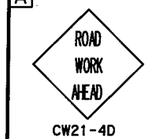
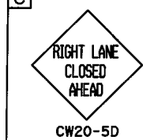
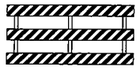
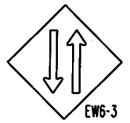
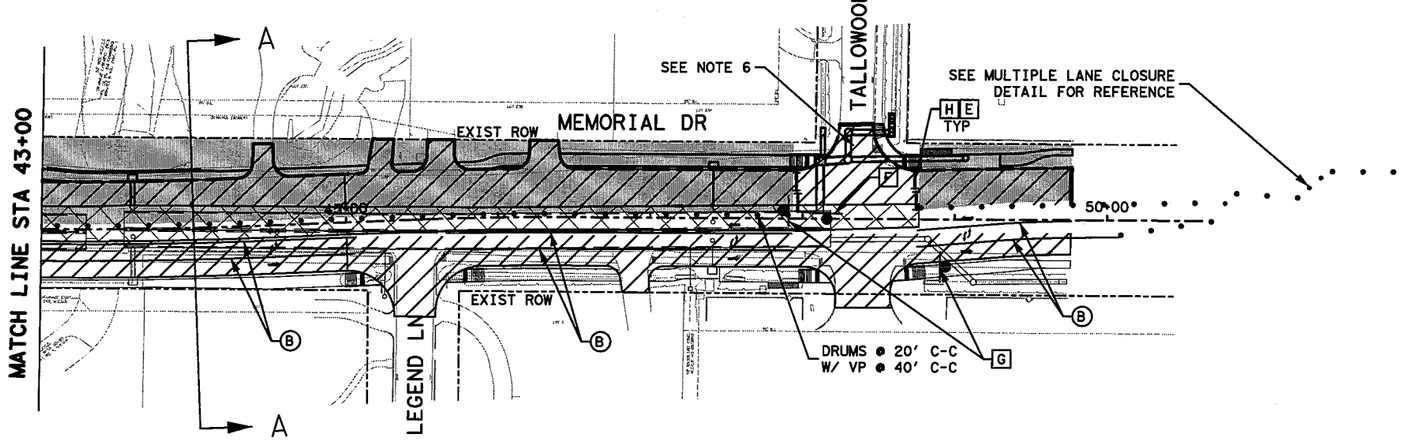
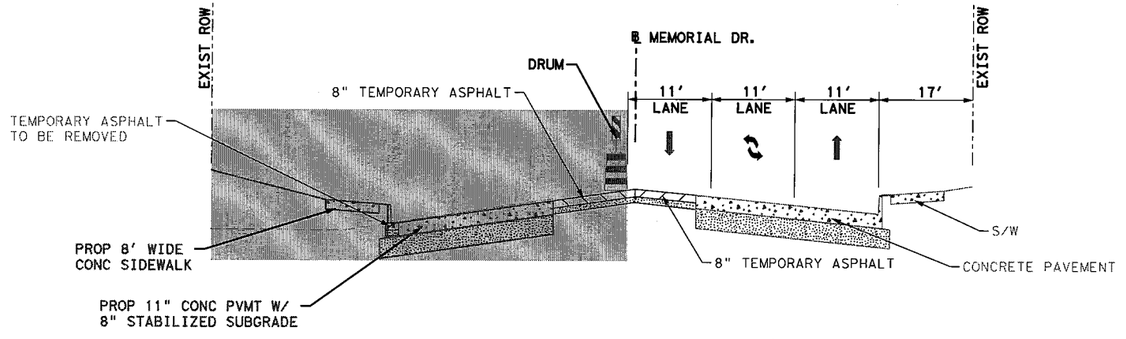
								
CW21-4D	G20-2	CW20-5D	CW20-5DL	R5-1	R1-1	R3-9b	TYPE III (B) BARRICADE	EW6-3





TYPICAL TRAFFIC CONTROL SECTION
SECTION A-A
N. T. S.

LEGEND

- WORK ZONE
- TEMP PAVEMENT
- EXIST DIRECTION OF TRAFFIC
- PROP DIRECTION OF TRAFFIC
- BARRELS OR DRUMS
- SIGN
- TYPE III BARRICADE W/ ROAD CLOSED SIGN (R11-2)
- LOW PROFILE CONCRETE BARRIER
- (A) WK ZN PAV MRK REMOV(TRAF BTN) TY W
- (B) WK ZN PAV MRK REMOV(TRAF BTN) TY Y
- (C) WK ZN PAV MRK REMOV(W) (ARROW)
- (D) WK ZN PAV MRK REMOV(W) (WORD)

NOTES:

1. PRIOR TO CONSTRUCTION ACROSS DRIVEWAY COORDINATE WITH CM, CONTRACTOR TO MAINTAIN ACCESS TO RESIDENTS AND BUSINESSESS AT ALL TIMES.
2. MAINTAIN MINIMUM 11-FEET LANE WIDTH IN EACH DIRECTION AT ALL TIMES.
3. REFER TO TCP STANDARD DETAILS FOR MORE INFORMATION.
4. MAINTAIN DRAINAGE AT ALL TIMES.
5. PROVIDE LPCTB WHILE STORM SEWER LEADS ARE BEING CONSTRUCTED.
6. SEE CITY INTERSECTION PHASING FOR RECONSTRUCTION OF PAVEMENT ACROSS SIDE STREETS.
7. MAINTAIN ACCESS TO BUS STOPS AT ALL TIMES.

0 200 400
(IN FEET)
SCALE: PLAN 1": 200'

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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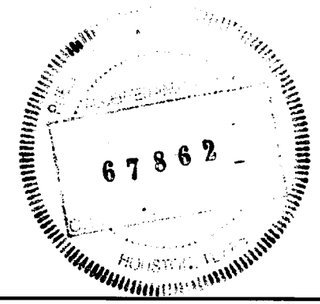
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

TRAFFIC CONTROL PLAN PHASE 3 STEP 3

SHEET 2 OF 2

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	51



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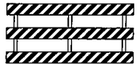
A	B	C	D	E	F	G	H	I	J	K
										
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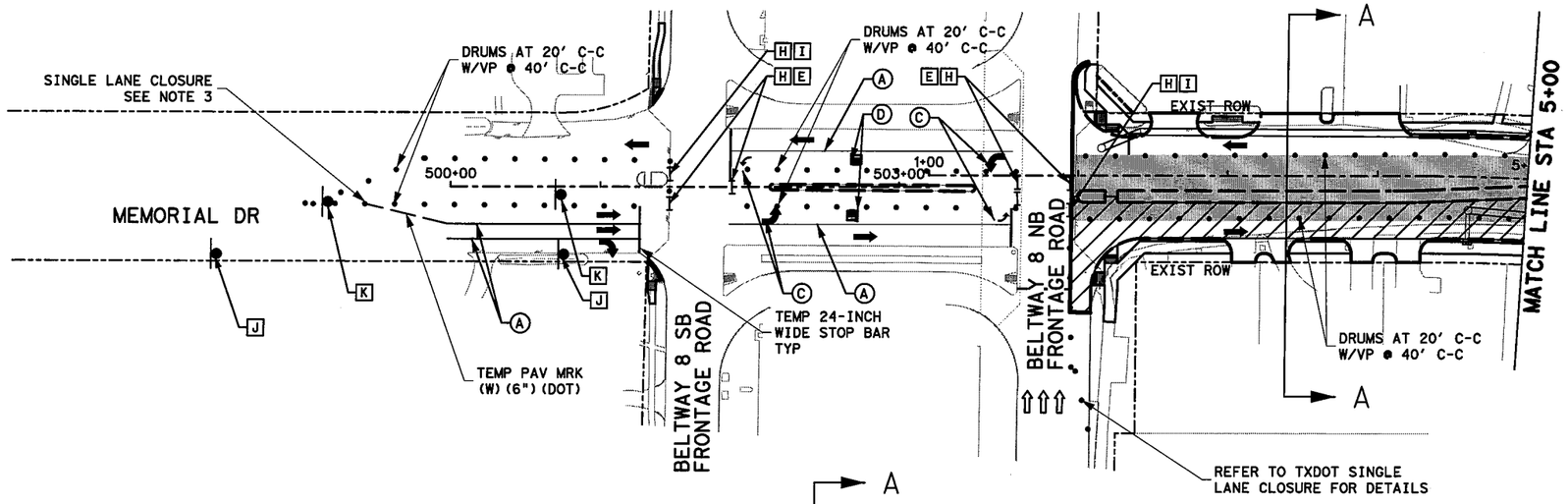

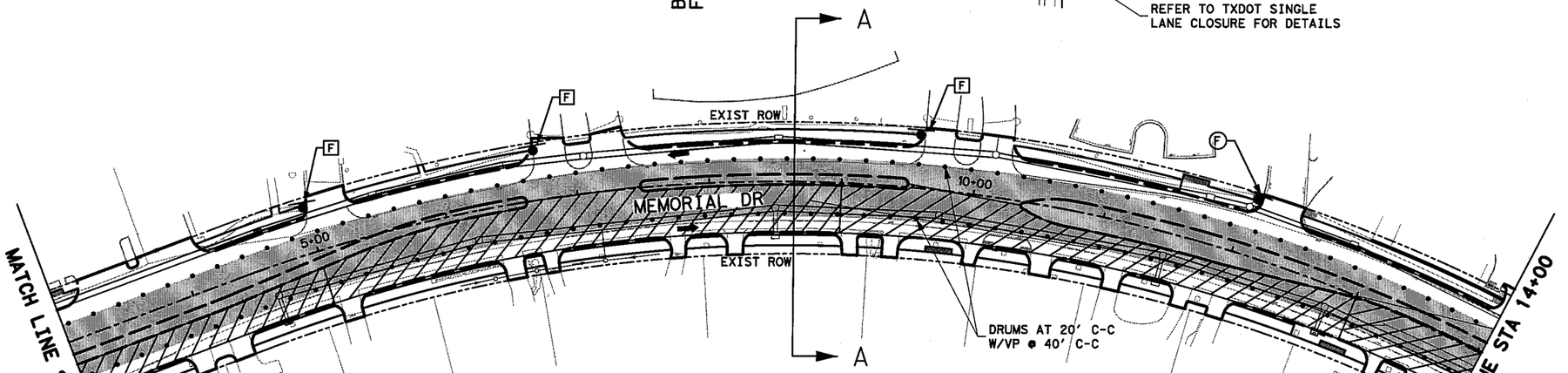

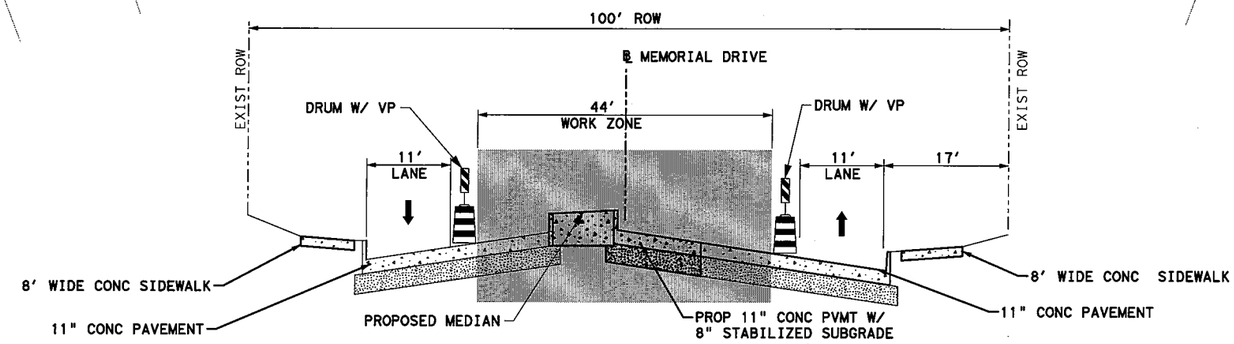

TYPICAL TRAFFIC CONTROL SECTION
SECTION A-A
(SEE NOTE 3)
N. T. S.

LEGEND

- WORK ZONE
- TEMP PAVEMENT
- EXIST DIRECTION OF TRAFFIC
- PROP DIRECTION OF TRAFFIC
- BARRELS OR DRUMS
- SIGN
- TYPE III BARRICADE W/ ROAD CLOSED SIGN (R11-2)
- LOW PROFILE CONCRETE BARRIER
- (A) WK ZN PAV MRK REMOV (TRAF BTN) TY W
- (B) WK ZN PAV MRK REMOV (TRAF BTN) TY Y
- (C) WK ZN PAV MRK REMOV (W) (ARROW)
- (D) WK ZN PAV MRK REMOV (W) (WORD)

NOTES:

1. PRIOR TO CONSTRUCTION ACROSS DRIVEWAY COORDINATE WITH CM. CONTRACTOR TO MAINTAIN ACCESS TO RESIDENTS AND BUSINESSES AT ALL TIMES.
2. MAINTAIN MINIMUM 11-FEET LANE WIDTH IN EACH DIRECTION AT ALL TIMES.
3. REFER TO TCP STANDARD DETAILS FOR MORE INFORMATION.
4. PROP SB TRAFFIC SIGNAL POLES TO BE CONSTRUCTED IN THIS PHASE. REFER TO TRAFFIC SIGNAL PLANS FOR ADDITIONAL INFORMATION.

0 200 400
(IN FEET)
SCALE: PLAN 1":200'

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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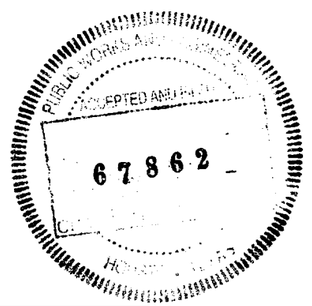
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

TRAFFIC CONTROL PLAN PHASE 4 STEP 1

SHEET 1 OF 2



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CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	52

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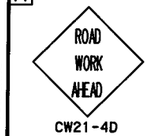
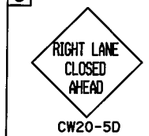
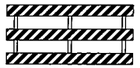
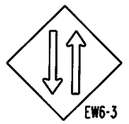
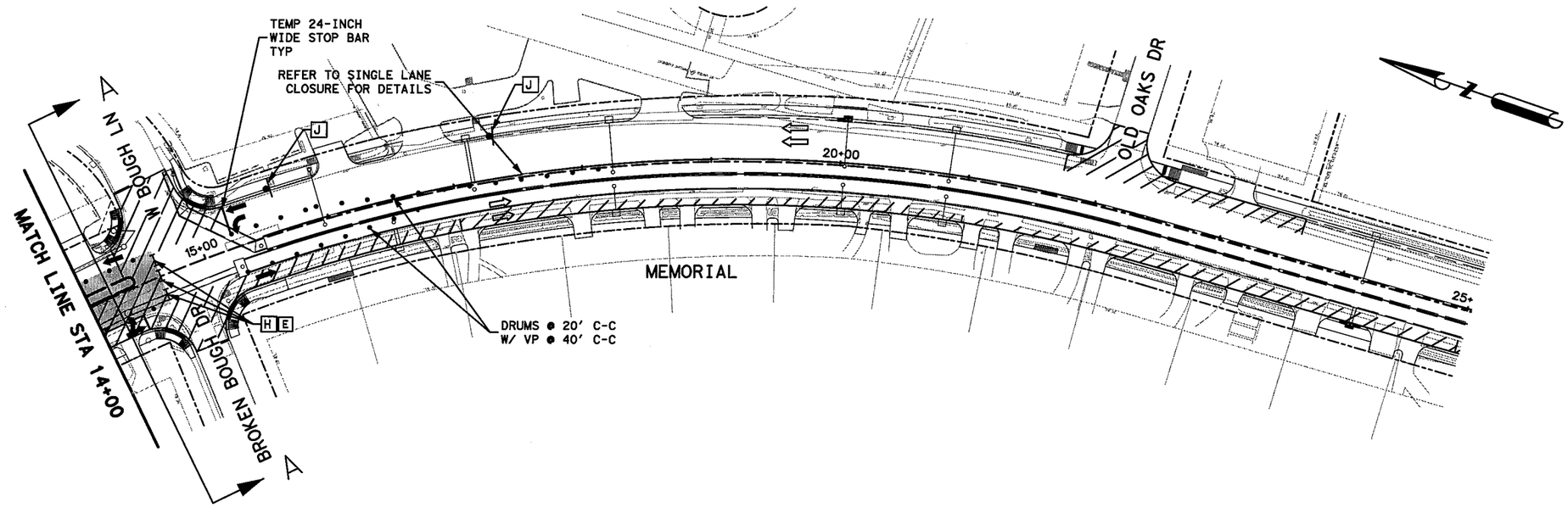
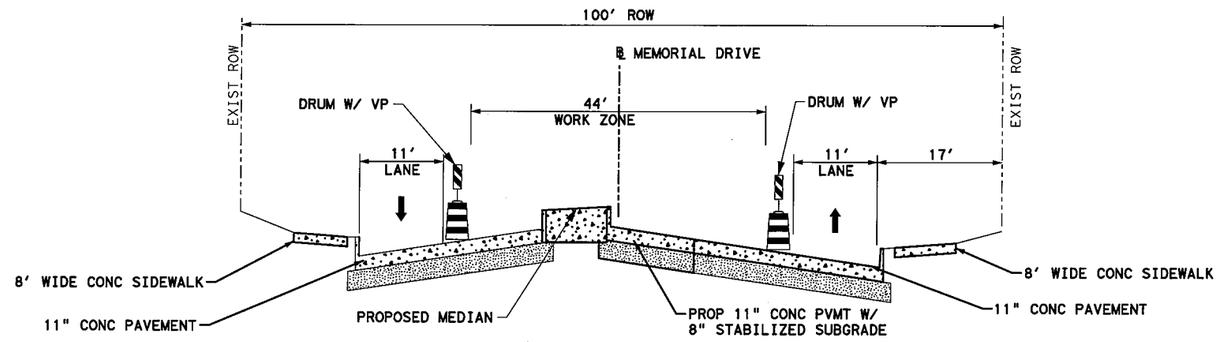
AAGakhar

A	B	C	D	E	F	G	H	I	J
									
CW21-4D	G20-2	CW20-5D	CW20-5DL	R5-1	R1-1	R3-9b	TYPE III (B) BARRICADE W/R11-2	EW6-3	





TYPICAL TRAFFIC CONTROL SECTION
SECTION A-A
N.T.S.

LEGEND

- WORK ZONE
- TEMP PAVEMENT
- EXIST DIRECTION OF TRAFFIC
- PROP DIRECTION OF TRAFFIC
- BARRELS OR DRUMS
- SIGN
- TYPE III BARRICADE W/ ROAD CLOSED SIGN (R11-2)
- LOW PROFILE CONCRETE BARRIER
- (A) WK ZN PAV MRK REMOV(TRAF BTN) TY W
- (B) WK ZN PAV MRK REMOV(TRAF BTN) TY Y
- (C) WK ZN PAV MRK REMOV(W) (ARROW)
- (D) WK ZN PAV MRK REMOV(W) (WORD)

NOTES:

1. PRIOR TO CONSTRUCTION ACROSS DRIVEWAY COORDINATE WITH CM. CONTRACTOR TO MAINTAIN ACCESS TO RESIDENTS AND BUSINESSESS AT ALL TIMES.
2. MAINTAIN MINIMUM 11-FEET LANE WIDTH IN EACH DIRECTION AT ALL TIMES.
3. REFER TO TCP STANDARD DETAILS FOR MORE INFORMATION.
4. REFER TO BROKEN BOUGH INTERSECTION SHEETS FOR MORE INFORMATION.

0 200 400
(IN FEET)
SCALE: PLAN 1":200'

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED
PROFESSIONAL ENGINEER
03/04/2020
Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

Lockwood, Andrews & Newnam, Inc.
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FIRM REGISTATION NO. 2614

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

TRAFFIC CONTROL PLAN PHASE 4 STEP 1

SHEET 2 OF 2

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	53

PUBLIC WORKS AND TRANSPORTATION
ACCEPTED AND FILED
67862
HARRIS COUNTY, TEXAS

AAGakhar
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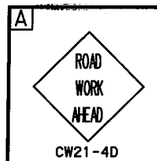
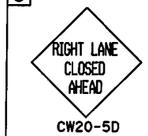
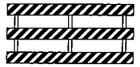
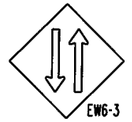
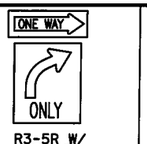
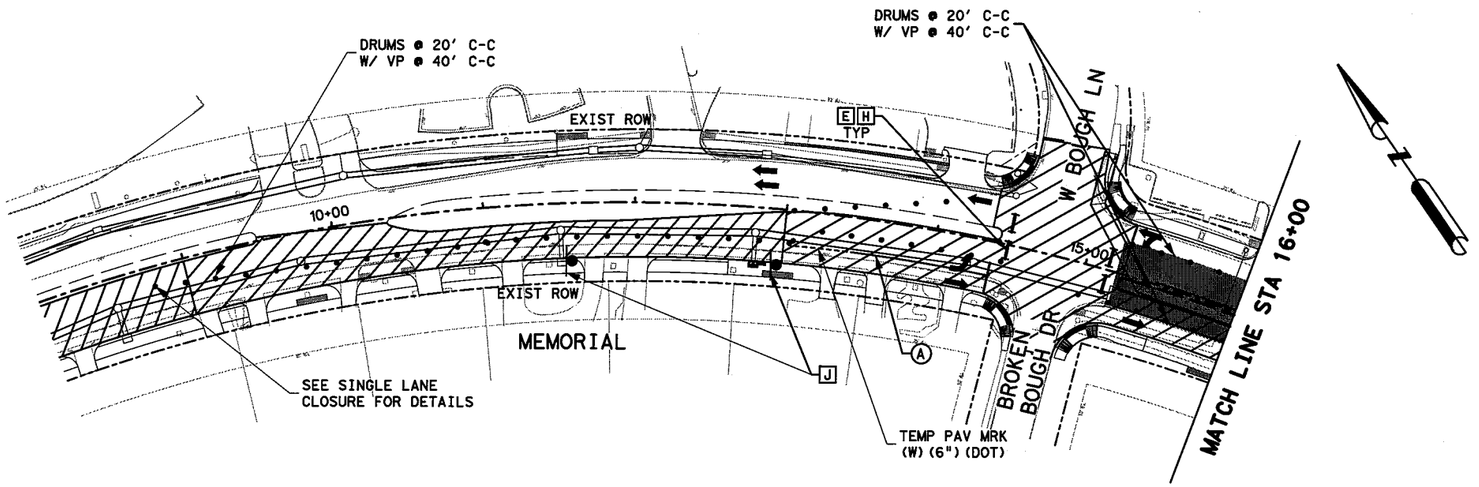
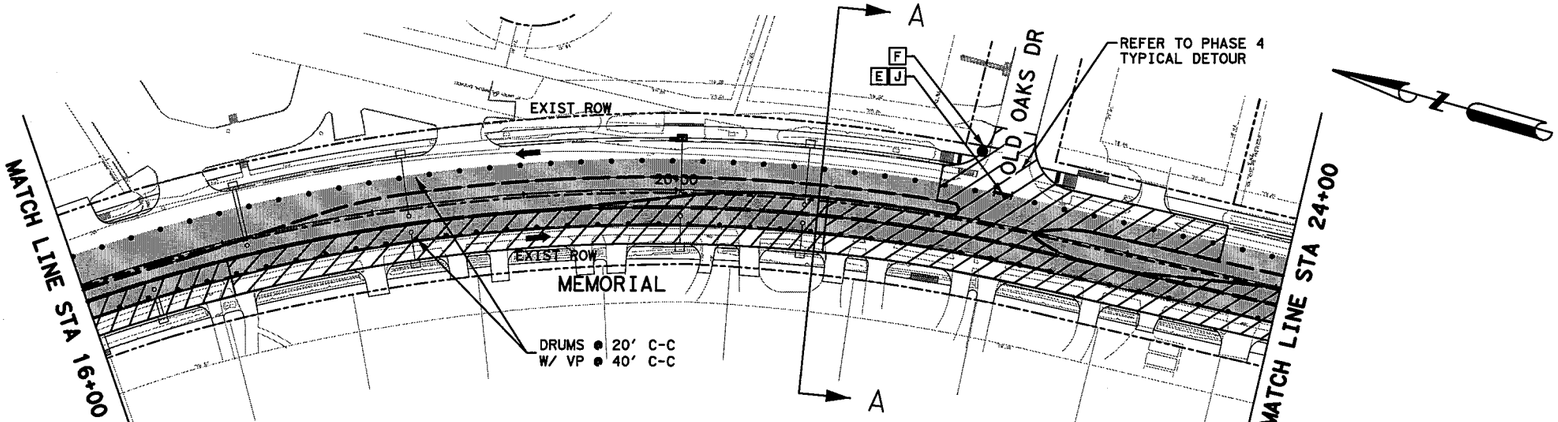
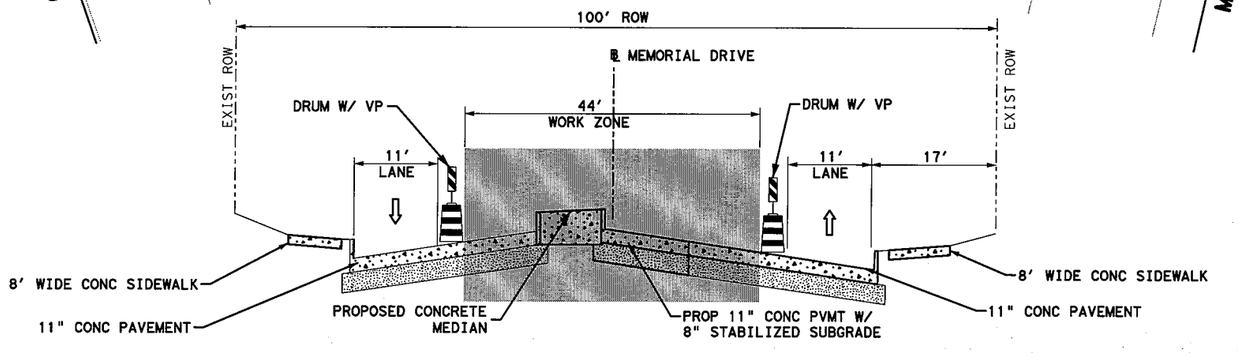
A	B	C	D	E	F	G	H	I	J
									
CW21-4D	G20-2	CW20-5D	CW20-5DL	R5-1	R1-1	R3-9b	TYPE III (B) BARRICADE	EW6-3	R3-5R W/ R6-1R







TYPICAL TRAFFIC CONTROL SECTION
SECTION A-A
(SEE NOTE 3)
N.T.S.

LEGEND

- WORK ZONE
- TEMP PAVEMENT
- EXIST DIRECTION OF TRAFFIC
- PROP DIRECTION OF TRAFFIC
- BARRELS OR DRUMS
- SIGN
- TYPE III BARRICADE W/ ROAD CLOSED SIGN (R11-2)
- LOW PROFILE CONCRETE BARRIER
- (A) WK ZN PAV MRK REMOV(TRAF BTN) TY W
- (B) WK ZN PAV MRK REMOV(TRAF BTN) TY Y
- (C) WK ZN PAV MRK REMOV(W) (ARROW)
- (D) WK ZN PAV MRK REMOV(W) (WORD)

NOTES:

1. PRIOR TO CONSTRUCTION ACROSS DRIVEWAY COORDINATE WITH CM. CONTRACTOR TO MAINTAIN ACCESS TO RESIDENTS AND BUSINESSESS AT ALL TIMES.
2. MAINTAIN MINIMUM 11-FEET LANE WIDTH IN EACH DIRECTION AT ALL TIMES.
3. REFER TO TCP STANDARD DETAILS FOR MORE INFORMATION.

0 200 400
(IN FEET)
SCALE: PLAN 1": 200'

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED
PROFESSIONAL ENGINEER
03/04/2020
Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

TRAFFIC CONTROL PLAN
PHASE 4 STEP 2

SHEET 1 OF 2

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	54

PUBLIC WORKS AND TRANSPORTATION
ACCEPTED AND FILED
67862
HOUSTON, TEXAS

AAGakhar
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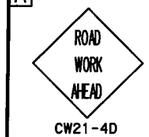
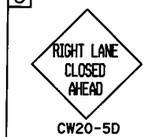
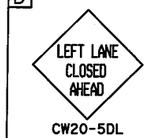
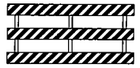
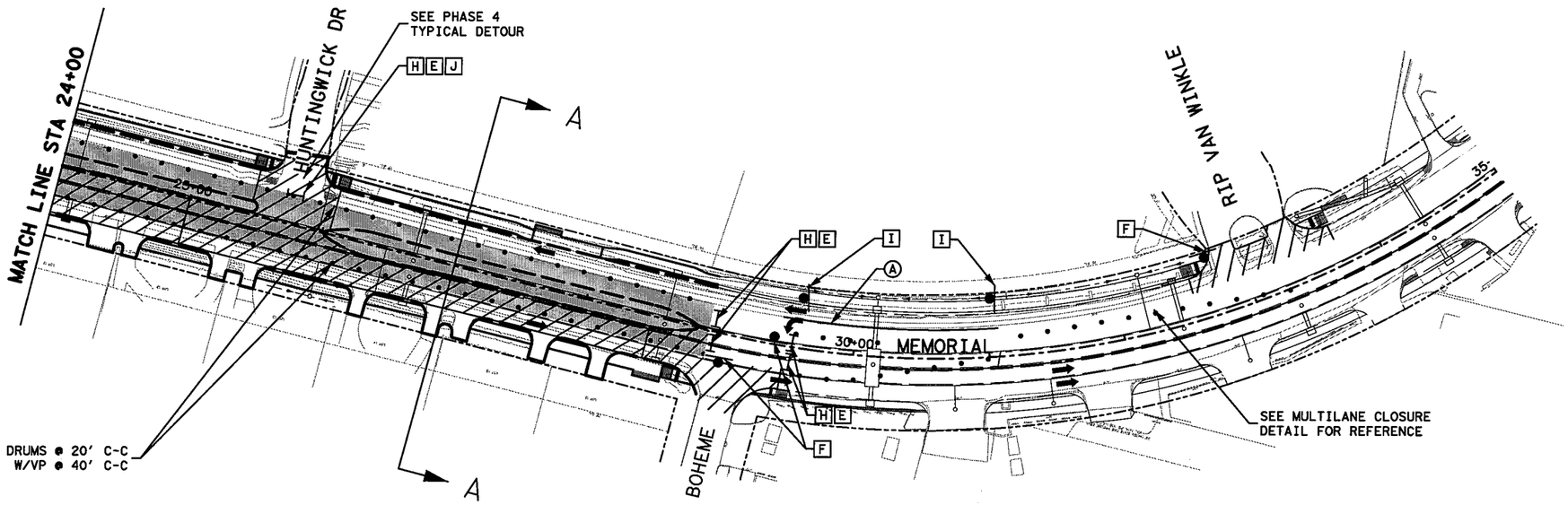
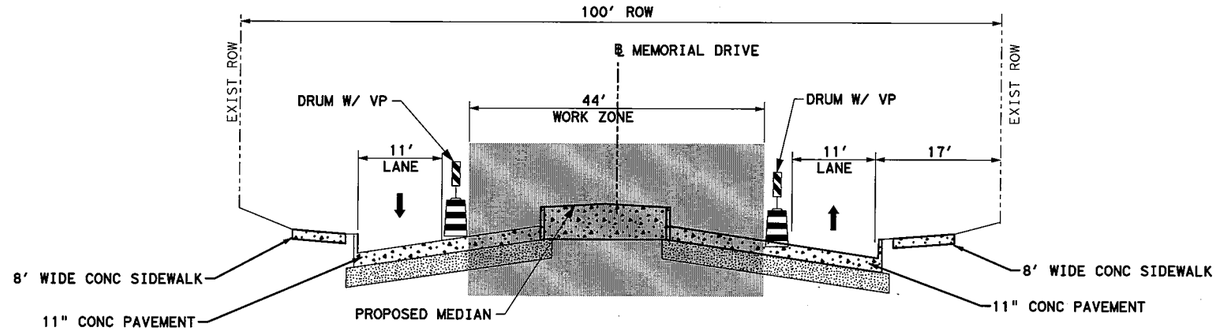
A	B	C	D	E	F	G	H	I	J
									
CW21-4D	G20-2	CW20-5D	CW20-5DL	R5-1	R1-1	R3-9b	TYPE III (B) BARRICADE	R3-7L	R3-5R W/ R6-1R





TYPICAL TRAFFIC CONTROL SECTION
SECTION A-A
(SEE NOTE 3)
N. T. S.

LEGEND

- WORK ZONE
- TEMP PAVEMENT
- EXIST DIRECTION OF TRAFFIC
- PROP DIRECTION OF TRAFFIC
- BARRELS OR DRUMS
- SIGN
- TYPE III BARRICADE W/ ROAD CLOSED SIGN (R11-2)
- LOW PROFILE CONCRETE BARRIER
- (A) WK ZN PAV MRK REMOV(TRAF BTN) TY W
- (B) WK ZN PAV MRK REMOV(TRAF BTN) TY Y
- (C) WK ZN PAV MRK REMOV(W) (ARROW)
- (D) WK ZN PAV MRK REMOV(W) (WORD)

NOTES:

1. PRIOR TO CONSTRUCTION ACROSS DRIVEWAY COORDINATE WITH CM. CONTRACTOR TO MAINTAIN ACCESS TO RESIDENTS AND BUSINESSESS AT ALL TIMES.
2. MAINTAIN MINIMUM 11-FEET LANE WIDTH IN EACH DIRECTION AT ALL TIMES.
3. REFER TO TCP STANDARD DETAILS FOR MORE INFORMATION.

0 200 400
(IN FEET)
SCALE: PLAN 1":200'

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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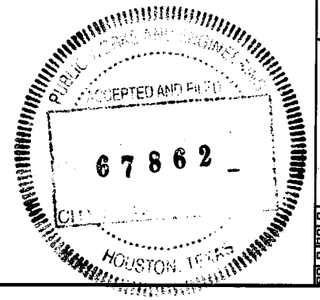
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

TRAFFIC CONTROL PLAN PHASE 4 STEP 2

SHEET 2 OF 2



DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	55

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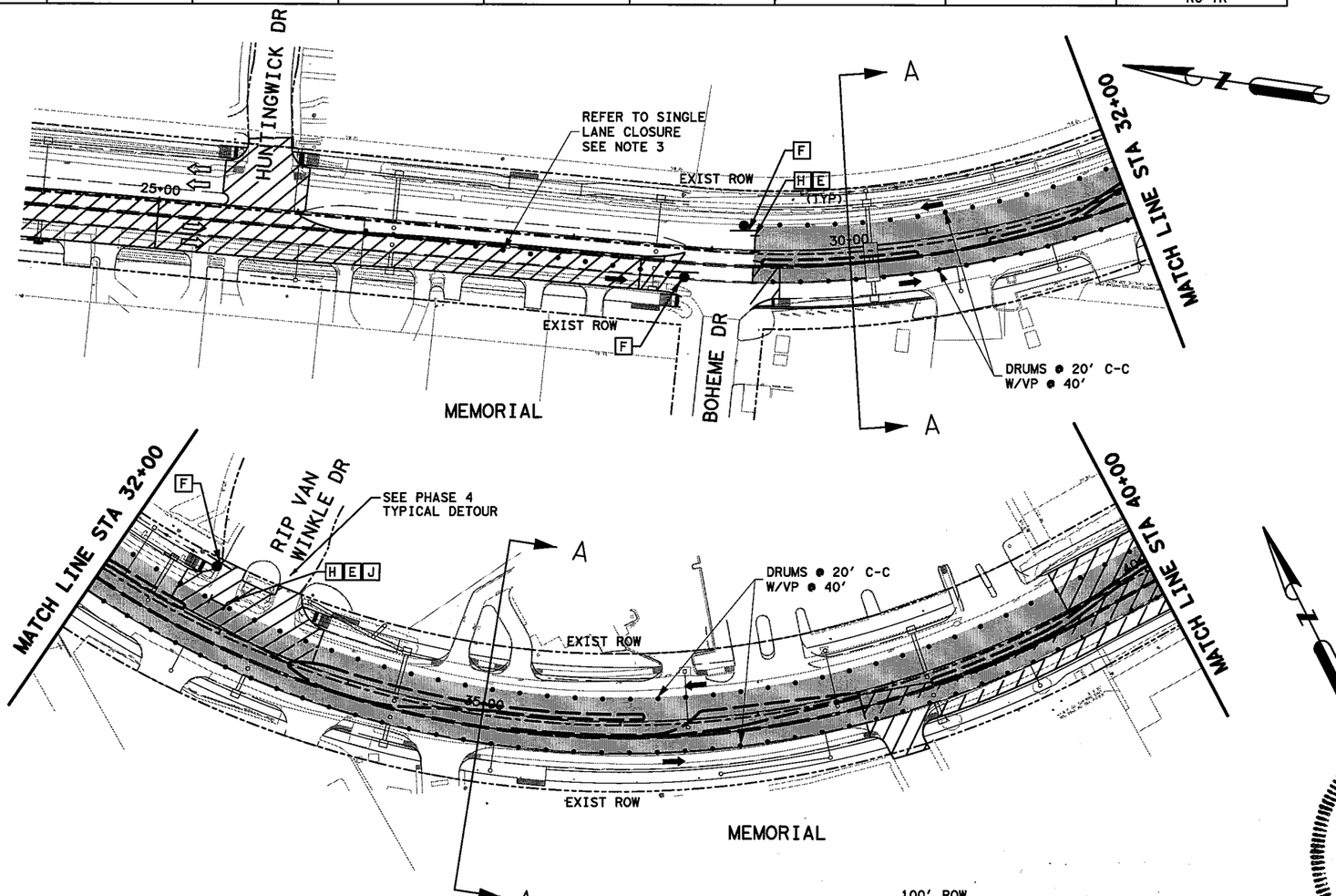
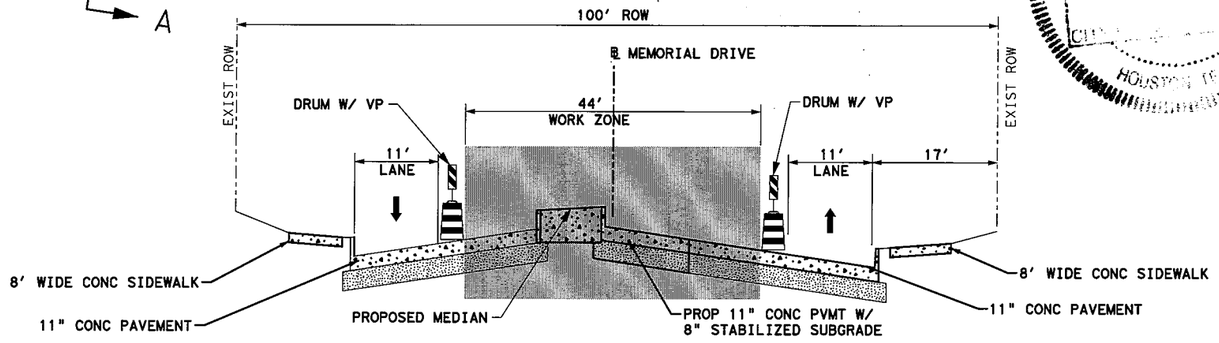
A	B	C	D	E	F	G	H	I	J
ROAD WORK AHEAD	END ROAD WORK	RIGHT LANE CLOSED AHEAD	LEFT LANE CLOSED AHEAD	DO NOT ENTER	STOP	CENTER LANE ONLY			ONE WAY ONLY
CW21-4D	G20-2	CW20-5D	CW20-5DL	R5-1	R1-1	R3-9b	TYPE III (B) BARRICADE	EW6-3	R3-5R W/ R6-1R





TYPICAL TRAFFIC CONTROL SECTION
SECTION A-A
N.T.S.

LEGEND

- WORK ZONE
- TEMP PAVEMENT
- EXIST DIRECTION OF TRAFFIC
- PROP DIRECTION OF TRAFFIC
- BARRELS OR DRUMS
- SIGN
- TYPE III BARRICADE W/ ROAD CLOSED SIGN (R11-2)
- LOW PROFILE CONCRETE BARRIER
- (A) WK ZN PAV MRK REMOV(TRAF BTN) TY W
- (B) WK ZN PAV MRK REMOV(TRAF BTN) TY Y
- (C) WK ZN PAV MRK REMOV(W) (ARROW)
- (D) WK ZN PAV MRK REMOV(W) (WORD)

NOTES:

1. PRIOR TO CONSTRUCTION ACROSS DRIVEWAY COORDINATE WITH CM. CONTRACTOR TO MAINTAIN ACCESS TO RESIDENTS AND BUSINESSESS AT ALL TIMES.
2. MAINTAIN MINIMUM 11-FEET LANE WIDTH IN EACH DIRECTION AT ALL TIMES.
3. REFER TO TCP STANDARED DETAILS FOR MORE INFORMATION.

0 200 400
(IN FEET)
SCALE: PLAN 1":200'

ACCEPTED AND FILED
PUBLIC UTILITY COMMISSION OF TEXAS
67862
HOUSTON, TEXAS

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED PROFESSIONAL ENGINEER
03/04/2020
Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

TRAFFIC CONTROL PLAN PHASE 4 STEP 3

SHEET 1 OF 2

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	56

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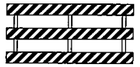
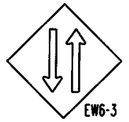
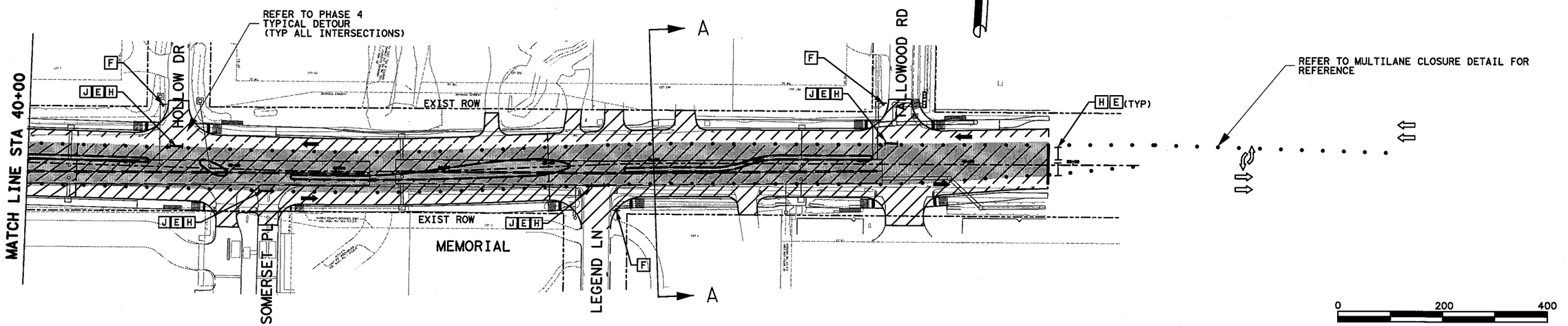
A	B	C	D	E	F	G	H	I	J
									
CW21-4D	G20-2	CW20-5D	CW20-5DL	R5-1	R1-1	R3-9b	TYPE III (B) BARRICADE	EW6-3	R3-5R W/ R6-1R

LEGEND

- WORK ZONE
- TEMP PAVEMENT
- EXIST DIRECTION OF TRAFFIC
- PROP DIRECTION OF TRAFFIC
- BARRELS OR DRUMS
- SIGN
- TYPE III BARRICADE W/ ROAD CLOSED SIGN (R11-2)
- LOW PROFILE CONCRETE BARRIER
- (A) WK ZN PAV MRK REMOV(TRAF BTN) TY W
- (B) WK ZN PAV MRK REMOV(TRAF BTN) TY Y
- (C) WK ZN PAV MRK REMOV(W) (ARROW)
- (D) WK ZN PAV MRK REMOV(W) (WORD)

NOTES:

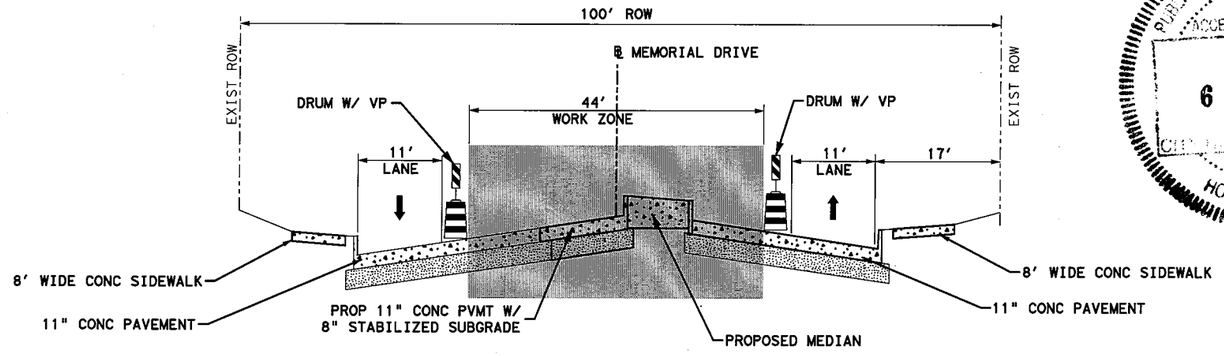
1. PRIOR TO CONSTRUCTION ACROSS DRIVEWAY COORDINATE WITH CM. CONTRACTOR TO MAINTAIN ACCESS TO RESIDENTS AND BUSINESSESS AT ALL TIMES.
2. MAINTAIN MINIMUM 11-FEET LANE WIDTH IN EACH DIRECTION AT ALL TIMES.
3. REFER TO TCP STANDARED DETAILS FOR MORE INFORMATION.



0 200 400

(IN FEET)

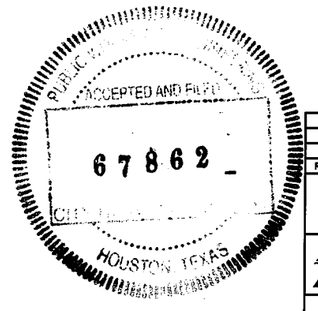
SCALE: PLAN 1": 200'



TYPICAL TRAFFIC CONTROL SECTION

SECTION A-A

N. T. S.



Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

TRAFFIC CONTROL PLAN PHASE 4 STEP 3

SHEET 2 OF 2

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	57

Plotted on: 3/4/2020 2:16:57 PM
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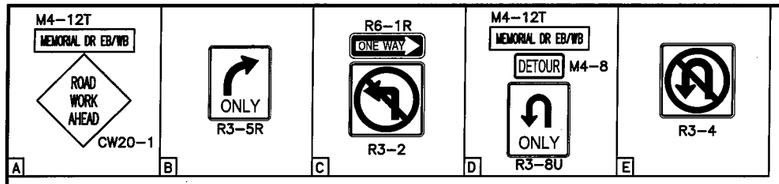
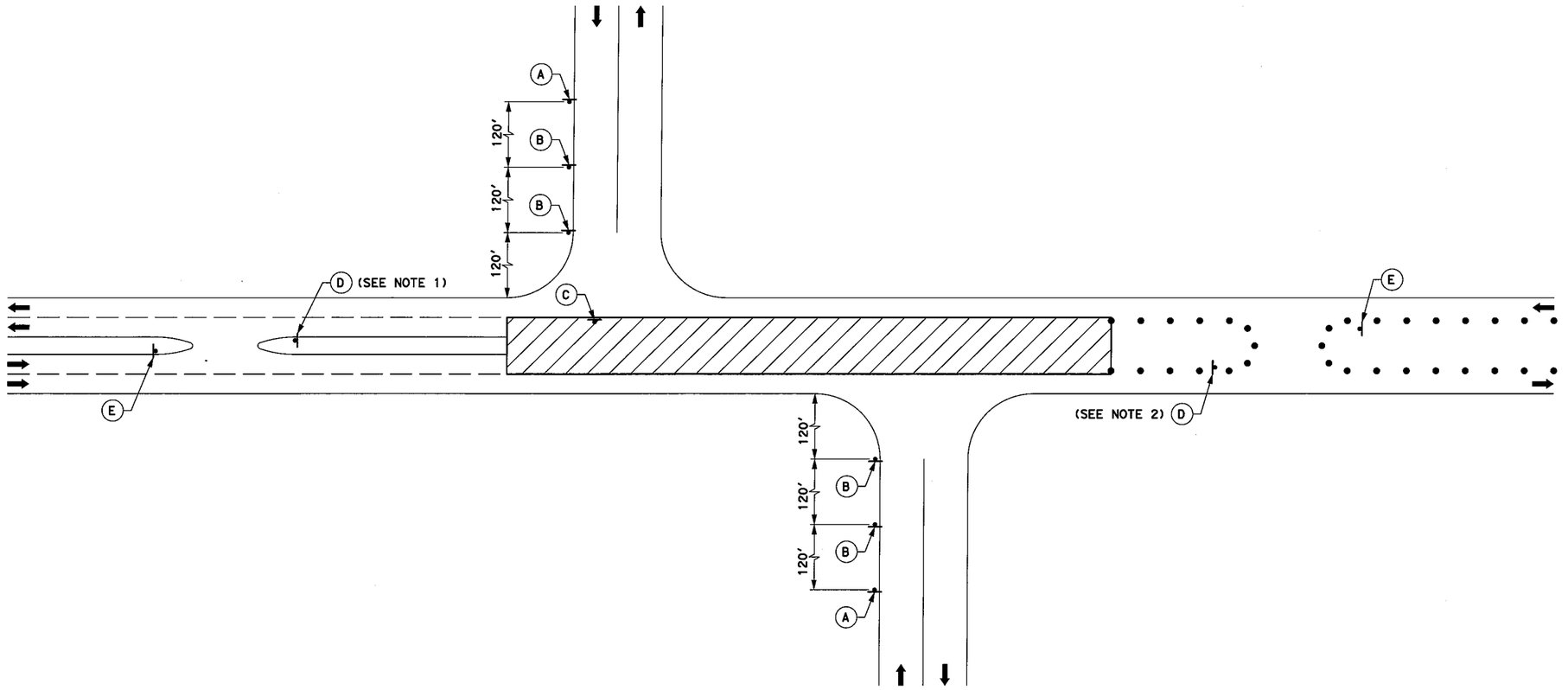


LEGEND

- WORK ZONE
- TEMPORARY GROUND MOUNTED SIGN
- CHANNELIZING DEVICE
- TYPE III BARRICADE W/ ROAD CLOSED SIGN
- DIRECTION OF TRAFFIC
- FLASHING ARROW BOARD

NOTES:

1. DETOUR TRAFFIC TO NEXT MEDIAN OPENING.
2. CONTRACTOR TO PROVIDE TURNAROUND WHERE NO MEDIANS EXIST.



PHASE 4 TYPICAL DETOUR

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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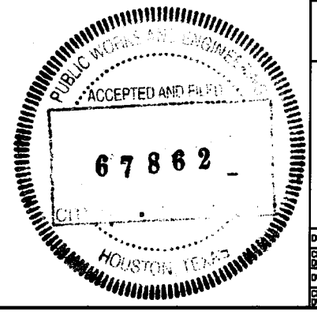
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

TRAFFIC CONTROL PLAN
PHASE 4 TYPICAL DETOUR



DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	58

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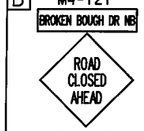
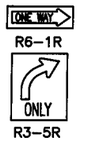
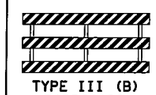
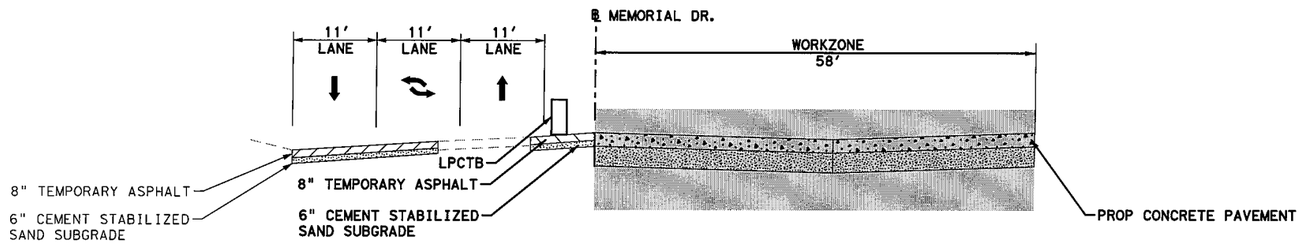
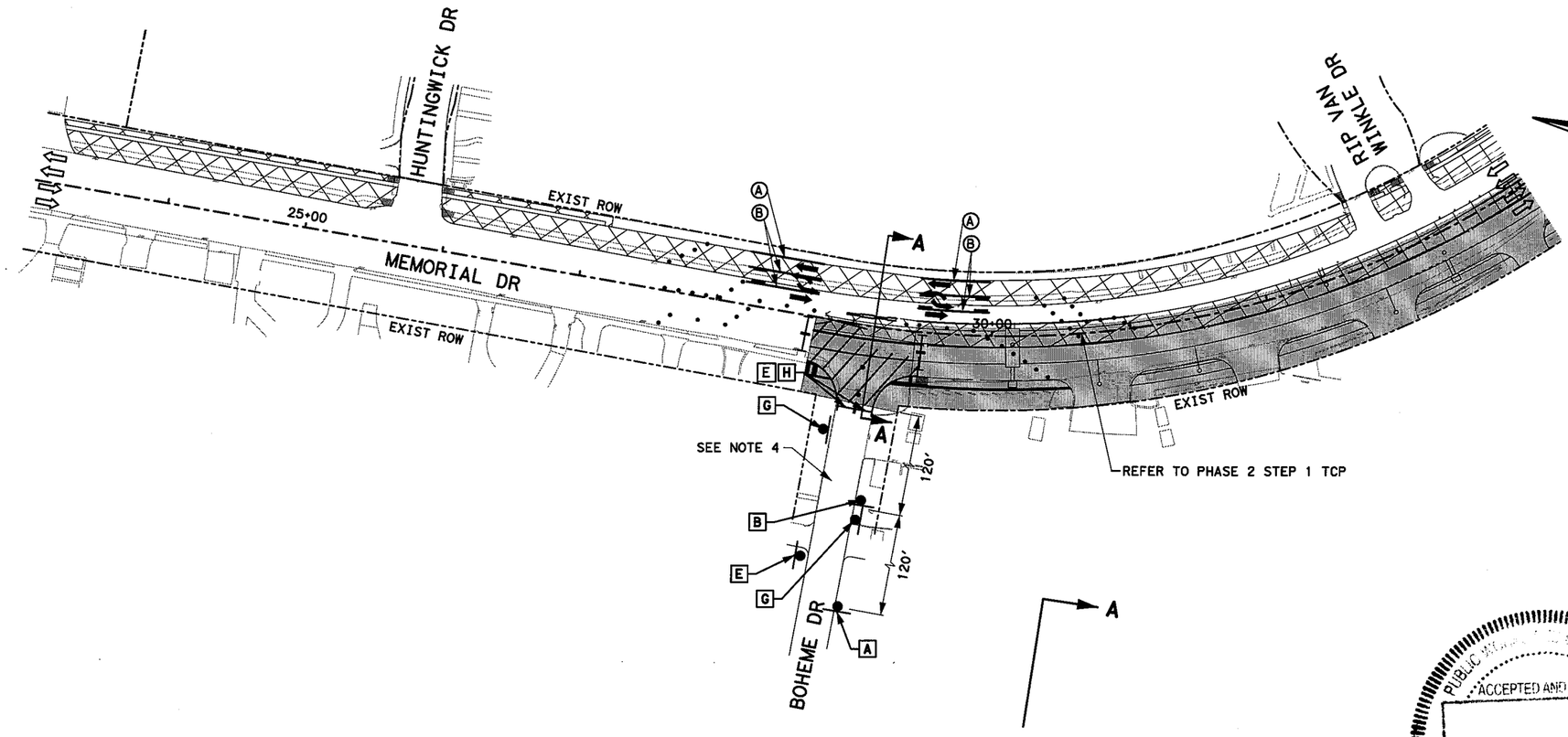
A	B	C	D	E	F	G	H
 CW21-4D	 CW20-3D	 G20-2	 R6-1R R3-2	 R6-1R R3-5R	 R6-1L R3-1	 R6-1L R3-5L	 TYPE III (B) BARRICADE



TYPICAL TRAFFIC CONTROL SECTION
SECTION A-A
(SEE NOTE 3)
N.T.S.



LEGEND

- WORK ZONE
- TEMP PAVEMENT
- EXIST DIRECTION OF TRAFFIC
- PROP DIRECTION OF TRAFFIC
- BARRELS OR DRUMS
- SIGN
- TYPE III BARRICADE W/ ROAD CLOSED SIGN (R11-2)
- LOW PROFILE CONCRETE BARRIER
- (A) WK ZN PAV MRK REMOV(TRAF BTN) TY W
- (B) WK ZN PAV MRK REMOV(TRAF BTN) TY Y
- (C) WK ZN PAV MRK REMOV(W) (ARROW)
- (D) WK ZN PAV MRK REMOV(W) (WORD)

NOTES:

1. PRIOR TO CONSTRUCTION ACROSS DRIVEWAY COORDINATE WITH CM. CONTRACTOR TO MAINTAIN ACCESS TO RESIDENTS AND BUSINESSESS AT ALL TIMES.
2. MAINTAIN MINIMUM 11-FEET LANE WIDTH IN EACH DIRECTION AT ALL TIMES.
3. REFER TO TCP STANDARD DETAILS FOR MORE INFORMATION.
4. SEE BOHEME DETOUR PLAN FOR MORE INFORMATION.
5. INTERSECTION SHALL NOT BE CLOSED LONGER THAN 3 DAYS. PLAN CONSTRUCTION OF RCB'S AND PAVEMENT ACCORDINGLY.

0 200 400
(IN FEET)
SCALE: PLAN 1":200'

03/04/2020
Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

Lockwood, Andrews & Newnam, Inc. A LEO A DALY COMPANY — FIRM REGISTATION NO. 2614

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

TRAFFIC CONTROL PLAN PHASE 2 BOHEME INTERSECTION

SHEET 1 OF 1

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	59

AAGakhar
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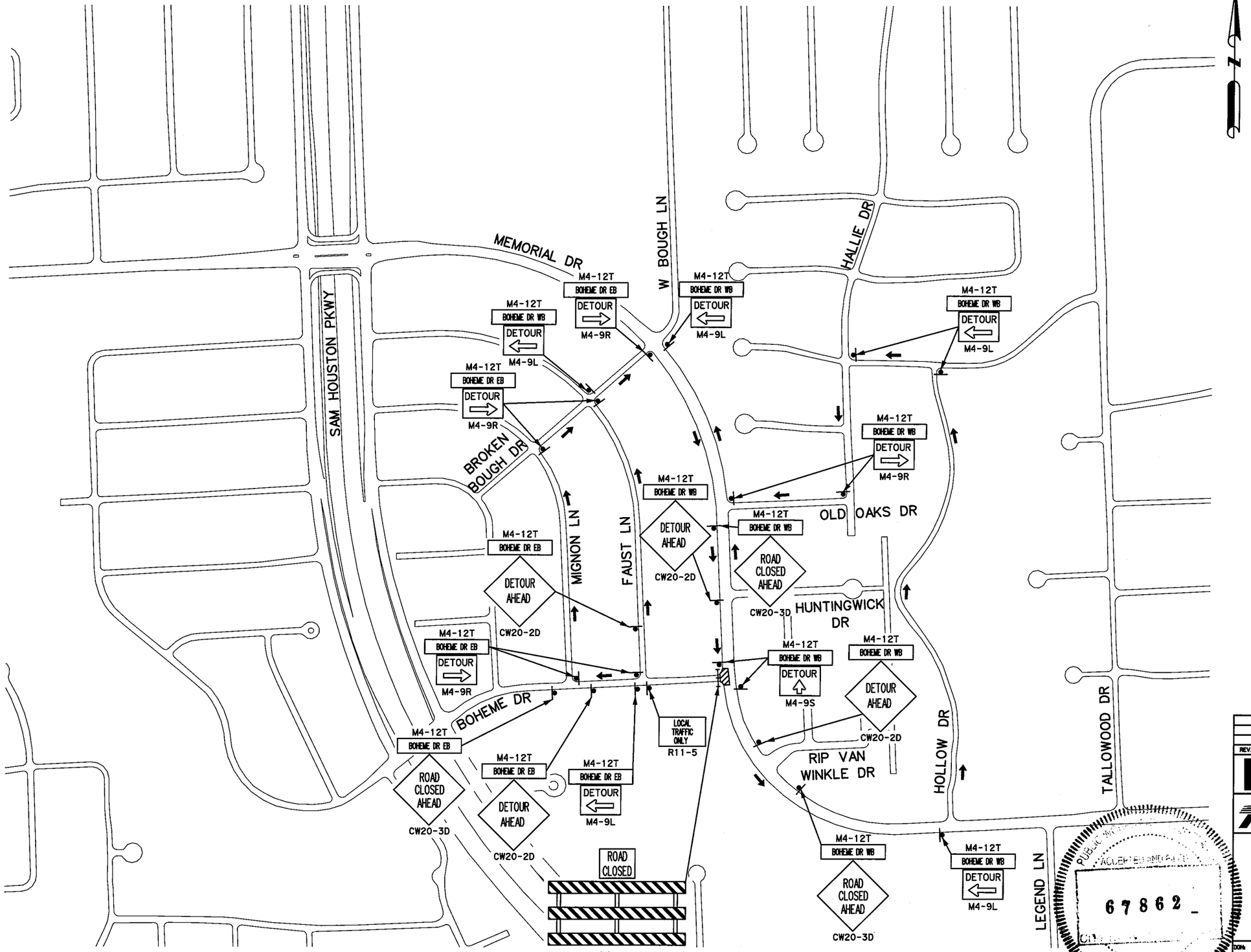

LEGEND

- WORK ZONE
- TRAFFIC FLOW
- SIGN
- TYPE III BARRICADE W/ ROAD CLOSED SIGN (R11-2)

0 400 800

(IN FEET)

SCALE: PLAN 1": 400'

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED
PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

TRAFFIC CONTROL PLAN PHASE 2 BOHEME INTERSECTION DETOUR

SHEET 1 OF 1

ACCEPTED FOR PUBLIC WORKS
67862
HOUSTON, TEXAS

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	60

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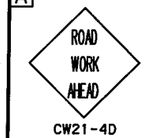
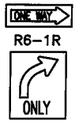
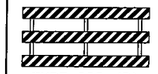
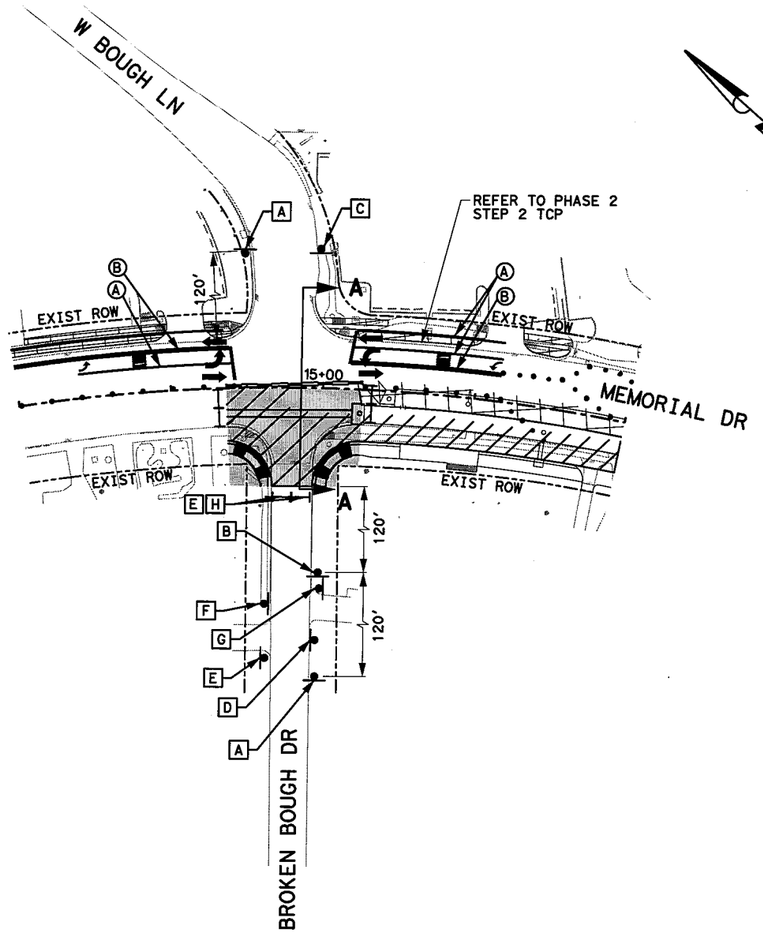
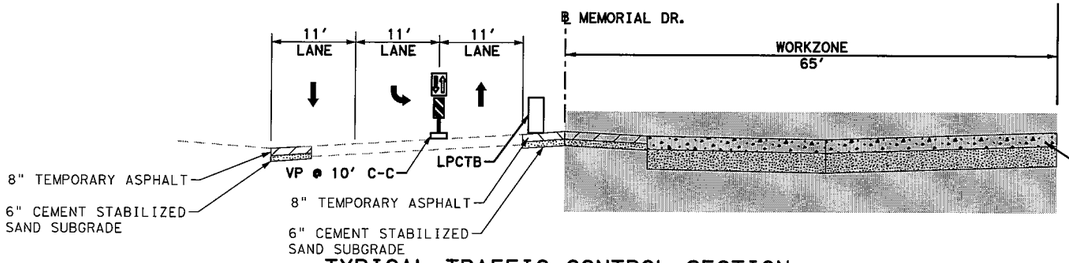
A	B	C	D	E	F	G	H
 CW21-4D	 CW20-3D	 G20-2	 R3-2	 R3-5R	 R3-1	 R3-5L	 TYPE III (B) BARRICADE W/R11-2





TYPICAL TRAFFIC CONTROL SECTION
SECTION A-A
(SEE NOTE 3)
N. T. S.

LEGEND

- WORK ZONE
- TEMP PAVEMENT
- EXIST DIRECTION OF TRAFFIC
- PROP DIRECTION OF TRAFFIC
- BARRELS OR DRUMS
- SIGN
- TYPE III BARRICADE W/ ROAD CLOSED SIGN (R11-2)
- LOW PROFILE CONCRETE BARRIER
- (A) WK ZN PAV MRK REMOV(TRAF BTN) TY W
- (B) WK ZN PAV MRK REMOV(TRAF BTN) TY Y
- (C) WK ZN PAV MRK REMOV(W) (ARROW)
- (D) WK ZN PAV MRK REMOV(W) (WORD)

NOTES:

1. PRIOR TO CONSTRUCTION ACROSS DRIVEWAY COORDINATE WITH CM. CONTRACTOR TO MAINTAIN ACCESS TO RESIDENTS AND BUSINESSESS AT ALL TIMES.
2. MAINTAIN MINIMUM 11-FEET LANE WIDTH IN EACH DIRECTION AT ALL TIMES.
3. REFER TO TCP STANDARD DETAILS FOR MORE INFORMATION.
4. SEE BOHEME DETOUR PLAN FOR MORE INFORMATION.
5. INTERSECTION SHALL NOT BE CLOSED LONGER THAN 3 DAYS. PLAN CONSTRUCTION OF RCB'S AND PAVEMENT ACCORDINGLY.

0 200 400
(IN FEET)
SCALE: PLAN 1": 200'

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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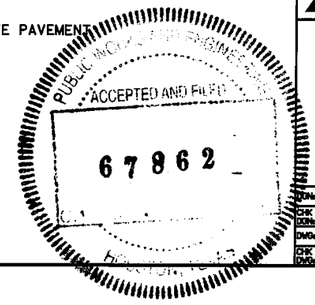
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

TRAFFIC CONTROL PLAN PHASE 2 BROKEN BOUGH INTERSECTION

SHEET 1 OF 1

	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK: JDN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK: DWG:	HOU	HARRIS	0912	72	391	61



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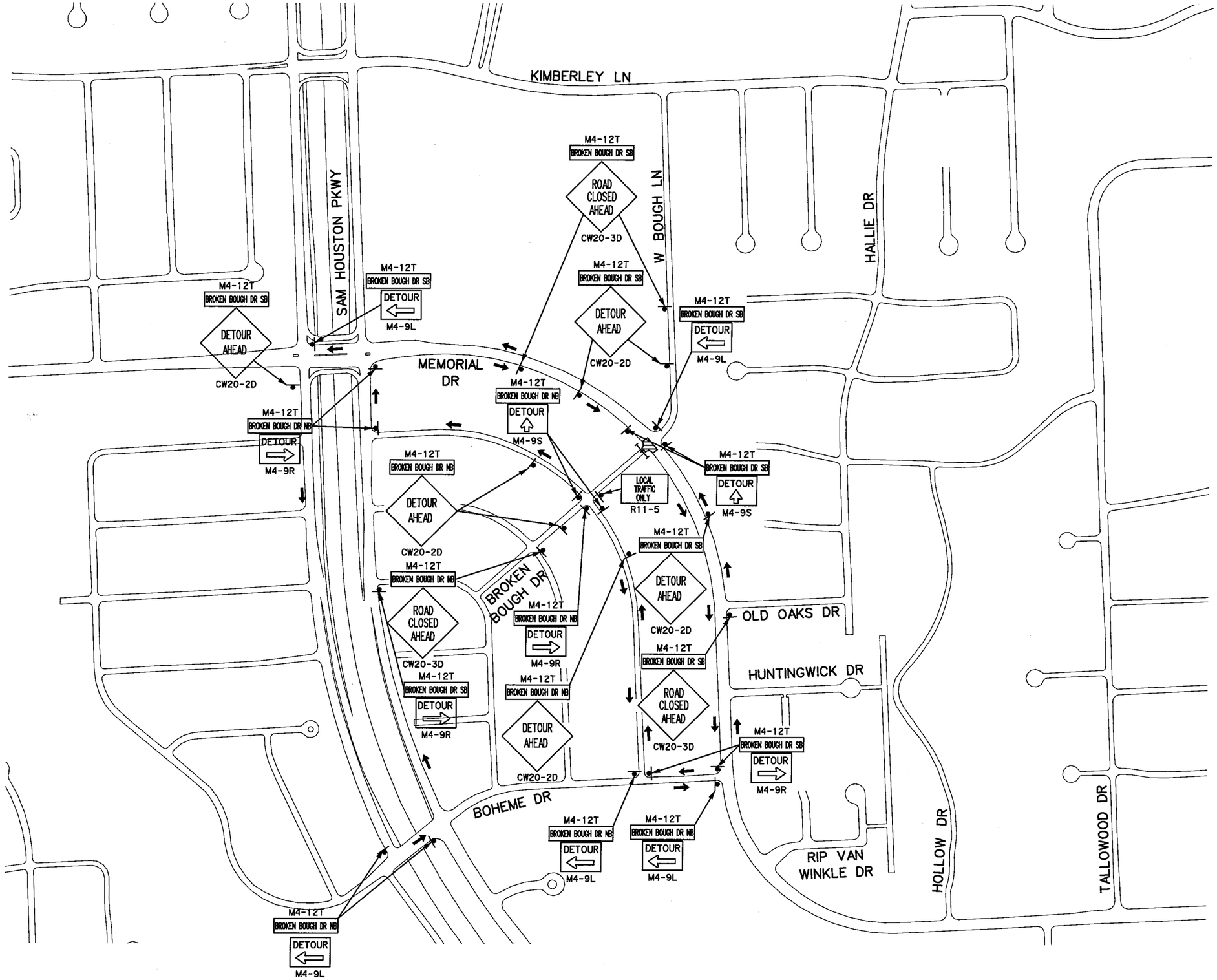

LEGEND

- WORK ZONE
- TRAFFIC FLOW
- SIGN
- TYPE III BARRICADE W/ ROAD CLOSED SIGN (R11-2)

N

PUBLIC WORKS CONSTRUCTION
ACCEPTED AND FILED
67862
CITY OF HOUSTON

0 400 800
(IN FEET)
SCALE: PLAN 1": 400'

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED
PROFESSIONAL ENGINEER
03/04/2020
Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

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FIRM REGISTATION NO. 2614

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

TRAFFIC CONTROL PLAN PHASE 2 BROKEN BOUGH INTERSECTION DETOUR

SHEET 1 OF 1

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	62

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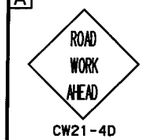
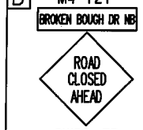
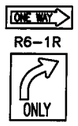
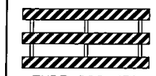
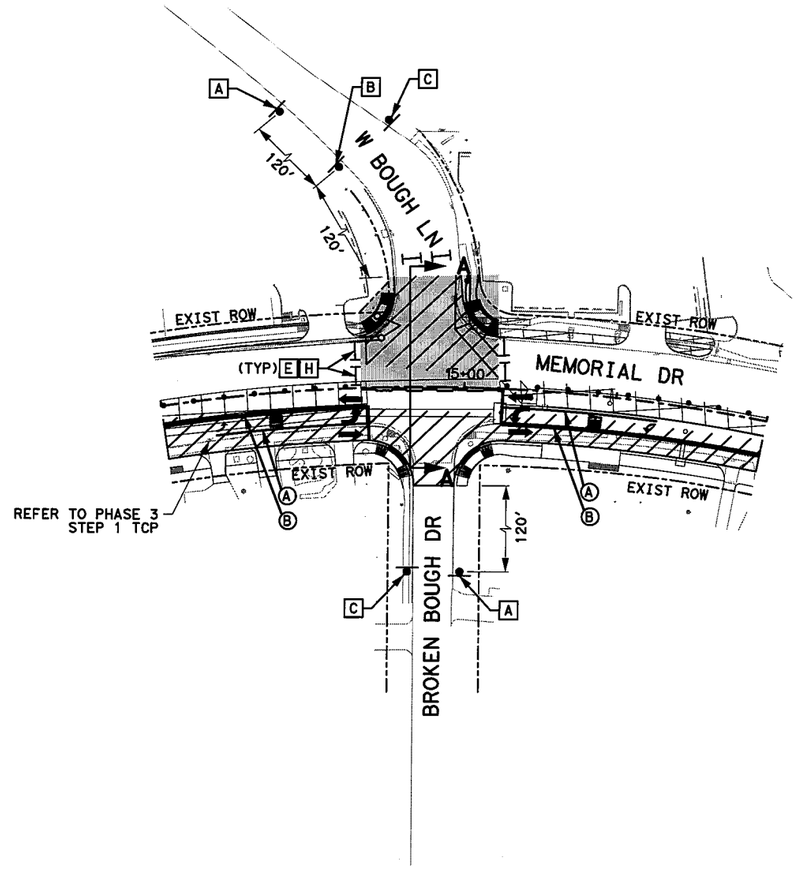
 CW21-4D	 CW20-3D	 G20-2	 R3-2	 R3-5R	 R3-1	 R3-5L	 TYPE III (B) BARRICADE W/R11-2



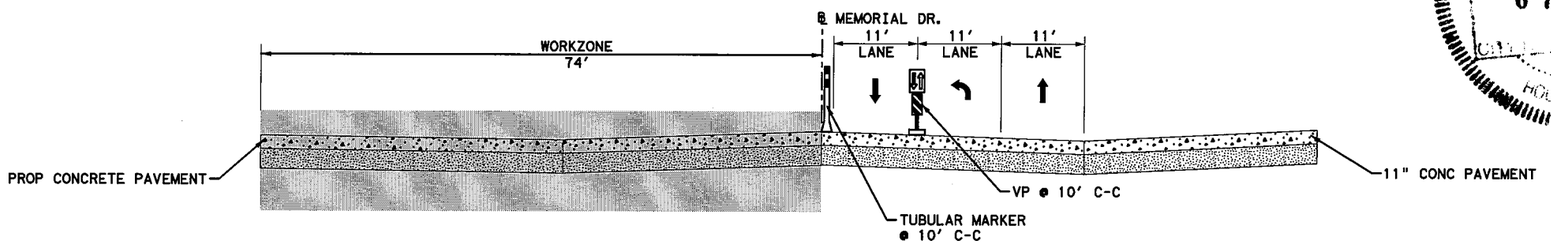
LEGEND

- WORK ZONE
- TEMP PAVEMENT
- EXIST DIRECTION OF TRAFFIC
- PROP DIRECTION OF TRAFFIC
- BARRELS OR DRUMS
- SIGN
- TYPE III BARRICADE W/ ROAD CLOSED SIGN (R11-2)
- LOW PROFILE CONCRETE BARRIER
- (A) WK ZN PAV MRK REMOV(TRAF BTN) TY W
- (B) WK ZN PAV MRK REMOV(TRAF BTN) TY Y
- (C) WK ZN PAV MRK REMOV(W) (ARROW)
- (D) WK ZN PAV MRK REMOV(W) (WORD)

NOTES:

1. PRIOR TO CONSTRUCTION ACROSS DRIVEWAY COORDINATE WITH CM. CONTRACTOR TO MAINTAIN ACCESS TO RESIDENTS AND BUSINESSESS AT ALL TIMES.
2. MAINTAIN MINIMUM 11-FEET LANE WIDTH IN EACH DIRECTION AT ALL TIMES.
3. REFER TO TCP STANDARD DETAILS FOR MORE INFORMATION.
4. SEE BOHEME DETOUR PLAN FOR MORE INFORMATION.
5. INTERSECTION SHALL NOT BE CLOSED LONGER THAN 3 DAYS. PLAN CONSTRUCTION OF RCB'S AND PAVEMENT ACCORDINGLY.

0 200 400
(IN FEET)
SCALE: PLAN 1": 200'



TYPICAL TRAFFIC CONTROL SECTION
SECTION A-A
(SEE NOTE 3)
N.T.S.

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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FIRM REGISTATION NO. 2614

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

TRAFFIC CONTROL PLAN PHASE 3 BROKEN BOUGH INTERSECTION

SHEET 1 OF 1

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	63

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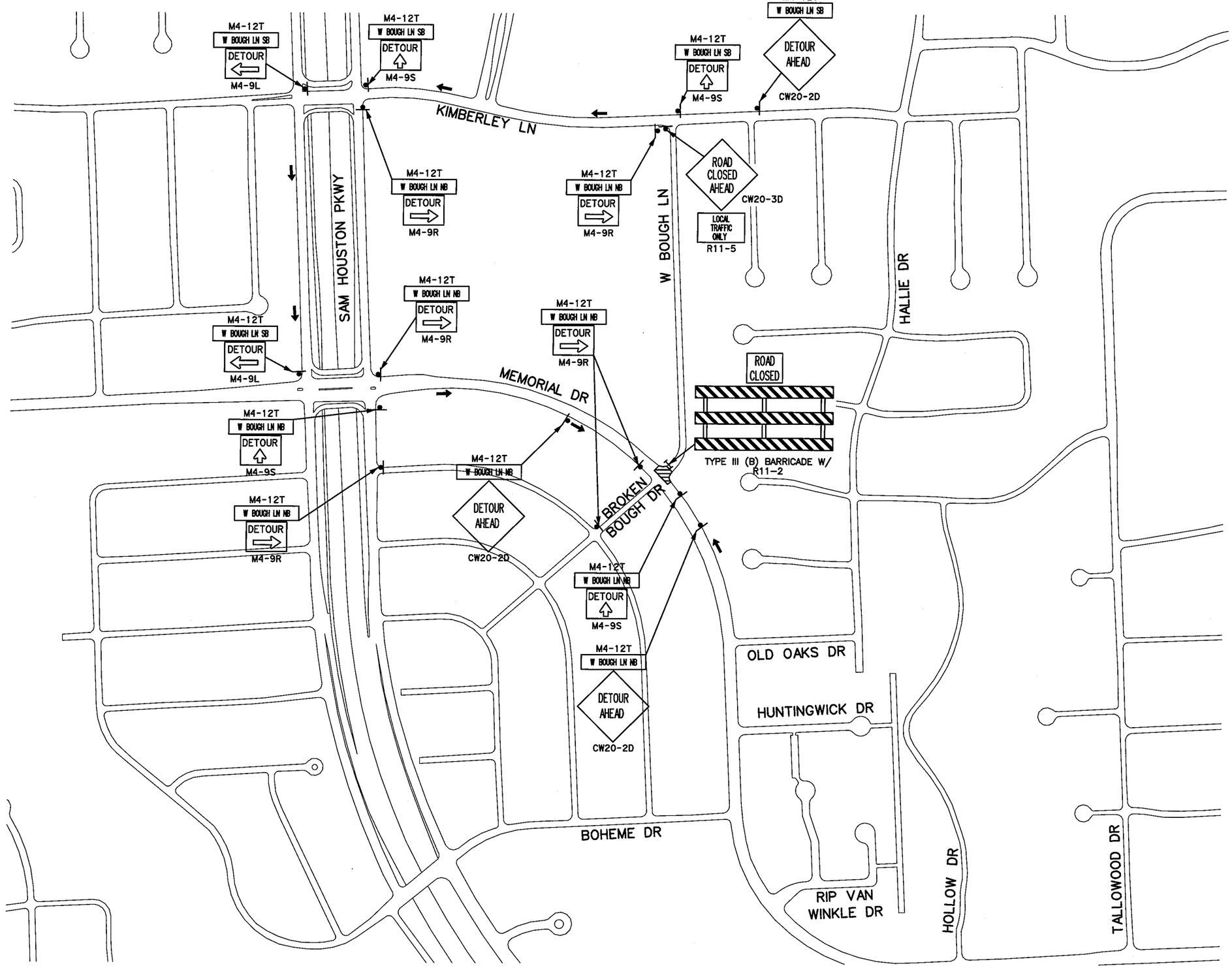

LEGEND

- WORK ZONE
- TRAFFIC FLOW
- SIGN
- TYPE III BARRICADE W/ ROAD CLOSED SIGN (R11-2)

N

ACCEPTED AND FILED
PUBLIC
67862
CITY
HOUSTON, TEXAS

0 400 800

(IN FEET)

SCALE: PLAN 1": 400'

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED
PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

TRAFFIC CONTROL PLAN PHASE 3 BROKEN BOUGH INTERSECTION DETOUR

SHEET 1 OF 1

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	64

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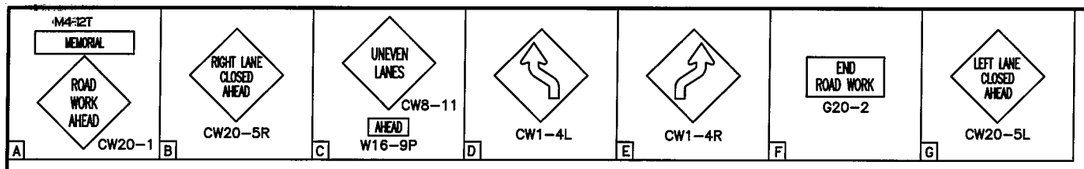
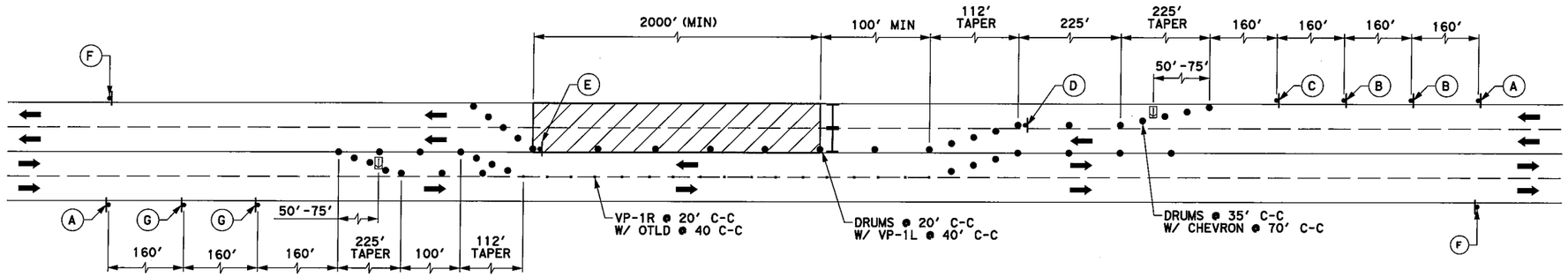
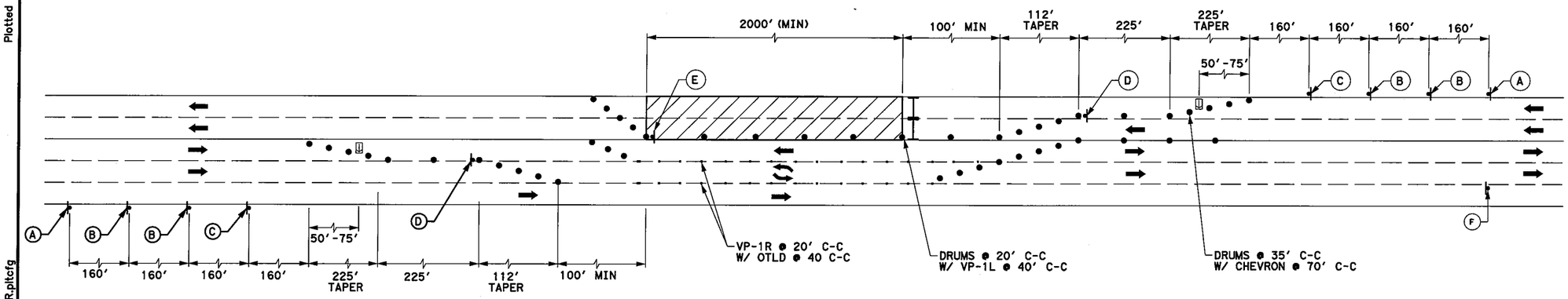


LEGEND

- WORK ZONE
- TEMPORARY GROUND MOUNTED SIGN
- CHANNELIZING DEVICE
- TYPE III BARRICADE W/ ROAD CLOSED SIGN
- DIRECTION OF TRAFFIC
- FLASHING ARROW BOARD



MULTILANE CLOSURE DETAIL



MULTILANE CLOSURE W/ CONTINUOUS LEFT TURN LANE DETAIL

STATE OF TEXAS
MICHAEL A. SALINAS
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LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

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HOUSTON, TEXAS

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

TRAFFIC CONTROL PLAN MULTILANE CLOSURE DETAILS

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
SCALE: DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK: DWG:	HOU	HARRIS	0912	72	391	65

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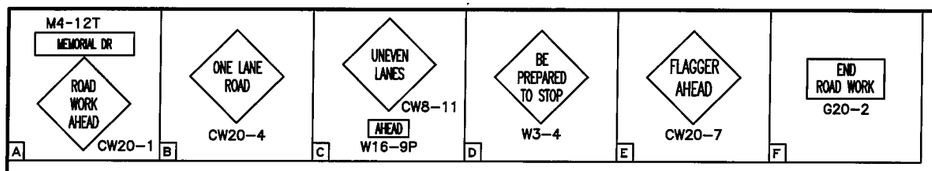
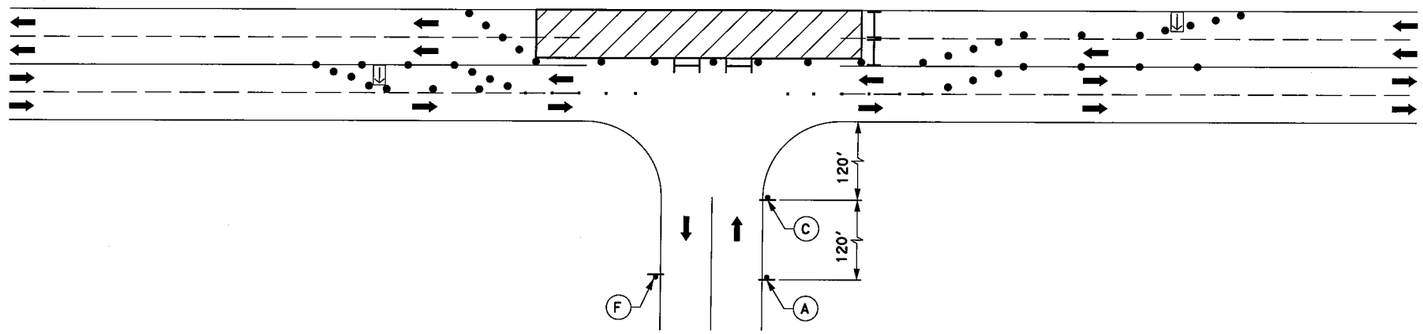
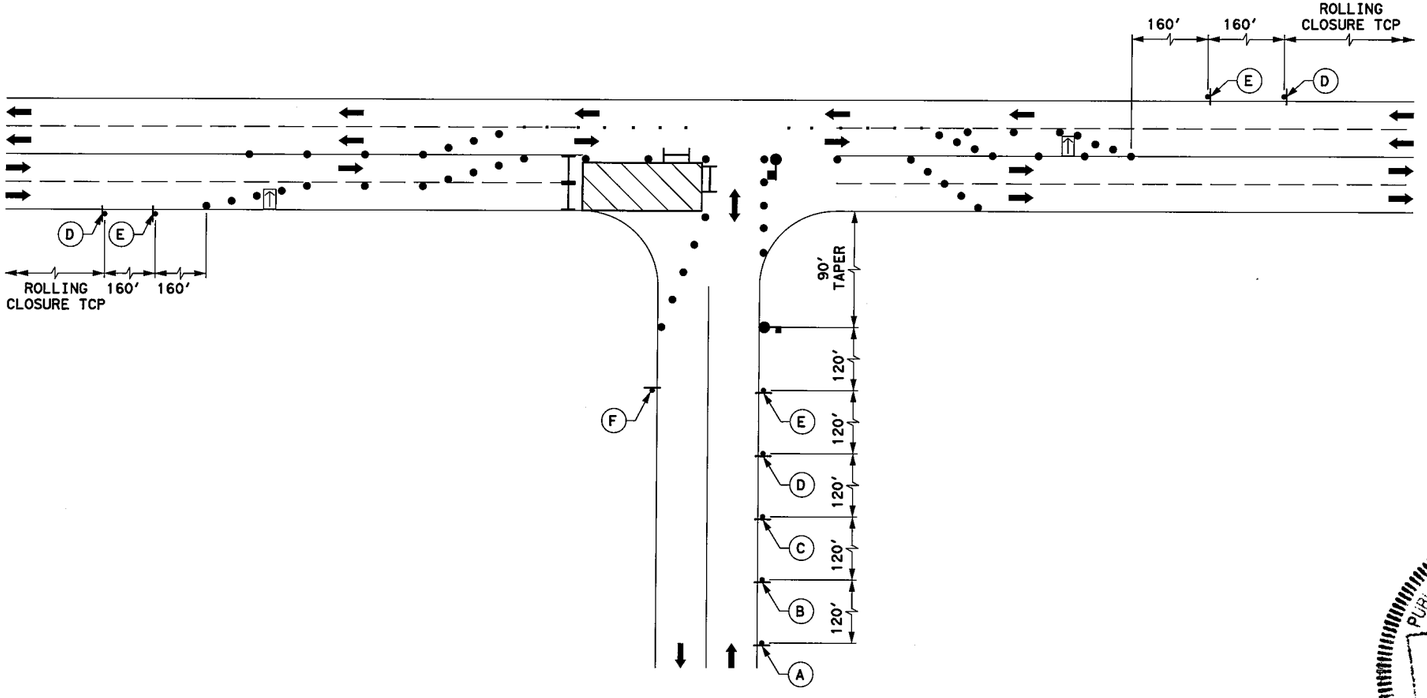


LEGEND

- WORK ZONE
- TEMPORARY GROUND MOUNTED SIGN
- CHANNELIZING DEVICE
- TYPE III BARRICADE W/ ROAD CLOSED SIGN
- DIRECTION OF TRAFFIC
- FLASHING ARROW BOARD



TYPICAL 3-WAY INTERSECTION
THROUGH LANE CLOSURE



TYPICAL 3-WAY INTERSECTION
LEFT LANE CLOSURE

STATE OF TEXAS
MICHAEL A. SALINAS
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03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

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67862 -
CITY OF HOUSTON

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

TRAFFIC CONTROL PLAN
INTERSECTION DETAILS

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	66

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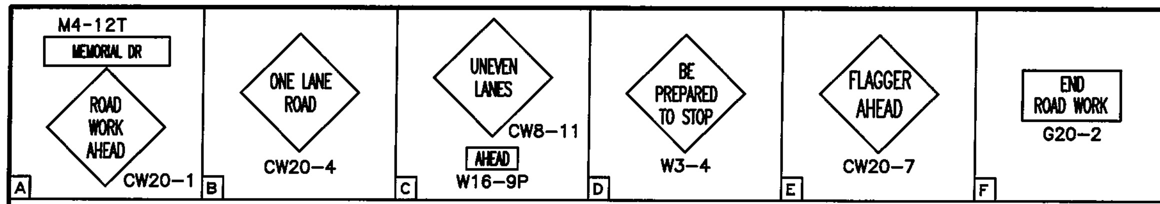
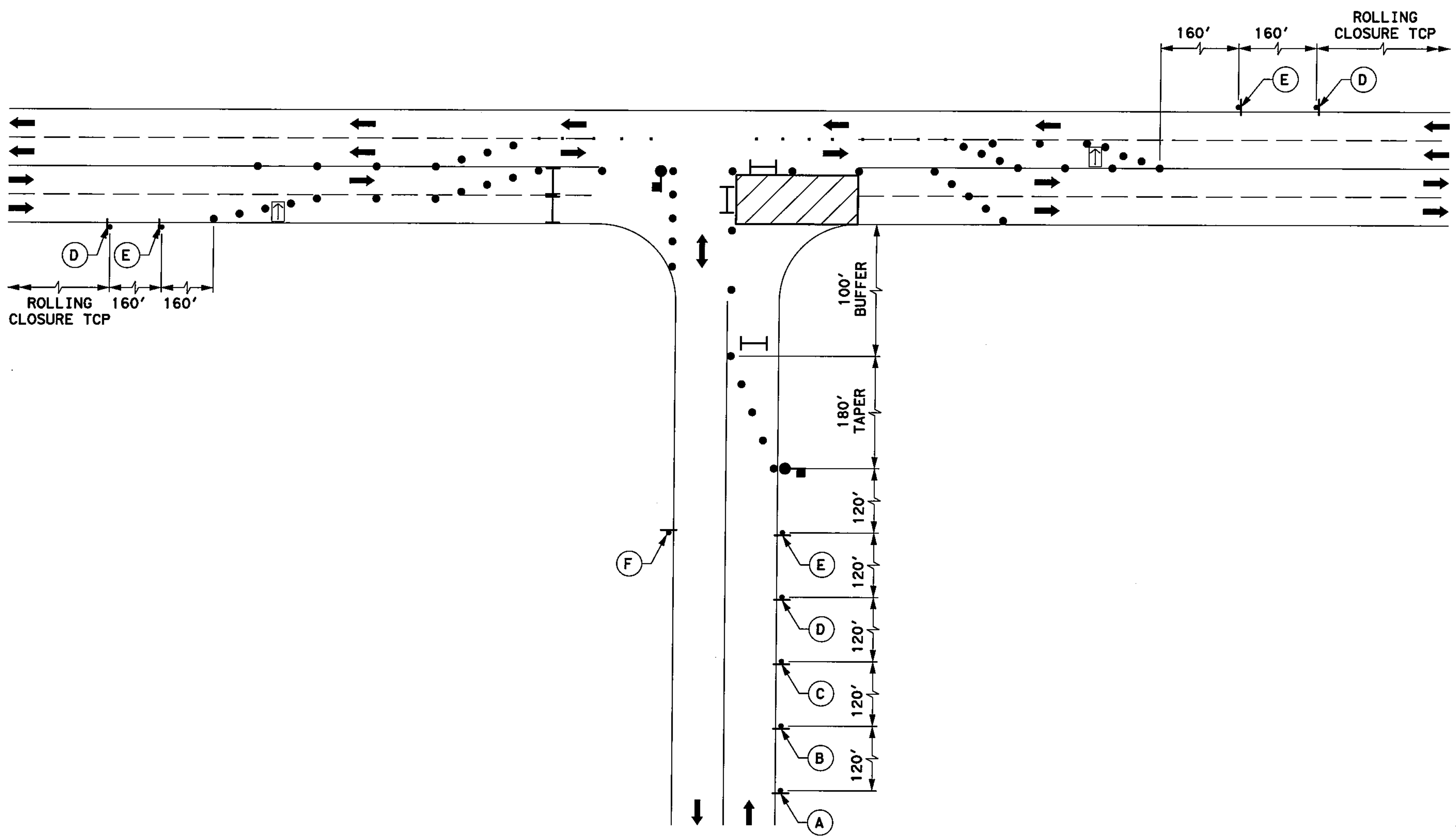


LEGEND

- WORK ZONE
- TEMPORARY GROUND MOUNTED SIGN
- CHANNELIZING DEVICE
- TYPE III BARRICADE W/ ROAD CLOSED SIGN
- DIRECTION OF TRAFFIC
- FLASHING ARROW BOARD



TYPICAL 3-WAY INTERSECTION
RIGHT LANE CLOSURE

03/04/2020

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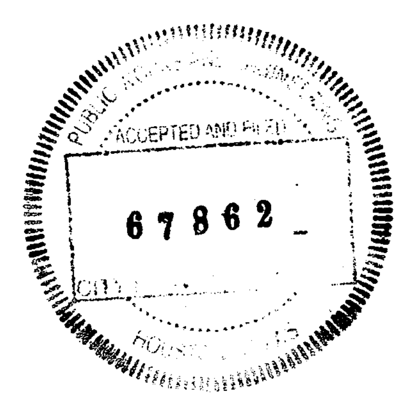

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

TRAFFIC CONTROL PLAN
INTERSECTION DETAILS

FED. RD. DIV. NO.	STATE	PROJECT NO.	HIGHWAY NO.
6	TEXAS	STP 1802(783)MM	CS

DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
HOU	HARRIS	0912	72	391	67

DGN: CHK DGN: DWG: CHK DWG:

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

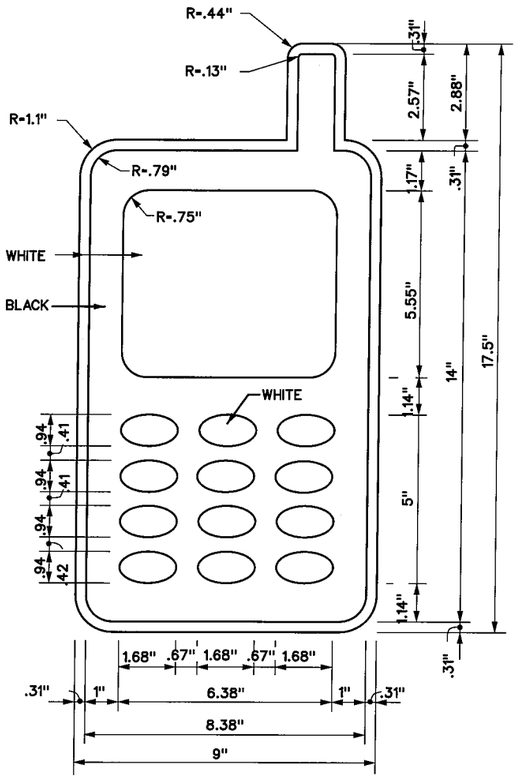
11. Except for devices required by Note 10, traffic control devices should be in place only while work is actually in progress or a definite need exists.

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

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

WORKER SAFETY APPAREL NOTES:

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



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

SIGN DETAIL (G20-10T)

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

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

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

SHEET 1 OF 12

Texas Department of Transportation

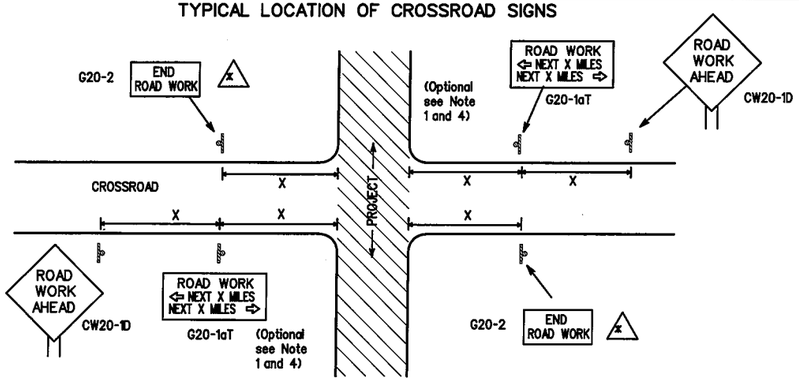
Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	72	391	CS
4-03 5-10 8-14	DIST	COUNTY		SHEET NO.
9-07 7-13	HOU	HARRIS		68

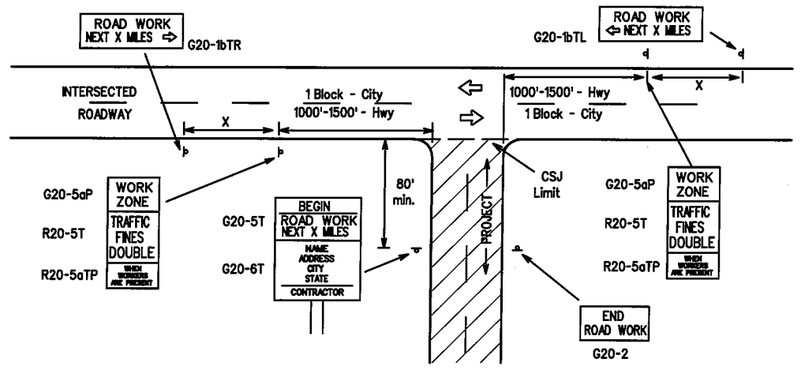
TYPICAL LOCATION OF CROSSROAD SIGNS



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

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

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

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

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

SIZE

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

SPACING

Posted Speed	Sign Spacing "X" Δ
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]

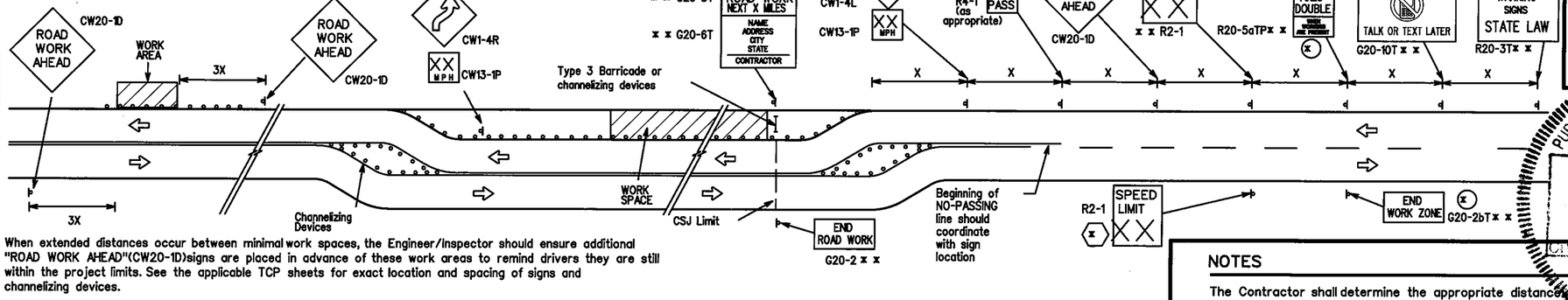
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

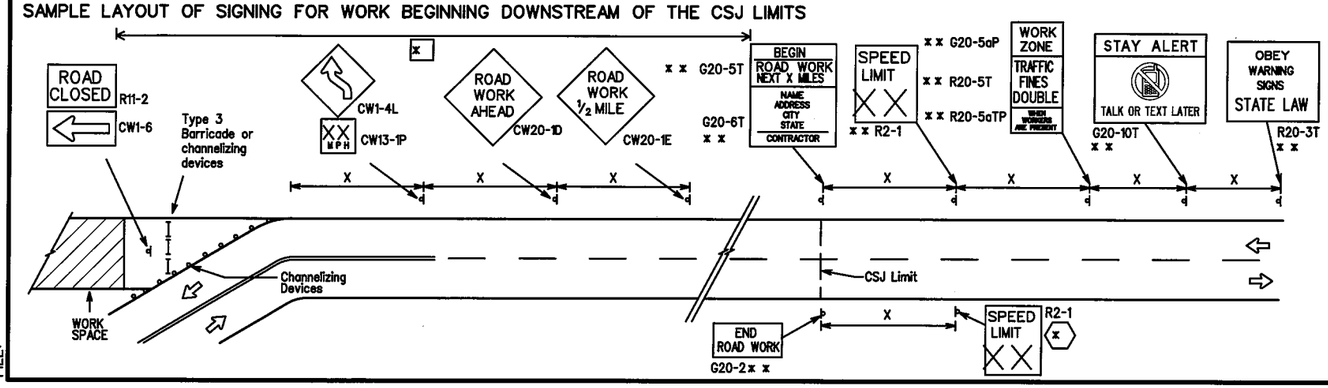
1. Special or larger size signs may be used as necessary.
2. Distance between signs should be increased as required to have 1500 feet advance warning.
3. Distance between signs should be increased as required to have 1/2 mile or more advance warning.
4. 36" x 36" "ROAD WORK AHEAD" (CW20-1D)signs may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

WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



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

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



SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS

NOTES

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

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

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

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

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

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

Texas Department of Transportation — Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-14

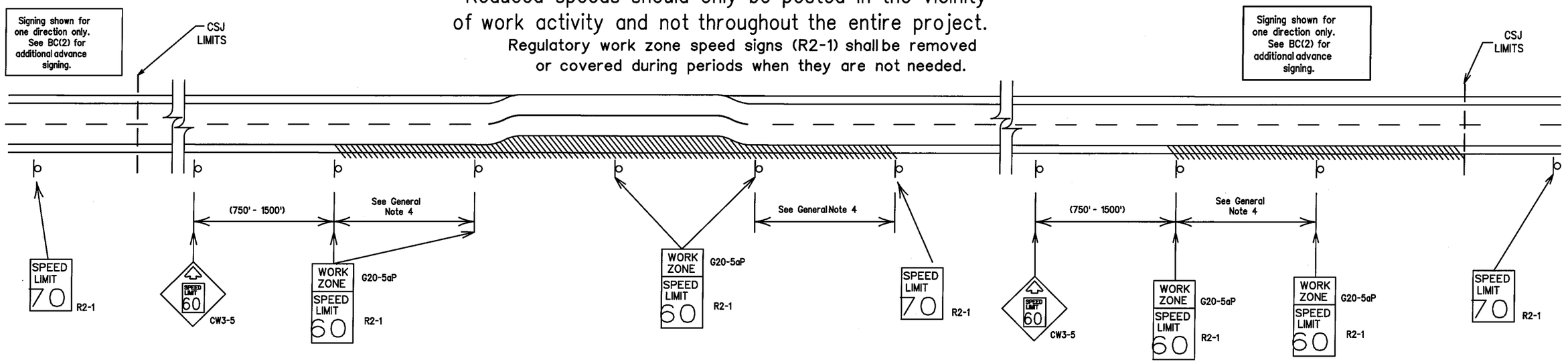
FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	72	391	CS
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13	HOU	HARRIS		69

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.

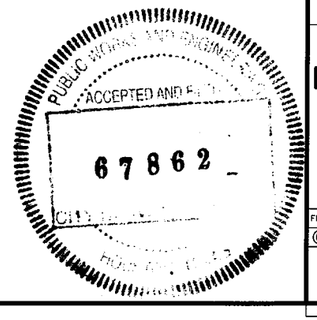
SHORT TERM WORK ZONE SPEED LIMITS

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 travelled way.

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

GENERAL NOTES

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



Texas Department of Transportation — Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS 9-07 8-14 7-13	0912	72	391	CS
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		70

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DATE:
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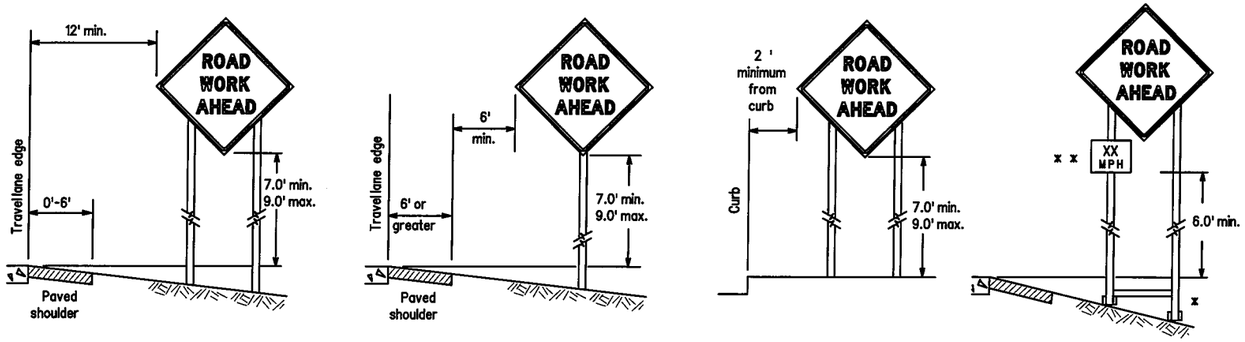
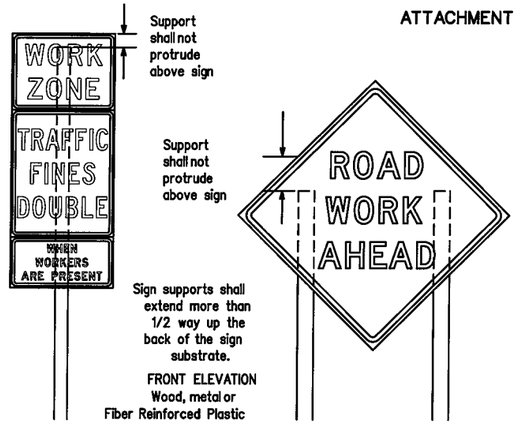
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



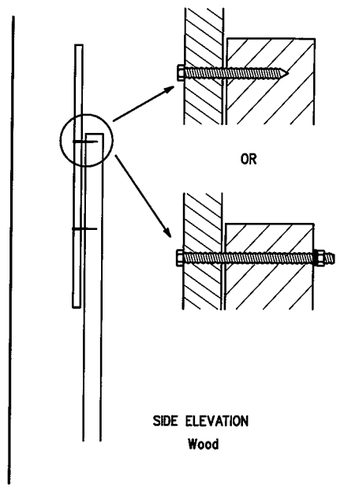
x When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

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

ATTACHMENT FOR SIGN SUPPORTS



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

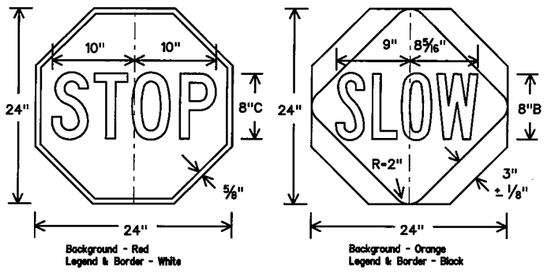


Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

STOP/SLOW PADDLES

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



CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

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

Texas Department of Transportation — Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-14

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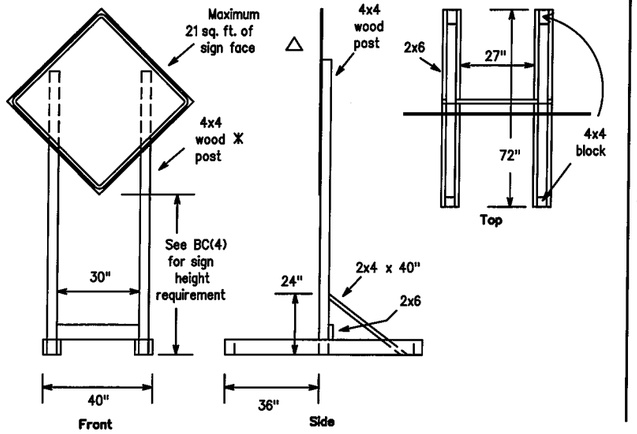
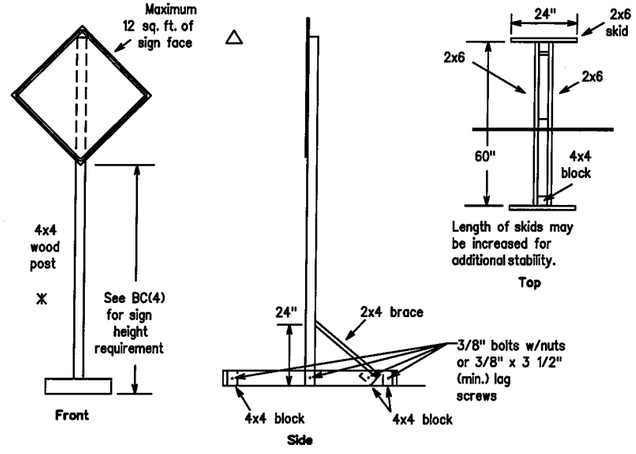
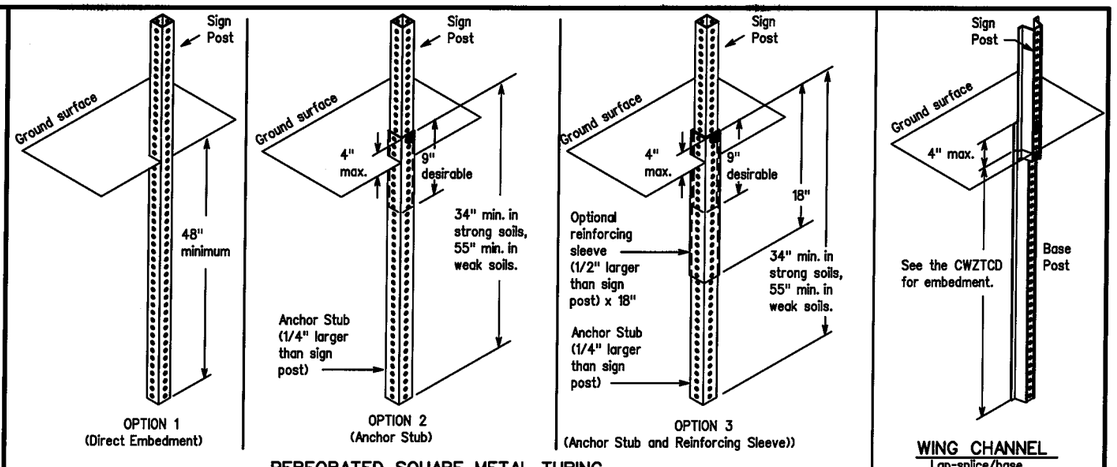




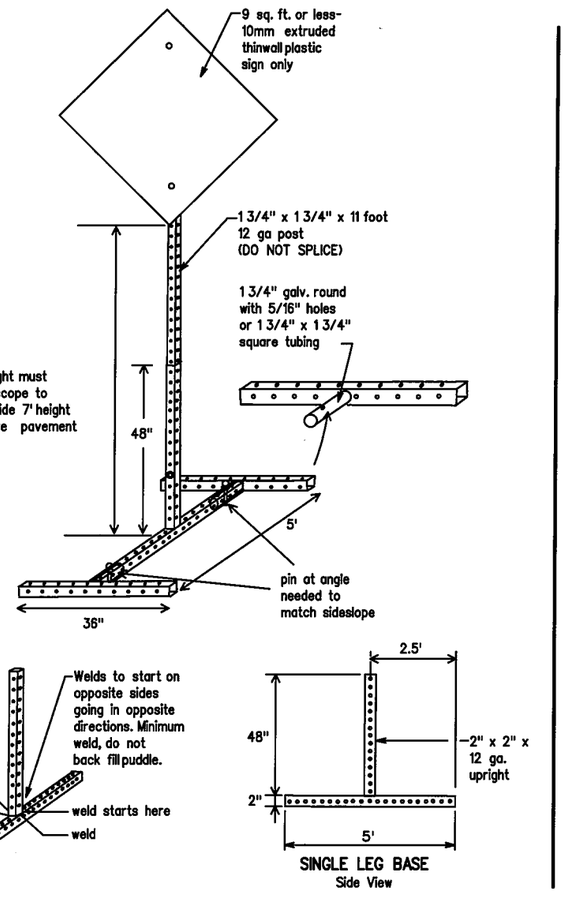
SKID MOUNTED WOOD SIGN SUPPORTS

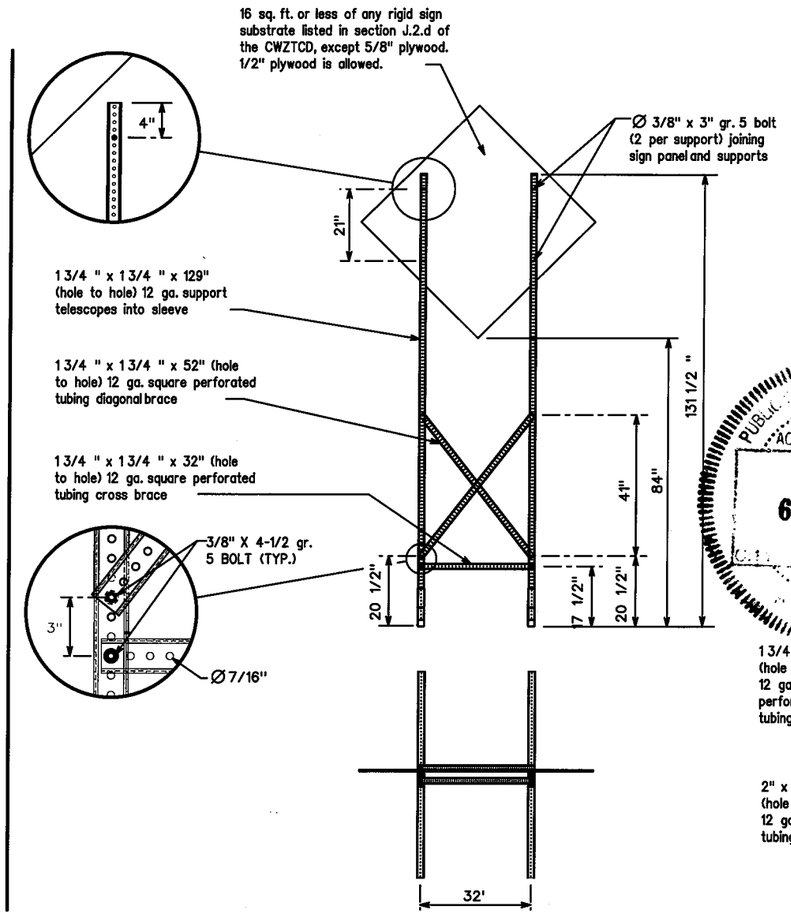
LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS □

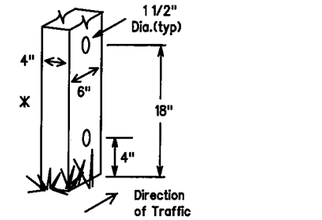


GROUND MOUNTED SIGN SUPPORTS

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

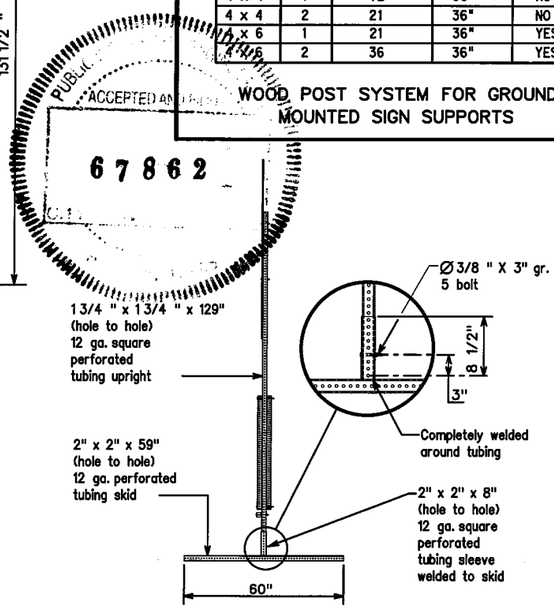






Nominal Post Size	Number of Posts	Maximum Sq. feet of Sign Face	Minimum Soil Embedment	Drilled Hole(s) Required
4 x 4	1	12	36"	NO
4 x 4	2	21	36"	NO
6 x 6	1	21	36"	YES
6 x 6	2	36	36"	YES

WOOD POST SYSTEM FOR GROUND MOUNTED SIGN SUPPORTS



WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

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

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

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

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

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BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-14

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SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

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

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

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

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

Other Condition List

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

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

Phase 2: Possible Component Lists

Action to Take/Effect on Travel List

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

Location List

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

Warning List

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

** Advance Notice List

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

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

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

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

WORDING ALTERNATIVES

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

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

FULL MATRIX PCMS SIGNS

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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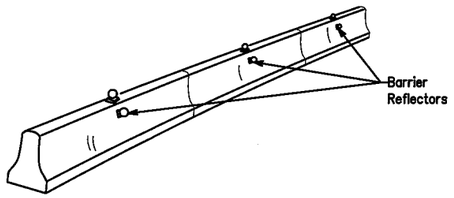
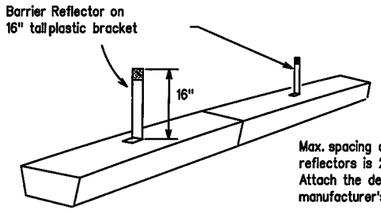
100

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

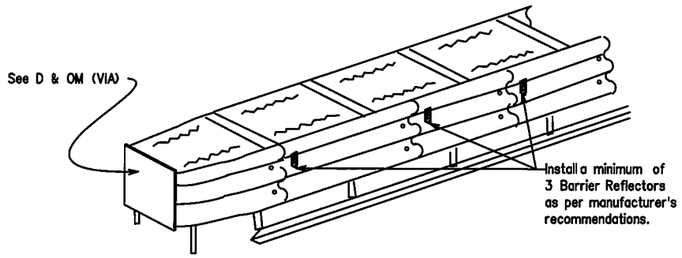


CONCRETE TRAFFIC BARRIER (CTB)

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



LOW PROFILE CONCRETE BARRIER (LPCB)



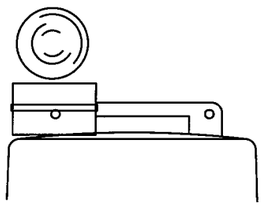
DELINEATION OF END TREATMENTS

END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS

WARNING LIGHTS

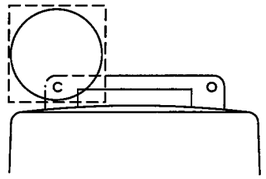


Type C Warning Light or approved substitute mounted on a drum adjacent to the travel way.

1. Warning lights shall meet the requirements of the TMUTCD.
2. Warning lights shall NOT be installed on barricades.
3. Type A-Low Intensity Flashing Warning Lights are commonly used with drums. They are intended to warn of or mark a potentially hazardous area. Their use shall be as indicated on this sheet and/or other sheets of the plans by the designation "FL". The Type A Warning Lights shall not be used with signs manufactured with Type B or C 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.



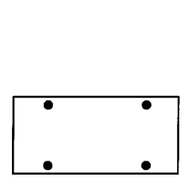
Warning reflector may be round or square. Must have a yellow reflective surface area of at least 30 square inches

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

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.

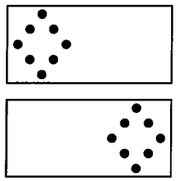
Arrow Boards may be located behind channelizing devices in place for a shoulder taper or merging taper, otherwise they shall be delineated with four (4) channelizing devices placed perpendicular to traffic on the upstream side of traffic.

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:

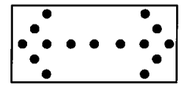


4 CORNER CAUTION

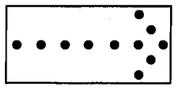
OR



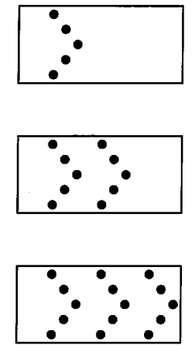
ALTERNATING DIAMOND CAUTION



DOUBLE ARROW



LEFT & RIGHT



CHEVRON ARROW
LEFT & RIGHT

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

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

ATTENTION
Flashing Arrow Boards shall be equipped with automatic dimming devices.

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

FLASHING ARROW BOARDS

SHEET 7 OF 12

TRUCK-MOUNTED ATTENUATORS

1. Truck-mounted attenuators (TMA) used on TxDOT facilities must meet the requirements outlined in the National Cooperative Highway Research Report No. 350 (NCHRP 350) or the Manual for Assessing Safety Hardware (MASH).
2. Refer to the CWZTCD for the requirements of Level 2 or Level 3 TMAs.
3. Refer to the CWZTCD for a list of approved TMAs.
4. TMAs are required on freeways unless otherwise noted in the plans.
5. A TMA should be used anytime that it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the work performance.
6. The only reason a TMA should not be required is when a work area is spread down the roadway and the work crew is an extended distance from the TMA.

Texas Department of Transportation

Traffic Operations Division Standard

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

BC(7)-14

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FILE:

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GENERAL NOTES

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

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

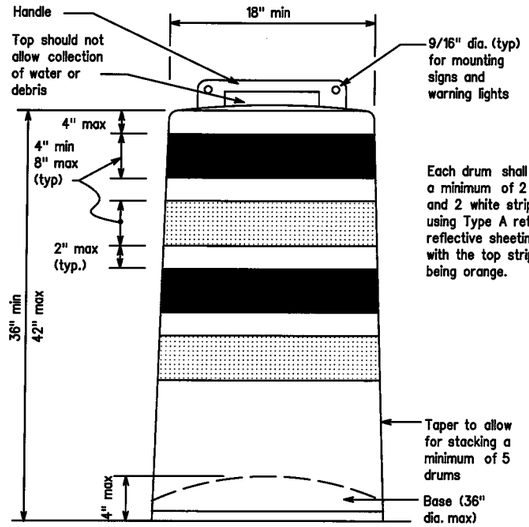
1. Plastic drums shall be a two-piece design: the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

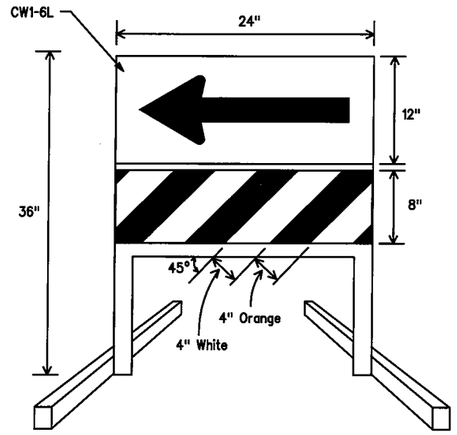
RETROREFLECTIVE SHEETING

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

BALLAST

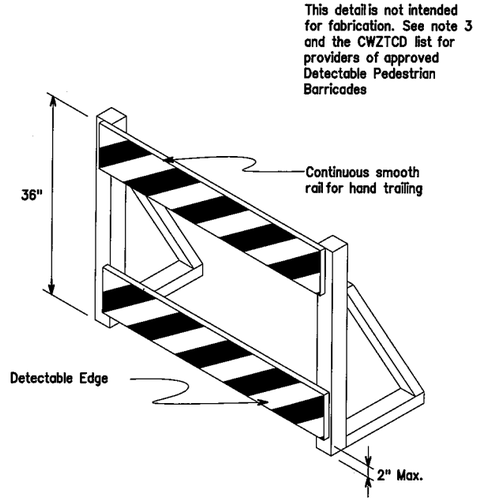
1. Unballasted bases shall be large enough to hold up to 50 lbs. of sand. This base, when filled with the ballast material, should weigh between 35 lbs (minimum) and 50 lbs (maximum). The ballast may be sand in one to three sandbags separate from the base, sand in a sand-filled plastic base, or other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





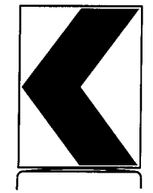
DIRECTION INDICATOR BARRICADE

1. The Direction Indicator Barricade may be used in tapers, transitions, and other areas where specific directional guidance to drivers is necessary.
2. If used, the Direction Indicator Barricade should be used in series to direct the driver through the transition and into the intended travel lane.
3. The Direction Indicator Barricade shall consist of One-Direction Large Arrow (CW1-6) sign in the size shown with a black arrow on a background of Type B or Type C Orange retroreflective sheeting above a rail with Type A retroreflective sheeting in alternating 4" white and orange stripes sloping downward at an angle of 45 degrees in the direction road users are to pass. Sheeting types shall be as per DMS 8300.
4. Double arrows on the Direction Indicator Barricade will not be allowed.
5. Approved manufacturers are shown on the CWZTCD List. Ballast shall be as approved by the manufacturers instructions.

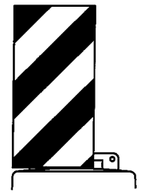


DETECTABLE PEDESTRIAN BARRICADES

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



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



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

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

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

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

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Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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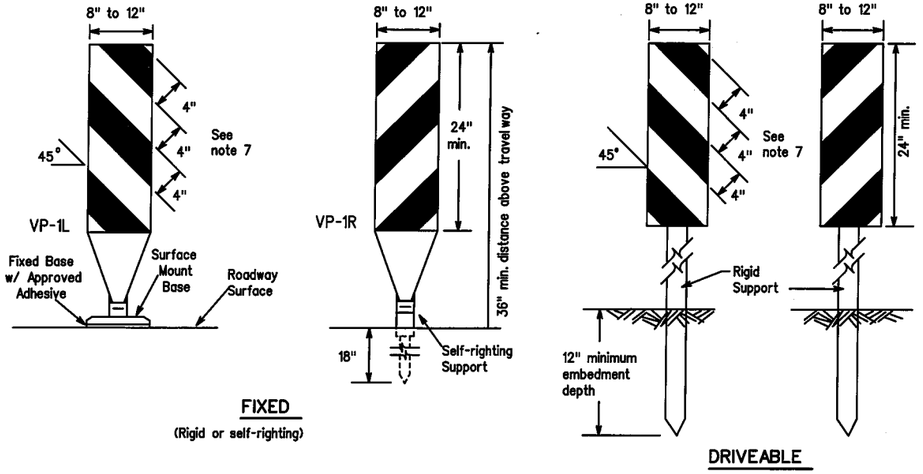
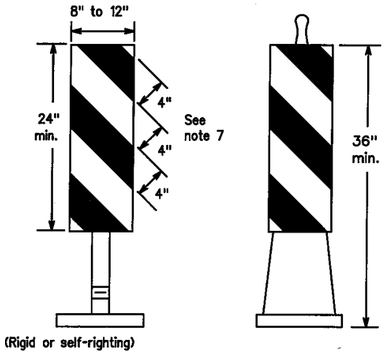


FIXED
(Rigid or self-righting)

DRIVEABLE

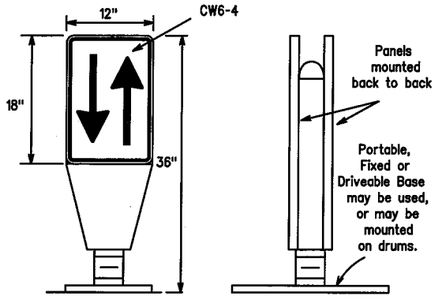


(Rigid or self-righting)

PORTABLE

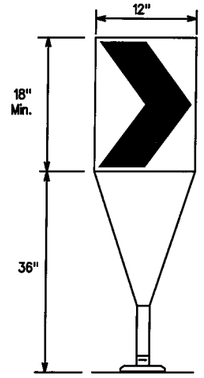
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is required. The Engineer/Inspector shall refer to the Roadway Design Manual Appendix B "Treatment of Pavement Drop-offs in Work Zones" for additional guidelines on the use of VP's for drop-offs.
3. VP's should be mounted back to back if used at the edge of cuts adjacent to two-way two lane roadways. Stripes are to be reflective orange and reflective white and should always slope downward toward the travel lane.
4. VP's used on expressways and freeways or other high speed roadways, may have more than 270 square inches of retroreflective area facing traffic.
5. Self-righting supports are available with portable base. See "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
6. Sheeting for the VP's shall be retroreflective Type A conforming to Departmental Material Specification DMS-8300, unless noted otherwise.
7. Where the height of reflective material on the vertical panel is 36 inches or greater, a panel stripe of 6 inches shall be used.

VERTICAL PANELS (VPs)



1. Opposing Traffic Lane Dividers (OTLD) are delineation devices designed to convert a normal one-way roadway section to two-way operation. OTLD's are used on temporary centerlines. The upward and downward arrows on the sign's face indicate the direction of traffic on either side of the divider. The base is secured to the pavement with an adhesive or rubber weight to minimize movement caused by a vehicle impact or wind gust.
2. The OTLD may be used in combination with 42" cones or VPs.
3. Spacing between the OTLD shall not exceed 500 feet. 42" cones or VPs placed between the OTLD's should not exceed 100 foot spacing.
4. The OTLD shall be orange with a black non-reflective legend. Sheeting for the OTLD shall be retroreflective Type B or Type C conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.

OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



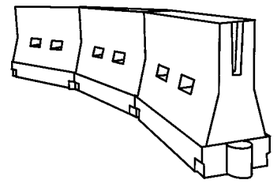
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

1. The chevron shall be a vertical rectangle with a minimum size of 12 by 18 inches.
2. Chevrons are intended to give notice of a sharp change of alignment with the direction of travel and provide additional emphasis and guidance for vehicle operators with regard to changes in horizontal alignment of the roadway.
3. Chevrons, when used, shall be erected on the outside of a sharp curve or turn, or on the far side of an intersection. They shall be in line with and at right angles to approaching traffic. Spacing should be such that the motorist always has three in view, until the change in alignment eliminates its need.
4. To be effective, the chevron should be visible for at least 500 feet.
5. Chevrons shall be orange with a black nonreflective legend. Sheeting for the chevron shall be retroreflective Type B or Type C conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.
6. For Long Term Stationary use on tapers or transitions on freeways and divided highways self-righting chevrons may be used to supplement plastic drums but not to replace plastic drums.

CHEVRONS

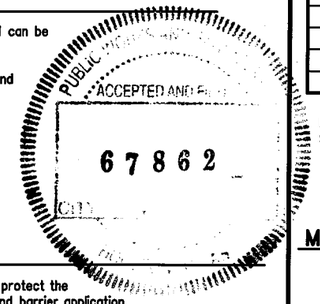
GENERAL NOTES

1. Work Zone channelizing devices illustrated on this sheet may be installed in close proximity to traffic and are suitable for use on high or low speed roadways. The Engineer/Inspector shall ensure that spacing and placement is uniform and in accordance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
2. Channelizing devices shown on this sheet may have a driveable, fixed or portable base. The requirement for self-righting channelizing devices must be specified in the General Notes or other plan sheets.
3. Channelizing devices on self-righting supports should be used in work zone areas where channelizing devices are frequently impacted by errant vehicles or vehicle related wind gusts making alignment of the channelizing devices difficult to maintain. Locations of these devices shall be detailed elsewhere in the plans. These devices shall conform to the TMUTCD and the "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
4. The Contractor shall maintain devices in a clean condition and replace damaged, nonreflective, faded, or broken devices and bases as required by the Engineer/Inspector. The Contractor shall be required to maintain proper device spacing and alignment.
5. Portable bases shall be fabricated from virgin and/or recycled rubber. The portable bases shall weigh a minimum of 30 lbs.
6. Pavement surfaces shall be prepared in a manner that ensures proper bonding between the adhesives, the fixed mount bases and the pavement surface. Adhesives shall be prepared and applied according to the manufacturer's recommendations.
7. The installation and removal of channelizing devices shall not cause detrimental effects to the final pavement surfaces, including pavement surface discoloration or surface integrity. Driveable bases shall not be permitted on final pavement surfaces. The Engineer/Inspector shall approve all application and removal procedures of fixed bases.



LONGITUDINAL CHANNELIZING DEVICES (LCD)

1. LCDs are crashworthy, lightweight, deformable devices that are highly visible, have good target value and can be connected together. They are not designed to contain or redirect a vehicle on impact.
2. LCDs may be used instead of a line of cones or drums.
3. LCDs shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
4. LCDs should not be used to provide positive protection for obstacles, pedestrians or workers.
5. LCDs shall be supplemented with retroreflective delineation as required for temporary barriers on BC(7) when placed roughly parallel to the travel lanes.
6. LCDs used as barricades placed perpendicular to traffic should have at least one row of reflective sheeting meeting the requirements for barricade rails as shown on BC(10) placed near the top of the LCD along the full length of the device.



WATER BALLASTED SYSTEMS USED AS BARRIERS

1. Water ballasted systems used as barriers shall not be used solely to channelize road users, but also to protect the work space per the appropriate NCHRP 350 crashworthiness requirements based on roadway speed and barrier application.
2. Water ballasted systems used to channelize vehicular traffic shall be supplemented with retroreflective delineation or channelizing devices to improve daytime/nighttime visibility. They may also be supplemented with pavement markings.
3. Water ballasted systems used as barriers shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
4. Water ballasted systems used as barriers should not be used for a merging taper except in low speed (less than 45 MPH) urban areas. When used on a taper in a low speed urban area, the taper shall be delineated and the taper length should be designed to optimize road user operations considering the available geometric conditions.
5. When water ballasted systems used as barriers have blunt ends exposed to traffic, they should be attenuated as per manufacturer recommendations or flared to a point outside the clear zone.

If used to channelize pedestrians, longitudinal channelizing devices or water ballasted systems must have a continuous detectable bottom for users of long canes and the top of the unit shall not be less than 32 inches in height.

HOLLOW OR WATER BALLASTED SYSTEMS USED AS LONGITUDINAL CHANNELIZING DEVICES OR BARRIERS

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

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

SHEET 9 OF 12

Texas Department of Transportation | Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-14

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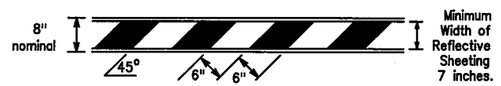
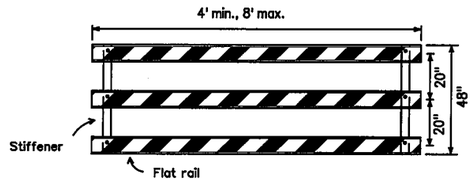
TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



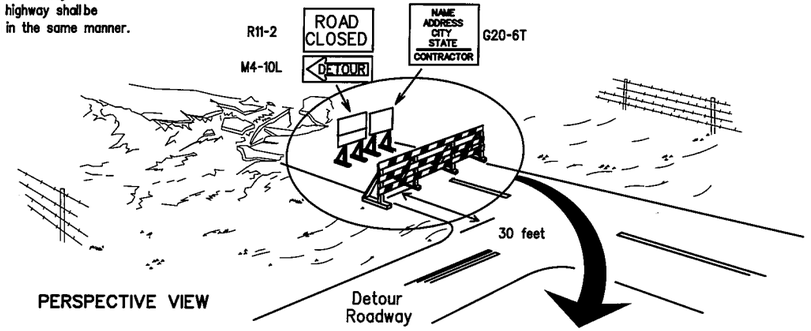
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

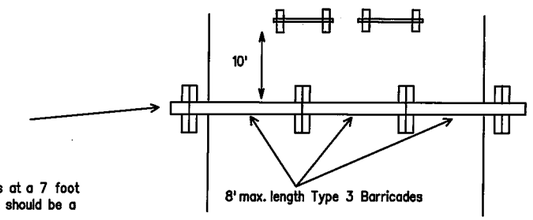
Each roadway of a divided highway shall be barricaded in the same manner.



PERSPECTIVE VIEW

The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.

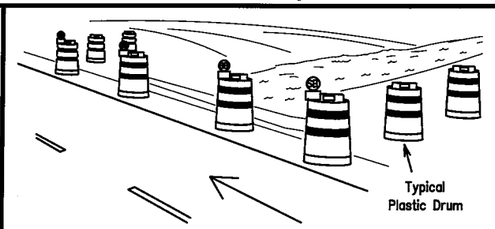
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

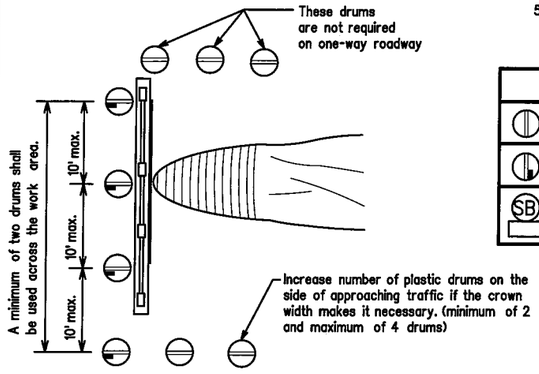
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

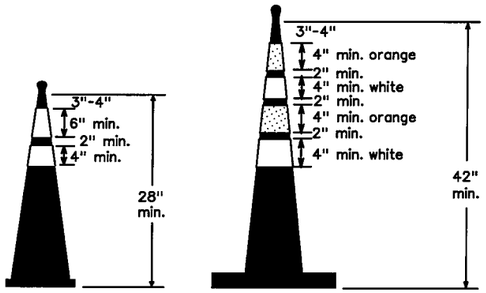
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



PLAN VIEW

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

CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS

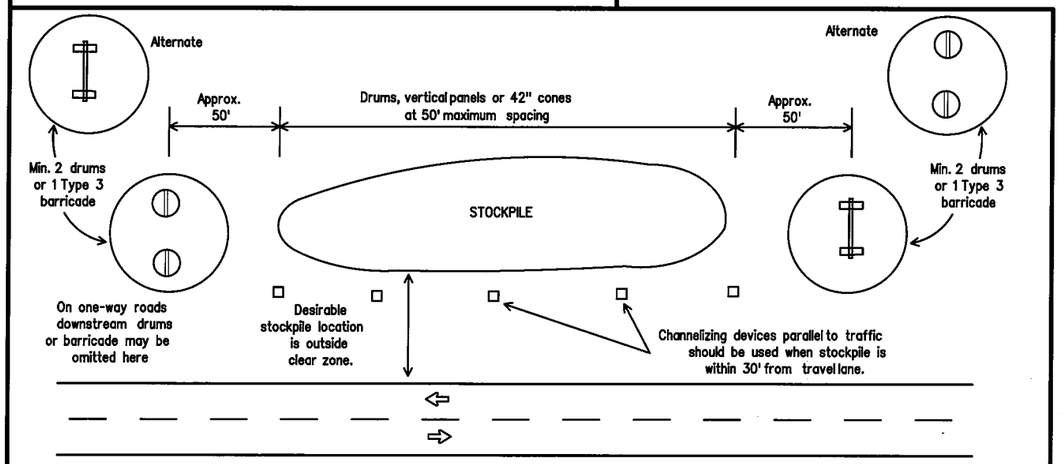


Two-Piece cones | One-Piece cones | Tubular Marker

28" Cones shall have a minimum weight of 9 1/2 lbs.

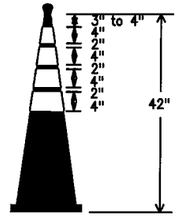
42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

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 used at night shall have white or white and orange reflective bands as shown above. The reflective bands shall have a smooth, sealed outer surface and meet the requirements of Departmental Material Specification DMS-8300 Type A.
5. 28" cones and tubular markers are generally suitable for short duration and short-term stationary work as defined on BC(4). These should not be used for intermediate-term or long-term stationary work unless personnel is on-site to maintain them in their proper upright position.
6. 42" two-piece cones, vertical panels or drums are suitable for all work zone durations.
7. Cones or tubular markers used on each project should be of the same size and shape.



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

THIS DEVICE SHALL NOT BE USED ON PROJECTS LET AFTER MARCH 2014.



EDGELINE CHANNELIZER

1. This device is intended only for use in place of a vertical panel to channelize traffic by indicating the edge of the travel lane. It is not intended to be used in transitions or tapers.
2. This device shall not be used to separate lanes of traffic (opposing or otherwise) or warn of objects.
3. This device is based on a 42 inch, two-piece cone with an alternate striping pattern: four 4 inch retroreflective bands, with an approximate 2 inch gap between bands. The color of the band should correspond to the color of the edgeline (yellow for left edgeline, white for right edgeline) for which the device is substituted or for which it supplements. The reflectorized bands shall be retroreflective Type A conforming to Departmental Material Specification DMS-8300, unless otherwise noted.
4. The base must weigh a minimum of 30 lbs.

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BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-14

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WORK ZONE PAVEMENT MARKINGS

GENERAL

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

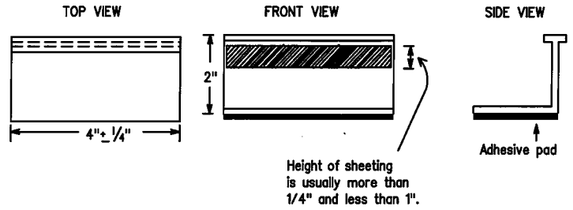
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

REMOVAL OF PAVEMENT MARKINGS

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

Temporary Flexible-Reflective Roadway Marker Tabs



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

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

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-14

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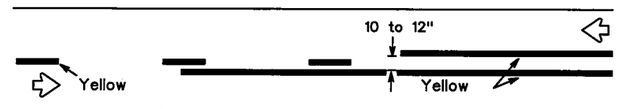
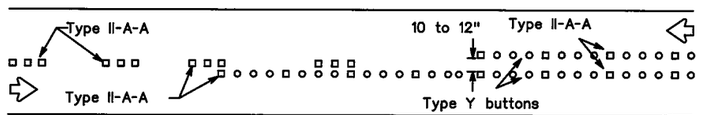
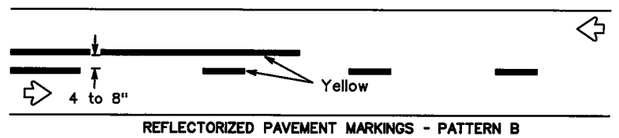
PAVEMENT MARKING PATTERNS



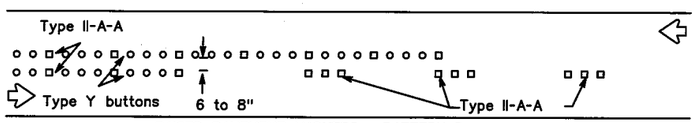
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



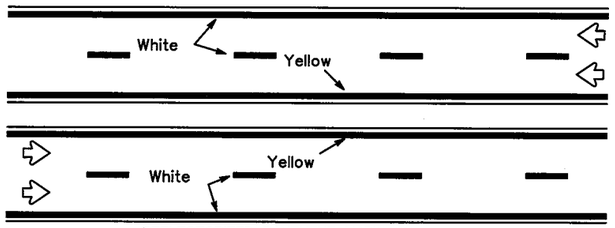
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



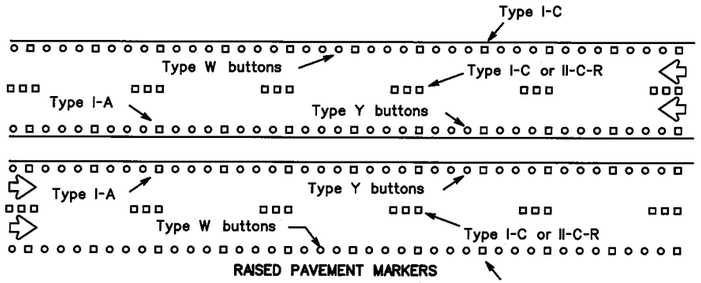
RAISED PAVEMENT MARKERS - PATTERN B

Pattern A is the TXDOT Standard, however Pattern B may be used if approved by the Engineer.
Prefabricated markings may be substituted for reflectorized pavement markings.

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



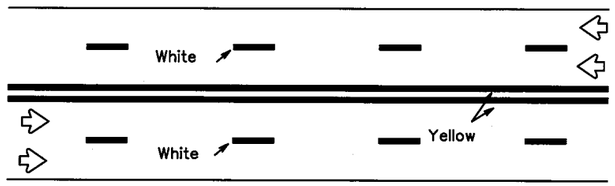
REFLECTORIZED PAVEMENT MARKINGS



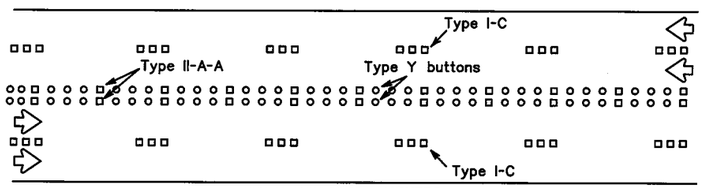
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



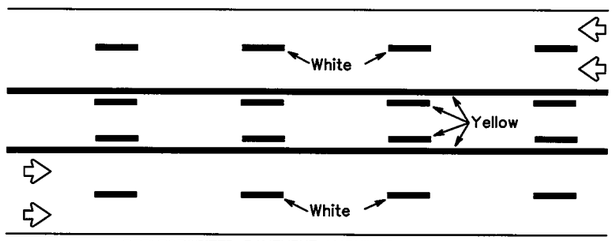
REFLECTORIZED PAVEMENT MARKINGS



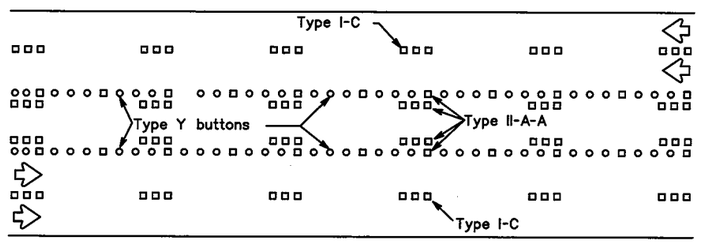
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS

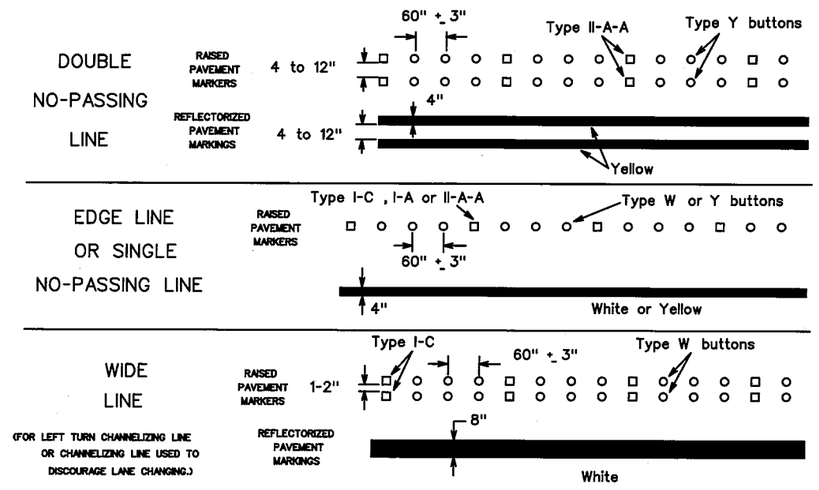


RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

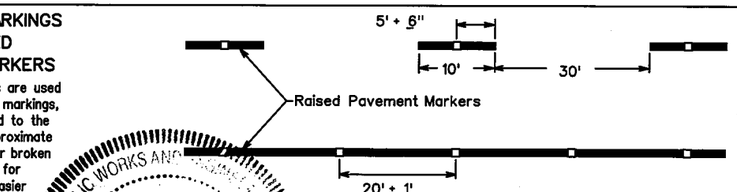
TWO-WAY LEFT TURN LANE

STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS



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.



Raised pavement markers used as standard pavement markings shall be from the approved products list and meet the requirements of Item 672 "RAISED PAVEMENT MARKERS."

Texas Department of Transportation

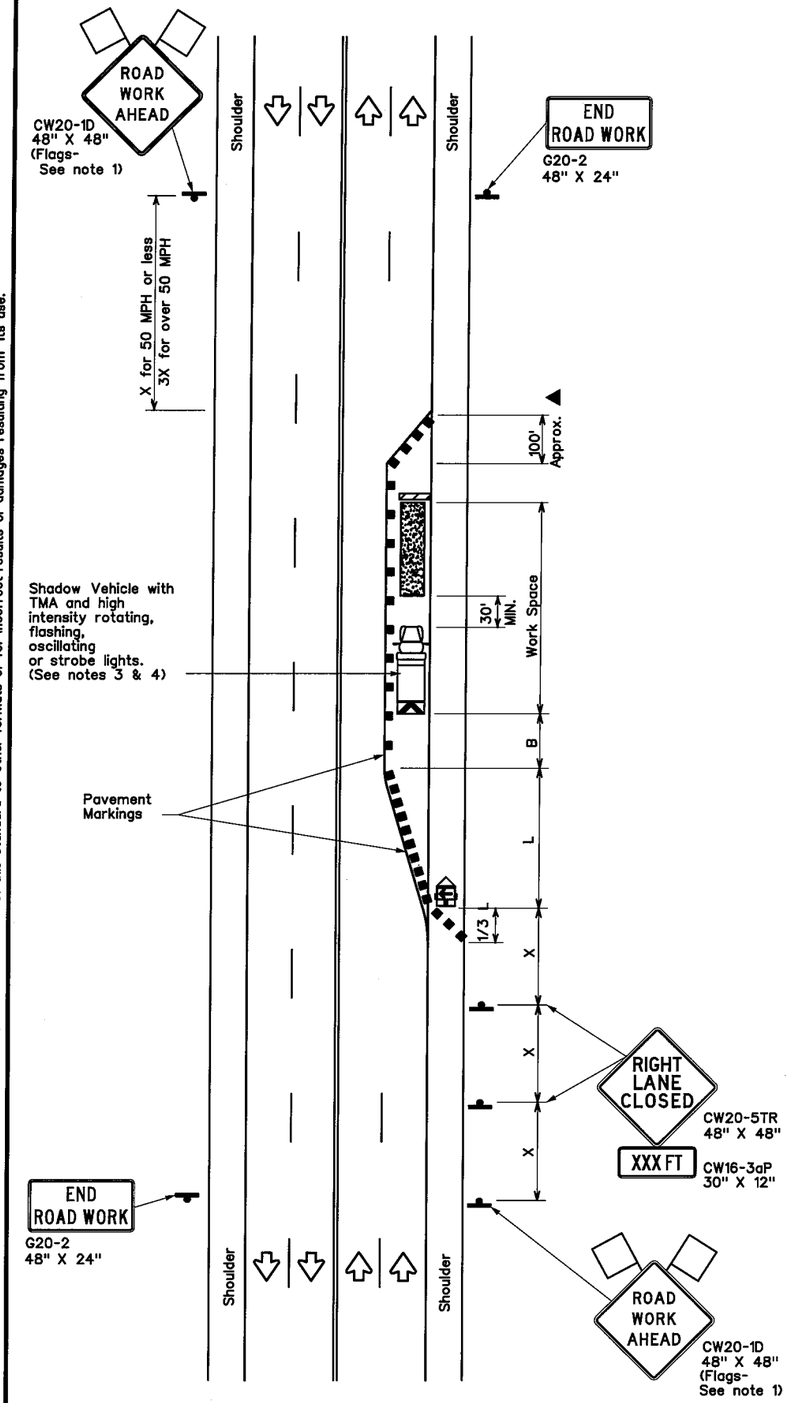
Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-14

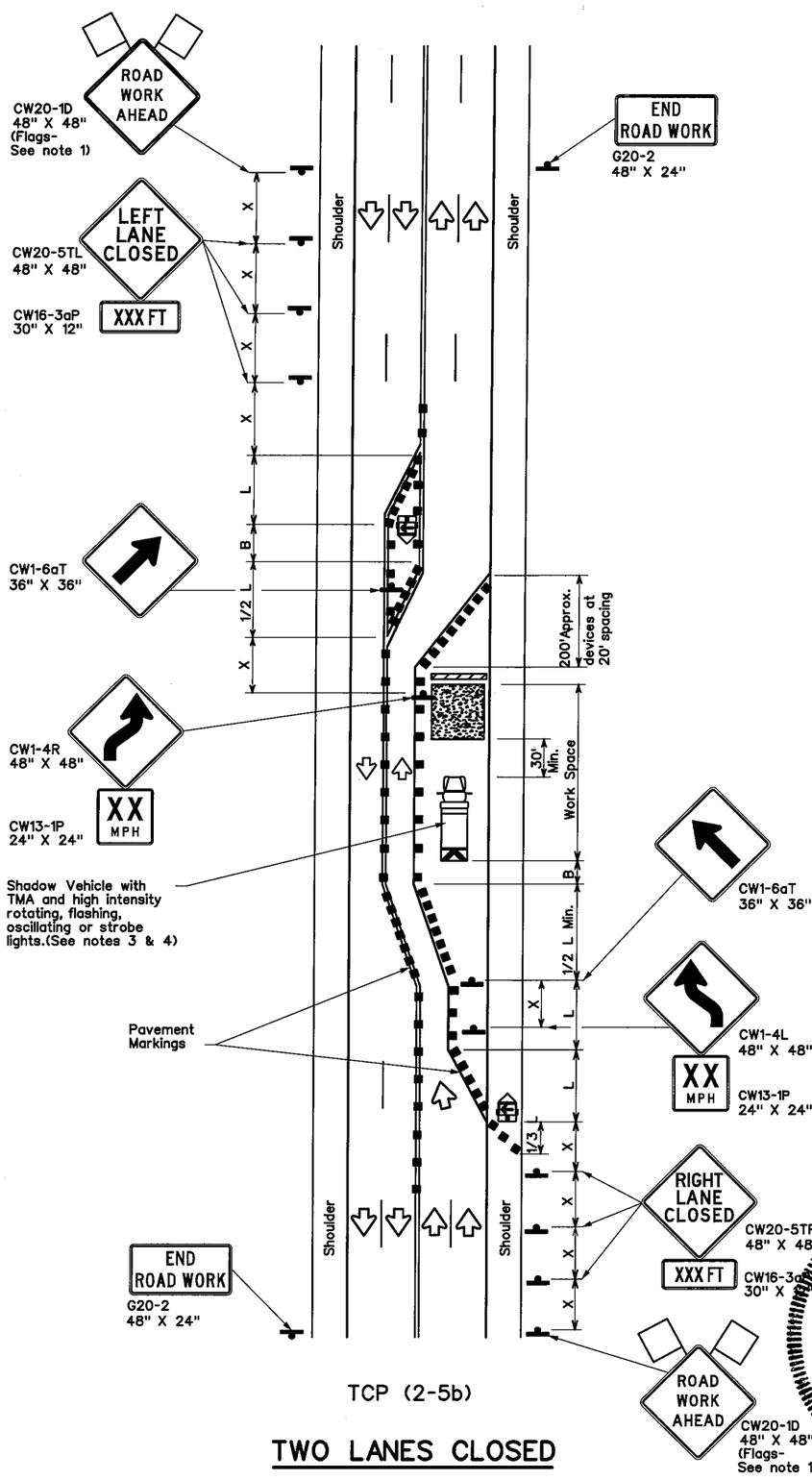
FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	72	391	CS
1-97 9-07	DIST	COUNTY		SHEET NO.
2-98 7-13	HOU	HARRIS		79
11-02 8-14				

DATE:
FILE:



TCP (2-5a)

ONE LANE CLOSED



TCP (2-5b)

TWO LANES CLOSED

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

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

TCP (2-5a)

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

TCP (2-5b)

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

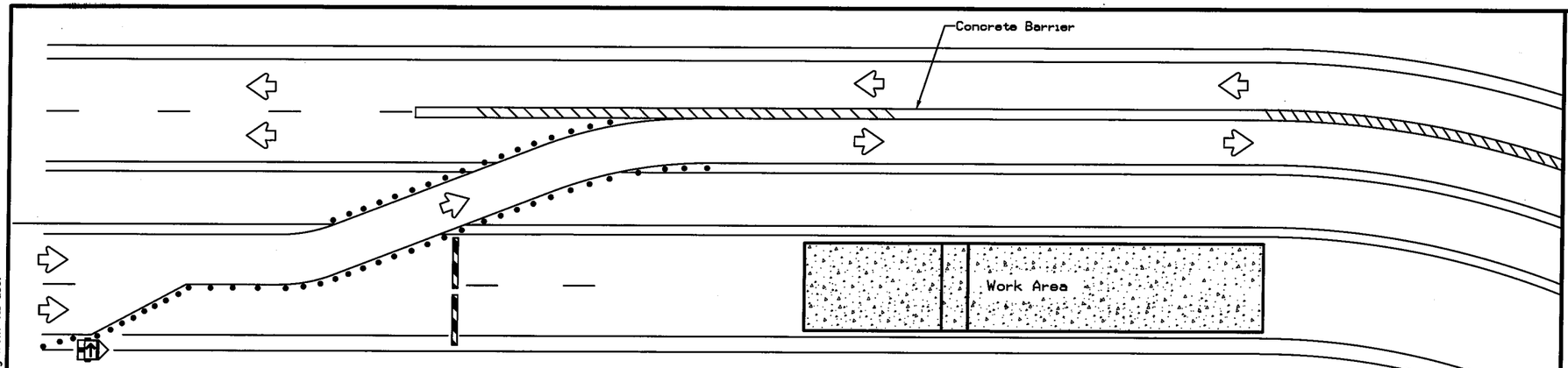
Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LONG TERM LANE CLOSURES MULTILANE CONVENTIONAL RDS.

TCP(2-5)-18

FILE: tcp2-5-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	72	391	CS
8-95 2-12	DIST	COUNTY		SHEET NO.
1-97 3-03	HOU	HARRIS		80
4-98 2-18				



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.

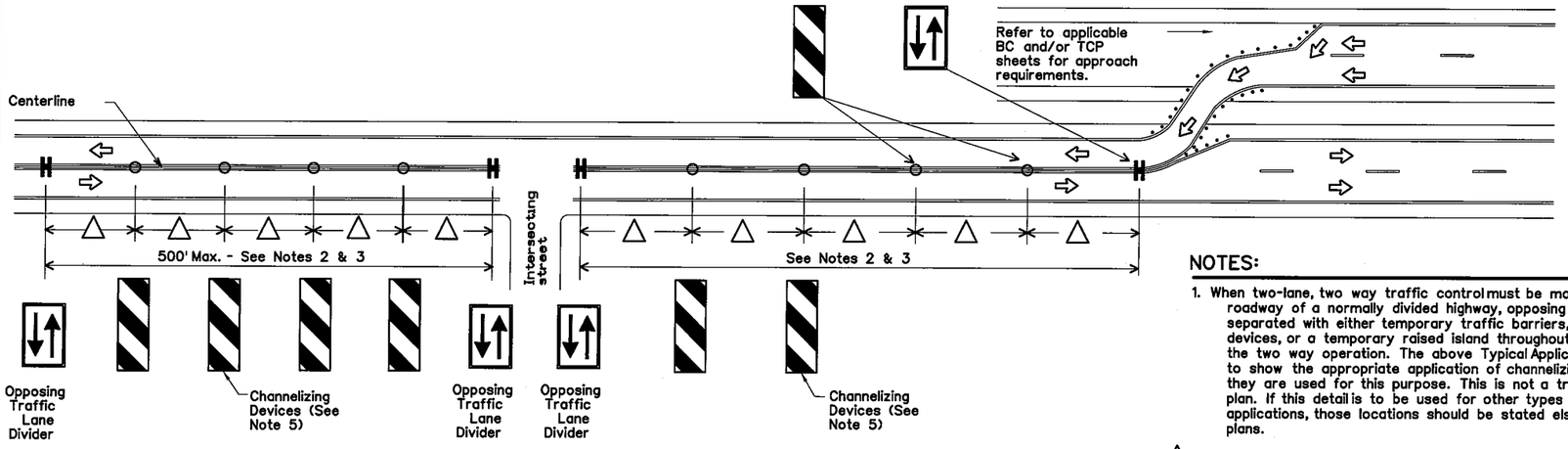
BARRIER DELINEATION WITH MODULAR GLARE SCREENS

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



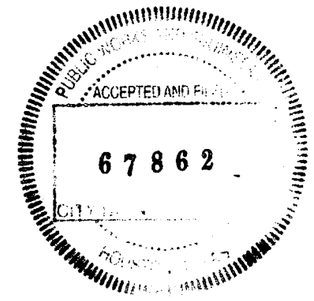
VERTICAL PANELS & OPPOSING TRAFFIC LANE DIVIDERS (OTLD) SEPARATING TWO-WAY TRAFFIC ON NORMALLY DIVIDED HIGHWAYS

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

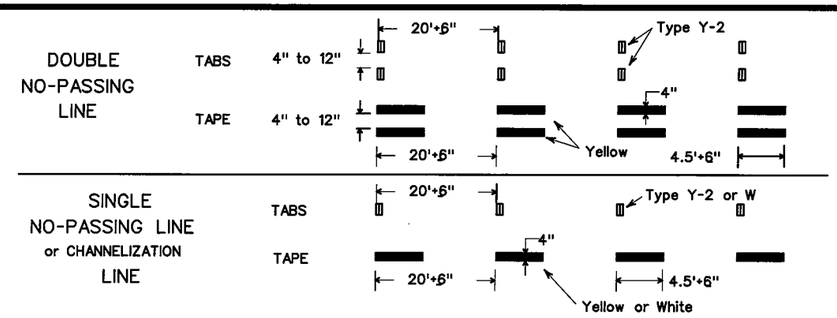
FILE: wztd-17.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-98 2-17 3-03 7-13	0912	72	391	CS
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		81

DATE:
FILE:

110

DATE:
FILE:

WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS



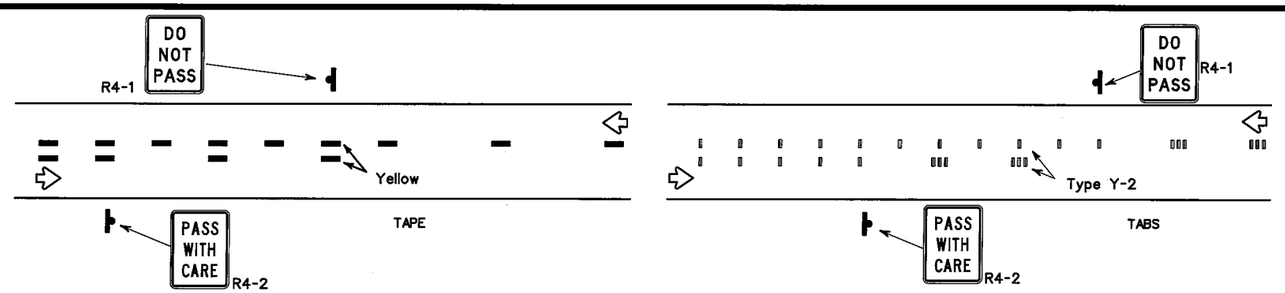
NOTES:

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.

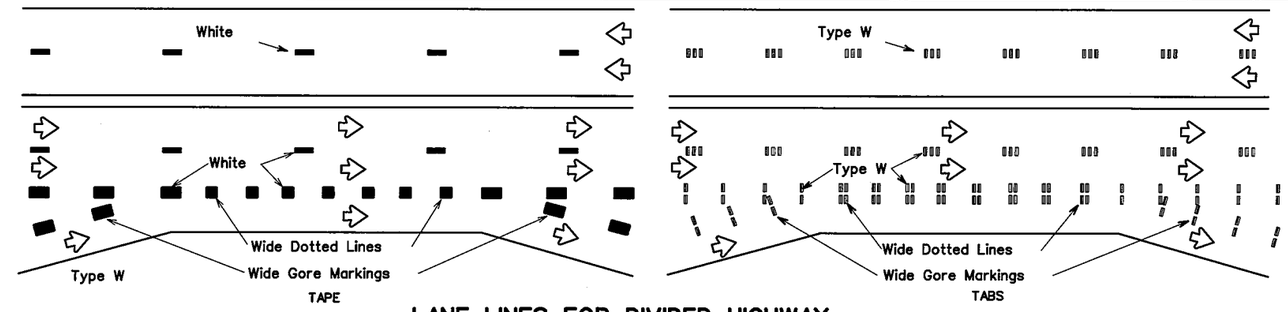
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS (TABS)

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.

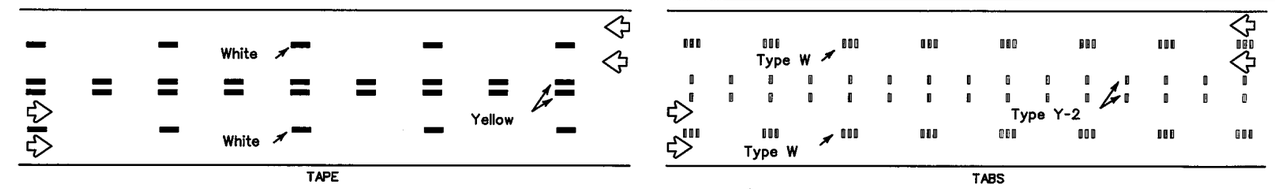
WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS



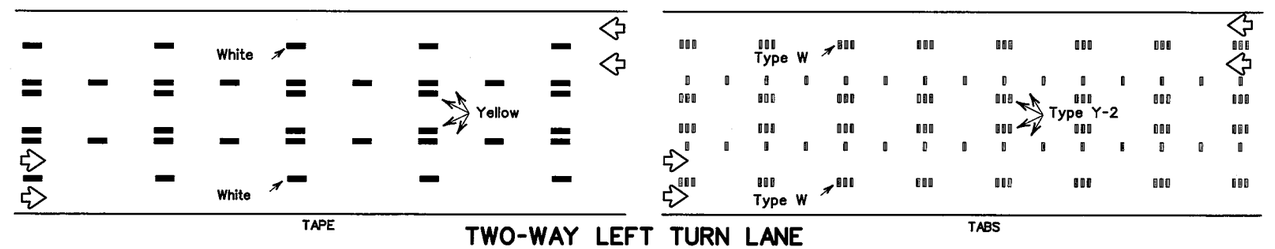
CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO LANE TWO-WAY HIGHWAYS



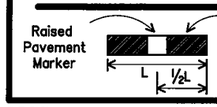
LANE LINES FOR DIVIDED HIGHWAY



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-8241 "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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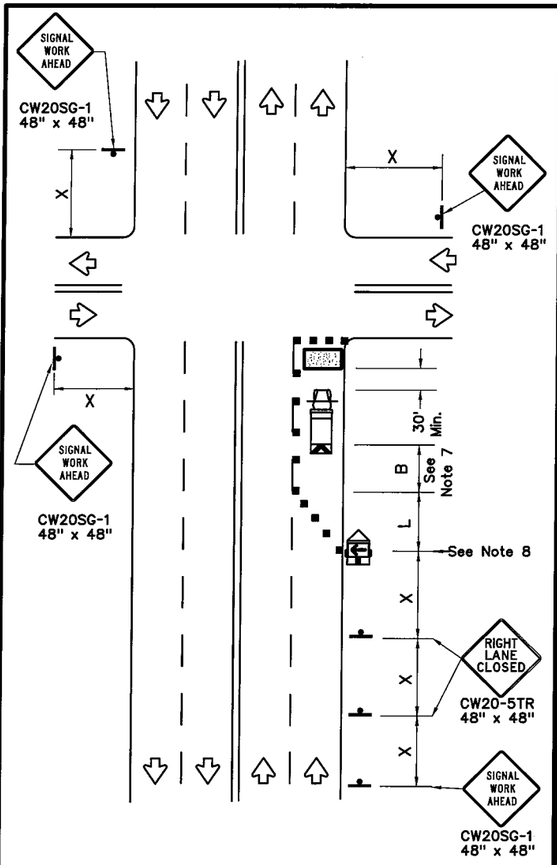
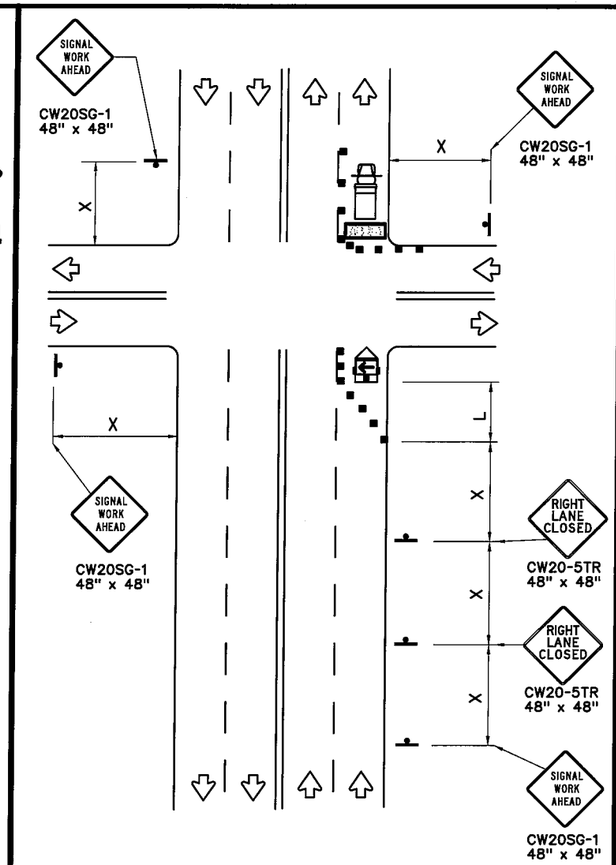
1-97	DIST	COUNTY		SHEET NO.
3-03	HOU	HARRIS		82
7-13				

111



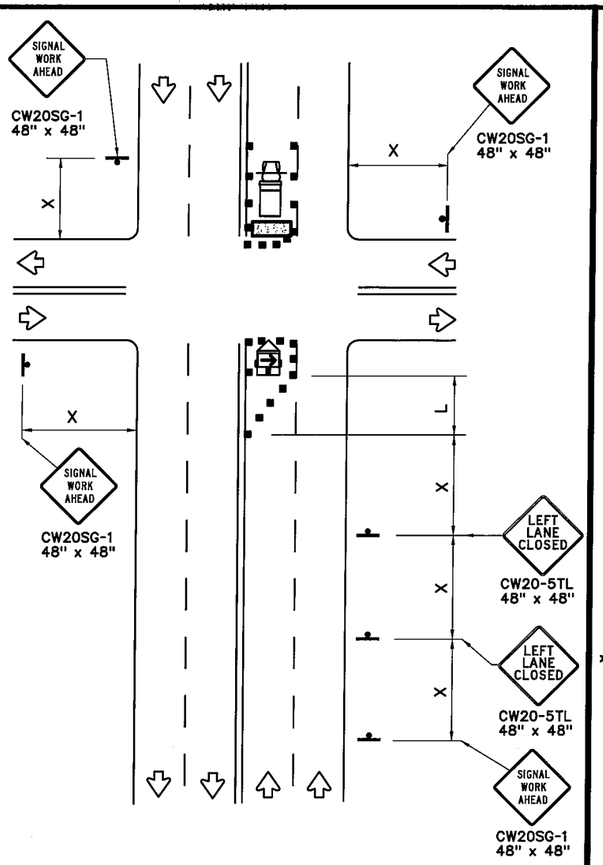
NEAR SIDE LANE CLOSURE

SHORT DURATION OR SHORT TERM STATIONARY



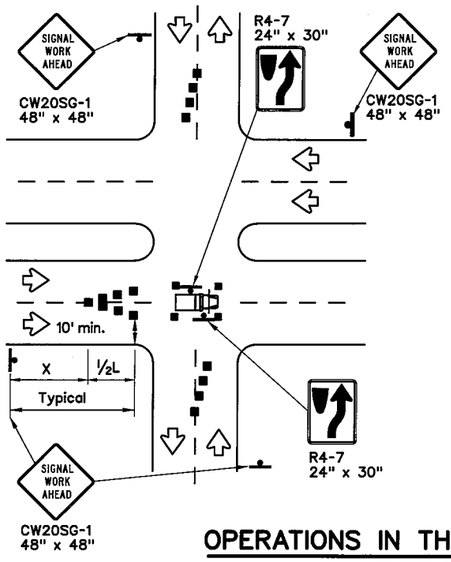
FAR SIDE RIGHT LANE CLOSURE

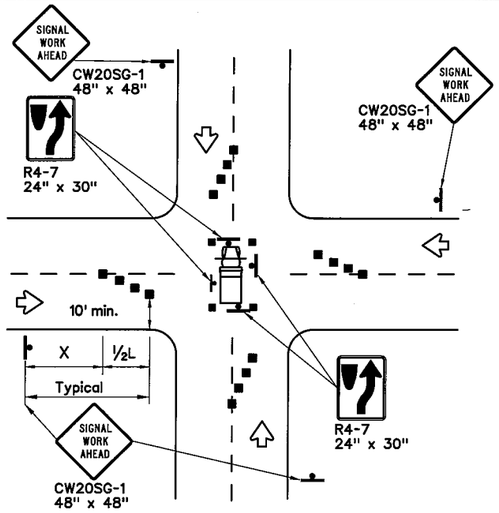
SHORT DURATION OR SHORT TERM STATIONARY



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'

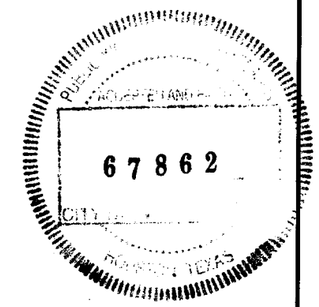
* Conventional Roads Only

** 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.



SHEET 1 OF 2

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC SIGNAL WORK TYPICAL DETAILS

WZ(BTS-1)-13

FILE: wzbts-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
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2-98 10-99 7-13	DIST	COUNTY		SHEET NO.
4-98 3-03	HOU	HARRIS		83

114

DATE:
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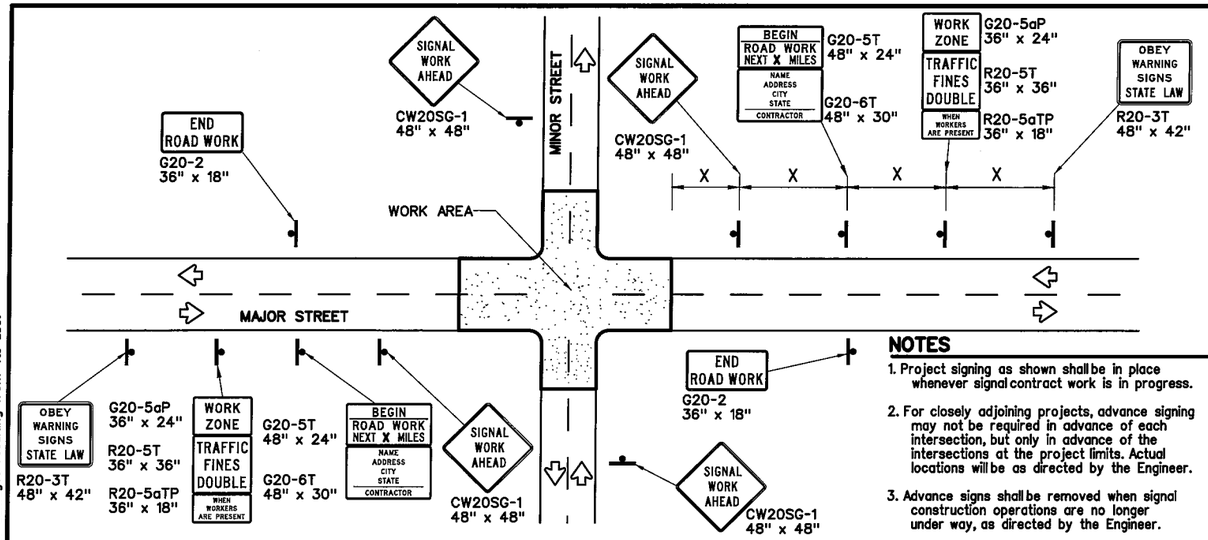


TYPICAL ADVANCE SIGNAL PROJECT SIGNING

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

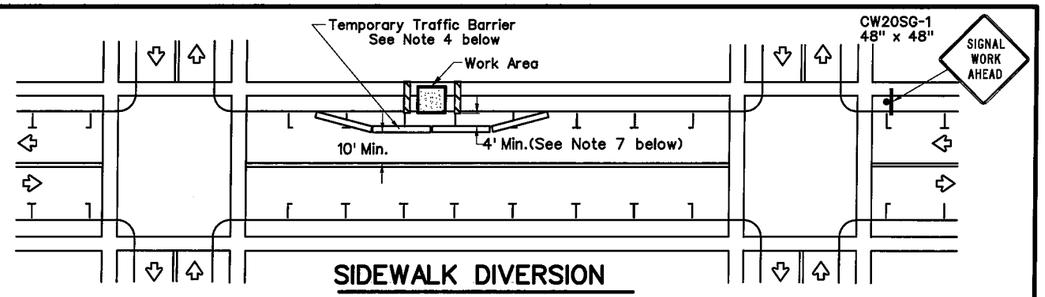
1. Weights used to keep signs from turning over should be sandbags filled with dry, cohesionless material.
2. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
3. Rock, concrete, iron, steel or other solid objects will not be permitted for use as sign support 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

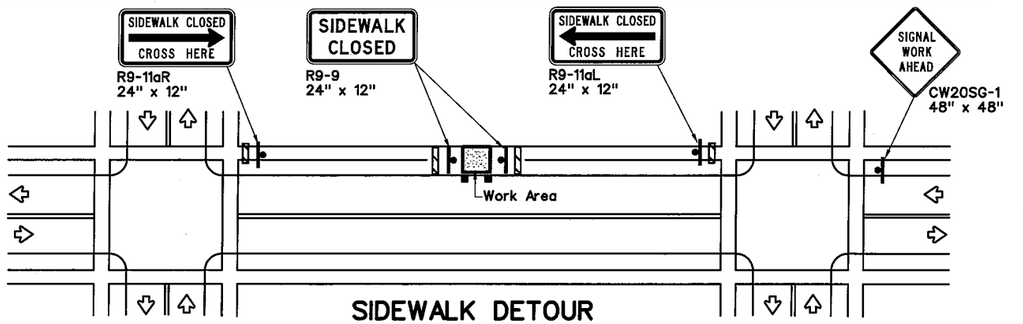
DEPARTMENTAL MATERIAL SPECIFICATIONS	
SIGN FACE MATERIALS	DMS-8300
FLEXIBLE ROLL-UP REFLECTIVE SIGNS	DMS-8310

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

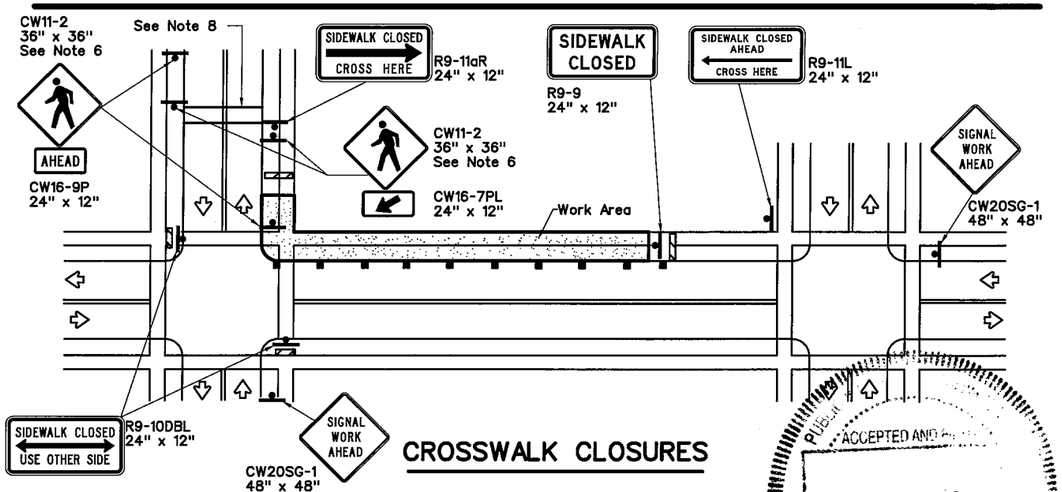
Only pre-qualified products shall be used. A copy of the "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources and may be found at the following web address:
http://www.txdot.gov/txdot_library/publications/construction.htm



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

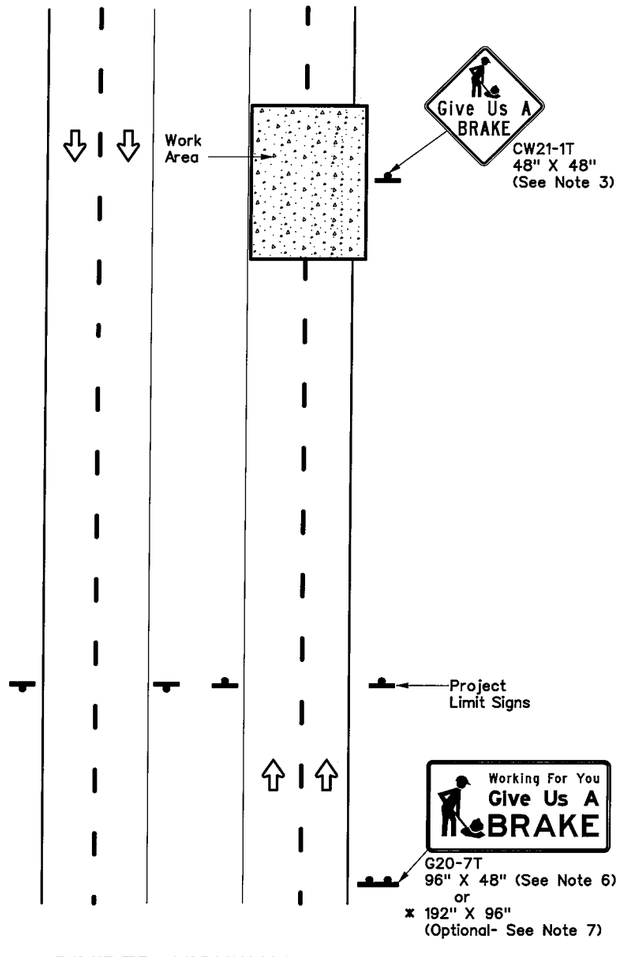
TRAFFIC SIGNAL WORK BARRICADES AND SIGNS

WZ(BTS-2)-13

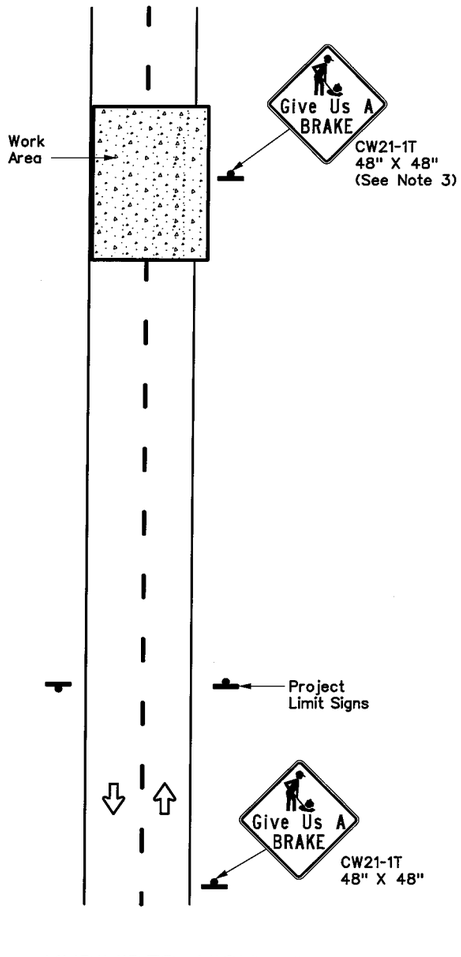
FILE: wzbts-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	72	391	CS
2-98 10-99 7-13	DIST	COUNTY		SHEET NO.
4-98 3-03	HOU	HARRIS		84

115

DATE:
FILE:



DIVIDED HIGHWAY



UNDIVIDED HIGHWAY

SIGNS ARE SHOWN FOR ONE DIRECTION OF TRAVEL

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

SUMMARY OF LARGE SIGNS

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

▲ See Note 6 Below

LEGEND	
	Sign
	Large Sign
	Traffic Flow

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

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

GENERAL NOTES

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

Texas Department of Transportation

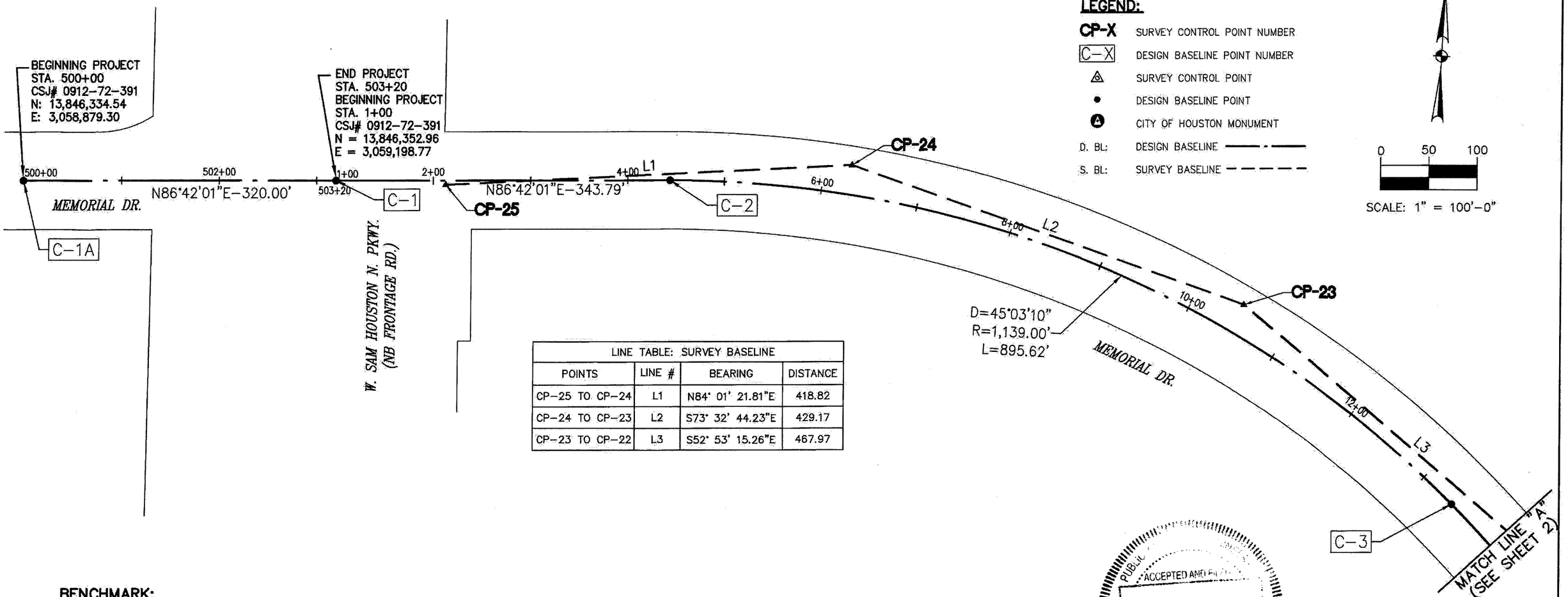
Traffic Operations Division Standard

WORK ZONE "GIVE US A BRAKE" SIGNS

WZ(BRK)-13

FILE: wzbrk-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 1995	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	72	391	CS
6-96 5-98 7-13	DIST	COUNTY		SHEET NO.
8-96 3-03	HOU	HARRIS		85

116



LINE TABLE: SURVEY BASELINE			
POINTS	LINE #	BEARING	DISTANCE
CP-25 TO CP-24	L1	N84° 01' 21.81"E	418.82
CP-24 TO CP-23	L2	S73° 32' 44.23"E	429.17
CP-23 TO CP-22	L3	S52° 53' 15.26"E	467.97

BENCHMARK:

CITY OF HOUSTON MONUMENT 4957-7713, A BRASS DISK IN CONCRETE, LOCATED ON MEMORIAL DRIVE APPROXIMATELY 150 FEET SOUTH OF OLD OAKS DRIVE INTERSECTION.

ELEV. 67.80 FEET NAVD 1988

NOTE:

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ALL ELEVATIONS ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).

VERTICAL DATUM ADJUSTMENT TO TXDOT REFERENCE DATUM:

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NAVD 1988 (TXDOT MONUMENT) ELEVATION
= NAVD 1988 (CITY OF HOUSTON MONUMENT) ELEVATION + 0.91 FT

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED
PROFESSIONAL ENGINEER

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

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

_____, P.E. DATE: 12/6/19

ACCEPTED AND FILED
PUBLIC
67862
CITY
HOUSTON, TEXAS

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

THIS SURVEY WAS PERFORMED UNDER MY SUPERVISION.

_____ R.P.L.S. DATE: 12/6/19

REV. NO.	DATE	DESCRIPTION	BY

KUO & associates, Inc.
Consulting Engineers & Surveyors
10300 Westoffice Dr., Suite 800, Houston, Texas 77042
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Engineering Firm Registration No. F-4578
Surveying Firm Registration No. 1007560

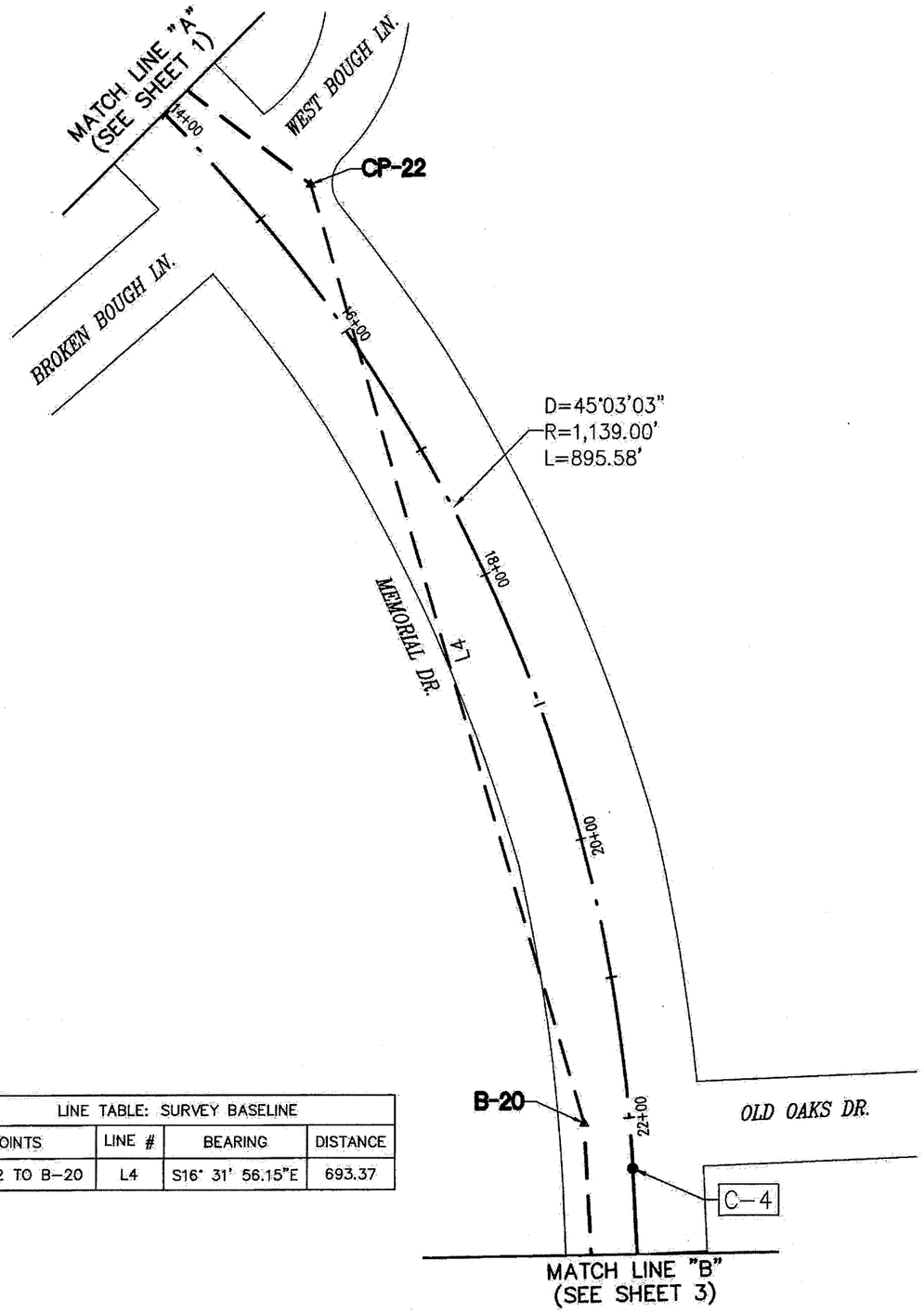
Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY
FIRM REGISTATION NO. 2614

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

SURVEY CONTROL INDEX SHEET

SHEET 1 OF 6

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK: DGN:	6	TEXAS				
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK: DWG:	HOU	HARRIS	0912	72	391	86



LINE TABLE: SURVEY BASELINE			
POINTS	LINE #	BEARING	DISTANCE
CP-22 TO B-20	L4	S16° 31' 56.15"E	693.37

BENCHMARK:

CITY OF HOUSTON MONUMENT 4957-7713, A BRASS DISK IN CONCRETE, LOCATED ON MEMORIAL DRIVE APPROXIMATELY 150 FEET SOUTH OF OLD OAKS DRIVE INTERSECTION.

ELEV. 67.80 FEET NAVD 1988

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= NAVD 1988 (CITY OF HOUSTON MONUMENT) ELEVATION + 0.91 FT

0 50 100

SCALE: 1" = 100'-0"

LEGEND:

CP-X	SURVEY CONTROL POINT NUMBER
C-X	DESIGN BASELINE POINT NUMBER
	SURVEY CONTROL POINT
	DESIGN BASELINE POINT
	CITY OF HOUSTON MONUMENT
D. BL:	DESIGN BASELINE
S. BL:	SURVEY BASELINE

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED
PROFESSIONAL ENGINEER

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KUTUBUL A. M. MAINUDDIN
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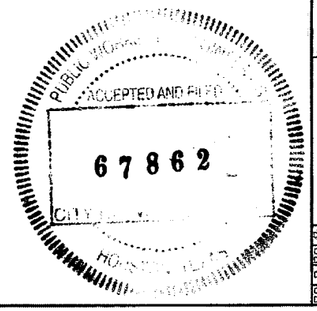

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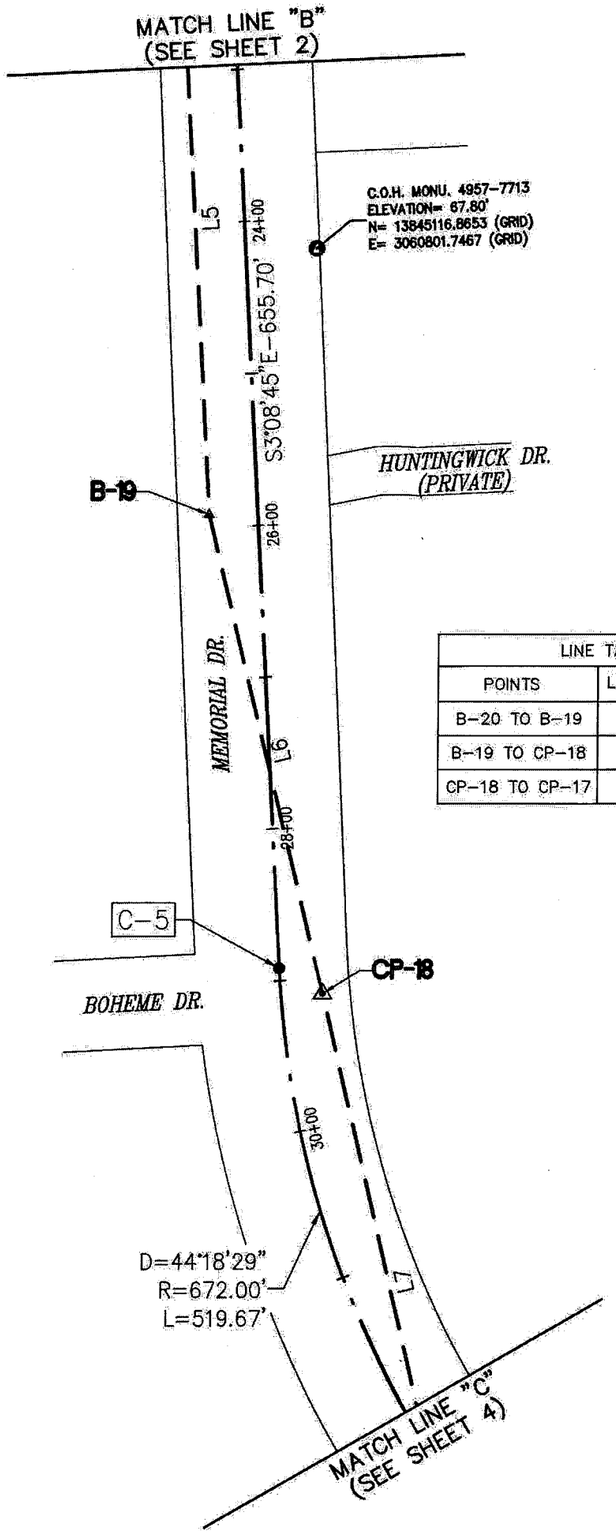
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

SURVEY CONTROL INDEX SHEET

SHEET 2 OF 6

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS				
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	87



LINE TABLE: SURVEY BASELINE			
POINTS	LINE #	BEARING	DISTANCE
B-20 TO B-19	L5	S3° 14' 35.05"E	388.86
B-19 TO CP-18	L6	S13° 44' 38.43"E	324.27
CP-18 TO CP-17	L7	S13° 10' 47.36"E	391.49

BENCHMARK:

CITY OF HOUSTON MONUMENT 4957-7713, A BRASS DISK IN CONCRETE, LOCATED ON MEMORIAL DRIVE APPROXIMATELY 150 FEET SOUTH OF OLD OAKS DRIVE INTERSECTION.

ELEV. 67.80 FEET NAVD 1988

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0 50 100

SCALE: 1" = 100'-0"

LEGEND:

CP-X	SURVEY CONTROL POINT NUMBER
C-X	DESIGN BASELINE POINT NUMBER
	SURVEY CONTROL POINT
	DESIGN BASELINE POINT
	CITY OF HOUSTON MONUMENT
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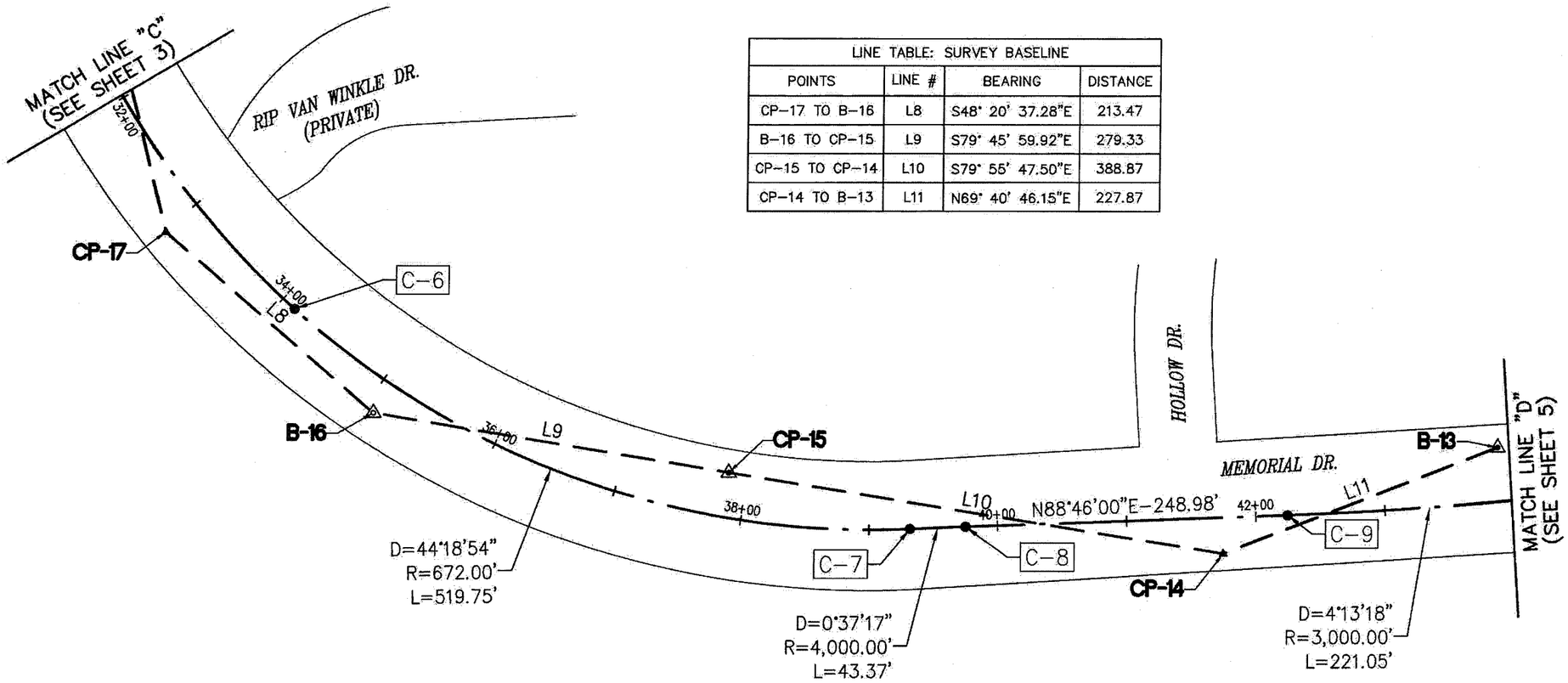
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

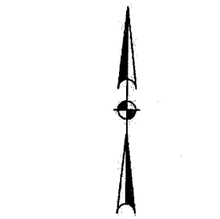
SURVEY CONTROL INDEX SHEET

SHEET 3 OF 6

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK. DGN:	6	TEXAS				
DWG.	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK. DWG.	HOU	HARRIS	0912	72	391	88



LINE TABLE: SURVEY BASELINE			
POINTS	LINE #	BEARING	DISTANCE
CP-17 TO B-16	L8	S48° 20' 37.28"E	213.47
B-16 TO CP-15	L9	S79° 45' 59.92"E	279.33
CP-15 TO CP-14	L10	S79° 55' 47.50"E	388.87
CP-14 TO B-13	L11	N69° 40' 46.15"E	227.87



SCALE: 1" = 100'-0"

LEGEND:

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

SURVEY CONTROL INDEX SHEET

SHEET 4 OF 6

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
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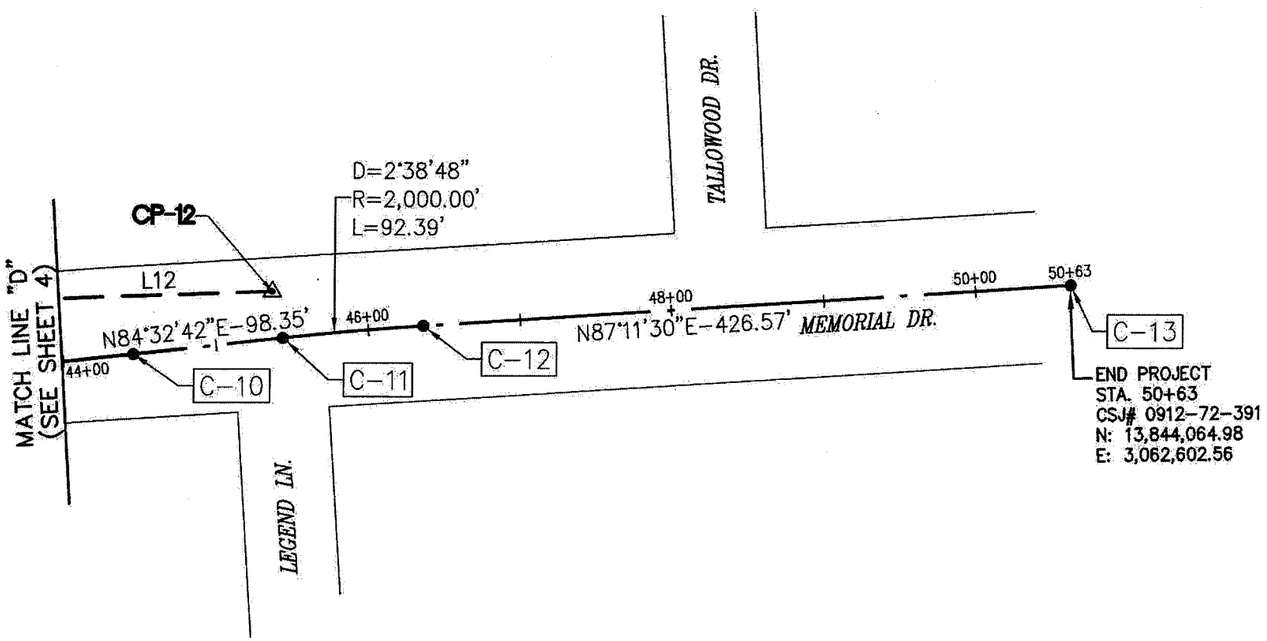
CHK DWG:	HOU	HARRIS	0912	72	391	89



LINE TABLE: SURVEY BASELINE			
POINTS	LINE #	BEARING	DISTANCE
B-13 TO CP-12	L12	N88° 57' 01.31"E	148.09

BENCHMARK:

CITY OF HOUSTON MONUMENT 4957-7713, A BRASS DISK IN CONCRETE, LOCATED ON MEMORIAL DRIVE APPROXIMATELY 150 FEET SOUTH OF OLD OAKS DRIVE INTERSECTION.

ELEV. 67.80 FEET NAVD 1988

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).

VERTICAL DATUM ADJUSTMENT TO TXDOT REFERENCE DATUM:

THE ELEVATION DIFFERENCE IN BETWEEN THE TXDOT MONUMENT'S (L1020222) PUBLISHED DATUM NAVD 1988 AND CITY OF HOUSTON MONUMENT'S DATUM NAVD 1988 IS 0.91'.

NAVD 1988 (TXDOT MONUMENT) ELEVATION
= NAVD 1988 (CITY OF HOUSTON MONUMENT) ELEVATION + 0.91 FT

0 50 100

SCALE: 1" = 100'-0"

LEGEND:

CP-X	SURVEY CONTROL POINT NUMBER
C-X	DESIGN BASELINE POINT NUMBER
	SURVEY CONTROL POINT
	DESIGN BASELINE POINT
	CITY OF HOUSTON MONUMENT
D. BL:	DESIGN BASELINE
S. BL:	SURVEY BASELINE

ACCEPTED AND FILED
67862

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED
PROFESSIONAL ENGINEER

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

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

_____, P.E. DATE: 12/6/19

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

THIS SURVEY WAS PERFORMED UNDER MY SUPERVISION.

_____ R.P.L.S. DATE: 12/6/19

REV. NO.	DATE	DESCRIPTION	BY

KUO
& associates, Inc.
Consulting Engineers
& Surveyors
10300 Westoffice Dr., Suite 800, Houston, Texas 77042
Tel: 713-975-8769, Fax: 713-975-0920, www.kuoassociates.com
Engineering Firm Registration No. F-4578
Surveying Firm Registration No. 1007560

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

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

SURVEY CONTROL INDEX SHEET

SHEET 5 OF 6

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS				
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	90

SURVEY BASELINE POINTS DATA (TEMPORARY BENCHMARK)						
POINT No.	NORTHING (SURFACE)	EASTING (SURFACE)	ELEVATION	D. BL STA.	OFFSET	DESCRIPTION
CP-12	13,844,068.01	3,062,077.71	74.13'	45+40.16	31.08L	SET 1/2" I.R. W/ CAP
B-13	13,844,065.30	3,061,929.64	74.13'	43+91.75	41.98L	SET "X" CUT
CP-14	13,843,986.16	3,061,715.95	67.00'	41+74.35	33.82R	SET 1/2" I.R. W/ CAP
CP-15	13,844,054.16	3,061,333.07	67.18'	37+84.43	34.70L	SET "X" CUT
B-16	13,844,103.78	3,061,058.19	68.72'	35+07.80	26.08R	SET 1/2" I.R. W/ CAP
CP-17	13,844,245.66	3,060,898.70	67.94'	33+04.42	33.08R	SET "X" CUT
CP-18	13,844,626.84	3,060,809.43	69.13'	29+10.59	27.40L	SET "X" CUT
B-19	13,844,941.83	3,060,732.39	67.63'	25+94.22	33.98R	SET 1/2" I.R. W/ CAP
B-20	13,845,330.07	3,060,710.39	68.40'	22+04.31	34.13R	SET 1/2" I.R. W/ CAP
CP-22	13,845,994.77	3,060,513.09	71.87'	15+05.73	40.65L	SET "X" CUT
CP-23	13,846,277.14	3,060,139.90	73.07'	10+48.64	28.67L	SET 1/2" I.R. W/ CAP
CP-24	13,846,398.70	3,059,728.31	73.77'	6+27.54	28.32L	SET 1/2" I.R. W/ CAP
CP-25	13,846,355.09	3,059,311.76	74.13'	2+12.93	6.37R	SET "X" CUT

DESIGN BASELINE POINTS DATA			
POINT No.	D. BL STA.	NORTHING (SURFACE)	EASTING (SURFACE)
C-1A	500+00.00	13,846,334.54	3,058,879.30
C-1	503+20.00 1+00.00	13,846,352.96	3,059,198.77
C-2	4+43.79	13,846,372.75	3,059,541.99
C-3	13+41.46	13,846,085.03	3,060,366.40
C-4	22+39.13	13,845,298.14	3,060,744.84
C-5	28+94.85	13,844,643.42	3,060,780.82
C-6	34+20.03	13,844,184.85	3,060,997.81
C-7	39+45.21	13,844,008.65	3,061,473.56
C-8	45+41.10	13,844,009.82	3,061,516.91
C-9	45+71.11	13,844,015.18	3,061,765.84
C-10	50+63.69	13,844,028.07	3,061,986.46
C-11	45+43.87	13,844,037.42	3,062,084.36
C-12	46+36.26	13,844,044.08	3,062,176.50
C-13	50+62.83	13,844,064.98	3,062,602.56

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED
PROFESSIONAL ENGINEER

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

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_____, P.E. DATE: 12/6/19

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

THIS SURVEY WAS PERFORMED UNDER MY SUPERVISION.

_____, R.P.L.S. DATE: 12/6/19

PUBLIC ROADS
ACCEPTED AND
67862

REV. NO.	DATE	DESCRIPTION	BY

KUO & associates, Inc.
Consulting Engineers & Surveyors
10300 Westoffice Dr., Suite 800, Houston, Texas 77042
Tel: 713-975-8769, Fax: 713-975-0920, www.kuoassociates.com
Engineering Firm Registration No. F-4526
Surveying Firm Registration No. 1007560

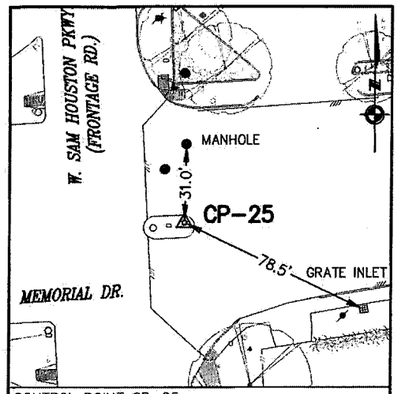
Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY
FIRM REGISTATION NO. 2614

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

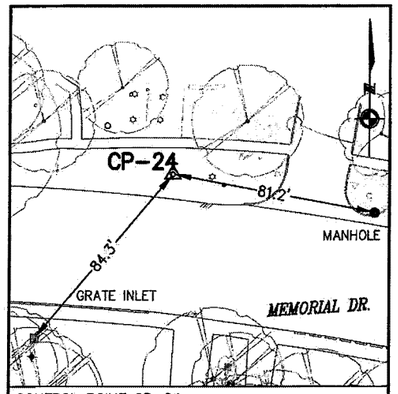
SURVEY CONTROL INDEX SHEET

SHEET 6 OF 6

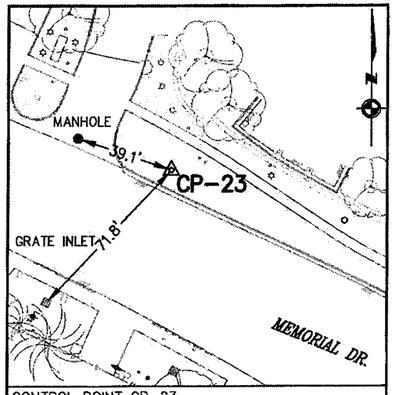
DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS				
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	91



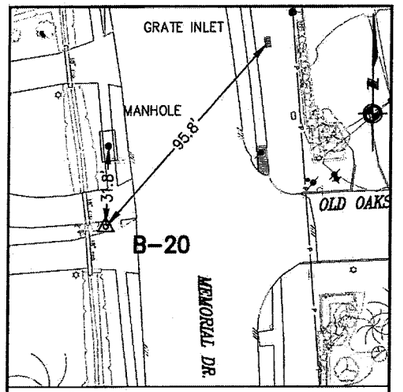
CONTROL POINT CP-25
NORTHING: 13,846,355.09
EASTING: 3,059,311.76
CL STA./OFFSET: 2+12.93 / 6.37 RT
ELEV.=74.13'
DESC.: SET "X" CUT



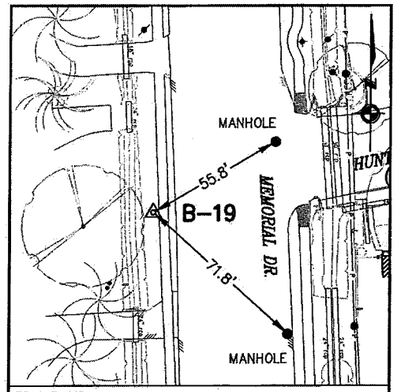
CONTROL POINT CP-24
NORTHING: 13,846,398.70
EASTING: 3,059,728.31
CL STA./OFFSET: 6+27.54 / 28.32 LT
ELEV.=73.77'
DESC.: SET 1/2" I.R. W/ CAP



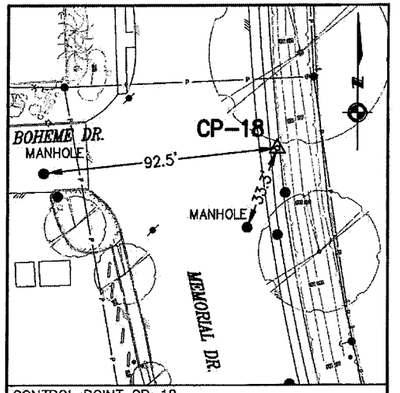
CONTROL POINT CP-23
NORTHING: 13,846,277.14
EASTING: 3,060,139.90
CL STA./OFFSET: 10+48.64 / 28.67 LT
ELEV.=73.07'
DESC.: SET 1/2" I.R. W/ CAP



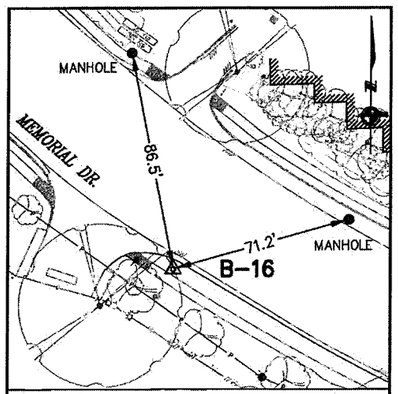
TBM B-20
NORTHING: 13,845,330.07
EASTING: 3,060,710.39
CL STA./OFFSET: 22+04.31 / 34.13 RT
ELEV.=68.40'
DESC.: SET 1/2" I.R. W/ CAP



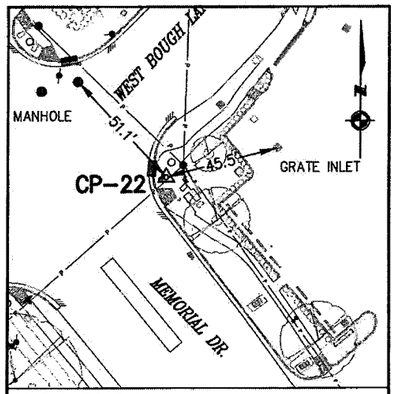
TBM B-19
NORTHING: 13,844,941.83
EASTING: 3,060,732.39
CL STA./OFFSET: 25+94.22 / 33.98 RT
ELEV.=67.63'
DESC.: SET 1/2" I.R. W/ CAP



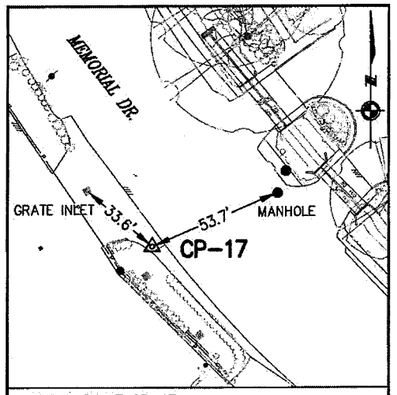
CONTROL POINT CP-18
NORTHING: 13,844,626.84
EASTING: 3,060,809.43
CL STA./OFFSET: 29+13.68 / 25.41 LT
ELEV.=69.13'
DESC.: SET "X" CUT



TBM B-16
NORTHING: 13,844,103.78
EASTING: 3,061,058.19
CL STA./OFFSET: 35+09.43 / 27.29 RT
ELEV.=68.72'
DESC.: SET 1/2" I.R. W/ CAP



CONTROL POINT CP-22
NORTHING: 13,845,994.77
EASTING: 3,060,513.09
CL STA./OFFSET: 15+05.73 / 40.65 LT
ELEV.=71.87'
DESC.: SET "X" CUT



CONTROL POINT CP-17
NORTHING: 13,844,245.66
EASTING: 3,060,898.70
CL STA./OFFSET: 33+04.42 / 33.08 RT
ELEV.=67.94'
DESC.: SET "X" CUT

0 30 60

SCALE: 1" = 60'-0"

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

BENCHMARK:

CITY OF HOUSTON MONUMENT 4957-7713, A BRASS DISK IN CONCRETE, LOCATED ON MEMORIAL DRIVE APPROXIMATELY 150 FEET SOUTH OF OLD OAKS DRIVE INTERSECTION.

ELEV. 67.80 FEET NAVD 1988

NOTE:

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

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_____ R.P.L.S. DATE: 12/6/19

PUBLIC WORKS AND ENGINEERING
ACCEPTED AND F...
67862

REV. NO.	DATE	DESCRIPTION	BY

KUO & associates, Inc.
Consulting Engineers & Surveyors
10300 Westoffice Dr., Suite 800, Houston, Texas 77042
Tel: 713-975-8769, Fax: 713-975-0920, www.kuoassociates.com
Engineering Firm Registration No. F-4578
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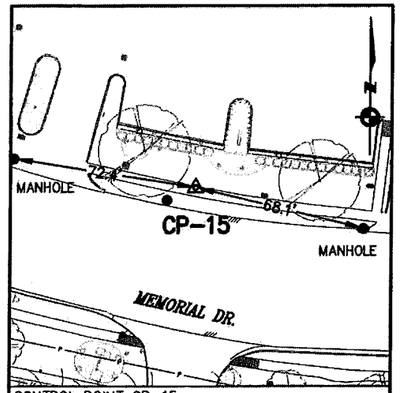
A LEO A DALY COMPANY
FIRM REGISTATION NO. 2614

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

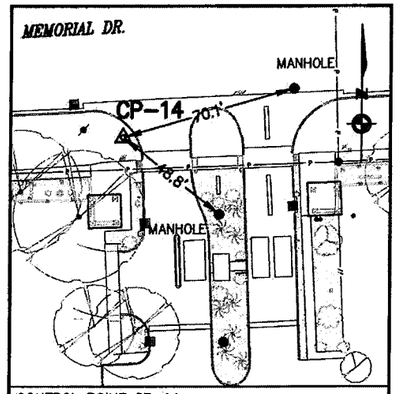
HORIZONTAL AND VERTICAL CONTROL

SHEET 1 OF 2

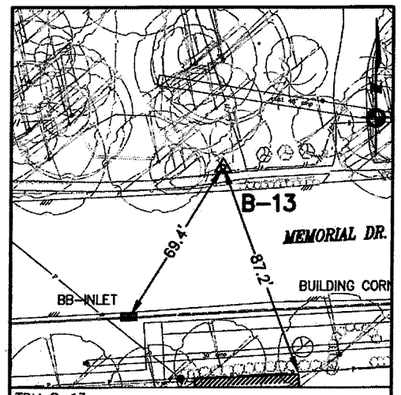
DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS				
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	92



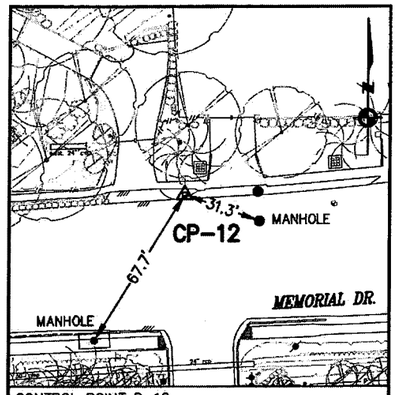
CONTROL POINT CP-15
NORTHING: 13,844,054.16
EASTING: 3,061,333.07
CL STA./OFFSET: 37+85.54 / 34.23 LT
ELEV.=67.18'
DESC.: SET "X" CUT



CONTROL POINT CP-14
NORTHING: 13,843,986.16
EASTING: 3,061,715.95
CL STA./OFFSET: 41+74.35 / 33.82 RT
ELEV.=67.00'
DESC.: SET 1/2" I.R. W/ CAP

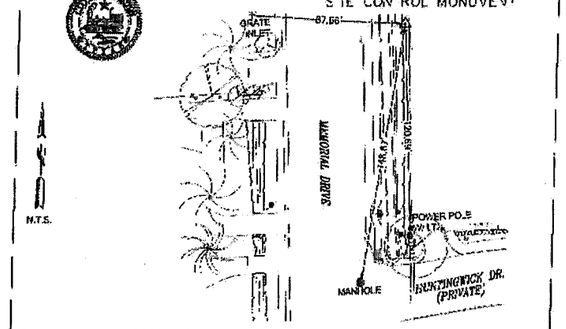


TBM B-13
NORTHING: 13,844,065.30
EASTING: 3,061,929.64
CL STA./OFFSET: 43+91.53 / 35.15 LT
ELEV.=65.72'
DESC.: SET "X" CUT



CONTROL POINT B-12
NORTHING: 13,844,068.01
EASTING: 3,062,077.71
CL STA./OFFSET: 45+39.56 / 30.89 LT
ELEV.=66.89'
DESC.: SET 1/2" I.R. W/ CAP

CITY OF HOUSTON 4957
CITY SURVEY 77'3
S TE CONTROL MONUVENT



Project WBS#: N-T:7C0C-C312-4
Texas Coordinate System of 1983, South Central Zone, U. S. Survey Feet
X= 3,060,403.8845
Y= 13,843,377.2355
Lat.= 29° 46' 08.32251" (N)
Lon.= 95° 33' 27.84560" (W)
Reference Frame Used: NAD '83 (2011) (EPOCH: 2010)
Vertical Adjustment used: NAVD '88
General Location: NORTHWEST OF THE INTERSECTION OF MEMORIAL DRIVE AT HUNTINGWICK DRIVE
Date Set: 12-17-'4 Type of Work: 4A
3 Nearest project control points (bearings and distances station below):
1 S 2°36'57" W 188.27'
2 N 23°11'40" W 231.85'
3 S 00°53'55" E 490.08'

NOTE:
1. Bearings are grid bearings.
2. Scale Factor = (S.F. 0.999870017).
3. Surface= Grid / S.F.

Keymap Page: 489 H
Orthometric Elevation = 67.80 FEET
Ellipsoid Height= -22.106 FEET
Geoid: GEOID '12A
Datum Source & Adjustment: GPS STATIC

Surveyed By: Kuo & Associates, Inc.
10700 Richmond Avenue, Suite 103
Houston, TX 77042

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

City of Houston, Harris County, Texas

0 30 60
SCALE: 1" = 60'-0"

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

BENCHMARK:

CITY OF HOUSTON MONUMENT 4957-7713, A BRASS DISK IN CONCRETE, LOCATED ON MEMORIAL DRIVE APPROXIMATELY 150 FEET SOUTH OF OLD OAKS DRIVE INTERSECTION.

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STATE OF TEXAS MICHAEL A. SALINAS 123342 LICENSED PROFESSIONAL ENGINEER

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

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_____, P.E. DATE: 12/6/19

THIS SURVEY WAS PERFORMED UNDER MY SUPERVISION.

_____, R.P.L.S. DATE: 12/6/19

PUBLIC WORKS AND ENGINEERING ACCEPTED JAN 2020 67862

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

REV. NO.	DATE	DESCRIPTION	BY

KUO & associates, Inc. 03/04/2020
Consulting Engineers & Surveyors
10300 Westoffice Dr., Suite 800, Houston, Texas 77042
Tel: 713-975-8769, Fax: 713-975-0920, www.kuoassociates.com
Engineering Firm Registration No. F-4578
Surveying Firm Registration No. 1007560

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

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

HORIZONTAL AND VERTICAL CONTROL

SHEET 2 OF 2

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS				
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	93

Beginning chain PR-MEM-NEW description

Point 302 N 13,846,352.9565 E 3,059,198.7711 Sta 1+00.00

Course from 302 to PC PR-MEM-NEW-1 N 86° 42' 00.90" E Dist 343.7915

Curve Data

Curve PR-MEM-NEW-1
P.I. Station 15+85.85 N 13,846,438.4818 E 3,060,682.1620
Delta - 90° 09' 13.92" (RT)
Degree - 5° 01' 49.29"
Tangent - 1,142.0629
Length - 1,792.1958
Radius - 1,139.0000
External - 473.9565
Long Chord - 1,612.9507
Mid. Ord. - 334.6875
P.C. Station 4+43.79 N 13,846,372.7450 E 3,059,541.9925
P.T. Station 22+35.99 N 13,845,298.1399 E 3,060,744.8366
C.C. N 13,845,235.6334 E 3,059,607.5530
Back - N 86° 42' 00.90" E
Ahead - S 3° 08' 45.18" E
Chord Bear - S 48° 13' 22.14" E

Course from PT PR-MEM-NEW-1 to PC PR-MEM-NEW-2 S 3° 08' 45.18" E Dist 655.7047

Curve Data

Curve PR-MEM-NEW-2
P.I. Station 35+48.72 N 13,843,987.3896 E 3,060,816.8771
Delta - 88° 42' 31.60" (LT)
Degree - 8° 31' 34.17"
Tangent - 657.0239
Length - 1,040.4309
Radius - 672.0000
External - 267.8214
Long Chord - 939.5828
Mid. Ord. - 191.5002
P.C. Station 28+91.69 N 13,844,643.4233 E 3,060,780.8207
P.T. Station 39+32.12 N 13,844,008.6537 E 3,061,473.5568
C.C. N 13,844,680.3017 E 3,061,451.8080
Back - S 3° 08' 45.18" E
Ahead - N 88° 08' 43.22" E
Chord Bear - S 47° 30' 00.98" E

Curve Data

Curve PR-MEM-NEW-3
P.I. Station 39+53.81 N 13,844,009.3556 E 3,061,495.2318
Delta - 0° 37' 16.55" (RT)
Degree - 1° 25' 56.62"
Tangent - 21.6864
Length - 43.3724
Radius - 4,000.0000
External - 0.0588
Long Chord - 43.3722
Mid. Ord. - 0.0588
P.C. Station 39+32.12 N 13,844,008.6537 E 3,061,473.5568
P.T. Station 39+75.50 N 13,844,009.8224 E 3,061,516.9132
C.C. N 13,840,010.7491 E 3,061,603.0139
Back - N 88° 08' 43.22" E
Ahead - N 88° 45' 59.77" E
Chord Bear - N 88° 27' 21.50" E

Course from PT PR-MEM-NEW-3 to PC PR-MEM-NEW-4 N 88° 45' 59.77" E Dist 248.9804

Curve Data

Curve PR-MEM-NEW-4
P.I. Station 43+35.05 N 13,844,017.5618 E 3,061,876.3834
Delta - 4° 13' 18.02" (LT)
Degree - 1° 54' 35.49"
Tangent - 110.5732
Length - 221.0463
Radius - 3,000.0000
External - 2.0370
Long Chord - 220.9963
Mid. Ord. - 2.0357
P.C. Station 42+24.48 N 13,844,015.1817 E 3,061,765.8359
P.T. Station 44+45.52 N 13,844,028.0735 E 3,061,986.4558
C.C. N 13,847,014.4866 E 3,061,701.2603
Back - N 88° 45' 59.77" E
Ahead - N 84° 32' 41.75" E
Chord Bear - N 86° 39' 20.76" E

Course from PT PR-MEM-NEW-4 to PC PR-MEM-NEW-5 N 84° 32' 41.75" E Dist 98.3517

Curve Data

Curve PR-MEM-NEW-5
P.I. Station 45+90.07 N 13,844,041.8154 E 3,062,130.3538
Delta - 2° 38' 47.93" (RT)
Degree - 2° 51' 53.24"
Tangent - 46.2009
Length - 92.3854
Radius - 2,000.0000
External - 0.5336
Long Chord - 92.3772
Mid. Ord. - 0.5334
P.C. Station 45+43.87 N 13,844,037.4233 E 3,062,084.3621
P.T. Station 46+36.26 N 13,844,044.0791 E 3,062,176.4992
C.C. N 13,842,046.4812 E 3,062,274.4924
Back - N 84° 32' 41.75" E
Ahead - N 87° 11' 29.68" E
Chord Bear - N 85° 52' 05.71" E

Course from PT PR-MEM-NEW-5 to 303 N 87° 11' 29.68" E Dist 426.5707

Point 303 N 13,844,064.9796 E 3,062,602.5576 Sta 50+62.83

Ending chain PR-MEM-NEW description

STATE OF TEXAS
MARK WOODWARD
98672
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

Lockwood, Andrews & Newnam, Inc.
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

HORIZONTAL CURVE DATA

SHEET 1 OF 1

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	94

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67862
HARRIS COUNTY, TEXAS

Beginning profile PF-MEM-OPT3_MW description:

		STATION	ELEV	GRADE	TOTAL L	BACK L	AHEAD L
VPI	1	1+95.70	73.8822				
VPI	2	4+61.00	72.6000	-0.4833			
VPI	3	6+50.00	73.2615	0.3500			
VPI	4	8+50.00	72.5615	-0.3500			
VPI	5	9+90.03	73.0516	0.3500			
VPI	6	12+80.63	71.1185	-0.6652			
VPI	7	14+74.90	71.7985	0.3500			
VPI	8	17+10.00	70.2753	-0.6479			
VPI	9	20+85.00	68.1998	-0.5535			
VPI	10	22+35.00	68.7248	0.3500			
VPI	11	24+16.00	68.0900	-0.3507			
VPI	12	25+70.00	68.6500	0.3636			
VPI	13	26+70.00	68.2700	-0.3800			
VPI	14	27+70.00	68.8500	0.5800			
VPI	15	28+60.00	68.5282	-0.3575			
VPI	16	29+07.00	68.6927	0.3500			
VPI	17	30+15.00	68.1500	-0.5025			
VPI	18	31+00.00	68.4514	0.3545			
VPI	19	34+35.94	67.1700	-0.3814			
VPI	20	36+31.50	67.9700	0.4091			
VPI	21	38+25.00	66.8355	-0.5863			
VPI	22	39+30.00	67.2030	0.3500			
VPI	23	40+43.00	66.7100	-0.4362			
VPI	24	42+15.00	67.5700	0.5000			
VPI	25	43+60.00	67.0486	-0.3596			
VPI	26	46+00.00	67.9500	0.3756			
VPI	27	47+41.20	67.4558	-0.3500			
VPI	28	49+72.94	68.9948	0.6641			

Ending profile PF-MEM-OPT3_MW description

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

Lockwood, Andrews & Newnam, Inc.
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

VERTICAL CURVE DATA

SHEET 1 OF 1

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	95

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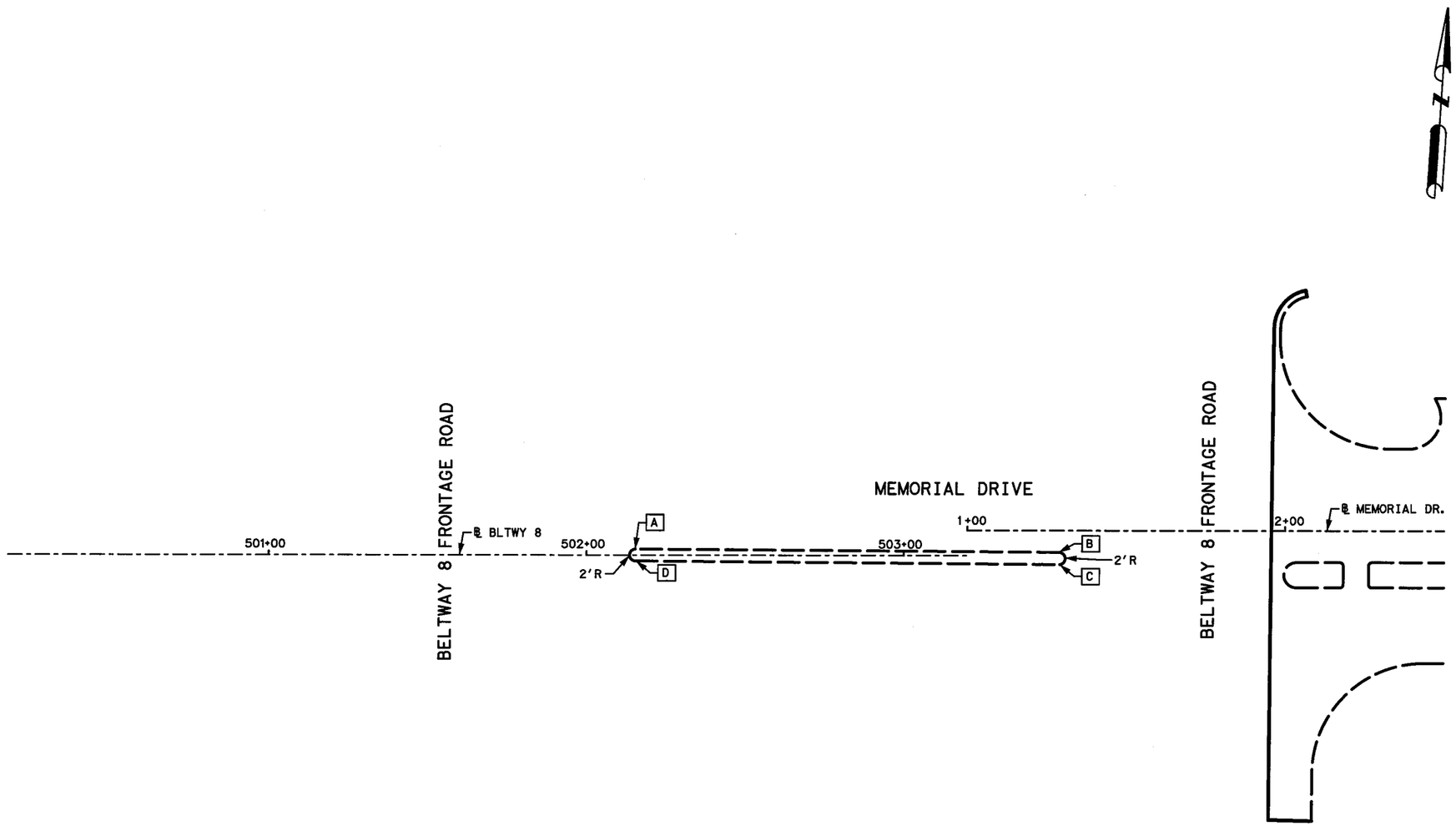
HORIZONTAL GEOMETRY DATA			
NO.	DESCRIP	STATION	OFFSET
A	PT	502+15.31	1.92 LT
B	PC	1+28.87	6.90 RT
C	PT	1+29.20	10.78 RT
D	PC	502+15.64	1.87 RT



0 40 80

(IN FEET)

SCALE: PLAN 1":40'

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

HORIZONTAL GEOMETRY LAYOUT

SHEET 1 OF 1

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	96

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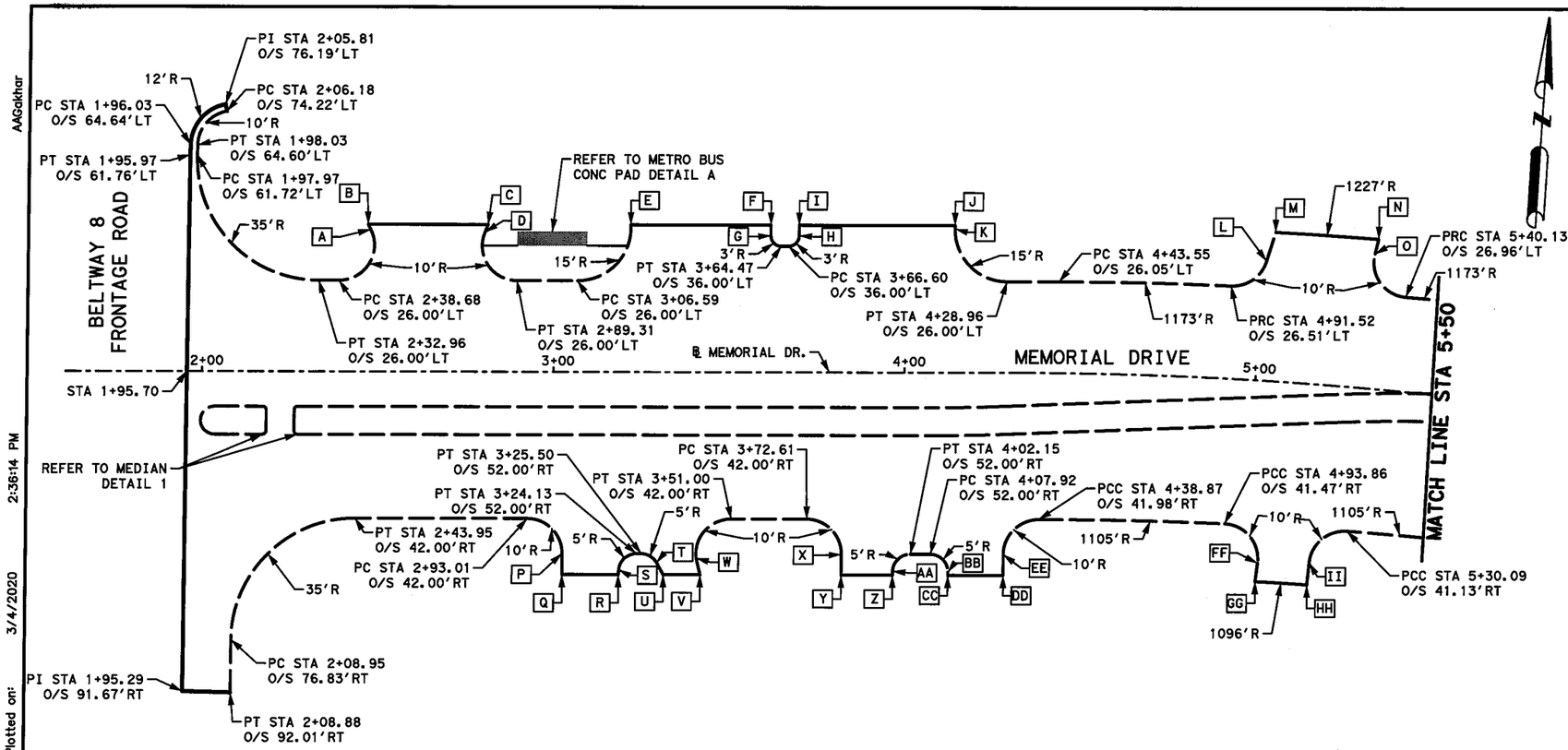


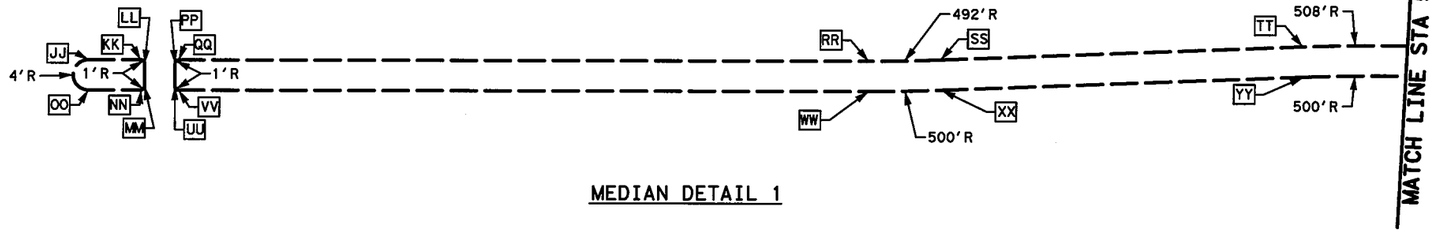
HORIZONTAL GEOMETRY DATA			
NO.	DESCRIP	STATION	OFFSET
JJ	PT	2+03.69	10.00 RT
KK	PC	2+17.37	10.00 RT
LL	PT	2+18.37	10.99 RT
MM	PC	2+18.37	17.01 RT
NN	PT	2+17.37	18.00 RT
OO	PC	2+03.69	18.00 RT
PP	PC	2+26.37	11.00 RT
QQ	PT	2+27.37	10.00 RT
RR	PC	4+08.48	10.00 RT
SS	PT	4+27.69	9.63 RT
TT	PC	5+22.97	2.45 RT
UU	PC	2+26.37	17.00 RT
VV	PT	2+27.37	18.00 RT
WW	PC	4+08.63	18.00 RT
XX	PT	4+27.85	17.63 RT
YY	PC	5+23.91	10.39 RT

HORIZONTAL GEOMETRY DATA			
NO.	DESCRIP	STATION	OFFSET
A	PT	2+47.59	40.54 LT
B	PI	2+46.85	42.00 LT
C	PI	2+80.96	42.00 LT
D	PC	2+80.06	39.80 LT
E	PI	3+21.56	42.00 LT
F	PI	3+61.47	42.00 LT
G	PC	3+61.47	39.00 LT
H	PT	3+69.60	39.00 LT
I	PI	3+69.60	42.00 LT
J	PI	4+13.96	42.00 LT
K	PC	4+13.96	41.05 LT
L	PT	5+00.85	34.12 LT
M	PI	5+02.82	42.51 LT
N	PI	5+31.11	42.73 LT
O	PC	5+30.48	38.50 LT
P	PT	3+03.01	51.97 RT
Q	PI	3+03.03	58.00 RT
R	PI	3+19.03	58.00 RT
S	PC	3+19.15	56.58 RT
T	PT	3+29.86	54.55 RT
U	PI	3+31.77	58.00 RT
V	PI	3+42.26	58.00 RT
W	PC	3+41.07	53.19 RT
X	PT	3+82.61	52.09 RT
Y	PI	3+82.55	58.00 RT
Z	PI	3+97.13	58.00 RT
AA	PC	3+97.15	56.88 RT
BB	PT	4+12.92	57.15 RT
CC	PI	4+12.90	58.00 RT
DD	PI	4+28.65	58.00 RT
EE	PC	4+28.65	51.99 RT
FF	PT	5+04.41	52.17 RT
GG	PI	5+04.04	57.48 RT
HH	PI	5+19.60	57.37 RT
II	PC	5+19.73	50.99 RT

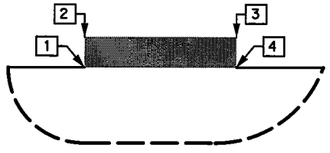
0 40 80

(IN FEET)

SCALE: PLAN 1":40'



MEDIAN DETAIL 1



METRO BUS CONC PAD
DETAIL A
N.T.S.

METRO BUS PAD GEOMETRY		
NO.	STATION	OFFSET
1	2+89.31	36.00 LT
2	2+89.31	40.00 LT
3	3+09.31	40.00 LT
4	3+09.31	36.00 LT

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED
PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

HORIZONTAL GEOMETRY LAYOUT

SHEET 1 OF 12

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	97

Plotted on: 3/4/2020 2:36:14 PM AAGakhar
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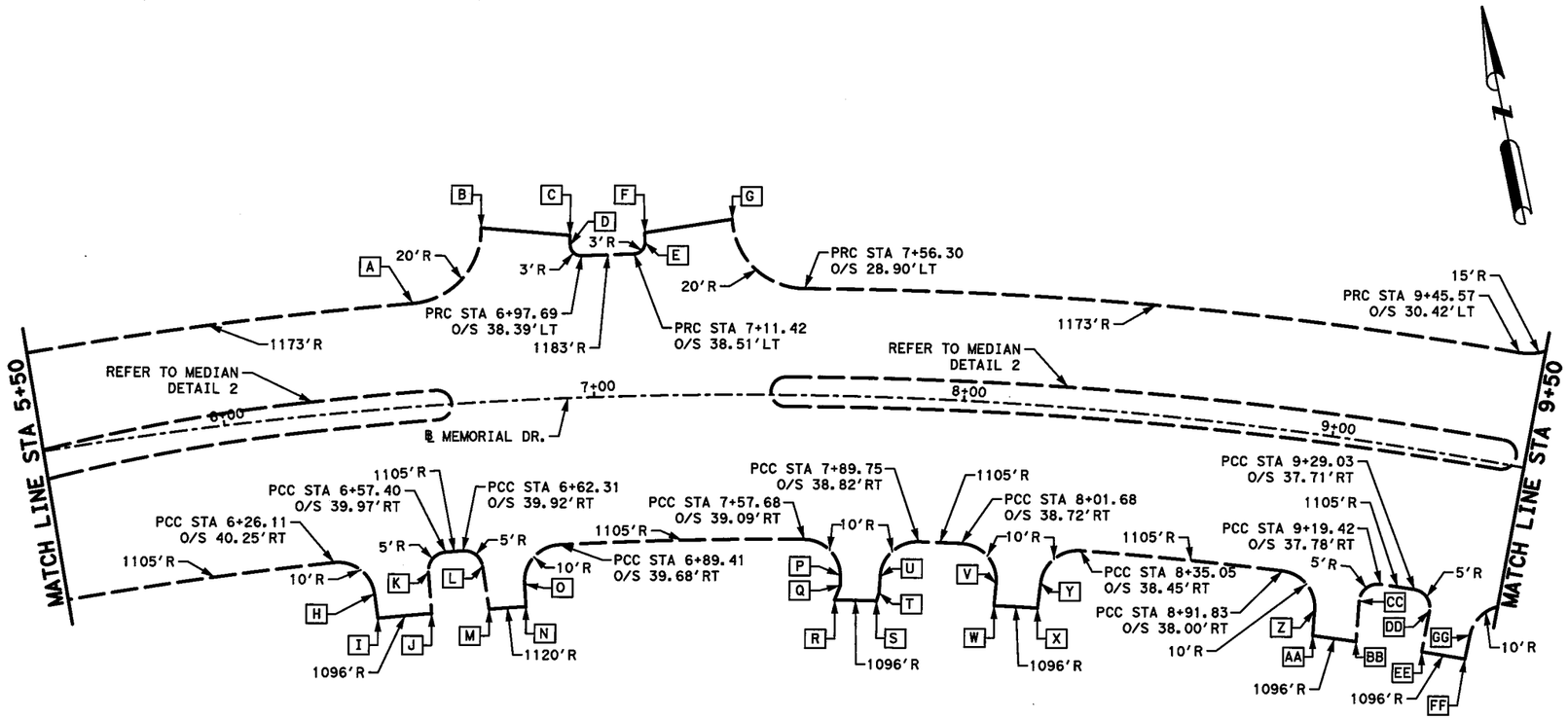
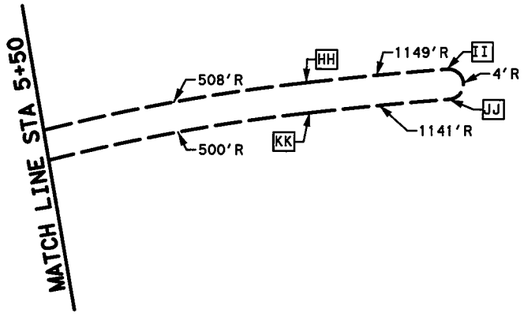
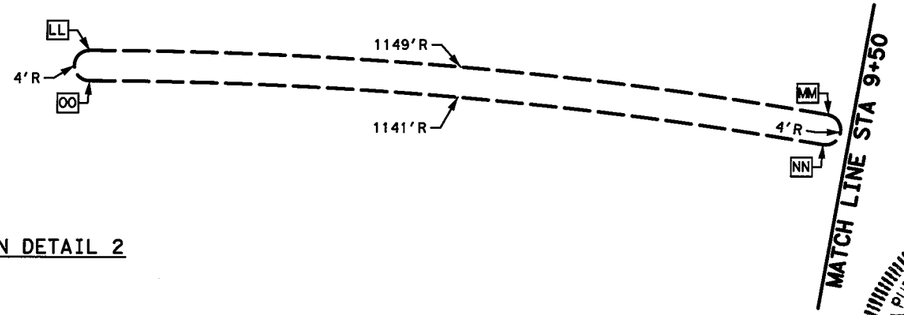


HORIZONTAL GEOMETRY DATA			
NO.	DESCRIP	STATION	OFFSET
II	PCC	6+57.55	4.04 LT
JJ	PRC	6+57.62	3.96 RT
KK	PCC	6+20.52	4.30 RT
LL	PC	7+51.76	4.86 LT
MM	PCC	9+45.92	6.42 LT
NN	PRC	9+42.98	1.58 RT
OO	PRC	7+51.83	3.14 RT

HORIZONTAL GEOMETRY DATA			
NO.	DESCRIP	STATION	OFFSET
A	PC	6+52.91	28.00 LT
B	PI	6+71.93	47.16 LT
C	PI	6+94.77	44.01 LT
D	PC	6+94.76	41.39 LT
E	PT	7+14.29	41.49 LT
F	PI	7+14.30	44.13 LT
G	PC	7+36.99	47.52 LT
H	PT	6+36.65	49.71 RT
I	PI	6+37.07	56.45 RT
J	PI	6+52.40	56.33 RT
K	PC	6+52.24	45.04 RT
L	PT	6+67.54	44.45 RT
M	PI	6+68.75	56.20 RT
N	PI	6+79.18	56.12 RT
O	PC	6+79.05	49.92 RT
P	PT	7+68.21	48.72 RT
Q	PI	7+68.33	51.35 RT
R	PI	7+66.80	55.42 RT
S	PI	7+78.71	55.32 RT
T	PI	7+79.30	53.16 RT
U	PC	7+79.40	48.65 RT
V	PT	8+12.21	49.01 RT
W	PI	8+12.06	55.05 RT
X	PI	8+24.43	54.95 RT
Y	PC	8+24.71	48.10 RT
Z	PT	9+02.33	47.30 RT
AA	PI	9+02.87	54.30 RT
BB	PI	9+15.26	54.20 RT
CC	PC	9+14.29	43.21 RT
DD	PT	9+34.26	42.77 RT
EE	PI	9+34.13	54.05 RT
FF	PI	9+46.58	53.95 RT
GG	PC	9+46.73	47.32 RT
HH	PC	6+20.44	3.70 LT





MEDIAN DETAIL 2

0 40 80

(IN FEET)

SCALE: PLAN 1": 40'

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

Lockwood, Andrews & Newnam, Inc.
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

HORIZONTAL GEOMETRY LAYOUT

SHEET 2 OF 12

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	98

Plotted on: 3/4/2020 2:36:32 PM AAGakhar

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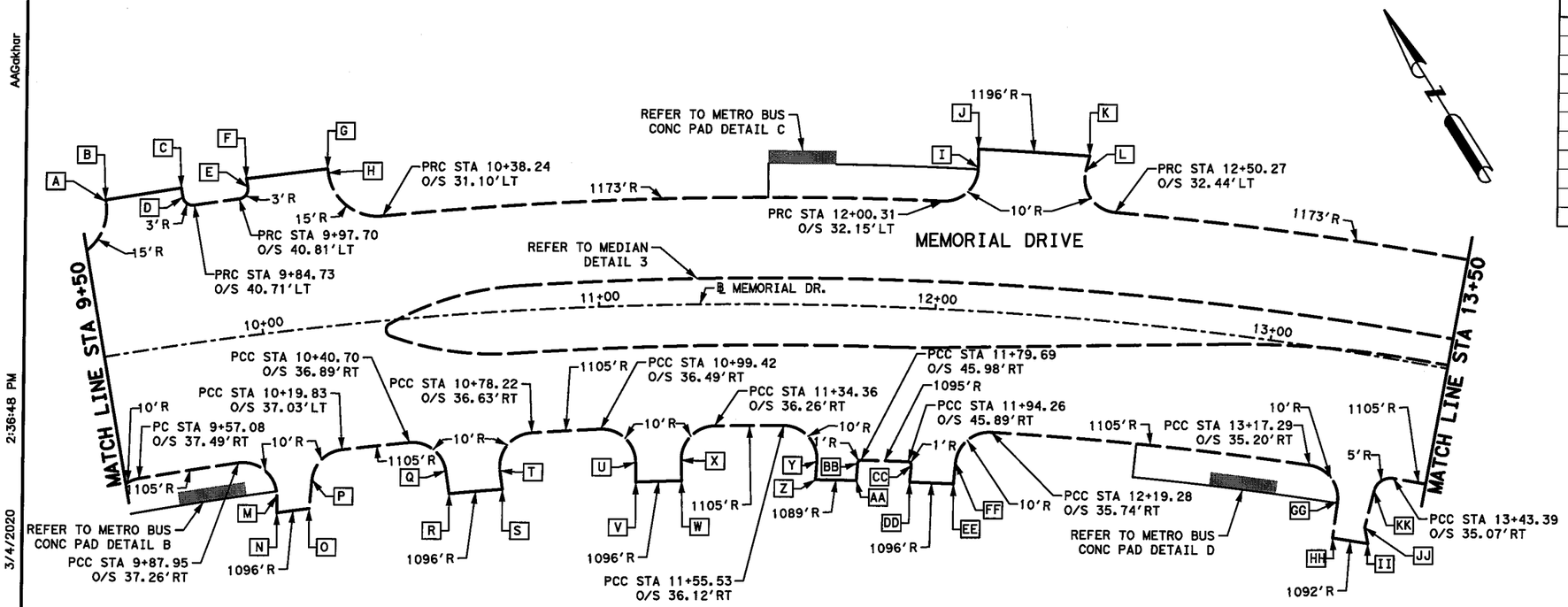
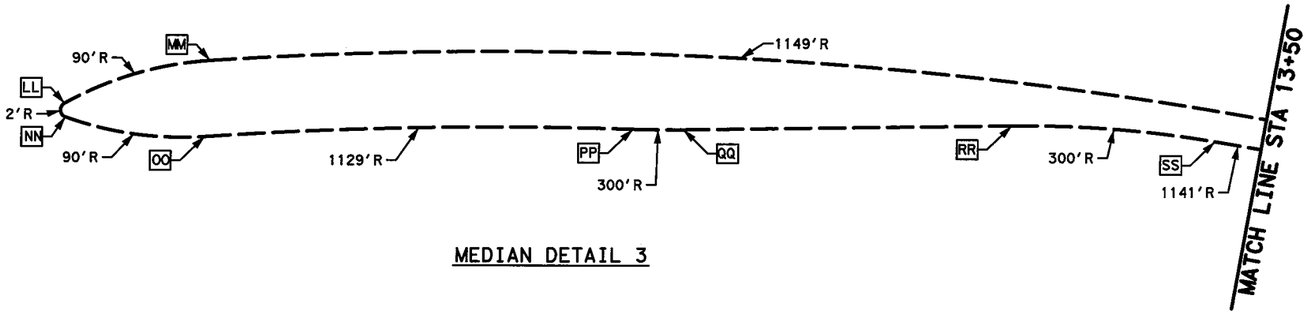
Design Filename: pw:\\lan-pw.bentley.com\lan-pw-01\Documents\Projects\120-11972-000\4-0-Production-Working\4-1-BIM-CAD\Roadway\HORIZ GEO-02



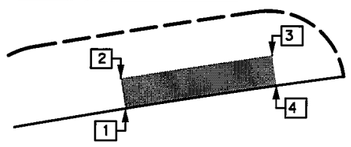
HORIZONTAL GEOMETRY DATA			
NO.	DESCRIP	STATION	OFFSET
JJ	PI	13+37.39	50.99 RT
KK	PC	13+38.25	39.72 RT
LL	PC	10+37.63	1.08 RT
MM	PCC	10+76.49	7.36 LT
NN	PC	10+37.59	4.71 RT
OO	PRC	10+74.03	12.66 RT
PP	PRC	11+87.75	11.93 RT
QQ	PT	12+01.16	11.47 RT
RR	PC	12+87.58	2.89 RT
SS	PCC	13+41.05	0.92 LT

HORIZONTAL GEOMETRY DATA			
NO.	DESCRIP	STATION	OFFSET
A	PT	9+59.89	45.69 LT
B	PI	9+59.88	46.17 LT
C	PI	9+81.71	46.35 LT
D	PC	9+81.82	43.58 LT
E	PT	10+00.56	43.98 LT
F	PI	10+00.42	46.50 LT
G	PI	10+23.69	46.69 LT
H	PC	10+23.73	45.49 LT
I	PT	12+09.88	42.72 LT
J	PI	12+09.56	48.20 LT
K	PI	12+41.37	48.46 LT
L	PC	12+40.70	43.99 LT
M	PT	9+98.39	48.44 RT
N	PI	9+97.78	53.53 RT
O	PI	10+07.83	53.44 RT
P	PC	10+09.70	45.01 RT
Q	PT	10+51.17	46.19 RT
R	PI	10+51.71	53.08 RT
S	PI	10+68.30	52.95 RT
T	PC	10+67.89	47.37 RT
U	PT	11+09.91	46.68 RT
V	PI	11+09.82	52.61 RT
W	PI	11+24.09	52.49 RT
X	PC	11+24.01	46.42 RT
Y	PT	11+66.01	46.57 RT
Z	PI	11+65.78	52.15 RT
AA	PI	11+78.48	52.05 RT
BB	PC	11+78.65	46.94 RT
CC	PT	11+95.31	46.94 RT
DD	PI	11+95.05	51.92 RT
EE	PI	12+08.68	51.81 RT
FF	PC	12+08.94	45.40 RT
GG	PT	13+27.74	44.60 RT
HH	PI	13+28.10	55.63 RT
II	PI	13+39.24	55.56 RT

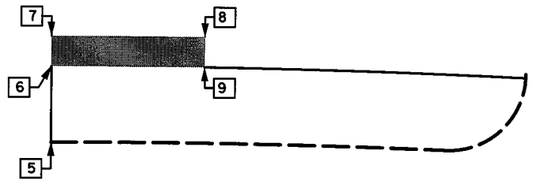
METRO BUS PAD GEOMETRY		
NO.	STATION	OFFSET
1	9+68.30	47.41 RT
2	9+68.27	43.41 RT
3	9+89.12	43.26 RT
4	9+89.15	47.26 RT
5	11+49.78	31.84 LT
6	11+49.73	41.84 LT
7	11+49.70	45.84 LT
8	11+69.14	45.96 LT
9	11+69.16	41.96 LT
10	12+63.92	35.49 RT
11	12+63.98	45.49 RT
12	12+87.76	45.36 RT
13	12+87.73	41.36 RT
14	13+08.40	41.25 RT
15	13+08.42	45.25 RT



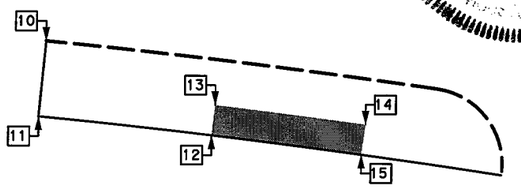
MEDIAN DETAIL 3



METRO BUS CONC PAD
DETAIL B
N.T.S.



METRO BUS CONC PAD
DETAIL C
N.T.S.



METRO BUS CONC PAD
DETAIL D
N.T.S.

0 40 80
(IN FEET)
SCALE: PLAN 1" = 40'

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

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67862

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

HORIZONTAL GEOMETRY LAYOUT

SHEET 3 OF 12

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	99

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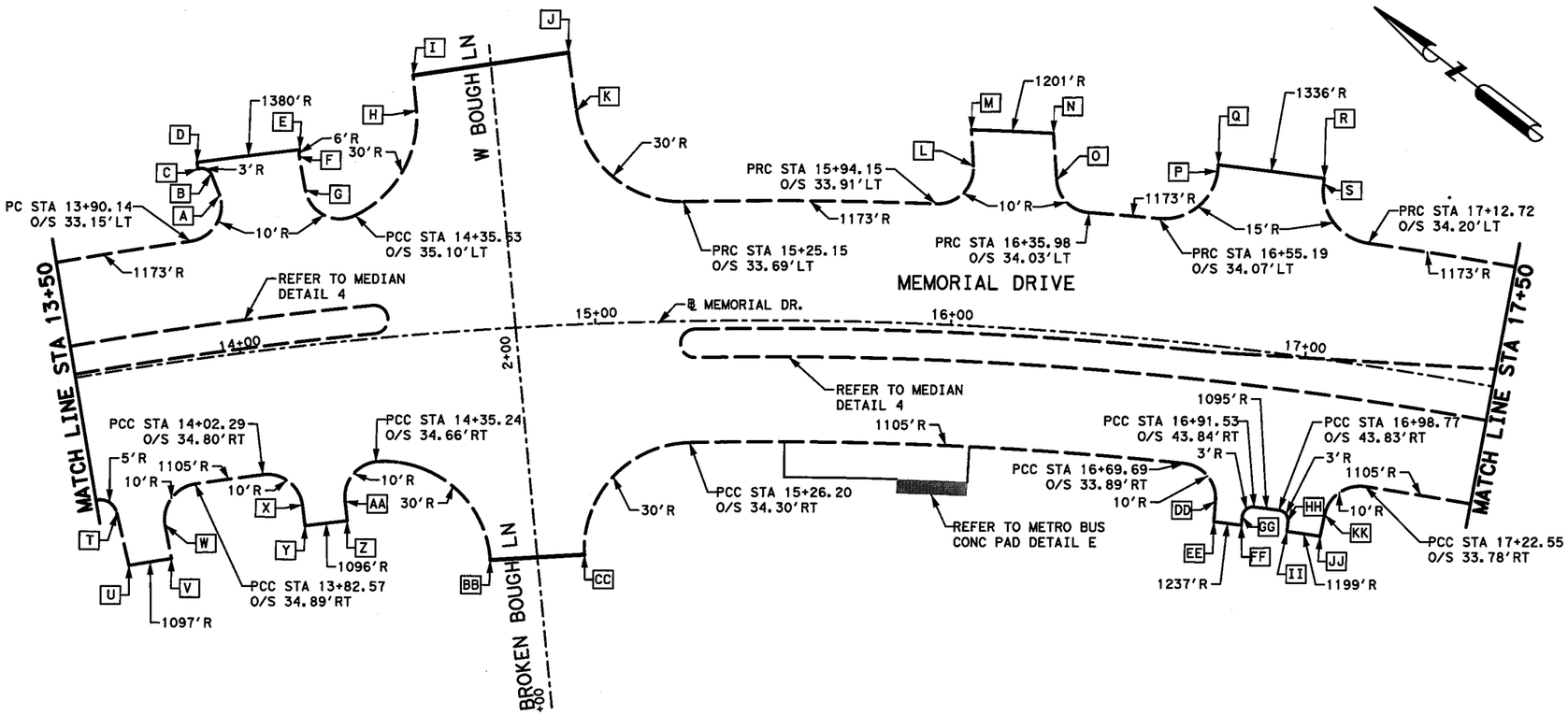
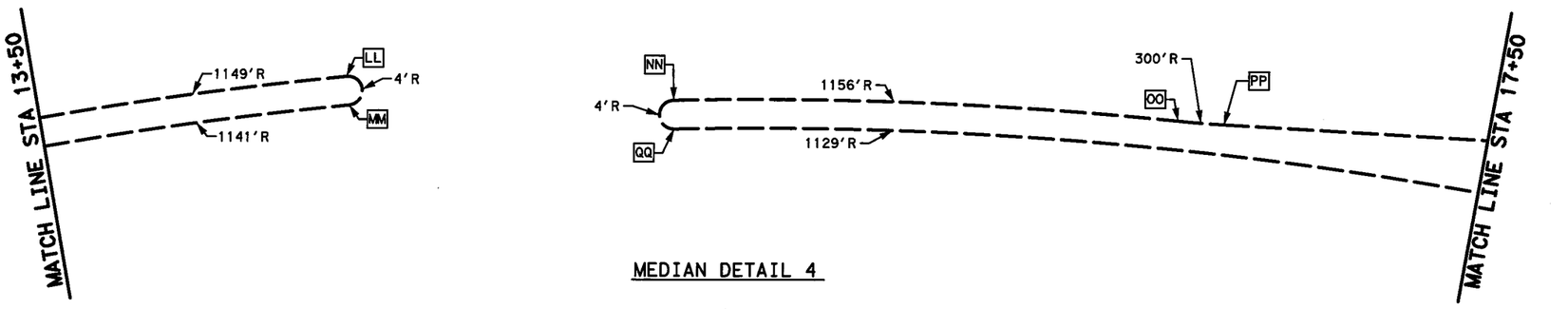
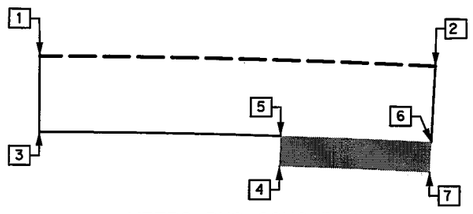




MEDIAN DETAIL 4



METRO BUS CONC PAD
DETAIL E
N.T.S.

HORIZONTAL GEOMETRY DATA			
NO.	DESCRIP	STATION	OFFSET
KK	PC	17+12.19	43.30 RT
LL	PC	14+38.24	9.36 LT
MM	PRC	14+38.28	1.36 LT
NN	PC	15+27.96	2.30 RT
OO	PRC	16+67.94	1.88 RT
PP	PT	16+80.68	1.49 LT
QQ	PC	15+27.99	10.30 RT

HORIZONTAL GEOMETRY DATA			
NO.	DESCRIP	STATION	OFFSET
A	PT	13+99.57	44.97 LT
B	PC	13+97.96	51.35 LT
C	PT	13+94.58	53.06 LT
D	PI	13+94.57	54.95 LT
E	PC	14+22.28	55.11 LT
F	PT	14+21.96	53.21 LT
G	PC	14+22.72	43.62 LT
H	PT	14+54.28	62.93 LT
I	PI	14+54.06	72.94 LT
J	PI	14+95.14	76.68 LT
K	PC	14+96.79	60.16 LT
L	PT	16+03.69	45.00 LT
M	PI	16+02.54	55.23 LT
N	PI	16+24.61	55.55 LT
O	PC	16+26.43	42.53 LT
P	PT	16+69.54	49.01 LT
Q	PI	16+69.54	50.77 LT
R	PI	16+98.30	50.55 LT
S	PC	16+98.30	49.08 LT
T	PT	13+58.91	39.68 RT
U	PI	13+60.06	54.86 RT
V	PI	13+72.68	54.79 RT
W	PC	13+72.22	45.07 RT
X	PT	14+12.74	44.65 RT
Y	PI	14+12.83	50.57 RT
Z	PI	14+25.37	50.50 RT
AA	PC	14+25.26	44.96 RT
BB	PI	14+66.50	66.10 RT
CC	PC	14+94.54	65.08 RT
DD	PT	16+80.10	43.56 RT
EE	PI	16+80.33	49.32 RT
FF	PI	16+88.49	49.38 RT
GG	PC	16+88.41	46.94 RT
HH	PT	17+01.91	46.73 RT
II	PI	17+02.01	49.47 RT
JJ	PI	17+11.84	49.52 RT

METRO BUS PAD GEOMETRY		
NO.	STATION	OFFSET
1	15+53.67	34.21 RT
2	16+07.26	34.05 RT
3	15+53.71	44.21 RT
4	15+86.70	48.11 RT
5	15+86.68	44.11 RT
6	16+07.29	44.05 RT
7	16+07.31	48.05 RT

PUBLIC WORKS AND ENGINEERING
ACCEPTED AND FILED
67862

0 40 80
(IN FEET)
SCALE: PLAN 1": 40'

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED
PROFESSIONAL ENGINEER
03/04/2020
Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

HORIZONTAL GEOMETRY LAYOUT

SHEET 4 OF 12

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	100

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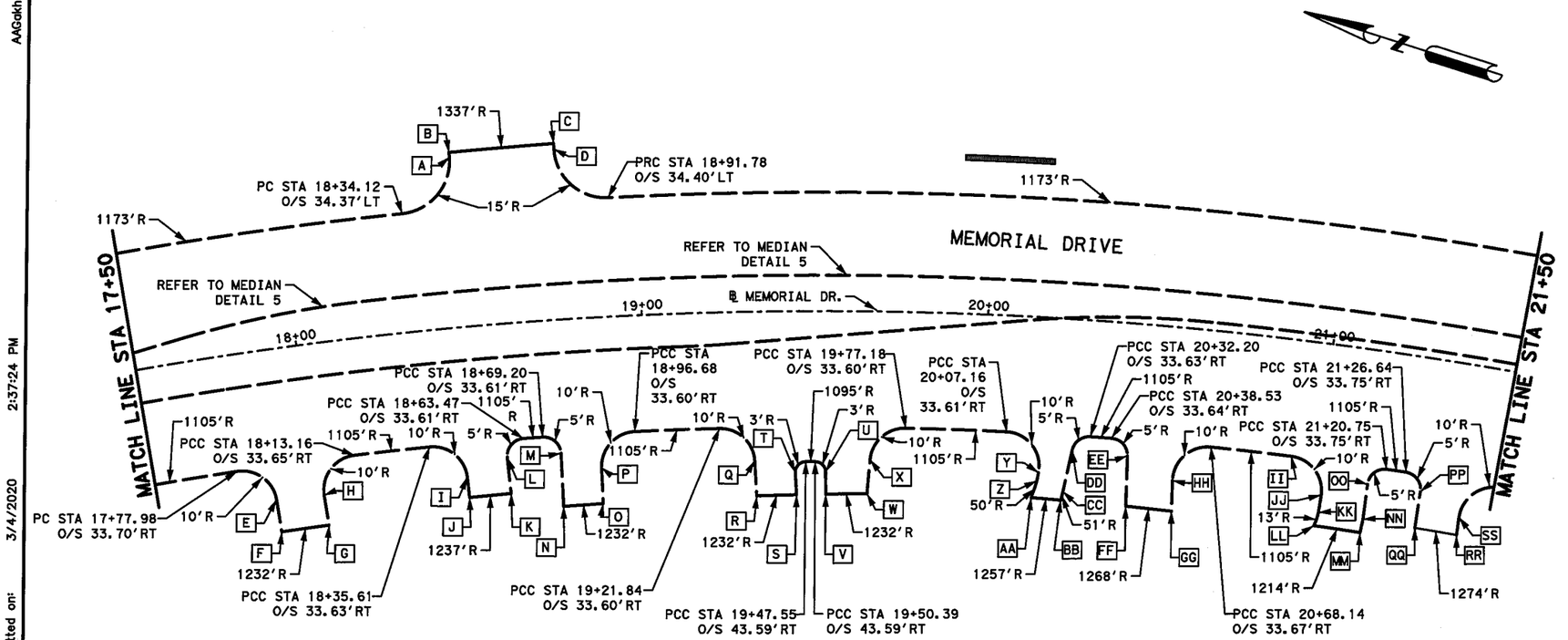

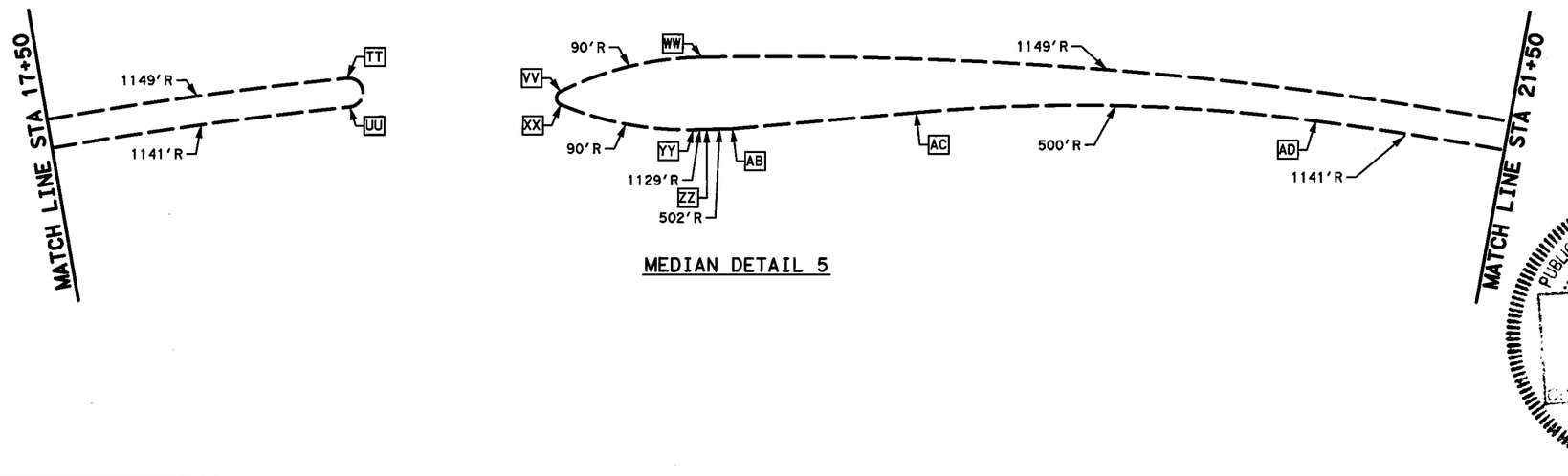

MEDIAN DETAIL 5

HORIZONTAL GEOMETRY DATA			
NO.	DESCRIP	STATION	OFFSET
JJ	PT	21+02.58	43.76 RT
KK	PC	21+02.49	48.87 RT
LL	PI	21+01.66	52.81 RT
MM	PI	21+15.83	53.03 RT
NN	PI	21+16.10	49.08 RT
OO	PC	21+15.87	38.87 LT
PP	PT	21+31.81	38.70 RT
QQ	PI	21+31.94	49.29 RT
RR	PI	21+44.73	49.44 RT
SS	PC	21+44.53	44.22 RT
TT	PC	18+35.68	10.37 RT
UU	PRC	18+35.68	2.37 RT
VV	PC	18+93.44	2.23 RT
WW	PCC	19+32.26	10.41 RT
XX	PC	18+93.38	1.40 RT
YY	PCC	19+29.67	9.59 RT
ZZ	PRC	19+33.44	9.59 RT
AB	PT	19+40.56	9.52 RT
AC	PC	19+91.16	4.41 RT
AD	PCC	21+00.98	2.29 RT

HORIZONTAL GEOMETRY DATA			
NO.	DESCRIP	STATION	OFFSET
A	PT	18+48.49	49.28 LT
B	PI	18+48.49	50.68 LT
C	PI	18+77.39	50.94 LT
D	PC	18+77.39	49.30 LT
E	PT	17+88.38	43.44 RT
F	PI	17+88.68	52.95 RT
G	PI	18+03.14	52.91 RT
H	PC	18+02.78	44.09 RT
I	PT	18+46.01	43.37 RT
J	PI	18+46.20	49.35 RT
K	PI	18+58.69	49.24 RT
L	PC	18+58.31	38.80 RT
M	PT	18+74.38	38.67 RT
N	PI	18+74.21	54.10 RT
O	PI	18+86.23	53.97 RT
P	PC	18+86.29	43.59 RT
Q	PT	19+32.23	43.17 RT
R	PI	19+32.73	53.36 RT
S	PI	19+44.82	53.16 RT
T	PC	19+44.43	46.77 RT
U	PT	19+53.52	46.55 RT
V	PI	19+53.63	53.02 RT
W	PI	19+66.08	52.79 RT
X	PC	19+66.81	42.94 RT
Y	PT	20+17.46	44.96 RT
Z	PC	20+17.13	47.37 RT
AA	PI	20+15.72	52.29 RT
BB	PC	20+24.71	52.52 RT
CC	PT	20+25.22	49.99 RT
DD	PC	20+27.08	37.92 RT
EE	PT	20+43.69	38.39 RT
FF	PI	20+44.48	52.96 RT
GG	PI	20+58.37	53.26 RT
HH	PC	20+57.76	44.37 RT
II	PCC	20+92.20	33.70 RT

0 40 80
(IN FEET)
SCALE: PLAN 1"=40'

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

HORIZONTAL GEOMETRY LAYOUT

SHEET 5 OF 12

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CSK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CSK DWG:	HOU	HARRIS	0912	72	391	101

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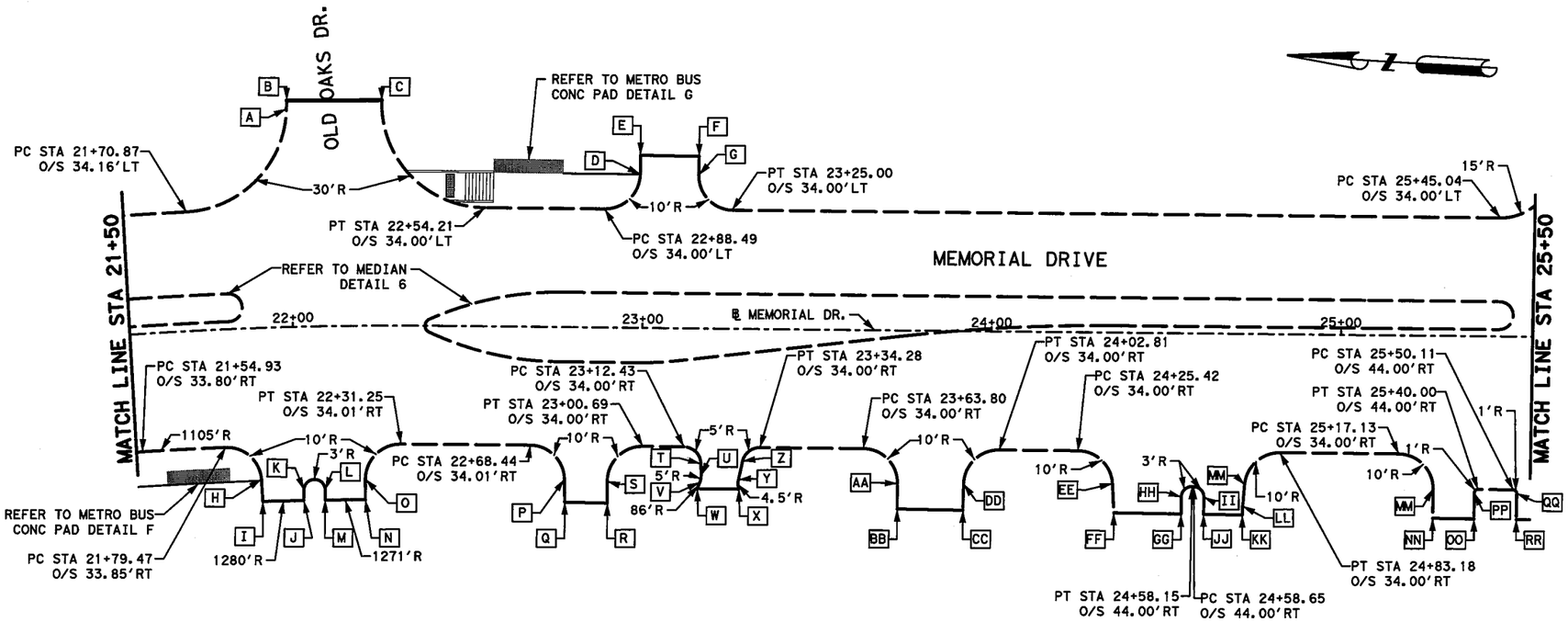
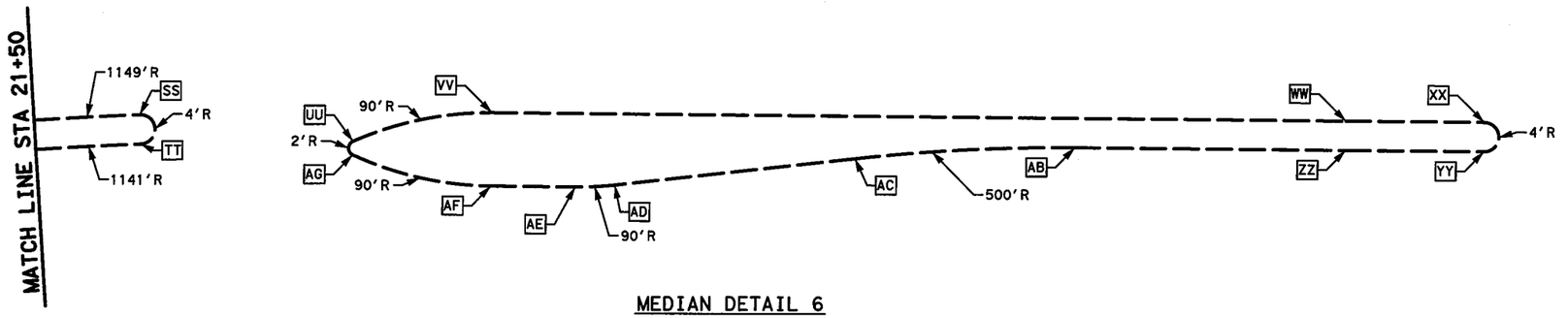


HORIZONTAL GEOMETRY DATA			
NO.	DESCRIP	STATION	OFFSET
JJ	PI	24+61.65	51.93 RT
KK	PI	24+72.74	52.01 RT
LL	PI	24+72.79	49.46 RT
MM	PT	25+27.13	43.96 RT
NN	PI	25+27.16	52.41 RT
OO	PI	25+39.05	52.49 RT
PP	PC	25+39.00	45.00 RT
QQ	PT	25+51.11	45.00 RT
RR	PI	25+51.14	52.58 RT
SS	PC	21+81.70	10.14 LT
TT	PRC	21+81.68	2.14 LT
UU	PC	22+38.93	1.82 LT
VV	PT	22+76.42	10.00 LT
WW	PI	25+07.72	10.00 LT
XX	PC	25+45.22	10.00 LT
YY	PT	25+45.22	2.00 LT
ZZ	PI	25+07.72	2.00 LT
AB	PC	24+34.49	2.00 LT
AC	PT	23+74.92	1.56 RT
AD	PC	23+09.94	9.36 RT
AE	PT	22+99.22	10.00 RT
AF	PC	22+76.42	10.00 RT
AG	PCC	22+38.92	1.81 RT

HORIZONTAL GEOMETRY DATA			
NO.	DESCRIP	STATION	OFFSET
A	PT	21+99.32	62.54 LT
B	PI	21+99.42	64.92 LT
C	PC	22+25.17	64.60 LT
D	PT	22+98.49	44.00 LT
E	PI	22+98.49	49.48 LT
F	PI	23+15.25	49.30 LT
G	PC	23+15.25	44.00 LT
H	PT	21+89.83	43.42 RT
I	PI	21+90.07	49.83 RT
J	PI	22+02.33	49.90 RT
K	PC	22+02.39	46.85 RT
L	PT	22+08.75	46.94 RT
M	PI	22+08.73	49.92 RT
N	PI	22+20.76	49.96 RT
O	PC	22+20.77	44.01 RT
P	PT	22+78.45	43.69 RT
Q	PI	22+78.66	50.31 RT
R	PI	22+90.81	50.44 RT
S	PC	22+90.70	44.18 RT
T	PT	23+17.43	38.80 RT
U	PC	23+17.56	42.15 RT
V	PCC	23+17.22	44.16 RT
W	PI	23+16.48	46.00 RT
X	PC	23+28.42	46.00 RT
Y	PT	23+28.27	43.30 RT
Z	PC	23+29.39	37.98 RT
AA	PT	23+73.80	43.94 RT
BB	PI	23+73.84	51.29 RT
CC	PI	23+92.72	51.43 RT
DD	PC	23+92.81	43.88 RT
EE	PT	24+35.40	43.36 RT
FF	PI	24+35.94	51.74 RT
GG	PI	24+55.15	51.88 RT
HH	PC	24+55.15	47.00 RT
II	PT	24+61.65	47.00 RT



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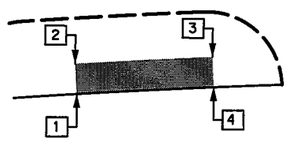
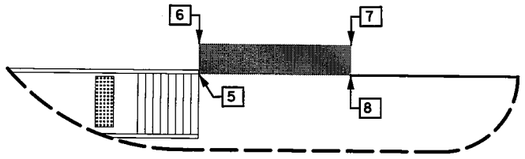


METRO BUS CONC PAD DETAIL F
N.T.S.



METRO BUS CONC PAD DETAIL G
N.T.S.

METRO BUS PAD GEOMETRY		
NO.	STATION	OFFSET
1	21+61.78	43.82 RT
2	21+61.79	39.82 RT
3	21+80.50	39.86 RT
4	21+80.49	43.86 RT
5	22+56.54	44.00 LT
6	22+56.54	48.00 LT
7	22+76.54	48.00 LT
8	22+76.54	44.00 LT

PUBLIC WORKS AND ENGINEERING
ACCEPTED AND FILED
67862

0 40 80
(IN FEET)
SCALE: PLAN 1":40'

STATE OF TEXAS
MARK WOODWARD
98672
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

HORIZONTAL GEOMETRY LAYOUT

SHEET 6 OF 12

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	102

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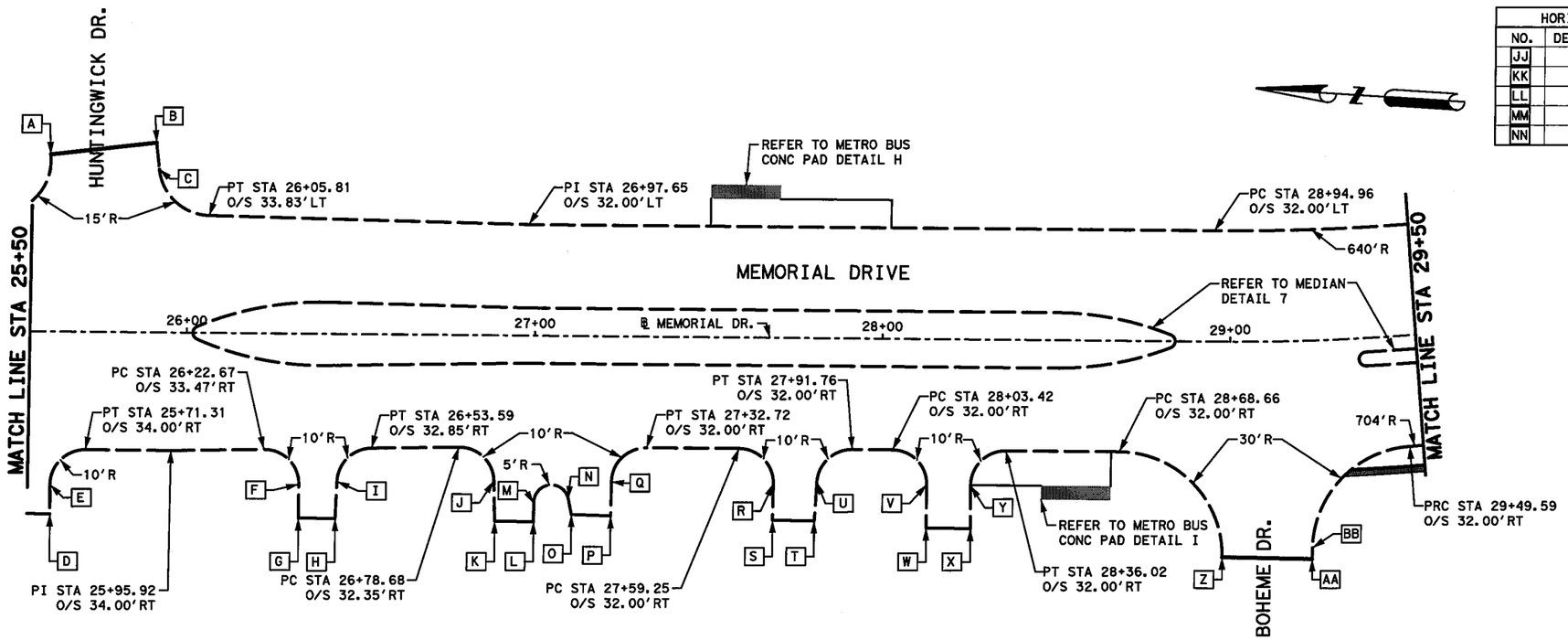
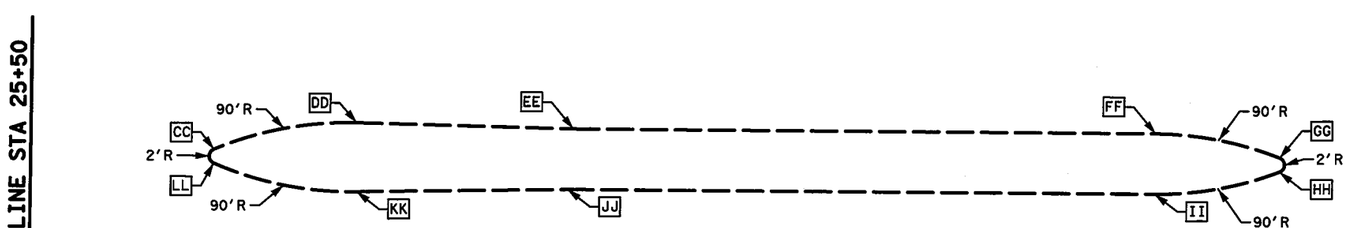
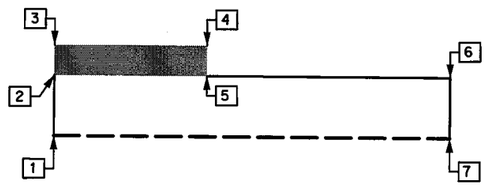


HORIZONTAL GEOMETRY DATA			
NO.	DESCRIP	STATION	OFFSET
JJ	PI	26+95.90	8.00 RT
KK	PC	26+40.58	9.10 RT
LL	PCC	26+02.93	1.84 RT
MM	PC	29+38.75	8.00 RT
NN	PRC	29+38.75	4.00 RT

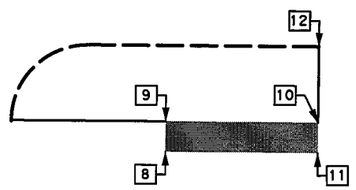
HORIZONTAL GEOMETRY DATA			
NO.	DESCRIP	STATION	OFFSET
A	PI	25+59.91	51.00 LT
B	PI	25+90.31	54.63 LT
C	PC	25+91.22	47.05 LT
D	PI	25+61.42	52.66 RT
E	PC	25+61.31	44.13 RT
F	PT	26+32.87	43.46 RT
G	PI	26+32.86	53.18 RT
H	PI	26+43.43	53.26 RT
I	PC	26+43.79	42.50 RT
J	PT	26+88.87	42.01 RT
K	PI	26+89.26	53.59 RT
L	PI	27+00.40	53.67 RT
M	PC	27+00.46	48.33 RT
N	PT	27+10.35	46.96 RT
O	PI	27+11.31	51.50 RT
P	PI	27+22.64	51.78 RT
Q	PC	27+22.72	41.92 RT
R	PT	27+69.25	42.04 RT
S	PI	27+69.20	52.64 RT
T	PI	27+81.21	52.76 RT
U	PC	27+81.77	41.50 RT
V	PT	28+13.42	41.99 RT
W	PI	28+13.42	54.50 RT
X	PI	28+26.15	54.59 RT
Y	PC	28+26.02	42.10 RT
Z	PI	28+98.34	62.24 RT
AA	PI	29+22.00	63.07 RT
BB	PC	29+22.15	59.88 RT
CC	PC	26+02.93	1.84 LT
DD	PT	26+40.28	9.14 LT
EE	PI	26+97.23	8.00 LT
FF	PC	28+50.26	8.00 LT
GG	PCC	28+82.92	1.86 LT
HH	PCC	28+82.92	1.86 RT
II	PT	28+50.26	8.00 RT



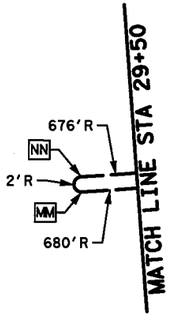
MEDIAN DETAIL 7



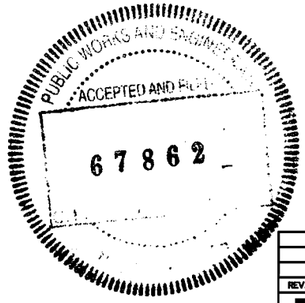
METRO BUS CONC PAD
DETAIL H
N.T.S.



METRO BUS CONC PAD
DETAIL I
N.T.S.



METRO BUS PAD GEOMETRY		
NO.	STATION	OFFSET
1	27+50.00	32.00 LT
2	27+50.00	40.00 LT
3	27+50.00	44.00 LT
4	27+70.00	44.00 LT
5	27+70.00	40.00 LT
6	28+02.00	40.00 LT
7	28+02.00	32.00 LT
8	28+46.32	46.00 RT
9	28+46.32	42.00 RT
10	28+66.32	42.00 RT
11	28+66.32	46.00 RT
12	28+66.32	32.00 RT



0 40 80
(IN FEET)
SCALE: PLAN 1" = 40'

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

HORIZONTAL GEOMETRY LAYOUT

SHEET 7 OF 12

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
DSN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK:	HOU	HARRIS	0912	72	391	103

Pen Table: MEMORIAL.tbl
Plot Driver: c:\projectwise\aagakhar\d0531333\MEMORIAL DR.pltcfg
Plotted on: 3/4/2020 2:37:53 PM AAGakhar
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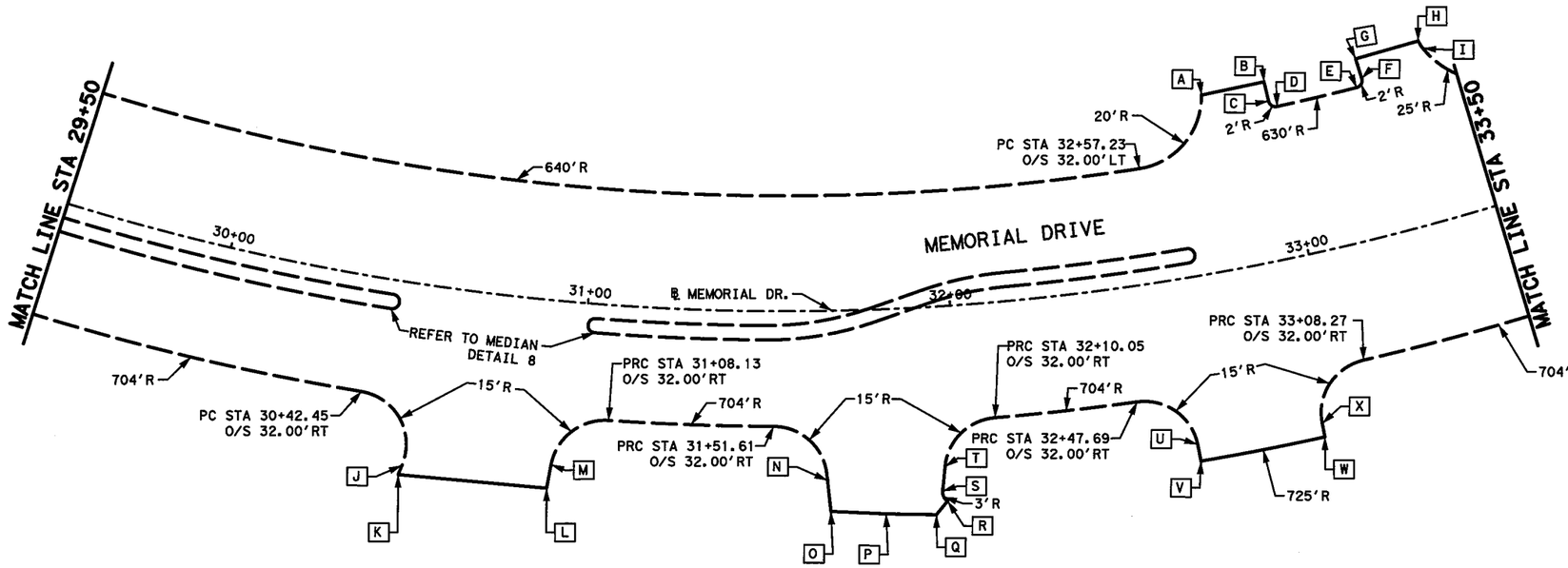

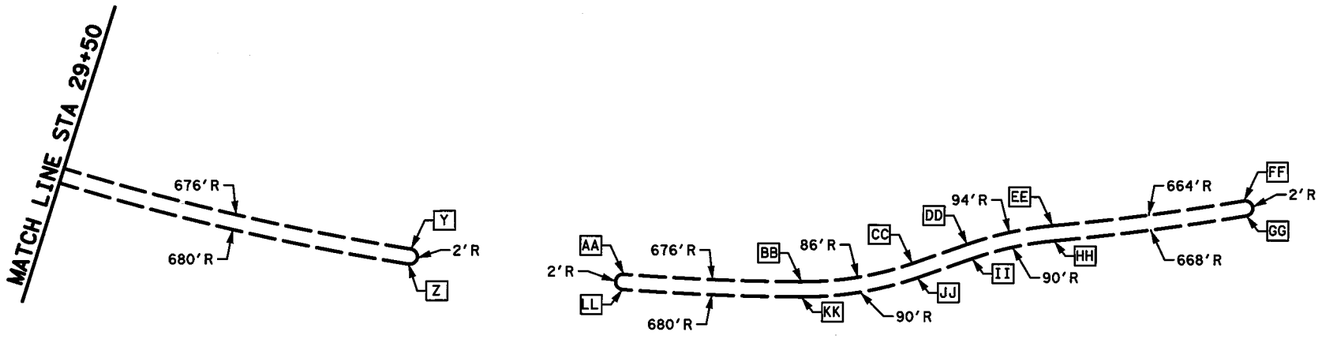

MEDIAN DETAIL 8

HORIZONTAL GEOMETRY DATA			
NO.	DESCRIP	STATION	OFFSET
A	PI	32+78.65	49.26 LT
B	PI	32+97.68	49.47 LT
C	PC	32+97.83	43.95 LT
D	PRC	32+99.97	42.00 LT
E	PRC	33+23.98	42.00 LT
F	PT	33+26.12	44.11 LT
G	PI	33+25.78	49.77 LT
H	PI	33+45.07	49.97 LT
I	PC	33+45.81	47.58 LT
J	PT	30+56.04	50.54 RT
K	PI	30+55.41	53.22 RT
L	PI	30+93.62	52.12 RT
M	PC	30+94.16	45.52 RT
N	PT	31+65.73	47.13 RT
O	PI	31+66.53	55.75 RT
P	PI	31+80.56	59.91 RT
Q	PI	31+93.31	57.82 RT
R	PC	31+96.34	54.25 RT
S	PT	31+95.22	51.36 RT
T	PC	31+96.19	44.56 RT
U	PT	32+61.70	46.17 RT
V	PI	32+61.90	50.93 RT
W	PI	32+94.23	50.58 RT
X	PC	33+94.25	46.79 RT
Y	PC	30+46.49	4.00 RT
Z	PCC	30+46.49	8.00 RT
AA	PC	31+02.51	4.00 RT
BB	PCC	31+48.98	4.00 RT
CC	PT	31+78.08	0.43 LT
DD	PC	31+92.70	4.79 LT
EE	PRC	32+15.71	8.00 LT
FF	PRC	32+66.99	8.00 LT
GG	PCC	32+66.99	4.00 LT
HH	PRC	32+15.71	4.00 LT
II	PT	31+93.81	0.94 LT
JJ	PC	31+79.26	3.39 RT
KK	PCC	31+48.98	8.00 RT
LL	PCC	31+02.51	8.00 RT

0 40 80

(IN FEET)

SCALE: PLAN 1":40'

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

HORIZONTAL GEOMETRY LAYOUT

SHEET 8 OF 12

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	104

PUBLIC WORKS AND ENGINEERING
ACCEPTED AND FILED
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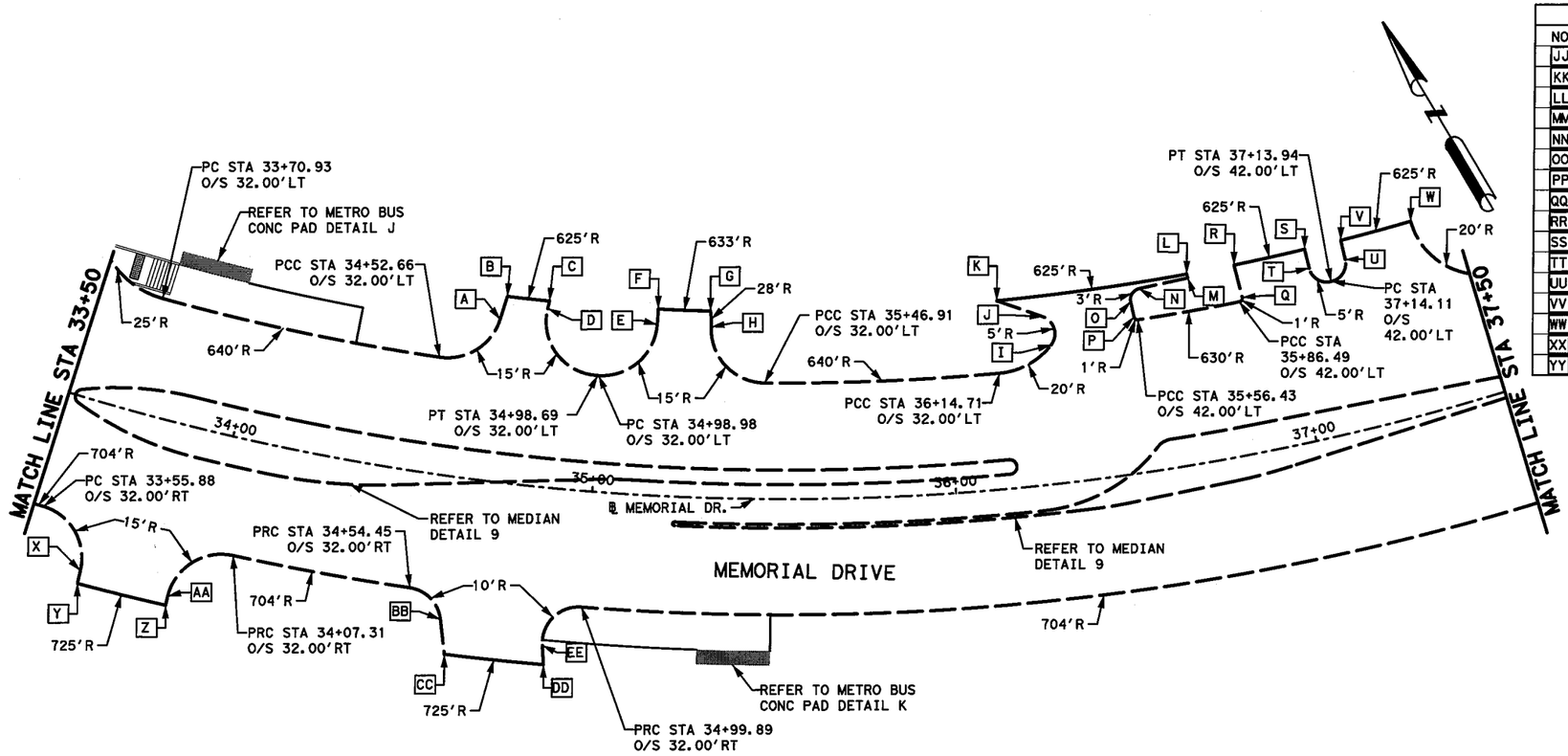
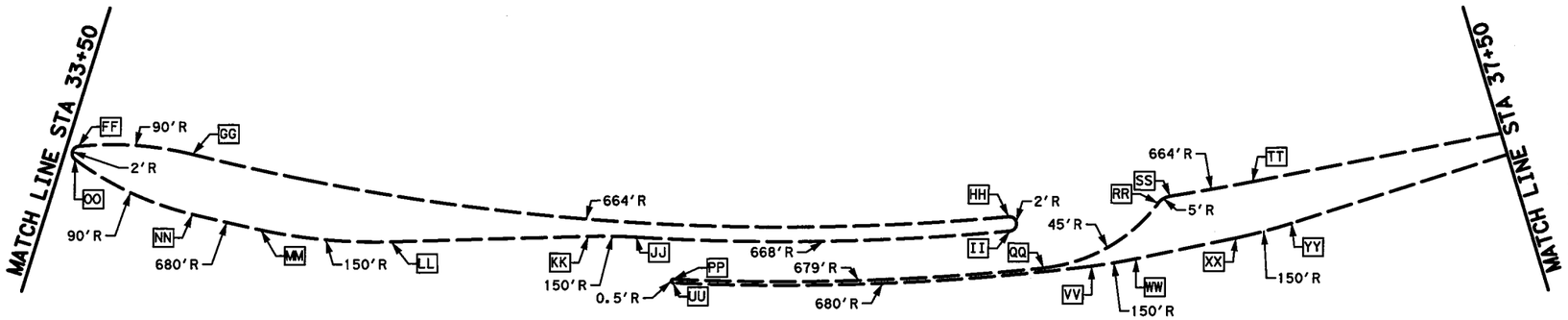
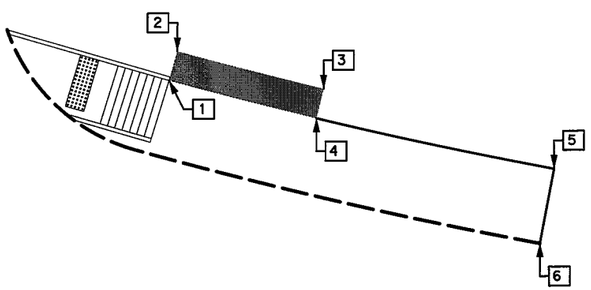


HORIZONTAL GEOMETRY DATA			
NO.	DESCRIP	STATION	OFFSET
JJ	PRC	35+12.33	4.00 LT
KK	PT	34+99.08	3.29 LT
LL	PC	34+45.74	4.65 RT
MM	PCC	34+10.34	8.00 RT
NN	PCC	33+91.26	8.00 RT
OO	PCC	33+56.49	1.88 RT
PP	PC	35+23.00	7.00 RT
QQ	PCC	36+23.53	7.00 RT
RR	PRC	36+56.87	6.59 RT
SS	PRC	36+60.38	8.00 LT
TT	PT	36+83.55	8.00 LT
UU	PC	35+23.00	8.00 RT
VV	PCC	36+36.53	8.00 RT
WW	PT	36+48.75	7.60 RT
XX	PC	36+76.21	6.38 RT
YY	PT	36+91.84	5.37 RT

HORIZONTAL GEOMETRY DATA			
NO.	DESCRIP	STATION	OFFSET
A	PT	34+68.55	44.59 LT
B	PI	34+69.78	51.10 LT
C	PI	34+82.41	51.18 LT
D	PC	34+82.12	49.09 LT
E	PT	35+14.84	47.11 LT
F	PI	35+14.81	51.38 LT
G	PC	35+30.39	51.48 LT
H	PRC	35+30.78	47.12 LT
I	PCC	36+30.33	38.30 LT
J	PT	36+28.79	46.27 LT
K	PI	36+15.65	51.94 LT
L	PI	36+72.69	52.21 LT
M	PI	36+72.78	51.15 LT
N	PC	36+58.05	50.41 LT
O	PT	36+55.04	47.21 LT
P	PC	36+55.36	42.93 LT
Q	PT	36+87.56	43.06 LT
R	PI	36+86.96	52.27 LT
S	PI	37+08.48	52.36 LT
T	PC	37+08.56	46.95 LT
U	PT	37+19.48	46.96 LT
V	PI	37+19.56	52.41 LT
W	PC	37+41.01	52.33 LT
X	PT	33+69.89	46.18 RT
Y	PI	33+70.03	49.78 RT
Z	PI	33+93.32	49.54 RT
AA	PC	33+93.29	46.99 RT
BB	PT	34+63.57	39.48 RT
CC	PI	34+65.80	48.92 RT
DD	PI	34+91.40	48.76 RT
EE	PC	34+90.60	43.55 RT
FF	PC	33+56.40	1.85 LT
GG	PRC	33+87.31	8.00 LT
HH	PRC	36+15.28	8.00 LT
II	PCC	36+15.28	4.00 LT

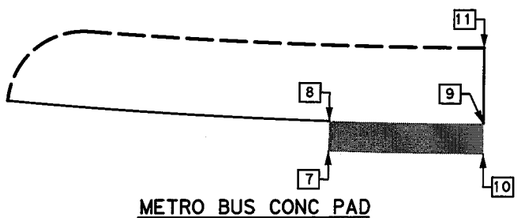




METRO BUS CONC PAD
DETAIL J
N.T.S.

MEDIAN DETAIL 9

METRO BUS PAD GEOMETRY		
NO.	STATION	OFFSET
1	33+72.84	42.00 LT
2	33+72.84	46.00 LT
3	33+94.17	46.00 LT
4	33+94.17	42.00 LT
5	34+28.24	42.00 LT
6	34+28.26	32.00 LT
7	35+30.37	46.00 RT
8	35+30.37	42.00 RT
9	35+49.41	42.00 RT
10	35+49.41	46.00 RT
11	35+49.41	32.00 RT



METRO BUS CONC PAD
DETAIL K
N.T.S.

PUBLIC WORKS
ACCEPTED AS
67862

0 40 80
(IN FEET)
SCALE: PLAN 1"=40'

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED
PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION
AND ACCESS MANAGEMENT

HORIZONTAL GEOMETRY
LAYOUT

SHEET 9 OF 12

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	105

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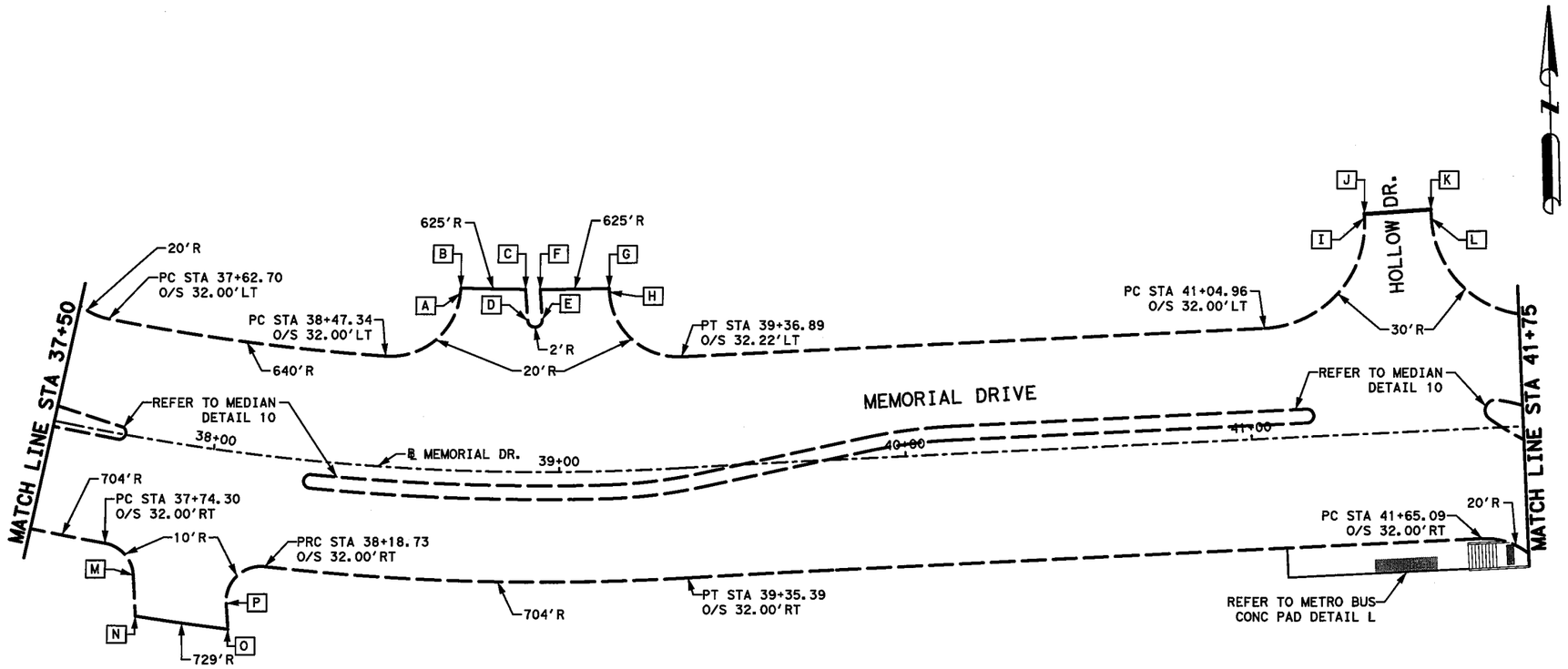
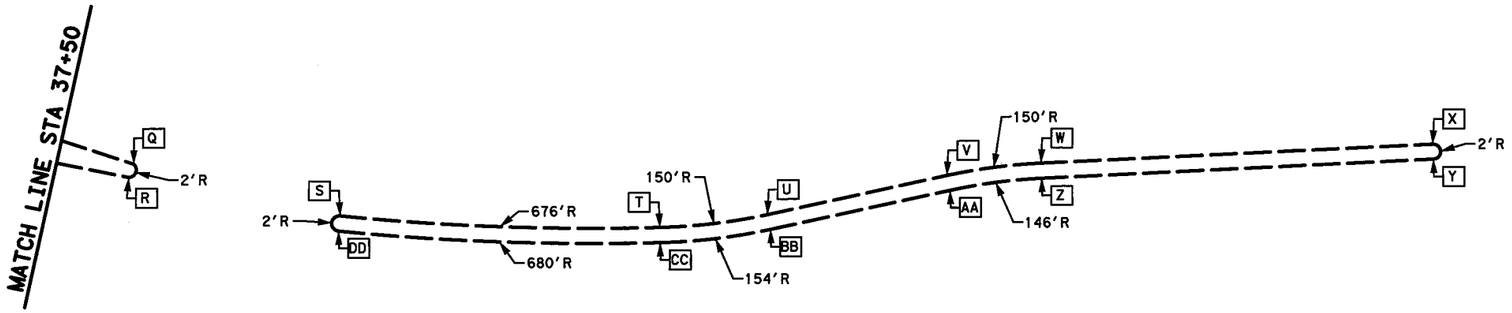
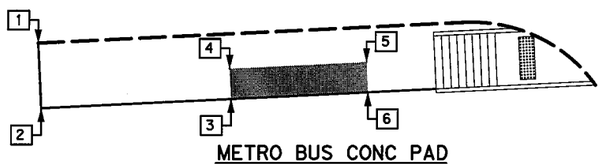


HORIZONTAL GEOMETRY DATA			
NO.	DESCRIP	STATION	OFFSET
A	PT	38+69.00	51.36 LT
B	PI	38+69.08	52.86 LT
C	PI	38+89.39	52.91 LT
D	PC	38+90.23	43.83 LT
E	PT	38+94.68	44.15 LT
F	PI	38+93.96	52.91 LT
G	PI	39+15.55	52.95 LT
H	PC	39+15.59	51.90 LT
I	PT	41+34.95	62.58 LT
J	PI	41+34.93	63.67 LT
K	PI	41+54.17	64.02 LT
L	PC	41+54.21	61.45 LT
M	PT	37+83.48	39.74 RT
N	PI	37+85.92	51.38 RT
O	PI	38+10.89	51.30 RT
P	PC	38+09.50	43.92 RT
Q	PC	37+73.31	2.00 LT
R	PT	37+72.69	1.67 RT
S	PC	38+28.79	4.00 RT
T	PCC	39+12.41	4.00 RT
U	PT	39+40.62	1.88 RT
V	PC	39+88.31	5.93 LT
W	PT	40+13.12	8.00 LT
X	PC	41+16.12	8.00 LT
Y	PT	41+16.12	4.00 LT
Z	PC	40+13.12	4.00 LT
AA	PT	39+88.97	1.99 LT
BB	PC	39+41.24	5.83 RT
CC	PCC	39+12.41	8.00 RT
DD	PCC	38+28.80	8.00 RT
EE	PC	41+68.53	2.73 LT
FF	PCC	41+70.98	8.01 LT



MEDIAN DETAIL 10



METRO BUS CONC PAD
DETAIL L
N.T.S.

METRO BUS PAD GEOMETRY		
NO.	STATION	OFFSET
1	41+08.93	32.00 RT
2	41+08.93	40.60 RT
3	41+33.93	40.60 RT
4	41+33.93	36.60 RT
5	41+51.93	36.60 RT
6	41+33.93	40.60 RT

0 40 80
(IN FEET)
SCALE: PLAN 1"=40'

STATE OF TEXAS
MARK WOODWARD
98672
LICENSED
PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

ACCEPTED AND FILED
67862

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

HORIZONTAL GEOMETRY LAYOUT

SHEET 10 OF 12

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	106

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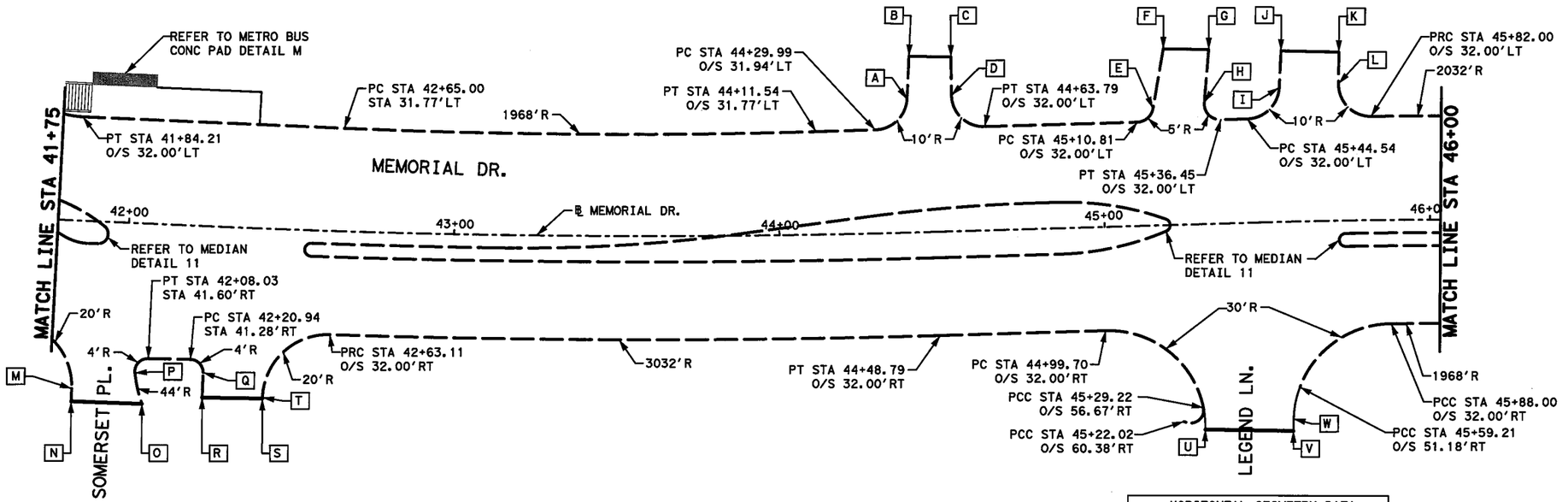
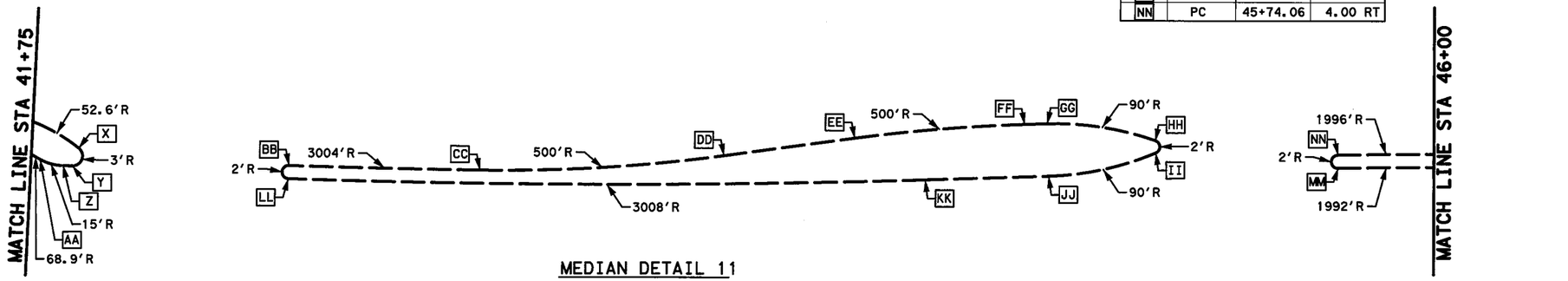
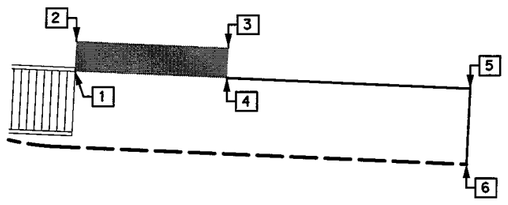


HORIZONTAL GEOMETRY DATA			
NO.	DESCRIP	STATION	OFFSET
A	PT	44+40.03	41.17 LT
B	PI	44+40.86	54.36 LT
C	PI	44+53.87	53.75 LT
D	PC	44+53.79	41.95 LT
E	PT	45+15.72	36.05 LT
F	PI	45+19.23	54.38 LT
G	PI	45+33.20	53.71 LT
H	PC	45+31.48	37.51 LT
I	PT	45+54.37	41.33 LT
J	PI	45+55.09	52.66 LT
K	PI	45+72.41	51.96 LT
L	PC	45+72.20	42.19 LT
M	PT	41+85.09	51.89 RT
N	PI	41+85.11	55.83 RT
O	PC	42+06.83	55.71 RT
P	PCC	42+04.18	46.24 RT
Q	PT	42+25.04	45.21 RT
R	PI	42+25.17	52.90 RT
S	PI	42+43.45	52.47 RT
T	PC	42+43.45	52.16 RT
U	PI	45+29.66	63.47 RT
V	PI	45+56.90	64.72 RT
W	PC	45+57.07	60.96 RT
X	PC	41+92.54	1.40 RT
Y	PT	41+90.87	6.84 RT
Z	PC	41+88.10	6.91 RT
AA	PCC	41+80.97	5.31 RT
BB	PC	42+56.31	4.00 RT
CC	PCC	43+14.06	4.00 RT
DD	PT	43+88.01	0.58 LT
EE	PC	44+27.72	5.25 LT
FF	PT	44+79.40	8.00 LT
GG	PC	44+86.31	8.00 LT
HH	PCC	45+18.97	1.86 LT
II	PCC	45+18.97	1.86 RT

HORIZONTAL GEOMETRY DATA			
NO.	DESCRIP	STATION	OFFSET
JJ	PT	44+86.31	8.00 RT
KK	PC	44+48.79	8.00 RT
LL	PCC	42+56.31	8.00 RT
MM	PC	45+74.06	8.00 RT
NN	PC	45+74.06	4.00 RT



MEDIAN DETAIL 11



METRO BUS CONC PAD
DETAIL M
N. T. S.

METRO BUS PAD GEOMETRY		
NO.	STATION	OFFSET
1	41+86.54	42.00 LT
2	41+86.54	46.00 LT
3	42+06.54	46.00 LT
4	42+06.54	42.00 LT
5	42+38.69	41.98 LT
6	42+38.66	31.98 LT

0 40 80

(IN FEET)

SCALE: PLAN 1": 40'

STATE OF TEXAS
MARK WOODWARD
98672
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

HORIZONTAL GEOMETRY LAYOUT

SHEET 11 OF 12

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DW:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DW:	HOU	HARRIS	0912	72	391	107

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67862

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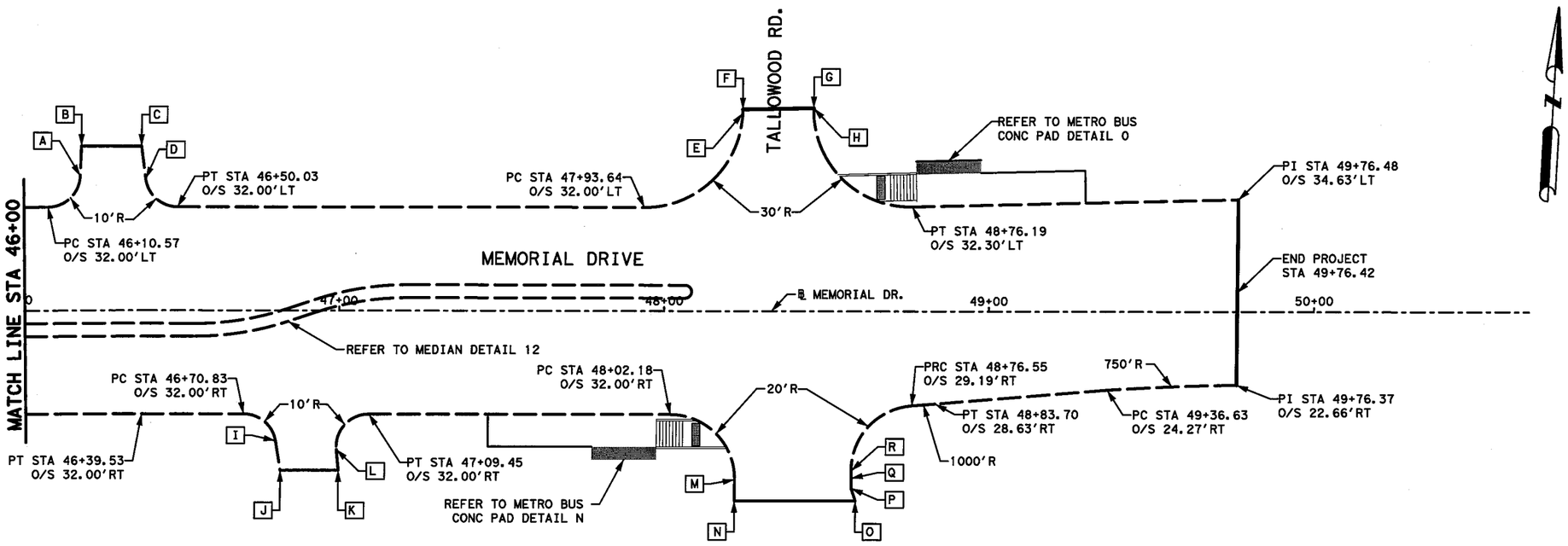
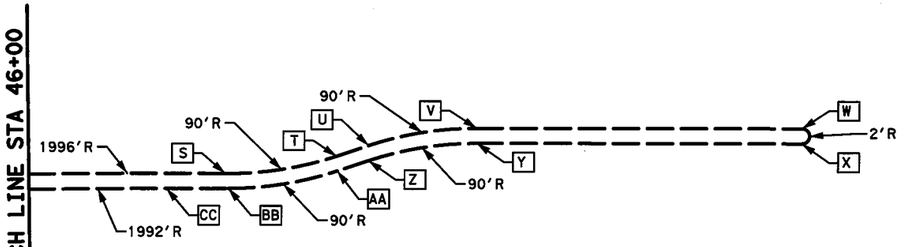
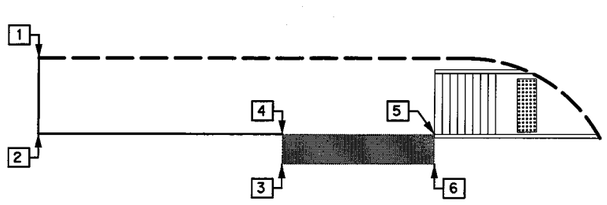


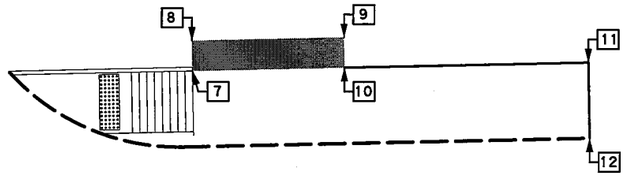
HORIZONTAL GEOMETRY DATA			
NO.	DESCRIP	STATION	OFFSET
A	PT	46+20.36	41.58 LT
B	PI	46+20.70	50.80 LT
C	PI	46+38.77	50.67 LT
D	PC	46+40.12	40.64 LT
E	PT	48+23.63	61.16 LT
F	PI	48+23.66	62.29 LT
G	PI	48+45.50	62.70 LT
H	PC	48+45.50	62.64 LT
I	PT	46+80.69	40.33 RT
J	PI	46+82.23	49.41 RT
K	PI	47+00.14	49.44 RT
L	PC	46+99.50	42.99 RT
M	PT	48+22.18	52.16 RT
N	PI	48+22.12	58.70 RT
O	PI	48+59.40	58.69 RT
P	PI	48+58.12	54.80 RT
Q	PI	48+58.08	51.71 RT
R	PC	48+58.05	49.39 RT
S	PC	46+54.92	4.06 RT
T	PT	46+84.12	0.57 LT
U	PC	46+92.49	3.37 LT
V	PT	47+21.00	8.00 LT
W	PC	48+06.39	8.00 LT
X	PT	48+06.39	4.00 LT
Y	PC	47+21.00	4.00 LT
Z	PT	46+92.50	0.63 RT
AA	PC	46+84.31	3.37 RT
BB	PT	46+55.80	8.00 RT
CC	PC	46+39.53	8.00 RT



MEDIAN DETAIL 12



METRO BUS CONC PAD
DETAIL N
N.T.S.



METRO BUS CONC PAD
DETAIL O
N.T.S.

METRO BUS PAD GEOMETRY		
NO.	STATION	OFFSET
1	47+46.01	32.00 RT
2	47+46.01	42.00 LT
3	47+78.01	46.00 RT
4	47+78.01	32.00 RT
5	47+98.01	42.00 RT
6	47+98.01	46.00 RT
7	47+77.29	42.33 LT
8	47+77.20	46.33 LT
9	48+97.19	46.79 LT
10	48+97.29	42.80 LT
11	49+29.28	43.54 LT
12	49+29.51	33.54 LT

0 40 80
(IN FEET)
SCALE: PLAN 1": 40'

STATE OF TEXAS
MARK WOODWARD
98672
LICENSED
PROFESSIONAL ENGINEER
03/04/2020
Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION
AND ACCESS MANAGEMENT

HORIZONTAL GEOMETRY
LAYOUT

SHEET 12 OF 12

DGNs	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CSK DGNs	6	TEXAS	STP 1802(783)MM			CS
DWGs	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CSK DWGs	HOU	HARRIS	0912	72	391	108

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PUBLIC WORKS
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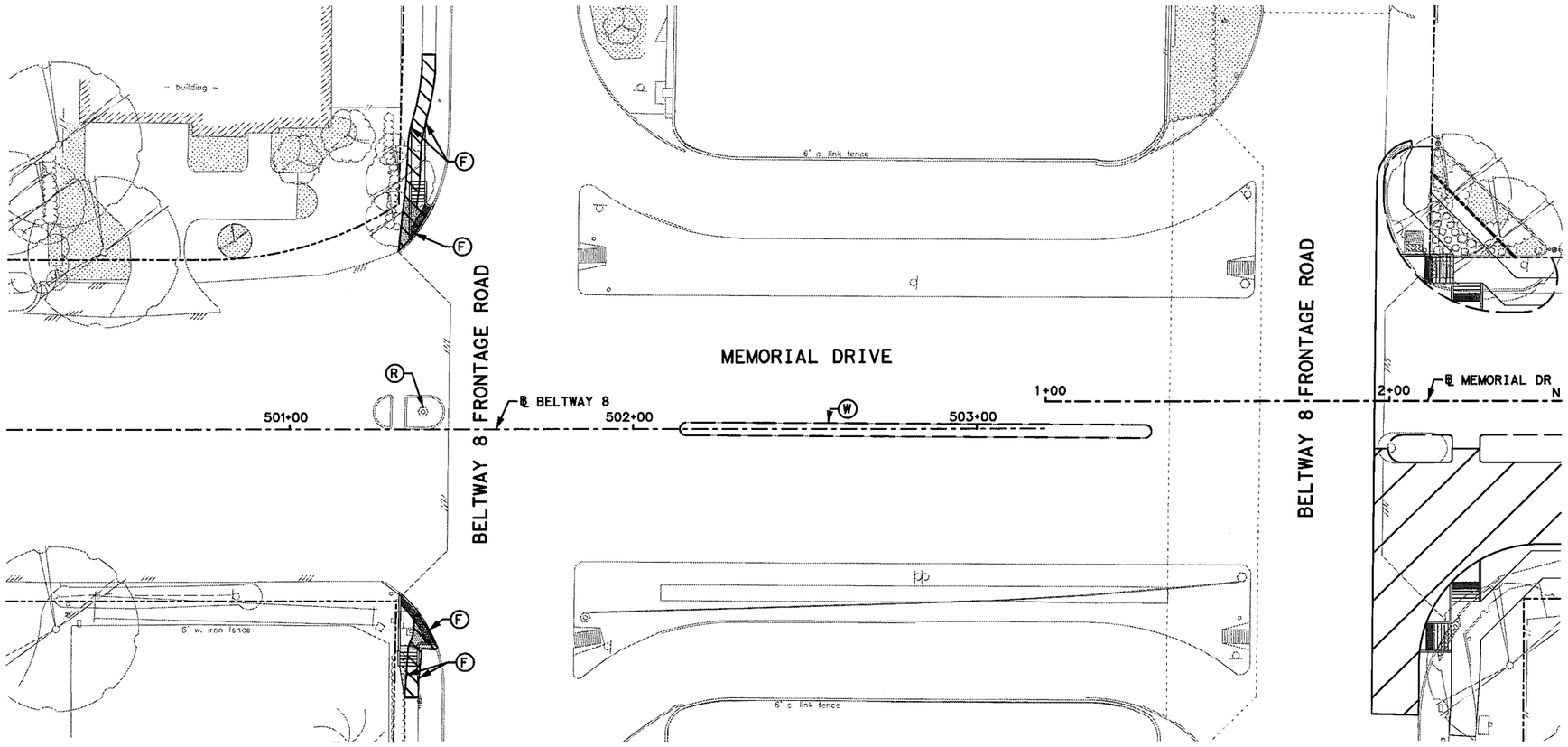

LEGEND

- (A) REMOVE PIPE(RCP,PVC OR CMP)
- (B) REMOVE INLET
- (C) REMOVE MH OR JCT BOX
- (D) REMOVE CONC PAV
- (E) REMOVE CONC/ASPH DRWY
- (F) REMOVE CONC SIDEWALK/RAMP
- (G) REMOVE CONC CURB
- (H) REMOVE ASPH PAV & BASE
- (I) REMOVE SMALL STRUCTURE
- (J) SAWCUT
- (K) REMOVE BOX CULVERT
- (L) REMOVE CEM STAB CRUSHED SHELL
- (M) ABANDON, GROUT AND FILL EXIST SAN SWR
- (N) GROUT FILL & ABANDON EXIST SAN SWR MH
- (O) REMOVE EXIST SAN SWR MH
- (P) REMOVE EXIST TREE/SHRUBS
- (Q) REMOVE TRAFFIC SIGNS
- (R) REMOVE EXIST TRAFFIC SIGNAL
- (S) REMOVE UTILITY
- (T) REMAIN IN PLACE
- (U) REMOVE LANDSCAPE
- (V) REMOVE FENCE
- (W) REMOVE ISLAND
- (X) PLUG LINE

NOTES:

1. PERFORM TREE PROTECTION AND RELATED WORK SHOWN IN TREE PROTECTION PLANS PRIOR TO DEMOLITION WORK.
2. CAP AND WELD ALL PVC PIPES FOR EXISTING IRRIGATION SYSTEMS TO POINT BEYOND DISTURBANCE AND/OR LIMITS OF WORK.
3. REFER TO ROADWAY PLANS FOR ADDITIONAL INFORMATION.

0 40 80

(IN FEET)

SCALE: PLAN 1"=40'

4. REFER TO LIGHTING PLAN FOR ADDITIONAL LIGHTING REMOVAL INFORMATION.
5. COORDINATE DEMOLITION WORK AND IMPACTS TO EXISTING IRRIGATION SYSTEMS. REPAIR EXISTING SYSTEMS TO MAINTAIN CONTINOUS OPERATION AT ALL TIMES. EXISTING SYSTEMS MUST NOT BE INOPERABLE DUE TO PROJECT IMPACT FOR MORE THAN TWO CONTINOUS WORKING DAYS. REMOVAL, REPAIRS AND RELATED WORK IS SUBSIDIARY TO ITEM 170 AND IS NOT PAID.

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

PUBLIC WORKS ENGINEERING
ACCEPTED AND RELEASED
67862

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

DEMOLITION PLAN BELTWAY 8

SHEET 1 OF 1

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CSJ:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CSJ:	HOU	HARRIS	0912	72	391	109

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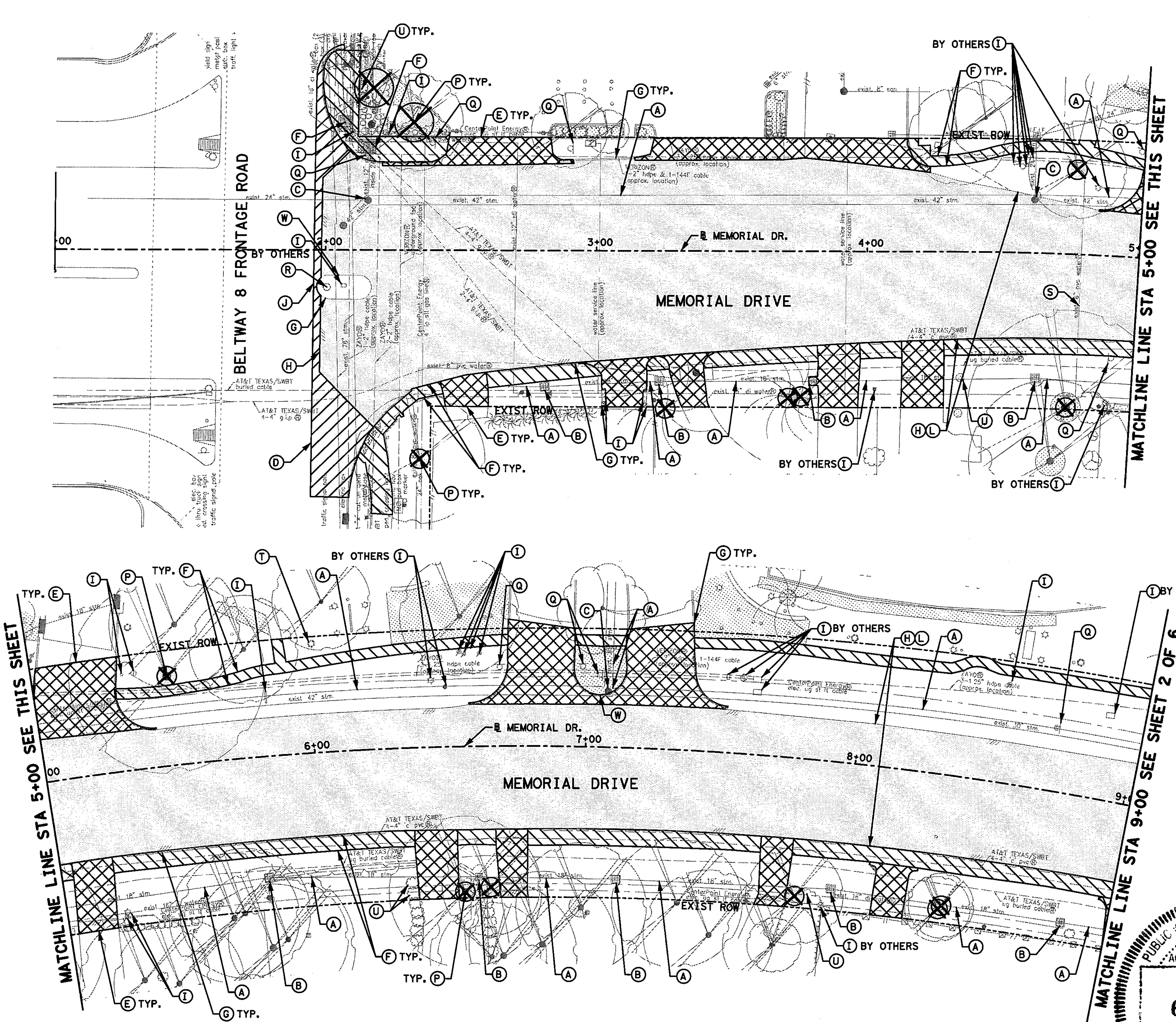

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- (R) REMOVE EXIST TRAFFIC SIGNAL
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- (V) REMOVE FENCE
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- (X) PLUG LINE

NOTES:

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3. REFER TO ROADWAY PLANS FOR ADDITIONAL INFORMATION.

0 40 80
(IN FEET)
SCALE: PLAN 1":40'

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STATE OF TEXAS
MARK WOODWARD
96672
LICENSED PROFESSIONAL ENGINEER
03/04/2020
Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

PUBLIC WORKS ... ACCEPTED AND ...
67862

REV. NO.	DATE	DESCRIPTION	BY

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A LEO A DALY COMPANY
FIRM REGISTATION NO. 2614

Texas Department of Transportation
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

DEMOLITION PLAN
BEGIN PROJECT TO STA 9+00

SHEET 1 OF 6

FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
6	TEXAS	STP 1802(783)MM			CS
DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
HOU	HARRIS	0912	72	391	110

DGN: CHK DGN: DWG: CHK DWG:

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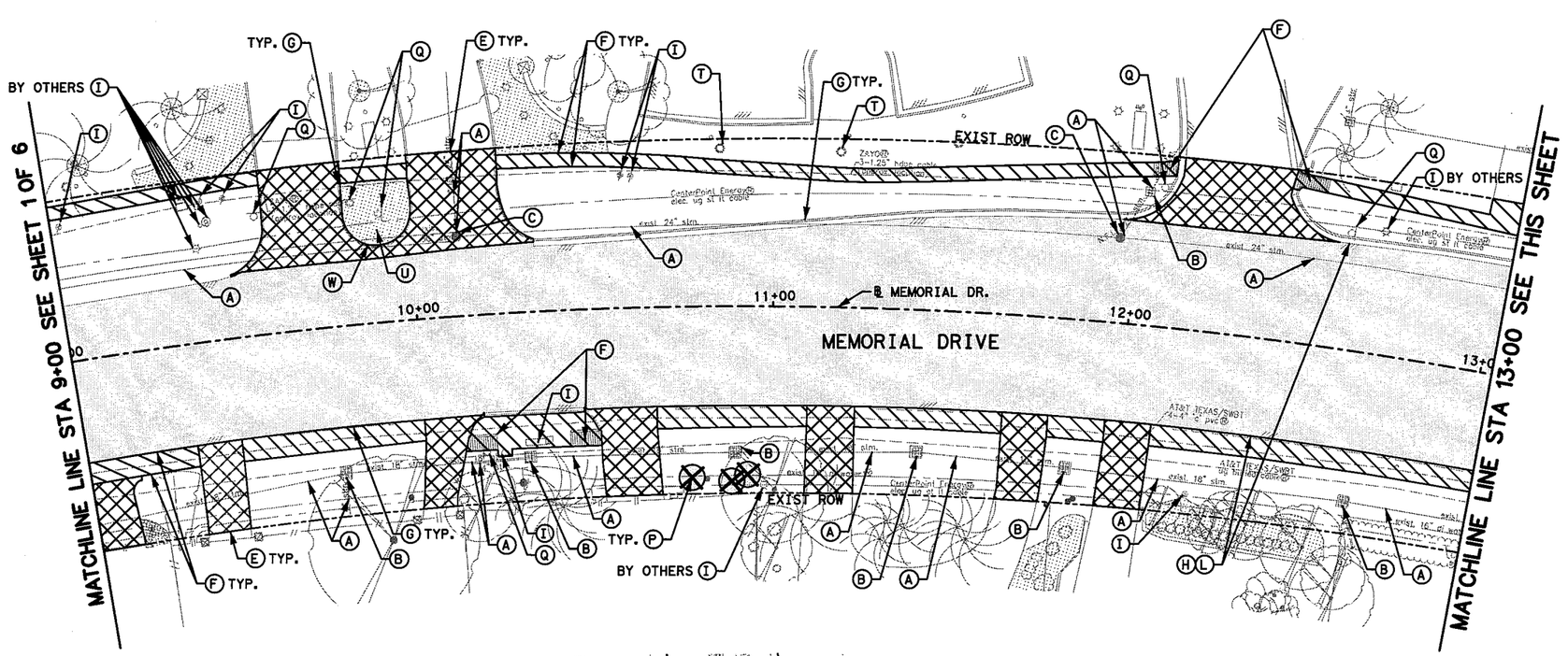

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NOTES:

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0 40 80
(IN FEET)
SCALE: PLAN 1": 40'

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03/04/2020
Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

PUBLIC WORKS AND ENGINEERING
ACCEPTED AND F...
67862

REV. NO.	DATE	DESCRIPTION	BY

Lockwood, Andrews & Newnam, Inc.
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FIRM REGISTATION NO. 2614

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

DEMOLITION PLAN STA 9+00 TO STA 17+00

SHEET 2 OF 6

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	111

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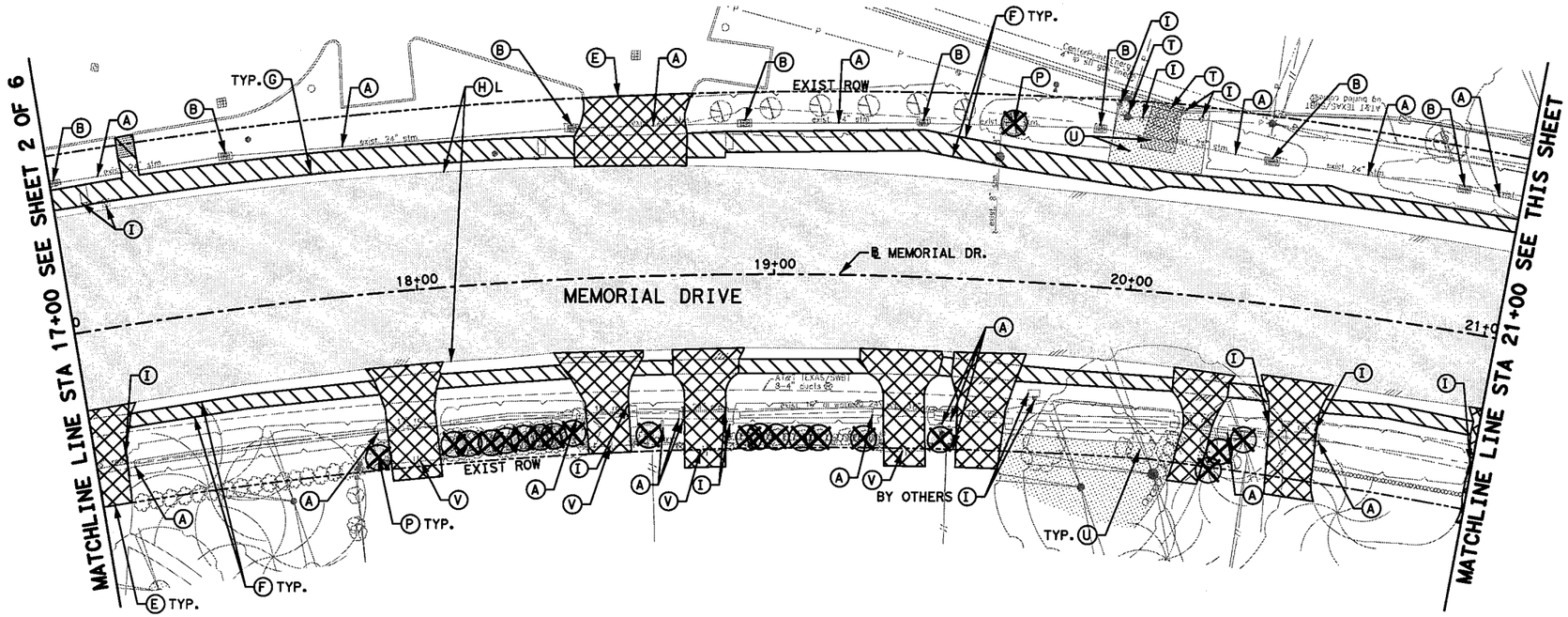

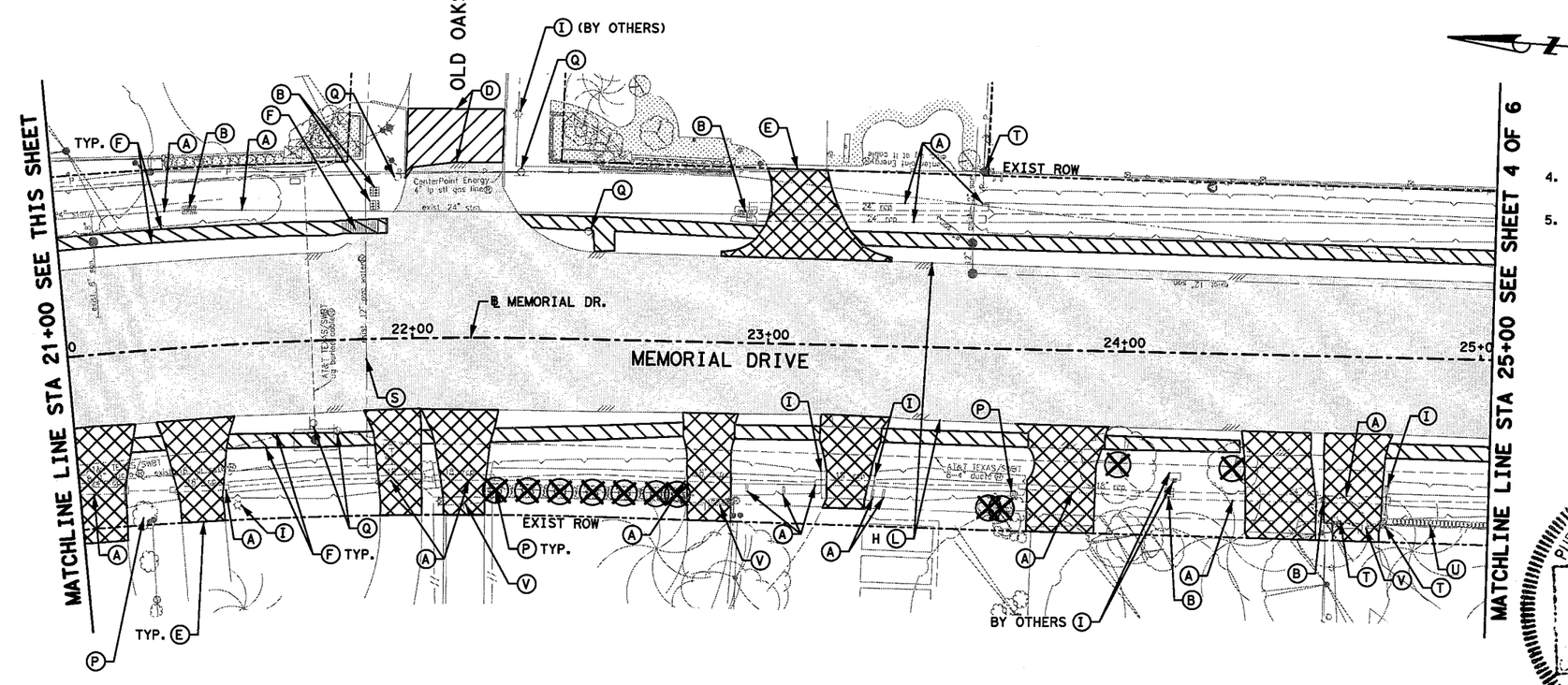

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3. REFER TO ROADWAY PLANS FOR ADDITIONAL INFORMATION.

