FHWA TEXAS DIVISION				SHEET NO. 1
STATE	DISTRICT	COUNTY		
TEXAS	PARIS	GRAYSON		
CONTROL	SECTION	JOB	HIGHWAY NO.	
0091	10	002	FS 121	

INDEX OF SHEETS

SEE SHEET 2 FOR INDEX OF SHEETS

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED STATE HIGHWAY IMPROVEMENT

FEDERAL AID PROJECT NO.

F 2021 (862)

FS 121
GRAYSON COUNTY

LIMITS: FROM FM 121 TO COUNTY LINE ROAD

TOTAL LENGTH OF PROJECT =
ROADWAY = 23,632 FT. = 4.476 MI.
BRIDGE = 0.00 FT. = 0.000 MI.
TOTAL = 23,632 FT. = 4.476 MI.

TYPE OF WORK: FOR THE CONSTRUCTION OF 2 LANE UNDIVIDED FS 121 CONSISTING OF: PAVING, GRADING, DITCHES, CULVERTS SIGNING, AND PAVEMENT MARKINGS

FUNCTIONAL CLASS = PRINCIPAL ARTERIAL
DESIGN SPEEDS = 55 MPH FM SPUR 121
50 MPH FM 121
30 MPH STIFF CHAPEL RD
20 MPH SCHARFF RD
AADT (2023) = 4,300
AADT (2043) = 12,700

FINAL PLANS

LETTING DATE:

DATE CONTRACTOR BEGAN WORK:

DATE WORK WAS COMPLETED:

DATE WORK WAS ACCEPTED:

ORIGINAL CONTRACT WORKING DAYS:

USED OF WORKING DAYS

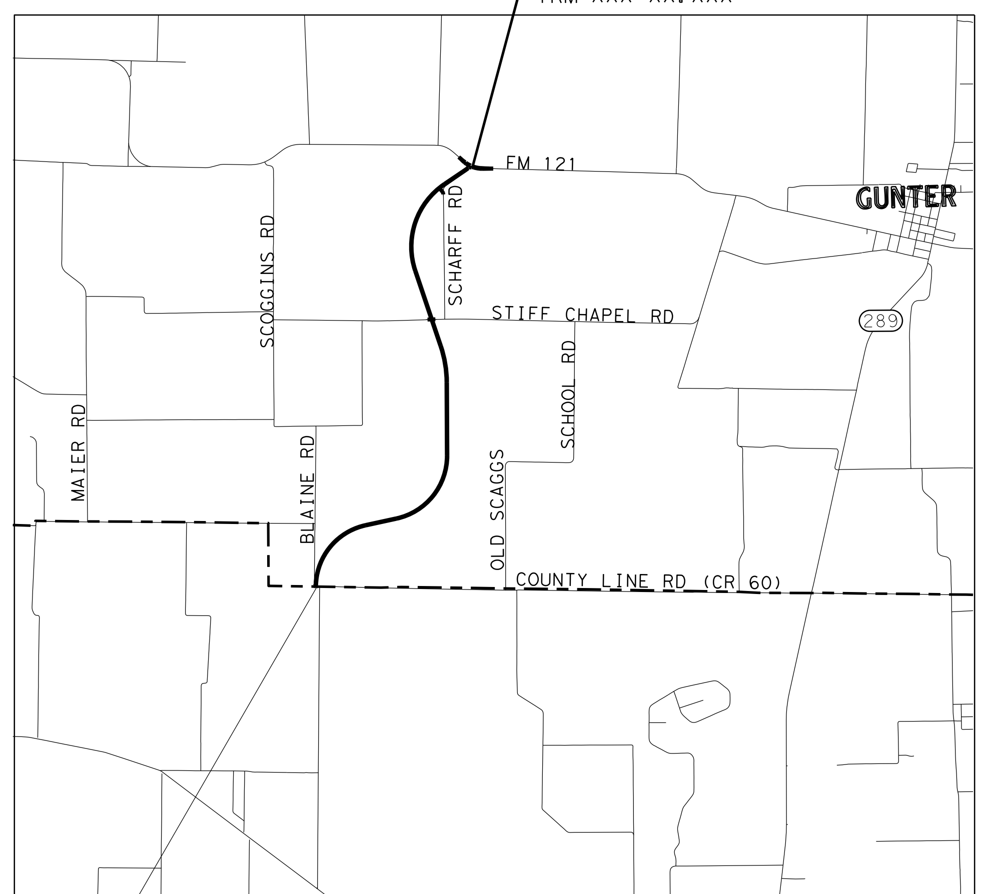
NO. OF CHANGE ORDERS:

FINAL CONTRACT COST:

PERCENT OVER/UNDER RUN:

CONTRACTOR:

END PROJECT
CSJ 0091-10-002
STA 3606+21
TRM XXX+XX.XXX



N

GRAYSON COUNTY

NTS

PARIS DISTRICT

BEGIN PROJECT
CSJ 0091-10-002
STA 3369+89
TRM XXX+XX.XXX

EXCEPTIONS: N/A
EQUATIONS: N/A
RAILROAD CROSSINGS: N/A

I CERTIFY THAT THIS PROJECT WAS BUILT IN ACCORDANCE WITH PLANS AND SPECIFICATIONS.

AREA ENGINEER DATE

REQUIRED SIGNS SHALL BE IN ACCORDANCE WITH BC (1)- 21 THRU BC (12)- 21 AND THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES".

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

BGE, Inc.
2595 Dallas Parkway, Suite 101, Frisco, TX 75034
Tel: 972-464-4800 • www.bgeinc.com
TBPE Registration No. F-1046

SUBMITTED FOR LETTING: 7/15/2021

Ashley Beyer

Ashley Christine Beyer, P.E. - BGE, INC.

RECOMMENDED FOR LETTING: 7/16/2021

DocuSigned by:

DIRECTOR OF TRANSPORTATION PLANNING & DEVELOPMENT

RECOMMENDED FOR LETTING: 7/19/2021

DocuSigned by:
Aaron R. Bloom
2F03D019E58F45F... AREA ENGINEER

APPROVED FOR LETTING: 7/16/2021

DocuSigned by:
Noel Paramanantham
AF7AF41AFE60... DISTRICT ENGINEER

FILE: \\bgepwiiics01\iCS*pdf*work*dir\460\33795*66\248-05COV01*BGE.dgn
DATE: 7/15/2021 8:19:57 PM

INDEX OF SHEETS

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

STATE OF TEXAS
JENN-HWAN MA
83964
LICENSED
PROFESSIONAL ENGINEER

JENN-HWAN MA & , P.E. 7/15/2021 Date

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

STATE OF TEXAS
ASHLEY C. BEYER
130809
LICENSED
PROFESSIONAL ENGINEER

ASHLEY CHRISTINE BEYER & , P.E. 7/15/2021 Date

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

STATE OF TEXAS
STEPHEN T. SKROVANEK
138388
LICENSED
PROFESSIONAL ENGINEER

STEPHEN T. SKROVANEK & , P.E. 7/15/2021 Date

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

STATE OF TEXAS
CURTIS KESTILA
111513
LICENSED
PROFESSIONAL ENGINEER

CURTIS KESTILA & , P.E. 7/15/2021 Date

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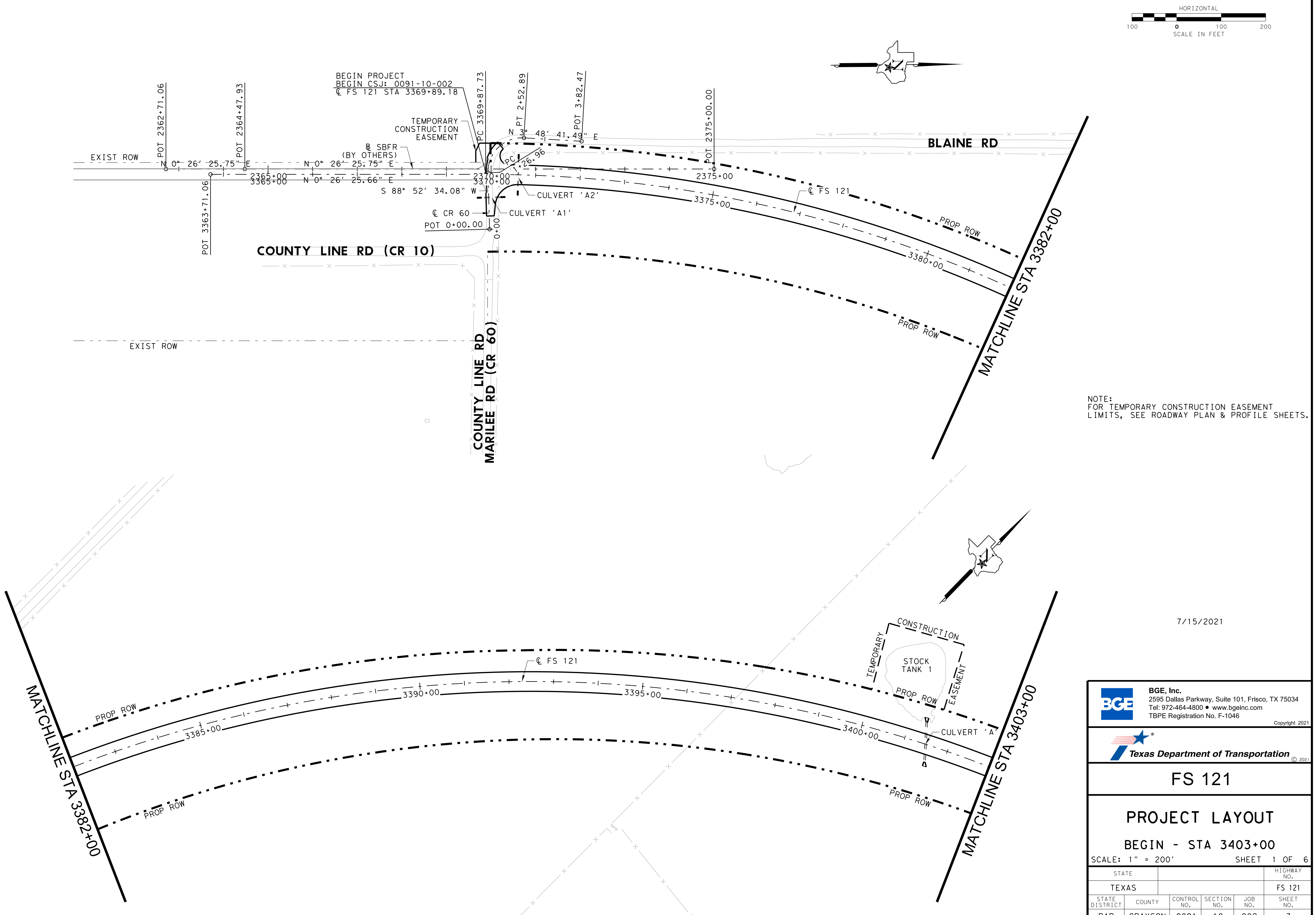
6			FS 121
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	PAR	GRAYSON	2
CONTROL	SECTION	JOB	
0091	10	002	


HORIZONTAL
100 0 100 200
SCALE IN FEET
BEGIN PROJECT
BEGIN CSJ: 0091-10-002
℄ FS 121 STA 3369+89.18
TEMPORARY CONSTRUCTION EASEMENT
℄ SBFR (BY OTHERS)
EXIST ROW
POT 2362+71.06
POT 2364+47.93
POT 3363+71.06
PC 3369+87.73
PT 2+52.89
POT 3+82.47
POT 2375+00.00
N 0° 26′ 25.75" E
N 0° 26′ 25.75" E
N 0° 26′ 25.66" E
N 3° 48′ 41.49" E
S 88° 52′ 34.08" W
2365+00
3365+00
2370+00
3370+00
2375+00
3375+00
3380+00
PC
26.96
BLAINE RD
℄ FS 121
CULVERT 'A2'
CULVERT 'A1'
℄ CR 60
POT 0+00.00
0+00
PROP ROW
COUNTY LINE RD (CR 10)
COUNTY LINE RD
MARILEE RD (CR 60)
EXIST ROW
MATCHLINE STA 3382+00
MATCHLINE STA 3382+00
3385+00
3390+00
3395+00
3400+00
TEMPORARY CONSTRUCTION EASEMENT
STOCK TANK 1
CULVERT 'A'
MATCHLINE STA 3403+00

NOTE:
FOR TEMPORARY CONSTRUCTION EASEMENT LIMITS, SEE ROADWAY PLAN & PROFILE SHEETS.

7/15/2021

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FS 121

PROJECT LAYOUT

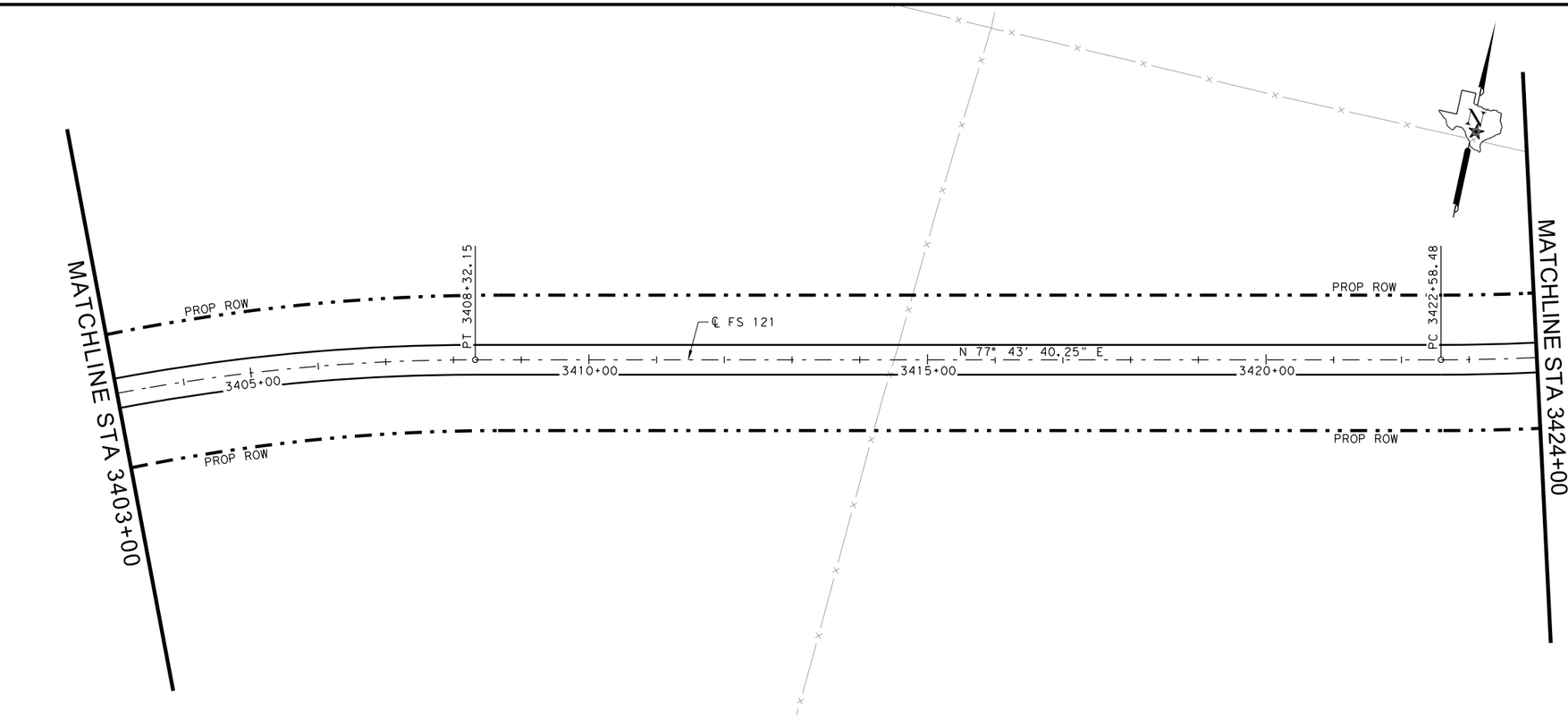
BEGIN - STA 3403+00

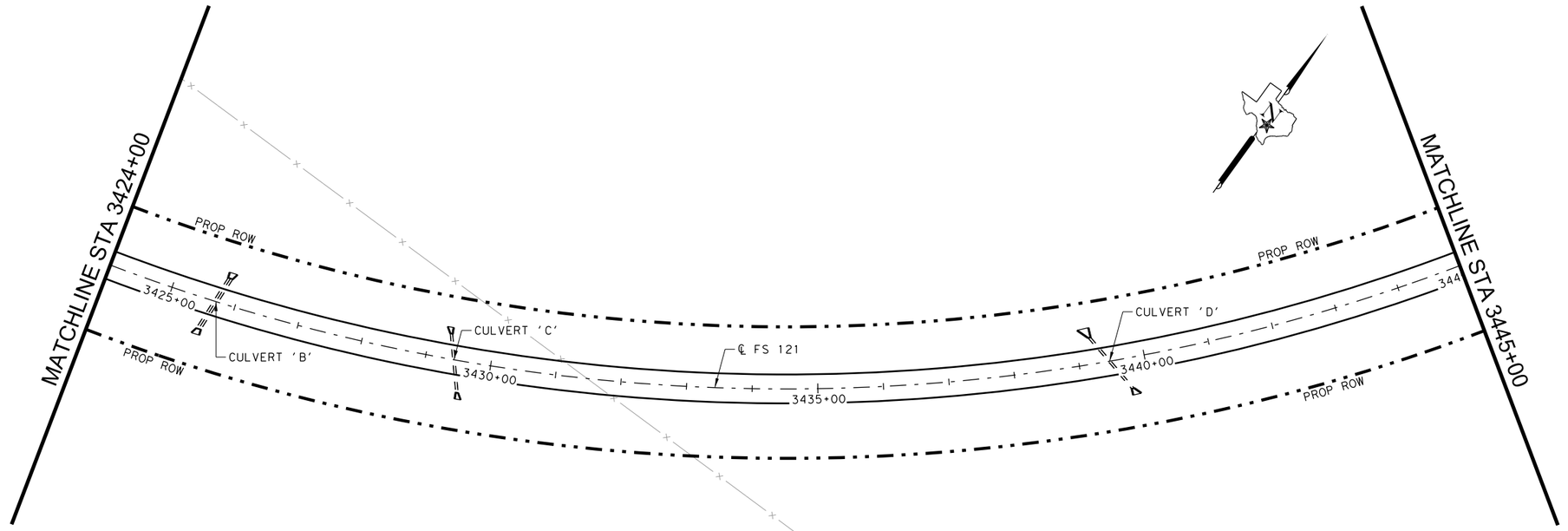
SCALE: 1" = 200′ SHEET 1 OF 6

STATE		HIGHWAY NO.
TEXAS		FS 121

STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	3

HORIZONTAL
100 0 100 200
SCALE IN FEET





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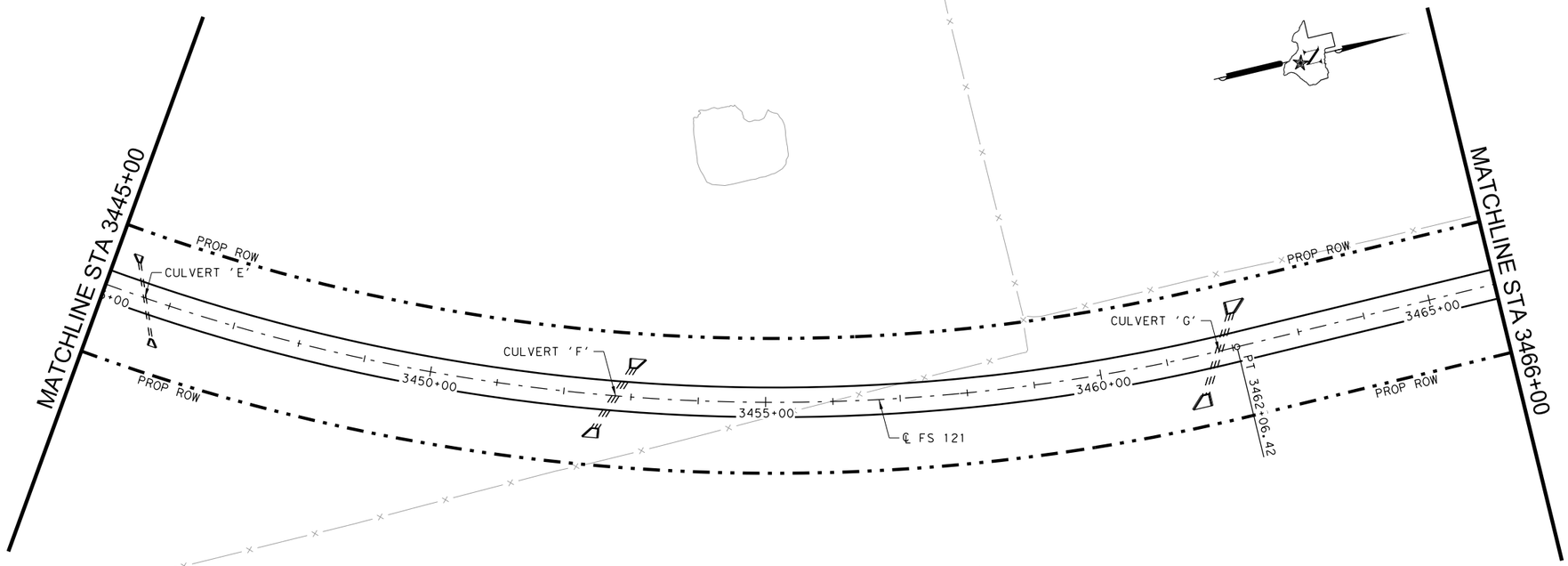
FS 121

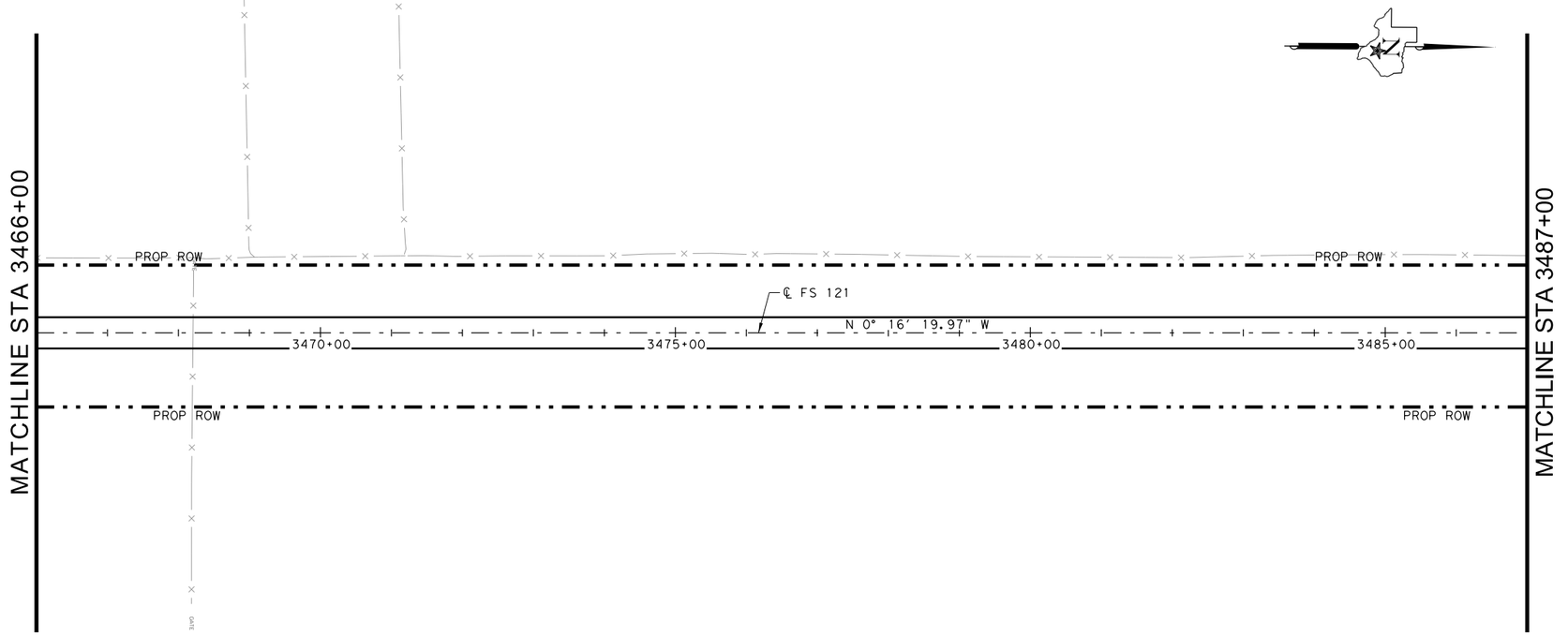
PROJECT LAYOUT

STA 3403+00 - STA 3445+00

SCALE: 1" = 200' SHEET 2 OF 6

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	4





HORIZONTAL
100 0 100 200
SCALE IN FEET

7/15/2021

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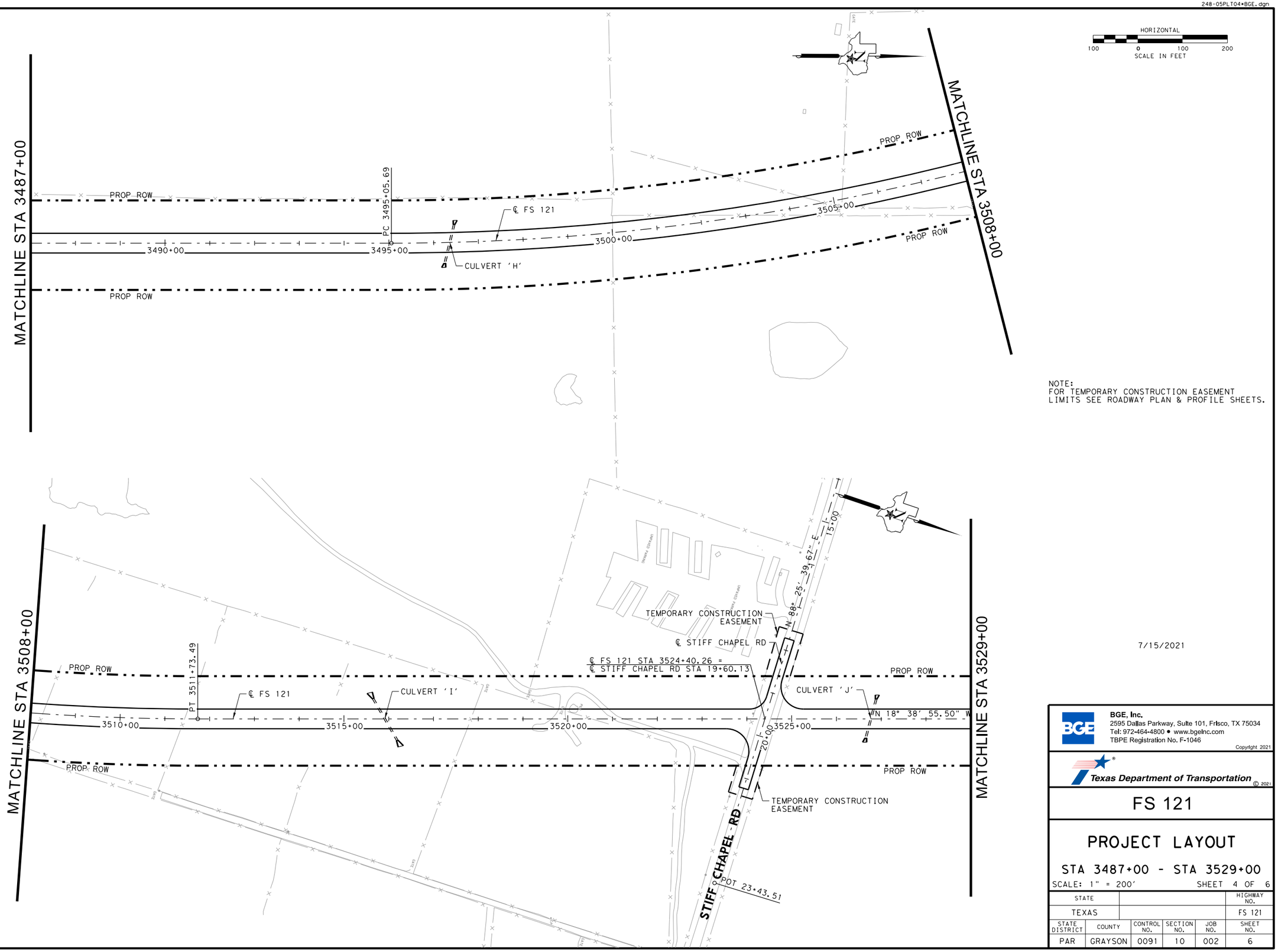
FS 121

PROJECT LAYOUT

STA 3445+00 - STA 3487+00

SCALE: 1" = 200' SHEET 3 OF 6

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	5



NOTE:
FOR TEMPORARY CONSTRUCTION EASEMENT LIMITS SEE ROADWAY PLAN & PROFILE SHEETS.

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FS 121

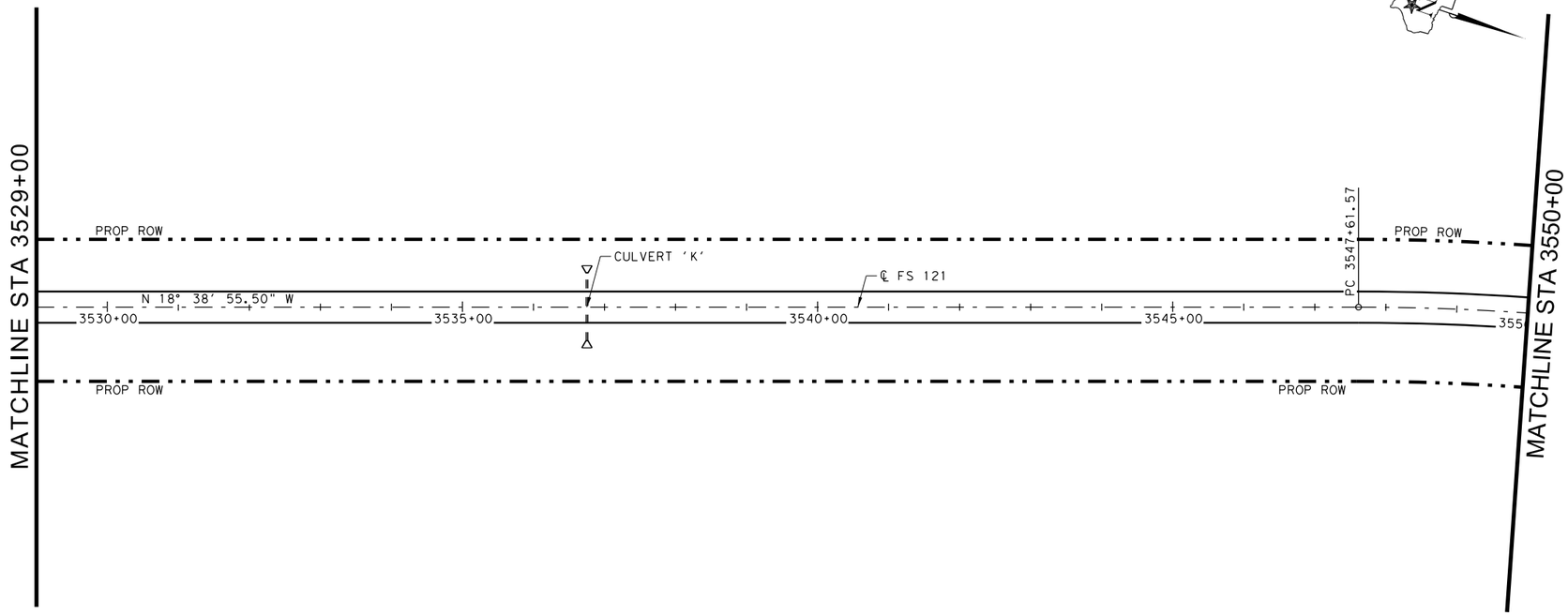
PROJECT LAYOUT

STA 3487+00 - STA 3529+00

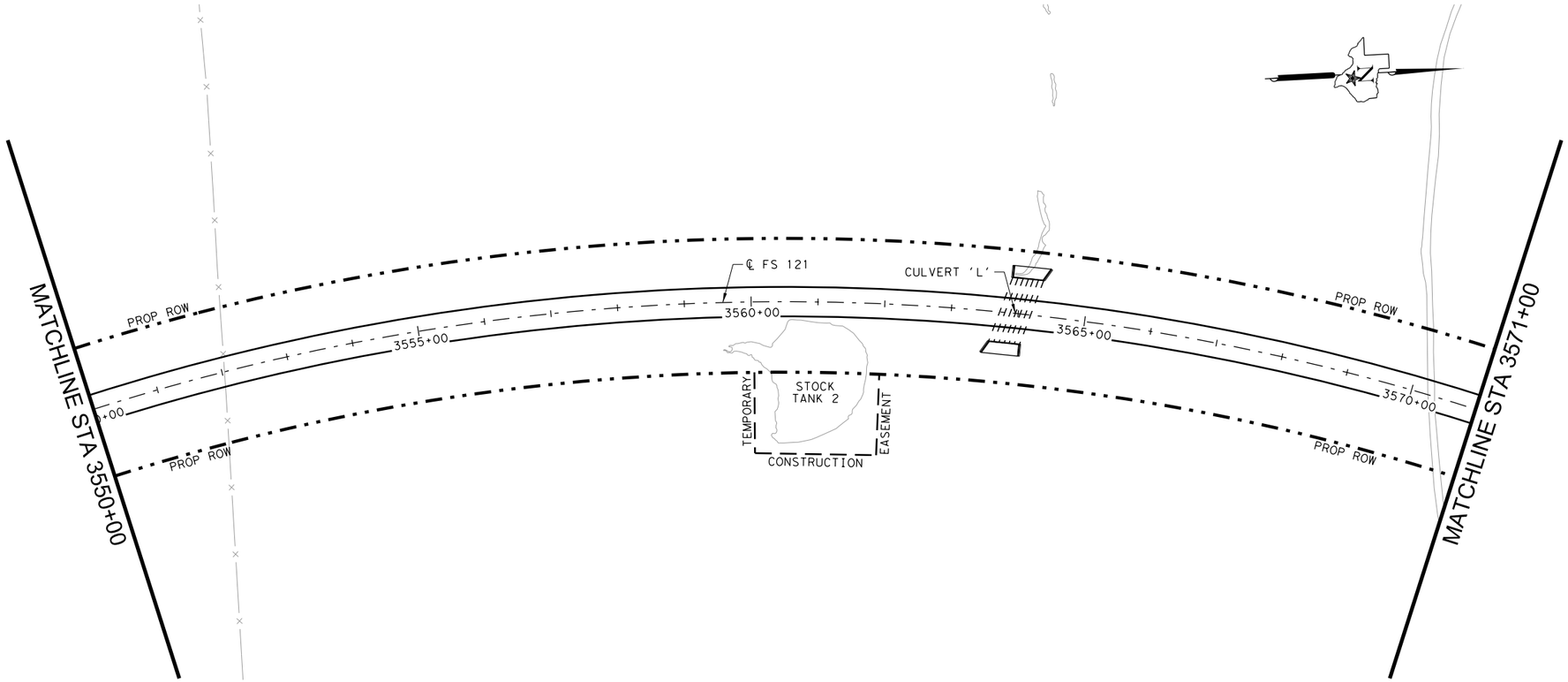
SCALE: 1" = 200' SHEET 4 OF 6

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	6

HORIZONTAL
100 0 100 200
SCALE IN FEET



NOTE:
FOR TEMPORARY CONSTRUCTION EASEMENT
LIMITS SEE ROADWAY PLAN & PROFILE SHEETS.



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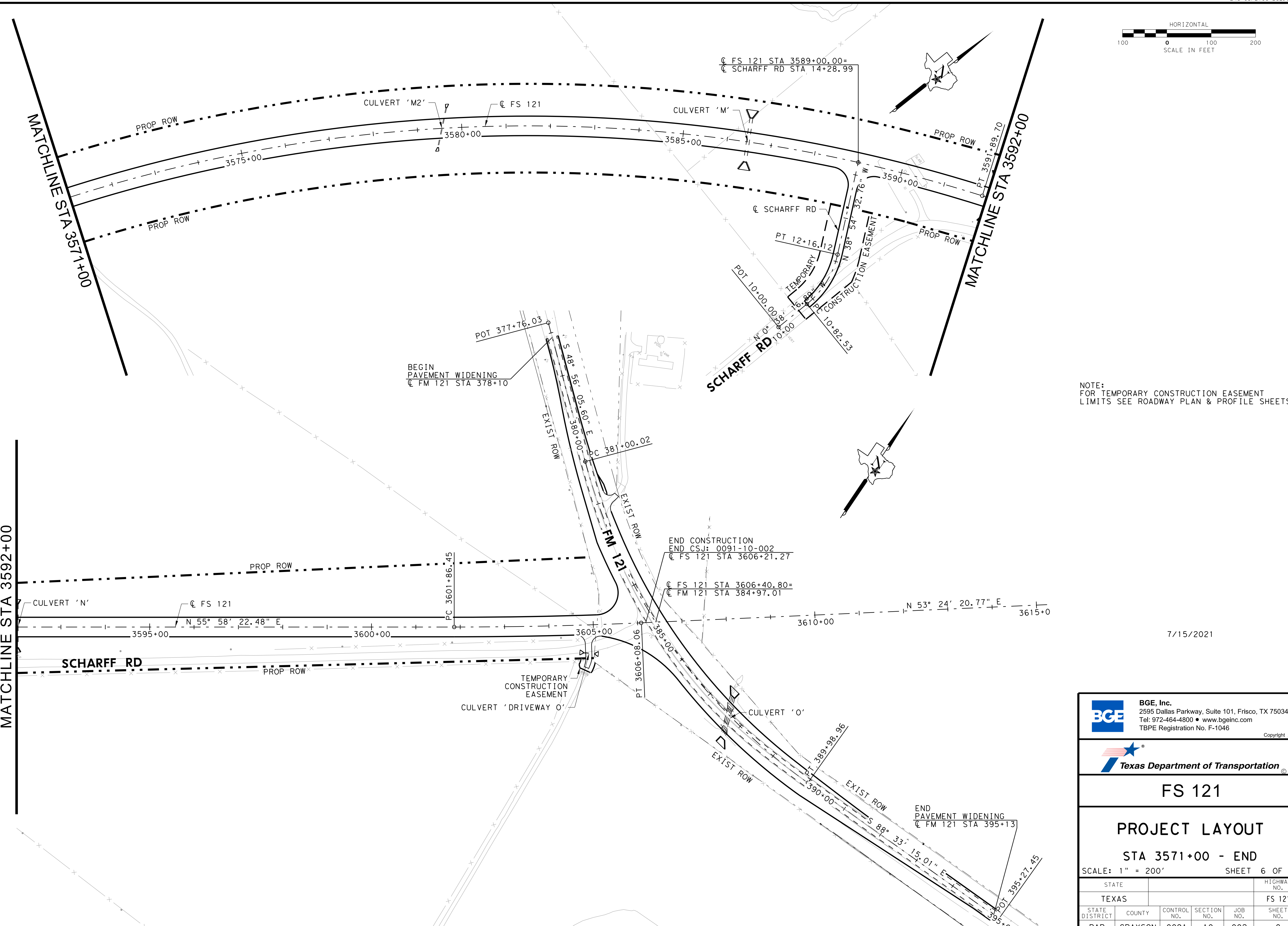
FS 121

PROJECT LAYOUT

STA 3529+00 - STA 3571+00

SCALE: 1" = 200' SHEET 5 OF 6

STATE				HIGHWAY NO.
TEXAS				FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	7



HORIZONTAL
100 0 100 200
SCALE IN FEET
MATCHLINE STA 3571+00
MATCHLINE STA 3592+00
PROP ROW
CULVERT 'M2'
℄ FS 121
3575+00
3580+00
3585+00
3590+00
CULVERT 'M'
℄ FS 121 STA 3589+00.00=
℄ SCHARFF RD STA 14+28.99
PT 3591+89.70
℄ SCHARFF RD
PT 12+16.12
N 38° 54' 32.76" W
TEMPORARY CONSTRUCTION EASEMENT
POT 10+00.00
10+00
10+82.53
SCHARFF RD
POT 377+76.03
BEGIN
PAVEMENT WIDENING
℄ FM 121 STA 378+10
S 48° 56' 05.60" E
380+00
PC 381+00.02
EXIST ROW
FM 121
NOTE:
FOR TEMPORARY CONSTRUCTION EASEMENT
LIMITS SEE ROADWAY PLAN & PROFILE SHEETS.
END CONSTRUCTION
END CSJ: 0091-10-002
℄ FS 121 STA 3606+21.27
℄ FS 121 STA 3606+40.80=
℄ FM 121 STA 384+97.01
N 53° 24' 20.77" E
3610+00
3615+0
PC 3601+86.45
CULVERT 'N'
N 55° 58' 22.48" E
3595+00
3600+00
3605+00
PT 3606+08.06
385+00
TEMPORARY
CONSTRUCTION
EASEMENT
CULVERT 'DRIVEWAY O'
CULVERT 'O'
PT 389+98.96
390+00
S 88° 33' 15.01" E
END
PAVEMENT WIDENING
℄ FM 121 STA 395+13
POT 395+27.45
395+00
7/15/2021

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FS 121

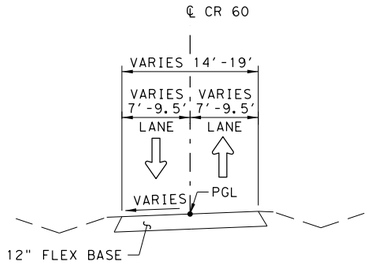
PROJECT LAYOUT

STA 3571+00 - END

SCALE: 1" = 200'   SHEET 6 OF 6

STATE		HIGHWAY NO.
TEXAS		FS 121

STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	8



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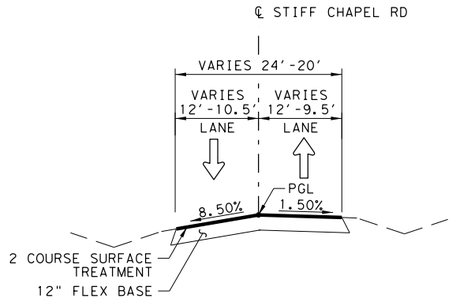
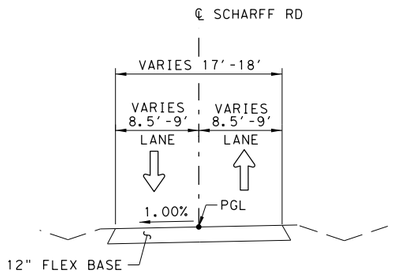
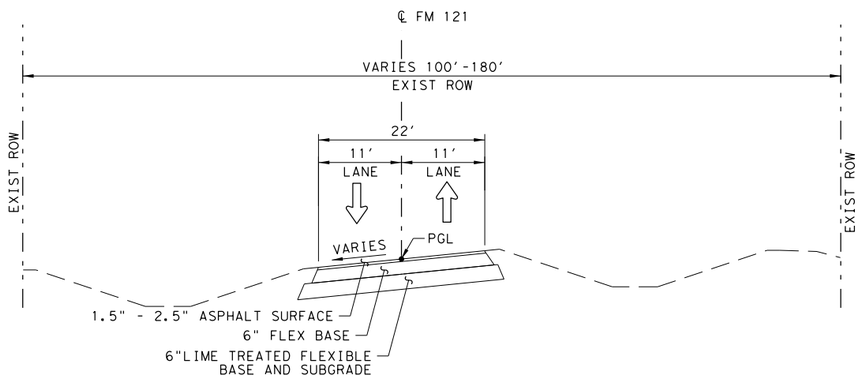


EXISTING STIFF CHAPEL RD



EXISTING SCHARFF RD



EXISTING FM 121

7/15/2021

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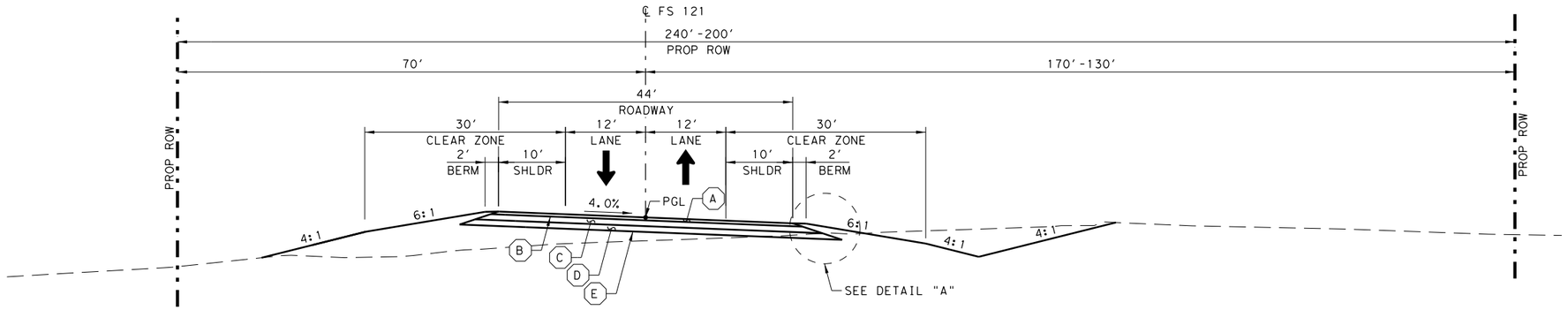
FS 121

EXISTING TYPICAL SECTIONS

SCALE: N/A SHEET 1 OF 1

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	9



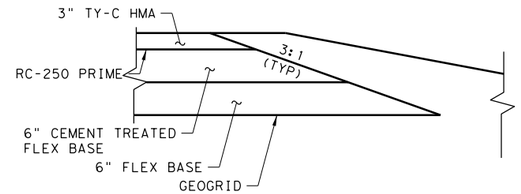
FS 121

STA 3369+89 TO STA 3392+33

CROSS SLOPE TRANSITION
STA 3370+59 TO STA 3372+24

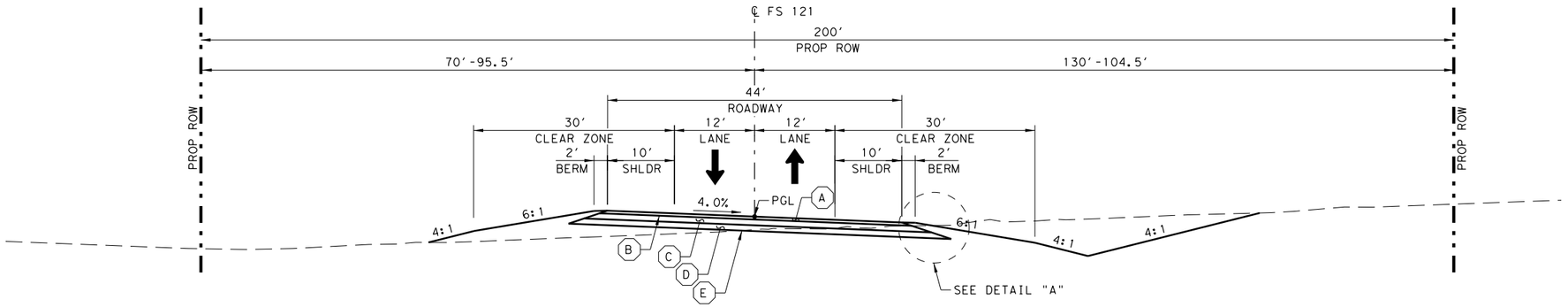
LEGEND

A	3" TY-C HMA
B	RC-250 PRIME
C	6" CEMENT TREATED FLEX BASE
D	6" FLEX BASE
E	GEOGRID



DETAIL "A"

N.T.S.