0 40 80
(IN FEET)
SCALE: PLAN 1" = 40'

4. REFER TO LIGHTING PLAN FOR ADDITIONAL LIGHTING REMOVAL INFORMATION.
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STATE OF TEXAS
MARK WOODWARD
96672
LICENSED PROFESSIONAL ENGINEER
03/04/2020
Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

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FIRM REGISTATION NO. 2614

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

DEMOLITION PLAN STA 17+00 TO STA 25+00

SHEET 3 OF 6

	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	112

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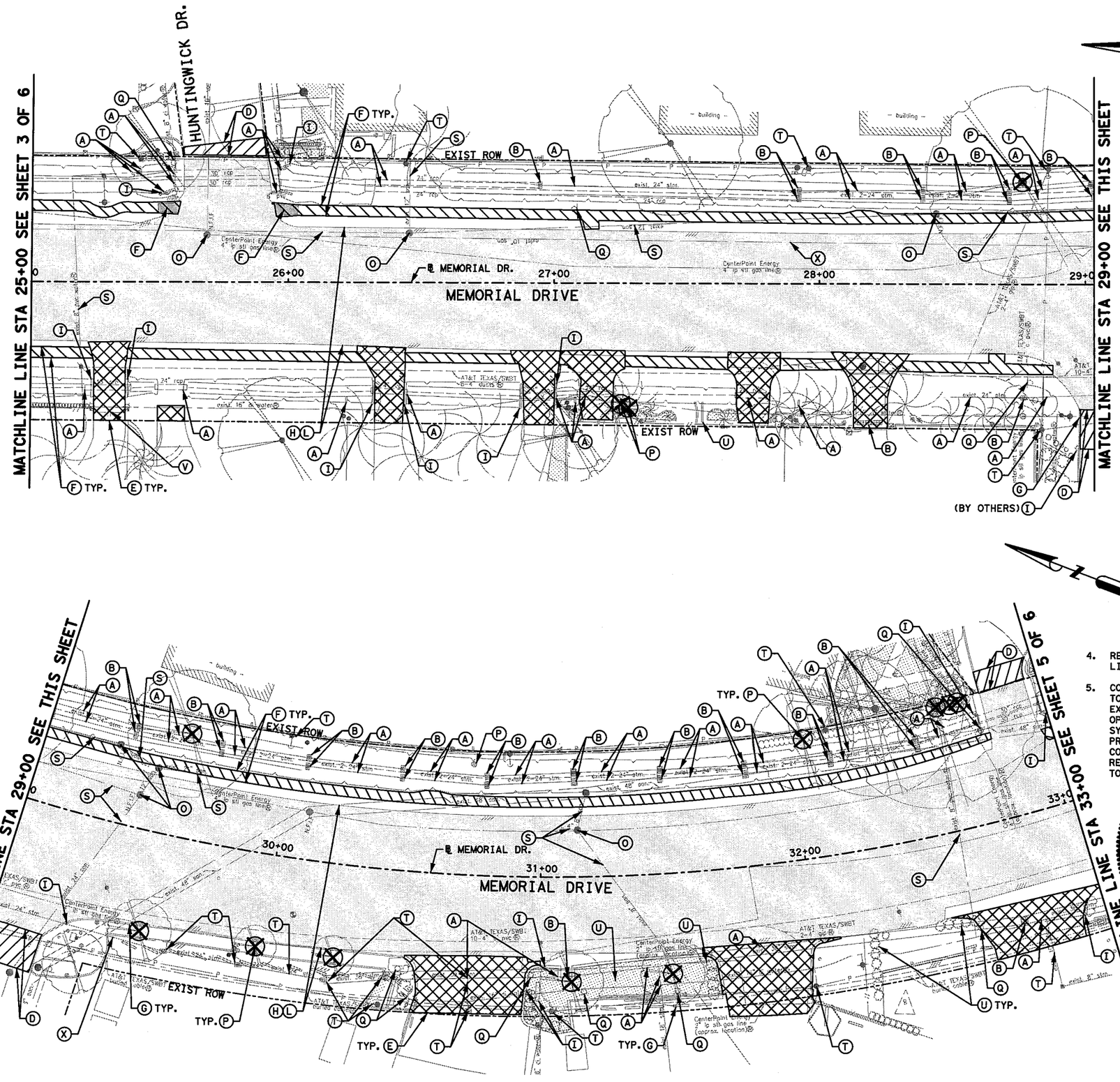

LEGEND

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0 40 80

(IN FEET)

SCALE: PLAN 1" : 40'

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STATE OF TEXAS
MARK WOODWARD
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LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

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REV. NO.	DATE	DESCRIPTION	BY

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

DEMOLITION PLAN STA 25+00 TO STA 33+00

SHEET 4 OF 6

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	113

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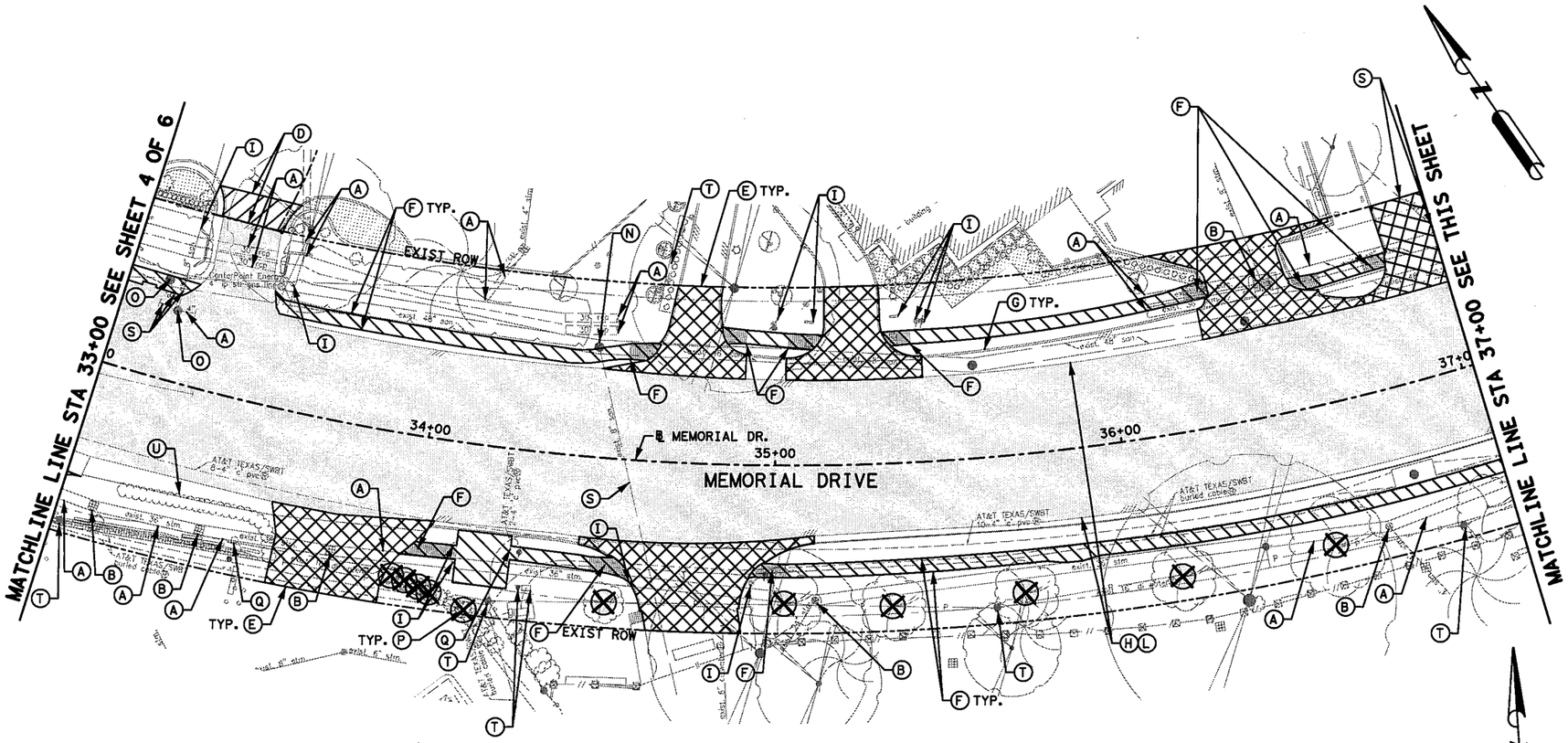

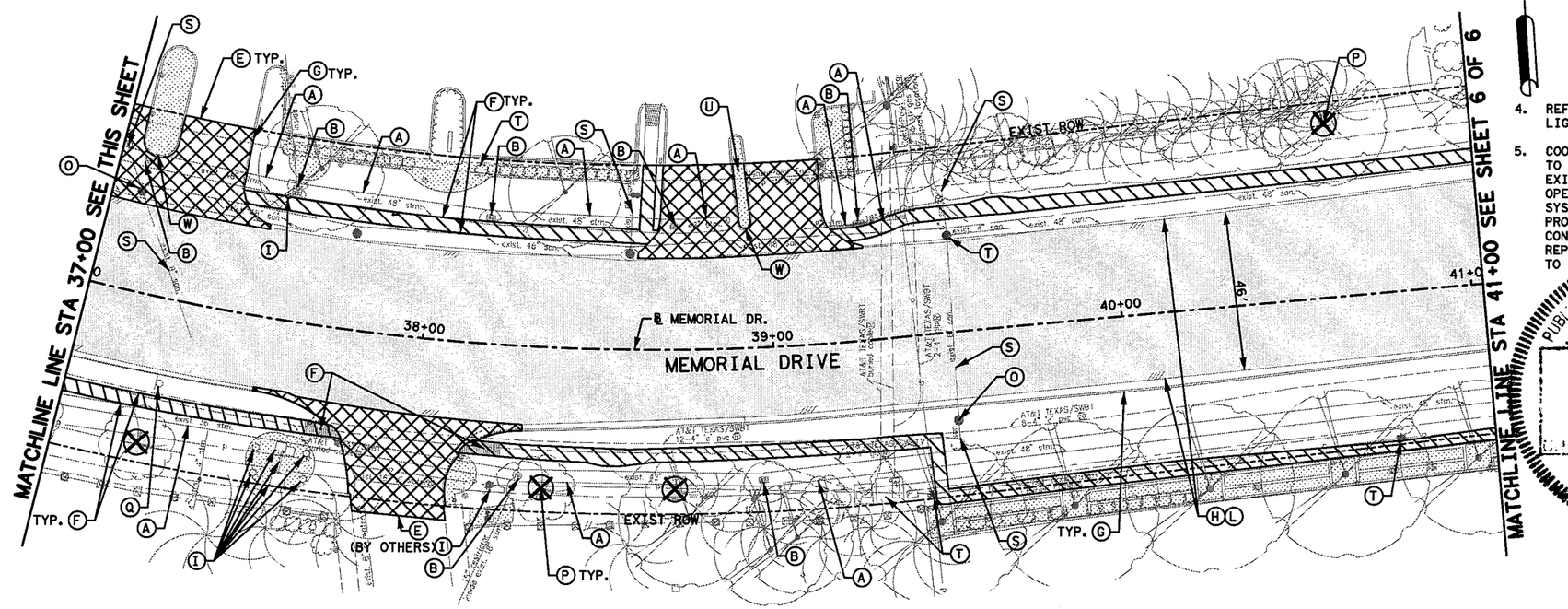

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0 40 80
(IN FEET)
SCALE: PLAN 1"=40'

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STATE OF TEXAS
MARK WOODWARD
86672
LICENSED
PROFESSIONAL ENGINEER
03/04/2020
Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

PUBLIC WORKS
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REV. NO.	DATE	DESCRIPTION	BY

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Texas Department of Transportation
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

DEMOLITION PLAN STA 33+00 TO STA 41+00

SHEET 5 OF 6

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWN:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CK DWN:	HOU	HARRIS	0912	72	391	114

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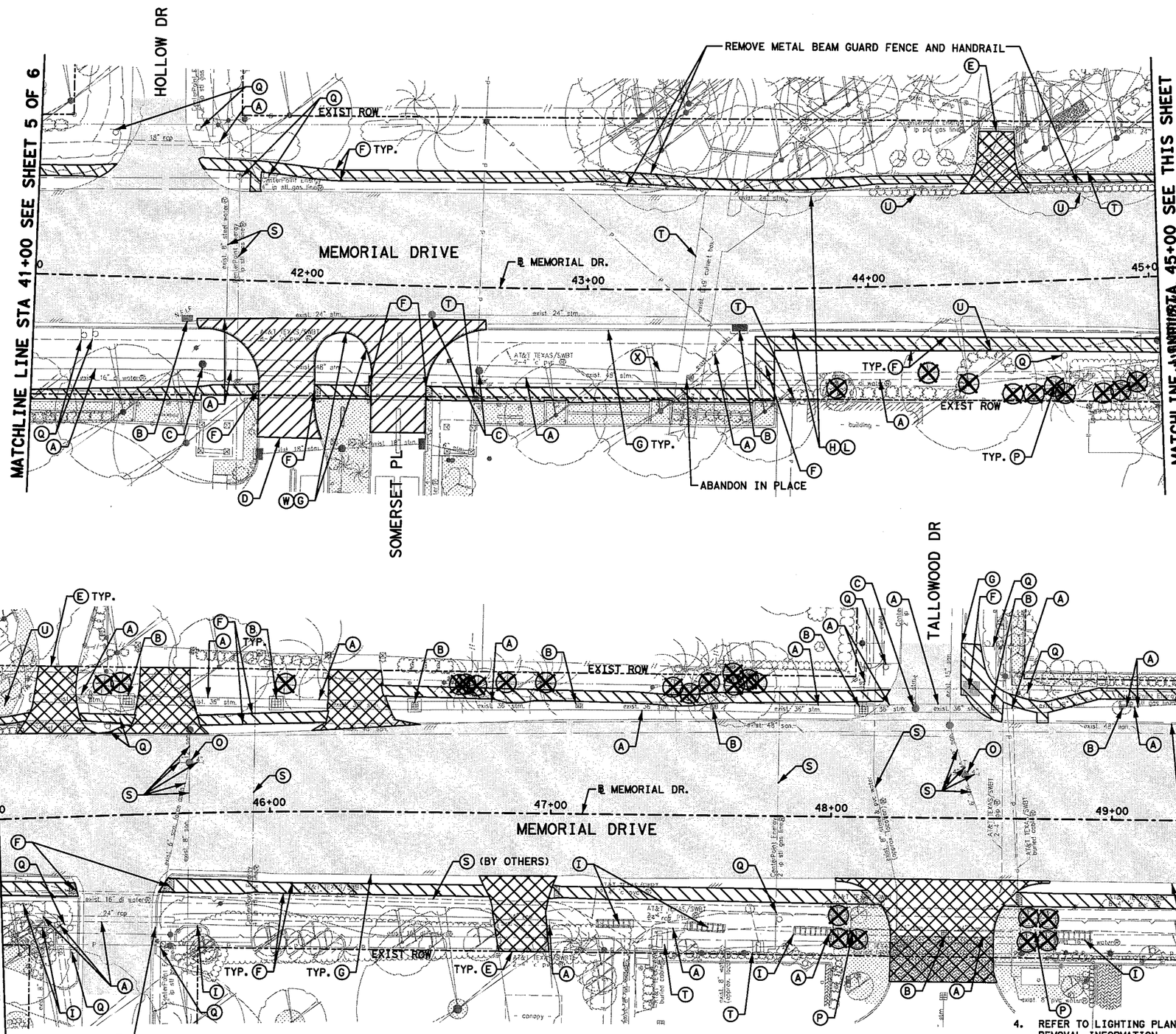

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0 40 80

(IN FEET)

SCALE: PLAN 1": 40'

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03/04/2020

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Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

Lockwood, Andrews & Newnam, Inc. A LEO A DALY COMPANY — FIRM REGISTATION NO. 2614

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

DEMOLITION PLAN STA 41+00 TO END PROJECT

SHEET 7 OF 7

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CK: DWG:	HOU	HARRIS	0912	72	391	115

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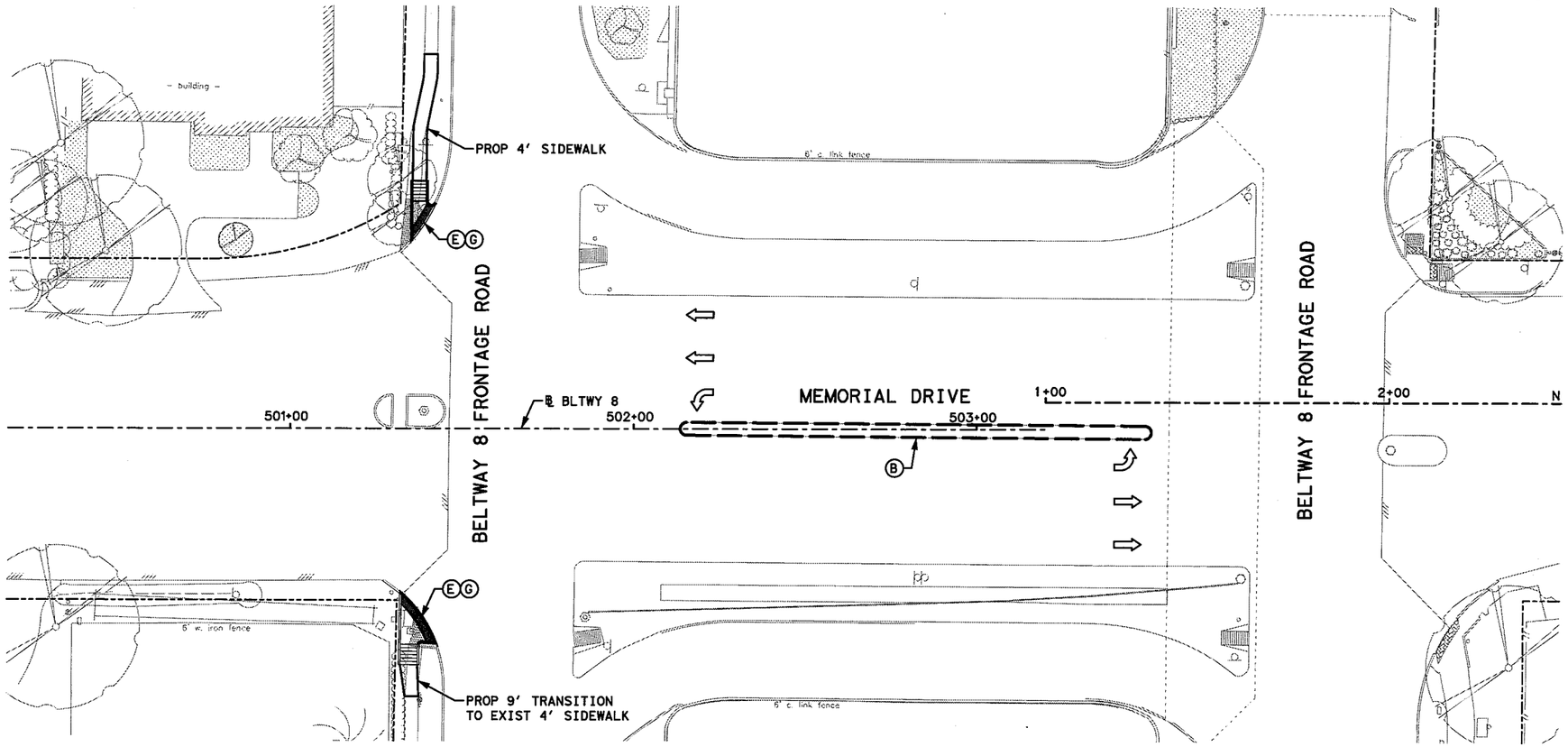

LEGEND

- PROPOSED LANE
- EXISTING LANE
- (CURVE) HORIZONTAL ALIGNMENT CURVE NAME
- EXISTING ROW
- PROPOSED CURB
- EXISTING CURB
- 11" JRCP HES
- 9" THICK CONC BUS SHELTER AREA
- (A) 11" JRCP
- (B) 6" CONC CURB
- (C) CONC DRIVEWAY
- (D) 8' WIDE CONC SIDEWALK
- (E) WHEEL CHAIR RAMP
- (F) TOE WALL
- (G) TRUNCATED DOMES
- (H) ADJUST MH COVER/METER BOX
- (X) DRIVEWAY NUMBER (SEE DRIVEWAY TABULATION AND DETAILS SHEET)

NOTES:

1. REFER TO DRAINAGE IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
2. REFER TO WATER & SAN SWR IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
3. REFER TO IRRIGATION SHEETS FOR PROPOSED SLEEVE LOCATIONS.
4. REFER TO TRAFFIC SIGNAL SHEETS FOR MORE INFORMATION.
5. REFER TO ROADWAY HORIZONTAL GEOMETRY SHEET FOR MORE INFORMATION.
6. REFER TO LANDSCAPE/HARDSCAPE DETAILS FOR MORE INFORMATION ON BACK OF CURB AND BUS SHELTER IMPROVEMENTS.
7. EXCAVATION LIMITS ARE LIMITED TO THE PROPOSED SIDEWALK. CONSTRUCTION EQUIPMENT AND MATERIALS SHALL NOT ENCROACH EXIST LANDSCAPING SYSTEM.

0 40 80

(IN FEET)

SCALE: PLAN 1" = 40'

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

ROADWAY PLAN BELTWAY 8

SHEET 1 OF 1

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	116

PUBLIC WORKS ENGINEERING
67862
TRANSPORTATION

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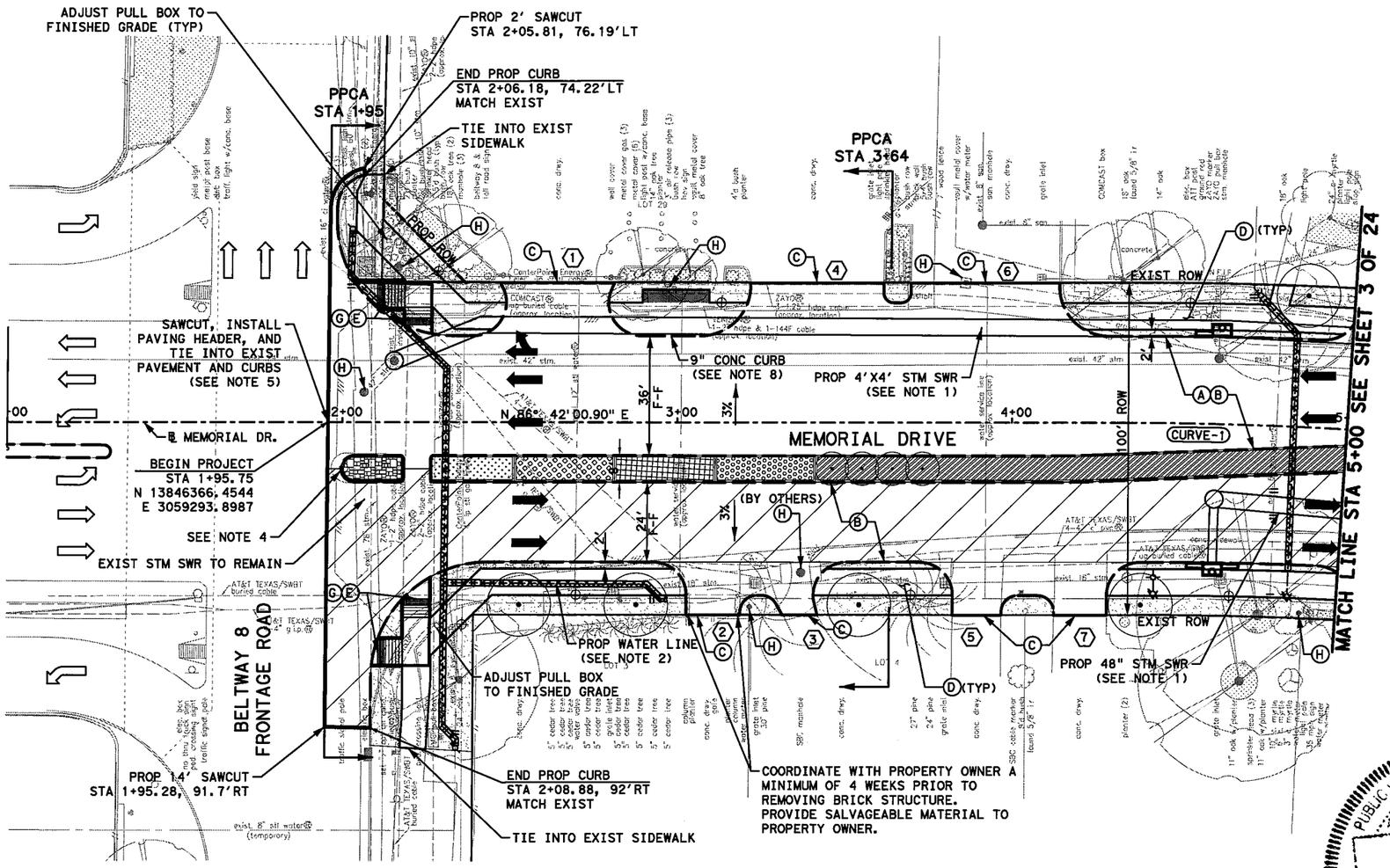

LEGEND

- PROPOSED LANE
- EXISTING LANE
- (CURVE) HORIZONTAL ALIGNMENT CURVE NAME
- EXISTING ROW
- PROPOSED CURB
- EXISTING CURB
- 11" JRCP HES
- 9" THICK CONC BUS SHELTER AREA
- (A) 11" JRCP
- (B) 6" CONC CURB
- (C) CONC DRIVEWAY
- (D) 8' WIDE CONC SIDEWALK
- (E) WHEEL CHAIR RAMP
- (F) TOE WALL
- (G) TRUNCATED DOMES
- (H) ADJUST MH COVER/METER BOX
- (X) DRIVEWAY NUMBER (SEE DRIVEWAY TABULATION AND DETAILS SHEET)

NOTES:

1. REFER TO DRAINAGE IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
2. REFER TO WATER & SAN SWR IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
3. REFER TO IRRIGATION SHEETS FOR PROPOSED SLEEVE LOCATIONS.
4. REFER TO TRAFFIC SIGNAL SHEETS FOR MORE INFORMATION.
5. REFER TO ROADWAY HORIZONTAL GEOMETRY SHEET FOR MORE INFORMATION.
6. REFER TO LANDSCAPE/HARDSCAPE DETAILS FOR MORE INFORMATION ON BACK OF CURB AND BUS SHELTER IMPROVEMENTS.
7. EXCAVATION LIMITS ARE LIMITED TO THE PROPOSED SIDEWALK. CONSTRUCTION EQUIPMENT AND MATERIALS SHALL NOT ENCROACH EXIST LANDSCAPING SYSTEM.

0 40 80

(IN FEET)

SCALE: PLAN 1": 40'

NOTES:

8. REFER TO METRO DETAILS FOR MORE INFORMATION.
9. POTENTIALLY PETROLEUM CONTAMINATED AREAS (PPCA) HAS BEEN INDENTIFIED WITHIN THE PROJECT LIMITS. REFER TO SOIL AND GROUNDWATER MANAGEMENT PLAN FOR MORE INFORMATION.
10. REFER TO EXIST UTILITY PLANS FOR MORE CONTACT INFORMATION TO ADJUST EXIST FACILITIES.

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

PUBLIC WORKS AND TRANSPORTATION
ACCEPTED AND FILED
67862

REV. NO.	DATE	DESCRIPTION	BY

Lockwood, Andrews & Newnam, Inc. A LEO A DALY COMPANY — FIRM REGISTATION NO. 2614

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

ROADWAY PLAN BEGIN PROJECT TO STA 5+00

SHEET 1 OF 24

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CRK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CRK DWG:	HOU	HARRIS	0912	72	391	117

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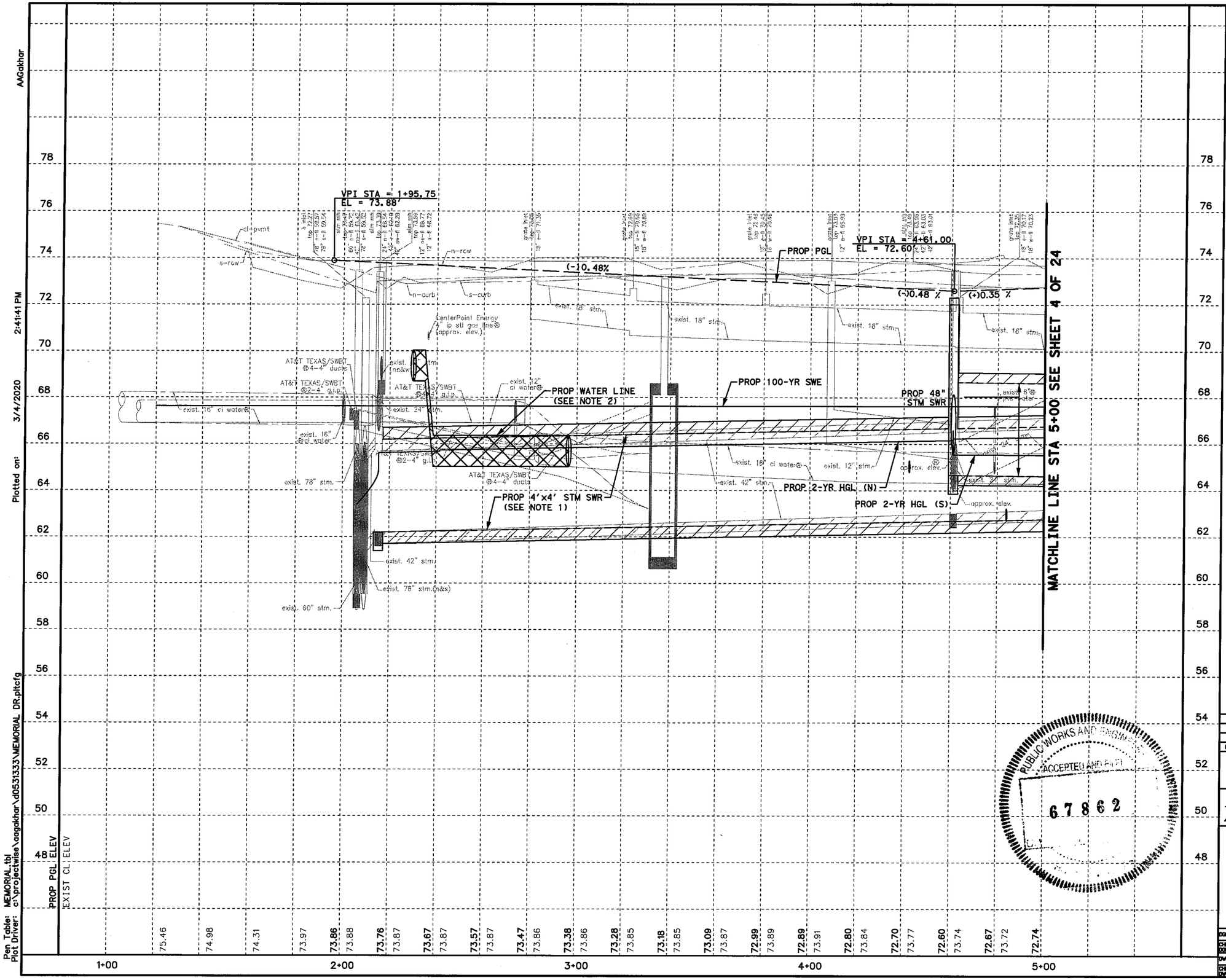

	1+00	2+00	3+00	4+00	5+00
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EXIST CL ELEV					

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NOTES:
1. REFER TO DRAINAGE IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
2. REFER TO WATER & SAN SWR IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.

0 40 80
(IN FEET)
SCALE: 1"=40' - H
1"=4' - V

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

ROADWAY PROFILE BEGIN PROJECT TO STA 5+00

SHEET 2 OF 24

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	118

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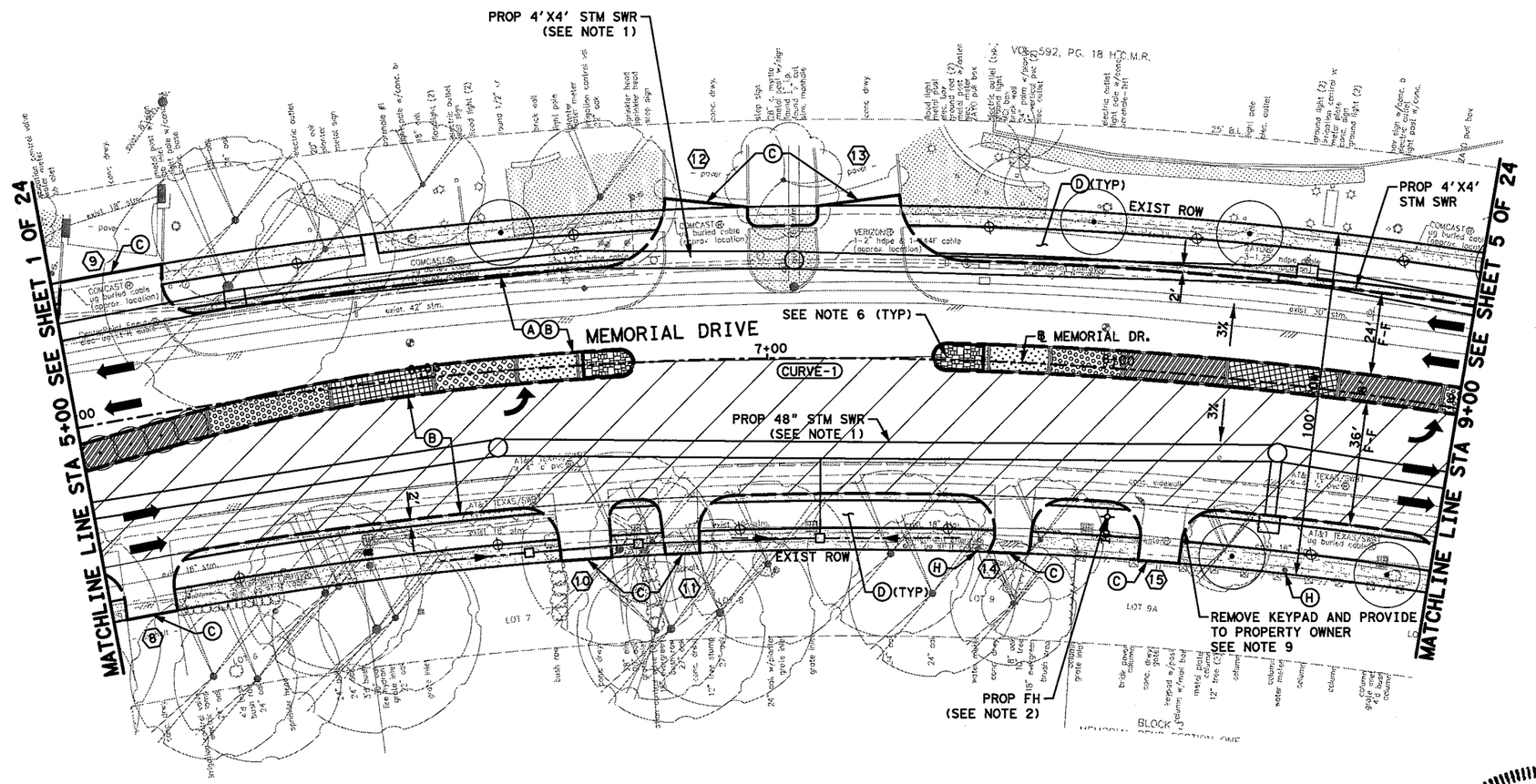

LEGEND

- PROPOSED LANE
- EXISTING LANE
- (CURVE) HORIZONTAL ALIGNMENT CURVE NAME
- EXISTING ROW
- PROPOSED CURB
- EXISTING CURB
- 11" JRCP HES
- 9" THICK CONC BUS SHELTER AREA
- (A) 11" JRCP
- (B) 6" CONC CURB
- (C) CONC DRIVEWAY
- (D) 8' WIDE CONC SIDEWALK
- (E) WHEEL CHAIR RAMP
- (F) TOE WALL
- (G) TRUNCATED DOMES
- (H) ADJUST MH COVER/METER BOX
- (X) DRIVEWAY NUMBER (SEE DRIVEWAY TABULATION AND DETAILS SHEET)

NOTES:

1. REFER TO DRAINAGE IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
2. REFER TO WATER & SAN SWR IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
3. REFER TO IRRIGATION SHEETS FOR PROPOSED SLEEVE LOCATIONS.
4. REFER TO TRAFFIC SIGNAL SHEETS FOR MORE INFORMATION.
5. REFER TO ROADWAY HORIZONTAL GEOMETRY SHEET FOR MORE INFORMATION.
6. REFER TO LANDSCAPE/HARDSCAPE DETAILS FOR MORE INFORMATION ON BACK OF CURB AND BUS SHELTER IMPROVEMENTS.
7. EXCAVATION LIMITS ARE LIMITED TO THE PROPOSED SIDEWALK. CONSTRUCTION EQUIPMENT AND MATERIALS SHALL NOT ENCROACH EXIST LANDSCAPING SYSTEM.

0 40 80

(IN FEET)

SCALE: PLAN 1": 40'

STATE OF TEXAS
MARK WOODWARD
98672
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

PUBLIC WORKS & ENGINEERING
ACCEPTED AND FILED
67862
HOUSTON, TEXAS

NOTES:

8. REFER TO METRO DETAILS FOR MORE INFORMATION.
9. COORDINATE WITH PROPERTY OWNER A MINIMUM OF 4 WEEKS PRIOR TO CONSTRUCTING DRIVEWAY.

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

ROADWAY PLAN
STA 5+00 TO STA 9+00

SHEET 3 OF 24

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	119

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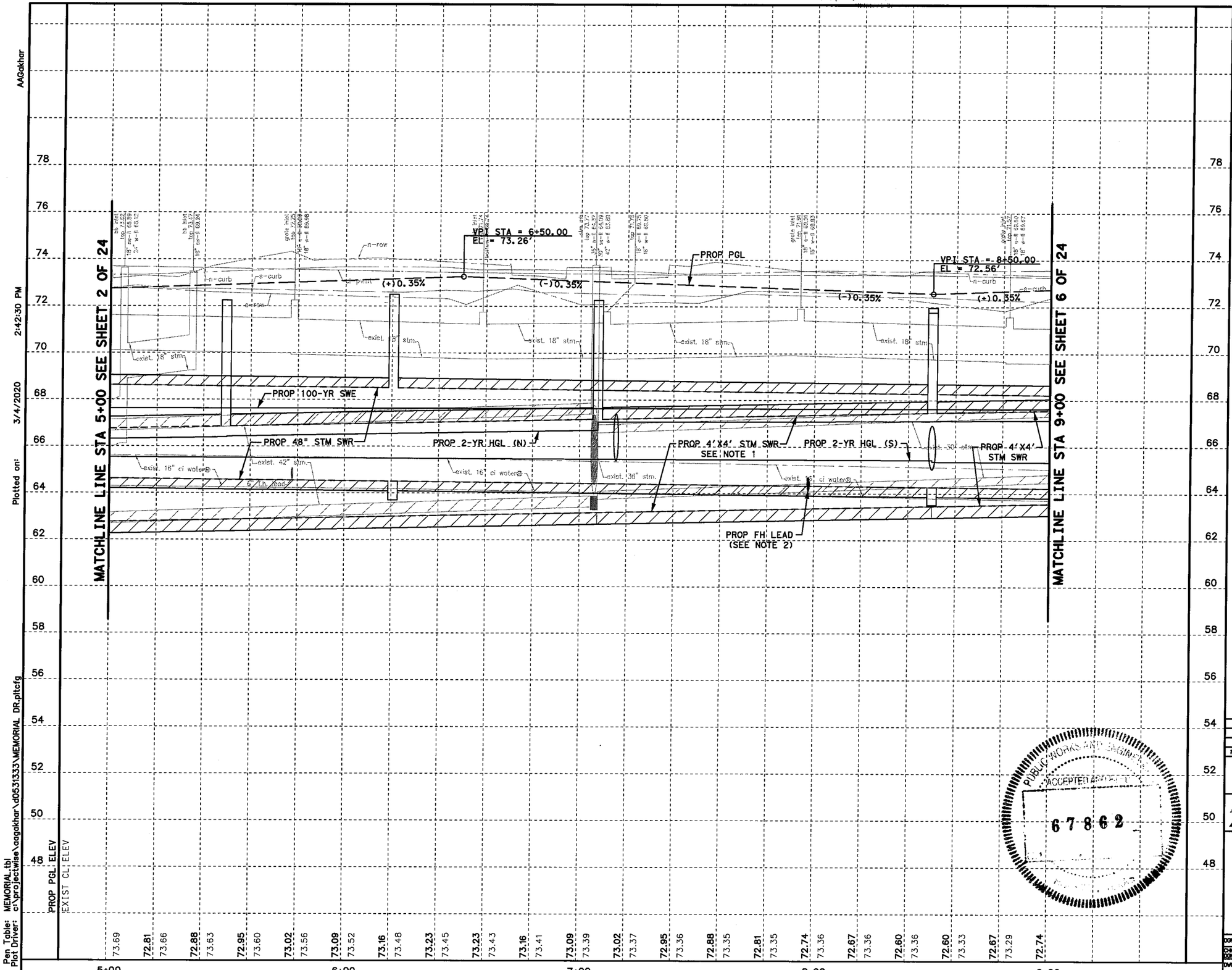

NOTES:

1. REFER TO DRAINAGE IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
2. REFER TO WATER & SAN SWR IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.

0 40 80

(IN FEET)
SCALE: 1"=40' - H
1"=4' - V

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

ROADWAY PROFILE
STA 5+00 TO STA 9+00

SHEET 4 OF 24

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	120

ACCEPTED FOR PUBLIC WORKS AND ENGINEERING
67862

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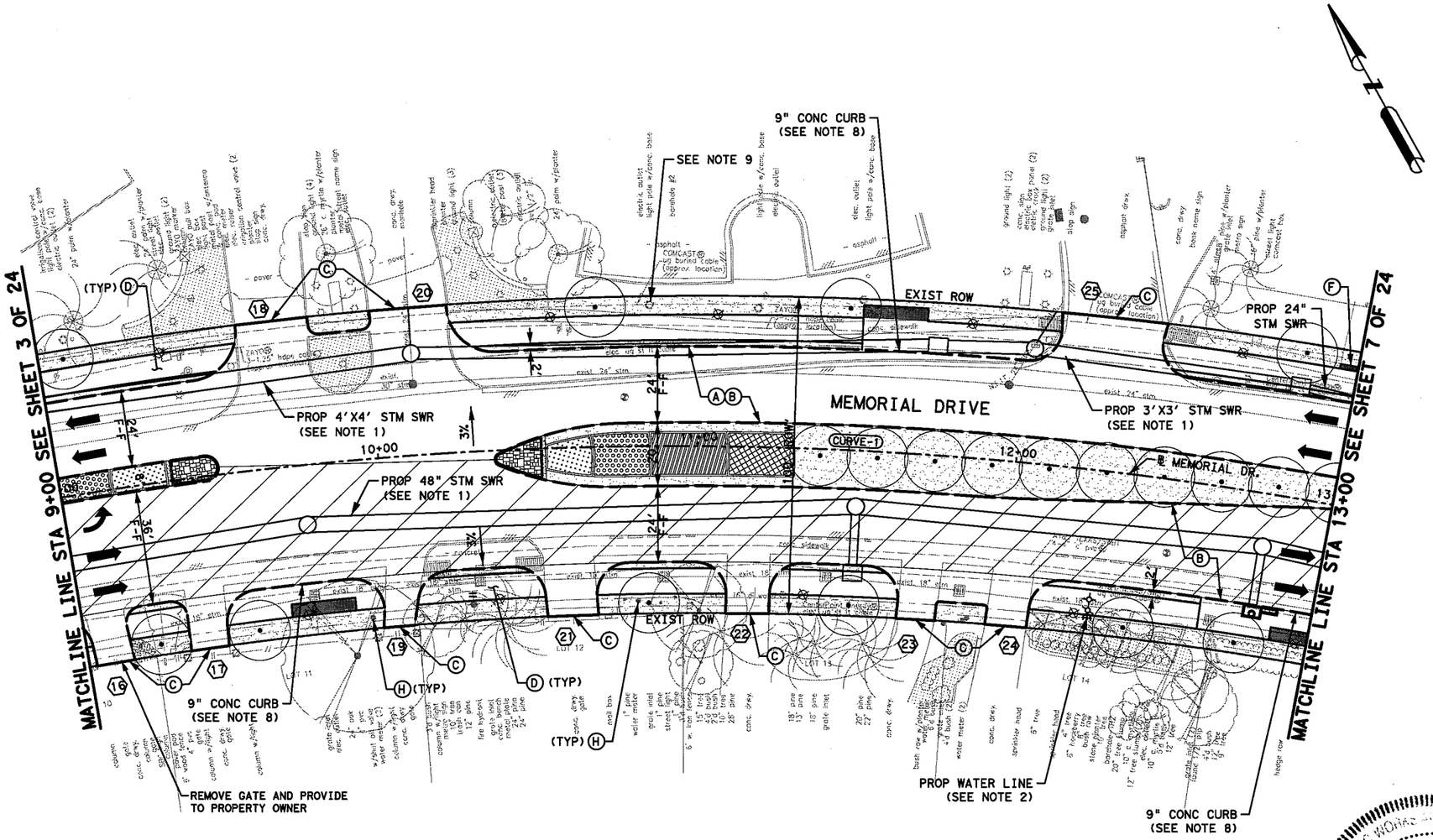

LEGEND

- PROPOSED LANE
- EXISTING LANE
- (CURVE) HORIZONTAL ALIGNMENT CURVE NAME
- EXISTING ROW
- PROPOSED CURB
- EXISTING CURB
- 11" JRCP HES
- 9" THICK CONC BUS SHELTER AREA
- (A) 11" JRCP
- (B) 6" CONC CURB
- (C) CONC DRIVEWAY
- (D) 8' WIDE CONC SIDEWALK
- (E) WHEEL CHAIR RAMP
- (F) TOE WALL
- (G) TRUNCATED DOMES
- (H) ADJUST MH COVER/METER BOX
- (X) DRIVEWAY NUMBER (SEE DRIVEWAY TABULATION AND DETAILS SHEET)

NOTES:

1. REFER TO DRAINAGE IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
2. REFER TO WATER & SAN SWR IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
3. REFER TO IRRIGATION SHEETS FOR PROPOSED SLEEVE LOCATIONS.
4. REFER TO TRAFFIC SIGNAL SHEETS FOR MORE INFORMATION.
5. REFER TO ROADWAY HORIZONTAL GEOMETRY SHEET FOR MORE INFORMATION.
6. REFER TO LANDSCAPE/HARDSCAPE DETAILS FOR MORE INFORMATION ON BACK OF CURB AND BUS SHELTER IMPROVEMENTS.
7. EXCAVATION LIMITS ARE LIMITED TO THE PROPOSED SIDEWALK. CONSTRUCTION EQUIPMENT AND MATERIALS SHALL NOT ENCROACH EXIST LANDSCAPING SYSTEM.

0 40 80

(IN FEET)

SCALE: PLAN 1": 40'

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

PUBLIC WORKS & TRANSPORTATION
ACCEPTED AND APPROVED
67862

NOTES:

8. REFER TO METRO DETAILS FOR MORE INFORMATION.
9. COORDINATE WITH PROPERTY OWNER A MINIMUM OF 4 WEEKS PRIOR TO REQUIRING ANY ADJUSTMENTS.

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

ROADWAY PLAN
STA 9+00 TO STA 13+00

SHEET 5 OF 24

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	121

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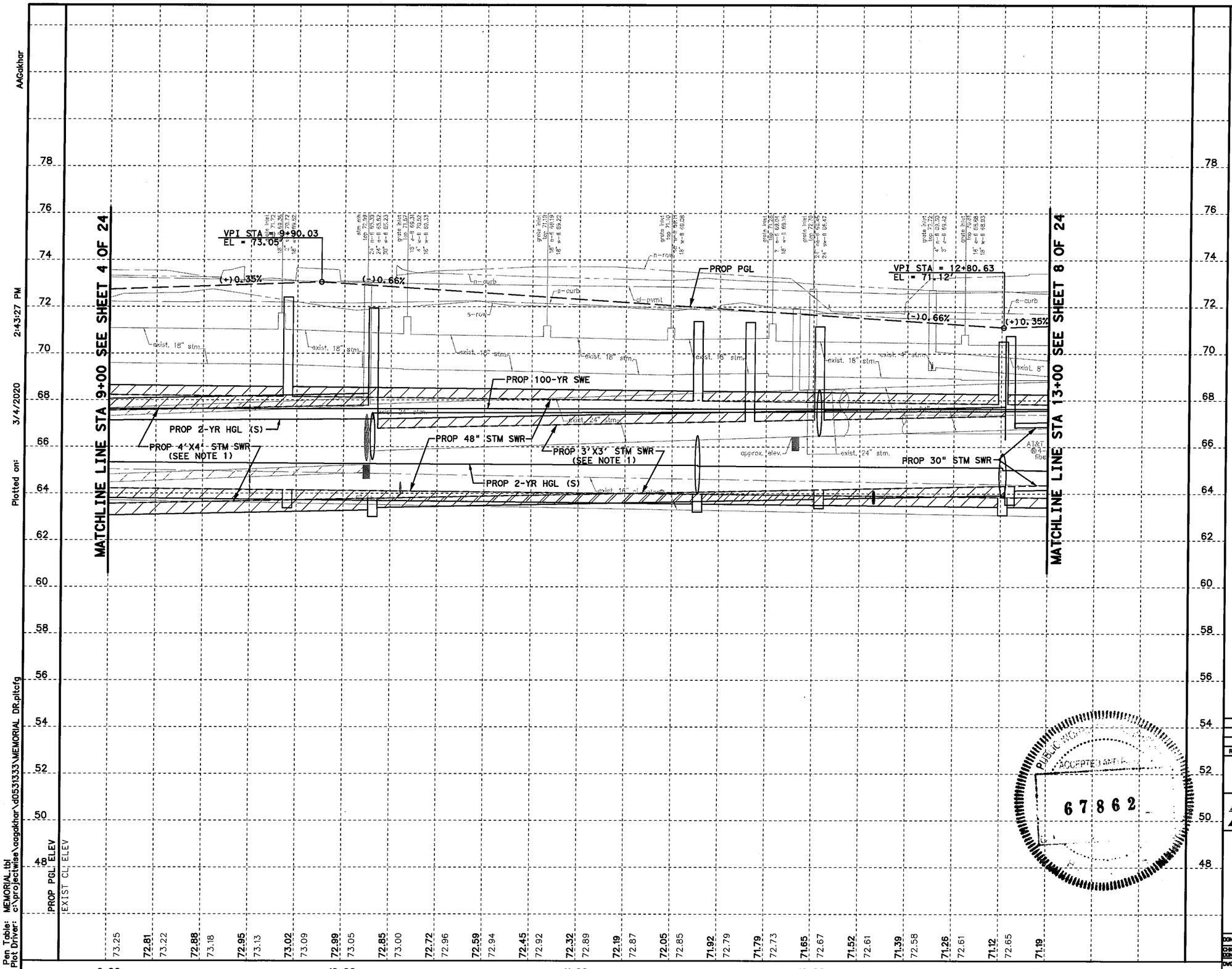

NOTES:

1. REFER TO DRAINAGE IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
2. REFER TO WATER & SAN SWR IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.

0 40 80

(IN FEET)
SCALE: 1":40' - H
1":4' - V

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

PUBLIC HIGHWAY IMPROVEMENT
ACCEPTED AND FILED
67862

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

ROADWAY PROFILE
STA 9+00 TO STA 13+00

SHEET 6 OF 24

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
SCALE:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK:	HOU	HARRIS	0912	72	391	122

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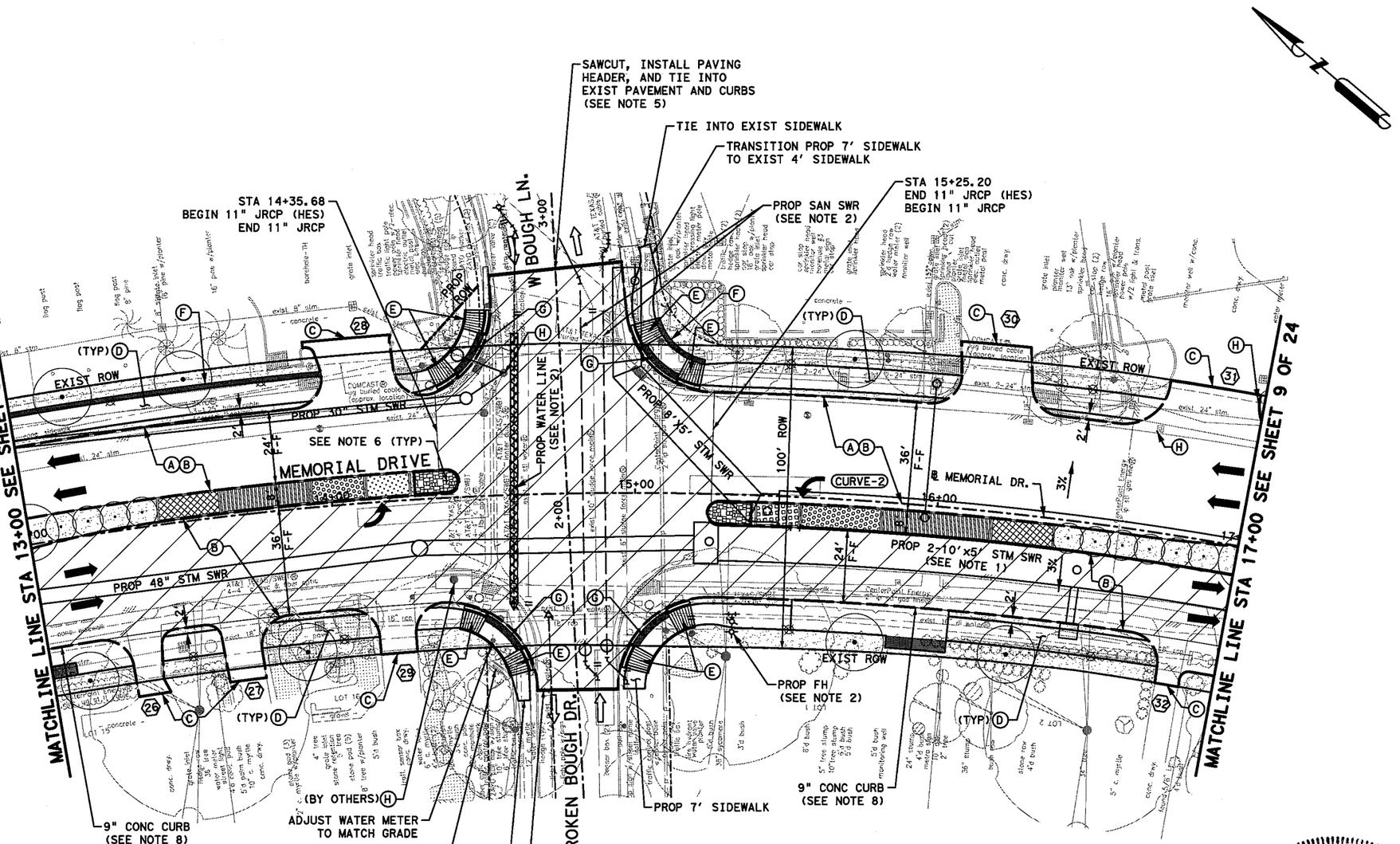

LEGEND

- PROPOSED LANE
- EXISTING LANE
- (CURVE) HORIZONTAL ALIGNMENT CURVE NAME
- EXISTING ROW
- PROPOSED CURB
- EXISTING CURB
- 11" JRCP HES
- 9" THICK CONC BUS SHELTER AREA
- (A) 11" JRCP
- (B) 6" CONC CURB
- (C) CONC DRIVEWAY
- (D) 8' WIDE CONC SIDEWALK
- (E) WHEEL CHAIR RAMP
- (F) TOE WALL
- (G) TRUNCATED DOMES
- (H) ADJUST MH COVER/METER BOX
- (X) DRIVEWAY NUMBER (SEE DRIVEWAY TABULATION AND DETAILS SHEET)

NOTES:

1. REFER TO DRAINAGE IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
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3. REFER TO IRRIGATION SHEETS FOR PROPOSED SLEEVE LOCATIONS.
4. REFER TO TRAFFIC SIGNAL SHEETS FOR MORE INFORMATION.
5. REFER TO ROADWAY HORIZONTAL GEOMETRY SHEET FOR MORE INFORMATION.
6. REFER TO LANDSCAPE/HARDSCAPE DETAILS FOR MORE INFORMATION ON BACK OF CURB AND BUS SHELTER IMPROVEMENTS.
7. EXCAVATION LIMITS ARE LIMITED TO THE PROPOSED SIDEWALK. CONSTRUCTION EQUIPMENT AND MATERIALS SHALL NOT ENCROACH EXIST LANDSCAPING SYSTEM.

0 40 80

(IN FEET)

SCALE: PLAN 1": 40'

STATE OF TEXAS
MARK WOODWARD
98672
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

NOTES:

8. REFER TO METRO DETAILS FOR MORE INFORMATION.
9. COORDINATE WITH HOA A MINIMUM OF 4 WEEKS PRIOR TO REMOVING SIGN.

PUBLIC WORKS ENGINEER
67862

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

ROADWAY PLAN
STA 13+00 TO STA 17+00

SHEET 7 OF 24

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	123

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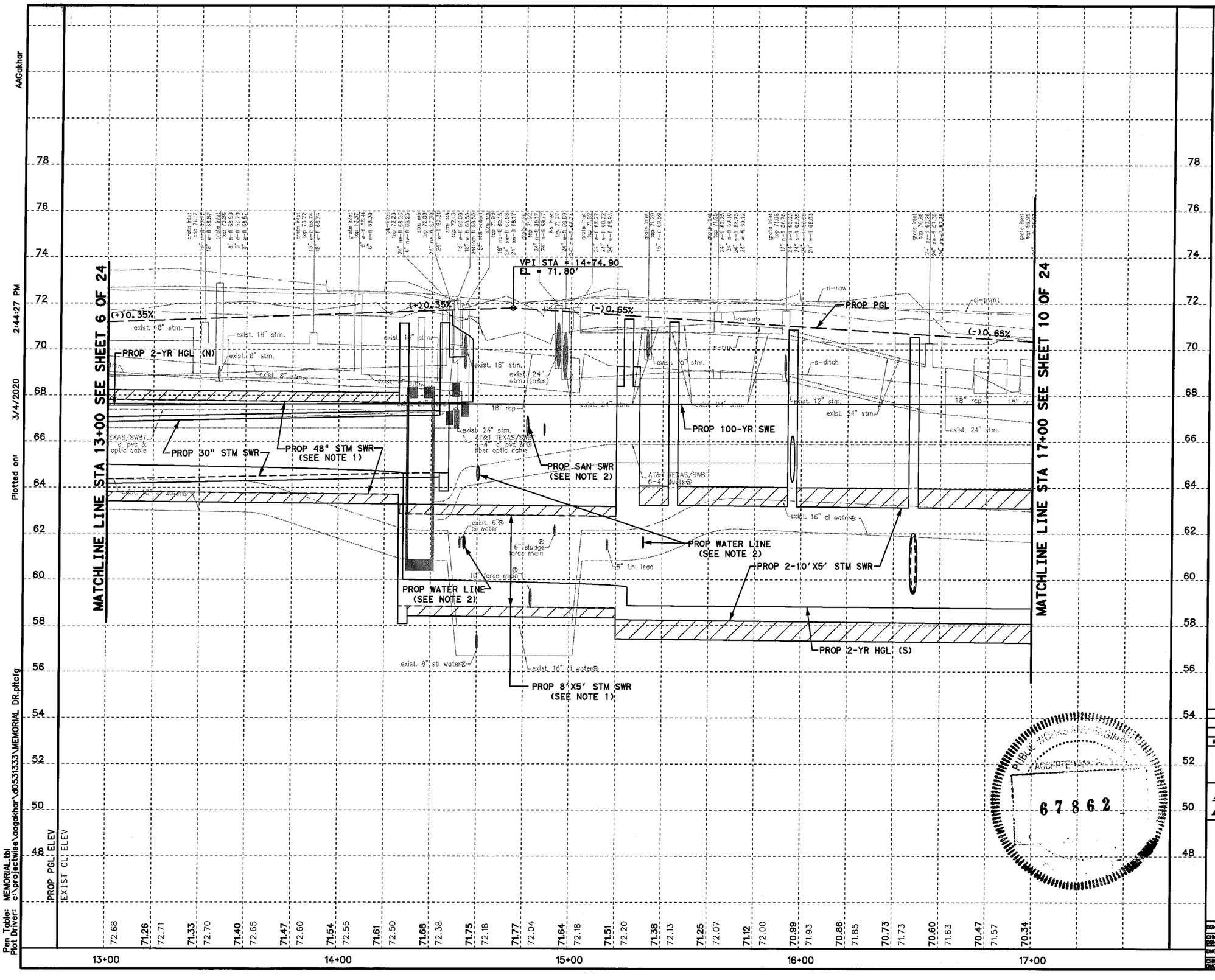

NOTES:

1. REFER TO DRAINAGE IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
2. REFER TO WATER & SAN SWR IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.

0 40 80

(IN FEET)
SCALE: 1"=40' - H
1"=4' - V

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
©2020

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

ROADWAY PROFILE
STA 13+00 TO STA 17+00

SHEET 8 OF 24

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
DSN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK: DWG:	HOU	HARRIS	0912	72	391	124

PUBLIC WORKS AND TRANSPORTATION
ACCEPTED
6 7 8 6 2

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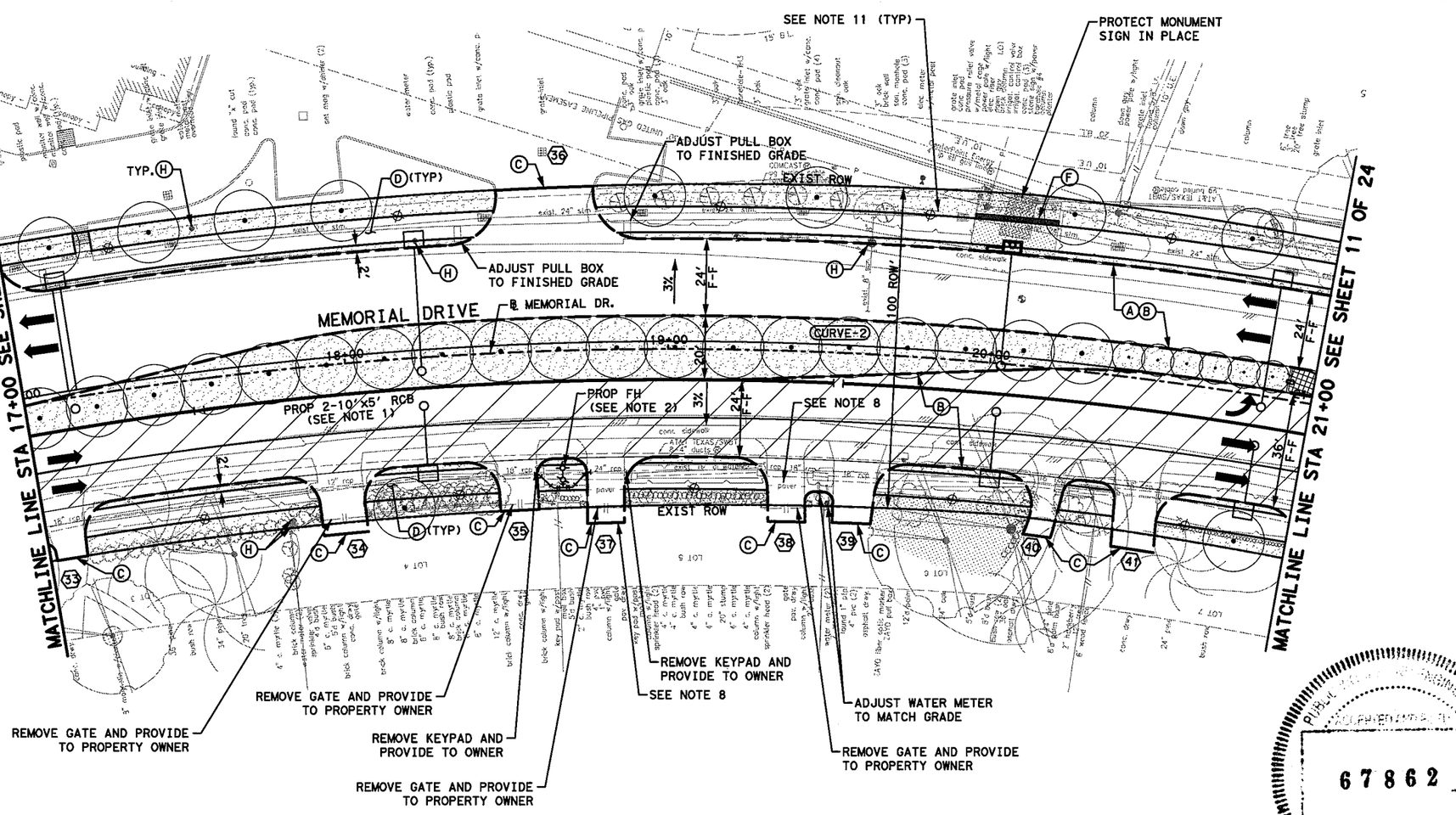

LEGEND

- PROPOSED LANE
- EXISTING LANE
- (CURVE) HORIZONTAL ALIGNMENT CURVE NAME
- EXISTING ROW
- PROPOSED CURB
- EXISTING CURB
- 11" JRCP HES
- 9" THICK CONC BUS SHELTER AREA
- (A) 11" JRCP
- (B) 6" CONC CURB
- (C) CONC DRIVEWAY
- (D) 8' WIDE CONC SIDEWALK
- (E) WHEEL CHAIR RAMP
- (F) TOE WALL
- (G) TRUNCATED DOMES
- (H) ADJUST MH COVER/METER BOX
- (X) DRIVEWAY NUMBER (SEE DRIVEWAY TABULATION AND DETAILS SHEET)

NOTES:

1. REFER TO DRAINAGE IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
2. REFER TO WATER & SAN SWR IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
3. REFER TO IRRIGATION SHEETS FOR PROPOSED SLEEVE LOCATIONS.
4. REFER TO TRAFFIC SIGNAL SHEETS FOR MORE INFORMATION.
5. REFER TO ROADWAY HORIZONTAL GEOMETRY SHEET FOR MORE INFORMATION.
6. REFER TO LANDSCAPE/HARDSCAPE DETAILS FOR MORE INFORMATION ON BACK OF CURB AND BUS SHELTER IMPROVEMENTS.
7. EXCAVATION LIMITS ARE LIMITED TO THE PROPOSED SIDEWALK. CONSTRUCTION EQUIPMENT AND MATERIALS SHALL NOT ENCROACH EXIST LANDSCAPING SYSTEM.

0 40 80

(IN FEET)

SCALE: PLAN 1" = 40'

NOTES:

8. MATCH EXIST STAMPED CONCRETE PATTERN AND STAIN. COST IS SUBSIDIARY TO DRIVEWAY CONSTRUCTION.
9. REFER TO METRO DETAILS FOR MORE INFORMATION.
10. REFER TO CROSS SECTIONS FOR MORE INFORMATION.
11. FILL IN EXIST DITCHES WITH SELECT BACKFILL TO SIDEWALK SUBGRADE OR FINISHED GRADE. REFER TO CROSS SECTIONS FOR MORE INFORMATION. FILL SHALL BE COMPENSATED BY THE EMBANKMENT PAY ITEM.

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

PUBLIC ENGINEER
67862

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

ROADWAY PLAN
STA 17+00 TO STA 21+00

SHEET 9 OF 24

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	125

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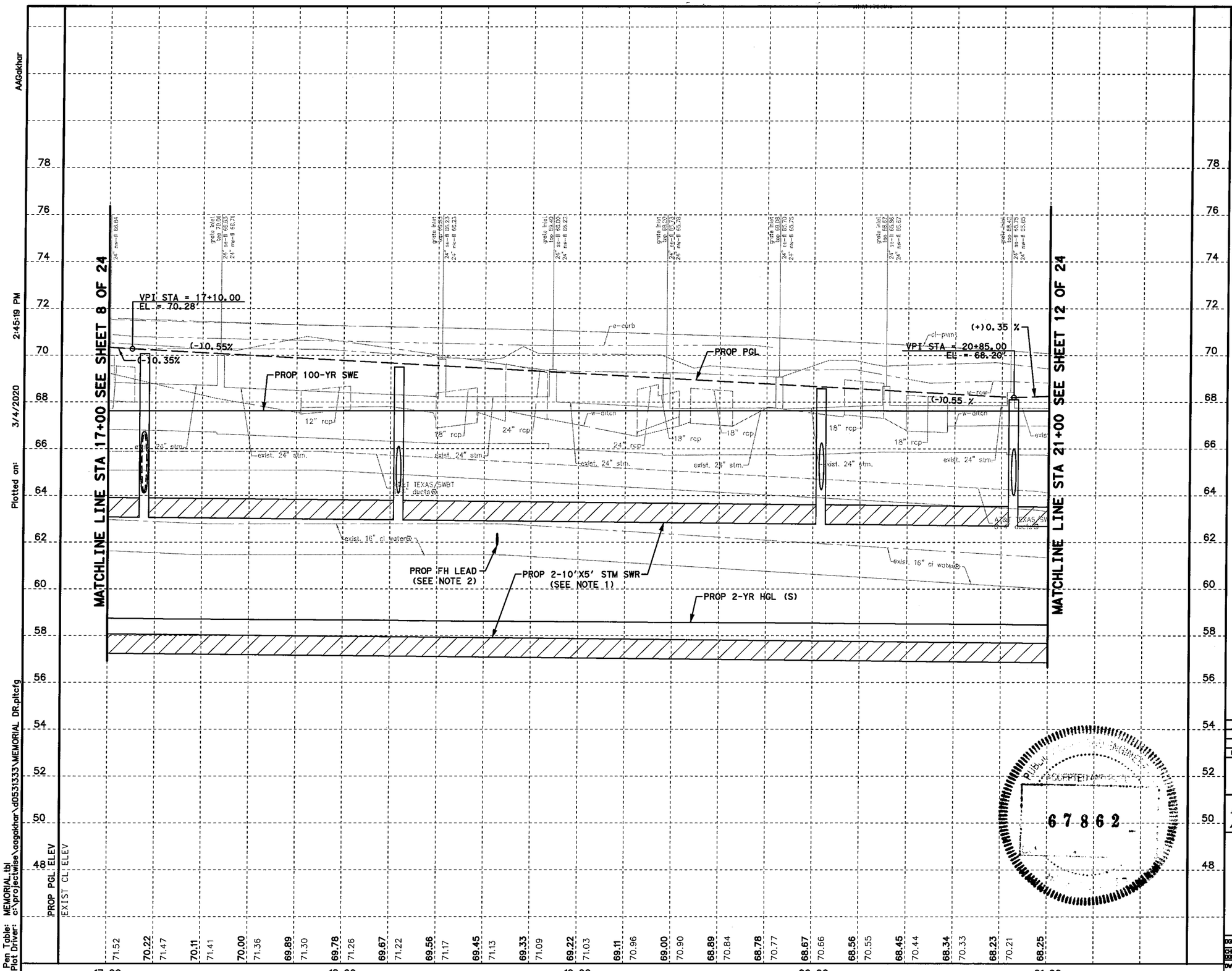

NOTES:

1. REFER TO DRAINAGE IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
2. REFER TO WATER & SAN SWR IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.

0 40 80

(IN FEET)
SCALE: 1"= 40' - H
1"= 4' - V

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

ROADWAY PROFILE
STA 17+00 TO STA 21+00

SHEET 10 OF 24

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	126

67862

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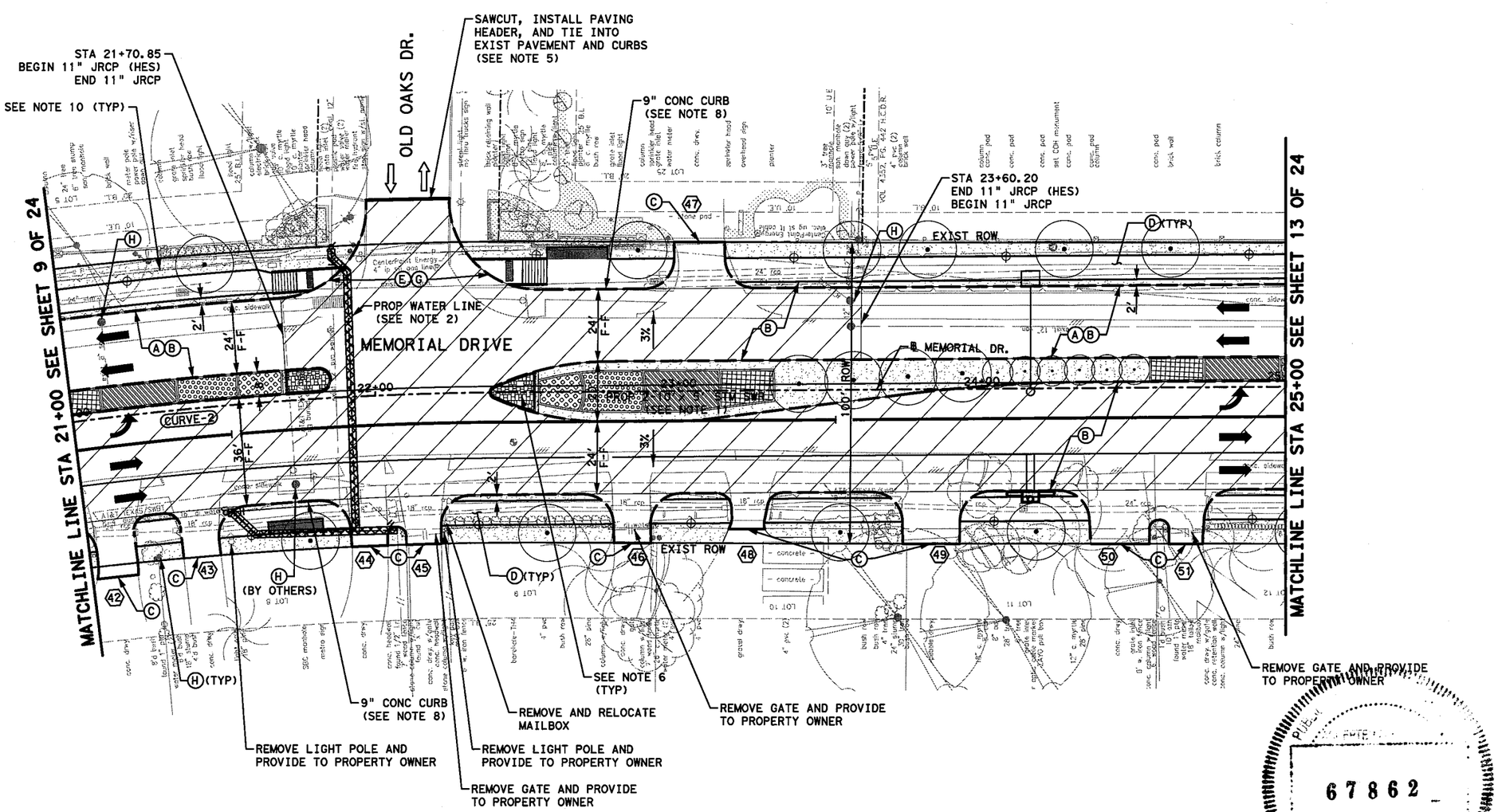

LEGEND

- PROPOSED LANE
- EXISTING LANE
- (CURVE) HORIZONTAL ALIGNMENT CURVE NAME
- EXISTING ROW
- PROPOSED CURB
- EXISTING CURB
- 11" JRCP HES
- 9" THICK CONC BUS SHELTER AREA
- (A) 11" JRCP
- (B) 6" CONC CURB
- (C) CONC DRIVEWAY
- (D) 8' WIDE CONC SIDEWALK
- (E) WHEEL CHAIR RAMP
- (F) TOE WALL
- (G) TRUNCATED DOMES
- (H) ADJUST MH COVER/METER BOX
- (X) DRIVEWAY NUMBER (SEE DRIVEWAY TABULATION AND DETAILS SHEET)

NOTES:

1. REFER TO DRAINAGE IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
2. REFER TO WATER & SAN SWR IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
3. REFER TO IRRIGATION SHEETS FOR PROPOSED SLEEVE LOCATIONS.
4. REFER TO TRAFFIC SIGNAL SHEETS FOR MORE INFORMATION.
5. REFER TO ROADWAY HORIZONTAL GEOMETRY SHEET FOR MORE INFORMATION.
6. REFER TO LANDSCAPE/HARDSCAPE DETAILS FOR MORE INFORMATION ON BACK OF CURB AND BUS SHELTER IMPROVEMENTS.
7. EXCAVATION LIMITS ARE LIMITED TO THE PROPOSED SIDEWALK. CONSTRUCTION EQUIPMENT AND MATERIALS SHALL NOT ENCROACH EXIST LANDSCAPING SYSTEM.

0 40 80

(IN FEET)

SCALE: PLAN 1" = 40'

STATE OF TEXAS
MARK WOODWARD
98672
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

PUBLIC RIGHT OF WAY
67862

NOTES:

8. REFER TO METRO DETAILS FOR MORE INFORMATION.
9. REFER TO EXISTING UTILITY PLANS FOR CONTACT INFORMATION TO ADJUST EXIST FACILITIES.
10. FILL IN EXIST DITCHES WITH SELECT BACKFILL TO SIDEWALK SUBGRADE OR FINISHED GRADE. REFER TO CROSS SECTIONS FOR MORE INFORMATION. FILL SHALL BE COMPENSATED BY THE EMBANKMENT PAY ITEM.

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

ROADWAY PLAN
STA 21+00 TO STA 25+00

SHEET 11 OF 24

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	127

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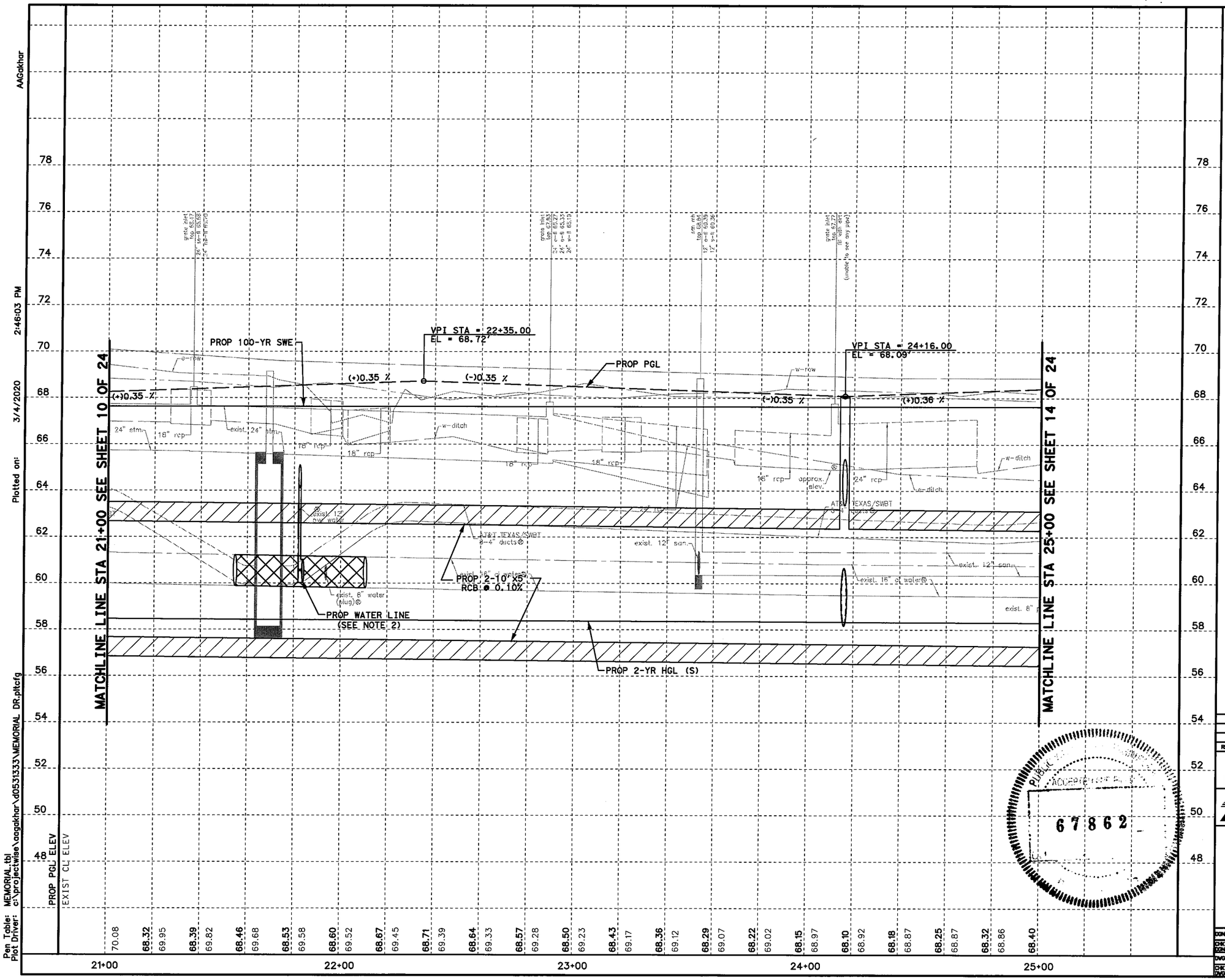

NOTES:

1. REFER TO DRAINAGE IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
2. REFER TO WATER & SAN SWR IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.

0 40 80

(IN FEET)
SCALE: 1"=40' - H
1"=4' - V

STATE OF TEXAS
MARK WOODWARD
98672
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

Lockwood, Andrews & Newnam, Inc.
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FIRM REGISTATION NO. 2614

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

ROADWAY PROFILE
STA 21+00 TO STA 25+00

SHEET 12 OF 24

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CK DWG:	HOU	HARRIS	0912	72	391	128

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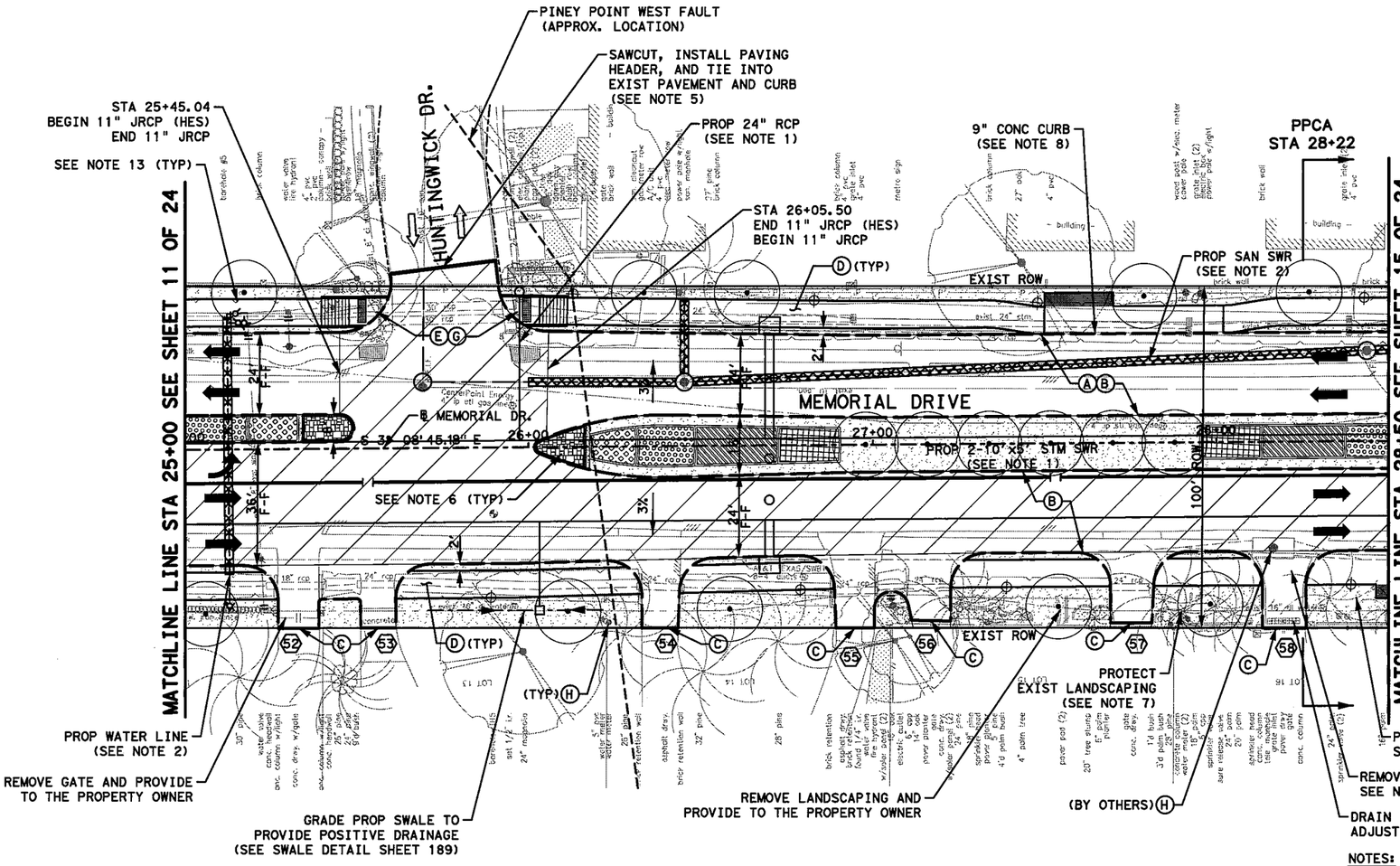

LEGEND

- PROPOSED LANE
- EXISTING LANE
- (CURVE) HORIZONTAL ALIGNMENT CURVE NAME
- EXISTING ROW
- PROPOSED CURB
- EXISTING CURB
- 11" JRCP HES
- 9" THICK CONC BUS SHELTER AREA
- (A) 11" JRCP
- (B) 6" CONC CURB
- (C) CONC DRIVEWAY
- (D) 8' WIDE CONC SIDEWALK
- (E) WHEEL CHAIR RAMP
- (F) TOE WALL
- (G) TRUNCATED DOMES
- (H) ADJUST MH COVER/METER BOX
- (X) DRIVEWAY NUMBER (SEE DRIVEWAY TABULATION AND DETAILS SHEET)

NOTES:

1. REFER TO DRAINAGE IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
2. REFER TO WATER & SAN SWR IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
3. REFER TO IRRIGATION SHEETS FOR PROPOSED SLEEVE LOCATIONS.
4. REFER TO TRAFFIC SIGNAL SHEETS FOR MORE INFORMATION.
5. REFER TO ROADWAY HORIZONTAL GEOMETRY SHEET FOR MORE INFORMATION.
6. REFER TO LANDSCAPE/HARDSCAPE DETAILS FOR MORE INFORMATION ON BACK OF CURB AND BUS SHELTER IMPROVEMENTS.
7. EXCAVATION LIMITS ARE LIMITED TO THE PROPOSED SIDEWALK. CONSTRUCTION EQUIPMENT AND MATERIALS SHALL NOT ENCROACH EXIST LANDSCAPING SYSTEM.

0 40 80

(IN FEET)

SCALE: PLAN 1":40'

PUBLIC WORKS AND ENGINEERING
ACCEPTED AND FILED
67862

STATE OF TEXAS
MARK WOODWARD
98672
LICENSED
PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

ROADWAY PLAN
STA 25+00 TO STA 28+50

SHEET 13 OF 24

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: DGN:	6	TEXAS	STP 1802(783)MM			CS
DW:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CK: DW:	HOU	HARRIS	0912	72	391	129

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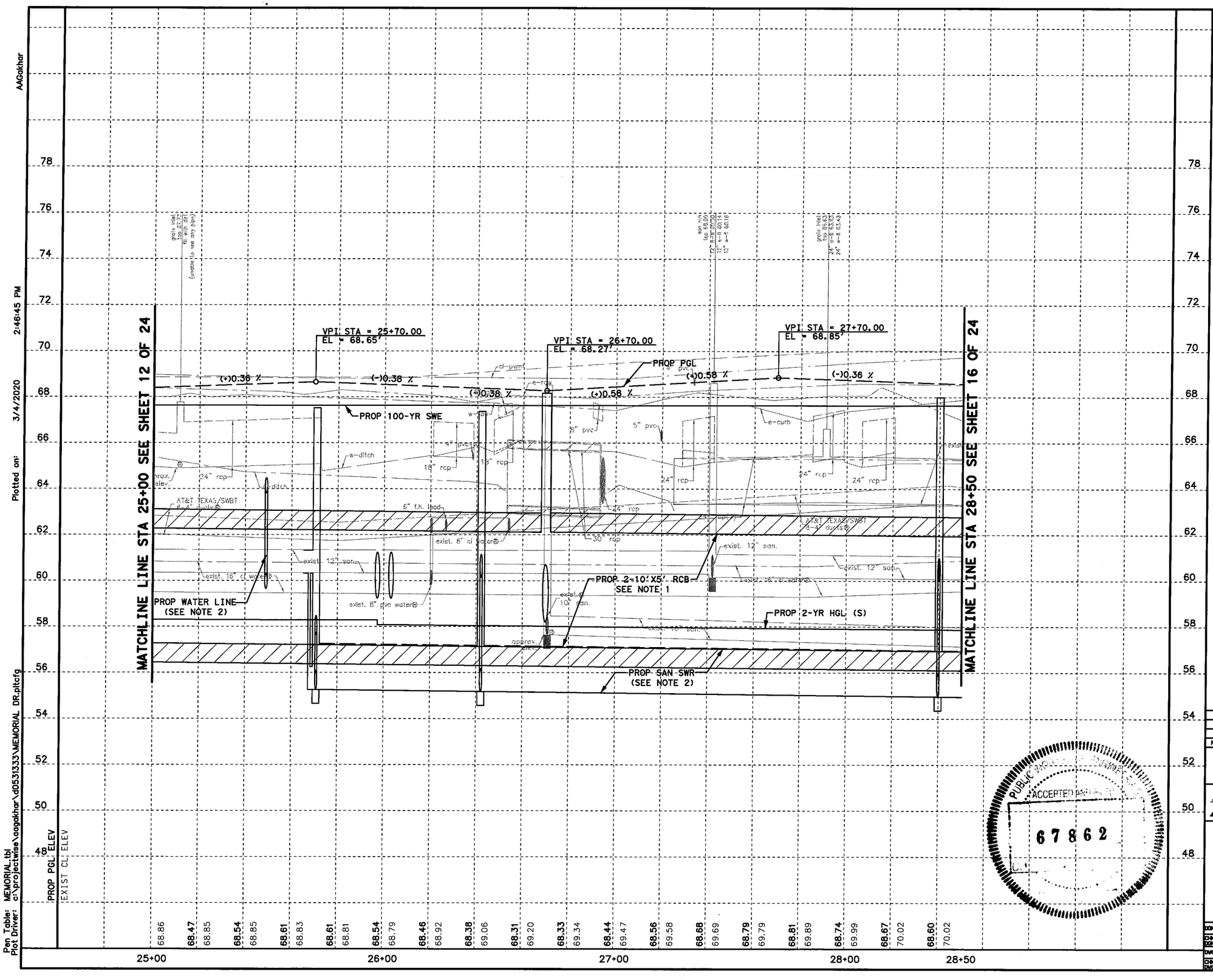

NOTES:

1. REFER TO DRAINAGE IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
2. REFER TO WATER & SAN SWR IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.

0 40 80

(IN FEET)
SCALE: 1"=40' - H
1"=4' - V

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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PUBLIC WORKS & TRANSPORTATION
ACCEPTED AND APPROVED
67862

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

ROADWAY PROFILE
STA 25+00 TO STA 28+50

SHEET 14 OF 24

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	130

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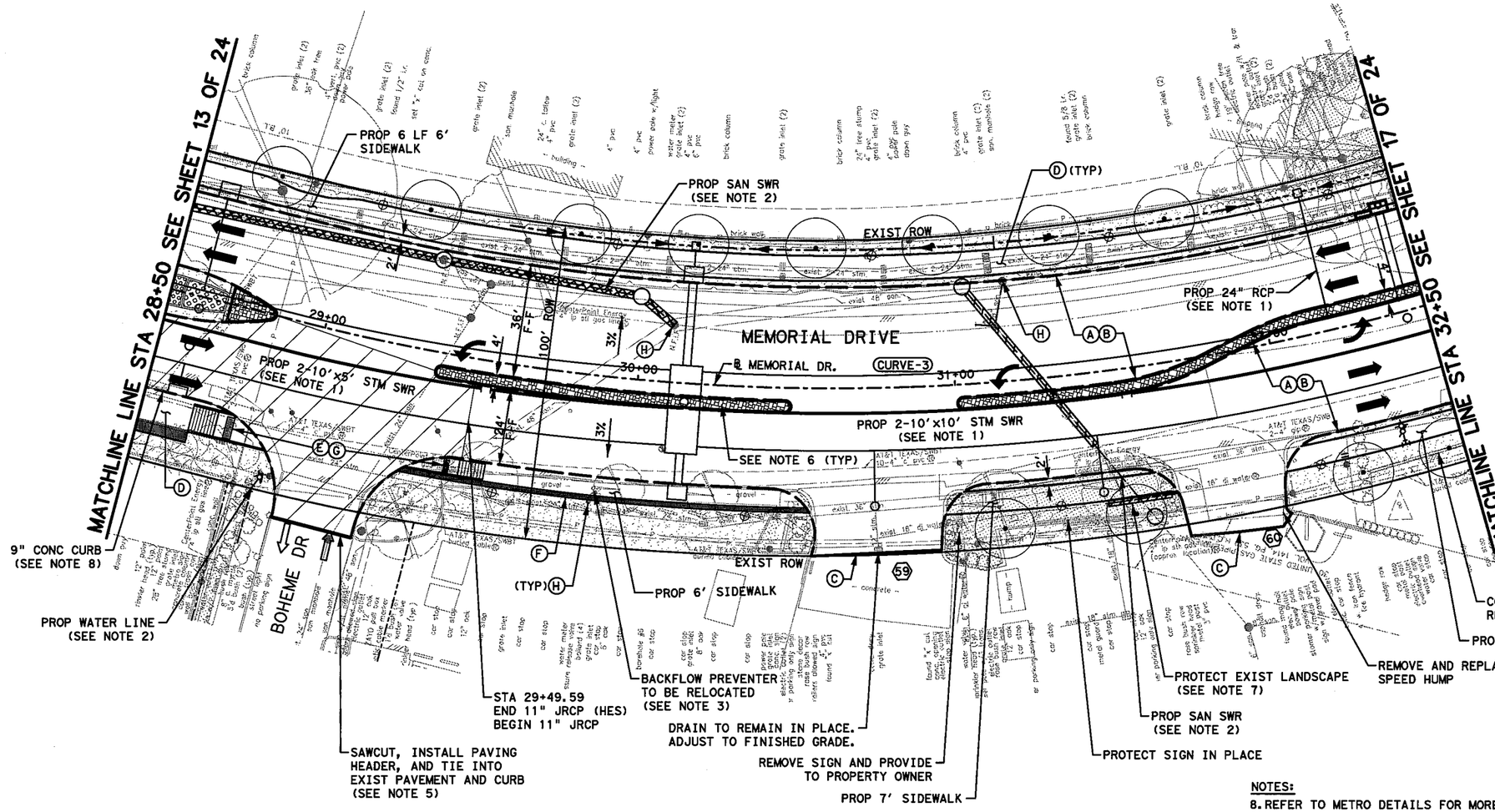

LEGEND

- PROPOSED LANE
- EXISTING LANE
- (CURVE) HORIZONTAL ALIGNMENT CURVE NAME
- EXISTING ROW
- PROPOSED CURB
- EXISTING CURB
- 11" JRCP HES
- 9" THICK CONC BUS SHELTER AREA
- (A) 11" JRCP
- (B) 6" CONC CURB
- (C) CONC DRIVEWAY
- (D) 8' WIDE CONC SIDEWALK
- (E) WHEEL CHAIR RAMP
- (F) TOE WALL
- (G) TRUNCATED DOMES
- (H) ADJUST MH COVER/METER BOX
- (X) DRIVEWAY NUMBER (SEE DRIVEWAY TABULATION AND DETAILS SHEET)

NOTES:

1. REFER TO DRAINAGE IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
2. REFER TO WATER & SAN SWR IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
3. REFER TO IRRIGATION SHEETS FOR PROPOSED SLEEVE LOCATIONS.
4. REFER TO TRAFFIC SIGNAL SHEETS FOR MORE INFORMATION.
5. REFER TO ROADWAY HORIZONTAL GEOMETRY SHEET FOR MORE INFORMATION.
6. REFER TO LANDSCAPE/HARDSCAPE DETAILS FOR MORE INFORMATION ON BACK OF CURB AND BUS SHELTER IMPROVEMENTS.
7. EXCAVATION LIMITS ARE LIMITED TO THE PROPOSED SIDEWALK. CONSTRUCTION EQUIPMENT AND MATERIALS SHALL NOT ENCROACH EXIST LANDSCAPING SYSTEM.

0 40 80

(IN FEET)

SCALE: PLAN 1" = 40'

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

67862

NOTES:

8. REFER TO METRO DETAILS FOR MORE INFORMATION.
9. COORDINATE PROPERTY WITH OWNER A MINIMUM OF 4 WEEKS PRIOR TO REMOVING SIGN.
10. POTENTIALLY PETROLEUM CONTAMINATED AREAS (PPCA) HAS BEEN IDENTIFIED BETWEEN STA 28+22 TO STA 39+10. REFER TO SOIL AND GROUNDWATER MANAGEMENT PLAN FOR MORE INFORMATION.
11. REFER TO EXISTING UTILITY PLANS FOR CONTACT INFORMATION TO ADJUST EXIST FACILITIES.
12. FILL IN EXIST DITCHES WITH SELECT BACKFILL TO SIDEWALK SUBGRADE OR FINISHED GRADE. REFER TO CROSS SECTIONS FOR MORE INFORMATION. FILL SHALL BE COMPENSATED BY THE EMBANKMENT PAY ITEM.

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

ROADWAY PLAN STA 28+50 TO STA 32+50

SHEET 15 OF 24

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	131

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AAGakhar

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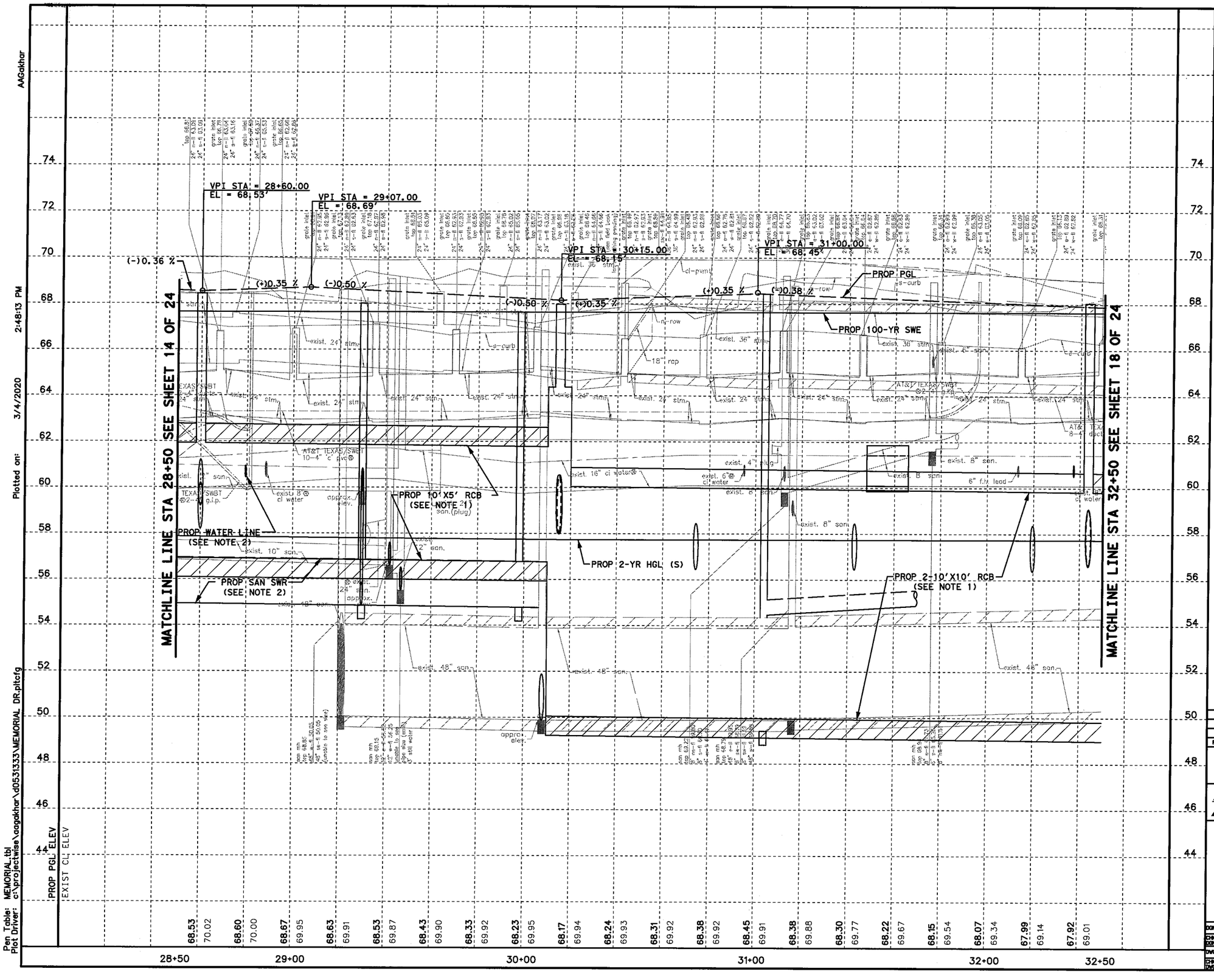

NOTES:

1. REFER TO DRAINAGE IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
2. REFER TO WATER & SAN SWR IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.

AARON A. GAKHAR
LICENSED PROFESSIONAL ENGINEER
67862

0 40 80
(IN FEET)
SCALE: 1"=40' - H
1"=4' - V

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

ROADWAY PROFILE
STA 28+50 TO STA 32+50

SHEET 16 OF 24

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	132

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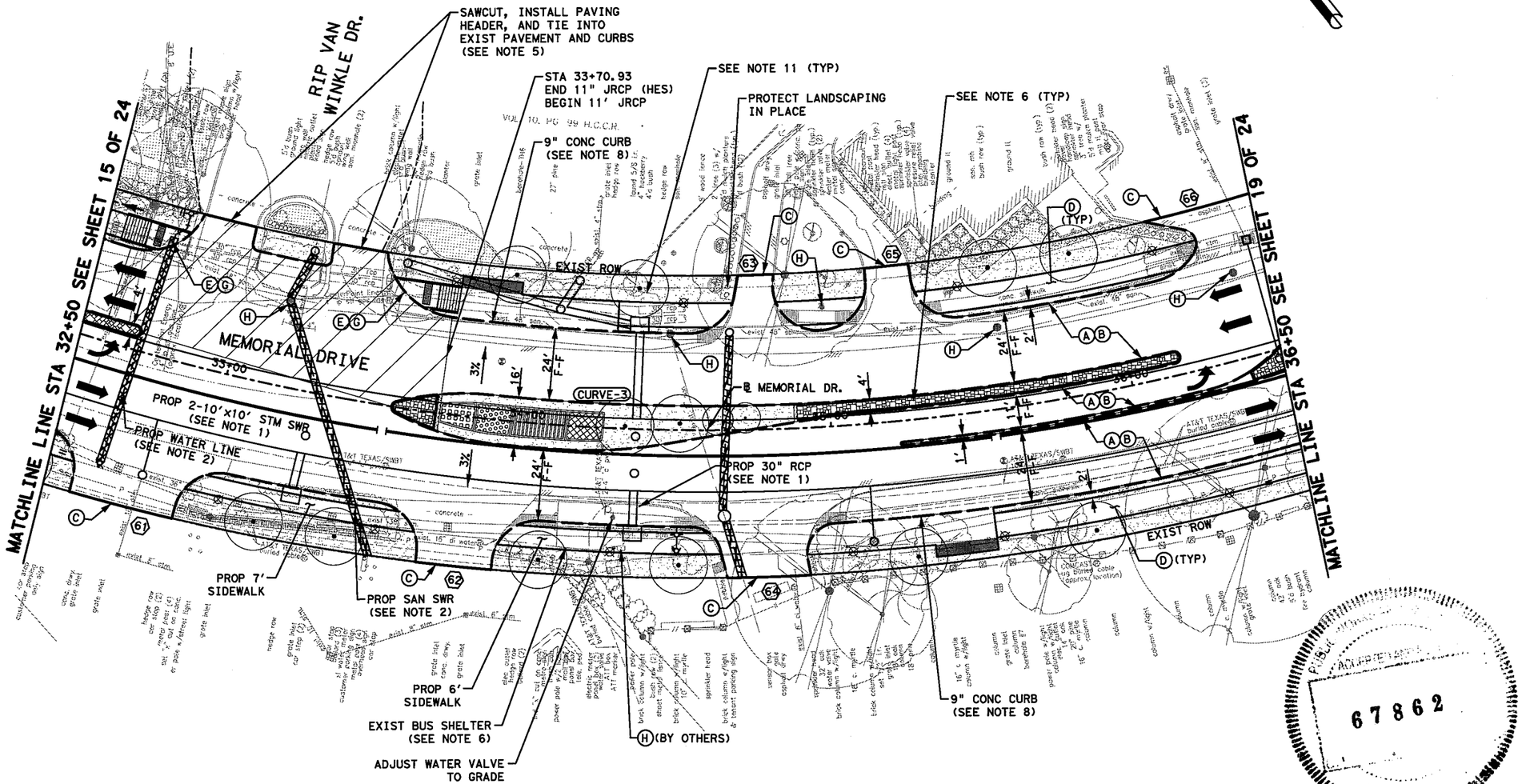

LEGEND

- PROPOSED LANE
- EXISTING LANE
- (CURVE) HORIZONTAL ALIGNMENT CURVE NAME
- EXISTING ROW
- PROPOSED CURB
- EXISTING CURB
- 11" JRCP HES
- 9" THICK CONC BUS SHELTER AREA
- (A) 11" JRCP
- (B) 6" CONC CURB
- (C) CONC DRIVEWAY
- (D) 8' WIDE CONC SIDEWALK
- (E) WHEEL CHAIR RAMP
- (F) TOE WALL
- (G) TRUNCATED DOMES
- (H) ADJUST MH COVER/METER BOX
- (X) DRIVEWAY NUMBER (SEE DRIVEWAY TABULATION AND DETAILS SHEET)

NOTES:

1. REFER TO DRAINAGE IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
2. REFER TO WATER & SAN SWR IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
3. REFER TO IRRIGATION SHEETS FOR PROPOSED SLEEVE LOCATIONS.
4. REFER TO TRAFFIC SIGNAL SHEETS FOR MORE INFORMATION.
5. REFER TO ROADWAY HORIZONTAL GEOMETRY SHEET FOR MORE INFORMATION.
6. REFER TO LANDSCAPE/HARDSCAPE DETAILS FOR MORE INFORMATION ON BACK OF CURB AND BUS SHELTER IMPROVEMENTS.
7. EXCAVATION LIMITS ARE LIMITED TO THE PROPOSED SIDEWALK. CONSTRUCTION EQUIPMENT AND MATERIALS SHALL NOT ENCROACH EXIST LANDSCAPING SYSTEM.

0 40 80

(IN FEET)

SCALE: PLAN 1": 40'

NOTES:

8. REFER TO METRO DETAILS FOR MORE INFORMATION.
9. POTENTIALLY PETROLEUM CONTAMINATED AREAS (PPCA) HAS BEEN IDENTIFIED BETWEEN STA 28+22 TO STA 39+10. REFER TO SOIL AND GROUNDWATER MANAGEMENT PLAN FOR MORE INFORMATION.
10. REFER TO EXIST UTILITY PLANS FOR CONTACT INFORMATION TO ADJUST EXIST FACILITIES.
11. FILL IN EXIST DITCHES WITH SELECT BACKFILL TO SIDEWALK SUBGRADE OR FINISHED GRADE. REFER TO CROSS SECTIONS FOR MORE INFORMATION. FILL SHALL BE COMPENSATED BY THE EMBANKMENT PAY ITEM.

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED
PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

PUBLIC WORKS ENGINEERING
67862

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

ROADWAY PLAN
STA 32+50 TO STA 36+50

SHEET 17 OF 24

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	133

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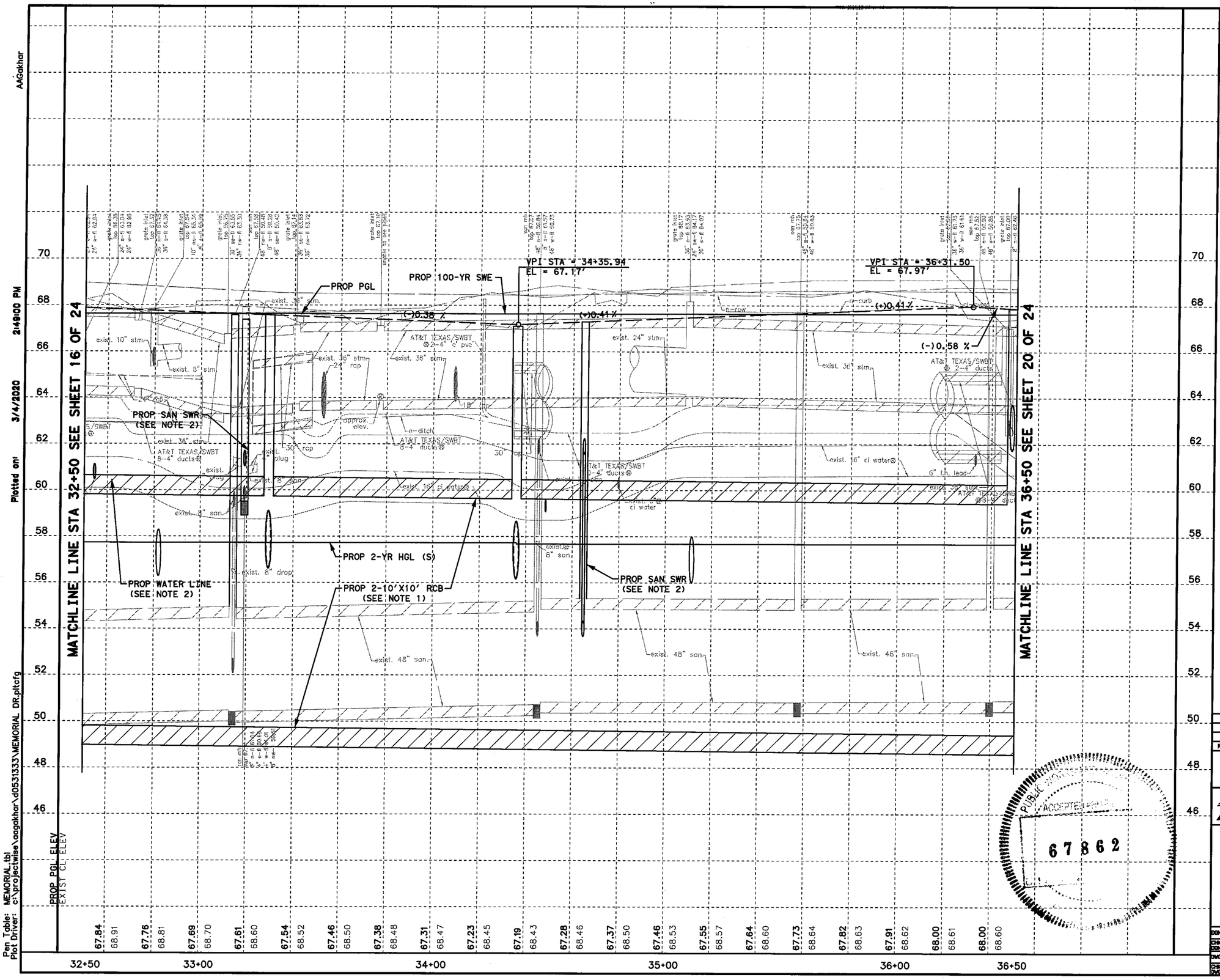

NOTES:

1. REFER TO DRAINAGE IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
2. REFER TO WATER & SAN SWR IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.

0 40 80

(IN FEET)
SCALE: 1"=40' - H
1"=4' - V

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

ROADWAY PROFILE
STA 32+50 TO STA 36+50

SHEET 18 OF 24

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	134

ACCEPTED FOR PUBLIC MAINTENANCE
67862

AAGakhar
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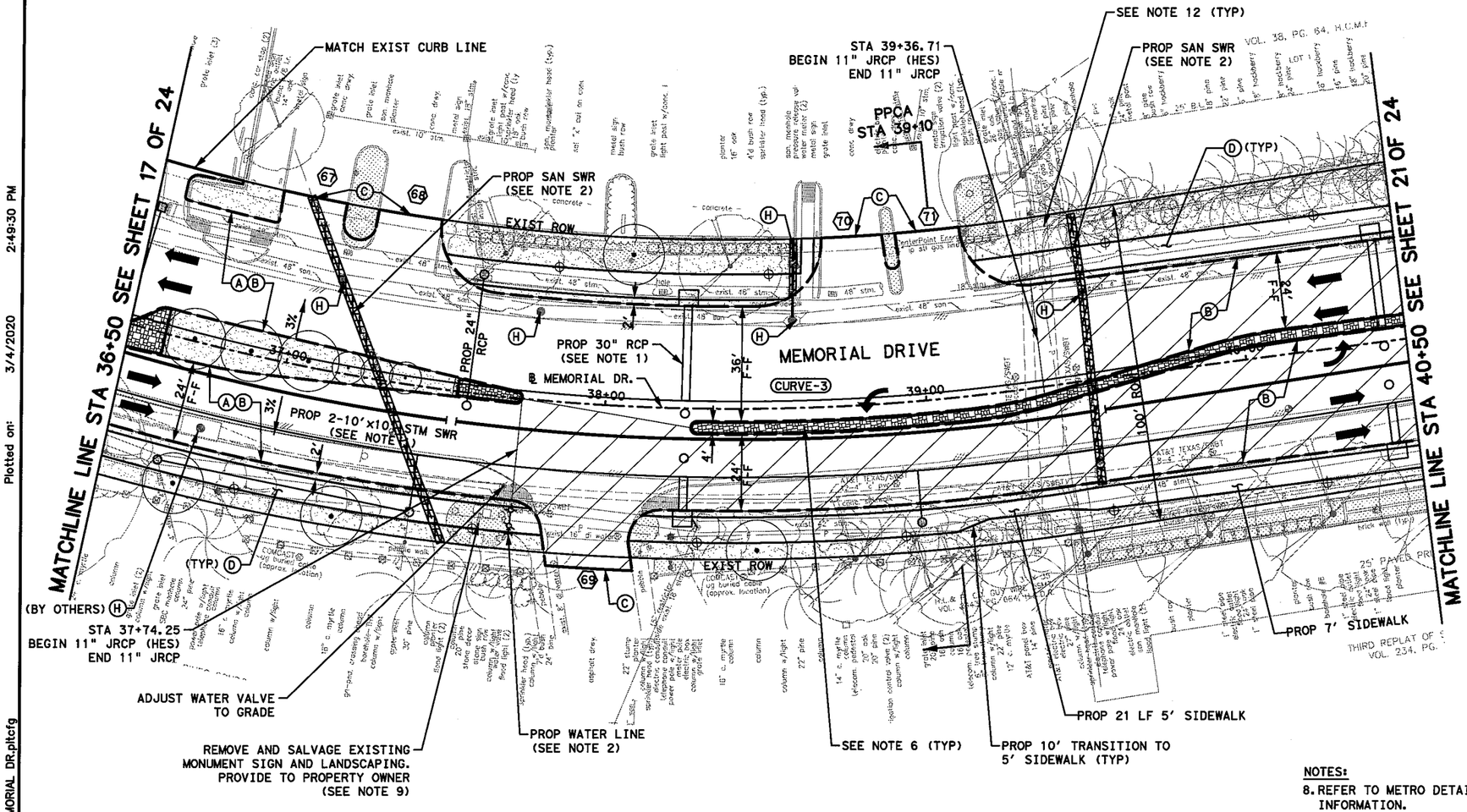

LEGEND

- PROPOSED LANE
- EXISTING LANE
- (CURVE) HORIZONTAL ALIGNMENT CURVE NAME
- EXISTING ROW
- PROPOSED CURB
- EXISTING CURB
- 11" JRCP HES
- 9" THICK CONC BUS SHELTER AREA
- (A) 11" JRCP
- (B) 6" CONC CURB
- (C) CONC DRIVEWAY
- (D) 8' WIDE CONC SIDEWALK
- (E) WHEEL CHAIR RAMP
- (F) TOE WALL
- (G) TRUNCATED DOMES
- (H) ADJUST MH COVER/METER BOX
- (X) DRIVEWAY NUMBER (SEE DRIVEWAY TABULATION AND DETAILS SHEET)

NOTES:

1. REFER TO DRAINAGE IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
2. REFER TO WATER & SAN SWR IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
3. REFER TO IRRIGATION SHEETS FOR PROPOSED SLEEVE LOCATIONS.
4. REFER TO TRAFFIC SIGNAL SHEETS FOR MORE INFORMATION.
5. REFER TO ROADWAY HORIZONTAL GEOMETRY SHEET FOR MORE INFORMATION.
6. REFER TO LANDSCAPE/HARDSCAPE DETAILS FOR MORE INFORMATION ON BACK OF CURB AND BUS SHELTER IMPROVEMENTS.
7. EXCAVATION LIMITS ARE LIMITED TO THE PROPOSED SIDEWALK. CONSTRUCTION EQUIPMENT AND MATERIALS SHALL NOT ENCROACH EXIST LANDSCAPING SYSTEM.

0 40 80

(IN FEET)

SCALE: PLAN 1"= 40'

ACCEPTED AND PUBLIC STORM SYSTEM
67862

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

NOTES:

8. REFER TO METRO DETAILS FOR MORE INFORMATION.
9. COORDINATE WITH PROPERTY OWNER A MINIMUM OF 4 WEEKS PRIOR TO REMOVING SIGN.
10. POTENTIALLY PETROLEUM CONTAMINATED AREAS (PPCA) HAS BEEN IDENTIFIED BETWEEN STA 28+22 TO STA 39+10. REFER TO SOIL AND GROUNDWATER MANAGEMENT PLAN FOR MORE INFORMATION.
11. REFER TO EXISTING UTILITY PLANS FOR CONTACT INFORMATION TO ADJUST EXIST FACILITIES.
12. FILL IN EXIST DITCH WITH SELECT BACKFILL TO SIDEWALK SUBGRADE OR FINISHED GRADE. REFER TO CROSS SECTIONS FOR MORE INFORMATION. FILL SHALL BE COMPENSATED BY THE EMBANKMENT PAY ITEM.

ACCEPTED AND PUBLIC STORM SYSTEM
67862

REV. NO.	DATE	DESCRIPTION	BY

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

ROADWAY PLAN
STA 36+50 TO STA 40+50

SHEET 19 OF 24

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	135

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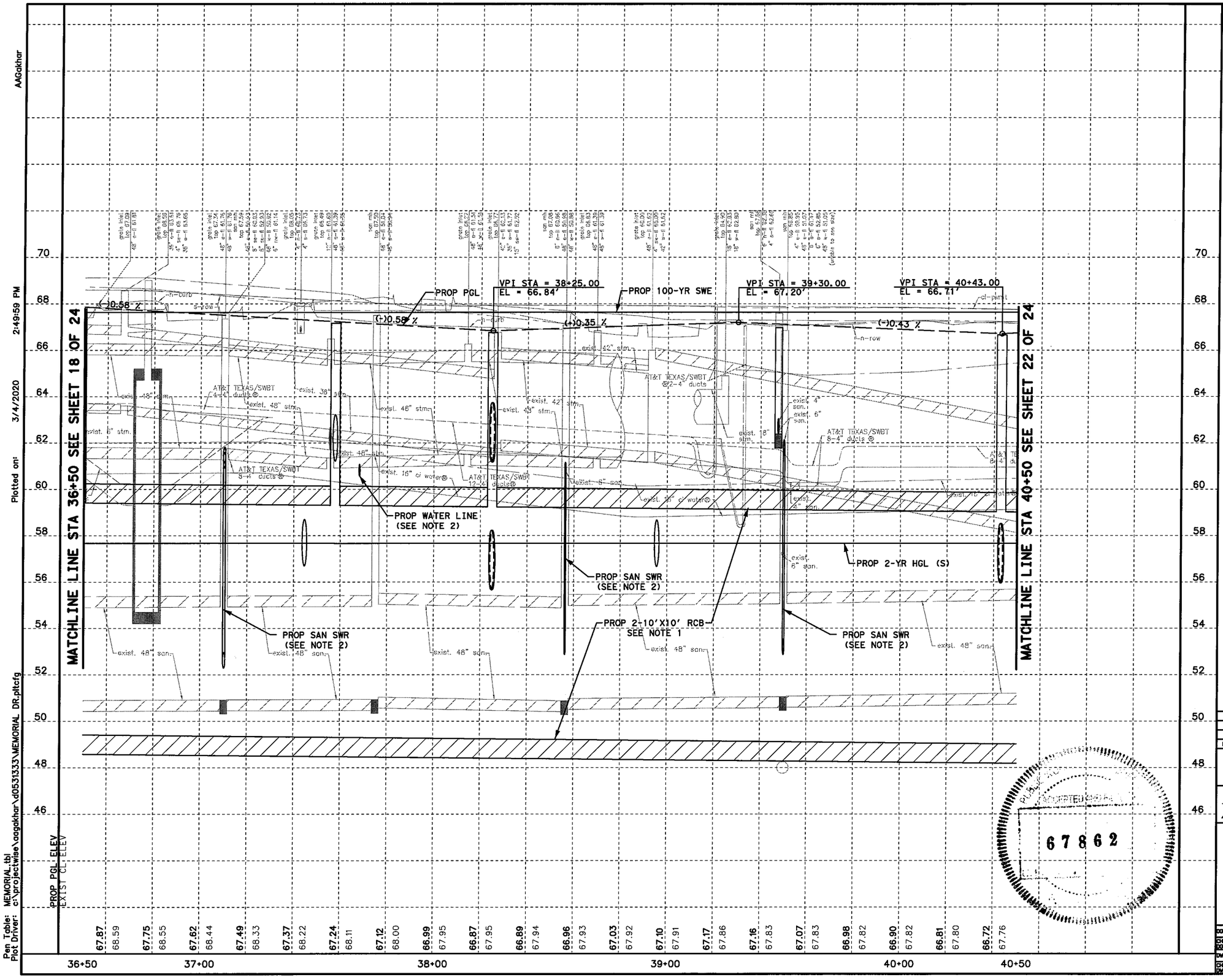

NOTES:

1. REFER TO DRAINAGE IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
2. REFER TO WATER & SAN SWR IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.

0 40 80

(IN FEET)
SCALE: 1"=40' - H
1"=4' - V

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

ROADWAY PROFILE
STA 36+50 TO STA 40+50

SHEET 20 OF 24

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CSK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CSK DWG:	HOU	HARRIS	0912	72	391	136

67862

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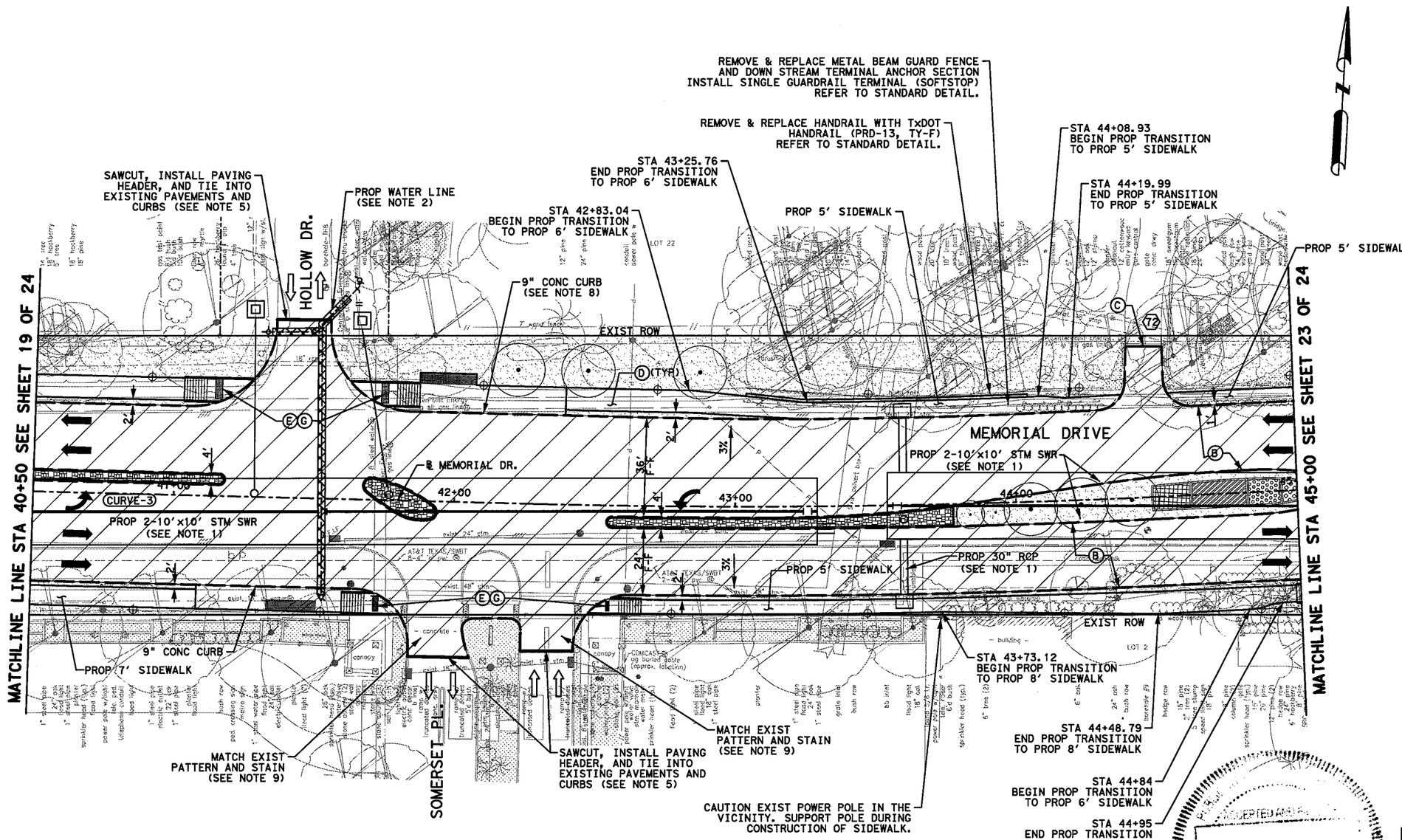

LEGEND

- PROPOSED LANE
- EXISTING LANE
- (CURVE) HORIZONTAL ALIGNMENT CURVE NAME
- EXISTING ROW
- PROPOSED CURB
- EXISTING CURB
- 11" JRCP HES
- 9" THICK CONC BUS SHELTER AREA
- (A) 11" JRCP
- (B) 6" CONC CURB
- (C) CONC DRIVEWAY
- (D) 8' WIDE CONC SIDEWALK
- (E) WHEEL CHAIR RAMP
- (F) TOE WALL
- (G) TRUNCATED DOMES
- (H) ADJUST MH COVER/METER BOX
- (X) DRIVEWAY NUMBER (SEE DRIVEWAY TABULATION AND DETAILS SHEET)

NOTES:

1. REFER TO DRAINAGE IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
2. REFER TO WATER & SAN SWR IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
3. REFER TO IRRIGATION SHEETS FOR PROPOSED SLEEVE LOCATIONS.
4. REFER TO TRAFFIC SIGNAL SHEETS FOR MORE INFORMATION.
5. REFER TO ROADWAY HORIZONTAL GEOMETRY SHEET FOR MORE INFORMATION.
6. REFER TO LANDSCAPE/HARDSCAPE DETAILS FOR MORE INFORMATION ON BACK OF CURB AND BUS SHELTER IMPROVEMENTS.
7. EXCAVATION LIMITS ARE LIMITED TO THE PROPOSED SIDEWALK. CONSTRUCTION EQUIPMENT AND MATERIALS SHALL NOT ENCROACH EXIST LANDSCAPING SYSTEM.

0 40 80

(IN FEET)

SCALE: PLAN 1": 40'

NOTES:

8. REFER TO METRO DETAILS FOR MORE INFORMATION.
9. COST TO MATCH EXIST MATERIAL IS SUBSIDIARY TO PAVEMENT CONSTRUCTION.
10. FILL IN EXIST DITCHES WITH SELECT BACKFILL TO SIDEWALK SUBGRADE OR FINISHED GRADE. REFER TO CROSS SECTIONS FOR MORE INFORMATION. FILL SHALL BE COMPENSATED BY THE EMBANKMENT PAY ITEM.

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED PROFESSIONAL ENGINEER
04/07/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

ACCEPTED AS NOTED
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Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY
FIRM REGISTATION NO. 2614

Texas Department of Transportation
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

ROADWAY PLAN STA 40+50 TO STA 45+00

SHEET 21 OF 24

DGNs	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CSK DGNs	6	TEXAS	STP 1802(783)MM			CS
DWGs	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CSK DWGs	HOU	HARRIS	0912	72	391	137

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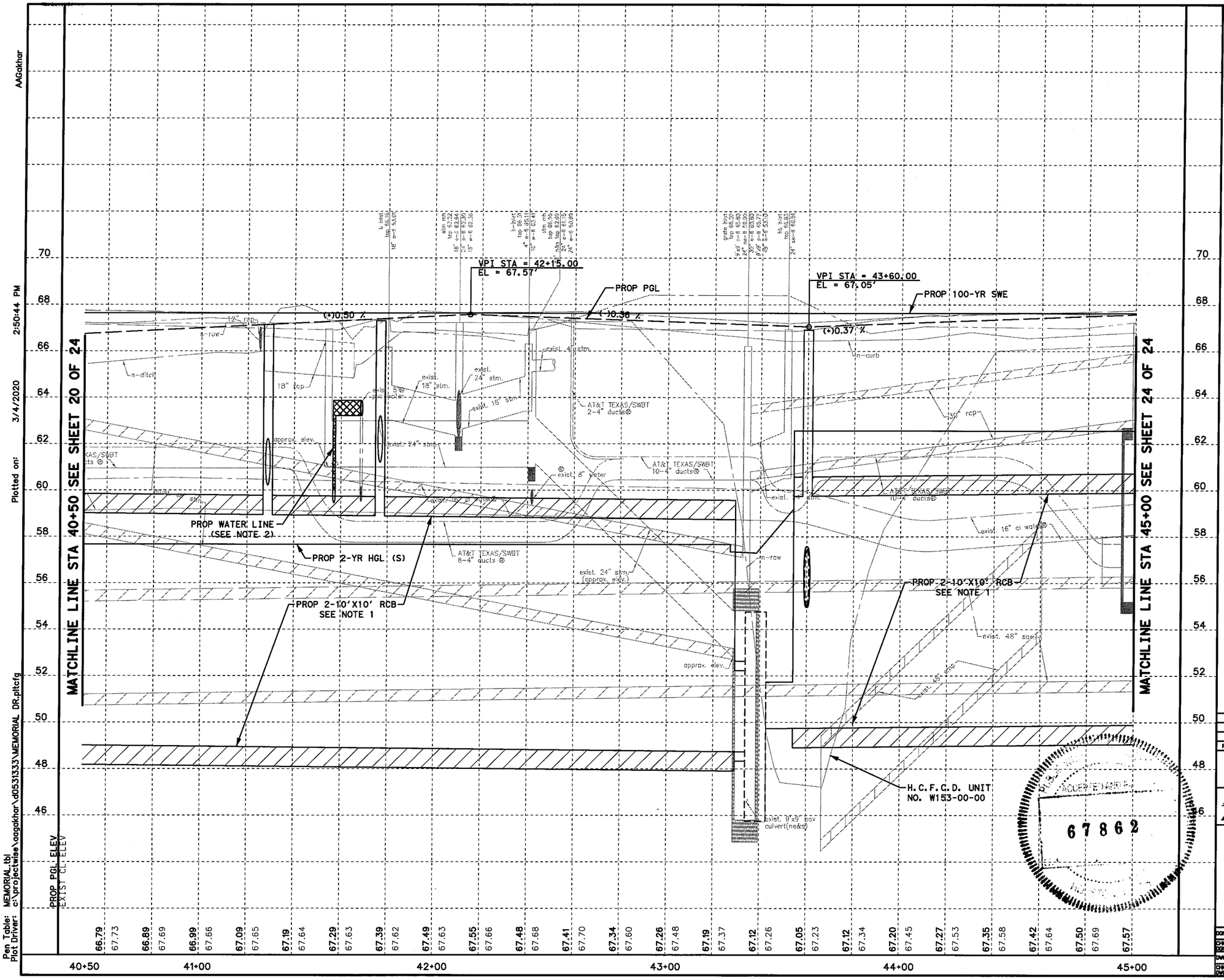

NOTES:

1. REFER TO DRAINAGE IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
2. REFER TO WATER & SAN SWR IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.

0 40 80

(IN FEET)
SCALE: 1"=40' - H
1"=4' - V

STATE OF TEXAS
MARK WOODWARD
98672
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

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Lockwood, Andrews & Newnam, Inc.
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FIRM REGISTATION NO. 2614

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

ROADWAY PROFILE
STA 40+50 TO STA 45+00

SHEET 22 OF 24

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	138

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MATCHLINE LINE STA 45+00 SEE SHEET 21 OF 24

LEGEND LN

PROP 5' SIDEWALK

STA 45+83.32
BEGIN PROP TRANSITION
TO PROP 8' SIDEWALK

STA 46+06.77
END PROP TRANSITION
TO PROP 8' SIDEWALK

MEMORIAL DRIVE

℄ MEMORIAL DR.

EXIST ROW

PROP 24" RCP
(SEE NOTE 1)

PROP 48" STM SWR

PROP 2-10'x10' STM SWR
(SEE NOTE 1)

PROP SAN SWR
(SEE NOTE 2)

SEE NOTE 6 (TYP)

PROP WATER LINE
(SEE NOTE 2)

SAWCUT, INSTALL PAVING HEADER,
AND TIE INTO EXIST PAVEMENT
(SEE NOTE 5)

TAPER PROP 6" CURB TO
0" WITHIN 5 FEET

REMOVE AND REPLACE
SLOTTED CURB

TALLOWOOD RD.

9" CONC CURB
(SEE NOTE 8)

TIE INTO EXIST
SIDEWALK

STA 49+67.36
END PROP TRANSITION
TO PROP 4' SIDEWALK

STA 49+39.27
BEGIN PROP TRANSITION
TO PROP 4' SIDEWALK

END PROJECT
STA 49+76.41
N 13844060.5852
E 3062512.9782

100' ROW

TIE TO EXISTING PAVEMENT
(SEE NOTE 5)

PROP 36" RCP

PROP 6' SIDEWALK

EXISTING MONUMENT SIGN
TO REMAIN IN PLACE

PROP PEBBLE FINISH
DRIVEWAY

SEE NOTE 9 (TYP)

PROP BRICK PAVERS
FINISH DRIVEWAY

STA 49+36.39
BEGIN PROP TRANSITION
TO PROP 4' SIDEWALK

STA 49+56.44
END PROP TRANSITION
TO PROP 4' SIDEWALK

END DITCH FILL LIMITS

TIE INTO EXIST
SIDEWALK

LEGEND

- PROPOSED LANE
- EXISTING LANE
- (CURVE) HORIZONTAL ALIGNMENT CURVE NAME
- EXISTING ROW
- PROPOSED CURB
- EXISTING CURB
- 11" JRCP HES
- 9" THICK CONC BUS SHELTER AREA
- (A) 11" JRCP
- (B) 6" CONC CURB
- (C) CONC DRIVEWAY
- (D) 8' WIDE CONC SIDEWALK
- (E) WHEEL CHAIR RAMP
- (F) TOE WALL
- (G) TRUNCATED DOMES
- (H) ADJUST MH COVER/METER BOX
- (X) DRIVEWAY NUMBER (SEE DRIVEWAY TABULATION AND DETAILS SHEET)

NOTES:

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4. REFER TO TRAFFIC SIGNAL SHEETS FOR MORE INFORMATION.
5. REFER TO ROADWAY HORIZONTAL GEOMETRY SHEET FOR MORE INFORMATION.
6. REFER TO LANDSCAPE/HARDSCAPE DETAILS FOR MORE INFORMATION ON BACK OF CURB AND BUS SHELTER IMPROVEMENTS.
7. EXCAVATION LIMITS ARE LIMITED TO THE PROPOSED SIDEWALK. CONSTRUCTION EQUIPMENT AND MATERIALS SHALL NOT ENCROACH EXIST LANDSCAPING SYSTEM.

0 40 80
(IN FEET)
SCALE: PLAN 1"=40'

STATE OF TEXAS
MARK WOODWARD
98672
LICENSED
PROFESSIONAL ENGINEER
04/07/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

ROADWAY PLAN
STA 45+00 TO END PROJECT

SHEET 23 OF 24

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	139

67862

NOTES:

8. REFER TO METRO DETAILS FOR MORE INFORMATION.
9. FILL IN EXIST DITCHES WITH SELECT BACKFILL TO SIDEWALK SUBGRADE OR FINISHED GRADE. REFER TO CROSS SECTIONS FOR MORE INFORMATION. FILL SHALL BE COMPENSATED BY THE EMBANKMENT PAY ITEM.
10. COORDINATE WITH HOA A MINIMUM OF 4 WEEKS PRIOR TO REMOVING RETAINING WALL.

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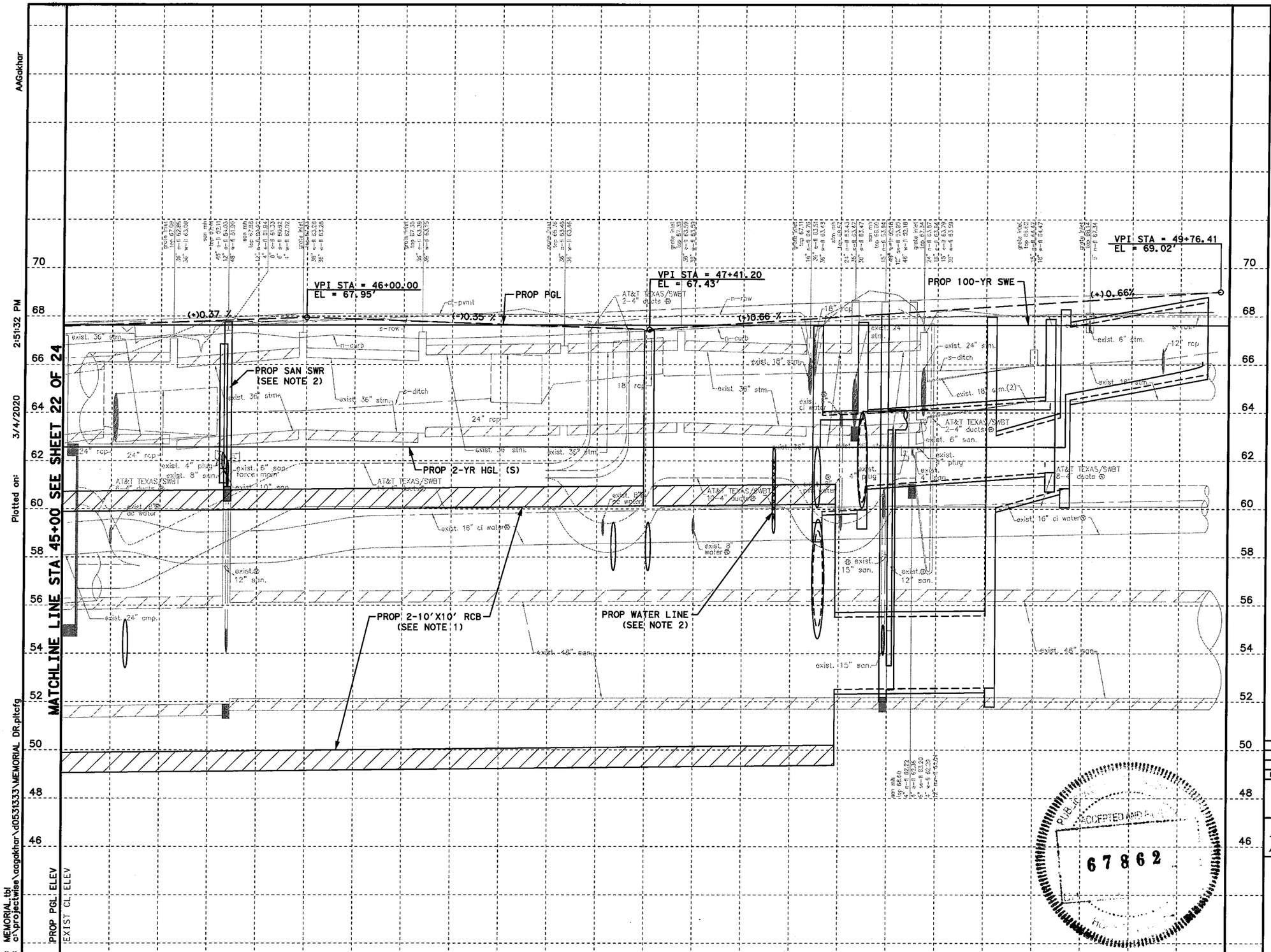

NOTES:

1. REFER TO DRAINAGE IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
2. REFER TO WATER & SAN SWR IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.

0 40 80

(IN FEET)
SCALE: 1"=40' - H
1"=4' - V

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
©2020

ACCEPTED AND APPROVED FOR PUBLICATION
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

ROADWAY PROFILE
STA 45+00 TO END PROJECT

SHEET 24 OF 24

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	140

AAGakhar
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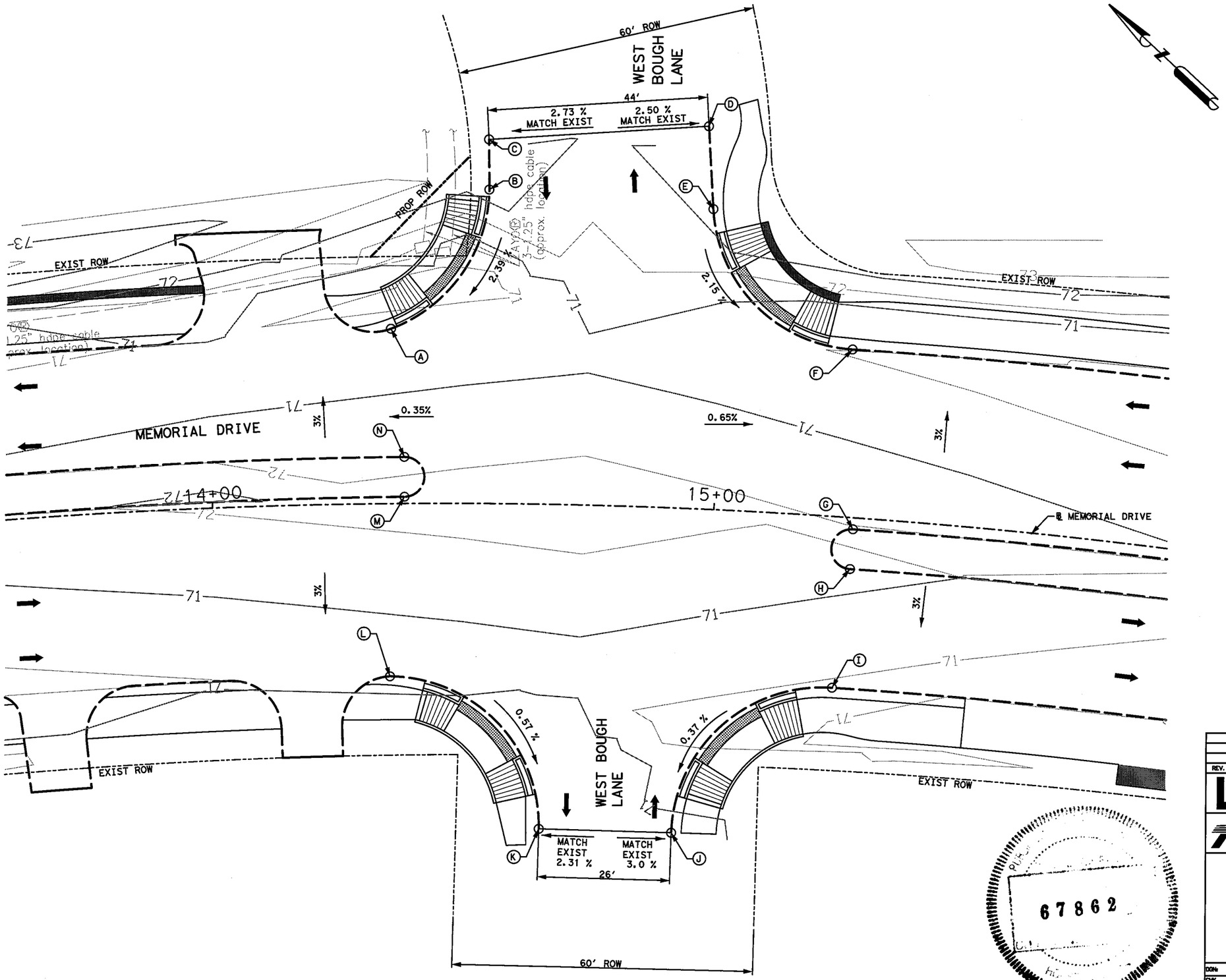

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NO.	ELEVATION	DESCRIPTION
A	70.60	GUTTER
B	71.46	GUTTER
C	71.70	GUTTER
D	71.75	GUTTER
E	71.39	GUTTER
F	70.46	GUTTER
G	71.39	GUTTER
H	71.15	GUTTER
I	70.44	GUTTER
J	70.26	GUTTER
K	70.35	GUTTER
L	70.62	GUTTER
M	71.63	GUTTER
N	71.39	GUTTER

0 20 40
(IN FEET)
SCALE: PLAN 1":20'

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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A LEO A DALY COMPANY
FIRM REGISTATION NO. 2614

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

WEST BOUGH LANE INTERSECTION LAYOUT

SHEET 1 OF 7

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	141

67862

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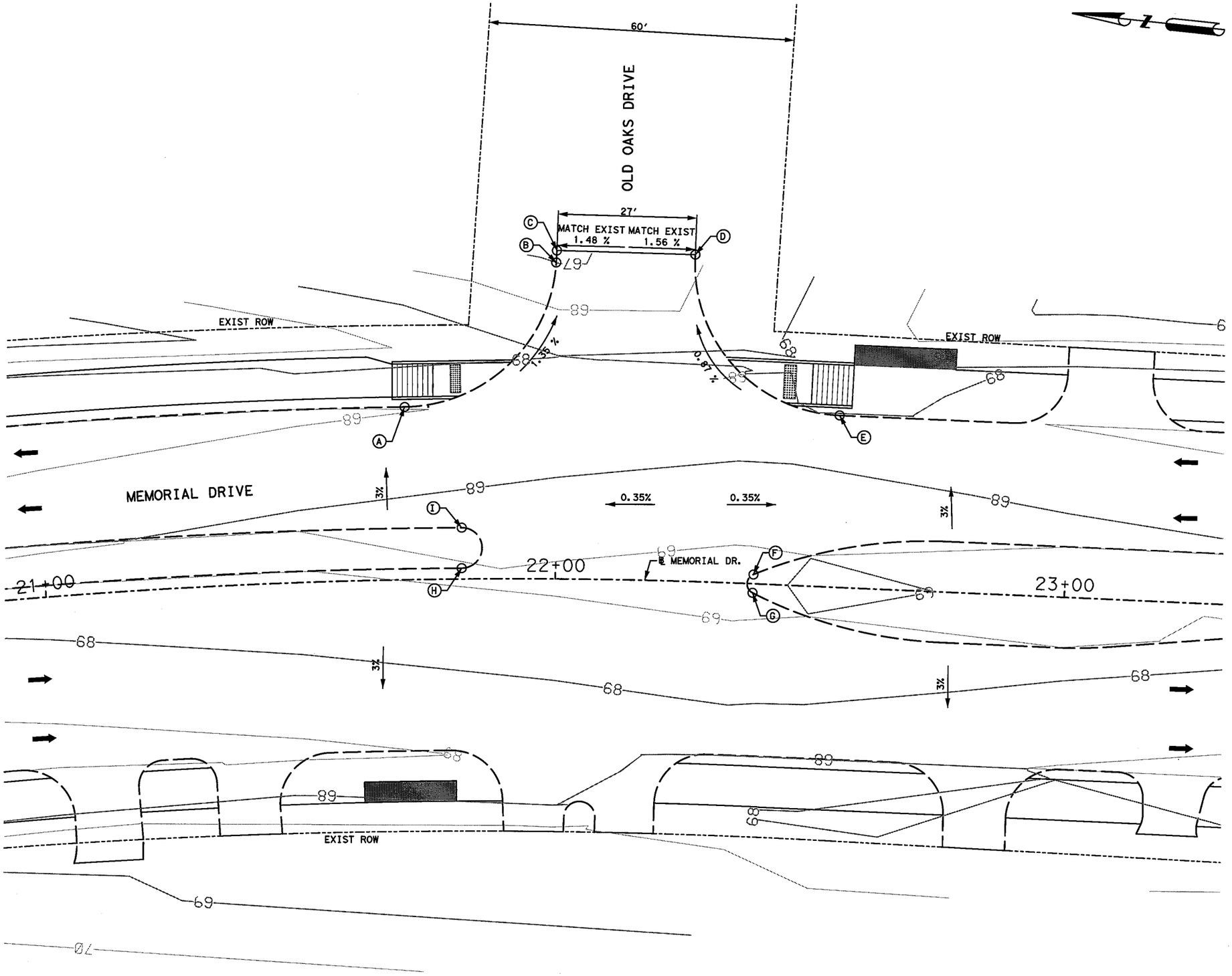

HORIZONTAL GEOMETRY DATA		
NO.	ELEVATION	DESCRIPTION
A	67.48	GUTTER
B	66.87	GUTTER
C	66.84	GUTTER
D	66.83	GUTTER
E	68.65	GUTTER
F	68.65	GUTTER
G	67.69	GUTTER
H	68.47	GUTTER
I	68.23	GUTTER

0 20 40
(IN FEET)
SCALE: PLAN 1": 20'

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

OLD OAKS DRIVE INTERSECTION LAYOUT

SHEET 2 OF 7

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	142

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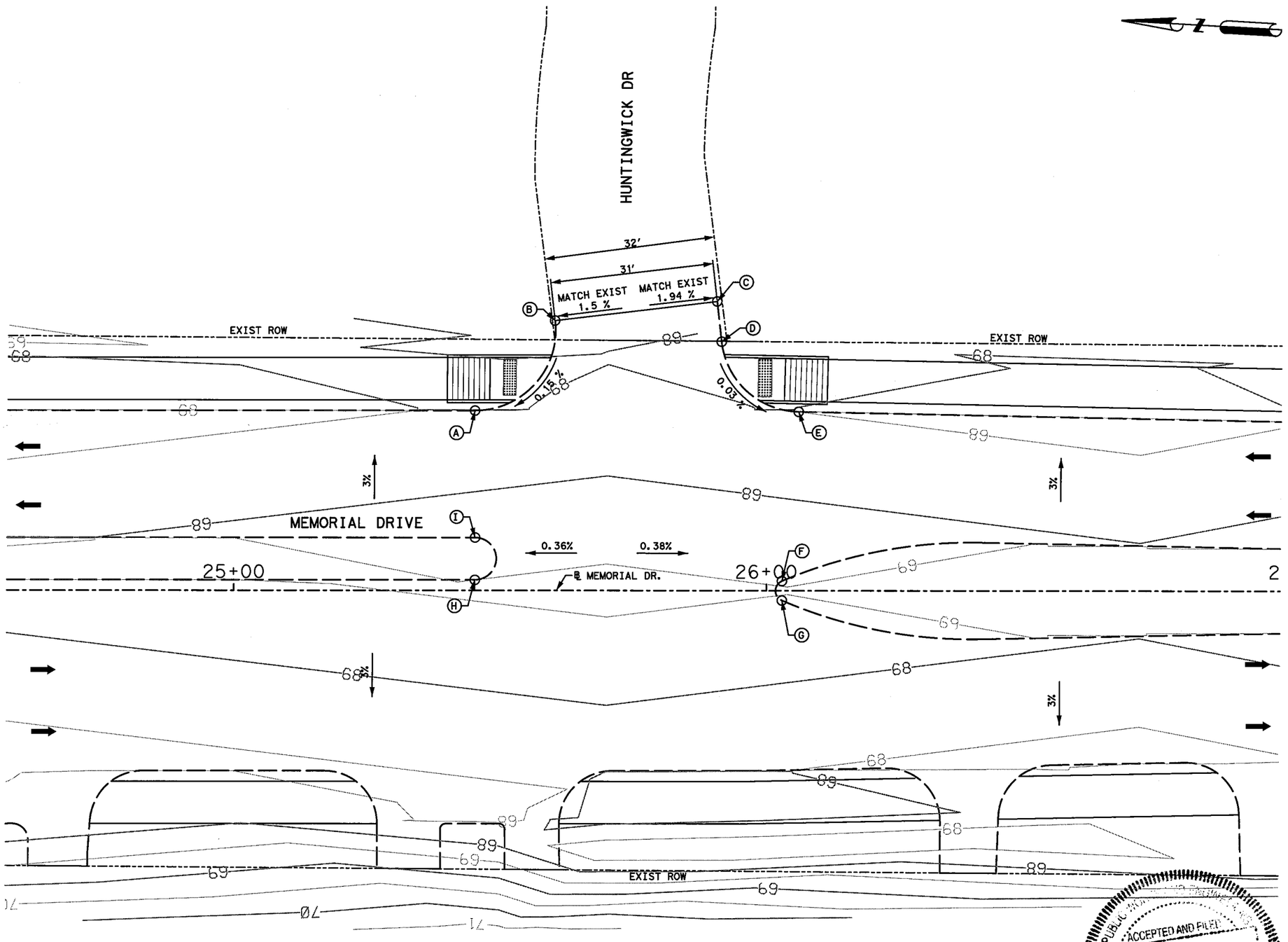
HORIZONTAL GEOMETRY DATA		
NO.	ELEVATION	DESCRIPTION
A	67.54	GUTTER
B	67.58	GUTTER
C	67.51	GUTTER
D	67.51	GUTTER
E	67.50	GUTTER
F	68.47	GUTTER
G	68.47	GUTTER
H	68.50	GUTTER
I	68.26	GUTTER



0 20 40
(IN FEET)
SCALE: PLAN 1": 20'

STATE OF TEXAS
MARK WOODWARD
98672
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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FIRM REGISTATION NO. 2614

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

HUNTINGWICK DRIVE INTERSECTION LAYOUT

SHEET 3 OF 7

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	143

ACCEPTED AND FILED
67862

Plotted on: 3/4/2020 2:53:22 PM AAGakhar
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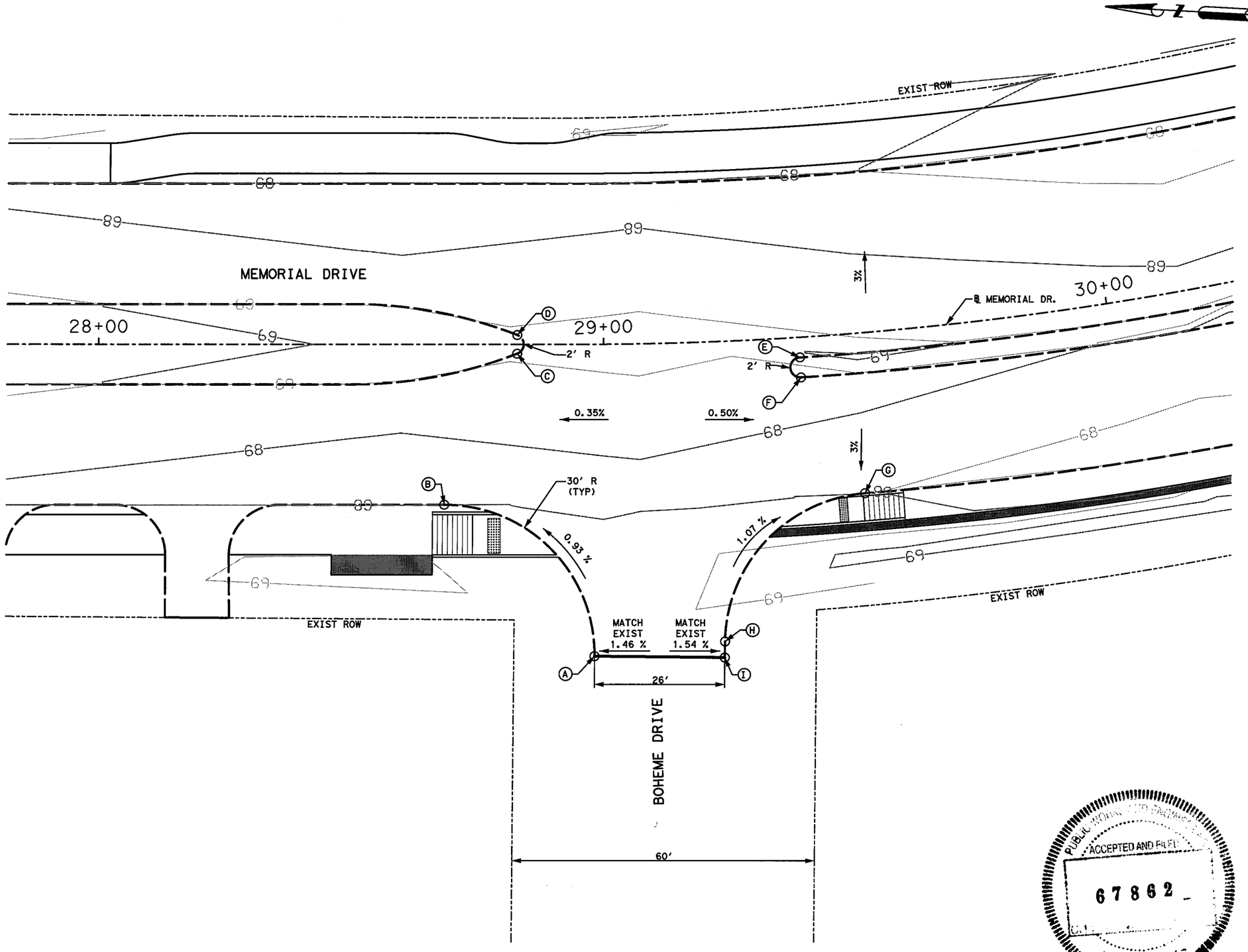
Design Filename: pw:\\lan-pw.bentley.com:lan-pw-01\Documents\Projects\120-11972-000\4-0-Production-Working\4-1-BIM-CAD\Roadway\PR-INT 03.dgn



HORIZONTAL GEOMETRY DATA		
NO.	ELEVATION	DESCRIPTION
A	68.04	GUTTER
B	67.60	GUTTER
C	68.55	GUTTER
D	68.55	GUTTER
E	68.41	GUTTER
F	68.29	GUTTER
G	67.52	GUTTER
H	68.00	GUTTER
I	68.03	GUTTER

0 20 40
(IN FEET)
SCALE: PLAN 1"=20'

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED
PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

PUBLIC WORKS AND TRANSPORTATION
ACCEPTED AND FILED
67862
HOUSTON, TEXAS

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

BOHEME DRIVE
INTERSECTION LAYOUT

SHEET 4 OF 7

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
DGN:	HOU	HARRIS	0912	72	391	144

Pen Table: MEMORIAL.tbl
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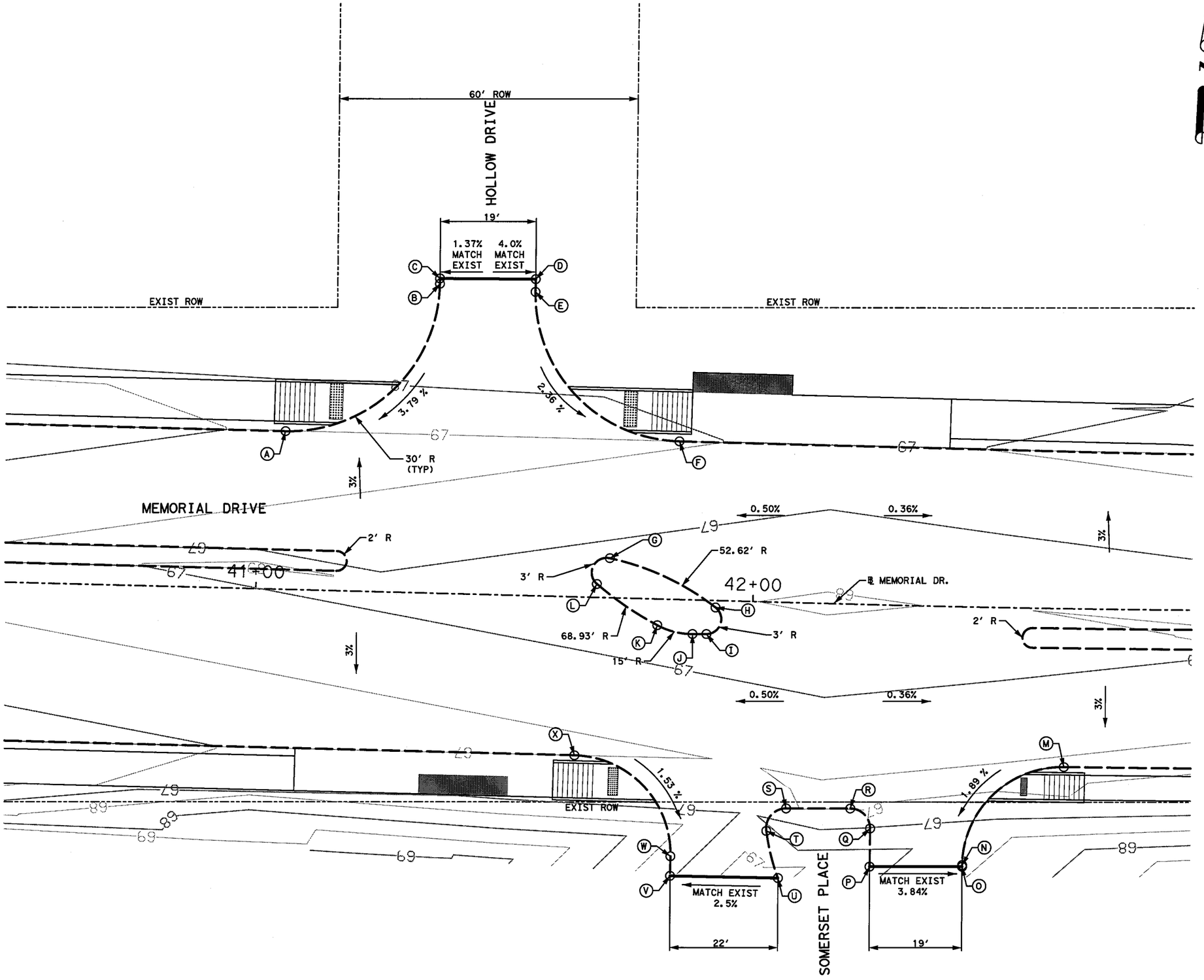

HORIZONTAL GEOMETRY DATA		
NO.	ELEVATION	DESCRIPTION
A	66.06	GUTTER
B	67.87	GUTTER
C	67.87	GUTTER
D	67.62	GUTTER
E	67.56	GUTTER
F	66.46	GUTTER
G	67.11	GUTTER
H	67.42	GUTTER
I	67.24	GUTTER
J	67.23	GUTTER
K	67.24	GUTTER
L	67.26	GUTTER
M	66.44	GUTTER
N	65.84	GUTTER
O	65.84	GUTTER
P	66.57	GUTTER
Q	66.64	GUTTER
R	66.70	GUTTER
S	66.69	GUTTER
T	66.56	GUTTER
U	66.37	GUTTER
V	65.82	GUTTER
W	65.88	GUTTER
X	66.36	GUTTER

PUBLIC WORKS
ACCEPTED AND FILED
67862

0 20 40
(IN FEET)
SCALE: PLAN 1":20'

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

HOLLOW DRIVE & SOMERSET PLACE INTERSECTION LAYOUT

SHEET 5 OF 7

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	145

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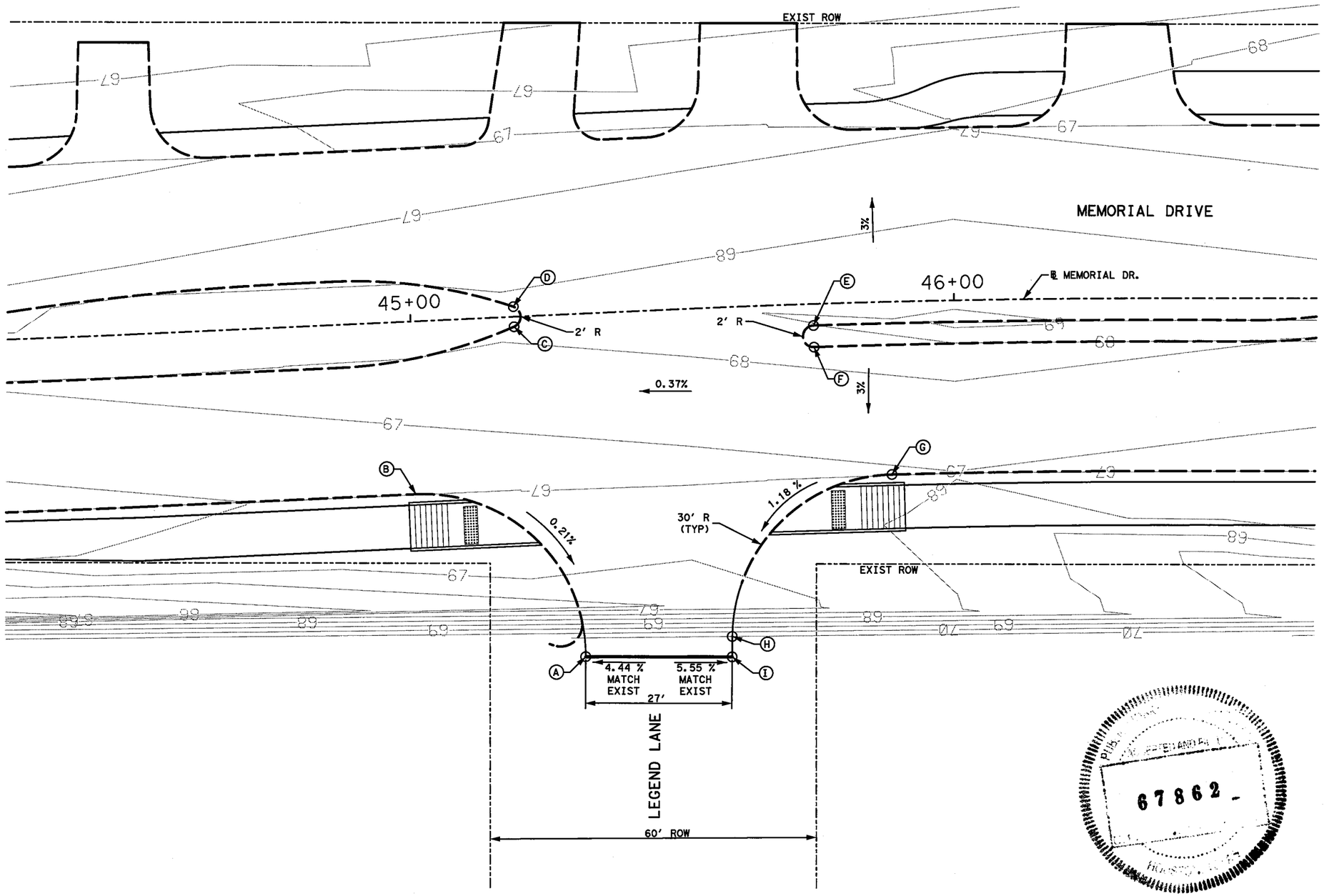
HORIZONTAL GEOMETRY DATA		
NO.	ELEVATION	DESCRIPTION
A	66.51	GUTTER
B	66.61	GUTTER
C	67.59	GUTTER
D	67.59	GUTTER
E	67.73	GUTTER
F	67.61	GUTTER
G	66.95	GUTTER
H	66.40	GUTTER
I	66.36	GUTTER



0 20 40

(IN FEET)

SCALE: PLAN 1": 20'

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED
PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

LEGEND LANE INTERSECTION LAYOUT

SHEET 6 OF 7

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	146

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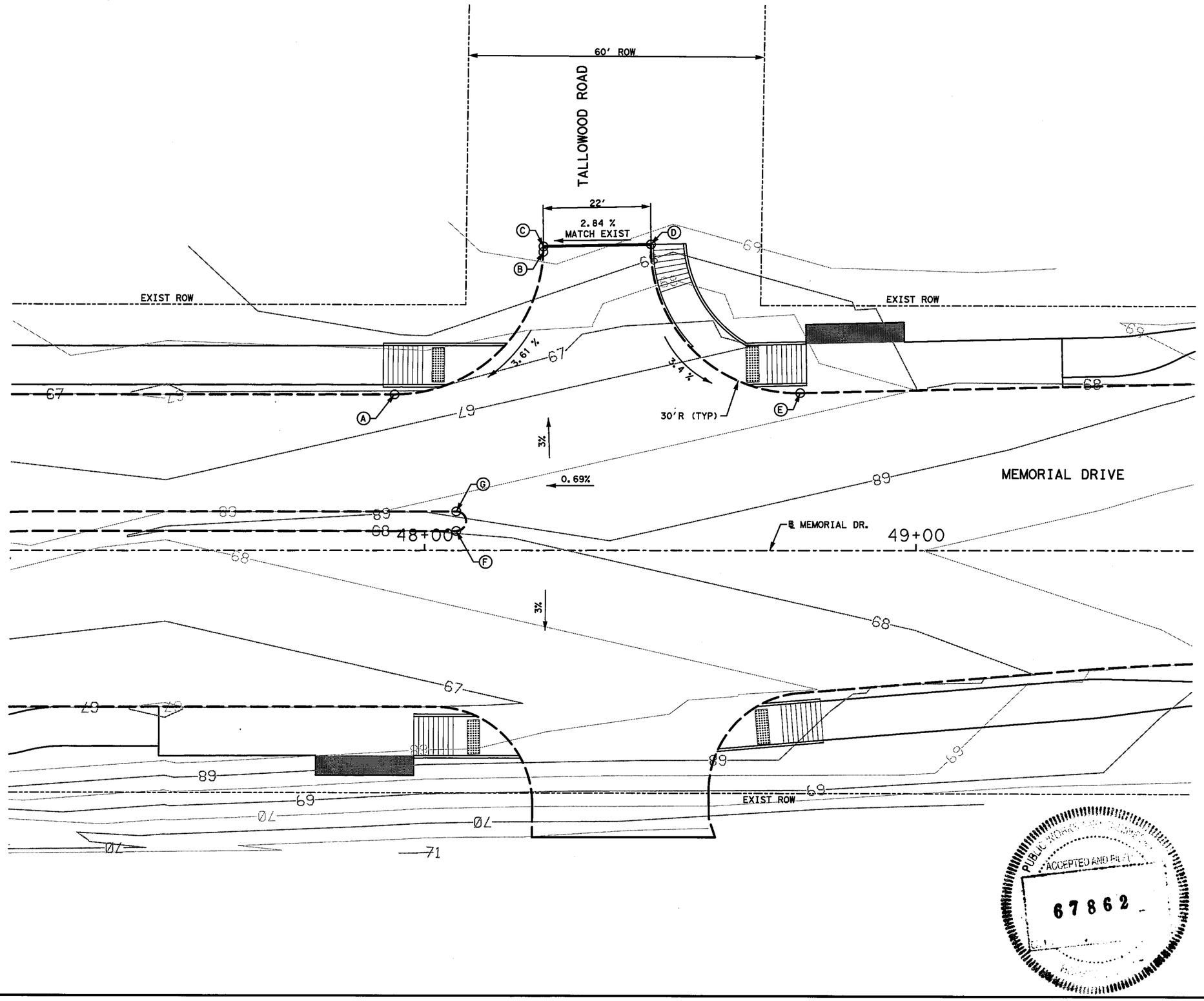
Design Filename: pw:\\lan-pw.bentley.com:lan-pw-01\Documents\Projects\120-11972-0001\4-0-Production-Working\4-1-BIM-CAD\Roadway\PR-INT 06.dgn

HORIZONTAL GEOMETRY DATA		
NO.	ELEVATION	DESCRIPTION
A	66.84	GUTTER
B	68.51	GUTTER
C	68.55	GUTTER
D	68.99	GUTTER
E	67.38	GUTTER
F	67.76	GUTTER
G	67.65	GUTTER



0 20 40
(IN FEET)
SCALE: PLAN 1" = 20'

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

Lockwood, Andrews & Newnam, Inc.
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67862

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

TALLOWOOD ROAD INTERSECTION LAYOUT

SHEET 7 OF 7

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	147

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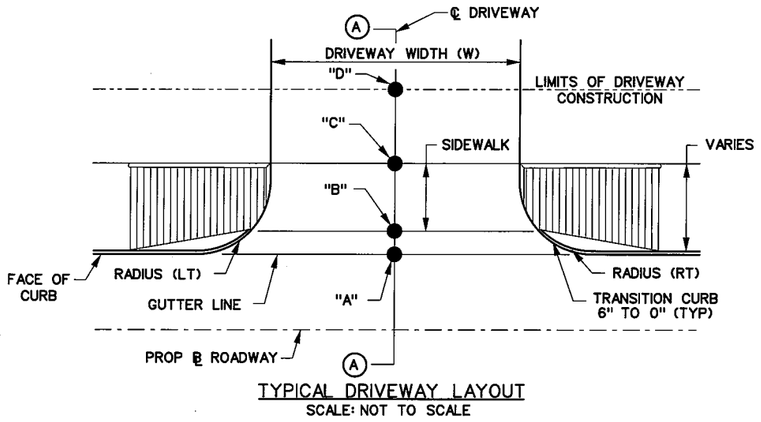
MEMORIAL DRIVE																		
DRIVEWAY NO.	DRIVEWAY CL STATION	OFFSET *					ELEVATION				Slope			RADIUS		DRIVEWAY WIDTH (W)	DRIVEWAY CONCRETE THICKNESS	SIDWALK WIDTH THRU DRIVEWAY	DRIVEWAY TYPE
		LT/RT	POINT "A"	POINT "B"	POINT "C"	POINT "D"	POINT "A"	POINT "B"	POINT "C"	POINT "D"	A-B	B-C	C-D	LT	RT				
1	2+63.90	LT	26.00	28.00	36.00	42.00	72.77	73.09	73.25	73.38	16.0%	2.0%	2.2%	10'	10'	34.00	7" CONC	8.0	COMMERCIAL
2	3+11.03	RT	42.00	44.00	52.00	58.00	72.07	72.39	72.55	73.23	16.0%	2.0%	11.3%	10'	5'	16.00	7" CONC	8.0	RESIDENTIAL
3	3+34.72	RT	42.00	44.00	52.00	58.00	71.95	72.27	72.43	72.79	16.0%	2.0%	6.0%	5'	10'	10.00	7" CONC	8.0	RESIDENTIAL
4	3+41.51	LT	26.00	28.00	36.00	42.00	72.40	72.72	72.88	73.48	16.0%	2.0%	10.0%	15'	3'	40.00	7" CONC	8.0	COMMERCIAL
5	3+89.80	RT	42.00	44.00	52.00	58.00	71.68	72.00	72.16	73.12	16.0%	2.0%	16.0%	10'	5'	14.50	7" CONC	8.0	RESIDENTIAL
6	3+91.78	LT	26.00	28.00	36.00	42.00	72.15	72.47	72.63	73.17	16.0%	2.0%	9.0%	3'	15'	44.00	7" CONC	8.0	COMMERCIAL
7	4+20.73	RT	42.00	44.00	52.00	58.00	71.53	71.85	72.01	72.87	16.0%	2.0%	14.3%	5'	10'	16.00	7" CONC	8.0	RESIDENTIAL
8	5+11.82	RT	41.30	43.30	51.30	57.42	71.54	71.86	72.02	72.73	16.0%	2.0%	11.6%	10'	10'	15.00	7" CONC	8.0	RESIDENTIAL
9	5+14.05	LT	26.72	28.72	36.72	42.62	71.99	72.31	72.47	73.19	16.0%	2.0%	12.2%	10'	10'	29.00	7" CONC	8.0	COMMERCIAL
10	6+44.73	RT	40.08	42.08	50.08	56.39	72.04	72.08	72.24	72.31	2.0%	2.0%	1.1%	10'	5'	15.00	7" CONC	8.0	RESIDENTIAL
11	6+73.96	RT	39.82	41.82	49.82	56.17	71.98	72.30	72.46	72.91	16.0%	2.0%	7.1%	5'	10'	10.00	7" CONC	8.0	RESIDENTIAL
12	6+83.33	LT	28.27	30.27	38.27	45.52	72.30	72.62	72.78	73.12	16.0%	2.0%	4.7%	20'	3'	24.00	7" CONC	8.0	COMMERCIAL
13	7+25.66	LT	28.63	30.63	38.63	45.77	72.14	72.46	72.62	73.17	16.0%	2.0%	7.7%	3'	20'	24.00	7" CONC	8.0	COMMERCIAL
14	7+73.83	RT	38.96	40.96	48.96	55.37	71.66	71.98	72.14	72.64	16.0%	2.0%	7.8%	10'	10'	11.00	7" CONC	8.0	RESIDENTIAL
15	8+18.25	RT	38.59	40.59	48.59	55.00	71.67	71.99	72.15	72.58	16.0%	2.0%	6.7%	10'	10'	12.00	7" CONC	8.0	RESIDENTIAL
16	9+07.71	RT	37.87	39.87	47.87	54.25	71.62	71.94	72.10	72.52	16.0%	2.0%	6.6%	10'	5'	12.00	7" CONC	8.0	RESIDENTIAL
17	9+40.63	RT	37.62	39.62	47.62	54.00	71.75	72.07	72.23	72.69	16.0%	2.0%	7.2%	5'	10'	12.00	7" CONC	8.0	RESIDENTIAL
18	9+70.80	LT	30.61	32.61	40.61	46.20	72.06	72.38	72.54	73.17	16.0%	2.0%	11.3%	15'	3'	23.00	7" CONC	8.0	COMMERCIAL
19	10+03.89	RT	37.15	39.15	47.15	53.49	71.85	71.89	72.05	72.09	2.0%	2.0%	0.6%	10'	10'	10.00	7" CONC	8.0	RESIDENTIAL
20	10+12.05	LT	30.91	32.91	40.91	46.60	71.98	72.30	72.46	73.06	16.0%	2.0%	10.5%	3'	15'	24.00	7" CONC	8.0	COMMERCIAL
21	10+59.46	RT	36.76	38.76	46.76	53.02	71.49	71.81	71.97	72.24	16.0%	2.0%	4.3%	10'	10'	16.00	7" CONC	8.0	RESIDENTIAL
22	11+16.84	RT	36.37	38.37	46.37	52.55	71.12	71.44	71.60	72.00	16.0%	2.0%	6.5%	10'	10'	14.00	7" CONC	8.0	RESIDENTIAL
23	11+72.02	RT	36.02	38.02	46.02	52.10	70.76	71.08	71.24	72.24	16.0%	2.0%	16.4%	10'	1'	12.00	7" CONC	8.0	RESIDENTIAL
24	12+01.76	RT	35.84	37.84	45.84	51.86	70.57	70.89	71.05	71.89	16.0%	2.0%	14.0%	1'	10'	13.00	7" CONC	8.0	RESIDENTIAL
25	12+25.55	LT	32.30	34.30	42.30	48.33	70.52	70.84	71.00	71.84	16.0%	2.0%	13.9%	10'	10'	33.00	7" CONC	8.0	COMMERCIAL
26	13+32.75	RT	35.13	37.13	45.13	55.60	70.25	70.57	70.73	71.98	16.0%	2.0%	11.9%	10'	5'	9.00	7" CONC	8.0	RESIDENTIAL
27	13+66.27	RT	34.96	36.96	44.96	54.83	70.37	70.69	70.85	72.02	16.0%	2.0%	11.9%	5'	10'	12.00	7" CONC	8.0	RESIDENTIAL
28	14+12.24	LT	33.65	35.18	42.48	55.03	70.57	70.81	70.97	72.45	15.7%	2.0%	11.8%	10'	10'	24.00	7" CONC	8.0	COMMERCIAL
29	14+19.07	RT	34.72	36.72	44.72	50.53	70.56	70.88	71.04	71.98	16.0%	2.0%	16.2%	10'	10'	12.00	7" CONC	8.0	RESIDENTIAL
30	16+16.12	LT	33.97	35.97	43.97	55.39	69.87	70.19	70.35	72.14	16.0%	2.0%	15.7%	10'	10'	23.00	7" CONC	8.0	COMMERCIAL
31	16+83.95	LT	34.14	36.14	44.14	50.66	69.43	69.75	69.91	70.66	16.0%	2.0%	11.5%	15'	15'	27.00	7" CONC	8.0	COMMERCIAL
32	16+84.37	RT	33.86	35.86	43.86	49.35	69.43	69.75	69.91	70.29	16.0%	2.0%	6.9%	10'	3'	8.00	7" CONC	8.0	RESIDENTIAL
33	17+06.89	RT	33.81	35.81	43.81	49.50	69.29	69.61	69.77	70.30	16.0%	2.0%	9.3%	3'	10'	9.00	7" CONC	8.0	RESIDENTIAL

NOTE:

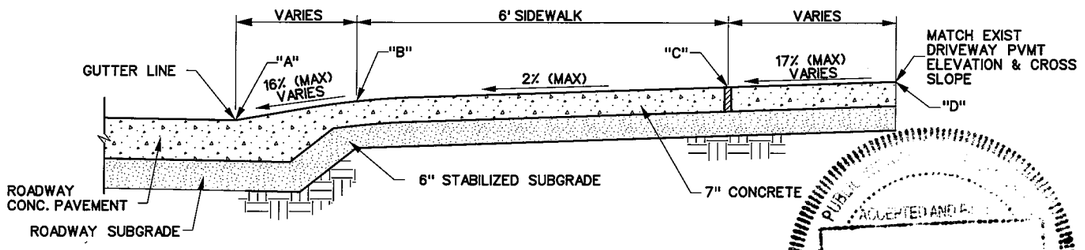
1. REFER TO CONCRETE SIDEWALK & DRIVEWAY DETAILS FOR ADDITIONAL INFORMATION
2. ELEVATION AT POINT "D" IS(+/-) AS SHOWN IN DRIVEWAY TABLE. MATCH EXISTING ELEVATION AT ROW.
3. REFER TO PLAN & PROFILE SHEETS FOR ADDITIONAL INFORMATION

LEGEND:

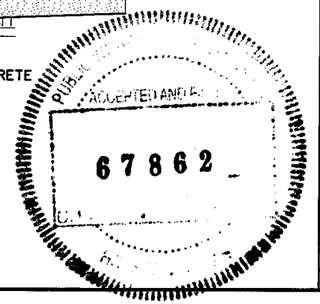
* OFFSET DISTANCE TO POINT "D" IS FROM PROPOSED BL MEMORIAL.



TYPICAL DRIVEWAY LAYOUT
SCALE: NOT TO SCALE



SECTION A
TYPICAL DRIVEWAY SECTION
SCALE: NOT TO SCALE



Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

DRIVEWAY TABULATION DETAILS

SHEET 1 OF 2

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	148

AAGakhar
Plotted on: 3/4/2020 2:55:55 PM
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Design Filename: pw:\\lan-pw.bentley.com:lan-pw-01\Documents\Projects\120-11972-000\4-0-Production-Working\4-1-BIM-CAD\Roadway\PR-DRV TAB 01.dgn

DRIVEWAY NO.	DRIVEWAY CL STATION	OFFSET *					ELEVATION				Slope			RADIUS		DRIVEWAY WIDTH(W)	DRIVEWAY CONCRETE THICKNESS	SIDWALK WIDTH THRU DRIVEWAY	DRIVEWAY TYPE
		LT/RT	POINT "A"	POINT "B"	POINT "C"	POINT "D"	POINT "A"	POINT "B"	POINT "C"	POINT "D"	A-B	B-C	C-D	LT	RT				
34	17+95.89	RT	33.67	35.67	43.67	52.94	68.79	69.11	69.27	70.36	16.0%	2.0%	11.8%	10'	10'	14.00	7" CONC	8.0	RESIDENTIAL
35	18+52.52	RT	33.62	35.62	43.62	49.30	68.48	68.80	68.96	69.87	16.0%	2.0%	16.0%	10'	5'	12.00	7" CONC	8.0	RESIDENTIAL
36	18+65.75	LT	34.39	36.39	44.39	56.20	68.38	68.70	68.86	70.24	16.0%	2.0%	11.7%	15'	15'	30.00	7" CONC	8.0	COMMERCIAL
37	18+80.19	RT	33.60	35.60	43.60	48.39	68.33	68.65	68.81	70.37	16.0%	2.0%	32.6%	5'	10'	11.00	7" CONC	8.0	RESIDENTIAL
38	19+38.91	RT	33.59	35.59	43.59	53.26	68.00	68.32	68.48	70.02	16.0%	2.0%	15.9%	10'	3'	12.00	7" CONC	8.0	RESIDENTIAL
39	19+59.82	RT	33.59	35.59	43.59	52.91	67.89	68.21	68.37	69.58	16.0%	2.0%	13.0%	3'	10'	12.00	7" CONC	8.0	RESIDENTIAL
40	20+23.18	RT	33.63	35.63	43.63	52.41	67.53	67.85	68.01	69.38	16.0%	2.0%	15.6%	10'	5'	8.00	7" CONC	8.0	RESIDENTIAL
41	20+50.26	RT	33.65	35.65	43.65	53.11	67.38	67.70	67.86	68.98	16.0%	2.0%	11.8%	5'	10'	13.00	7" CONC	8.0	RESIDENTIAL
42	21+09.11	RT	33.73	35.73	43.73	52.93	67.27	67.59	67.75	68.83	16.0%	2.0%	11.7%	10'	5'	13.00	7" CONC	8.0	RESIDENTIAL
43	21+38.37	RT	33.77	35.77	43.77	49.37	67.37	67.69	67.85	68.70	16.0%	2.0%	15.2%	5'	10'	12.00	7" CONC	8.0	RESIDENTIAL
44	21+96.24	RT	33.89	35.89	43.89	49.87	67.48	67.80	67.96	68.66	16.0%	2.0%	11.7%	10'	3'	12.00	7" CONC	8.0	RESIDENTIAL
45	22+14.79	RT	33.93	35.93	43.93	49.94	67.63	67.95	68.11	68.64	16.0%	2.0%	8.8%	3'	10'	12.00	7" CONC	8.0	RESIDENTIAL
46	22+84.74	RT	34.00	36.00	44.00	50.37	67.53	67.85	68.01	68.32	16.0%	2.0%	4.9%	10'	10'	12.00	7" CONC	8.0	RESIDENTIAL
47	23+06.87	LT	34.00	36.00	44.00	49.39	67.45	67.77	67.93	68.63	16.0%	2.0%	13.0%	10'	10'	17.00	7" CONC	8.0	COMMERCIAL
48	23+23.36	RT	34.00	36.00	44.00	46.00	67.39	67.71	67.87	67.93	16.0%	2.0%	3.0%	5'	5'	35.00	7" CONC	8.0	RESIDENTIAL
49	23+83.28	RT	34.00	36.00	44.00	51.36	67.18	67.50	67.66	68.30	16.0%	2.0%	8.7%	10'	10'	19.00	7" CONC	8.0	RESIDENTIAL
50	24+45.54	RT	34.00	36.00	44.00	51.81	67.18	67.50	67.66	68.37	16.0%	2.0%	9.1%	10'	3'	19.00	7" CONC	8.0	RESIDENTIAL
51	24+67.19	RT	34.00	36.00	44.00	51.97	67.26	67.58	67.74	68.13	16.0%	2.0%	4.9%	3'	10'	11.00	7" CONC	8.0	RESIDENTIAL
52	25+33.11	RT	34.00	36.00	44.00	52.45	67.50	67.77	67.93	68.11	13.5%	2.0%	2.1%	10'	1'	12.00	7" CONC	8.0	RESIDENTIAL
53	25+56.28	RT	34.00	36.00	44.00	52.62	67.58	67.76	67.92	68.10	9.0%	2.0%	2.1%	1'	10'	10.00	7" CONC	8.0	RESIDENTIAL
54	26+37.74	RT	33.16	35.16	43.16	53.22	67.40	67.72	67.88	68.16	16.0%	2.0%	2.8%	10'	10'	11.00	7" CONC	8.0	RESIDENTIAL
55	26+94.40	RT	32.03	34.03	36.03	53.63	67.45	67.50	67.66	68.06	2.5%	2.0%	2.3%	10'	5'	11.00	7" CONC	8.0	RESIDENTIAL
56	27+16.97	RT	32.00	34.00	42.00	51.64	67.58	67.90	68.06	68.44	16.0%	2.0%	3.9%	5'	10'	11.00	7" CONC	8.0	RESIDENTIAL
57	27+75.20	RT	32.00	34.00	42.00	52.70	67.87	68.12	68.28	68.51	12.5%	2.0%	2.1%	10'	10'	12.00	7" CONC	8.0	RESIDENTIAL
58	28+19.79	RT	32.00	34.00	42.00	54.54	67.71	68.03	68.19	68.54	16.0%	2.0%	2.8%	10'	10'	13.00	7" CONC	8.0	RESIDENTIAL
59	30+74.50	RT	32.00	32.43	39.16	52.38	67.40	67.45	67.59	67.41	11.6%	2.0%	-1.4%	15'	15'	41.00	7" CONC	7.0	COMMERCIAL
60	31+80.62	RT	32.00	34.00	41.00	54.14	67.18	67.50	67.64	69.25	16.0%	2.0%	12.3%	15'	15'	31.00	7" CONC	7.0	COMMERCIAL
61	32+78.06	RT	32.00	34.00	41.00	50.75	66.81	67.13	67.27	67.65	16.0%	2.0%	3.9%	15'	15'	35.00	7" CONC	7.0	COMMERCIAL
62	33+81.67	RT	32.00	34.00	41.00	49.66	66.41	66.73	66.87	67.61	16.0%	2.0%	8.5%	15'	15'	25.00	7" CONC	7.0	COMMERCIAL
63	34+73.02	LT	32.00	34.00	42.00	51.14	66.36	66.68	66.84	68.33	16.0%	2.0%	16.3%	15'	15'	11.00	7" CONC	8.0	COMMERCIAL
64	34+75.39	RT	32.00	34.00	41.36	48.84	66.37	66.69	66.85	68.00	16.0%	2.0%	15.4%	10'	10'	27.00	7" CONC	8.0	COMMERCIAL
65	35+23.54	LT	32.00	34.00	42.00	51.43	66.57	66.89	67.05	68.30	16.0%	2.0%	13.3%	15'	15'	14.00	7" CONC	8.0	COMMERCIAL
66	36+44.54	LT	32.00	34.00	42.00	52.07	66.93	67.10	67.26	67.46	8.5%	2.0%	2.0%	20'	1'	22.00	7" CONC	8.0	COMMERCIAL
67	36+97.72	LT	32.00	34.00	42.00	52.32	66.62	66.94	67.10	67.32	16.0%	2.0%	2.1%	1'	5'	20.00	7" CONC	8.0	COMMERCIAL
68	37+30.29	LT	32.00	34.00	42.00	52.45	66.43	66.75	66.91	67.44	16.0%	2.0%	5.1%	5'	20'	20.00	7" CONC	8.0	COMMERCIAL
69	37+94.59	RT	32.00	34.00	42.00	51.34	66.06	66.38	66.54	67.63	16.0%	2.0%	11.7%	10'	10'	27.00	7" CONC	8.0	COMMERCIAL
70	38+79.23	LT	32.00	34.00	42.00	52.89	66.06	66.29	66.45	66.67	11.5%	2.0%	2.0%	20'	2'	19.00	7" CONC	8.0	COMMERCIAL
71	39+04.76	LT	32.00	34.00	42.00	52.93	66.15	66.17	66.33	66.55	1.0%	2.0%	2.0%	2'	20'	20.00	7" CONC	8.0	COMMERCIAL
72	41+94.54	RT	32.00	33.60	40.60	55.77	66.50	66.51	66.65	65.99	0.6%	2.0%	-4.4%	20'	4'	22.00	7" CONC	7.0	RESIDENTIAL
73	42+34.03	RT	32.00	33.60	39.98	52.67	66.54	66.55	66.67	66.32	0.6%	2.0%	-2.8%	4'	20'	19.00	7" CONC	6.0	RESIDENTIAL
74	44+46.59	LT	32.00	33.43	38.35	54.06	66.41	66.67	66.77	66.01	18.2%	2.0%	-4.8%	10'	10'	13.00	7" CONC	5.0	RESIDENTIAL
75	45+22.76	LT	32.00	33.61	39.62	54.05	66.70	66.71	66.83	66.34	0.6%	2.0%	-3.4%	5'	5'	14.00	7" CONC	6.0	RESIDENTIAL
76	45+62.86	LT	32.00	34.00	42.00	52.29	66.85	67.17	67.33	67.65	16.0%	2.0%	3.1%	10'	10'	18.00	7" CONC	8.0	RESIDENTIAL
77	46+30.70	LT	32.00	34.00	42.00	50.72	66.88	67.20	67.36	67.83	16.0%	2.0%	5.4%	10'	10'	19.00	7" CONC	8.0	RESIDENTIAL
78	46+88.74	RT	32.00	34.00	42.00	49.42	66.68	67.00	67.16	68.34	16.0%	2.0%	15.9%	10'	10'	18.00	7" CONC	8.0	RESIDENTIAL
79	48+39.38	RT	32.00	34.00	42.00	58.70	67.48	67.80	67.96	69.71	16.0%	2.0%	10.5%	20'	20'	30.00	7" CONC	8.0	RESIDENTIAL

NOTE:

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

LEGEND:

* OFFSET DISTANCE TO POINT "D" IS FROM PROPOSED BL MEMORIAL.

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED PROFESSIONAL ENGINEER
03/04/2020
Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

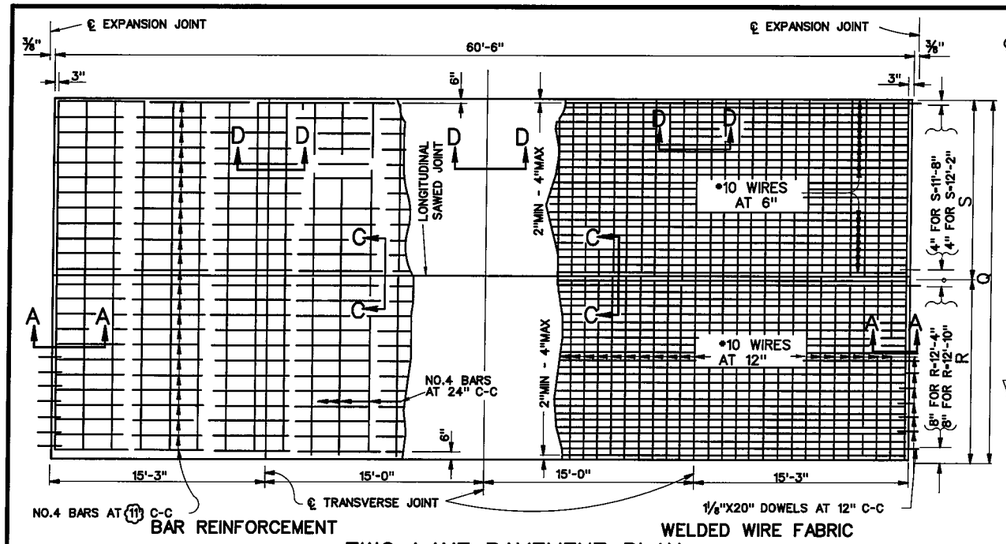
Texas Department of Transportation ©2020

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

DRIVEWAY TABULATION DETAILS

SHEET 2 OF 2

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	149

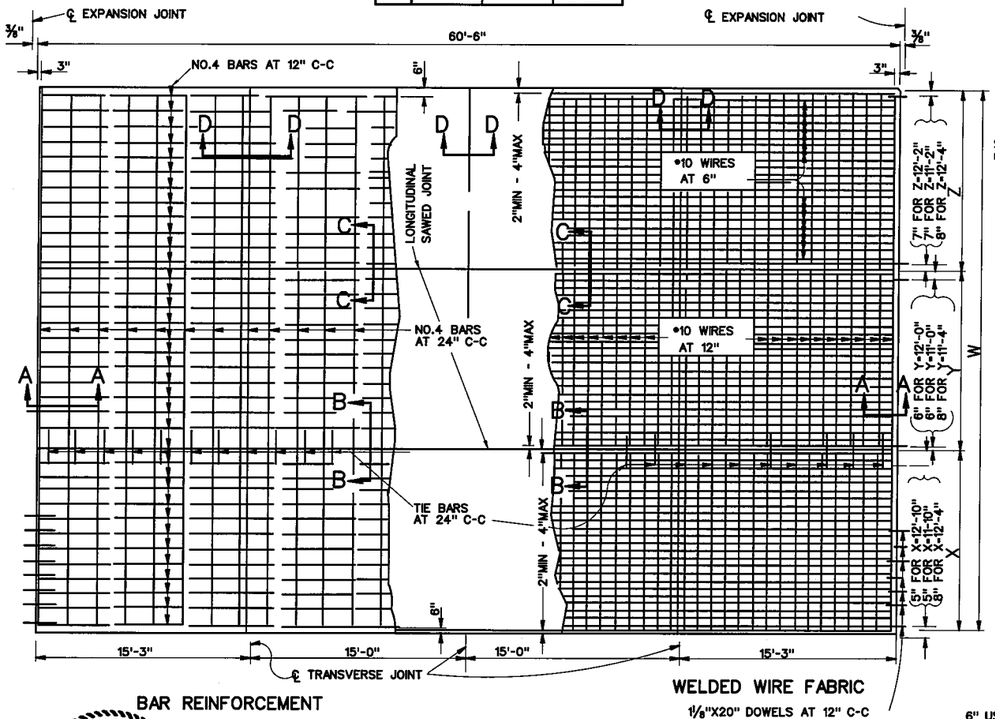


BAR REINFORCEMENT

WELDED WIRE FABRIC

TWO LANE PAVEMENT PLAN

	WIDTH - Q		
	24'-0"	24'-6"	25'-0"
R	12'-4"	12'-4"	12'-10"
S	11'-8"	12'-2"	12'-2"



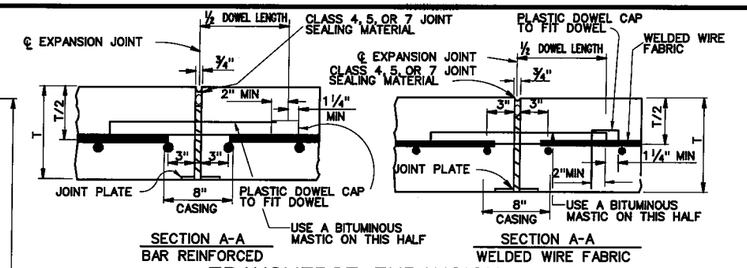
BAR REINFORCEMENT

WELDED WIRE FABRIC

THREE LANE PAVEMENT PLAN

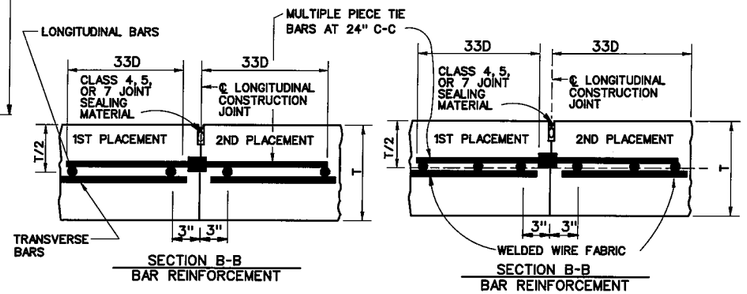
	WIDTH - W		
	37'-0"	36'-0"	34'-0"
X	12'-10"	12'-4"	11'-10"
Y	12'-0"	11'-4"	11'-0"
Z	12'-2"	12'-4"	11'-2"

D = DIAMETER
R = RADIUS
T = THICKNESS

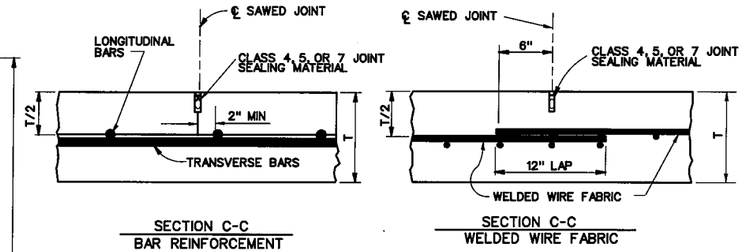


TRANSVERSE EXPANSION JOINTS

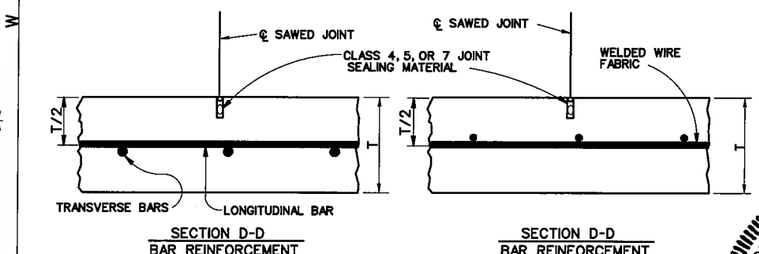
NOTE: DOWEL BARS CONFORMING TO ASTM A615 OR A616 GRADE 60 ARE ACCEPTABLE



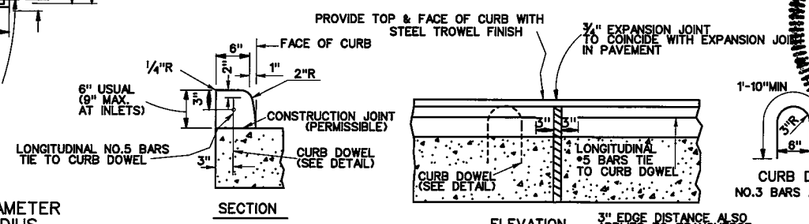
LONGITUDINAL CONSTRUCTION JOINTS



LONGITUDINAL SAWED JOINTS



TRANSVERSE SAWED JOINTS



TYPICAL 6" CURB (DETAIL)

GENERAL NOTES

1. MULTIPLE PIECE TIE BARS ARE REQUIRED AT LONGITUDINAL CONSTRUCTION JOINTS. USE MULTIPLE PIECE TIE BAR ASSEMBLIES WITH STOP TYPE COUPLINGS AND WITH THREADS ON THE BARS. ENSURE THE MULTIPLE PIECE TIE BAR ASSEMBLIES DEVELOP A MINIMUM ULTIMATE TENSILE STRENGTH EQUAL TO 1.25 TIMES THE YIELD STRENGTH OF THE TRANSVERSE BARS BEING JOINED. USE DEFORMED REINFORCING BARS FOR TIE BARS. TIE BAR ASSEMBLIES MADE FROM STEELS OTHER THAN ASTM GRADE 60 AND WITH DEFORMATIONS OTHER THAN ASTM STANDARD MAY BE USED IF IT CAN BE PROVEN TO THE ENGINEER THAT THEY ARE IN EVERY RESPECT THE EQUAL OF THE ASSEMBLIES SPECIFIED. LABORATORY TESTING OF THE PROPOSED ASSEMBLIES, AT THE CONTRACTOR'S EXPENSE, MAY BE REQUIRED.
2. FORM CONSTRUCTION JOINTS WITH METAL OR WOOD FORMS EQUAL IN DEPTH TO THE NOMINAL DEPTH OF THE PAVEMENT OR BY OTHER MEANS APPROVED PRIOR TO THEIR USE.
3. SAW LONGITUDINAL AND TRANSVERSE JOINTS AS SOON AS SAWING CAN BE ACCOMPLISHED WITHOUT DAMAGE TO THE PAVEMENT AND BEFORE 24 HOURS AFTER PLACING THE CONCRETE, THE EXACT TIME WILL BE APPROVED BY THE ENGINEER. PREFORMED JOINT WITH ASPHALT STRIP IS NOT ACCEPTABLE.
4. LONGITUDINAL JOINTS ARE SHOWN OFFSET FOUR INCHES FROM THE THEORETICAL LANE LINE AND MAY BE OFFSET TO EITHER SIDE IF THE WIDTH OF THE WIRE FABRIC IS PROPERLY ADJUSTED.
5. ONE OF THE LONGITUDINAL JOINTS OF PAVEMENT SLABS WIDER THAN TWO LANES MAY BE A CONSTRUCTION JOINT. FOR PAVEMENT SLABS WIDER THAN 15 FT. PROVIDE A LOGITUDINAL SAWED JOINT UNLESS OTHERWISE DIRECTED.
6. FORM THE JOINT SEAL SPACE AT TRANSVERSE EXPANSION JOINTS BY USING A STRAIGHT FORM PLACED BEHIND THE LONGITUDINAL FLOAT. LOOSEN THE FORM AS SOON AS THE CONCRETE WILL RETAIN ITS SHAPE AND EDGE WITH AN APPROVED EDGING TOOL. TOOL BOTH EDGES OF LONGITUDINAL CONSTRUCTION JOINTS TO A 1/8IN. RADIUS AT THE PAVEMENT SURFACE.
7. DO NOT DISCHARGE CONCRETE FROM THE MIXER DIRECTLY ON TOP OF OR ON THE SIDES OF THE EXPANSION JOINT ASSEMBLIES.
8. LAP TRANSVERSE EDGES OF SHEETS OF WELDED WIRE FABRIC 12 INCHES EXCEPT AT TRANSVERSE EXPANSION JOINTS. LAP LONGITUDINAL EDGES 6 INCHES EXCEPT AT LONGITUDINAL CONSTRUCTION JOINTS.
9. DOWEL BARS MAY BE COATED WITH STAINLESS STEEL, MONEL METAL, OR IN ACCORDANCE WITH THE ITEM "REINFORCING STEEL" SECTION ON EPOXY COATING: WITH A WELDED DOWEL ASSEMBLY SUPPORT, AS APPROVED. ENSURE THE CASING CONFORMS TO THE REQUIREMENTS OF ONE OF THE GRADES OF ASTM A167-70 OR A176-71 AND IS NOT LESS THAN 0.010 INCH THICK. PROVIDE A CASING AT LEAST 8 INCHES LONG AND THAT COVERS THE MIDDLE 8 INCHES OF THE DOWEL.
10. SECURE DOWELS PARALLEL TO THE PAVEMENT SURFACE AND PERPENDICULAR TO THE JOINT WITH THE AID OF APPROVED WELDED WIRE BASKET ARRANGEMENTS. ENSURE WELDED WIRE BASKET ARRANGEMENTS DO NOT CROSS THE EXPANSION JOINT. UNIFORMLY COAT DOWELS WITH A BITUMINOUS MASTIC ON THE END WITH THE DOWEL CAP.
11. DO NOT BEND TIE BARS AND DOWEL BARS. TO PREVENT DISPLACEMENT OF WIRE FABRIC BY CONCRETE PLACEMENT, TIE THE FABRIC PANEL TOGETHER AND TIE THE INITIAL FABRIC PANELS OF EACH SLAB TO THE DOWEL BASKET OR AS DIRECTED.
12. TOOL PAVEMENT EDGES TO A RADIUS OF 1/8 IN. WITH AN APPROVED EDGING TOOL.
13. DETAILS FOR PAVEMENT WIDTH, PAVEMENT THICKNESS, AND CROWN-SLOPE ARE ELSEWHERE SHOWN ON THE PLANS.
14. THE CONTRACTOR HAS THE OPTION OF USING WELDED WIRE FABRIC OR BAR REINFORCEMENT. LOCATE THE LONGITUDINAL STEEL AT THE CENTER OF THE SLAB. TAKE NECESSARY PRECAUTIONS TO INSURE THAT THE FINAL POSITION OF STEEL IS WITHIN 1/2 IN. OF THE SLAB CENTER. ENSURE THE LONGITUDINAL AND TRANSVERSE STEEL SPACING DOES NOT VARY MORE THAN ONE-TWELFTH OF SPACING SHOWN.
15. LONGITUDINAL STEEL MAY BE SPLICED WITH 33 TIMES BAR DIAMETER LAPS.
16. FOR LANE WIDTHS NOT SHOWN OR FOR VARIABLE PANEL LENGTHS AND WIDTHS, SPACE REINFORCING STEEL AND DOWELS AS DIRECTED.
17. USE APPROVED BAR MAT CHAIRS. DO NOT EXCEED CHAIR SPACING OF 30 IN. C-C (TRANSVERSE) AND 48 IN. C-C (LONGITUDINAL). GALVANIZING THE CHAIRS IS NOT REQUIRED.
18. OBTAIN BOARDS FOR EXPANSION JOINT FILLER FROM REDWOOD TIMBER.
19. PROVIDE AND CONSTRUCT THE JOINT PLATE AS APPROVED.
20. WHEN CURB IS PLACED SEPARATELY FROM THE CONCRETE PAVEMENT, PROVIDE THE REINFORCING STEEL AS SHOWN IN THE CURB DETAIL. THE CURB REINFORCING STEEL MAY BE OMITTED WHEN THE CURB IS PLACED MONOLITHICALLY.

(GENERAL NOTES CONTINUED ON SHEET 2 OF 2)

STATE OF TEXAS
MARK WOODWARD
96872
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

PUBLIC WORKS
ACCEPTED AND FILED
67862

Texas Department of Transportation
Houston District

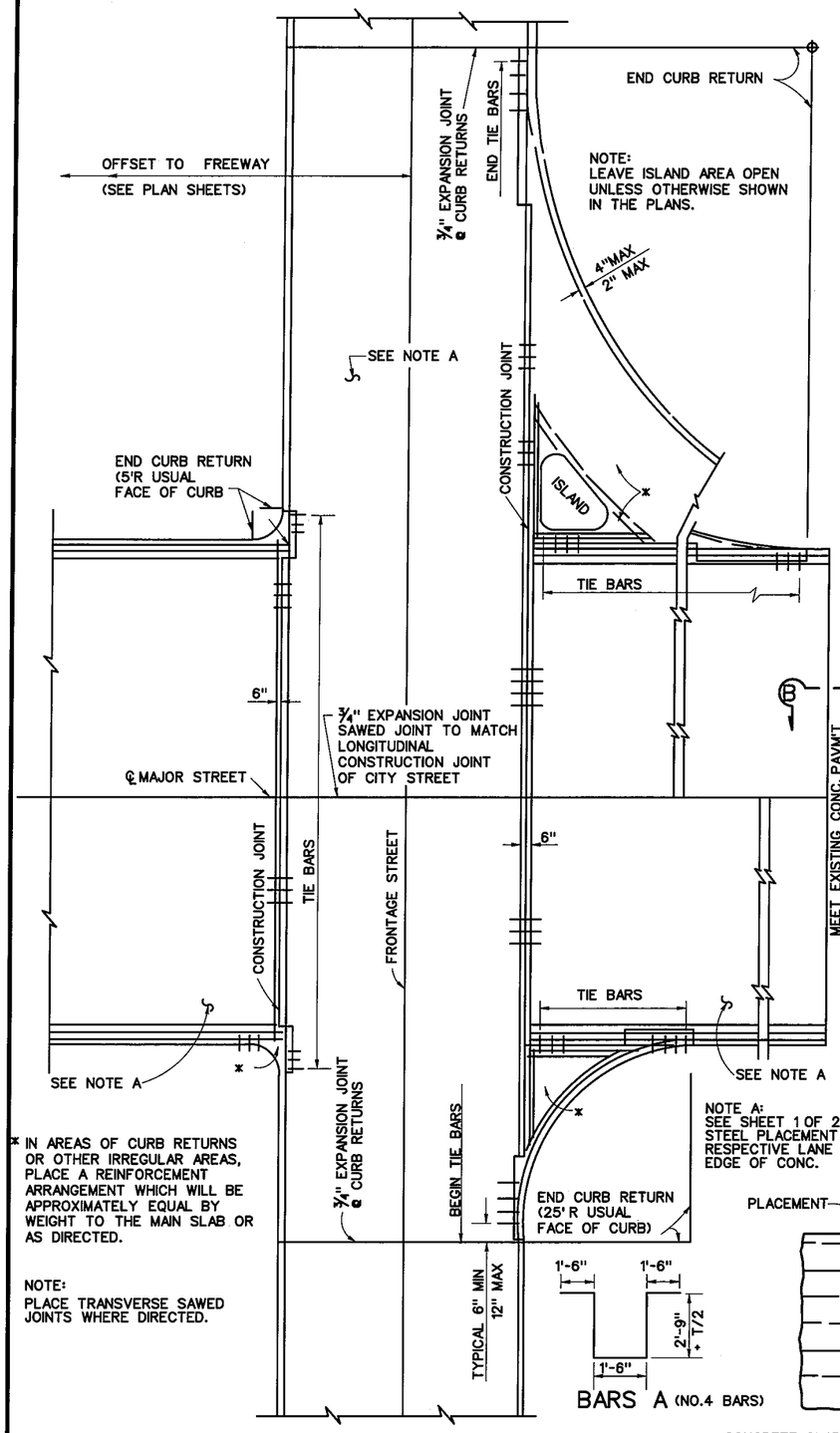
JOINTED REINFORCED CONCRETE PAVEMENT DETAILS(MOD)

FOR PAVEMENT THICKNESS 11 INCHES OR LESS)

JRCP

SHEET 1 OF 2

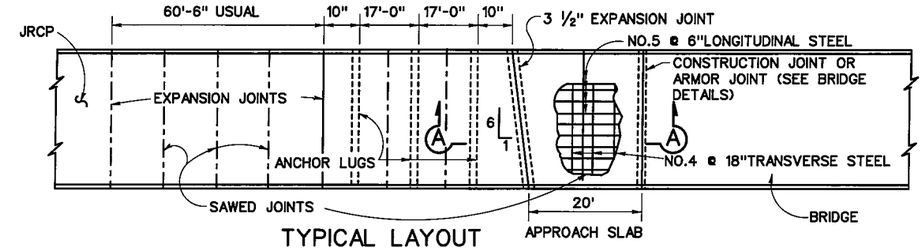
FILE: STDB-2.dgn	DN:	CK:	DW:	CK:	
©TxDOT MAR.2004	DIST	FED REG	PROJECT NO.		SHEET
REVISIONS 5/05 2004 SPECS 7/2010 ADDED NOTE 8/2015 MODIFIED NOTES	HOU	6	STP1802(783)MM		150
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	HARRIS		0912	72	391	C5



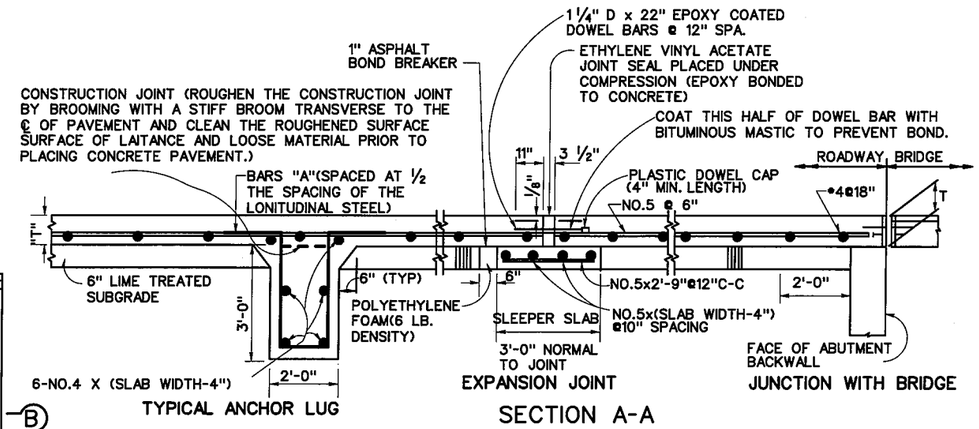
* IN AREAS OF CURB RETURNS OR OTHER IRREGULAR AREAS, PLACE A REINFORCEMENT ARRANGEMENT WHICH WILL BE APPROXIMATELY EQUAL BY WEIGHT TO THE MAIN SLAB OR AS DIRECTED.

NOTE:
PLACE TRANSVERSE SAWED JOINTS WHERE DIRECTED.

INTERSECTION OF MAJOR STREET WITH FRONTAGE STREET
TYPICAL REINFORCING PLAN



TYPICAL LAYOUT
(TERMINAL ANCHORAGE AT BRIDGES)

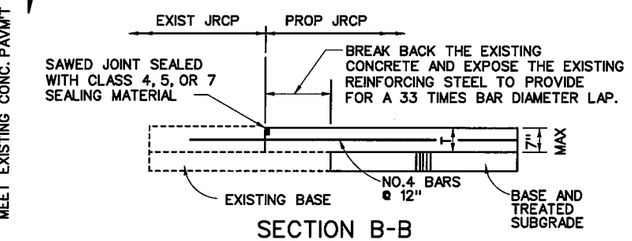


TYPICAL ANCHOR LUG

EXPANSION JOINT

SECTION A-A

JUNCTION WITH BRIDGE

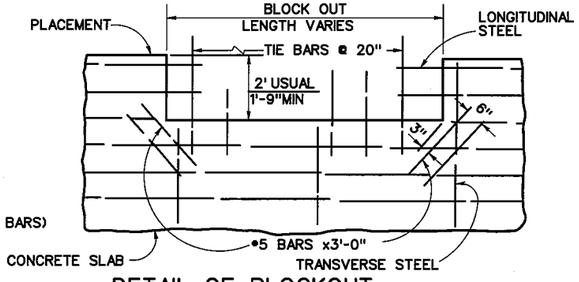


SECTION B-B
(FOR PROPOSED PAVEMENT DEPTHS OF 7" MAX)

**

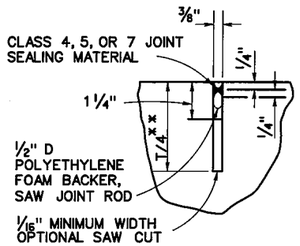
REPLACE ANY BENT LONGITUDNIAL REINFORCING. IF THERE IS NOT SUFFICIENT EXPOSED REINFORCING TO PROVIDE A MINIMUM OF A 33 TIMES BAR DIAMETER LAP, REMOVE THE EXISTING PAVEMENT AND SUFFICIENTLY EXPOSE THE EXISTING REINFORCING TO PROVIDE A 33 TIMES BAR DIAMETER LAP. REPLACE ANY SHEAR BARS THAT ARE DISTURBED, BY DRILLING AND GROUTING AS REQUIRED BY NOTE *29. PERFORM THIS CORRECTIVE ACTION AT NO EXPENSE TO THE DEPARTMENT.

NOTE A:
SEE SHEET 1 OF 2 FOR STEEL PLACEMENT FOR THE RESPECTIVE LANE WIDTHS. EDGE OF CONC.

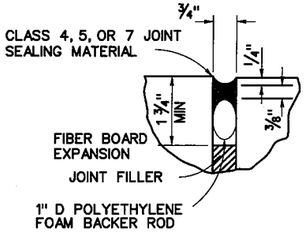


DETAIL OF BLOCKOUT

*OMIT TIE BARS @ INLET BLOCK-OUT



SAWED JOINT



EXPANSION JOINTS

** IF SILICEOUS RIVER GRAVEL IS USED AS THE COARSE AGGREGATE, THIS DEPTH IS T/3.

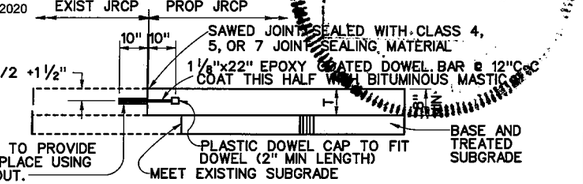
JOINT SEALING DETAILS

GENERAL NOTES (CONTINUED FROM SHEET 1 OF 2)

21. CONSTRUCT ANCHOR LUGS, EXPANSION JOINTS, AND SLEEPER SLABS AS DETAILED IN SECTION A-A. THESE WILL BE PAID FOR IN ACCORDANCE WITH ITEM, "CONCRETE PAVEMENT TERMINALS."
22. REINFORCING STEEL FOR TERMINAL ANCHOR SYSTEMS MAY BE GRADE 40 OR GRADE 60.
23. PLACE CONCRETE FOR ANCHOR LUGS AS SOON AS POSSIBLE AFTER COMPLETING EXCAVATION,TO PRESERVE THE INHERENT SOIL CHARACTERISTICS. EXCAVATING FOR AND PLACING CONCRETE FOR ANCHOR SYSTEM MAY BE IN PREFORMED SECTIONS CORRESPONDING TO THE WIDTH OF PAVING PLACEMENT.
24. APPLY A STEEL TROWEL FINISH TO SLEEPER SLABS AND AND COAT WITH AN ASPHALT BOND BREAKER.
25. THE DETAILS FOR ANCHORS, LUGS, EXPANSION JOINTS, AND SLEEPER SLABS ARE NOT APPLICABLE UNLESS SHOWN ELSEWHERE IN THE PLANS.
26. APPROACH SLAB WILL BE PAID FOR IN ACCORDANCE WITH THE ITEM "CONCRETE STRUCTURES."
27. WITHIN 5 MINUTES OF SAWING, COMPLETELY REMOVE THE RESULTING SLURRY FROM THE JOINT BY FLUSHING WITH HIGH PRESSURE WATER. THEN ALLOW THE JOINT TO DRY FOR A MINIMUM OF 48 HOURS BEFORE SANDBLASTING THE JOINT.
28. DO NOT SHEAR CUT DOWEL BARS.
29. SIZE ADDITIONAL SHEAR BARS AS LONGITUDIAL BARS AND SPACE THEM MIDWAY BETWEEN ALTERNATE LONGITUDINAL BARS ALONG THE TRANSVERSE CONSTRUCTION JOINT FORMED AT THE LEAVE-OUT.
30. IF THE CONCRETE DESIGN REQUIRES GREATER THAN 5.5 SACKS OF CEMENTITIOUS MATERIAL PER CUBIC YARD, WRITTEN APPROVAL BY THE AREA ENGINEER WILL BE REQUIRED. ENSURE CONCRETE PAVEMENT MIXES PLACED FROM APRIL 1 TO OCTOBER 31 CONTAIN A MINIMUM OF 25 PERCENT BY WEIGHT OF CLASS "F" FLY ASH.
31. IN LOCATIONS WHERE THE PLANS CALL FOR FAST TRACK CONCRETE PAVEMENT IN LIEU OF JRCP (LAID ON COMPACTED OR STABILIZED SUBGRADE), USE DETAILS IN THIS STANDARD IN CONJUNCTION WITH THE APPROPRIATE FAST TRACK CONCRETE SPECIFICATION. IF THE JRCP IS LAID UPON A BASE STRUCTURE, ADD 3" TO THE FAST TRACK PAVEMENT THICKNESS TO COMPENSATE FOR THE BASE.

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED PROFESSIONAL ENGINEER
03/04/2020
Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

ACCEPTED AND FILED
PUBLIC WORKS
67862



SECTION B-B
(FOR PROPOSED PAVEMENT DEPTHS OF 8" MIN)

Texas Department of Transportation
Houston District

JOINTED REINFORCED CONCRETE PAVEMENT DETAILS(MOD)

EXPANSION JOINT DESIGN

(FOR PAVEMENT THICKNESS (11) INCHES OR LESS)

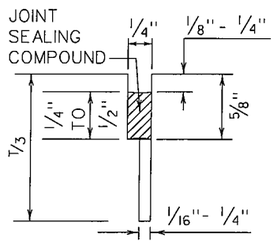
JRCP

SHEET 2 OF 2

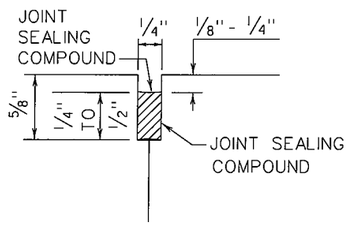
FILE: STDB-2.dgn	DN:	CK:	DW:	CK:
©TxDOT MAR.2004	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS 5/05 2004 SPECS 7/2010 ADDED NOTE 9/2013 ADDED NOTE 8/2015 MODIFIED NOTES	HOU	6	STP1802(783)MM	151
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	HARRIS	0912	72	391	CS

DATE:
FILE:

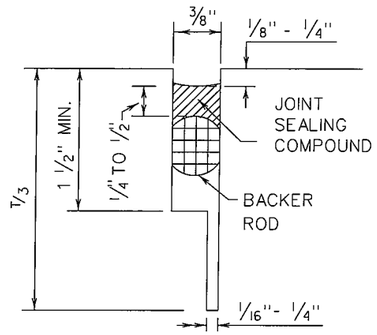
METHOD B: JOINT SEALING COMPOUND



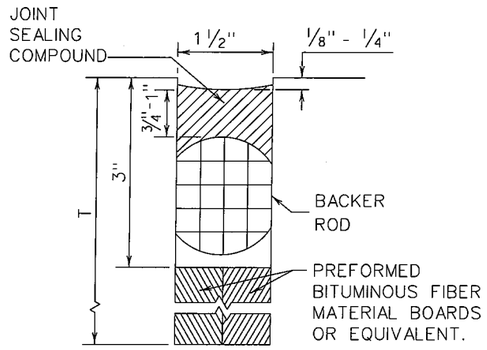
LONGITUDINAL SAWED CONTRACTION JOINT



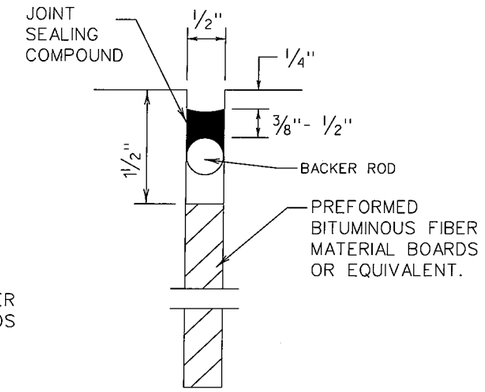
LONGITUDINAL OR TRANSVERSE CONSTRUCTION JOINT



TRANSVERSE SAWED CONTRACTION JOINT

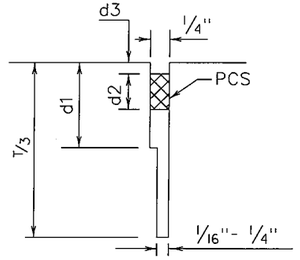


TRANSVERSE FORMED EXPANSION JOINT

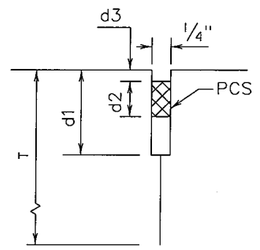


FORMED ISOLATION JOINT

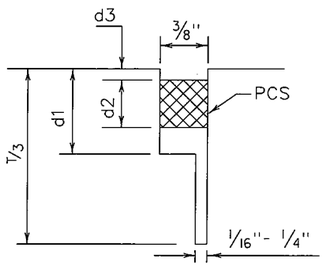
METHOD A: PREFORMED COMPRESSION SEALS (PCS)(DMS-6310 CLASS 6)



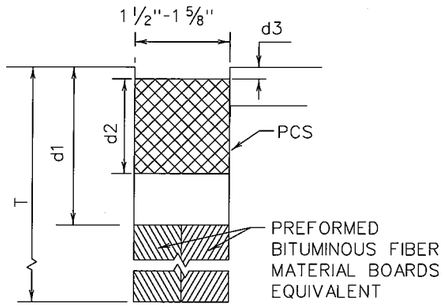
LONGITUDINAL SAWED CONTRACTION JOINT



LONGITUDINAL CONSTRUCTION JOINT



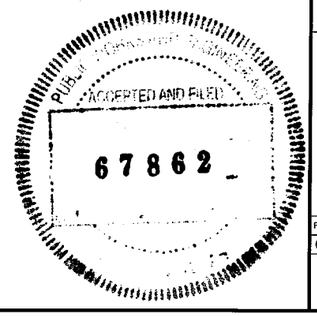
TRANSVERSE SAWED CONTRACTION JOINT



TRANSVERSE FORMED EXPANSION JOINT

GENERAL NOTES

1. UNLESS OTHERWISE SHOWN IN THE PLANS, EITHER METHOD "A" OR METHOD "B" MAY BE USED.
2. THE LOCATION OF JOINTS SHALL BE AS SHOWN ELSEWHERE IN THE PLANS.
3. THE JOINT RESERVOIR FOR SEALANT OR PCS SHALL BE SAWED UNLESS OTHERWISE SHOWN ON THE PLANS FOR THE LONGITUDINAL AND TRANSVERSE CONSTRUCTION JOINTS AND THE SAWED JOINTS.
4. DIMENSIONS d1, d2, AND d3 SHOWN IN METHOD A SHALL BE IN ACCORDANCE WITH THE PREFORMED COMPRESSION SEAL MANUFACTURER'S RECOMMENDATION.
5. REFER TO DMS-6310 "JOINT SEALANTS AND FILLERS" FOR THE CLASSIFICATIONS.
6. FOR SAWED LONGITUDINAL JOINT, LONGITUDINAL OR TRANSVERSE CONSTRUCTION JOINT, USE JOINT SEALANT CLASS 5 OR 8 UNLESS OTHERWISE SHOWN ON THE PLAN OR APPROVED.
7. FOR TRANSVERSE SAWED CONTRACTION, TRANSVERSE FORMED EXPANSION JOINT, AND ISOLATION JOINT USE JOINT SEALANT CLASS 5 OR 8 AT NEW JOINTS. USE JOINT SEALANT CLASS 4,5,7,OR 8 FOR MAINTAINING EXISTING JOINTS.
8. THE JOINTS SHALL BE CLEANED IN ACCORDANCE WITH THE ITEM 438 "CLEANING AND SEALING JOINTS" OR ITEM 713 "CLEANING AND SEALING JOINTS AND CRACKS (CONCRETE PAVEMENT)".
9. ISOLATION JOINTS ACCOMMODATE HORIZONTAL AND VERTICAL MOVEMENTS THAT OCCUR BETWEEN A PAVEMENT AND A STRUCTURE. ISOLATION JOINTS MAY BE USED FOR BRIDGE ABUTMENTS, INTERSECTIONS, CURB AND GUTTER, OLD AND NEW PAVEMENTS, OR AROUND DRAINAGE INLETS, MANHOLES, FOOTINGS AND LIGHTING STRUCTURES.



Texas Department of Transportation

Design Division Standard

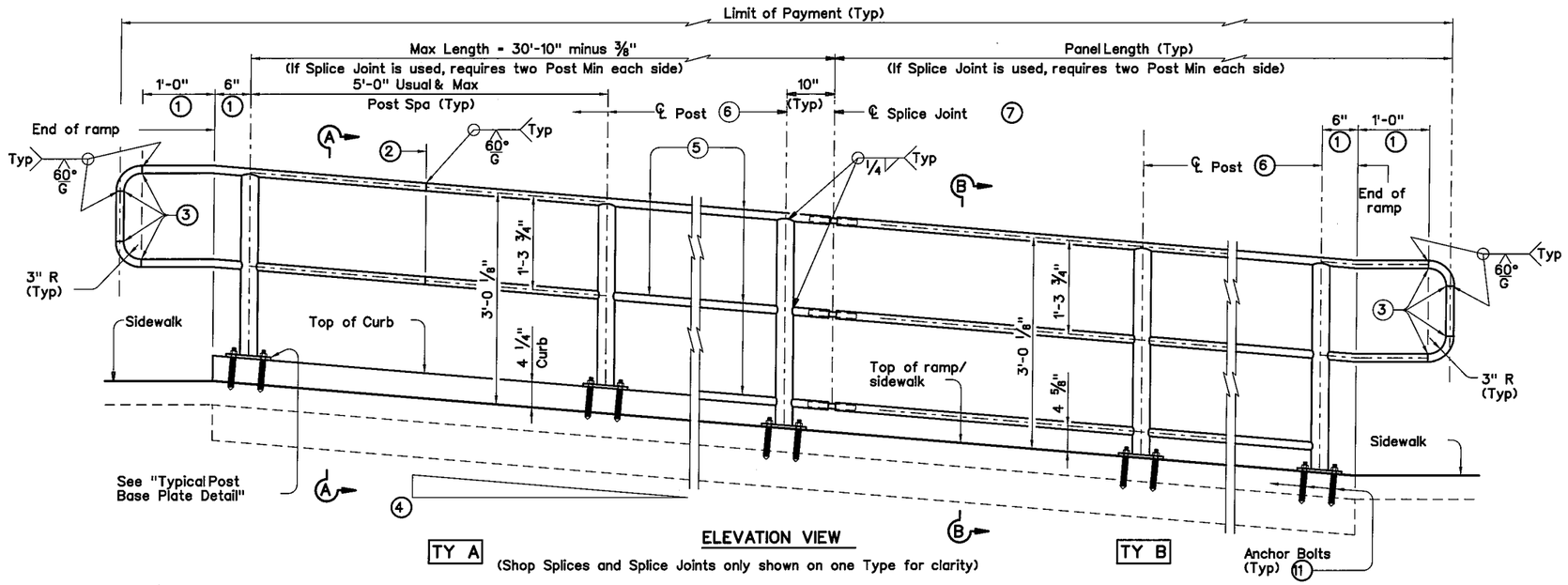
CONCRETE PAVING DETAILS

JOINT SEALS

JS-14

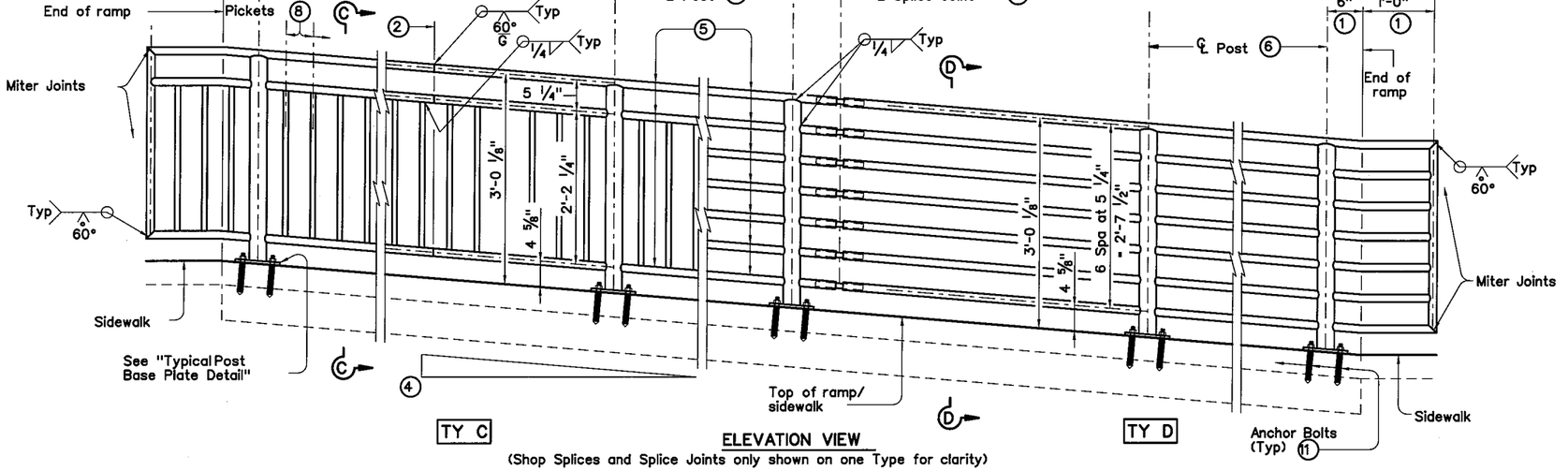
FILE: js14.dgn	DN: TxDOT	DN: HC	DW: HC	CK: AN
©TxDOT: DECEMBER 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	72	391	CS
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		152

DATE:
FILE:



ELEVATION VIEW

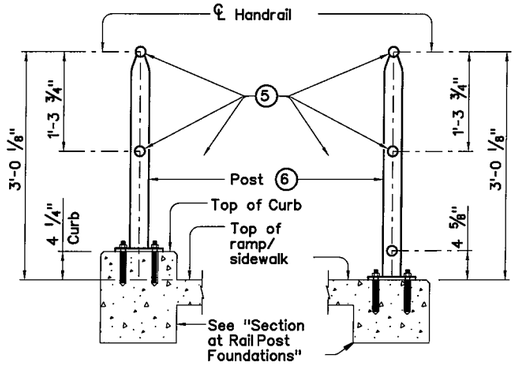
(Shop Splices and Splice Joints only shown on one Type for clarity)



ELEVATION VIEW

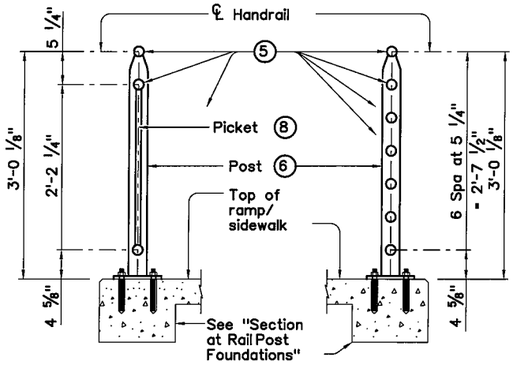
(Shop Splices and Splice Joints only shown on one Type for clarity)

RECOMMENDED USAGE ⑨ ⑩	
Dropoff Height/ Condition	Recommended Rail Options
<30" dropoff	TY A, TY B, TY C, or TY D
≥ 30" dropoff, or along Bike Path	TY E or TY F



SECTION A-A
(Showing Handrail) TY A

SECTION B-B
(Showing Handrail) TY B



SECTION C-C
(Showing Handrail) TY C

SECTION D-D
(Showing Handrail) TY D

① Parallel to ground.

② One shop splice per panel is permitted with minimum 85 percent penetration. The weld may be square groove or single vee groove. Grind smooth.

③ Shop splice is permitted with minimum 85 percent penetration. The weld may be square groove or single vee groove. Grind smooth.

④ See Ramp Details located elsewhere in plans for ramp slope and dimensions. Maximum ramp slope will not exceed 8.3 percent. Level landing required for each 30" rise if grade exceeds 5 percent.

⑤ 1 ½" Dia. Standard Pipe (1.900" O.D., 0.145" wall thickness). Parallel to ramp / sidewalk. Provide holes as needed in 1 ½" Dia. pipe for galvanizing drainage and venting.

⑥ 2 ½" Dia. Standard Pipe (2.875" O.D., 0.203" wall thickness). See "Post Mount Detail" for crimping and trimming post to fit Dia. of top rail. Provide holes as needed in post for galvanizing drainage and venting. Plumb all posts.

⑦ See "Handrail Fabrication Details" for Splice Joints.

⑧ ℄ ⅝" Dia. Round Bar equal spacing at 4 ½" Max. Plumb all pickets.

⑨ When needed for accessibility (grade 5 percent) or as needed for pedestrian safety.

⑩ Not to be used on bridges.

⑪ See "General Notes" for anchor bolt information.

PUBLIC WORKS
ACCEPTED AND FILED
67862

SHEET 1 OF 3

Texas Department of Transportation

Design Division Standard

PEDESTRIAN HANDRAIL DETAILS

PRD-13

FILE: prd13.dgn	DN: TxDOT	CK: AM	DW: JTR	CK: CGL
©TxDOT Decmeber 2006	CONT	SECT	JOB	HIGHWAY
REVISIONS REVISED MAY, 2013 (VP)	0912	72	391	CS
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		153

DATE:
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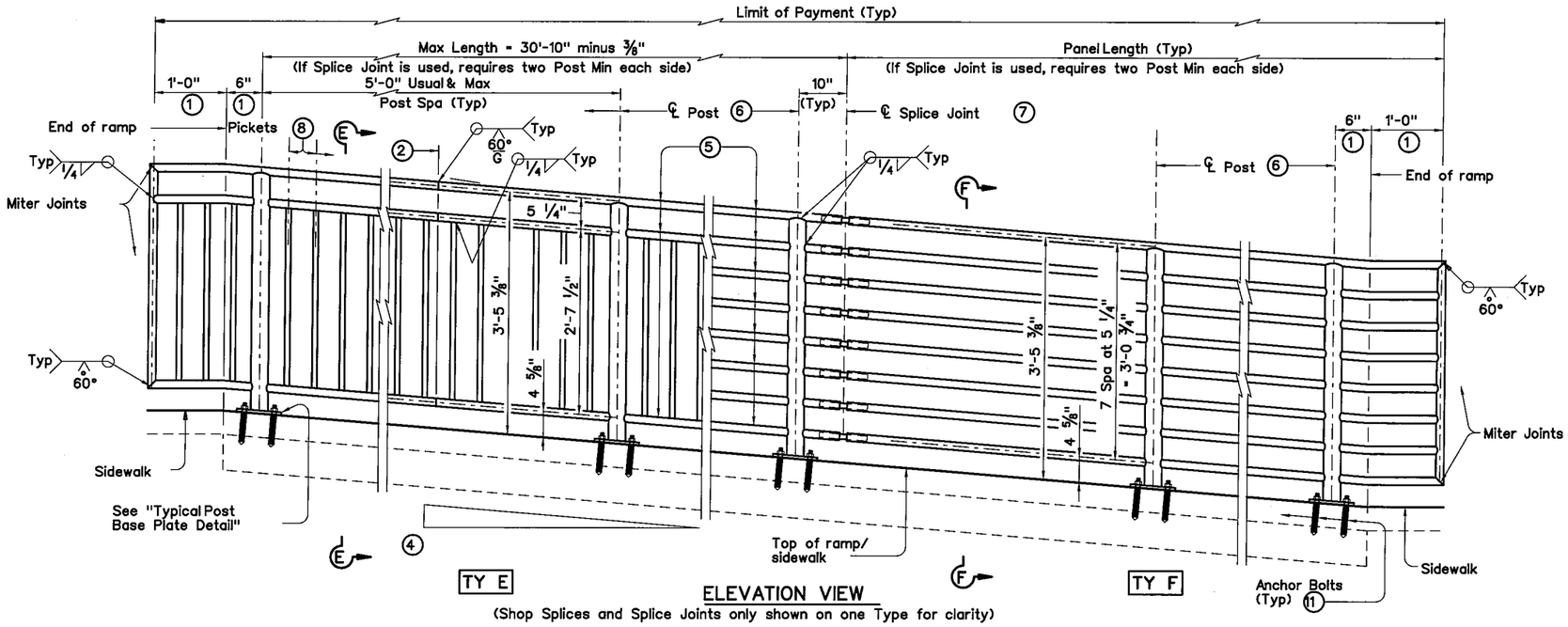
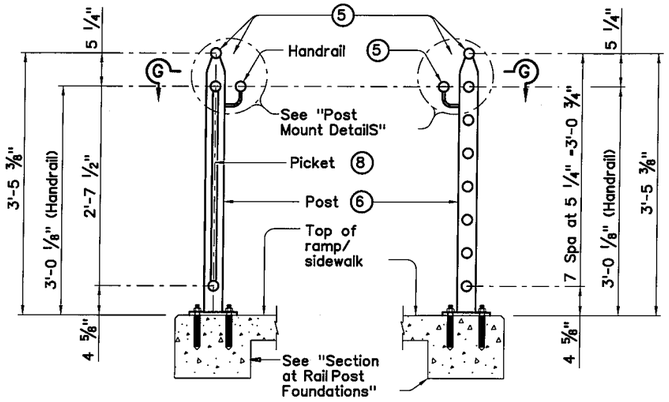
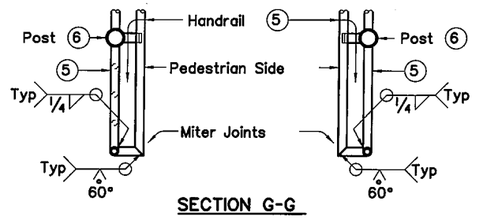




SECTION E-E
(Showing Handrail) TY E

SECTION F-F
(Showing Handrail) TY F



SECTION G-G
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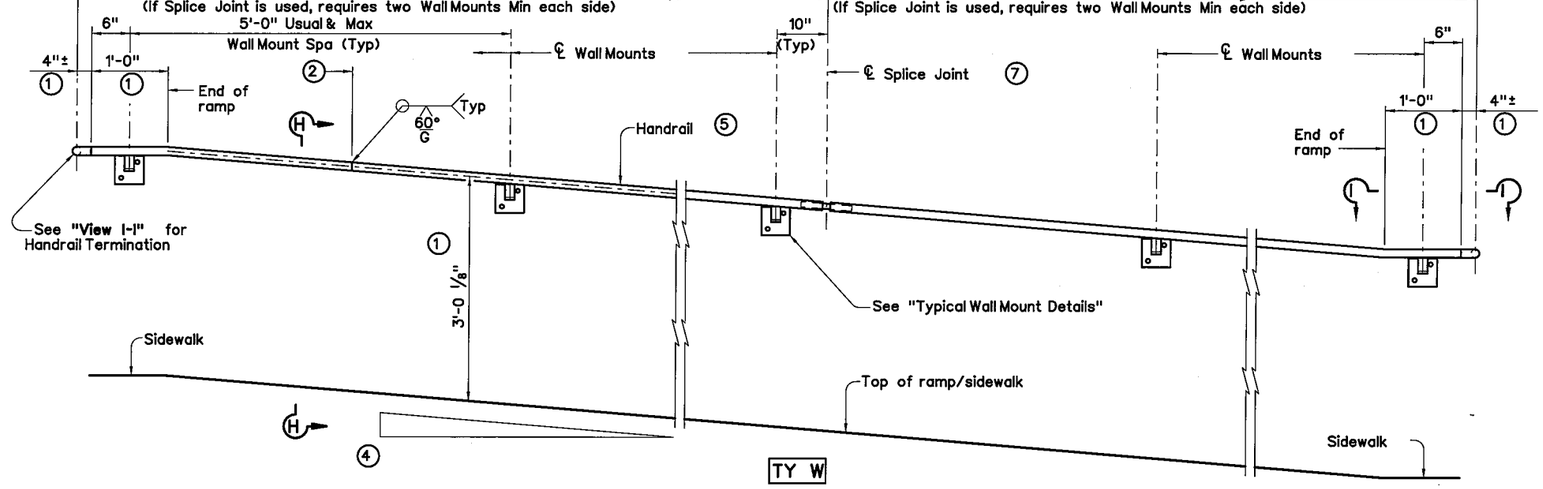
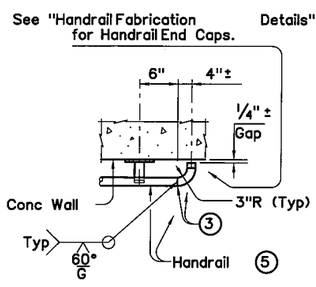
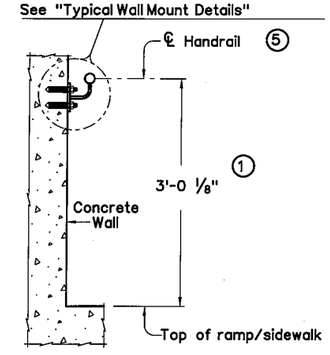




VIEW I-I
(Showing Handrail Termination)



SECTION H-H
(Showing Handrail) TY W

1. Parallel to ground.
2. One shop splice per panel is permitted with minimum 85 percent penetration. The weld may be square groove or single vee groove. Grind smooth.
3. Shop splice is permitted with minimum 85 percent penetration. The weld may be square groove or single vee groove. Grind smooth.
4. See Ramp Details located elsewhere in plans for ramp slope and dimensions. Maximum ramp slope will not exceed 8.3 percent. Level landing required for each 30" rise if grade exceeds 5 percent.
5. 1 1/2" Dia. Standard Pipe (1.900" O.D., 0.145" wall thickness). Parallel to ramp / sidewalk. Provide holes as needed in 1 1/2" Dia. pipe for galvanizing drainage and venting.
6. 2 1/2" Dia. Standard Pipe (2.875" O.D., 0.203" wall thickness). See "Post Mount Detail" for crimping and trimming post to fit Dia. of top rail. Provide holes as needed in post for galvanizing drainage and venting. Plumb all posts.
7. See "Handrail Fabrication Details" for Splice Joints.
8. ℄ 5/8" Dia. Round Bar equal spacing at 4 1/2" Max. Plumb all pickets.
11. See "General Notes" for anchor bolt information.

SHEET 2 OF 3

Texas Department of Transportation

Design Division Standard

PEDESTRIAN HANDRAIL DETAILS

PRD-13

FILE: prd13.dgn	DN: TxDOT	CK: AM	DW: JTR	CK: CGL
© TxDOT December 2006	CONT	SECT	JOB	HIGHWAY
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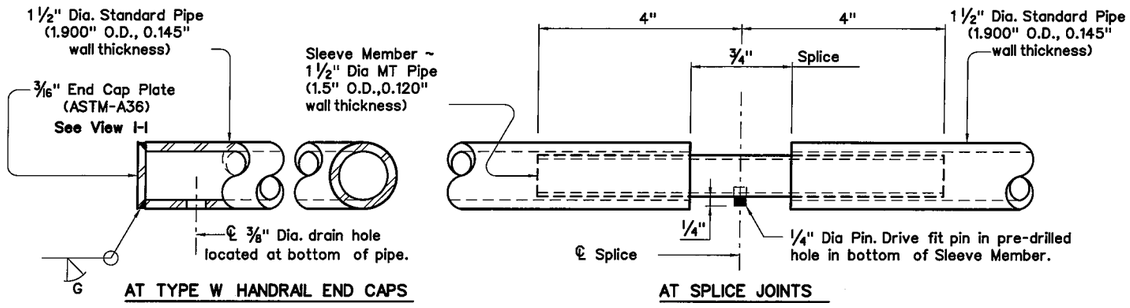
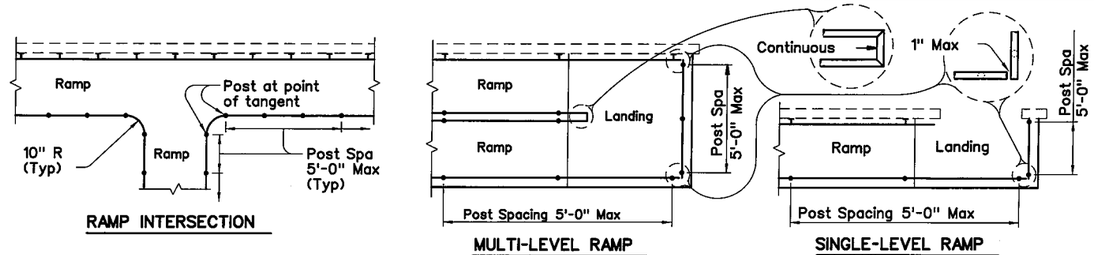
REVISED MAY, 2013 (VP)	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		154

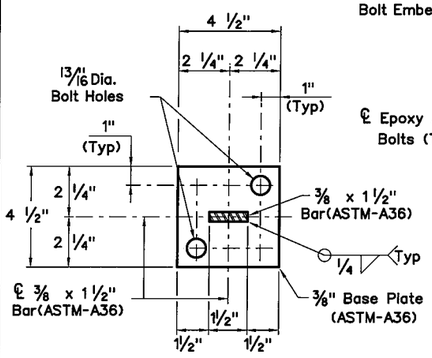
DATE:
FILE:

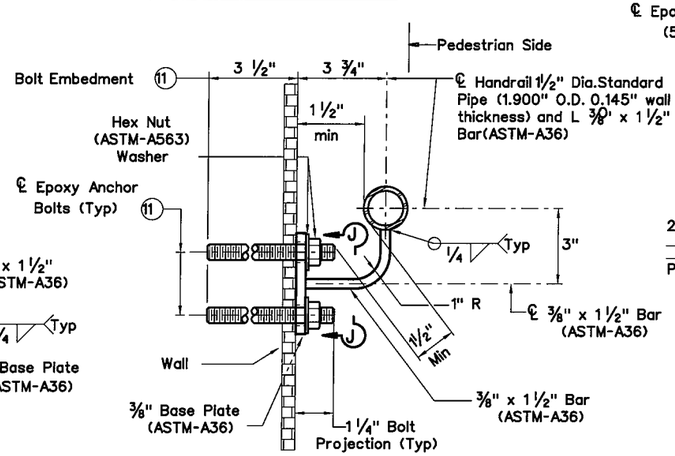


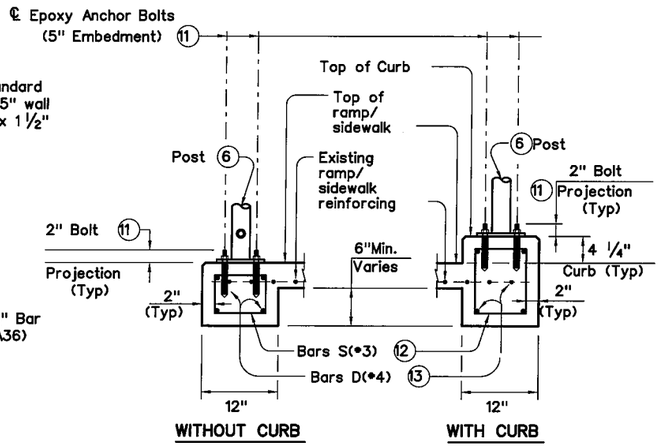
HANDRAIL FABRICATION DETAILS



PLAN SHOWING RAIL AT RAMP CONDITIONS







SECTION AT RAIL POST FOUNDATIONS

TYPICAL WALL MOUNT DETAILS

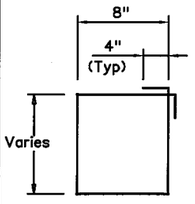
(5) 1 ½" Dia. Standard Pipe (1.900" O.D., 0.145" wall thickness). Parallel to ramp/sidewalk. Provide holes as needed in 1 ½" Dia. pipe for galvanizing drainage and venting.

(6) 2 ½" Dia. Standard Pipe (2.875" O.D., 0.203" wall thickness). Plumb all posts. See "Post Mount Detail" for crimping and trimming post to fit the diamenter of top rail. Provide holes as needed in post for galvanizing drainage and venting.

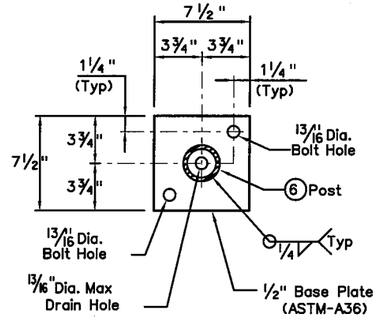
(11) See "General Notes" for anchor bolt information.

(2) Bars S(•3) spaced at 12" Max (Spaced 3" from outside edge of overall length of Ramp/Sidewalk).

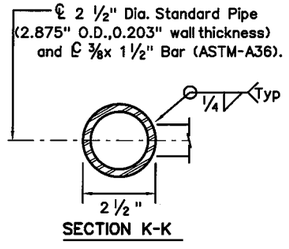
(13) Provide 1 ½" end cover to Bars D(•4) from outside edge of overall length of Ramp/Sidewalk.



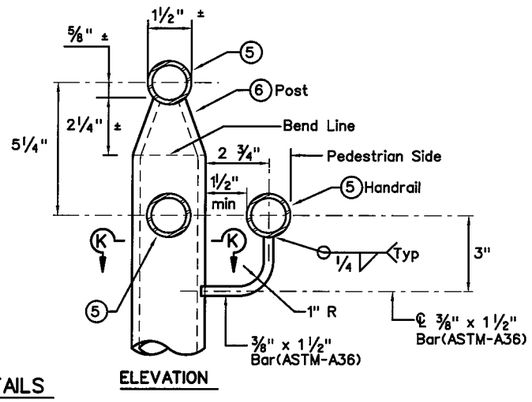
BARS S (•3)



TYPICAL POST BASE PLATE DETAIL



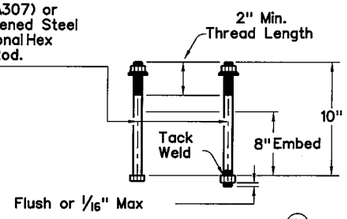
SECTION K-K



ELEVATION

POST MOUNT DETAILS

℄ ⅝" Dia. Hex Head Anchor Bolt (ASTM-A307) or Threaded Rod (ASTM-A36) with one Hardened Steel Washer placed under Hex Nut. One additional Hex Nut will be furnished for each Threaded Rod.



CAST-IN-PLACE ANCHOR BOLT OPTIONS
(Used for Post Base Plate only)

GENERAL NOTES

Designed according to ADAAG, Texas Accessibility Standards, Uniform Building Code, and AASHTO LRFD Specifications.

Handrail anchorage details shown on this standard may require modification for select structure types. See appropriate details elsewhere in plans for these modifications.

Pipe will conform to ASTM-A53 Grade B or A500 Grade B. Steel plates and steel bars will conform to ASTM-A36. Mechanical tubing (MT) will conform to ASTM A513 Grade 1015 or higher. Galvanize all steel components except reinforcing steel unless noted otherwise.

Concrete for foundations will be in accordance with Item 531 "Sidewalks". All reinforcing steel must be Grade 60. Bar laps, where required, will be as follows: Uncoated ~ #4 - 1'-5" Epoxy coated ~ #4 - 2'-1"

When the plans require painted steel, follow the requirements for painting galvanized steel in Item 446, "Cleaning and Painting Steel". Sleeve Members will receive galvanization and only get field painted after installation unless directed otherwise by Engineer.

Epoxy Anchor bolts for wall mount and post base plate will be ⅝" Dia. ASTM A36 threaded rods with one hex nut and one hardened steel washer at each bolt. ⅝" Dia. threaded rod embedment depth for wall mounts is 3 ½" and embedment depth for post base plate is 5".

Embed threaded rods into concrete with a Type III (Class C) epoxy meeting the requirements of DMS-6100, "Epoxies and Adhesives". Mix and dispense adhesive with the manufacturer's static mixing nozzle/dual cartridge system. Core drill holes (percussion drilling not permitted).

At the contractor's option the post base plate anchor bolts may be cast with the Ramp/Sidewalk (See Cast-in-Place Anchor Bolt Options).

Optional cast-in-place anchor bolts will be ⅝" Dia ASTM A307 Grade A bolts (or A36 threaded rods with one tack welded hex nut each) with one hex nut and one hardened steel washer at each bolt. Embedment depth of cast-in-place bolt will be 8" for post base plate.

Handrails and any wall or other surface adjacent to them will be free of any sharp or abrasive elements.

Submit shop drawings to the Engineer unless otherwise noted. For curved handrail applications, fabricate the handrail to the curve if radius is less than 600 ft. Shop drawings are required when rail is fabricated to the curve.

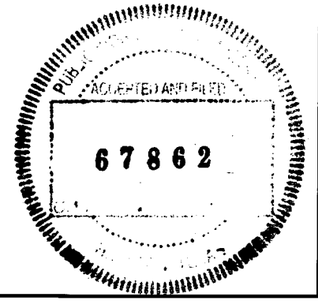
For all handrails, erection drawings will be submitted to the Engineer for approval to ensure proper installation.

Drawings will show handrail mount locations with bolts setting, spacing, ramp slope, and/or splice joint locations, and handrail lengths with identification showing where each handrail goes on the layout.

Payment for concrete sidewalks or curb ramps will be paid for in accordance with Item 531 "Sidewalks".

Payment for all items shown is to be included in unit price bid in accordance with Item 450 "Railing" of the type specified.

All exposed edges will be rounded or chamfered to approximately ⅛" by grinding.



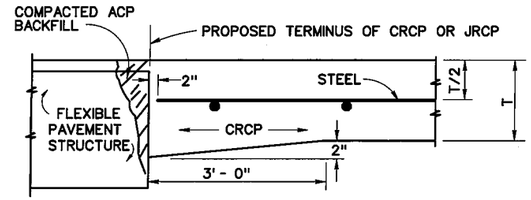
Texas Department of Transportation

Design Division Standard

PEDESTRIAN HANDRAIL DETAILS

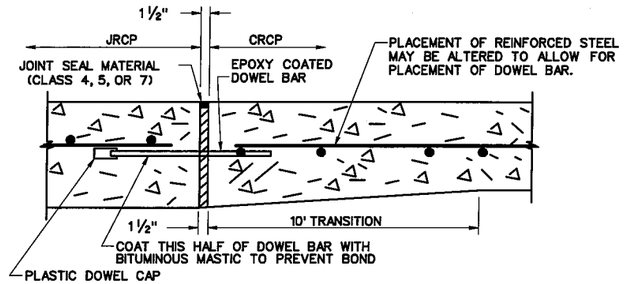
PRD-13

FILE: prd13.dgn	DN: TxDOT	CK: AM	DW: JTR	CK: CGL
©TxDOT December 2006	CONT	SECT	JOB	HIGHWAY
REVISIONS REVISED MAY, 2013 (VP)	0912	72	391	CS
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		155



NOTE:
ADDITIONAL CONCRETE FOR THICKENED EDGE IS SUBSIDIARY TO VARIOUS BID ITEMS. BACKFILL DISTURBED MATERIAL IN THE FLEXIBLE PAVEMENT WITH ACP. THIS ACP IS SUBSIDIARY TO VARIOUS BID ITEMS.

JUNCTURE A & B - CRCP OR JRCP WITH FLEXIBLE TYPE PAVEMENT STRUCTURE

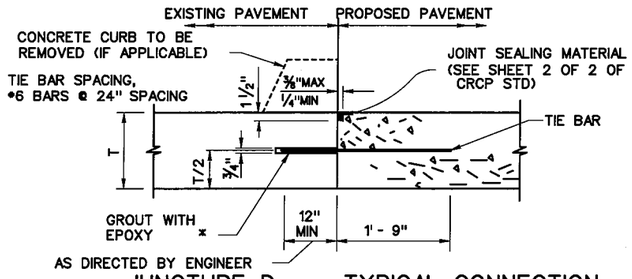


FOR DETAILS NOT SHOWN, SEE TRANSVERSE EXPANSION JOINT DETAILS ELSEWHERE IN PLANS.

DETAIL "B" - DOWEL ASSEMBLY AT EXPANSION JOINT

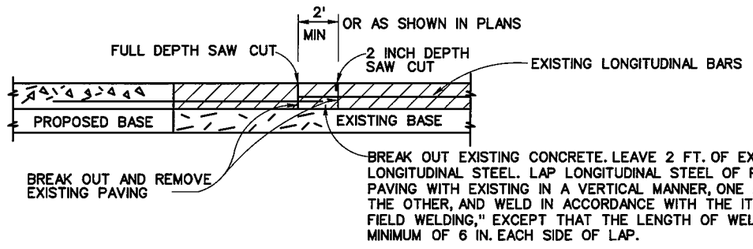
DOWEL BAR DATA			
SLAB THICKNESS(T)	6"-7.5"	8"-10"	10.5"-15"
DOWEL SIZE	1"	1¼"	1½"
DOWEL LENGTH	18"	20"	22"
DOWEL BAR SPACING	12"	12"	12"

TABLE A - DOWEL BAR DATA



JUNCTURE D - TYPICAL CONNECTION TO EXISTING CONCRETE

* FOR EPOXY TYPE SEE ITEM 361.



JUNCTURE F - "BREAK BACK" CONCRETE CRCP WITH CRCP OR JRCP WITH JRCP

GENERAL NOTES

1. FOR FURTHER INFORMATION REGARDING PLACING CONCRETE AND REINFORCEMENT, REFER TO THE GOVERNING SPECIFICATION FOR CONCRETE PAVEMENT.
2. THE DESIGN REQUIREMENTS FOR THE PAVEMENT STRUCTURE, I.E. BAR SPACING, BAR SIZE LAP REQUIREMENTS, ETC., ARE SHOWN ON THE APPROPRIATE PAVEMENT DESIGN DETAIL.
3. SLEEPER SLAB AND ADDITIONAL REINFORCING REQUIRED ON THIS DRAWING ARE INCIDENTAL TO THE VARIOUS BID ITEMS.
4. USE THE SIZE, SPACING, AND LENGTH OF DOWEL BARS SHOWN IN TABLE "A".
5. WHERE THERE WILL BE A JUNCTURE AND ADDITIONAL JRCP PAVING WILL BE PLACED AT A FUTURE DATE, MULTIPLE PIECE DOWEL BARS WILL BE PERMITTED AT THE JUNCTURE. PROVIDE MULTIPLE PIECE DOWEL BAR ASSEMBLIES WITH A MINIMUM ULTIMATE TENSILE STRENGTH OF 60.0 KIPS AND THAT HAVE SMOOTH EPOXY COATED BARS. ENSURE THE MULTIPLE PIECE DOWEL BAR ASSEMBLIES HAVE STOP TYPE COUPLINGS AND HAVE HAVE ROLLED THREADS ON THE BARS. DISMANTLE THE BAR AND FIT THE COUPLING PORTION USED IN CONSTRUCTION, WITH A PLASTIC CAP. FURNISH THE REMAINING PORTION OF THE BAR TO THE ENGINEER.
6. WHERE THE PAVING IS CRCP AND A RAMP COMPOSED OF A FLEXIBLE PAVEMENT WILL BE USED AT THE JUNCTURE UNTIL FUTURE PAVING IS CONSTRUCTED, MULTIPLE PIECE TIE BARS MAY BE USED IF PERMITTED BY THE ENGINEER. IF USED, ENSURE THE MULTIPLE PIECE TIE BAR ASSEMBLIES HAVE STOP TYPE COUPLINGS AND ROLLED THREADS ON THE BARS. FURNISH MULTIPLE PIECE TIE BAR ASSEMBLIES THAT DEVELOP A MINIMUM ULTIMATE TENSILE STRENGTH EQUAL TO 1.25 TIMES THE YIELD STRENGTH OF THE TRANSVERSE BARS BEING JOINED. FOR TIE BARS, USE DEFORMED REINFORCING BARS. TIE BAR ASSEMBLIES MADE FROM STEELS OTHER THAN ASTM GRADE 60 AND WITH DEFORMATIONS OTHER THAN ASTM STD. MAY BE USED PROVIDED THEY PROVE SATISFACTORY TO THE ENGINEER AND ARE IN EVERY RESPECT THE EQUAL TO THE ASSEMBLIES SPECIFIED. LABORATORY TESTING OF THE PROPOSED ASSEMBLIES, AT THE CONTRACTOR'S EXPENSE, MAY BE REQUIRED. LAP AND WELD ONE PORTION OF THE TIE BAR ASSEMBLY TO EACH LONGITUDINAL BAR IN ACCORDANCE WITH THE ITEM "STRUCTURAL FIELD WELDING "AND THE OTHER PORTION INTO THE COUPLING PRIOR TO PAVING. ENSURE MULTIPLE PIECE TIE BAR LENGTHS CONFORM TO THE TIE BAR LENGTHS SHOWN ELSEWHERE IN THE PLANS. ADDITIONAL "SHEAR STEEL" WILL ALSO BE REQUIRED AND MAY BE USED WITH MULTIPLE PIECE ASSEMBLIES AS PREVIOUSLY DESCRIBED. USE ADDITIONAL STEEL BARS OF EQUAL DIAMETER AT A SPACING DOUBLE THAT OF THE LONGITUDINAL STEEL AND ENSURE THE LENGTH IS 66 TIMES THE TIE BAR DIAMETER.
7. DO NOT SHEAR CUT DOWEL BARS.
8. ENSURE DOWEL BAR EPOXY COATING CONFORMS TO ARTICLE 440.2.7., "EPOXY COATING".
9. REPLACE ANY BENT LONGITUDINAL REINFORCING. IF THERE IS NOT SUFFICIENT EXPOSED REINFORCING TO PROVIDE A MINIMUM OF A 33 TIMES BAR DIAMETER LAP, REMOVE THE EXISTING PAVEMENT AND SUFFICIENTLY EXPOSE THE EXISTING REINFORCING TO PROVIDE A 33 TIMES BAR DIAMETER LAP. REPLACE ANY SHEAR BARS THAT ARE DISTURBED, BY DRILLING AND GROUTING AS REQUIRED BY NOTE 12 BELOW. PERFORM THIS CORRECTIVE ACTION AT NO EXPENSE TO THE DEPARTMENT.
10. TIE BARS AND DOWEL BARS OMITTED, LOST, OR DAMAGED SHALL BE REPAIRED BY DRILLING AND EPOXY GROUTING AT NO EXPENSE TO THE DEPARTMENT.
11. JUNCTURES A & B ARE ONLY SUITABLE FOR MINOR STREETS WITH LOW TRAFFIC VOLUMES.
12. FURNISH ADDITIONAL SHEAR BARS (DIAMETER "D") OF THE SAME SIZE AS LONGITUDINAL BARS AND SPACE THEM MIDWAY BETWEEN ALTERNATE LONGITUDINAL BARS ALONG THE TRANSVERSE CONSTRUCTION JOINT FORMED AT THE LEAVE-OUT.

LEGEND

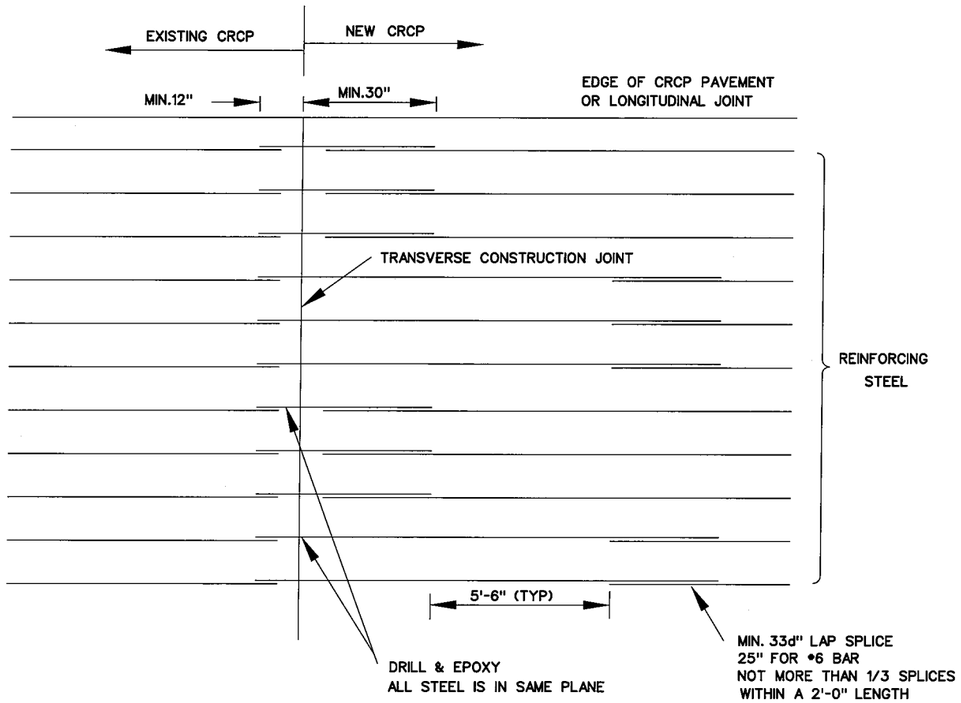
ACP - ASPHALT CONCRETE PAVEMENT
CRCP - CONTINUOUSLY REINFORCED CONCRETE PAVEMENT
JRCP - JOINTED REINFORCED CONCRETE PAVEMENT
T - THICKNESS

Texas Department of Transportation
Houston District

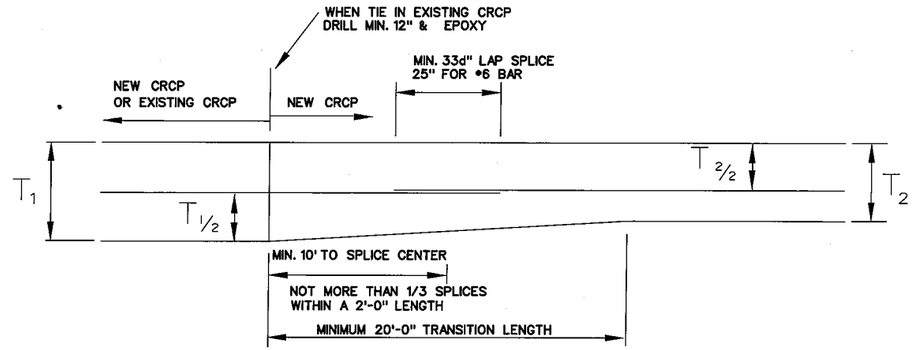
CONCRETE PAVEMENT JUNCTURES

CPJ

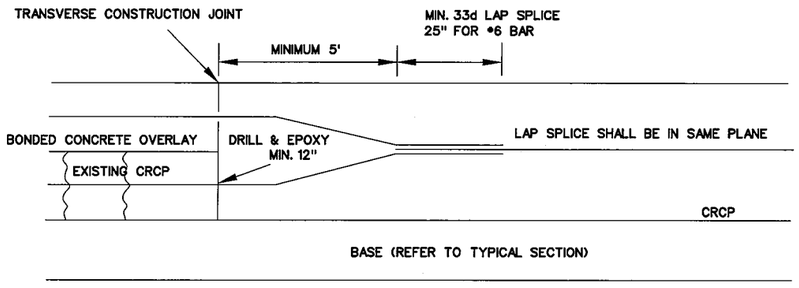
FILE: STDB-5.dgn	DN:	CK:	DW:	CK:	
© TxDOT DEC. 2009	DIST	FED REG	PROJECT NO.		SHEET
REVISIONS 5/05 2004 SPECS REVISED 4/2008 2/15 2014 SPECS	HOU	6	STP1802(783)MM		156
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	HARRIS		0912	72	391	C5



EXISTING CRCP TO NEW CRCP

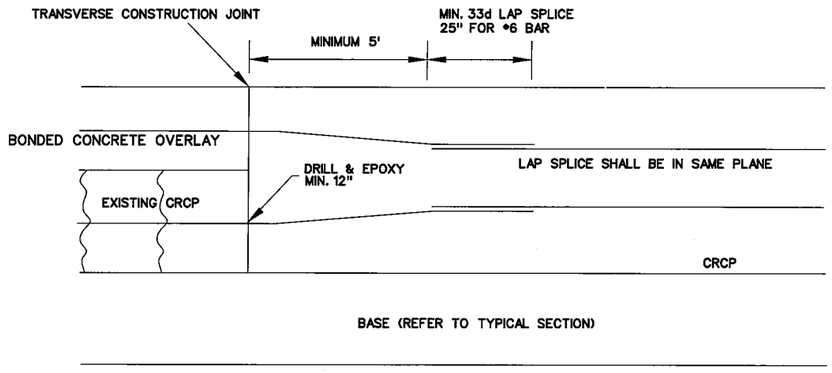


CRCP THICKNESS TRANSITION



CRCP BONDED OVERLAY TO CRCP TRANSITION

(ONE LAYER STEEL)



CRCP BONDED OVERLAY TO CRCP TRANSITION

(TWO LAYER STEEL)

ACCEPTED AND F...

67862

SHEET 2 OF 2

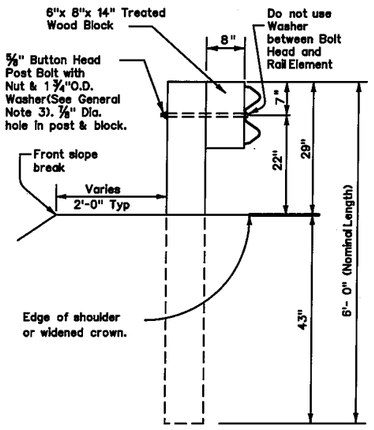
Texas Department of Transportation
Houston District

CONCRETE PAVEMENT JUNCTURES

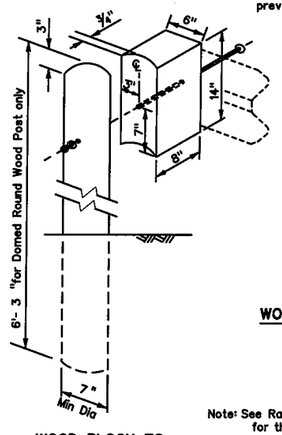
CPJ

FILE: STDB-5.dgn	DN:	CK:	DW:	CK:	
© TxDOT DEC. 2009	DIST	FED REG	PROJECT NO.		SHEET
REVISIONS 5/05 2004 SPECS REVISED 4/2008 2/15 2014 SPECS	HOU	6	STP1802(783)MM		157
	COUNTY		CONTROL	SECT JOB	HIGHWAY
	HARRIS		0912	72 391	C5

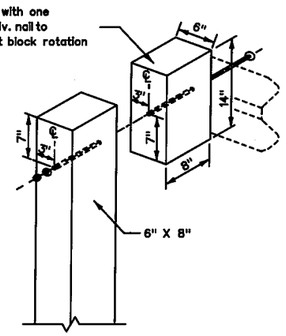
DATE:
FILE:



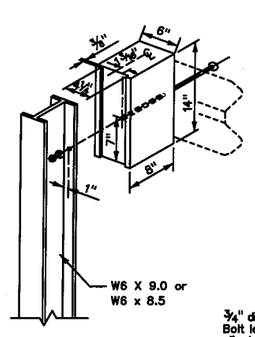
TYPICAL POST



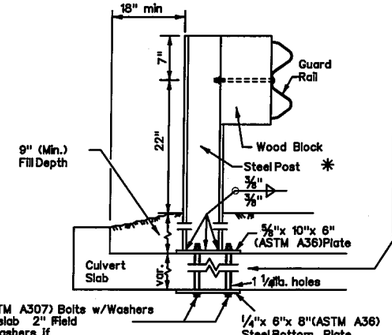
WOOD BLOCK TO ROUND WOOD POST



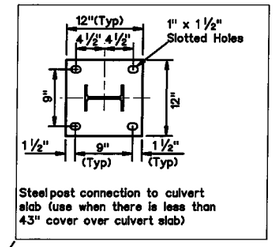
WOOD BLOCK TO RECTANGULAR WOOD POST



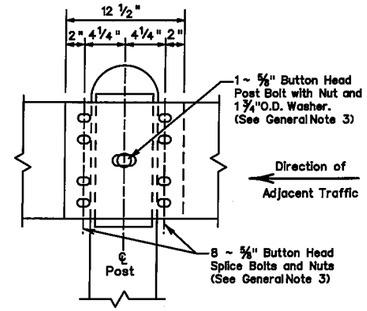
WOOD BLOCK TO STEEL POST



*LOW FILL CULVERT POST
FOR USE ON NON-BRIDGE CLASS CULVERTS ONLY

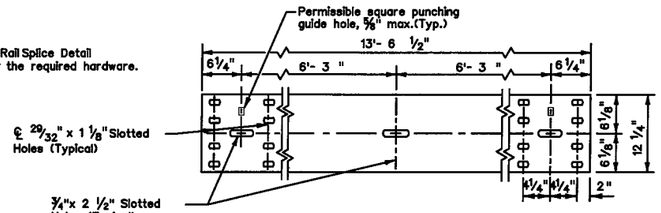


*Post(s) may require field modifications to ensure proper guardrail height.



RAIL SPLICE DETAIL

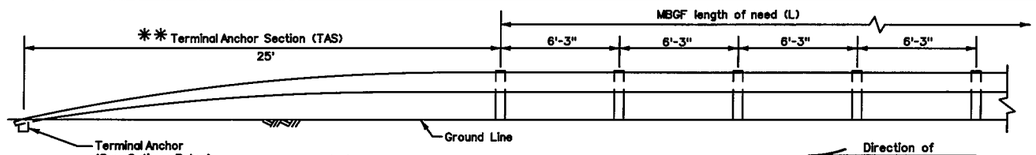
Note: See Rail Splice Detail for the required hardware.



ELEVATION 12 1/2'(NOM.) W-BEAM SECTION
25 foot sections may also be supplied (See General Note 2)

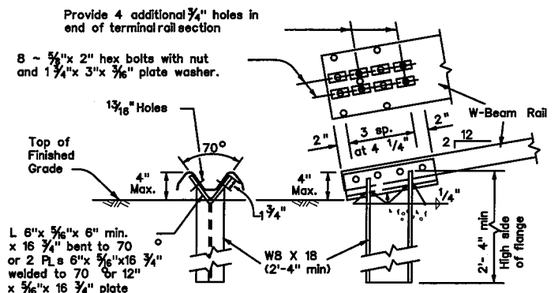
GENERAL NOTES

1. The type of post (round wood post, rectangular wood post, or steel post) will be shown elsewhere in the plans. The exact position of MBGF shall be shown elsewhere in the plans or as directed by the Engineer. Steel posts to be galvanized in accordance with Item 445, "Galvanizing."
2. Rail element shall meet the requirements of Item 540,"Metal Beam Guard Fence" except as modified on the plans. The Contractor may furnish rail elements of 12 1/2 or 25 foot nominal lengths.
3. Button head "post" bolts (ASTM A307) shall be of sufficient length to extend through the full thickness of the nut (ASTM A563) and Type A (1 3/4" O.D.)washer and not more than 1" beyond it. Button head "splice" bolts (ASTM A307) are 5/8" x 1 1/4" (or 2" long at triple rail splices) with a 5/8" double recessed nut (ASTM A563).
4. Fittings (bolts, nuts, and washers) shall be galvanized in accordance with Item 445, "Galvanizing." Fittings shall be subsidiary to the bid item.
5. Crown shall be widened to accommodate the Metal Beam Guard Fence.
6. The lateral approach to the guard fence, shall have a slope rate of not more than 1V:10H.
7. Unless otherwise shown in the plans, guard fence placed in the vicinity of curbs shall be positioned so that the face of curb is located directly below or behind the face of the block. Rail placed over curbs shall be installed so that the post bolt is located approximately 21 inches above the gutter pan or roadway surface.
8. If solid rock is encountered within 0 to 18" of the finished grade, drill a 22" dia. hole, 24" into the rock, or drill two 12" dia. front to back overlapping holes, 24" into the rock. If solid rock is encountered below 18",drill a 12" dia. hole, 12" into the rock or to the standard embedment depth, whichever is less. Any excess post length, after meeting these depths, may be field cut to ensure proper guardrail mounting height. Backfill with a cohesionless material.
9. Posts shall not be set in concrete, of any depth.
10. Special fabrication will be required at installations having a curvature of less than 150 ft. radius.
11. The terminal anchor section (TAS) post shall be set in Class A concrete (unless otherwise shown in the plans) in accordance with Item 421,"Hydraulic Cement Concrete." Concrete shall be subsidiary to the bid item requiring construction of the terminal anchor section (TAS). Terminal anchor post to be galvanized in accordance with Item 445, "Galvanizing."
12. Unless otherwise shown in the plans, a composite material post and/or block that meets the requirements of DMS-7210,"Composite Material Posts and Blocks for Metal Beam Guard Fence" may be substituted for posts and/or blocks of similar dimensions. The Construction Division, TxDOT maintains a Material Producer List (MPL) for producers of materials conforming to DMS-7210. Only producers on the MPL can furnish composite material posts and/or blocks.



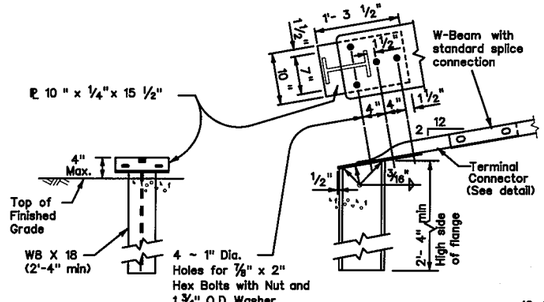
**TERMINAL ANCHOR SECTION (TAS)

Terminal anchor sections are only for downstream use, when located outside the horizontal clearance area of opposing traffic.



OPTION (1)

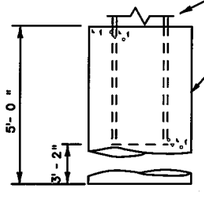
Note: This anchor post requires four additional 3/4" holes (shop or field) in the rail member with eight 5/8" hex bolts with nut and plate washer.



OPTION (2)

Note: This anchor post requires the use of the 10 ga. terminal connector with four 7/8" hex bolts with nut and washer.

TERMINAL ANCHOR POST OPTIONS
(See General Note 11)



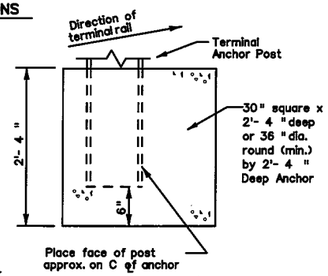
Notes :

Either concrete anchor may be used with either post option above.

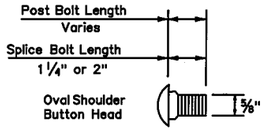
No construction joint is allowed in the concrete anchor.

Terminal rail may be bolted to post and in twist position prior to placing concrete anchor.

If concrete anchor is precast, the area should be compacted as directed by the Engineer, when placed in the field.

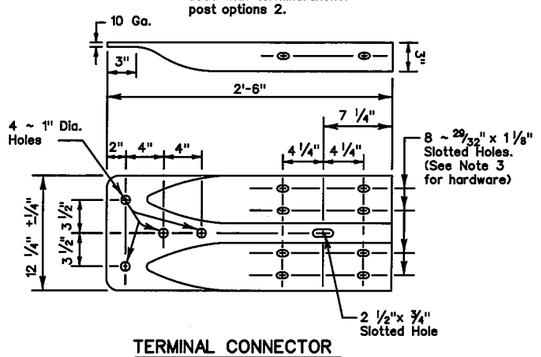


TERMINAL CONCRETE ANCHOR OPTIONS
(See General Note 11)

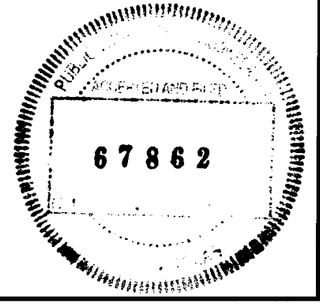


BUTTON HEAD BOLT
Post and Splice Bolts (See General Note 3)

Note: Terminal Connector to be used with terminal anchor post options 2.



TERMINAL CONNECTOR
For connection hardware to concrete rails, see the MBGF transition standards.



Texas Department of Transportation

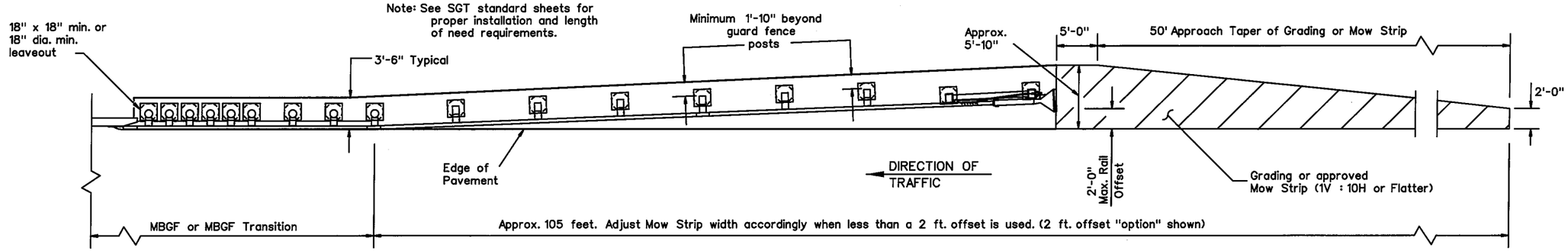
Design Division Standard

METAL BEAM GUARD FENCE

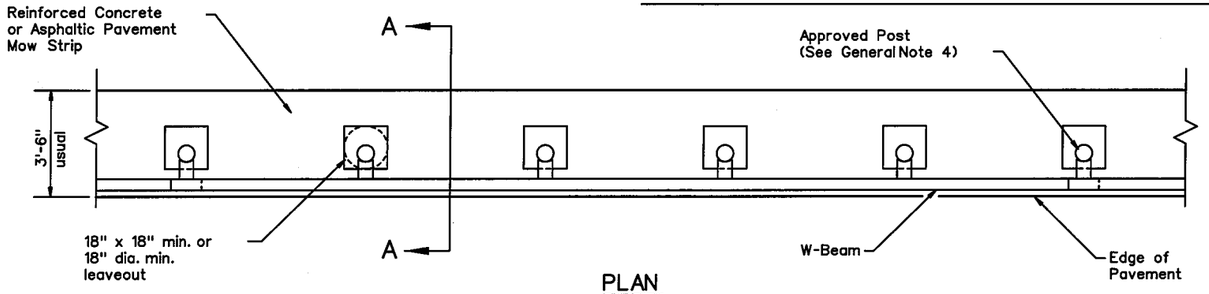
MBGF-11

FILE: mbgf11.dgn	DN: TxDOT	CK: AM	DW: BD	CK: VP
©TxDOT July 1994	CONT	SECT	JOB	HIGHWAY
REVISIONS 12-2011	0912	72	391	CS
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		158

DATE:
FILE:

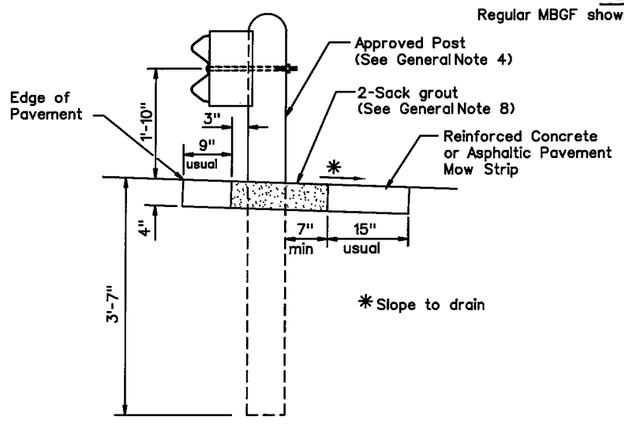


GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS



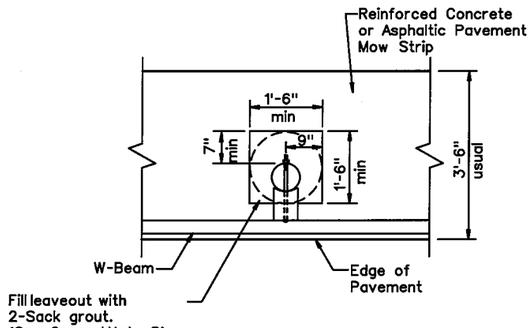
PLAN

Regular MBGF shown with Mow Strip



SECTION A-A

Typical



MOW STRIP DETAIL

Reinforced Concrete or Asphaltic Pavement Mow Strip with 18" x 18" or 18" dia. minimum leaveout.

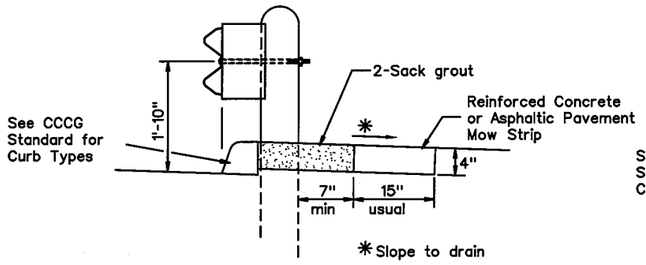
Note: Site Condition(s)

Site conditions may exist where grading is required for the proper installation of metal guard fence and end treatments.

Approach grading or mow strip may be decreased or eliminated. As directed by the Engineer.

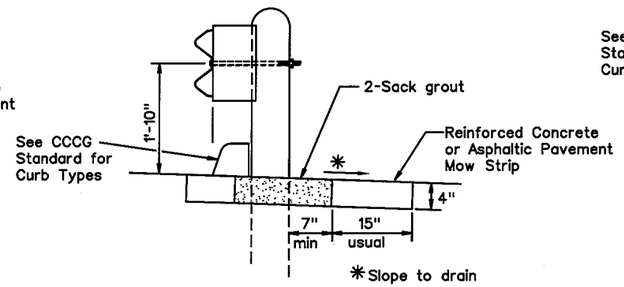
GENERAL NOTES

1. This mow strip design is for use with metal beam guard fence, guard fence transitions, and guard fence end treatments (See SGT standards for proper SGT installation).
2. Mow strips shall be asphaltic pavement or reinforced concrete (wire mesh or synthetic fiber), as shown on the plans and will be paid for under the pertinent bid item of work. Asphaltic pavement shall meet the requirements of the item, and be placed in accordance with the pertinent bid item as shown on the plans. Reinforced concrete shall be placed in accordance with Item 432, "Riprap." The use of the synthetic fiber in lieu of steel reinforcing is acceptable, provided the fiber producer is on the Department Material Producer List (MPL), maintained by TxDOT, Construction Division.
3. The leaveout behind the post shall be a minimum of 7".
4. The type of approved post will be shown elsewhere in the plans. See the applicable standard sheets for additional details and information.
5. Other curb placement options may be used. Curbs are not considered part of the mow strip and will be paid for under other pertinent bid item.
6. Depth of mow strip will be 4".
7. The limits of payment for asphaltic pavement or reinforced concrete will include leaveouts for posts.
8. The leave-outs shall be filled with no more than a 2-sack grout mixture (1 part cement, 5 parts water, and 14 parts sand by volume) with a 28-day compressive strength of approximately 120 psi or less. Provide grout of a consistency that will flow into and completly fill all voids. Due to auger size, larger leave-out dimensions are acceptable from both an impact performance and maintenance repair standpoint (Suggested maximum leave-out of 20"). Payment for furnishing and placing the grout mixture will be subsidiary to the pay Item of rip rap mow strip.



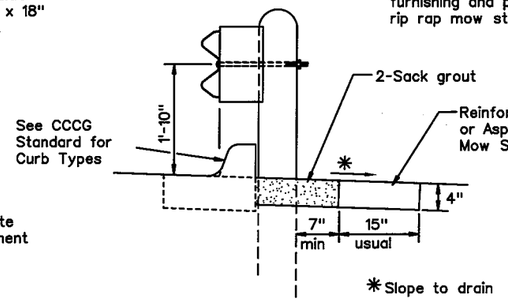
CURB OPTION (1)

This option will increase the post embedment through out the system.

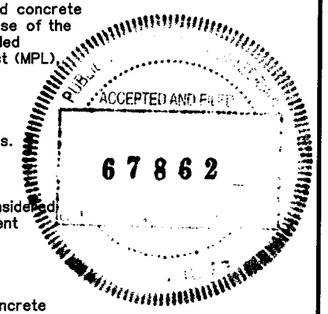


CURB OPTION (2)

Curb shown on top of mow strip



CURB OPTION (3)

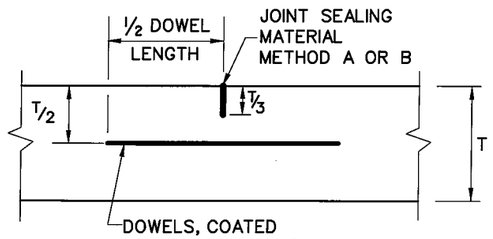


Texas Department of Transportation — Design Division Standard

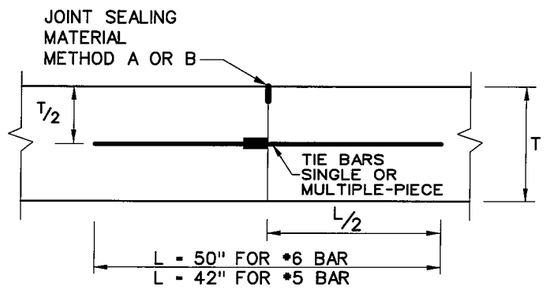
METAL BEAM GUARD FENCE
(MOW STRIP)
MBGF(MS)-17

FILE: mbgfms17.dgn	DN: TxDOT	CK: KM	DW: TXDOT	CK: CL
©TxDOT April 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS Revised 12, 2017 KM	0912	72	391	CS
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		150

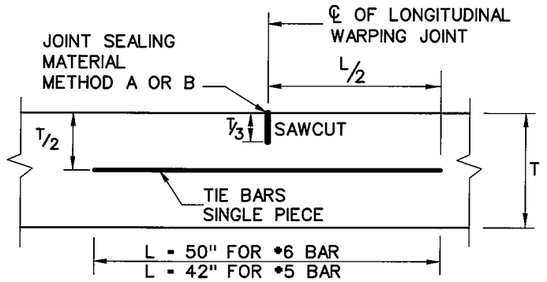
DATE:
FILE:



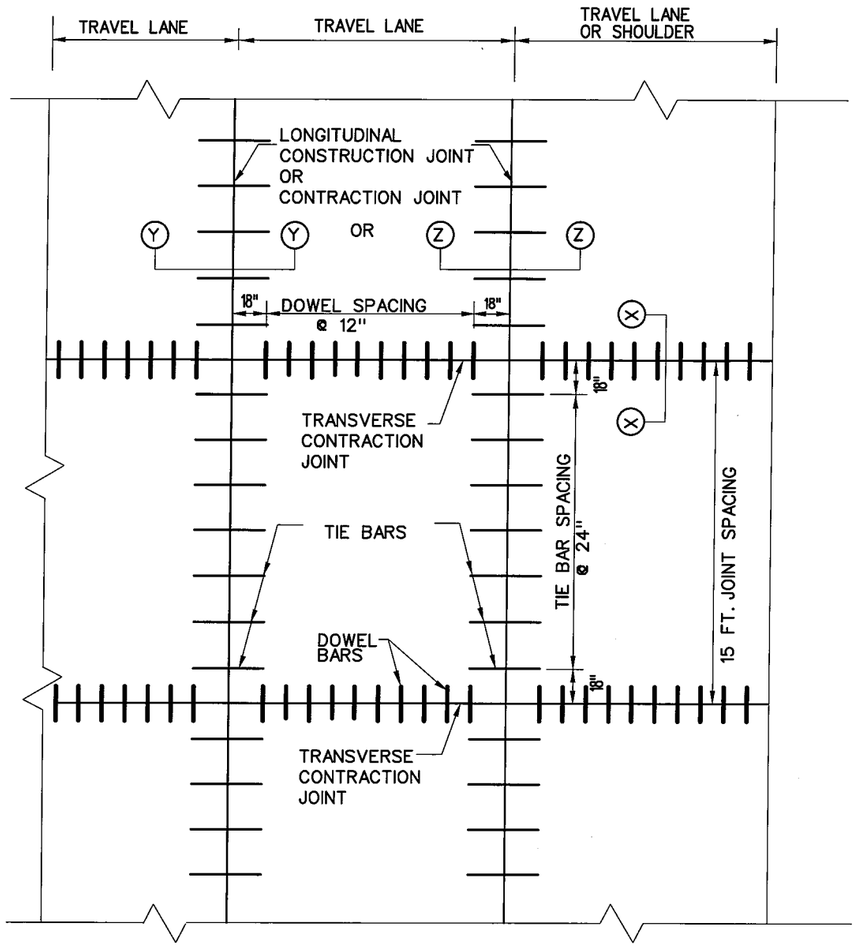
TRANSVERSE CONTRACTION JOINT
SECTION X-X



LONGITUDINAL CONSTRUCTION JOINT
SECTION Y-Y



LONGITUDINAL CONTRACTION JOINT
SECTION Z-Z



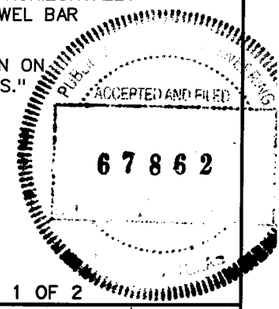
TYPICAL PAVEMENT LAYOUT
PLAN VIEW (NOT TO SCALE)

TABLE NO.1 DOWELS (SMOOTH BARS)		
SLAB THICKNESS T (IN.)	BAR DIA. AND LENGTH	AVERAGE SPACING (IN.)
6 to 7.5	1" X 18"	12
8 to 10	1 ¼" X 18"	12
>= 10.5	1 ½" X 18"	12

TABLE NO.2 TIE BARS (DEFORMED BARS)		
SLAB THICKNESS T (IN.)	BAR SIZE	AVERAGE SPACING (IN.)
6 to 7.5	#5	24
>= 8	#6	24

GENERAL NOTES

1. DETAILS FOR PAVEMENT WIDTH, PAVEMENT THICKNESS AND THE CROWN CROSS-SLOPE SHALL BE SHOWN ELSEWHERE IN THE PLANS. PAVEMENTS WIDER THAN 100 FT. WITHOUT A FREE LONGITUDINAL JOINT ARE NOT COVERED BY THIS STANDARD.
2. FOR FURTHER INFORMATION REGARDING THE PLACEMENT OF CONCRETE AND LOAD TRANSFER DEVICES REFER TO THE GOVERNING SPECIFICATION FOR "CONCRETE PAVEMENT".
3. THE SPACING BETWEEN TRANSVERSE CONTRACTION JOINTS SHALL BE 15 FT. UNLESS OTHERWISE SHOWN IN THE PLANS.
4. TRANSVERSE CONSTRUCTION JOINTS MAY BE FORMED BY USE OF METAL OR WOOD FORMS EQUAL IN DEPTH TO THE DEPTH OF PAVEMENT, OR BY METHODS APPROVED BY THE ENGINEER.
5. USE HAND-OPERATED IMMERSION VIBRATORS TO CONSOLIDATE THE CONCRETE ADJACENT TO ALL THE FORMED JOINTS.
6. PAVEMENT WIDTHS OF MORE THAN 15 FT. SHALL HAVE A LONGITUDINAL JOINT (SECTION Z-Z OR SECTION Y-Y). THESE JOINTS SHALL BE LOCATED WITHIN 6 IN. OF THE LANE LINE UNLESS THE JOINT LOCATION IS SHOWN ELSEWHERE ON THE PLANS.
7. THE JOINT BETWEEN OUTSIDE LANE AND SHOULDER SHALL BE A LONGITUDINAL CONTRACTION JOINT (SECTION Z-Z) UNLESS OTHERWISE SHOWN IN THE PLANS. THE SAW CUT DEPTH FOR THE LONGITUDIANL CONTRACTION JOINT (SECTION Z-Z) SHALL BE ONE THIRD OF THE SLABTHICKNESS (T/3).
8. WHEN TYING CONCRETE GUTTER AT A LONGITUDINAL JOINT, THE TIE BAR LENGTH OR POSITION MAY BE ADJUSTED. PROVIDE 3 IN. OF CONCRETE COVER FROM THE BACK OF GUTTER TO THE END OF TIE BAR.
9. REPLACE MISSING OR DAMAGED TIE BARS WITHOUT ADDITIONAL COMPENSATION BY DRILLING MIN. 10 IN. DEEP AND GROUTING TIE BARS WITH TYPE III, CLASS C EPOXY. MEET THE PULL-OUT TEST REQUIREMENTS IN ITEM 361.
10. WHEN AN MONOLITHIIC CURB IS SPECIFIED, THE JOINT IN THE CURB SHALL COINCIDE WITH PAVEMENT JOINTS AND MAY BE FORMED BY ANY MEANS APPROVED BY THE ENGINEER.
11. DOWEL BAR PLACEMENT TOLERANCE SHALL BE +/- 1/4 IN. HORIZONTALLY AND VERTICALLY UNLESS OTHERWISE SPECIFIED.WHERE DOWEL BAR BASKETS ARE USED, REMOVE THE SHIPPING WIRES.
12. THE DETAIL FOR JOINT SEALANT AND RESERVOIR IS SHOWN ON STANDARD SHEET "CONCRETE PAVING DETAILS, JOINT SEALS."



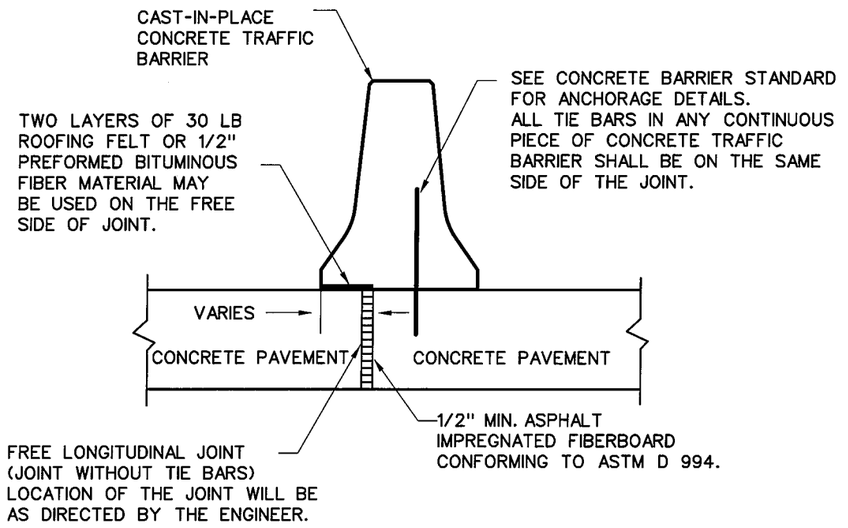
Texas Department of Transportation
Design Division Standard

CONCRETE PAVEMENT DETAILS
CONTRACTION DESIGN
T-6 to 12 INCHES

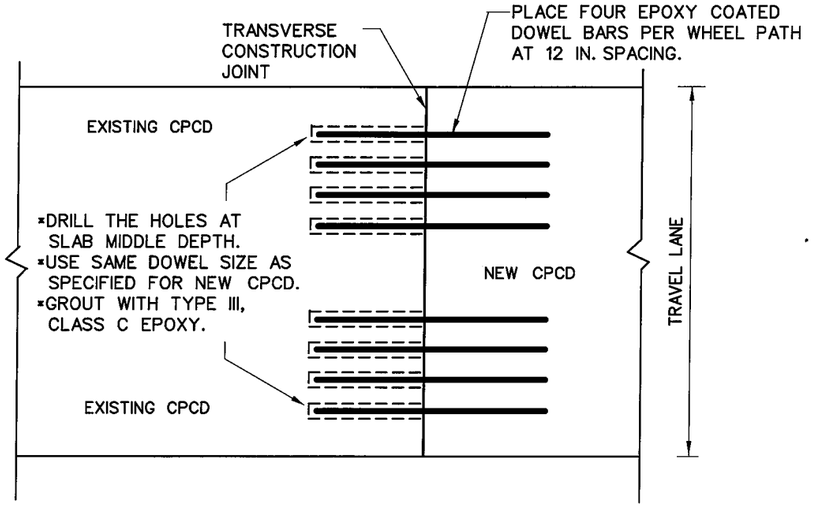
CPCD-14

FILE: cpcd14.dgn	DN: TxDOT	DN: HC	DW: HC	CK: AN
©TxDOT: DECEMBER 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	72	391	CS
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		160

DATE:
FILE:



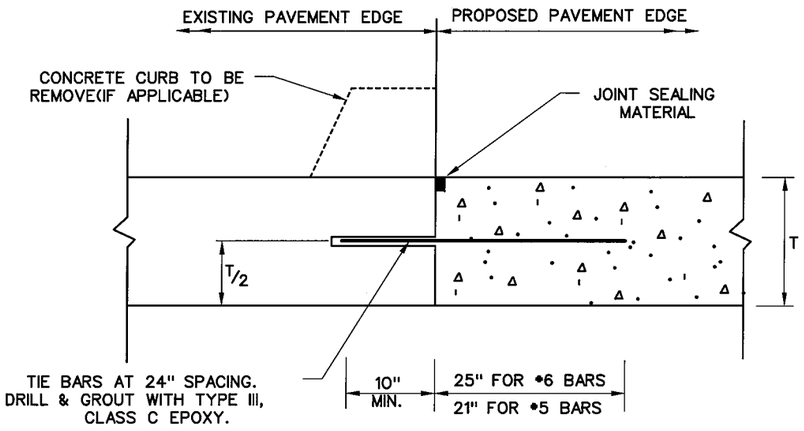
FREE LONGITUDINAL JOINT DETAIL



TRANSVERSE JOINT DETAIL

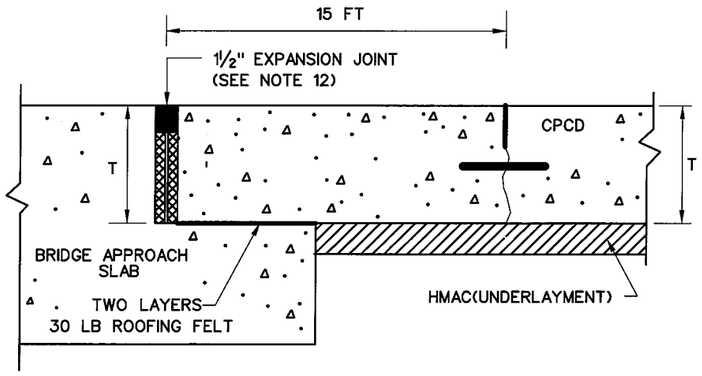
EXISTING CPCD TO NEW CPCD

PLAN VIEW (NOT TO SCALE)



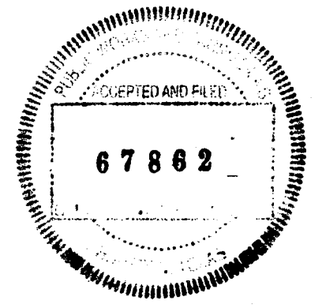
1. BEFORE WIDENING WORK, DEMONSTRATE THAT THE BOND STRENGTH OF THE EPOXY-GROUTED TIE BARS MEETS THE REQUIREMENTS OF PULL-OUT TEST SPECIFIED IN ITEM 361.
2. SPACE TIE BARS AT 24" SPACING. USE #6 BARS FOR 8" AND THICKER SLABS, USE #5 BARS FOR LESS THAN 8" THICK SLABS.
3. THE TRANSVERSE JOINTS OF PROPOSED PAVEMENT SHALL COINCIDE WITH EXISTING PAVEMENT JOINTS UNLESS OTHERWISE SHOWN ON THE PLANS.

LONGITUDINAL WIDENING JOINT DETAIL



TRANSVERSE EXPANSION JOINT DETAIL

AT BRIDGE APPROACH



SHEET 2 OF 2

Texas Department of Transportation

Design Division Standard

CONCRETE PAVEMENT DETAILS
CONTRACTION DESIGN
T-6 to 12 INCHES

CPCD-14

FILE: cpcd14.dgn	DN: TxDOT		DN: HC		DW: HC	CK: AN
©TxDOT: DECEMBER 2014	CONT	SECT	JOB		HIGHWAY	
REVISIONS	0912	72	391		CS	
	DIST	COUNTY			SHEET NO.	
	HOU	HARRIS			161	

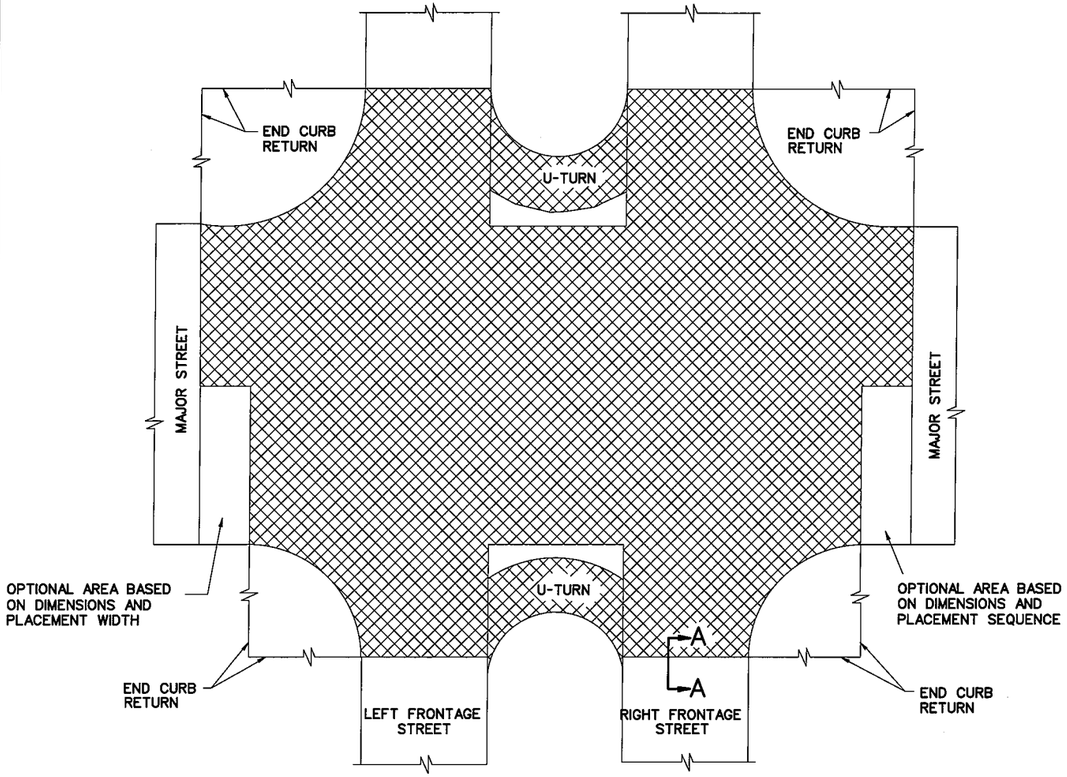


FIGURE 2

INTERSECTION OF MAJOR STREET WITH FRONTAGE STREET

FAST TRACK PAVING AREA

TYPICAL PAVING PLANS

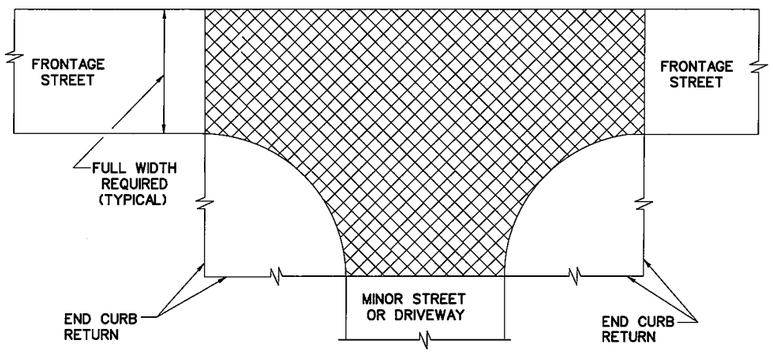


FIGURE 3

INTERSECTION OF MINOR STREET OR DRIVEWAY WITH FRONTAGE STREET

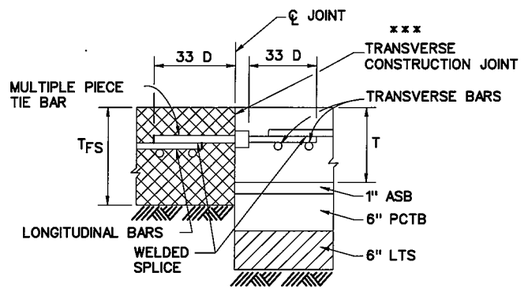
TABLE 1

EQUIVALENT PAVEMENT THICKNESS	
$T_{(IN.)}$ *	$T_{FS(IN.)}$ **
<=12"	T+3"
>12"	15"

* WITH BASE STRUCTURE OF:
1" ASPHALT STABILIZED BASE
6" PORTLAND CEMENT TREATED BASE
6" LIME TREATED SUBGRADE

** ON AS CUT SUBGRADE

*** SEE JOINT SEALING DETAILS ON CRCP STANDARDS



SINGLE MAT

TRANSVERSE CONSTRUCTION JOINTS

SECTION A - A
FIGURE 1

GENERAL NOTES

1. DEFINITION OF TERMS

   T_{FS} - FAST TRACK CONCRETE PAVING DEPTH AT INTERSECTIONS AND LEAVE OUTS.
   T - NOMINAL CONCRETE PAVING DEPTH AS SHOWN IN THE PLANS.
   DETERMINE FAST TRACK CONCRETE PAVING DEPTH USING TABLE 1 AND THE NOMINAL CONCRETE PAVING DEPTH "T" SHOWN IN THE PLANS.

2. AT INTERSECTIONS AND LEAVE-OUT LOCATIONS USE THE SAME LONGITUDINAL AND TRANSVERSE BAR SPACING FOR THE FAST TRACK PAVING AREA AS THAT USED FOR THE ADJACENT CONCRETE PAVING DEPTH "T" (EXCEPT BAR SIZE SHALL BE #7 ON SINGLE MAT). FOR SINGLE MAT FAST TRACK PAVING, PLACE THE LONGITUDINAL AND TRANSVERSE BARS FOR THE FAST TRACK PAVING AREA AT THE HORIZONTAL PLANE ELEVATION THAT IS TWO TIE-BAR DIAMETERS LOWER THAN THAT USED FOR THE ADJACENT CONCRETE PAVEMENT DEPTH "T", AS SHOWN IN FIGURE 1. USE SINGLE MAT STEEL IN FAST TRACK PAVING AREAS ADJACENT TO PAVEMENT SLABS WITH SINGLE MAT REINFORCING. USE DOUBLE MAT STEEL IN FAST TRACK PAVING AREAS ADJACENT TO PAVEMENT SLABS WITH DOUBLE MAT REINFORCING.

3. THE REQUIRED FAST TRACK PAVING AREAS WILL BE SHOWN ON THE PLANS. THE CONTRACTOR HAS THE OPTION TO UTILIZE FAST TRACK CONCRETE PAVING AT U-TURNS, AT INTERSECTIONS, AT MINOR STREETS, AND AT DRIVEWAYS WITH FRONTAGE ROAD LEAVE-OUT AREAS THAT ARE NOT SHOWN ON THE PLANS, WITH PRIOR WRITTEN APPROVAL FROM THE ENGINEER. TYPICAL PAVING PLANS FOR THE INTERSECTION OF A MAJOR STREET WITH THE FRONTAGE ROAD ARE SHOWN AS FIGURE 2, AND FOR THE INTERSECTION OF A MINOR STREET OR DRIVEWAY WITH THE FRONTAGE ROAD AS FIGURE 3. FAST TRACK PAVE THE FRONTAGE ROAD FOR THE FULL FRONTAGE ROAD WIDTH AND PLACE IN STAGES AS REQUIRED.

4. USE ADDITIONAL #6 REINFORCING STEEL BARS (MINIMUM 42 INCHES LONG) AND SPACE THEM MIDWAY BETWEEN ALTERNATE LONGITUDINAL BARS ALONG THE THE TRANSVERSE CONSTRUCTION JOINT FORMED AT THE FAST TRACK PAVING INTERFACE (T_{FS} WITH THE ADJACENT PAVEMENT SLAB (T).

5. SPLICE LENGTH IS A MINIMUM OF 33 TIMES THE NOMINAL STEEL DIAMETER.

6. PLACE THE CONCRETE PLACEMENT AT A UNIFORM DEPTH THROUGHOUT THE FAST TRACK CONCRETE PAVING AREA.

7. FOR CONTINUOUS SECTIONS OF ROADWAY WHERE FAST TRACK PAVING IS THE PRIMARY PAVEMENT TYPE, USE THE BAR SIZE AND SPACING FROM THE CRCP STANDARDS THAT CORRESPONDS TO THE FAST TRACK SLAB THICKNESS.

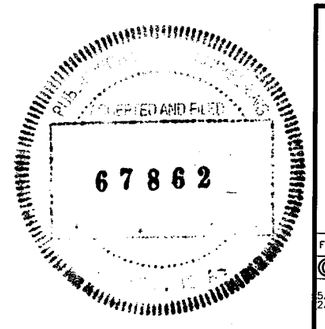
8. USE LONGITUDINAL TIE-BARS OF THE SAME SIZE DIAMETER AND SPACING AS THE LONGITUDINAL BAR. A SINGLE PIECE TIE-BAR MAY BE USED IF THE 33 TIMES DIAMETER TIE-BAR PROJECTION DOES NOT INTERFERE WITH THE SAFE HANDLING OF TRAFFIC.

9. BASE THE DEPTH OF SAW CUTS FOR SAWED JOINTS ON THE FAST TRACK CONCRETE PAVEMENT THICKNESS.

10. THIS STANDARD IS NOT INTENDED TO REPLACE OTHER STANDARDS EXCEPT WHERE SPECIFICALLY STATED HEREIN. FOR PAVING DETAILS NOT SHOWN ON THIS DRAWING, REFER TO THE STANDARD SHEETS FOR CONTINUOUSLY REINFORCED CONCRETE PAVEMENT SHOWN ELSEWHERE IN THE PLANS.

LEGEND

ASB - ASPHALT STABILIZED BASE
CRCP - CONTINUOUSLY REINFORCED CONCRETE PAVEMENT
D - DIAMETER
LTS - LIME TREATED SUBGRADE
PCTB - PORTLAND CEMENT TREATED BASE

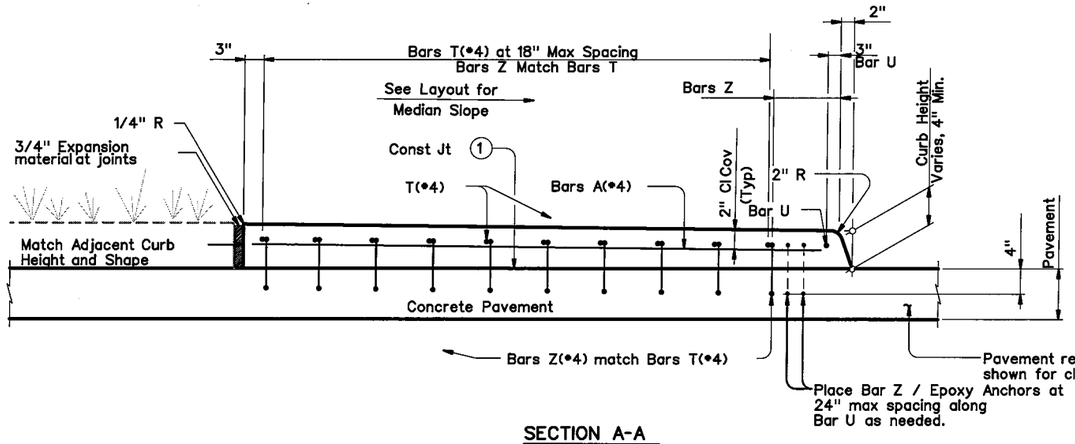


Texas Department of Transportation
Houston District

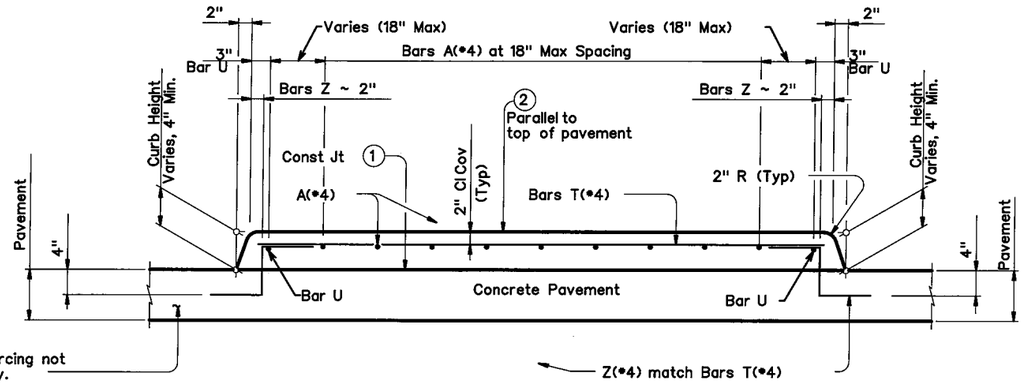
FAST TRACK CONTINUOUSLY REINFORCED CONCRETE PAVEMENT DETAILS

CRCP-FT

FILE: STDB-4.dgn	DN:	CK:	DW:	CK:
© TxDOT DEC. 2009	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS 5/05 2004 SPECS 2/15 2014 SPECS	HOU	6	STP1802(783)MM	162
	COUNTY	CONTROL	SECT JOB	HIGHWAY
	HARRIS	0912	72 391	C5



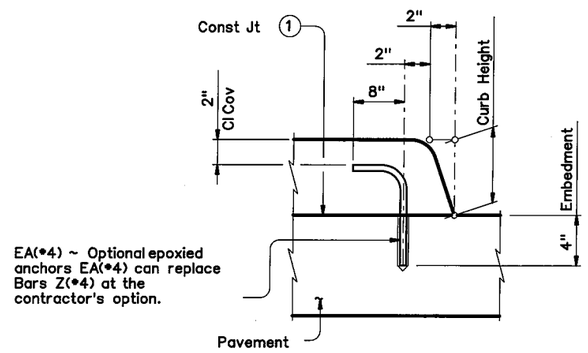
SECTION A-A



SECTION B-B

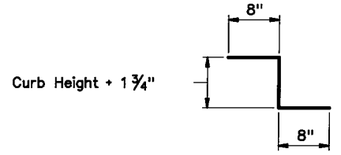
1 Provide broom finish to top of pavement where raised median area is defined.

2 Unless noted otherwise on the pavement details.

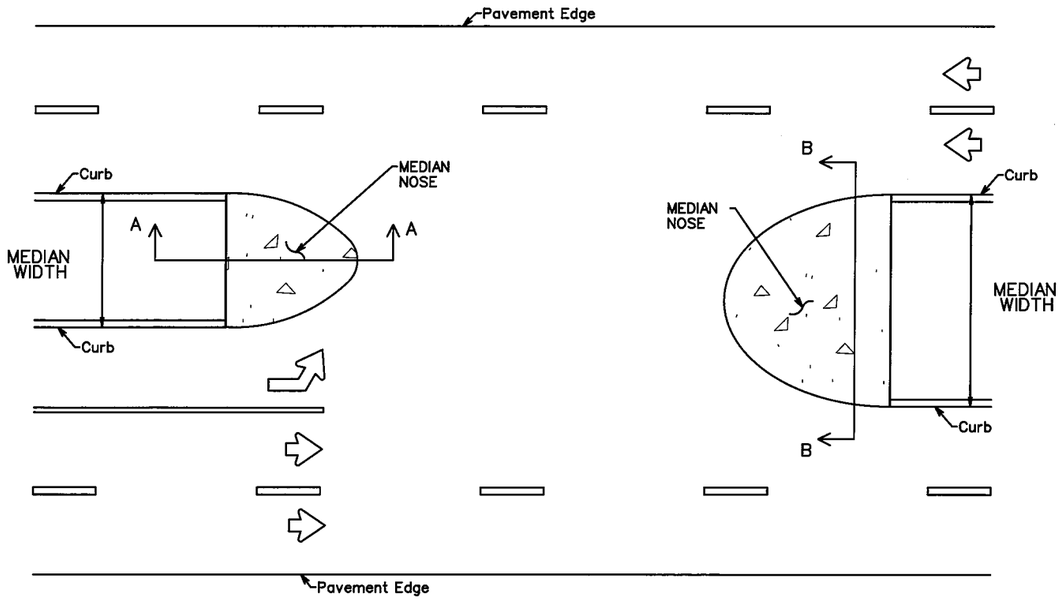


OPTIONAL
EPOXY ANCHORS

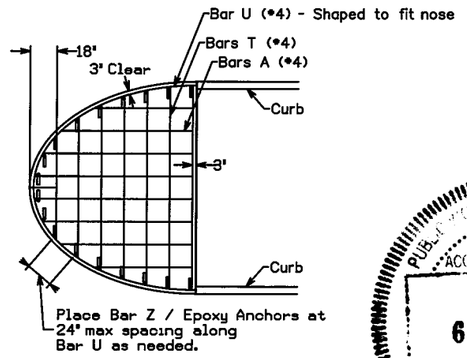
Embed EA(#4) bar into concrete with a Type III (Class C) epoxy meeting the requirements of DMS-6100,"Epoxies and Adhesives". Follow manufacturer's directions for installing the epoxied anchor bars.



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

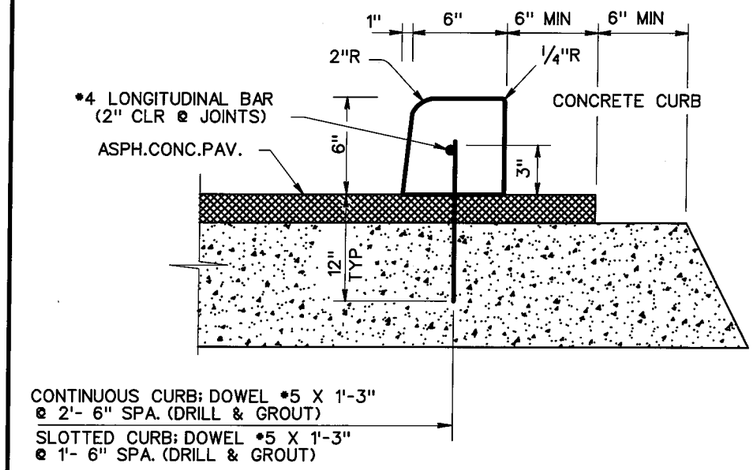
Texas Department of Transportation
Houston District

MEDIAN NOSE DETAILS

HOU-MEDNS

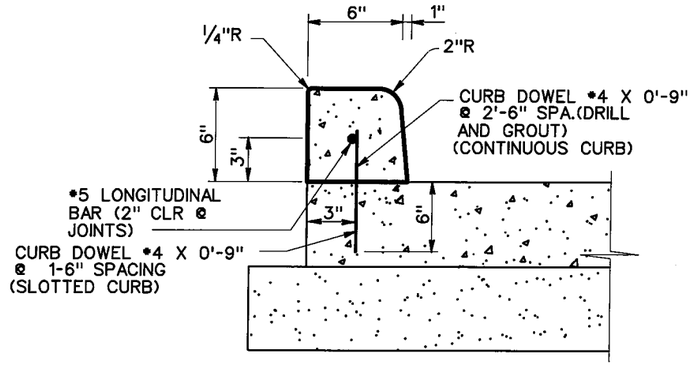
FILE: stdB13.dgn	DN: NHEB	CK: TxDOT	DW: NHEB	CK: TxDOT
©TxDOT September 2014	DISTRICT	PROJECT		SHEET
REVISIONS 03/15 FOR 2014 SPECS	HOU	STP1802(783)MM		163
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	HARRIS	0912	72	391	C5

LEVELS DGN PATH: BO



SHOWN ON EXISTING OR PROPOSED ACP PAVEMENT

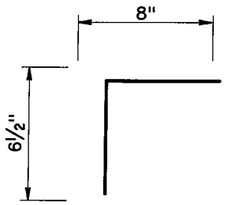
(PAY ITEM 529-6011) - FOR CONTINUOUS



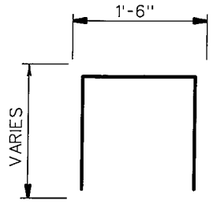
SHOWN ON EXISTING OR PROPOSED CONCRETE PAVEMENT

(PAY ITEM 529-6011) - FOR CONTINUOUS

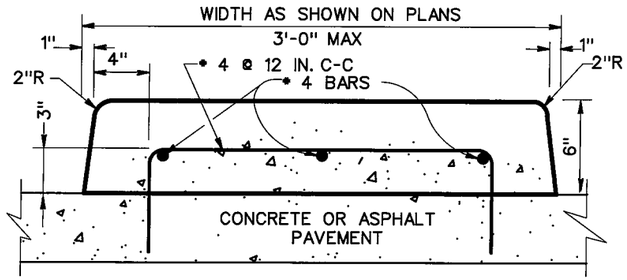
CONCRETE CURB (DOWEL) (6 IN.)



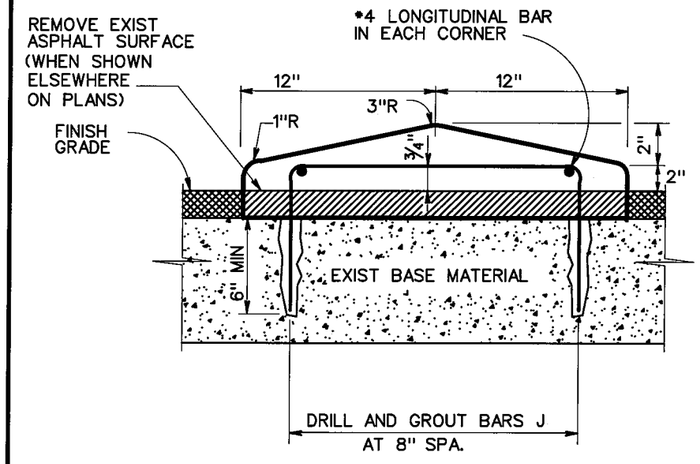
BAR K
*4



BAR J
*4

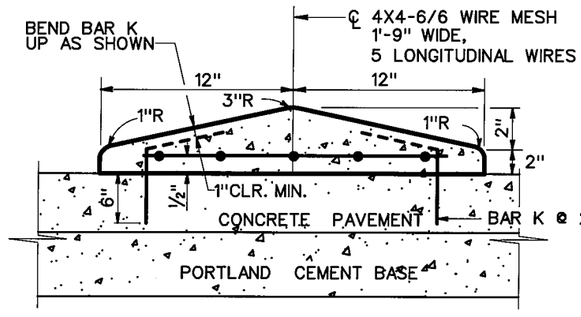


ITEM 536-6001 CONCRETE MEDIAN
SEE NOTE 2



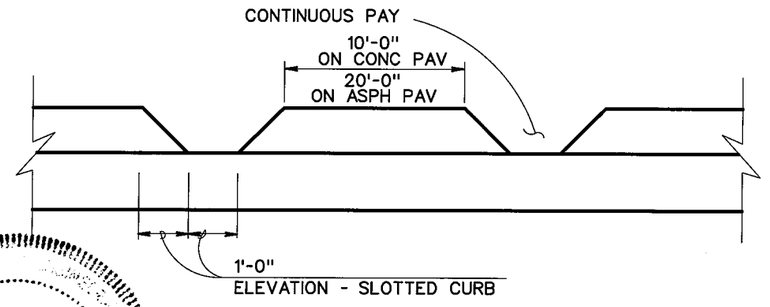
SHOWN ON EXISTING ACP PAVEMENT

SEE NOTE 2 - ITEM 536-6003 CONC DIRECTIONAL ISLAND

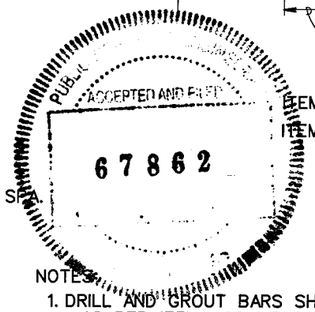


SHOWN ON EXISTING OR PROPOSED CONCRETE PAVEMENT

SEE NOTE 2 - ITEM 536-6003 CONC DIRECTIONAL ISLAND



ITEM 529-6012 CONCRETE CURB (SLOTTED) - ON CONC.
ITEM 529-6009 CONC CURB (DOWEL)(SLOTTED) - ON ASPH.



NOTES:

1. DRILL AND GROUT BARS SHOWN AS PER ITEM 420.4.7.10, 6" EMBEDMENT, MINIMUM ON CONC.
2. INSTALL A 2 INCH DRAINAGE OPENING AT 10 FT C-C WHEN CURB/ISLAND IS NOT ON TOP OF CROSS SECTION. (LOCATED ON A 2 OR 3 PERCENT TRANSVERSE GRADE, OR SUPERELEVATION.)

CONCRETE DIRECTIONAL ISLAND

Texas Department of Transportation
Houston District

CONCRETE CURB AND DIRECTIONAL ISLAND DETAILS CC & DID

FILE: STDB-9.dgn	DN:	CK:	DW:	CK:	
©TxDOT 2014 REVISIONS	DIST	FED REG	PROJECT NO.		SHEET
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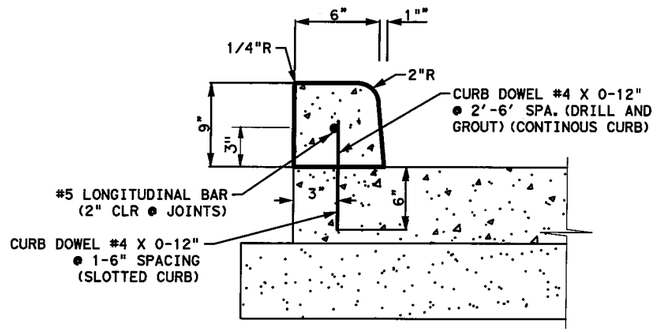
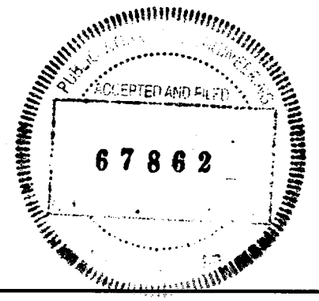
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	HARRIS		0912	72	391	CS



CONCRETE CURB (DOWEL) (9 IN.)
SHOWN ON EXISTING OR PROPOSED CONCRETE PAVEMENT
N. T. S.



Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

9" CONCRETE CURB CC(MOD)

SHEET 1 OF 1

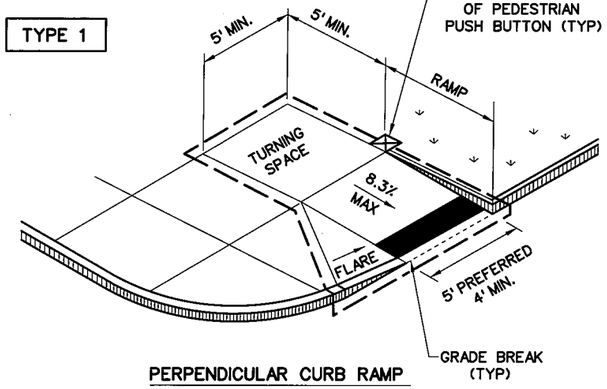
DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	165

Pen Table: MEMORIAL.tbl
Plot Driver: c:\projectwise\aagakhar\d0531333\MEMORIAL DR.pltcfg
Plotted on: 3/4/2020 2:59:44 PM AAGakhar

Design Filename: pw:\\lan-pw.bentley.com:lan-pw-01\Documents\Projects\120-11972-000\4-0-Production-Working\4-1-BIM-CAD\Roadway\Standards\CC&DID(MOD)

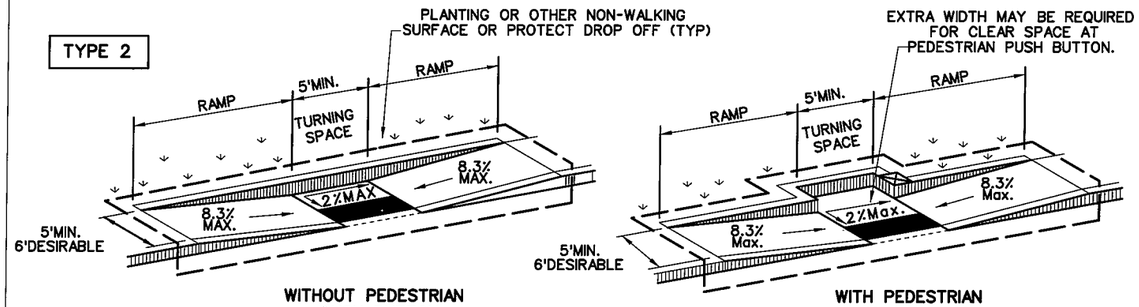
DATE:
FILE:

TYPE 1



PERPENDICULAR CURB RAMP

TYPE 2

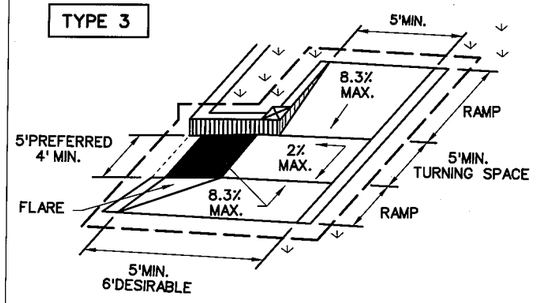


WITHOUT PEDESTRIAN PUSH BUTTON

WITH PEDESTRIAN PUSH BUTTON

PARALLEL CURB RAMP

TYPE 3



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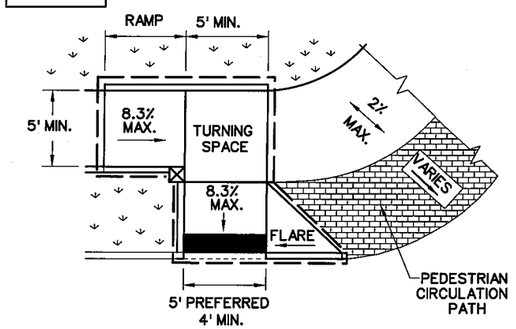
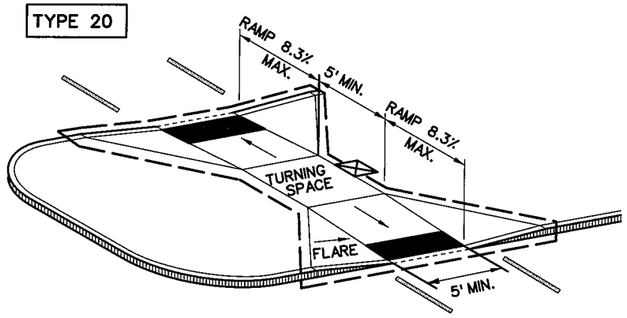


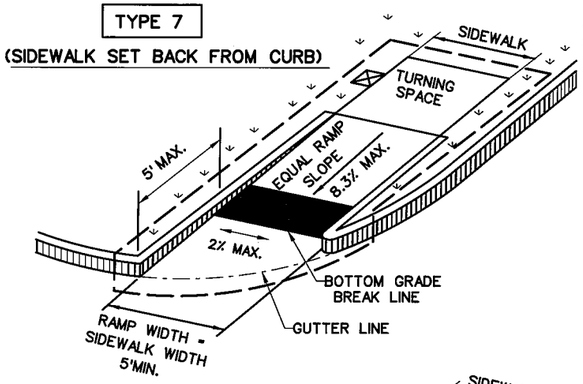
COMBINATION CURB RAMPS

TYPE 20

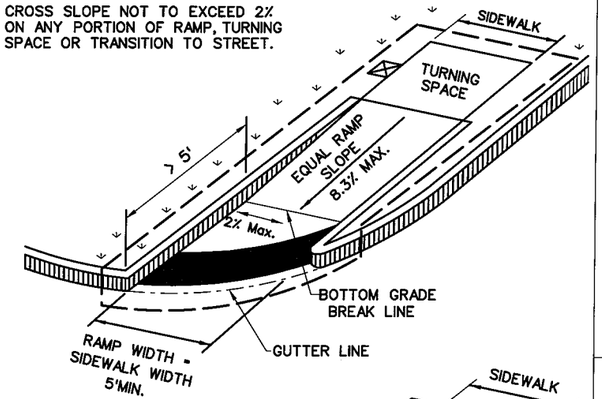


CURB RAMPS AT MEDIAN ISLANDS

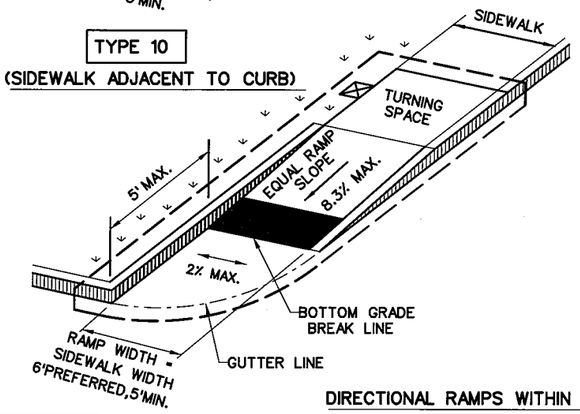
TYPE 7
(SIDEWALK SET BACK FROM CURB)



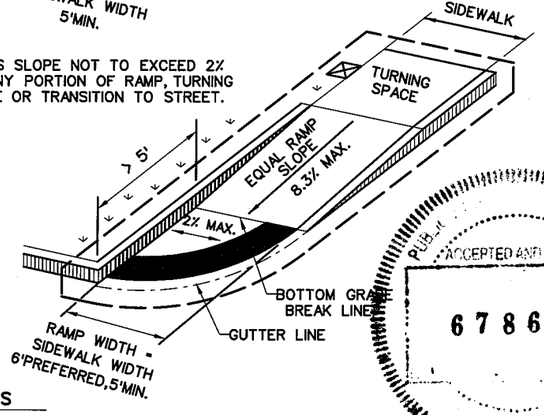
CROSS SLOPE NOT TO EXCEED 2% ON ANY PORTION OF RAMP, TURNING SPACE OR TRANSITION TO STREET.



TYPE 10
(SIDEWALK ADJACENT TO CURB)

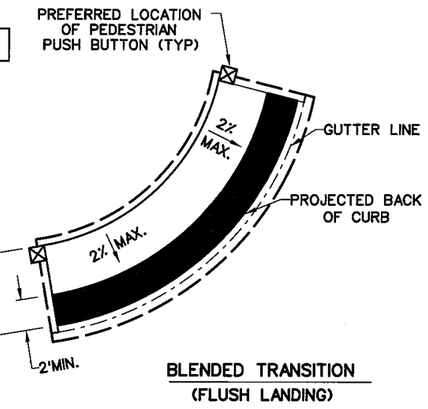


CROSS SLOPE NOT TO EXCEED 2% ON ANY PORTION OF RAMP, TURNING SPACE OR TRANSITION TO STREET.



DIRECTIONAL RAMPS WITHIN RADIUS

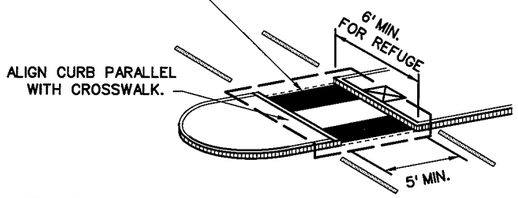
TYPE 5



BLENDED TRANSITION
(FLUSH LANDING)

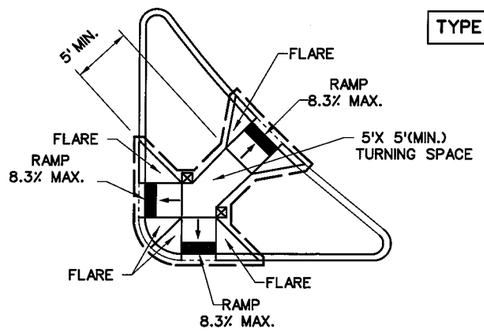
INSTALL DETECTABLE WARNING SURFACE AT EACH END OF THE CUT-THROUGH RAMP WITH A MINIMUM 2' USUAL SIDEWALK SURFACE BETWEEN. IF MEDIAN IS LESS THAN 6' WIDE, ELIMINATE DETECTABLE WARNING SURFACES.

TYPE 21

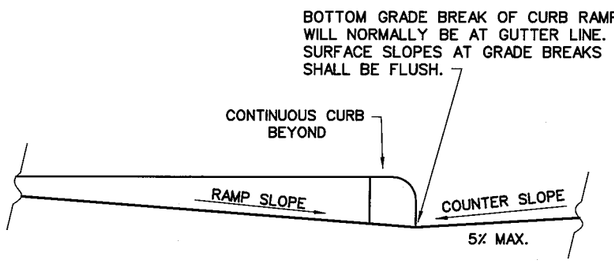


NOTE: CURB DETAILS ARE SHOWN ELSEWHERE IN THE PLANS.

TYPE 22



COMBINATION ISLAND RAMPS



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

SHEET 1 OF 4

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	391	CS
REVISED 08,2005 REVISED 06,2012 REVISED 01,2018	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		166

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 applicalble standards may remain in place unless otherwise shown on the plans.

DETECTABLE WARNING MATERIAL

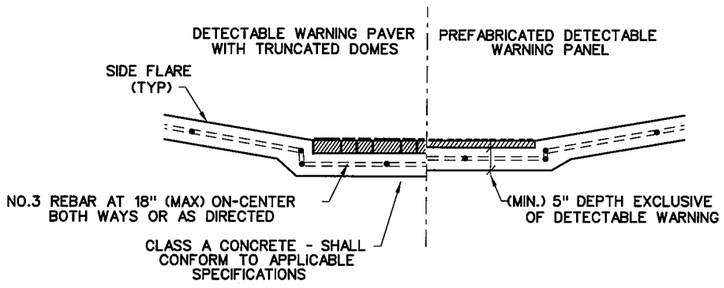
19. Curb ramps must contain a detectable warning surface that consists of raised truncated domes complying with PROWAG. The surface must contrast visually with adjoining surfaces, including side flares. Furnish and install an approved cast-in-place dark brown or dark red detectable warning surface material adjacent to uncolored concrete, unless specified elsewhere in the plans.
20. Detectable Warning Materials must meet TxDOT Departmental Materials Specification DMS 4350 and be listed on the Material Producer List. Install products in accordance with manufacturer's specifications.
21. Detectable warning surfaces must be firm, stable and slip resistant.
22. Detectable warning surfaces shall be a minimum of 24 inches in depth in the direction of pedestrian travel, and extend the full width of the curb ramp or landing where the pedestrian access route enters the street.
23. Detectable warning surfaces shall be located so that the edge nearest the curb line is at the back of curb and neither end of that edge is greater than 5 feet from the back of curb. Detectable warning surfaces may be curved along the corner radius.
24. Shaded areas on Sheet 1 of 4 indicate the approximate location for the detectable warning surface for each curb ramp type.

DETECTABLE WARNING PAVERS (IF USED)

25. Furnish detectable warning paver units meeting all requirements of ASTM C-936, C-33. Lay in a two by two unit basket weave pattern or as directed.
26. Lay full-size units first followed by closure units consisting of at least 25 percent (25%) of a full unit. Cut detectable warning paver units using a power saw.

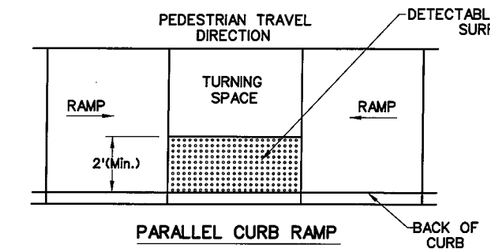
SIDEWALKS

27. Provide clear ground space at operable parts, including pedestrian push buttons. Operable parts shall be placed within unobstructed reach range specified in PROWAG section R406.
28. Place traffic signal or illumination poles, ground boxes, controller boxes, signs, drainage facilities and other items so as not to obstruct the pedestrian access route or clear ground space.
29. Street grades and cross slopes shall be as shown elsewhere in the plans.
30. Changes in level greater than 1/4 inch are not permitted.
31. The least possible grade should be used to maximize accessibility. The running slope of sidewalks and crosswalks within the public right of way may follow the grade of the parallel roadway. Where a continuous grade greater than five percent (5%) must be provided, handrails may be desirable to improve accessibility. Handrails may also be needed to protect pedestrians from potentially hazardous conditions. If provided, handrails shall comply with PROWAG R409.
32. Handrail extensions shall not protrude into the usable landing area or into intersecting pedestrian routes.
33. Driveways and turnouts shall be constructed and paid for in accordance with Item "Intersections, Driveways and Turnouts". Sidewalks shall be constructed and paid for in accordance with Item, "Sidewalks".
34. Sidewalk details are shown elsewhere in the plans.

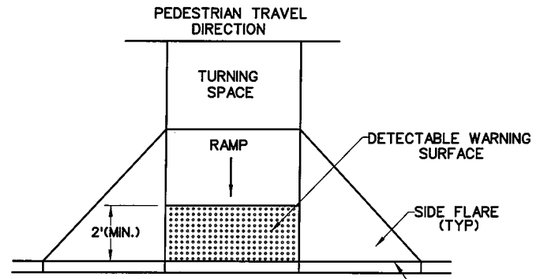


SECTION VIEW DETAIL
CURB RAMP AT DETECTIBLE WARNINGS

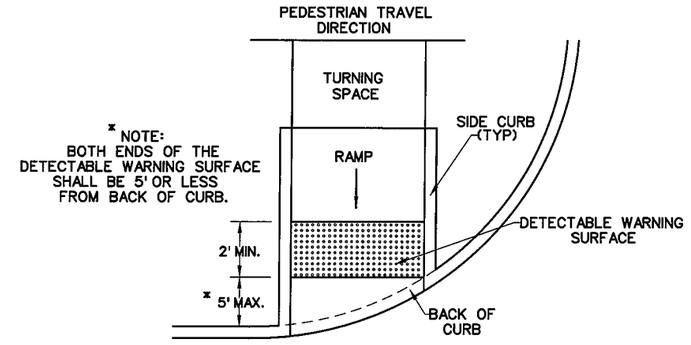
DETECTABLE WARNING SURFACE DETAILS



PARALLEL CURB RAMP
TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON LANDING AT STREET EDGE.



PERPENDICULAR CURB RAMP
TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON SLOPING RAMP RUN.



DIRECTIONAL CURB RAMP
TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON SLOPING RAMP RUN.

SHEET 2 OF 4

Texas Department of Transportation

Design Division Standard

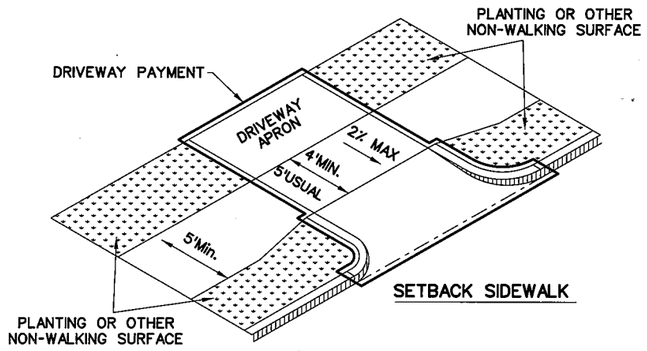
PEDESTRIAN FACILITIES CURB RAMPS

PED-18

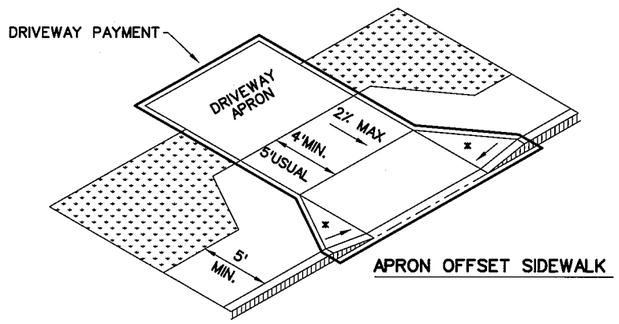
FILE: ped18	DN: TxDOT	DW: VP	CK: KM	CK: PK & JG
© TxDOT: MARCH, 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	72	391	CS
REVISED 08,2005 REVISED 06,2012 REVISED 01,2018	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		167

DATE:
FILE:

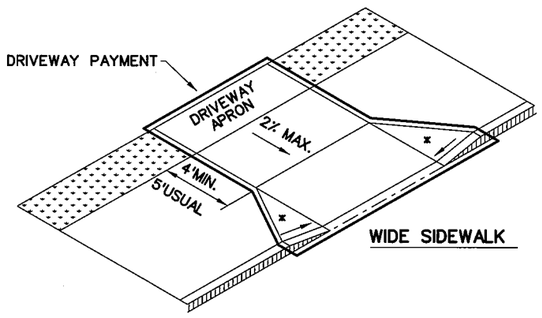
SIDEWALK TREATMENT AT DRIVEWAYS



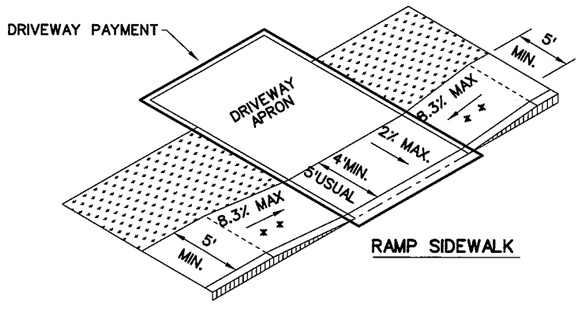
SETBACK SIDEWALK



APRON OFFSET SIDEWALK



WIDE SIDEWALK

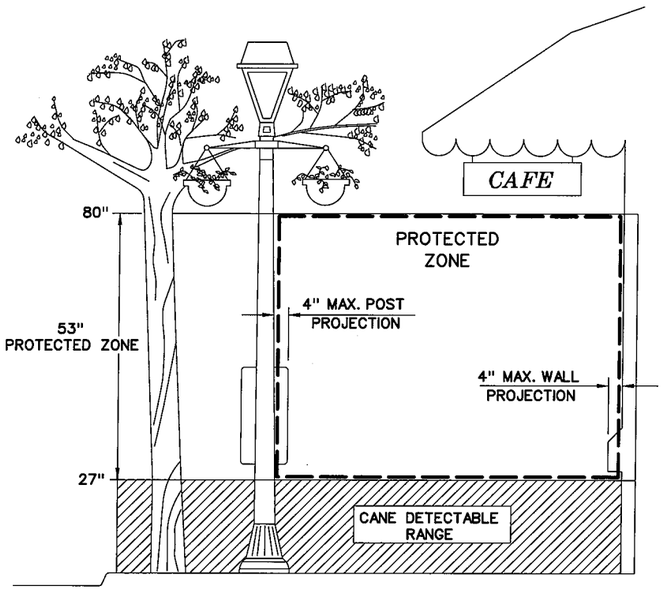


RAMP SIDEWALK

NOTES:

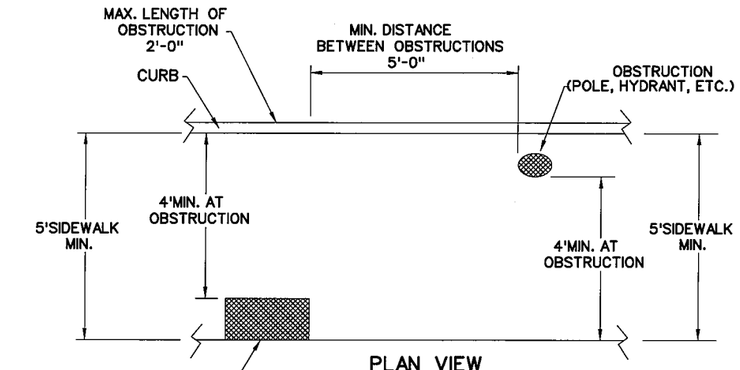
* WHERE DRIVEWAYS CROSS THE PEDESTRIAN ROUTE, SIDES SHALL BE FLARED AT 10% MAX SLOPE.

* * 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

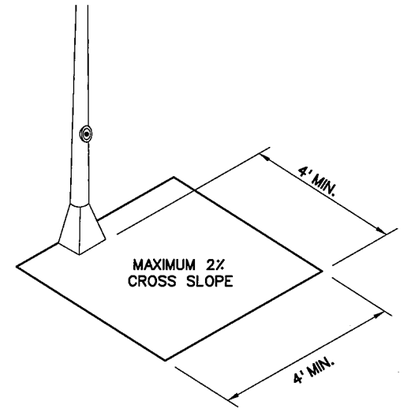
NOTE: IN PEDESTRIAN CIRCULATION AREA, MAXIMUM 4" PROJECTION FOR POST OR WALL MOUNTED OBJECTS BETWEEN 27" AND 80" ABOVE THE SURFACE.



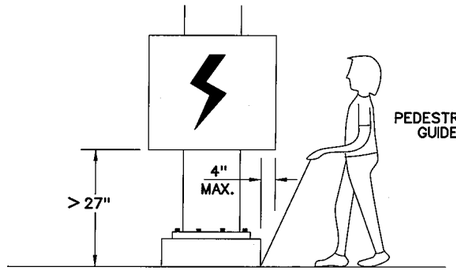
PLAN VIEW

PLACEMENT OF STREET FIXTURES

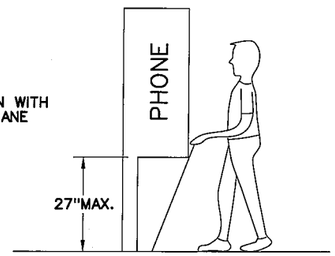
NOTE: ITEMS NOT INTENDED FOR PUBLIC USE. MINIMUM 4' X 4' CLEAR GROUND SPACE REQUIRED AT PUBLIC USE FIXTURES.



CLEAR SPACE ADJACENT TO PEDESTRIAN PUSH BUTTON



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"

PROFESSIONAL ENGINEER
67862

Texas Department of Transportation

Design Division Standard

PEDESTRIAN FACILITIES CURB RAMPS

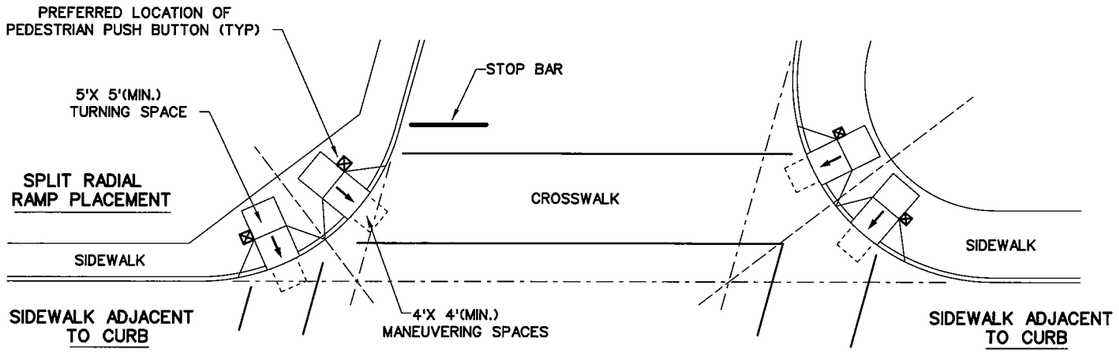
PED-18

FILE: ped18	DN: TxDOT	DW: VP	CK: KM	CK: PK & JG
© TxDOT: MARCH, 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	72	391	CS
REVISED 08,2005 REVISED 06,2012 REVISED 01,2018	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		168

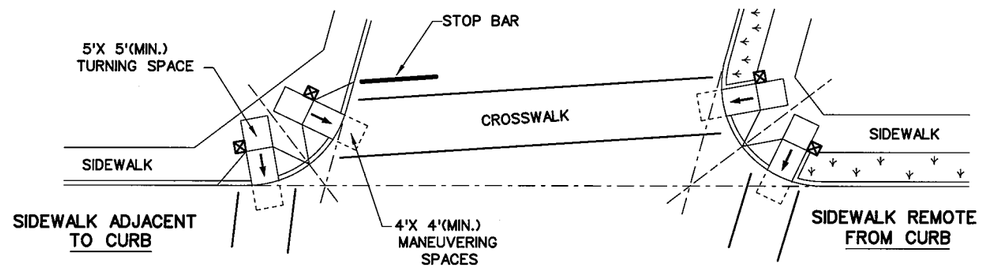
DATE:
FILE:

TYPICAL CROSSING LAYOUTS

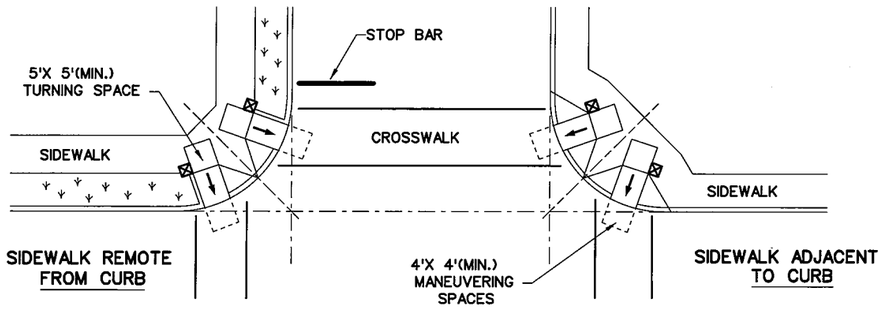
SEE SHEET 1 OF 4 FOR DETAILS AND DIMENSIONS



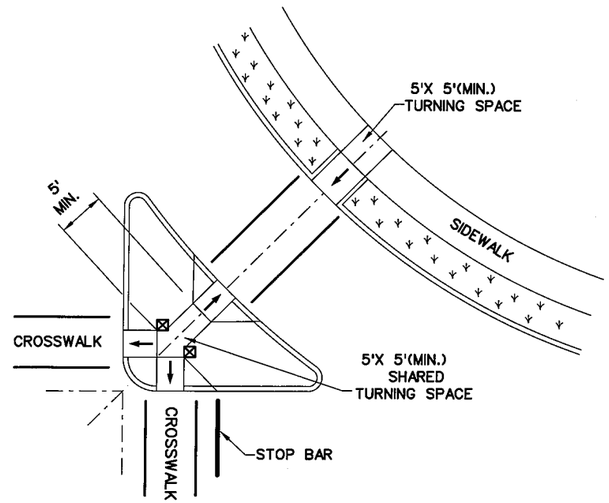
SKEWED INTERSECTION WITH "LARGE" RADIUS



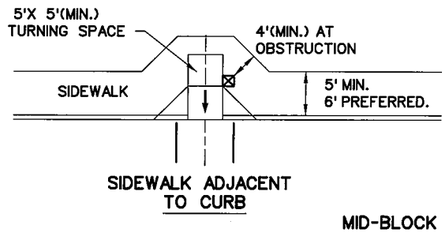
SKEWED INTERSECTION WITH "SMALL" RADIUS

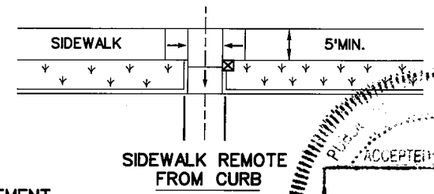


NORMAL INTERSECTION WITH "SMALL" RADIUS

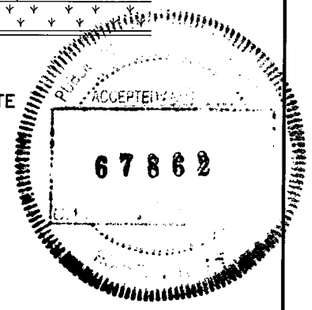


AT INTERSECTION
W/FREE RIGHT TURN & ISLAND





MID-BLOCK PLACEMENT
PERPENDICULAR RAMPS



LEGEND:

SHOWS DOWNWARD SLOPE. →

DENOTES PREFERRED LOCATION OF PEDESTRIAN PUSH BUTTON (IF APPLICABLE). ⊠

DENOTES PLANTING OR NON-WALKING SURFACE NOT PART OF PEDESTRIAN CIRCULATION PATH.

Texas Department of Transportation | Design Division Standard

PEDESTRIAN FACILITIES CURB RAMPS

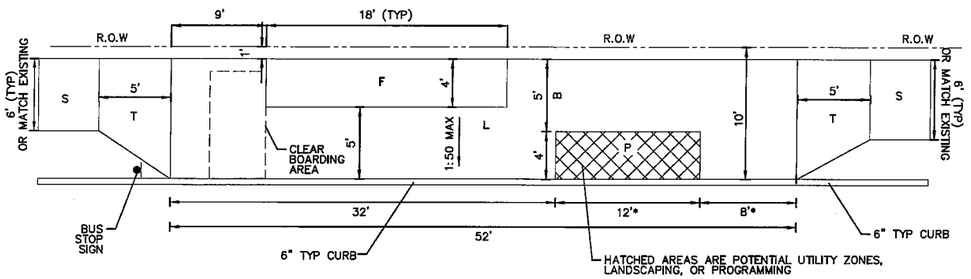
PED-18

FILE: ped18	DN: TxDOT		DW: VP	CK: KM	CK: PK & JG
© TxDOT: MARCH, 2002	CONT	SECT	JOB		HIGHWAY
REVISIONS	0912	72	391		CS
REVISED 08.2005 REVISED 06.2012 REVISED 01.2018	DIST		COUNTY		SHEET NO.
	HOU		HARRIS		199

NOTES:
1) LOCATION OF BUS STOP LONGITUDINALLY ALONG THE ROADWAY WILL NEED TO ACCOUNT FOR THE CRITICAL SHELTER OBSTRUCTION TO LINE OF SIGHT AND OTHER GUIDELINES SET FORTH IN METRO TRANSIT DESIGN STANDARDS.
2) CLEAR SIDEWALK (S) SHALL BE A MINIMUM OF 5' WIDE. IF THE DISTANCE BETWEEN BACK-OF-CURB AND ROW LINE (E) IS 12' OR GREATER, SEE "METRO BUS STOP DETAIL-6 INCH CURB WITH STANDARD ROW" TO ACCOMMODATE ADDITIONAL PROGRAMMING AREAS AS WELL AS 6' SIDEWALK, IF ROW ALLOWS.
3) THE SIDEWALK TRANSITION (T) FROM THE LANDING (L) TO EXISTING SIDEWALK SHOULD NOT HAVE A LONGITUDINAL SLOPE GREATER THAN 5% OR CROSS SLOPE GREATER THAN 2% EXCEPT TO MATCH EXISTING CROSS SLOPE. THE TRANSITION (T) SHOULD BE MINIMUM 5' LONG OR MAY BE LENGTHENED TO MITIGATE EXCESSIVE SLOPE. FOLLOW GUIDELINES COMPLIANT WITH AMERICANS WITH DISABILITIES ACT (ADA) AND TEXAS ACCESSIBILITY STANDARDS (TAS).
4) REFER TO "METRO BUS STOP CONCRETE DETAILS" FOR EXPANSION AND CONTROL JOINTS INSTALLATION.
5) 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 (F) (6" THICK).
6) PROGRAMMING AREAS (P) MAY INCLUDE LANDSCAPING, BIKE PARKING, UTILITIES, STREET FURNITURE, ETC. AS DEEMED ALLOWABLE BY METRO.
7) SHOW EXISTING PRIVATE AND PUBLIC UTILITIES. ADJUST VALVES AND PULLBOXES IF NEEDED. AVOID UTILITY CONFLICTS IN AREAS MARKED "L." VERTICAL UTILITIES MAY EXIST IN AREAS MARKED "P." IDENTIFY AND PROTECT EXISTING GAS PIPELINES OR VALVES WITHIN THE WORK AREA.
8) CONTRACTOR TO AVOID DAMAGE TO ANY PRIVATE PROPERTY AND/OR TREES.
9) CONTRACTOR TO CONTACT METRO AT (713) 615-6195 ONCE FOUNDATION (F) AND LANDING (L) ARE COMPLETELY IN-PLACE.

Area	Paving Thickness	Running Slope	Cross Slope
Landing (L)	4.5"	Match Street	2% max
Bus Shelter Area (F)^	9"	2% max	2% max
Transition Area (T)	4.5"	5% max	2% max
Sidewalk (S)	4.5"	5% max	2% max*
Programming Areas (P)	4.5" (Optional)	2% max	2% max

*Except to match existing
^See METRO Foundation Details Type I, II, and IV



* 0' FOR SITES WHERE STOP FOR ONLY 40' BUS IS FEASIBLE

METRO

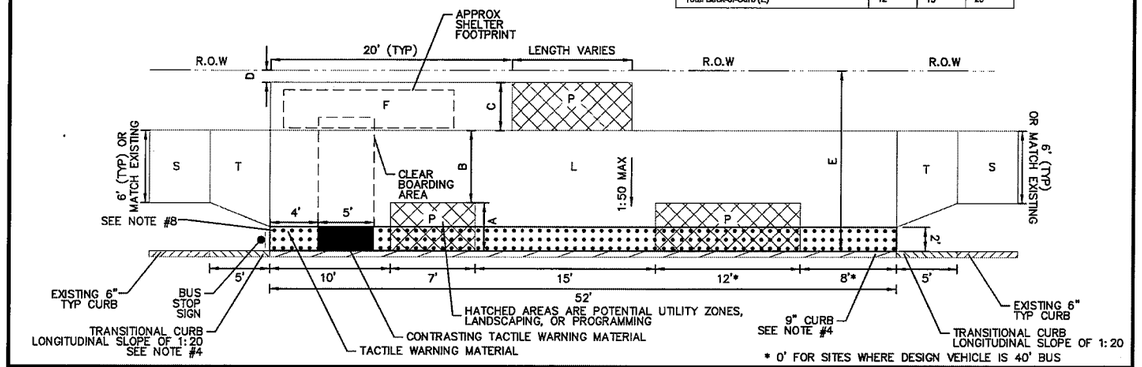
METRO BUS STOP DETAIL
6 INCH CURB WITH CONSTRAINED ROW

NOTES:
1) LOCATION OF BUS STOP LONGITUDINALLY ALONG THE ROADWAY SHOULD ACCOUNT FOR THE CRITICAL SHELTER OBSTRUCTION TO LINE OF SIGHT AND OTHER GUIDELINES SET FORTH IN METRO TRANSIT DESIGN STANDARDS.
2) CLEAR SIDEWALK (S) SHALL BE A MINIMUM OF 5' WIDE IF THE DISTANCE BETWEEN BACK-OF-CURB AND ROW LINE (E) IS LESS THAN 12', SEE "METRO BUS STOP DETAIL-9 INCH CURB WITH CONSTRAINED ROW" TO ACCOMMODATE 5' SIDEWALK.
3) THE SIDEWALK TRANSITION (T) FROM THE LANDING (L) TO EXISTING SIDEWALK SHOULD NOT HAVE A LONGITUDINAL SLOPE GREATER THAN 5% OR CROSS SLOPE GREATER THAN 2% EXCEPT TO MATCH EXISTING CROSS SLOPE. THE TRANSITION (T) SHOULD BE MINIMUM 5' LONG OR MAY BE LENGTHENED TO MITIGATE EXCESSIVE SLOPE. FOLLOW GUIDELINES COMPLIANT WITH AMERICANS WITH DISABILITIES ACT (ADA) AND TEXAS ACCESSIBILITY STANDARDS (TAS).
4) REFER TO "METRO BUS STOP CONCRETE DETAILS" FOR REBAR REQUIREMENTS FOR 9 INCH AND TRANSITIONAL CURB AND EXPANSION AND CONTROL JOINTS.
5) 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 (F) (6" THICK).
6) PROGRAMMING AREAS (P) MAY INCLUDE LANDSCAPING, BIKE PARKING, UTILITIES, STREET FURNITURE, ETC. AS DEEMED ALLOWABLE BY METRO.
7) THE LANDING AREA (L) SHALL CONTAIN REINFORCING TRANSVERSE STEEL #4 BAR CONTINUOUS 12" C-C (TYP) AND LONGITUDINAL STEEL #4 BAR CONTINUOUS 12" C-C (TYP).
8) TACTILE WARNING MATERIAL SHALL EXTEND ALONG TRANSITIONAL CURB WHERE SIDEWALK PAVING MEETS TRANSITIONAL CURB.
9) SHOW EXISTING PRIVATE AND PUBLIC UTILITIES. ADJUST VALVES AND PULLBOXES IF NEEDED. AVOID UTILITY CONFLICTS IN AREAS MARKED "L." VERTICAL UTILITIES MAY EXIST IN AREAS MARKED "P." IDENTIFY AND PROTECT EXISTING GAS PIPELINES OR VALVES WITHIN THE WORK AREA.
10) CONTRACTOR TO AVOID DAMAGE TO ANY PRIVATE PROPERTY AND/OR TREES.
11) CONTRACTOR TO CONTACT METRO AT (713) 615-6195 ONCE FOUNDATION (F) AND LANDING (L) ARE COMPLETELY IN-PLACE.

Area	Paving Thickness	Running Slope	Cross Slope
Landing (L)	4.5"	Match Street	2% max
Bus Shelter Area (F)^	9"	2% max	2% max
Transition Area (T)	4.5"	5% max	2% max
Sidewalk (S)	4.5"	5% max	2% max*
Programming Areas (P)	4.5" (Optional)	2% max	2% max

*Except to match existing
^See METRO Foundation Details Type I, II, and IV

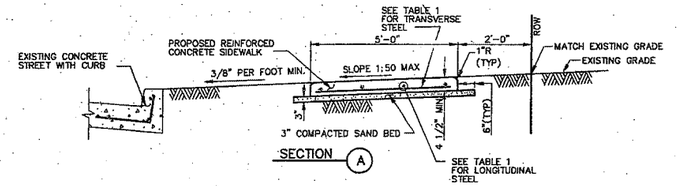
Dimension	Minimum	Standard	Preferred
Warning/safety buffer/programming (A)	2'	4'	6'
Clear sidewalk (B)	5'	6'	10'
Shelter/amenity zone (C)	4'	4'	8'
ROW buffer (D)	1'	1'	1'
Total Back-of-Curb (E)	12'	15'	25'

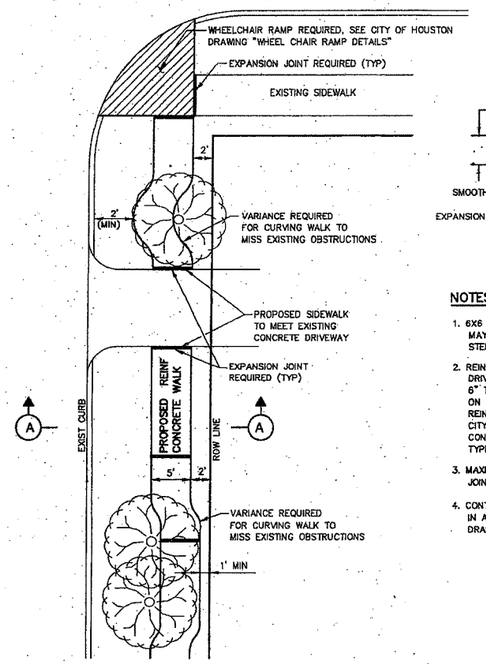


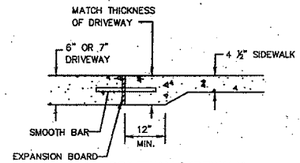
* 0' FOR SITES WHERE DESIGN VEHICLE IS 40' BUS

METRO

METRO BUS STOP DETAIL
9 INCH CURB WITH STANDARD ROW







DRIVEWAY/SIDEWALK HEADER DETAIL

NOTES:

1. 6X6 – W2.9XW2.9 WELDED WIRE FABRIC MAY BE USED IN LIEU OF THE REINFORCING STEEL GIVEN IN TABLE 1.
2. REINFORCED CONCRETE SIDEWALKS THRU DRIVEWAYS OPENINGS SHALL BE EITHER 6" THICK OR 7" THICK AS SPECIFIED ON 6" STABILIZED SUBGRADE. FOR THE REINFORCING STEEL REQUIREMENTS, SEE CITY OF HOUSTON DRAWING "REINFORCED CONCRETE DRIVEWAY DETAILS ON CURB TYPE STREETS".
3. MAXIMUM SPACING FOR EXPANSION JOINTS SHALL BE 40 FEET.
4. CONTRACTOR SHALL CONSTRUCT SIDEWALK IN A MANNER NOT TO BLOCK THE NATURAL DRAINAGE FROM ADJACENT PROPERTY.

TABLE 1

REINFORCING STEEL INFORMATION
FOR 4 ½ " THICK SIDEWALKS
EXPANSION JOINT SPACING = 40 FT
fc' = 3,000 PSI AND fy = 60,000 PSI

SIDEWALK THICKNESS (IN)	SIDEWALK WIDTH (FT)	LONGITUDINAL STEEL #3 BARS			TRANSVERSE STEEL #3 BARS SPACING (IN)
		NUMBER OF BARS	SPACING (IN)	END BAR SPACING (IN)	
4.5	6	3	18	3	18

CONCRETE SIDEWALK DETAIL
FOR STREETS WITH CURBS
N. T. S.

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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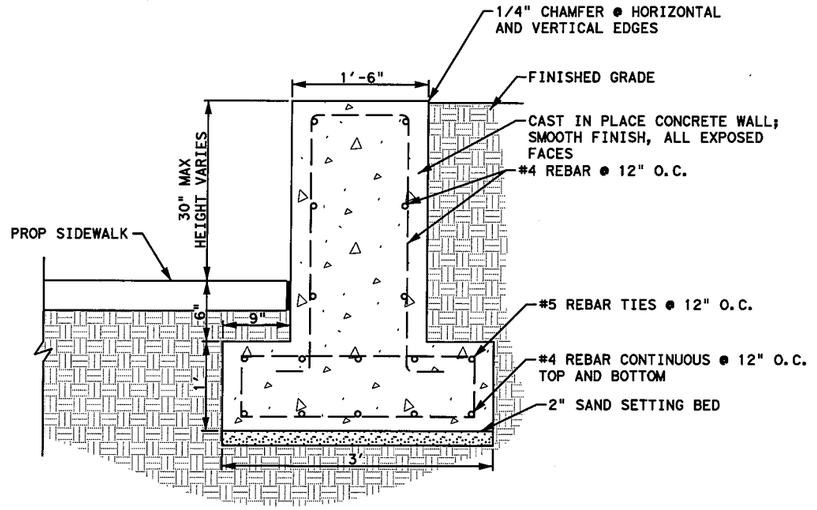
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

SIDEWALK DETAILS

SHEET 1 OF 1

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWN:	HOU	HARRIS	0912	72	391	170



RETAINING WALL DETAIL
N.T.S.

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

RETAINING WALL DETAIL

SHEET 1 OF 1

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	171

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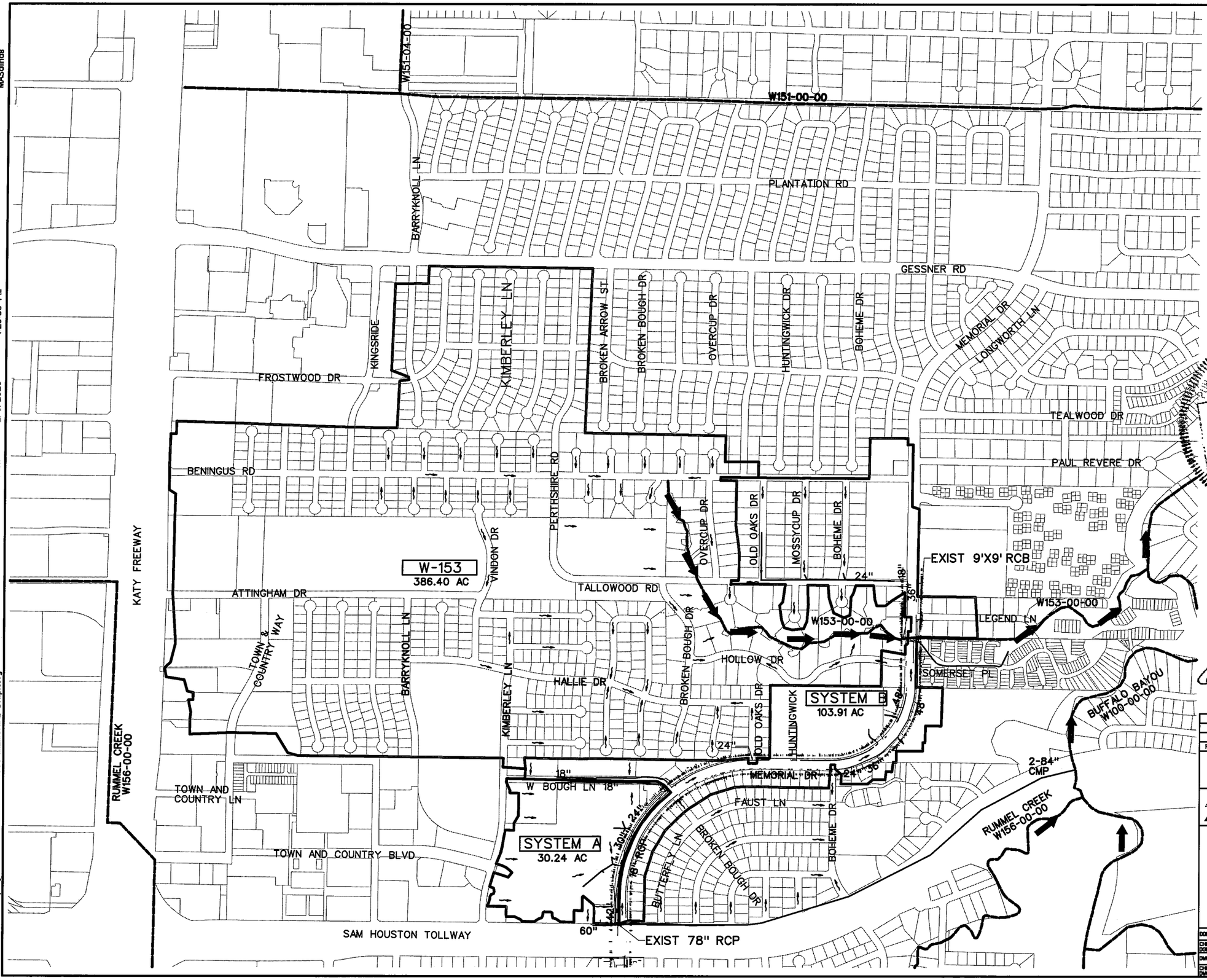

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

EXISTING OVERALL DRAINAGE AREA MAP

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	172

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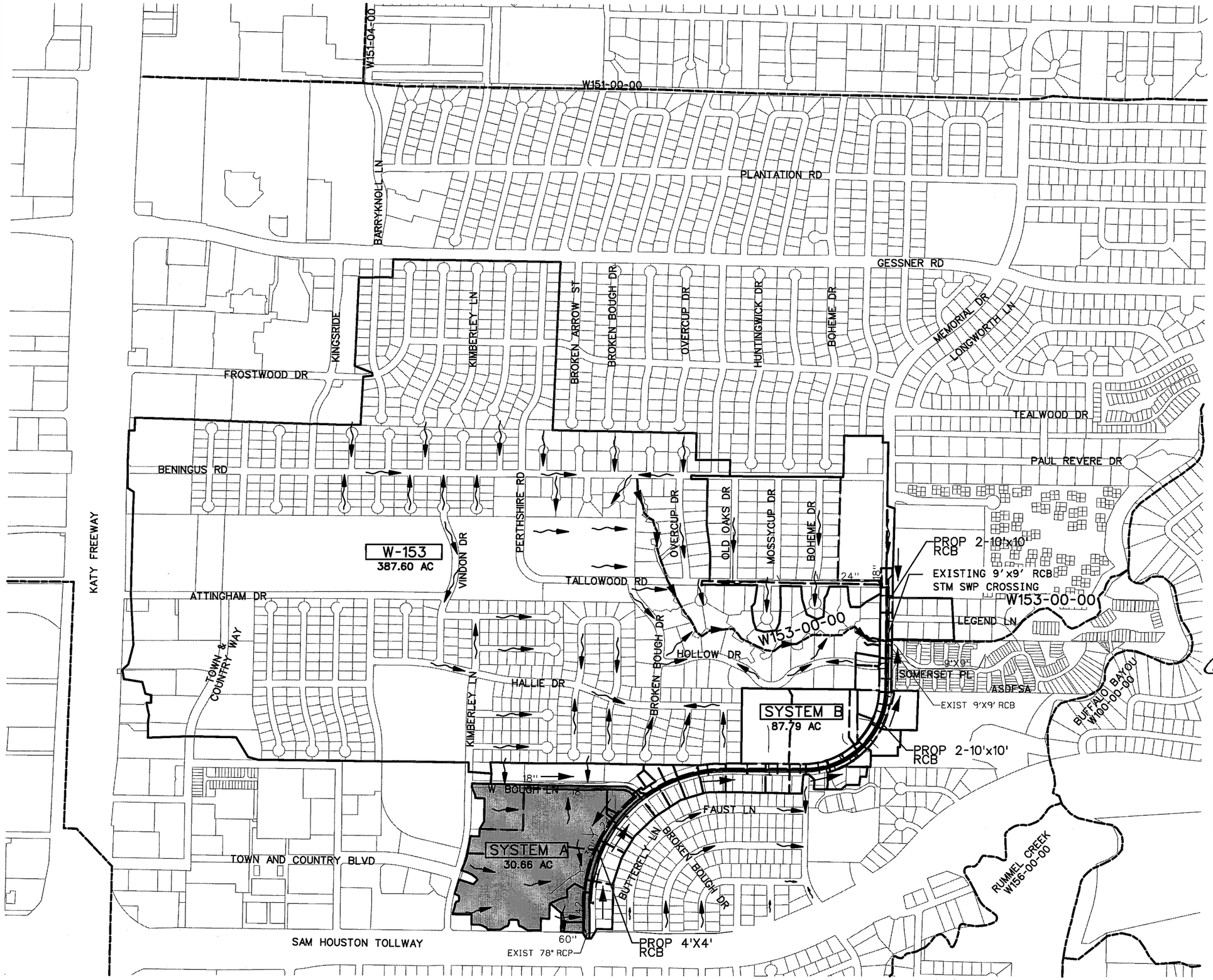

LEGEND

- DRAINAGE AREA
- DIRECTION OF OVERLAND FLOW
- DIRECTION OF STORM SEWER FLOW
- STREAM
- DRAINAGE SYSTEM A BOUNDARY
- DRAINAGE SYSTEM B BOUNDARY

NOTES:

1. DRAINAGE AREA RUNOFFS ARE CALCULATED USING RATIONAL METHOD. REFER TO THE FINAL DRAINAGE IMPACT ANALYSIS REPORT AUGUST 2019 PREPARED BY LOCKWOOD, ANDREWS, & NEWNAM, INC.
2. FOR INTERNAL DRAINAGE AREAS, SEE DRAINAGE AREA MAPS.

ACCEPTED AND FILED
67862
N

0 200 400 800
(IN FEET)
1 INCH = 400 FEET

STATE OF TEXAS
WEIMIN LI
88740
LICENSED PROFESSIONAL ENGINEER

2-6-20

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

PROPOSED OVERALL DRAINAGE AREA MAP

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	173

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SAM HOUSTON TOLLWAY

EXIST 60" RCP

EXIST 78" RCP

MEMORIAL DRIVE

5+00

EXIST 42" RCP

EXIST 30" RCP

EXIST 24" RCP

0+00

MATCHLINE SEE STA 11+00

A-01

A-02

A-03

A-04

A-OUT
30.66
73.47

MA-01
30.66
73.62

MH-A-3

MH-22
1.81
3.84

MH-21
1.81
3.84

MH-19
3.16
6.29

MH-58
3.16
6.29

MH-A03
28.43
69.33

MH-A04
15.18
37.87

A-123

A-127

A-130

A-132

B-131

B-126

B-139

YD-1

YD-2

YD-3

LEGEND

MH•
AREA
FLOW

MANHOLE NUMBER
TOTAL CUMULATIVE AREA (AC)
2-YR Q (CFS)

B--

DRAINAGE AREA

B--

INLET ID

EXISTING STORM SEWER

2 YR FLOW DIRECTION

SYSTEM DRAINAGE BOUNDARY

DRAINAGE AREA

NOTE:

1. REFER TO THE DRAINAGE IMPACT ANALYSIS REPORT AUGUST 2019 PREPARED BY LOCKWOOD, ANDREWS & NEWMAN, INC. FOR ADDITIONAL HYDROLOGIC AND HYDRAULIC INFORMATION.

PROFESSIONAL ENGINEER
ACCEPTED AND FILED
67862

0 80 160
(IN FEET)
SCALE: PLAN 1" = 80'

STATE OF TEXAS
WEIMIN LI
88740
LICENSED PROFESSIONAL ENGINEER
2-6-20

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

PROPOSED DRAINAGE AREA MAP

SHEET 1 OF 5

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	174

MH-A05
4.94
12.62

A-123A

A-05

A-04

A-08

A-07

A-123B

MATCHLINE SEE STA 11+00

W BOUGH DR.

B-15

TAYLORCREST RD.

MH-A01
4.51
11.77

MH-A08

A-08

A-07

A-123B

B-139

B-139

MH-46
5.47
14.08

MH-75
3.82
7.34

MH-16
5.15
9.76

B-122

B-122

MH-47
0.24
.711

B-15

B-14

15+00

MH-15
5.15
9.76

B-14

BROKEN BOUGH DR.

MH-28
5.15
9.76

MH-14A
11.61
23.77

B-120

MH-81
10.62
22.19

BUTTERFLY LN.

MH-70
10.86
22.59

B-118

B-120

B-119

B-119

MH-13
13.30
26.69

MH-14B
12.23
24.97

B-118

B-117

B-117

B-116A

MEMORIAL DRIVE

COBBLESTONE DR

BROKEN BOUGH DR.

FAUST LN.

MH-12A
14.39
28.14

B-115A

B-116A

B-115A

MATCHLINE SEE STA 20+00

LEGEND

MH• / AREA / FLOW — MANHOLE NUMBER; TOTAL CUMULATIVE AREA (AC); 2-YR Q (CFS)

B-- — DRAINAGE AREA

B-- — INLET ID

EXISTING STORM SEWER

2 YR FLOW DIRECTION

SYSTEM DRAINAGE BOUNDARY

DRAINAGE AREA

NOTE:

1. REFER TO THE DRAINAGE IMPACT ANALYSIS REPORT AUGUST 2019 PREPARED BY LOCKWOOD, ANDREWS & NEWMAN, INC. FOR ADDITIONAL HYDROLOGIC AND HYDRAULIC INFORMATION.

0 80 160

(IN FEET)

SCALE: PLAN 1": 80'

STATE OF TEXAS
WEIMIN LI
88740
LICENSED PROFESSIONAL ENGINEER

2-6-20

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

PROPOSED DRAINAGE AREA MAP

SHEET 2 OF 5

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CK: DWG:	HOU	HARRIS	0912	72	391	175

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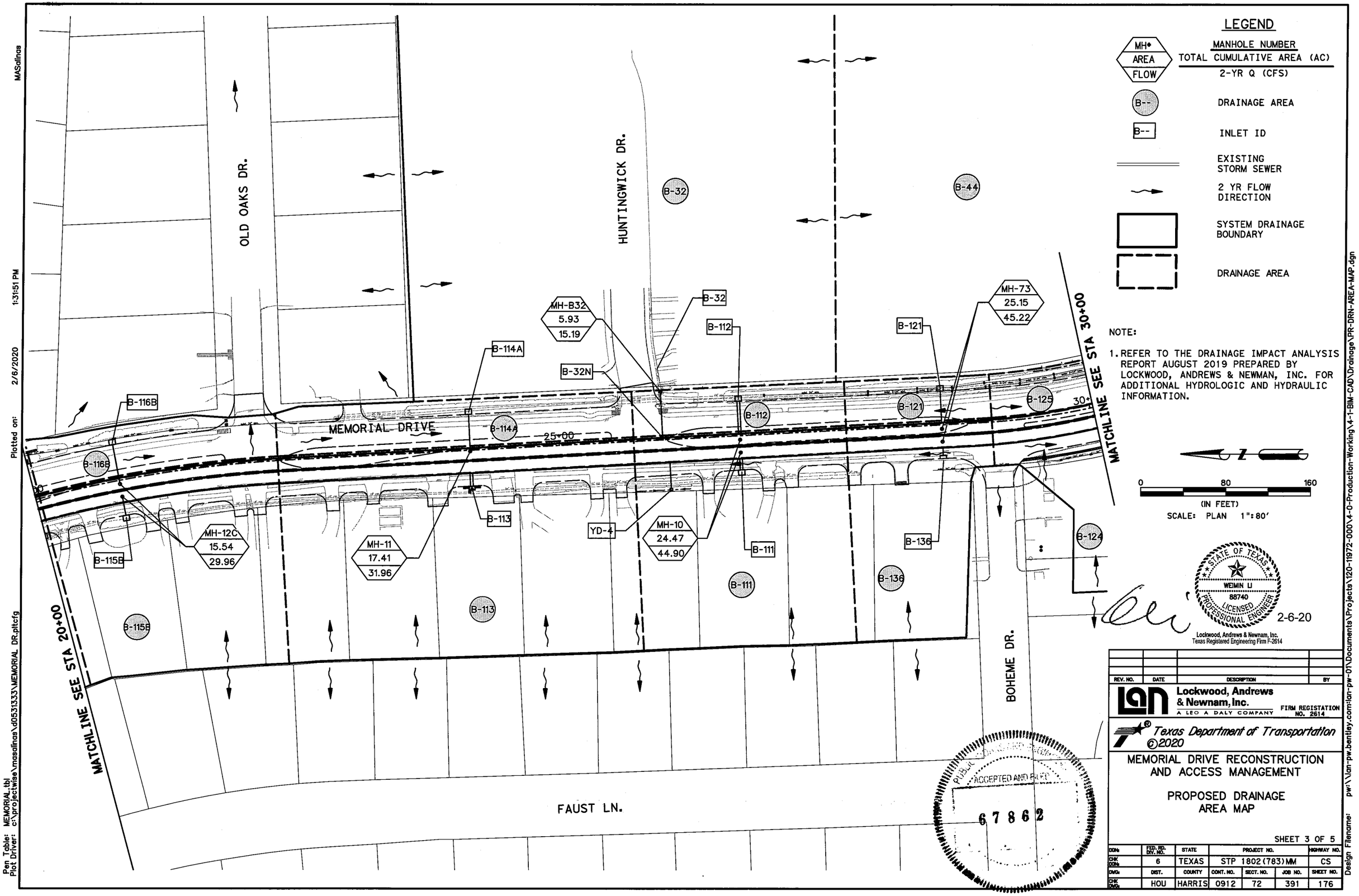

LEGEND

- MH# / AREA / FLOW — MANHOLE NUMBER; TOTAL CUMULATIVE AREA (AC); 2-YR Q (CFS)
- B-- — DRAINAGE AREA
- B-- — INLET ID
- EXISTING STORM SEWER
- 2 YR FLOW DIRECTION
- SYSTEM DRAINAGE BOUNDARY
- DRAINAGE AREA

NOTE:

1. REFER TO THE DRAINAGE IMPACT ANALYSIS REPORT AUGUST 2019 PREPARED BY LOCKWOOD, ANDREWS & NEWMAN, INC. FOR ADDITIONAL HYDROLOGIC AND HYDRAULIC INFORMATION.

0 80 160

(IN FEET)

SCALE: PLAN 1": 80'

STATE OF TEXAS
WEIMIN LI
88740
LICENSED PROFESSIONAL ENGINEER

2-6-20

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

PROPOSED DRAINAGE AREA MAP

SHEET 3 OF 5

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	176

ACCEPTED AND FILED FOR PUBLIC USE
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MATCHLINE SEE STA 30+00

MATCHLINE SEE STA 40+00

MEMORIAL DRIVE

RIP VAN WINKLE DR.

FAUST LN.

B-125 YD-5 MH-08 25.92 45.86 B-124 M-09N B-124 B-125 MH-09 0.60 .50 YD-6 MH-07B 27.16 48.20 MH-B44 6.82 17.37 B-44 W153 MH-B41 1.09 3.02 B-110 B-110 B-109 B-41 B-41N B-50N B-41 B-44 MH-108 7.50 18.94 MH-B50 0.42 1.19 MH-B58 0.67 1.90 B-58 B-58 MH-07A 27.90 48.79 B-50 B-109 B-107 B-108 B52 MH-80 0.39 1.11 B-56 B-63 B52 B-56 MH-B56-1 0.85 2.37 MH-B56 38.47 66.93 MH-05 41.03 71.21 B-50 MH-06 36.15 63.77 B108 B-106 B-107 B-55N B-61N B-106 B-104 B-55 MH-B55 1.09 3.01 MH-B52 37.62 65.41 MH-B61-2 MH-B61-1 B-105 B-61-3N B-55 MH-B61 1.83 4.96 B-105 B-61 MH-B61-3 B-61

LEGEND

MH# / AREA / FLOW	MANHOLE NUMBER / TOTAL CUMULATIVE AREA (AC) / 2-YR Q (CFS)
B--	DRAINAGE AREA
B--	INLET ID
	EXISTING STORM SEWER
	2 YR FLOW DIRECTION
	SYSTEM DRAINAGE BOUNDARY
	DRAINAGE AREA

NOTE:

1. REFER TO THE DRAINAGE IMPACT ANALYSIS REPORT AUGUST 2019 PREPARED BY LOCKWOOD, ANDREWS & NEWMAN, INC. FOR ADDITIONAL HYDROLOGIC AND HYDRAULIC INFORMATION.

0 80 160

(IN FEET)

SCALE: PLAN 1": 80'

PROFESSIONALLY PREPARED BY PUBLIC WORKS AND TRANSPORTATION 67862

STATE OF TEXAS WEIMIN LI 88740 LICENSED PROFESSIONAL ENGINEER

2-6-20

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

PROPOSED DRAINAGE AREA MAP

SHEET 4 OF 5

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	177

Plotted on: MASdlinas 2/6/2020 1:31:55 PM

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DDFile

Plotted on: 2/20/2020 8:21:29 AM

Pen Table: MEMORIAL.tbl
Plot Driver: c:\projectwise\ddfile\d0531333\MemorialDr.pltcfg

LEGEND

- MH• / AREA / FLOW — MANHOLE NUMBER; TOTAL CUMULATIVE AREA (AC); 2-YR Q (CFS)
- B-- — DRAINAGE AREA
- B-- — INLET ID
- EXISTING STORM SEWER
- 2 YR FLOW DIRECTION
- SYSTEM DRAINAGE BOUNDARY
- DRAINAGE AREA

0 80 160
(IN FEET)
SCALE: PLAN 1": 80'

NOTE:

1. REFER TO THE DRAINAGE IMPACT ANALYSIS REPORT AUGUST 2019 PREPARED BY LOCKWOOD, ANDREWS & NEWMAN, INC. FOR ADDITIONAL HYDROLOGIC AND HYDRAULIC INFORMATION.

STATE OF TEXAS
WEIMIN LI
88740
LICENSED PROFESSIONAL ENGINEER
2-6-20

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
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67862

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

PROPOSED DRAINAGE AREA MAP

SHEET 5 OF 5

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	178

Design Filename: pw:\\lan-pw.bentley.com:lan-pw-01\Documents\Projects\120-11972-000\4-0-Production-Working\4-1-BIM-CAD\Drainage\PR-DRN-AREA-MAP.dgn

SYSTEM A - PROPOSED RUNOFF COMPUTATION

Drainage Area ID	Drainage Area (AC)	Runoff Coefficient Weighted C Value	Time of Concentration (MIN)	Time of Concentration Used (MIN)	2-Year Intensity (IN/HR)	10-Year Intensity (IN/HR)	100-Year Intensity (IN/HR)	2-Year Peak Discharge (CFS)	10-Year Peak Discharge (CFS)	100-Year Peak Discharge (CFS)
A-01	0.35	0.80	23.30	23.30	3.62	5.40	8.33	1.00	1.49	2.30
A-02	1.29	0.80	25.46	25.46	3.44	5.15	7.97	3.55	5.31	8.23
A-03	12.86	0.80	30.68	30.68	3.08	4.64	7.25	31.65	47.72	74.53
A-04	10.03	0.80	30.01	30.01	3.12	4.70	7.33	25.02	37.69	58.81
A-05	0.09	0.80	21.51	21.51	3.78	5.63	8.65	0.26	0.39	0.60
A-07	0.70	0.80	24.40	24.40	3.52	5.27	8.14	1.98	2.96	4.57
A-08	3.81	0.80	27.66	27.66	3.27	4.92	7.65	9.98	14.99	23.30
A-123A	0.21	0.82	22.61	22.61	3.68	5.48	8.45	0.64	0.96	1.47
A-123B	0.34	0.84	23.28	23.28	3.62	5.40	8.33	1.04	1.55	2.39
A-127	0.40	0.84	23.50	23.50	3.60	5.37	8.29	1.19	1.77	2.74
A-130	0.12	0.82	21.92	21.92	3.74	5.57	8.57	0.38	0.56	0.86
A-132	0.47	0.86	23.76	23.76	3.58	5.34	8.25	1.45	2.17	3.34

SYSTEM B - PROPOSED RUNOFF COMPUTATION

Drainage Area ID	Drainage Area (AC)	Runoff Coefficient Weighted C Value	Time of Concentration (MIN)	Time of Concentration Used (MIN)	2-Year Intensity (IN/HR)	10-Year Intensity (IN/HR)	100-Year Intensity (IN/HR)	2-Year Peak Discharge (CFS)	10-Year Peak Discharge (CFS)	10-Year Peak Discharge (CFS)
B-14	0.24	0.80	22.80	22.80	3.66	5.46	8.42	0.71	1.06	1.63
B-15	5.47	0.80	28.49	28.49	3.22	4.84	7.53	14.08	21.17	32.96
B-32	5.93	0.80	28.68	28.68	3.21	4.82	7.51	15.19	22.84	35.57
B-41	1.09	0.80	25.16	25.16	3.46	5.18	8.02	3.02	4.53	7.01
B-44	6.82	0.80	29.03	29.03	3.18	4.79	7.46	17.37	26.13	40.72
B-50	0.42	0.80	23.57	23.57	3.59	5.37	8.28	1.19	1.78	2.75
B-52	0.39	0.80	23.46	23.46	3.60	5.38	8.30	1.11	1.66	2.57
B-55	1.09	0.80	25.15	25.15	3.46	5.18	8.02	3.01	4.51	6.98
B-56	0.85	0.80	24.72	24.72	3.50	5.23	8.09	2.37	3.55	5.49
B-58	0.67	0.80	24.33	24.33	3.53	5.28	8.16	1.90	2.84	4.39
B-61	1.83	0.80	26.13	26.13	3.39	5.08	7.87	4.97	7.45	11.55
B-63	0.94	0.54	24.89	24.89	3.48	5.21	8.06	1.76	2.64	4.09
B-64	0.42	0.54	23.57	23.57	3.59	5.37	8.28	0.81	1.21	1.86
B-69	0.68	0.64	24.36	24.36	3.53	5.27	8.15	1.53	2.29	3.54
B-70	22.76	0.54	32.34	32.34	2.98	4.50	7.05	36.76	55.52	86.91
B-70-2	0.01	0.72	19.07	19.07	4.04	5.98	9.14	0.02	0.03	0.04
B-71	4.69	0.54	28.13	28.13	3.24	4.87	7.58	8.21	12.34	19.20
B-73	4.09	0.54	27.82	27.82	3.26	4.90	7.63	7.21	10.83	16.85
B-76	10.77	0.80	30.20	30.20	3.11	4.68	7.31	26.86	40.48	63.18
B-101	0.44	0.87	23.65	23.65	3.59	5.36	8.27	1.37	2.05	3.16
B-102	0.45	0.71	23.68	23.68	3.58	5.35	8.26	1.13	1.69	2.62
B-103	0.33	0.84	23.23	23.23	3.62	5.41	8.34	1.00	1.49	2.30
B-104	0.34	0.75	23.26	23.26	3.62	5.40	8.33	0.91	1.36	2.09
B-105	0.40	0.77	23.50	23.50	3.60	5.37	8.29	1.10	1.64	2.53
B-106	0.33	0.82	23.23	23.23	3.62	5.41	8.34	0.98	1.46	2.26
B-107	0.35	0.82	23.32	23.32	3.61	5.40	8.32	1.04	1.55	2.39
B-108	0.40	0.81	23.51	23.51	3.60	5.37	8.29	1.16	1.73	2.67
B-109	0.33	0.81	23.21	23.21	3.62	5.41	8.34	0.95	1.42	2.19
B-110	0.15	0.80	22.14	22.14	3.72	5.54	8.53	0.44	0.65	1.00
B-111	0.94	0.62	24.89	24.89	3.48	5.21	8.06	2.03	3.04	4.70
B-112	0.20	0.84	22.50	22.50	3.69	5.50	8.47	0.60	0.90	1.38
B-113	1.53	0.63	25.78	25.78	3.41	5.11	7.93	3.28	4.91	7.62
B-114A	0.34	0.83	23.28	23.28	3.62	5.40	8.33	1.03	1.53	2.37
B-115A	0.74	0.64	24.49	24.49	3.52	5.26	8.13	1.65	2.47	3.82
B-115B	0.91	0.64	24.85	24.85	3.49	5.22	8.07	2.04	3.05	4.72
B-116A	0.34	0.84	23.29	23.29	3.62	5.40	8.33	1.05	1.57	2.42
B-116B	0.24	0.81	22.79	22.79	3.66	5.46	8.42	0.72	1.08	1.66
B-117	0.71	0.64	24.42	24.42	3.52	5.27	8.14	1.59	2.37	3.67
B-118	0.37	0.82	23.39	23.39	3.61	5.39	8.31	1.09	1.62	2.51
B-119	0.75	0.64	24.50	24.50	3.51	5.26	8.13	1.67	2.49	3.85
B-120	0.62	0.81	24.19	24.19	3.54	5.29	8.18	1.77	2.65	4.10
B-121	0.13	0.83	21.99	21.99	3.73	5.56	8.56	0.40	0.60	0.92
B-122	1.33	0.64	25.52	25.52	3.43	5.14	7.97	2.90	4.34	6.72
B-124	0.60	0.67	24.14	24.14	3.54	5.30	8.19	1.41	2.11	3.26
B-125	0.18	0.82	22.40	22.40	3.70	5.51	8.49	0.55	0.82	1.26
B-126	1.35	0.63	25.55	25.55	3.43	5.14	7.96	2.91	4.36	6.76
B-131	1.81	0.63	26.10	26.10	3.39	5.08	7.88	3.84	5.76	8.93
B-133	0.45	0.80	23.69	23.69	3.58	5.35	8.26	1.28	1.91	2.95
B-134	0.41	0.80	23.54	23.54	3.60	5.37	8.29	1.17	1.75	2.71
B-136	0.55	0.64	24.00	24.00	3.56	5.31	8.21	1.24	1.85	2.86
B-139	0.67	0.63	24.31	24.31	3.53	5.28	8.16	1.48	2.22	3.43
W-153	387.60	0.52	70.00	70.00	1.79	2.76	4.45	360.72	557.14	897.66

STATE OF TEXAS
WEIMIN LI
88740
LICENSED
PROFESSIONAL ENGINEER

2-6-20

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

PROPOSED SYSTEM A & B RUNOFF COMPUTATION

SHEET 1 OF 13

67862

FED. RD. DIV. NO.	STATE	PROJECT NO.	HIGHWAY NO.
6	TEXAS	STP 1802(783)MM	CS

DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
HOU	HARRIS	0912	72	391	179

MASalinas
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SYSTEM A - PROPOSED 2-YR NODE SUMMARY

NODE ID	NODE TYPE	CUMULATIVE C-Value	CUMULATIVE AREA (AC)	CUMULATIVE TC (MIN)	CUMULATIVE INTENSITY (IN/HR)	SUPPLIED DISCHARGE (CFS)	CUMULATIVE DISCHARGE (CFS)	JUNCTION LOSS (FT)
A-OUT	Outlet	0.80	30.66	32.88	0.00	0	0.00	2.18
MA-01	Junction	0.80	30.66	32.87	3.00	0	73.64	0.74
A-01	Junction	0.80	0.35	23.30	3.62	0	1.00	0.16
MH-A-3	Junction	0.80	30.31	32.78	3.00	0	72.81	0.05
A-132	Curb	0.80	30.31	32.08	3.00	0	72.81	0.07
A-02	Other	0.80	1.29	25.46	3.44	0	3.55	0.02
A-130	Curb	0.80	28.55	31.77	3.04	0	69.63	0.03
MH-A03	Junction	0.80	28.43	31.24	3.04	0	69.33	0.34
A-03	Other	0.80	12.86	30.68	3.08	0	31.65	0.34
A-127	Curb	0.80	15.57	30.70	3.08	0	38.42	0.01
MH-A04	Junction	0.80	15.18	30.09	3.11	0	37.87	0.25
A-04	Other	0.80	10.03	30.01	3.12	0	25.02	0.99
A-123A	Curb	0.80	5.15	29.16	3.17	0	13.13	0.00
MH-A05	Junction	0.80	4.94	29.01	3.18	0	12.62	0.00
A-05	Other	0.80	0.09	21.51	3.78	0	0.26	0.00
A-123B	Curb	0.80	4.85	28.62	3.21	0	12.50	0.01
MH-A01	Junction	0.80	4.51	27.90	3.26	0	11.77	0.02
MH-A08	Junction	0.80	4.51	27.84	3.26	0	11.77	0.00
A-07	Junction	0.80	0.70	24.40	3.52	0	1.98	0.17
A-08	Junction	0.80	3.81	27.66	3.27	0	9.98	0.50

SYSTEM B - PROPOSED 2-YR NODE SUMMARY

NODE ID	NODE TYPE	CUMULATIVE C-Value	CUMULATIVE AREA (AC)	CUMULATIVE TC (MIN)	CUMULATIVE INTENSITY (IN/HR)	SUPPLIED DISCHARGE (CFS)	CUMULATIVE DISCHARGE (CFS)	JUNCTION LOSS (FT)
OUT-B	Outlet	0.55	475.38	70.03	0.00	0	0.00	0.05
W-153	Other	0.55	475.38	70.00	1.79	0	469.09	0.93
N-R2	Junction	0.62	44.74	35.07	2.84	0	78.14	3.37
N-R1	Other	0.75	43.05	52.14	2.21	0	72.69	0.31
MH-B73	Junction	0.54	4.09	27.91	3.26	0	7.21	0.01
MH-B61	Other	0.00	0.00	0.00	0.00	0.5	0.50	0.00
MH-B61	Other	0.00	0.00	0.00	0.00	0.5	0.50	0.00
MH-B61-	Other	0.00	0.00	0.82	0.00	0	0.50	0.00
MH-B61	Other	0.80	1.83	26.40	3.39	0	4.97	0.41
MH-B58	Junction	0.80	0.67	24.41	3.53	0	1.90	0.00
MH-B56-	Junction	0.80	0.85	24.84	3.50	0	2.37	0.04
B-61N	Junction	0.75	37.62	48.92	2.29	0	65.44	0.00
MH-B55	Junction	0.80	1.09	25.23	3.46	0	3.01	0.00
MH-B52	Junction	0.75	37.62	48.38	2.30	0	65.41	0.00
MH-B50	Junction	0.80	0.42	23.65	3.59	0	1.19	0.01
MH-B44	Junction	0.80	6.82	29.18	3.18	0	17.37	0.31
MH-B41	Junction	0.80	1.09	25.28	3.46	0	3.02	0.01
MH-B32	Junction	0.80	5.93	28.72	3.21	0	15.19	0.03
MH-81	Junction	0.72	10.62	33.60	2.91	0	22.19	0.00
MH-80	Other	0.80	0.39	23.64	3.60	0	1.11	0.04
MH-75	Junction	0.63	3.82	31.08	3.05	0	7.34	0.03
MH-73	Junction	0.73	25.15	43.36	2.48	0	45.22	0.01
MH-70	Junction	0.72	10.86	33.97	2.89	0	22.59	0.01
MH-69B	Junction	0.64	0.68	24.55	3.53	0	1.53	0.00
MH-69A	Junction	0.64	0.68	24.69	3.53	0	1.53	0.00
MH-58	Junction	0.63	3.16	29.96	3.17	0	6.29	0.01
MH-47	Junction	0.80	0.24	22.90	3.66	0	0.71	0.02
MH-46	Junction	0.80	5.47	28.52	3.22	0	14.08	0.10
MH-41	Junction	0.54	22.76	32.44	2.98	0	36.76	0.18
MH-40	Junction	0.63	33.54	32.47	2.97	0	62.38	0.33
MH-39	Junction	0.62	38.23	32.51	2.97	0	69.86	1.29
MH-38	Junction	0.75	43.05	51.35	2.21	0	72.69	0.00
MH-37	Junction	0.75	42.63	51.04	2.22	0	72.48	0.00
MH-28	Junction	0.63	5.15	33.32	3.01	0	9.76	0.05
MH-22	Junction	0.63	1.81	26.24	3.39	0	3.84	0.08
MH-21	Junction	0.63	1.81	27.44	3.39	0	3.84	0.00
MH-19	Junction	0.63	3.16	29.16	3.17	0	6.29	0.07
MH-16	Junction	0.63	5.15	31.88	3.01	0	9.76	0.10
MH-15	Junction	0.63	5.15	32.75	3.01	0	9.76	0.01
MH-14B	Junction	0.72	12.23	34.96	2.84	0	24.97	0.01
MH-14A	Junction	0.71	11.61	34.42	2.87	0	23.77	0.01
MH-13	Junction	0.72	13.30	35.82	2.80	0	26.69	0.02
MH-12C	Junction	0.71	15.54	37.82	2.70	0	29.96	0.02
MH-12A	Junction	0.72	14.39	37.19	2.73	0	28.14	0.01
MH-11	Junction	0.71	17.41	40.37	2.59	0	31.96	0.01
MH-108	Junction	0.80	7.50	29.39	3.16	0	18.94	0.13
MH-10	Junction	0.73	24.47	42.16	2.52	0	44.90	0.01

SYSTEM B - PROPOSED 2-YR NODE SUMMARY

NODE ID	NODE TYPE	CUMULATIVE C-Value	CUMULATIVE AREA (AC)	CUMULATIVE TC (MIN)	CUMULATIVE INTENSITY (IN/HR)	SUPPLIED DISCHARGE (CFS)	CUMULATIVE DISCHARGE (CFS)	JUNCTION LOSS (FT)
MH-09	Junction	0.00	0.00	0.00	0.00	0.5	0.50	0.00
MH-08	Junction	0.73	25.92	44.39	2.44	0	45.86	0.00
MH-07B	Junction	0.73	27.16	45.90	2.41	0	48.20	0.00
MH-07A	Junction	0.73	27.90	46.41	2.37	0	48.79	0.00
MH-06	Junction	0.75	36.15	47.15	2.34	0	63.77	0.05
MH-05	Junction	0.75	41.03	49.38	2.27	0	71.21	0.00
MH-04	Junction	0.75	41.69	50.57	2.24	0	71.78	0.00
MH-03	Junction	0.62	38.91	32.54	2.97	0	71.11	0.00
MH-02	Junction	0.62	39.77	32.98	2.94	0	72.54	0.00
MH-01	Junction	0.62	44.74	35.01	2.84	0	78.14	0.00
M-09N	Other	0.73	25.92	44.78	2.42	0	46.10	0.00
B-76	Junction	0.80	10.77	30.20	3.11	0	26.86	0.26
B-73N	Junction	0.61	43.86	34.13	2.88	0	77.39	0.01
B-73	Other	0.54	4.09	27.82	3.26	0	7.21	0.37
B-71	Grate	0.54	4.69	28.13	3.24	0	8.21	0.25
B-70-2	Grate	0.54	22.76	32.36	2.98	0	36.76	0.30
B-70	Grate	0.54	22.76	32.34	2.98	0	36.76	0.23
B-69	Headwall	0.64	0.68	24.36	3.53	0	1.53	0.13
B-64	Grate	0.54	0.42	23.57	3.59	0	0.81	0.05
B-63	Grate	0.54	0.94	24.89	3.48	0	1.76	0.08
B-61-3	Other	0.75	41.03	49.77	2.26	0	71.35	0.00
B-61	Other	0.80	1.83	26.13	3.39	0	4.97	0.29
B-58	Other	0.80	0.67	24.33	3.53	0	1.90	0.12
MH-B56	Junction	0.75	38.47	48.99	2.28	0	66.93	0.00
B-56	Other	0.80	0.85	24.72	3.50	0	2.37	0.29
B-55N	Junction	0.75	37.23	47.61	2.33	0	65.38	0.00
B-55	Other	0.80	1.09	25.15	3.46	0	3.01	0.22
B-52	Other	0.80	0.39	23.46	3.60	0	1.11	0.24
B-50N	Junction	0.73	27.58	46.13	2.38	0	48.36	0.00
B-50	Other	0.80	0.42	23.57	3.59	0	1.19	0.20
B-44	Other	0.80	6.82	29.03	3.18	0	17.37	0.59
B-41N	Junction	0.73	27.01	45.22	2.41	0	47.91	0.00
B-41	Other	0.80	1.09	25.16	3.46	0	3.02	0.25
B-32N	Junction	0.73	23.34	41.69	2.54	0	43.34	0.21
B-32	Other	0.80	5.93	28.68	3.21	0	15.19	0.50
B-15C	Other	0.80	5.47	29.19	3.22	0	14.08	0.01
B-15B	Other	0.80	5.47	28.74	3.22	0	14.08	0.05
B-15	Grate	0.80	5.47	28.49	3.22	0	14.08	0.47
B-14	Other	0.80	0.24	22.80	3.66	0	0.71	0.13
B-139	Curb	0.63	0.67	24.31	3.53	0	1.48	0.01
B-136	Grate	0.64	0.55	24.00	3.56	0	1.24	0.07
B-134	Curb	0.80	0.41	23.54	3.60	0	1.17	0.00
B-133	Curb	0.80	0.45	23.69	3.58	0	1.28	0.00
B-131	Curb	0.63	1.81	26.10	3.39	0	3.84	0.15
B-126	Curb	0.63	1.35	25.55	3.43	0	2.91	0.11
B-125	Curb	0.82	0.18	22.40	3.70	0	0.55	0.03
B-124	Curb	0.67	0.60	24.14	3.54	0	1.41	0.07
B-122	Curb	0.64	1.33	25.52	3.43	0	2.90	0.10
B-121	Curb	0.83	0.13	21.99	3.73	0	0.40	0.03
B-120	Curb	0.81	0.62	24.19	3.54	0	1.77	0.07
B-119	Curb	0.64	0.75	24.50	3.51	0	1.67	0.08
B-118	Curb	0.82	0.37	23.39	3.61	0	1.09	0.06
B-117	Curb	0.64	0.71	24.42	3.52	0	1.59	0.08
B-116B	Curb	0.81	0.24	22.79	3.66	0	0.72	0.05
B-116A	Curb	0.84	0.34	23.29	3.62	0	1.05	0.05
B-115B	Curb	0.64	0.91	24.85	3.49	0	2.04	0.10
B-115A	Curb	0.64	0.74	24.49	3.52	0	1.65	0.08
B-114A	Curb	0.83	0.34	23.28	3.62	0	1.03	0.06
B-113	Curb	0.63	1.53	25.78	3.41	0	3.28	0.12
B-112	Curb	0.84	0.20	22.50	3.69	0	0.60	0.04
B-111	Curb	0.62	0.94	24.89	3.48	0	2.03	0.09
B-110	Curb	0.80	0.15	22.14	3.72	0	0.44	0.00
B-109	Curb	0.81	0.33	23.21	3.62	0	0.95	0.00
B-108	Curb	0.80	7.90	29.47	3.15	0	19.93	0.53
B-107	Curb	0.82	0.35	23.32	3.61	0	1.04	0.00
B-106	Curb	0.82	0.33	23.23	3.62	0	0.98	0.05
B-105	Curb	0.80	2.23	26.42	3.36	0	5.96	0.05
B-104	Curb	0.75	0.34	23.26	3.62	0	0.91	0.00
B-103	Curb	0.84	0.33	23.23	3.62	0	1.00	0.00
B-102	Curb	0.71	0.45	23.68	3.58	0	1.13	0.00
B-101	Curb	0.87	0.44	23.65	3.59	0	1.37	0.00

ACCEPTED AND FILED
67862

STATE OF TEXAS
WEIMIN LI
88740
LICENSED PROFESSIONAL ENGINEER

2-6-20

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation ©2020

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

SYSTEM A & B
PROPOSED 2-YR NODE SUMMARY

SHEET 2 OF 13

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	180

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SYSTEM A - PROPOSED 10-YR NODE SUMMARY

NODE ID	NODE TYPE	CUMULATIVE C-Value	CUMULATIVE AREA (AC)	CUMULATIVE TC (MIN)	CUMULATIVE INTENSITY (IN/HR)	SUPPLIED DISCHARGE (CFS)	CUMULATIVE DISCHARGE (CFS)	JUNCTION LOSS (FT)
A-OUT	Outlet	0.80	30.66	32.38	0.00	0	0.00	2.18
MA-01	Junction	0.80	30.66	32.37	4.50	0	110.61	1.25
A-01	Junction	0.80	0.35	23.30	5.40	0	1.49	0.21
MH-A-3	Junction	0.80	30.31	32.30	4.55	0	110.54	0.10
A-132	Curb	0.80	30.31	31.77	4.55	0	110.54	0.14
A-02	Other	0.80	1.29	25.46	5.15	0	5.31	0.04
A-130	Curb	0.80	28.55	31.54	4.60	0	105.23	0.05
MH-A03	Junction	0.80	28.43	31.14	4.60	0	104.77	0.63
A-03	Other	0.80	12.86	30.68	4.64	0	47.72	0.71
A-127	Curb	0.80	15.57	30.64	4.64	0	57.99	0.02
MH-A04	Junction	0.80	15.18	30.06	4.69	0	57.08	0.50
A-04	Other	0.80	10.03	30.01	4.70	0	37.69	2.24
A-123A	Curb	0.80	5.15	29.02	4.79	0	19.82	0.01
MH-A05	Junction	0.80	4.94	28.88	4.80	0	19.03	0.01
A-05	Other	0.80	0.09	21.51	5.63	0	0.39	0.00
A-123B	Curb	0.80	4.85	28.53	4.84	0	18.83	0.02
MH-A01	Junction	0.80	4.51	27.84	4.91	0	17.70	0.04
MH-A08	Junction	0.80	4.51	27.78	4.91	0	17.70	0.00
A-07	Junction	0.80	0.70	24.40	5.27	0	2.96	0.01
A-08	Junction	0.80	3.81	27.66	4.92	0	14.99	1.12

SYSTEM B - PROPOSED 10-YR NODE SUMMARY

NODE ID	NODE TYPE	CUMULATIVE C-Value	CUMULATIVE AREA (AC)	CUMULATIVE TC (MIN)	CUMULATIVE INTENSITY (IN/HR)	SUPPLIED DISCHARGE (CFS)	CUMULATIVE DISCHARGE (CFS)	JUNCTION LOSS (FT)
OUT-B	Outlet	0.55	475.38	70.02	0.00	0	0.00	0.05
W-153	Other	0.55	475.38	70.00	2.76	0	723.71	2.19
N-R1	Other	0.75	43.05	48.43	3.55	0	115.70	0.79
N-R2	Junction	0.62	44.74	34.74	4.32	0	119.00	11.92
MH-38	Junction	0.75	43.05	47.77	3.55	0	115.70	0.00
MH-01	Junction	0.62	44.74	34.68	4.32	0	119.00	0.00
B-64	Grate	0.54	0.42	23.57	5.37	0	1.21	0.07
MH-37	Junction	0.75	42.63	47.50	3.56	0	115.30	0.00
B-101	Curb	0.87	0.44	23.65	5.36	0	2.05	0.00
B-102	Curb	0.71	0.45	23.68	5.35	0	1.69	0.00
B-73N	Junction	0.61	43.86	33.91	4.38	0	117.52	0.01
B-63	Grate	0.54	0.94	24.89	5.21	0	2.64	0.10
MH-04	Junction	0.75	41.69	47.10	3.58	0	114.11	0.00
MH-02	Junction	0.62	39.77	32.90	4.46	0	109.77	0.00
MH-B73	Junction	0.54	4.09	27.90	4.90	0	10.83	0.01
B-103	Curb	0.84	0.33	23.23	5.41	0	1.49	0.00
B-104	Curb	0.75	0.34	23.26	5.40	0	1.36	0.00
B-61-3N	Other	0.75	41.03	46.42	3.63	0	113.75	0.00
B-133	Curb	0.80	0.45	23.69	5.35	0	1.91	0.01
B-134	Curb	0.80	0.41	23.54	5.37	0	1.75	0.01
MH-03	Junction	0.62	38.91	32.53	4.49	0	107.44	0.01
B-73	Other	0.54	4.09	27.82	4.90	0	10.83	0.19
MH-05	Junction	0.75	41.03	46.08	3.63	0	113.25	0.00
MH-B61-3	Other	0.00	0.00	0.00	0.00	0.5	0.50	0.00
MH-39	Junction	0.62	38.23	32.50	4.49	0	105.55	1.30
MH-69A	Junction	0.64	0.68	24.65	5.27	0	2.29	0.00
B-105	Curb	0.80	2.23	26.33	5.06	0	8.96	0.07
B-106	Curb	0.82	0.33	23.23	5.41	0	1.46	0.07
MH-B56	Junction	0.75	38.47	45.75	3.65	0	106.31	0.00
B-71	Grate	0.54	4.69	28.13	4.87	0	12.34	0.10
MH-40	Junction	0.63	33.54	32.46	4.49	0	94.24	0.72
MH-69B	Junction	0.64	0.68	24.53	5.27	0	2.29	0.00
MH-B61	Other	0.80	1.83	26.31	5.08	0	7.45	0.55
B-61N	Junction	0.75	37.62	45.69	3.67	0	104.57	0.00
MH-B56-1	Junction	0.80	0.85	24.83	5.23	0	3.55	0.06
MH-41	Junction	0.54	22.76	32.43	4.50	0	55.52	0.41
B-69	Headwall	0.64	0.68	24.36	5.27	0	2.29	0.00
B-61	Other	0.80	1.83	26.13	5.08	0	7.45	0.57
MH-B52	Junction	0.75	37.62	45.23	3.67	0	104.07	0.00
MH-B61-1	Other	0.00	0.00	0.82	0.00	0	0.50	0.00
B-56	Other	0.80	0.85	24.72	5.23	0	3.55	0.43
B-76	Junction	0.80	10.77	30.20	4.68	0	40.48	0.51
B-70-2	Grate	0.54	22.76	32.36	4.50	0	55.52	0.68
B-55N	Junction	0.75	37.23	44.54	3.71	0	103.93	0.00
MH-80	Other	0.80	0.39	23.62	5.38	0	1.66	0.06
MH-B61-2	Other	0.00	0.00	0.00	0.00	0.5	0.50	0.00
B-70	Grate	0.54	22.76	32.34	4.50	0	55.52	0.52
MH-06	Junction	0.75	36.15	44.15	3.73	0	101.25	0.11
MH-B55	Junction	0.80	1.09	25.22	5.18	0	4.51	0.01
B-52	Other	0.80	0.39	23.46	5.38	0	1.66	0.38
B-107	Curb	0.82	0.35	23.32	5.40	0	1.55	0.00
B-108	Curb	0.80	7.90	29.37	4.76	0	30.05	0.64
MH-07A	Junction	0.73	27.90	43.54	3.76	0	77.27	0.00
B-55	Other	0.80	1.09	25.15	5.18	0	4.51	0.28
MH-108	Junction	0.80	7.50	29.31	4.76	0	28.56	0.15

SYSTEM B - PROPOSED 10-YR NODE SUMMARY

NODE ID	NODE TYPE	CUMULATIVE C-Value	CUMULATIVE AREA (AC)	CUMULATIVE TC (MIN)	CUMULATIVE INTENSITY (IN/HR)	SUPPLIED DISCHARGE (CFS)	CUMULATIVE DISCHARGE (CFS)	JUNCTION LOSS (FT)
B-109	Curb	0.81	0.33	23.21	5.41	0	1.42	0.00
B-50N	Junction	0.73	27.58	43.30	3.78	0	76.55	0.00
MH-B44	Junction	0.80	6.82	29.13	4.79	0	26.13	0.41
MH-B58	Junction	0.80	0.67	24.40	5.28	0	2.84	0.00
MH-07B	Junction	0.73	27.16	43.11	3.82	0	76.13	0.00
MH-B50	Junction	0.80	0.42	23.64	5.37	0	1.78	0.03
B-44	Other	0.80	6.82	29.03	4.79	0	26.13	1.08
B-58	Other	0.80	0.67	24.33	5.28	0	2.84	0.15
B-110	Curb	0.80	0.15	22.14	5.54	0	0.65	0.00
B-41N	Junction	0.73	27.01	42.53	3.82	0	75.68	0.00
B-50	Other	0.80	0.42	23.57	5.37	0	1.78	0.28
M-09N	Other	0.73	25.92	42.17	3.84	0	72.73	0.00
MH-B41	Junction	0.80	1.09	25.27	5.18	0	4.53	0.01
MH-08	Junction	0.73	25.92	41.83	3.86	0	72.59	0.00
MH-09	Junction	0.00	0.00	0.00	0.00	0.5	0.50	0.00
B-41	Other	0.80	1.09	25.16	5.18	0	4.53	0.33
B-124	Curb	0.67	0.60	24.14	5.30	0	2.11	0.01
B-125	Curb	0.82	0.18	22.40	5.51	0	0.82	0.00
MH-73	Junction	0.73	25.15	40.98	3.91	0	71.38	0.00
B-121	Curb	0.83	0.13	21.99	5.56	0	0.60	0.02
B-136	Grate	0.64	0.55	24.00	5.31	0	1.85	0.01
MH-10	Junction	0.73	24.47	39.94	3.97	0	70.70	0.00
B-111	Curb	0.62	0.94	24.89	5.21	0	3.04	0.02
B-112	Curb	0.84	0.20	22.50	5.50	0	0.90	0.00
B-32N	Junction	0.73	23.34	39.53	3.99	0	68.17	0.19
MH-11	Junction	0.71	17.41	38.41	4.06	0	50.11	0.01
MH-B32	Junction	0.80	5.93	28.71	4.82	0	22.84	0.04
B-113	Curb	0.63	1.53	25.78	5.11	0	4.91	0.03
B-114A	Curb	0.83	0.34	23.28	5.40	0	1.53	0.08
MH-12C	Junction	0.71	15.54	36.31	4.20	0	46.60	0.01
B-32	Other	0.80	5.93	28.68	4.82	0	22.84	0.83
B-115B	Curb	0.64	0.91	24.85	5.22	0	3.05	0.14
B-116B	Curb	0.81	0.24	22.79	5.46	0	1.08	0.06
MH-12A	Junction	0.72	14.39	35.79	4.24	0	43.69	0.00
MH-13	Junction	0.72	13.30	34.57	4.33	0	41.31	0.01
B-115A	Curb	0.64	0.74	24.49	5.26	0	2.47	0.11
B-116A	Curb	0.84	0.34	23.29	5.40	0	1.57	0.07
B-117	Curb	0.64	0.71	24.42	5.27	0	2.37	0.10
B-118	Curb	0.82	0.37	23.39	5.39	0	1.62	0.08
MH-14B	Junction	0.72	12.23	33.85	4.38	0	38.53	0.00
B-120	Curb	0.81	0.62	24.19	5.29	0	2.65	0.10
MH-14A	Junction	0.71	11.61	33.38	4.42	0	36.63	0.00
B-119	Curb	0.64	0.75	24.50	5.26	0	2.49	0.10
MH-70	Junction	0.72	10.86	33.00	4.45	0	34.77	0.00
MH-47	Junction	0.80	0.24	22.88	5.46	0	1.06	0.02
MH-81	Junction	0.72	10.62	32.67	4.47	0	34.10	0.00
B-14	Other	0.80	0.24	22.80	5.46	0	1.06	0.16
B-15C	Other	0.80	5.47	29.09	4.84	0	21.17	0.00
MH-28	Junction	0.63	5.15	32.43	4.60	0	14.93	0.02
B-15B	Other	0.80	5.47	28.70	4.84	0	21.17	0.02
MH-15	Junction	0.63	5.15	31.91	4.60	0	14.93	0.01
MH-46	Junction	0.80	5.47	28.51	4.84	0	21.17	0.15
MH-16	Junction	0.63	5.15	31.16	4.60	0	14.93	0.13
B-15	Grate	0.80	5.47	28.49	4.84	0	21.17	0.75
B-122	Curb	0.64	1.33	25.52	5.14	0	4.34	0.13
MH-75	Junction	0.63	3.82	30.45	4.66	0	11.20	0.04
B-139	Curb	0.63	0.67	24.31	5.28	0	2.22	0.01
MH-58	Junction	0.63	3.16	29.46	4.82	0	9.55	0.01
MH-19	Junction	0.63	3.16	28.71	4.82	0	9.55	0.08
B-126	Curb	0.63	1.35	25.55	5.14	0	4.36	0.15
MH-21	Junction	0.63	1.81	27.24	5.08	0	5.76	0.00
MH-22	Junction	0.63	1.81	26.23	5.08	0	5.76	0.08
B-131	Curb	0.63	1.81	26.10	5.08	0	5.76	0.19

STATE OF TEXAS
WEIMIN LI
88740
LICENSED PROFESSIONAL ENGINEER
2-6-20

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
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PUBLIC HIGHWAY ENGINEER
REVIEWED AND FILED
67862
DATE

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

SYSTEM A & B
PROPOSED 10-YR NODE SUMMARY

SHEET 3 OF 13

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	181

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MASdinas

SYSTEM A - PROPOSED 100-YR NODE SUMMARY

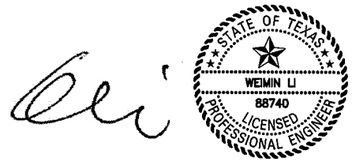
NODE ID	NODE TYPE	CUMULATIVE C-Value	CUMULATIVE AREA (AC)	CUMULATIVE TC (MIN)	CUMULATIVE INTENSITY (IN/HR)	SUPPLIED DISCHARGE (CFS)	CUMULATIVE DISCHARGE (CFS)	JUNCTION LOSS (FT)
A-OUT	Outlet	0.80	30.66	31.75	0.00	0	0.00	2.18
MA-01	Junction	0.80	30.66	31.74	7.12	0	174.98	3.52
A-01	Junction	0.80	0.35	23.30	8.33	0	2.30	0.28
MH-A-3	Junction	0.80	30.31	31.70	7.16	0	174.12	0.24
A-132	Curb	0.80	30.31	31.37	7.16	0	174.12	0.37
A-02	Other	0.80	1.29	25.46	7.97	0	8.23	0.11
A-130	Curb	0.80	28.55	31.22	7.21	0	164.97	0.11
MH-A03	Junction	0.80	28.43	30.96	7.21	0	164.24	1.56
A-03	Other	0.80	12.86	30.68	7.25	0	74.53	1.73
A-127	Curb	0.80	15.57	30.54	7.26	0	90.73	0.04
MH-A04	Junction	0.80	15.18	30.04	7.33	0	89.10	1.23
A-04	Other	0.80	10.03	30.01	7.33	0	58.81	5.45
A-123A	Curb	0.80	5.15	28.71	7.50	0	31.05	0.01
MH-A05	Junction	0.80	4.94	28.59	7.52	0	29.81	0.02
A-05	Other	0.80	0.09	21.51	8.65	0	0.60	0.00
A-123B	Curb	0.80	4.85	28.27	7.56	0	29.46	0.04
MH-A01	Junction	0.80	4.51	27.78	7.64	0	27.55	0.10
MH-A08	Junction	0.80	4.51	27.74	7.64	0	27.55	0.00
A-07	Junction	0.80	0.70	24.40	8.14	0	4.57	0.03
A-08	Junction	0.80	3.81	27.66	7.65	0	23.30	2.70

SYSTEM B - PROPOSED 100-YR NODE SUMMARY

NODE ID	NODE TYPE	CUMULATIVE C-Value	CUMULATIVE AREA (AC)	CUMULATIVE TC (MIN)	CUMULATIVE INTENSITY (IN/HR)	SUPPLIED DISCHARGE (CFS)	CUMULATIVE DISCHARGE (CFS)	JUNCTION LOSS (FT)
OUT-B	Outlet	0.55	475.38	70.01	0.00	0	0.00	0.05
W-153	Other	0.55	475.38	70.00	4.45	0	1165.11	5.56
N-R1	Other	0.75	43.05	45.31	5.87	0	190.26	3.06
N-R2	Junction	0.62	44.74	34.41	6.82	0	187.79	29.69
MH-38	Junction	0.75	43.05	44.75	5.87	0	190.26	0.00
MH-01	Junction	0.62	44.74	34.36	6.82	0	187.79	0.00
B-64	Grate	0.54	0.42	23.57	8.28	0	1.86	0.01
MH-37	Junction	0.75	42.63	44.53	5.88	0	189.47	0.00
B-101	Curb	0.87	0.44	23.65	8.27	0	3.16	0.01
B-102	Curb	0.71	0.45	23.68	8.26	0	2.62	0.00
B-73N	Junction	0.61	43.86	33.71	6.89	0	184.94	0.03
B-63	Grate	0.54	0.94	24.89	8.06	0	4.09	0.03
MH-04	Junction	0.75	41.69	44.18	5.91	0	187.35	0.00
MH-02	Junction	0.62	39.77	32.81	6.99	0	172.23	0.00
MH-B73	Junction	0.54	4.09	27.89	7.63	0	16.85	0.03
B-103	Curb	0.84	0.33	23.23	8.34	0	2.30	0.00
B-104	Curb	0.75	0.34	23.26	8.33	0	2.09	0.00
B-61-3N	Other	0.75	41.03	43.61	5.98	0	186.38	0.00
B-133	Curb	0.80	0.45	23.69	8.26	0	2.95	0.01
B-134	Curb	0.80	0.41	23.54	8.29	0	2.71	0.01
MH-03	Junction	0.62	38.91	32.49	7.03	0	168.36	0.01
B-73	Other	0.54	4.09	27.82	7.63	0	16.85	0.45
MH-05	Junction	0.75	41.03	43.31	5.98	0	185.88	0.01
MH-B61-	Other	0.00	0.00	0.00	0.00	0.5	0.50	0.00
MH-39	Junction	0.62	38.23	32.46	7.03	0	165.38	3.18
MH-69A	Junction	0.64	0.68	24.62	8.15	0	3.54	0.00
B-105	Curb	0.80	2.23	26.26	7.85	0	13.92	0.17
B-106	Curb	0.82	0.33	23.23	8.34	0	2.26	0.00
MH-B56	Junction	0.75	38.47	43.02	6.00	0	174.32	0.00
B-71	Grate	0.54	4.69	28.13	7.58	0	19.20	0.24
MH-40	Junction	0.63	33.54	32.44	7.03	0	147.63	1.76
MH-69B	Junction	0.64	0.68	24.51	8.15	0	3.54	0.00
MH-B61	Other	0.80	1.83	26.25	7.87	0	11.55	0.43
B-61N	Junction	0.75	37.62	42.97	6.04	0	171.27	0.00
MH-B56-	Junction	0.80	0.85	24.82	8.09	0	5.49	0.13
MH-41	Junction	0.54	22.76	32.40	7.04	0	86.92	1.00
B-69	Headwall	0.64	0.68	24.36	8.15	0	3.54	0.00
B-61	Other	0.80	1.83	26.13	7.87	0	11.55	1.38
MH-B52	Junction	0.75	37.62	42.58	6.04	0	170.77	0.00
MH-B61-	Other	0.00	0.00	0.82	0.00	0	0.50	0.00
B-56	Other	0.80	0.85	24.72	8.09	0	5.49	0.76
B-76	Junction	0.80	10.77	30.20	7.31	0	63.18	1.24
B-70-2	Grate	0.54	22.76	32.35	7.04	0	86.92	1.67
B-55N	Junction	0.75	37.23	41.99	6.09	0	170.27	0.00
MH-80	Other	0.80	0.39	23.60	8.30	0	2.57	0.19
MH-B61-	Other	0.00	0.00	0.00	0.00	0.5	0.50	0.00
B-70	Grate	0.54	22.76	32.34	7.05	0	86.91	1.27
MH-06	Junction	0.75	36.15	41.66	6.12	0	165.73	0.26
MH-B55	Junction	0.80	1.09	25.22	8.02	0	6.98	0.02
B-52	Other	0.80	0.39	23.46	8.30	0	2.57	0.79
B-107	Curb	0.82	0.35	23.32	8.32	0	2.39	0.00
B-108	Curb	0.80	7.90	29.25	7.43	0	46.95	1.56
MH-07A	Junction	0.73	27.90	41.13	6.16	0	126.24	0.00
B-55	Other	0.80	1.09	25.15	8.02	0	6.98	0.18
MH-108	Junction	0.80	7.50	29.21	7.44	0	44.59	0.37

SYSTEM B - PROPOSED 100-YR NODE SUMMARY

NODE ID	NODE TYPE	CUMULATIVE C-Value	CUMULATIVE AREA (AC)	CUMULATIVE TC (MIN)	CUMULATIVE INTENSITY (IN/HR)	SUPPLIED DISCHARGE (CFS)	CUMULATIVE DISCHARGE (CFS)	JUNCTION LOSS (FT)
B-109	Curb	0.81	0.33	23.21	8.34	0	2.19	0.00
B-50N	Junction	0.73	27.58	40.93	6.18	0	124.96	0.00
MH-B44	Junction	0.80	6.82	29.10	7.46	0	40.72	0.99
MH-B58	Junction	0.80	0.67	24.39	8.16	0	4.39	0.00
MH-07B	Junction	0.73	27.16	40.77	6.24	0	124.04	0.00
MH-B50	Junction	0.80	0.42	23.63	8.28	0	2.75	0.08
B-44	Other	0.80	6.82	29.03	7.46	0	40.72	2.61
B-58	Other	0.80	0.67	24.33	8.16	0	4.39	0.03
B-110	Curb	0.80	0.15	22.14	8.53	0	1.00	0.00
B-41N	Junction	0.73	27.01	40.28	6.24	0	123.31	0.00
B-50	Other	0.80	0.42	23.57	8.28	0	2.75	0.40
M-09N	Other	0.73	25.92	39.97	6.27	0	118.39	0.00
MH-B41	Junction	0.80	1.09	25.26	8.02	0	7.01	0.02
MH-08	Junction	0.73	25.92	39.68	6.29	0	118.37	0.00
MH-09	Junction	0.00	0.00	0.00	0.00	0.5	0.50	0.00
B-41	Other	0.80	1.09	25.16	8.02	0	7.01	0.46
B-124	Curb	0.67	0.60	24.14	8.19	0	3.26	0.01
B-125	Curb	0.82	0.18	22.40	8.49	0	1.26	0.00
MH-73	Junction	0.73	25.15	38.92	6.36	0	116.21	0.00
B-121	Curb	0.83	0.13	21.99	8.56	0	0.92	0.00
B-136	Grate	0.64	0.55	24.00	8.21	0	2.86	0.01
MH-10	Junction	0.73	24.47	38.02	6.45	0	114.81	0.00
B-111	Curb	0.62	0.94	24.89	8.06	0	4.70	0.01
B-112	Curb	0.84	0.20	22.50	8.47	0	1.38	0.00
B-32N	Junction	0.73	23.34	37.68	6.48	0	110.57	0.42
MH-11	Junction	0.71	17.41	36.76	6.57	0	80.99	0.01
MH-B32	Junction	0.80	5.93	28.70	7.51	0	35.57	0.11
B-113	Curb	0.63	1.53	25.78	7.93	0	7.62	0.04
B-114A	Curb	0.83	0.34	23.28	8.33	0	2.37	0.01
MH-12C	Junction	0.71	15.54	34.94	6.76	0	74.88	0.00
B-32	Other	0.80	5.93	28.68	7.51	0	35.57	1.99
B-115B	Curb	0.64	0.91	24.85	8.07	0	4.72	0.04
B-116B	Curb	0.81	0.24	22.79	8.42	0	1.66	0.00
MH-12A	Junction	0.72	14.39	34.50	6.80	0	70.10	0.00
MH-13	Junction	0.72	13.30	33.52	6.91	0	65.95	0.00
B-115A	Curb	0.64	0.74	24.49	8.13	0	3.82	0.02
B-116A	Curb	0.84	0.34	23.29	8.33	0	2.42	0.01
B-117	Curb	0.64	0.71	24.42	8.14	0	3.67	0.02
B-118	Curb	0.82	0.37	23.39	8.31	0	2.51	0.01
MH-14B	Junction	0.72	12.23	32.89	6.98	0	61.38	0.00
B-120	Curb	0.81	0.62	24.19	8.18	0	4.10	0.02
MH-14A	Junction	0.71	11.61	32.51	7.03	0	58.25	0.00
B-119	Curb	0.64	0.75	24.50	8.13	0	3.85	0.01
MH-70	Junction	0.72	10.86	32.20	7.06	0	55.20	0.00
MH-47	Junction	0.80	0.24	22.88	8.42	0	1.63	0.01
MH-81	Junction	0.72	10.62	31.92	7.09	0	54.08	0.00
B-14	Other	0.80	0.24	22.80	8.42	0	1.63	0.22
B-15C	Other	0.80	5.47	29.00	7.53	0	32.96	0.00
MH-28	Junction	0.63	5.15	31.72	7.26	0	23.57	0.01
B-15B	Other	0.80	5.47	28.67	7.53	0	32.96	0.01
MH-15	Junction	0.63	5.15	31.26	7.26	0	23.57	0.00
MH-46	Junction	0.80	5.47	28.50	7.53	0	32.96	0.44
MH-16	Junction	0.63	5.15	30.57	7.26	0	23.57	0.08
B-15	Grate	0.80	5.47	28.49	7.53	0	32.96	1.71
B-122	Curb	0.64	1.33	25.52	7.97	0	6.72	0.04
MH-75	Junction	0.63	3.82	29.93	7.34	0	17.64	0.03
B-139	Curb	0.63	0.67	24.31	8.16	0	3.43	0.01
MH-58	Junction	0.63	3.16	29.04	7.54	0	14.96	0.00
MH-19	Junction	0.63	3.16	28.40	7.54	0	14.96	0.05
B-126	Curb	0.63	1.35	25.55	7.96	0	6.76	0.06
MH-21	Junction	0.63	1.81	27.11	7.88	0	8.93	0.00
MH-22	Junction	0.63	1.81	26.22	7.88	0	8.93	0.05
B-131	Curb	0.63	1.81	26.10	7.88	0	8.93	0.25



2-6-20

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation ©2020

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

SYSTEM A & B
PROPOSED 100-YR NODE SUMMARY

SHEET 4 OF 13

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	182

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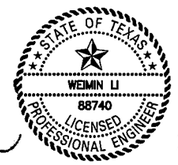
SYSTEM A - PROPOSED 2-YR INLET SUMMARY

INLET ID	INLET TYPE	PROFILE TYPE	SLOPES LONG. (%)	SLOPES TRANS. (%)	n-VALUE	TOTAL FLOW (CFS)	INLET CAPACITY (CFS)	BYPASS FLOW (CFS)	BYPASS INLET ID	PONDED WIDTH ALLOWED (FT)	PONDED WIDTH ACTUAL (FT)	PONDED DEPTH ALLOWED (FT)	PONDED DEPTH ACTUAL (FT)	INLET LENGTH/GRATE ACTUAL (FT)	INLET LENGTH/GRATE AREA (SF)	INLET LENGTH/GRATE AREA CLOG (%)
A-132	Curb	Sag	n/a	3.00	0.015	1.45	6.31	0.00	n/a	12.00	7.56	0.36	0.14	10.00	n/a	n/a
A-130	Curb	On Grade	0.350	3.00	0.015	0.38	0.38	0.00	A-132	12.00	4.62	0.36	0.14	5.00	n/a	n/a
A-127	Curb	Sag	n/a	3.00	0.015	1.19	8.79	0.00	n/a	12.00	6.24	0.36	0.10	15.00	n/a	n/a
A-123A	Curb	On Grade	0.665	3.00	0.015	0.64	0.64	0.00	A-123B	12.00	5.00	0.36	0.15	5.00	n/a	n/a
A-123B	Curb	Sag	n/a	3.00	0.015	1.04	3.83	0.00	n/a	12.00	6.55	0.36	0.15	5.00	n/a	n/a

SYSTEM B - PROPOSED 2-YR INLET SUMMARY

INLET ID	INLET TYPE	PROFILE TYPE	SLOPES LONG. (%)	SLOPES TRANS. (%)	n-VALUE	TOTAL FLOW (CFS)	INLET CAPACITY (CFS)	BYPASS FLOW (CFS)	BYPASS INLET ID	PONDED WIDTH ALLOWED (FT)	PONDED WIDTH ACTUAL (FT)	PONDED DEPTH ALLOWED (FT)	PONDED DEPTH ACTUAL (FT)	INLET LENGTH/GRATE ACTUAL (FT)	INLET LENGTH/GRATE AREA (SF)	INLET LENGTH/GRATE AREA CLOG (%)
B-64	Grate	Sag	n/a	0.00	0.015	0.81	13.38	0.00	n/a	n/a	n/a	2.00	0.13	n/a	3.52	0.5
B-63	Grate	Sag	n/a	0.00	0.015	1.76	13.38	0.00	n/a	n/a	n/a	2.00	0.22	n/a	3.52	0.5
B-103	Curb	Sag	n/a	3.00	0.015	1.00	3.83	0.00	n/a	12.00	5.67	0.36	0.15	5.00	n/a	n/a
B-104	Curb	Sag	n/a	3.00	0.015	0.91	3.83	0.00	n/a	12.00	5.60	0.36	0.14	5.00	n/a	n/a
B-105	Curb	Sag	n/a	3.00	0.015	1.10	3.83	0.00	n/a	12.00	6.16	0.36	0.16	5.00	n/a	n/a
B-106	Curb	Sag	n/a	3.00	0.015	0.98	3.83	0.00	n/a	12.00	5.90	0.36	0.15	5.00	n/a	n/a
B-107	Curb	Sag	n/a	3.00	0.015	1.04	3.83	0.00	n/a	12.00	6.42	0.36	0.15	5.00	n/a	n/a
B-108	Curb	Sag	n/a	3.00	0.015	1.16	3.83	0.00	n/a	12.00	6.69	0.36	0.16	5.00	n/a	n/a
B-110	Curb	On Grade	0.351	3.00	0.015	0.44	0.44	0.00	B-108	12.00	4.89	0.36	0.15	10.00	n/a	n/a
B-109	Curb	On Grade	0.35	3.00	0.015	0.95	0.95	0.00	B-107	12.00	6.53	0.36	0.20	5.00	n/a	n/a
B-124	Curb	Sag	n/a	3.00	0.015	1.41	3.83	0.00	n/a	12.00	6.45	0.36	0.19	5.00	n/a	n/a
B-125	Curb	Sag	n/a	3.00	0.015	0.55	3.83	0.00	n/a	12.00	4.53	0.36	0.10	5.00	n/a	n/a
B-121	Curb	Sag	n/a	3.00	0.015	0.40	3.83	0.00	n/a	12.00	4.15	0.36	0.08	5.00	n/a	n/a
B-136	Grate	Sag	n/a	3.00	0.015	1.24	5.36	0.00	n/a	12.00	7.86	0.36	0.14	n/a	9.28	0.5
B-111	Curb	Sag	n/a	3.00	0.015	2.03	3.83	0.00	n/a	12.00	7.86	0.36	0.24	5.00	n/a	n/a
B-112	Curb	Sag	n/a	3.00	0.015	0.60	3.83	0.00	n/a	12.00	4.76	0.36	0.11	5.00	n/a	n/a
B-113	Curb	Sag	n/a	3.00	0.015	3.28	8.79	0.00	n/a	12.00	9.41	0.36	0.19	15.00	n/a	n/a
B-114A	Curb	Sag	n/a	3.00	0.015	1.03	3.83	0.00	n/a	12.00	6.09	0.36	0.15	5.00	n/a	n/a
B-115B	Curb	Sag	n/a	3.00	0.015	2.40	3.83	0.00	n/a	12.00	9.06	0.36	0.26	5.00	n/a	n/a
B-116B	Curb	Sag	n/a	3.00	0.015	0.72	3.83	0.00	n/a	12.00	5.87	0.36	0.12	5.00	n/a	n/a
B-115A	Curb	On Grade	0.55	3.00	0.015	1.96	1.60	0.36	B-115B	12.00	7.86	0.36	0.24	5.00	n/a	n/a
B-116A	Curb	On Grade	0.553	3.00	0.015	1.17	1.17	0.00	B-116B	12.00	6.48	0.36	0.19	10.00	n/a	n/a
B-117	Curb	On Grade	0.55	3.00	0.015	1.85	1.54	0.31	B-115A	12.00	7.69	0.36	0.23	5.00	n/a	n/a
B-118	Curb	On Grade	0.553	3.00	0.015	1.36	1.25	0.12	B-116A	12.00	6.87	0.36	0.21	5.00	n/a	n/a
B-120	Curb	On Grade	0.55	3.00	0.015	1.77	1.50	0.28	B-118	12.00	7.58	0.36	0.23	5.00	n/a	n/a
B-119	Curb	On Grade	0.65	3.00	0.015	1.67	1.41	0.26	B-117	12.00	7.19	0.36	0.22	5.00	n/a	n/a
B-15	Grate	Sag	n/a	0.00	0.035	14.08	31.14	0.00	n/a	n/a	n/a	2.00	0.67	n/a	8.194	0.5
B-122	Curb	Sag	n/a	3.00	0.015	3.08	6.31	0.00	n/a	12.00	8.46	0.36	0.22	10.00	n/a	n/a
B-139	Curb	On Grade	0.665	3.00	0.015	1.48	1.29	0.19	B-122	12.00	6.85	0.36	0.21	5.00	n/a	n/a
B-126	Curb	Sag	n/a	3.00	0.015	2.91	3.83	0.00	n/a	12.00	10.00	0.36	0.30	5.00	n/a	n/a
B-131	Curb	Sag	n/a	2.98	0.015	3.84	8.79	0.00	n/a	12.00	9.69	0.36	0.21	15.00	n/a	n/a
B-101	Curb	Sag	n/a	3.00	0.015	1.37	8.79	0.00	n/a	12.00	6.94	0.36	0.10	15.00	n/a	n/a
B-102	Curb	Sag	n/a	3.00	0.015	1.13	3.83	0.00	n/a	12.00	6.47	0.36	0.16	5.00	n/a	n/a
B-133	Curb	Sag	n/a	3.00	0.015	1.28	3.83	0.00	n/a	12.00	6.17	0.36	0.17	5.00	n/a	n/a
B-134	Curb	Sag	n/a	3.00	0.015	1.17	3.83	0.00	n/a	12.00	5.97	0.36	0.16	5.00	n/a	n/a
B-71	Grate	Sag	n/a	0.00	0.015	8.21	31.47	0.00	n/a	n/a	n/a	2.00	0.50	n/a	8.28	0.5
B-70-2	Grate	Sag	n/a	0.00	0.015	9.96	31.47	0.00	n/a	n/a	n/a	2.00	0.57	n/a	8.28	0.5
B-70	Grate	On Grade	2.60	-33.00	0.035	36.76	26.82	9.94	B-70-2	16.00	9.33	2.00	0.96	n/a	8.28	0.5



2-6-20

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
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MEMORIAL DRIVE RECONSTRUCTION
AND ACCESS MANAGEMENT

SYSTEM A & B
PROPOSED 2-YR INLET SUMMARY

SHEET 5 OF 13

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	183

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Plotted on: 2/6/2020 1:58:07 PM MASalinas

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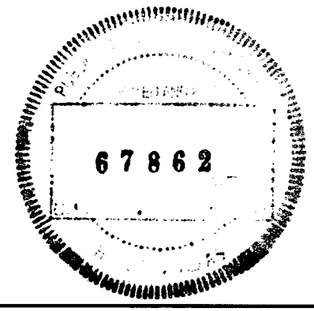
Plot Driver: c:\projectwise\masalinas\d0531333\MEMORIAL DR.pltcfg

SYSTEM A - PROPOSED 10-YR INLET SUMMARY

INLET ID	INLET TYPE	PROFILE TYPE	SLOPES LONG. (%)	SLOPES TRANS. (%)	n-VALUE	TOTAL FLOW (CFS)	INLET CAPACITY (CFS)	BYPASS FLOW (CFS)	BYPASS INLET ID	PONDED WIDTH ALLOWED (FT)	PONDED WIDTH ACTUAL (FT)	PONDED DEPTH ALLOWED (FT)	PONDED DEPTH ACTUAL (FT)	INLET LENGTH ACTUAL (FT)	GRATE AREA (SF)	GRATE AREA CLOG (%)
A-132	Curb	Sag	n/a	3.00	0.015	2.17	6.31	0.00	n/a	12.00	8.78	0.36	0.18	10.00	n/a	n/a
A-130	Curb On Grade		0.35	3.00	0.015	0.56	0.56	0.00	A-132	12.00	5.36	0.36	0.16	5.00	n/a	n/a
A-127	Curb	Sag	n/a	3.00	0.015	1.77	8.79	0.00	n/a	12.00	7.25	0.36	0.12	15.00	n/a	n/a
A-123A	Curb On Grade		0.665	3.00	0.015	0.96	0.93	0.03	A-123B	12.00	5.81	0.36	0.17	5.00	n/a	n/a
A-123B	Curb	Sag	n/a	3.00	0.015	1.58	3.83	0.00	n/a	12.00	7.65	0.36	0.20	5.00	n/a	n/a

SYSTEM B - PROPOSED 10-YR INLET SUMMARY

INLET ID	INLET TYPE	PROFILE TYPE	SLOPES LONG. (%)	SLOPES TRANS. (%)	n-VALUE	TOTAL FLOW (CFS)	INLET CAPACITY (CFS)	BYPASS FLOW (CFS)	BYPASS INLET ID	PONDED WIDTH ALLOWED (FT)	PONDED WIDTH ACTUAL (FT)	PONDED DEPTH ALLOWED (FT)	PONDED DEPTH ACTUAL (FT)	INLET LENGTH ACTUAL (FT)	GRATE AREA (SF)	GRATE AREA CLOG (%)
B-64	Grate	Sag	n/a	0.00	0.015	1.21	13.38	0.00	n/a	n/a	n/a	2.00	0.17	n/a	3.52	0.5
B-63	Grate	Sag	n/a	0.00	0.015	2.64	13.38	0.00	n/a	n/a	n/a	2.00	0.29	n/a	3.52	0.5
B-103	Curb	Sag	n/a	3.00	0.015	1.49	3.83	0.00	n/a	12.00	6.58	0.36	0.19	5.00	n/a	n/a
B-104	Curb	Sag	n/a	3.00	0.015	1.36	3.83	0.00	n/a	12.00	6.51	0.36	0.18	5.00	n/a	n/a
B-105	Curb	Sag	n/a	3.00	0.015	1.64	3.83	0.00	n/a	12.00	7.16	0.36	0.21	5.00	n/a	n/a
B-106	Curb	Sag	n/a	3.00	0.015	1.46	3.83	0.00	n/a	12.00	6.86	0.36	0.19	5.00	n/a	n/a
B-107	Curb	Sag	n/a	3.00	0.015	1.62	3.83	0.00	n/a	12.00	7.59	0.36	0.20	5.00	n/a	n/a
B-108	Curb	Sag	n/a	3.00	0.015	1.73	3.83	0.00	n/a	12.00	7.77	0.36	0.21	5.00	n/a	n/a
B-110	Curb On Grade		0.351	3.00	0.015	0.65	0.65	0.00	B-108	12.00	5.67	0.36	0.17	10.00	n/a	n/a
B-109	Curb On Grade		0.35	3.00	0.015	1.42	1.35	0.07	B-107	12.00	7.59	0.36	0.23	5.00	n/a	n/a
B-124	Curb	Sag	n/a	3.00	0.015	2.11	3.83	0.00	n/a	12.00	8.07	0.36	0.24	5.00	n/a	n/a
B-125	Curb	Sag	n/a	3.00	0.015	0.82	3.83	0.00	n/a	12.00	5.26	0.36	0.13	5.00	n/a	n/a
B-121	Curb	Sag	n/a	3.00	0.015	0.60	3.83	0.00	n/a	12.00	4.82	0.36	0.10	5.00	n/a	n/a
B-136	Grate	Sag	n/a	3.00	0.015	1.85	5.36	0.00	n/a	12.00	9.14	0.36	0.18	n/a	9.28	0.5
B-111	Curb	Sag	n/a	3.00	0.015	3.04	3.83	0.00	n/a	12.00	10.28	0.36	0.31	5.00	n/a	n/a
B-112	Curb	Sag	n/a	3.00	0.015	0.90	3.83	0.00	n/a	12.00	5.53	0.36	0.14	5.00	n/a	n/a
B-113	Curb	Sag	n/a	3.00	0.015	4.91	8.79	0.00	n/a	12.00	10.95	0.36	0.24	15.00	n/a	n/a
B-114A	Curb	Sag	n/a	3.00	0.015	1.53	3.83	0.00	n/a	12.00	7.08	0.36	0.20	5.00	n/a	n/a
B-115B	Curb	Sag	n/a	3.00	0.015	4.22	3.83	0.00	n/a	12.00	12.80	0.36	0.38	5.00	n/a	n/a
B-116B	Curb	Sag	n/a	3.00	0.015	1.08	3.83	0.00	n/a	12.00	6.82	0.36	0.16	5.00	n/a	n/a
B-115A	Curb On Grade		0.55	3.00	0.015	3.41	2.25	1.16	B-115B	12.00	9.68	0.36	0.29	5.00	n/a	n/a
B-116A	Curb On Grade		0.553	3.00	0.015	2.12	2.12	0.00	B-116B	12.00	8.10	0.36	0.24	10.00	n/a	n/a
B-117	Curb On Grade		0.55	3.00	0.015	3.05	2.10	0.94	B-115A	12.00	9.28	0.36	0.28	5.00	n/a	n/a
B-118	Curb On Grade		0.553	3.00	0.015	2.34	1.79	0.55	B-116A	12.00	8.41	0.36	0.25	5.00	n/a	n/a
B-120	Curb On Grade		0.55	3.00	0.015	2.65	1.94	0.72	B-118	12.00	8.81	0.36	0.26	5.00	n/a	n/a
B-119	Curb On Grade		0.65	3.00	0.015	2.49	1.82	0.68	B-117	12.00	8.36	0.36	0.25	5.00	n/a	n/a
B-15	Grate	Sag	n/a	0.00	0.035	21.17	31.14	0.00	n/a	n/a	n/a	2.00	0.92	n/a	8.194	0.5
B-122	Curb	Sag	n/a	3.00	0.015	4.87	6.31	0.00	n/a	12.00	10.10	0.36	0.30	10.00	n/a	n/a
B-139	Curb On Grade		0.665	3.00	0.015	2.22	1.68	0.53	B-122	12.00	7.96	0.36	0.24	5.00	n/a	n/a
B-126	Curb	Sag	n/a	3.00	0.015	4.36	3.83	0.00	n/a	12.00	13.10	0.36	0.39	5.00	n/a	n/a
B-131	Curb	Sag	n/a	2.98	0.015	5.76	8.79	0.00	n/a	12.00	11.28	0.36	0.27	15.00	n/a	n/a
B-101	Curb	Sag	n/a	3.00	0.015	2.05	8.79	0.00	n/a	12.00	8.07	0.36	0.14	15.00	n/a	n/a
B-102	Curb	Sag	n/a	3.00	0.015	1.69	3.83	0.00	n/a	12.00	7.52	0.36	0.21	5.00	n/a	n/a
B-133	Curb	Sag	n/a	3.00	0.015	1.91	3.83	0.00	n/a	12.00	7.55	0.36	0.23	5.00	n/a	n/a
B-134	Curb	Sag	n/a	3.00	0.015	1.75	3.83	0.00	n/a	12.00	7.13	0.36	0.21	5.00	n/a	n/a
B-71	Grate	Sag	n/a	0.00	0.015	12.34	31.47	0.00	n/a	n/a	n/a	2.00	0.66	n/a	8.28	0.5
B-70-2	Grate	Sag	n/a	0.00	0.015	17.39	31.47	0.00	n/a	n/a	n/a	2.00	0.83	n/a	8.28	0.5
B-70	Grate	On Grade	2.60	-33.00	0.035	55.52	38.16	17.36	B-70-2	16.00	10.61	2.00	1.17	n/a	8.28	0.5



2-6-20

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation ©2020

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

SYSTEM A & B
PROPOSED 10-YR INLET SUMMARY

SHEET 6 OF 13

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	184

Pen Table: MEMORIAL.tbl
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SYSTEM A - PROPOSED 100-YR INLET SUMMARY

INLET ID	INLET TYPE	PROFILE TYPE	SLOPES		n-VALUE	TOTAL FLOW (CFS)	INLET CAPACITY (CFS)	BYPASS FLOW (CFS)	BYPASS INLET ID	PONDED WIDTH		PONDED DEPTH		INLET LENGTH	GRATE	
			LONG. (%)	TRANS. (%)						ALLOWED (FT)	ACTUAL (FT)	ALLOWED (FT)	ACTUAL (FT)	ACTUAL (FT)	AREA (SF)	AREA CLOG (%)
A-132	Curb	Sag	n/a	3.00	0.015	3.34	6.31	0.00	n/a	12.00	10.34	0.36	0.24	10.00	n/a	n/a
A-130	Curb	On Grade	0.35	3.00	0.015	0.86	0.86	0.00	A-132	12.00	6.30	0.36	0.19	5.00	n/a	n/a
A-127	Curb	Sag	n/a	3.00	0.015	2.74	8.79	0.00	n/a	12.00	8.53	0.36	0.17	15.00	n/a	n/a
A-123A	Curb	On Grade	0.67	3.00	0.015	1.47	1.29	0.18	A-123B	12.00	6.83	0.36	0.21	5.00	n/a	n/a
A-123B	Curb	Sag	n/a	3.00	0.015	2.58	3.83	0.00	n/a	12.00	9.22	0.36	0.28	5.00	n/a	n/a

SYSTEM B - PROPOSED 100-YR INLET SUMMARY

INLET ID	INLET TYPE	PROFILE TYPE	SLOPES		n-VALUE	TOTAL FLOW (CFS)	INLET CAPACITY (CFS)	BYPASS FLOW (CFS)	BYPASS INLET ID	PONDED WIDTH		PONDED DEPTH		INLET LENGTH	GRATE	
			LONG. (%)	TRANS. (%)						ALLOWED (FT)	ACTUAL (FT)	ALLOWED (FT)	ACTUAL (FT)	ACTUAL (FT)	AREA (SF)	AREA CLOG (%)
B-64	Grate	Sag	n/a	0.00	0.015	1.86	13.38	0.00	n/a	0.00	0.00	2.00	0.23	n/a	3.52	0.5
B-63	Grate	Sag	n/a	0.00	0.015	4.09	13.38	0.00	n/a	0.00	0.00	2.00	0.38	n/a	3.52	0.5
B-103	Curb	Sag	n/a	3.00	0.015	2.30	3.83	0.00	n/a	12.00	8.54	0.36	0.26	5.00	n/a	n/a
B-104	Curb	Sag	n/a	3.00	0.015	2.09	3.83	0.00	n/a	12.00	8.02	0.36	0.24	5.00	n/a	n/a
B-105	Curb	Sag	n/a	3.00	0.015	2.53	3.83	0.00	n/a	12.00	9.12	0.36	0.27	5.00	n/a	n/a
B-106	Curb	Sag	n/a	3.00	0.015	2.26	3.83	0.00	n/a	12.00	8.45	0.36	0.25	5.00	n/a	n/a
B-107	Curb	Sag	n/a	3.00	0.015	2.74	3.83	0.00	n/a	12.00	9.61	0.36	0.29	5.00	n/a	n/a
B-108	Curb	Sag	n/a	3.00	0.015	2.67	3.83	0.00	n/a	12.00	9.44	0.36	0.28	5.00	n/a	n/a
B-110	Curb	On Grade	0.35	3.00	0.015	1.00	1.00	0.00	B-108	12.00	6.67	0.36	0.20	10.00	n/a	n/a
B-109	Curb	On Grade	0.35	3.00	0.015	2.19	1.84	0.35	B-107	12.00	8.93	0.36	0.27	5.00	n/a	n/a
B-124	Curb	Sag	n/a	3.00	0.015	3.26	3.83	0.00	n/a	12.00	10.79	0.36	0.32	5.00	n/a	n/a
B-125	Curb	Sag	n/a	3.00	0.015	1.26	3.83	0.00	n/a	12.00	6.18	0.36	0.17	5.00	n/a	n/a
B-121	Curb	Sag	n/a	3.00	0.015	0.92	3.83	0.00	n/a	12.00	5.66	0.36	0.14	5.00	n/a	n/a
B-136	Grate	Sag	n/a	3.00	0.015	2.86	5.36	0.00	n/a	12.00	10.76	0.36	0.24	n/a	9.28	0.5
B-111	Curb	Sag	n/a	3.00	0.015	4.70	3.83	0.00	n/a	12.00	13.76	0.36	0.41	5.00	n/a	n/a
B-112	Curb	Sag	n/a	3.00	0.015	1.38	3.83	0.00	n/a	12.00	6.50	0.36	0.18	5.00	n/a	n/a
B-113	Curb	Sag	n/a	3.00	0.015	7.62	8.79	0.00	n/a	12.00	12.90	0.36	0.33	15.00	n/a	n/a
B-114A	Curb	Sag	n/a	3.00	0.015	2.37	3.83	0.00	n/a	12.00	8.71	0.36	0.26	5.00	n/a	n/a
B-115B	Curb	Sag	n/a	3.00	0.015	7.74	3.83	0.00	n/a	12.00	19.20	0.36	0.58	5.00	n/a	n/a
B-116B	Curb	Sag	n/a	3.00	0.015	1.84	3.83	0.00	n/a	12.00	8.34	0.36	0.22	5.00	n/a	n/a
B-115A	Curb	On Grade	0.55	3.00	0.015	6.15	3.13	3.02	B-115B	12.00	12.07	0.36	0.36	5.00	n/a	n/a
B-116A	Curb	On Grade	0.55	3.00	0.015	4.03	3.84	0.18	B-116B	12.00	10.30	0.36	0.31	10.00	n/a	n/a
B-117	Curb	On Grade	0.55	3.00	0.015	5.18	2.85	2.33	B-115A	12.00	11.32	0.36	0.34	5.00	n/a	n/a
B-118	Curb	On Grade	0.55	3.00	0.015	4.11	2.50	1.61	B-116A	12.00	10.38	0.36	0.31	5.00	n/a	n/a
B-120	Curb	On Grade	0.55	3.00	0.015	4.10	2.50	1.60	B-118	12.00	10.37	0.36	0.31	5.00	n/a	n/a
B-119	Curb	On Grade	0.65	3.00	0.015	3.85	2.34	1.51	B-117	12.00	9.84	0.36	0.30	5.00	n/a	n/a
B-15	Grate	Sag	n/a	0.00	0.035	32.96	31.14	0.00	n/a	0.00	31.27	2.00	2.24	n/a	8.194	0.5
B-122	Curb	Sag	n/a	3.00	0.015	7.97	6.31	0.00	n/a	12.00	14.02	0.36	0.42	10.00	n/a	n/a
B-139	Curb	On Grade	0.67	3.00	0.015	3.43	2.18	1.25	B-122	12.00	9.37	0.36	0.28	5.00	n/a	n/a
B-126	Curb	Sag	n/a	3.00	0.015	6.76	3.83	0.00	n/a	12.00	17.54	0.36	0.53	5.00	n/a	n/a
B-131	Curb	Sag	n/a	2.98	0.015	8.93	8.79	0.00	n/a	12.00	13.30	0.36	0.36	15.00	n/a	n/a
B-101	Curb	Sag	n/a	3.00	0.015	3.16	8.79	0.00	n/a	12.00	9.49	0.36	0.18	15.00	n/a	n/a
B-102	Curb	Sag	n/a	3.00	0.015	2.62	3.83	0.00	n/a	12.00	9.31	0.36	0.28	5.00	n/a	n/a
B-133	Curb	Sag	n/a	3.00	0.015	2.95	3.83	0.00	n/a	12.00	10.09	0.36	0.30	5.00	n/a	n/a
B-134	Curb	Sag	n/a	3.00	0.015	2.71	3.83	0.00	n/a	12.00	9.53	0.36	0.29	5.00	n/a	n/a
B-71	Grate	Sag	n/a	0.00	0.015	19.20	31.47	0.00	n/a	0.00	0.00	2.00	0.89	n/a	8.28	0.5
B-70-2	Grate	Sag	n/a	0.00	0.015	31.42	31.47	0.00	n/a	0.00	0.00	2.00	1.99	n/a	8.28	0.5
B-70	Grate	On Grade	2.60	-33.00	0.035	86.91	55.54	31.38	B-70-2	16.00	12.28	2.00	1.45	n/a	8.28	0.5

STATE OF TEXAS
WEIMIN LI
88740
LICENSED PROFESSIONAL ENGINEER

2-6-20

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
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PUBLIC WORKS ENGINEERING
ACCEPTED AND FILED
67862

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

SYSYEM A & B
PROPOSED 100-YR INLET SUMMARY

SHEET 7 OF 13

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	185

Plotted on: 2/6/2020 1:58:07 PM MASalinas
Pen Table: MEMORIAL.tbl
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SYSTEM A - PROPOSED 2-YR LINK SUMMARY

LINK ID	US NODE	DS NODE	FLOWLINE US (ft)	FLOWLINE DS (ft)	SHAPE	SPAN (ft)	RISE (ft)	# OF BARRELS	LENGTH (ft)	SLOPE (ft/ft)	n-Value	HGL US (ft)	HGL DS (ft)	DEPTH UNIFORM (ft)	DEPTH ACTUAL (ft)	VELOCITY UNIFORM (ft)	VELOCITY ACTUAL (ft)	Q (cfs)	CAPACITY (cfs)	NOTES
MA-01	MA-01	A-OUT	62.19	61.42	Circular	n/a	3.5	1	13.11	5.87	0.013	65.61	63.40	1.32	1.98	22.21	13.12	73.64	262.27	(Exist)
A-01	A-01	MA-01	68.72	66.54	Circular	n/a	1.0	1	27.91	7.81	0.013	69.32	66.76	0.21	0.22	8.12	7.97	1.00	10.71	(Exist)
MH-A-3	MH-A-3	MA-01	62.24	62.19	Box	4.0	4.0	1	28.21	0.18	0.015	65.73	65.61	3.71	3.42	4.90	5.32	72.81	79.86	
A-132	A-132	MH-A-3	62.68	62.24	Box	4.0	4.0	1	220.24	0.20	0.015	66.24	65.73	3.47	3.49	5.25	5.22	72.81	84.78	
A-02	A-02	A-132	64.52	64.50	Circular	n/a	2.0	1	14.33	0.14	0.013	66.27	66.24	0.91	1.74	2.55	1.22	3.55	9.09	(Exist)
A-130	A-130	A-132	62.86	62.68	Box	4.0	4.0	1	91.29	0.20	0.015	66.43	66.24	3.47	3.56	5.02	4.89	69.63	84.22	
MH-A03	MH-A03	A-130	63.17	62.86	Box	4.0	4.0	1	161.66	0.19	0.015	67.05	66.43	3.47	3.57	5.00	4.86	69.33	83.06	
A-03	A-03	MH-A03	64.40	64.37	Circular	n/a	3.0	1	32.92	0.09	0.013	67.47	67.05	3.00	2.68	4.59	4.75	31.65	21.66	(Exist)
A-127	A-127	MH-A03	63.46	63.17	Box	4.0	4.0	1	146.00	0.20	0.015	67.11	67.05	2.10	3.88	4.57	2.48	38.42	84.53	
MH-A04	MH-A04	A-127	63.78	63.46	Box	4.0	4.0	1	166.76	0.19	0.015	67.44	67.11	2.10	3.65	4.50	2.59	37.87	83.09	
A-04	A-04	MH-A04	65.45	65.39	Circular	n/a	2.0	1	36.73	0.16	0.013	69.29	67.44	2.00	2.00	8.17	7.96	25.02	9.84	(Exist)
A-123A	A-123A	MH-A04	64.10	63.78	Box	3.0	3.0	1	165.06	0.19	0.015	67.50	67.44	1.30	3.00	3.37	1.46	13.13	38.78	
MH-A05	MH-A05	A-123A	64.16	64.10	Box	3.0	3.0	1	30.46	0.20	0.015	67.51	67.50	1.25	3.00	3.36	1.40	12.62	39.09	
A-05	A-05	MH-A05	66.49	66.46	Circular	n/a	2.0	1	15.48	0.19	0.013	67.51	67.51	0.22	1.05	1.36	0.16	0.26	10.71	(Exist)
A-123B	A-123B	MH-A05	64.32	64.16	Box	3.0	3.0	1	80.73	0.20	0.015	67.54	67.51	1.21	3.00	3.45	1.39	12.50	39.21	
MH-A01	MH-A01	A-123B	64.65	64.32	Circular	n/a	2.5	1	169.74	0.19	0.013	67.70	67.54	1.47	2.50	3.93	2.40	11.77	19.45	
MH-A07	MH-A08	MH-A01	64.68	64.65	Circular	n/a	2.5	1	14.90	0.20	0.013	67.71	67.70	1.47	2.50	3.93	2.40	11.77	19.80	
A-07	A-07	MH-A08	68.23	68.17	Circular	n/a	2.0	1	9.81	0.61	0.013	68.89	68.63	0.45	0.46	3.73	3.68	1.98	19.03	
A-08	A-08	MH-A08	69.38	69.15	Circular	n/a	1.5	1	61.40	0.38	0.013	71.64	70.37	1.50	1.22	5.79	6.49	9.98	6.92	(Exist)

SYSTEM B - PROPOSED 2-YR LINK SUMMARY

LINK ID	US NODE	DS NODE	FLOWLINE US (ft)	FLOWLINE DS (ft)	SHAPE	SPAN (ft)	RISE (ft)	# OF BARRELS	LENGTH (ft)	SLOPE (ft/ft)	n-Value	HGL US (ft)	HGL DS (ft)	DEPTH UNIFORM (ft)	DEPTH ACTUAL (ft)	VELOCITY UNIFORM (ft)	VELOCITY ACTUAL (ft)	Q (cfs)	CAPACITY (cfs)	NOTES
W-153	W-153	OUT-B	45.80	45.79	Box	9.0	9.0	1	10.00	0.10	0.015	57.29	56.35	8.35	9.00	6.24	5.79	469.09	521.38	(Exist)
N-R1	N-R1	W-153	48.75	48.73	Circular	n/a	3.5	1	11.28	0.14	0.013	57.66	57.29	3.50	3.50	7.75	7.56	72.69	40.76	RESTRICTOR
N-R2	N-R2	W-153	49.75	49.72	Circular	n/a	2.0	1	15.87	0.19	0.013	62.55	57.29	2.00	2.00	25.52	24.87	78.14	10.58	RESTRICTOR
MH-38	MH-38	N-R1	48.91	48.75	Box	10.0	10.0	2	149.32	0.11	0.015	57.66	57.66	1.16	8.91	3.13	0.41	72.69	1447.35	
MH-01	MH-01	N-R2	49.75	49.75	Box	10.0	10.0	2	5.74	0.02	0.015	62.55	62.55	2.48	10.00	1.58	0.39	78.14	576.24	
B-64	B-64	MH-38	61.33	61.22	Circular	n/a	2.0	1	71.68	0.15	0.013	61.78	61.53	0.41	0.31	1.74	2.59	0.81	9.53	
MH-37	MH-37	MH-38	48.95	48.91	Box	10.0	10.0	2	49.02	0.07	0.015	57.66	57.66	1.39	8.75	2.60	0.41	72.48	1167.00	
B-101	B-101	MH-01	55.05	55.00	Circular	n/a	2.5	1	33.00	0.15	0.013	62.55	62.55	0.50	2.50	1.99	0.28	1.37	17.18	
B-102	B-102	MH-01	55.61	55.00	Circular	n/a	2.5	1	36.36	1.68	0.013	62.55	62.55	0.25	2.50	4.37	0.23	1.13	57.15	
B-73N	B-73N	MH-01	49.92	49.75	Box	10.0	10.0	2	166.21	0.10	0.015	62.56	62.55	1.24	10.00	3.13	0.39	77.39	1392.58	
B-63	B-63	MH-37	60.32	60.22	Circular	n/a	2.0	1	74.76	0.13	0.013	61.00	60.68	0.62	0.46	2.15	3.23	1.76	8.90	
MH-04	MH-04	MH-37	49.03	48.95	Box	10.0	10.0	2	85.93	0.10	0.015	57.66	57.66	1.16	8.72	3.09	0.41	71.78	1373.55	
MH-02	MH-02	B-73N	50.17	49.95	Box	10.0	10.0	2	214.79	0.10	0.015	62.56	62.56	1.16	10.00	3.13	0.36	72.54	1397.70	
MH-B73	MH-B73	B-73N	53.46	53.41	Circular	n/a	2.0	1	38.73	0.13	0.013	62.60	62.56	1.47	2.00	2.92	2.30	7.21	8.74	
B-103	B-103	MH-04	56.02	56.00	Circular	n/a	2.5	1	27.50	0.07	0.013	57.67	57.66	0.51	1.66	1.37	0.29	1.00	11.90	
B-104	B-104	MH-04	56.06	56.00	Circular	n/a	2.5	1	42.50	0.14	0.013	57.67	57.66	0.41	1.66	1.71	0.26	0.91	16.58	
B-61-3N	B-61-3N	MH-04	49.18	49.02	Box	10.0	10.0	2	147.90	0.11	0.015	57.66	57.66	1.16	8.64	3.08	0.41	71.35	1413.81	
B-133	B-133	MH-02	57.43	57.41	Circular	n/a	2.0	1	26.25	0.08	0.013	62.56	62.56	0.62	2.00	1.56	0.41	1.28	6.72	
B-134	B-134	MH-02	57.46	57.41	Circular	n/a	2.0	1	43.75	0.11	0.013	62.56	62.56	0.53	2.00	1.77	0.37	1.17	8.23	
MH-03	MH-03	MH-02	50.22	50.17	Box	10.0	10.0	2	70.99	0.07	0.015	62.56	62.56	1.32	10.00	2.70	0.36	71.11	1158.99	
B-73	B-73	MH-B73	63.56	62.95	Circular	n/a	2.0	1	40.31	1.51	0.013	64.96	63.67	0.70	0.72	7.43	7.09	7.21	29.94	(Exist)
MH-05	MH-05	B-61-3N	49.25	49.18	Box	10.0	10.0	2	71.55	0.10	0.015	57.67	57.66	1.16	8.49	3.07	0.42	71.21	1366.01	
MH-B61-3	MH-B61-3	B-61-3N	56.67	56.64	Circular	n/a	2.0	1	28.33	0.11	0.013	57.67	57.66	0.35	1.02	1.34	0.31	0.50	7.92	
MH-39	MH-39	MH-03	59.89	55.05	Circular	n/a	4.0	1	52.59	9.20	0.013	63.70	56.37	1.08	1.32	25.42	19.26	69.86	468.78	
MH-69A	MH-69A	MH-03	52.59	52.51	Circular	n/a	3.0	1	70.36	0.11	0.013	62.56	62.56	0.53	3.00	1.83	0.22	1.53	24.19	
B-105	B-105	MH-05	55.73	55.71	Circular	n/a	2.5	1	25.50	0.08	0.013	57.72	57.67	1.32	1.96	2.27	1.45	5.96	12.36	
B-106	B-106	MH-05	61.27	61.22	Circular	n/a	2.5	1	44.50	0.11	0.013	61.74	61.54	0.46	0.32	1.59	2.66	0.98	14.79	
MH-B56	MH-B56	MH-05	49.31	49.25	Box	10.0	10.0	2	68.56	0.09	0.015	57.67	57.67	1.16	8.42	2.88	0.40	66.93	1302.67	
B-71	B-71	MH-39	64.83	64.80	Circular	n/a	2.5	1	18.92	0.16	0.013	66.17	65.75	1.25	0.95	3.36	4.77	8.21	17.57	
MH-40	MH-40	MH-39	59.97	59.89	Circular	n/a	4.0	1	17.52	0.46	0.013	64.06	63.70	2.35	3.81	8.14	5.05	62.38	104.43	
MH-69B	MH-69B	MH-69A	60.86	60.00	Circular	n/a	3.0	1	41.90	2.05	0.013	62.57	62.56	0.27	2.56	5.00	0.24	1.53	102.79	
MH-B61	MH-B61	B-105	61.28	61.22	Circular	n/a	2.0	1	5.91	1.02	0.013	62.47	61.92	0.63	0.70	5.80	5.10	4.97	24.51	
B-61N	B-61N	MH-B56	49.32	49.31	Box	10.0	10.0	2	12.91	0.11	0.015	57.67	57.67	1.08	8.36	3.02	0.39	65.44	1438.33	
MH-B56-1	MH-B56-1	MH-B56	61.29	61.22	Circular	n/a	2.0	1	46.65	0.15	0.013	61.99	61.76	0.70	0.54	2.40	3.50	2.37	9.43	
MH-41	MH-41	MH-40	60.09	59.97	Circular	n/a	4.0	1	18.33	0.66	0.013	64.25	64.06	1.54	4.00	8.24	2.93	36.76	125.02	
B-69	B-69	MH-69B	65.60	64.50	Circular	n/a	3.0	1	56.29	1.95	0.013	66.12	64.77	0.27	0.27	4.93	4.90	1.53	100.30	(Exist)
B-61	B-61	MH-B61	62.88	62.57	Circular	n/a	1.3	1	67.34	0.46	0.013	64.38	63.47	1.25	0.90	4.15	5.23	4.97	4.72	
MH-52	MH-B52	B-61N	49.42	49.32	Box	10.0	10.0	2	96.96	0.10	0.015	57.67	57.67	1.08	8.35	3.02	0.39	65.41	1402.55	
MH-B61-1	MH-B61-1	B-61N	56.73	56.70	Circular	n/a	2.0	1	30.06	0.10	0.013	57.67	57.67	0.35	0.97	1.34	0.33	0.50	7.69	(Exist)
B-56	B-56	MH-B56-1	62.35	61.69	Circular	n/a	1.0	1	42.84	1.54	0.013	63.39	62.21	0.52	0.52	5.74	5.69	2.37	4.76	
B-76	B-76	MH-40	61.52	60.97	Circular	n/a	3.0	1	77.06	0.71	0.013	64.40	64.06	1.46	3.00	7.85	3.80	26.86	60.61	
B-70-2	B-70-2	MH-41	60.37	60.29	Circular	n/a	3.5	1	28.28	0.28	0.013	64.59	64.25	2.16	3.50	5.91	3.82	36.76	57.56	
B-55N	B-55N	MH-B52	49.56	49.42	Box	10.0	10.0	2	138.95	0.10	0.015	57.67	57.67	1.08	8.25	3.02	0.40	65.38	1386.25	
MH-80	MH-80	MH-B52	61.79	61.73	Circular	n/a	2.0	1	46.00	0.13	0.013	62.30	62.10	0.50	0.37	1.82	2.83	1.11	8.79	
MH-B61-2	MH-B61-2	MH-B61-1	57.00	56.86	Circular	n/a	2.0	1	79.67	0.18	0.013	57.68	57.67	0.31	0.81	1.63	0.42	0.50	10.20	
B-70	B-70	B-70-2	60.47	60.39	Circular	n/a	3.5	1	9.10	0.88	0.013	64.83	64.59	1.51	3.50	9.22	3.82	36.76	101.48	
MH-06	MH-06	B-55N	49.63	49.56	Box	10.0	10.0	2	76.37	0.09	0.015	57.73	57.67	1.16	8.11	2.75	0.39	63.77	1322.20	
MH-B55	MH-B55	B-55N	56.03	56.00	Circular	n/a	2.0	1	30.22	0.10	0.013	57.68	57.67	0.91	1.67	2.17	1.07	3.01	7.67	
B-52	B-52	MH-80	63.91	62.40	Circular	n/a	0.7	1	59.82	2.52	0.013	64.75	62.76	0.36	0.36	5.70	5.70	1.11	2.15	(Exist)
B-107	B-107	MH-06	56.18	56.16	Circular	n/a	2.5	1	27.00	0.07	0.013	57.73	57.73	0.51	1.57	1.43	0.32	1.04	12.01	
B-108	B-108	MH-06	56.28	56.16	Circular	n/a	2.5	1	43.00	0.28	0.013	58.54	57.73	1.91	1.57	4.96	6.16	19.93	23.31	
MH-07A	MH-07A	MH-06	49.72	49.63	Box	10.0	10.0	2	107.71	0.08	0.015	57.73	57.73	1.01	8.10	2.43	0.30	48.79	1262.43	
B-55	B-55	MH-B55	64.30	64.17	Circular	n/a	2.0	1	21.00	0.62	0.013	65.12	64.73	0.56	0.56	4.21	4.20	3.01	19.15	(Exist)
MH-108	MH-108	B-108	57.22	57.16	Circular	n/a	2.5	1	22.72	0.26	0.013	58.99	58.64	1.83	1.48	4.91	6.28	18.94	22.68	
B-109	B-109	MH-07A	56.65	56.61	Circular	n/a	2.5	1	27.01	0.15	0.013	57.73	57.73	0.42	1.12	1.74	0.45	0.95	16.98	
B-50N	B-50N	MH-07A	49.78	49.72	Box	10.0	10.0	2	47.94	0.13	0.015	57.73	57.73	0.85	8.01	2.84	0.30	48.36	1544.94	
MH-B44	MH-B44	MH-108	57.33	57.20	Circular	n/a	2.5	1	56.50	0.23	0.013	59.44	58.99	1.83	1.79	4.50	4.61	17.37	21.16	
MH-B58	MH-B58	MH-108	57.24	57.22	Circular	n/a	2.5	1	10.74	0.19	0.013	59.00	58.99	0.55	1.77	2.37	0.51	1.90	19.04	
MH-07B	MH-07B	B-50N	49.82	49.78	Box	10.0	10.0	2	35.67	0.10	0.015	57.73	57.73	0.93	7.95	2.60	0.30	48.20	1367.95	

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation ©2020

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

SYSTEM A & B
PROPOSED 2-YR LINK SUMMARY

SHEET 8 OF 13

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	186

Design Filename: pw:\\lan-pw.bentley.com:lan-pw-01\Documents\Projects\120-11972-000\4-0-Production-Working\4-1-BIM-CAD\Drainage\PR-STM-SWR-CALCS.dgn

Plotted on: 2/6/2020 2:14:04 PM AAGakhar

Pen Table: MEMORIAL.tbl
Plot Driver: c:\projectwise\aagakhar\d0531333\MemorialDr.pltcfg

SYSTEM B - PROPOSED 2-YR LINK SUMMARY

LINK ID	US NODE	DS NODE	FLOWLINE US (ft)	FLOWLINE DS (ft)	SHAPE	SPAN (ft)	RISE (ft)	# OF BARRELS	LENGTH (ft)	SLOPE (ft/ft)	n-Value	HGL US (ft)	HGL DS (ft)	DEPTH UNIFORM (ft)	DEPTH ACTUAL (ft)	VELOCITY UNIFORM (ft)	VELOCITY ACTUAL (ft)	Q (cfs)	CAPACITY (cfs)	NOTES
MH-B50	MH-B50	B-50N	56.52	56.42	Circular	n/a	2.0	1	29.60	0.34	0.013	57.74	57.73	0.41	1.31	2.60	0.55	1.19	14.14	
B-44	B-44	MH-B44	63.30	63.02	Circular	n/a	2.0	1	52.99	0.53	0.013	65.86	64.52	1.76	1.50	5.93	6.86	17.37	17.69	(Exist)
B-58	B-58	MH-B58	64.42	64.40	Circular	n/a	2.0	1	10.76	0.19	0.013	65.08	64.88	0.60	0.48	2.39	3.30	1.90	10.49	(Exist)
B-110	B-110	MH-07B	56.66	56.59	Circular	n/a	2.5	1	43.25	0.16	0.013	57.73	57.73	0.28	1.14	1.42	0.20	0.44	17.75	
B-41N	B-41N	MH-07B	49.92	49.82	Box	10.0	10.0	2	105.23	0.10	0.015	57.73	57.73	0.93	7.91	2.58	0.30	47.91	1379.50	
B-50	B-50	MH-B50	65.34	64.40	Circular	n/a	0.8	1	28.95	3.25	0.013	66.08	64.72	0.31	0.32	6.34	6.21	1.19	4.24	(Exist)
M-09N	M-09N	B-41N	49.99	49.92	Box	10.0	10.0	2	69.17	0.10	0.015	57.73	57.73	0.89	7.81	2.59	0.30	46.10	1389.26	
MH-B41	MH-B41	B-41N	56.45	56.42	Circular	n/a	2.0	1	30.14	0.10	0.013	57.75	57.73	0.91	1.31	2.18	1.39	3.02	7.68	
MH-08	MH-08	M-09N	50.05	49.99	Box	10.0	10.0	2	59.98	0.10	0.015	57.73	57.73	0.89	7.74	2.58	0.30	45.86	1369.73	
MH-09	MH-09	M-09N	56.48	56.45	Circular	n/a	2.0	2	29.52	0.10	0.013	57.73	57.73	0.25	1.28	1.11	0.12	0.50	15.52	
B-41	B-41	MH-B41	65.18	64.70	Circular	n/a	1.5	1	39.74	1.21	0.013	66.14	65.23	0.52	0.53	5.50	5.43	3.02	12.42	(Exist)
B-124	B-124	MH-08	58.02	58.00	Circular	n/a	2.5	1	26.74	0.08	0.013	58.58	58.39	0.59	0.39	1.61	2.92	1.41	12.07	
B-125	B-125	MH-08	58.04	58.00	Circular	n/a	2.5	1	43.26	0.09	0.013	58.40	58.23	0.37	0.23	1.22	2.37	0.55	13.42	
MH-73	MH-73	MH-08	56.91	56.76	Box	10.0	5.0	2	156.34	0.10	0.015	57.85	57.73	0.89	0.97	2.54	2.32	45.22	557.72	
B-121	B-121	MH-73	59.26	59.20	Circular	n/a	2.0	1	45.00	0.13	0.013	59.58	59.42	0.30	0.22	1.35	2.16	0.40	8.89	
B-136	B-136	MH-73	58.22	58.20	Circular	n/a	2.0	1	20.08	0.10	0.013	58.77	58.59	0.56	0.39	1.73	2.93	1.24	7.68	
MH-10	MH-10	MH-73	57.10	56.91	Box	10.0	5.0	2	190.00	0.10	0.015	58.02	57.85	0.85	0.94	2.64	2.38	44.90	569.37	
B-111	B-111	MH-10	58.22	58.20	Circular	n/a	2.5	1	25.52	0.08	0.013	58.89	58.66	0.73	0.46	1.69	3.23	2.03	12.35	
B-112	B-112	MH-10	58.25	58.20	Circular	n/a	2.5	1	45.55	0.11	0.013	58.62	58.45	0.36	0.25	1.40	2.31	0.60	14.62	
B-32N	B-32N	MH-10	57.17	57.10	Box	10.0	5.0	2	72.68	0.10	0.015	58.28	58.02	0.85	0.92	2.55	2.36	43.34	558.78	
MH-11	MH-11	B-32N	57.36	57.17	Box	10.0	5.0	2	181.32	0.11	0.015	58.34	58.28	0.70	1.11	2.30	1.44	31.96	582.84	
MH-B32	MH-B32	B-32N	59.61	59.23	Circular	n/a	2.0	1	55.53	0.68	0.013	61.05	60.60	1.36	1.37	6.65	6.63	15.19	20.13	
B-113	B-113	MH-11	58.22	58.20	Circular	n/a	2.5	1	27.00	0.07	0.013	59.07	58.79	0.95	0.59	1.91	3.68	3.28	12.01	
B-114A	B-114A	MH-11	63.44	63.37	Circular	n/a	2.0	1	47.00	0.15	0.013	63.95	63.72	0.47	0.35	1.83	2.79	1.03	9.39	
MH-12C	MH-12C	MH-11	57.69	57.36	Box	10.0	5.0	2	329.32	0.10	0.015	58.49	58.34	0.70	0.98	2.15	1.53	29.96	569.96	
B-32	B-32	MH-B32	63.63	63.60	Circular	n/a	2.0	1	12.00	0.21	0.013	65.91	65.01	2.00	1.41	4.96	6.44	15.19	11.11	(Exist)
B-115B	B-115B	MH-12C	64.04	64.00	Circular	n/a	2.0	1	26.69	0.15	0.013	64.74	64.50	0.66	0.50	2.26	3.36	2.04	9.42	
B-116B	B-116B	MH-12C	64.07	64.00	Circular	n/a	2.0	1	47.31	0.15	0.013	64.49	64.30	0.40	0.30	1.64	2.50	0.72	9.36	
MH-12A	MH-12A	MH-12C	57.77	57.69	Box	10.0	5.0	2	80.96	0.10	0.015	58.54	58.49	0.66	0.80	2.14	1.77	28.14	565.98	
MH-13	MH-13	MH-12A	57.95	57.77	Box	10.0	5.0	2	177.82	0.10	0.015	58.66	58.54	0.62	0.77	2.16	1.73	26.69	572.86	
B-115A	B-115A	MH-12A	64.27	64.25	Circular	n/a	2.0	1	26.61	0.08	0.013	64.91	64.70	0.70	0.45	1.67	3.17	1.65	6.67	
B-116A	B-116A	MH-12A	64.30	64.25	Circular	n/a	2.0	1	49.89	0.10	0.013	64.82	64.60	0.53	0.35	1.58	2.80	1.05	7.70	
B-117	B-117	MH-13	64.27	64.25	Circular	n/a	2.0	1	26.64	0.08	0.013	64.90	64.69	0.70	0.44	1.61	3.14	1.59	6.67	
B-118	B-118	MH-13	64.32	64.25	Circular	n/a	2.0	1	47.36	0.15	0.013	64.84	64.61	0.48	0.36	1.85	2.86	1.09	9.36	
MH-14B	MH-14B	MH-13	58.06	57.95	Box	10.0	5.0	2	107.47	0.10	0.015	58.74	58.66	0.60	0.71	2.08	1.76	24.97	576.04	
B-120	B-120	MH-14B	64.30	64.25	Circular	n/a	2.5	1	47.20	0.11	0.013	64.93	64.68	0.62	0.43	1.86	3.12	1.77	14.36	
MH-14A	MH-14A	MH-14B	58.13	58.06	Box	10.0	5.0	2	66.25	0.11	0.015	58.79	58.74	0.58	0.68	2.05	1.76	23.77	585.26	
B-119	B-119	MH-14A	59.47	59.45	Circular	n/a	2.5	1	26.67	0.08	0.013	60.08	59.87	0.66	0.42	1.61	3.06	1.67	12.08	
MH-70	MH-70	MH-14A	58.18	58.13	Box	10.0	5.0	2	51.77	0.10	0.015	58.83	58.79	0.58	0.66	1.95	1.72	22.59	559.54	
MH-47	MH-47	MH-70	64.33	64.25	Circular	n/a	2.0	1	50.35	0.16	0.013	64.71	64.54	0.38	0.29	1.70	2.56	0.71	9.70	
MH-81	MH-81	MH-70	58.24	58.18	Box	10.0	5.0	2	47.72	0.13	0.015	58.85	58.83	0.52	0.65	2.13	1.72	22.19	638.44	
B-14	B-14	MH-47	69.11	68.78	Circular	n/a	1.0	1	22.85	1.44	0.013	69.59	69.06	0.28	0.28	4.03	3.99	0.71	4.61	(Exist)
B-15C	B-15C	MH-81	58.25	58.24	Box	8.0	5.0	1	10.45	0.10	0.015	58.89	58.85	0.77	0.61	2.28	2.87	14.08	206.04	
MH-28	MH-28	MH-81	58.25	58.24	Box	10.0	5.0	1	23.50	0.04	0.015	58.92	58.85	0.70	0.61	1.40	1.59	9.76	185.72	
B-15B	B-15B	B-15C	58.31	58.25	Box	8.0	5.0	1	61.77	0.10	0.015	59.04	58.89	0.77	0.64	2.28	2.76	14.08	211.02	
MH-15	MH-15	MH-28	58.85	58.76	Circular	n/a	4.0	1	95.51	0.09	0.013	60.01	59.67	1.29	0.91	2.78	4.54	9.76	47.43	
MH-46	MH-46	B-15B	58.34	58.31	Box	8.0	5.0	1	30.03	0.09	0.015	59.17	59.04	0.77	0.73	2.28	2.41	14.08	203.40	
MH-16	MH-16	MH-15	63.84	63.70	Circular	n/a	4.0	1	145.24	0.10	0.013	65.11	64.61	1.29	0.91	2.78	4.54	9.76	47.97	
B-15	B-15	MH-46	69.17	69.16	Circular	n/a	2.0	1	8.40	0.12	0.013	71.32	70.51	2.00	1.35	4.60	6.23	14.08	8.40	(Exist)
B-122	B-122	MH-16	63.86	63.84	Ellipse	3.2	2.0	1	21.71	0.09	0.013	65.13	65.11	0.69	1.27	1.91	0.87	2.90	12.36	
MH-75	MH-75	MH-16	63.97	63.84	Circular	n/a	4.0	1	127.88	0.10	0.013	65.21	65.11	1.09	1.27	2.66	2.13	7.34	49.27	
B-139	B-139	MH-75	64.00	63.97	Circular	n/a	2.5	1	21.50	0.14	0.013	65.22	65.21	0.53	1.24	1.94	0.61	1.48	16.48	
MH-58	MH-58	MH-75	64.14	63.97	Circular	n/a	4.0	1	171.82	0.10	0.013	65.29	65.21	1.00	1.24	2.57	1.89	6.29	48.60	
MH-19	MH-19	MH-58	64.27	64.15	Circular	n/a	4.0	1	123.82	0.10	0.013	65.43	65.29	1.00	1.14	2.57	2.12	6.29	48.10	
B-126	B-126	MH-19	65.31	65.27	Ellipse	3.2	2.0	1	21.43	0.19	0.013	65.96	65.74	0.56	0.47	2.54	3.27	2.91	17.60	
MH-21	MH-21	MH-19	64.50	64.27	Circular	n/a	4.0	1	224.83	0.10	0.013	65.49	65.43	0.79	1.16	2.18	1.27	3.84	49.42	
MH-22	MH-22	MH-21	64.66	64.50	Circular	n/a	4.0	1	156.39	0.10	0.013	65.63	65.49	0.79	0.99	2.18	1.59	3.84	49.42	
B-131	B-131	MH-22	65.69	65.66	Circular	n/a	2.5	1	22.18	0.14	0.013	66.59	66.30	0.86	0.64	2.56	3.84	3.84	16.23	

STATE OF TEXAS
WEIMIN LI
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LICENSED PROFESSIONAL ENGINEER
2-6-20
Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

SYSTEM B
PROPOSED 2-YR LINK SUMMARY

SHEET 9 OF 13

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	187

SYSTEM A - PROPOSED 10-YR LINK SUMMARY

LINK ID	US NODE	DS NODE	FLOWLINE US (ft)	FLOWLINE DS (ft)	SHAPE	SPAN (ft)	RISE (ft)	# OF BARRELS	LENGTH (ft)	SLOPE (ft/ft)	n-Value	HGL US (ft)	HGL DS (ft)	DEPTH UNIFORM (ft)	DEPTH ACTUAL (ft)	VELOCITY UNIFORM (ft)	VELOCITY ACTUAL (ft)	Q (cfs)	CAPACITY (cfs)	NOTES
MA-01	MA-01	A-OUT	62.19	61.42	Circular	n/a	3.5	1	13.11	5.87	0.013	66.61	63.92	1.65	2.50	24.72	15.06	110.61	262.27	(Exist)
A-01	A-01	MA-01	68.72	66.54	Circular	n/a	1.0	1	27.91	7.81	0.013	69.49	66.81	0.26	0.27	9.12	8.80	1.49	10.71	(Exist)
MH-A-3	MH-A-3	MA-01	62.24	62.19	Box	4.0	4.0	1	28.21	0.18	0.015	66.85	66.61	4.00	4.00	6.98	6.91	110.54	79.86	
A-132	A-132	MH-A-3	62.68	62.24	Box	4.0	4.0	1	220.24	0.20	0.015	68.06	66.85	4.00	4.00	6.98	6.91	110.54	84.78	
A-02	A-02	A-132	64.52	64.50	Circular	n/a	2.0	1	14.33	0.14	0.013	68.11	68.06	1.17	2.00	2.77	1.69	5.31	9.09	(Exist)
A-130	A-130	A-132	62.86	62.68	Box	4.0	4.0	1	91.29	0.20	0.015	68.51	68.06	4.00	4.00	6.64	6.58	105.23	84.22	
MH-A03	MH-A03	A-130	63.17	62.86	Box	4.0	4.0	1	161.66	0.19	0.015	69.85	68.51	4.00	4.00	6.61	6.55	104.77	83.06	
A-03	A-03	MH-A03	64.40	64.37	Circular	n/a	3.0	1	32.92	0.09	0.013	70.72	69.85	3.00	3.00	6.93	6.75	47.72	21.66	(Exist)
A-127	A-127	MH-A03	63.46	63.17	Box	4.0	4.0	1	146.00	0.20	0.015	70.06	69.85	2.97	4.00	4.88	3.62	57.99	84.53	
MH-A04	MH-A04	A-127	63.78	63.46	Box	4.0	4.0	1	166.76	0.19	0.015	70.78	70.06	2.97	4.00	4.80	3.57	57.08	83.09	
A-04	A-04	MH-A04	65.45	65.39	Circular	n/a	2.0	1	36.73	0.16	0.013	74.03	70.78	2.00	2.00	12.31	12.00	37.69	9.84	(Exist)
A-123A	A-123A	MH-A04	64.10	63.78	Box	3.0	3.0	1	165.06	0.19	0.015	70.90	70.78	1.76	3.00	3.75	2.20	19.82	38.78	
MH-A05	MH-A05	A-123A	64.16	64.10	Box	3.0	3.0	1	30.46	0.20	0.015	70.93	70.90	1.67	3.00	3.80	2.12	19.03	39.09	
A-05	A-05	MH-A05	66.49	66.46	Circular	n/a	2.0	1	15.48	0.19	0.013	70.93	70.93	0.27	2.00	1.53	0.12	0.39	10.71	(Exist)
A-123B	A-123B	MH-A05	64.32	64.16	Box	3.0	3.0	1	80.73	0.20	0.015	71.00	70.93	1.67	3.00	3.76	2.09	18.83	39.21	
MH-A01	MH-A01	A-123B	64.65	64.32	Circular	n/a	2.5	1	169.74	0.19	0.013	71.36	71.00	2.05	2.50	4.10	3.61	17.70	19.45	
MH-A07	MH-A08	MH-A01	64.68	64.65	Circular	n/a	2.5	1	14.90	0.20	0.013	71.38	71.36	1.98	2.50	4.25	3.61	17.70	19.80	
A-07	A-07	MH-A08	68.23	68.17	Circular	n/a	2.0	1	9.81	0.61	0.013	71.40	71.38	0.55	2.00	4.17	0.94	2.96	19.03	
A-08	A-08	MH-A08	69.38	69.15	Circular	n/a	1.5	1	61.40	0.38	0.013	73.75	71.38	1.50	1.50	8.70	8.48	14.99	6.92	(Exist)

SYSTEM B - PROPOSED 10-YR LINK SUMMARY

LINK ID	US NODE	DS NODE	FLOWLINE US (ft)	FLOWLINE DS (ft)	SHAPE	SPAN (ft)	RISE (ft)	# OF BARRELS	LENGTH (ft)	SLOPE (ft/ft)	n-Value	HGL US (ft)	HGL DS (ft)	DEPTH UNIFORM (ft)	DEPTH ACTUAL (ft)	VELOCITY UNIFORM (ft)	VELOCITY ACTUAL (ft)	Q (cfs)	CAPACITY (cfs)	NOTES
W-153	W-153	OUT-B	45.80	45.79	Box	9.0	9.0	1	10.00	0.10	0.015	58.56	56.35	9.00	9.00	9.03	8.94	723.71	521.38	(Exist)
N-R1	N-R1	W-153	48.75	48.73	Circular	n/a	3.5	1	11.28	0.14	0.013	59.50	58.56	3.50	3.50	12.34	12.03	115.70	40.76	RESTRICTOR
N-R2	N-R2	W-153	49.75	49.72	Circular	n/a	2.0	1	15.87	0.19	0.013	74.88	58.56	2.00	2.00	38.86	37.88	119.00	10.58	RESTRICTOR
MH-38	MH-38	N-R1	48.91	48.75	Box	10.0	10.0	2	149.32	0.11	0.015	59.50	59.50	1.55	10.00	3.74	0.58	115.70	1447.35	
MH-01	MH-01	N-R2	49.75	49.75	Box	10.0	10.0	2	5.74	0.02	0.015	74.88	74.88	3.71	10.00	1.60	0.60	119.00	576.24	
B-64	B-64	MH-38	61.33	61.22	Circular	n/a	2.0	1	71.68	0.15	0.013	61.88	61.60	0.50	0.38	1.97	2.93	1.21	9.53	
MH-37	MH-37	MH-38	48.95	48.91	Box	10.0	10.0	2	49.02	0.07	0.015	59.51	59.50	1.86	10.00	3.11	0.58	115.30	1167.00	
B-101	B-101	MH-01	55.05	55.00	Circular	n/a	2.5	1	33.00	0.15	0.013	74.88	74.88	0.61	2.50	2.23	0.42	2.05	17.18	
B-102	B-102	MH-01	55.61	55.00	Circular	n/a	2.5	1	36.36	1.68	0.013	74.88	74.88	0.31	2.50	4.93	0.35	1.69	57.15	
B-73N	B-73N	MH-01	49.92	49.75	Box	10.0	10.0	2	166.21	0.10	0.015	74.89	74.88	1.62	10.00	3.62	0.59	117.52	1392.58	
B-63	B-63	MH-37	60.32	60.22	Circular	n/a	2.0	1	74.76	0.13	0.013	61.15	60.79	0.76	0.57	2.40	3.62	2.64	8.90	
MH-04	MH-04	MH-37	49.03	48.95	Box	10.0	10.0	2	85.93	0.10	0.015	59.51	59.51	1.62	10.00	3.51	0.57	114.11	1373.55	
MH-02	MH-02	B-73N	50.17	49.95	Box	10.0	10.0	2	214.79	0.10	0.015	74.90	74.89	1.55	10.00	3.55	0.55	109.77	1397.70	
MH-B73	MH-B73	B-73N	53.46	53.41	Circular	n/a	2.0	1	38.73	0.13	0.013	75.00	74.89	2.00	2.00	3.54	3.45	10.83	8.74	
B-103	B-103	MH-04	56.02	56.00	Circular	n/a	2.5	1	27.50	0.07	0.013	59.51	59.51	0.62	2.50	1.56	0.30	1.49	11.90	
B-104	B-104	MH-04	56.06	56.00	Circular	n/a	2.5	1	42.50	0.14	0.013	59.51	59.51	0.50	2.50	1.97	0.28	1.36	16.58	
B-61-3N	B-61-3N	MH-04	49.18	49.02	Box	10.0	10.0	2	147.90	0.11	0.015	59.51	59.51	1.55	10.00	3.68	0.57	113.75	1413.81	
B-133	B-133	MH-02	57.43	57.41	Circular	n/a	2.0	1	26.25	0.08	0.013	74.91	74.90	0.76	2.00	1.74	0.61	1.91	6.72	
B-134	B-134	MH-02	57.46	57.41	Circular	n/a	2.0	1	43.75	0.11	0.013	74.91	74.90	0.65	2.00	2.00	0.56	1.75	8.23	
MH-03	MH-03	MH-02	50.22	50.17	Box	10.0	10.0	2	70.99	0.07	0.015	74.90	74.90	1.70	10.00	3.16	0.54	107.44	1158.99	
B-73	B-73	MH-B73	63.56	62.95	Circular	n/a	2.0	1	40.31	1.51	0.013	75.27	75.00	0.87	2.00	8.32	3.45	10.83	29.94	(Exist)
MH-05	MH-05	B-61-3N	49.25	49.18	Box	10.0	10.0	2	71.55	0.10	0.015	59.51	59.51	1.62	10.00	3.49	0.57	113.25	1366.01	
MH-B61-3	MH-B61-3	B-61-3N	56.67	56.64	Circular	n/a	2.0	1	28.33	0.11	0.013	59.51	59.51	0.35	2.00	1.34	0.16	0.50	7.92	
MH-39	MH-39	MH-03	59.89	55.05	Circular	n/a	4.0	1	52.59	9.20	0.013	76.48	74.90	1.34	4.00	28.58	8.40	105.55	468.78	
MH-69A	MH-69A	MH-03	52.59	52.51	Circular	n/a	3.0	1	70.36	0.11	0.013	74.90	74.90	0.66	3.00	1.99	0.32	2.29	24.19	
B-105	B-105	MH-05	55.73	55.71	Circular	n/a	2.5	1	25.50	0.08	0.013	59.60	59.51	1.61	2.50	2.67	1.83	8.96	12.36	
B-106	B-106	MH-05	61.27	61.22	Circular	n/a	2.5	1	44.50	0.11	0.013	61.84	61.61	0.55	0.39	1.83	2.95	1.46	14.79	
MH-B56	MH-B56	MH-05	49.31	49.25	Box	10.0	10.0	2	68.56	0.09	0.015	59.52	59.51	1.55	10.00	3.44	0.53	106.31	1302.67	
B-71	B-71	MH-39	64.83	64.80	Circular	n/a	2.5	1	18.92	0.16	0.013	76.60	76.48	1.61	2.50	3.68	2.51	12.34	17.57	
MH-40	MH-40	MH-39	59.97	59.89	Circular	n/a	4.0	1	17.52	0.46	0.013	77.28	76.48	3.17	4.00	8.83	7.50	94.24	104.43	
MH-69B	MH-69B	MH-69A	60.86	60.00	Circular	n/a	3.0	1	41.90	2.05	0.013	74.91	74.90	0.32	3.00	5.65	0.32	2.29	102.79	
MH-B61	MH-B61	B-105	61.28	61.22	Circular	n/a	2.0	1	5.91	1.02	0.013	62.80	62.09	0.79	0.87	6.51	5.66	7.45	24.51	
B-61N	B-61N	MH-B56	49.32	49.31	Box	10.0	10.0	2	12.91	0.11	0.015	59.52	59.52	1.47	10.00	3.56	0.52	104.57	1438.33	
MH-B56-1	MH-B56-1	MH-B56	61.29	61.22	Circular	n/a	2.0	1	46.65	0.15	0.013	62.16	61.88	0.88	0.66	2.67	3.93	3.55	9.43	
MH-41	MH-41	MH-40	60.09	59.97	Circular	n/a	4.0	1	18.33	0.66	0.013	77.71	77.28	1.95	4.00	9.12	4.42	55.52	125.02	
B-69	B-69	MH-69B	65.60	64.50	Circular	n/a	3.0	1	56.29	1.95	0.013	74.91	74.91	0.33	3.00	5.55	0.32	2.29	100.30	(Exist)
B-61	B-61	MH-B61	62.88	62.57	Circular	n/a	1.3	1	67.34	0.46	0.013	65.21	63.66	1.25	1.09	6.22	6.57	7.45	4.72	
MH-52	MH-B52	B-61N	49.42	49.32	Box	10.0	10.0	2	96.96	0.10	0.015	59.52	59.52	1.47	10.00	3.54	0.52	104.07	1402.55	
MH-B61-1	MH-B61-1	B-61N	56.73	56.70	Circular	n/a	2.0	1	30.06	0.10	0.013	59.52	59.52	0.35	2.00	1.34	0.16	0.50	7.69	(Exist)
B-56	B-56	MH-B56-1	62.35	61.69	Circular	n/a	1.0	1	42.84	1.54	0.013	63.83	62.37	0.68	0.68	6.26	6.22	3.55	4.76	
B-76	B-76	MH-40	61.52	60.97	Circular	n/a	3.0	1	77.06	0.71	0.013	78.07	77.28	1.88	3.00	8.68	5.73	40.48	60.61	
B-70-2	B-70-2	MH-41	60.37	60.29	Circular	n/a	3.5	1	28.28	0.28	0.013	78.48	77.71	3.08	3.50	6.19	5.77	55.52	57.56	
B-55N	B-55N	MH-B52	49.56	49.42	Box	10.0	10.0	2	138.95	0.10	0.015	59.52	59.52	1.55	10.00	3.36	0.52	103.93	1386.25	
MH-80	MH-80	MH-B52	61.79	61.73	Circular	n/a	2.0	1	46.00	0.13	0.013	62.42	62.18	0.62	0.45	2.02	3.17	1.66	8.79	
MH-B61-2	MH-B61-2	MH-B61-1	57.00	56.86	Circular	n/a	2.0	1	79.67	0.18	0.013	59.52	59.52	0.31	2.00	1.63	0.16	0.50	10.20	
B-70	B-70	B-70-2	60.47	60.39	Circular	n/a	3.5	1	9.10	0.88	0.013	79.03	78.48	1.93	3.50	10.24	5.77	55.52	101.48	
MH-06	MH-06	B-55N	49.63	49.56	Box	10.0	10.0	2	76.37	0.09	0.015	59.63	59.52	1.55	9.96	3.27	0.51	101.25	1322.20	
MH-B55	MH-B55	B-55N	56.03	56.00	Circular	n/a	2.0	1	30.22	0.10	0.013	59.54	59.52	1.17	2.00	2.35	1.44	4.51	7.67	
B-52	B-52	MH-80	63.91	62.40	Circular	n/a	0.7	1	59.82	2.52	0.013	65.20	62.87	0.47	0.47	6.21	6.21	1.66	2.15	(Exist)
B-107	B-107	MH-06	56.18	56.16	Circular	n/a	2.5	1	27.00	0.07	0.013	59.64	59.63	0.62	2.50	1.62	0.32	1.55	12.01	
B-108	B-108	MH-06	56.28	56.16	Circular	n/a	2.5	1	43.00	0.28	0.013	60.51	59.63	2.50	2.50	6.28	6.12	30.05	23.31	
MH-07A	MH-07A	MH-06	49.72	49.63	Box	10.0	10.0	2	107.71	0.08	0.015	59.64	59.63	1.32	10.00	2.94	0.39	77.27	1262.43	
B-55	B-55	MH-B55	64.30	64.17	Circular	n/a	2.0	1	21.00	0.62	0.013	65.34	64.86	0.69	0.69	4.73	4.69	4.51	19.15	(Exist)
MH-108	MH-108	B-108	57.22	57.16	Circular	n/a	2.5	1	22.72	0.26	0.013	60.77	60.51	2.50	2.50	5.97	5.82	28.56	22.68	

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Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

SYSTEM A & B
PROPOSED 10-YR LINK SUMMARY

SHEET 10 OF 13

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	188

Plotted on: 2/6/2020 1:58:03 PM
Pen Table: MEMORIAL.tbl
Plot Driver: c:\projectwise\masalinas\d0531333\MEMORIAL DR.pltcfg
MASalinas
Design Filename: pw:\\lan-pw.bentley.com:lan-pw-01\Documents\Projects\120-11972-000\4-0-Production-Working\4-1-BIM-CAD\Drainage\PR-STM-SWR-CALCS.dgn

SYSTEM B - PROPOSED 10-YR LINK SUMMARY

LINK ID	US NODE	DS NODE	FLOWLINE US (ft)	FLOWLINE DS (ft)	SHAPE	SPAN (ft)	RISE (ft)	# OF BARRELS	LENGTH (ft)	SLOPE (ft/ft)	n-Value	HGL US (ft)	HGL DS (ft)	DEPTH UNIFORM (ft)	DEPTH ACTUAL (ft)	VELOCITY UNIFORM (ft)	VELOCITY ACTUAL (ft)	Q (cfs)	CAPACITY (cfs)	NOTES
B-109	B-109	MH-07A	56.65	56.61	Circular	n/a	2.5	1	27.01	0.15	0.013	59.64	59.64	0.51	2.50	1.96	0.29	1.42	16.98	
B-50N	B-50N	MH-07A	49.78	49.72	Box	10.0	10.0	2	47.94	0.13	0.015	59.64	59.64	1.16	9.92	3.30	0.39	76.55	1544.94	
MH-B44	MH-B44	MH-108	57.33	57.20	Circular	n/a	2.5	1	56.50	0.23	0.013	61.40	60.77	2.50	2.50	5.46	5.32	26.13	21.16	
MH-B58	MH-B58	MH-108	57.24	57.22	Circular	n/a	2.5	1	10.74	0.19	0.013	60.77	60.77	0.68	2.50	2.64	0.58	2.84	19.04	
MH-07B	MH-07B	B-50N	49.82	49.78	Box	10.0	10.0	2	35.67	0.10	0.015	59.64	59.64	1.24	9.86	3.08	0.39	76.13	1367.95	
MH-B50	MH-B50	B-50N	56.52	56.42	Circular	n/a	2.0	1	29.60	0.34	0.013	59.67	59.64	0.50	2.00	2.91	0.57	1.78	14.14	
B-44	B-44	MH-B44	63.30	63.02	Circular	n/a	2.0	1	52.99	0.53	0.013	67.37	64.81	2.00	1.79	8.53	8.81	26.13	17.69	(Exist)
B-58	B-58	MH-B58	64.42	64.40	Circular	n/a	2.0	1	10.76	0.19	0.013	65.23	64.99	0.73	0.59	2.72	3.69	2.84	10.49	(Exist)
B-110	B-110	MH-07B	56.66	56.59	Circular	n/a	2.5	1	43.25	0.16	0.013	59.64	59.64	0.34	2.50	1.63	0.13	0.65	17.75	
B-41N	B-41N	MH-07B	49.92	49.82	Box	10.0	10.0	2	105.23	0.10	0.015	59.64	59.64	1.24	9.82	3.06	0.39	75.68	1379.50	
B-50	B-50	MH-B50	65.34	64.40	Circular	n/a	0.8	1	28.95	3.25	0.013	66.33	64.80	0.39	0.40	7.05	6.83	1.78	4.24	(Exist)
M-09N	M-09N	B-41N	49.99	49.92	Box	10.0	10.0	2	69.17	0.10	0.015	59.64	59.64	1.16	9.72	3.13	0.37	72.73	1389.26	
MH-B41	MH-B41	B-41N	56.45	56.42	Circular	n/a	2.0	1	30.14	0.10	0.013	59.66	59.64	1.17	2.00	2.36	1.44	4.53	7.68	
MH-08	MH-08	M-09N	50.05	49.99	Box	10.0	10.0	2	59.98	0.10	0.015	59.64	59.64	1.24	9.65	2.93	0.38	72.59	1369.73	
MH-09	MH-09	M-09N	56.48	56.45	Circular	n/a	2.0	2	29.52	0.10	0.013	59.64	59.64	0.25	2.00	1.11	0.08	0.50	15.52	
B-41	B-41	MH-B41	65.18	64.70	Circular	n/a	1.5	1	39.74	1.21	0.013	66.40	65.36	0.65	0.66	6.15	6.02	4.53	12.42	(Exist)
B-124	B-124	MH-08	58.02	58.00	Circular	n/a	2.5	1	26.74	0.08	0.013	59.65	59.64	0.73	1.64	1.76	0.62	2.11	12.07	
B-125	B-125	MH-08	58.04	58.00	Circular	n/a	2.5	1	43.26	0.09	0.013	59.64	59.64	0.44	1.64	1.40	0.24	0.82	13.42	
MH-73	MH-73	MH-08	56.91	56.76	Box	10.0	5.0	2	156.34	0.10	0.015	59.65	59.64	1.16	2.88	3.08	1.24	71.38	557.72	
B-121	B-121	MH-73	59.26	59.20	Circular	n/a	2.0	1	45.00	0.13	0.013	59.70	59.65	0.37	0.45	1.51	1.11	0.60	8.89	
B-136	B-136	MH-73	58.22	58.20	Circular	n/a	2.0	1	20.08	0.10	0.013	59.67	59.65	0.70	1.45	1.88	0.76	1.85	7.68	
MH-10	MH-10	MH-73	57.10	56.91	Box	10.0	5.0	2	190.00	0.10	0.015	59.67	59.65	1.16	2.74	3.05	1.29	70.70	569.37	
B-111	B-111	MH-10	58.22	58.20	Circular	n/a	2.5	1	25.52	0.08	0.013	59.69	59.67	0.88	1.47	1.97	1.01	3.04	12.35	
B-112	B-112	MH-10	58.25	58.20	Circular	n/a	2.5	1	45.55	0.11	0.013	59.67	59.67	0.44	1.47	1.54	0.30	0.90	14.62	
B-32N	B-32N	MH-10	57.17	57.10	Box	10.0	5.0	2	72.68	0.10	0.015	59.87	59.67	1.16	2.57	2.94	1.33	68.17	558.78	
MH-11	MH-11	B-32N	57.36	57.17	Box	10.0	5.0	2	181.32	0.11	0.015	59.88	59.87	0.93	2.70	2.70	0.93	50.11	582.84	
MH-B32	MH-B32	B-32N	59.61	59.23	Circular	n/a	2.0	1	55.53	0.68	0.013	61.66	60.93	2.00	1.70	7.46	8.02	22.84	20.13	
B-113	B-113	MH-11	58.22	58.20	Circular	n/a	2.5	1	27.00	0.07	0.013	59.92	59.88	1.17	1.68	2.17	1.40	4.91	12.01	
B-114A	B-114A	MH-11	63.44	63.37	Circular	n/a	2.0	1	47.00	0.15	0.013	64.06	63.80	0.57	0.43	2.07	3.12	1.53	9.39	
MH-12C	MH-12C	MH-11	57.69	57.36	Box	10.0	5.0	2	329.32	0.10	0.015	59.90	59.88	0.89	2.52	2.62	0.92	46.60	569.96	
B-32	B-32	MH-B32	63.63	63.60	Circular	n/a	2.0	1	12.00	0.21	0.013	67.05	65.30	2.00	1.70	7.46	8.02	22.84	11.11	(Exist)
B-115B	B-115B	MH-12C	64.04	64.00	Circular	n/a	2.0	1	26.69	0.15	0.013	64.90	64.61	0.82	0.61	2.51	3.76	3.05	9.42	
B-116B	B-116B	MH-12C	64.07	64.00	Circular	n/a	2.0	1	47.31	0.15	0.013	64.59	64.36	0.47	0.36	1.92	2.83	1.08	9.36	
MH-12A	MH-12A	MH-12C	57.77	57.69	Box	10.0	5.0	2	80.96	0.10	0.015	59.91	59.90	0.85	2.21	2.57	0.99	43.69	565.98	
MH-13	MH-13	MH-12A	57.95	57.77	Box	10.0	5.0	2	177.82	0.10	0.015	59.92	59.91	0.85	2.14	2.43	0.97	41.31	572.86	
B-115A	B-115A	MH-12A	64.27	64.25	Circular	n/a	2.0	1	26.61	0.08	0.013	65.06	64.80	0.88	0.55	1.86	3.54	2.47	6.67	
B-116A	B-116A	MH-12A	64.30	64.25	Circular	n/a	2.0	1	49.89	0.10	0.013	64.94	64.68	0.65	0.43	1.79	3.13	1.57	7.70	
B-117	B-117	MH-13	64.27	64.25	Circular	n/a	2.0	1	26.64	0.08	0.013	65.04	64.79	0.88	0.54	1.78	3.51	2.37	6.67	
B-118	B-118	MH-13	64.32	64.25	Circular	n/a	2.0	1	47.36	0.15	0.013	64.96	64.69	0.59	0.44	2.11	3.16	1.62	9.36	
MH-14B	MH-14B	MH-13	58.06	57.95	Box	10.0	5.0	2	107.47	0.10	0.015	59.93	59.92	0.77	1.97	2.49	0.98	38.53	576.04	
B-120	B-120	MH-14B	64.30	64.25	Circular	n/a	2.5	1	47.20	0.11	0.013	65.07	64.78	0.77	0.53	2.06	3.47	2.65	14.36	
MH-14A	MH-14A	MH-14B	58.13	58.06	Box	10.0	5.0	2	66.25	0.11	0.015	59.94	59.93	0.77	1.87	2.37	0.98	36.63	585.26	
B-119	B-119	MH-14A	59.47	59.45	Circular	n/a	2.5	1	26.67	0.08	0.013	60.21	59.97	0.81	0.52	1.82	3.41	2.49	12.08	
MH-70	MH-70	MH-14A	58.18	58.13	Box	10.0	5.0	2	51.77	0.10	0.015	59.94	59.94	0.77	1.81	2.25	0.96	34.77	559.54	
MH-47	MH-47	MH-70	64.33	64.25	Circular	n/a	2.0	1	50.35	0.16	0.013	64.80	64.60	0.47	0.35	1.89	2.83	1.06	9.70	
MH-81	MH-81	MH-70	58.24	58.18	Box	10.0	5.0	2	47.72	0.13	0.015	59.95	59.94	0.70	1.76	2.45	0.97	34.10	638.44	
B-14	B-14	MH-47	69.11	68.78	Circular	n/a	1.0	1	22.85	1.44	0.013	69.73	69.12	0.34	0.34	4.52	4.45	1.06	4.61	(Exist)
B-15C	B-15C	MH-81	58.25	58.24	Box	8.0	5.0	1	10.45	0.10	0.015	59.95	59.95	1.01	1.71	2.63	1.55	21.17	206.04	
MH-28	MH-28	MH-81	58.25	58.24	Box	10.0	5.0	1	23.50	0.04	0.015	59.97	59.95	0.93	1.71	1.61	0.88	14.93	185.72	
B-15B	B-15B	B-15C	58.31	58.25	Box	8.0	5.0	1	61.77	0.10	0.015	59.98	59.95	1.01	1.70	2.63	1.56	21.17	211.02	
MH-15	MH-15	MH-28	58.85	58.76	Circular	n/a	4.0	1	95.51	0.09	0.013	60.28	59.97	1.64	1.21	3.07	4.66	14.93	47.43	
MH-46	MH-46	B-15B	58.34	58.31	Box	8.0	5.0	1	30.03	0.09	0.015	60.14	59.98	1.01	1.67	2.63	1.59	21.17	203.40	
MH-16	MH-16	MH-15	63.84	63.70	Circular	n/a	4.0	1	145.24	0.10	0.013	65.41	64.83	1.58	1.13	3.22	5.11	14.93	47.97	
B-15	B-15	MH-46	69.17	69.16	Circular	n/a	2.0	1	8.40	0.12	0.013	72.30	70.81	2.00	1.65	6.91	7.65	21.17	8.40	(Exist)
B-122	B-122	MH-16	63.86	63.84	Ellipse	3.2	2.0	1	21.71	0.09	0.013	65.67	65.42	0.81	0.58	2.28	3.65	4.34	12.36	
MH-75	MH-75	MH-16	63.97	63.84	Circular	n/a	4.0	1	127.88	0.10	0.013	65.53	65.41	1.35	1.57	3.00	2.44	11.20	49.27	
B-139	B-139	MH-75	64.00	63.97	Circular	n/a	2.5	1	21.50	0.14	0.013	65.54	65.53	0.64	1.56	2.23	0.69	2.22	16.48	
MH-58	MH-58	MH-75	64.14	63.97	Circular	n/a	4.0	1	171.82	0.10	0.013	65.60	65.53	1.23	1.56	2.91	2.11	9.55	48.60	
MH-19	MH-19	MH-58	64.27	64.15	Circular	n/a	4.0	1	123.82	0.10	0.013	65.75	65.60	1.29	1.45	2.72	2.32	9.55	48.10	
B-126	B-126	MH-19	65.31	65.27	Ellipse	3.2	2.0	1	21.43	0.19	0.013	66.11	65.85	0.69	0.58	2.88	3.66	4.36	17.60	
MH-21	MH-21	MH-19	64.50	64.27	Circular	n/a	4.0	1	224.83	0.10	0.013	65.79	65.75	0.94	1.48	2.56	1.37	5.76	49.42	
MH-22	MH-22	MH-21	64.66	64.50	Circular	n/a	4.0	1	156.39	0.10	0.013	65.92	65.79	0.94	1.29	2.56	1.64	5.76	49.42	
B-131	B-131	MH-22	65.69	65.66	Circular	n/a	2.5	1	22.18	0.14	0.013	66.80	66.45	1.06	0.79	2.90	4.30	5.76	16.23	

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2-6-20

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

SYSTEM B
PROPOSED 10-YR LINK SUMMARY

SHEET 11 OF 13

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	189

Plotted on: 2/6/2020 1:58:04 PM
Pen Table: MEMORIAL.tbl
Plot Driver: c:\projectwise\masalinas\d0531333\MEMORIAL DR.pltcfg
MASalinas
Design Filename: pw:\lan-pw.bentley.com:lan-pw-01\Documents\Projects\120-11972-000\4-0-Production\Working\4-1-BIM-CAD\Drainage\PR-STM-SWR-CALCS.dgn

SYSTEM A - PROPOSED 100-YR LINK SUMMARY

LINK ID	US NODE	DS NODE	FLOWLINE US (ft)	FLOWLINE DS (ft)	SHAPE	SPAN (ft)	RISE (ft)	# OF BARRELS	LENGTH (ft)	SLOPE (ft/ft)	n-Value	HGL US (ft)	HGL DS (ft)	DEPTH UNIFORM (ft)	DEPTH ACTUAL (ft)	VELOCITY UNIFORM (ft)	VELOCITY ACTUAL (ft)	Q (cfs)	CAPACITY (cfs)	NOTES
MA-01	MA-01	A-OUT	62.19	61.42	Circular	n/a	3.5	1	13.11	5.87	0.013	69.14	64.48	2.20	3.06	27.56	19.62	174.98	262.27	(Exist)
A-01	A-01	MA-01	68.72	66.54	Circular	n/a	1.0	1	27.91	7.81	0.013	69.74	66.88	0.33	0.34	10.31	9.75	2.30	10.71	(Exist)
MH-A-3	MH-A-3	MA-01	62.24	62.19	Box	4.0	4.0	1	28.21	0.18	0.015	69.72	69.14	4.00	4.00	10.99	10.88	174.12	79.86	
A-132	A-132	MH-A-3	62.68	62.24	Box	4.0	4.0	1	220.24	0.20	0.015	72.75	69.72	4.00	4.00	10.99	10.88	174.12	84.78	
A-02	A-02	A-132	64.52	64.50	Circular	n/a	2.0	1	14.33	0.14	0.013	72.87	72.75	1.64	2.00	2.98	2.62	8.23	9.09	(Exist)
A-130	A-130	A-132	62.86	62.68	Box	4.0	4.0	1	91.29	0.20	0.015	73.85	72.75	4.00	4.00	10.42	10.31	164.97	84.22	
MH-A03	MH-A03	A-130	63.17	62.86	Box	4.0	4.0	1	161.66	0.19	0.015	77.14	73.85	4.00	4.00	10.37	10.27	164.24	83.06	
A-03	A-03	MH-A03	64.40	64.37	Circular	n/a	3.0	1	32.92	0.09	0.013	79.28	77.14	3.00	3.00	10.82	10.54	74.53	21.66	(Exist)
A-127	A-127	MH-A03	63.46	63.17	Box	4.0	4.0	1	146.00	0.20	0.015	77.66	77.14	4.00	4.00	5.73	5.67	90.73	84.53	
MH-A04	MH-A04	A-127	63.78	63.46	Box	4.0	4.0	1	166.76	0.19	0.015	79.41	77.66	4.00	4.00	5.63	5.57	89.10	83.09	
A-04	A-04	MH-A04	65.45	65.39	Circular	n/a	2.0	1	36.73	0.16	0.013	87.34	79.41	2.00	2.00	19.21	18.72	58.81	9.84	(Exist)
A-123A	A-123A	MH-A04	64.10	63.78	Box	3.0	3.0	1	165.06	0.19	0.015	79.72	79.41	2.51	3.00	4.13	3.45	31.05	38.78	
MH-A05	MH-A05	A-123A	64.16	64.10	Box	3.0	3.0	1	30.46	0.20	0.015	79.79	79.72	2.41	3.00	4.12	3.31	29.81	39.09	
A-05	A-05	MH-A05	66.49	66.46	Circular	n/a	2.0	1	15.48	0.19	0.013	79.79	79.79	0.34	2.00	1.72	0.19	0.60	10.71	(Exist)
A-123B	A-123B	MH-A05	64.32	64.16	Box	3.0	3.0	1	80.73	0.20	0.015	79.95	79.79	2.32	3.00	4.23	3.27	29.46	39.21	
MH-A01	MH-A01	A-123B	64.65	64.32	Circular	n/a	2.5	1	169.74	0.19	0.013	80.82	79.95	2.50	2.50	5.76	5.61	27.55	19.45	
MH-A07	MH-A08	MH-A01	64.68	64.65	Circular	n/a	2.5	1	14.90	0.20	0.013	80.88	80.82	2.50	2.50	5.76	5.61	27.55	19.80	
A-07	A-07	MH-A08	68.23	68.17	Circular	n/a	2.0	1	9.81	0.61	0.013	80.92	80.88	0.69	2.00	4.73	1.46	4.57	19.03	
A-08	A-08	MH-A08	69.38	69.15	Circular	n/a	1.5	1	61.40	0.38	0.013	86.61	80.88	1.50	1.50	13.53	13.19	23.30	6.92	(Exist)

SYSTEM B - PROPOSED 100-YR LINK SUMMARY

LINK ID	US NODE	DS NODE	FLOWLINE US (ft)	FLOWLINE DS (ft)	SHAPE	SPAN (ft)	RISE (ft)	# OF BARRELS	LENGTH (ft)	SLOPE (ft/ft)	n-Value	HGL US (ft)	HGL DS (ft)	DEPTH UNIFORM (ft)	DEPTH ACTUAL (ft)	VELOCITY UNIFORM (ft)	VELOCITY ACTUAL (ft)	Q (cfs)	CAPACITY (cfs)	NOTES
W-153	W-153	OUT-B	45.80	45.79	Box	9.0	9.0	1	10.00	0.10	0.015	61.98	56.35	9.00	9.00	14.53	14.38	1165.11	521.38	(Exist)
N-R1	N-R1	W-153	48.75	48.73	Circular	n/a	3.5	1	11.28	0.14	0.013	65.45	61.98	3.50	3.50	20.29	19.78	190.26	40.76	RESTRICTOR
N-R2	N-R2	W-153	49.75	49.72	Circular	n/a	2.0	1	15.87	0.19	0.013	102.61	61.98	2.00	2.00	61.33	59.78	187.79	10.58	RESTRICTOR
MH-38	MH-38	N-R1	48.91	48.75	Box	10.0	10.0	2	149.32	0.11	0.015	65.46	65.45	2.17	10.00	4.39	0.95	190.26	1447.35	
MH-01	MH-01	N-R2	49.75	49.75	Box	10.0	10.0	2	5.74	0.02	0.015	102.61	102.61	4.95	10.00	1.90	0.94	187.79	576.24	
B-64	B-64	MH-38	61.33	61.22	Circular	n/a	2.0	1	71.68	0.15	0.013	65.47	65.46	0.62	2.00	2.26	0.59	1.86	9.53	
MH-37	MH-37	MH-38	48.95	48.91	Box	10.0	10.0	2	49.02	0.07	0.015	65.46	65.46	2.48	10.00	3.83	0.95	189.47	1167.00	
B-101	B-101	MH-01	55.05	55.00	Circular	n/a	2.5	1	33.00	0.15	0.013	102.62	102.61	0.75	2.50	2.54	0.64	3.16	17.18	
B-102	B-102	MH-01	55.61	55.00	Circular	n/a	2.5	1	36.36	1.68	0.013	102.62	102.61	0.38	2.50	5.62	0.53	2.62	57.15	
B-73N	B-73N	MH-01	49.92	49.75	Box	10.0	10.0	2	166.21	0.10	0.015	102.65	102.61	2.17	10.00	4.27	0.93	184.94	1392.58	
B-63	B-63	MH-37	60.32	60.22	Circular	n/a	2.0	1	74.76	0.13	0.013	65.51	65.46	1.00	2.00	2.61	1.30	4.09	8.90	
MH-04	MH-04	MH-37	49.03	48.95	Box	10.0	10.0	2	85.93	0.10	0.015	65.46	65.46	2.32	10.00	4.04	0.94	187.35	1373.55	
MH-02	MH-02	B-73N	50.17	49.95	Box	10.0	10.0	2	214.79	0.10	0.015	102.65	102.65	2.17	10.00	3.98	0.86	172.23	1397.70	
MH-B73	MH-B73	B-73N	53.46	53.41	Circular	n/a	2.0	1	38.73	0.13	0.013	102.89	102.65	2.00	2.00	5.50	5.36	16.85	8.74	
B-103	B-103	MH-04	56.02	56.00	Circular	n/a	2.5	1	27.50	0.07	0.013	65.47	65.46	0.77	2.50	1.79	0.47	2.30	11.90	
B-104	B-104	MH-04	56.06	56.00	Circular	n/a	2.5	1	42.50	0.14	0.013	65.47	65.46	0.62	2.50	2.19	0.43	2.09	16.58	
B-61-3N	B-61-3N	MH-04	49.18	49.02	Box	10.0	10.0	2	147.90	0.11	0.015	65.47	65.46	2.17	10.00	4.30	0.93	186.38	1413.81	
B-133	B-133	MH-02	57.43	57.41	Circular	n/a	2.0	1	26.25	0.08	0.013	102.67	102.65	0.94	2.00	2.04	0.94	2.95	6.72	
B-134	B-134	MH-02	57.46	57.41	Circular	n/a	2.0	1	43.75	0.11	0.013	102.67	102.65	0.82	2.00	2.23	0.86	2.71	8.23	
MH-03	MH-03	MH-02	50.22	50.17	Box	10.0	10.0	2	70.99	0.07	0.015	102.67	102.65	2.32	10.00	3.63	0.84	168.36	1158.99	
B-73	B-73	MH-B73	63.56	62.95	Circular	n/a	2.0	1	40.31	1.51	0.013	103.57	102.89	1.12	2.00	9.29	5.36	16.85	29.94	(Exist)
MH-05	MH-05	B-61-3N	49.25	49.18	Box	10.0	10.0	2	71.55	0.10	0.015	65.48	65.47	2.32	10.00	4.01	0.93	185.88	1366.01	
MH-B61-3	MH-B61-3	B-61-3N	56.67	56.64	Circular	n/a	2.0	1	28.33	0.11	0.013	65.47	65.47	0.35	2.00	1.34	0.16	0.50	7.92	
MH-39	MH-39	MH-03	59.89	55.05	Circular	n/a	4.0	1	52.59	9.20	0.013	106.55	102.67	1.71	4.00	32.29	13.16	165.38	468.78	
MH-69A	MH-69A	MH-03	52.59	52.51	Circular	n/a	3.0	1	70.36	0.11	0.013	102.67	102.67	0.79	3.00	2.37	0.50	3.54	24.19	
B-105	B-105	MH-05	55.73	55.71	Circular	n/a	2.5	1	25.50	0.08	0.013	65.68	65.48	2.50	2.50	2.91	2.84	13.92	12.36	
B-106	B-106	MH-05	61.27	61.22	Circular	n/a	2.5	1	44.50	0.11	0.013	65.48	65.48	0.70	2.50	2.02	0.46	2.26	14.79	
MH-B56	MH-B56	MH-05	49.31	49.25	Box	10.0	10.0	2	68.56	0.09	0.015	65.48	65.48	2.17	10.00	4.03	0.87	174.32	1302.67	
B-71	B-71	MH-39	64.83	64.80	Circular	n/a	2.5	1	18.92	0.16	0.013	106.83	106.55	2.50	2.50	4.01	3.91	19.20	17.57	
MH-40	MH-40	MH-39	59.97	59.89	Circular	n/a	4.0	1	17.52	0.46	0.013	108.50	106.55	4.00	4.00	12.05	11.75	147.63	104.43	
MH-69B	MH-69B	MH-69A	60.86	60.00	Circular	n/a	3.0	1	41.90	2.05	0.013	102.68	102.67	0.40	3.00	6.44	0.50	3.54	102.79	
MH-B61	MH-B61	B-105	61.28	61.22	Circular	n/a	2.0	1	5.91	1.02	0.013	66.12	65.68	1.01	2.00	7.27	3.68	11.55	24.51	
B-61N	B-61N	MH-B56	49.32	49.31	Box	10.0	10.0	2	12.91	0.11	0.015	65.49	65.48	2.01	10.00	4.26	0.86	171.27	1438.33	
MH-B56-1	MH-B56-1	MH-B56	61.29	61.22	Circular	n/a	2.0	1	46.65	0.15	0.013	65.64	65.48	1.14	2.00	2.96	1.75	5.49	9.43	
MH-41	MH-41	MH-40	60.09	59.97	Circular	n/a	4.0	1	18.33	0.66	0.013	109.57	108.50	2.58	4.00	10.14	6.92	86.92	125.02	
B-69	B-69	MH-69B	65.60	64.50	Circular	n/a	3.0	1	56.29	1.95	0.013	102.68	102.68	0.40	3.00	6.33	0.50	3.54	100.30	(Exist)
B-61	B-61	MH-B61	62.88	62.57	Circular	n/a	1.3	1	67.34	0.46	0.013	69.65	66.12	1.25	1.25	9.65	9.41	11.55	4.72	
MH-52	MH-B52	B-61N	49.42	49.32	Box	10.0	10.0	2	96.96	0.10	0.015	65.49	65.49	2.09	10.00	4.09	0.85	170.77	1402.55	
MH-B61-1	MH-B61-1	B-61N	56.73	56.70	Circular	n/a	2.0	1	30.06	0.10	0.013	65.49	65.49	0.35	2.00	1.34	0.16	0.50	7.69	(Exist)
B-56	B-56	MH-B56-1	62.35	61.69	Circular	n/a	1.0	1	42.84	1.54	0.013	67.42	65.64	1.00	1.00	7.17	6.99	5.49	4.76	
B-76	B-76	MH-40	61.52	60.97	Circular	n/a	3.0	1	77.06	0.71	0.013	110.43	108.50	3.00	3.00	9.17	8.94	63.18	60.61	
B-70-2	B-70-2	MH-41	60.37	60.29	Circular	n/a	3.5	1	28.28	0.28	0.013	111.45	109.57	3.50	3.50	9.27	9.03	86.92	57.56	
B-55N	B-55N	MH-B52	49.56	49.42	Box	10.0	10.0	2	138.95	0.10	0.015	65.50	65.49	2.17	10.00	3.93	0.85	170.27	1386.25	
MH-80	MH-80	MH-B52	61.79	61.73	Circular	n/a	2.0	1	46.00	0.13	0.013	65.68	65.49	0.76	2.00	2.33	0.82	2.57	8.79	
MH-B61-2	MH-B61-2	MH-B61-1	57.00	56.86	Circular	n/a	2.0	1	79.67	0.18	0.013	65.49	65.49	0.31	2.00	1.63	0.16	0.50	10.20	
B-70	B-70	B-70-2	60.47	60.39	Circular	n/a	3.5	1	9.10	0.88	0.013	112.79	111.45	2.64	3.50	11.15	9.03	86.91	101.48	
MH-06	MH-06	B-55N	49.63	49.56	Box	10.0	10.0	2	76.37	0.09	0.015	65.76	65.50	2.17	10.00	3.83	0.83	165.73	1322.20	
MH-B55	MH-B55	B-55N	56.03	56.00	Circular	n/a	2.0	1	30.22	0.10	0.013	65.54	65.50	1.64	2.00	2.53	2.22	6.98	7.67	
B-52	B-52	MH-80	63.91	62.40	Circular	n/a	0.7	1	59.82	2.52	0.013	68.95	65.68	0.68	0.68	7.31	7.13	2.57	2.15	(Exist)
B-107	B-107	MH-06	56.18	56.16	Circular	n/a	2.5	1	27.00	0.07	0.013	65.77	65.76	0.81	2.50	1.75	0.49	2.39	12.01	
B-108	B-108	MH-06	56.28	56.16	Circular	n/a	2.5	1	43.00	0.28	0.013	67.89	65.76	2.50	2.50	9.81	9.57	46.95	23.31	
MH-07A	MH-07A	MH-06	49.72	49.63	Box	10.0	10.0	2	107.71	0.08	0.015	65.76	65.76	1.86	10.00	3.40	0.63	126.24	1262.43	
B-55	B-55	MH-B55	64.30	64.17	Circular	n/a	2.0	1	21.00	0.62	0.013	65.72	65.54	0.87	1.37	5.30	3.04	6.98	19.15	(Exist)
MH-108	MH-108	B-108	57.22	57.16	Circular	n/a	2.5	1	22.72	0.26	0.013	68.53	67.89	2.50	2.50	9.32	9.09	44.59	22.68	

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LICENSED PROFESSIONAL ENGINEER

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Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

SYSTEM A & B
PROPOSED 100-YR LINK SUMMARY

SHEET 12 OF 13

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	190

Plotted on: 2/6/2020 1:58:04 PM
Pen Table: MEMORIAL.tbl
Plot Driver: c:\projectwise\masalinas\d0531333\MEMORIAL DR.pltcfg
MASalinas
Design Filename: pw:\\lan-pw.bentley.com:lan-pw-01\Documents\Projects\120-11972-000\4-0-Production-Working\4-1-BIM-CADDrainage\PR-STM-SWR-CALCS.dgn

SYSTEM B - PROPOSED 100-YR LINK SUMMARY

LINK ID	US NODE	DS NODE	FLOWLINE US (ft)	FLOWLINE DS (ft)	SHAPE	SPAN (ft)	RISE (ft)	# OF BARRELS	LENGTH (ft)	SLOPE (ft/ft)	n-Value	HGL US (ft)	HGL DS (ft)	DEPTH UNIFORM (ft)	DEPTH ACTUAL (ft)	VELOCITY UNIFORM (ft)	VELOCITY ACTUAL (ft)	Q (cfs)	CAPACITY (cfs)	NOTES
B-109	B-109	MH-07A	56.65	56.61	Circular	n/a	2.5	1	27.01	0.15	0.013	65.77	65.76	0.62	2.50	2.29	0.45	2.19	16.98	
B-50N	B-50N	MH-07A	49.78	49.72	Box	10.0	10.0	2	47.94	0.13	0.015	65.77	65.76	1.55	10.00	4.04	0.63	124.96	1544.94	
MH-B44	MH-B44	MH-108	57.33	57.20	Circular	n/a	2.5	1	56.50	0.23	0.013	70.08	68.53	2.50	2.50	8.51	8.30	40.72	21.16	
MH-B58	MH-B58	MH-108	57.24	57.22	Circular	n/a	2.5	1	10.74	0.19	0.013	68.53	68.53	0.84	2.50	3.02	0.90	4.39	19.04	
MH-07B	MH-07B	B-50N	49.82	49.78	Box	10.0	10.0	2	35.67	0.10	0.015	65.77	65.77	1.70	10.00	3.65	0.62	124.04	1367.95	
MH-B50	MH-B50	B-50N	56.52	56.42	Circular	n/a	2.0	1	29.60	0.34	0.013	65.85	65.77	0.62	2.00	3.34	0.87	2.75	14.14	
B-44	B-44	MH-B44	63.30	63.02	Circular	n/a	2.0	1	52.99	0.53	0.013	74.41	70.08	2.00	2.00	13.30	12.96	40.72	17.69	(Exist)
B-58	B-58	MH-B58	64.42	64.40	Circular	n/a	2.0	1	10.76	0.19	0.013	68.57	68.53	0.94	2.00	3.03	1.40	4.39	10.49	(Exist)
B-110	B-110	MH-07B	56.66	56.59	Circular	n/a	2.5	1	43.25	0.16	0.013	65.77	65.77	0.42	2.50	1.83	0.20	1.00	17.75	
B-41N	B-41N	MH-07B	49.92	49.82	Box	10.0	10.0	2	105.23	0.10	0.015	65.77	65.77	1.70	10.00	3.62	0.62	123.31	1379.50	
B-50	B-50	MH-B50	65.34	64.40	Circular	n/a	0.8	1	28.95	3.25	0.013	66.90	65.85	0.51	0.83	7.82	5.04	2.75	4.24	(Exist)
M-09N	M-09N	B-41N	49.99	49.92	Box	10.0	10.0	2	69.17	0.10	0.015	65.77	65.77	1.62	10.00	3.64	0.59	118.39	1389.26	
MH-B41	MH-B41	B-41N	56.45	56.42	Circular	n/a	2.0	1	30.14	0.10	0.013	65.82	65.77	1.64	2.00	2.54	2.23	7.01	7.68	
MH-08	MH-08	M-09N	50.05	49.99	Box	10.0	10.0	2	59.98	0.10	0.015	65.78	65.77	1.70	10.00	3.48	0.59	118.37	1369.73	
MH-09	MH-09	M-09N	56.48	56.45	Circular	n/a	2.0	2	29.52	0.10	0.013	65.78	65.77	0.25	2.00	1.11	0.08	0.50	15.52	
B-41	B-41	MH-B41	65.18	64.70	Circular	n/a	1.5	1	39.74	1.21	0.013	66.82	65.56	0.84	0.86	6.87	6.71	7.01	12.42	(Exist)
B-124	B-124	MH-08	58.02	58.00	Circular	n/a	2.5	1	26.74	0.08	0.013	65.78	65.78	0.95	2.50	1.90	0.66	3.26	12.07	
B-125	B-125	MH-08	58.04	58.00	Circular	n/a	2.5	1	43.26	0.09	0.013	65.78	65.78	0.55	2.50	1.57	0.26	1.26	13.42	
MH-73	MH-73	MH-08	56.91	56.76	Box	10.0	5.0	2	156.34	0.10	0.015	65.79	65.78	1.70	5.00	3.42	1.16	116.21	557.72	
B-121	B-121	MH-73	59.26	59.20	Circular	n/a	2.0	1	45.00	0.13	0.013	65.79	65.79	0.46	2.00	1.71	0.29	0.92	8.89	
B-136	B-136	MH-73	58.22	58.20	Circular	n/a	2.0	1	20.08	0.10	0.013	65.81	65.79	0.88	2.00	2.15	0.91	2.86	7.68	
MH-10	MH-10	MH-73	57.10	56.91	Box	10.0	5.0	2	190.00	0.10	0.015	65.80	65.79	1.62	5.00	3.53	1.15	114.81	569.37	
B-111	B-111	MH-10	58.22	58.20	Circular	n/a	2.5	1	25.52	0.08	0.013	65.82	65.80	1.10	2.50	2.26	0.96	4.70	12.35	
B-112	B-112	MH-10	58.25	58.20	Circular	n/a	2.5	1	45.55	0.11	0.013	65.81	65.80	0.55	2.50	1.72	0.28	1.38	14.62	
B-32N	B-32N	MH-10	57.17	57.10	Box	10.0	5.0	2	72.68	0.10	0.015	66.23	65.80	1.55	5.00	3.57	1.11	110.57	558.78	
MH-11	MH-11	B-32N	57.36	57.17	Box	10.0	5.0	2	181.32	0.11	0.015	66.24	66.23	1.24	5.00	3.27	0.81	80.99	582.84	
MH-B32	MH-B32	B-32N	59.61	59.23	Circular	n/a	2.0	1	55.53	0.68	0.013	67.71	66.23	2.00	2.00	11.62	11.32	35.57	20.13	
B-113	B-113	MH-11	58.22	58.20	Circular	n/a	2.5	1	27.00	0.07	0.013	66.29	66.24	1.47	2.50	2.54	1.55	7.62	12.01	
B-114A	B-114A	MH-11	63.44	63.37	Circular	n/a	2.0	1	47.00	0.15	0.013	66.26	66.24	0.70	2.00	2.40	0.75	2.37	9.39	
MH-12C	MH-12C	MH-11	57.69	57.36	Box	10.0	5.0	2	329.32	0.10	0.015	66.26	66.24	1.24	5.00	3.03	0.75	74.88	569.96	
B-32	B-32	MH-B32	63.63	63.60	Circular	n/a	2.0	1	12.00	0.21	0.013	70.09	67.71	2.00	2.00	11.62	11.32	35.57	11.11	(Exist)
B-115B	B-115B	MH-12C	64.04	64.00	Circular	n/a	2.0	1	26.69	0.15	0.013	66.30	66.26	1.06	2.00	2.81	1.50	4.72	9.42	
B-116B	B-116B	MH-12C	64.07	64.00	Circular	n/a	2.0	1	47.31	0.15	0.013	66.26	66.26	0.59	2.00	2.16	0.53	1.66	9.36	
MH-12A	MH-12A	MH-12C	57.77	57.69	Box	10.0	5.0	2	80.96	0.10	0.015	66.26	66.26	1.16	5.00	3.02	0.70	70.10	565.98	
MH-13	MH-13	MH-12A	57.95	57.77	Box	10.0	5.0	2	177.82	0.10	0.015	66.27	66.26	1.08	5.00	3.05	0.66	65.95	572.86	
B-115A	B-115A	MH-12A	64.27	64.25	Circular	n/a	2.0	1	26.61	0.08	0.013	66.29	66.26	1.17	2.00	1.99	1.22	3.82	6.67	
B-116A	B-116A	MH-12A	64.30	64.25	Circular	n/a	2.0	1	49.89	0.10	0.013	66.28	66.26	0.82	2.00	1.99	0.77	2.42	7.70	
B-117	B-117	MH-13	64.27	64.25	Circular	n/a	2.0	1	26.64	0.08	0.013	66.30	66.27	1.12	2.00	2.04	1.17	3.67	6.67	
B-118	B-118	MH-13	64.32	64.25	Circular	n/a	2.0	1	47.36	0.15	0.013	66.28	66.27	0.73	2.00	2.40	0.80	2.51	9.36	
MH-14B	MH-14B	MH-13	58.06	57.95	Box	10.0	5.0	2	107.47	0.10	0.015	66.27	66.27	1.08	5.00	2.83	0.61	61.38	576.04	
B-120	B-120	MH-14B	64.30	64.25	Circular	n/a	2.5	1	47.20	0.11	0.013	66.29	66.27	0.95	2.02	2.38	0.96	4.10	14.36	
MH-14A	MH-14A	MH-14B	58.13	58.06	Box	10.0	5.0	2	66.25	0.11	0.015	66.28	66.27	1.01	5.00	2.90	0.58	58.25	585.26	
B-119	B-119	MH-14A	59.47	59.45	Circular	n/a	2.5	1	26.67	0.08	0.013	66.29	66.28	1.03	2.50	2.03	0.79	3.85	12.08	
MH-70	MH-70	MH-14A	58.18	58.13	Box	10.0	5.0	2	51.77	0.10	0.015	66.28	66.28	1.01	5.00	2.75	0.55	55.20	559.54	
MH-47	MH-47	MH-70	64.33	64.25	Circular	n/a	2.0	1	50.35	0.16	0.013	66.29	66.28	0.57	2.00	2.20	0.52	1.63	9.70	
MH-81	MH-81	MH-70	58.24	58.18	Box	10.0	5.0	2	47.72	0.13	0.015	66.28	66.28	0.93	5.00	2.91	0.54	54.08	638.44	
B-14	B-14	MH-47	69.11	68.78	Circular	n/a	1.0	1	22.85	1.44	0.013	69.92	69.22	0.43	0.44	5.08	4.98	1.63	4.61	(Exist)
B-15C	B-15C	MH-81	58.25	58.24	Box	8.0	5.0	1	10.45	0.10	0.015	66.28	66.28	1.32	5.00	3.13	0.82	32.96	206.04	
MH-28	MH-28	MH-81	58.25	58.24	Box	10.0	5.0	1	23.50	0.04	0.015	66.29	66.28	1.24	5.00	1.91	0.47	23.57	185.72	
B-15B	B-15B	B-15C	58.31	58.25	Box	8.0	5.0	1	61.77	0.10	0.015	66.29	66.28	1.32	5.00	3.13	0.82	32.96	211.02	
MH-15	MH-15	MH-28	58.85	58.76	Circular	n/a	4.0	1	95.51	0.09	0.013	66.32	66.29	2.11	4.00	3.50	1.88	23.57	47.43	
MH-46	MH-46	B-15B	58.34	58.31	Box	8.0	5.0	1	30.03	0.09	0.015	66.73	66.29	1.39	5.00	2.96	0.82	32.96	203.40	
MH-16	MH-16	MH-15	63.84	63.70	Circular	n/a	4.0	1	145.24	0.10	0.013	66.46	66.32	2.11	2.62	3.50	2.70	23.57	47.97	
B-15	B-15	MH-46	69.17	69.16	Circular	n/a	2.0	1	8.40	0.12	0.013	74.88	71.06	2.00	1.90	10.76	10.69	32.96	8.40	(Exist)
B-122	B-122	MH-16	63.86	63.84	Ellipse	3.2	2.0	1	21.71	0.09	0.013	66.50	66.46	1.06	1.62	2.50	1.56	6.72	12.36	
MH-75	MH-75	MH-16	63.97	63.84	Circular	n/a	4.0	1	127.88	0.10	0.013	66.52	66.46	1.76	2.62	3.31	2.03	17.64	49.27	
B-139	B-139	MH-75	64.00	63.97	Circular	n/a	2.5	1	21.50	0.14	0.013	66.53	66.52	0.81	2.50	2.50	0.70	3.43	16.48	
MH-58	MH-58	MH-75	64.14	63.97	Circular	n/a	4.0	1	171.82	0.10	0.013	66.55	66.52	1.58	2.55	3.23	1.77	14.96	48.60	
MH-19	MH-19	MH-58	64.27	64.15	Circular	n/a	4.0	1	123.82	0.10	0.013	66.63	66.55	1.58	2.40	3.23	1.90	14.96	48.10	
B-126	B-126	MH-19	65.31	65.27	Ellipse	3.2	2.0	1	21.43	0.19	0.013	66.70	66.63	0.88	1.36	3.23	1.87	6.76	17.60	
MH-21	MH-21	MH-19	64.50	64.27	Circular	n/a	4.0	1	224.83	0.10	0.013	66.65	66.63	1.17	2.36	2.91	1.16	8.93	49.42	
MH-22	MH-22	MH-21	64.66	64.50	Circular	n/a	4.0	1	156.39	0.10	0.013	66.72	66.65	1.17	2.15	2.91	1.30	8.93	49.42	
B-131	B-131	MH-22	65.69	65.66	Circular	n/a	2.5	1	22.18	0.14	0.013	67.10	66.72	1.39	1.06	3.18	4.53	8.93	16.23	

ACCEPTED AND FILED
PUBLIC WORKS AND ENGINEERING
67862

STATE OF TEXAS
WEIMIN LI
88740
LICENSED PROFESSIONAL ENGINEER

2-6-20

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

SYSTEM B
PROPOSED 100-YR LINK SUMMARY

SHEET 13 OF 13

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	191

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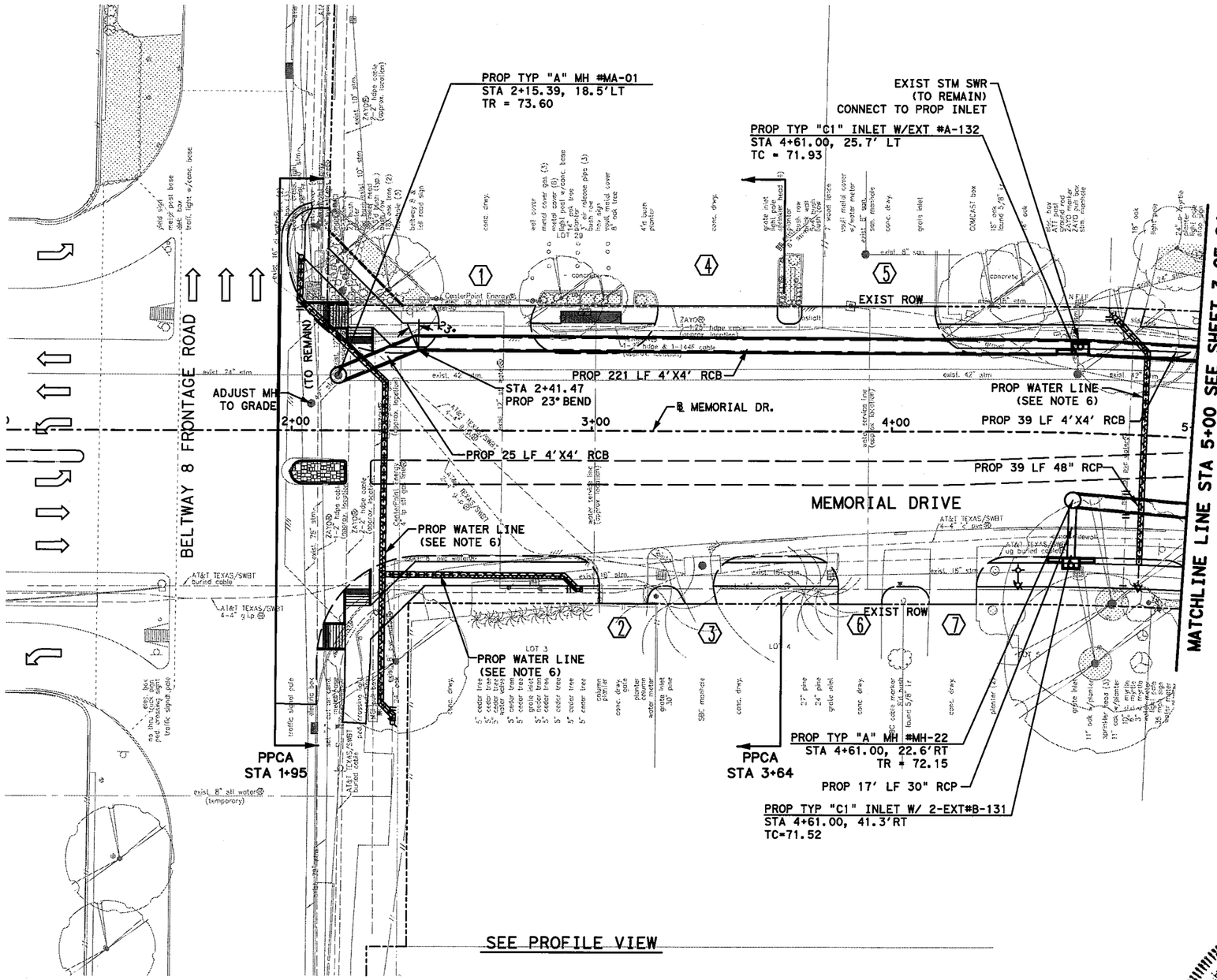

LEGEND:

- PROP STORM SEWER
- EXIST STORM SEWER
- PROP ROADWAY FACE OF CURB
- PROP INLET OR JCT BOX
- PROP MANHOLE
- EXIST INLET OR JUNCTION BOX
- EXIST MANHOLE
- BORE HOLE LOCATION

NOTES:

1. ALL RCP ARE CLASS III UNLESS OTHERWISE NOTED.
2. CONTRACTOR TO MAINTAIN POSITIVE DRAINAGE DURING CONSTRUCTION AND FIELD VERIFY FLOWLINES OF ALL TO CONNECTIONS TO EXISTING DRAINAGE STRUCTURES TO VERIFY POSITIVE DRAINAGE TO PROPOSED STORM SEWER PRIOR TO CONSTRUCTION.
3. REFER TO TXDOT HOUSTON DISTRICT BRIDGE MISCELLANEOUS SEWER DETAILS (MSD) FOR PIPE COLLAR, PIPE BEND, AND OTHER PIPE AND MANHOLE INLET CAP CONNECTION DETAILS.
4. REFER TO MODIFIED STANDARDS FOR TYPE "A/B" MANHOLES AND TYPE "C1" INLETS WHERE STRUCTURE IS NOTED "ON BOX" IN PLAN & PROFILE.
5. REFER TO TXDOT STATEWIDE STANDARD BRIDGE FOR BOX CULVERT CAST-IN-PLACE (SCP-MD & MC-MD), PRECAST JUNCTION BOX (PJB), AND PRECAST (SCP-MD) MISCELLANEOUS DETAILS FOR PROPOSED BENDS IN BOXES.
6. REFER TO PAVEMENT IMPROVEMENTS PLAN & PROFILE, WATER LINE & SAN SWR PLAN & PROFILE, SIGNING AND PAVEMENT MARKINGS PLAN SHEETS FOR MORE INFORMATION.
7. REFER TO LATERAL PROFILE SHEETS FOR PROPOSED FLOWLINES FOR STUB-INS.

0 40 80
(IN FEET)
SCALE: PLAN 1"= 40'

STATE OF TEXAS
WEIMIN LI
88740
LICENSED PROFESSIONAL ENGINEER
2-6-20

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STORM SEWER PLAN
BEGIN PROJECT TO STA 5+00

SHEET 1 OF 24

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	192

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67862

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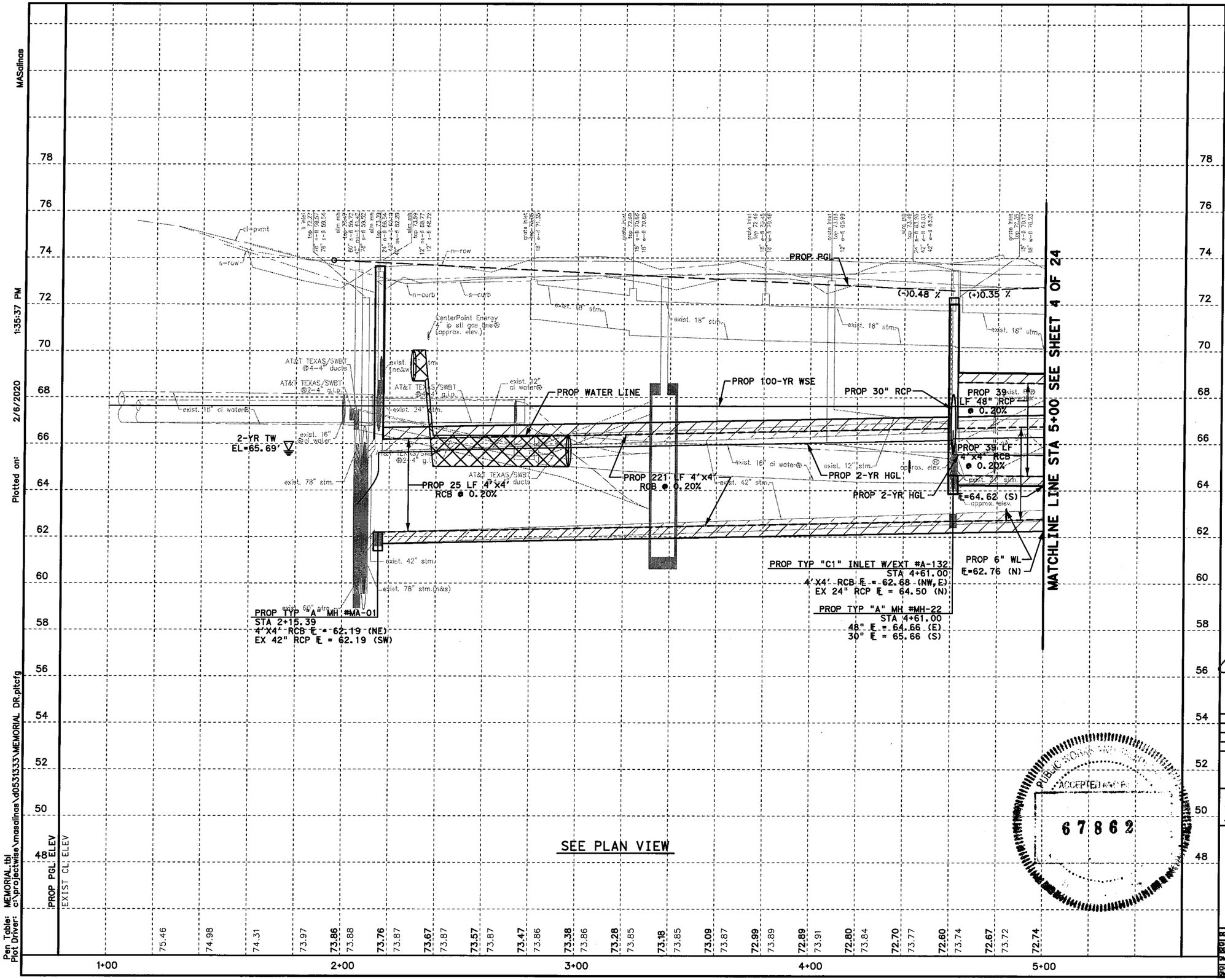

NOTES:

1. REFER TO LATERAL PROFILE SHEETS FOR PROPOSED FLOWLINES FOR STUB-INS.

0 40 80

(IN FEET)
SCALE: 1"=40' - H
1"=4' - V

STATE OF TEXAS
WEIMIN LI
88740
LICENSED PROFESSIONAL ENGINEER

2-6-20

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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ACCEPTED
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STORM SEWER PROFILE BEGIN PROJECT TO STA 5+00

SHEET 2 OF 24

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	193

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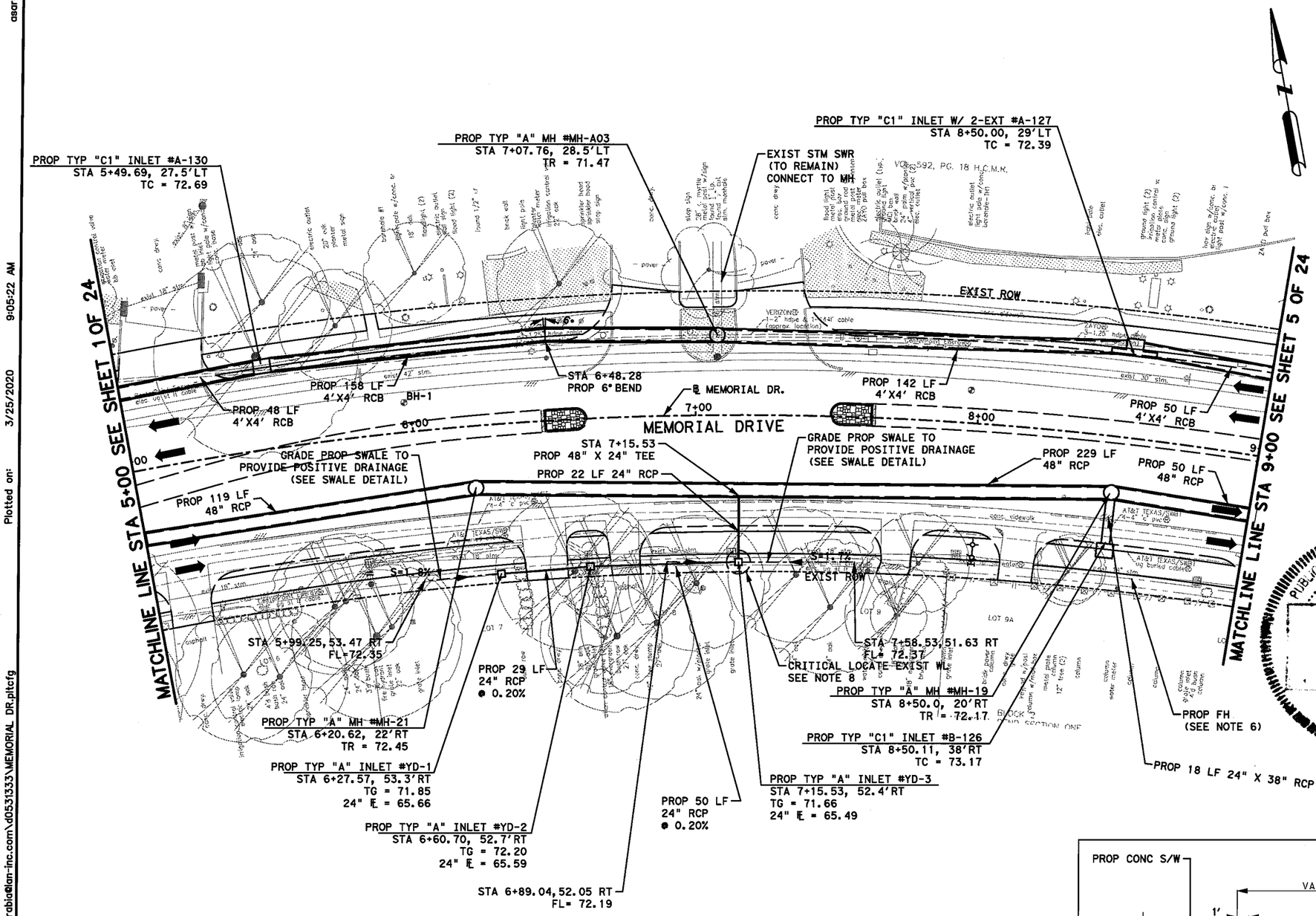
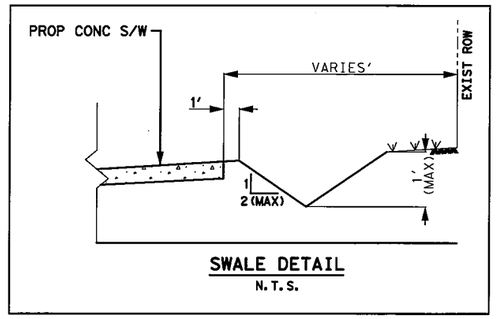


SEE PROFILE VIEW

NOTE (CONT.):

8. LOCATE EXIST WL WITHIN 30 DAYS AFTER NTP IS ISSUED. PROVIDE DEPTH OF COVER INFORMATION TO PM.



SWALE DETAIL

N. T. S.

LEGEND:

- PROP STORM SEWER
- EXIST STORM SEWER
- PROP ROADWAY FACE OF CURB
- PROP INLET OR JCT BOX
- PROP MANHOLE
- EXIST INLET OR JUNCTION BOX
- EXIST MANHOLE
- BORE HOLE LOCATION

NOTES:

1. ALL RCP ARE CLASS III UNLESS OTHERWISE NOTED.
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3. REFER TO TXDOT HOUSTON DISTRICT BRIDGE MISCELLANEOUS SEWER DETAILS (MSD) FOR PIPE COLLAR, PIPE BEND, AND OTHER PIPE AND MANHOLE INLET CAP CONNECTION DETAILS.
4. REFER TO MODIFIED STANDARDS FOR TYPE "A/B" MANHOLES AND TYPE "C1" INLETS WHERE STRUCTURE IS NOTED "ON BOX" IN PLAN & PROFILE.
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7. REFER TO LATERAL PROFILE SHEETS FOR PROPOSED FLOWLINES FOR STUB-INS.

PUBLIC WORKS AND ENGINEERING
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0 40 80
(IN FEET)
SCALE: PLAN 1" = 40'

STATE OF TEXAS
WEIMIN LI
88740
LICENSED
PROFESSIONAL ENGINEER

3/31/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STORM SEWER PLAN STA 5+00 TO STA 9+00

SHEET 3 OF 24

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	194

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MATCHLINE STA 5+00 SEE SHEET 2 OF 24

MATCHLINE STA 9+00 SEE SHEET 6 OF 24

PROP PGL

(+)0.35%

(-)0.35%

n-row

n-curb

s-curb

exist. 18" stm.

exist. 36" stm.

exist. 42" stm.

exist. 16" ci water

6" fm. lead

PROP 2-YR HGL

PROP 100-YR WSE

STUB-IN-RCP #YD-3
STA 7+15.53
24" E = 65.40 (N)

PROP 48 LF 4'X4' RCB @ 0.20%

E=64.62 (S)

E=62.76 (N)

PROP 119 LF 48" RCP @ 0.10%

PROP 158 LF 4'X4' RCB @ 0.20%

PROP 229 LF 48" RCP @ 0.10%

PROP 142 LF 4'X4' RCB @ 0.20%

PROP 30" RCP

PROP 50 LF 48" RCP @ 0.10%

PROP 50 LF 4'X4' RCB @ 0.20%

E=64.22 (S)

E=63.56 (N)

PROP TYP "C1" INLET #A-130
STA 5+49.69.00
4'X4' RCB E = 62.86 (E,W)

PROP TYP "A" MH #MH-21
STA 6+20.62
48" E = 64.50 (E,W)

PROP TYP "A" MH #MH-A03
STA 7+07.76
4'X4' RCB E = 63.17 (E,W)
EX 36" RCP E = 63.47 (N)

PROP TYP "C1" INLET W/2-EXT #A-127
STA 8+50.00
4'X4' RCB E = 63.46 (E,W)

PROP TYP "A" MH #MH19
STA 8+50.11
48" E = 64.27 (E,W)
38" E = 65.04 (S)

SEE PLAN VIEW

PROP PGL ELEV	EXIST CL ELEV
73.69	
72.81	73.66
72.88	73.63
72.95	73.60
73.02	73.56
73.09	73.52
73.16	73.48
73.23	73.45
73.23	73.43
73.16	73.41
73.09	73.39
73.02	73.37
72.95	73.36
72.88	73.35
72.81	73.35
72.74	73.36
72.67	73.36
72.60	73.36
72.60	73.33
72.67	73.29
72.74	

5+00 6+00 7+00 8+00 9+00

78 76 74 72 70 68 66 64 62 60 58 56 54 52 50 48

NOTES:

1. REFER TO LATERAL PROFILE SHEETS FOR PROPOSED FLOWLINES FOR STUB-INS.

0 40 80
(IN FEET)
SCALE: 1"=40' - H
1"=4' - V

STATE OF TEXAS
WEIMIN LI
88740
LICENSED PROFESSIONAL ENGINEER
2-6-20

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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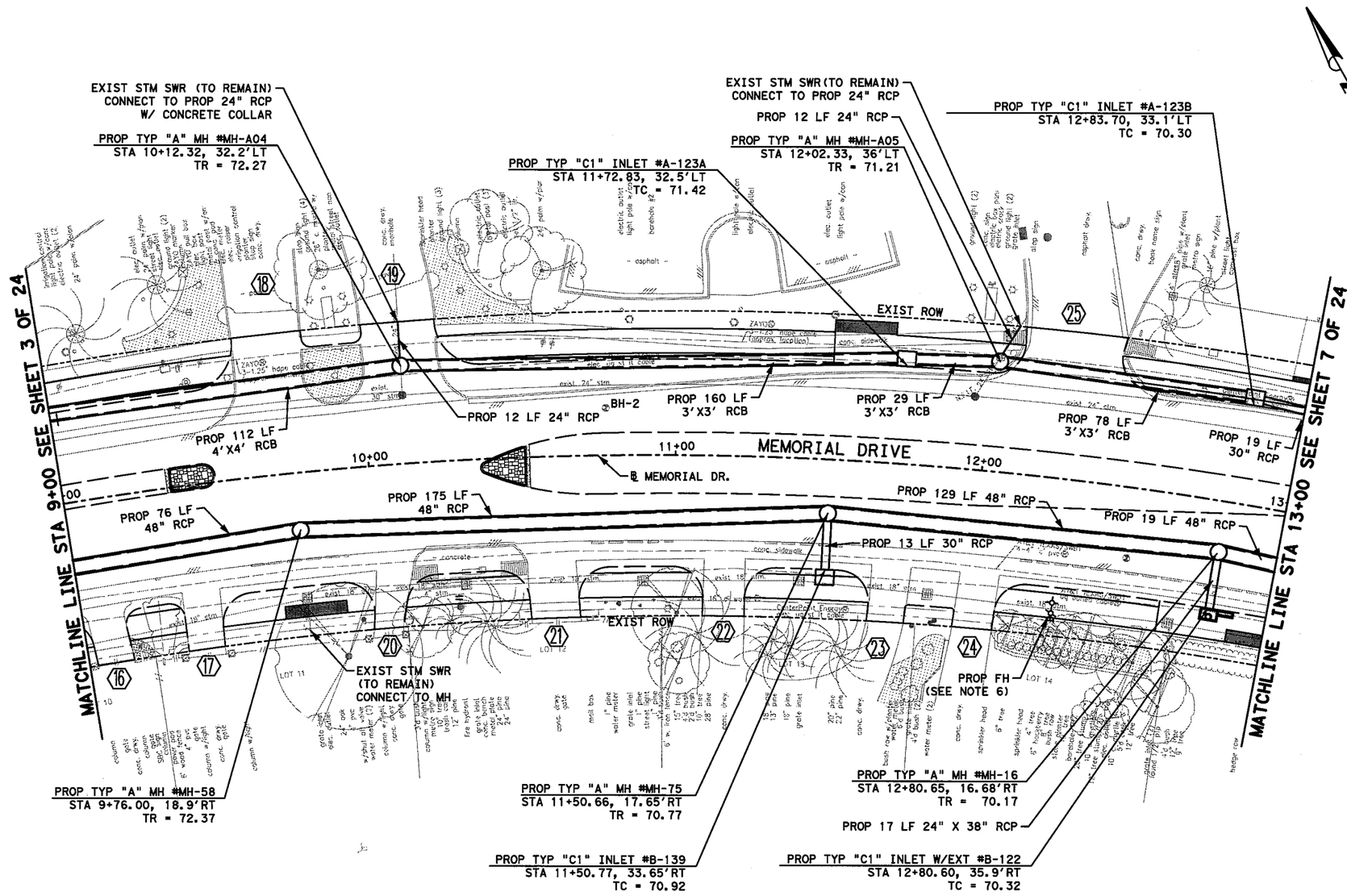
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STORM SEWER PROFILE
STA 5+00 TO STA 9+00

SHEET 4 OF 24

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CK:	HOU	HARRIS	0912	72	391	195



SEE PROFILE VIEW

LEGEND:

- PROP STORM SEWER
- EXIST STORM SEWER
- PROP ROADWAY FACE OF CURB
- PROP INLET OR JCT BOX
- PROP MANHOLE
- EXIST INLET OR JUNCTION BOX
- EXIST MANHOLE
- BORE HOLE LOCATION

NOTES:

1. ALL RCP ARE CLASS III UNLESS OTHERWISE NOTED.
2. CONTRACTOR TO MAINTAIN POSITIVE DRAINAGE DURING CONSTRUCTION AND FIELD VERIFY FLOWLINES OF ALL TO CONNECTIONS TO EXISTING DRAINAGE STRUCTURES TO VERIFY POSITIVE DRAINAGE TO PROPOSED STORM SEWER PRIOR TO CONSTRUCTION.
3. REFER TO TXDOT HOUSTON DISTRICT BRIDGE MISCELLANEOUS SEWER DETAILS (MSD) FOR PIPE COLLAR, PIPE BEND, AND OTHER PIPE AND MANHOLE INLET CAP CONNECTION DETAILS.
4. REFER TO MODIFIED STANDARDS FOR TYPE "A/B" MANHOLES AND TYPE "C1" INLETS WHERE STRUCTURE IS NOTED "ON BOX" IN PLAN & PROFILE.
5. REFER TO TXDOT STATEWIDE STANDARD BRIDGE FOR BOX CULVERT CAST-IN-PLACE (SCP-MD & MC-MD), PRECAST JUNCTION BOX (PJB), AND PRECAST (SCP-MD) MISCELLANEOUS DETAILS FOR PROPOSED BENDS IN BOXES.
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7. REFER TO LATERAL PROFILE SHEETS FOR PROPOSED FLOWLINES FOR STUB-INS.

0 40 80
(IN FEET)
SCALE: PLAN 1": 40'

STATE OF TEXAS
WEIMIN LI
88740
LICENSED PROFESSIONAL ENGINEER
2-6-20

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STORM SEWER PLAN
STA 9+00 TO STA 13+00

SHEET 5 OF 24

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	196

67862

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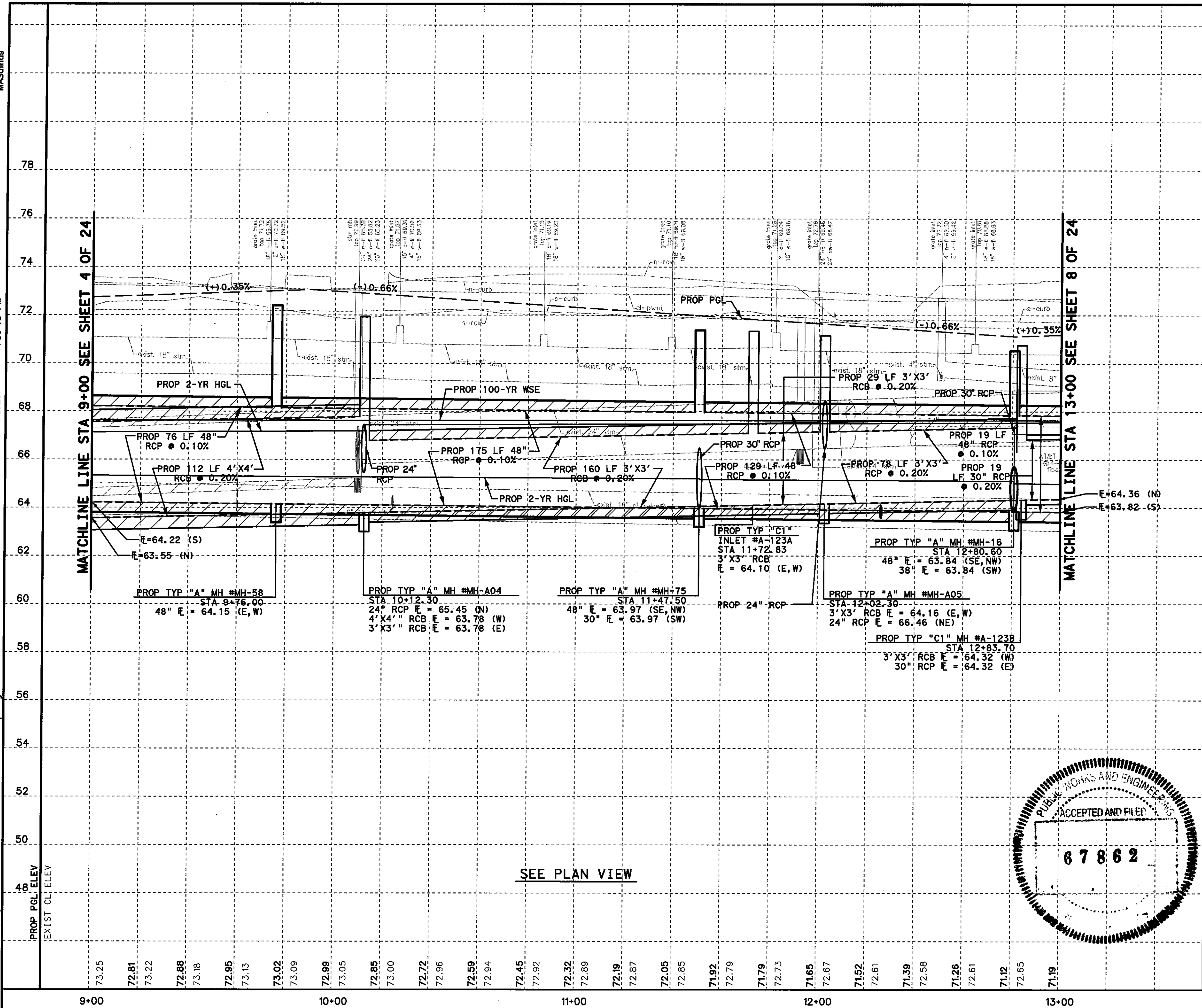

NOTES:

1. REFER TO LATERAL PROFILE SHEETS FOR PROPOSED FLOWLINES FOR STUB-INS.

0 40 80
(IN FEET)
SCALE: 1":40' - H
1":4' - V

STATE OF TEXAS
WEIMIN LI
88740
LICENSED PROFESSIONAL ENGINEER
2-6-20
Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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Texas Department of Transportation
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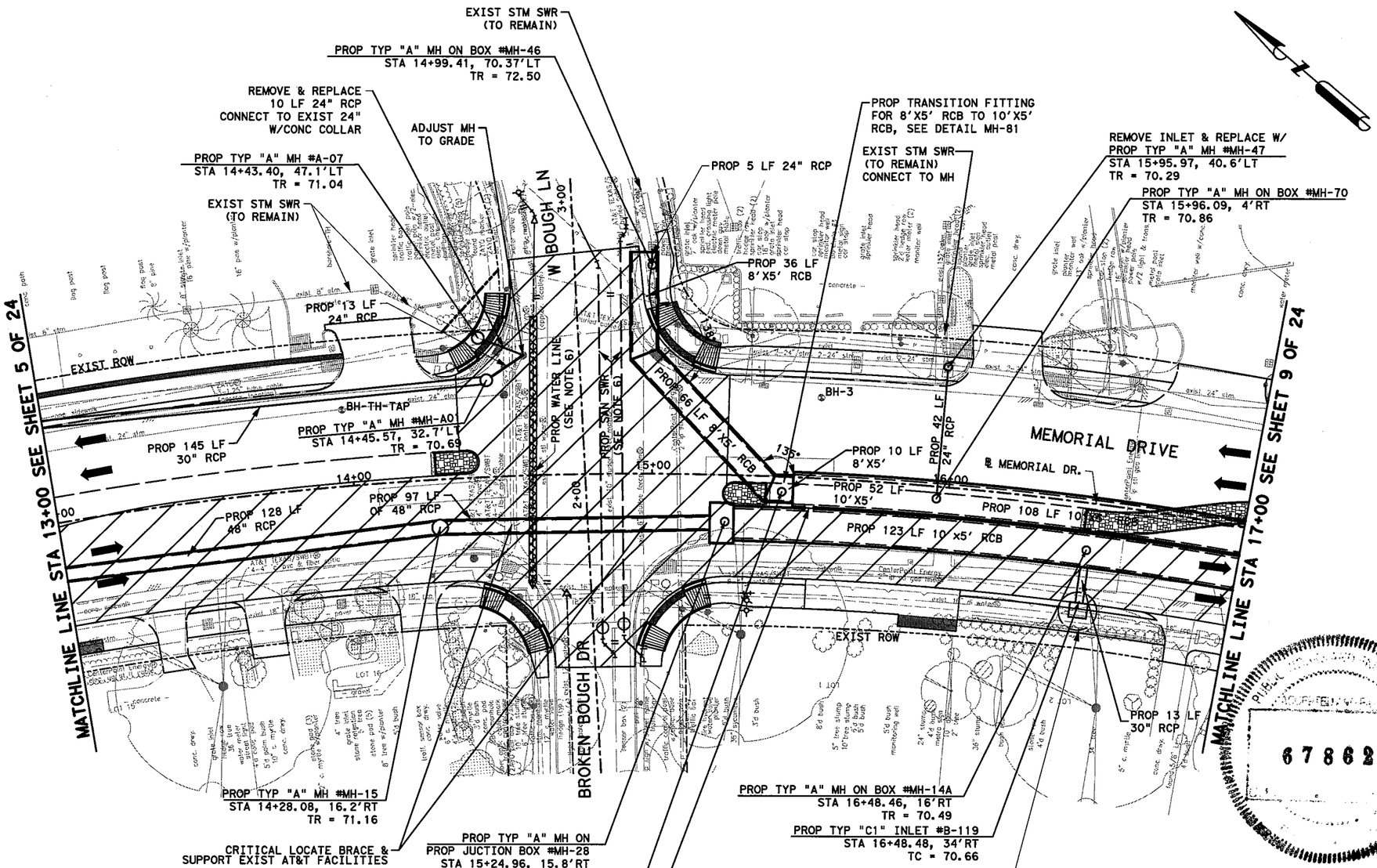
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STORM SEWER PROFILE
STA 9+00 TO STA 13+00

SHEET 6 OF 24

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	197



SEE PROP PROFILE VIEW

LEGEND:

- PROP STORM SEWER
- EXIST STORM SEWER
- PROP ROADWAY FACE OF CURB
- PROP INLET OR JCT BOX
- PROP MANHOLE
- EXIST INLET OR JUNCTION BOX
- EXIST MANHOLE
- BORE HOLE LOCATION

NOTES:

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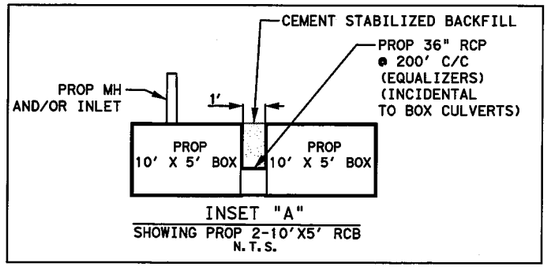
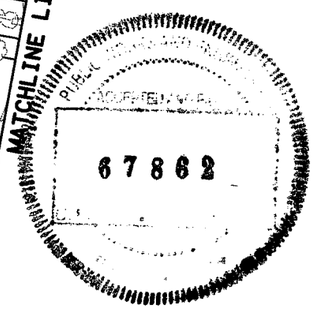
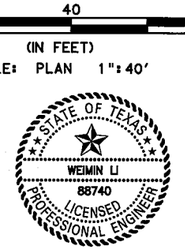
NOTE (CONT.):
8. LOCATE EXIST WL WITHIN 30 DAYS AFTER NTP IS ISSUED. PROVIDE DEPTH OF COVER INFORMATION TO PM.



INSET "A"
SHOWING PROP 2-10'X5' RCB
N. T. S.

0 40 80
(IN FEET)
SCALE: PLAN 1": 40'





4/13/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
©2020

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STORM SEWER PLAN STA 13+00 TO STA 17+00

SHEET 7 OF 24

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	198

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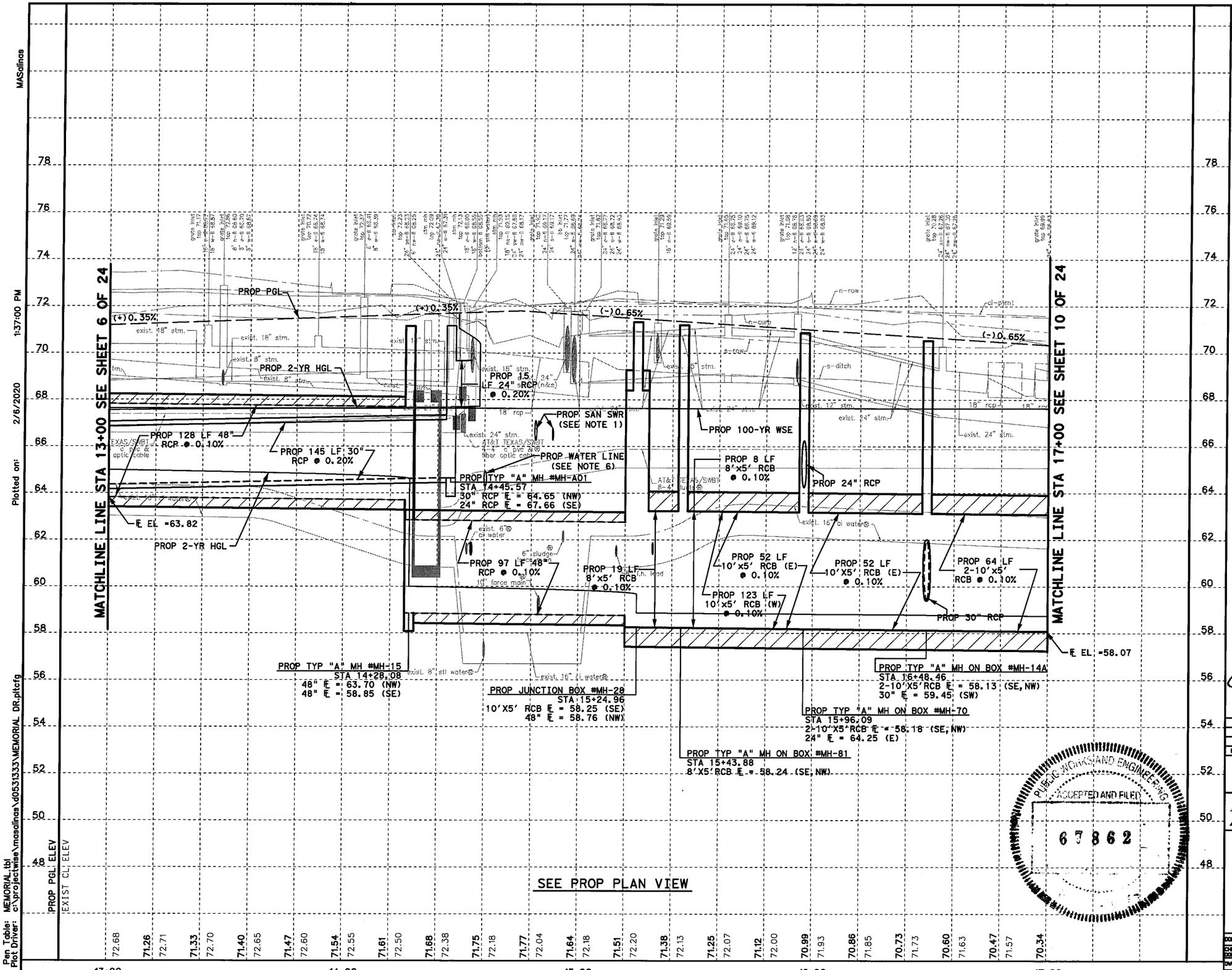

NOTES:

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2. REFER TO LATERAL PROFILE SHEETS FOR PROPOSED FLOWLINES FOR STUB-INS.

0 40 80
(IN FEET)
SCALE: 1"=40' - H
1"=4' - V

STATE OF TEXAS
WEIMIN LI
88740
LICENSED PROFESSIONAL ENGINEER
2-6-20

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STORM SEWER PROFILE STA 13+00 TO STA 17+00

SHEET 8 OF 24

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	199

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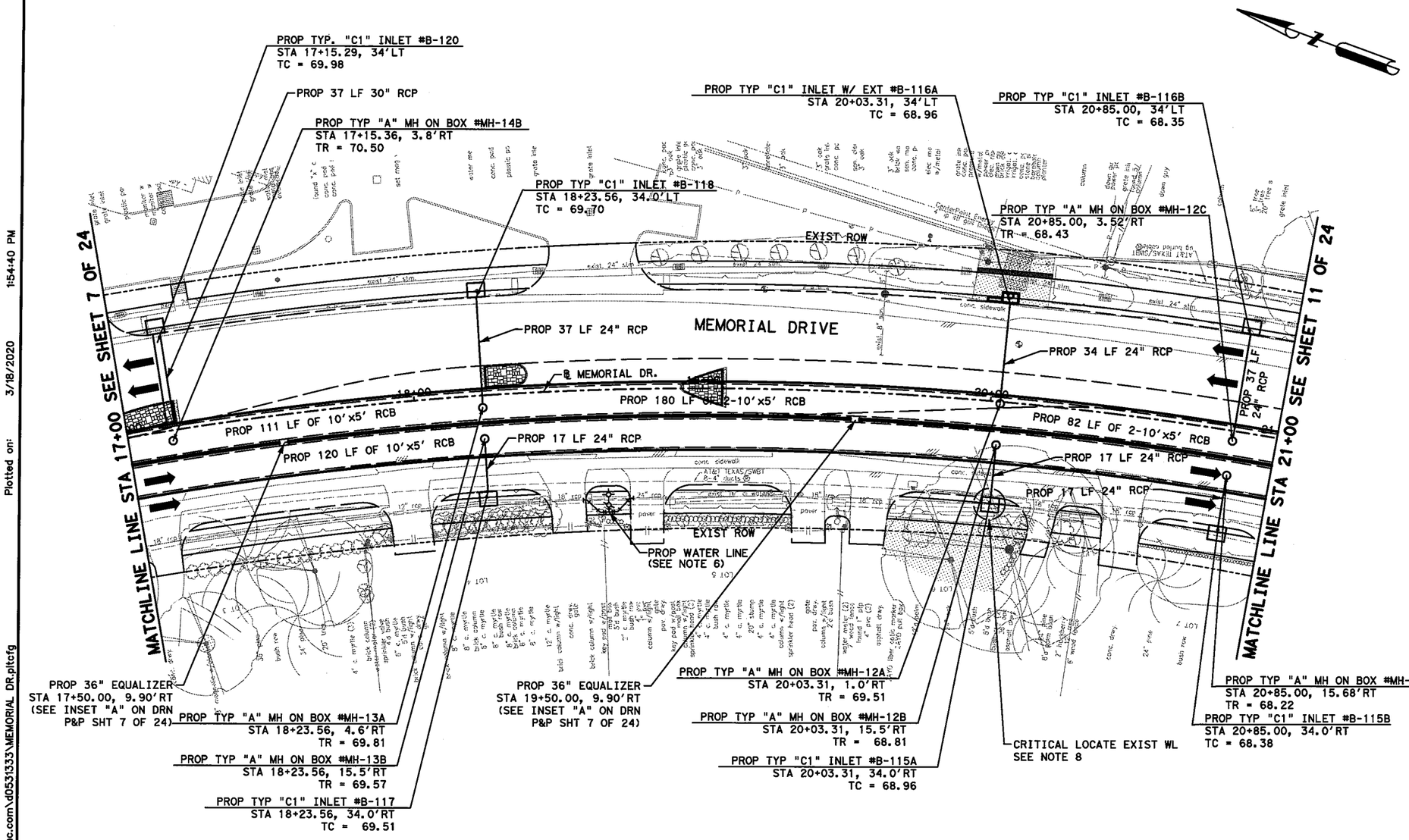

SEE PROFILE VIEW

LEGEND:

- PROP STORM SEWER
- EXIST STORM SEWER
- PROP ROADWAY FACE OF CURB
- PROP INLET OR JCT BOX
- PROP MANHOLE
- EXIST INLET OR JUNCTION BOX
- EXIST MANHOLE
- BORE HOLE LOCATION

NOTES:

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NOTE (CONT.):
8. LOCATE EXIST WL WITHIN 30 DAYS AFTER NTP IS ISSUED. PROVIDE DEPTH OF COVER INFORMATION TO PM.

0 40 80
(IN FEET)
SCALE: PLAN 1": 40'

STATE OF TEXAS
WEIMIN LI
88740
LICENSED
PROFESSIONAL ENGINEER
4/13/2020
Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

PUBLIC WORKS AND ENGINEERING
ACCEPTED AND FILED
67862

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STORM SEWER PLAN STA 17+00 TO STA 21+00

SHEET 9 OF 24

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	200

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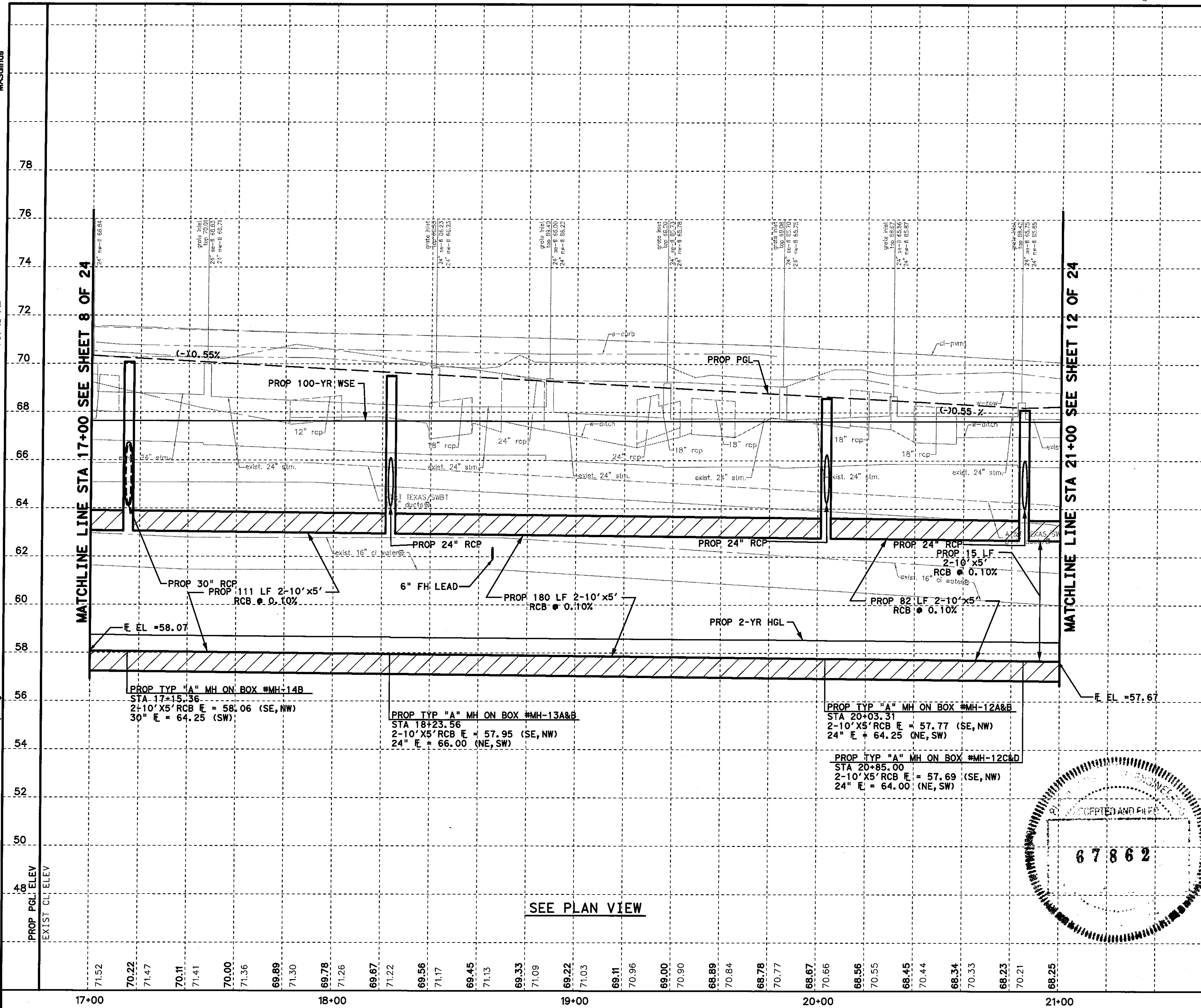

NOTE:

1. REFER TO LATERAL PROFILE SHEETS FOR PROPOSED FLOWLINES FOR STUB-INS.

0 40 80

(IN FEET)

SCALE: 1":40' - H
1":4' - V

STATE OF TEXAS
WEIMIN LI
88740
LICENSED
PROFESSIONAL ENGINEER

2-6-20

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

ACCEPTED AND FILED
67862

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
©2020

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STORM SEWER PROFILE
STA 17+00 TO STA 21+00

SHEET 10 OF 24

FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
6	TEXAS	STP 1802(783)MM			CS
DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
HOU	HARRIS	0912	72	391	201

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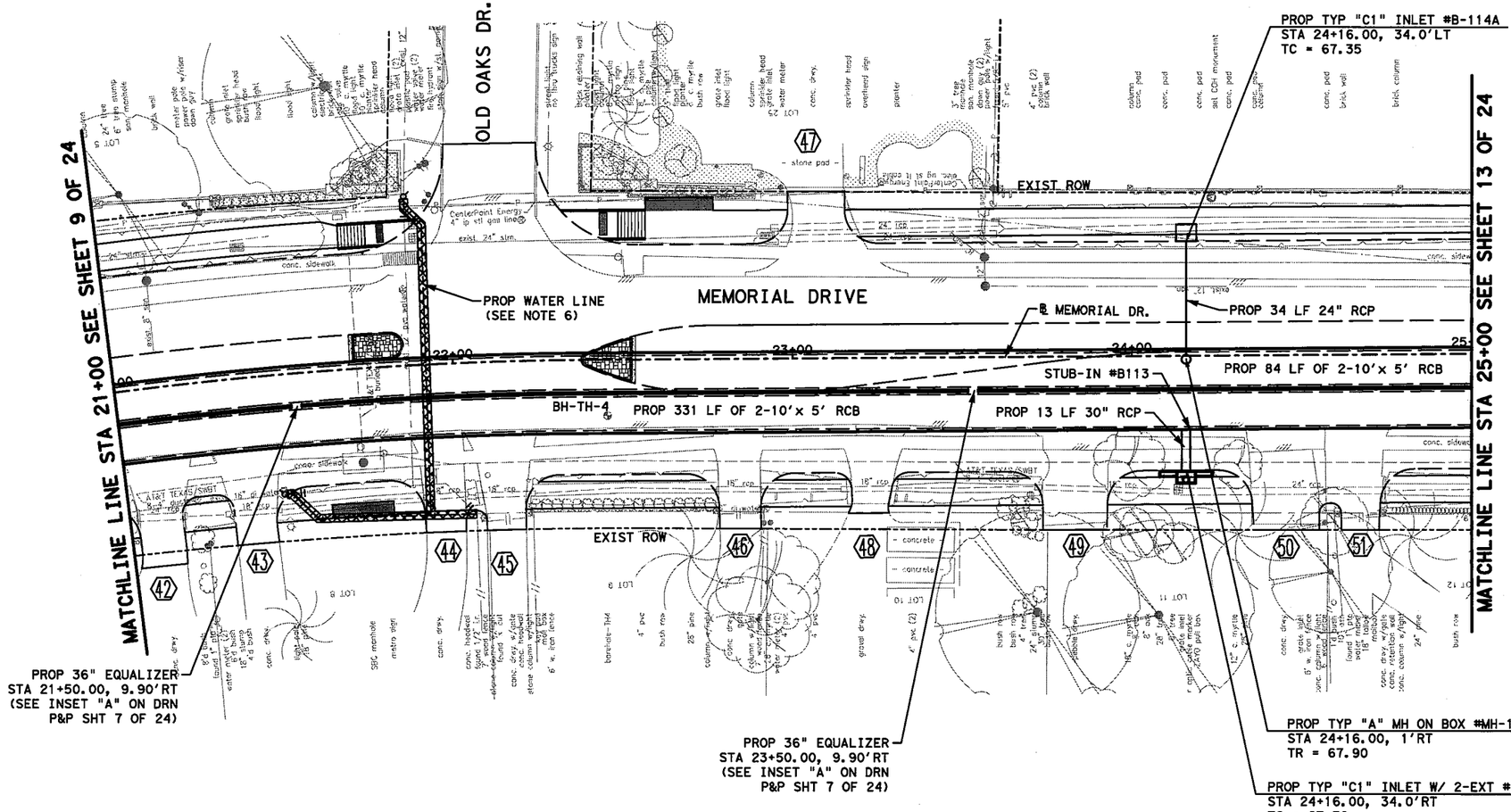

SEE PROFILE VIEW

LEGEND:

- PROP STORM SEWER
- EXIST STORM SEWER
- PROP ROADWAY FACE OF CURB
- PROP INLET OR JCT BOX
- PROP MANHOLE
- EXIST INLET OR JUNCTION BOX
- EXIST MANHOLE
- BORE HOLE LOCATION

NOTES:

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0 40 80

(IN FEET)

SCALE: PLAN 1": 40'

STATE OF TEXAS
WEIMIN LI
88740
LICENSED PROFESSIONAL ENGINEER

2-6-20

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STORM SEWER PLAN
STA 21+00 TO STA 25+00

SHEET 11 OF 24

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	202

RELEASED FOR BIDDING AND FILING
67862

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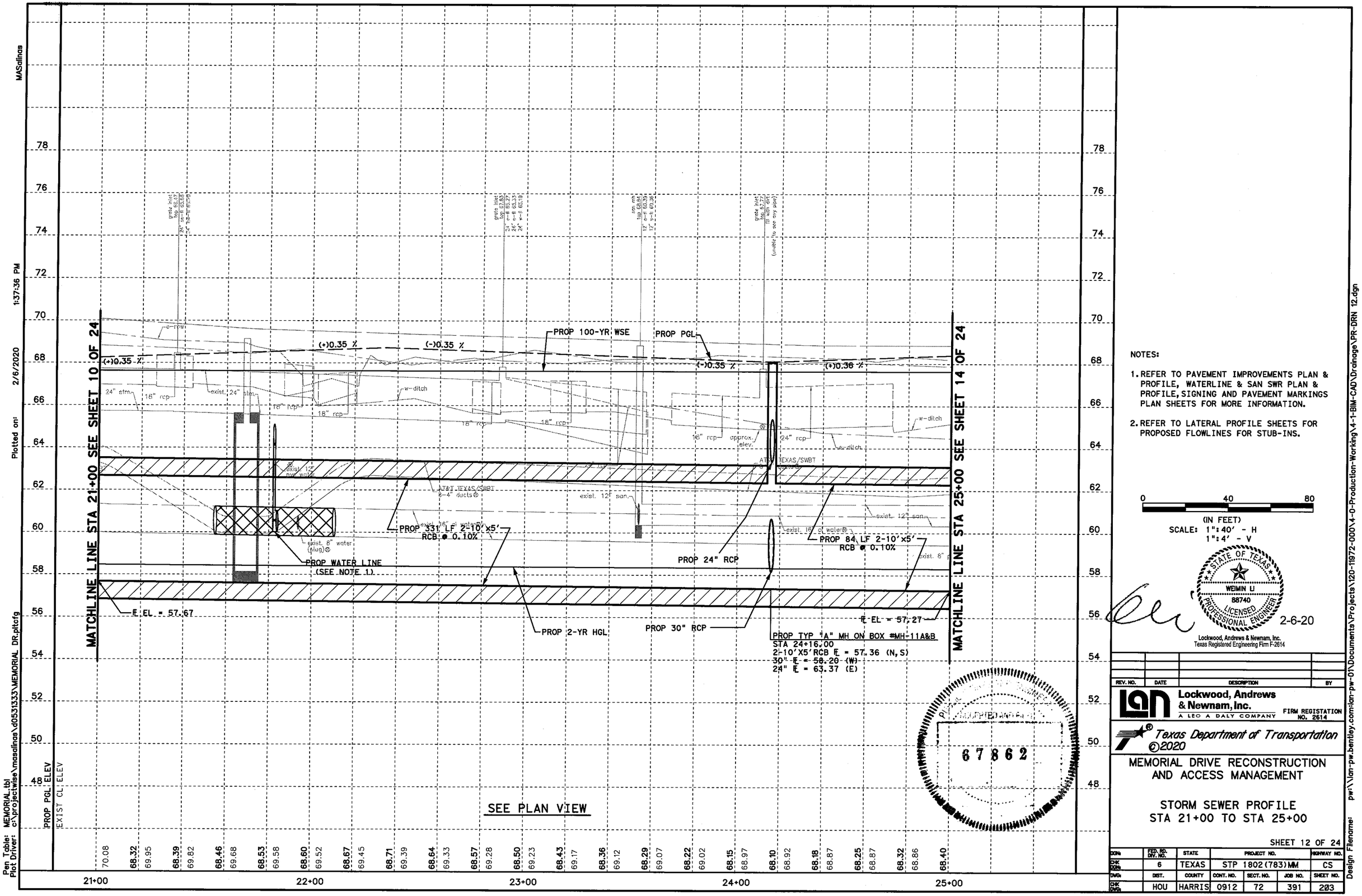

NOTES:

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0 40 80

(IN FEET)
SCALE: 1"=40' - H
1"=4' - V

STATE OF TEXAS
WEIMIN LI
88740
LICENSED PROFESSIONAL ENGINEER

2-6-20

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STORM SEWER PROFILE
STA 21+00 TO STA 25+00

SHEET 12 OF 24

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	203

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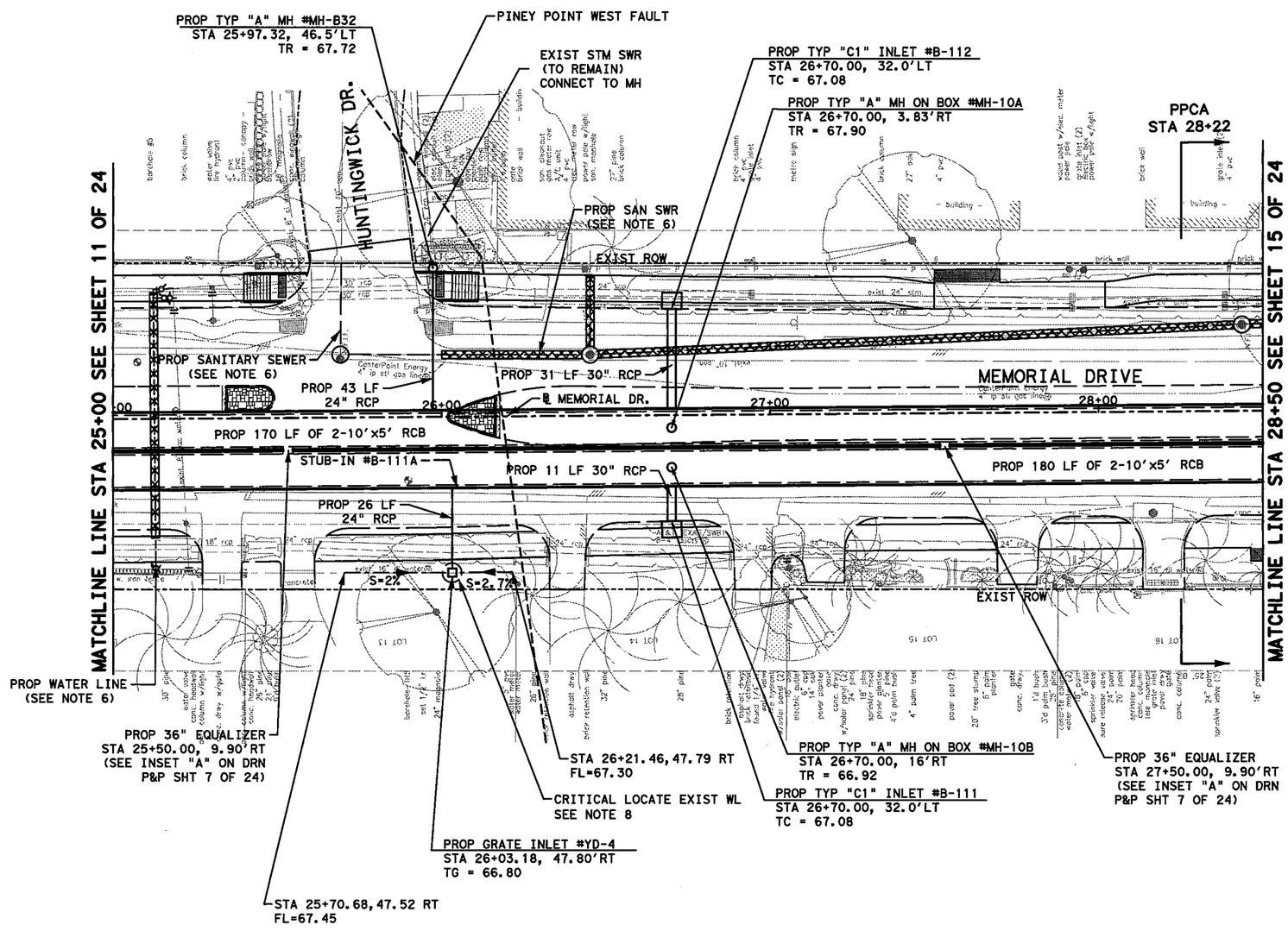

SEE PROFILE VIEW

LEGEND:

- PROP STORM SEWER
- EXIST STORM SEWER
- PROP ROADWAY FACE OF CURB
- PROP INLET OR JCT BOX
- PROP MANHOLE
- EXIST INLET OR JUNCTION BOX
- EXIST MANHOLE
- BORE HOLE LOCATION

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NOTE (CONT.):
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0 40 80
(IN FEET)
SCALE: PLAN 1": 40'

ACCEPTED AND FILED
67862

4/13/2020

STATE OF TEXAS
WEIMIN LI
88740
LICENSED
PROFESSIONAL ENGINEER

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STORM SEWER PLAN
STA 25+00 TO STA 28+50

SHEET 13 OF 24

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	204

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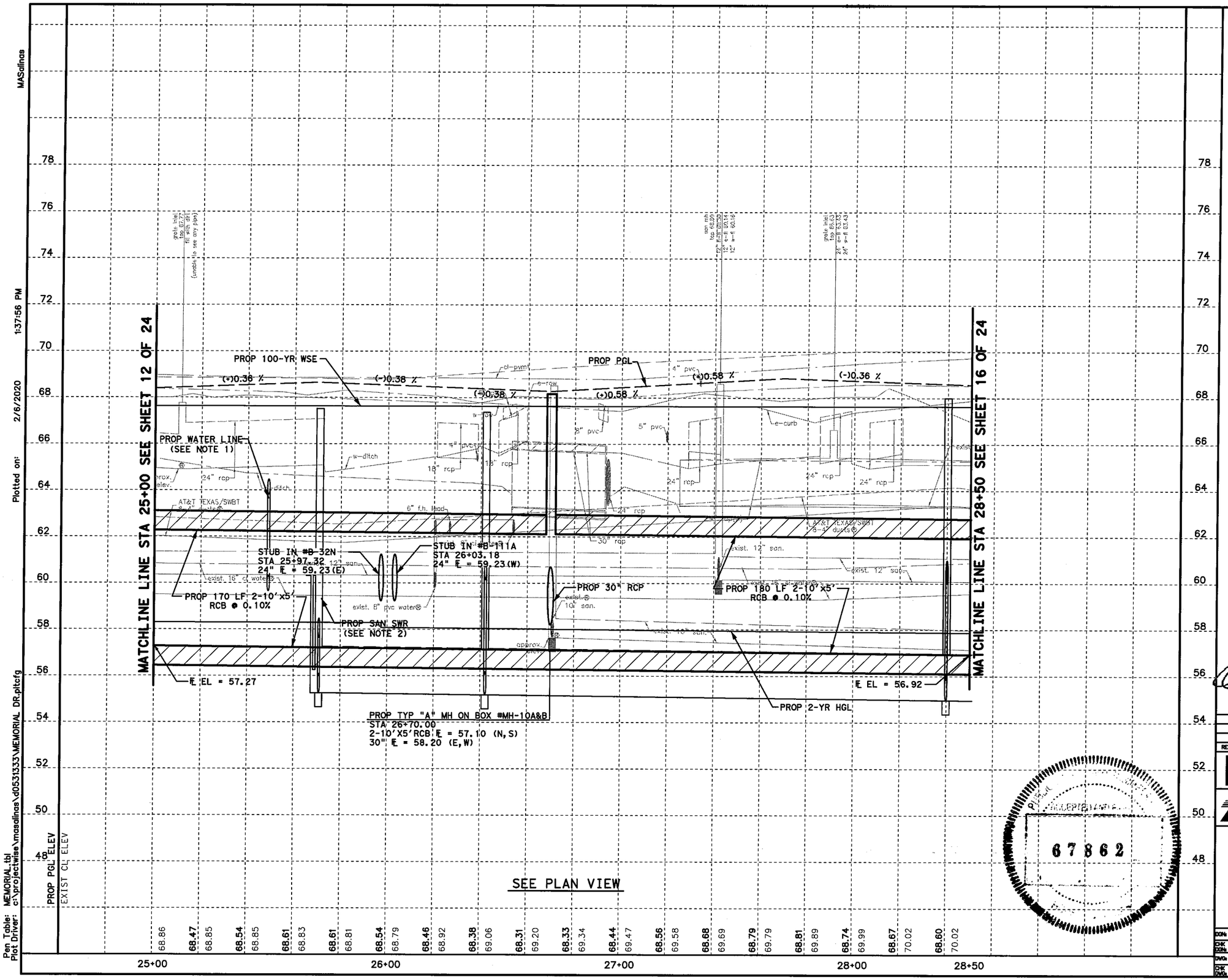

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0 40 80

(IN FEET)
SCALE: 1"=40' - H
1"=4' - V

STATE OF TEXAS
WEIMIN LI
88740
LICENSED PROFESSIONAL ENGINEER
2-6-20

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Texas Registered Engineering Firm F-2614

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STORM SEWER PROFILE STA 25+00 TO STA 28+50

SHEET 14 OF 24

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	205

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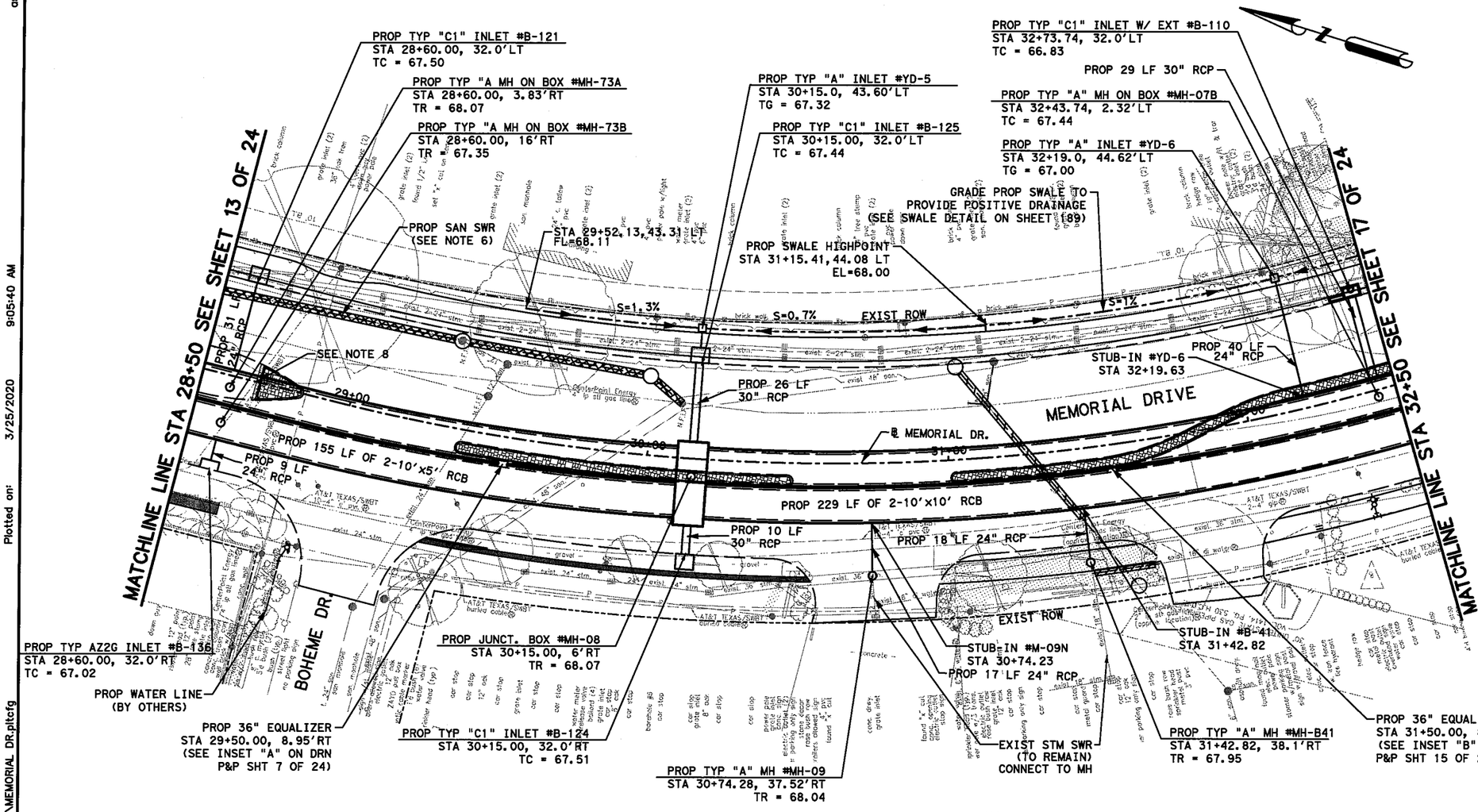


SEE PROFILE VIEW

LEGEND:

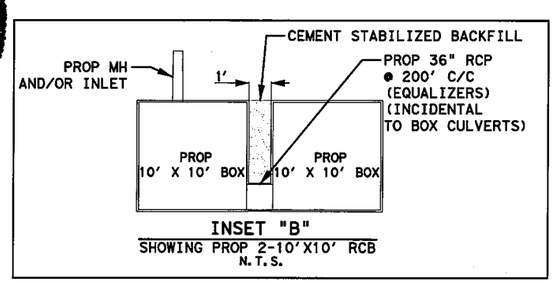
- PROP STORM SEWER
- EXIST STORM SEWER
- PROP ROADWAY FACE OF CURB
- PROP INLET OR JCT BOX
- PROP MANHOLE
- EXIST INLET OR JUNCTION BOX
- EXIST MANHOLE
- BORE HOLE LOCATION

NOTES:

1. ALL RCP ARE CLASS III UNLESS OTHERWISE NOTED.
2. CONTRACTOR TO MAINTAIN POSITIVE DRAINAGE DURING CONSTRUCTION AND FIELD VERIFY FLOWLINES OF ALL TO CONNECTIONS TO EXISTING DRAINAGE STRUCTURES TO VERIFY POSITIVE DRAINAGE TO PROPOSED STORM SEWER PRIOR TO CONSTRUCTION.
3. REFER TO TXDOT HOUSTON DISTRICT BRIDGE MISCELLANEOUS SEWER DETAILS (MSD) FOR PIPE COLLAR, PIPE BEND, AND OTHER PIPE AND MANHOLE INLET CAP CONNECTION DETAILS.
4. REFER TO MODIFIED STANDARDS FOR TYPE "A/B" MANHOLES AND TYPE "C1" INLETS WHERE STRUCTURE IS NOTED "ON BOX" IN PLAN & PROFILE.
5. REFER TO TXDOT STATEWIDE STANDARD BRIDGE FOR BOX CULVERT CAST-IN-PLACE (SCP-MD & MC-MD), PRECAST JUNCTION BOX (PJB), AND PRECAST (SCP-MD) MISCELLANEOUS DETAILS FOR PROPOSED BENDS IN BOXES.
6. REFER TO PAVEMENT IMPROVEMENTS PLAN & PROFILE, WATER LINE & SAN SWR PLAN & PROFILE, SIGNING AND PAVEMENT MARKINGS PLAN SHEETS FOR MORE INFORMATION.
7. REFER TO LATERAL PROFILE SHEETS FOR PROPOSED FLOWLINES FOR STUB-INS.

NOTE:

8. AT&T WILL REMOVE CONDUIT, CONTACT AT&T A MINIMUM OF 2 WEEKS PRIOR TO PERFORMING EXCAVATION IN THE VICINITY.



INSET "B"
SHOWING PROP 2-10'X10' RCB
N.T.S.

0 40 80
(IN FEET)
SCALE: PLAN 1": 40'

STATE OF TEXAS
WEIMIN LI
88740
LICENSED PROFESSIONAL ENGINEER

4/13/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

PUBLIC WORKS AND ENGINEERING
ACCEPTED AND FILED
67862

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
©2020

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STORM SEWER PLAN
STA 28+50 TO STA 32+50

SHEET 15 OF 24

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	206

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MATCHLINE LINE STA 28+50 SEE SHEET 14 OF 24

MATCHLINE LINE STA 32+50 SEE SHEET 18 OF 24

PROP 100-YR WSE

PROP PGL

(+)0.35 %

(-)0.50 %

(-)0.38 %

PROP WATERLINE (SEE NOTE 1)

PROP 10 LF 2-10'x5' RCB @ 0.10% san. (plug)

PROP 155 LF 2-10'x5' RCB @ 0.10%

PROP 24" RCP

PROP TYP "A" MH ON BOX #MH-73A&B
STA 28+60.00
2-10'X5' RCB E = 56.91 (N,S)
24" E = 59.20 (E)
24" E = 58.20 (W)
E EL = 56.92

PROP 2-YR HGL

PROP 30" RCP

PROP SAN SWR (SEE NOTE 1)

STUB-IN #M-09N
STA 30+74.23
24" E = 56.45 (W)

PROP JUNCTION BOX #MH-08
STA 30+15.00
2-10'X10' RCB E = 50.05 (N,S)
2-10'X5' RCB E = 56.76 (N)
30" E = 58.00 (E,W)

STUB-IN #B-41
STA 31+42.82
24" E = 56.42 (W)

PROP 229 LF 2-10'x10' RCB @ 0.10%

PROP FH LEAD

STUB-IN #YD-6
STA 32+19.63
24" E = 56.37 (E)

PROP 30" RCP

PROP 7 LF 2-10'x10' RCB @ 0.10%

PROP TYP "A" MH ON BOX #MH-07B
STA 32+43.74
2-10'X10' RCB E = 49.82 (NW,SE)
30" E = 56.59 (NE)

E EL = 49.81

SEE PLAN VIEW

PROP PGL ELEV
EXIST CL ELEV

28+50 29+00 30+00 31+00 32+00 32+50

68.53 70.02 | 68.60 70.00 | 68.67 69.95 | 68.63 69.91 | 68.53 69.87 | 68.43 69.90 | 68.33 69.92 | 68.23 69.95 | 68.17 69.94 | 68.24 69.93 | 68.31 69.92 | 68.38 69.92 | 68.45 69.91 | 68.38 69.88 | 68.30 69.77 | 68.22 69.67 | 68.15 69.54 | 68.07 69.34 | 67.99 69.14 | 67.92 69.01

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FILED FOR RECORD IN HARRIS COUNTY, TEXAS
ACCEPTED AND FILED
67862

NOTES:

1. REFER TO PAVEMENT IMPROVEMENTS PLAN & PROFILE, WATERLINE & SAN SWR PLAN & PROFILE, SIGNING AND PAVEMENT MARKINGS PLAN SHEETS FOR MORE INFORMATION.
2. REFER TO LATERAL PROFILE SHEETS FOR PROPOSED FLOWLINES FOR STUB-INS.

0 40 80
(IN FEET)
SCALE: 1"=40' - H
1"=4' - V

STATE OF TEXAS
WEIMIN LI
88740
LICENSED PROFESSIONAL ENGINEER
2-6-20

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
©2020

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STORM SEWER PROFILE STA 28+50 TO STA 32+50

SHEET 16 OF 24

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	207

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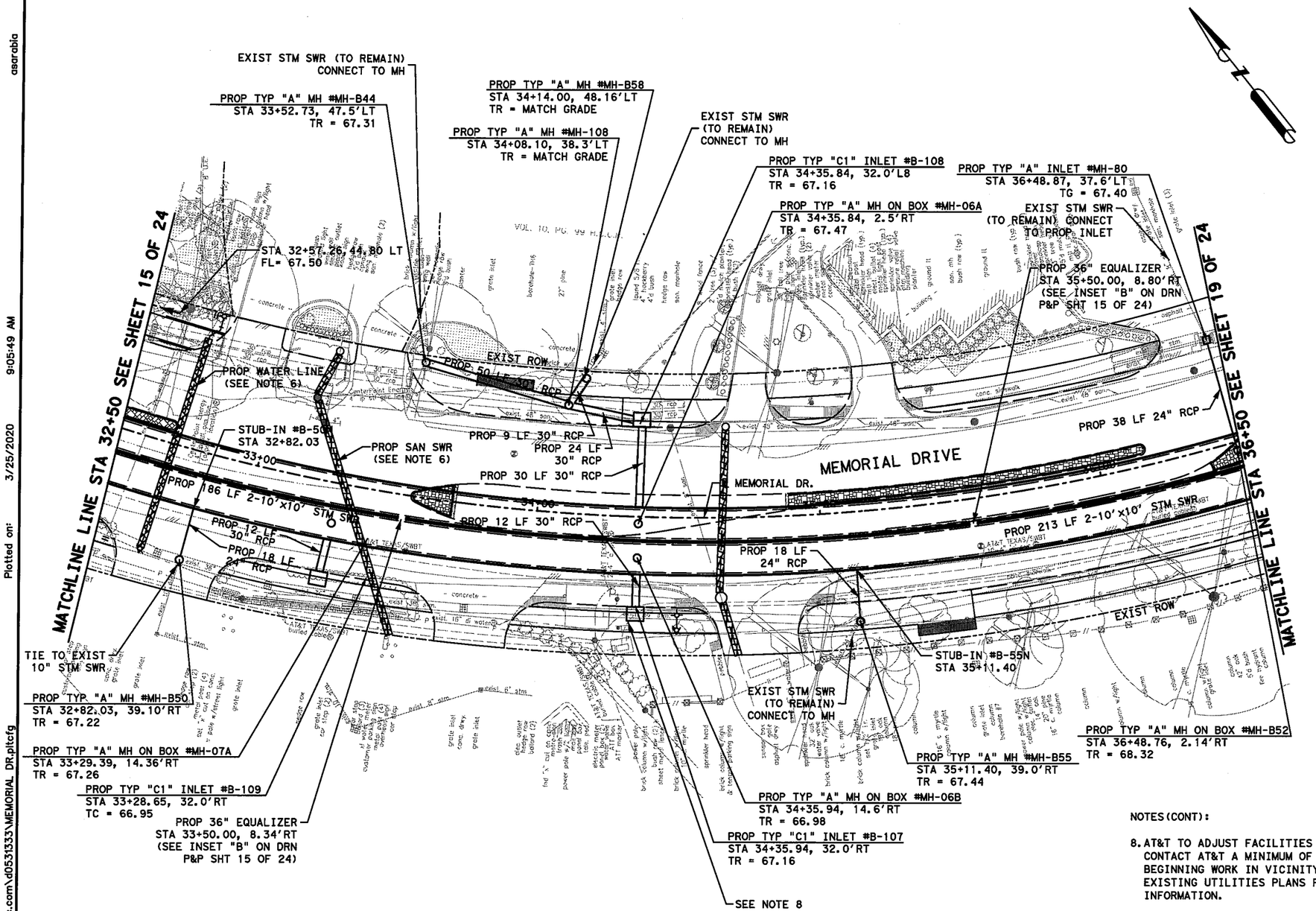

LEGEND:

- PROP STORM SEWER
- EXIST STORM SEWER
- PROP ROADWAY FACE OF CURB
- PROP INLET OR JCT BOX
- PROP MANHOLE
- EXIST INLET OR JUNCTION BOX
- EXIST MANHOLE
- BORE HOLE LOCATION

NOTES:

1. ALL RCP ARE CLASS III UNLESS OTHERWISE NOTED.
2. CONTRACTOR TO MAINTAIN POSITIVE DRAINAGE DURING CONSTRUCTION AND FIELD VERIFY FLOWLINES OF ALL TO CONNECTIONS TO EXISTING DRAINAGE STRUCTURES TO VERIFY POSITIVE DRAINAGE TO PROPOSED STORM SEWER PRIOR TO CONSTRUCTION.
3. REFER TO TXDOT HOUSTON DISTRICT BRIDGE MISCELLANEOUS SEWER DETAILS (MSD) FOR PIPE COLLAR, PIPE BEND, AND OTHER PIPE AND MANHOLE INLET CAP CONNECTION DETAILS.
4. REFER TO MODIFIED STANDARDS FOR TYPE "A/B" MANHOLES AND TYPE "C1" INLETS WHERE STRUCTURE IS NOTED "ON BOX" IN PLAN & PROFILE.
5. REFER TO TXDOT STATEWIDE STANDARD BRIDGE FOR BOX CULVERT CAST-IN-PLACE (SCP-MD & MC-MD), PRECAST JUNCTION BOX (PJB), AND PRECAST (SCP-MD) MISCELLANEOUS DETAILS FOR PROPOSED BENDS IN BOXES.
6. REFER TO PAVEMENT IMPROVEMENTS PLAN & PROFILE, WATER LINE & SAN SWR PLAN & PROFILE, SIGNING AND PAVEMENT MARKINGS PLAN SHEETS FOR MORE INFORMATION.
7. REFER TO LATERAL PROFILE SHEETS FOR PROPOSED FLOWLINES FOR STUB-INS.

NOTES (CONT):

8. AT&T TO ADJUST FACILITIES NEAR INLET. CONTACT AT&T A MINIMUM OF 6 WEEKS PRIOR TO BEGINNING WORK IN VICINITY. REFER TO EXISTING UTILITIES PLANS FOR CONTACT INFORMATION.

0 40 80

(IN FEET)

SCALE: PLAN 1": 40'

STATE OF TEXAS
WEIMIN LI
88740
LICENSED
PROFESSIONAL ENGINEER

4/13/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STORM SEWER PLAN STA 32+50 TO STA 36+50

SHEET 17 OF 24

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	208

67862

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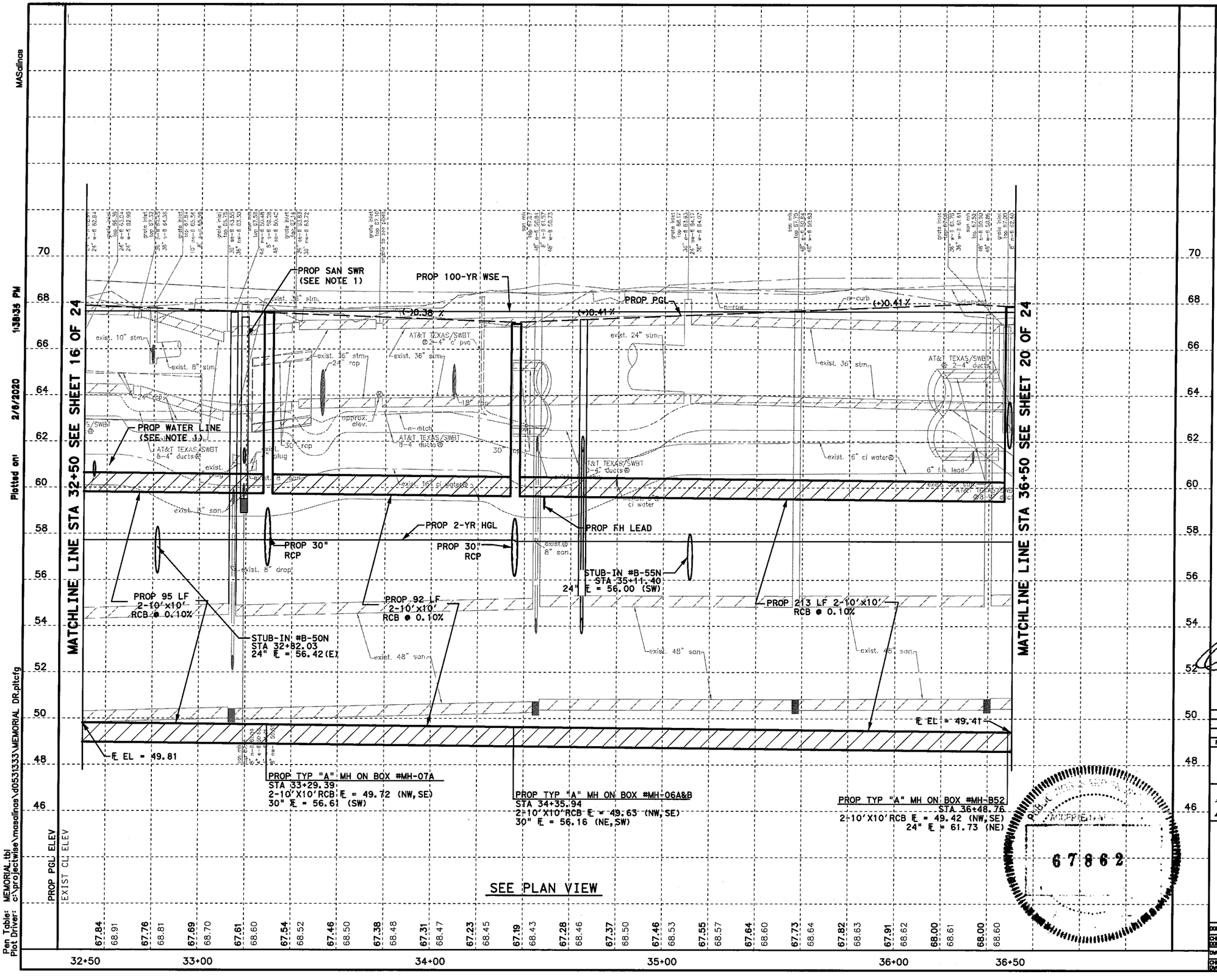

NOTES:

1. REFER TO PAVEMENT IMPROVEMENTS PLAN & PROFILE, WATERLINE & SAN SWR PLAN & PROFILE, SIGNING AND PAVEMENT MARKINGS PLAN SHEETS FOR MORE INFORMATION.
2. REFER TO LATERAL PROFILE SHEETS FOR PROPOSED FLOWLINES FOR STUB-INS.

0 40 80

(IN FEET)
SCALE: 1"=40' - H
1"=4' - V

STATE OF TEXAS
WEIMIN LI
88740
LICENSED PROFESSIONAL ENGINEER
2-6-20

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
©2020

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STORM SEWER PROFILE
STA 32+50 TO STA 36+50

SHEET 18 OF 24

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	209

67862

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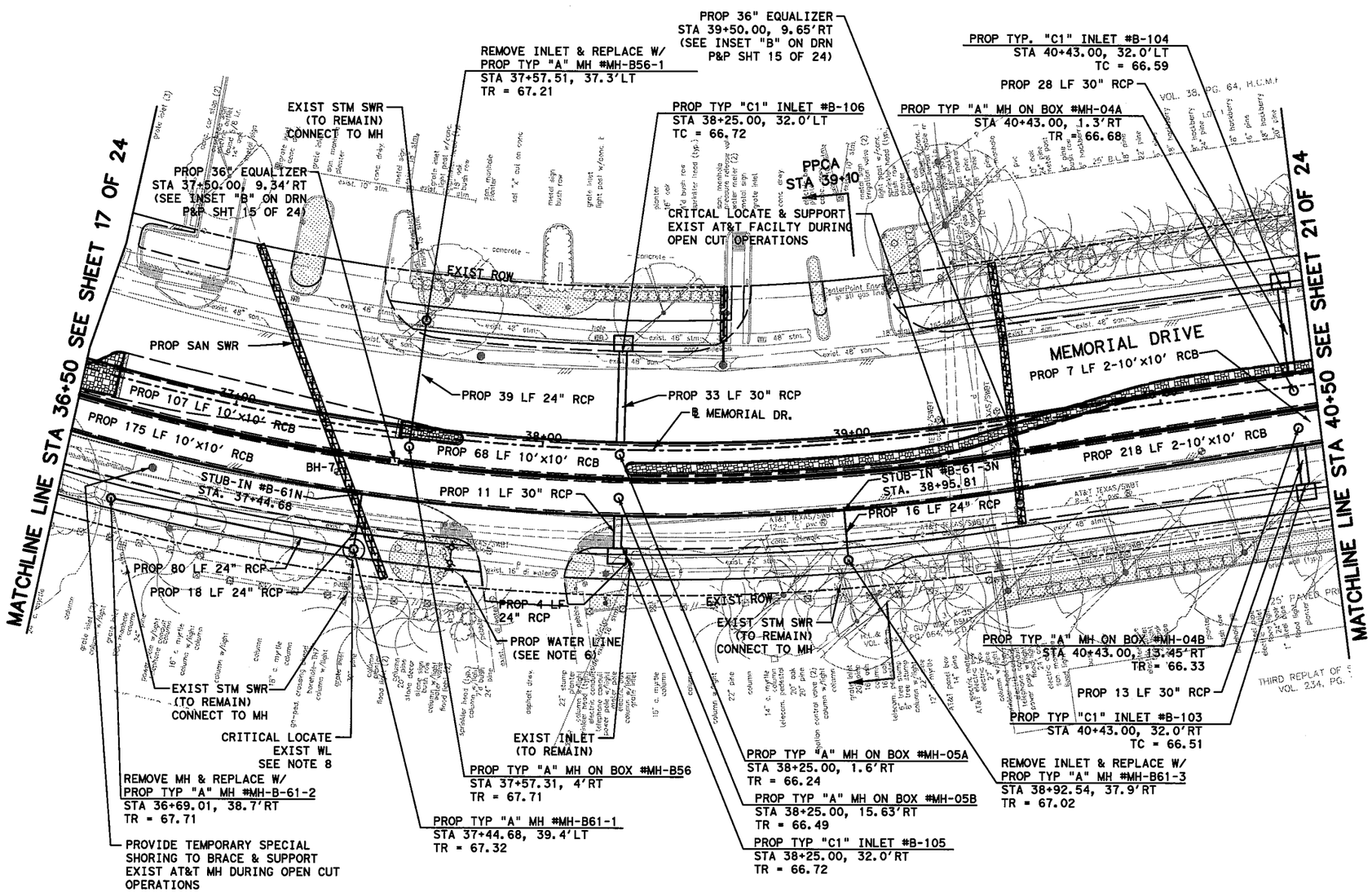

LEGEND:

- PROP STORM SEWER
- EXIST STORM SEWER
- PROP ROADWAY FACE OF CURB
- PROP INLET OR JCT BOX
- PROP MANHOLE
- EXIST INLET OR JUNCTION BOX
- EXIST MANHOLE
- BORE HOLE LOCATION

NOTES:

1. ALL RCP ARE CLASS III UNLESS OTHERWISE NOTED.
2. CONTRACTOR TO MAINTAIN POSITIVE DRAINAGE DURING CONSTRUCTION AND FIELD VERIFY FLOWLINES OF ALL TO CONNECTIONS TO EXISTING DRAINAGE STRUCTURES TO VERIFY POSITIVE DRAINAGE TO PROPOSED STORM SEWER PRIOR TO CONSTRUCTION.
3. REFER TO TXDOT HOUSTON DISTRICT BRIDGE MISCELLANEOUS SEWER DETAILS (MSD) FOR PIPE COLLAR, PIPE BEND, AND OTHER PIPE AND MANHOLE INLET CAP CONNECTION DETAILS.
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6. REFER TO PAVEMENT IMPROVEMENTS PLAN & PROFILE, WATER LINE & SAN SWR PLAN & PROFILE, SIGNING AND PAVEMENT MARKINGS PLAN SHEETS FOR MORE INFORMATION.
7. REFER TO LATERAL PROFILE SHEETS FOR PROPOSED FLOWLINES FOR STUB-INS.

NOTE (CONT.):

8. LOCATE EXIST WL WITHIN 30 DAYS AFTER NTP IS ISSUED. PROVIDE DEPTH OF COVER INFORMATION TO PM.

0 40 80

(IN FEET)

SCALE: PLAN 1": 40'

WEIMIN LI 88740 LICENSED PROFESSIONAL ENGINEER — STATE OF TEXAS

4/13/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

Lockwood, Andrews & Newnam, Inc. A LEO A DALY COMPANY — FIRM REGISTATION NO. 2614

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STORM SEWER PLAN STA 36+50 TO STA 40+50

SHEET 19 OF 24

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	210

ACCEPTED AND FILED — PUBLIC WORKS & ENGINEERING — 67862

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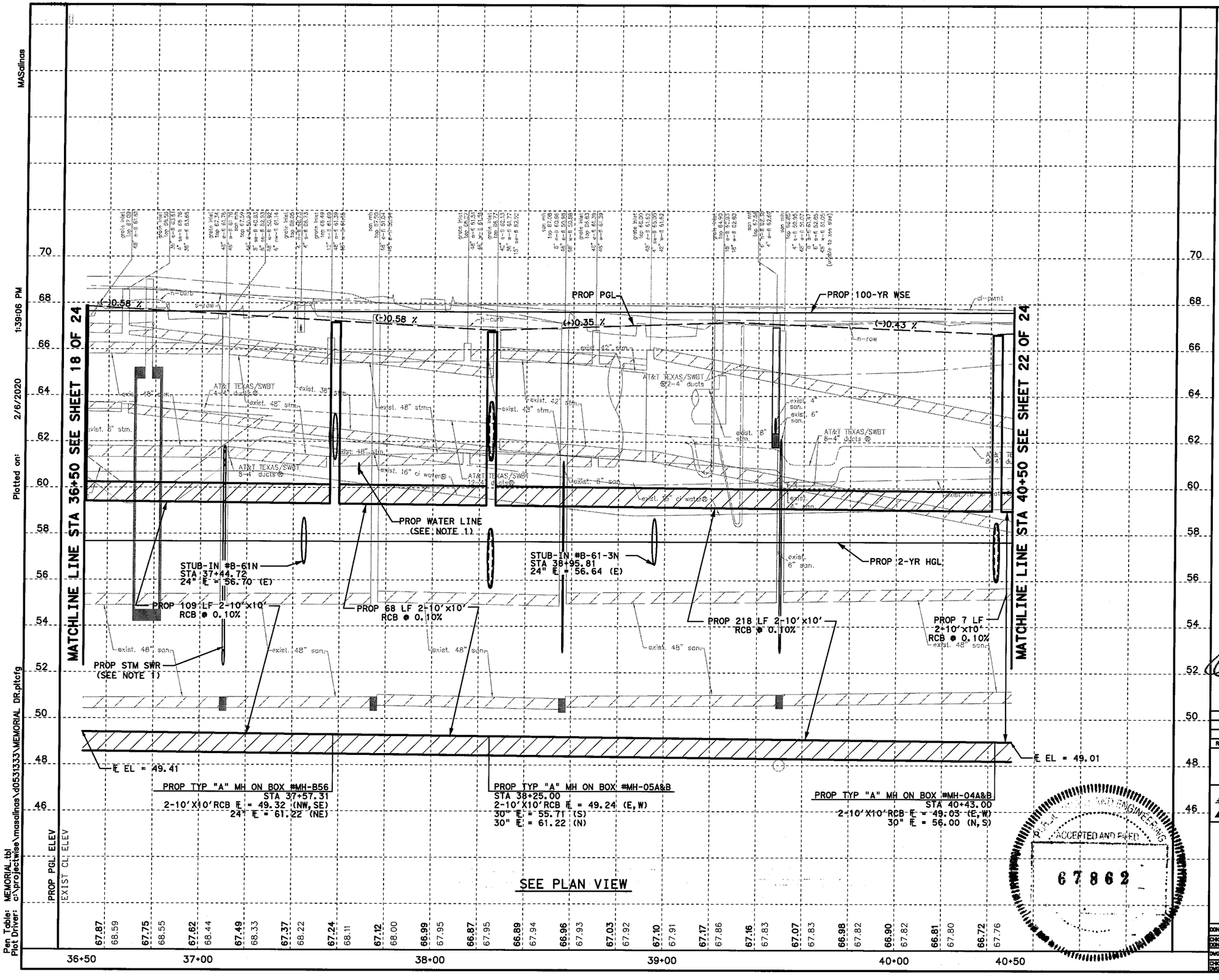

NOTES:

1. REFER TO PAVEMENT IMPROVEMENTS PLAN & PROFILE, WATERLINE & SAN SWR PLAN & PROFILE, SIGNING AND PAVEMENT MARKINGS PLAN SHEETS FOR MORE INFORMATION.
2. REFER TO LATERAL PROFILE SHEETS FOR PROPOSED FLOWLINES FOR STUB-INS.

0 40 80

(IN FEET)
SCALE: 1"=40' - H
1"=4' - V

STATE OF TEXAS
WEIMIN LI
88740
LICENSED PROFESSIONAL ENGINEER
2-6-20

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2814

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STORM SEWER PROFILE STA 36+50 TO STA 40+50

SHEET 20 OF 24

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	211

ACCEPTED AND FILED
67862

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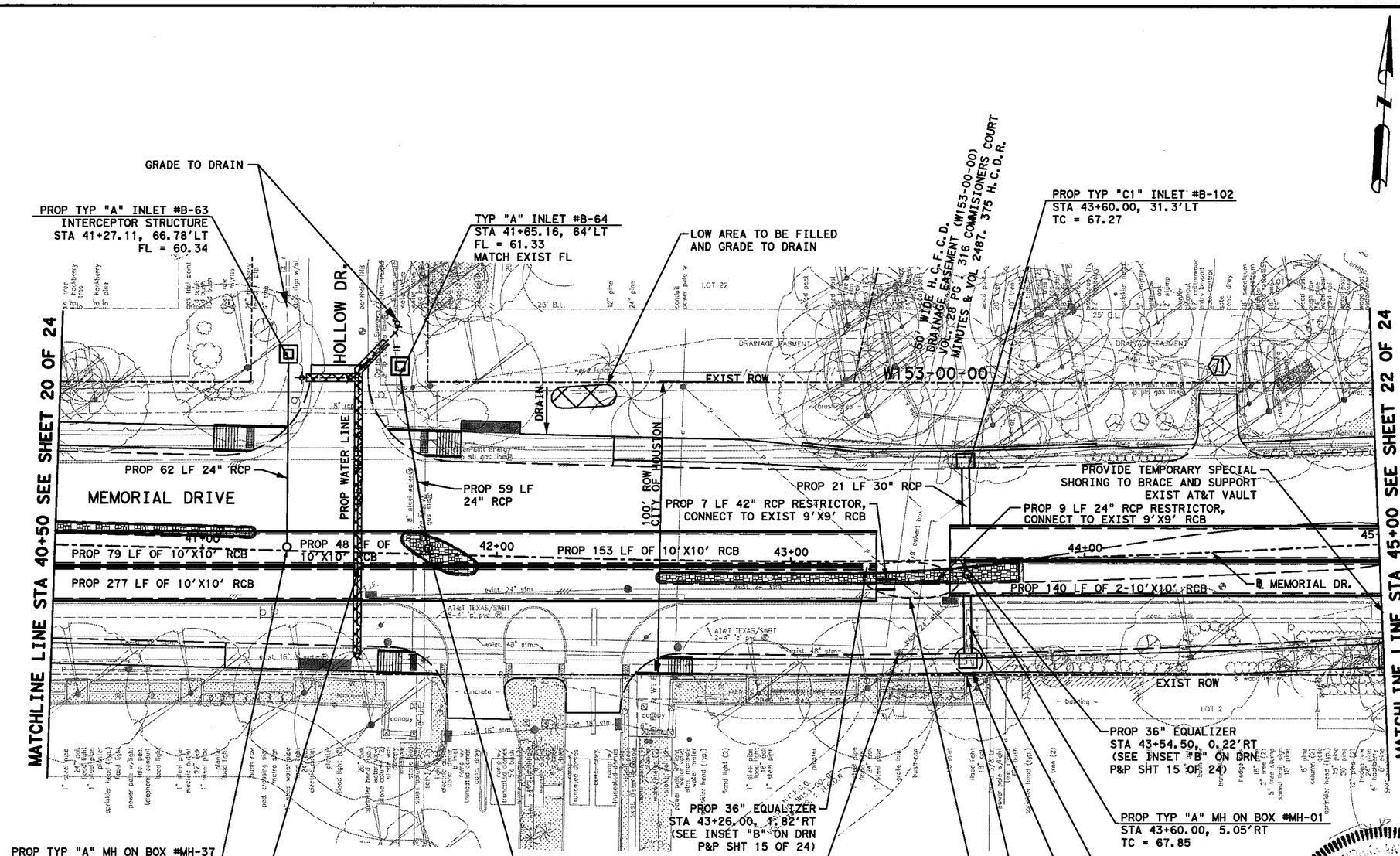

LEGEND:

- PROP STORM SEWER
- EXIST STORM SEWER
- PROP ROADWAY FACE OF CURB
- PROP INLET OR JCT BOX
- PROP MANHOLE
- EXIST INLET OR JUNCTION BOX
- EXIST MANHOLE
- BORE HOLE LOCATION

NOTES:

1. ALL RCP ARE CLASS III UNLESS OTHERWISE NOTED.
2. CONTRACTOR TO MAINTAIN POSITIVE DRAINAGE DURING CONSTRUCTION AND FIELD VERIFY FLOWLINES OF ALL TO CONNECTIONS TO EXISTING DRAINAGE STRUCTURES TO VERIFY POSITIVE DRAINAGE TO PROPOSED STORM SEWER PRIOR TO CONSTRUCTION.
3. REFER TO TXDOT HOUSTON DISTRICT BRIDGE MISCELLANEOUS SEWER DETAILS (MSD) FOR PIPE COLLAR, PIPE BEND, AND OTHER PIPE AND MANHOLE INLET CAP CONNECTION DETAILS.
4. REFER TO MODIFIED STANDARDS FOR TYPE "A/B" MANHOLES AND TYPE "C1" INLETS WHERE STRUCTURE IS NOTED "ON BOX" IN PLAN & PROFILE.
5. REFER TO TXDOT STATEWIDE STANDARD BRIDGE FOR BOX CULVERT CAST-IN-PLACE (SCP-MD & MC-MD), PRECAST JUNCTION BOX (PJB), AND PRECAST (SCP-MD) MISCELLANEOUS DETAILS FOR PROPOSED BENDS IN BOXES.
6. REFER TO PAVEMENT IMPROVEMENTS PLAN & PROFILE, WATER LINE & SAN SWR PLAN & PROFILE, SIGNING AND PAVEMENT MARKINGS PLAN SHEETS FOR MORE INFORMATION.
7. REFER TO LATERAL PROFILE SHEETS FOR PROPOSED FLOWLINES FOR STUB-INS.

NOTE (CONT.):

8. PERFORM CRITICAL LOCATES WITHIN 30 DAYS AFTER NTP. NOTIFY PROJECT MANAGER IF PROP CONNECTION FALLS WITHIN A JOINT.
9. LOCATE EXIST WL WITHIN 30 DAYS AFTER NTP IS ISSUED. PROVIDE DEPTH OF COVER INFORMATION TO PM.

0 40 80

(IN FEET)

SCALE: PLAN 1": 40'

STATE OF TEXAS
WEIMIN LI
88740
LICENSED PROFESSIONAL ENGINEER

4/13/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

PUBLIC WORKS AND ENGINEERING
ACCEPTED AND APPROVED
67862

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
©2020

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STORM SEWER PLAN STA 40+50 TO STA 45+00

SHEET 21 OF 24

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	212

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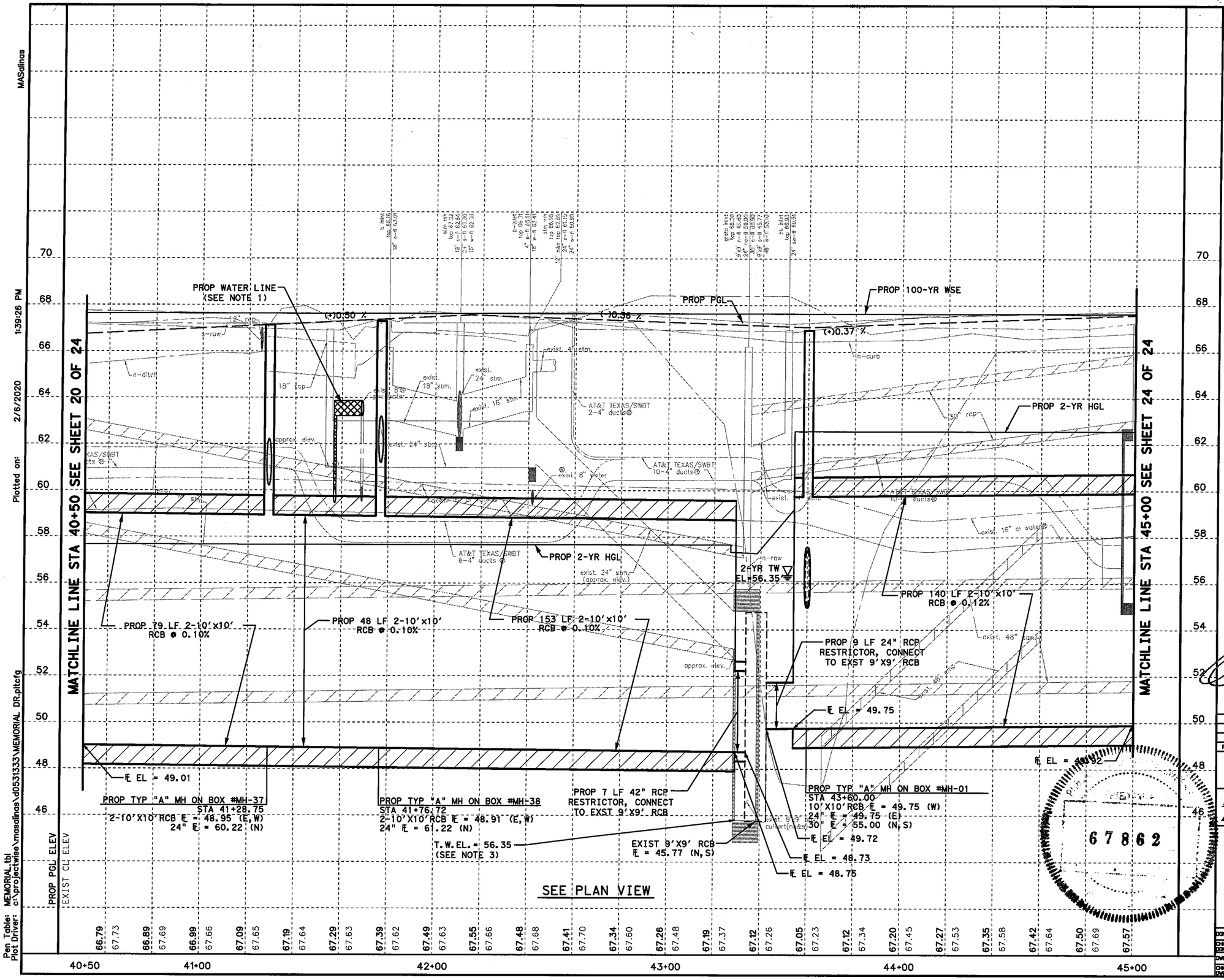

NOTES:

1. REFER TO PAVEMENT IMPROVEMENTS PLAN & PROFILE, WATERLINE & SAN SWR PLAN & PROFILE, SIGNING AND PAVEMENT MARKINGS PLAN SHEETS FOR MORE INFORMATION.
2. REFER TO LATERAL PROFILE SHEETS FOR PROPOSED FLOWLINES FOR STUB-INS.
3. DRAINAGE AREA RUNOFFS ARE CALCULATED USING RATIONAL METHOD. REFER TO THE FINAL DRAINAGE IMPACT ANALYSIS REPORT AUGUST 2019 PREPARED BY LOCKWOOD, ANDREWS, & NEWNAM, INC.

0 40 80
(IN FEET)
SCALE: 1":40' - H
1":4' - V

STATE OF TEXAS
WEIMIN LI
88740
LICENSED PROFESSIONAL ENGINEER
2-6-20
Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
©2020

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STORM SEWER PROFILE
STA 40+50 TO STA 45+00

SHEET 22 OF 24

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CK DWG:	HOU	HARRIS	0912	72	391	213

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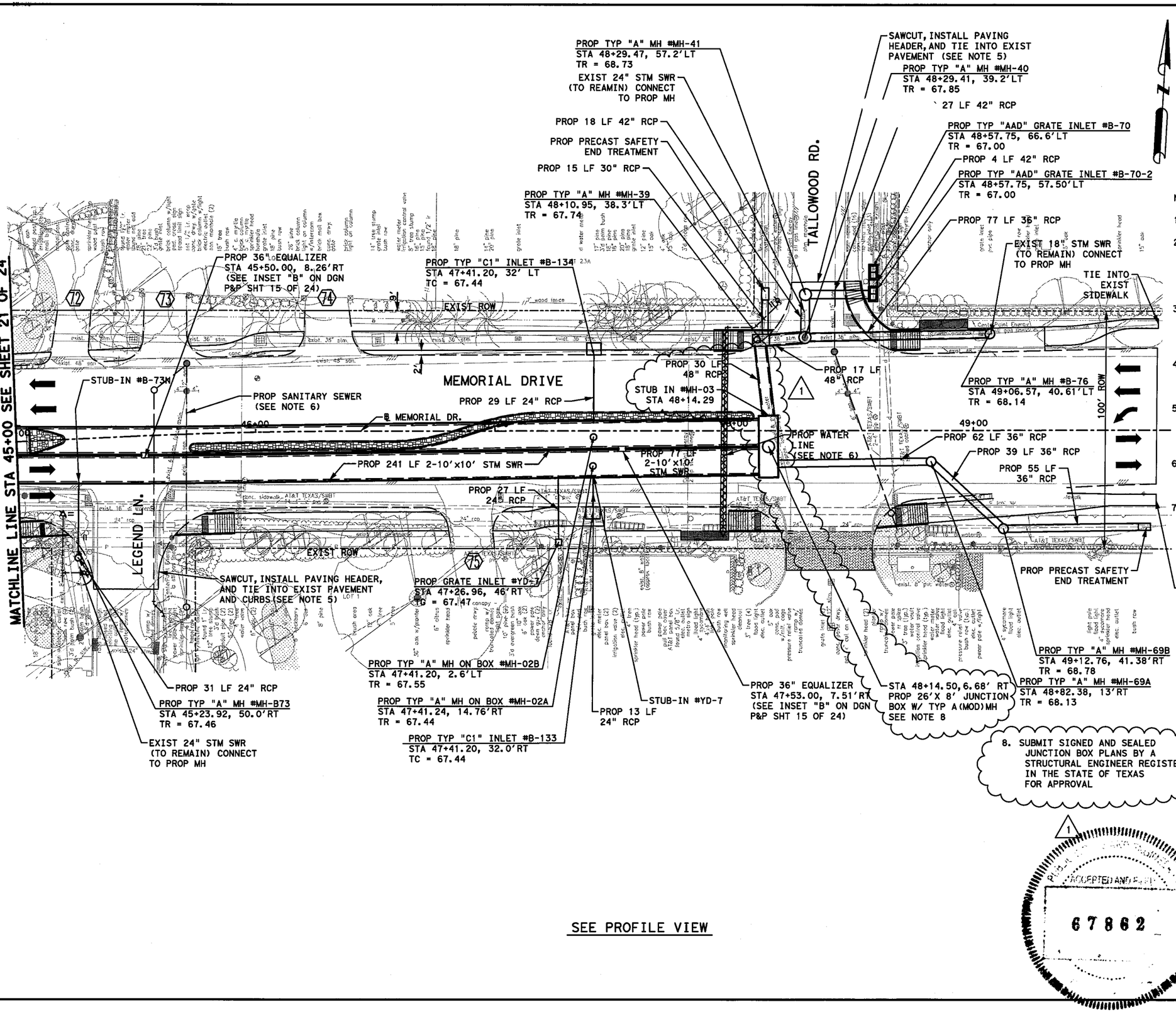

LEGEND:

- PROP STORM SEWER
- EXIST STORM SEWER
- PROP ROADWAY FACE OF CURB
- PROP INLET OR JCT BOX
- PROP MANHOLE
- EXIST INLET OR JUNCTION BOX
- EXIST MANHOLE
- BORE HOLE LOCATION

NOTES:

1. ALL RCP ARE CLASS III UNLESS OTHERWISE NOTED.
2. CONTRACTOR TO MAINTAIN POSITIVE DRAINAGE DURING CONSTRUCTION AND FIELD VERIFY FLOWLINES OF ALL TO CONNECTIONS TO EXISTING DRAINAGE STRUCTURES TO VERIFY POSITIVE DRAINAGE TO PROPOSED STORM SEWER PRIOR TO CONSTRUCTION.
3. REFER TO TXDOT HOUSTON DISTRICT BRIDGE MISCELLANEOUS SEWER DETAILS (MSD) FOR PIPE COLLAR, PIPE BEND, AND OTHER PIPE AND MANHOLE INLET CAP CONNECTION DETAILS.
4. REFER TO MODIFIED STANDARDS FOR TYPE "A/B" MANHOLES AND TYPE "C1" INLETS WHERE STRUCTURE IS NOTED "ON BOX" IN PLAN & PROFILE.
5. REFER TO TXDOT STATEWIDE STANDARD BRIDGE FOR BOX CULVERT CAST-IN-PLACE (SCP-MD & MC-MD), PRECAST JUNCTION BOX (PJB), AND PRECAST (SCP-MD) MISCELLANEOUS DETAILS FOR PROPOSED BENDS IN BOXES.
6. REFER TO PAVEMENT IMPROVEMENTS PLAN & PROFILE, WATER LINE & SAN SWR PLAN & PROFILE, SIGNING AND PAVEMENT MARKINGS PLAN SHEETS FOR MORE INFORMATION.
7. REFER TO LATERAL PROFILE SHEETS FOR PROPOSED FLOWLINES FOR STUB-INS.

8. SUBMIT SIGNED AND SEALED JUNCTION BOX PLANS BY A STRUCTURAL ENGINEER REGISTERED IN THE STATE OF TEXAS FOR APPROVAL

0 40 80
(IN FEET)
SCALE: PLAN 1": 40'

STATE OF TEXAS
WEIMIN LI
88740
LICENSED PROFESSIONAL ENGINEER

7/28/20

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY
1	08-18-2020	CHANGE ORDER #01	

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

Texas Department of Transportation
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STORM SEWER PLAN STA 40+50 TO END PROJECT

SHEET 23 OF 24

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	214

ACCEPTED AND FILED
67862

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MASalinas

MATCHLINE STA 45+00 SEE SHEET 22 OF 24

PROP 100-YR WSE

PROP SAN SWR (SEE NOTE 2)

PROP 2-YR HGL

PROP WATERLINE (SEE NOTE 2)

PROP PGL

(+)0.37 %

(-)0.35 %

(+)0.66 %

PROP 75 LF 36" RCP @ 0.73%

PROP TYP "A" MH #B-76
STA 49+06+57
36" RCP E = 61.52 (W)

PROP 58 LF 36" RCP @ 1.88%

E = 65.60

PROP 30 LF 36" RCP @ 2.83%

PROP TYP "A" MH #MH-69B
STA 49+12.76
36" RCP E = 60.86 (NW)
36" RCP E = 64.50 (E)

PROP 18 LF 48" RCP @ 0.42%

PROP 48" RCP

STUB-IN #YD-7
STA 47+26.96
24" E = 57.41 (N)

STUB-IN #B-133
STA 47+41.27
E=57.45

STUB-IN #B-73N
STA 45+23.92
24" E = 53.41 (W)

PROP 241 LF 2-10'x10' RCB @ 0.10%

PROP 77 LF 2-10'x10' RCB @ 0.10%

PROP 64 LF 36" RCP @ 0.10%

PROP TYP "A" MH #MH-40
STA 48+29.41
48" RCP E = 59.97 (W)
42" RCP E = 60.29 (N)
36" RCP E = 60.97 (E)

PROP TYP "A" MH #MH-39
STA 48+10.95
48" RCP E = 59.89 (E)
48" RCP E = 58.62 (SW)
30" RCP E = 64.80 (N)

PROP TYP "A" MH #MH-69A
STA 48+82.38
36" RCP E = 52.59 (W)
36" RCP E = 60.00 (SE)

36 E = 52.52

FL=50.22

STA 48+14.50
PROP 26'X8' JUNCTION BOX W/TYP A(MOD) MH
48" FL= 58.56 (N)
36" FL= 52.22 (E)

E = 49.92

PROP TYP "A" MH ON BOX #MH-02A&B
STA 47+41.20
2-10'X10'RCB E = 50.17 (E,W)
24" E = 57.41 (N,S)

SEE PLAN VIEW

PROP PGL ELEV	EXIST CL ELEV
67.74	
67.65	67.76
67.72	67.76
67.80	67.76
67.87	67.90
67.95	68.10
67.88	68.09
67.81	68.09
67.74	68.08
67.67	68.08
67.60	68.07
67.53	68.16
67.46	68.25
67.52	68.34
67.66	68.43
67.80	68.52
67.94	68.58
68.08	68.64
68.21	68.70
68.35	68.76
68.49	68.81
68.63	68.86
68.77	68.91
68.91	68.96

45+00 46+00 47+00 48+00 49+00

70 68 66 64 62 60 58 56 54 52 50 48 46

NOTES:

1. REFER TO PAVEMENT IMPROVEMENTS PLAN & PROFILE, WATERLINE & SAN SWR PLAN & PROFILE, SIGNING AND PAVEMENT MARKINGS PLAN SHEETS FOR MORE INFORMATION.
2. REFER TO LATERAL PROFILE SHEETS FOR PROPOSED FLOWLINES FOR STUB-INS.
3. DRAINAGE AREA RUNOFFS ARE CALCULATED USING RATIONAL METHOD. REFER TO THE FINAL DRAINAGE IMPACT ANALYSIS REPORT AUGUST 2019 PREPARED BY LOCKWOOD, ANDREWS, & NEWNAM, INC.

0 40 80
(IN FEET)
SCALE: 1"=40' - H
1"=4' - V

STATE OF TEXAS
WEIMIN LI
88740
LICENSED PROFESSIONAL ENGINEER
7/28/20

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY
1	08-18-2020	RE-ISSUED FOR CONSTRUCTION	

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

Texas Department of Transportation ©2020

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STORM SEWER PROFILE STA 40+50 TO END PROJECT

SHEET 24 OF 24

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CK DWG:	HOU	HARRIS	0912	72	391	215

67862

ACCEPTED AND FILED

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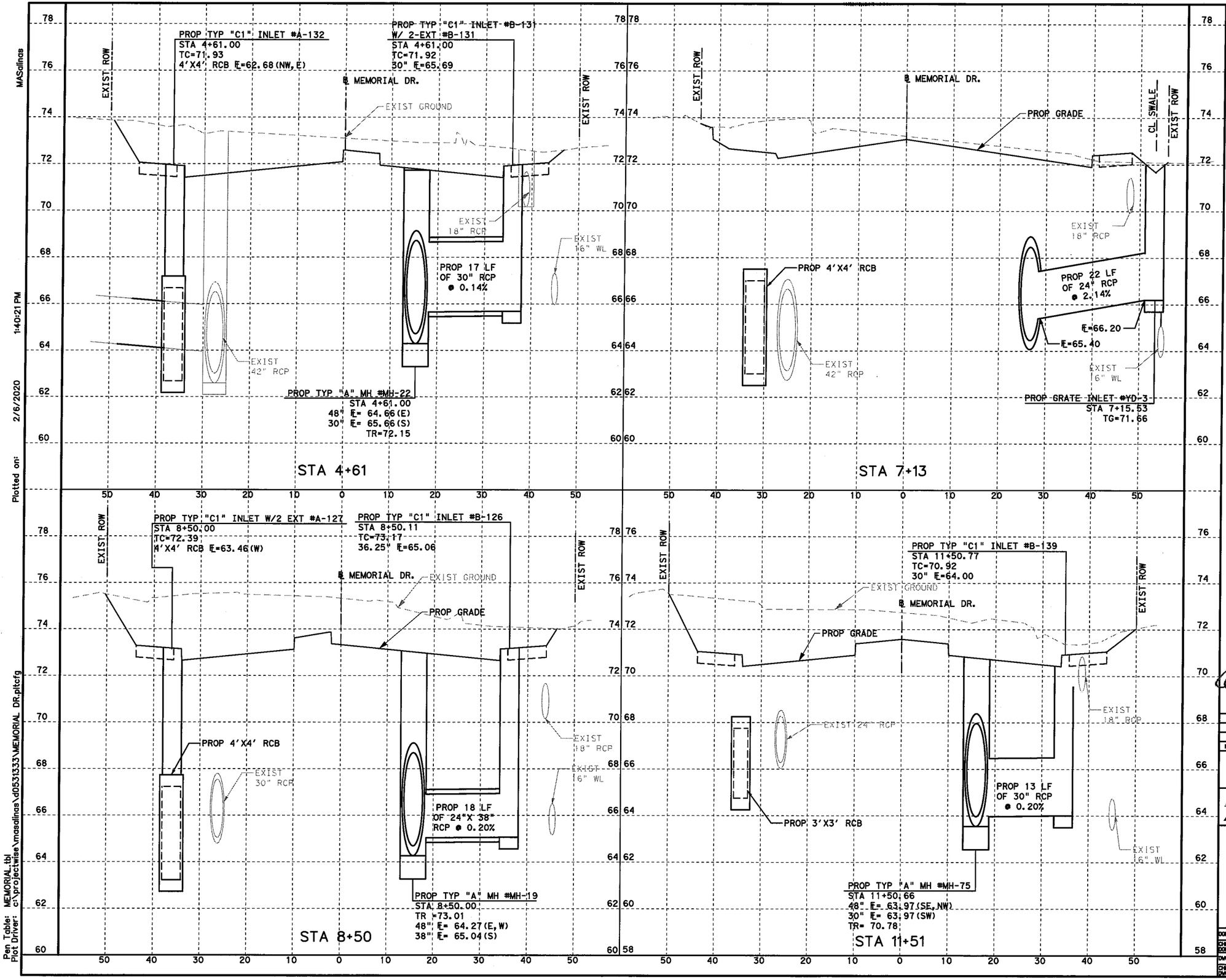

NOTE:

1. THE EXISTING DRAINAGE SYSTEM WILL BE REMOVED AND PAID FOR WITH THE APPLICABLE PAY ITEM (ITEM 496 - REMOVING STRUCTURE)

PUBLIC WORKS AND ENGINEERING
ACCEPTED AND FILED
67862

0 20 40
(IN FEET)
SCALE: PLAN 1":20'-H

0 4 8
(IN FEET)
SCALE: PROFILE 1":4' - V

STATE OF TEXAS
WEIMIN LI
88740
LICENSED PROFESSIONAL ENGINEER
2-6-20

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STORM SEWER LATERALS

SHEET 1 OF 16

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	216

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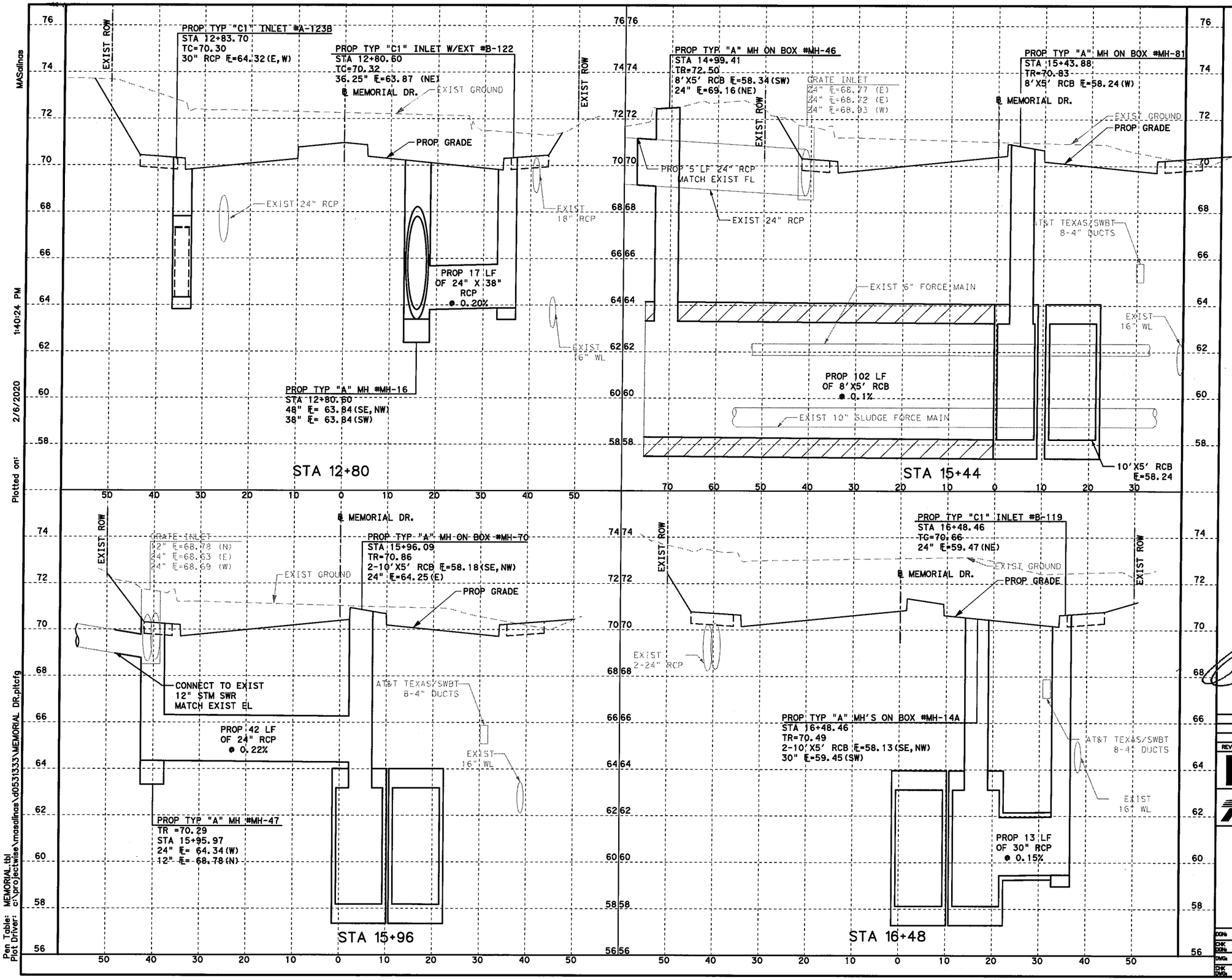

NOTE:

1. THE EXISTING DRAINAGE SYSTEM WILL BE REMOVED AND PAID FOR WITH THE APPLICABLE PAY ITEM (ITEM 496 - REMOVING STRUCTURE)

ACCEPTED AND F...
67862

0 20 40
(IN FEET)
SCALE: PLAN 1":20'-H

0 4 8
(IN FEET)
SCALE: PROFILE 1":4' - V

STATE OF TEXAS
WEIMIN LI
88740
LICENSED PROFESSIONAL ENGINEER
2-6-20

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

Lockwood, Andrews & Newnam, Inc.
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FIRM REGISTATION NO. 2614

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STORM SEWER LATERALS

SHEET 2 OF 16

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	217

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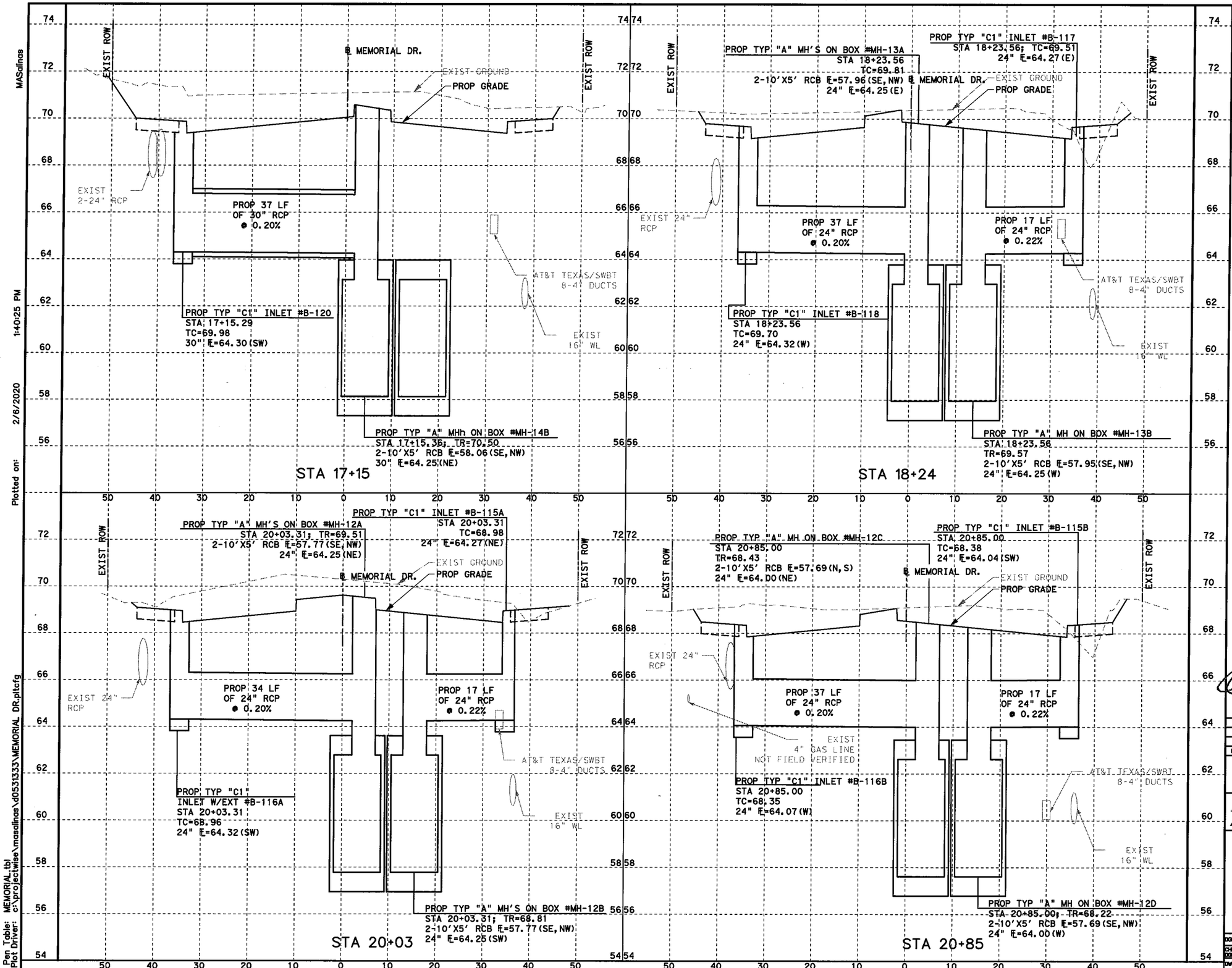
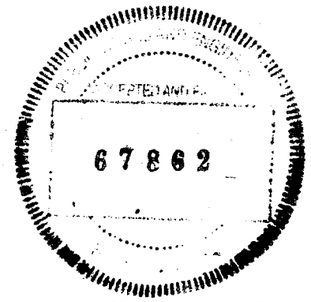


NOTE:

1. THE EXISTING DRAINAGE SYSTEM WILL BE REMOVED AND PAID FOR WITH THE APPLICABLE PAY ITEM (ITEM 496 - REMOVING STRUCTURE)



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0 4 8
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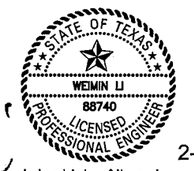
SCALE: PROFILE 1":4' - V



2-6-20

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STORM SEWER LATERALS

SHEET 3 OF 16

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	218

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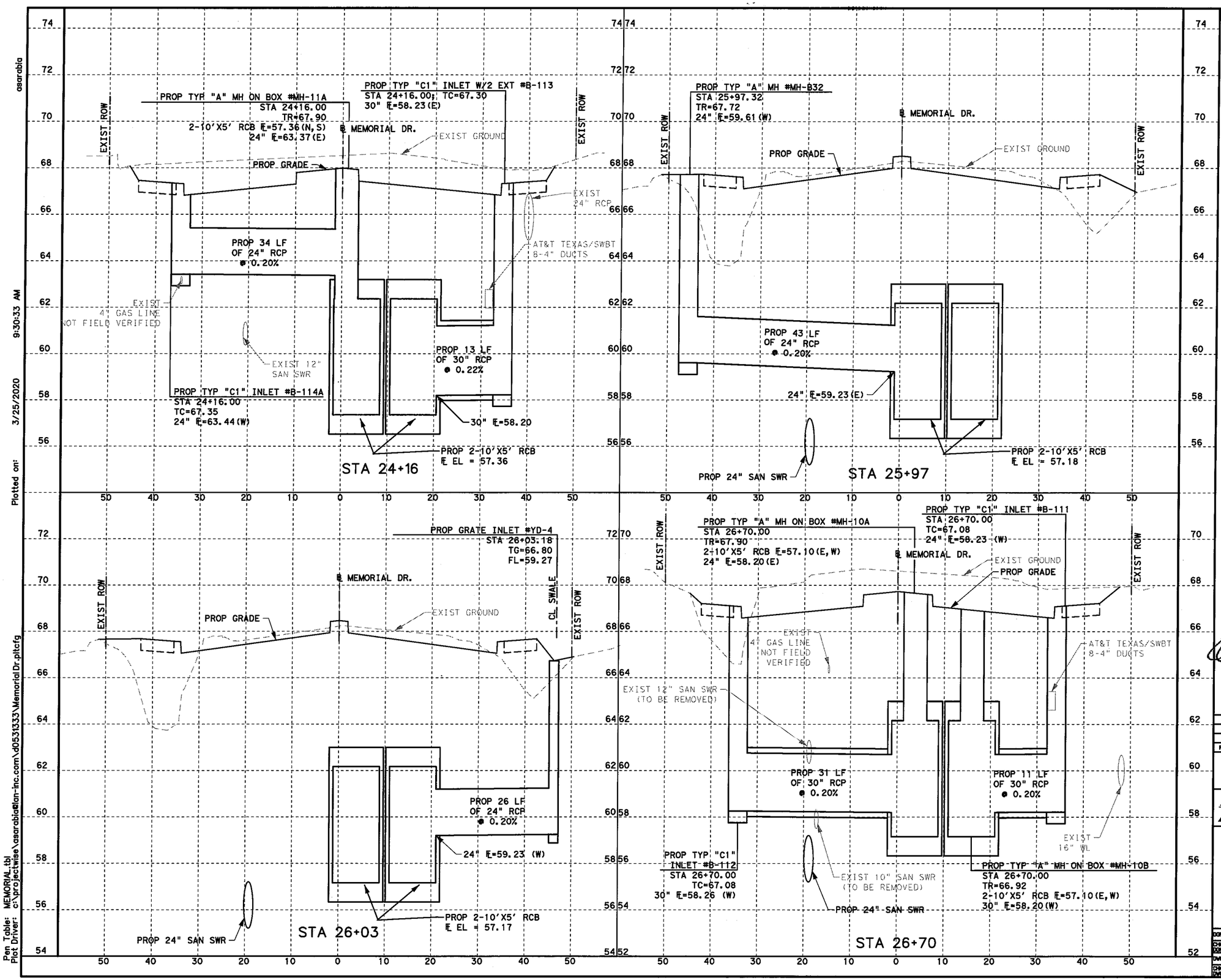

NOTE:

1. THE EXISTING DRAINAGE SYSTEM WILL BE REMOVED AND PAID FOR WITH THE APPLICABLE PAY ITEM (ITEM 496 - REMOVING STRUCTURE)

ACCEPTED AND FILED
67862

0 20 40
(IN FEET)
SCALE: PLAN 1":20'-H

0 4 8
(IN FEET)
SCALE: PROFILE 1":4' - V

STATE OF TEXAS
WEIMIN LI
88740
LICENSED PROFESSIONAL ENGINEER

3/31/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STORM SEWER LATERALS

SHEET 4 OF 16

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CK DWG:	HOU	HARRIS	0912	72	391	219

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PROP TYP "A" MH ON BOX #MH-73A
STA 28+60.00
TR=68.07
2-10'X5' RCB E=56.92(N,S)
24" E=59.20(W)

PROP TYP "AZ2G" INLET #B-136
STA 28+60.00
TC=67.02
24" E=58.22(W)

PROP TYP "C1" INLET #B-121
STA 28+60.00
TC=67.50
24" E=59.26(E)

PROP TYP "A" MH ON BOX #MH-73B
STA 28+60.00
TR=67.35
2-10'X5' RCB E=56.92(N,S)
24" E=58.20(E)

PROP JUNCT. BOX #MH-08
STA 30+15.00
TR=68.10
2-10'X10' RCB E=50.06 (S)
2-10'X5' RCB E=56.76 (N)
30" E=58.00(E,W)

PROP TYP GRATE INLET #YD-5
STA 30+15.00
TC=67.32
30" E=62.70 (SW)

PROP TYP "C1" INLET #B-124
STA 30+15.00
TC=68.07
30" E=58.02 (NE)

PROP TYP "C1"
INLET #B-125
STA 30+15.00
TC=67.44
30" E=58.04 (SW)
24" E=62.69 (NE)

EXIST ROW
EXIST GROUND
PROP GRADE
℄ MEMORIAL DR.
EXIST 24" RCP
EXIST 2-24" RCP
AT&T TEXAS/SWBT 8-4" DUCTS
EXIST 4" GAS LINE NOT FIELD VERIFIED
EXIST 2" SAN SWR (TO BE REMOVED)
EXIST 4" GAS LINE NOT FIELD VERIFIED
EXIST 16" WL
EXIST 16" WL
EXIST 24" RCP
EXIST 10" SAN SWR (TO BE ABANDONED)
EXIST 48" SAN SWR
PROP 24" SAN SWR
PROP 31 LF OF 24" RCP @ 0.20%
PROP 9 LF OF 24" RCP @ 0.20%
PROP 5 LF OF 24" RCP @ 0.20%
PROP 26 LF OF 30" RCP @ 0.20%
PROP 10 LF OF 30" RCP @ 0.20%
PROP JUNCT. BOX FL EL = 50.05

STA 28+60
STA 30+15

NOTE:

1. THE EXISTING DRAINAGE SYSTEM WILL BE REMOVED AND PAID FOR WITH THE APPLICABLE PAY ITEM (ITEM 496 - REMOVING STRUCTURE)

0 20 40
(IN FEET)
SCALE: PLAN 1":20'-H

0 4 8
(IN FEET)
SCALE: PROFILE 1":4' - V

STATE OF TEXAS
WEIMIN LI
88740
LICENSED PROFESSIONAL ENGINEER
2-6-20
Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STORM SEWER LATERALS

SHEET 5 OF 16

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	220

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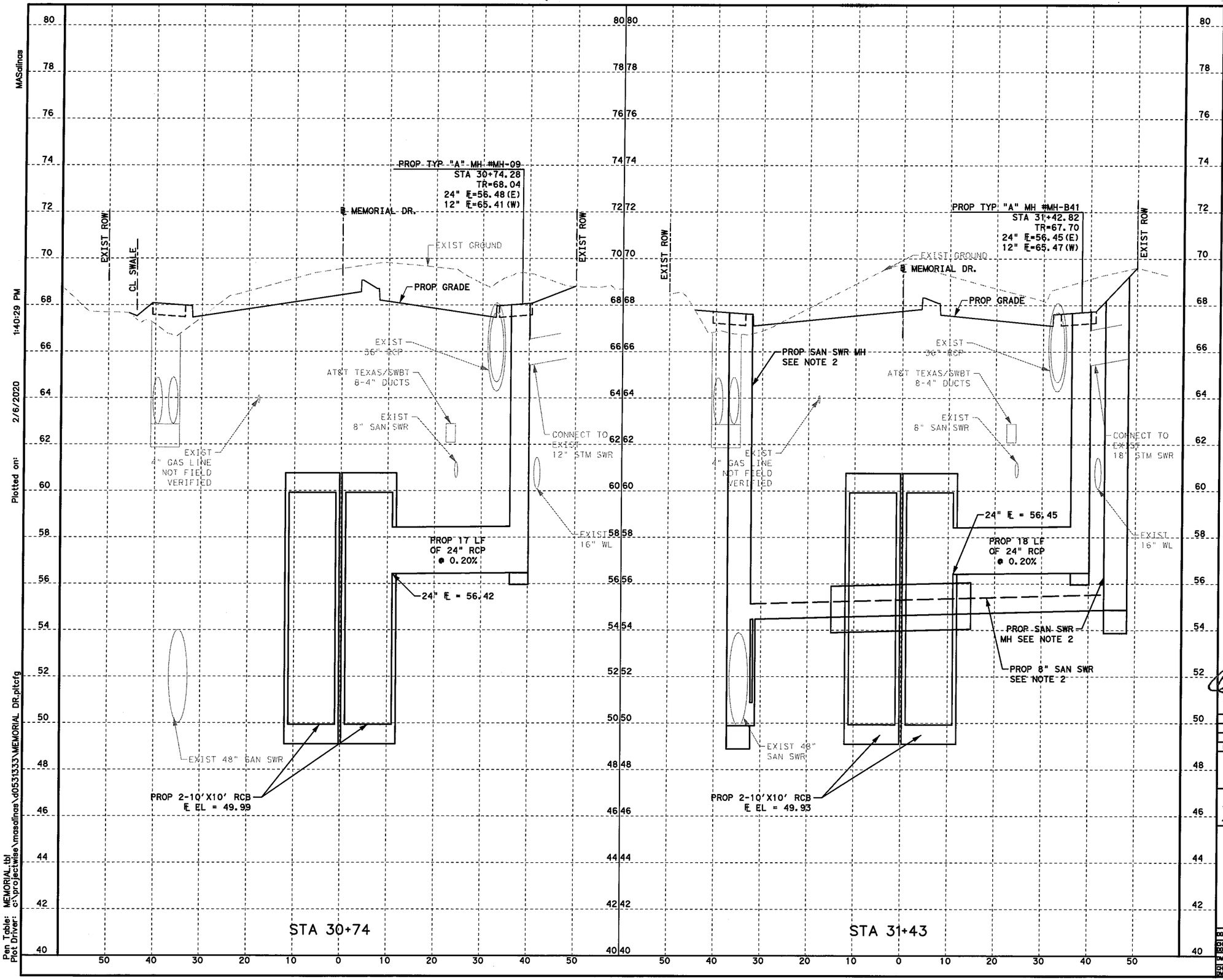

NOTE:

1. THE EXISTING DRAINAGE SYSTEM WILL BE REMOVED AND PAID FOR WITH THE APPLICABLE PAY ITEM (ITEM 496 - REMOVING STRUCTURE)
2. SEE WATERLINE AND SAN SWR CROSSING SHEETS FOR MORE INFORMATION

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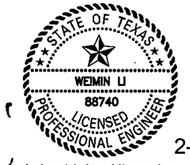
(IN FEET)
SCALE: PLAN 1":20'-H

0 4 8
(IN FEET)
SCALE: PROFILE 1":4' - V



2-6-20

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STORM SEWER LATERALS

SHEET 6 OF 16

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	221

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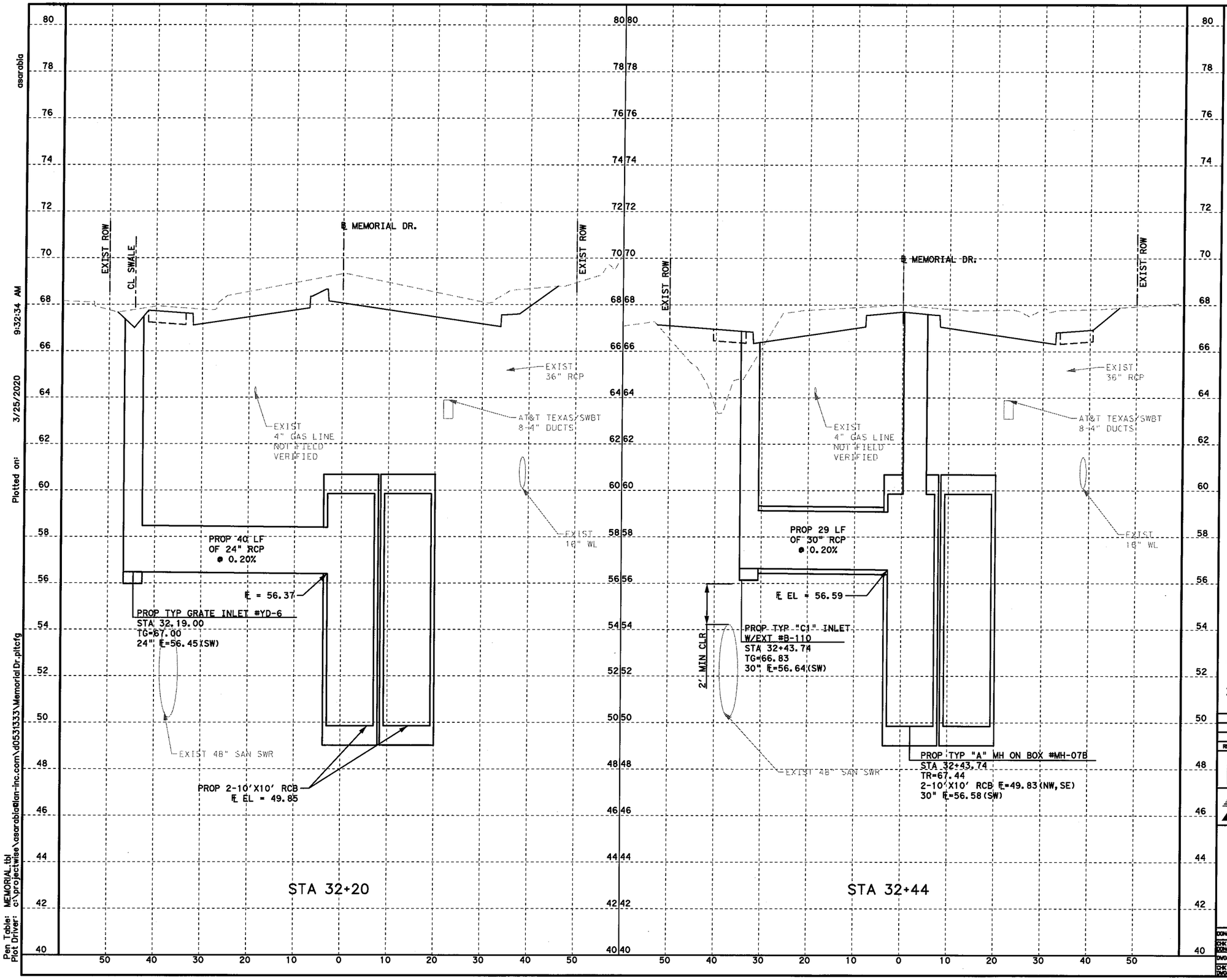

NOTE:

1. THE EXISTING DRAINAGE SYSTEM WILL BE REMOVED AND PAID FOR WITH THE APPLICABLE PAY ITEM (ITEM 496 - REMOVING STRUCTURE)

67862

0 20 40
(IN FEET)
SCALE: PLAN 1":20'-H

0 4 8
(IN FEET)
SCALE: PROFILE 1":4' - V

STATE OF TEXAS
WEIMIN LI
88740
LICENSED PROFESSIONAL ENGINEER

3/31/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STORM SEWER LATERALS

SHEET 7 OF 16

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: KDN:	6	TEXAS	STP 1802(783)MM			CS
DW:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CK: DW:	HOU	HARRIS	0912	72	391	222

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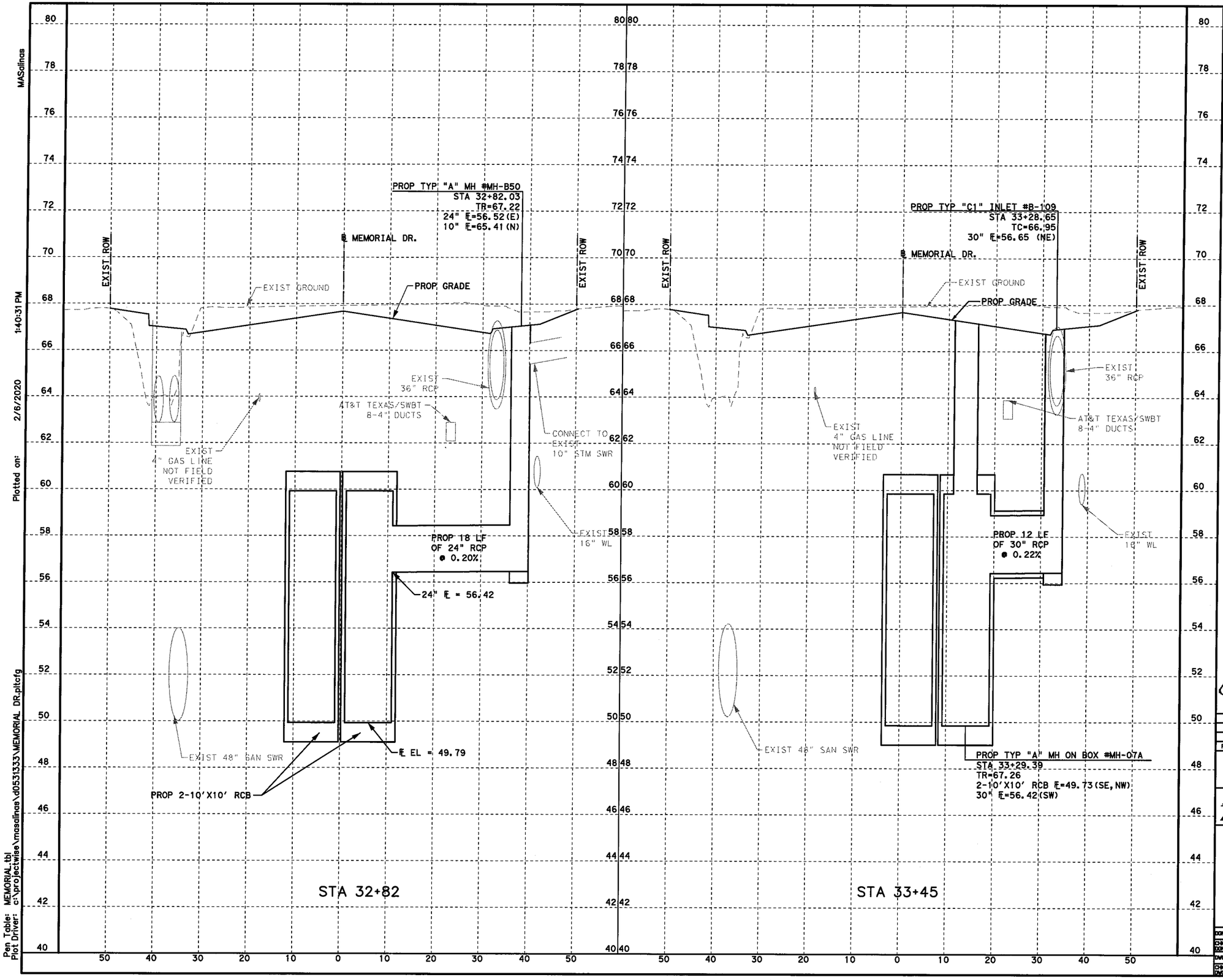

NOTE:

1. THE EXISTING DRAINAGE SYSTEM WILL BE REMOVED AND PAID FOR WITH THE APPLICABLE PAY ITEM (ITEM 496 - REMOVING STRUCTURE)

ACCEPTED AND FILED
PUBLIC WORKS AND ENGINEERING
67862

0 20 40
(IN FEET)
SCALE: PLAN 1":20'-H

0 4 8
(IN FEET)
SCALE: PROFILE 1":4' - V

STATE OF TEXAS
WEIMIN LI
88740
LICENSED PROFESSIONAL ENGINEER

2-6-20

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STORM SEWER LATERALS

SHEET 8 OF 16

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	223

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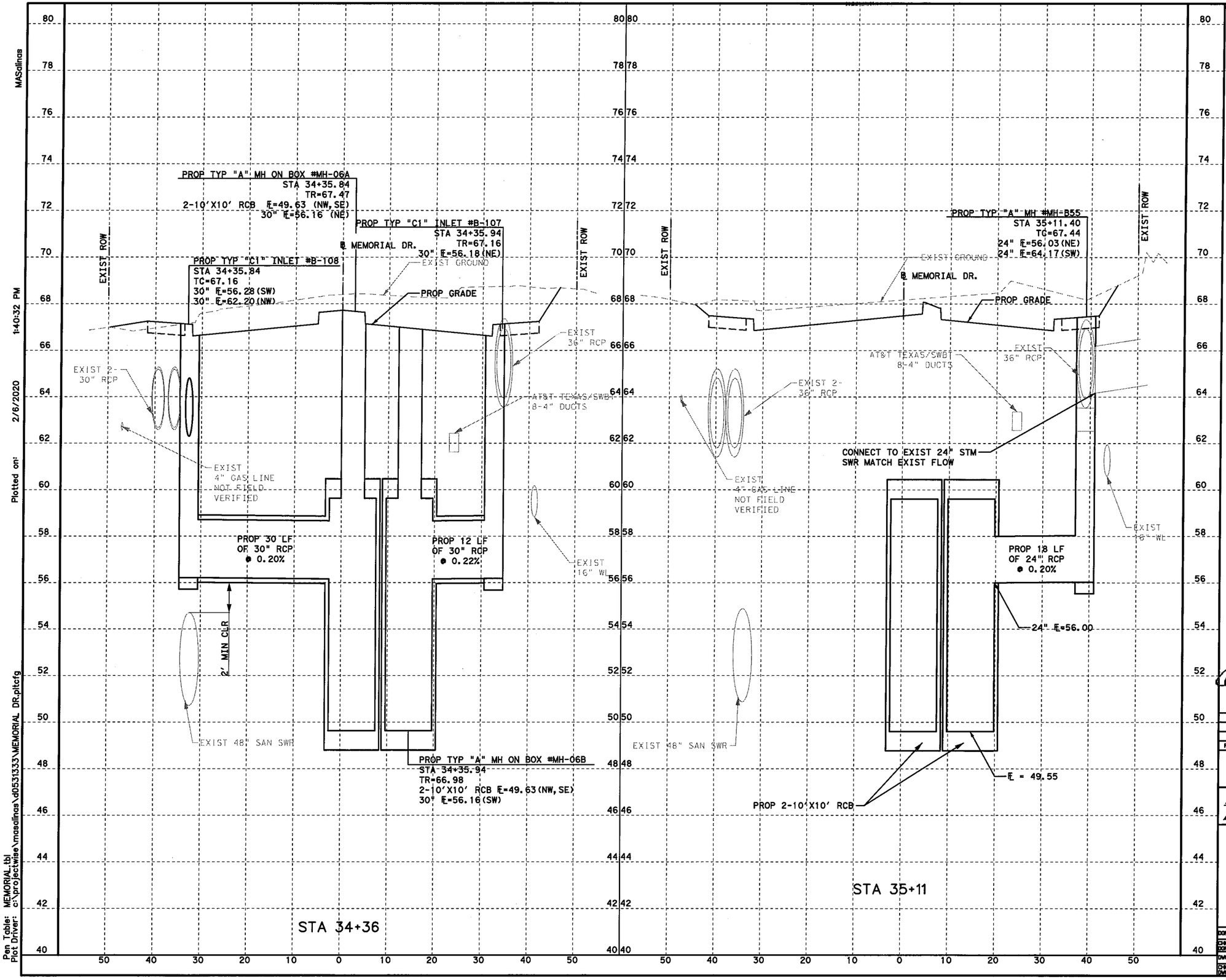

NOTE:

1. THE EXISTING DRAINAGE SYSTEM WILL BE REMOVED AND PAID FOR WITH THE APPLICABLE PAY ITEM (ITEM 496 - REMOVING STRUCTURE)

67862

0 20 40
(IN FEET)
SCALE: PLAN 1":20'-H

0 4 8
(IN FEET)
SCALE: PROFILE 1":4' - V

STATE OF TEXAS
WEIMIN LI
88740
LICENSED PROFESSIONAL ENGINEER
2-6-20

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STORM SEWER LATERALS

SHEET 9 OF 16

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	224

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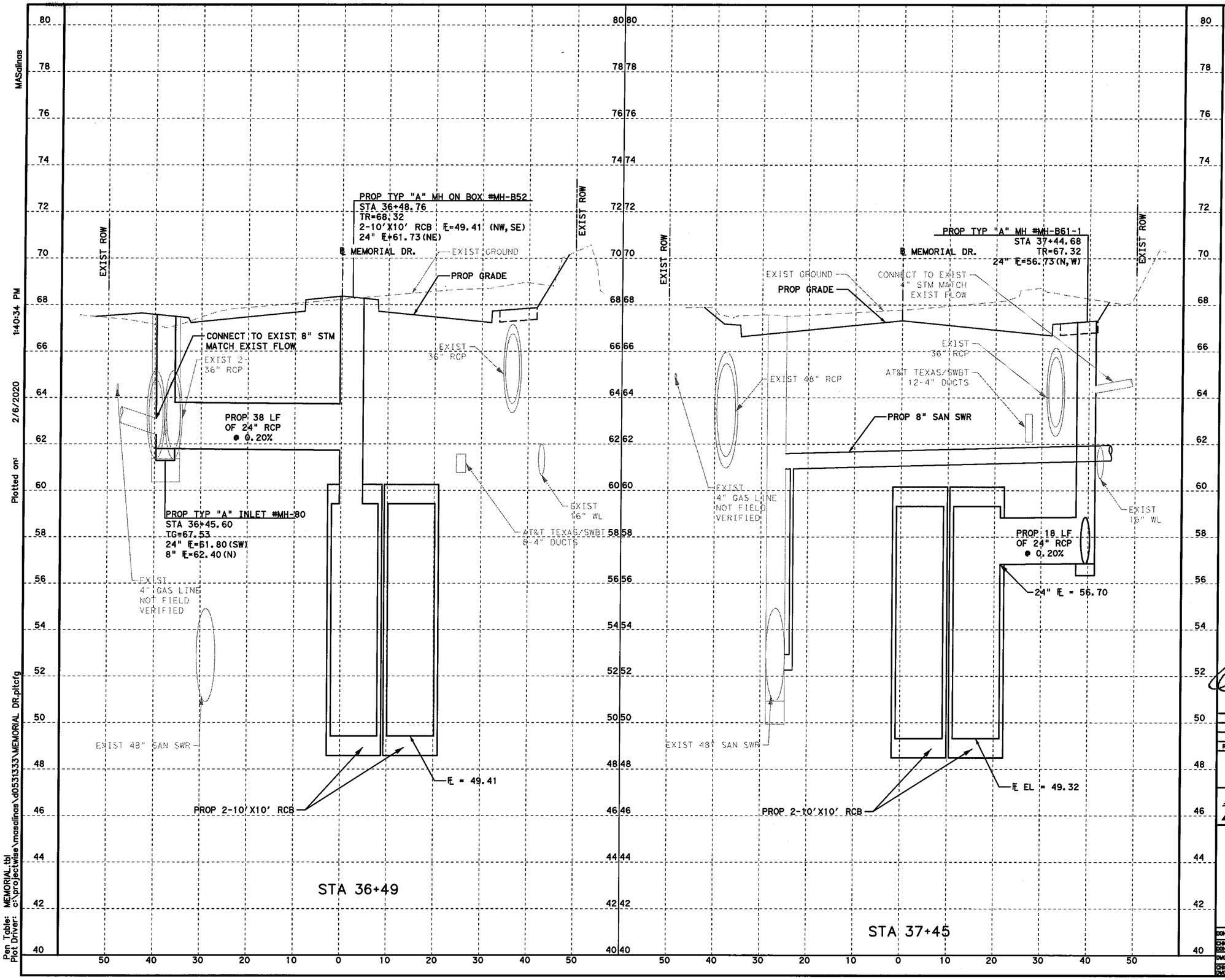
MASalinas



NOTE:

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67862

0 20 40
(IN FEET)
SCALE: PLAN 1" = 20' - H

0 4 8
(IN FEET)
SCALE: PROFILE 1" = 4' - V

STATE OF TEXAS
WEIMIN LI
88740
LICENSED PROFESSIONAL ENGINEER

2-6-20

Lockwood, Andrews & Newnam, Inc.
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STORM SEWER LATERALS

SHEET 10 OF 16

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	225

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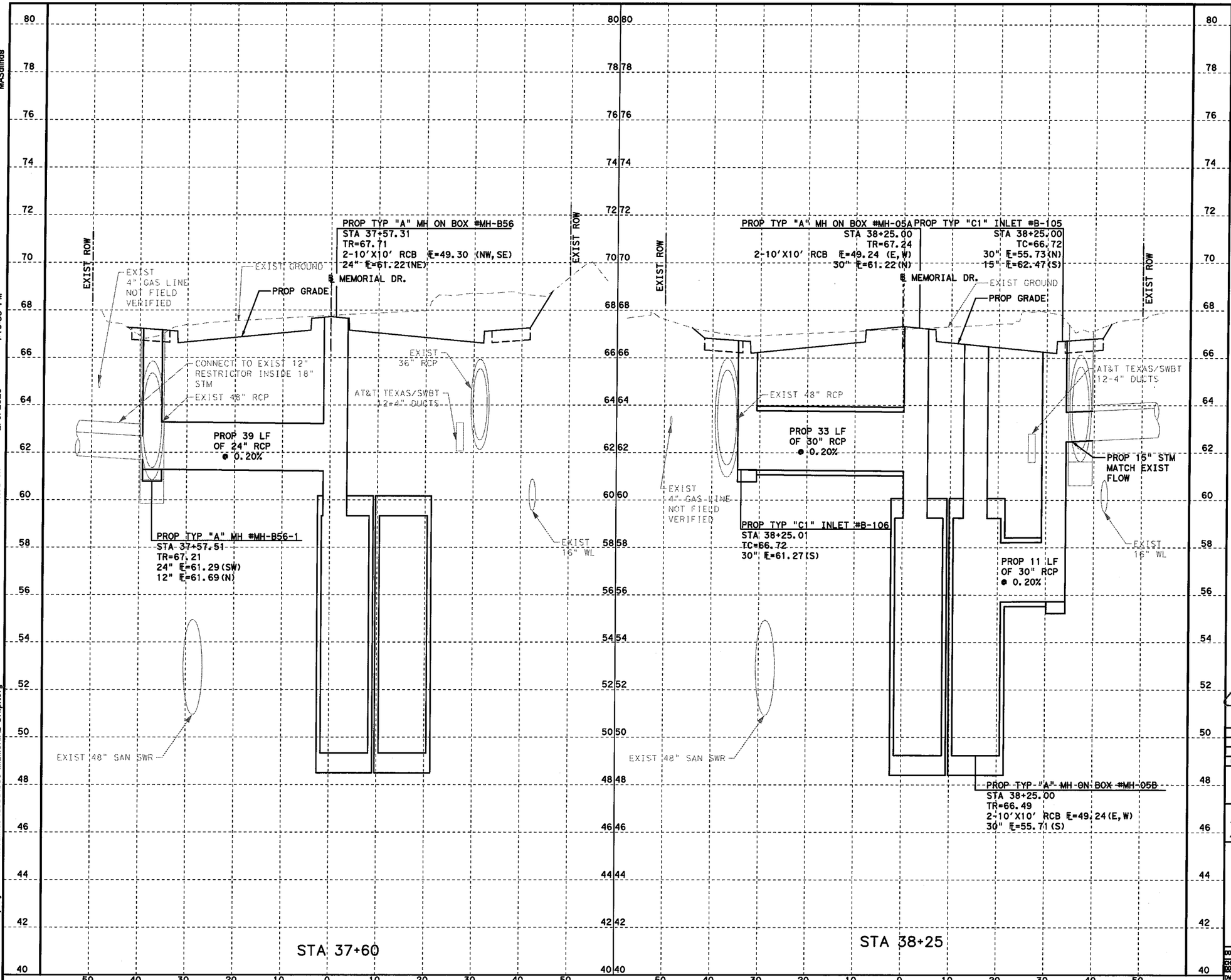

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STATE OF TEXAS
WEIMIN LI
67862
REGISTERED PROFESSIONAL ENGINEER

0 20 40
(IN FEET)
SCALE: PLAN 1":20'-H

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SCALE: PROFILE 1":4' - V

STATE OF TEXAS
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2-6-20

Lockwood, Andrews & Newnam, Inc.
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STORM SEWER LATERALS

SHEET 11 OF 16

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	226

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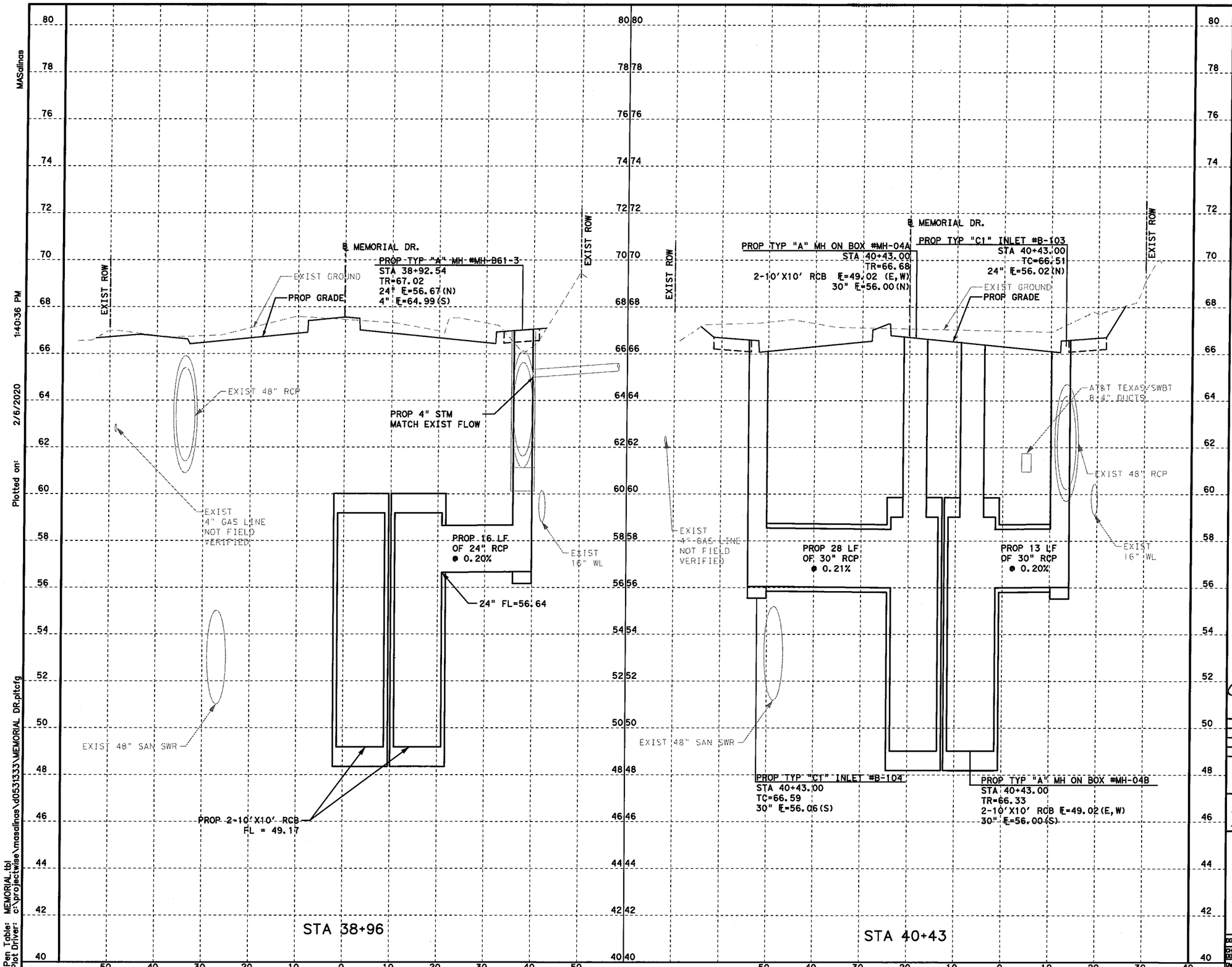
MASalinas



NOTE:

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PUBLIC WORKS AND ENGINEERING
ACCEPTED AND FILED
67862

0 20 40
(IN FEET)
SCALE: PLAN 1":20'-H

0 4 8
(IN FEET)
SCALE: PROFILE 1":4' - V

STATE OF TEXAS
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88740
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2-6-20

Lockwood, Andrews & Newnam, Inc.
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REV. NO.	DATE	DESCRIPTION	BY

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STORM SEWER LATERALS

SHEET 12 OF 16

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	227

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PROP TYP "A" MH ON BOX #MH-37
STA 41+28.75 ℄ MEMORIAL DR.
TR=67.10
2-10'X10' RCB ℄=48.94(E,W)
24" ℄=60.22(N)

EXIST ROW

EXIST GROUND
PROP GRADE

EXIST 18" RCP

EXIST 48" RCP
AT&T TEXAS/SWBT
8-4" DUCTS

PROP 62 LF
OF 24" RCP
@ 0.20%

EXIST
4" GAS LINE
NOT FIELD
VERIFIED

PROP TYP "A" INLET #B-63 INTERCEPTOR STRUCTURE
STA 41+27.11
TR=66.78
24" ℄=60.32(S)

EXIST
16" WL

EXIST 48" SAN SWR

PROP 2-10'X10' RCB

STA 41+29

PROP TYP "A" MH ON BOX #MH-38
STA 41+76.72
TR=67.33
2-10'X10' RCB ℄=48.89(E,W)
24" ℄=61.21(N)

℄ MEMORIAL DR.