FS 121

STA 3392+33 TO STA 3409+50

CROSS SLOPE TRANSITION
STA 3407+85 TO STA 3409+50

7/15/2021

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FS 121

PROPOSED TYPICAL SECTIONS

SCALE: N/A

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
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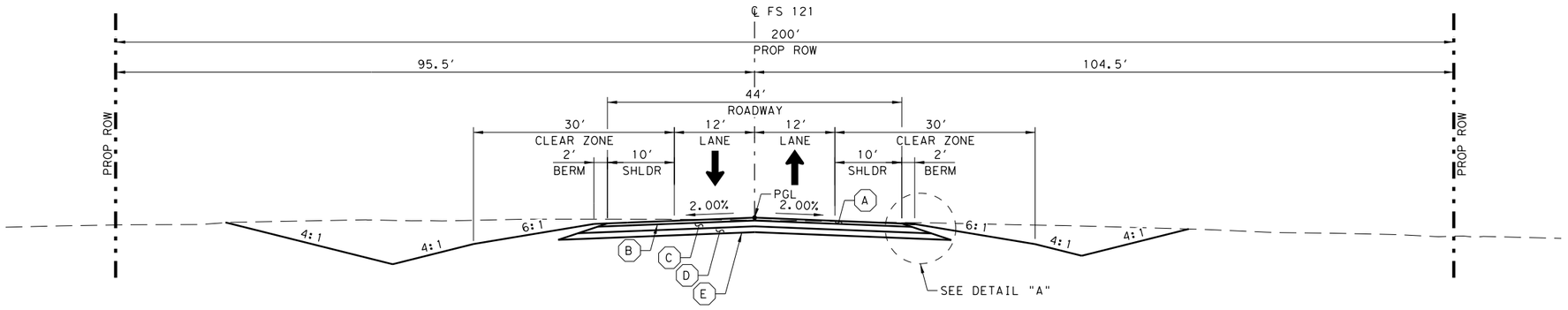
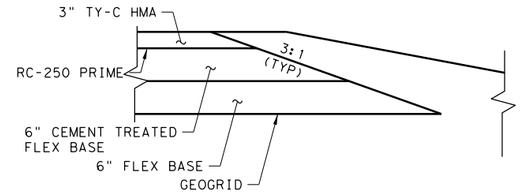


FS 121

STA 3409+50 TO STA 3421+40
STA 3463+25 TO STA 3493+90
STA 3512+90 TO STA 3546+45

LEGEND

A	3" TY-C HMA
B	RC-250 PRIME
C	6" CEMENT TREATED FLEX BASE
D	6" FLEX BASE
E	GEOGRID



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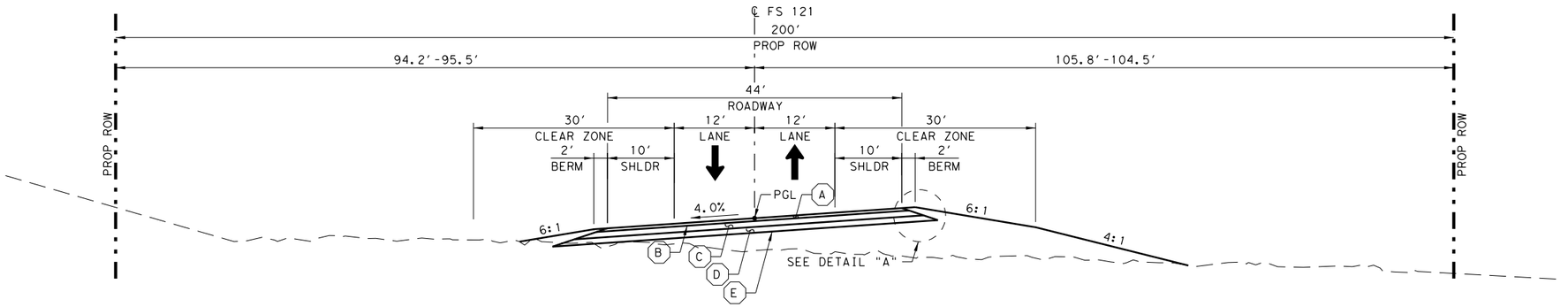

FS 121

STA 3421+40 TO STA 3463+25

CROSS SLOPE TRANSITION
STA 3421+40 TO STA 3423+05
STA 3461+60 TO STA 3463+25

7/15/2021

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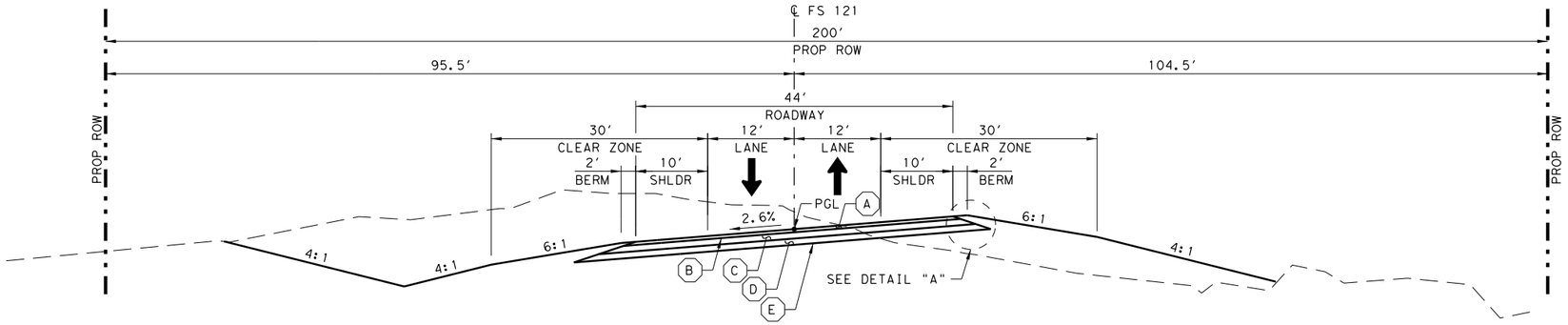
FS 121

PROPOSED TYPICAL SECTIONS

SCALE: N/A SHEET 2 OF 6

STATE				HIGHWAY NO.
TEXAS				FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	11



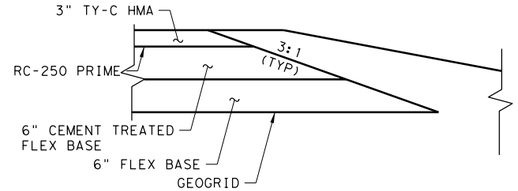
FS 121

STA 3493+90 TO STA 3512+90

CROSS SLOPE TRANSITION
STA 3493+90 TO STA 3495+55
STA 3511+25 TO STA 3512+90

LEGEND

A	3" TY-C HMA
B	RC-250 PRIME
C	6" CEMENT TREATED FLEX BASE
D	6" FLEX BASE
E	GEOGRID



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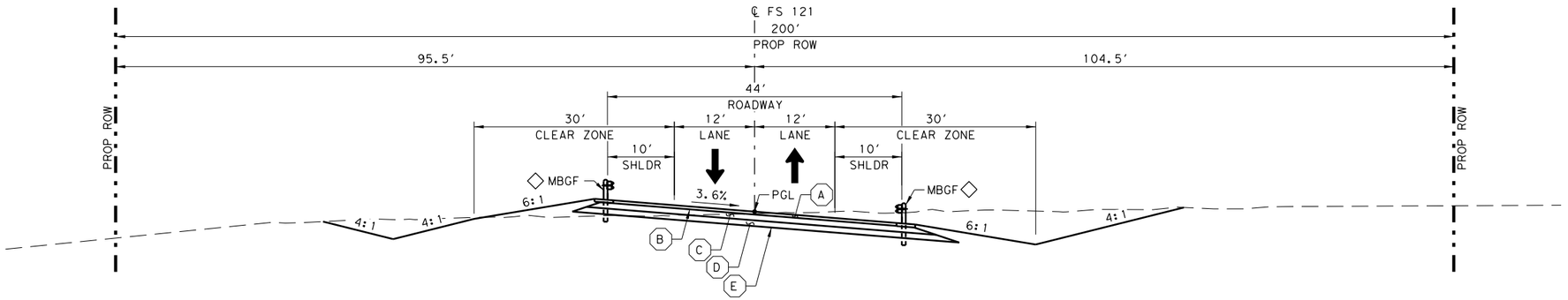

◇ FOR LIMITS OF MBGF
SEE PLAN VIEW

FS 121

STA 3546+45 TO STA 3590+41

CROSS SLOPE TRANSITION
STA 3546+45 TO STA 3548+10

7/15/2021

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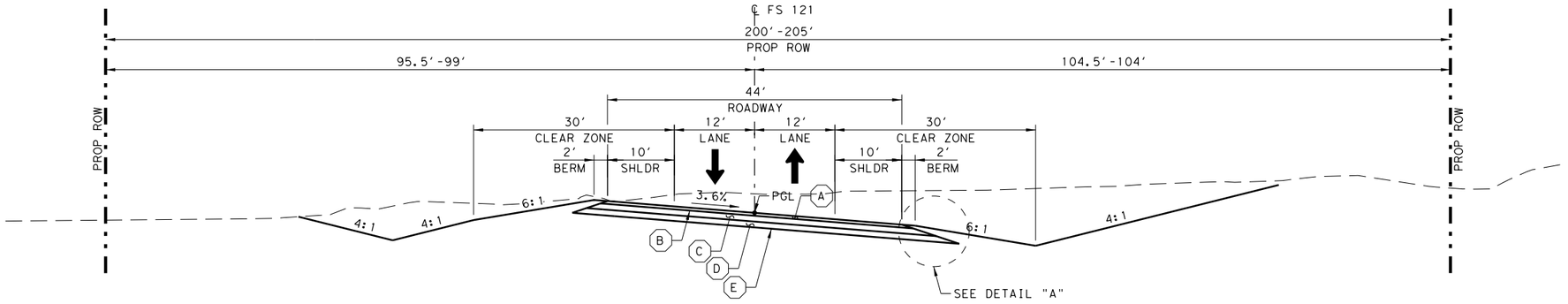
FS 121

PROPOSED TYPICAL SECTIONS

SCALE: N/A

STATE				HIGHWAY NO.
TEXAS				FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	12



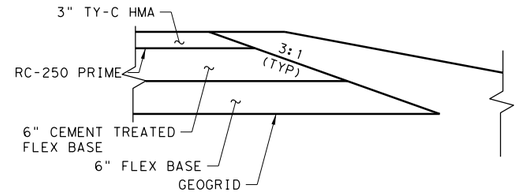
FS 121

STA 3590+41 TO STA 3593+10

CROSS SLOPE TRANSITION
STA 3590+45 TO STA 3593+10

LEGEND

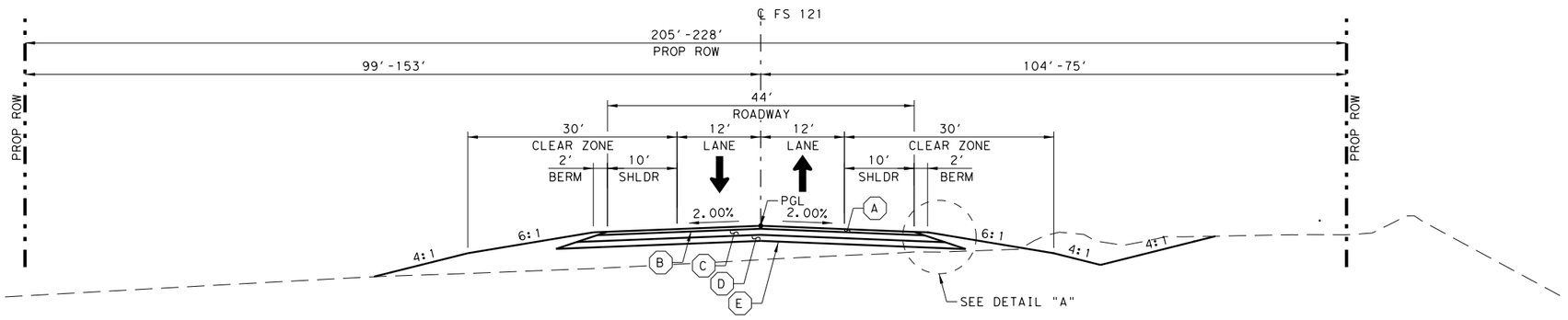
A	3" TY-C HMA
B	RC-250 PRIME
C	6" CEMENT TREATED FLEX BASE
D	6" FLEX BASE
E	GEOGRID



DETAIL "A"

N.T.S.

7/15/2021



FS 121

STA 3593+10 TO STA 3606+21

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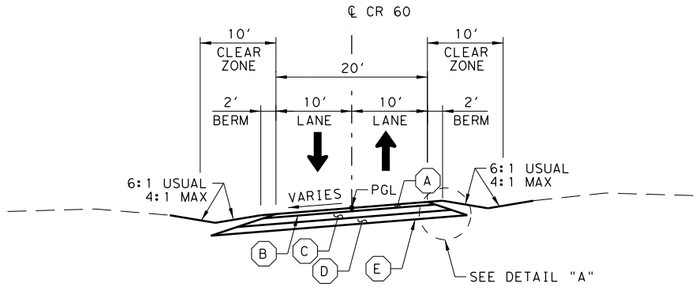
FS 121

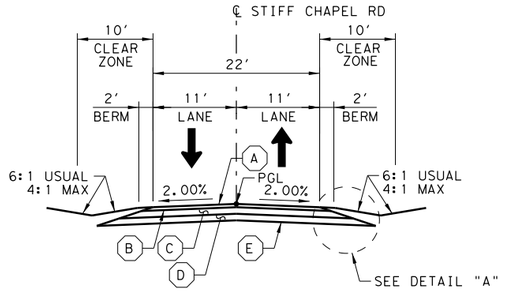
PROPOSED TYPICAL SECTIONS

SCALE: N/A SHEET 4 OF 6

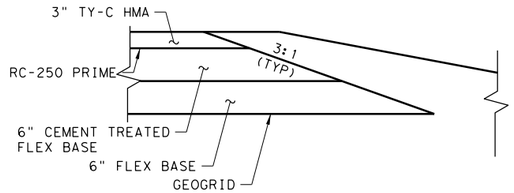
STATE				HIGHWAY NO.
TEXAS				FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	13



CR 60

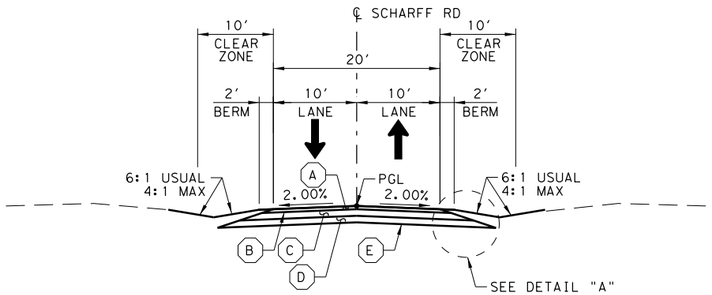


STIFF CHAPEL RD



DETAIL "A"

N. T. S.



SCHARFF RD

LEGEND

A	3" TY-C HMA
B	RC-250 PRIME
C	6" CEMENT TREATED FLEX BASE
D	6" FLEX BASE
E	GEOGRID

7/15/2021

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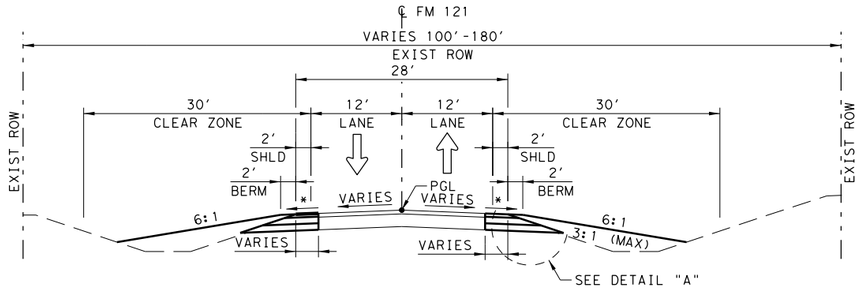
FS 121

PROPOSED TYPICAL SECTIONS

SCALE: N/A

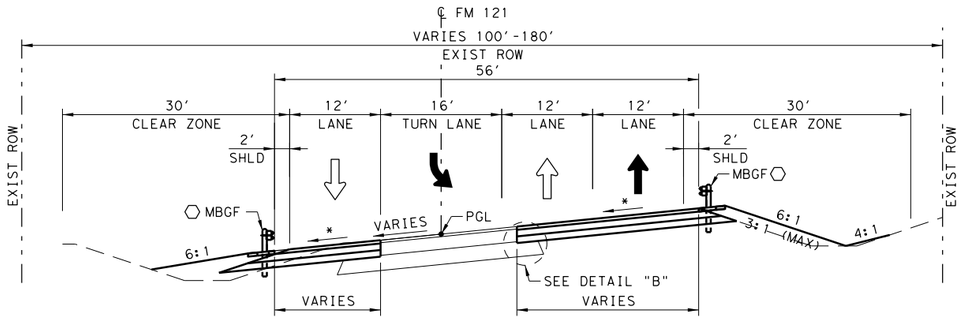
STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	14



* MATCH EXISTING CROSS SLOPE

FM 121

STA 378+10 TO STA 378+28
STA 394+67 TO STA 395+13

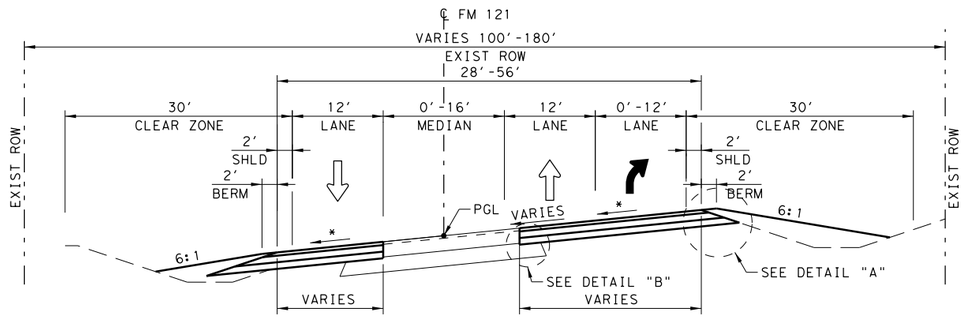


⬡ FOR LIMITS OF MBGF SEE PLAN VIEW

* MATCH EXISTING CROSS SLOPE

FM 121

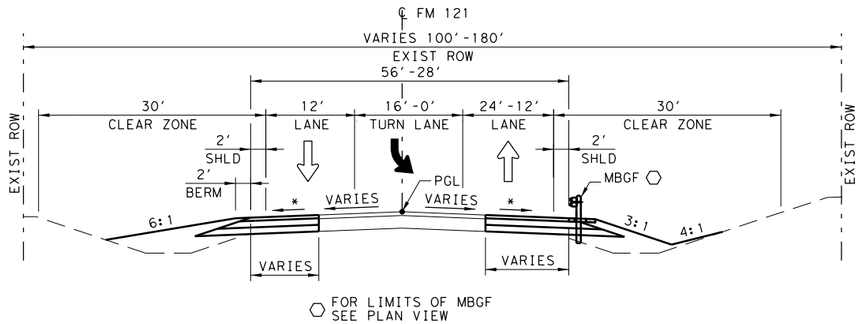
STA 386+25 TO STA 389+41



* MATCH EXISTING CROSS SLOPE

FM 121

STA 378+28 TO STA 382+79

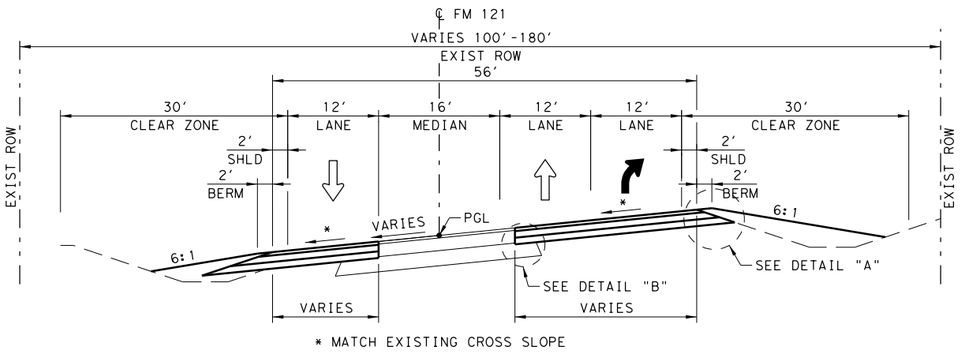


⬡ FOR LIMITS OF MBGF SEE PLAN VIEW

* MATCH EXISTING CROSS SLOPE

FM 121

STA 389+41 TO STA 395+13



* MATCH EXISTING CROSS SLOPE

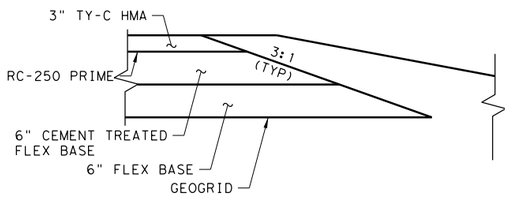
FM 121

STA 382+79 TO STA 383+85

FM 121

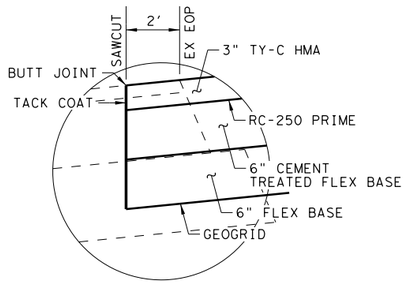
STA 383+85 TO STA 386+25

"INTERSECTION"



DETAIL "A"

N.T.S.



DETAIL "B"

N.T.S.

LEGEND

A	3" TY-C HMA
B	RC-250 PRIME
C	6" CEMENT TREATED FLEX BASE
D	6" FLEX BASE
E	GEOGRID

NOTES:

1. FOR PAVEMENT DESIGN SEE DETAIL 'A' & DETAIL 'B'
2. TACK COAT IS SUBSIDIARY TO ITEM 3076 6016

7/15/2021

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FS 121

PROPOSED TYPICAL SECTIONS

SCALE: N/A SHEET 6 OF 6

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	15

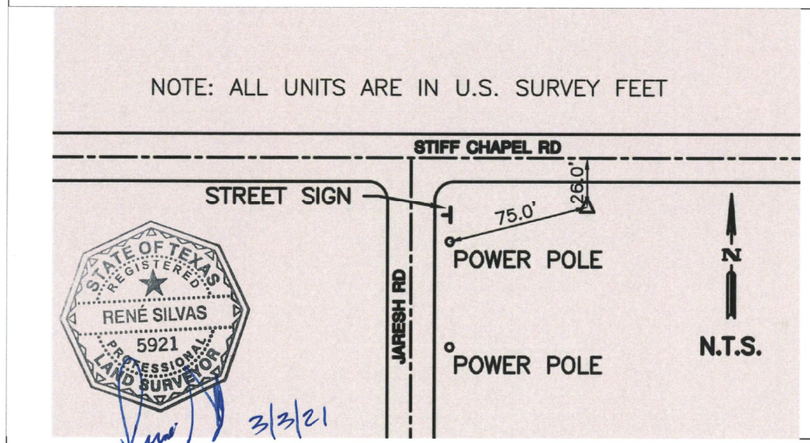
Texas Department of Transportation

Primary Survey Control

Highway / Location Stiff Chapel Rd & Jaresh Rd		Station Name 10000
TxDOT CSJ No. 0901-19-189		
County Grayson	State Texas	Established By BGE, Inc.
TxDOT Survey Level 2	Date Established February 14, 2018	
Intervisible Stations NONE	Survey Method Hz. GPS OBS (RTN)	
Unit of Measure FEET	Survey Method Vt. GPS OBS (VRS)	
Hz. Datum NAD 83 (2010)	Vt. Datum NGVD 88	
Projection Zone 4202 - NC	Geoid Model 12A (CONUS)	
Monument(s) Held Hz. McKinney DMCL_g1014		
Monument(s) Held Vt. McKinney DMCL_g1014		

Geodetic Position	Grid Coordinates	Ground Coordinates
Lat 033-26-17.748	North 7,210,264.14	North 7,211,365.22
Long -096-49-36.676	East 2,478,867.61	East 2,479,246.16
Elevation 695.28		
TxDOT Surface Adjustment Factor 1.000152710		
Mapping Angle 0°54'45"	Scale Factor 0.99989532	Combined Factor 0.99986208
Mark Logo	Stamping	
Type of Marker 3 ¼" Aluminum Rebar Cap		

Station Sketch



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Highway / Location Stiff Chapel Rd & Jaresh Rd	Station Name 10000
TxDOT CSJ No. 0901-19-189	

To Reach Description

Set 5/8-inch iron rod with TXDOT aluminum cap at the southeast corner of the intersection of Stiff Chapel Road and Jaresh Road, approximately 26 feet south of the Centerline of Stiff Chapel Road and 75 feet northeast of a power pole.

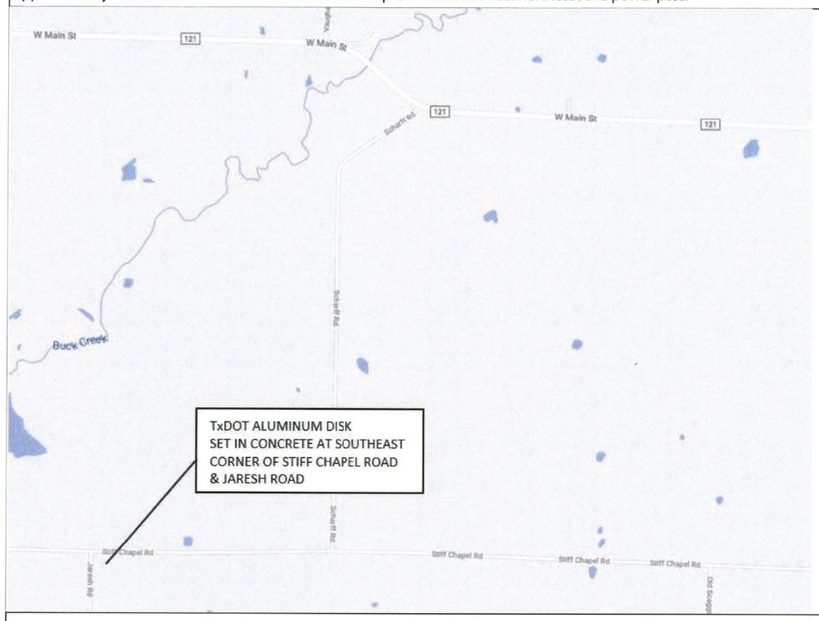

Photo 1-Station Detail	Photo 2-Station Area Picture
	

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Texas Department of Transportation

FS 121

SURVEY CONTROL

SHEET 1

SCALE: N/A SHEET 1 OF 4

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	16

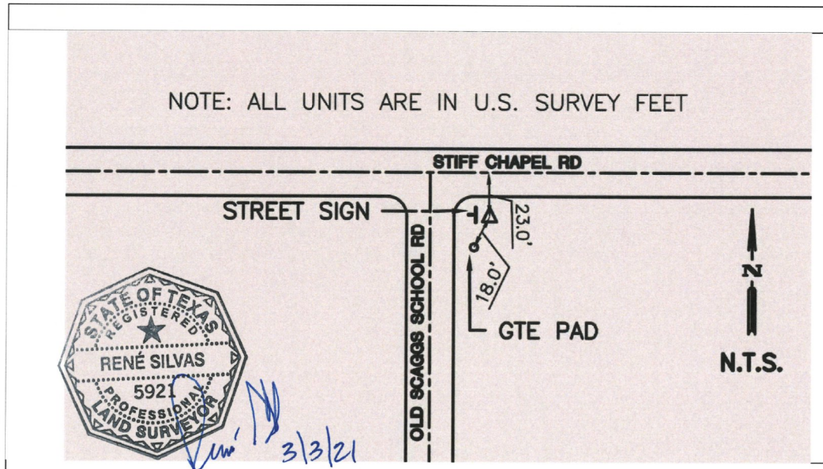
Texas Department of Transportation

Primary Survey Control

Highway / Location Stiff Chapel Rd & Old Scaggs School Rd		Station Name 10001
TxDOT CSJ No. 0901-19-189		
County Grayson	State Texas	Established By BGE, Inc.
TxDOT Survey Level 2	Date Established February 14, 2018	
Intervisible Stations NONE	Survey Method Hz. GPS OBS (RTN)	
Unit of Measure FEET	Survey Method Vt. GPS OBS (VRS)	
Hz. Datum NAD 83 (2010)	Vt. Datum NGVD 88	
Projection Zone 4202 - NC	Geoid Model 12A (CONUS)	
Monument(s) Held Hz. McKinney DMCL_g1014		
Monument(s) Held Vt. McKinney DMCL_g1014		

Geodetic Position	Grid Coordinates	Ground Coordinates
Lat 033-26-15.925	North 7,210,233.12	North 7,211,334.20
Long -096-47-44.177	East 2,488,402.03	East 2,488,782.03
Elevation 717.76		
TxDOT Surface Adjustment Factor 1.000152710		
Mapping Angle 0°55'46"	Scale Factor 0.99989526	Combined Factor 0.99986092
Mark Logo	Stamping 1	
Type of Marker 3 ¼" Aluminum Rebar Cap		

Station Sketch



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Highway / Location Stiff Chapel Rd & Old Scaggs School Rd	Station Name 10001
TxDOT CSJ No. 0901-19-189	

To Reach Description

5/8-inch iron rod with TXDOT aluminum cap at the southeast corner of the intersection of Stiff Chapel Road and Old Scaggs School Road, approximately 23 feet south of the centerline of Stiff Chapel Road and 18 feet northeast of a GTE transformer pad.

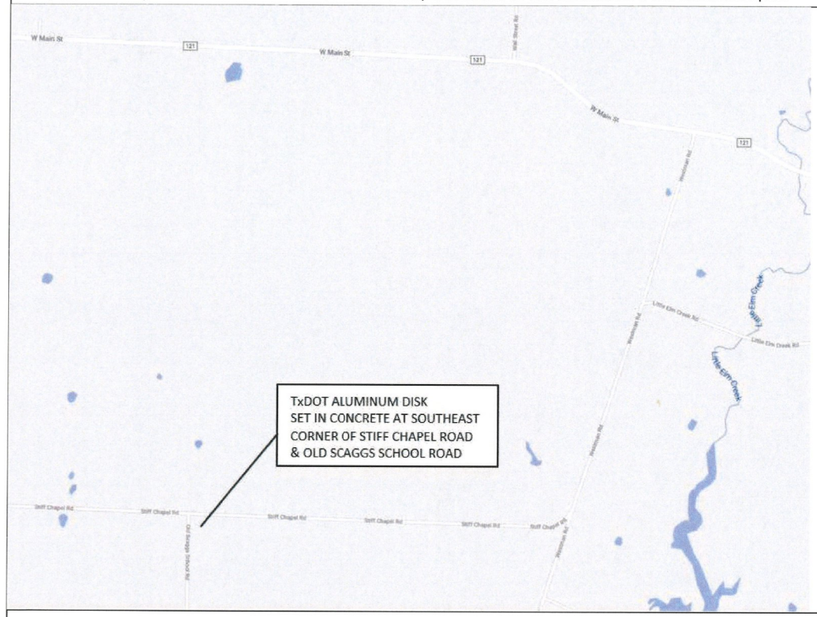

Photo 1-Station Detail	Photo 2-Station Area Picture
	

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FS 121

SURVEY CONTROL

SHEET 2

SCALE: N/A SHEET 2 OF 4

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	17

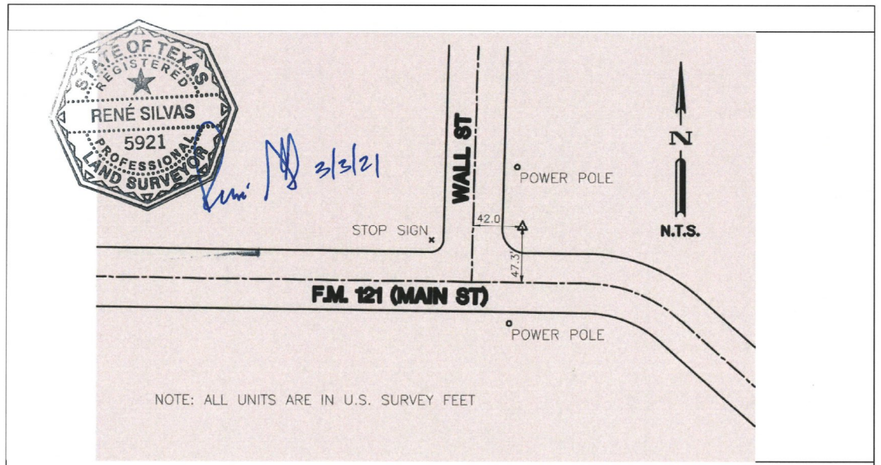
Texas Department of Transportation

Primary Survey Control

Highway / Location F.M. 121(W Main St) & Wall St		Station Name 10002
TxDOT CSJ No. 0901-19-189		
County Grayson	State Texas	Established By BGE, Inc.
TxDOT Survey Level 2	Date Established February 14, 2018	
Intervisible Stations NONE	Survey Method Hz. GPS OBS (RTN)	
Unit of Measure FEET	Survey Method Vt. GPS OBS (VRS)	
Hz. Datum NAD 83 (2010)	Vt. Datum NGVD 88	
Projection Zone 4202 - NC	Geoid Model 12A (CONUS)	
Monument(s) Held Hz. McKinney DMCL_g1014		
Monument(s) Held Vt. McKinney DMCL_g1014		

Geodetic Position	Grid Coordinates	Ground Coordinates
Lat 033-27-21.776	North 7,216,963.80	North 7,218,065.90
Long -096-46-49.044	East 2,492,964.21	East 2,493,344.91
Elevation 695.09		
TxDOT Surface Adjustment Factor 1.000152710		
Mapping Angle 0°56'17"	Scale Factor 0.99989745	Combined Factor 0.99986421
Mark Logo	Stamping	
Type of Marker 3 ¼" Aluminum Rebar Cap		

Station Sketch



Point Information Disclaimer: This data has been supplied by state statute. No expressed or implied warranties are made by TxDOT for the accuracy, completeness, reliability, usability, or suitability of the point data. The department assumes no responsibility for incorrect results or damages resulting from the use of data.

Highway / Location F.M. 121(W Main St) & Wall St	Station Name 10002
TxDOT CSJ No. 0901-19-189	

To Reach Description

Set 5/8-inch iron with TXDOT aluminum cap at the northeast corner of the intersection of F.M. 121 (W Main St) and Wall Street, approximately 42 feet east of the centerline of Wall Street and 47 feet north of the centerline of F.M. 121.

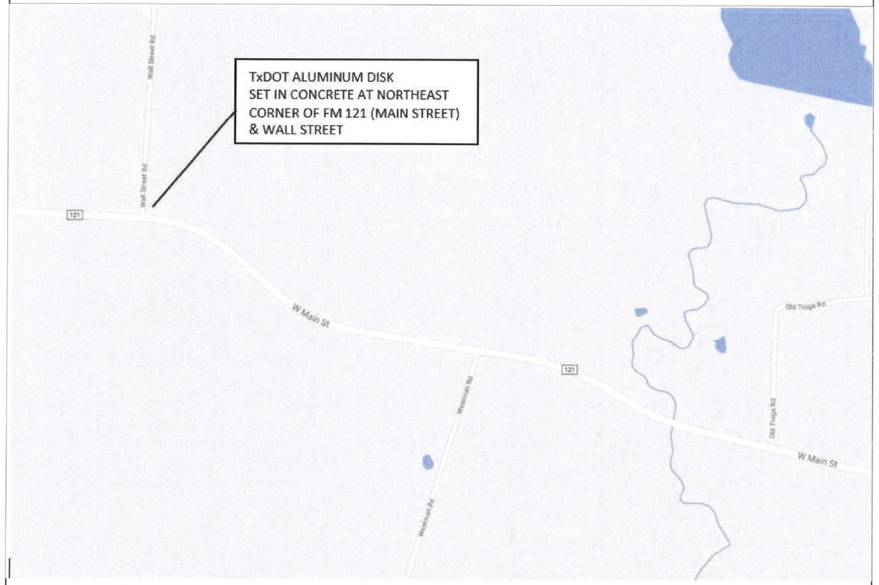


Photo 1-Station Detail	Photo 2-Station Area Picture
	

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Texas Department of Transportation

FS 121

SURVEY CONTROL

SHEET 3

SCALE: N/A SHEET 3 OF 4

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	18

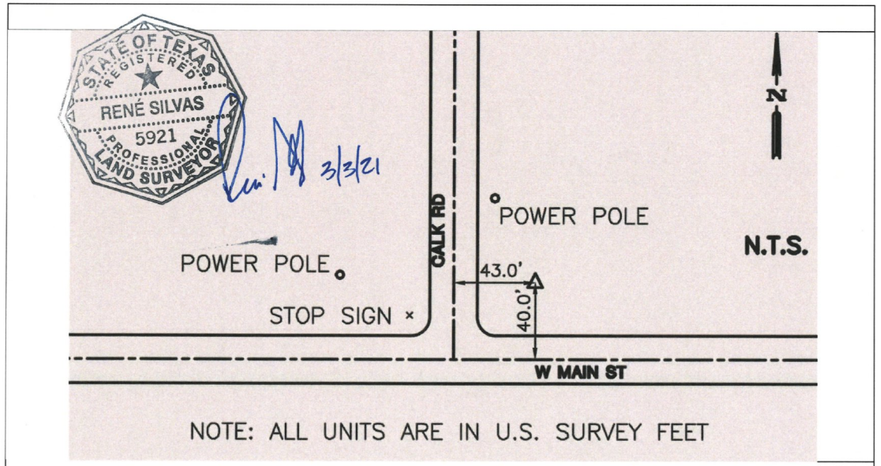
Texas Department of Transportation

Primary Survey Control

Highway / Location F.M. 121 (W Main St) & Calk Rd		Station Name 10003
TxDOT CSJ No. 0901-19-189		
County Grayson	State Texas	Established By BGE, Inc.
TxDOT Survey Level 2	Date Established February 14, 2018	
Intervisible Stations NONE	Survey Method Hz. GPS OBS (RTN)	
Unit of Measure FEET	Survey Method Vt. GPS OBS (VRS)	
Hz. Datum NAD 83 (2010)	Vt. Datum NGVD 88	
Projection Zone 4202 - NC	Geoid Model 12A (CONUS)	
Monument(s) Held Hz. McKinney DMCL_g1014		
Monument(s) Held Vt. McKinney DMCL_g1014		

Geodetic Position	Grid Coordinates	Ground Coordinates
Lat 033-27-37.500	North 7,218,286.89	North 7,219,389.19
Long -096-50-03.923	East 2,476,431.27	East 2,476,809.44
Elevation 677.89		
TxDOT Surface Adjustment Factor 1.000152710		
Mapping Angle 0°54'30"	Scale Factor 0.99989799	Combined Factor 0.99986556
Mark Logo	Stamping	
Type of Marker 3 ¼" Aluminum Rebar Cap		

Station Sketch



Highway / Location F.M. 121 (W Main St) & Calk Rd	Station Name 10003
TxDOT CSJ No. 0901-19-189	

To Reach Description

Set 5/8-inch iron rod with TXDOT aluminum cap at the northeast corner of the intersection of F.M. 121 (W Main St) and Calk Rd, approximately 43 feet east of the centerline of Wall Street and 40 feet north of the centerline of F.M. 121.

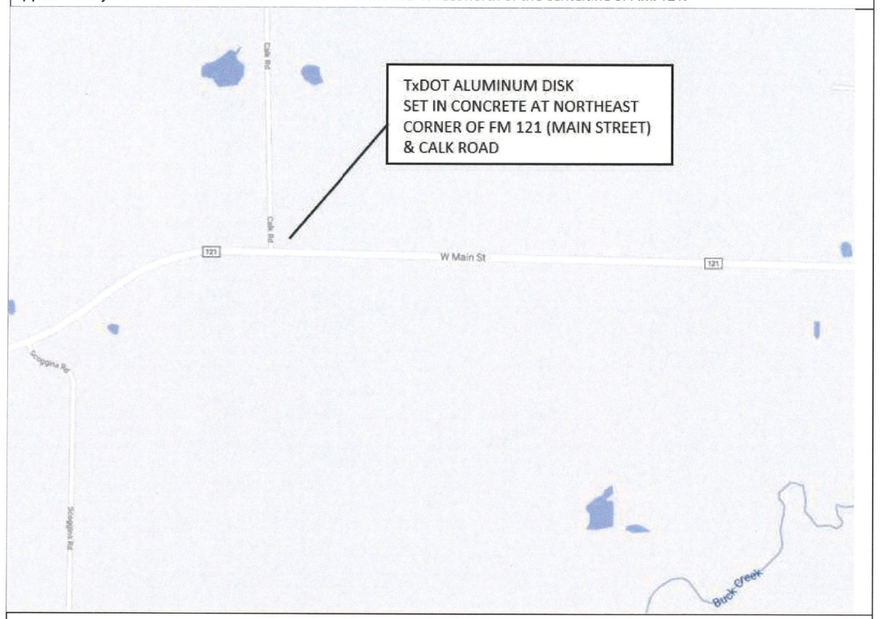


Photo 1-Station Detail	Photo 2-Station Area Picture
	

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Texas Department of Transportation

FS 121

SURVEY CONTROL

SHEET 4

SCALE: N/A SHEET 4 OF 4

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	19

GENERAL NOTES

General:
Contractor questions will be accepted through email, phone, and in person. Contractor questions on this project are to be addressed to the following individual(s):

Sherman Area Office
Aaron Bloom, P.E. – Aaron.Bloom@txdot.gov
Colby Shelton, P.E. – Colby.Shelton@txdot.gov

All contractor questions will be reviewed by the Engineer. Once a response is developed, it will be posted to TxDOT's Public FTP at the following Address:
https://ftp.dot.state.tx.us/pub/txdot-info/Pre-Letting%20Responses/
All questions submitted that generate a response will be posted through this site. The site is organized by District, Project Type (Construction or Maintenance), Letting Date, CCSJ/Project Name.

Earthwork cross sections may be obtained from the Area Engineer's office.

Dispose of waste materials at an approved site. Furnish written approval from the property owner before disposal of waste materials.

Locate equipment a minimum of 30 ft. from roadway when possible. Place signs and barricades as approved.

Stockpile sites for construction materials must be approved. Obtain approval from Area Engineer's office for stockpile locations. Give at least 48 hours notification prior to stockpiling material.

Item 2 Instructions to Bidders:

View plans on-line or download from the web at:
http://www.txdot.gov/business/letting-bids/plans-online.html

Order plans from any of the plan reproduction companies shown on the web at:
http://www.txdot.gov/business/letting-bids/repro-companies.html

Item 5 Control of the Work:

The responsibility for the construction surveying on this contract will be in accordance with Section 5.9.3, Method C.

Working days will be computed and charged in accordance with Article 8.3.1.4 Standard Work Week.

Right and left are determined based upon the forward direction of stationing in the specific control section.

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

Item 8 Prosecution and Progress:

Before beginning work on this project submit in writing, for approval, a plan of construction operations outlining in detail a sequence of work to be followed.

Provide a Bar Chart progress schedule for this project.

This project includes Special Provision SP 008-003 which allows up to a 90-day delay to begin work on the project to allow for flexibility in material availability.

Item 9 Measurement and Payment:

Items of work for the Monthly Estimate will be cut off on the 25th of each month. Items of work performed after the 25th will be processed and paid on the following month's estimate. Material on Hand (MOH) will cut off on the 20th of each month. Special circumstances will be considered on a case by case basis.

Item 100 Preparing Right of Way:

Remove all trees to 30 ft. clear zone from the travel lanes on both sides of roadway. At cross structures, remove trees to the Right of Way (ROW) line and within 100 ft. of the structure, parallel to the roadway.

Remove underbrush and neatly trim trees and overhanging branches to produce a 60 ft. vertical clear area within the limits of Prep ROW. Remove any trees or underbrush that interferes with construction operations including relocation of ditches or other drainage elements.

Obtain approval of equipment used to trim limbs. A boom axe will not be allowed. Remove all trimmed debris from the ROW or mulch all debris and incorporate into the topsoil on State ROW to the satisfaction of the Engineer.

Item 110 Excavation:

Material below finished subgrade elevation suspected of containing sulfates will be tested in accordance with Tex-145-E by the Department. Treat subgrade material to the required depth and width in accordance with the Soil Sulfates Mitigation General Notes.

Before excavation operations the existing topsoil shall be salvaged in a manner to preserve the vigor of the existing grass sod per Item 160.

Item 132 Embankment:

Test potential embankment sources using Tex-145-E to determine the presence and concentration of sulfates. Do not bring soil with greater than 3000 ppm sulfates into project.

Embankment sources containing sulfates that meet specification requirements may be used as fill material provided it is placed with at least 1 ft. of separation from materials to be treated with lime, cement, or other calcium-based stabilizers. When soils are to be placed with less than 1 ft. of separation from material to be treated with lime, cement, or other calcium based stabilizers, process and treat such soils according to the Soil Sulfates Mitigation General Notes.

Excavation pits for project embankment made within 250 ft. of State Right of Way must be approved.

Before embankment operations the existing topsoil shall be salvaged in a manner to preserve the vigor of the existing grass sod per Item 160.

Item 164 Seeding for Erosion Control, 166 Fertilizer:

Apply fertilizer with a ratio of 3-1-2 (N-P-K) over the areas to be seeded. This work will not be paid for directly, but will be considered subsidiary.

Item 168 Vegetative Watering:

Use water trucks equipped with a sprinkler system adequate to permit coverage of the entire seeded area from the roadbed. This equipment must be available to perform watering throughout the duration of vegetative establishment.

Water all seeded areas the day seed is applied. Thereafter, maintain the seeded areas in a well-watered condition throughout the duration of vegetative establishment.

Item 247 Flexible Base:

The following are flexible base material grading requirements.

- Linear Shrinkage (Tex-107-E) = 6.0% max.
- Liquid Limit (Tex-104-E) = 40% max.
- Wet Ball Mill (Tex-116-E) = 40% max.
- Wet Ball Mill increase passing the #40 sieve (Tex-116-E) = 20% max.
- Percent retained on sieve (Tex-110-E):
  - 1-3/4 in. sieve = 0%
  - 7/8 in. sieve = 10-35%
  - 3/8 in. sieve = 30-50%
  - No. 4 sieve = 45-65%
  - No. 40 sieve = 70-85%

All tests must be in accordance with TxDOT standard test methods.

Flexible base shall not contain more than 1% by weight of clay balls.

Place blue top hubs for alignment and elevations of new base at centerline and edge of pavement.

Item 275 Cement Treatment (Road Mixed):

Microcracking is required where flexible base widths accept full roller width. When temperatures during curing period average below 60 degrees F, perform microcracking operations between 48 and 72 hours.

Subgrade, embankment or backfill suspected of containing sulfates will be tested in accordance with Tex-145-E by the Department. Subgrade, embankment or backfill material within 1ft. of any area to be treated using cement is subject to the following restriction:

- Greater than 7,000 ppm sulfates – Do not treat with any cement or other calcium based stabilizers. Material within 1ft. of any area to be treated with cement or other calcium based stabilizers must be removed or processed as directed.

Item 300 Asphalts, Oils, and Emulsions:

Provide 1 L (1 qt.) clean and dry screw top or friction-lid sampling cans as directed.

Furnish at least one sample of each type of asphalt used on the project for QA/QC purposes.

Item 302 Aggregates for Surface Treatments:

The following are Grade 5 Modified aggregate grading requirements.

- Percent retained on sieve (Tex-200-F):
  - 1/2 in. sieve = 0%
  - 3/8 in. sieve = 0-5%
  - No. 4 sieve = 30-80%
  - No. 8 sieve = 85-100%
  - No. 200 sieve = 95-100%

The decantation requirement for Grade 5 Modified aggregate is 4% maximum.

The requirements for Flakiness Index, Magnesium Sulfate Soundness, and Los Angeles Abrasion are waived for the Grade 5 Modified aggregate.