EXIST ROW

EXIST GROUND
PROP GRADE

EXIST
18" RCP

EXIST
4" GAS LINE
NOT FIELD
VERIFIED

PROP 59 LF
OF 24" RCP
@ 0.20%

AT&T TEXAS/
SWBT 8-4" DUCTS

EXIST
16" WL

PROP TYP "A" INLET #B-64
STA 41+65.16
24" ℄=61.33(N)

EXIST
48" RCP

EXIST 48" SAN SWR

PROP 2-10'X10' RCB

STA 41+77

NOTE:

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67862

0 20 40
(IN FEET)
SCALE: PLAN 1":20'-H

0 4 8
(IN FEET)
SCALE: PROFILE 1":4' - V

STATE OF TEXAS
WEIMIN LI
88740
LICENSED
PROFESSIONAL ENGINEER

2-6-20

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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FIRM REGISTATION NO. 2614

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STORM SEWER LATERALS

SHEET 13 OF 16

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	228

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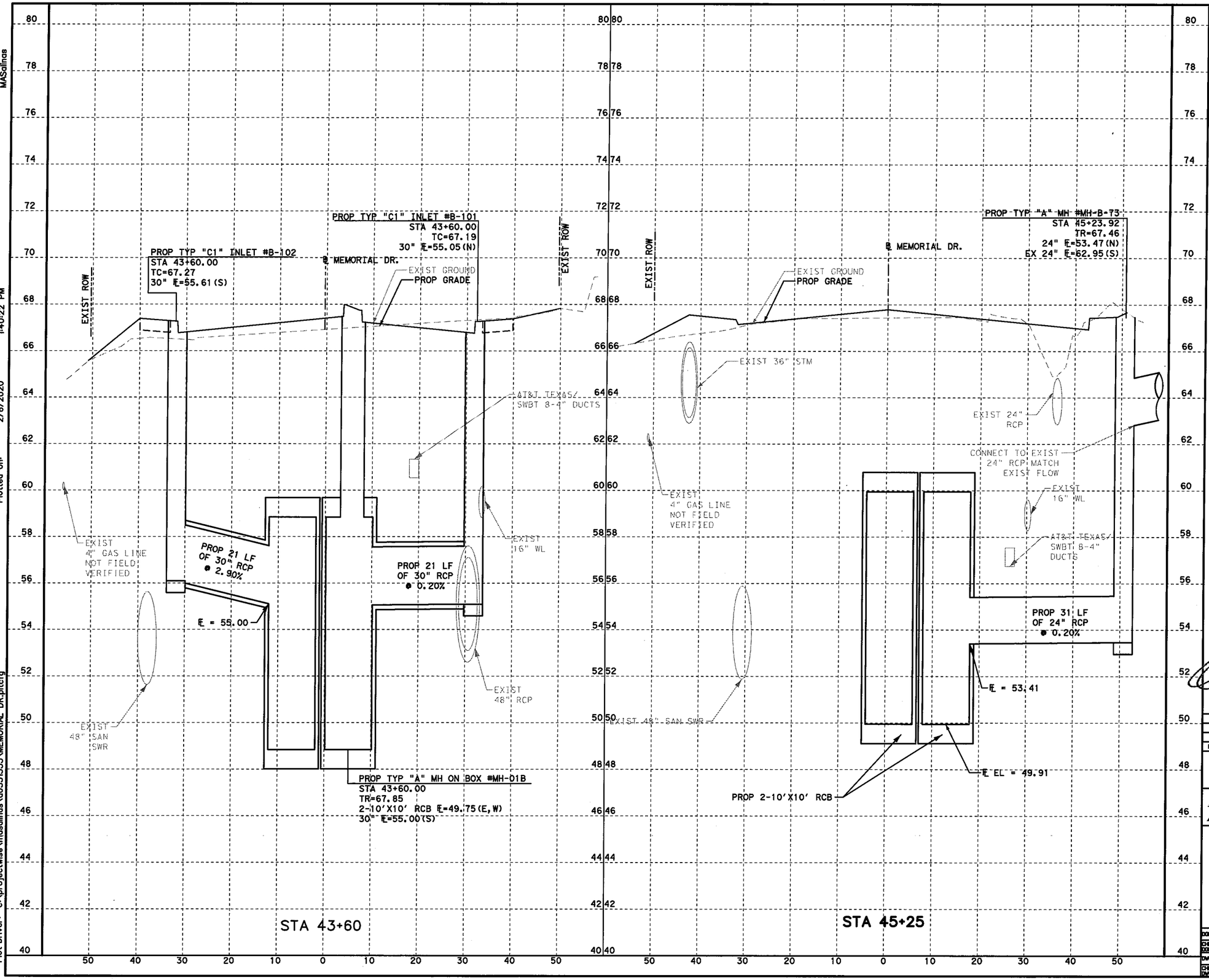

NOTE:

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PUBLIC WORKS AND ENGINEERING
ACCEPTED AND FILED
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(IN FEET)
SCALE: PLAN 1":20'-H

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(IN FEET)
SCALE: PROFILE 1":4' - V

STATE OF TEXAS
WEIMIN LI
88740
LICENSED PROFESSIONAL ENGINEER

2-6-20

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STORM SEWER LATERALS

SHEET 14 OF 16

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CK DWG:	HOU	HARRIS	0912	72	391	229

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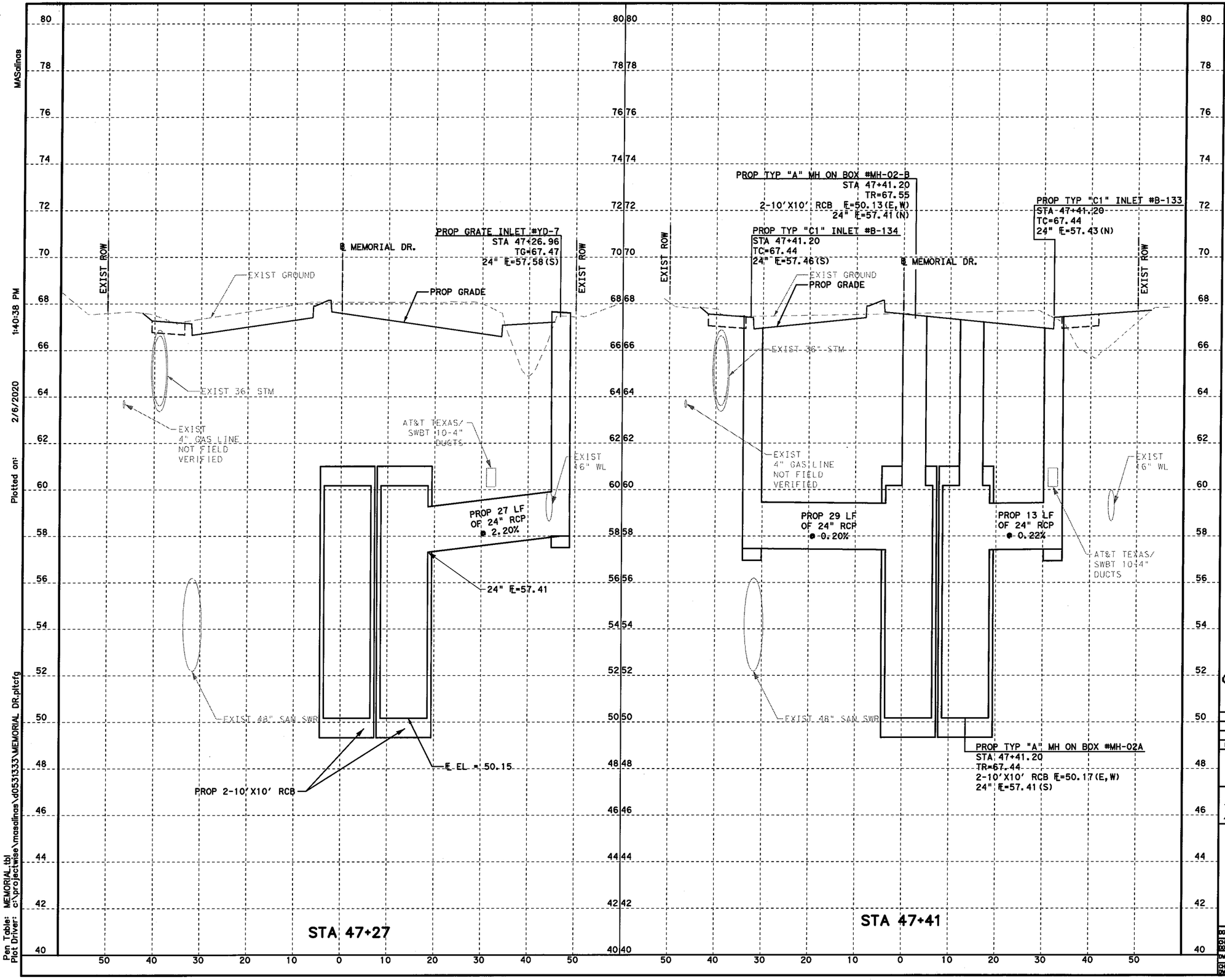

NOTE:

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PUBLIC WORKS
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67862

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STATE OF TEXAS
WEIMIN LI
88740
LICENSED PROFESSIONAL ENGINEER
2-6-20

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STORM SEWER LATERALS

SHEET 15 OF 16

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	230

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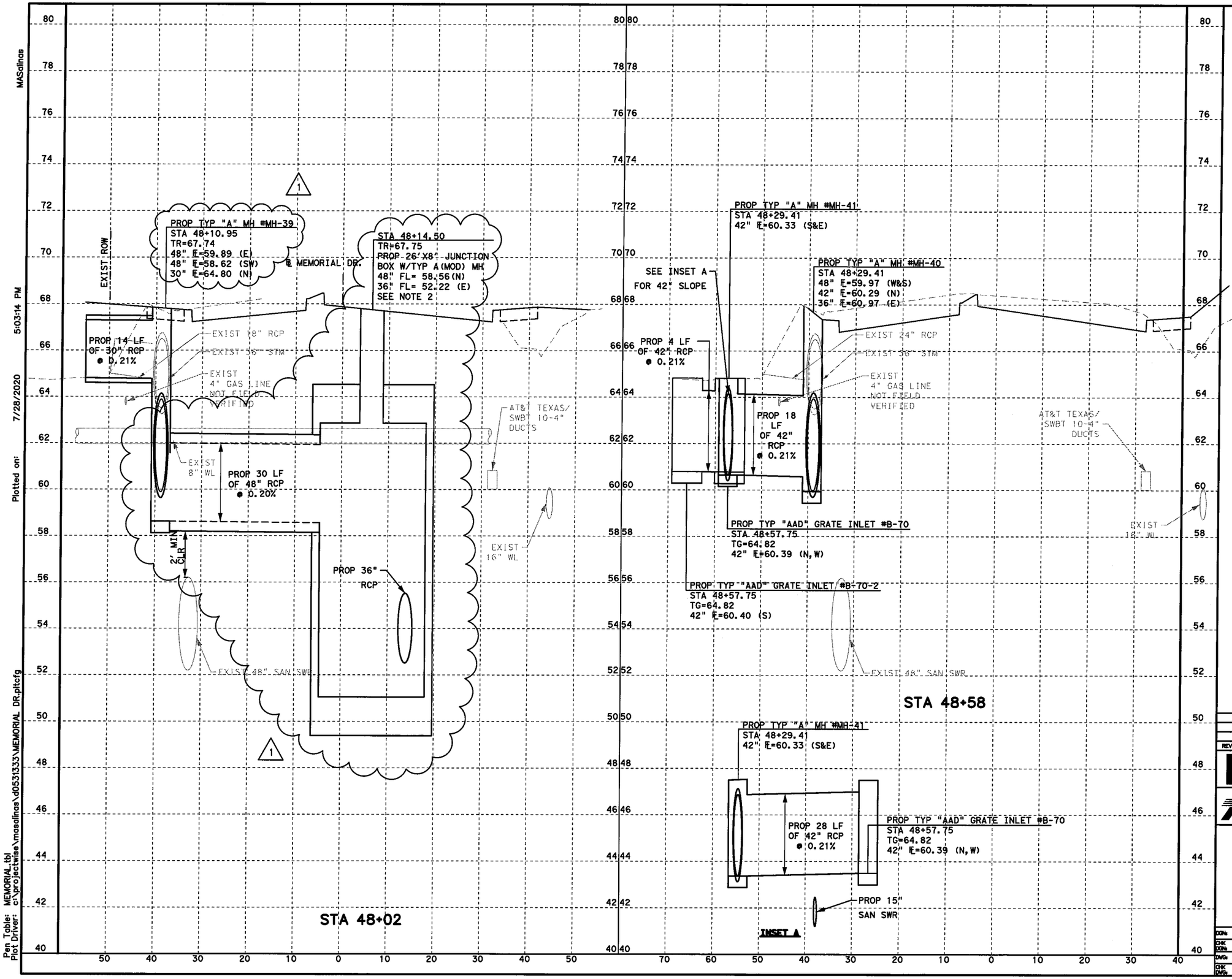

NOTE:

1. THE EXISTING DRAINAGE SYSTEM WILL BE REMOVED AND PAID FOR WITH THE APPLICABLE PAY ITEM (ITEM 496 - REMOVING STRUCTURE)

2. SUBMIT SIGNED AND SEALED JUNCTION BOX PLANS BY A STRUCTURAL ENGINEER REGISTERED IN THE STATE OF TEXAS FOR APPROVAL.

67862

0 20 40
(IN FEET)
SCALE: PLAN 1":20'-H

0 4 8
(IN FEET)
SCALE: PROFILE 1":4' - V

STATE OF TEXAS
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88740
LICENSED PROFESSIONAL ENGINEER

7/28/20

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY
1	08-18-2020	CHANGE ORDER #01	

Lockwood, Andrews & Newnam, Inc.
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STORM SEWER LATERALS

SHEET 16 OF 16

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	231

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GENERAL NOTES

1. GOVERNING CODES AND STANDARDS:
   - A. INTERNATIONAL BUILDING CODE (IBC), 2012.
   - B. AMERICAN CONCRETE INSTITUTE (ACI) – BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE, ACI 318–11.
   - C. AMERICAN CONCRETE INSTITUTE (ACI) – BUILDING CODE REQUIREMENTS FOR ENVIRONMENTAL CONCRETE STRUCTURES AND COMMENTARY, ACI 350–06
   - D. AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC) – SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS, WITH COMMENTARY, 13TH EDITION.
2. DESIGN LOADS
   - A. DEAD LOAD INCLUDES WEIGHT OF STRUCTURAL COMPONENTS AND EARTH.

     ASSUMED SOIL UNIT WEIGHT = 130 PCF
   - B. LIVE LOAD ON TOP SLAB IS THE GREATER OF:

     300 PSF
     OR HS–20 WHEEL LOAD
3. PRINCIPAL OPENINGS ARE SHOWN ON THESE DRAWINGS. THE CONTRACTOR SHALL EXAMINE THE CIVIL DRAWINGS FOR REQUIRED OPENINGS TO BE PROVIDED, WHETHER SHOWN ON THESE DRAWINGS OR NOT. VERIFY SIZE AND LOCATION OF ALL OPENINGS.
4. SEE CIVIL DRAWINGS FOR FLOOR ELEVATIONS, SLOPES, LOCATION OF DEPRESSED FLOOR AREAS, FLOOR FINISHES, WALKS, CURBS, TOPPING SLABS, ETC. ALL SLAB RECESSES SHALL BE PROVIDED BY THE CONTRACTOR WHETHER SHOWN ON THE STRUCTURAL DRAWINGS OR NOT.
5. STRUCTURAL MEMBERS HAVE BEEN SPACED TO ACCOMMODATE THE EQUIPMENT SPECIFIED. ANY SUBSTITUTIONS CAUSING CHANGES IN THE STRUCTURE SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR AND CALCULATIONS SHALL BE SUBMITTED TO THE ENGINEER OF RECORD FOR APPROVAL. THE CALCULATIONS AND ANY ACCOMPANYING DRAWINGS SHALL BE SEALED BY A PROFESSIONAL ENGINEER, LICENSED IN THE STATE OF TEXAS.
6. ANY REQUIRED CHANGES TO THE STRUCTURAL DRAWINGS DUE TO THE ACCEPTANCE OF ALTERNATES AND/OR SUBSTITUTES IS THE RESPONSIBILITY OF THE CONTRACTOR AND CALCULATIONS SHALL BE SUBMITTED TO THE ENGINEER OF RECORD FOR APPROVAL. THE CALCULATIONS AND ANY ACCOMPANYING DRAWINGS SHALL BE SEALED BY A PROFESSIONAL ENGINEER, LICENSED IN THE STATE OF TEXAS.
7. REPRODUCTION NOTE:
   THE USE OR REPRODUCTION OF THESE CONTRACT DRAWINGS BY ANY CONTRACTOR, SUBCONTRACTOR, ERECTOR, OR MATERIAL SUPPLIER IN LIEU OF PREPARATION OF SHOP DRAWINGS SIGNIFIES HIS ACCEPTANCE OF ALL INFORMATION SHOWN HEREIN AS CORRECT, AND OBLIGATES HIMSELF TO ANY JOB EXPENSE, REAL OR IMPLIED, ARISING DUE TO ANY ERRORS THAT MAY OCCUR HEREIN. IN ADDITION, ALL REFERENCES TO LOCKWOOD, ANDREWS AND NEWNAM, INC., INCLUDING ALL PROFESSIONAL SEALS ARE TO BE REMOVED IF THESE CONTRACT DRAWINGS ARE TO BE USED AS SHOP DRAWINGS.
8. REFER TO THE SPECIFICATIONS FOR DETAILED REQUIREMENTS NOT FULLY ADDRESSED IN THESE NOTES.

STRUCTURAL EXCAVATION, BACKFILL, AND COMPACTION NOTES

1. BEFORE THE START OF EARTHWORK OPERATIONS, ADEQUATELY PROTECT EXISTING STRUCTURES, UTILITIES, AND OTHER PERMANENT OBJECTS FROM DAMAGE. THE CONTRACTOR IS RESPONSIBLE FOR THE REPAIR OR REPLACEMENT OF ALL DAMAGED ELEMENTS, AT NO ADDITIONAL COST TO THE OWNER.
2. EXCAVATION WORK SHALL BE NEAT AND FREE OF DEBRIS AND LOOSE MATERIAL. REFER TO THE SPECIFICATIONS FOR PROTECTION OF EXCAVATIONS.
3. EXCAVATIONS SHALL NOT BE MADE DURING INCLEMENT WEATHER, WATER ACCUMULATION IN EXCAVATIONS EXCEEDING 1 INCH SHALL BE PUMPED OUT BEFORE THE CONCRETE IS PLACED.
4. ALL EXCAVATIONS AND BACKFILL OPERATIONS SHALL BE IN ACCORDANCE WITH THE LATEST OSHA EXCAVATION SAFETY STANDARDS.
5. ALL SURFICIAL VEGETATION AND OTHER ORGANIC MATTER SHALL BE REMOVED BENEATH PROPOSED FOUNDATIONS AND SLABS–ON–GRADE PRIOR TO CONSTRUCTION. THE EXPOSED SURFACE SHALL BE PROOF–ROLLED WITH ANY SOFT OR WEAK AREAS REMOVED AND REPLACED WITH COMPACTED SELECT FILL.
6. BACKFILL MATERIAL SHALL BE A NON–ORGANIC, NON–EXPANSIVE, WELL–GRADED SOIL AND SHALL BE COMPACTED TO 95 PERCENT STANDARD PROCTOR DENSITY, MEETING THE REQUIREMENTS OF TYPE A BACKFILL AS SPECIFIED IN TXDOT ITEM 132 – EMBANKMENT. EXCEPT THAT THE LIQUID LIMIT SHALL BE NO GREATER THAN 35.

CONCRETE NOTES

1. CONCRETE CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE AMERICAN CONCRETE INSTITUTE BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE, ACI 318.
2. CONCRETE FOR THE JUNCTION BOX STRUCTURES SHALL BE NORMAL WEIGHT CLASS S CONCRETE AND HAVE A MINIMUM COMPRESSIVE STRENGTH OF 4000 POUNDS PER SQUARE INCH AT 28 DAYS, PER TXDOT ITEM 421 HYDRAULIC CEMENT CONCRETE.
3. FOR ALL OTHER CONCRETE STRENGTH REQUIREMENTS, REFER TO THE CIVIL SHEETS.
4. NORMAL WEIGHT CONCRETE SHALL WEIGH NOT MORE THAN 150 PCF.
5. DETAILING, FABRICATION AND ERECTION OF REINFORCING BARS SHALL COMPLY WITH ACI "MANUAL OF STANDARD PRACTICE FOR DETAILING REINFORCED CONCRETE STRUCTURES" (ACI 315).
6. REINFORCING STEEL SHALL BE NEW DOMESTIC DEFORMED BILLET STEEL, CONFORMING TO ASTM A 615 WITH SUPPLEMENTARY REQUIREMENTS S1, GRADE 60. WELDED WIRE FABRIC SHALL CONFORM TO ASTM A 185, GRADE 60 AND SHALL BE SUPPLIED IN FLAT SHEETS ONLY.
7. PROVIDE ONE NO. 5 x 4'–0" BAR AT ALL RE–ENTRANT CORNERS, PLACED ON THE DIAGONAL WITH 1 INCH CLEARANCE FROM CORNER AND TOP OF SLAB. (THIS INCLUDES ANY RECTILINEAR HOLES MADE DUE TO STANDARD CONSTRUCTION PRACTICES.)
8. PROVIDE A 3/4–INCH CHAMFER AT ALL EXPOSED EDGES OF CONCRETE UNLESS DETAILED OTHERWISE.
9. PROVIDE PLASTIC CHAIRS AND SPACERS AT 5'–0" O.C. FOR ALL SLABS AND BEAMS ABOVE GRADE.
10. LAP CONTINUOUS UNSCHEDULED REINFORCING BARS 30 BAR DIAMETERS UNLESS NOTED OTHERWISE.
11. THE LOCATION OF CONSTRUCTION JOINTS SHALL BE APPROVED BY THE STRUCTURAL ENGINEER. CONSTRUCTION JOINTS SHALL BE MADE IN THE CENTER OF SPANS WITH VERTICAL BULKHEADS UNLESS NOTED OTHERWISE. THERE SHALL BE NO HORIZONTAL CONSTRUCTION JOINTS IN CONCRETE POURS.
12. HORIZONTAL WALL REINFORCEMENT SHALL BE CONTINUOUS WITH 90 DEGREE BENDS AND 12 INCH RETURNS ALONG EACH WALL AT CORNERS.
13. PROVIDE NO. 4 HORIZONTAL AT 12 INCHES O.C. MAXIMUM IN EACH FACE OF BEAMS EXCEEDING 21 INCHES IN DEPTH.
14. MINIMUM REINFORCING STEEL COVERAGE SHALL BE AS FOLLOWS:

TOP SLABS	1½"
WALLS	1½"
CONCRETE CAST PERMANENTLY AGAINST EARTH	3"
BASE SLABS	3" BOTTOM
	1½" TOP & SIDES

15. EPOXY COAT ENDS OF ANY REBAR LEFT EXPOSED IN THE FINAL STRUCTURE.

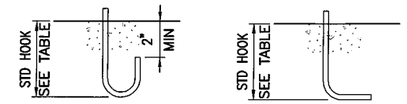
REINFORCING LAP SPLICE & EMBEDMENT SCHEDULE

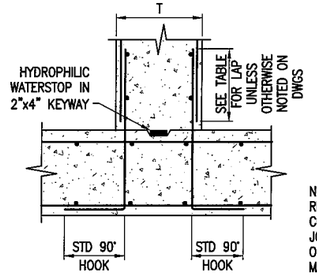
BAR SIZE	MIN LAP LENGTH (IN)		MIN EMBEDMENT LENGTH (IN)		
	TOP BARS	OTHER BARS	TOP BARS	OTHER BARS	STD HOOK
3	24	18	18	14	7
4	32	24	25	19	9
5	40	31	31	24	12
6	48	37	37	28	14
7	70	54	54	42	17
8	80	62	62	47	19
9	90	70	70	54	21
10	102	78	78	60	24
11	113	87	87	67	27

1. LAP SPLICES AND EMBEDMENT LENGTHS NOT SHOWN ON THE DRAWINGS SHALL CONFORM TO THE TABLE ABOVE.

2. TOP BARS ARE HORIZONTAL BARS WITH MORE THAN 12 INCHES DEPTH OF CONCRETE CAST BELOW THE REINFORCING BAR.

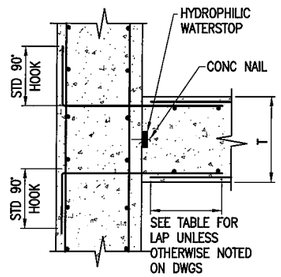
3. EMBEDMENT LENGTH OF STANDARD HOOKS.



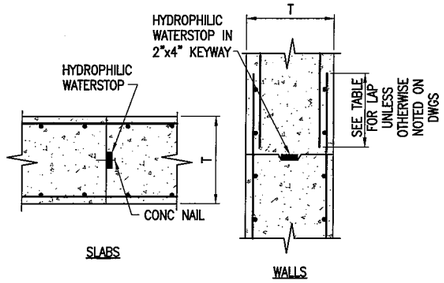


NOTE:
REINFORCING SHALL BE CONTINUOUS THROUGH JOINT. WATERSTOP REQUIRED ONLY IF JOINT IS BELOW MAX. WATER SURFACE OR BELOW FINISHED GRADE.

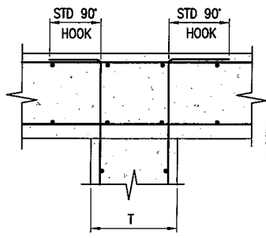
1 CONSTRUCTION JOINT
BASE OF WALLS



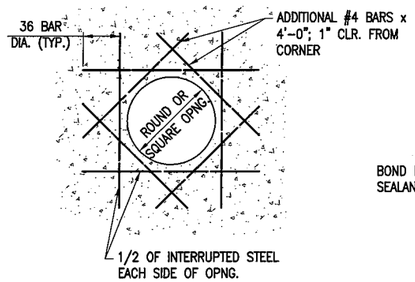
2 CONSTRUCTION JOINT
WALL INTERSECTIONS



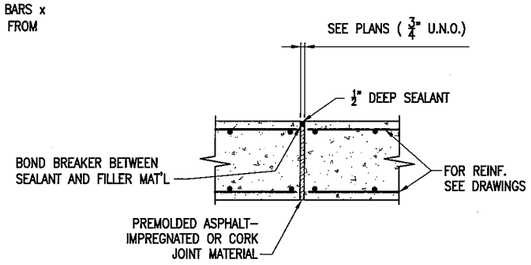
3 CONSTRUCTION JOINT
FOR SLABS AND WALLS



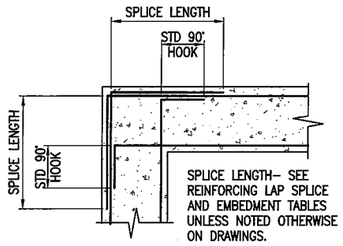
4 CONSTRUCTION JOINT
WALL TO SLAB SOFFIT



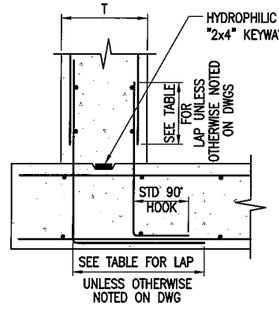
REINFORCING AT OPENINGS
5 8" OR LARGER



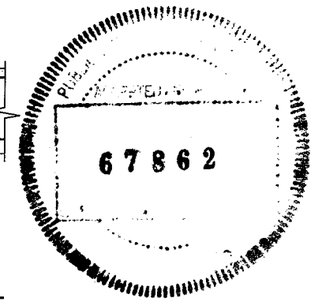
ISOLATION OR EXPANSION JOINT
6 WITHOUT DOWELS



7 CORNER REINFORCING
FOR WALLS OR GRADE BEAMS



8 CONSTRUCTION JOINT
BASE OF WALLS



Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
© 2020

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT
JUNCTION BOX
GENERAL NOTES AND TYPICAL DETAILS (S1)

SHEET 1 OF 2

DSN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK:	6	TEXAS	STP 1802(783)MM			CS
DWN:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK:	HOU	HARRIS	0912	72	391	232

JUNCTION BOX DIMENSIONS

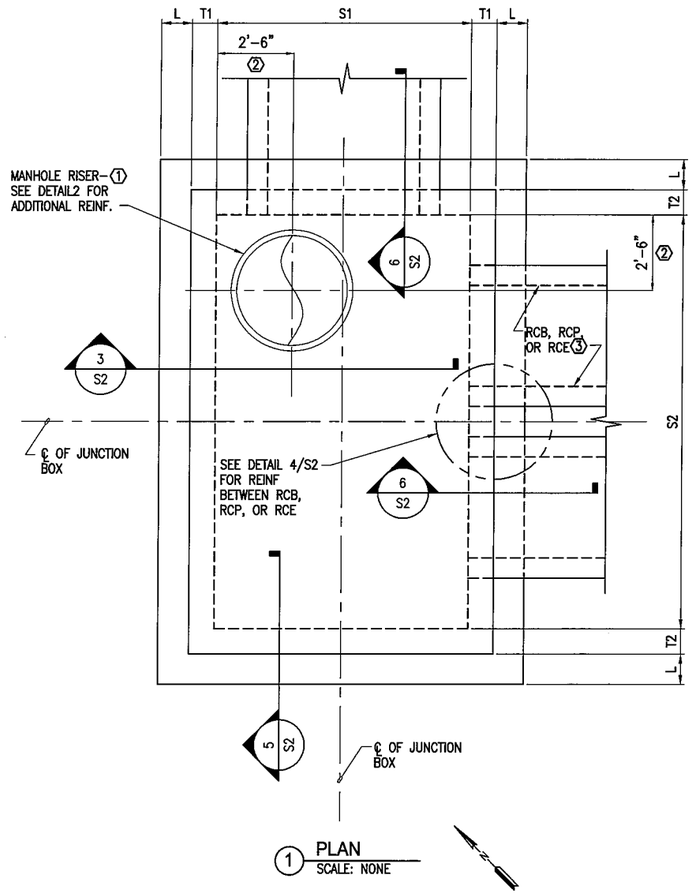
STA	ID	S1	S2	H	T1	T2	TS	BS	L	EL. "A"
15+ 24.96	JB 28	8'-0"	14'-0"	7'-8"	1'-0"	1'-0"	1'-0"	1'-3"	1'-0"	57.42'
30+15.00	JB 08	10'-0"	28'-0"	14'-6"	1'-8"	1'-8"	1'-3"	1'-8"	1'-0"	49.22'

REINFORCING STEEL

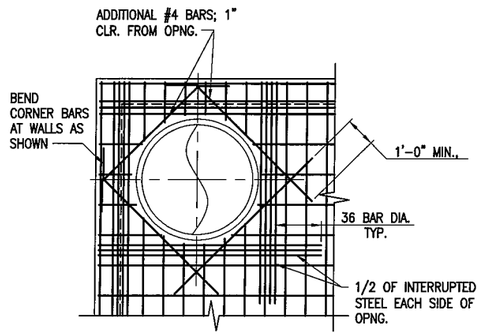
	BARS A		BARS B		BARS C		BARS D		BARS M		BARS N		BARS R		BARS S	
	SIZE	SPA.	SIZE	SPA.	SIZE	SPA.	SIZE	SPA.	SIZE	SPA.	SIZE	SPA.	SIZE	SPA.	SIZE	SPA.
15+ 24.96	#6	8"	#6	8"	#6	8"	#6	8"	#5	8"	#7	8"	#6	8"	#6	8"
30+15.00	#8	6"	#6	8"	#6	6"	#6	8"	#6	8"	#7	6"	#8	6"	#7	8"

KEYED NOTES:

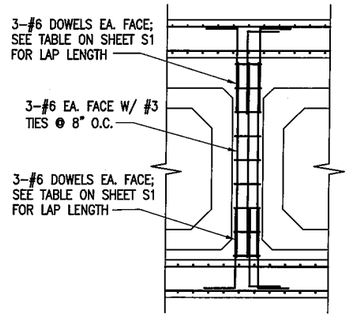
1. SEE PLAN AND PROFILE SHEETS FOR THE TOP ELEVATION OF THE MANHOLE COVERS. SEE JUNCTION BOX MANHOLE RISER SHEET FOR MANHOLE DETAILS.
2. TYPICAL DIMENSION UNLESS OTHERWISE NOTED ON PLAN.
3. SEE PLAN AND PROFILE SHEETS FOR RCB, RCP, OR RCE SIZE, FLOWLINE, AND LOCATION.



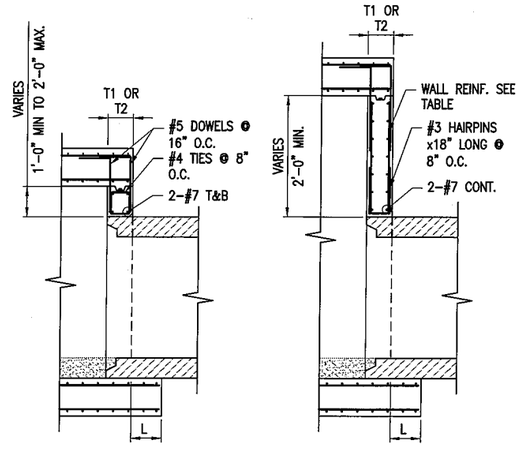
1 PLAN
SCALE: NONE



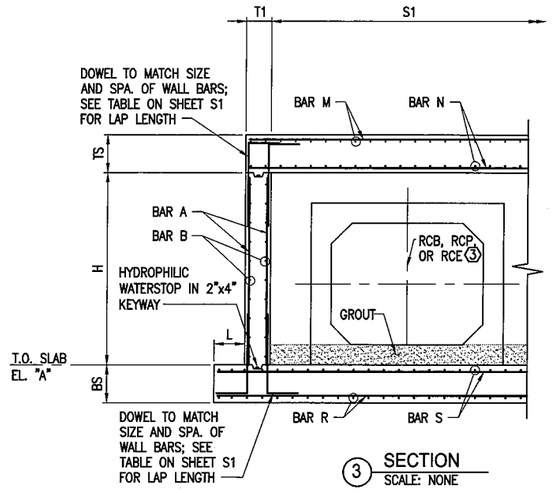
2 PLAN- REINF. STEEL AT RISER OPNG.
SCALE: NONE



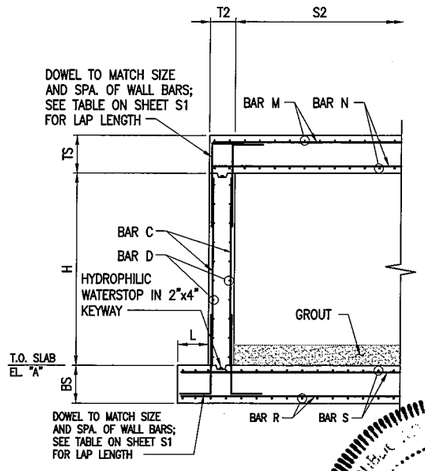
4 DETAIL - REINF. BETWEEN RCB OR RCP
SCALE: NONE



6 SECTION AT WALL OPENINGS
SCALE: NONE

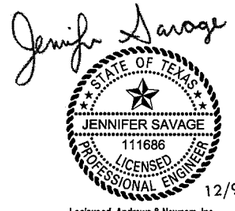


3 SECTION
SCALE: NONE



5 SECTION
SCALE: NONE

NOTE: MAIN REINF. FOR TOP AND BOTTOM SLAB TO RUN IN THE SHORT DIRECTION. PLACE MAIN REINF. ON OUTSIDE FACE OF EACH SLAB.



Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation

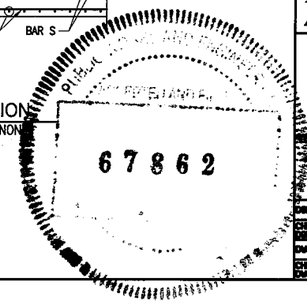
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

JUNCTION BOX

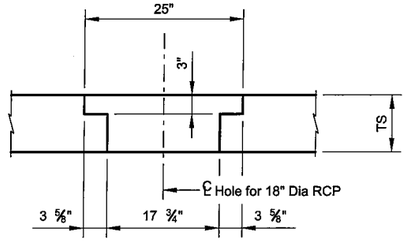
PLAN, SECTION, AND SCHEDULE (S2)

SHEET 2 OF 2

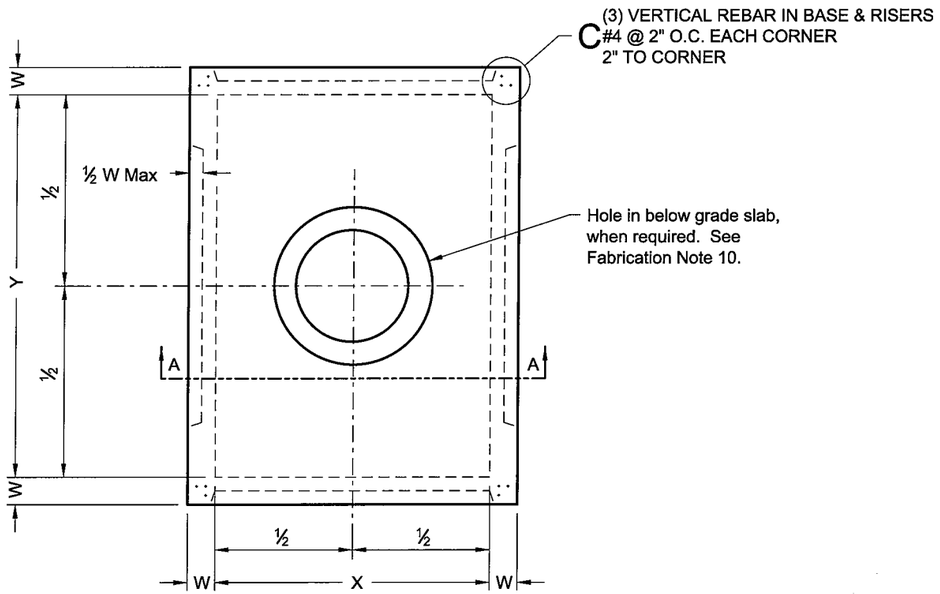
DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK:	6	TEXAS	STP 1802(783)MM			CS
DWN:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CK:	HOU	HARRIS	0912	72	391	233



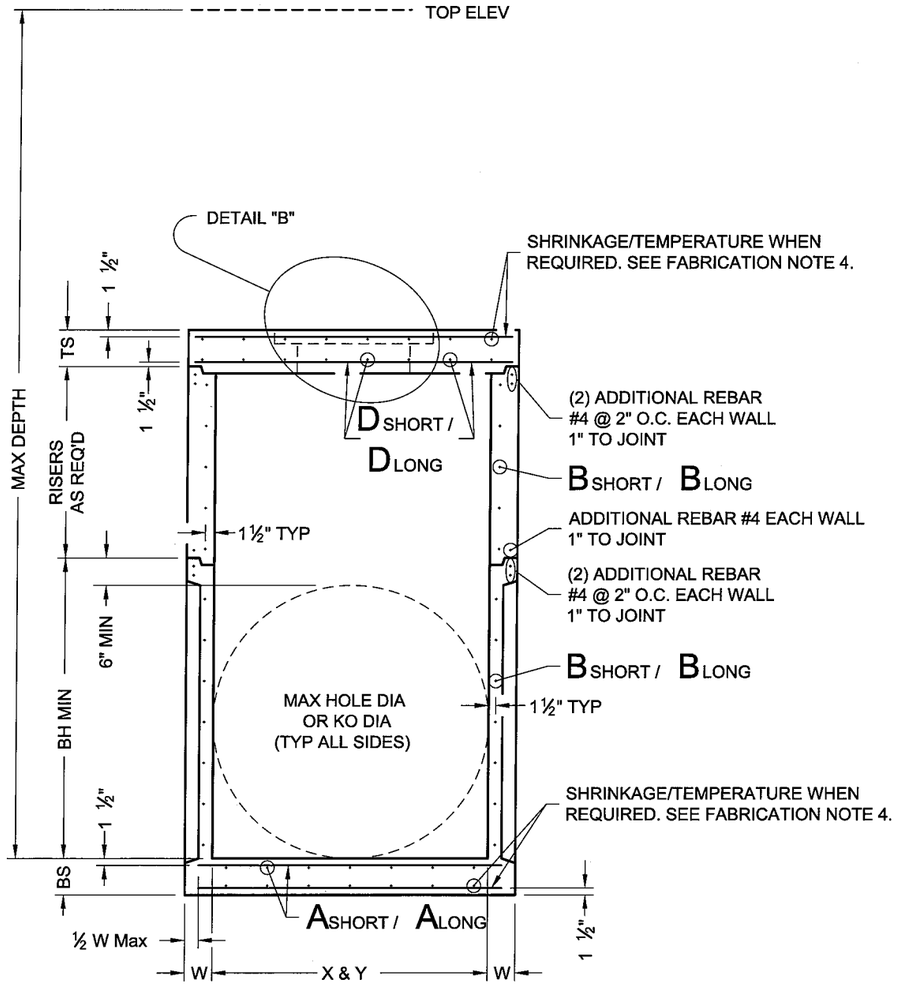
DATE:
FILE:



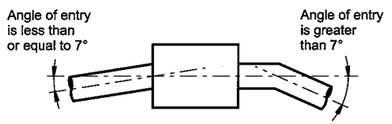
DETAIL "B"



PLAN VIEW



SECTION A-A



PIPE CONNECTION DETAIL

Connect pipes within 7° of normal to PJB wall.
If necessary, use pipe elbow or curved approach alignment to stay within this limit.

FABRICATION NOTES:
1. Provide Class "H" concrete in accordance with Item 421 and having a minimum compressive strength of 5,000 psi.
2. Provide Grade 60 reinforcing steel or equivalent area of WWR.
3. Provide typical clear cover of 1 ½" to reinforcing steel at interior or exterior walls.
4. Walls or slabs with a thickness of 8" or greater require shrinkage and temperature reinforcing steel. Provide steel area = 0.11 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.
10. Provide hole in below grade slab only when PJB is installed with inlet type POD.

INSTALLATION NOTES:
1. Inverts (benching) to be provided by Contractor. Concrete or mortar used for invert is subsidiary to junction box.
2. Seal tongue and groove joints with preformed or bulk mastic in conformance with Manufacturer's recommendations. Tongue and groove joints may be grouted no more than 1" between each section, or ½ the joint depth, whichever is greater.
3. Do not grout rubber gasket joints without Manufacturer's recommendation.
4. For rigid pipe, cut hole in thin wall panel (KO) 4" Max, 2" Min larger than pipe OD.
5. For flexible pipe, consult boot/seal Manufacturer's specification for placement tolerance and hole size. Center pipe in hole and install boot/seal per Manufacturer's specification.

GENERAL NOTES:
1. Precast Junction Box consists of base slab, base unit, risers (as required), and below grade slab. See sheet PDD for sizes.
2. Designed according to ASTM C913.
3. Payment for junction box is per Item 465 "Junction Boxes, Manholes, and Inlets" by type and size.

Cover dimensions are clear dimensions, unless noted otherwise.

HL93 LOADING

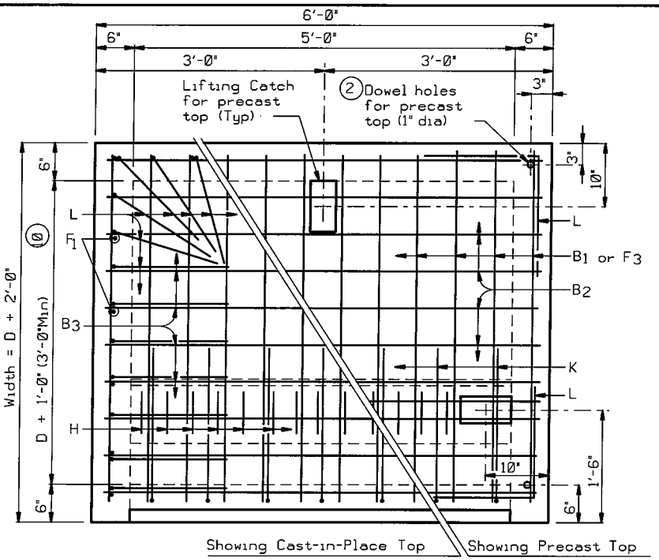
Texas Department of Transportation

Bridge Division Standard

PRECAST JUNCTION BOX

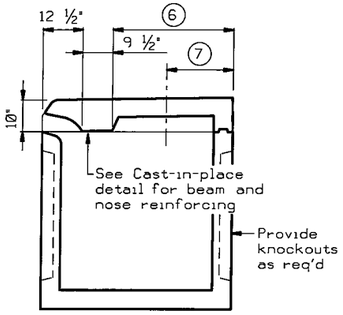
PJB

FILE: prestd09.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT January 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	72	391	CS
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		234



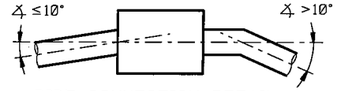
PLAN

(2) If precast top is used, provide 4 ~ 5/8" dia x 1'-6" smooth bars in inlet walls for 1" dia holes



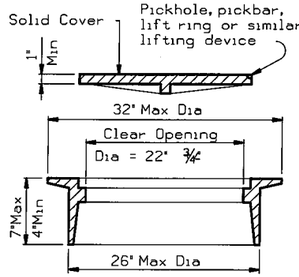
PREFABRICATED INLET

(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"



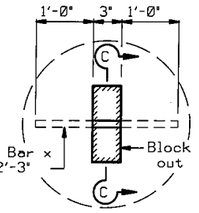
PIPE CONNECTION DETAIL

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.

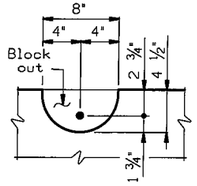


RING AND COVER DETAILS

EJIW No V-1814 or Neenah No R5900-FTX

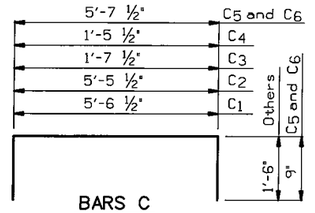


PLAN

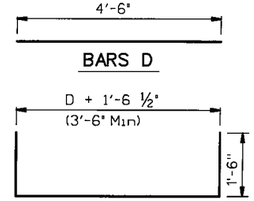


SECTION C-C

LIFTING CATCH

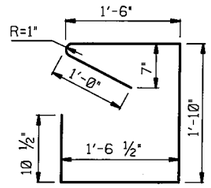


BARS C

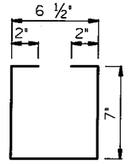


BARS D

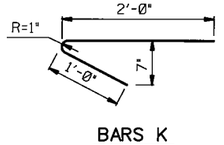
BARS E



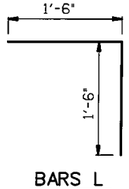
BARS G



BARS H



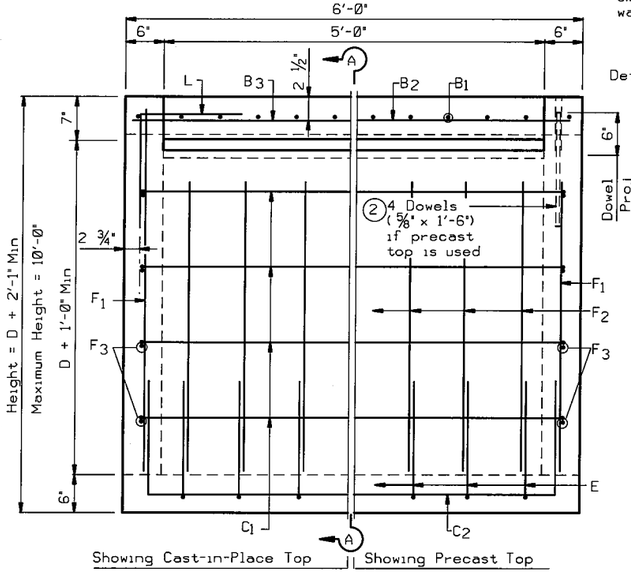
BARS K



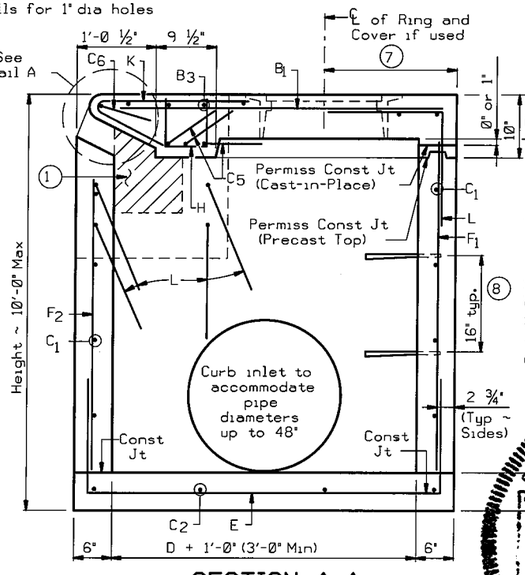
BARS L

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_{1-3}	#4	12"
G	#4	6"
H	#3	4"
K	#4	9"
L	#4	6"

(9) As shown



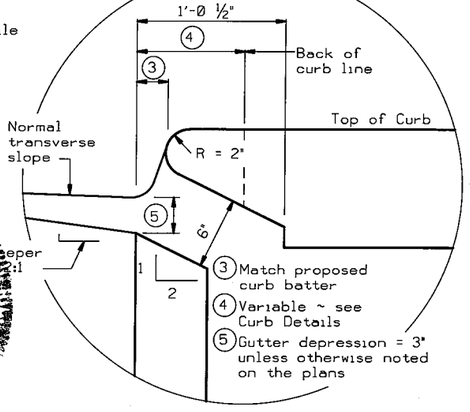
ELEVATION



SECTION A-A

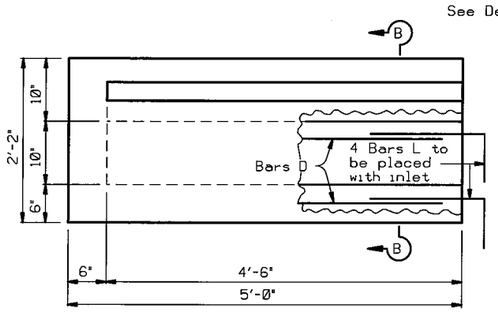
(7) 1'-6" Min, 1'-9" Max Adjust placement of Ring and Cover as necessary to avoid conflict with Bars H.

(8) Ladder rung is Ductile Iron, Aluminum or Cast Iron.

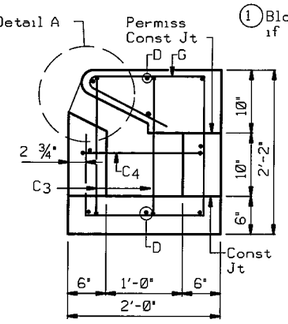


DETAIL A

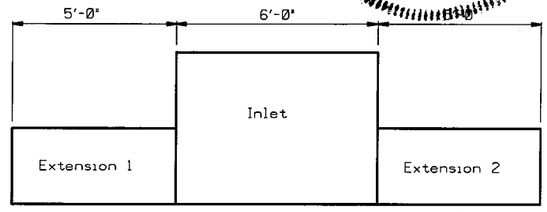
(1) Block out to accommodate extension if used and to place 4 Bars L



EXTENSION ELEVATION



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

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.

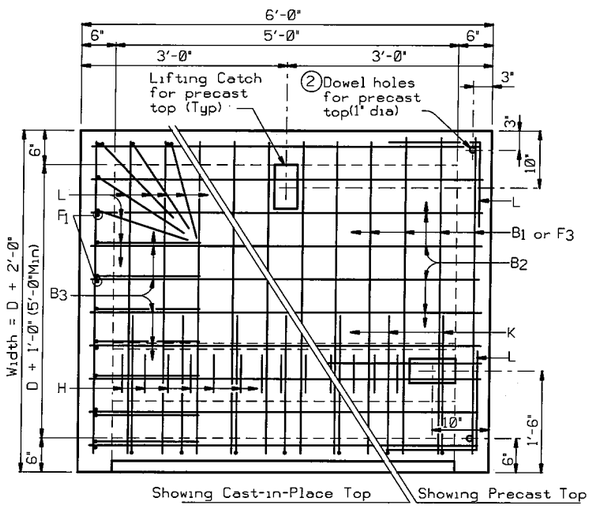
Ring and cover shall conform to the requirements of AASHTO M306, "Standard Specification for Drainage Structure Castings". Materials shall conform to ASTM A48, Class 35B for gray iron castings or ASTM A536, Grade 65-45-12 for ductile iron castings. Aluminum alloy castings shall not be permitted.

Texas Department of Transportation
Houston District

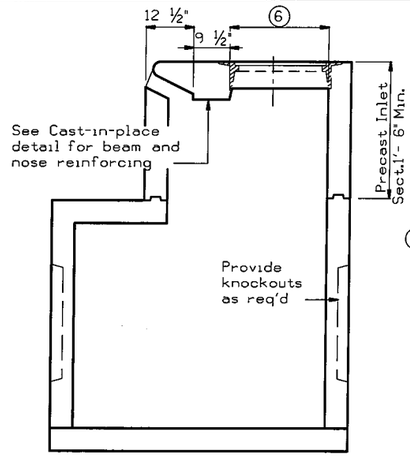
CURB INLET TYPE C
(WITH OR WITHOUT EXTENSION)

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 1802(783)MM		235
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	HARRIS		0912	72	391	CS

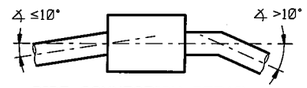


PLAN



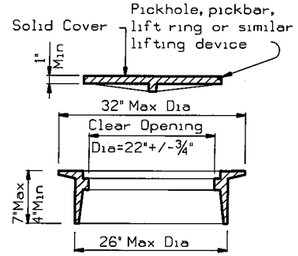
PREFABRICATED INLET

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"



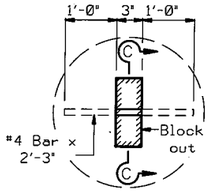
PIPE CONNECTION DETAIL

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.

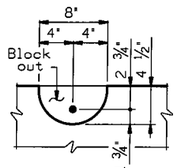


RING AND COVER DETAILS

EJIW No V-1814 or Neenah No R5900 FTX



PLAN

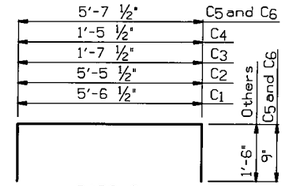


SECTION C-C

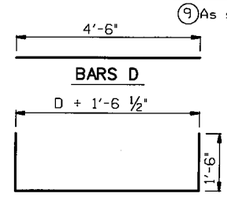
LIFTING CATCH

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

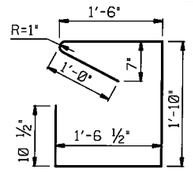


BARS C

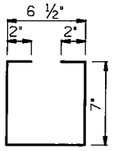


BARS D

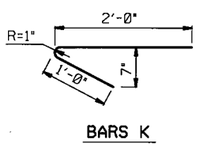
BARS E



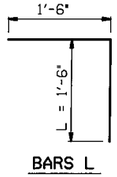
BARS G



BARS H



BARS K



BARS L

GENERAL NOTES:

No alternate designs nor alternate details shall be permitted for precast or cast in place inlets.

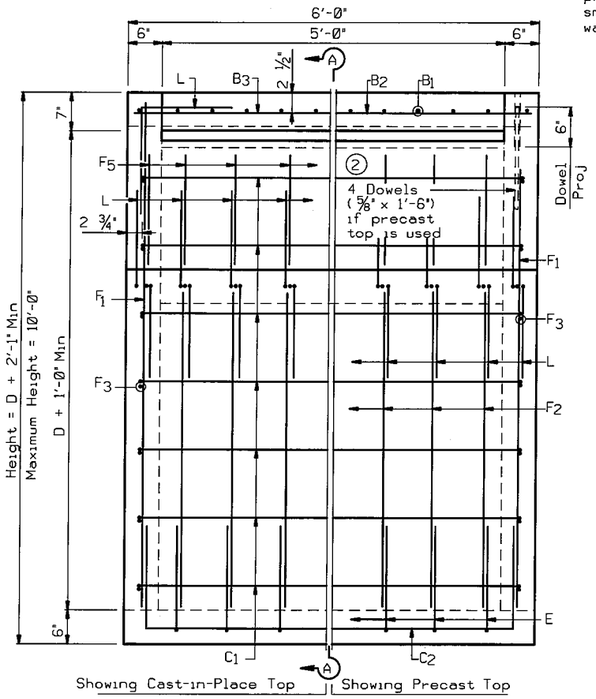
Quantities shown herein are for Contractor's information only. Unless otherwise shown in the plans, payment will be made for each inlet of the type specified and for each extension. Each five foot curb opening of extension is considered "one extension" regardless of whether placed monolithically or precast. Extension length shall be in multiples of 5 feet.

Engineer has the option of specifying cast-in-place top with ring and cover or removable precast top as specified elsewhere in plans.

Shop drawings will be required for precast construction of inlets.

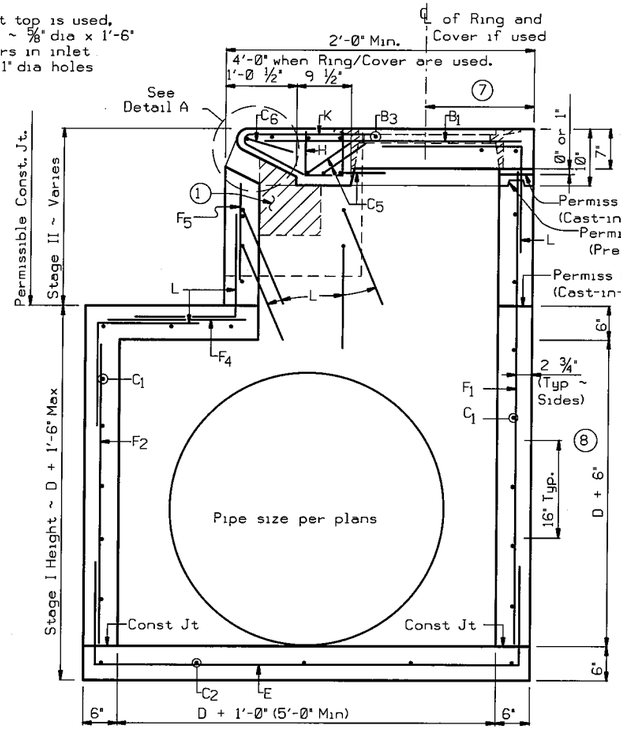
In areas of conflict between reinforcing steel, blockouts, pipes, anchor bolts or other reinforcing steel, the reinforcement shall be bent or adjusted to clear as directed by the Engineer.

Ring and cover shall conform to the requirements of AASHTO M306, "Standard Specification for Drainage Structure Castings". Materials shall conform to ASTM A48, Class 35B for gray iron castings or ASTM A536, Grade 65-45-12 for ductile iron castings. Aluminum alloy castings shall not be permitted.



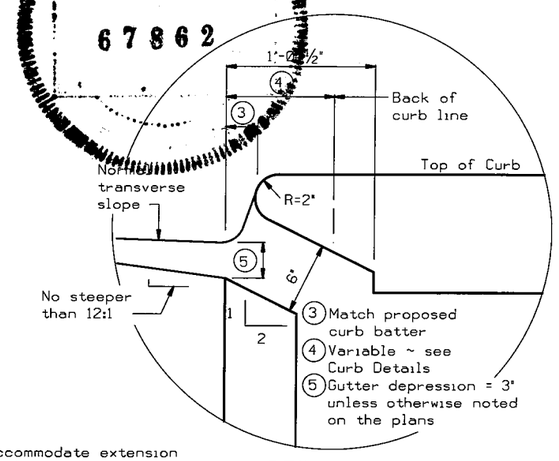
ELEVATION

② If precast top is used, provide 4 ~ ⅝" dia x 1'-6" smooth bars in inlet walls for 1" dia holes

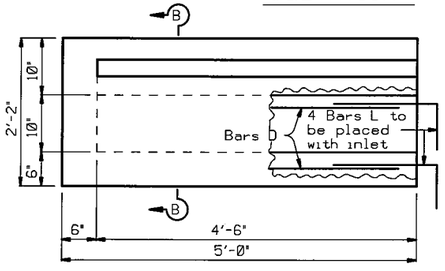


SECTION A-A

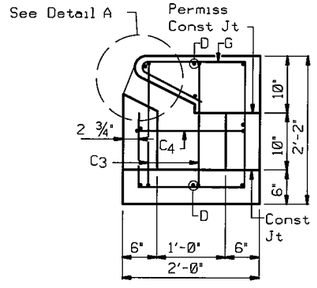
⑦ 1'- 7" Usual, Adjust placement of Ring and Cover as necessary to avoid conflict with Bars H.



DETAIL A

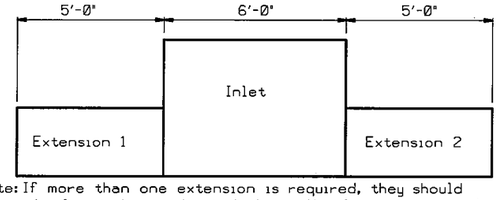


EXTENSION ELEVATION



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

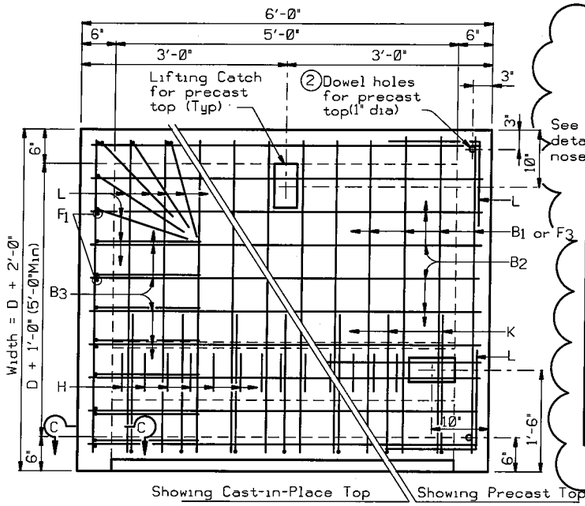
Texas Department of Transportation
Houston District

CURB INLET TYPE C1
(WITH OR WITHOUT EXTENSION)

HIL-C1

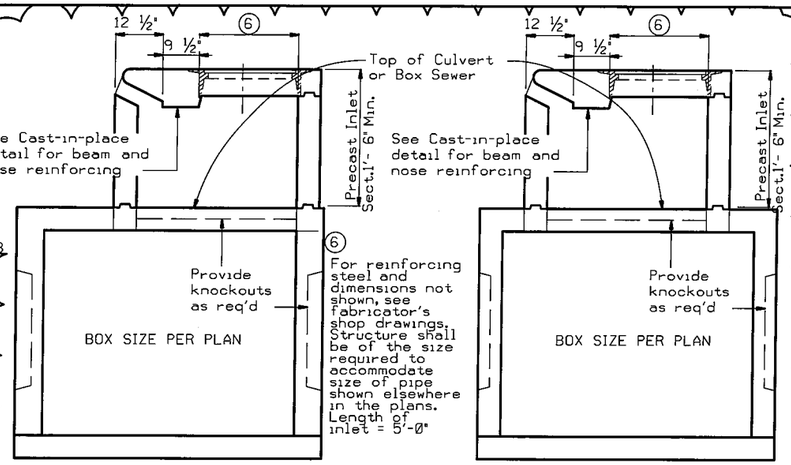
FILE: STDD2.DGN	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT	STD:
©TxDOT Feb 2010	DIST	FED REG	PROJECT NO.		SHEET
REVISIONS 2/2010 Note for alternate design and opening on the back of inlet. 0/2016 Removed ladder rung and wordings.	HOUS	6	STP 1802(783)MM		236
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	HARRIS		0912	72	391	CS

STDD2.DGN



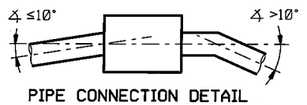
PLAN

② If precast top is used, provide 4 ~ ⅞" dia x 1'-6" smooth bars in inlet walls for 1" dia holes



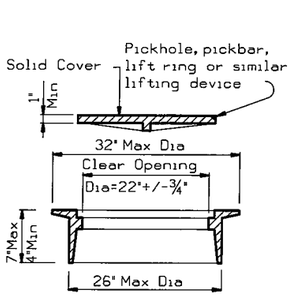
PREFABRICATED INLET

PREFABRICATED INLET



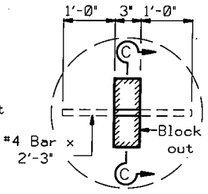
PIPE CONNECTION DETAIL

Connecting pipes should enter within 10° of normal to inlet wall. If necessary, pipe elbow or curved approach alignment should be used to stay within this limit.

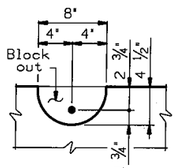


RING AND COVER DETAILS

EJIW No V-1814 or Neenah No R5900 FTX



PLAN

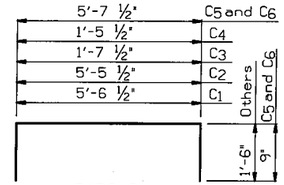


SECTION C-C

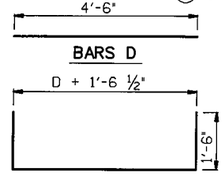
LIFTING CATCH

REINF STEEL		
Bar	Size	Spacing
B1	#4	6"
B2	#5	6"
B3	#4	6"
C1-2	#4	12"
C3-4	#4	⑨
C5	#6	⑨
C6	#4	⑨
D	#4	⑨
E	#4	12"
F1-5	#4	12"
G	#4	6"
H	#3	4"
K	#4	9"
L	#4	6"

⑨ As shown

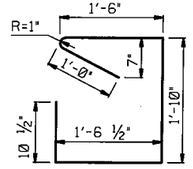


BARS C

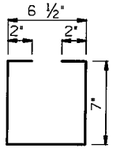


BARS D

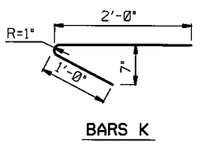
BARS E



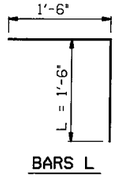
BARS G



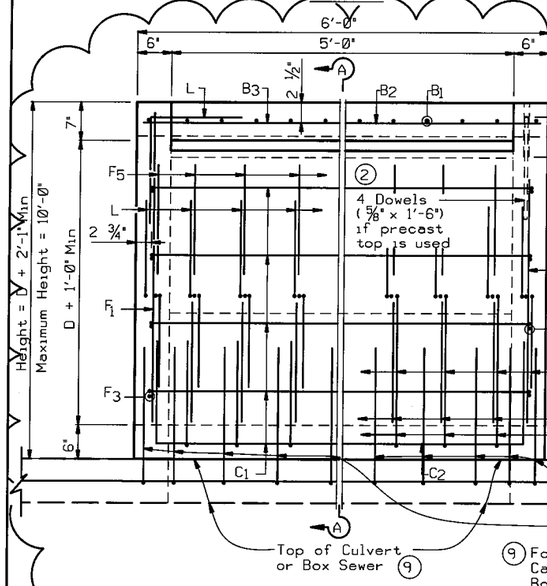
BARS H



BARS K

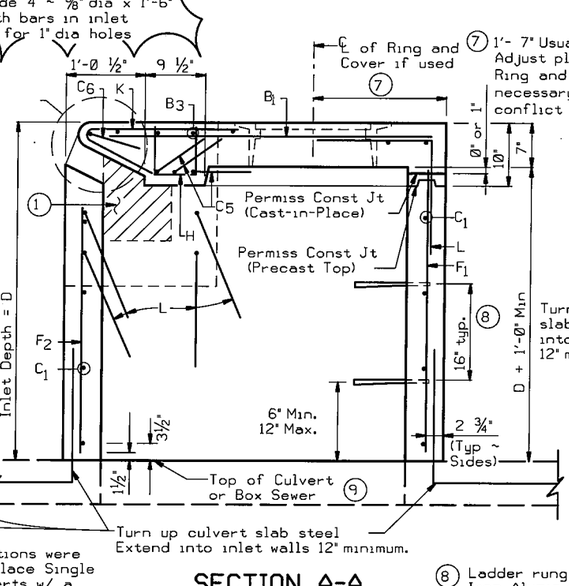


BARS L

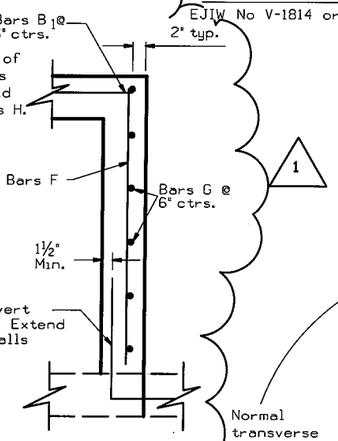


Showing Cast-in-Place Top | Showing Precast Top

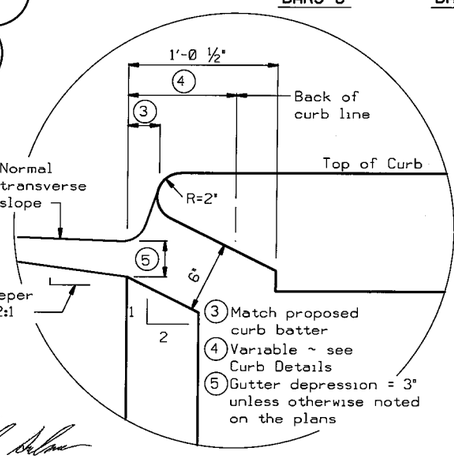
ELEVATION



SECTION A-A



SECTION C-C



DETAIL A

GENERAL NOTES:

No alternate designs nor alternate details shall be permitted for precast or cast in place inlets.

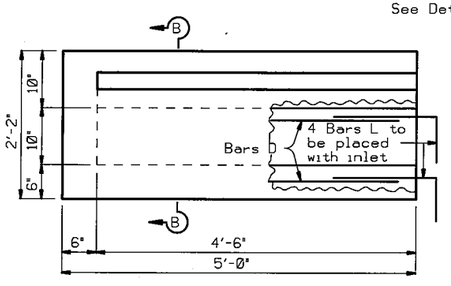
Quantities shown herein are for Contractor's information only. Unless otherwise shown in the plans, payment will be made for each inlet of the type specified and for each extension. Each five foot curb opening of extension is considered 'one extension' regardless of whether placed monolithically or precast. Extension length shall be in multiples of 5 feet.

Engineer has the option of specifying cast-in-place top with ring and cover or removable precast top as specified elsewhere in plans.

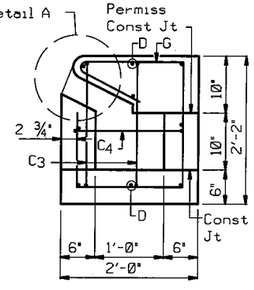
Shop drawings will be required for precast construction of inlets.

In areas of conflict between reinforcing steel, blockouts, pipes, anchor bolts or other reinforcing steel, the reinforcement shall be bent or adjusted to clear as directed by the Engineer.

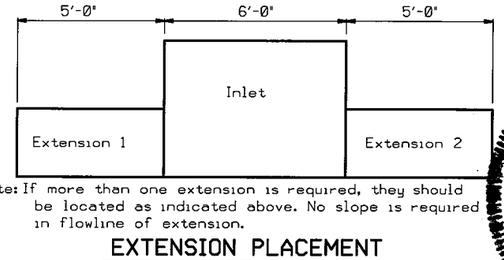
Ring and cover shall conform to the requirements of AASHTO M306, 'Standard Specification for Drainage Structure Castings'. Materials shall conform to ASTM A48, Class 35B for gray iron castings or ASTM A536, Grade 65-45-12 for ductile iron castings. Aluminum alloy castings shall not be permitted.



EXTENSION ELEVATION



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

⑧ Ladder rung is Ductile Iron, Aluminum or Cast Iron.

D = Diameter
R = Radius

⑨ For locations were Cast-In-Place Single Box Culverts w/ a span width ≤ 7-LF is used a wall thickness of a box shall account for a minimum 10-ft of fill height.

① Block out to accommodate extension if used and to place 4 Bars L

STATE OF TEXAS
MICHAEL A. SALINAS
123342
REGISTERED PROFESSIONAL ENGINEER
2/6/20

P.E. 67862

F-2614

1 MODIFIED CURB INLET TO BE CONSTRUCTED ON TOP OF BOX CULVERT OR STORM SEWER

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.

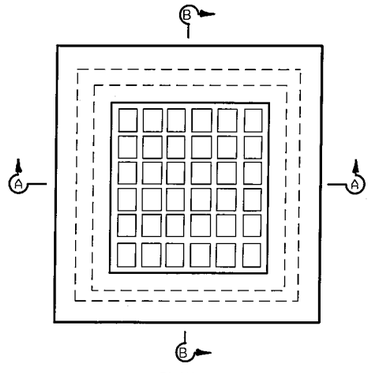
Texas Department of Transportation
Houston District

MODIFICATION I OF CURB INLET TYPE C1 (WITH OR WITHOUT EXTENSION)

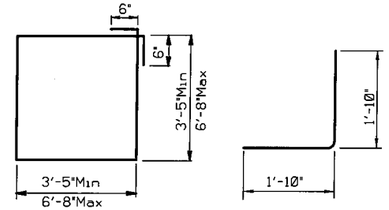
(MOD 1)HIL-C1

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 1802 (783) MM			237
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	HARRIS		0912	72	391	CS

STDD2.DGN

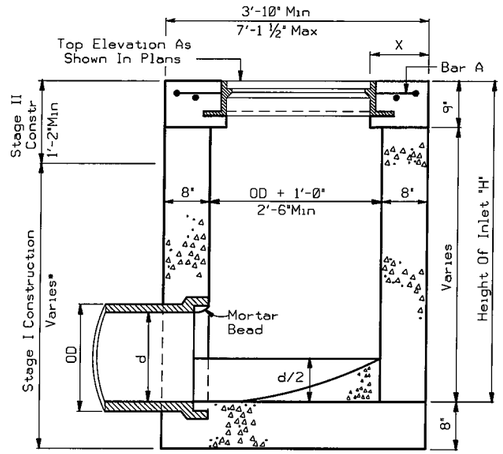


PLAN



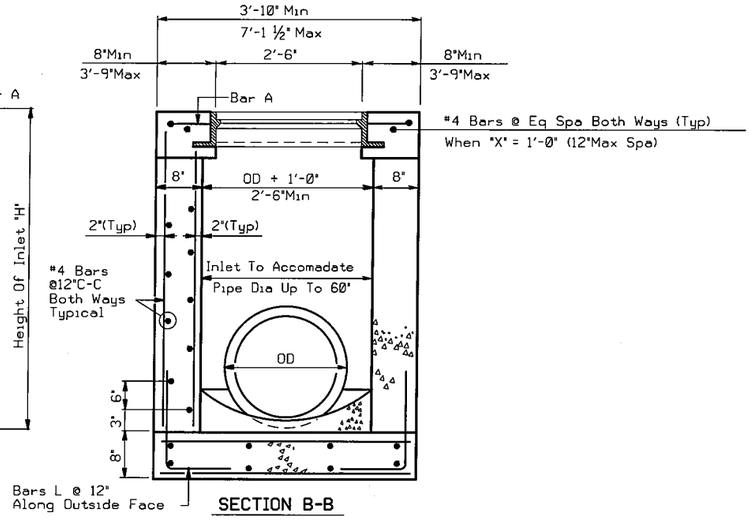
BAR A (#4)

BAR L (#4)



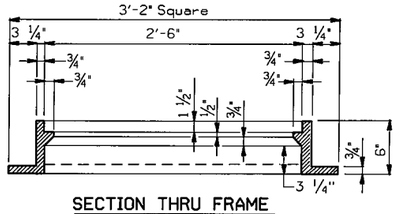
* But Not Less Than Six Inches Over Highest Entering Pipe.

SECTION A-A

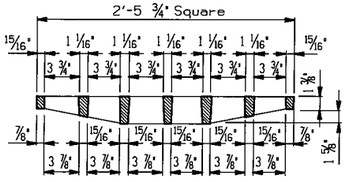


SECTION B-B

TYPE A INLET



SECTION THRU FRAME



SECTION THRU GRATE

FRAME AND GRATE

Neenah No.R3418-A
EJIW No.V-4880-1

GENERAL NOTES:

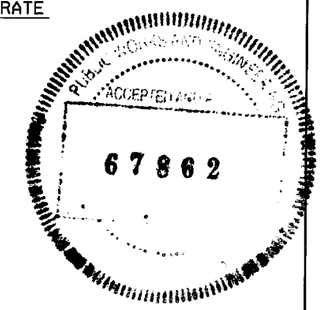
Where Size Of Pipes Passing Thru Inlet Exceeds 30" Increase Inside Width To Outside Diameter Of Pipe Plus 1'-0" (OD + 1'-0").

See Standard or Detail Sheet For Excavation and Backfill Diagrams.

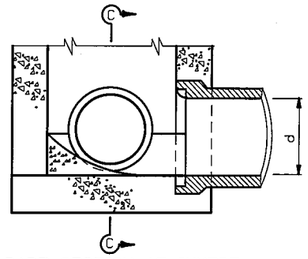
Inlets Shall Be Built To Stage I And Finished After All Grading Operations Are Substantially Completed.

Frames And Grates May Be Gray Cast Iron.

Shop Drawings Will Be Required For Precast Construction Of Inlets.

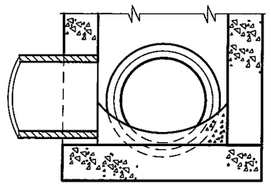


NOT FOR TRAFFIC LOADS

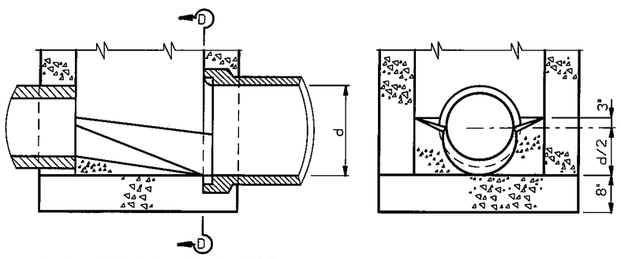


PART SECTION AT INVERT

Showing Shaping Of Invert, Pipe Entering From Adjacent Sides



SECTION C-C



PART SECTION AT INVERT

Showing Shaping Of Invert, Pipe Entering From Opposite Sides

SECTION D-D

d = Diameter

Texas Department of Transportation
Houston District

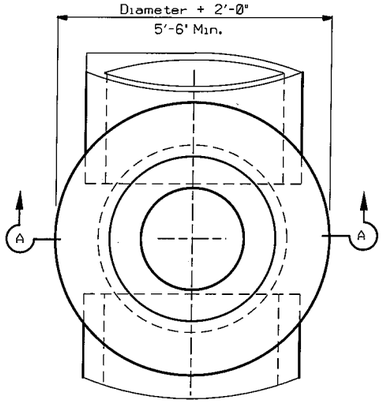
INLET TYPE A

HIL-A

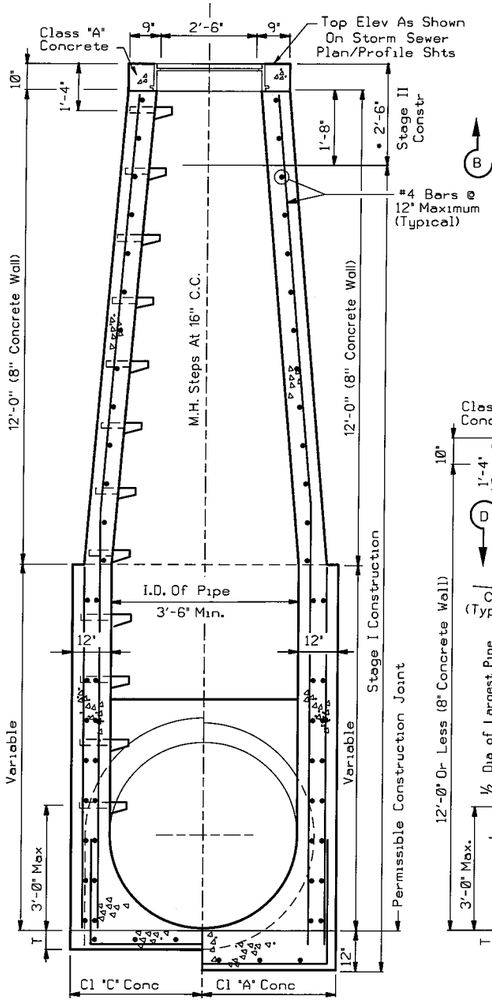
FILE: STDD4.DGN	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT	STD:	
©TxDOT 2014	DIST	FED REG	PROJECT NO.			SHEET
REVISIONS 9/30/2016: Removed Manhole Steps	HOUS	6	STP 1802(783)MM			238
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	HARRIS		0912	72	391	CS

STDD4.DGN

HOU

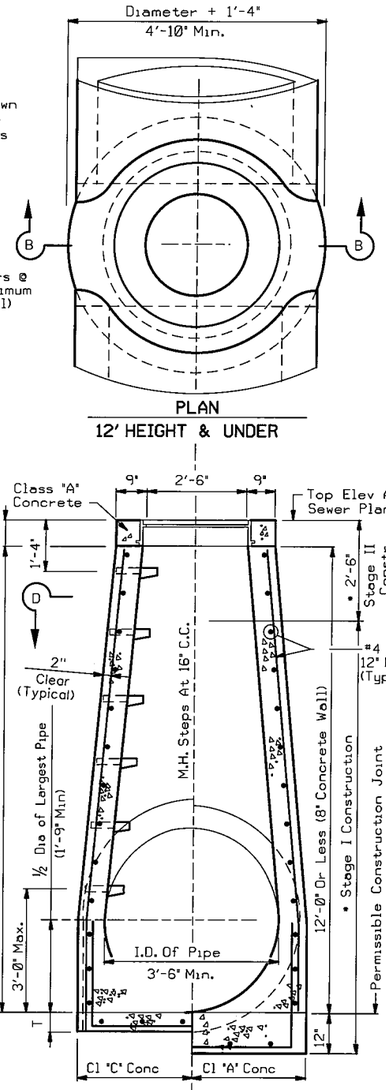


PLAN
OVER 12' HEIGHT



MONOLITHIC SEWERS | PRECAST PIPE SEWERS

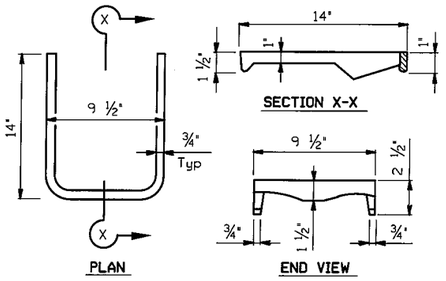
SECTION A-A



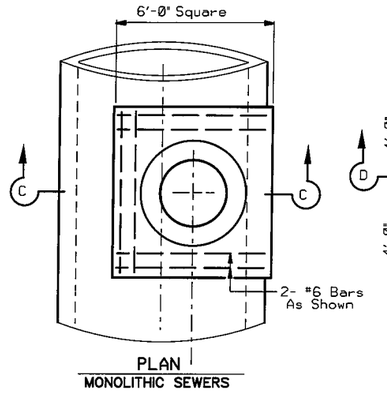
MONOLITHIC SEWERS | PRECAST PIPE SEWERS

SECTION B-B

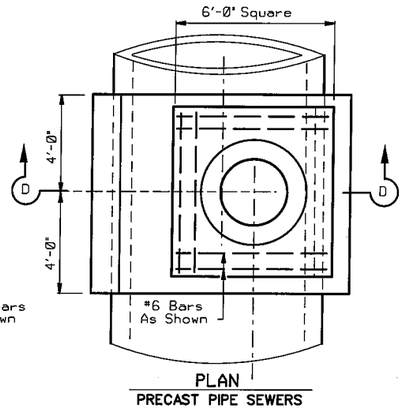
MANHOLE - TYPE A
FOR PIPES 54" AND SMALLER



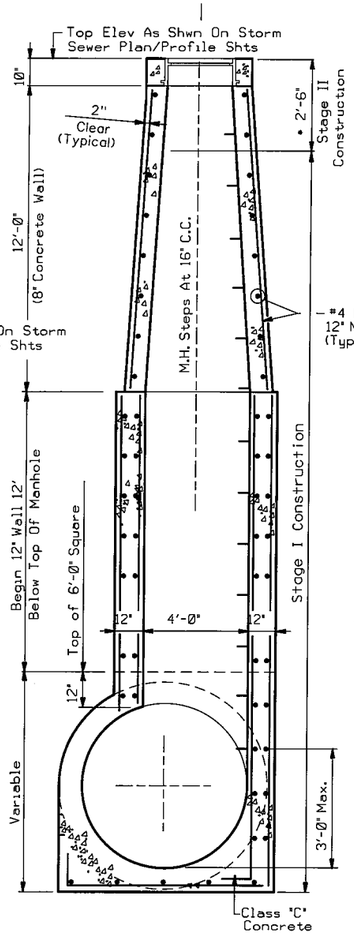
CAST IRON MANHOLE STEPS
(In Stock Locally)



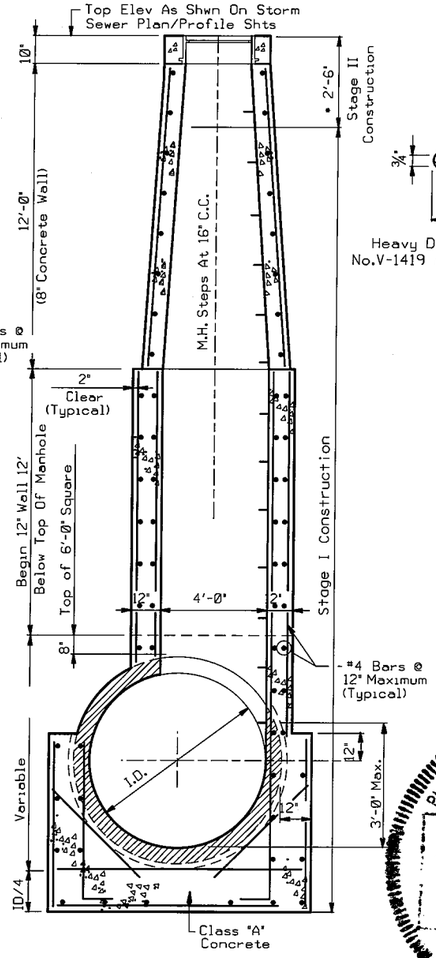
PLAN
MONOLITHIC SEWERS



PLAN
PRECAST PIPE SEWERS



SECTION C-C



SECTION D-D

MANHOLE - TYPE B
FOR PIPES 60" AND LARGER

GENERAL NOTES:

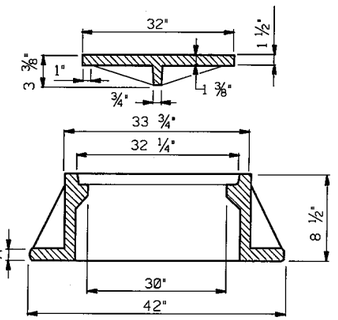
See Standard or Detail Sheet For Excavation And Backfill Diagrams.

All Manholes In Graded Areas Shall Be Built To Stage I And Finished After All Grading Operations Are Substantially Completed.

* But Not Less Than 6 Inches Above Highest Pipe.

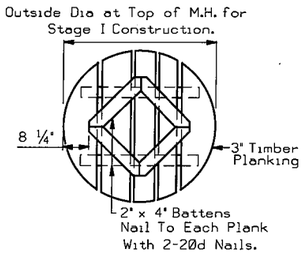
'T' Thickness Of Shell Equals That Of Larger Diameter Pipe.

Optional Monolithic Or Precast Designs Permitted. Optional Designs Shall Be Signed & Sealed By A Registered Professional Engineer.



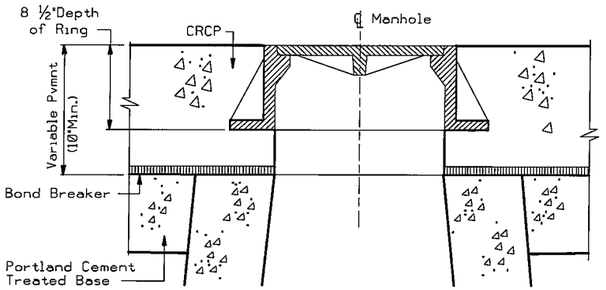
Heavy Duty 30"ID Ring as Required. Vulcan No.V-1419 w/ribbed cover, Neenah No.R1740-BTX

RING AND COVER



PLAN

TEMPORARY TIMBER COVER



RING AND COVER CAST
MONOLITHICALLY WITH PAVEMENT

FOR DIRECT TRAFFIC

d = Diameter
R = Radius

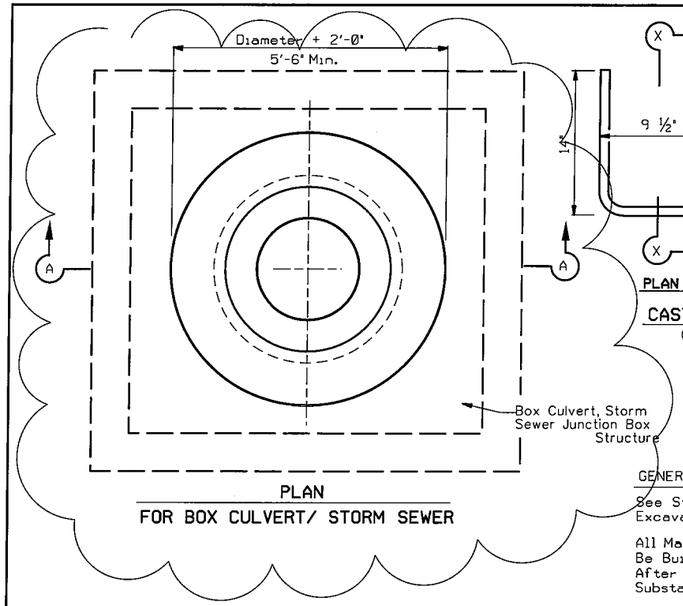
Texas Department of Transportation
Houston District

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 1802(783)MM		239
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	HARRIS		0912	72	391	CS

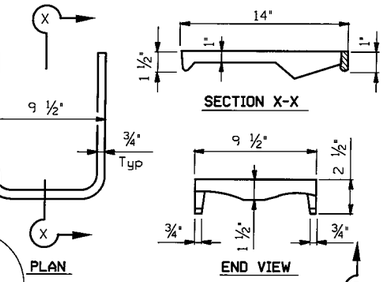
STD-D10

c:\projectwise\ccarrillo\d0742677\stdd10.dgn



PLAN

FOR BOX CULVERT/ STORM SEWER



PLAN

SECTION X-X

END VIEW

CAST IRON MANHOLE STEPS

(In Stock Locally)

1

GENERAL NOTES:

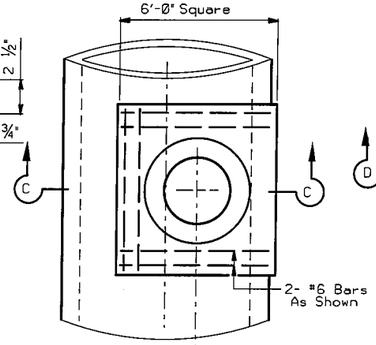
See Standard or Detail Sheet For Excavation And Backfill Diagrams.

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.

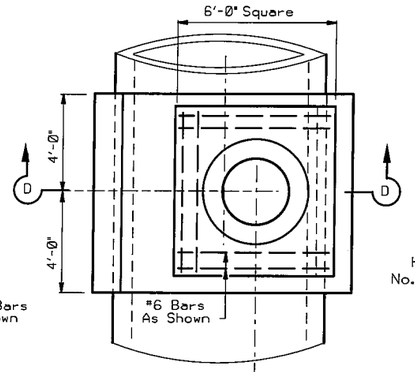
"T" Thickness Of Shell Equals That Of Larger Diameter Pipe.

Optional Monolithic Or Precast Designs Permitted. Optional Designs Shall Be Signed & Sealed By A Registered Professional Engineer.



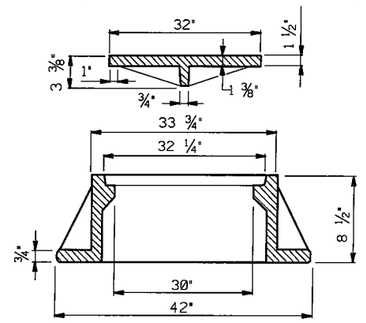
PLAN

MONOLITHIC SEWERS



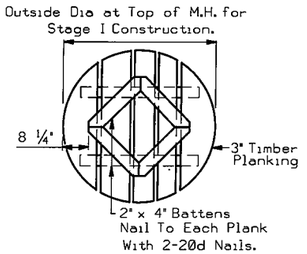
PLAN

PRECAST PIPE SEWERS



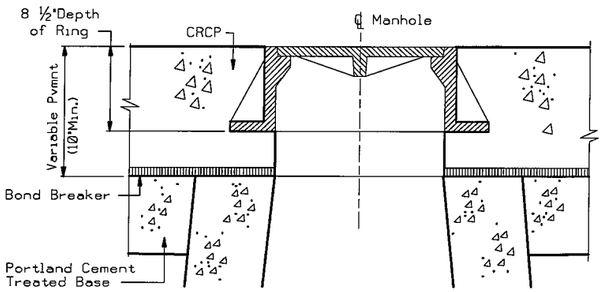
Heavy Duty 30"ID Ring as Required. Vulcan No.V-1419 w/ribbed cover, Neenah No.R1740-BTX

RING AND COVER



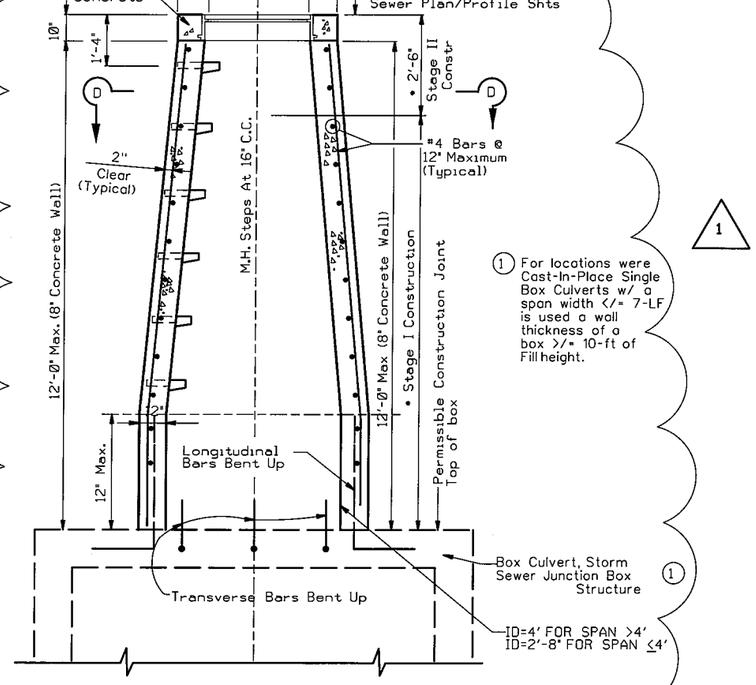
PLAN

TEMPORARY TIMBER COVER



RING AND COVER CAST

MONOLITHICALLY WITH PAVEMENT

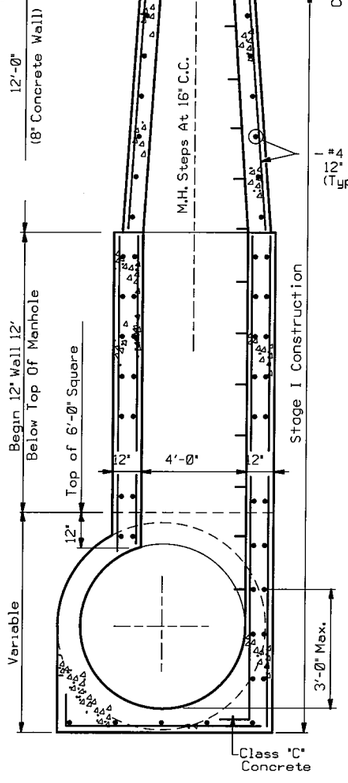


SECTION A-A

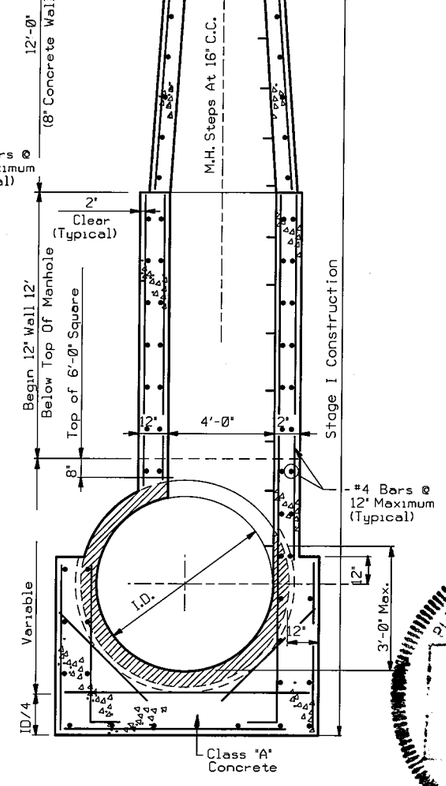
MANHOLE - TYPE A/B

FOR BOX CULVERT/ STORM SEWER

1 For locations were Cast-In-Place Single Box Culverts w/ a span width </= 7-LF is used a wall thickness of a box >/= 10-ft of Fill height.



SECTION C-C



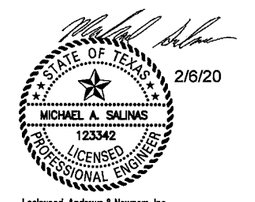
SECTION D-D

MANHOLE - TYPE B

FOR PIPES 60" AND LARGER

d = Diameter
R = Radius

1 MODIFIED CURB INLET TO BE CONSTRUCTED ON TOP OF BOX CULVERT OR STORM SEWER



Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

FOR DIRECT TRAFFIC

Texas Department of Transportation
Houston District

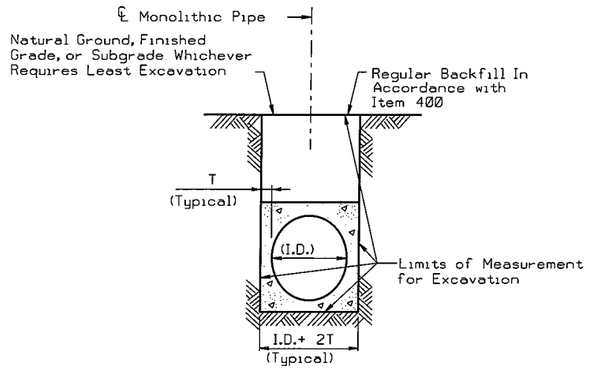
MODIFICATION OF MANHOLES TYPE A & B

MH-A/B (MOD)

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 1802(783)MM			240
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	HARRIS		0912	72	391	CS

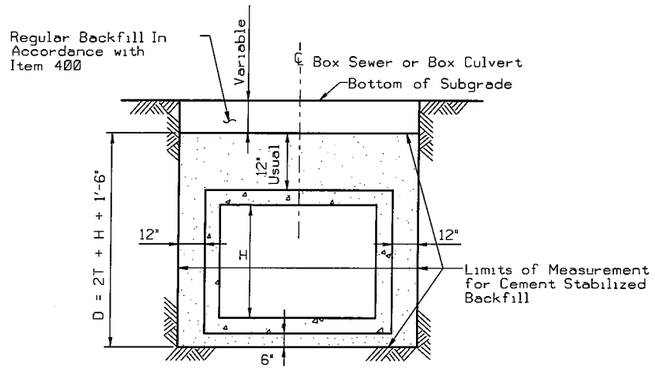
STD-D10

c:\projectwise\jccarrillo\d0742677\stdd10_MOD.dgn



EXCAVATION DETAIL

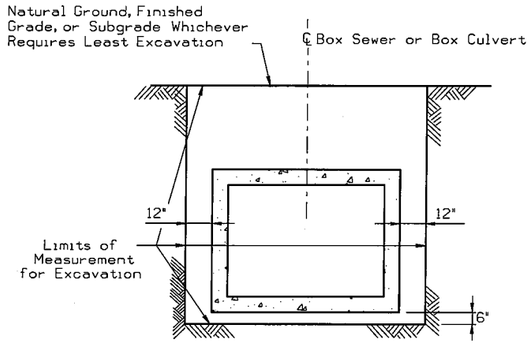
MONOLITHIC PIPE
IN A PAVED OR GRADED AREA



BACKFILL DETAIL

BOX CULVERTS
IN A GRADED OR PAVED AREA
INCLUDING DETOURS *

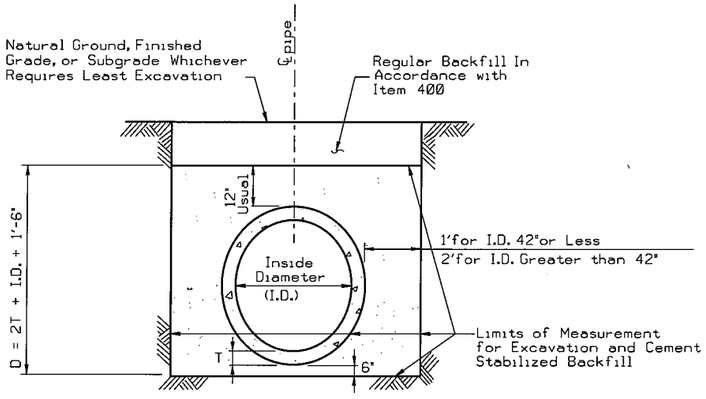
REINFORCED CONCRETE PIPE			
EXCAVATION AND BACKFILL QUANTITIES			
PIPE DIA. IN.	T FT.	CULVERT OR SEWER EXCAVATION IN A PAVED OR GRADED AREA C.Y.PER L.F.PER FT.OF DEPTH	CEMENT STABILIZED BACKFILL IN A PAVED OR GRADED AREA C.Y.PER L.F. OF PIPE
18	0.19	0.144	0.383
24	0.23	0.165	0.478
30	0.29	0.188	0.586
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



EXCAVATION DETAIL

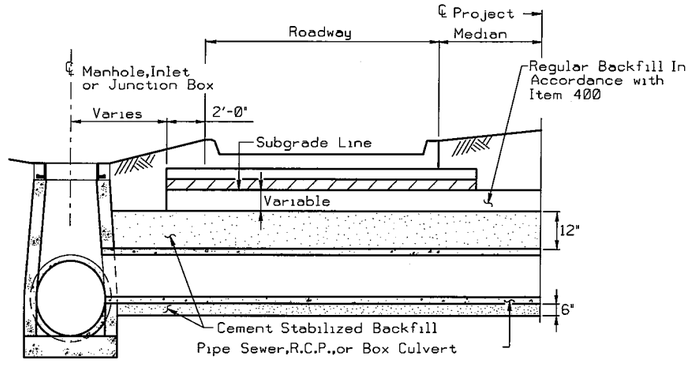
BOX CULVERTS
IN A GRADED AREA

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

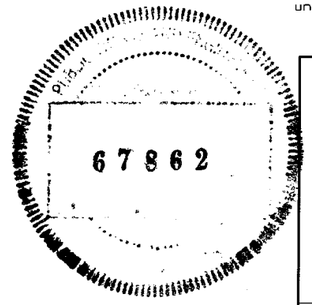
NOTE:

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.

D = Depth
H = Height
T = Thickness
R = Radius
Dia = Diameter

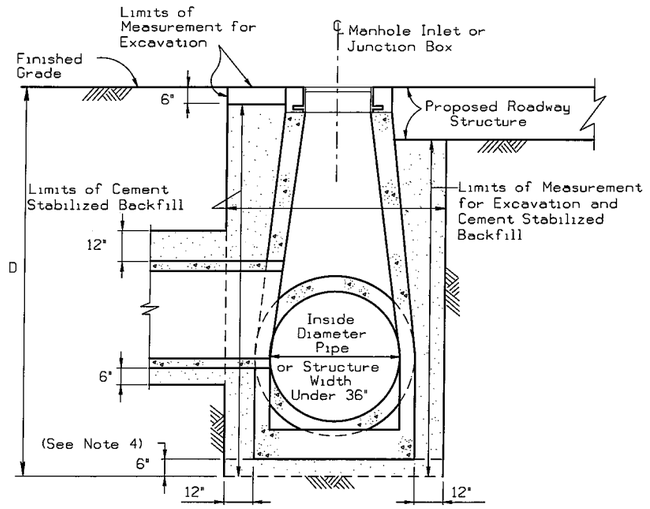


Texas Department of Transportation
Houston District

EXCAVATION AND BACKFILL DIAGRAMS

E&BD

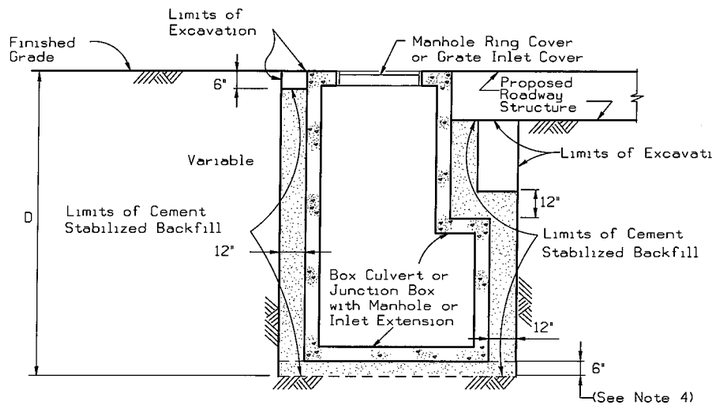
FILE: STDEI.DGN	DN: TxDot	CK: TxDot	DW: TxDot	CK: TxDot
© TxDOT FEB 2010	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS REVISED 11/05 REVISED 2/2018 Added note to Table 1,Sht 2 of 2. REVISED 6/12 REVISED 9/14	HOUSTON	6	STP 1802(783)MM	241
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	HARRIS	0912	72	391	CS



EXCAVATION AND BACKFILL DETAIL

MANHOLES SMALLER THAN 36 IN.
IN A PAVED OR GRADED AREAS

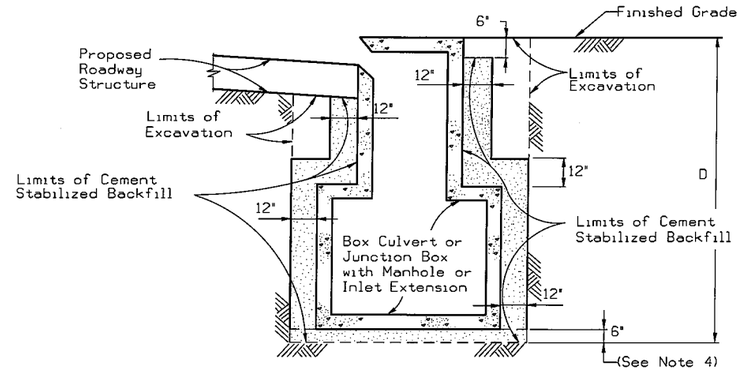
N.T.S.



EXCAVATION AND BACKFILL DETAIL

JUNCTION BOXES IN A
PAVED OR GRADED AREA

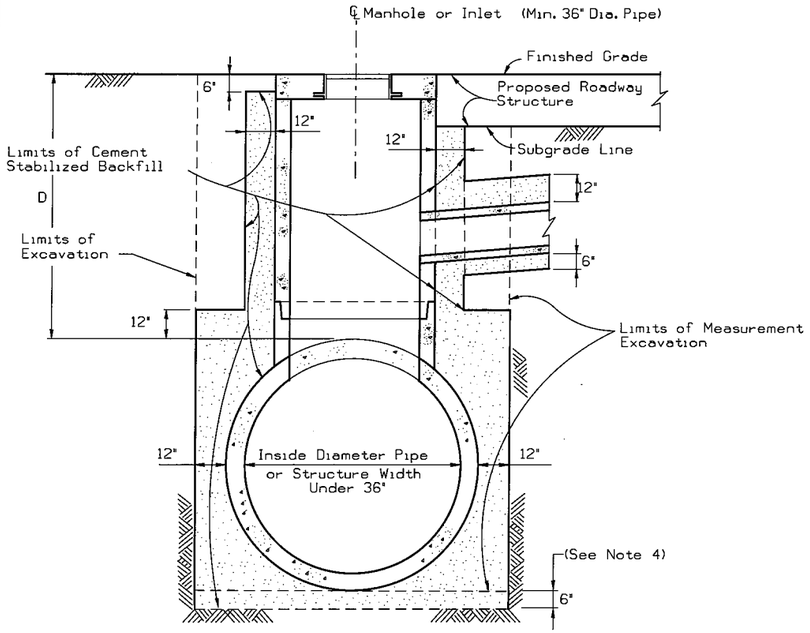
N.T.S.



EXCAVATION AND BACKFILL DETAIL

INLET EXTENSIONS ON A BOX CULVERT
IN A PAVED OR GRADED AREA

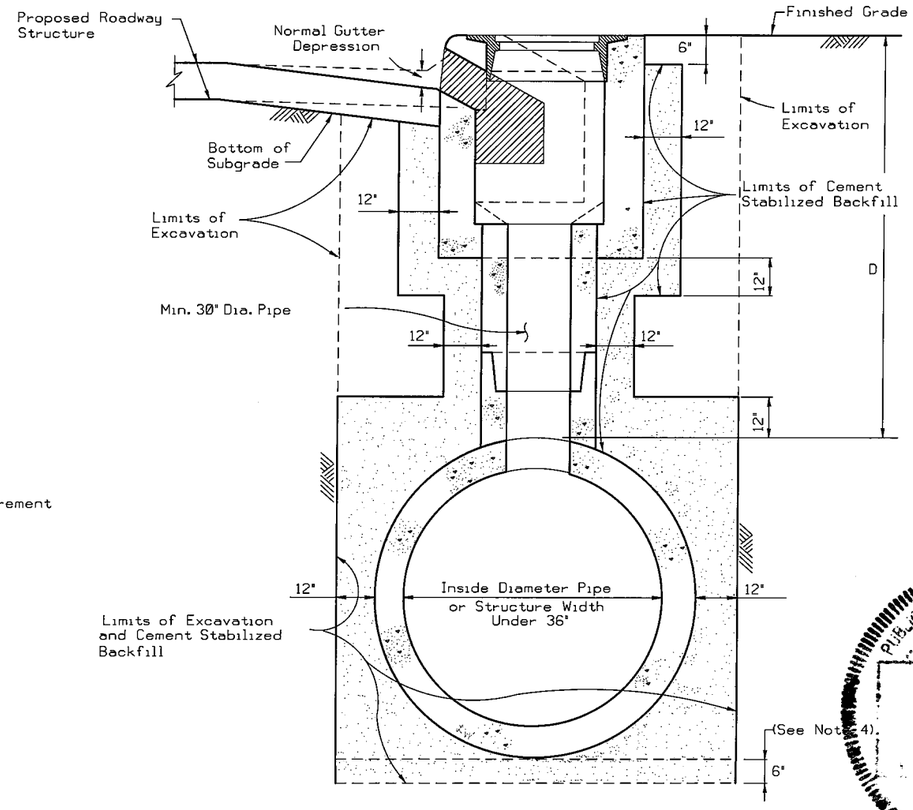
N.T.S.



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. I.
2. Proposed roadway structure includes pavement, base and any subgrade.
3. For backfill of intersecting pipes and box culverts, see "Excavation and Backfill Diagram for Pipes and Box Culverts."
4. 6" cement stabilized backfill will be required only for precast units.

SHEET 2 OF 2

PUBLIC WORKS AND RURAL
67862

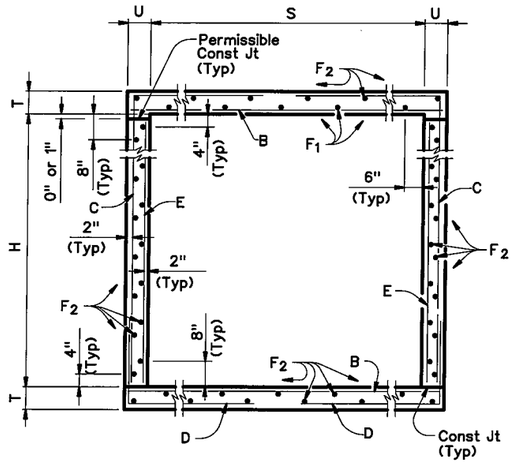
Texas Department of Transportation
Houston District

EXCAVATION AND BACKFILL DIAGRAMS

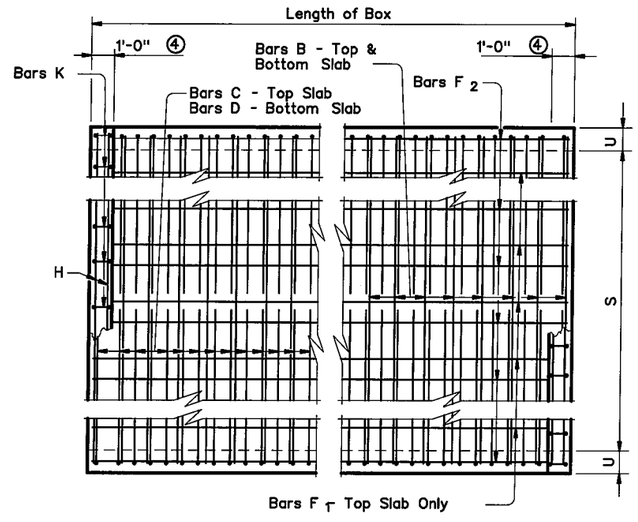
E&BD

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 1802(783)MM		242
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	HARRIS	0912	72	391	CS

DATE:
FILE:



TYPICAL SECTION



PLAN OF REINF STEEL

① 0" min to 5'-0" max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail, bicycle rail or curbs taller than 1'-0", refer to ECD standard. For structures with T6 bridge rail, refer to T6-CM standard. For structures with traffic rail, other than T6, refer to RAC standard.

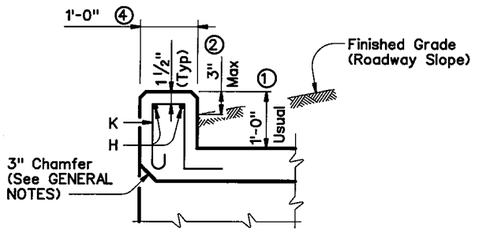
② For vehicle safety, the following requirements must be met:
- For structures without bridge rail, curbs shall project no more than 3" above finished grade.
- For structures with bridge rail, curbs shall be flush with finished grade.
Curb heights shall be reduced, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

③ For curbs less than 1'-0" high, tilt bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, bars K may be omitted.

④ 1'-0" typical. 2'-0" when RAC standard is referred to elsewhere in the plans.

Deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064 may be used to replace conventional reinforcement shown at the Contractor's option. The area of required reinforcement may be reduced by the ratio of 60 ksi / 70 ksi. Spacing of WWR is limited to 4" Min and 18" Max. When required, provide lap splices in the WWR of the same length required for the equivalent bar size, rounded up for wire sizes between conventional bar sizes.

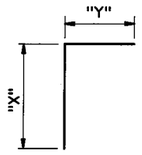
Example Conversion: Replacement of No. 6 Gr 60 at 6" Spacing with WWR.
WWR required = (0.44 sq in/ 0.5') x (60 ksi/70 ksi) = 0.754 sq in/ft.
If D30.6 wire is used to meet the 0.754 sq in/ft requirement in this example, the required spacing = (0.306 sq in/ 0.754 sq in/ft) x 12 in/ft = 4.87" Max spacing.
Required lap length for the provided D30.6 wire is 2'-2" (Lap required for uncoated No. 5 bars, as shown in Item 440).



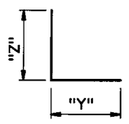
SECTION THRU CURB

GENERAL NOTES:

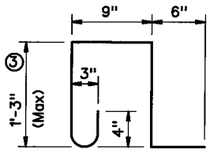
Designed according to AASHTO LRFD Specifications.
Designed to the maximum fill height shown.
All reinforcing steel shall be Grade 60.
All concrete shall be Class "C" with these exceptions: use Class "S" for top slabs of culverts with overlay, with 1-to-2 course surface treatment, or with the top slab as the final riding surface.
Class "C" concrete shall have a minimum compressive strength of 3,600 psi. Class "S" concrete shall have a minimum compressive strength of 4,000 psi.
The use of permanent forms is not allowed.
The bottom edge of the top slab shall be chamfered 3" at the entrance.
Reinforcing bars shall be adjusted to provide a minimum of 1¼" clear cover.
Construction joints shown at the flow line may be raised a maximum of 6" at the Contractor's option. If this option is used, Bars E may be cut off or raised, and Bars C and D may be reversed.
See standard SCC-MD for skewed ends, angle sections and lengthening details.



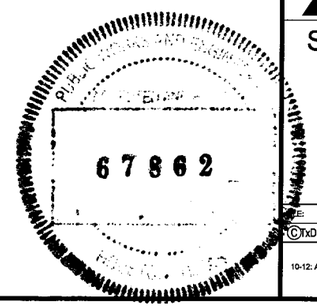
BARS C



BARS D



BARS K ~ #4
(Spa = 1'-0" Max)
(Length = 4'-3")



HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation — Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE
0' TO 30' FILL

SCC-8

FILE: scc08sta.dgn	DN: GAF	CK: LMW	DW: BWH/TxDOT	CK: GAF
©TxDOT February 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	72	391	CS
10-12: Added WWR	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		243

DATE:
FILE:

BILLS OF REINFORCING STEEL (For Box Length = 40 feet)

SECTION DIMENSIONS				⑤ FILL HEIGHT	Bars B					Bars C							Bars D							Bars E~#4 at 18" Max			Bars F 1~#4				Bars F 2~#4 at 18" Max			Bars H 4~#4		Bars K		QUANTITIES: Per foot of Barrel		Curb		Total	
S	H	T	U		No.	Size	Spa	Length	Weight	No.	Size	Spa	Length	Weight	"X"	"Y"	No.	Size	Spa	Length	Weight	"Y"	"Z"	No.	Length	Wt	No.	Spa	Length	Wt	No.	Length	Wt	Length	Wt	No.	Wt	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)
8'-0"	4'-0"	7"	7"	13'	162	#6	6"	8'-11"	2,170	194	#5	5"	8'- 8"	1,754	4'- 5"	4'- 3"	194	#5	5"	6'-10"	1,383	4'- 3"	2'- 7"	56	4'-0"	150	13	7"	39'-9"	345	32	39'-9"	850	8'-11"	24	20	57	0.569	166.3	0.7	81	23.5	6,733
8'-0"	4'-0"	8"	7"	16'	194	#6	5"	8'-11"	2,598	194	#5	5"	8'- 9"	1,770	4'- 6"	4'- 3"	194	#5	5"	6'-11"	1,400	4'- 3"	2'- 8"	56	4'-0"	150	6	18"	39'-9"	159	32	39'-9"	850	8'-11"	24	20	57	0.626	173.2	0.7	81	25.7	7,008
8'-0"	4'-0"	9"	8"	20'	194	#6	5"	9'- 1"	2,647	194	#5	5"	8'-10"	1,787	4'- 7"	4'- 3"	194	#5	5"	7'- 0"	1,416	4'- 3"	2'- 9"	56	4'-0"	150	6	18"	39'-9"	159	32	39'-9"	850	9'- 1"	24	22	62	0.716	175.2	0.7	86	29.3	7,095
8'-0"	4'-0"	10"	8"	23'	194	#6	5"	9'- 1"	2,647	138	#6	7"	8'-11"	1,848	4'- 8"	4'- 3"	138	#6	7"	7'- 6"	1,555	4'- 3"	3'- 3"	56	4'-0"	150	6	18"	39'-9"	159	32	39'-9"	850	9'- 1"	24	22	62	0.774	180.2	0.7	86	31.7	7,295
8'-0"	4'-0"	11"	9"	30'	162	#7	6"	9'- 3"	3,063	194	#5	5"	9'- 0"	1,821	4'- 9"	4'- 3"	194	#5	5"	7'- 2"	1,450	4'- 3"	2'-11"	56	4'-0"	150	6	18"	39'-9"	159	34	39'-9"	903	9'- 3"	25	22	62	0.867	188.7	0.7	87	35.4	7,633
8'-0"	5'-0"	7"	7"	13'	162	#6	6"	8'-11"	2,170	194	#5	5"	9'- 8"	1,956	5'- 5"	4'- 3"	194	#5	5"	6'-10"	1,383	4'- 3"	2'- 7"	56	5'-0"	187	13	7"	39'-9"	345	36	39'-9"	956	8'-11"	24	20	57	0.612	174.9	0.7	81	25.2	7,078
8'-0"	5'-0"	8"	7"	16'	194	#6	5"	8'-11"	2,598	194	#5	5"	9'- 9"	1,973	5'- 6"	4'- 3"	194	#5	5"	6'-11"	1,400	4'- 3"	2'- 8"	56	5'-0"	187	6	18"	39'-9"	159	36	39'-9"	956	8'-11"	24	20	57	0.669	181.8	0.7	81	27.5	7,354
8'-0"	5'-0"	9"	8"	20'	194	#6	5"	9'- 1"	2,647	194	#5	5"	9'-10"	1,990	5'- 7"	4'- 3"	194	#5	5"	7'- 0"	1,416	4'- 3"	2'- 9"	56	5'-0"	187	6	18"	39'-9"	159	36	39'-9"	956	9'- 1"	24	22	62	0.765	183.9	0.7	86	31.3	7,441
8'-0"	5'-0"	10"	8"	23'	194	#6	5"	9'- 1"	2,647	194	#5	5"	9'-11"	2,007	5'- 8"	4'- 3"	194	#5	5"	7'- 1"	1,433	4'- 3"	2'-10"	56	5'-0"	187	6	18"	39'-9"	159	36	39'-9"	956	9'- 1"	24	22	62	0.823	184.7	0.7	86	33.6	7,475
8'-0"	5'-0"	11"	9"	30'	194	#7	5"	9'- 3"	3,668	194	#5	5"	10'- 0"	2,023	5'- 9"	4'- 3"	194	#5	5"	7'- 2"	1,450	4'- 3"	2'-11"	56	5'-0"	187	6	18"	39'-9"	159	38	39'-9"	1,009	9'- 3"	25	22	62	0.923	212.4	0.7	87	37.6	8,583
8'-0"	6'-0"	7"	7"	13'	194	#6	5"	8'-11"	2,598	162	#5	6"	10'- 8"	1,802	6'- 5"	4'- 3"	162	#5	6"	6'-10"	1,155	4'- 3"	2'- 7"	56	6'-0"	224	13	7"	39'-9"	345	40	39'-9"	1,062	8'-11"	24	20	57	0.655	179.7	0.7	81	26.9	7,267
8'-0"	6'-0"	8"	7"	16'	194	#6	5"	8'-11"	2,598	194	#5	5"	10'- 9"	2,175	6'- 6"	4'- 3"	194	#5	5"	6'-11"	1,400	4'- 3"	2'- 8"	56	6'-0"	224	6	18"	39'-9"	159	40	39'-9"	1,062	8'-11"	24	20	57	0.712	190.5	0.7	81	29.2	7,699
8'-0"	6'-0"	9"	8"	20'	194	#6	5"	9'- 1"	2,647	194	#5	5"	10'-10"	2,192	6'- 7"	4'- 3"	194	#5	5"	7'- 0"	1,416	4'- 3"	2'- 9"	56	6'-0"	224	6	18"	39'-9"	159	40	39'-9"	1,062	9'- 1"	24	22	62	0.815	192.5	0.7	86	33.3	7,786
8'-0"	6'-0"	10"	8"	23'	194	#6	5"	9'- 1"	2,647	194	#5	5"	10'-11"	2,209	6'- 8"	4'- 3"	194	#5	5"	7'- 1"	1,433	4'- 3"	2'-10"	56	6'-0"	224	6	18"	39'-9"	159	40	39'-9"	1,062	9'- 1"	24	22	62	0.872	193.4	0.7	86	35.6	7,820
8'-0"	6'-0"	11"	9"	30'	194	#7	5"	9'- 3"	3,668	194	#5	5"	11'- 0"	2,226	6'- 9"	4'- 3"	194	#5	5"	7'- 2"	1,450	4'- 3"	2'-11"	56	6'-0"	224	6	18"	39'-9"	159	42	39'-9"	1,115	9'- 3"	25	22	62	0.978	221.1	0.7	87	39.8	8,929
8'-0"	7'-0"	7"	7"	13'	194	#6	5"	8'-11"	2,598	194	#5	5"	11'- 8"	2,361	7'- 5"	4'- 3"	194	#5	5"	6'-10"	1,383	4'- 3"	2'- 7"	56	7'-0"	262	13	7"	39'-9"	345	40	39'-9"	1,062	8'-11"	24	20	57	0.699	200.3	0.7	81	28.7	8,092
8'-0"	7'-0"	8"	7"	16'	194	#6	5"	8'-11"	2,598	194	#5	5"	11'- 9"	2,378	7'- 6"	4'- 3"	194	#5	5"	6'-11"	1,400	4'- 3"	2'- 8"	56	7'-0"	262	6	18"	39'-9"	159	40	39'-9"	1,062	8'-11"	24	20	57	0.755	196.5	0.7	81	30.9	7,940
8'-0"	7'-0"	9"	8"	20'	194	#6	5"	9'- 1"	2,647	194	#5	5"	11'-10"	2,394	7'- 7"	4'- 3"	194	#5	5"	7'- 0"	1,416	4'- 3"	2'- 9"	56	7'-0"	262	6	18"	39'-9"	159	40	39'-9"	1,062	9'- 1"	24	22	62	0.864	198.5	0.7	86	35.3	8,026
8'-0"	7'-0"	10"	8"	23'	162	#7	6"	9'- 1"	3,008	194	#5	5"	11'-11"	2,411	7'- 8"	4'- 3"	194	#5	5"	7'- 1"	1,433	4'- 3"	2'-10"	56	7'-0"	262	6	18"	39'-9"	159	40	39'-9"	1,062	9'- 1"	24	22	62	0.922	208.4	0.7	86	37.6	8,421
8'-0"	7'-0"	11"	9"	30'	194	#7	5"	9'- 3"	3,668	194	#5	5"	12'- 0"	2,428	7'- 9"	4'- 3"	194	#5	5"	7'- 2"	1,450	4'- 3"	2'-11"	56	7'-0"	262	6	18"	39'-9"	159	42	39'-9"	1,115	9'- 3"	25	22	62	1.034	227.1	0.7	87	42.1	9,169
8'-0"	8'-0"	7"	7"	13'	194	#6	5"	8'-11"	2,598	194	#5	5"	12'- 8"	2,563	8'- 5"	4'- 3"	194	#5	5"	6'-10"	1,383	4'- 3"	2'- 7"	56	8'-0"	299	13	7"	39'-9"	345	44	39'-9"	1,168	8'-11"	24	20	57	0.742	208.9	0.7	81	30.4	8,437
8'-0"	8'-0"	8"	7"	16'	194	#6	5"	8'-11"	2,598	194	#5	5"	12'- 9"	2,580	8'- 6"	4'- 3"	194	#5	5"	6'-11"	1,400	4'- 3"	2'- 8"	56	8'-0"	299	6	18"	39'-9"	159	44	39'-9"	1,168	8'-11"	24	20	57	0.798	205.1	0.7	81	32.6	8,285
8'-0"	8'-0"	9"	8"	20'	194	#6	5"	9'- 1"	2,647	194	#5	5"	12'-10"	2,597	8'- 7"	4'- 3"	194	#5	5"	7'- 0"	1,416	4'- 3"	2'- 9"	56	8'-0"	299	6	18"	39'-9"	159	44	39'-9"	1,168	9'- 1"	24	22	62	0.914	207.2	0.7	86	37.3	8,372
8'-0"	8'-0"	10"	8"	23'	162	#7	6"	9'- 1"	3,008	194	#5	5"	12'-11"	2,614	8'- 8"	4'- 3"	194	#5	5"	7'- 1"	1,433	4'- 3"	2'-10"	56	8'-0"	299	6	18"	39'-9"	159	44	39'-9"	1,168	9'- 1"	24	22	62	0.971	217.0	0.7	86	39.5	8,767
8'-0"	8'-0"	11"	9"	30'	194	#7	5"	9'- 3"	3,668	194	#5	5"	13'- 0"	2,630	8'- 9"	4'- 3"	194	#5	5"	7'- 2"	1,450	4'- 3"	2'-11"	56	8'-0"	299	6	18"	39'-9"	159	46	39'-9"	1,221	9'- 3"	25	22	62	1.090	235.7	0.7	87	44.3	9,514

⑤ For each box size, minimum fill height shown shall be used for all culverts with less than 2'-0" of fill.

Deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064 may be used to replace conventional reinforcement shown at the Contractor's option. The area of required reinforcement may be reduced by the ratio of 60 ksi / 70 ksi. Spacing of WWR is limited to 4" Min and 18" Max. When required, provide lap splices in the WWR of the same length required for the equivalent bar size, rounded up for wire sizes between conventional bar sizes.

Example Conversion: Replacement of No. 6 Gr 60 at 6" Spacing with WWR.
WWR required = (0.44 sq in/ 0.5') x (60 ksi/70 ksi) = 0.754 sq in/ft.
If D30.6 wire is used to meet the 0.754 sq in/ft requirement in this example, the required spacing = (0.306 sq in/ 0.754 sq in/ft) x 12 in/ft = 4.87" Max spacing.
Required lap length for the provided D30.6 wire is 2'-2" (Lap required for uncoated No. 5 bars, as shown in Item 440).

HL93 LOADING

67862

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE
0' TO 30' FILL

SCC-8

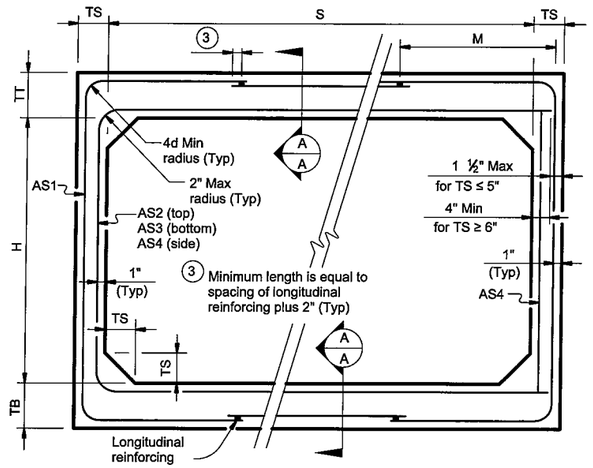
FILE: scc08ste.dgn	DN: GAF	CK: LMW	DW: BWH/TxDOT	CK: GAF
©TxDOT February 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	72	391	CS
10-12: Added WWR	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		244

BOX DATA

SECTION DIMENSIONS					Fill Height	M (Min)	REINFORCING (sq. in. / ft.) ②							① Lift Weight
S (ft.)	H (ft.)	TT (in.)	TB (in.)	TS (in.)	(ft.)	(in.)	AS1	AS2	AS3	AS4	AS5	AS7	AS8	(tons)
3	2	7	6	4	< 2	-	0.17	0.25	0.16	0.10	0.17	0.17	0.14	3.3
3	2	4	4	4	2 < 3	31	0.13	0.19	0.18	0.10	-	-	-	2.4
3	2	4	4	4	3 - 5	31	0.10	0.11	0.12	0.10	-	-	-	2.4
3	2	4	4	4	10	31	0.10	0.10	0.10	0.10	-	-	-	2.4
3	2	4	4	4	15	31	0.10	0.13	0.13	0.10	-	-	-	2.4
3	2	4	4	4	20	31	0.11	0.17	0.17	0.10	-	-	-	2.4
3	2	4	4	4	25	31	0.14	0.21	0.21	0.10	-	-	-	2.4
3	2	4	4	4	30	31	0.17	0.25	0.25	0.10	-	-	-	2.4
3	2	4	4	4	35	31	0.20	0.29	0.30	0.10	-	-	-	2.4
3	3	7	6	4	< 2	-	0.17	0.27	0.17	0.10	0.17	0.17	0.14	3.7
3	3	4	4	4	2 < 3	31	0.10	0.22	0.21	0.10	-	-	-	2.8
3	3	4	4	4	3 - 5	31	0.10	0.14	0.14	0.10	-	-	-	2.8
3	3	4	4	4	10	31	0.10	0.11	0.11	0.10	-	-	-	2.8
3	3	4	4	4	15	31	0.10	0.14	0.15	0.10	-	-	-	2.8
3	3	4	4	4	20	31	0.10	0.18	0.19	0.10	-	-	-	2.8
3	3	4	4	4	25	31	0.10	0.23	0.23	0.10	-	-	-	2.8
3	3	4	4	4	30	31	0.12	0.27	0.28	0.10	-	-	-	2.8
3	3	4	4	4	35	31	0.14	0.32	0.32	0.10	-	-	-	2.8

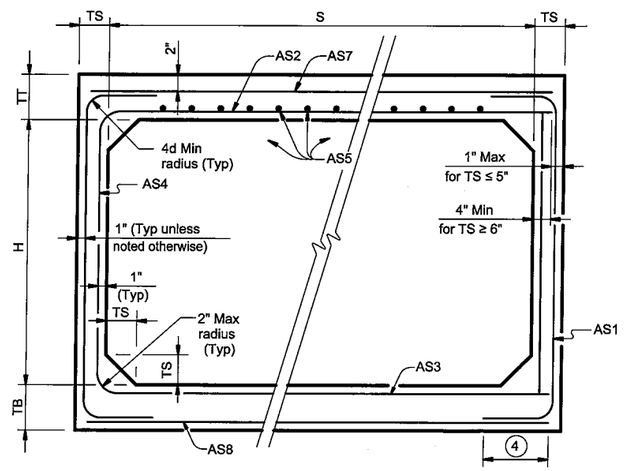
① For box length = 8'-0"

② AS1 thru AS4, AS7 and AS8 are minimum required areas of reinforcement per linear foot of box length. AS5 is minimum required area of reinforcement per linear foot of box width.



CORNER OPTION "A" CORNER OPTION "B"

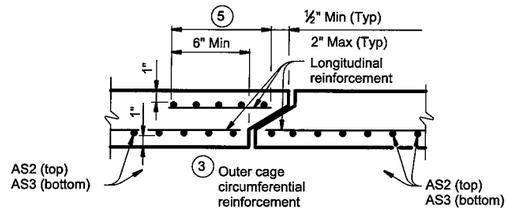
FILL HEIGHT 2 FT AND GREATER



CORNER OPTION "A" CORNER OPTION "B"

FILL HEIGHT LESS THAN 2 FT

④ Length is equal to spacing of longitudinal reinforcing plus 2". (10" Min) (Typ)



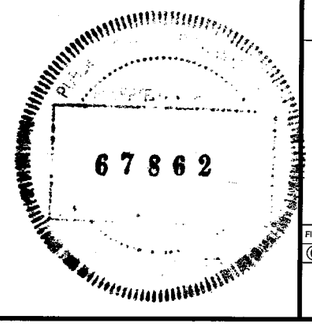
SECTION A-A

(Showing top and bottom slab joint reinforcement.)

MATERIAL NOTES:
Provide 0.03 sq. in./ft. minimum longitudinal reinforcement at each face in slabs and walls. This minimum requirement may be met by the transverse wires when wire mesh reinforcement is used.
Provide Class H concrete (f'c = 5,000 psi).

GENERAL NOTES:
Designs shown conform to ASTM C1577. Refer to ASTM C1577 for information or details not shown.
See Box Culverts Precast Miscellaneous Details (SCP-MD) standard sheet for details and notes not shown.
In lieu of furnishing the designs shown on this sheet, the contractor may furnish an alternate design that is equal to or exceeds the box design for the design fill height in the table. Submit shop plans for alternate designs in accordance with Item "Precast Concrete Structural Members (Fabrication)".

HL93 LOADING



Texas Department of Transportation — Bridge Division Standard

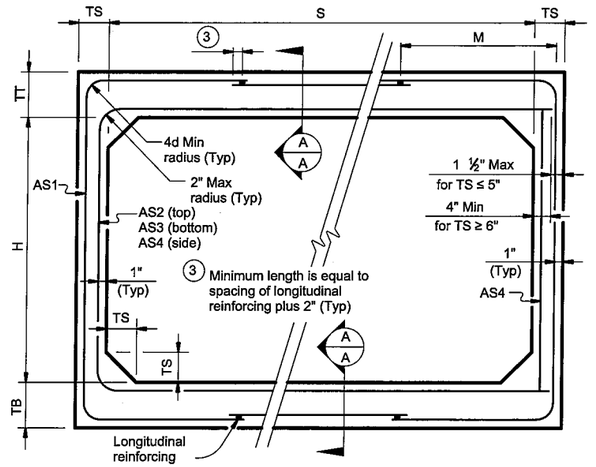
SINGLE BOX CULVERTS PRECAST
3'-0" SPAN

SCP-3

FILE:	scp03sts-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT	February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS		0912	72	391	CS
		DIST	COUNTY		SHEET NO.
		HOU	HARRIS		245

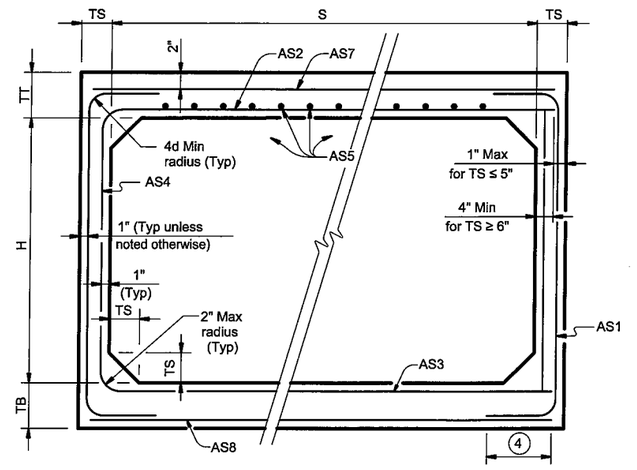
BOX DATA

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)
4	2	7.5	6	5	< 2	-	0.18	0.27	0.15	0.12	0.18	0.18	0.14	4.5
4	2	5	5	5	2 < 3	38	0.18	0.19	0.17	0.12	-	-	-	3.6
4	2	5	5	5	3 - 5	38	0.13	0.13	0.13	0.12	-	-	-	3.6
4	2	5	5	5	10	38	0.12	0.12	0.12	0.12	-	-	-	3.6
4	2	5	5	5	15	38	0.14	0.16	0.16	0.12	-	-	-	3.6
4	2	5	5	5	20	38	0.18	0.20	0.21	0.12	-	-	-	3.6
4	2	5	5	5	25	38	0.23	0.25	0.25	0.12	-	-	-	3.6
4	2	5	5	5	30	38	0.28	0.30	0.30	0.12	-	-	-	3.6
4	3	7.5	6	5	< 2	-	0.18	0.31	0.18	0.12	0.18	0.18	0.14	5.0
4	3	5	5	5	2 < 3	38	0.15	0.23	0.20	0.12	-	-	-	4.1
4	3	5	5	5	3 - 5	38	0.12	0.16	0.16	0.12	-	-	-	4.1
4	3	5	5	5	10	38	0.12	0.14	0.14	0.12	-	-	-	4.1
4	3	5	5	5	15	38	0.12	0.18	0.18	0.12	-	-	-	4.1
4	3	5	5	5	20	38	0.14	0.23	0.24	0.12	-	-	-	4.1
4	3	5	5	5	25	38	0.17	0.29	0.29	0.12	-	-	-	4.1
4	3	5	5	5	30	38	0.21	0.35	0.35	0.12	-	-	-	4.1
4	4	7.5	6	5	< 2	-	0.18	0.33	0.20	0.12	0.18	0.18	0.14	5.5
4	4	5	5	5	2 < 3	38	0.12	0.26	0.23	0.12	-	-	-	4.6
4	4	5	5	5	3 - 5	38	0.12	0.18	0.18	0.12	-	-	-	4.6
4	4	5	5	5	10	38	0.12	0.15	0.15	0.12	-	-	-	4.6
4	4	5	5	5	15	38	0.12	0.19	0.20	0.12	-	-	-	4.6
4	4	5	5	5	20	38	0.12	0.25	0.25	0.12	-	-	-	4.6
4	4	5	5	5	25	38	0.14	0.31	0.31	0.12	-	-	-	4.6
4	4	5	5	5	30	38	0.17	0.37	0.37	0.12	-	-	-	4.6



CORNER OPTION "A" CORNER OPTION "B"

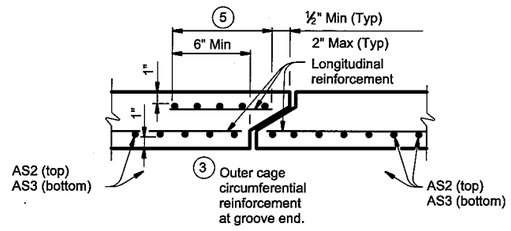
FILL HEIGHT 2 FT AND GREATER



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)".

(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.

HL93 LOADING

Texas Department of Transportation — Bridge Division Standard

SINGLE BOX CULVERTS PRECAST
4'-0" SPAN

SCP-4

FILE:	scp04sts-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT	February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS		0912	72	391	CS
		DIST	COUNTY		SHEET NO.
		HOU	HARRIS		246

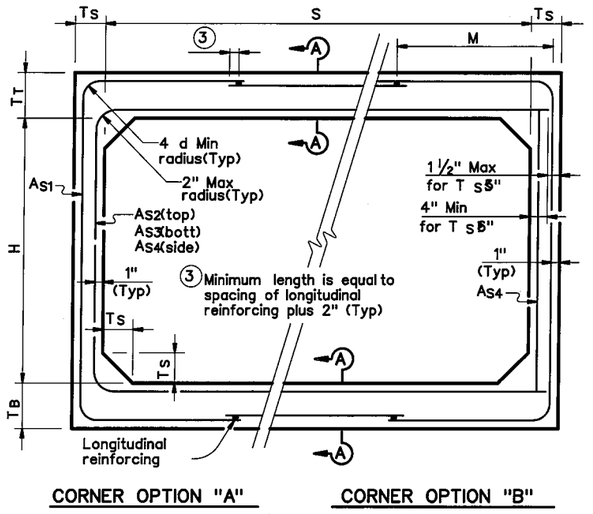
DATE:
FILE:

BOX DATA

SECTION DIMENSIONS					Fill Height	M (Min)	REINFORCING (in^2/ft) ②								① Lift Weight (Tons)
S (ft)	H (ft)	T_T (In)	T_B (In)	T_S (In)	(ft)	(In)	A_{S1}	A_{S2}	A_{S3}	A_{S4}	A_{S5}	A_{S6}	A_{S7}	A_{S8}	
8	4	8	8	8	<2	-	0.27	0.38	0.29	0.19	0.19	0.19	0.19	0.19	11.2
8	4	8	8	8	2<3	50	0.31	0.34	0.32	0.19	-	-	-	-	11.2
8	4	8	8	8	3-5	50	0.25	0.27	0.27	0.19	-	-	-	-	11.2
8	4	8	8	8	10	45	0.26	0.28	0.29	0.19	-	-	-	-	11.2
8	4	8	8	8	15	41	0.34	0.37	0.38	0.19	-	-	-	-	11.2
8	4	8	8	8	20	41	0.44	0.48	0.49	0.19	-	-	-	-	11.2
8	5	8	8	8	<2	-	0.24	0.40	0.32	0.19	0.19	0.19	0.19	0.19	12.0
8	5	8	8	8	2<3	50	0.28	0.37	0.35	0.19	-	-	-	-	12.0
8	5	8	8	8	3-5	45	0.23	0.29	0.30	0.19	-	-	-	-	12.0
8	5	8	8	8	10	45	0.23	0.31	0.32	0.19	-	-	-	-	12.0
8	5	8	8	8	15	41	0.30	0.41	0.42	0.19	-	-	-	-	12.0
8	5	8	8	8	20	41	0.39	0.52	0.54	0.19	-	-	-	-	12.0
8	6	8	8	8	<2	-	0.22	0.42	0.35	0.19	0.19	0.19	0.19	0.19	12.8
8	6	8	8	8	2<3	50	0.25	0.40	0.38	0.19	-	-	-	-	12.8
8	6	8	8	8	3-5	50	0.21	0.32	0.33	0.19	-	-	-	-	12.8
8	6	8	8	8	10	45	0.22	0.33	0.34	0.19	-	-	-	-	12.8
8	6	8	8	8	15	41	0.28	0.43	0.45	0.19	-	-	-	-	12.8
8	6	8	8	8	20	41	0.36	0.55	0.57	0.19	-	-	-	-	12.8
8	7	8	8	8	<2	-	0.20	0.44	0.37	0.19	0.19	0.19	0.19	0.19	13.6
8	7	8	8	8	2<3	55	0.23	0.43	0.41	0.19	-	-	-	-	13.6
8	7	8	8	8	3-5	55	0.19	0.34	0.35	0.19	-	-	-	-	13.6
8	7	8	8	8	10	50	0.20	0.34	0.36	0.19	-	-	-	-	13.6
8	7	8	8	8	15	41	0.26	0.45	0.47	0.19	-	-	-	-	13.6
8	7	8	8	8	20	41	0.33	0.57	0.60	0.19	-	-	-	-	13.6
8	8	8	8	8	<2	-	0.20	0.45	0.40	0.19	0.19	0.19	0.19	0.19	14.4
8	8	8	8	8	2<3	65	0.21	0.45	0.44	0.19	-	-	-	-	14.4
8	8	8	8	8	3-5	65	0.19	0.36	0.38	0.19	-	-	-	-	14.4
8	8	8	8	8	10	55	0.19	0.35	0.38	0.19	-	-	-	-	14.4
8	8	8	8	8	15	45	0.24	0.46	0.49	0.19	-	-	-	-	14.4
8	8	8	8	8	20	45	0.31	0.59	0.62	0.19	-	-	-	-	14.4

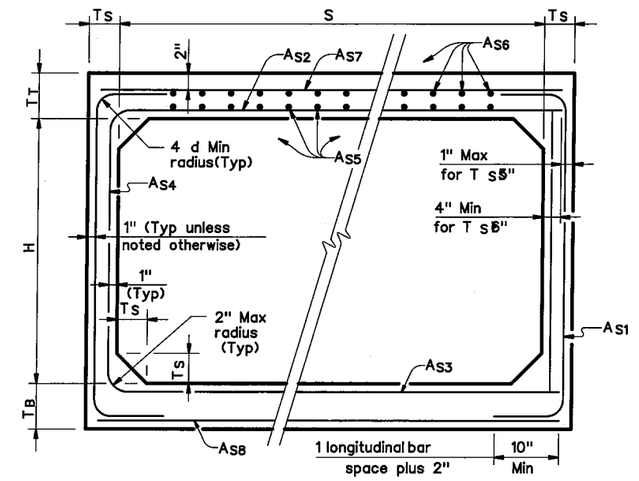
① For Box Length = 8'-0"

② A_{S1} thru A_{S4}, A_{S7} and A_{S8} are minimum required areas of reinforcement per linear foot of box length. A_{S5} and A_{S6} are minimum required areas of reinforcement per linear foot of box width.



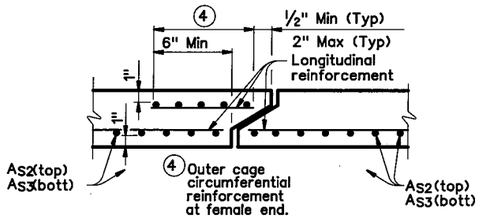
CORNER OPTION "A" CORNER OPTION "B"

FILL HEIGHT 2 FT AND GREATER



CORNER OPTION "A" CORNER OPTION "B"

FILL HEIGHT LESS THAN 2 FT



SECTION A-A

(TOP AND BOTTOM SLAB JOINT REINFORCEMENT)

GENERAL NOTES:

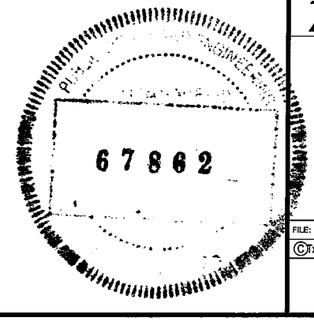
Designs shown conform to ASTM C1577. Refer to ASTM C1577 for information or details not shown.

All concrete shall be Class "H" Concrete with a minimum compressive strength of 5,000 psi.

See SCP-MD standard sheet for miscellaneous 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. Shop plans for alternate designs shall be submitted in accordance with item "Precast Concrete Structural Members (Fabrication)".

HL93 LOADING



Texas Department of Transportation — Bridge Division Standard

SINGLE BOX CULVERTS PRECAST

8'-0" SPAN

SCP-8

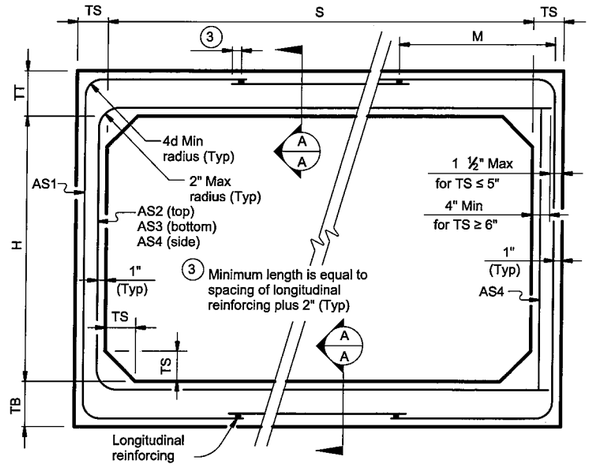
FILE: scp08sts.dgn	DN: GAF	CK: LMW	DW: BWH/TxDOT	CK: GAF
©TxDOT February 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	72	391	CS
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		247

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)
10	4	10	10	10	< 2	-	0.33	0.34	0.27	0.24	0.24	0.24	0.24	16.5
10	4	10	10	10	2 < 3	58	0.38	0.35	0.30	0.24	-	-	-	16.5
10	4	10	10	10	3 - 5	53	0.31	0.28	0.27	0.24	-	-	-	16.5
10	4	10	10	10	10	52	0.36	0.32	0.33	0.24	-	-	-	16.5
10	4	10	10	10	15	52	0.47	0.42	0.43	0.24	-	-	-	16.5
10	4	10	10	10	20	52	0.61	0.54	0.55	0.24	-	-	-	16.5
10	4	10	10	10	25	52	0.75	0.67	0.68	0.24	-	-	-	16.5
10	5	10	10	10	< 2	-	0.30	0.36	0.30	0.24	0.24	0.24	0.24	17.5
10	5	10	10	10	2 < 3	58	0.35	0.39	0.34	0.24	-	-	-	17.5
10	5	10	10	10	3 - 5	52	0.28	0.31	0.30	0.24	-	-	-	17.5
10	5	10	10	10	10	52	0.33	0.35	0.36	0.24	-	-	-	17.5
10	5	10	10	10	15	47	0.42	0.46	0.47	0.24	-	-	-	17.5
10	5	10	10	10	20	47	0.55	0.59	0.61	0.24	-	-	-	17.5
10	5	10	10	10	25	47	0.68	0.73	0.75	0.24	-	-	-	17.5
10	6	10	10	10	< 2	-	0.28	0.38	0.33	0.24	0.24	0.24	0.24	18.5
10	6	10	10	10	2 < 3	58	0.32	0.42	0.37	0.24	-	-	-	18.5
10	6	10	10	10	3 - 5	53	0.26	0.34	0.33	0.24	-	-	-	18.5
10	6	10	10	10	10	52	0.30	0.38	0.39	0.24	-	-	-	18.5
10	6	10	10	10	15	47	0.39	0.49	0.51	0.24	-	-	-	18.5
10	6	10	10	10	20	47	0.50	0.63	0.65	0.24	-	-	-	18.5
10	6	10	10	10	25	47	0.61	0.78	0.80	0.24	-	-	-	18.5
10	7	10	10	10	< 2	-	0.25	0.40	0.36	0.24	0.24	0.24	0.24	19.5
10	7	10	10	10	2 < 3	58	0.30	0.45	0.40	0.24	-	-	-	19.5
10	7	10	10	10	3 - 5	58	0.24	0.36	0.35	0.24	-	-	-	19.5
10	7	10	10	10	10	52	0.28	0.40	0.42	0.24	-	-	-	19.5
10	7	10	10	10	15	47	0.36	0.52	0.54	0.24	-	-	-	19.5
10	7	10	10	10	20	47	0.46	0.67	0.69	0.24	-	-	-	19.5
10	7	10	10	10	25	47	0.56	0.82	0.85	0.24	-	-	-	19.5
10	8	10	10	10	< 2	-	0.24	0.41	0.38	0.24	0.24	0.24	0.24	20.5
10	8	10	10	10	2 < 3	64	0.27	0.47	0.43	0.24	-	-	-	20.5
10	8	10	10	10	3 - 5	58	0.24	0.38	0.38	0.24	-	-	-	20.5
10	8	10	10	10	10	52	0.26	0.42	0.44	0.24	-	-	-	20.5
10	8	10	10	10	15	47	0.34	0.54	0.57	0.24	-	-	-	20.5
10	8	10	10	10	20	47	0.43	0.69	0.72	0.24	-	-	-	20.5
10	9	10	10	10	< 2	-	0.24	0.42	0.41	0.24	0.24	0.24	0.24	21.5
10	9	10	10	10	2 < 3	70	0.26	0.50	0.46	0.24	-	-	-	21.5
10	9	10	10	10	3 - 5	64	0.24	0.40	0.40	0.24	-	-	-	21.5
10	9	10	10	10	10	58	0.25	0.43	0.46	0.24	-	-	-	21.5
10	9	10	10	10	15	52	0.32	0.56	0.59	0.24	-	-	-	21.5
10	9	10	10	10	20	47	0.40	0.71	0.75	0.24	-	-	-	21.5
10	10	10	10	10	< 2	-	0.24	0.44	0.44	0.24	0.24	0.24	0.24	22.5
10	10	10	10	10	2 < 3	79	0.25	0.52	0.48	0.24	-	-	-	22.5
10	10	10	10	10	3 - 5	70	0.24	0.42	0.43	0.24	-	-	-	22.5
10	10	10	10	10	10	64	0.24	0.44	0.48	0.24	-	-	-	22.5
10	10	10	10	10	15	52	0.30	0.57	0.61	0.24	-	-	-	22.5
10	10	10	10	10	25	52	0.38	0.73	0.77	0.24	-	-	-	22.5

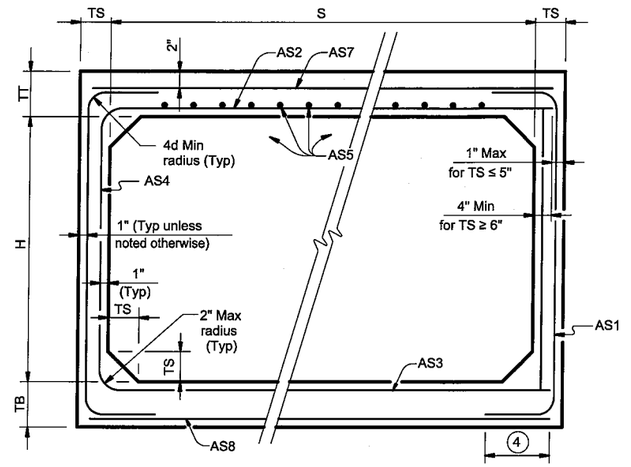
(1) For box length = 8'-0"

(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"

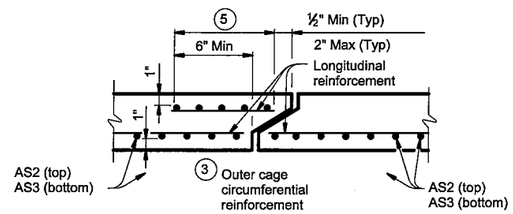
FILL HEIGHT 2 FT AND GREATER



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).

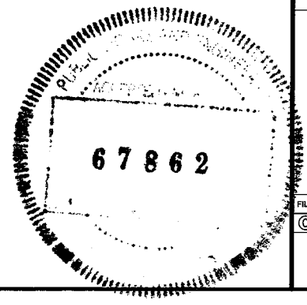
GENERAL NOTES:

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

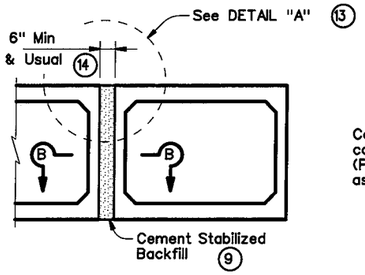
SINGLE BOX CULVERTS PRECAST

10'-0" SPAN

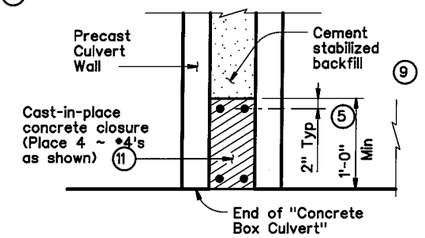
SCP-10

FILE:	scp10sts-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT	February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS		0912	72	391	CS
		DIST	COUNTY		SHEET NO.
		HOU	HARRIS		248

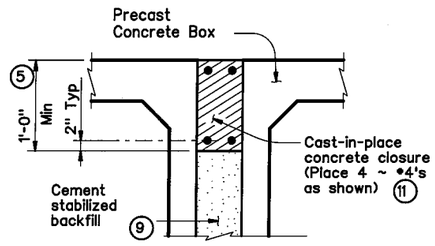
DATE:
FILE:



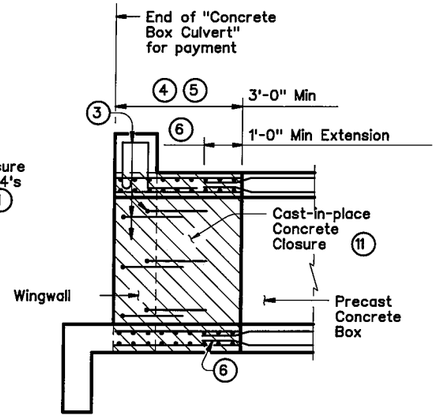
MULTIPLE UNIT PLACEMENT



SECTION B-B

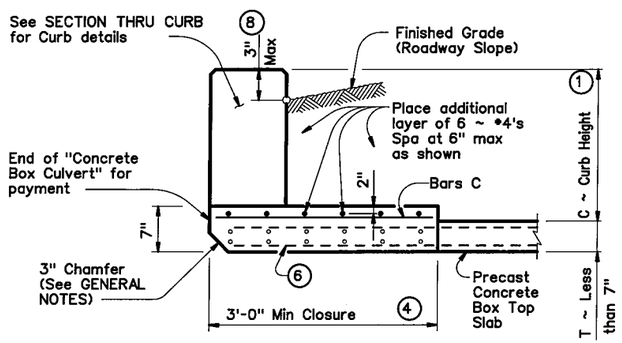


DETAIL "A" (13)

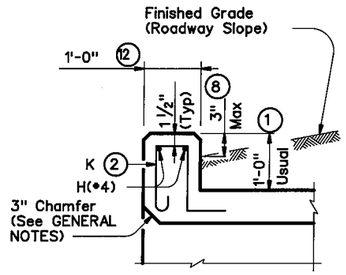


WINGWALL CONNECTION

(Also applies to Safety End Treatment)

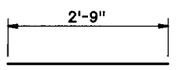


SECTION THRU TOP SLABS LESS THAN 7"

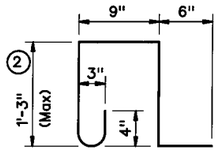


SECTION THRU CURB

(10) QUANTITIES PER FOOT OF CURB	
Reinforcing Steel	4.18 Lb
Concrete	0.037 CY



BARS C ~ #4
(Spa = 1'-0" Max)



BARS K ~ #4
(Spa = 1'-0" Max)
(Length = 4'-3")

(1) 0" min to 5'-0" max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail, bicycle rail or curbs taller than 1'-0", refer to ECD standard. For structures with T6 traffic rail, refer to T6-CM standard. For structures with traffic rail, other than T6, refer to RAC standard.

(2) For curbs less than 1'-0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.

(3) Curb, Wingwall or Safety End Treatment reinforcing shall extend into concrete closure. Any reinforcing that does not fit into the closure shall be bent or trimmed as necessary.

(4) Cast-in-place concrete closure shall be 3'-0" min. Boxes shall be cast short or broken back in the field. All reinforcing in the closure shall be the same size and spacing as in the precast box section. Except where shown otherwise, the cast-in-place closure shall be flush with the inside and outside faces of the precast box section.

(5) For multiple unit placements the length of the closure for the interior walls may be adjusted as necessary. The length of the top slab, bottom slab, and exterior wall closure shall not be less than 3'-0". See Section B-B detail when interior walls are cast full length.

(6) Precast box reinforcing shall extend a minimum of 1'-0" into concrete closure (Typ).

(7) Bands of reinforcing matching the inside and outside face reinforcing shall be placed in the gaps of the top and bottom slabs. A band matching the outside face reinforcing of the wall shall be placed in the gaps of the walls (placed in the outside face only). The bands shall be tack welded to the exposed reinforcing at each point of contact.

(8) For vehicle safety, the following requirements must be met:
- For structures without bridge rail, curbs shall project no more than 3" above finished grade.
- For structures with bridge rail, curbs shall be flush with finished grade.

Curb heights shall be reduced, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

(9) Cement Stabilized Backfill between boxes is considered part of the Box Culvert for payment.

(10) All curb concrete and reinforcing is considered part of the Box Culvert for payment.

(11) Any additional concrete and reinforcing required for the closures shall be considered as subsidiary to the Concrete Box Culvert.

(12) 1'-0" typical. 2'-0" when RAC standard is referred to elsewhere in the plans.

(13) For multiple unit placement with overlay, with 1 to 2 course surface treatment, or with the top slab as the final riding surface, provide wall closure as shown in DETAIL "A".

(14) This dimension may be increased with approval of the Engineer to allow the precast boxes to be tunneled or jacked in accordance with Item 476, "Jacking, Boring, or Tunneling Pipe or Box". No payment will be made for any additional material in the gap between adjacent boxes.

GENERAL NOTES:

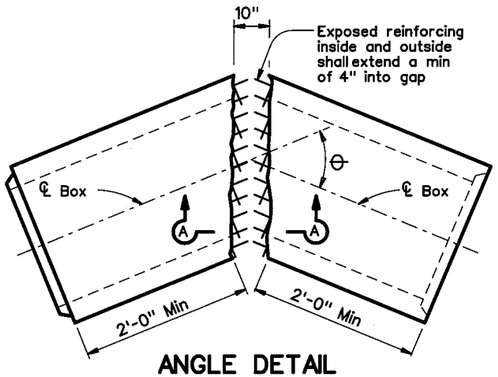
Designed according to AASHTO LRFD Specifications.

All closure concrete shall be Class "C" with a minimum compressive strength of 3600 psi and shall be placed according to the Item, "Concrete Substructures".

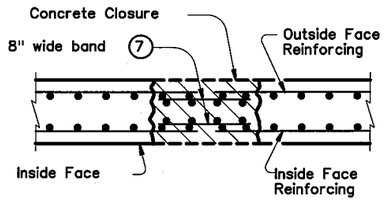
Any additional concrete required for the closures shall be considered as subsidiary to the Concrete Box Culvert.

Refer to the Single Box Culverts Precast standard for details not shown.

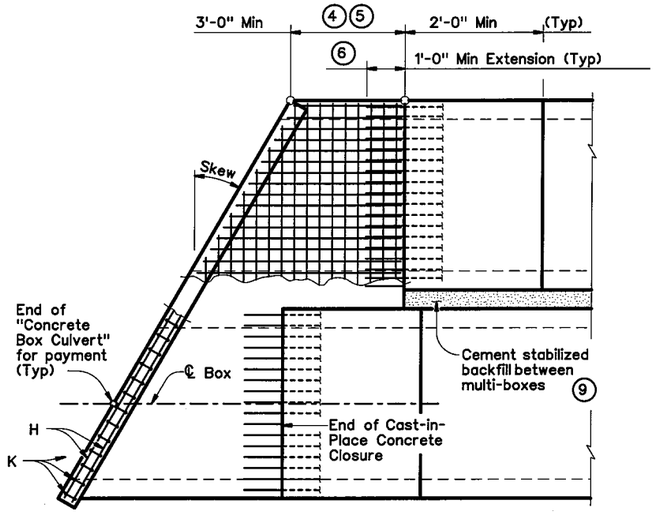
The bottom edge of the top slab closure shall be chamfered 3 inches at the entrance.



ANGLE DETAIL



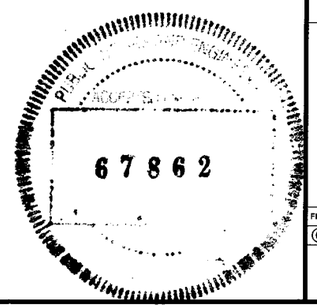
SECTION A-A



PLAN OF SKEWED ENDS

(Showing multi-box placement)

HL93 LOADING



Texas Department of Transportation

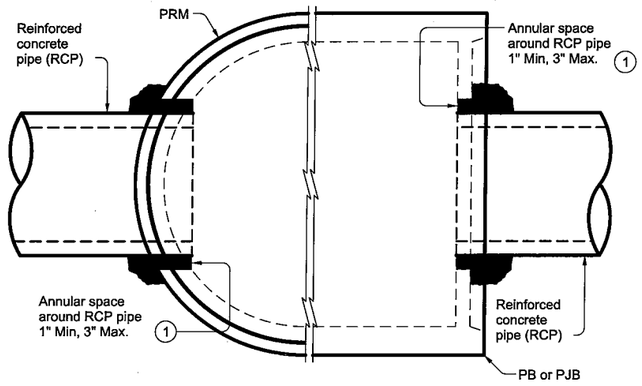
Bridge Division Standard

BOX CULVERTS PRECAST MISCELLANEOUS DETAILS

SCP-MD

FILE: scpmdsts.dgn	DN: GAF	CK: LMW	DW: BWH/TxDOT	CK: GAF
©TxDOT February 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	72	391	CS
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		249

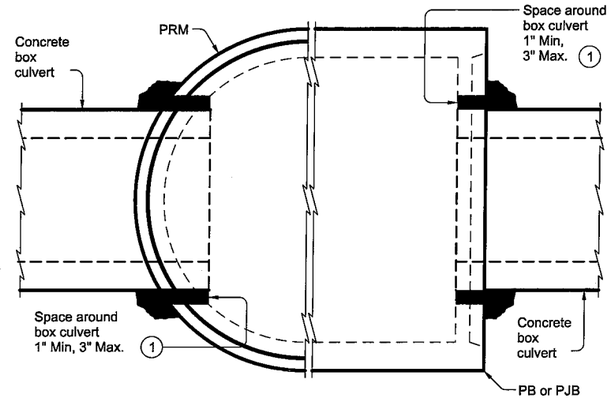
DATE:
FILE:



PRECAST ROUND MANHOLE (PRM) WITH THROUGH-HOLE

PRECAST BASE (PB) OR PRECAST JUNCTION BOX (PJB) WITH THIN-WALL KNOCK-OUT

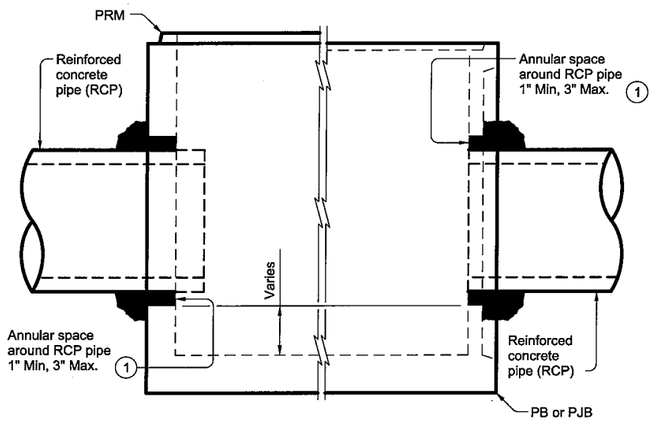
TYPICAL HALF PLAN



PRECAST ROUND MANHOLE (PRM) WITH THROUGH-HOLE

PRECAST BASE (PB) OR PRECAST JUNCTION BOX (PJB) WITH THIN-WALL KNOCK-OUT

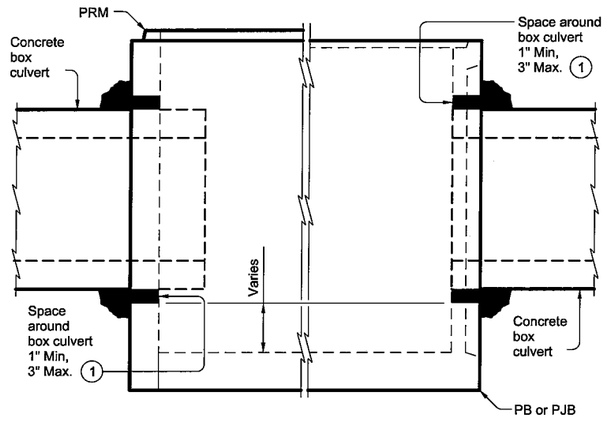
TYPICAL HALF PLAN



PRECAST ROUND MANHOLE (PRM) WITH THROUGH-HOLE

PRECAST BASE (PB) OR PRECAST JUNCTION BOX (PJB) WITH THIN-WALL KNOCK-OUT

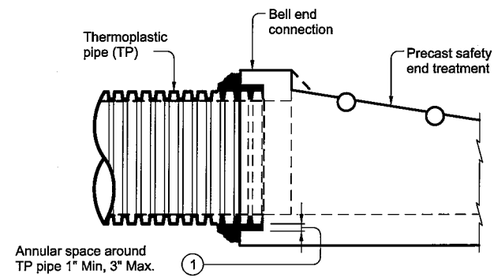
TYPICAL HALF ELEVATION



PRECAST ROUND MANHOLE (PRM) WITH THROUGH-HOLE

PRECAST BASE (PB) OR PRECAST JUNCTION BOX (PJB) WITH THIN-WALL KNOCK-OUT

TYPICAL HALF ELEVATION



TYPICAL PARTIAL ELEVATION OF PRECAST SAFETY END TREATMENTS

Showing square PSET for parallel drainage, cross drainage shown similar.

1 Completely fill the void between the precast structure and the connecting pipe or box with cementitious grouts and mortars in accordance with DMS-4675 "Cementitious Grouts and Mortars for Miscellaneous Application".

CONSTRUCTION NOTES:
Do not grout rubber gasket joints without Manufacturer's recommendations.
Do not use bricks, masonry blocks, native stone, or similar materials in conjunction with grouted connections when filling void spaces around pipes or box culverts.

MATERIAL NOTES:
Provide grouted connections in accordance with DMS-4675 "Cementitious Grouts and Mortars for Miscellaneous Application".

GENERAL NOTES:
See applicable standards for notes and details not shown:
Precast Base (PB)
Precast Junction Box (PJB)
Precast Round Manhole (PRM)
Precast Safety End Treatments C/D Square (PSET-SC)
Precast Safety End Treatments P/D Square (PSET-SP)
Provide Concrete Box Culverts in accordance with Item 462 "Concrete Box Culverts and Drains".
Provide Reinforced Concrete Pipe (RCP) in accordance with Item 464 "Reinforced Concrete Pipe".
Provide Thermoplastic Pipe (TP) in accordance with Special Specification Thermoplastic Pipe.
Payment for grouted connections is considered subsidiary to other bid items.

ACCEPTED AS NOTED
67862

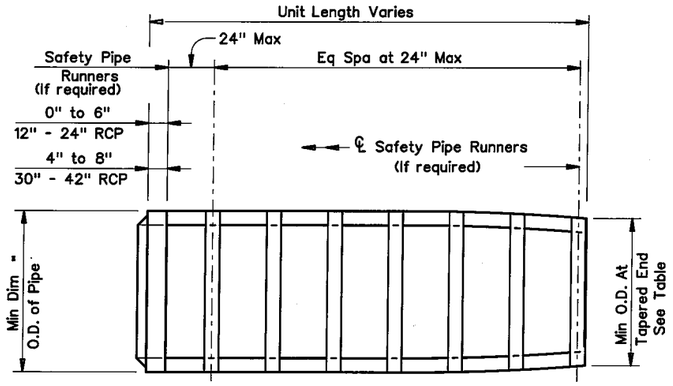
Texas Department of Transportation

Bridge Division Standard

PIPE AND BOX GROUTED CONNECTIONS FOR PRECAST STRUCTURES

PBGC

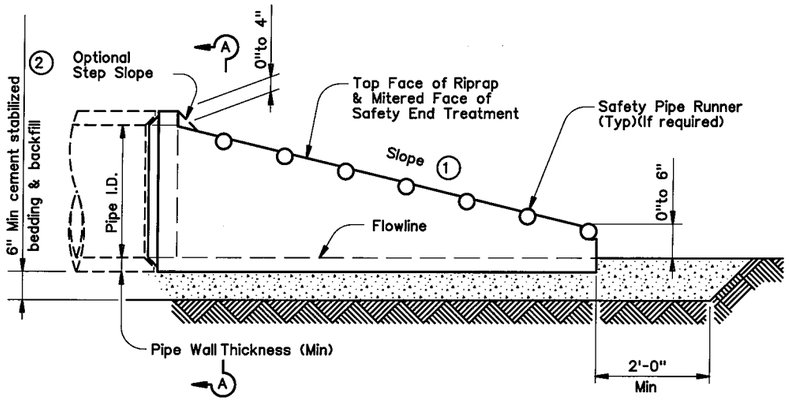
FILE: pbgcstd1-20.dgn	DN: TxDOT	CK: TAR	DW: JTR	CK: TAR
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	72	391	CS
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		250



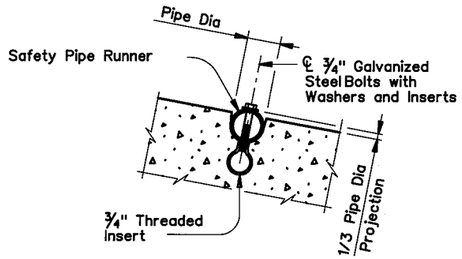
PLAN VIEW - 12" THRU 24"

1. Slope as shown elsewhere in the plans. Slope of 6:1 or flatter is required for vehicle safety.
2. Cement stabilized bedding and backfill shall be in accordance with the Item, "Excavation and Backfill for Structures". Bedding and backfill shall be considered subsidiary to the Item "Safety End Treatment". When concrete riprap is specified around the Safety End Treatment backfill shall be as directed by Engineer.
3. The top 4" of void between Precast End Treatments shall be filled with concrete Riprap and shall be considered subsidiary to Safety End Treatment.
4. Clear distance between pipes shall be adjusted to provide for the minimum distance between safety end treatments.

PIPE I.D.	MINIMUM WALL THICKNESS	MINIMUM O.D.	MIN O.D. AT TAPERED END	MIN REINF REQUIREMENTS (Sq in/ft of pipe)	MAXIMUM SLOPE	MINIMUM LENGTH OF UNIT	PIPE RUNNERS REQUIRED		REQUIRED PIPE RUNNER SIZES		
							SINGLE PIPE	MULTIPLE PIPE	NOMINAL DIA.	O.D.	I.D.
12"	2"	16"	16"	0.07 CIRC.	6:1	4'-0"	No	Yes, for >2 pipes	3" STD	3.500"	3.068"
15"	2 ¼"	19 ½"	19"	0.07 CIRC.	6:1	5'-8"	No	Yes, for >2 pipes	3" STD	3.500"	3.068"
18"	2 ½"	23"	21 ½"	0.07 CIRC.	6:1	7'-3"	No	Yes, for >2 pipes	3" STD	3.500"	3.068"
24"	3"	30"	27"	0.07 CIRC.	6:1	10'-6"	No	Yes, for >2 pipes	3" STD	3.500"	3.068"
30"	3 ½"	37"	31"	0.18 CIRC.	6:1	12'-1"	No	Yes	4" STD	4.500"	4.026"
36"	4"	44"	36"	0.19 ELIP.	6:1	15'-4"	Yes	Yes	4" STD	4.500"	4.026"
42"	4 ½"	51"	41 ½"	0.23 ELIP.	6:1	18'-7"	Yes	Yes	4" STD	4.500"	4.026"

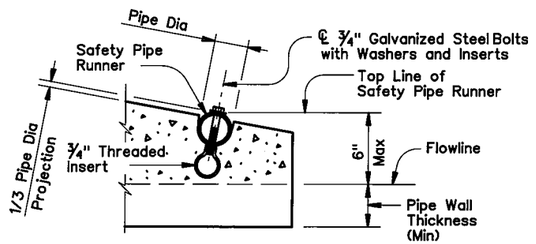


LONGITUDINAL ELEVATION - 12" THRU 24"

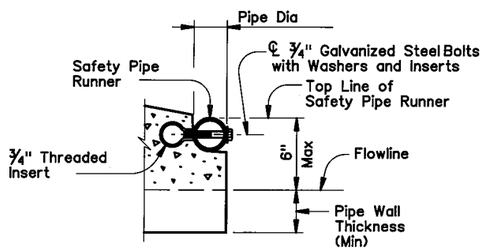


INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)



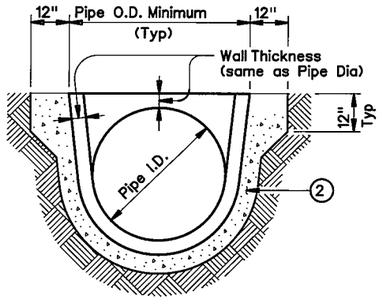
OPTION A



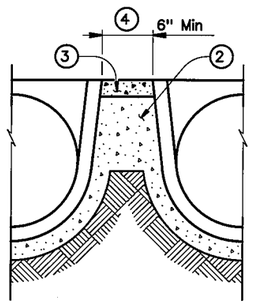
OPTION B

END DETAILS FOR INSTALLATION OF SAFETY PIPE RUNNERS

(If required)



SECTION A-A



MULTIPLE PIPE INSTALLATION

GENERAL NOTES:

Precast safety end treatment for reinforced concrete pipe may be used for TYPE II end treatment as specified in Item "Safety End Treatment".

When Precast Safety End Treatment is used as a Contractor's alternate to mitered RCP, Riprap will not be required unless noted otherwise on the plans.

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

All precast concrete end sections shall be manufactured in accordance with Item "Reinforced Concrete Pipe" and in accordance with ASTM Specification C-76, Class III, Wall B for circular pipe.

Precast concrete end sections shall be provided with a spigot or bell end for compatibility to upstream or downstream end conditions with sufficient annular space to allow for mortar, cold applied asphalt joint compound or pre-formed plastic gasket material.

Methods of lifting shall be provided by the manufacturer for ease of loading, unloading and installation.

Pipe Runners are designed for a traversing load of 10,000 Lbs at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.

Pipe Runners shall conform to the requirements of ASTM A53 (Type E or S, Grade B), ASTM A500 (Grade B), or API 5LX52.

All steel components except reinforcing, shall be galvanized after fabrication. Galvanizing damaged during transport or construction shall be repaired in accordance with the specifications.

Texas Department of Transportation

Bridge Division Standard

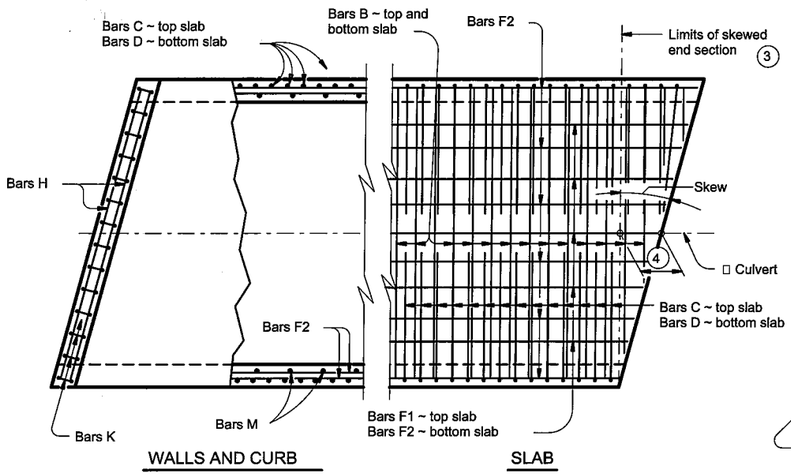
PRECAST SAFETY END TREATMENT

TYPE II ~ PARALLEL DRAINAGE

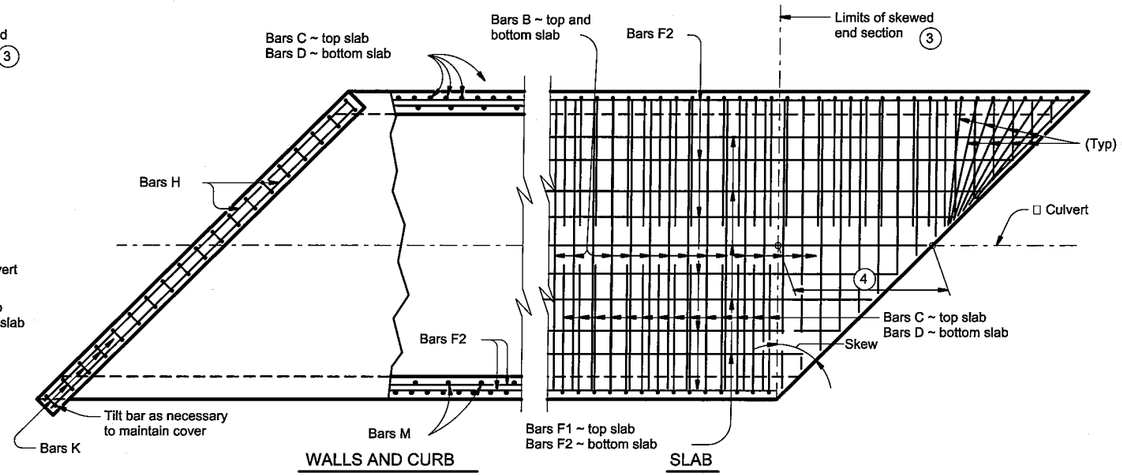
PSET-RP

FILE: psetrpss.dgn	DN: RLW	CK: KLR	DW: JTR	CK: GAF
©TxDOT February 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	72	391	CS
11-10: Add note for synthetic fibers.	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		251

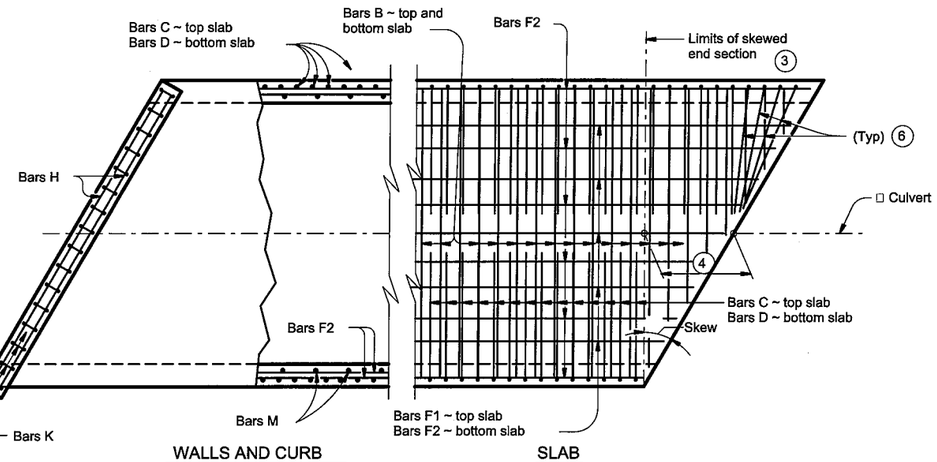
DATE:
FILE:



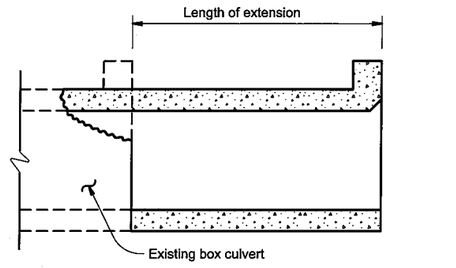
PLAN OF SKEWED ENDS ~ FROM 0° TO 15° (7)



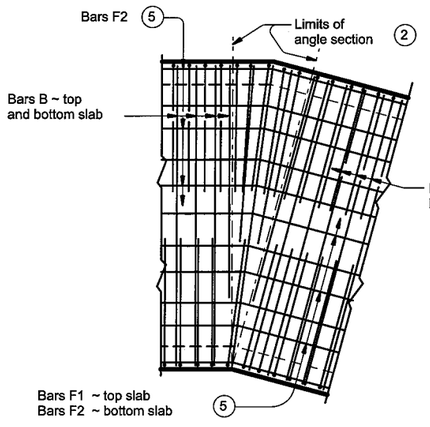
PLAN OF SKEWED ENDS ~ OVER 30° TO 45°



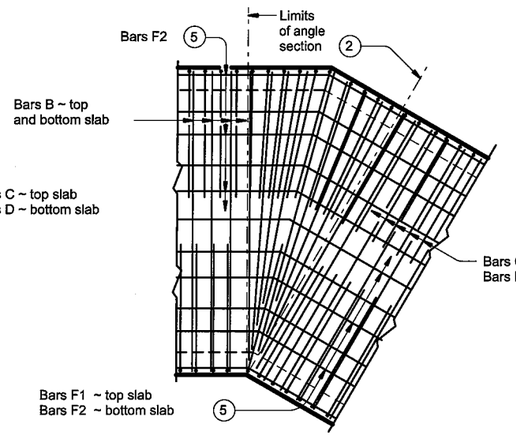
PLAN OF SKEWED ENDS ~ OVER 15° TO 30°



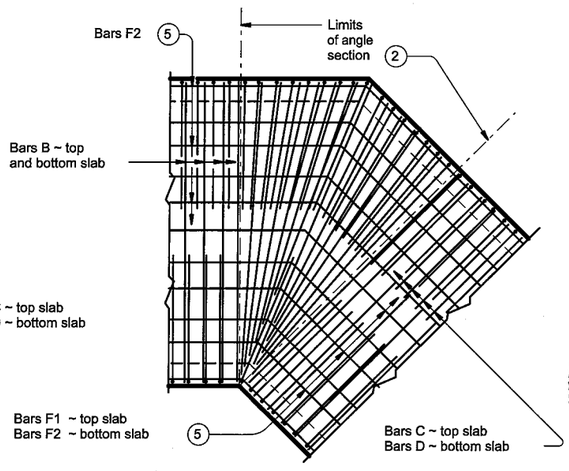
LENGTHENING DETAIL (1)



PLAN OF ANGLE SECTION ~ FROM 0° TO 15°



PLAN OF ANGLE SECTION ~ OVER 15° TO 30°



PLAN OF ANGLE SECTION ~ OVER 30° TO 45°

(1) For skewed box culverts with less than 2'-0" of fill, break back the top slab to provide a 1'-10" minimum lap of the existing longitudinal bars with the longitudinal bars in the extension.

For non-skewed box culverts with less than 2'-0" of fill and for skewed or non-skewed culverts with a fill depth of 2'-0" or greater, break back the top slab to provide a 1'-10" minimum lap of the existing longitudinal bars with the longitudinal bars in the extension. Alternatively, if the box is non-skewed, embed #6 anchor bars with a Type III, C, D , E, or F ancher adhesive into the existing walls, top and bottom slab at 1'-6" center-to-center spacing. Minimum embedment depth is 8". Anchor adhesive chosen must be able to achieve a basic bond strength in tension, Nba, of 26.4 kips. Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use. Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing." Test adhesive anchors in accordance with Item 450.3.3, "Tests." Test 3 anchors per 100 anchors installed.

Break back wings and apron as necessary to install the extension. Clean and extend the exposed wingwall and apron reinforcing into the extension. When lengthening existing box culverts with dimensions different than current standard dimensions, form horizontal and vertical transitions as directed by the Engineer. Match bottom slabs to maintain an uninterrupted flow line. Field bend existing and new reinforcing into transitions and maintain specified cover requirements. For top slabs of culverts with overlay, with 1-to-2 course surface treatment, or with the top slab as the final riding surface, adjust the "H" dimension to provide a smooth riding surface.

(2) When the spacing between Bars B becomes less than half of the normal spacing, cut bars to avoid conflict.

(3) The length of Bars B vary in the skewed end sections.

(4) [One half of overall width] x [tangent of the skew angle]

(5) Place Bars F1 and F2 continuously through the angle section. Bend Bars F1 and F2 to remain parallel to the walls of the box culvert.

(6) When necessary to avoid conflictin acute corners, shorten the slab extension leg of Bars C and Bars D to a minimum of 1'-6" for skews of 30° thru 45°.

(7) At the Contractor's option, for skews of 15° or less, place Bars B, C, and D parallel to the skewed end while maintaining spacing along centerline of box. Increase lengths of Bars B shown on the Single Box Culverts Cast-In-Place (SCC) standards sheets to accommodate the skew.

CONSTRUCTION NOTES:

Do not use permanent forms.
When required, lap Bars H 1'-8" for uncoated or galvanized bars.
Provide a minimum of 1 ½" clear cover.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel, if required elsewhere in the plans.
Provide Class C concrete (f'c = 3,600 psi) with these exceptions:
provide Class S concrete (f'c = 4,000 psi) for top slabs of culverts with overlay, with 1-to-2 course surface treatment, or with the top slab as the final riding surface.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

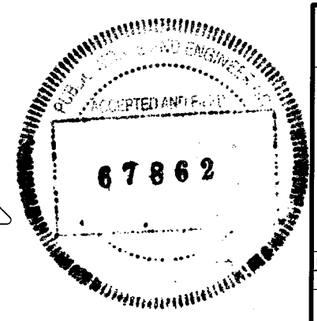
Refer to Single Box Culverts Cast-in-Place (SCC) standard sheets for details of straight sections of culvert.

For skewed sections and angle sections, refer to Single Box Culverts Cast-in-Place (SCC) standard sheets for slab and wall dimensions, bar sizes, maximum bar spacing, and any other details not shown.

For skewed ends with curbs, adjust length of Bars H, number of Bars K, curb concrete volume, and reinforcing steel weight by dividing the values shown on the culvert Single Box Culverts Cast-in-Place (SCC) standard sheets by the cosine of the skew angle.

Cover dimensions are clear dimensions, unless noted otherwise.

HL93 LOADING



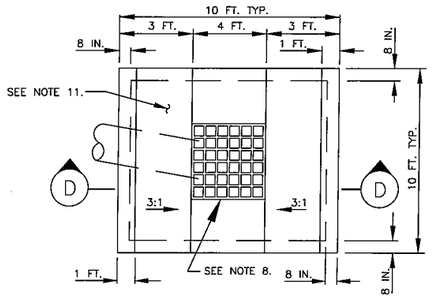
Texas Department of Transportation

Bridge Division Standard

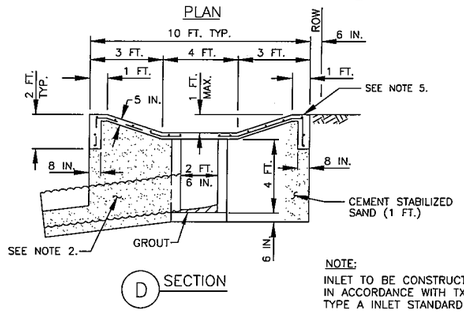
SINGLE BOX CULVERTS CAST-IN-PLACE MISCELLANEOUS DETAILS

SCC-MD

FILE: sccmdste-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	72	391	CS
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		252



PLAN



D SECTION

NOTE:
INLET TO BE CONSTRUCTED IN ACCORDANCE WITH TXDOT TYPE A INLET STANDARD

URBAN BACKSLOPE INTERCEPTOR STRUCTURE

GENERAL NOTES:

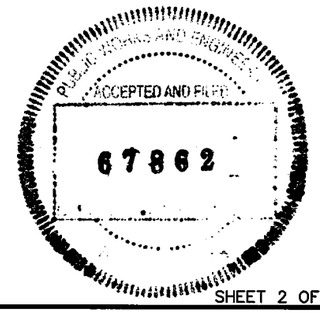
1. PLACE CORRUGATED METAL PIPE INTERCEPTOR OUTFALL PIPES IN ACCORDANCE WITH ITEM 460, "CORRUGATED METAL PIPE." WITHIN HCFCD ROW, USE MINIMUM 24" DIA, 16 GAUGE PIPE.

2. PROVIDE AND PLACE CEMENT STABILIZED BACKFILL AND STRUCTURAL EXCAVATION IN ACCORDANCE WITH ITEM 400, "EXCAVATION AND BACKFILL FOR STRUCTURES.

3. INSTALL STORM SEWER PLANT OUTFALLS, 48 INCHES DIAMETER OR LARGER WITH RIPRAP EROSION PROTECTION, DIMENSIONED AS SHOWN IN THE "TYPICAL STORM SEWER OUTFALL LAYOUT" DETAIL. EXCAVATE AND PLACE EMBANKMENT AND BACKFILL FOR STORM SEWER OUTFALLS IN ACCORDANCE WITH ITEM 400. "EXCAVATION AND BACKFILL FOR STRUCTURES."

4. PROVIDE AND PLACE CONCRETE IN ACCORDANCE WITH ITEM 420-2294 "CL A" CONCRETE (DITCH INTERCEPTOR STUCTURE) (EA.)

5. INTERCEPTOR STRUCTURES:
   a. ADJUST LENGTH AND WIDTH IN FIELD AS NECESSARY.
   b. PROVIDE A 2 FT. DEEP X 8 IN. WIDE TOE WALL AROUND THE STRUCTURE.
   c. STEEL REINFORCEMENT - #4 BARS (GRADE 40) AT 12 INCHES ON CENTER EACH WAY.
   d. ANY INTERCEPTOR OUTFALL PIPE LARGER THAN MAXIMUM SIZE INDICATED REQUIRES A SEPARATE DETAIL.
   e. MATCH TOP OF CONCRETE WITH NATURAL GROUND
6. SET THE FLOWLINE OF OUTFALL PIPES 1 FOOT ABOVE THE CHANNEL FLOWLINE OR 1 FOOT ABOVE THE NORMAL WATER LEVEL, WHICHEVER IS HIGHEST, UNLESS OTHERWISE SHOW IN PLANS.
7. BACKFILL ANY VOIDS BEYOND THE LIMITS OF THE CONCRETE INTERCEPTOR PAD WITH CEMENT STABILIZED BACKFILL PER ITEM 400.
8. INTERCEPTOR STRUCTURES SHOWN ARE FOR SIZES 42 INCH DIAMETER AND SMALLER. LARGER DIAMETER PIPE ARE DETAILED ELSEWHERE IN THE PLANS.
9. SEE CONCRETE CHANNEL LINING DETAIL SHEET FOR CMP OUTFALL DETAILS THROUGH CONCRETE CHANNEL RIPRAP.
10. OUTFALL DETAILS SHOWN ARE SUITABLE ON SLOPES UP TO AND INCLUDING 4:1. FLATTER SLOPES WILL REQUIRE AN INDIVIDUALLY DESIGNED STRUCTURE.
11. FOR URBAN INTERCEPTOR STRUCTURES, IF APPLICABLE, SEE TxDOT STANDARDS FOR INLETS TYPES A, AD, AND AAD, AND RIPRAP DETAILS AROUND.



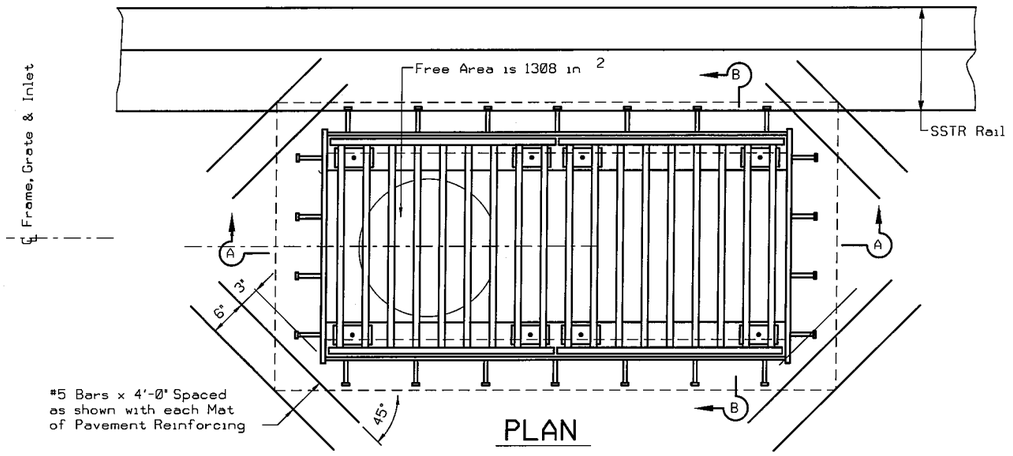
Texas Department of Transportation
Houston District

HCFCD INTERCEPTOR STRUCTURE DETAILS

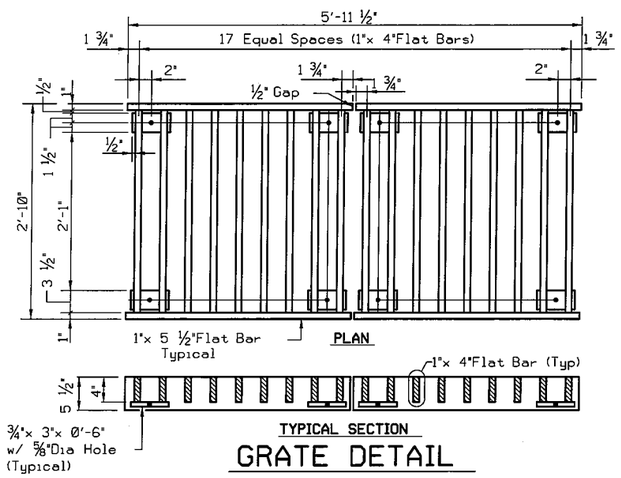
HCFCD-ISD (2)

FILE: STDG5.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT DEC,2012	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS	HOU	6	STP 1802(783)MM	253
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	HARRIS	0912	72	391	CS

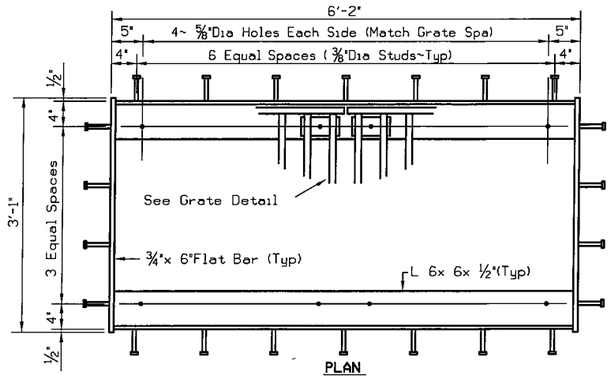
STDG5Cb



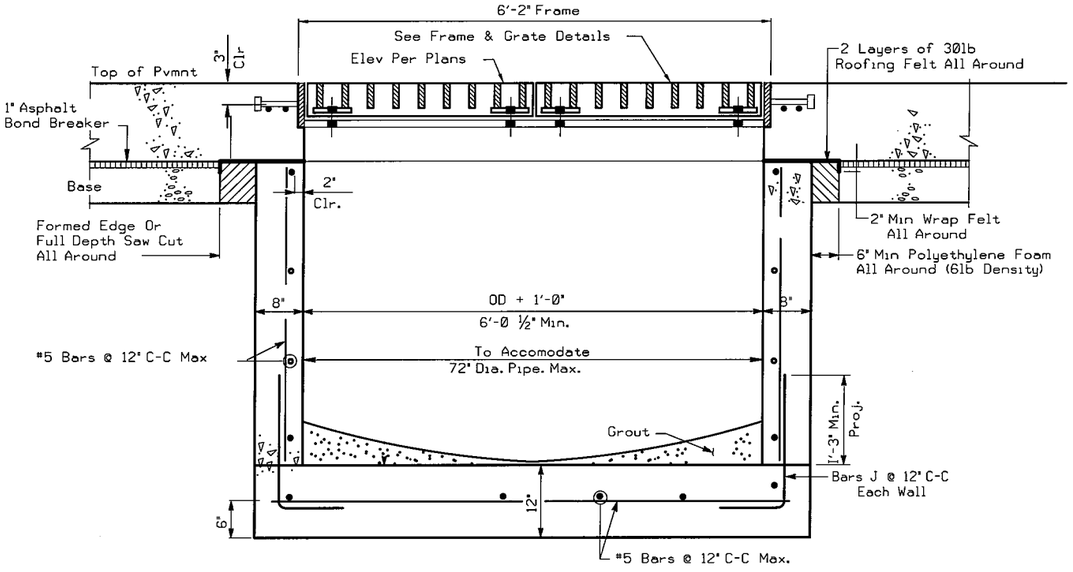
PLAN



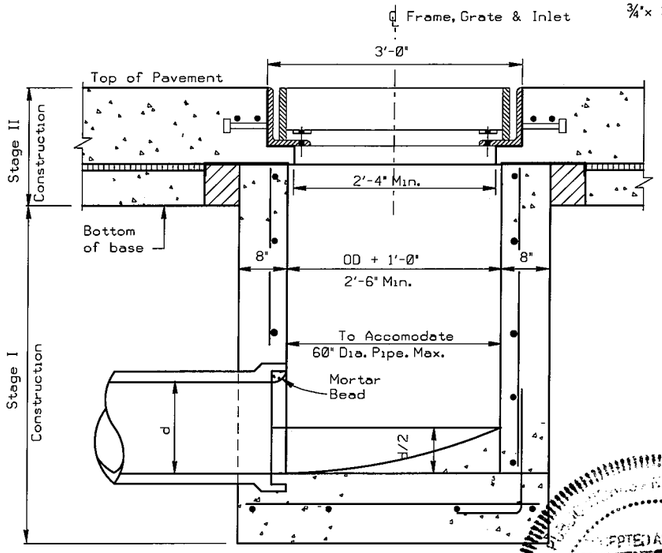
GRATE DETAIL



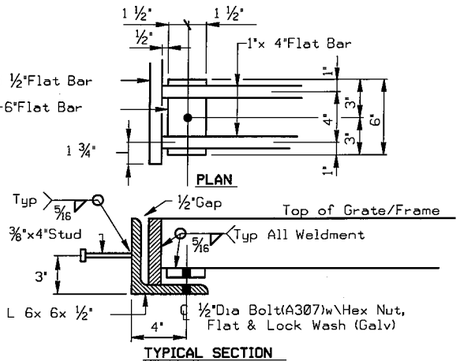
FRAME DETAIL



SECTION A-A



SECTION B-B



WELDMENT DETAIL

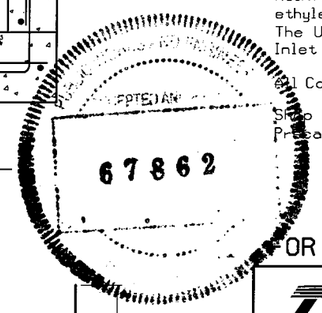
GENERAL NOTES:

All steel is ASTM-A36 and shall be galvanized after fabrication.

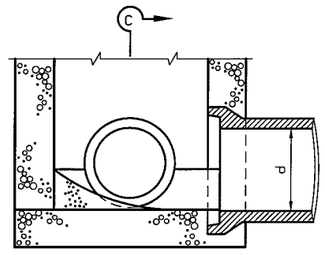
Cost Of Furnishing And Installing Frames, Grates, Additional Pavement Reinforcing, Roofing Felt And Polyethylene Foam Shall Be Included In The Unit Price Bid For The Type Of Inlet Selected.

All Concrete Shall Be Class C.

Shop Drawings Will Be Required For Precast Construction Of Inlets.

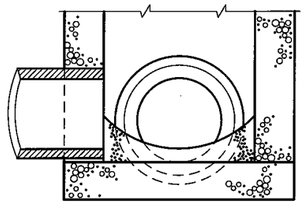


FOR TRAFFIC LOADS

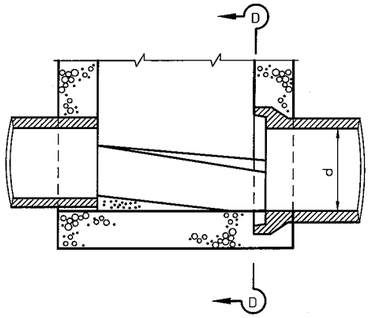


PART SECTION AT INVERT

Showing Shaping Of Invert, Pipe Entering From Adjacent Sides

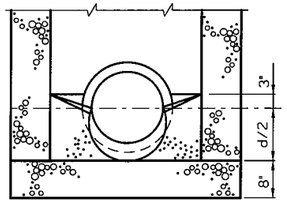


SECTION C-C

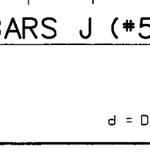


PART SECTION AT INVERT

Showing Shaping Of Invert, Pipe Entering From Opposite Sides



SECTION D-D



BARS J (#5)

d = Diameter

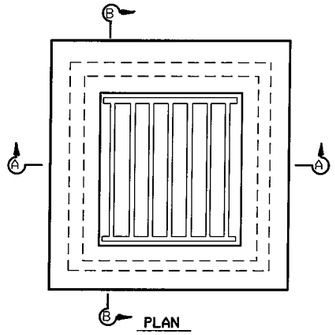
Texas Department of Transportation
Houston District

INLET TYPE AZ2G

HIL-AZ2G

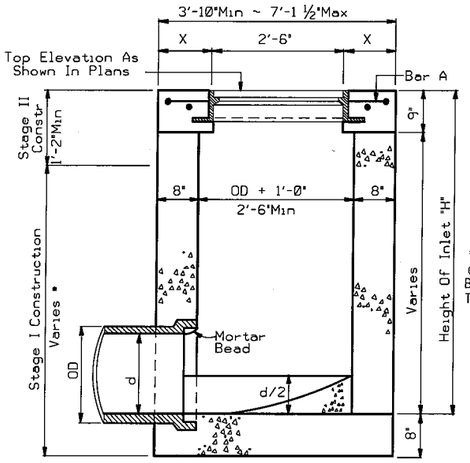
FILE: STDD7.DGN	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT	STD:	
©TxDOT Feb 2010	DIST	FED REG	PROJECT NO.			SHEET
REVISIONS	HOUS	6	STP 1802(782)MM			254
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	HARRIS		0912	72	391	CS

STDD7.DGN

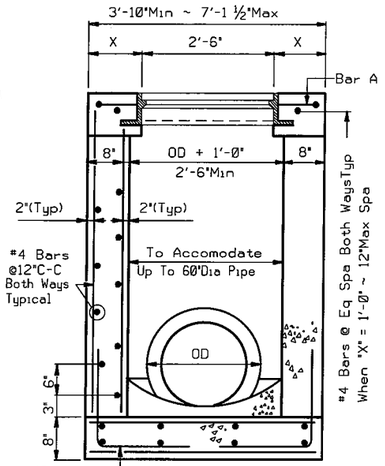


• But Not Less Than Six Inches Over Highest Entering Pipe.

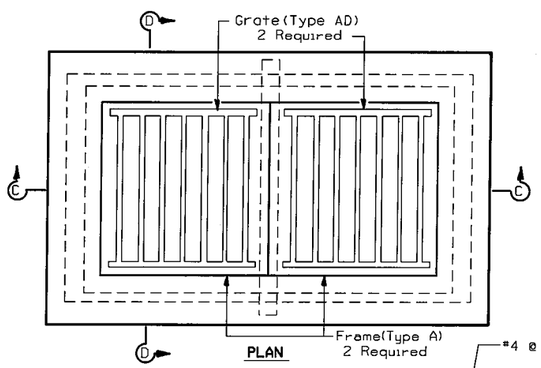
X = 8" Min to 3'-9" Max



SECTION A-A

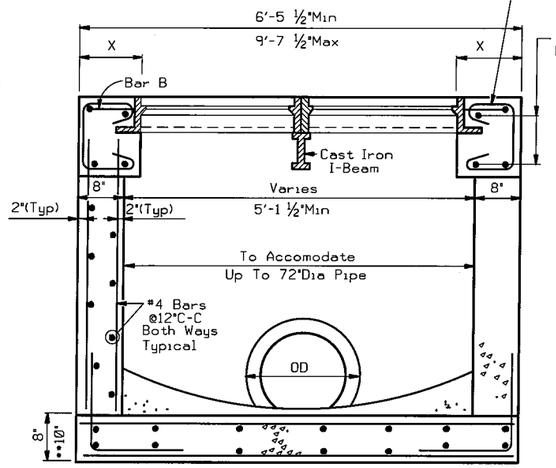


SECTION B-B

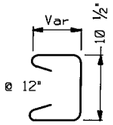


• But Not Less Than Six Inches Over Highest Entering Pipe.

•• For Pipe Diameters 66" And Greater

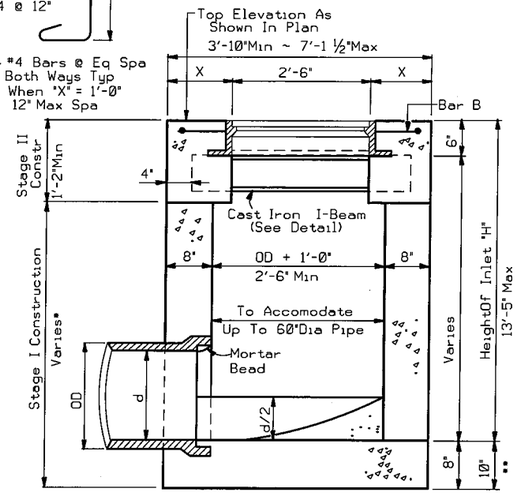


SECTION C-C



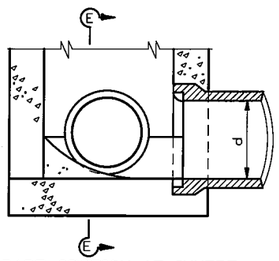
#4 @ 12"

#4 Bars @ Eq Spa Both Ways Typ When "X" = 1'-0" 12" Max Spa

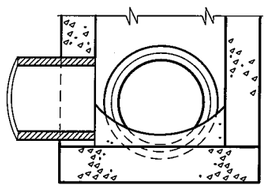


SECTION D-D

INLET TYPE AD

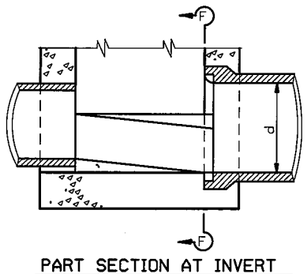


PART SECTION AT INVERT

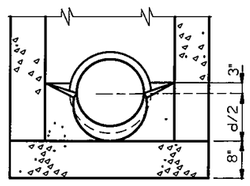


SECTION E-E

Showing Shaping Of Invert, Pipe Entering From Adjacent Sides



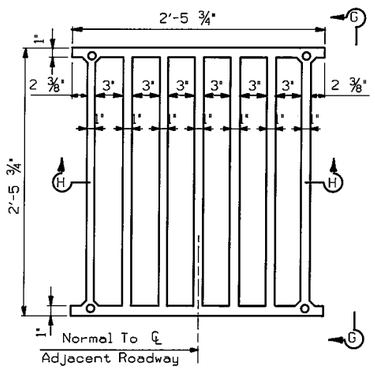
PART SECTION AT INVERT



SECTION F-F

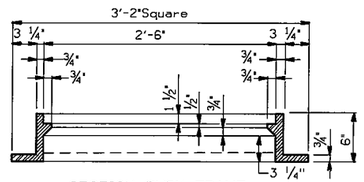
Showing Shaping Of Invert, Pipe Entering From Opposite Sides

INLET TYPE AAD

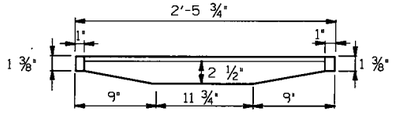


PLAN

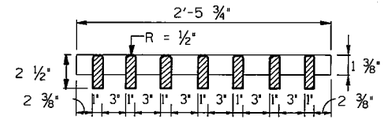
Provide 4 ~ Stainless Steel Hex Head Bolts per Grate



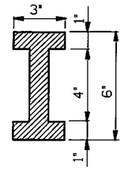
SECTION THRU FRAME



ELEVATION G-G



SECTION H-H



SECTION OF CAST IRON I-BEAM

FRAME AND GRATE

Type AD ~ Neenah No.3418 or EJIW No.V-4880-2
Type AAD ~ Neenah No.3418-2 or EJIW No.V-4881-2

d = Diameter
R = Radius

GENERAL NOTES:

Type AD Inlet contains a single frame with grate. Type AAD Inlet contains a double frame and double grate with an I-beam.

Frame and Grates may be gray cast iron.

The Furnishing And Installation Of Cast Iron I-Beams Shall Be Considered Incidental To Inlet (Compl) (Ty AAD) Or Inlet (Stage II) (Ty AAD) As The Case May Be.

Where Size Of Pipes Passing Thru Inlet Exceeds 30", Increase Inside Width To Diameter Of Pipe Plus 1'-0" (OD + 1'-0")

Cast Iron Manhole Steps (See Manhole Details) Spaced At 16" Centers And Located On Wall Specified By The Engineer Shall Be Provided And Installed Where "D" Exceeds 5'-0".

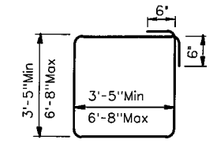
See Standard or Detail Sheet For Excavation and Backfill Diagrams.

Type AD & AAD Inlets Shall Be Built To Stage I And Finished After All Grading Operations Are Substantially Completed.

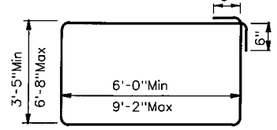
Shop Drawings Will Be Required For Precast Construction Of Inlets.

Upon installation of the grates the threads of the bolts shall be coated with thread lock type adhesive (Lockite or equal). Reapply thread lock adhesive each time grates are removed.

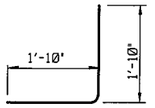
Bolted grates and frames are a matched set, do not unbolt without 'Match Marking' so that grates and frames are re-installed as originally built.



BAR A (#4)



BAR B (#4)



BAR L (#4)

NOT FOR TRAFFIC LOADS

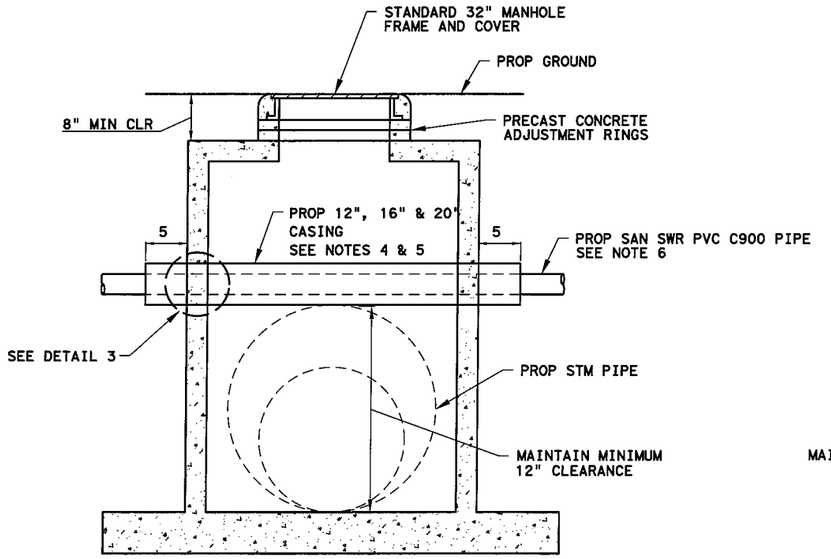
Texas Department of Transportation
Houston District

INLETS TYPE AD & AAD

HIL-AD/AAD

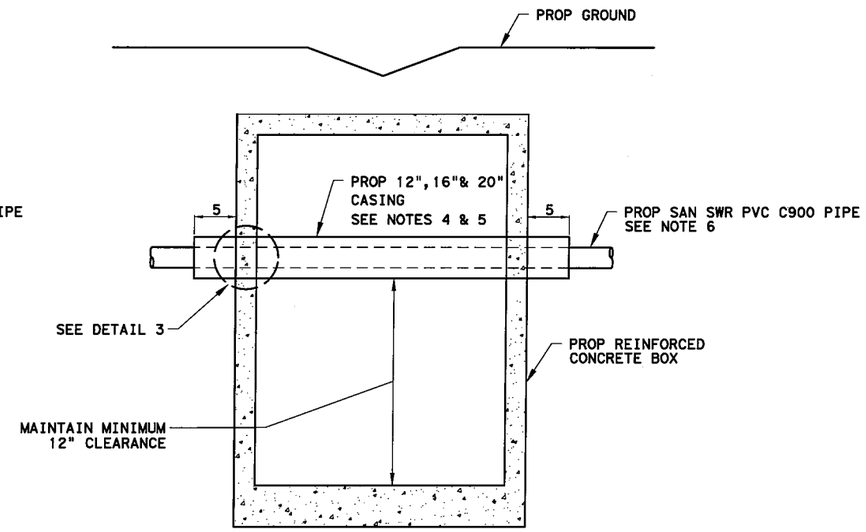
FILE: STDD5.DGN	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT	STD#	
© TxDOT 2014	DIST	FED REG	PROJECT NO.			SHEET
REVISIONS	HOUS	6	STP 1802(783)MM			255
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	HARRIS		0912	72	391	CS

STDD5.DGN



1 CONFLICT MANHOLE TYPICAL DETAIL

NOT TO SCALE

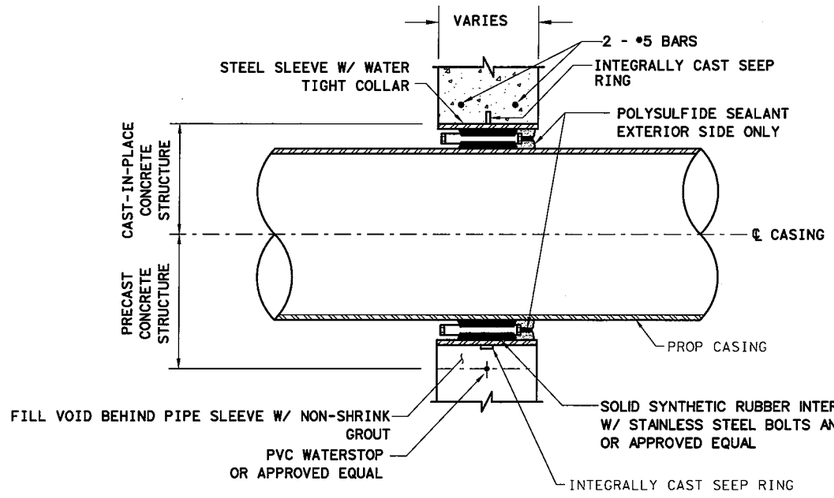


2 BOX CROSSING TYPICAL DETAIL

NOT TO SCALE

NOTES

1. MAINTAIN POSITIVE FLOW.
2. REFER TO STORM SEWER STANDARD DETAILS FOR TYPE "A" INLET RISER OR TYPE "C" MANHOLE RISER.
3. ALL OPENINGS AT PIPE SHALL BE SEALED WITH LINK SEAL STAINLESS STEEL BOLT AND NUTS, BY GPT LINK-SEAL OR APPROVED EQUAL. ANY REMAINING VOIDS MAY BE FILLED WITH ELASTOMETRIC GROUT (TYPE 3 CEMENT).
4. 4" SANITARY SEWER PIPE TO BE INSTALLED IN 12" DIA CASING. 6" TO 8" SANITARY SEWER PIPE TO BE INSTALLED IN 16" DIA CASING.
5. 10" TO 12" SANITARY SEWER PIPE TO BE INSTALLED IN 20" DIA CASING.
6. REMOVE AND REPLACE EXISTING SANITARY SEWER WITH PROPOSED PVC C900 (SDR 18) SANITARY SEWER WITH RESTRAINED JOINTS CENTERED THROUGH STORM MANHOLE/BOX.



3 TYPICAL WALL PENETRATION DETAIL

NOT TO SCALE

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED
PROFESSIONAL ENGINEER
02/06/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

67862

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

DRAINAGE
MISCELLANEOUS DETAILS

SHEET 1 OF 1

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	256

Plotted on: 2/6/2020 4:26:03 PM AAGakhar
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STA 1+95

EXIST F.H. TO REMAIN

CAUTION EXIST GAS FACILITY IN VICINITY

PPCA STA 3+64

BELTWAY 8 FRONTAGE ROAD

EXIST ROW

PROP 4'X4' RCB (SEE NOTE 1)

2-6"X45° BENDS, RJ
1-6" GV W/BOX
1-6" CUT, PLUG & ABANDON
1-6" WET CONNECTION

MEMORIAL DR

℄ MEMORIAL DR.

PROP 6" DIP W/RJ

PROP 16" DIP W/ RJ

PROP 48" RCP (SEE NOTE 1)

MATCHLINE LINE STA 5+00 SEE SHEET 2 OF 12

1-16"X16" TEE, RJ

PROP 16" DIP W/ RJ

CAUTION EXIST GAS FACILITY IN VICINITY

1-16"X8" REDUCER

2-8"X45° BENDS, RJ
1-8" GV W/BOX
1-8" CUT, PLUG & ABANDON
1-8" WET CONNECTION

2-16"X45° BENDS, RJ
1-16" GV W/BOX
1-16" WET CONNECTION
1-16" CUT, PLUG & ABANDON

1-16"X6" TS&V W/BOX
1-F.H. 3' BC

1-16"X6" TS&V W/BOX

LEGEND

- EXISTING ROW
- PROPOSED WATERLINE
- PROPOSED SAN SWR
- PROPOSED RESTRAINED JOINT
- ABANDON EXIST SS
- CRITICAL LOCATE

NOTES:

1. REFER TO DRAINAGE AND ROADWAY IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
2. REFER TO DEMOLITION PLAN SHEETS FOR MORE INFORMATION.
3. MAINTAIN WATER SERVICES TO ALL CUSTOMERS, FIRE HYDRANTS, AND INTERCONNECTIONS AS NECESSARY FOR CONSTRUCTION.
4. ABANDON EXISTING 16"/8" WL AND TRANSFER SERVICES TO PROPOSED 16"/8" WATER LINES. COORDINATE WITH PROPERTY OWNERS.
5. REFER TO WATER LINE AND SAN SWR CROSSINGS FOR MORE INFORMATION.
6. SUBMIT CCTV VIDEO INSPECTIONS OF ALL NEW SANITARY SEWER MAINLINES, LATERALS, AND MANHOLES TO THE CITY OF HOUSTON, IN ACCORDANCE WITH CITY OF HOUSTON SPECIFICATION 02558.
7. POTENTIALLY PETROLEUM CONTANIMATED AREA (PPCA) HAS BEEN IDENTIFIED FROM STA 1+95 TO 3+64. REFER TO SOIL AND GROUNDWATER MANAGEMENT PLAN FOR MORE INFORMATION.

PROP PGL

(-)0.48 %

(+)0.35 %

PROP 16" WL

1' MIN CLR

4' MIN COVER

CONNECT TO EXIST 16" WL

PROP 6" FH LEAD

PROP 100 YR WSE

PROP 48" RCP

PROP 2 YR HGL

PROP 4'X4' RCB

18" MIN CLR

PROP 16" WL

PROP 6" DIP W/ RJ

LIMITS OF DIP RESTRAINED JOINTS SEE CITY OF HOUSTON DETAIL 02511-01

0 40 80
(IN FEET)
SCALE: PLAN 1": 40'

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
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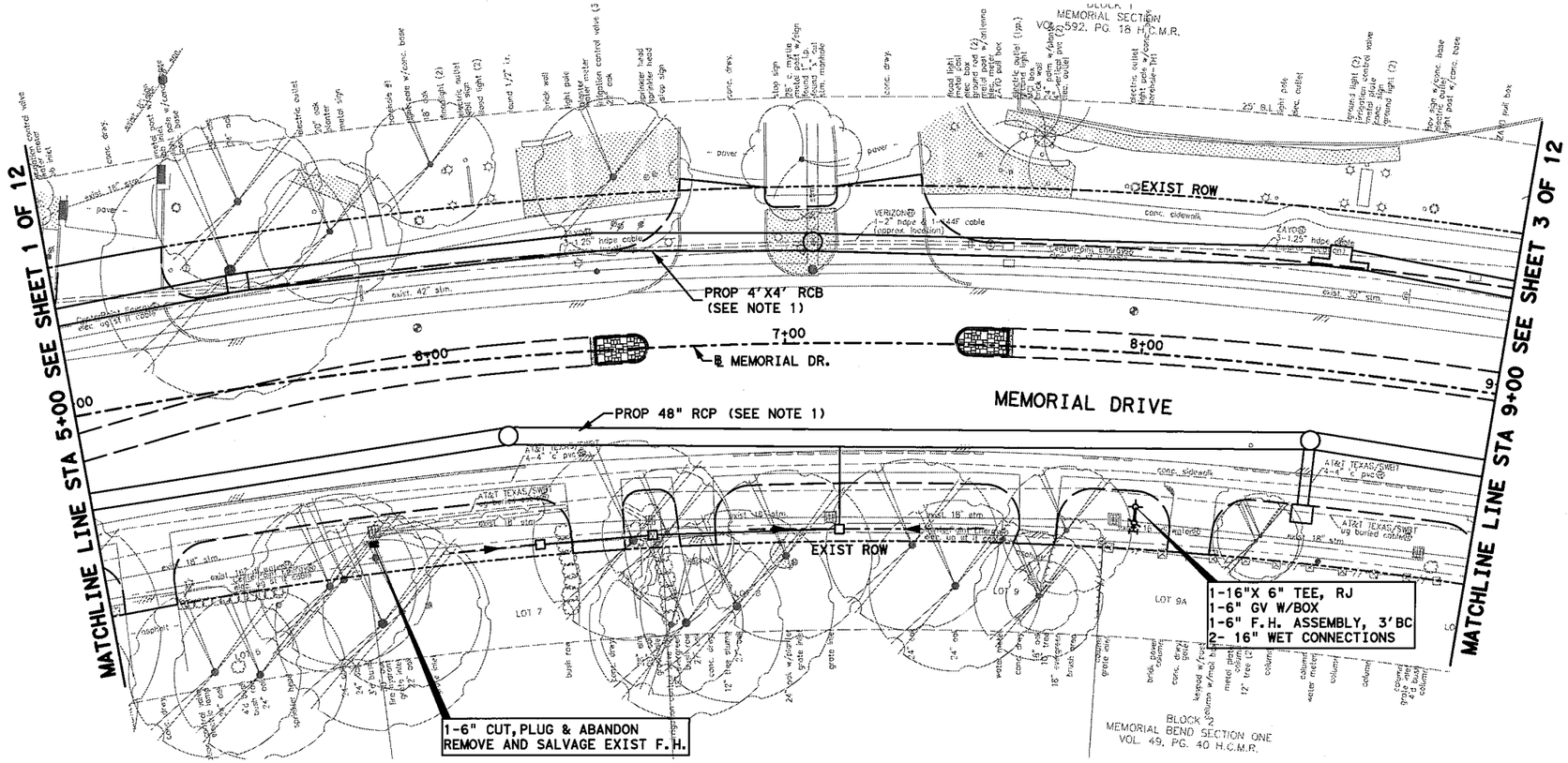
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

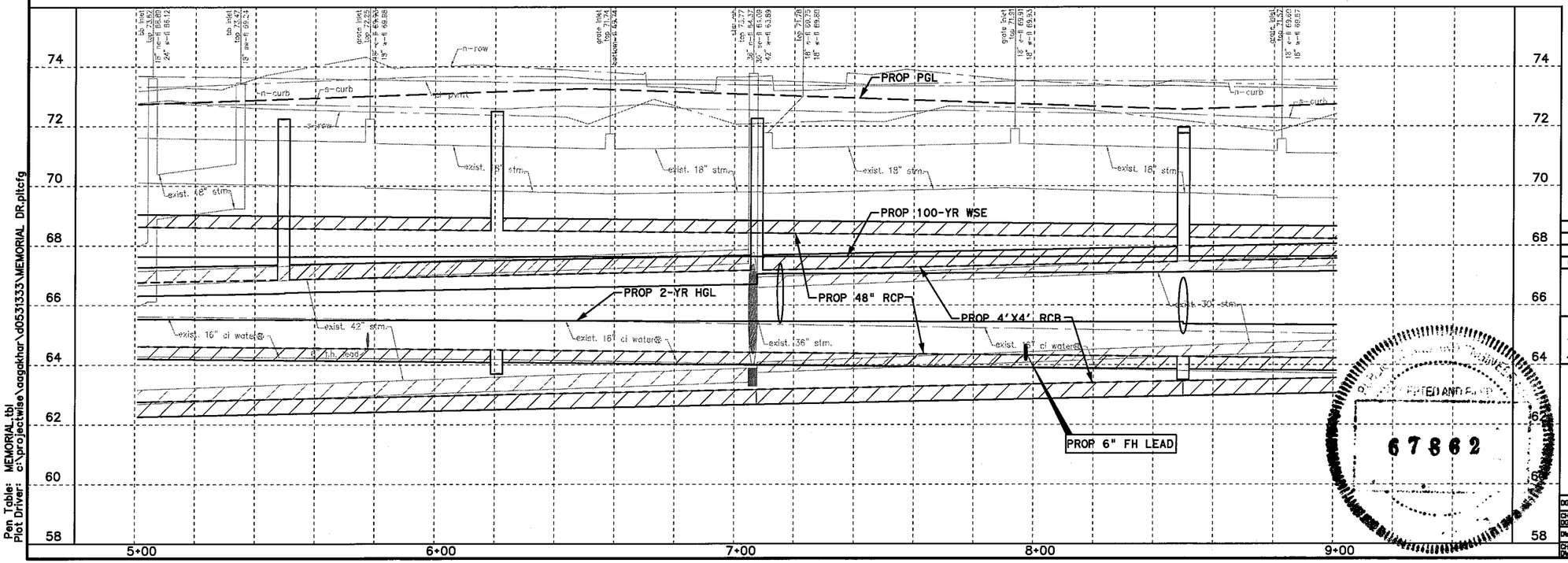
PLAN & PROFILE WATER & SAN SWR IMPROVEMENTS BEGIN PROJECT TO STA 5+00

SHEET 1 OF 12

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWN:	HOU	HARRIS	0912	72	391	257

ACCEPTED AS NOTED
67862





LEGEND

- EXISTING ROW
- PROPOSED WATERLINE
- PROPOSED SAN SWR
- PROPOSED RESTRAINED JOINT
- ABANDON EXIST SS
- CRITICAL LOCATE

NOTES:

1. REFER TO DRAINAGE AND ROADWAY IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
2. REFER TO DEMOLITION PLAN SHEETS FOR MORE INFORMATION.
3. MAINTAIN WATER SERVICES TO ALL CUSTOMERS, FIRE HYDRANTS, AND INTERCONNECTIONS AS NECESSARY FOR CONSTRUCTION.
4. SUBMIT CCTV VIDEO INSPECTIONS OF ALL NEW SANITARY SEWER MAINLINES, LATERALS, AND MANHOLES TO THE CITY OF HOUSTON, IN ACCORDANCE WITH CITY OF HOUSTON SPECIFICATION 02558.

0 40 80
(IN FEET)
SCALE: PLAN 1":40'

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED
PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

PLAN & PROFILE WATER & SAN SWR IMPROVEMENTS STA 5+00 TO STA 9+00

SHEET 2 OF 12

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	258

67862

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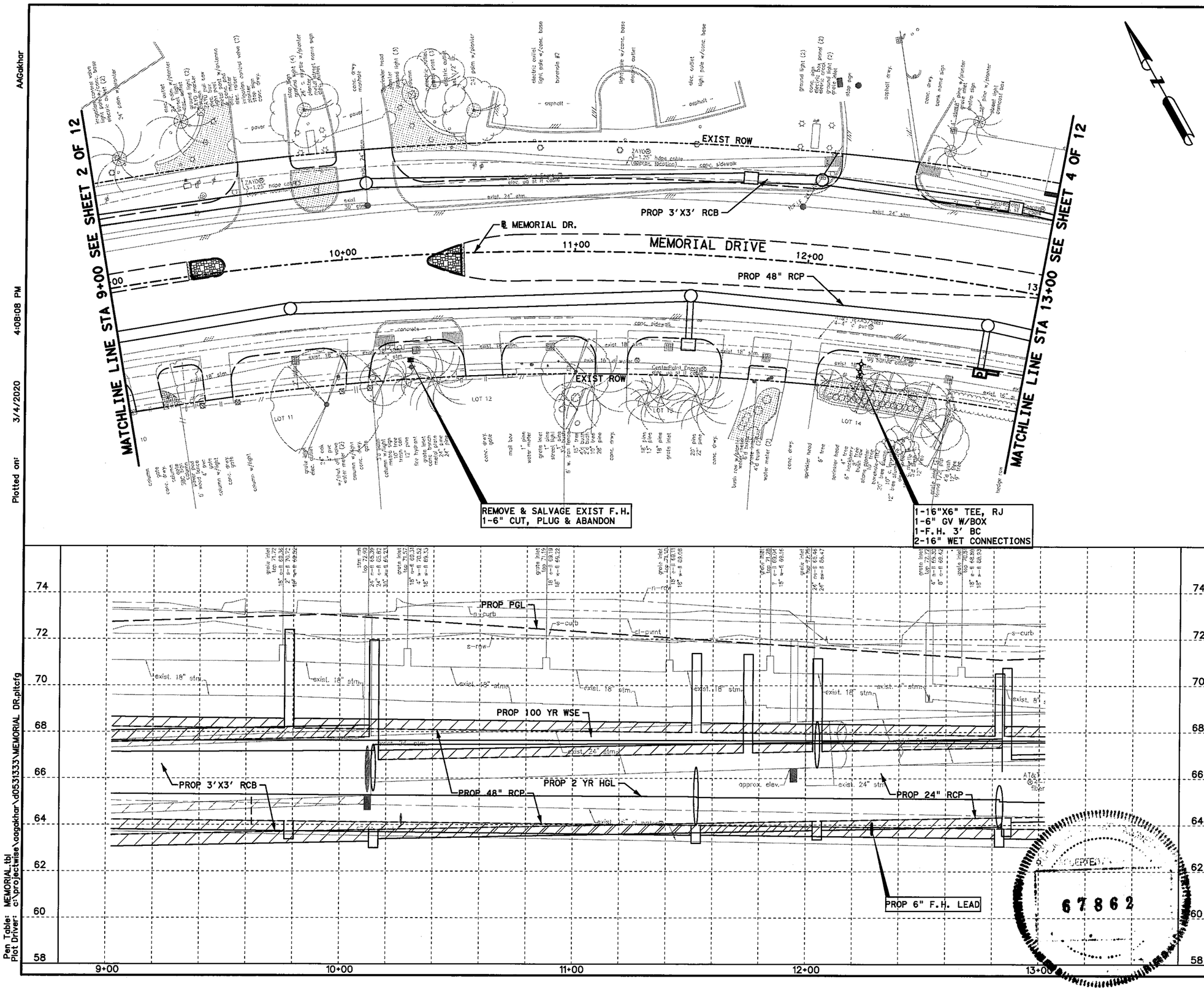

LEGEND

- EXISTING ROW
- PROPOSED WATERLINE
- PROPOSED SAN SWR
- PROPOSED RESTRAINED JOINT
- ABANDON EXIST SS
- CRITICAL LOCATE

NOTES:

1. REFER TO DRAINAGE AND ROADWAY IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
2. REFER TO DEMOLITION PLAN SHEETS FOR MORE INFORMATION.
3. MAINTAIN WATER SERVICES TO ALL CUSTOMERS, FIRE HYDRANTS, AND INTERCONNECTIONS AS NECESSARY FOR CONSTRUCTION.
4. ABANDON EXISTING 16"/8" WL AND TRANSFER SERVICES TO PROPOSED 16"/8" WATER LINES. COORDINATE WITH PROPERTY OWNERS.
5. SUBMIT CCTV VIDEO INSPECTIONS OF ALL NEW SANITARY SEWER MAINLINES, LATERALS, AND MANHOLES TO THE CITY OF HOUSTON, IN ACCORDANCE WITH CITY OF HOUSTON SPECIFICATION 02558.

0 40 80

(IN FEET)
SCALE: 1"=40' - H
1"=4' - V

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED
PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

PLAN & PROFILE WATER & SAN SWR IMPROVEMENTS STA 9+00 TO STA 13+00

SHEET 3 OF 12

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	259

67862

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1-8" WET CONNECTION
2-8"X45 BENDS, RJ
1-12"X8" REDUCER, RJ
1-8" CUT, PLUG & ABANDON
1-8" GV W/BOX

PROP 155 LF OF 6" FM, RJ
(BY TRENCHLESS)
SEE NOTE 5

PROP 12" DIP W/ RJ
BY TRENCHLESS
SEE NOTE 5

PROP 125 LF OF 10" FM, RJ
(BY TRENCHLESS)
SEE NOTE 5

PROP 24" RCP
SEE NOTE 1

PROP 48" RCP
SEE NOTE 1

PROP 2-10'X5' RCB
SEE NOTE 1

1-16"X12" TS&V W/BOX

PROP 12" WL BY OTHERS

REMOVE & SALVAGE EXIST F.H.
1-6" CUT, PLUG & ABANDON

1-16"X6" TEE, RJ
1-6" GV W/ BOX
1-F.H. ASSEMBLY, 11' B.C.
2-16" WET CONNECTIONS
REMOVE 5 LF OF EXIST 16" WL

MATCHLINE LINE STA 13+00 SEE SHEET 3 OF 12

MATCHLINE LINE STA 17+00 SEE SHEET 5 OF 12

MEMORIAL DRIVE

BROKEN BOUGH DR

EXIST ROW

LEGEND

- EXISTING ROW
- PROPOSED WATERLINE
- PROPOSED SAN SWR
- PROPOSED RESTRAINED JOINT
- ABANDON EXIST SS
- CRITICAL LOCATE

NOTES:

1. REFER TO DRAINAGE AND ROADWAY IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
2. REFER TO DEMOLITION PLAN SHEETS FOR MORE INFORMATION.
3. MAINTAIN WATER SERVICES TO ALL CUSTOMERS, FIRE HYDRANTS, AND INTERCONNECTIONS AS NECESSARY FOR CONSTRUCTION.
4. ABANDON EXISTING 8" WL AND TRANSFER SERVICES TO PROPOSED 12" WATER LINES. COORDINATE WITH PROPERTY OWNERS.
5. REFER TO WATER LINE AND SAN SWR CROSSINGS FOR MORE INFORMATION.
6. SUBMIT CCTV VIDEO INSPECTIONS OF ALL NEW SANITARY SEWER MAINLINES, LATERALS, AND MANHOLES TO THE CITY OF HOUSTON, IN ACCORDANCE WITH CITY OF HOUSTON SPECIFICATION 02558.

PROP 10" SAN SWR FM
PROP 6" SAN SWR FM
PROP PGL
PROP 100-YR WSE
PROP 24" RCP
PROP 48" RCP
PROP 2-YR HGL
PROP 12" WL
PROP 48" RCP
PROP 6" FH LEAD
PROP 2-10'X5' RCB

0 40 80
(IN FEET)
SCALE: 1"=40' - H
1"=4' - V

STATE OF TEXAS
MICHAEL A. SALINAS
123742
LICENSED PROFESSIONAL ENGINEER
03/04/2020
Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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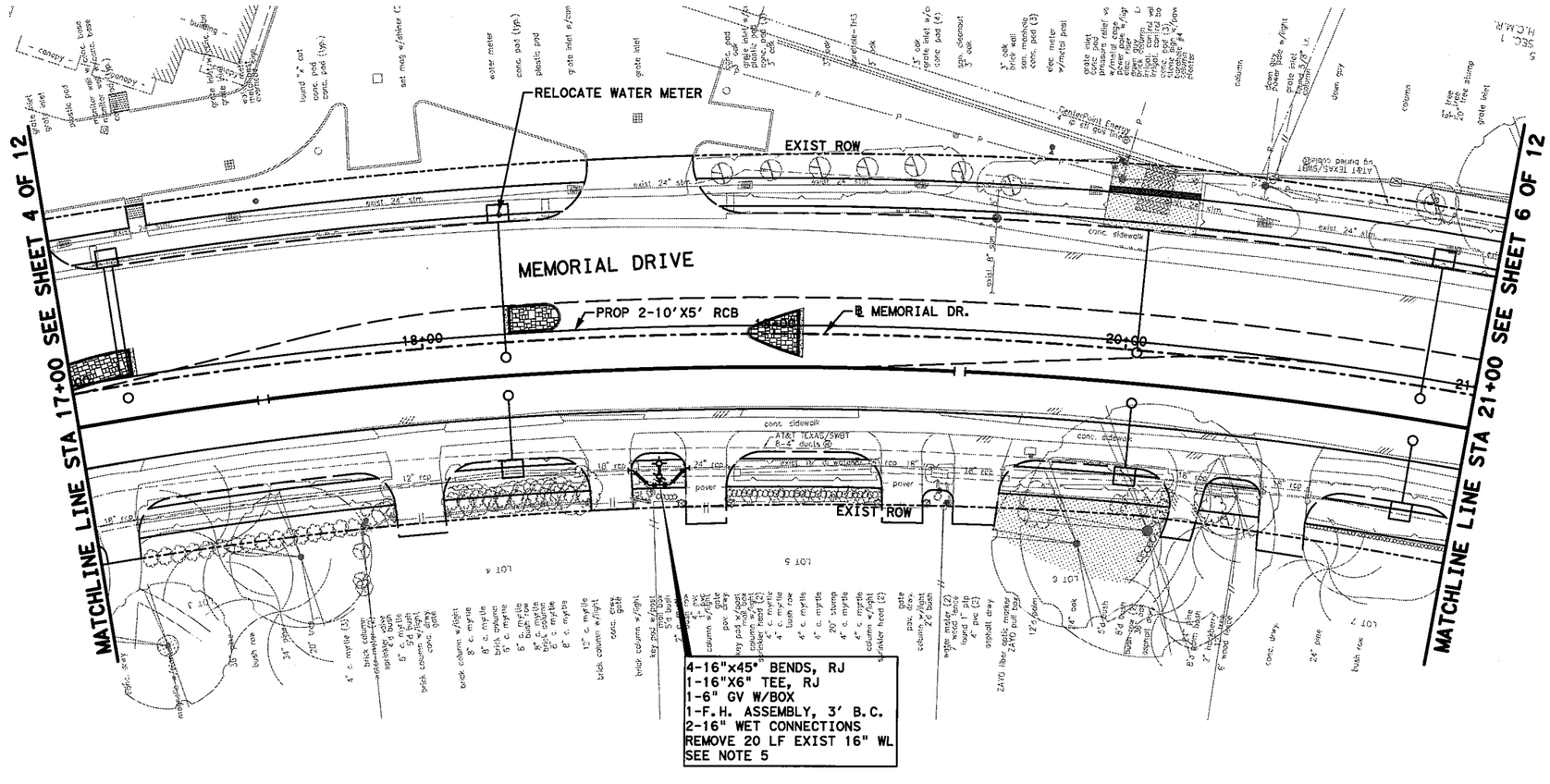
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

PLAN & PROFILE
WATER & SAN SWR IMPROVEMENTS
STA 13+00 TO STA 17+00

SHEET 4 OF 12

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	260

67862



LEGEND

- EXISTING ROW
- PROPOSED WATERLINE
- PROPOSED SAN SWR
- PROPOSED RESTRAINED JOINT
- ABANDON EXIST SS
- CRITICAL LOCATE

NOTES:

1. REFER TO DRAINAGE AND ROADWAY IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
2. REFER TO DEMOLITION PLAN SHEETS FOR MORE INFORMATION.
3. MAINTAIN WATER SERVICES TO ALL CUSTOMERS, FIRE HYDRANTS, AND INTERCONNECTIONS AS NECESSARY FOR CONSTRUCTION.
4. ABANDON EXISTING 16"/8" WL AND TRANSFER SERVICES TO PROPOSED 16"/8" WATER LINES. COORDINATE WITH PROPERTY OWNERS.
5. RELOCATE EXIST WATER METER OUTSIDE OF SIDEWALK LIMITS.
6. SUBMIT CCTV VIDEO INSPECTIONS OF ALL NEW SANITARY SEWER MAINLINES, LATERALS, AND MANHOLES TO THE CITY OF HOUSTON, IN ACCORDANCE WITH CITY OF HOUSTON SPECIFICATION 02558.

0 40 80

(IN FEET)
SCALE: 1":40' - H
1":4' - V

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED
PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

PLAN & PROFILE
WATER & SAN SWR IMPROVEMENTS
STA 17+00 TO STA 21+00

SHEET 5 OF 12

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	261

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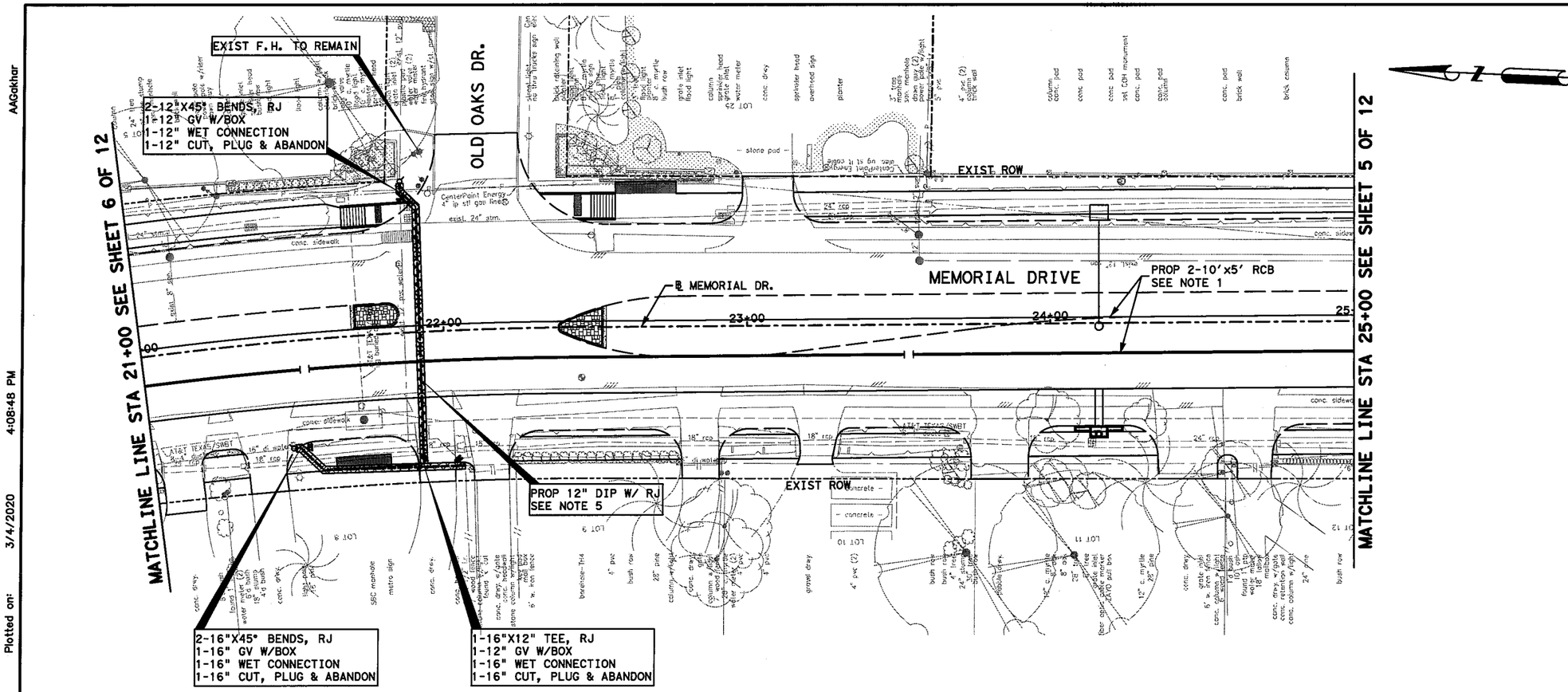

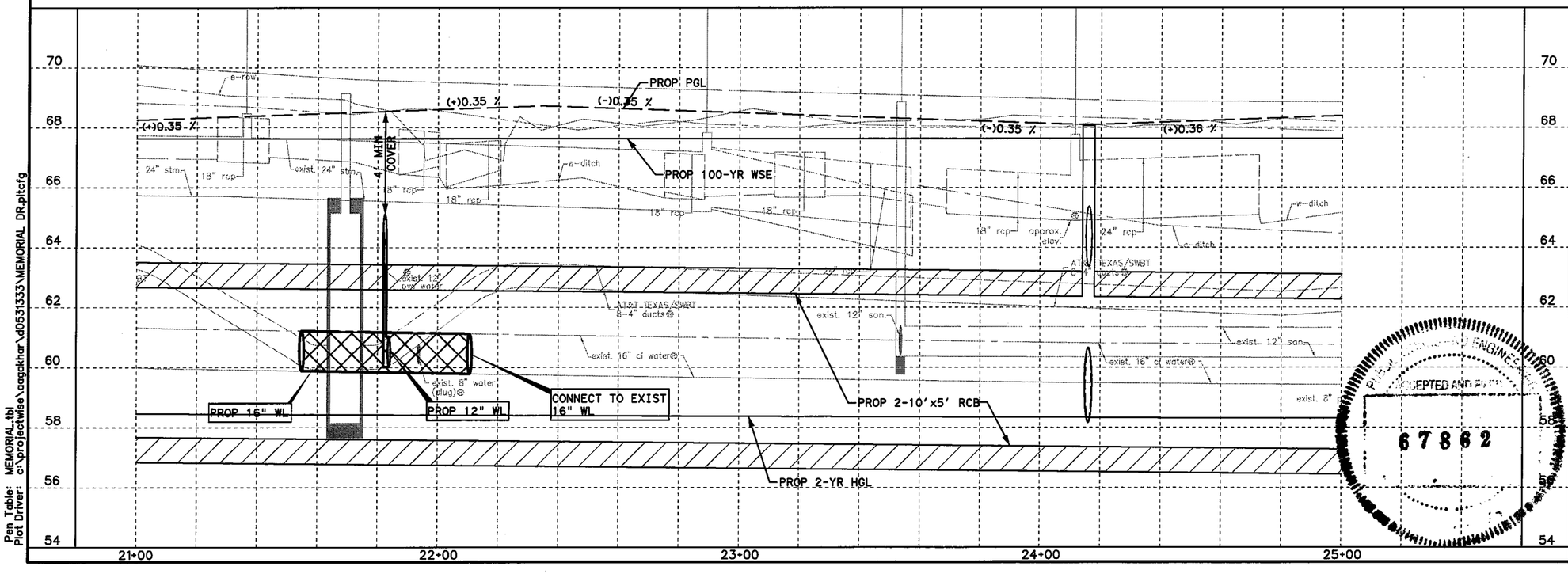

LEGEND

- EXISTING ROW
- PROPOSED WATERLINE
- PROPOSED SAN SWR
- PROPOSED RESTRAINED JOINT
- ABANDON EXIST SS
- CRITICAL LOCATE

NOTES:

1. REFER TO DRAINAGE AND ROADWAY IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
2. REFER TO DEMOLITION PLAN SHEETS FOR MORE INFORMATION.
3. MAINTAIN WATER SERVICES TO ALL CUSTOMERS, FIRE HYDRANTS, AND INTERCONNECTIONS AS NECESSARY FOR CONSTRUCTION.
4. ABANDON EXISTING 16"/8" WL AND TRANSFER SERVICES TO PROPOSED 16"/8" WATER LINES. COORDINATE WITH PROPERTY OWNERS.
5. REFER TO WATER LINE AND SAN SWR CROSSINGS FOR MORE INFORMATION.
6. SUBMIT CCTV VIDEO INSPECTIONS OF ALL NEW SANITARY SEWER MAINLINES, LATERALS, AND MANHOLES TO THE CITY OF HOUSTON, IN ACCORDANCE WITH CITY OF HOUSTON SPECIFICATION 02558.

0 40 80

(IN FEET)
SCALE: 1":40' - H
1":4' - V

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED
PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
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ACCEPTED AND FILED
67862

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

PLAN & PROFILE
WATER & SAN SWR IMPROVEMENTS
STA 21+00 TO STA 25+00

SHEET 6 OF 12

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	262

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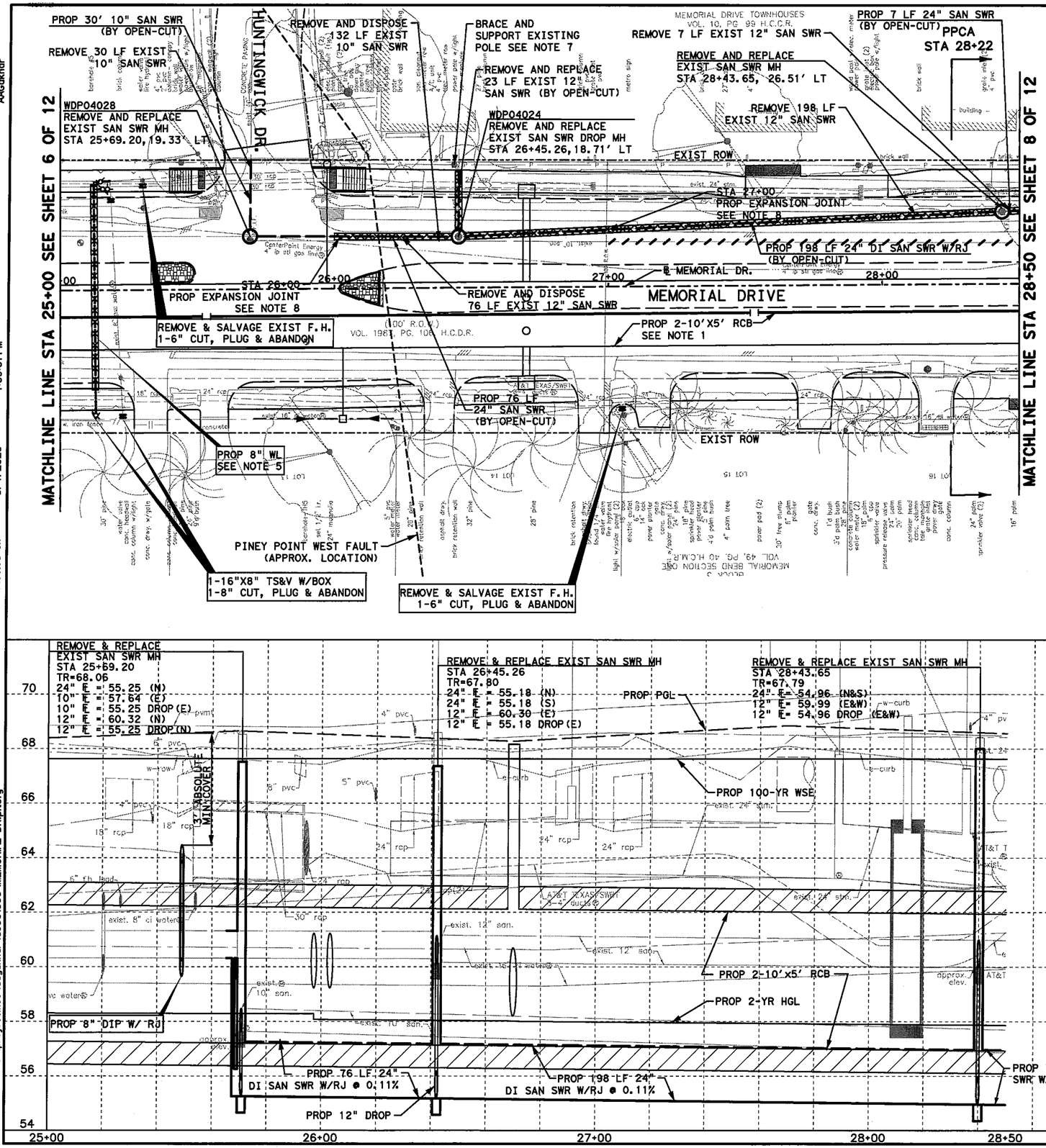

LEGEND

- EXISTING ROW
- PROPOSED WATERLINE
- PROPOSED SAN SWR
- PROPOSED RESTRAINED JOINT
- ABANDON EXIST SS
- CRITICAL LOCATE

NOTES:

1. REFER TO DRAINAGE AND ROADWAY IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
2. REFER TO DEMOLITION PLAN SHEETS FOR MORE INFORMATION.
3. MAINTAIN WATER SERVICES TO ALL CUSTOMERS, FIRE HYDRANTS, AND INTERCONNECTIONS AS NECESSARY FOR CONSTRUCTION.
4. ABANDON EXISTING 16"/8" WL AND TRANSFER SERVICES TO PROPOSED 16"/8" WATER LINES. COORDINATE WITH PROPERTY OWNERS.
5. REFER TO WATER LINE AND SAN SWR CROSSINGS FOR MORE INFORMATION.
6. SUBMIT CCTV VIDEO INSPECTIONS OF ALL NEW SANITARY SEWER MAINLINES, LATERALS, AND MANHOLES TO THE CITY OF HOUSTON, IN ACCORDANCE WITH CITY OF HOUSTON SPECIFICATION 02558.
7. CONTACT COLE STEVENSON AT 713-945-4530 A MINIMUM OF 6 WEEKS PRIOR TO CONSTRUCTING SANITARY SEWER TO BRACE POLE.
8. PROVIDE EBAA IRON FLEX TEND FLEXIBLE EXPANSION JOINT OR APPROVED EQUAL. PROP 24" SAN SWR BETWEEN EXPANSION JOINT SHALL BE RESTRAINED DUCTILE IRON PIPE. PROVIDE TWO WRAPS OF POLYETHYLENE WRAP AROUND DUCTILE IRON PIPE AND EXPANSION JOINT. INCLUDE COST OF FITTING IN 24-INCH DI RESTR JT BID CODE.
9. POTENTIALLY PETROLEUM CONTANIMATED AREA (PPCA) HAS BEEN IDENTIFIED BETWEEN STA 28+22 TO STA 39+10. REFER TO SOIL AND GROUNDWATER MANAGEMENT PLAN FOR MORE INFORMATION.

0 40 80

(IN FEET)
SCALE: 1"=40' - H
1"=4' - V

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED
PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

PLAN & PROFILE WATER & SAN SWR IMPROVEMENTS STA 25+00 TO STA 28+50

SHEET 7 OF 12

ACCEPTED AND FILED
67862

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	263

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MATCHLINE LINE STA 28+50 SEE SHEET 8 OF 12

MATCHLINE LINE STA 32+50 SEE SHEET 6 OF 12

MEMORIAL DRIVE

BOHEME DR

WDP04022
REMOVE AND REPLACE
EXIST SAN SWR MH
STA 29+32.42, 28.94' LT

WDP04011
REMOVE AND DISPOSE
EXIST SAN SWR MH
STA 29+49.12, 23.92' LT

WDP04010
REMOVE AND DISPOSE
EXIST SAN SWR MH
STA 29+44.58
,12.46' LT

WDP04012
REMOVE AND DISPOSE
EXIST SAN SWR MH
STA 31+13.91

REMOVE AND DISPOSE
EXIST 12" SAN SWR

PROP 80 LF
24" SAN SWR

PROP 64 LF
24" SAN SWR

PROP 14 LF
24" SAN SWR

EXIST ROW

REMOVE AND DISPOSE 15 LF
EXIST 8" SAN SWR

ABANDON EXIST SAN SWR MH
STA 31+17.44, 31.73' LT
SEE NOTE 8

PROP ECCENTRIC SAN SWR MH
STA 31+03.90, 30.94' LT

PROP 36 LF 8" SAN
SWR IN 16" CASING

PROP 2-
10'x5' RCB

REMOVE AND DISPOSE
EXIST 4" SAN SWR

REMOVE AND DISPOSE
40 LF 24" SAN SWR
CAP END

PROP SAN SWR MH
STA 29+98.55, 26.32' LT

PROP 8" WL BY OTHERS

PROP FH BY OTHERS

PROP 18 LF 16" DIP WL IN 30" CASING
CENTERED ON MH
2-16" WET CONNECTIONS
REMOVE AND DISPOSE 20 LF EXIST 16" WL

REMOVE AND SALVAGE EXIST F.H.
1-6" CUT, PLUG & ABANDON

1-16"x6" TEE, RJ
1-6" GV W/BOX
1-F.H. ASSEMBLY, 3' B.C.
2-16" WET CONNECTIONS
REMOVE AND REPLACE 10' EXIST 16" WL

LEGEND

- EXISTING ROW
- PROPOSED WATERLINE
- PROPOSED SAN SWR
- PROPOSED RESTRAINED JOINT
- ABANDON EXIST SS
- NOTES: CRITICAL LOCATE

1. REFER TO DRAINAGE AND ROADWAY IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
2. REFER TO DEMOLITION PLAN SHEETS FOR MORE INFORMATION.
3. MAINTAIN WATER SERVICES TO ALL CUSTOMERS, FIRE HYDRANTS, AND INTERCONNECTIONS AS NECESSARY FOR CONSTRUCTION.
4. ABANDON EXISTING 16"/8" WL AND TRANSFER SERVICES TO PROPOSED 16"/8" WATER LINES. COORDINATE WITH PROPERTY OWNERS.
5. REFER TO WATER LINE AND SAN SWR CROSSINGS FOR MORE INFORMATION.
6. SUBMIT CCTV VIDEO INSPECTIONS OF ALL NEW SANITARY SEWER MAINLINES, LATERALS, AND MANHOLES TO THE CITY OF HOUSTON, IN ACCORDANCE WITH CITY OF HOUSTON SPECIFICATION 02558.
7. POTENTIALLY PETROLEUM CONTANIMATED AREA (PPCA) HAS BEIDENTIFIED BETWEEN STA 28+22 TO STA 39+10. REFER TO SOIL AND GROUNDWATER MANAGEMENT PLAN FOR MORE INFORMATION.
8. REFER TO STANDARD SANITARY SEWER DETAILS SHEET 3 OF 3 FOR CAPPED MANHOLE DETAILS FOR MORE INFORMATION.

REMOVE & REPLACE EXIST
SAN SWR MH
STA 29+32.42
TR=68.00
24" E= 54.86 (N&S)
12" E= 59.83 (E&W)
12" E= 54.86 DROP (E&W)

PROP SAN SWR MH
STA 29+98.55
TR=67.63
24" E= 54.78 (N&S)

PROP SAN SWR MH
STA 31+03.90
8" E= 59.80 (NE)
8" E= 49.89 DROP(S)
48" E= 49.89 (E&W)

PROP SAN SWR DROP CONNECTIONS
24" E= 53.91 (N)
24" E= 49.88 DROP(S)

PROP 2-10'x5' RCB

PROP 80 LF 24"
DI SAN SWR W/RJ @
0.11%

PROP 64 LF 24"
DI SAN SWR W/RJ @
0.11%

PROP FH
BY OTHERS

PROP PGL

PROP 100-YR WSE

PROP 16" WL IN
30" CASING

PROP 6" F.H. LEAD

PROP 2-10'x10'RCB

PROP 2-YR HGL

PROP 91 LF 8"
SAN SWR @ 1.44%

0 40 80
(IN FEET)
SCALE: 1"=40' - H
1"=4' - V

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED
PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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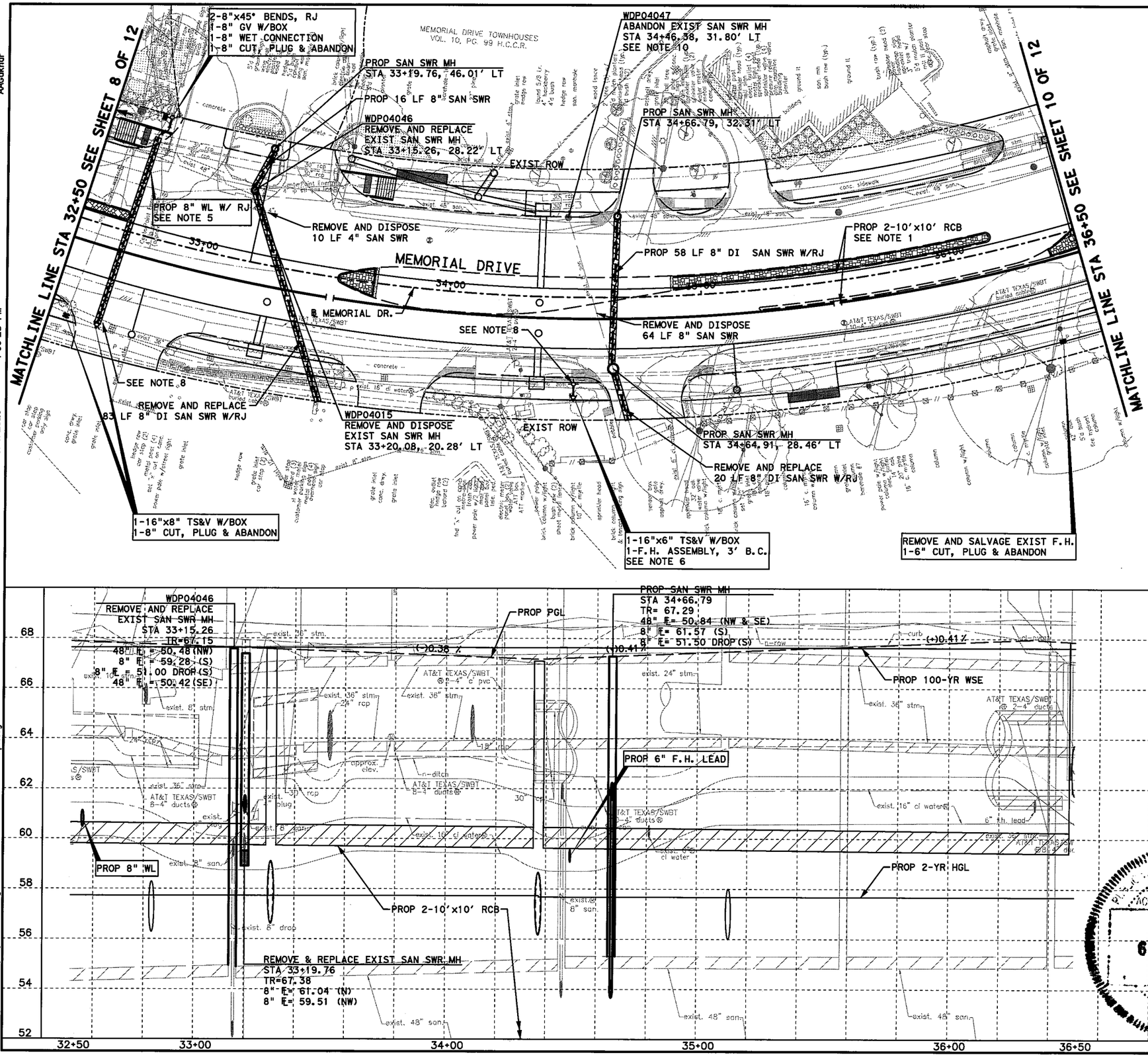
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

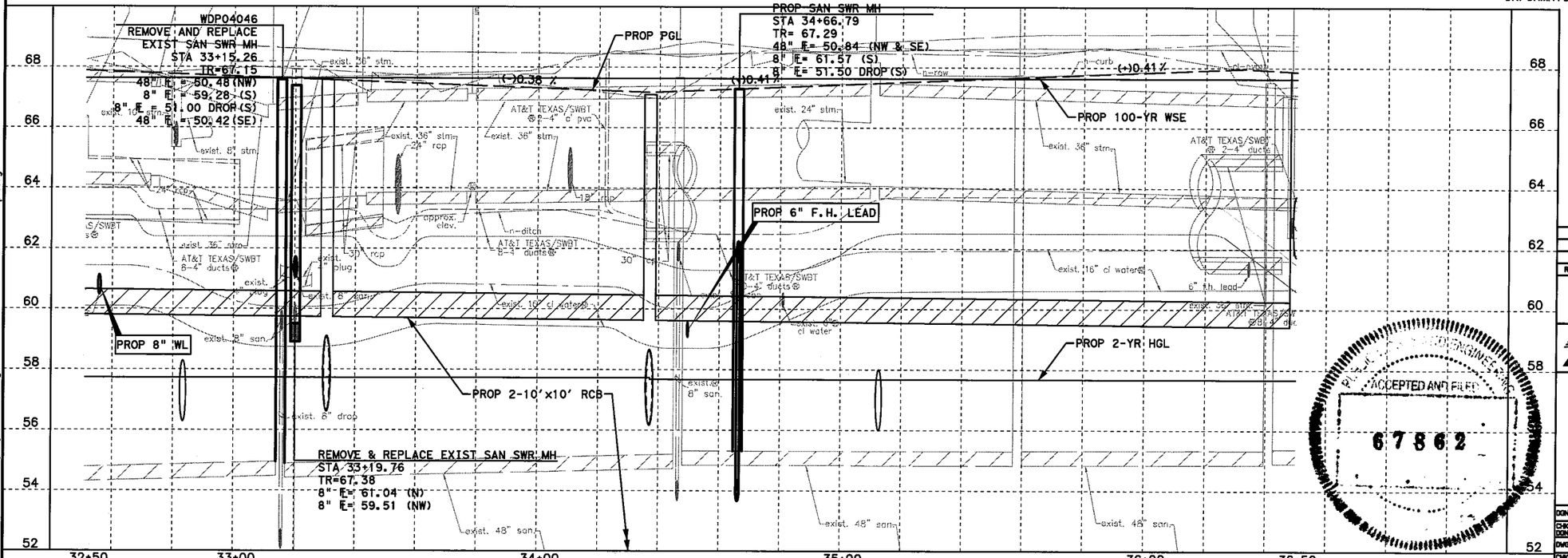
PLAN & PROFILE
WATER & SAN SWR IMPROVEMENTS
STA 28+50 TO STA 32+50

SHEET 8 OF 12

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
DSK: DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
DSK: DWG:	HOU	HARRIS	0912	72	391	264

67862





LEGEND

- EXISTING ROW
- PROPOSED WATERLINE
- PROPOSED SAN SWR
- PROPOSED RESTRAINED JOINT
- ABANDON EXIST SS
- CRITICAL LOCATE

NOTES:

1. REFER TO DRAINAGE AND ROADWAY IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
2. REFER TO DEMOLITION PLAN SHEETS FOR MORE INFORMATION.
3. MAINTAIN WATER SERVICES TO ALL CUSTOMERS, FIRE HYDRANTS, AND INTERCONNECTIONS AS NECESSARY FOR CONSTRUCTION.
4. ABANDON EXISTING 16"/8" WL AND TRANSFER SERVICES TO PROPOSED 16"/8" WATER LINES. COORDINATE WITH PROPERTY OWNERS.
5. REFER TO WATER LINE AND SAN SWR CROSSINGS FOR MORE INFORMATION.
6. MAINTAIN DRAINAGE AT ALL TIMES. PROVIDE A TEMPORARY CONNECTION IF EXISTING STM SWR NEEDS TO BE REMOVED FOR TAPPING OPERATIONS. INCLUDE PAYMENT IN TS&V PAY ITEM.
7. SUBMIT CCTV VIDEO INSPECTIONS OF ALL NEW SANITARY SEWER MAINLINES, LATERALS, AND MANHOLES TO THE CITY OF HOUSTON, IN ACCORDANCE WITH CITY OF HOUSTON SPECIFICATION 02558.
8. PROVIDE TEMPORARY CONNECTION TO EXIST DRAINAGE SYSTEM TO MAINTAIN DRAINAGE. COST IS SUBSIDIARY TO PROP WL.
9. POTENTIALLY PETROLEUM CONTANIMATED AREA (PPCA) HAS BEEN IDENTIFIED BETWEEN STA 28+22 TO STA 39+10. REFER TO SOIL AND GROUNDWATER MANAGEMENT PLAN FOR MORE INFORMATION.
10. REFER TO STANDARD SANITARY SEWER DETAILS SHEET 3 OF 3 FOR CAPPED MANHOLE DETAILS FOR MORE INFORMATION.

0 40 80

(IN FEET)
SCALE: 1"=40' - H
1"=4' - V

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
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ACCEPTED AND FILED
67862

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

PLAN & PROFILE
WATER & SAN SWR IMPROVEMENTS
STA 32+50 TO STA 36+50

SHEET 9 OF 12

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWN:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWN:	HOU	HARRIS	0912	72	391	265

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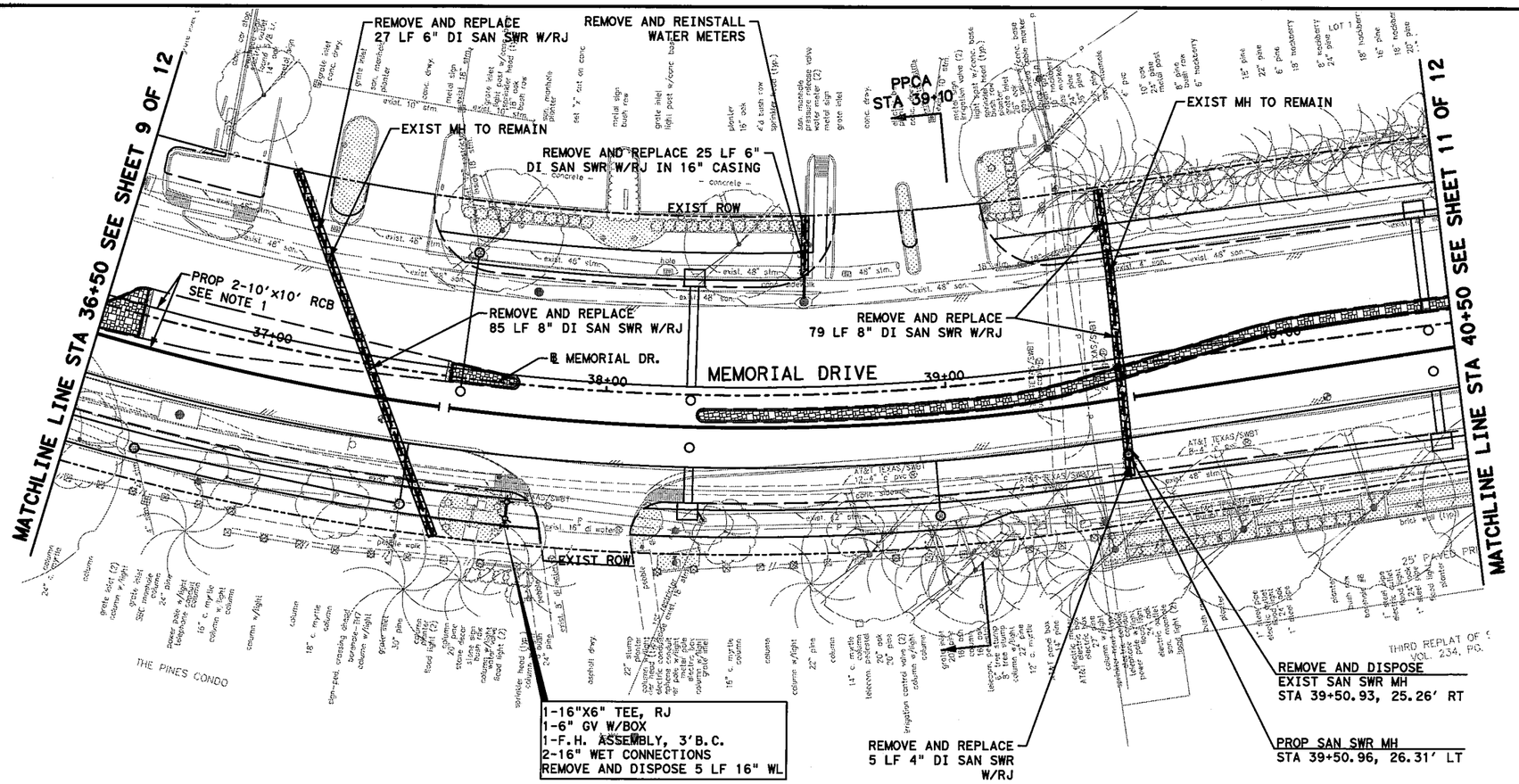

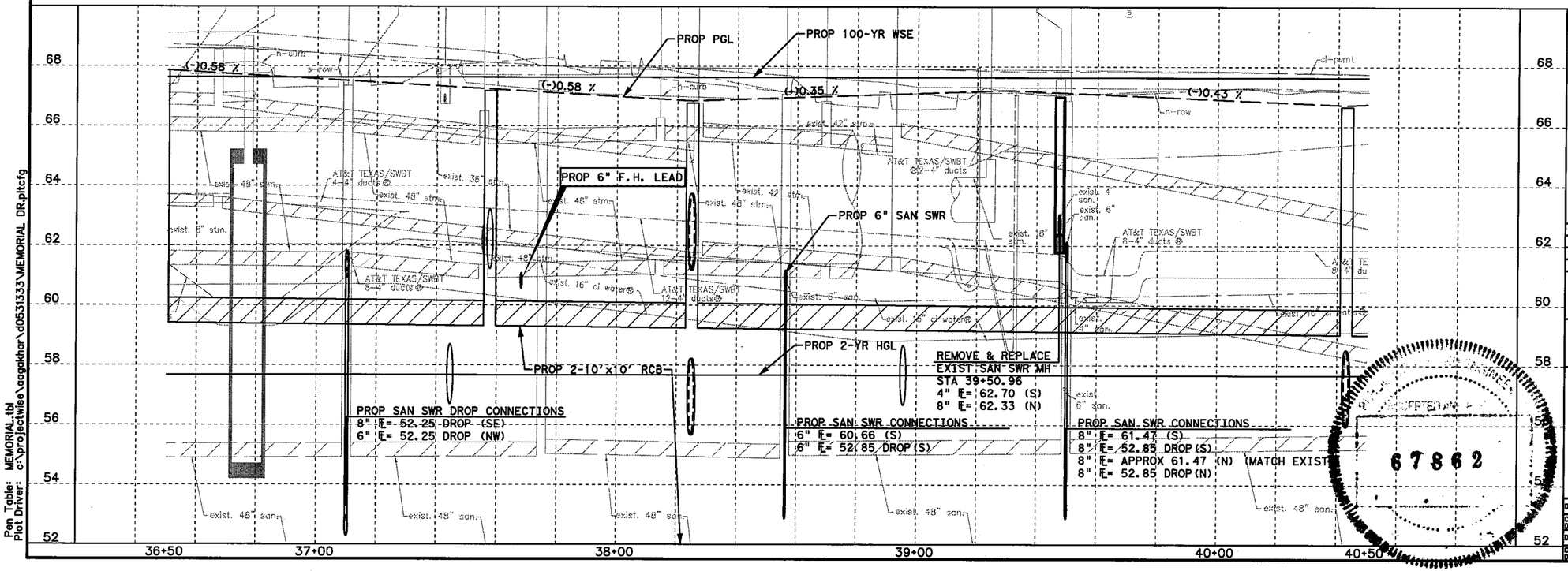

LEGEND

- EXISTING ROW
- PROPOSED WATERLINE
- PROPOSED SAN SWR
- PROPOSED RESTRAINED JOINT
- ABANDON EXIST SS
- CRITICAL LOCATE

NOTES:

1. REFER TO DRAINAGE AND ROADWAY IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
2. REFER TO DEMOLITION PLAN SHEETS FOR MORE INFORMATION.
3. MAINTAIN WATER SERVICES TO ALL CUSTOMERS, FIRE HYDRANTS, AND INTERCONNECTIONS AS NECESSARY FOR CONSTRUCTION.
4. ABANDON EXISTING 16"/8" WL AND TRANSFER SERVICES TO PROPOSED 16"/8" WATER LINES. COORDINATE WITH PROPERTY OWNERS.
5. REFER TO WATER LINE AND SAN SWR CROSSINGS FOR MORE INFORMATION.
6. SUBMIT CCTV VIDEO INSPECTIONS OF ALL NEW SANITARY SEWER MAINLINES, LATERALS, AND MANHOLES TO THE CITY OF HOUSTON, IN ACCORDANCE WITH CITY OF HOUSTON SPECIFICATION 02558.
7. POTENTIALLY PETROLEUM CONTANIMATED AREA (PPCA) HAS BEEN IDENTIFIED BETWEEN STA 28+22 TO STA 39+10. REFER TO SOIL AND GROUNDWATER MANAGEMENT PLAN FOR MORE INFORMATION.

0 40 80

(IN FEET)
SCALE: 1"= 40' - H
1"= 4' - V

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED
PROFESSIONAL ENGINEER
03/04/2020

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Texas Registered Engineering Firm F-2614

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

PLAN & PROFILE WATER & SAN SWR IMPROVEMENTS STA 36+50 TO STA 40+50

SHEET 10 OF 12

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	266

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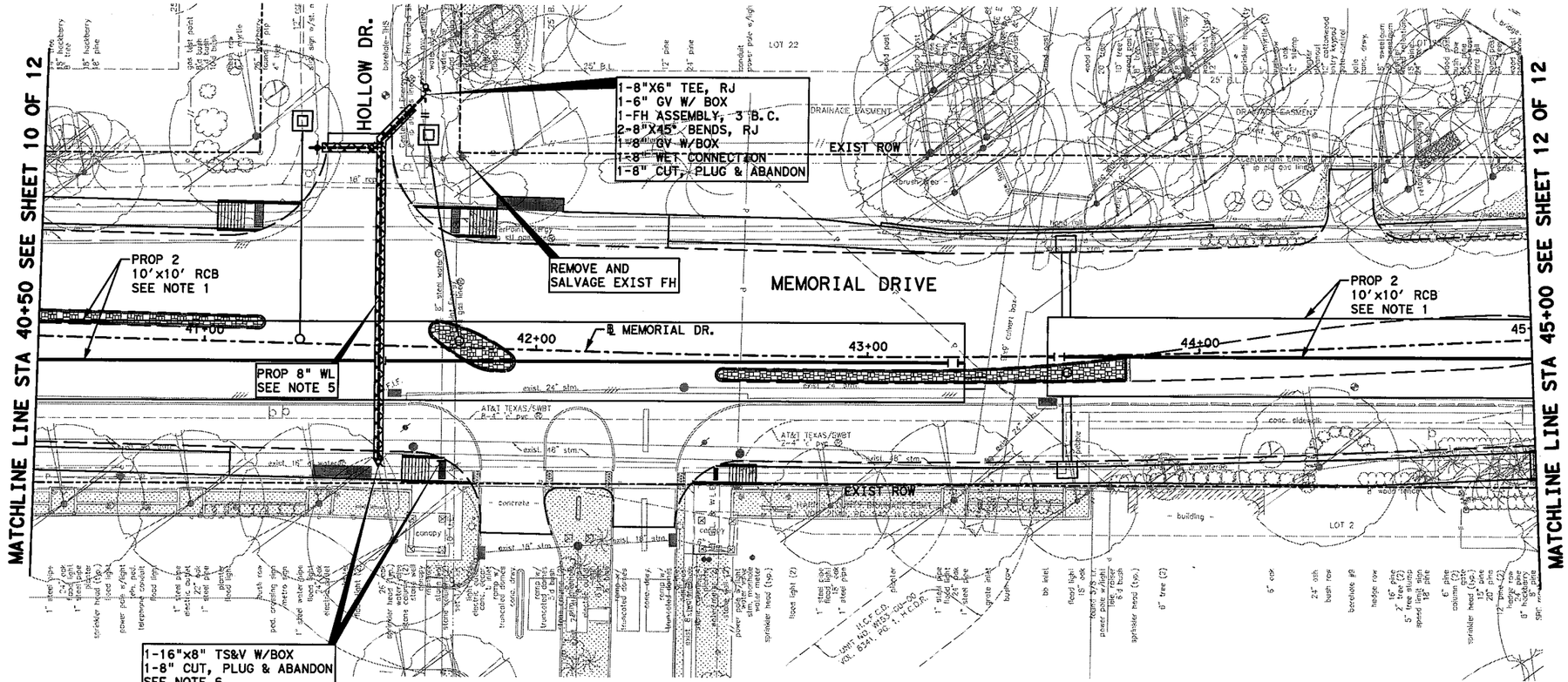

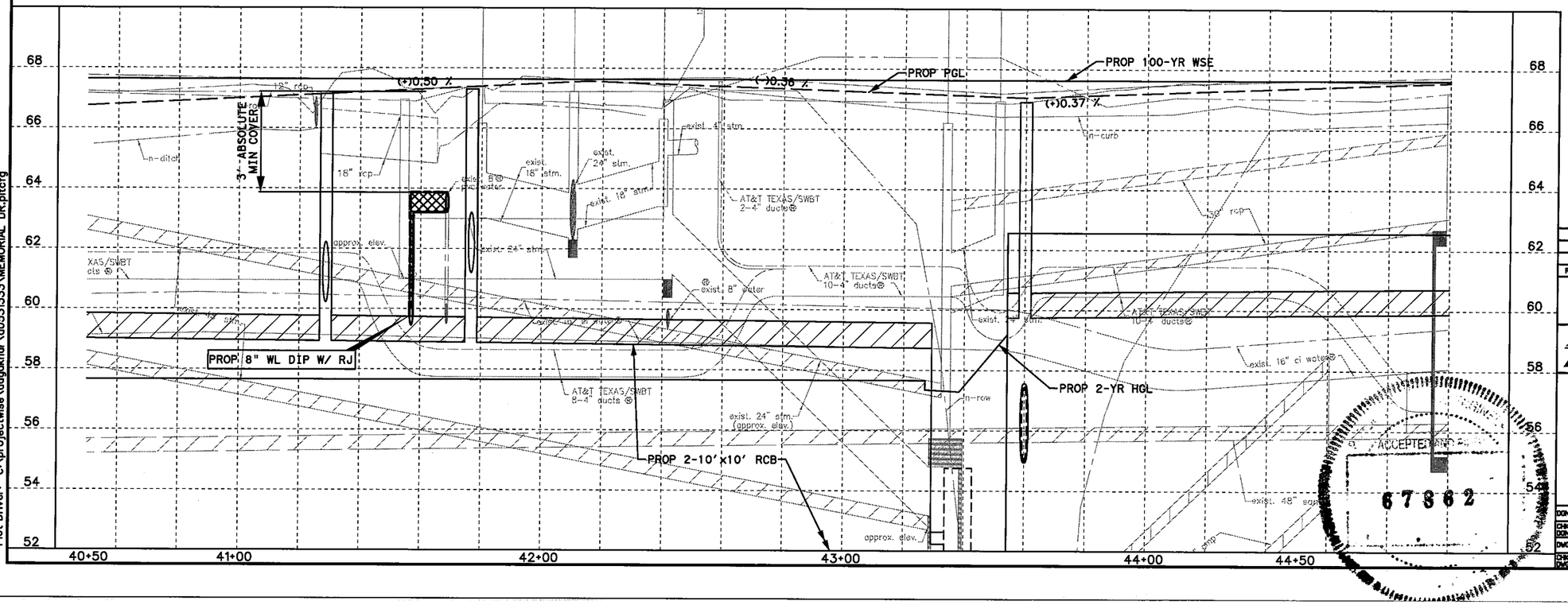

LEGEND

- EXISTING ROW
- PROPOSED WATERLINE
- PROPOSED SAN SWR
- PROPOSED RESTRAINED JOINT
- ABANDON EXIST SS
- CRITICAL LOCATE

NOTES:

1. REFER TO DRAINAGE AND ROADWAY IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
2. REFER TO DEMOLITION PLAN SHEETS FOR MORE INFORMATION.
3. MAINTAIN WATER SERVICES TO ALL CUSTOMERS, FIRE HYDRANTS, AND INTERCONNECTIONS AS NECESSARY FOR CONSTRUCTION.
4. ABANDON EXISTING 16"/8" WL AND TRANSFER SERVICES TO PROPOSED 16"/8" WATER LINES. COORDINATE WITH PROPERTY OWNERS.
5. REFER TO WATER LINE AND SAN SWR CROSSINGS FOR MORE INFORMATION.
6. MAINTAIN DRAINAGE AT ALL TIMES. PROVIDE TEMPORARY CONNECTION TO EXIST 48" STM SWR IF EXIST PIPE NEEDS TO BE REMOVED FOR TAPPING OPERATIONS. INCLUDE PAYMENT IN TS&V ITEM.
7. SUBMIT CCTV VIDEO INSPECTIONS OF ALL NEW SANITARY SEWER MAINLINES, LATERALS, AND MANHOLES TO THE CITY OF HOUSTON, IN ACCORDANCE WITH CITY OF HOUSTON SPECIFICATION 02558.

0 40 80

(IN FEET)
SCALE: 1":40' - H
1":4' - V

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED
PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

PLAN & PROFILE WATER & SAN SWR IMPROVEMENTS STA 40+50 TO STA 45+00

SHEET 11 OF 12

ACCEPTED
67862

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	267

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MATCHLINE LINE STA 45+00 SEE SHEET 11 OF 12

PROP CORROSION RESIST MH
STA 45+58.18, 19.06' LT

WD034003A
REMOVE AND REPLACE
EXIST SAN SWR MH
STA 45+71.91, 29.67' LT

EXIST F.H. TO REMAIN

1-8" WET CONNECTION
2-8"X45° BENDS,RJ
1-8"X90° BENDS,RJ
1-8" GV W/BOX
1-8" CUT, PLUG & ABANDON

PROP 8" DIP WL W/RJ

EXIST ROW

MEMORIAL DRIVE

TALLOWOOD RD.

REMOVE AND REPLACE 28 LF
15" SAN SWR (BY OPEN-CUT)

REMOVE AND REPLACE
EXIST SAN SWR MH
STA 48+47.43, 15.66' LT

REMOVE AND DISPOSE 8 LF
EXIST 4" SAN SWR

REMOVE AND DISPOSE 12 LF
EXIST 4" SAN SWR

PROP 15 LF 8"
SAN SWR

PROP 2-10'X10' RCB

46+00

47+00

48+00

49+00

℄ MEMORIAL DR.

WD034003
REMOVE AND DISPOSE
EXIST SAN SWR MH
STA 45+71.56, 18.08' LT

WD034009
REMOVE AND DISPOSE
EXIST SAN SWR MH
STA 48+47.43, 15.66' LT

PROP 100 LF 6"
SAN SWR FM

REMOVE AND DISPOSE
100 LF 6" SAN SWR

EXIST ROW

REMOVE AND DISPOSE EXIST
80 LF 6" SAN SWR

PROP 100 LF 12" SAN
SWR (BY OPEN-CUT)

PROP 72 LF 10" SAN SWR
(BY OPEN-CUT)

LEGEND LN.

PROP 8" WATER
LINE BY OTHERS

REMOVE & SALVAGE EXIST FH
1-6" CUT, PLUG & ABANDON

1-16"X8" TSV W/BOX
1-8" CUT, PLUG & ABANDON

PROP SAN SWR MH
STA 45+68.80, 72.70' RT

LEGEND

- EXISTING ROW
- PROPOSED WATERLINE
- PROPOSED SAN SWR
- PROPOSED RESTRAINED JOINT
- ABANDON EXIST SS
- CRITICAL LOCATE

NOTES:

1. REFER TO DRAINAGE AND ROADWAY IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
2. REFER TO DEMOLITION PLAN SHEETS FOR MORE INFORMATION.
3. MAINTAIN WATER SERVICES TO ALL CUSTOMERS, FIRE HYDRANTS, AND INTERCONNECTIONS AS NECESSARY FOR CONSTRUCTION.
4. ABANDON EXISTING 16"/8" WL AND TRANSFER SERVICES TO PROPOSED 16"/8" WATER LINES. COORDINATE WITH PROPERTY OWNERS.
5. REFER TO WATER LINE AND SAN SWR CROSSINGS FOR MORE INFORMATION.
6. SUBMIT CCTV VIDEO INSPECTIONS OF ALL NEW SANITARY SEWER MAINLINES, LATERALS, AND MANHOLES TO THE CITY OF HOUSTON, IN ACCORDANCE WITH CITY OF HOUSTON SPECIFICATION 02558.

ACCEPTED
67862

0 40 80
(IN FEET)
SCALE: 1"=40' - H
1"=4' - V

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED
PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

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FIRM REGISTATION NO. 2614

Texas Department of Transportation
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

PLAN & PROFILE
WATER & SAN SWR IMPROVEMENTS
STA 45+00 TO END PROJECT

SHEET 12 OF 12

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
DSN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK: DWG:	HOU	HARRIS	0912	72	391	268

68 66 64 62 60 58 56 54 52

45+00 46+00 47+00 48+00 49+00

(+)0.37 %
(-)0.35 %
(+)0.66 %

PROP PGL
PROP 100-YR WSE
PROP 2-YR HGL
PROP 8" WL
4' MIN COVER

REMOVE & REPLACE EXIST SAN SWR MH
STA 45+71.91
TR=67.47
8" E= 60.40 (S)
8" E= 53.50 DROP(S)
12" E= 61.28 (N)
12" E= 52.50 DROP(N)
48" E= 51.90 (E & W)

PROP CORROSION RESISTANT MH
STA 45+58.18
TR=65.29
6" E= 60.42 (SW)
6" E= 60.92 (N)

PROP 2-10'X10' RCB

REMOVE & REPLACE EXIST SAN SWR MH
STA 48+47.43
TR=67.43
15" E DROP(N)= 57.60
15" E(N)= 53.94
10" E(SE)= 63.30
10" E DROP(SE)= 52.50
48" E(E&W)= 52.18

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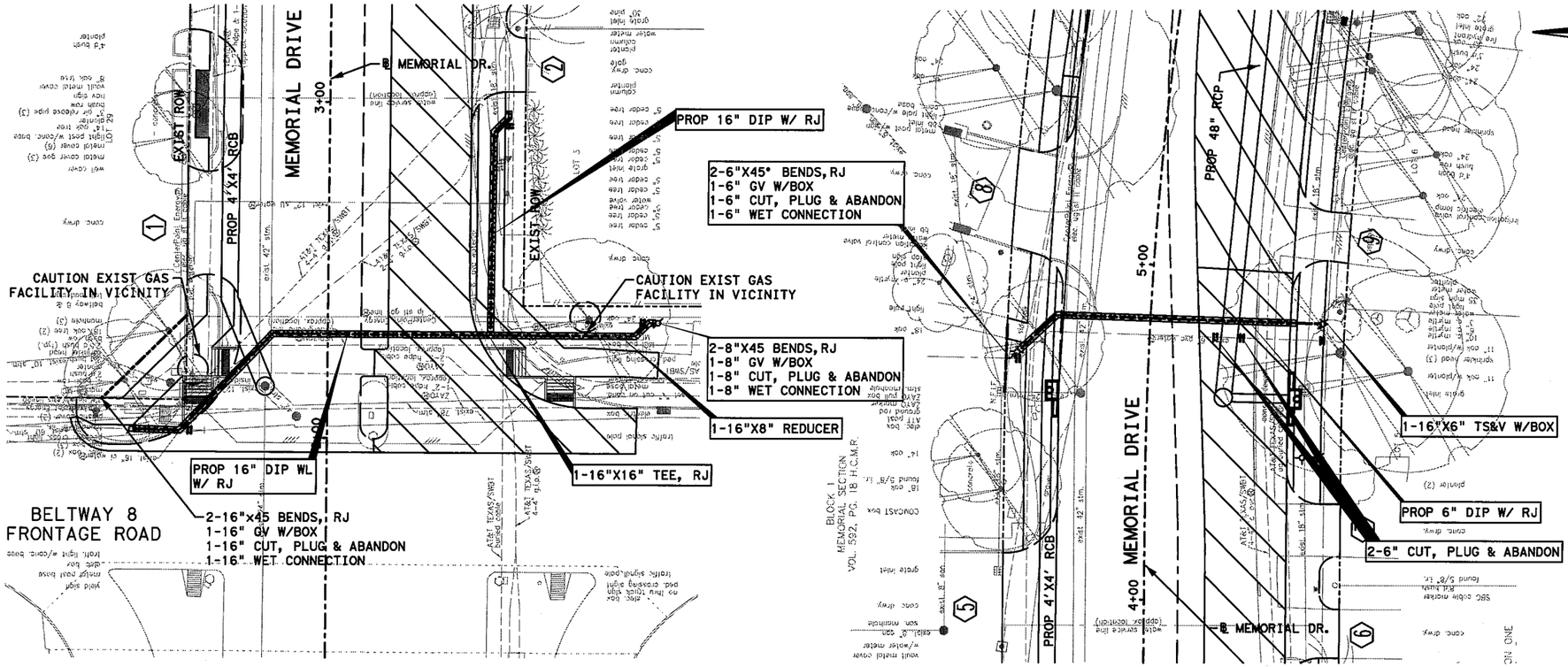
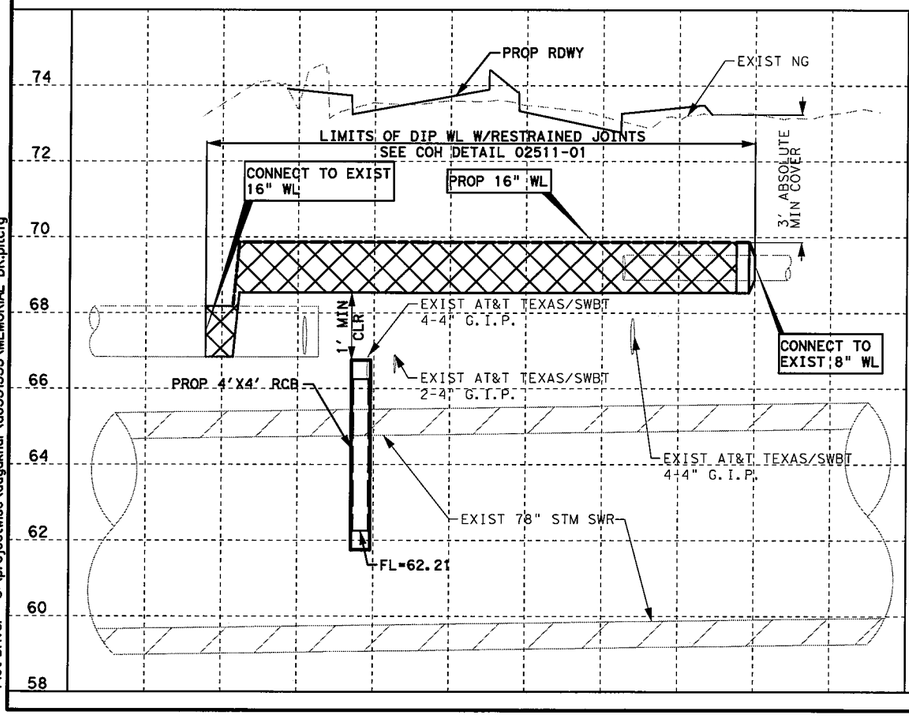


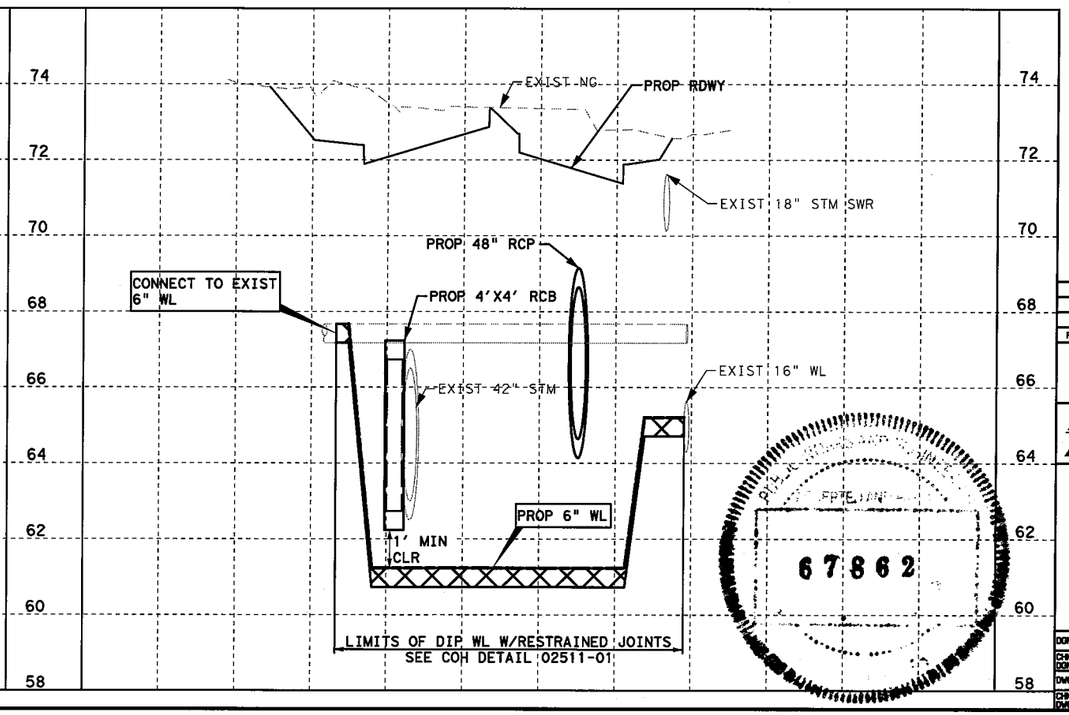
LEGEND

- EXISTING ROW
- PROPOSED WATERLINE
- PROPOSED SAN SWR
- PROPOSED RESTRAINED JOINT
- ABANDON EXIST SS
- CRITICAL LOCATE

NOTES:

1. REFER TO DRAINAGE AND ROADWAY IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
2. REFER TO DEMOLITION PLAN SHEETS FOR MORE INFORMATION.
3. MAINTAIN WATER SERVICES TO ALL CUSTOMERS, FIRE HYDRANTS, AND INTERCONNECTIONS AS NECESSARY FOR CONSTRUCTION.
4. POTENTIALLY PETROLEUM CONTANIMATED AREAS HAS BEEN IDENTIFIED BETWEEN STA 1+95 TO STA 3+64. REFER TO SOIL AND GROUNDWATER MANAGEMENT PLAN FOR MORE INFORMATION.





0 40 80

(IN FEET)
SCALE: 1"=40' - H
1"=4' - V

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED PROFESSIONAL ENGINEER
03/04/2020

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REV. NO.	DATE	DESCRIPTION	BY

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A LEO A DALY COMPANY
FIRM REGISTATION NO. 2614

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

WATER AND SAN SWR CROSSINGS

SHEET 1 OF 7

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	269

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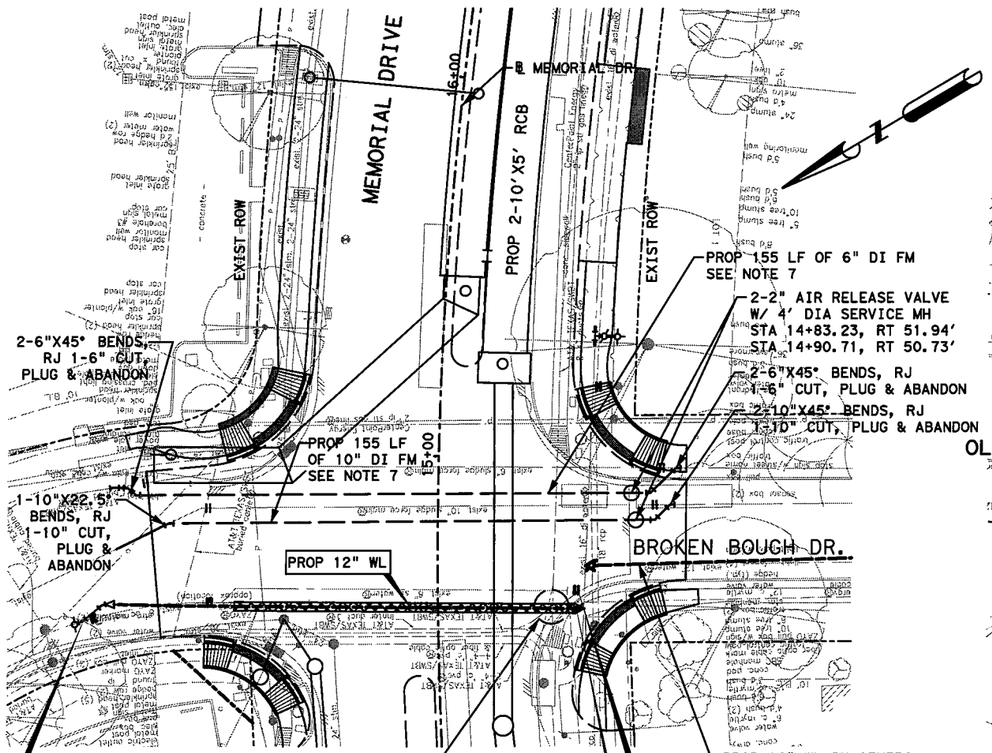
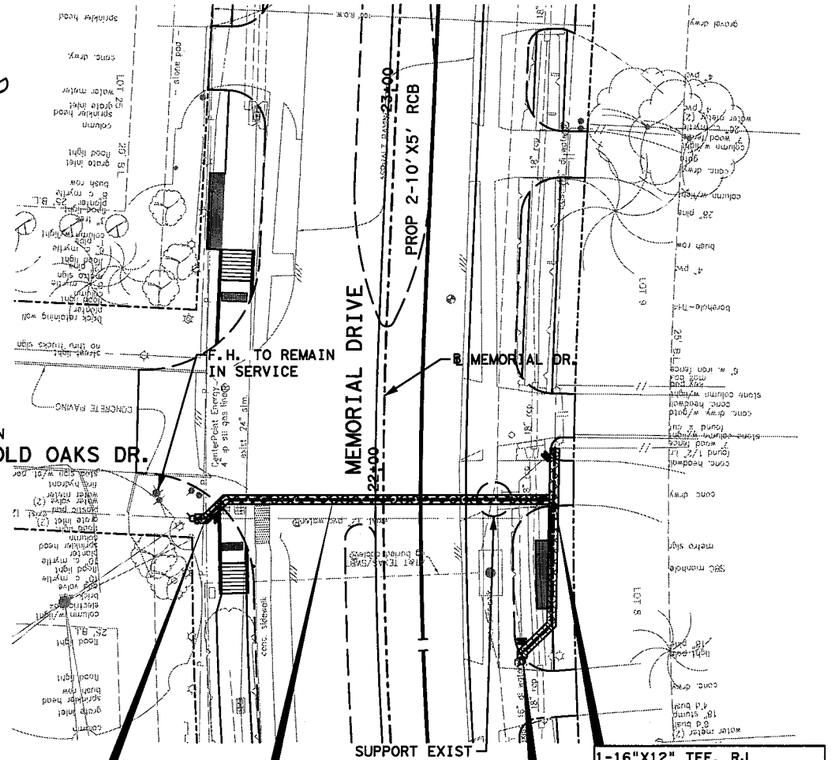


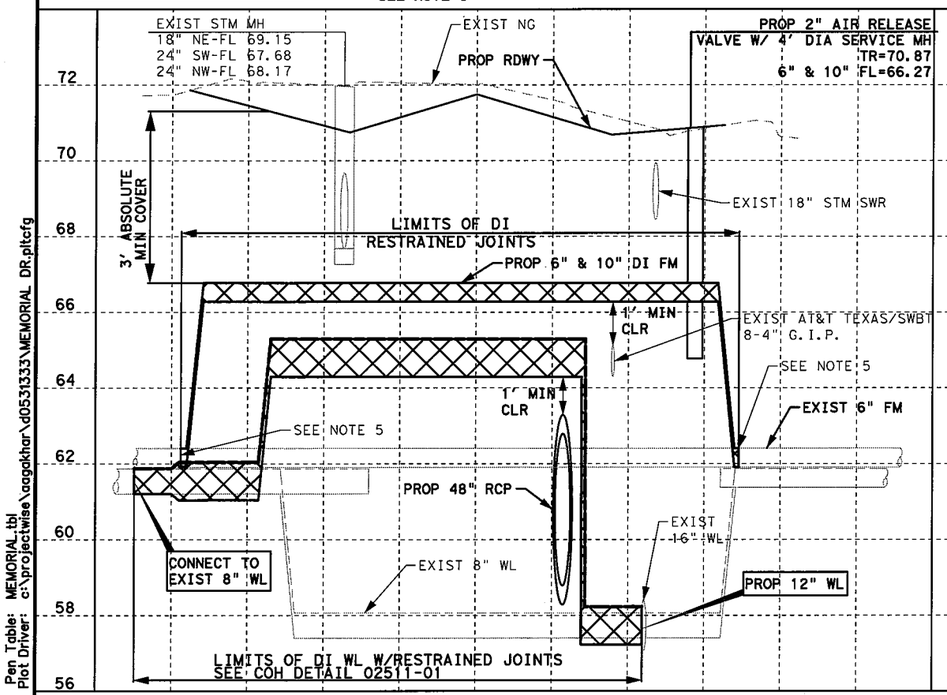


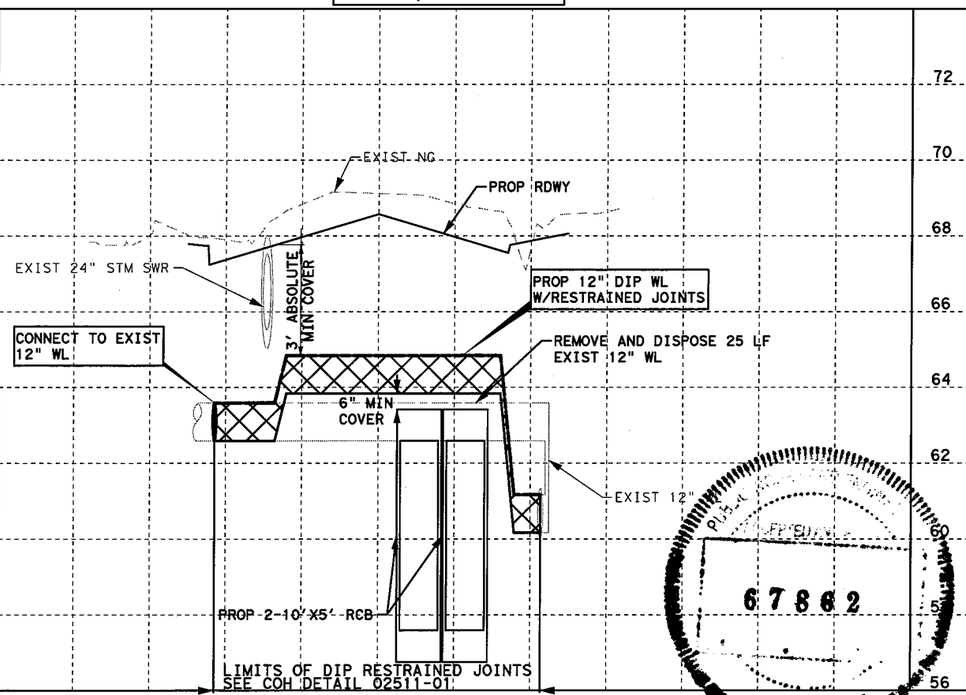
LEGEND

- EXISTING ROW
- PROPOSED WATERLINE
- PROPOSED SAN SWR
- PROPOSED RESTRAINED JOINT
- ABANDON EXIST SS
- CRITICAL LOCATE

NOTES:

1. REFER TO DRAINAGE AND ROADWAY IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
2. REFER TO DEMOLITION PLAN SHEETS FOR MORE INFORMATION.
3. MAINTAIN WATER SERVICES TO ALL CUSTOMERS, FIRE HYDRANTS, AND INTERCONNECTIONS AS NECESSARY FOR CONSTRUCTION.
4. ABANDON EXISTING 16"/8" WL AND TRANSFER SERVICES TO PROPOSED 16"/8" WATER LINES. COORDINATE WITH PROPERTY OWNERS.
5. CONNECT TO EXIST 6" FM. USE ISOLATION FLANGES IF DISSIMLAR METALS ENCOUNTERED.
6. SUBMIT CCTV VIDEO INSPECTIONS OF ALL NEW SANITARY SEWER MAINLINES, LATERALS, AND MANHOLES TO THE CITY OF HOUSTON, IN ACCORDANCE WITH CITY OF HOUSTON SPECIFICATION 02558.
7. COORDINATE WITH CITY OF HOUSTON WASTEWATER OPERATIONS A MINIMUM OF 72 HOURS BEFORE BEGINNING FORCE MAIN RELOCATION.
8. BRACING AT&T STRUCTURES IS INCIDENTAL TO ITEMS 7049





0 40 80

(IN FEET)
SCALE: 1"=40' - H
1"=4' - V

STATE OF TEXAS
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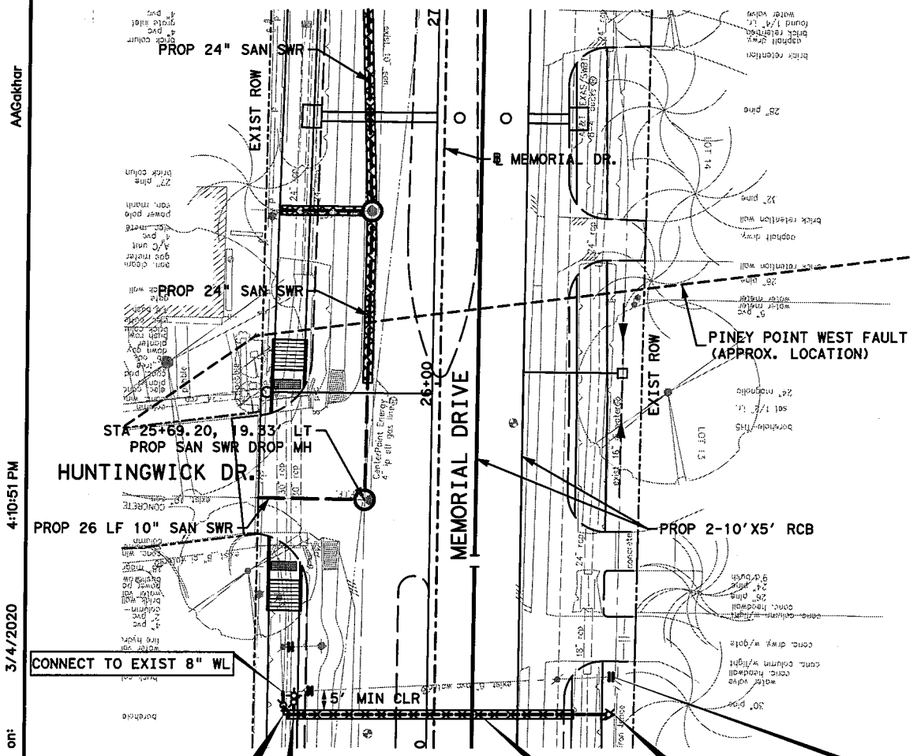
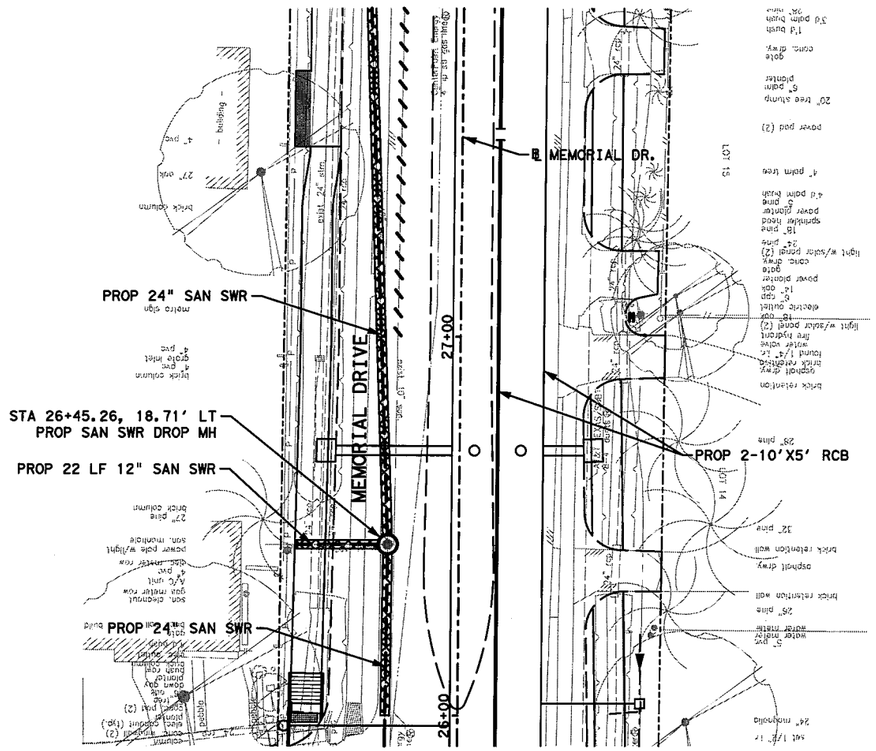
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

WATER & SAN SWR CROSSING

SHEET 2 OF 7

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	270





LEGEND

- EXISTING ROW
- PROPOSED WATERLINE
- PROPOSED SAN SWR
- PROPOSED RESTRAINED JOINT
- ABANDON EXIST SS
- CRITICAL LOCATE

N

NOTES:

1. REFER TO DRAINAGE AND ROADWAY IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
2. REFER TO DEMOLITION PLAN SHEETS FOR MORE INFORMATION.
3. MAINTAIN WATER SERVICES TO ALL CUSTOMERS, FIRE HYDRANTS, AND INTERCONNECTIONS AS NECESSARY FOR CONSTRUCTION.
4. ABANDON EXISTING 16"/8" WL AND TRANSFER SERVICES TO PROPOSED 16"/8" WATER LINES. COORDINATE WITH PROPERTY OWNERS.
5. SUBMIT CCTV VIDEO INSPECTIONS OF ALL NEW SANITARY SEWER MAINLINES, LATERALS, AND MANHOLES TO THE CITY OF HOUSTON, IN ACCORDANCE WITH CITY OF HOUSTON SPECIFICATION 02558.

ACCEPTED AND FILED
67862

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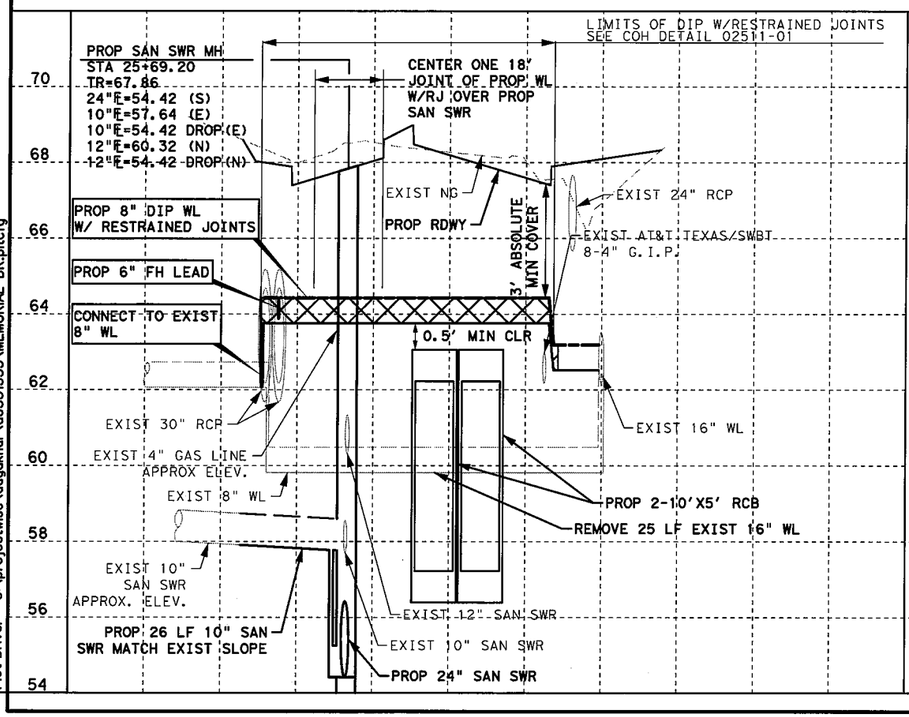
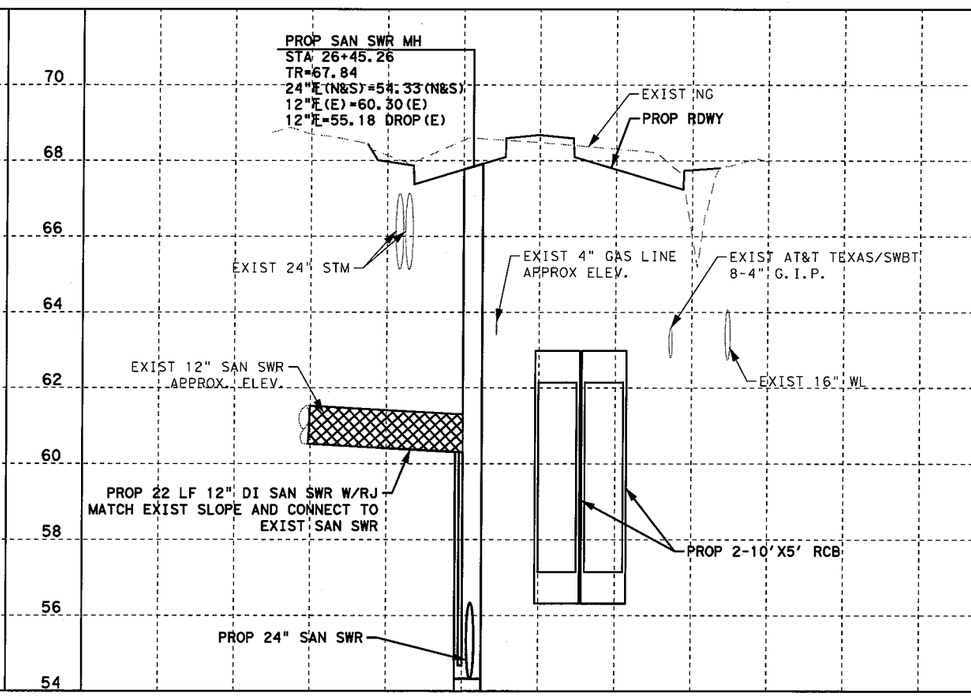
1"=4' - V





STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED PROFESSIONAL ENGINEER
03/04/2020
Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

WATER & SAN SWR CROSSING

SHEET 3 OF 7

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	271

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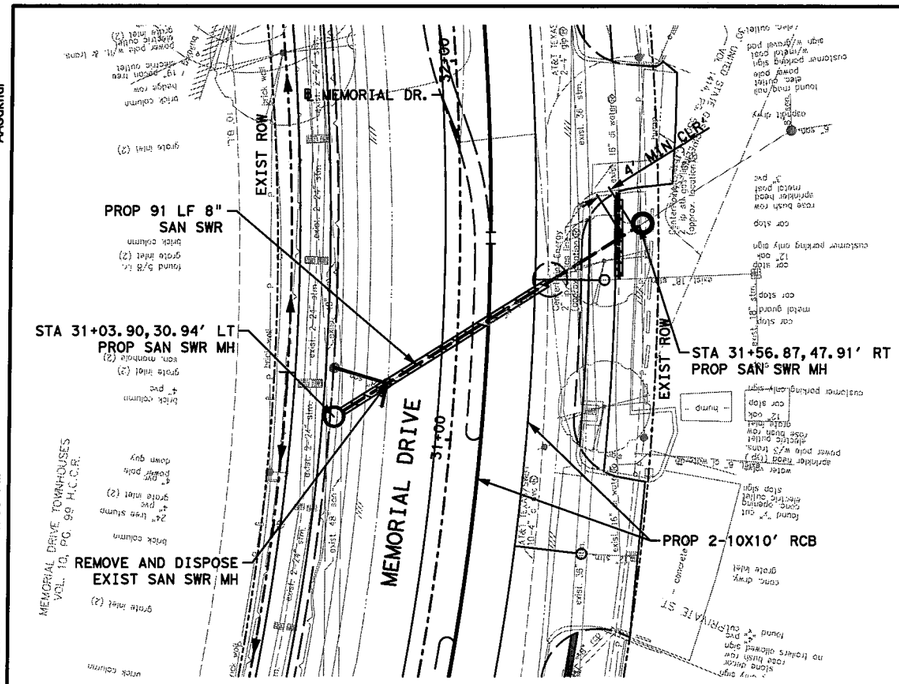
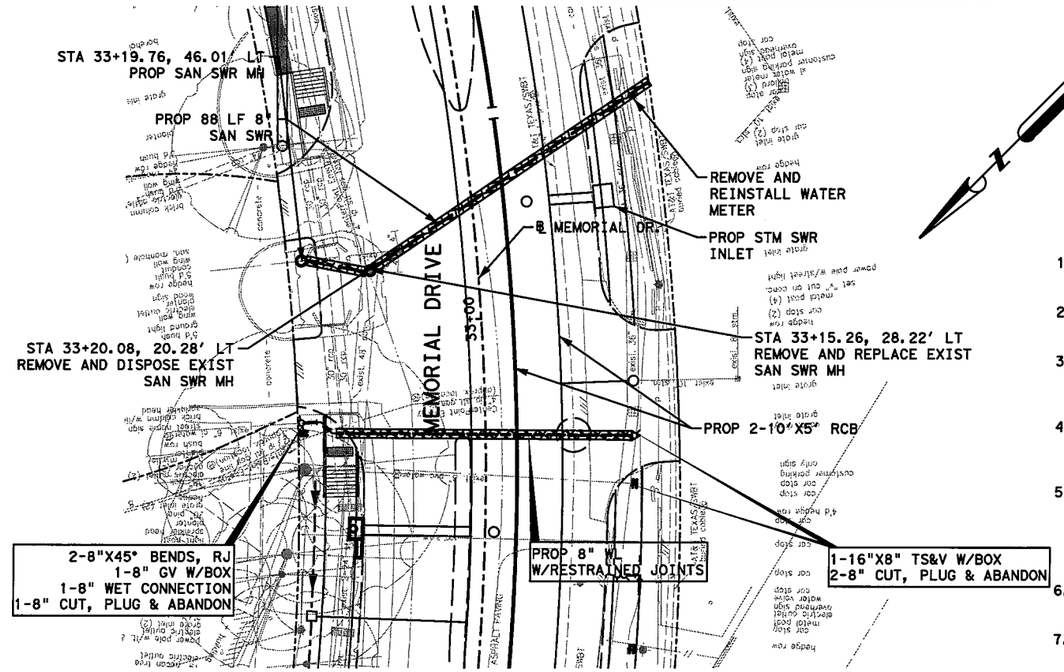


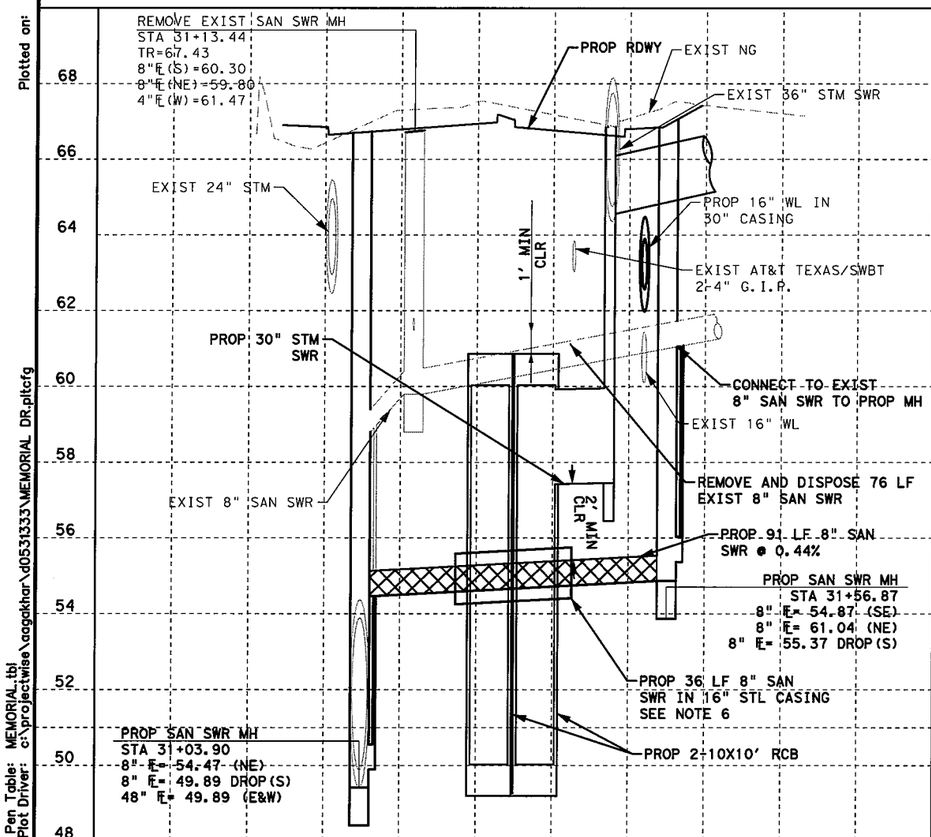


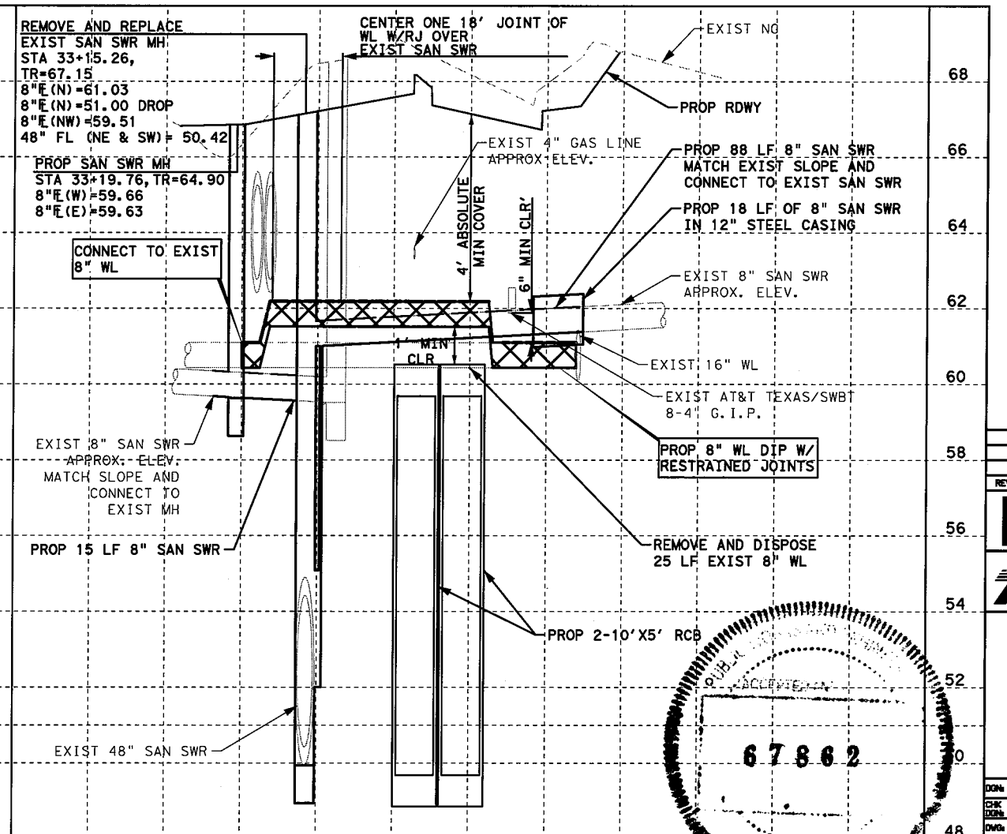
LEGEND

- EXISTING ROW
- PROPOSED WATERLINE
- PROPOSED SAN SWR
- PROPOSED RESTRAINED JOINT
- ABANDON EXIST SS
- CRITICAL LOCATE

NOTES:

1. REFER TO DRAINAGE AND ROADWAY IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
2. REFER TO DEMOLITION PLAN SHEETS FOR MORE INFORMATION.
3. MAINTAIN WATER SERVICES TO ALL CUSTOMERS, FIRE HYDRANTS, AND INTERCONNECTIONS AS NECESSARY FOR CONSTRUCTION.
4. ABANDON EXISTING 16"/8" WL AND TRANSFER SERVICES TO PROPOSED 16"/8" WATER LINES. COORDINATE WITH PROPERTY OWNERS.
5. SUBMIT CCTV VIDEO INSPECTIONS OF ALL NEW SANITARY SEWER MAINLINES, LATERALS, AND MANHOLES TO THE CITY OF HOUSTON, IN ACCORDANCE WITH CITY OF HOUSTON SPECIFICATION 02558.
6. REFER TO DRAINAGE MISCELLANEOUS DETAILS FOR PIPE PENETRATION DETAIL.
7. POTENTIALLY PETROLEUM CONTANIMATED AREA (PPCA) HAS BEEN IDENTIFIED BETWEEN STA 28+22 TO STA 39+10. REFER TO SOIL AND GROUNDWATER MANAGEMENT PLAN FOR MORE INFORMATION.





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(IN FEET)

SCALE: PLAN 1":40'

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

WATER & SAN SWR CROSSING

SHEET 4 OF 7

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	272

PUBLIC ACCEPTED 67862

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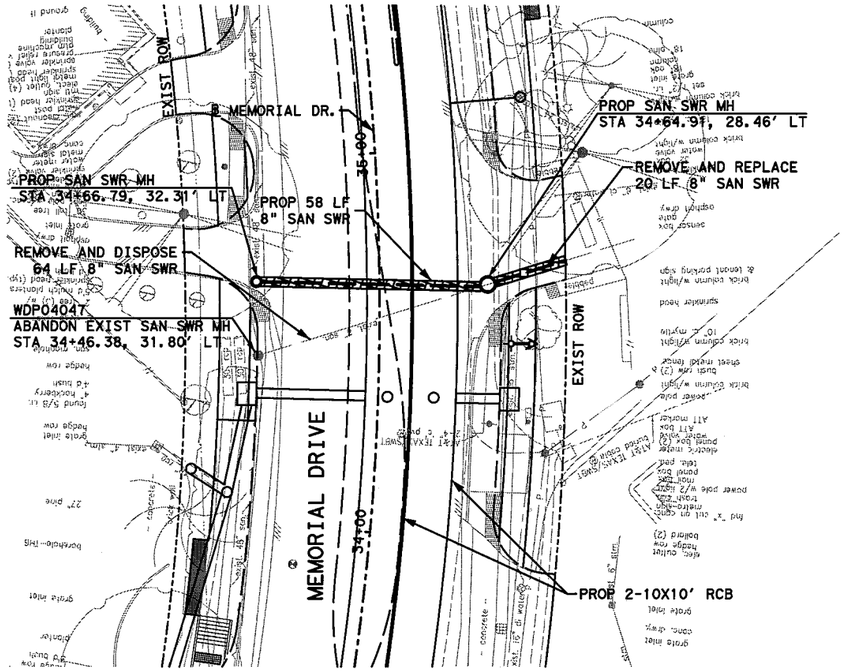
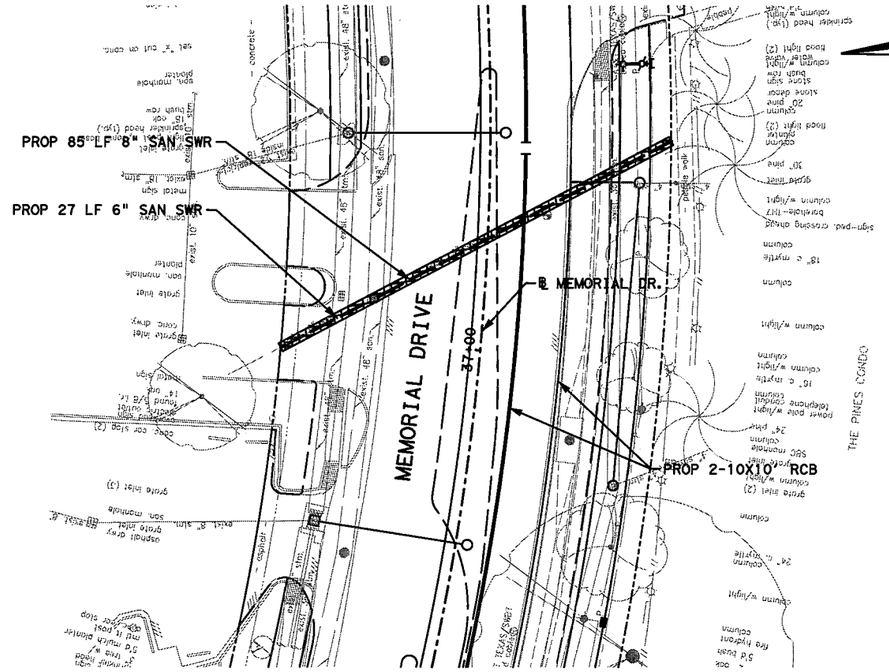


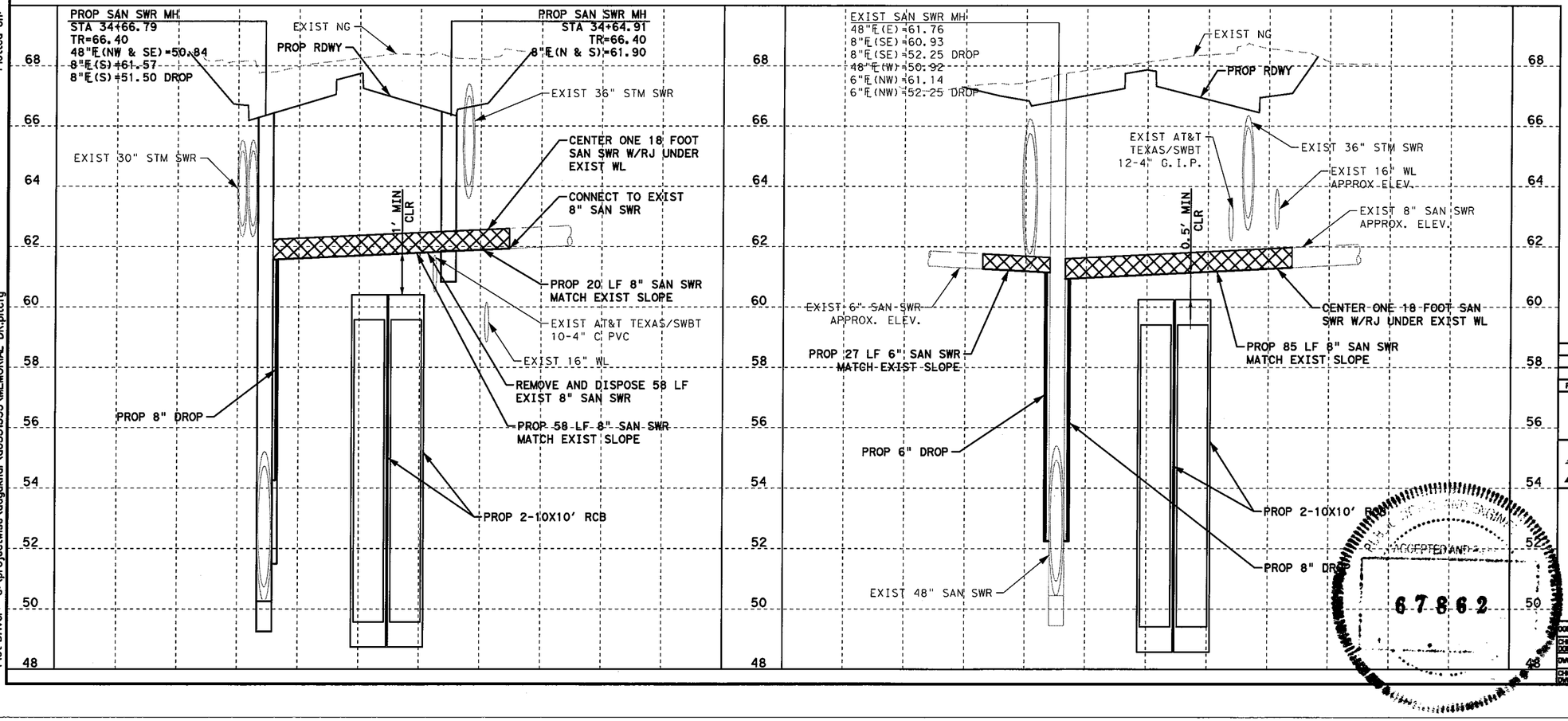


LEGEND

- EXISTING ROW
- PROPOSED WATERLINE
- PROPOSED SAN SWR
- PROPOSED RESTRAINED JOINT
- ABANDON EXIST SS
- CRITICAL LOCATE

NOTES:

1. REFER TO DRAINAGE AND ROADWAY IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
2. REFER TO DEMOLITION PLAN SHEETS FOR MORE INFORMATION.
3. MAINTAIN WATER SERVICES TO ALL CUSTOMERS, FIRE HYDRANTS, AND INTERCONNECTIONS AS NECESSARY FOR CONSTRUCTION.
4. ABANDON EXISTING 16"/8" WL AND TRANSFER SERVICES TO PROPOSED 16"/8" WATER LINES. COORDINATE WITH PROPERTY OWNERS.
5. SUBMIT CCTV VIDEO INSPECTIONS OF ALL NEW SANITARY SEWER MAINLINES, LATERALS, AND MANHOLES TO THE CITY OF HOUSTON, IN ACCORDANCE WITH CITY OF HOUSTON SPECIFICATION 02558.
6. POTENTIALLY PETROLEUM CONTANIMATED AREA (PPCA) HAS BEEN IDENTIFIED BETWEEN STA 28+22 TO STA 39+10. REFER TO SOIL AND GROUNDWATER MANAGEMENT PLAN FOR MORE INFORMATION.



0 40 80

(IN FEET)
SCALE: 1"=40' - H
1"=4' - V

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED
PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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FIRM REGISTATION NO. 2614

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

WATER & SAN SWR CROSSING

SHEET 5 OF 7

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	273

RELEASED FOR CONSTRUCTION
ACCEPTED AND
67862

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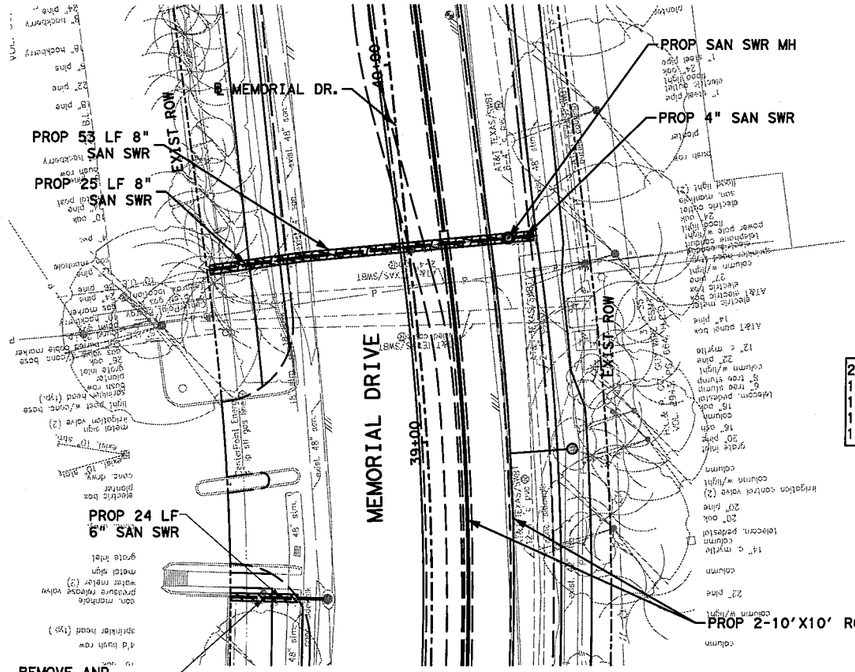
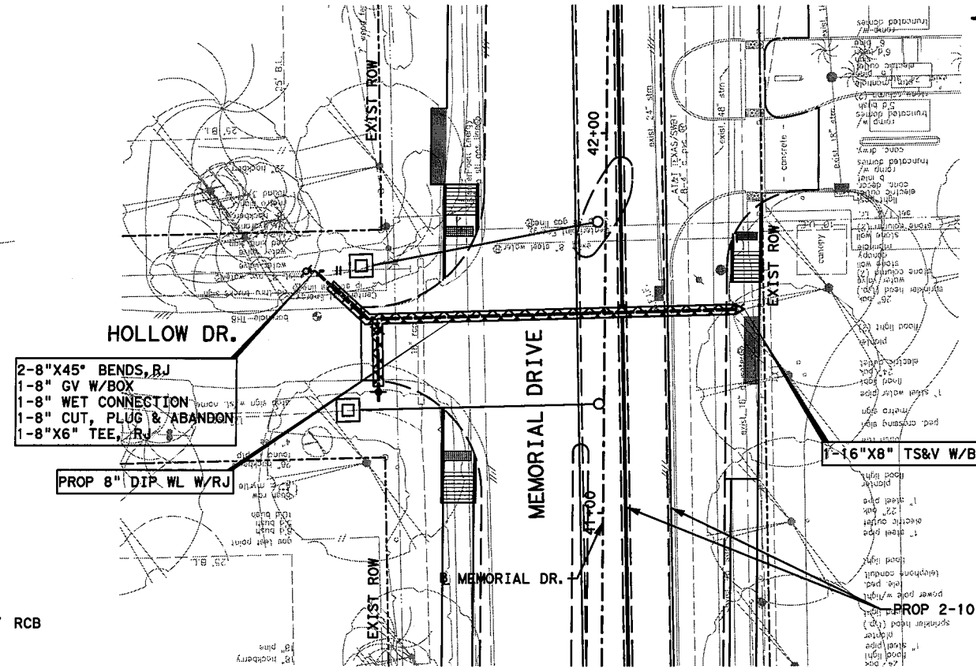


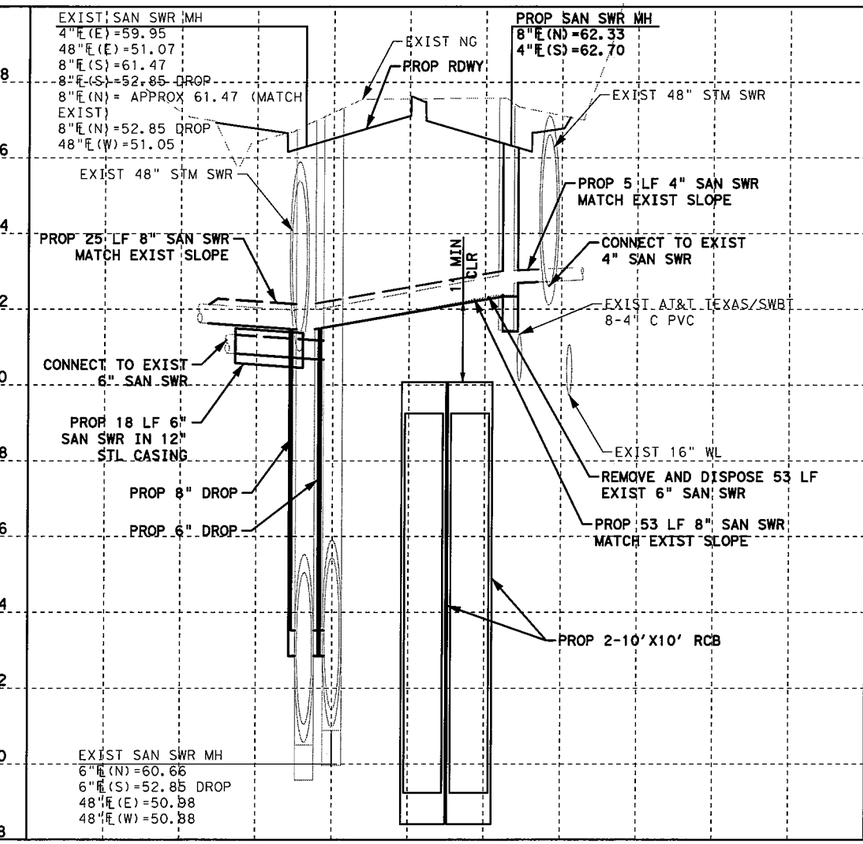


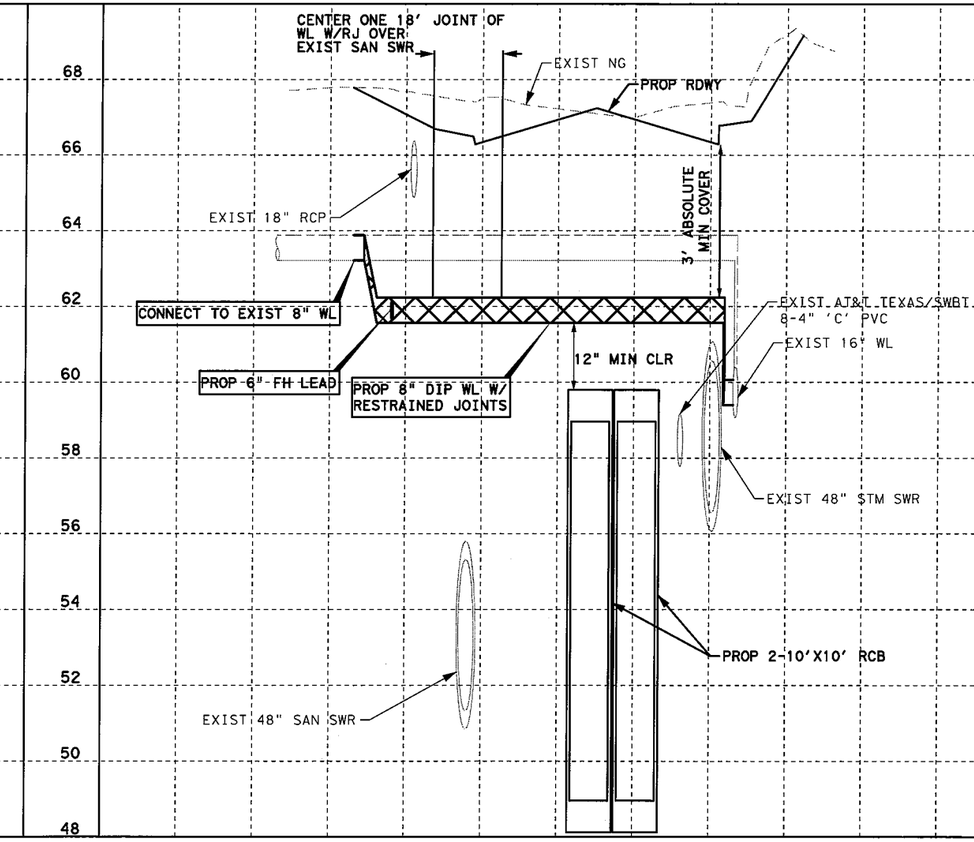
LEGEND

- EXISTING ROW
- PROPOSED WATERLINE
- PROPOSED SAN SWR
- PROPOSED RESTRAINED JOINT
- ABANDON EXIST SS
- CRITICAL LOCATE

NOTES:

1. REFER TO DRAINAGE AND ROADWAY IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
2. REFER TO DEMOLITION PLAN SHEETS FOR MORE INFORMATION.
3. MAINTAIN WATER SERVICES TO ALL CUSTOMERS, FIRE HYDRANTS, AND INTERCONNECTIONS AS NECESSARY FOR CONSTRUCTION.
4. ABANDON EXISTING 16"/8" WL AND TRANSFER SERVICES TO PROPOSED 16"/8" WATER LINES. COORDINATE WITH PROPERTY OWNERS.
5. SUBMIT CCTV VIDEO INSPECTIONS OF ALL NEW SANITARY SEWER MAINLINES, LATERALS, AND MANHOLES TO THE CITY OF HOUSTON, IN ACCORDANCE WITH CITY OF HOUSTON SPECIFICATION 02558.
6. MAINTAIN DRAINAGE AT ALL TIMES. COST FOR TEMPORARY PIPE COMPLETE IN PLACE IS INCIDENTAL TO THE PROP WL ITEM.





ACCEPTED AND RELEASED FOR CONSTRUCTION
67862

0 40 80
(IN FEET)
SCALE: 1":40' - H
1":4' - V

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED
PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation ©2020

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

WATER & SAN SWR CROSSING

SHEET 6 OF 7

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CK: DWG:	HOU	HARRIS	0912	72	391	274

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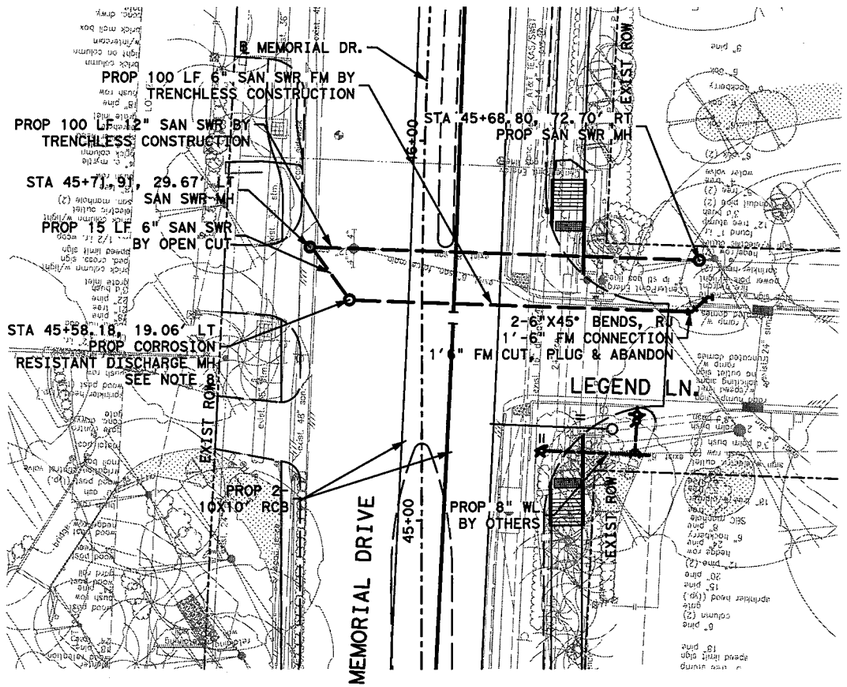
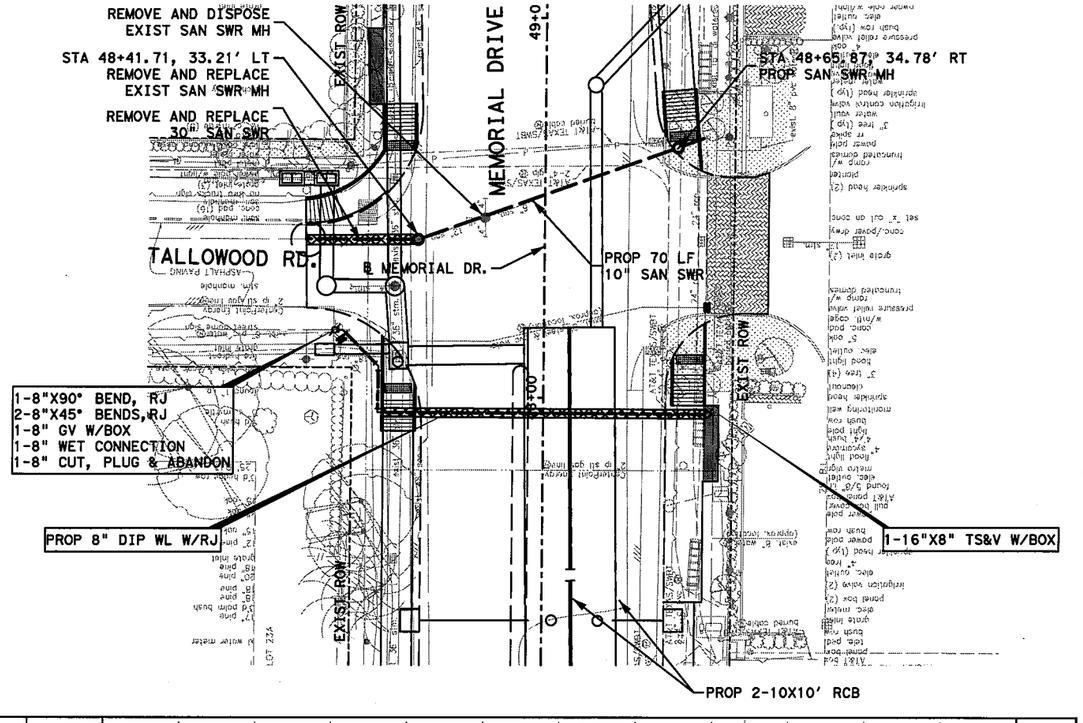


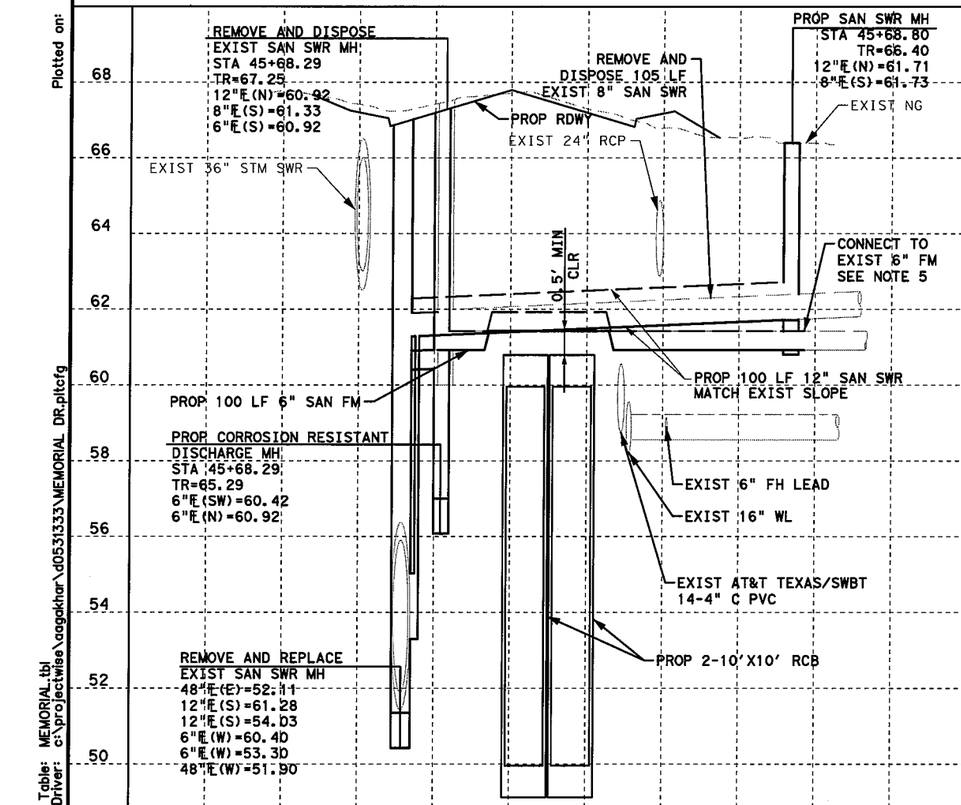


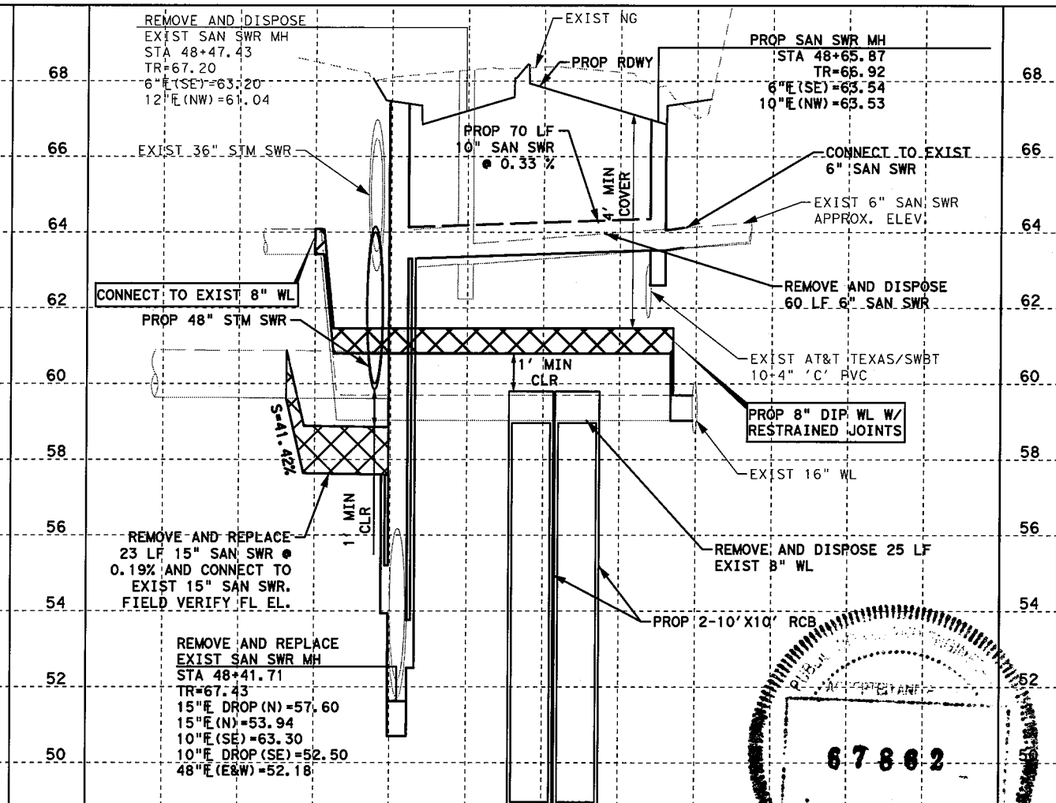
LEGEND

- EXISTING ROW
- PROPOSED WATERLINE
- PROPOSED SAN SWR
- PROPOSED RESTRAINED JOINT
- ABANDON EXIST SS
- CRITICAL LOCATE

NOTES:

1. REFER TO DRAINAGE AND ROADWAY IMPROVEMENTS PLAN & PROFILE SHEETS FOR MORE INFORMATION.
2. REFER TO DEMOLITION PLAN SHEETS FOR MORE INFORMATION.
3. MAINTAIN WATER SERVICES TO ALL CUSTOMERS, FIRE HYDRANTS, AND INTERCONNECTIONS AS NECESSARY FOR CONSTRUCTION.
4. ABANDON EXISTING 16"/8" WL AND TRANSFER SERVICES TO PROPOSED 16"/8" WATER LINES. COORDINATE WITH PROPERTY OWNERS.
5. PROVIDE ISOLATION FLANGES IF DISSIMILAR MATERIAL IS ENCOUNTERED.
6. SUBMIT CCTV VIDEO INSPECTIONS OF ALL NEW SANITARY SEWER MAINLINES, LATERALS, AND MANHOLES TO THE CITY OF HOUSTON, IN ACCORDANCE WITH CITY OF HOUSTON SPECIFICATION 02558.
7. MAINTAIN DRAINAGE AT ALL TIMES. COST FOR TEMPORARY PIPE COMPLETE IN PLACE IS INCIDENTAL TO THE PROP WL BID CODE.
8. PROVIDE CORROSION RESISTANT MANHOLE WITH LINER/COATING SYSTEM MEETING CITY OF HOUSTON APPROVED PRODUCT LIST.