Item 316 Surface Treatments:

The information below is intended to provide general guidance and as a basis of estimate. The engineer will determine the asphalt type and rates to be used at the time of application based on the season and weather conditions at the time.

Material rates for construction projects:

Cover Prime

Asphalt Type	RC-250
Asphalt Rate	0.28 gal/sy
Aggregate	TY B
Aggregate Grade	5 or Mod 5
Aggregate Rate	1:140 cy/sy
Minimum Cure Time	14 days (or as approved by the Engineer)

1st Course Seal

Asphalt Type	AC-20-5TR or AC-20XP
Asphalt Rate	0.46 gal/sy
Aggregate	TY B
Aggregate Grade	3
Aggregate Rate	1:105 cy/sy

2nd Course Seal

Asphalt Type	AC-20-5TR or AC-20XP
Asphalt Rate	0.36 gal/sy
Aggregate	TY PB
Aggregate Grade	4
Aggregate Rate	1:120 cy/sy

Item 400 Excavation and Backfill for Structures:

Excavation and backfill for bridge, culvert and Safety End Treatment construction/installation will be subsidiary to Item 462, 464, 466, and 467.

Item 402 Trench Excavation Protection

Submit a Trench Excavation Protection Plan to the Engineer a minimum of 3 weeks prior to use. The excavation support plan shall address excavation/protection methods, work sequencing, traffic control, backfill operations, etc.

Item 403 Temporary Special Shoring

Submit a Temporary Special Shoring Plan to the Engineer a minimum of 3 weeks prior to use. The excavation support plan shall address excavation/protection methods, work sequencing, traffic control, backfill operations, etc.

Item 420 Concrete Structures:

Do not use membrane curing for structural elements.

Item 432 Riprap:

The Engineer may adjust placement of riprap in the field.

Filter fabric is required for stone riprap.

Item 462 Concrete Box Culverts and Drains:

Required excavation and backfill will be subsidiary to this Item.

Item 464 Reinforced Concrete Pipe:

Required excavation and backfill will be subsidiary to this Item.

Concrete pipe collars shall be subsidiary this item.

Item 466 Headwalls and Wingwalls:

Required excavation, backfill and pipe saw cutting will be subsidiary to this Item.

Unless shown in plans to obtain from an offsite source, obtain headwall and wingwall backfill from ROW and perform grading to shape ditch to headwall/wingwall as directed by the Engineer. Backfill and ditch grading will be subsidiary to this Item.

Riprap apron, between wingwalls, will be subsidiary to this Item.

Item 467 Safety End Treatment:

Required excavation, backfill and pipe saw cutting will be subsidiary to this Item.

Unless shown in plans to obtain from an offsite source, obtain safety end treatment (SET) backfill from ROW and perform grading to shape ditch to SET as directed by the Engineer. This work will be subsidiary to this Item.

Parallel pipe culverts that are 30 in. diameter and smaller require precast safety end treatment (SET) installation unless directed otherwise by the Engineer. The Engineer will determine if cast-in-place SETs are to replace precast SETs that would project over 3 in. above surrounding ground surface or when otherwise indicated in the plans. Additional work to install cast in place SETs will be subsidiary to this Item.

Cross pipe culverts that are 30 in. diameter and smaller require precast SET unless indicated otherwise in the plans.

Repair damaged culvert ends prior to SET installation. Clean and repair corrugated metal pipe (CMP) ends by straightening or cutting off damaged ends. Paint cut off ends with zinc paint. Repair minor damaged reinforced concrete pipe (RCP) ends with epoxy mortar. This work will be subsidiary to this Item.

When necessary to close connection gaps, grout precast SETs to culvert ends. Materials, labor and equipment for this will be subsidiary to this Item.

Placement of concrete riprap between multiple SETs on multiple barrel culverts will be subsidiary to this Item.

During SET installation, unless indicated otherwise in the plans, match SET flow line grade with the culvert flow line grade.

Item 502 Barricades, Signs, and Traffic Handling:

Do not begin Item 502 Barricades, Signs, and Traffic Handling on the roadway until both of the following conditions are met:

- The work schedule is approved.
- No more than 5 workdays will pass between the beginning of Item 502 and the actual commencement of roadway work bid items.

The Contractor Force Account “Safety Contingency” that has been established for this project is intended to be utilized for work zone enhancements that could not be foreseen in the project planning and design stage to improve the effectiveness of the Traffic Control Plan. 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.

The traffic control plan for this contract consists of the installation and maintenance of warning signs and other traffic control devices shown in the specifications, general notes, the Texas Manual on Uniform Traffic Control Devices (TMUTCD), traffic control plan sheets, and standard BC sheets.

Ensure that all travel lanes are open at night.

Provide pilot car during one lane/two-way traffic operations.

Provide shadow vehicles equipped with Truck Mounted Attenuators (TMA) as shown on Traffic Control Plan (TCP) standards.

The following items will be required for flaggers on this project:

- Flaggers are required to wear a white hard hat while performing flagging operations.
- Flaggers will be required at the intersection of all State maintained roadways.
- Flaggers may be required at other high traffic generating intersections as deemed necessary by the Area Engineer.

Portable traffic signals for TCP (2-8)-20 PAR will be subsidiary to this Item.

All road closures must be approved by the Engineer. Provide a 2 week notice and proposed traffic control plan to the Engineer prior to the desired roadway closure period. The use of portable changeable message signs (PCMS) may be required in advance of the closure. When PCMS are used, begin display of closure information 10 days prior to roadway closure.

Correct all traffic control device deficiencies within the time frame noted on the Traffic Control Device Inspection Form 599. Failure to make corrections within time frame specified may result in no payment for this Item for the month of the noted deficiency.

The final estimate will be withheld until all disturbed areas are covered with at least 70% perennial vegetative cover.

Item 506 Temporary Erosion, Sedimentation, and Environmental Controls:

The Temporary Erosion Control measures for this project will consist of the following items, as directed:

- Temporary Sediment Control Fence
- Rock Filter Dams

Acquire approval for any change to the location or usage of temporary erosion control measures prior to installation. Placement of temporary erosion control measures may be altered, as directed, to satisfy the requirements of the SW3P.

Silt fences will remain the property of the Contractor upon completion of the project. The final estimate will not be released until all silt fences have been properly removed, or as directed, and 70% establishment of vegetative cover is obtained.

All rock filter dams shall be installed with 6:1 slopes regardless of their location on the project. Failure to do so will result in no payment for the dam.

The pay item to remove rock filter dams will require only a partial removal after 70% perennial vegetation has been established and approved. When removing the rock filter dams, leave the lower layer of rock adjacent to the ground in place so as not to disturb the soil.

Refer to the SW3P sheet for the total disturbed area for the project.

The disturbed area in this project, all project locations in the Contract, and Contractor project specific locations (PSLs) within one mile of the project limits will further establish the authorization requirements for storm water discharges. The Department will obtain an authorization to discharge storm water from the Texas Commission on Environmental Quality (TCEQ) for the construction activities shown on the plans. Obtain any required authorization from the TCEQ for any Contractor PSLs for construction support activities on or off ROW. When the total area disturbed for all projects in the Contract and PSLs within one mile of the project limits exceeds 5 acres, provide a copy of the Contractors NOI for PSLs on the ROW (to the appropriate MS4 operator when on an off-system route).

Item 512 Portable Traffic Barrier:

At project completion, all portable traffic barriers (PTB) shall become the property of the Contractor.

Reflectors shall be placed on all PTB as shown on standard D&OM (2)-15 throughout stage construction. Expense for this work will be subsidiary to this Item.

Item 533 Milled Rumble Strips:

Roadway rumble strips shall be milled into pavement.

Item 540 Metal Beam Guard Fence:

Metal beam guard fence (MBGF) delineation shall be installed within ten (10) working days of the completion of each MBGF section. Concrete mow strip is not considered to be a part of this work.

Item 560 Mailbox Assemblies:

Install new mailboxes unless the property owner chooses to have an existing, compliant mailbox reinstalled. Return all custom non-compliant mailboxes to the property owner.

All new mailboxes furnished and installed by the Contractor will display the address number using one inch (1 in.) adhesive back numbering. The color, type, and style of numbering shall be consistent throughout the project.

Item 585 Ride Quality for Pavement Surfaces:

Use Surface Test Type B, Pay Adjustment Schedule 1, to evaluate ride quality of the final pavement surface on travel lanes and shoulders in accordance with Item 585 Ride Quality for Pavement Surfaces. A localized roughness penalty of $500 per occurrence will be assessed.

Item 644 Small Roadside Sign Assemblies:

Use the Southern Plains style triangular slip base for all post types.

Once the cover prime is completed, the Paris District Traffic Operations office will field verify the need and spacing of chevrons. If this verification results in fewer materials than estimated in the plans, the Department will purchase the excess signs at invoice price.

Remove the city street and county road topper from existing signs and install on the new city street and county road sign assemblies. This work will be subsidiary to Item 644.

Stake proposed sign locations and obtain the Engineer's approval of locations prior to placing foundations.

Contact the Engineer to obtain updated curve travel speeds before manufacture of curve speed warning signs.

Item 662 Work Zone Pavement Markings:

Non-removable markings may be paint and beads.

Place flexible reflective roadway tabs in accordance with the current WZ (STPM) prior to seal coat operations. Place tabs to indicate the beginning and ending of no passing zones.

Cut, remove and properly dispose of the upright portions of all work zone tabs prior to acceptance of any roadway. Remove entire tab when located on HMAC or concrete surfaces.

Item 666 Reflectorized Pavement Markings:

Lay out pilot lines for approval 24 hours prior to all final pavement marking applications. No striping may be placed unless the inspector is present and at least 24 hours advance notice has been given by the Contractor.

Use equipment with footage counters capable of measuring the linear footage of striping placed. Calibrate counters prior to the beginning of striping operations.

For Type II pavement marking operations, reduce truck speed enough to ensure that the beads drop onto the stripe and do not roll in the paint film.

Due to problems in traffic handling, do not place a dash center stripe and edge line at the same time.

Contact the Engineer at least 7 days before pavement marking placement for re-establishment of no-passing zones.

Item 3076 Dense-Graded Hot-Mix Asphalt:

Use a self-propelled, wheel mounted material transfer vehicle (MTV) capable of receiving mix from the haul trucks, separate from the paver. The MTV shall have a minimum storage capacity of approximately 25 tons. It shall be equipped with a pivoting discharge conveyor and shall completely and thoroughly remix the material prior to placement. The effectiveness of the MTV's remixing ability is subject to the approval of the Engineer. In addition, the paver shall have a surge storage insert with a minimum capacity of 20 tons.

When submitting material mix designs for approval, specify Hot Mix Asphalt Concrete (HMAC) or Warm Mix Asphalt (WMA) at the time of design submittal. After design submittal, continue producing the selected design unless directed otherwise by the Engineer.

Evaluation of the mixture for moisture susceptibility will be performed by using test method TEX 530-C (boil test) and there shall be no evidence of stripping during design verification or at any time during production.

A tack coat is required for all overlay areas and for all longitudinal joints unless otherwise directed.

Perform all sampling for aggregate quality testing on stockpiles at the HMAC plant. Mixture sampling for QC/QA testing will typically be taken from the truck at the plant; however, the Engineer may direct that a sample be taken at any point or location of mixture during production, delivery or placement.

Preparation and construction of permanent / temporary transitions, terminations of mix courses and transitions to driveways and intersecting roadways is subsidiary to Item 341. This includes

all labor, machinery, materials and incidentals to complete the work including planing, removal, hauling and stockpiling of materials and necessary clean-up.

Item 5001 Geogrid Base Reinforcement:

Install Geogrid with at least a 1 ft. overlap along the longest joint when construction sequencing allows as determined by the Engineer.

Install Geogrid per manufacturer's specifications and according to the following.

- Cascade base onto Geogrid using a bulldozer to a depth of at least 6 in. so that no equipment has direct contact with Geogrid. Raise dozer blade gradually as each lift is pushed out over the Geogrid.
- Do not operate rubber tired equipment directly on Geogrid unless allowed by the Engineer. Should operating rubber tired equipment directly on Geogrid be allowed, operate at no more than 5 mph, do not turn tires on the Geogrid or make sudden stops and starts which causes excessive deformation waves. Keep Geogrid taut and flat.
- Adjustments to Geogrid installation or construction methods may be directed by the Engineer to minimize deformation waves.
- Sufficiently compact unbound buffer layer directly above Geogrid to achieve the required density in all subsequently constructed pavement layers.

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

Shadow vehicles with truck mounted attenuator (TMA) or trailer attenuator (TA) are required on the traffic control plan and TCP standards for this project. The contractor will be responsible for determining if one or more of these traffic control operations will be ongoing at the same time to determine the total number of TMAs or TAs needed for the project.

TRAFFIC CONTROL

BID ITEM NO.	0423 6003	0508 6001	0512 6001	0512 6025	0512 6049	0545 6003	0545 6005	0545 6019	0662 6004	0662 6016	0662 6034	0662 6063	0662 6075	0662 6095	0678 6001	6185 6003	6185 6002
DESCRIPTION	RETAINING WALL (TEMP WALL)	CONSTRUCTING DETOURS	PORT CTB (FUR & INST) (SGL SLOPE) (TY 1)	PORT CTB (MOVE) (SGL SLP) (TY 1)	PORT CTB (REMOVE) (SGL SLP) (TY 1)	CRASH CUSH ATTEN (MOVE & RESET)	CRASH CUSH ATTEN (REMOVE)	CRASH CUSH ATTEN (INSTL) (S) (N) (TL3)	WK ZN PAV MRK NON-REMOV (W) 4" (SLD)	WK ZN PAV MRK NON-REMOV (W) 24" (SLD)	WK ZN PAV MRK NON-REMOV (Y) 4" (SLD)	WK ZN PAV MRK REMOV (W) 4" (SLD)	WK ZN PAV MRK REMOV (W) 24" (SLD)	WK ZN PAV MRK REMOV (Y) 4" (SLD)	PAV SURF PREP FOR MRK (4")	TMA (MOBILE OPERATION)	TMA (STATIONARY)
UNIT	SF	SY	LF	LF	LF	EA	EA	EA	LF	LF	LF	LF	LF	LF	LF	HR	DAY
PHASE 1																	
1 OF 2	60	1636										4663		4438	9101		
2 OF 2		909									1544				1544		
PHASE 2																	
1 OF 14		4260															
2 OF 14																	
3 OF 14																	
4 OF 14																	
5 OF 14																	
6 OF 14																	
7 OF 14																	
8 OF 14																	
9 OF 14																	
10 OF 14																	
11 OF 14																	
12 OF 14																	
13 OF 14			1470					4	2013	24	346	2476		4498	9333		
14 OF 14	287	827							750		1047	400		1280	3477		
PHASE 3																	
1 OF 4									514		474	62		62	1112		
2 OF 5															0		
2 OF 4																	
3 OF 4												150	55	26	176		
4 OF 4				90		2						2983	70	3720	6703		
PHASE 4																	
1 OF 1				1350		2						2107	70	3720	5827		
PROJECT TOTAL	347	7,632	1,470	1,440	1,470	4	4	4	3,277	24	3,411	12,841	195	17,744	37,273	40	56

DATE	BY	REV	REVISION

CIVIL ASSOCIATES, INC.
CAI
9330 LBJ FRWY SUITE 1150
Dallas, Texas 75243
Firm Registration No. 6981

Texas Department of Transportation

FS 121

QUANTITY SUMMARY

TRAFFIC CONTROL PLAN

STATE		HIGHWAY NO.
TEXAS		FS 121

STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	21

		ROADWAY														
SHT NO.	BID ITEM NO.	100 6002	104 6067	247 6238	275 6003	275 6001	316 6029	316 6403	432 6045	530 6004	540 6033	540 6002	544 6001	5001 6002	560 6007	3076 6016
	DESCRIPTION	PREPARING ROW	REMOVING CONC (SAWCUT)	FL BS (CMP IN PLC) (TY A GR 4) (12")	CEMENT TREAT (NEW BASE) (6")	CEMENT	ASPH (RC-250)	AGGR (TY-B GR-5 OR TY-L GR-5)	RIPRAP (MOW STRIP) (4 IN)	DRIVEWAYS (CONC)	MTL BM GD FEN (LONG SPAN SYSTEM)	MTL W-BEAM GD FEN (STEEL POST)	GUARDRAIL END TREATMENT (INSTALL)	GEOGRID BASE REINFORCEMENT (TY II)	MAILBOX INSTALL-S (WC-POST) TY 3	D-GR HMA TY-C SAC-A PG64-22
	UNIT	STA	LF	SY	SY	TON	GAL	CY	CY	SY	EA	LF	EA	SY	EA	TON
1	BEGIN TO 3372+50	2.6		1,789	1,736	16	472	13						1,895		274
2	3372+50 TO 3383+00	10.5		5,659	5,484	50	1,487	38						6,009		862
3	3383+00 TO 3393+50	10.5		5,659	5,484	50	1,487	38						6,009		862
4	3393+50 TO 3404+00	10.5		5,659	5,484	50	1,487	38						6,009		862
5	3404+00 TO 3414+50	10.5		5,659	5,484	50	1,487	38						6,009		862
6	3414+50 TO 3425+00	10.5		5,659	5,484	50	1,487	38						6,009		862
7	3425+00 TO 3435+50	10.5		5,659	5,484	50	1,487	38						6,009		862
8	3435+50 TO 3446+00	10.5		5,659	5,484	50	1,487	38						6,009		862
9	3446+00 TO 3456+50	10.5		5,659	5,484	50	1,487	38						6,009		862
10	3456+50 TO 3467+00	10.5		5,659	5,484	50	1,487	38						6,009		862
11	3467+00 TO 3477+50	10.5		5,659	5,484	50	1,487	38						6,009		862
12	3477+50 TO 3488+00	10.5		5,659	5,484	50	1,487	38						6,009		862
13	3488+00 TO 3498+50	10.5		5,659	5,484	50	1,487	38						6,009		862
14	3498+50 TO 3509+00	10.5		5,659	5,484	50	1,487	38						6,009		862
15	3509+00 TO 3519+50	10.5		5,660	5,484	50	1,487	38						6,010		862
16	3519+50 TO 3530+00	10.5		6,780	6,568	60	1,780	46						7,203		1,031
17	3530+00 TO 3540+50	10.5		5,659	5,484	50	1,487	38						6,009		862
18	3540+50 TO 3551+00	10.5		5,658	5,483	50	1,487	38						6,008		862
19	3551+00 TO 3561+50	10.5		5,659	5,484	50	1,487	38	4					6,009		862
20	3561+50 TO 3572+00	10.5		5,659	5,484	50	1,487	38	44			575	4	6,009		862
21	3572+00 TO 3582+50	10.5		5,659	5,484	50	1,487	38						6,009		862
22	3582+50 TO 3593+00	10.5		6,590	6,366	58	1,720	44						7,036		995
23	3593+00 TO 3603+50	10.5		5,659	5,484	50	1,487	38						6,009		862
24	3603+50 TO END	2.7	17	1,993	1,954	18	491	13						2,071	1	288
24	FM 121			5,885	5,599	51	1,488	38	59	147	1	762.5	4	6,456	1	854
		236.3	17	136,217	131,902	1,202	35,691	914	107	147	1	1,337.5	8	144,841	2	20,682

REMOVALS					
SHT NO.	BID ITEM NO.	0496 6043	0496 6050	0496 6051	677 6001
	DESCRIPTION	REMOV STR (SMALL FENCE)	REMOV STR (DRIVEWAY CULVERT)	REMOV STR (PIPE GATE)	ELIM EXT PAV MRK & MRKS (4")
	UNIT	LF	EA	LF	LF
1	BEGIN TO 3383+00	535			
2	3383+00 TO 3404+00	250			
3	3404+00 TO 3425+00	210			
4	3425+00 TO 3446+00	395			
5	3446+00 TO 3467+00	715			
6	3467+00 TO 3488+00	200			
7	3488+00 TO 3509+00	2,295		36	
8	3509+00 TO 3530+00	1,385		18	
9	3530+00 TO 3551+00				
10	3551+00 TO 3572+00	205			
11	3572+00 TO 3593+00	969			
12	3593+00 TO END	1,185	1		
1	FM 121				3,418
	TOTAL	8,344	1	54	3,418

PRIME COURSE:
ASPH (RC 250) @ 0.28 GAL/SY
AGGR (TY -B)
(GR-5 OR GR-5 MOD) @ 1CY / 140SY

D-GR HMA TY-C
(SAC-A PG64-22) @ 110 LBS/SY*IN

CEMENT TREATMENT

BASED ON AN ASSUMED DRY COMPACTION UNIT
WEIGHT OF 135 LBS/CF @ 3% BY WEIGHT
A MINIMUM 7-DAY COMPRESSIVE STREGHT OF 300 PSI IS
RECOMMENDED FOR THE SOIL-CEMENT MIX IN ORDER TO
DETERMINE THE OPTIMUM CEMENT CONTENT

DATE	BY	REV	REVISION

BGE, Inc.
2595 Dallas Parkway, Suite 101, Frisco, TX 75034
Tel: 972-464-4800 • www.bgeinc.com
TBPE Registration No. F-1046

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FS 121

QUANTITY SUMMARY

ROADWAY

SHEET 2 OF 6

STATE		HIGHWAY NO.
TEXAS		FS 121

STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	22

DRAINAGE															
STATION	BID ITEM NO.	402 6001	432 6006	462 6001	462 6004	462 6005	462 6011	462 6015	464 6003	464 6005	466 6005	466 6018	467 6106	467 6109
	DESCRIPTION	TRENCH EXCAVATION PROTECTION	RIPRAP (CONC)(CL B)	CONC BOX CULV (3 FT X 2 FT)	CONC BOX CULV (4 FT X 3 FT)	CONC BOX CULV (4 FT X 4 FT)	CONC BOX CULV (6 FT X 4 FT)	CONC BOX CULV (7 FT X 4 FT)	RC PIPE (CL III)(18 IN)	RC PIPE (CL III)(24 IN)	HEADWALL (CH - FW - 0) (DIA= 24 IN)	HEADWALL (CH - FW - 15) (DIA= 18 IN)	SET (TY I)(S=3 FT)(HW=3FT)(4:1)(C)	SET (TY I)(S=3 FT)(HW= 3 FT)(6:1)(C)
	UNIT	LF	CY	LF	LF	LF	LF	LF	LF	LF	EA	EA	EA	EA
0+71.33	Culvert A1								43					
3370+60.87	Culvert A2								72					
3401+48.70	Culvert A		2	92									1	1
3425+70.01	Culvert B		3	184									1	1
3429+43.32	Culvert C		2	92									1	1
3439+46.54	Culvert D		3	103									1	1
3445+61.65	Culvert E		2	116									2	
3452+77.08	Culvert F		8		218									
3461+78.99	Culvert G		8			256								
3496+36.13	Culvert H	23	2	91									1	1
3515+91.39	Culvert I		2	110										2
3526+76.92	Culvert J		2	92									1	1
3536+75.31	Culvert K									97	2			
3563+95.79	Culvert L		25					624						
3579+55.44	Culvert M2								93			2		
3586+46.87	Culvert M		11				101							
3592+01.80	Culvert N	9	2	100									2	
	Culvert Driveway-O								27					
387+62.10	Culvert O	48	12	297									1	1
	TOTAL	80	84	1,277	218	256	101	624	235	97	2	2	11	9

DRAINAGE												
STATION	BID ITEM NO.	467 6144	467 6146	467 6150	467 6219	467 6220	467 6249	467 6346	467 6362	496 6001	496 6005
	DESCRIPTION	SET (TY I)(S= 4 FT)(HW= 4 FT)(4:1)(C)	SET (TY I)(S= 4 FT)(HW= 4 FT)(6:1)(C)	SET (TY I)(S= 4 FT)(HW= 5 FT)(4:1)(C)	SET (TY I)(S= 6 FT)(HW= 5 FT)(4:1)(C)	*SET (TY I)(S= 6 FT)(HW= 5 FT)(6:1)(C)	SET (TY I)(S= 7 FT)(HW= 5 FT)(4:1)(C)	SET (TY II)(18 IN)(CMP)(4:1)(P)	SET (TY II)(18 IN)(RCP)(6:1)(C)	REMOV STR (BOX CULVERT)	REMOV STR (WINGWALL)
	UNIT	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA
0+71.33	Culvert A1								2		
3370+60.87	Culvert A2								2		
3401+48.70	Culvert A										
3425+70.01	Culvert B										
3429+43.32	Culvert C										
3439+46.54	Culvert D										
3445+61.65	Culvert E										
3452+77.08	Culvert F	1	1								
3461+78.99	Culvert G			2							
3496+36.13	Culvert H										
3515+91.39	Culvert I										
3526+76.92	Culvert J										
3536+75.31	Culvert K										
3563+95.79	Culvert L						2				
3579+55.44	Culvert M2										
3586+46.87	Culvert M				1	1					
3592+01.80	Culvert N										
	Culvert Driveway-O							2			
387+62.10	Culvert O									1	2
	TOTAL	1	1	2	1	1	2	2	4	1	2

DATE	BY	REV	REVISION

BGE, Inc.
2595 Dallas Parkway, Suite 101, Frisco, TX 75034
Tel: 972-464-4800 • www.bgeinc.com
TBPE Registration No. F-1046

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FS 121

QUANTITY SUMMARY

DRAINAGE

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	23

SIGNAGE

SHT NO.	BID ITEM NO.	644 6001	644 6030
	DESCRIPTION	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	IN SM RD SN SUP&AM TYS80(1)SA(T)
	UNIT	EA	EA
1	BEGIN TO 3383+00	7	
2	3383+00 TO 3404+00		
3	3404+00 TO 3425+00		
4	3425+00 TO 3446+00		
5	3446+00 TO 3467+00		
6	3467+00 TO 3488+00		
7	3488+00 TO 3509+00		
8	3509+00 TO 3530+00	3	
9	3530+00 TO 3551+00	1	
10	3551+00 TO 3572+00		
11	3572+00 TO 3593+00	3	
12	3593+00 TO END	5	1
13	FM 121	6	
14	STIFF CHAPEL/SCHARFF	6	1
	TOTAL	31	2

PAVEMENT MARKINGS

SHT NO.	BID ITEM NO.	533 6003	533 6004	658 6047	658 6062	666 6030	666 6036	666 6048	666 6054	666 6078	666 6141	666 6303	666 6315	672 6007	672 6009
	DESCRIPTION	RUMBLE STRIPS (SHOULDER) ASPHALT	RUMBLE STRIPS (CENTERLINE) ASPHALT	INSTL OM ASSM (OM-2Y)(WC)GND	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	REFL PAV MRK TY I (W)8"(DOT)(100MIL)	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	REFL PAV MRK TY I (W)(ARROW)(100MIL)	REFL PAV MRK TY I (W)(WORD)(100MIL)	REFL PAV MRK TY I (Y)12"(SLD)(100MIL)	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	REFL PAV MRKR TY I-C	REFL PAV MRKR TY II-A-A
	UNIT	LF	LF	EA	EA	LF	LF	LF	EA	EA	LF	LF	LF	EA	EA
1	BEGIN TO 3383+00	2,530	1,270	4				35				2,670	2,540		32
2	3383+00 TO 3404+00	4,200	2,100	4								4,200	4,200		53
3	3404+00 TO 3425+00	4,200	2,100									4,200	4,200		53
4	3425+00 TO 3446+00	4,200	2,100	15								4,200	4,200		53
5	3446+00 TO 3467+00	4,200	2,100	9								4,200	4,200		53
6	3467+00 TO 3488+00	4,200	2,100									4,200	4,200		53
7	3488+00 TO 3509+00	4,200	2,100	4								4,200	4,200		53
8	3509+00 TO 3530+00	3,945	2,025	8								4,275	4,050		51
9	3530+00 TO 3551+00	4,200	2,100	4								4,200	4,200		53
10	3551+00 TO 3572+00	4,200	2,100	4	10							4,200	4,200		53
11	3572+00 TO 3593+00	4,080	2,000	12								4,230	4,000		50
12	3593+00 TO END	2,300	1,385	4				15				2,640	2,765		32
13	FM 121			4	10	800	580		3	3	400	3,315	4,240	30	212
14	STIFF CHAPEL/SCHARFF							50					1,180		16
	TOTAL	46,455	23,480	72	20	800	580	100	3	3	400	50,730	52,375	30	817

DATE	BY	REV	REVISION

BGE, Inc.
2595 Dallas Parkway, Suite 101, Frisco, TX 75034
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TBPE Registration No. F-1046

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FS 121

QUANTITY SUMMARY

PAVEMENT MARKINGS

STATE		HIGHWAY NO.
TEXAS		FS 121

STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	24

SW3P

BID ITEM NO.	164 6009	164 6011	164 6015		168 6001	506 6001	506 6002	506 6011	506 6020	506 6024	506 6038	506 6039
DESCRIPTION	BROADCAST SEED (TEMP) (WARM)	BROADCAST SEED (TEMP) (COOL)	STRAW/HAY MLCH SEED(PERM)(RURAL)(CLAY)	FERTILIZER *	VEGETATIVE WATERING	ROCK FILTER DAMS (INSTALL) (TY 1)	ROCK FILTER DAMS (INSTALL) (TY 2)	ROCK FILTER DAMS (REMOVE)	CONSTRUCTION EXITS (INSTALL) (TY 1)	CONSTRUCTION EXITS (REMOVE)	TEMP SEDMT CONT FENCE (INSTALL)	TEMP SEDMT CONT FENCE (REMOVE)
UNIT	SY	SY	SY	LB	MG	LF	LF	LF	SY	SY	LF	LF
PHASE 1												
1 OF 2							66		78		48	
2 OF 2									78		734	
PHASE 2												
1 OF 14	4791	4791	9582	1886	115	15			78		1627	
2 OF 14	9978	9978	19956	3928	240	135	204				2182	
3 OF 14	10316	10316	20632	4061	248	30					534	
4 OF 14	8461	8460	16921	3331	204	172	66				1450	
5 OF 14	9982	9981	19963	3929	240	66	52				1642	
6 OF 14	11722	11721	23443	4614	282	20					1079	
7 OF 14	9857	9857	19714	3880	237	80					2585	
8 OF 14	7192	7191	14383	2831	173	154					2083	
9 OF 14	9066	9066	18132	3569	218						1852	
10 OF 14	9394	9393	18787	3698	226		110				1440	
11 OF 14	9495	9495	18990	3738	228	204			78		1854	
12 OF 14	5501	5500	11001	2165	133	85					1078	
13 OF 14	4112	4112	8224	1619	99	28			78		274	
14 OF 14											551	
PHASE 3												
1 OF 4	422	421	843	166	11							
2 OF 4	292	291	583	115	7							
3 OF 4	0	0			0							
4 OF 4	0	0			0							
PHASE 4												
1 OF 1	2043	2042	4085	804	50	28					32	
TOTAL	112,624	112,615	225,239	44,334	2,711	1,017	498	1,515	390	390	21,045	21,045

* FOR CONTRACTORS INFORMATION ONLY, 2 CYCLES AT 50 LBS, NITROGEN PER ACRE AT 21-7-14 (NPK) ANALYSIS * 0.0492 LBS/SY/CYCLE

DATE	BY	REV	REVISION

CIVIL ASSOCIATES, INC.
CAI
9330 LBJ FRWY SUITE 1150
Dallas, Texas 75243
Firm Registration No. 6981

Texas Department of Transportation

FS 121

QUANTITY SUMMARY

SW3P

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	25

EARTHWORK - FM SPUR 121

BID ITEM NO.	110 6001	110 6003	132 6004
DESCRIPTION	EXCAVATION (ROADWAY)	EXCAVATION (SPECIAL)	EMBANKMENT (FINAL) (DENS CONT) (TY B)
STA	CY	CY	CY
3370+00	125		0
3371+00	260		37
3372+00	536		52
3373+00	590		90
3374+00	628		90
3375+00	647		72
3376+00	681		42
3377+00	729		19
3378+00	696		11
3379+00	572		23
3380+00	418		118
3381+00	294		246
3382+00	281		317
3383+00	297		389
3384+00	330		369
3385+00	332		363
3386+00	301		473
3387+00	343		399
3388+00	497		215
3389+00	736		91
3390+00	983		22
3391+00	1047		31
3392+00	893		94
3393+00	808		152
3394+00	765		202
3395+00	721		212
3396+00	707		250
3397+00	753		235
3398+00	850		140
3399+00	664		147
3400+00	438		275
3401+00	422		2251
3402+00	358		398
3403+00	446		196
3404+00	654		112
3405+00	638		96
3406+00	601		82
3407+00	642		109
3408+00	667		122
3409+00	880		60
3410+00	938		23
3411+00	720		44
3412+00	529		49
3413+00	491		26
3414+00	800		9
3415+00	1095		4
3416+00	1038		13
3417+00	717		72
3418+00	448		176
3419+00	404		195
3420+00	706		82
3421+00	1117		2
3422+00	1087		3
3423+00	650		124
3424+00	347		355
3425+00	283		479
3426+00	169		554
3427+00	222		408
3428+00	409		167
3429+00	279		420
3430+00	71		946
3431+00	199		875
3432+00	416		350
3433+00	462		139
3434+00	467		94
3435+00	549		36
3436+00	525		39
3437+00	297		175
3438+00	133		390
3439+00	122		501
3440+00	216		446
3441+00	310		369
3442+00	290		464
3443+00	238		663
3444+00	178		879
3445+00	141		995
3446+00	130		1152
3447+00	74		1271
3448+00	16		1258
3449+00	13		1331
3450+00	22		1410

EARTHWORK - FM SPUR 121

BID ITEM NO.	110 6001	110 6003	132 6004
DESCRIPTION	EXCAVATION (ROADWAY)	EXCAVATION (SPECIAL)	EMBANKMENT (FINAL) (DENS CONT) (TY B)
STA	CY	CY	CY
3451+00	26		1444
3452+00	36		1462
3453+00	26		1532
3454+00	15		1570
3455+00	59		1403
3456+00	108		1205
3457+00	126		1242
3458+00	138		1331
3459+00	103		1619
3460+00	39		2295
3461+00	31		2762
3462+00	77		2989
3463+00	102		2554
3464+00	162		1582
3465+00	280		813
3466+00	377		290
3467+00	402		144
3468+00	361		160
3469+00	403		171
3470+00	435		191
3471+00	328		321
3472+00	249		393
3473+00	319		283
3474+00	521		126
3475+00	732		40
3476+00	693		65
3477+00	419		230
3478+00	151		435
3479+00	53		488
3480+00	101		379
3481+00	307		158
3482+00	694		24
3483+00	724		126
3484+00	520		188
3485+00	644		84
3486+00	864		24
3487+00	1022		58
3488+00	1049		216
3489+00	1052		338
3490+00	940		468
3491+00	564		674
3492+00	226		1038
3493+00	149		1091
3494+00	238		739
3495+00	401		541
3496+00	502		515
3497+00	367		459
3498+00	421		266
3499+00	608		265
3500+00	473		463
3501+00	716		467
3502+00	1138		348
3503+00	1202		326
3504+00	1113		288
3505+00	512		270
3506+00	61		252
3507+00	51		207
3508+00	12		300
3509+00	0		502
3510+00	0		453
3511+00	0		252
3512+00	8		115
3513+00	138		47
3514+00	264		84
3515+00	300		218
3516+00	282		588
3517+00	224		782
3518+00	261		690
3519+00	344		564
3520+00	596		484
3521+00	601		460
3522+00	562		767
3523+00	360		844
3524+00	315		742
3525+00	213		821
3526+00	40		976
3527+00	10		1058
3528+00	36		894
3529+00	112		515
3530+00	219		272
3531+00	330		86

EARTHWORK - FM SPUR 121

BID ITEM NO.	110 6001	110 6003	132 6004
DESCRIPTION	EXCAVATION (ROADWAY)	EXCAVATION (SPECIAL)	EMBANKMENT (FINAL) (DENS CONT) (TY B)
STA	CY	CY	CY
3532+00	361		64
3533+00	211		355
3534+00	45		954
3535+00	3		1569
3536+00	8		1830
3537+00	24		1667
3538+00	108		1265
3539+00	267		734
3540+00	452		304
3541+00	612		99
3542+00	803		45
3543+00	806		128
3544+00	566		305
3545+00	359		499
3546+00	200		692
3547+00	136		707
3548+00	153		391
3549+00	268		91
3550+00	336		35
3551+00	377		85
3552+00	520		91
3553+00	378		305
3554+00	226		441
3555+00	411		227
3556+00	581		90
3557+00	511		87
3558+00	262		350
3559+00	88		642
3560+00	35		747
3561+00	500	445	2858
3562+00	76		959
3563+00	150		1006
3564+00	163		1109
3565+00	81		1629
3566+00	39		1674
3567+00	10		1374
3568+00	59		774
3569+00	208		176
3570+00	541		9
3571+00	673		49
3572+00	423		187
3573+00	211		448
3574+00	125		725
3575+00	87		844
3576+00	184		552
3577+00	416		158
3578+00	495		62
3579+00	359		286
3580+00	235		563
3581+00	452		358
3582+00	789		74
3583+00	856		30
3584+00	527		125
3585+00	127		590
3586+00	15		1549
3587+00	23		2376
3588+00	70		2213
3589+00	1206		1149
3590+00	1737		239
3591+00	1149		186
3592+00	807		966
3593+00	466		1104
3594+00	339		388
3595+00	445		221
3596+00	554		162
3597+00	491		264
3598+00	370		548
3599+00	300		941
3600+00	217		1559
3601+00	171		2401
3602+00	197		2329
3603+00	259		1379
3604+00	286		934
3605+00	67		1189
3606+00	154		985
3607+00	0		0
3608+00	0		0
3609+00	0		0
3610+00	0		0
3611+00	0		0
TOTAL	95,421	445	132,016

EARTHWORK - FM 121

BID ITEM NO.	110 6001	132 6004
DESCRIPTION	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL) (DENS CONT) (TY B)
STA	CY	CY
378+00	0	0
379+00	27	29
380+00	50	117
381+00	45	190
382+00	95	183
383+00	111	151
384+00	83	678
385+00	218	733
386+00	263	244
387+00	185	317
388+00	138	439
389+00	78	413
390+00	86	317
391+00	99	221
392+00	95	199
393+00	89	191
394+00	86	152
395+00	76	148
396+00	0	0
TOTAL	1,824	4,722

EARTHWORK - STIFF CHAPEL

BID ITEM NO.	110 6001	132 6004
DESCRIPTION	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL) (DENS CONT) (TY B)
STA	CY	CY
17+00	0	0
18+00	46	18
19+00	71	200
20+00	91	344
21+00	127	174
22+00	62	13
TOTAL	397	749

EARTHWORK - SCHARFF

BID ITEM NO.	110 6001	132 6004
DESCRIPTION	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL) (DENS CONT) (TY B)
STA	CY	CY
10+00	0	0
11+00	60	1
12+00	226	1
13+00	422	0
TOTAL	708	2

DATE	BY	REV	REVISION

BGE, Inc.
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Tel: 972-464-4800 • www.bgeinc.com
TBPE Registration No. F-1046

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FS 121

QUANTITY SUMMARY

EARTHWORK

SHEET 6 OF 6

STATE		HIGHWAY NO.
TEXAS		FS 121

STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	26

7/15/2021 7:30:38 PM

LOC NO.	TCP PHASE	PLAN SHEET NUMBER	LOCATION	STA	TEST LEVEL	DIRECTION OF TRAFFIC (UNI/BI)	FOUNDATION PAD		BACKUP SUPPORT			AVAILABLE SITE LENGTH	CRASH CUSHION									
															MOVE / RESET		L	L	R	R	S	S
							PROPOSED MATERIAL	PROPOSED THICKNESS	DESCRIPTION	WIDTH	HEIGHT		INSTALL	REMOVE	MOVE/ RESET	FROM LOC. #	N	W	N	W	N	W
1	PHASE 2		FM 121	378+38	TL-3	UNI	2-CST		CONCRETE SAFETY BARRIER	2′	3′-6"	25′	1								S/N	
2	PHASE 2		FM 121	384+68	TL-3	UNI	2-CST		CONCRETE SAFETY BARRIER	2′	3′-6"	25′	1								S/N	
3	PHASE 2		FM 121	386+57	TL-3	UNI	2-CST		CONCRETE SAFETY BARRIER	2′	3′-6"	25′	1								S/N	
4	PHASE 2		FM 121	394+97	TL-3	UNI	2-CST		CONCRETE SAFETY BARRIER	2′	3′-6"	25′	1								S/N	
5	PHASE 4		DETOUR*FM 121A	102+80	TL-3	UNI	2-CST		CONCRETE SAFETY BARRIER	2′	3′-6"	25′			1	3					S/N	
6	PHASE 4		DETOUR*FM 121A	116+80	TL-3	UNI	2-CST		CONCRETE SAFETY BARRIER	2′	3′-6"	25′			1	4					S/N	
												TOTALS	4		2							

LEGEND:

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

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

CRASH CUSHION SUMMARY SHEET

FILE: ccss.dgn	DN: TxDOT	CK:	CK:
© TxDOT	CONT	SECT	JOB	HIGHWAY
REVISIONS	0091	10	002	FS 121
	DIST	COUNTY	
	PAR	GRAYSON	
			SHEET NO.
			27

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0091-10-002 **DISTRICT** Paris **COUNTY** Grayson
HIGHWAY FS 121

ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL
	100-6002	PREPARING ROW	STA	236.300	
	104-6067	REMOVING CONC (SAWCUT)	LF	17.000	
	110-6001	EXCAVATION (ROADWAY)	CY	98,350.000	
	110-6003	EXCAVATION (SPECIAL)	CY	445.000	
	132-6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	CY	137,489.000	
	164-6009	BROADCAST SEED (TEMP) (WARM)	SY	112,624.000	
	164-6011	BROADCAST SEED (TEMP) (COOL)	SY	112,615.000	
	164-6015	STRAW/HAY MLCH SEED(PERM)(RURAL)(CLAY)	SY	225,239.000	
	168-6001	VEGETATIVE WATERING	MG	2,711.000	
	247-6238	FL BS (CMP IN PLC)(TY A GR 4)(12")	SY	136,217.000	
	275-6001	CEMENT	TON	1,202.000	
	275-6003	CEMENT TREAT (NEW BASE) (6")	SY	131,902.000	
	316-6029	ASPH (RC-250)	GAL	35,691.000	
	316-6403	AGGR (TY-B GR-5 OR TY-L GR-5)	CY	914.000	
	402-6001	TRENCH EXCAVATION PROTECTION	LF	80.000	
	423-6003	RETAINING WALL (TEMP WALL)	SF	347.000	
	432-6006	RIPRAP (CONC)(CL B)	CY	84.000	
	432-6045	RIPRAP (MOW STRIP)(4 IN)	CY	107.000	
	462-6001	CONC BOX CULV (3 FT X 2 FT)	LF	1,277.000	
	462-6004	CONC BOX CULV (4 FT X 3 FT)	LF	218.000	
	462-6005	CONC BOX CULV (4 FT X 4 FT)	LF	256.000	
	462-6011	CONC BOX CULV (6 FT X 4 FT)	LF	101.000	
	462-6015	CONC BOX CULV (7 FT X 4 FT)	LF	624.000	
	464-6003	RC PIPE (CL III)(18 IN)	LF	235.000	
	464-6005	RC PIPE (CL III)(24 IN)	LF	97.000	
	466-6005	HEADWALL (CH - FW - 0) (DIA= 24 IN)	EA	2.000	
	466-6018	HEADWALL (CH - FW - 15) (DIA= 18 IN)	EA	2.000	
	467-6106	SET (TY I)(S=3 FT)(HW=3FT)(4:1)(C)	EA	11.000	
	467-6109	SET (TY I)(S=3 FT)(HW= 3 FT)(6:1)(C)	EA	9.000	
	467-6144	SET (TY I)(S= 4 FT)(HW= 4 FT)(4:1) (C)	EA	1.000	
	467-6146	SET (TY I)(S= 4 FT)(HW= 4 FT)(6:1) (C)	EA	1.000	
	467-6150	SET (TY I)(S= 4 FT)(HW= 5 FT)(4:1) (C)	EA	2.000	
	467-6219	SET (TY I)(S= 6 FT)(HW= 5 FT)(4:1) (C)	EA	1.000	
	467-6220	SET (TY I)(S= 6 FT)(HW= 5 FT)(6:1) (C)	EA	1.000	
	467-6249	SET (TY I)(S= 7 FT)(HW= 5 FT)(4:1) (C)	EA	2.000	
	467-6346	SET (TY II) (18 IN) (CMP) (4: 1) (P)	EA	2.000	
	467-6362	SET (TY II) (18 IN) (RCP) (6: 1) (C)	EA	4.000	
	496-6001	REMOV STR (BOX CULVERT)	EA	1.000	
	496-6005	REMOV STR (WINGWALL)	EA	2.000	
	496-6043	REMOV STR (SMALL FENCE)	LF	8,344.000	
	496-6050	REMOV STR (DRIVEWAY CULVERT)	EA	1.000	

Estimate & Quantity Sheet

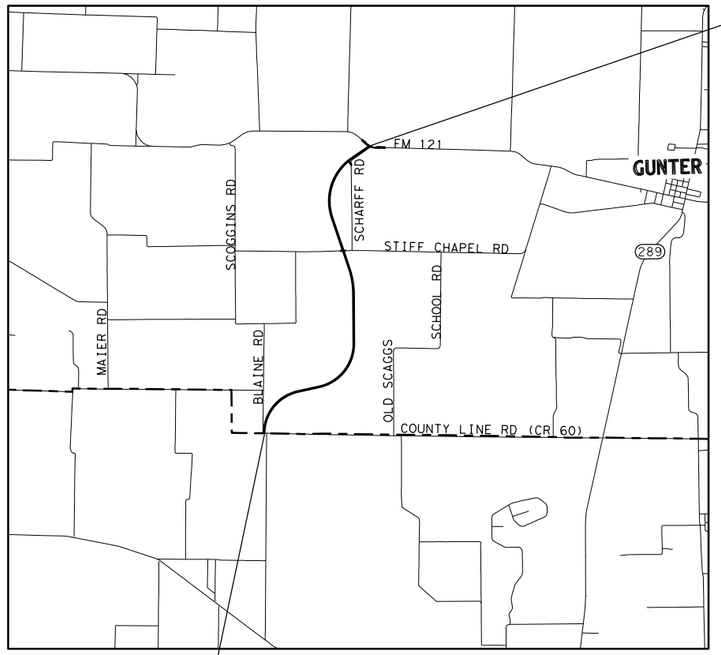
CONTROLLING PROJECT ID 0091-10-002 **DISTRICT** Paris **COUNTY** Grayson
HIGHWAY FS 121

ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL
	496-6051	REMOV STR (PIPE GATE)	LF	54.000	
	500-6001	MOBILIZATION	LS	1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	16.000	
	506-6001	ROCK FILTER DAMS (INSTALL) (TY 1)	LF	1,017.000	
	506-6002	ROCK FILTER DAMS (INSTALL) (TY 2)	LF	498.000	
	506-6011	ROCK FILTER DAMS (REMOVE)	LF	1,515.000	
	506-6020	CONSTRUCTION EXITS (INSTALL) (TY 1)	SY	390.000	
	506-6024	CONSTRUCTION EXITS (REMOVE)	SY	390.000	
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	21,045.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	21,045.000	
	508-6001	CONSTRUCTING DETOURS	SY	7,632.000	
	512-6001	PORT CTB (FUR & INST)(SGL SLOPE)(TY 1)	LF	1,470.000	
	512-6025	PORT CTB (MOVE)(SGL SLP)(TY 1)	LF	1,440.000	
	512-6049	PORT CTB (REMOVE)(SGL SLP)(TY 1)	LF	1,470.000	
	530-6004	DRIVEWAYS (CONC)	SY	147.000	
	533-6003	RUMBLE STRIPS (SHOULDER) ASPHALT	LF	46,455.000	
	533-6004	RUMBLE STRIPS (CENTERLINE) ASPHALT	LF	23,480.000	
	540-6002	MTL W-BEAM GD FEN (STEEL POST)	LF	1,337.500	
	540-6033	MTL BM GD FEN (LONG SPAN SYSTEM)	EA	1.000	
	544-6001	GUARDRAIL END TREATMENT (INSTALL)	EA	8.000	
	545-6003	CRASH CUSH ATTEN (MOVE & RESET)	EA	4.000	
	545-6005	CRASH CUSH ATTEN (REMOVE)	EA	4.000	
	545-6019	CRASH CUSH ATTEN (INSTL)(S)(N)(TL3)	EA	4.000	
	560-6007	MAILBOX INSTALL-S (WC-POST) TY 3	EA	2.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	31.000	
	644-6030	IN SM RD SN SUP&AM TYS80(1)SA(T)	EA	2.000	
	658-6047	INSTL OM ASSM (OM-2Y)(WC)GND	EA	72.000	
	658-6062	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	EA	20.000	
	662-6004	WK ZN PAV MRK NON-REMOV (W)4"(SLD)	LF	3,277.000	
	662-6016	WK ZN PAV MRK NON-REMOV (W)24"(SLD)	LF	24.000	
	662-6034	WK ZN PAV MRK NON-REMOV (Y)4"(SLD)	LF	3,411.000	
	662-6063	WK ZN PAV MRK REMOV (W)4"(SLD)	LF	12,841.000	
	662-6075	WK ZN PAV MRK REMOV (W)24"(SLD)	LF	195.000	
	662-6095	WK ZN PAV MRK REMOV (Y)4"(SLD)	LF	17,744.000	
	666-6030	REFL PAV MRK TY I (W)8"(DOT)(100MIL)	LF	800.000	
	666-6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF	580.000	
	666-6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF	100.000	
	666-6054	REFL PAV MRK TY I (W)(ARROW)(100MIL)	EA	3.000	
	666-6078	REFL PAV MRK TY I (W)(WORD)(100MIL)	EA	3.000	
	666-6141	REFL PAV MRK TY I (Y)12"(SLD)(100MIL)	LF	400.000	
	666-6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	LF	50,730.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0091-10-002 **DISTRICT** Paris **COUNTY** Grayson
HIGHWAY FS 121

ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL
	666-6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	LF	52,375.000	
	672-6007	REFL PAV MRKR TY I-C	EA	30.000	
	672-6009	REFL PAV MRKR TY II-A-A	EA	817.000	
	677-6001	ELIM EXT PAV MRK & MRKS (4")	LF	3,418.000	
	678-6001	PAV SURF PREP FOR MRK (4")	LF	37,273.000	
	3076-6016	D-GR HMA TY-C SAC-A PG64-22	TON	20,682.000	
	5001-6002	GEOGRID BASE REINFORCEMENT (TY II)	SY	144,841.000	
	6185-6002	TMA (STATIONARY)	DAY	56.000	
	6185-6003	TMA (MOBILE OPERATION)	HR	40.000	
	18	EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)	LS	1.000	
		SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000	



END PROJECT
CSJ 0091-10-002
STA 3606+21
TRM XXX+XX.XXX

BEGIN PROJECT
CSJ 0091-10-002
STA 3369+89
TRM XXX+XX.XXX

N

SIGNS G20-1bTR, G20-1bTL or G20-5T, G20-6T, G20-2, G20-2bT, CW20-1D, R20-3T, G20-10T, R20-5T, G20-9TP AND R20-5aTP WILL BE REQUIRED AT PROJECT LIMITS.