0 40 80

(IN FEET)
SCALE: 1"=40' - H
1"=4' - V

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

WATER LINE AND SAN SWR CROSSING

SHEET 7 OF 7

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWN:	HOU	HARRIS	0912	72	391	275

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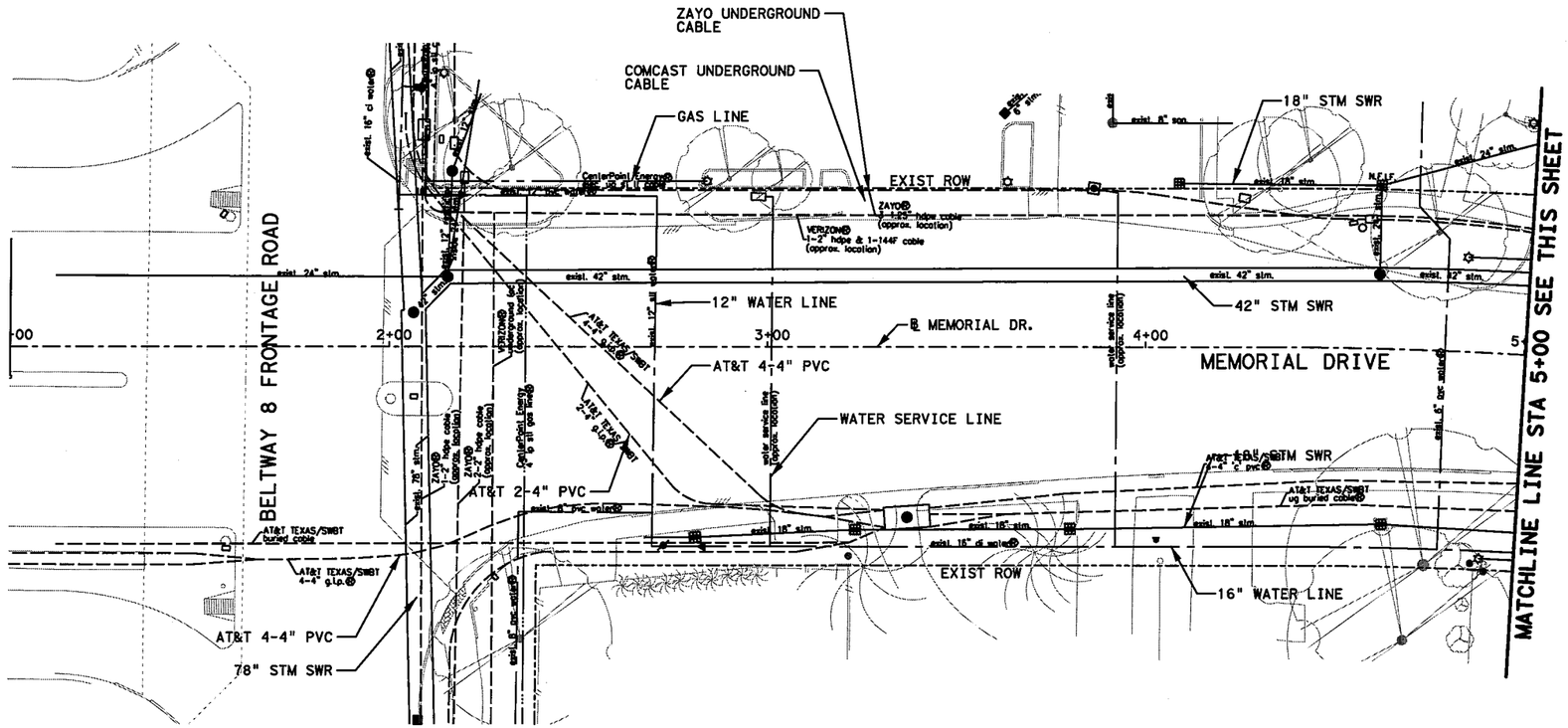

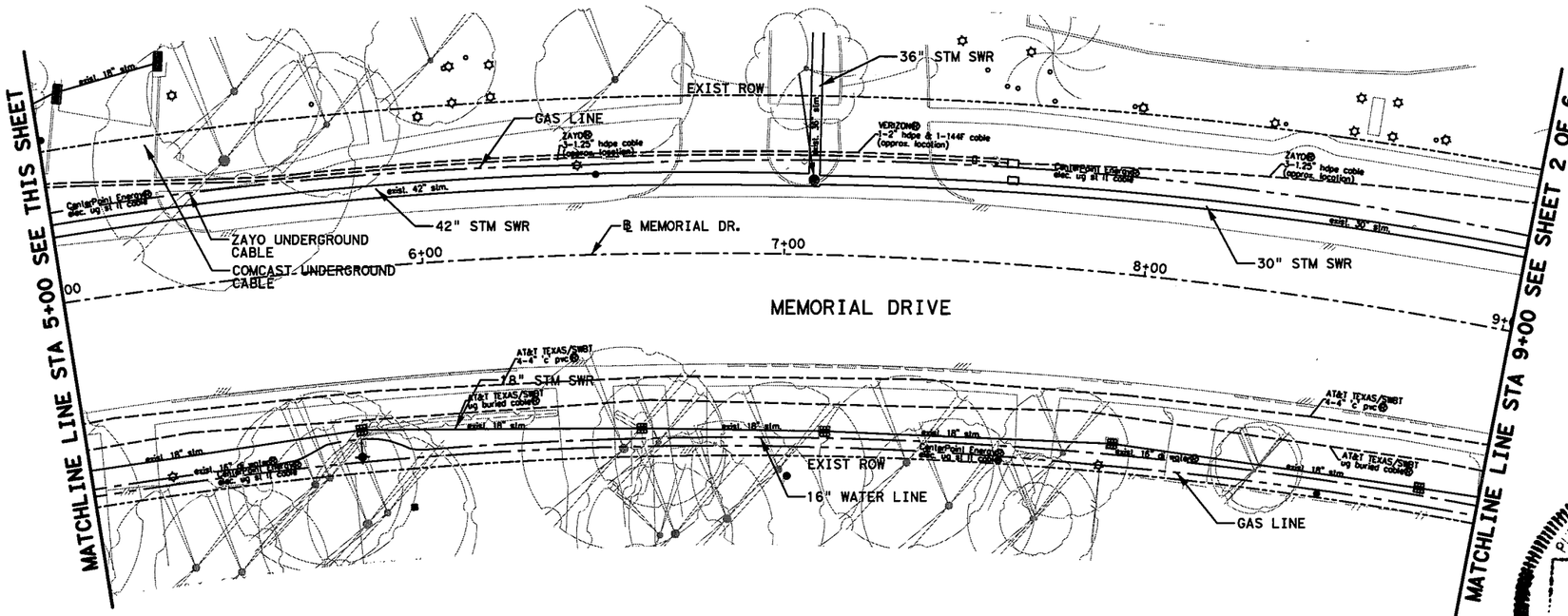

NOTES:

1. THE LOCATIONS OF UTILITIES SHOWN ARE APPROXIMATE. CONTRACTOR SHALL VERIFY ELEVATION & LOCATION PRIOR TO ANY EXCAVATION WORK.
2. COORDINATE WITH APPROPRIATE PRIVATE UTILITY CONTACT TO FIELD ADJUST EXISTING APPURTENANCES TO REMAIN IN PLACE. CONTACT UTILITY REPRESENTATIVE 6 WEEKS PRIOR TO ANY ADJUSTMENTS.
3. AT&T TEXAS
   MR. JAMES MANAHL: 713-918-0043
4. CENTERPOINT ENERGY/GAS:
   MS. SHAUNA WEINMANN, P.E.: 713-207-4884
5. CENTERPOINT ENERGY/ELECTRIC
   MR. EDWARD HUSLEY:
   EDWARD.HUSLEY@CENTERPOINTENERGY.COM
6. COMCAST
   MS. DANA INGRAM: 713-637-5638
7. CENTERPOINT ENERGY/STREET LIGHTING
   MS. ESTRELLA RODRIGUEZ: 713-945-3219
8. ZAYO
   MR. KEVIN SEWALL: 817-665-8438
9. PHONOSCOPE
   MR. JOHN LAMBERT: 832-917-5570
10. VERIZON
    MR. MICHAEL MABE: MICHAEL.MABE@VERIZON.COM

0 40 80
(IN FEET)
SCALE: PLAN 1": 40'

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED
PROFESSIONAL ENGINEER
03/04/2020
Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

EXISTING UTILITIES
BEGIN PROJECT TO STA 9+00

SHEET 1 OF 6

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	276

ACCEPTED AND F
67862

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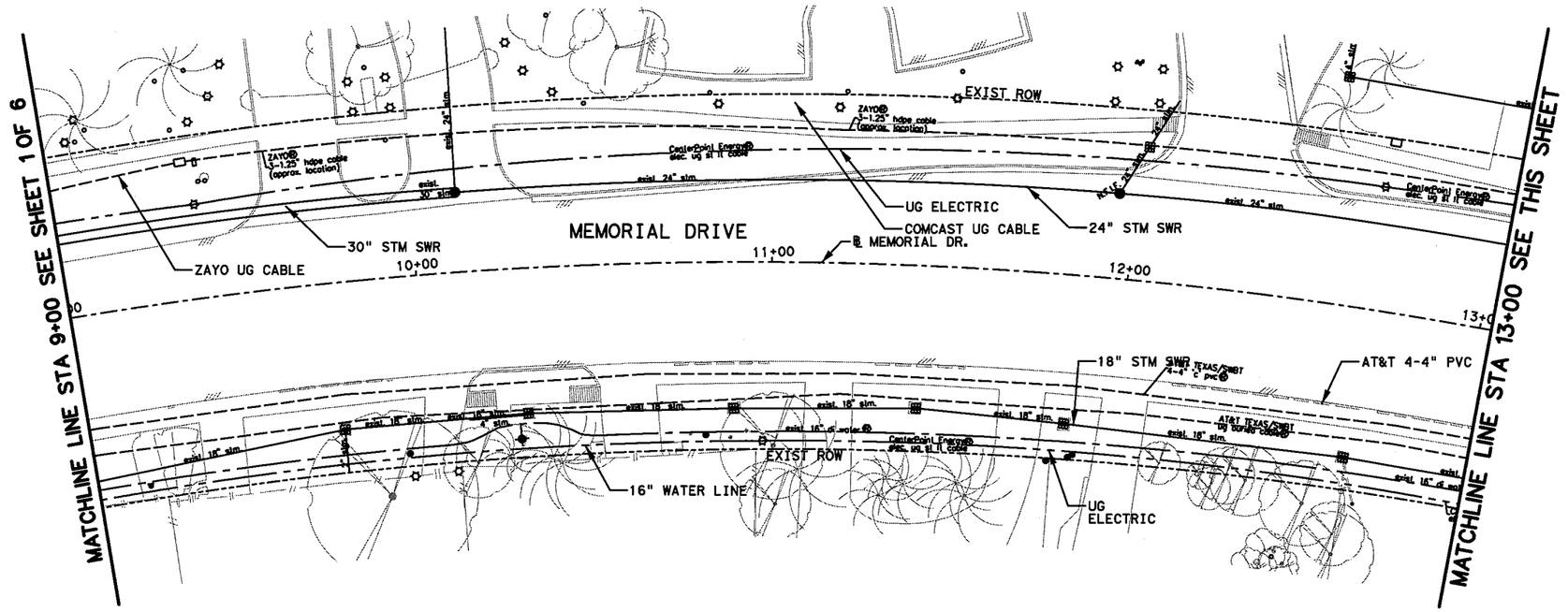

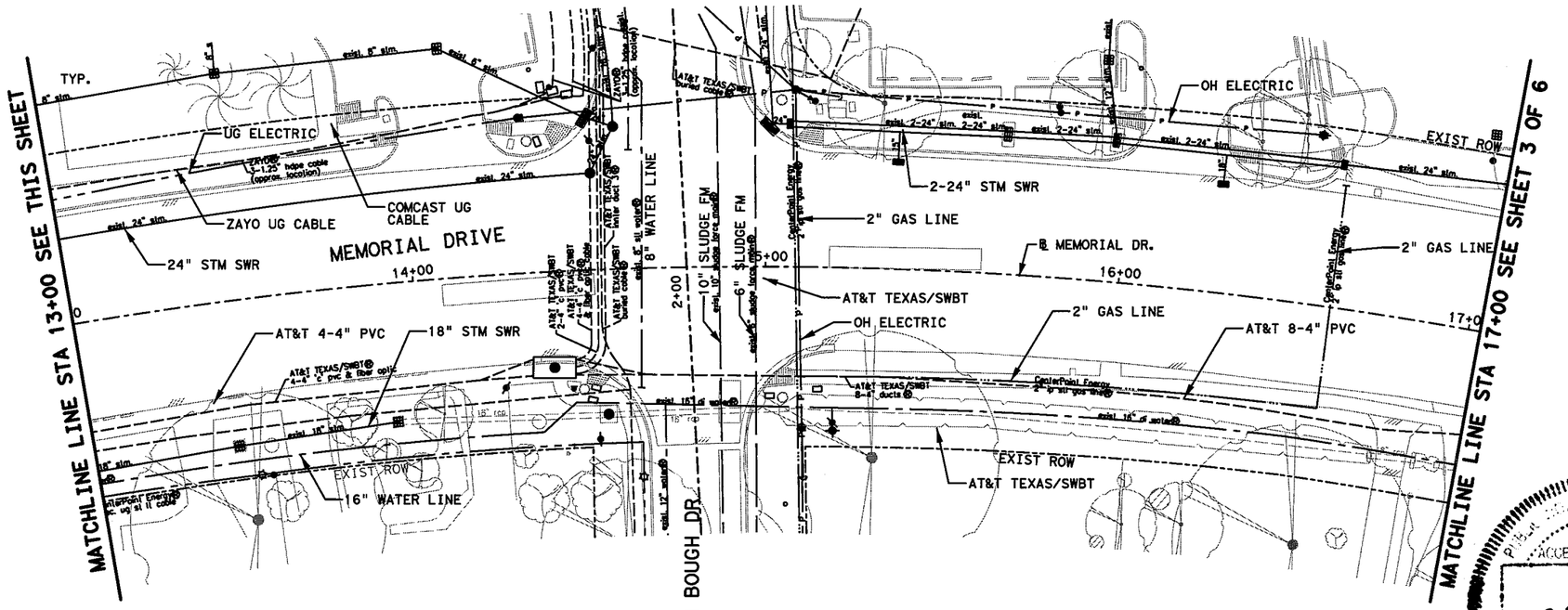

NOTES:

1. THE LOCATIONS OF UTILITIES SHOWN ARE APPROXIMATE. CONTRACTOR SHALL VERIFY ELEVATION & LOCATION PRIOR TO ANY EXCAVATION WORK.
2. COORDINATE WITH APPROPRIATE PRIVATE UTILITY CONTACT TO FIELD ADJUST EXISTING APPURTENANCES TO REMAIN IN PLACE. CONTACT UTILITY REPRESENTATIVE 6 WEEKS PRIOR TO ANY ADJUSTMENTS.
3. AT&T TEXAS
   MR. JAMES MANAHL: 713-918-0043
4. CENTERPOINT ENERGY/GAS:
   MS. SHAUNA WEINMANN, P.E.: 713-207-4884
5. CENTERPOINT ENERGY/ELECTRIC
   MR. EDWARD HUSLEY:
   EDWARD.HUSLEY@CENTERPOINTENERGY.COM
6. COMCAST
   MS. DANA INGRAM: 713-637-5638
7. CENTERPOINT ENERGY/STREET LIGHTING
   MS. ESTRELLA RODRIGUEZ: 713-945-3219
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9. PHONOSCOPE
   MR. JOHN LAMBERT: 832-917-5570
10. VERIZON
    MR. MICHAEL MABE: MICHAEL.MABE@VERIZON.COM

0 40 80
(IN FEET)
SCALE: PLAN 1":40'

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED PROFESSIONAL ENGINEER
03/04/2020
Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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ACCEPTED
67862

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

EXISTING UTILITIES STA 9+00 TO STA 17+00

SHEET 2 OF 6

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	277

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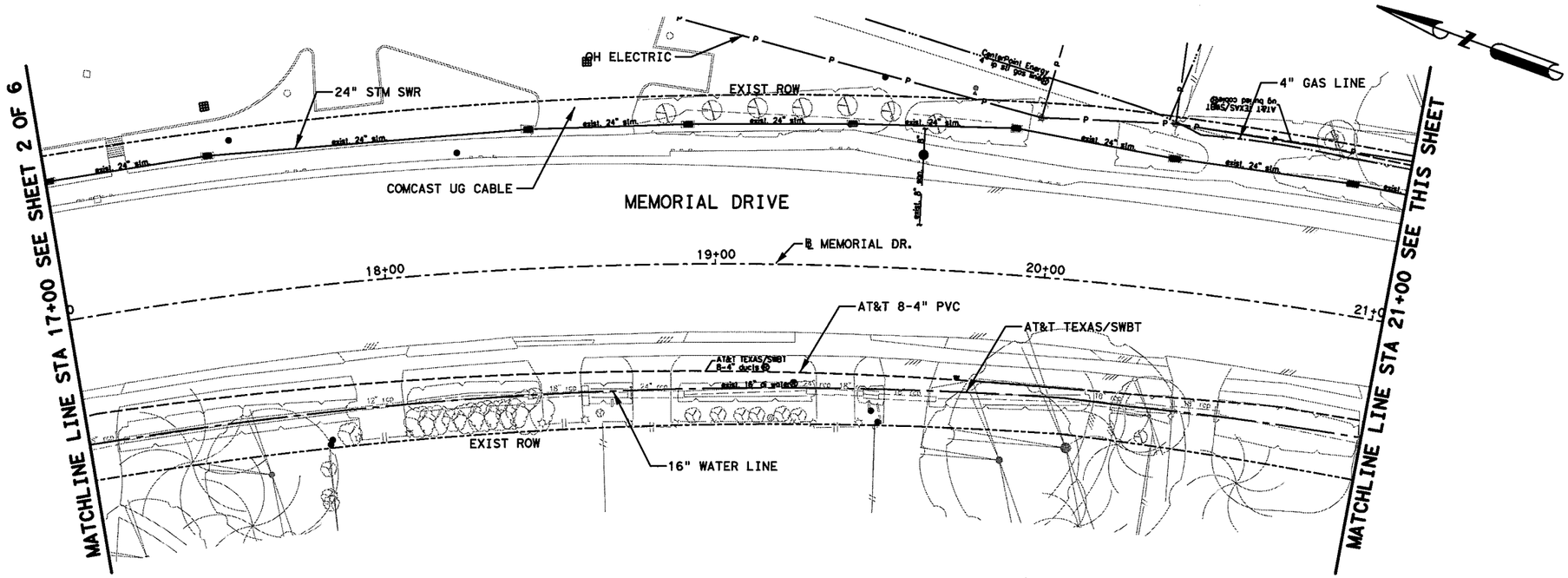

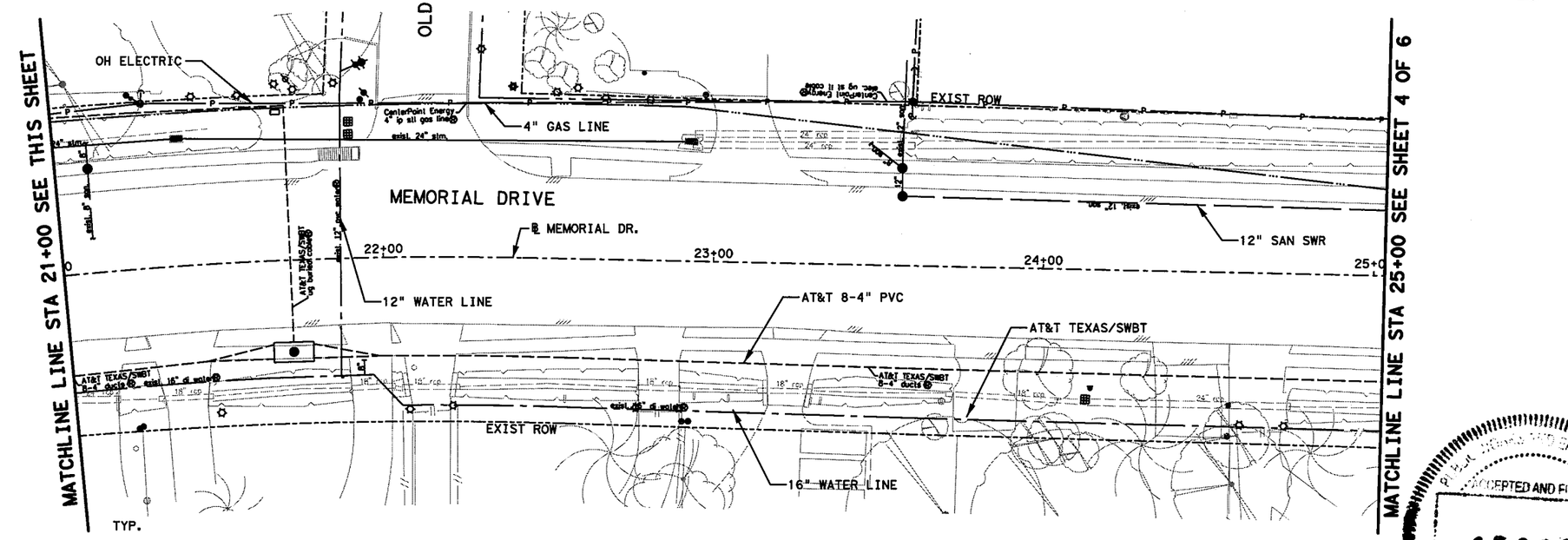

NOTES:

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2. COORDINATE WITH APPROPRIATE PRIVATE UTILITY CONTACT TO FIELD ADJUST EXISTING APPURTENANCES TO REMAIN IN PLACE. CONTACT UTILITY REPRESENTATIVE 6 WEEKS PRIOR TO ANY ADJUSTMENTS.
3. AT&T TEXAS
   MR. JAMES MANAHL: 713-918-0043
4. CENTERPOINT ENERGY/GAS:
   MS. SHAUNA WEINMANN, P.E.: 713-207-4884
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9. PHONOSCOPE
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10. VERIZON
    MR. MICHAEL MABE: MICHAEL.MABE@VERIZON.COM

0 40 80
(IN FEET)
SCALE: PLAN 1"=40'

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED
PROFESSIONAL ENGINEER
03/04/2020
Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

EXISTING UTILITIES
STA 17+00 TO STA 25+00

SHEET 3 OF 6

	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
DSN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK:	HOU	HARRIS	0912	72	391	278

ACCEPTED AND FILED
67862

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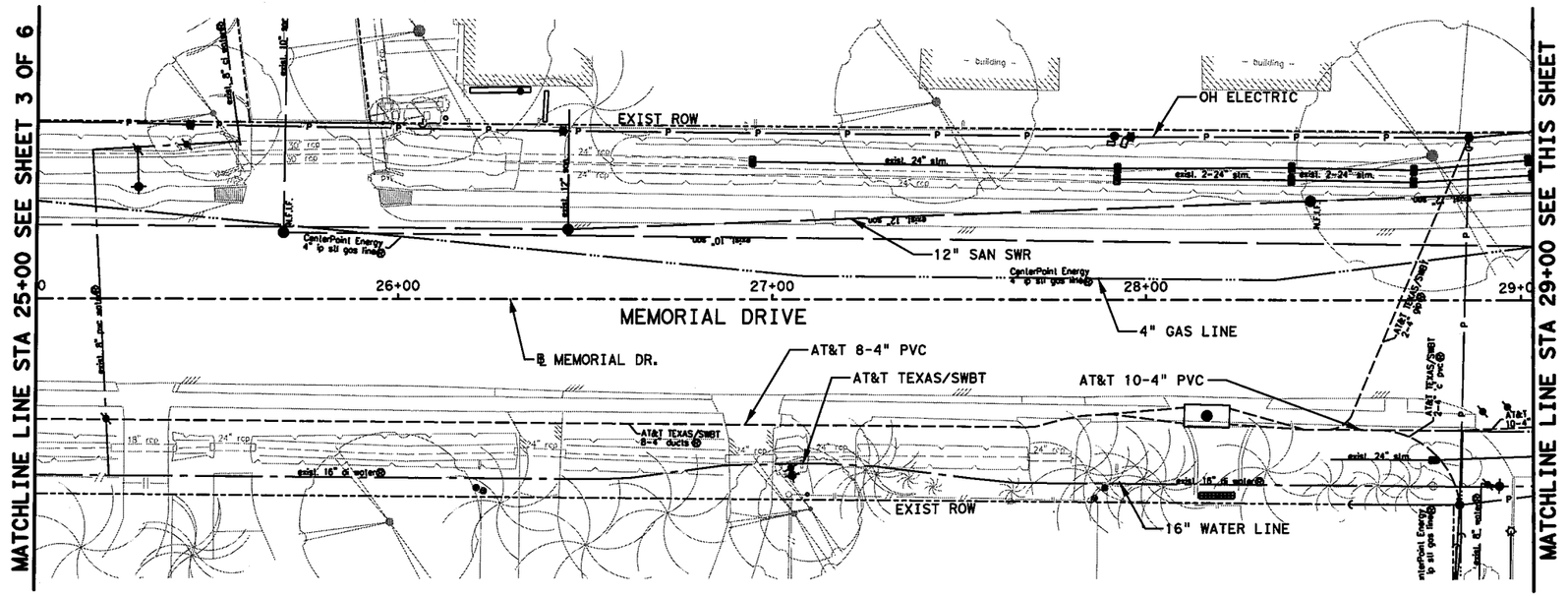

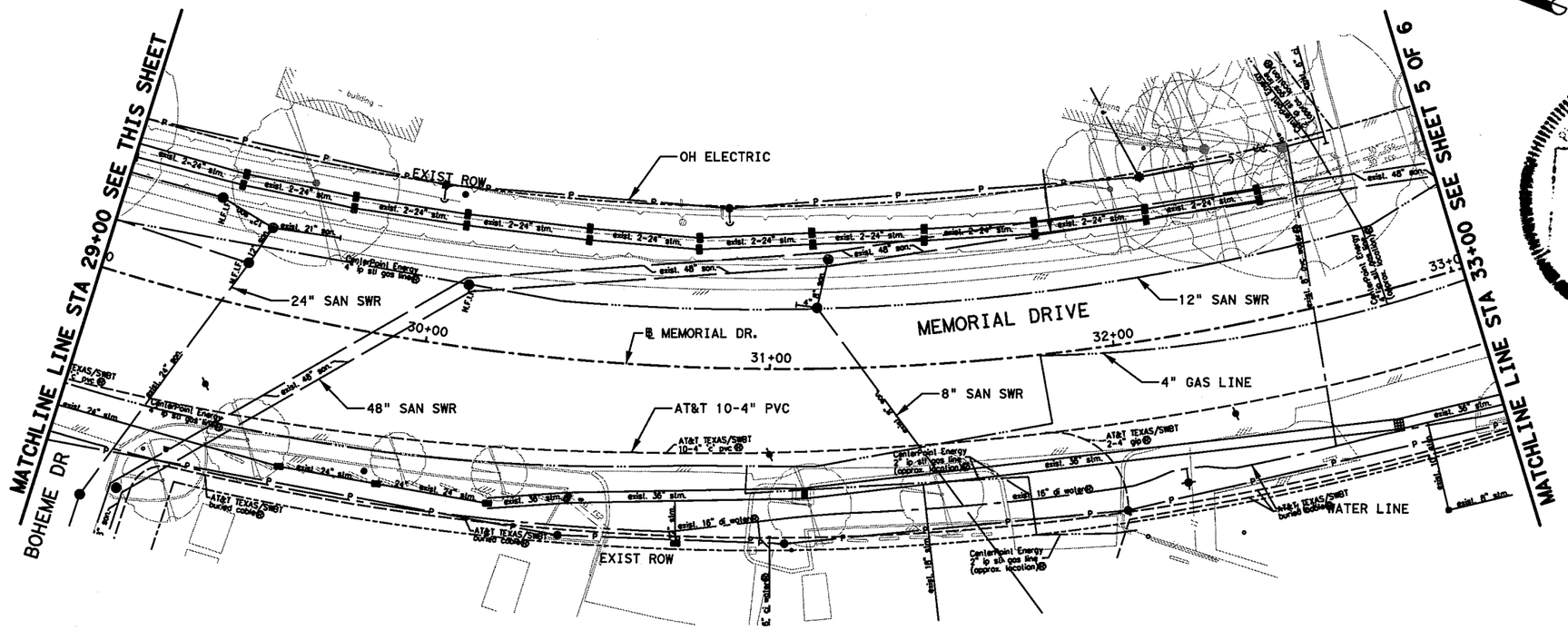

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10. VERIZON
    MR. MICHAEL MABE: MICHAEL.MABE@VERIZON.COM

0 40 80
(IN FEET)
SCALE: PLAN 1" = 40'

ACCEPTED AND F... 67862

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED
PROFESSIONAL ENGINEER
03/04/2020
Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

EXISTING UTILITIES STA 25+00 TO STA 33+00

SHEET 4 OF 6

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	279

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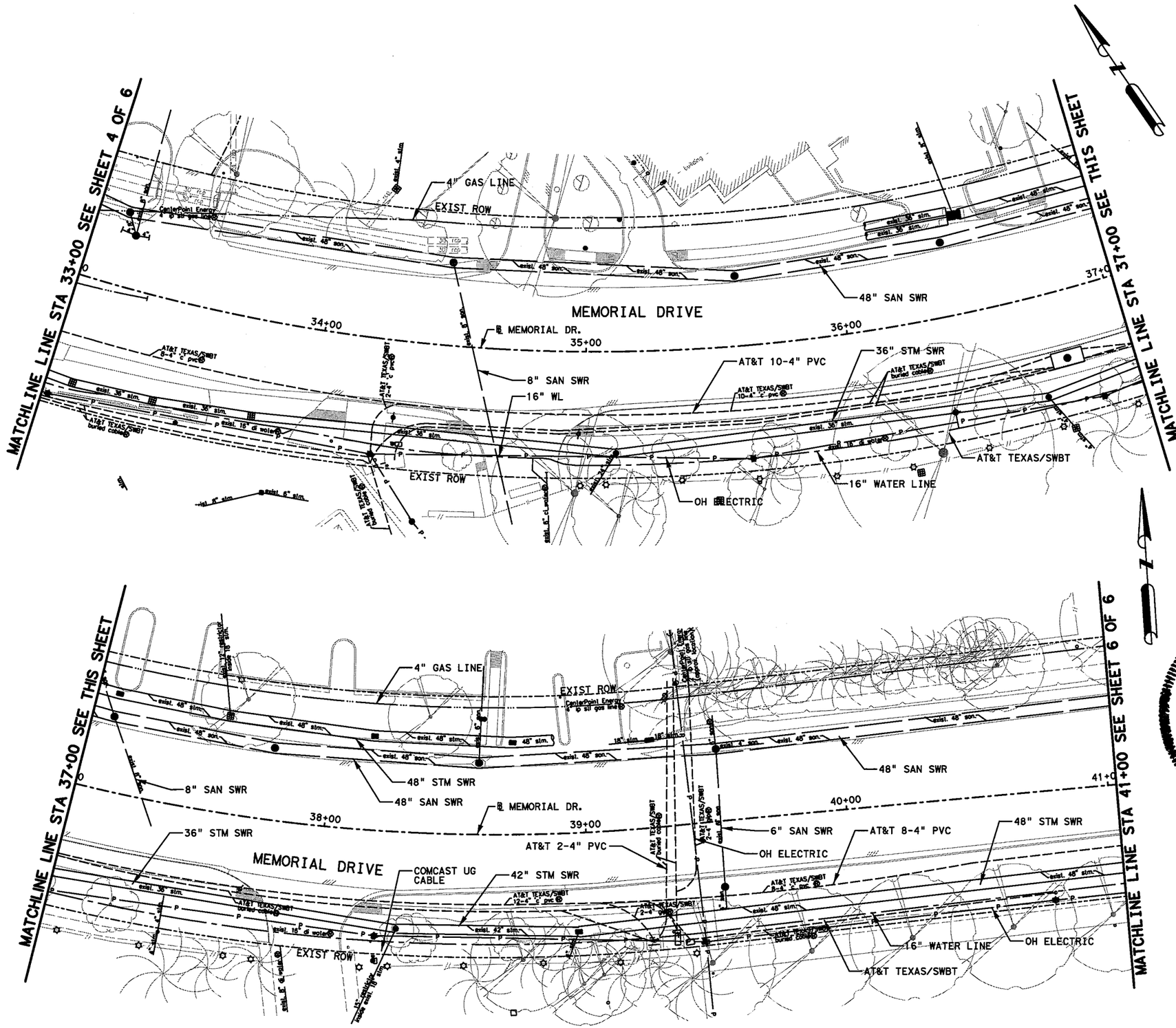

NOTES:

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10. VERIZON
    MR. MICHAEL MABE: MICHAEL.MABE@VERIZON.COM

0 40 80
(IN FEET)
SCALE: PLAN 1" = 40'

ACCEPTED AND FILED
PUBLIC WORKS AND ENGINEERING
67862

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED PROFESSIONAL ENGINEER
03/04/2020
Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

EXISTING UTILITIES
STA 33+00 TO STA 41+00

SHEET 5 OF 6

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	280

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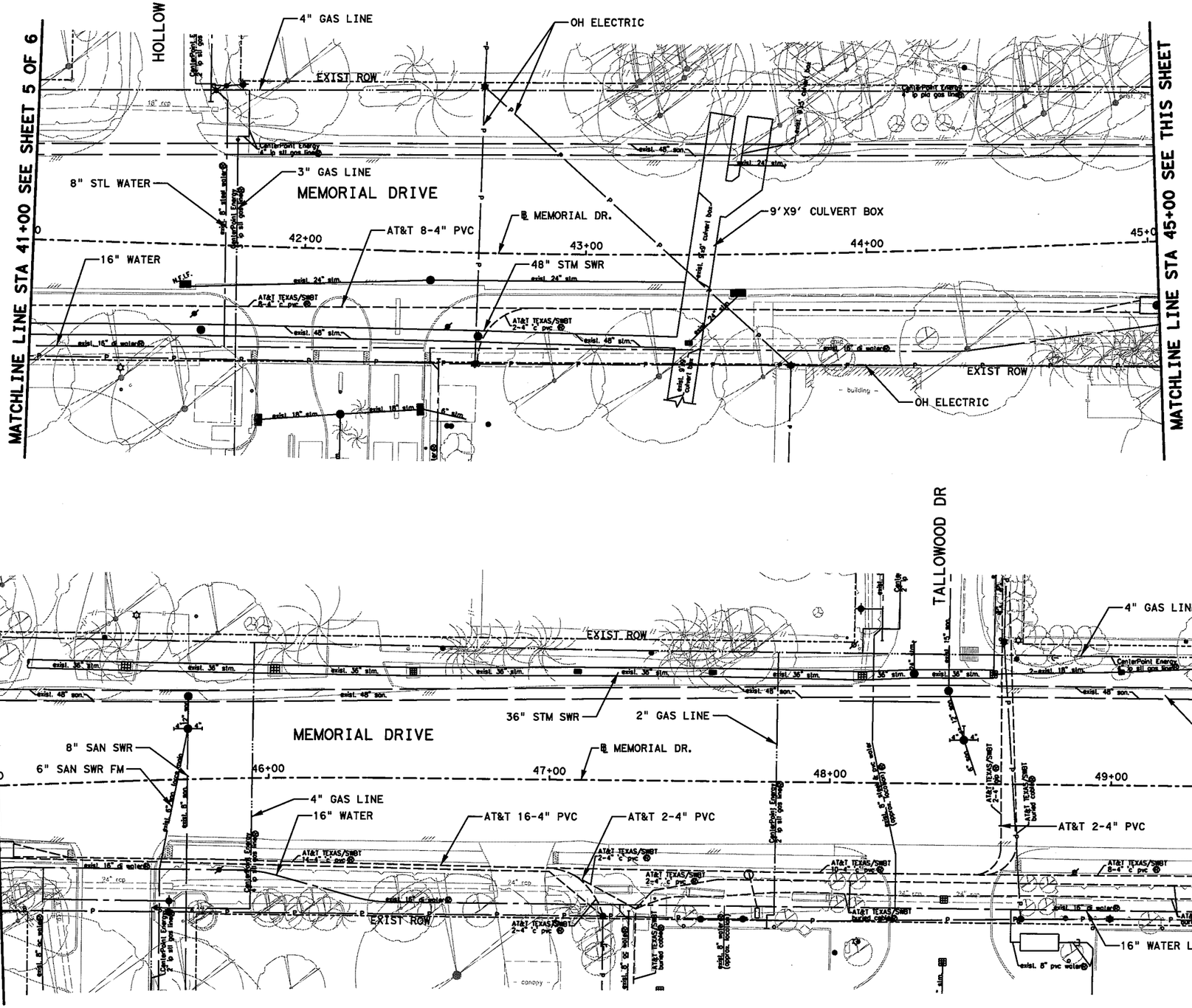

NOTES:

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10. VERIZON
    MR. MICHAEL MABE: MICHAEL.MABE@VERIZON.COM

ACCEPTED AS NOTED
67862

0 50
(IN FEET)
SCALE: PLAN 1":40'

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED
PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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FIRM REGISTATION NO. 2614

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

EXISTING UTILITIES STA 41+00 TO END PROJECT

SHEET 6 OF 6

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	281

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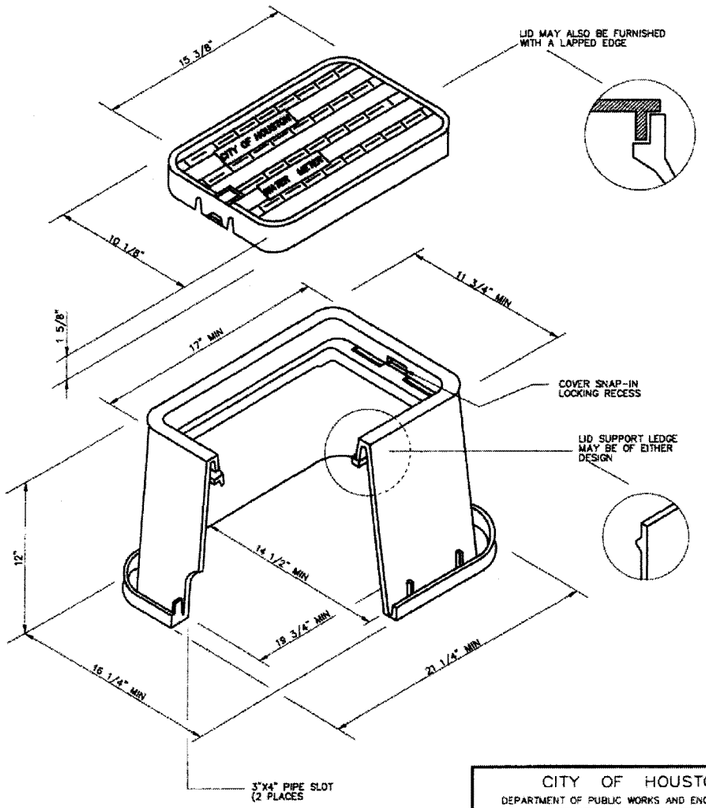
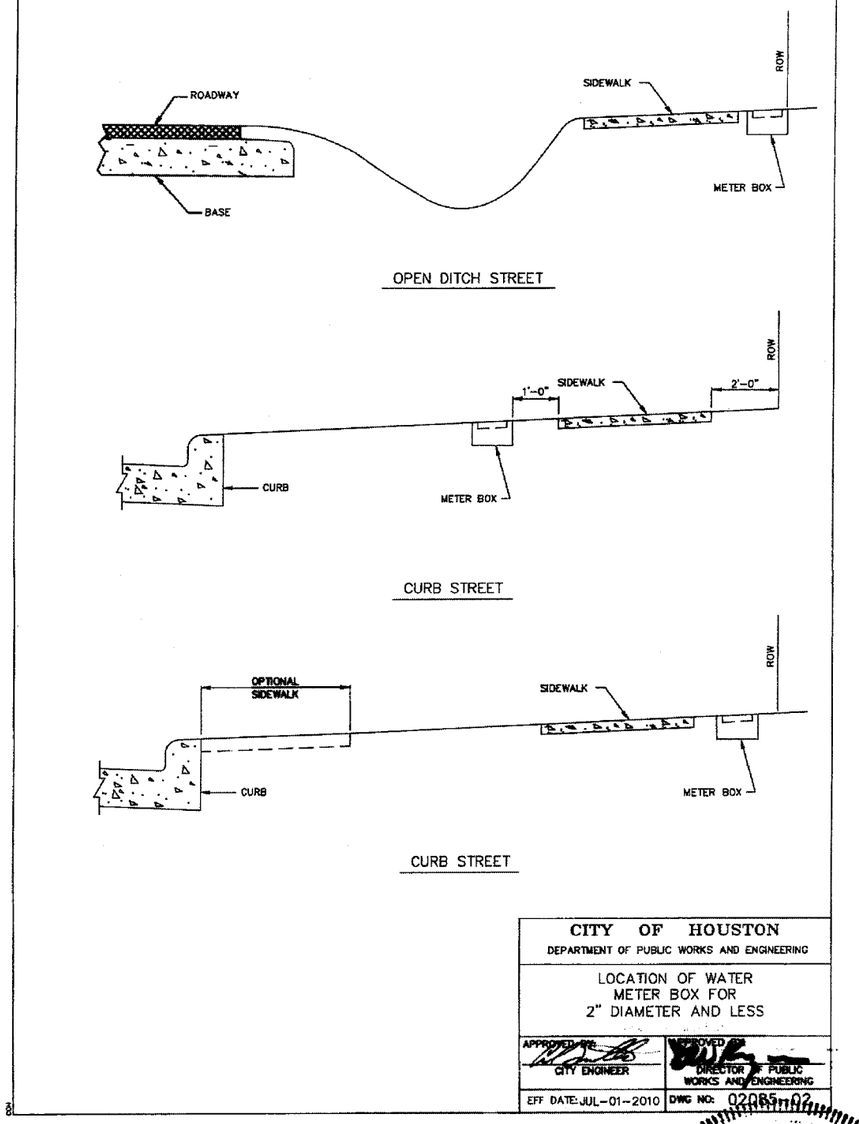


NOTE

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 ⅝" 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

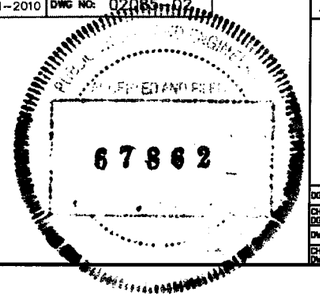


OPEN DITCH STREET

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: 02083-02



Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STANDARD WATERLINE DETAILS

SHEET 1 OF 5

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	282

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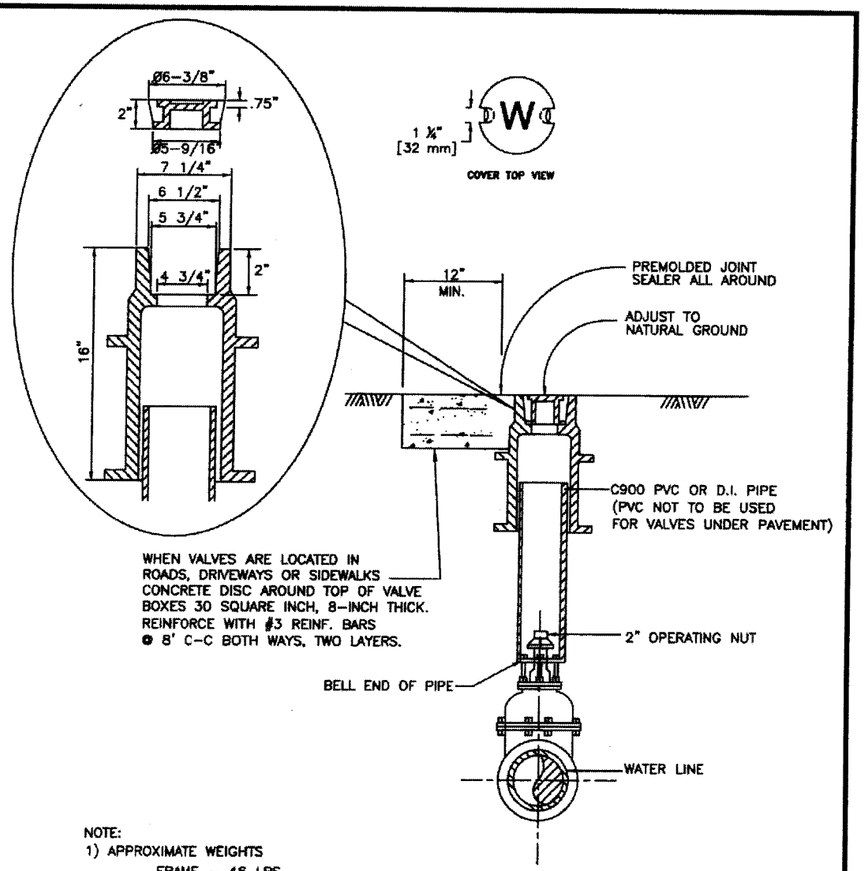
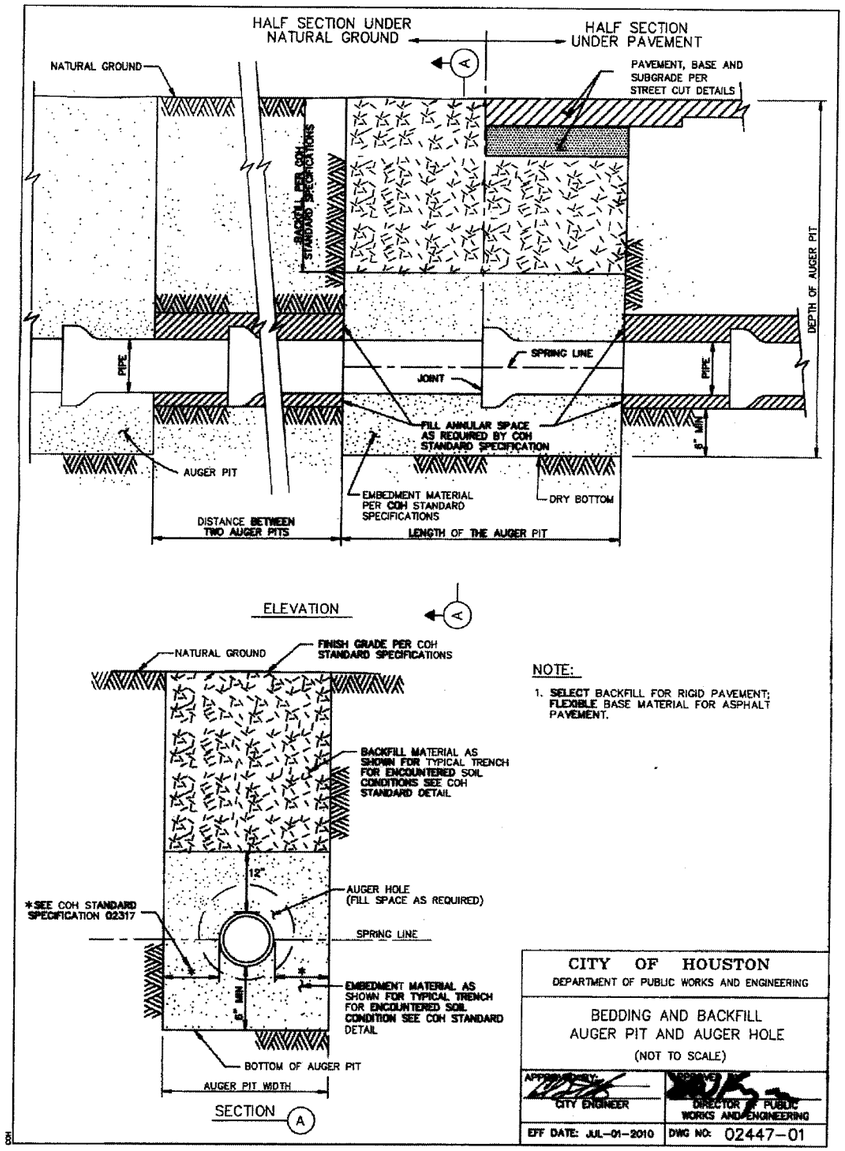


NOTE:
1) APPROXIMATE WEIGHTS
FRAME - 46 LBS
COVER - 10 LBS
2) MATERIAL - GRAY IRON ASTM A48 CL35B

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



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

PUBLIC WORKS AND ENGINEERING
ACCEPTED AND FILED
67862

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED
PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

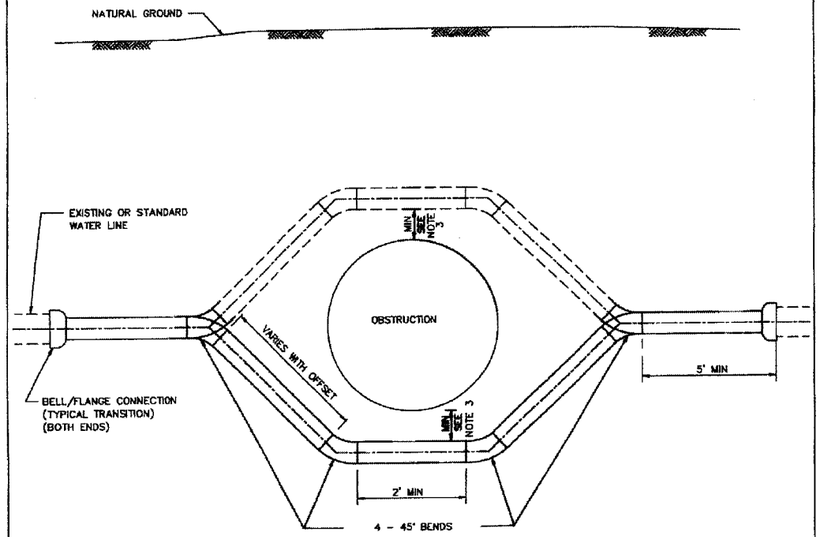
STANDARD WATERLINE DETAILS

SHEET 2 OF 5

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	283

NOTE:

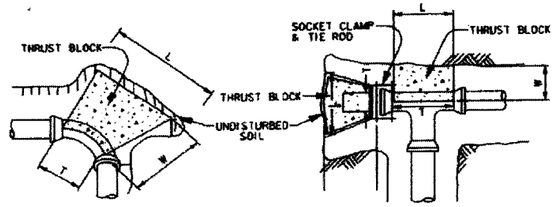
1. MATERIALS AND COATINGS TO BE IN ACCORDANCE WITH WATER LINE STANDARD SPECIFICATIONS.
2. RESTRAIN EXISTING PIPING BEYOND STEEL SECTION AS REQUIRED TO PREVENT MOVEMENT.
3. AS PER DESIGN GUIDELINE.



PIPE OFFSET ALTERNATES

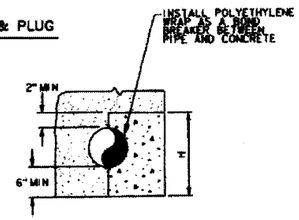
1. DUCTILE IRON PIPE **PRESSURE** 250 PSI WITH APPROVED RESTRAINED **JOINTS.**
2. PVC PIPE WITH INTEGRAL RESTRAINED JOINT SYSTEM, OR DUCTILE – IRON RESTRINED JOINT FITTINGS, EPOXY LINED AND COATED. USE 250 PSI AWWA C900 DR 14 FOR PVC RESTRAINED JOINTS.
3. PVC NOT ALLOWED FOR GREATER THAN 20 FT OF COVER 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



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

ACCEPTED AND FILED
67862

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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A LEO A DALY COMPANY
FIRM REGISTATION NO. 2614

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STANDARD WATERLINE DETAILS

SHEET 3 OF 5

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	284

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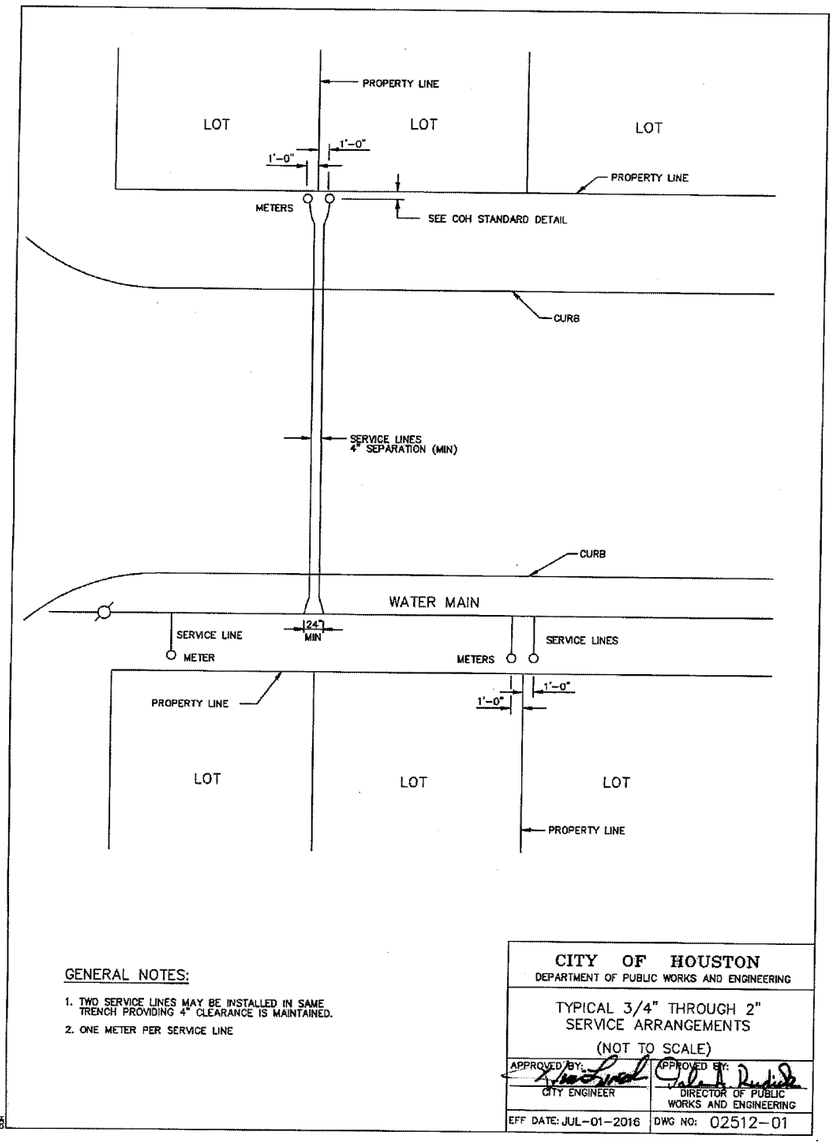


GENERAL NOTES:

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

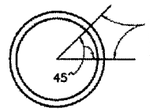
TYPICAL 3/4" THROUGH 2" SERVICE ARRANGEMENTS
(NOT TO SCALE)

APPROVED BY: CITY ENGINEER	APPROVED BY: DIRECTOR OF PUBLIC WORKS AND ENGINEERING
EFF DATE: JUL-01-2016	DWG NO: 02512-01

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



SERVICE TAPS TO BE MADE IN THIS ZONE EXCEPT FOR PVC FASTTAP

BLOW-OFF & CHLORINATION TAPS ARE MADE IN VERTICAL POSITION

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

ACCEPTED AND FILED
67862

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
©2020

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STANDARD DETAILS

SHEET 4 OF 5

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWN:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWN:	HOU	HARRIS	0912	72	391	285

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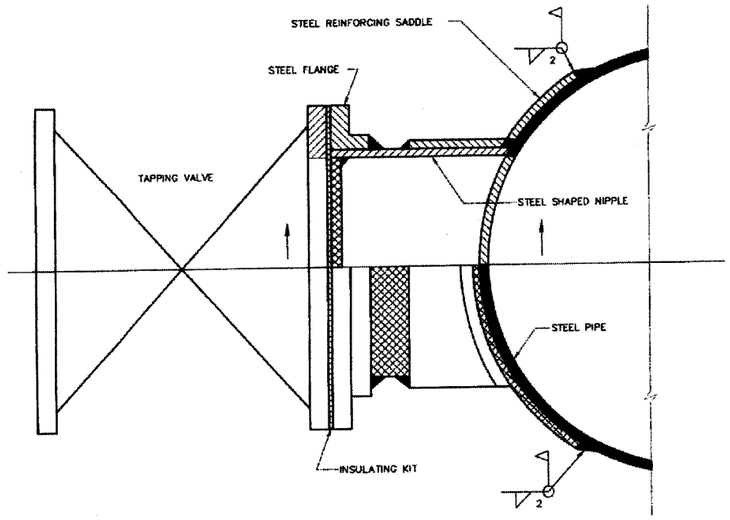
GENERAL NOTES:

1. PROVIDE STEEL TAPPING SLEEVE AS PER WATER MAIN SPECIFICATIONS.
2. WELDING SHALL BE AS NOTED IN WELD SYMBOLS.
3. INSULATING KIT IN ACCORDANCE WITH WATER MAIN SPECIFICATIONS.
4. REPAIR COATING AS PER WATER MAIN STANDARD SPECIFICATIONS.

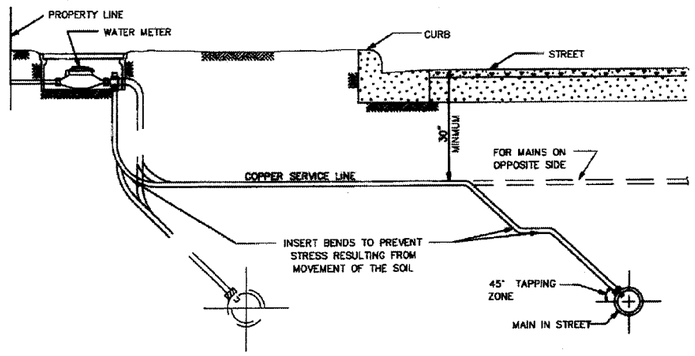


CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

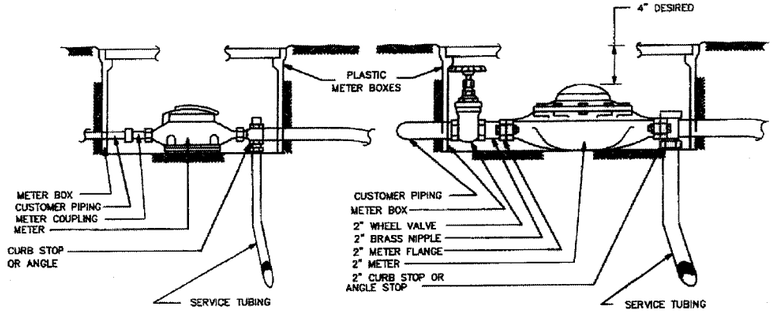
STANDARD TAP TO EXISTING STEEL MAIN
(NOT TO SCALE)

APPROVED BY: CITY ENGINEER | APPROVED: DIRECTOR OF PUBLIC WORKS AND ENGINEERING
EFF DATE: JULY-01-2010 | DWG NO: 02512-04

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: DIRECTOR OF PUBLIC WORKS AND ENGINEERING
EFF DATE: JULY-01-2010 | DWG NO: 02526-01

ACCEPTED AND FILED
67862

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

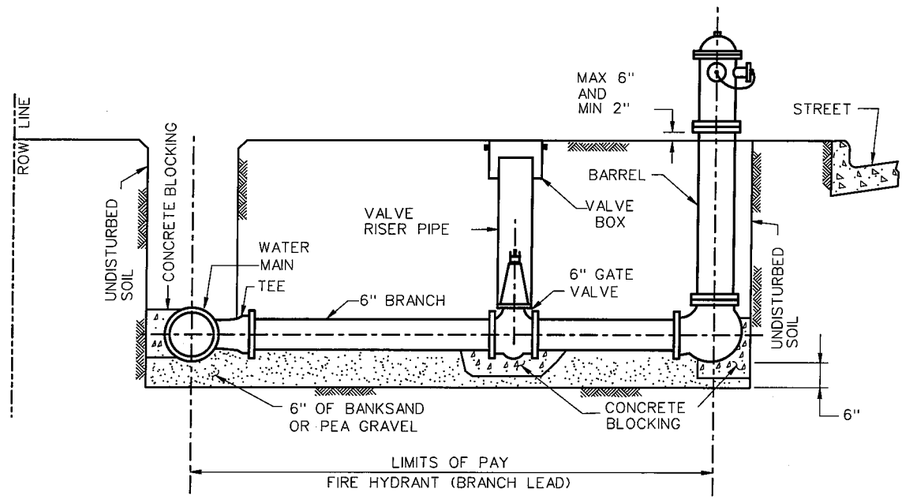
Texas Department of Transportation ©2020

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STANDARD WATER LINE DETAILS

SHEET 5 OF 5

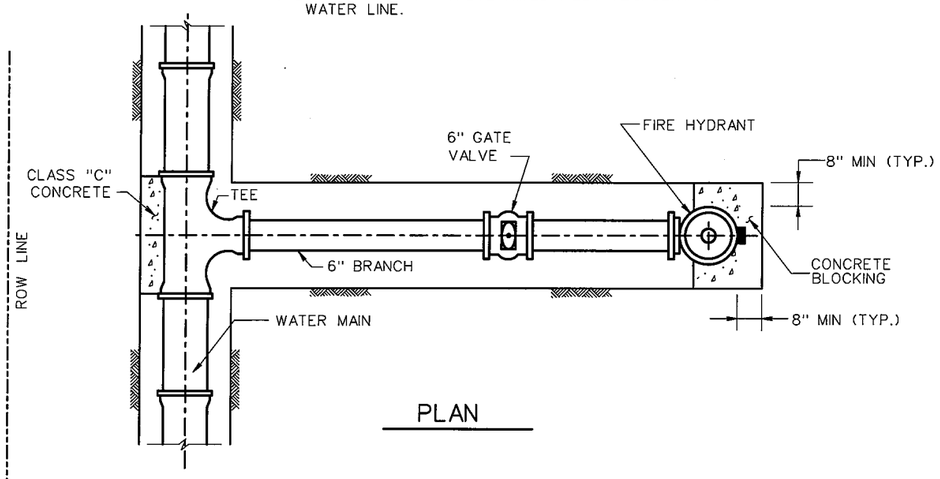
DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	286



SECTION

NOTES:

1. FIRE HYDRANT ASSEMBLY INCLUDES HYDRANT, BARREL, GATE VALVE w/ BOX, AND RISER PIPE.
2. ON CURB AND GUTTER ROADWAYS, LOCATE FIRE HYDRANTS AT PC's OF INTERSECTION CURB RADIUS, 3 FT. BEHIND CURB OR PROJECTED FUTURE CURB.
3. ON OPEN-DITCH ROADWAYS, LOCATE HYDRANTS WITHIN 5 FT. OF THE RIGHT-OF-WAY LINES.
4. ENSURE FIRE HYDRANT NOZZLE FACES THE STREET.
5. LOCATE HYDRANT VALVE IMMEDIATELY ADJACENT TO WATER LINE.



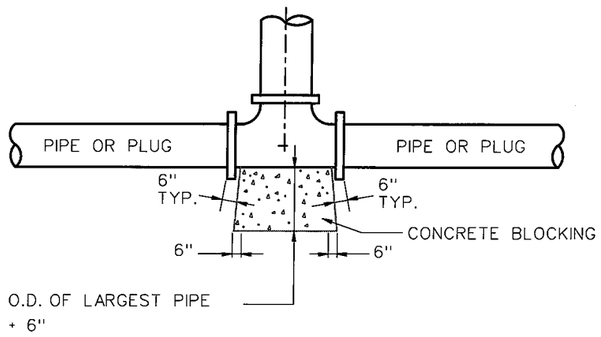
PLAN

STANDARD

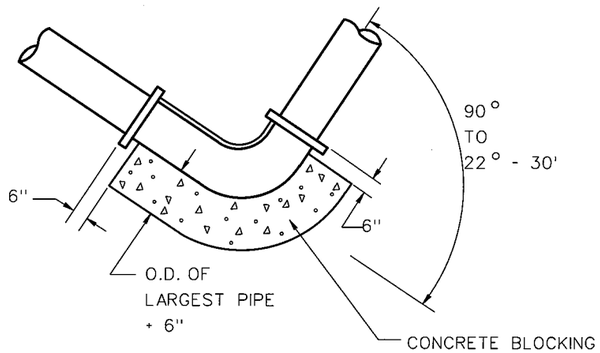
FIRE HYDRANT DETAIL

(NOT TO SCALE)

NOTE: MINIMUM THICKNESS OF THRUST IS THE O.D. OF LARGEST PIPE + 6 IN.



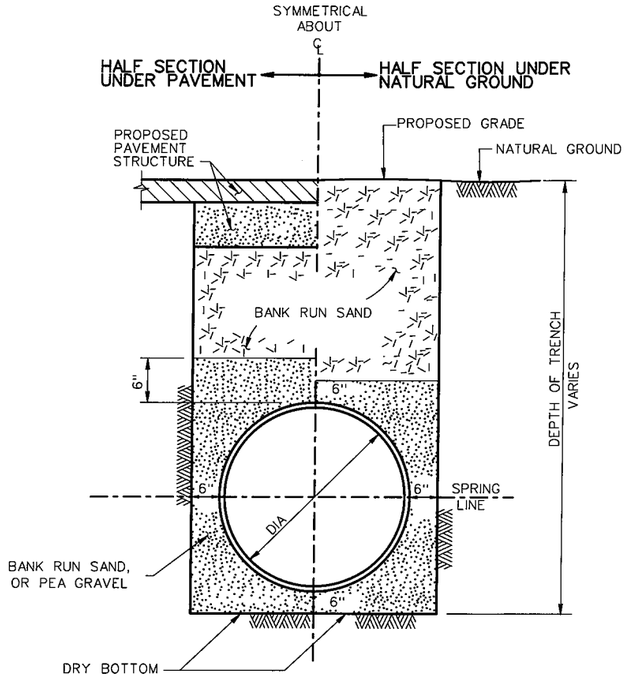
DETAIL "A"



DETAIL "B"

CONCRETE BLOCKING DETAILS

(NOT TO SCALE)



WATER DISTRIBUTION MAIN

BEDDING AND BACKFILL FOR

OPEN CUT TRENCHES

(NOT TO SCALE)

PUBLIC WORKS AND ENGINEERING
ACCEPTED AND FILED
67862

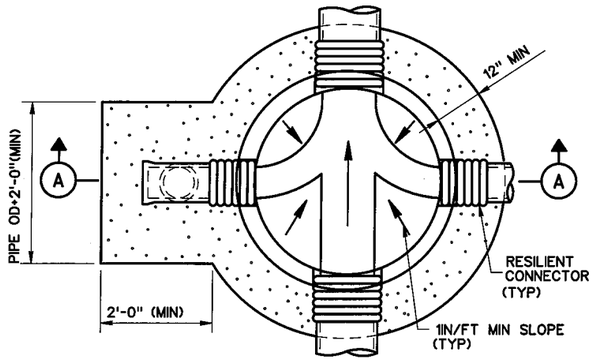
Texas Department of Transportation
Houston District

WATER LINE STANDARD

WLS-11

FILE: STDF5.DGN	DN: TxDot	CK: TxDot	DW: TxDot	CK: TxDot
©TxDOT FEBRUARY 2011	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS 03/15 2014 SPECS	HOU	6	STP 1802(783)MM	287
	COUNTY		CONTROL SECT JOB	HIGHWAY
	HARRIS		0912 72 391	CS

STD F5



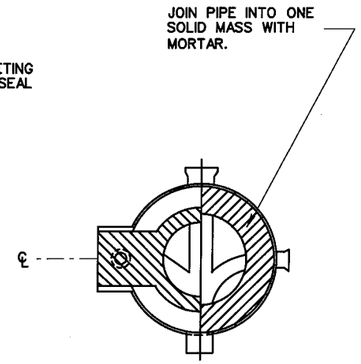
FOUNDATION PLAN (PRECAST MANHOLE)

GENERAL NOTES:

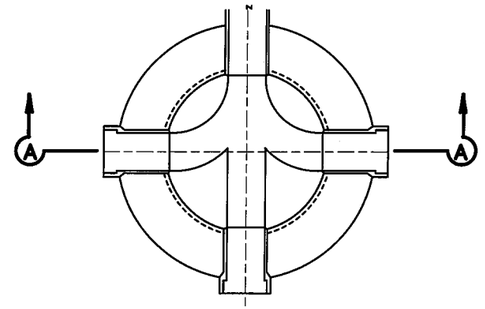
1. DEPTH OF MANHOLE DETERMINES SECTIONS REQUIRED.
2. THE MAXIMUM TOTAL HEIGHT OF THE ADJUSTMENT RINGS IS 1.5 FT.
3. INSTALL MANHOLE DROP AND INTERSECTING PIPES ONLY WHEN CALLED FOR IN THE PLAN AND PROFILE DRAWING.
4. ECCENTRIC PRECAST CONCRETE MANHOLE MAY BE USED.
5. FOR PRECAST SECTIONS, PROVIDE JOINTS BETWEEN SECTIONS, WITH O-RING GASKETS CONFORMING TO ASTM C 443.
6. WHERE RIGID JOINTS BETWEEN PIPE AND CAST-IN-PLACE MANHOLE BASE ARE USED, PROVIDE A POLYETHYLENE-ISOPRENE WATERSTOP MEETING PHYSICAL PROPERTY REQUIREMENTS OF ASTM C 923, SUCH AS PRES-SEAL WS SERIES, OR APPROVED EQUAL.

GENERAL NOTES:

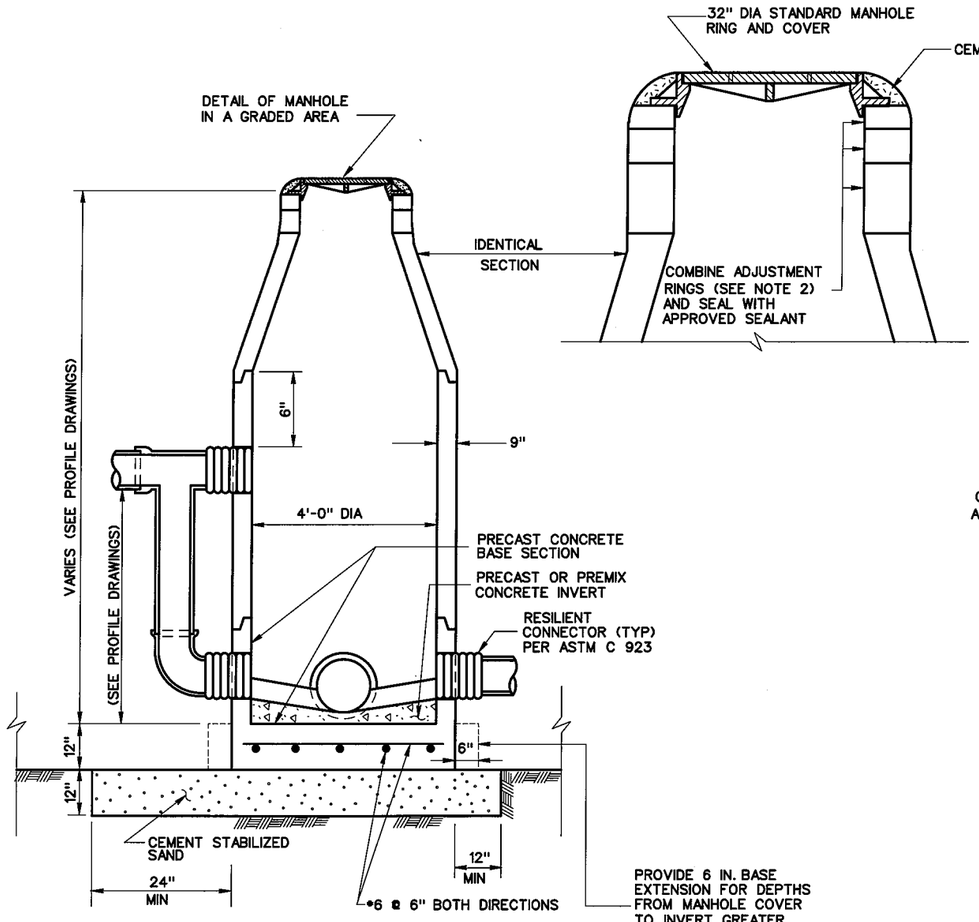
7. CONSTRUCT MANHOLES IN GRADED AREAS TO STAGE I AND FINISHED AFTER GRADING OPERATIONS ARE SUBSTANTIALLY COMPLETE.
8. WHERE THE FLOWLINE OF A PIPE ENTERING A MANHOLE IS GREATER THAN 2 FT. ABOVE THE FLOWLINE OF THE MANHOLE, A STANDARD DROP AS DETAILED ON THIS SHEET IS REQUIRED. USE THE SAME DIAMETER FOR THE DROP PIPE AS THE CONNECTING INFLOW PIPE.
9. JOIN PIPES INTO SOLID MASS WITH MORTAR.



SECTION A-B

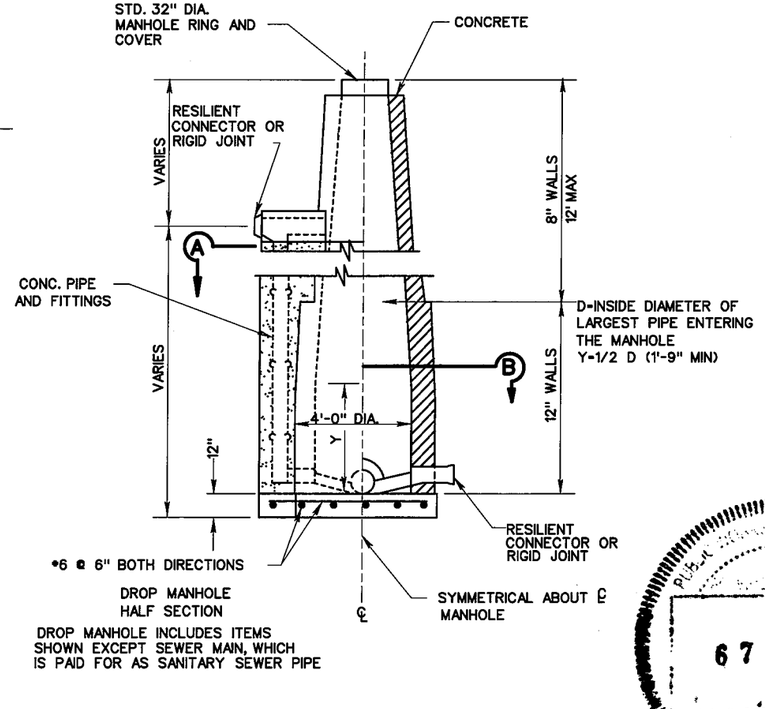


SECTION B-B

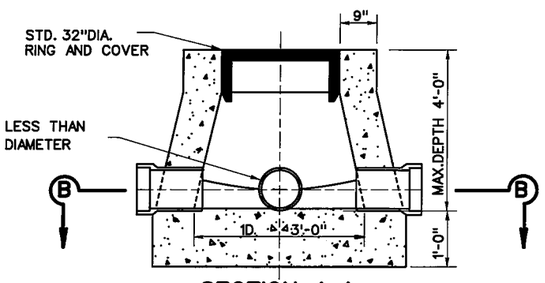


SECTION A A

MANHOLE TYPE 1 (PRECAST)



MANHOLE TYPE 1 (CAST-IN-PLACE)



SECTION A-A

STANDARD SANITARY SEWER (MONOLITHIC OR CAST IN PLACE) MANHOLE TYPE 2

PUBLICATION NO. 67862

Texas Department of Transportation
Houston District (Roadway)

SANITARY SEWER DETAILS

SSD-1

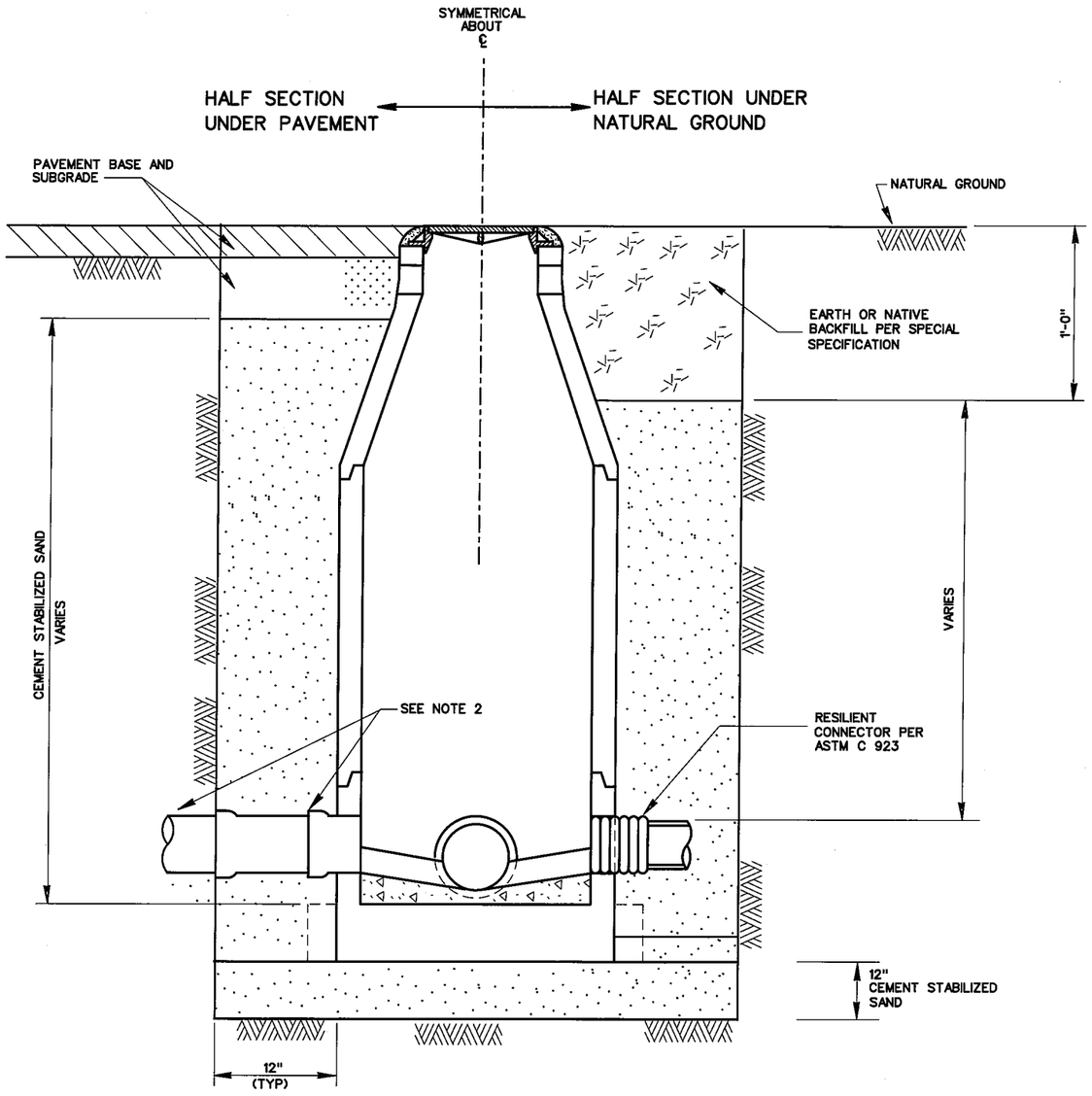
FILE: STDF1.DGN	DN: TxDot	CK: TxDot	DW: TxDot	CK: TxDot
© TxDOT MAY 2006	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS	HOU	6	STP 1802(783)MM	288
12/2004 06/2006 03/2015 2014 SPECS	COUNTY		CONTROL SECT JOB	HIGHWAY
	HARRIS		0912 72 391	CS

SHEET 1 OF 4

STD F1

NOTES:

1. GROUTING THE MANHOLE STRUCTURE ANNULAR SPACE IS PERMITTED IN CASES WHERE INSUFFICIENT WORK SPACE EXISTS FOR PLACING AND COMPACTING CEMENT STABILIZED SAND.
2. ARRANGE PIPE JOINTS AS SHOWN WHEN USING RIGID CONNECTION TO CAST IN PLACE MANHOLE BASE.



TYPICAL CROSS-SECTION

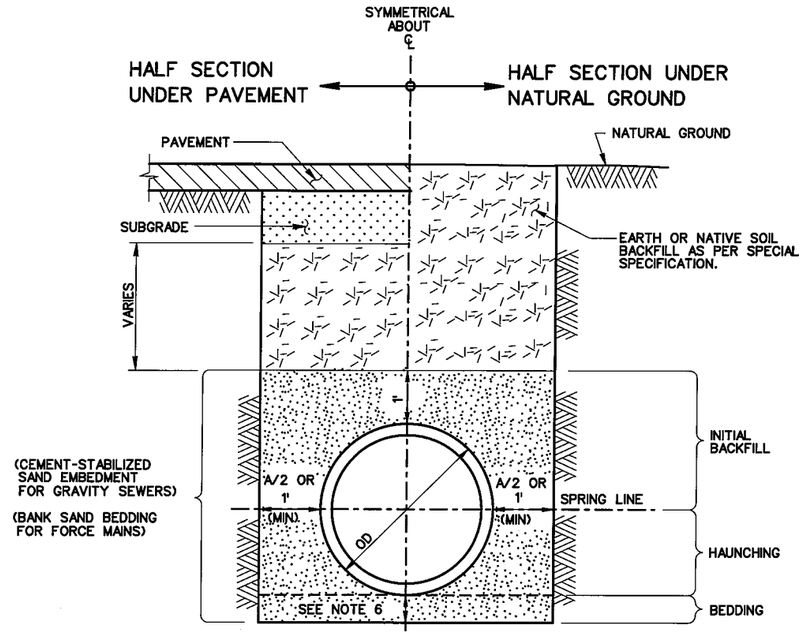
SANITARY SEWER
BACKFILL OF MANHOLES
(PRECAST AND CAST-IN-PLACE)

NOTES:

3. USE THIS DETAIL ONLY FOR DRY STABLE TRENCH CONDITIONS.
4. MIN. TRENCH WIDTH IS PIPE OD PLUS AN ALLOWANCE "A" FOR THE NOMINAL PIPE SIZE:

NOMINAL PIPE SIZE	"A"
LESS THAN 18 IN.	18 IN.
18 IN. TO 30 IN.	24 IN.
OVER 30 IN.	36 IN.

5. MAX TRENCH WIDTH IS THE MIN TRENCH WIDTH PLUS 24 IN. UNLESS OTHERWISE NOTED.
6. MINIMUM CEMENT STABILIZED SAND BEDDING IS THE GREATER OF 1/8 OD OR 6 IN.



TYPICAL CROSS-SECTION

SANITARY SEWER
EXCAVATION AND BACKFILL DIAGRAM
DRY STABLE TRENCH
NOT TO SCALE

PUBLIC WORKS
67862

Texas Department of Transportation
Houston District

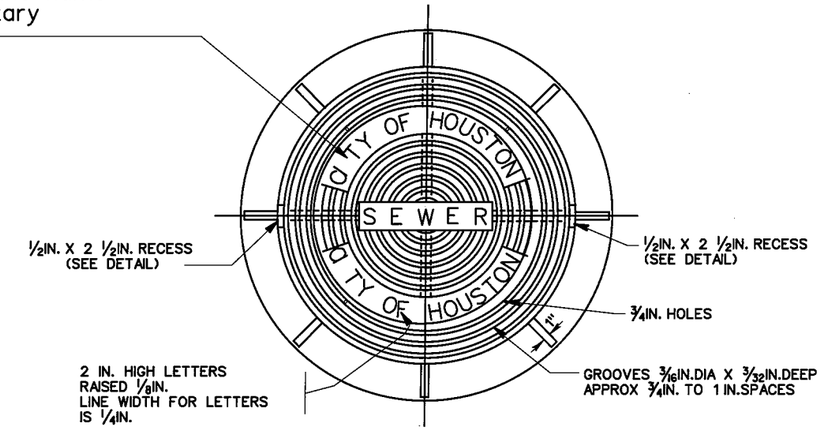
SANITARY SEWER DETAILS

SSD-2

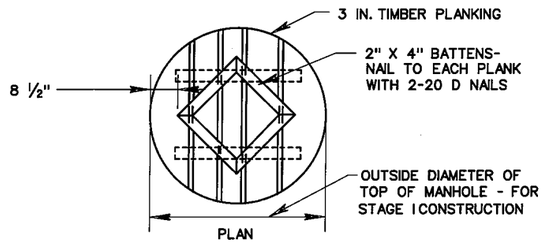
FILE: STDF2.DGN	DN: TxDot	CK: TxDot	DW: TxDot	CK: TxDot
© TxDOT MAY 2006	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS 6/2006 3/15 2015 SPECS	HOU 6	STP 1802(783)MM		289
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	HARRIS	0912	72	391	CS

STD F2

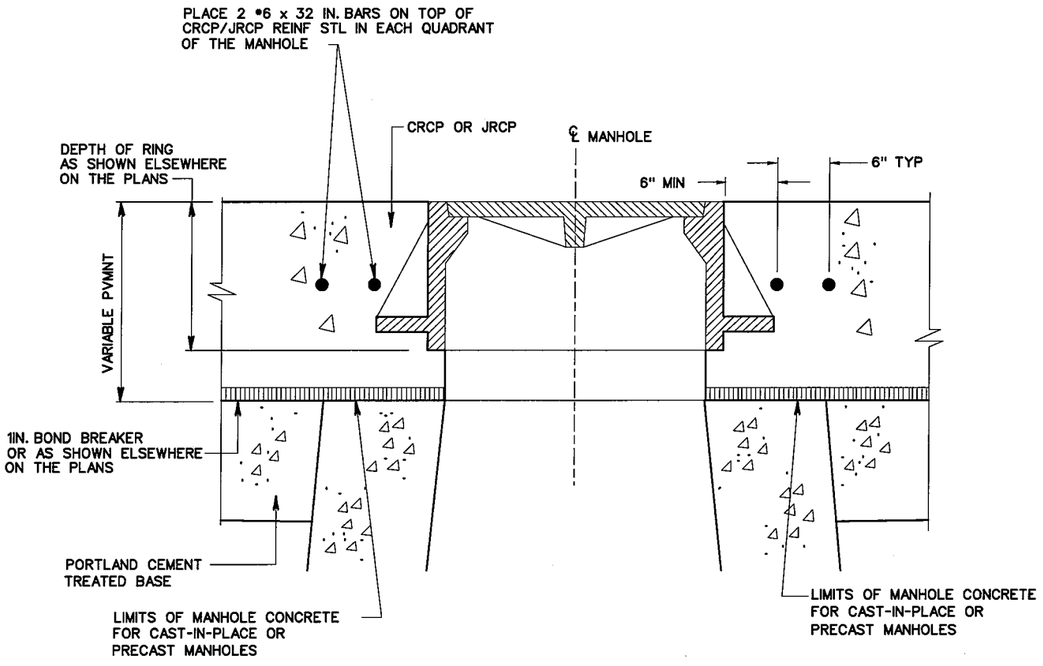
Note to Contractors:
Manhole cover for City of Houston is shown as an example. Covers should depict the name of the city with jurisdiction over sanitary sewer facility.



PLAN-MANHOLE RING AND COVER

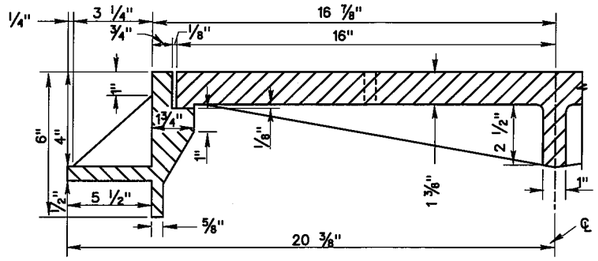


TEMPORARY TIMBER COVER FOR MANHOLES



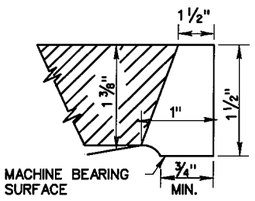
RING AND COVER CAST MONOLITHICALLY WITH PAVEMENT

NOTE: JRCP - JOINTED REINFORCED CONCRETE PAVEMENT
CRCP - CONTINUOUSLY REINFORCED CONCRETE PAVEMENT



HALF SECTION
32 IN. MANHOLE RING AND COVER

STANDARD MANHOLE RING AND COVER



RECESS DETAIL

SHEET 3 OF 4

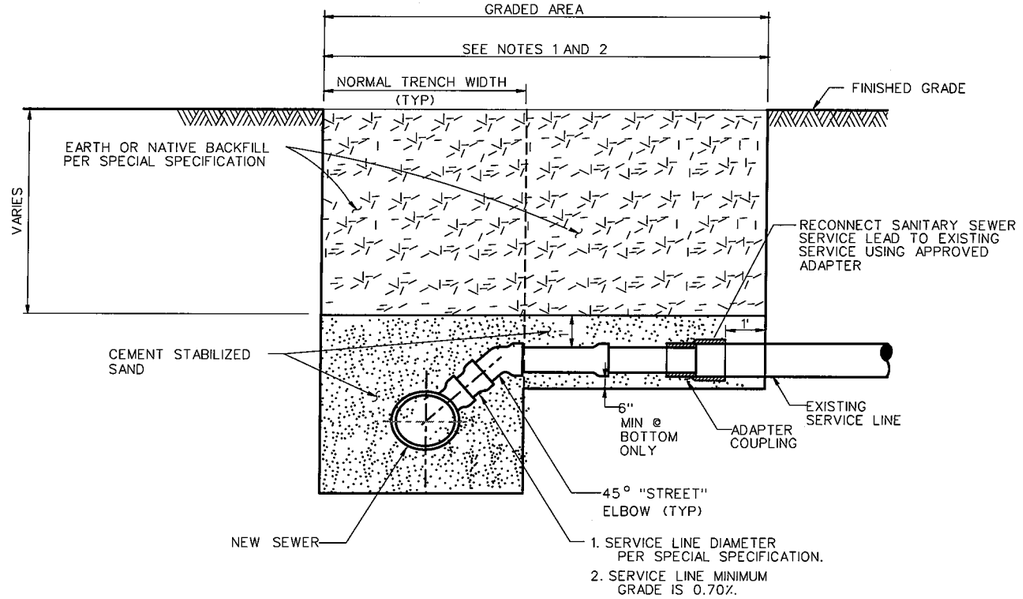
Texas Department of Transportation
Houston District (Roadway)

SANITARY SEWER DETAILS

SSD-3

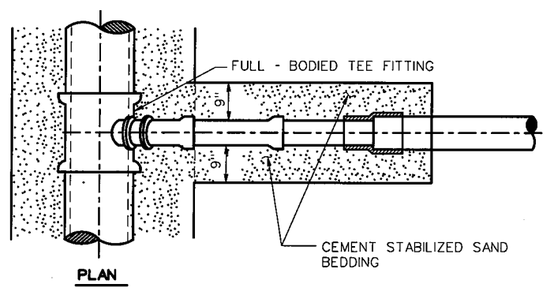
FILE: STDF3.DGN	DN: TxDot	CK: TxDot	DW: TxDot	CK: TxDot
© TxDOT MAY 2006	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS 6/2006 3/15 2014 SPECS 9/2016	HOU	6	STP 1802(783)MM	290
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	HARRIS	0912	72	391	CS

STD F3



CROSS-SECTION OF SEWERS AT SERVICE CONNECTION

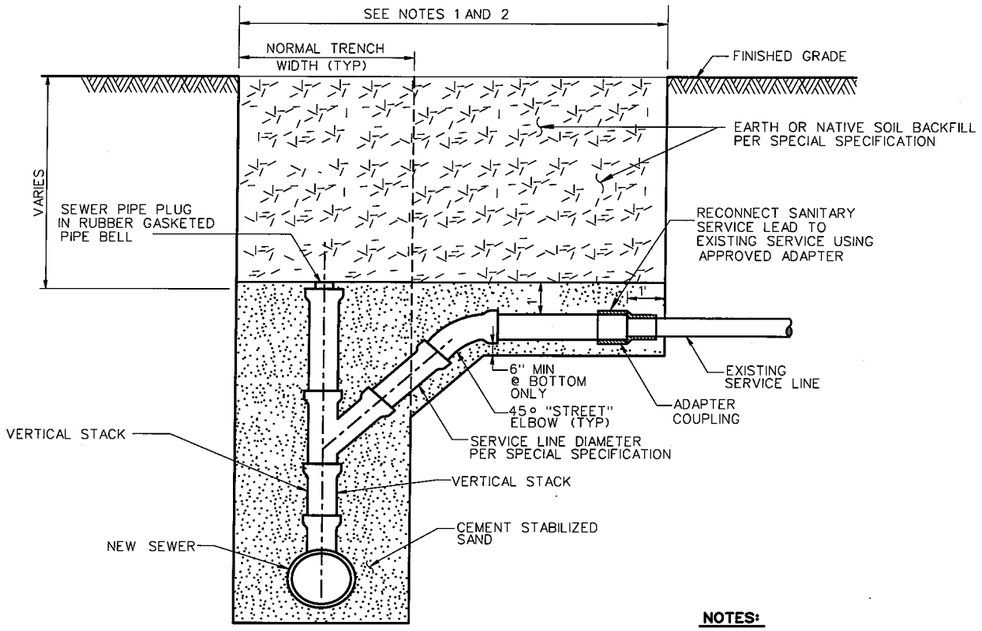
(NOT TO SCALE)



PLAN

SERVICE RECONNECTION ON NEW OR REPLACEMENT SEWER

(NOT TO SCALE)

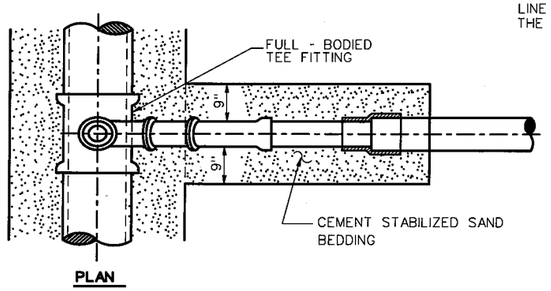


CROSS-SECTION OF SEWERS AT SERVICE CONNECTION

(NOT TO SCALE)

NOTES:

1. REPLACE EXISTING SERVICE LINE TO THE EXTENT SHOWN ON PLAN AND PROFILE DRAWINGS, OR WITHIN RIGHT OF WAY LIMITS.
2. EXCAVATE AND REMOVE EXISTING SEWER LATERALS AS REQUIRED TO ALLOW RECONSTRUCTION.
3. EMBEDMENT AND BACKFILL FOR SERVICE LINE IS INCLUDED IN THE PRICE FOR THE SERVICE CONNECTION.



PLAN

SERVICE RECONNECTION WITH STACK

(NOT TO SCALE)

Texas Department of Transportation
Houston District (Roadway)

SANITARY SEWER DETAILS

SSD-4

FILE: STDF4.DGN	DN: TxDot	CK: TxDot	DW: TxDot	CK: TxDot
© TxDOT MAY 2006	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS 6/2006 3/15 2014 SPECS	HOU	6	STP 1802(783)MM	291
	COUNTY		CONTROL SECT JOB	HIGHWAY
	HARRIS		0912 72 391	CS

STD F4

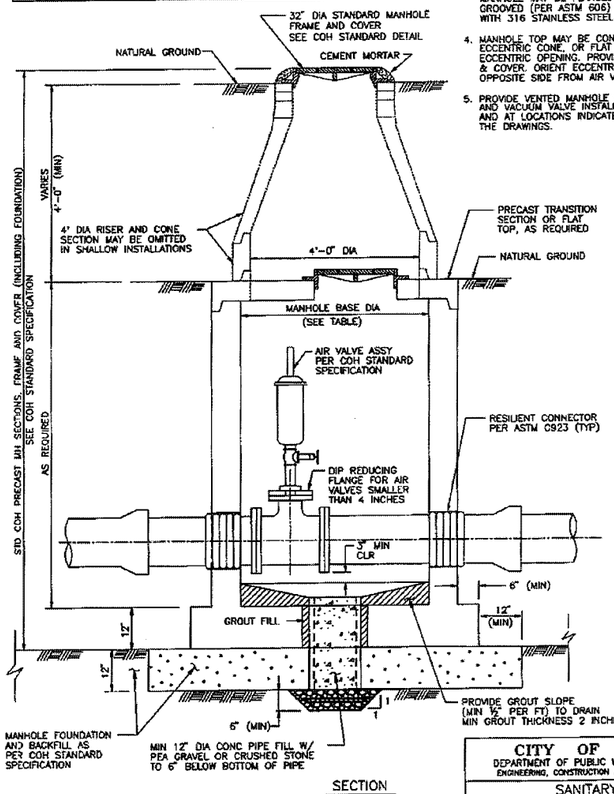
67862

NOTES TO SPECIFIER:

1. *CHECK THAT FORCE MAIN BURIAL DEPTH AT AIR VALVE MANHOLE WILL PROVIDE 1'-0" CLEAR SPACE OVER VALVE INSIDE MANHOLE.*
2. *SHOW STA LOCATION OR MANHOLE, TOP ELEV, AND VALVE SIZE ON PLAN & PROFILE SHEET.*
3. *INCLUDE ALSO VENTED MH DETAIL FOR AIR & VACUUM VALVE INSTALLATIONS.*

NOTES:

1. AIR VALVE MAY BE AIR RELEASE OR AIR AND VACUUM RELEASE VALVE AS NOTED ON PLAN AND PROFILE SHEET.
2. SEE COH STANDARD SPECIFICATION FOR AIR VALVE ASSEMBLY REQUIREMENTS.
3. PROVIDE LINED DUCTILE IRON PIPE, THICK CLASS 53, FOR FORCE MAIN WITHIN 12" OF OUTSIDE FACE OF MANHOLE. JOINTS WITHIN MANHOLE MAY BE FLANGED (AS SHOWN) OR GROOVED (PER ASTM 606) WITHIN MANHOLE, WITH 316 STAINLESS STEEL BOLTS.
4. MANHOLE TOP MAY BE CONCENTRIC CONE, ECCENTRIC CONE, OR FLAT TOP WITH ECCENTRIC OPENING. PROVIDE 32" FRAME & COVER. ORIENT ECCENTRIC OPENING OPPOSITE SIDE FROM AIR VALVE.
5. PROVIDE VENTED MANHOLE FOR AIR AND VACUUM VALVE INSTALLATIONS AND AT LOCATIONS INDICATED ON THE DRAWINGS.



SECTION

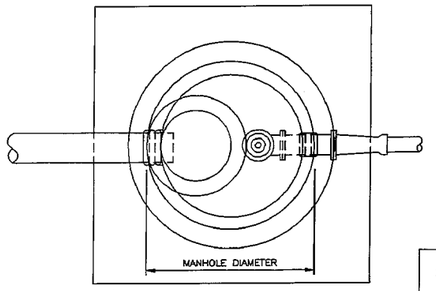
TABLE

MANHOLE BASE DIAMETER (FT)	MAX FORCE MAIN DIAMETER
4	8
6	16
8	36

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE DIVISION

SANITARY SEWER
AIR RELEASE OR AIR/VACUUM
RELEASE VALVE MANHOLE
(NOT TO SCALE)

APPROVED BY: CITY ENGINEER — APPROVED BY: DIRECTOR OF PUBLIC WORKS AND ENGINEERING
EFF DATE: OCT-01-2002 — DWG NO: 02082-09



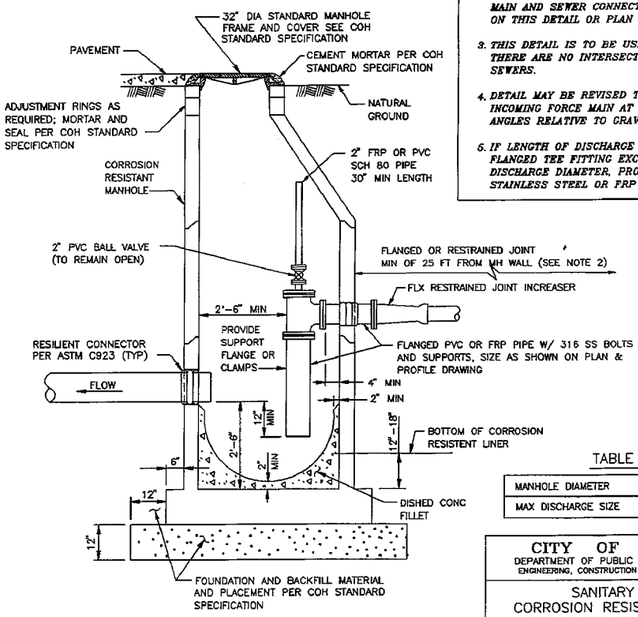
PLAN VIEW

NOTES:

1. SEAT MANHOLE FRAME IN SEALANT PER COH STANDARD SPECIFICATION.
2. IF FORCE MAIN HAS BENDS WITHIN 25 FT OF MANHOLE, EXTEND RESTRAINED JOINTS TO 25 FT MINIMUM UPSTREAM OF BEND.
3. OMIT CEMENT MORTAR WHEN MANHOLE IS LOCATED IN PAVED AREA.
4. MINIMUM REINFORCING IN BASE SHALL BE 5 @ 8 E W.
5. PRECAST RINGS SHALL BE PROVIDED FOR A COMBINED ADJUSTMENT HEIGHT OF AT LEAST 12". THE TOTAL HEIGHT OF THE ADJUSTMENT RINGS SHALL NOT EXCEED 1'-6".

NOTES TO SPECIFIER:

1. *INDICATE SIZE OF FORCE MAIN, INCREASER AND DISCHARGE EITHER ON THIS DETAIL OR ON PLAN AND PROFILE.*
2. *PROVIDE INVERT ELEVATIONS OR FORCE MAIN AND SEWER CONNECTIONS TO MH, ON THIS DETAIL OR PLAN AND PROFILE.*
3. *THIS DETAIL IS TO BE USED ONLY WHEN THERE ARE NO INTERSECTING GRAVITY SEWERS.*
4. *DETAIL MAY BE REVISED TO ORIENT INCOMING FORCE MAIN AT OTHER ANGLES RELATIVE TO GRAVITY SEWER.*
5. *IF LENGTH OF DISCHARGE DROP BELOW FLANGED TEE FITTING EXCEEDS 7 TIMES DISCHARGE DIAMETER, PROVIDE STAINLESS STEEL OR FRP PIPE SUPPORT.*



ELEVATION VIEW

TABLE 02082-07

MANHOLE DIAMETER	4'-0"	5'-0"	6'-0"
MAX DISCHARGE SIZE	6"	14"	24"

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING
ENGINEERING, CONSTRUCTION AND REAL ESTATE DIVISION

SANITARY SEWER
CORROSION RESISTANT MANHOLE
FOR FORCE MAIN DISCHARGE
(NOT TO SCALE)

APPROVED BY: CITY ENGINEER — APPROVED BY: DIRECTOR OF PUBLIC WORKS AND ENGINEERING
EFF DATE: OCT-01-2002 — DWG NO: 02082-07

03/04/2020
Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

Lockwood, Andrews & Newnam, Inc. A LEO A DALY COMPANY — FIRM REGISTATION NO. 2614

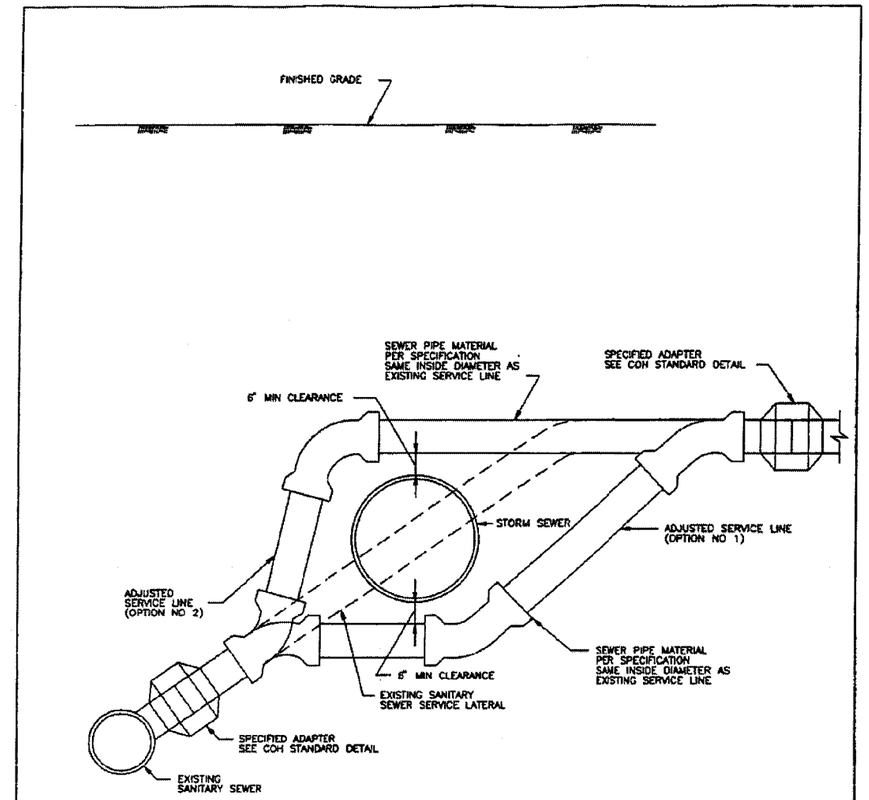
Texas Department of Transportation ©2020

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

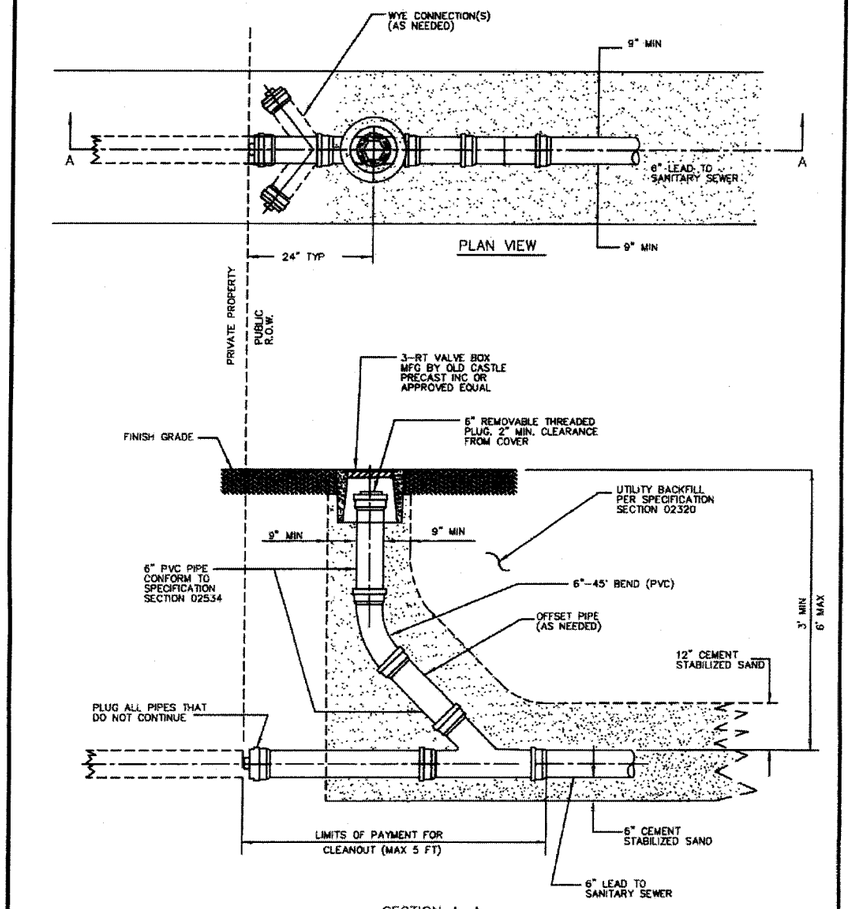
STANDARD SANITARY SEWER DETAILS

SHEET 1 OF 3

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	292



CITY OF HOUSTON DEPARTMENT OF PUBLIC WORKS AND ENGINEERING ENGINEERING, CONSTRUCTION AND REAL ESTATE DIVISION	
SANITARY SEWER SERVICE LINE RECONNECTION FOR STORM SEWER CONFLICTS (NOT TO SCALE)	
APPROVED BY: CITY ENGINEER	APPROVED BY: DIRECTOR OF PUBLIC WORKS AND ENGINEERING
EFF DATE: OCT-01-2002	DWG NO: 02534-03



SECTION A-A

NOTES:

1. USE CEMENT STABILIZED SAND BEDDING 6" BELOW PIPE AND 12" ABOVE PIPE.
2. MAINTAIN MINIMUM CLEARANCE OF 12" FROM DRIVEWAY.
3. CLEANOUT COVER SHALL BE EMBOSSED WITH "SS CO COH".
4. DO NOT LOCATE WITHIN SIDEWALK PAVING, EXCEPT WHEN REQUIRED.

CITY OF HOUSTON DEPARTMENT OF PUBLIC WORKS AND ENGINEERING	
STANDARD CLEANOUT DETAIL ON SERVICE LEAD (NOT TO SCALE)	
APPROVED BY: CITY ENGINEER	APPROVED BY: DIRECTOR OF PUBLIC WORKS AND ENGINEERING
EFF DATE: JULY-01-2010	DWG NO: 02534-05

67862

STATE OF TEXAS
MICHAEL A. SALINAS
123342
LICENSED
PROFESSIONAL ENGINEER
03/04/2020
Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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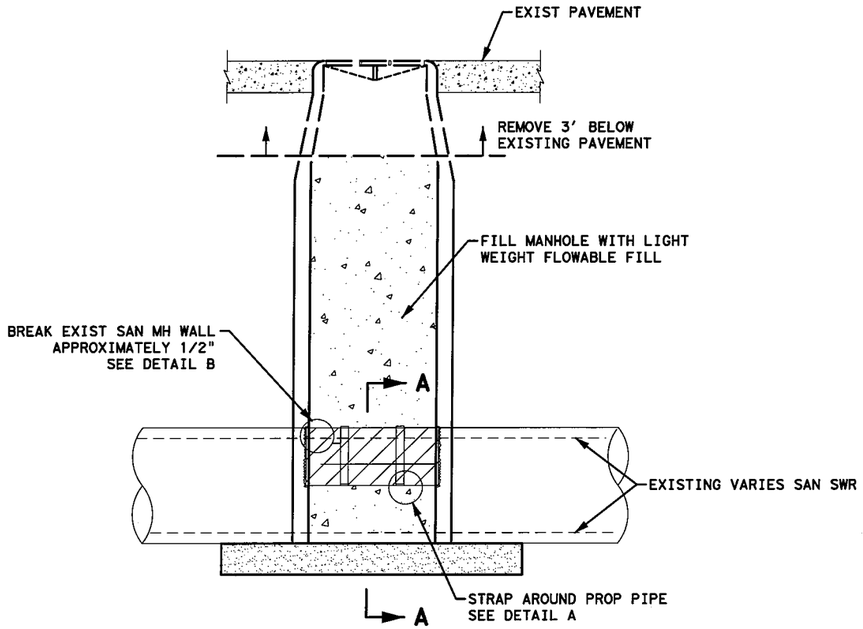
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STANDARD SANITARY SEWER DETAILS

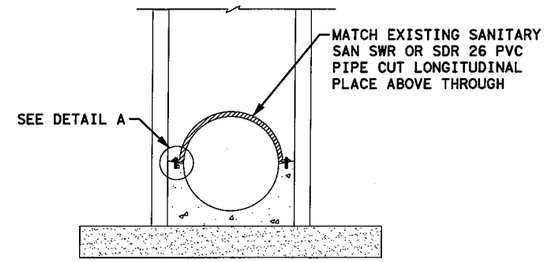
SHEET 2 OF 3

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	293

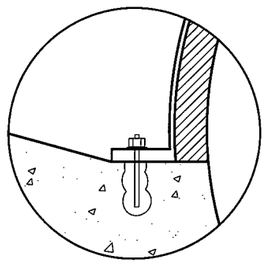
STATION	OFFSET	PIPE DIAMETER	EXIST SAN SWR TYPE	FLOW ELEVATION
31+17.44	31.73' LT	48"	PVC	49.89
34+46.38	31.80' LT	48"	PVC	50.73



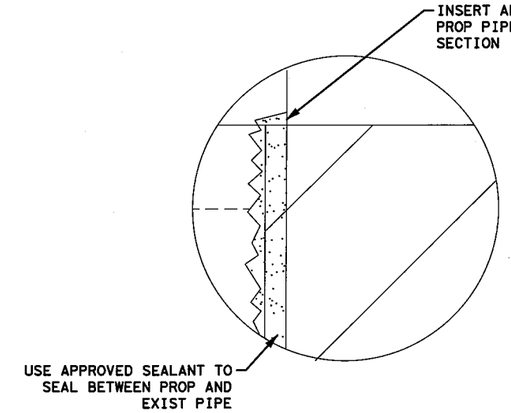
TYPICAL PROFILE VIEW CAPPED MANHOLE



SECTION A



DETAIL A



DETAIL B

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STANDARD SANITARY SEWER DETAILS

SHEET 3 OF 3

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	294

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NOTES FOR PERMANENT TRAFFIC SIGNAL(S):

1. ALL EQUIPMENT / MATERIALS AND CONSTRUCTION SHALL MEET OR EXCEED THE REQUIREMENTS CONTAINED IN THE CURRENT CITY OF HOUSTON STANDARD SPECIFICATIONS AND STANDARD DRAWINGS, THE PROJECT SPECIFIC SPECIFICATIONS AND THE PLANS.
2. ALL ELECTRICAL WORK SHALL BE IN CONFORMANCE WITH THE PROVISIONS AND REQUIREMENTS OF THE NATIONAL ELECTRICAL CODE.
3. ALL SIGNS SHALL BE MANUFACTURED IN ACCORDANCE WITH THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD, LATEST REVISION).
4. THE CONTRACTOR SHALL ARRANGE THE INSTALLATION OF SIGNALS, POLES AND CONDUIT SO AS TO PERMIT THE CONTINUOUS MOVEMENT OF TRAFFIC IN ALL DIRECTIONS AT ALL TIMES. THE CONTRACTOR SHALL NOT CLOSE MORE THAN ONE LANE OF A ROADWAY AT ONE TIME WITHOUT PRIOR APPROVAL OF THE CITY.
5. THE CONTRACTOR SHALL CLEAN UP AND REMOVE FROM THE WORK AREA ALL LOOSE MATERIAL RESULTING FROM CONTRACT OPERATIONS EACH DAY PRIOR TO WORK BEING SUSPENDED FOR THAT DAY.
6. THE CONTRACTOR SHALL CONTACT THE ENGINEER TO ARRANGE FOR METER AND ELECTRICAL SERVICE CONNECTION FROM THE POWER COMPANY.
7. ALL PEDESTRIAN PUSH BUTTON ASSEMBLIES SHALL MEET ADA REQUIREMENTS. THE SIGNS THAT SHALL BE USED ARE IDENTIFIED IN THE TMUTCD, LATEST REVISION AS R10-3E.
8. OVERHEAD STREET NAME SIGNS SHALL BE INSTALLED SUCH THAT THE BOTTOM OF THE SIGN IS NO LESS THAN 17 FEET ABOVE THE ROADWAY PAVEMENT OR NO LESS THAN 16 FEET ABOVE THE FINISHED GRADE BEYOND THE SHOULDER.
9. THE LOCATION OF EACH NEW POLE FOUNDATION, PULL BOX, CONTROLLER CABINET FOUNDATION, UPS CABINET FOUNDATION AND ELECTRIC SERVICE PEDESTAL FOUNDATION SHALL BE MARKED IN THE FIELD AS SHOWN ON THE PLANS. THE EXACT LOCATION SHALL BE APPROVED BY THE ENGINEER AND/OR THE APPROVED CITY OF HOUSTON REPRESENTATIVE PRIOR TO BEGINNING INSTALLATION OF THE FOUNDATION.
10. THE TOP OF THE POLE FOUNDATION SHALL BE LEVEL WITH THE FINISHED GRADE. IF THE SLOPE OR SHOULDER DROPS OFF FROM FINISHED GRADE, THE CONTRACTOR SHALL GRADE AROUND POLE FOUNDATION. THE TOP OF THE FOUNDATION SHALL EXTEND NO MORE THAN 4 INCHES ABOVE SURROUNDING GRADE.
11. ALL CONCRETE USED FOR TRAFFIC SIGNAL POLE AND CABINET FOUNDATIONS SHALL BE CLASS "A" (REFER TO THE CITY OF HOUSTON SPECIFICATION FOR CONCRETE).
12. MAST ARM POLES SHALL NOT BE INSTALLED ON THE FOUNDATIONS LESS THAN SEVEN DAYS AFTER THE PLACEMENT OF THE CONCRETE FOR THE FOUNDATION.
13. ANCHOR BOLTS FOR SIGNAL POLES SHALL BE SET SO THAT TWO ARE IN COMPRESSION AND TWO ARE IN TENSION. PRIOR TO THE INSTALLATION OF THE NUT, THE THREADS OF THE ANCHOR BOLT SHALL BE COATED WITH PIPE JOINT COMPOUND.
14. ALL UNDERGROUND CONSTRUCTION (CONDUIT, FOUNDATIONS AND PULL BOXES) FOR THE INTERSECTION SHALL BE COMPLETED PRIOR TO THE INSTALLATION OF POLES, SIGNALS AND CABINETS. THE CONTRACTOR SHALL NOT PROCEED TO ABOVE GROUND WORK UNTIL THE ENGINEER AND/OR APPROVED CITYOF HOUSTON REPRESENTATIVE HAS CONFIRMED THAT THE MATERIALS FOR A COMPLETE INSTALLATION ARE AVAILABLE.
15. UNDERGROUND CONDUIT FOR SIGNAL CABLE SHALL BE SCHEDULE 80 ELECTRICAL PVC CONDUIT OF THE DIAMETER SHOWN ON THE PLANS, UNLESS OTHERWISE NOTED. ALL COUPLINGS AND CONNECTIONS SHALL BE TIGHT AND WATERPROOF.
16. ALL ABOVE GROUND CONDUIT FOR SIGNAL CABLE SHALL BE HOT DIPPED GALVANIZED STEEL RIGID METAL CONDUIT OF THE DIAMETERS SHOWN ON THE PLANS, UNLESS OTHERWISE NOTED. ALL COUPLINGS AND CONNECTIONS SHALL BE TIGHT AND WATERPROOF.
17. PROVIDE NEW AND UNUSED MATERIALS. ENSURE THAT ALL MATERIALS AND INSTALLATIONS COMPLY WITH NATIONAL ELECTRIC CODE (NEC), TXDOT STANDARDS AND SPECIFICATIONS, NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA), AND ARE LISTED BY UNDERWRITERS LABORATORIES (UL) OR A NATIONALLY RECOGNIZED TESTING LAB (NRTL). WHERE REFERENCE IS MADE TO NEMA LISTED DEVICES, INTERNATIONAL ELECTROTECHNICAL COMMISSION (IEC) LISTED DEVICES WILL NOT BE CONSIDERED AN ACCEPTABLE EQUAL TO A NEMA LISTED DEVICE. ACCCEPTABLE DEVICES MAY HAVE BOTH A NEMA AND IEC LISTING. FAULTY FABRICATION OR POOR WORKMANSHIP IN ANY MATERIAL, EQUIPMENT, OR INSTALLATION IS JUSTIFICATION FOR REJECTION. REPLACE OR REINSALL REJECTED MATERIAL OR EQUIPMENT AT NO ADDITIONAL COST TO THE DEPARTMENT.
18. CONDUIT INSTALLED UNDER EXISTING PAVED DRIVEWAYS, ROADWAYS OR SIDEWALKS, WHICH ARE NOT SCHEDULED TO BE RECONSTRUCTED AS PART OF THIS PROJECT, SHALL BE INSTALLED BY MEANS OF BORING. THE CONTRACTOR SHALL NOT CUT OPEN ANY STREET OR DRIVEWAY FOR CONDUIT INSTALLATION WITHOUT THE PRIOR APPROVAL OF THE ENGINEER AND/OR THE APPROVED CITY OF HOUSTON REPRESENTATIVE.
19. CONDUIT NOT PLACED UNDER PAVED DRIVEWAYS, ROADWAY PAVEMENT OR SIDEWALK MAY BE PLACED BY CUTTING A TRENCH, INSTALLING THE CONDUIT AND BACKFILLING. ANY TRENCHING FOR CONDUIT WIDER THAN THREE (3) INCHES SHALL BE RESODDED.
20. PULL BOXES SHALL NOT BE INSTALLED WITHIN CONCRETE CURB ACCESS RAMPS. IN ADDITION, ANY PULL BOXES INSTALLED BEHIND CURBS SHALL BE INSTALLED BETWEEN THE CURB AND THE PROPOSED/FUTURE SIDEWALK OR BEYOND THE PROPOSED / FUTURE SIDEWALK. AN EXCEPTION TO THIS NOTE WOULD BE PULL BOXES INSTALLED IN A MEDIAN. ANY PULL BOXES INSTALLED ALONG AN UNCURBED ROADWAY SHALL BE INSTALLED ADJACENT TO, BUT NOT WITHIN, THE SHOULDER.
21. A 5/8 IN. X 10 FT. GROUND ROD SHALL BE INSTALLED IN THE PULL BOX LOCATED ON EACH CORNER. TWO GROUND ROD CLAMPS SHALL BE FURNISHED FOR GROUNDING THE GROUND WIRE.
22. ALL CONDUITS SHALL BE CLEANED BY COMPRESSED AIR AND A PROPERLY SIZED CONDUIT PISTON OR MANDREL SHALL BE PULLED THROUGH THE CONDUIT PRIOR TO CABLE INSTALLATION.
23. WHEN PULLING TRAFFIC SIGNAL SYSTEM CABLES THROUGH CONDUIT, THE CABLES SHALL BE LUBRICATED WITH A LUBRICANT NORMALLY USED FOR THIS PURPOSE. ANY ABRASION TO ANY CONDUCTOR INSULATION WHICH OCCURS WHILE PULLING CABLE FOR THE TRAFFIC SIGNAL SYSTEM WILL BE CAUSE FOR THE IMMEDIATE REJECTION OF THE CABLE. IF THIS OCCURS, THE CONTRACTOR SHALL REMOVE AND REPLACE THE ENTIRE CABLE RUN AT THEIR EXPENSE.
24. A MINIMUM OF THREE (3) FEET OF EACH WIRE AND CABLE MEASURED FROM THE TOP OF THE PULL BOX SHALL BE LEFT IN EACH PULL BOX AND AT EACH POLE BASE. PROVIDE P GRAVEL-3' SLACK APRON. 25.ALL CABLES SHALL BE STRIPPED, FORMED AND TERMINATED IN A NEAT AND UNIFORM MANNER WHETHER IN THE SIGNAL HEAD OR CONTROLLER CABINET.
25. ALL CABLES SHALL BE BROUGHT INTO THE TERMINAL HOUSING OF SIGNALS AND/OR CONTROLLER CABINETS AND A SUFFICIENT LENGTH OF CABLE SHALL BE LEFT SO THAT ALL TERMINAL CONNECTIONS MAY BE MADE WITHOUT THE NECESSITY OF SPLICING THE CABLE.
26. THE HIGH VOLTAGE CABLES SHOULD BE SEPARATED FROM THE LOW VOLTAGE CABLES AS MUCH AS POSSIBLE.
27. ALL VEHICLE AND PEDESTRIAN INDICATIONS SHALL BE LED.
28. THE CONTRACTOR SHALL BAG ALL NEWLY INSTALLED VEHICULAR AND/OR PEDESTRIAN TRAFFIC SIGNAL HEADS WITH BLACK PLASTIC OR OTHER APPROVED MATERIAL UNTIL THE FINAL INSPECTION AND ACCEPTANCE BY THE CITY TRAFFIC ENGINEER AND/OR APPROVED CITY OF HOUSTON REPRESENTATIVE. THE BLACK PLASTIC OR OTHER APPROVED MATERIAL/DEVICE SHALL COMPLETELY COVER THE TRAFFIC SIGNAL HEAD AND SHALL OBSCURE THE VIEW OF THE TRAFFIC SIGNAL INDICATIONS SO THAT THEY CANNOT BE SEEN UNTIL THE TRAFFIC SIGNAL IS PLACED IN OPERATION. DURING CONSTRUCTION, THE TRAFFIC SIGNAL WILL BE DE-ENERGIZED WHILE NOT IN USE FOR TESTING.
29. DO NOT USE BURLAP TO COVER SIGNAL HEADS OR PEDESTRIAN HEADS WHEN NOT IN USE.
30. ALL STRIPING AND PAVEMENT MARKINGS ARE TO BE DONE UNDER THIS CONTRACT AND SHALL BE IN PLACE PRIOR TO THE ACTIVATION OF THE TRAFFIC SIGNAL.THE CONTRACTOR SHALL VERIFY THE LOCATION OF ALL STOP LINES PRIOR TO THE INSTALLATION OF LOOP DETECTORS.
31. ALL CONSTRUCTION SIGNING AND CONSTRUCTION TRAFFIC CONTROL DEVICES SHALL BE IN CONFORMANCE WITH THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD, LATEST REVISION).
32. NO LOOP DETECTOR SHALL BE CUT IN A PARALLEL EXPANSION JOINT. LOOPS CUT ACROSS EXPANSION JOINTS SHALL HAVE A SLACK IN THE CABLE FOR EXPANSION.
33. ALL VEHICLE ROADWAY DETECTION LOOP CABLES SHALL BE #14 AWG IMSA 51-5-1985 CABLE. LEAD-IN CABLES SHALL BE #16 AWG IMSA 50-2-1984 CABLE. NO SPLICES SHALL BE ALLOWED IN THE ROADWAY DETECTION LOOP CABLE EXCEPT AT THE PULL BOX ADJACENT TO LOOP. THE DETECTOR LEAD-IN CABLE SHALL NOT BE SPLICED.
34. DETECTION LOOP SAW CUTS SHALL BE FLUSHED WITH WATER UNDER PRESSURE AND THEN DRIED WITH AIR UNDER PRESSURE.
35. THERE SHALL BE NO SPLICING IN CONDUCTORS EXCEPT FOR THE NECESSARY SPLICE BETWEEN ROADWAY LOOP WIRE AND DETECTOR LEAD-IN CABLE IN THE PULL BOX ADJACENT TO THE DETECTOR. THESE SPLICES SHALL BE WATERPROOF AND SHALL BE IN COMPLIANCE WITH THE CITY OF HOUSTON STANDARD DRAWINGS FOR TRAFFIC SIGNAL CONSTRUCTION. THESE SPLICES SHALL BE MADE BY THE CONTRACTOR. DO NOT GROUND THE CABLE SHIELD AT THE PULL BOX.
36. TWO #10AWG-THHN CONDUCTORS SHALL BE INSTALLED FROM EACH LUMINARE TO THE CONTROLLER CABINET, LEAVING THREE FEET OF SLACK FOR EACH CONDUCTOR (MEASURED FROM THE TOP OF THE PULL BOX) IN EACH PULL BOX. ROUTE FOUR CONDUCTORS TO THE LUMINARE WITH THE PHOTOELECTRIC CELL. AN IN-LINE FUSE SHALL BE INSTALLED FOR EACH LUMINARE IN THE ASSOCIATED PULL BOX.
37. THE EMERGENCY VEHICLE PREEMPTION SENSOR CABLE SHALL BE OPTICOM DETECTOR CABLE MODEL NO. 138. THE CABLE SHALL NOT BE SPLICED.
38. FOR INSTALLATION OF THE GPS ANTENNA, SEE "CITY OF HOUSTON MISCELLANEOUS DETAILS SHEET".
39. THE CONTRACTOR SHALL LOCATE/EXPOSE ALL UTILITIES THAT MAY BE IN CONFLICT WITH SIGNAL POLE LOCATIONS BY HAND EXCAVATION PRIOR TO CONSTRUCTION. IF UTILITIES ARE IN CONFLICT THE ENGINEER WILL BE CONTACTED TO FIND AN ALTERNATE LOCATION FOR THE SIGNAL POLES.
40. THE MOUNTING LOCATION FOR THE UNINTERRUPTIBLE POWER SUPPLY UNIT ON THE CONTROLLER CABINET ASSEMBLY SHALL BE DETERMINED BY THE ENGINEER PRIOR TO INSTALLATION OF THE CABINET FOUNDATION.
41. CONTRACTOR TO FURNISH, INSTALL AND PROGRAM UNINTERRUPTIBLE POWER SUPPLY UNIT (UPS) PER THE SPECIFICATIONS AND DETAILS SHOWN ON "CITY OF HOUSTON MISCELLANEOUS DETAILS SHEET"
42. CONTRACTOR SHALL MAINTAIN AND KEEP OPERATIONAL ALL INTELLIGENT TRANSPORTATION SYSTEMS (ITS) INFRASTRUCTURE DURING CONSTRUCTION. INFRASTRUCTURE INCLUDES, BUT NOT LIMITED TO, FIBER CABLE, COPPER, ETHERNET SWITCHES, WIMAX, BLUETOOTH, ETC. INTERRUPTION OF ITS OPERATIONS SHALL REQUIRE APPROVAL FROM THE CITY OF HOUSTON TRAFFIC OPERATIONS DIVISION/ ITS SECTION AT A MINIMUM OF ONE WEEK IN ADVANCE. PLEASE CONTACT THE TRAFFIC OPERATIONS DIVISION/ ITS SECTION FOR QUESTIONS AT 713-881-3172.
43. FURNISH VEHICULAR TRAFFIC SIGNAL HEADS WITH YELLOW HOUSING AND BLACK LOUVERED BACKPLATES.

    FURNISH ALL MATERIALS. SUPPLY THE CONTROLLER WITH PHASE SEQUENCE, DETECTOR UNITS, DETECTOR CARD RACK, AND POWER SUPPLY, TO THE DEPARTMENT'S SIGNAL SHOP, 6810 KATY ROAD, HOUSTON, TEXAS, 45 DAYS IN ADVANCE FOR INSPECTION, SET UP AND TESTING. CONTACT MR. MICHAEL AWA, P.E., IN WRITING, AT LEAST 15 WORKING DAYS PRIOR TO PICKING UP THE MATERIALS.
44. ADDRESS: TEXAS DEPARTMENT OF TRANSPORTATION
    i. P.O. BOX 1386
    ii. HOUSTON, TEXAS 77251-1386
    iii. TEL. NO. (713) 802-5661

    THE TRAFFIC SIGNAL CONSTRUCTION AND MAINTENANCE OFFICE WILL PROVIDE PHASING AND TIMING FOR TEMPORARY AND PERMANENT TRAFFIC SIGNALS.
45. THE CONTRACTOR SUPPLIED CONTROLLER WILL BE DELIVERED TO THE CITY OF HOUSTON TRAFFIC OPERATIONS CENTER 2200 PATTERSON STREET, HOUSTON, TEXAS 77007
    TEL. NO. (713)-803-3011 FOR PHASE SEQUENCING AND TESTING.
46. PICK UP THE SIGNAL CONTROLLER(S) AT THE TRAFFIC OPERATIONS CENTER, 2200 PATTERSON STREET, HOUSTON, TEXAS 77077 TEL. NO. (713)-803-3011. CONTACT MR. STEVE UREN AT THE ABOVE ADDRESS IN WRITING, NINETY (90) DAYS IN ADVANCE OF PICKUP. INSTALL THE CONTROLLER(S) IN ACCORDANCE WITH THE PLANS.

67862

STATE OF TEXAS
ZINA I. SCHWARTZ
85814
LICENSED
PROFESSIONAL ENGINEER

3/4/2020

CONSOR
F-12040

Texas Department of Transportation
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT
PERMANENT SIGNAL GENERAL NOTES

SHEET 1 OF 1

DGN: CONSOR	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: CONSOR	6	TEXAS	STP 1802(783)MM			CS
DWG: CONSOR	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: CONSOR	HOU	HARRIS	0912	72	391	295

NOTES FOR TEMPORARY TRAFFIC SIGNAL(S):

1. PROVIDE AND INSTALL TEMPORARY TRAFFIC SIGNALS PRIOR TO REMOVING THE EXISTING SIGNALS. UTILIZE AN EXISTING POWER SOURCE FOR INSTALLING THE TEMPORARY SIGNALS, IF POSSIBLE. INSPECT THE SITE TO DETERMINE THE METHOD OF PROVIDING SERVICE TO TEMPORARY SIGNAL INSTALLATION, IF NECESSARY. ADDITIONAL CONDUIT, POLES, CABLE, ETC., ARE CONSIDERED INCIDENTAL TO ITEM 681, "TEMPORARY TRAFFIC SIGNALS FOR CONSTRUCTION".

2. PROVIDE A CONTROLLER FOR EACH TEMPORARY SIGNAL INSTALLATION. PROVIDE TWO (2) SIGNAL HEADS FOR EACH APPROACH. PROVIDE EACH SPAN WITH SUFFICEINT SPARE SIGNAL CABLE TO ALLOW FOR ADJUSTMENTS NECESSARY TO LOCATE THE SIGNAL HEADS OVER THE APPROPRIATE LANES DURING EACH PHASE AND SEQUENCE OF CONSTRUCTION. THE TEMPORARY SIGNAL IS PAID FOR UNDER ITEM 681, "TEMPORARY TRAFFIC SIGNALS FOR CONSTRUCTION".

3. MAINTAIN THE EXISTING SIGNAL INSTALLATION UNTIL THE TEMPORARY SIGNAL INSTALLATION IS OPERATIONAL.

4. MAINTAIN THE TEMPORARY SIGNAL INSTALLATION UNTIL THE PERMANENT SIGNAL INSTALLATION IS OPERATIONAL. WRAP THE SIGNAL HEADS WITH DARK PLASTIC OR SUITABLE MATERIAL TO CONCEAL THE SIGNAL FACES FROM TIME OF THE INSTALLATION UNTIL PLACING INTO OPERATION. DO NOT USE BURLAP.

5. INSTALL TEMPORARY WOOD POLES WITHIN THE EXISTING RIGHT-OF-WAY OR TEMPORARY CONSTRUCTION EASEMENT IN ACCORDANCE WITH THE LATEST TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES. THE ENGINEER WILL APPROVE THE LOCATION(S) OF POLES, CONTROLLERS(S), ELECTRICAL SERVICE, ETC.

6. PROVIDE A UNIFORMED POLICE OFFICER FOR TRAFFIC CONTROL, AT NO EXPENSE TO THE DEPARTMENT, DURING THE "SWITCH OVER" OF SIGNAL INSTALLATIONS AND DURING ANY PERIOD OF TIME THAT A SIGNAL INSTALLTION MAY BE OUT OF SERVICE. THE UNIFORMED POLICE OFFICER MUST HAVE JURISDICTION WITHIN THE PROJECT LIMITS.

7. ALL EQUIPMENT UTILIZED FOR THE TEMPORARY TRAFFIC SIGNAL INSTALLATION, MUST CONFORM, TO AND BE INSTALLED IN ACCORDANCE WITH, THE DEPARTMENT STANDARDS AND SPECIFICATIONS.

8. INSTALL SIGNALS HORIZONATALLY AT A MINIMUM OG 18 FT. – 6 IN. ABOVE THE ROADWAY.

9. REPLACE PAVEMENT, SIDEWALKS, OR CURBS DAMAGED BY THE CONTRACTOR DURING CONSTRUCTION. SUCH REPAIR IS INCIDENTAL TO ITEM 681, TEMPORARY TRAFFIC SIGNALS FOR CONSTRUCTION.

10. DETERMINE THE EXACT LOCATION OF ALL UNDERGROUND UTILITIES PRIOR TO CONSTRUCTION. REPAIR ANY EXISTING UTILITIES DAMAGED DURING CONSTRUCTION BY THE CONTRACTOR AT NO EXPENSE TO THE DEPARTMENT.

11. ONCE THE INTERGRITY AND/OR FUNCTION OF THE EXISTING TRAFFIC SIGNAL(S) IS ALTERED BY THE CONTRACTOR, MAINTAIN AND OPERATE THE EXISTING TRAFFIC SIGNAL(S) UNTIL THE TRAFFIC SIGNAL WORK IS ACCEPTED BY THE DEPARTMENT. DURING CONSTRUCTION OF THE PROPOSED TRAFFIC SIGNAL WORK, MAINTAIN THE CONTINUOUS OPERATION OF THE EXISTING TRAFFIC SIGNAL(S) AND/OR TEMPORARY TRAFFIC SIGNAL(S) IN CONFORMANCE WITH THE LATEST TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES. ASSUME FULL RESPONSIBILITY FOR THE CONTINUOUS MAINTENANCE AND REPAIR OF THE SIGNAL EQUIPMENT. NO EXTRA COMPENSATION WILL BE ALLOWED FOR THIS WORK.

12. RESPOND IMMEDIATELY (24 HOURS A DAY) TO REPORTED TRAFFIC SIGNAL MALFUNCTIONS AT ANY OF THE INCLUDED SIGNALIZED INTERSECTIONS AFTER ASSUMING RESPONSIBILITY FOR THE MAINTENACE OF THE SIGNAL EQUIPMENT AS OUTLINED ABOVE.

13. PHASING SEQUENCE AND SIGNAL TIMING WILL BE DETERMINED BY THE CITY OF HOUSTON SUBJECT TO THE APPROVAL OF THE ENGINEER.

14. PROVIDE A FULL TIMED QUALIFIED TRAFFIC SIGNAL TECHNICIAN RESPONSIBLE FOR THE MAINTENACE AND/OR REPLACEMENT OF ALL TRAFFIC SIGNAL DEVICES.

15. COORDINATE INSTALLATIONS OF THE TEMPORARY TRAFFIC SIGNALS DURING CONSTRUCTION WITH THE VARIOUS PHASES AND STEPS OF THE PROPOSED ROADWAY CONSTRUCTION.

16. REMOVE EXISTING CONCRETE POLE FOUNDATIONS TO TWO (2) FEET BELOW THE FINISH GRADE. BACKFILL WITH LIKE MATERIAL EQUAL IN COMPOSITION AND DENSITY TO SURROUNDING AREA, AND BY REPLACING ANY SURFACING WITH LIKE MATERIAL TO EQUIVALENT CONDITION. THIS WORK IS INCIDENTALTO ITEM 681, TEMPORARY TRAFFIC SIGNALS FOR CONSTRUCTION.

17. INSTALL CERTAIN PORTIONS OF THE PERMANENT TRAFFIC SIGNAL SYSTEMS, IF POSSIBLE, DURING CONSTRUCTION, IF THERE IS NO CONFLICT WITH ROADWAY CONSTRUCTION AND AS APPROVED.

18. WRAP TRAFFIC SIGNAL HEADS NOT USED DURING CERTAIN PHASES OR STEPS OF THE TRAFFIC CONTROL PLAN WITH DARK PLASTIC OR SUITABLE MATERIAL TO CONCEAL SIGNAL FACES UNTIL THEY ARE PLACED IN OPERATION. DO NOT USE BURLAP. DISCONNECT TRAFFIC SIGNAL CABLE IN THE CONTROLLER FOR UNUSED SIGNAL HEADS.

19. COIL SUFFICIENT AMOUNT OF SIGNAL CABLE TO ACCOMMODATE SIGNAL HEAD ADJUSTMENTS DURING THE VARIOUS PHASES OF CONSTRUCTION.

20. REUSE EXISTING WIRE AND CABLES, IF POSSIBLE, DURING VARIOUS PHASES/SEQUENCES OF CONSTRUCTION IF DEEMED ACCEPTABLE.

21. VERIFY THE EXACT LOCATION OF THE SERVICE OUTLET DURING THE VARIOUS PHASES/SEQUENCES OF CONSTRUCTION. THE SERVICE OUTLET IS SUBJECT TO RELOCATION TO ANY CORNER AT NO ADDITIONAL COST TO THE DEPARTMENT DURING ANY PHASE/SEQUECE OF CONSTRUCTION.

22. FOR EACH PHASE/SEQUENCE OF THE TRAFFIC CONTROL, BEFORE STARTING OTHER CONSTRUCTION, CONSTRUCT AND MAKE THE TEMPORARY TRAFFIC SIGNAL(S) OPERATIONAL.

23. ENSURE THE TEMPORARY SIGNALS REMAIN OPERATIONAL UNTIL THE "SWITCH OVER" TO NEXT PHASE/SEQUENCE OF CONSTRUCTION. KEEP DOWN TIME, IF ANY, TO A MINIMUM, ACCOMPLISH THE "SWITCH OVER" DURING OFF-PEAK HOURS BETWEEN 9:00 AM AND 3:00 PM.

24. FURNISH NEW SOLID STATE TEMPORARY POLE MOUNTED CONTROLLERS WITH AN INTERNAL TIME BASED COORDINATION UNIT. IN ADDITION TO ATTACHING THE CONTROLLER TO THE POLE, FURNISH AND INSTALL A STURDY PLATFORM TO STABILIZE THE CONTROLLER. SECURE THE ENGINEER'S APPROVAL OF THE CABINET PLATFORM BEFORE INTSTALLATION.

25. FURNISH 3/8-IN. GALVANIZED DOWN GUY(S) (HIGH STRENGTH) FOR WOOD POLES. FURNISH 8 FT. -10 IN. SCREW ANCHORS. FURNISH "SIDEWALK" DOWN-GUYS IF FIELD CONDITIONS DO NOT ALLOW FOR THE STANDARDS DOWN-GUY ASSEMBLY.

26. PROVIDE CONTINUOUS CONDUCTORS WITHOUT SPLICES FROM SIGNAL CONTOLLERS TO SIGNAL HEADS.

27. FOR SPAN WIRE SIGNALS, ATTACH THE VIVDS COAX AND POWER CABLE TO A 5/16-IN. GALVANIZED GUY WIRE (HIGH STRENGTH) BETWEEN THE SIGNAL POLES ABOVE THE TRAFFIC CABLE STRAP THE VIVDS CABLE TO GUY WIRE WITH A METAL CABLE STRAP (ALUMINIMUM OR STAINLESS STEEL), ¾-IN MINIMUM WIDTH, AND TWO WRAPS AT 15 IN. MAXIMUM SPACING.

28. FOR VIVDS CAMERA(S) MOUNTED TO LUMINAIRE ARMS, STRAP THE VIVDS COAX AND POWER CABLE TO THE ARM WITH A MERTAL CABLE STRAP (ALUMINUM OR STAINLESS STEEL), 3.4-IN. MINIMUM WIDTH AND TWO WRAPS AT 15 IN. MAXIMUM SPACING.

29. FURNISH VIDEO IMAGING VEHICLE DETECTION SYSTEM(VIVDS) CABLE RECOMMENDED BY MANUFACTURER OR PURCHASE CABLE FROM THE SAME MANUFACTURER THAT SUPPLIED/PROVIDED THE VIVDS EQUIPMENT.

30. RETAIN ALL REMOVED TEMPORARY SIGNAL COMPONENTS, EXCEPT FOR THE VIVDS EQUIPMENT.

31. THE VIVDS EQUIPMENT USED FOR VEHICLE DETECTION AT THE TEMPORARY TRAFFIC SIGNAL LOCATIONS IS TO BE REMOVED AND DELIVERED TO THE DEPARTMENT'S SIGNAL SHOP, 6810 KATY ROAD, HOUSTON, TEXAS. OR AS DIRECTED BY THE DEPARTMENT'S ENGINEER.

32. VIDEO IMAGING VEHICLE DETECTION SYSTEM(VIVDS) IS TO BE USED TO DETECT VEHICLE DURING THE VARIOUS PHASES OF CONSTRUCTION. RELOCATE CAMERAS AS NECESSARY. PROVIDE SUFFICIENT AMOUNT OF COAXIAL CABLE AND POWER CONDUCTORS TO ACCOMMODATE ANY ADJUSTMENTS DURING THE VARIOUS PHASES OF CONSTRUCTION. THIS WORK IS INCIDENTAL TO "VIVDS TEMPORARY".

33. CONTACT AND COORDINATE WITH THE OWNER OF THE OPTICOM EQUIPMENT PRIOR TO CONSTRUCTION. THE OWNER IS TO REMOVE OPTICOM EQUIPMENT PRIOR TO CONSTRUCTION. ONCE THE CONSTRUCTION IS COMPLETED, IT IS THE OWNER'S RESPONSIBILITY TO RESINTALL THE OPTICOM COMPONENTS.

STATE OF TEXAS
ZINA I. SCHWARTZ
85814
LICENSED
PROFESSIONAL ENGINEER

3/4/2020

REV. NO.	DATE	DESCRIPTION	BY

CONSOR
F-12040

Texas Department of Transportation

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT
TEMPORARY SIGNAL GENERAL NOTES

67862

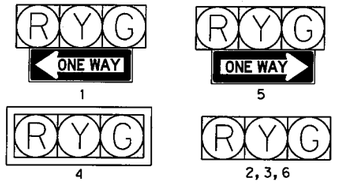
SHEET 1 OF 1

DGN: CONSOR	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: CONSOR	6	TEXAS	STP 1802(783)MM			CS
DWG: CONSOR	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: CONSOR	HOU	HARRIS	0912	72	391	296

EXISTING TRAFFIC SIGNAL HEADS

W1 THRU W8

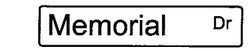
1 WAY, 3 SECTION
12" HORIZONTAL

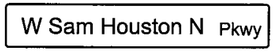


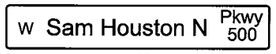
1 WAY, 4 SECTION
12" VERTICAL

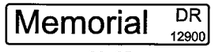
7

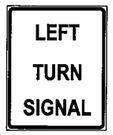
EXISTING SIGNS

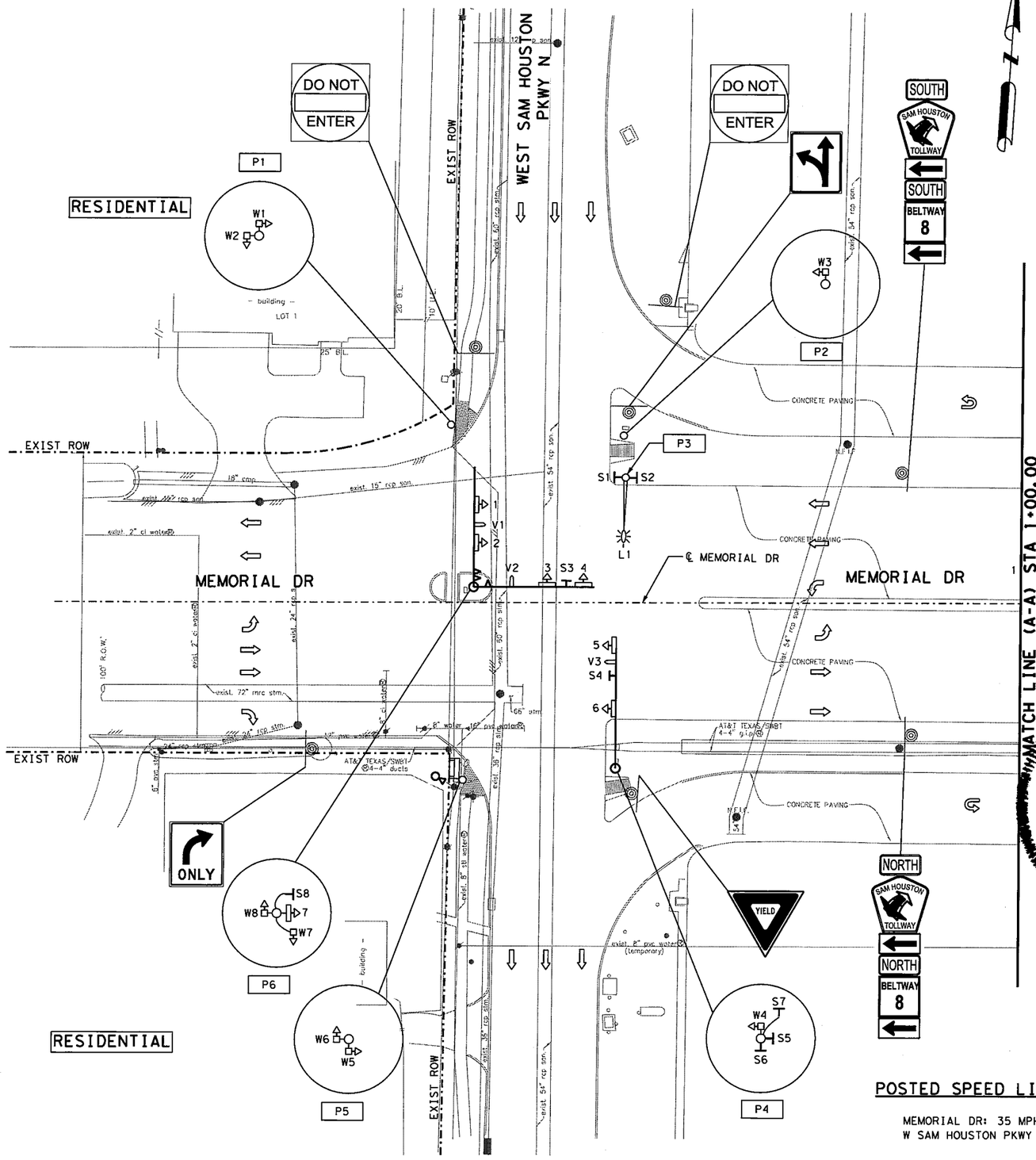












LEGEND

- 1 — EXISTING SIGNAL HEAD AND NUMBER
- S-# — EXISTING SIGN
- EXISTING SIGNAL POLE W/ MAST ARM
- EXISTING PED POLE
- EXISTING ELECTRICAL SERVICE
- V-# — EXISTING VIDEO CAMERA
- EXISTING OPTICOM
- EXISTING PED SIGNAL
- EXISTING PED PUSH BUTTON
- EXISTING CONTROLLER CABINET
- EXISTING WIMAX ANTENNA
- EXISTING LUMINAIRE
- TRAFFIC FLOW
- EXISTING GROUND MOUNT SIGN

NOTES:

1. THE CONTRACTOR SHALL LOCATE ALL UTILITIES PRIOR TO COMMENCING WORK.
2. THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY CONTRACTOR'S FAILURE TO LOCATE AND PRESERVE THESE UTILITIES, WHETHER UNDERGROUND, ABOVE GROUND, OR OVERHEAD.

0 20 40

POSTED SPEED LIMIT

MEMORIAL DR: 35 MPH
W SAM HOUSTON PKWY N: 40 MPH

67862

STATE OF TEXAS
ZINA I. SCHWARTZ
85814
LICENSED PROFESSIONAL ENGINEER

2/6/2020

REV. NO.	DATE	DESCRIPTION	BY

CONSOR F-12040

Texas Department of Transportation ©2020

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT
CONDITION LAYOUT

MEMORIAL DR AT
WEST SAM HOUSTON
PKWY N

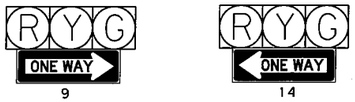
SHEET 1 OF 2

DGN: CONSOR	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: CONSOR	6	TEXAS	STP 1802(783)MM			CS
DWG: CONSOR	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: CONSOR	HOU	HARRIS	0912	72	391	297

EXISTING TRAFFIC SIGNAL HEADS

W9 THRU W16

1 WAY, 3 SECTION
12" HORIZONTAL

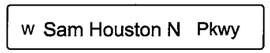


8, 10, 11, 13

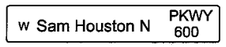
1 WAY, 4 SECTION
12" HORIZONTAL

12

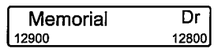
EXISTING SIGNS



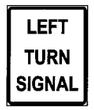
S9



S10



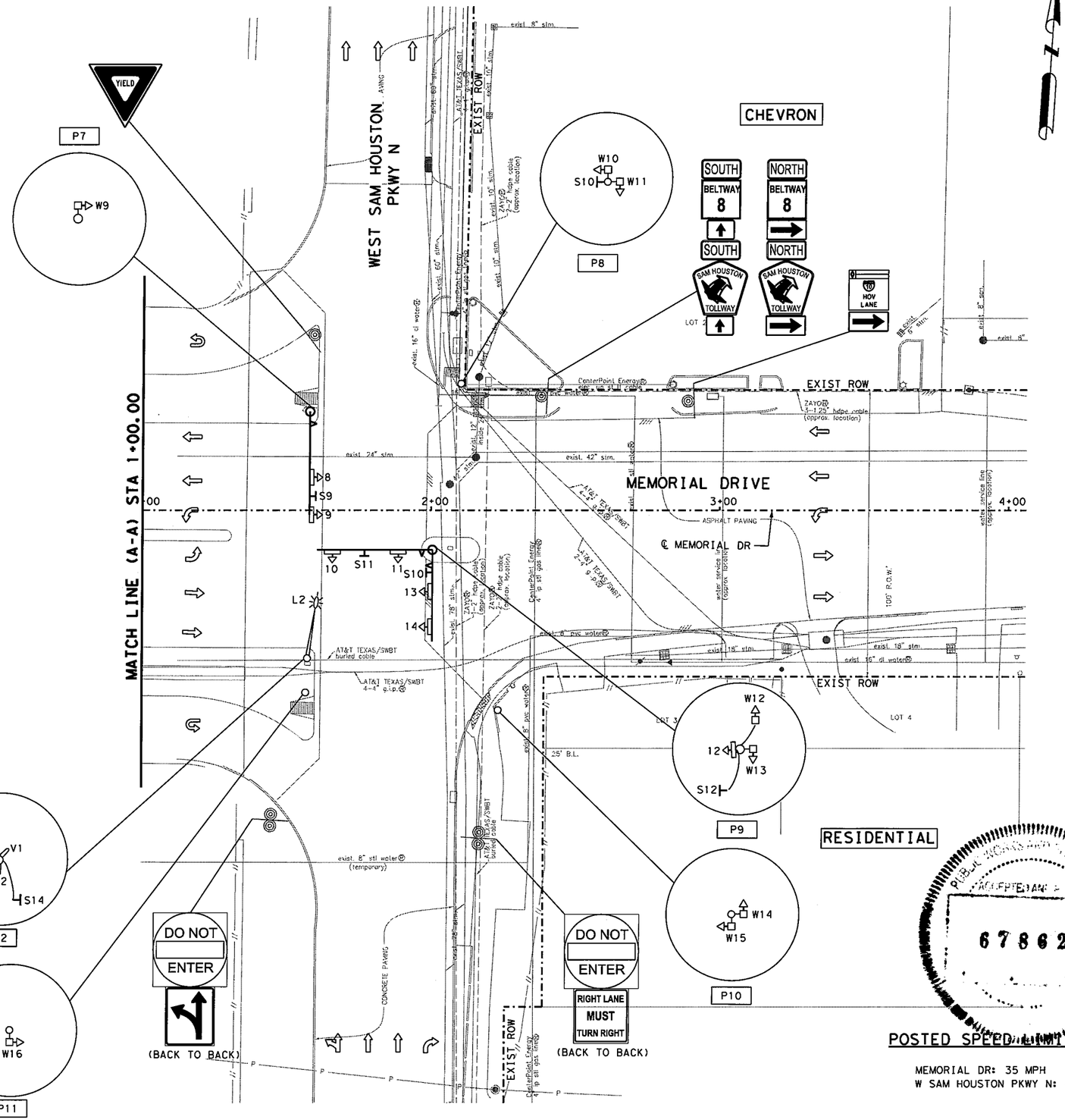
S11



S12

S13

S14



LEGEND

1	EXISTING SIGNAL HEAD AND NUMBER
S-#	EXISTING SIGN
	EXISTING SIGNAL POLE W/ MAST ARM
	EXISTING PED POLE
	EXISTING ELECTRICAL SERVICE
V-#	EXISTING VIDEO CAMERA
	EXISTING OPTICOM
	EXISTING PED SIGNAL
	EXISTING PED PUSH BUTTON
	EXISTING CONTROLLER CABINET
	EXISTING WIMAX ANTENNA
	EXISTING LUMINAIRE
	TRAFFIC FLOW
	EXISTING GROUND MOUNT SIGN

NOTES:

1. THE CONTRACTOR SHALL LOCATE ALL UTILITIES PRIOR TO COMMENCING WORK.
2. THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY CONTRACTOR'S FAILURE TO LOCATE AND PRESERVE THESE UTILITIES, WHETHER UNDERGROUND, ABOVE GROUND, OR OVERHEAD.

POSTED SPEED LIMIT

MEMORIAL DR: 35 MPH
W SAM HOUSTON PKWY N: 40 MPH

0 20 40

STATE OF TEXAS
ZINA I. SCHWARTZ
85814
LICENSED
PROFESSIONAL ENGINEER

2/6/2020

REV. NO.	DATE	DESCRIPTION	BY

CONSOR
F-12040

Texas Department of Transportation
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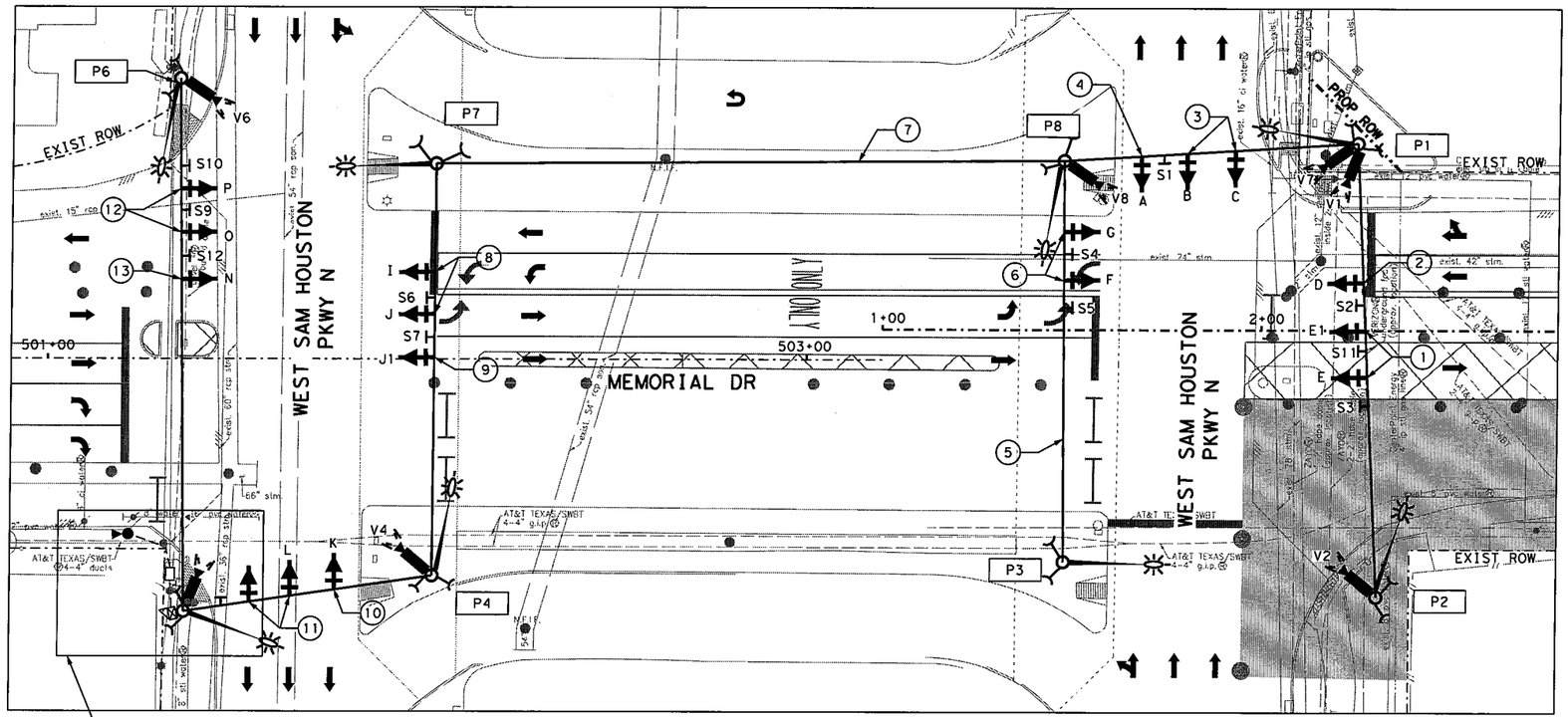
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT
CONDITION LAYOUT

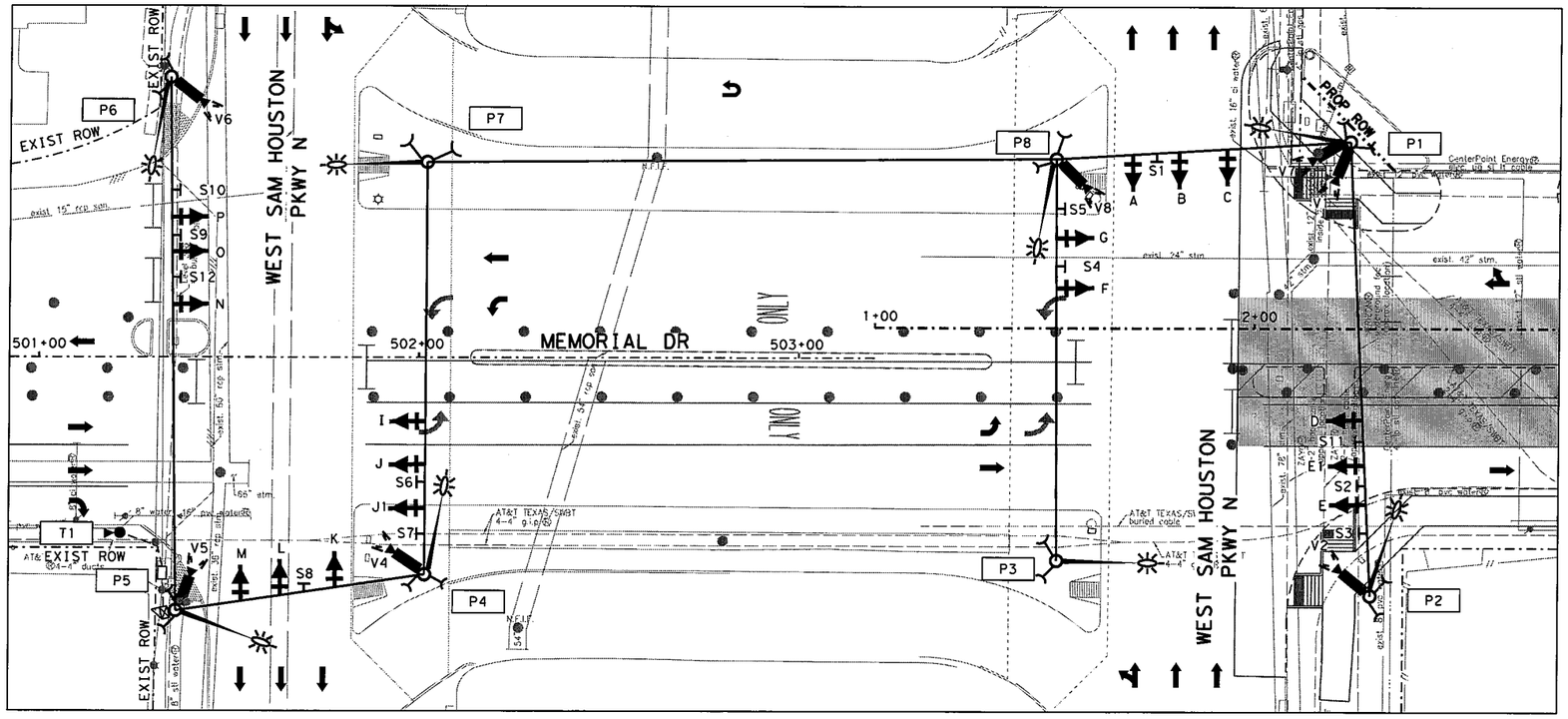
MEMORIAL DR AT WEST SAM HOUSTON PKWY N

SHEET 2 OF 2

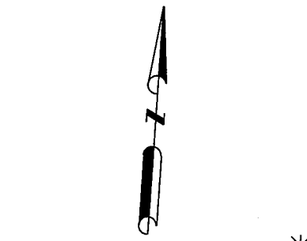
DGN: CONSOR	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: CONSOR	6	TEXAS	STP 1802(783)MM			CS
DWG: CONSOR	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: CONSOR	HOU	HARRIS	0912	72	391	298



PHASE II STEP 3 (STEP 4)



PHASE-III STEP 1 (STEPS 2 THRU 3)



DETAIL A
N.T.S

LEGEND

- TEMP POLE-MOUNTED CONTROLLER CABINET
- TEMP TIMBER POLE W/ 2 DOWN GUYS
- TEMP SPAN WIRE
- X TEMP SIGNAL HEAD
- S# TEMP SIGN
- TEMP LUMINAIRE
- TEMP ELECTRICAL SERVICE
- V# TEMP VIVDS CAMERA
- WORK ZONE
- TEMP ASPHALT
- TYPE III BARRICADE
- DRUMS
- TYPE D GROUND BOX W/APRON
- TRAFFIC FLOW

0 20 40

STATE OF TEXAS
ZINA I. SCHWARTZ
85814
LICENSED
PROFESSIONAL ENGINEER

3/4/2020

REV. NO.	DATE	DESCRIPTION	BY

CONSOR
F-12040

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PUBLIC WORKS AND ENGINEERING
ACCEPTANCE
67862

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT
TEMPORARY SIGNAL LAYOUT
MEMORIAL DR AT WEST SAM HOUSTON PKWY N

SHEET 1 OF 3

DGN: CONSOR	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: CONSOR	6	TEXAS	STP 1802(783)MM			CS
DWG: CONSOR	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: CONSOR	HOU	HARRIS	0912	72	391	299

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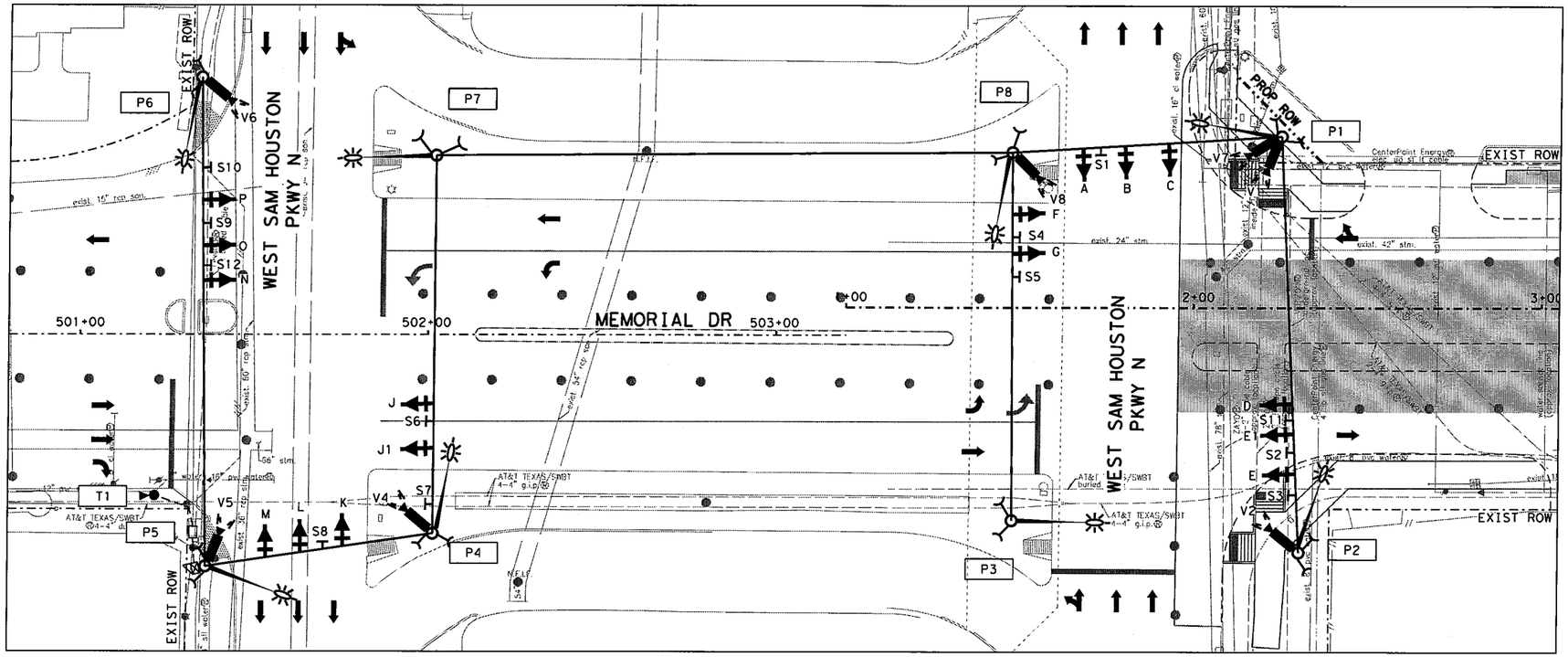


PHASE-IV STEP1 (STEPS 2 THRU 3)

LEGEND

- TEMP POLE-MOUNTED CONTROLLER CABINET
- TEMP TIMBER POLE W/ 2 DOWN GUYS
- TEMP SPAN WIRE
- X TEMP SIGNAL HEAD
- S# TEMP SIGN
- TEMP LUMINAIRE
- TEMP ELECTRICAL SERVICE
- V# TEMP VIVDS CAMERA
- WORK ZONE
- TEMP ASPHALT
- TYPE III BARRICADE
- DRUMS
- TYPE D GROUND BOX W/APRON
- TRAFFIC FLOW

TEMPORARY TRAFFIC SIGNALS

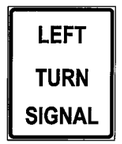
1 WAY, 3 SECTION 12" HORIZONTAL

A, B, C, E, E1, F, G, I, J, K, J1, L, M, O, P

1 WAY, 4 SECTION 12" HORIZONTAL

D, N

TEMPORARY OVERHEAD SIGNS



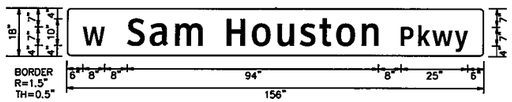
S11, S12
R6-2R
(30"X36")

S4, S6
R6-2R
(30"X36")

S2, S9
R6-2L
(30"X36")

RELOCATED EXISTING STREET NAME SIGNS

PROPOSED TEMPORARY STREET NAME SIGNS



S3, S10

12900 Memorial Dr 12800

S1

w Sam Houston N Pkwy

S5, S7

Memorial Dr

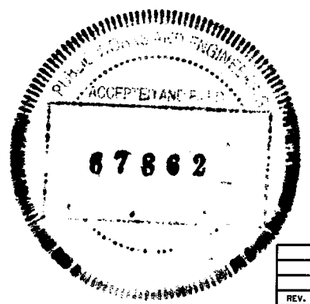
S8

NOTES:

1. THE CONTRACTOR SHALL LOCATE ALL UTILITIES PRIOR TO COMMENCING WORK.
2. THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY CONTRACTOR'S FAILURE TO LOCATE AND PRESERVE THESE UTILITIES, WHETHER UNDERGROUND, ABOVE GROUND, OR OVERHEAD.
3. THE ORIENTATION OF LUMINAIRES ARE FOR VISUAL PURPOSE ONLY. LUMINAIRES ARE TO BE MOUNTED PERPENDICULAR TO THE CENTERLINE OF ROADWAY BEING LIGHTED.
4. REFER TO TCP LAYOUTS FOR ADDITIONAL INFORMATION.
5. THE CONTRACTOR SHALL ALSO MAINTAIN PEDESTRIAN ACCESSIBLITY TO PUSH BUTTONS AND PROPER SIGNAL ALIGNMENT THROUGHOUT TCP STAGES, OTHWERWISE BAG PEDESTRIAN SIGNAL HEADS AND INTALL CROSSWALK CLOSED SIGNS AND PROVIDE PEDESTRIAN DETOUR.
6. CONTRACTOR SHALL NOTIFY THE CITY OF HOUSTON TRAFFIC OPERATIONS FOR ANY SIGNAL TIMING MODIFICATIONS AT LEAST 72 PRIOR TO IMPLEMENTING THE TCP STAGES. THIS NOTE APPLIES TO ALL CONSTRUCTION PHASES AND STAGES.

** POLES P5 AND P6 ARE PLACED IN THE SIDEWALK DUE TO SPACE CONSTRAINT. CONTRACTOR TO CONSTRUCT THE PED RAMPS AT THESE CORNERS DURING THE END OF CONSTRUCTION AFTER THE TEMP POES ARE REMOVED.

0 20 40



3/4/2020

REV. NO.	DATE	DESCRIPTION	BY

CONSOR F-12040

Texas Department of Transportation ©2020

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

TEMPORARY SIGNAL LAYOUT

MEMORIAL DR AT WEST SAM HOUSTON PKWY N

SHEET 2 OF 3

DGN: CONSOR	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK DGN: CONSOR	6	TEXAS	STP 1802(783)MM			CS
DWG: CONSOR	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CK DWG: CONSOR	HOU	HARRIS	0912	72	391	300

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CONDUIT AND CONDUCTOR RUNS														
RUN NO.	CONDUIT		CONDUCTORS				CABLES				VIVDS			
	PVC		POWER		GROUND		SIGNAL		LUMINAIRE		POWER 3/C #16		COAXIAL	
	2" (SCHD 80)		#6 INSULATED		#6 BARE		#12/7C		TRAY CABLE #12/4C					
	NO	TRENCH	NO	LENGTH	NO	LENGTH	NO	LENGTH	NO	LENGTH	NO	LENGTH	NO	LENGTH
1							1	71	1	71	1	71	1	71
2							2	49	1	49	1	49	1	49
3							3	45	2	45	3	45	3	45
4							4	25	2	25	3	25	3	25
5									1	74				
6							1	34	1	34				
7							5	165	4	165	4	165	4	165
8							6	40	5	40	4	40	4	40
9							7	70	5	70	4	70	4	70
10							8	26	6	26	5	26	5	26
11							9	40	6	40	5	40	5	40
12							1	41	1	41	1	41	1	41
13							2	100	1	100	1	100	1	100
14	2	11	2	51	1	51			8	51				
15	2	16	2	49	1	49			8	49				
17							11	26			7	26	7	26
TOTAL (LF)		54		200		100		3088		2915		2083		2083
EST. TOTAL		57		210		105		3467		3061		2187		2187

* COIL 25' EXTRA ON POLE FOR DIFFERENT PHASES/STEPS

CAMERA	VEHICLE DETECTION CHART
	SETTING
V1	PRESENCE NB THRU AND NB LEFT
V2	PRESENCE EB THRU AND EB LEFT
V4	PRESENCE EB THRU
V5	PRESENCE SB THRU AND SB LEFT
V6	ADVANCE WB THRU AND WB LEFT
V7	PRESENCE EB THRU AND EB LEFT
V8	PRESENCE WB THRU

V2 NOT OPERATIONAL IN PHASE II
V7 NOT OPERATIONAL IN PHASES III & IV

POLE #	SIGNAL POLE CHART
	DESCRIPTION
P1	PROPOSED 40' TIMBER POLE W/ VIVDS AND LUMINAIRE
P2	PROPOSED 40' TIMBER POLE W/ VIVDS AND LUMINAIRE
P3	PROPOSED 40' TIMBER POLE W/ LUMINAIRE
P4	PROPOSED 40' TIMBER POLE W/ VIVDS AND LUMINAIRE
P5	PROPOSED 40' TIMBER POLE W/ VIVDS, CONTROLLER AND LUMINAIRE
P6	PROPOSED 40' TIMBER POLE W/ VIVDS AND LUMINAIRE
P7	PROPOSED 40' TIMBER POLE W/ LUMINAIRE
P8	PROPOSED 40' TIMBER POLE W/ VIVDS AND LUMINAIRE

ELECTRICAL SERVICE DATA												
ELECTRICAL SERVICE ID	SHEET NAME	ELECTRICAL SERVICE DESCRIPTION (SEE ED(5)-14 AND ED(10)-14)	SERVICE CONDUIT SIZE	SERVICE CONDUCTORS NO /SIZE	SAFETY SWITCH AMPS	MAIN CKT BKR POLE/AMP	TWO-POLE CONTACTOR AMPS	PANEL BD/ LOADCENTER AMP RATING	BRANCH CIRCUIT ID	BRANCH CKT BKR POLE/AMPS	BRANCH CIRCUIT AMPS	KVA LOAD
T1	MEMORIAL DR AT W SAM HOUSTON PKWY N (SHEET 1 OF 3)	ELC SRV TY D 120/240 060 (NS)SS(E)TP(O)	1-1/4"	3/#6	N/A	2P/60	N/A	100	SIGNAL	1P/50	40	5.52
							30		LUMINAIRE	2P/20	6	

PHASE I AND PHASE II (STEPS 1 THRU 2):

1. EXISTING SIGNAL TO BE IN OPERATION IN THIS PHASE AND STEPS.
2. TEMP SIGNALS MUST BE INSTALLED AND WORKING BEFORE THE EXISTING SIGNALS CAN BE REMOVED.

PHASE II STEP 3:

1. ACTIVATE TEMPORARY SIGNAL FOR THIS PHASE
2. COVER SIGNAL I FOR THIS STEP
3. SIGNAL TO BE IN OPERATION AS SHOWN THROUGHOUT END OF PHASE II STEP 3.

PHASE II STEP 4:

1. UNCOVER SIGNAL I FOR THIS STEP
2. SHIFT SIGNAL HEADS D,E,E1 AND SIGNS S2,S3 AND S11 IN FRONT OF EB TRAVEL LANES.
3. SHIFT SIGNAL HEADS I, J, J1 AND SIGNS S6 AND S7 IN FRONT EB TRAVEL LANES.
4. SIGNAL TO BE IN OPERATION AS SHOWN THROUGHOUT END OF PHASE II.

PHASE III STEP 1:

1. ADJUST THE TRAFFIC SIGNAL HEADS, SIGNS AND VIVDS AS SHOWN IN THE PLANS, BEFORE THE START OF CONSTRUCTION OF THIS PHASE.
2. SIGNAL TO BE IN OPERATION AS SHOWN THROUGHOUT PHASE III FOR STEPS 2 THRU 3

PHASE IV STEP 1:

1. ADJUST THE TRAFFIC SIGNAL HEADS, SIGNS AND VIVDS AS SHOWN IN THE PLANS, BEFORE THE START OF CONSTRUCTION OF THIS PHASE.
2. SIGNAL TO BE IN OPERATION AS SHOWN THROUGHOUT PHASE IV FOR STEPS 2 THRU 3
3. REMOVE TEMPORARY TRAFFIC SIGNAL AT THE END OF THIS PHASE AND ACTIVATE PERMANENT TRAFFIC SIGNAL AT THE END OF PHASE IV CONSTRUCTION.

STATE OF TEXAS
ZINA I. SCHWARTZ
85814
LICENSED
PROFESSIONAL ENGINEER

3/4/2020

REV. NO.	DATE	DESCRIPTION	BY

CONSOR
F-12040

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT
TEMPORARY SIGNAL LAYOUT
MEMORIAL DR AT
WEST SAM HOUSTON PKWY N

SHEET 3 OF 3

DGN: CONSOR	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: CONSOR	6	TEXAS	STP 1802(783)MM			CS
DWG: CONSOR	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: CONSOR	HOU	HARRIS	0912	72	391	301

ACCEPTED AND FILED
67862

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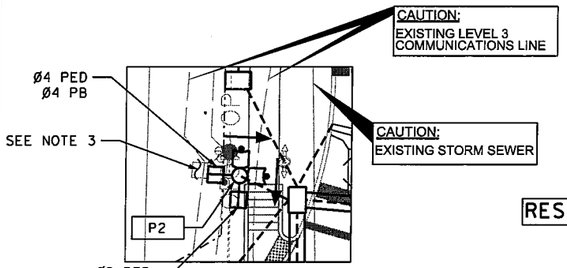

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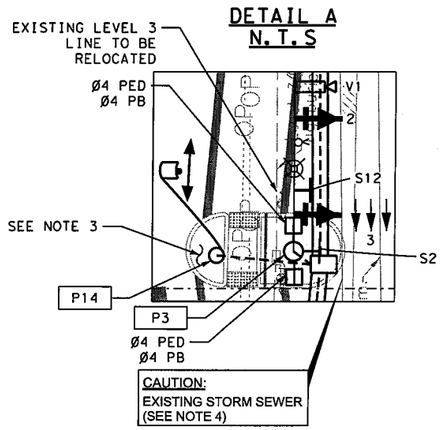

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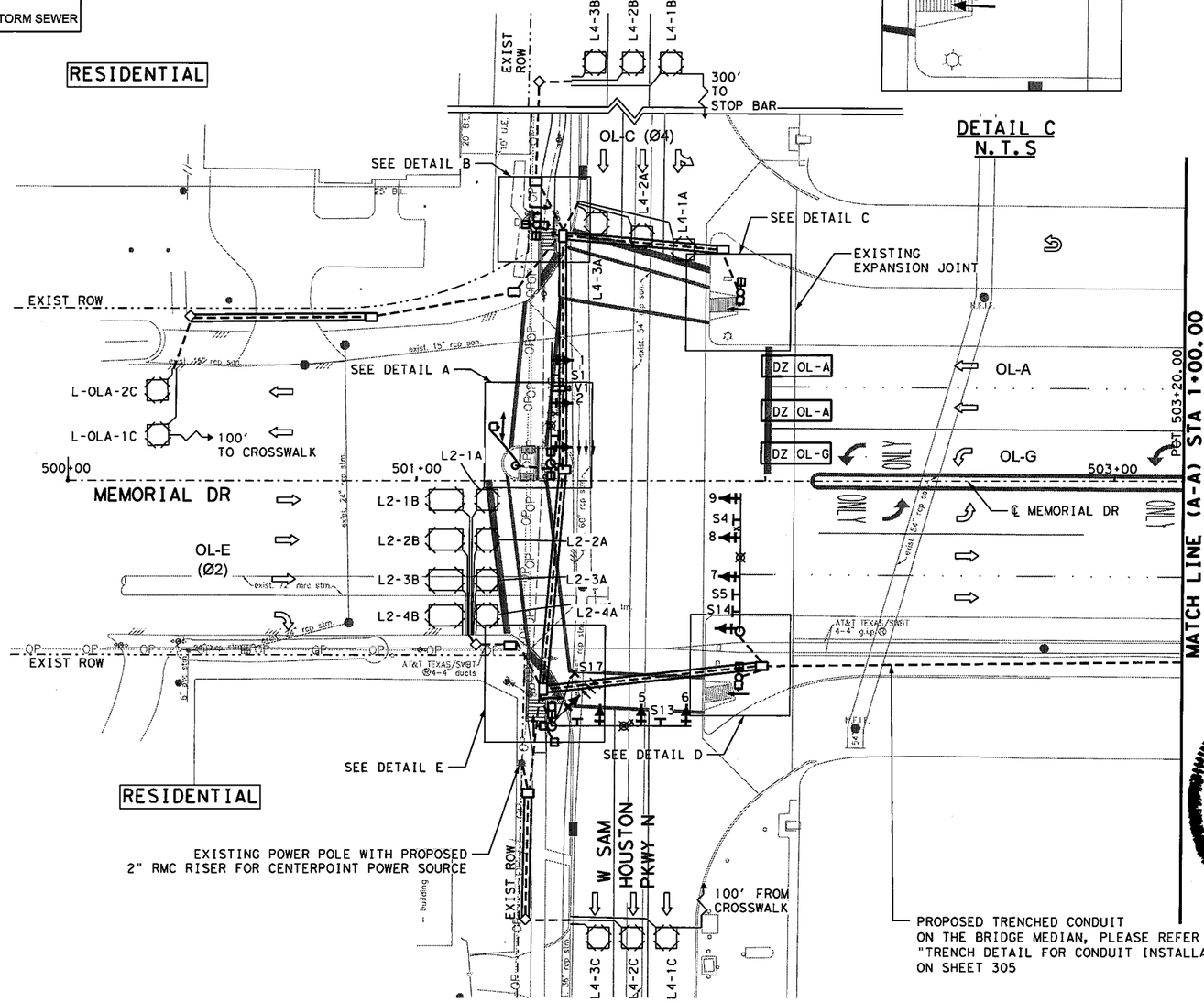
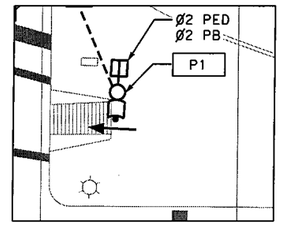




DETAIL C
N.T.S

LEGEND

- PROPOSED SIGNAL HEAD
- PROPOSED SIGNAL POLE W/ MAST ARM
- PROPOSED SIGN
- PROPOSED PED SIGNAL HEAD
- PROPOSED PED PUSH BUTTON
- PROPOSED VIVDS CAMERA
- PROPOSED LUMINAIRE
- PROPOSED CONTROLLER CABINET
- PROPOSED METER
- PROPOSED GROUND BOX TY A W/APRON
- PROPOSED GROUND BOX TY B W/APRON
- PROPOSED GROUND BOX TY C W/APRON
- TRAFFIC FLOW ARROW

S1= R6-2L (30"X36") "ONE WAY LEFT"
S2= R10-5L (30"X36") "LEFT ON GREEN ARROW ONLY"
**S3= STREET NAME "Memorial Dr"
S4= R6-2R (30"X36") "ONE WAY RIGHT"
**S5= STREET NAME "W Sam Houston Pkwy N", BLOCK NUMBER 12900
**S12= STREET NAME "W Sam Houston Pkwy N", BLOCK NUMBER 12900
S13= R3-8MS (36"X30") "Thru/left and thru only"
S14= R3-5R (30"X36") "RIGHT TURN ONLY"
S17=R10-5L (30"X36") "LEFT ON GREEN ARROW ONLY"

** STANDARD CITY OF HOUSTON STREET NAME SIGNS

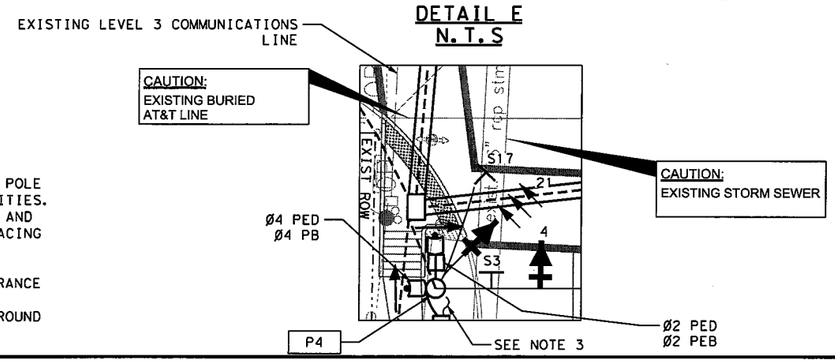
POSTED SPEED LIMIT

MEMORIAL DR: 35 MPH
W SAM HOUSTON PKWY N: 40 MPH

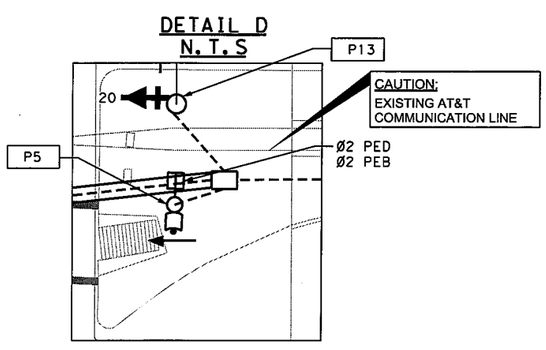
0 20 40

NOTES:

1. THE CONTRACTOR SHALL LOCATE ALL UTILITIES PRIOR TO COMMENCING WORK.
2. THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY CONTRACTOR'S FAILURE TO LOCATE AND PRESERVE THESE UTILITIES, WHETHER UNDERGROUND, ABOVE GROUND, OR OVERHEAD.
3. PED PUSH BUTTONS ARE NOT SEPARATED BY 10FT. THE AUDIBLE WALK INDICATION SHALL BE A SPEECH WALK MESSAGE
4. CONTRACTOR TO USE CAUTION WHILE INSTALLING THE POLE FOUNDATIONS BECAUSE OF CLOSE PROXIMITY TO UTILITIES. CONTRACTOR TO MAKE SURE EXISTING COMMUNICATION AND OVERHEAD POWER LINES ARE RELOCATED PRIOR TO PLACING SIGNAL POLE FOUNDATIONS
5. CONTRACTOR TO MAINTAIN A MINIMUM OF 32IN. CLEARANCE AROUND THE POLE FOUNDATIONS FOR PEDESTRIAN AND WHEELCHAIRS. PROVIDE A NOTCH IN THE SIDEWALK AROUND THE PED POLE.



DETAIL E
N.T.S



DETAIL D
N.T.S

ACCEPTED AND
67862

STATE OF TEXAS
ZINA I. SCHWARTZ
85814
LICENSED
PROFESSIONAL ENGINEER

3/4/2020

REV. NO.	DATE	DESCRIPTION	BY

CONSOR
F-12040

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT
PROPOSED TRAFFIC SIGNAL PLAN
MEMORIAL DR AT WEST SAM HOUSTON PKWY N

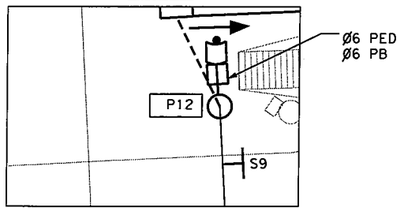
SHEET 1 OF 2

DGN: CONSOR	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: CONSOR	6	TEXAS	STP 1802(783)MM			CS
DWG: CONSOR	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: CONSOR	HOU	HARRIS	0912	72	391	302

S6= R6-2L (30"X36") "LEFT TURN ONE WAY"
S7= R10-5L (30"X36") "LEFT ON GREEN ARROW ONLY"
**S8= STREET NAME "Memorial Dr", BLOCK NUMBERS 12900 AND 12800
**S9= STREET NAME "W Sam Houston Pkwy N", BLOCK NUMBER 12800
S10= R6-2R (30"X36") "RIGHT TURN ONE WAY"
**S11= STREET NAME "W Sam Houston Pkwy N", BLOCK NUMBER 12800
S15= R3-8WS (36"X30") "Thru/left and thru only"
S16= R3-5R (30"X36") "RIGHT TURN ONLY
S18=R10-5L (30"X36") "LEFT TURN ON GREEN ARROW ONLY"

** STANDARD CITY OF HOUSTON STREET NAME SIGNS

DETAIL A
N.T.S



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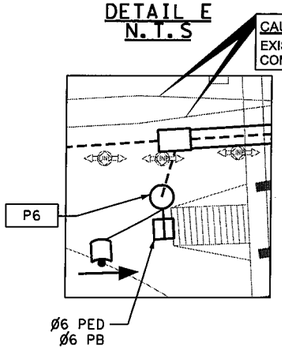

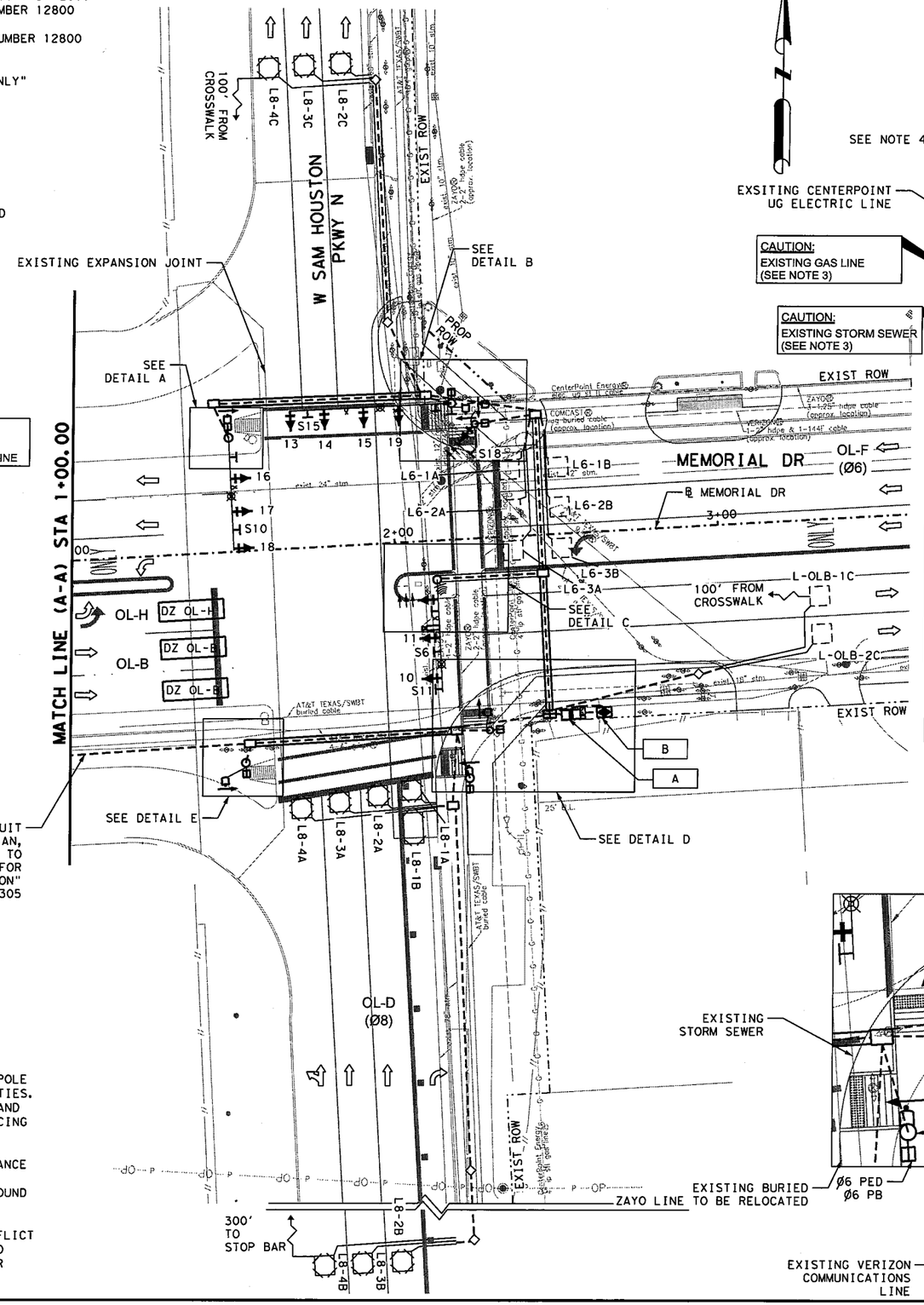

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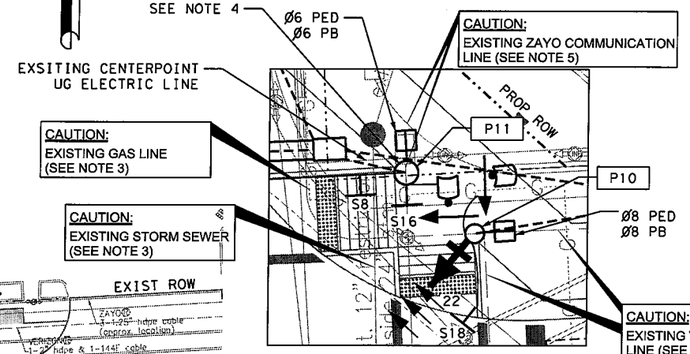

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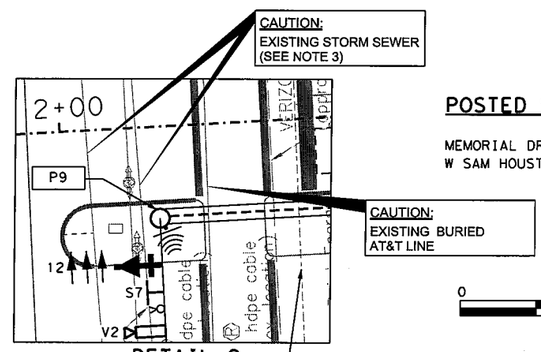

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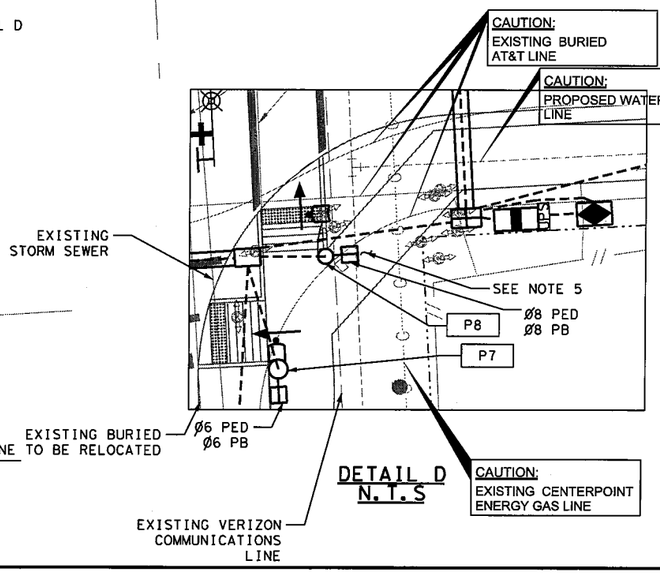

LEGEND

- PROPOSED SIGNAL HEAD
- PROPOSED SIGNAL POLE W/ MAST ARM
- PROPOSED SIGN
- PROPOSED PED SIGNAL HEAD
- PROPOSED PED PUSH BUTTON
- PROPOSED VIVDS CAMERA
- PROPOSED LUMINAIRE
- PROPOSED CONTROLLER CABINET
- PROPOSED METER
- PROPOSED GROUND BOX TY A W/APRON
- PROPOSED GROUND BOX TY B W/APRON
- PROPOSED GROUND BOX TY C W/APRON
- TRAFFIC FLOW ARROW

POSTED SPEED LIMIT

MEMORIAL DR: 35 MPH
W SAM HOUSTON PKWY N: 40 MPH

0 20 40

NOTES:

1. THE CONTRACTOR SHALL LOCATE ALL UTILITIES PRIOR TO COMMENCING WORK.
2. THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY CONTRACTOR'S FAILURE TO LOCATE AND PRESERVE THESE UTILITIES, WHETHER UNDERGROUND, ABOVE GROUND, OR OVERHEAD.
3. CONTRACTOR TO USE CAUTION WHILE INSTALLING THE POLE FOUNDATIONS BECAUSE OF CLOSE PROXIMITY TO UTILITIES. CONTRACTOR TO MAKE SURE EXISTING COMMUNICATION AND OVERHEAD POWER LINES ARE RELOCATED PRIOR TO PLACING SIGNAL POLE FOUNDATIONS
4. CONTRACTOR TO MAINTAIN A MINIMUM OF 32IN. CLEARANCE AROUND THE POLE FOUNDATIONS FOR PEDESTRIAN AND WHEELCHAIRS. PROVIDE A NOTCH IN THE SIDEWALK AROUND THE PED POLE.
5. LOCATION OF POLES P10 AND P11 ARE IN DIRECT CONFLICT WITH EXISTING COMMUNICATION LINES. CONTRACTOR TO MAKE SURE THE EXISTING LINES ARE RELOCATED PRIOR TO INSTALLATION OF POLE FOUNDATIONS.

STATE OF TEXAS
ZINA I. SCHWARTZ
85814
LICENSED
PROFESSIONAL ENGINEER

67862

3/4/2020

REV. NO.	DATE	DESCRIPTION	BY

CONSOR F-12040

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT
PROPOSED TRAFFIC SIGNAL PLAN MEMORIAL DR AT WEST SAM HOUSTON PKWY N

SHEET 2 OF 2

DGN: CONSOR	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: CONSOR	6	TEXAS	STP 1802(783)MM			CS
DWG: CONSOR	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: CONSOR	HOU	HARRIS	0912	72	391	303

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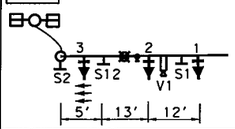
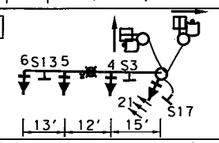
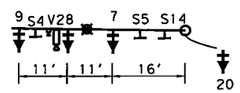
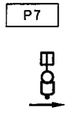
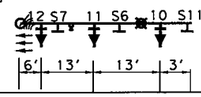
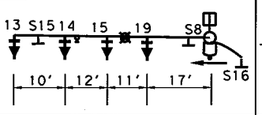
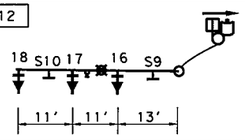
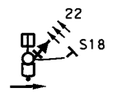
POLE SCHEDULE

POLE NUMBER	POLE TYPE	MAST ARM		SIGNALS		LUMINAIRE TYPE	PED PB TYPE/SIGN	REMARKS	LOCATION	CITY OF HOUSTON STANDARDS
		SIGNAL	LUMIN	MOUNTING	FACE					
P1 P5 P8 	PED 15'	--	--	1-PED	1-CDP	--	POLARA NAVIGATOR R10-3E(L)	--	AT APPROX. POLE P1 - STA 501+92.43, 54.27' LT (℄ MEMORIAL DR) POLE P8 - STA 2+30.03, 59.87' RT (℄ MEMORIAL DR) POLE P13 - STA 501+92.91, 56.74'RT (℄ MEMORIAL DR)	02893-02 02893-03 02893-07
P3 	TYPE 1	35'	15'	3-ASTROBRAC 2-PED	1-H3L 2-H3 2-CDP	106 WATT SYSTEM MAX LED COBRA HEAD LUMINAIRE	--	PRE-EMPT SENSOR SIGNS: S1 = R6-2L (30"X36") S2 = R10-5L (30"X36") S12 = "W SAM HOUSTON PKWY" WITH BLOCK NUMBER 12902 V1=VIVDS CAMERA	AT APPROX. POLE P3 - STA 501+38.31, 4.89' LT(℄ MEMORIAL DR)	02893-02 02893-03 02893-04A 02893-04B 02893-05 02893-09 02893-12
P4 	TYPE 2	40'	15'	3-ASTROBRAC 1-SIDE OF POLE 2-PED	3-H3 2-CDP 1-V3L	106 WATT SYSTEM MAX LED COBRA HEAD LUMINAIRE	POLARA NAVIGATOR R10-3E(L)	PRE-EMPT SENSOR SIGNS: S3 = "MEMORIAL DR" S13 = R3-8MS (30"X30")	AT APPROX. POLE P4 - STA 501+39.28, 70.84' RT (℄ MEMORIAL DR)	02893-02 02893-03 02893-04A 02893-04B 02893-05 02893-09
P13 	TYPE 2	40'	15'	3-ASTROBRAC 1-SIDE OF POLE	3-H3 1-V3	106 WATT SYSTEM MAX LED COBRA HEAD LUMINAIRE	--	PRE-EMPT SENSOR SIGNS: S4 = R6-2R (30"X36") S5 = "W SAM HOUSTON PKWY N" WITH BLOCK NUMBER 12903 S14 = R3-5R (30"X36") V2=VIVDS CAMERA	AT APPROX. POLE P5- STA 501+93.06 43.54' RT (℄ MEMORIAL DR)	02893-02 02893-03 02893-04A 02893-04B 02893-05 02893-09 02893-12
P6 P7 	PED 15'	--	--	1-PED	1-CDP	--	POLARA NAVIGATOR R10-3E(R)	--	AT APPROX. POLE P6 - STA 1+54.02 65.79' RT (℄ MEMORIAL DR) POLE P7 - STA 2+23.90 74.40' RT (℄ MEMORIAL DR)	02893-02 02893-03 02893-07
P9 	TYPE 1	35'	15'	3-ASTROBRAC	1-H3L 2-H3	106 WATT SYSTEM MAX LED COBRA HEAD LUMINAIRE	--	WIMAX, PRE-EMPT SENSOR SIGNS: S6 = R6-2L (30"X36") S7 = R10-5L (30"X36") S11 = "W SAM HOUSTON PKWY N" WITH BLOCK NUMBER 12855	AT APPROX. POLE P9 - STA 2+13.29 12.14' RT (℄ MEMORIAL DR)	02893-02 02893-03 02893-04A 02893-04B 02893-05 02893-09
P11 	TYPE 2	50'	15'	4-ASTROBRAC 1-PED	4-H3	106 WATT SYSTEM MAX LED COBRA HEAD LUMINAIRE	POLARA NAVIGATOR R10-3E(L)	PRE-EMPT SENSOR SIGNS: S8 = "MEMORIAL DR" WITH BLOCK NUMBERS 12900 AND 12800 S15 = R3-8MS (30"X30") S16 = R3-5R (30"X36")	AT APPROX. POLE P11 - STA 2+17.31 43.00' LT (℄ MEMORIAL DR)	02893-02 02893-03 02893-04A 02893-04B 02893-05 02893-09
P12 	TYPE 1	35'	15'	3-ASTROBRAC 1-PED	3-H3	106 WATT SYSTEM MAX LED COBRA HEAD LUMINAIRE	POLARA NAVIGATOR R10-3E(L)	PRE-EMPT SENSOR SIGNS: S9 = "W SAM HOUSTON PKWY N" WITH BLOCK NUMBER 12860 S10 = R6-2R (30"X36")	AT APPROX. POLE P12 = STA 1+47.85 35.50' LT (℄ MEMORIAL DR)	02893-02 02893-03 02893-04A 02893-04B 02893-05 02893-09
P10 	20'	--	--	1-SIDE OF POLE 1-PED	1-V3L 1-CDP	--	POLARA NAVIGATOR R10-3E(R)	--	AT APPROX. POLE P10 - STA 2+24.60 35.56' LT (℄ MEMORIAL DR)	02893-02 02893-03 02893-04A 02893-04B 02893-05
P14 	PED 5'	--	--	--	--	--	POLARA NAVIGATOR R10-3E(MOD)	--	AT APPROX. POLE P14 - STA 501+38.40 4.91' LT (℄ MEMORIAL DR)	02893-02 02893-03 02893-07
P2 	PED 15'	--	--	2-PED	2-CDP	--	POLARA NAVIGATOR R10-3E(L)	--	AT APPROX. POLE P2 - STA 501+33.75 73.72' LT (℄ MEMORIAL DR)	02893-02 02893-03 02893-07

NOTES:

1. REFER TO PAVEMENT MARKING PLANS FOR STOP BAR LOCATIONS.
2. INSTALL LUMINAIRES PARALLEL TO MAST ARMS.
3. ALL NON HOUSTON PUBLIC WORKS STANDARD ITEMS SUCH AS THE CUSTOM SIGNS SHAL BE PROVIDED AND MAINTAINED BY THE MEMORIAL MANAGEMENT DISTRICT. CONTACT PAT WALTERS (PH - 713-984-8737) AT MEMORIAL MANAGEMENT DISTRICT FOR MORE INFORMATION ON MEMORIAL DISTRICT STREET NAME SIGNS.

* USE SCREW ANCHOR FOUNDATIONS FOR PED POLES P2, P7 AND P8.

STATE OF TEXAS
ZINA I. SCHWARTZ
85814
LICENSED
PROFESSIONAL ENGINEER

2/6/2020

REV. NO.	DATE	DESCRIPTION	BY

CONSOR
F-12040

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT
TRAFFIC SIGNAL
POLE SCHEDULE
MEMORIAL DR AT
WEST SAM HOUSTON PKWY N

SHEET 1 OF 2

DGN: CONSOR	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: CONSOR	6	TEXAS	STP 1802(783)MM			CS
DWG: CONSOR	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: CONSOR	HOU	HARRIS	0912	72	391	304

67862

PREFORMED LOOP LOCATIONS

ITEM BY DIRECTION	STATION ℄ MEMORIAL DR	OFFSET
WESTBOUND (THRU LANE) PHASE 6 CALL LOOPS (6'X6') L6-1A L6-1B L6-2A L6-2B L6-3A L6-3B	 STA 2+35.42 STA 2+50.43 STA 2+35.42 STA 2+50.43 STA 2+35.42 STA 2+50.43	 CENTERED IN LANE CENTERED IN LANE CENTERED IN LANE CENTERED IN LANE CENTERED IN LANE CENTERED IN LANE
EASTBOUND (THRU LANE) OL-B DOWNSTREAM LOOPS (6'X6') L-OLB-1C L-OLB-2C	 100' FROM CROSSWALK 100' FROM CROSSWALK	 CENTERED IN LANE CENTERED IN LANE

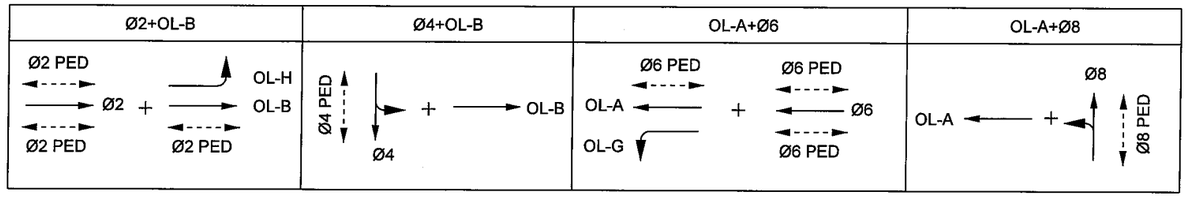
SAWCUT LOOP LOCATIONS

ITEM BY DIRECTION	STATION ℄ MEMORIAL DR	OFFSET
SOUTHBOUND (THRU LANE) PHASE 4 CALL LOOPS (6'X6') L4-1A L4-2A L4-3A PHASE 4 PULSE LOOPS(6'X6') L4-1B L4-2B L4-3B PHASE 4 DOWNSTREAM LOOPS (6'X6') L4-1C L4-2C L4-3C	 STA 501+75.99 STA 501+64.15 STA 501+51.19 300' FROM STOP BAR 300' FROM STOP BAR 300' FROM STOP BAR 100' FROM CROSSWALK 100' FROM CROSSWALK 100' FROM CROSSWALK	 CENTERED IN LANE CENTERED IN LANE CENTERED IN LANE CENTERED IN LANE CENTERED IN LANE CENTERED IN LANE CENTERED IN LANE CENTERED IN LANE CENTERED IN LANE
WESTBOUND THRU LANES OL-A DOWNSTREAM LOOPS (6'X6') L-OLA-1C L-OLA-2C	 100' FROM CROSSWALK 100' FROM CROSSWALK	 CENTERED IN LANE CENTERED IN LANE
NORTHBOUND (THRU LANE) PHASE 8 CALL LOOPS (6'X6') L8-2A L8-3A L8-4A PHASE 8 PULSE LOOPS(6'X6') L8-2B L8-3B L8-4B NORTHBOUND (RIGHT LANE) L8-1A L8-1B PHASE 8 DOWNSTREAM LOOPS(6'X6') L8-2C L8-3C L8-4C	 STA 1+95.11 STA 1+82.99 STA 1+71.35 300' FROM STOP BAR 300' FROM STOP BAR 300' FROM STOP BAR STA 2+05.66 STA 2+05.66 100' FROM CROSSWALK 100' FROM CROSSWALK 100' FROM CROSSWALK	 CENTERED IN LANE CENTERED IN LANE CENTERED IN LANE CENTERED IN LANE CENTERED IN LANE CENTERED IN LANE CENTERED IN LANE CENTERED IN LANE CENTERED IN LANE CENTERED IN LANE CENTERED IN LANE
EASTBOUND (THRU LANE) PHASE 2 CALL LOOPS L2-1A (6'X6') L2-2A (6'X6') L2-3A (6'X6') L2-4A (6'X6') L2-1B (6'X10') L2-2B (6'X10') L2-3B (6'X10') L2-4B (6'X10') OL-B DOWNSTREAM LOOPS (6'X6') L-OLB-1C L-OLB-2C	 STA 501+20.23 STA 501+20.23 STA 501+20.23 STA 501+20.23 STA 501+08.44 STA 501+08.44 STA 501+08.44 STA 501+08.44 100' FROM CROSSWALK 100' FROM CROSSWALK	 CENTERED IN LANE CENTERED IN LANE CENTERED IN LANE CENTERED IN LANE CENTERED IN LANE CENTERED IN LANE CENTERED IN LANE CENTERED IN LANE CENTERED IN LANE CENTERED IN LANE

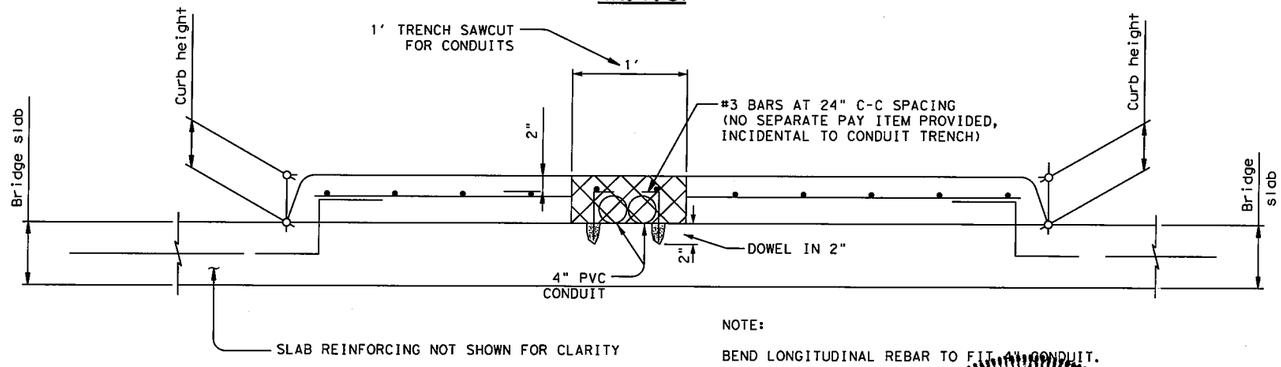
TRAFFIC SIGNAL CONTROLLER

CABINET/METER	TYPE	CONTROLLER	AUX. CONTROL	REMARKS	LOCATION (℄ MEMORIAL DR)	STANDARDS
B	METERED PEDESTAL SERVICE UL TYPE 3R	METERED SERVICE PEDESTAL WITH 30 AMP & 60 AMP SINGLE POLE CIRCUIT BREAKERS STREET LIGHTS PHOTOCELL TO ADD TO SERVICE PANEL	--	PROVIDE METER SOCKET WINDOW 4"H X 6"W	AT APPROX. STA 2+38.23 OFFSET 119.14' RT	02893-14
A UPS	TYPE 340 ITS	2070LX W/1C CPU MODULE W/GPS SERIAL COMMUNICATIONS MODULE & UPS	--	STD SPEC 16730 & 16731, STD SPEC 16732 - UNINTERRUPTED POWER SUPPLY, STD SPEC 16733 - FIELD HARDNEDED ETHERNET SWITCH (MIN. TWO FIBER PORTS AND SIX COPPER PORTS), STD SPEC 16734 -WIMAX, STD SPEC 16758 - GPS SERIAL COMMUNICATION MODULE	AT APPROX. STA 2+36.34 OFFSET 101.83' RT	02893-10C

PROPOSED TRAFFIC SIGNAL PHASING SEQUENCE



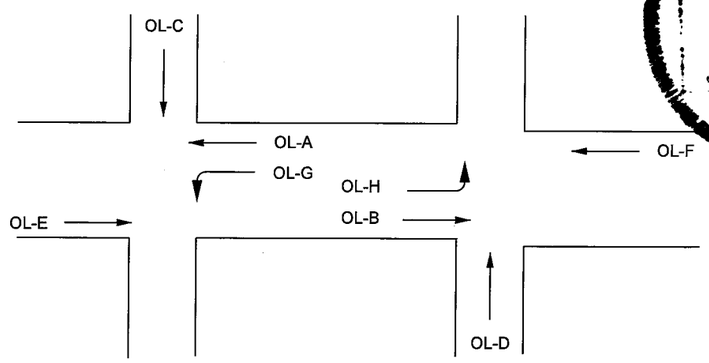
TRENCH DETAIL FOR CONDUIT INSTALLATION ON BRIDGE MEDIAN (N.T.S)



NOTE:

BEND LONGITUDINAL REBAR TO FIT AT CONDUIT.

PROPOSED TRAFFIC SIGNAL PHASING DIAGRAM



STATE OF TEXAS
ZINA I. SCHWARTZ
85814
LICENSED
PROFESSIONAL ENGINEER

2/6/2020

REV. NO.	DATE	DESCRIPTION	BY

CONSOR F-12040

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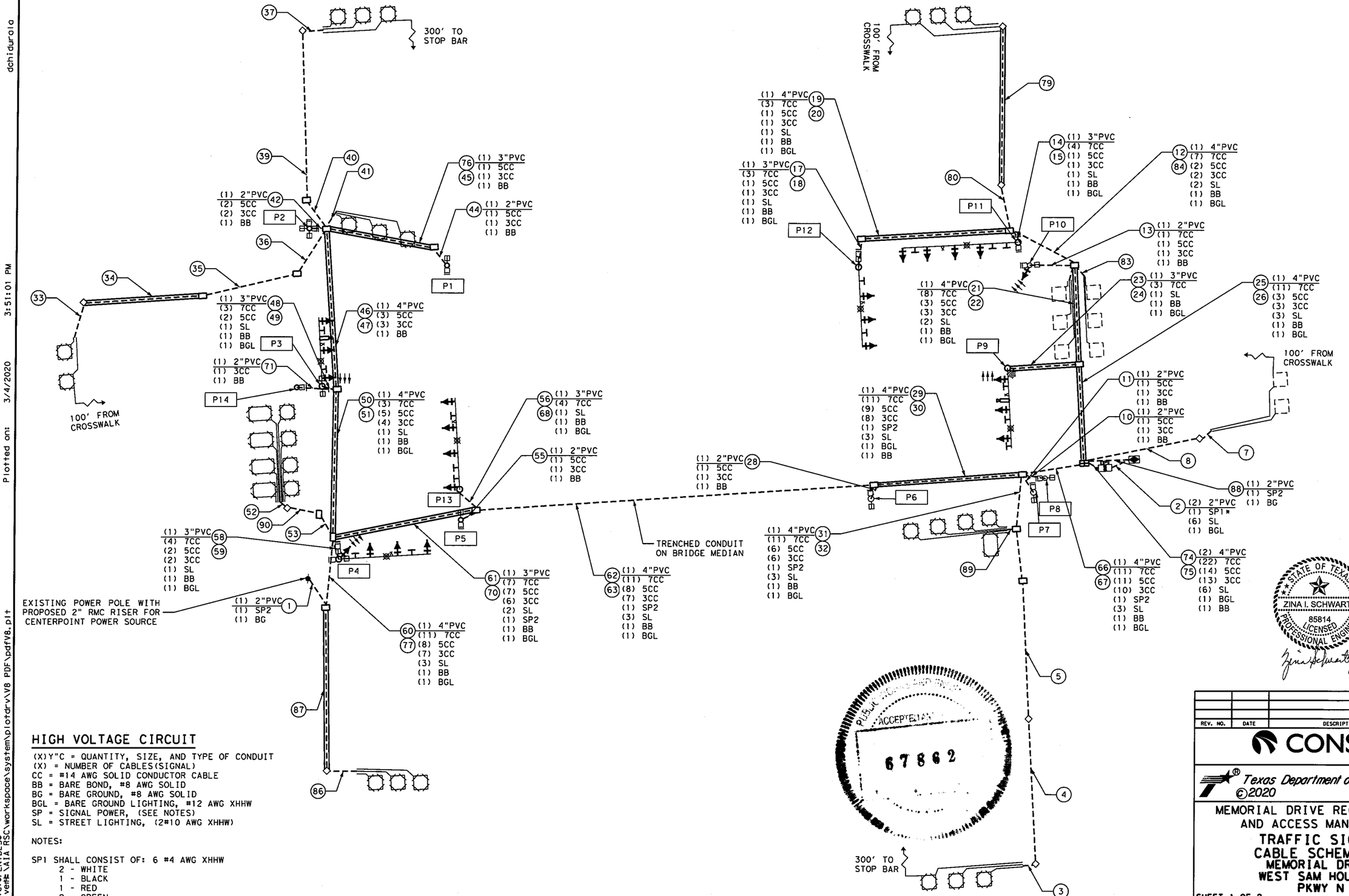
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

TRAFFIC SIGNAL POLE SCHEDULE MEMORIAL DR AT WEST SAM HOUSTON PKWY N

SHEET 2 OF 2

DGN: CONSOR	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: CONSOR	6	TEXAS	STP 1802(783)MM			CS
DWG: CONSOR	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: CONSOR	HOU	HARRIS	0912	72	391	305



HIGH VOLTAGE CIRCUIT

(X)Y"C = QUANTITY, SIZE, AND TYPE OF CONDUIT
(X) = NUMBER OF CABLES(SIGNAL)
CC = #14 AWG SOLID CONDUCTOR CABLE
BB = BARE BOND, #8 AWG SOLID
BG = BARE GROUND, #8 AWG SOLID
BGL = BARE GROUND LIGHTING, #12 AWG XHHW
SP = SIGNAL POWER, (SEE NOTES)
SL = STREET LIGHTING, (2#10 AWG XHHW)

NOTES:

SP1 SHALL CONSIST OF: 6 #4 AWG XHHW
2 - WHITE
1 - BLACK
1 - RED
2 - GREEN

SP2 SHALL CONSIST OF: 3 #4 AWG XHHW WITH GROUND

*SIGNAL POWER CABLES ARE TO BE KEPT IN A SEPARATE CONDUIT

REV. NO.	DATE	DESCRIPTION	BY

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT
TRAFFIC SIGNAL CABLE SCHEMATIC
MEMORIAL DR AT WEST SAM HOUSTON PKWY N

SHEET 1 OF 2

DGN: CONSOR	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: CONSOR	6	TEXAS	STP 1802(783)MM			CS
DWG: CONSOR	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: CONSOR	HOU	HARRIS	0912	72	391	306

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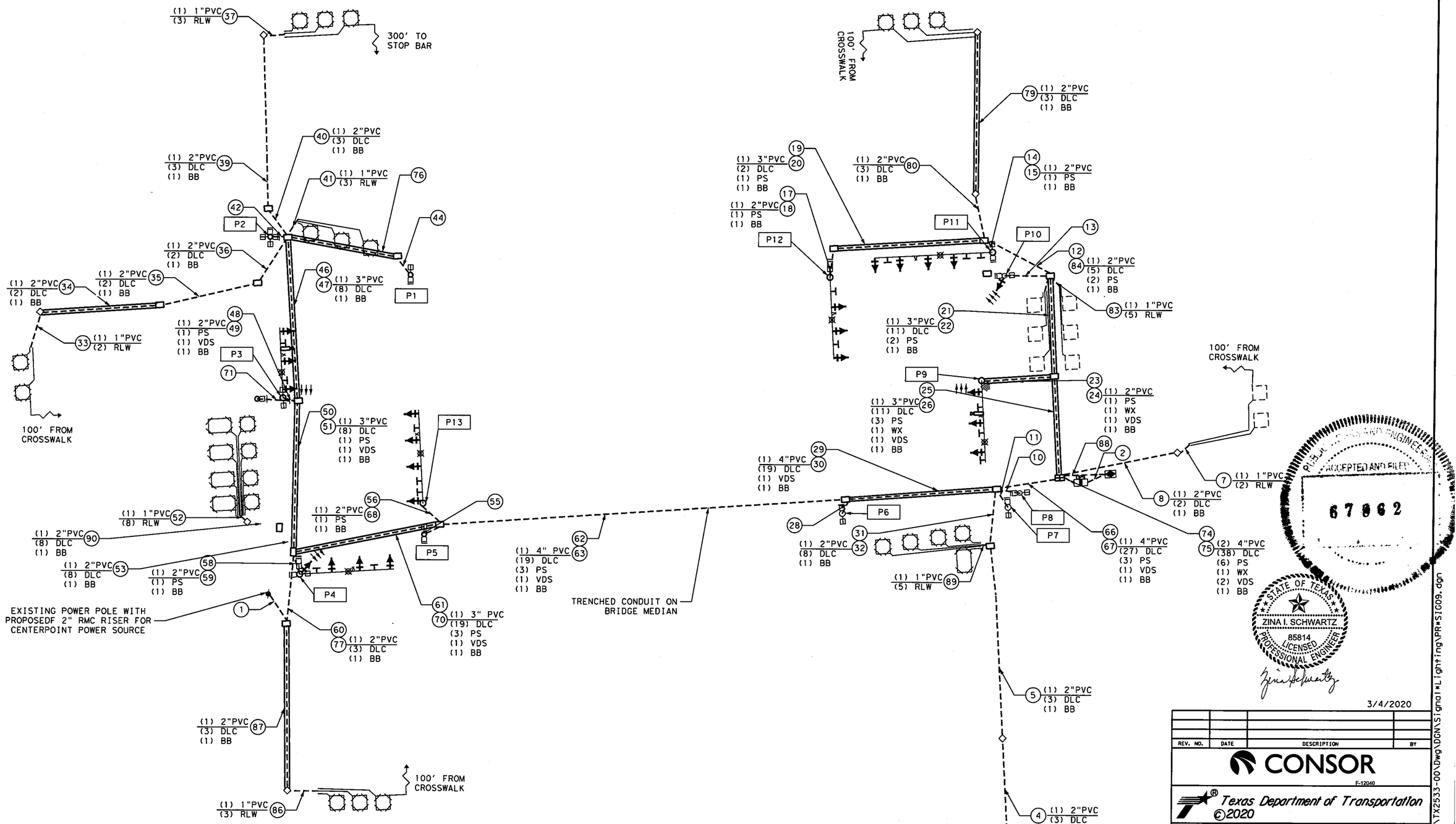

LOW VOLTAGE CIRCUIT

(X)Y"C = QUANTITY, SIZE, AND TYPE OF CONDUIT
DLC = DETECTOR LEAD-IN CABLE, 14 AWG (IMSA 50-2-1984)
PS = PRE-EMPT SENSOR, OPTICOM, #20-3CC SHIELDED CABLE (3M MODEL 138)
WX = WIMAX ANTENNA POWER CABLE, CAT5E 24 AWG
RLW = ROADWAY LOOP DETECTOR, 14 AWG (IMSA 51-5-1985)
BB = BARE BOND #8 AWG SOLID

NOTE:

1. PROVIDE 150' OF cat-5e CABLE FOR INSTALLATION OF WIMAX.

ACCEPTED AND FILED
67962

STATE OF TEXAS
ZINA I. SCHWARTZ
85814
LICENSED PROFESSIONAL ENGINEER

3/4/2020

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT
TRAFFIC SIGNAL CABLE SCHEMATIC
MEMORIAL DR AT WEST SAM HOUSTON PKWY N

SHEET 2 OF 2

DGN: CONSOR	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK. CONSOR	6	TEXAS	STP 1802(783)MM			CS
DWG: CONSOR	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK. CONSOR	HOU	HARRIS	0912	72	391	307

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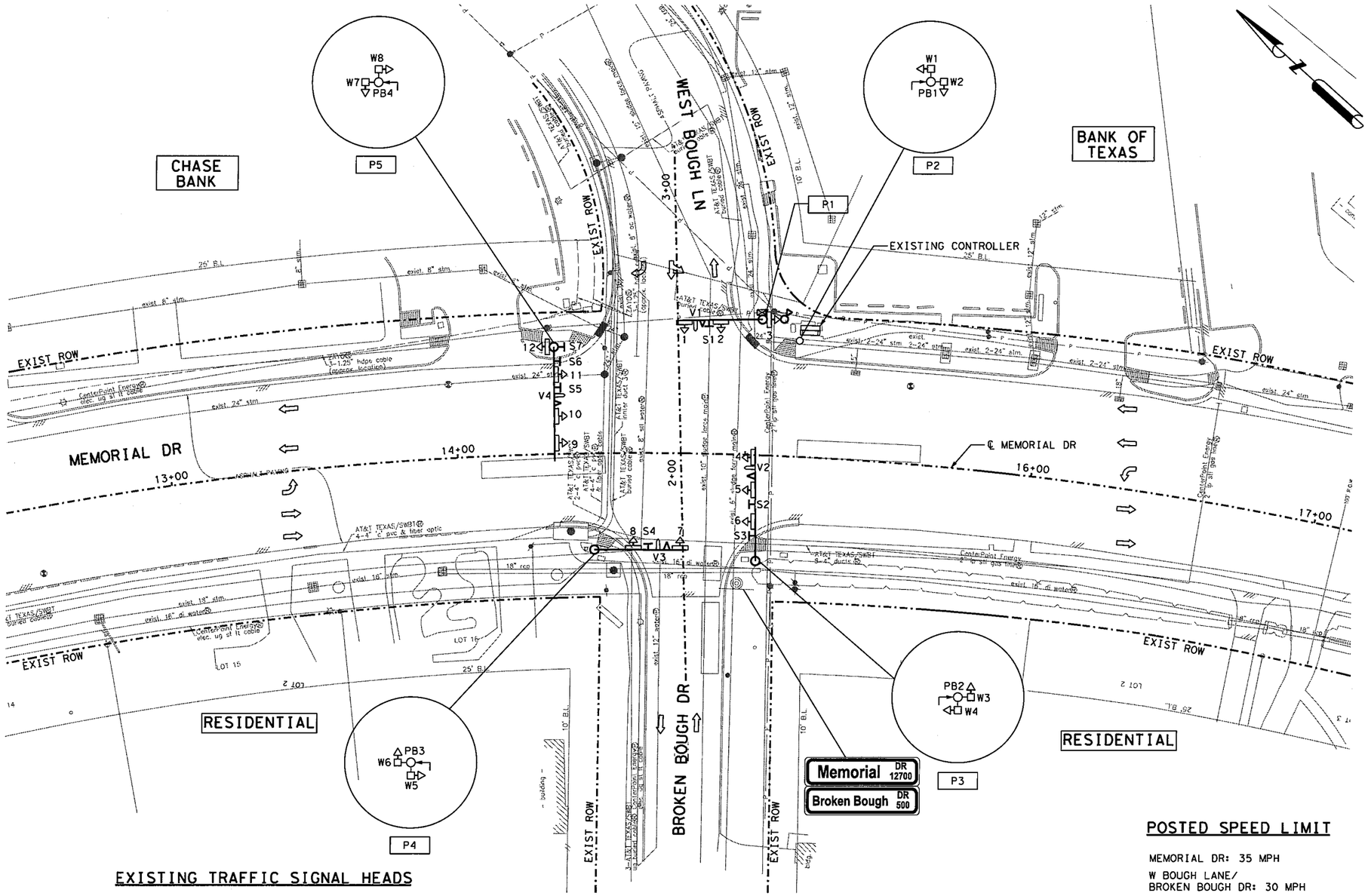

LEGEND

- EXISTING SIGNAL HEAD AND NUMBER
- EXISTING SIGN
- EXISTING SIGNAL POLE W/ MAST ARM
- EXISTING PED POLE
- EXISTING ELECTRICAL SERVICE
- EXISTING VIDEO CAMERA
- EXISTING OPTICOM
- EXISTING PED SIGNAL
- EXISTING PED PUSH BUTTON
- EXISTING CONTROLLER CABINET
- EXISTING WIMAX ANTENNA
- EXISTING LUMINAIRE
- TRAFFIC FLOW
- EXISTING GROUND MOUNT SIGN

ACCEPTED AS NOTED
67862

0 20 40

STATE OF TEXAS
ZINA I. SCHWARTZ
85814
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PROFESSIONAL ENGINEER

2/6/2020

EXISTING TRAFFIC SIGNAL HEADS

1 WAY, 3 SECTION HORIZONTAL — R Y G — 1, 2, 5, 6, 7, 8, 10, 11

1 WAY, 3 SECTION VERTICAL — R Y G — 3, 12

1 WAY, 4 SECTION HORIZONTAL — R R ← Y G — LEFT TURN SIGNAL — 4, 9

W1 THRU W8

EXISTING OVERHEAD SIGNS

Broken Bough Dr 500 → — S3

← West Bough Ln 600 — S2

Memorial Dr 12800 12800 — S1, S4

West Bough Ln 600 → — S6

← Broken Bough Dr 500 — S5

DO NOT BLOCK INTERSECTION — S7

EXISTING PEDESTRIAN SIGNS

PB2, PB4 PB1, PB3

POSTED SPEED LIMIT

MEMORIAL DR: 35 MPH

W BOUGH LANE/
BROKEN BOUGH DR: 30 MPH

REV. NO.	DATE	DESCRIPTION	BY

CONSOR F-12040

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT
CONDITION LAYOUT

MEMORIAL DR AT AT W BOUGH LN/ BROKEN BOUGH DR

SHEET 1 OF 1

DGN: CONSOR	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: CONSOR	6	TEXAS	STP 1802(783)MM			CS
DWG: CONSOR	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: CONSOR	HOU	HARRIS	0912	72	391	308

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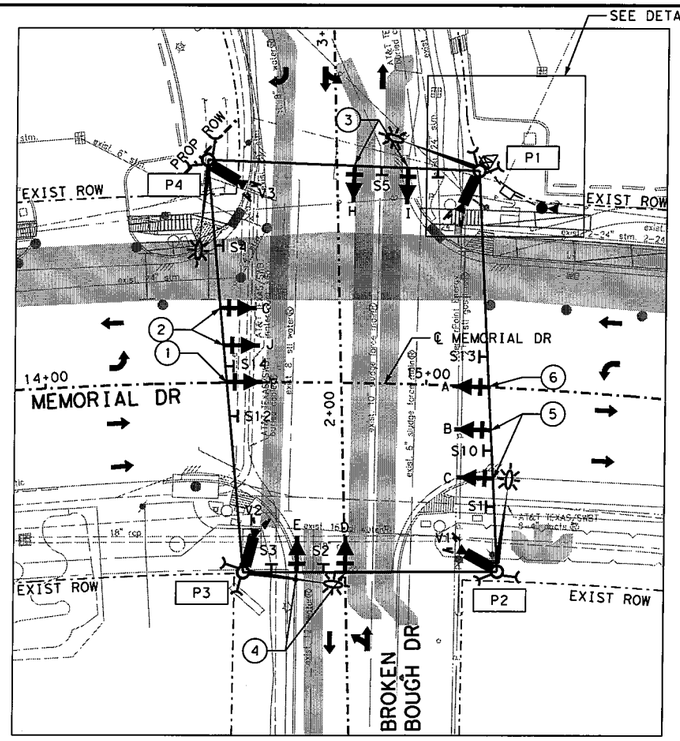
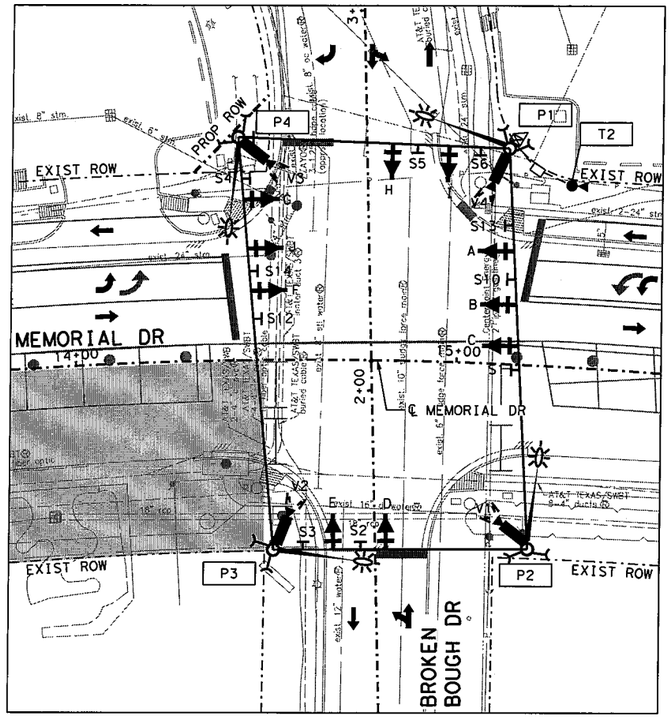
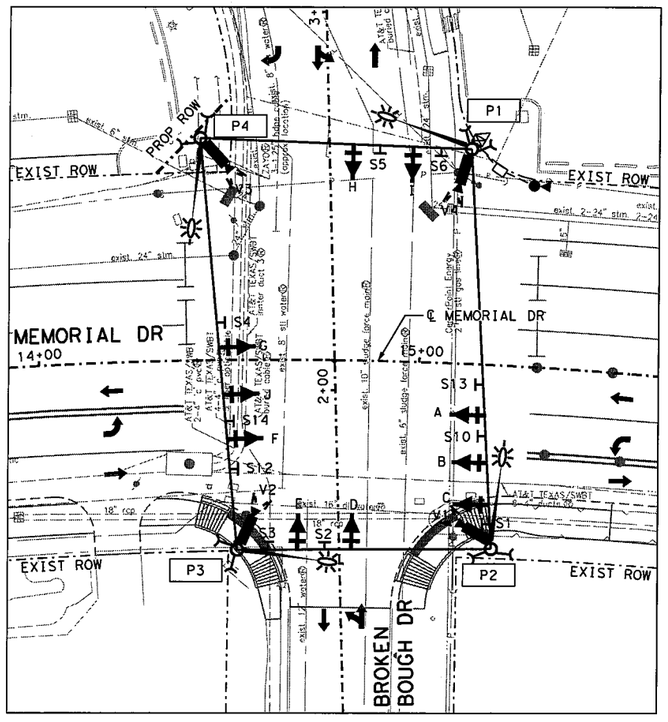


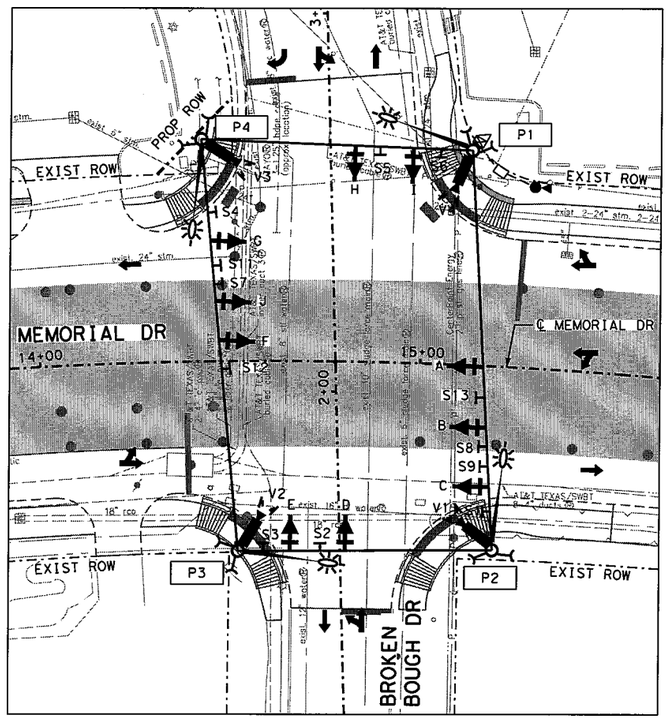
PHASE I



PHASE II STEP1 (STEPS 2 THRU 4)



PHASE III STEP1 (STEPS 2 THRU 3)



PHASE IV STEP1 (STEP 2 THRU 3)

LEGEND

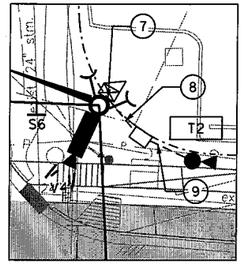
- TEMP POLE-MOUNTED CONTROLLER CABINET
- TEMP TIMBER POLE W/ 2 DOWN GUYS
- TEMP SPAN WIRE
- X — TEMP SIGNAL HEAD
- S# — TEMP SIGN
- TEMP LUMINAIRE
- TEMP ELECTRICAL SERVICE
- V# — TEMP VIVDS CAMERA
- WORK ZONE
- TEMP ASPHALT
- TYPE III BARRICADE
- DRUMS
- TYPE D GROUND BOX W/APRON
- TRAFFIC FLOW

TEMPORARY TRAFFIC SIGNALS

1 WAY, 3 SECTION 12" HORIZONTAL	1 WAY, 3 SECTION 12" HORIZONTAL
R Y G	R Y 6
B, C, D, E, G, H, I, J	A, F

NOTES:

1. THE CONTRACTOR SHALL LOCATE ALL UTILITIES PRIOR TO COMMENCING WORK.
2. THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY CONTRACTOR'S FAILURE TO LOCATE AND PRESERVE THESE UTILITIES, WHETHER UNDERGROUND, ABOVE GROUND, OR OVERHEAD.
3. THE ORIENTATION OF LUMINAIRES ARE FOR VISUAL PURPOSE ONLY. LUMINAIRES ARE TO BE MOUNTED PERPENDICULAR TO THE CENTERLINE OF ROADWAY BEING LIGHTED.
4. REFER TO TCP LAYOUTS FOR ADDITIONAL INFORMATION.
5. THE CONTRACTOR SHALL ALSO MAINTAIN PEDESTRIAN ACCESSIBLITY TO PUSH BUTTONS AND PROPER SIGNAL ALIGNMENT THROUGHOUT TCP STAGES, OTHWERWISE BAG PEDESTRIAN SIGNAL HEADS AND INTALL CROSSWALK CLOSED SIGNS AND PROVIDE PEDESTRIAN DETOUR.
6. CONTRACTOR SHALL NOTIFY THE CITY OF HOUSTON TRAFFIC OPERATIONS FOR ANY SIGNAL TIMING MODIFICATIONS AT LEAST 72 PRIOR TO IMPLEMENTING THE TCP STAGES. THIS NOTE APPLIES TO ALL CONSTRUCTION PHASES AND STAGES.



DETAIL A
N.T.S

PROFESSIONAL ENGINEER
67862

0 20 40

STATE OF TEXAS
ZINA I. SCHWARTZ
85814
LICENSED
PROFESSIONAL ENGINEER

3/4/2020

REV. NO.	DATE	DESCRIPTION	BY

CONSOR
F-12040

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT
TEMPORARY SIGNAL LAYOUT
MEMORIAL DR AT AT W BOUGH LN/ BROKEN BOUGH DR

SHEET 1 OF 2

DGN: CONSOR	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
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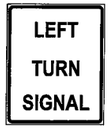
CHK DWG: CONSOR	HOU	HARRIS	0912	72	391	309

TEMPORARY OVERHEAD SIGN

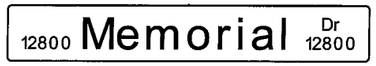
R10-12
30"X36"
S2, S5, S7, S8

R3-6L
30"X36"
S9, S11

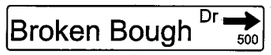


R10-10L
30"X36"
S10, S14

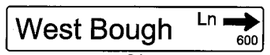
RELOCATED EXISTING STREET NAME SIGNS



S3, S6



S1



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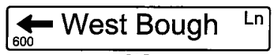

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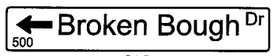

S12

CONDUIT AND CONDUCTOR RUNS														
RUN NO.	CONDUIT		CONDUCTORS				CABLES				VIVDS			
	PVC		POWER		GROUND		SIGNAL		LUMINAIRE					
	2" (SCHD 80)		#6 INSULATED		#6 BARE		#12/7C		TRAY CABLE #12/4C		POWER 3/C - #16		COAXIAL	
	NO.	TRENCH	NO	LENGTH	NO	LENGTH	NO	LENGTH	NO	LENGTH	NO	LENGTH	NO	LENGTH
1							1	50	1	50	1	50	1	50
2							2	58	1	50	1	58	1	58
3							3	73	2	73	2	73	2	73
4							1	67						
5							2	38	1	38	1	38	1	38
6							3	68	1	68	1	69	1	69
7							6	26			4	26	4	26
8	2	5	2	45	2	45			4	45				
9	2	8	2	38	2	38			4	38				
TOTAL (LF)		26		166		166		888		684		465		465
EST. TOTAL		27		174		174		1032		718		488		488

* COIL 25' EXTRA ON POLE FOR DIFFERENT PHASES/STEPS

ELECTRICAL SERVICE DATA												
ELECTRICAL SERVICE ID	SHEET NAME	ELECTRICAL SERVICE DESCRIPTION (SEE ED(5)-14 AND ED(10)-14)	SERVICE CONDUIT SIZE	SERVICE CONDUCTORS NO /SIZE	SAFETY SWITCH AMPS	MAIN CKT BKR POLE/AMP	TWO-POLE CONTACTOR AMPS	PANEL BD/ LOADCENTER AMP RATING	BRANCH CIRCUIT ID	BRANCH CKT BKR POLE/AMPS	BRANCH CIRCUIT AMPS	KVA LOAD
T2	MEMORIAL DR AT W BOUGH LN/BROKEN BOUGH DR (SHEET 1 OF 2)	ELC SRV TY D 120/240 060 (NS)SS(E)TP(O)	1-1/4"	3/#6	N/A	2P/60	N/A	100	SIGNAL	1P/50	40	5.16
							30		LUMINAIRE	2P/20	3	

PHASE I:

1. TEMP SIGNAL MUST BE INSTALLED AND WORKING BEFORE THE EXISTING SIGNAL CAN BE REMOVED.
2. ACTIVATE TEMPORARY SIGNAL FOR THIS PHASE

PHASE II:

1. ADJUST SIGNAL HEADS, SIGNS AND VIVDS AS SHOWN IN THE PLANS, BEFORE THE START OF CONSTRUCTION OF THIS PHASE.
2. SIGNAL TO BE IN OPERATION AS SHOWN THROUGH OUT PHASE II STEPS 1 THRU 3

PHASE III:

1. ADJUST SIGNAL HEADS, SIGNS AND VIVDS AS SHOWN IN THE PLANS, BEFORE THE START OF CONSTRUCTION OF THIS PHASE.
2. SIGNAL TO BE IN OPERATION AS SHOWN THROUGHOUT PHASE III STEPS 1 THRU 3

PHASE IV STEP 1:

1. INSTALL SIGNS S7, S8, S9 BEFORE THE START OF THIS PHASE
2. REMOVE SIGNS S10 AND S14 AT THE START OF THIS PHASE.
3. ADJUST SIGNAL HEADS, SIGNS AND VIVDS AS SHOWN IN THE PLANS, BEFORE THE START OF CONSTRUCTION OF THIS PHASE.
4. SHIFT SIGNAL HEADS F, J AND G IN FRONT OF WB TRAVEL LANES. COVER SIGNAL HEADS A AND F.
5. SIGNAL TO BE IN OPERATION AS SHOWN THROUGHOUT THE END OF PHASE IV STEP 1.

PHASE IV STEP 2:

1. SHIFT SIGNAL HEADS J, G IN FRONT OF WB TRAVEL LANES. INSTALL SIGN S11 AND SHIFT SIGN S7 IN BETWEEN SIGNAL HEADS.
2. SHIFT SIGNAL HEADS B, C IN FRONT OF EB TRAVEL LANES. REMOVE SIGN S9 AND SHIFT SIGN S8 IN BETWEEN SIGNAL HEADS.
3. SIGNAL TO BE IN OPERATION THROUGHOUT PHASE IV STEPS 2 THRU 3.
4. REMOVE TEMPORARY TRAFFIC SIGNAL AT THE END OF PHASE IV CONSTRUCTION AND ACTIVATE PERMANENT SIGNAL.

POLE #	SIGNAL POLE CHART
	DESCRIPTION
P1	PROPOSED 40' TIMBER POLE W/ VIVDS, LUMINAIRE AND CONTROLLER
P2	PROPOSED 40' TIMBER POLE W/ VIVDS AND LUMINAIRE
P3	PROPOSED 40' TIMBER POLE W/ VIVDS AND LUMINAIRE
P4	PROPOSED 40' TIMBER POLE W/ VIVDS AND LUMINAIRE

CAMERA	VEHICLE DETECTION CHART
	SETTING
V1	PRESENCE SB THRU AND SB LEFT
V2	PRESENCE WB THRU AND WB LEFT
V3	PRESENCE NB THRU AND NB LEFT
V4	PRESENCE EB THRU AND EB LEFT

STATE OF TEXAS
ZINA I. SCHWARTZ
85814
LICENSED
PROFESSIONAL ENGINEER

3/4/2020

REV. NO.	DATE	DESCRIPTION	BY

CONSOR
F-12040

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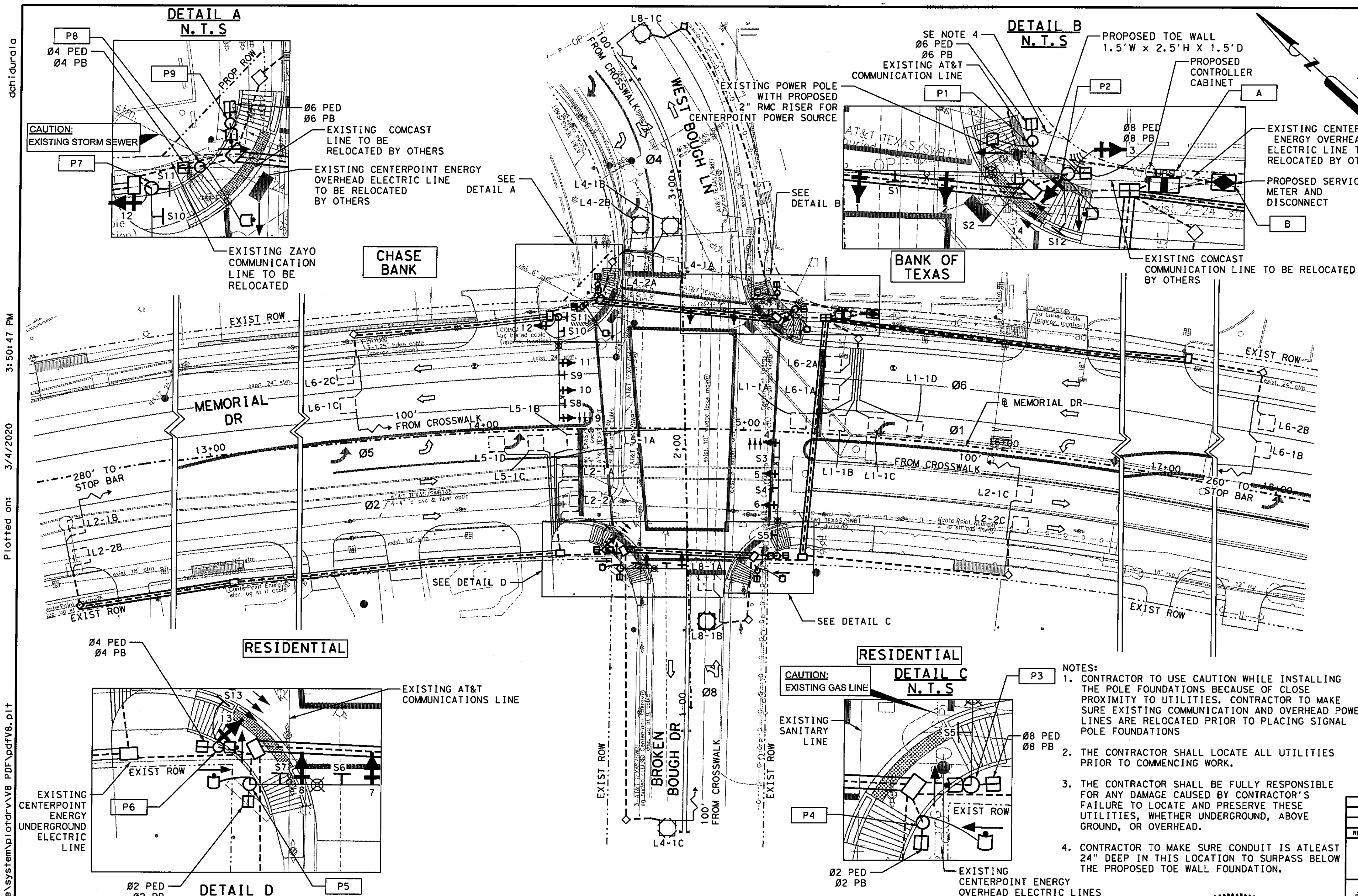
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT
TEMPORARY SIGNAL LAYOUT
MEMORIAL DR AT AT W BOUGH LN/ BROKEN BOUGH DR

SHEET 2 OF 2

DGN: CONSOR	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: CONSOR	6	TEXAS	STP 1802(783)MM			CS
DWG: CONSOR	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: CONSOR	HOU	HARRIS	0912	72	391	310



LEGEND

- PROPOSED SIGNAL HEAD
- PROPOSED SIGNAL POLE W/ MAST ARM
- PROPOSED SIGN
- PROPOSED PED SIGNAL HEAD
- PROPOSED PED PUSH BUTTON
- PROPOSED VIVDS CAMERA
- PROPOSED LUMINAIRE
- PROPOSED CONTROLLER CABINET
- PROPOSED METER
- PROPOSED GROUND BOX TY A W/APRON
- PROPOSED GROUND BOX TY B W/APRON
- PROPOSED GROUND BOX TY C W/APRON
- TRAFFIC FLOW ARROW

POSTED SPEED LIMIT

MEMORIAL DR: 35 MPH
W BOUGH LN/
BROKEN BOUGH DR: 30 MPH

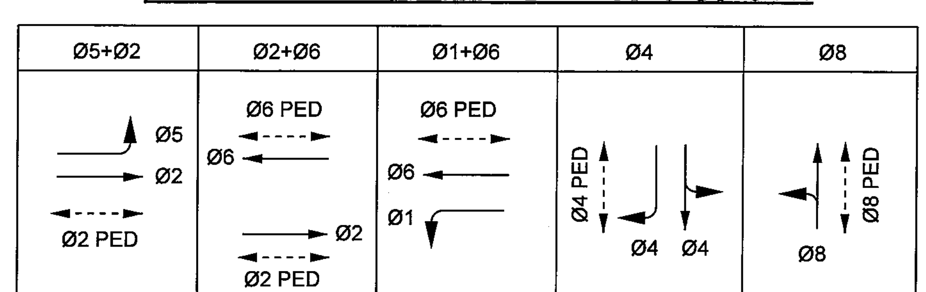
0 20 40

NOTES:
1. CONTRACTOR TO USE CAUTION WHILE INSTALLING THE POLE FOUNDATIONS BECAUSE OF CLOSE PROXIMITY TO UTILITIES. CONTRACTOR TO MAKE SURE EXISTING COMMUNICATION AND OVERHEAD POWER LINES ARE RELOCATED PRIOR TO PLACING SIGNAL POLE FOUNDATIONS
2. THE CONTRACTOR SHALL LOCATE ALL UTILITIES PRIOR TO COMMENCING WORK.
3. THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY CONTRACTOR'S FAILURE TO LOCATE AND PRESERVE THESE UTILITIES, WHETHER UNDERGROUND, ABOVE GROUND, OR OVERHEAD.
4. CONTRACTOR TO MAKE SURE CONDUIT IS ATLEAST 24" DEEP IN THIS LOCATION TO SURPASS BELOW THE PROPOSED TOE WALL FOUNDATION.

S1= R3-6 (30"X36") (Left Turn/Thru)
++S2= STREET NAME "Memorial Dr", BLOCK NUMBER 12900 PER MEMORIAL DIST. SPECIFICATIONS
S3= R10-5L (30"X36") "LEFT ON GREEN ARROW ONLY"
++S4= STREET NAME "<-- West Bough Ln", BLOCK NUMBER 500 PER MEMORIAL DIST. SPECIFICATIONS
**S5= STREET NAME "Broken Bough Dr -->", BLOCK NUMBER 500
S6= R3-8MR (30"X30") "Thru/Left and Right Only"
**S7= STREET NAME "Memorial Dr", BLOCK NUMBER 12800
S8= R10-5L (30"X36") "LEFT TURN ON GREEN ARROW ONLY"
**S9= STREET NAME "<-- Broken Bough Dr", BLOCK NUMBER 500
++S10= STREET NAME "West Bough Ln -->", BLOCK NUMBER 500 PER MEMORIAL DIST. SPECIFICATIONS
S11= R10-7 (24"X30") "DO NOT BLOCK INTERSECTION"
S12= R10-5L (30"X36") "LEFT ON GREEN ARROW ONLY"
S13= R10-5L (30"X36") "LEFT ON GREEN ARROW ONLY"

** STANDARD CITY OF HOUSTON STREET NAME SIGNS
++ MEMORIAL DISTRICT STREET NAME SIGNS DESIGNED PER MEMORIAL DIST. SPECIFICATIONS

PROPOSED TRAFFIC SIGNAL PHASING DIAGRAM



STATE OF TEXAS
ZINA I. SCHWARTZ
85814
LICENSED
PROFESSIONAL ENGINEER

3/4/2020

REV. NO.	DATE	DESCRIPTION	BY

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT
PROPOSED TRAFFIC SIGNAL PLAN
MEMORIAL DR AT AT W BOUGH LN/ BROKEN BOUGH DR

SHEET 1 OF 1

	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
DGN: CONSOR	6	TEXAS	STP 1802(783)MM			CS
CHK: CONSOR	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
DWG: CONSOR	HOU	HARRIS	0912	72	391	311

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POLE SCHEDULE

POLE NUMBER	POLE TYPE	MAST ARM		SIGNALS		LUMINAIRE TYPE	PED PB TYPE/SIGN	REMARKS	LOCATION	STANDARDS
		SIGNAL	LUMIN	MOUNTING	FACE					
P1 P8	PED 15'	--	--	1-PED	1-CDP	--	POLARA NAVIGATOR R10-3E(L)	--	AT APPROX. POLE P1 - STA 15+12.56, 53.42' LT (℄ MEMORIAL DR) POLE P8 - STA 14+37.66, 47.49'LT (℄ MEMORIAL DR)	02893-02 02893-03 02893-07
P2	TYPE 2	40'	15'	2-ASTROBRAC 2-SIDE OF POLE 1-PED	1-H4TL 1-H3 1-V3 1-V3L 1-CDP	106 WATT SYSTEM MAX LED COBRA HEAD LUMINAIRE	POLARA NAVIGATOR R10-3E(R)	WIMAX, PRE-EMPT SENSOR SIGNS: S1 = R3-6 (30"X36") S2 = "MEMORIAL DR" WITH BLOCK NUMBER 12900 DESIGNED PER MEMORIAL DIST. SPECIFICATIONS	AT APPROX. POLE P2 - STA 15+19.21, 47.37' LT(℄ MEMORIAL DR)	02893-02 02893-03 02893-04A 02893-04B 02893-05 02893-09
P5	TYPE 1	25'	15'	2-ASTROBRAC 1-PED	1-H4TL 1-H3 1-CDP	106 WATT SYSTEM MAX LED COBRA HEAD LUMINAIRE	POLARA NAVIGATOR R10-3E(R)	PRE-EMPT SENSOR SIGNS: S6 = R3-8MR (30"X30") S7 = "MEMORIAL DR" WITH BLOCK NUMBER 12800	AT APPROX. POLE P5 - STA 14+53.30, 54.22' RT (℄ MEMORIAL DR)	02893-02 02893-03 02893-07
P3	TYPE 2	45'	15'	3-ASTROBRAC 1-PED	1-H3L 2-H3 1-CDP	106 WATT SYSTEM MAX LED COBRA HEAD LUMINAIRE	POLARA NAVIGATOR R10-3E(L)	PRE-EMPT SENSOR SIGNS: S3 = R10-5 (30" X 36") S4 ="<-- WEST BOUGH LN" WITH BLOCK NUMBER 500 DESIGNED AS PER MEMORIAL DIST.SPECIFICATIONS S5 = "BROKEN BOUGH DR -->" WITH BLOCK NUMBER 500	AT APPROX. POLE P3 - STA 15+13.39 48.20' RT(℄ MEMORIAL DR)	02893-02 02893-03 02893-04A 02893-04B 02893-05 02893-09
P7	TYPE 2	40'	15'	3-ASTROBRAC 1-SIDE OF POLE	1-H3L 2-H3 1-V3	106 WATT SYSTEM MAX LED COBRA HEAD LUMINAIRE	--	PRE-EMPT SENSOR SIGNS: S8= R10-5 (30"X36") S9 = "<-- BROKEN BOUGH DR" WITH BLOCK NUMBER 500 S10 = "WEST BOUGH LN -->" WITH BLOCK NUMBER 500 DESIGNED PER MEMORIAL DIST. SPECIFICATIONS S11 = R10-7 (24"X30")	AT APPROX. POLE P7 - STA 14+29.82, 43.64' LT(℄ MEMORIAL DR)	02893-02 02893-03 02893-04A 02893-04B 02893-05 02893-09
P4 P9	PED 15'	--	--	1-PED	1-CDP	--	POLARA NAVIGATOR R10-3E(R)	--	AT APPROX. POLE P4 - STA 15+05.97 54.26' RT (℄ MEMORIAL DR) POLE P9 - STA 14+43.39, 55.72' LT(℄ MEMORIAL DR)	02893-02 02893-03 02893-07
P6	20'	--	--	1-PED 1-SIDE OF POLE	1-CDP 1-V3L	--	POLARA NAVIGATOR R10-3E(R)	--	AT APPROX. POLE P6 - STA 14+47.24, 46.97' RT(℄ MEMORIAL DR)	02893-02 02893-03 02893-04A 02893-04B 02893-05

TRAFFIC SIGNAL CONTROLLER

CABINET/METER	TYPE	CONTROLLER	AUX. CONTROL	REMARKS	LOCATION (℄ MEMORIAL DR)	CITY OF HOUSTON STANDARDS
B	METERED PEDESTAL SERVICE UL TYPE 3R	METERED SERVICE PEDESTAL WITH 30 AMP & 60 AMP SINGLE POLE CIRCUIT BREAKERS STREET LIGHT PHOTOCELL TO ADD TO SERVICE PANEL	--	PROVIDE METER SOCKET WINDOW 4"H X 6"W	AT APPROX. STA 15+49.37 OFFSET 47.66' LT	02893-14
A UPS	TYPE 340 ITS	2070LX W/1C CPU MODULE W/GPS SERIAL COMMUNICATIONS MODULE & UPS	--	STD SPEC 16730 & 16731, STD SPEC 16732 - UNINTERRUPTED POWER SUPPLY, STD SPEC 16733 - FIELD HARDNEDED ETHERNET SWITCH (MIN. TWO FIBER PORTS AND SIX COPPER PORTS), STD SPEC 16734 -WIMAX, STD SPEC 16758 - GPS SERIAL COMMUNICATION MODULE	AT APPROX. STA 15+37.95 OFFSET 47.86' LT	02893-10C

PREFORMED LOOP LOCATIONS

ITEM BY DIRECTION	STATION ℄ MEMORIAL DR	OFFSET
SOUTHBOUND (THRU/LEFT LANE) PHASE 4 CALL (6'X6') LOOP		
L4-1A	STA 14+71.35	CENTERED IN LANE
L4-2A	STA 14+71.35	CENTERED IN LANE
NORTHBOUND (THRU/LEFT LANE) PHASE 8 CALL (6'X6') LOOP		
L8-1A	STA 14+86.26	CENTERED IN LANE
EASTBOUND (LEFT LANE) PHASE 5 PRESENCE LOOPS		
L5-1A (6'X6')	STA 14+50.43	CENTERED IN LANE
L5-1B (6'X6')	STA 14+35.24	CENTERED IN LANE
L5-1C (6'X6')	STA 14+20.24	CENTERED IN LANE
L5-1D (6'X6')	STA 14+05.18	CENTERED IN LANE
EASTBOUND (THRU LANE) PHASE 2 CALL (6'X6') LOOP		
L2-1A	STA 14+33.63	CENTERED IN LANE
L2-2A	STA 14+33.63	CENTERED IN LANE
PHASE 2 PULSE LOOPS		
L2-1B LEADING EDGE (6'X6') LOOP	STA 11+57.48	280' TO STOP BAR
L2-2B LEADING EDGE (6'X6') LOOP	STA 11+57.48	280' TO STOP BAR
PHASE 2 DOWNSTREAM LOOPS		
L2-1C	STA 16+09.07	100' FROM CROSSWALK
L2-2C	STA 16+09.07	100' FROM CROSSWALK
WESTBOUND (THRU LANE) PHASE 6 CALL (6'X6') LOOP		
L6-1A	STA 15+33.66	CENTERED IN LANE
L6-2A	STA 15+33.66	CENTERED IN LANE
PHASE 6 PULSE LOOPS		
L6-1B LEADING EDGE (6'X6') LOOP	STA 17+92.70	260' TO STOP BAR
L6-2B LEADING EDGE (6'X6') LOOP	STA 17+92.70	260' TO STOP BAR
PHASE 6 DOWNSTREAM LOOPS		
L6-1C	STA 13+47.95	100' FROM CROSSWALK
L6-2C	STA 13+47.95	100' FROM CROSSWALK
WESTBOUND (LEFT TURN LANE) PHASE 1 PRESENCE LOOPS		
L1-1A (6'x6')	STA 15+21.06	CENTERED IN LANE
L1-1B (6'x6')	STA 15+36.04	CENTERED IN LANE
L1-1C (6'x6')	STA 15+50.77	CENTERED IN LANE
L1-1D (6'x6')	STA 15+65.87	CENTERED IN LANE

NOTES:

1. REFER TO PAVEMENT MARKING PLANS FOR STOP BAR LOCATIONS.
2. INSTALL LUMINAIRES PARALLEL TO MAST ARMS.

PUBLIC WORKS & ENGINEERING ACCEPTED 67862

STATE OF TEXAS ZINA I. SCHWARTZ 85814 LICENSED PROFESSIONAL ENGINEER

3/4/2020

SAWCUT LOOP LOCATIONS

ITEM BY DIRECTION	STATION ℄ MEMORIAL DR	OFFSET
SOUTHBOUND (THRU/LEFT LANE) PHASE 4 CALL (6'X6') LOOP		
L4-1B	STA 14+59.85	CENTERED IN LANE
L4-2B	STA 14+59.85	CENTERED IN LANE
PHASE 4 DOWNSTREAM (6'X6') LOOP		
L4-1C	STA 14+72.06	CENTERED IN LANE
NORTHBOUND (THRU/LEFT LANE) PHASE 8 CALL (6'X6') LOOP		
L8-1B	STA 14+86.26	CENTERED IN LANE
PHASE 8 DOWNSTREAM (6'X6') LOOP		
L8-1C	STA 14+61.24	CENTERED IN LANE

SPECIAL NOTE:

1. ALL NON HOUSTON PUBLIC WORKS STANDARD ITEMS SUCH AS THE CUSTOM SIGNS SHAL BE PROVIDED AND MAINTAINED BY THE MEMORIAL MANAGEMENT DISTRICT. REFER TO SHEETS "MISCELLANEOUS DETAILS MEMORIAL DISTRICT STREET NAME STANDARDS" FOR MORE DETAILS. CONTACT PAT WALTERS (PH - 713-984-8737) AT MEMORIAL MANAGEMENT DISTRICT FOR MORE INFORMATION ON MEMORIAL DISTRICT STREET NAME SIGNS.

REV. NO.	DATE	DESCRIPTION	BY

CONSOR F-12040

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

TRAFFIC SIGNAL POLE SCHEDULE MEMORIAL DR AT AT W BOUGH LN/ BROKEN BOUGH DR

SHEET 1 OF 1

DGN: CONSOR	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: CONSOR	6	TEXAS	STP 1802(783)MM			CS
DWG: CONSOR	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: CONSOR	HOU	HARRIS	0912	72	391	312

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HIGH VOLTAGE CIRCUIT

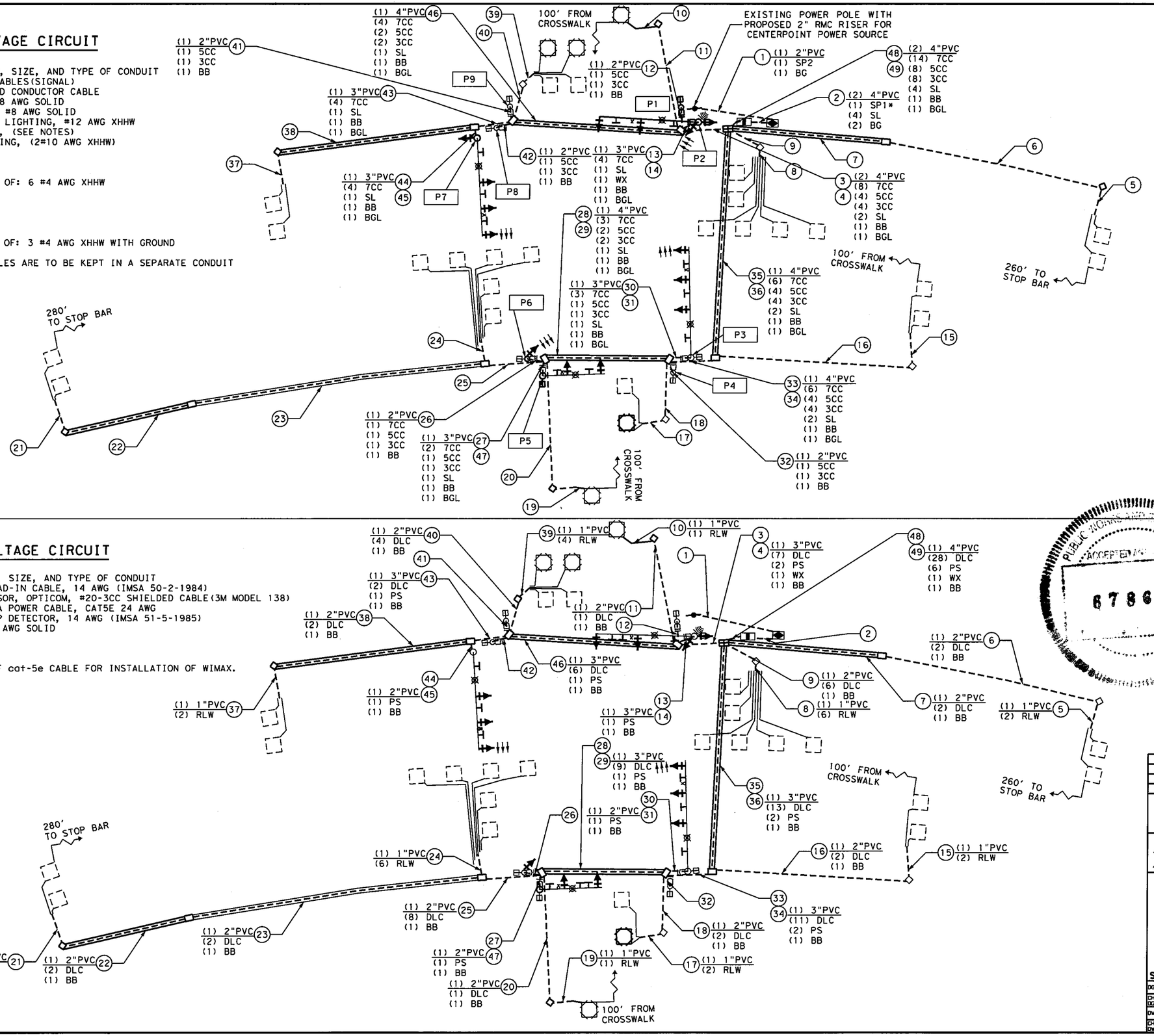
(X)Y"C = QUANTITY, SIZE, AND TYPE OF CONDUIT
(X) = NUMBER OF CABLES(SIGNAL)
CC = #14 AWG SOLID CONDUCTOR CABLE
BB = BARE BOND, #8 AWG SOLID
BG = BARE GROUND, #8 AWG SOLID
BGL = BARE GROUND LIGHTING, #12 AWG XHHW
SP = SIGNAL POWER, (SEE NOTES)
SL = STREET LIGHTING, (2#10 AWG XHHW)

NOTES:

SP1 SHALL CONSIST OF: 6 #4 AWG XHHW
2 - WHITE
1 - BLACK
1 - RED
2 - GREEN

SP2 SHALL CONSIST OF: 3 #4 AWG XHHW WITH GROUND

*SIGNAL POWER CABLES ARE TO BE KEPT IN A SEPARATE CONDUIT

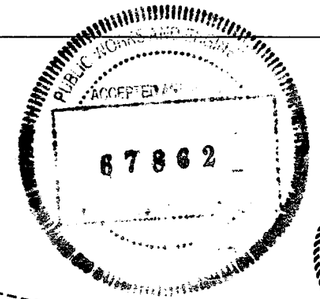


LOW VOLTAGE CIRCUIT

(X)Y"C = QUANTITY, SIZE, AND TYPE OF CONDUIT
DLC = DETECTOR LEAD-IN CABLE, 14 AWG (IMSA 50-2-1984)
PS = PRE-EMPT SENSOR, OPTICOM, #20-3CC SHIELDED CABLE(3M MODEL 138)
WX = WIMAX ANTENNA POWER CABLE, CAT5E 24 AWG
RLW = ROADWAY LOOP DETECTOR, 14 AWG (IMSA 51-5-1985)
BB = BARE BOND #8 AWG SOLID

NOTE:

1. PROVIDE 150' OF cat-5e CABLE FOR INSTALLATION OF WIMAX.



3/4/2020

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

TRAFFIC SIGNAL CABLE SCHEMATIC MEMORIAL DR AT AT W BOUGH LN/ BROKEN BOUGH DR

SHEET 1 OF 1

DGN: CONSOR	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: CONSOR	6	TEXAS	STP 1802(783)MM			CS
DWG: CONSOR	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: CONSOR	HOU	HARRIS	0912	72	391	313

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GENERAL NOTES FOR ALL ELECTRICAL WORK

1. The location of all conduits, junction boxes, ground boxes, and electrical services is diagrammatic and may be shifted to accommodate field conditions.

2. Provide new and unused materials. Ensure that all materials and installations comply with the applicable articles of the National Electrical Code (NEC), TxDOT standards and specifications, National Electrical Manufacturers Association (NEMA), and are listed by Underwriters Laboratories (UL) or a Nationally Recognized Testing Lab (NRTL). NRTLs such as Canadian Standard Association (CSA), Intertek Testing Services NA Inc., or FM Approvals LLC can be considered equivalent to UL. Where reference is made to NEMA listed devices, International Electrotechnical Commission (IEC) listed devices will not be considered an acceptable equal to a NEMA listed device. Acceptable devices may have both a NEMA and IEC listing. Faulty fabrication or poor workmanship in any material, equipment, or installation is justification for rejection. Replace or reinstall rejected material or equipment at no additional cost to the Department.

3. Miscellaneous nuts, bolts and hardware, except for high strength bolts, may be stainless steel when plans specify galvanized, provided the bolt size is ½ in. or less in diameter.

4. Provide the following test equipment as required by the Engineer to confirm compliance with the contract and the NEC: voltmeter, ammeter, megohm meter (1000 volt DC), ground resistance tester, torque wrenches, and torque screwdrivers. Ensure all equipment has been properly calibrated within the last year. Provide calibration certification to the Engineer upon request. Operate test equipment during inspection as requested by the Engineer.

5. Install grounding as shown on the plans and in accordance with the NEC. Ensure all metallic conduits; metal poles; luminaires; and metal enclosures are bonded to the equipment grounding conductor. Provide stranded bare copper or green insulated grounding conductors. Ground rods, connectors, and bonding jumpers are subsidiary to the various bid items.

6. When required by the Engineer, notify the Department in writing of materials from the Material Producers List (MPL) intended for use on each project. Prequalified materials are listed on the MPL on TxDOT's website under "Roadway Illumination and Electrical Supplies." No substitutions will be allowed for materials on this list.

CONDUIT

A. MATERIALS

1. Provide conduit, junction boxes, fittings, and hardware as per TxDOT Departmental Material Specification (DMS) 11030 "Conduit" and Item 618 "Conduit" of TxDOT's "Standard Specifications For Construction And Maintenance Of Highways, Streets, And Bridges," latest edition. Provide conduits listed under Item 618 on the MPL under "Roadway Illumination and Electrical Supplies." Provide conduit types according to the descriptive code or as shown on the plans. Do not substitute other types of conduits for those shown. Provide liquidtight flexible metal conduit (LFMC) when flexible conduit is called for on galvanized steel rigid metallic conduit (RMC) systems. Provide liquidtight flexible nonmetallic conduit (LFNC) when flexible conduit is called for on polyvinyl chloride (PVC) systems.

2. Provide galvanized steel RMC for all exposed conduits, unless otherwise shown on the plans. Properly bond all metal conduits.

3. Unless otherwise shown on the plans, provide junction boxes with a minimum size as shown in the following table, which applies to the greatest number of conductors entering the box through one conduit with no more than four conduits per box. When a mixture of conductor sizes is present, count the conductors as if all are of the larger size. For situations not applicable to the table, size junction boxes in accordance with NEC.

AWG	3 CONDUCTORS	5 CONDUCTORS	7 CONDUCTORS
#1	10" x 10" x 4"	12" x 12" x 4"	16" x 16" x 4"
#2	8" x 8" x 4"	10" x 10" x 4"	12" x 12" x 4"
#4	8" x 8" x 4"	10" x 10" x 4"	10" x 10" x 4"
#6	8" x 8" x 4"	8" x 8" x 4"	10" x 10" x 4"
#8	8" x 8" x 4"	8" x 8" x 4"	8" x 8" x 4"

4. Junction boxes with an internal volume of less than 100 cu. in. and supported by entering raceways must have threaded entries or hubs identified for the intended purpose and supported by connection of two or more rigid metal conduits. Secure conduit within 3 ft. of the enclosure or within 18 in. of the enclosure if all conduit entries are on the same side. Mechanically secure all junction boxes with an internal volume greater than 100 cu. inches.

5. Provide hot dipped galvanized cast iron or sand cast aluminum outlet boxes for junction boxes containing only 10 AWG or 12 AWG conductors. Do not use die cast aluminum boxes. Size outlet boxes according to the NEC.

6. Do not use intermediate metal conduit (IMC) or electrical metallic tubing (EMT) unless specifically required by the plan sheets. When EMT is called for, provide junction boxes made from galvanized steel sheeting, listed and approved for outdoor use, unless otherwise noted on the plans. Size all galvanized steel junction boxes in accordance with the NEC. Provide junction boxes for IMC conduit systems that meet the same requirements for junction boxes used with RMC systems.

7. Provide PVC junction boxes intended for outdoor use on PVC conduit systems, unless otherwise noted on the plans.

8. Provide PVC elbows in PVC conduit systems, unless otherwise shown on the plans. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the PVC conduit system. When galvanized steel RMC elbows are specifically called for in the plans and any portion of the RMC elbow is buried less than 18 in., ground the RMC elbow by means of a grounding bushing on a rigid metal extension. Grounding of the rigid metal elbow is not required if the entire RMC elbow is encased in a minimum of 2 in. of concrete. PVC extensions are allowed on these concrete encased rigid metal elbows. RMC or PVC elbows are subsidiary to various bid items.

9. When required, provide High-Density Polyethylene (HDPE) conduit with factory installed internal conductors according to Item 622 "Duct Cable." At the Contractor's request and with approval by the Engineer, substitute HDPE conduit with no conductors for bored schedule 40 or schedule 80 PVC conduit bid under Item 618. Ensure bored HDPE substituted for PVC is schedule 40 and of the same size PVC called for in the plans. Ensure the substituted HDPE meets the requirements of Item 622, except that the conduit is supplied without factory-installed conductors. Make the transition of the HDPE conduit to PVC (or RMC elbow when required) at the bore pit. Provide conduit of the size and schedule as shown on the plans. Do not extend substituted conduit into ground boxes or foundations. Provide PVC or galvanized steel RMC elbows as called for at all ground boxes and foundations.

10. Use two-hole straps when supporting 2 in. and larger conduits. On electrical service poles, properly sized stainless steel or hot dipped galvanized one-hole standoff straps are allowed on the service riser conduit.

B. CONSTRUCTION METHODS

1. Provide and install expansion joint conduit fittings on all structure-mounted conduits at the structure's expansion joints to allow for movement of the conduit. In addition, provide and install expansion joint fittings on all continuous runs of galvanized steel RMC conduit externally exposed on structures such as bridges at maximum intervals of 150 ft. When requested by the project Engineer, supply manufacturer's specification sheet for expansion joint conduit fittings. Repair or replace expansion joint fittings that do not allow for movement at no additional cost to the Department. Provide the method of determining the amount of expansion to the Engineer upon request. Do not use LFMC or LFNC as a substitute for the required expansion conduit fittings.

2. Space all conduit supports at maximum intervals of 5 ft. Install conduit spacers when attaching metal conduit to surface of concrete structures. See "Conduit Mounting Options" on ED(2). Install conduit support within 3 ft. of all enclosures and conduit terminations.

3. Do not attach conduit supports directly to pre-stressed concrete beams except as shown specifically in the plans or as approved by the Engineer.

4. Unless otherwise shown on the plans, jack or bore conduit placed beneath existing roadways, driveways, sidewalks, or after the base or surfacing operation has begun. Backfill and compact the bore pits below the conduit per Item 476 "Jacking, Boring, or Tunneling Pipe or Box" prior to installing conduit or duct cable to prevent bending of the connections.

5. When placing conduit in the sub-grade of new roadways, backfill all trenches with excavated material unless otherwise noted on the plans. When placing conduit in the sub-base of new roadways, backfill all trenches with cement-stabilized base as per requirements of Items 110 "Excavation", 400 "Excavation and Backfill for Structures", 401 "Flowable Backfill", 402 "Trench Excavation Protection", and 403 "Temporary Special Shoring."

6. Provide and place warning tape approximately 10 in. above all trenched conduit as per Item 618.

7. During construction, temporarily cap or plug open ends of all conduit and raceways immediately after installation to prevent entry of dirt, debris and animals. Temporary caps constructed of durable duct tape are allowed. Tightly fix the tape to the conduit opening. Clean out the conduit and prove it clear in accordance with Item 618 prior to installing any conductors.

8. Ensure conduit entry into the top of any enclosure is waterproof by installing conduit sealing hubs or using boxes with threaded bosses. This includes surface mounted safety switches, meter cans, service enclosures, auxiliary enclosures and junction boxes. Grounding bushings on water tight sealing hubs are not required.

9. Fit the ends of all PVC conduit terminations with bushings or bell end fittings. Provide and install a grounding type bushing on all metal conduit terminations.

10. Install a bonding jumper from each grounding bushing to the nearest ground rod, grounding lug, or equipment grounding conductor. Ensure all bonding jumpers are the same size as the equipment grounding conductor. Bonding of conduit used as a casing under roadways for duct cable is not required, if the duct extends the full length through the casing.

11. At all electrical services, install a 6 AWG solid copper grounding electrode conductor.

12. Place conduits entering ground boxes so that the conduit openings are between 3 in. and 6 in. from the bottom of the box. See the ground box detail on sheet ED(4).

13. Seal ends of all conduits with duct seal, expandable foam, or by other methods approved by the Engineer. Seal conduit immediately after completion of conductor installation and pull tests. Do not use duct tape as a permanent conduit sealant. Do not use silicone caulk as a conduit sealant.

14. File smooth the cut ends of all mounting strut and conduit. Before installing, paint the field cut ends of all mounting strut and RMC (threaded or non-threaded) with zinc rich paint (94% or more zinc content) to alleviate overspray. Use zinc rich paint to touch up galvanized material as allowed under Item 445 "Galvanizing." Do not paint non-galvanized material with a zinc rich paint as an alternative for materials required to be galvanized.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS CONDUITS & NOTES

ED(1)-14

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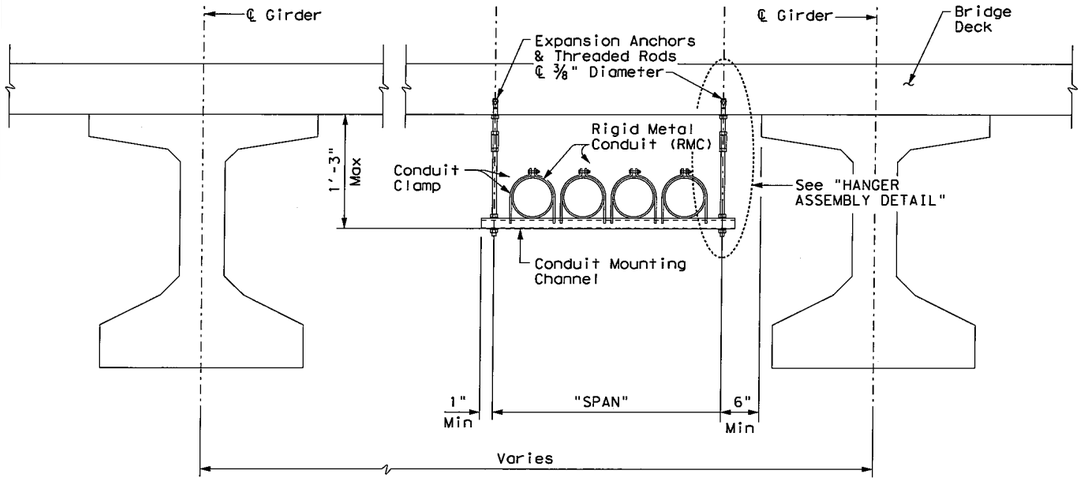
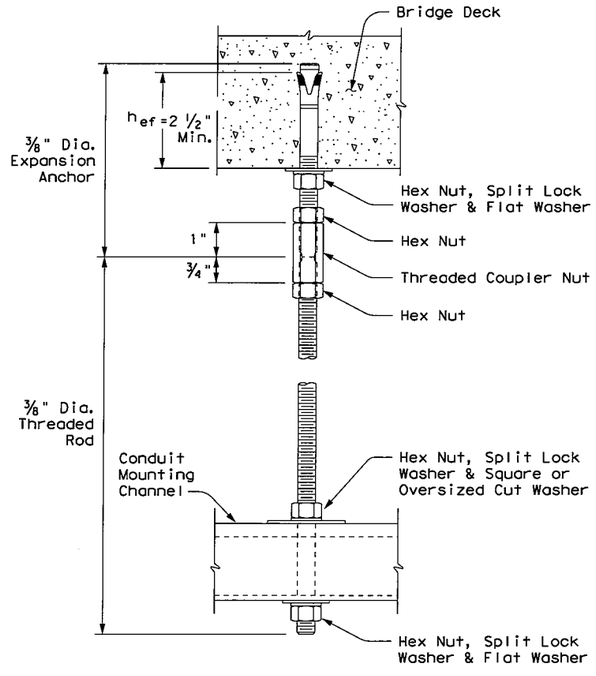
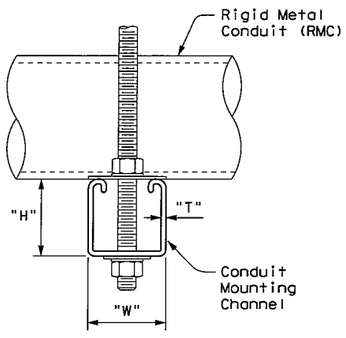


CONDUIT HANGING DETAIL

CONDUIT MOUNTING CHANNEL		
"SPAN"	"W" x "H"	"T"
less than 2'	1 5/8" x 1 3/8"	12 Ga.
2'-0" to 2'-6"	1 5/8" x 1 5/8"	12 Ga.
>2'-6" to 3'-0"	1 5/8" x 2 7/16"	12 Ga.

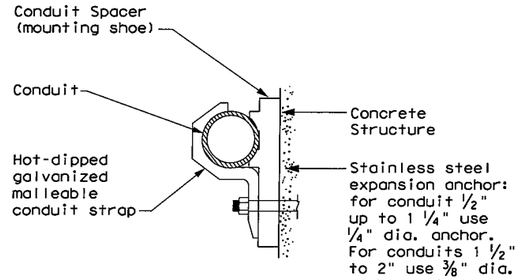
Channels with round or short slotted hole patterns are allowed, if the load carrying capacity is not reduced by more than 15%.

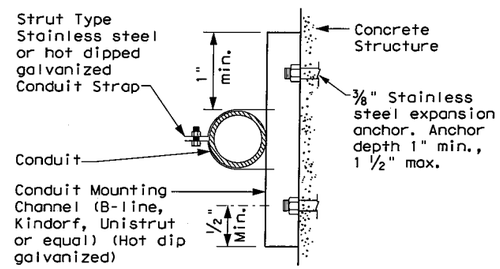




HANGER ASSEMBLY DETAIL

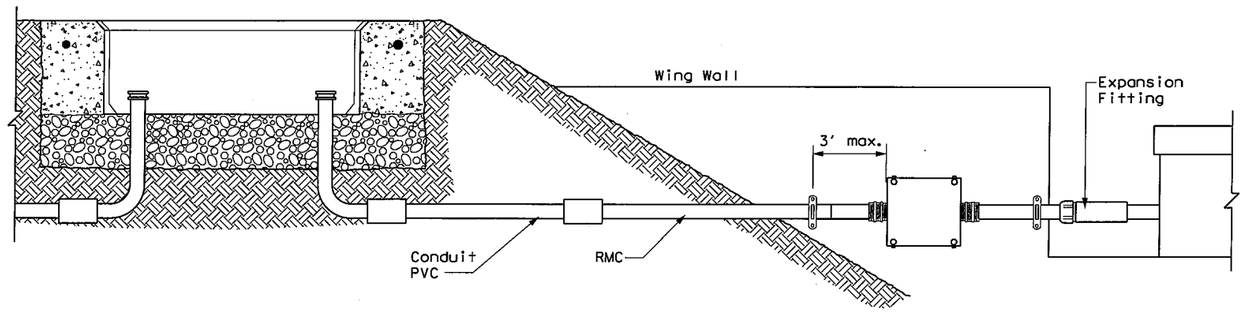
ELECTRIC CONDUIT TO BRIDGE DECK ATTACHMENT





CONDUIT MOUNTING OPTIONS

Attachment to concrete surfaces
See ED(1)B.2



TYPICAL CONDUIT ENTRY TO BRIDGE STRUCTURE DETAIL

EXPANSION ANCHOR NOTES FOR BRIDGE DECK ATTACHMENT

1. Use torque controlled mechanical expansion anchors that are approved for use in cracked concrete by the International Code Council, Evaluation Service (ICC-ES). The chosen anchor product shall have a designated ICC-ES Evaluation Report number, and its approval status shall be maintained on the ICC-ES website under Division 031600 for Concrete Anchors.
2. Unless otherwise approved by the Engineer: do not use adhesive anchors; do not use expansion anchors that are not included in the ICC-ES approval list; and do not use expansion anchors that are only approved for use in uncracked concrete.
3. Use anchors manufactured with stainless steel expansion wedges. Anchors manufactured with carbon steel expansion wedges are not allowed. Anchor bodies can be either zinc-plated carbon steel or stainless steel. For application in marine environment, both the anchor body and expansion wedge shall be stainless steel.
4. Install anchors as shown on the plans and in accordance with the anchor manufacturer's published installation instructions. Arrange a field demonstration test to evaluate the procedures and tools. The test shall be witnessed and approved by the Engineer prior to furnishing anchors on the structure.
5. Prior to hole drilling, use rebar locator to ensure clearing of existing deck strands or reinforcement. Install anchors to ensure a minimum effective embedment depth, (h_{ef}), as shown. Increase (h_{ef})as needed to ensure sufficient thread length for proper torqueing and tightening of anchors.
6. Use anchors of minimum 1600 Lbs tensile capacity (minimum of steel, concrete breakout, and concrete pullout strengths as determined by ACI 318 Appendix D) at the required minimum embedment depth (h_{ef}). No lateral loads shall be introduced after conduit installation.

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Traffic Operations Division Standard

ELECTRICAL DETAILS CONDUIT SUPPORTS

ED(2)-14

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ELECTRICAL CONDUCTORS

A. MATERIAL INFORMATION

1. Provide Type XHHW insulated conductors in accordance with Departmental Material Specification (DMS)11040 "Conductors" and Item 620 "Electrical Conductors." Provide conductors as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies" Item 620. Color code insulated conductors in conformance with the NEC. Identify grounded (neutral) conductors with white insulation. Identify grounding conductors (ground wires) with green insulation or bare conductors. Identify ungrounded (hot) conductors with any color insulation except green, white, or gray. Keep color scheme consistent throughout the wiring system. Identify conductors 6 American Wire Gauge (AWG) and smaller by continuous color jacket. Identify electrical conductors 4 AWG and larger by continuous color jacket or by colored tape. When identifying conductors with colored tape, mark at least 6 in. of the conductor's insulation with half laps of tape.

2. Provide a solid copper 6 AWG grounding electrode conductor to bond the electrical service equipment to the concrete encased grounding electrode or the ground rod at the service location. Connect the grounding electrode conductor to the ground rod with a UL listed connector in accordance with DMS 11040. Connect the grounding electrode conductor to the concrete encased grounding electrode as shown in the plans.

3. Where two or more circuits are present in one conduit or enclosure, permanently identify the conductors of each branch circuit by attaching a non-metallic tag around both circuit conductors at each accessible location. Provide tags with two straps, large enough to indicate circuit number, letter, or other identification as shown in the plans. Print circuit identification on the tag with a permanent marker.

4. Use listed compression or screw type pressure connectors, terminal blocks, or split bolt connectors for splicing as specified in DMS 11040. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Provide UL listed gel-filled insulating splice covers. Splicing materials, insulating materials, breakaway disconnects, splice covers, and fuse holders are subsidiary to various bid items.

B. CONSTRUCTION METHODS

1. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the conduit system. After installing conductors in conduit, perform conductor pull test. If a conductor cannot be freely pulled, make any needed alterations or repairs at no additional cost to the department. Perform insulation resistance tests in accordance with Item 620. Coordinate with the Engineer to witness the tests.

2. Leave 2 ft. minimum, 3 ft. maximum length for each conductor up to the splice in ground boxes. Leave 3 ft. minimum, 4 ft. maximum length of conductor in ground boxes when pulled through with no splice. Leave 1 ft. minimum, 1.5 ft. maximum length of conductor at enclosures, weatherheads and pole bases.

3. Make splices only in junction boxes, ground boxes, pole bases, or electrical enclosures and use only listed compression or screw type pressure connectors, terminal blocks, or split bolt connectors. Insulate splices with heavy wall heat shrink tubing or gel-filled insulating splice covers to provide a watertight splice. Overlap conductor insulation with heat shrink tubing a minimum of 2 in. past both sides of the splice. Where heat shrink tubing may not shrink sufficiently to provide a watertight seal around the individual conductors, prior to heating the tubing, increase the diameter of the conductor insulation using hot melt adhesive tape to provide a watertight seal between the individual conductors and the heat shrink tubing. Ensure the tape extends past the heat shrink tubing. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Heat shrink tubing that appears to have been burned, or overheated, is considered defective and must be replaced.

4. Size and install gel-filled insulating splice covers according to manufacturer's specifications when used in place of heat shrink tubing.

5. Wire nuts with factory applied waterproof sealant may be used for 8 AWG or smaller conductors in above ground junction boxes, but not in pole bases or ground boxes. Install wire nuts in an upright position to prevent the accumulation of water.

6. Support conductors in illumination poles with a J-hook at the top of the pole.

7. When terminating conductors, remove the insulation and jacketing material without nicking the individual strands of the conductor. Conductors with nicked individual conductor strands or removed strands will be considered damaged.

8. Replace conductors and cables that are damaged beyond repair or that fail an insulation resistance test at no additional cost to the department.

9. Do not repair damaged conductors with duct tape, electrical tape, or wire nuts. Use only approved splicing methods.

10. Do not terminate more than one conductor under a single connector, unless the connector is rated for multiple conductors. Do not exceed the pressure connector's listing for maximum number and size of conductors allowed.

11. Install breakaway connectors on conductors bid under Item 620 whenever those conductors pass through a breakaway support device. Follow manufacturer's instructions when terminating conductors to breakaway connectors. Properly torque threaded connections. Proper terminations are critical to the safe operation of breakaway devices. Trim waterproofing boots on breakaway connectors to fit snugly around the conductor to ensure waterproof connection. Only one conductor may enter a single opening in a boot. Provide waterproof boots with the correct number of openings. Leave unused openings factory sealed. Use prequalified breakaway connectors as shown on the MPL.

12. Provide and install a separate stranded equipment grounding conductor (EGC) in all conduits that contain circuit wiring of 50 volts or more. Unless shown elsewhere, size the EGC to be the same size as the largest current carrying conductor contained in the conduit. Ensure all EGCs are bonded together at every accessible location. For traffic signal installations, provide a minimum size 8 AWG EGC. The EGC is paid for under Item 620.

C. TEMPORARY WIRING

1. Install temporary conductors and electrical equipment in accordance with the NEC article "Temporary Installations" and Department standard sheets.

2. Provide a ground fault circuit interrupter (GFCI) for power outlets for portable electrical equipment, power tools, ice machines, ice storage bins and refrigerators located outdoors at grade. GFCI may be any one of the following: molded cord and plug set, receptacle, or circuit breaker type.

3. Use listed wire nuts with factory applied sealant for temporary wiring where approved.

4. Enclose conductor splices within a listed enclosure or ground box, or ensure the splices are more than 10 ft. above grade vertically and more than 5 ft. horizontally from any metal structure. Where installing temporary conductors in areas subject to vehicle traffic or mobile construction equipment, ensure the vertical clearance to ground is at least 18 ft. when measured at the lowest point. Ground messenger wires that support power conductors in conformance with the NEC.

5. Protect and when necessary repair any existing electrical conduits uncovered during the construction process in a timely manner and in conformance with the NEC.

GROUND RODS & GROUNDING ELECTRODES

A. MATERIAL INFORMATION

1. Provide and install a grounding electrode at electrical services. Provide ground rods according to DMS 11040 and the plans. Larger diameter or longer length rods may be called for in some specific locations, see the individual plans sheets. Concrete encased grounding electrodes may be called for in specific locations including electrical service, see individual plan sheets.

B. CONSTRUCTION METHODS

1. Furnish auxiliary ground rods for lightning protection and install in soil, concrete, or both, as called for in the plans. For ground rods installed in concrete, ensure the connection of the conductor to the ground rod is readily accessible for inspection or repairs. For ground rods installed in soil, ensure that the upper end is between 2 to 4 in. below finished grade.

2. Do not place ground rods in the same drilled hole as a timber pole.

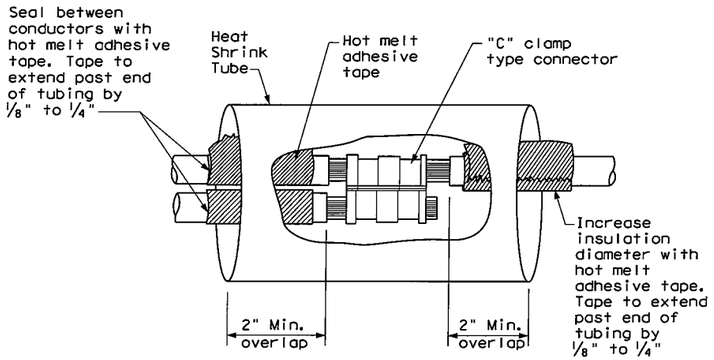
3. Install ground rods so the imprinted part number is at the upper end of the rod.

4. Remove all non-conductive coatings such as concrete splatter from the rod at the clamp location.

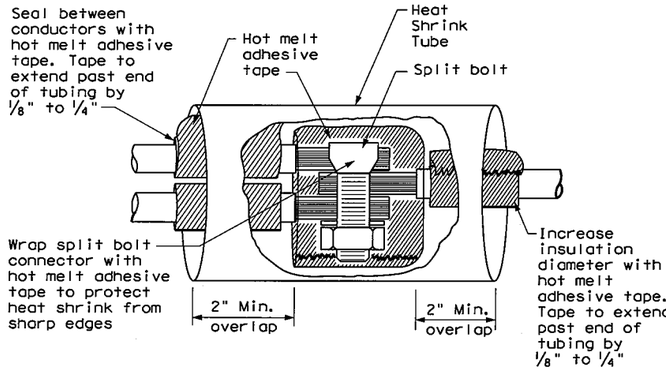
5. Route all conductors as short and straight as possible for connection to lightning protection ground rods. When a bend is required, ensure a minimum radius bend of four inches for these conductors.

6. Unless otherwise called for in the plans, protect grounding electrode conductors with non-metallic conduit. When protecting grounding electrode conductors with metal conduit, provide and install a grounding type bushing and properly sized bonding jumper on each end of the metal conduit.

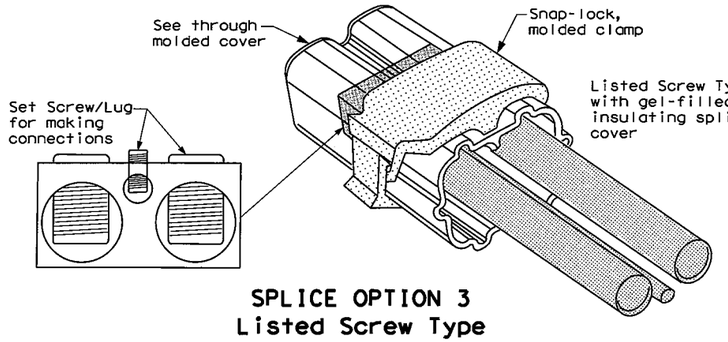
7. Written authorization is required before installing a ground rod in a horizontal trench for rocky soil or a solid rock bottom.



SPLICE OPTION 1
Compression Type



SPLICE OPTION 2
Split Bolt Type



SPLICE OPTION 3
Listed Screw Type

67862

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS CONDUCTORS

ED(3)-14

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ELECTRICAL SERVICES NOTES

1. Provide new materials. Ensure installation and materials comply with the applicable provisions of the National Electrical Code (NEC) and National Electrical Manufacturers Association (NEMA) standards. Ensure material is Underwriters Laboratories (UL) listed. Provide and install electrical service conduits, conductors, disconnects, contactors, circuit breaker panels, and branch circuit breakers as shown on the Electrical Service Data chart in the plans. Faulty fabrication or poor workmanship in material, equipment, or installation is justification for rejection. Where manufacturers provide warranties and guarantees as a customary trade practice, furnish these to the State.
2. Provide electrical services in accordance with Electrical Details standard sheets, Departmental Material Specification (DMS) 11080 "Electrical Services," DMS 11081 "Electrical Services-Type A," DMS 11082 "Electrical Services-Type C," DMS 11083 "Electrical Services-Type D," DMS 11084 "Electrical Services-Type T," DMS 11085 "Electrical Services-Pedestal (PS)", and Item 628 "Electrical Services" of the Standard Specifications. Provide electrical service types A, C, and D, as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies," Item 628. Provide other service types as detailed on the plans.
3. Provide all work, materials, services, and any incidentals needed to install a complete electrical service as specified in the plans.
4. Coordinate with the Engineer and the utility provider for metering and compliance with utility requirements. Primary line extensions, connection charges, meter charges, and other charges by the utility company to provide power to the location are paid for in accordance with Item 628. Get approval for the costs associated with these charges prior to engaging the utility company to do the work. Consult with the utility provider to determine costs and requirements, and coordinate the work as approved.
5. The enclosure manufacturer will provide Master Lock Type 2 with brass tumblers keyed #2195 for all custom electrical enclosures. Installing Contractor is to provide Master Lock #2195 Type 2 with brass tumblers for "off the shelf" enclosures. Master Lock #2195 keys and locks become property of the State. Unless otherwise approved, do not energize electrical service equipment until locks are installed.
6. Enclosures with external disconnects that de-energize all equipment inside the enclosure do not need a dead front trim. Protect incoming line terminations from incidental contact as required by the NEC.
7. When galvanized is specified for nuts, screws, bolts or miscellaneous hardware, stainless steel may be used.
8. Provide wiring and electrical components rated for 75°C. Provide red, black, and white colored XHHW service entrance conductors of minimum size 6 American Wire Gauge (AWG). Identify size 6 AWG conductors by continuous color jacket. Identify electrical conductors sized 4 AWG and larger by continuous color jacket or by colored tape. Mark at least 6 inches of the conductor's insulation with half laps of colored tape, when identifying conductors. Ensure each service entrance conductor exits through a separately bushed non-metallic opening in the weatherhead. The lengths of the conductors outside the weatherhead are to be 12 inches minimum, 18 inches maximum, or as required by utility.
9. All electrical service conduit and conductors attached to the electrical service including the riser or the elbow below ground are subsidiary to the electrical service. For an underground utility feed, all service conduit and conductors after the elbow, including service conduit and conductors for the utility pole riser when furnished by the Contractor, will be paid for separately.
10. Provide rigid metal conduit (RMC) for all conduits on service, except for the ½ in. PVC conduit containing the electrical service grounding electrode conductor. Size the service entrance conduit as shown in the plans. Ensure conduit for branch circuit entry to enclosure is the same size as that shown on the layout sheets for branch circuit conduit. Extend all rigid metal conduits a minimum of 6 inches underground and then couple to the type and schedule of the conduit shown on the layout for that particular branch circuit. Install a grounding bushing on the RMC where it terminates in the service enclosure.
11. Use of liquidtight flexible metal conduit (LFMC) is allowed between the meter and service enclosure when they are mounted 90 to 180 degrees to each other. Size the LFMC the same size as service entrance conduit. LFMC must not exceed 3 feet in length. Strap LFMC within 1 foot of each end. LFMC less than 12 inches in length need not be strapped. Each end of LFMC must have a grounding bushing or be terminated with a grounding fitting. The LFMC must contain a grounded (neutral) conductor. Ensure any bend in LFMC never exceeds 180 degrees. A pull test is required on all installed conductors, with at least six inches of free conductor movement demonstrated to the satisfaction of the Engineer.
12. Ensure all mounting hardware and installation details of services conform to utility company specifications.
13. For all electrical service enclosures listed under Item 628 on the MPL, the UL 508 enclosure manufacturers will prepare and submit a schematic drawing unique to each service. Before shipment to the job site, place the applicable laminated schematic drawings and the laminated plan sheet showing the electrical service data chart used to build the enclosure in the enclosure's data pocket. The installing contractor will copy and laminate the actual project plan sheets detailing all equipment and branch circuits supplied by that service. The laminated plan sheets are to be placed in the service enclosure's document pocket. Reduce 11 in. x 17 in. plan sheets to 8 ½ in. x 11 in. before laminating. If the installation differs from the plan sheets, the installing contractor is to redline plan sheets before laminating.
14. When providing an "Off The Shelf" Type D or Type T service, provide laminated plan sheets detailing equipment and branch circuits supplied by that service. Reduce 11 in. x 17 in. plan sheets to 8 ½ in. x 11 in before laminating. Deliver these drawings before completion of the work to the Engineer, instead of placing in enclosure that has no door pocket.
15. Do not install conduit in the back wall of a service enclosure where it would penetrate the equipment mounting panel inside the enclosure. Provide grounding bushings on all metal conduits, and terminate bonding jumpers to grounding bus. Grounding bushings are not required when the end of the metal conduit is fitted with a conduit sealing hub or threaded boss, such as a meter base hub.

SERVICE ASSEMBLY ENCLOSURE

1. Provide threaded hub for all conduit entries into the top of enclosure.
2. Type galvanized steel (GS) enclosures may be used for Type C panelboards and for Type D and T services that do not use an enclosure mounted photocell or lighting contactor. Provide GS enclosures in accordance with DMS 11080, 11082, 11083, and 11084.
3. Provide aluminum (AL) and stainless steel (SS) enclosures for Types A, C, and D in accordance with DMS 11080, 11081, 11082, 11083, and 11084. Do not paint stainless steel.
4. Provide pedestal service (PS) enclosures in accordance with ED(9) and DMS 11080 and 11085. Do not provide GS pedestal services. If GS is shown in the PS descriptive code, provide an AL enclosure.

MAIN DISCONNECT & BRANCH CIRCUIT BREAKERS

1. Field drill flange-mounted remote operator handle if needed, to ensure handle is lockable in both the "On" and "Off" positions.
2. When the utility company provides a transformer larger than 50 KVA, verify that the available fault current is less than the circuit breaker's ampere interrupting capacity (AIC) rating and provide documentation from the electric utility provider to the Engineer.

PHOTOELECTRIC CONTROL

1. Provide photocell as listed on the MPL. Move, adjust, or shield the photocell from stray or ambient night time light to ensure proper operation. Mount photocell facing north when practical. Mount top of pole photocells as shown on Top Mounted Photocell Detail.

* ELECTRICAL SERVICE DATA

Elec. Service ID	Plan Sheet Number	Electrical Service Description	Service Conduit **Size	Service Conductors No./Size	Safety Switch Amps	Main Ckt. Bkr. Pole/Amps	Two-Pole Contractor Amps	Panelbd/ Loadcenter Amp Rating	Branch Circuit ID	Branch Ckt. Bkr. Pole/Amps	Branch Circuit Amps	KVA Load
SB 183	289	ELC SRV TY A 240/480 100(SS)AL(E)SF(U)	2"	3/#2	100	2P/100	100	N/A	Lighting NB	2P/40	26	28.1
									Lighting SB	2P/40	25	
									Underpass	1P/20	15	
NB Access	30	ELC SRV TY D 120/240 060(NS)SS(E)TS(O)	1 ¼"	3/#6	N/A	2P/60		100	Sig. Controller	1P/30	23	5.3
							30		Luminaires	2P/20	9	
									CCTV	1P/20	3	
2nd & Main	58	ELC SRV TY T 120/240 000(NS)GS(N)SP(O)	1 ¼"	3/#6	N/A	N/A	N/A	70	Flashing Beacon 1	1P/20	4	1.0
									Flashing Beacon 2	1P/20	4	

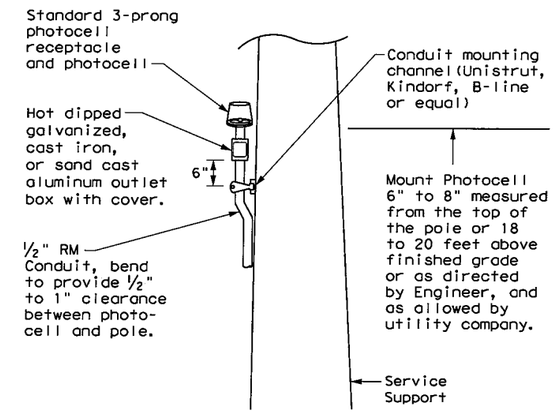
* Example only, not for construction. All new electrical services must have electrical service data chart specific to that service as shown in the plans.

** Verify service conduit size with utility. Size may change due to utility meter requirements. Ensure conduit size meets the National ELectrical Code.

EXPLANATION OF ELECTRICAL SERVICE DESCRIPTIVE CODE

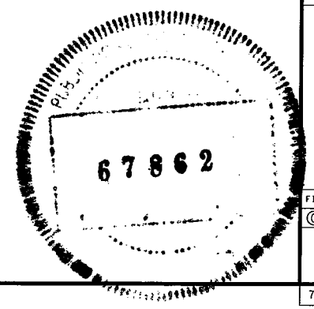
ELEC SERV TY X XXX/XXX XXX (XX) XX (X) XX (X)

- Schematic Type
- Service Voltage V / V
- Disconnect Amp Rating
  000 indicates main lug only/ Typically Type T
- (SS)= Safety Switch Ahead of Meter-Check with Utility
  (NS)= No safety Switch Ahead of Meter-Check with Utility
- Enclosure Type
  GS= Galvanized steel("off the shelf")
  SS= Stainless steel(Custom Enclosure)See MPL
  AL= Aluminum (Custom Enclosure)See MPL
- Photocell Mounting Location
  (E)= Inside Service/Enclosure Mounted
  (T)= Top of pole
  (L)= Luminaire mounted
  (N)= None/No Photocell or Lighting Contactor Required
- Service Support Type
  GC= Granite concrete
  OC= Other concrete
  TP= Timber pole
  SP= Steel pole
  SF= Steel frame
  OT= Pole by others or paid for separately
  EX= Existing pole
  TS= Service on traffic signal pole
  PS= Pedestal Service
- O= Overhead Service Feed from Utility
  U= Underground Service Feed from Utility



TOP MOUNTED PHOTOCELL

Install conduit strap maximum 3 feet from box. 5 foot maximum spacing between straps supporting conduit.



Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE NOTES & DATA

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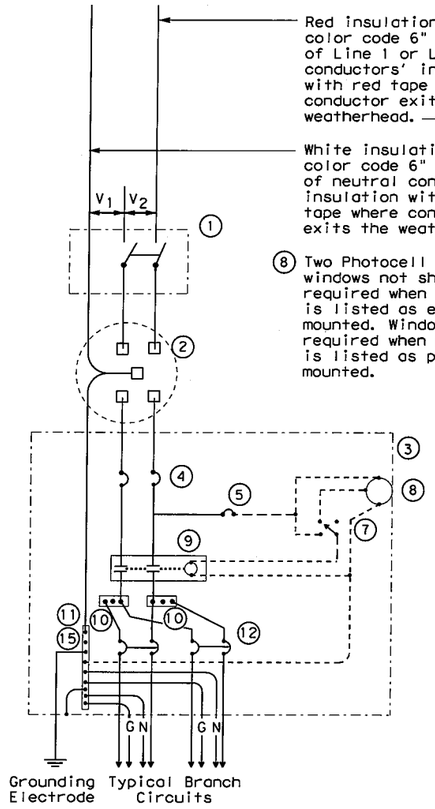
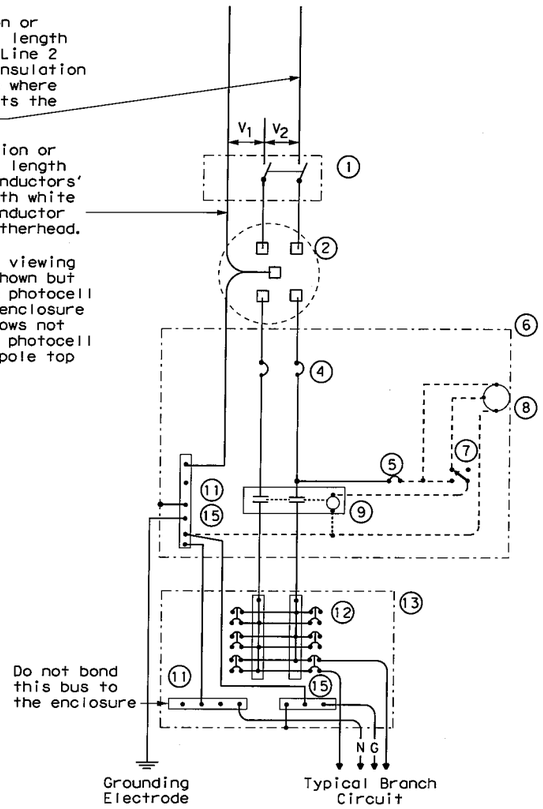
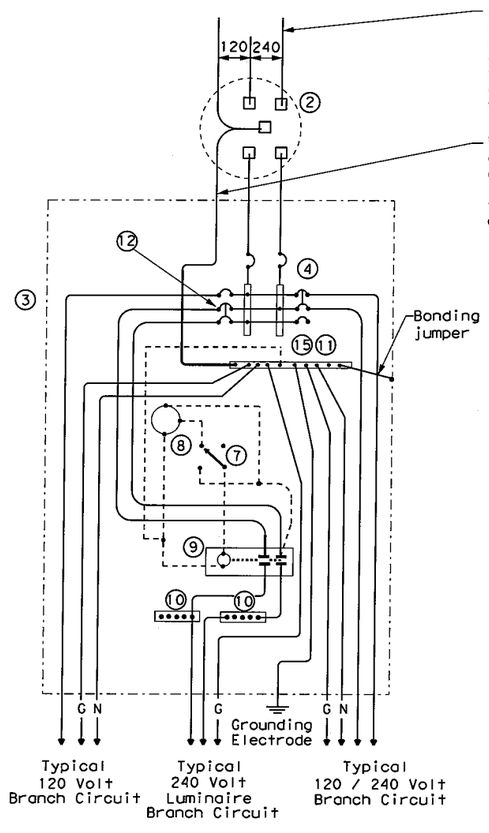


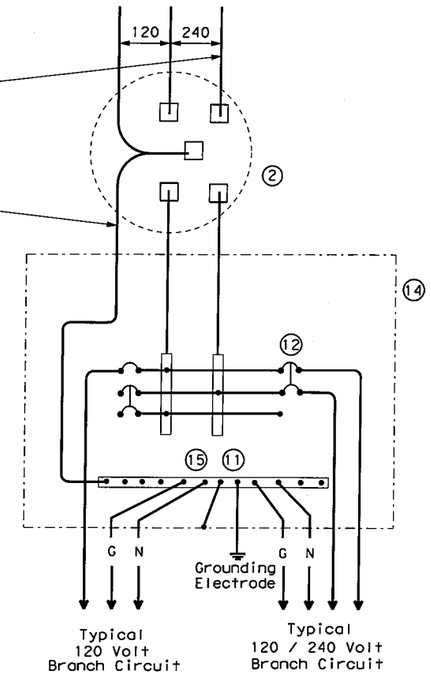
SCHEMATIC TYPE A
THREE WIRE



SCHEMATIC TYPE C
THREE WIRE



SCHEMATIC TYPE D - CUSTOM
120/240 VOLTS - THREE WIRE



SCHEMATIC TYPE T
120/240 VOLTS - THREE WIRE

Galvanized steel-"Buy Off The Shelf" only. When required install photocell top of the pole or on luminaire only, no lighting contractor will be installed.

WIRING LEGEND	
———	Power Wiring
- - - - - - -	Control Wiring
—N—	Neutral Conductor
—G—	Equipment grounding conductor-always required

SCHEMATIC LEGEND	
1	Safety Switch (when required)
2	Meter (when required-verify with electric utility provider)
3	Service Assembly Enclosure
4	Main Disconnect Breaker (See Electrical Service Data)
5	Circuit Breaker, 15 Amp (Control Circuit)
6	Auxiliary Enclosure
7	Control Station ("H-O-A" Switch)
8	Photo Electric Control (enclosure-mounted shown)
9	Lighting Contactor
10	Power Distribution Terminal Blocks
11	Neutral Bus
12	Branch Circuit Breaker (See Electrical Service Data)
13	Separate Circuit Breaker Panelboard
14	Load Center
15	Ground Bus

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE ENCLOSURE AND NOTES
ED(6)-14

FILE: ed6-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	72	391	CS
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		318

71F

DATE: 2/6/2020 8:15:57 AM
FILE: H:\TXPROJ\TX2533-00\Dwg\DGN\Standards\SIGNAL\ED(10)-14.dgn

TIMBER POLE (TP) SERVICE SUPPORT NOTES

1. Ensure electrical service support is a class 5 treated timber pole as per Item 627 "Treated Timber Poles." Embed timber pole to depth required in Item 627.
2. Conduit and electrical conductors attached to the electrical service pole and underground within 12 in. of service pole are not paid for directly but are subsidiary to the electrial service.
3. Install pole-top mounted photocell (T) on north side of pole, or in service enclosure (E) as required. See Electrical Service Data chart in plan set.
4. Gain pole as required to provide flat surface for each channel. Gain timber pole to 5/8 in. max. depth and 1 7/8 in. max. height. Gain pole in a neat and workmanlike manner.
5. Mount meter and service equipment on stainless steel or galvanized channel (Unistrut, Kindorf, or equal). Provide channel sized 1 in. to 3 3/4 in. maximum depth, and 1 1/2 in. to 1 5/8 in. maximum width. File smooth the cut ends of galvanized channel and paint with zinc rich paint before installing on pole. Secure each channel section to timber pole with two galvanized or SS lag bolts, 1/4 in. minimum diameter by 1 1/2 in. minimum length. Use a galvanized or SS flat washer on each lag bolt. Do not stack channel.
6. When excess length must be trimmed from poles, trim from the top end only.

(1) Class 5 pole, height as required

(2) Service drop from utility company (attached below weatherhead)

(3) Service conduit (RMC) and service entrance conductors - One Red, One Black, One White (See Electrical Service Data)

(4) Safety switch (when required)

(5) Meter (when required)

(6) Service enclosure

(7) 6 AWG bare grounding electrode conductor in 1/2 in. PVC to ground rod - extend 1/2 in. PVC 6 in. underground.

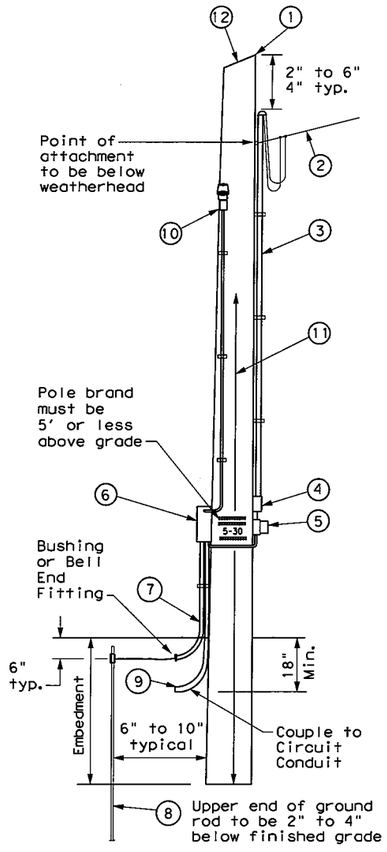
(8) 5/8 in. x 8 ft. Copper clad ground rod - drive ground rod to a depth of 2 in. to 4 in. below grade.

(9) RMC same size as branch circuit conduit.

(10) See pole-top mounted photocell detail on ED(5).

(11) When required by the serving utility provide bare 6 AWG copper conductor. Run wire from pole top to butt wrap or copper butt plate. Protect conductor with non-conductive material to a height of 8 ft. above finished grade.

(12) When required by utility, cut top of pole at an angle to enhance rain run off.

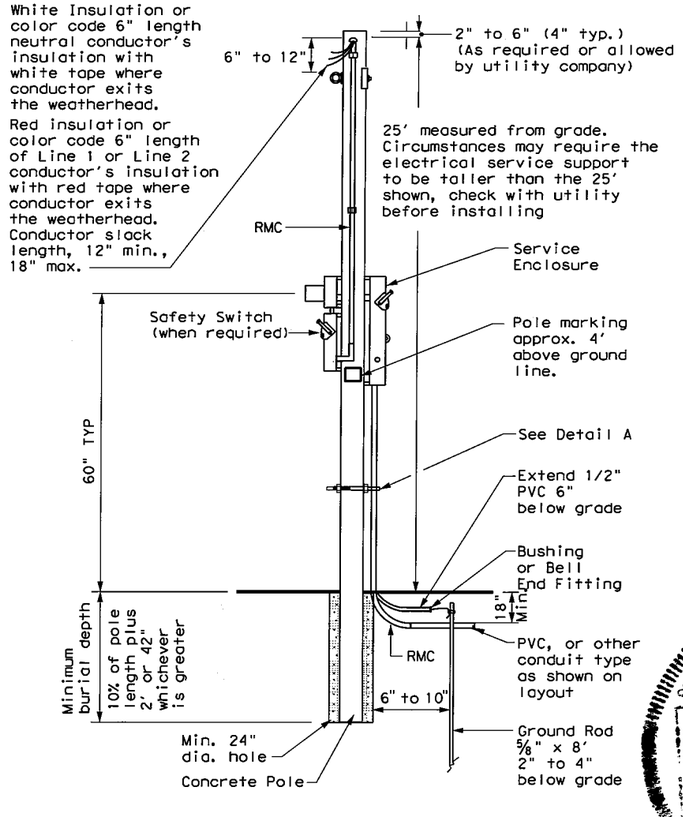


SERVICE SUPPORT TYPE TP (O)

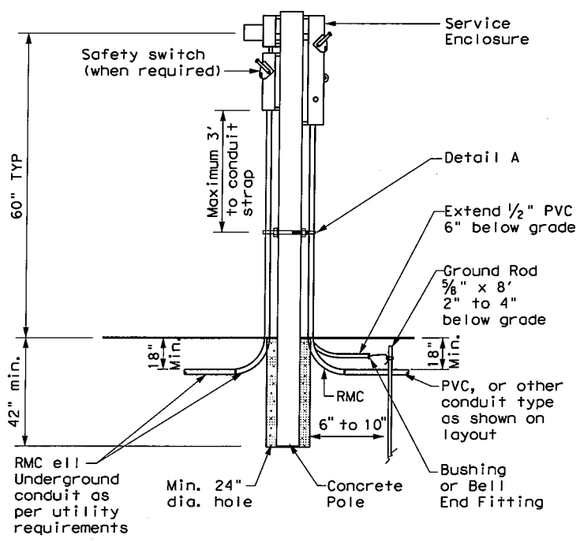
GRANITE CONCRETE (GC) & OTHER CONCRETE (OC) NOTES

Ensure electrical service support structures bid as type Granite Concrete (GC) or Other Concrete (OC) meet the following requirements.

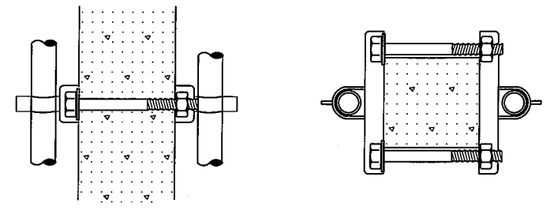
1. Provide GC and OC poles that meet the requirements of DMS 11080 "Electrical Services."
2. Provide prestressed concrete poles suitable for direct embedment into the ground without special foundations.
3. Verify poles are marked as required on DMS 11080. Location of marking should be approximately 4' above final grade. Use the two-point pickup locations when handling pole in horizontal position, and one-point pickup location for use in raising the pole to a vertical position. These marks are small but conspicuous.
4. Embed poles 42 in. or 10% of the length plus 2 ft., whichever is greater.
5. Ensure all installation details of services are in accordance with utility company specifications.
6. Install a one point rack or eye bolt bracket 6 inches to 12 inches below the weatherhead as an overhead service drop anchoring point for the electric utility.
7. Furnish and install galvanized or stainless steel channel strut 1 1/2 in. or 1 5/8 in. wide by 1 in. up to 3 3/4 in. deep (Unistrut, Kindorf, B-line or equal). Attach channel strut with stainless steel concrete anchors (max. 1" depth), square U-bolts or back to back channel strut with long bolts, or other secure mounting as approved by the Engineer. Ensure bolts are galvanized in accordance with ASTM A153. Do not stack channel struts.
8. Backfill the holes thoroughly by tamping in 6 in. lifts. After tamping to grade, place additional backfill material in a 6 inch high cone around the pole to allow for settling. Use material equal in composition and density to the surrounding area. Backfilling will not be paid for directly but is subsidiary to various bid items.



CONCRETE SERVICE SUPPORT
Overhead (O)

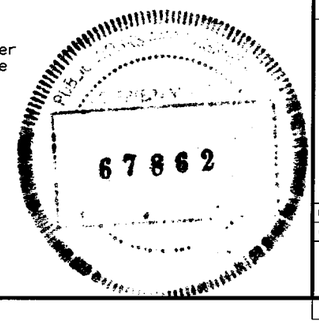


CONCRETE SERVICE SUPPORT
Underground (U)



DETAIL A

See Note 7. Before installing channel that has been cut, file sharp edges and paint with zinc-rich paint. Ensure there is no paint splatter on the pole.



Texas Department of Transportation

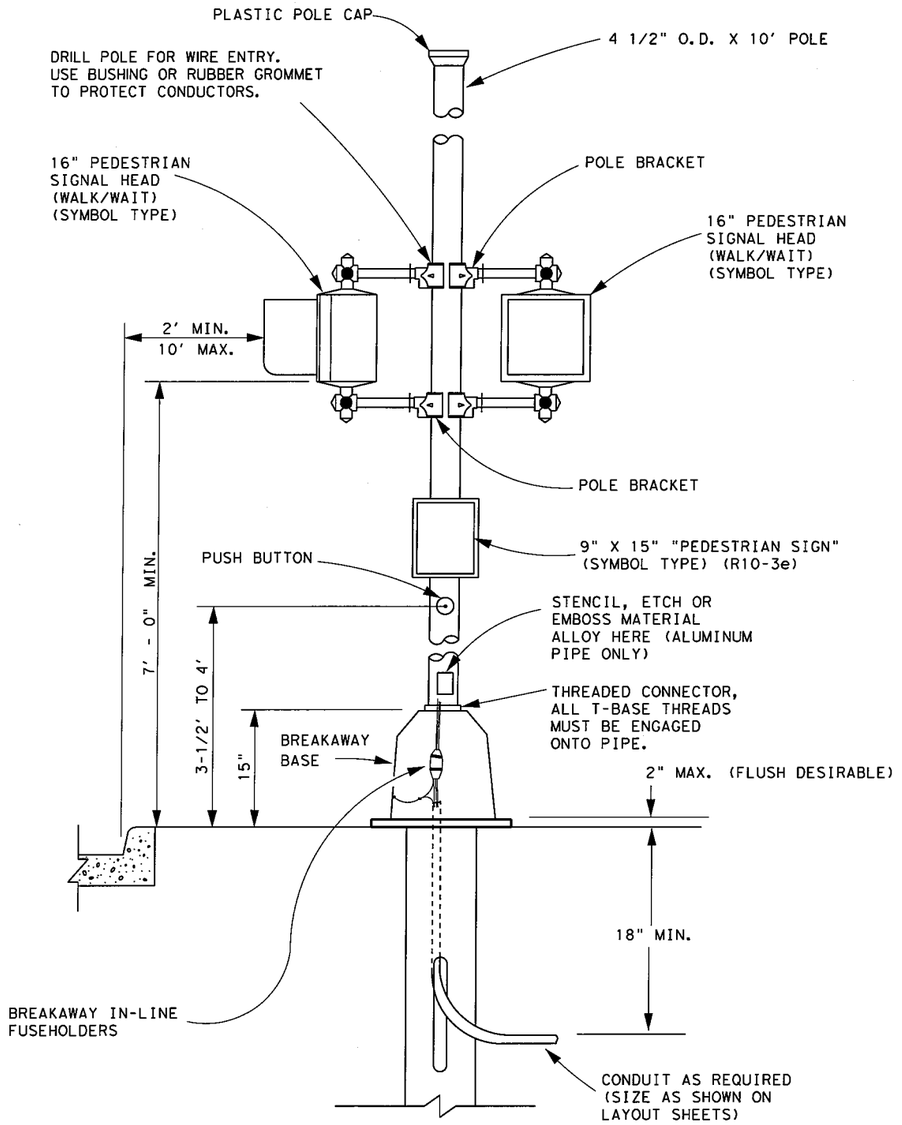
Traffic Operations Division Standard

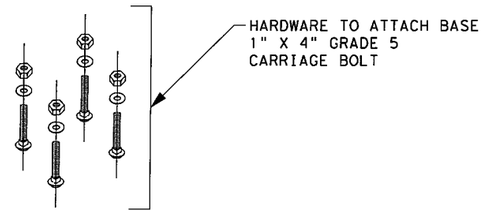
ELECTRICAL DETAILS SERVICE SUPPORT TYPES GC, OC, & TP

ED(10)-14

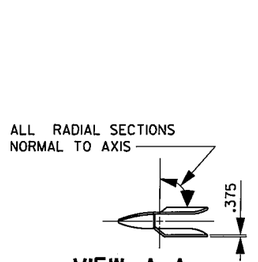
FILE: ed10-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	72	391	CS
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		319

71K

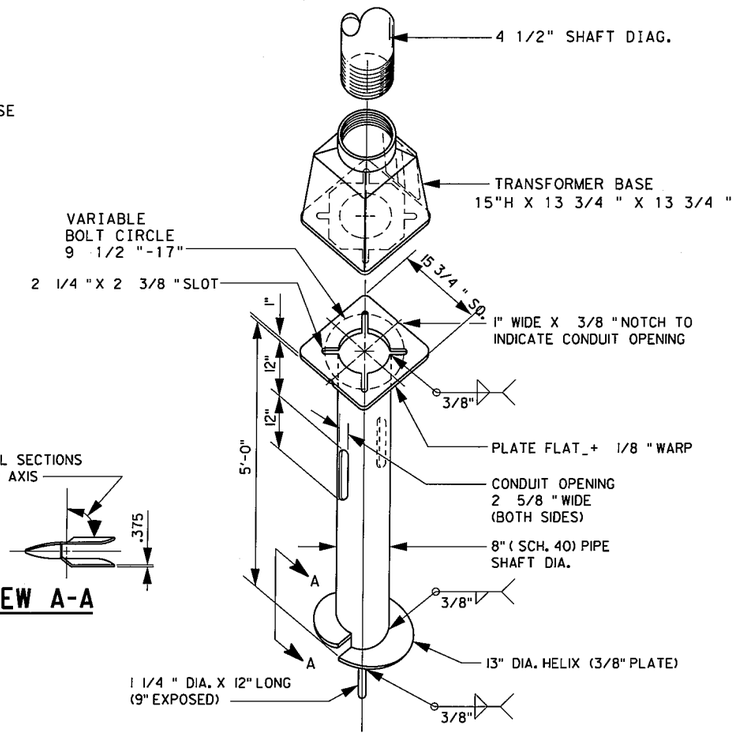




HARDWARE DETAIL



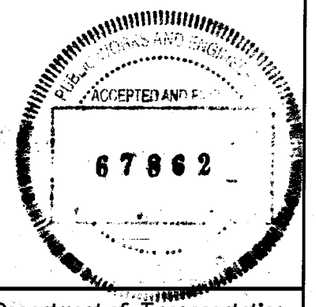
VIEW A-A



SCREW ANCHOR FOUNDATION DETAIL

NOTE:

SEE STANDARD (RFBA - 13) FOR NOTES AND
NON - FUSED BREAKAWAY ELECTRICAL CONNECTOR DETAILS



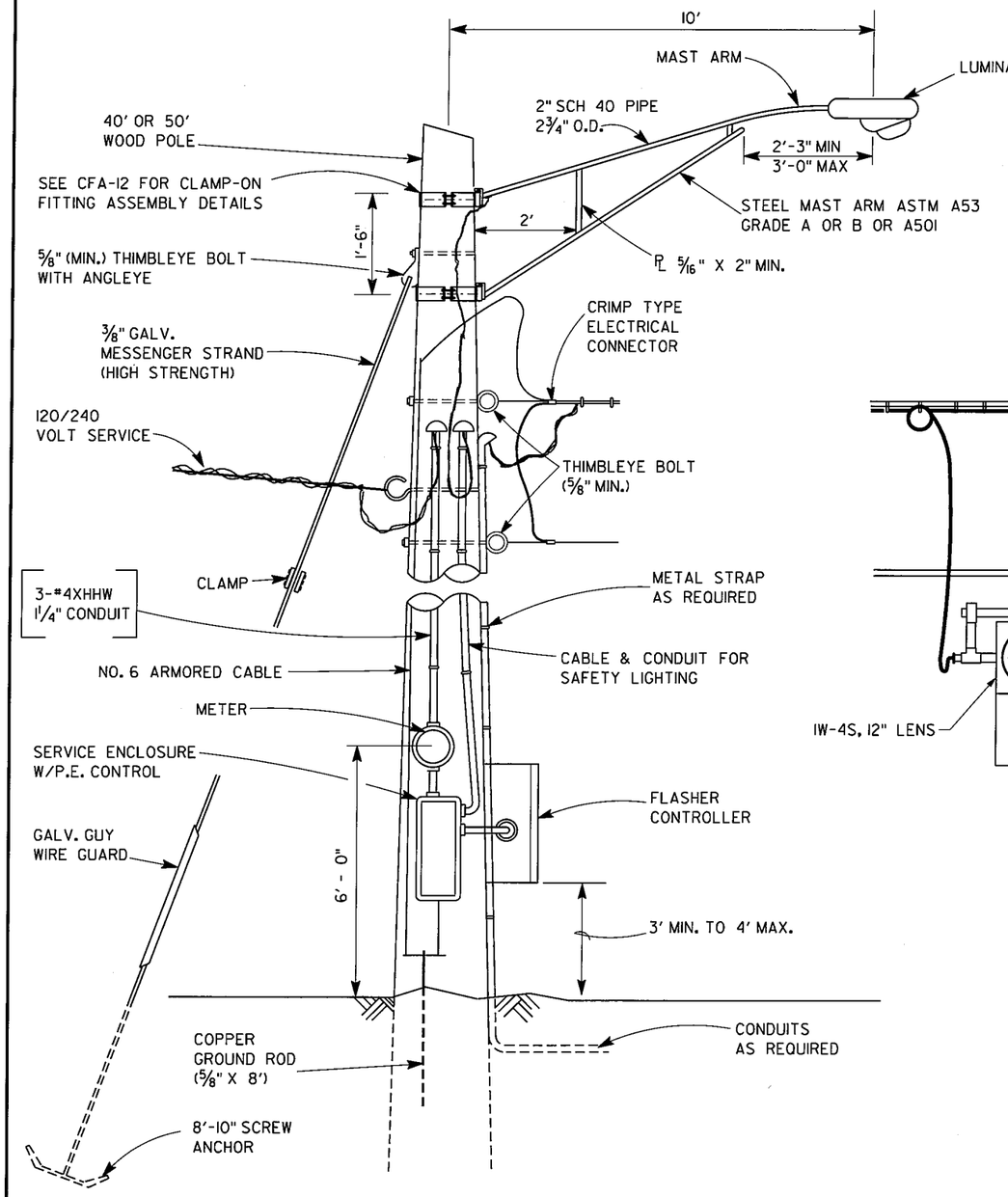
Texas Department of Transportation
Houston District

SIGNAL DETAILS/STANDARDS CONSTRUCTION DETAILS FOR POLE MOUNTED PEDESTRIAN SIGNALS

CD/PMPS

FILE:	DN:	CK:	DW:	CK:
© TxDOT 2007	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS 04-05 11-08 02-15 05-05 01-14 03-07 07-14	HOU	6	STP 1802(783) MM	320
	COUNTY	CONTROL	SECT / JOB	HIGHWAY
	HARRIS	0912	72 / 391	CS

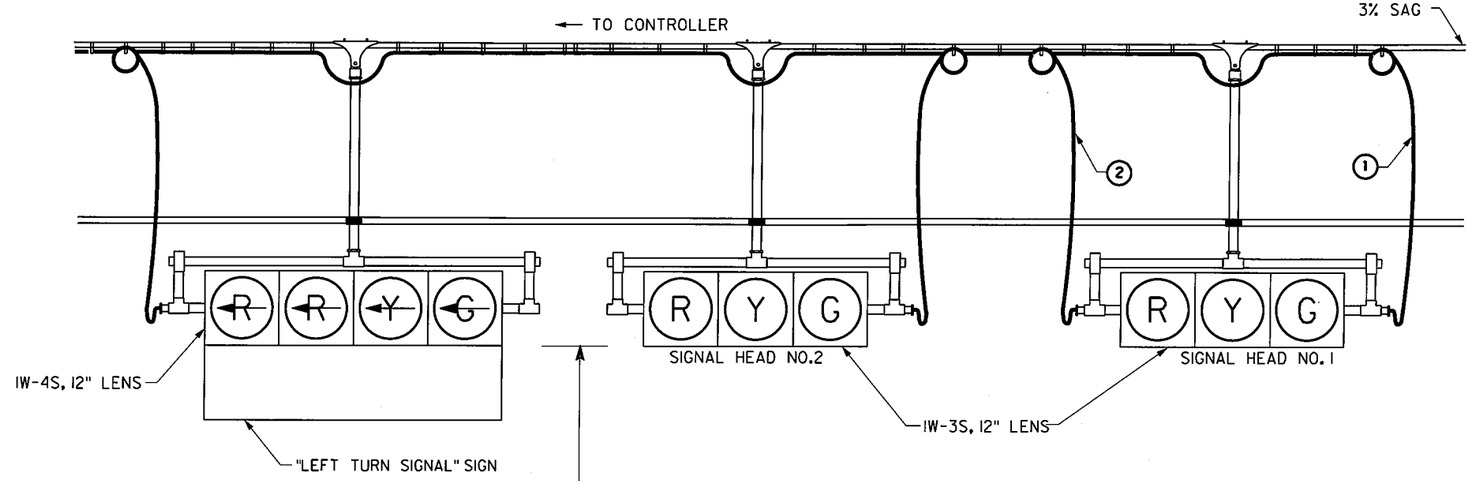
STD-M4



NOTE: THE CONTRACTOR SHALL COIL ON THE SPAN WIRE A SUFFICIENT LENGTH OF SIGNAL CABLE FOR ADJUSTING SIGNAL HEADS DURING THE VARIOUS PHASES OF CONSTRUCTION.

NOTES:

1. WRAP SIGNAL HEADS WITH DARK PLASTIC OR SUITABLE MATERIAL TO CONCEAL THE SIGNAL FACES FROM THE TIME OF INSTALLATION UNTIL PLACING INTO OPERATION.
2. INSTALL GROUNDING BUSHINGS ON THE ENDS OF UNDERGROUND RIGID METAL CONDUITS. GROUND AND BOND CONDUITS, POLES, AND CONTROLLERS TO THE NEAREST GROUND ROD USING SOFT BARE NO. 6 COPPER WIRE.
3. FURNISH HIGH STRENGTH GALVANIZED SPAN WIRE.
4. FURNISH MINIMUM 2 SIGNAL HEADS PER APPROACH.
5. FURNISH LEFT TURN SIGNAL HEAD WHEN REQUIRED.
6. FOR TEMPORARY SIGNAL INSTALLATION, INSTALL A SEPARATE POWER SOURCE, IF REQUIRED.
7. FOR TEMPORARY SIGNAL INSTALLATION, INSTALL LUMINAIRES ON WOOD SIGNAL POLES, IF REQUIRED. CONSTRUCT STEEL UPSWEEP MAST ARM FOR WOOD POLE MOUNTING OF 2 IN. PIPE WITH SLIPFITTER MOUNTING OF THE LUMINAIRE.
8. FOR TEMPORARY SIGNAL INSTALLATION, COIL A SUFFICIENT LENGTH OF SIGNAL CABLE ON THE SPAN WIRE FOR ADJUSTING SIGNAL HEADS DURING THE VARIOUS PHASES OF CONSTRUCTION.



① LEAD - IN CABLE FROM CONTROLLER TO SIGNAL HEAD NO. 1

② JUMPER TO SIGNAL HEAD NO. 2

NOTE: BACKPLATES OMITTED FOR CLARITY (IF REQUIRED)

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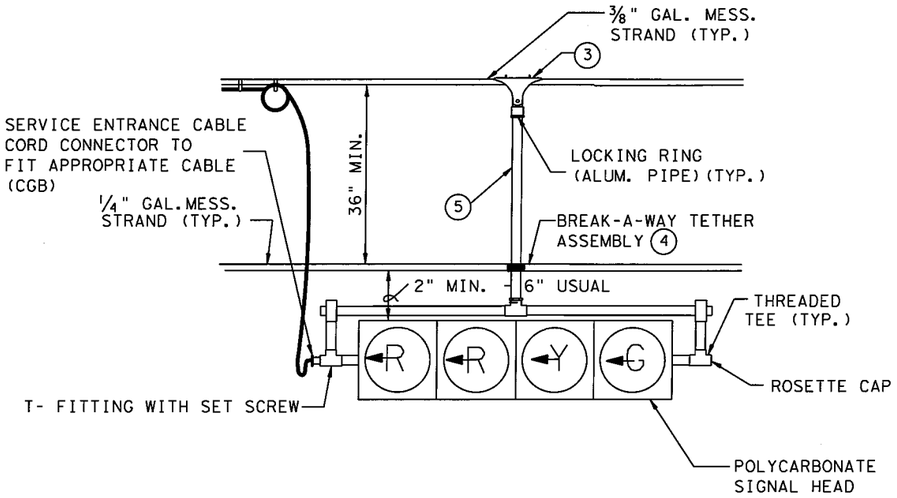
Houston District

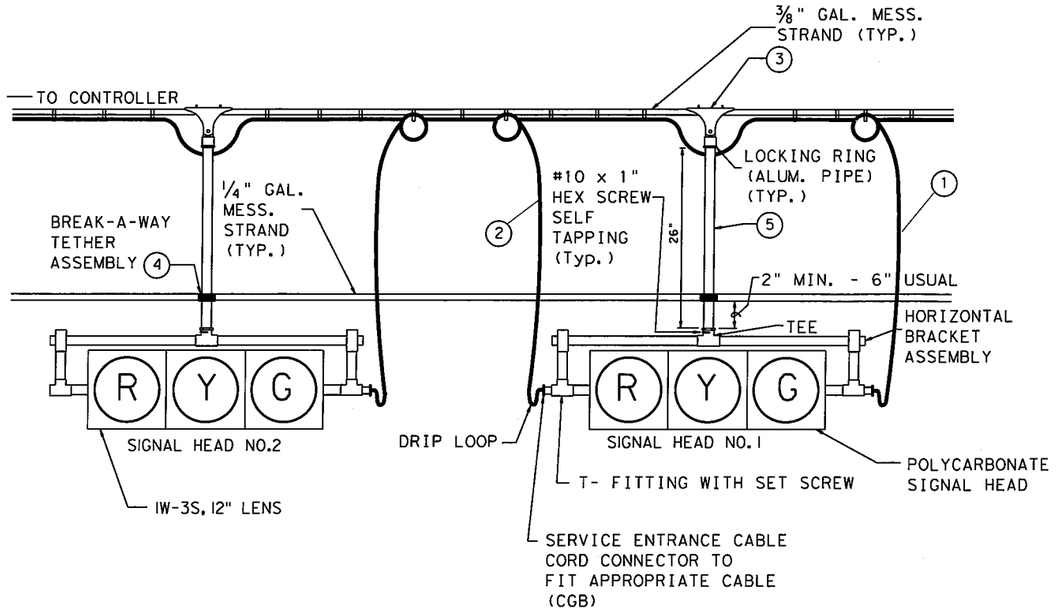
SIGNAL DETAILS/STANDARDS CONSTRUCTION DETAILS FOR TRAFFIC SIGNALS (WOOD POLE)

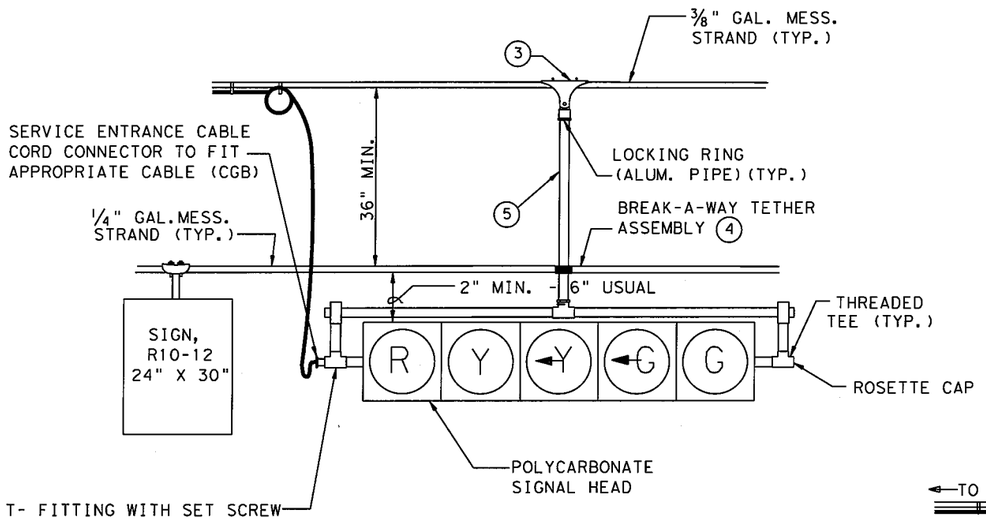
CD/TS/WP

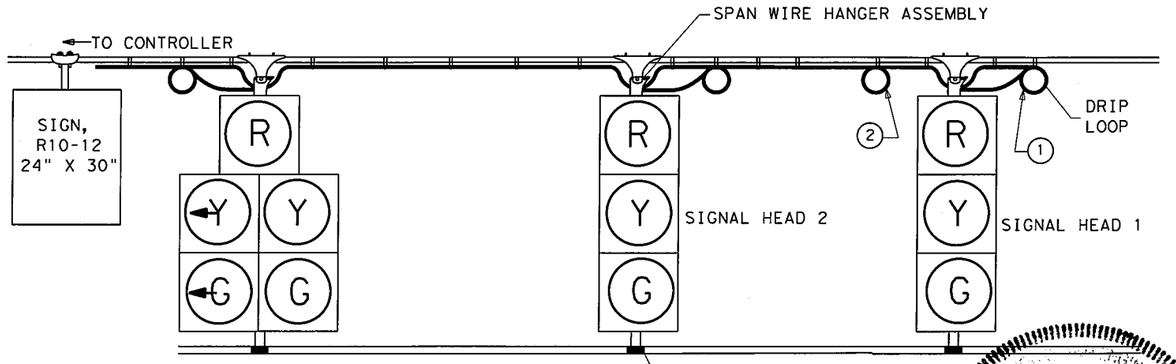
FILE:	DN:	CK:	DW:	CK:
© TxDOT 2008	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS 03-07 05-08 8-12	HOU	6	STP 1802(783)MM	321
	COUNTY		CONTROL SECT JOB	HIGHWAY
	HARRIS		0912 72 391	CS

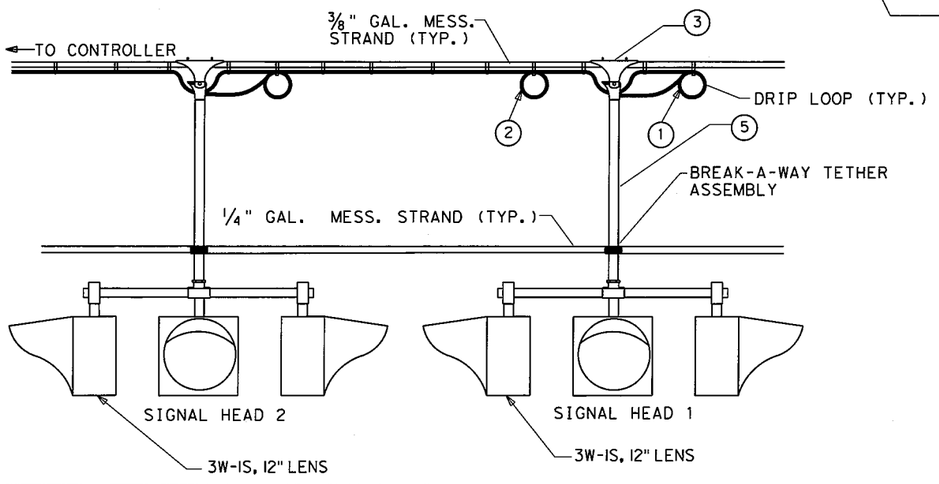
STD-M10











(1) LEAD - IN CABLE FROM CONTROLLER TO SIGNAL HEAD NO. 1

(2) JUMPER TO SIGNAL HEAD NO. 2

(3) CAST ALUMINUM SPAN WIRE CLAMP AND FEMALE CLEVIS ADAPTER (ALUMINUM PIPE) OR CAST ALUMINUM SPAN WIRE CLAMP TO ACCOMMODATE ADJUSTABLE HANGER BRACKET. SECURE CLEVIS PIN WITH A WASHER (BOTH ENDS) AND HUMP BACK COTTER PIN. DRILL CLEVIS PIN OPENINGS AND FIT WITH A SPLIT BUSHING. CLEVIS PIN, WASHER, COTTER PIN, AND SPLIT BUSHING TO BE STAINLESS STEEL.

(4) INSTALL TETHER CABLE ON BACK SIDE OF PIPE OR ADJUSTABLE BRACKET.

(5) 1 1/2" ALUM. PIPE (TYP.) OR ALUM. ADJUSTABLE HANGER BRACKET W/BREAKWAY TETHER ASSEMBLY

NOTE: BACKPLATES OMITTED FOR CLARITY

ACCEPTED AND FILED
PUBLIC WORKS ENGINEER
67862

Texas Department of Transportation
Houston District

SIGNAL DETAILS/STANDARDS
SIGNAL HEAD SPAN WIRE MOUNT DETAILS

SHS/WMD

FILE:	DN:	CK:	DW:	CK:
© TxDOT 2004	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS 12-04 08-12 11-16	HOU	6	STP 1802(783)MM	322
	COUNTY		CONTROL SECT JOB	HIGHWAY
	HARRIS		0912 72 391	CS

STD-M11

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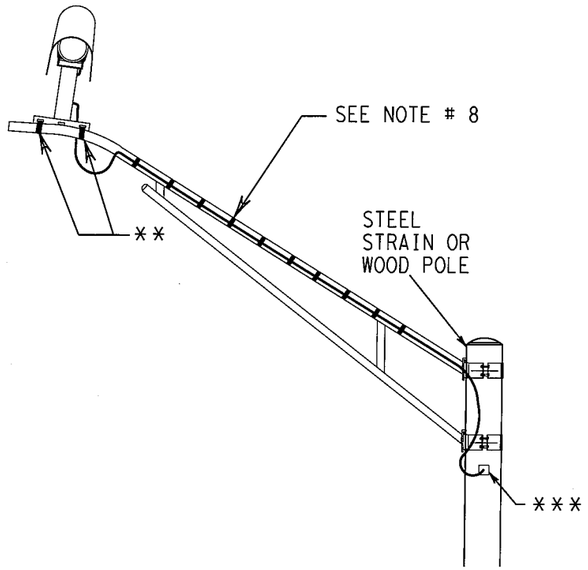
NOTES FOR VIDEO DETECTION:

1. INSTALL VIDEO DETECTION PROCESSOR UNIT INSIDE CONTROLLER CABINET.
2. INSTALL VIDEO DETECTION CAMERA & BRACKET AS DETAILED OR AS DIRECTED BY THE VIDEO DETECTION SUPPLIER.
3. MOUNT CAMERAS AS FAR OVER THE ROADWAY AS POSSIBLE.
4. USE ¾ IN. STAINLESS STEEL BANDING MATERIAL TO INSTALL CAMERA MOUNTS.
5. AIM CAMERA SO THAT HORIZON IS NOT VISIBLE IN THE FIELD OF VIEW.
6. INSTALL CAMERA ENCLOSURE ASSEMBLY SO THAT IT CAN ROTATE AFTER INSTALLATION TO PROVIDE PROPER ALIGNMENT.
7. PROVIDE WATER TIGHT CABLE ENTRY AND EXIT POINTS IN THE MAST ARM AND/OR POLES.
8. FOR VIVDS COAX AND POWER CABLES ATTACHED TO LUMINAIRE ARM, PROVIDE A METAL CABLE STRAP (ALUMINUM OR STAINLESS STEEL), 3/4-IN MINIMUM WIDTH AND TWO WRAPS AT 8 IN. MAXIMUM SPACING.

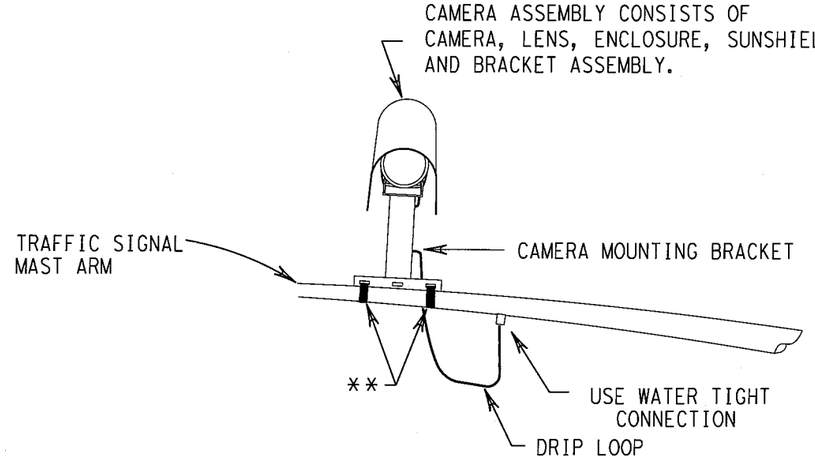
* 4 FT. PIPE EXTENSION WHEN MOUNTED ON TRAFFIC SIGNAL MAST ARM.

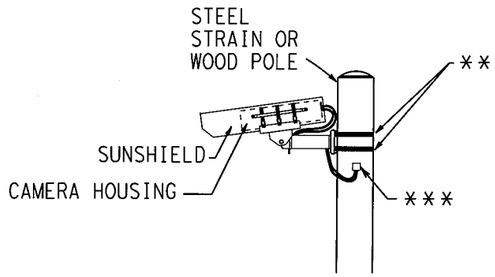
** ¾ IN. (MIN) STAINLESS STEEL BANDING 2 PLACES MIN.

*** ENTRY INTO STEEL POLE OR CONDUIT WEATHERHEAD ON WOOD POLE

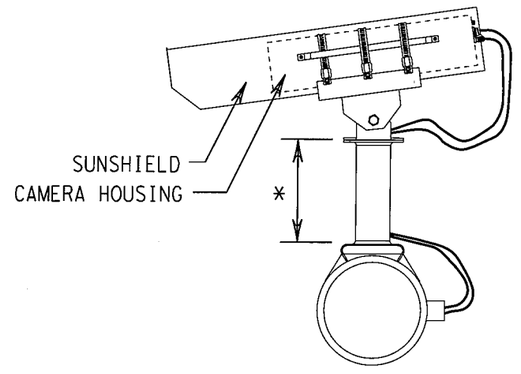


LUMINAIRE ARM MOUNT

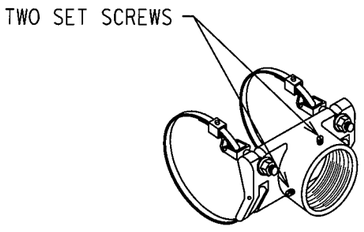




POLE MOUNT



SIDE VIEW



BAND MOUNT BRACKET DETAIL

67862

Texas Department of Transportation
Houston District

SIGNAL DETAILS/STANDARDS
VIVDS CAMERA
MOUNTING DETAILS

VC/MD

FILE:	DN:	CK:	DW:	CK:
© TxDOT 2010	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS	HOU	6	STP 1802(783)MM	323
02/2004 03/16/2006 09/2010	COUNTY		CONTROL SECT JOB	HIGHWAY
	HARRIS		0912 72 391	CS

STD-M13

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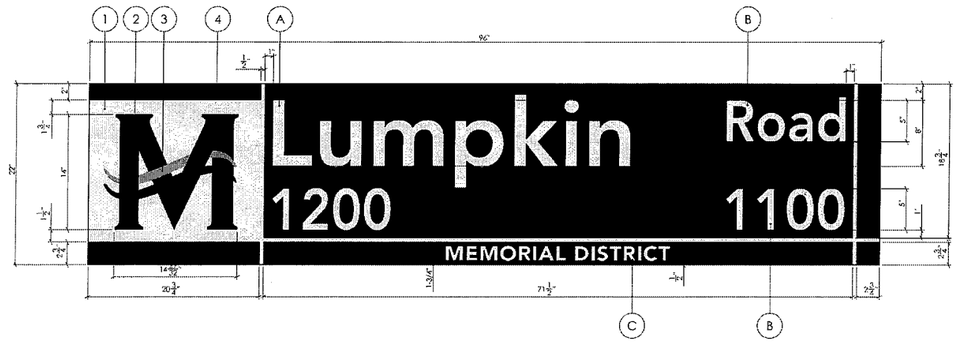
96Mast, Typical



Materials

1. 3M DG3 4090 white retro-reflective prismatic vinyl, applied to 100% of one face.
2. Orafol 951-080 Brown opaque cast vinyl.
3. Orafol 951-811 Sahara Beige opaque cast vinyl.
4. Orafol 951-079 Red Brown opaque cast vinyl.

Fonts

A. Avenir LT Pro 85 Heavy, 8" capital, 812 pt. (Adobe Illustrator), kearned to fit.

B. Avenir LT Pro 85 Heavy, 5" capital, 508pt. (Adobe Illustrator), kearned to fit.

C. Avenir LT Pro 85 Heavy, 1-3/4" capital, 178 pt. (Adobe Illustrator), kearned to fit.

96" x 22" Memorial District Overhead Street ID

1/8" aluminum blank. Apply 3M DG3 white retro-reflective vinyl to cover 100% of one side. Revese side is painted to match Orafol 951-080 Brown vinyl. Copy is reverse die-cut opaque cast vinyl as noted. Logo is die-cut opaque cast vinyl as noted.

Fabricate seventeen (17) for mast arm mounting (96Mast)

UNLESS OTHERWISE SPECIFIED:	NAME/SIGNATURE	DATE
Voltage:	DRAWN ELW	7/18/16
	CHECKED	
Notes:	SALES APPR.	
	CUST. APPR.	
DO NOT SCALE DRAWING	PERMITS REQ'D	
PROPRIETARY AND CONFIDENTIAL	COMMENTS:	

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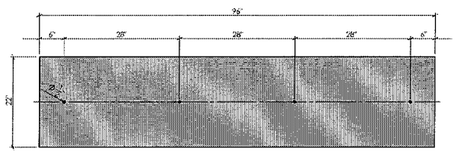
W.A.S./ArcSign
5002 Coral Gables Dr - Houston, Tx 77087 - 281-802-3546

TITLE: MEMORIAL DISTRICT OVERHEAD STREET ID

SIZE B | DWG. NO. 16-06-001 | REV

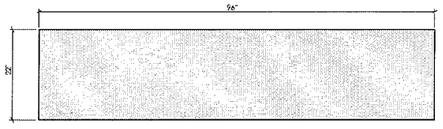
SCALE: 1.5" = 1'-0" | SHEET 1 OF 4

96Mast



96" x 22" x 0.125" Aluminum mast arm blank. Seventeen (17) thus. Drill mounting holes on router.

Reverse cut Orafol 951-079 Red Brown vinyl applied to reflective white vinyl. See layout files. Seventeen (17) thus.



96" x 22" x 0.125" Reflective white vinyl applied to 96" x 22" aluminum blanks. Seventeen (17) thus.

Reverse cut Orafol 951-811 Sahara Beige vinyl applied to reflective white vinyl. See layout files, Seventeen (17) thus.

Reverse cut Orafol 951-080 Brown vinyl applied to reflective white vinyl. Copy varies, see message schedule and layout files, Seventeen (17) thus.

UNLESS OTHERWISE SPECIFIED:	NAME/SIGNATURE	DATE
Voltage:	DRAWN ELW	7/18/16
	CHECKED	
Notes:	SALES APPR.	
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5002 Coral Gables Dr - Houston, Tx 77087 - 281-802-3546

TITLE: MEMORIAL DISTRICT OVERHEAD STREET ID

SIZE B | DWG. NO. 16-06-001 | REV

SCALE: 1.5" = 1'-0" | SHEET 2 OF 4

MEMORIAL DISTRICT MANAGEMENT WILL SUPPLY THE STREET NAME SIGNS PER MEMORIAL DISTRICT SPECIFICATIONS. CONTRACTOR TO CONTACT PAT WALTERS (PH-713-984-8737) FOR INSTALLATION OF THESE SIGNS AS SHOWN ON THE PLANS. THIS SHEET IS FOR CONTRACTOR'S INFORMATION ONLY.

REV. NO.	DATE	DESCRIPTION	BY

CONSOR
F-12040

Texas Department of Transportation

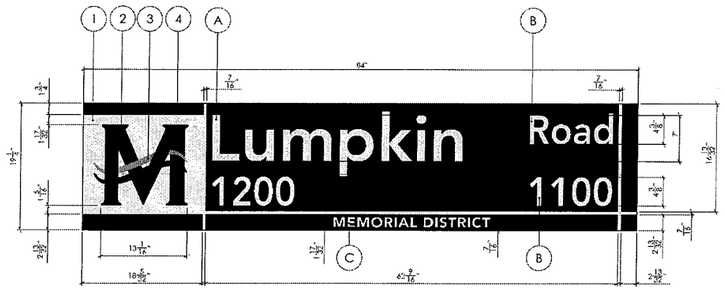
67862

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT
MISCELLANEOUS DETAILS
MEMORIAL DISTRICT
STREET NAME STANDARDS

SHEET 1 OF 2

	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
DGN: CONSOR	6	TEXAS	STP 1802(783)MM			CS
DWG: CONSOR	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: CONSOR	HOU	HARRIS	0912	72	391	324

84Span & 84Mast, Typical



Materials

1. 3M DG3 4090 white retro-reflective prismatic vinyl, applied to 100% of one face.
2. Orafol 951-080 Brown opaque cast vinyl.
3. Orafol 951-811 Sahara Beige opaque cast vinyl.
4. Orafol 951-079 Red Brown opaque cast vinyl.

Fonts

A. Avenir LT Pro 85 Heavy, 7" capital, 710 pt. (Adobe Illustrator), kearned to fit.

B. Avenir LT Pro 85 Heavy, 4-3/8" capital, 445 pt. (Adobe Illustrator), kearned to fit.

C. Avenir LT Pro 85 Heavy, 1-17/32" capital, 156 pt. (Adobe Illustrator), kearned to fit.

84" x 19.25" Memorial District Overhead Street ID

1/8" aluminum blank. Apply 3M DG3 white retro-reflective vinyl to cover 100% of one side. Revese side is painted to match Orafol 951-080 Brown vinyl. Copy is reverse die-cut opaque cast vinyl as noted. Logo is die-cut opaque cast vinyl as noted.

Fabricate eleven (11) for span wire mounting (84Span)
Fabricate three (3) for mast arm mounting (84Mast)

UNLESS OTHERWISE SPECIFIED:		NAME/SIGNATURE	DATE
Voltage:	DRAWN	ELW	7/18/16
	CHECKED		
Notes:	SALES APPR.		
	CUST. APPR.		
DO NOT SCALE DRAWING	PERMITS REQ'D		
	COMMENTS:		

PROPRIETARY AND CONFIDENTIAL
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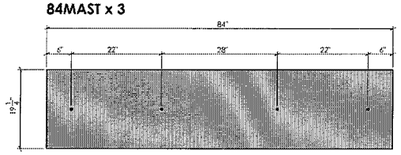
W.A.S./ArcSign
5002 Coral Gables Dr - Houston, Tx 77087 - 281-802-3546

TITLE: MEMORIAL DISTRICT OVERHEAD STREET ID

SIZE B | DWG. NO. 16-06-001 | REV

SCALE: 1.5" = 12" | SHEET 3 OF 4

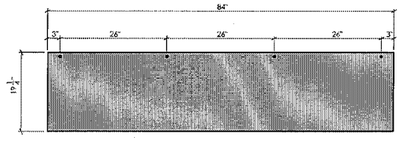
84MAST x 3



19.25" x 84" x 0.125" Aluminum mast arm blank. Three (3) thus.

Reverse cut Orafol 951-079 Red Brown vinyl appliedto reflective white vinyl. See layout files, Fourteen (14) thus.

84Span x 11



19.25" x 84" x 0.125" Aluminum span wire blank. Eleven (11) thus.

Reverse cut Orafol 951-811 Sahara Beige vinyl applied to reflective white vinyl. See layout files, Fourteen (14) thus.

Lumpkin Road 1200 1100

Reverse cut Orafol 951-080 Brown vinyl applied to reflective white vinyl. Copy varies, see message schedule and layout files, Fourteen (14) thus.

UNLESS OTHERWISE SPECIFIED:		NAME/SIGNATURE	DATE
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	CHECKED		
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W.A.S./ArcSign
5002 Coral Gables Dr - Houston, Tx 77087 - 281-802-3546

TITLE: MEMORIAL DISTRICT OVERHEAD STREET ID

SIZE B | DWG. NO. 16-06-001 | REV

SCALE: 3/4" = 12" | SHEET 4 OF 4

MEMORIAL DISTRICT MANAGEMENT WILL SUPPLY THE STREET NAME SIGNS PER MEMORIAL DISTRICT SPECIFICATIONS. CONTRACTOR TO CONTACT PAT WALTERS (PH-713-984-8737) FOR INSTALLATION OF THESE SIGNS AS SHOWN ON THE PLANS.
THIS SHEET IS FOR CONTRACTOR'S INFORMATION ONLY.

REV. NO.	DATE	DESCRIPTION	BY

CONSOR
F-12040

Texas Department of Transportation
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT
MISCELLANEOUS DETAILS
MEMORIAL DISTRICT
STREET NAME STANDARDS

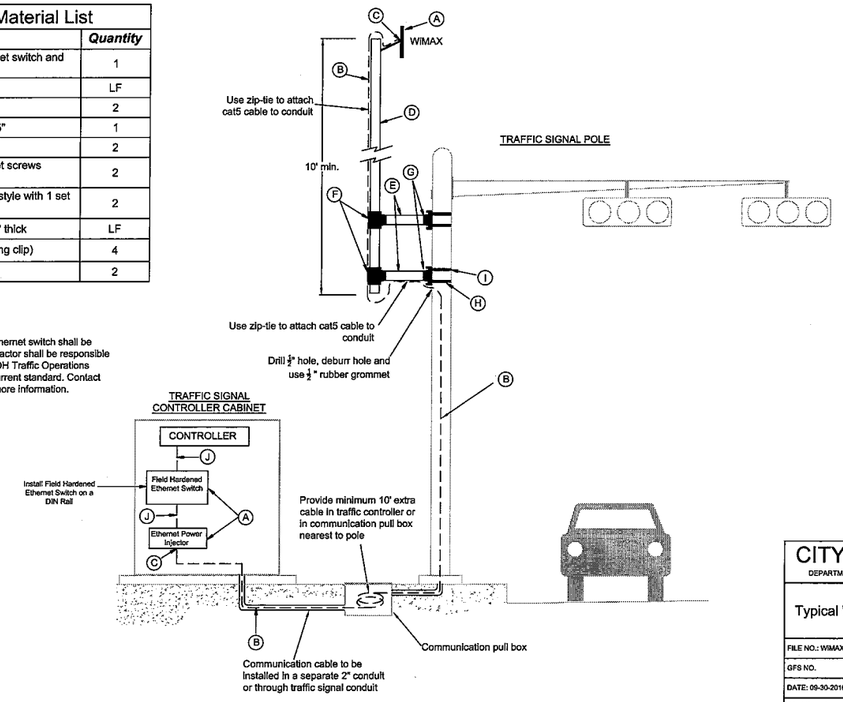
SHEET 2 OF 2

DGN: CONSOR	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: CONSOR	6	TEXAS	STP 1802(783)MM			CS
DWG: CONSOR	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: CONSOR	HOU	HARRIS	0912	72	391	325

67662

WiMAX Installation - Material List		
Item	*Description*	*Quantity*
A	WiMAX CPE, POE Injector, Ethernet switch and DIN rail*	1
B	Shielded outdoor rated Cat-5e	LF
C	Shielded RJ-45	2
D	Alum. Conduit Extension 10 ft x 1.5"	1
E	Alum. Nipple Conduit 10" x 1.5"	2
F	Alum. Tee reamed on run with 4 set screws painted black	2
G	Alum. pole plate universal fit band style with 1 set screw painted black	2
H	Stainless steel band ¾" wide x 0.30" thick	LF
I	¾" stainless steel wing seals (banding clip)	4
J	Ethernet cable	2

Note:
* - WiMAX CPE, POE Injector and Field Hardened Ethernet switch shall be compatible with existing WiMAX infrastructure. Contractor shall be responsible for all compatibility testing and providing results to COH Traffic Operations Division if proposing a subscriber different than the current standard. Contact COH Traffic Operations Division (713.843.5458) for more information.



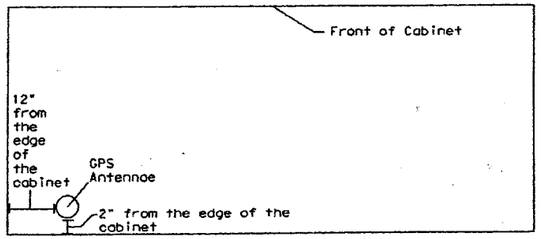
CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

Typical WiMAX Installation Details

FILE NO.: WiMAX Installation.dwg	
GFS NO.	
DATE: 09-30-2016	
SCALE: NTS	
CITY OFHOUSTON P.N.:	
P.M.:	
SHEET NO. 1 OF 1	

GPS ANTENNAE INSTALLATION DETAIL

Top View of an ITS 340 Cabinet



1) GPS antennae installation location is shown above. Drill a hole in the top of cabinet (hole must be 12" from the edge as shown to ensure you don't drill through the fan housing).

2) The antennae has a sticky washer on it. Peel the paper off that washer and place the antennae on the cabinet feeding the screw end and cabling into the cabinet.

3) Screw antennae tight on cabinet and connect cabling to the GPS card installed in the controller.

STATE OF TEXAS
ZINA I. SCHWARTZ
85814
LICENSED
PROFESSIONAL ENGINEER

2/6/2020

REV. NO.	DATE	DESCRIPTION	BY

CONSOR
F-12040

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

CITY OF HOUSTON MISCELLANEOUS DETAILS

SHEET 1 OF 2

DGN: CONSOR	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
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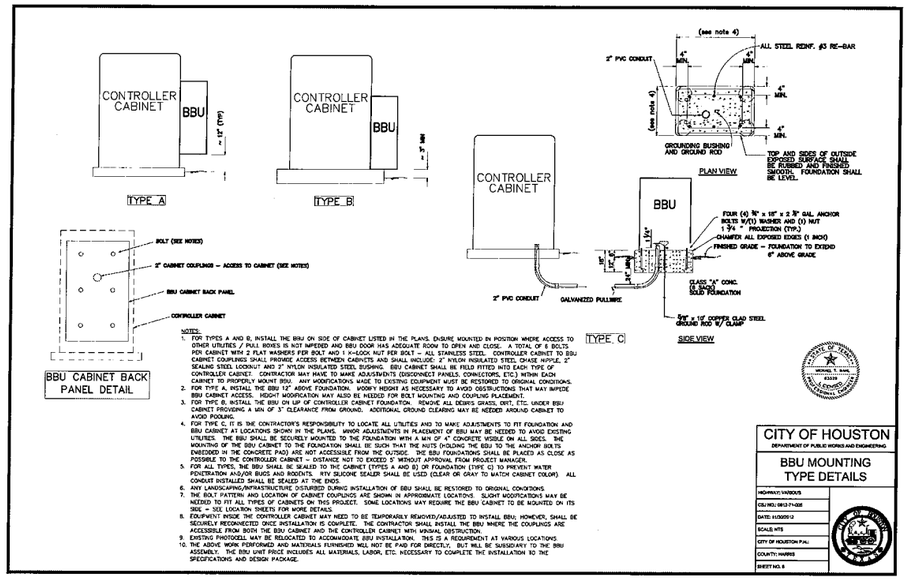
DWG: CONSOR	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: CONSOR	HOU	HARRIS	0912	72	391	326



BBU CABINET BACK PANEL DETAIL

NOTES:
1. FOR TYPES A AND B, INSTALL THE BBU ON SIDE OF CABINET LISTED IN THE PLANS. ENSURE MOUNTED IN POSITION WHERE ACCESS TO OTHER UTILITIES / PULL BOXES IS NOT IMPEDED AND BBU DOOR HAS ADEQUATE ROOM TO OPEN AND CLOSE. A TOTAL OF 8 BOLTS PER CABINET WITH 2 FLAT WASHERS PER BOLT AND 1 K-LOCK NUT PER BOLT – ALL STAINLESS STEEL. CONTROLLER CABINET TO BBU CABINET COUPLINGS SHALL PROVIDE ACCESS BETWEEN CABINETS AND SHALL INCLUDE: 2" NYLON INSULATED STEEL GHASE NIPPLE, 2" SEALING STEEL LOCKNUT AND 2" NYLON INSULATED STEEL BUSHING. BBU CABINET SHALL BE FIELD FITTED INTO EACH TYPE OF CONTROLLER CABINET. CONTRACTOR MAY HAVE TO MAKE ADJUSTMENTS (DISCONNECT PANELS, CONNECTORS, ETC.) WITHIN EACH CABINET TO PROPERLY MOUNT BBU. ANY MODIFICATIONS MADE TO EXISTING EQUIPMENT MUST BE RESTORED TO ORIGINAL CONDITIONS.
2. FOR TYPE A, INSTALL THE BBU 12" ABOVE FOUNDATION. WORK HEIGHT AS NECESSARY TO AVOID OBSTRUCTIONS THAT MAY IMPEDE BBU CABINET ACCESS. HEIGHT MODIFICATION MAY ALSO BE NEEDED FOR BOLT MOUNTING AND COUPLING PLACEMENT.
3. FOR TYPE B, INSTALL THE BBU ON LIP OF CONTROLLER CABINET FOUNDATION. REMOVE ALL DEBRIS GRASS, DIRT, ETC. UNDER BBU CABINET PROVIDING A MIN OF 3" CLEARANCE FROM GROUND. ADDITIONAL GROUND CLEARING MAY BE NEEDED AROUND CABINET TO AVOID POOLING.
4. FOR TYPE C, IT IS THE CONTRACTOR'S RESPONSIBILITY TO LOCATE ALL UTILITIES AND TO MAKE ADJUSTMENTS TO FIT FOUNDATION AND BBU CABINET AT LOCATIONS SHOWN IN THE PLANS. MINOR ADJUSTMENTS IN PLACEMENT OF BBU MAY BE NEEDED TO AVOID EXISTING UTILITIES. THE BBU SHALL BE SECURELY MOUNTED TO THE FOUNDATION WITH A MIN OF 4" CONCRETE VISIBLE ON ALL SIDES. THE MOUNTING OF THE BBU CABINET TO THE FOUNDATION SHALL BE SUCH THAT THE NUTS (HOLDING THE BBU TO THE ANCHOR BOLTS EMBEDDED IN THE CONCRETE PAD) ARE NOT ACCESSIBLE FROM THE OUTSIDE. THE BBU FOUNDATIONS SHALL BE PLACED AS CLOSE AS POSSIBLE TO THE CONTROLLER CABINET – DISTANCE NOT TO EXCEED 5' WITHOUT APPROVAL FROM PROJECT MANAGER.
5. FOR ALL TYPES, THE BBU SHALL BE SEALED TO THE CABINET (TYPES A AND B) OR FOUNDATION (TYPE C) TO PREVENT WATER PENETRATION AND/OR BUGS AND RODENTS. RTV SILICONE SEALER SHALL BE USED (CLEAR OR GRAY TO MATCH CABINET COLOR). ALL CONDUIT INSTALLED SHALL BE SEALED AT THE ENDS.
6. ANY LANDSCAPING/INFRASTRUCTURE DISTURBED DURING INSTALLATION OF BBU SHALL BE RESTORED TO ORIGINAL CONDITIONS.
7. THE BOLT PATTERN AND LOCATION OF CABINET COUPLINGS ARE SHOWN IN APPROXIMATE LOCATIONS. SLIGHT MODIFICATIONS MAY BE NEEDED TO FIT ALL TYPES OF CABINETS ON THIS PROJECT. SOME LOCATIONS MAY REQUIRE THE BBU CABINET TO BE MOUNTED ON ITS SIDE – SEE LOCATION SHEETS FOR MORE DETAILS.
8. EQUIPMENT INSIDE THE CONTROLLER CABINET MAY NEED TO BE TEMPORARILY REMOVED/ADJUSTED TO INSTALL BBU; HOWEVER, SHALL BE SECURELY RECONNECTED ONCE INSTALLATION IS COMPLETE. THE CONTRACTOR SHALL INSTALL THE BBU WHERE THE COUPLINGS ARE ACCESSIBLE FROM BOTH THE BBU CABINET AND THE CONTROLLER CABINET WITH MINIMAL OBSTRUCTION.
9. EXISTING PHOTOCELL MAY BE RELOCATED TO ACCOMMODATE BBU INSTALLATION. THIS IS A REQUIREMENT AT VARIOUS LOCATIONS.
10. THE ABOVE WORK PERFORMED AND MATERIALS FURNISHED WILL NOT BE PAID FOR DIRECTLY, BUT WILL BE SUBSIDIARY TO THE BBU ASSEMBLY. THE BBU UNIT PRICE INCLUDES ALL MATERIALS, LABOR, ETC. NECESSARY TO COMPLETE THE INSTALLATION TO THE SPECIFICATIONS AND DESIGN PACKAGE.

MICHAEL T. SHAW
83026
LICENSED PROFESSIONAL ENGINEER

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

BBU MOUNTING TYPE DETAILS

HIGHWAY: VARIOUS	
CSJ NO.: 0912-71-005	
DATE: 11/20/2012	
SCALE: NTS	
CITY OF HOUSTON P.N.:	
COUNTY: HARRIS	
SHEET NO.: 8	

UPS Controller Settings ITS-340
Menu Options: 4 – 4 – 2

- Program following settings into Configuration – Cabinet – Inputs:

Cabinet Table 1 Inputs

Channel	S2	S3	S4	S5
FctnType	Alarm	PlnEna	PlnSel	Alarm
FctnIndx	3	8	8	4
Device	IN3	IN3	IN3	None
Pin	28	29	29	None
Chan1	0	0	0	64
Chan2	0	0	0	0
Logic	And	And	And	And

- Input File 3 must be turned on:

Cabinet Table 1 Devices

Device	1	2	3	4	5
FIO Addr/TF Blk/Out(SIU)	14Pak	Off	Off	Off	unused
Det Blk/In SIU	On	On	On	Off	Off

- In the controller select from Home Screen:
  - 2 for PARAMETER
  - 7 for EXTERNAL
- Note: ADD an External Plan 8 in controller as follows:
  - Enable (ENA) ExtPln 8 and select pin (PinSel) 8
  - in controller mode (Ctrl Mode) set to FLASH *(using plus or minus button on key pad)* and for Plan leave it 0

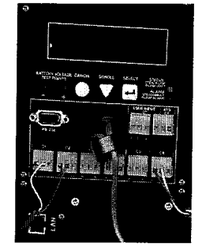
Parameters External Plan Params

Plan	Enable	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	CtrlMode	Plan	Description
1	X			X						ExtPlan	1	Dial 1
2	X	X		X						ExtPlan	2	Dial 2
3	X		X	X						ExtPlan	3	Dial 3
4	X	X	X	X						ExtPlan	4	Dial 4
5										ExtPlan	0	Return To Schedule
6										ExtPlan	0	
7										ExtPlan	0	
8	X								X	Flash	0	

- Configuring the UPS Module & Setting Alarms
  - Connect Laptop to UPS LAN port via crossover CAT-5 Ethernet cable
  - Open Internet Explorer on Laptop
  - Type in following IP address into html browser bar: 192.168.0.90
    - This will access the ALPHA user interface
  - Click on UPS Maintenance, then click Relay & Load Shed
    - Change Relay C2 to Timer 1
    - Change Timer 1 from 2 hrs. (default factory setting) to 4 hrs.
  - Lastly, click Update Config. It will prompt you for a password, and the default password is set to 1111

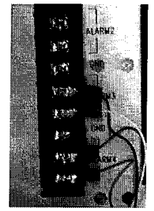
- Wiring ALPHA UPS contacts

C1	C2	C3	C4	C5	C6 (Fan)
Black-NO White-C	Blue-NO Green-C	*Not used*	*Not used*	*Not used*	Red-NO White-C



- Wiring 340 [ITS] cabinet
  - Inside 340 [ITS] cabinet, 242 card on Input File 3 (first card beside SIU) shows Alarm 3 on top channel (CH1), and Alarm 4 on bottom channel (CH2). CH1 indicates output from C1 of UPS and indicates running on battery backup power supply. CH2 indicates output from C2 of UPS and indicates cabinet has been running on battery backup for 4 or more hours, once this indication is received, controller will flash to conserve battery life

  - On field input panel #2, wire as shown: C1 lands on ALARM3 (UPS ON) and C2 lands on ALARM4 (UPS FLASH)



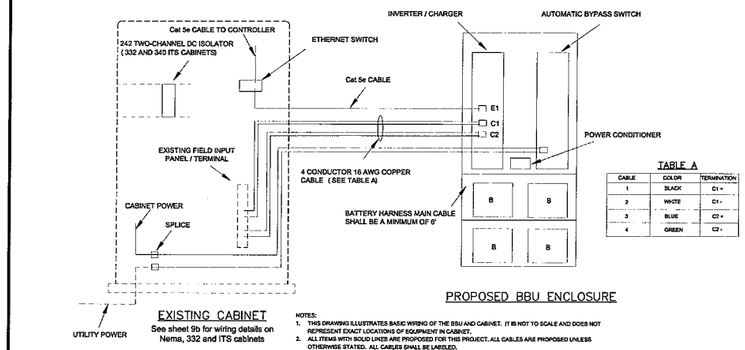


TABLE A

CABLE	COLOR	TERMINATION
1	BLACK	C1 +
2	WHITE	C1 -
3	BLUE	C2 +
4	GREEN	C2 -

B = BATTERIES
E1 = ETHERNET PORT
C1 = CONTACT #1 = UPS ON
C2 = CONTACT #2 = UPS FLASH

NOTES:
1. THIS DRAWING ILLUSTRATES BASIC WIRING OF THE BBU AND CABINET. IT IS NOT TO SCALE AND DOES NOT REPRESENT EXACT LOCATIONS OF EQUIPMENT IN CABINET.
2. ALL ITEMS WITH SOLID LINES ARE PROPOSED FOR THIS PROJECT. ALL CABLES ARE PROPOSED UNLESS OTHERWISE STATED. ALL CABLES SHALL BE LABELED.
3. THE ABOVE WORK PERFORMED AND MATERIALS FURNISHED WILL NOT BE PAID FOR DIRECTLY, BUT WILL BE SUBSIDIARY TO THE BBU ASSEMBLY.
4. THE PROPOSED UPS SYSTEM SHALL SUPPORT ETHERNET PROTOCOL FOR COMMUNICATIONS TO INTERNET.
5. ALL BBU CONTACT CONNECTIONS SHALL BE TESTED TO ENSURE PROPER OPERATION WITH TRAFFIC CONTROL EQUIPMENT (CABINET, CONTROLLER, ETC.).
6. SECURELY MOUNT THE ETHERNET SWITCH IN THE CABINET VIA THE DIN RAIL FOR 340 ITS AND 332 CABINETS, COMMUNICATIONS BOX IN METRO CABINET OR ON SHELF IN P CABINET. ADDITIONAL POWER STRIP SHALL BE PROVIDED AND INSTALLED BY CONTRACTOR.
7. THE POWER CONDITIONER SHALL SPREAD THE CHARGE VOLTAGE EQUALLY ACROSS ALL BATTERIES. IT SHALL ALLOW THE REPLACEMENT OF SINGLE BATTERIES IN THE CHAIN. IT SHALL ENSURE THAT EVERY BATTERY IS PROPERLY CHARGED TO OPTIMIZE THE LIFE AND RUNTIME OF EACH BATTERY. IT SHALL MEET CSA C22.2 NO.107.1 AND UL 1778 STANDARDS.
8. BATTERIES SHALL BE NUMBERED 1-4.

MICHAEL T. SHAW
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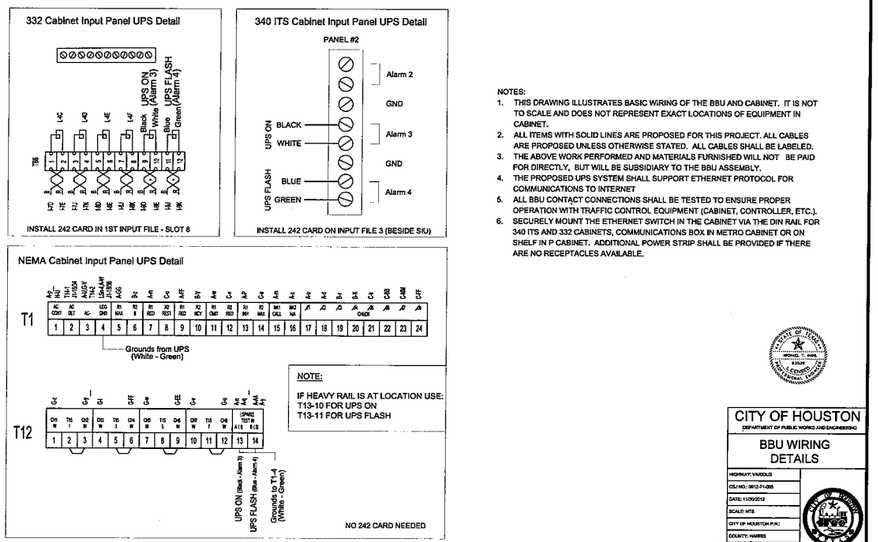
LICENSED PROFESSIONAL ENGINEER

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

BBU WIRING DETAILS

HIGHWAY: VARIOUS	
CSJ NO.: 0912-71-005	
DATE: 11/20/2012	
SCALE: NTS	
CITY OF HOUSTON P.N.:	
COUNTY: HARRIS	
SHEET NO.: 9A	



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3. THE ABOVE WORK PERFORMED AND MATERIALS FURNISHED WILL NOT BE PAID FOR DIRECTLY, BUT WILL BE SUBSIDIARY TO THE BBU ASSEMBLY.
4. THE PROPOSED UPS SYSTEM SHALL SUPPORT ETHERNET PROTOCOL FOR COMMUNICATIONS TO INTERNET
5. ALL BBU CONTACT CONNECTIONS SHALL BE TESTED TO ENSURE PROPER OPERATION WITH TRAFFIC CONTROL EQUIPMENT (CABINET, CONTROLLER, ETC.).
6. SECURELY MOUNT THE ETHERNET SWITCH IN THE CABINET VIA THE DIN RAIL FOR 340 ITS AND 332 CABINETS, COMMUNICATIONS BOX IN METRO CABINET OR ON SHELF IN P CABINET. ADDITIONAL POWER STRIP SHALL BE PROVIDED IF THERE ARE NO RECEPTACLES AVAILABLE.

NOTE:
IF HEAVY RAIL IS AT LOCATION USE:
T13-10 FOR UPS ON
T13-11 FOR UPS FLASH

MICHAEL T. SHAW
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LICENSED PROFESSIONAL ENGINEER

CITY OF HOUSTON
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

BBU WIRING DETAILS

HIGHWAY: VARIOUS	
CSJ NO.: 0912-71-005	
DATE: 11/20/2012	
SCALE: NTS	
CITY OF HOUSTON P.N.:	
COUNTY: HARRIS	
SHEET NO.: 9B	

PLOTTED
67862

STATE OF TEXAS
ZINA I. SCHWARTZ
85814
LICENSED PROFESSIONAL ENGINEER

2/6/2020

REV. NO.	DATE	DESCRIPTION	BY

CONSOR
F-12040

Texas Department of Transportation
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

CITY OF HOUSTON MISCELLANEOUS DETAILS

SHEET 2 OF 2

DGN: CONSOR	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
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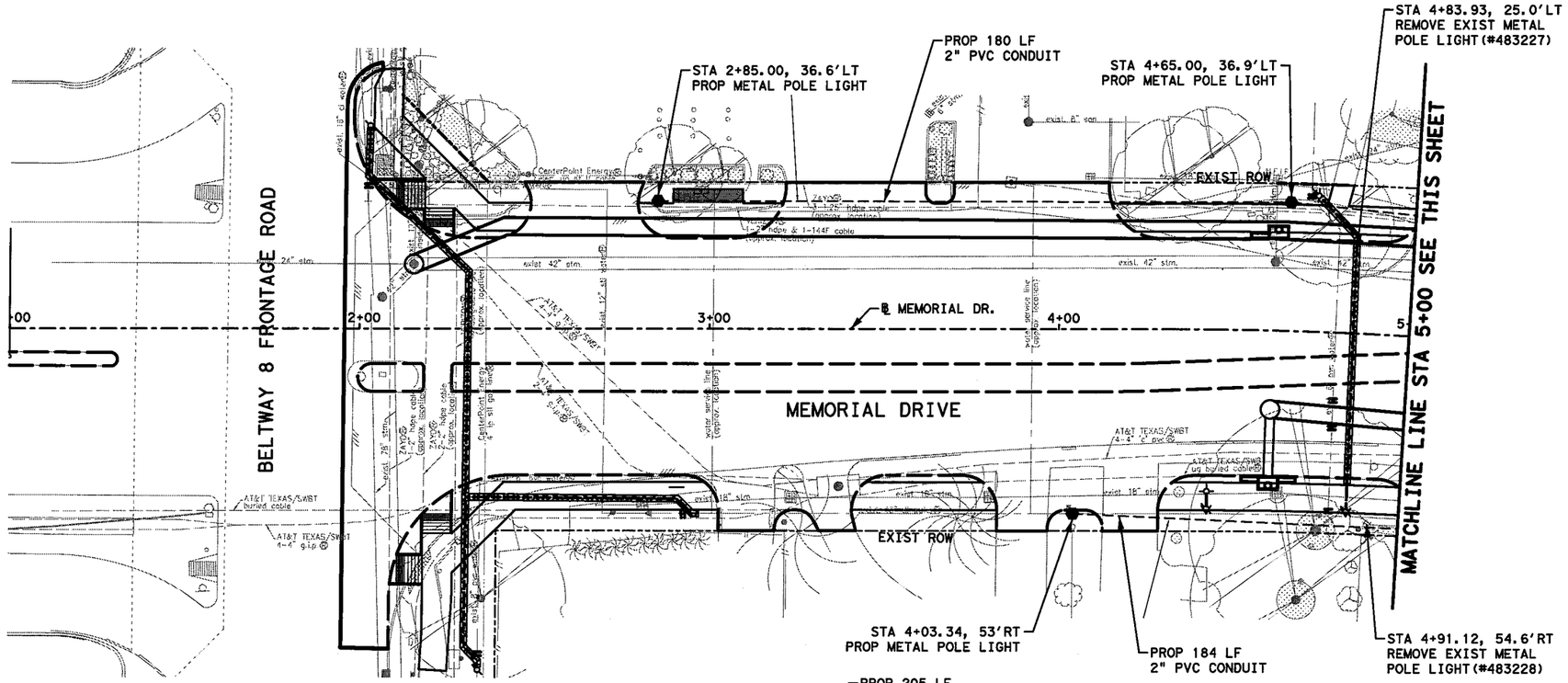

LEGEND

- EXIST METAL POLE LIGHT TO BE REMOVED (BY OTHERS)
- EXIST WOOD POLE LIGHT
- EXIST WOOD POLE
- PROPOSED METAL POLE LIGHT
- PROPOSED WOOD POLE LIGHT
- PROPOSED PULL BOX
- PROPOSED TRAFFIC SIGNAL POLE W/ STREET LIGHT
- PROPOSED PVC CONDUIT AND CONDUCTORS
- PROPOSED BORED CONDUIT AND CONDUCTORS

NOTES:

1. EXISTING STREET LIGHTS POLES, CONDUITS AND WIRING TO BE REMOVED.
2. COORDINATE WITH UTILITY COMPANY FOR DE-ENERGIZING AND POLE REMOVAL/DISPOSAL.
3. ALL WOOD POLES TO REMAIN IN PLACE UNLESS OTHERWISE NOTED.
4. ALL PROP LIGHTS TO BE 115W LED UNLESS NOTED DIFFERENTLY ON PLANS.
5. ALL PROP METAL POLE LIGHTS SHALL BE 35' BASE TYPE COBRA POLES W/ 10' TRUSS ARMS UNLESS NOTED DIFFERENTLY ON PLANS.
6. ALL STREET LIGHT FOUNDATIONS TO BE INSTALLED BY CONTRACTOR.

0 40 80

(IN FEET)

SCALE: PLAN 1" = 40'

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED
PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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67862

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STREET LIGHTING PLAN BEGIN PROJECT TO STA 9+00

SHEET 1 OF 6

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
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DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	328

Plotted on: 3/4/2020 4:31:08 PM AAGakhar

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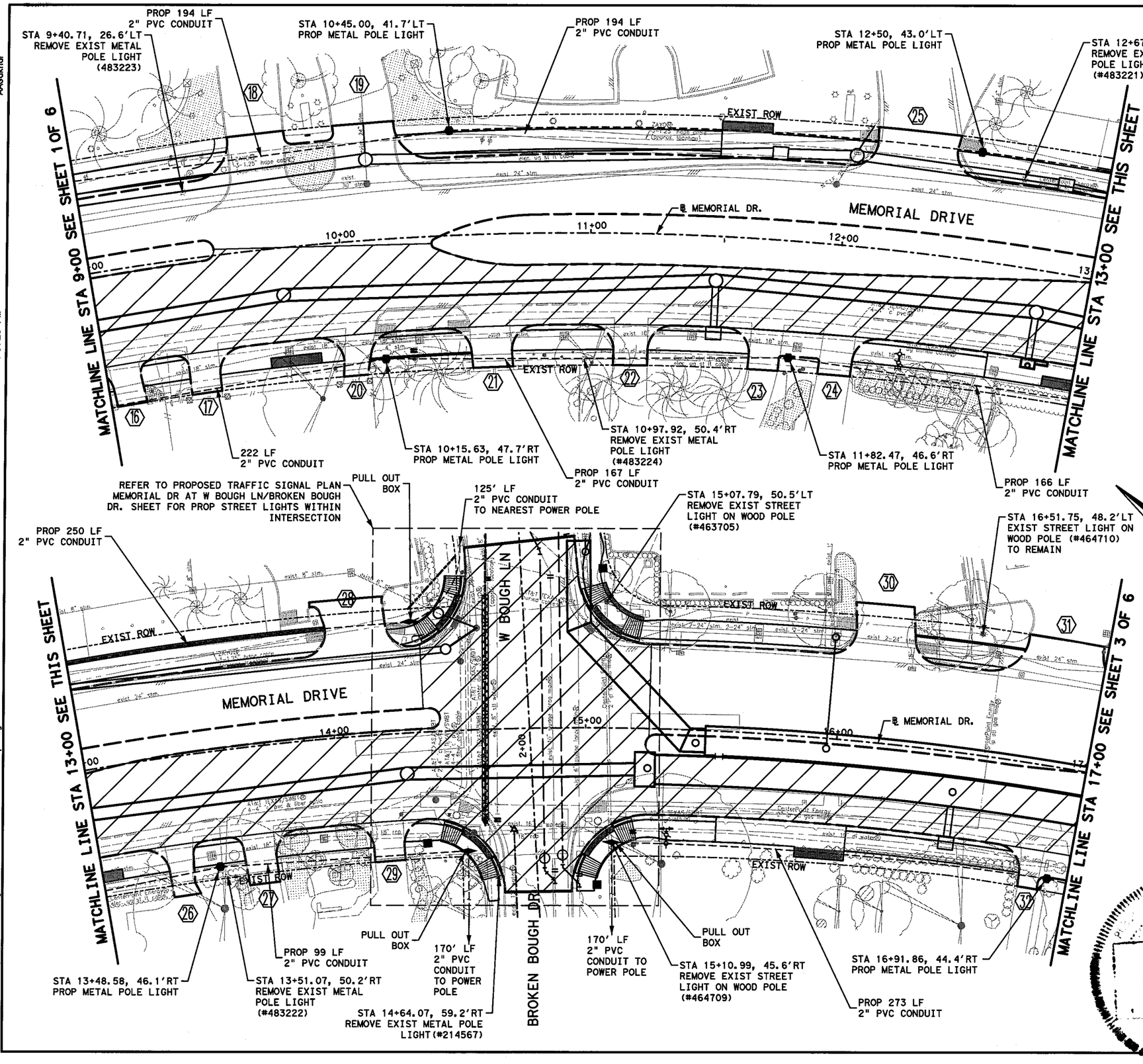

LEGEND

- EXIST METAL POLE LIGHT TO BE REMOVED (BY OTHERS)
- EXIST WOOD POLE LIGHT
- EXIST WOOD POLE
- PROPOSED METAL POLE LIGHT
- PROPOSED WOOD POLE LIGHT
- PROPOSED PULL BOX
- PROPOSED TRAFFIC SIGNAL POLE W/ STREET LIGHT
- PROPOSED PVC CONDUIT AND CONDUCTORS
- PROPOSED BORED CONDUIT AND CONDUCTORS

NOTES:

1. EXISTING STREET LIGHTS POLES, CONDUITS AND WIRING TO BE REMOVED.
2. COORDINATE WITH UTILITY COMPANY FOR DE-ENERGIZING AND POLE REMOVAL/DISPOSAL.
3. ALL WOOD POLES TO REMAIN IN PLACE UNLESS OTHERWISE NOTED.
4. ALL PROP LIGHTS TO BE 115W LED UNLESS NOTED DIFFERENTLY ON PLANS.
5. ALL PROP METAL POLE LIGHTS SHALL BE 35' BASE TYPE COBRA POLES W/ 10' TRUSS ARMS UNLESS NOTED DIFFERENTLY ON PLANS.
6. ALL STREET LIGHT FOUNDATIONS TO BE INSTALLED BY CONTRACTOR.

0 40 80

(IN FEET)

SCALE: PLAN 1": 40'

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED
PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation ©2020

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STREET LIGHTING PLAN STA 9+00 TO STA 17+00

SHEET 2 OF 6

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWN:	HOU	HARRIS	0912	72	391	329

67862

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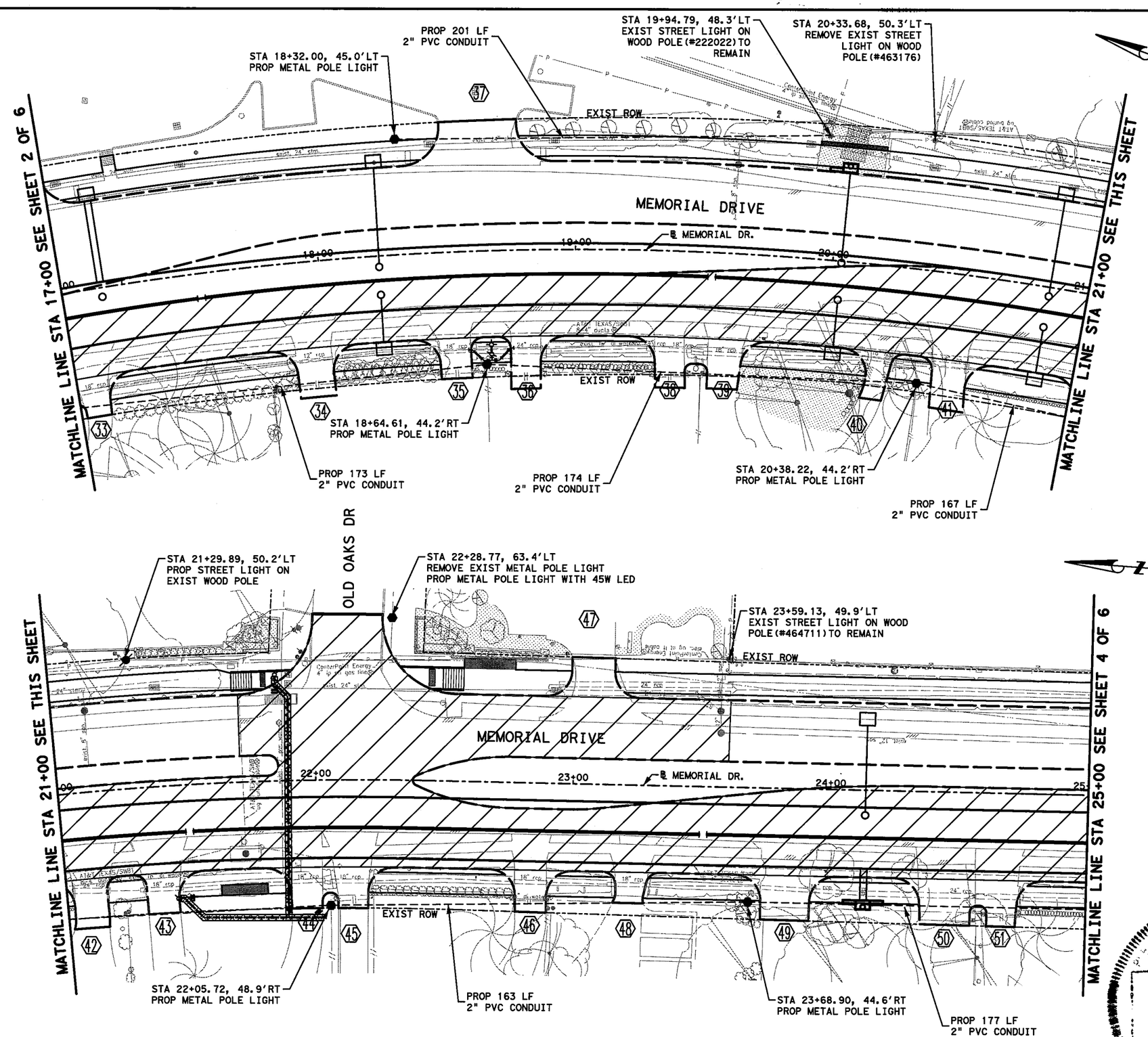

LEGEND

- EXIST METAL POLE LIGHT TO BE REMOVED (BY OTHERS)
- EXIST WOOD POLE LIGHT
- EXIST WOOD POLE
- PROPOSED METAL POLE LIGHT
- PROPOSED WOOD POLE LIGHT
- PROPOSED PULL BOX
- PROPOSED TRAFFIC SIGNAL POLE W/ STREET LIGHT
- PROPOSED PVC CONDUIT AND CONDUCTORS
- PROPOSED BORED CONDUIT AND CONDUCTORS

NOTES:

1. EXISTING STREET LIGHTS POLES, CONDUITS AND WIRING TO BE REMOVED.
2. COORDINATE WITH UTILITY COMPANY FOR DE-ENERGIZING AND POLE REMOVAL/DISPOSAL.
3. ALL WOOD POLES TO REMAIN IN PLACE UNLESS OTHERWISE NOTED.
4. ALL PROP LIGHTS TO BE 115W LED UNLESS NOTED DIFFERENTLY ON PLANS.
5. ALL PROP METAL POLE LIGHTS SHALL BE 35' BASE TYPE COBRA POLES W/ 10' TRUSS ARMS UNLESS NOTED DIFFERENTLY ON PLANS.
6. ALL STREET LIGHT FOUNDATIONS TO BE INSTALLED BY CONTRACTOR.

0 40 80
(IN FEET)
SCALE: PLAN 1" = 40'

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED
PROFESSIONAL ENGINEER
03/04/2020
Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
©2020

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STREET LIGHTING PLAN
STA 17+00 TO STA 25+00

SHEET 3 OF 6

DSN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK:	6	TEXAS	STP 1802(783)MM			CS
DSN:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
DWN:	HOU	HARRIS	0912	72	391	330
CK:						

67862

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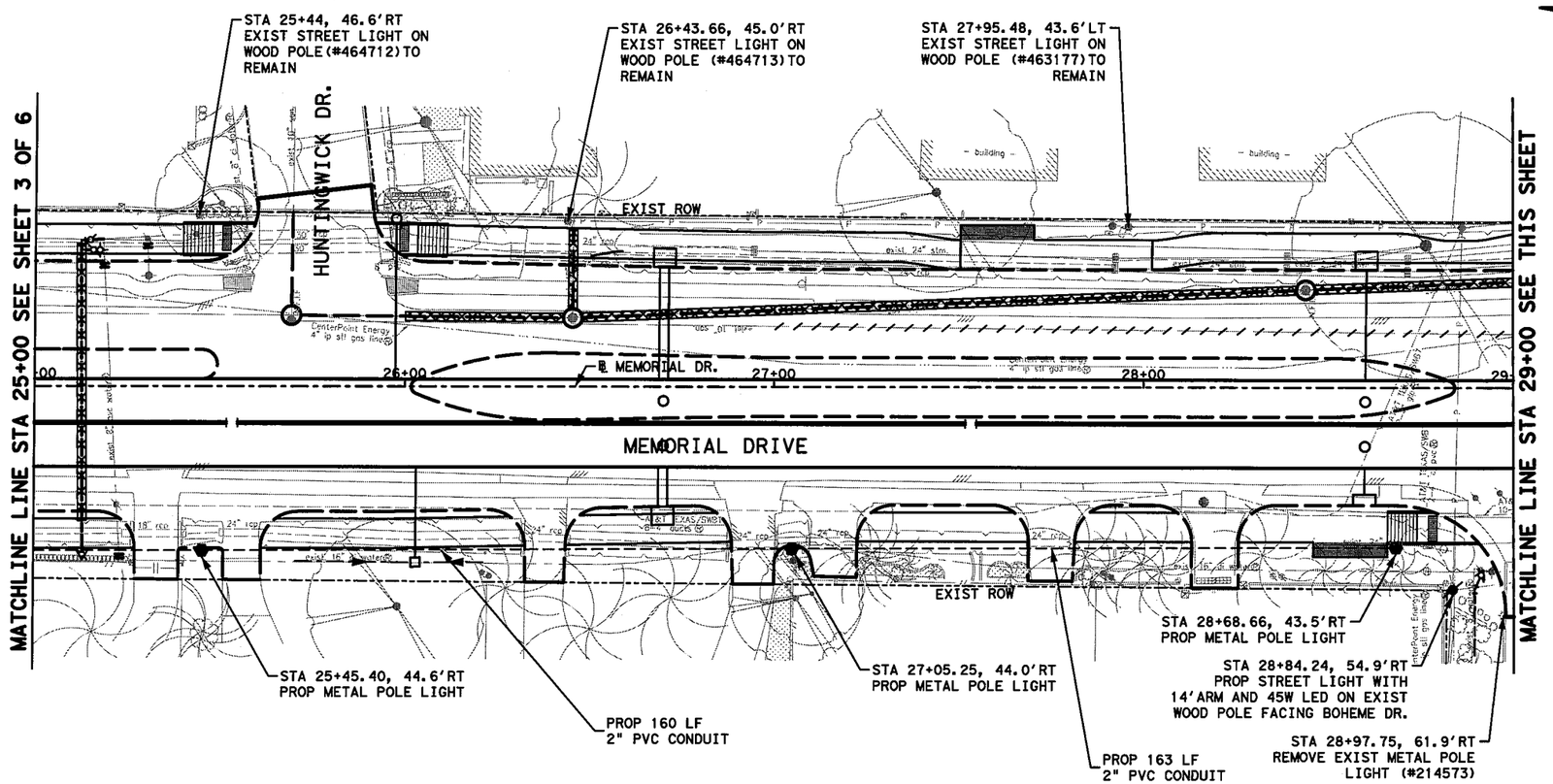

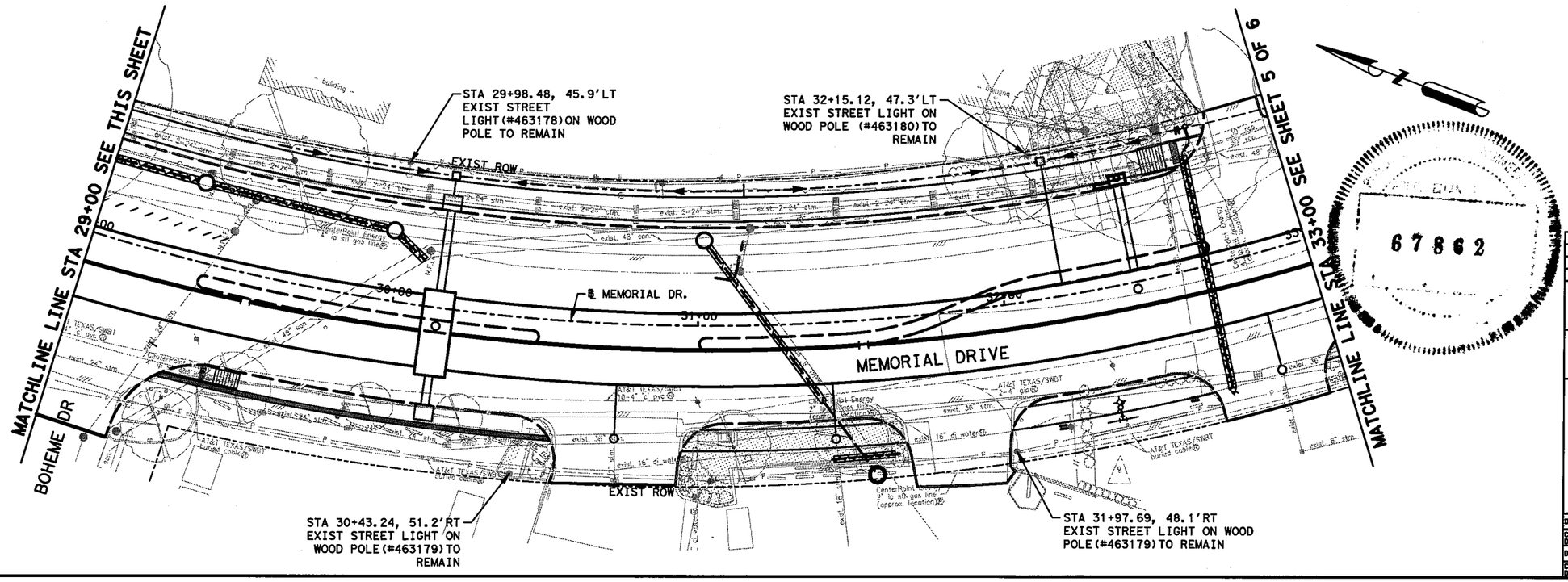

LEGEND

- EXIST METAL POLE LIGHT TO BE REMOVED (BY OTHERS)
- EXIST WOOD POLE LIGHT
- EXIST WOOD POLE
- PROPOSED METAL POLE LIGHT
- PROPOSED WOOD POLE LIGHT
- PROPOSED PULL BOX
- PROPOSED TRAFFIC SIGNAL POLE W/ STREET LIGHT
- PROPOSED PVC CONDUIT AND CONDUCTORS
- PROPOSED BORED CONDUIT AND CONDUCTORS

NOTES:

1. EXISTING STREET LIGHTS POLES, CONDUITS AND WIRING TO BE REMOVED.
2. COORDINATE WITH UTILITY COMPANY FOR DE-ENERGIZING AND POLE REMOVAL/DISPOSAL.
3. ALL WOOD POLES TO REMAIN IN PLACE UNLESS OTHERWISE NOTED.
4. ALL PROP LIGHTS TO BE 115W LED UNLESS NOTED DIFFERENTLY ON PLANS.
5. ALL PROP METAL POLE LIGHTS SHALL BE 35' BASE TYPE COBRA POLES W/ 10' TRUSS ARMS UNLESS NOTED DIFFERENTLY ON PLANS.
6. ALL STREET LIGHT FOUNDATIONS TO BE INSTALLED BY CONTRACTOR.

0 40 80
(IN FEET)
SCALE: PLAN 1":40'

STATE OF TEXAS
MARK WOODWARD
98672
LICENSED
PROFESSIONAL ENGINEER
03/04/2020
Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

67862

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
©2020

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STREET LIGHTING PLAN
STA 25+00 TO STA 33+00

SHEET 4 OF 6

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWN:	HOU	HARRIS	0912	72	391	331

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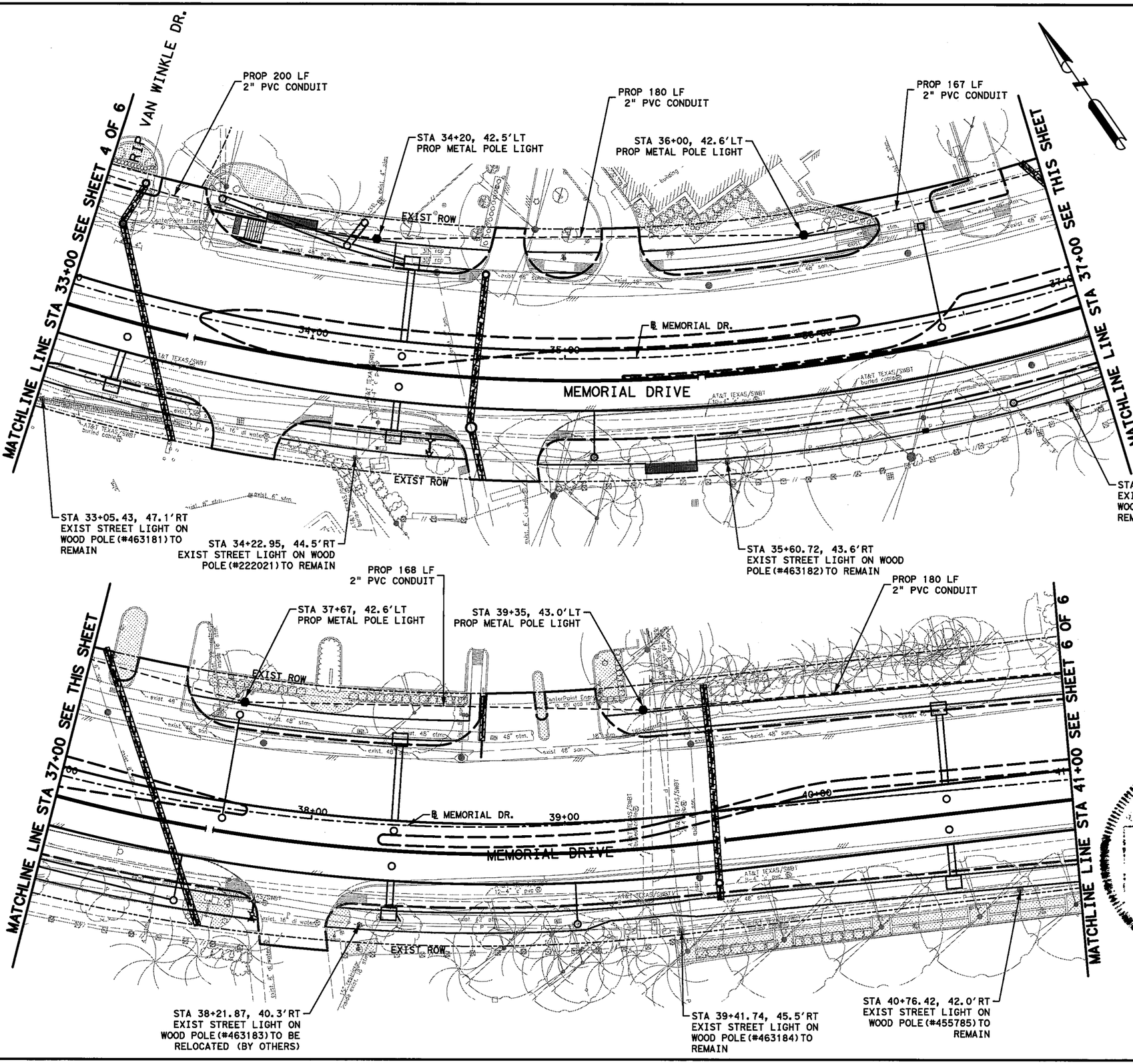

LEGEND

- EXIST METAL POLE LIGHT TO BE REMOVED (BY OTHERS)
- EXIST WOOD POLE LIGHT
- EXIST WOOD POLE
- PROPOSED METAL POLE LIGHT
- PROPOSED WOOD POLE LIGHT
- PROPOSED PULL BOX
- PROPOSED TRAFFIC SIGNAL POLE W/ STREET LIGHT
- PROPOSED PVC CONDUIT AND CONDUCTORS
- PROPOSED BORED CONDUIT AND CONDUCTORS

NOTES:

1. EXISTING STREET LIGHTS POLES, CONDUITS AND WIRING TO BE REMOVED.
2. COORDINATE WITH UTILITY COMPANY FOR DE-ENERGIZING AND POLE REMOVAL/DISPOSAL.
3. ALL WOOD POLES TO REMAIN IN PLACE UNLESS OTHERWISE NOTED.
4. ALL PROP LIGHTS TO BE 115W LED UNLESS NOTED DIFFERENTLY ON PLANS.
5. ALL PROP METAL POLE LIGHTS SHALL BE 35' BASE TYPE COBRA POLES W/ 10' TRUSS ARMS UNLESS NOTED DIFFERENTLY ON PLANS.
6. ALL STREET LIGHT FOUNDATIONS TO BE INSTALLED BY CONTRACTOR.

0 40 80
(IN FEET)
SCALE: PLAN 1"= 40'

STATE OF TEXAS
MARK WOODWARD
98672
LICENSED PROFESSIONAL ENGINEER
03/04/2020
Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

67862

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STREET LIGHTING PLAN STA 33+00 TO STA 41+00

SHEET 5 OF 6

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	332

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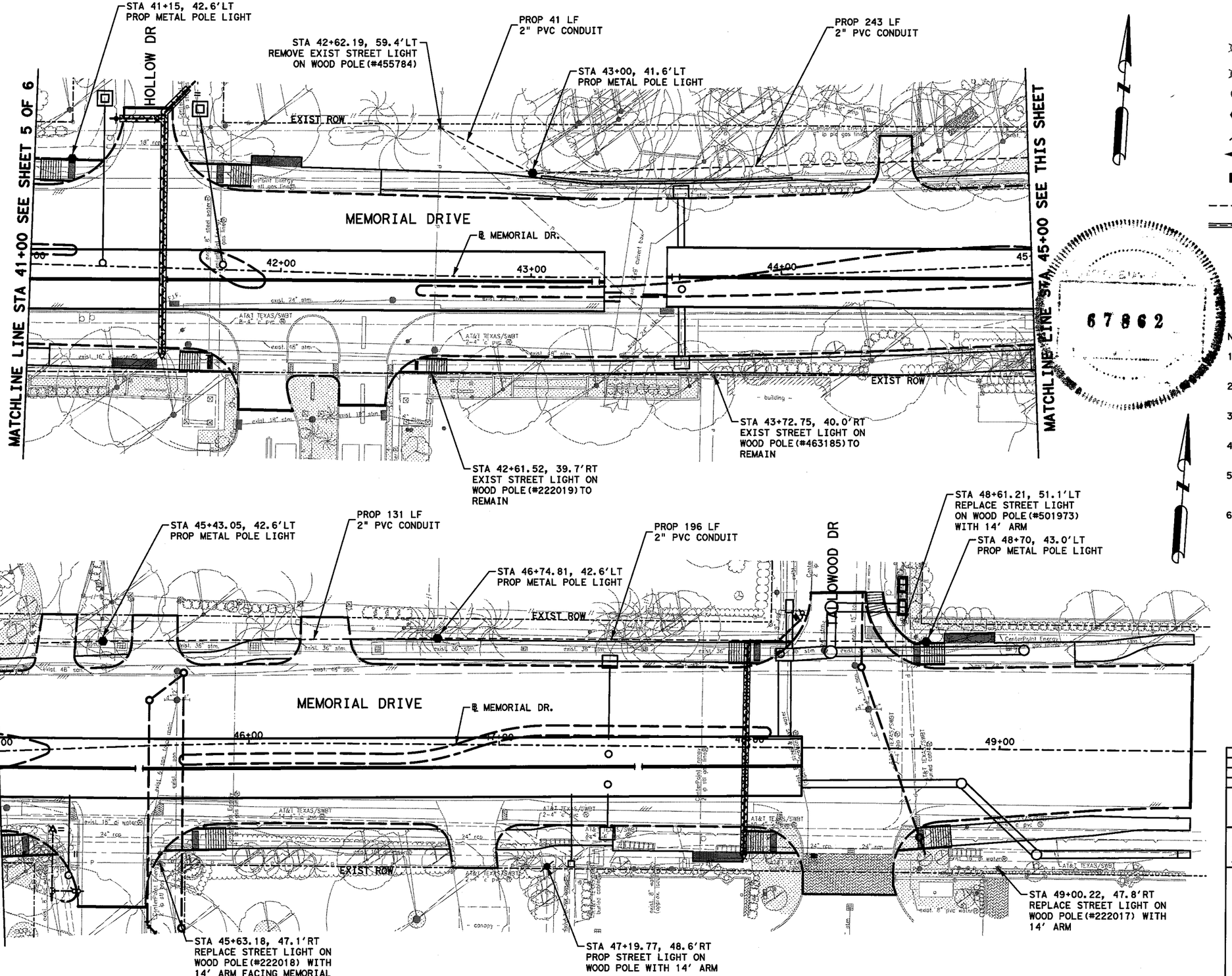

LEGEND

- EXIST METAL POLE LIGHT TO BE REMOVED (BY OTHERS)
- EXIST WOOD POLE LIGHT
- EXIST WOOD POLE
- PROPOSED METAL POLE LIGHT
- PROPOSED WOOD POLE LIGHT
- PROPOSED PULL BOX
- PROPOSED TRAFFIC SIGNAL POLE W/ STREET LIGHT
- PROPOSED PVC CONDUIT AND CONDUCTORS
- PROPOSED BORED CONDUIT AND CONDUCTORS

67862

NOTES:

1. EXISTING STREET LIGHTS POLES, CONDUITS AND WIRING TO BE REMOVED.
2. COORDINATE WITH UTILITY COMPANY FOR DE-ENERGIZING AND POLE REMOVAL/DISPOSAL.
3. ALL WOOD POLES TO REMAIN IN PLACE UNLESS OTHERWISE NOTED.
4. ALL PROP LIGHTS TO BE 115W LED UNLESS NOTED DIFFERENTLY ON PLANS.
5. ALL PROP METAL POLE LIGHTS SHALL BE 35' BASE TYPE COBRA POLES W/ 10' TRUSS ARMS UNLESS NOTED DIFFERENTLY ON PLANS.
6. ALL STREET LIGHT FOUNDATIONS TO BE INSTALLED BY CONTRACTOR.

0 40 80

(IN FEET)

SCALE: PLAN 1": 40'

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED
PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STREET LIGHTING PLAN STA 41+00 TO END PROJECT

SHEET 6 OF 6

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	333

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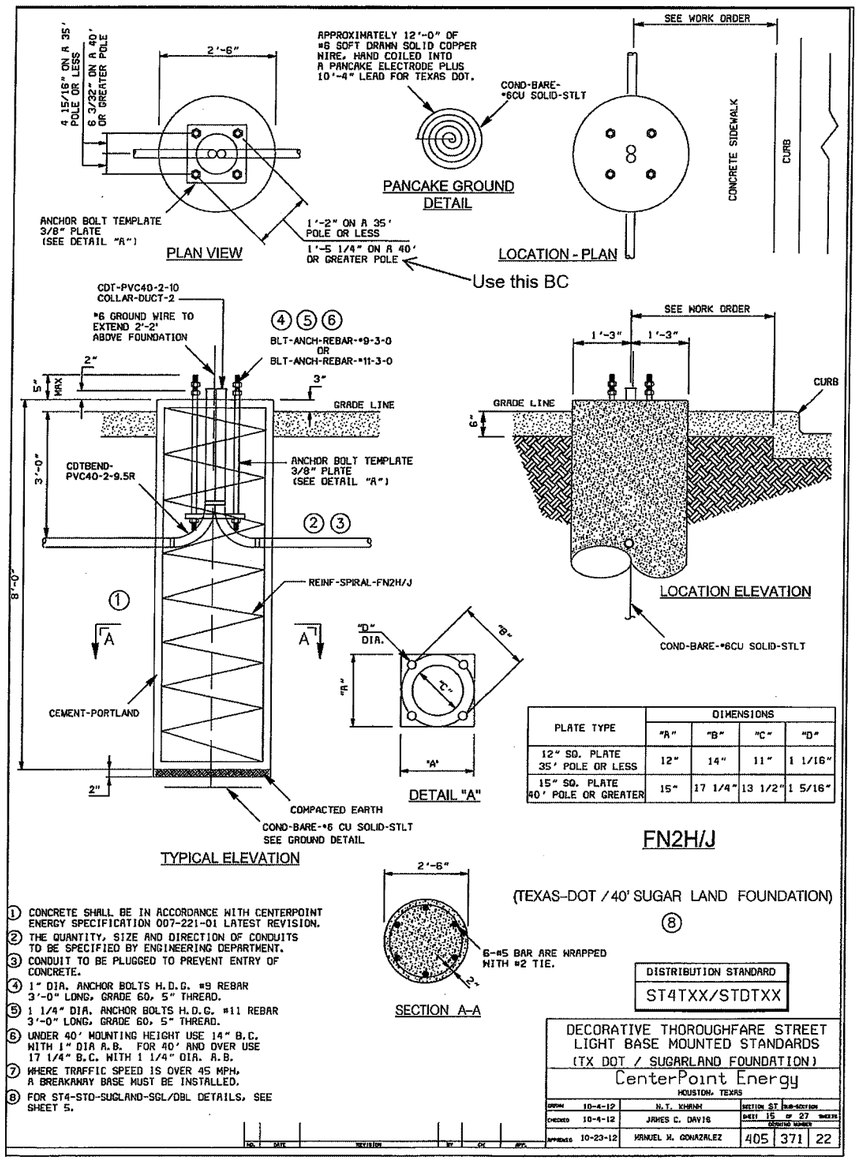

PLATE TYPE	DIMENSIONS			
	"A"	"B"	"C"	"D"
12" SQ. PLATE 35' POLE OR LESS	12"	14"	11"	1 1/16"
15" SQ. PLATE 40' POLE OR GREATER	15"	17 1/4"	13 1/2"	1 5/16"

FN2H/J

(TEXAS-DOT / 40' SUGAR LAND FOUNDATION)

⑧

DISTRIBUTION STANDARD
ST4TXX/STDTXX

1. CONCRETE SHALL BE IN ACCORDANCE WITH CENTERPOINT ENERGY SPECIFICATION 007-221-01 LATEST REVISION.
2. THE QUANTITY, SIZE AND DIRECTION OF CONDUITS TO BE SPECIFIED BY ENGINEERING DEPARTMENT.
3. CONDUIT TO BE PLUGGED TO PREVENT ENTRY OF CONCRETE.
4. 1" DIA. ANCHOR BOLTS H.D.G. #9 REBAR 3'-0" LONG, GRADE 60, 5" THREAD.
5. 1 1/4" DIA. ANCHOR BOLTS H.D.G. #11 REBAR 3'-0" LONG, GRADE 60, 5" THREAD.
6. UNDER 40' MOUNTING HEIGHT USE 14" B.C. WITH 1" DIA A.B. FOR 40' AND OVER USE 17 1/4" B.C. WITH 1 1/4" DIA. A.B.
7. WHERE TRAFFIC SPEED IS OVER 45 MPH, A BREAKAWAY BASE MUST BE INSTALLED.
8. FOR ST4-STD-SUGLAND-SGL/DBL DETAILS, SEE SHEET 5.

DECORATIVE THOROUGHFARE STREET LIGHT BASE MOUNTED STANDARDS
(TX DOT / SUGARLAND FOUNDATION)
CenterPoint Energy
HOUSTON, TEXAS

DESIGNED	10-4-12	N.T. KHAN	SECTION ST	SUB-SECTION
CHECKED	10-4-12	JAMES C. DAVIS	SHEET 15 OF 27 SHEETS	
APPROVED	10-23-12	MANUEL M. GONZALEZ	DRAWING NUMBER 405 371 22	

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation ©2020

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STREET LIGHTING DETAILS

SHEET 1 OF 1

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	334

67862

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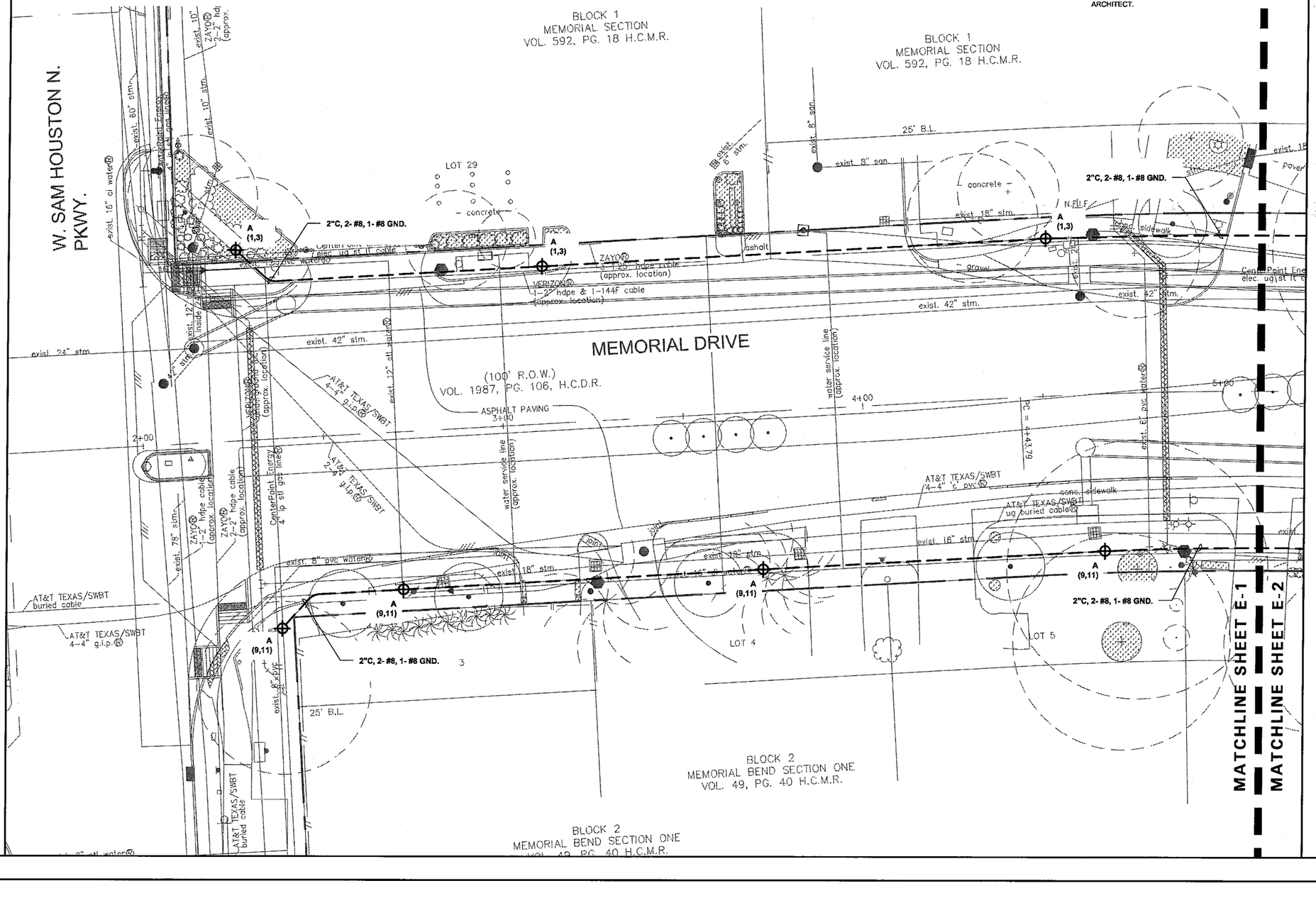
QUANTITIES			
ITEM NO.	DESCRIPTION	UNIT	QUANTITY
0618-6046	CONDT (PVC) (SCHD 80) (2")	LF	650
0620-6008	ELEC CONDR (NO. 8) INSULATED	LF	1,400
0620-6008	ELEC CONDR (NO. 8) INSULATED (GROUND WIRE)	LF	700
1002-6002	LANDSCAPE AMENITY (TYP 1) PER DESCRIPTION IN FIXTURE SCHEDULE (RE: DRAWING E-18)	EA	7

LEGEND:

- PROPOSED ELECTRICAL SERVICE POLE (RE: DRAWING E-17)
- PROPOSED SCHEDULE 80 PVC CONDUIT, UNDERGROUND
- PROPOSED GROUND BOX
- A (1,3) PROPOSED LANDSCAPE AMENITY (CIRCUIT NUMBER)

GENERAL NOTES:

1. ALL ELECTRICAL WORK SHALL BE DONE IN COMPLIANCE WITH THE NEC AND TXDOT STANDARDS.
2. LOCATION OF UTILITIES SHOWN ARE APPROXIMATE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO LOCATE ALL UTILITIES (PUBLIC AND PRIVATE) PRIOR TO COMMENCING WORK. THE CONTRACTOR IS FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY HIS/HER FAILURE TO LOCATE AND PRESERVE THESE UTILITIES, WHETHER UNDERGROUND, ABOVEGROUND OR OVERHEAD.
3. ALL WIRING TO BE 600V Cu, TYPE XHHW. SEE CONDUIT AND CONDUCTOR SCHEDULE FOR CONDUCTOR SIZING. GROUND WIRES SHALL BE AS PER NEC 250.
4. NEW BRANCH CIRCUITS 1-3 AND 9-11 ON PLAN DRAWING E-1 ARE TO BE FED FROM NEW TYPE D ELECTRICAL SERVICE, AS SHOWN ON DRAWING E-17.
5. IN DRIP ZONES OF ALL EXISTING TREES, ELECTRICAL CONTRACTOR SHALL AIR SPADE OR HAND DUG ALL TRENCHES. NO ROOTS OVER 1/2" SHALL BE CUT OR REMOVED.
6. LOCATION OF ALL ELECTRICAL ITEMS TO BE FIELD APPROVED PRIOR TO INSTALLATION BY LANDSCAPE ARCHITECT.



Landscape Architect

swa

1245 West 18th Street
Houston, Texas
77008-3342
United States
www.swagroup.com
+1.713.868.1676 o

Electrical Engineer

HUNT & HUNT ENGINEERING CORP.
P.O. Box 771294 • Houston, Texas 77215
TBPE Firm No. F-3446

FILED AND RECORDED
ENGINEERING
67862

0 30 60
(IN FEET)
SCALE: 1"=30'-0"

STATE OF TEXAS
AYOUB FAHMI YOUSEF ODEH
125040
REGISTERED PROFESSIONAL ENGINEER
02-03-2020

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

PEDESTRIAN LIGHTING LAYOUT

E-1 SHEET 1 OF 16

DGN: AO	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: AO	6	TEXAS	STP 1802 (783) MM			CS
DWG: AH	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: LH	HOU	HARRIS	0912	72	391	335

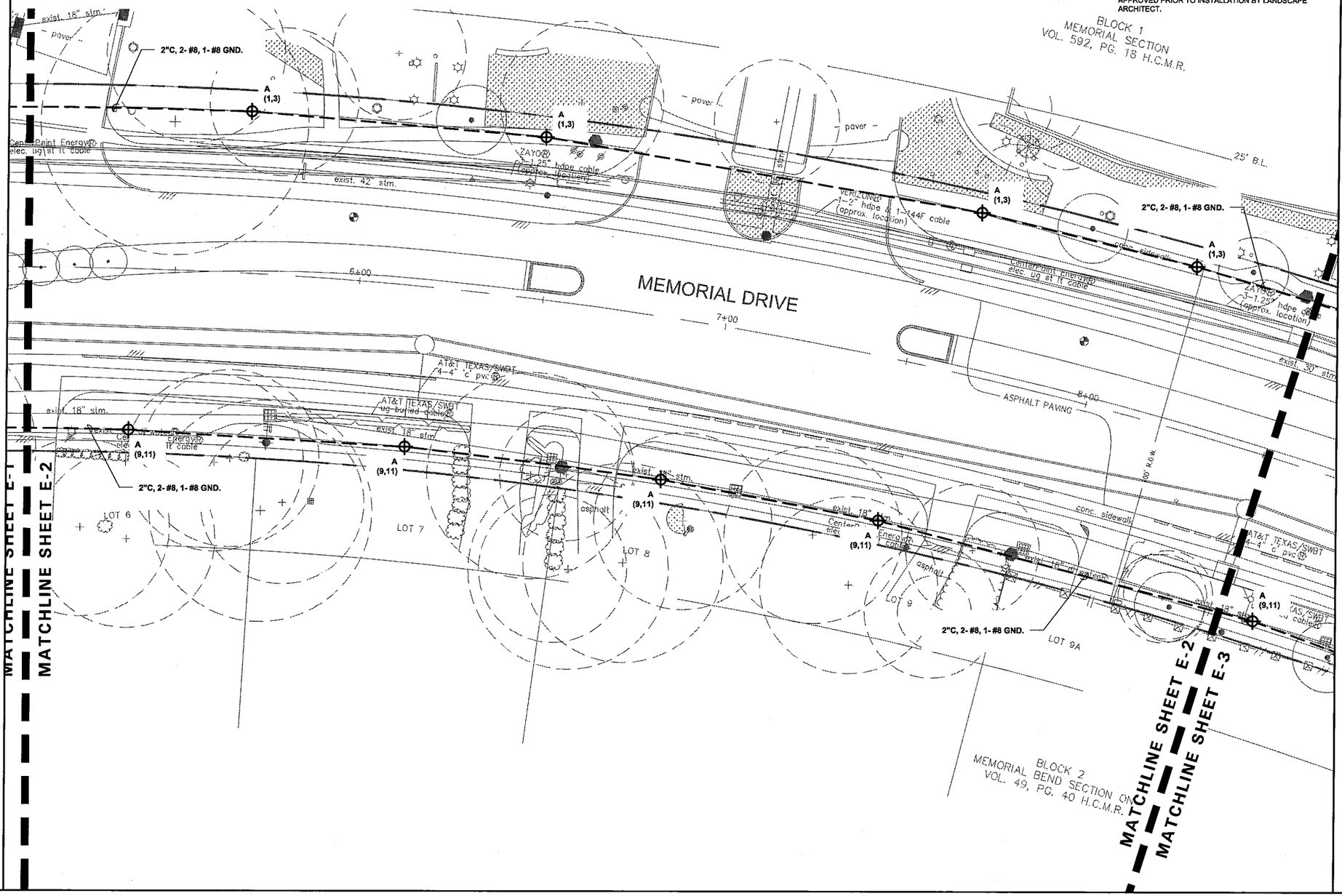
QUANTITIES			
ITEM NO.	DESCRIPTION	UNIT	QUANTITY
0818-6046	CONDT (PVC) (SCHD 80) (2")	LF	750
0620-6008	ELEC CONDR (NO. 8) INSULATED	LF	1,600
0620-6008	ELEC CONDR (NO. 8) INSULATED (GROUND WIRE)	LF	800
1002-6002	LANDSCAPE AMENITY (TYP 1) PER DESCRIPTION IN FIXTURE SCHEDULE (RE: DRAWING E-18)	EA	8

LEGEND:

- PROPOSED ELECTRICAL SERVICE POLE (RE: DRAWING E-17)
- PROPOSED SCHEDULE 80 PVC CONDUIT, UNDERGROUND
- PROPOSED GROUND BOX
- A (1,3) PROPOSED LANDSCAPE AMENITY (CIRCUIT NUMBER)

GENERAL NOTES:

1. ALL ELECTRICAL WORK SHALL BE DONE IN COMPLIANCE WITH THE NEC AND TXDOT STANDARDS.
2. LOCATION OF UTILITIES SHOWN ARE APPROXIMATE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO LOCATE ALL UTILITIES (PUBLIC AND PRIVATE) PRIOR TO COMMENCING WORK. THE CONTRACTOR IS FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY HIS/HER FAILURE TO LOCATE AND PRESERVE THESE UTILITIES, WHETHER UNDERGROUND, ABOVEGROUND OR OVERHEAD.
3. ALL WIRING TO BE 600V Cu, TYPE XHHW. SEE CONDUIT AND CONDUCTOR SCHEDULE FOR CONDUCTOR SIZING. GROUND WIRES SHALL BE AS PER NEC 250.
4. NEW BRANCH CIRCUITS 1-3 AND 9-11 ON PLAN DRAWING E-2 ARE TO BE FED FROM NEW TYPE D ELECTRICAL SERVICE, AS SHOWN ON DRAWING E-17.
5. IN DRIP ZONES OF ALL EXISTING TREES, ALL TRENCHES SHALL BE AIR SPADE TRENCHED OR HAND DUG. NO ROOTS OVER 1/2" SHALL BE CUT OR REMOVED.
6. LOCATION OF ALL ELECTRICAL ITEMS TO BE FIELD APPROVED PRIOR TO INSTALLATION BY LANDSCAPE ARCHITECT.



Landscape Architect

swa
1245 West 18th Street
Houston, Texas
77008-3342
United States
www.swagroup.com
+1.713.868.1676 o

Electrical Engineer

HUNT & HUNT ENGINEERING CORP.
P.O. Box 771294 • Houston, Texas 77215
TBPE Firm No. F-3446

ACCEPTED AND FILED
67862

0 30 60
(IN FEET)
SCALE: 1"=30'-0"

STATE OF TEXAS
AYOUB FAHMI YOUSEF ODEH
125040
REGISTERED PROFESSIONAL ENGINEER
02-03-2020

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

PEDESTRIAN LIGHTING LAYOUT

E-2

SHEET 2 OF 16

DGN: AO	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: AO	6	TEXAS	STP 1802 (783) MM			CS
DWG: AH	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: LH	HOU	HARRIS	0912	72	391	336

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QUANTITIES

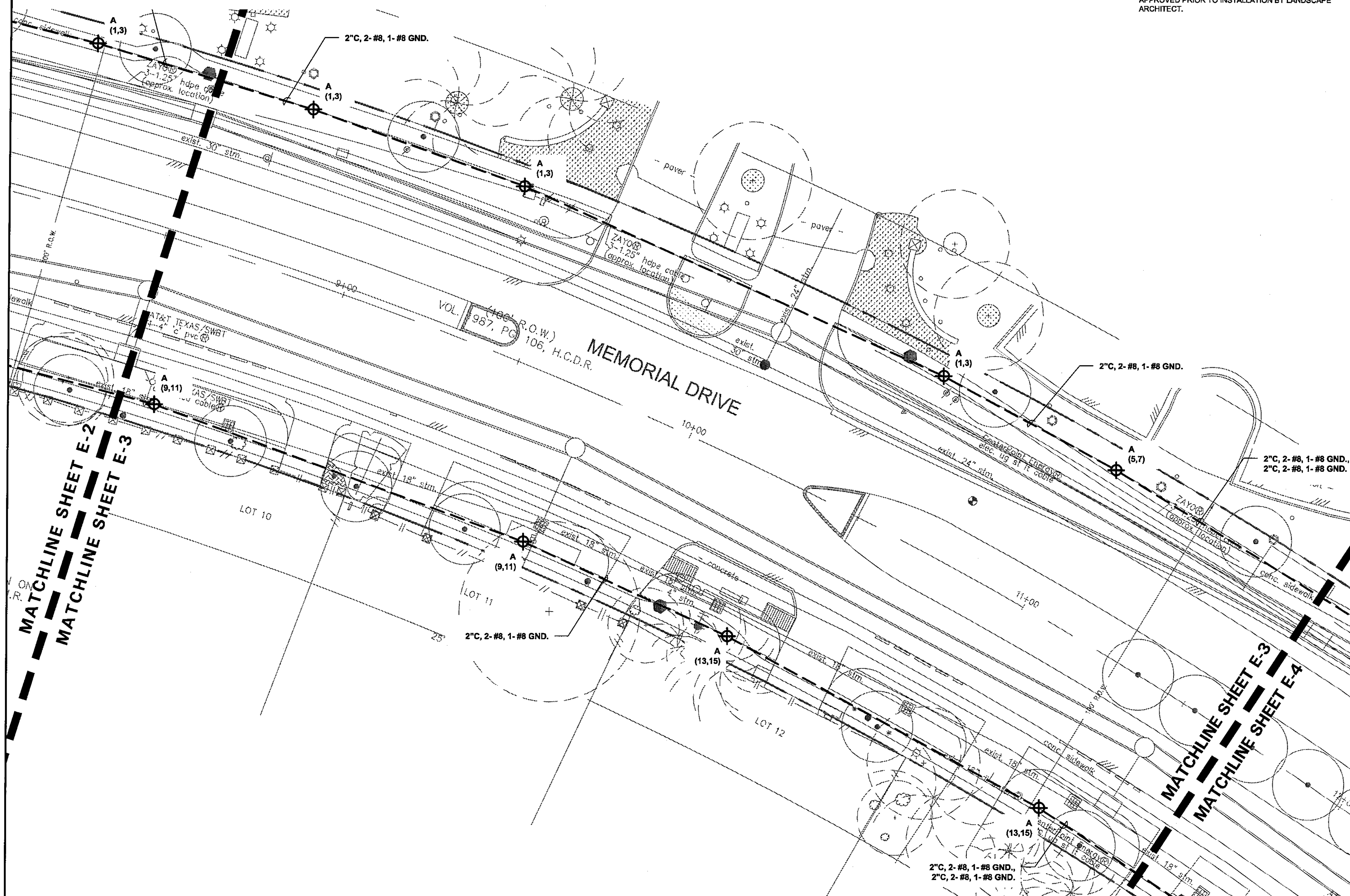
ITEM NO.	DESCRIPTION	UNIT	QUANTITY
0618-6046	CONDT (PVC) (SCHD 80) (2")	LF	900
0620-6008	ELEC CONDR (NO. 8) INSULATED	LF	1,840
0620-6008	ELEC CONDR (NO. 8) INSULATED (GROUND WIRE)	LF	920
1002-6002	LANDSCAPE AMENITY (TYP 1) PER DESCRIPTION IN FIXTURE SCHEDULE (RE: DRAWING E-18)	EA	8

LEGEND:

- PROPOSED ELECTRICAL SERVICE POLE (RE: DRAWING E-17)
- PROPOSED SCHEDULE 80 PVC CONDUIT, UNDERGROUND
- PROPOSED GROUND BOX
- A (1,3) PROPOSED LANDSCAPE AMENITY (CIRCUIT NUMBER)

GENERAL NOTES:

1. ALL ELECTRICAL WORK SHALL BE DONE IN COMPLIANCE WITH THE NEC AND TXDOT STANDARDS.
2. LOCATION OF UTILITIES SHOWN ARE APPROXIMATE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO LOCATE ALL UTILITIES (PUBLIC AND PRIVATE) PRIOR TO COMMENCING WORK. THE CONTRACTOR IS FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY HIS/HER FAILURE TO LOCATE AND PRESERVE THESE UTILITIES, WHETHER UNDERGROUND, ABOVEGROUND OR OVERHEAD.
3. ALL WIRING TO BE 600V Cu, TYPE XHHW. SEE CONDUIT AND CONDUCTOR SCHEDULE FOR CONDUCTOR SIZING. GROUND WIRES SHALL BE AS PER NEC 250.
4. NEW BRANCH CIRCUITS 1-3, 5-7, 9-11 AND 13-15 ON PLAN DRAWING E-3 ARE TO BE FED FROM NEW TYPE D ELECTRICAL SERVICE, AS SHOWN ON DRAWING E-17.
5. IN DRIP ZONES OF ALL EXISTING TREES, ALL TRENCHES SHALL BE AIR SPADE TRENCHED OR HAND DUG. NO ROOTS OVER 1/2" SHALL BE CUT OR REMOVED.
6. LOCATION OF ALL ELECTRICAL ITEMS TO BE FIELD APPROVED PRIOR TO INSTALLATION BY LANDSCAPE ARCHITECT.



Landscape Architect

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Electrical Engineer

HUNT & HUNT ENGINEERING CORP.
P.O. Box 771294 • Houston, Texas 77215
TBPE Firm No. F-3446

67862

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(IN FEET)
SCALE: 1"=30'-0"

STATE OF TEXAS
AYOUB FAHMI YOUSEF ODEH
125040
REGISTERED PROFESSIONAL ENGINEER
02-03-2020

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

PEDESTRIAN LIGHTING LAYOUT

E-3 SHEET 3 OF 16

DGN: AO	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: AO	6	TEXAS	STP 1802 (783) MM			CS
DWG: AH	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: LH	HOU	HARRIS	0912	72	391	337

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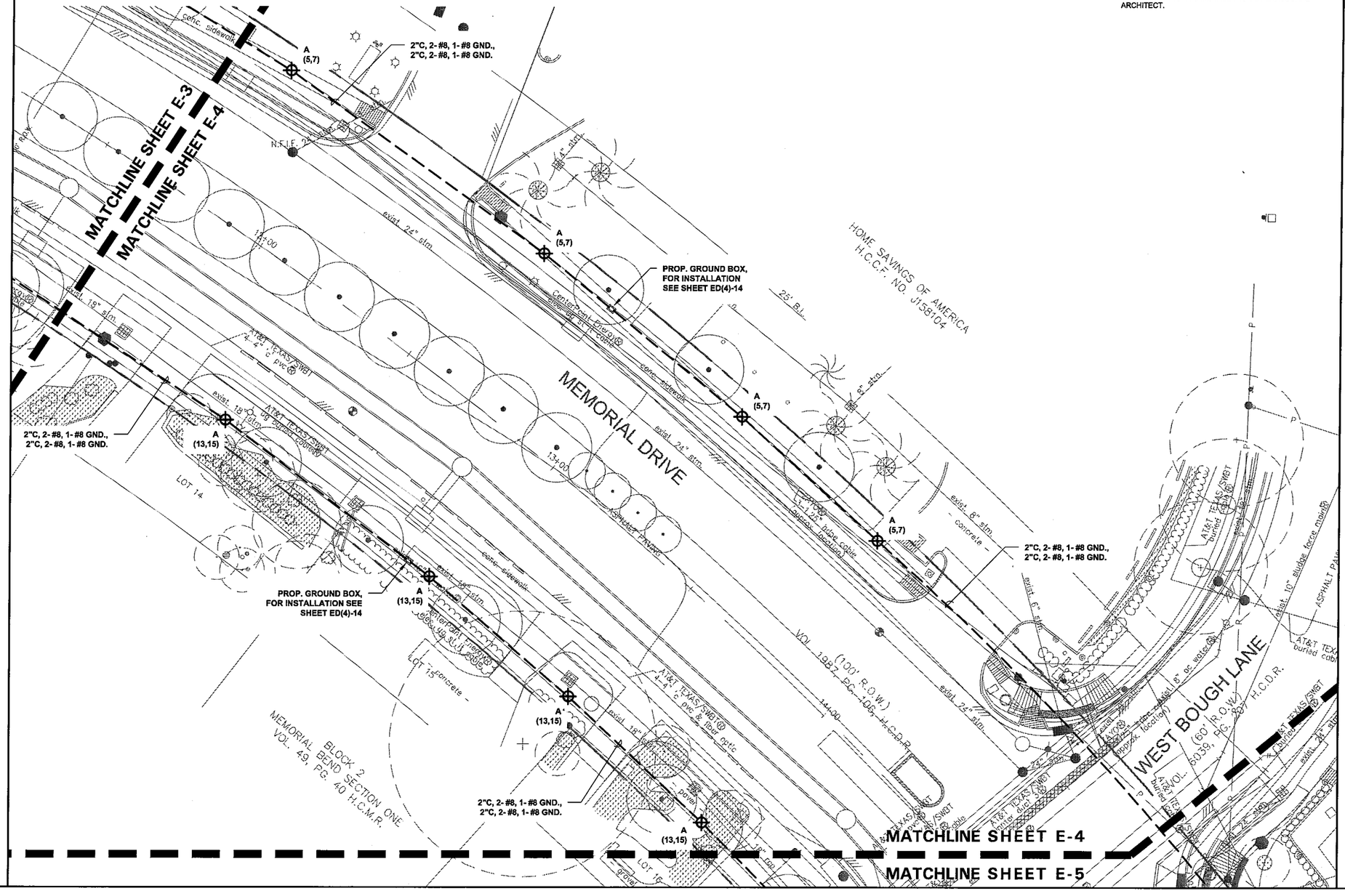
QUANTITIES			
ITEM NO.	DESCRIPTION	UNIT	QUANTITY
0618-6046	CONDT (PVC) (SCHD 80) (2")	LF	1,200
0620-6008	ELEC CONDR (NO. 8) INSULATED	LF	2,600
0620-6008	ELEC CONDR (NO. 8) INSULATED (GROUND WIRE)	LF	1,300
0624-6002	GROUND BOX TY A (122311) W/APRON	EA	2
1002-6002	LANDSCAPE AMENITY (TYP 1) PER DESCRIPTION IN FIXTURE SCHEDULE (RE: DRAWING E-18)	EA	8

LEGEND:

- PROPOSED ELECTRICAL SERVICE POLE (RE: DRAWING E-17)
- PROPOSED SCHEDULE 80 PVC CONDUIT, UNDERGROUND
- PROPOSED GROUND BOX
- A (1,3) PROPOSED LANDSCAPE AMENITY (CIRCUIT NUMBER)

GENERAL NOTES:

1. ALL ELECTRICAL WORK SHALL BE DONE IN COMPLIANCE WITH THE NEC AND TXDOT STANDARDS.
2. LOCATION OF UTILITIES SHOWN ARE APPROXIMATE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO LOCATE ALL UTILITIES (PUBLIC AND PRIVATE) PRIOR TO COMMENCING WORK. THE CONTRACTOR IS FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY HIS/HER FAILURE TO LOCATE AND PRESERVE THESE UTILITIES, WHETHER UNDERGROUND, ABOVEGROUND OR OVERHEAD.
3. ALL WIRING TO BE 600V Cu, TYPE XHHW. SEE CONDUIT AND CONDUCTOR SCHEDULE FOR CONDUCTOR SIZING. GROUND WIRES SHALL BE AS PER NEC 250.
4. NEW BRANCH CIRCUITS 5-7 AND 13-15 ON PLAN DRAWING E-4 ARE TO BE FED FROM NEW TYPE D ELECTRICAL SERVICE, AS SHOWN ON DRAWING E-17.
5. IN DRIP ZONES OF ALL EXISTING TREES, ALL TRENCHES SHALL BE AIR SPADE TRENCHED OR HAND DUG. NO ROOTS OVER 1/2" SHALL BE CUT OR REMOVED.
6. LOCATION OF ALL ELECTRICAL ITEMS TO BE FIELD APPROVED PRIOR TO INSTALLATION BY LANDSCAPE ARCHITECT.



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TBPE Firm No. F-3446

ACCEPTED AND FILED
67862

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(IN FEET)
SCALE: 1"=30'-0"

STATE OF TEXAS
AYOUB FAHMI YOUSEF ODEH
125040
REGISTERED PROFESSIONAL ENGINEER
02-03-2020

REV. NO.	DATE	DESCRIPTION	BY

Lockwood, Andrews & Newnam, Inc.
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FIRM REGISTATION NO. 2614

Texas Department of Transportation

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

PEDESTRIAN LIGHTING LAYOUT

E-4

SHEET 4 OF 16

DGN: AO	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: AO	6	TEXAS	STP 1802 (783) MM			CS
DWG: AH	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: LH	HOU	HARRIS	0912	72	391	338

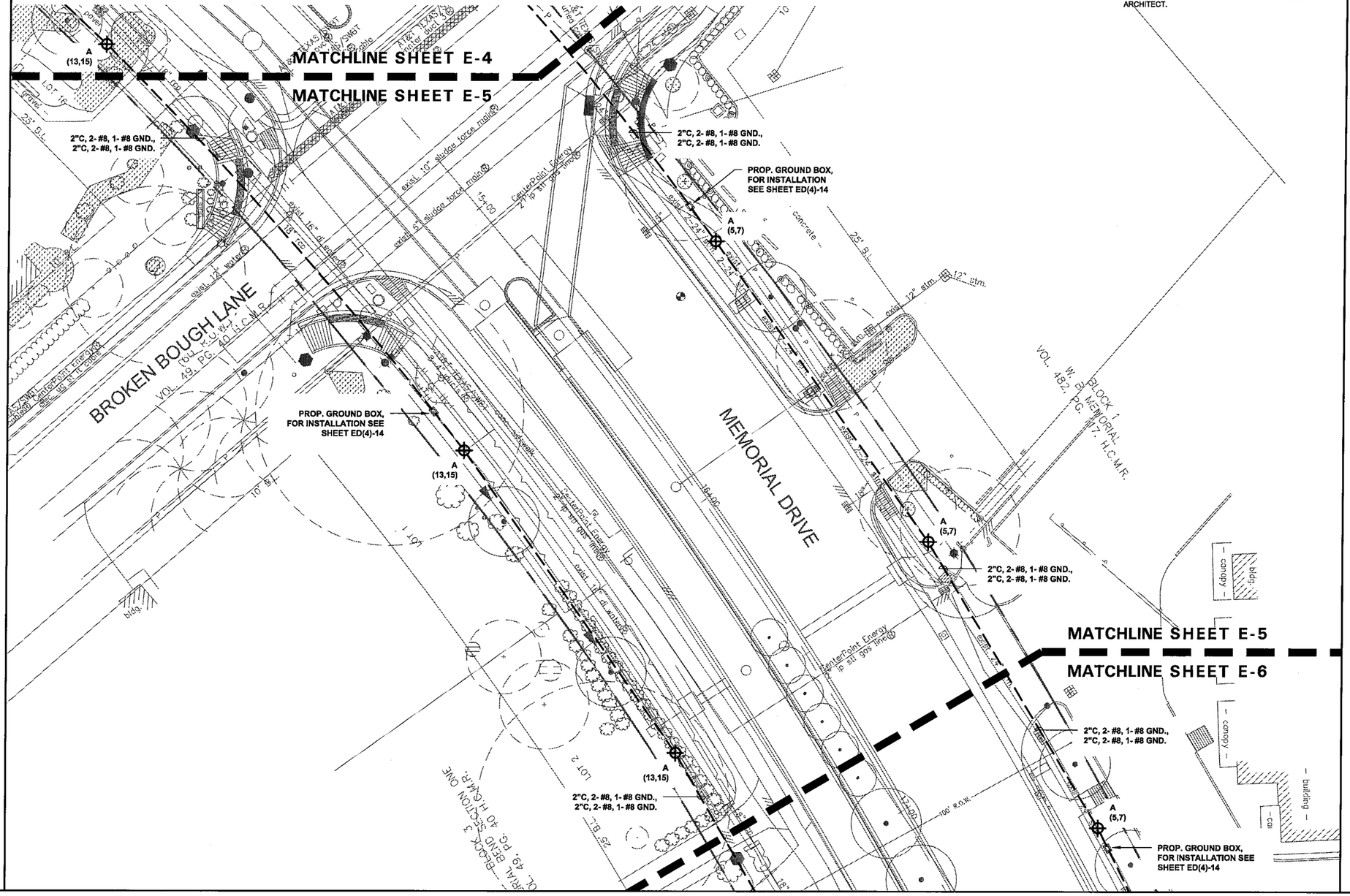
QUANTITIES			
ITEM NO.	DESCRIPTION	UNIT	QUANTITY
0618-6046	CONDT (PVC) (SCHD 80) (2")	LF	1,080
0620-6008	ELEC CONDR (NO. 8) INSULATED	LF	2,220
0620-6008	ELEC CONDR (NO. 8) INSULATED (GROUND WIRE)	LF	1,110
0624-6002	GROUND BOX TY A (122311) W/APRON	EA	2
1002-6002	LANDSCAPE AMENITY (TYP 1) PER DESCRIPTION IN FIXTURE SCHEDULE (RE: DRAWING E-18)	EA	4

LEGEND:

- PROPOSED ELECTRICAL SERVICE POLE (RE: DRAWING E-17)
- PROPOSED SCHEDULE 80 PVC CONDUIT, UNDERGROUND
- PROPOSED GROUND BOX
- A (1,3) PROPOSED LANDSCAPE AMENITY (CIRCUIT NUMBER)

GENERAL NOTES:

1. ALL ELECTRICAL WORK SHALL BE DONE IN COMPLIANCE WITH THE NEC AND TXDOT STANDARDS.
2. LOCATION OF UTILITIES SHOWN ARE APPROXIMATE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO LOCATE ALL UTILITIES (PUBLIC AND PRIVATE) PRIOR TO COMMENCING WORK. THE CONTRACTOR IS FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY HIS/HER FAILURE TO LOCATE AND PRESERVE THESE UTILITIES, WHETHER UNDERGROUND, ABOVEGROUND OR OVERHEAD.
3. ALL WIRING TO BE 600V Cu, TYPE XHHW. SEE CONDUIT AND CONDUCTOR SCHEDULE FOR CONDUCTOR SIZING. GROUND WIRES SHALL BE AS PER NEC 250.
4. NEW BRANCH CIRCUITS 5-7 AND 13-15 ON PLAN DRAWING E-5 ARE TO BE FED FROM NEW TYPE D ELECTRICAL SERVICE, AS SHOWN ON DRAWING E-17.
5. IN DRIP ZONES OF ALL EXISTING TREES, ALL TRENCHES SHALL BE AIR SPADE TRENCHED OR HAND DUG. NO ROOTS OVER 1/2" SHALL BE CUT OR REMOVED.
6. LOCATION OF ALL ELECTRICAL ITEMS TO BE FIELD APPROVED PRIOR TO INSTALLATION BY LANDSCAPE ARCHITECT.



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Electrical Engineer

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TBPE Firm No. F-3446

RELEASED FOR BIDDING
SIGNED AND FILED
67862

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(IN FEET)
SCALE: 1"=30'-0"

STATE OF TEXAS
AYOUB FAHMI YOUSEF ODEH
125040
REGISTERED PROFESSIONAL ENGINEER
02-03-2020

REV. NO.	DATE	DESCRIPTION	BY

Lockwood, Andrews & Newnam, Inc.
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FIRM REGISTATION NO. 2614

Texas Department of Transportation

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

PEDESTRIAN LIGHTING LAYOUT

E-5 SHEET 5 OF 16

DGN: AO	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: AO	6	TEXAS	STP 1802 (783) MM			CS
DWG: AH	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: LH	HOU	HARRIS	0912	72	391	339

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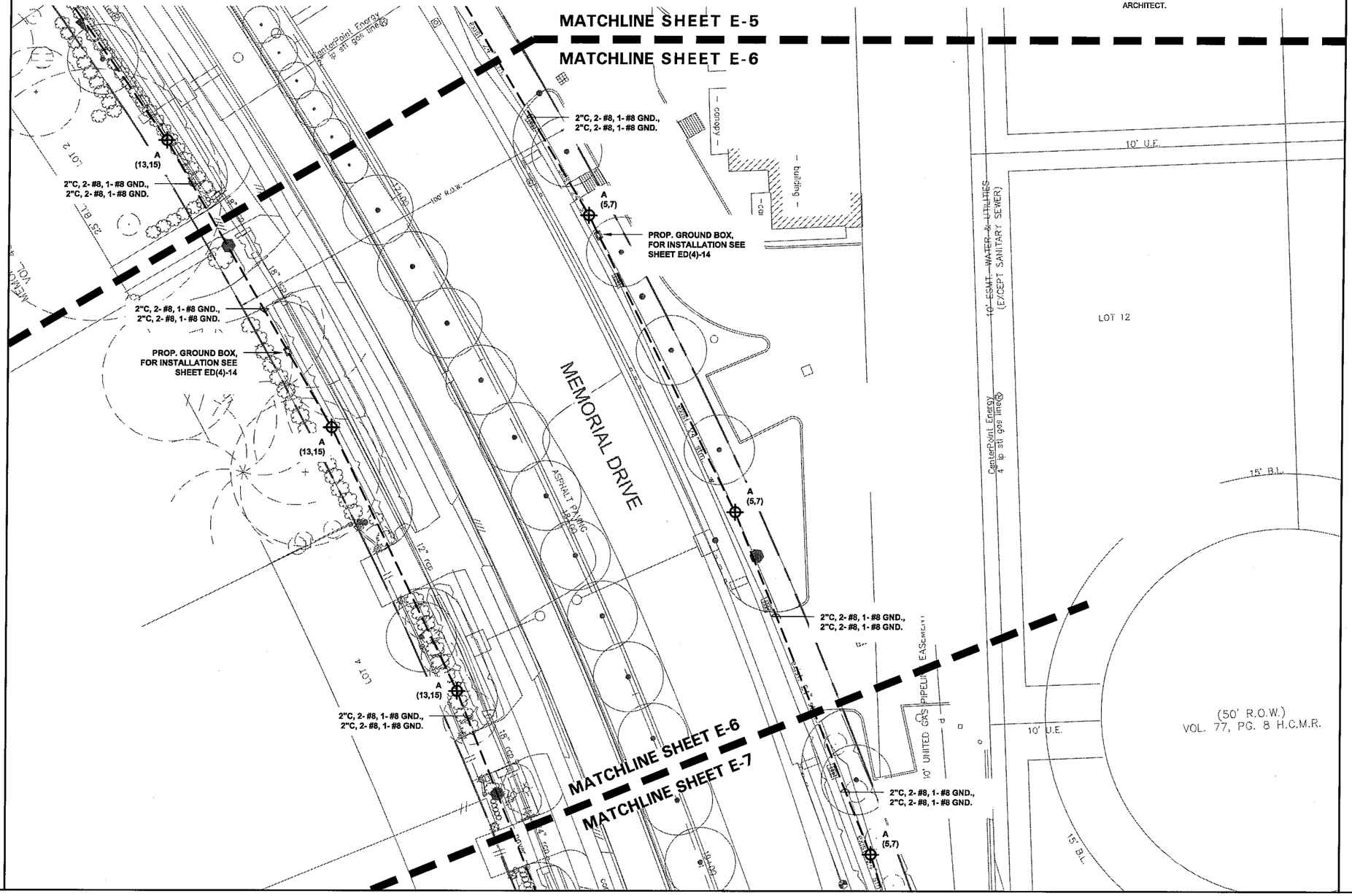
QUANTITIES			
ITEM NO.	DESCRIPTION	UNIT	QUANTITY
0618-6046	CONDT (PVC) (SCHD 80) (2")	LF	850
0620-6008	ELEC CONDR (NO. 8) INSULATED	LF	1,740
0620-6008	ELEC CONDR (NO. 8) INSULATED (GROUND WIRE)	LF	870
0624-6002	GROUND BOX TY A (122311) W/APRON	EA	2
1002-6002	LANDSCAPE AMENITY (TYP 1) PER DESCRIPTION IN FIXTURE SCHEDULE (RE: DRAWING E-18)	EA	4

LEGEND:

- PROPOSED ELECTRICAL SERVICE POLE (RE: DRAWING E-17)
- PROPOSED SCHEDULE 80 PVC CONDUIT, UNDERGROUND
- PROPOSED GROUND BOX
- A (1,3) PROPOSED LANDSCAPE AMENITY (CIRCUIT NUMBER)

GENERAL NOTES:

1. ALL ELECTRICAL WORK SHALL BE DONE IN COMPLIANCE WITH THE NEC AND TXDOT STANDARDS.
2. LOCATION OF UTILITIES SHOWN ARE APPROXIMATE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO LOCATE ALL UTILITIES (PUBLIC AND PRIVATE) PRIOR TO COMMENCING WORK. THE CONTRACTOR IS FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY HIS/HER FAILURE TO LOCATE AND PRESERVE THESE UTILITIES, WHETHER UNDERGROUND, ABOVEGROUND OR OVERHEAD.
3. ALL WIRING TO BE 600V Cu, TYPE XHHW. SEE CONDUIT AND CONDUCTOR SCHEDULE FOR CONDUCTOR SIZING. GROUND WIRES SHALL BE AS PER NEC 250.
4. NEW BRANCH CIRCUITS 5-7 AND 13-15 ON PLAN DRAWING E-6 ARE TO BE FED FROM NEW TYPE D ELECTRICAL SERVICE, AS SHOWN ON DRAWING E-17.
5. IN DRIP ZONES OF ALL EXISTING TREES, ALL TRENCHES SHALL BE AIR SPADE TRENCHED OR HAND DUG. NO ROOTS OVER 1/2" SHALL BE CUT OR REMOVED.
6. LOCATION OF ALL ELECTRICAL ITEMS TO BE FIELD APPROVED PRIOR TO INSTALLATION BY LANDSCAPE ARCHITECT.



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Electrical Engineer

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ACCEPTED AND FILED
67862

0 30 60
(IN FEET)
SCALE: 1"=30'-0"

STATE OF TEXAS
AYOUB FAHMI YOUSEF ODEH
125040
REGISTERED PROFESSIONAL ENGINEER
02-03-2020

REV. NO.	DATE	DESCRIPTION	BY

Lockwood, Andrews & Newnam, Inc.
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FIRM REGISTATION NO. 2614

Texas Department of Transportation

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

PEDESTRIAN LIGHTING LAYOUT

E-6 SHEET 6 OF 16

DGN: AO	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: AO	6	TEXAS	STP 1802 (783) MM			CS
DWG: AH	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: LH	HOU	HARRIS	0912	72	391	340

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QUANTITIES

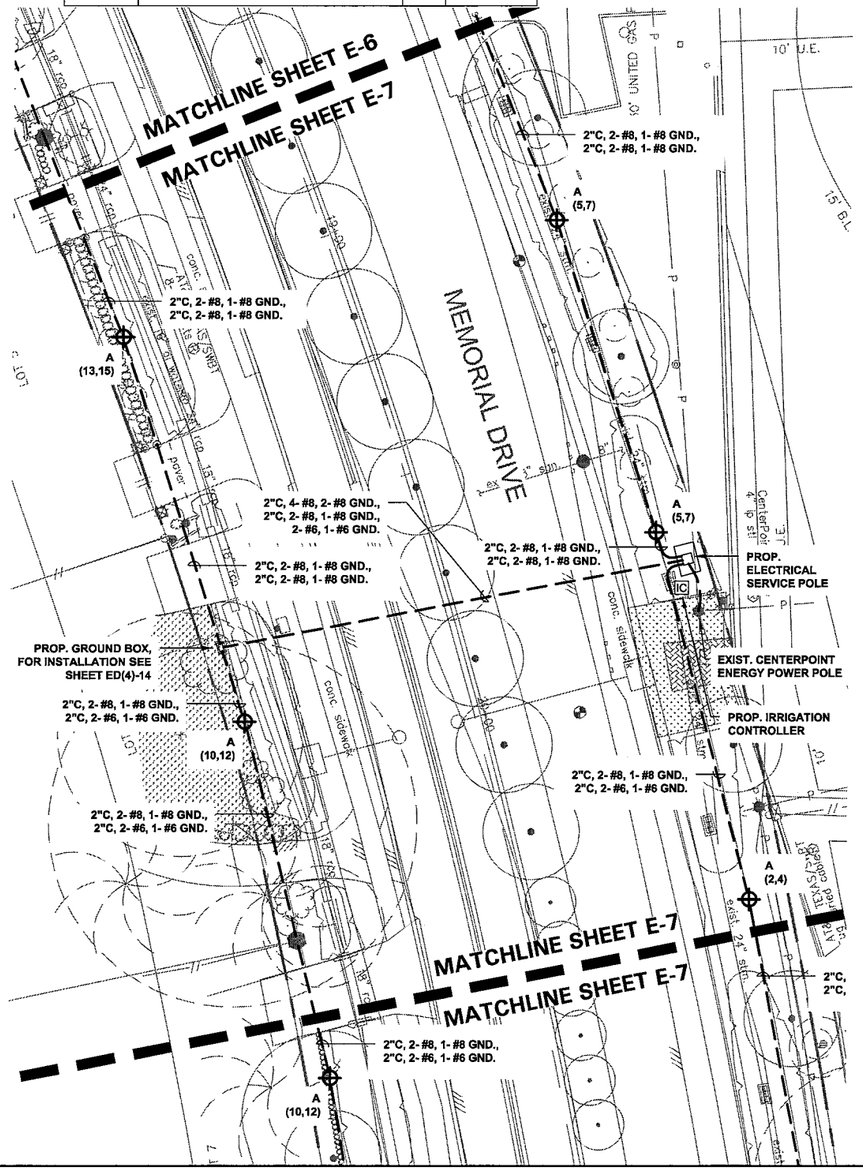
ITEM NO.	DESCRIPTION	UNIT	QUANTITY
0618-6042	CONDT (PVC) (SCHD 80) (1 1/4")	LF	15
0618-6046	CONDT (PVC) (SCHD 80) (2")	LF	1,725
0620-6008	ELEC CONDR (NO. 8) INSULATED	LF	2,740
0620-6008	ELEC CONDR (NO. 8) INSULATED (GROUND WIRE)	LF	1,370
0620-6010	ELEC CONDR (NO. 6) INSULATED	LF	1,360
0620-6010	ELEC CONDR (NO. 6) INSULATED (GROUND WIRE)	LF	680
0624-6002	GROUND BOX TY A (122311) W/APRON	EA	1
0628-6344	ELECTRICAL SERVICE TYPE D 120/240 100 (NS)SS(E)OC(U)	EA	1
1002-6002	LANDSCAPE AMENITY (TYP 1) PER DESCRIPTION IN FIXTURE SCHEDULE (RE: DRAWING E-18)	EA	8

LEGEND:

- PROPOSED ELECTRICAL SERVICE POLE (RE: DRAWING E-17)
- PROPOSED SCHEDULE 80 PVC CONDUIT, UNDERGROUND
- PROPOSED GROUND BOX
- A (1,3) PROPOSED LANDSCAPE AMENITY (CIRCUIT NUMBER)

GENERAL NOTES:

1. ALL ELECTRICAL WORK SHALL BE DONE IN COMPLIANCE WITH THE NEC AND TXDOT STANDARDS.
2. LOCATION OF UTILITIES SHOWN ARE APPROXIMATE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO LOCATE ALL UTILITIES (PUBLIC AND PRIVATE) PRIOR TO COMMENCING WORK. THE CONTRACTOR IS FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY HIS/HER FAILURE TO LOCATE AND PRESERVE THESE UTILITIES, WHETHER UNDERGROUND, ABOVEGROUND OR OVERHEAD.
3. ALL WIRING TO BE 600V Cu, TYPE XHHW. SEE CONDUIT AND CONDUCTOR SCHEDULE FOR CONDUCTOR SIZING. GROUND WIRES SHALL BE AS PER NEC 250.
4. PROVIDE UNDERGROUND SERVICE FROM CPE POWER POLE. INSTALL WEATHERHEAD, RISER, STANDOFF BRACKETS, CONDUIT AND WIRING IN ACCORDANCE WITH CPE STANDARDS AND COORDINATE ALL WORK WITH CPE. ALL ELECTRICAL SERVICE WORK WILL BE SUBSIDIARY TO ITEM 0628.
5. NEW BRANCH CIRCUITS 2-4, 5-7, 10-12 AND 13-15 ON PLAN DRAWING E-7 ARE TO BE FED FROM NEW TYPE D ELECTRICAL SERVICE, AS SHOWN ON DRAWING E-17.
6. CONTRACTOR SHALL SUBMIT DIMENSIONAL DRAWINGS FOR ALL SUPPORTS, SHOWING ALL COMPONENTS, TO PROJECT ENGINEER FOR APPROVAL PRIOR TO FABRICATION. REFERENCE TXDOT DRAWING ED(10)-14.
7. IN DRIP ZONES OF ALL EXISTING TREES, ALL TRENCHES SHALL BE AIR SPADE TRENCHED OR HAND DUG. NO ROOTS OVER 1/2" SHALL BE CUT OR REMOVED.
8. LOCATION OF ALL ELECTRICAL ITEMS TO BE FIELD APPROVED PRIOR TO INSTALLATION BY LANDSCAPE ARCHITECT.



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Electrical Engineer

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TBPE Firm No. F-3446

PUBLIC ACCEPTED AND FILED
67862

0 30 60
(IN FEET)
SCALE: 1"=30'-0"

STATE OF TEXAS
AYOUB FAHMI YOUSEF ODEH
125040
REGISTERED PROFESSIONAL ENGINEER
02-03-2020

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

PEDESTRIAN LIGHTING LAYOUT

E-7 SHEET 7 OF 16

DGN: AO	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: AO	6	TEXAS	STP 1802 (783) MM			CS
DWG: AH	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: LH	HOU	HARRIS	0912	72	391	341

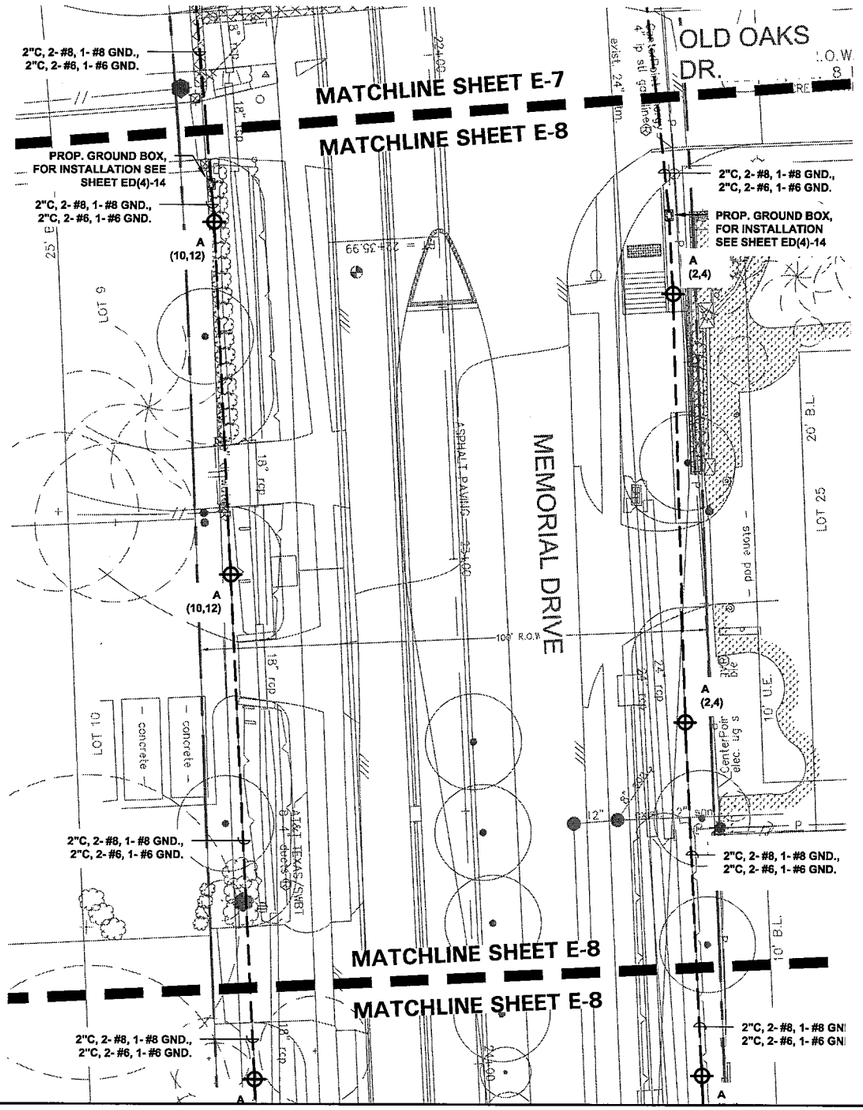
QUANTITIES			
ITEM NO.	DESCRIPTION	UNIT	QUANTITY
0618-6046	CONDT (PVC) (SCHD 80) (2")	LF	1,640
0620-6006	ELEC CONDR (NO. 8) INSULATED	LF	1,680
0620-6008	ELEC CONDR (NO. 8) INSULATED (GROUND WIRE)	LF	840
0620-6010	ELEC CONDR (NO. 6) INSULATED	LF	1,680
0620-6010	ELEC CONDR (NO. 6) INSULATED (GROUND WIRE)	LF	840
0624-6002	GROUND BOX TY A (122311) W/APRON	EA	4
1002-6002	LANDSCAPE AMENITY (TYP 1) PER DESCRIPTION IN FIXTURE SCHEDULE (RE: DRAWING E-18)	EA	8

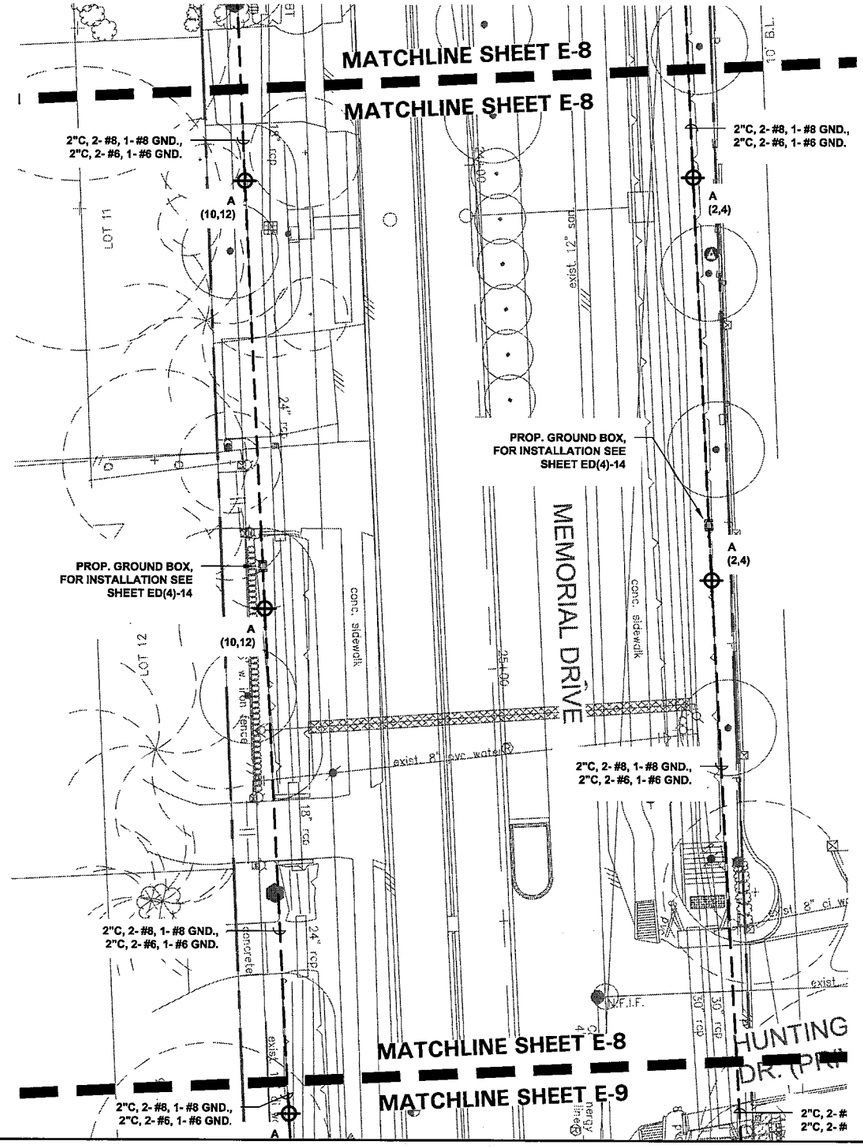
LEGEND:

- PROPOSED ELECTRICAL SERVICE POLE (RE: DRAWING E-17)
- PROPOSED SCHEDULE 80 PVC CONDUIT, UNDERGROUND
- PROPOSED GROUND BOX
- A (1,3) PROPOSED LANDSCAPE AMENITY (CIRCUIT NUMBER)

GENERAL NOTES:

1. ALL ELECTRICAL WORK SHALL BE DONE IN COMPLIANCE WITH THE NEC AND TXDOT STANDARDS.
2. LOCATION OF UTILITIES SHOWN ARE APPROXIMATE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO LOCATE ALL UTILITIES (PUBLIC AND PRIVATE) PRIOR TO COMMENCING WORK. THE CONTRACTOR IS FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY HIS/HER FAILURE TO LOCATE AND PRESERVE THESE UTILITIES, WHETHER UNDERGROUND, ABOVEGROUND OR OVERHEAD.
3. ALL WIRING TO BE 600V Cu, TYPE XHHW. SEE CONDUIT AND CONDUCTOR SCHEDULE FOR CONDUCTOR SIZING. GROUND WIRES SHALL BE AS PER NEC 250.
4. NEW BRANCH CIRCUITS 2-4 AND 10-12 ON PLAN DRAWING E-8 ARE TO BE FED FROM NEW TYPE D ELECTRICAL SERVICE, AS SHOWN ON DRAWING E-17.
5. IN DRIP ZONES OF ALL EXISTING TREES, ALL TRENCHES SHALL BE AIR SPADE TRENCHED OR HAND DUG. NO ROOTS OVER 1/2" SHALL BE CUT OR REMOVED.
6. LOCATION OF ALL ELECTRICAL ITEMS TO BE FIELD APPROVED PRIOR TO INSTALLATION BY LANDSCAPE ARCHITECT.





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SCALE: 1"=30'-0"

STATE OF TEXAS
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REGISTERED PROFESSIONAL ENGINEER
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Texas Department of Transportation

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

PEDESTRIAN LIGHTING LAYOUT

E-8

SHEET 8 OF 16

DGN: AO	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: AO	6	TEXAS	STP 1802 (783) MM			CS
DWG: AH	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: LH	HOU	HARRIS	0912	72	391	342

QUANTITIES			
ITEM NO.	DESCRIPTION	UNIT	QUANTITY
0618-6046	CONDT (PVC) (SCHD 80) (2")	LF	1,750
0620-6008	ELEC CONDR (NO. 8) INSULATED	LF	1,850
0620-6008	ELEC CONDR (NO. 8) INSULATED (GROUND WIRE)	LF	925
0620-6010	ELEC CONDR (NO. 6) INSULATED	LF	1,850
0620-6010	ELEC CONDR (NO. 6) INSULATED (GROUND WIRE)	LF	925
0624-6002	GROUND BOX TY A (122311) W/APRON	EA	3
1002-6002	LANDSCAPE AMENITY (TYP 1) PER DESCRIPTION IN FIXTURE SCHEDULE (RE: DRAWING E-18)	EA	10

LEGEND:

- PROPOSED ELECTRICAL SERVICE POLE (RE: DRAWING E-17)
- PROPOSED SCHEDULE 80 PVC CONDUIT, UNDERGROUND
- PROPOSED GROUND BOX
- A (1,3) PROPOSED LANDSCAPE AMENITY (CIRCUIT NUMBER)

GENERAL NOTES:

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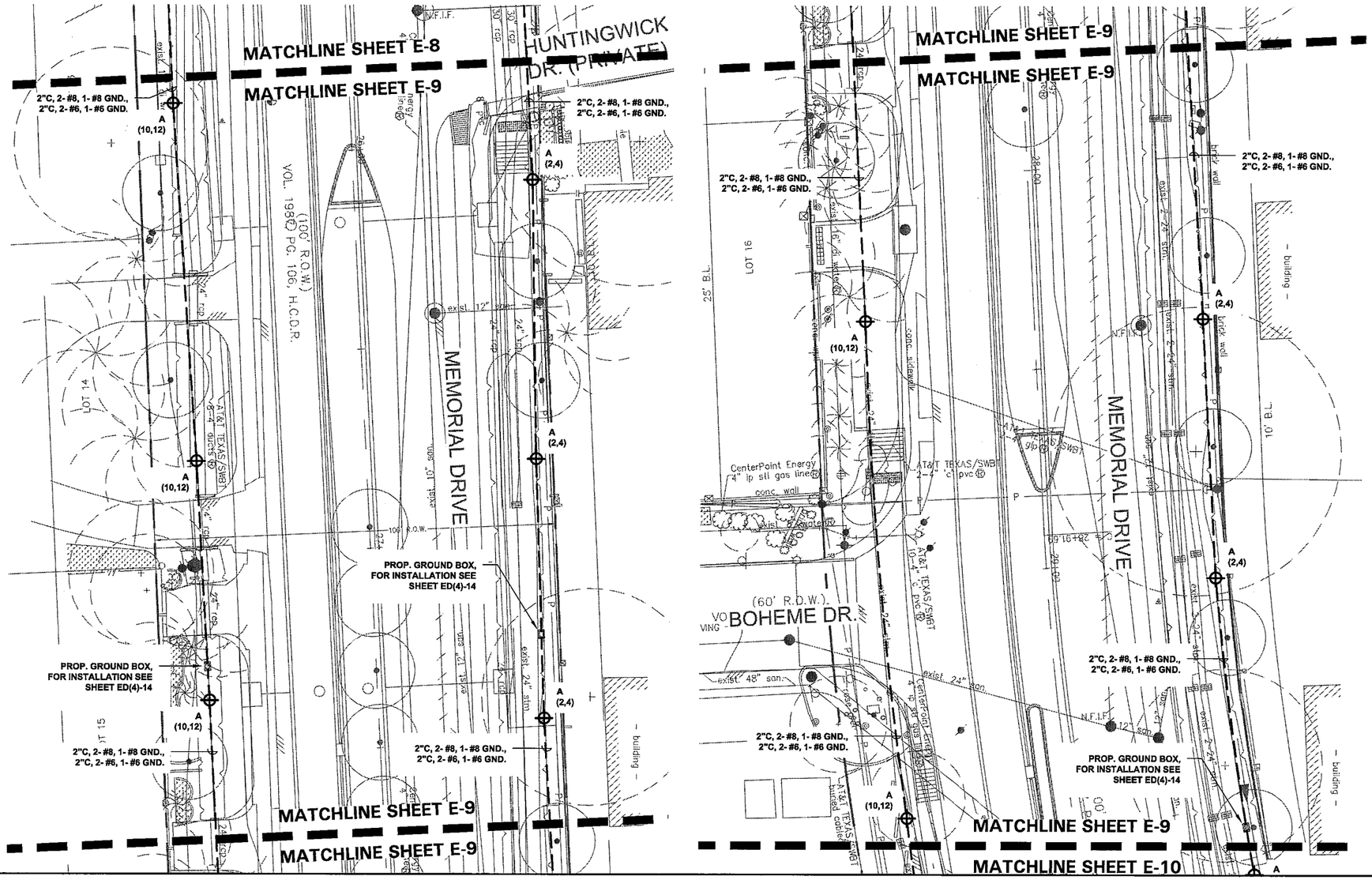
3. ALL WIRING TO BE 600V Cu, TYPE XHHW. SEE CONDUIT AND CONDUCTOR SCHEDULE FOR CONDUCTOR SIZING. GROUND WIRES SHALL BE AS PER NEC 250.
4. NEW BRANCH CIRCUITS 2-4, 5-7 AND 10-12 ON PLAN DRAWING E-9 ARE TO BE FED FROM NEW TYPE D ELECTRICAL SERVICE, AS SHOWN ON DRAWING E-17.
5. IN DRIP ZONES OF ALL EXISTING TREES, ALL TRENCHES SHALL BE AIR SPADE TRENCHED OR HAND DUG. NO ROOTS OVER 1/2" SHALL BE CUT OR REMOVED.
6. LOCATION OF ALL ELECTRICAL ITEMS TO BE FIELD APPROVED PRIOR TO INSTALLATION BY LANDSCAPE ARCHITECT.



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SCALE: 1"=30'-0"

STATE OF TEXAS
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02-03-2020

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

PEDESTRIAN LIGHTING LAYOUT

E-9 SHEET 9 OF 16

DGN: AO	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: AO	6	TEXAS	STP 1802 (783) MM			CS
DWG: AH	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: LH	HOU	HARRIS	0912	72	391	343

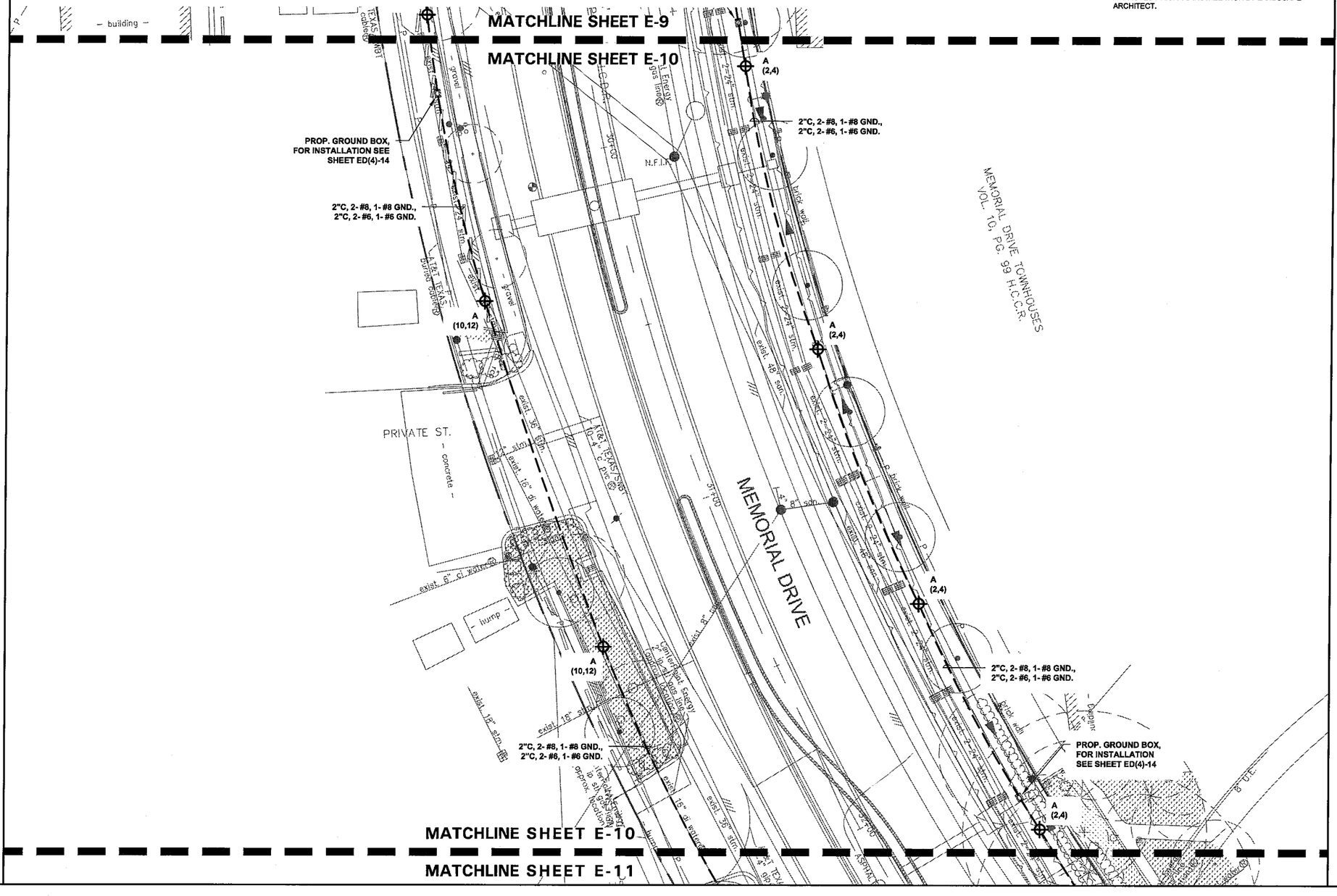
QUANTITIES			
ITEM NO.	DESCRIPTION	UNIT	QUANTITY
0618-6046	CONDT (PVC) (SCHD 80) (2")	LF	1,010
0620-6008	ELEC CONDR (NO. 8) INSULATED	LF	1,050
0620-6008	ELEC CONDR (NO. 8) INSULATED (GROUND WIRE)	LF	525
0620-6010	ELEC CONDR (NO. 6) INSULATED	LF	1,050
0620-6010	ELEC CONDR (NO. 6) INSULATED (GROUND WIRE)	LF	525
0624-6002	GROUND BOX TY A (122311) W/APRON	EA	2
1002-6002	LANDSCAPE AMENITY (TYP 1) PER DESCRIPTION IN FIXTURE SCHEDULE (RE: DRAWING E-18)	EA	6

LEGEND:

- PROPOSED ELECTRICAL SERVICE POLE (RE: DRAWING E-17)
- PROPOSED SCHEDULE 80 PVC CONDUIT, UNDERGROUND
- PROPOSED GROUND BOX
- A (1,3) PROPOSED LANDSCAPE AMENITY (CIRCUIT NUMBER)

GENERAL NOTES:

1. ALL ELECTRICAL WORK SHALL BE DONE IN COMPLIANCE WITH THE NEC AND TXDOT STANDARDS.
2. LOCATION OF UTILITIES SHOWN ARE APPROXIMATE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO LOCATE ALL UTILITIES (PUBLIC AND PRIVATE) PRIOR TO COMMENCING WORK. THE CONTRACTOR IS FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY HIS/HER FAILURE TO LOCATE AND PRESERVE THESE UTILITIES, WHETHER UNDERGROUND, ABOVEGROUND OR OVERHEAD.
3. ALL WIRING TO BE 600V Cu, TYPE XHHW. SEE CONDUIT AND CONDUCTOR SCHEDULE FOR CONDUCTOR SIZING. GROUND WIRES SHALL BE AS PER NEC 250.
4. NEW BRANCH CIRCUITS 2-4 AND 10-12 ON PLAN DRAWING E-10 ARE TO BE FED FROM NEW TYPE D ELECTRICAL SERVICE, AS SHOWN ON DRAWING E-17.
5. IN DRIP ZONES OF ALL EXISTING TREES, ALL TRENCHES SHALL BE AIR SPADE TRENCHED OR HAND DUG. NO ROOTS OVER 1/2" SHALL BE CUT OR REMOVED.
6. LOCATION OF ALL ELECTRICAL ITEMS TO BE FIELD APPROVED PRIOR TO INSTALLATION BY LANDSCAPE ARCHITECT.



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Electrical Engineer

HUNT & HUNT ENGINEERING CORP.
P.O. Box 771294 • Houston, Texas 77215
TBPE Firm No. F-3446

STATE OF TEXAS
REGISTERED AND LICENSED
67862

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SCALE: 1"=30'-0"

STATE OF TEXAS
AYOUB FAHMI YOUSEF ODEH
125040
REGISTERED PROFESSIONAL ENGINEER
02-03-2020

REV. NO.	DATE	DESCRIPTION	BY

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

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

PEDESTRIAN LIGHTING LAYOUT

E-10

SHEET 10 OF 16

DGN: AO	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: AO	6	TEXAS	STP 1802 (783) MM			CS
DWG: AH	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: LH	HOU	HARRIS	0912	72	391	344

QUANTITIES

ITEM NO.	DESCRIPTION	UNIT	QUANTITY
0618-6046	CONDT (PVC) (SCHD 80) (2")	LF	1,130
0620-6008	ELEC CONDR (NO. 8) INSULATED	LF	1,140
0620-6008	ELEC CONDR (NO. 8) INSULATED (GROUND WIRE)	LF	570
0620-6010	ELEC CONDR (NO. 6) INSULATED	LF	1,200
0620-6010	ELEC CONDR (NO. 6) INSULATED (GROUND WIRE)	LF	600
0624-6002	GROUND BOX TY A (122311) W/APRON	EA	2
1002-6002	LANDSCAPE AMENITY (TYP 1) PER DESCRIPTION IN FIXTURE SCHEDULE (RE: DRAWING E-18)	EA	6

LEGEND:

- PROPOSED ELECTRICAL SERVICE POLE (RE: DRAWING E-17)
- PROPOSED SCHEDULE 80 PVC CONDUIT, UNDERGROUND
- PROPOSED GROUND BOX
- A (1,3) PROPOSED LANDSCAPE AMENITY (CIRCUIT NUMBER)

GENERAL NOTES:

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3. ALL WIRING TO BE 600V Cu, TYPE XHHW. SEE CONDUIT AND CONDUCTOR SCHEDULE FOR CONDUCTOR SIZING. GROUND WIRES SHALL BE AS PER NEC 250.
4. NEW BRANCH CIRCUITS 2-4 AND 10-12 ON PLAN DRAWING E-11 ARE TO BE FED FROM NEW TYPE D ELECTRICAL SERVICE, AS SHOWN ON DRAWING E-17.
5. IN DRIP ZONES OF ALL EXISTING TREES, ALL TRENCHES SHALL BE AIR SPADE TRENCHED OR HAND DUG. NO ROOTS OVER 1/2" SHALL BE CUT OR REMOVED.
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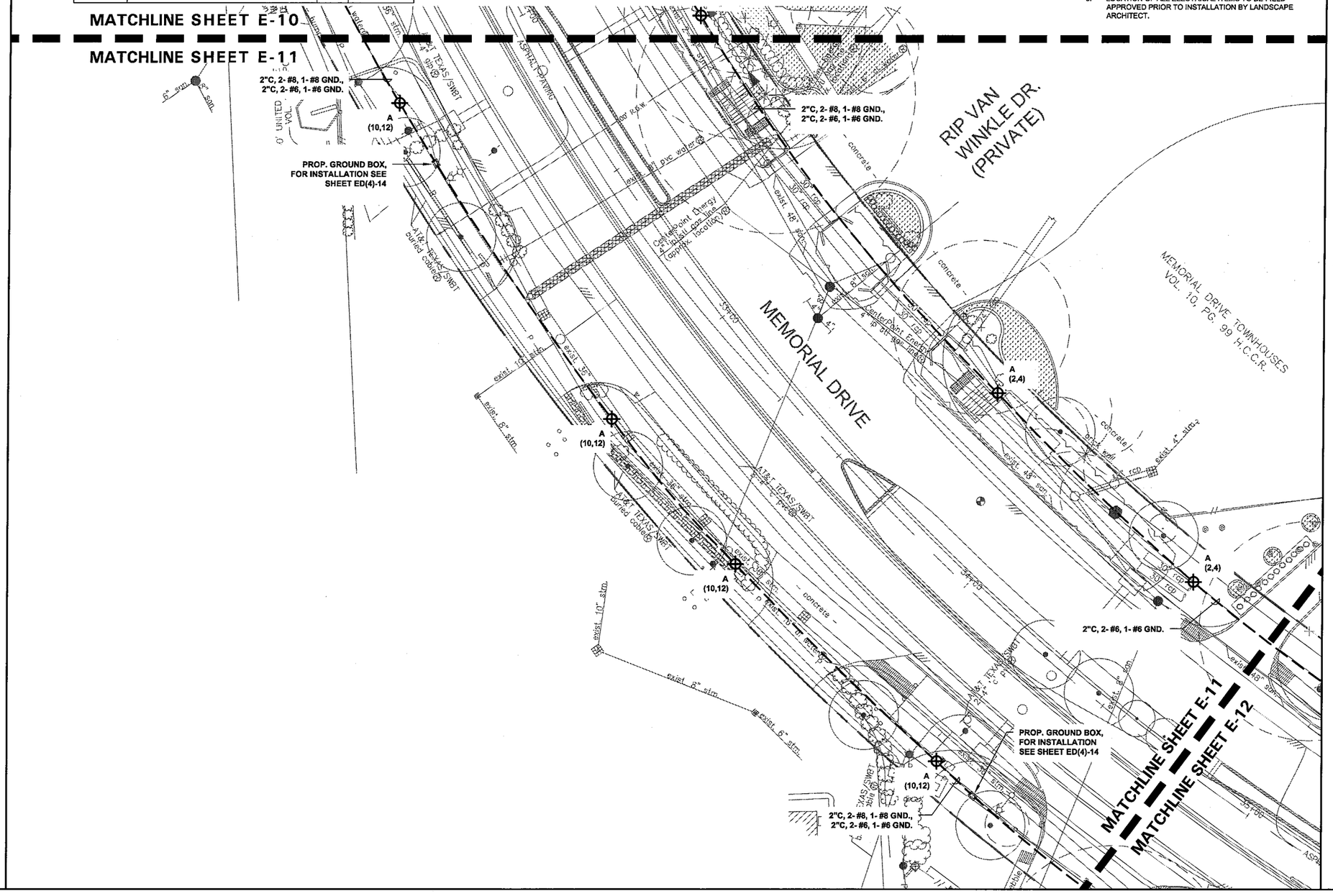

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STATE OF TEXAS
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REGISTERED PROFESSIONAL ENGINEER
02-03-2020

REV. NO.	DATE	DESCRIPTION	BY

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FIRM REGISTATION NO. 2614

Texas Department of Transportation

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

PEDESTRIAN LIGHTING LAYOUT

E-11

SHEET 11 OF 16

DGN: AO	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: AO	6	TEXAS	STP 1802 (783) MM			CS
DWG: AH	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: LH	HOU	HARRIS	0912	72	391	345

QUANTITIES			
ITEM NO.	DESCRIPTION	UNIT	QUANTITY
0618-6046	CONDT (PVC) (SCHD 80) (2")	LF	625
0620-6008	ELEC CONDR (NO. 8) INSULATED	LF	250
0620-6008	ELEC CONDR (NO. 8) INSULATED (GROUND WIRE)	LF	125
0620-6010	ELEC CONDR (NO. 6) INSULATED	LF	1,050
0620-6010	ELEC CONDR (NO. 8) INSULATED (GROUND WIRE)	LF	525
1002-6002	LANDSCAPE AMENITY (TYP 1) PER DESCRIPTION IN FIXTURE SCHEDULE (RE: DRAWING E-18)	EA	6

LEGEND:

- PROPOSED ELECTRICAL SERVICE POLE (RE: DRAWING E-17)
- PROPOSED SCHEDULE 80 PVC CONDUIT, UNDERGROUND
- PROPOSED GROUND BOX
- A (1,3) PROPOSED LANDSCAPE AMENITY (CIRCUIT NUMBER)

GENERAL NOTES:

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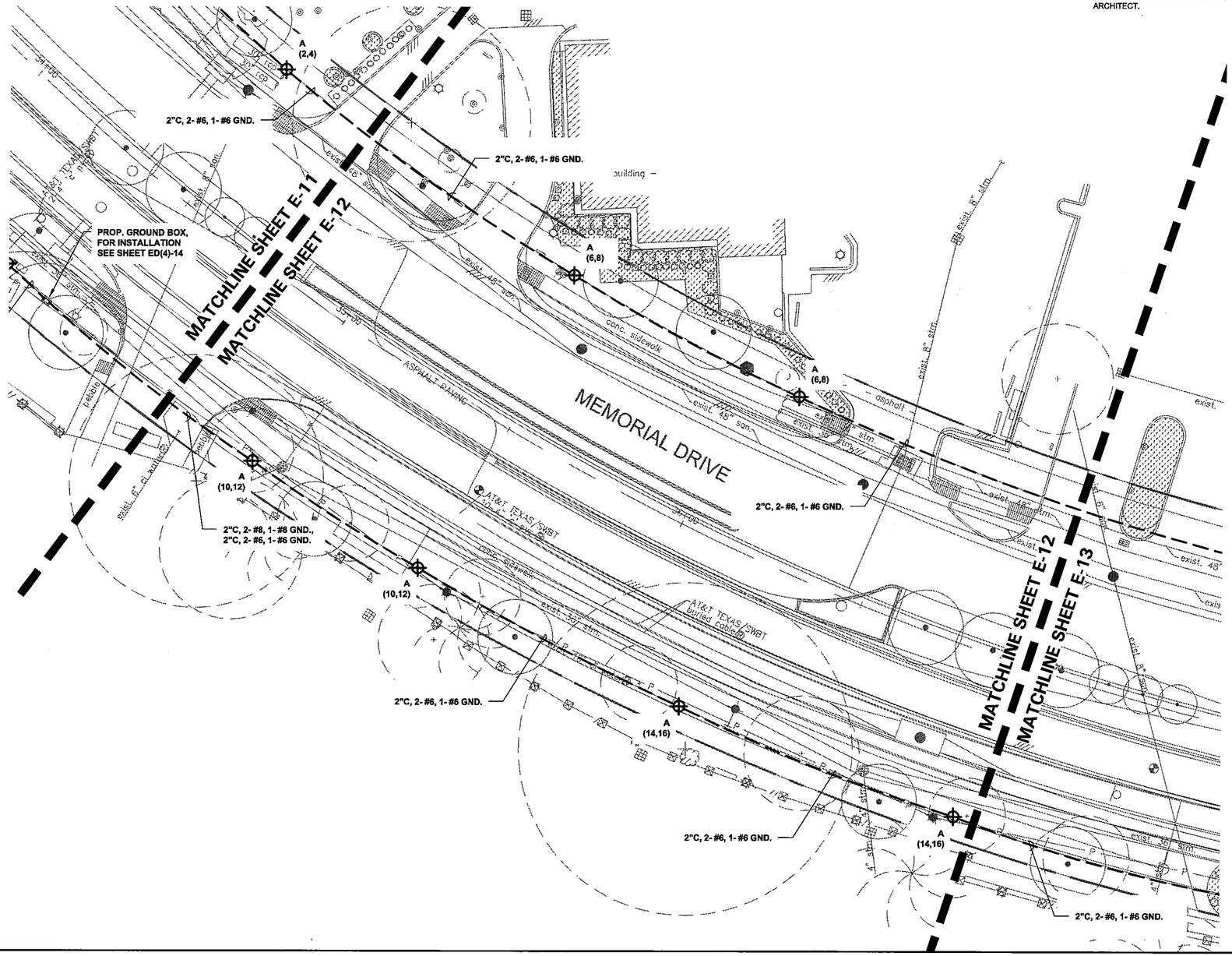
3. ALL WIRING TO BE 600V Cu, TYPE XHHW. SEE CONDUIT AND CONDUCTOR SCHEDULE FOR CONDUCTOR SIZING. GROUND WIRES SHALL BE AS PER NEC 250.
4. NEW BRANCH CIRCUITS 6-8, 10-12 AND 14-16 ON PLAN DRAWING E-12 ARE TO BE FED FROM NEW TYPE D ELECTRICAL SERVICE, AS SHOWN ON DRAWING E-17.
5. IN DRIP ZONES OF ALL EXISTING TREES, ALL TRENCHES SHALL BE AIR SPADE TRENCHED OR HAND DUG. NO ROOTS OVER 1/2" SHALL BE CUT OR REMOVED.
6. LOCATION OF ALL ELECTRICAL ITEMS TO BE FIELD APPROVED PRIOR TO INSTALLATION BY LANDSCAPE ARCHITECT.



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STATE OF TEXAS
AYOUB FAHMI YOUSEF ODEH
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REGISTERED PROFESSIONAL ENGINEER
02-03-2020

REV. NO.	DATE	DESCRIPTION	BY

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Texas Department of Transportation

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

PEDESTRIAN LIGHTING LAYOUT

E-12

SHEET 12 OF 16

DGN: AO	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: AO	6	TEXAS	STP 1802 (783) MM			CS
DWG: AH	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: LH	HOU	HARRIS	0912	72	391	346

QUANTITIES			
ITEM NO.	DESCRIPTION	UNIT	QUANTITY
0618-6046	CONDT (PVC) (SCHD 80) (2")	LF	690
0620-6010	ELEC CONDR (NO. 6) INSULATED	LF	1,420
0620-6010	ELEC CONDR (NO. 6) INSULATED (GROUND WIRE)	LF	710
1002-6002	LANDSCAPE AMENITY (TYP 1) PER DESCRIPTION IN FIXTURE SCHEDULE (RE: DRAWING E-18)	EA	7

LEGEND:

- PROPOSED ELECTRICAL SERVICE POLE (RE: DRAWING E-17)
- PROPOSED SCHEDULE 80 PVC CONDUIT, UNDERGROUND
- PROPOSED GROUND BOX
- A (1,3) PROPOSED LANDSCAPE AMENITY (CIRCUIT NUMBER)

GENERAL NOTES:

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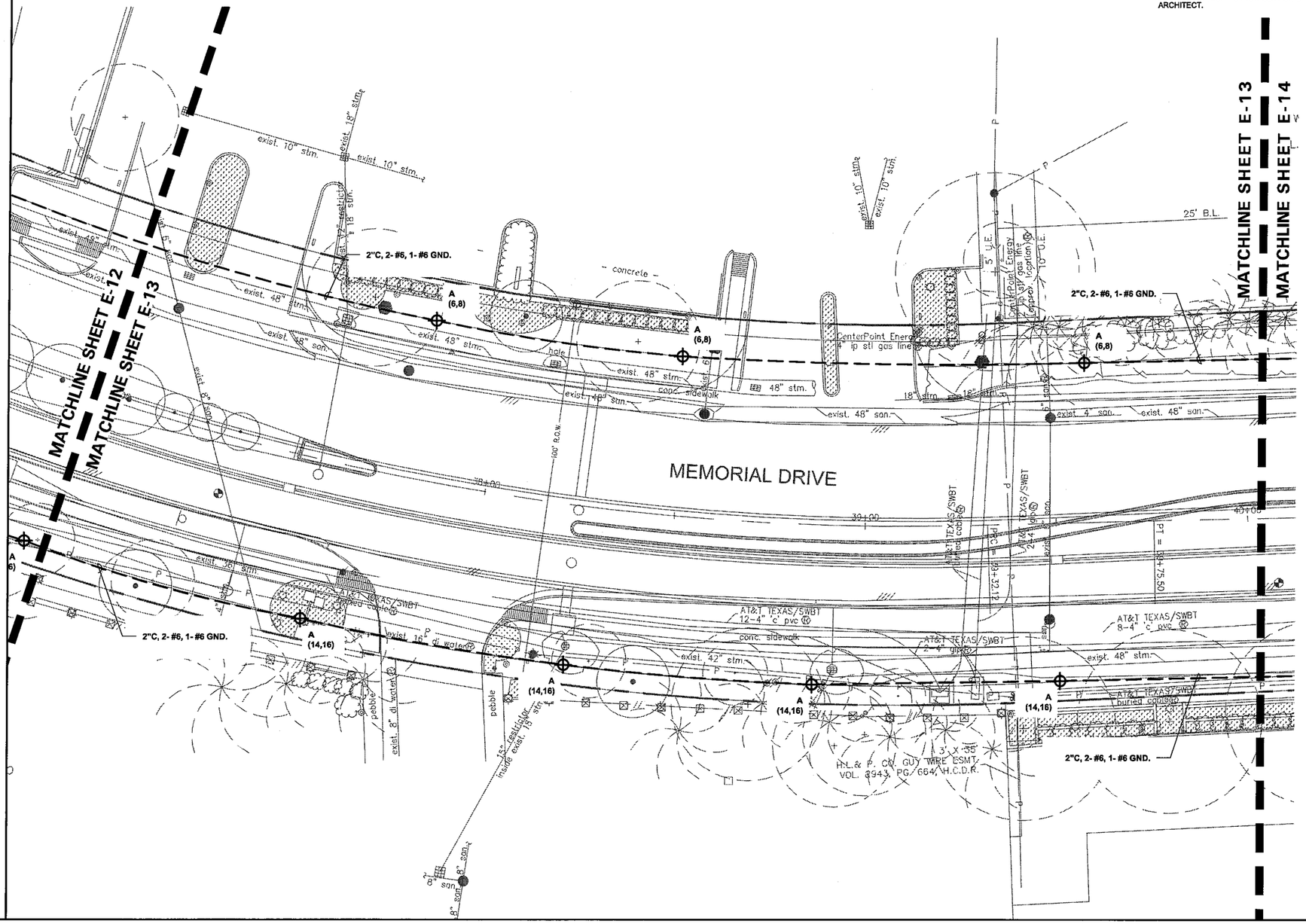
3. ALL WIRING TO BE 600V Cu, TYPE XHHW. SEE CONDUIT AND CONDUCTOR SCHEDULE FOR CONDUCTOR SIZING. GROUND WIRES SHALL BE AS PER NEC 250.
4. NEW BRANCH CIRCUITS 6-8 AND 14-16 ON PLAN DRAWING E-13 ARE TO BE FED FROM NEW TYPE D ELECTRICAL SERVICE, AS SHOWN ON DRAWING E-17.
5. IN DRIP ZONES OF ALL EXISTING TREES, ALL TRENCHES SHALL BE AIR SPADE TRENCHED OR HAND DUG. NO ROOTS OVER 1/2" SHALL BE CUT OR REMOVED.
6. LOCATION OF ALL ELECTRICAL ITEMS TO BE FIELD APPROVED PRIOR TO INSTALLATION BY LANDSCAPE ARCHITECT.



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ACCEPTED AND FILED
67862

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SCALE: 1"=30'-0"

STATE OF TEXAS
AYOUB FAHMI YOUSEF ODEH
125040
REGISTERED PROFESSIONAL ENGINEER
02-03-2020

REV. NO.	DATE	DESCRIPTION	BY

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Texas Department of Transportation

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

PEDESTRIAN LIGHTING LAYOUT

E-13 SHEET 13 OF 16

DGN: AO	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: AO	6	TEXAS	STP 1802 (783) MM			CS
DWG: AH	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: LH	HOU	HARRIS	0912	72	391	347

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QUANTITIES			
ITEM NO.	DESCRIPTION	UNIT	QUANTITY
0618-6046	CONDT (PVC) (SCHD 80) (2")	LF	775
0620-6010	ELEC CONDR (NO. 6) INSULATED	LF	1,640
0620-6010	ELEC CONDR (NO. 6) INSULATED (GROUND WIRE)	LF	820
1002-6002	LANDSCAPE AMENITY (TYP 1) PER DESCRIPTION IN FIXTURE SCHEDULE (RE: DRAWING E-18)	EA	8

LEGEND:

- PROPOSED ELECTRICAL SERVICE POLE (RE: DRAWING E-17)
- PROPOSED SCHEDULE 80 PVC CONDUIT, UNDERGROUND
- PROPOSED GROUND BOX
- A (1,3) PROPOSED LANDSCAPE AMENITY (CIRCUIT NUMBER)

GENERAL NOTES:

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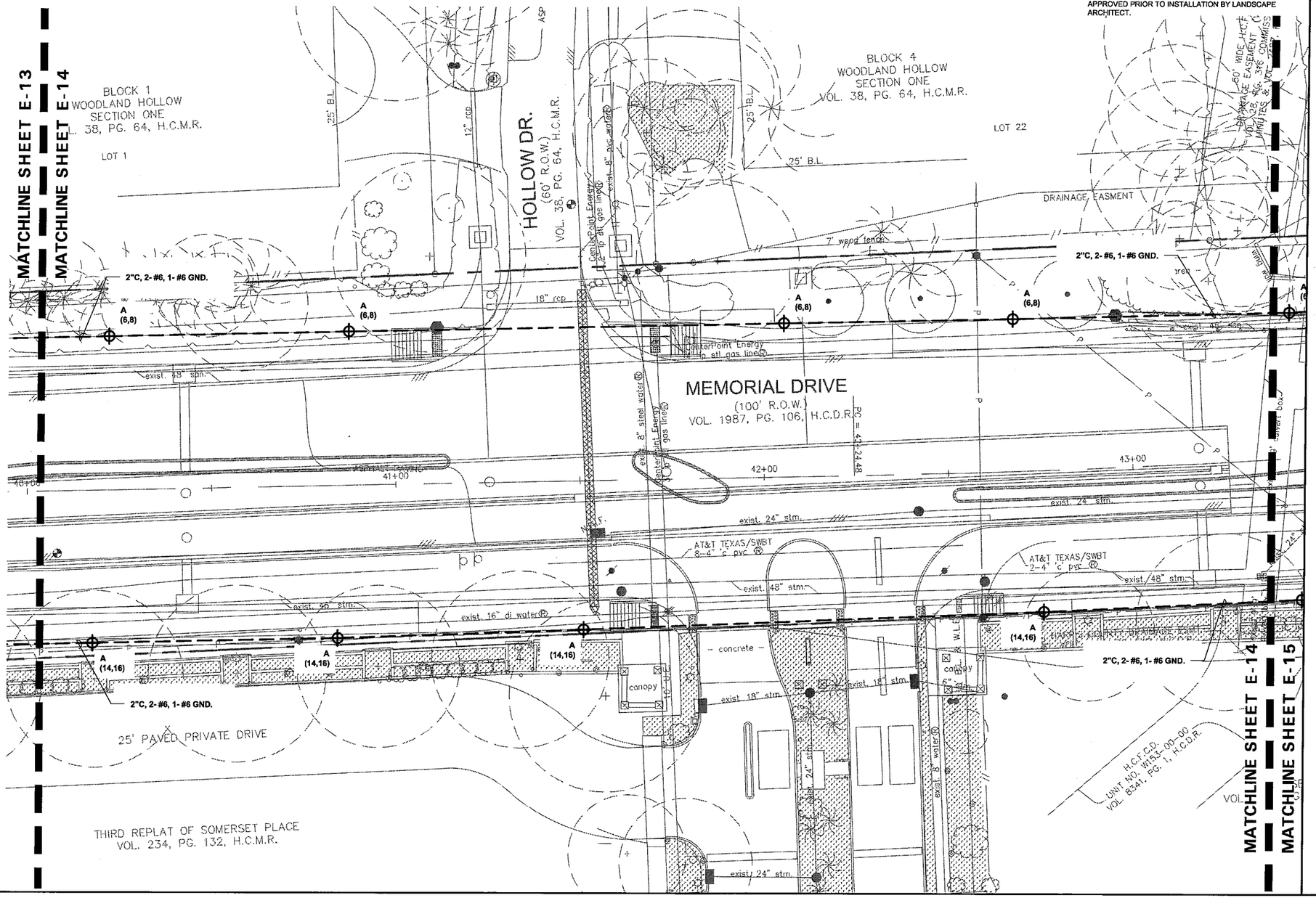
3. ALL WIRING TO BE 600V Cu, TYPE XHHW. SEE CONDUIT AND CONDUCTOR SCHEDULE FOR CONDUCTOR SIZING. GROUND WIRES SHALL BE AS PER NEC 250.
4. NEW BRANCH CIRCUITS 6-8 AND 14-16 ON PLAN DRAWING E-14 ARE TO BE FED FROM NEW TYPE D ELECTRICAL SERVICE, AS SHOWN ON DRAWING E-17.
5. IN DRIP ZONES OF ALL EXISTING TREES, ALL TRENCHES SHALL BE AIR SPADE TRENCHED OR HAND DUG. NO ROOTS OVER 1/2" SHALL BE CUT OR REMOVED.
6. LOCATION OF ALL ELECTRICAL ITEMS TO BE FIELD APPROVED PRIOR TO INSTALLATION BY LANDSCAPE ARCHITECT.



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ACCEPTED AS NOTED
67862

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SCALE: 1"=30'-0"

STATE OF TEXAS
AYOUB FAHMI YOUSEF ODEH
125040
REGISTERED PROFESSIONAL ENGINEER
02-03-2020

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

PEDESTRIAN LIGHTING LAYOUT

E-14

SHEET 14 OF 16

DGN: AO	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: AO	6	TEXAS	STP 1802 (783) MM			CS
DWG: AH	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: LH	HOU	HARRIS	0912	72	391	348

QUANTITIES			
ITEM NO.	DESCRIPTION	UNIT	QUANTITY
0618-6046	CONDT (PVC) (SCHD 80) (2")	LF	760
0620-6010	ELEC CONDR (NO. 6) INSULATED	LF	1,640
0620-6010	ELEC CONDR (NO. 8) INSULATED (GROUND WIRE)	LF	820
1002-6002	LANDSCAPE AMENITY (TYP 1) PER DESCRIPTION IN FIXTURE SCHEDULE (RE: DRAWING E-18)	EA	10

LEGEND:

- PROPOSED ELECTRICAL SERVICE POLE (RE: DRAWING E-17)
- PROPOSED SCHEDULE 80 PVC CONDUIT, UNDERGROUND
- PROPOSED GROUND BOX
- A (1,3) PROPOSED LANDSCAPE AMENITY (CIRCUIT NUMBER)

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3. ALL WIRING TO BE 600V Cu, TYPE XHHW. SEE CONDUIT AND CONDUCTOR SCHEDULE FOR CONDUCTOR SIZING. GROUND WIRES SHALL BE AS PER NEC 250.
4. NEW BRANCH CIRCUITS 6-8 AND 14-16 ON PLAN DRAWING E-15 ARE TO BE FED FROM NEW TYPE D ELECTRICAL SERVICE, AS SHOWN ON DRAWING E-17.
5. IN DRIP ZONES OF ALL EXISTING TREES, ALL TRENCHES SHALL BE AIR SPADE TRENCHED OR HAND DUG. NO ROOTS OVER 1/2" SHALL BE CUT OR REMOVED.
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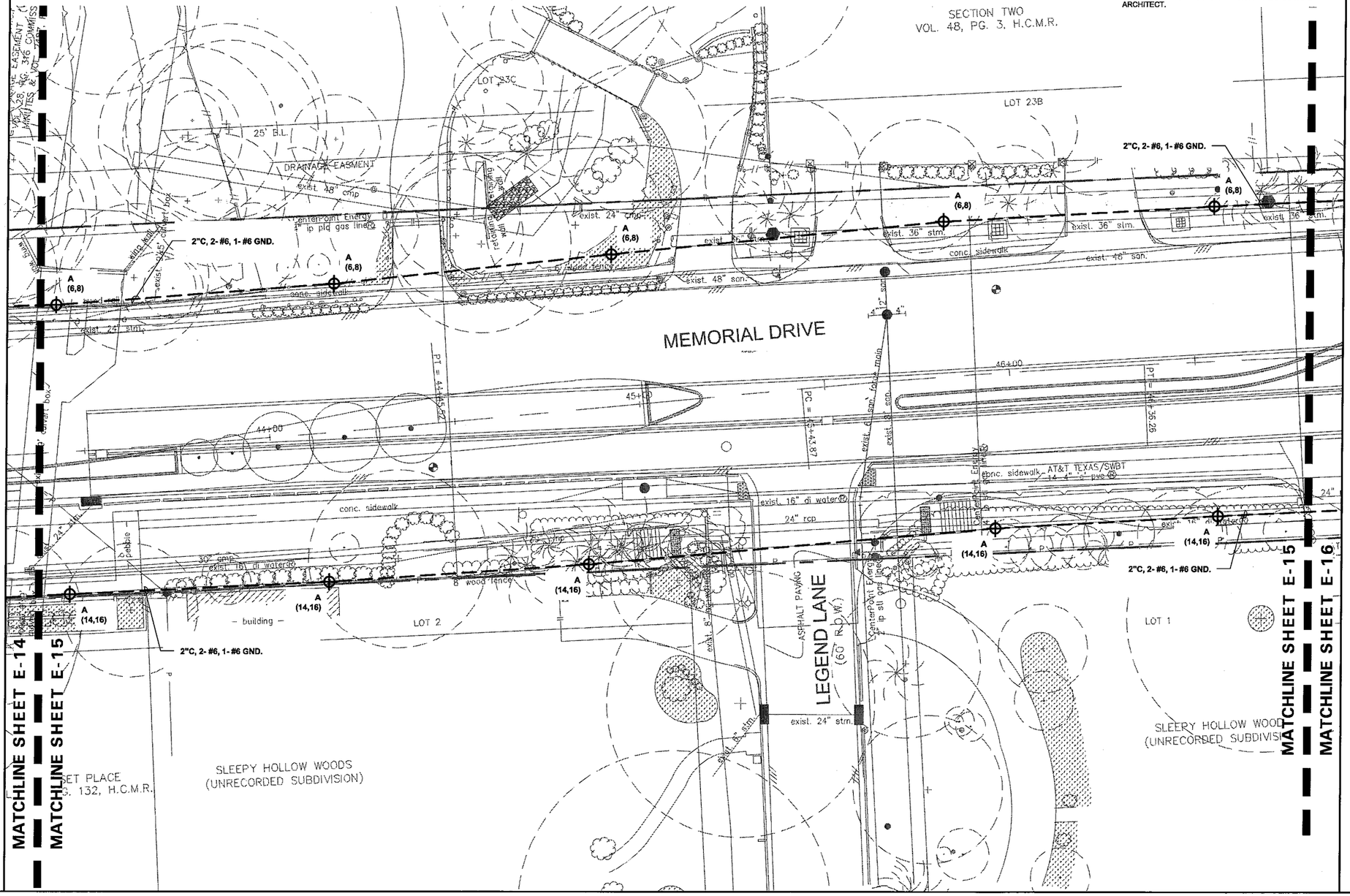

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ACCEPTED AND FILED
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STATE OF TEXAS
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125040
REGISTERED PROFESSIONAL ENGINEER
02-03-2020

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Texas Department of Transportation

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

PEDESTRIAN LIGHTING LAYOUT

E-15 SHEET 15 OF 16

DGN: AO	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: AO	6	TEXAS	STP 1802 (783) MM			CS
DWG: AH	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: LH	HOU	HARRIS	0912	72	391	349

QUANTITIES			
ITEM NO.	DESCRIPTION	UNIT	QUANTITY
0618-6046	CONDT (PVC) (SCHD 80) (2")	LF	430
0620-6010	ELEC CONDR (NO. 6) INSULATED	LF	920
0620-6010	ELEC CONDR (NO. 6) INSULATED (GROUND WIRE)	LF	460
1002-6002	LANDSCAPE AMENITY (TYP 1) PER DESCRIPTION IN FIXTURE SCHEDULE (RE: DRAWING E-18)	EA	6

LEGEND:

- PROPOSED ELECTRICAL SERVICE POLE (RE: DRAWING E-17)
- PROPOSED SCHEDULE 80 PVC CONDUIT, UNDERGROUND
- PROPOSED GROUND BOX
- A (1,3) PROPOSED LANDSCAPE AMENITY (CIRCUIT NUMBER)

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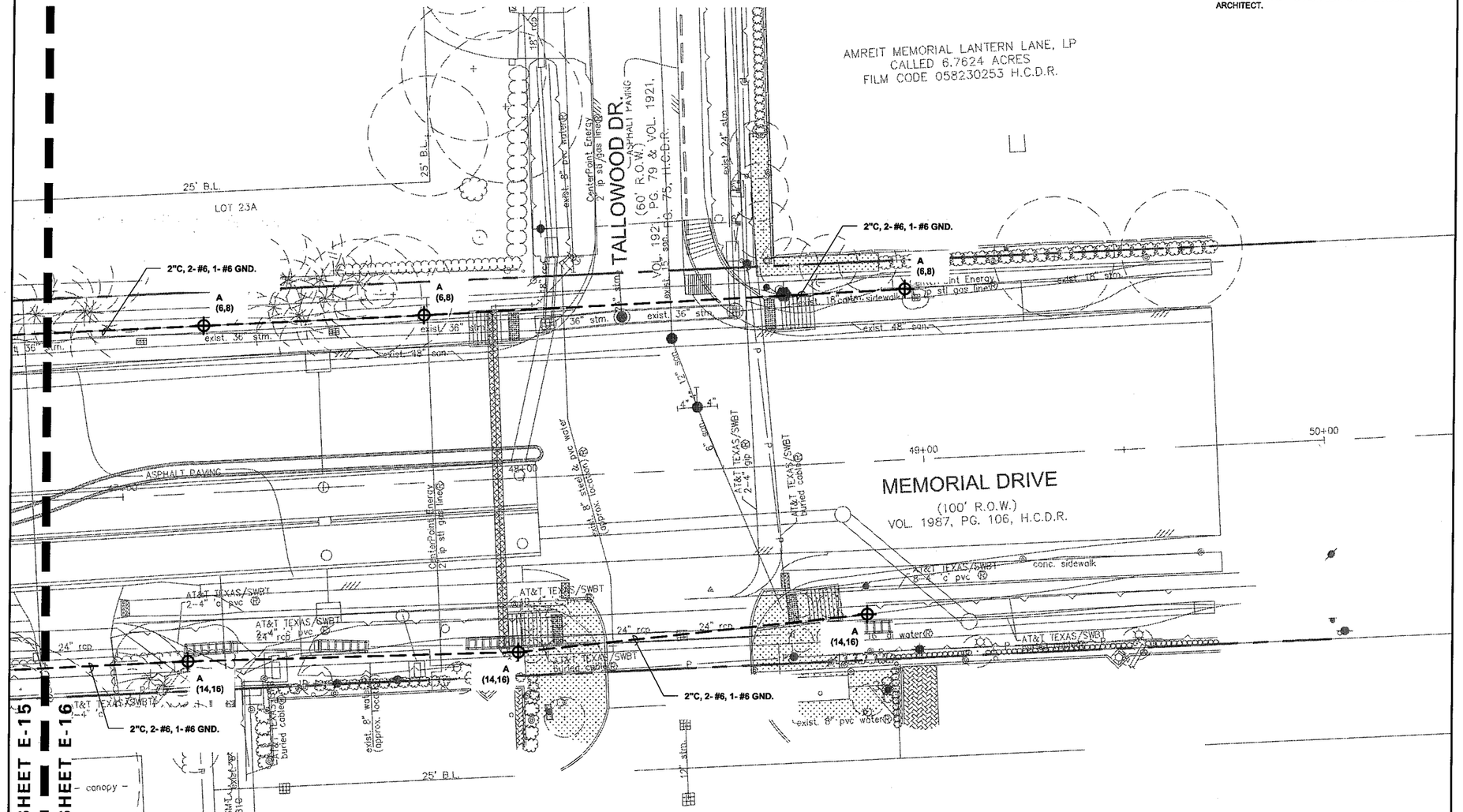

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PUBLIC WORKS ACCEPTED AND FILED
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SCALE: 1"=30'-0"

STATE OF TEXAS
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REGISTERED PROFESSIONAL ENGINEER
02-03-2020

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A LEO A DALY COMPANY
FIRM REGISTATION NO. 2814

Texas Department of Transportation

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

PEDESTRIAN LIGHTING LAYOUT

E-16 SHEET 16 OF 16

DGN: AO	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: AO	6	TEXAS	STP 1802 (783) MM			CS
DWG: AH	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: LH	HOU	HARRIS	0912	72	391	350

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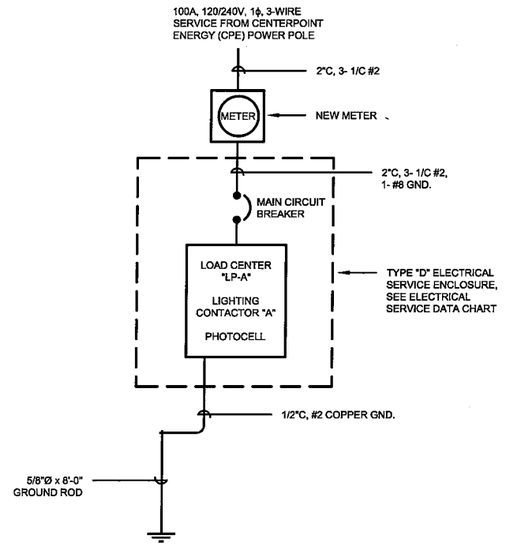
ELECTRICAL SERVICE DATA

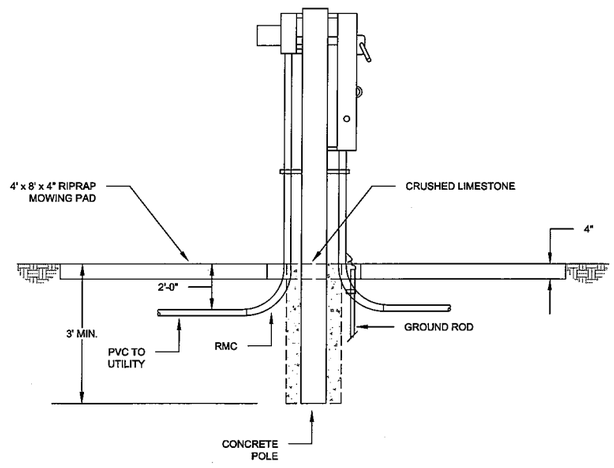
ELEC. SERVICE NO.	SHEET NO.	ELECTRICAL SERVICE DESCRIPTION (SEE ED (5) & (6) - 14)	SERVICE CONDUIT SIZE	SERVICE CONDUCTORS NO./SIZE	SAFETY SWITCH AMPS	MAIN CKT. BREAKER POLE/AMP	16-POLE CONTACTOR AMPS	PANELBOARD/ LOADCENTER AMP RATING	CIRCUIT NO.	BRANCH CKT. BKR. POLE/AMPS	BRANCH CIRCUIT AMPS	KVA LOAD
LP-A	E-7	ELC SRV TY D 120/240 100 (NS)SS(E)OC(U) CONTRACTOR SHALL SUBMIT DIMENSIONAL DRAWING OF ELECTRIC SERVICE SHOWING ALL COMPONENTS TO PROJECT ENGINEER FOR APPROVAL PRIOR TO FABRICATION. REFERENCE TxDOT STANDARD ED(10)-14.	2"	3 / #2	N/A	2P / 100	30	100	(A) LIGHTING 1-3	2P / 20	2.3	0.54
									(F) LIGHTING 2-4	2P / 20	3.8	0.92
									(B) LIGHTING 5-7	2P / 20	2.5	0.59
									(E) LIGHTING 6-8	2P / 20	3.8	0.92
									(C) LIGHTING 9-11	2P / 20	2.3	0.54
									(H) LIGHTING 10-12	2P / 20	4.5	1.08
									(D) LIGHTING 13-15	2P / 20	2.5	0.59
									(G) LIGHTING 14-16	2P / 20	4.1	0.97
									SPARE 17-19	2P / 20		
									IRRIGATION 18	1P / 20	1.7	0.20
									SPARE 20	1P / 20		

CONDUIT AND CONDUCTOR SCHEDULE

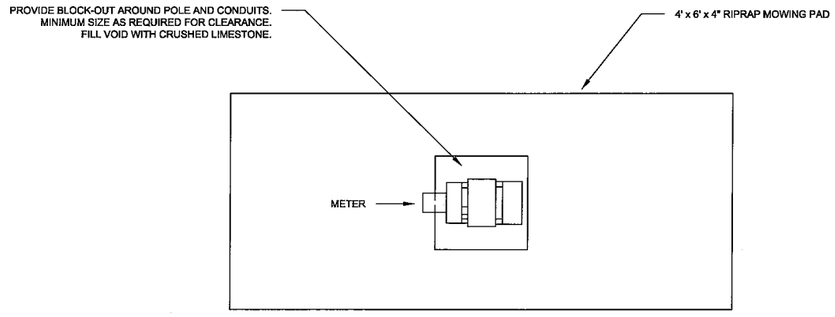
CKT	SERVES	WATTS/ VA	XHHW COPPER WIRE	XHHW COPPER COND	XHHW COPPER COND	XHHW COPPER WIRE	WATTS/ VA	SERVES	CKT
1	PEDESTRIAN LIGHTS, E. SIDE OF MEMORIAL DR. - NORTH (10)	270	8	2"	2"	8	459	PEDESTRIAN LIGHTS, E. SIDE OF MEMORIAL DR. - SOUTH (17)	2
3		270					459		4
5	PEDESTRIAN LIGHTS, E. SIDE OF MEMORIAL DR. - NORTH (11)	297	8	2"	2"	6	459	PEDESTRIAN LIGHTS, E. SIDE OF MEMORIAL DR. - SOUTH (17)	6
7		297					459		8
9	PEDESTRIAN LIGHTS, W. SIDE OF MEMORIAL DR. - NORTH (10)	270	8	2"	2"	8	540	PEDESTRIAN LIGHTS, W. SIDE OF MEMORIAL DR. - SOUTH (20)	10
11		270					540		12
13	PEDESTRIAN LIGHTS, W. SIDE OF MEMORIAL DR. - NORTH (11)	297	8	2"	2"	6	486	PEDESTRIAN LIGHTS, W. SIDE OF MEMORIAL DR. - SOUTH (18)	14
15		297					486		16
17	SPARE				1 1/4"	8	200	IRRIGATION CONTROLLER	18
19								SPARE	20



ONE-LINE DIAGRAM
SCALE: NTS



1 SERVICE POLE WITH RIPRAP MOWING PAD ELEVATION
SCALE: NTS



2 SERVICE POLE WITH RIPRAP MOWING PAD PLAN
SCALE: NTS

GENERAL NOTES:

1. UNDERGROUND UTILITIES MAY EXIST IN THE AREA. CONTRACTOR SHALL VERIFY UTILITY LOCATIONS BEFORE TRENCHING, DIGGING OR BORING.
2. ALL BURIED CONDUIT SHALL BE POLYVINYL CHLORIDE (PVC), SCHEDULE 80. BURIED CONDUIT SHALL HAVE 4" WIDE WARNING TAPE ABOVE AT 12" BELOW GRADE. WARNING TAPE SHALL READ, "DANGER - ELECTRICAL LINE". ALL EXPOSED CONDUIT SHALL BE PVC COATED RIGID GALVANIZED STEEL (RGS). UNDERGROUND ELBOWS FOR STUB-UPS SHALL BE PVC-COATED GALVANIZED STEEL. TRANSITIONS FROM BURIED TO EXPOSED SHALL BE PVC-COATED RIGID GALVANIZED STEEL.
3. ALL CONDUIT RUNS, FITTINGS, JUNCTION BOXES, AND ELECTRICAL DEVICES LOCATIONS ARE APPROXIMATE. FIELD LOCATE ALL CONDUIT AND DEVICES, AND ALL WORK SHALL BE PERFORMED, IN ACCORDANCE TO NATIONAL ELECTRICAL CODE AND TxDOT STANDARDS.
4. IN DRIP ZONES OF ALL EXISTING TREES, ALL TRENCHES SHALL BE AIR SPADE TRENCHED OR HAND DUG. NO ROOTS OVER 1/2" SHALL BE CUT OR REMOVED.
5. CONCRETE FOR RIPRAP SHALL BE CLASS "B" IN ACCORDANCE WITH ITEM 0421, "HYDRAULIC CEMENT CONCRETE".
6. BLOCK-OUT SHALL BE LARGE ENOUGH TO ACCOMMODATE THE SERVICE POLE, CONDUITS AND GROUND ROD OR AS DIRECTED BY THE ENGINEER.
7. RIPRAP MOWING PAD AND CRUSHED LIMESTONE WILL NOT BE PAID FOR DIRECTLY, BUT SHALL BE CONSIDERED SUBSIDIARY TO ITEM 0628, "ELECTRICAL SERVICES".

Landscape Architect

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Electrical Engineer

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TBPE Firm No. F-3446

ACCEPTED AND FILED
67862

STATE OF TEXAS
AYOUB FAHMI YOUSEF ODEH
125040
REGISTERED PROFESSIONAL ENGINEER
02-03-2020

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

PEDESTRIAN LIGHTING GENERAL NOTES & SERVICE DETAILS

E-17 SHEET 1 OF 1

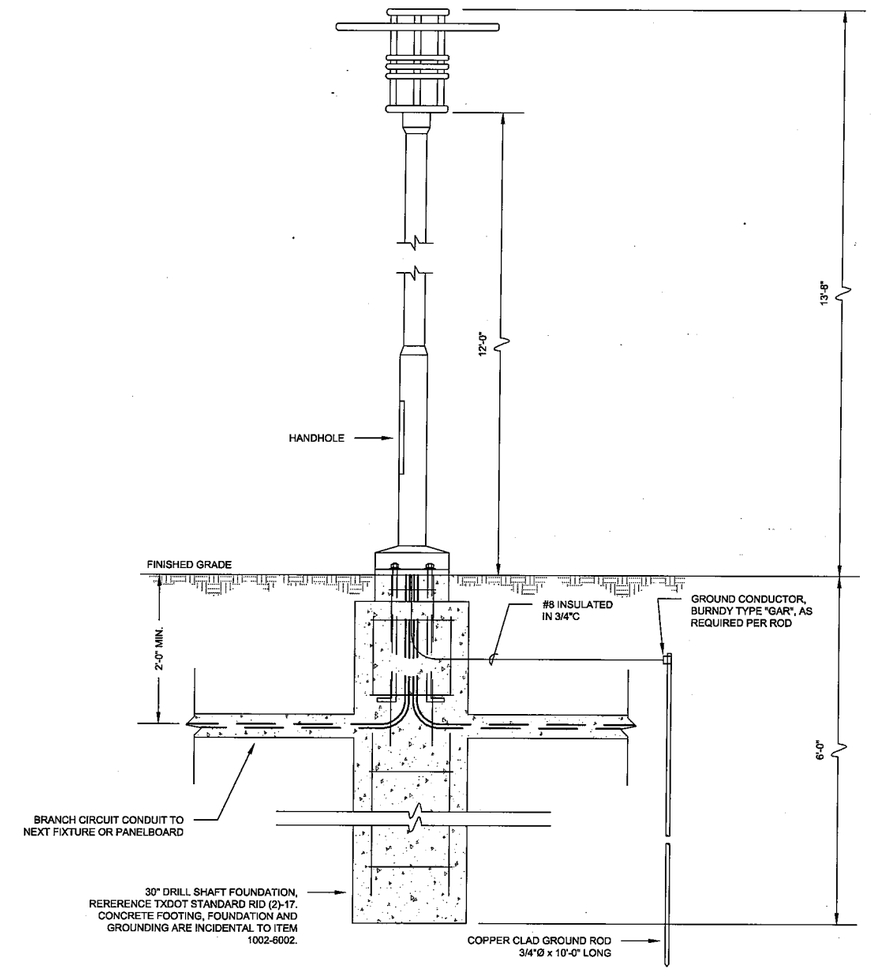
DGN: AO	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: AO	6	TEXAS	STP 1802 (783) MM			CS
DWG: AH	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: LH	HOU	HARRIS	0912	72	391	351

LIGHTING FIXTURE SCHEDULE

TYPE	MANUFACTURER AND CATALOG NUMBER	DESCRIPTION	VOLTAGE	LAMPS	MOUNTING	REMARKS
A	HESS AMERICA AV650 360L WW UNV A 12S S CC	LANDSCAPE AMENITY (MEMORIAL CITY REDEVELOPMENT AUTHORITY PEDESTRIAN LIGHT AND POLE STANDARD). CUSTOM PAINT COLOR: METALLIC MATTHEWS PAINT, CHAMPAGNE GREY METALLIC MP 16771.	240	1-54W LED/3000K	POLE	UL LISTED FOR WET LOCATIONS

NOTES:

1. CONTRACTOR SHALL SUBMIT PRODUCT INFORMATION AND SAMPLE FOR APPROVAL PRIOR TO STARTING WORK.
2. ALL FIXTURES SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S INSTALLATION INSTRUCTIONS.
3. CONTRACTOR TO PHYSICALLY MARK ALL PROPOSED LIGHT LOCATIONS. ARCHITECT/ENGINEER TO APPROVE ALL LIGHT AND CONDUIT LOCATIONS BEFORE INSTALLATION.



1 TYPICAL POLE MOUNTING DETAIL-ITEM 1002-6002 LANDSCAPE AMENITY (TYP. 1)
SCALE: NTS

Landscape Architect

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Electrical Engineer

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ACCEPTED
67802

STATE OF TEXAS
AYOUB FAHMI YOUSEF ODEH
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02-03-2020

REV. NO.	DATE	DESCRIPTION	BY

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Texas Department of Transportation

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

PEDESTRIAN LIGHTING DETAILS

E-18 SHEET 1 OF 1

DGN: AO	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: AO	6	TEXAS	STP 1802 (783) MM			CS
DWG: AH	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: LH	HOU	HARRIS	0912	72	391	352

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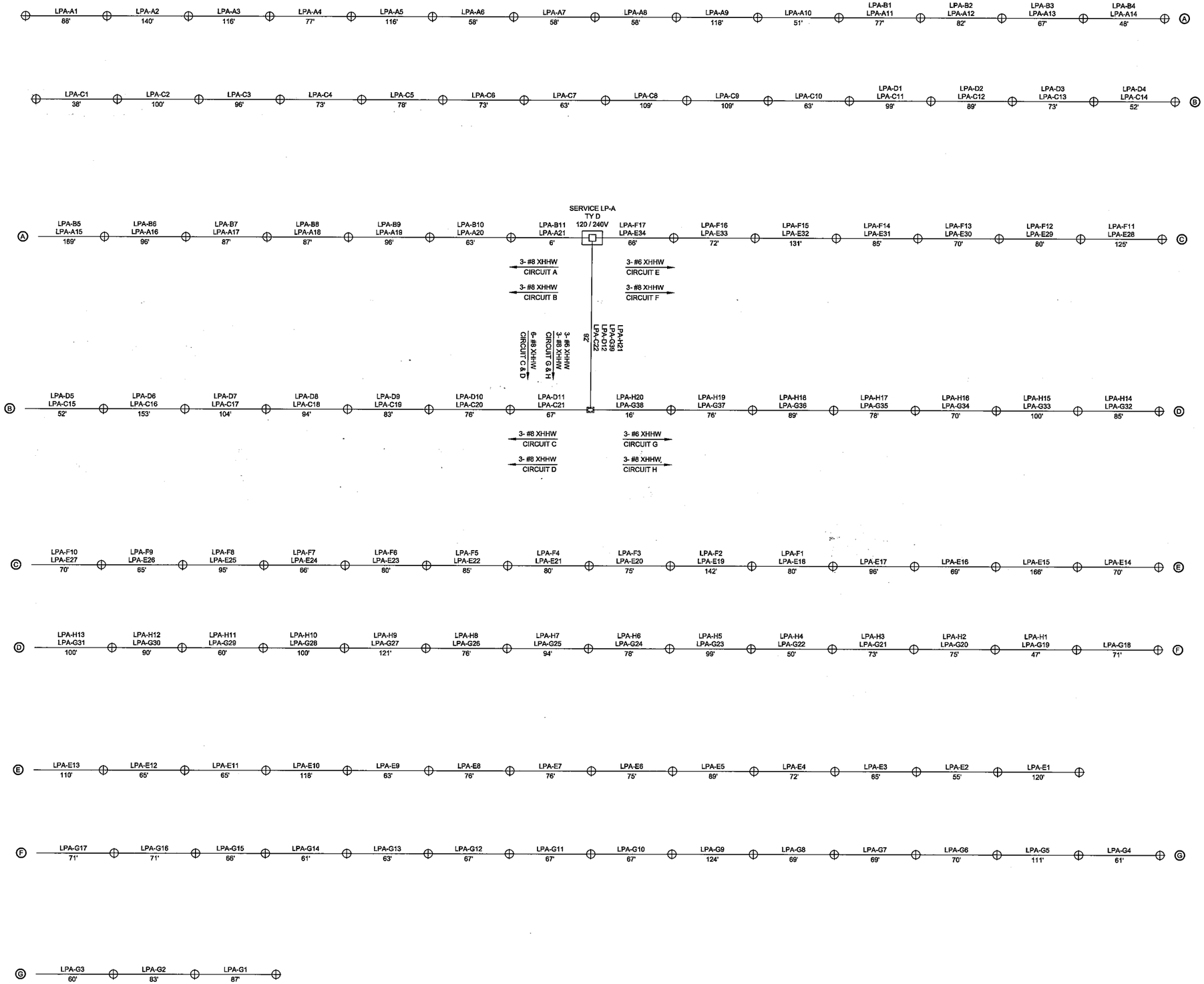

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STATE OF TEXAS
AYOUB FAHMI YOUSEF ODEH
125040
REGISTERED
PROFESSIONAL ENGINEER
02-03-2020

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

PEDESTRIAN LIGHTING CIRCUIT DIAGRAM

E-19

SHEET 1 OF 1

DGN: AO	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN: AO	6	TEXAS	STP 1802 (783) MM			CS
DWG: AH	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG: LH	HOU	HARRIS	0912	72	391	353

DATE:
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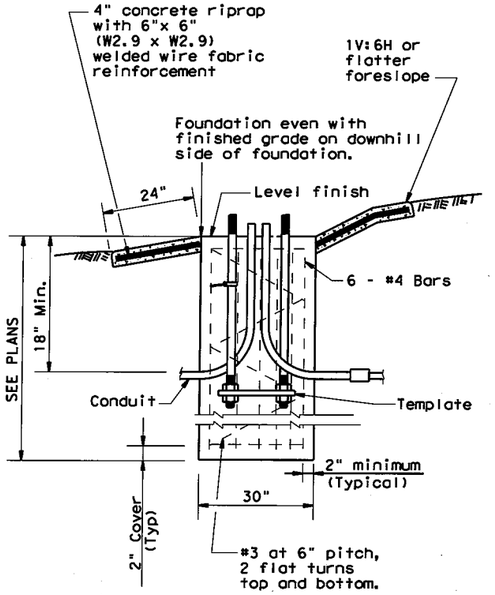
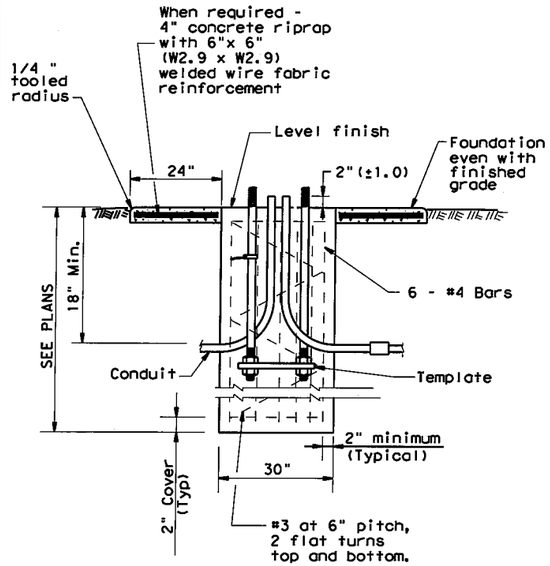


SECTION A-A
SHOWING SLOPED GRADE



SECTION A-A
SHOWING CONSTANT GRADE

TABLE 1

ANCHOR BOLTS

POLE MOUNTING HEIGHT	BOLT CIRCLE		ANCHOR BOLT SIZE
	Shoe Base	T-Base	
<40 ft.	13 in.	14 in.	1in. x 30in.
40-50 ft.	15 in.	17 ¼in.	1 ¼in. x 30in.

TABLE 2

RECOMMENDED FOUNDATION LENGTHS
(See note 1)

MOUNTING HEIGHT	TEXAS CONE PENETROMETER N Blows/ft		
	10	15	40
≤20 ft.	6'	6'	6'
>20 ft. to 30 ft.	8'	6'	6'
>30 ft. to 40 ft.	8'	8'	6'
>40 ft. to 50 ft.	10'	8'	6'

TABLE 3

PAY QUANTITY OF RIPRAP PER FOUNDATION (Install only when shown on the plans)

Foundation Diameter	RIPRAP DIAMETER	RIPRAP (CONC) (CL B)
30 in.	78 in.	0.35 CY

GENERAL NOTES:

1. "Recommended Foundation Lengths" table is for information purposes only. Foundation lengths shall be as shown on the plans, or as directed by the Engineer. Foundations will be paid for under Item 416, "Drilled Shaft Foundations," unless otherwise shown on the plans.
2. Erect roadway illumination assembly poles plumb and true. Form and level the top 6" of the foundation so the pole will be plumb. Use leveling nuts to plumb shoe base poles. Do not use shims or leveling nuts under transformer bases. Do not grout between baseplate and the foundation.
3. Ensure Class 2A and 2B fit for anchor bolts and nuts. Tap and chase nuts after galvanizing. Anchor bolt body with rolled threads need not be full size.
4. Use appropriate class of concrete as specified in Items 416 and 432. Concrete for riprap may be upgraded to Class C at no extra cost to the Department.
5. Place riprap around the foundation when called for elsewhere in the plans. Riprap will be paid for under Item 432.
6. Locate breakaway roadway illumination assemblies as shown in the placement table, unless otherwise dimensioned on the plans. Protect non-breakaway illumination assemblies from vehicular impact (i.e. 2.5 ft. behind guard rail or mounted on traffic barrier), or located outside the clear zone, except that 2.5 ft. from curb face is minimum desired for light poles on city streets, 45 mph or less. See Roadway Design Manual for further information.
7. Use 4 hold down and 4 connecting washers on transformer base poles as recommended by the manufacturer and supplied with base.
8. Install a minimum of 2 conduits in each foundation. See lighting layout sheets for locations of foundations with more than 2 conduits. Cap unused conduits in foundations on both ends.
9. Conduit location in foundations is critical for breakaway devices. Place conduits 2 in. apart on centerline as shown.
10. Bond anchor bolt to rebar cage with #6 bare stranded copper conductor. Use listed mechanical connectors rated for embedment in concrete. The bonded steel in the foundation creates a concrete encased grounding electrode which replaces the ground rod.
11. Use riprap on T-base foundations that are located on sloped grades.

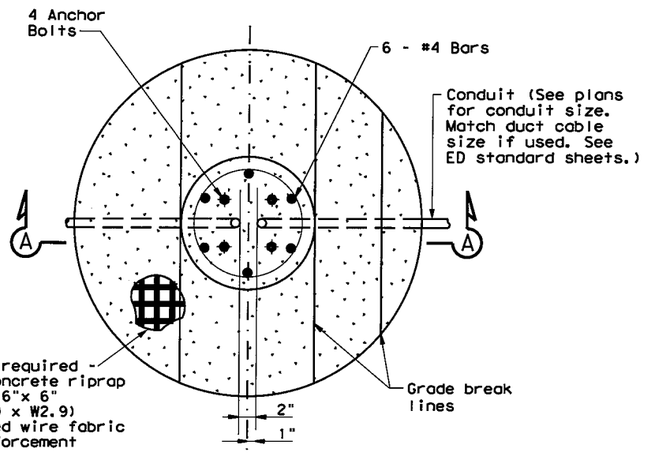
TABLE 4

BREAKAWAY POLE PLACEMENT (See note 6)

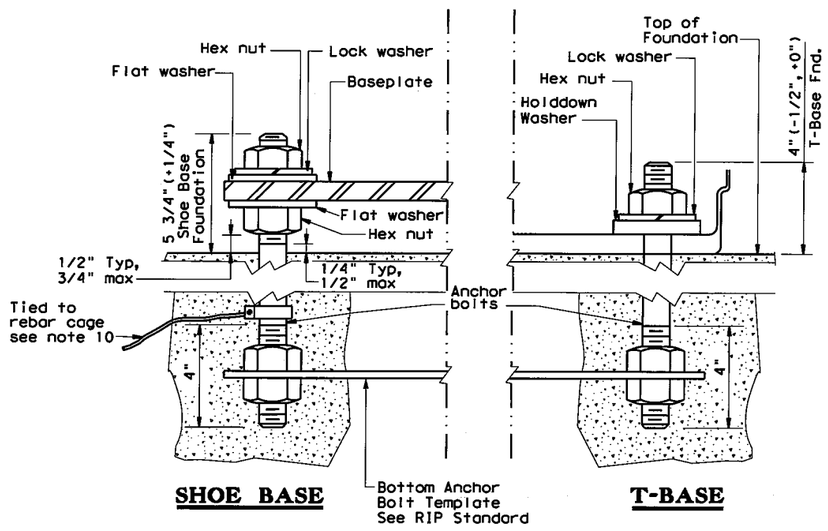
ROADWAY FUNCTIONAL CLASSIFICATION	** POLE OFFSET (DISTANCE TO FACE OF TRANSFORMER BASE)
Freeway Mainlanes (roadway with full control of access)	15 ft. (minimum and typical) from lane edge
All curbed, 45 mph or less design speed	2.5 ft. minimum (15 ft. desirable) from curb face
All others	10 ft. minimum*(15 ft. desirable) from lane edge

* or as close to ROW line as is practical

** provide 2/5 of the luminaire mounting height behind the pole for "falling area" to prevent encroachment on the other travel lanes. See design guidelines.



FOUNDATION DETAIL



ANCHOR BOLT DETAIL

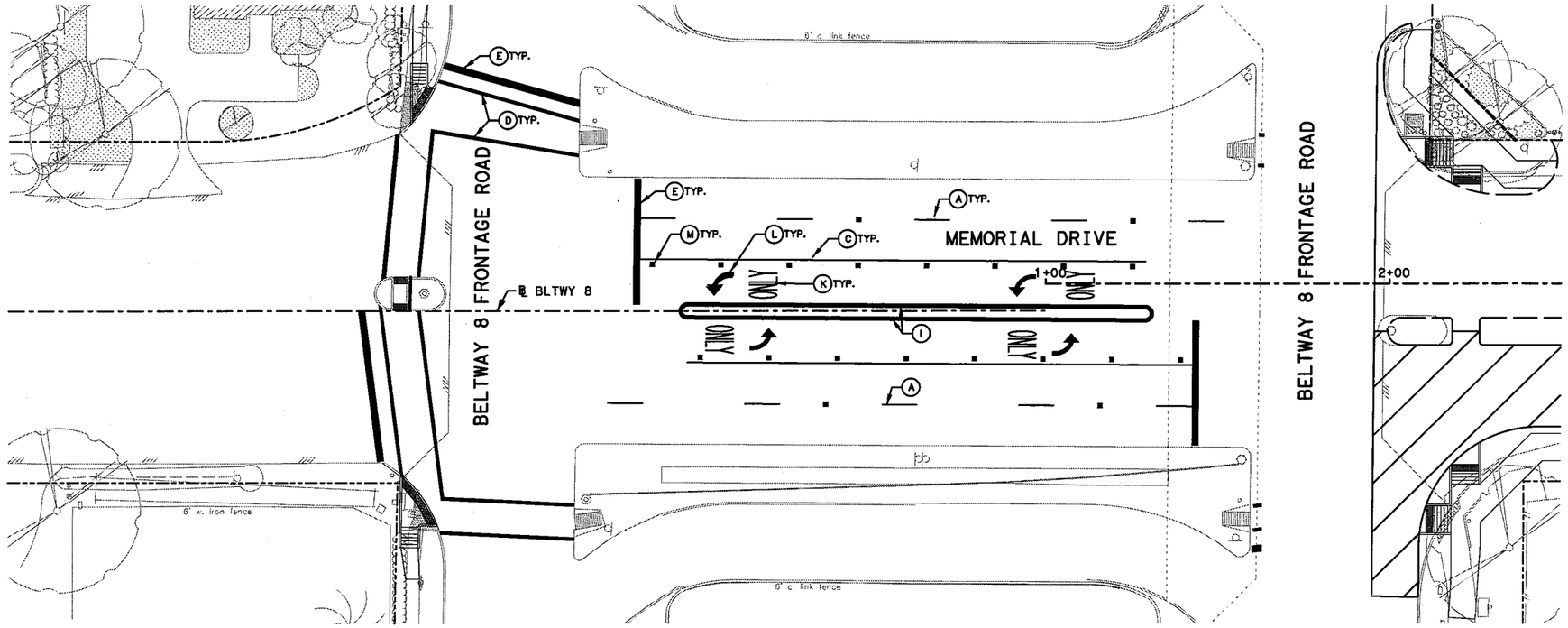
Texas Department of Transportation

Traffic Operations Division Standard

ROADWAY ILLUMINATION DETAILS
(RDWY ILLUM FOUNDATIONS)
RID(2)-17

FILE: rid2-17.dgn	DN:	CK:	DW:	CK:
©TxDOT January 2007	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	72	391	CS
1-11	DIST	COUNTY		SHEET NO.
7-17	HOU	HARRIS		354

728



LEGEND

- GROUND MOUNTED SIGN
- PROPOSED CURB
- (A) MULTIPOLYMER PAV MRK (W) (4") (BRK)
- (B) MULTIPOLYMER PAV MRK (W) (6") (DOT)
- (C) MULTIPOLYMER PAV MRK (W) (8") (SLD)
- (D) MULTIPOLYMER PAV MRK (W) (12") (SLD)
- (E) MULTIPOLYMER PAV MRK (W) (24") (SLD)
- (F) REFL PAV MRK TY II (W) (12") (SLD)
- (G) MULTIPOLYMER PAV MRK (Y) (4") (SLD)
- (H) MULTIPOLYMER PAV MRK (Y) (4") (BRK)
- (I) REFL PAV MRK TY II (Y) (12") (SLD)
- (J) REFL PAV MRK TY II (R) (12") (FIRE LANE)
- (K) PREFAB PAV MRK TY C (W) (WORD)
- (L) PREFEB PAV MRK TY C (W) (ARROW)
- (M) REFL PAV MRKR TY I-C
- (N) REFL PAV MRKR TY II-A-A
- (O) REFL PAV MRKR TY II-C-R
- (P) MULTIPOLYMER PAV MRK (W) (4") (SLD)
- (Q) MULTIPOLYMER PAV MRK (Y) (24") (SLD)

NOTES:

1. REFER TO SITE MATERIALS PLAN FOR TEXTURED PAVEMENT TYPE.
2. REFER TO SIGNAGE AND STRIPING STANDARDS FOR MORE DETAILS.
3. REFER TO SUMMARY OF PAVEMENT MARKING QUANTITIES AND SUMMARY OF SMALL SIGNS FOR QUANTITIES
4. REFER TO STANDARD HIGHWAY SIGN DESIGNS FOR TEXAS.
5. A DOUBLE-REFLECTORIZED BLUE MARKER SHALL BE PLACED 6-INCHES OFFSET FROM THE PAVEMENT CENTERLINE AT ALL FIRE HYDRANT LOCATIONS. HYDRANTS LOCATED AT INTERSECTIONS SHALL HAVE A MARKER PLACED ON EACH STREET. PAYMENT IS SUBSIDIARY OF PROPOSED/EXISTING FIRE HYDRANTS.

0 40 80
(IN FEET)
SCALE: PLAN 1"= 40'

STATE OF TEXAS
MARK WOODWARD
95672
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation ©2020

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

SIGNING AND PAVEMENT MARKING PLAN BELTWAY 8

SHEET 1 OF 7

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	355

67862

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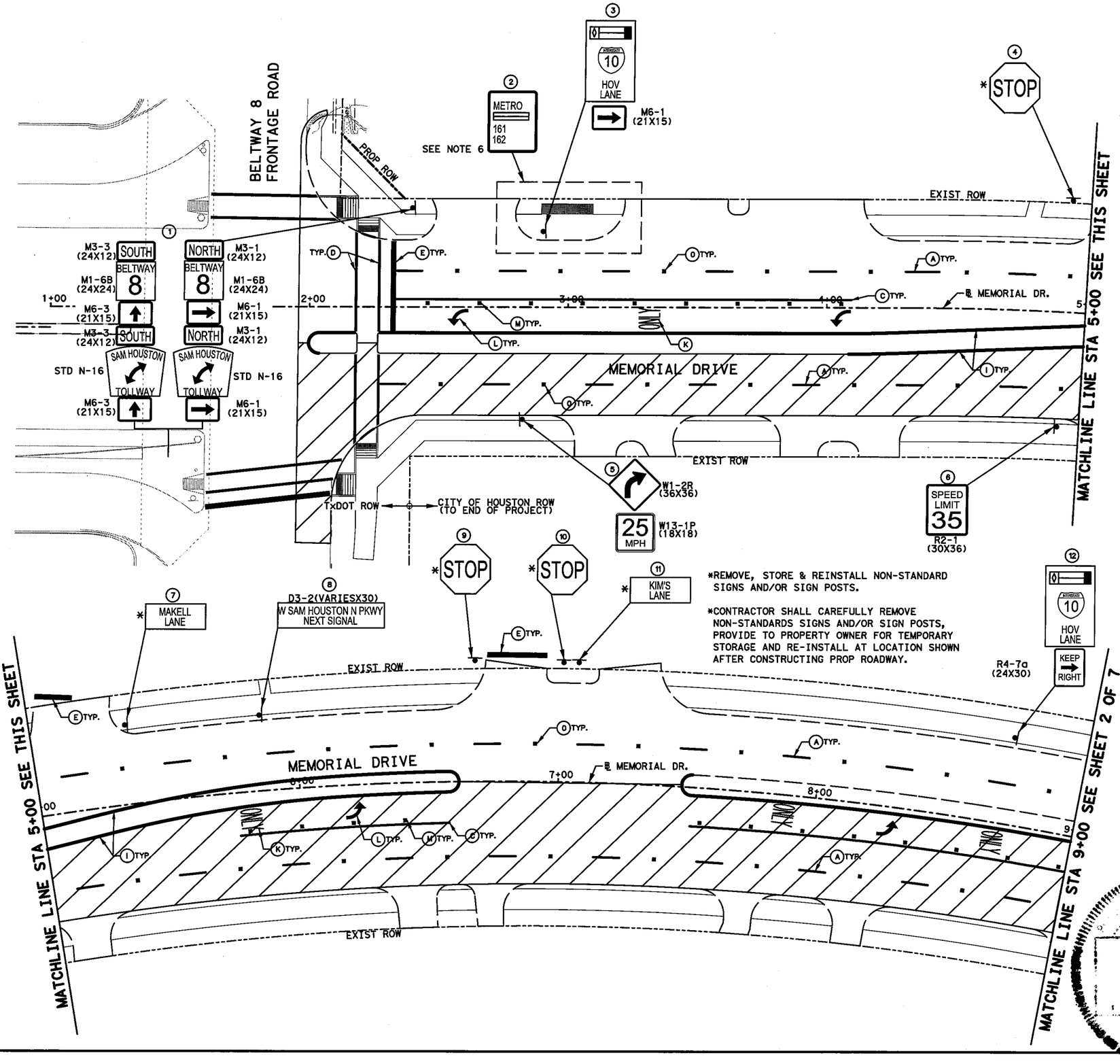

LEGEND

- GROUND MOUNTED SIGN
- PROPOSED CURB
- (A) MULTIPOLYMER PAV MRK (W) (4") (BRK)
- (B) MULTIPOLYMER PAV MRK (W) (6") (DOT)
- (C) MULTIPOLYMER PAV MRK (W) (8") (SLD)
- (D) MULTIPOLYMER PAV MRK (W) (12") (SLD)
- (E) MULTIPOLYMER PAV MRK (W) (24") (SLD)
- (F) REFL PAV MRK TY II (W) (12") (SLD)
- (G) MULTIPOLYMER PAV MRK (Y) (4") (SLD)
- (H) MULTIPOLYMER PAV MRK (Y) (4") (BRK)
- (I) REFL PAV MRK TY II (Y) (12") (SLD)
- (J) REFL PAV MRK TY II (R) (12") (FIRE LANE)
- (K) PREFAB PAV MRK TY C (W) (WORD)
- (L) PREFEB PAV MRK TY C (W) (ARROW)
- (M) REFL PAV MRKR TY I-C
- (N) REFL PAV MRKR TY II-A-A
- (O) REFL PAV MRKR TY II-C-R
- (P) MULTIPOLYMER PAV MRK (W) (4") (SLD)
- (Q) MULTIPOLYMER PAV MRK (Y) (24") (SLD)

NOTES:

1. REFER TO SITE MATERIALS PLAN FOR TEXTURED PAVEMENT TYPE.
2. REFER TO SIGNAGE AND STRIPING STANDARDS FOR MORE DETAILS.
3. REFER TO SUMMARY OF PAVEMENT MARKING QUANTITIES AND SUMMARY OF SMALL SIGNS FOR QUANTITIES
4. REFER TO STANDARD HIGHWAY SIGN DESIGNS FOR TEXAS.
5. A DOUBLE-REFLECTORIZED BLUE MARKER SHALL BE PLACED 6-INCHES OFFSET FROM THE PAVEMENT CENTERLINE AT ALL FIRE HYDRANT LOCATIONS. HYDRANTS LOCATED AT INTERSECTIONS SHALL HAVE A MARKER PLACED ON EACH STREET. PAYMENT IS SUBSIDIARY OF PROPOSED/EXISTING FIRE HYDRANTS.
6. COORDINATE WITH METRO A MINIMUM OF 72 HOURS FOR PROPOSED SIGNS AND PLACEMENT.

0 40 80

(IN FEET)

SCALE: PLAN 1":40'

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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A LEO A DALY COMPANY
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

SIGNING AND PAVEMENT MARKING PLAN BEGIN PROJECT TO STA 9+00

SHEET 2 OF 7

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	356

67862

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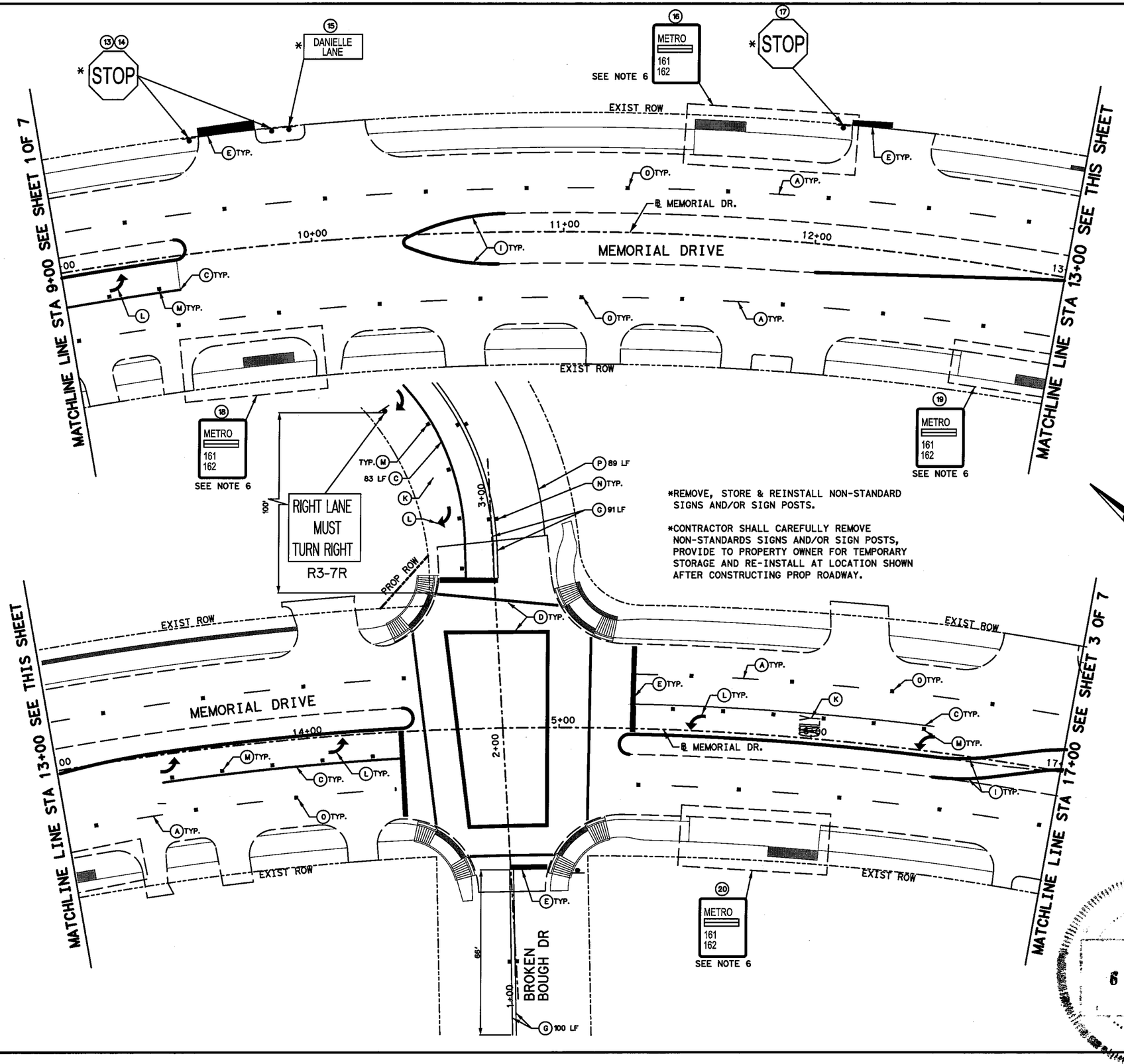

*REMOVE, STORE & REINSTALL NON-STANDARD SIGNS AND/OR SIGN POSTS.

*CONTRACTOR SHALL CAREFULLY REMOVE NON-STANDARDS SIGNS AND/OR SIGN POSTS, PROVIDE TO PROPERTY OWNER FOR TEMPORARY STORAGE AND RE-INSTALL AT LOCATION SHOWN AFTER CONSTRUCTING PROP ROADWAY.

LEGEND

- GROUND MOUNTED SIGN
- PROPOSED CURB
- (A) MULTIPOLYMER PAV MRK (W) (4") (BRK)
- (B) MULTIPOLYMER PAV MRK (W) (6") (DOT)
- (C) MULTIPOLYMER PAV MRK (W) (8") (SLD)
- (D) MULTIPOLYMER PAV MRK (W) (12") (SLD)
- (E) MULTIPOLYMER PAV MRK (W) (24") (SLD)
- (F) REFL PAV MRK TY II (W) (12") (SLD)
- (G) MULTIPOLYMER PAV MRK (Y) (4") (SLD)
- (H) MULTIPOLYMER PAV MRK (Y) (4") (BRK)
- (I) REFL PAV MRK TY II (Y) (12") (SLD)
- (J) REFL PAV MRK TY II (R) (12") (FIRE LANE)
- (K) PREFAB PAV MRK TY C (W) (WORD)
- (L) PREFEB PAV MRK TY C (W) (ARROW)
- (M) REFL PAV MRKR TY I-C
- (N) REFL PAV MRKR TY II-A-A
- (O) REFL PAV MRKR TY II-C-R
- (P) MULTIPOLYMER PAV MRK (W) (4") (SLD)
- (Q) MULTIPOLYMER PAV MRK (Y) (24") (SLD)

NOTES:

1. REFER TO SITE MATERIALS PLAN FOR TEXTURED PAVEMENT TYPE.
2. REFER TO SIGNAGE AND STRIPING STANDARDS FOR MORE DETAILS.
3. REFER TO SUMMARY OF PAVEMENT MARKING QUANTITIES AND SUMMARY OF SMALL SIGNS FOR QUANTITIES
4. REFER TO STANDARD HIGHWAY SIGN DESIGNS FOR TEXAS.
5. A DOUBLE-REFLECTORIZED BLUE MARKER SHALL BE PLACED 6-INCHES OFFSET FROM THE PAVEMENT CENTERLINE AT ALL FIRE HYDRANT LOCATIONS. HYDRANTS LOCATED AT INTERSECTIONS SHALL HAVE A MARKER PLACED ON EACH STREET. PAYMENT IS SUBSIDIARY OF PROPOSED/EXISTING FIRE HYDRANTS.
6. COORDINATE WITH METRO A MINIMUM OF 72 HOURS FOR PROPOSED SIGNS AND PLACEMENT.

0 40 80

(IN FEET)

SCALE: PLAN 1": 40'

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED
PROFESSIONAL ENGINEER

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614 03/04/2020

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation ©2020

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

SIGNING AND PAVEMENT MARKING PLAN STA 9+00 TO STA 17+00

SHEET 3 OF 7

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	357

67862

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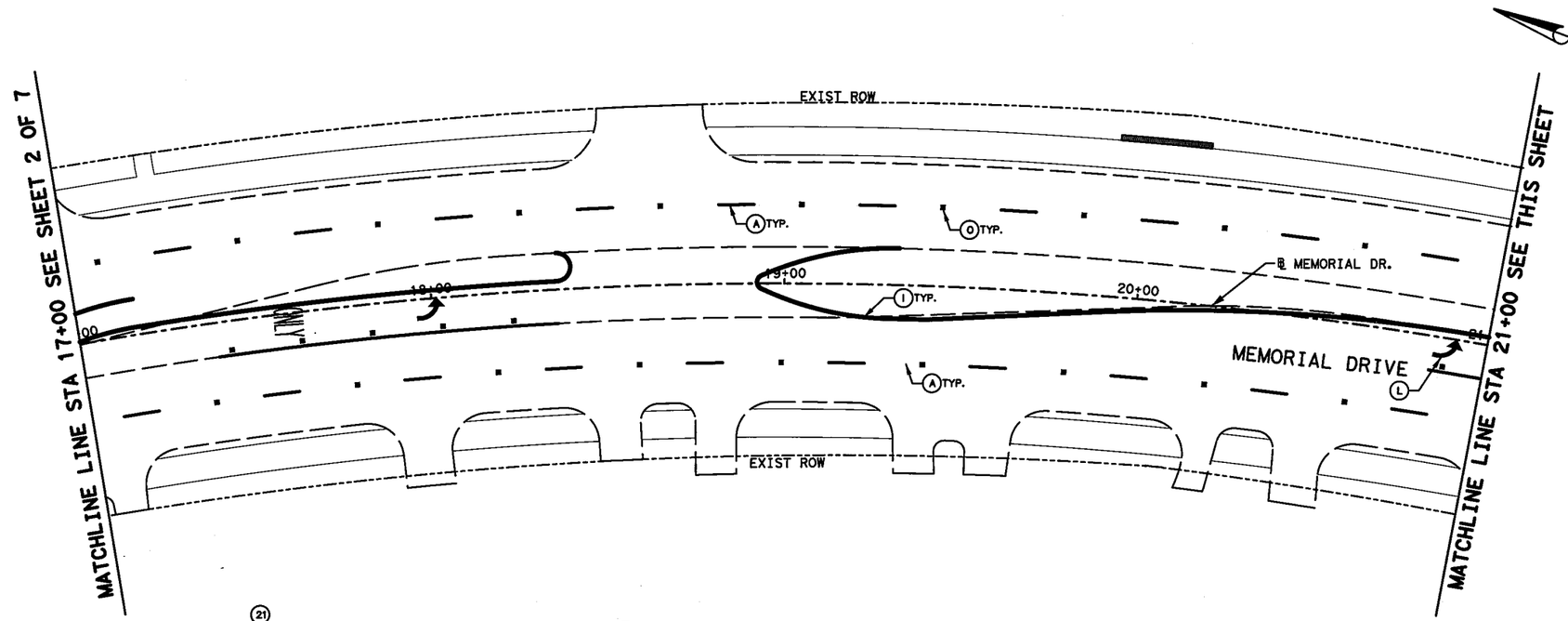

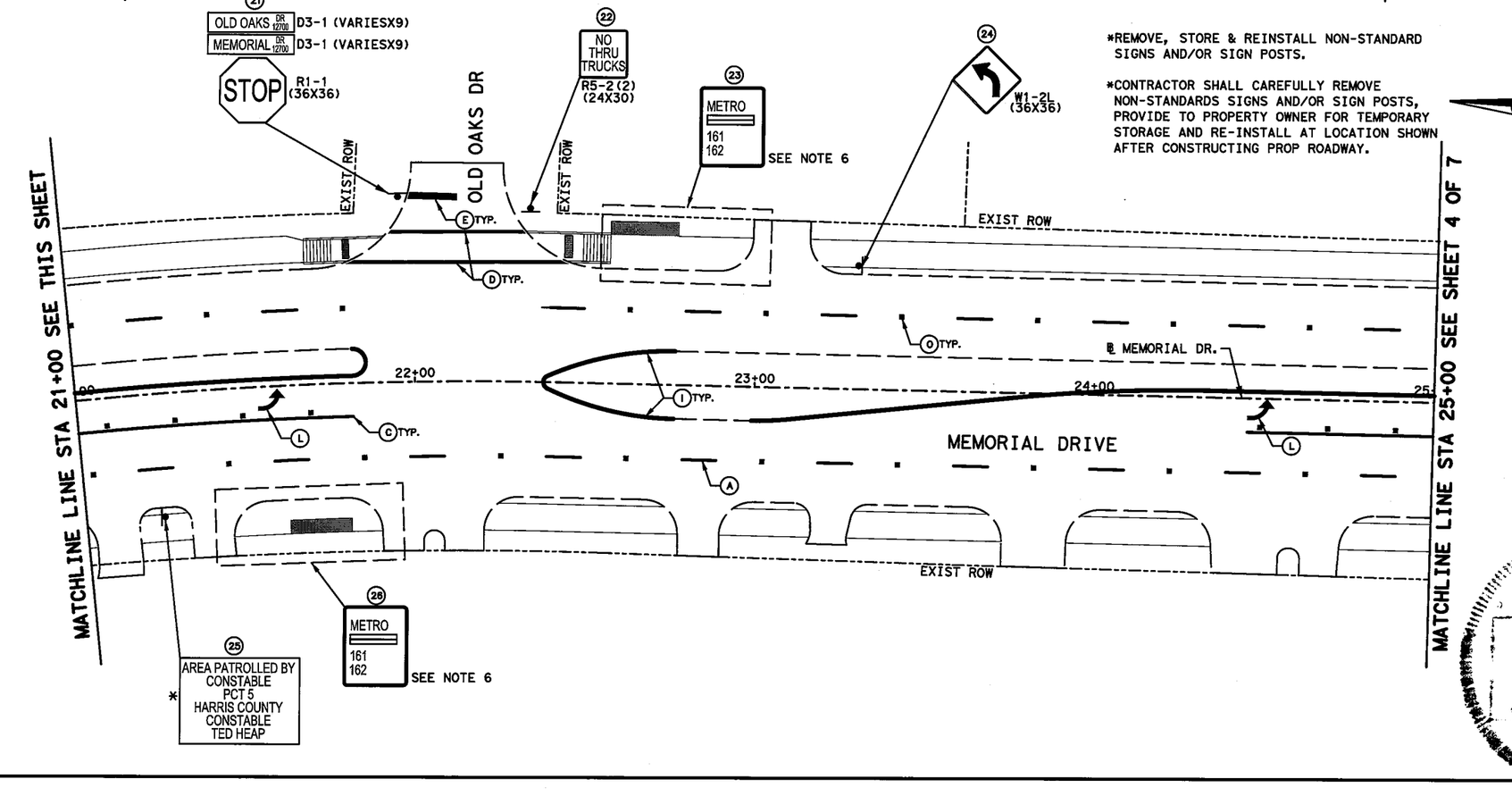

*REMOVE, STORE & REINSTALL NON-STANDARD SIGNS AND/OR SIGN POSTS.

*CONTRACTOR SHALL CAREFULLY REMOVE NON-STANDARDS SIGNS AND/OR SIGN POSTS, PROVIDE TO PROPERTY OWNER FOR TEMPORARY STORAGE AND RE-INSTALL AT LOCATION SHOWN AFTER CONSTRUCTING PROP ROADWAY.

LEGEND

- GROUND MOUNTED SIGN
- PROPOSED CURB
- (A) MULTIPOLYMER PAV MRK (W) (4") (BRK)
- (B) MULTIPOLYMER PAV MRK (W) (6") (DOT)
- (C) MULTIPOLYMER PAV MRK (W) (8") (SLD)
- (D) MULTIPOLYMER PAV MRK (W) (12") (SLD)
- (E) MULTIPOLYMER PAV MRK (W) (24") (SLD)
- (F) REFL PAV MRK TY II (W) (12") (SLD)
- (G) MULTIPOLYMER PAV MRK (Y) (4") (SLD)
- (H) MULTIPOLYMER PAV MRK (Y) (4") (BRK)
- (I) REFL PAV MRK TY II (Y) (12") (SLD)
- (J) REFL PAV MRK TY II (R) (12") (FIRE LANE)
- (K) PREFAB PAV MRK TY C (W) (WORD)
- (L) PREFEB PAV MRK TY C (W) (ARROW)
- (M) REFL PAV MRKR TY I-C
- (N) REFL PAV MRKR TY II-A-A
- (O) REFL PAV MRKR TY II-C-R
- (P) MULTIPOLYMER PAV MRK (W) (4") (SLD)
- (Q) MULTIPOLYMER PAV MRK (Y) (24") (SLD)

NOTES:

1. REFER TO SITE MATERIALS PLAN FOR TEXTURED PAVEMENT TYPE.
2. REFER TO SIGNAGE AND STRIPING STANDARDS FOR MORE DETAILS.
3. REFER TO SUMMARY OF PAVEMENT MARKING QUANTITIES AND SUMMARY OF SMALL SIGNS FOR QUANTITIES
4. REFER TO STANDARD HIGHWAY SIGN DESIGNS FOR TEXAS.
5. A DOUBLE-REFLECTORIZED BLUE MARKER SHALL BE PLACED 6-INCHES OFFSET FROM THE PAVEMENT CENTERLINE AT ALL FIRE HYDRANT LOCATIONS. HYDRANTS LOCATED AT INTERSECTIONS SHALL HAVE A MARKER PLACED ON EACH STREET. PAYMENT IS SUBSIDIARY OF PROPOSED/EXISTING FIRE HYDRANTS.
6. COORDINATE WITH METRO A MINIMUM OF 72 HOURS FOR PROPOSED SIGNS AND PLACEMENT.

0 40 80

(IN FEET)

SCALE: PLAN 1": 40'

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED PROFESSIONAL ENGINEER

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614 03/04/2020

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

SIGNING AND PAVEMENT MARKING PLAN STA 17+00 TO STA 25+00

SHEET 4 OF 7

67862

	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CONT:	6	TEXAS	STP 1802(783)MM			CS
DIST:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK:	HOU	HARRIS	0912	72	391	358

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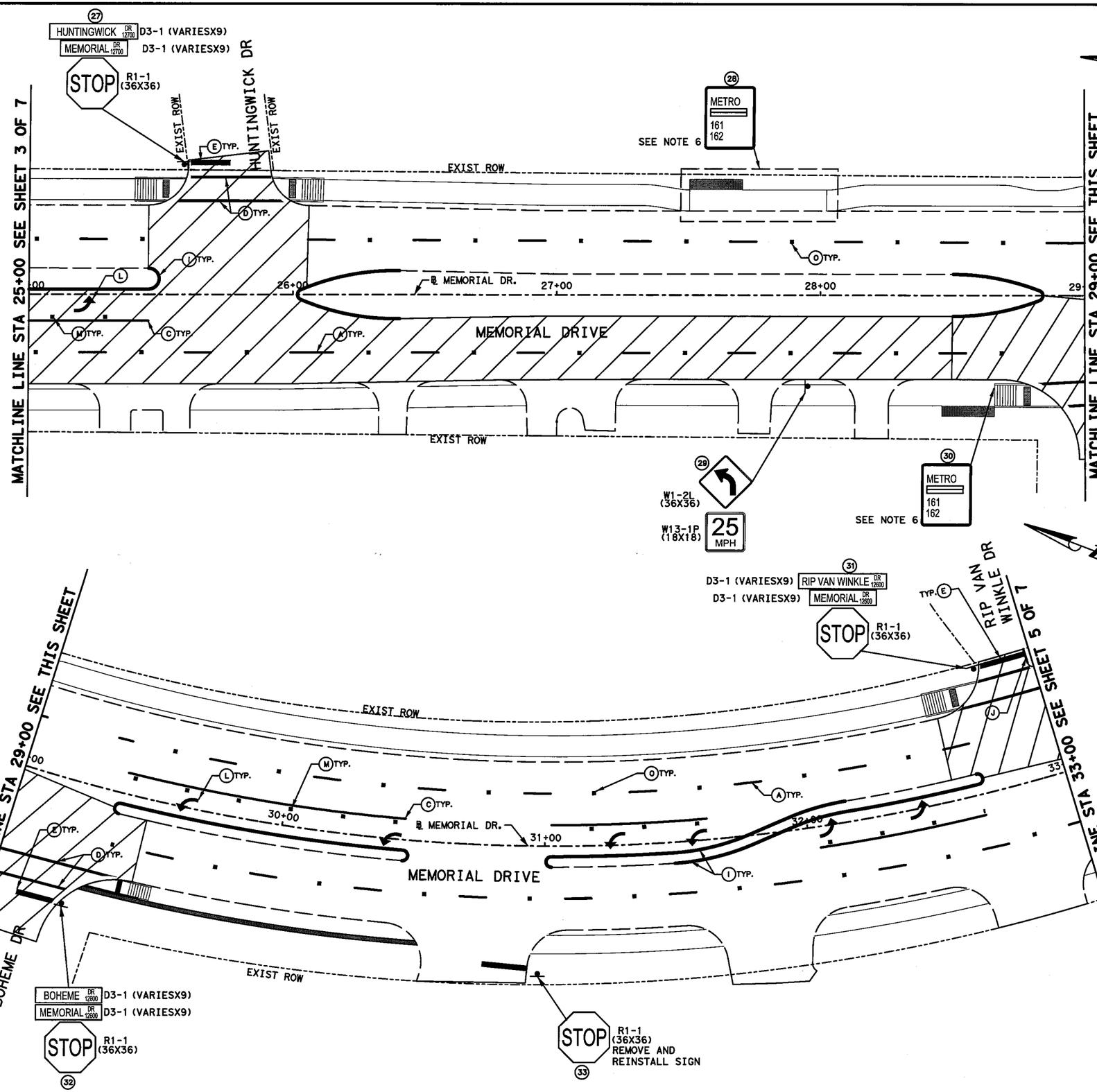

LEGEND

- GROUND MOUNTED SIGN
- PROPOSED CURB
- (A) MULTIPOLYMER PAV MRK (W) (4") (BRK)
- (B) MULTIPOLYMER PAV MRK (W) (6") (DOT)
- (C) MULTIPOLYMER PAV MRK (W) (8") (SLD)
- (D) MULTIPOLYMER PAV MRK (W) (12") (SLD)
- (E) MULTIPOLYMER PAV MRK (W) (24") (SLD)
- (F) REFL PAV MRK TY II (W) (12") (SLD)
- (G) MULTIPOLYMER PAV MRK (Y) (4") (SLD)
- (H) MULTIPOLYMER PAV MRK (Y) (4") (BRK)
- (I) REFL PAV MRK TY II (Y) (12") (SLD)
- (J) REFL PAV MRK TY II (R) (12") (FIRE LANE)
- (K) PREFAB PAV MRK TY C (W) (WORD)
- (L) PREFEB PAV MRK TY C (W) (ARROW)
- (M) REFL PAV MRKR TY I-C
- (N) REFL PAV MRKR TY II-A-A
- (O) REFL PAV MRKR TY II-C-R
- (P) MULTIPOLYMER PAV MRK (W) (4") (SLD)
- (Q) MULTIPOLYMER PAV MRK (Y) (24") (SLD)

NOTES:

1. REFER TO SITE MATERIALS PLAN FOR TEXTURED PAVEMENT TYPE.
2. REFER TO SIGNAGE AND STRIPING STANDARDS FOR MORE DETAILS.
3. REFER TO SUMMARY OF PAVEMENT MARKING QUANTITIES AND SUMMARY OF SMALL SIGNS FOR QUANTITIES
4. REFER TO STANDARD HIGHWAY SIGN DESIGNS FOR TEXAS.
5. A DOUBLE-REFLECTORIZED BLUE MARKER SHALL BE PLACED 6-INCHES OFFSET FROM THE PAVEMENT CENTERLINE AT ALL FIRE HYDRANT LOCATIONS. HYDRANTS LOCATED AT INTERSECTIONS SHALL HAVE A MARKER PLACED ON EACH STREET. PAYMENT IS SUBSIDIARY OF PROPOSED/EXISTING FIRE HYDRANTS.
6. COORDINATE WITH METRO A MINIMUM OF 72 HOURS FOR PROPOSED SIGNS AND PLACEMENT.

0 40 80

(IN FEET)

SCALE: PLAN 1" = 40'

67862

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED
PROFESSIONAL ENGINEER

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614 03/04/2020

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

SIGNING AND PAVEMENT MARKING PLAN STA 25+00 TO STA 33+00

SHEET 5 OF 7

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	359

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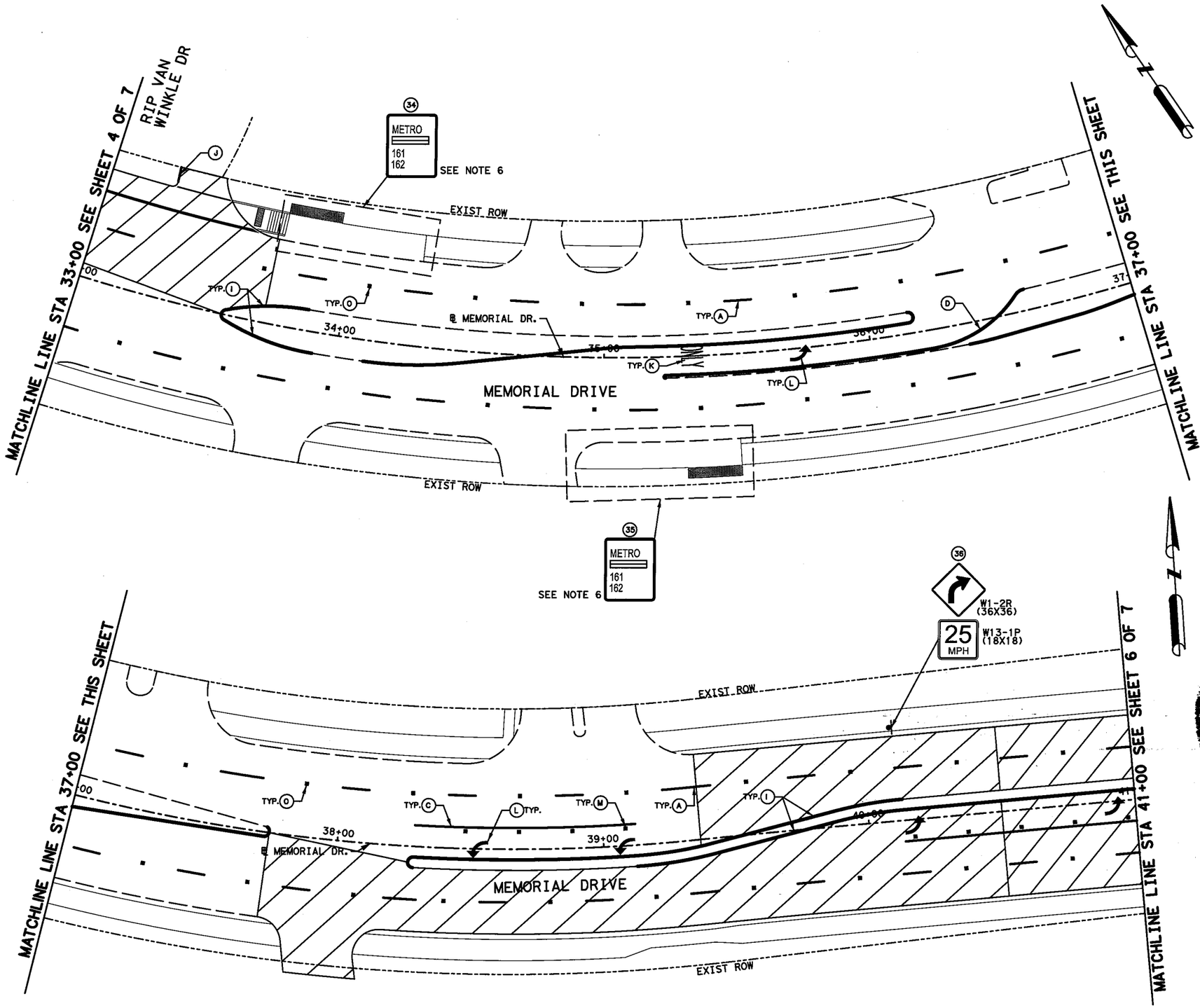

LEGEND

- GROUND MOUNTED SIGN
- PROPOSED CURB
- (A) MULTIPOLYMER PAV MRK (W) (4") (BRK)
- (B) MULTIPOLYMER PAV MRK (W) (6") (DOT)
- (C) MULTIPOLYMER PAV MRK (W) (8") (SLD)
- (D) MULTIPOLYMER PAV MRK (W) (12") (SLD)
- (E) MULTIPOLYMER PAV MRK (W) (24") (SLD)
- (F) REFL PAV MRK TY II (W) (12") (SLD)
- (G) MULTIPOLYMER PAV MRK (Y) (4") (SLD)
- (H) MULTIPOLYMER PAV MRK (Y) (4") (BRK)
- (I) REFL PAV MRK TY II (Y) (12") (SLD)
- (J) REFL PAV MRK TY II (R) (12") (FIRE LANE)
- (K) PREFAB PAV MRK TY C (W) (WORD)
- (L) PREFEB PAV MRK TY C (W) (ARROW)
- (M) REFL PAV MRKR TY I-C
- (N) REFL PAV MRKR TY II-A-A
- (O) REFL PAV MRKR TY II-C-R
- (P) MULTIPOLYMER PAV MRK (W) (4") (SLD)
- (Q) MULTIPOLYMER PAV MRK (Y) (24") (SLD)

NOTES:

1. REFER TO SITE MATERIALS PLAN FOR TEXTURED PAVEMENT TYPE.
2. REFER TO SIGNAGE AND STRIPING STANDARDS FOR MORE DETAILS.
3. REFER TO SUMMARY OF PAVEMENT MARKING QUANTITIES AND SUMMARY OF SMALL SIGNS FOR QUANTITIES
4. REFER TO STANDARD HIGHWAY SIGN DESIGNS FOR TEXAS.
5. A DOUBLE-REFLECTORIZED BLUE MARKER SHALL BE PLACED 6-INCHES OFFSET FROM THE PAVEMENT CENTERLINE AT ALL FIRE HYDRANT LOCATIONS. HYDRANTS LOCATED AT INTERSECTIONS SHALL HAVE A MARKER PLACED ON EACH STREET. PAYMENT IS SUBSIDIARY OF PROPOSED/EXISTING FIRE HYDRANTS.
6. COORDINATE WITH METRO A MINIMUM OF 72 HOURS FOR PROPOSED SIGNS AND PLACEMENT.

0 40 80

(IN FEET)

SCALE: PLAN 1"= 40'

67862

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED
PROFESSIONAL ENGINEER

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614 03/04/2020

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

SIGNING AND PAVEMENT MARKING PLAN STA 33+00 TO STA 41+00

SHEET 6 OF 7

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CK DWG:	HOU	HARRIS	0912	72	391	360

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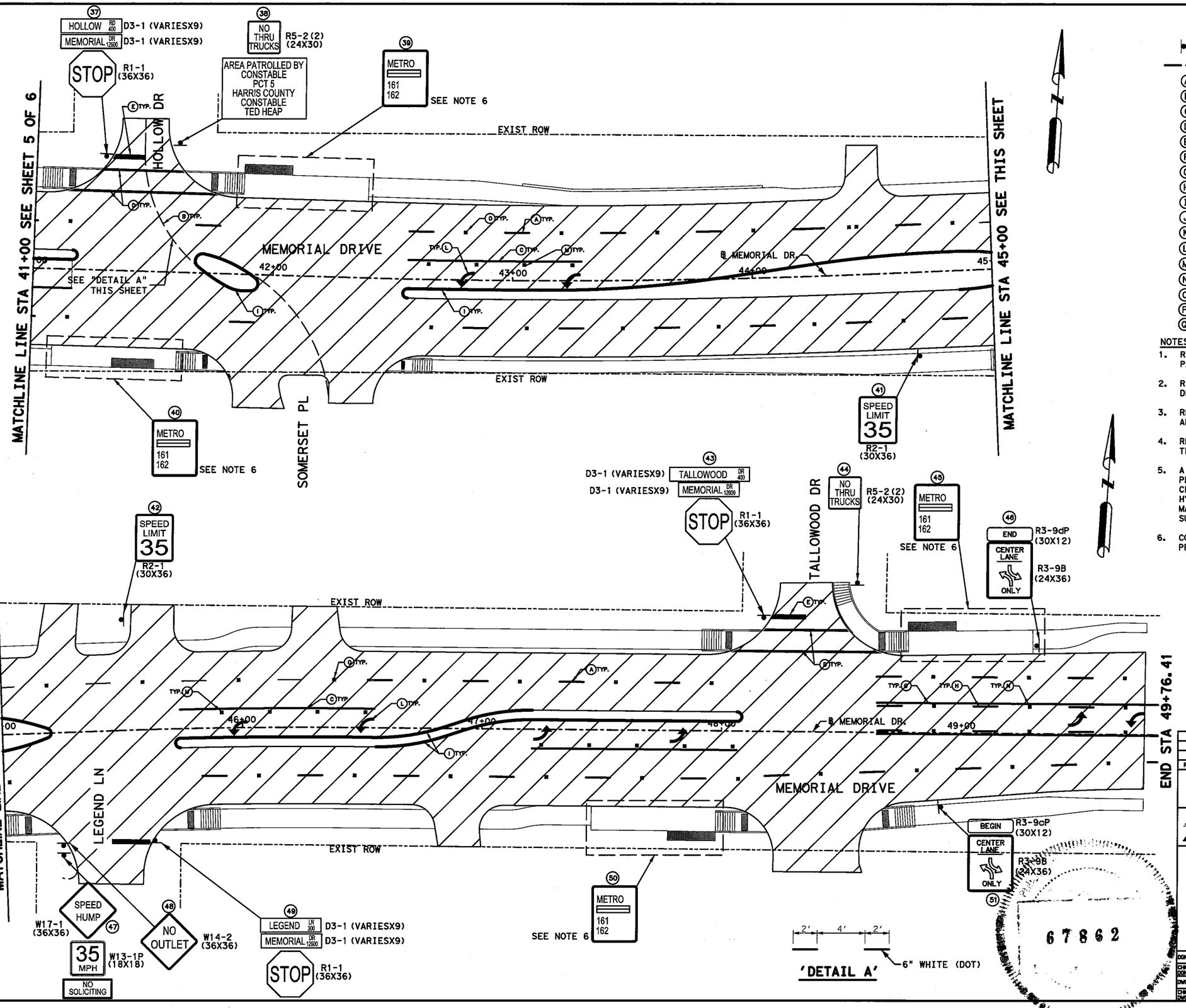

LEGEND

- GROUND MOUNTED SIGN
- PROPOSED CURB
- (A) MULTIPOLYMER PAV MRK (W) (4") (BRK)
- (B) MULTIPOLYMER PAV MRK (W) (6") (DOT)
- (C) MULTIPOLYMER PAV MRK (W) (8") (SLD)
- (D) MULTIPOLYMER PAV MRK (W) (12") (SLD)
- (E) MULTIPOLYMER PAV MRK (W) (24") (SLD)
- (F) REFL PAV MRK TY II (W) (12") (SLD)
- (G) MULTIPOLYMER PAV MRK (Y) (4") (SLD)
- (H) MULTIPOLYMER PAV MRK (Y) (4") (BRK)
- (I) REFL PAV MRK TY II (Y) (12") (SLD)
- (J) REFL PAV MRK TY II (R) (12") (FIRE LANE)
- (K) PREFAB PAV MRK TY C (W) (WORD)
- (L) PREFEB PAV MRK TY C (W) (ARROW)
- (M) REFL PAV MRKR TY I-C
- (N) REFL PAV MRKR TY II-A-A
- (O) REFL PAV MRKR TY II-C-R
- (P) MULTIPOLYMER PAV MRK (W) (4") (SLD)
- (Q) MULTIPOLYMER PAV MRK (Y) (24") (SLD)

NOTES:

1. REFER TO SITE MATERIALS PLAN FOR TEXTURED PAVEMENT TYPE.
2. REFER TO SIGNAGE AND STRIPING STANDARDS FOR MORE DETAILS.
3. REFER TO SUMMARY OF PAVEMENT MARKING QUANTITIES AND SUMMARY OF SMALL SIGNS FOR QUANTITIES
4. REFER TO STANDARD HIGHWAY SIGN DESIGNS FOR TEXAS.
5. A DOUBLE-REFLECTORIZED BLUE MARKER SHALL BE PLACED 6-INCHES OFFSET FROM THE PAVEMENT CENTERLINE AT ALL FIRE HYDRANT LOCATIONS. HYDRANTS LOCATED AT INTERSECTIONS SHALL HAVE A MARKER PLACED ON EACH STREET. PAYMENT IS SUBSIDIARY OF PROPOSED/EXISTING FIRE HYDRANTS.
6. COORDINATE WITH METRO A MINIMUM OF 72 HOURS FOR PROPOSED SIGNS AND PLACEMENT.

0 40 80

(IN FEET)

SCALE: PLAN 1": 40'

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED PROFESSIONAL ENGINEER

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614 03/04/2020

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

SIGNING AND PAVEMENT MARKING PLAN STA 41+00 TO END PROJECT

SHEET 7 OF 7

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	361

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GENERAL NOTES

1. THE EXISTING SIGNS LOCATED ON PUBLIC CONSTRUCTION SITE ARE THE PROPERTY OF THE CITY OF HOUSTON. THROUGHOUT THE PERIOD OF THE CONTRACT, THE CONTRACTOR SHALL PROTECT THESE SIGNS SUCH THAT THEY ARE NOT DAMAGED IN THE COURSE OF CONSTRUCTION ACTIVITY. SUCH PROTECTION SHALL INCLUDE THE PERIOD AFTER SIGNS ARE REMOVED FROM INSTALLATION AND STORED BY THE CONTRACTOR OR DELIVERED TO THE TRAFFIC OPERATIONS CENTER (2200 PATTERSON). THE GENERAL TRAFFIC SUPERINTENDENT (832–395–6728/6756) MUST BE NOTIFIED 48 HOURS IN ADVANCE PRIOR TO DELIVERY.
2. AFTER SIGNS ARE REMOVED FROM INSTALLATION AND ARE BEING STORED BY THE CONTRACTOR, THE CONTRACTOR SHALL CONTACT THE TRAFFIC OPERATIONS DIVISION OF THE PUBLIC WORKS AND ENGINEERING DEPARTMENT (832–395–6728/6756) AND ARRANGE FOR A CONVENIENT TIME TO DELIVER ONLY CITY SIGNS AND POSTS IDENTIFIED BY TRAFFIC OPERATIONS DIVISION TO 2200 PATTERSON.
3. PRIOR TO THE START OF CONSTRUCTION, ALL EXISTING SIGNS WITHIN THE AREA OF CONSTRUCTION WILL BE INVENTORIED AND DOCUMENTED JOINTLY BY THE CITY INSPECTOR AND THE CONTRACTOR. THIS DOCUMENT WILL BE JOINTLY SIGNED BY BOTH PARTIES REFLECTING THE SIGN TYPE, SIGN SIZE, SIGN CONDITION, SIGN LOCATION, REFLECTIVITY ADEQUACY, ETC. THE CONTRACTOR IS HELD ACCOUNTABLE FOR THESE SIGNS THROUGHOUT THE PROJECT AND AT THE PROJECTS COMPLETION.
4. ALL GROUND MOUNTED STOP SIGNS, WARNING SIGNS, AND OTHER REGULATORY SIGNS SHALL USE AT A MINIMUM HIGH INTENSITY PRISMATIC REFLECTIVE SHEETING.
5. ALL OVERHEAD SIGNS SHALL USE DIAMOND GRADE REFLECTIVE SHEETING.
6. ALL OTHER SIGNS SHALL USE SUPER ENGINEER GRADE SHEETING.
7. ALL BLANKS TO BE INSTALLED SHALL BE OF THE 3000, 5000 OR 6000 SERIES ALUMINUM WITH A YEILD STRENGTH OF 3003–H14 ALLOY.
8. "T" DENOTES THICKNESS OF SIGN BLANKS.
9. ALL HOLES SHALL BE ⅜" DIAMETER DRILLED OR PUNCHED AS SHOWN ON EACH BLANK DETAIL AND SHALL BE FREE OF BURRS AND / OR ROUGH EDGES.
10. SIGN BLANK CORNERS TO BE ROUNDED AS SHOWN ON EACH DETAIL ON SHEET 01509–03.
11. ALL SIGN BLANK ARE TO BE ETCHED, DEGREASED, AND HAVE AN ALODINE FINISH PRIOR TO APPLICATION OF LEGENDS.
12. ALL DETAILS ARE NOT TO SCALE.
13. ALL SIGNS SHALL BE MANUFACTURED AND INSTALLED IN CONFORMANCE TO THE LATEST TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD) AND STANDARD HIGHWAY SIGNS LATEST EDITION.
14. REINSTALLATION OF PREVIOUSLY EXISTING SIGNS, WHERE REQUIRED PER PLANS, SHALL BE AT THE CONTRACTOR'S EXPENSE.

TYPICAL GROUND SIGN INSTALLATION PERFORATED SQUARE METAL TUBING

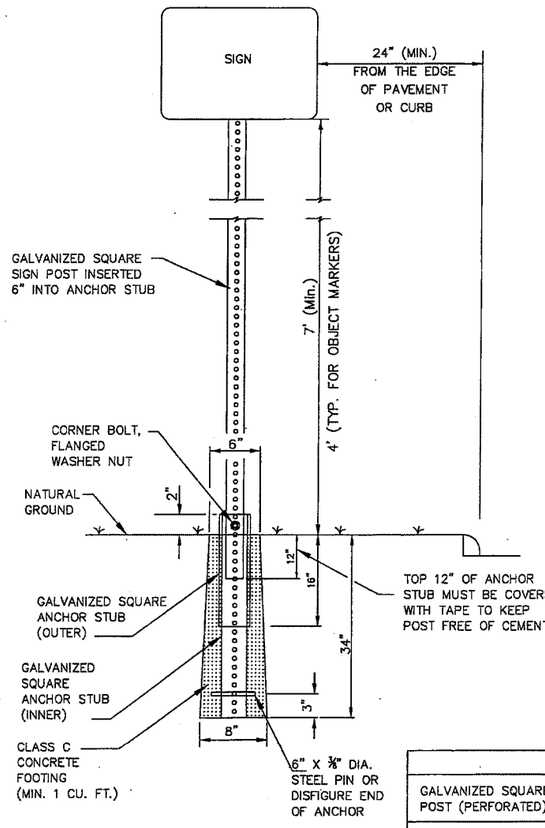
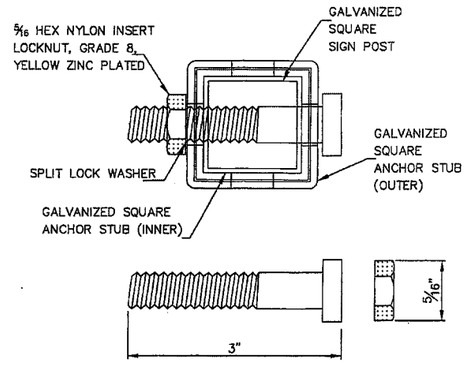
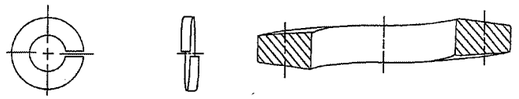


TABLE A	
GALVANIZED SQUARE SIGN POST (PERFORATED)	1–3/4" x 1–3/4" (14 GAUGE)
GALVANIZED SQUARE ANCHOR STUB (PERFORATED) (INNER)	2" x 2" x 36" (14 GAUGE)
GALVANIZED SQUARE ANCHOR STUB (PERFORATED) (OUTER)	2¼" x 2¼" x 18" (14 GAUGE)

CORNER BOLT



5/16" SPLIT LOCK WASHER, HIGH ALLOY MECHANICAL DEPOSITED YELLOW SINK



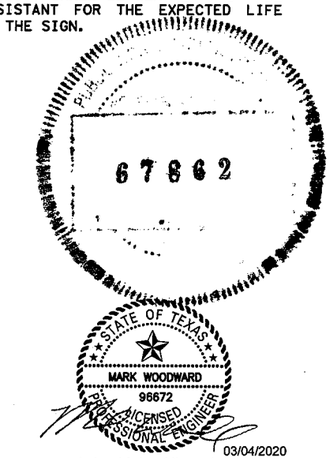
NOMINAL WASHER SIZE	A INSIDE DIAMETER MAX	A INSIDE DIAMETER MIN	B OUTSIDE DIAMETER MAX	T MEAN SECTION (Thickness)	W SECTION WIDTH
5/16"	0.322	0.314	0.583	0.078	0.125

DIMENSIONS: ASME B18.21.1
MATERIAL: ALLOY STEEL PER ASME B18.211
FINISH: MECHANICAL ZINC PER ASME B695, CLASS 5, TYPE 2 (YELLOW)

EACH FINISHED SIGN SHALL HAVE THE FOLLOWING STICKER AFFIXED TO THE BACK IN A LOCATION WHERE IT WILL BE VISIBLE WHEN THE SIGN IS INSTALLED:

CITY OF HOUSTON
VERNON CIVIL STATUTES
ART 6701d / ARTICLE III, SEC. 37
Unlawful to Deface, Remove, Knockdown, or Alter Any Traffic Control Device
MAXIMUM FINE $200.00
Date of Sign Manufacture: 00/04
Sheeting Manufacturer: XYZ, Inc.
Sheeting Lot No.: 12345-678

THE STICKER SHALL BE ZEBRA TECHNOLOGIES Z-ULTIMATE 3000 WHITE OR APPROVED EQUAL. FINISHED PRODUCT SHALL BE WEATHER AND FADE RESISTANT FOR THE EXPECTED LIFE OF THE SIGN.



Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

CITY OF HOUSTON
HOUSTON PUBLIC WORKS

GENERAL NOTES AND GROUND SIGN MOUNTING
(NOT TO SCALE)

CITY TRAFFIC ENGINEER
CITY ENGINEER
DIRECTOR OF HOUSTON PUBLIC WORKS

EFF. DATE: JUL–01–2018
DWG NO: 01509–01

REV. NO.	DATE	DESCRIPTION	BY

Lockwood, Andrews & Newnam, Inc. A LEO A DALY COMPANY — FIRM REGISTATION NO. 2614

Texas Department of Transportation ©2020

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

GENERAL NOTES AND GROUND SIGN MOUNTING DETAIL

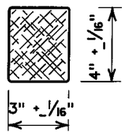
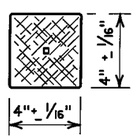
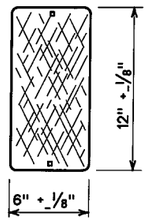
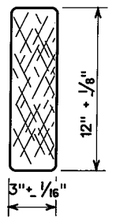
SHEET 1 OF 1

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	362

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

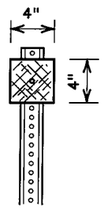
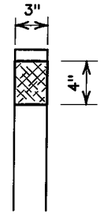
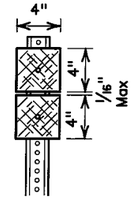
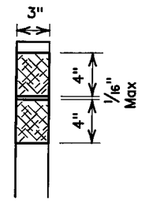
DATE:
FILE:

REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

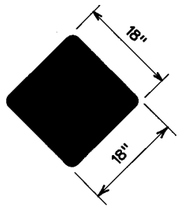
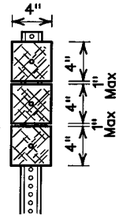
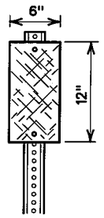
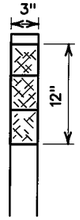
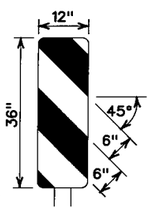
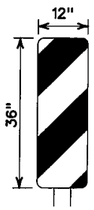
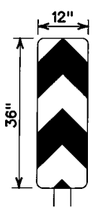
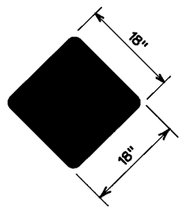
	SIZE 1	SIZE 2	SIZE 3	SIZE 4
DEVICE				
SHEETING	Yellow, White or Red Type B or C reflective sheeting			

NOTE
1. Size 1 and 4 - Direct applied reflective sheeting for use on flexible post (flx).
2. Size 2 and 3 - For use on wing channel (wc) post only. Use approved metal, plastic or fiberglass backplate with 17/64" mounting holes.

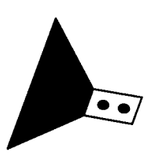
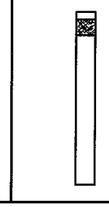
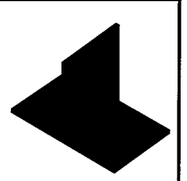
DELINEATORS

	SINGLE		DOUBLE	
DEVICE				
	1-Size 2 reflector unit	1-Size 1 reflector unit	2-Size 2 reflector units	2-Size 1 reflector units
SHEETING	Yellow, White or Red Type B or C Reflective Sheeting			
POST TYPE	WC	FLX	WC	FLX
MOUNT TYPE	GND	GND, SRF	GND	GND, SRF

OBJECT MARKERS

	Type 1 (OM-1)	Type 2 (OM-2)			Type 3 (OM-3)			Type 4 (OM-4)
	OM-1	OM-2X	OM-2Y	OM-2Z	OM-3L	OM-3R	OM-3C	OM-4
DEVICE								
		3-Size 2 reflector units	1-Size 3 reflector unit	3-Size 1 reflector units or 1-Size 4 reflector unit				
SHEETING	Yellow-Type B or C Sheeting (FL)	Yellow - Type B or C Sheeting			Alternating acrylic black and retroflective yellow - Type B or C Sheeting (FL)			Red -Type B or C Sheeting (FL)
POST TYPE	TWT	WC	WC	FLX	TWT			TWT
MOUNT TYPE	WAS, WAP	GND	GND	GND, SRF	WAS, WAP			WAS, WAP

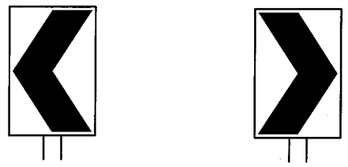
BARRIER REFLECTORS (BRF)

	GF1	GF2	CTB
DEVICE			

1. Barrier reflectors shall meet the requirements of DMS 8600.
2. Approved Barrier Reflectors are listed on the "Barrier Reflectors" Material Producer List at: www.txdot.gov.

SHEETING	Yellow, White, Red
NOTE	1. Minimum 9 square inches of reflective sheeting surface area.

CHEVRONS

DEVICE 

W1-8

SIZE (W x L)	18"x 24" (Conventional)	24"x 30" (Conventional Oversize)	30"x 36" (Expressway)	36" x 48" (Freeway)
MOUNTING HEIGHT	4'-0" or 7'-0"		7'-0" Only	

NOTE
1. CHEVRON (W1-8) signs and ONE DIRECTION LARGE ARROW (W1-6) Signs shall be installed per Sign Mounting Details (SMD) Standard Sheets and paid under Item 644 (Small Roadside Sign Assemblies).
2. The Texas version of the ONE DIRECTION LARGE ARROW sign (W1-9T) may be used instead of the ONE DIRECTIONAL LARGE ARROW (W1-6).

ONE DIRECTION LARGE ARROW

DEVICE 

W1-6

SIZE (W x L)	48" x 24" (Conventional)	60" x 30" (Expressway & Freeway)
MOUNTING HEIGHT	7'-0"	

D & OM DESCRIPTIVE CODES

INSTL DEL ASSM (D-XX)SZ X (XXX)XXX(XX)

NUMBER OF REFLECTORS
- S = Single
- D = Double

COLOR OF REFLECTORS
- W = White
- Y = Yellow
- R = Red

REFLECTOR UNIT SIZE
- 1 or 2

TYPE OF POST OR DELINEATOR
- WC = Wing Channel Post
- FLX = Flexible Post
- BRF = Barrier Reflector

TYPE OF MOUNT
- GND = Embedded (drivable or set in concrete)
- CTB = Concrete Barrier Mount
- GF1 or GF2 = Guard Fence Attachment
- SRF = Surface Mount

DIRECTION
- If Required
- BI = Bi-Directional
- BR = Bi-Directional with red on back

INSTL OM ASSM (OM-XX) (XXX)XXX(XX)

TYPE OF OBJECT MARKER
- 1, 2, 3, or 4

NUMBER OF REFLECTORS OR DIRECTION
- X = 3-Size 2 reflector units (Type 2 only)
- Y = 1-Size 3 reflector unit (Type 2 only)
- Z = 3-Size 1 or 1-Size 4 reflector unit(s)(Type 2 only)
- L = Left Side (Type 3 Object Marker only)
- R = Right Side (Type 3 Object Marker only)
- C = Center (Type 3 Object Marker only)

TYPE OF POST
- WC = Wing Channel Post
- FLX = Flexible Post
- TWT = Thin Walled Tubing

TYPE OF MOUNT
- GND = Embedded (drivable)
- SRF = Surface Mount
- WAS = Wedge Anchor Steel
- WAP = Wedge Anchor Plastic

DIRECTION
- If Required
- BI = Bi-Directional

DEPARTMENTAL MATERIAL SPECIFICATIONS

FLEXIBLE DELINEATOR & OBJECT MARKER POSTS (EMBEDDED & SURFACE MOUNT TYPES)	DMS-4400
SIGN FACE MATERIALS	DMS-8300
DELINEATORS, OBJECT MARKERS AND BARRIER REFLECTORS	DMS-8600

NOTE:
Delineator and object marker backplates and sign substrates shall be 0.080" Aluminum sign blank to conform to ASTM B-209 Alloy 6061-T6 or approved alternative.

Texas Department of Transportation

Traffic Operations Division Standard

DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION

D & OM(1)-15

FILE: dom1-15.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	72	391	CS
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10	HOU	HARRIS		363

20A

DATE: 3/4/2020 4:35:40 PM
FILE: c:\projectwise\aggakhar\d0742862\Sign Mounting Details - General Notes_Details.dgn

SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

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

Post Type

FRP = Fiberglass Reinforced Plastic Pipe (see SMD(FRP))
TWT = Thin-Walled Tubing (see SMD(TWT))
10BWG = 10 BWG Tubing (see SMD(SLIP-1) to (SLIP-3))
S80 = Schedule 80 Pipe (see SMD(SLIP-1) to (SLIP-3))

Number of Posts (1 or 2)

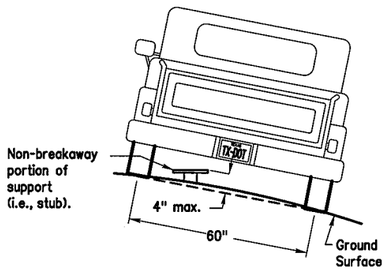
Anchor Type

UA = Universal Anchor - Concreted (see SMD(FRP) and (TWT))
UB = Universal Anchor - Bolted down (see SMD(FRP) and (TWT))
WS = Wedge Anchor Steel - (see SMD(TWT))
WP = Wedge Anchor Plastic (see SMD(TWT))
SA = Slipbase - Concreted (see SMD(SLIP-1) to (SLIP-3))
SB = Slipbase - Bolted Down (see SMD(SLIP-1) to (SLIP-3))

Sign Mounting Designation

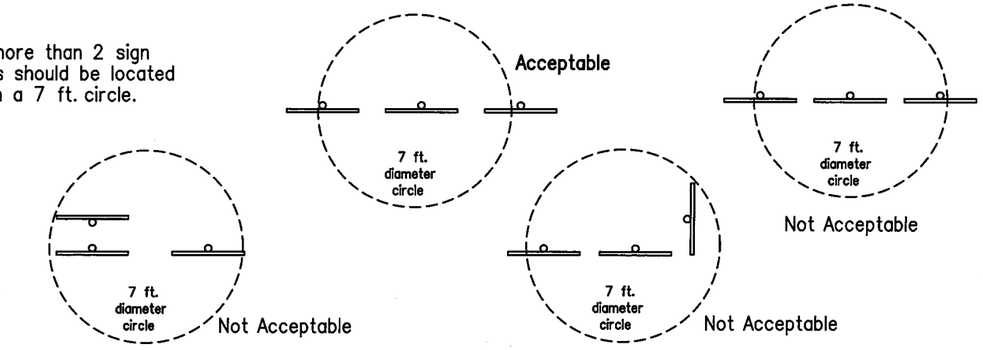
P = Prefab. "Plain" (see SMD(SLIP-1) to (SLIP-3), (TWT), (FRP))
T = Prefab. "T" (see SMD(SLIP-1) to (SLIP-3), (TWT))
U = Prefab. "U" (see SMD(SLIP-1) to (SLIP-3))
IF REQUIRED
1EXT or 2EXT = Number of Extensions (see SMD(SLIP-1) to (SLIP-3), (TWT))
BM = Extruded Wind Beam (see SMD(SLIP-1) to (SLIP-3))
WC = 1.12 #/ft Wing Channel (see SMD(SLIP-1) to (SLIP-3))
EXAL = Extruded Aluminum Sign Panels (see SMD(SLIP-1) to (SLIP-3))

REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



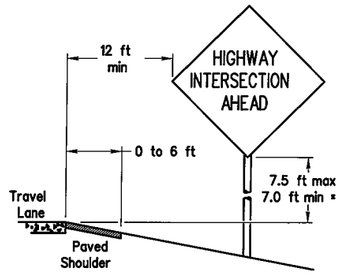
To avoid vehicle undercarriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).

No more than 2 sign posts should be located within a 7 ft. circle.



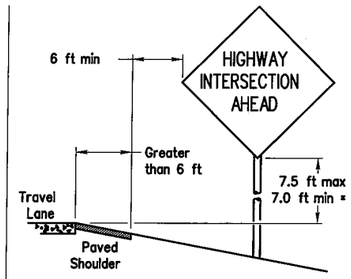
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

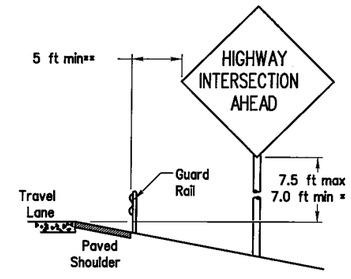
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



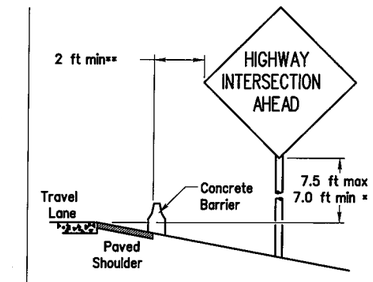
GREATER THAN 6 FT. WIDE

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.

BEHIND BARRIER



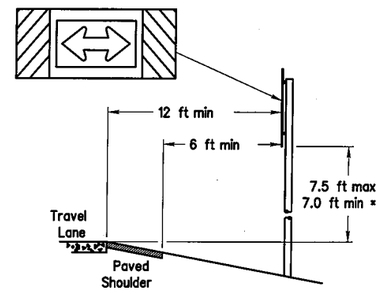
BEHIND GUARDRAIL



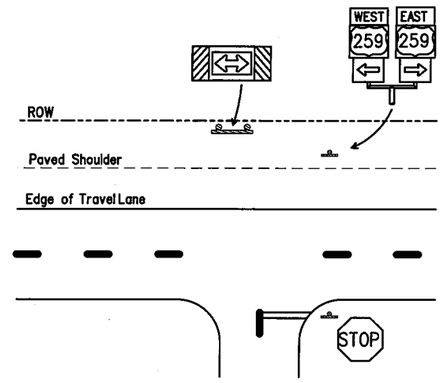
BEHIND CONCRETE BARRIER

**Sign clearance based on distance required for proper guard rail or concrete barrier performance.

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.



* 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.

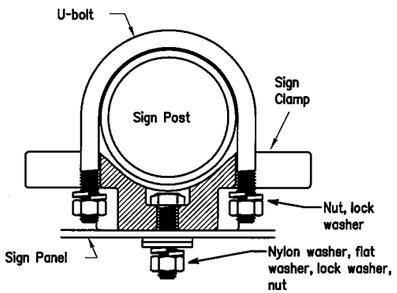
The maximum values may be increased when directed by the Engineer.

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

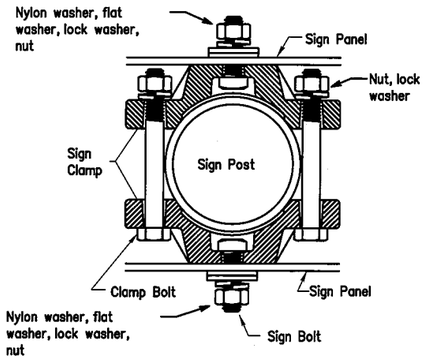


Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

When two sign clamps are used to mount signs back-to-back, use a 5/16-18 UNC galvanized hex head per ASTM A307 with nut and helical-spring lock washer. The approximate bolt lengths for various post sizes and sign clamp types are given in the table at right. The bolt length may need to be adjusted depending upon field conditions.

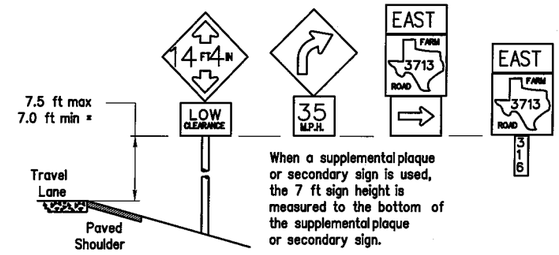
Sign clamps may be either the specific size clamp or the universal clamp.

Back-to-Back Signs



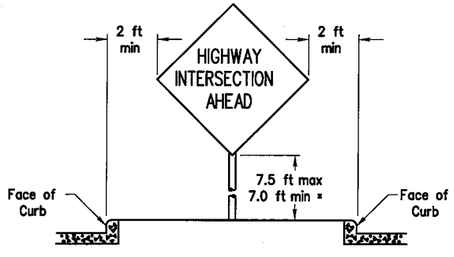
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



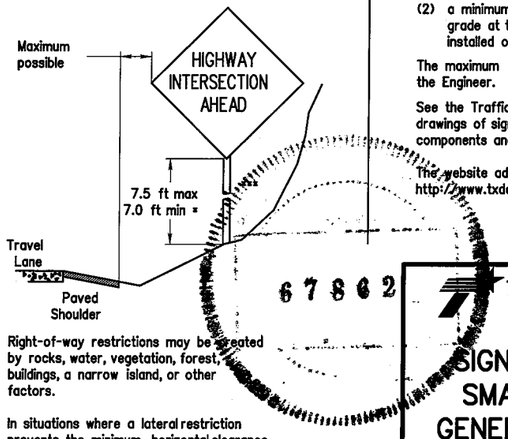
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

CURB & GUTTER OR RAISED ISLAND



RESTRICTED RIGHT-OF-WAY

(When 6 ft min. is not possible.)



Right-of-way restrictions may be created by rocks, water, vegetation, forest, buildings, a narrow island, or other factors.

In situations where a lateral restriction prevents the minimum horizontal clearance from the edge of the travel lane, signs should be placed as far from the travel lane as practical.

*** Post may be shorter if protected by guardrail or if Engineer determines the post could not be hit due to extreme slope.

67862

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

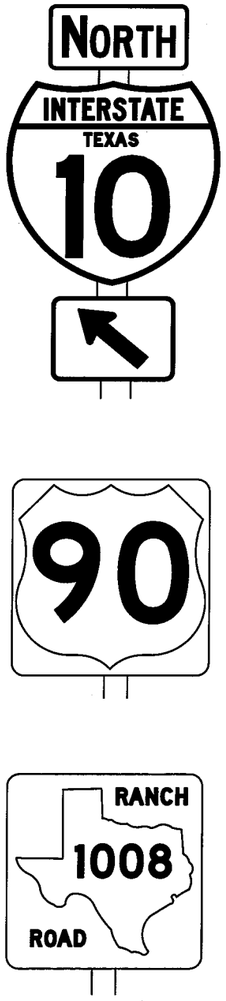
SMD(GEN)-08

©TxDOT July 2002	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
9-08 REVISIONS	CONT	SECT	JOB	HIGHWAY
	0912	72	391	CS
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		364

DATE:
FILE:

REQUIREMENTS FOR INDEPENDENT MOUNTED ROUTE SIGNS

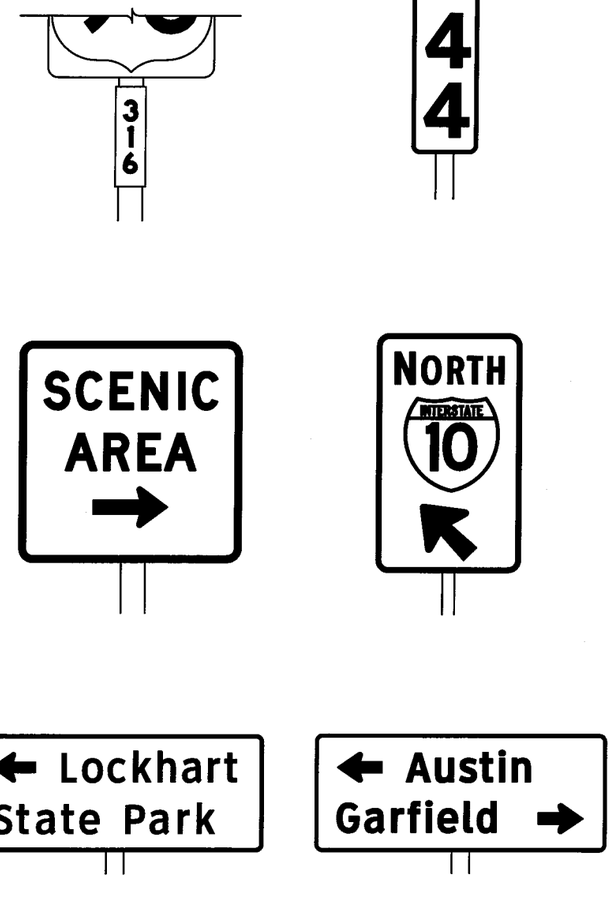
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE A SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & BORDERS	ALL OTHERS	TYPE B or C SHEETING



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.

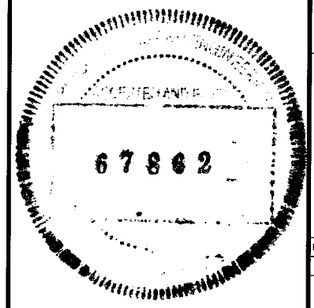
8. Mounting details of roadside signs are shown in the "SMD series" Standard Plan Sheets.

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

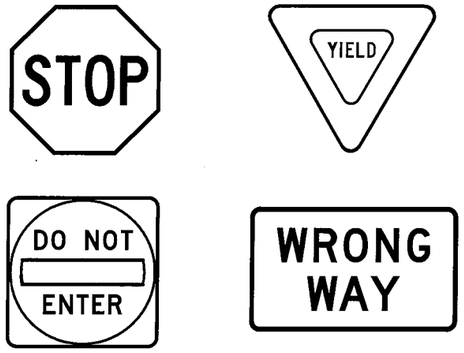
TYPICAL SIGN REQUIREMENTS

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	391	CS
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	HOU	HARRIS		365

DATE:
FILE:

REQUIREMENTS FOR RED BACKGROUND REGULATORY SIGNS
(STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)



REQUIREMENTS FOR FOUR SPECIFIC SIGNS ONLY

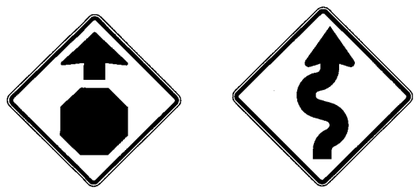
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	WHITE	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE B OR C SHEETING
LEGEND	RED	TYPE B OR C SHEETING

REQUIREMENTS FOR WHITE BACKGROUND REGULATORY SIGNS
(EXCLUDING STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)

TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND,BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND,BORDERS AND SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

REQUIREMENTS FOR WARNING SIGNS



TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	FLOURESCENT YELLOW	TYPE B_{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

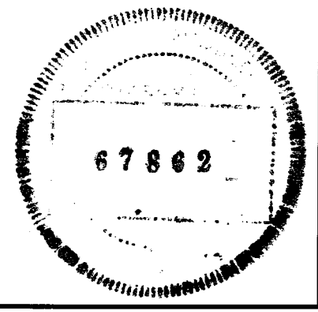
1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).
2. Sign legend shall use the Federal Highway Administration (FHWA) Standard Highway 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

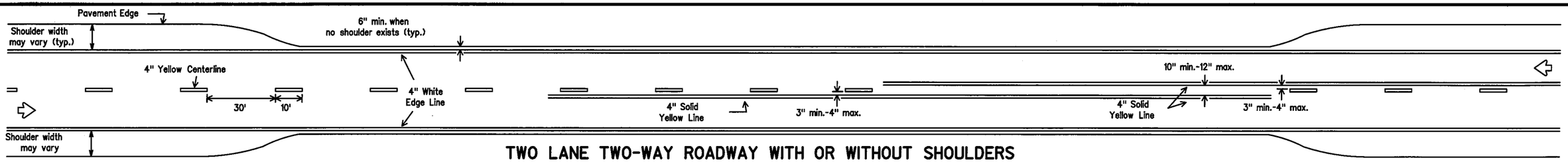
Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

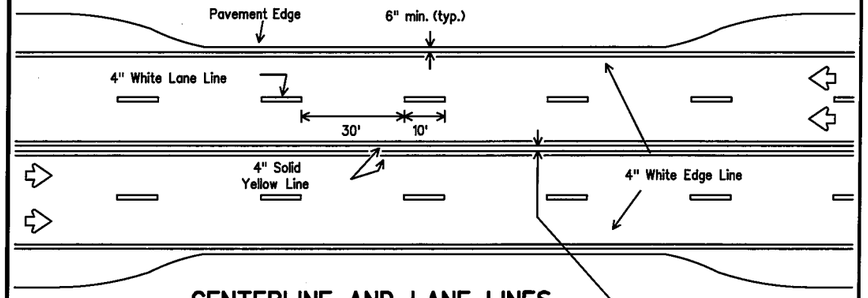
TSR(4)-13

FILE: tsr4-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	72	391	CS
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	HOU	HARRIS		366

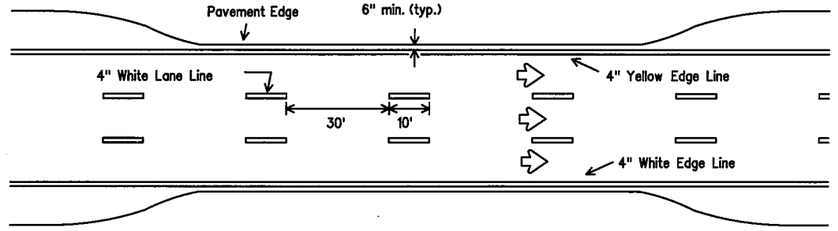
DATE:
FILE:



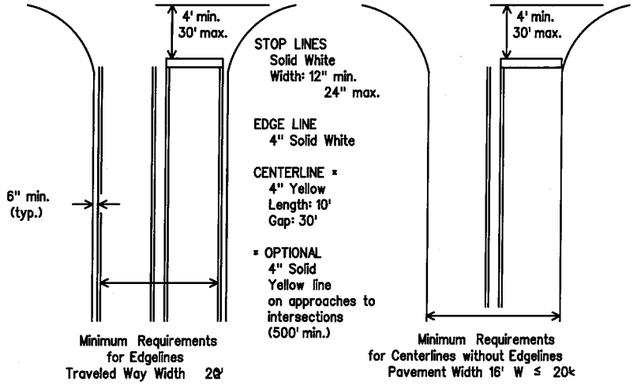
TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS

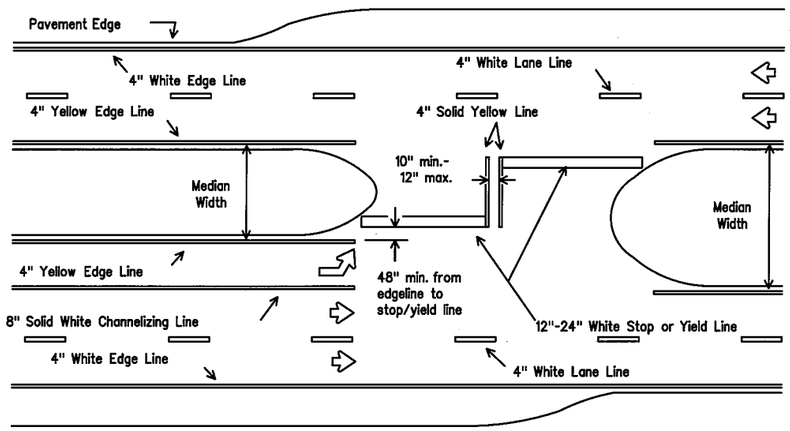


EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



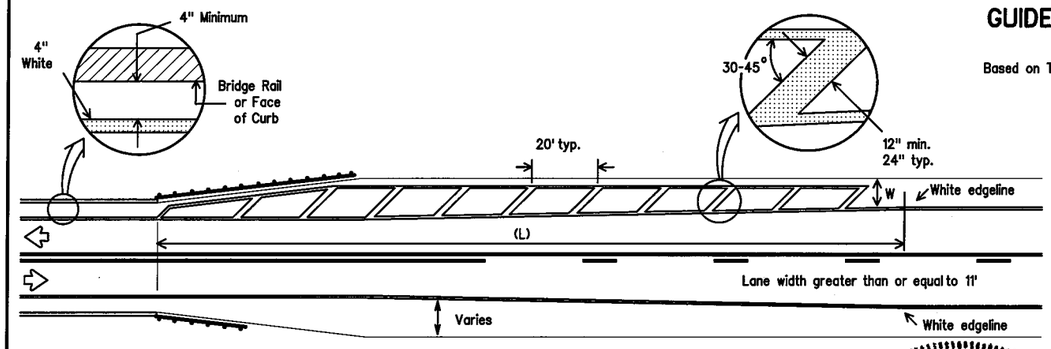
GUIDE FOR PLACEMENT OF STOP LINES, EDGE LINE & CENTERLINE

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:

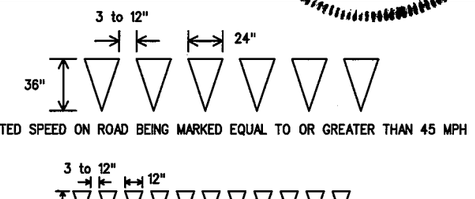
An 8 foot shoulder in advance of a bridge reduces to 4 feet on a 70 MPH roadway. The length of the crosshatching should be:
L = 8 x 70 = 560 ft.
A 4 foot shoulder in advance of a bridge reduces to 2 feet on a 40 MPH roadway. The length of the crosshatching should be:
L = 4(40) ? 60 = 106.67 ft. rounded 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.



FOR POSTED SPEED ON ROAD BEING MARKED EQUAL TO OR GREATER THAN 45 MPH

FOR POSTED SPEED ON ROAD BEING MARKED EQUAL TO OR LESS THAN 40 MPH

YIELD LINES

Texas Department of Transportation
Traffic Operations Division

TYPICAL STANDARD PAVEMENT MARKINGS

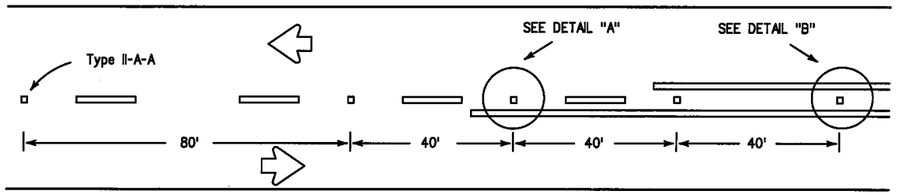
PM(1)-12

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

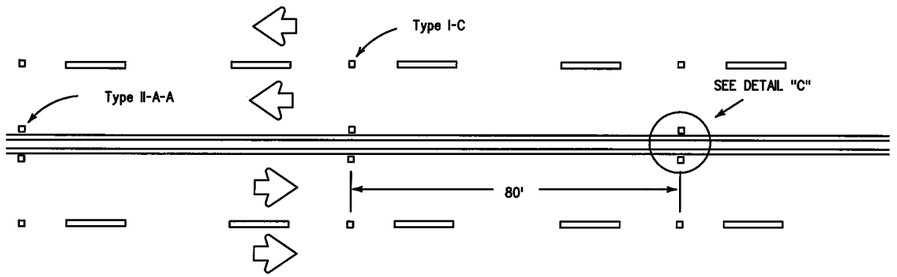
REVISIONS
8-95 2-12
5-00
8-00
3-03

CONT	SECT	JOB	HIGHWAY
0912	72	391	CS
DIST	COUNTY		SHEET NO.
HOU	HARRIS		367

REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE

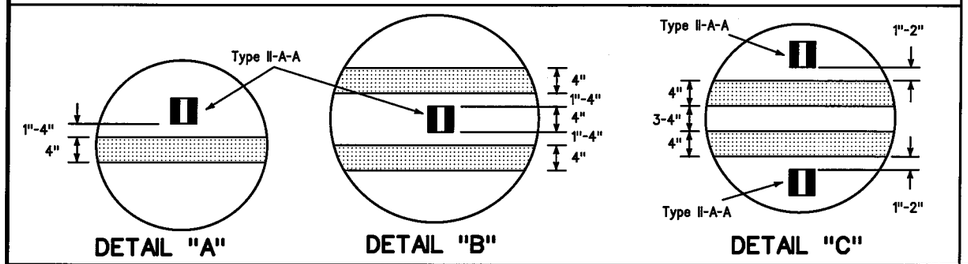


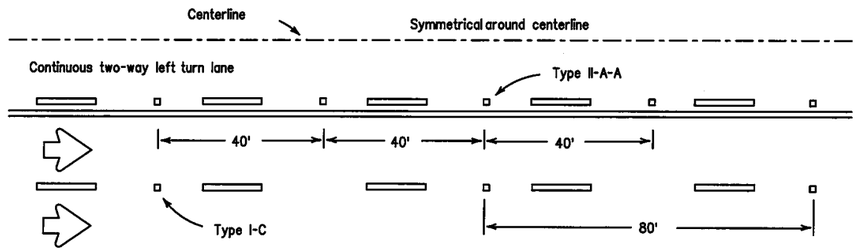
CENTERLINE FOR ALL TWO LANE ROADWAYS



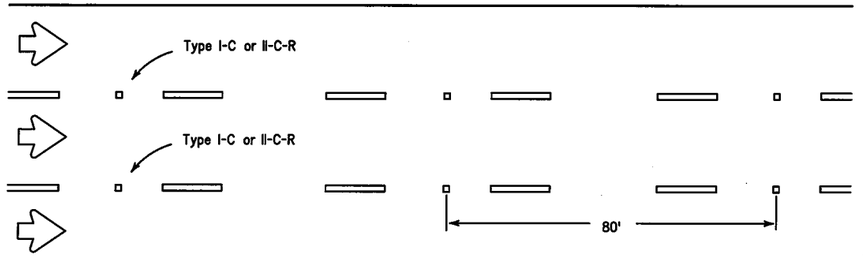
CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY HIGHWAYS

Raised pavement marker Type I-C, clear face toward normal traffic, shall be placed on 80-foot centers.



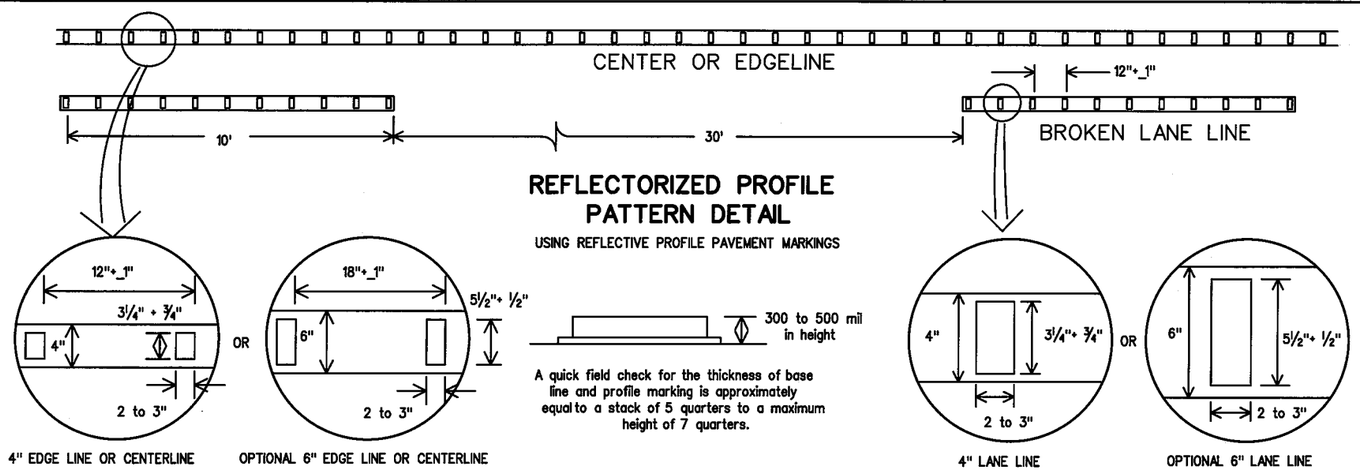


CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

Raised pavement markers Type II-C-R shall have clear face toward normal traffic and red face toward wrong-way traffic.



4" EDGE LINE OR CENTERLINE — OPTIONAL 6" EDGE LINE OR CENTERLINE — 4" LANE LINE — OPTIONAL 6" LANE LINE

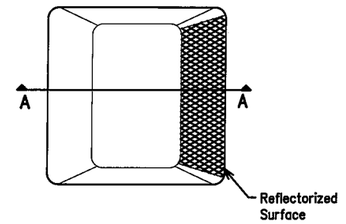
NOTE:
Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

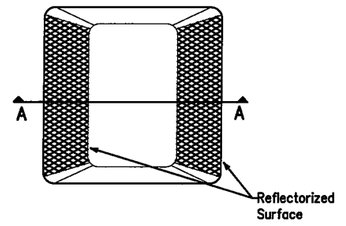
1. All raised pavement markers placed in broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.

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

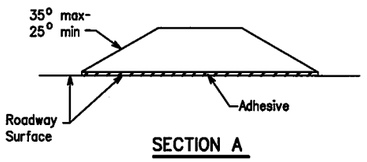
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)



Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS

Texas Department of Transportation
Traffic Operations Division

POSITION GUIDANCE USING RAISED MARKERS
REFLECTORIZED PROFILE MARKINGS
PM(2)-12

REVISIONS		DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
4-92	2-10	CONT	SECT	JOB	HIGHWAY
5-00	2-12	0912	72	391	CS
8-00		DIST	COUNTY		SHEET NO.
2-08		HOU	HARRIS		368

DATE:
FILE:

22B

SITE DESCRIPTION

PROJECT LIMITS: THIS PROJECT IS ALONG MEMORIAL DRIVE FROM BELTWAY 8 TO EAST OF TALLOWOOD.

PROJECT DESCRIPTION: FOR THE CONSTRUCTION OF A NON-FREEWAY FACILITY CONSISITING OF WIDENING TO A 4-LANE DIVIDED ROADWAY, GRADING, CONCRETE PAVEMENT WITH CURB AND GUTTER, DRAINAGE STRUCTURES. SIGNING AND PAVEMENT MARKINGS, LIGHTING, ILLUMINATION & SIGNALS. TOTAL PROJECT LENGTH =4,966.10 FT.= 0.995 MI

MAJOR SOIL DISTURBING ACTIVITIES: THERE IS NO MAJOR SOIL DISTURBANCE AT THIS PROJECT LOCATION. THE EXISTING PROJECT ROADWAY CROSS-SECTION IS ASPHALT PAVEMENT WITH ROADSIDE DITCHES.

TOTAL PROJECT AREA: 11.13 A.C.

TOTAL AREA TO BE DISTURBED: 11.13 A.C.

WEIGHTED RUNOFF COEFFICIENT: 0.64
(AFTER CONSTRUCTION): 0.65

EXISTING CONDITION OF SOIL & VEGETATIVE COVER AND % OF EXISTING VEGETATIVE COVER: SMALL LOCATIONS OF SHORT GRASS LESS THAN 24.94% OF VEGETATIVE COVER MOSTLY IMPERVIOUS PAVEMENT WITH TREE LANDSCAPING FOR COMMERCIAL AND RESIDENTAL ADJACENT PROPERTIES.

NAME OF RECEIVING WATERS: THE STORM WATER RUNNOFF FROM MEMORIAL DRIVE 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:

- ____ SILT FENCES
- ____ HAY BALES
- _X_ 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
- ____ CURBS AND GUTTERS
- _X_ STORM SEWERS
- ____ VELOCITY CONTROL DEVICES
- _X_ EROSION CONTROL LOGS

OTHER:

NARRATIVE - SEQUENCE OF CONSTRUCTION (STORM WATER MANAGEMENT) ACTIVITIES:

TBD

STORMWATER MANAGEMENT: THE TRAFFIC CONTROL PHASING IS DEVELOPED IN A MANNER, WHICH WILL ALLOW THE CONTINUAL USE OF THE EXISTING STORMWATER SYSTEM IN CONJUNCTION WITH THE PROPOSED STORMWATER LINES THROUGHOUT THE CONSTRUCTION PHASE OF 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 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:

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 stream bed. 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
MARK WOODWARD
96672
LICENSED
PROFESSIONAL ENGINEER
03/04/2020
F-2614

STATE OF TEXAS
REGISTERED
HIGHWAY ENGINEER
67862

Texas Department of Transportation
Houston District

TxDOT STORM WATER POLLUTION PREVENTION PLAN

SW3P

FILE: SW3P NARR.DGN	DN: LAN	CK: LAN	DW: LAN	CK: LAN
©TxDOT JANUARY 2007	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS	HOU	6		369
9/2010 INSPECTION NOTE 9/2013 INSPECTION NOTE 11/2013 SW3P TO SWP3 03/2015 2014 SPECS	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	HARRIS		0912	72	391	CS

STD G-1

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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 Require

☐ 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

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.

Additional Comments

The Soil and Groundwater Management Plan (SGMP) supersedes the TxDOT Standard Specification Article 6.10 regarding HazMat. The SGMP is to provide the Contractor with specific instructions and guidance to be used regarding the location, testing, management, and disposal of contaminated soil and groundwater that will be encountered during installation of utilities along certain segments of the project described below.

VII. OTHER ENVIRONMENTAL ISSUES

Comments:

Version 2.1

Texas Department of Transportation

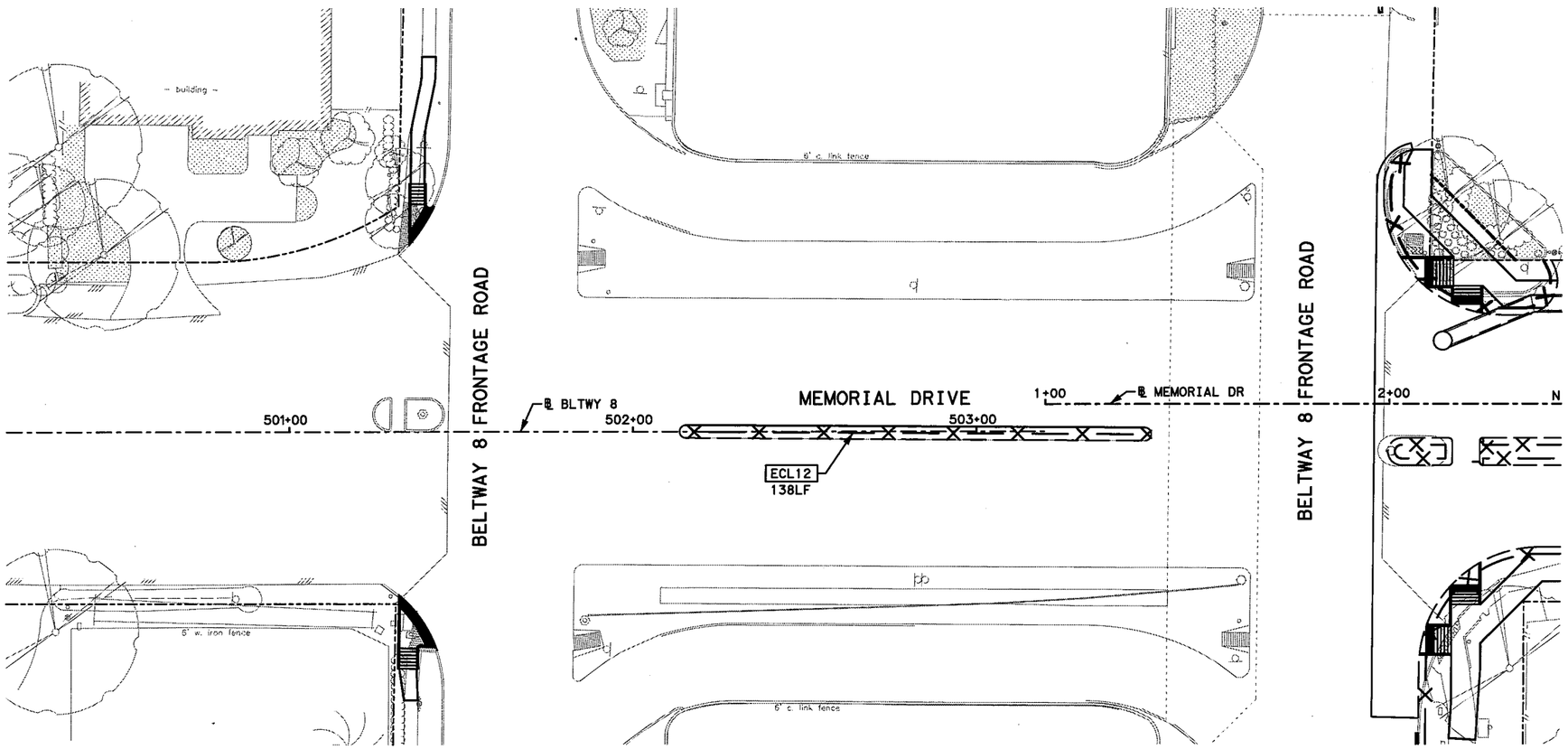
TxDOT Houston District

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

EPIC

FILE: EPIC Sheet.dgn	DN:	CK:	DW:	CK:
© TxDOT: March 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	72	391	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 County		370

DATE: Mar 06, 2020
FILE:



LEGEND:

- 8" EROSION CONTROL LOGS
- 12" EROSION CONTROL LOGS
- RFD2 — ROCK FILTER DAM
- PROP STORM SEWER
- PROP DITCH ℄
- PROP INLET
- PROP MANHOLE
- PROP JUNCTION BOX
- EXIST STORM SEWER
- EXIST INLET
- EXIST MANHOLE
- EXIST TRAFFIC LANE
- PROP TRAFFIC LANE

NOTES

1. INSTALL STORM WATER POLLUTION PREVENTION DEVICES AS WORK PROGRESSES DEPENDING ON TRAFFIC CONTROL PHASES.

0 40 80

(IN FEET)

SCALE: PLAN 1": 40'

STATE OF TEXAS
MARK WOODWARD
98672
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

ACCEPTED AND FILED
TEXAS DEPARTMENT OF TRANSPORTATION
67862

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STORM WATER POLLUTION PREVENTION PLAN BELTWAY 8

SHEET 1 OF 1

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	371

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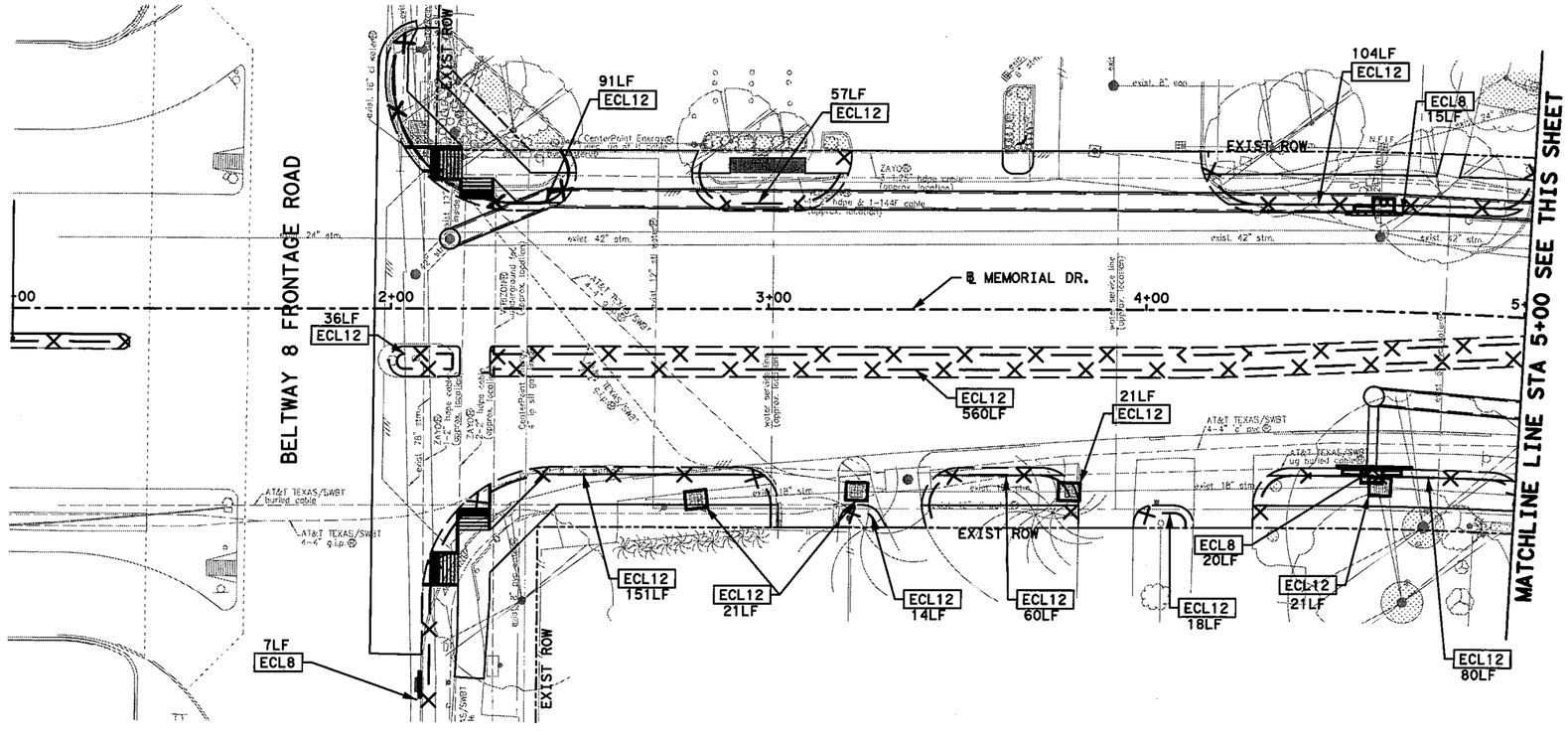

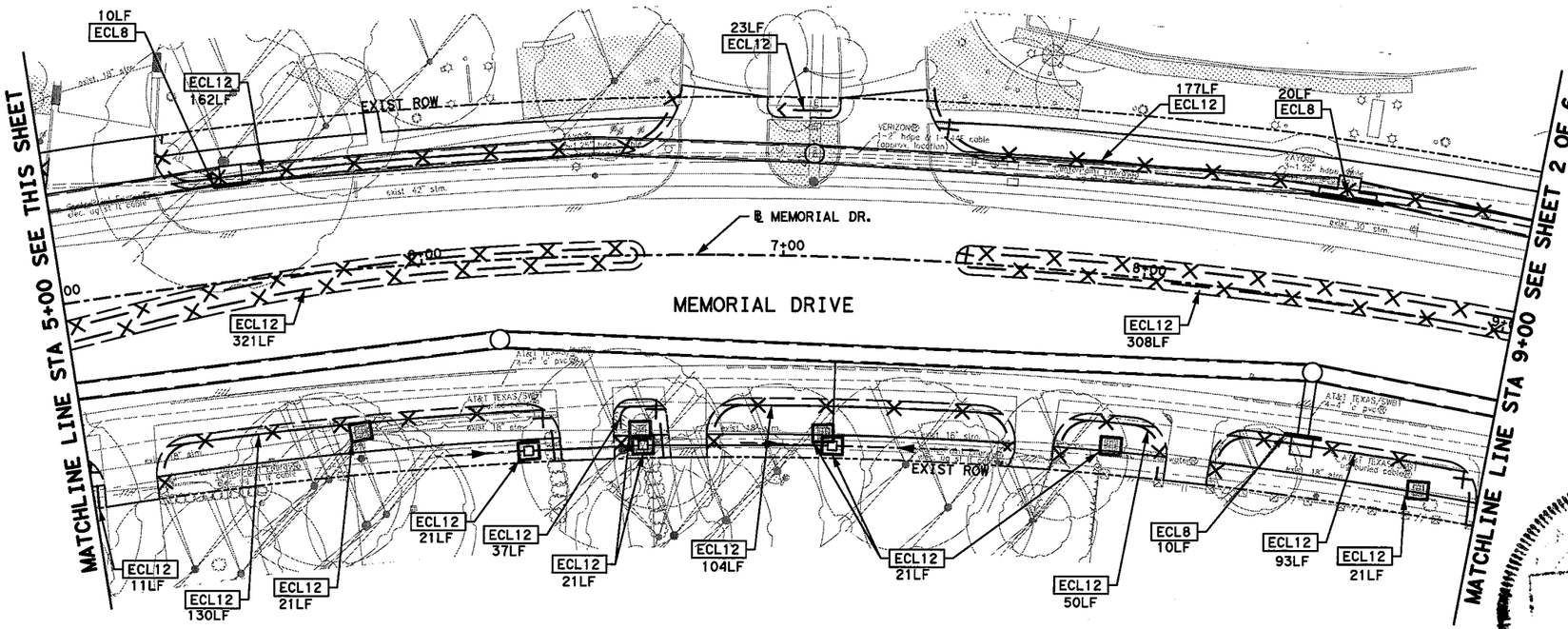

LEGEND:

- 8" EROSION CONTROL LOGS [ECL8]
- 12" EROSION CONTROL LOGS [ECL12]
- RFD2 ROCK FILTER DAM
- PROP STORM SEWER
- PROP DITCH ℄
- PROP INLET
- PROP MANHOLE
- PROP JUNCTION BOX
- EXIST STORM SEWER
- EXIST INLET
- EXIST MANHOLE
- EXIST TRAFFIC LANE
- PROP TRAFFIC LANE

NOTES

1. INSTALL STORM WATER POLLUTION PREVENTION DEVICES AS WORK PROGRESSES DEPENDING ON TRAFFIC CONTROL PHASES.

0 40 80

(IN FEET)

SCALE: PLAN 1":40'

STATE OF TEXAS
MARK WOODWARD
98672
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STORM WATER POLLUTION PREVENTION PLAN BEGIN PROJECT TO STA 9+00

SHEET 1 OF 6

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	372

67862

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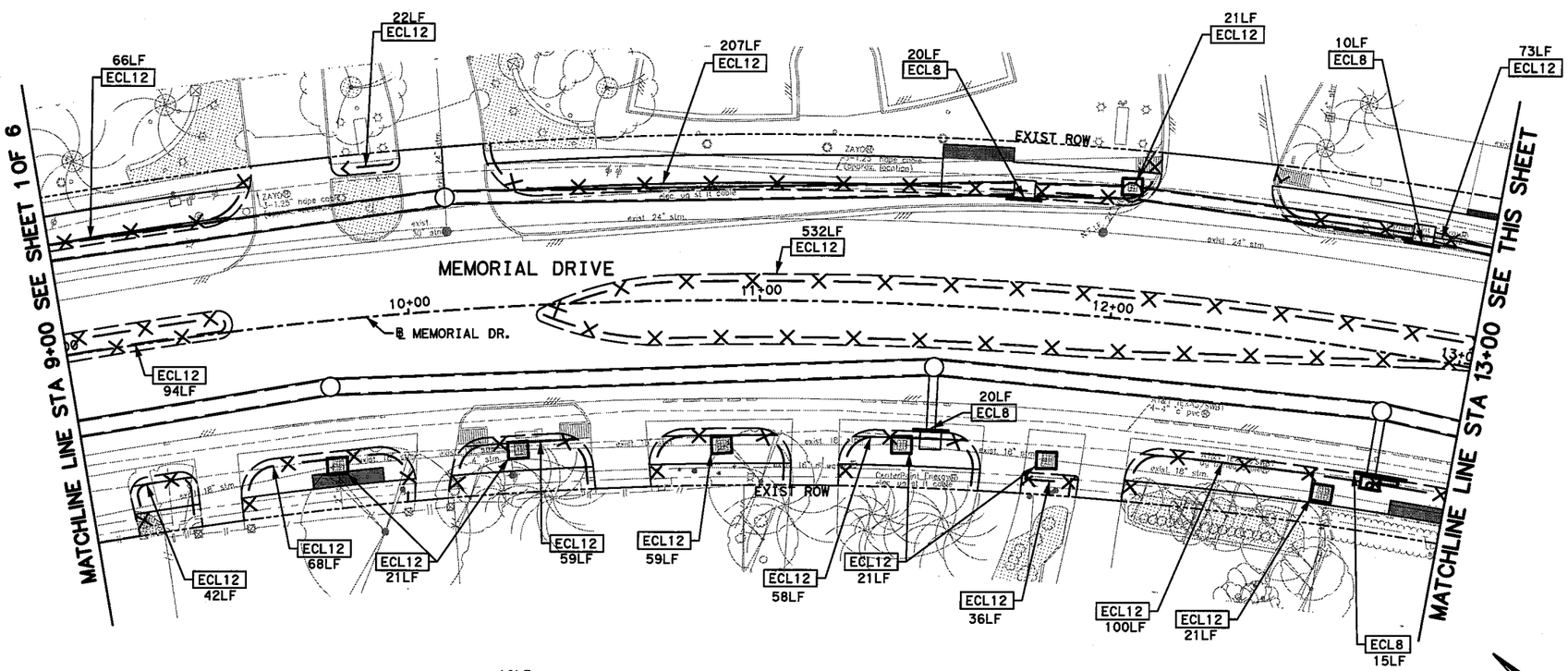

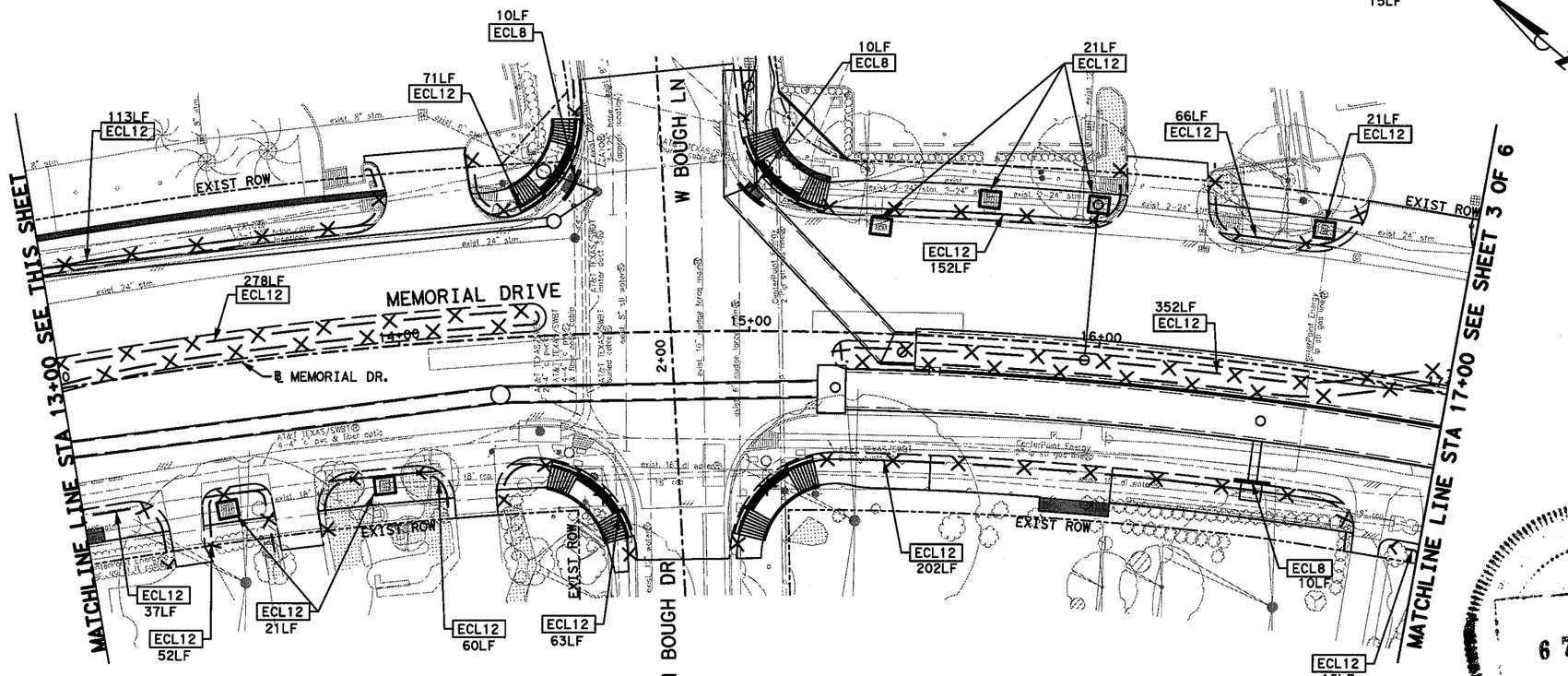

LEGEND:

- 8" EROSION CONTROL LOGS [ECL8]
- 12" EROSION CONTROL LOGS [ECL12]
- RFD2 ROCK FILTER DAM
- PROP STORM SEWER
- PROP DITCH ℄
- PROP INLET
- PROP MANHOLE
- PROP JUNCTION BOX
- EXIST STORM SEWER
- EXIST INLET
- EXIST MANHOLE
- EXIST TRAFFIC LANE
- PROP TRAFFIC LANE

NOTES

1. INSTALL STORM WATER POLLUTION PREVENTION DEVICES AS WORK PROGRESSES DEPENDING ON TRAFFIC CONTROL PHASES.

0 40 80

(IN FEET)

SCALE: PLAN 1":40'

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STORM WATER POLLUTION PREVENTION PLAN STA 9+00 TO STA 17+00

SHEET 2 OF 6

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	373

ENGINEERING
FILED
67862

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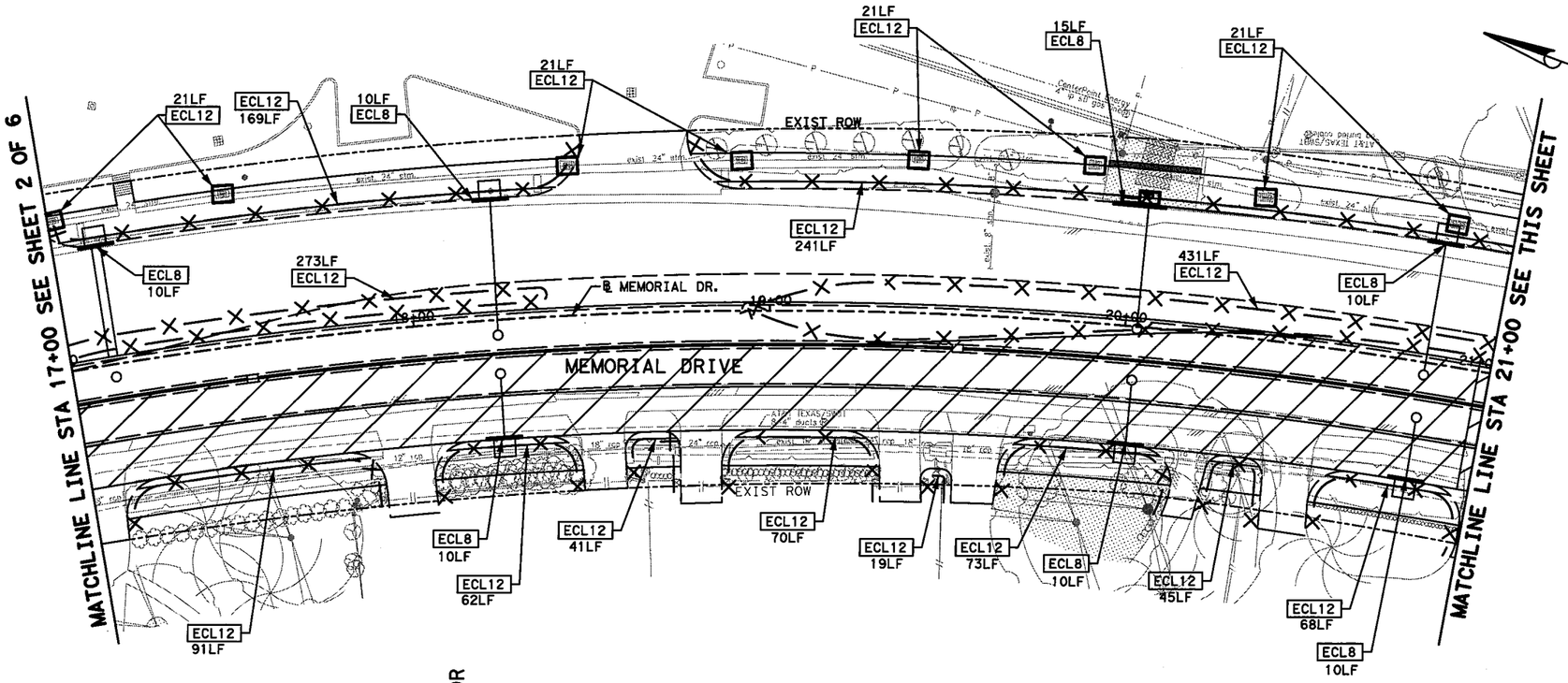

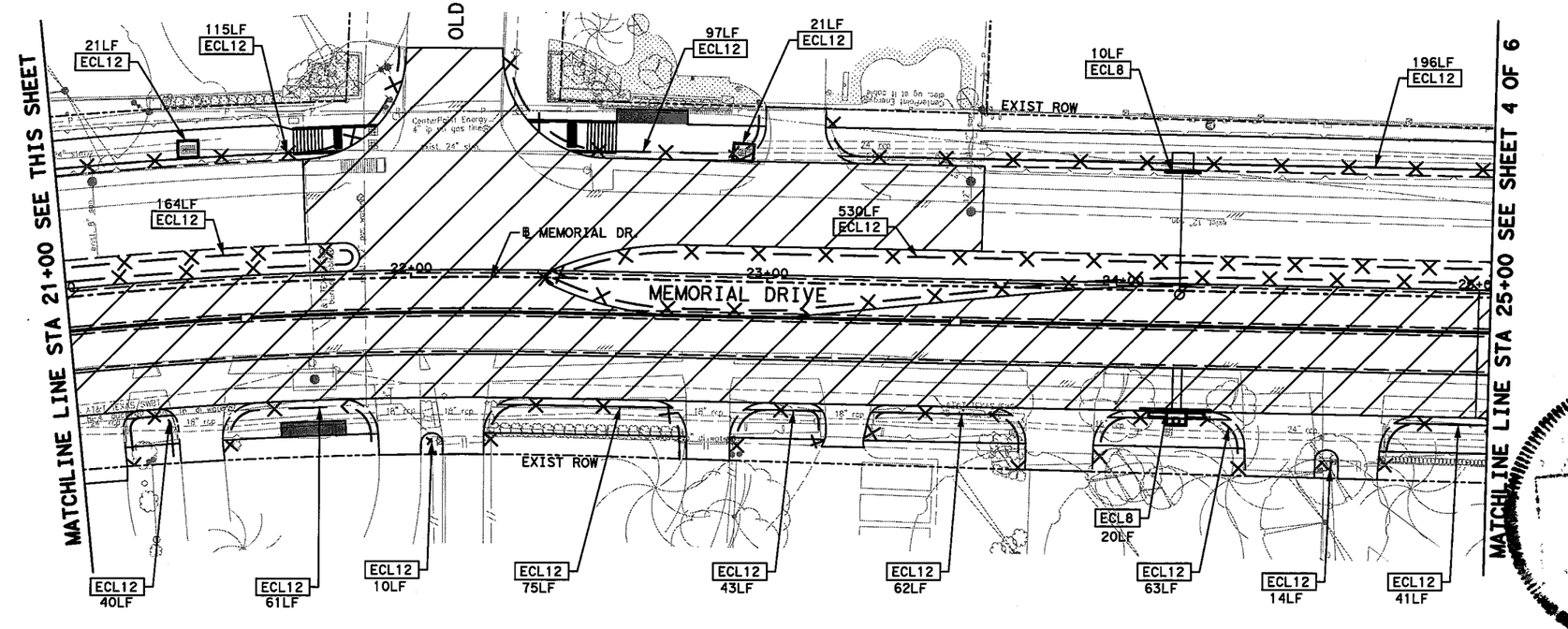

LEGEND:

- 8" EROSION CONTROL LOGS ECL8
- 12" EROSION CONTROL LOGS ECL12
- RFD2 ROCK FILTER DAM
- PROP STORM SEWER
- PROP DITCH ℄
- PROP INLET
- PROP MANHOLE
- PROP JUNCTION BOX
- EXIST STORM SEWER
- EXIST INLET
- EXIST MANHOLE
- EXIST TRAFFIC LANE
- PROP TRAFFIC LANE

NOTES

1. INSTALL STORM WATER POLLUTION PREVENTION DEVICES AS WORK PROGRESSES DEPENDING ON TRAFFIC CONTROL PHASES.

0 40 80
(IN FEET)
SCALE: PLAN 1": 40'

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STORM WATER POLLUTION PREVENTION PLAN STA 17+00 TO STA 25+00

SHEET 3 OF 6

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK. DSN:	6	TEXAS	STP 1802(783)MM			CS
DWN:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK. DWN:	HOU	HARRIS	0912	72	391	374

ACCEPTED AND ENGINEER
67862

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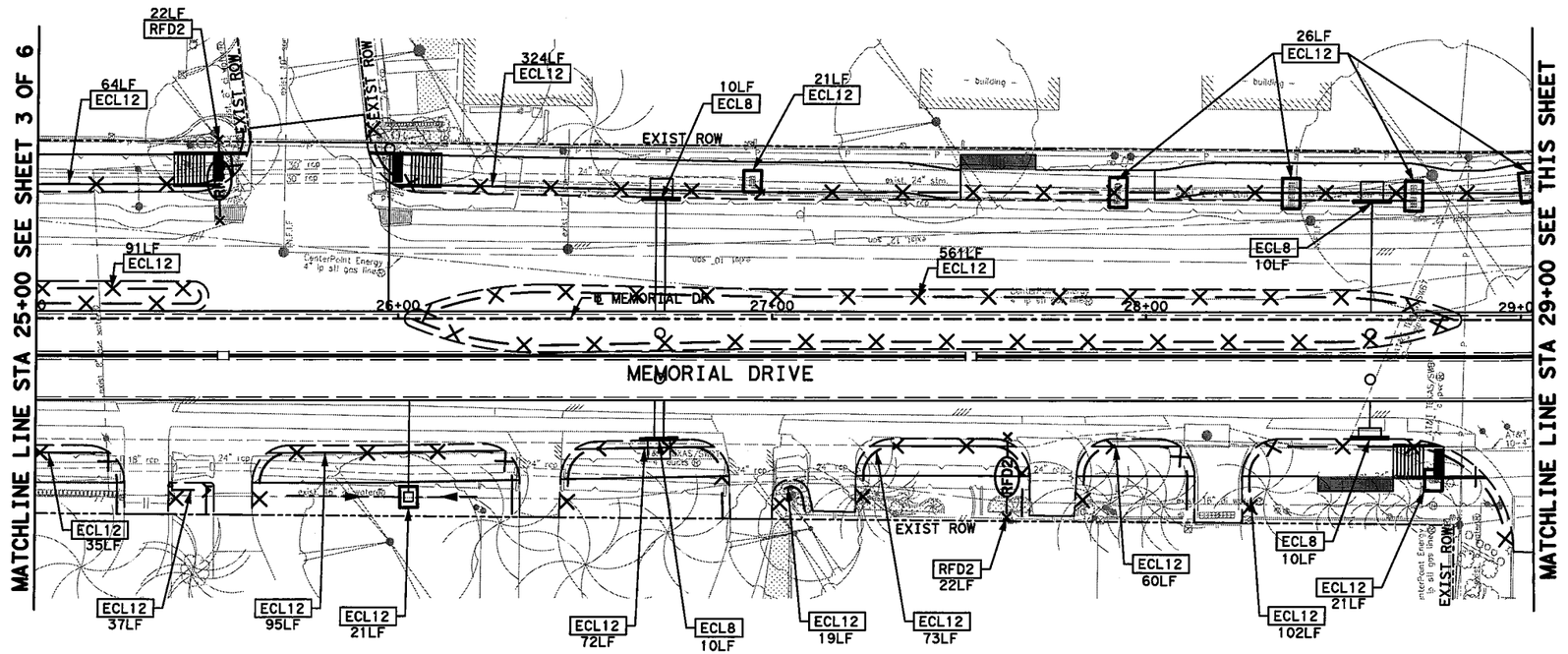

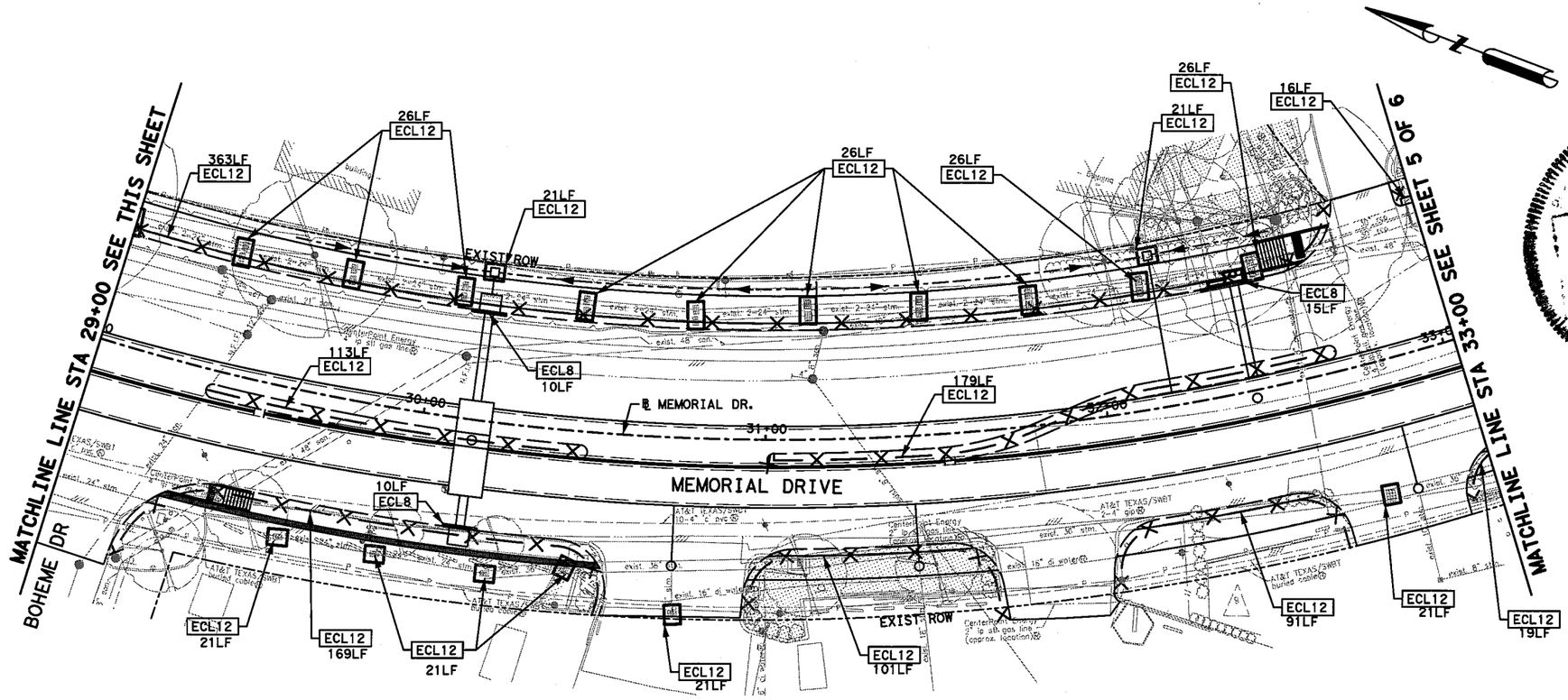

LEGEND:

- 8" EROSION CONTROL LOGS [ECL8]
- 12" EROSION CONTROL LOGS [ECL12]
- ROCK FILTER DAM (RFD2)
- PROP STORM SEWER
- PROP DITCH ℄
- PROP INLET
- PROP MANHOLE
- PROP JUNCTION BOX
- EXIST STORM SEWER
- EXIST INLET
- EXIST MANHOLE
- EXIST TRAFFIC LANE
- PROP TRAFFIC LANE

NOTES

1. INSTALL STORM WATER POLLUTION PREVENTION DEVICES AS WORK PROGRESSES DEPENDING ON TRAFFIC CONTROL PHASES.

0 40 80

(IN FEET)

SCALE: PLAN 1": 40'

ACCEPTED AND FILED
67862

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STORM WATER POLLUTION PREVENTION PLAN STA 25+00 TO STA 33+00

SHEET 4 OF 6

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DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CK: DWG:	HOU	HARRIS	0912	72	391	375

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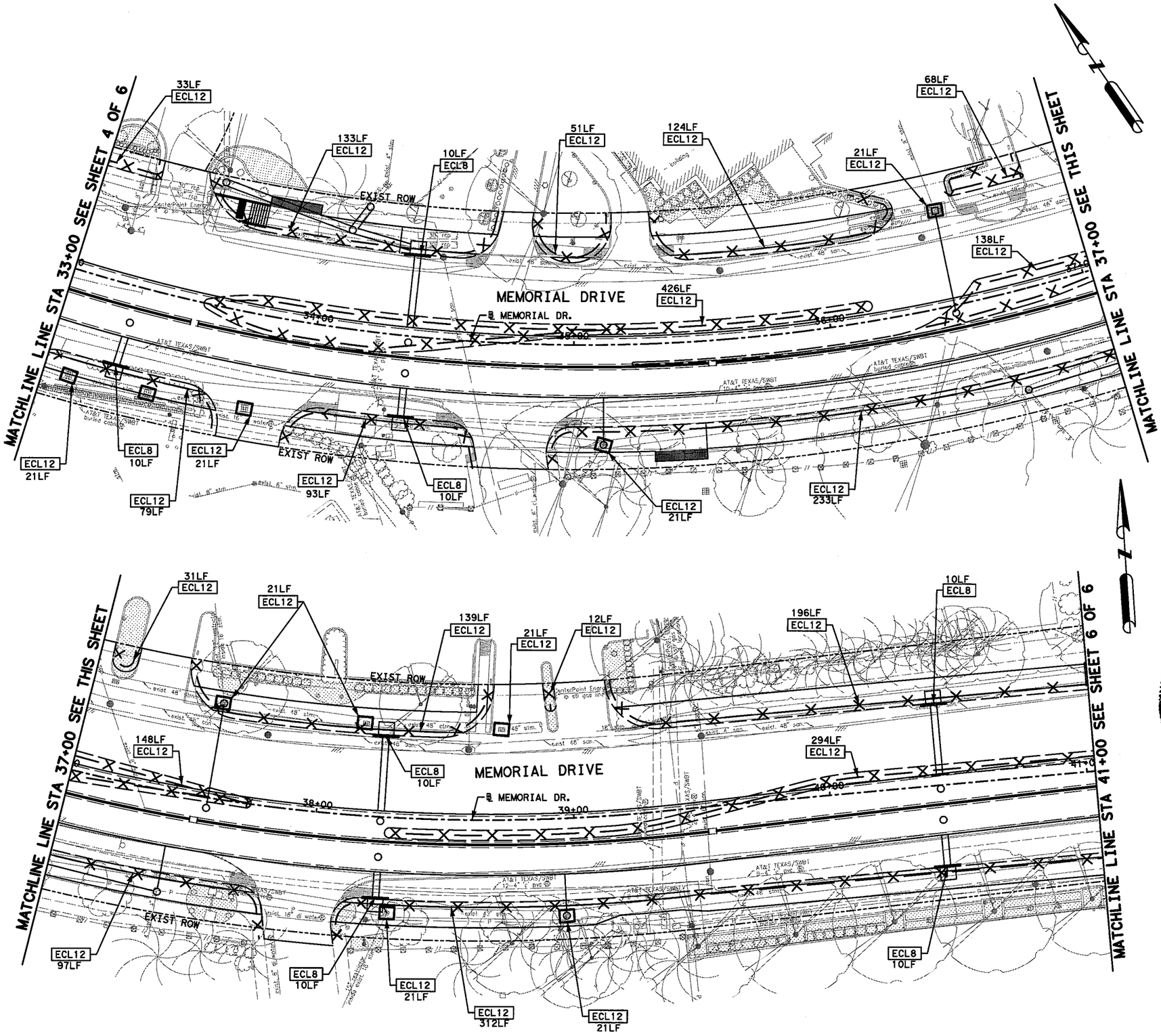


LEGEND:

- 8" EROSION CONTROL LOGS [ECL8]
- 12" EROSION CONTROL LOGS [ECL12]
- RFD2 ROCK FILTER DAM
- PROP STORM SEWER
- PROP DITCH ℄
- PROP INLET
- PROP MANHOLE
- PROP JUNCTION BOX
- EXIST STORM SEWER
- EXIST INLET
- EXIST MANHOLE
- EXIST TRAFFIC LANE
- PROP TRAFFIC LANE

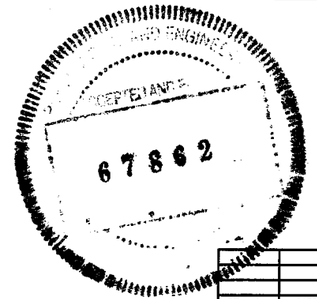
NOTES

1. INSTALL STORM WATER POLLUTION PREVENTION DEVICES AS WORK PROGRESSES DEPENDING ON TRAFFIC CONTROL PHASES.

0 40 80

(IN FEET)

SCALE: PLAN 1":40'



Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

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FIRM REGISTATION NO. 2614

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STORM WATER POLLUTION PREVENTION PLAN STA 33+00 TO STA 41+00

SHEET 5 OF 6

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	376

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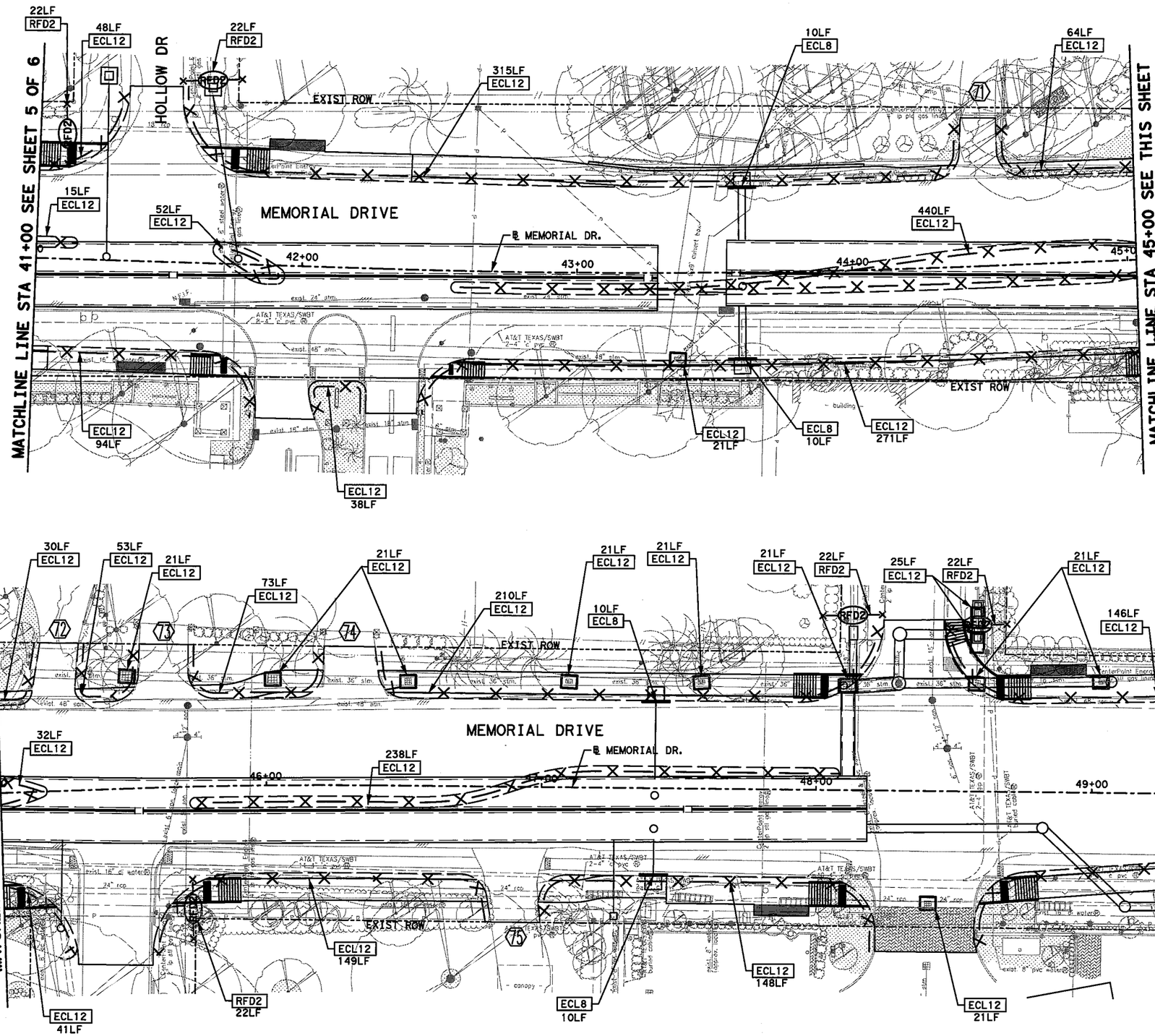

LEGEND:

- 8" EROSION CONTROL LOGS [ECL8]
- 12" EROSION CONTROL LOGS [ECL12]
- ROCK FILTER DAM (RFD2)
- PROP STORM SEWER
- PROP DITCH ℄
- PROP INLET
- PROP MANHOLE
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- EXIST STORM SEWER
- EXIST INLET
- EXIST MANHOLE
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- PROP TRAFFIC LANE

NOTES

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0 40 80

(IN FEET)

SCALE: PLAN 1": 40'

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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A LEO A DALY COMPANY
FIRM REGISTATION NO. 2614

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

STORM WATER POLLUTION PREVENTION PLAN
STA 41+00 TO END PROJECT

SHEET 6 OF 6

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	377

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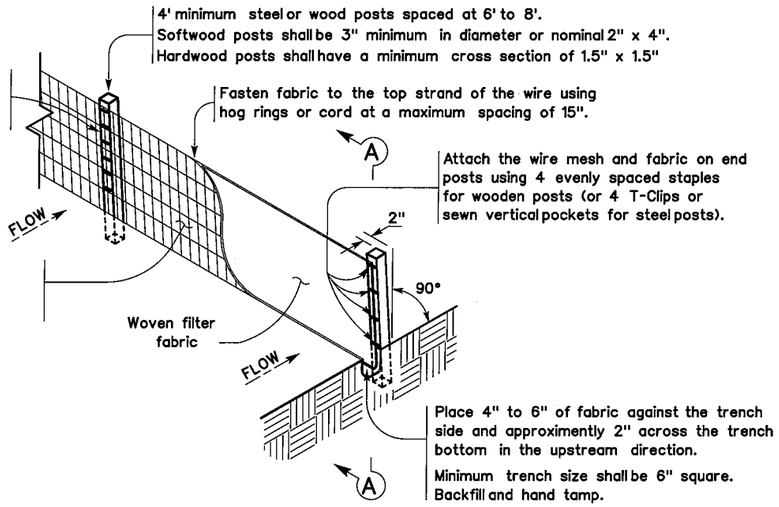
DATE
FILE

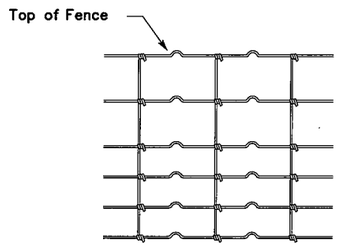
Connect the ends of the successive reinforcement sheets or rolls a minimum of 6 times with hog rings.

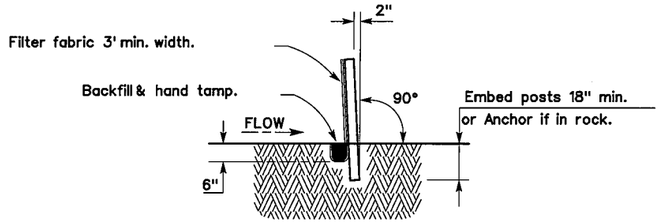
Galvanized welded wire mesh (W.W.M.) (12.5 GA. SWG Min.) with a maximum opening size of 2"x 4"or Woven Mesh (W.M.)(See woven mesh option detail)



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.

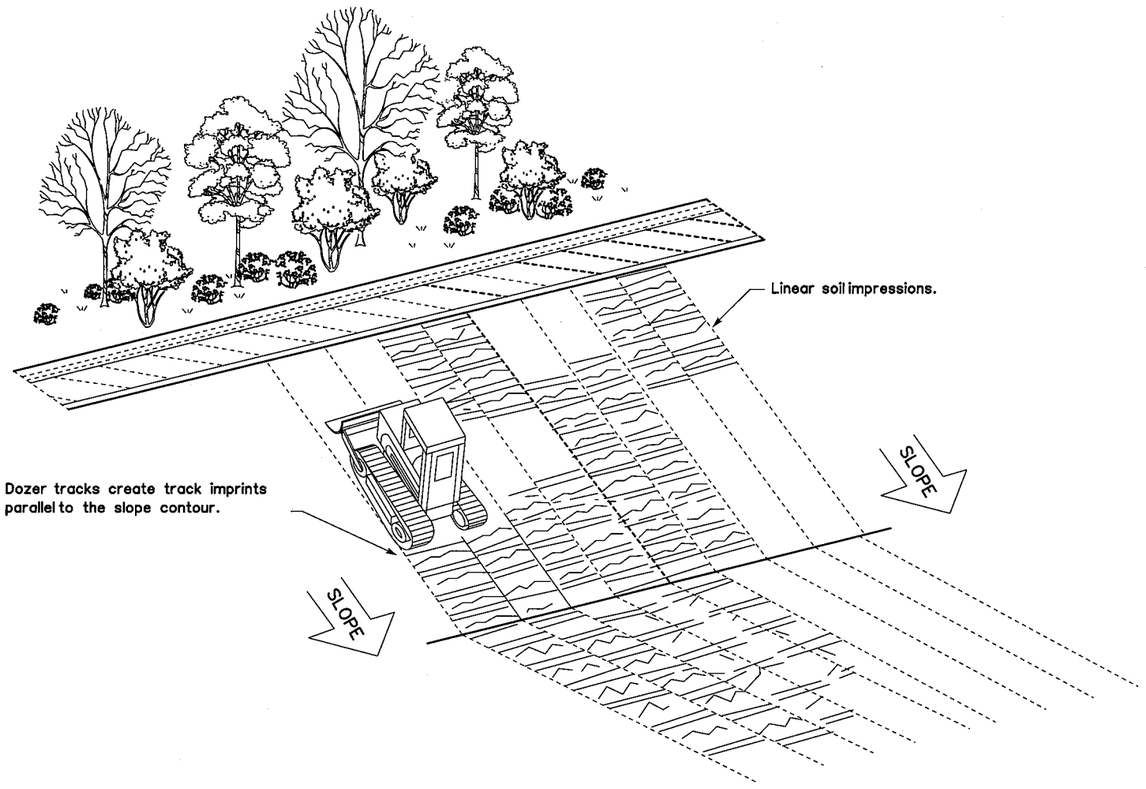
LEGEND

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

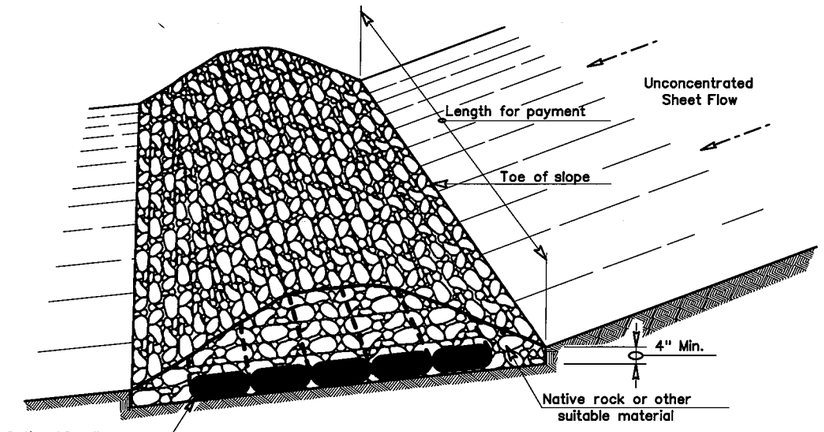
Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

FENCE & VERTICAL TRACKING

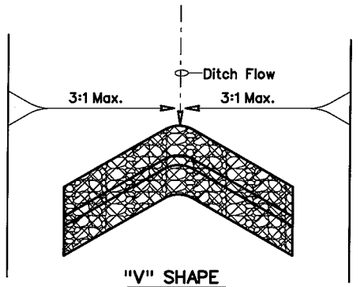
EC(1)-16

FILE: ec116	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	72	391	CS
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		378

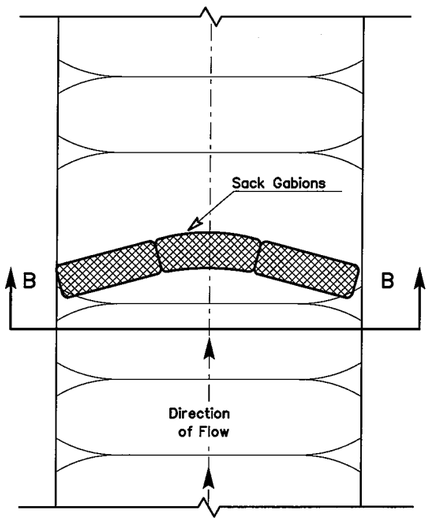


FILTER DAM AT TOE OF SLOPE

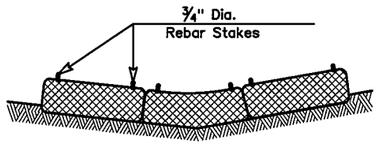
RFD1



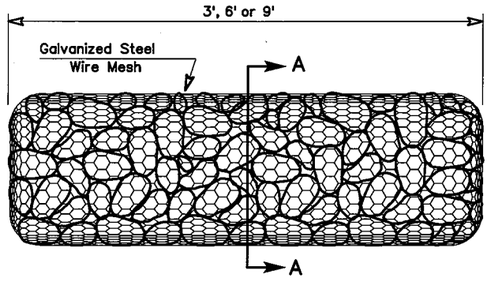
"V" SHAPE
PLAN VIEW



PLAN VIEW

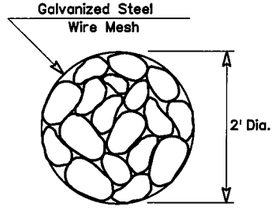


SECTION B-B

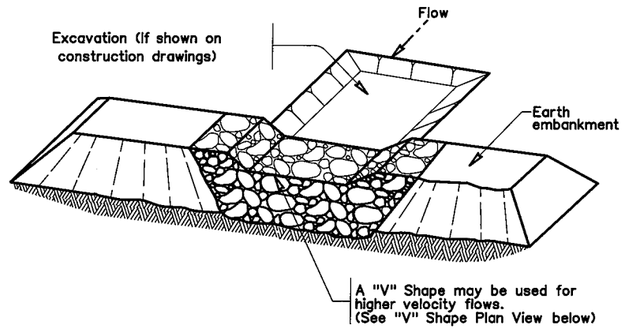


TYPE 4 (SACK GABIONS)

RFD4

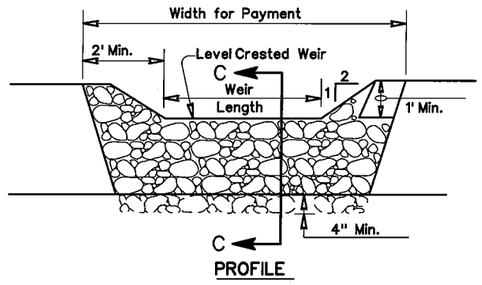


SECTION A-A

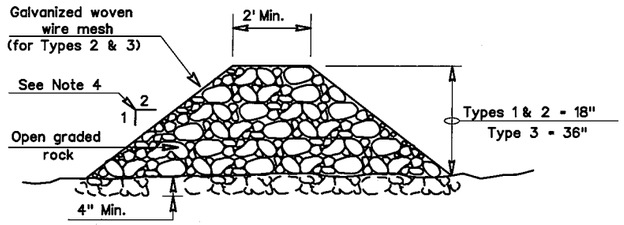


FILTER DAM AT SEDIMENT TRAP

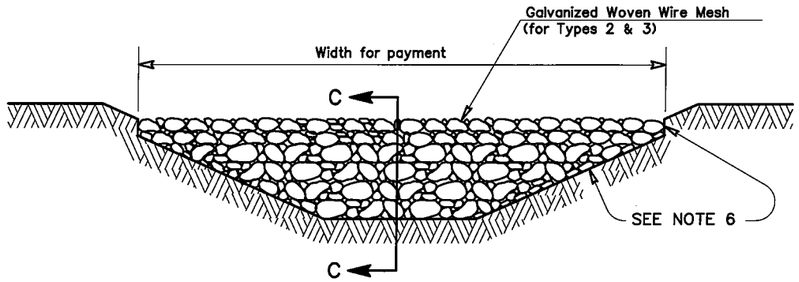
RFD1 OR RFD2



PROFILE



SECTION C-C



FILTER DAM AT CHANNEL SECTIONS

RFD1 OR RFD2 OR RFD3

GENERAL NOTES

1. If shown on the plans or directed by the Engineer, filter dams should be placed near the toe of slopes where erosion is anticipated, upstream and/or downstream at drainage structures, and in roadway ditches and channels to collect sediment.
2. Materials (aggregate, wire mesh, sandbags, etc.) shall be as indicated by the specification for "Rock Filter Dams for Erosion and Sedimentation Control".
3. The rock filter dam dimensions shall be as indicated on the SW3P plans.
4. Side slopes should be 2:1 or flatter. Dams within the safety zone shall have sideslopes of 6:1 or flatter.
5. Maintain a minimum of 1' between top of rock filter dam weir and top of embankment for filter dams at sediment traps.
6. Filter dams should be embedded a minimum of 4" into existing ground.
7. The sediment trap for ponding of sediment laden runoff shall be of the dimensions shown on the plans.
8. Rock filter dam types 2 & 3 shall be secured with 20 gauge galvanized woven wire mesh with 1" diameter hexagonal openings. The aggregate shall be placed on the mesh to the height & slopes specified. The mesh shall be folded at the upstream side over the aggregate and tightly secured to itself on the downstream side using wire ties or hog rings. For in stream use, the mesh should be secured or staked to the stream bed prior to aggregate placement.
9. Sack Gabions should be staked down with 3/4" dia. rebar stakes, and have a double-twisted hexagonal weave with a nominal mesh opening of 2 1/2" x 3 1/4"
10. Flow outlet should be onto a stabilized area (vegetation, rock, etc.).
11. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

ROCK FILTER DAM USAGE GUIDELINES

Rock Filter Dams should be constructed downstream from disturbed areas to intercept sediment from overland runoff and/or concentrated flow. The dams should be sized to filter a maximum flow through rate of 60 GPM/FT^2 of cross sectional area. A 2 year storm frequency may be used to calculate the flow rate.

Type 1 (18" high with no wire mesh) (3" to 6" aggregate): Type 1 may be used at the toe of slopes, around inlets, in small ditches, and at dike or swale outlets. This type of dam is recommended to control erosion from a drainage area of 5 acres or less. Type 1 may not be used in concentrated high velocity flows (approximently 8 Ft/Sec or more) in which aggregate wash out may occur. Sandbags may be used at the embedded foundation (4" deep min.) for better filtering efficiency of low flows if called for on the plans or directed by the Engineer.

Type 2 (18" high with wire mesh) (3" to 6" aggregate): Type 2 may be used in ditches and at dike or swale outlets.

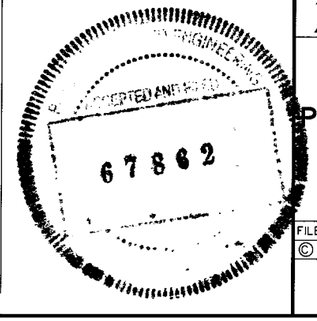
Type 3 (36" high with wire mesh) (4" to 8" aggregate): Type 3 may be used in stream flow and should be secured to the stream bed.

Type 4 (Sack gabions) (3" to 6" aggregate): Type 4 May be used in ditches and smaller channels to form an erosion control dam.

Type 5: Provide rock filter dams as shown on plans.

PLAN SHEET LEGEND

Type 1 Rock Filter Dam	RFD1
Type 2 Rock Filter Dam	RFD2
Type 3 Rock Filter Dam	RFD3
Type 4 Rock Filter Dam	RFD4



Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

ROCK FILTER DAMS

EC(2)-16

FILE: ec216	DN: TxDOT		CK: KM	DW: VP		DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY	
REVISIONS	0912	72	391		CS	
	DIST	COUNTY			SHEET NO.	
	HOU	HARRIS			379	

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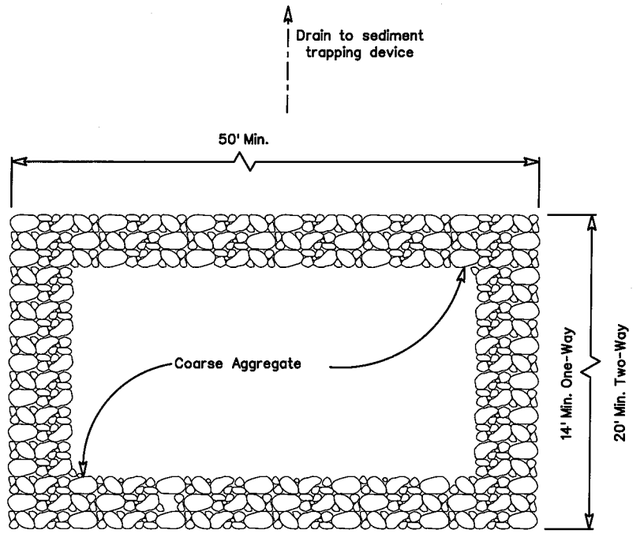
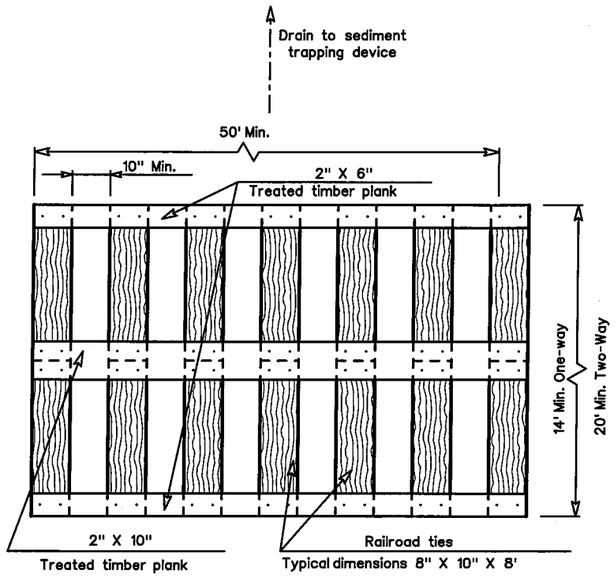
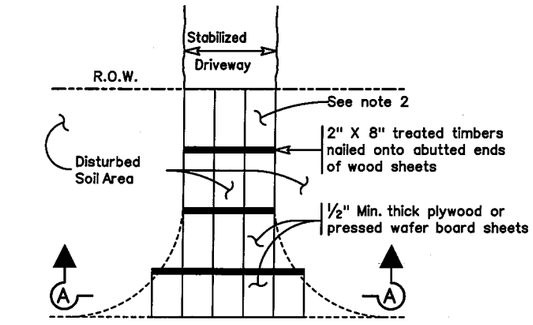


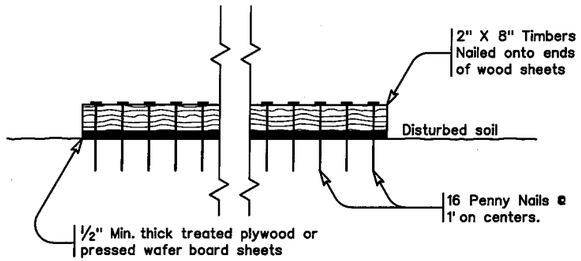
PLAN VIEW



PLAN VIEW



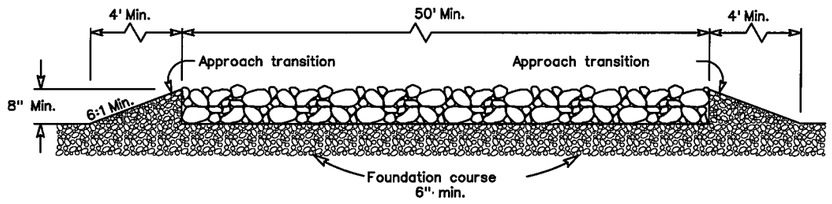
PLAN VIEW



SECTION A-A

CONSTRUCTION EXIT (TYPE 3)

SHORT TERM



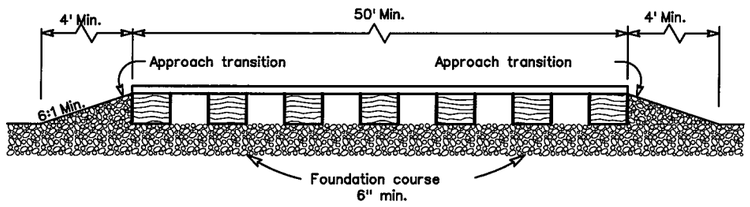
ELEVATION VIEW

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)

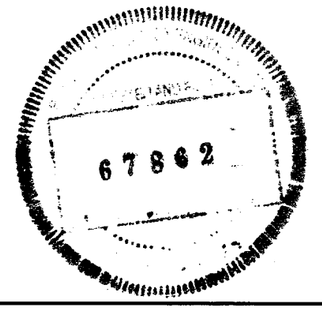
TIMBER CONSTRUCTION (LONG TERM)

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
©TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	72	391	CS
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		380

DATE:
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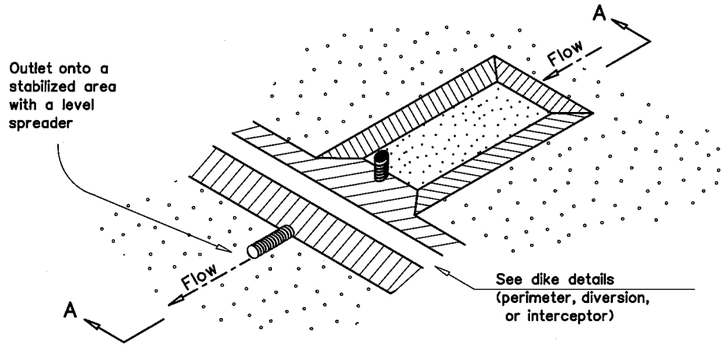
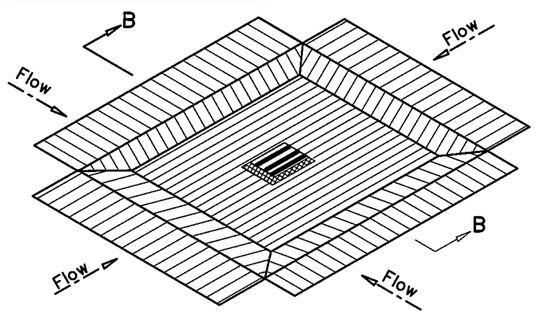


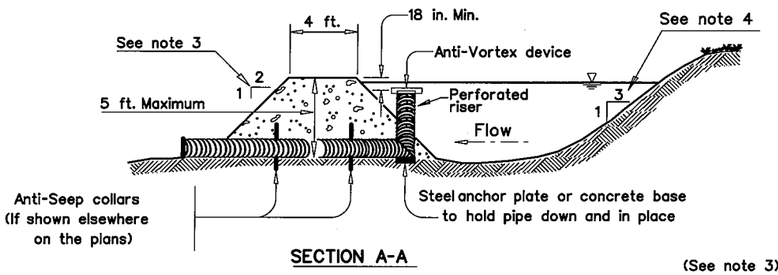
SEDIMENT BASIN AND/OR TRAP WITH PIPE OUTLET

ST/PO

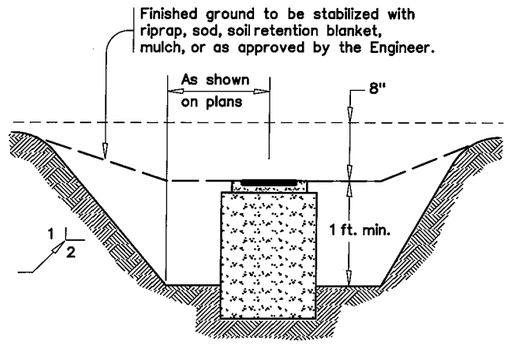


DROP INLET SEDIMENT TRAP

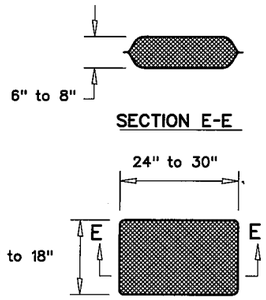
ST-DI



SECTION A-A

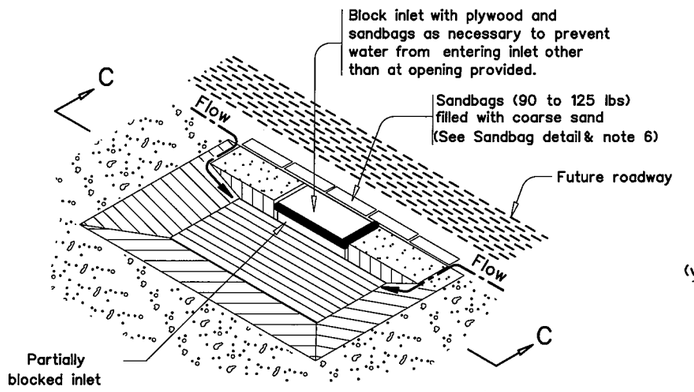


SECTION B-B



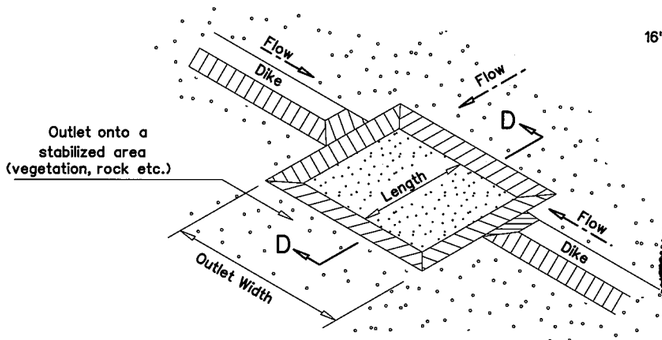
SECTION E-E

SANDBAG DETAIL



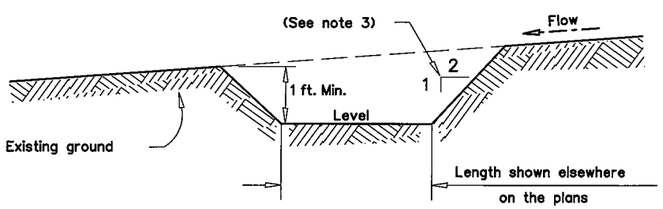
CURB INLET SEDIMENT TRAP

ST-CI



SEDIMENT TRAP WITH LEVEL STABILIZED OUTLET

ST



SECTION C-C

SECTION D-D

GENERAL NOTES

1. Pipe outlet material shall conform to the Item "Pipe Underdrains" or as accepted by the Engineer.
2. All pipe connections shall be watertight.
3. Side slopes within the safety clear zone of a roadway shall be 6:1 or flatter. Protect the traveling public from inlet stacks within the clear zone.
4. Sediment basins shall have side slopes of 3:1 or flatter.
5. The dimensions and limits of excavation for sediment basins and traps will be as shown elsewhere on the plans.
6. The sandbag material shall be made of polypropylene, polyethylene or polyamide woven fabric, min. unit weight 4 ounces /SY, Mullen burst strength exeeding 300 psi and ultraviolet stability exeeding 70%.
7. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

SEDIMENT BASIN & TRAP USAGE GUIDELINES

A sediment basin and/or trap may be used to precipitate sediment out of runoff draining from an unstabilized area.

Basins: The drainage area for a sediment basin should not exceed 100 acres. The basin capacity shall be at least 1800 CF/Acre of drainage area (0.5" over the drainage area). If the disturbed area draining to the basin is larger than 10 acres, the basin capacity should be 3600 CF/Acre (1.0" over the drainage area).

The basin should have a 40 hour draw-down time with an emergency spillway. The spillway may be designed to pass the peak rate of runoff from a 25 year frequency storm. The 100 year storm should be investigated to consider possible flooding impacts.

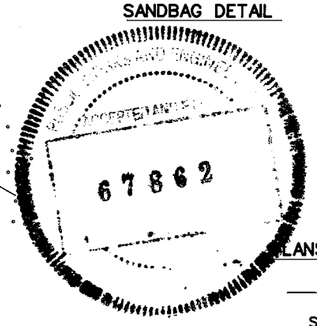
The entrance into the basin should be protected from erosion. The basin should be cleaned when the capacity has been reduced by 1/3.

Traps: The drainage area for a sediment trap should not exceed 5 acres. The trap capacity should be 1800 CF/Acre (0.5" over the drainage area).

Sediment traps should be placed in the following locations:
1. Within drainage ditches spaced @ 500' on center
2. Immediately preceding ditch inlets
3. Just before the drainage enters a water course
4. Just before the drainage leaves the right of way

The trap outlet may either be through a perforated riser and pipe assembly designed to achieve a 40 hour draw-down time or over a level stabilized area (vegetation, rock, etc.).

The trap should be cleaned when the capacity has been reduced by ½ or the sediment has accumulated to a depth of 1', whichever is less.



PLANS SHEET LEGEND

ST/PO
Sediment Basin and / or Trap with Pipe Outlet

ST-DI
Drop Inlet Sediment Trap

ST-CI
Curb Inlet Sediment Trap

ST
Sediment Trap with Level Stabilized Outlet

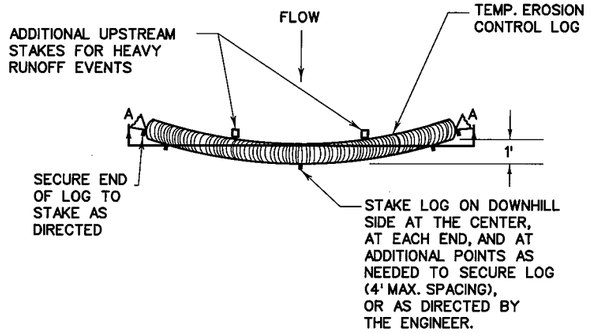
Texas Department of Transportation

Design Division Standard

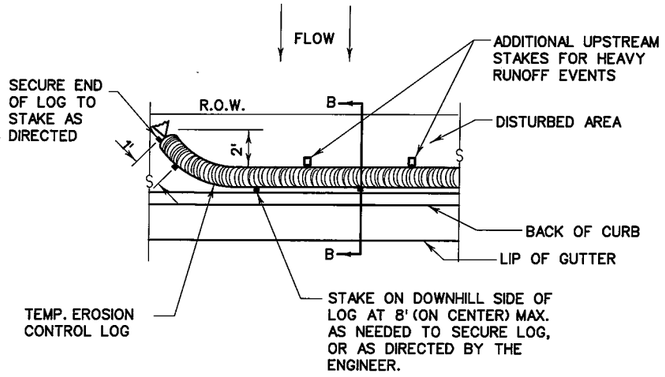
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES
SEDIMENT BASINS AND TRAPS (EARTHWORK FOR EROSION CONTROL)

EC(6)-16

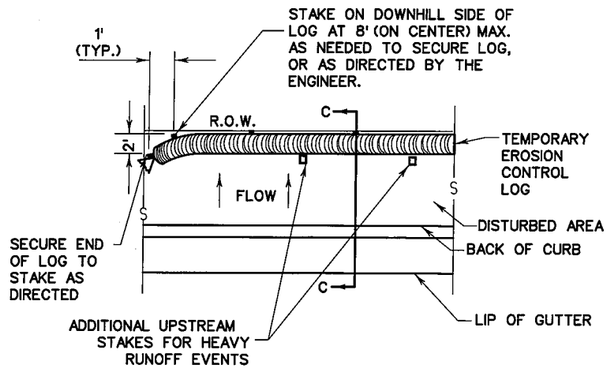
FILE: ec616	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	72	391	CS
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		381



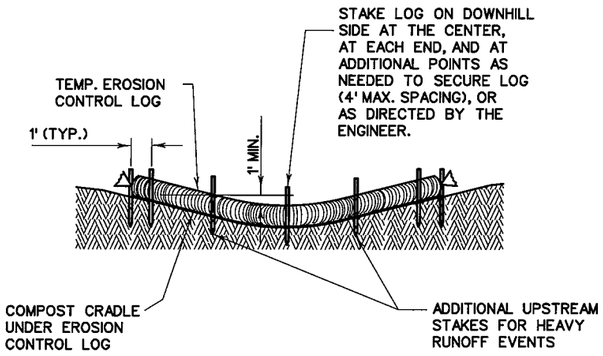
PLAN VIEW



PLAN VIEW



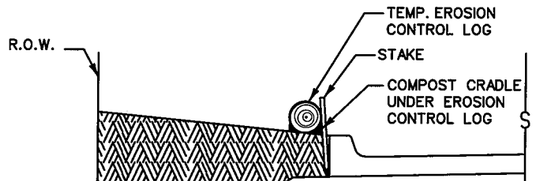
PLAN VIEW



SECTION A-A

EROSION CONTROL LOG DAM

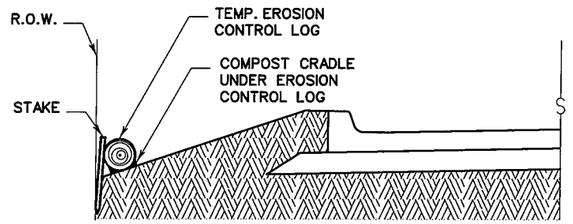
CL-D



SECTION B-B

EROSION CONTROL LOG AT BACK OF CURB

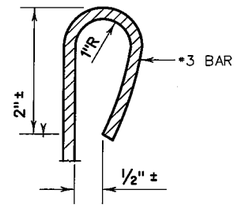
CL-BOC



SECTION C-C

EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY

CL-ROW



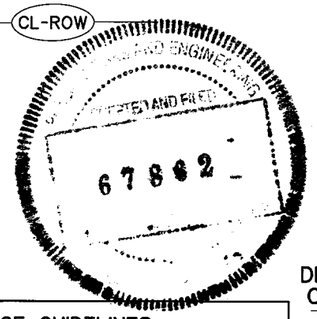
REBAR STAKE DETAIL

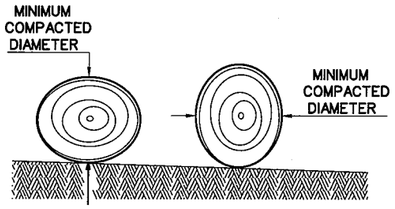
LEGEND

- CL-D — EROSION CONTROL LOG DAM
- CL-BOC — EROSION CONTROL LOG AT BACK OF CURB
- CL-ROW — EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY
- CL-SST — EROSION CONTROL LOGS ON SLOPES STAKE AND TRENCHING ANCHORING
- CL-SSL — EROSION CONTROL LOGS ON SLOPES STAKE AND LASHING ANCHORING
- CL-DI — EROSION CONTROL LOG AT DROP INLET
- CL-CI — EROSION CONTROL LOG AT CURB INLET
- CL-GI — EROSION CONTROL LOG AT CURB & GRATE INLET

GENERAL NOTES:

1. EROSION CONTROL LOGS SHALL BE INSTALLED IN ACCORDANCE WITH MANFACTURER'S RECOMMENDATIONS, OR AS DIRECTED BY THE ENGINEER.
2. LENGTHS OF EROSION CONTROL LOGS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND AS REQUIRED FOR THE PURPOSE INTENDED.
3. UNLESS OTHERWISE DIRECTED, USE BIODEGRADABLE OR PHOTODEGRADABLE CONTAINMENT MESH ONLY WHERE LOG WILL REMAIN IN PLACE AS PART OF A VEGETATIVE SYSTEM. FOR TEMPORARY INSTALLATIONS, USE RECYCLABLE CONTAINMENT MESH.
4. FILL LOGS WITH SUFFICIENT FILTER MATERIAL TO ACHIEVE THE MINIMUM COMPACTED DIAMETER SPECIFIED IN THE PLANS WITHOUT EXCESSIVE DEFORMATION.
5. STAKES SHALL BE 2" X 2" WOOD OR •3 REBAR, 2'-4' LONG, EMBEDDED SUCH THAT 2" PROTRUDES ABOVE LOG, OR AS DIRECTED BY THE ENGINEER.
6. DO NOT PLACE STAKES THROUGH CONTAINMENT MESH.
7. COMPOST CRADLE MATERIAL IS INCIDENTAL & WILL NOT BE PAID FOR SEPARATELY.
8. SANDBAGS USED AS ANCHORS SHALL BE PLACED ON TOP OF LOGS & SHALL BE OF SUFFICIENT SIZE TO HOLD LOGS IN PLACE.
9. TURN THE ENDS OF EACH ROW OF LOGS UPSLOPE TO PREVENT RUNOFF FROM FLOWING AROUND THE LOG.
10. FOR HEAVY RUNOFF EVENTS, ADDITIONAL UPSTREAM STAKES MAY BE NECESSARY TO KEEP LOG FROM FOLDING IN ON ITSELF.





DIAMETER MEASUREMENTS OF EROSION CONTROL LOGS SPECIFIED IN PLANS

SEDIMENT BASIN & TRAP USAGE GUIDELINES

An erosion control log sediment trap may be used to filter sediment out of runoff draining from an unstabilized area.

Log Traps: The drainage area for a sediment trap should not exceed 5 acres. The trap capacity should be 1800 CF/Acre (0.5" over the drainage area).

Control logs should be placed in the following locations:

1. Within drainage ditches spaced as needed or min. 500' on center
2. Immediately preceding ditch inlets or drain inlets
3. Just before the drainage enters a water course
4. Just before the drainage leaves the right of way
5. Just before the drainage leaves the construction limits where drainage flows away from the project.

The logs should be cleaned when the sediment has accumulated to a depth of 1/2 the log diameter.

Cleaning and removal of accumulated sediment deposits is incidental and will not be paid for separately.