CW20-1D AND G20-2 WILL BE REQUIRED AT ALL CROSSROADS.

G20-1a WILL BE REQUIRED AT ALL MAJOR CROSSROADS.

SIGNAGE LEGEND
G20-1bTR or G20-1bTL (48X18) - ROAD WORK NEXT X MILES or
G20-5T (48X24)- BEGIN ROAD WORK NEXT X MILES
G20-6T (48X30)- NAME,ADDRESS, CITY, STATE, CONTRACTOR
G20-9TP (36X30) - BEGIN WORK ZONE
G20-2bT (36X18) - END WORK ZONE
R20-3T (48X42)- OBEY WARNING SIGNS STATE LAW
G20-1aT (72X36)- ROAD WORK NEXT X MILES NEXT X MILES
CW20-1D (48X48)- ROAD WORK AHEAD
R20-5T (36X36)- TRAFFIC FINES DOUBLE
R20-5aTP (36X18) - WHEN WORKERS ARE PRESENT
G20-2 (48X24) - END ROAD WORK
G20-10T (60X48) - STAY ALERT TALK OR TEXT LATER
G20-5aP (24X18) - WORK ZONE

NOTE:

ALL TRAFFIC CONTROL DEVICES WILL CONFORM WITH THE TEXAS "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS" (TMUTCD), AND WILL BE MAINTAINED AS DIRECTED. ADDITIONAL GUIDELINES FOR TRAFFIC CONTROL DEVICES MAY BE FOUND IN THE TMUTCD.

FOR CHANNELIZING DEVICE PLACEMENT AND SPACING FOR ALL PHASES, REFER TO THE TCP STANDARDS.

GENERAL

A. INSTALL ALL SIGNS, BARRICADES AND TRAFFIC CONTROL DEVICES AS SHOWN AND IN ACCORDANCE WITH THE STANDARD BC SHEETS AND AS DIRECTED.

B. ADDITIONAL SIGNS, BARRICADES OR TRAFFIC CONTROL DEVICES OTHER THAN THOSE SPECIFIED MAY BE REQUIRED FOR THE SAFE MOVEMENT OF TRAFFIC THROUGH THE PROJECT. PAYMENT FOR ALL SUCH SIGNS, BARRICADES OR TRAFFIC CONTROL DEVICES SHALL BE CONSIDERED AS SUBSIDIARY TO THE ITEM 502, "BARRICADES, SIGNS AND TRAFFIC HANDLING".

C. WORK SITES SHOULD BE CAREFULLY MONITORED TO ENSURE THAT TRAFFIC CONTROL MEASURES ARE OPERATING EFFECTIVELY AND THAT ALL DEVICES USED ARE CLEARLY VISIBLE, CLEAN AND IN GOOD REPAIR.

D. THE CONTRACTOR WILL PROVIDE SAFE ACCESS TO AND FROM ALL PRIVATE PROPERTY AT ALL TIMES AND IN ALL WEATHER CONDITIONS.

E. THE CONTRACTOR WILL BE REQUIRED TO SUBMIT A DETAILED SCHEDULE OF WORK TO THE PROJECT ENGINEER PRIOR TO THE BEGINNING OF CONSTRUCTION WHICH GENERALLY CONFORMS TO THE SEQUENCE SHOWN ON THE TCP SEQUENCE OF OPERATION.

F. COMPLETE ALL WORK ON PROJECT AS SHOWN ON THE VARIOUS PLAN SHEETS AND IN COMPLIANCE WITH THE GENERAL NOTES OF THIS CONTRACT.

G. ANY REQUEST TO ALTER THE SEQUENCE OF OPERATION OR TRAFFIC CONTROL PLAN WILL BE SUBMITTED TO THE ENGINEER FOR HIS WRITTEN APPROVAL.

H. THE CONTRACTOR IS NOT ALLOWED TO WORK IN AREAS WITH ONGOING UTILITY RELOCATION.

SEQUENCE OF OPERATION:

1. SET PROJECT BARRICADES
2. INSTALL REQUIRED TEMPORARY EROSION CONTROL DEVICES BY PHASES PER EROSION CONTROL PLANS.
3. INSTALL CULVERT O BY STAGES PRIOR TO PHASE 1 CONSTRUCTION.
4. PHASE 1

   TRAFFIC:

   FM 121 - SHIFT CENTER LINE TO THE SOUTH

   SCHARFF RD - REMAINS THE SAME AS EXISTING

   STIFF CHAPEL RD - REMAINS THE SAME AS EXISTING

   CR 60 - REMAINS THE SAME AS EXISTING

   CONSTRUCTION:

   FM 121 - CONSTRUCT TEMPORARY PAVEMENT ALONG WB FM 121

   STIFF CHAPEL RD - CONSTRUCT TEMPORARY PAVEMENT ALONG NORTH SIDE OF STIFF CHAPEL RD
5. PHASE 2

   TRAFFIC:

   FM 121 - UTILIZE TEMPORARY PAVEMENT CONSTRUCTED IN PHASE 1, SHIFT TRAFFIC TO THE NORTH

   SCHARFF RD - TO REMAIN OPEN BUT SHALL BE CLOSED AT THE TIME OF CONSTRUCTION OF THE FS 121/FM 121 INTERSECTION AND SHALL NOT BE SIMULTANEOUS WITH THE CONSTRUCTION OF THE PROPOSED SCHARFF RD TIE IN WITH FS 121

   STIFF CHAPEL RD - SHIFT TRAFFIC TO THE NORTH UTILIZING THE TEMPORARY PAVEMENT CONSTRUCTED IN PHASE 1

   CR 60 - REMAINS THE SAME AS EXISTING

   CONSTRUCTION:

   FM 121 - CONSTRUCT PERMANENT PAVEMENT WIDENING ALONG EB

   FM SPUR 121 - CONSTRUCT PERMANENT PAVEMENT TO THE FULL WIDTH FROM STA 3370+50 TO STA 3524+40 & FROM STA 3524+99 TO FM 121

   SCHARFF RD - CONSTRUCT PROPOSED ALIGNMENT/FS 121 TIE-IN

   STIFF CHAPEL RD - CONSTRUCT PROPOSED PERMANENT EB LANE WITH TEMPORARY RETAINING WALL & TEMPORARY PAVEMENT ALONG SOUTH EDGE OF EB LANE

   CR 60 - CONSTRUCT TEMPORARY PAVEMENT FOR DETOUR
6. PHASE 3

   TRAFFIC:

   FM 121 - REMAINS THE SAME AS PHASE 2

   SCHARFF RD - OPEN TRAFFIC TO NEWLY CONSTRUCTED FM SPUR 121 PERMANENT

   STIFF CHAPEL RD - SHIFT TRAFFIC TO NEWLY CONSTRUCTED EB PERMANENT AND TEMPORARY PAVEMENT

   CR 60 - SHIFT TRAFFIC TO NEWLY CONSTRUCTED TEMPORARY DETOUR PAVEMENT

   CONSTRUCTION:

   FM SPUR 121 - CONSTRUCT CR 60 INTERSECTION

   STIFF CHAPEL RD - CONSTRUCT PROPOSED PERMANENT WB LANE

   CR 60 - CONSTRUCT PERMANENT PAVEMENT
7. PHASE 4

   TRAFFIC:

   FM 121 - UTILIZE PERMANENT PAVEMENT CONSTRUCTED ALONG EB IN PHASE 2, SHIFT TRAFFIC TO THE SOUTH

   CONSTRUCTION:

   FM 121 - CONSTRUCT THE PERMANENT PAVEMENT WIDENING ALONG WB
8. CLEAN UP PROJECT AND REMOVE TEMPORARY EROSION CONTROL DEVICES AND PROJECT BARRICADES.

STATE OF TEXAS
JENN-HWAN MA
83964
LICENSED
PROFESSIONAL ENGINEER

8/5/2021

DATE	BY	REV	REVISION

CIVIL ASSOCIATES, INC.
CAI
9330 LBJ FRWY SUITE 1150
Dallas, Texas 75243
Firm Registration No. 6981

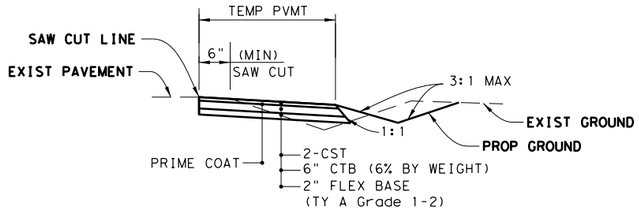
Texas Department of Transportation

FS 121

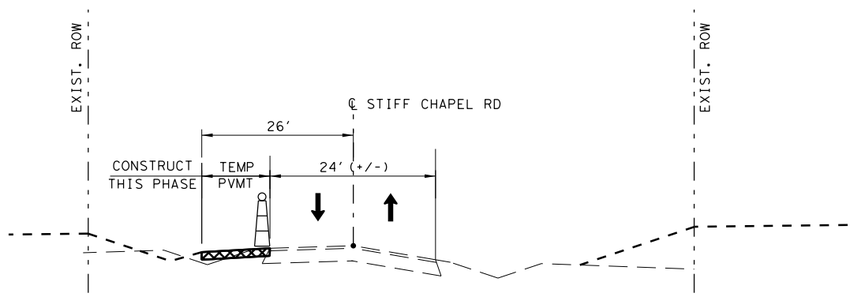
TRAFFIC CONTROL PLAN CONSTRUCTION SEQUENCE

SHEET 1 OF 1

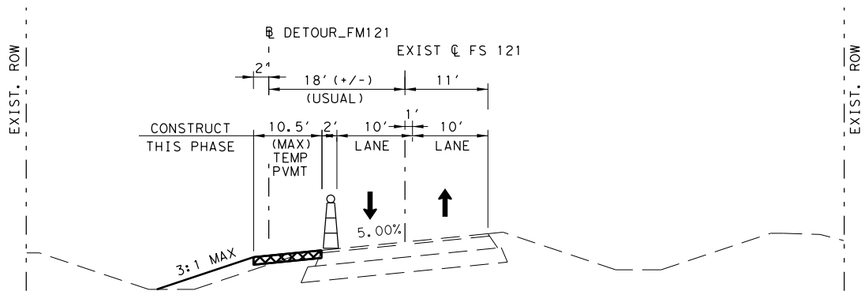
STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	29



TEMPORARY PAVEMENT STRUCTURE DETAILS



STIFF CHAPEL RD PHASE 1
AT INTERSECTION



FM 121 PHASE 1

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTED PREVIOUS PHASE
- TEMPORARY CONSTRUCTED PREVIOUS PHASE
- (A)/(AR) WK ZN PAV MRK (N-R)/(R)(W)4"(BRK)
- (B)/(BR) WK ZN PAV MRK (N-R)/(R)(W)4"(SLD)
- (C)/(CR) WK ZN PAV MRK (N-R)/(R)(Y)4"(SLD)
- (D)/(DR) WK ZN PAV MRK (N-R)/(R)(W)8"(SLD)
- (E)/(ER) WK ZN PAV MRK (N-R)/(R)(W)24"(SLD)

7/15/2021

DATE	BY	REV	REVISION

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Firm Registration No. 6981

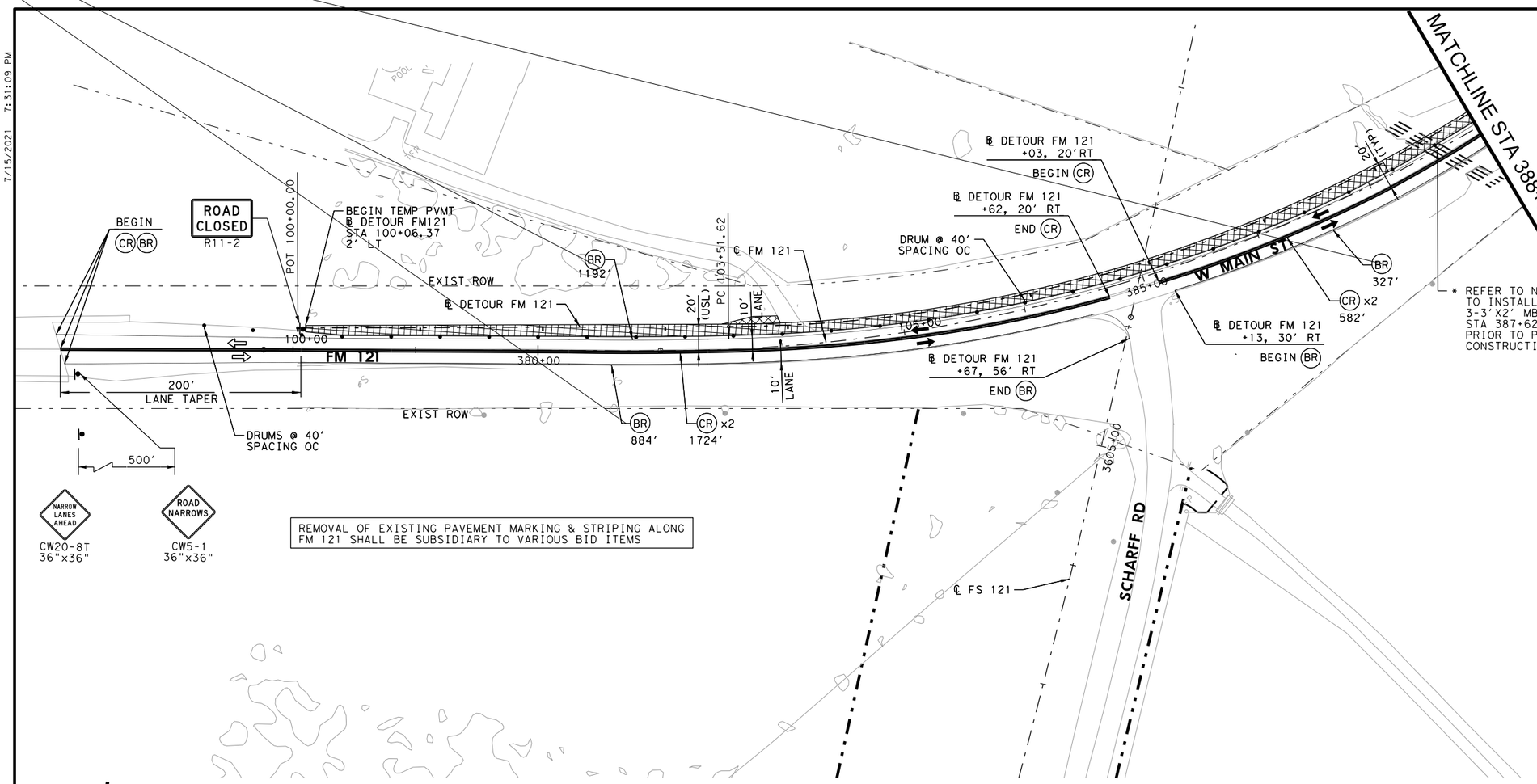
Texas Department of Transportation

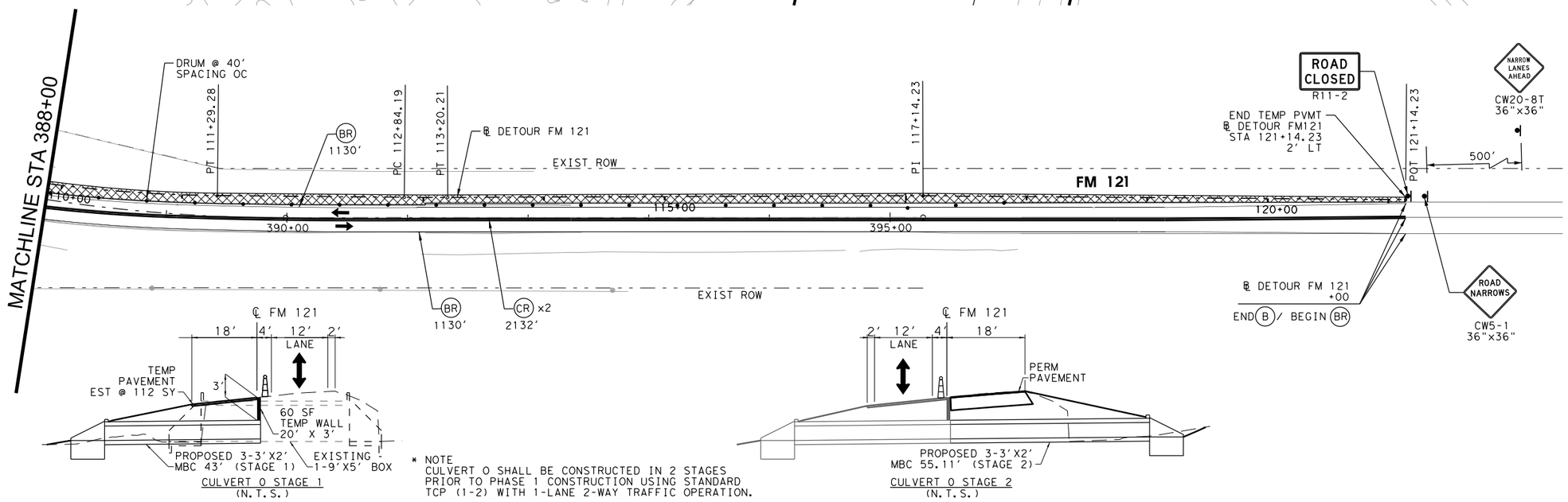
FS 121

TRAFFIC CONTROL PLAN TYPICAL SECTIONS
PHASE 1

SHEET 1 OF 1

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	30



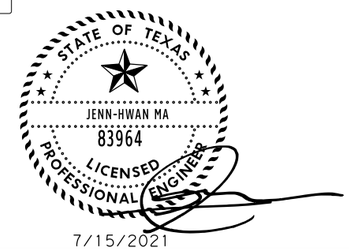


* NOTE
CULVERT O SHALL BE CONSTRUCTED IN 2 STAGES PRIOR TO PHASE 1 CONSTRUCTION USING STANDARD TCP (1-2) WITH 1-LANE 2-WAY TRAFFIC OPERATION.