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

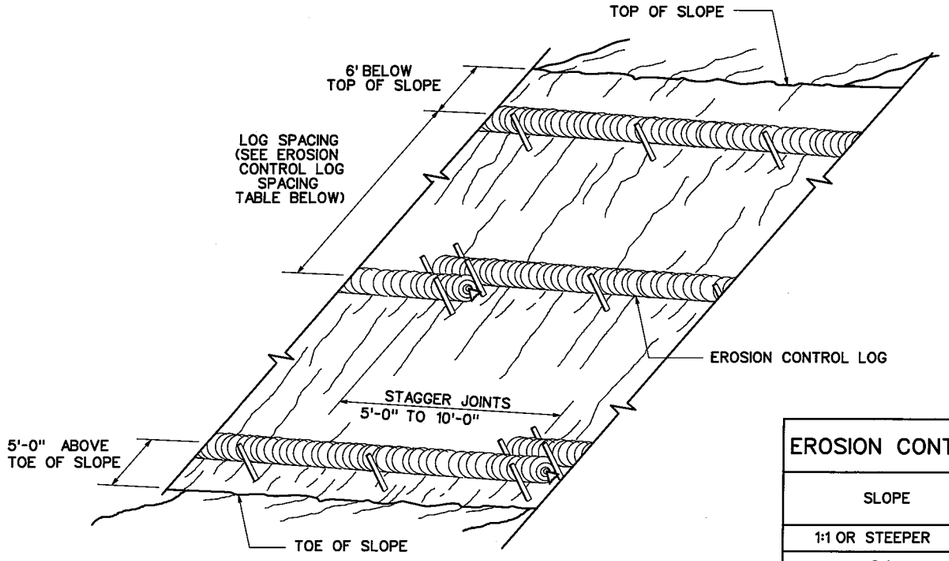
EROSION CONTROL LOG

EC(9)-16

FILE: ec916	DN: TxDOT	CK: KM	DW: LS/PT	CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	72	391	CS
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		382

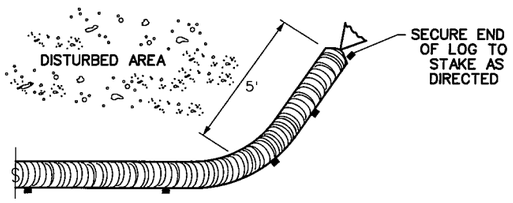
DATE:
FILE:

DATE:
FILE:



EROSION CONTROL LOGS ON SLOPES
STAKE AND TRENCHING ANCHORING

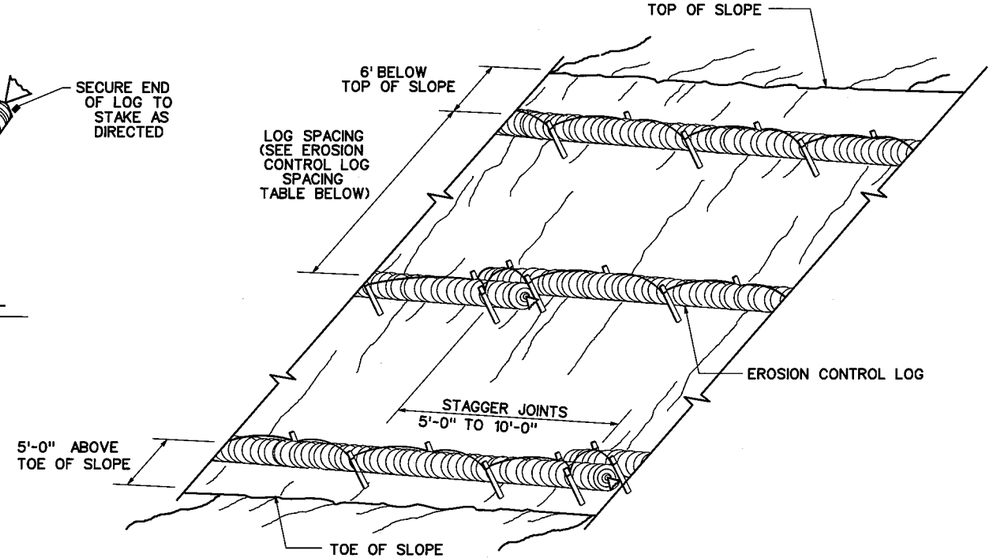
CL-SST



END SECTION RAP DETAIL

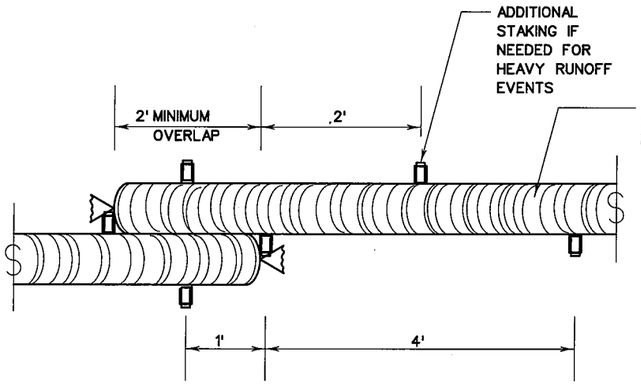
EROSION CONTROL LOG SPACING TABLE				
SLOPE	LOG DIAMETER			
	6"	8"	12"	18"
1:1 OR STEEPER	5'	10'	15'	20'
2:1	10'	20'	30'	40'
3:1	15'	30'	45'	60'
4:1 OR FLATTER	20'	40'	60'	80'

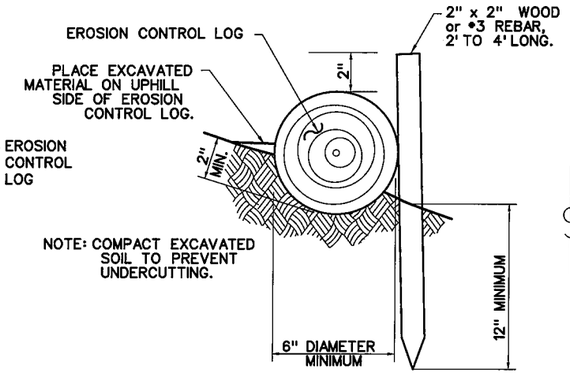
* ADJUSTMENTS CAN BE MADE FOR SOIL TYPE:
SOFT, LOAMY SOILS-ADJUST ROWS CLOSER TOGETHER;
HARD, ROCKY SOILS- ADJUST ROWS FARTHER APART



EROSION CONTROL LOGS ON SLOPES
STAKE AND LASHING ANCHORING

CL-SSL

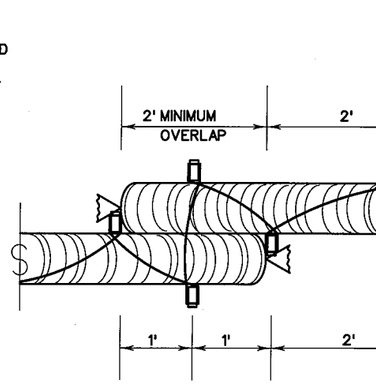


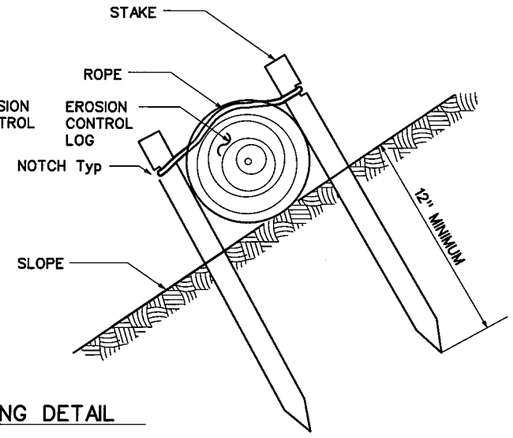


STAKE AND TRENCHING ANCHORING DETAIL

CL-SST

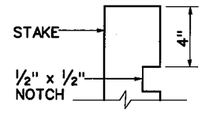
TRENCH DEPTH TABLE	
LOG DIAMETER	DEPTH
6"	2"
8"	3"
12"	4"
18"	5"



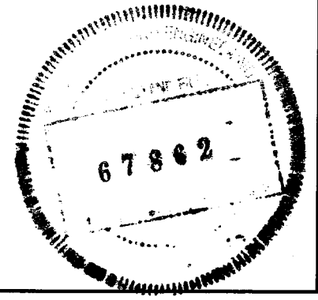


STAKE AND LASHING ANCHORING DETAIL

CL-SSL



STAKE NOTCH DETAIL



SHEET 2 OF 3

Texas Department of Transportation

Design Division Standard

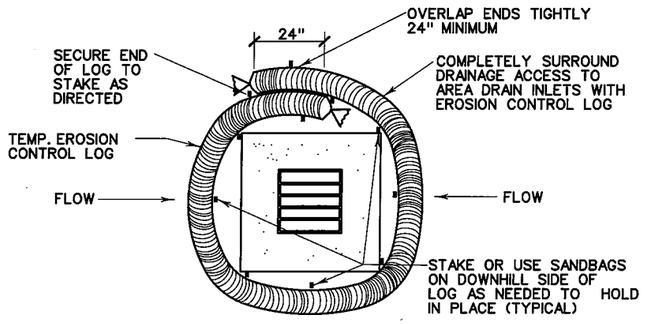
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

EC(9)-16

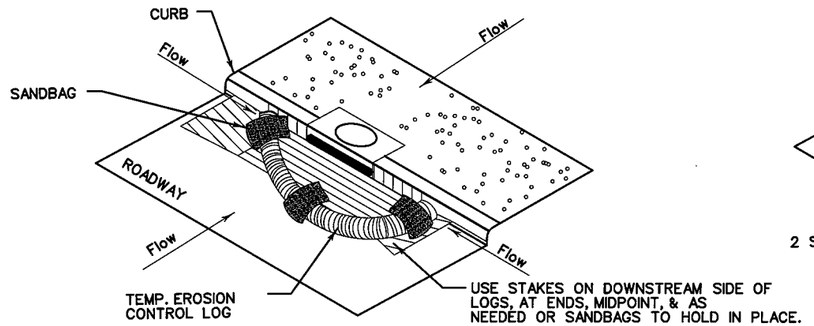
FILE: ec116	DN: TxDOT	CK: KM	DW: LS/PT	CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0912	72	391	CS
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		383

DATE:
FILE:



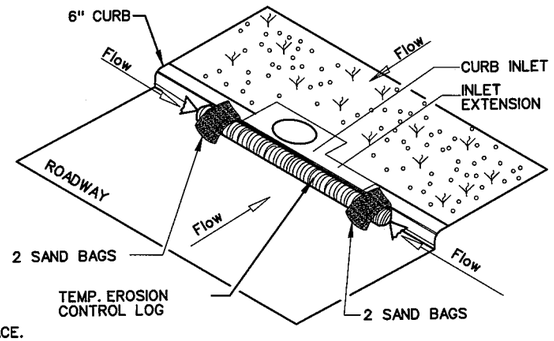
EROSION CONTROL LOG AT DROP INLET

CL-DI



EROSION CONTROL LOG AT CURB INLET

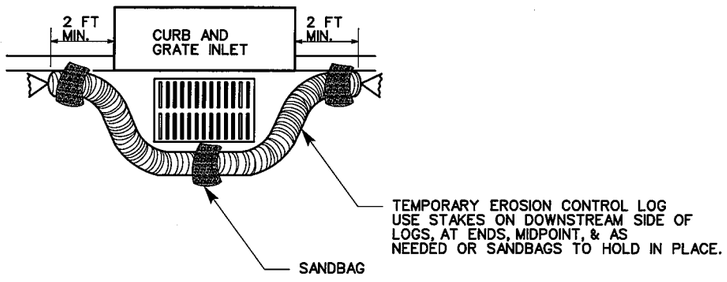
CL-CI



EROSION CONTROL LOG AT CURB INLET

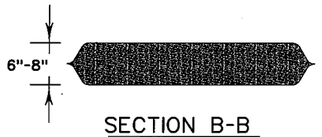
CL-CI

NOTE:
EROSION CONTROL LOGS USED AT CURB INLETS SHOULD ONLY BE USED IF THEY WILL NOT IMPEDE TRAFFIC OR FLOOD THE ROADWAY OR WHEN THE STORM SEWER SYSTEM IS NOT FULLY FUNCTIONAL.

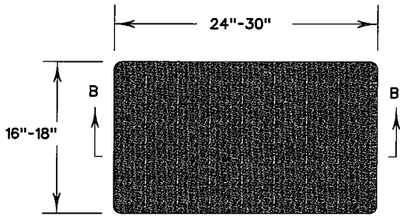


EROSION CONTROL LOG AT CURB & GRADE INLET

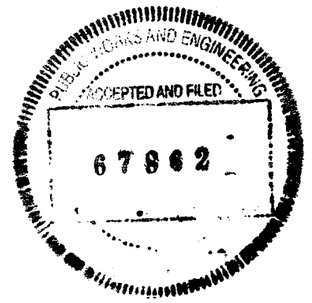
CL-GI



SECTION B-B



SANDBAG DETAIL



Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

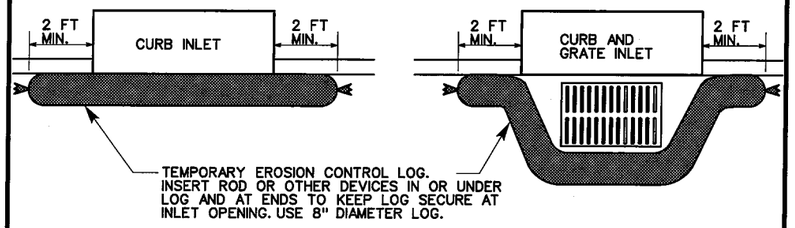
EROSION CONTROL LOG

EC(9)-16

FILE: ec916	DN: TxDOT	CK: KM	DW: LS/PT	CK: LS		
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY		
REVISIONS	0912	72	391	CS		
	DIST	COUNTY		SHEET NO.		
	HOU	HARRIS		384		

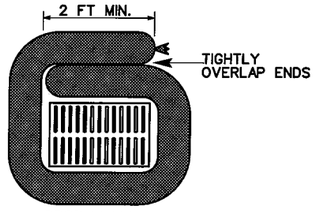
CURB INLETS
8" DIAMETER LOGS

ITEM 506-6040 BIODEG EROSN CONT LOGS (INSTL) (8")

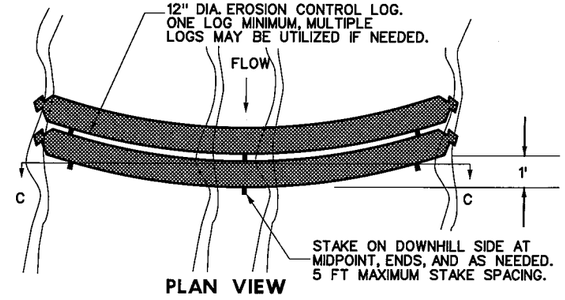


DROP INLETS AND OTHER LOCATIONS
12" DIAMETER LOGS

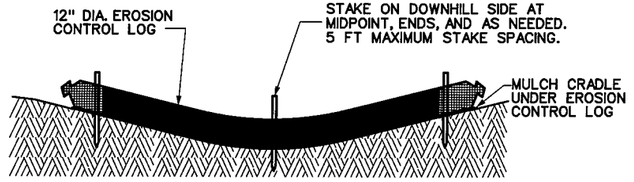
ITEM 506-6041 BIODEG EROSN CONT LOGS (INSTL)(12")



DROP INLETS

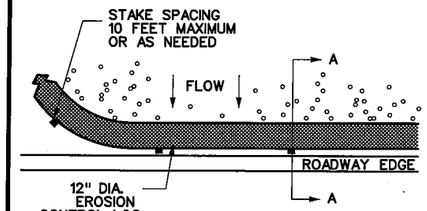


PLAN VIEW

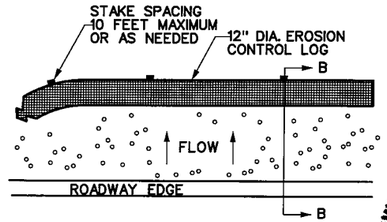


SECTION C-C

DRAINAGE SWALE OR DITCH



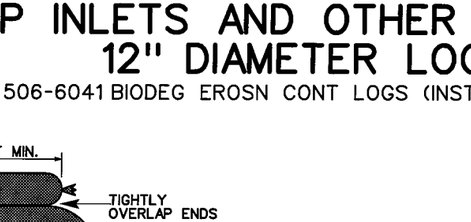
PLAN VIEW



PLAN VIEW

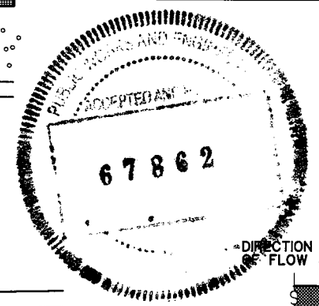
SECTION A-A

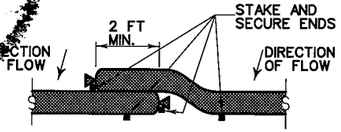
SLOPE TO ROADWAY EDGE



SECTION B-B

SLOPE AWAY FROM ROADWAY EDGE





END OF LOG OVERLAP

MATERIAL REQUIREMENTS

FILL:

Use 100% shredded mulch or other non-compost biodegradable material as fill for logs.
No compost or fines.

DO NOT USE MATERIAL WHICH PROHIBITS WATER INFILTRATION.

LOG MESH:
Use mesh with 1/4" openings or larger. Mesh must allow water infiltration but also hold fill material in place.

SEDIMENT BASIN & TRAP USAGE GUIDELINES

A sediment trap (erosion control log) may be used to filter sediment out of runoff draining from an unstabilized area.

Traps: The drainage area for a sediment trap should not exceed 5 acres. The trap capacity should be 1800 CF/Acre (0.5" over the drainage area).

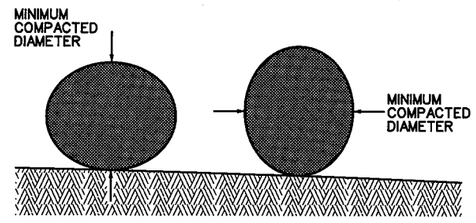
Sediment traps should be placed in the following locations:

1. Within drainage ditches spaced as needed or min. 500' on center
2. Immediately preceding ditch inlets
3. Just before the drainage enters a water course
4. Just before the drainage leaves the right of way

The trap should be cleaned when the capacity has been reduced by 1/2 or the sediment has accumulated to a depth of 1', whichever is less.

REQUIRED ITEMS:

- ITEM 506-6040 BIODEG EROSN CONT LOGS (INSTL) (8") LF
- ITEM 506-6041 BIODEG EROSN CONT LOGS (INSTL) (12") LF
- ITEM 506-6043 BIODEG EROSN CONT LOGS (REMOVE) LF



DIAMETER MEASUREMENTS OF EROSION CONTROL LOGS SPECIFIED IN PLANS

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		385
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	HARRIS	0912	72	391	CS

STD G-4A

TYPE OF WORK — ITEMS AND REQUIREMENTS FOR EACH TYPE OF WORK

SODDING	PERMANENT SEEDING	TEMPORARY SEEDING	Reference Item 161, 162, 164, 166, 168 of the Texas Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges 2014 for specifications, dimensions, volumes and measurements that are not shown. Use latest Houston District, Special Provisions for those items indicated.		
	✓		**161-6017 COMPOST MANUF TOPSOIL (BIP)(4") SY**	APPLICATION RATE Item 161.2.1. Compost Manufactured Topsoil (CMT)	Item 161.2. Materials. Submit quality control (QC) documentation to the Engineer. Compost producer's STA certification must be dated to meet STA requirements (certification must be within 30 or 90 days per STA requirements). Lab analysis performed by an STA-certified lab must be dated within 30 days before delivery of the compost.
✓			**162-6002 BLOCK SODDING SY**	GRASS SPECIES Item 162.2. Materials. Common Bermuda (Cynodon Dactylon)	Item 162.2.1. Block Sod. Use block palletized or roll type sod. **REMOVE PLASTIC BACKING FROM ROLL TYPE SOD.** Place sod within 48 hours of delivery to site. No exceptions. Place sod with joints alternating on each row to prevent continuous joint lines. Peg sod as needed with wood pegs to hold sod in place. Pegging sod is subsidiary to Item 162.
	✓		**164-6066 DRILL SEEDING(PERM)(WARM OR COOL) SY** Item 164.1. Description Provide and install seeding as shown on District Standard	PLANTING MONTH / SEED MIX March, April, 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 fertilizer at a rate of 4000 lbs/acre.	Use a NON-CHEMICAL fertilizer which meets all the following criteria: (1) BRAND NAME must be registered with the Texas State Chemist as a commercial fertilizer. (2) Meets USEPA guidelines for unrestricted use. (3) Derived from biological sources such as, but not limited to: sewage sludge, manures, vegetation, etc. (4) In granular form and essentially dust free. Submit proof of registration and nutrient source to Engineer. Use the following products or an approved equal(see note this sheet): Sigma, SIGMA AgriScience, 281-851-6749 Sustanite-standard grade, Automation Nation, Inc., 713-675-4999 Milorganite, MMSD, 800-287-9645 Agricultural Organic P/L, Ag Org, INC., 713-523-4396
✓	✓	✓	**168-6001 VEGETATIVE WATERING MG**	APPLICATION RATE Item 168.3 Construction. 6000 gallons/acre 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

67862

Texas Department of Transportation

HOUSTON DISTRICT

FERTILIZER, SEED, SOD, STRAW, COMPOST, AND WATER

SHEET 1 OF 1

REVISIONS	FILE: OCT 2014	FED DIV	STATE	PROJECT NUMBER			SHEET
10/2014 UPDATED TO 2014 SPECS 3/2015 MINOR CORRECTIONS	ORIGINAL:	6	TEXAS	STP 1802(783)MM			386
		DIST	COUNTY	CONTROL	SECT	JOB	HIGHWAY
		12	HARRIS	0912	72	391	CS

STD K-1

GENERAL NOTES:

1. VERIFY SITE INFORMATION, INCLUDING PROPERTY LINES, EASEMENTS, BUILDINGS, ROADWAY CURB AND GUTTERS, UTILITIES AND OTHER INFORMATION AFFECTING THE SCOPE OF WORK INCLUDED ON THESE DRAWINGS. MORE SPECIFIC UTILITY INFORMATION IS INDICATED ON THE CIVIL DRAWINGS.
2. CONTRACTOR SHALL CONTACT THE TxDOT LANDSCAPE ARCHITECT FOR DIRECTION ON HOW TO PROCEED IF ACTUAL SITE CONDITIONS VARY FROM WHAT IS SHOWN ON THE DRAWINGS. REFERENCES TO LANDSCAPE ARCHITECT SHALL MEAN TxDOT LANDSCAPE ARCHITECT.
3. EXCAVATION IN THE VICINITY OF UTILITIES SHALL BE UNDERTAKEN WITH CARE. THE CONTRACTOR BEARS FULL RESPONSIBILITY FOR THIS WORK. THE CONTRACTOR SHALL VERIFY THE LOCATION OF ALL SITE UTILITIES PRIOR TO BEGINNING EXCAVATION. ANY DAMAGE TO UTILITIES THAT ARE TO REMAIN CAUSED BY ANY PERSON, VEHICLE, EQUIPMENT, OR TOOL RELATED TO THE EXECUTION OF THE CONTRACT SHALL BE REPAIRED IMMEDIATELY AT NO EXPENSE TO THE OWNER.
4. BASE INFORMATION INCLUDING THE LOCATION OF PROPERTY LINES, EASEMENTS, BUILDINGS, ROADS AND CURBS HAVE BEEN TAKEN FROM THE CIVIL ENGINEER'S DRAWINGS. FOR ADDITIONAL INFORMATION REFER TO CIVIL ENGINEERING DRAWINGS.
5. THE CONTRACTOR SHALL NOTIFY LOCAL AUTHORITIES AND THE GENERAL CONTRACTOR FOR LOCATION OF EXISTING UNDERGROUND UTILITIES. POT HOLE AS NECESSARY TO CONFIRM LOCATIONS PRIOR TO EXCAVATION.

TREE PROTECTION NOTES:

1. ALL GUIDELINES STATED BELOW SHALL BE STRICTLY ADHERED TO AND MONITORED BY THE GENERAL CONTRACTOR AND ALL SUB-CONTRACTORS CONTRACTED BY THE GENERAL CONTRACTOR, OWNER AND/OR OTHER CONSULTANTS.
2. TREE DRIP LINE IS DEFINED AS THE OUTER LIMIT OF THE TREE CANOPY EDGE AT ALL POINTS (360° AROUND TREE PERIMETER) SET AT FURTHEST OUTREACH OF SUCH NOTED TREE CANOPY.
3. PRIOR TO TREE CLEARING, BRUSH REMOVAL, MASS GRADING OR ANY OTHER TYPE OF CONSTRUCTION OPERATION, THE GENERAL CONTRACTOR SHALL CLEARLY TAG OR MARK ALL TREES TO BE REMOVED AND OBTAIN THE TxDOT LANDSCAPE ARCHITECT'S FINAL APPROVAL PRIOR TO SUCH TREE REMOVAL AND TREE PROTECTION FENCING OPERATION COMMENCES.
4. **THE GENERAL CONTRACTOR SHALL PROVIDE AND SET TREE PROTECTION FENCING AROUND EACH TREE OR GROUP OF TREES TO BE RETAINED AS NOTED IN THE TREE PROTECTION DOCUMENTS TO PREVENT THE REMOVAL OF PROTECTED TREES, STORAGE OF CONSTRUCTION MATERIALS, PLACEMENT OF DEBRIS OR FILL, CONSTRUCTION OPERATIONS AND/OR EQUIPMENT USAGE WITHIN THE DRIP LINE.**
5. DURING CONSTRUCTION OPERATIONS, THE GENERAL CONTRACTOR SHALL PROHIBIT CLEANING, PARKING, OR STORAGE OF EQUIPMENT OR MATERIALS UNDER THE CANOPY OF TREES AND PREVENT RUN-OFF FROM SUCH NOTED ITEMS. THE CONTRACTOR SHALL NOT ALLOW THE DISPOSAL OF ANY WASTE MATERIAL SUCH AS, BUT NOT LIMITED TO, PAINT, OIL, SOLVENTS, ASPHALT, CONCRETE, MORTAR, ETC., OR ALLOW RUN-OFF FROM ANY SUCH ITEMS IN TO THE CANOPY AREA.
6. NO ATTACHMENTS OR WIRES OF ANY KIND, OTHER THAN THOSE OF A PROTECTIVE NATURE, SHOULD BE ATTACHED TO ANY TREE.
7. NO FILL OR STORAGE OF FILL MATERIALS OR ANY EXCAVATION OPERATIONS SHALL OCCUR WITHIN THE DRIP LINE OF A TREE TO BE PRESERVED UNLESS THERE IS A SPECIFIC APPROVED PLAN FOR USE OF TREE WELLS OR RETAINING WALLS. MAJOR CHANGES OF GRADE (SIX INCHES OR GREATER) WILL REQUIRE ADDITIONAL MEASURES TO MAINTAIN PROPER OXYGEN AND WATER EXCHANGE WITH THE ROOTS. IN ADDITION, THE DEVELOPER SHOULD ADHERE TO THE FOLLOWING GUIDELINES TO PROTECT THE TREES TO BE PRESERVED.
8. REFER TO TREE PROTECTION PLAN SHEETS AND DETAILS FOR FENCING LAYOUT AND TYPE OF FENCE REFERENCE INCLUDING TYPE AND SPECIFICATION OF FENCING REQUIRED.
9. ANY ADDITIONAL TREES REQUIRED FOR REMOVAL FOR CONSTRUCTION PROCESSES, UTILITY INSTALLATIONS, ETC. THAT ARE NOT NOTED OR REFERENCED ON PLANS SHALL BE NOTED ON PLAN (8.5 X 11) WITH REASON FOR REMOVAL AND SUBMITTED TO TxDOT LANDSCAPE ARCHITECT FOR REVIEW AND PROCESSING WITH THE CITY OF HOUSTON. UPON APPROVAL OF SUBJECT TREE'S REMOVAL BY TxDOT LANDSCAPE ARCHITECT AND CITY OF HOUSTON SUCH TREE CAN BE REMOVED IN MANNER DEEMED APPROPRIATE. CONTRACTOR TO ALLOW MIN. FIVE (5) WORKING DAYS FOR SUCH NOTED APPROVAL.

EXISTING TREE MAINTENANCE NOTES:

1. EXISTING TREE MAINTENANCE SHALL OCCUR AS NOTED FOR ALL EXISTING TREES AS REQUIRED PER TREE PROTECTION PLAN SHEETS AND DETAILS. SUCH OPERATIONS MAY INCLUDE TRIMMING, PRUNING, FERTILIZING, WATERING, ROOT PRUNING AND/OR FOLIAGE WASHING AS REQUIRED BY SITE ARBORIST OR TxDOT LANDSCAPE ARCHITECT. EXISTING TREE MAINTENANCE IS SUBSIDIARY TO ITEM 1004-6001.
2. TREE MAINTENANCE OPERATIONS SHALL BE DEEMED HIGH PRIORITY AND SHALL OCCUR WHEN SUCH NOTED OPERATIONS ARE NOTED TO OCCUR AND SHALL OCCUR AS NOTED BY ARBORIST OR TxDOT LANDSCAPE ARCHITECT.

TREE REMOVAL NOTES:

1. ALL TREES TO BE REMOVED SHALL BE MARKED PER PLANS FOR REVIEW AND APPROVAL BY TxDOT LANDSCAPE ARCHITECT PRIOR TO WORK.
2. ALL TREES 6" CALIPER AND UNDER IN AREAS NOT MARKED FOR REMOVAL SHALL REMAIN UNLESS OTHERWISE NOTED. ALL TREES 6" CALIPER AND LESS IN NOTED CLEARING AREAS SHALL BE REMOVED UNDER DIRECTION OF TxDOT LANDSCAPE ARCHITECT.
3. ONCE PROPOSED TREES FOR REMOVAL HAVE BEEN MARKED AND APPROVED BY TxDOT LANDSCAPE ARCHITECT AND CITY OF HOUSTON FORESTER, REMOVAL WORK MUST BE PERFORMED IN A SWIFT AND CLEAN MANNER. DEBRIS MUST BE REMOVED FROM SITE SAME DAY AS TREE REMOVAL.

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FIRM REGISTRATION NO. 2614

Texas Department of Transportation

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L0.01

GENERAL LANDSCAPE NOTES

SHEET 01 OF 109

DGN	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN	6	TEXAS	STP 1802 (783) MM			CS
DWN	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWN	HOU	HARRIS	0912	72	391	387

LANDSCAPE DEMOLITION NOTES:

1. CONTRACTOR SHALL DEMOLISH ALL ITEMS NECESSARY TO INSTALL NEW WORK PER PLANS. DEMOLITION WORK SHALL INCLUDE BUT NOT BE LIMITED TO ITEMS INDICATED BY REFERENCED NOTES AND SYMBOLS ON THE DEMOLITION PLANS.
2. CONTRACTOR SHALL VERIFY IN FIELD ALL DIMENSIONS AND ITEMS TO BE REMOVED. PROMPTLY NOTIFY THE TxDOT LANDSCAPE ARCHITECT IN WRITING OF ANY DISCREPANCIES.
3. INSTALL TEMPORARY BARRIERS TO SEPARATE CONSTRUCTION FROM OCCUPIED AREAS OR AREAS ACCESSIBLE TO PUBLIC OR OWNER EMPLOYEES. BARRIER SHALL BE DUST-TIGHT. COORDINATE DEMOLITION SCHEDULE WITH OWNER. MINIMIZE DISRUPTIONS FROM SOUND OR CONSTRUCTION EQUIPMENT AND PERSONNEL TO OCCUPIED AREAS.
4. FOR ALL EXISTING PLUMBING - IRRIGATION AND DRAINAGE ITEMS REMOVED, DEMOLISH LINES BACK TO GRADE OR WALLS TO REMAIN, ABOVE OR BELOW FLOOR. CAP ALL LINES.

SITE/LANDSCAPE SLEEVING NOTES:

1. ALL SITE/LANDSCAPE SLEEVE LOCATIONS AND SIZES SHALL BE NOTED WITHIN THESE DOCUMENTS FOR IRRIGATION, FOUNTAIN AND DRAINAGE SCOPE OF WORK ONLY. ADDITIONAL MISCELLANEOUS FUTURE USE SLEEVES ARE PROVIDED IN SOME LOCATIONS.
2. CONTRACTOR IS RESPONSIBLE TO VERIFY ALL OTHER CONSULTANTS AND SUB-CONTRACTOR SLEEVING REQUIREMENTS AND PLACE SUCH SLEEVES PRIOR TO HARDSCAPE INSTALLATION.

LAYOUT/DIMENSIONAL CONTROL NOTES:

1. CONTRACTOR IS RESPONSIBLE FOR LOCATING AND PROTECTING ALL EXISTING UTILITIES.
2. THE CONTRACTOR SHALL LAYOUT AND VERIFY ALL DIMENSIONS PRIOR TO CONSTRUCTION. ANY DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE TxDOT LANDSCAPE ARCHITECT FOR DIRECTION AND RESOLUTION OF DISCREPANCIES PRIOR TO PROCEEDING.
3. FOR DIMENSIONS OF BUILDING, PARKING STRUCTURE AND OTHER RELATED NON-LANDSCAPE WORK, REFER TO THE ARCHITECTURAL OR CIVIL DRAWINGS.
4. VERIFY LOCATIONS OF ALL SITE IMPROVEMENTS INSTALLED UNDER OTHER SECTIONS. IF ANY PART OF THIS PLAN CANNOT BE FOLLOWED DUE TO SITE CONDITIONS, CONTACT THE TxDOT LANDSCAPE ARCHITECT FOR INSTRUCTION PRIOR TO COMMENCING WORK.
5. ALL DIMENSIONS ARE TAKEN PERPENDICULAR TO WALL, CURB, P.O.B., OR CENTERLINE UNLESS OTHERWISE NOTED. DIMENSIONS AT CURB ARE FROM BACK OF CURB.
6. COORDINATE POINTS HAVE BEEN COORDINATED WITH CIVIL ENGINEER.
7. EDGES OF IRREGULAR PAVING ARE LOCATED BY COORDINATES AND ARE GENERAL LOCATIONS. CONTRACTOR SHALL STAKE POINTS IN FIELD. STAKED EDGES SHALL BE REVIEWED BY TxDOT LANDSCAPE ARCHITECT FOR FINAL LAYOUT APPROVAL AND SETTING AND MAY REQUIRE ADJUSTMENTS IN FIELD FOR FINAL PLACEMENT. WRITTEN DIMENSIONS TAKE PRECEDENCE OVER SCALED DIMENSIONS.
8. CENTERLINES OF PAVEMENT / PAVERS ARE LOCATED BY COORDINATES AND ARE GENERAL LOCATIONS. CONTRACTOR SHALL STAKE POINTS AND ESTABLISH PAVEMENT EDGE WITH TEMPORARILY STAKED STEEL EDGING AT NOTED OFFSET. TEMPORARY STEEL EDGE STAKING SHALL BE REVIEWED BY TxDOT LANDSCAPE ARCHITECT FOR FINAL LAYOUT APPROVAL AND SETTING AND MAY REQUIRE ADJUSTMENTS IN FIELD FOR FINAL PLACEMENT. WRITTEN DIMENSIONS TAKE PRECEDENCE OVER SCALED DIMENSIONS.
9. THIS DRAWING INCLUDES THE LOCATION OF VARIOUS DRAIN DEVICES AND SYSTEMS. COORDINATE CONSTRUCTION, DETAILS AND UTILITY CONNECTIONS WITH RELATED ARCHITECTURAL AND ENGINEERING DRAWINGS. CONFIRM LOCATIONS WITH THE TxDOT ENGINEER AND LANDSCAPE ARCHITECT PRIOR TO ROUGH IN.
10. FOR HANDICAPPED STANDARDS, VERIFY COMPLIANCE WITH LATEST EDITION OF ADA AND LOCAL AND STATE HANDICAP STANDARDS PRIOR TO CONSTRUCTION. WHERE FIELD MODIFICATIONS ARE REQUIRED FOR COMPLIANCE, CONSTRUCTION CHANGES MAY BE APPLIED INCLUDING DIFFERENT GRADES AND LAYOUT THAN THOSE NOTED HEREIN.
11. SURFACES SHALL BE ADA COMPLIANT ALONG ACCESS AND EGRESS. FLAGSTONE SHALL HAVE NO ADJACENT SURFACE IRREGULARITIES GREATER THAN 1/4" IN ANY PIECE OR BETWEEN ADJACENT PIECES
12. WHERE DIMENSIONS ARE CALLED AS "EQUAL", ALL REFERENCED ITEMS SHALL BE SPACED EQUALLY, MEASURED TO THEIR CENTER LINES OR OTHER NOTED REFERENCES.
13. INSTALL ALL INTERSECTING ELEMENTS AT 90 DEGREES TO EACH OTHER UNLESS OTHERWISE NOTED.

EXPANSION JOINT NOTES:

1. PROVIDE EXPANSION JOINTS IN ALL CASES WHERE CONCRETE FLATWORK MEETS VERTICAL STRUCTURES SUCH AS WALLS, CURBS, STEPS AND BUILDING OR WHERE CONCRETE ABUTS UTILITY VAULTS OR BOXES. REQUIRED EXPANSION JOINTS AT ALL VAULTS AND VERTICAL STRUCTURES MAY NOT BE SHOWN ON THESE DRAWINGS BUT ARE A CONSTRUCTION REQUIREMENT.

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Texas Department of Transportation

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L0.02

GENERAL LANDSCAPE NOTES

SHEET 02 OF 109

DGN	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DWG	6	TEXAS	STP 1802 (783) MM			CS
DWG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG	HOU	HARRIS	0912	72	391	388

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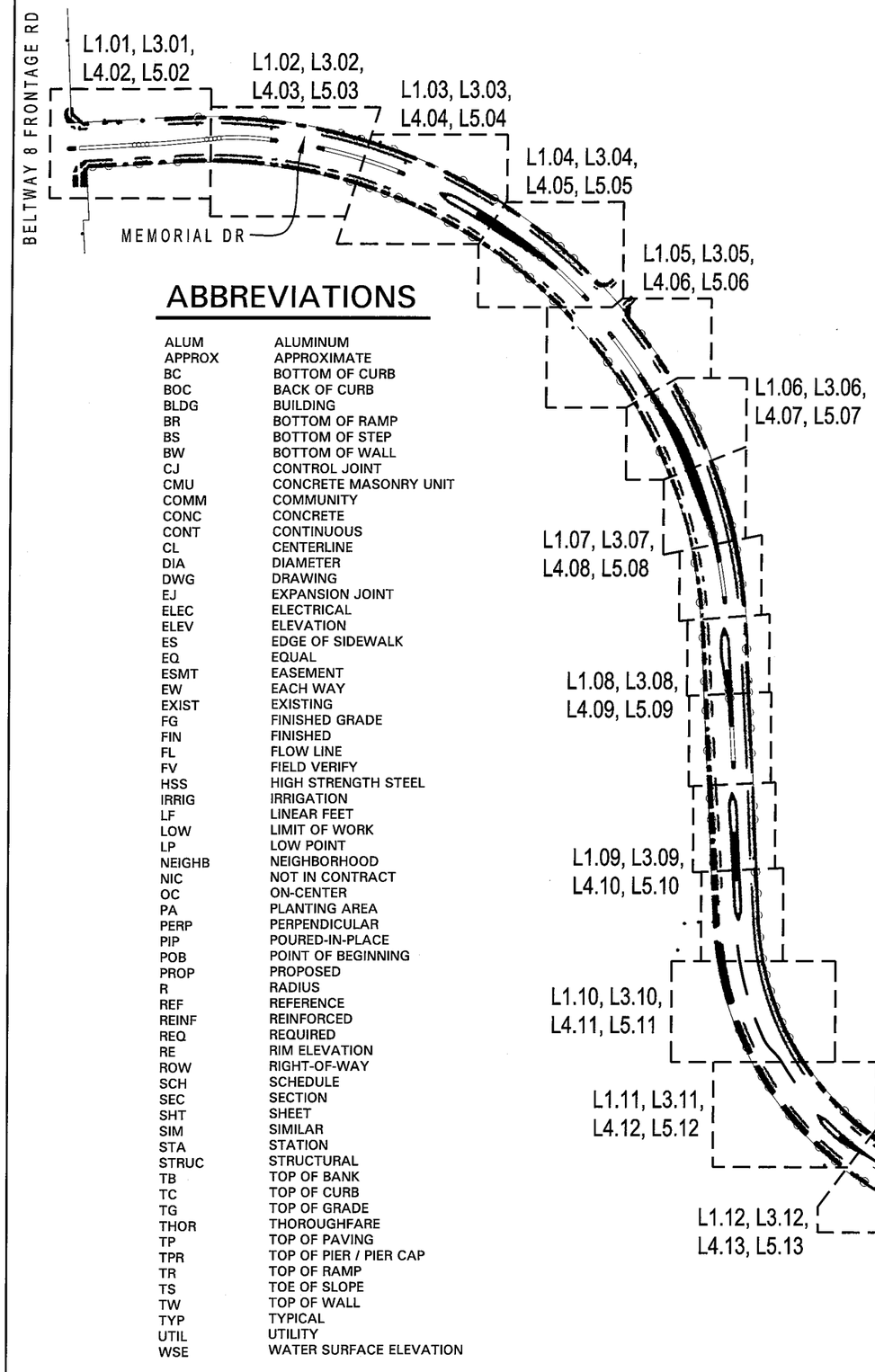

ABBREVIATIONS

ALUM	ALUMINUM
APPROX	APPROXIMATE
BC	BOTTOM OF CURB
BOC	BACK OF CURB
BLDG	BUILDING
BR	BOTTOM OF RAMP
BS	BOTTOM OF STEP
BW	BOTTOM OF WALL
CJ	CONTROL JOINT
CMU	CONCRETE MASONRY UNIT
COMM	COMMUNITY
CONC	CONCRETE
CONT	CONTINUOUS
CL	CENTERLINE
DIA	DIAMETER
DWG	DRAWING
EJ	EXPANSION JOINT
ELEC	ELECTRICAL
ELEV	ELEVATION
ES	EDGE OF SIDEWALK
EQ	EQUAL
ESMT	EASEMENT
EW	EACH WAY
EXIST	EXISTING
FG	FINISHED GRADE
FIN	FINISHED
FL	FLOW LINE
FV	FIELD VERIFY
HSS	HIGH STRENGTH STEEL
IRRIG	IRRIGATION
LF	LINEAR FEET
LOW	LIMIT OF WORK
LP	LOW POINT
NEIGHB	NEIGHBORHOOD
NIC	NOT IN CONTRACT
OC	ON-CENTER
PA	PLANTING AREA
PERP	PERPENDICULAR
PIP	POURED-IN-PLACE
POB	POINT OF BEGINNING
PROP	PROPOSED
R	RADIUS
REF	REFERENCE
REINF	REINFORCED
REQ	REQUIRED
RE	RIM ELEVATION
ROW	RIGHT-OF-WAY
SCH	SCHEDULE
SEC	SECTION
SHT	SHEET
SIM	SIMILAR
STA	STATION
STRUC	STRUCTURAL
TB	TOP OF BANK
TC	TOP OF CURB
TG	TOP OF GRADE
THOR	THOROUGHFARE
TP	TOP OF PAVING
TPR	TOP OF PIER / PIER CAP
TR	TOP OF RAMP
TS	TOE OF SLOPE
TW	TOP OF WALL
TYP	TYPICAL
UTIL	UTILITY
WSE	WATER SURFACE ELEVATION

DRAWING NOT TO SCALE

SHEET INDEX

SHEET NO.	SHEET TITLE
L0.01	GENERAL LANDSCAPE NOTES
L0.02	GENERAL LANDSCAPE NOTES
L0.03	LANDSCAPE SHEET INDEX
L1.00	LAYOUT & MATERIAL SCHEDULES
L1.01	LAYOUT & MATERIAL PLAN
L1.02	LAYOUT & MATERIAL PLAN
L1.03	LAYOUT & MATERIAL PLAN
L1.04	LAYOUT & MATERIAL PLAN
L1.05	LAYOUT & MATERIAL PLAN
L1.06	LAYOUT & MATERIAL PLAN
L1.07	LAYOUT & MATERIAL PLAN
L1.08	LAYOUT & MATERIAL PLAN
L1.09	LAYOUT & MATERIAL PLAN
L1.10	LAYOUT & MATERIAL PLAN
L1.11	LAYOUT & MATERIAL PLAN
L1.12	LAYOUT & MATERIAL PLAN
L1.13	LAYOUT & MATERIAL PLAN
L1.14	LAYOUT & MATERIAL PLAN
L1.15	LAYOUT & MATERIAL PLAN
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L2.01	CONCRETE PAVER DETAILS
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L2.03	PEDESTRIAN LIGHT BASE LOCATION DETAILS
L3.00	IRRIGATION NOTES
L3.00A	IRRIGATION NOTES
L3.01	IRRIGATION PLAN
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L3.15	IRRIGATION PLAN
L3.16	IRRIGATION PLAN
L3.17	IRRIGATION MATERIALS LEGEND
L3.18	IRRIGATION MATERIALS LEGEND
L3.19	IRRIGATION MATERIALS LEGEND
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L3.29	IRRIGATION DETAILS
L3.30	IRRIGATION DETAILS

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L3.32	IRRIGATION DETAILS
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L3.34	IRRIGATION DETAILS
L3.35	IRRIGATION DETAILS
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L4.00	PLANTING NOTES & SPECIFICATIONS
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L4.18	PLANTING DETAILS
L4.19	LANDSCAPE PLANTING MAINTENANCE REQUIREMENTS
L5.00	TREE MITIGATION CALCULATIONS
L5.00A	TREE MITIGATION VARIANCE REQUEST FORM
L5.00B	TREE MITIGATION VARIANCE FORM
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L5.02	TREE MITIGATION PLAN
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L5.05	TREE MITIGATION PLAN
L5.06	TREE MITIGATION PLAN
L5.07	TREE MITIGATION PLAN
L5.08	TREE MITIGATION PLAN
L5.09	TREE MITIGATION PLAN
L5.10	TREE MITIGATION PLAN
L5.11	TREE MITIGATION PLAN
L5.12	TREE MITIGATION PLAN
L5.13	TREE MITIGATION PLAN
L5.14	TREE MITIGATION PLAN
L5.15	TREE MITIGATION PLAN
L5.16	TREE MITIGATION PLAN
L5.17	TREE MITIGATION PLAN

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LANDSCAPE SHEET INDEX

SHEET 03 OF 109

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802 (783) MM			CS
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CHK DWG:	HOU	HARRIS	0912	72	391	389

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LIGHTING SCHEDULE

SYMBOL	KEY	PAY ITEM	REQUIREMENTS	SUPPLIER	MATERIAL	SIZE	COLOR	FINISH	REMARK	DETAIL
⊕	L1	1002-6002 LANDSCAPE AMENITY (TYP 1)	AVALON AV650 PEDESTRIAN LIGHT FIXTURE, POLE, & FOUNDATION	HESS AMERICA	ALUMINUM	12'-0"	MATTHEWS 'CHAMPAGNE GREY METALLIC' MP16771	CUSTOM PAINTED	REFERENCE ELECTRICAL QUANTITIES	SHEET E-18; SHEET L2.03

NOTE:
SUBMIT PRODUCT INFORMATION AND MATERIAL SPECIFICATIONS TO TxDOT ENGINEER AND TxDOT LANDSCAPE ARCHITECT FOR APPROVAL PRIOR TO DELIVERY AND WORK.

02 LIGHTING SCHEDULE

MATERIALS SCHEDULE

SYMBOL	KEY	PAY ITEM	REQUIREMENTS	SUPPLIER	MATERIAL	SIZE	COLOR	FINISH	REMARK	DETAIL
	P1	528-6004 LANDSCAPE PAVERS	CONCRETE UNIT PAVER, 'PLAZA MUSTER-K' PAVER BY PAVESTONE, PRODUCT NO. 639, VEHICULAR RATED, SAND SET, RANDOM PATTERN WITH SOLDIER COURSE AT CONC. CURB AND CONC. BAND.	PAVESTONE, HANOVER OR APPROVED EQUAL	CONCRETE	80MM THICK, WIDTH & LENGTH PER MFG SPECS	'AUSTIN GOLD BLEND'	MANUFACTURER SPECIFICATION	REFERENCE HARDSCAPE QUANTITIES	DETAIL 01, SHEET L2.01
	P2	432-6006 RIPRAP (CONC)(CL B)	1' X 1' CONCRETE BAND BETWEEN PAVERS AND PLANTING AREA AT MEDIAN & 4.5" THICK CONCRETE SUB-BASE BELOW LANDSCAPE PAVERS	CONTRACTOR SUPPLIED	CONCRETE	1'-0" X 1'-0" CONC. BAND; 4.5" THICK CONC. SUB - BASE	NATURAL	LIGHT BROOM FINISH	REFERENCE HARDSCAPE QUANTITIES	DETAIL 01, SHEET L2.02

NOTE:
SUBMIT PRODUCT INFORMATION AND MATERIAL SPECIFICATIONS TO TxDOT ENGINEER AND TxDOT LANDSCAPE ARCHITECT FOR APPROVAL PRIOR TO DELIVERY AND WORK.

01 MATERIALS SCHEDULE

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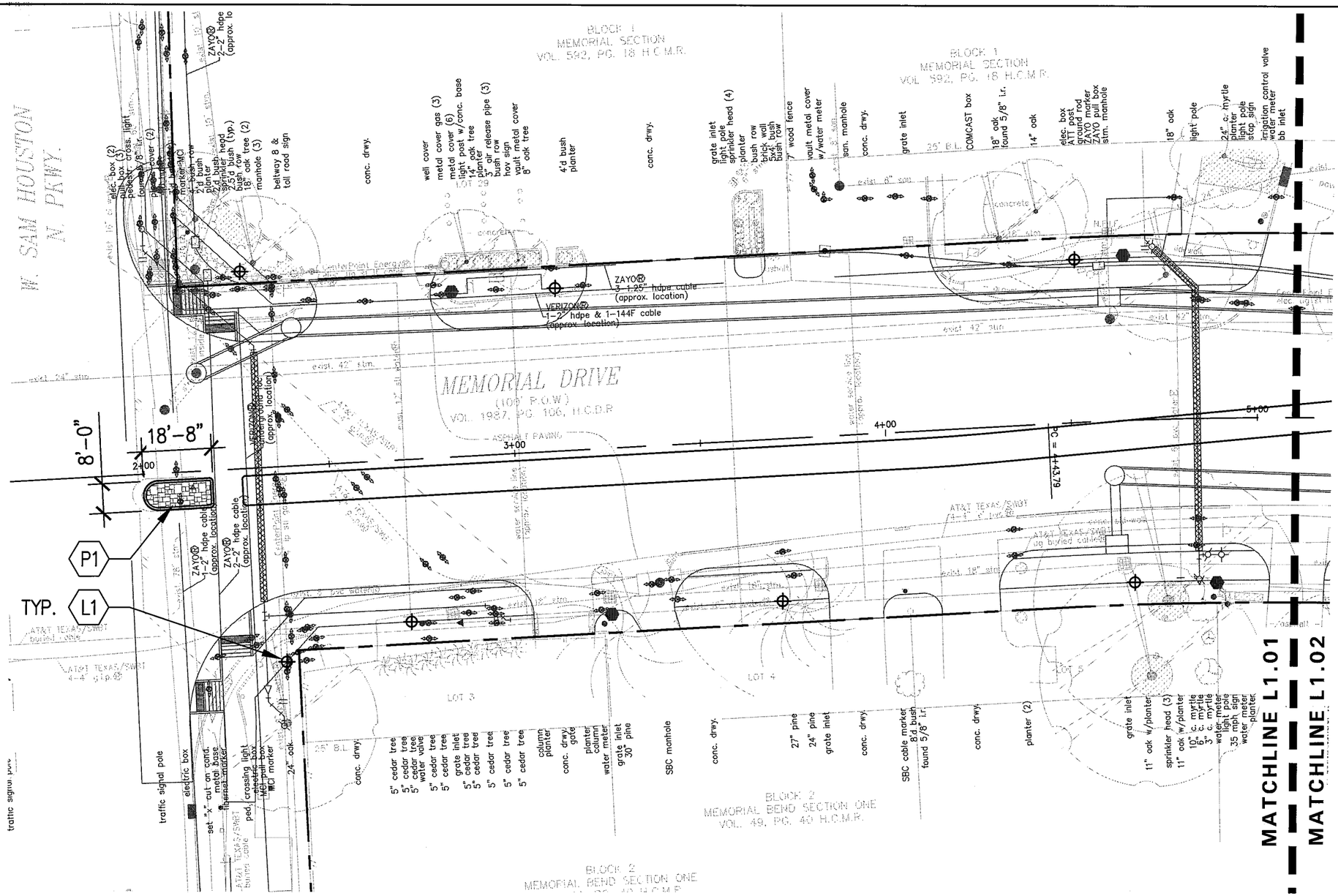
LAYOUT & MATERIAL SCHEDULES

SHEET 04 OF 109

DGN	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN	6	TEXAS	STP 1802 (783) MM			CS
DWG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG	HOU	HARRIS	0912	72	391	390



LAYOUT & MATERIALS LEGEND

- L1 — ITEM 1002-6002, LANDSCAPE AMENITY (TYP 1). REF. 02 / L1.00
- P1 — ITEM 528-6004, LANDSCAPE PAVERS. 'PLAZA MUSTER-K' CONC. PAVERS, BY PAVESTONE. REF. 01 / L1.00 FOR PAVERS, CONCRETE BASE AND EDGE, AND OTHER REQUIREMENTS.
- P2 — ITEM 432-6006, RIPRAP (CONC)(CL B). CONCRETE EDGE AT LANDSCAPE PAVER EDGE. REF. 01 / L1.00

NOTES:
1. PEDESTRIAN LIGHT LOCATIONS SHALL BE APPROVED BY CITY OF HOUSTON OWNER REPRESENTATIVE AND TXDOT LANDSCAPE ARCHITECT PRIOR TO BEGINNING CONSTRUCTION.
2. REFERENCE L2.03 FOR PLACEMENT DETAIL OF PEDESTRIAN LIGHT AT CONCRETE WALK.

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LAYOUT & MATERIAL PLAN

SHEET 05 OF 109

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK:	6	TEXAS	STP 1802 (783) MM			CS
DWN:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK: DWN:	HOU	HARRIS	0912	72	391	391

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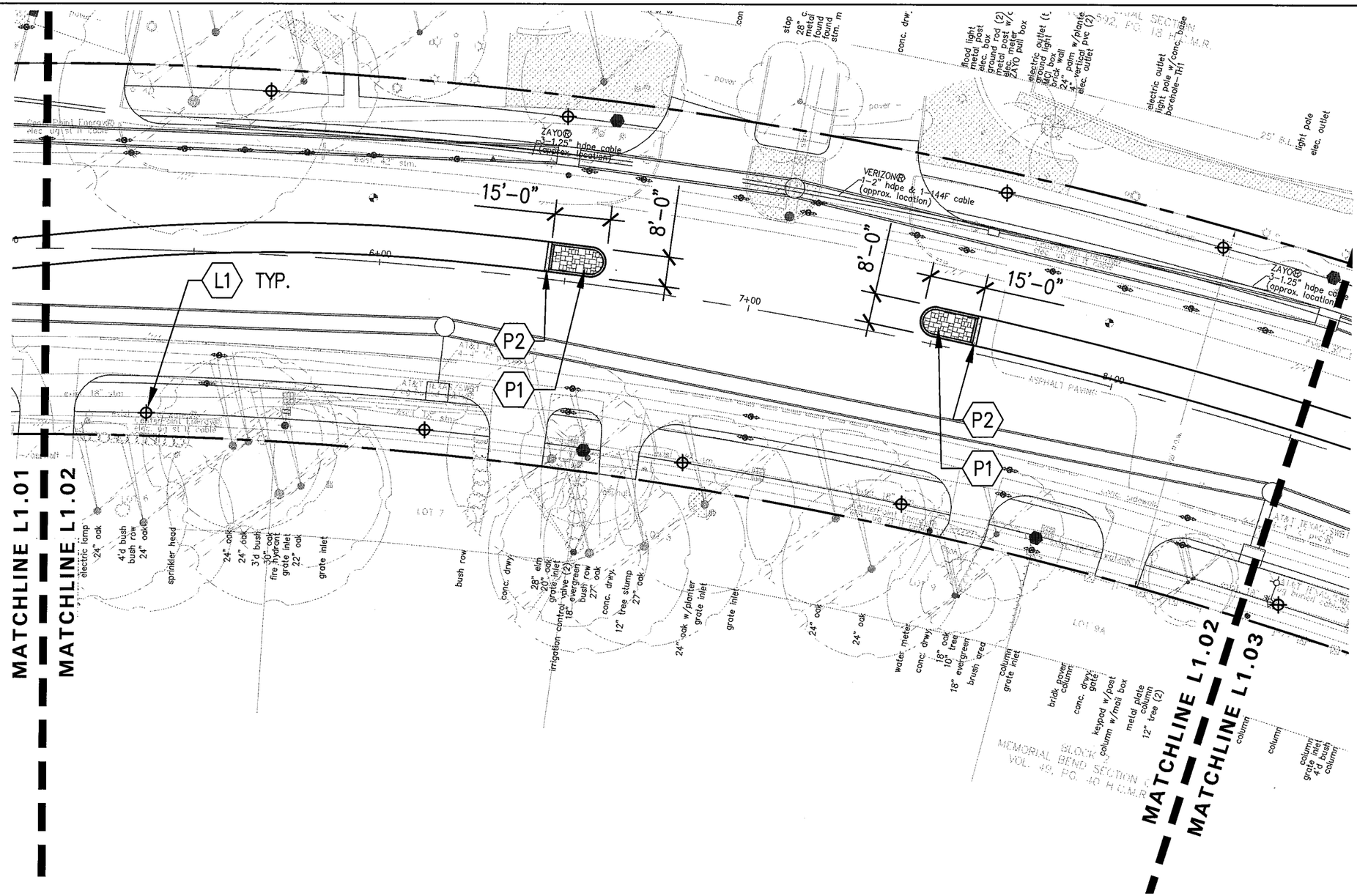

LAYOUT & MATERIALS LEGEND

- L1 — ITEM 1002-6002, LANDSCAPE AMENITY (TYP 1). REF. 02 / L1.00
- P1 — ITEM 528-6004, LANDSCAPE PAVERS. 'PLAZA MUSTER-K' CONC. PAVERS, BY PAVESTONE. REF. 01 / L1.00 FOR PAVERS, CONCRETE BASE AND EDGE, AND OTHER REQUIREMENTS.
- P2 — ITEM 432-6006, RIPRAP (CONC)(CL B). CONCRETE EDGE AT LANDSCAPE PAVER EDGE. REF. 01 / L1.00

NOTES:
1. PEDESTRIAN LIGHT LOCATIONS SHALL BE APPROVED BY CITY OF HOUSTON OWNER REPRESENTATIVE AND TXDOT LANDSCAPE ARCHITECT PRIOR TO BEGINNING CONSTRUCTION.
2. REFERENCE L2.03 FOR PLACEMENT DETAIL OF PEDESTRIAN LIGHT AT CONCRETE WALK.

Landscape Architect

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(IN FEET)
SCALE: PLAN 1":30'

JAMES W. VICK
LICENSED ARCHITECT 17041
TEXAS BOARD OF ARCHITECTURAL EXAMINERS
FEB 27 2020

100% CONSTRUCTION DOCUMENTS

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation

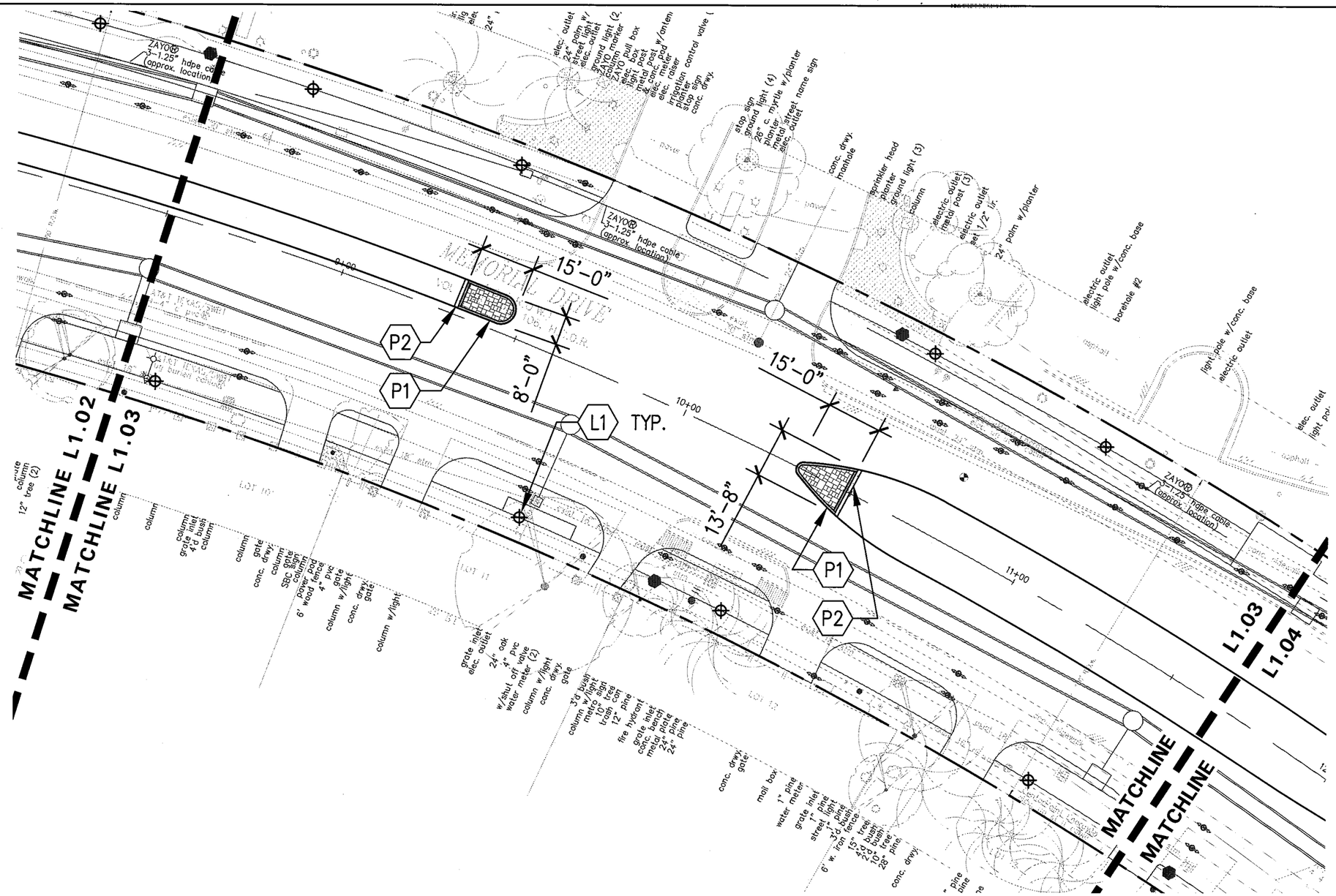
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L1.02

LAYOUT & MATERIAL PLAN

SHEET 06 OF 109

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802 (783) MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	392



LAYOUT & MATERIALS LEGEND

- L1 — ITEM 1002-6002, LANDSCAPE AMENITY (TYP 1). REF. 02 / L1.00
- P1 — ITEM 528-6004, LANDSCAPE PAVERS. 'PLAZA MUSTER-K' CONC. PAVERS, BY PAVESTONE. REF. 01 / L1.00 FOR PAVERS, CONCRETE BASE AND EDGE, AND OTHER REQUIREMENTS.
- P2 — ITEM 432-6006, RIPRAP (CONC)(CL B). CONCRETE EDGE AT LANDSCAPE PAVER EDGE. REF. 01 / L1.00

NOTES:
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2. REFERENCE L2.03 FOR PLACEMENT DETAIL OF PEDESTRIAN LIGHT AT CONCRETE WALK.

Landscape Architect

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JAMES W. VICK
ARCHITECT # 10477
FEB 5 2020

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REV. NO.	DATE	DESCRIPTION	BY

Lockwood, Andrews & Newnam, Inc.
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L1.03

LAYOUT & MATERIAL PLAN

SHEET 07 OF 109

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK:	6	TEXAS	STP 1802 (783) MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK: DWG:	HOU	HARRIS	0912	72	391	393

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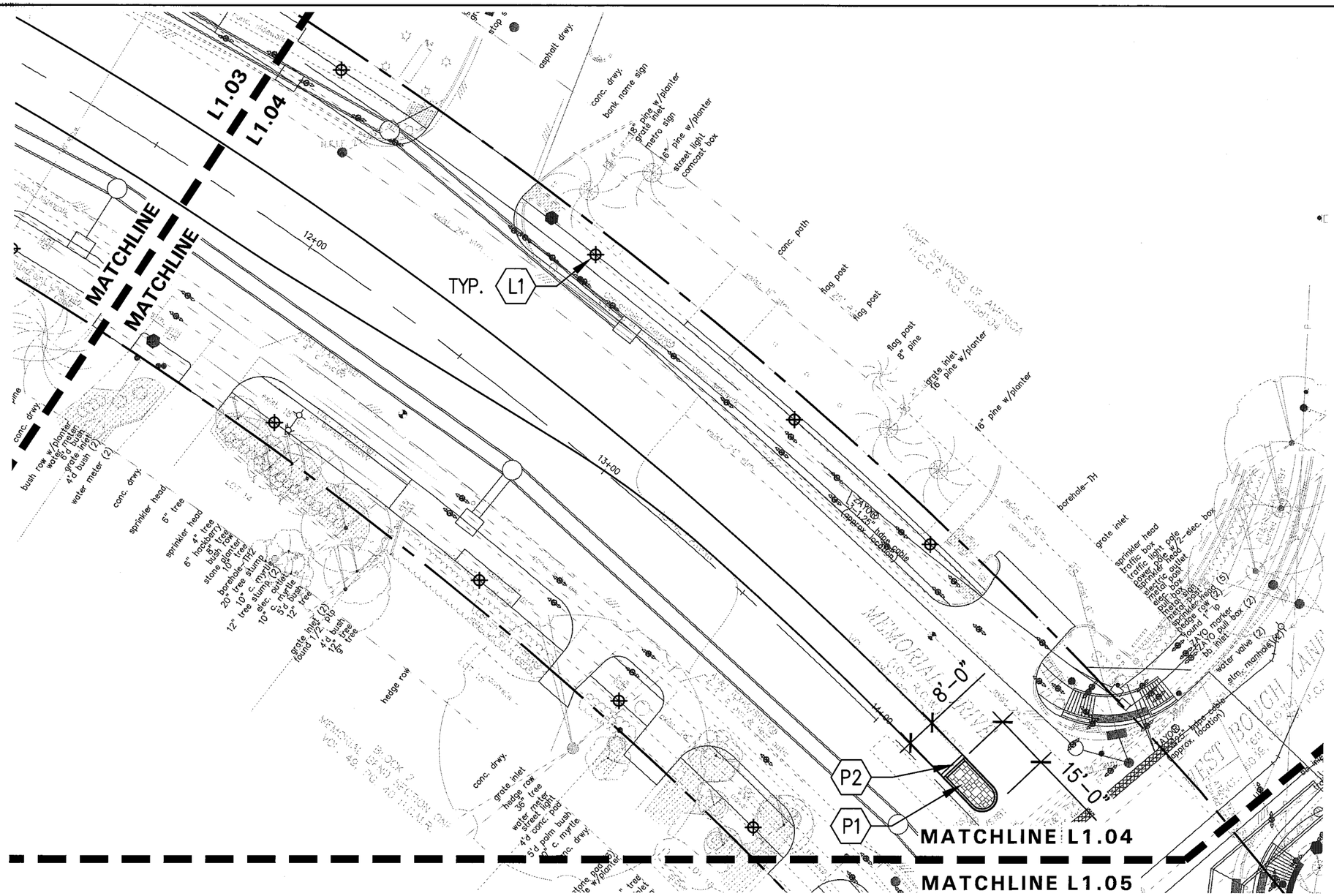

LAYOUT & MATERIALS LEGEND

- ⊕ L1 — ITEM 1002-6002, LANDSCAPE AMENITY (TYP 1). REF. 02 / L1.00
- P1 — ITEM 528-6004, LANDSCAPE PAVERS. 'PLAZA MUSTER-K' CONC. PAVERS, BY PAVESTONE. REF. 01 / L1.00 FOR PAVERS, CONCRETE BASE AND EDGE, AND OTHER REQUIREMENTS.
- P2 — ITEM 432-6006, RIPRAP (CONC)(CL B). CONCRETE EDGE AT LANDSCAPE PAVER EDGE. REF. 01 / L1.00

NOTES:
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JAMES W. VICK
ARCHITECT #10477
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Texas Department of Transportation

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L1.04

LAYOUT & MATERIAL PLAN

SHEET 08 OF 109

DGN	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN	6	TEXAS	STP 1802 (783) MM			CS
DWG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG	HOU	HARRIS	0912	72	391	394

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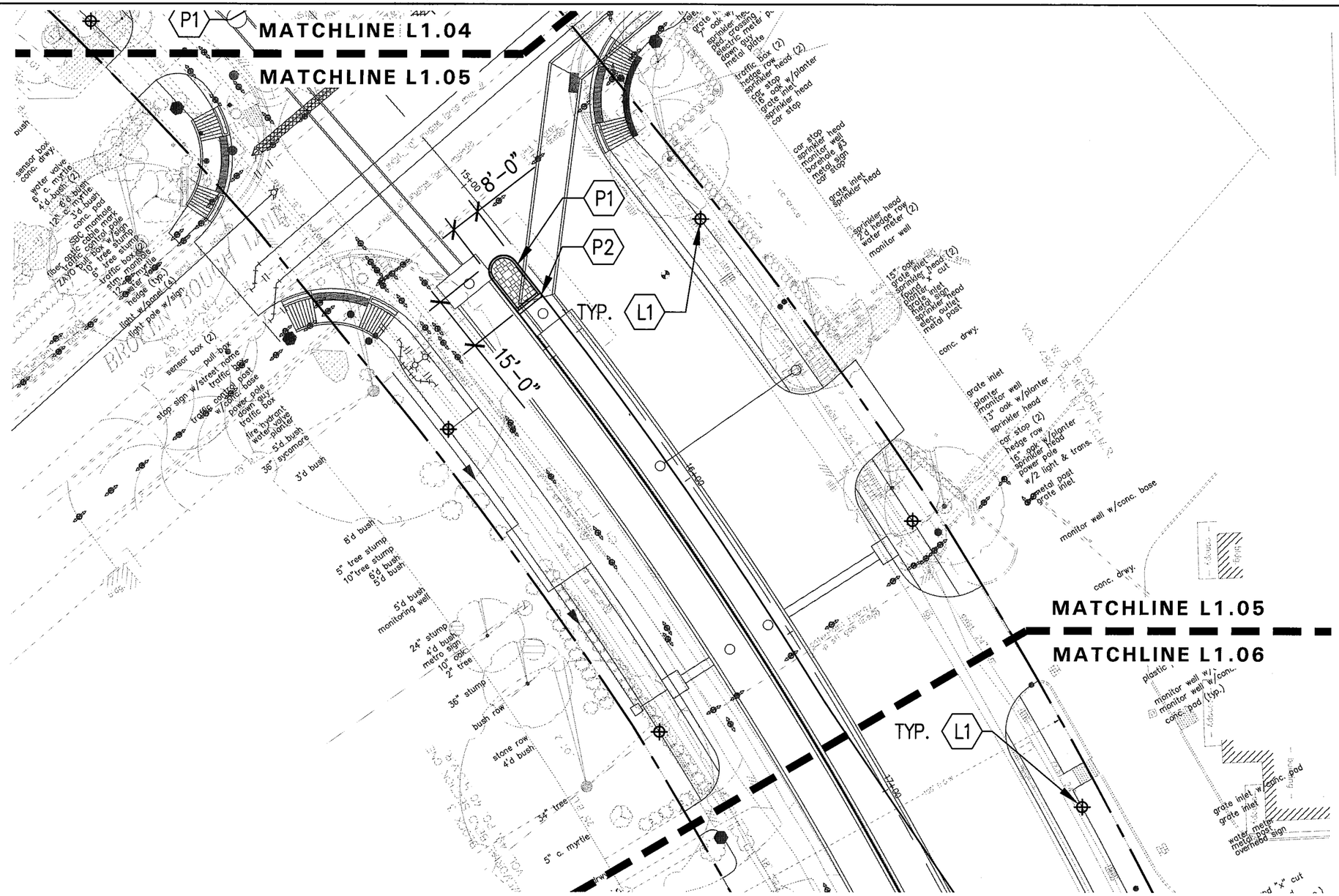

LAYOUT & MATERIALS LEGEND

- L1 — ITEM 1002-6002, LANDSCAPE AMENITY (TYP 1). REF. 02 / L1.00
- P1 — ITEM 528-6004, LANDSCAPE PAVERS, 'PLAZA MUSTER-K' CONC. PAVERS, BY PAVESTONE. REF. 01 / L1.00 FOR PAVERS, CONCRETE BASE AND EDGE, AND OTHER REQUIREMENTS.
- P2 — ITEM 432-6006, RIPRAP (CONC)(CL B). CONCRETE EDGE AT LANDSCAPE PAVER EDGE. REF. 01 / L1.00

NOTES:
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2. REFERENCE L2.03 FOR PLACEMENT DETAIL OF PEDESTRIAN LIGHT AT CONCRETE WALK.

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REV. NO.	DATE	DESCRIPTION	BY

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L1.05

LAYOUT & MATERIAL PLAN

SHEET 09 OF 109

DGN	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN	6	TEXAS	STP 1802 (783) MM			CS
DWG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG	HOU	HARRIS	0912	72	391	395

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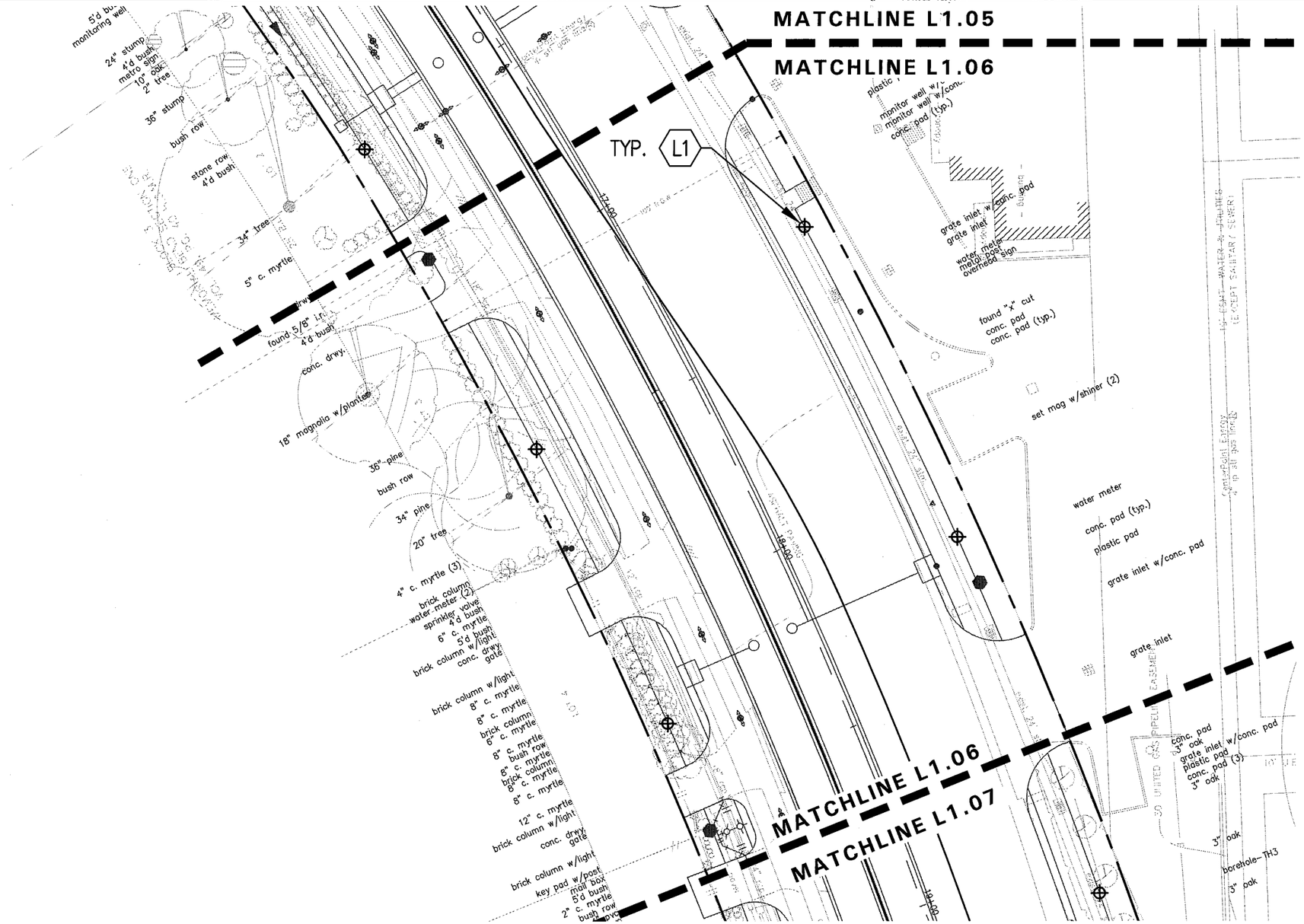

LAYOUT & MATERIALS LEGEND

- ⊕ L1 — ITEM 1002-6002, LANDSCAPE AMENITY (TYP 1). REF. 02 / L1.00
- P1 — ITEM 528-6004, LANDSCAPE PAVERS. 'PLAZA MUSTER-K' CONC. PAVERS, BY PAVESTONE. REF. 01 / L1.00 FOR PAVERS, CONCRETE BASE AND EDGE, AND OTHER REQUIREMENTS.
- P2 — ITEM 432-6006, RIPRAP (CONC)(CL B). CONCRETE EDGE AT LANDSCAPE PAVER EDGE. REF. 01 / L1.00

NOTES:
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2. REFERENCE L2.03 FOR PLACEMENT DETAIL OF PEDESTRIAN LIGHT AT CONCRETE WALK.

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ARCHITECT #10477
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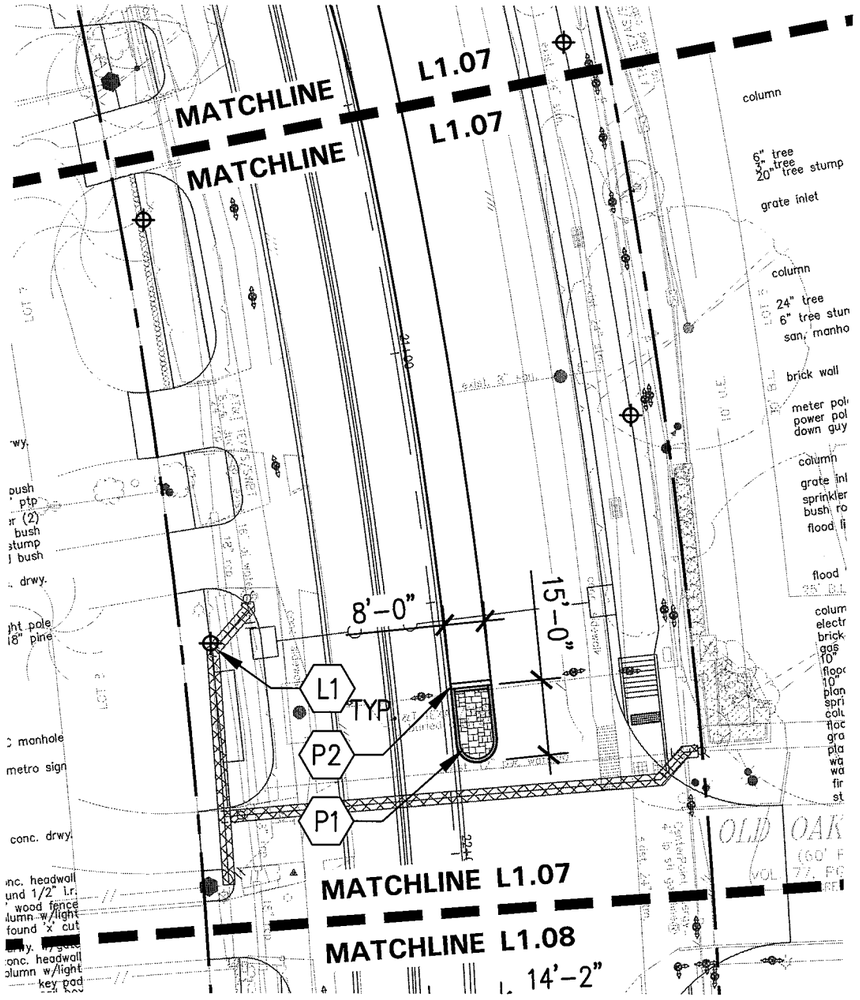
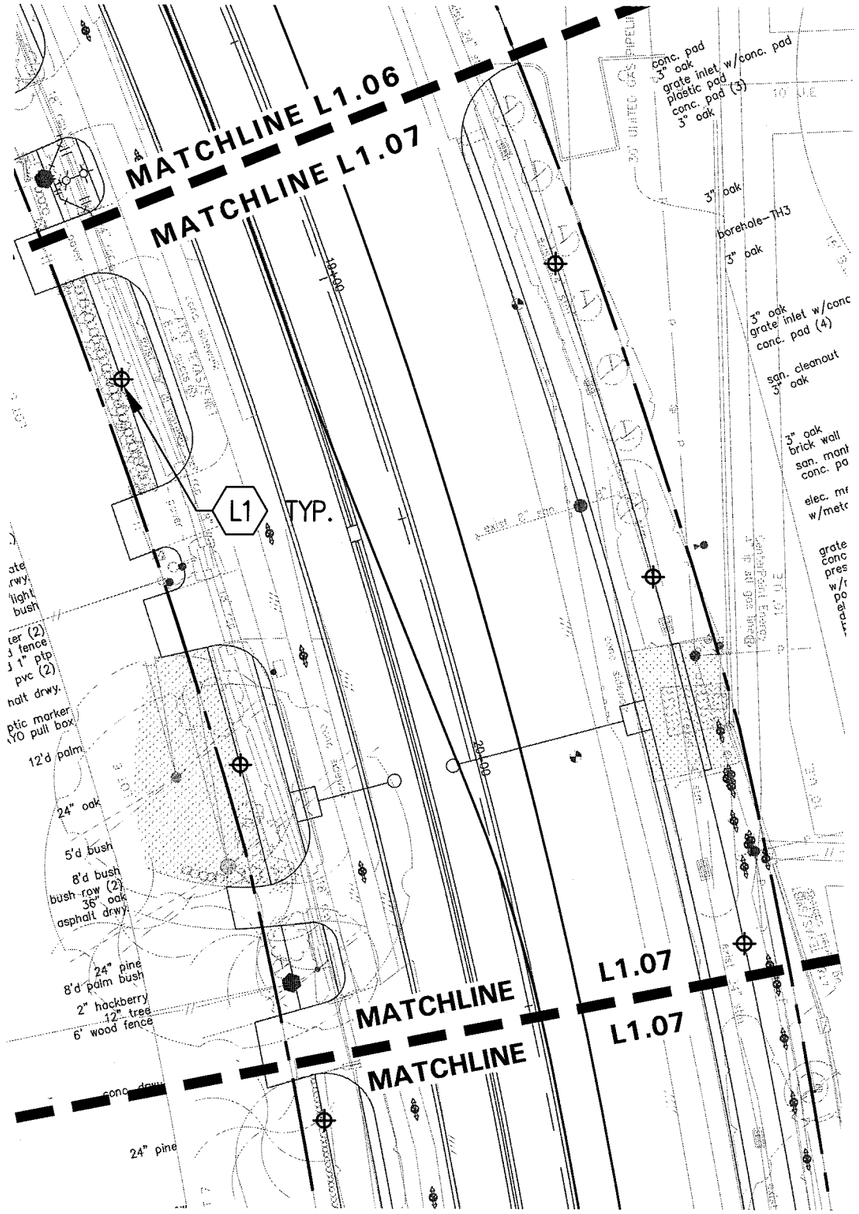
LAYOUT & MATERIAL PLAN

SHEET 10 OF 109

DSN	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DWG	6	TEXAS	STP 1802 (783) MM			CS
DWG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG	HOU	HARRIS	0912	72	391	396





LAYOUT & MATERIALS LEGEND

- L1 — ITEM 1002-6002, LANDSCAPE AMENITY (TYP 1). REF. 02 / L1.00
- P1 — ITEM 528-6004, LANDSCAPE PAVERS. 'PLAZA MUSTER-K' CONC. PAVERS, BY PAVESTONE. REF. 01 / L1.00 FOR PAVERS, CONCRETE BASE AND EDGE, AND OTHER REQUIREMENTS.
- P2 — ITEM 432-6006, RIPRAP (CONC)(CL B). CONCRETE EDGE AT LANDSCAPE PAVER EDGE. REF. 01 / L1.00

NOTES:
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Texas Department of Transportation

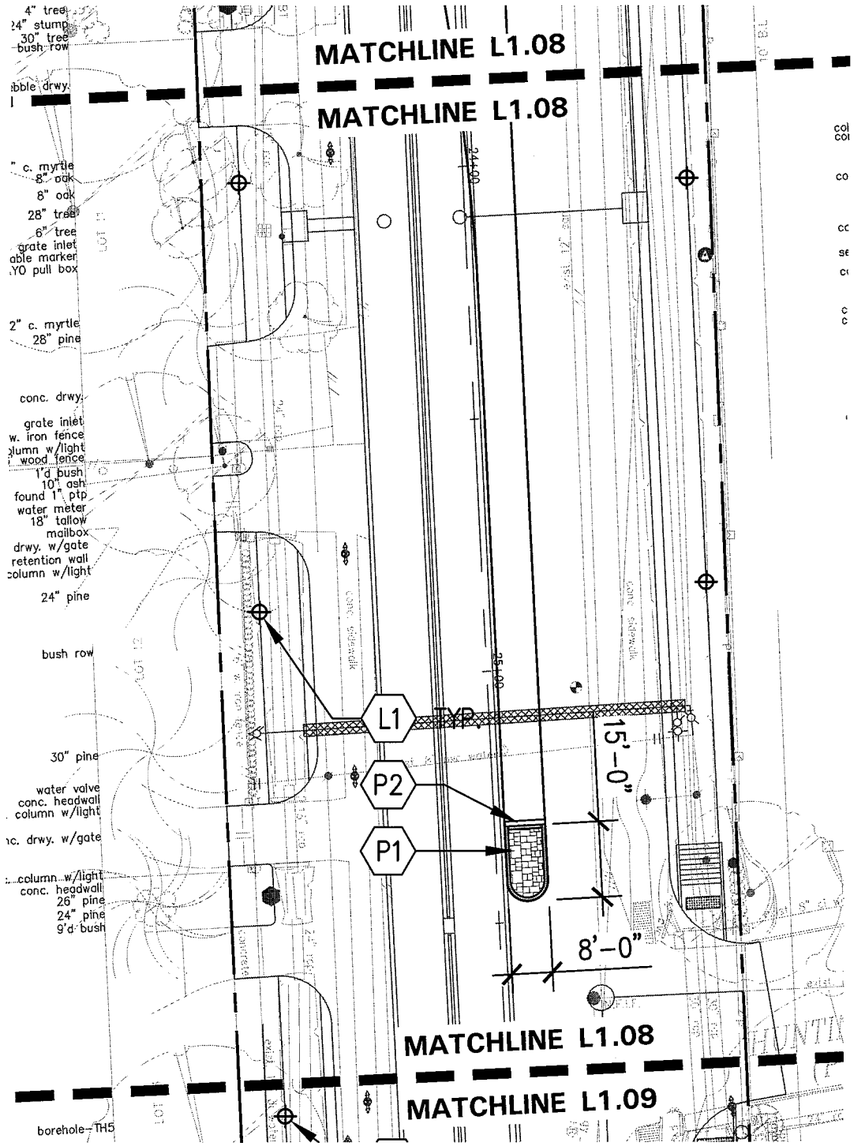
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

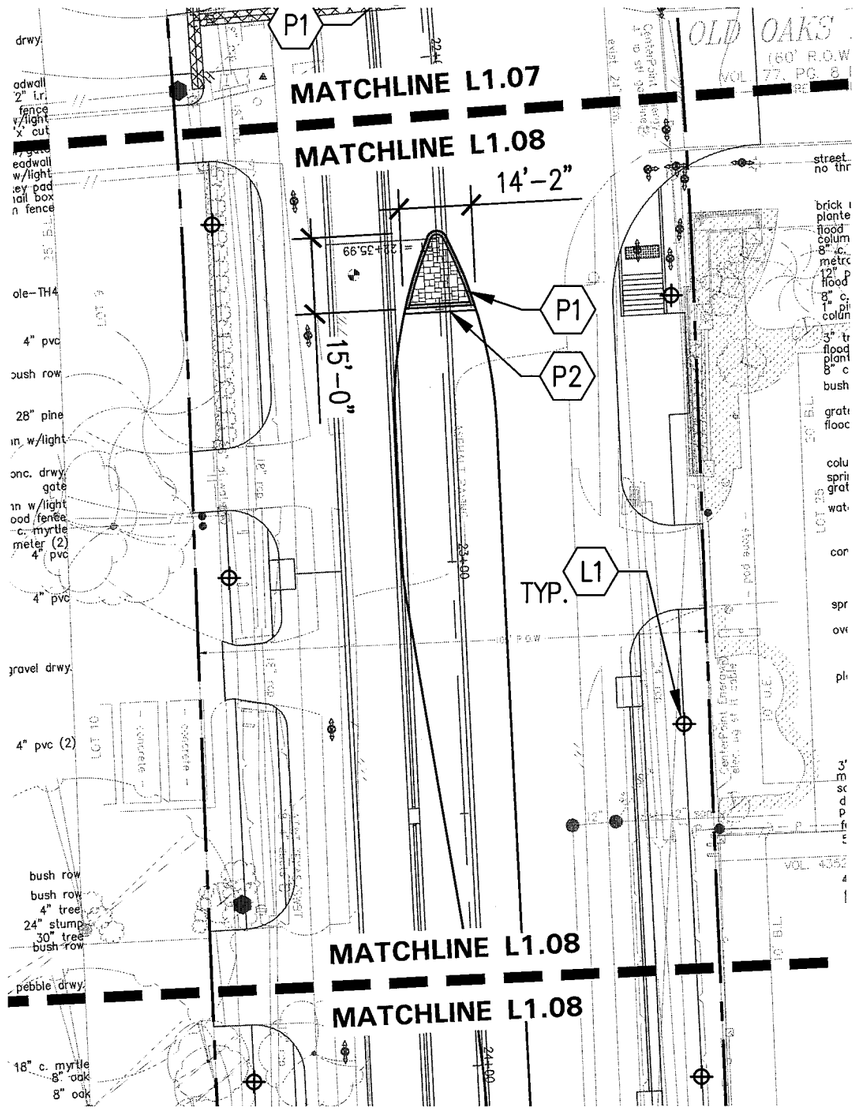
L1.07

LAYOUT & MATERIAL PLAN

SHEET 11 OF 109

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN:	6	TEXAS	STP 1802 (783) MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	397





LAYOUT & MATERIALS LEGEND

- L1 — ITEM 1002-6002, LANDSCAPE AMENITY (TYP 1). REF. 02 / L1.00
- P1 — ITEM 528-6004, LANDSCAPE PAVERS. 'PLAZA MUSTER-K' CONC. PAVERS, BY PAVESTONE. REF. 01 / L1.00 FOR PAVERS, CONCRETE BASE AND EDGE, AND OTHER REQUIREMENTS.
- P2 — ITEM 432-6006, RIPRAP (CONC)(CL B). CONCRETE EDGE AT LANDSCAPE PAVER EDGE. REF. 01 / L1.00

NOTES:
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ARCHITECT #17017
FEB 5 2020

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Texas Department of Transportation

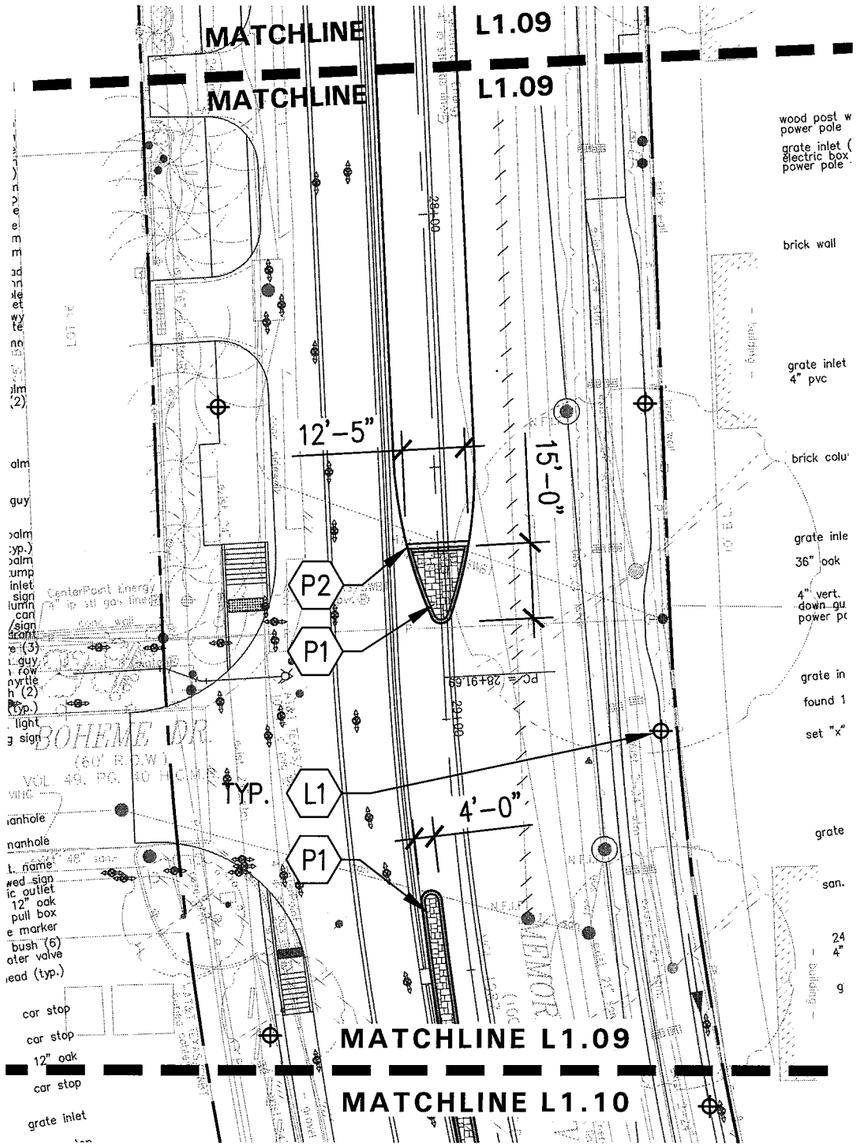
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

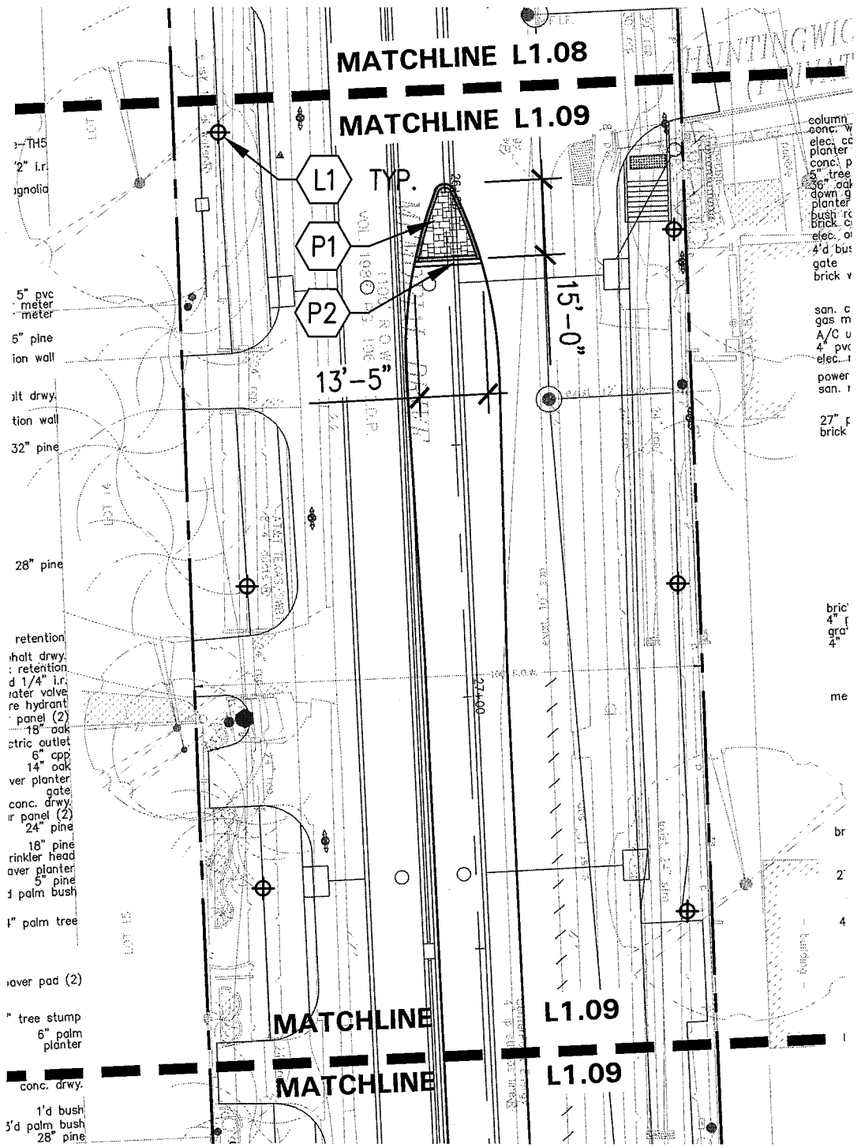
L1.08

LAYOUT & MATERIAL PLAN

SHEET 12 OF 109

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN:	6	TEXAS	STP 1802 (783) MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	398





LAYOUT & MATERIALS LEGEND

- ⊕ L1 — ITEM 1002-6002, LANDSCAPE AMENITY (TYP 1). REF. 02 / L1.00
- P1 — ITEM 528-6004, LANDSCAPE PAVERS. 'PLAZA MUSTER-K' CONC. PAVERS, BY PAVESTONE. REF. 01 / L1.00 FOR PAVERS, CONCRETE BASE AND EDGE, AND OTHER REQUIREMENTS.
- P2 — ITEM 432-6006, RIPRAP (CONC)(CL B). CONCRETE EDGE AT LANDSCAPE PAVER EDGE. REF. 01 / L1.00

NOTES:
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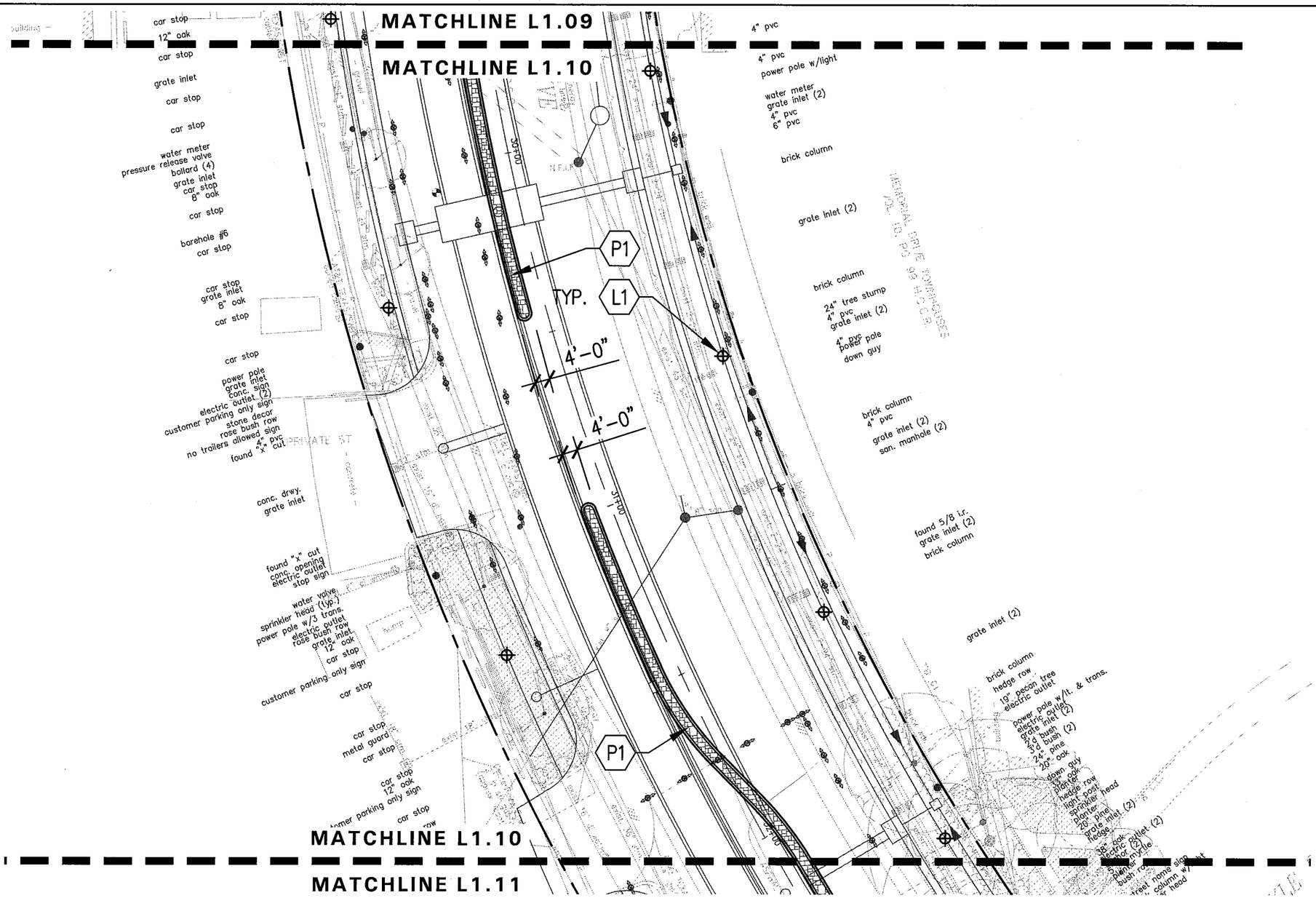
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L1.09

LAYOUT & MATERIAL PLAN

SHEET 13 OF 109

DGN	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
QUIC DGN	6	TEXAS	STP 1802 (783) MM			CS
DWG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
QUIC DWG	HOU	HARRIS	0912	72	391	399



LAYOUT & MATERIALS LEGEND

- L1 — ITEM 1002-6002, LANDSCAPE AMENITY (TYP 1). REF. 02 / L1.00
- P1 — ITEM 528-6004, LANDSCAPE PAVERS. 'PLAZA MUSTER-K' CONC. PAVERS, BY PAVESTONE. REF. 01 / L1.00 FOR PAVERS, CONCRETE BASE AND EDGE, AND OTHER REQUIREMENTS.
- P2 — ITEM 432-6006, RIPRAP (CONC)(CL B). CONCRETE EDGE AT LANDSCAPE PAVER EDGE. REF. 01 / L1.00

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JAMES W. VICK
ARCHITECT #10477
FEB 5 2020

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REV. NO.	DATE	DESCRIPTION	BY

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

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L1.10

LAYOUT & MATERIAL PLAN

SHEET 14 OF 109

DSN	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK	6	TEXAS	STP 1802 (783) MM			CS
DWG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK	HOU	HARRIS	0912	72	391	400
DWG						

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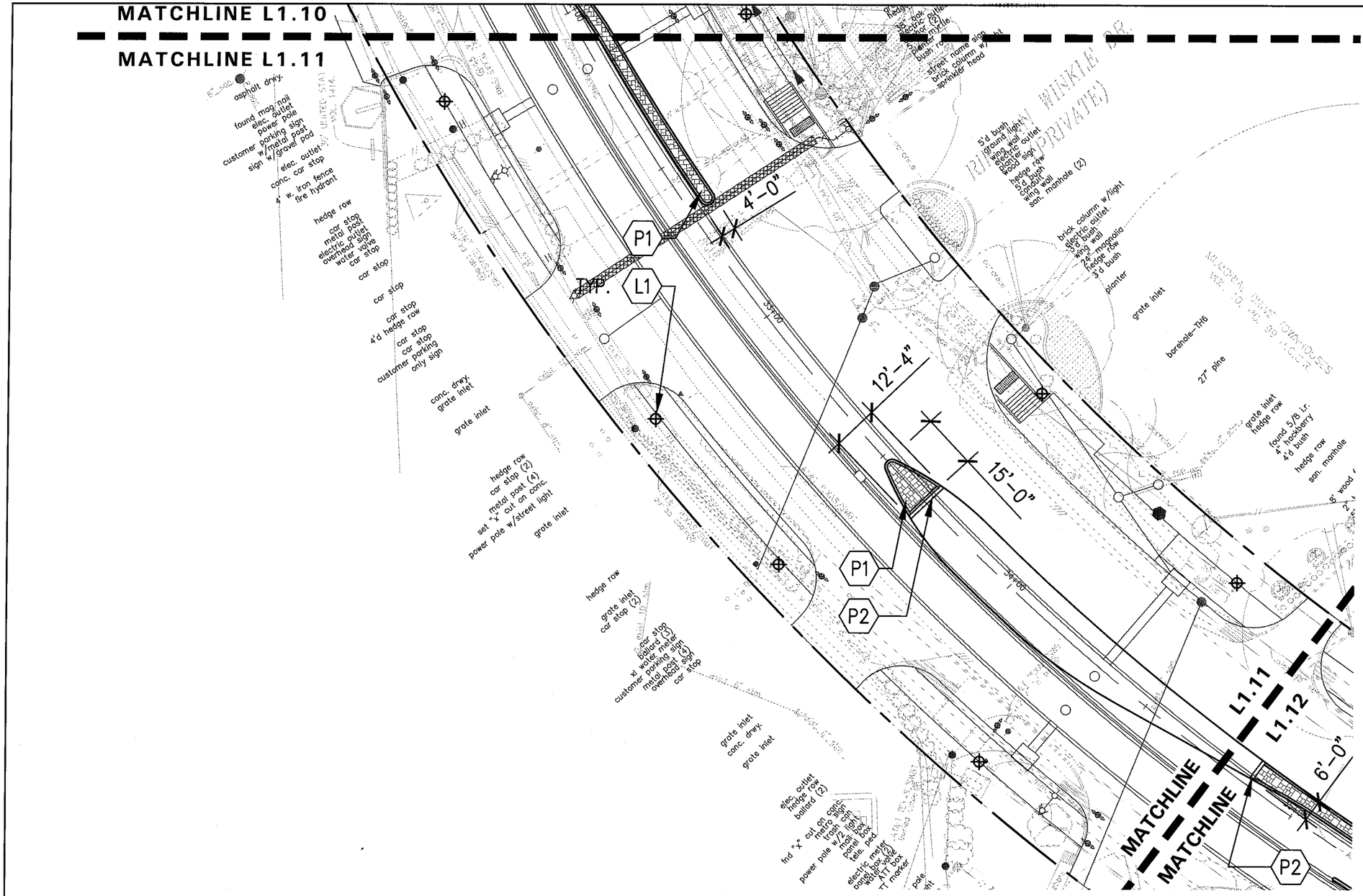

LAYOUT & MATERIALS LEGEND

- ⊕ L1 — ITEM 1002-6002, LANDSCAPE AMENITY (TYP 1). REF. 02 / L1.00
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- P2 — ITEM 432-6006, RIPRAP (CONC)(CL B). CONCRETE EDGE AT LANDSCAPE PAVER EDGE. REF. 01 / L1.00

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ARCHITECT # 10477
FEB 27 2020

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REV. NO.	DATE	DESCRIPTION	BY

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A LEO A DALY COMPANY
FIRM REGISTRATION NO. 2614

Texas Department of Transportation

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

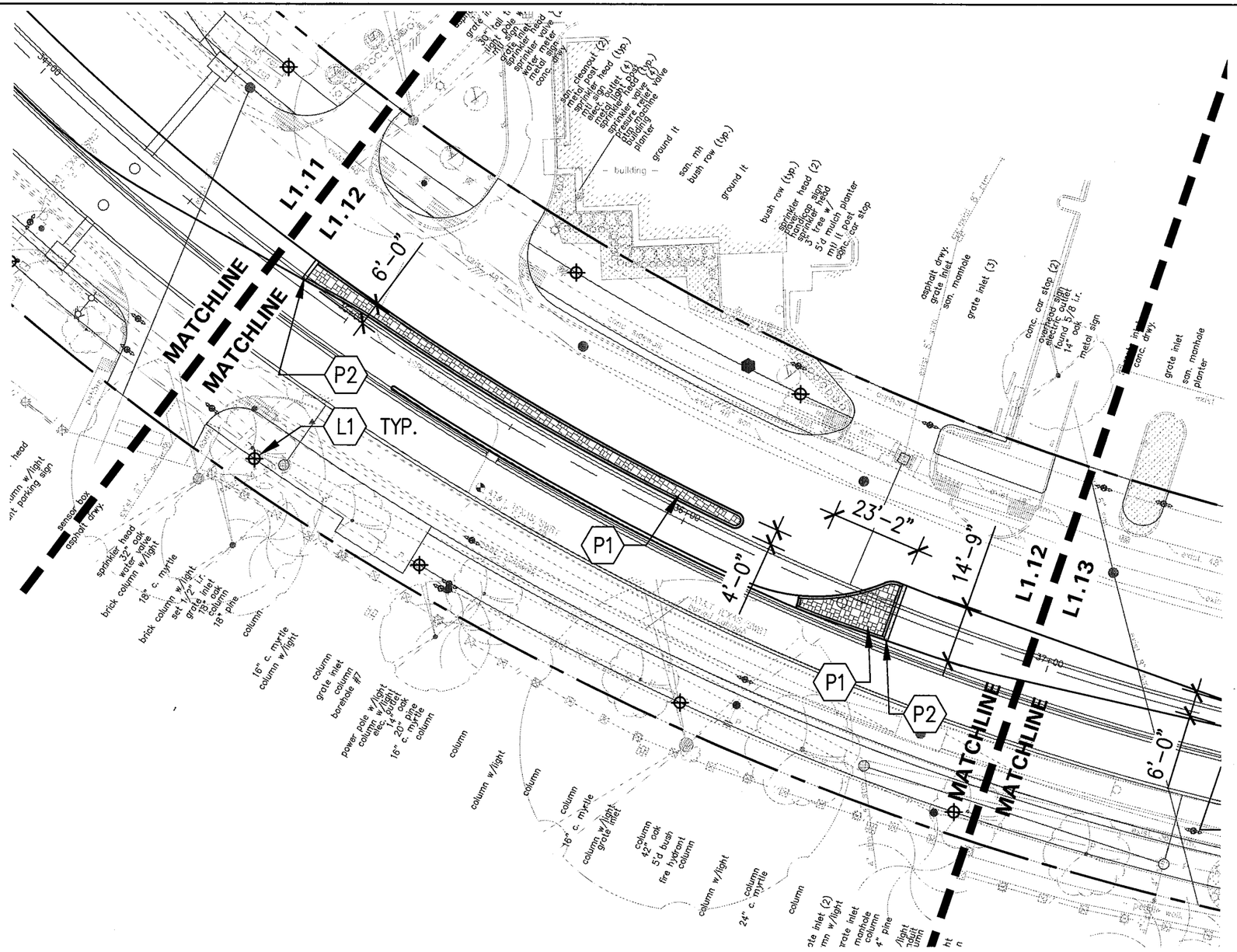
L1.11

LAYOUT & MATERIAL PLAN

SHEET 15 OF 109

DGN	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DWG	6	TEXAS	STP 1802 (783) MM			CS
DWG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG	HOU	HARRIS	0912	72	391	401

P:\RHTN\RHTS503 WO-13 CIP T11731B Memorial\4 DrawingsGraphics\AutoCAD\Sheets\LAYOUT\L1.11 LAYOUT & MATERIAL PLAN.dwg | ROLIVER | ANSI FULL BLEED B (11.00 X 17.00 INCHES) | 2/27/2020



LAYOUT & MATERIALS LEGEND

- L1 — ITEM 1002-6002, LANDSCAPE AMENITY (TYP 1). REF. 02 / L1.00
- P1 — ITEM 528-6004, LANDSCAPE PAVERS. 'PLAZA MUSTER-K' CONC. PAVERS, BY PAVESTONE. REF. 01 / L1.00 FOR PAVERS, CONCRETE BASE AND EDGE, AND OTHER REQUIREMENTS.
- P2 — ITEM 432-6006, RIPRAP (CONC)(CL B). CONCRETE EDGE AT LANDSCAPE PAVER EDGE. REF. 01 / L1.00

NOTES:
1. PEDESTRIAN LIGHT LOCATIONS SHALL BE APPROVED BY CITY OF HOUSTON OWNER REPRESENTATIVE AND TXDOT LANDSCAPE ARCHITECT PRIOR TO BEGINNING CONSTRUCTION.
2. REFERENCE L2.03 FOR PLACEMENT DETAIL OF PEDESTRIAN LIGHT AT CONCRETE WALK.

Landscape Architect

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67862

0 30 60
(IN FEET)
SCALE: PLAN 1":30'

JAMES W. VICK
TEXAS BOARD OF ARCHITECTURAL EXAMINERS
ARCHITECT #10477
FEB 5 2020

100% CONSTRUCTION DOCUMENTS

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation

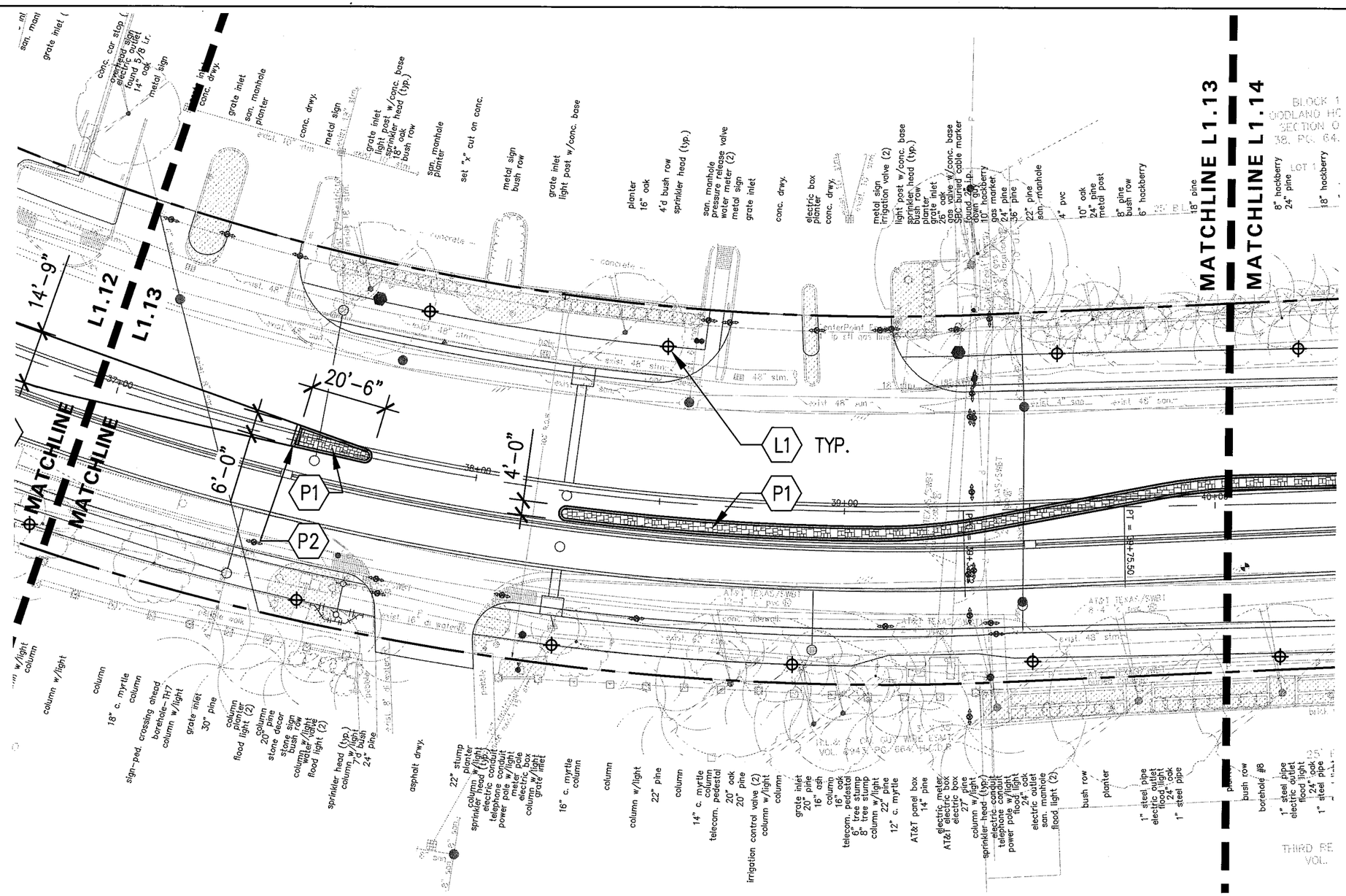
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L1.12

LAYOUT & MATERIAL PLAN

SHEET 16 OF 109

DGN	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN	6	TEXAS	STP 1802 (783) MM			CS
DWG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG	HOU	HARRIS	0912	72	391	402



LAYOUT & MATERIALS LEGEND

⊕ L1	ITEM 1002-6002, LANDSCAPE AMENITY (TYP 1). REF. 02 / L1.00
P1	ITEM 528-6004, LANDSCAPE PAVERS. 'PLAZA MUSTER-K' CONC. PAVERS, BY PAVESTONE. REF. 01 / L1.00 FOR PAVERS, CONCRETE BASE AND EDGE, AND OTHER REQUIREMENTS.
P2	ITEM 432-6006, RIPRAP (CONC)(CL B). CONCRETE EDGE AT LANDSCAPE PAVER EDGE. REF. 01 / L1.00

NOTES:
1. PEDESTRIAN LIGHT LOCATIONS SHALL BE APPROVED BY CITY OF HOUSTON OWNER REPRESENTATIVE AND TXDOT LANDSCAPE ARCHITECT PRIOR TO BEGINNING CONSTRUCTION.
2. REFERENCE L2.03 FOR PLACEMENT DETAIL OF PEDESTRIAN LIGHT AT CONCRETE WALK.

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(IN FEET)
SCALE: PLAN 1":30'

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FEB 19 2020

100% CONSTRUCTION DOCUMENTS

REV. NO.	DATE	DESCRIPTION	BY

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

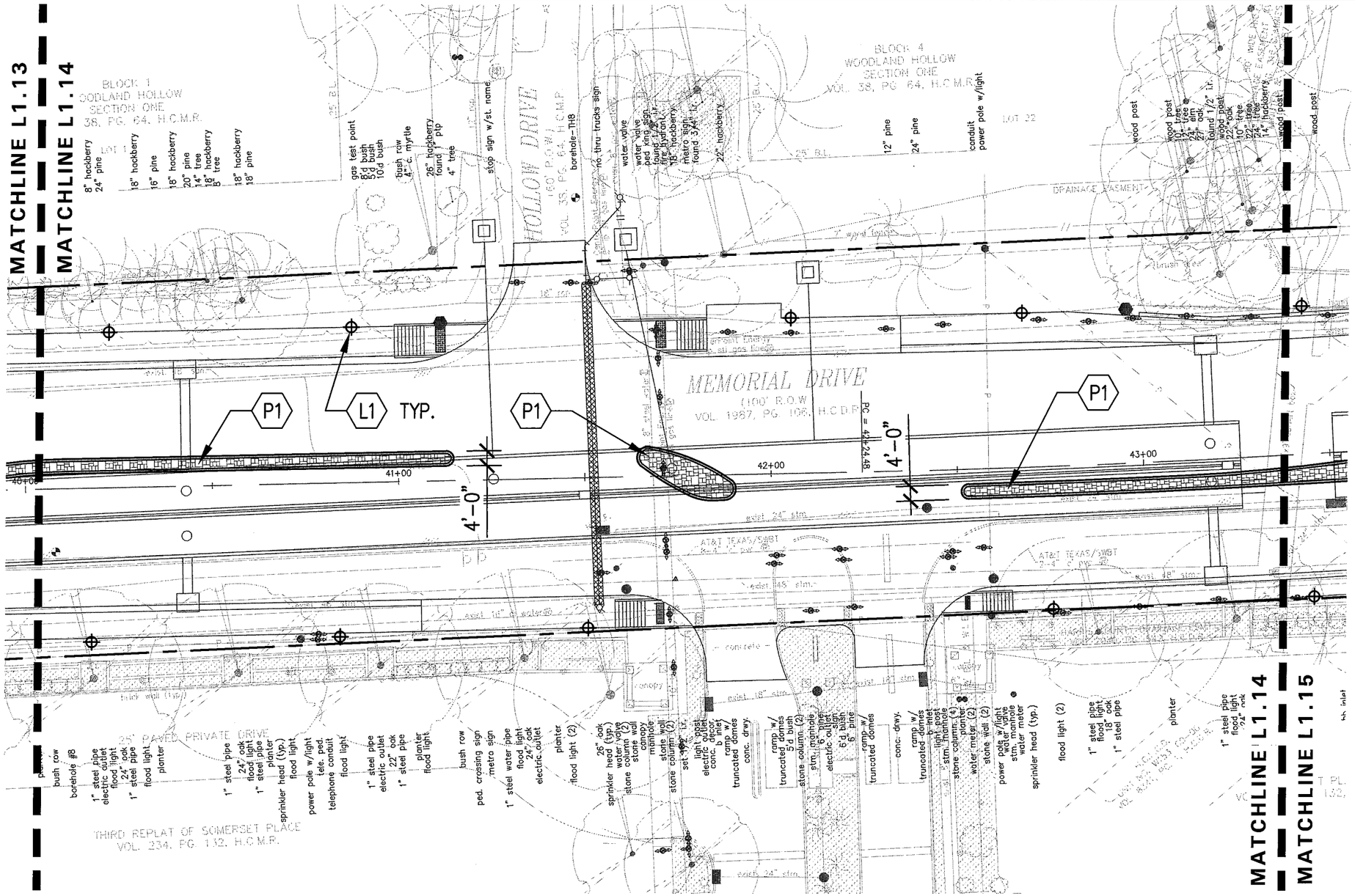
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L1.13

LAYOUT & MATERIAL PLAN

SHEET 17 OF 109

DSGN	FED. RDS. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSGN	6	TEXAS	STP 1802 (783) MM			CS
DWG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG	HOU	HARRIS	0912	72	391	403



LAYOUT & MATERIALS LEGEND

- L1 — ITEM 1002-6002, LANDSCAPE AMENITY (TYP 1). REF. 02 / L1.00
- P1 — ITEM 528-6004, LANDSCAPE PAVERS. 'PLAZA MUSTER-K' CONC. PAVERS, BY PAVESTONE. REF. 01 / L1.00 FOR PAVERS, CONCRETE BASE AND EDGE, AND OTHER REQUIREMENTS.
- P2 — ITEM 432-6006, RIPRAP (CONC)(CL B). CONCRETE EDGE AT LANDSCAPE PAVER EDGE. REF. 01 / L1.00

NOTES:
1. PEDESTRIAN LIGHT LOCATIONS SHALL BE APPROVED BY CITY OF HOUSTON OWNER REPRESENTATIVE AND TXDOT LANDSCAPE ARCHITECT PRIOR TO BEGINNING CONSTRUCTION.
2. REFERENCE L2.03 FOR PLACEMENT DETAIL OF PEDESTRIAN LIGHT AT CONCRETE WALK.

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(IN FEET)
SCALE: PLAN 1": 30'

TEXAS BOARD OF ARCHITECTURAL EXAMINERS
JAMES W. VICK
ARCHITECT # 10477
FEB 5 2020

100% CONSTRUCTION DOCUMENTS

REV. NO.	DATE	DESCRIPTION	BY

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

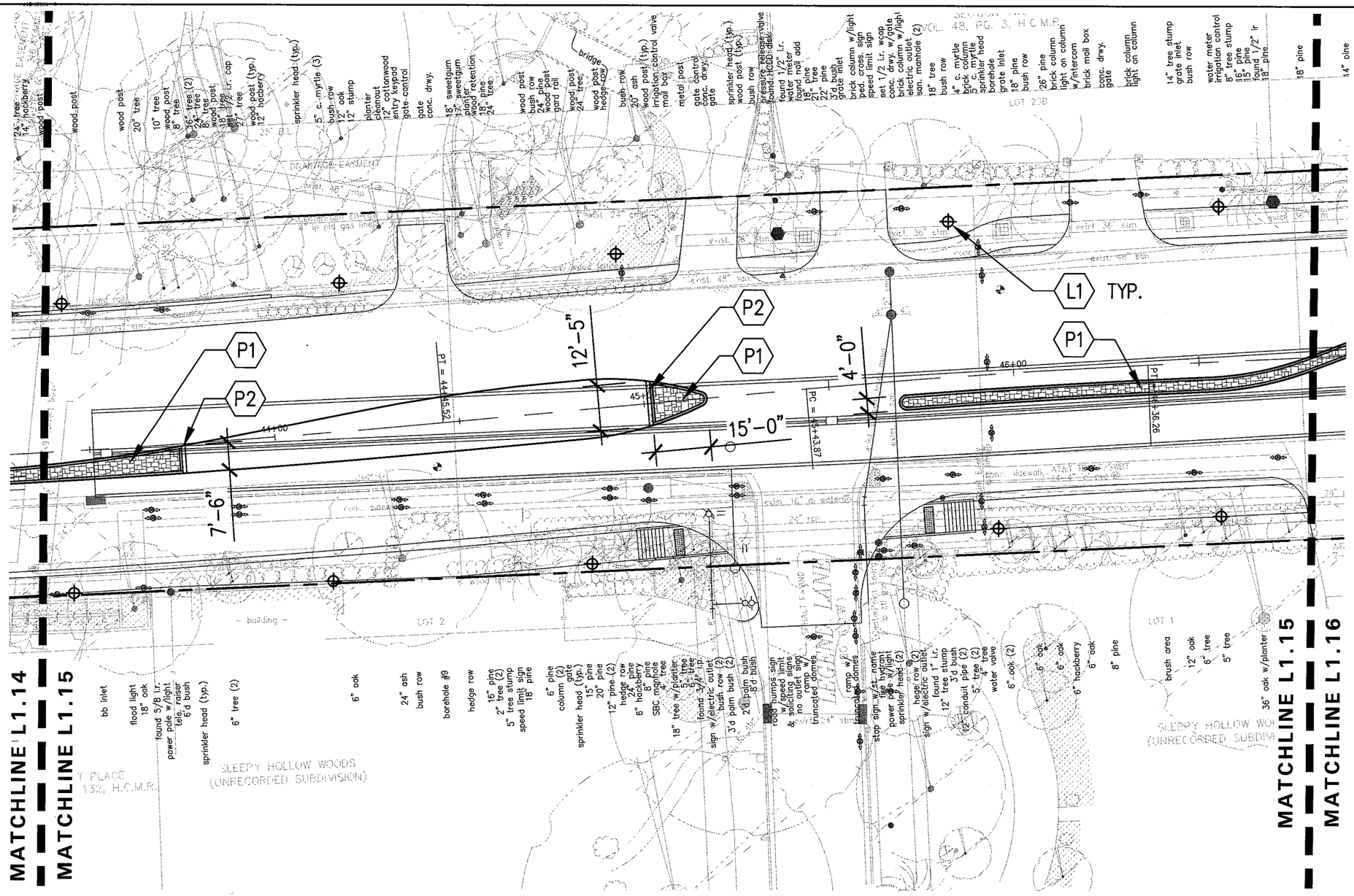
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L1.14

LAYOUT & MATERIAL PLAN

SHEET 18 OF 109

DSGN	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSGN	6	TEXAS	STP 1802 (783) MM			CS
DWN	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWN	HOU	HARRIS	0912	72	391	404



LAYOUT & MATERIALS LEGEND

- ⊕ L1 — ITEM 1002-6002, LANDSCAPE AMENITY (TYP 1). REF. 02 / L1.00
- P1 — ITEM 528-6004, LANDSCAPE PAVERS. 'PLAZA MUSTER-K' CONC. PAVERS, BY PAVESTONE. REF. 01 / L1.00 FOR PAVERS, CONCRETE BASE AND EDGE, AND OTHER REQUIREMENTS.
- P2 — ITEM 432-6006, RIPRAP (CONC)(CL B). CONCRETE EDGE AT LANDSCAPE PAVER EDGE. REF. 01 / L1.00

NOTES:
1. PEDESTRIAN LIGHT LOCATIONS SHALL BE APPROVED BY CITY OF HOUSTON OWNER REPRESENTATIVE AND TXDOT LANDSCAPE ARCHITECT PRIOR TO BEGINNING CONSTRUCTION.
2. REFERENCE L2.03 FOR PLACEMENT DETAIL OF PEDESTRIAN LIGHT AT CONCRETE WALK.

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REV. NO.	DATE	DESCRIPTION	BY

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY
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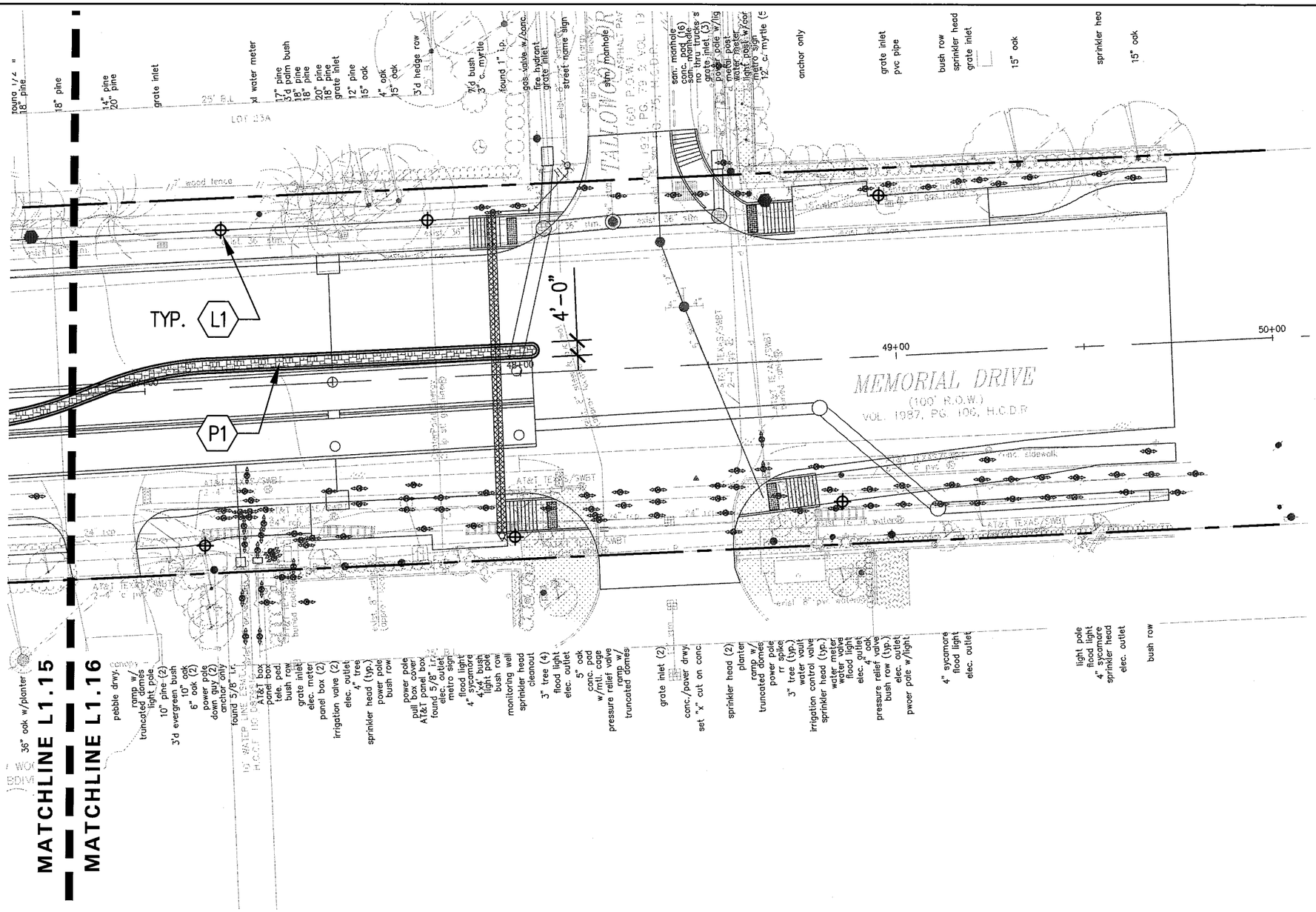
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L1.15

LAYOUT & MATERIAL PLAN

SHEET 19 OF 109

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN:	6	TEXAS	STP 1802 (783) MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	405



LAYOUT & MATERIALS LEGEND

- L1 — ITEM 1002-6002, LANDSCAPE AMENITY (TYP 1). REF. 02 / L1.00
- P1 — ITEM 528-6004, LANDSCAPE PAVERS. 'PLAZA MUSTER-K' CONC. PAVERS, BY PAVESTONE. REF. 01 / L1.00 FOR PAVERS, CONCRETE BASE AND EDGE, AND OTHER REQUIREMENTS.
- P2 — ITEM 432-6006, RIPRAP (CONC)(CL B). CONCRETE EDGE AT LANDSCAPE PAVER EDGE. REF. 01 / L1.00

NOTES:
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2. REFERENCE L2.03 FOR PLACEMENT DETAIL OF PEDESTRIAN LIGHT AT CONCRETE WALK.

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PLANS
67862

0 30 60
(IN FEET)
SCALE: PLAN 1":30'

TEXAS BOARD OF ARCHITECTURAL EXAMINERS
JAMES W. VICK
ARCHITECT #10477
FEB 5 2020

100% CONSTRUCTION DOCUMENTS

REV. NO.	DATE	DESCRIPTION	BY

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

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L1.16

LAYOUT & MATERIAL PLAN

SHEET 20 OF 109

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DWG:	6	TEXAS	STP 1802 (783) MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	406

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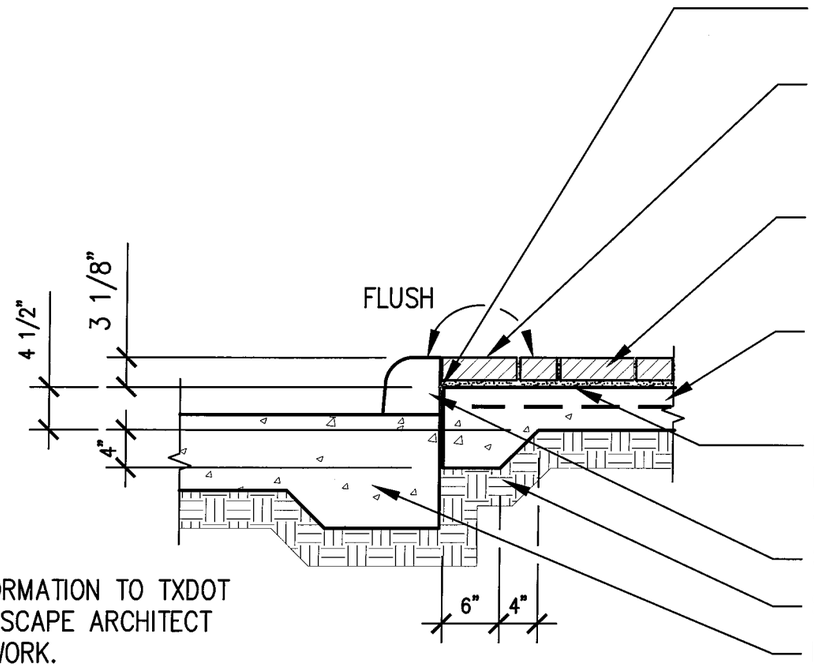


½" EXPANSION JOINT WITH BACKER ROD & SEALANT.

PLAZA RECTANGULAR PAVER, BY PAVESTONE. SOLDIER COURSE ALONG ENTIRE PERIMETER. COLOR TO BE 'AUSTIN GOLD BLEND'. ITEM 528-6004.

PLAZA 'MUSTER-K' PAVER, BY PAVESTONE. RANDOM PATTERN. COLOR TO BE 'AUSTIN GOLD BLEND'. ITEM 528-6004.

CONCRETE BASE AND EDGE; #3 18" OCEW. ITEM 432-6006, RIPRAP (CONC)(CL B), TO BE PAID SEPARATELY.

FILTER FABRIC: TURN UP AT EDGE OF MATERIAL, INCLUDING 24" WIDE COVERAGE AT ALL JOINTS INCINDENTAL.

CONC. CURB, REF. CIVIL DWGS.

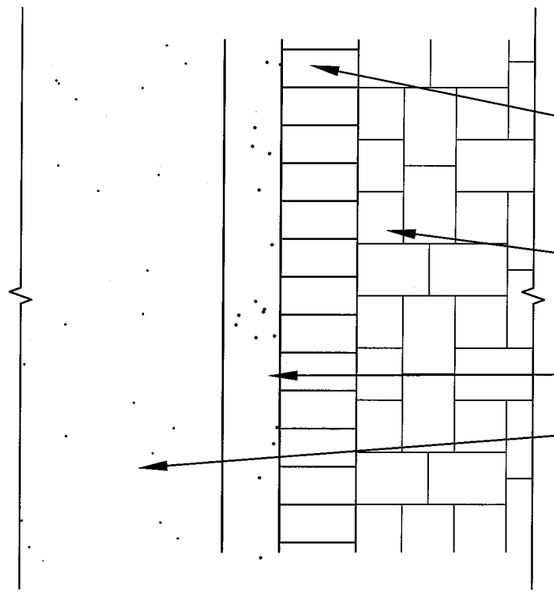
SUBGRADE, REF. CIVIL DWGS.

ROADWAY PAVEMENT, REF. CIVIL DWGS.

NOTE:
SUBMIT MATERIAL AND INFORMATION TO TXDOT ENGINEER AND TXDOT LANDSCAPE ARCHITECT FOR APPROVAL PRIOR TO WORK.

02 SECTION – MEDIAN PAVERS AT CURB

N.T.S.



PLAZA RECTANGULAR PAVER, BY PAVESTONE. SOLDIER COURSE ALONG ENTIRE PERIMETER. COLOR TO BE 'AUSTIN GOLD BLEND'. ITEM 528-6004.

PLAZA 'MUSTER-K' PAVER, BY PAVESTONE. RANDOM PATTERN. COLOR TO BE 'AUSTIN GOLD BLEND'. ITEM 528-6004.

CONC. CURB, REF. CIVIL DWGS.

ROADWAY PAVEMENT, REF. CIVIL DWGS.

01 PLAN – MEDIAN PAVERS AT CURB

N.T.S.

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TEXAS BOARD OF ARCHITECTURAL EXAMINERS
JAMES W. VICK
ARCHITECT
11041
2020

100% CONSTRUCTION DOCUMENTS

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation

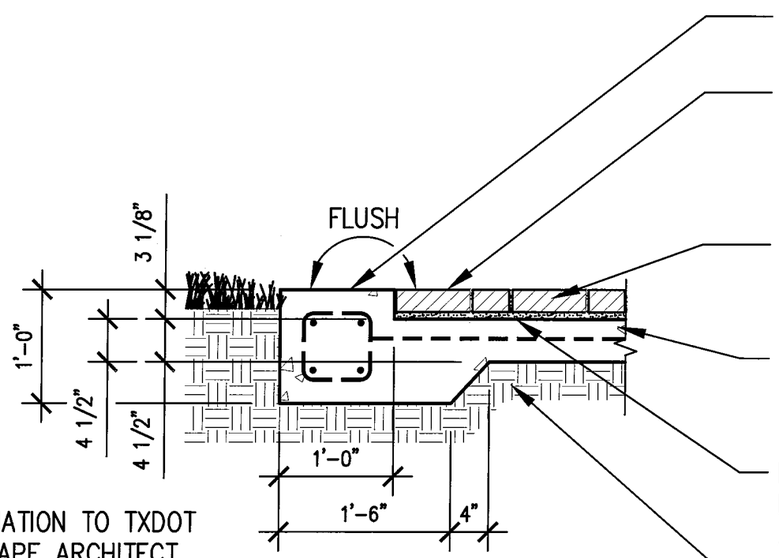
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L2.01

CONCRETE PAVER DETAILS

SHEET 21 OF 109

DGN	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN	6	TEXAS	STP 1802 (783) MM			CS
DWD	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG	HOU	HARRIS	0912	72	391	407



CONCRETE EDGE, ITEM 432-6006; LIGHT BROOM FINISH.

PLAZA RECTANGULAR PAVER, BY PAVESTONE. SOLDIER COURSE ALONG ENTIRE PERIMETER. COLOR TO BE 'AUSTIN GOLD BLEND'. ITEM 528-6004.

PLAZA 'MUSTER-K' PAVER, BY PAVESTONE. RANDOM PATTERN. COLOR TO BE 'AUSTIN GOLD BLEND'. ITEM 528-6004.

CONCRETE BASE AND EDGE; #3 18" OCEW. ITEM 432-6006, RIPRAP (CONC)(CL B), TO BE PAID SEPARATELY.

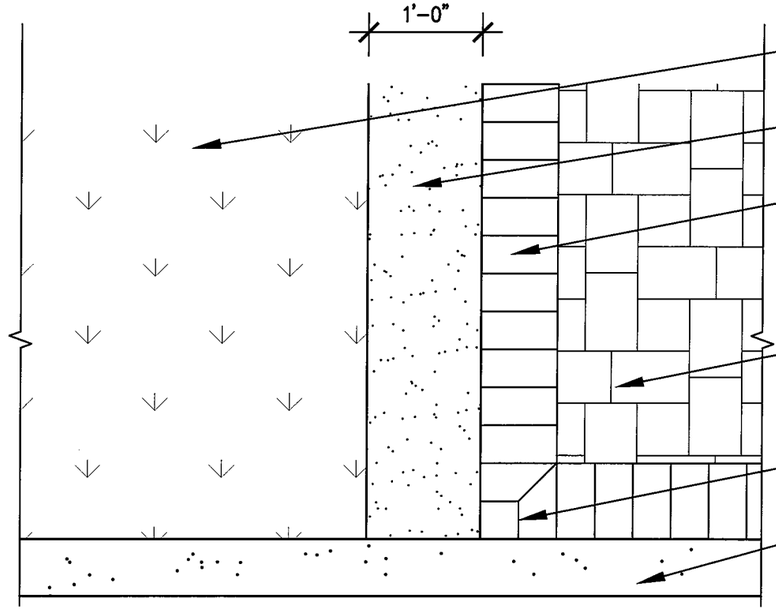
FILTER FABRIC: TURN UP AT EDGE OF MATERIAL, INCLUDING 24" WIDE COVERAGE AT ALL JOINTS INCINDENTAL.

SUBGRADE, REF. CIVIL DWGS.

NOTE:
SUBMIT MATERIAL AND INFORMATION TO TXDOT ENGINEER AND TXDOT LANDSCAPE ARCHITECT FOR APPROVAL PRIOR TO WORK.

02 SECTION – MEDIAN PAVERS AT CONC. BAND

3/4" = 1'-0"



PLANTING AREA: REF. PLANTING PLAN & PLANTING DETAILS.

CONCRETE EDGE, ITEM 432-6006; LIGHT BROOM FINISH.

PLAZA RECTANGULAR PAVER, BY PAVESTONE. SOLDIER COURSE ALONG ENTIRE PERIMETER. COLOR TO BE 'AUSTIN GOLD BLEND'. ITEM 528-6004.

PLAZA 'MUSTER-K' PAVER, BY PAVESTONE. RANDOM PATTERN. COLOR TO BE 'AUSTIN GOLD BLEND'. ITEM 528-6004.

MITER JOINT PAVERS AT CONCRETE EDGE AND CONCRETE ROADWAY CURB

CONCRETE CURB, REF. CIVIL DWGS.

01 PLAN – MEDIAN PAVERS AT CONC. BAND

3/4" = 1'-0"

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FEB 13 2020

100% CONSTRUCTION DOCUMENTS

REV. NO.	DATE	DESCRIPTION	BY

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

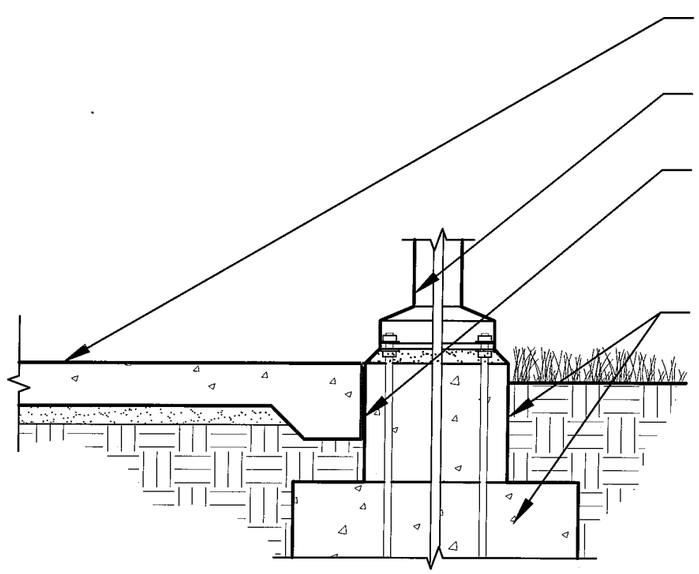
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L2.02

CONCRETE PAVER DETAILS

SHEET 22 OF 109

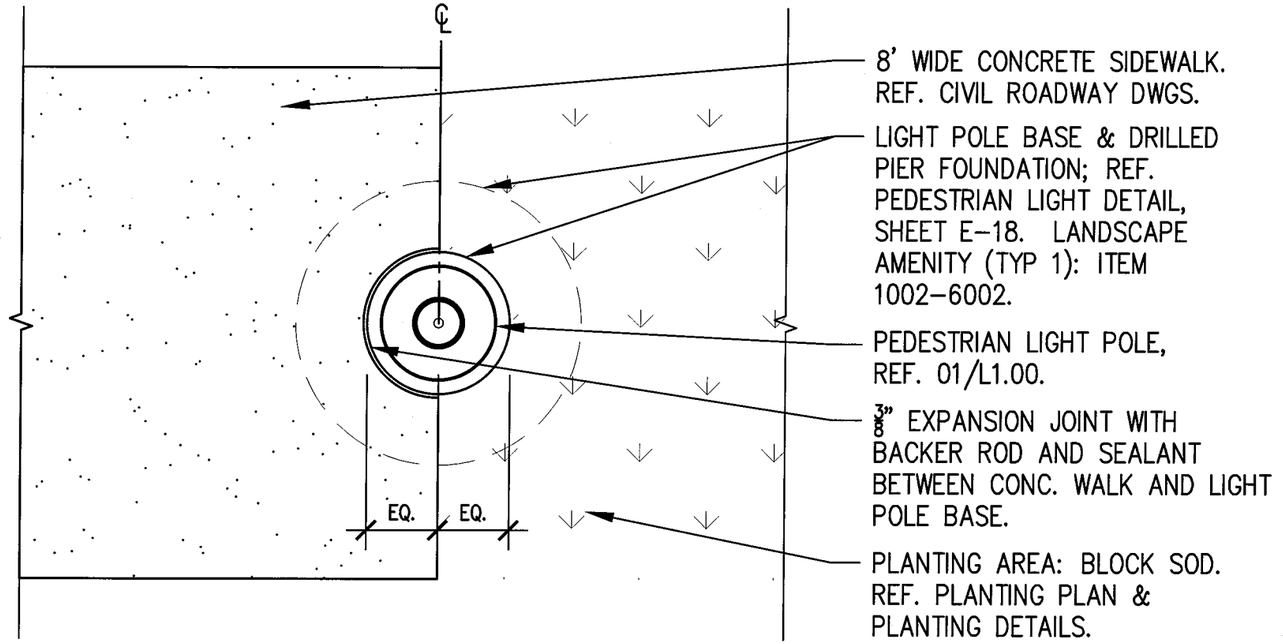
DSN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK: DSN:	6	TEXAS	STP 1802 (783) MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK: DWG:	HOU	HARRIS	0912	72	391	408



02 SECTION – CONC. WALK AT LIGHT POLE BASE

N.T.S.

NOTE:
CONTRACTOR IS RESPONSIBLE FOR COORDINATING PEDESTRIAN LIGHT LOCATIONS AND RECEIVING APPROVAL PRIOR TO INSTALLING 8 FOOT WIDE CONCRETE WALK.



01 PLAN – CONC. WALK AT LIGHT POLE BASE

N.T.S.

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TEXAS BOARD OF ARCHITECTURAL EXAMINERS
JAMES W. VICK
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FEB 14 2020

100% CONSTRUCTION DOCUMENTS

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation

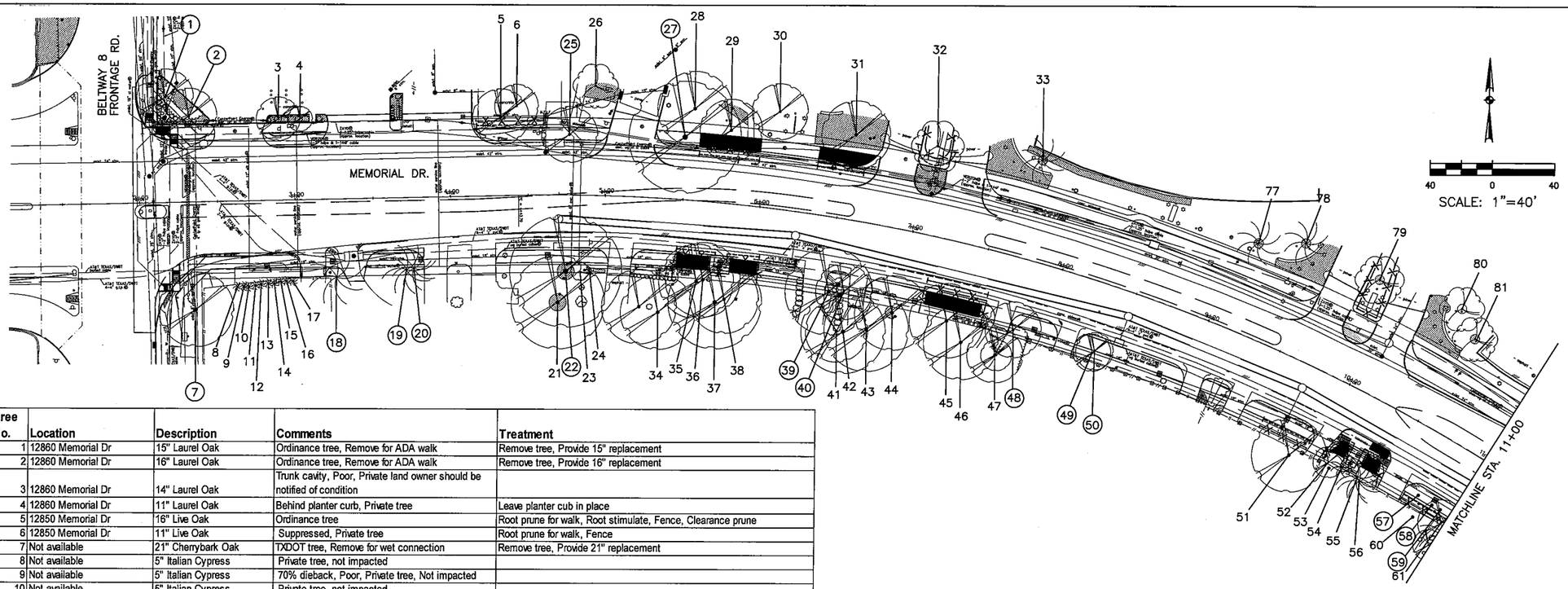
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L2.03

PEDESTRIAN LIGHT BASE LOCATION DETAILS

SHEET 23 OF 109

DGN	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN	6	TEXAS	STP 1802 (783) MM			CS
DWG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG	HOU	HARRIS	0912	72	391	409



Tree No.	Location	Description	Comments	Treatment
1	12860 Memorial Dr	15" Laurel Oak	Ordinance tree, Remove for ADA walk	Remove tree, Provide 15" replacement
2	12860 Memorial Dr	16" Laurel Oak	Ordinance tree, Remove for ADA walk	Remove tree, Provide 16" replacement
3	12860 Memorial Dr	14" Laurel Oak	Trunk cavity, Poor, Private land owner should be notified of condition	
4	12860 Memorial Dr	11" Laurel Oak	Behind planter curb, Private tree	Leave planter cub in place
5	12850 Memorial Dr	16" Live Oak	Ordinance tree	Root prune for walk, Root stimulate, Fence, Clearance prune
6	12850 Memorial Dr	11" Live Oak	Suppressed, Private tree	Root prune for walk, Fence
7	Not available	21" Cherrybark Oak	TXDOT tree, Remove for wet connection	Remove tree, Provide 21" replacement
8	Not available	5" Italian Cypress	Private tree, not impacted	
9	Not available	5" Italian Cypress	70% dieback, Poor, Private tree, Not impacted	
10	Not available	5" Italian Cypress	Private tree, not impacted	
11	Not available	5" Italian Cypress	Private tree, not impacted	
12	Not available	5" Italian Cypress	Private tree, not impacted	
13	Not available	5" Italian Cypress	Private tree, not impacted	
14	Not available	5" Italian Cypress	Private tree, not impacted	
15	Not available	5" Italian Cypress	Private tree, not impacted	
16	Not available	5" Italian Cypress	Private tree, not impacted	
17	Not available	5" Italian Cypress	Private tree, not impacted	
18	Not available	27" Pine	Ordinance tree, Remove for new drive	Remove tree, Provide 27" replacement
19	Not available	18" Pine	Ordinance tree, Remove for ADA walk	Remove tree, Provide 18" replacement
20	Not available	19" Pine	Ordinance tree, Remove for ADA walk	Remove tree, Provide 19" replacement
21	12847 Memorial	31" Water Oak	40% dieback, Private tree, Not impacted	
22	12847 Memorial	34" Water Oak	Ordinance tree, Remove for ADA walk	Remove tree, Provide 34" replacement
23	12847 Memorial	3" Crepe Myrtle	Not ordinance tree	
24	12847 Memorial	2" Juniper	Not ordinance tree	Clearance prune
25	12850 Memorial Dr	15" Live Oak	Ordinance tree, Remove for storm	Remove tree, Provide 15" replacement
26	12850 Memorial Dr	15" Crepe Myrtle	Private tree, not impacted	
27	12850 Memorial Dr	28" Live Oak	Ordinance tree, Remove for ADA walk	Remove tree, Provide 28" replacement
28	12850 Memorial Dr	22" Live Oak	1-sided to tree 27, Private tree	Demo-form-pour walk without damage to tree roots 1" diameter or larger
29	12850 Memorial Dr	15" Live Oak	Ordinance tree	Demo-form-pour walk without damage to tree roots 1" diameter or larger, Root prune for street, Fence, Clearance prune, Root stimulate
30	12850 Memorial Dr	16" Live Oak	Private tree, not impacted	
31	12850 Memorial Dr	23" Live Oak	Private tree	Demo-form-pour walk without damage to tree roots 1" diameter or larger, Root prune for street, Fence, Clearance prune, Root stimulate
32	12850 Memorial Dr	27" Crepe Myrtle	Private tree	Root prune for drive, Fence, Clearance prune, Root stimulate
33	12850 Memorial Dr	45' Palm	Private tree, not impacted	
34	12843 Memorial Dr	18" Post Oak	Private tree, not impacted	
35	12843 Memorial Dr	19" Post Oak	Private tree	Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence, Clearance prune
36	12843 Memorial Dr	21" Post Oak	Private tree	Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence, Clearance prune
37	12839 Memorial Dr	32" Post Oak	Private tree	Root prune for plug, Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence, Clearance prune
38	12839 Memorial Dr	18" Post Oak	Private tree	Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence, Clearance prune
39	12839 Memorial Dr	21" American Elm	60% dieback, Ordinance tree, Remove for drive	Remove tree, no replacement required
40	12835 Memorial Dr	11" Arborvitae	Not ordinance tree, Remove for walk	Remove tree, no replacement required
41	12835 Memorial Dr	17" Post Oak	Private tree, not impacted	
42	12835 Memorial Dr	22" Post Oak	Private tree, not impacted	
43	12835 Memorial Dr	19" Post Oak	Private tree, not impacted	
44	12835 Memorial Dr	15" Post Oak	Trunk cankers, 80% dead, Private, Not impacted	
45	12835 Memorial Dr	21" Post Oak	Private tree	Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence, Clearance prune
46	12835 Memorial Dr	35" Post Oak	Private tree	Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence, Clearance prune
47	12835 Memorial Dr	12" Post Oak	Private tree	Clearance prune
48	12835 Memorial Dr	9" Arborvitae	Not ordinance tree, Remove for walk	Remove tree, no replacement required
49	12827 Memorial Dr	9" Arborvitae	Not ordinance tree, Remove for walk	Remove tree, no replacement required
50	12827 Memorial Dr	11" Lacebark Elm	Ordinance tree, Remove for ADA walk	Remove tree, Provide 11" replacement

Tree No.	Location	Description	Comments	Treatment
51	12823 Memorial Dr	21" Water Oak	New home impacts, Trunk wounds, 50% dieback, Poor, Private tree	Root prune for walk, Clearance prune, Fence
52	12819 Memorial Dr	5" Oleander	Not ordinance tree	Clearance prune
53	12819 Memorial Dr	10" Laurel Oak	Suppressed, Private tree	Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence, Clearance prune
54	12819 Memorial Dr	10" Pine	Thin canopy, Ordinance tree	Root prune for plug, Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence, Clearance prune
55	12819 Memorial Dr	18" Post Oak	Ordinance tree	Demo-form-pour walk without damage to tree roots 1" diameter or larger, Root prune for street, Fence, Clearance prune, Root stimulate
56	12819 Memorial Dr	10" Post Oak	Private tree	Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence, Clearance prune
57	12819 Memorial Dr	2" Pine	Ordinance tree, Remove for ADA walk	Remove tree, provide 2" replacement
58	12819 Memorial Dr	2" Pine	Ordinance tree, Remove for ADA walk	Remove tree, provide 2" replacement
59	12819 Memorial Dr	2" Pine	Ordinance tree, Remove for ADA walk	Remove tree, provide 2" replacement
60	12819 Memorial Dr	23" Pine	Private tree	Root prune for walk, Fence, Clearance prune
61	12815 Memorial Dr	11" Redbud	Trunk cavity, Poor, Not ordinance tree	Clearance prune
77	12850 Memorial Dr	35' Palm	Private tree, not impacted	
78	12850 Memorial Dr	40' Palm	Private tree, not impacted	
79	12850 Memorial Dr	23" Crepe Myrtle	Private tree	Fence, Clearance prune
80	12850 Memorial Dr	40' Palm	Private tree, not impacted	
81	12850 Memorial Dr	40' Palm	Private tree, not impacted	

TREE PRESERVATION PLAN LEGEND

- 1 — TREE NUMBER/LOCATION
- (1) — TREE TO BE REMOVED
- -X-X- — TREE PROTECTION FENCE
- ------ — ROOT PRUNING TRENCH
- ■ — DEMO-FORM-POUR WITHOUT DAMAGE TO ROOTS 1" OR LARGER

NOTE:
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4. CONTRACTOR IS RESPONSIBLE FOR CANOPY PRUNING, ROOT PRUNING, PROTECTION AND MARKING AS SHOWN IN PLANS AND DETAILS.

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APPROVED: Craig N. Koehl 12-05-2019

REV. NO.	DATE	DESCRIPTION	BY

Lockwood, Andrews & Newnam, Inc. A LEO A DALY COMPANY — FIRM REGISTATION NO. 2614

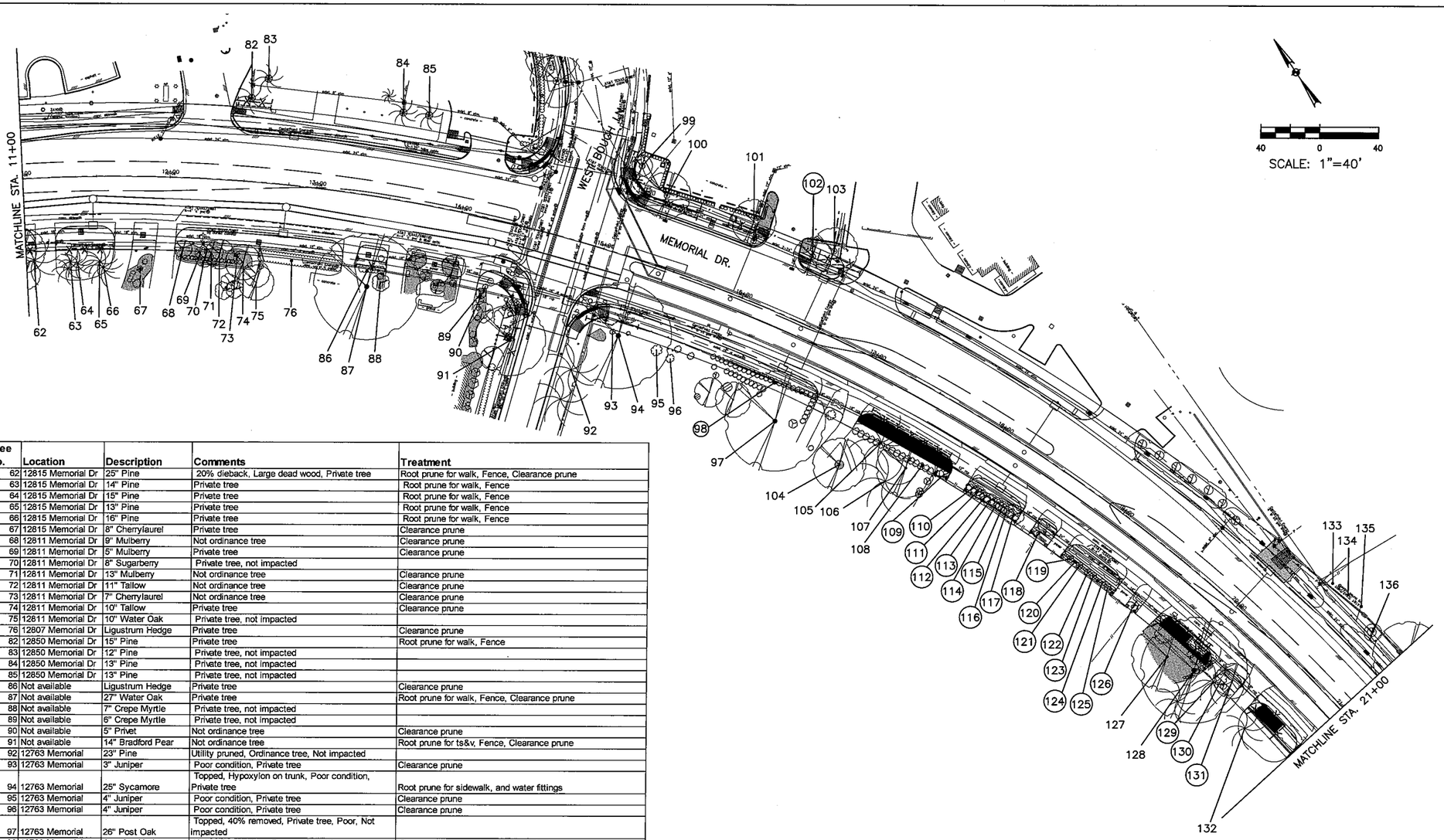
Texas Department of Transportation ©2018

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

TREE PROTECTION PLAN SHEET 1 OF 8

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	410

$USER$ $TIME$ $DATE$ Plotted on:
Pen Table: $PENTBLS$
Plot Driver: $PLTDRVL$
Design Filename: $FILEL$



SCALE: 1"=40'

Tree No.	Location	Description	Comments	Treatment
62	12815 Memorial Dr	25" Pine	20% dieback, Large dead wood, Private tree	Root prune for walk, Fence, Clearance prune
63	12815 Memorial Dr	14" Pine	Private tree	Root prune for walk, Fence
64	12815 Memorial Dr	15" Pine	Private tree	Root prune for walk, Fence
65	12815 Memorial Dr	13" Pine	Private tree	Root prune for walk, Fence
66	12815 Memorial Dr	16" Pine	Private tree	Root prune for walk, Fence
67	12815 Memorial Dr	8" Cherrylaurel	Private tree	Clearance prune
68	12811 Memorial Dr	9" Mulberry	Not ordinance tree	Clearance prune
69	12811 Memorial Dr	5" Mulberry	Private tree	Clearance prune
70	12811 Memorial Dr	8" Sugarberry	Private tree, not impacted	
71	12811 Memorial Dr	13" Mulberry	Not ordinance tree	Clearance prune
72	12811 Memorial Dr	11" Tallow	Not ordinance tree	Clearance prune
73	12811 Memorial Dr	7" Cherrylaurel	Not ordinance tree	Clearance prune
74	12811 Memorial Dr	10" Tallow	Private tree	Clearance prune
75	12811 Memorial Dr	10" Water Oak	Private tree, not impacted	
76	12807 Memorial Dr	Ligustrum Hedge	Private tree	Clearance prune
82	12850 Memorial Dr	15" Pine	Private tree	Root prune for walk, Fence
83	12850 Memorial Dr	12" Pine	Private tree, not impacted	
84	12850 Memorial Dr	13" Pine	Private tree, not impacted	
85	12850 Memorial Dr	13" Pine	Private tree, not impacted	
86	Not available	Ligustrum Hedge	Private tree	Clearance prune
87	Not available	27" Water Oak	Private tree	Root prune for walk, Fence, Clearance prune
88	Not available	7" Crepe Myrtle	Private tree, not impacted	
89	Not available	6" Crepe Myrtle	Private tree, not impacted	
90	Not available	5" Privet	Not ordinance tree	Clearance prune
91	Not available	14" Bradford Pear	Not ordinance tree	Root prune for ts&v, Fence, Clearance prune
92	12763 Memorial	23" Pine	Utility pruned, Ordinance tree, Not impacted	
93	12763 Memorial	3" Juniper	Poor condition, Private tree	Clearance prune
94	12763 Memorial	25" Sycamore	Topped, Hypoxylon on trunk, Poor condition, Private tree	Root prune for sidewalk, and water fittings
95	12763 Memorial	4" Juniper	Poor condition, Private tree	Clearance prune
96	12763 Memorial	4" Juniper	Poor condition, Private tree	Clearance prune
97	12763 Memorial	26" Post Oak	Topped, 40% removed, Private tree, Poor, Not impacted	
98	12763 Memorial	Jasmine Hedge	Not ordinance tree, Remove for walk	Remove tree, no replacement required
99	12764 Memorial	10" Live Oak	Private tree	Root prune for walk, Fence, Clearance prune
100	12764 Memorial	14" Live Oak	Ordinance tree	Root prune for walk, Fence, Clearance prune
101	12764 Memorial	15" Live Oak	Utility pruned, Private tree	Root prune for walk, Fence, Clearance prune
102	12764 Memorial	14" Live Oak	Ordinance tree, Remove for ADA walk	Remove tree, Provide 14" replacement
103	12764 Memorial	17" Live Oak	Root damage from new commercial construction to east, Utility pruned, Private tree	Root prune for walk, Fence, Clearance prune
104	12755 Memorial	16" Magnolia	50% dieback, Private tree, Not impacted	
105	12755 Memorial	25" Pine	Ordinance tree, Remove for ADA walk	Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence, Root stimulate, Clearance prune
106	12755 Memorial	28" Pine	Private tree, not impacted	
107	12755 Memorial	22" Cherrybark Oak	Private tree	Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence, Clearance prune
108	12755 Memorial	Ligustrum Hedge	Not ordinance tree	Clearance prune
109	12755 Memorial	4" Ligustrum	Not ordinance tree, Remove for walk	Remove tree, no replacement required
110	12751 Memorial	10" Crepe Myrtle	Topped, Not ordinance tree, Remove for walk	Remove tree, no replacement required
111	12751 Memorial	10" Crepe Myrtle	Topped, Not ordinance tree, Remove for walk	Remove tree, no replacement required
112	12751 Memorial	10" Crepe Myrtle	Topped, Not ordinance tree, Remove for walk	Remove tree, no replacement required
113	12751 Memorial	10" Crepe Myrtle	Topped, Not ordinance tree, Remove for walk	Remove tree, no replacement required
114	12751 Memorial	10" Crepe Myrtle	Topped, Not ordinance tree, Remove for walk	Remove tree, no replacement required
115	12751 Memorial	10" Crepe Myrtle	Topped, Not ordinance tree, Remove for walk	Remove tree, no replacement required
116	12751 Memorial	10" Crepe Myrtle	Topped, Not ordinance tree, Remove for walk	Remove tree, no replacement required
117	12751 Memorial	10" Crepe Myrtle	Topped, Not ordinance tree, Remove for walk	Remove tree, no replacement required
118	12751 Memorial	10" Crepe Myrtle	Topped, Not ordinance tree, Remove for walk	Remove tree, no replacement required
119	12747 Memorial	8" Crepe Myrtle	Topped, Not ordinance tree, Remove for walk	Remove tree, no replacement required
120	12747 Memorial	8" Crepe Myrtle	Topped, Not ordinance tree, Remove for walk	Remove tree, no replacement required
121	12747 Memorial	8" Crepe Myrtle	Topped, Not ordinance tree, Remove for walk	Remove tree, no replacement required
122	12747 Memorial	8" Crepe Myrtle	Topped, Not ordinance tree, Remove for walk	Remove tree, no replacement required
123	12747 Memorial	8" Crepe Myrtle	Topped, Not ordinance tree, Remove for walk	Remove tree, no replacement required
124	12747 Memorial	8" Crepe Myrtle	Topped, Not ordinance tree, Remove for walk	Remove tree, no replacement required
125	12747 Memorial	8" Crepe Myrtle	Topped, Not ordinance tree, Remove for walk	Remove tree, no replacement required
126	12747 Memorial	3" Ligustrum	Topped, Not ordinance tree, Remove for walk	Remove tree, no replacement required

Tree No.	Location	Description	Comments	Treatment
127	12739 Memorial	23" Cherrybark Oak	Private tree	Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence, Clearance prune
128	12739 Memorial	37" Water Oak	Suppressed, Private tree	Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence, Clearance prune
129	12739 Memorial	20" Pine	Ordinance tree, Remove for ADA walk	Remove tree, Provide 20" replacement
130	12739 Memorial	5" Sugarberry	Not ordinance tree, Remove for walk	Remove tree, no replacement required
131	12739 Memorial	9" Redbud	Not ordinance tree, Remove for walk	Remove tree, no replacement required
132	12739 Memorial	19" Pine	New private drive construction impacts, 35% dieback, Private tree	Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence
133	12718 Old Oaks	8" Raintree	Private tree	Clearance prune
134	12718 Old Oaks	12" Tallow	Utility pruned, Private tree	
135	12718 Old Oaks	15" Water Oak	Utility pruned, Private tree	
136	12718 Old Oaks	17" Yaupon	Not ordinance tree	Clearance prune

TREE PRESERVATION PLAN LEGEND

- 1 — TREE NUMBER/LOCATION
- (1) — TREE TO BE REMOVED
- —X—X— TREE PROTECTION FENCE
- ROOT PRUNING TRENCH
- DEMO–FORM–POUR WITHOUT DAMAGE TO ROOTS 1" OR LARGER

NOTE:
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ACCEPTED AN... 67962

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APPROVED: Craig N. Koehl 12-05-2019

REV. NO.	DATE	DESCRIPTION	BY

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

TREE PROTECTION PLAN SHEET 2 OF 8

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	411

Plotted on: $DATE$ $TIME$ $USER$
Pen Table: $PENTBL$
Plot Driver: $PLTDRV$
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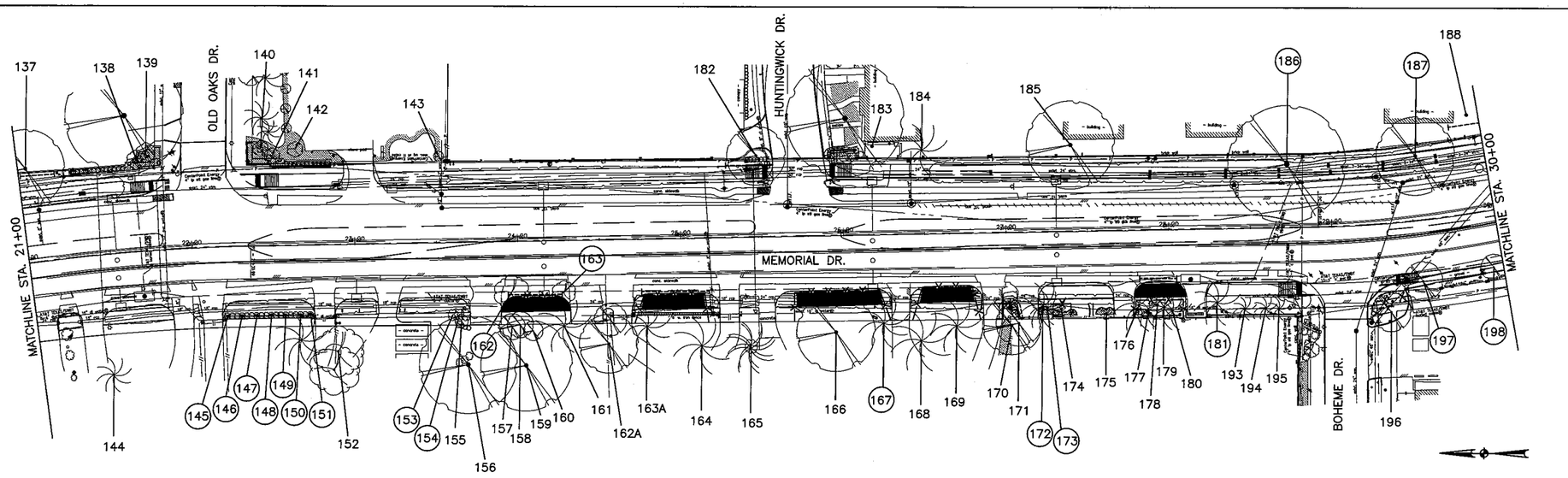

SCALE: 1"=40'

Tree No.	Location	Description	Comments	Treatment
137	12718 Old Oaks	18" Ligustrum	Private tree	Root prune for walk, Clearance prune
138	12718 Old Oaks	13" Crepe Myrtle	Private tree, not impacted	
139	12718 Old Oaks	13" Crepe Myrtle	Private tree, not impacted	
140	12726 Memorial	17" Pine	Private tree, not impacted	
141	12726 Memorial	15" Crepe Myrtle	Private tree, not impacted	
142	12726 Memorial	15" Crepe Myrtle	Private tree, not impacted	
143	12726 Memorial	5" Holly	Private tree, not impacted	
144	12735 Memorial	17" Pine	Private tree, not impacted	
145	12731 Memorial	3" Crepe Myrtle	Not ordinance tree, Remove for walk	Remove tree, no replacement required
146	12731 Memorial	3" Crepe Myrtle	Not ordinance tree, Remove for walk	Remove tree, no replacement required
147	12731 Memorial	3" Crepe Myrtle	Not ordinance tree, Remove for walk	Remove tree, no replacement required
148	12731 Memorial	3" Crepe Myrtle	Not ordinance tree, Remove for walk	Remove tree, no replacement required
149	12731 Memorial	3" Crepe Myrtle	Not ordinance tree, Remove for walk	Remove tree, no replacement required
150	12731 Memorial	3" Crepe Myrtle	Not ordinance tree, Remove for walk	Remove tree, no replacement required
151	12731 Memorial	3" Crepe Myrtle	Not ordinance tree, Remove for walk	Remove tree, no replacement required
152	12727 Memorial	22" Crepe Myrtle	Topped, Private, Not impacted	
153	12727 Memorial	4" Live Oak	Ordinance tree, Remove for ADA walk	Remove tree, Provide 4" replacement
154	12727 Memorial	3" Redbud	Not ordinance tree, Remove for walk	Remove tree, no replacement required
155	12727 Memorial	5" Redbud	Not ordinance tree	Clearance prune
156	12727 Memorial	33" Post Oak	Broken top, Private, Not impacted	
157	Not available	11" Water Oak	Private tree	Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence, Clearance prune
158	Not available	11" Water Oak	Private tree	Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence, Clearance prune
159	Not available	26" Post Oak	Thin, Poor, Private tree, Not impacted	
160	Not available	9" Raintree	Private tree	Clearance prune
161	Not available	25" Pine	Trunk wounds, House demo impacts, Private tree	Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence, Clearance prune
162	Not available	10" Crepe Myrtle	Not ordinance tree, Remove for street	Remove tree, no replacement required
162A	12719 Memorial	11" Raintree	Private tree	Clearance prune
163	Not available	10" Crepe Myrtle	Not ordinance tree, Remove for street	Remove tree, no replacement required
163A	12719 Memorial	27" Pine	Private tree	Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence, Clearance prune

Tree No.	Location	Description	Comments	Treatment
164	12719 Memorial	28" Pine	Private tree	Root prune for plug, Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence, Clearance prune
165	Not available	23" Pine	Private tree, not impacted	
166	Not available	17" Magnolia	30% dieback, Private tree	Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence, Clearance prune
167	Not available	24" Pine	Ordinance tree	Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence
168	Not available	29" Pine	Heart rot burls, Private tree, Fair condition	Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence
169	Not available	23" Pine	Thin canopy, Private tree, Fair condition	Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence
170	12707 Memorial	18" Water Oak	Private tree	Root prune for street light base & drive, Fence, Clearance prune
171	12707 Memorial	14" Water Oak	Suppressed, Private tree	Root prune for drive, Fence, Clearance prune
172	12707 Memorial	20" Pine	Remove for fill, Ordinance tree	Remove tree, Provide 20" replacement
173	12707 Memorial	15" Pine	Remove for fill, Ordinance tree	Remove tree, Provide 15" replacement
174	12707 Memorial	6" Pine	Ordinance tree	Fence
175	12707 Memorial	5' Palm	Not ordinance tree	
176	12707 Memorial	25" Pine	Ordinance tree	Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence
177	12703 Memorial	25' Palm	Not ordinance tree	
178	12703 Memorial	5' Palm	Not ordinance tree	
179	12703 Memorial	18' Palm	Not ordinance tree	
180	12703 Memorial	25' Palm	Not ordinance tree	
181	12703 Memorial	15' Palm	Not ordinance tree	
182	12726 Memorial	15" Little Gem Magnolia	Utility pruned, Private tree	Root prune for walk and water fitting, Clearance prune
183	12726 Memorial	10" Crepe Myrtle	Behind brick wall, Private, Not impacted	
184	12726 Memorial	20" Pine	Behind brick wall, Private, Not impacted	
185	12726 Memorial	28" Water Oak	Behind brick wall, Private, Not impacted	
186	12726 Memorial	25" American Elm	Trunk decay, Topped by utility, Structurally compromised, remove for safety	Remove tree, no replacement required
187	12726 Memorial	17" Tallow	Not ordinance tree, Remove for walk	Remove tree, no replacement required
188	12726 Memorial	16" Pecan	Utility pruned, Private tree	Root prune for walk, Clearance prune
193	12703 Memorial	15' Palm	Not ordinance tree	
194	12703 Memorial	10' Palm	Not ordinance tree	
195	12703 Memorial	15' Palm	Not ordinance tree	
196	12699 Memorial	10" Live Oak	Girdled by cable, Topped by utility, Ordinance tree	Root prune for street and walk, Fence, Clearance prune
197	12699 Memorial	11" Live Oak	Ordinance tree, Remove for ADA walk	Remove tree, Provide 11" replacement
198	12699 Memorial	9" Live Oak	Ordinance tree, Remove for ADA walk	Remove tree, Provide 9" replacement

TREE PRESERVATION PLAN LEGEND

- TREE NUMBER/LOCATION
- (1) TREE TO BE REMOVED
- TREE PROTECTION FENCE
- ROOT PRUNING TRENCH
- DEMO–FORM–POUR WITHOUT DAMAGE TO ROOTS 1" OR LARGER

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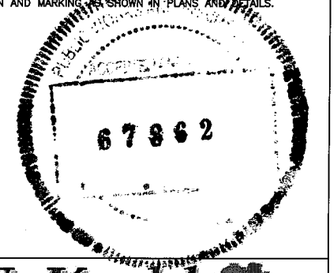

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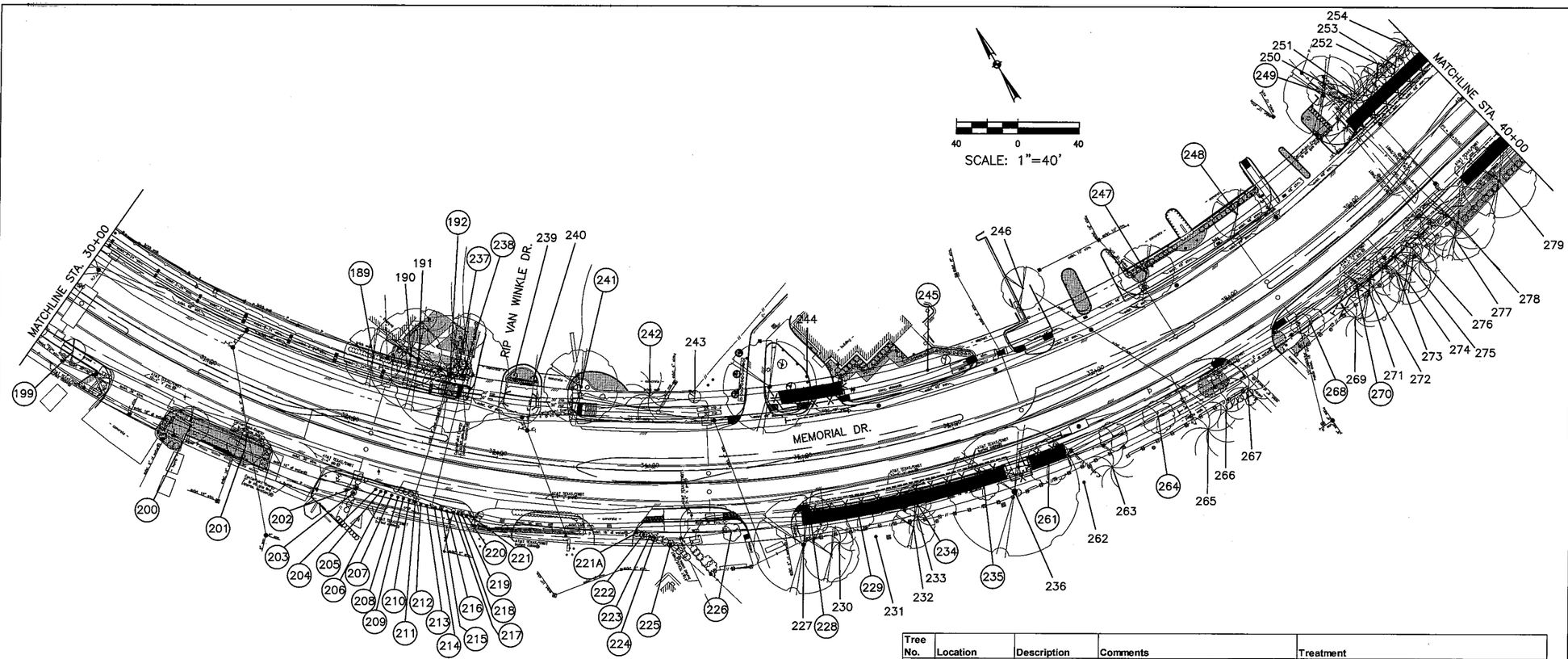
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

TREE PROTECTION PLAN
SHEET 3 OF 8

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	412

Plotted on: $USER$ $TIME$ $DATE$
Pen Table: $PENTBL$
Plot Driver: $PLTDRVL$
Design Filename: $FILE1$



Tree No.	Location	Description	Comments	Treatment
189	12726 Memorial	13" Pecan	Remove for RCP removal, Topped, Poor, Ordinance tree	Remove tree, no replacement required
190	12726 Memorial	15" Green Ash	Utility pruned, Private tree	Root prune for RCP removal, Fence, Clearance prune
191	12726 Memorial	26" Post Oak	Utility pruned, Private tree	Root prune for RCP removal, Fence, Clearance prune
192	12726 Memorial	19" Pine	Remove for RCP removal, Topped, Poor, Ordinance tree	Remove tree, Provide 19" replacement
193	12703 Memorial	15' Palm	Not ordinance tree	
194	12703 Memorial	10' Palm	Not ordinance tree	
195	12703 Memorial	15' Palm	Not ordinance tree	
196	12699 Memorial	10" Live Oak	Girdled by cable, Topped by utility, Ordinance tree	Root prune for street and walk, Fence, Clearance prune
197	12699 Memorial	11" Live Oak	Ordinance tree, Remove for ADA walk	Remove tree, Provide 11" replacement
198	12699 Memorial	9" Live Oak	Ordinance tree, Remove for ADA walk	Remove tree, Provide 9" replacement
199	12699 Memorial	10" Live Oak	Ordinance tree, Remove for ADA walk	Remove tree, Provide 10" replacement
200	12651 Memorial	13" Live Oak	Ordinance tree, Remove for ADA walk	Remove tree, Provide 13" replacement
201	12651 Memorial	12" Live Oak	Ordinance tree, Remove for ADA walk	Remove tree, Provide 12" replacement
202	12645 Memorial	5" Ligustrum	Not ordinance tree, Remove for walk	Remove tree, no replacement required
203	12645 Memorial	5" Ligustrum	Not ordinance tree, Remove for walk	Remove tree, no replacement required
204	12645 Memorial	5" Ligustrum	Not ordinance tree, Remove for walk	Remove tree, no replacement required
205	12645 Memorial	5" Ligustrum	Not ordinance tree, Remove for walk	Remove tree, no replacement required
206	12645 Memorial	5" Ligustrum	Not ordinance tree, Remove for walk	Remove tree, no replacement required
207	12645 Memorial	5" Ligustrum	Not ordinance tree, Remove for walk	Remove tree, no replacement required
208	12645 Memorial	5" Ligustrum	Not ordinance tree, Remove for walk	Remove tree, no replacement required
209	12645 Memorial	5" Ligustrum	Not ordinance tree, Remove for walk	Remove tree, no replacement required
210	12645 Memorial	5" Ligustrum	Not ordinance tree, Remove for walk	Remove tree, no replacement required
211	12645 Memorial	5" Ligustrum	Not ordinance tree, Remove for walk	Remove tree, no replacement required
212	12645 Memorial	5" Ligustrum	Not ordinance tree, Remove for walk	Remove tree, no replacement required
213	12645 Memorial	5" Ligustrum	Not ordinance tree, Remove for walk	Remove tree, no replacement required
214	12645 Memorial	5" Ligustrum	Not ordinance tree, Remove for walk	Remove tree, no replacement required
215	12645 Memorial	5" Ligustrum	Not ordinance tree, Remove for walk	Remove tree, no replacement required
216	12645 Memorial	5" Ligustrum	Not ordinance tree, Remove for walk	Remove tree, no replacement required
217	12645 Memorial	5" Ligustrum	Not ordinance tree, Remove for walk	Remove tree, no replacement required
218	12645 Memorial	5" Ligustrum	Not ordinance tree, Remove for walk	Remove tree, no replacement required
219	12645 Memorial	5" Ligustrum	Not ordinance tree, Remove for walk	Remove tree, no replacement required
220	12645 Memorial	5" Ligustrum	Not ordinance tree, Remove for walk	Remove tree, no replacement required
221	12645 Memorial	5" Ligustrum	Not ordinance tree, Remove for walk	Remove tree, no replacement required
221A	12645 Memorial	4" Ligustrum	Not ordinance tree, Remove for walk	Remove tree, no replacement required
222	12645 Memorial	4" Ligustrum	Not ordinance tree, Remove for walk	Remove tree, no replacement required
223	12645 Memorial	4" Ligustrum	Not ordinance tree, Remove for walk	Remove tree, no replacement required
224	12645 Memorial	4" Ligustrum	Not ordinance tree, Remove for walk	Remove tree, no replacement required
225	12645 Memorial	4" Ligustrum	Not ordinance tree, Remove for walk	Remove tree, no replacement required
226	12633 Memorial	10" Crepe Myrtle	Not ordinance tree, Remove for walk	Remove tree, no replacement required
227	12633 Memorial	25" Water Oak	Utility pruned, Private tree	Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence
228	12633 Memorial	10" Crepe Myrtle	Not ordinance tree, Remove for walk	Remove tree, no replacement required
229	12633 Memorial	7" Crepe Myrtle	Not ordinance tree, Remove for walk	Remove tree, no replacement required
230	12633 Memorial	16" Pine	Utility pruned, Private tree	Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence
231	12633 Memorial	11" Pine	Utility pruned, Private tree	Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence
232	12633 Memorial	15" Southern Red Oak	Utility pruned, Private tree	Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence
233	12633 Memorial	14" Pine	Utility pruned, Private tree	Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence
234	12633 Memorial	9" Crepe Myrtle	Not ordinance tree, Remove for walk	Remove tree, no replacement required
235	12633 Memorial	9" Crepe Myrtle	Not ordinance tree, Remove for walk	Remove tree, no replacement required
236	12633 Memorial	43" Cottonwood	Trunk cavity, Private owner needs to monitor for structural integrity, Utility pruned, Private tree	Root prune for plug, Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence, Clearance prune

Tree No.	Location	Description	Comments	Treatment
237	12726 Memorial	14" Pine	Heart rot, Leaning to street, Remove for safety concerns	Remove tree, no replacement required
238	12726 Memorial	33" Water Oak	Remove for RCP removal, Ordinance tree	Remove tree, Provide 33" replacement
239	12726 Memorial	5" Blueberry	In planter, Not ordinance tree, Not impacted	
240	12726 Memorial	5" Blueberry	In planter, Not ordinance tree, Not impacted	
241	12726 Memorial	17" Magnolia	Remove for storm, Ordinance tree	Remove tree, Provide 17" replacement
242	12726 Memorial	21" Pine	Chlorotic, Thin canopy, Ordinance tree, Remove for storm	Remove tree, Provide 21" replacement
243	12726 Memorial	8" Sugarberry	Not ordinance tree	Clearance prune
244	Prosperity Bank	27" American Elm	Impacts from bank and drive construction, 20% dieback, Private tree	Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence, Clearance prune
245	Prosperity Bank	3" Slender Silhouette Sweetgum	Ordinance tree, Remove for ADA walk	Remove tree, Provide 3" replacement
246	12600 Memorial	13" Live Oak	Private tree, not impacted	
247	12600 Memorial	17" Live Oak	Ordinance tree, Remove for ADA walk	Remove tree, Provide 17" replacement
248	12600 Memorial	16" Live Oak	Ordinance tree, Remove for ADA walk	Remove tree, Provide 16" replacement
249	Not available	18" Pine	Sweeps in trunk, Leaning to street, Remove for safety concerns	Remove tree, no replacement required
250	Not available	18" Pine	Ordinance tree	Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence
251	Not available	17" Pine	Ordinance tree	Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence
252	Not available	9" Ligustrum	Not ordinance tree	Clearance prune
253	Not available	9" Ligustrum	Not ordinance tree	Clearance prune
254	Not available	18" Pine	Ordinance tree	Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence
255	Not available	18" Pine	Ordinance tree	Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence
256	Not available	20" Pine	Ordinance tree	Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence
257	Not available	9" Redbud	Not ordinance tree	
258	Not available	16" Pine	Ordinance tree	Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence
259	Not available	16" Pine	Ordinance tree	Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence
260	Not available	14" Pine	Ordinance tree	Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence
261	12633 Memorial	11" Crepe Myrtle	Not ordinance tree, Remove for walk	Remove tree, no replacement required
262	12633 Memorial	15" Pine	Private tree, not impacted	
263	12633 Memorial	25" Pine	Heart rot burls, Private tree, Fair condition	Root prune for walk
264	12633 Memorial	11" Crepe Myrtle	Not ordinance tree, Remove for walk	Remove tree, no replacement required
265	12633 Memorial	33" Pine	Private tree	Root prune for walk
266	12633 Memorial	15" Pine	Utility pruned, Private tree	Root prune for walk
267	12633 Memorial	17" Pine	Utility pruned, Private tree	Root prune for walk
268	12633 Memorial	9" Crepe Myrtle	Not ordinance tree, Remove for walk	Remove tree, no replacement required
269	12633 Memorial	18" Pine	Utility pruned, Private tree	Fence, Root prune for walk
270	12633 Memorial	10" Crepe Myrtle	Not ordinance tree, Remove for walk	Remove tree, no replacement required
271	12633 Memorial	14" Water Oak	80% dead, Hypoxylon on trunk, Poor, Private tree	
272	12633 Memorial	15" Pine	Utility pruned, Ordinance tree	Fence, Root prune for walk
273	12633 Memorial	22" Pine	Utility pruned, Ordinance tree	Fence, Root prune for walk
274	12633 Memorial	16" Water Oak	Utility pruned, Private tree	Fence, Root prune for walk
275	12633 Memorial	7" Crepe Myrtle	Private tree	
276	12633 Memorial	19" Pine	Heart rot burls, Private tree, Fair condition	Fence, Root prune for walk
277	12633 Memorial	25" Pine	Utility pruned, Private tree	Fence, Root prune for walk
278	12633 Memorial	20" Water Oak	Utility pruned, Private tree	Root prune for walk, Fence, Clearance prune
279	12625 Memorial	21" Water Oak	Utility pruned, Private tree	Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence, Clearance prune

TREE PRESERVATION PLAN LEGEND

- 1 — TREE NUMBER/LOCATION
- (1) — TREE TO BE REMOVED
- -X-X- — TREE PROTECTION FENCE
- ----- — ROOT PRUNING TRENCH
- ■ — DEMO-FORM-POUR WITHOUT DAMAGE TO ROOTS 1" OR LARGER

NOTE:
1. THIS TREE PROTECTION PLAN WAS DEVELOPED WITH INFORMATION PROVIDED BY DESIGN ENGINEER IN DRAWINGS DATED JUNE 2019. THE PLAN CONSIDERS ALL FITTINGS, VERTICAL OFFSETS AND AREAS OF NECESSARY EXCAVATION. CHANGES MADE TO DESIGN MAY COMPROMISE THE TREE PROTECTION PLAN. REFER TO TREE PROTECTION PLAN SHEET 8 OF 8. CONDITION OF EACH TREE IS BASED ON VISUAL EVALUATION AT TIME OF DESIGN. CONDITION AND STRUCTURAL INTEGRITY OF EACH TREE IS NOT GUARANTEED BY DESIGNER AT ANY POINT IN THE FUTURE, AS ENVIRONMENTAL AND MAINTENANCE INFLUENCES ON EACH TREE CAN NOT BE DETERMINED BY DESIGNER.
2. IN AREAS WHERE INDIVIDUAL TREES HAVE NOT BEEN TIED IN BY SURVEY APPROXIMATE LOCATION IS INDICATED ON TPP. ACCURACY OF REPRESENTED LOCATION CANT, AND IS NOT GUARANTEED BY DESIGNER.
3. MARK ALL TREES FOR REMOVAL, OR PROTECTION, OR TREATMENTS FOR APPROVAL BY TXDOT LANDSCAPE ARCHITECT PRIOR TO WORK.
4. CONTRACTOR IS RESPONSIBLE FOR [illegible], ROOT PRUNING, PROTECTION AND MARKING AS SHOWN IN PLANS AND DETAILS.

67862

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APPROVED: Craig N. Koehl 12-05-2019

REV. NO.	DATE	DESCRIPTION	BY

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

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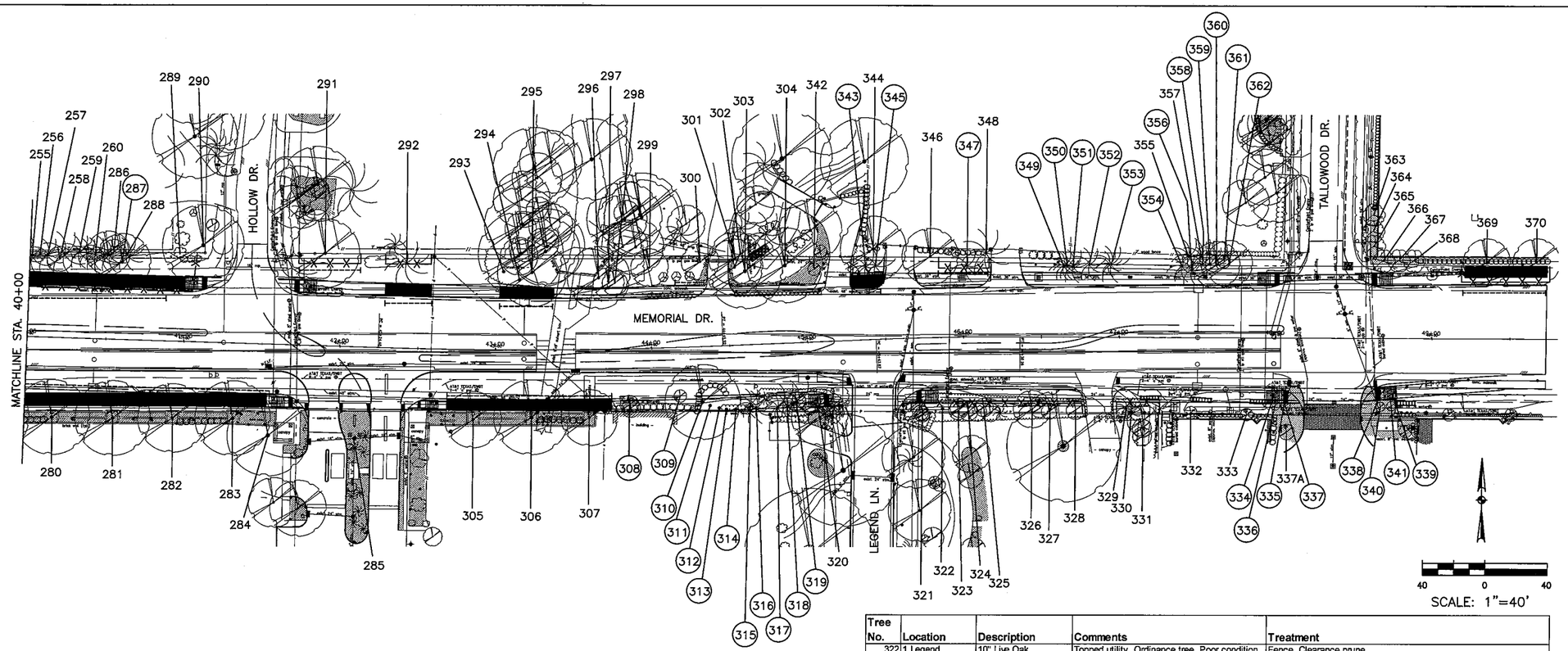
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

TREE PROTECTION PLAN SHEET 4 OF 8

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	413

Plotted on: $USER$ $TIME$ $DATE$
Pen Table: $PENTBLS$
Plot Driver: $PLTDRVL$
Design Filename: $FILEL$



Tree No.	Location	Description	Comments	Treatment
255	Not available	18" Pine	Ordinance tree	Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence
256	Not available	20" Pine	Ordinance tree	Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence
257	Not available	9" Redbud	Not ordinance tree, Remove for walk	Remove tree, no replacement required
258	Not available	16" Pine	Ordinance tree	Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence
259	Not available	16" Pine	Ordinance tree	Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence
260	Not available	14" Pine	Ordinance tree	Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence
280	12625 Memorial	16" Water Oak	Utility pruned, Private tree	Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence, Clearance prune
281	12625 Memorial	18" Water Oak	Utility pruned, Private tree	Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence, Clearance prune
282	12625 Memorial	17" Water Oak	Utility pruned, Private tree	Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence, Clearance prune
283	12625 Memorial	17" Water Oak	Utility pruned, Private tree	Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence, Clearance prune
284	12625 Memorial	22" Water Oak	Utility pruned, Private tree, not impacted	
285	12625 Memorial	10" Pine	Private tree, not impacted	
286	Not available	15" Pine	Ordinance tree	Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence, Clearance prune
287	Not available	14" Sugarberry	Leaning to street, Not ordinance tree, Remove for safety concerns	Remove tree, no replacement required
288	Not available	15" Pine	Ordinance tree	Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence, Clearance prune
289	Not available	10" Oleander	Not ordinance tree	Clearance prune
290	Not available	15" Sugarberry	Dying, Poor, Private tree, Not impacted	
291	Not available	17" Sugarberry	Private tree	Root prune for walk, Fence, Clearance prune
292	Not available	19" Pine	Ordinance tree	Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence, Clearance prune
293	Not available	9" Ligustrum	Not ordinance tree	Clearance prune
294	Not available	9" Ligustrum	Not ordinance tree	Clearance prune
295	Not available	19" Shumard Oak	Ordinance tree	Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence, Clearance prune
296	Not available	16" Sycamore	In ditch, Not ordinance tree	Clearance prune
297	Not available	11" Sycamore	In ditch, Not ordinance tree	Clearance prune
298	Not available	10" Sycamore	In ditch, Not ordinance tree	Clearance prune
299	Not available	13" Sugarberry	In ditch, Not ordinance tree	Clearance prune
300	Not available	13" Sycamore	Private tree	Root prune for sidewalk
301	Not available	14" Sycamore	Not ordinance tree	
302	Not available	13" Sycamore	Not ordinance tree	
303	Not available	12" Sugarberry	Topped, Not ordinance tree	
304	Not available	22" Green Ash	In ditch, Ordinance tree	Clearance prune
305	12625 Memorial	15" Water Oak	Topped, Private tree	Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence
306	12625 Memorial	20" Water Oak	Topped, Private tree	Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence
307	12625 Memorial	17" Water Oak	Topped, Private tree	Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence
308	2 Legend	10" Yaupon	Not ordinance tree, Remove for walk	Remove tree, no replacement required
309	2 Legend	6" Shumard Oak	Ordinance tree, Remove for ADA walk	Remove tree, Provide 6" replacement
310	2 Legend	19" Green Ash	Ordinance tree, Remove for ADA walk	Remove tree, Provide 19" replacement
311	2 Legend	11" Pine	Ordinance tree, Remove for ADA walk	Remove tree, Provide 11" replacement
312	2 Legend	12" Pine	Ordinance tree, Remove for ADA walk	Remove tree, Provide 12" replacement
313	2 Legend	15" Green Ash	Ordinance tree, Remove for ADA walk	Remove tree, Provide 15" replacement
314	2 Legend	10" Pine	Ordinance tree, Remove for ADA walk	Remove tree, Provide 10" replacement
315	2 Legend	16" Pine	Ordinance tree, Remove for ADA walk	Remove tree, Provide 16" replacement
316	2 Legend	10" Pine	Ordinance tree, Remove for ADA walk	Remove tree, Provide 10" replacement
317	2 Legend	24" Pine	Ordinance tree, Remove for ADA walk	Remove tree, Provide 24" replacement
318	2 Legend	7" Pine	Ordinance tree, Remove for ADA walk	Remove tree, Provide 7" replacement
319	2 Legend	5" Water Oak	Dead, Ordinance tree, Remove for walk	Remove tree, no replacement required
320	2 Legend	11" Cherrylaurel	Private tree	Clearance prune
321	1 Legend	13" Cherrylaurel	Topped, Private tree, Poor, Not impacted	
322	1 Legend	10" Live Oak	Topped utility, Ordinance tree, Poor condition	Fence, Clearance prune
323	1 Legend	9" Live Oak	Topped utility, Ordinance tree, Poor condition	Fence, Clearance prune
324	1 Legend	8" Water Oak	Topped utility, Ordinance tree, Poor condition	Fence, Clearance prune
325	1 Legend	7" Sugarberry	Topped utility, Not ordinance tree	Fence, Clearance prune
326	1 Legend	10" Sawtooth Oak	Topped utility, Ordinance tree, Poor condition	Fence, Clearance prune
327	1 Legend	5" Shumard Oak	Topped utility, Ordinance tree, Poor condition	Fence, Clearance prune
328	1 Legend	5" Citrus	Topped utility, Not ordinance tree	Fence, Clearance prune
329	1 Legend	11" Pine	Topped utility, Ordinance tree, Poor condition	Fence, Clearance prune
330	1 Legend	9" Pine	Topped utility, Ordinance tree, Poor condition	Fence, Clearance prune
331	1 Legend	10" Live Oak	Topped utility, Ordinance tree, Poor condition	Fence, Clearance prune
332	12545 Memorial	4" Mexican Sycamore	Under powerlines, Private tree, Not impacted	
333	12545 Memorial	4" Mexican Sycamore	Under powerlines, Private tree, Not impacted	
334	12545 Memorial	3" Bottlebrush	Not ordinance tree, Remove for walk	Remove tree, no replacement required
335	12545 Memorial	3" Bottlebrush	Not ordinance tree, Remove for walk	Remove tree, no replacement required
336	12545 Memorial	3" Bottlebrush	Not ordinance tree, Remove for walk	Remove tree, no replacement required
337	12545 Memorial	3" Bottlebrush	Not ordinance tree, Remove for walk	Remove tree, no replacement required
337A	12545 Memorial	5" Live Oak	Private tree, not impacted	
338	12545 Memorial	3" Bottlebrush	Not ordinance tree, Remove for walk	Remove tree, no replacement required
339	12545 Memorial	3" Bottlebrush	Not ordinance tree, Remove for walk	Remove tree, no replacement required
340	12545 Memorial	3" Bottlebrush	Not ordinance tree, Remove for walk	Remove tree, no replacement required
341	12545 Memorial	3" Bottlebrush	Not ordinance tree, Remove for walk	Remove tree, no replacement required
342	12568 Memorial	3" Crepe Myrtle	Not ordinance tree	
343	12568 Memorial	14" Pine	Remove for street light, Ordinance tree	Remove tree, Provide 14" replacement
344	12564 Memorial	15" Green Ash	Private tree	Root prune for RCP removal, Fence, Clearance prune
345	12564 Memorial	17" Pine	Remove for street light, Ordinance tree	Remove tree, Provide 17" replacement
346	12564 Memorial	Tree removed		
347	12564 Memorial	13" Pine	Remove for RCP removal, Ordinance tree	Remove tree, Provide 13" replacement
348	12564 Memorial	22" Pine	Private tree	Root prune for RCP removal, Fence, Clearance prune
349	12564 Memorial	13" Pine	Remove for RCP removal, Ordinance tree	Remove tree, Provide 13" replacement
350	12564 Memorial	11" Pine	Remove for RCP removal, Ordinance tree	Remove tree, Provide 11" replacement
351	12564 Memorial	14" Pine	Remove for RCP removal, Ordinance tree	Remove tree, Provide 14" replacement
352	12564 Memorial	17" Pine	Remove for RCP removal, Ordinance tree	Remove tree, Provide 17" replacement
353	12564 Memorial	22" Pine	Remove for RCP removal, Ordinance tree	Remove tree, Provide 22" replacement
354	12564 Memorial	14" Pine	Remove for RCP removal, Ordinance tree	Remove tree, Provide 14" replacement
355	12564 Memorial	15" Pine	Private tree	Root prune for RCP removal, Fence, Clearance prune
356	12564 Memorial	11" Pine	Remove for RCP removal, Ordinance tree	Remove tree, Provide 11" replacement
357	12564 Memorial	15" Pine	Private tree	Root prune for RCP removal, Fence, Clearance prune
358	12564 Memorial	12" Pine	Remove for RCP removal, Ordinance tree	Remove tree, Provide 12" replacement
359	12564 Memorial	11" Pine	Remove for RCP removal, Ordinance tree	Remove tree, Provide 11" replacement
360	12564 Memorial	11" Post Oak	Remove for RCP removal, Ordinance tree	Remove tree, Provide 11" replacement
361	12564 Memorial	5" Post Oak	Remove for RCP removal, Ordinance tree	Remove tree, Provide 5" replacement
362	12564 Memorial	15" Post Oak	Remove for RCP removal, Ordinance tree	Remove tree, Provide 15" replacement
363	12534 Memorial	10" Crepe Myrtle	Not ordinance tree	
364	12534 Memorial	10" Crepe Myrtle	Not ordinance tree	
365	12534 Memorial	10" Crepe Myrtle	Not ordinance tree	
366	12534 Memorial	10" Crepe Myrtle	Not ordinance tree	Clearance prune
367	12534 Memorial	10" Crepe Myrtle	Not ordinance tree	Clearance prune
368	12534 Memorial	10" Crepe Myrtle	Not ordinance tree	Clearance prune
369	12534 Memorial	15" Live Oak	Ordinance tree	Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence, Clearance prune
370	12534 Memorial	14" Live Oak	Ordinance tree	Root prune for street, Demo-form-pour walk without damage to tree roots 1" diameter or larger, Fence, Clearance prune

TREE PRESERVATION PLAN LEGEND

- 1 — TREE NUMBER/LOCATION
- (1) — TREE TO BE REMOVED
- X-X — TREE PROTECTION FENCE
- ROOT PRUNING TRENCH
- DEMO-FORM-POUR WITHOUT DAMAGE TO ROOTS 1" OR LARGER

NOTE:
1. THIS TREE PROTECTION PLAN WAS DEVELOPED WITH INFORMATION PROVIDED BY DESIGN ENGINEER IN DRAWINGS DATED JUNE 2019. THE PLAN CONSIDERS ALL FITTINGS, VERTICAL OFFSETS AND AREAS OF NECESSARY EXCAVATION. CHANGES MADE TO DESIGN MAY COMPROMISE THE TREE PROTECTION PLAN. REFER TO TREE PROTECTION PLAN SHEET 8 OF 8. CONDITION OF EACH TREE IS BASED ON VISUAL EVALUATION AT TIME OF DESIGN. CONDITION AND STRUCTURAL INTEGRITY OF EACH TREE IS NOT GUARANTEED BY DESIGNER AT ANY POINT IN THE FUTURE, AS ENVIRONMENTAL AND MAINTENANCE INFLUENCES ON EACH TREE CAN NOT BE DETERMINED BY DESIGNER.
2. IN AREAS WHERE INDIVIDUAL TREES HAVE NOT BEEN TIED IN BY SURVEY APPROXIMATE LOCATION IS INDICATED ON TPP. ACCURACY OF REPRESENTED LOCATION CANT, AND IS NOT GUARANTEED BY DESIGNER.
3. MARK ALL TREES FOR REMOVAL, OR PROTECTION, OR TREATMENTS FOR APPROVAL BY TXDOT LANDSCAPE ARCHITECT PRIOR TO WORK.
4. CONTRACTOR IS RESPONSIBLE FOR CANOPY PRUNING, ROOT PRUNING, PROTECTION AND MARKING AS SHOWN IN PLANS AND DETAILS.

67862

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281-391-0022 ckoehl@koehlurbanforestry.com

APPROVED: Craig N. Koehl 12-05-2019

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

TREE PROTECTION PLAN
SHEET 5 OF 8

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	414

Plotted on: $USER$ $TIME$ $DATE$
Pen Table: $PENTBL$
Plot Driver: $PLTDRVL$
Design Filename: $FILE$

Tree Removal List

Tree No.	Description	Comments	Replacement requirement
1	12860 W Sam Houston N	15" Laurel Oak	15
2	12860 W Sam Houston N	16" Laurel Oak	16
7	Not available	21" Cherrybark Oak	21
18	Not available	27" Pine	27
19	Not available	18" Pine	18
20	Not available	19" Pine	19
22	12847 Memorial	34" Water Oak	34
25	12850 Memorial Dr	15" Live Oak	15
27	12850 Memorial Dr	28" Live Oak	28
39	12839 Memorial Dr	21" American Elm	0
40	12835 Memorial Dr	11" Arborvitae	0
48	12835 Memorial Dr	9" Arborvitae	0
49	12827 Memorial Dr	9" Arborvitae	0
50	12827 Memorial Dr	11" Lacebark Elm	11
57	12819 Memorial Dr	2" Pine	2
58	12819 Memorial Dr	2" Pine	2
59	12819 Memorial Dr	2" Pine	2
98	12763 Memorial	Jasmine Hedge	0
102	12764 Memorial	14" Live Oak	14
109	12755 Memorial	4" Ligustrum	0
110	12751 Memorial	10" Crepe Myrtle	0
111	12751 Memorial	10" Crepe Myrtle	0
112	12751 Memorial	10" Crepe Myrtle	0
113	12751 Memorial	10" Crepe Myrtle	0
114	12751 Memorial	10" Crepe Myrtle	0
115	12751 Memorial	10" Crepe Myrtle	0
116	12751 Memorial	10" Crepe Myrtle	0
117	12751 Memorial	10" Crepe Myrtle	0
118	12751 Memorial	10" Crepe Myrtle	0
119	12747 Memorial	8" Crepe Myrtle	0
120	12747 Memorial	8" Crepe Myrtle	0
121	12747 Memorial	8" Crepe Myrtle	0
122	12747 Memorial	8" Crepe Myrtle	0
123	12747 Memorial	8" Crepe Myrtle	0
124	12747 Memorial	8" Crepe Myrtle	0
125	12747 Memorial	8" Crepe Myrtle	0
126	12747 Memorial	3" Ligustrum	0
129	12739 Memorial	20" Pine	20
130	12739 Memorial	5" Sugarberry	0
131	12739 Memorial	9" Redbud	0
145	12731 Old Oaks	3" Crepe Myrtle	0
146	12731 Old Oaks	3" Crepe Myrtle	0
147	12731 Old Oaks	3" Crepe Myrtle	0
148	12731 Old Oaks	3" Crepe Myrtle	0
149	12731 Old Oaks	3" Crepe Myrtle	0
150	12731 Old Oaks	3" Crepe Myrtle	0
151	12731 Old Oaks	3" Crepe Myrtle	0
153	12727 Memorial	4" Live Oak	4
154	12727 Memorial	3" Redbud	0
162	Not available	10" Crepe Myrtle	0
163	Not available	10" Crepe Myrtle	0
172	12707 Memorial	20" Pine	20
173	12707 Memorial	15" Pine	15
186	12726 Memorial	25" American Elm	0
187	12726 Memorial	17" Tallow	0
189	12726 Memorial	13" Pecan	0
192	12726 Memorial	19" Pine	19
197	12699 Memorial	11" Live Oak	11
198	12699 Memorial	9" Live Oak	9
199	12699 Memorial	10" Live Oak	10
200	12651 Memorial	13" Live Oak	13
201	12651 Memorial	12" Live Oak	12
202	12645 Memorial	5" Ligustrum	0
203	12645 Memorial	5" Ligustrum	0
204	12645 Memorial	5" Ligustrum	0
205	12645 Memorial	5" Ligustrum	0
206	12645 Memorial	5" Ligustrum	0
207	12645 Memorial	5" Ligustrum	0
208	12645 Memorial	5" Ligustrum	0
209	12645 Memorial	5" Ligustrum	0
210	12645 Memorial	5" Ligustrum	0
211	12645 Memorial	5" Ligustrum	0
212	12645 Memorial	5" Ligustrum	0

Tree Removal List

Tree No.	Description	Comments	Replacement requirement
213	12645 Memorial	5" Ligustrum	0
214	12645 Memorial	5" Ligustrum	0
215	12645 Memorial	5" Ligustrum	0
216	12645 Memorial	5" Ligustrum	0
217	12645 Memorial	5" Ligustrum	0
218	12645 Memorial	5" Ligustrum	0
219	12645 Memorial	5" Ligustrum	0
220	12645 Memorial	5" Ligustrum	0
221	12645 Memorial	5" Ligustrum	0
221A	12645 Memorial	4" Ligustrum	0
222	12645 Memorial	4" Ligustrum	0
223	12645 Memorial	4" Ligustrum	0
224	12645 Memorial	4" Ligustrum	0
225	12645 Memorial	4" Ligustrum	0
226	12633 Memorial	10" Crepe Myrtle	0
228	12633 Memorial	10" Crepe Myrtle	0
229	12633 Memorial	7" Crepe Myrtle	0
234	12633 Memorial	9" Crepe Myrtle	0
235	12633 Memorial	9" Crepe Myrtle	0
237	12726 Memorial	14" Pine	0
238	12726 Memorial	33" Water Oak	33
241	12726 Memorial	17" Magnolia	17
242	12726 Memorial	21" Pine	21
245	Prosperity Bank	3" Slender Silhouette Sweetgum	3
247	12600 Memorial	17" Live Oak	17
248	12600 Memorial	16" Live Oak	16
249	Not available	18" Pine	0
261	12633 Memorial	11" Crepe Myrtle	0
264	12633 Memorial	11" Crepe Myrtle	0
268	12633 Memorial	9" Crepe Myrtle	0
270	12633 Memorial	10" Crepe Myrtle	0
287	Not available	14" Sugarberry	0
308	2 Legend	10" Yaupon	0
309	2 Legend	6" Shumard Oak	6
310	2 Legend	19" Green Ash	19
311	2 Legend	11" Pine	11
312	2 Legend	12" Pine	12
313	2 Legend	15" Green Ash	15
314	2 Legend	10" Pine	10
315	2 Legend	16" Pine	16
316	2 Legend	10" Pine	10
317	2 Legend	24" Pine	24
318	2 Legend	7" Pine	7
319	2 Legend	5" Water Oak	0
334	12545 Memorial	3" Bottlebrush	0
335	12545 Memorial	3" Bottlebrush	0
336	12545 Memorial	3" Bottlebrush	0
337	12545 Memorial	3" Bottlebrush	0
338	12545 Memorial	3" Bottlebrush	0
339	12545 Memorial	3" Bottlebrush	0
340	12545 Memorial	3" Bottlebrush	0
341	12545 Memorial	3" Bottlebrush	0
343	12568 Memorial	14" Pine	14
345	12564 Memorial	17" Pine	17
347	12564 Memorial	13" Pine	13
349	12564 Memorial	13" Pine	13
350	12564 Memorial	11" Pine	11
351	12564 Memorial	14" Pine	14
352	12564 Memorial	17" Pine	17
353	12564 Memorial	22" Pine	22
354	12564 Memorial	14" Pine	14
356	12564 Memorial	11" Pine	11
358	12564 Memorial	12" Pine	12
359	12564 Memorial	11" Pine	11
360	12564 Memorial	11" Post Oak	11
361	12564 Memorial	5" Post Oak	5
362	12564 Memorial	15" Post Oak	15
		TOTAL REPLACEMENT INCHES REQUIRED	**763**

Tree Replacement List

Quantity	Caliper Size	Species	Container/Tree Spade size
		Refer Landscape Architect drawings for replacement plantings	
		TOTAL REPLACEMENT INCHES INCLUDED IN PLAN	**0**

NOTE: Tree replacement locations shown on plans must be coordinated with adjacent property owner and City of Houston Urban Forestry and PWE prior to PURCHASING trees and excavation for planting. Coordination shall be completed by construction contractor's Certified Arborist. Trees to be maintained and watered for 2 years following planting per standard spec 02915. Timing of planting may be delayed in periods of drought with mandatory water restrictions in place–timing to be coordinated with City of Houston Urban Forestry. Trees in esplanade groupings to be planted in common bed with 4" of hardwood mulch between trees.

PUBLIC WORKS ACCEPTED 67862

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281-391-0022 ckoehl@koehlurbanforestry.com

APPROVED: Craig N. Koehl 12-05-2019

REV. NO.	DATE	DESCRIPTION	BY

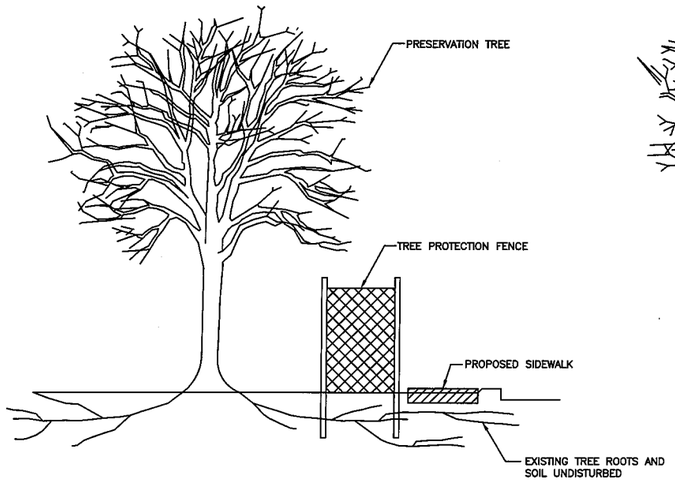
Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY
FIRM REGISTATION NO. 2614

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

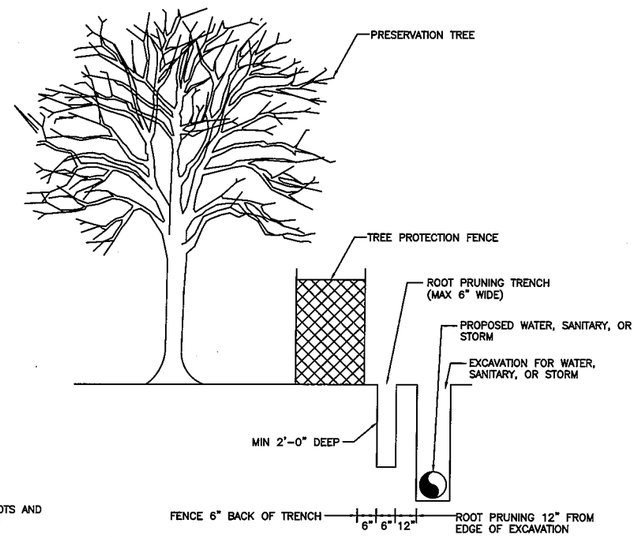
TREE PROTECTION PLAN
SHEET 6 OF 8

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	415

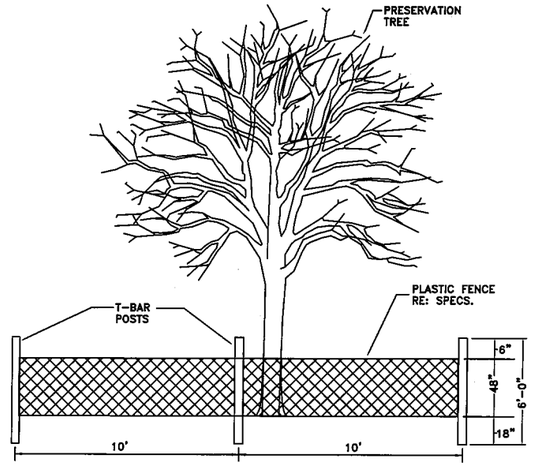
Plotted on: $USER$ $TIME$ $DATE$
Pen Table: $PENTBL$
Plot Driver: $PLTDRVL$
Design Filename: $FILE$



DEMO-FORM-POUR WALK WITHOUT DAMAGE TO ROOTS
NOT TO SCALE

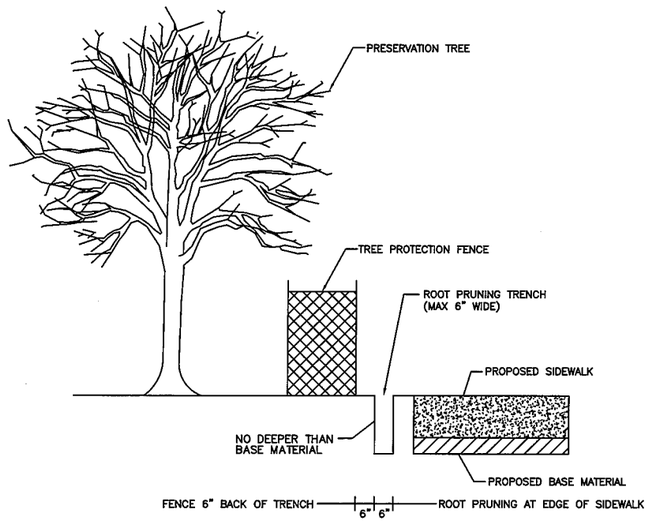


ROOT PRUNE FOR WATER, SANITARY, OR STORM LINE
NOT TO SCALE

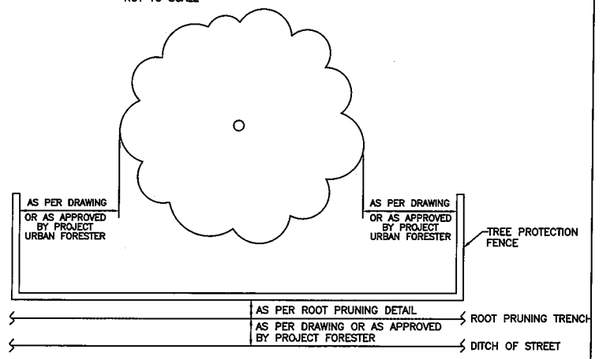


TREE PROTECTION FENCING DETAIL A
NOT TO SCALE

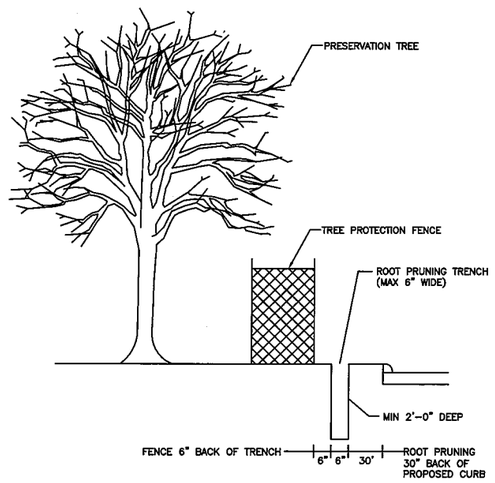
NOTES:
1. SEE SUMMARY SHEET FOR ESTIMATED QUANTITIES. INFORMATION IS FOR CONTRACTOR'S INFORMATION ONLY.
2. TREE PROTECTION, CANOPY PRUNING, ROOT PRUNING, FENCING, AND RELATED WORK IS SUBSIDIARY TO ITEM 100 AND IS NOT PAID SEPARATELY.



ROOT PRUNE FOR SIDEWALK
NOT TO SCALE



TREE PROTECTION FENCING DETAIL B
NOT TO SCALE



ROOT PRUNE FOR STREET-CURB & GUTTER - NO 0CC
NOT TO SCALE

67862

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APPROVED: Craig N. Koehl 12-05-2019

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

TREE PROTECTION PLAN
SHEET 7 OF 8

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	416

Plotted on: $USER$ $TIME$ $DATE$
Pen Table: $PENTBLS$
Plot Driver: $PLTDRVL$
Design Filename: $FILEL$

TREE PROTECTION

PART 1 - GENERAL

1.01 PROJECT CONDITIONS

A. Preserve and protect existing trees and plants to remain from foliage, branch, trunk, or root damage that could result from construction operations.

B. Prevent following types of damage:

1. Compaction of root zone by foot or vehicular traffic, or material storage.
2. Trunk damage from equipment operations, material storage, or from nailing or bolting.
3. Trunk and branch damage caused by ropes or guy wires.
4. Root or soil contamination from spilled solvents, gasoline, paint, lime slurry, and other noxious materials.
5. Branch damage due to improper pruning or trimming.
6. Damage from lack of water due to:
   a. Cutting or altering natural water migration patterns near root zones.
   b. Failure to provide adequate watering.
7. Damage from alteration of soil pH caused by depositing lime, concrete, plaster, or other base materials near root zones.
8. Cutting of roots larger than one inch in diameter not called out to be pruned with root pruning in the Tree Protection Plan.

1.02 DAMAGE ASSESSMENT

A. When trees other than those designated for removal are destroyed or damaged as a result of construction operations, remove and replace with same size, species, and variety up to and including 8 inches in trunk diameter. Trees larger than 8 inches in diameter shall be replaced with an 8 inch diameter tree of the same species and variety and total contract amount will be reduced by an amount determined from the following formula: 0.7854 x D2 x $125.00 where D is diameter in inches of tree or shrub trunk measured 12 inches above grade for that portion of the tree which is greater than 8 inches in diameter. A permit must be applied for and approved by City of Houston Forestry prior to removal of any tree not scheduled for removal in the tree treatment schedule.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Pruning Paint: Black latex, water-based paint, free of all petroleum products.

B. Fertilizer/Root stimulant: Root stimulant shall be a root stimulant that contains at a minimum the following ingredients: Ectomycorrhizal Fungi, VA Mycorrhizal (VAM) Fungi, *Rhizosphere Bacillus spp.,* Kelp Meal, Humic Acid, and Soluble Yucca. Fertilizer shall be Davey ArborGreen.

C. Tree Protection Fencing: Orange, plastic mesh fencing, 4 feet in height with 6 feet high "T" posts installed 10 feet on centers as per drawings.

D. Plastic Root/Soil Protection: Clear polyethylene sheeting, minimum 6 mil. thickness.

E. Sandy Loam Backfill: a loam consisting of less than 7 percent clay, less than 50 percent silt, and between 43 and 50 percent sand

PART 3 - EXECUTION

3.01 PROTECTION OF EXISTING TREES AND SHRUBS

A. Site preparation work and/or construction work shall not begin in any area where tree preservation measures have not been completed and approved by City of Houston and/or TXDOT.

B. Protect exposed roots and root zone areas from contamination from stabilization materials and concrete using plastic root/soil protection (polyethylene).

C. Cover exposed roots within 4 hours to reduce damage caused by desiccation. Roots may be covered with soil, mulch, polyethylene, or wet burlap to help protect them from drying.

D. Designate limited areas as concrete washout areas. Locate concrete washout areas away from root zones.

E. 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 6" from tree side edge of sidewalk for trees called out for root pruning for sidewalk, 30" back of proposed curb for trees called out for root prune for street, 12" from edge of excavation for trees called out for root pruning for storm, water or other utility. 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 the City of Houston and/or TXDOT prior to installation. 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, and minimum of 24" deep in all other locations. All roots shall be cut by trencher, chainsaw, or handsaw to the specified depth. Roots shall be cut cleanly, and 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.

F. Install tree protection fencing around each tree to be preserved as indicated in the tree treatment schedule and on the tree protection plan.

1. Each tree to be preserved shall be protected with a tree protection fence. The fencing shall be continuous between posts, shall be pulled taut prior to securing to posts, and shall be firmly attached to the posts with a minimum of 4 wire ties.
2. All tree protection fencing shall be installed prior to site work or construction activity. The fence shall be placed in a continuous alignment as shown on the tree protection plan. Fences shown on tree protection plan are drawn to scale and shall be installed as drawn, in the field. In general, fences shall be placed 12" back of proposed sidewalk edge, 36" back of proposed curb, and 24" back of excavation for storm, water or other utility. Exact locations shall be approved by the City of Houston and/or TXDOT in the field. The Fences shall be placed to protect roots, trunks, and foliage. The contractor shall not remove or relocate tree protection fencing and shall not operate within the limits shown without direct approval of the City of Houston and/or TXDOT. No excavation should occur in the area of the tree protection fencing for trees called out with "Fence" in the tree protection plan.
3. Storage of equipment or materials will not be allowed inside a fence. Entryways and access into a protected area shall not be provided unless approved by the City of Houston and/or TXDOT.
4. Damage to tree fences occurring during the progress of the work shall be repaired immediately at no additional cost to owner. Workmen shall be clearly instructed to exercise caution in performance of work near trees being preserved.
5. Tree protection fencing shall be removed by contractor, at no additional costs, upon completion of all construction activity in each work zone area. Tree protection fencing materials used in the first two work zone areas shall be removed and utilized in subsequent work zone areas.

G. Pruning of Trees

1. Trees shall be pruned in accordance with the American National Standard for tree pruning, ANSI A300 (Part 1) - Most Current 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 in tree protection plan for public streets, sidewalks, and construction areas. Provide 14 feet of vertical clearance over existing streets, from back of curb on one side to back of curb on the other side. Provide 7' of vertical clearance over existing or proposed sidewalks. 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. Pruning of the trees identified will be completed with approval and supervision of City of Houston.
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 back to a lateral that is at 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 on cuts made between February and November.
5. Pruning of trees designated in the tree protection plan shall include removal of dead, diseased, and/or broken limbs larger than 1" in diameter.

H. Tree Removal

1. Trees scheduled for removal shall be sawed down and debris hauled from the site the same day. The stump shall be ground to 6" below grade and excess grindings shall be hauled from the site the same day, so that a pile of grindings is not left where the stump was ground. Enough grindings should be left so that an open hole does not remain.
2. Only those trees called out for removal in the Tree Treatment Schedule shall be removed, or otherwise damaged. Should it be determined that any additional trees must be removed, a permit must be applied for and approved from the City of Houston prior to removal.

I. Root Stimulation

1. Deep root-stimulate designated trees. Mix fertilizer with wetting agent per label instructions.
2. Stimulate entire root zone area within the dripline of the tree and continue 10 feet beyond the dripline, leaving out areas of anticipated root loss (construction areas) and sidewalks and street pavement.
3. Mixture shall be injected into the top 10 inches of soil under pressure of 150 to 200 psi as soil conditions warrant.
4. Mix in a tank with agitation capability per label instructions. Inject the mixture on a 2.5 ft. square grid at 4 lbs. actual nitrogen per 1,000 sq. ft.

J. Regularly water trees which have received root damage, to eliminate additional stress caused by lack of moisture. Water during periods without adequate rainfall. For example, should 1.0" of rain not be received within a week period, the trees should be thoroughly watered. March through September, water once every two weeks. October through February, water every three weeks. Water thoroughly to saturate the entire root zone area. Watering is subsidiary to Item 100.

K. Chemically treat tree trunks with evidence of borer activity with the appropriate approved insecticide mixed and applied per the manufacturer's product application recommendations. Trees shall be sprayed within 24 hours after observance of borer activity.

L. Grading and filling around trees.

1. Maintain existing grade within the dripline of trees, unless otherwise indicated.
2. Where existing grade around trees is above new finish grade, under supervision of City of Houston and/or TXDOT, carefully hand excavate within the dripline to make transition to new finish grade.
3. Where existing grade is below new finish grade, place sandy loam soil in a single layer to make the transition to new grade. Do not compact; hand grade to required elevation.

M. Demolition, Forming and Pouring Sidewalks(Sidewalk on Grade)

1. Demolition of existing sidewalks, located in or adjacent to the limits of tree protection fencing, shall be completed without disturbing, cutting, or otherwise damaging tree roots and soil located beneath them.
2. The new sidewalk shall be formed at or above the elevation of the existing sidewalk, without disturbing, cutting or otherwise damaging tree roots. Every effort has been made to address tree root and sidewalk elevation issues with information available in the field and on plan and profile sheets. The elevation of every tree root was not available, if tree roots are found to be in conflict with proposed sidewalk, City of Houston and/or TXDOT shall be consulted as to how to install sidewalks with minimal impacts to adjacent trees.

N. Demolition, Forming and Pouring of Drive Way Approaches

1. Demolition of existing driveway approaches located beneath the dripline of any tree shall be completed without disturbing, cutting, or otherwise damaging tree roots and soil located beneath them.
2. The new approach shall be formed at or above the elevation of the existing approach where tree roots 1" diameter or larger are present, without disturbing, cutting or otherwise damaging tree roots. Maximum drive slopes may be needed at bottom of apron to allow forming of drive over tree roots at top of drive. As with sidewalks, the elevation of every tree root was not available in design. If tree roots are found to be in conflict with proposed approach, City of Houston and/or TXDOT shall be consulted as to how to install drive way with minimal impacts to adjacent trees.

O. Arborist Qualifications

1. Arborist - Employ qualified arborist acceptable to City's Forester to complete all tree treatments. Arborist shall be normally engaged in the field and have a minimum of 5 years' experience. Qualifications of the selected arborist shall be submitted for review and approval by the City of Houston and/or TXDOT.

PUBLIC WORKS AND TRANSPORTATION
ACCEPTED
67862

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APPROVED: Craig N. Koehl 12-05-2019

REV. NO.	DATE	DESCRIPTION	BY

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

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

TREE PROTECTION PLAN
SHEET 8 OF 8

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK. DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK. DWG:	HOU	HARRIS	0912	72	391	417

Plotted on: $USER$ $TIME$ $DATE$
Pen Table: $PENTBL$
Plot Driver: $PLTDRVL$
Design Filename: $FILE$

1. ALL LOCAL MUNICIPAL AND STATE LAWS, RULES AND REGULATIONS GOVERNING OR RELATING TO ANY PORTION OF THIS WORK ARE HEREBY INCORPORATED INTO AND MADE A PART OF THESE SPECIFICATIONS AND THEIR PROVISIONS SHALL BE CARRIED OUT BY THE CONTRACTOR.

2. THE CONTRACTOR SHALL VERIFY THE LOCATIONS OF ALL EXISTING UTILITIES, STRUCTURES AND SERVICES BEFORE COMMENCING WORK. THE LOCATIONS OF UTILITIES, STRUCTURES AND SERVICES SHOWN IN THESE PLANS ARE APPROXIMATE ONLY. ANY DISCREPANCIES BETWEEN THESE PLANS AND ACTUAL FIELD CONDITIONS SHALL BE REPORTED TO THE OWNER'S REPRESENTATIVE.

3. THE CONTRACTOR SHALL OBTAIN THE PERTINENT ENGINEERING OR ARCHITECTURAL PLANS BEFORE BEGINNING WORK.

4. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS REQUIRED TO PERFORM THE WORK INDICATED HEREIN BEFORE BEGINNING WORK.

5. THIS DESIGN IS DIAGRAMMATIC. ALL EQUIPMENT SHOWN IN PAVED AREAS IS FOR DESIGN CLARITY ONLY AND IS TO BE INSTALLED WITHIN PLANTING AREAS. THE ACTUAL LOCATION OF MAINLINE AND RELATED IRRIGATION EQUIPMENT SHALL BE WITHIN PLANTER AND A MINIMUM OF 18" OFF ADJACENT HARDSCAPE AND OTHER OBSTACLES, TYPICAL. TREE BUBBLERS SHALL BE ALIGNED WITH TREES AS SHOWN ON THE PLANTING PLANS, AND AS DIRECTED BY OWNER'S AUTHORIZED REPRESENTATIVE. THE CONTRACTOR SHALL CONFIRM ALL LAYOUT IN FIELD WITH OWNER'S AUTHORIZED REPRESENTATIVE PRIOR TO STARTING WORK.

6. THE CONTRACTOR SHALL NOT WILLFULLY INSTALL ANY EQUIPMENT AS SHOWN ON THE PLANS WHEN IT IS OBVIOUS IN THE FIELD THAT UNKNOWN CONDITIONS EXIST THAT WERE NOT EVIDENT AT THE TIME THESE PLANS WERE PREPARED. ANY SUCH CONDITIONS SHALL BE BROUGHT TO THE ATTENTION OF THE OWNER'S REPRESENTATIVE PRIOR TO ANY WORK OR THE IRRIGATION CONTRACTOR SHALL ASSUME ALL RESPONSIBILITY FOR ANY FIELD CHANGES DEEMED NECESSARY BY THE OWNER.

7. INSTALL ALL EQUIPMENT AS SHOWN IN THE DETAILS AND SPECIFICATIONS. CONTRACTOR SHALL BE RESPONSIBLE TO COMPLY WITH LOCAL CITY, COUNTY AND STATE REQUIREMENTS FOR BOTH EQUIPMENT AND INSTALLATION.

8. ACTUAL LOCATION FOR THE INSTALLATION OF THE BACKFLOW PREVENTER AND THE AUTOMATIC CONTROLLER IS TO BE DETERMINED IN THE FIELD BY THE OWNER'S AUTHORIZED REPRESENTATIVE.

9. FOR MEDIAN SYSTEMS USING CONVENTIONALLY WIRED CONTROL VALVES, THE CONTRACTOR IS TO PROVIDE ADDITIONAL PILOT WIRE(S) FROM CONTROLLER ALONG ENTIRETY OF MAINLINE TO THE LAST RCV ON EACH AND EVERY LEG OF MAINLINE. ROUTE A QUANTITY OF PILOT WIRES EQUAL TO THE NUMBER OF OPEN STATIONS REMAINING ON THE CONTROLLER PLUS TWO (2) SPARE WIRES. LABEL WIRES AT BOTH ENDS.

10. ALL PIPE UNDER PAVED AREAS TO BE INSTALLED IN SLEEVING TWICE THE DIAMETER OF THE PIPE CARRIED. SEE LEGEND FOR TYPE. ALL WIRE UNDER PAVED AREAS TO BE INSTALLED IN A SCH. 40 SLEEVE THE SIZE REQUIRED TO EASILY PULL WIRE THROUGH. ALL SLEEVES TO BE INSTALLED WITH A MINIMUM DEPTH AS SHOWN ON THE SLEEVING DETAILS. SLEEVES TO EXTEND AT LEAST 12" PAST THE EDGE OF THE PAVING.

11. ALL QUICK COUPLER AND REMOTE CONTROL VALVES TO BE INSTALLED IN SHRUB OR GROUND COVER AREAS WHERE POSSIBLE. ALL QUICK COUPLER AND REMOTE CONTROL VALVES TO BE INSTALLED AS SHOWN ON THE INSTALLATION DETAILS. INSTALL ALL QUICK COUPLER AND REMOTE CONTROL VALVES WITHIN 18" OF HARDSCAPE. NO QUICK COUPLER VALVES WILL BE PERMITTED WITHIN MEDIANS DESIGNED TO HOUSTON ADOPT-AN-ESPLANADE STANDARDS.

12. ALL HEADS ARE TO BE INSTALLED WITH THE NOZZLE, SCREEN AND ARCS SHOWN ON THE PLANS. ALL HEADS ARE TO BE ADJUSTED TO PREVENT OVERSPRAY ONTO BUILDINGS, WALLS, FENCES AND HARDSCAPE. THIS INCLUDES, BUT NOT LIMITED TO, ADJUSTMENT OF DIFFUSER PIN OR ADJUSTMENT SCREW, REPLACEMENT OF PRESSURE COMPENSATING SCREENS, REPLACEMENT OF NOZZLES WITH MORE APPROPRIATE RADIUS UNITS AND THE REPLACEMENT OF NOZZLES WITH ADJUSTABLE ARC UNITS.

13. CONTRACTOR SHALL INSTALL ADDITIONAL CHECK VALVES TO HEADS AND LATERALS AS REQUIRED TO PREVENT LOW HEAD DRAINAGE.

14. THE CONTRACTOR SHALL USE PROPER GROUNDING TECHNIQUES FOR GROUNDING THE CONTROLLER AND RELATED EQUIPMENT PER MANUFACTURERS SPECIFICATIONS. SWEENEY AND ASSOCIATES RECOMMENDS MEASURING FOR PROPER GROUND AT LEAST ONCE ANNUALLY, AND NECESSARY ADJUSTMENTS MADE TO COMPLY WITH MANUFACTURER SPECIFICATIONS.

15. THE CONTRACTOR IS REQUIRED TO CONTACT DIGALERT, CITY OF HOUSTON UTILITIES AND TXDOT UTILITIES A MINIMUM OF TWO (2) DAYS PRIOR TO THE START OF ANY EXCAVATIONS ON THE PROJECT AND SPECIFICALLY PRIOR TO THE INSTALLATION OF ANY GROUNDING RODS. LOG ONTO WWW.DIGALERT.ORG TO START A PROJECT TICKET. DIGALERT IS A FREE SERVICE PROVIDED TO THE PROJECT. FAILURE TO CONTACT AND HAVE THE EXISTING UTILITIES IDENTIFIED, LOCATED AND MARKED SHALL MAKE THE CONTRACTOR SOLELY RESPONSIBLE FOR ANY AND ALL DAMAGES.

16. THE CONTRACTOR SHALL VERIFY THE ACTUAL LOCATION, WATER TYPE, METER SIZE AND WATER PRESSURE IN THE FIELD PRIOR TO STARTING WORK. MEASUREMENT OF THE STATIC (NO WATER MOVING) WATER PRESSURE IS ACCEPTABLE FOR POTABLE WATER SYSTEMS WHERE NO PUMP HAS BEEN INDICATED ON THESE PLANS. IF ANY OF THE POC INFORMATION SHOWN ON THESE DRAWING IS FOUND TO BE DIFFERENT THAN THE ACTUAL POC INFORMATION GATHERED IN THE FIELD, IMMEDIATELY NOTIFY THE LANDSCAPE ARCHITECT AND IRRIGATION CONSULTANT. SHOULD THE CONTRACTOR FAIL TO VERIFY THE POC INFORMATION AS SHOWN HEREIN, ANY CHANGES REQUIRED BY LOW PRESSURE OR VOLUME SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR.

17. IRRIGATION CONTROLLER(S) SHALL BE OF THE BRAND, MODEL AND STATION SIZE AS INDICATED ON THE IRRIGATION MATERIALS LEGEND. THE CONTROLLER(S) SHALL BE INSTALLED IN THE APPROXIMATE LOCATION(S) SHOWN. THE CONTRACTOR SHALL COORDINATE THE REQUIRED ELECTRICAL POWER SUPPLY AT THIS LOCATION WITH THE OWNER'S AUTHORIZED REPRESENTATIVE. FINAL LOCATION OF CONTROLLER AND ELECTRICAL POINT OF CONNECTION SHALL BE CONFIRMED WITH OWNER'S AUTHORIZED REPRESENTATIVE PRIOR TO STARTING WORK.

18. CONTRACTOR SHALL ADJUST ALL HEADS AS REQUIRED TO ACCOMMODATE ANY VERTICAL OBSTRUCTIONS THAT MAY OCCUR IN THE LANDSCAPE, INCLUDING BUT NOT LIMITED TO LIGHT POLES, FIRE HYDRANTS, TREES, ETC. WHEN A SLIGHT RELOCATION OF THE HEAD IS NOT SUFFICIENT TO CLEAR THE OBSTACLE, OR IF IT NEGATIVELY AFFECTS THE COVERAGE, AN ADDITIONAL HEAD SHALL BE INSTALLED TO PLACE ONE HEAD ON EITHER SIDE OF THE OBSTACLE. THE NOZZLES OF THESE TWO HEADS SHALL HAVE ARC PATTERNS THAT ADD UP TO THE ORIGINAL ARC PATTERN OF THE HEAD INDICATED ON THE PLANS. THE CONTRACTOR SHALL VERIFY ALL HEAD LAYOUT WITH OWNER'S AUTHORIZED REPRESENTATIVE PRIOR TO STARTING WORK.

19. CONTRACTOR SHALL MARK PROPOSED LOCATIONS OF WATER METERS, BACKFLOW DEVICES AND CAGES, VALVE BOXES, CONTROLLERS FOR APPROVAL BY OWNER'S AUTHORIZED REPRESENTATIVE PRIOR TO WORK.

20. IRRIGATION SLEEVE INSTALLATIONS SHALL BE COORDINATED WITH GRADING WORK ROADWAY CONSTRUCTION TO LIMIT DISTURBANCES TO THE HARDSCAPE. IRRIGATION SLEEVES ARE INCIDENTAL TO ITEM 170 AND WILL NOT BE PAID SEPARATELY.

21. PROPOSED IRRIGATION SLEEVES SHOWN ON THE PLANS ARE NOT EXISTING AND SHALL BE INSTALLED BY THE CONTRACTOR.

22. CONTRACTOR IS RESPONSIBLE FOR COORDINATING WITH DEMOLITION WORK AND IMPACTS TO EXISTING IRRIGATION SYSTEMS. REPAIR EXISTING SYSTEMS TO MAINTAIN CONTINUOUS OPERATION AT ALL TIMES. EXISTING SYSTEMS MUST NOT BE INOPERABLE DUE TO PROJECT IMPACTS FOR MORE THAN 2 CONTINUOUS WORKING DAYS. REMOVAL, REPAIRS AND RELATED WORK IS SUBSIDIARY TO ITEM 170 AND IS NOT PAID SEPARATELY.

23. CONTRACTOR IS RESPONSIBLE FOR PROVIDING AS-BUILT IRRIGATION PLANS TO TXDOT, LANDSCAPE ARCHITECT AND OWNER'S AUTHORIZED REPRESENTATIVE BEFORE FINAL PAYMENT OF ITEM 170. AS-BUILT IRRIGATION PLANS MUST BE SEALED BY LICENSED IRRIGATOR.

24. CONTRACTOR SHALL SUBMIT ALL MATERIAL PRODUCT DOCUMENTATION FOR APPROVAL BY TXDOT LANDSCAPE ARCHITECT AND OWNER'S AUTHORIZED REPRESENTATIVE PRIOR TO WORK.

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irrigation design

67862

STATE OF TEXAS
EDWARD J. KOCHANEK
20439
LICENSED IRRIGATOR

26 February 2020

REV. NO.	DATE	DESCRIPTION	BY
	02/26/2020	100% CONSTRUCTION DOCUMENTS	

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY
FIRM REGISTRATION NO. 2514

Texas Department of Transportation

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L3.00

IRRIGATION NOTES

SHEET 24 OF 109

DSN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN:	6	TEXAS	STP 1802 (783) MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	418

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 DIAGRAMMATIC 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 SEPARATELY UNLESS SHOWN ON PLANS.
6. SEE IRRIGATION DETAILS AND LEGEND SHEETS 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 NCASEMENT 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.

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STATE OF TEXAS
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LICENSED IRRIGATOR

26 February 2020

REV. NO.	DATE	DESCRIPTION	BY
	02/18/2020	100% CONSTRUCTION DOCUMENTS	

Lockwood, Andrews & Newnam, Inc.
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FIRM REGISTATION NO. 2614

Texas Department of Transportation

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

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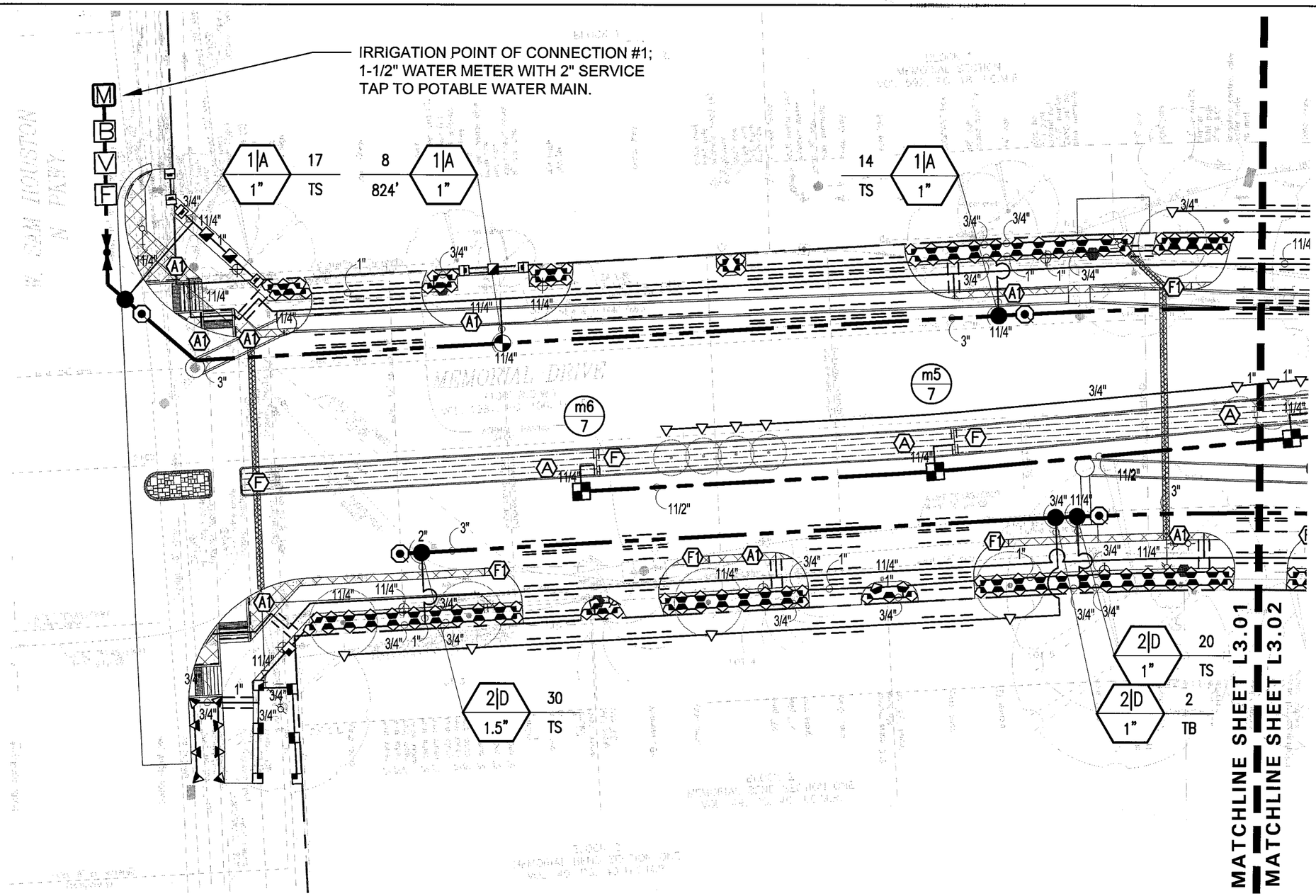
IRRIGATION NOTES

SHEET 25 OF 109

DSN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN:	6	TEXAS	STP 1802 (783) MM			CS
DWN:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWN:	HOU	HARRIS	0912	72	391	419



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PUBLIC WORKS AND ENGINEERING
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0 30 60
(IN FEET)
SCALE: PLAN 1":30'

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MEMORIAL DRIVE RECONSTRUCTION
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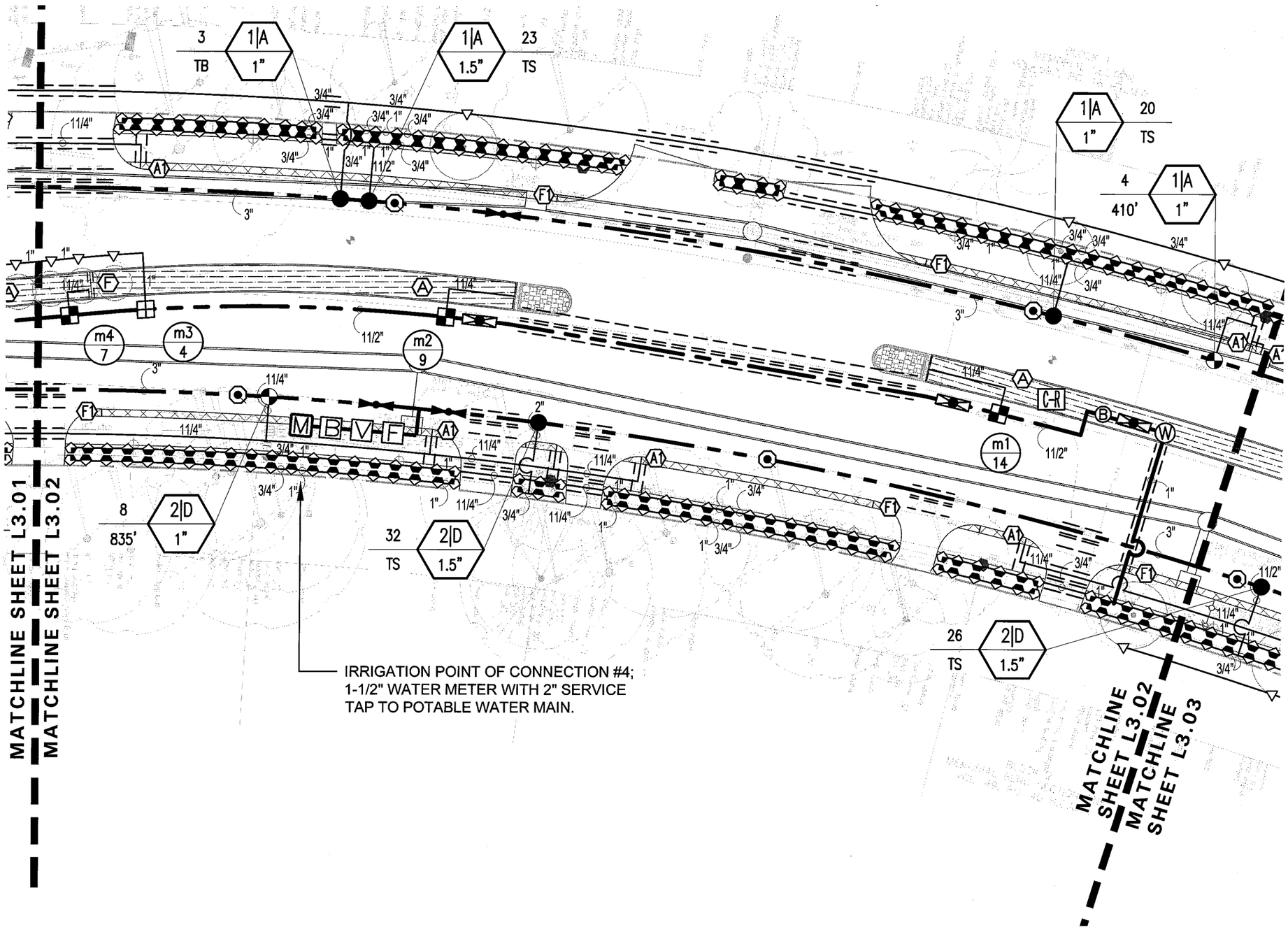
IRRIGATION PLAN

SHEET 26 OF 109

DSN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK:	6	TEXAS	STP 1802 (783) MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CK:	HOU	HARRIS	0912	72	391	420



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PUBLIC ACCEPTANCE
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0 30 60
(IN FEET)
SCALE: PLAN 1":30'

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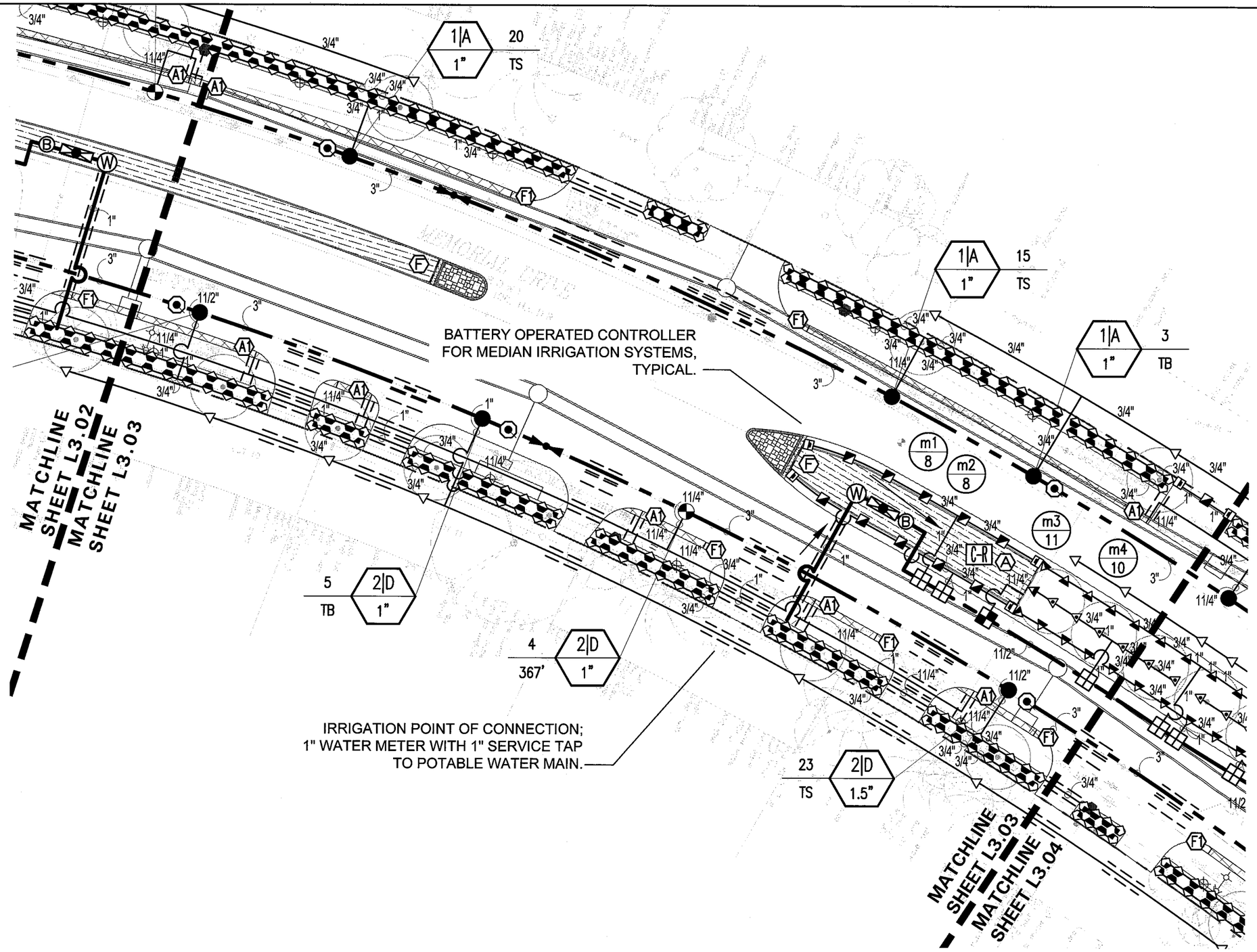
IRRIGATION PLAN

SHEET 27 OF 109

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN:	6	TEXAS	STP 1802 (783) MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWN:	HOU	HARRIS	0912	72	391	421



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MEMORIAL DRIVE RECONSTRUCTION
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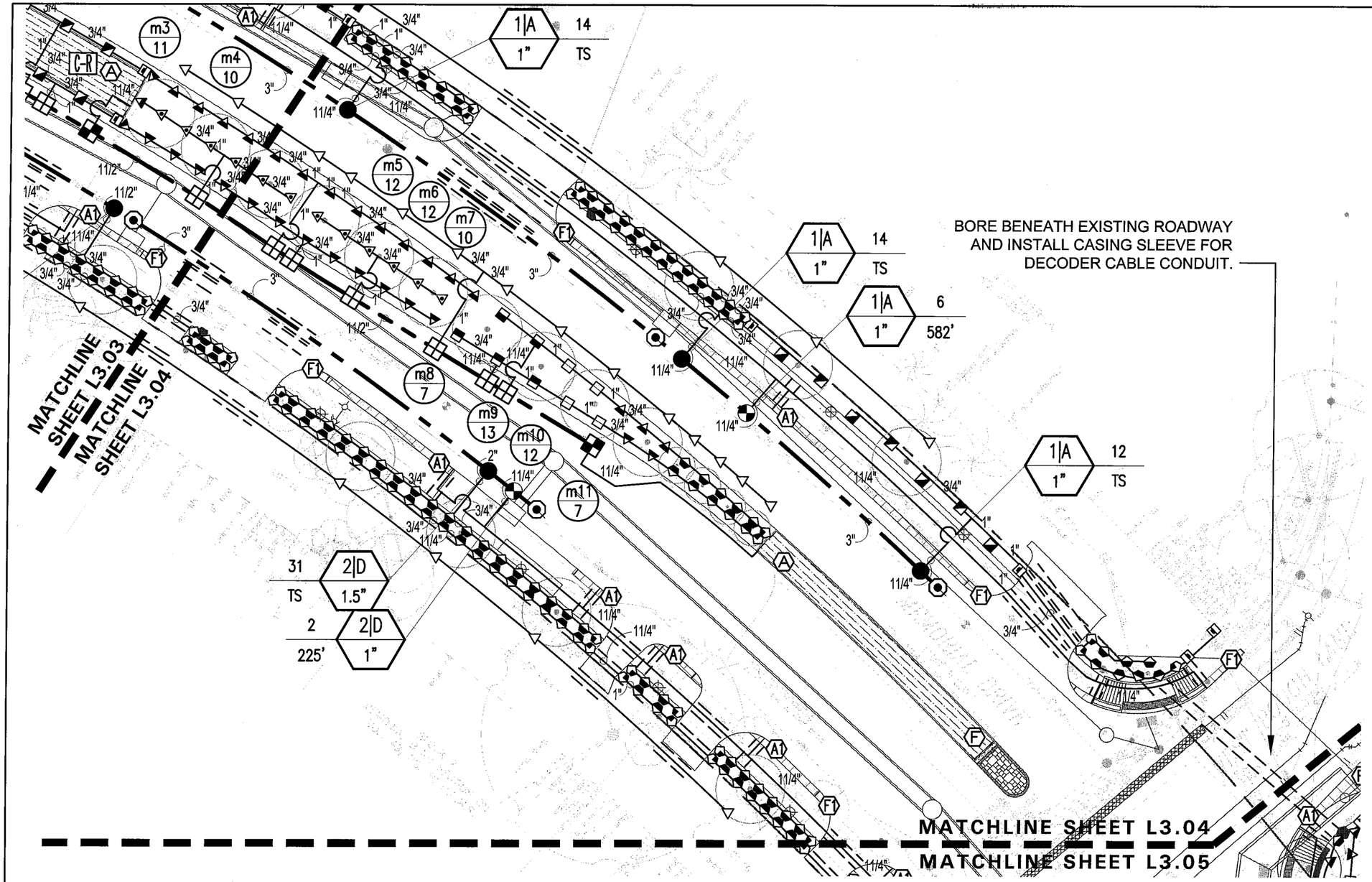
IRRIGATION PLAN

SHEET 28 OF 109

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DWN:	6	TEXAS	STP 1802 (783) MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWN:	HOU	HARRIS	0912	72	391	422



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0 30 60
(IN FEET)
SCALE: PLAN 1":30'

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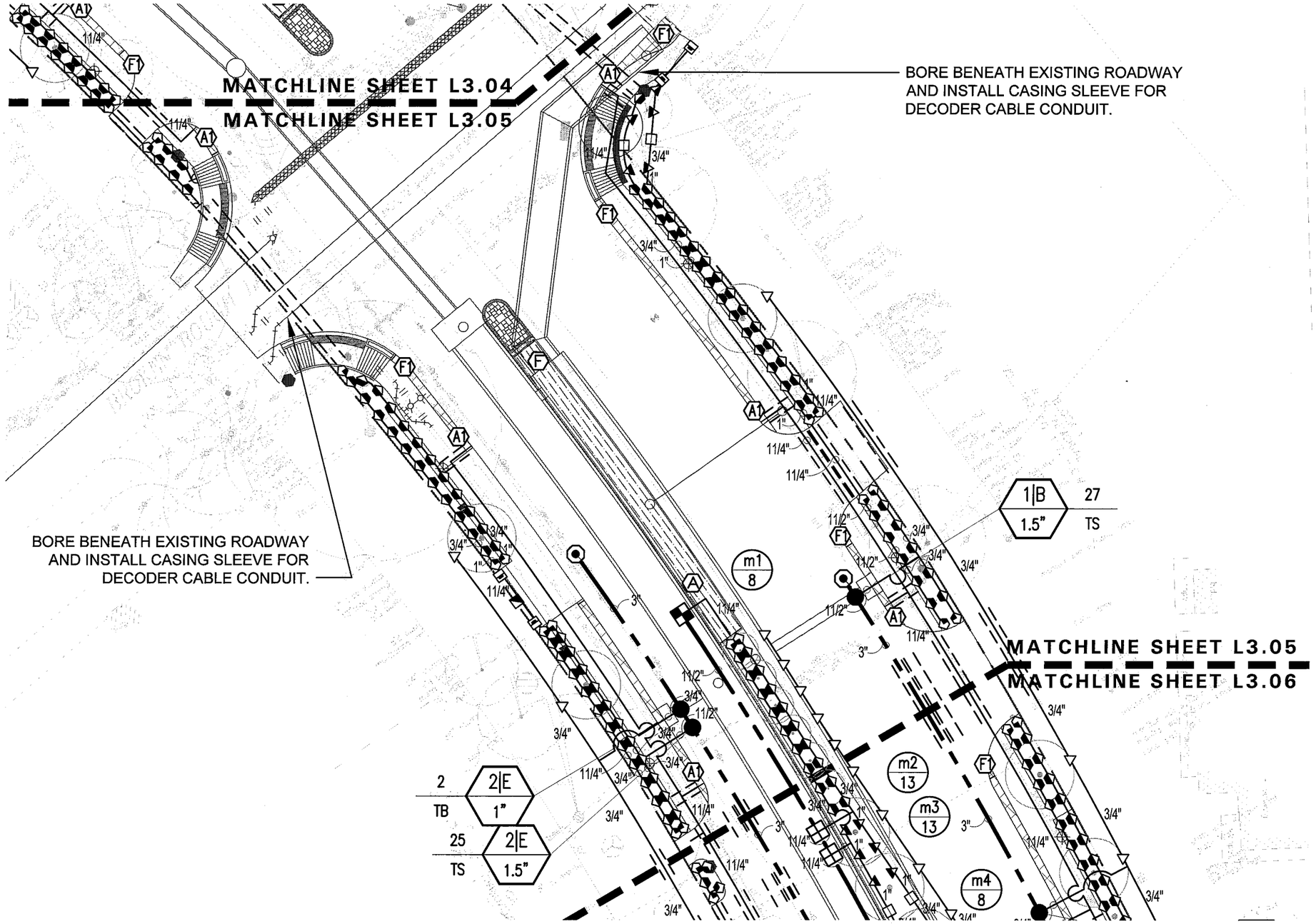
IRRIGATION PLAN

SHEET 29 OF 109

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802 (783) MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	423



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26 February 2020

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FIRM REGISTATION NO. 2614

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

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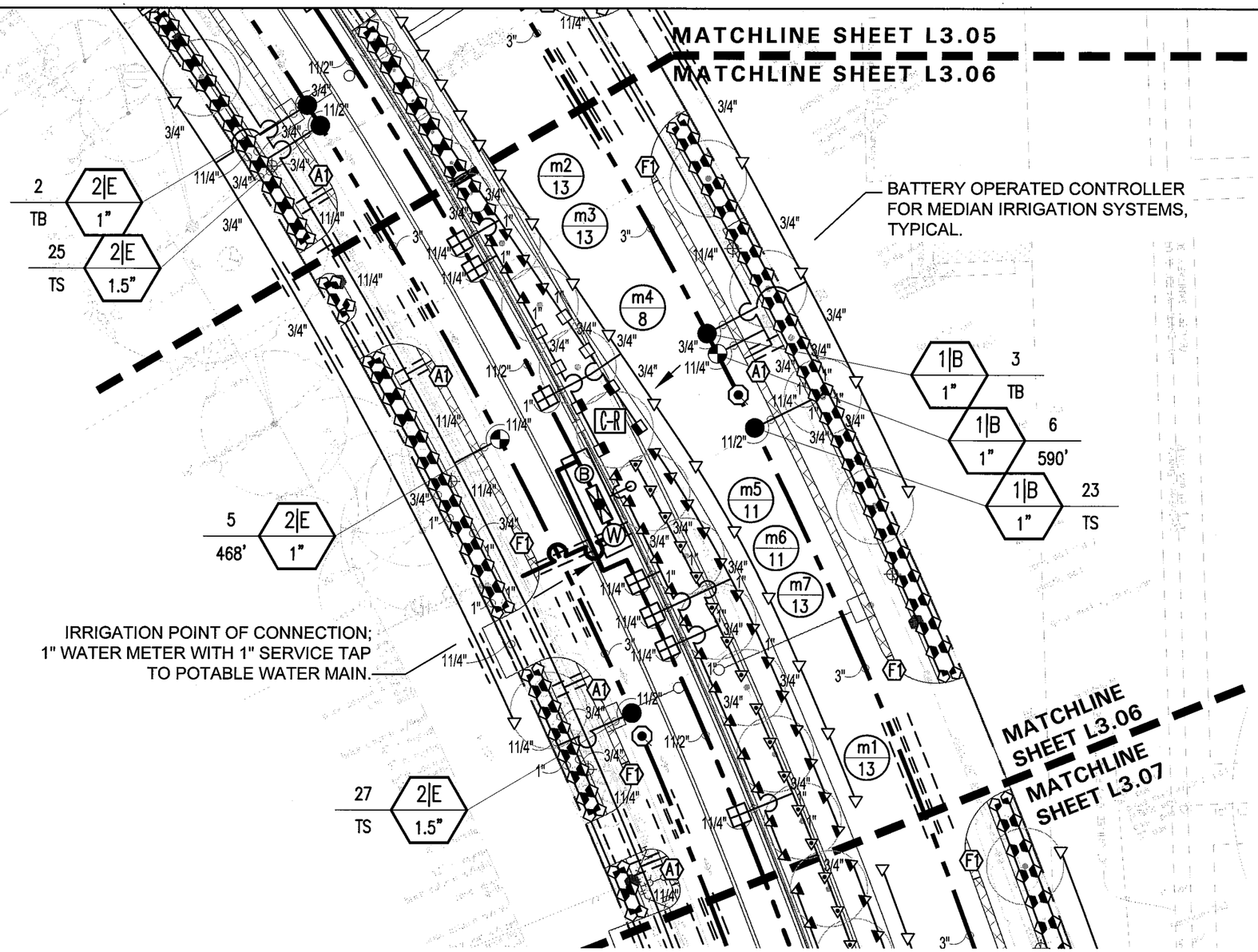
IRRIGATION PLAN

SHEET 30 OF 109

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN:	6	TEXAS	STP 1802 (783) MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	424



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PROFESSIONAL LANDSCAPE ARCHITECT
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(IN FEET)
SCALE: PLAN 1":30'

STATE OF TEXAS
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LICENSED IRRIGATOR

26 February 2020

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

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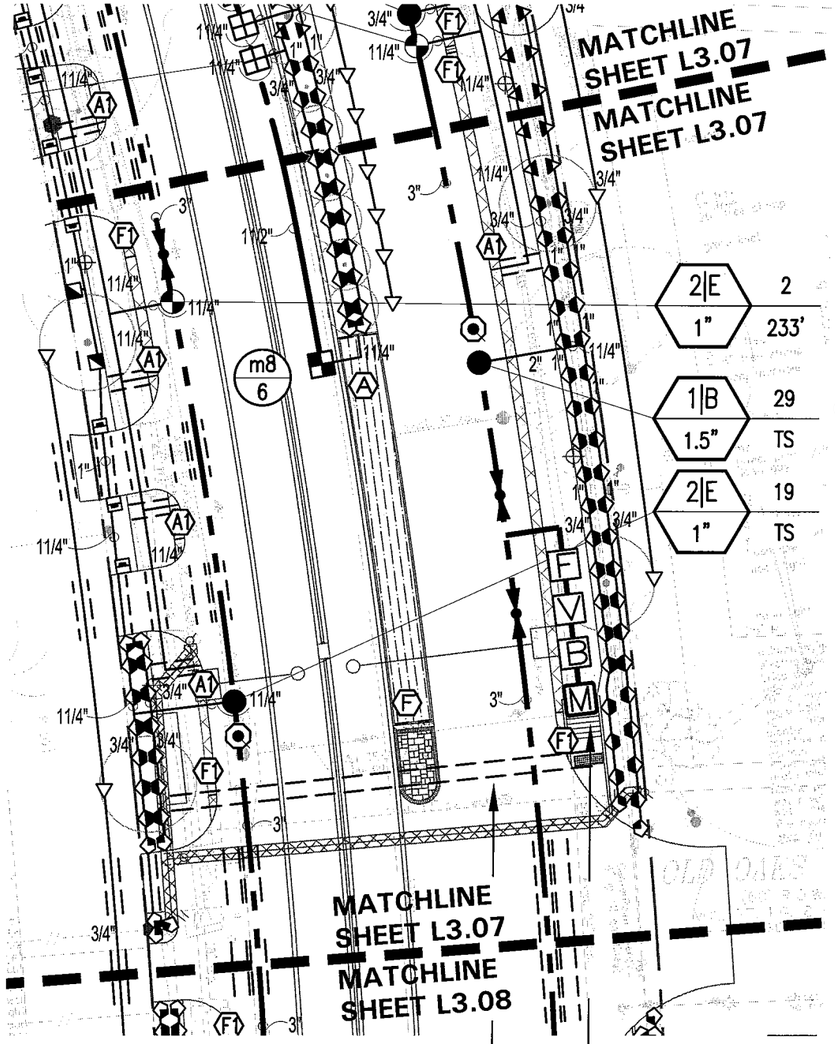
IRRIGATION PLAN

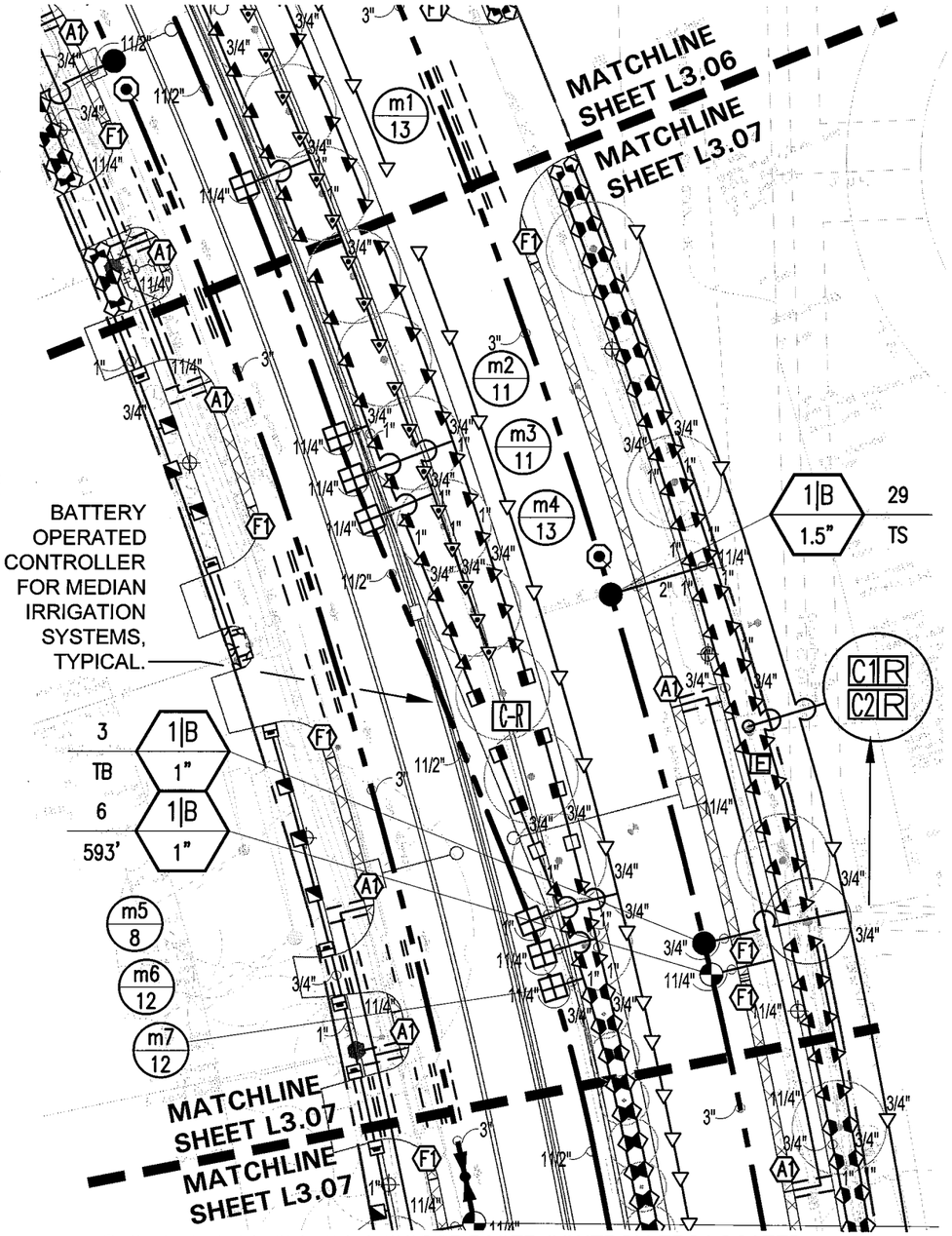
SHEET 31 OF 109

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DWN:	6	TEXAS	STP 1802 (783) MM			CS
DW:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWN:	HOU	HARRIS	0912	72	391	425



BORE BENEATH EXISTING ROADWAY AND INSTALL CASING SLEEVE FOR DECODER CABLE CONDUIT.

IRRIGATION POINT OF CONNECTION #2; 1-1/2" WATER METER WITH 2" SERVICE TAP TO POTABLE WATER MAIN.



TWO (2) RAIN BIRD ESP-LXD DECODER BASED CONTROLLERS LOCATED AT NEW ELECTRICAL SERVICE RACK. SYMBOLS ARE ENLARGED AND SHOWN OUTSIDE THE LIMITS OF WORK FOR CLARITY ONLY. SEE PEDESTRIAN LIGHTING LAYOUT PLANS FOR FINAL LOCATION.

CONTROLLER #1 SHALL OPERATE ALL SYSTEMS INSTALLED ON THE NORTH/EAST SIDE OF MEMORIAL DRIVE. CONTROLLER #2 SHALL OPERATE ALL SYSTEMS INSTALLED ON THE SOUTH/WEST SIDE OF MEMORIAL DRIVE. EACH PROPOSED SYSTEM SHALL BE OPERATED BY AN INDEPENDENT TWO-WIRE CABLE PATH.

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

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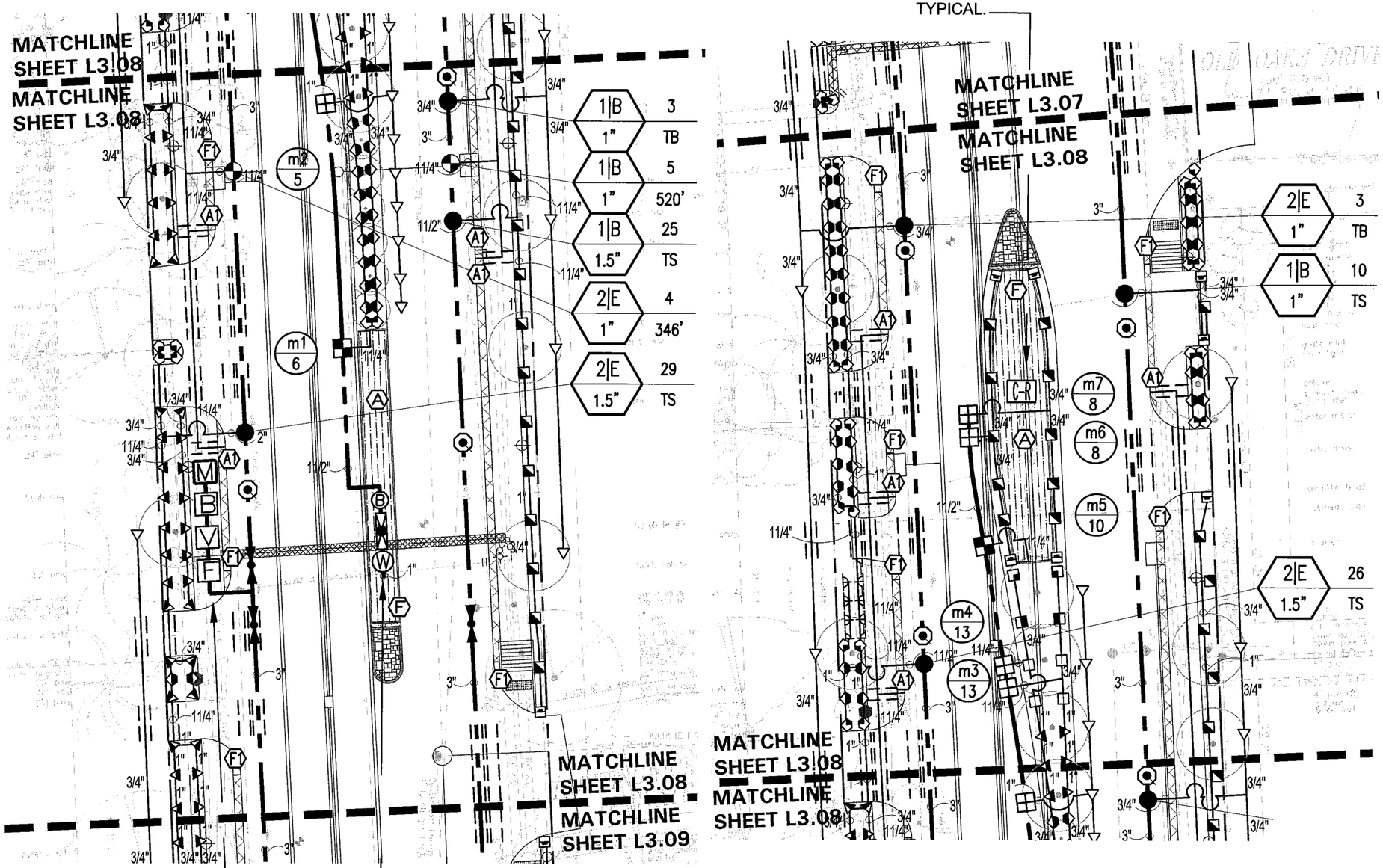
IRRIGATION PLAN

SHEET 32 OF 109

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802 (783) MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	426

BATTERY OPERATED CONTROLLER
FOR MEDIAN IRRIGATION SYSTEMS,
TYPICAL.



IRRIGATION POINT OF CONNECTION;
1" WATER METER WITH 1" SERVICE TAP
TO POTABLE WATER MAIN.

IRRIGATION POINT OF CONNECTION #5;
1-1/2" WATER METER WITH 2" SERVICE
TAP TO POTABLE WATER MAIN.

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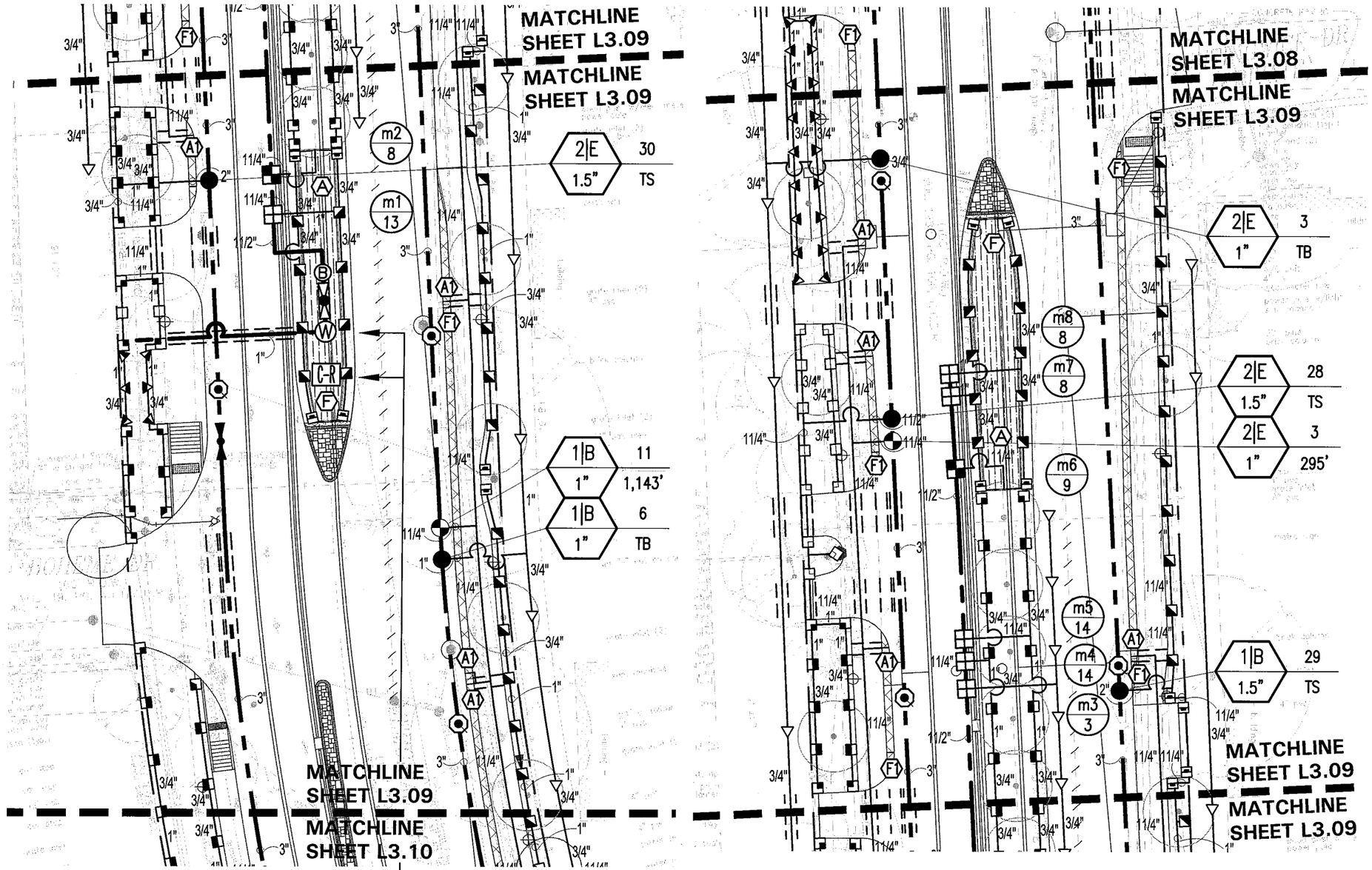
MEMORIAL DRIVE RECONSTRUCTION
AND ACCESS MANAGEMENT

L3.08

IRRIGATION PLAN

SHEET 33 OF 109

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN:	6	TEXAS	STP 1802 (783) MM			CS
DWN:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWN:	HOU	HARRIS	0912	72	391	427



IRRIGATION POINT OF CONNECTION;
1" WATER METER WITH 1" SERVICE TAP
TO POTABLE WATER MAIN.

BATTERY OPERATED CONTROLLER
FOR MEDIAN IRRIGATION SYSTEMS,
TYPICAL.

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AND ACCESS MANAGEMENT

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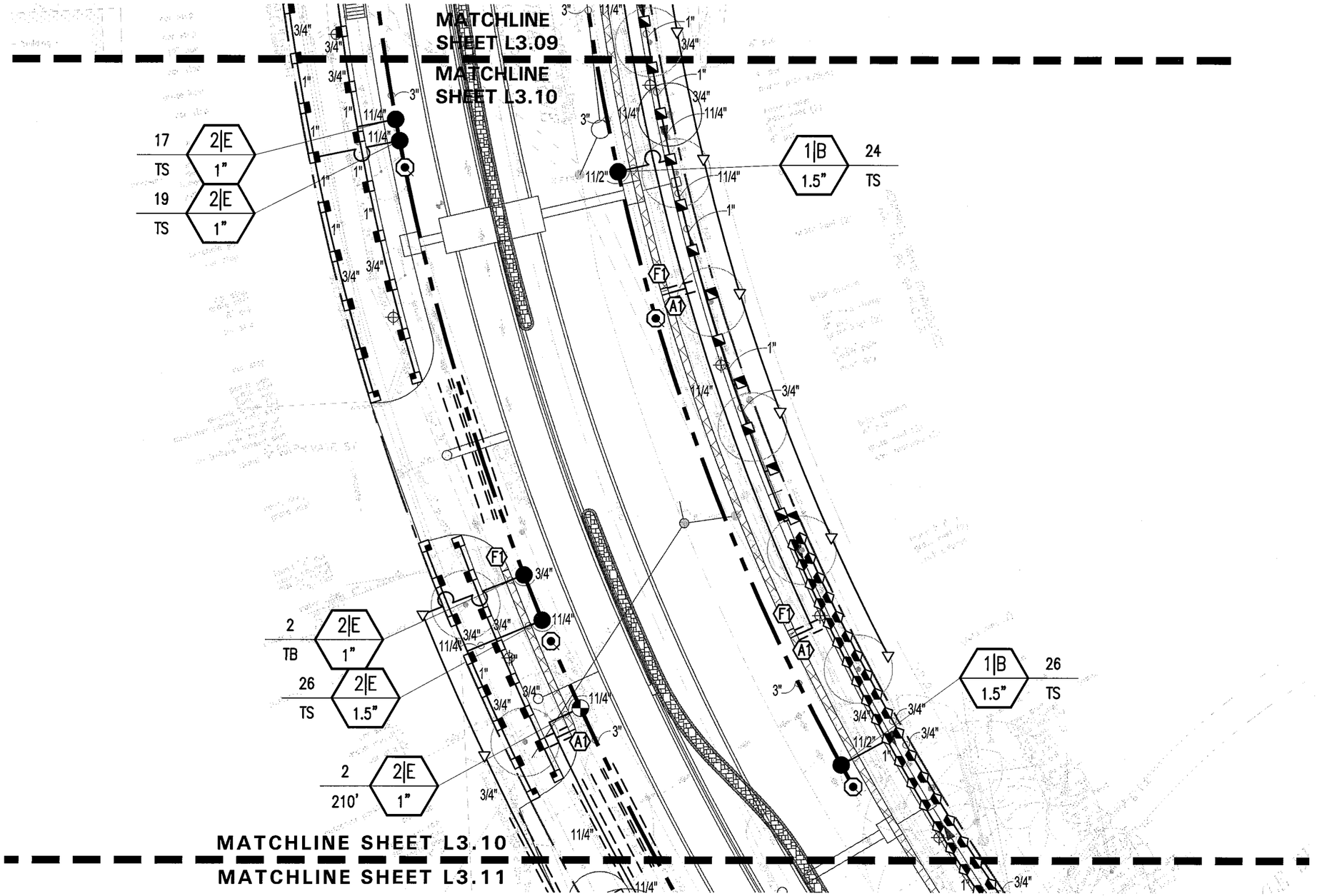
IRRIGATION PLAN

SHEET 34 OF 109

DSN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN:	6	TEXAS	STP 1802 (783) MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	428



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sweeney + associates
irrigation design

PLANS ACCEPTANCE
67962

0 30 60
(IN FEET)
SCALE: PLAN 1":30'

STATE OF TEXAS
EDWARD J. KOCHANEK
20439
LICENSED IRRIGATOR
26 February 2020

REV. NO.	DATE	DESCRIPTION	BY
	02/18/2020	100% CONSTRUCTION DOCUMENTS	

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

Texas Department of Transportation

MEMORIAL DRIVE RECONSTRUCTION
AND ACCESS MANAGEMENT

L3.10

IRRIGATION PLAN

SHEET 35 OF 109

DSN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK: KMN	6	TEXAS	STP 1802 (783) MM			CS
DWN:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK: EKK	HOU	HARRIS	0912	72	391	429

MATCHLINE SHEET L3.10

MATCHLINE SHEET L3.11

BORE BENEATH EXISTING ROADWAY AND INSTALL CASING SLEEVE FOR DECODER CABLE CONDUIT.

BORE BENEATH EXISTING DRIVEWAY AND INSTALL CASING SLEEVE FOR DECODER CABLE CONDUIT.

BATTERY OPERATED CONTROLLER FOR MEDIAN IRRIGATION SYSTEMS, TYPICAL.

IRRIGATION POINT OF CONNECTION; 1" WATER METER WITH 1" SERVICE TAP TO POTABLE WATER MAIN.

16 TS 2|E 1"

1|C 1.5" 27 TS

5 TB 2|F 1"

32 TS 2|F 1.5"

m1 5

m2 10

m3 3

m4 13

MATCHLINE SHEET L3.11

MATCHLINE SHEET L3.12

E:\Dropbox (Sweeney & Associates)\Drawings - Texas\swa - houston\Memorial Drive\L3.11 IRRIGATION PLAN.dwg | AARON CHAVERRI | ANSI FULL BLEED B (11.00 X 17.00 INCHES) | 2/26/2020

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ACCEPTED AN... PUBLIC ... 67862

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(IN FEET)

SCALE: PLAN 1":30'

STATE OF TEXAS
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FIRM REGISTRATION NO. 2614

Texas Department of Transportation

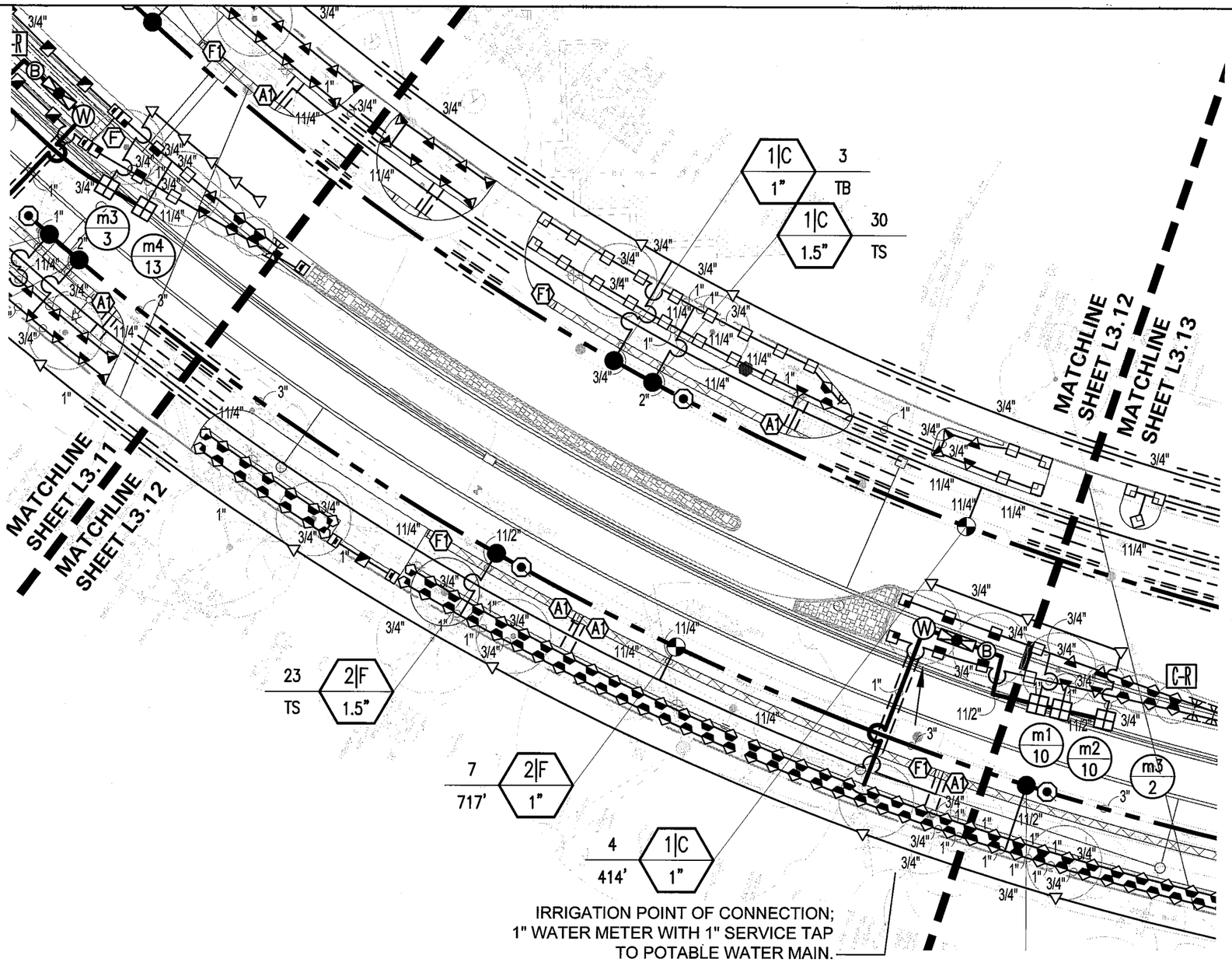
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L3.11

IRRIGATION PLAN

SHEET 36 OF 109

DSN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN:	6	TEXAS	STP 1802 (783) MM			CS
DWN:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWN:	HOU	HARRIS	0912	72	391	430



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ACCEPTED AND FILED
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(IN FEET)
SCALE: PLAN 1":30'

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FIRM REGISTATION NO. 2614

Texas Department of Transportation

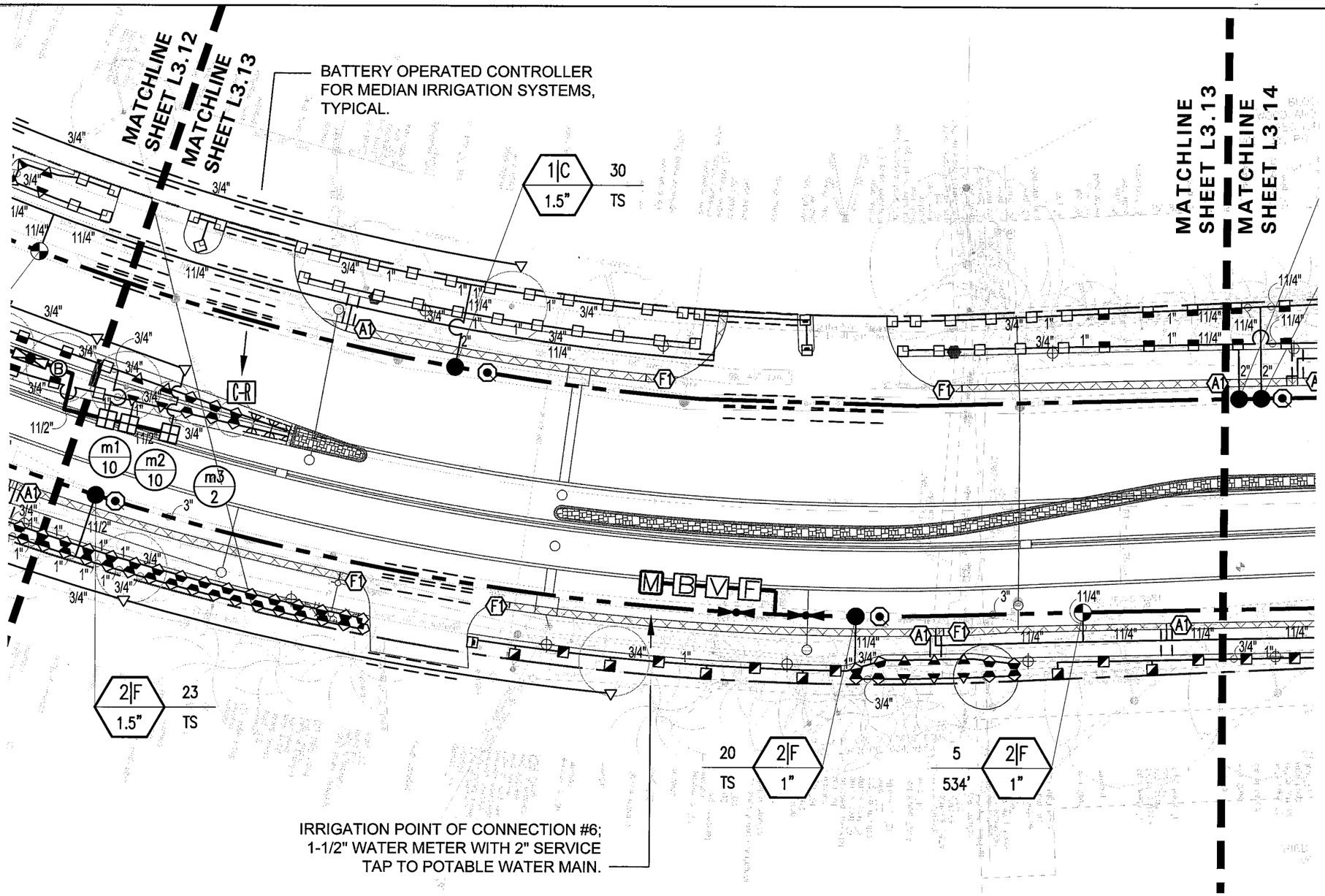
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L3.12

IRRIGATION PLAN

SHEET 37 OF 109

DSN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN:	6	TEXAS	STP 1802 (783) MM			CS
DWN:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWN:	HOU	HARRIS	0912	72	391	431



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(IN FEET)
SCALE: PLAN 1":30'

STATE OF TEXAS
EDWARD J. KOCHANEK
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LICENSED IRRIGATOR
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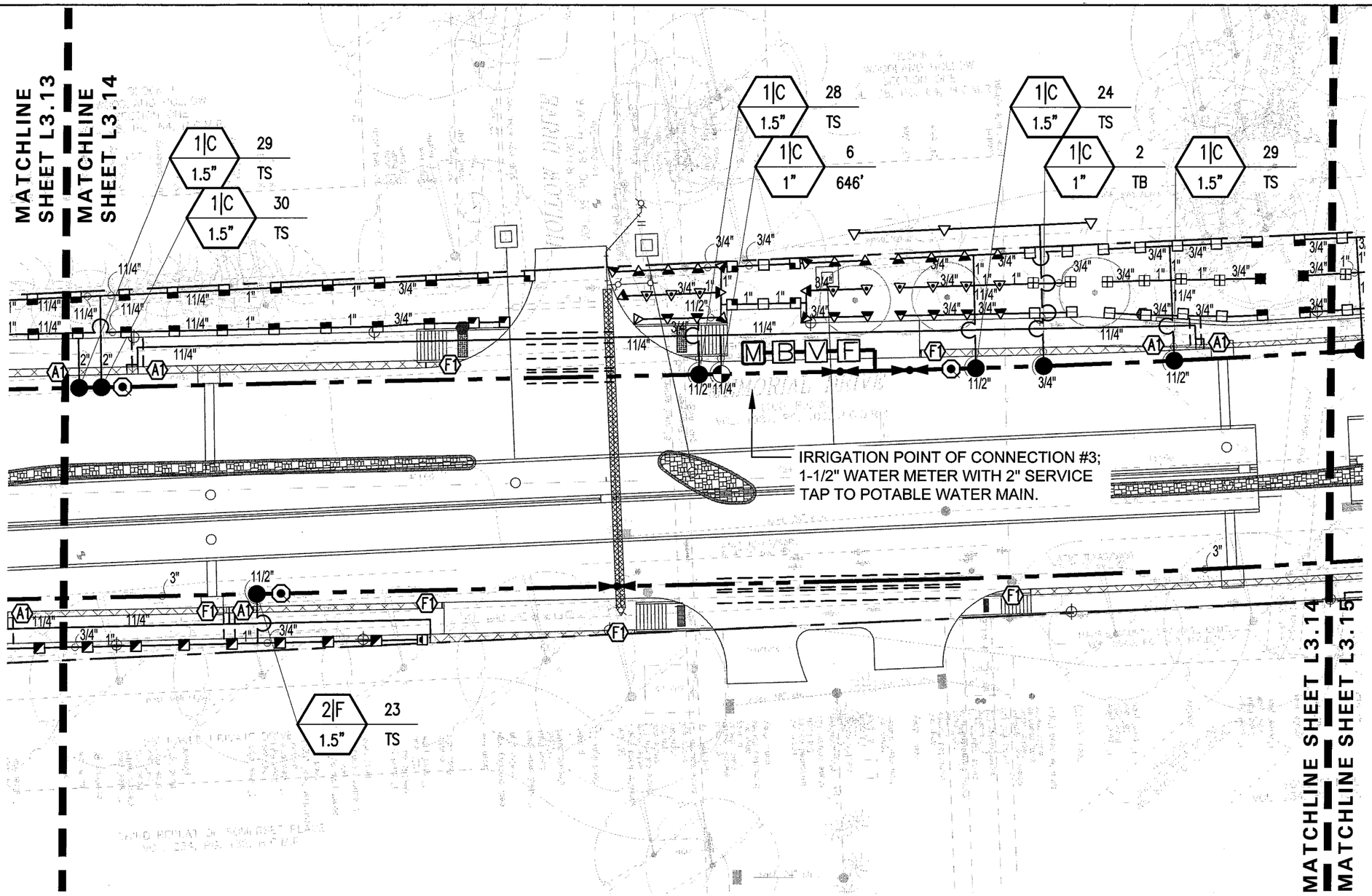
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L3.13

IRRIGATION PLAN

SHEET 38 OF 109

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN:	6	TEXAS	STP 1802 (783) MM			CS
DWN:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWN:	HOU	HARRIS	0912	72	391	432



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(IN FEET)
SCALE: PLAN 1":30'

STATE OF TEXAS
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LICENSED IRRIGATOR

26 February 2020

REV. NO.	DATE	DESCRIPTION	BY
	02/15/2020	100% CONSTRUCTION DOCUMENTS	

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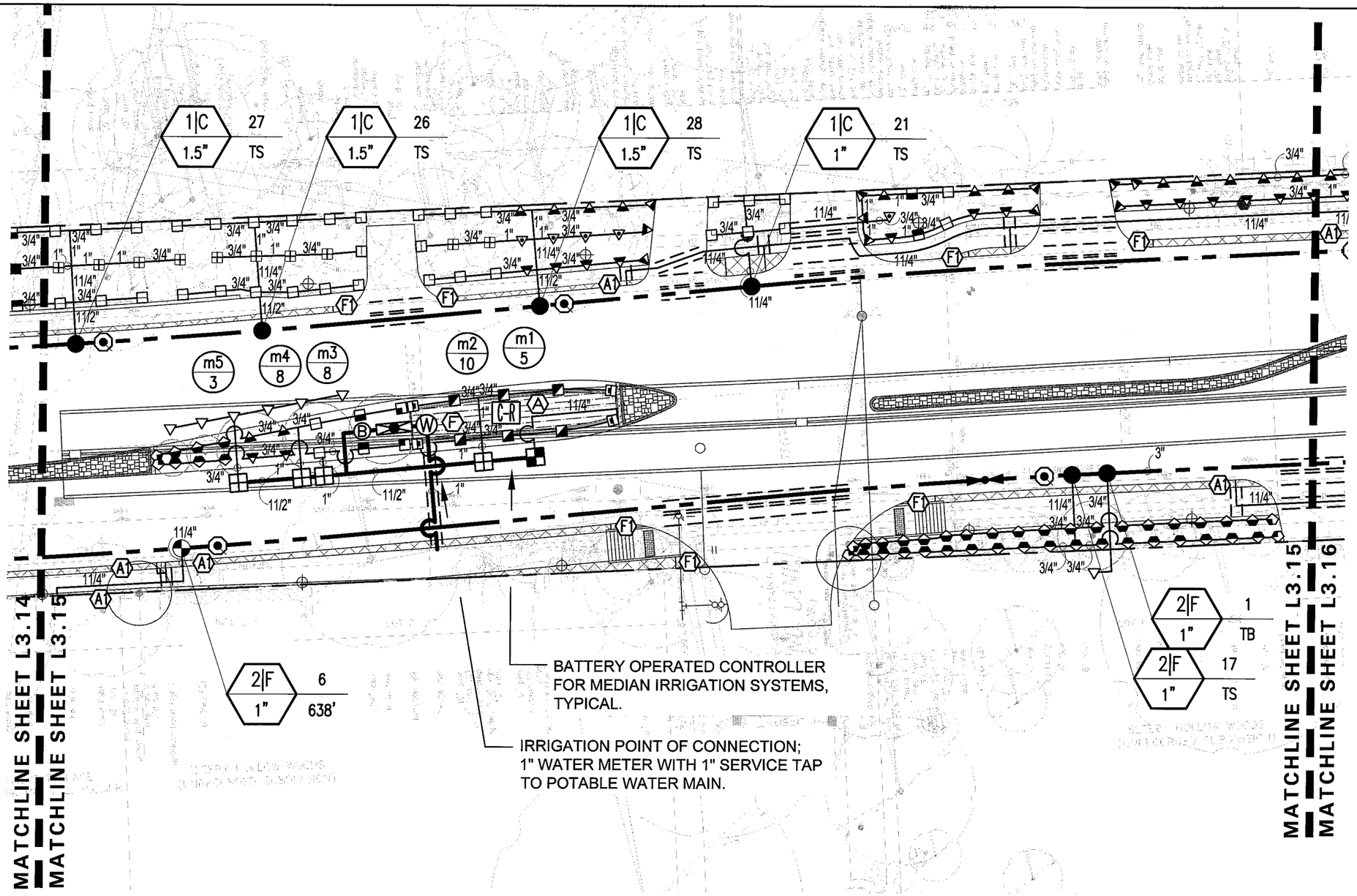
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L3.14

IRRIGATION PLAN

SHEET 39 OF 109

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802 (783) MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	433



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0 30 60
(IN FEET)
SCALE: PLAN 1":30'

STATE OF TEXAS
EDWARD J. KOCHANEK
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LICENSED IRRIGATOR

26 February 2020

REV. NO.	DATE	DESCRIPTION	BY
	02/18/2020	100% CONSTRUCTION DOCUMENTS	

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

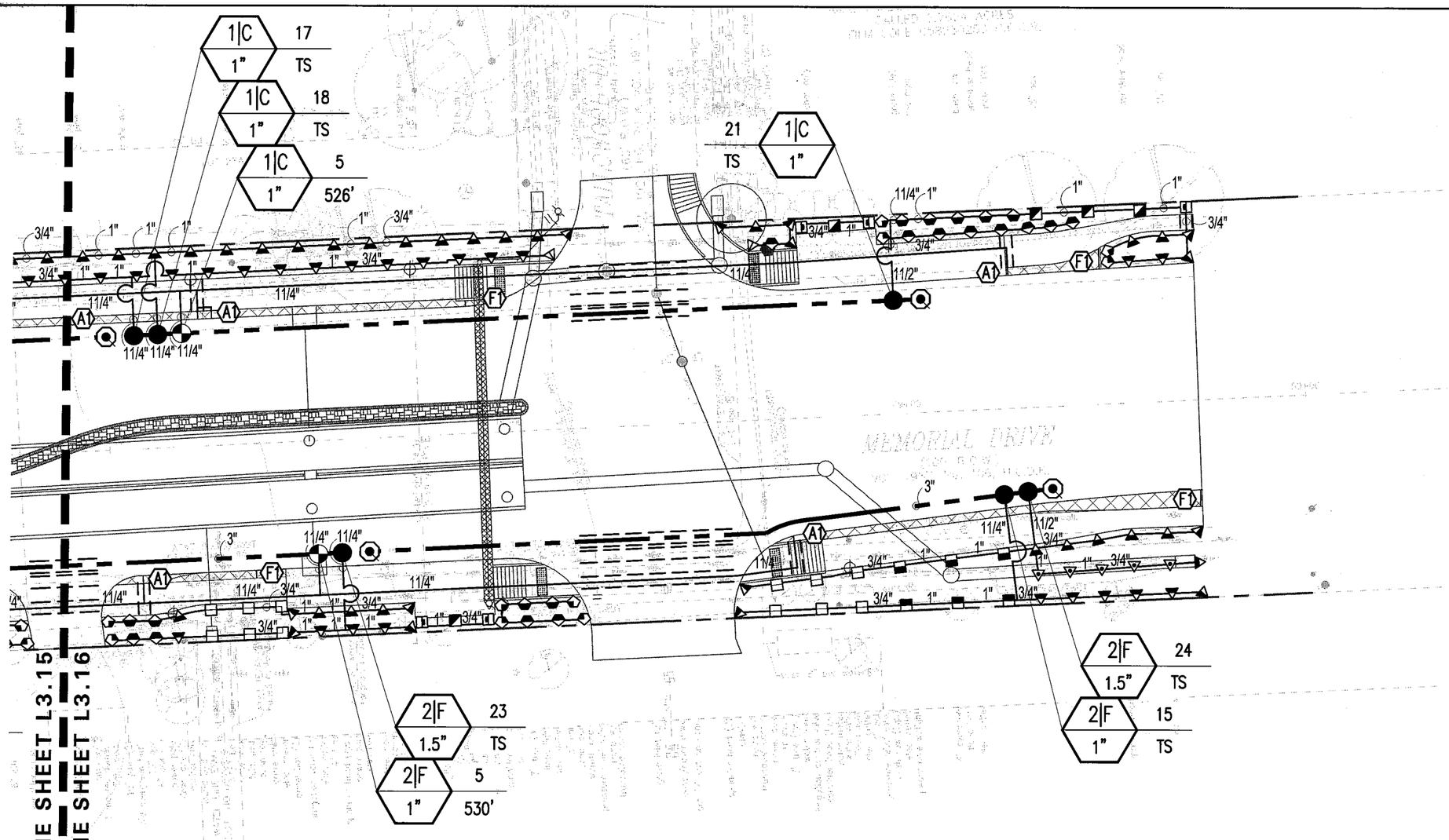
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L3.15

IRRIGATION PLAN

SHEET 40 OF 109

DSN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN:	6	TEXAS	STP 1802 (783) MM			CS
DWN:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWN:	HOU	HARRIS	0912	72	391	434



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R.P.E. & L.A. BOARD OF ENGINEERS
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(IN FEET)
SCALE: PLAN 1":30'

STATE OF TEXAS
EDWARD J. KOCHANEK
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LICENSED IRRIGATOR

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Texas Department of Transportation

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L3.16

IRRIGATION PLAN

SHEET 41 OF 109

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN:	6	TEXAS	STP 1802 (783) MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	435

SYMBOL Q	T	H	F	MANUFACTURER	MODEL NO. / DESCRIPTION	FLOW RATE (GPM)	PSI	RADIUS	P.R. (TRI.)	DETAIL
				HUNTER	PROS-06 6" POP-UP TURF HEAD WITH 5Q/5H NOZZLES	.12, .23	30	5 FT	2.05 IN./HR.	A
				HUNTER	PROS-06 6" POP-UP TURF HEAD WITH 8Q/8T/8H/8F NOZZLES	.24, .32, .47, .97	30	8 FT	1.69 IN./HR.	A
				HUNTER	PROS-06 6" POP-UP TURF HEAD WITH 10Q/10T/10H/10F NOZZLES	.42, .57, .88, 1.59	30	10 FT	1.77 IN./HR.	A
				HUNTER	PROS-06 6" POP-UP TURF HEAD WITH 12Q/12T/12H/12F NOZZLES	.67, .89, 1.30, 2.70	30	12 FT	2.09 IN./HR.	A
				HUNTER	PROS-06 6" POP-UP TURF HEAD WITH 15Q/15T/15H/15F NOZZLES	.97, 1.30, 1.86, 3.75	30	15 FT	1.85 IN./HR.	A
				HUNTER	PROS-06 6" POP-UP TURF HEAD WITH LCS/RCS/SS530 NOZZLES	.65, 1.30	30	4X15 FT 4X30 FT	2.09 IN./HR.	A
				HUNTER	PROS-04 4" POP-UP BUBBLER HEAD WITH A MSBN-25Q PRESSURE COMPENSATING BUBBLER NOZZLE. EACH SYMBOL REPRESENTS TWO (2) BUBBLERS PER TREE. PLACE THE BUBBLER HEADS 6" FROM THE EDGE OF THE ROOT BALL AND ON OPPOSITE SIDES OF THE TREE, TYPICAL. ADJUST BUBBLER STREAMS TO WET THE ROOT BALL AND ADJACENT AMENDED SOIL WITHOUT HITTING THE TRUNK OF THE TREE.	.25 (0.50 TOTAL)	30	1.5 FT	N/A	A,B
NO SYMBOL				AS APPROVED	ALL SPRINKLER HEAD SWING JOINTS SHALL BE CONSTRUCTED SOLELY OF SCH. 80 PVC.					A
				RAIN BIRD	XFS-06-12 SUBSURFACE DRIP TUBING (COPPER EXTERIOR COLOR) WITH 0.60 GPH, PRESSURE COMPENSATING EMITTERS INTERNALLY INSTALLED IN THE DRIP TUBING AT 12" O.C. SPACING. DRIP TUBING SHALL BE EQUIPPED WITH COPPER CHIP TECHNOLOGY TO PREVENT ROOT INTRUSION INTO THE DRIP EMITTER. DRIP TUBING SHALL BE INSTALLED 2" BELOW FINISHED SOIL GRADE (NOT COUNTING MULCH) AND IN PARALLEL ROWS A MAXIMUM OF 16" ON CENTER. THE PERIMETER ROW OF DRIP TUBING SHALL BE INSTALLED A MAXIMUM OF 4" FROM THE EDGE OF ANY HARDSCAPE OR TURF EDGE. ALL SUBSEQUENT INTERIOR ROWS SHALL BE ADJUSTED TO PROVIDE AN EVEN SPACING ACROSS THE PLANTER WITHOUT EXCEEDING 16" MAXIMUM SPACING. INSTALL 9" PVC COATED GALVANIZED TUBING STAKES A MAXIMUM OF FIVE (5) FEET ON CENTER ALONG THE LENGTH OF THE TUBING. TUBING STAKES SHALL BE MODEL #GDTS140900 AS MANUFACTURED BY GPH IRRIGATION PRODUCTS (866) 582-9684. THE HATCH PATTERN SYMBOLS ON THE PLANS REPRESENT THE APPROXIMATE DIRECTION AND SPACING OF THE DRIP TUBING ROWS, SEE ACTUAL SPACING REQUIREMENTS ABOVE AND IN DETAILS.					C,D
NO SYMBOL				RAIN BIRD	CONNECTION BETWEEN XFS DRIP TUBING AND PVC SUPPLY AND DISCHARGE HEADERS SHALL BE MADE USING XF DRIP LINE BARBED FITTINGS, SCH. 40 PVC THREADED FITTINGS, SCH. 80 NIPPLES AND FLEXIBLE NIPPLES. WHEN THE CONNECTION IS AT THE END RUN OF THE TUBING USE A 1/2" SCH. 40 PVC THREADED 90° ELBOW, A 1/2" X LENGTH AS REQUIRED SCH. 80 PVC THREADED NIPPLE, A 1/2" X 6" MIPT X FIPT FLEXIBLE NIPPLE, AND A XFF-MA-050 17mm BARB X 1/2" MIPT ADAPTER FITTING. WHEN THE CONNECTION IS IN THE MIDDLE OF THE TUBING RUN USE A 1/2" SCH. 40 PVC THREADED TEE FITTING, A 1/2" X LENGTH AS REQUIRED SCH. 80 PVC THREADED NIPPLE, A 1/2" X 6" MIPT X FIPT FLEXIBLE NIPPLE, AND TWO (2) XFF-MA-050 17mm BARB X 1/2" MIPT ADAPTERS. ALL END RUNS OF TUBING SHALL BE CONNECTED WITH A PVC DISCHARGE HEADER. FLEXIBLE NIPPLES SHALL BE MODEL #GFN050600 AS MANUFACTURED BY GPH IRRIGATION PRODUCTS (866) 582-9684.					C,D
NO SYMBOL				RAIN BIRD	XF SERIES 17mm BARBED FITTINGS FOR ALL CONNECTIONS BETWEEN DRIP TUBING (TUBING-TO-TUBING ONLY). ALL BARBED DRIP TUBING FITTINGS SHALL BE INSTALLED USING A FITINS-TOOL FOR PROPER INSERTION OF THE FITTING INTO THE TUBING. NO HEATING OF TUBING SHALL BE ALLOWED.					N/A
				AS APPROVED	PVC SUPPLY AND DISCHARGE HEADERS SHALL BE PVC LATERAL LINE PIPE (AS SHOWN BELOW), 1 1/4" MINIMUM SIZE WITH SCH. 40 PVC FITTINGS.					C,D,P
				GPH IRRIGATION/ RAIN BIRD	GDFN DRIP FLUSH / INDICATOR NOZZLE, ORANGE IN COLOR, INSTALLED ONTO A RAIN BIRD 1812 12" POP-UP SPRINKLER BODY. THE FLUSH NOZZLE SHALL BE ORIENTED TO SEND FLUSH WATER INTO THE PLANTER AREA AND CLOSED FOR NORMAL OPERATION OF THE DRIP SYSTEM.					C,E
				RAIN BIRD	ARV050 AIR/VACUUM RELIEF VALVE INSTALLED WITH A XFD-TFA-075 BARB X BARB X 3/4" FIPT TEE FITTING AND A AND A 3/4" X 1/2" SCH. 40 PVC THREADED REDUCER BUSHING. INSTALL AIR RELIEF ASSEMBLY AT THE HIGH POINT OF EACH PLANTER. SEE PLANS FOR APPROXIMATE LOCATION AND QUANTITY OF ARV'S PER DRIP ZONE. USING AN AIR RELIEF LATERAL CONSTRUCTED OF XFD "BLANK" XF TUBING, CONNECT AIR RELIEF VALVE TO ALL DRIP LINE LATERALS WITHIN THE ELEVATED AREA. MULTIPLE ARV'S MAY BE REQUIRED PER DRIP TUBING ZONE, SEE PLANS. INSTALL INSIDE A 7" ROUND VALVE BOX.					C,F
				HUNTER	PLD-BV MANUAL BALL VALVE FOR SYSTEM FLUSH INSTALLED AT FAR END OF ECO-MAT TURF DRIP SYSTEMS.					CC,DD
				HUNTER	PLD-AVR AIR RELIEF VALVE INSTALLED AT OPTIMAL HIGH POINT OF ECO-MAT TURF DRIP SYSTEMS.					CC,DD

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P.U.C. RECORDS AND ENGINEERING
67862

STATE OF TEXAS
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FIRM REGISTATION NO. 2614

Texas Department of Transportation

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L3.17

IRRIGATION MATERIALS LEGEND

SHEET 42 OF 109

DSN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN:	6	TEXAS	STP 1802 (783) MM			CS
DWN:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWN:	HOU	HARRIS	0912	72	391	436

SYMBOL	MANUFACTURER	MODEL NO. / DESCRIPTION	DETAIL
	HUNTER	ECO-MAT 17mm FLEECE IRRIGATION MAT WITH FLEECE WRAPPED PLD TUBING. PLD TUBING SHALL BE EQUIPPED WITH 0.60 GPH EMITTERS INTERNALLY INSTALLED IN THE DRIP TUBING AT 12" O.C. SPACING. DRIP EMITTERS SHALL BE PRESSURE COMPENSATING AND EQUIPPED WITH AN INTERNAL CHECK VALVE. THE WRAPPED DRIP TUBING SHALL BE MANUFACTURED ATTACHED TO 32" WIDE PANELS OF FLEECE MATTING, TWO (2) TUBES TO A PANEL AND SPACED AT 14" ON CENTER ROW SPACING. ECO-MAT SHALL BE INSTALLED 6" BELOW FINISHED SOIL GRADE AND COMPLETELY UNDERLAY THE PLANTED AREA. PANELS SHALL BE ALIGNED TO FORM PARALLEL ROWS OF WRAPPED TUBING, MAINTAINING THE 14" ROW SPACING. TO ACHIEVE THIS ROW SPACING, THE PANELS MUST HAVE A 4" OVERLAP BETWEEN FLEECE MAT PANELS. FLEECE PANELS MUST EXTEND TO THE EDGES OF ALL PLANTING AREAS AND BE IN CONTACT WITH ADJACENT HARDSCAPE EDGES. FLEECE WRAPPED TUBING SHALL BE CONNECTED TO PVC SUPPLY AND DISCHARGE HEADERS. INSTALL 9" PVC COATED GALVANIZED TUBING STAKES A MAXIMUM OF FIVE (5) FEET ON CENTER ALONG THE LENGTH OF THE WRAPPED TUBING. TUBING STAKES SHALL BE MODEL #GDTS140900 AS MANUFACTURED BY GPH IRRIGATION PRODUCTS (866) 582-9684. THE HATCH PATTERN SYMBOLS ON THE PLANS REPRESENT THE EXTENT OF THE ECO-MAT SYSTEM.	CC,DD
M	P.O.C.	1 1/2" POTABLE (DOMESTIC) WATER METER WITH 2" SERVICE LINE. VERIFY METER SIZE, LOCATION AND WATER PRESSURE IN FIELD.	N/A
B	WILKINS	375S, 1 1/2" R/P BACK FLOW PREVENTION DEVICE WITH WYE STRAINER, INSTALL WITH BRASS NIPPLES, UNIONS AND FITTINGS, SIZED PER DEVICE	G
NO SYMBOL	V.I.T.	STRONG BOX SBBC-45SS "SMOOTH TOUCH" STAINLESS STEEL BACK FLOW DEVICE ENCLOSURE.	G
NO SYMBOL	V.I.T.	PBB-45 "POLAR BEARIER" INSULATED BACK FLOW DEVICE COVER, FOR INFORMATION CONTACT V.I.T. PRODUCTS (800) 729-1314.	N/A
V	BUCKNER	3200-150, 1 1/2" NORMALLY CLOSED, BRASS MASTER CONTROL VALVE. WIRE TO SINGLE STATION DECODER AND CONNECT TO TWO-WIRE CONTROL PATH. INSTALL INSIDE A STANDARD RECTANGULAR VALVE BOX.	H
F	RAIN BIRD	FS150P 1 1/2" PVC TEE, HDPE IMPELLER TYPE FLOW SENSOR. WIRE TO SENSOR DECODER AND CONNECT TO TWO-WIRE CONTROL PATH. INSTALL PER MANUFACTURER'S RECOMMENDATIONS AND INSIDE A STANDARD RECTANGULAR VALVE BOX.	I
	LASCO	VXX101N-SC 2" - 3" SLO-CLOSE SCH. 80 PVC, TRUE-UNION BALL VALVE WITH SOLVENT WELD SOCKET CONNECTIONS, LINE SIZE PER MAINLINE. INSTALL INSIDE A 10" ROUND VALVE BOX.	J
	RAIN BIRD	33-DLRC 3/4" QUICK COUPLER VALVE WITH LOCKING VINYL COVER AND A LASCO G13T-218 SWING JOINT. INSTALL INSIDE A PURPLE RECTANGULAR VALVE BOX WITH 1" BRASS BALL VALVE FOR ISOLATION PER TCEQ REQUIREMENTS	K
	RAIN BIRD	1X0-PEB PLASTIC REMOTE CONTROL VALVE (RCV), 1" - 11/2" SIZES. INSTALL THE RCV INSIDE A STANDARD RECTANGULAR VALVE BOX.	L
	RAIN BIRD	XCZ-100-PRF PLASTIC DRIP REMOTE CONTROL VALVE ASSEMBLY, 1" SIZE, WITH 1" PRESSURE REGULATING FILTER. INSTALL THE DRCV ASSEMBLY INSIDE A JUMBO RECTANGULAR VALVE BOX.	M
C	RAIN BIRD	ESP-LXD/LXMMSS 75-STATION DECODER (TWO WIRE) CONTROLLER INSIDE A STAINLESS STEEL CABINET, INSTALLED ON TOP OF LXMMSSPED STAINLESS STEEL PEDESTAL. INSTALL EACH CONTROLLER WITH A PBC-LXD PROGRAMMING BACK-UP CARTRIDGE. PROVIDE ONE (1) DPU-210 DECODER PROGRAMMING UNIT FOR THE PROJECT FOR USE DURING INSTALLATION AND AS A TURNOVER ITEM UPON COMPLETION. PROVIDE ONE (1) LIMRKIT LANDSCAPE REMOTE CONTROL KIT FOR THE PROJECT AS A TURNOVER ITEM. GROUND THE CONTROLLER AS RECOMMENDED BY THE MANUFACTURER. INSTALL A RAIN BIRD LSP-1TURF LINE SURGE PROTECTION UNIT AT THE CONTROLLER AND ONE A MAXIMUM OF 500 FEET ON CENTER OR EVERY 8 DECODERS (WHICHEVER IS SMALLER) ALONG THE ENTIRE TWO-WIRE PATH. SURGE PROTECTION SHALL BE AS RECOMMENDED BY THE MANUFACTURER TO INSURE WARRANTY PROTECTION.	N,O
NO SYMBOL	RAIN BIRD	EACH MASTER VALVE, REMOTE CONTROL VALVE AND DRIP REMOTE CONTROL VALVE SHALL BE INSTALLED WITH A FD-101-TURF SINGLE STATION TWO- WIRE DECODER. MULTIPLE STATION DECODERS MAY BE USED ON GROUPS OF REMOTE AND DRIP REMOTE CONTROL VALVE AT THE DISCRETION OF THE CONTRACTOR. VALVES SHARING MULTIPLE STATION DECODERS SHALL NOT BE MORE THAN 25 FEET APART. EACH FLOW SENSOR SHALL BE INSTALLED WITH A SD-210-TURF SENSOR DECODER. LSP-1-TURF LINE SURGE PROTECTION DEVICES SHALL BE INSTALLED ALONG THE TWO-WIRE PATH AT AN ON CENTER SPACING NOT TO EXCEED 500 FEET. INSTALL THE LSP DEVICE AND GROUND ROD IN A STANDARD RECTANGULAR VALVE BOX. INSTALL ONE LSP DEVICE WITHIN 10 FEET OF THE IRRIGATION CONTROLLER ASSEMBLY.	X,Y,Z
NO SYMBOL	PAIGE ELECTRIC	THE CONTROLLER SHALL BE GROUNDED USING A #182000 5/8" X 8 FOOT COPPER CLAD GROUND ROD, A #182005 CAST BRONZE ROD CLAMP AND THE REQUIRED LENGTH OF #6AWG BARE, SINGLE STRAND COPPER GROUND WIRE. INSTALL INSIDE A 10" ROUND VALVE BOX.	O
R	RAIN BIRD	RSD WIRED RAIN SENSOR, MOUNT IN RGVRSS ENCLOSURE ON THE SIDE OF THE CONTROLLER ENCLOSURE, WIRE TO THE CONTROLLER.	N/A
E	N/A	120 VOLT ELECTRICAL POWER FOR CONTROLLER, SEE PEDESTRIAN LIGHTING LAYOUT SHEETS FOR ELECTRICAL CONNECTION.	N/A

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STATE OF TEXAS
EDWARD J. KOCHANEK
20439
LICENSED IRRIGATOR

26 February 2020

REV. NO.	DATE	DESCRIPTION	BY
	02/18/2020	100% CONSTRUCTION DOCUMENTS	

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

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L3.18

IRRIGATION MATERIALS LEGEND

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN:	6	TEXAS	STP 1802 (783) MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	437

SYMBOL	MANUFACTURER	MODEL NO. / DESCRIPTION	DETAIL
———	AS APPROVED	PVC PIPE 3/4" - 2" SCH. 40, SOLVENT WELD WITH SCH. 40 PVC FITTINGS, AS LATERAL LINES INSTALLED 12" BELOW FINISHED GRADE	P
— — — —	AS APPROVED	PVC PIPE 1-1/2" - 3" SCH. 40, SOLVENT WELD WITH SCH. 80 PVC FITTINGS, AS MAINLINES INSTALLED 18" - 36" BELOW FINISHED GRADE, REFER TO INSTALLATION DETAIL FOR PIPE DEPTH.	P
— — — — —	AS APPROVED	PVC PIPE SCH. 40 AS SLEEVING, 2 TIMES THE DIAMETER OF PIPE OR WIRE BUNDLE CARRIED (2" MINIMUM SIZE) INSTALL ALL PIPE AND WIRE UNDER PAVING, HARDSCAPE, ETC. (OR AS DIRECTED BY OWNER'S AUTHORIZED REPRESENTATIVE) INSIDE SLEEVES. SLEEVES UNDER PEDESTRIAN PAVING SHALL BE INSTALLED 24" BELOW FINISHED GRADE. SLEEVES UNDER VEHICULAR PAVING SHALL BE INSTALLED 36" BELOW FINISHED GRADE. **FOR CASINGS OF PIPE BORED BENEATH EXISTING ROADWAYS, CONTRACTOR SHALL USE CL. 200 PVC PIPE.	Q,R
NO SYMBOL	LASCO	ALL FITTINGS USED WITH SOLVENT WELD MAINLINE PIPE SHALL BE SCH. 80 PVC FITTINGS, GRAY IN COLOR, AND SIZED TO MATCH THE THR MAINLINE PIPE. ALL FITTINGS USED WITH SOLVENT WELD LATERAL LINE PIPE SHALL BE SCH. 40 PVC, WHITE IN COLOR, AND SIZED TO MATCH THE LATERAL LINE PIPE. ALL THREADED PVC NIPPLES SHALL BE SCH. 80 PVC PIPE, DARK GRAY IN COLOR, WITH MOLDED THREADS.	N/A
NO SYMBOL	AS APPROVED	ALL SOLVENT WELD MAINLINES ABOVE 2" IN SIZE SHALL HAVE CONCRETE THRUST BLOCKING INSTALLED AT ALL DIRECTIONAL CHANGES INCLUDING ELBOWS (45° AND 90°) AND TEES. MAINLINE PIPES UNDER 2" SIZE AND ALL LATERAL LINES DO NOT REQUIRE THRUST BLOCKING.	S
NO SYMBOL	AS APPROVED	ALL SOLVENT WELD CONNECTIONS FOR BOTH MAINLINE AND LATERAL LINE SHALL BE MADE USING THE TWO-STEP PROCESS OF PRIMER AND SOLVENT CEMENT. PRIMER SHALL BE LOW VOC "PURPLE PRIMER". MAINLINE SOLVENT CEMENT SHALL BE LOW VOC, "GRAY-HEAVY BODY" CEMENT. LATERAL LINE SOLVENT CEMENT SHALL BE LOW VOC, GRAY OR BLUE COLORED MEDIUM BODIED CEMENT. USE DAUBERS SIZED AT LEAST ONE-HALF THE SIZE OF THE LARGEST PIPE BEING JOINED. ALL SOLVENT CEMENTED JOINTS SHALL BE MADE PER THE PIPE AND FITTING MANUFACTURER'S RECOMMENDATIONS.	N/A
NO SYMBOL	PAIGE ELECTRIC	P7072D DIRECT BURIAL IRRIGATION CONTROL CABLE (TWO-WIRE PATH) WITH TWO, PARALLEL, PVC INSULATED, SOLID COPPER CONDUCTOR IRRIGATION CONTROL WIRES, #14UF SIZE, WITH A IMPREGNATED POLYETHYLENE, COLOR CODED JACKET. JACKET COLOR SHALL BE RED AND THE CONDUCTORS INSULATION SHALL BE RED AND BLACK. WHERE MULTIPLE CONTROLLERS ARE USED ON THE PROJECT, EACH CONTROLLER SHALL HAVE A CONTROL CABLE OF A DIFFERENT COLOR. THE CONTRACTOR SHALL ROUTE THE CONTROL CABLE FROM THE CONTROLLER ALONG THE MAINLINE IN ALL DIRECTIONS AWAY FROM THE CONTROLLER. LOOP THE CONTROL CABLE UP AND INTO EACH VALVE BOX ALONG THE MAINLINE, PROVIDING A 3 FOOT MINIMUM LOOP IN EACH VALVE BOX.	P,Q
NO SYMBOL	3M	DBR/Y-6 DIRECT BURIAL (I.L. APPROVED) WATER-PROOF WIRE CONNECTORS FOR USE ON ALL WIRE SPLICES AND CONNECTIONS	T
NO SYMBOL	NDS (K.B.I.)	KSC-XXX-S SWING CHECK VALVE, LATERAL LINE SIZE, INSTALL ONE (1) ON THE DOWNSTREAM SIDE OF EACH RCV WHEN THE RCV IS LOWER THAN THE SPRINKLERS, BUBBLERS OR DRIP EMITTERS. INSTALL WITHIN SPRINKLER / BUBBLER / DRIP ZONES AS REQUIRED TO PREVENT LOW HEAD DRAINAGE.	N/A
NO SYMBOL	NDS (K.B.I.)	KC-XXX-S SPRING CHECK VALVE, LATERAL LINE SIZE, INSTALL ONE (1) ON THE DOWNSTREAM SIDE OF EACH RCV WHEN THE RCV IS HIGHER THAN THE SPRINKLERS, BUBBLERS OR DRIP EMITTERS. INSTALL WITHIN SPRINKLER / BUBBLER / DRIP ZONES AS REQUIRED TO PREVENT LOW HEAD DRAINAGE.	N/A
NO SYMBOL	RAIN BIRD	ALL VALVE BOXES SHALL BE VB SERIES, PLASTIC TYPE WITH OVERLAPPING LIDS. VALVE BOX BODIES SHALL BE BLACK IN COLOR. LIDS FOR BOXES IN TURF AREAS SHALL BE GREEN. LIDS FOR VALVE BOXES IN SHRUB AREAS SHALL BE BLACK. ALL BOXES SHALL BE SECURED WITH A RAIN BIRD VB-LOCK-P PENTA HEAD BOLT, WASHER AND CLIP. BOXES SHALL BE AS SHOWN BELOW:	N/A

DESCRIPTION	TURF AREAS (GREEN LIDS)	SHRUB AREAS (BLACK LIDS)
7" ROUND BOXES	VB-7RND	VB-7RNDBK (RB ITEM ID #11484)
10" ROUND BOXES	VB-10RND	VB-10RNDBK (RB ITEM ID #61461)
STANDARD RECTANGULAR BOXES	VB-STD	VB-STDBK (RB ITEM ID #61411)
JUMBO RECTANGULAR BOXES	VB-JMB	VB-JMBBK (RB ITEM ID #A61441)

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FIRM REGISTRATION NO. 2614

Texas Department of Transportation

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L3.19

IRRIGATION MATERIALS LEGEND

SHEET 44 OF 109

DSN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK DSN:	6	TEXAS	STP 1802 (783) MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CK DWG:	HOU	HARRIS	0912	72	391	438

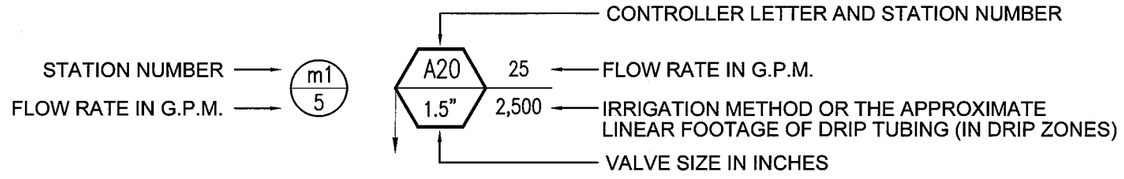
E:\Dropbox (Sweeney & Associates)\Drawings - Texas\swa - houston\Memorial Drive\L3.19 IRRIGATION LEGEND.dwg | ADRIANARR | ANSI FULL BLEED B (11.00 X 17.00 INCHES) | 2/26/2020

*FOR TXDOT CONTRACTOR'S INFORMATION ONLY:
DESIGN IS TO MEET CITY OF HOUSTON ADOPT-AN-ESPLANADE STANDARDS. ANY DEVIATION FROM THESE PLANS MUST BE APPROVED BY TXDOT LANDSCAPE ARCHITECT AND OWNER'S AUTHORIZED REPRESENTATIVE PRIOR TO WORK.

ADOPT-AN-ESPLANADE* MEDIANS ONLY

SYMBOL	MANUFACTURER	MODEL NO. / DESCRIPTION	DETAIL
Ⓦ	P.O.C.	POTABLE IRRIGATION 1" WATER METER. VERIFY ACTUAL LOCATION, SIZE, AND WATER PRESSURE IN THE FIELD	N/A
Ⓑ	FEBCO	765 SERIES, 1" PVB TYPE BACKFLOW PREVENTION ASSEMBLY, INSTALLED WITHIN ENCLOSURE. BACKFLOW ASSEMBLY SHALL BE INSTALLED NO FURTHER THAN 18" FROM IRRIGATION WATER METER	U
NO SYMBOL	HOT BOX	HOT BOX FLIP TOP FIBERGLASS ENCLOSURE WITH INSULATION, MODEL # LF011019022, INSTALL WITH GLASS PAD FIBERGLASS MOUNTING PAD, MODEL # GG019027005. CONTRACTOR SHALL CONFIRM SPECIFIED ENCLOSURE WITH MANUFACTURER PRIOR TO ORDERING. HOT BOX PHONE NO. (800) 736-0238	U
	NIBCO	T-113 GATE VALVE, LINE SIZE, WITH BRONZE WHEEL HANDLE	V
	RAIN BIRD	100-PEB-PRS-D SERIES PLASTIC PRESSURE REGULATING CONTROL VALVE, 1" SIZE, WITH DC-LATCHING SOLENOID.	AA
	RAIN BIRD	XCZ-100-PRF PLASTIC DRIP REMOTE CONTROL VALVE ASSEMBLY, 1" SIZE, WITH 1" PRESSURE REGULATING FILTER AND DC-LATCHING SOLENOID. INSTALL THE DRCV ASSEMBLY INSIDE A JUMBO RECTANGULAR VALVE BOX.	BB
C-R	HUNTER	XCH-600/1200-SS* BATTERY OPERATED CONTROLLER WITH XCHSPOLE (STEEL MOUNTING POLE) AND XCHSPB (STAINLESS STEEL MOUNTING BRACKET). ALL CONTROL VALVES SHALL BE INSTALLED WITH DC-LATCHING SOLENOID. CONTROLLER SHALL BE INSTALLED WITH A MINI-CLIK RAIN SENSOR, MOUNT TO REAR OF ENCLOSURE AND WIRE TO CONTROLLER. *CONTRACTOR MAY REQUEST CUSTOM CONTROLLER ENCLOSURE BID FROM CUSTOM SECURITY FENCE & IRON WORKS LLC OF HOUSTON TEXAS. CONTACT EMILIO LAZANO SR., PHONE # (281) 219-1400 FOR BID INFORMATION. NOTE: WHERE ELECTRICAL SERVICE EXISTS, CONTRACTOR MAY INCLUDE MODEL 526500 120VAC/24V PLUG-IN TRANSFORMER.	W
NO SYMBOL	PAIGE ELECTRIC	P7079D POLYETHYLENE INSULATED, SOLID COPPER CONDUCTOR IRRIGATION CONTROL WIRE #14UF AWG DIRECT BURIAL (U.L. APPROVED). PILOT WIRES SHALL BE RED IN COLOR, COMMON GROUND WIRE SHALL BE WHITE IN COLOR, SPARE WIRES SHALL BE YELLOW IN COLOR. WHERE MULTIPLE CONTROLLERS ARE USED ON THE PROJECT, EACH CONTROLLER SHALL HAVE A DIFFERENT COLOR FOR PILOT WIRES. THE CONTRACTOR SHALL ROUTE TWO (2) SPARE CONTROL WIRES (YELLOW) FROM THE CONTROLLER ALONG THE MAINLINE IN ALL DIRECTIONS AWAY FROM THE CONTROLLER. LOOP SPARE WIRES UP AND INTO EACH VALVE BOX ALONG THE MAINLINE, PROVIDING A 3 FOOT MINIMUM LOOP.	A
NO SYMBOL	3M	DBR/Y-6 DIRECT BURIAL (I.L. APPROVED) WATER-PROOF WIRE CONNECTORS FOR USE ON ALL WIRE SPLICES AND CONNECTIONS	T

VALVE CALLOUT LEGEND



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STATE OF TEXAS
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LICENSED IRRIGATOR

26 February 2020

REV. NO.	DATE	DESCRIPTION	BY
	02/18/2020	100% CONSTRUCTION DOCUMENTS	

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

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

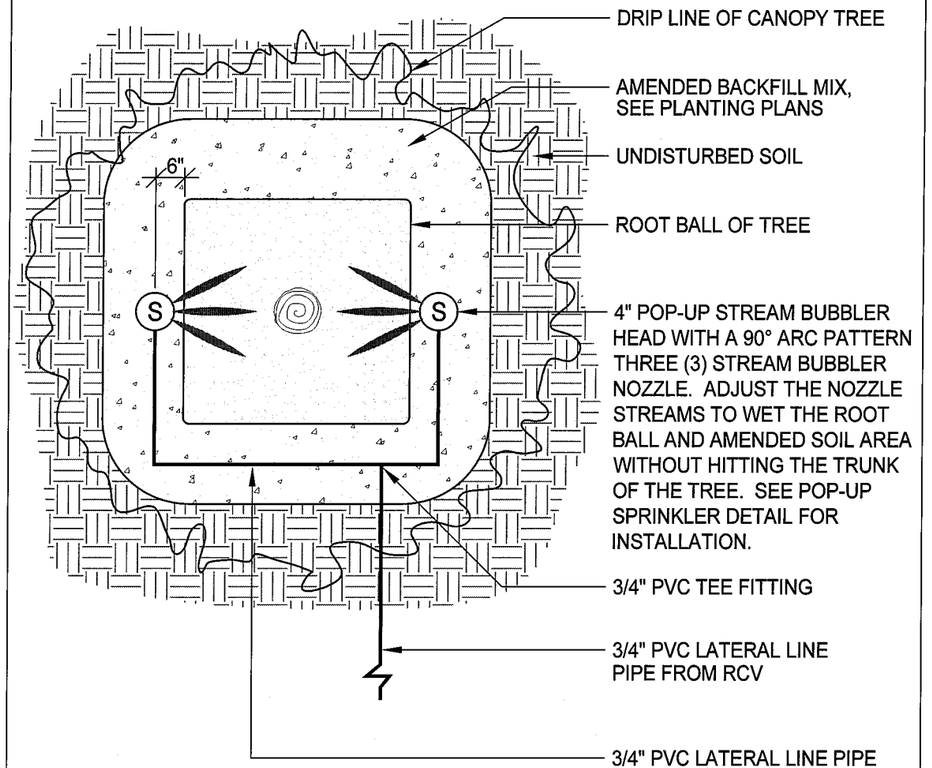
L3.20

IRRIGATION MATERIALS LEGEND

SHEET 45 OF 109

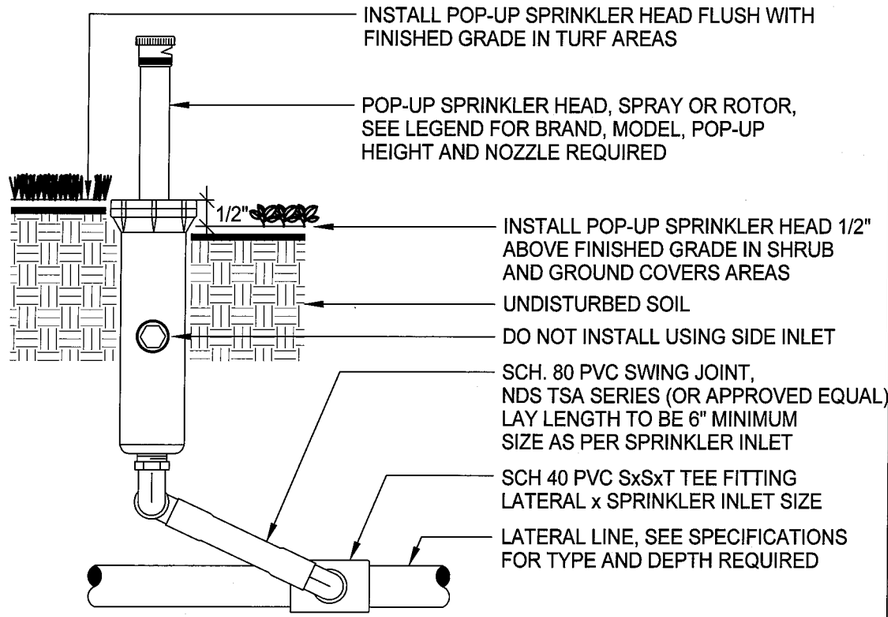
DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: DWN:	6	TEXAS	STP 1802 (783) MM			CS
DW:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CK: DWG:	HOU	HARRIS	0912	72	391	439

E:\Dropbox (Sweeney & Associates)\Drawings - Texas\swa - houston\Memorial Drive\L3.20 IRRIGATION LEGEND.dwg | ADRIANARR |ANSI FULL BLEED B (11.00 X 17.00 INCHES) | 2/26/2020



PLAN VIEW - N.T.S.

B TREE BUBBLER LAYOUT



NOTE:
INSTALL SPRINKLER HEADS 6" FROM PAVING EDGE IN SHRUB AND GROUND COVER AREAS.
INSTALL SPRINKLER HEADS 12" FROM THE FACE OF BUILDING WALLS OR WINDOWS.
INSTALL SPRINKLER HEADS 4" FROM PAVING EDGE IN TURF AREAS.

INSTALL SPRINKLER HEADS PLUMB. ADJUST SPRAYS OR NOZZLE STREAM TO COVER LANDSCAPE AREA WITHOUT OVERSPRAY ONTO PAVING, FENCES, WALLS OR BUILDINGS.

ALL SPRINKLER HEAD SWING JOINTS SHALL BE MADE OF SCH. 80 PVC, TYPICAL.

CONTRACTOR MUST MOCK-UP FOR APPROVAL BY OWNER'S AUTHORIZED REPRESENTATIVE PRIOR TO CONTINUING WORK.

SECTION VIEW - N.T.S.

A POP-UP SPRINKLER HEAD

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PLUMBING PLAN
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26 February 2020

REV. NO.	DATE	DESCRIPTION	BY
	02/18/2020	100% CONSTRUCTION DOCUMENTS	

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FIRM REGISTATION NO. 2814

Texas Department of Transportation

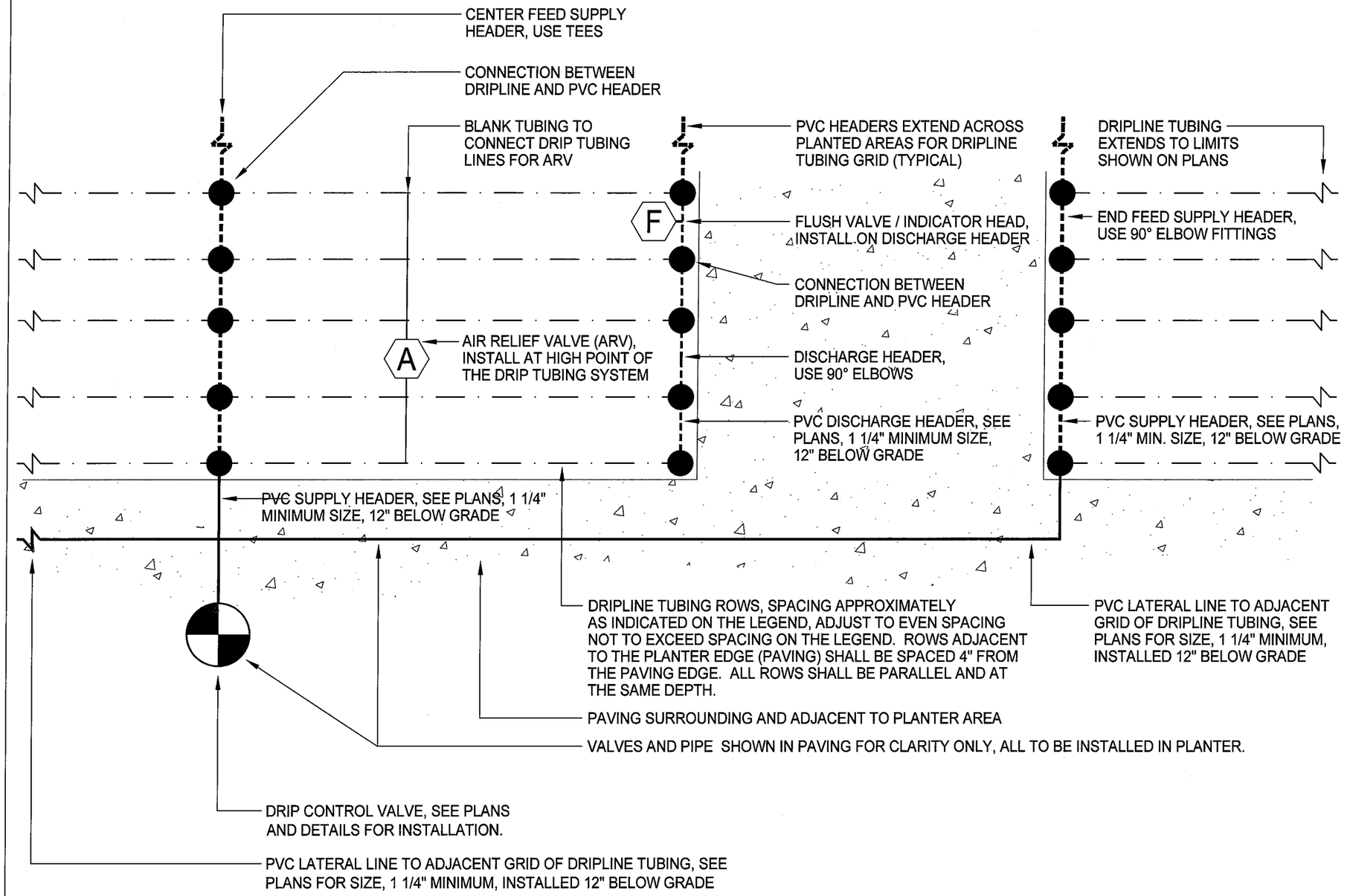
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L3.21

IRRIGATION DETAILS

SHEET 46 OF 109

DSN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN:	6	TEXAS	STP 1802 (783) MM			CS
DWN:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWN:	HOU	HARRIS	0912	72	391	440



NOTE:
CONTRACTOR MUST INSTALL ONE AREA OF BED IRRIGATION FOR APPROVAL BY OWNER'S AUTHORIZED REPRESENTATIVE PRIOR TO CONTINUING WORK.

PLAN VIEW - N.T.S.

© DRIPLINE LAYOUT

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REV. NO.	DATE	DESCRIPTION	BY
	02/25/2020	100% CONSTRUCTION DOCUMENTS	

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A LEO A DALY COMPANY
FIRM REGISTATION NO. 2614

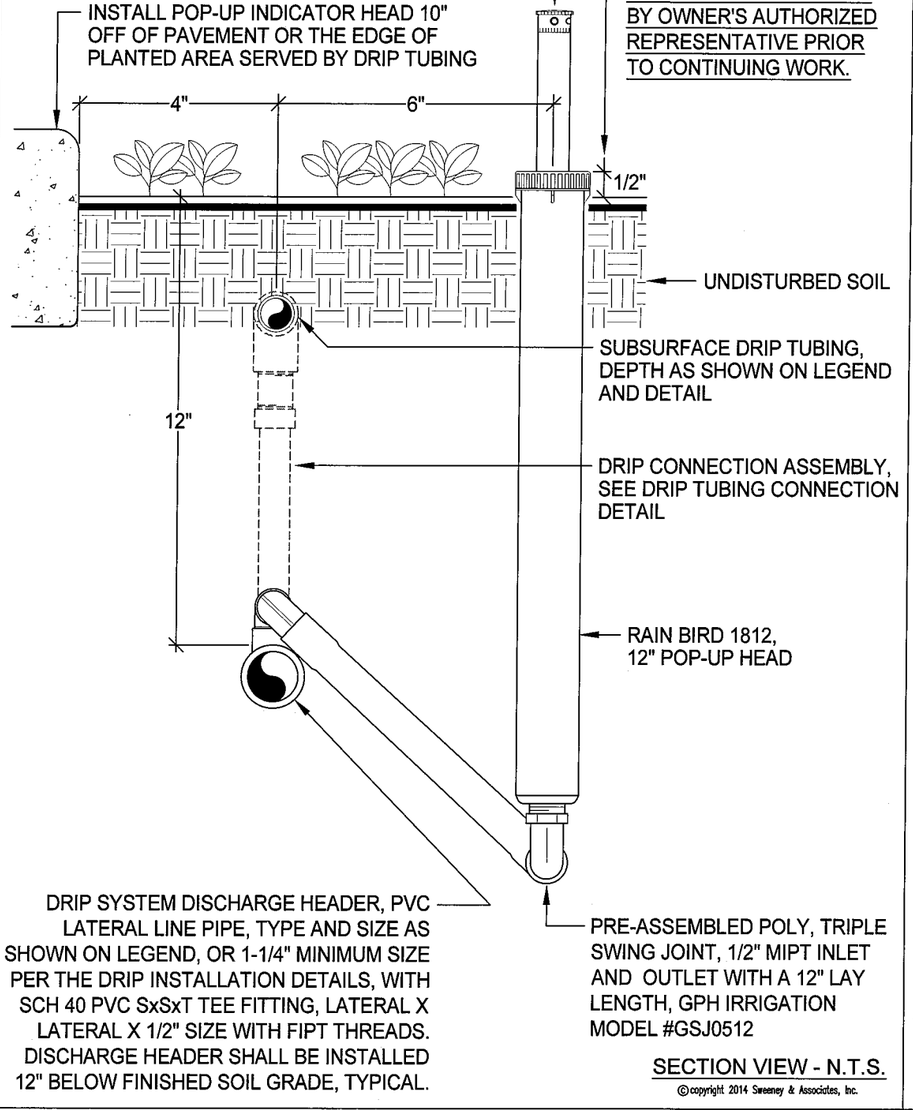
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L3.22

IRRIGATION DETAILS

SHEET 47 OF 109

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN:	6	TEXAS	STP 1802 (783) MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	441



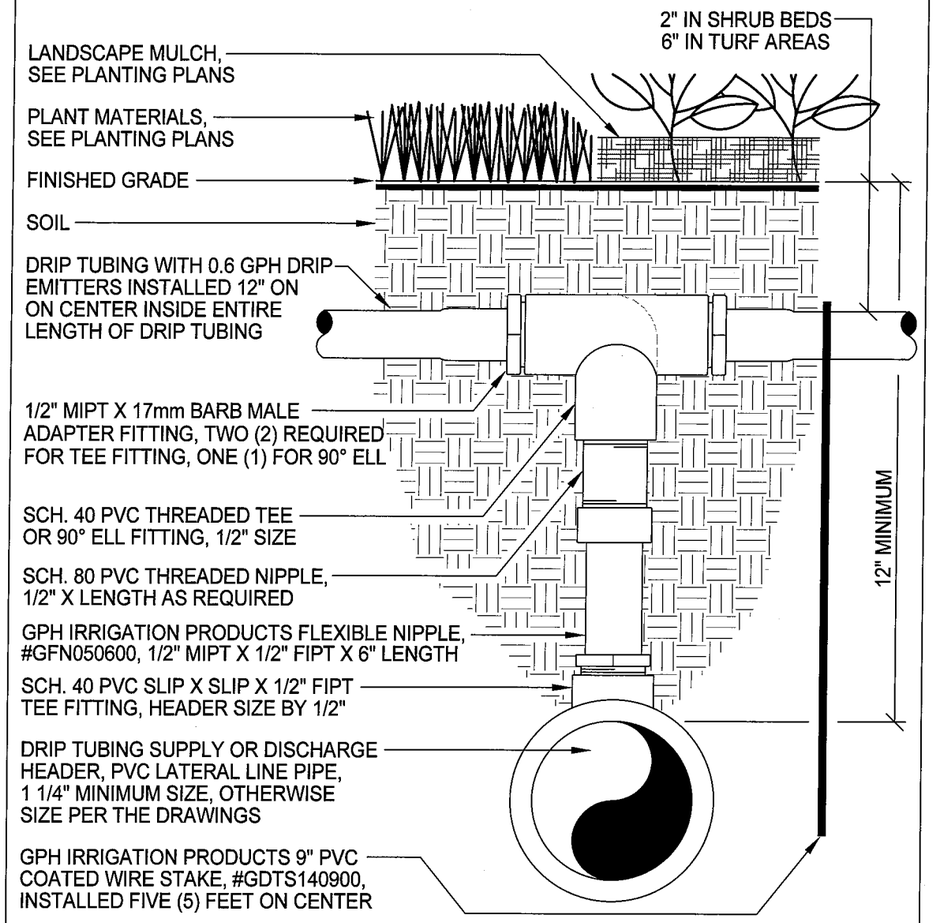
NOTE:
INSTALL INDICATOR HEAD 10" FROM THE EDGE OF PAVING OR THE PLANTER EDGE.

INSTALL ORANGE COLORED INDICATOR NOZZLE ON POP-UP HEAD AND ADJUST TO FULLY CLOSED.

CONTRACTOR MUST MOCK-UP FOR APPROVAL BY OWNER'S AUTHORIZED REPRESENTATIVE PRIOR TO CONTINUING WORK.

SECTION VIEW - N.T.S.

(E) DRIPLINE CONNECTION



NOTE:
DRIP TUBING CONNECTION REQUIRED FOR ALL CONNECTIONS BETWEEN DRIP TUBING AND PVC HEADERS.

FOR CONNECTIONS AT END RUNS OF TUBING, USE A 90° ELL FITTING AND ONE ADAPTER FITTING FOR CONNECTION.

FOR CONNECTIONS IN THE MIDDLE OF RUNS OF TUBING, USE A TEE FITTING AND TWO ADAPTER FITTINGS FOR THE CONNECTION.

CONTRACTOR MUST MOCK-UP FOR APPROVAL BY OWNER'S AUTHORIZED REPRESENTATIVE PRIOR TO CONTINUING WORK.

SECTION VIEW - N.T.S.

(D) DRIPLINE CONNECTION

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Texas Department of Transportation

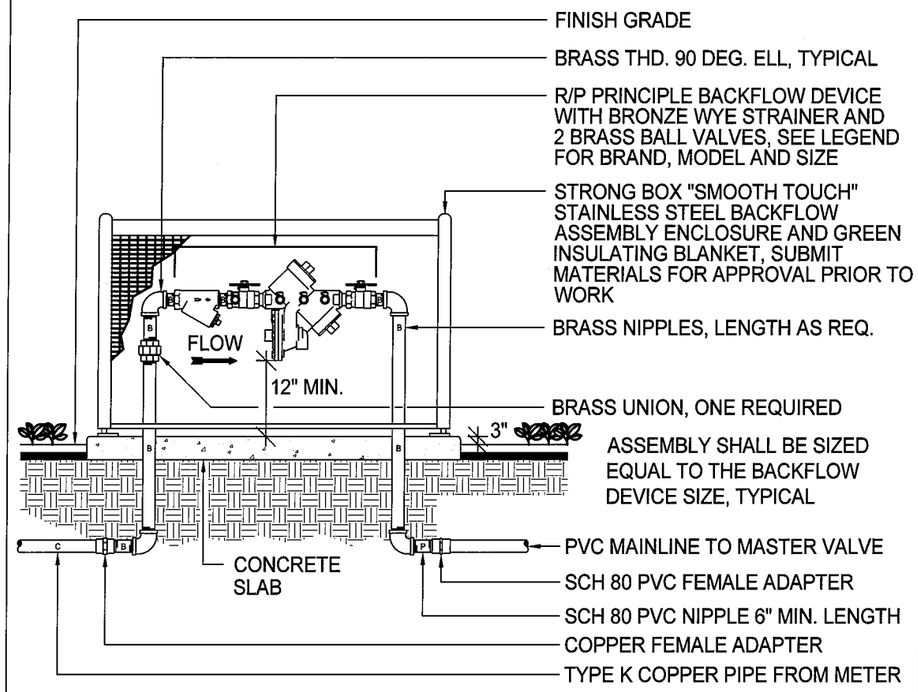
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L3.23

IRRIGATION DETAILS

SHEET 48 OF 109

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802 (783) MM			CS
DWN:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWN:	HOU	HARRIS	0912	72	391	442



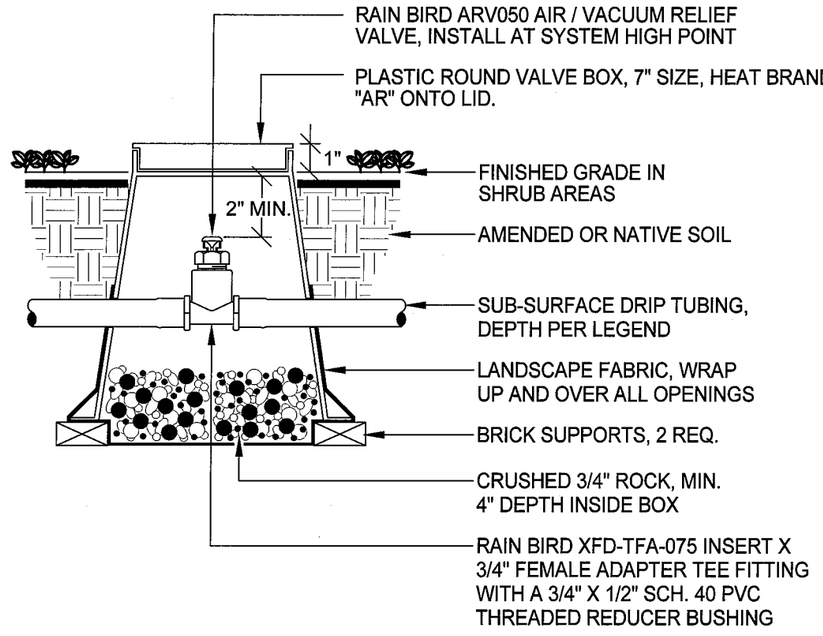
NOTE:
CONCRETE SLAB SHALL BE MINIMUM 6" THICK AND EXTEND AT LEAST 4" PAST THE OUTSIDE DIMENSIONS OF ENCLOSURE.

ENCLOSURE BASES ARE INCIDENTAL TO ITEM 170 AND WILL NOT BE PAID SEPARATELY.

CONTRACTOR MUST PROVIDE MATCHING PADLOCKS FOR ALL PROPOSED BACKFLOW DEVICE ENCLOSURES.

SECTION VIEW - N.T.S.

G BACKFLOW DEVICE



NOTE:
USE STANDARD OPENINGS PROVIDED IN VALVE BOX FOR PIPE, DO NOT CUT BOX.

SECTION VIEW - N.T.S.

F DRIP AIR RELIEF VALVE

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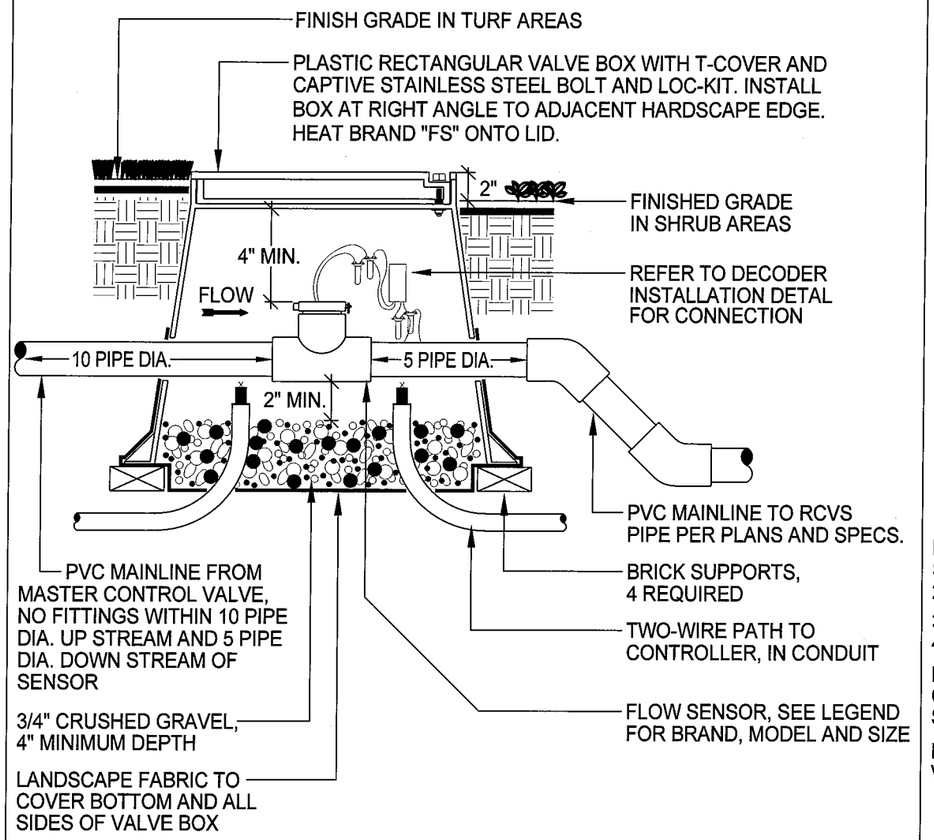
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L3.24

IRRIGATION DETAILS

SHEET 49 OF 109

DSN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK. DSN:	6	TEXAS	STP 1802 (783) MM			CS
DWN:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK. DWN:	HOU	HARRIS	0912	72	391	443

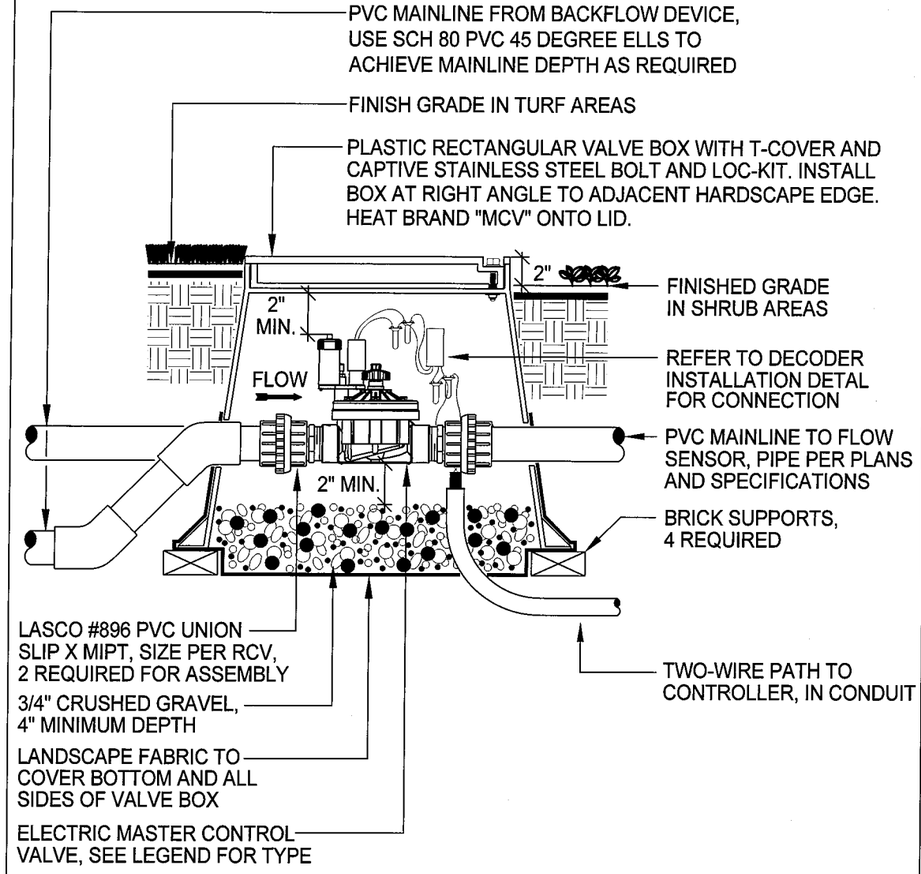


NOTE:
USE STANDARD OPENINGS PROVIDED IN VALVE BOX FOR PIPE, DO NOT CUT BOX.

USE SCH 80 PVC 45 DEGREE ELLS TO ACHIEVE MAINLINE DEPTH AS REQUIRED.

SECTION VIEW - N.T.S.

(I) FLOW SENSOR



NOTE:
USE STANDARD OPENINGS PROVIDED IN VALVE BOX FOR PIPE, DO NOT CUT BOX.

SECTION VIEW - N.T.S.

(H) MASTER CONTROL VALVE

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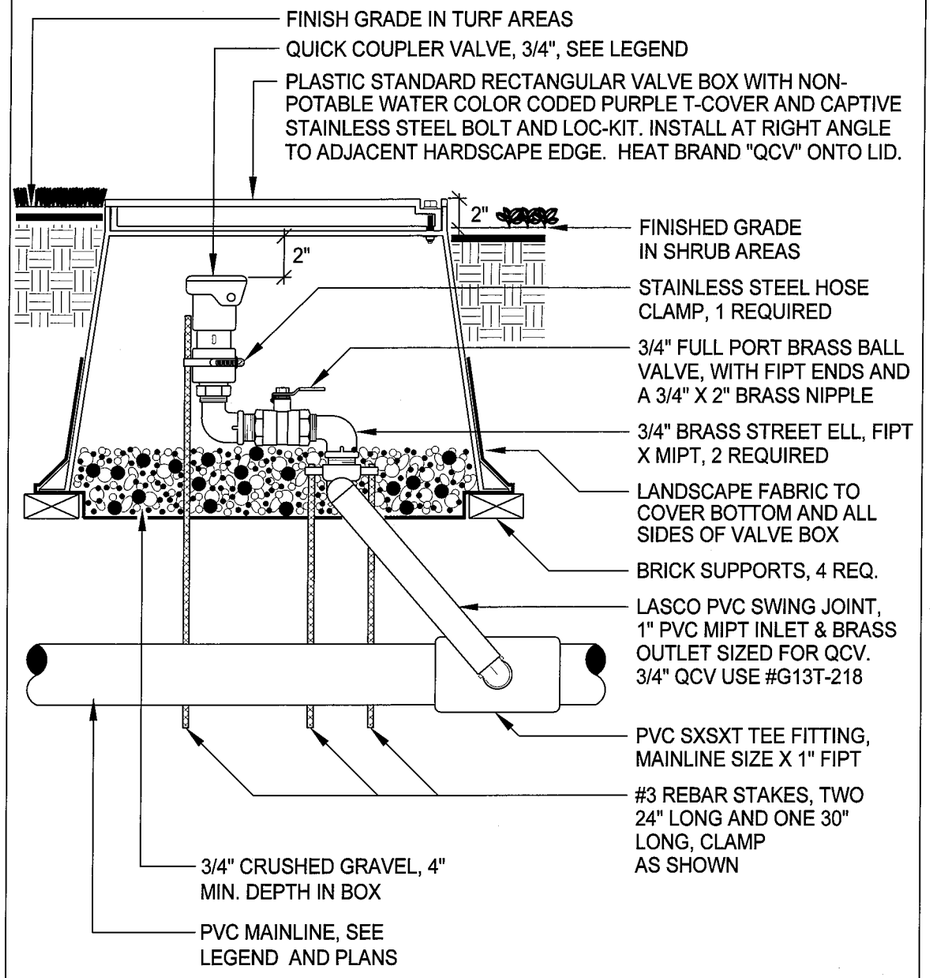
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L3.25

IRRIGATION DETAILS

SHEET 50 OF 109

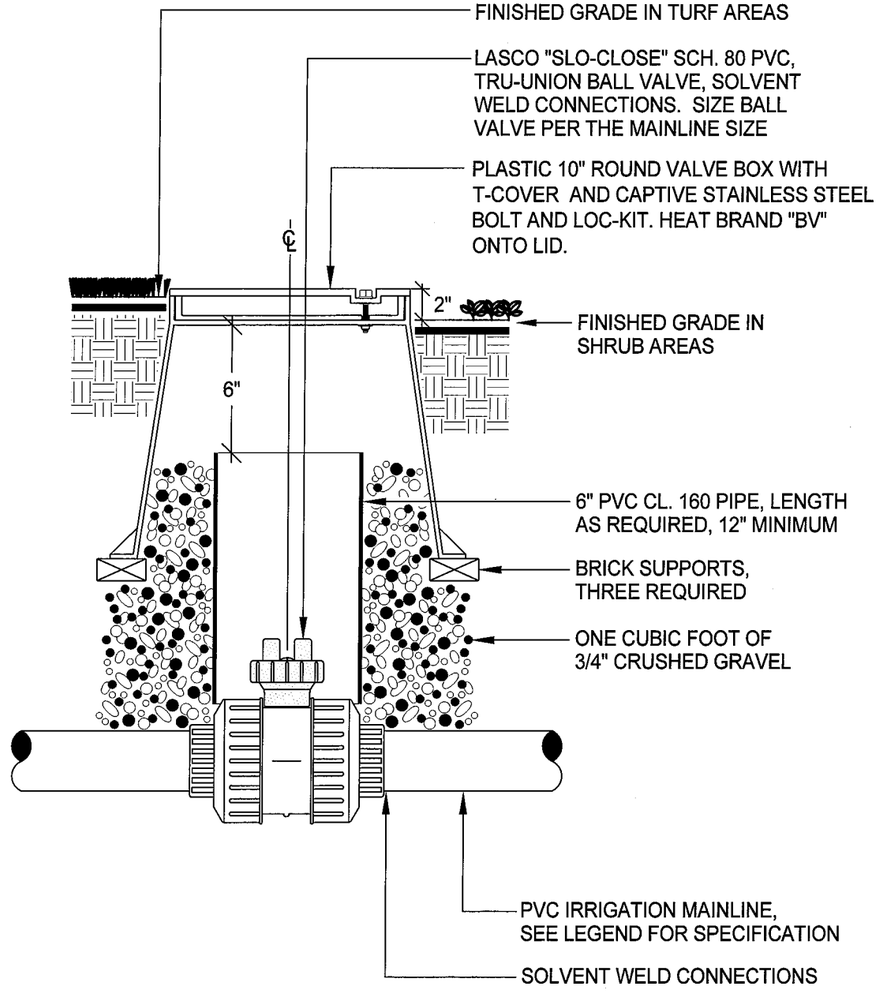
DSN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN:	6	TEXAS	STP 1802 (783) MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	444



NOTE:
USE AN APPROVED, NON-HARDENING, TEFLON ASSEMBLY PASTE ON ALL THREADED FITTINGS.

SECTION VIEW - N.T.S.

(K) QUICK COUPLER VALVE



NOTE:
PROVIDE ONE 30" STEEL VALVE KEY FOR EA. 3 VALVES INSTALLED

SECTION VIEW - N.T.S.

(J) ISOLATION VALVE

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s+a sweeney + associates
irrigation design

67862

STATE OF TEXAS
EDWARD J. KOCHANEK
20439
LICENSED IRRIGATOR

26 February 2020

REV. NO.	DATE	DESCRIPTION	BY
	02/26/2020	100% CONSTRUCTION DOCUMENTS	

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

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

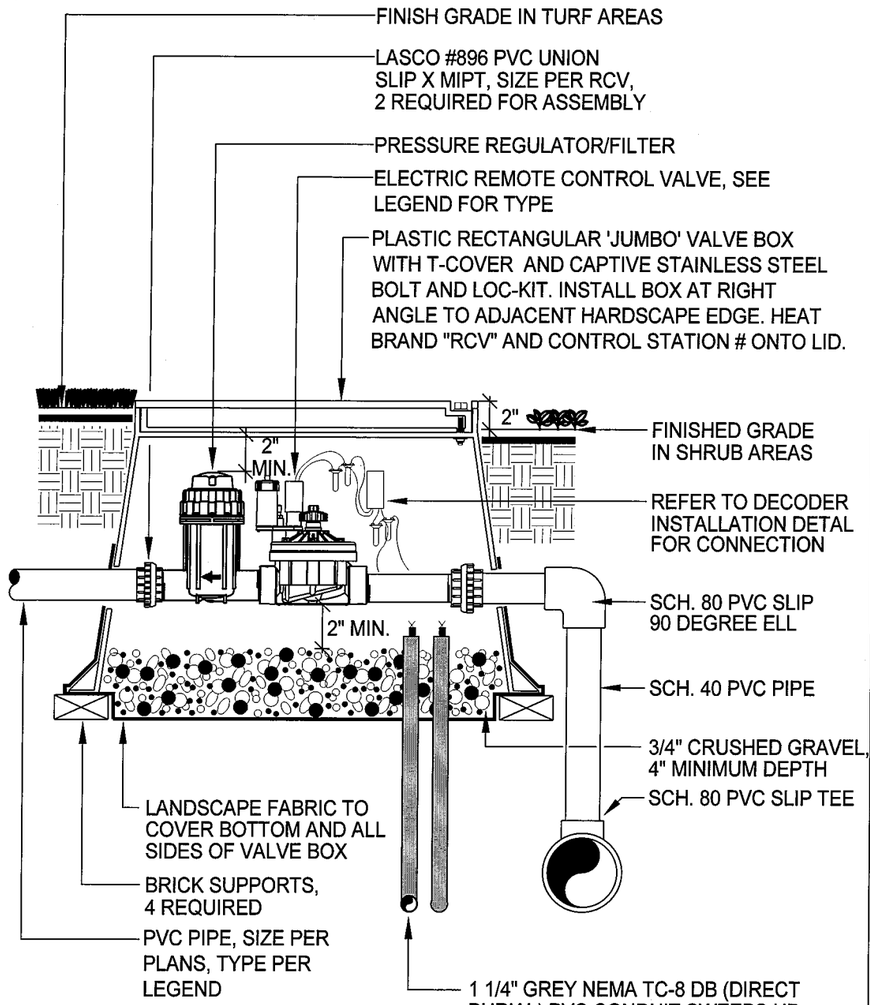
L3.26

IRRIGATION DETAILS

SHEET 51 OF 109

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK. DGN:	6	TEXAS	STP 1802 (783) MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK. DWG:	HOU	HARRIS	0912	72	391	445

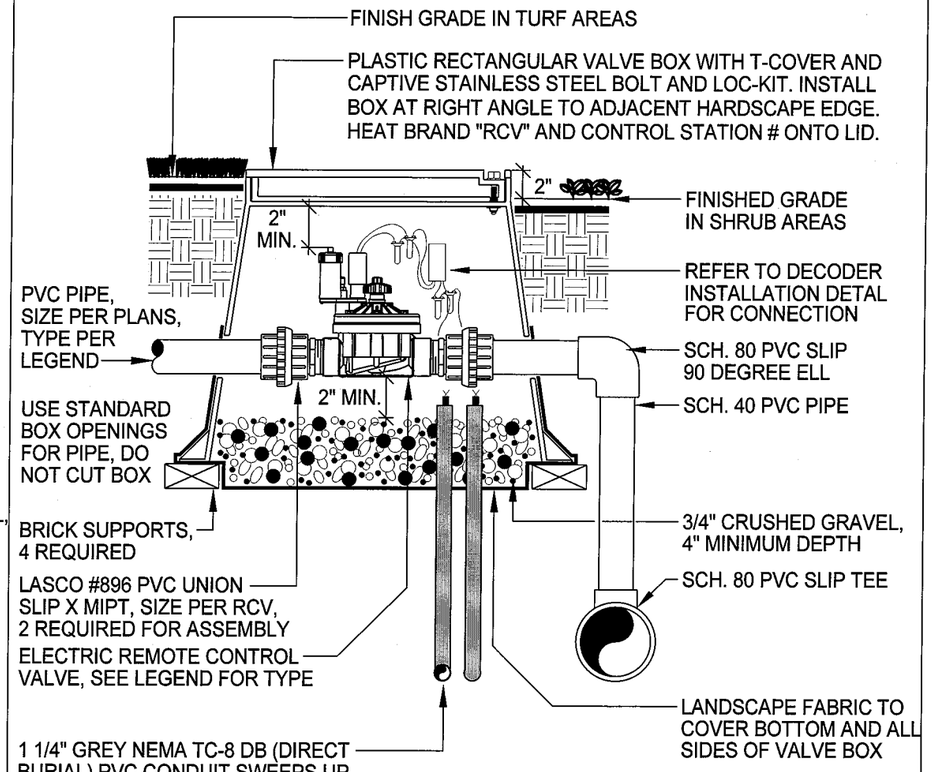
E:\Dropbox (Sweeney & Associates)\Drawings - Texas\swa - houston\Memorial Drive\L3.26 IRRIGATION DETAILS.dwg | AARON CHAVERRI |ANSI FULL BLEED B (11.00 X 17.00 INCHES) | 2/26/2020



NOTE:
USE STANDARD BOX OPENINGS FOR PIPE, DO NOT CUT BOX

SECTION VIEW - N.T.S.

M DRIP RCV ASSEMBLY



NOTE:
USE STANDARD BOX OPENINGS FOR PIPE, DO NOT CUT BOX

SECTION VIEW - N.T.S.

L REMOTE CONTROL VALVE

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Texas Department of Transportation

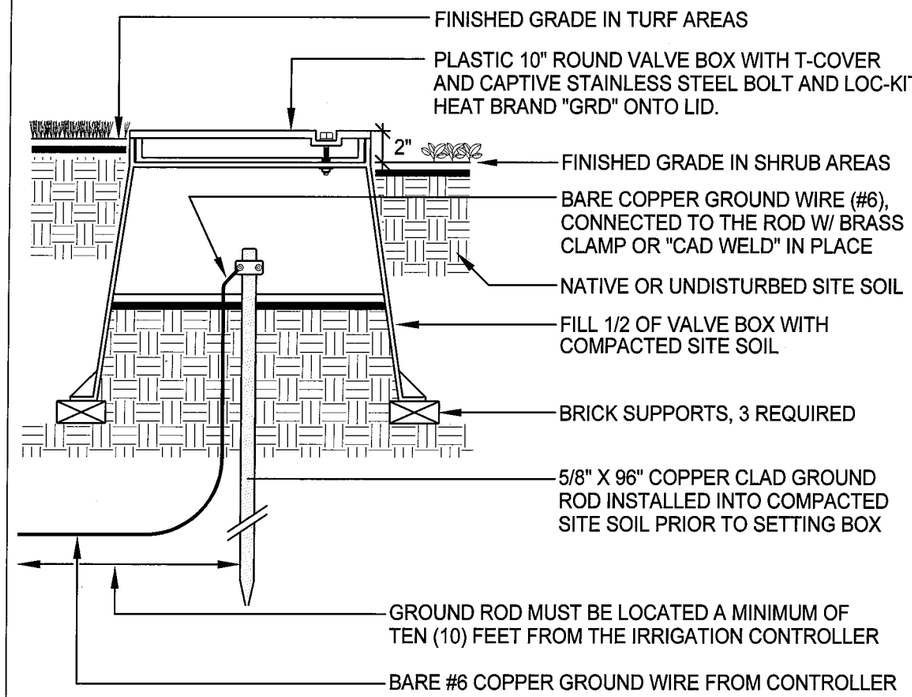
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L3.27

IRRIGATION DETAILS

SHEET 52 OF 109

DSN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN:	6	TEXAS	STP 1802 (783) MM			CS
DWN:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWN:	HOU	HARRIS	0912	72	391	446



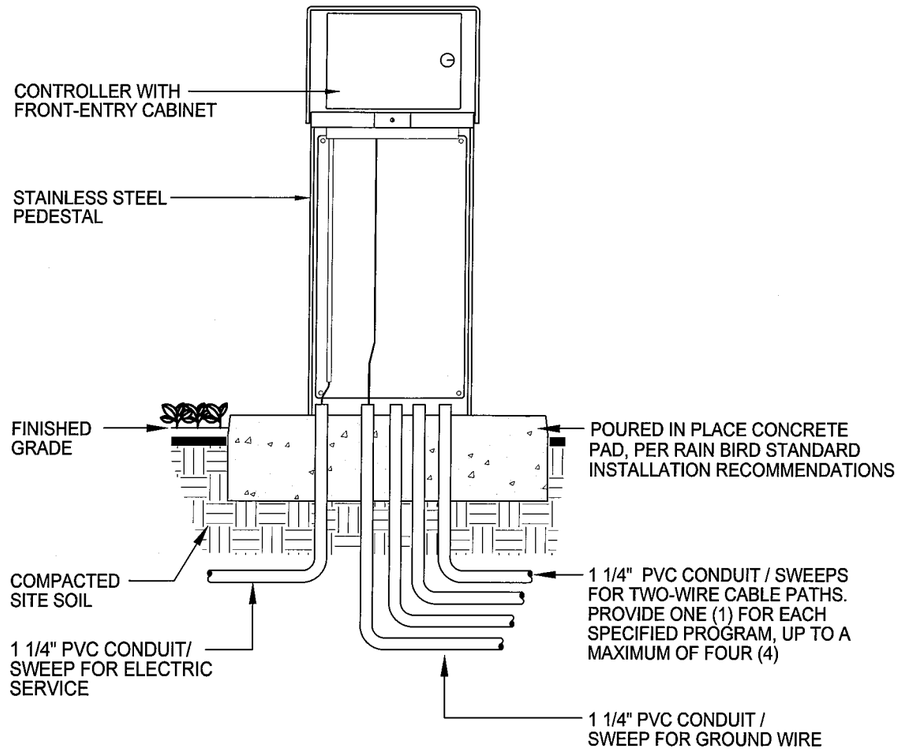
NOTE:
CONTRACTOR IS REQUIRED TO CONTACT 811 OR DIGALERT A MINIMUM OF TWO (2) DAYS PRIOR TO ANY EXCAVATION ON THE PROJECT AND SPECIFICALLY PRIOR TO THE INSTALLATION OF ANY GROUNDING RODS. DIAL 811 OR LOG ONTO WWW.DIGALERT.ORG.

EACH CONTROLLER SHALL HAVE A MINIMUM OF ONE (1) GROUND ROD INSTALLED.

GROUND ROD SHALL BE INSTALLED A MINIMUM OF TEN (10) FEET AWAY FROM THE IRRIGATION CONTROLLER OR ANY CONTROL WIRE PATH.

SECTION VIEW - N.T.S.

(O) GROUNDING ROD



SECTION VIEW - N.T.S.

(N) CONTROLLER ENCLOSURE

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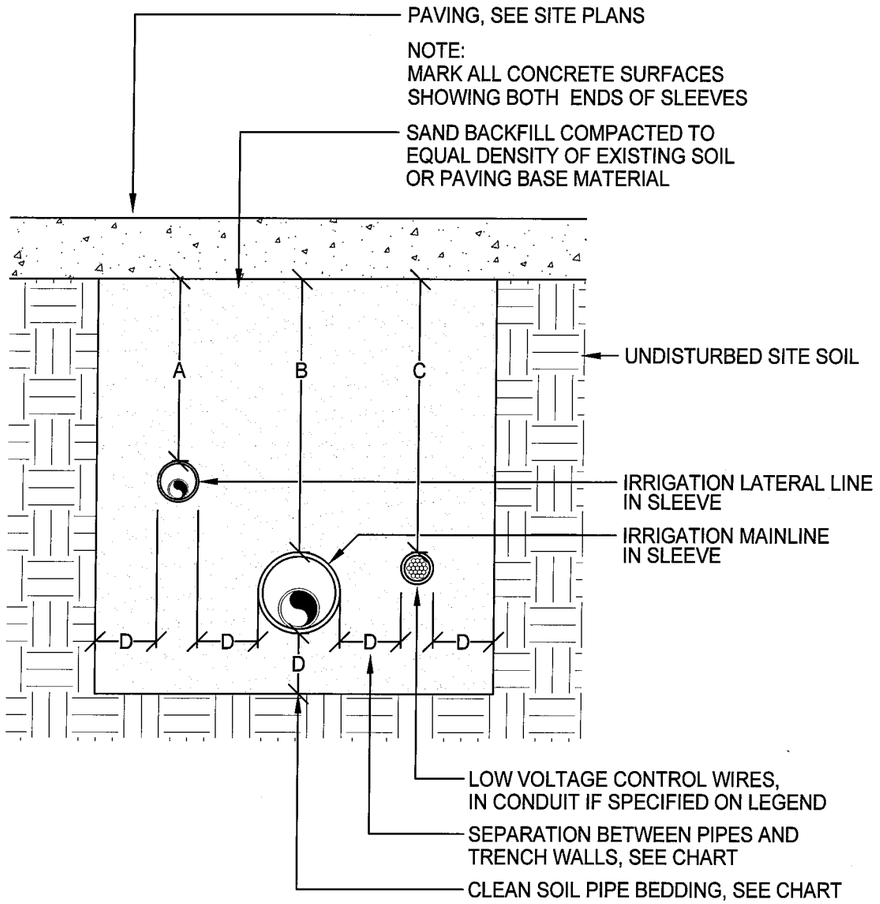
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L3.28

IRRIGATION DETAILS

SHEET 53 OF 109

DSN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN:	6	TEXAS	STP 1802 (783) MM			CS
DWN:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWN:	HOU	HARRIS	0912	72	391	447



SLEEVE DEPTH	A	B	C	D
UNDER PEDESTRIAN PAVING	12"	24"	24"	4"
UNDER VEHICULAR PAVING	24"	36"	36"	6"

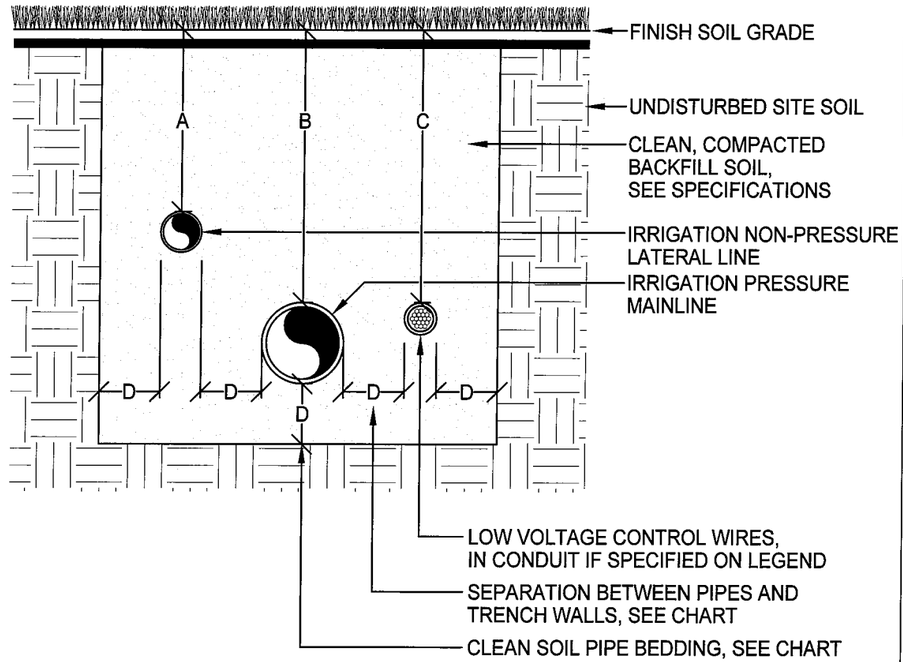
NOTE:
CONTRACTOR IS REQUIRED TO CONTACT DIGALERT, CITY OF HOUSTON UTILITIES AND TXDOT UTILITIES A MINIMUM OF TWO (2) DAYS PRIOR TO ANY EXCAVATION ON THE PROJECT.

SLEEVES SHALL BE TWICE THE DIAMETER OF THE PIPE OR WIRE BUNDLE CARRIED WITHIN.

SLEEVES SHALL EXTEND 12" PAST THE EDGE OF PAVING INTO THE PLANTER.

SECTION VIEW - N.T.S.

Q SLEEVE INSTALLATION



PIPE SIZES	A	B	C	D
SIZES 3/4" TO 2 1/2"	12"	18"	18"	4"
SIZES 3" AND 4"	18"	24"	24"	4"
SIZES 6" AND LARGER	X	30"	24"	6"

NOTE:
CONTRACTOR IS REQUIRED TO CONTACT DIGALERT, CITY OF HOUSTON UTILITIES AND TXDOT UTILITIES A MINIMUM OF TWO (2) DAYS PRIOR TO ANY EXCAVATION ON THE PROJECT.

SECTION VIEW - N.T.S.

P PIPE INSTALLATION

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26 February 2020

REV. NO.	DATE	DESCRIPTION	BY
	02/18/2020	100% CONSTRUCTION DOCUMENTS	

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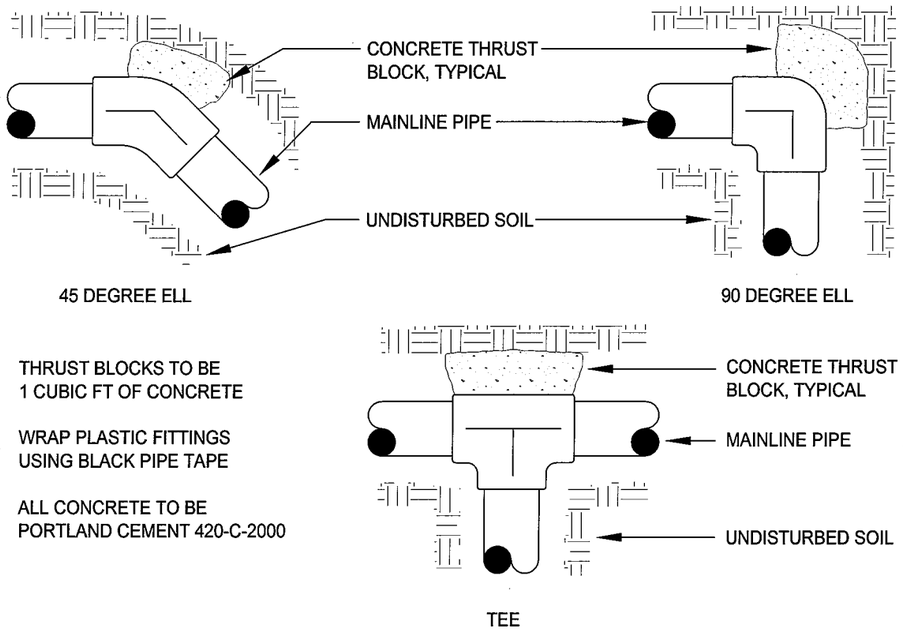
MEMORIAL DRIVE RECONSTRUCTION
AND ACCESS MANAGEMENT

L3.29

IRRIGATION DETAILS

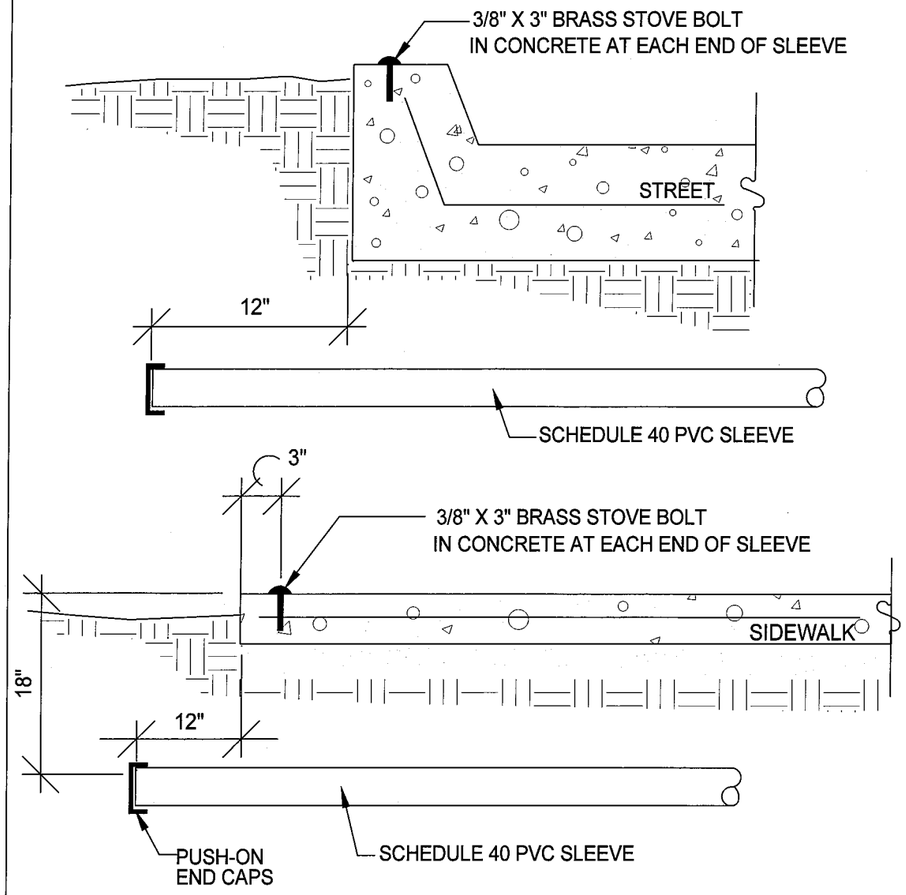
SHEET 54 OF 109

DSN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK. DSN:	6	TEXAS	STP 1802 (783) MM			CS
DWN:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK. DWN:	HOU	HARRIS	0912	72	391	448



PLAN VIEW - N.T.S.

(S) MAINLINE THRUST BLOCKS



SECTION VIEW - N.T.S.

(R) SLEEVE IDENTIFICATION

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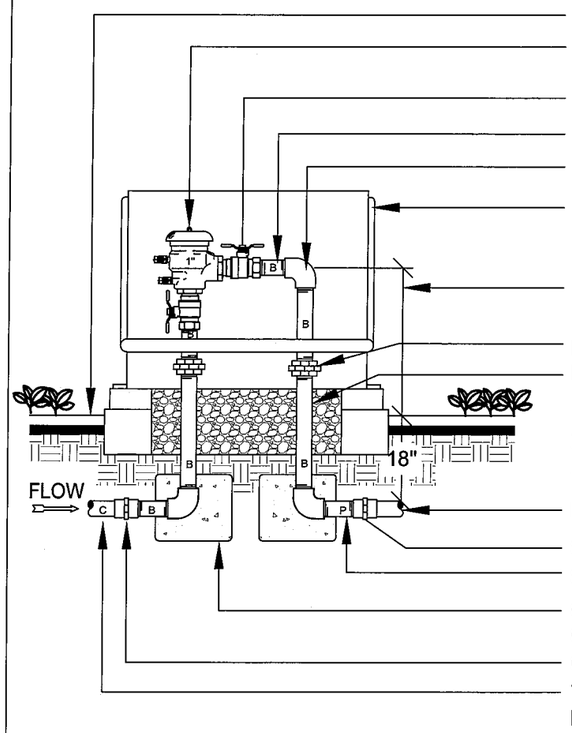
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L3.30

IRRIGATION DETAILS

SHEET 55 OF 109

DSN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK DSN:	6	TEXAS	STP 1802 (783) MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CK DWG:	HOU	HARRIS	0912	72	391	449



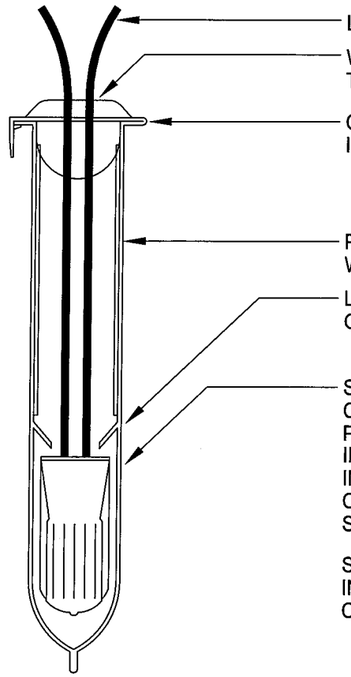
NOTE:
BACKFLOW DEVICE SHALL BE MAXIMUM 18" FROM IRRIGATION WATER METER.

CONTRACTOR MUST PROVIDE MATCHING PADLOCKS FOR ALL PROPOSED BACKFLOW DEVICE ENCLOSURES.

SECTION VIEW - N.T.S.

(U) PVB TYPE BACKFLOW

SUBMIT SAMPLE FOR APPROVAL BY OWNER'S AUTHORIZED REPRESENTATIVE PRIOR TO WORK.



NOTE:
WIRE CONNECTOR SHALL BE A 3M DBY-6 DIRECT BURY SPLICE KIT (U.L. APPROVED).

KIT SHALL INCLUDE A SCOTCHLOK Y SPRING CONNECTOR, A POLYPROPYLENE TUBE AND A WATERPROOF SEALING GEL. TUBE SHALL BE SUPPLIED PREFILLED WITH GEL.

DIRECT BURY SPLICE KIT SHALL BE USED TO ELECTRICALLY CONNECT 2 - 3 #14 OR 2 #12 PRE-STRIPPED COPPER WIRES. LARGER WIRES OR GREATER QUANTITIES OF WIRES SHALL REQUIRE A LARGER APPROVED WIRE CONNECTION.

SECTION VIEW - N.T.S.

(T) WIRE CONNECTORS

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

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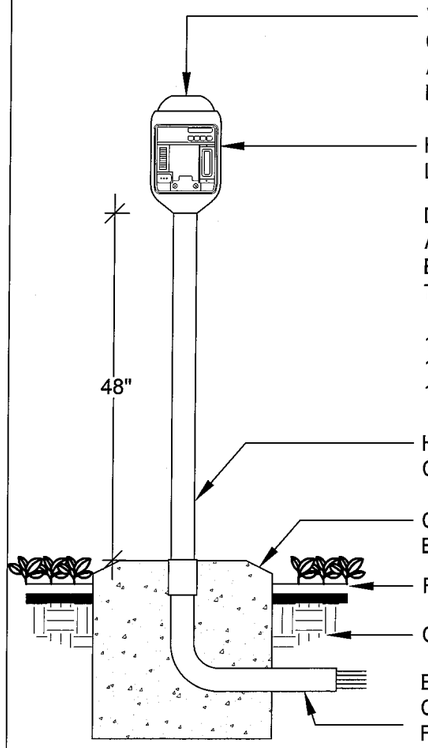
IRRIGATION DETAILS

SHEET 56 OF 109

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN:	6	TEXAS	STP 1802 (783) MM			CS
DWN:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWN:	HOU	HARRIS	0912	72	391	450



VERIFY THE FINAL LOCATION OF THE CONTROLLER WITH TXDOT LANDSCAPE ARCHITECT AND OWNER'S AUTHORIZED REPRESENTATIVE PRIOR TO INSTALLATION.

HUNTER BATTERY OPERATED CONTROLLER, SEE LEGEND FOR SPECIFICATION

DO NOT EXCEED THE MAXIMUM WIRE RUNS ALLOWABLE FOR THE CONTROLLER. WIRE RUN EQUALS THE LENGTH OF THE COMMON WIRE PLUS THE LENGTH OF THE LONGEST PILOT WIRE RUN.

16 AWG	800 FT MAX. RUN
14 AWG	1,300 FT MAX. RUN
12 AWG	2,000 FT MAX. RUN

HUNTER MODEL XCHSPOLE 48" TALL MOUNTING COLUMN. ALL WIRES ROUTE THROUGH BASE / TUBE.

CONCRETE PAD 18" X 18" X 18" BEVEL EDGES FOR DRAINAGE

FINISH GRADE

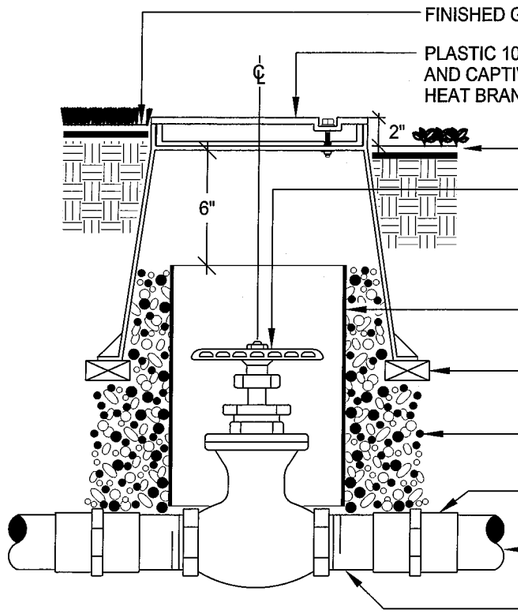
COMPACTED SOIL

ELECTRICAL SWEEP FOR LOW VOLTAGE CONTROL WIRES SEE TRENCHING DETAIL FOR WIRE DEPTH

NOTE:
ALL REMOTE CONTROL VALVES USED WITH THE SOLAR-POWERED CONTROLLER SHALL HAVE THE SOLENOIDS REPLACED WITH THE APPROPRIATE DC LATCHING SOLENOIDS. REFER TO IRRIGATION LEGEND FOR TYPE.

SECTION VIEW - N.T.S.

(W) BATTERY CONTROLLER



FINISHED GRADE IN TURF AREAS

PLASTIC 10" ROUND VALVE BOX WITH T-COVER AND CAPTIVE STAINLESS STEEL BOLT AND LOC-KIT. HEAT BRAND "GV" ONTO LID.

FINISHED GRADE IN SHRUB AREAS

GATE VALVE WITH BRONZE THREADED BODY AND MALLEABLE IRON HAND WHEEL. SIZE GATE VALVE PER THE MAINLINE SIZE

8" PVC CL. 160 PIPE, LENGTH AS REQUIRED, 12" MINIMUM

BRICK SUPPORTS, THREE REQUIRED

ONE CUBIC FOOT OF 3/4" CRUSHED GRAVEL

SCH 80 PVC SLIP COUPLING, SIZE PER MAINLINE AND VALVE

PVC IRRIGATION MAINLINE, SEE LEGEND FOR SPECIFICATION

SCH 80 PVC T.O.E. NIPPLE, SIZE PER VALVE, 6" MIN. LENGTH

SECTION VIEW - N.T.S.

(V) GATE VALVE

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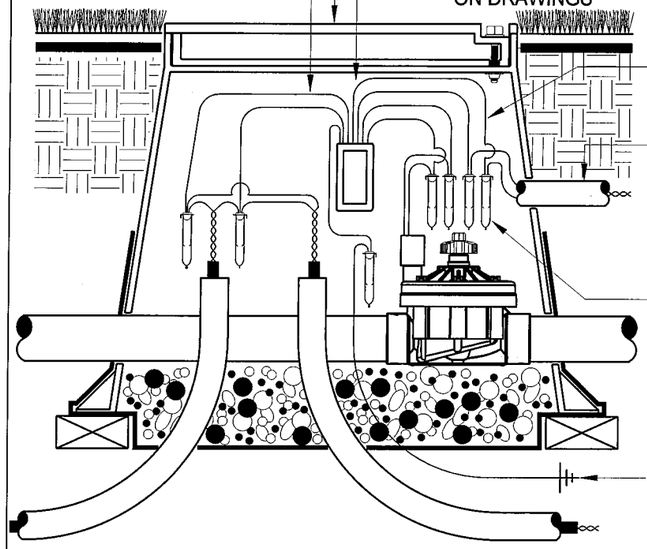
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L3.32

IRRIGATION DETAILS

SHEET 57 OF 109

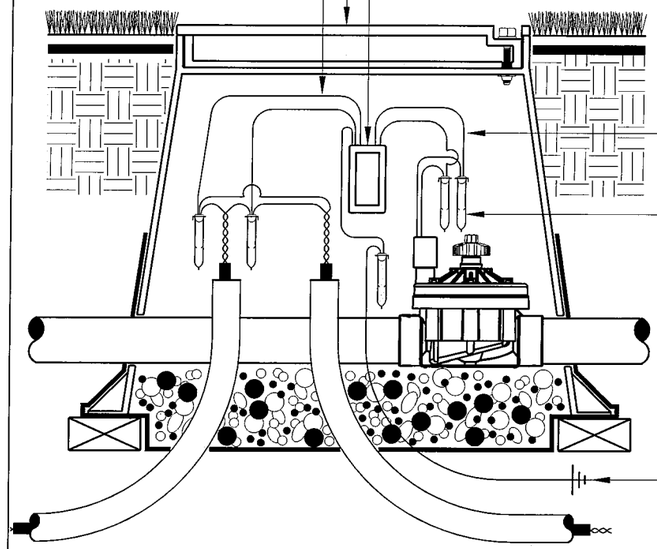
DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK DGN:	6	TEXAS	STP 1802 (783) MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CK DWG:	HOU	HARRIS	0912	72	391	451



NOTE:
DETAIL FOR DECODER INSTALLATION ONLY.
REFER TO RCV DETAIL FOR SPECIFIC COMPONENTS AND REQUIREMENTS FOR CONTROL VALVE INSTALLATION.
SECURE DECODER TO LIP OF VALVE BOX USING TIE OR METAL SCREW.

SECTION VIEW - N.T.S.

(Y) MULTI-STATION DECODER



NOTE:
DETAIL FOR DECODER INSTALLATION ONLY.
REFER TO RCV DETAIL FOR SPECIFIC COMPONENTS AND REQUIREMENTS FOR CONTROL VALVE INSTALLATION.
SECURE DECODER TO LIP OF VALVE BOX USING TIE OR METAL SCREW.

SECTION VIEW - N.T.S.

(X) SINGLE STATION DECODER

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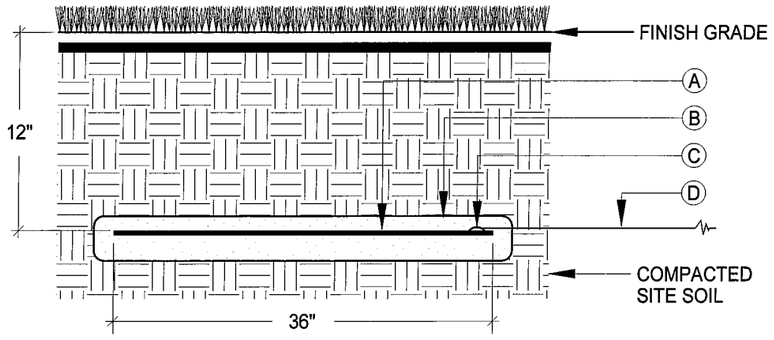
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L3.33

IRRIGATION DETAILS

SHEET 58 OF 109

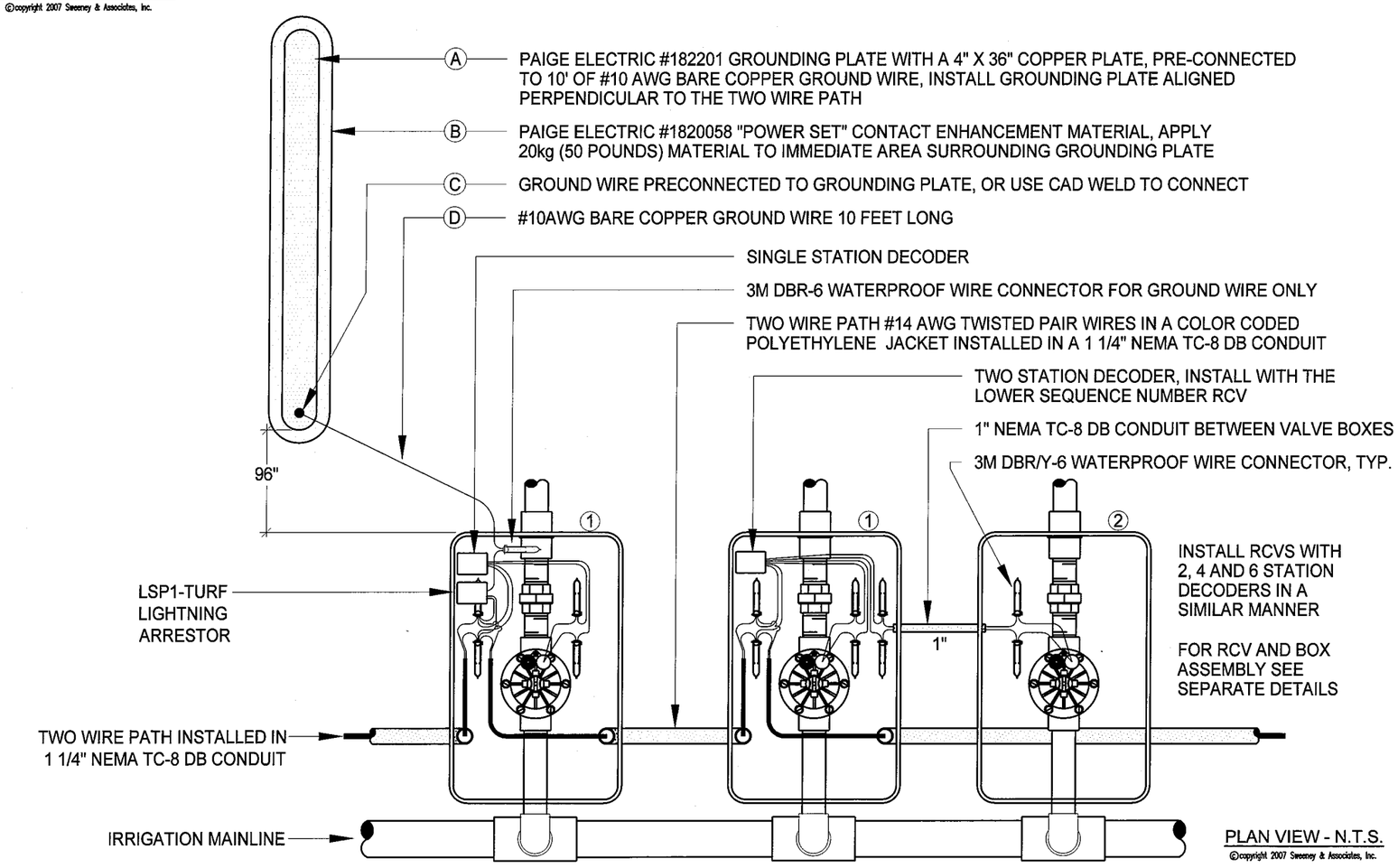
DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802 (783) MM			CS
DWN:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWN:	HOU	HARRIS	0912	72	391	452



SECTION VIEW - N.T.S.

NOTE:
DECODER SYSTEM GROUNDING SHALL BE AS RECOMMENDED BY THE MANUFACTURER OR AT A MINIMUM THE SYSTEM SHALL BE GROUNDED AT DECODERS EVERY 500 FEET ALONG THE THE TWO-WIRE PATH . ACCEPTABLE EARTH GROUND SHALL NOT EXCEED 10 OHMS.

NOTE:
DETAIL FOR DECODER AND GROUNDING INSTALLATION ONLY. REFER TO RCV DETAIL FOR SPECIFIC COMPONENTS AND REQUIREMENTS FOR CONTROL VALVE INSTALLATION.



PLAN VIEW - N.T.S.

Z MULTI-STATION DECODER WIRING AND GROUNDING

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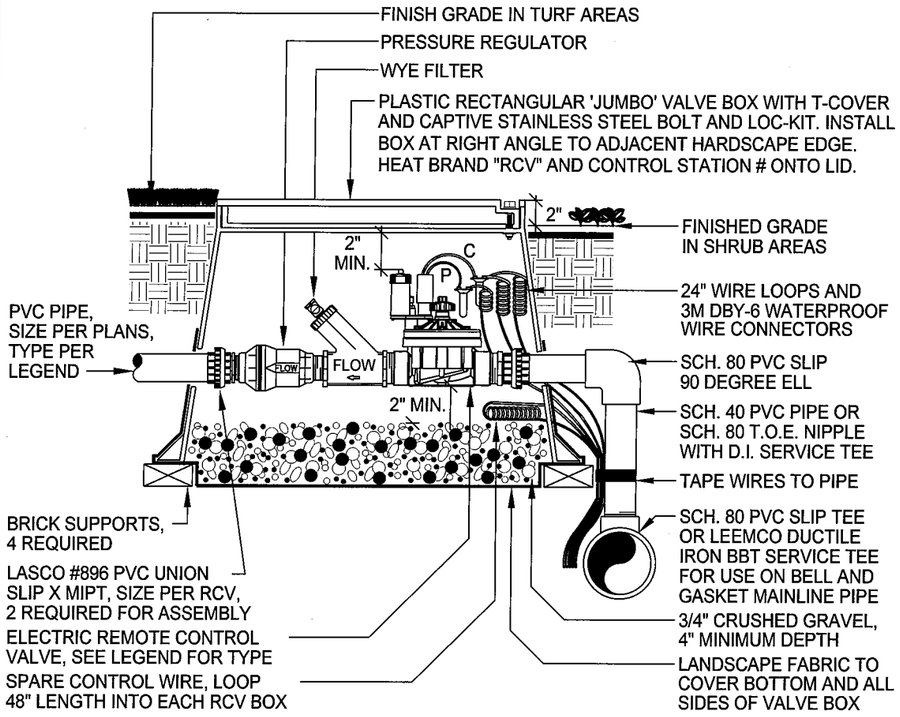
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L3.34

IRRIGATION DETAILS

SHEET 59 OF 109

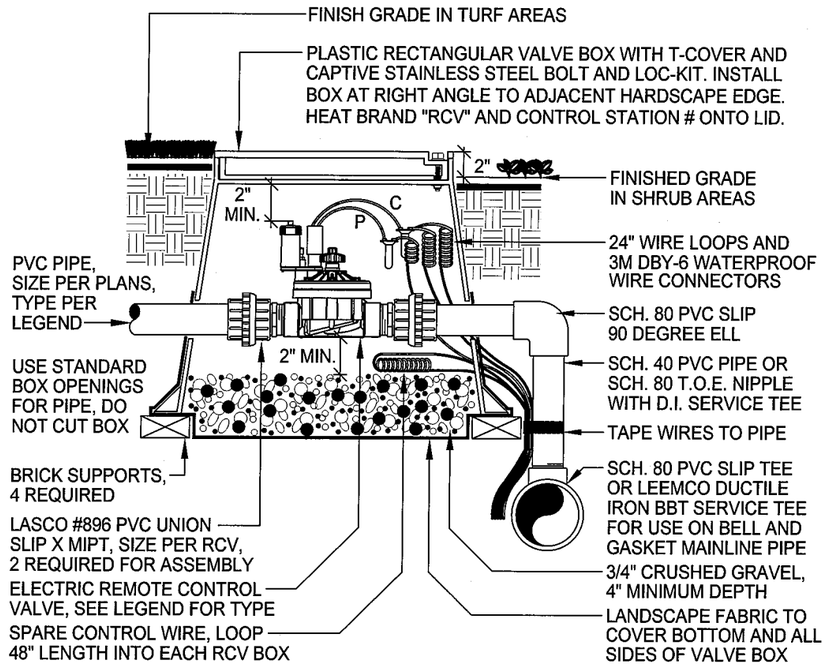
DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802 (783) MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	453



NOTE:
USE STANDARD BOX OPENINGS FOR PIPE, DO NOT CUT BOX.
ON ALL BATTERY OPERATED SYSTEMS, STANDARD SOLENOIDS SHALL BE REPLACED WITH DC-LATCHING TYPE.

SECTION VIEW - N.T.S.

BB MEDIAN DRIP VALVE ASSY.



SECTION VIEW - N.T.S.

AA MEDIAN RCV ASSEMBLY

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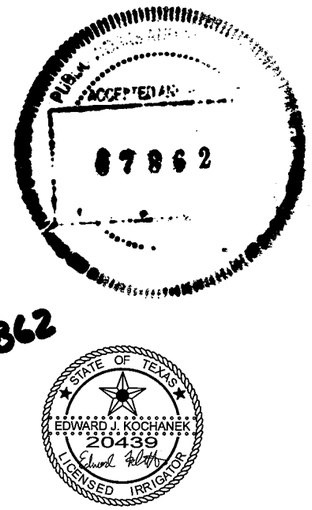

26 February 2020

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FIRM REGISTATION NO. 2614

Texas Department of Transportation

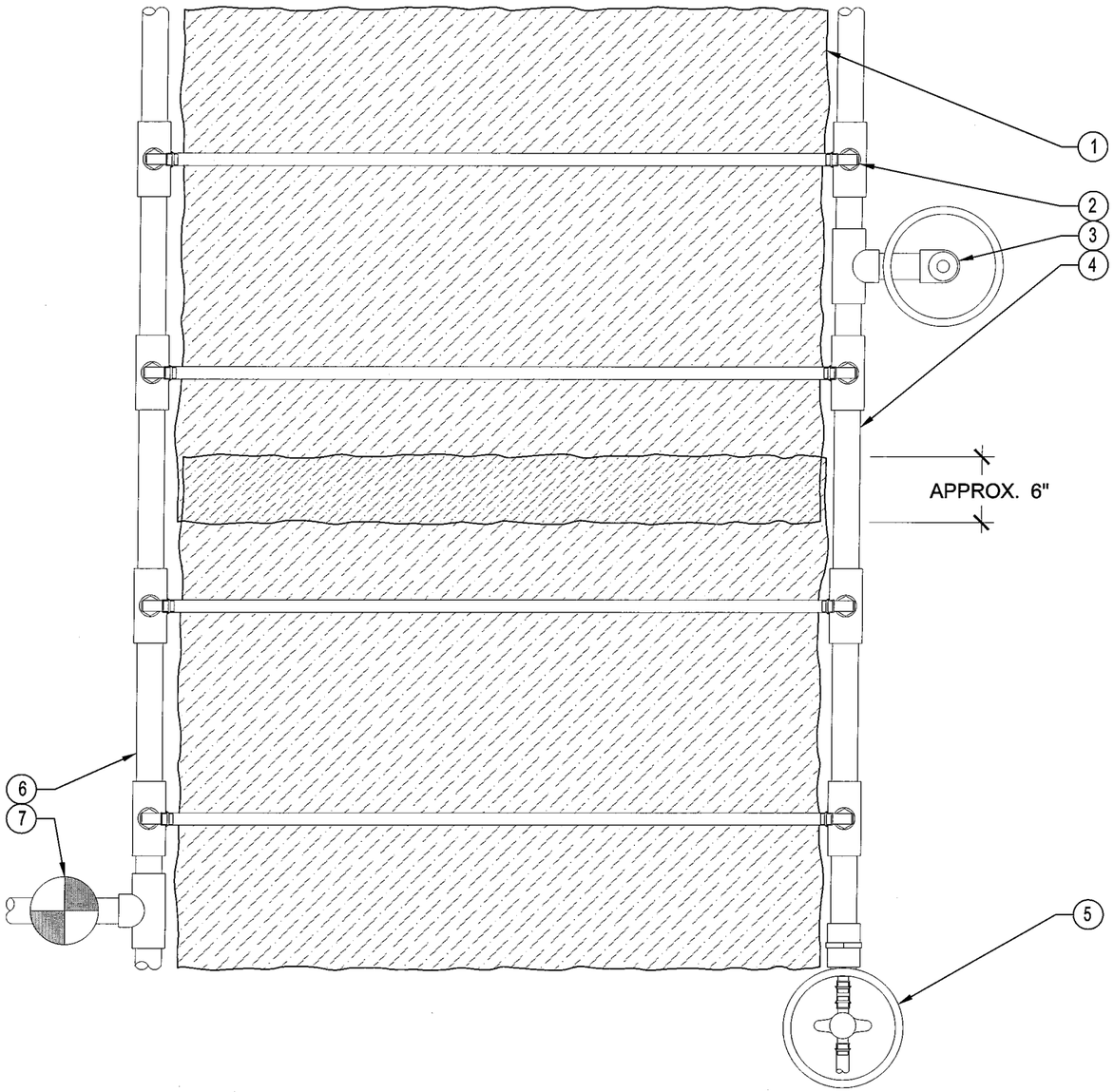
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L3.35

IRRIGATION DETAILS

SHEET 60 OF 109

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN:	6	TEXAS	STP 1802 (783) MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	454



ECO-MAT PLAN VIEW WITH PVC HEADER AND EXHAUST

LEGEND:

1. ECO-MAT PER PLAN
2. PVC TO DRIP LINE TUBING CONNECTION (PLD OR PLD-LOC FITTINGS) TYP.
3. AIR RELIEF VALVE IN VALVE BOX
4. PVC EXHAUST HEADER - SIZE PER PLAN
5. FLUSH POINT (PLD-BV) IN SUBTERRANEAN BOX PER PLAN
6. PVC SUPPLY HEADER - SIZE PER PLAN
7. DRIP REMOTE CONTROL VALVE ASSEMBLY - PER PLAN

NOTES
AIR RELIEF VALVE (PLD-AVR) INSTALLED IN VALVE BOX AT OPTIMAL HIGHEST POINT FROM CONTROL ZONE KIT. MULTIPLE AIR RELIEF VALVES MAY BE NEEDED TO ACCOMMODATE DIFFERENCES IN GRADE.

FLUSH POINT TO BE INSTALLED AT OPTIMAL FURTHEST POINT FROM CONTROL ZONE KIT TO ALLOW FOR MAXIMUM DEBRIS FLUSH IN SYSTEM.

HUNTER ECO-MAT INSTALLATION

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sweeney + associates
irrigation design

67862

STATE OF TEXAS
EDWARD J. KOCHANEK
20439
LICENSED IRRIGATOR

26 February 2020

REV. NO.	DATE	DESCRIPTION	BY
	02/18/2020	100% CONSTRUCTION DOCUMENTS	

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

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

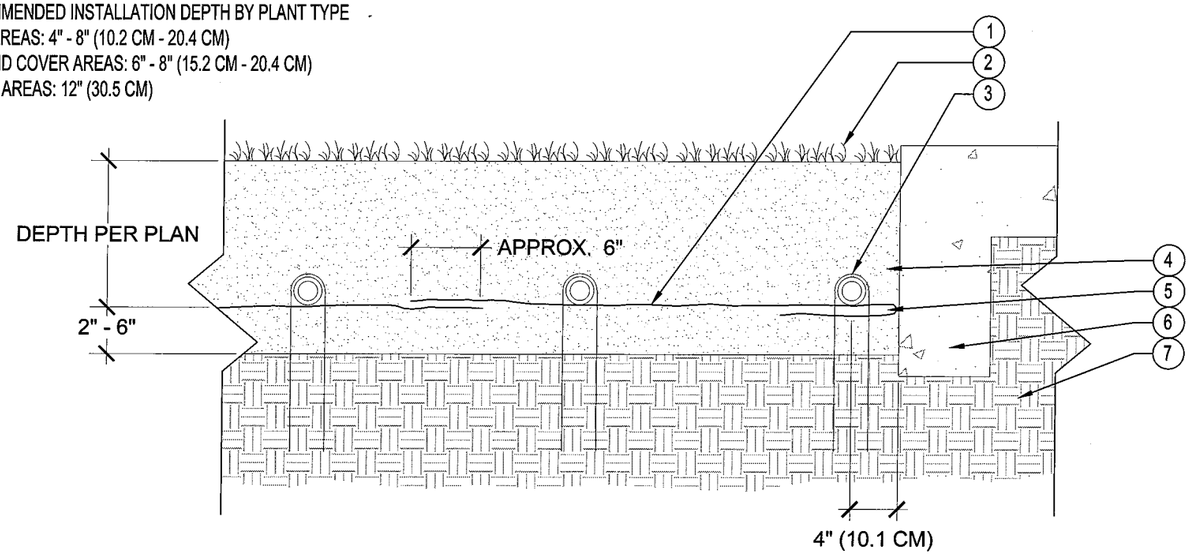
L3.36

IRRIGATION DETAILS

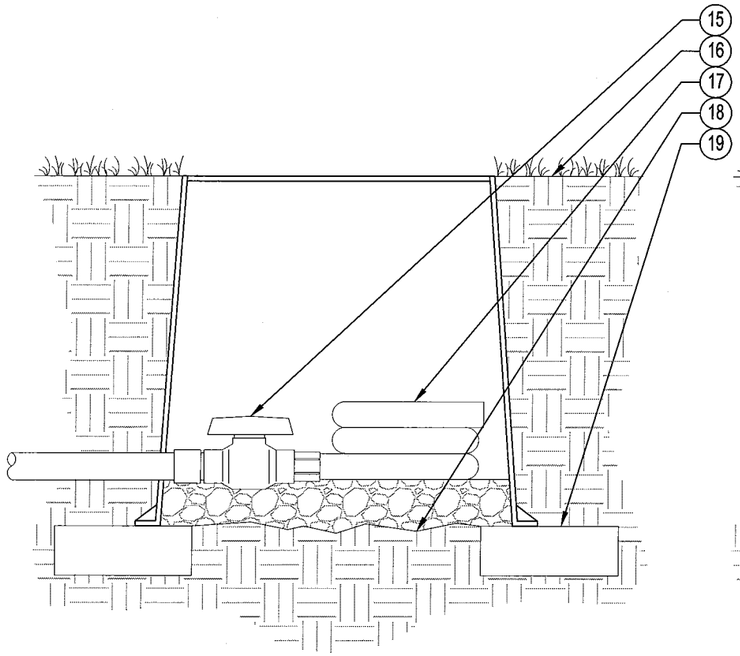
SHEET 61 OF 109

DSN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN:	6	TEXAS	STP 1802 (783) MM			CS
DWN:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWN:	HOU	HARRIS	0912	72	391	455

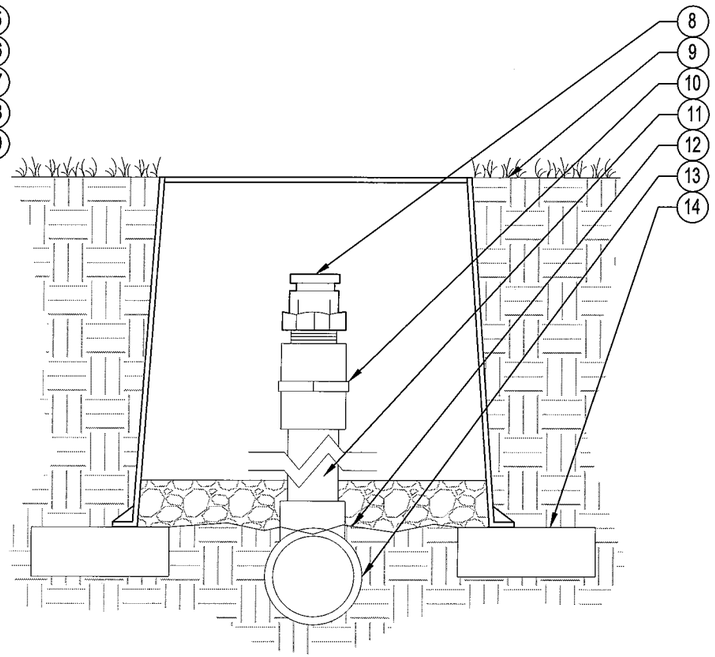
NOTES
RECOMMENDED INSTALLATION DEPTH BY PLANT TYPE
TURF AREAS: 4" - 8" (10.2 CM - 20.4 CM)
GROUND COVER AREAS: 6" - 8" (15.2 CM - 20.4 CM)
SHRUB AREAS: 12" (30.5 CM)



ECO-MAT - SECTION ADJACENT TO HARDSCAPE



FLUSH POINT - BALL VALVE



AIR RELIEF VALVE - PVC RISER

LEGEND:

1. ECO-MAT PER PLAN
2. PLANT MATERIAL (SEE PLANTING PLAN)
3. STAKE INSTALLED APPROX. 8' (2.4 M) ON CENTER OVER TUBING TYP.
4. AMENDED SOIL MEDIA (PER SOILS REPORT)
5. FOLD EXCESS FLEECE UNDER MAT ADJACENT TO HARDSCAPE EDGE
6. ADJACENT HARDSCAPE EDGE PER PLAN
7. NATIVE SOIL
8. AIR RELIEF VALVE
9. FINISHED GRADE
10. PVC FITTING
11. PVC RISER
12. FILTER FABRIC
13. PVC LATERAL PIPE
14. BRICK
15. BALL VALVE
16. FINISHED GRADE
17. IRRIGATION HOSE (LENGTH AS NECESSARY)
18. FILTER FABRIC
19. BRICK

NOTES
AIR RELIEF VALVE TO BE INSTALLED AT OPTIMAL HIGHEST POINT FROM CONTROL ZONE KIT. MULTIPLE AIR RELIEF VALVES MAY BE NEEDED TO ACCOMMODATE DIFFERENCES IN GRADE.

DD HUNTER ECO-MAT INSTALLATION

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Texas Department of Transportation

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L3.37

IRRIGATION DETAILS

SHEET 62 OF 109

DSN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK. DSN:	6	TEXAS	STP 1802 (783) MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK. DWG:	HOU	HARRIS	0912	72	391	456

IRRIGATION CONTROLLER RUN TIMES

Controller / POC		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total / Avg.
1 / A	ETo / Month (Inches):	2.36	2.83	4.32	5.01	6.11	6.57	6.52	6.08	5.57	4.28	2.90	2.35	**54.90**
	Historic Rainfall:	3.70	2.99	3.48	3.49	5.22	5.13	3.25	3.79	4.45	4.65	3.89	3.64	**47.68**
	ETo / Day (Inches):	0.08	0.09	0.14	0.16	0.20	0.21	0.21	0.20	0.18	0.14	0.09	0.08	**0.15**
	Irrigation Days / Week:	6	6	6	6	6	6	6	6	6	6	6	6	

Plant / Irrig. Type	AKc	Pr Rate	IE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
Turf	0.60	0.77	0.90	4.6	5.5	8.4	9.8	11.9	12.8	12.7	11.9	10.9	8.4	5.7	4.6	Min./Day/Zone
Inline Drip	Number of Zones:		3	**13.8**	**16.6**	**25.3**	**29.4**	**35.8**	**38.5**	**38.2**	**35.7**	**32.7**	**25.1**	**17.0**	**13.8**	**Total Min./Day**
Turf	0.60	1.74	0.65	2.8	3.4	5.2	6.0	7.3	7.9	7.8	7.3	6.7	5.1	3.5	2.8	Min./Day/Zone
Sprays	Number of Zones:		9	**25.4**	**30.5**	**46.6**	**54.0**	**65.9**	**70.8**	**70.3**	**65.5**	**60.1**	**46.1**	**31.3**	**25.3**	**Total Min./Day**
Tree	0.80	3.00	0.90	1.6	1.9	2.9	3.4	4.1	4.4	4.4	4.1	3.7	2.9	1.9	1.6	Min./Day/Zone
Bubblers	Number of Zones:		2	**3.2**	**3.8**	**5.8**	**6.7**	**8.2**	**8.8**	**8.7**	**8.1**	**7.5**	**5.7**	**3.9**	**3.1**	**Total Min./Day**
Total Number of Zones:			14	42.4	50.9	77.7	90.1	109.9	118.2	117.3	109.3	100.2	77.0	52.2	42.3	Total Min./Day
Total Sequential Run Time:				**0.7**	**0.8**	**1.3**	**1.5**	**1.8**	**2.0**	**2.0**	**1.8**	**1.7**	**1.3**	**0.9**	**0.7**	**Total Hrs./Day**
Total Sequential Run Time (Overhead Irrigation Only):				**0.4**	**0.5**	**0.8**	**0.9**	**1.1**	**1.2**	**1.2**	**1.1**	**1.0**	**0.8**	**0.5**	**0.4**	**Total Hrs./Day**

NOTE A:
POINT OF CONNECTION (POC) #1 (PROGRAM A) SHALL BE A 1-1/2" DOMESTIC WATER METER WITH A 2" SERVICE LINE. THE CONTRACTOR SHALL VERIFY THE ACTUAL LOCATION, WATER TYPE, METER SIZE AND WATER PRESSURE IN THE FIELD PRIOR TO STARTING WORK. MEASUREMENT OF THE STATIC (NO WATER MOVING) WATER PRESSURE IS ACCEPTABLE FOR POTABLE WATER SYSTEMS WHERE NO PUMP HAS BEEN INDICATED ON THESE PLANS. IF ANY OF THE POC INFORMATION SHOWN ON THESE DRAWING IS FOUND TO BE DIFFERENT THAN THE ACTUAL POC INFORMATION GATHERED IN THE FIELD, IMMEDIATELY NOTIFY THE LANDSCAPE ARCHITECT AND IRRIGATION CONSULTANT. SHOULD THE CONTRACTOR FAIL TO VERIFY THE POC INFORMATION AS SHOWN HEREIN, ANY CHANGES REQUIRED BY LOW PRESSURE OR VOLUME SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR.

WATER PRESSURE AT POC:	55	PSI (STATIC)
DESIGN WATER PRESSURE:	53	PSI
MAXIMUM SYSTEM DEMAND:	32	GPM
RESIDUAL WATER PRESSURE:	02	PSI

WATER PRESSURE LOSS CALCULATIONS

WATER METER NUMBER	TYP.	WATER METER SIZE (Inches)	1.50
HYDRAULIC GRADE LINE (FT)		WATER METER ELEVATION (FT)	
ELEVATION DIFFERENCE (FT)	0	STATIC PRESSURE (PSI)	55.0
REMOTE CONTROL VALVE #		REMOTE CONTROL VALVE SIZE (In.)	1.50
R.C.V. DEMAND (GPM)	32	TOTAL DEMAND (GPM)	32
HIGHEST HEAD SERVED (FT)		STATIC PRESSURE AT HIGHEST HEAD	55.0

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IRRIGATION DESIGN AND CONSULTING

PRESSURE LOSS CALCULATION IS PROVIDED FOR THIS PROJECT BY SWEENEY & ASSOCIATES, INC. UNAUTHORIZED USE BY ANY OTHER PERSON, COMPANY OR PROJECT IS FORBIDDEN WITHOUT WRITTEN PERMISSION.

SIZE (Inches)	DESCRIPTION	FLOW	#	LOSS	
2.00	SERVICE LINE (50 FT OF TYPE K COPPER)	32	1	0.56	PSI
1.50	WATER METER (DISC TYPE)	32	2	2.10	PSI
1.50	BACKFLOW PREVENTER (R/P TYPE)	32	3	11.00	PSI
1.50	FILTRATION (WYE FILTER)	32	4	0.25	PSI
2.00	BFD ASSEMBLY PIPING (BRASS W/ 4 ELLS)	32	6	0.67	PSI
1.50	MASTER CONTROL VALVE	32	7	1.00	PSI
1.50	FLOW SENSOR	32	8	0.25	PSI
3.00	ISOLATION VALVES (BALL TYPE)	32	9	1.00	PSI
3.00	750 FEET OF MAINLINE: SCH. 40 PVC	32	10	0.90	PSI
2.00	90 DEGREE ELBOWS	32	13	0.10	PSI
1.50	REMOTE CONTROL VALVE ASSEMBLY	32	14	1.50	PSI
10%	LATERAL LINE LOSSES	32	15	3.00	PSI
20%	FITTING LOSS (IN ADDITION TO ELBOWS SHOWN)	N/A	16	0.18	PSI
0.00	ELEVATION CHANGE (P.O.C. TO HIGHEST HEAD)	N/A	17	0.00	PSI
TOTAL SYSTEM PRESSURE LOSS (SUM OF #1 THRU #17)			18	22.5	PSI
PRESSURE REQUIRED AT HEAD (OPERATING PRESSURE)			19	30.0	PSI
TOTAL PRESSURE REQUIRED (SUM OF #18 AND #19)			20	52.5	PSI
STATIC WATER PRESSURE (FROM ABOVE)			21	55.0	PSI
RESIDUAL PRESSURE (SUBTRACT #20 FROM #21)			22	2.5	PSI

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irrigation design

67862

STATE OF TEXAS
EDWARD J. KOCHANEK
20439
LICENSED IRRIGATOR

26 February 2020

REV. NO.	DATE	DESCRIPTION	BY
	02/19/2020	100% CONSTRUCTION DOCUMENTS	

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

Texas Department of Transportation

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L3.38

IRRIGATION CALCULATIONS

SHEET 63 OF 109

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN:	6	TEXAS	STP 1802 (783) MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	457

IRRIGATION CONTROLLER RUN TIMES

Controller / POC		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total / Avg.
1 / B	ETo / Month (Inches):	2.36	2.83	4.32	5.01	6.11	6.57	6.52	6.08	5.57	4.28	2.90	2.35	**54.90**
	Historic Rainfall:	3.70	2.99	3.48	3.49	5.22	5.13	3.25	3.79	4.45	4.65	3.89	3.64	**47.68**
	ETo / Day (Inches):	0.08	0.09	0.14	0.16	0.20	0.21	0.21	0.20	0.18	0.14	0.09	0.08	**0.15**
	Irrigation Days / Week:	6	6	6	6	6	6	6	6	6	6	6	6	

Plant / Irrig. Type	AKc	Pr Rate	IE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
Turf	0.60	0.77	0.90	4.6	5.5	8.4	9.8	11.9	12.8	12.7	11.9	10.9	8.4	5.7	4.6	Min./Day/Zone
Inline Drip	Number of Zones:		4	**18.5**	**22.1**	**33.8**	**39.2**	**47.8**	**51.4**	**51.0**	**47.5**	**43.6**	**33.5**	**22.7**	**18.4**	**Total Min./Day**
Turf	0.60	1.74	0.65	2.8	3.4	5.2	6.0	7.3	7.9	7.8	7.3	6.7	5.1	3.5	2.8	Min./Day/Zone
Sprays	Number of Zones:		9	**25.4**	**30.5**	**46.6**	**54.0**	**65.9**	**70.8**	**70.3**	**65.5**	**60.1**	**46.1**	**31.3**	**25.3**	**Total Min./Day**
Tree	0.80	3.00	0.90	1.6	1.9	2.9	3.4	4.1	4.4	4.4	4.1	3.7	2.9	1.9	1.6	Min./Day/Zone
Bubblers	Number of Zones:		4	**6.3**	**7.6**	**11.6**	**13.4**	**16.4**	**17.6**	**17.4**	**16.3**	**14.9**	**11.5**	**7.8**	**6.3**	**Total Min./Day**
Total Number of Zones:			17	50.2	60.2	91.9	106.6	130.0	139.8	138.7	129.4	118.5	91.1	61.7	50.0	Total Min./Day
Total Sequential Run Time:				**0.8**	**1.0**	**1.5**	**1.8**	**2.2**	**2.3**	**2.3**	**2.2**	**2.0**	**1.5**	**1.0**	**0.8**	**Total Hrs./Day**
Total Sequential Run Time (Overhead Irrigation Only):				**0.4**	**0.5**	**0.8**	**0.9**	**1.1**	**1.2**	**1.2**	**1.1**	**1.0**	**0.8**	**0.5**	**0.4**	**Total Hrs./Day**

NOTE A:
POINT OF CONNECTION (POC) #1 (PROGRAM B) SHALL BE A 1-1/2" DOMESTIC WATER METER WITH A 2" SERVICE LINE. THE CONTRACTOR SHALL VERIFY THE ACTUAL LOCATION, WATER TYPE, METER SIZE AND WATER PRESSURE IN THE FIELD PRIOR TO STARTING WORK. MEASUREMENT OF THE STATIC (NO WATER MOVING) WATER PRESSURE IS ACCEPTABLE FOR POTABLE WATER SYSTEMS WHERE NO PUMP HAS BEEN INDICATED ON THESE PLANS. IF ANY OF THE POC INFORMATION SHOWN ON THESE DRAWING IS FOUND TO BE DIFFERENT THAN THE ACTUAL POC INFORMATION GATHERED IN THE FIELD, IMMEDIATELY NOTIFY THE LANDSCAPE ARCHITECT AND IRRIGATION CONSULTANT. SHOULD THE CONTRACTOR FAIL TO VERIFY THE POC INFORMATION AS SHOWN HEREIN, ANY CHANGES REQUIRED BY LOW PRESSURE OR VOLUME SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR.

WATER PRESSURE AT POC:	55	PSI (STATIC)
DESIGN WATER PRESSURE:	53	PSI
MAXIMUM SYSTEM DEMAND:	32	GPM
RESIDUAL WATER PRESSURE:	02	PSI

WATER PRESSURE LOSS CALCULATIONS

WATER METER NUMBER	TYP.	WATER METER SIZE (Inches)	1.50
HYDRAULIC GRADE LINE (FT)		WATER METER ELEVATION (FT)	
ELEVATION DIFFERENCE (FT)	0	STATIC PRESSURE (PSI)	55.0
REMOTE CONTROL VALVE #		REMOTE CONTROL VALVE SIZE (In.)	1.50
R.C.V. DEMAND (GPM)	32	TOTAL DEMAND (GPM)	32
HIGHEST HEAD SERVED (FT)		STATIC PRESSURE AT HIGHEST HEAD	55.0

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IRRIGATION DESIGN AND CONSULTING

SIZE (Inches)	DESCRIPTION	FLOW	#	LOSS	
2.00	SERVICE LINE (50 FT OF TYPE K COPPER)	32	1	0.56	PSI
1.50	WATER METER (DISC TYPE)	32	2	2.10	PSI
1.50	BACKFLOW PREVENTER (R/P TYPE)	32	3	11.00	PSI
1.50	FILTRATION (WYE FILTER)	32	4	0.25	PSI
2.00	BFD ASSEMBLY PIPING (BRASS W/ 4 ELLS)	32	6	0.67	PSI
1.50	MASTER CONTROL VALVE	32	7	1.00	PSI
1.50	FLOW SENSOR	32	8	0.25	PSI
3.00	ISOLATION VALVES (BALL TYPE)	32	9	1.00	PSI
3.00	750 FEET OF MAINLINE: SCH. 40 PVC	32	10	0.90	PSI
2.00	90 DEGREE ELBOWS	32	13	0.10	PSI
1.50	REMOTE CONTROL VALVE ASSEMBLY	32	14	1.50	PSI
10%	LATERAL LINE LOSSES	32	15	3.00	PSI
20%	FITTING LOSS (IN ADDITION TO ELBOWS SHOWN)	N/A	16	0.18	PSI
0.00	ELEVATION CHANGE (P.O.C. TO HIGHEST HEAD)	N/A	17	0.00	PSI
TOTAL SYSTEM PRESSURE LOSS (SUM OF #1 THRU #17)			18	22.5	PSI
PRESSURE REQUIRED AT HEAD (OPERATING PRESSURE)			19	30.0	PSI
TOTAL PRESSURE REQUIRED (SUM OF #18 AND #19)			20	52.5	PSI
STATIC WATER PRESSURE (FROM ABOVE)			21	55.0	PSI
RESIDUAL PRESSURE (SUBTRACT #20 FROM #21)			22	2.5	PSI

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

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L3.39

IRRIGATION CALCULATIONS

SHEET 64 OF 109

DSN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK. DSN:	6	TEXAS	STP 1802 (783) MM			CS
DWN:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK. DWN:	HOU	HARRIS	0912	72	391	458

IRRIGATION CONTROLLER RUN TIMES

Controller / POC		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total / Avg.
1 / C	ETo / Month (Inches):	2.36	2.83	4.32	5.01	6.11	6.57	6.52	6.08	5.57	4.28	2.90	2.35	**54.90**
	Historic Rainfall:	3.70	2.99	3.48	3.49	5.22	5.13	3.25	3.79	4.45	4.65	3.89	3.64	**47.68**
	ETo / Day (Inches):	0.08	0.09	0.14	0.16	0.20	0.21	0.21	0.20	0.18	0.14	0.09	0.08	**0.15**
	Irrigation Days / Week:	6	6	6	6	6	6	6	6	6	6	6	6	

Plant / Irrig. Type	AKc	Pr Rate	IE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
Turf	0.60	0.77	0.90	4.6	5.5	8.4	9.8	11.9	12.8	12.7	11.9	10.9	8.4	5.7	4.6	Min./Day/Zone
Inline Drip	Number of Zones:		3	**13.8**	**16.6**	**25.3**	**29.4**	**35.8**	**38.5**	**38.2**	**35.7**	**32.7**	**25.1**	**17.0**	**13.8**	**Total Min./Day**
Turf	0.60	1.74	0.65	2.8	3.4	5.2	6.0	7.3	7.9	7.8	7.3	6.7	5.1	3.5	2.8	Min./Day/Zone
Sprays	Number of Zones:		15	**42.4**	**50.9**	**77.6**	**90.0**	**109.8**	**118.1**	**117.2**	**109.2**	**100.1**	**76.9**	**52.1**	**42.2**	**Total Min./Day**
Tree	0.80	3.00	0.90	1.6	1.9	2.9	3.4	4.1	4.4	4.4	4.1	3.7	2.9	1.9	1.6	Min./Day/Zone
Bubblers	Number of Zones:		2	**3.2**	**3.8**	**5.8**	**6.7**	**8.2**	**8.8**	**8.7**	**8.1**	**7.5**	**5.7**	**3.9**	**3.1**	**Total Min./Day**
Total Number of Zones:			**20**	59.4	71.2	108.7	126.1	153.8	165.4	164.1	153.0	140.2	107.7	73.0	59.2	Total Min./Day
Total Sequential Run Time:				**1.0**	**1.2**	**1.8**	**2.1**	**2.6**	**2.8**	**2.7**	**2.6**	**2.3**	**1.8**	**1.2**	**1.0**	**Total Hrs./Day**
Total Sequential Run Time (Overhead Irrigation Only):				**0.7**	**0.8**	**1.3**	**1.5**	**1.8**	**2.0**	**2.0**	**1.8**	**1.7**	**1.3**	**0.9**	**0.7**	**Total Hrs./Day**

NOTE A:
POINT OF CONNECTION (POC) #3 (PROGRAM C) SHALL BE A 1-1/2" DOMESTIC WATER METER WITH A 2" SERVICE LINE. THE CONTRACTOR SHALL VERIFY THE ACTUAL LOCATION, WATER TYPE, METER SIZE AND WATER PRESSURE IN THE FIELD PRIOR TO STARTING WORK. MEASUREMENT OF THE STATIC (NO WATER MOVING) WATER PRESSURE IS ACCEPTABLE FOR POTABLE WATER SYSTEMS WHERE NO PUMP HAS BEEN INDICATED ON THESE PLANS. IF ANY OF THE POC INFORMATION SHOWN ON THESE DRAWING IS FOUND TO BE DIFFERENT THAN THE ACTUAL POC INFORMATION GATHERED IN THE FIELD, IMMEDIATELY NOTIFY THE LANDSCAPE ARCHITECT AND IRRIGATION CONSULTANT. SHOULD THE CONTRACTOR FAIL TO VERIFY THE POC INFORMATION AS SHOWN HEREIN, ANY CHANGES REQUIRED BY LOW PRESSURE OR VOLUME SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR.

WATER PRESSURE AT POC:	55	PSI (STATIC)
DESIGN WATER PRESSURE:	53	PSI
MAXIMUM SYSTEM DEMAND:	32	GPM
RESIDUAL WATER PRESSURE:	02	PSI

WATER PRESSURE LOSS CALCULATIONS

WATER METER NUMBER	TYP.	WATER METER SIZE (Inches)	1.50
HYDRAULIC GRADE LINE (FT)		WATER METER ELEVATION (FT)	
ELEVATION DIFFERENCE (FT)	0	STATIC PRESSURE (PSI)	55.0
REMOTE CONTROL VALVE #		REMOTE CONTROL VALVE SIZE (In.)	1.50
R.C.V. DEMAND (GPM)	32	TOTAL DEMAND (GPM)	32
HIGHEST HEAD SERVED (FT)		STATIC PRESSURE AT HIGHEST HEAD	55.0

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IRRIGATION DESIGN AND CONSULTING

SIZE (Inches)	DESCRIPTION	FLOW	#	LOSS	
2.00	SERVICE LINE (50 FT OF TYPE K COPPER)	32	1	0.56	PSI
1.50	WATER METER (DISC TYPE)	32	2	2.10	PSI
1.50	BACKFLOW PREVENTER (R/P TYPE)	32	3	11.00	PSI
1.50	FILTRATION (WYE FILTER)	32	4	0.25	PSI
2.00	BFD ASSEMBLY PIPING (BRASS W/ 4 ELLS)	32	6	0.67	PSI
1.50	MASTER CONTROL VALVE	32	7	1.00	PSI
1.50	FLOW SENSOR	32	8	0.25	PSI
3.00	ISOLATION VALVES (BALL TYPE)	32	9	1.00	PSI
3.00	750 FEET OF MAINLINE: SCH. 40 PVC	32	10	0.90	PSI
2.00	90 DEGREE ELBOWS	32	13	0.10	PSI
1.50	REMOTE CONTROL VALVE ASSEMBLY	32	14	1.50	PSI
10%	LATERAL LINE LOSSES	32	15	3.00	PSI
20%	FITTING LOSS (IN ADDITION TO ELBOWS SHOWN)	N/A	16	0.18	PSI
0.00	ELEVATION CHANGE (P.O.C. TO HIGHEST HEAD)	N/A	17	0.00	PSI
TOTAL SYSTEM PRESSURE LOSS (SUM OF #1 THRU #17)			18	22.5	PSI
PRESSURE REQUIRED AT HEAD (OPERATING PRESSURE)			19	30.0	PSI
TOTAL PRESSURE REQUIRED (SUM OF #18 AND #19)			20	52.5	PSI
STATIC WATER PRESSURE (FROM ABOVE)			21	55.0	PSI
RESIDUAL PRESSURE (SUBTRACT #20 FROM #21)			22	2.5	PSI

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irrigation design

67862
STATE OF TEXAS
EDWARD J. KOCHANEK
20439
LICENSED IRRIGATOR
26 February 2020

REV. NO.	DATE	DESCRIPTION	BY
	02/18/2020	100% CONSTRUCTION DOCUMENTS	

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY
FIRM REGISTATION NO. 2814

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L3.40

IRRIGATION CALCULATIONS

SHEET 65 OF 109

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN:	6	TEXAS	STP 1802 (783) MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	459

IRRIGATION CONTROLLER RUN TIMES

Controller / POC		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total / Avg.
2 / D	ETo / Month (Inches):	2.36	2.83	4.32	5.01	6.11	6.57	6.52	6.08	5.57	4.28	2.90	2.35	**54.90**
	Historic Rainfall:	3.70	2.99	3.48	3.49	5.22	5.13	3.25	3.79	4.45	4.65	3.89	3.64	**47.68**
	ETo / Day (Inches):	0.08	0.09	0.14	0.16	0.20	0.21	0.21	0.20	0.18	0.14	0.09	0.08	**0.15**
	Irrigation Days / Week:	6	6	6	6	6	6	6	6	6	6	6	6	

Plant / Irrig. Type	AKc	Pr Rate	IE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
Turf	0.60	0.77	0.90	4.6	5.5	8.4	9.8	11.9	12.8	12.7	11.9	10.9	8.4	5.7	4.6	Min./Day/Zone
Inline Drip	Number of Zones:		3	**13.8**	**16.6**	**25.3**	**29.4**	**35.8**	**38.5**	**38.2**	**35.7**	**32.7**	**25.1**	**17.0**	**13.8**	**Total Min./Day**
Turf	0.60	1.74	0.65	2.8	3.4	5.2	6.0	7.3	7.9	7.8	7.3	6.7	5.1	3.5	2.8	Min./Day/Zone
Sprays	Number of Zones:		6	**17.0**	**20.3**	**31.0**	**36.0**	**43.9**	**47.2**	**46.9**	**43.7**	**40.0**	**30.8**	**20.8**	**16.9**	**Total Min./Day**
Tree	0.80	3.00	0.90	1.6	1.9	2.9	3.4	4.1	4.4	4.4	4.1	3.7	2.9	1.9	1.6	Min./Day/Zone
Bubblers	Number of Zones:		2	**3.2**	**3.8**	**5.8**	**6.7**	**8.2**	**8.8**	**8.7**	**8.1**	**7.5**	**5.7**	**3.9**	**3.1**	**Total Min./Day**
Total Number of Zones:			11	34.0	40.7	62.2	72.1	87.9	94.5	93.8	87.5	80.2	61.6	41.7	33.8	Total Min./Day
Total Sequential Run Time:				**0.6**	**0.7**	**1.0**	**1.2**	**1.5**	**1.6**	**1.6**	**1.5**	**1.3**	**1.0**	**0.7**	**0.6**	**Total Hrs./Day**
Total Sequential Run Time (Overhead Irrigation Only):				**0.3**	**0.3**	**0.5**	**0.6**	**0.7**	**0.8**	**0.8**	**0.7**	**0.7**	**0.5**	**0.3**	**0.3**	**Total Hrs./Day**

NOTE A:
POINT OF CONNECTION (POC) #4 (PROGRAM D) SHALL BE A 1-1/2" DOMESTIC WATER METER WITH A 2" SERVICE LINE. THE CONTRACTOR SHALL VERIFY THE ACTUAL LOCATION, WATER TYPE, METER SIZE AND WATER PRESSURE IN THE FIELD PRIOR TO STARTING WORK. MEASUREMENT OF THE STATIC (NO WATER MOVING) WATER PRESSURE IS ACCEPTABLE FOR POTABLE WATER SYSTEMS WHERE NO PUMP HAS BEEN INDICATED ON THESE PLANS. IF ANY OF THE POC INFORMATION SHOWN ON THESE DRAWING IS FOUND TO BE DIFFERENT THAN THE ACTUAL POC INFORMATION GATHERED IN THE FIELD, IMMEDIATELY NOTIFY THE LANDSCAPE ARCHITECT AND IRRIGATION CONSULTANT. SHOULD THE CONTRACTOR FAIL TO VERIFY THE POC INFORMATION AS SHOWN HEREIN, ANY CHANGES REQUIRED BY LOW PRESSURE OR VOLUME SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR.

WATER PRESSURE AT POC:	55	PSI (STATIC)
DESIGN WATER PRESSURE:	53	PSI
MAXIMUM SYSTEM DEMAND:	32	GPM
RESIDUAL WATER PRESSURE:	02	PSI

WATER PRESSURE LOSS CALCULATIONS

WATER METER NUMBER	TYP.	WATER METER SIZE (Inches)	1.50
HYDRAULIC GRADE LINE (FT)		WATER METER ELEVATION (FT)	
ELEVATION DIFFERENCE (FT)	0	STATIC PRESSURE (PSI)	55.0
REMOTE CONTROL VALVE #		REMOTE CONTROL VALVE SIZE (In.)	1.50
R.C.V. DEMAND (GPM)	32	TOTAL DEMAND (GPM)	32
HIGHEST HEAD SERVED (FT)		STATIC PRESSURE AT HIGHEST HEAD	55.0

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IRRIGATION DESIGN AND CONSULTING

SIZE (Inches)	DESCRIPTION	FLOW	#	LOSS	
2.00	SERVICE LINE (50 FT OF TYPE K COPPER)	32	1	0.56	PSI
1.50	WATER METER (DISC TYPE)	32	2	2.10	PSI
1.50	BACKFLOW PREVENTER (R/P TYPE)	32	3	11.00	PSI
1.50	FILTRATION (WYE FILTER)	32	4	0.25	PSI
2.00	BFD ASSEMBLY PIPING (BRASS W/ 4 ELLS)	32	6	0.67	PSI
1.50	MASTER CONTROL VALVE	32	7	1.00	PSI
1.50	FLOW SENSOR	32	8	0.25	PSI
3.00	ISOLATION VALVES (BALL TYPE)	32	9	1.00	PSI
3.00	750 FEET OF MAINLINE: SCH. 40 PVC	32	10	0.90	PSI
2.00	90 DEGREE ELBOWS	32	13	0.10	PSI
1.50	REMOTE CONTROL VALVE ASSEMBLY	32	14	1.50	PSI
10%	LATERAL LINE LOSSES	32	15	3.00	PSI
20%	FITTING LOSS (IN ADDITION TO ELBOWS SHOWN)	N/A	16	0.18	PSI
0.00	ELEVATION CHANGE (P.O.C. TO HIGHEST HEAD)	N/A	17	0.00	PSI
TOTAL SYSTEM PRESSURE LOSS (SUM OF #1 THRU #17)			18	22.5	PSI
PRESSURE REQUIRED AT HEAD (OPERATING PRESSURE)			19	30.0	PSI
TOTAL PRESSURE REQUIRED (SUM OF #18 AND #19)			20	52.5	PSI
STATIC WATER PRESSURE (FROM ABOVE)			21	55.0	PSI
RESIDUAL PRESSURE (SUBTRACT #20 FROM #21)			22	2.5	PSI

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irrigation design

ACCEPTED AND RELEASED FOR CONSTRUCTION
67862

STATE OF TEXAS
EDWARD J. KOCHANEK
20439
LICENSED IRRIGATOR
26 February 2020

REV. NO.	DATE	DESCRIPTION	BY
	02/19/2020	100% CONSTRUCTION DOCUMENTS	

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

Texas Department of Transportation

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L3.41

IRRIGATION CALCULATIONS

SHEET 66 OF 109

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN:	6	TEXAS	STP 1802 (783) MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	460

IRRIGATION CONTROLLER RUN TIMES

Controller / POC		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total / Avg.
2 / E	ETo / Month (Inches):	2.36	2.83	4.32	5.01	6.11	6.57	6.52	6.08	5.57	4.28	2.90	2.35	**54.90**
	Historic Rainfall:	3.70	2.99	3.48	3.49	5.22	5.13	3.25	3.79	4.45	4.65	3.89	3.64	**47.68**
	ETo / Day (Inches):	0.08	0.09	0.14	0.16	0.20	0.21	0.21	0.20	0.18	0.14	0.09	0.08	**0.15**
	Irrigation Days / Week:	6	6	6	6	6	6	6	6	6	6	6	6	

Plant / Irrig. Type	AKc	Pr Rate	IE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
Turf	0.60	0.77	0.90	4.6	5.5	8.4	9.8	11.9	12.8	12.7	11.9	10.9	8.4	5.7	4.6	Min./Day/Zone
Inline Drip	Number of Zones:		5	**23.1**	**27.7**	**42.2**	**49.0**	**59.7**	**64.2**	**63.7**	**59.4**	**54.4**	**41.8**	**28.3**	**23.0**	**Total Min./Day**
Turf	0.60	1.74	0.65	2.8	3.4	5.2	6.0	7.3	7.9	7.8	7.3	6.7	5.1	3.5	2.8	Min./Day/Zone
Sprays	Number of Zones:		11	**31.1**	**37.3**	**56.9**	**66.0**	**80.5**	**86.6**	**85.9**	**80.1**	**73.4**	**56.4**	**38.2**	**31.0**	**Total Min./Day**
Tree	0.80	3.00	0.90	1.6	1.9	2.9	3.4	4.1	4.4	4.4	4.1	3.7	2.9	1.9	1.6	Min./Day/Zone
Bubblers	Number of Zones:		4	**6.3**	**7.6**	**11.6**	**13.4**	**16.4**	**17.6**	**17.4**	**16.3**	**14.9**	**11.5**	**7.8**	**6.3**	**Total Min./Day**
Total Number of Zones:			20	60.5	72.5	110.7	128.4	156.6	168.4	167.1	155.8	142.8	109.7	74.3	60.2	Total Min./Day
Total Sequential Run Time:				**1.0**	**1.2**	**1.8**	**2.1**	**2.6**	**2.8**	**2.8**	**2.6**	**2.4**	**1.8**	**1.2**	**1.0**	**Total Hrs./Day**
Total Sequential Run Time (Overhead Irrigation Only):				**0.5**	**0.6**	**0.9**	**1.1**	**1.3**	**1.4**	**1.4**	**1.3**	**1.2**	**0.9**	**0.6**	**0.5**	**Total Hrs./Day**

NOTE A:
POINT OF CONNECTION (POC) #5 (PROGRAM E) SHALL BE A 1-1/2" DOMESTIC WATER METER WITH A 2" SERVICE LINE. THE CONTRACTOR SHALL VERIFY THE ACTUAL LOCATION, WATER TYPE, METER SIZE AND WATER PRESSURE IN THE FIELD PRIOR TO STARTING WORK. MEASUREMENT OF THE STATIC (NO WATER MOVING) WATER PRESSURE IS ACCEPTABLE FOR POTABLE WATER SYSTEMS WHERE NO PUMP HAS BEEN INDICATED ON THESE PLANS. IF ANY OF THE POC INFORMATION SHOWN ON THESE DRAWING IS FOUND TO BE DIFFERENT THAN THE ACTUAL POC INFORMATION GATHERED IN THE FIELD, IMMEDIATELY NOTIFY THE LANDSCAPE ARCHITECT AND IRRIGATION CONSULTANT. SHOULD THE CONTRACTOR FAIL TO VERIFY THE POC INFORMATION AS SHOWN HEREIN, ANY CHANGES REQUIRED BY LOW PRESSURE OR VOLUME SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR.

WATER PRESSURE AT POC:	55	PSI (STATIC)
DESIGN WATER PRESSURE:	53	PSI
MAXIMUM SYSTEM DEMAND:	32	GPM
RESIDUAL WATER PRESSURE:	02	PSI

WATER PRESSURE LOSS CALCULATIONS

WATER METER NUMBER	TYP.	WATER METER SIZE (Inches)	1.50
HYDRAULIC GRADE LINE (FT)		WATER METER ELEVATION (FT)	
ELEVATION DIFFERENCE (FT)	0	STATIC PRESSURE (PSI)	55.0
REMOTE CONTROL VALVE #		REMOTE CONTROL VALVE SIZE (In.)	1.50
R.C.V. DEMAND (GPM)	32	TOTAL DEMAND (GPM)	32
HIGHEST HEAD SERVED (FT)		STATIC PRESSURE AT HIGHEST HEAD	55.0

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IRRIGATION DESIGN AND CONSULTING

SIZE (Inches)	DESCRIPTION	FLOW	#	LOSS	
2.00	SERVICE LINE (50 FT OF TYPE K COPPER)	32	1	0.56	PSI
1.50	WATER METER (DISC TYPE)	32	2	2.10	PSI
1.50	BACKFLOW PREVENTER (R/P TYPE)	32	3	11.00	PSI
1.50	FILTRATION (WYE FILTER)	32	4	0.25	PSI
2.00	BFD ASSEMBLY PIPING (BRASS W/ 4 ELLS)	32	6	0.67	PSI
1.50	MASTER CONTROL VALVE	32	7	1.00	PSI
1.50	FLOW SENSOR	32	8	0.25	PSI
3.00	ISOLATION VALVES (BALL TYPE)	32	9	1.00	PSI
3.00	750 FEET OF MAINLINE: SCH. 40 PVC	32	10	0.90	PSI
2.00	90 DEGREE ELBOWS	32	13	0.10	PSI
1.50	REMOTE CONTROL VALVE ASSEMBLY	32	14	1.50	PSI
10%	LATERAL LINE LOSSES	32	15	3.00	PSI
20%	FITTING LOSS (IN ADDITION TO ELBOWS SHOWN)	N/A	16	0.18	PSI
0.00	ELEVATION CHANGE (P.O.C. TO HIGHEST HEAD)	N/A	17	0.00	PSI
TOTAL SYSTEM PRESSURE LOSS (SUM OF #1 THRU #17)			18	22.5	PSI
PRESSURE REQUIRED AT HEAD (OPERATING PRESSURE)			19	30.0	PSI
TOTAL PRESSURE REQUIRED (SUM OF #18 AND #19)			20	52.5	PSI
STATIC WATER PRESSURE (FROM ABOVE)			21	55.0	PSI
RESIDUAL PRESSURE (SUBTRACT #20 FROM #21)			22	2.5	PSI

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PUBLIC WORKS AND TRANSPORTATION
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67862

STATE OF TEXAS
EDWARD J. KOCHANEK
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LICENSED IRRIGATOR
26 February 2020

REV. NO.	DATE	DESCRIPTION	BY
	02/26/2020	100% CONSTRUCTION DOCUMENTS	

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

Texas Department of Transportation

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L3.42

IRRIGATION CALCULATIONS

SHEET 67 OF 109

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN:	6	TEXAS	STP 1802 (783) MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	461

IRRIGATION CONTROLLER RUN TIMES

Controller / POC		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total / Avg.
2 / F	ETo / Month (Inches):	2.36	2.83	4.32	5.01	6.11	6.57	6.52	6.08	5.57	4.28	2.90	2.35	**54.90**
	Historic Rainfall:	3.70	2.99	3.48	3.49	5.22	5.13	3.25	3.79	4.45	4.65	3.89	3.64	**47.68**
	ETo / Day (Inches):	0.08	0.09	0.14	0.16	0.20	0.21	0.21	0.20	0.18	0.14	0.09	0.08	**0.15**
	Irrigation Days / Week:	6	6	6	6	6	6	6	6	6	6	6	6	

Plant / Irrig. Type	AKc	Pr Rate	IE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
Turf	0.60	0.77	0.90	4.6	5.5	8.4	9.8	11.9	12.8	12.7	11.9	10.9	8.4	5.7	4.6	Min./Day/Zone
Inline Drip	Number of Zones:		4	**18.5**	**22.1**	**33.8**	**39.2**	**47.8**	**51.4**	**51.0**	**47.5**	**43.6**	**33.5**	**22.7**	**18.4**	**Total Min./Day**
Turf	0.60	1.74	0.65	2.8	3.4	5.2	6.0	7.3	7.9	7.8	7.3	6.7	5.1	3.5	2.8	Min./Day/Zone
Sprays	Number of Zones:		10	**28.3**	**33.9**	**51.7**	**60.0**	**73.2**	**78.7**	**78.1**	**72.8**	**66.7**	**51.3**	**34.7**	**28.2**	**Total Min./Day**
Tree	0.80	3.00	0.90	1.6	1.9	2.9	3.4	4.1	4.4	4.4	4.1	3.7	2.9	1.9	1.6	Min./Day/Zone
Bubblers	Number of Zones:		2	**3.2**	**3.8**	**5.8**	**6.7**	**8.2**	**8.8**	**8.7**	**8.1**	**7.5**	**5.7**	**3.9**	**3.1**	**Total Min./Day**
Total Number of Zones:			**16**	49.9	59.8	91.3	105.9	129.1	138.9	137.8	128.5	117.7	90.5	61.3	49.7	Total Min./Day
Total Sequential Run Time:				**0.8**	**1.0**	**1.5**	**1.8**	**2.2**	**2.3**	**2.3**	**2.1**	**2.0**	**1.5**	**1.0**	**0.8**	**Total Hrs./Day**
Total Sequential Run Time (Overhead Irrigation Only):				**0.5**	**0.6**	**0.9**	**1.0**	**1.2**	**1.3**	**1.3**	**1.2**	**1.1**	**0.9**	**0.6**	**0.5**	**Total Hrs./Day**

NOTE A:
POINT OF CONNECTION (POC) #6 (PROGRAM F) SHALL BE A 1-1/2" DOMESTIC WATER METER WITH A 2" SERVICE LINE. THE CONTRACTOR SHALL VERIFY THE ACTUAL LOCATION, WATER TYPE, METER SIZE AND WATER PRESSURE IN THE FIELD PRIOR TO STARTING WORK. MEASUREMENT OF THE STATIC (NO WATER MOVING) WATER PRESSURE IS ACCEPTABLE FOR POTABLE WATER SYSTEMS WHERE NO PUMP HAS BEEN INDICATED ON THESE PLANS. IF ANY OF THE POC INFORMATION SHOWN ON THESE DRAWING IS FOUND TO BE DIFFERENT THAN THE ACTUAL POC INFORMATION GATHERED IN THE FIELD, IMMEDIATELY NOTIFY THE LANDSCAPE ARCHITECT AND IRRIGATION CONSULTANT. SHOULD THE CONTRACTOR FAIL TO VERIFY THE POC INFORMATION AS SHOWN HEREIN, ANY CHANGES REQUIRED BY LOW PRESSURE OR VOLUME SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR.

WATER PRESSURE AT POC:	55	PSI (STATIC)
DESIGN WATER PRESSURE:	53	PSI
MAXIMUM SYSTEM DEMAND:	32	GPM
RESIDUAL WATER PRESSURE:	02	PSI

WATER PRESSURE LOSS CALCULATIONS

WATER METER NUMBER	TYP.	WATER METER SIZE (Inches)	1.50
HYDRAULIC GRADE LINE (FT)		WATER METER ELEVATION (FT)	
ELEVATION DIFFERENCE (FT)	0	STATIC PRESSURE (PSI)	55.0
REMOTE CONTROL VALVE #		REMOTE CONTROL VALVE SIZE (In.)	1.50
R.C.V. DEMAND (GPM)	32	TOTAL DEMAND (GPM)	32
HIGHEST HEAD SERVED (FT)		STATIC PRESSURE AT HIGHEST HEAD	55.0

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IRRIGATION DESIGN AND CONSULTING

SIZE (Inches)	DESCRIPTION	FLOW	#	LOSS	
2.00	SERVICE LINE (50 FT OF TYPE K COPPER)	32	1	0.56	PSI
1.50	WATER METER (DISC TYPE)	32	2	2.10	PSI
1.50	BACKFLOW PREVENTER (R/P TYPE)	32	3	11.00	PSI
1.50	FILTRATION (WYE FILTER)	32	4	0.25	PSI
2.00	BFD ASSEMBLY PIPING (BRASS W/ 4 ELLS)	32	6	0.67	PSI
1.50	MASTER CONTROL VALVE	32	7	1.00	PSI
1.50	FLOW SENSOR	32	8	0.25	PSI
3.00	ISOLATION VALVES (BALL TYPE)	32	9	1.00	PSI
3.00	750 FEET OF MAINLINE: SCH. 40 PVC	32	10	0.90	PSI
2.00	90 DEGREE ELBOWS	32	13	0.10	PSI
1.50	REMOTE CONTROL VALVE ASSEMBLY	32	14	1.50	PSI
10%	LATERAL LINE LOSSES	32	15	3.00	PSI
20%	FITTING LOSS (IN ADDITION TO ELBOWS SHOWN)	N/A	16	0.18	PSI
0.00	ELEVATION CHANGE (P.O.C. TO HIGHEST HEAD)	N/A	17	0.00	PSI
	TOTAL SYSTEM PRESSURE LOSS (SUM OF #1 THRU #17)		18	22.5	PSI
	PRESSURE REQUIRED AT HEAD (OPERATING PRESSURE)		19	30.0	PSI
	TOTAL PRESSURE REQUIRED (SUM OF #18 AND #19)		20	52.5	PSI
	STATIC WATER PRESSURE (FROM ABOVE)		21	55.0	PSI
	RESIDUAL PRESSURE (SUBTRACT #20 FROM #21)		22	2.5	PSI

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s+a sweeney + associates
irrigation design

ACCEPTED AND FILED
PUBLIC RECORDS
67862

STATE OF TEXAS
EDWARD J. KOCHANEK
20439
LICENSED IRRIGATOR

26 February 2020

REV. NO.	DATE	DESCRIPTION	BY
	02/19/2020	100% CONSTRUCTION DOCUMENTS	

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

Texas Department of Transportation

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L3.43

IRRIGATION CALCULATIONS

SHEET 68 OF 109

DSN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN:	6	TEXAS	STP 1802 (783) MM			CS
DWN:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWN:	HOU	HARRIS	0912	72	391	462

IRRIGATION CONTROLLER RUN TIMES

Controller / POC		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total / Avg.
Typical Median	ETo / Month (Inches):	2.36	2.83	4.32	5.01	6.11	6.57	6.52	6.08	5.57	4.28	2.90	2.35	**54.90**
	Historic Rainfall:	3.70	2.99	3.48	3.49	5.22	5.13	3.25	3.79	4.45	4.65	3.89	3.64	**47.68**
	ETo / Day (Inches):	0.08	0.09	0.14	0.16	0.20	0.21	0.21	0.20	0.18	0.14	0.09	0.08	**0.15**
	Irrigation Days / Week:	6	6	6	6	6	6	6	6	6	6	6	6	

Plant / Irrig. Type	AKc	Pr Rate	IE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
Shrubs	0.40	0.77	0.90	3.1	3.7	5.6	6.5	8.0	8.6	8.5	7.9	7.3	5.6	3.8	3.1	Min./Day/Zone
Inline Drip	**Number of Zones:**		1	**3.1**	**3.7**	**5.6**	**6.5**	**8.0**	**8.6**	**8.5**	**7.9**	**7.3**	**5.6**	**3.8**	**3.1**	**Total Min./Day**
Turf	0.60	1.74	0.65	2.8	3.4	5.2	6.0	7.3	7.9	7.8	7.3	6.7	5.1	3.5	2.8	Min./Day/Zone
Sprays	**Number of Zones:**		1	**2.8**	**3.4**	**5.2**	**6.0**	**7.3**	**7.9**	**7.8**	**7.3**	**6.7**	**5.1**	**3.5**	**2.8**	**Total Min./Day**
Tree	0.80	3.00	0.90	1.6	1.9	2.9	3.4	4.1	4.4	4.4	4.1	3.7	2.9	1.9	1.6	Min./Day/Zone
Bubblers	**Number of Zones:**		1	**1.6**	**1.9**	**2.9**	**3.4**	**4.1**	**4.4**	**4.4**	**4.1**	**3.7**	**2.9**	**1.9**	**1.6**	**Total Min./Day**
Total Number of Zones:			**3**	7.5	9.0	13.7	15.9	19.4	20.8	20.7	19.3	17.7	13.6	9.2	7.5	Total Min./Day
Total Sequential Run Time:				**0.1**	**0.1**	**0.2**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.2**	**0.2**	**0.1**	**Total Hrs./Day**
Total Sequential Run Time (Overhead Irrigation Only):				**0.0**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.0**	**Total Hrs./Day**

NOTE A:
EACH MEDIAN POINT OF CONNECTION (POC) SHALL BE A 1" DOMESTIC WATER METER WITH A 1" SERVICE LINE. THE CONTRACTOR SHALL VERIFY THE ACTUAL LOCATION, WATER TYPE, METER SIZE AND WATER PRESSURE IN THE FIELD PRIOR TO STARTING WORK. MEASUREMENT OF THE STATIC (NO WATER MOVING) WATER PRESSURE IS ACCEPTABLE FOR POTABLE WATER SYSTEMS WHERE NO PUMP HAS BEEN INDICATED ON THESE PLANS. IF ANY OF THE POC INFORMATION SHOWN ON THESE DRAWING IS FOUND TO BE DIFFERENT THAN THE ACTUAL POC INFORMATION GATHERED IN THE FIELD, IMMEDIATELY NOTIFY THE LANDSCAPE ARCHITECT AND IRRIGATION CONSULTANT. SHOULD THE CONTRACTOR FAIL TO VERIFY THE POC INFORMATION AS SHOWN HEREIN, ANY CHANGES REQUIRED BY LOW PRESSURE OR VOLUME SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR.

WATER PRESSURE AT POC:	55	PSI (STATIC)
DESIGN WATER PRESSURE:	50	PSI
MAXIMUM SYSTEM DEMAND:	12	GPM
RESIDUAL WATER PRESSURE:	05	PSI

WATER PRESSURE LOSS CALCULATIONS

WATER METER NUMBER	TYPICAL	WATER METER SIZE (Inches)	1.00
HYDRAULIC GRADE LINE (FT)		WATER METER ELEVATION (FT)	
ELEVATION DIFFERENCE (FT)	0	STATIC PRESSURE (PSI)	55.0
REMOTE CONTROL VALVE #		REMOTE CONTROL VALVE SIZE (In.)	1.00
R.C.V. DEMAND (GPM)	12	TOTAL DEMAND (GPM)	12
HIGHEST HEAD SERVED (FT)		STATIC PRESSURE AT HIGHEST HEAD	55.0

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IRRIGATION DESIGN AND CONSULTING

SIZE (Inches)	DESCRIPTION	FLOW	#	LOSS	
1.00	SERVICE LINE (50 FT OF TYPE K COPPER)	12	1	2.47	PSI
1.00	WATER METER (DISC TYPE)	12	2	0.90	PSI
1.00	BACKFLOW PREVENTER (R/P TYPE)	12	3	4.00	PSI
1.00	BFD ASSEMBLY PIPING (BRASS W/ 4 ELLS)	12	6	2.96	PSI
1.50	ISOLATION VALVES (BALL TYPE)	12	9	0.50	PSI
1.50	500 FEET OF MAINLINE: SCH. 40 PVC	12	10	2.10	PSI
1.00	REMOTE CONTROL VALVE ASSEMBLY	12	14	3.00	PSI
10%	LATERAL LINE LOSSES	12	15	3.00	PSI
20%	FITTING LOSS (IN ADDITION TO ELBOWS SHOWN)	N/A	16	0.42	PSI
0.00	ELEVATION CHANGE (P.O.C. TO HIGHEST HEAD)	N/A	17	0.00	PSI
	TOTAL SYSTEM PRESSURE LOSS (SUM OF #1 THRU #17)		18	20.1	PSI
	PRESSURE REQUIRED AT HEAD (OPERATING PRESSURE)		19	30.0	PSI
	TOTAL PRESSURE REQUIRED (SUM OF #18 AND #19)		20	50.1	PSI
	STATIC WATER PRESSURE (FROM ABOVE)		21	55.0	PSI
	RESIDUAL PRESSURE (SUBTRACT #20 FROM #21)		22	4.9	PSI

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irrigation design

PUBLIC WORKS & TRANSPORTATION
ACCEPTED AND FILED
67862

STATE OF TEXAS
EDWARD J. KOCHANEK
20439
LICENSED IRRIGATOR

26 February 2020

REV. NO.	DATE	DESCRIPTION	BY
	02/18/2020	100% CONSTRUCTION DOCUMENTS	

Lockwood, Andrews & Newnam, Inc.
A LEO A DALY COMPANY
FIRM REGISTRATION NO. 2814

Texas Department of Transportation

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L3.44

IRRIGATION CALCULATIONS

SHEET 69 OF 109

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802 (783) MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	463

1. REFERENCE ITEM 5.10 INSPECTION OF THE TEXAS STANDARD SPECIFICATIONS FOR CONSTRUCTION AND MAINTENANCE OF HIGHWAYS, STREETS AND BRIDGES. 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 AND MAINTENANCE 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. PHOTOGRAPHS. 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 ROOT BALL IS MEASURED FROM THE TOP OF THE BALL, WHICH IN ALL CASES SHALL BEGIN IN THE ROOT FLARE.

8. HANDLING. 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 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. PROJECTS WITH IRRIGATION SYSTEMS MUST HAVE SYSTEM OPERATIONAL TO ALL VALVES PRIOR TO WORK.

12. MARK PLANT LOCATIONS AND BED OUTLINES. REFERENCE ITEM 192.3.3, MARK LOCATIONS FOR APPROVAL BY TXDOT LANDSCAPE ARCHITECT PRIOR TO WORK.

02 TXDOT PLANTING NOTES

ITEM 192-6013 MULCH

1. SHREDDED HARDWOOD; SHALL BE THE PRODUCT OF NATIVE HARDWOOD TREES FOR TIMBER OR PULP MANUFACTURING. BARK AND TREE MATERIAL SHALL BE SHREDDED IN A MANNER WHERE LARGE PIECES ARE AT A MINIMUM. THE MULCH SHALL BE FREE OF DEBRIS.
2. MULCH SHALL BE COMPOSTED. COMPOSTED MULCH FURNISHED BY 'THE GROUND UP', 1261 BRITTMOORE RD HOUSTON, TX 77043. (281) 970-0003, EXT. 3
3. FURNISH COPIES OF MANUFACTURERS' LITERATURE, CERTIFICATIONS, SOURCES, AND/OR LABORATORY ANALYTICAL DATA FOR COMPOSTED NATIVE MULCH TO THE TXDOT ENGINEER AND TXDOT LANDSCAPE ARCHITECT.
4. SUBMIT SAMPLE TO THE TXDOT ENGINEER AND TXDOT LANDSCAPE ARCHITECT FOR APPROVAL PRIOR TO DELIVERY AND WORK.
5. ALL TREE, SHRUB, GROUNDCOVER, ANNUALS, AND PERENNIAL PLANTING BEDS SHALL RECEIVE A UNIFORM 2" LAYER OF THE SPECIFIED MULCH ONCE PLANTING IS COMPLETE AND HAS BEEN INSPECTED TO CONFORM WITH THE DOCUMENTS.

ITEM 192-6016 PLANT BED PREPARATION

1. INCORPORATE 2" THICK LAYER OF PLANT SOIL MIX INTO 4" OF EXISTING SOIL AT THE BOTTOM OF EXCAVATED BED AREA. TOTAL TILLED THICKNESS IS 6". PERFORM BED PREPARATION TILLING PRIOR TO PLACEMENT OF FULL DEPTH OF PLANT SOIL MIX.
2. SEE DETAIL ON SHEET L4.18 FOR DIMENSIONS AND REQUIREMENTS.

01 PLANTING SOIL & MULCH SPECIFICATIONS

ITEM 192-6082 PLANT SOIL MIX (TURF SOIL)

1. TURF SOIL MIX TO BE ENRICHED TOPSOIL CONTAINING SCREENED TOPSOIL, BANK SAND, AND COMPOST AS SUPPLIED BY THE GROUND UP, HOUSTON , TX OR APPROVED EQUAL.
2. SEE DETAIL 05 ON SHEET L4.18 FOR DETAIL AND DIMENSIONS OF TURF SOIL MIX INSTALLATION.
3. FURNISH COPIES OF MANUFACTURERS' LITERATURE, CERTIFICATIONS, SOURCES, AND/OR LABORATORY ANALYTICAL DATA FOR PRE-BLENDED SOIL MIX TO THE TXDOT ENGINEER AND TXDOT LANDSCAPE ARCHITECT FOR APPROVAL PRIOR TO DELIVERY AND WORK.
4. SUBMIT TURF SOIL MIX SAMPLE TO THE TXDOT ENGINEER AND TXDOT LANDSCAPE ARCHITECT FOR APPROVAL PRIOR TO DELIVERY AND WORK. DELIVERY TICKETS MUST ACCOMPANY EACH SHIPMENT OF MATERIALS.
5. TILL INTO EXISTING SOIL TO A DEPTH OF 4" AND INSTALL TURF SOIL MIX IN LIFTS OF 6". COMPACT EACH LIFT TO 80% SPD BEFORE INSTALLING NEXT LIFT.
6. SEE PLANT BED PREPARATION NOTE THIS SHEET FOR TILLING REQUIREMENTS.

ITEM 192-6081 PLANT SOIL MIX (PLANTING SOIL)

1. PLANTING SOIL MIX TO BE PREMIUM FLOWERBED AND GARDEN SOIL AS SUPPLIED BY THE GROUND UP, HOUSTON, TX OR APPROVED EQUAL.
2. SEE DETAIL 03 ON SHEET L4.18 FOR DETAIL AND DIMENSIONS OF PLANTING SOIL MIX INSTALLATION.
3. FURNISH COPIES OF MANUFACTURERS' LITERATURE, CERTIFICATIONS, SOURCES, AND/OR LABORATORY ANALYTICAL DATA FOR PRE-BLENDED SOIL MIX TO THE TXDOT ENGINEER AND TXDOT LANDSCAPE ARCHITECT FOR APPROVAL PRIOR TO DELIVERY AND WORK.
4. SUBMIT PLANTING SOIL MIX SAMPLE TO THE TXDOT ENGINEER AND TXDOT LANDSCAPE ARCHITECT FOR APPROVAL PRIOR TO DELIVERY AND WORK. DELIVERY TICKETS MUST ACCOMPANY EACH SHIPMENT OF MATERIALS.
5. TILL INTO EXISTING SOIL TO A DEPTH OF 4" AND INSTALL PLANT SOIL MIX IN LIFTS OF 6". COMPACT EACH LIFT TO 80% SPD BEFORE INSTALLING NEXT LIFT.
6. SEE PLANT BED PREPARATION NOTE ON THIS SHEET FOR TILLING REQUIREMENTS.

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PUBLIC WORKS 67862

TEXAS BOARD OF ARCHITECTURAL EXAMINERS JAMES W. VICK ARCHITECT #10477 2020

100% CONSTRUCTION DOCUMENTS

REV. NO.	DATE	DESCRIPTION	BY

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

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L4.00

PLANTING NOTES & SPECIFICATIONS

SHEET 70 OF 109

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DRN:	6	TEXAS	STP 1802 (783) MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	464

P:\RHTRHTS503 WO-13 CIP T1731B Memorial\4 DrawingsGraphics\AutoCAD\Sheets\PLANTING\L4.00 PLANT SCHEDULE.dwg | ROLIVER |ANSI FULL BLEED B (11.00 X 17.00 INCHES) | 2/27/2020

PLANTING SCHEDULE

TREES

SYM	BOTANICAL NAME	COMMON NAME	QTY	UNIT	MINIMUM SPECIFICATIONS SIZE	CALIPER INCHES	HEIGHT	SPREAD	REMARK
PT	*Pinus taeda*	Loblolly Pine	47	EA	65 Gal.	3.5	14'	6'	MINIMUM SPECIFICATIONS, FULL, WELL BRANCHED, 8' CLEAR TRUNK HEIGHT, CENTRAL LEADER
TD	*Taxodium distucum*	Bald Cypress	87	EA	100 Gal.	4.5	15'	7'	MINIMUM SPECIFICATIONS, FULL, WELL BRANCHED, 8' CLEAR TRUNK HEIGHT, CENTRAL LEADER
LI	*Lagerstromia indica 'Muskogee'*	Crape Myrtle 'Muskogee'	37	EA	100 Gal.	4	14'	8'	MINIMUM SPECIFICATIONS, FULL, WELL BRANCHED, 3 CANE ONLY

TOTAL TREES: 171 **TOAL INCHES: 704**

SHRUBS

SYM	BOTANICAL NAME	COMMON NAME	QTY	UNIT	MINIMUM SPECIFICATIONS SIZE	SPACING	HEIGHT	SPREAD	REMARK
LC	*Loropetalum chinensis 'Little David'*	Loropetalum 'Little David'	484	EA	3 Gal.	30"	20"	20"	FULL PLANTS ROOTED TO CONTAINER
MC	*Muhlenbergia capillaris*	Gulf Coast Muhly	1274	EA	3 Gal.	24"	24"	18"	FULL PLANTS ROOTED TO CONTAINER

PERENNIALS & GROUNDCOVER

SYM	BOTANICAL NAME	COMMON NAME	QTY	UNIT	MINIMUM SPECIFICATIONS SIZE	SPACING	HEIGHT	SPREAD	REMARK
AA	*Angelonia angustifolia 'AngelMist'*	Angelonia 'AngelMist'	1,512	EA	4"	10" O.C.	--	--	EVEN MIX OF PURPLE, WHITE, & PINK SPECIMENS
ML	*Melampodium leucanthum*	Blackfoot Daisy	689	EA	1 Gal.	18" O.C.	12"	12"	FULL PLANTS ROOTED TO CONTAINER
TV	*Tulbaghia violacea*	Society Garlic	2,840	EA	1 Gal.	12" O.C.	12"	12"	FULL PLANTS ROOTED TO CONTAINER

SEEDING & SODDING

SYM	BOTANICAL NAME	COMMON NAME	QTY	UNIT	MINIMUM SPECIFICATIONS -	-	-	-	REMARK
CD	*Cynodon dactylon*	Common Bermuda Sod	86,082	SF	-	-	-	-	BLOCK SOD; ROLL SOD IS NOT ALLOWED

** Refer to sheet L4.18 for typical spacing. Mark locations in all beds for approval of TxDOT Landscape Architect and Owner's Representative prior to work.*

Landscape Architect

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PUBLIC CONVEYANCE
67862

TEXAS BOARD OF ARCHITECTURAL EXAMINERS
JAMES W. VICK
ARCHITECT 10417
FEB 13 2020

100% CONSTRUCTION DOCUMENTS

REV. NO.	DATE	DESCRIPTION	BY

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

MEMORIAL DRIVE RECONSTRUCTION
AND ACCESS MANAGEMENT

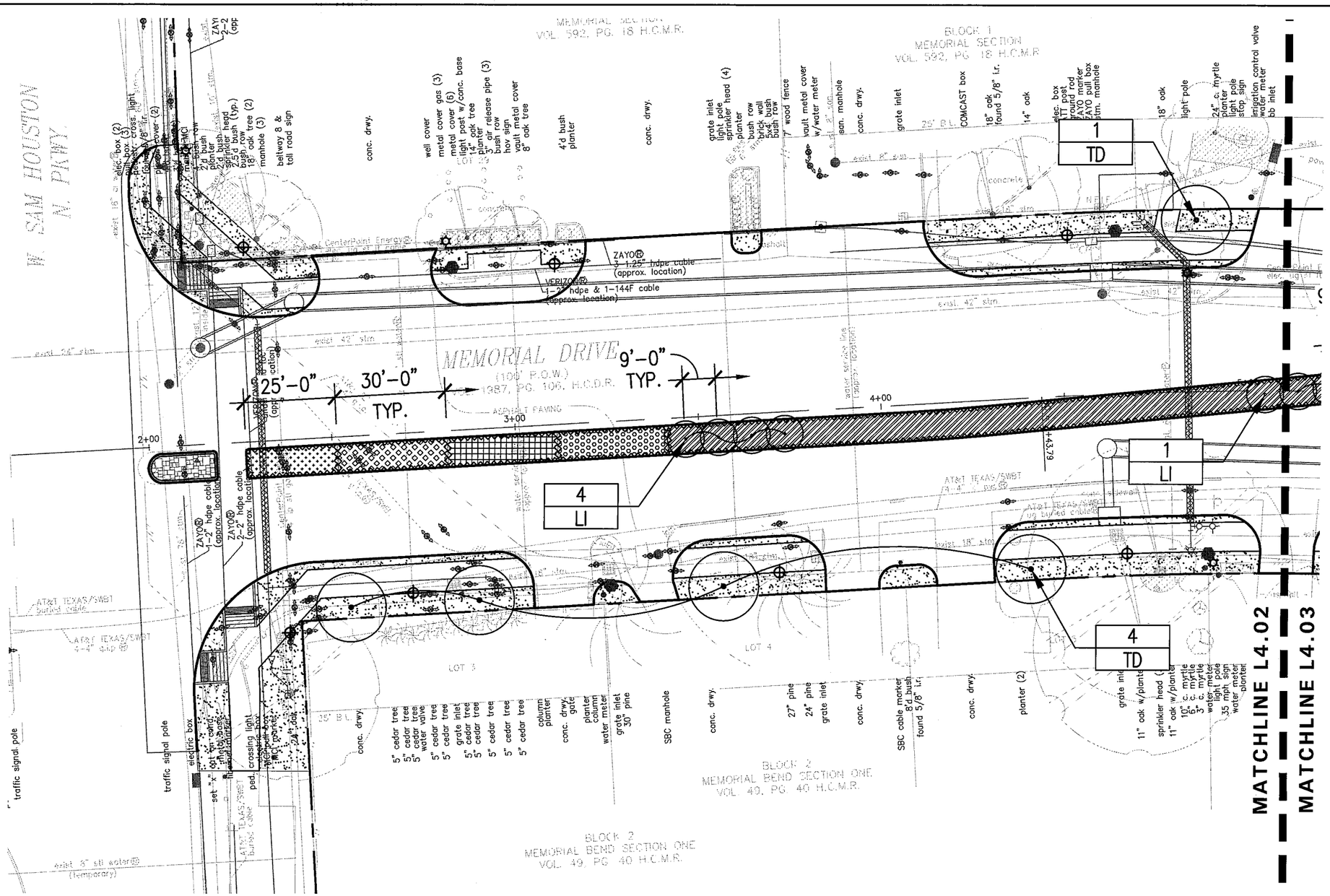
L4.01

PLANTING SCHEDULE

SHEET 71 OF 109

DGN	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN	6	TEXAS	STP 1802 (783) MM			CS
DWG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG	HOU	HARRIS	0912	72	391	465

P:\IRHTIRHTS503 WO-13 CIP T1731B Memorial\4 DrawingsGraphics\AutoCAD\Sheets\PLANTING\L4.01 PLANTING SCHEDULE.dwg | ROLIVER | ANSI FULL BLEED B (11.00 X 17.00 INCHES) | 2/27/2020



PLANTING LEGEND

- PROPOSED TREE
- EXISTING TREE
- BERMUDA
- ANGELONIA
- LOROPETALUM
- GULF COAST MUHLY
- SOCIETY GARLIC
- BLACKFOOT DAISY

NOTES:
1. REF. L4.01 FOR PLANTING SCHEDULE.
2. REF. L4.18 FOR PLANTING DETAILS.
3. TREE LAYOUT TO BE APPROVED IN FIELD BY LANDSCAPE ARCHITECT.
4. CONTRACTOR SHALL MARK ALL PLANT LOCATIONS AND SPACING FOR APPROVAL BY TxDOT LANDSCAPE ARCHITECT AND OWNER'S REPRESENTATIVE PRIOR TO WORK.

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ACCEPTED AND ... PUBLIC WORKS AND TRANSP...
67862

0 30 60
(IN FEET)
SCALE: PLAN 1":30'

TEXAS BOARD OF ARCHITECTURAL EXAMINERS
JAMES W. VICK
ARCHITECT
2/27/2020

100% CONSTRUCTION DOCUMENTS

REV. NO.	DATE	DESCRIPTION	BY

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

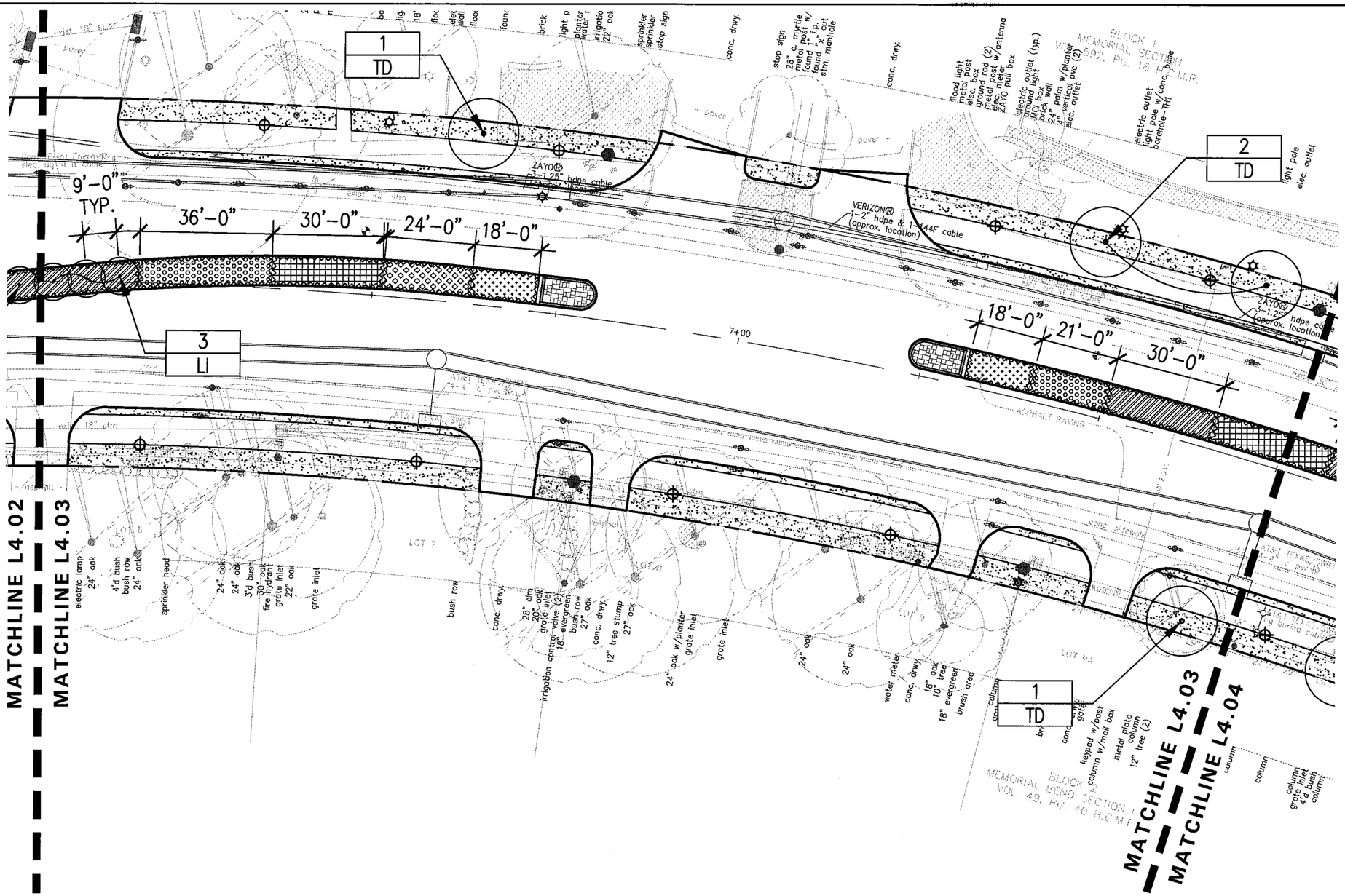
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L4.02

PLANTING PLAN

SHEET 72 OF 109

DGN	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN	6	TEXAS	STP 1802 (783) MM			CS
DWG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG	HOU	HARRIS	0912	72	391	466



PLANTING LEGEND

- PROPOSED TREE
- EXISTING TREE
- BERMUDA
- ANGELONIA
- LOROPETALUM
- GULF COAST MUHLY
- SOCIETY GARLIC
- BLACKFOOT DAISY

NOTES:
1. REF. L4.01 FOR PLANTING SCHEDULE.
2. REF. L4.18 FOR PLANTING DETAILS.
3. TREE LAYOUT TO BE APPROVED IN FIELD BY LANDSCAPE ARCHITECT.
4. CONTRACTOR SHALL MARK ALL PLANT LOCATIONS AND SPACING FOR APPROVAL BY TxDOT LANDSCAPE ARCHITECT AND OWNER'S REPRESENTATIVE PRIOR TO WORK.

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PUBLIC HIGHWAYS AND RIGHT-OF-WAY
ACCESS GRANTED
67862

0 30 60
(IN FEET)
SCALE: PLAN 1":30'

TEXAS BOARD OF ARCHITECTURAL EXAMINERS
JAMES W. VICK
ARCHITECT # 10477
FEB 27 2020

100% CONSTRUCTION DOCUMENTS

REV. NO.	DATE	DESCRIPTION	BY

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

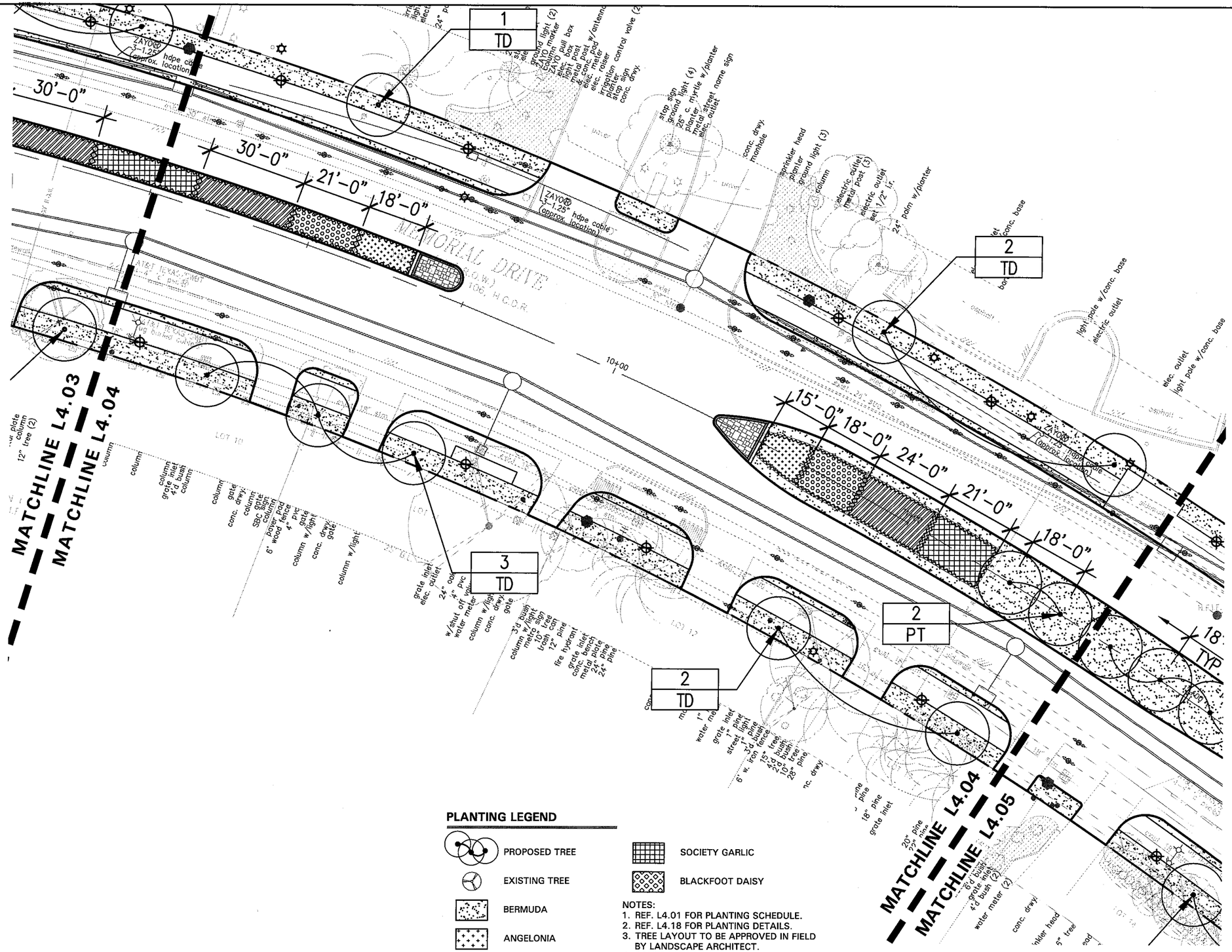
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L4.03

PLANTING PLAN

SHEET 73 OF 109

DGN	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DWG	6	TEXAS	STP 1802 (783) MM			CS
DWG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG	HOU	HARRIS	0912	72	391	467



PLANTING LEGEND

- PROPOSED TREE
- EXISTING TREE
- BERMUDA
- ANGELONIA
- LOROPETALUM
- GULF COAST MUHLY
- SOCIETY GARLIC
- BLACKFOOT DAISY

NOTES:
1. REF. L4.01 FOR PLANTING SCHEDULE.
2. REF. L4.18 FOR PLANTING DETAILS.
3. TREE LAYOUT TO BE APPROVED IN FIELD BY LANDSCAPE ARCHITECT.
4. CONTRACTOR SHALL MARK ALL PLANT LOCATIONS AND SPACING FOR APPROVAL BY TxDOT LANDSCAPE ARCHITECT AND OWNER'S REPRESENTATIVE PRIOR TO WORK.

Landscape Architect

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SCALE: PLAN 1":30'

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JAMES W. VICK
ARCHITECT 11047
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L4.04

PLANTING PLAN

SHEET 74 OF 109

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN:	6	TEXAS	STP 1802 (783) MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	468

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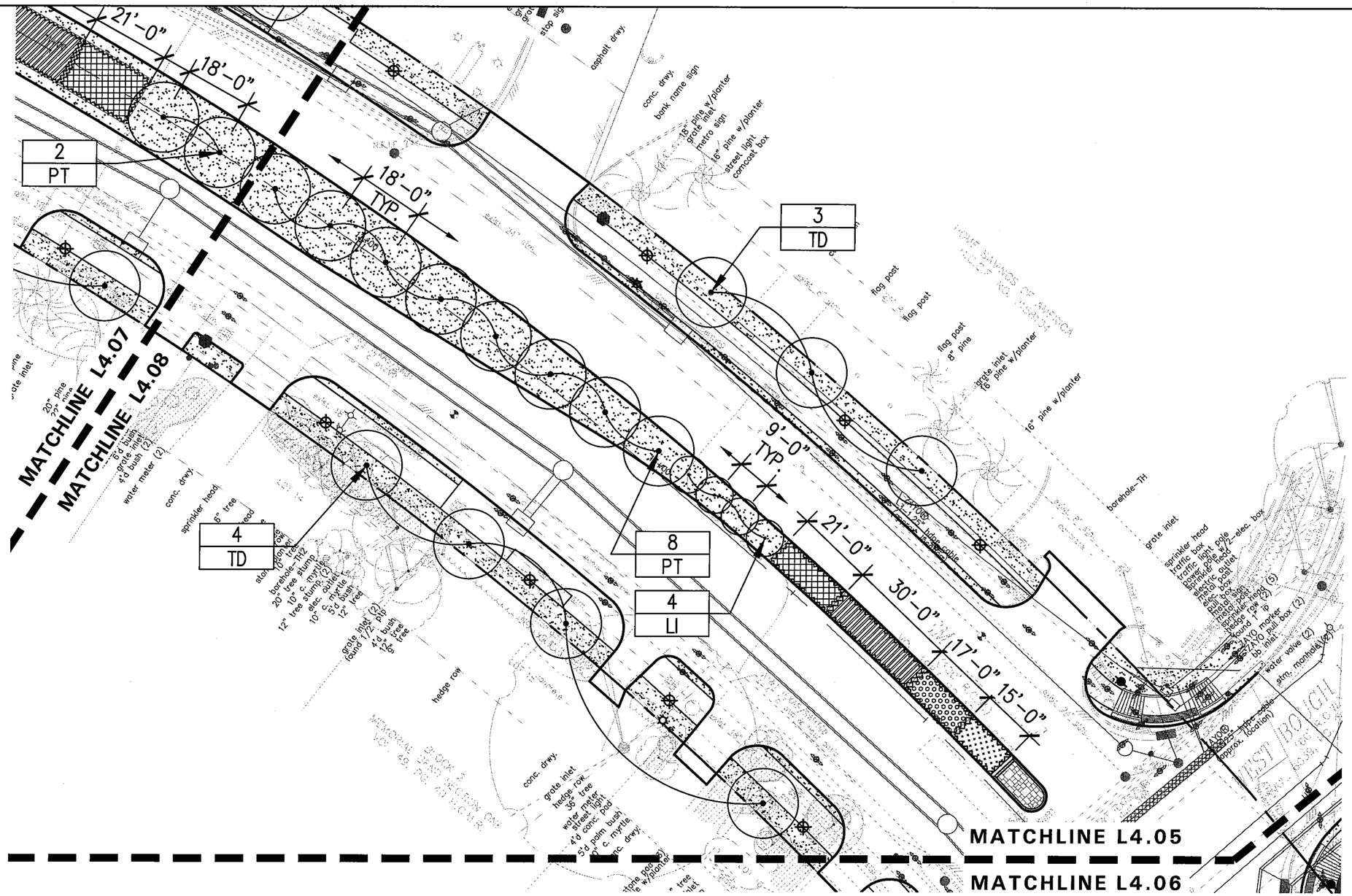

PLANTING LEGEND

- PROPOSED TREE
- EXISTING TREE
- BERMUDA
- ANGELONIA
- LOROPETALUM
- GULF COAST MUHLY
- SOCIETY GARLIC
- BLACKFOOT DAISY

NOTES:
1. REF. L4.01 FOR PLANTING SCHEDULE.
2. REF. L4.18 FOR PLANTING DETAILS.
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JAMES W. VICK
ARCHITECT 4104TT
FEB 5, 2020

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REV. NO.	DATE	DESCRIPTION	BY

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FIRM REGISTRATION NO. 2614

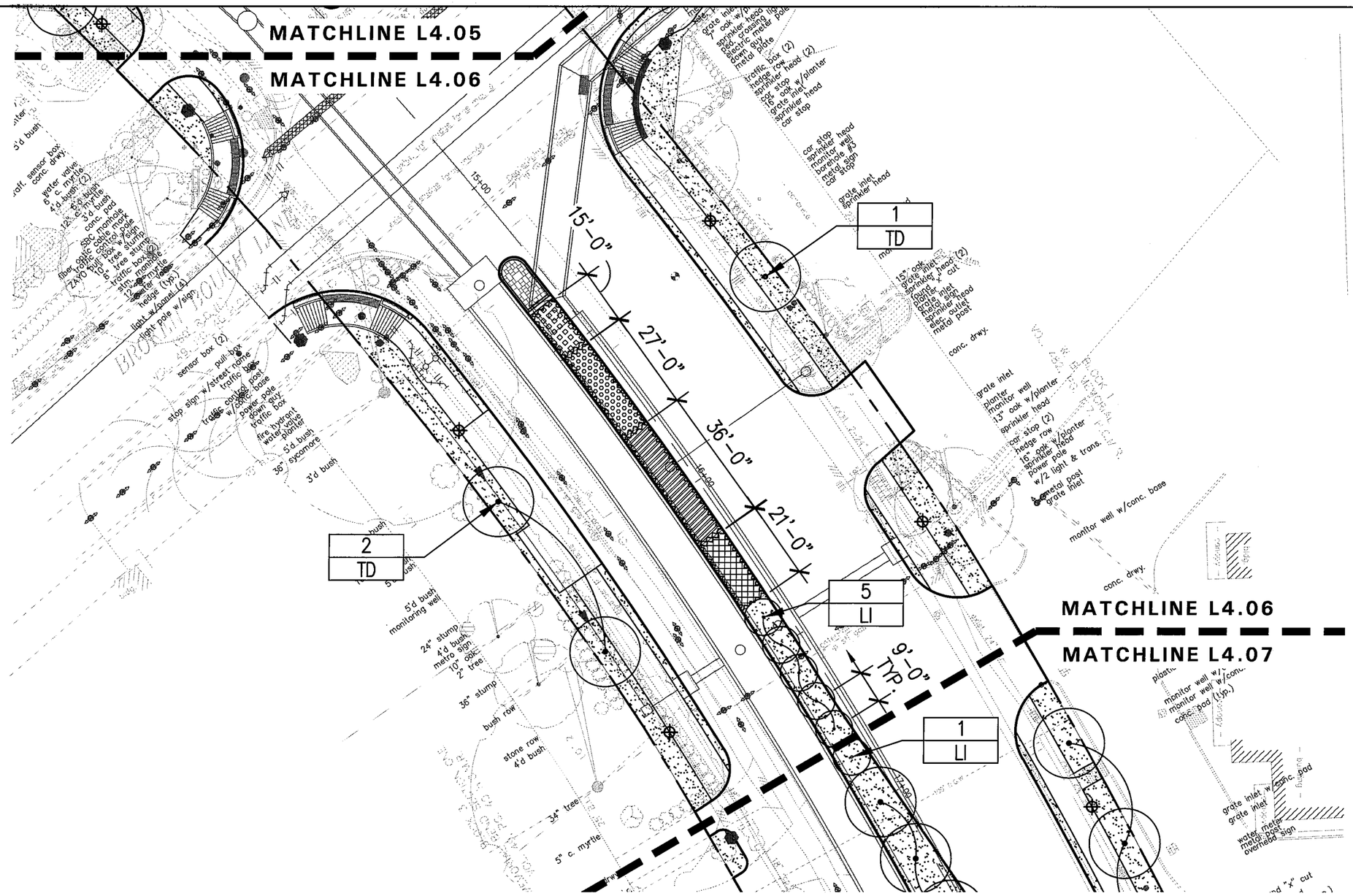
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L4.05

PLANTING PLAN

SHEET 75 OF 109

DGN	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
QUC DGN	6	TEXAS	STP 1802 (783) MM			CS
DWG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
QUC DWG	HOU	HARRIS	0912	72	391	469



PLANTING LEGEND

- PROPOSED TREE
- EXISTING TREE
- BERMUDA
- ANGELONIA
- LOROPETALUM
- GULF COAST MUHLY
- SOCIETY GARLIC
- BLACKFOOT DAISY

NOTES:
1. REF. L4.01 FOR PLANTING SCHEDULE.
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ARCHITECT
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FIRM REGISTRATION NO. 2614

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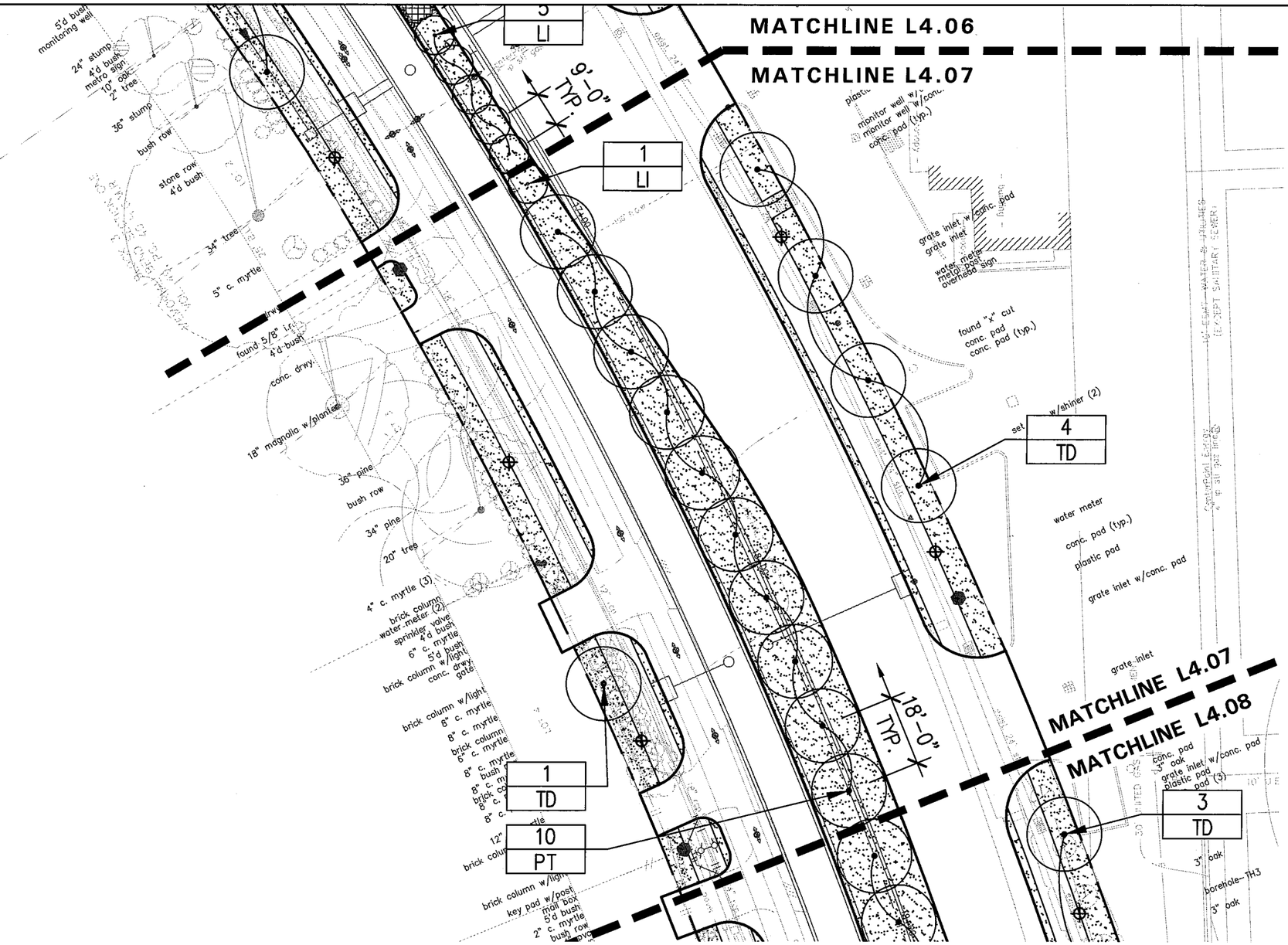
L4.06

PLANTING PLAN

SHEET 76 OF 109

DGN	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN	6	TEXAS	STP 1802 (783) MM			CS
DWG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG	HOU	HARRIS	0912	72	391	470



PLANTING LEGEND

- PROPOSED TREE
- EXISTING TREE
- BERMUDA
- ANGELONIA
- LOROPETALUM
- GULF COAST MUHLY
- SOCIETY GARLIC
- BLACKFOOT DAISY

NOTES:
1. REF. L4.01 FOR PLANTING SCHEDULE.
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ARCHITECT 11047
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L4.07

PLANTING PLAN

SHEET 77 OF 109

DGN	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN	6	TEXAS	STP 1802 (783) MM			CS
DWG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG	HOU	HARRIS	0912	72	391	471

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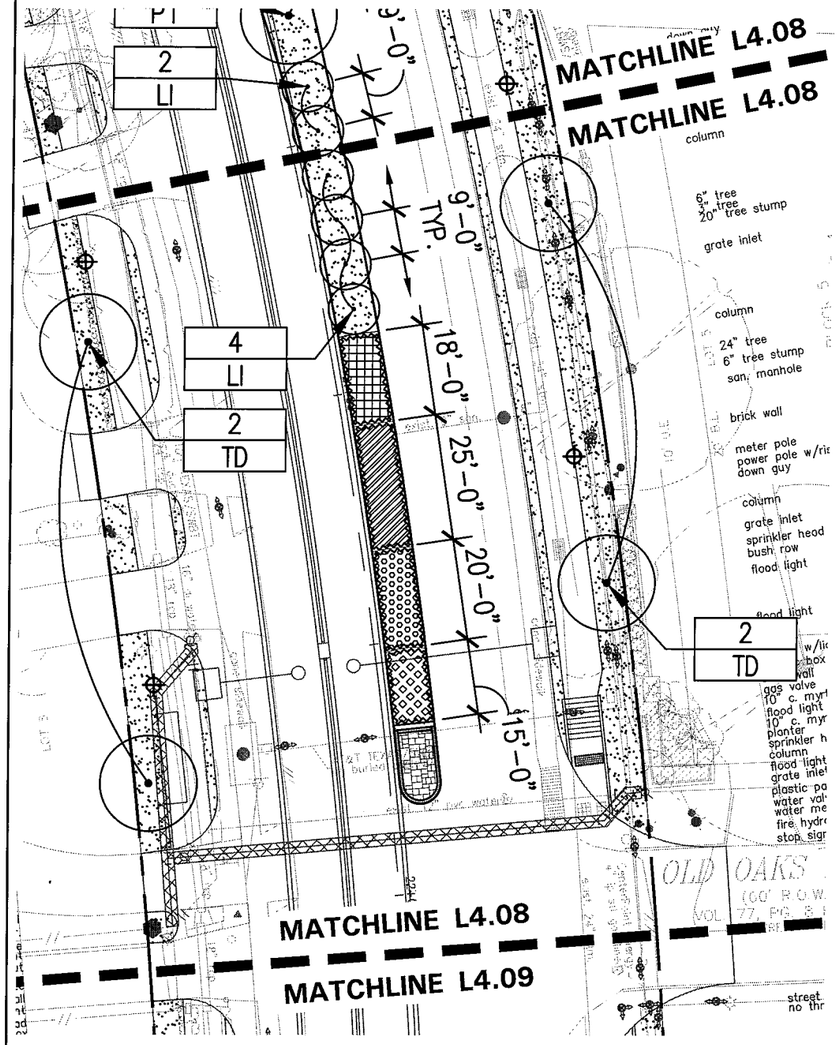

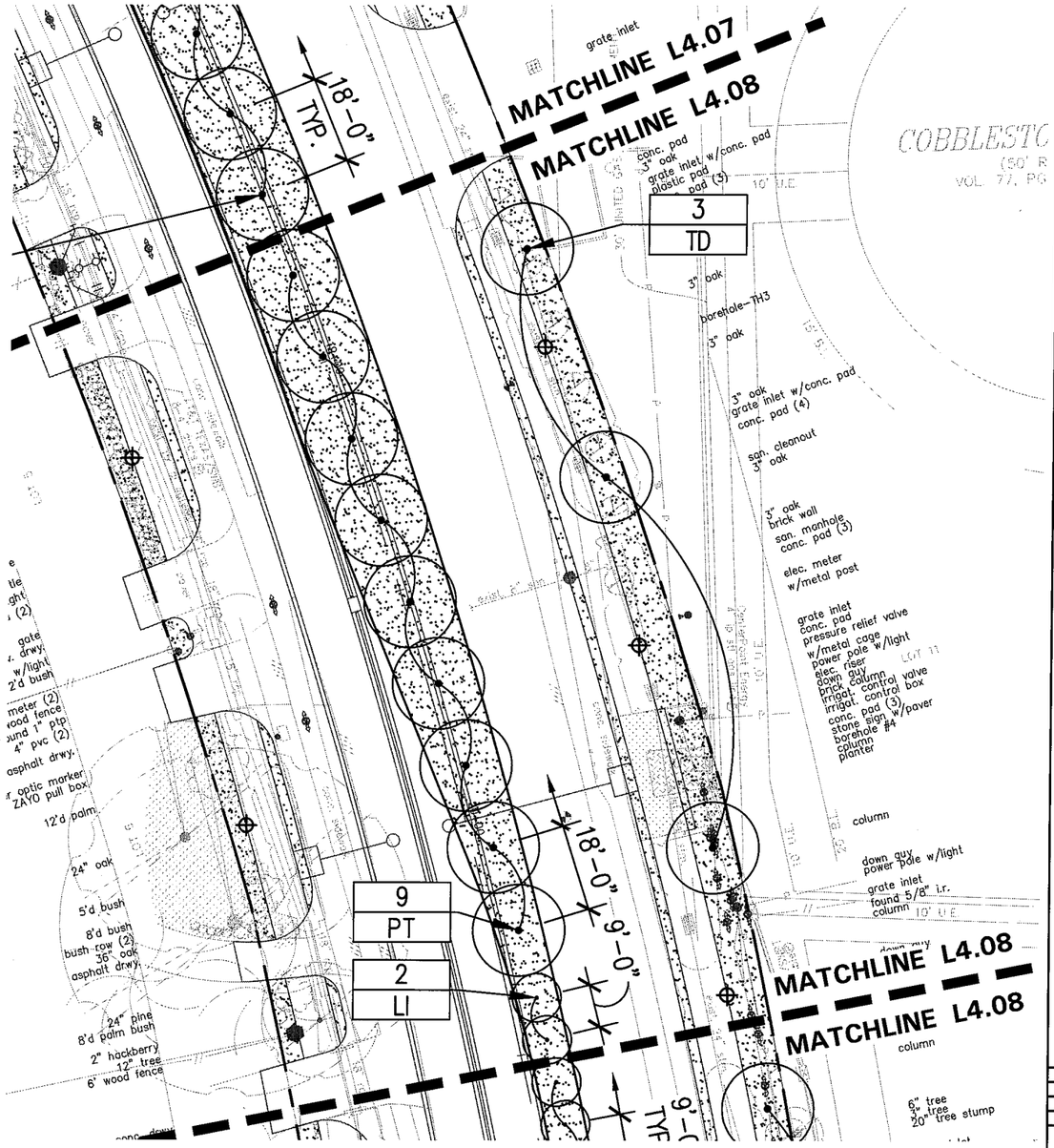

PLANTING LEGEND

- PROPOSED TREE
- EXISTING TREE
- BERMUDA
- ANGELONIA
- LOROPETALUM
- GULF COAST MUHLY
- SOCIETY GARLIC
- BLACKFOOT DAISY

NOTES:
1. REF. L4.01 FOR PLANTING SCHEDULE.
2. REF. L4.18 FOR PLANTING DETAILS.
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SCALE: PLAN 1":30'

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ARCHITECT # 10477
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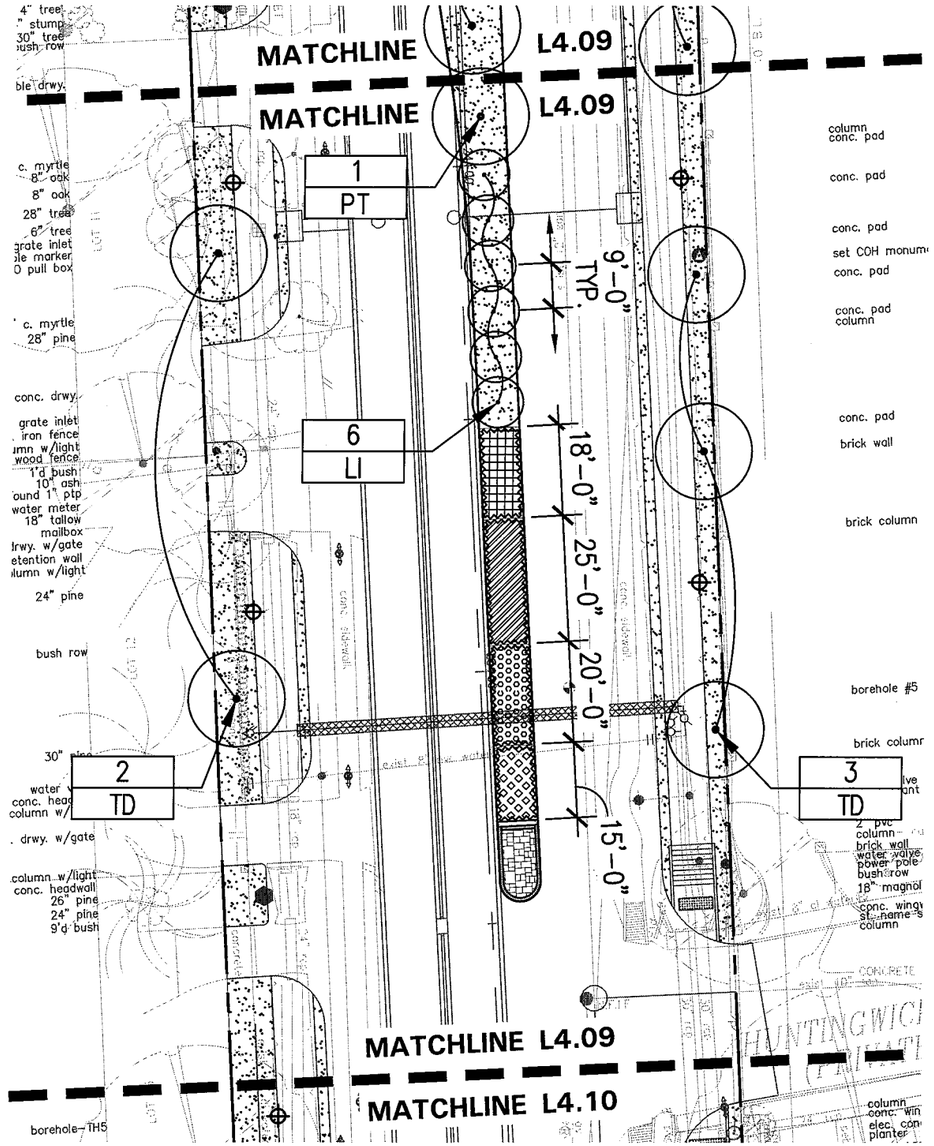
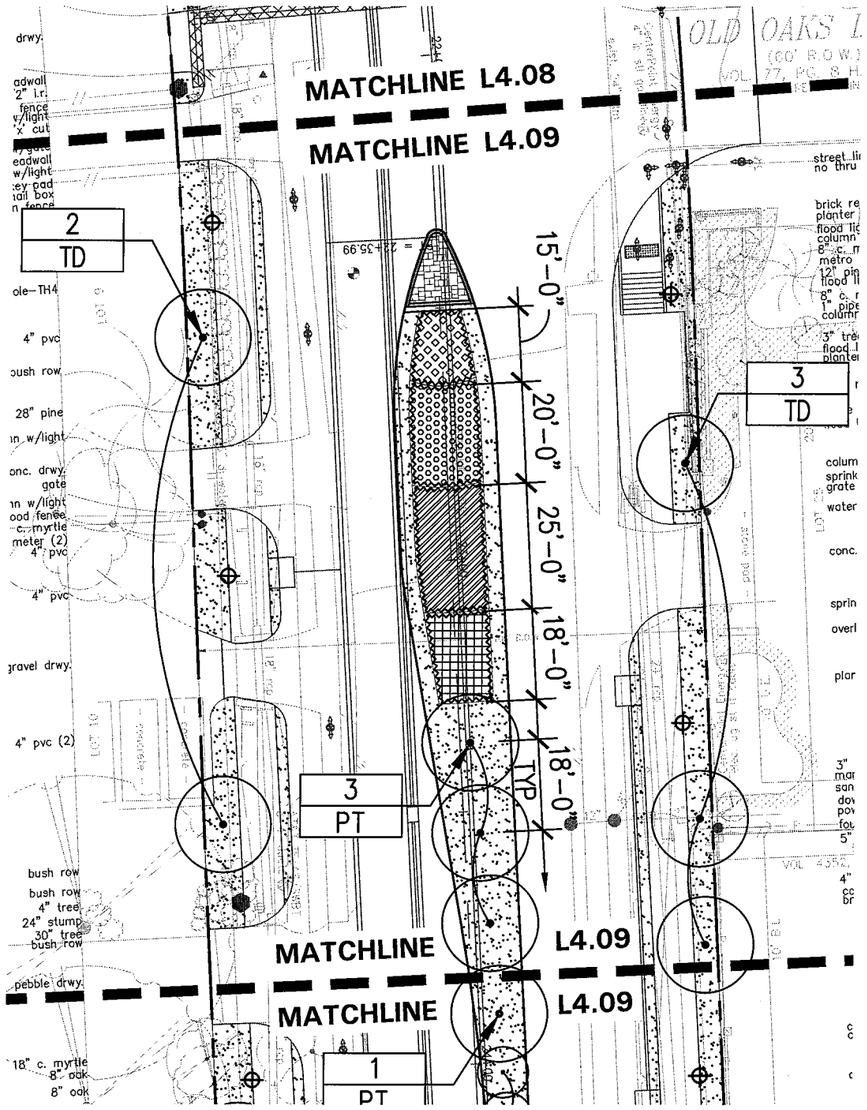
L4.08

PLANTING PLAN

SHEET 78 OF 109

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: DSN:	6	TEXAS	STP 1802 (783) MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CK: DWG:	HOU	HARRIS	0912	72	391	472





PLANTING LEGEND

- PROPOSED TREE
- EXISTING TREE
- BERMUDA
- ANGELONIA
- LOROPETALUM
- GULF COAST MUHLY
- SOCIETY GARLIC
- BLACKFOOT DAISY

NOTES:
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ARCHITECT #10477
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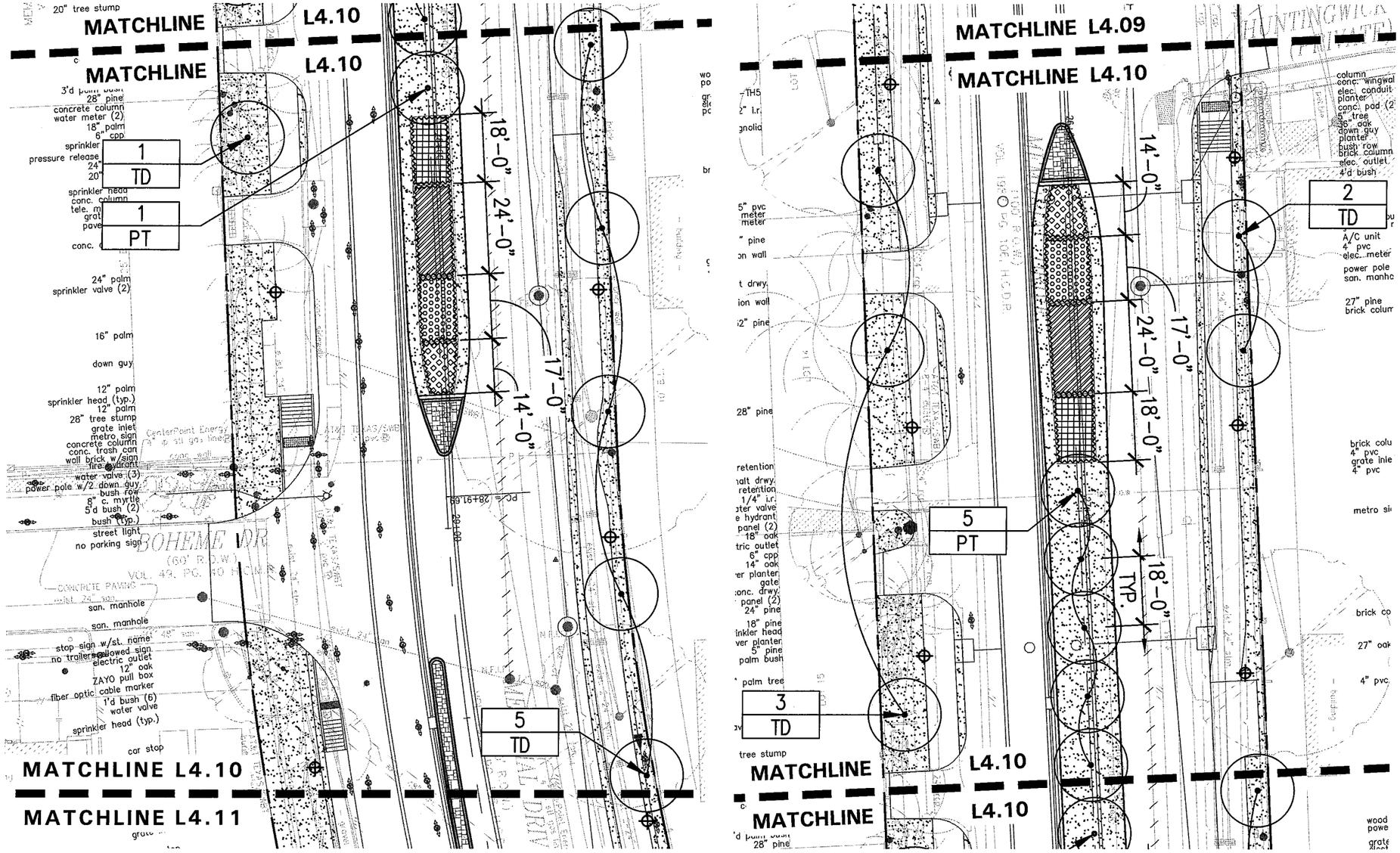
L4.09

PLANTING PLAN

SHEET 79 OF 109

DGN	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DRN	6	TEXAS	STP 1802 (783) MM			CS
DWG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG	HOU	HARRIS	0912	72	391	473



PLANTING LEGEND

- PROPOSED TREE
- EXISTING TREE
- BERMUDA
- ANGELONIA
- LOROPETALUM
- GULF COAST MUHLY
- SOCIETY GARLIC
- BLACKFOOT DAISY

NOTES:
1. REF. L4.01 FOR PLANTING SCHEDULE.
2. REF. L4.18 FOR PLANTING DETAILS.
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ARCHITECT #10477
TEXAS BOARD OF ARCHITECTURAL EXAMINERS
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L4.10

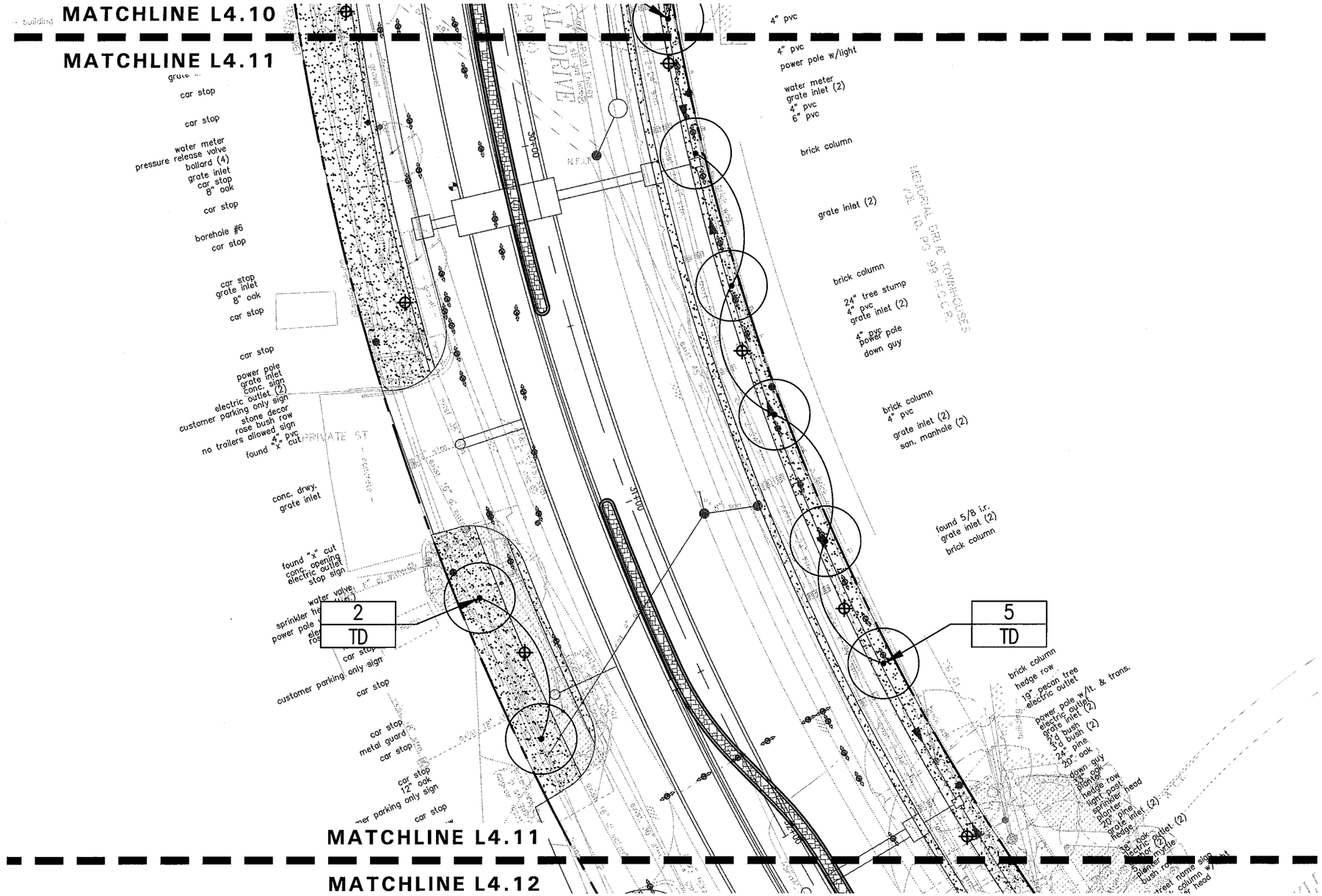
PLANTING PLAN

SHEET 80 OF 109

DGN	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN	6	TEXAS	STP 1802 (783) MM			CS
DWG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG	HOU	HARRIS	0912	72	391	474

MATCHLINE L4.10

MATCHLINE L4.11



MATCHLINE L4.11

MATCHLINE L4.12

PLANTING LEGEND

- PROPOSED TREE
- EXISTING TREE
- BERMUDA
- ANGELONIA
- LOROPETALUM
- GULF COAST MUHLY
- SOCIETY GARLIC
- BLACKFOOT DAISY

NOTES:
1. REF. L4.01 FOR PLANTING SCHEDULE.
2. REF. L4.18 FOR PLANTING DETAILS.
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TEXAS BOARD OF ARCHITECTURAL EXAMINERS
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ARCHITECT #10011
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L4.11

PLANTING PLAN

SHEET 81 OF 109

DGN	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN	6	TEXAS	STP 1802 (783) MM			CS
DWG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG	HOU	HARRIS	0912	72	391	475

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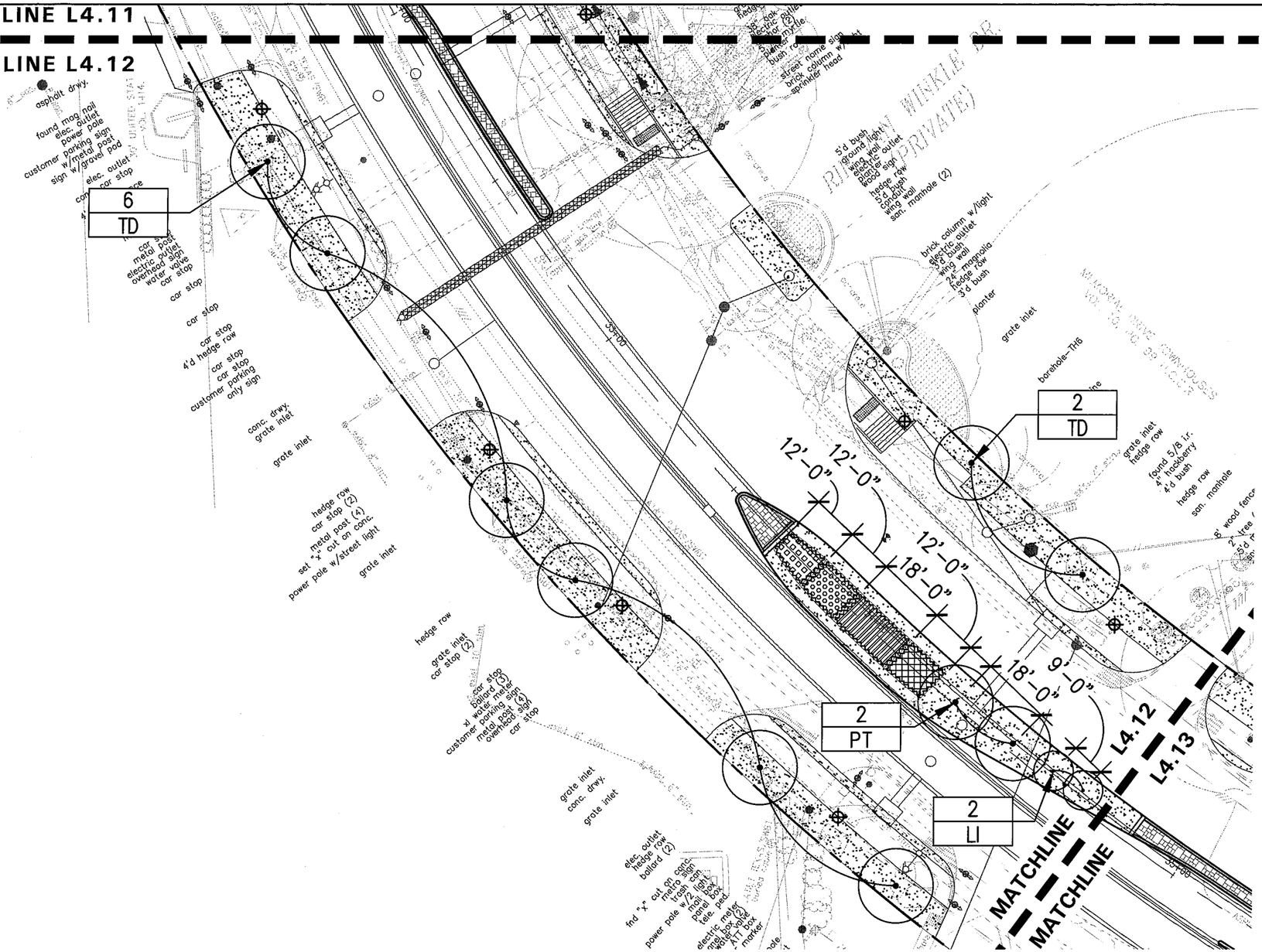
MATCHLINE L4.11

MATCHLINE L4.12



PLANTING LEGEND

- PROPOSED TREE
- EXISTING TREE
- BERMUDA
- ANGELONIA
- LOROPETALUM
- GULF COAST MUHLY
- SOCIETY GARLIC
- BLACKFOOT DAISY

NOTES:
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SCALE: PLAN 1":30'

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ARCHITECT #10477
FEB 5 2020

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REV. NO.	DATE	DESCRIPTION	BY

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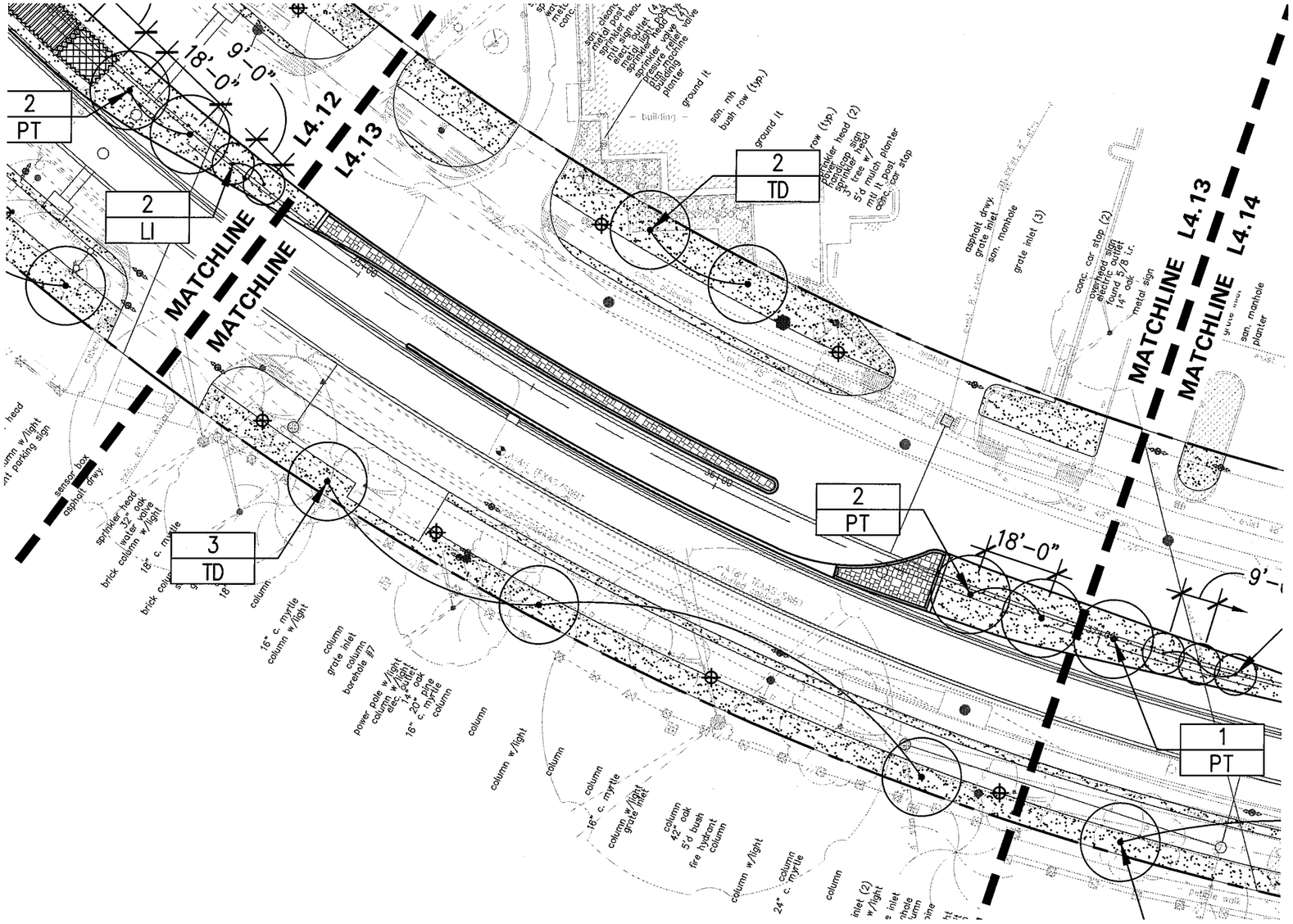
L4.12

PLANTING PLAN

SHEET 82 OF 109

DGN	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN	6	TEXAS	STP 1802 (783) MM			CS
DWG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG	HOU	HARRIS	0912	72	391	476



PLANTING LEGEND

- PROPOSED TREE
- EXISTING TREE
- BERMUDA
- ANGELONIA
- LOROPETALUM
- GULF COAST MUHLY
- SOCIETY GARLIC
- BLACKFOOT DAISY

NOTES:
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(IN FEET)
SCALE: PLAN 1":30'

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JAMES W. VICK
ARCHITECT # 10477
FEB 5 2020

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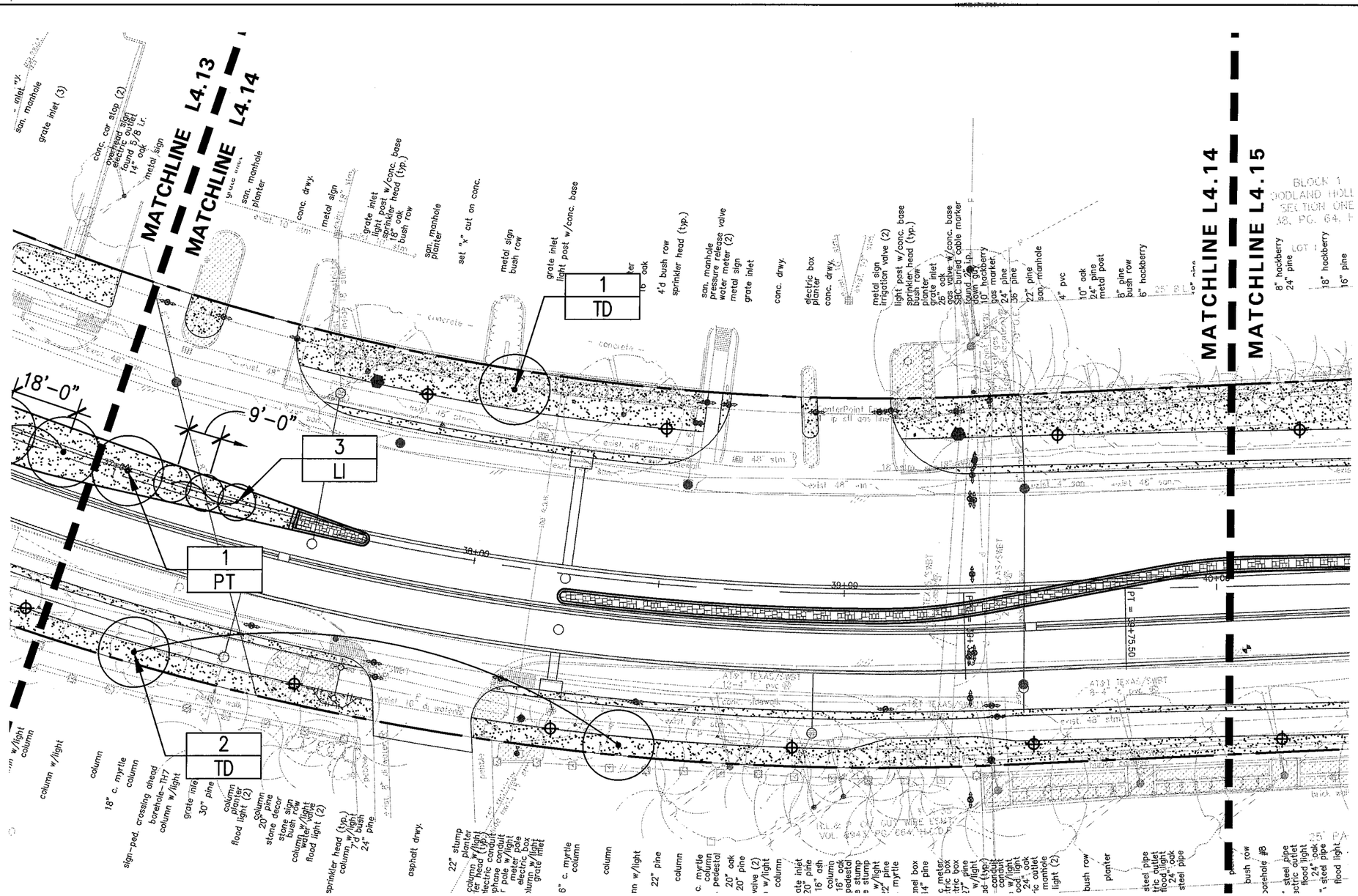
L4.13

PLANTING PLAN

SHEET 83 OF 109

DGN	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN	6	TEXAS	STP 1802 (783) MM			CS
DWG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG	HOU	HARRIS	0912	72	391	477



PLANTING LEGEND

- PROPOSED TREE
- EXISTING TREE
- BERMUDA
- ANGELONIA
- LOROPETALUM
- GULF COAST MUHLY
- SOCIETY GARLIC
- BLACKFOOT DAISY

NOTES:
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SCALE: PLAN 1": 30'

TEXAS BOARD OF ARCHITECTURAL EXAMINERS
JAMES W. VICK
ARCHITECT #10477
FEB 5 2020

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FIRM REGISTRATION NO. 2614

Texas Department of Transportation

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L4.14

PLANTING PLAN

SHEET 84 OF 109

DGN	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK: DW:	6	TEXAS	STP 1802 (783) MM			CS
DWG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CK: DW:	HOU	HARRIS	0912	72	391	478

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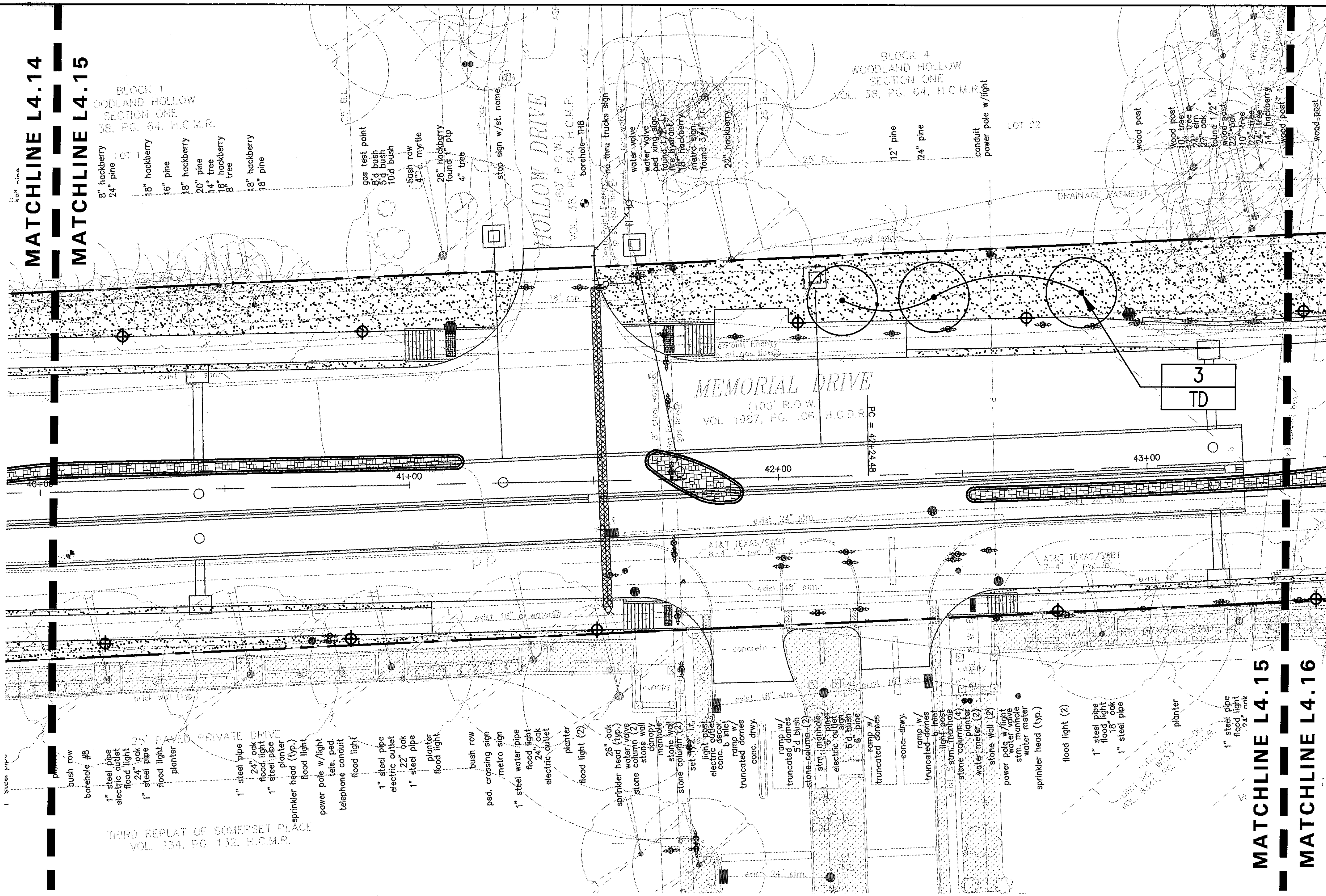

PLANTING LEGEND

- PROPOSED TREE
- EXISTING TREE
- BERMUDA
- ANGELONIA
- LOROPETALUM
- GULF COAST MUHLY
- SOCIETY GARLIC
- BLACKFOOT DAISY

NOTES:
1. REF. L4.01 FOR PLANTING SCHEDULE.
2. REF. L4.18 FOR PLANTING DETAILS.
3. TREE LAYOUT TO BE APPROVED IN FIELD BY LANDSCAPE ARCHITECT.
4. CONTRACTOR SHALL MARK ALL PLANT LOCATIONS AND SPACING FOR APPROVAL BY TxDOT LANDSCAPE ARCHITECT AND OWNER'S REPRESENTATIVE PRIOR TO WORK.

Landscape Architect

swa

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United States
www.swagroup.com
+1.713.868.1676 o

67862

0 30 60
(IN FEET)
SCALE: PLAN 1":30'

TEXAS BOARD OF ARCHITECTURAL EXAMINERS
JAMES W. VICK
ARCHITECT #10477
FEB 5, 2020

100% CONSTRUCTION DOCUMENTS

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation

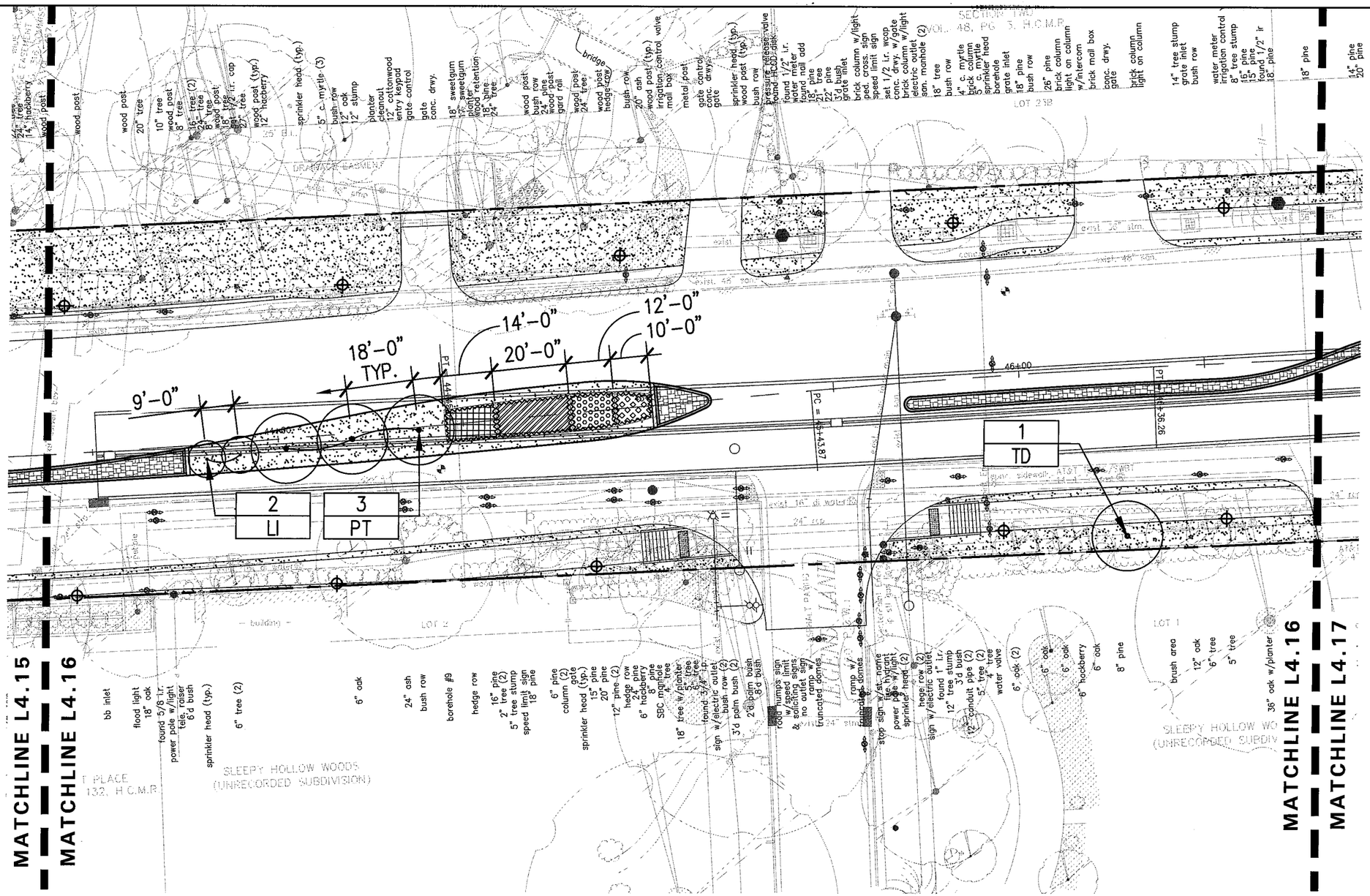
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L4.15

PLANTING PLAN

SHEET 85 OF 109

DGN	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN	6	TEXAS	STP 1802 (783) MM			CS
DWG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG	HOU	HARRIS	0912	72	391	479



PLANTING LEGEND

- PROPOSED TREE
- EXISTING TREE
- BERMUDA
- ANGELONIA
- LOROPETALUM
- GULF COAST MUHLY
- SOCIETY GARLIC
- BLACKFOOT DAISY

NOTES:
1. REF. L4.01 FOR PLANTING SCHEDULE.
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67862

0 30 60
(IN FEET)
SCALE: PLAN 1":30'

TEXAS BOARD OF ARCHITECTURAL EXAMINERS
JAMES W. VICK
ARCHITECT #17047
FEB 5, 2020

100% CONSTRUCTION DOCUMENTS

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation

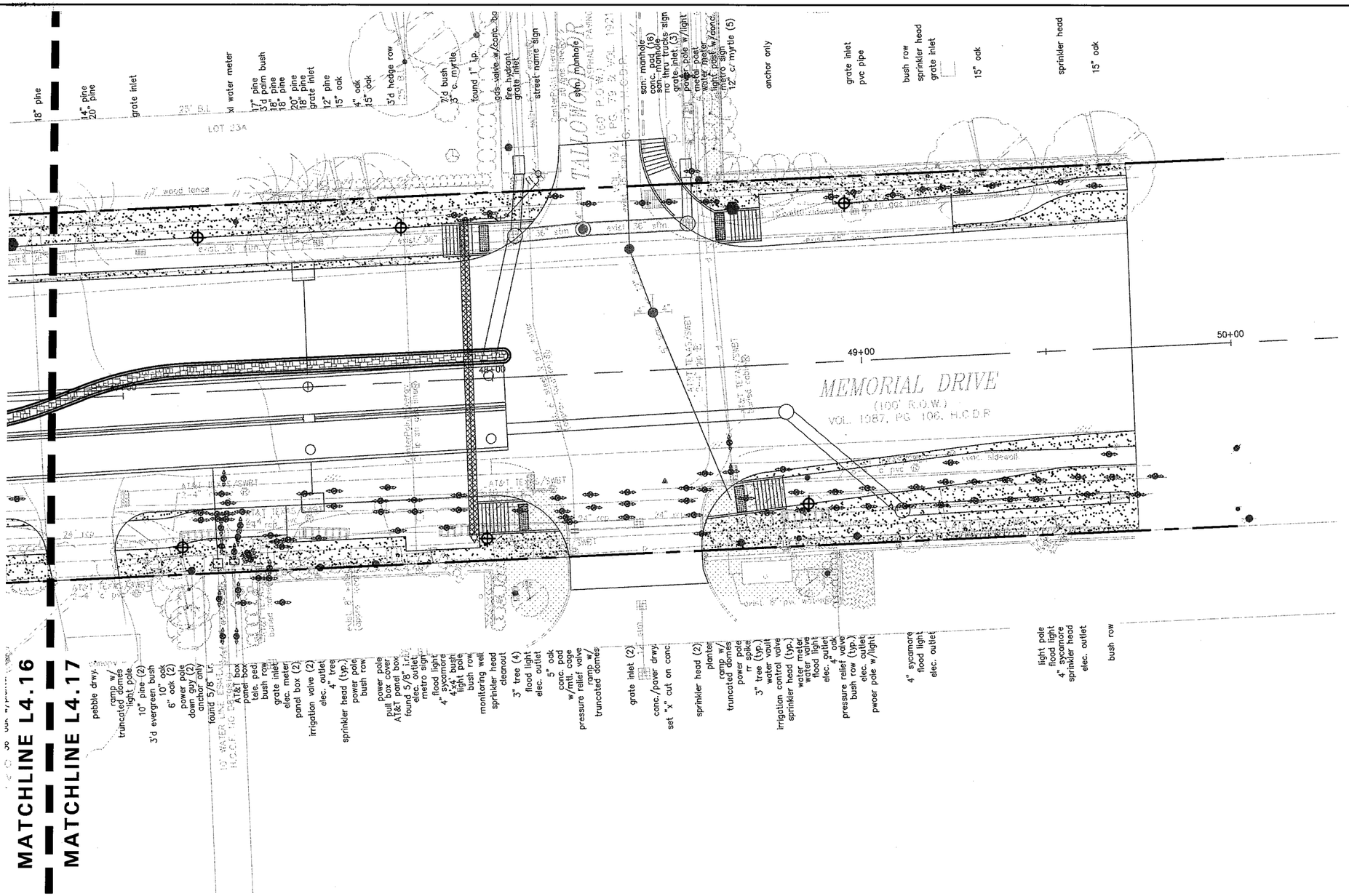
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L4.16

PLANTING PLAN

SHEET 86 OF 109

DGN	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN	6	TEXAS	STP 1802 (783) MM			CS
DWG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG	HOU	HARRIS	0912	72	391	480



PLANTING LEGEND

- PROPOSED TREE
- EXISTING TREE
- BERMUDA
- ANGELONIA
- LOROPETALUM
- GULF COAST MUHLY
- SOCIETY GARLIC
- BLACKFOOT DAISY

NOTES:
1. REF. L4.01 FOR PLANTING SCHEDULE.
2. REF. L4.18 FOR PLANTING DETAILS.
3. TREE LAYOUT TO BE APPROVED IN FIELD BY LANDSCAPE ARCHITECT.
4. CONTRACTOR SHALL MARK ALL PLANT LOCATIONS AND SPACING FOR APPROVAL BY TxDOT LANDSCAPE ARCHITECT AND OWNER'S REPRESENTATIVE PRIOR TO WORK.

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67862

0 30 60
(IN FEET)
SCALE: PLAN 1":30'

TEXAS BOARD OF ARCHTECTURAL EXAMINERS
JAMES W. VICK
ARCHITECT #10477
FEB 5 2020

100% CONSTRUCTION DOCUMENTS

REV. NO.	DATE	DESCRIPTION	BY

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

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L4.17

PLANTING PLAN

SHEET 87 OF 109

DGN	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK DGN	6	TEXAS	STP 1802 (783) MM			CS
DWG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CK DWG	HOU	HARRIS	0912	72	391	481

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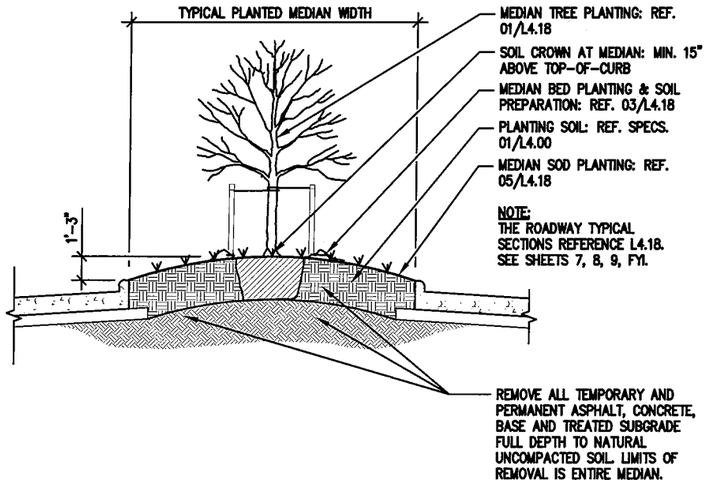
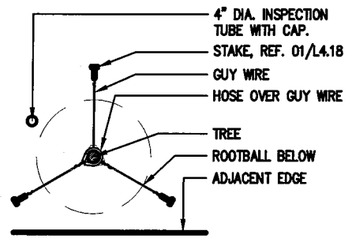
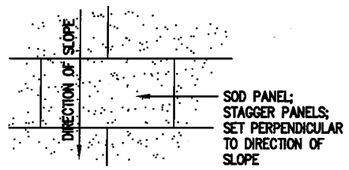


07 SECTION – TYPICAL PLANTING SOIL AT MEDIAN
N.T.S.

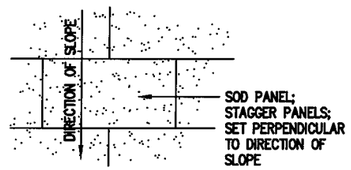


3 STAKES

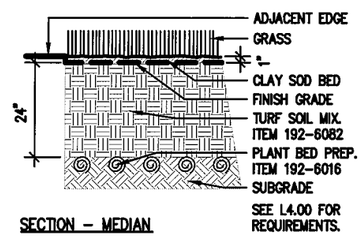
06 TYPICAL TREE STAKING
N.T.S.



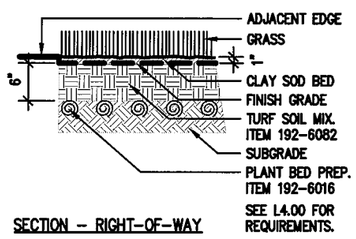
PLAN – MEDIAN



PLAN – RIGHT-OF-WAY



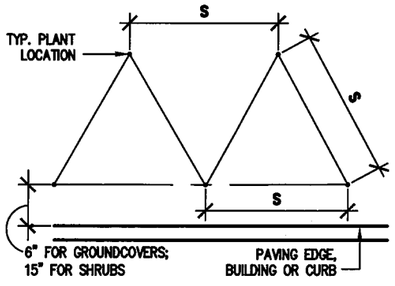
SECTION – MEDIAN



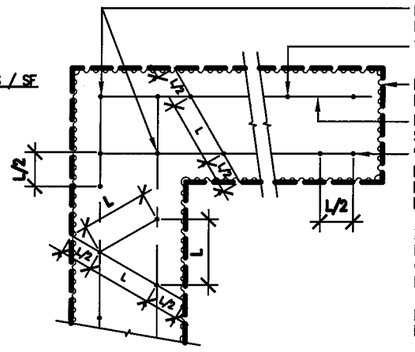
SECTION – RIGHT-OF-WAY

05 TYPICAL SOD PLANTING
N.T.S.

NOTE: DIMENSION 'S' DENOTES PLANT SPACING AS CALLED OUT ON PLANT LIST.



SPACING	PLANTS / SF
6" O.C.	4.61
8" O.C.	2.60
9" O.C.	1.78
10" O.C.	1.66
12" O.C.	1.15
15" O.C.	.738
18" O.C.	.50
24" O.C.	.28
30" O.C.	.18
36" O.C.	.12
48" O.C.	.07
60" O.C.	.04
72" O.C.	.03

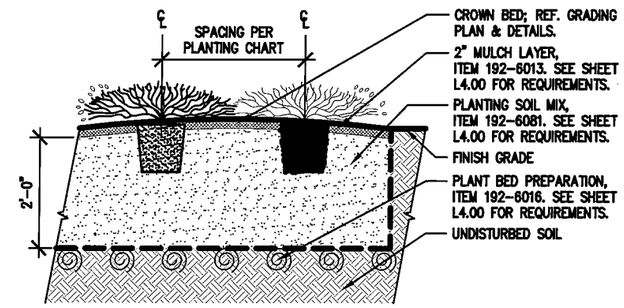


PIVOT SHRUBS AT INTERSECTION OF ROW LINES
TYP. SHRUB PLANTING
LIMIT OF SHRUBS OR HEADER-WHERE OCCURS
ROW LINE– ALIGN ALL SHRUBS IN ROW LINES
"INFILL SHRUB" AT INTERSECTION OF ROW LINES OR AT ENDS OF SHRUB ROW

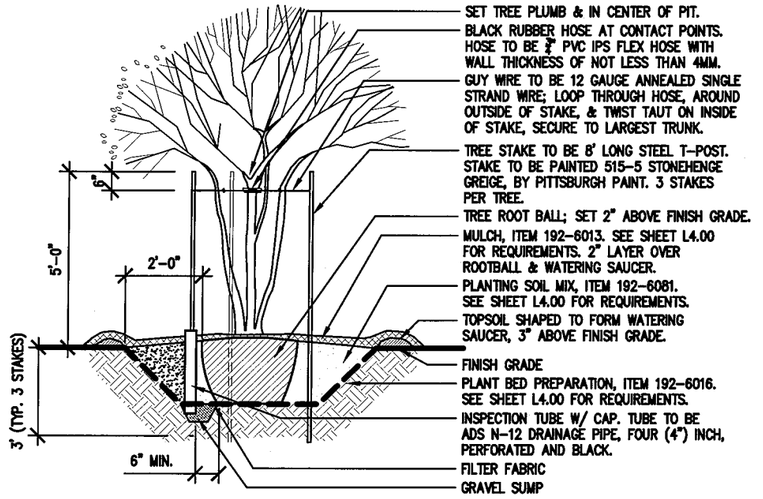
NOTE:
FOR SINGLE ROW OF SHRUBS, CENTER SHRUB IN ROW LINE BETWEEN LIMITS OF SHRUBS

L= SPACING AS CALLED FOR IN PLANTING PLAN

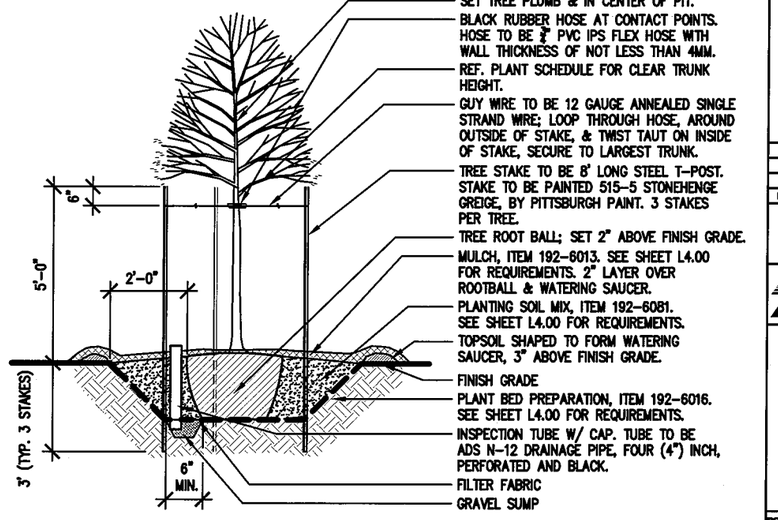
04 TYPICAL PLANT SPACING
N.T.S.



03 TYPICAL BED PLANTING
N.T.S.



02 TYPICAL MULTI-TRUNK TREE PLANTING
N.T.S.



01 TYPICAL TREE PLANTING
N.T.S.

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PUBLICATION
67862

TEXAS BOARD OF ARCHITECTURAL EXAMINERS
JAMES W. VICK
ARCHITECT
10477
FEB 5, 2020

100% CONSTRUCTION DOCUMENTS

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L4.18

PLANTING DETAILS

SHEET 88 OF 109

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN:	6	TEXAS	STP 1802 (783) MM			CS
DWN:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWN:	HOU	HARRIS	0912	72	391	482

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 (See PLANTING AND ESTABLISHMENT SHEET 2 OF 6 VEGETATIVE WATERING SCHEDULE FOR PALMS ONLY)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
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 4 AND 5 of 8, each application will be paid for separately)				✓			✓					✓
1006-6005 SOIL AMENDMENT (TYPE V) (PLANTING AND ESTABLISHMENT SHEETS 4 AND 5 of 8, 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 SHEET 1 OF 3, GUARANTEE AND ACCEPTANCE)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

* Remove any materials damaged by actions described in Item 7.17.
Removal and disposal of damaged materials is incidental to Item 192.
Contractor 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 and specifications shown will be at contractors expense.

PUBLIC WORKS ACCEPTED 67862

TEXAS BOARD OF ARCHITECTURAL EXAMINERS JAMES W. VICK ARCHITECT 10477 FEB 5 2020

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L4.19

LANDSCAPE PLANTING MAINTENANCE REQUIREMENTS

DGN	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN	6	TEXAS	STP 1802 (783) MM			CS
DWG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG	HOU	HARRIS	0912	72	391	483

STD K-4

CITY OF HOUSTON
DEPARTMENT OF PARKS & RECREATION

TREE MITIGATION LIST

EXISTING TREE NO.	CALIPER INCHES	SPECIES	TREE TYPE	CONDITION	IN R.O.W.	IN SETBACK	REMOVE	PAY	TREE BANK	MIT. REQ.
1	15"	Laurel Oak					X			15
2	16"	Laurel Oak					X			16
5	16"	Live Oak					X			16
7	21"	Cherrybark Oak					X			21
18	27"	Pine					X			27
19	18"	Pine					X			18
20	19"	Pine					X			19
22	34"	Water Oak					X			34
25	15"	Live Oak					X			15
27	28"	Live Oak					X			28
39	21"	American Elm					X			0
40	11"	Arborvitae					X			0
48	9"	Arborvitae					X			0
49	9"	Arborvitae					X			0
50	11"	Lacebark Elm					X			11
52	5"	Oleander					X			0
57	2"	Pine					X			2
58	2"	Pine					X			2
59	2"	Pine					X			2
68	9"	Mulberry					X			0
71	13"	Mulberry					X			0
72	11"	Tallow					X			0
73	7"	Cherrylaurel					X			0
90	5"	Privet					X			0
98	Hedge	Jasmine					X			0
102	14"	Live Oak					X			14
109	4"	Ligustrum					X			0
110	10"	Crepe Myrtle					X			0
111	10"	Crepe Myrtle					X			0
112	10"	Crepe Myrtle					X			0
113	10"	Crepe Myrtle					X			0
114	10"	Crepe Myrtle					X			0
115	10"	Crepe Myrtle					X			0
116	10"	Crepe Myrtle					X			0
117	10"	Crepe Myrtle					X			0
118	10"	Crepe Myrtle					X			0
119	8"	Crepe Myrtle					X			0
120	8"	Crepe Myrtle					X			0
121	8"	Crepe Myrtle					X			0
122	8"	Crepe Myrtle					X			0
123	8"	Crepe Myrtle					X			0
124	8"	Crepe Myrtle					X			0
125	8"	Crepe Myrtle					X			0
126	3"	Ligustrum					X			0
129	20"	Pine					X			20
130	5"	Sugarberry					X			0
131	3"	Redbud					X			0
145	3"	Crepe Myrtle					X			0
146	3"	Crepe Myrtle					X			0
147	3"	Crepe Myrtle					X			0
148	3"	Crepe Myrtle					X			0
149	3"	Crepe Myrtle					X			0
150	3"	Crepe Myrtle					X			0
151	3"	Crepe Myrtle					X			0
153	4"	Live Oak					X			4
154	3"	Redbud					X			0
155	5"	Redbud					X			0
162	10"	Crepe Myrtle					X			0
163	10"	Crepe Myrtle					X			0
167	24"	Pine					X			24
172	20"	Pine					X			20
173	15"	Pine					X			15
176	25"	Pine					X			25
177	25'	Palm					X			0
178	5'	Palm					X			0
179	18'	Palm					X			0
180	25'	Palm					X			0
181	15'	Palm					X			0
186	25"	American Elm					X			0
187	17"	Tallow					X			0
189	13"	Pecan					X			0
192	19"	Pine					X			19
197	11"	Live Oak					X			11
198	9"	Live Oak					X			9
199	10"	Live Oak					X			10
200	13"	Live Oak					X			13
201	12"	Live Oak					X			12
202	5"	Ligustrum					X			0
203	5"	Ligustrum					X			0
204	5"	Ligustrum					X			0
205	5"	Ligustrum					X			0
206	5"	Ligustrum					X			0

NOTE:

TREE MITIGATION INFORMATION FOR CONTRACTOR REFERENCE.

CITY OF HOUSTON
DEPARTMENT OF PARKS & RECREATION

TREE MITIGATION LIST

EXISTING TREE NO.	CALIPER INCHES	SPECIES	TREE TYPE	CONDITION	IN R.O.W.	IN SETBACK	REMOVE	PAY	TREE BANK	MIT. REQ.
207	5"	Ligustrum					X			0
208	5"	Ligustrum					X			0
209	5"	Ligustrum					X			0
210	5"	Ligustrum					X			0
211	5"	Ligustrum					X			0
212	5"	Ligustrum					X			0
213	5"	Ligustrum					X			0
214	5"	Ligustrum					X			0
215	5"	Ligustrum					X			0
216	5"	Ligustrum					X			0
217	5"	Ligustrum					X			0
218	5"	Ligustrum					X			0
219	5"	Ligustrum					X			0
220	5"	Ligustrum					X			0
221	5"	Ligustrum					X			0
221A	4"	Ligustrum					X			0
222	4"	Ligustrum					X			0
223	4"	Ligustrum					X			0
224	4"	Ligustrum					X			0
225	4"	Ligustrum					X			0
226	10"	Crepe Myrtle					X			0
228	10"	Crepe Myrtle					X			0
229	7"	Crepe Myrtle					X			0
234	9"	Crepe Myrtle					X			0
235	9"	Crepe Myrtle					X			0
237	14"	Pine					X			0
238	33"	Water Oak					X			33
241	17"	Magnolia					X			17
242	21"	Pine					X			21
245	3"	nder Silhouette Sweetgum					X			3
247	17"	Live Oak					X			17
248	16"	Live Oak					X			16
249	18"	Pine					X			0
257	9"	Redbud					X			0
261	11"	Crepe Myrtle					X			0
265	11"	Crepe Myrtle					X			0
268	9"	Crepe Myrtle					X			0
270	10"	Crepe Myrtle					X			0
287	14"	Sugarberry					X			0
308	10"	Yaupon					X			0
309	6"	Shumard Oak					X			6
310	19"	Green Ash					X			19
311	11"	Pine					X			11
312	12"	Pine					X			12
313	15"	Green Ash					X			15
314	10"	Pine					X			10
315	16"	Pine					X			16
316	10"	Pine					X			10
317	24"	Pine					X			24
318	7"	Pine					X			7
319	5"	Water Oak					X			0
334	3"	Bottlebrush					X			0
335	3"	Bottlebrush					X			0
336	3"	Bottlebrush					X			0
337	3"	Bottlebrush					X			0
338	3"	Bottlebrush					X			0
339	3"	Bottlebrush					X			0
340	3"	Bottlebrush					X			0
341	3"	Bottlebrush					X			0
343	14"	Pine					X			14
345	17"	Pine					X			17
346	15"	Southern Red Oak					X			0
347	13"	Pine					X			13
349	13"	Pine					X			13
350	11"	Pine					X			11
351	14"	Pine					X			14
352	17"	Pine					X			17
353	22"	Pine					X			22
354	14"	Pine					X			14
356	11"	Pine					X			11
358	12"	Pine					X			12
359	11"	Pine					X			11
360	11"	Post Oak					X			11
361	5"	Post Oak					X			5
362	15"	Post Oak					X			15
				-			-	-	$ -	859

1. TOTAL INCHES OF REQUIRED MITIGATION	859
2. TOTAL INCHES OF REQUIRED NEW STREET TREES AND PARKING LOT TREES (1.5" CAL)	240
3. TOTAL REQUIRED INCHES (Line 1 + Line 2)	1,099
4. TOTAL INCHES PRESERVED IN R.O.W. (Section 33-123 (a)(4))	-
5. TOTAL INCHES PRESERVED ON-SITE (Section 33-123 (a)(3))	-
6. TOTAL NEW INCHES OF STREET TREES AND PARKING LOT TREES.	704
7. TOTAL NEW INCHES OF MITIGATION TREES	-
8. NET CALIPER INCHES FOR STREET TREES AND PARKING LOT TREES (Line 2 - Line 4 - Line 6)	-
9. NET CALIPER INCHES FOR MITIGATION (Line 1 - Line 5 - Line 6)	-
10. STREET TREE DEPOSIT TO PLANNING DEPT. (0 STREET TREES)	$ -
11. MITIGATION DEPOSIT TO PARKS DEPT. (0 CALIPER INCHES)	$ -

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TEXAS BOARD OF ARCHITECTURAL EXAMINERS
JAMES W. VICK
ARCHITECT
11704
2020

100% CONSTRUCTION DOCUMENTS

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation

MEMORIAL DRIVE RECONSTRUCTION
AND ACCESS MANAGEMENT

L5.00

TREE MITIGATION CALCULATIONS

SHEET 90 OF 109

DGN	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN	6	TEXAS	STP 1802 (783) MM			CS
DWG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG	HOU	HARRIS	0912	72	391	484

P:\RHT\RHTS503 WO-13 CIP T1731B Memorial\4 DrawingsGraphics\AutoCAD\Sheets\TREE MITIGATION\L5.00 TREE MITIGATION CALCULATIONS & DETAILS.dwg | ROLIVER |ANSI FULL BLEED B (11.00 X 17.00 INCHES) | 2/27/2020

City of Houston

REQUEST FOR VARIANCE
From City of Houston Ordinance and Design Manual

Name of Requestor: James Vick, AIA Phone: 713-419-7979
Email: jvick@swagroup.com
Company: SWA (Landscape Architects) on behalf of the Memorial City Redevelopment Authority, TIRZ #17
Date: 26 June 2019

Project/Corridor Name:

Memorial Drive - Beltway 8 to Tallowood Road (CIP Project: T1731B)

Ordinance and Design Criteria for which variance is requested:

Chapter No.: 33 Page No(s).: Section Title: Sec. 33 - 121, 126, and 160 Figure:

Topic: Constraints in meeting tree planting and tree replacement requirements for street reconstruction projects.

Briefly Describe Current Criteria: See below re Sec. 33 - 121, 126 (Street Trees Required); Sec. - 160 (Tree Replacement).

Proposed Variance from Ordinance and Design Criteria (specify details and locations):

Topic: Tree Planting in the public ROW: Street Tree Required; Tree Replacement.

Describe Proposed Criteria: Tree planting will be performed as and where constraints do not exist to prevent tree planting.

Attach supporting documents such as reports, construction drawings, calculations, maps and/or photos prepared by a Professional Engineer.

- **Reason for Request (specify details and locations):**

Statement of why the criteria should be varied or is not applicable:

In accordance with Ordinance Sec. 33-121, subparagraphs (a) (4) and (b) (2), and Sec. 33-126 (a), the requirements for street trees and tree replacement applies to this Memorial Drive project. The ordinance language states that planting of street trees is required for "the length of street pavement, if the building site is a city-funded construction or reconstruction project that includes the entire width of pavement of a public street and is at least 30 feet in length". Furthermore, that street trees required shall be based on a formula of T = (X / 30), where T is the total trees required, X is the total length of the street measured on both sides, and 30 is the standard tree spacing (with trees having a minimum size of 1-1/2 inch caliper). Additionally, Section 33 – 160 (a) (1) Tree Replacement, stipulates that trees located in the ROW that are removed shall be replaced one caliper inch for one caliper inch.

Memorial Drive is being reconstructed as a new curb and gutter section with center medians for controlled left-turns, which improves safety and mobility over the current street section consisting of roadside ditches and undivided travel lanes. The existing ROW is constrained and no additional ROW is being acquired for the project. The area behind the proposed curb will generally be 10'. The project proposes to construct an 8' sidewalk on both sides of the new street behind the curb. The planting of street trees in the quantities required under the City's ordinance (sections referenced above) is not possible due to insufficient space within the ROW. Additionally, the proposed street section, by expanding the pavement, requires the removal of numerous, existing trees. Planting space for replacement trees is also insufficient, based on the proposed street improvements, constrained ROW width and proximity to / conflicts with existing trees on private property abutting the ROW.

SWA (Landscape Architects) has worked with LAN (the Engineer of Record) to explore different alternatives to comply with the City of Houston's requirements for street trees / tree replacement under its

Rev. 1, Date: 1/9/13

NOTE:

TREE MITIGATION INFORMATION FOR CONTRACTOR REFERENCE.

City of Houston

ordinance. In particular, we have located the new sidewalk so as to reduce the number of existing trees having to be removed (from 859" removed to 763" removed). We are also proposing to plant larger trees (4" minimum) rather than the minimum (1-1/2") established under the ordinance. Even with these design changes, the project will not meet the requirements, which are summarized below together with the proposed quantities to be provided.

	STREET TREES	REPLACEMENT TREES
REQUIRED	469"	763"
PROVIDED	440"	0"
DIFFERENCE	29"	763"

Note: all tree quantitles are expressed as caliper inches

Variance provisions under Chapter 33, Sec. 33-139 subparagraph (e) states that "Not withstanding the provisions of this section, the planning official and the Director of Houston Public Works shall use their best efforts to resolve any disputes regarding the application of this division to city-funded projects that include the entire width of the pavement of a public street and are at least 30 feet in length. The Director of Houston Public Works is authorized to promulgate guidelines for administration of this article, in consultation with the planning official, that are consistent with this chapter.

In light of the considerable constraints imposed by the particulars of this project as regards street trees and replacement trees, and every effort made to comply with the ordinance requirements, we are requesting an exception to the requirements under both ordinance sections governing Street Trees Required and Tree Replacement based on the quantities summarized above, and respectfully request a variance be approved.

Attachments: Memorial Drive Reconstruction and Access Management / Tree Protection Plan by C. N. Koehl / LAN

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PUBLIC WORKS 67862

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REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L5.00A

TREE MITIGATION VARIANCE REQUEST FORM

SHEET 91 OF 109

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN:	6	TEXAS	STP 1802 (783) MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	485

HOUSTON
PUBLIC WORKS

Variance from Infrastructure Design Manual (IDM)
Variance Request for
City Funded Projects (i.e., CIP)
Office of the City Engineer

Submitted by (Project Team)

Project Manager	Date		
Section Manager	Date		
Delivery Line Assistant Director	Date	Operations *(Operations signature is required if this variance will negatively impact service.)*	Date

OCE Reviewer:

Recommendation:
Print Name: Dorothy Jay Bullock
Signature: [signature] Date: 7/25/2019

☑ Approved as submitted
☐ Not Approved for Reason(s) Stated

Approved by City Engineer:

Print Name: **Joseph T. Myers, P.E., CFM**
Signature: [signature] Date: 7/26/19

☑ Approved as submitted
☐ Not Approved for Reason(s) Stated

Reason if not approved.

NOTE:

TREE MITIGATION INFORMATION FOR CONTRACTOR REFERENCE.

City of Houston

City of Houston Use Only:

Section	Reviewer Name	Date	Recommendation
HPARD - Urban For.	Dale Temple	7-18-19	Support the variance

City Engineer Deposition:

Justification of Decision:

Name: Dale Temple (Print)

Signature: Dale Temple Date: 7-25-19

☑ Accepted
☑ Accepted as Noted
☐ Not Accepted

1) Driveways are required to conform to the City's minimum standard width and radius at the initial opening connection to the City street.
2) Driveway approaches that do not follow the City minimum standard width from the roadway to the right-of-way line require a signed statement from the owner that they concur with the design prior to advertisement of the bid.

APPROVED
City of Houston
Parks & Recreation Dept.
Urban Forestry Division
By: [signature]
Title: Asst. Supt. Date: 7-25-19

Rev. 1, Date: 1/9/13

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TEXAS BOARD OF ARCHITECTURAL EXAMINERS
JAMES W. VICK
ARCHITECT
FEB 14, 2020

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REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L5.00B

TREE MITIGATION VARIANCE FORM

SHEET 92 OF 109

DGN	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN	6	TEXAS	STP 1802 (783) MM			CS
DWG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG	HOU	HARRIS	0912	72	391	486

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CITY OF HOUSTON
DEPARTMENT OF PLANNING & DEVELOPMENT

LANDSCAPE ANALYSIS FORM

1. TREE AND SHRUB PLANTING REQUIREMENT

A. STREET TREES: Sec. 33-126 (a)
Length of property line in linear feet as meaured along each street separately.

STREET NAME	Lineal Feet	Tree Planting Requirement	Equivalent Credits *	Total Trees Planted
Memorial Drive	4,790	160	-	171
		-	-	
		-	-	
		-	-	
			TOTAL STREET TREES	171

* Maximum street tree credits cannot exceed 50% of each block face.

B. PARKING LOT TREES: Sec. 33-127 (a)
50% of parking lot trees must be large trees.
Each parking space must be within 120' of a tree.

Tree Planting Requirements for Parking Lots

Total # of Proposed Parking Spaces	Trees Required	Equivalent Credits	Large Trees	Small Trees	NET
	0	0			0

C. PARKING LOT SHRUBS: Sec. 33-127 (b)
75% of the shrubs must be planted along the perimeter of the parking lot.
(Shrubs are required for new and/or the expanded portion of parking lots)

Shrub Requirements

Parking Lot Tree Requirement	Shrub Requirement adjacent to R.O.W.	Total Shrub Requirement
	0	

D. LANDSCAPE BUFFER
Sec. 33-128 (1)
Wood, concrete masonry opaque screening fence. (Min. 6')
Sec. 33-128 (2) Evergreen Screening.
A 6' high wood, concrete masonry opaque screening fence, or 15' wide evergreen planting strip along total length of line adjacent to existing single family residential, or limit of expansion adjacent to existing single family. (Site plan must show land use on all sides of property)

CREDITS WORKSHEET Sec. 33-123 (a) TREE PLANTING EQUIVALENCY CREDITS:

	STREET	PARKING
1. Number of proposed trees exceeding 4" caliper. Each 4" tree is (1) credit.	-	-
2. Depositing of monies with Parks and Recreation Department. $500.00 per tree. Proposed credits cannot exceed 30% of tree planting requirement above. Amount to be deposited: Proposed credits for Street Tree (0 x $500.00 = $0) Amount to be deposited: Proposed credits for Parking (0 x $500.00 = $0) The combined credits under items 1 & 2 may not exceed 50% of the total tree planting requirement.	-	-
3. Preservation of on-site trees, per the following schedule in caliper: minimum 4" - 6" 2 trees gretaer than 6" but less than 12" 3 trees 12" and greater 4 trees Total number of tree credits for this option: 0 trees.	-	- - -
4. Credit for preserving existing right-of-way street trees.		-
5. Proposed total number of tree credits (To receive credits, documenation must be provided in conformance with section 33-122)	-	-

NOTE:

TREE MITIGATION INFORMATION FOR CONTRACTOR REFERENCE.

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MEMORIAL DRIVE RECONSTRUCTION
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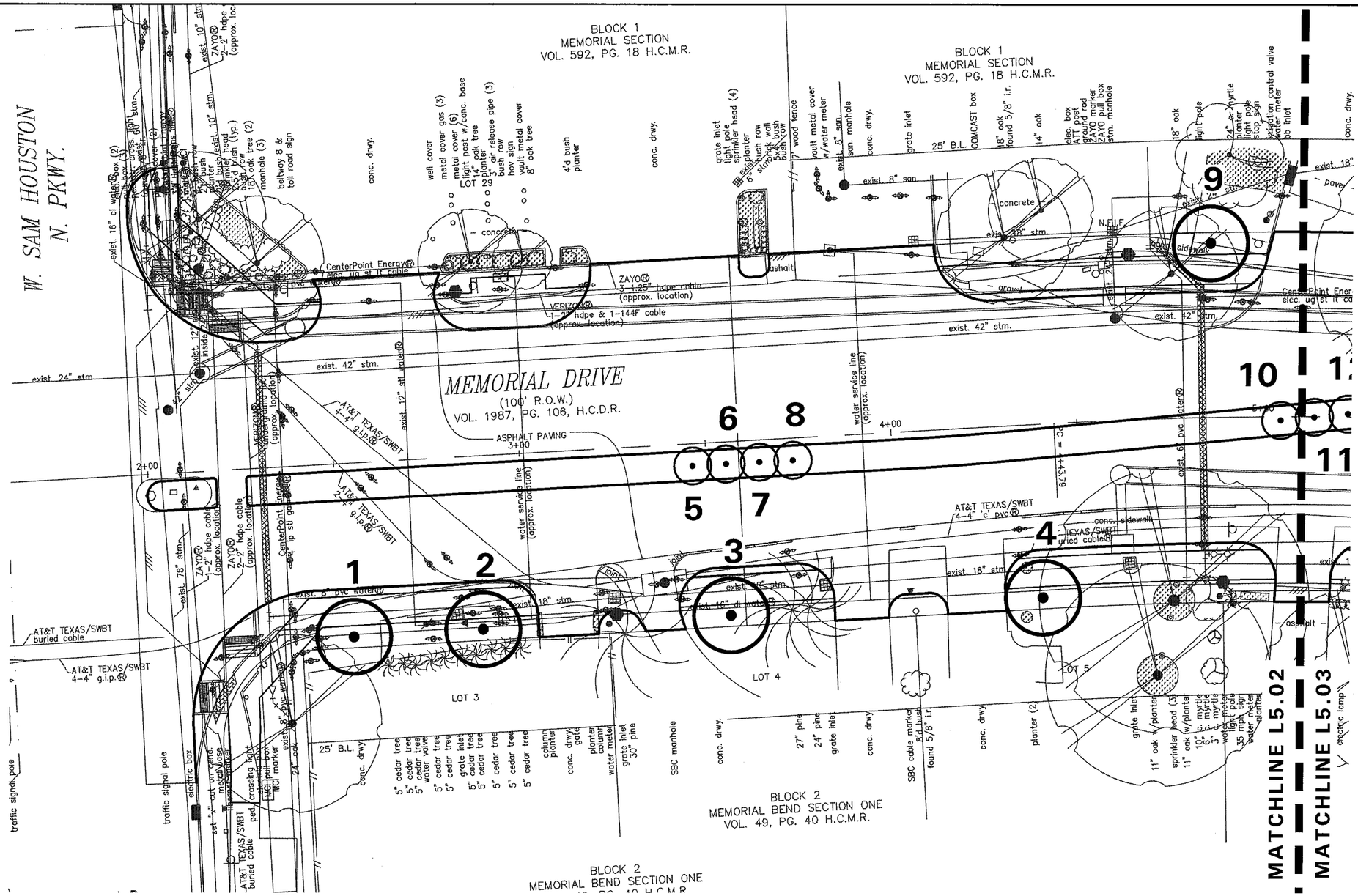
L5.01

TREE MITIGATION CALCULATIONS & DETAILS

SHEET 93 OF 109

DGN	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN	6	TEXAS	STP 1802 (783) MM			CS
DWG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG	HOU	HARRIS	0912	72	391	487



01 PLAN – PROPOSED STREET TREES

AS INDICATED

NOTES:

1. FOR EXISTING TREE LOCATIONS AND NUMBERING REFER TO PRELIMINARY TREE LOCATIONS SHEETS.
2. TREE MITIGATION PLANS FOR CONTRACTOR REFERENCE.

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(IN FEET)

SCALE: PLAN 1":30'

TEXAS BOARD OF ARCHITECTURAL EXAMINERS JAMES W. VICK ARCHITECT #10477

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REV. NO.	DATE	DESCRIPTION	BY

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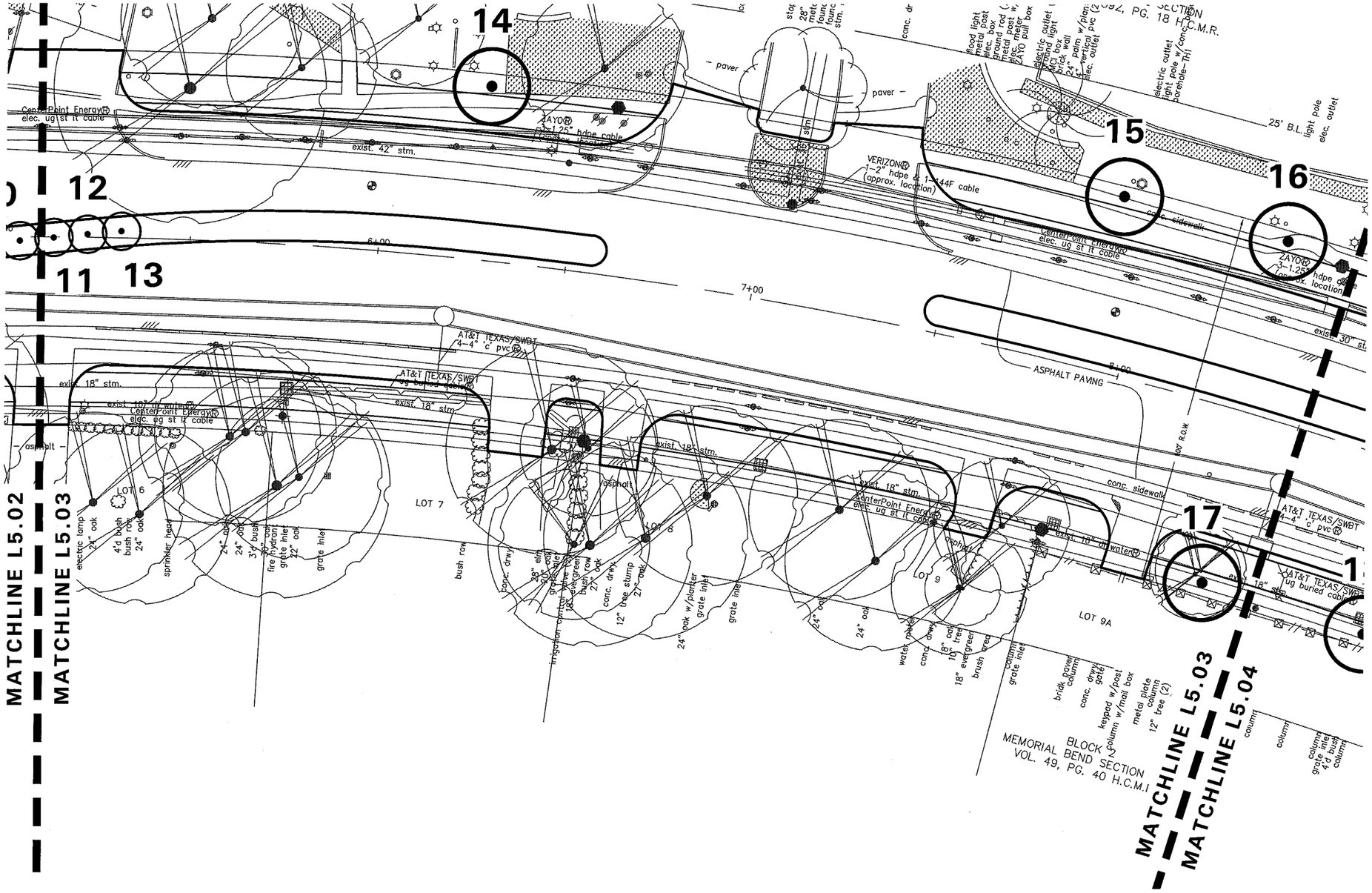
TREE MITIGATION PLAN

SHEET 94 OF 109

DGN	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN	6	TEXAS	STP 1802 (783) MM			CS
DWG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG	HOU	HARRIS	0912	72	391	488



01 PLAN – PROPOSED STREET TREES

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SCALE: PLAN 1":30'

JAMES W. VICK
ARCHITECT #10477
TEXAS BOARD OF ARCHTECTURAL EXAMINERS
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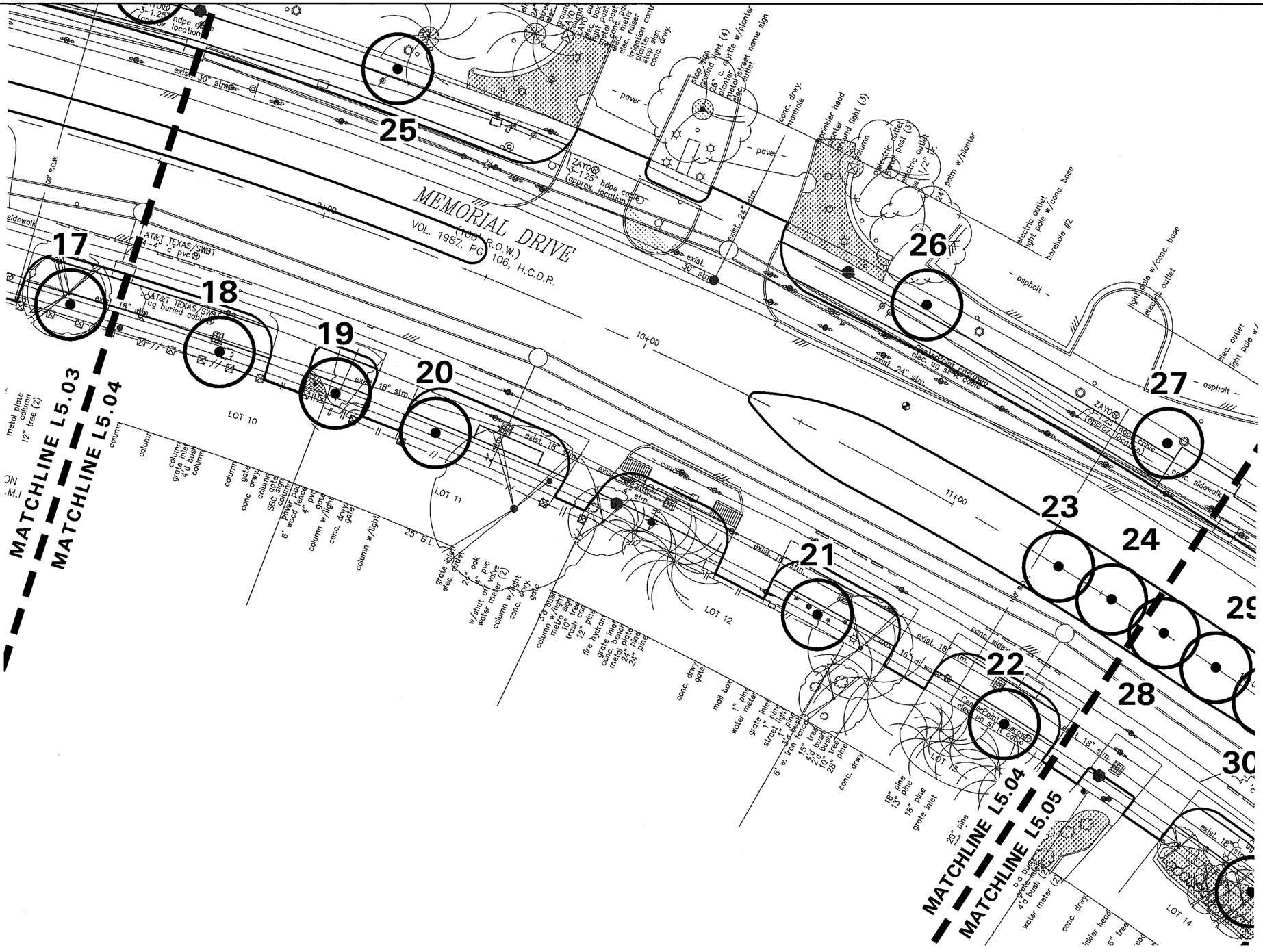
TREE MITIGATION PLAN

SHEET 95 OF 109

DGN	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN	6	TEXAS	STP 1802 (783) MM			CS
DWG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG	HOU	HARRIS	0912	72	391	489



01 PLAN – PROPOSED STREET TREES

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ARCHITECT #10477
FEB 13 2020

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

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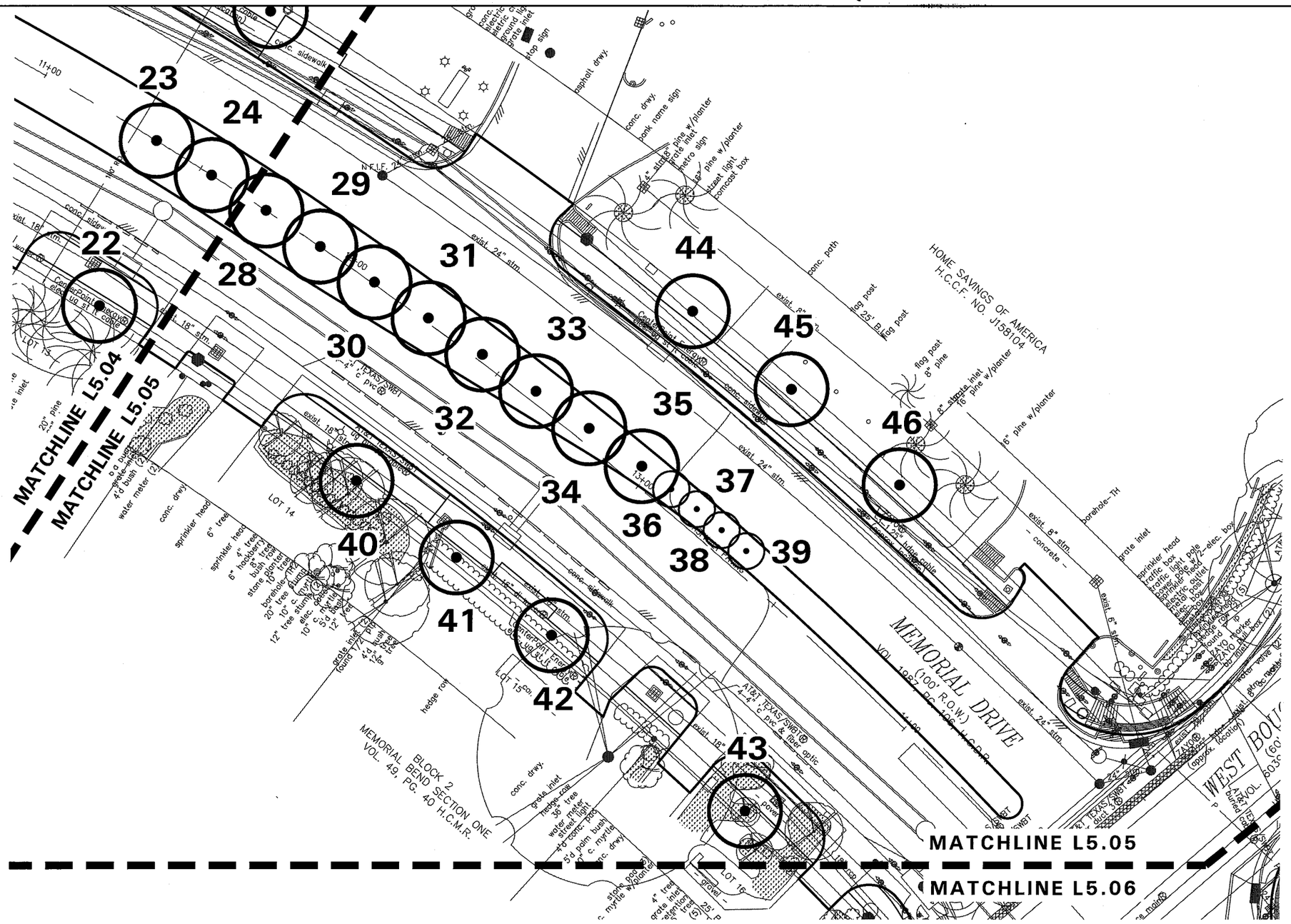
TREE MITIGATION PLAN

SHEET 96 OF 109

DGN	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN	6	TEXAS	STP 1802 (783) MM			CS
DWG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG	HOU	HARRIS	0912	72	391	490



01 PLAN – PROPOSED STREET TREES

AS INDICATED

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TEXAS BOARD OF ARCHITECTURAL EXAMINERS
JAMES W. VICK
ARCHITECT #10477
FEB 27 2020

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REV. NO.	DATE	DESCRIPTION	BY

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

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

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TREE MITIGATION PLAN

SHEET 97 OF 109

DGN	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN	6	TEXAS	STP 1802 (783) MM			CS
DWG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG	HOU	HARRIS	0912	72	391	491

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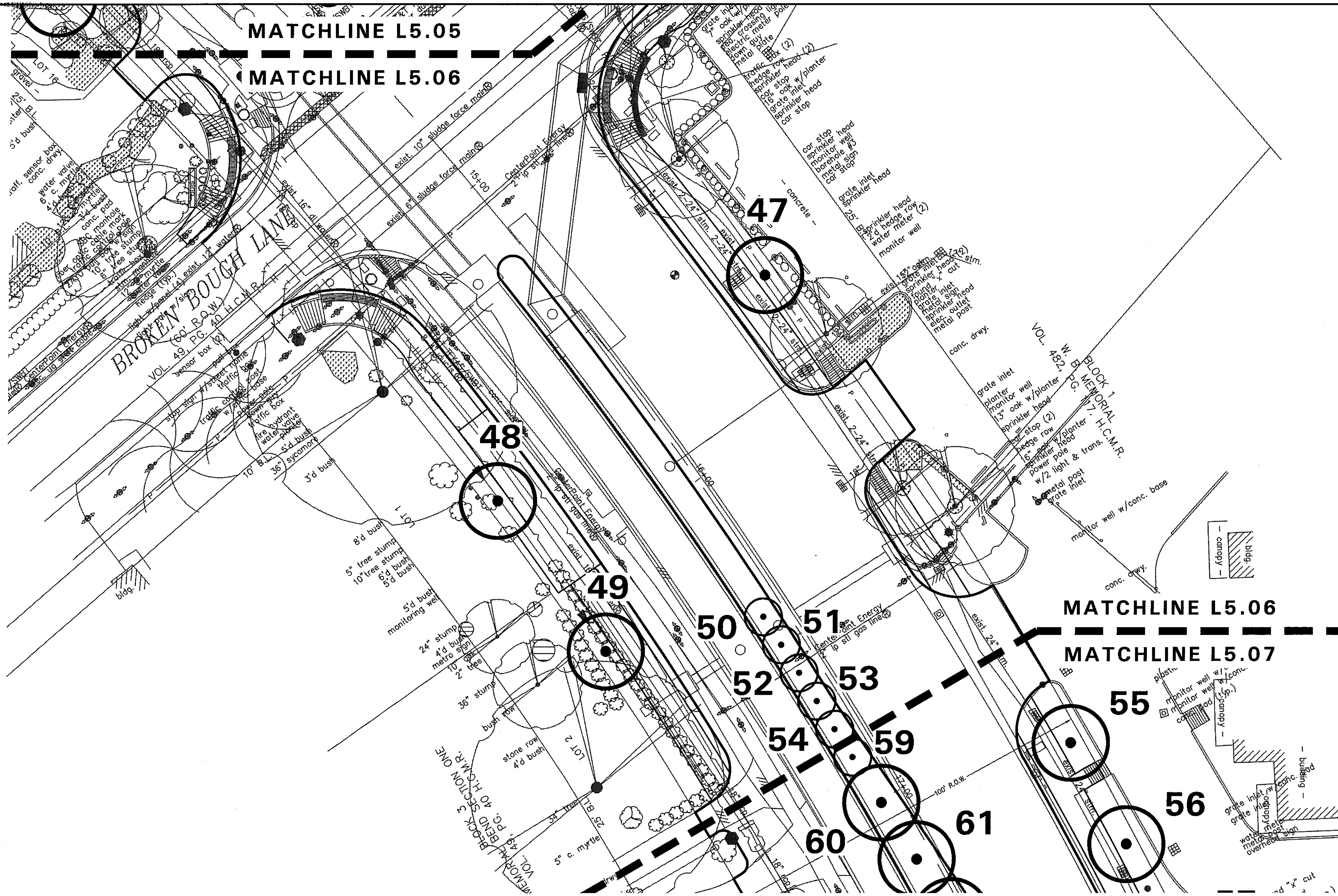

01 PLAN - PROPOSED STREET TREES

AS INDICATED

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SCALE: PLAN 1":30'

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ARCHITECT #10477
FEB 4, 2020

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Texas Department of Transportation

MEMORIAL DRIVE RECONSTRUCTION
AND ACCESS MANAGEMENT

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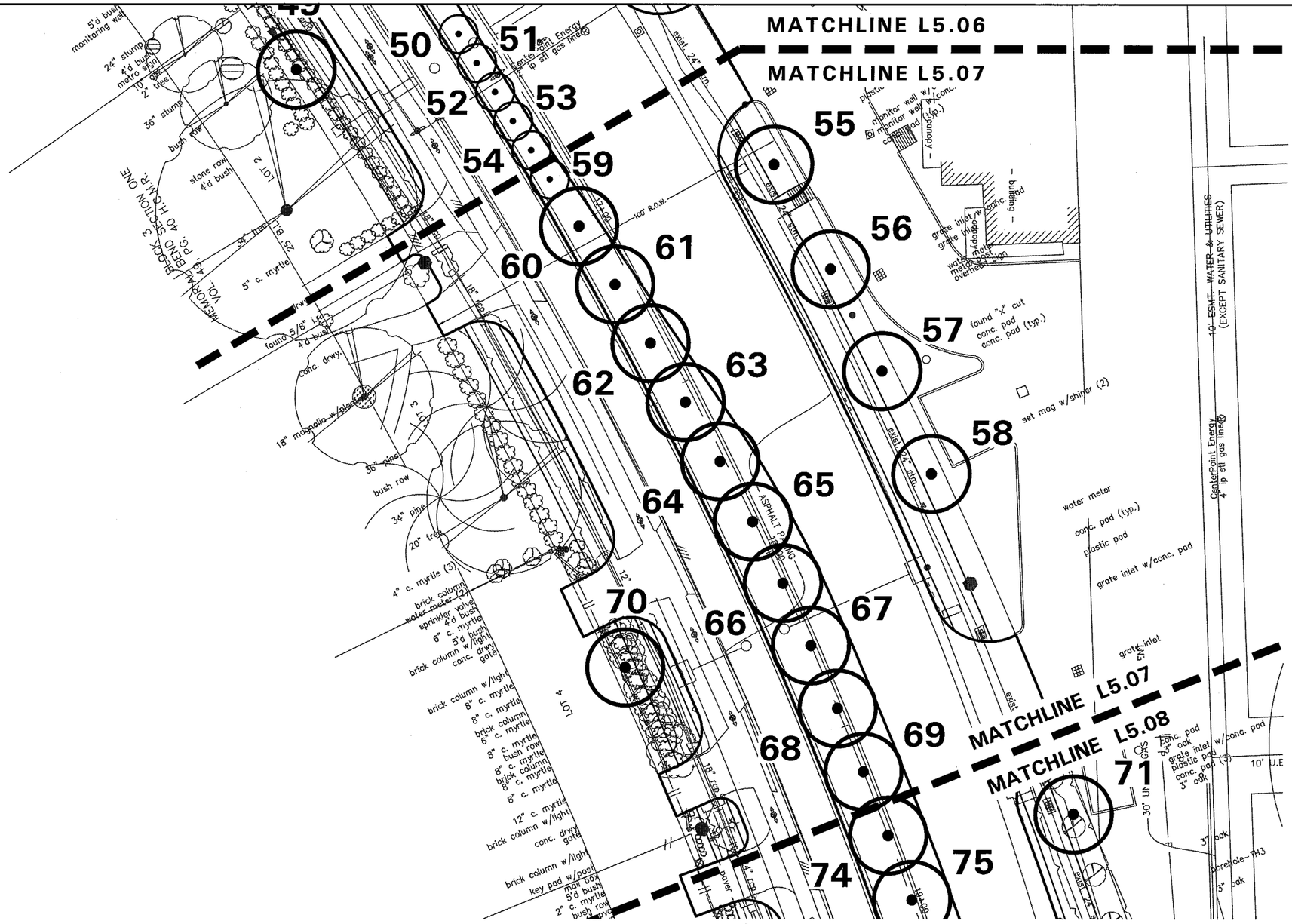
TREE MITIGATION PLAN

SHEET 98 OF 109

DGN	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN	6	TEXAS	STP 1802 (783) MM			CS
DWG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG	HOU	HARRIS	0912	72	391	492



01 PLAN – PROPOSED STREET TREES

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SCALE: PLAN 1":30'

TEXAS BOARD OF ARCHITECTURAL EXAMINERS
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

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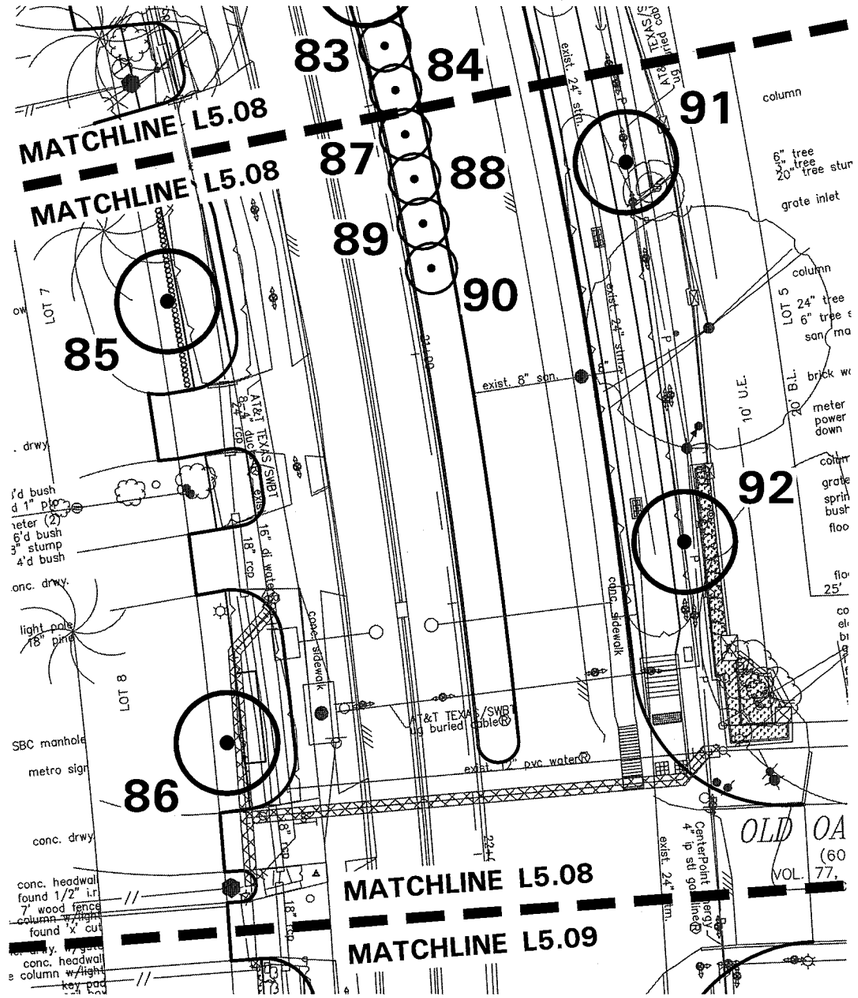
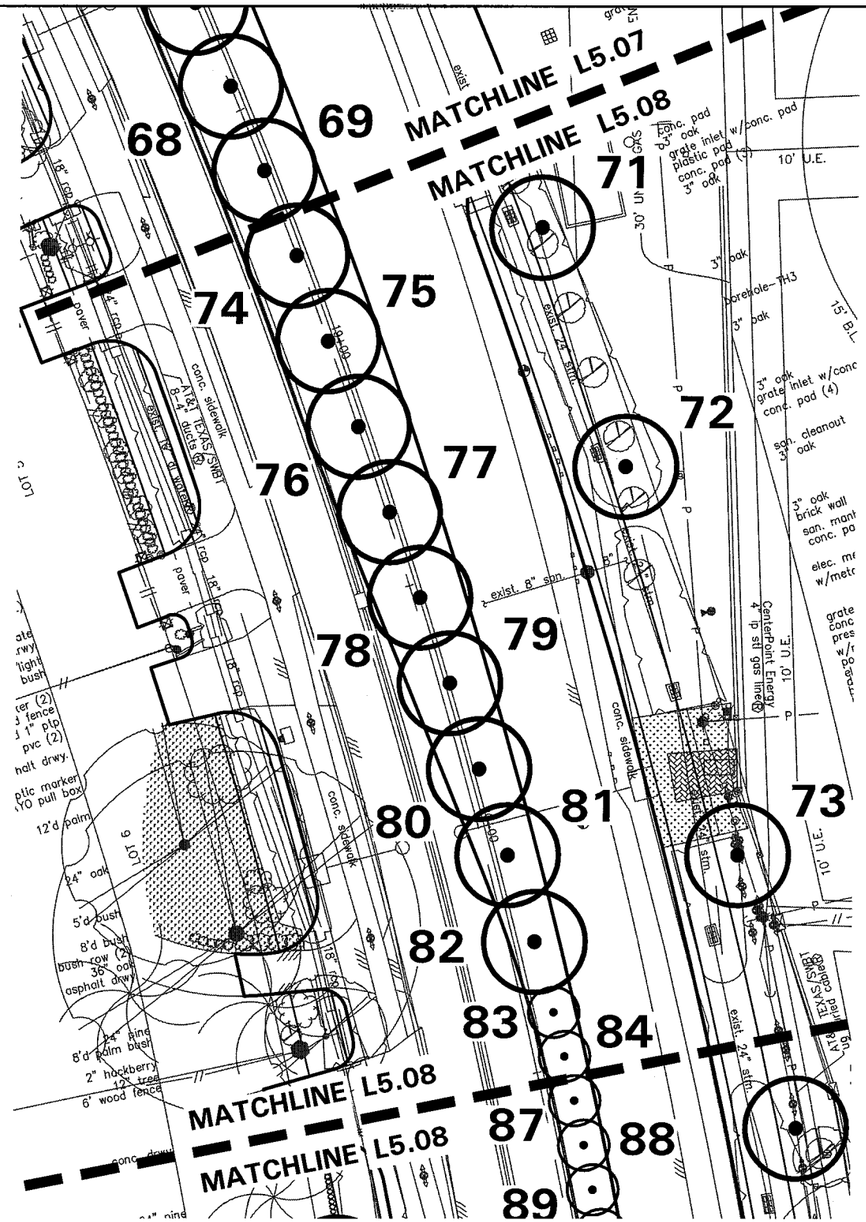
TREE MITIGATION PLAN

SHEET 99 OF 109

DGN	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN	6	TEXAS	STP 1802 (783) MM			CS
DWG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG	HOU	HARRIS	0912	72	391	493





01 PLAN – PROPOSED STREET TREES

AS INDICATED

NOTES:

1. FOR EXISTING TREE LOCATIONS AND NUMBERING REFER TO PRELIMINARY TREE LOCATIONS SHEETS.
2. TREE MITIGATION PLANS FOR CONTRACTOR REFERENCE.

Landscape Architect

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712 Main Street
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77002
United States
www.swagroup.com
+1.713.868.1676 o

67862

0 30 60

(IN FEET)

SCALE: PLAN 1": 30'

TEXAS BOARD OF ARCHITECTURAL EXAMINERS
JAMES W. VICK
ARCHITECT
11701
FEB 5 2020

100% CONSTRUCTION DOCUMENTS

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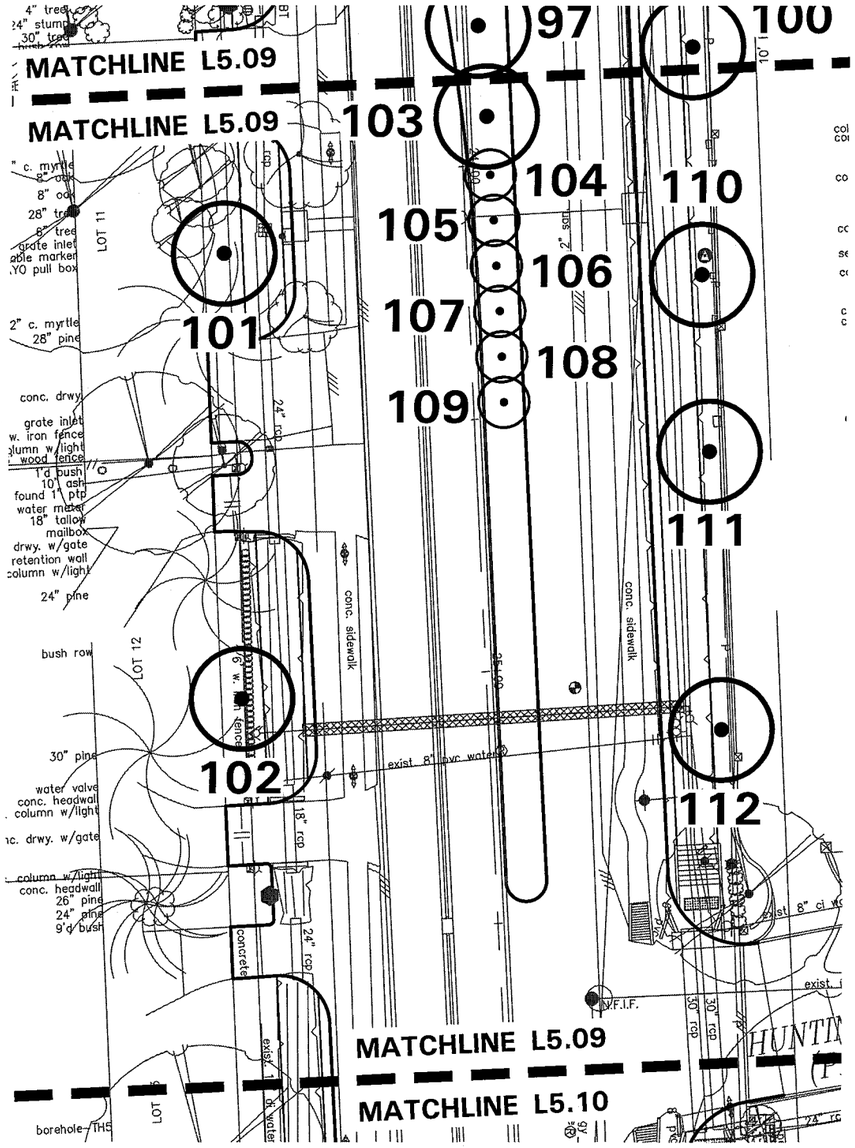
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

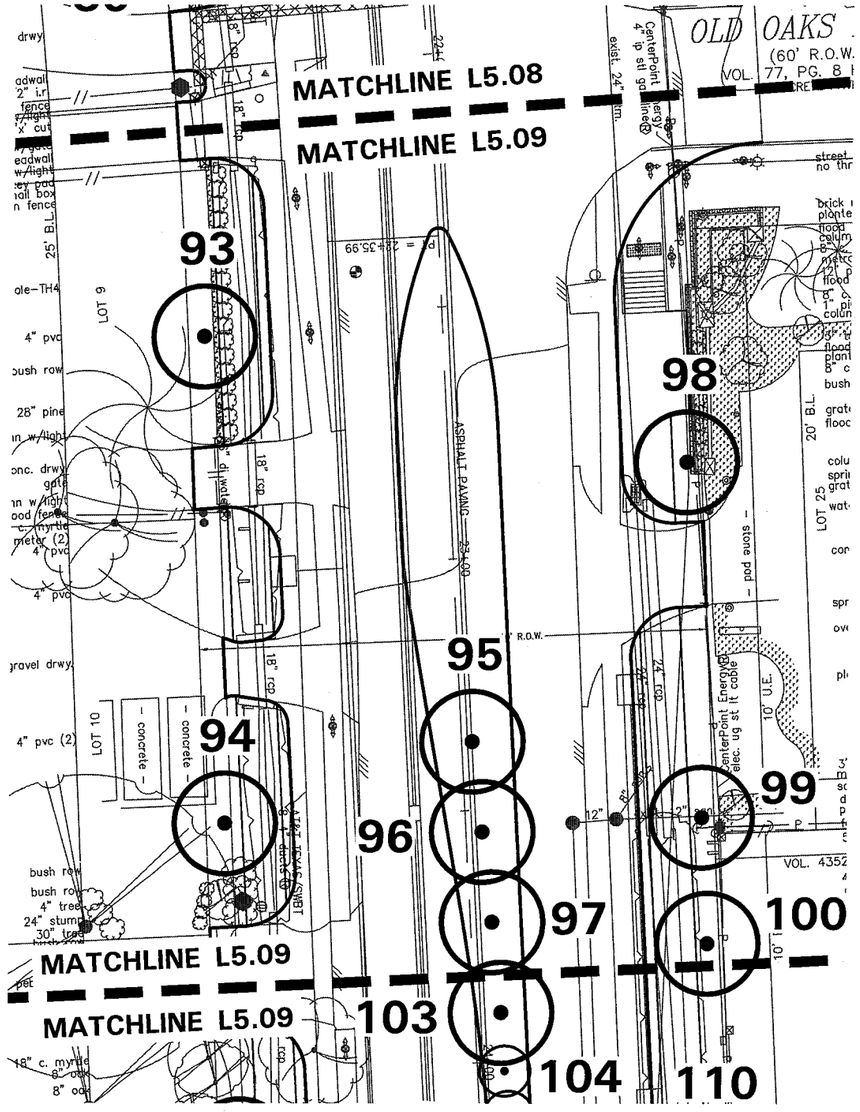
L5.08

TREE MITIGATION PLAN

SHEET 100 OF 109

DGN	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN	6	TEXAS	STP 1802 (783) MM			CS
DWG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG	HOU	HARRIS	0912	72	391	494





01 PLAN – PROPOSED STREET TREES

AS INDICATED

NOTES:

1. FOR EXISTING TREE LOCATIONS AND NUMBERING REFER TO PRELIMINARY TREE LOCATIONS SHEETS.
2. TREE MITIGATION PLANS FOR CONTRACTOR REFERENCE.

Landscape Architect

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67862

0 30 60

(IN FEET)

SCALE: PLAN 1":30'

TEXAS BOARD OF ARCHITECTURAL EXAMINERS
JAMES W. VICK
ARCHITECT
10417
FEB 6, 2020

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REV. NO.	DATE	DESCRIPTION	BY

Lockwood, Andrews & Newnam, Inc.
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Texas Department of Transportation

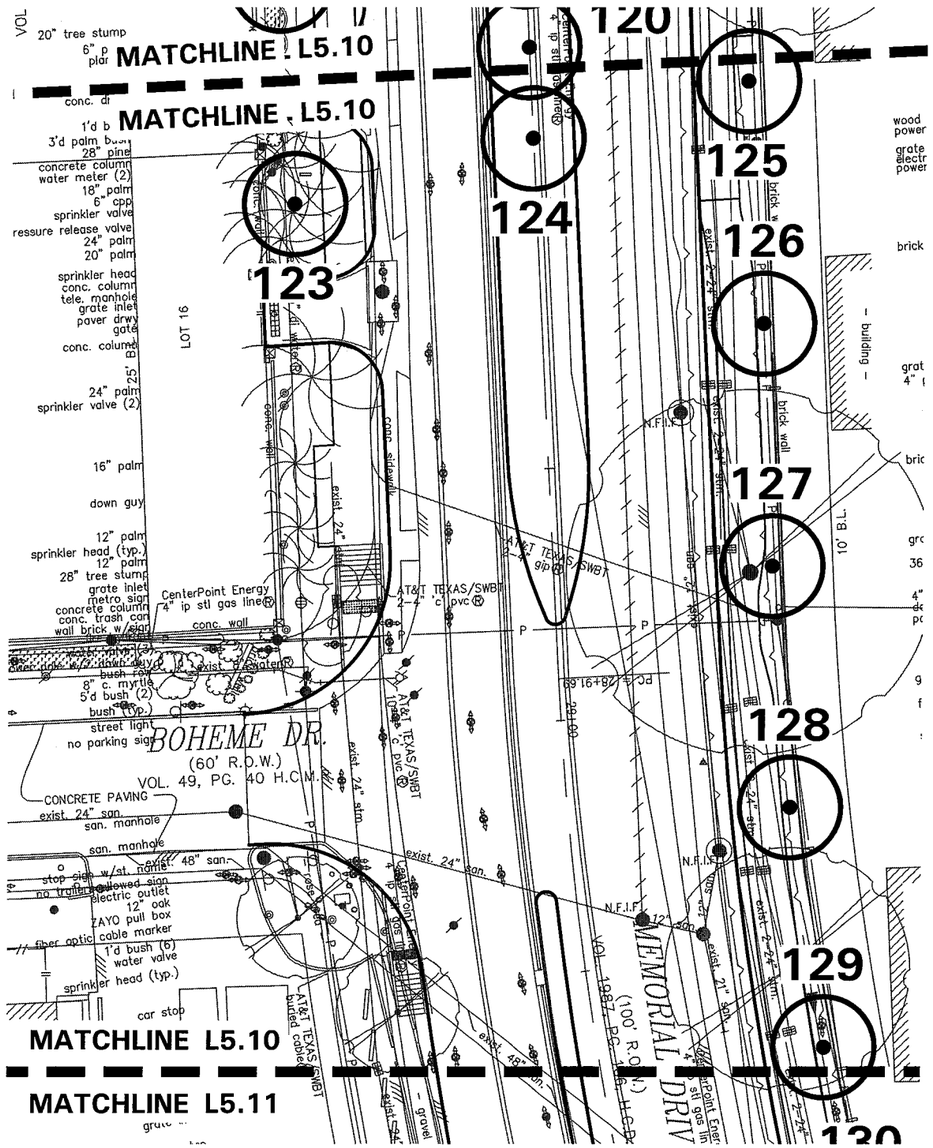
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L5.09

TREE MITIGATION PLAN

SHEET 101 OF 109

DGN	FED. NO. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN	6	TEXAS	STP 1802 (783) MM			CS
DWG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG	HOU	HARRIS	0912	72	391	495



01 PLAN – PROPOSED STREET TREES

AS INDICATED

NOTES:

1. FOR EXISTING TREE LOCATIONS AND NUMBERING REFER TO PRELIMINARY TREE LOCATIONS SHEETS.
2. TREE MITIGATION PLANS FOR CONTRACTOR REFERENCE.

Landscape Architect

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United States
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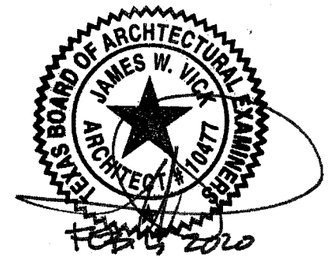
+1.713.868.1676 o

PLANS
67862

0 30 60
(IN FEET)
SCALE: PLAN 1":30'



100% CONSTRUCTION DOCUMENTS

REV. NO.	DATE	DESCRIPTION	BY

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FIRM REGISTRATION NO. 2614

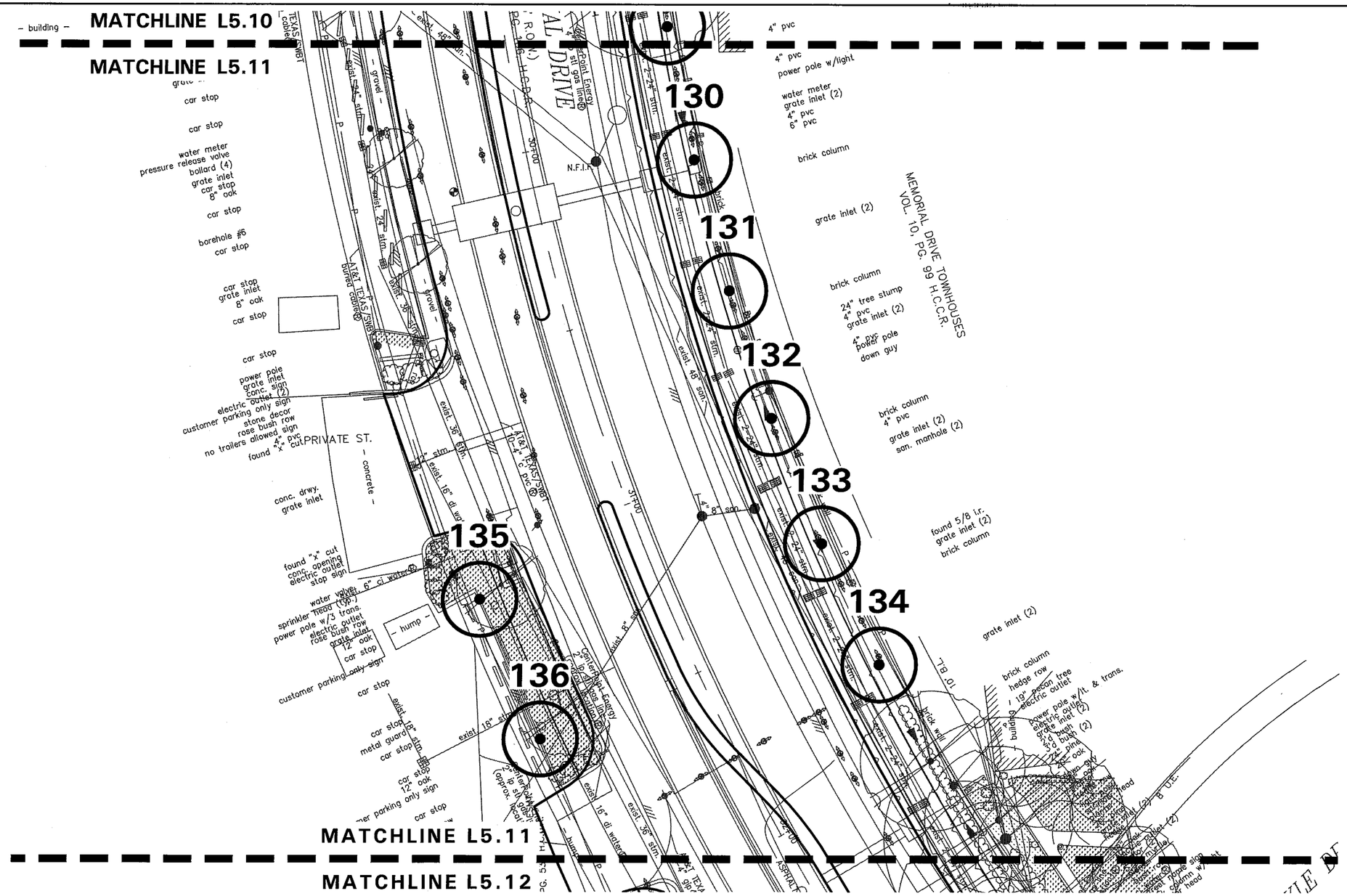
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L5.10

TREE MITIGATION PLAN

SHEET 102 OF 109

DSGN	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN	6	TEXAS	STP 1802 (783) MM			CS
DWG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG	HOU	HARRIS	0912	72	391	496



01 PLAN – PROPOSED STREET TREES

AS INDICATED

NOTES:

1. FOR EXISTING TREE LOCATIONS AND NUMBERING REFER TO PRELIMINARY TREE LOCATIONS SHEETS.
2. TREE MITIGATION PLANS FOR CONTRACTOR REFERENCE.

Landscape Architect

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67862

0 30 60
(IN FEET)
SCALE: PLAN 1": 30'

TEXAS BOARD OF ARCHITECTURAL EXAMINERS
JAMES W. VICK
ARCHITECT # 10477
FEB 5, 2020

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REV. NO.	DATE	DESCRIPTION	BY

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Texas Department of Transportation

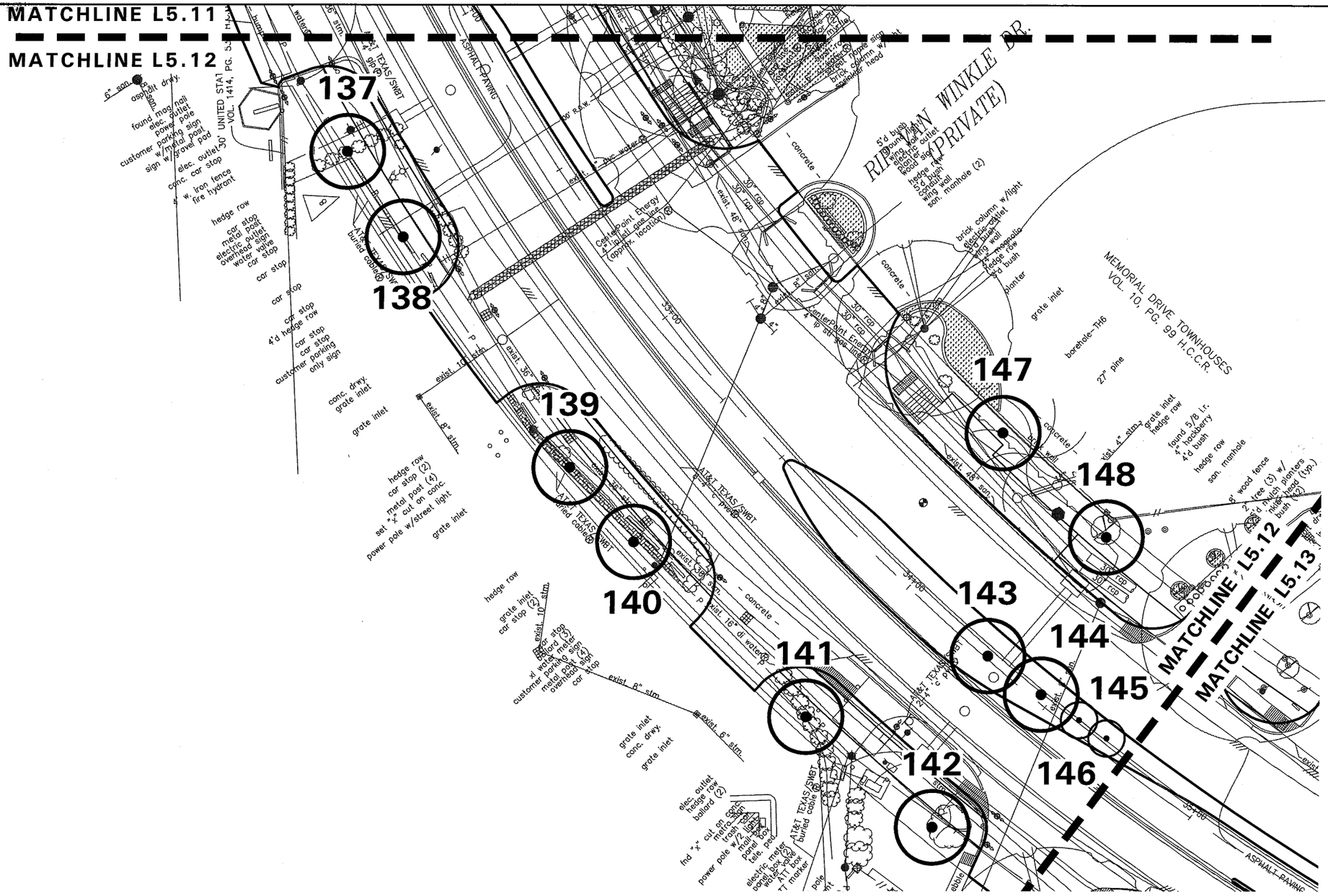
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L5.11

TREE MITIGATION PLAN

SHEET 103 OF 109

DGN	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK. DSN.	6	TEXAS	STP 1802 (783) MM			CS
DWG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK. DWG.	HOU	HARRIS	0912	72	391	497



01 PLAN – PROPOSED STREET TREES

AS INDICATED

NOTES:

1. FOR EXISTING TREE LOCATIONS AND NUMBERING REFER TO PRELIMINARY TREE LOCATIONS SHEETS.
2. TREE MITIGATION PLANS FOR CONTRACTOR REFERENCE.

Landscape Architect

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67862

0 30 60

(IN FEET)

SCALE: PLAN 1":30'

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JAMES W. VICK
ARCHITECT # 10417
FEB 5 2020

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L5.12

TREE MITIGATION PLAN

SHEET 104 OF 109

DGN	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN	6	TEXAS	STP 1802 (783) MM			CS
DWG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
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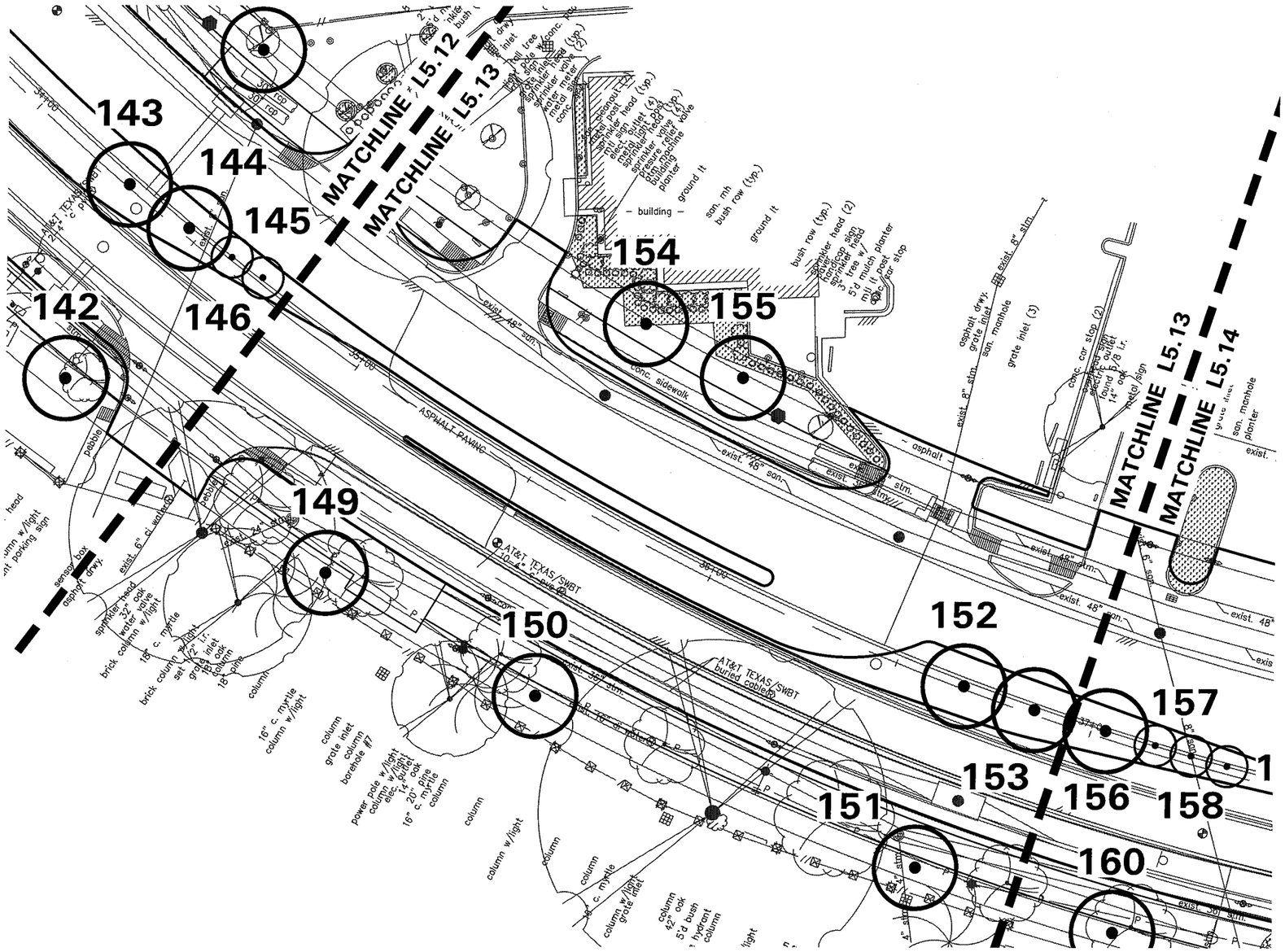

01 PLAN – PROPOSED STREET TREES

AS INDICATED

NOTES:

1. FOR EXISTING TREE LOCATIONS AND NUMBERING REFER TO PRELIMINARY TREE LOCATIONS SHEETS.
2. TREE MITIGATION PLANS FOR CONTRACTOR REFERENCE.

Landscape Architect

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67862

0 30 60
(IN FEET)
SCALE: PLAN 1":30'

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ARCHITECT #10477
FEB 5 2020

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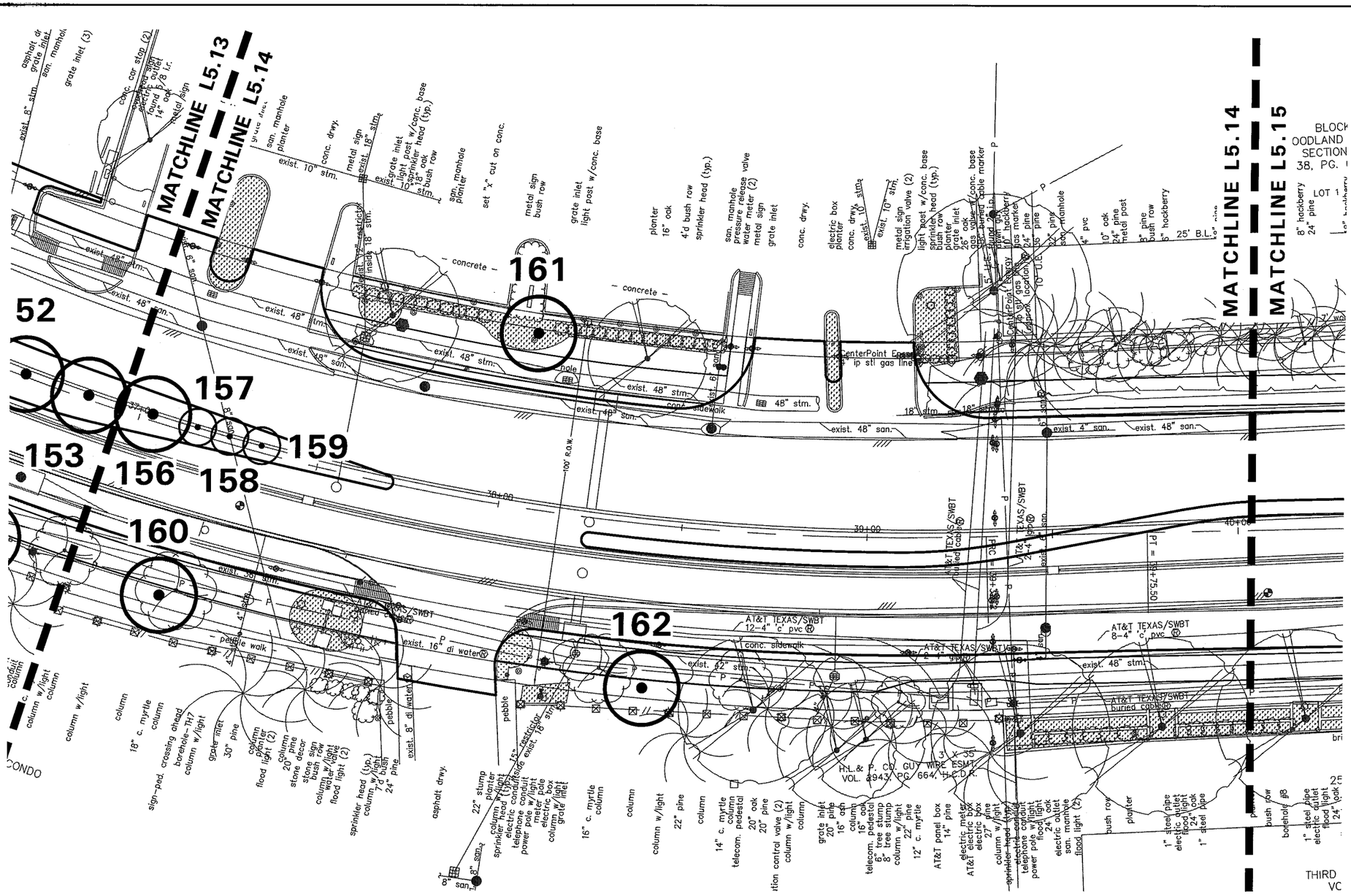
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L5.13

TREE MITIGATION PLAN

SHEET 105 OF 109

DGN	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN	6	TEXAS	STP 1802 (783) MM			CS
DWG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG	HOU	HARRIS	0912	72	391	499



01 PLAN – PROPOSED STREET TREES

AS INDICATED

NOTES:

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2. TREE MITIGATION PLANS FOR CONTRACTOR REFERENCE.

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67862

0 30 60
(IN FEET)
SCALE: PLAN 1":30'

JAMES W. VICK 104701 LICENSED LANDSCAPE ARCHITECT TEXAS BOARD OF ARCHITECTURAL EXAMINERS
2020

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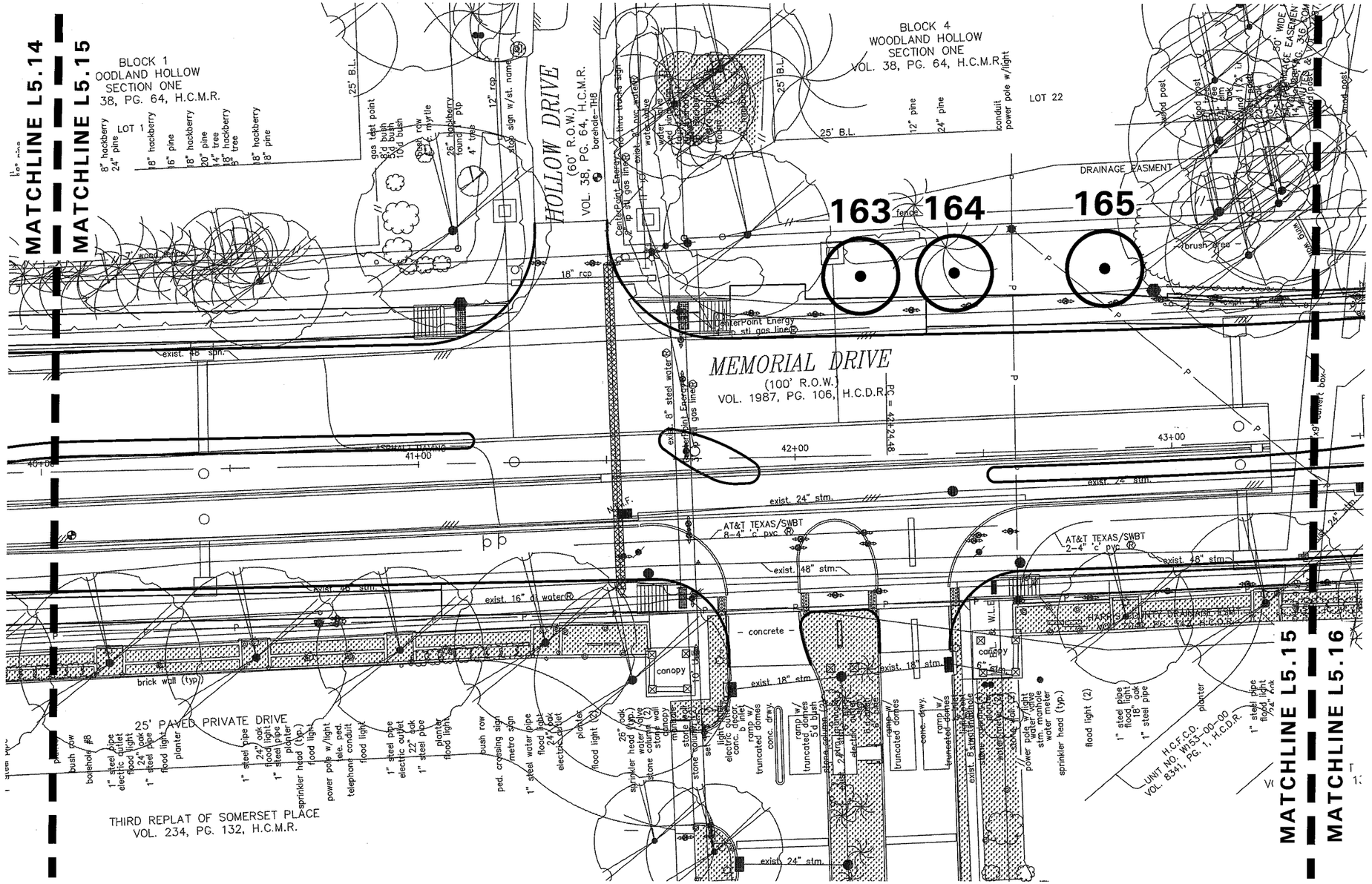
L5.14

TREE MITIGATION PLAN

SHEET 106 OF 109

DSN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN:	6	TEXAS	STP 1802 (783) MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	500



01 PLAN – PROPOSED STREET TREES

AS INDICATED

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PLS

67862

0 30 60

(IN FEET)

SCALE: PLAN 1":30'

TEXAS BOARD OF ARCHITECTURAL EXAMINERS
JAMES W. VICK
ARCHITECT
10477
2020

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FIRM REGISTRATION NO. 2614

Texas Department of Transportation

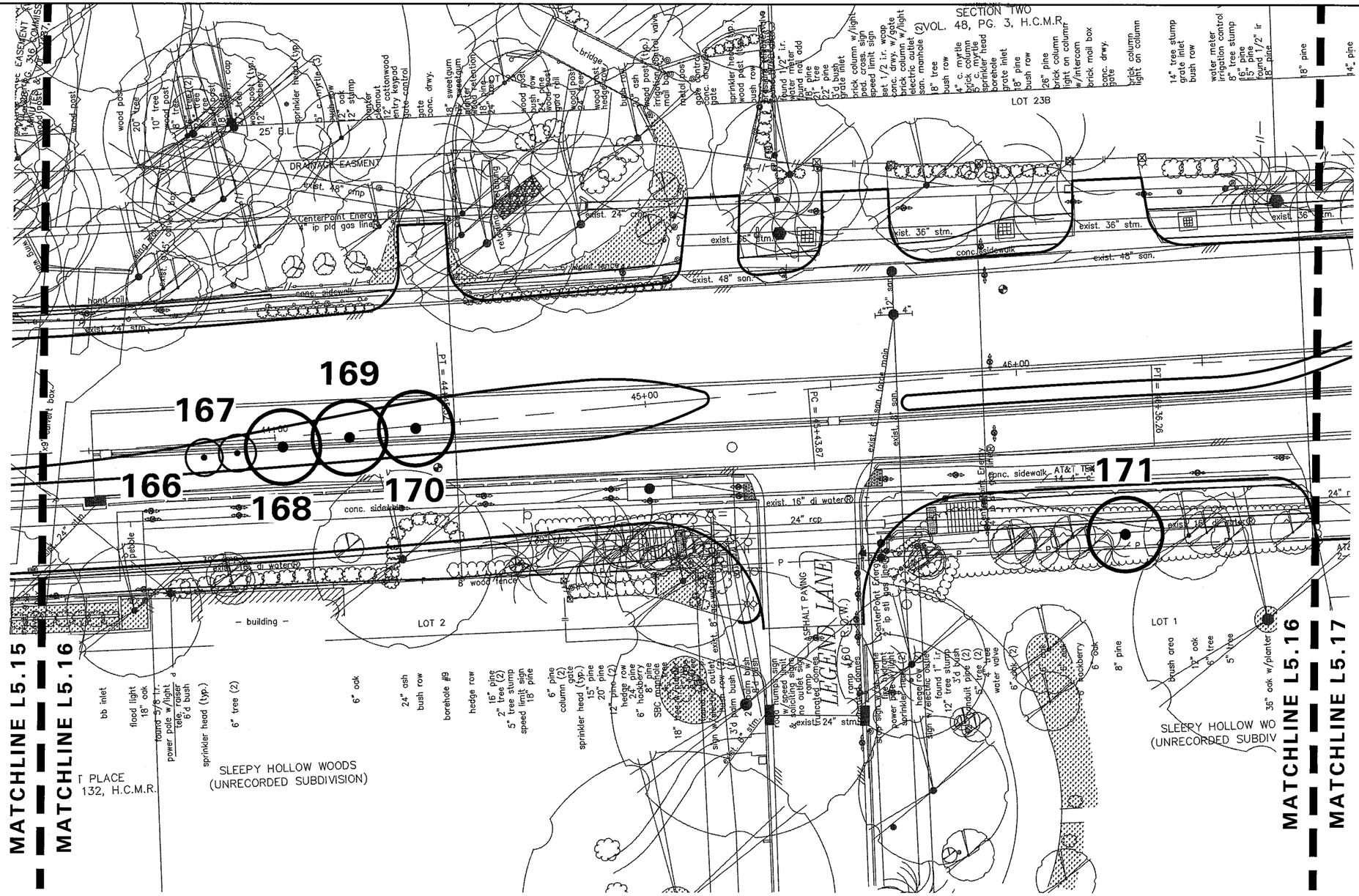
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L5.15

TREE MITIGATION PLAN

SHEET 107 OF 109

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK:	6	TEXAS	STP 1802 (783) MM			CS
DW:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CK:	HOU	HARRIS	0912	72	391	501
DW:						



01 PLAN – PROPOSED STREET TREES

AS INDICATED

NOTES:

1. FOR EXISTING TREE LOCATIONS AND NUMBERING REFER TO PRELIMINARY TREE LOCATIONS SHEETS.
2. TREE MITIGATION PLANS FOR CONTRACTOR REFERENCE.

Landscape Architect

swa

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United States
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PUBLIC WORKS
ACCEPTED
67862

0 30 60
(IN FEET)
SCALE: PLAN 1":30'

TEXAS BOARD OF ARCHTECTURAL EXAMINERS
JAMES W. VICK
ARCHITECT # 10477
FEB 14 2020

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Texas Department of Transportation

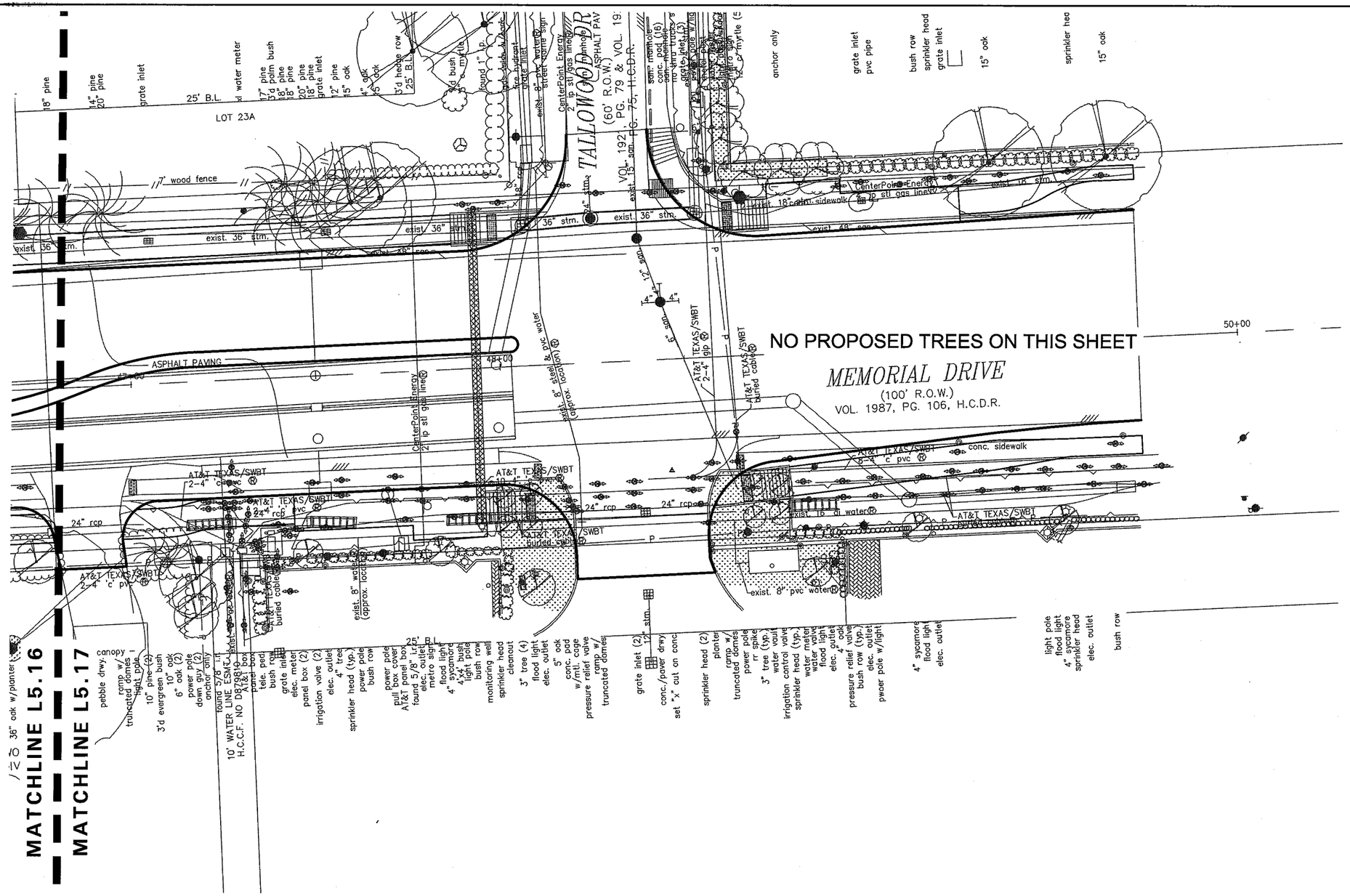
MEMORIAL DRIVE RECONSTRUCTION
AND ACCESS MANAGEMENT

L5.16

TREE MITIGATION PLAN

SHEET 108 OF 109

DGN	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DSN	6	TEXAS	STP 1802 (783) MM			CS
DWN	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWN	HOU	HARRIS	0912	72	391	502



01 PLAN – PROPOSED STREET TREES

AS INDICATED

NOTES:

1. FOR EXISTING TREE LOCATIONS AND NUMBERING REFER TO PRELIMINARY TREE LOCATIONS SHEETS.
2. TREE MITIGATION PLANS FOR CONTRACTOR REFERENCE.

Landscape Architect

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United States
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PUBLIC 67862

0 30 60
(IN FEET)
SCALE: PLAN 1":30'

TEXAS BOARD OF ARCHITECTURAL EXAMINERS
JAMES W. VICK
ARCHITECT #10477
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

L5.17

TREE MITIGATION PLAN

SHEET 109 OF 109

DSN	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK	6	TEXAS	STP 1802 (783) MM			CS
DWG	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK	HOU	HARRIS	0912	72	391	503

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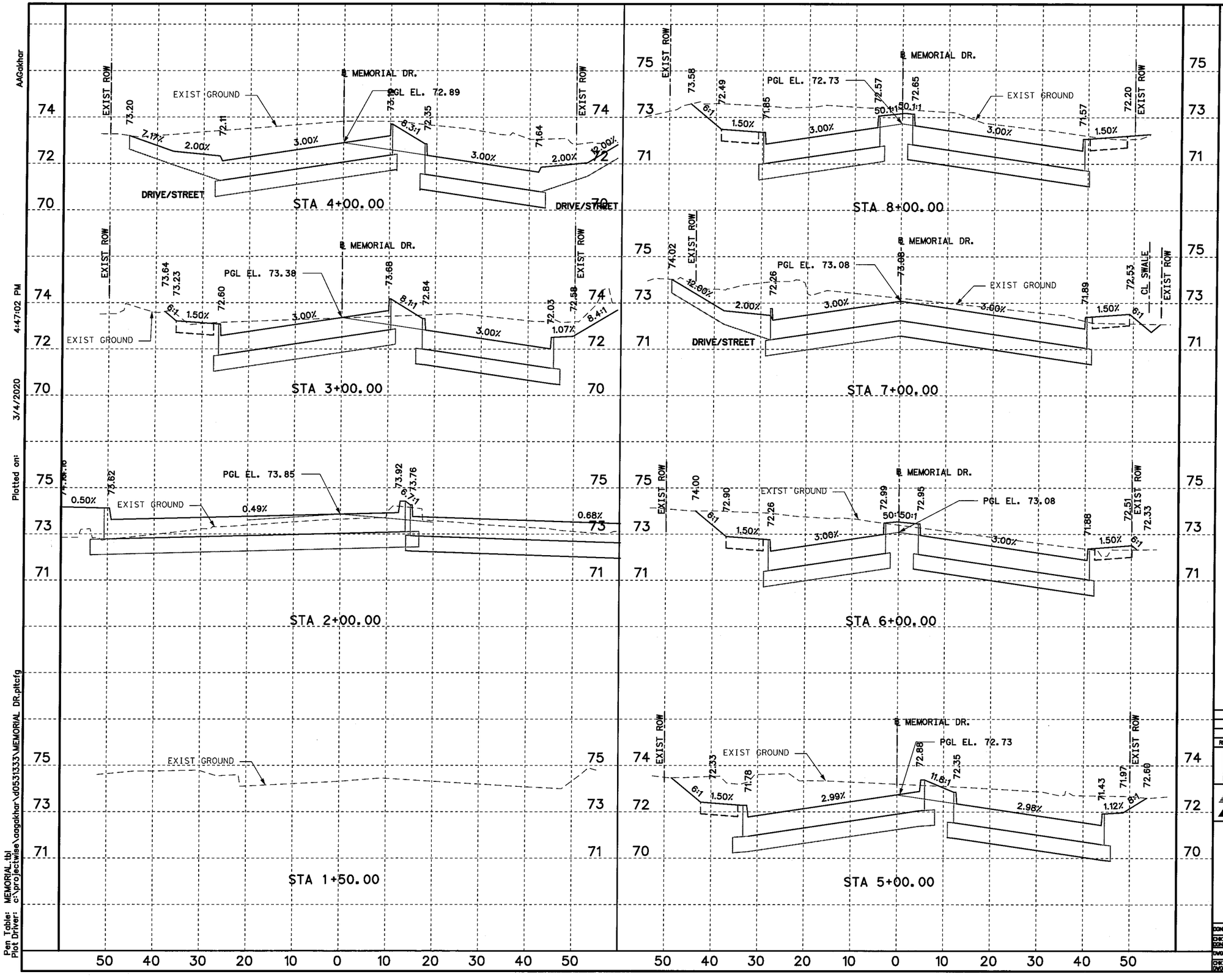

0 10 20
(IN FEET)
SCALE: PLAN 1":10'

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED PROFESSIONAL ENGINEER
03/04/2020
Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

Lockwood, Andrews & Newnam, Inc.
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FIRM REGISTATION NO. 2614

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

CROSS SECTIONS OPT-3

SHEET 1 OF 7

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	504

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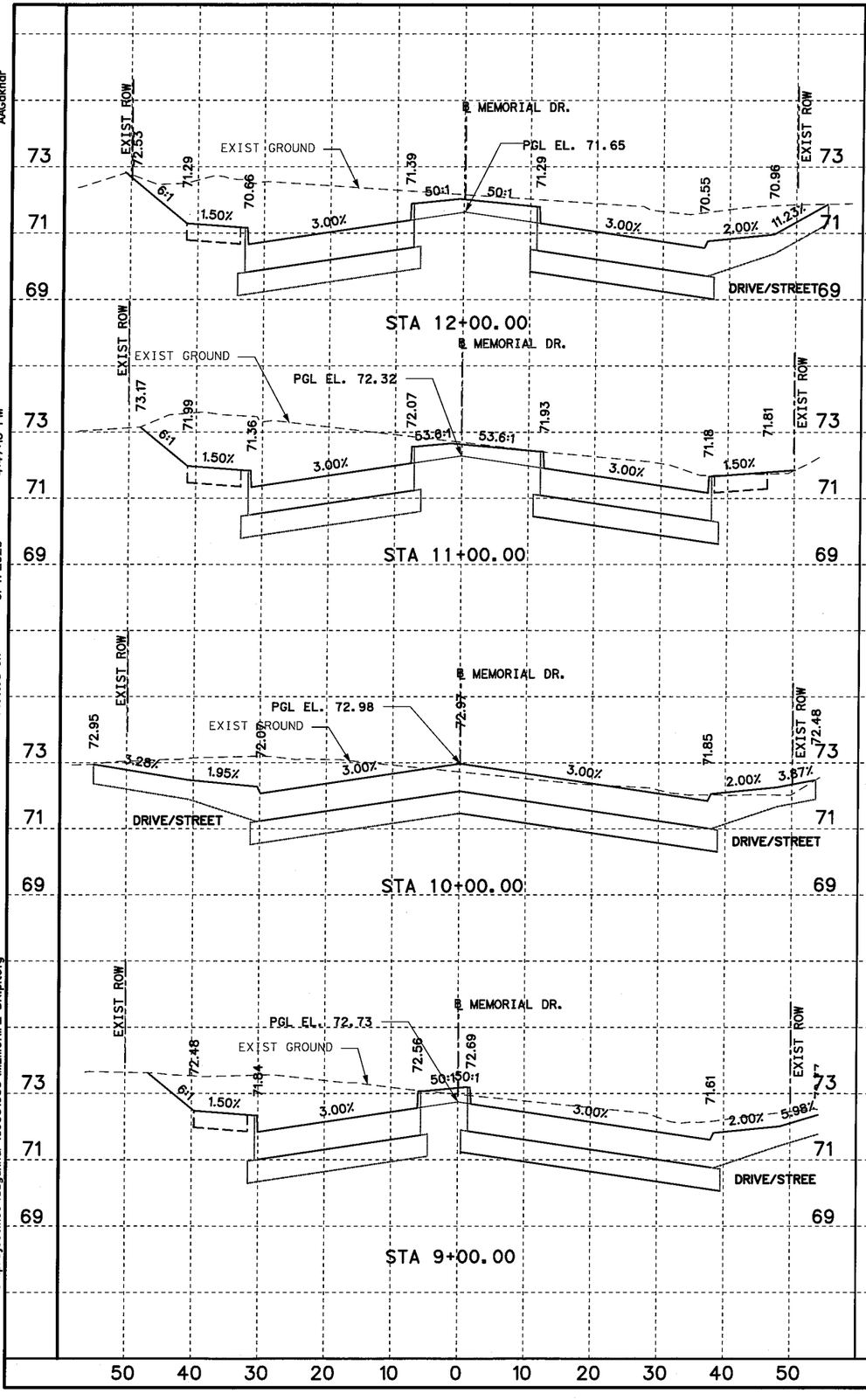

0 10 20
(IN FEET)
SCALE: PLAN 1"=10'

67862

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED
PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

Lockwood, Andrews & Newnam, Inc.
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

CROSS SECTIONS

SHEET 2 OF 7

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	505

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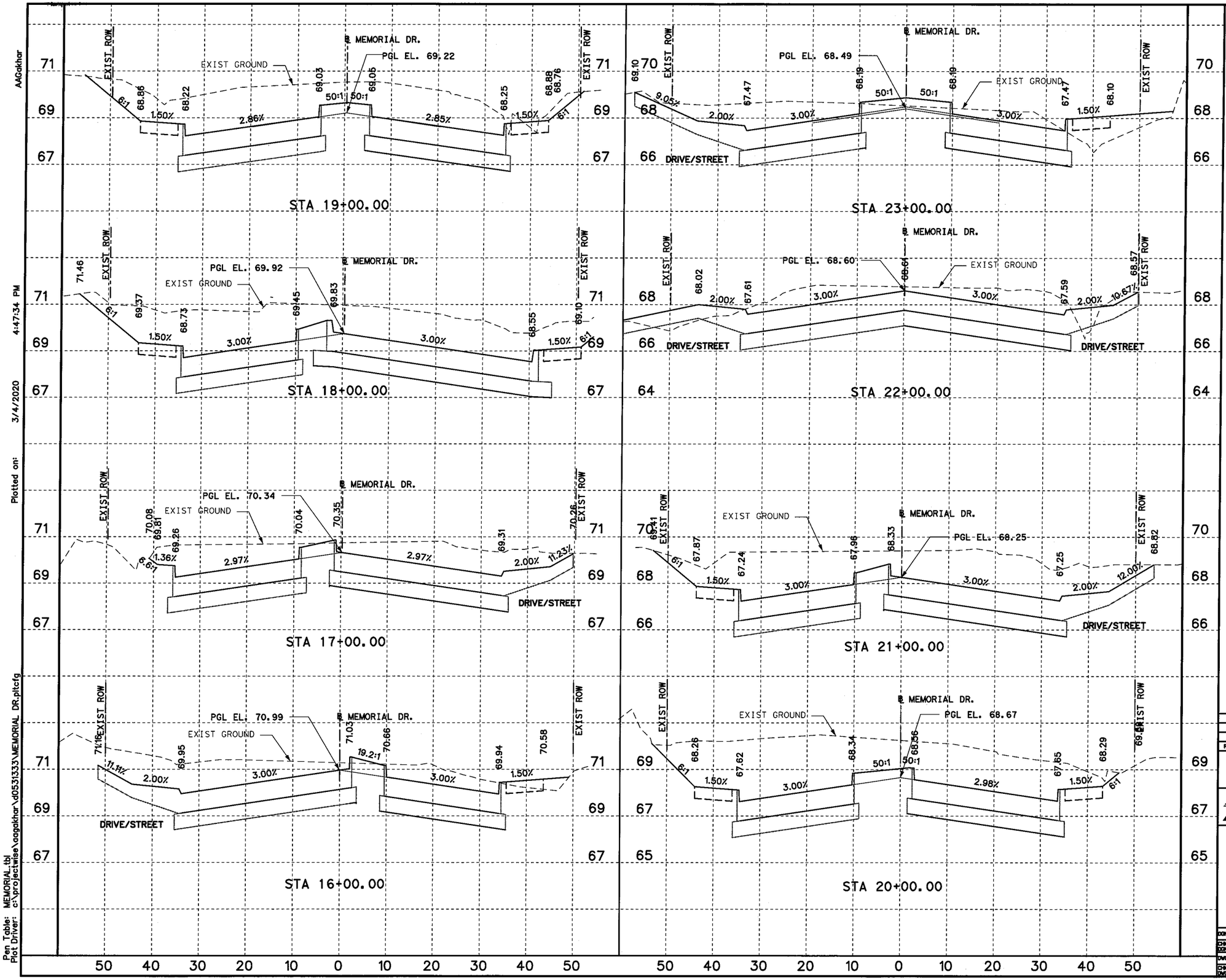

ACCEPTED AS NOTED
PUBLIC WORKS AND ENGINEERING
67862

0 10 20
(IN FEET)
SCALE: PLAN 1":10'

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED PROFESSIONAL ENGINEER
03/04/2020
Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

CROSS SECTIONS

SHEET 3 OF 7

CONT.	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK CONT.	6	TEXAS	STP 1802(783)MM			CS
DWG.	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG.	HOU	HARRIS	0912	72	391	506

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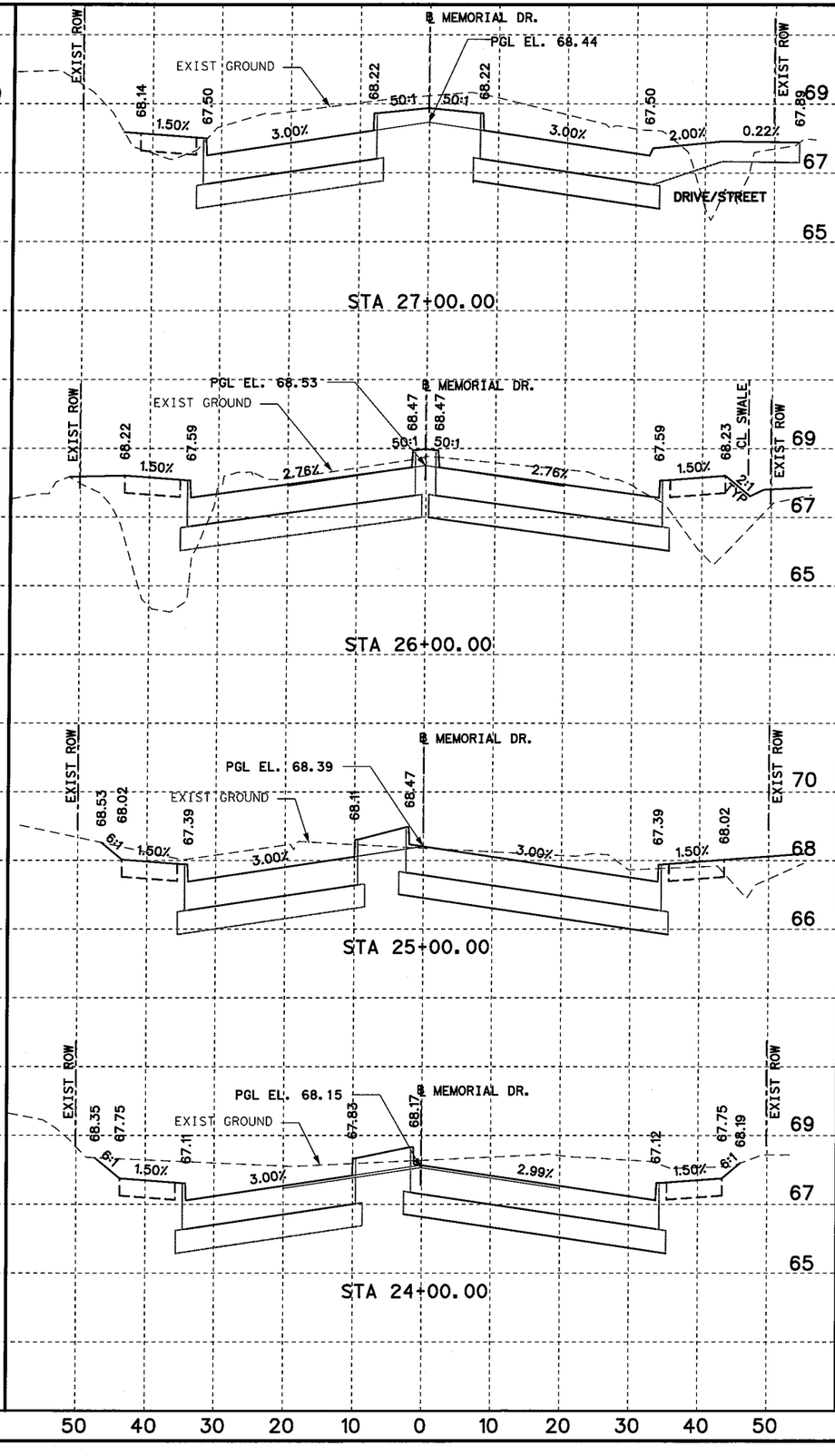

0 10 20

(IN FEET)

SCALE: PLAN 1":10'

STATE OF TEXAS
MARK WOODWARD
98672
LICENSED PROFESSIONAL ENGINEER

Lockwood, Andrews & Newnam, Inc. 03/04/2020
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

CROSS SECTIONS

SHEET 4 OF 7

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	507

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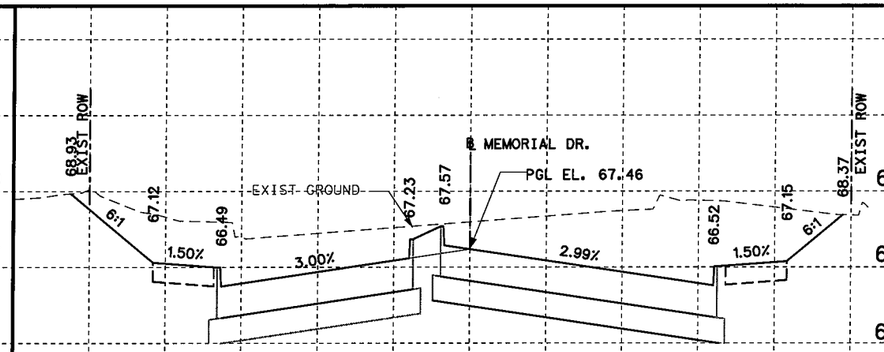

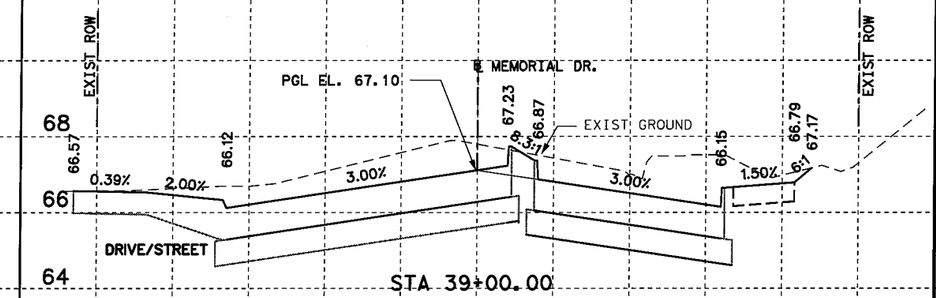

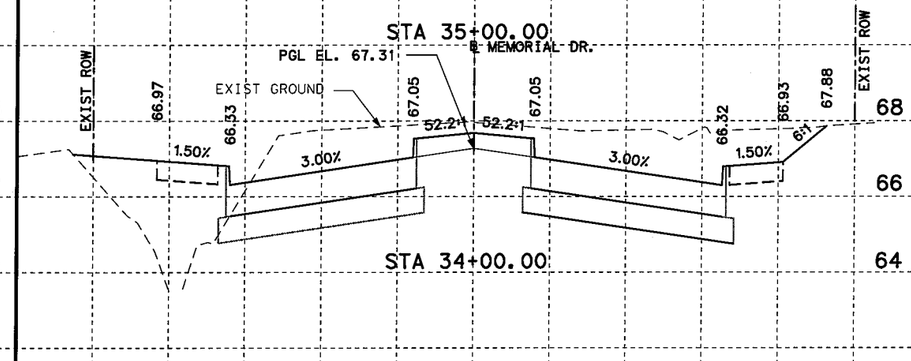

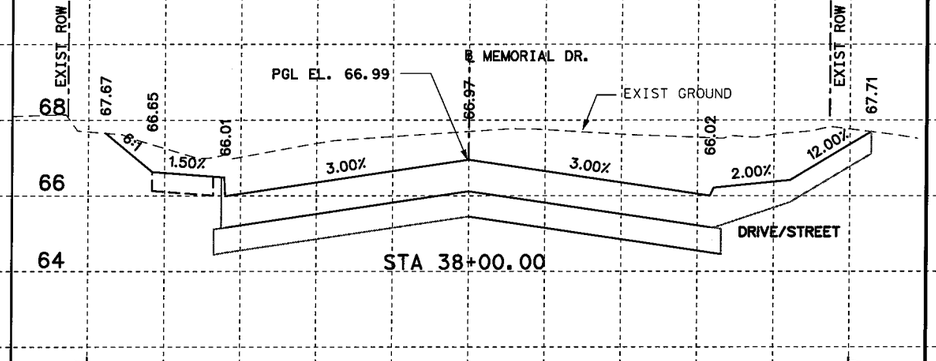

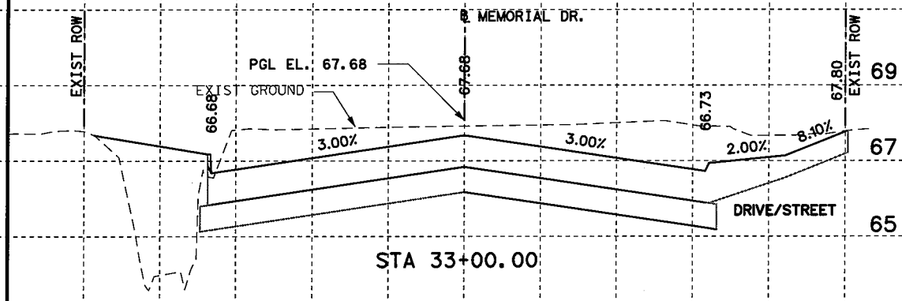

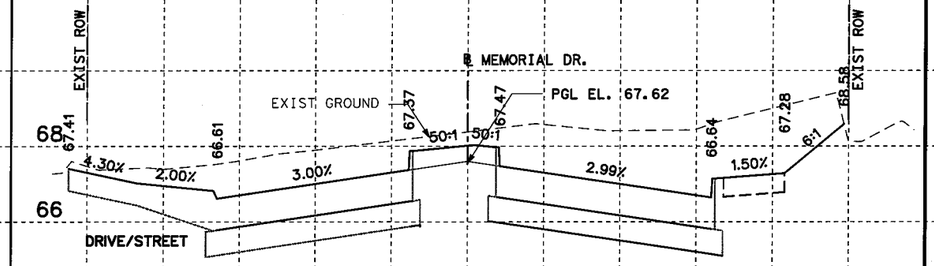

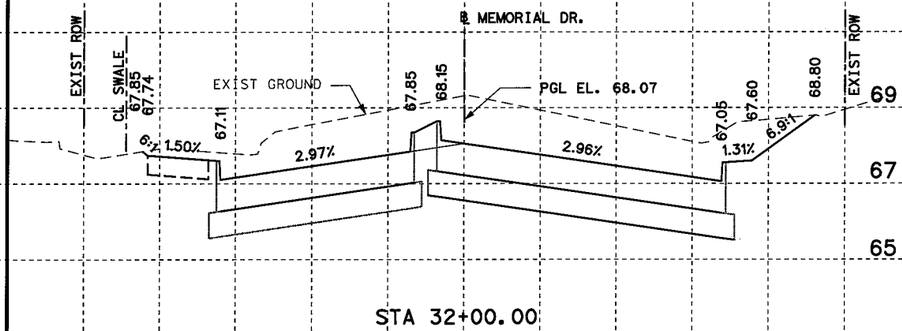

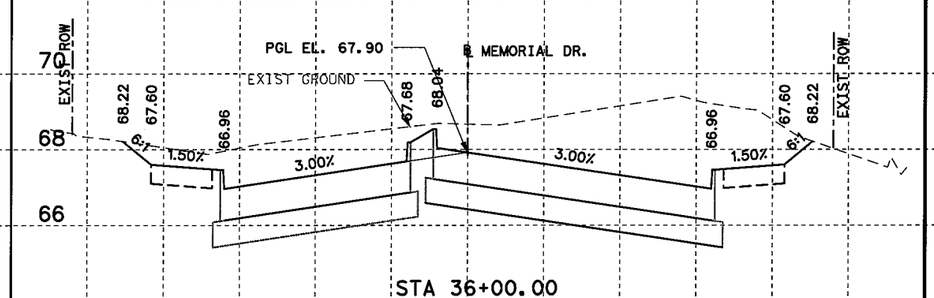

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67862

0 10 20
(IN FEET)
SCALE: PLAN 1":10'

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED
PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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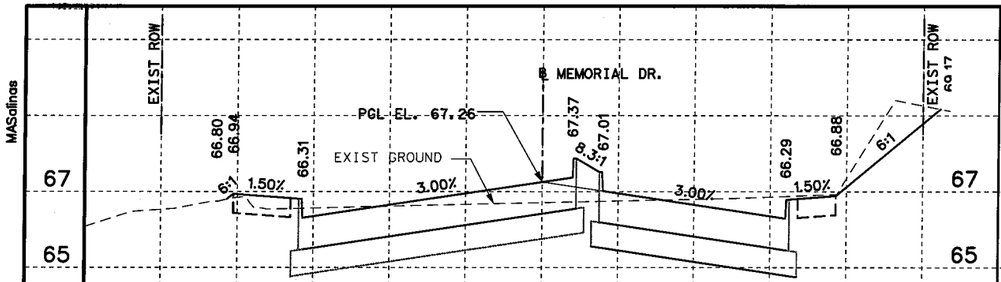
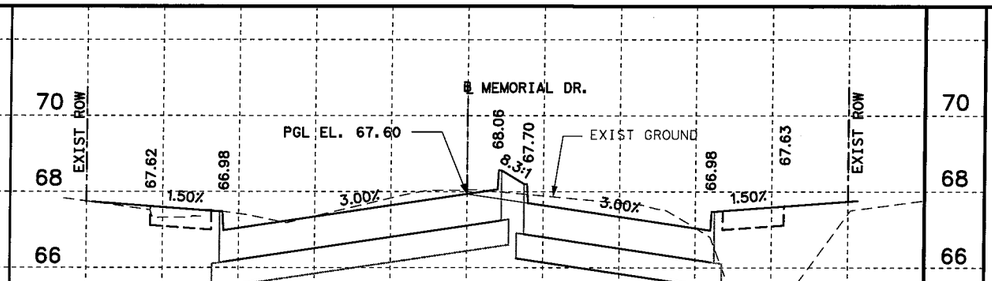
MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

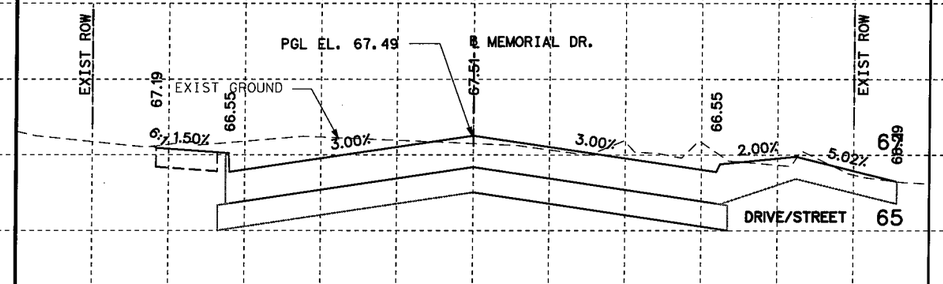
CROSS SECTIONS

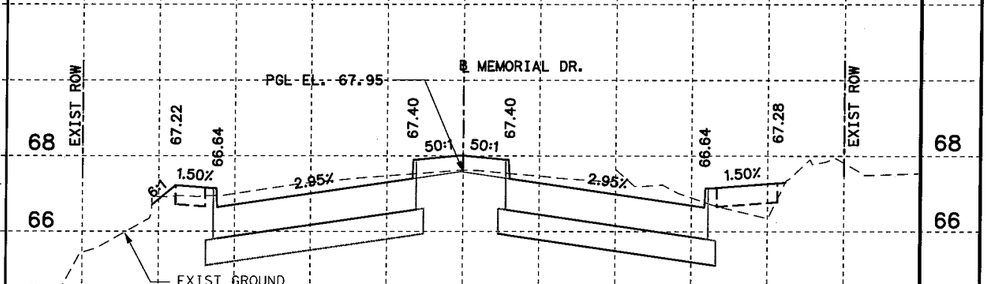
SHEET 5 OF 7

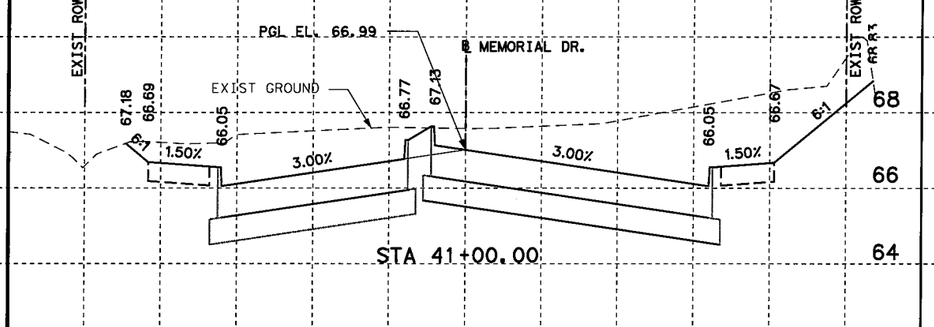
DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CK DWG:	HOU	HARRIS	0912	72	391	508

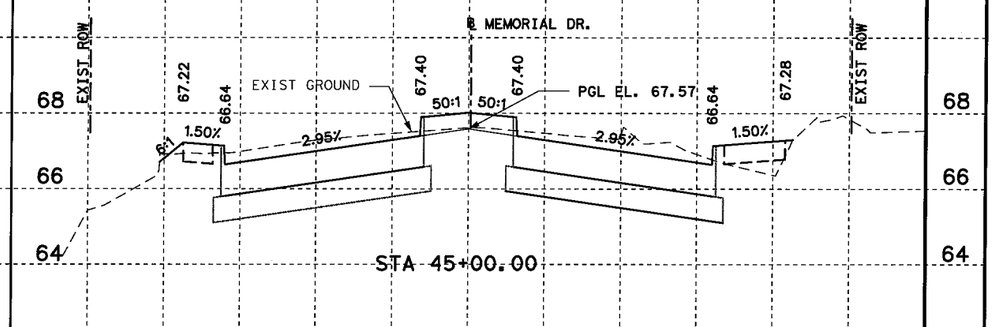


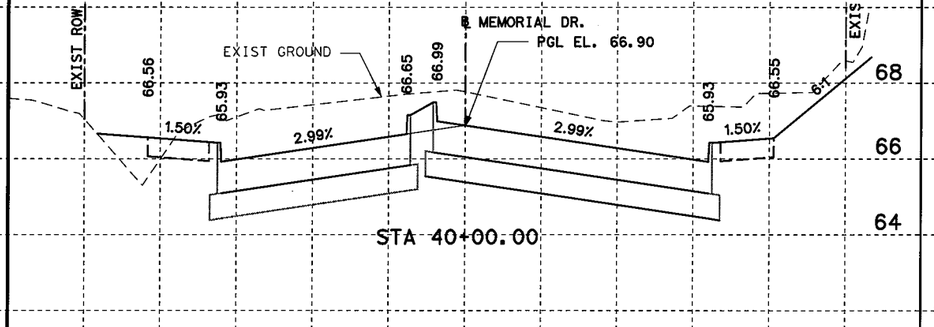


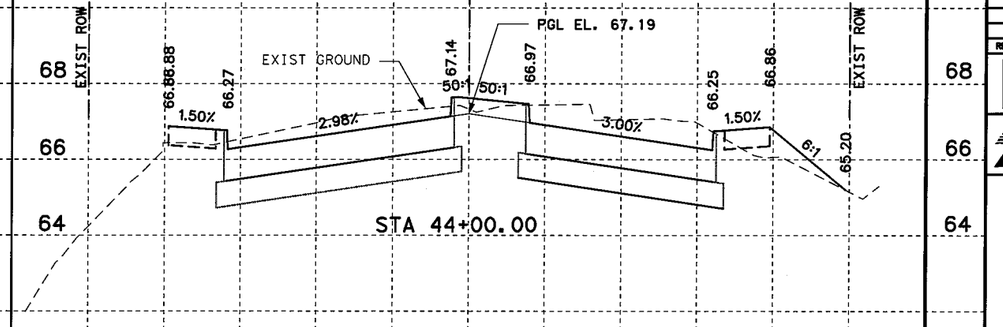












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0 10 20
(IN FEET)
SCALE: PLAN 1":10'

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED PROFESSIONAL ENGINEER
Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614
03/04/2020

REV. NO.	DATE	DESCRIPTION	BY

Lockwood, Andrews & Newnam, Inc.
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FIRM REGISTATION NO. 2614

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

CROSS SECTIONS

SHEET 6 OF 7

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
DSN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK:	HOU	HARRIS	0912	72	391	509

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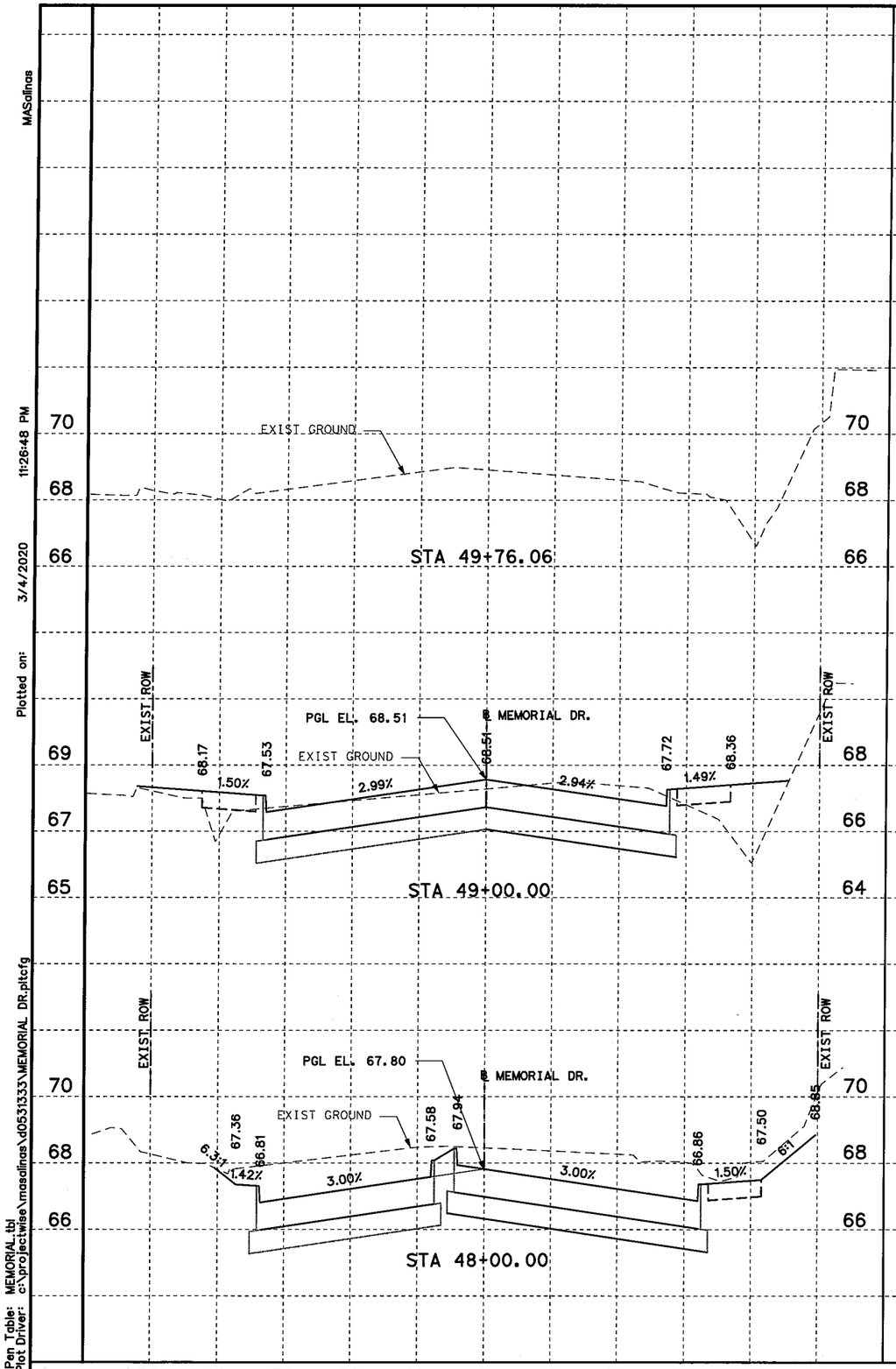

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0 10 20
(IN FEET)
SCALE: PLAN 1":10'

67862

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED PROFESSIONAL ENGINEER

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614
03/04/2020

REV. NO.	DATE	DESCRIPTION	BY

Lockwood, Andrews & Newnam, Inc.
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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

CROSS SECTIONS

SHEET 7 OF 7

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
EXIT DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	510

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DRILLING LOG

WinCore Version 3.1

County	HARRIS	Hole	T-1	District	HOUSTON
Highway	MEMORIAL DRIVE	Structure	ROADWAY/STORM SEWER	Date	02/13/2017
CSJ	N/A	Station	7+95.00	Grnd. Elev.	73.40 ft
		Offset	16.89L	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
72.4			PVMT, 3" AC+8" STAB. SHELL			14				
		8 (6) 9 (6)	CLAY, FAT, WITH SAND, soft to stiff, brown, gray, and tan -with ferrous stains, lean clay seams, and sand seams 1'-4' (CH)	0	20	23	69	51	123.2	P=2.25, -#200=80%
68.4	5					15				P=3.5
		12 (6) 14 (6)	CLAY, LEAN, stiff to very stiff, tan, gray, and brown, with sand seams, ferrous nodules, and calcareous nodules (CL)	5	38.5	17			133.1	P=3.75
63.4	10		CLAY, SANDY LEAN, stiff to very stiff, gray and tan, with ferrous stains, abundant sand seams, and fat clay pockets (CL)			13	36	23		P=3.75, -#200=54%
		12 (6) 18 (6)		9	44.3	16			135.8	P=3.0
58.4	15		SAND, CLAYEY, slightly compact, gray and tan, with ferrous and calcareous nodules -with silty sand pockets 17'-19' (SC)			13				P=4.5, -#200=29%
		13 (6) 20 (6)				8				
53.4	20		SAND, POORLY GRADED, WITH SILT, compact, gray and tan, with clayey sand seams, wet -with shell and sandstone fragments 25'-27' (SP-SM)							
		23 (6) 27 (6)				23				-#200=11%
25										
		27 (6) 29 (6)				23				
30										
		24 (6) 26 (6)								
38.4	35									TD = 35 ft
	40									

Remarks: Water was encountered at 19' (cave in) during drilling.

The ground water elevation was not determined during the course of this boring.

Driller: VAN AND SONS **Logger:** JG **Organization:** AVILES ENGINEERING CORP.

PLATE A-3

DRILLING LOG

WinCore Version 3.1

County	HARRIS	Hole	T-2	District	HOUSTON
Highway	MEMORIAL DRIVE	Structure	ROADWAY/STORM SEWER	Date	02/09/2017
CSJ	N/A	Station	12+47.26	Grnd. Elev.	71.84 ft
		Offset	21.66R	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
70.1			PVMT, 3" AC+9" STAB. CRUSHED LIMESTONE			18	35	21		P=2.25, -#200=73%
		4 (6) 7 (6)	CLAY, LEAN, WITH SAND, soft to very stiff, tan and gray, with ferrous nodules -with silty sand seams and limestone fragments 1'-2', clayey sand seams and gravel 2'-4', fat clay seams and calcareous nodules 5'-7', and silty-sand partings 10'-14' (CL)	0	11	19			126.9	P=1.25
	5					20	46	31		P=1.75, -#200=83%
		8 (6) 7 (6)		5	26.9	18			131.3	P=3.25
	10					19	42	28		P=2.5, -#200=72%
		15 (6) 17 (6)		9	28.1	19			135.4	P=2.0
57.8	15		SAND, CLAYEY, slightly compact, light gray and tan (SC)			14				P=4.5+, -#200=38%
54.8			SAND, POORLY GRADED, WITH SILT, slightly compact to very dense, gray -tan 17'-19' (SP-SM)			10				P=4.0
	20	25 (6) 27 (6)				20				-#200=10%
		16 (6) 20 (6)				23				
	25									
		50 (0) 50 (0)								
41.8	30									TD =30 ft
	35									
	40									

Remarks: Water was encountered at 24' during drilling and measured at 20.3' (cave in) after 15 min. Refusal encountered at 29'.

The ground water elevation was not determined during the course of this boring.

Driller: VAN AND SONS **Logger:** MRB **Organization:** AVILES ENGINEERING CORP.

Z:\Engineering\Reports\2017\104-17 Memorial Drive Reconstruction from BW-8 to Gessner - LAN (Chun Ho)\WinCore\T-2.CLG

PLATE A-4

PUBLIC 67862

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED
PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

BORING LOGS

SHEET 1 OF 4

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	511

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DRILLING LOG

1 of 1

WinCore Version 3.1

County	HARRIS	Hole	T-3	District	HOUSTON
Highway	MEMORIAL DRIVE	Structure	ROADWAY/STORM SEWER	Date	02/13/2017
CSJ	N/A	Station	19+17.62	Grnd. Elev.	69.68 ft
		Offset	33.34L	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
68.7			PVMT, 1.75" AC+5.5" C. STAB. SHELL			16	30	16		P=2.0, -#200=73%
		5 (6) 5 (6)	CLAY, LEAN, WITH SAND, soft to very stiff, brown, tan, and gray -with fat clay seams and ferrous stains 5'-9', and silty sand partings 7'-9' (CL)	0	14.6	20			131	P=1.5
	5					22	46	32		P=2.75, -#200=85%
		10 (6) 10 (6)		5	39.4	18			133	P=2.75
59.7	10		CLAY, SANDY LEAN, stiff to hard, gray -with silty sand seams 10'-12' (CL)			15				P=4.5+
		18 (6) 18 (6)		9	65.6	15	44	30	135.4	P=4.5+, -#200=56%
54.7	15		SAND, SILTY, slightly compact to very dense, light gray -with clay seams 17'-19', and clayey sand seams and large calcareous nodules 25'-27' (SM)			14				P=3.75
		11 (6) 13 (6)				19				-#200=25%
	20									
		32 (6) 41 (6)				23				
	25									
39.7	30	50 (2.5) 50 (1.5)								TD = 30 ft
	35									
	40									

Remarks: Water was encountered at 19' (cave in) during drilling.

The ground water elevation was not determined during the course of this boring.

Driller: VAN AND SONS **Logger: JG** **Organization: AVILES ENGINEERING CORP.**

PLATE A-5

DRILLING LOG

1 of 1

WinCore Version 3.1

County	HARRIS	Hole	T-4	District	HOUSTON
Highway	MEMORIAL DRIVE	Structure	ROADWAY/STORM SEWER	Date	02/10/2017
CSJ	N/A	Station	22+42.60	Grnd. Elev.	68.80 ft
		Offset	16.59R	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
67.1			PVMT, 6" AC+8.5" STAB. CRUSHED LIMESTONE			16	37	23		P=1.5, -#200=72%
		4 (6) 7 (6)	FILL, LEAN CLAY WITH SAND, stiff, gray, with calcareous nodules (CL)	0	19.6	15			131	P=1.5
64.8	5		CLAY, SANDY LEAN, soft, light gray, with abundant calcareous and ferrous nodules (CL)			12	41	26		P=4.0, -#200=55%
61.8		7 (6) 8 (6)	CLAY, LEAN, WITH SAND, soft to very stiff, gray and tan, with ferrous nodules (CL)	5	35	21			133.1	P=2.25
	10					18	37	23		P=3.5, -#200=79%
56.8			SAND, CLAYEY, slightly compact, gray, with silty sand seams (SC)			15				P=1.5
		16 (6) 17 (6)								
53.8	15		SAND, SILTY, loose to very dense, light gray -with sandy clay seams 15'-17', sandy silt seams 17'-19', and abundant sandstone fragments 25'-30' (SM)			16				P=1.5
		9 (6) 10 (6)				19				P=3.0, -#200=27%
	20									
		50 (2.5) 10 (0.5)				23				
	25									NO RECOVERY 25'-27'
38.8	30	50 (2.5) 50 (1.25)								TD = 30 ft
	35									
	40									

Remarks: Water was encountered at 19' (cave in) during drilling.

The ground water elevation was not determined during the course of this boring.

Driller: VAN AND SONS **Logger: JG** **Organization: AVILES ENGINEERING CORP.**

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PLATE A-6

67862

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

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MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

BORING LOGS

SHEET 2 OF 4

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	512

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DRILLING LOG

WinCore Version 3.1

County	HARRIS	Hole	T-5	District	HOUSTON
Highway	MEMORIAL DRIVE	Structure	ROADWAY/STORM SEWER	Date	02/10/2017
CSJ	N/A	Station	25+86.97	Grnd. Elev.	68.27 ft
		Offset	16.55R	GW Elev.	N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test Lateral Press. (psi)	Triaxial Test Deviator Stress (psi)	Properties MC	Properties LL	Properties PI	Properties Wet Den. (pcf)	Additional Remarks
66.6			PVMT, 5.5"AC+2"STAB. CRUSHED LIMESTONE+6.5" C. STAB. SHELL			19				P=1.0
		7 (6) 8 (6)	CLAY, LEAN, WITH SAND, soft, gray, with ferrous stains and silty sand seams (CL)			19	40	25		P=2.5, -#200=75%
63.3	5		CLAY, SANDY LEAN, soft to very stiff, gray and tan, with ferrous nodules -with silty sand seams/pockets 5'-7' and 10'-14', calcareous nodules 12'-14', chalky calcareous and fat clay pockets 15'-17', siltstone nodules, and silty/sandy clay pockets 15'-19' (CL)			18				P=2.5
		7 (6) 9 (6)		5	37.9	17			133.4	P=3.25
	10					16	30	17		P=2.75, -#200=59%
				9	15.6	15			129.8	P=2.0
		7 (6) 8 (6)				23	28	12		P=1.25, -#200=65%
	15			12	16.7	19			135.1	P=1.75
48.3	20	13 (6) 15 (6)	SAND, SILTY, dense to very dense, gray, wet -with fat clay seams 25'-27' (SM)			23				
		50 (5.5) 50 (2.5)				18				-#200=18%
	25									
38.3	30	50 (2.5) 50 (1.5)								TD = 30 ft
	35									
	40									

Remarks: Water was encountered at 20' (cave in) during drilling.

The ground water elevation was not determined during the course of this boring.

Driller: VAN AND SONS **Logger:** JG **Organization:** AVILES ENGINEERING CORP.

Z:\Engineering\Reports\2017\104-17 Memorial Drive Reconstruction from BW-8 to Gessner - LAN (Chun Ho)\WinCore\T-5.CLG

PLATE A-7

DRILLING LOG

WinCore Version 3.1

County	HARRIS	Hole	T-6	District	HOUSTON
Highway	MEMORIAL DRIVE	Structure	ROADWAY/STORM SEWER	Date	02/13/2017
CSJ	N/A	Station	33+88.66	Grnd. Elev.	67.86 ft
		Offset	19.00L	GW Elev.	N/A

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test Lateral Press. (psi)	Triaxial Test Deviator Stress (psi)	Properties MC	Properties LL	Properties PI	Properties Wet Den. (pcf)	Additional Remarks
66.9			PVMT, 4.5" AC+8" C. STAB. SHELL							
		6 (6) 8 (6)	CLAY, LEAN, WITH SAND, soft to stiff, gray -with roots and silt partings 0'-2', fat clay and silty sand seams 2'-4', and ferrous stains 5'-7' (CL)	0	10.8	16			129.9	P=1.25
						19	42	27		P=1.5, -#200=77%
	5			4	27.4	13			137.2	P=3.75
60.9			SAND, CLAYEY, slightly compact, gray and tan, with silty sand seams -with ferrous stains 10'-12' (SC)			10				P=3.25, -#200=43%
		19 (6) 18 (6)				15				P=3.75
	10					15				P=0.25
		9 (6) 17 (6)								
52.9	15		SAND, POORLY GRADED, WITH SILT, slightly compact to very dense, gray -with silty clayey sand pockets 17'-19', and fat clay pockets 25'-27' (SP-SM)			17				#200=12%
		16 (6) 24 (6)				17				
	20									
		26 (6) 23 (6)				21				
37.9	25									TD = 30 ft
		50 (3) 50 (1)								
	30									
	35									
	40									

Remarks: Water was encountered at 18' (cave in) during drilling.

The ground water elevation was not determined during the course of this boring.

Driller: VAN AND SONS **Logger:** JG **Organization:** AVILES ENGINEERING CORP.

Z:\Engineering\Reports\2017\104-17 Memorial Drive Reconstruction from BW-8 to Gessner - LAN (Chun Ho)\WinCore\T-6.CLG

PLATE A-8

67862

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED
PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation ©2020

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

BORING LOGS

SHEET 3 OF 4

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	513

Plotted on: 3/4/2020 4:49:04 PM
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Plot Driver: c:\projectwise\aagakhar\d0531333\MEMORIAL DR.pltcfg
AAGakhar
Design Filename: pw:\\lan-pw.bentley.com:lan-pw-01\Documents\Projects\120-19972-000\4-0-Production-Working\4-1-BIM-CAD\General\BOR-03.dgn

DRILLING LOG

WinCore Version 3.1

County	HARRIS	Hole	T-7	District	HOUSTON
Highway	MEMORIAL DRIVE	Structure	ROADWAY/STORM SEWER	Date	02/10/2017
CSJ	N/A	Station	37+33.89	Grnd. Elev.	68.20 ft
		Offset	17.80R	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
67.2			PVMT, 12" AC							
			FILL, LEAN CLAY WITH SAND, stiff, gray and tan -with fat clay pockets and silty sand seams 1'-2', and crushed limestone pockets 2'-4' (CL)	0	16.3	19			131.6	P=1.5
		9 (6) 12 (6)				18	33	19		P=1.0, -#200=77%
63.2	5		CLAY, SANDY LEAN, stiff, gray -with ferrous nodules and crushed limestone pockets 5'-7', sand pockets 7'-9', and silty sand seams 10'-12' (CL)			13				P=4.5+
		17 (6) 16 (6)		5	21.8	13			132.2	P=2.75
	10					13	29	15		P=3.75, -#200=51%
56.2			SAND, CLAYEY, compact, light gray -with silty clay pockets and silty sand seams 12'-14' (SC)	9	41.9	11			139.1	P=4.5+
	15	21 (6) 23 (6)				14				P=4.5+
						13				P=3.5, -#200=22%
48.2	20	25 (6) 27 (6)	SAND, SILTY, dense to very dense, light gray, wet (SM)							
		35 (6) 50 (6)				22				
	25									
38.2	30	50 (2.5) 50 (1.5)								TD = 30 ft
	35									
	40									

Remarks: Water was encountered at 20' (cave in) during drilling.

The ground water elevation was not determined during the course of this boring.

Driller: VAN AND SONS Logger: JG Organization: AVILES ENGINEERING CORP.

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PLATE A-9

DRILLING LOG

WinCore Version 3.1

County	HARRIS	Hole	T-8	District	HOUSTON
Highway	MEMORIAL DRIVE	Structure	ROADWAY/STORM SEWER	Date	02/15/2017
CSJ	N/A	Station	41+50.70	Grnd. Elev.	68.14 ft
		Offset	67.32L	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
67.1			PVMT, 4" AC+3" IRON ORE BASE							
66.1			FILL, SILTY SAND, with gravel(SM)			10				
		16 (6) 18 (6)	CLAY, FAT, WITH SAND, stiff to hard, tan and gray, with ferrous stains (CH)	0	110.3	15	51	35	135.4	P=4.5+, -#200=80%
63.1	5		SAND, CLAYEY, dense, gray and tan -with sandy clay seams 7'-9', and abundant silty sand seams and pockets 10'-12' (SC)			9				P=4.5+
		50 (4) 50 (2.5)		5	77.9	7	26	10	131.2	P=4.5+, -#200=43%
	10					4				P=1.75
56.1			CLAY, SANDY LEAN, stiff, gray and tan (CL)			12				P=4.5+, -#200=61%
		19 (6) 20 (6)								
53.1	15		SAND, CLAYEY, dense, gray and tan, with clay seams and pockets (SC)			10				P=0.5
		49 (6) 50 (3.5)				17				P=1.5, -#200=40%
45.1	20		SAND, SILTY, slightly compact, gray and tan, wet (SM)							
		9 (6) 13 (6)				22				
	25									
38.1	30	9 (6) 13 (6)								TD = 30 ft
	35									
	40									

Remarks: Water was encountered at 23' during drilling.

The ground water elevation was not determined during the course of this boring.

Driller: VAN AND SONS Logger: JG Organization: AVILES ENGINEERING CORP.

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PLATE A-10

67862

STATE OF TEXAS
MARK WOODWARD
96672
LICENSED
PROFESSIONAL ENGINEER
03/04/2020

Lockwood, Andrews & Newnam, Inc.
Texas Registered Engineering Firm F-2614

REV. NO.	DATE	DESCRIPTION	BY

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

Texas Department of Transportation ©2020

MEMORIAL DRIVE RECONSTRUCTION AND ACCESS MANAGEMENT

BORING LOGS

SHEET 4 OF 4

DGN:	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CHK DGN:	6	TEXAS	STP 1802(783)MM			CS
DWG:	DIST.	COUNTY	CONT. NO.	SECT. NO.	JOB NO.	SHEET NO.
CHK DWG:	HOU	HARRIS	0912	72	391	514

Pen Table: MEMORIAL.tbl
Plot Driver: c:\projectwise\aagakhar\d0531333\MEMORIAL_DR.pltcfg
Plotted on: 3/4/2020 4:49:15 PM AAGakhar

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