HORIZONTAL
50 0 50 100

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTED PREVIOUS PHASE
- TEMPORARY CONSTRUCTED PREVIOUS PHASE
- TRAFFIC FLOW
- PROPOSED TEMPORARY WALL
- SIGN
- BARRICADE TY III
- CONC TRAFFIC BARRIER (CTB)
- CHANNELIZING DEVICE
- CRASH CUSHION ATTENUATOR (CCA)
- (A)/(AR) WK ZN PAV MRK (N-R)/(R)(W)4"(BRK)
- (B)/(BR) WK ZN PAV MRK (N-R)/(R)(W)4"(SLD)
- (C)/(CR) WK ZN PAV MRK (N-R)/(R)(Y)4"(SLD)
- (D)/(DR) WK ZN PAV MRK (N-R)/(R)(W)8"(SLD)
- (E)/(ER) WK ZN PAV MRK (N-R)/(R)(W)24"(SLD)
- ARROW BOARD



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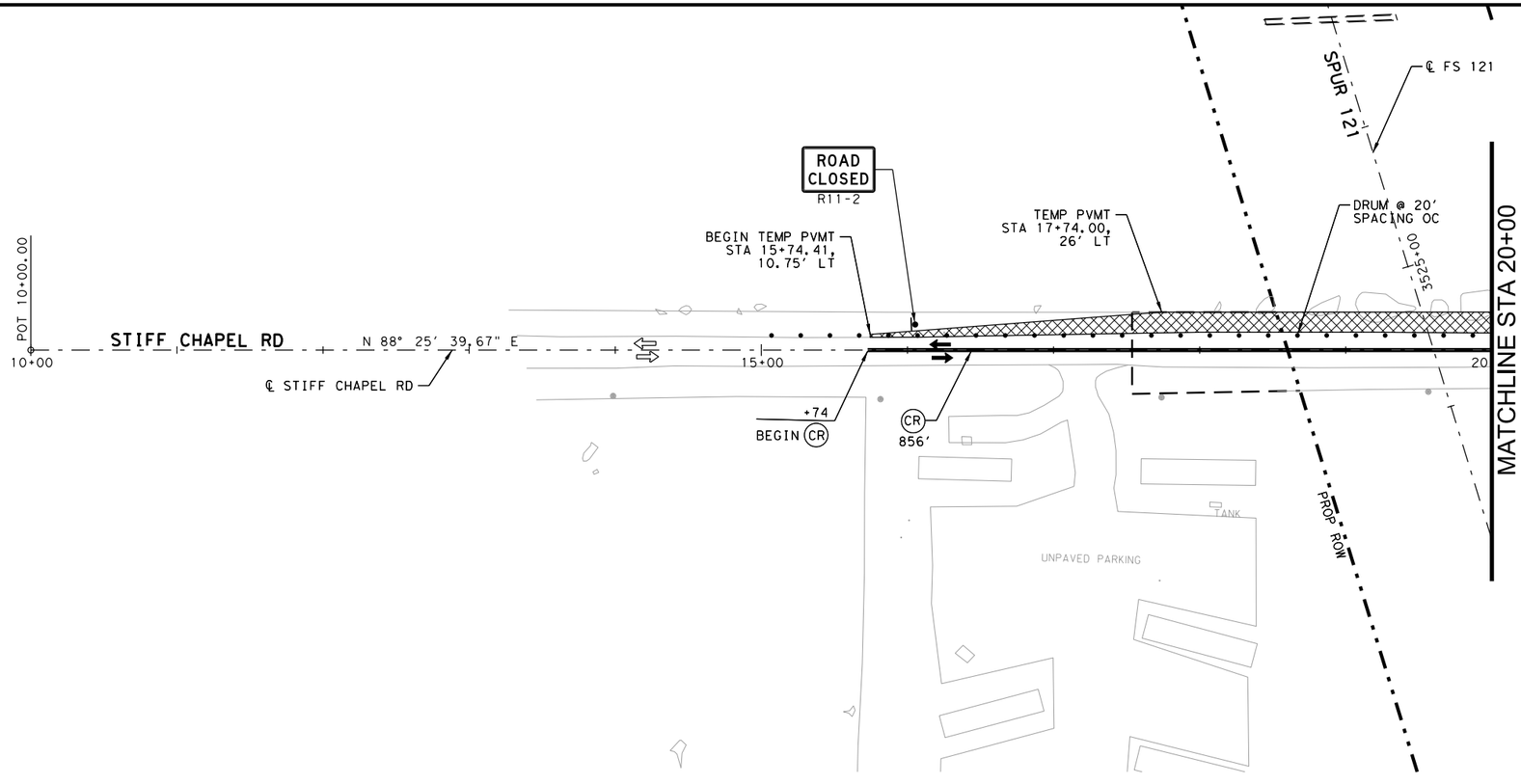
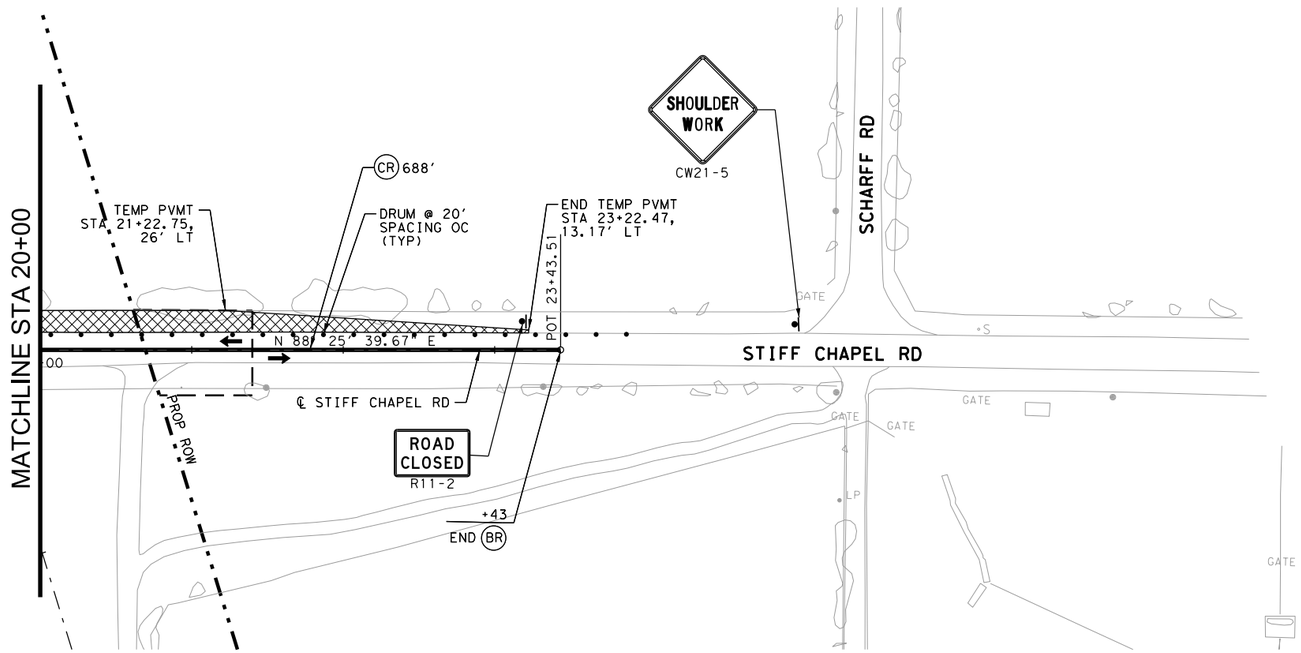
FS 121

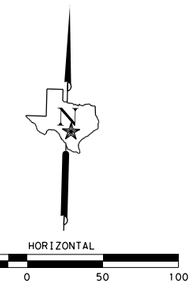
TRAFFIC CONTROL PLAN PHASE 1 FM 121

SHEET 1 OF 2

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	31

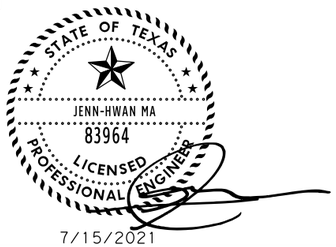






LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTED PREVIOUS PHASE
- TEMPORARY CONSTRUCTED PREVIOUS PHASE
- TRAFFIC FLOW
- PROPOSED TEMPORARY WALL
- SIGN
- BARRICADE TY III
- CONC TRAFFIC BARRIER (CTB)
- CHANNELIZING DEVICE
- CRASH CUSHION ATTENUATOR (CCA)
- (A)/(AR) WK ZN PAV MRK (N-R)/(R)(W)4"(BRK)
- (B)/(BR) WK ZN PAV MRK (N-R)/(R)(W)4"(SLD)
- (C)/(CR) WK ZN PAV MRK (N-R)/(R)(Y)4"(SLD)
- (D)/(DR) WK ZN PAV MRK (N-R)/(R)(W)8"(SLD)
- (E)/(ER) WK ZN PAV MRK (N-R)/(R)(W)24"(SLD)
- ARROW BOARD



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Dallas, Texas 75243
Firm Registration No. 6981

Texas Department of Transportation

FS 121

TRAFFIC CONTROL PLAN PHASE 1

STIFF CHAPEL RD

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	32

248-05TCP*DETOUR LAYOUT01.dgn

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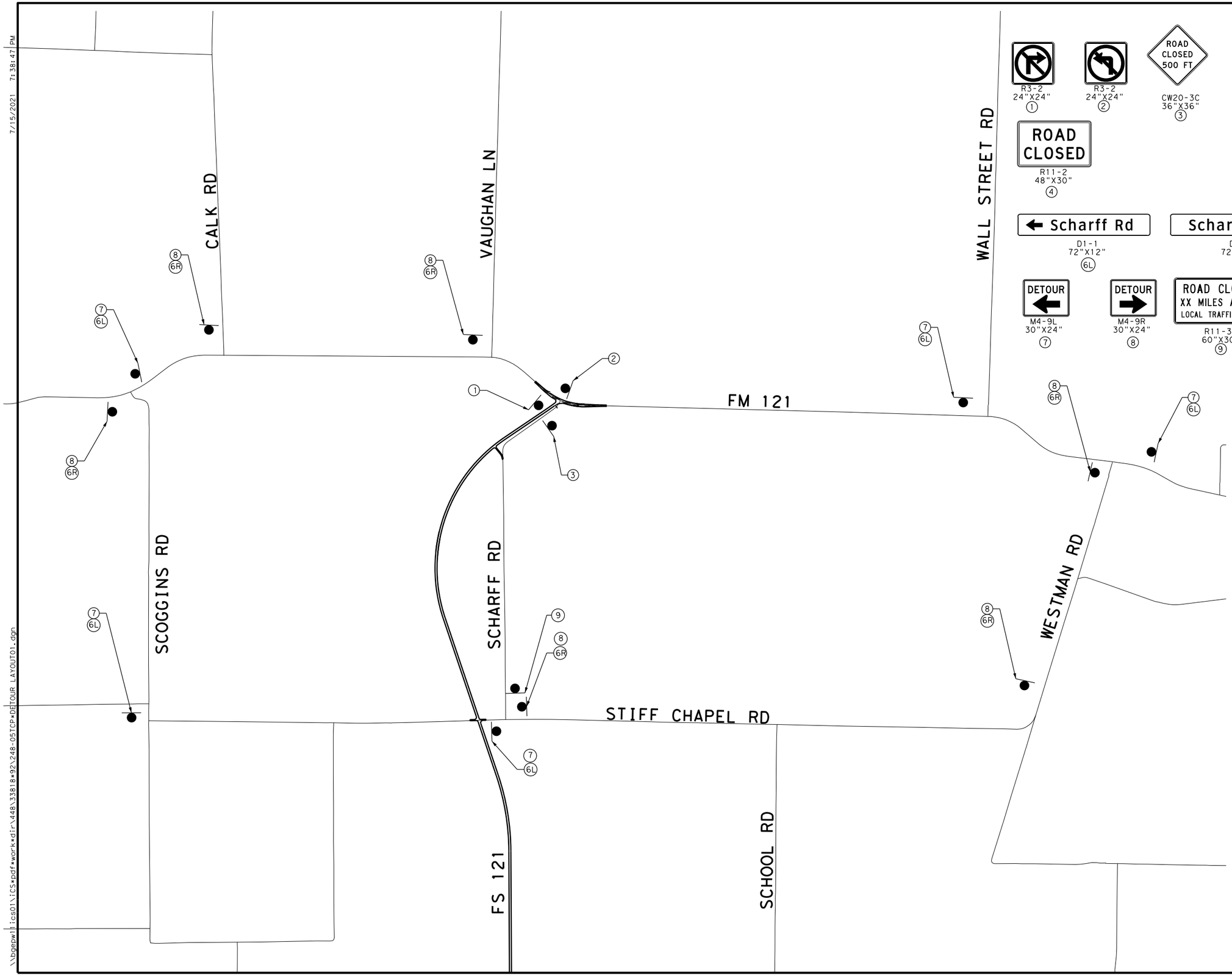

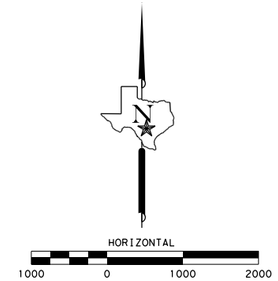

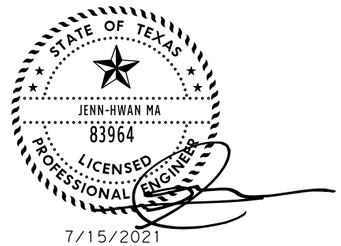

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FS 121

TRAFFIC CONTROL PLAN
PHASE 2
SCHARFF RD DETOUR

SCALE: 1" = 1000' SHEET 1 OF 1

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	33

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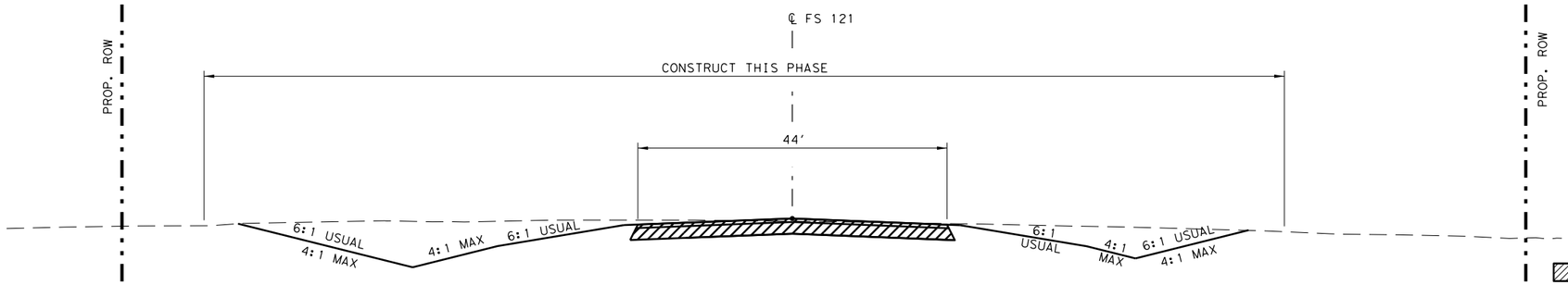
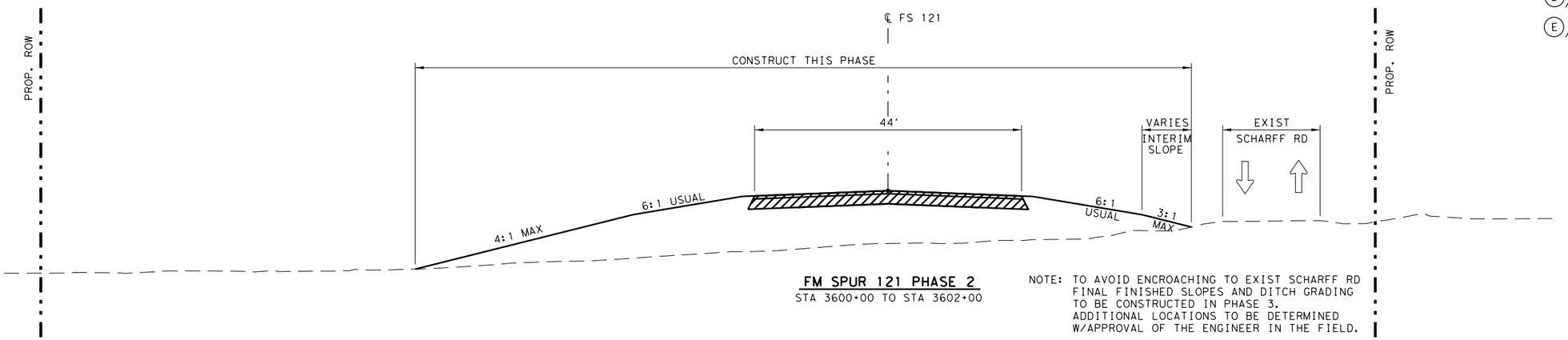


FM SPUR 121 PHASE 2
STA 3370+50 TO STA 3524+40
STA 3524+99 TO STA 3600+00
STA 3602+00 TO FM 121

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTED PREVIOUS PHASE
- TEMPORARY CONSTRUCTED PREVIOUS PHASE
- (A)/(AR) WK ZN PAV MRK (N-R)/(R)(W)4"(BRK)
- (B)/(BR) WK ZN PAV MRK (N-R)/(R)(W)4"(SLD)
- (C)/(CR) WK ZN PAV MRK (N-R)/(R)(Y)4"(SLD)
- (D)/(DR) WK ZN PAV MRK (N-R)/(R)(W)8"(SLD)
- (E)/(ER) WK ZN PAV MRK (N-R)/(R)(W)24"(SLD)



FM SPUR 121 PHASE 2
STA 3600+00 TO STA 3602+00

NOTE: TO AVOID ENCROACHING TO EXIST SCHARFF RD FINAL FINISHED SLOPES AND DITCH GRADING TO BE CONSTRUCTED IN PHASE 3. ADDITIONAL LOCATIONS TO BE DETERMINED W/APPROVAL OF THE ENGINEER IN THE FIELD.

7/15/2021

DATE	BY	REV	REVISION

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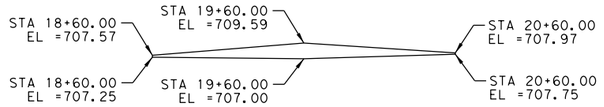
CAI
9330 LBJ FRWY SUITE 1150
Dallas, Texas 75243
Firm Registration No. 6981

Texas Department of Transportation

FS 121

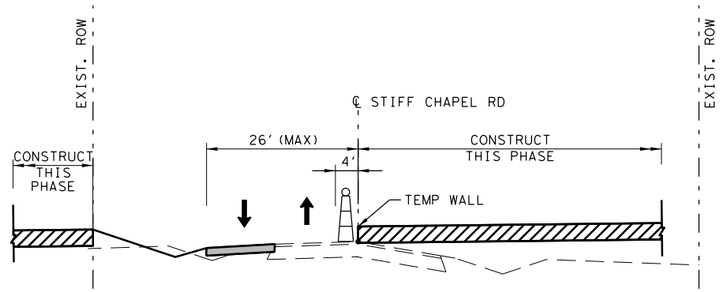
TRAFFIC CONTROL PLAN TYPICAL SECTIONS PHASE 2

STATE				HIGHWAY NO.
TEXAS				FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	34



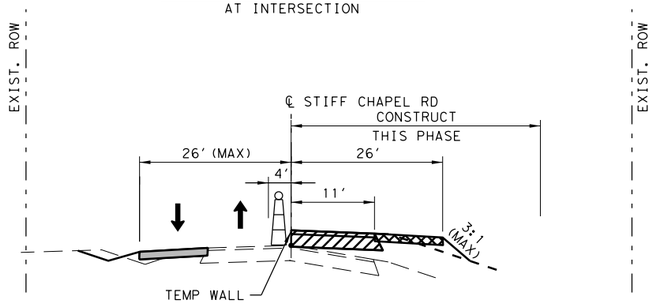
TEMPORARY WALL 01 PHASE 2

STIFF CHAPEL RD
AREA = 287 SF



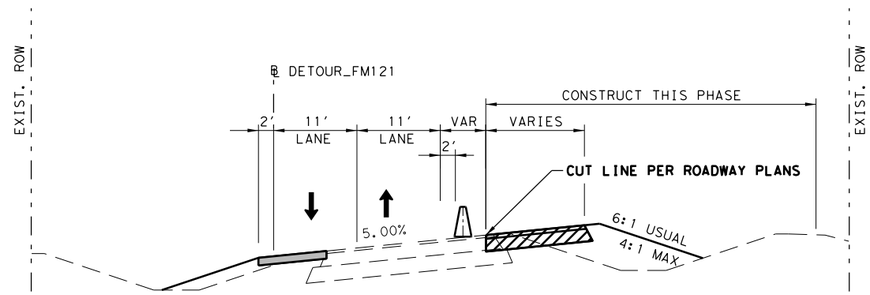
STIFF CHAPEL RD PHASE 2

AT INTERSECTION



STIFF CHAPEL RD PHASE 2

BEYOND INTERSECTION



FM 121 PHASE 2

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTED PREVIOUS PHASE
- TEMPORARY CONSTRUCTED PREVIOUS PHASE
- (A)/(AR) WK ZN PAV MRK (N-R)/(R)(W)4"(BRK)
- (B)/(BR) WK ZN PAV MRK (N-R)/(R)(W)4"(SLD)
- (C)/(CR) WK ZN PAV MRK (N-R)/(R)(Y)4"(SLD)
- (D)/(DR) WK ZN PAV MRK (N-R)/(R)(W)8"(SLD)
- (E)/(ER) WK ZN PAV MRK (N-R)/(R)(W)24"(SLD)

7/15/2021

DATE	BY	REV	REVISION

CIVIL ASSOCIATES, INC.
CAI
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Dallas, Texas 75243
Firm Registration No. 6981

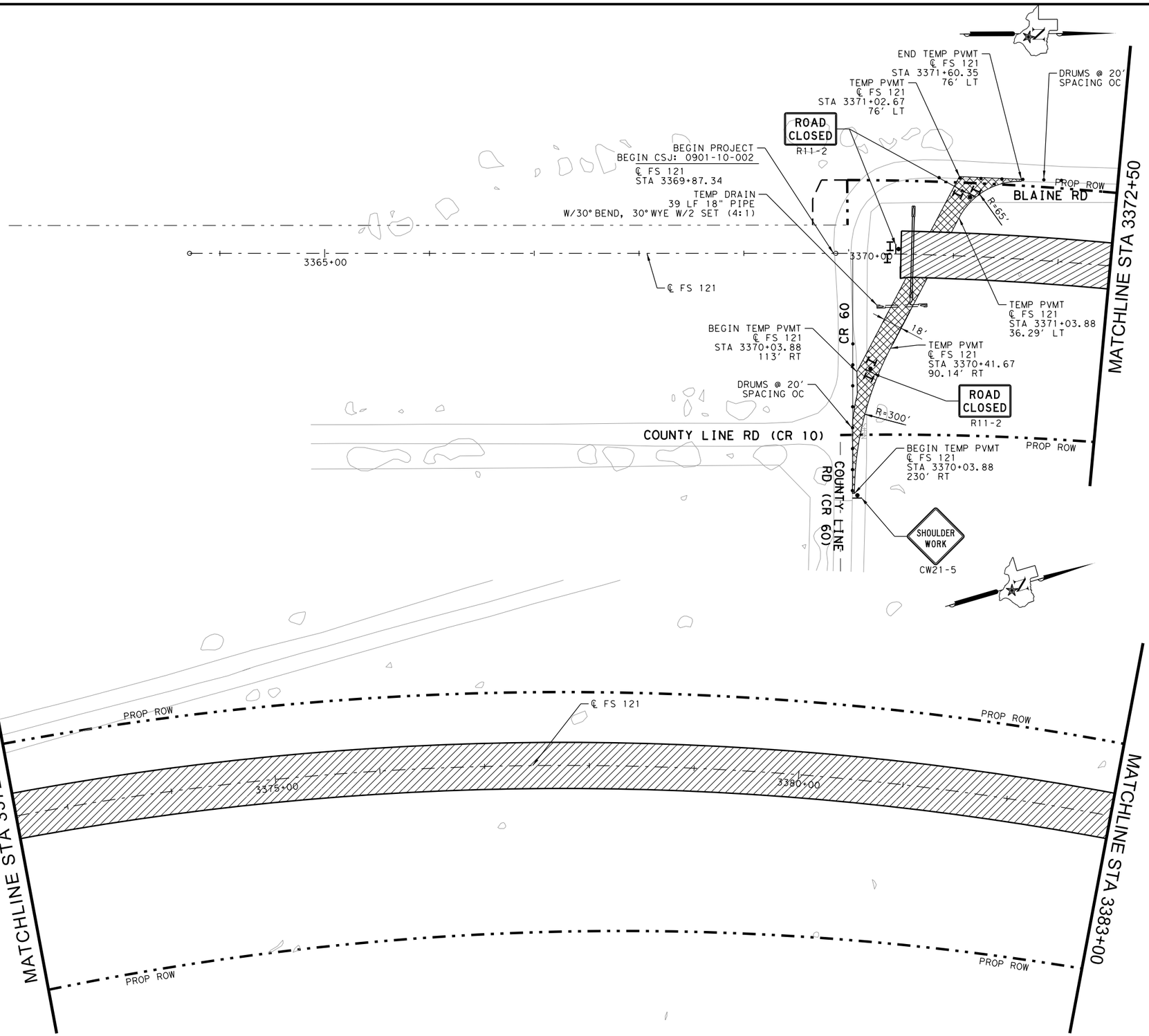
Texas Department of Transportation

FS 121

TRAFFIC CONTROL PLAN TYPICAL SECTIONS PHASE 2

STATE		HIGHWAY NO.
TEXAS		FS 121

STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	35



HORIZONTAL
50 0 50 100

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTED PREVIOUS PHASE
- TEMPORARY CONSTRUCTED PREVIOUS PHASE
- TRAFFIC FLOW
- PROPOSED TEMPORARY WALL
- SIGN
- BARRICADE TY III
- CONC TRAFFIC BARRIER (CTB)
- CHANNELIZING DEVICE
- CRASH CUSHION ATTENUATOR (CCA)
- (A)/(AR) WK ZN PAV MRK (N-R)/(R)(W)4"(BRK)
- (B)/(BR) WK ZN PAV MRK (N-R)/(R)(W)4"(SLD)
- (C)/(CR) WK ZN PAV MRK (N-R)/(R)(Y)4"(SLD)
- (D)/(DR) WK ZN PAV MRK (N-R)/(R)(W)8"(SLD)
- (E)/(ER) WK ZN PAV MRK (N-R)/(R)(W)24"(SLD)
- ARROW BOARD

STATE OF TEXAS
JENN-HWAN MA
83964
LICENSED PROFESSIONAL ENGINEER

7/15/2021

DATE	BY	REV	REVISION

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Dallas, Texas 75243
Firm Registration No. 6981

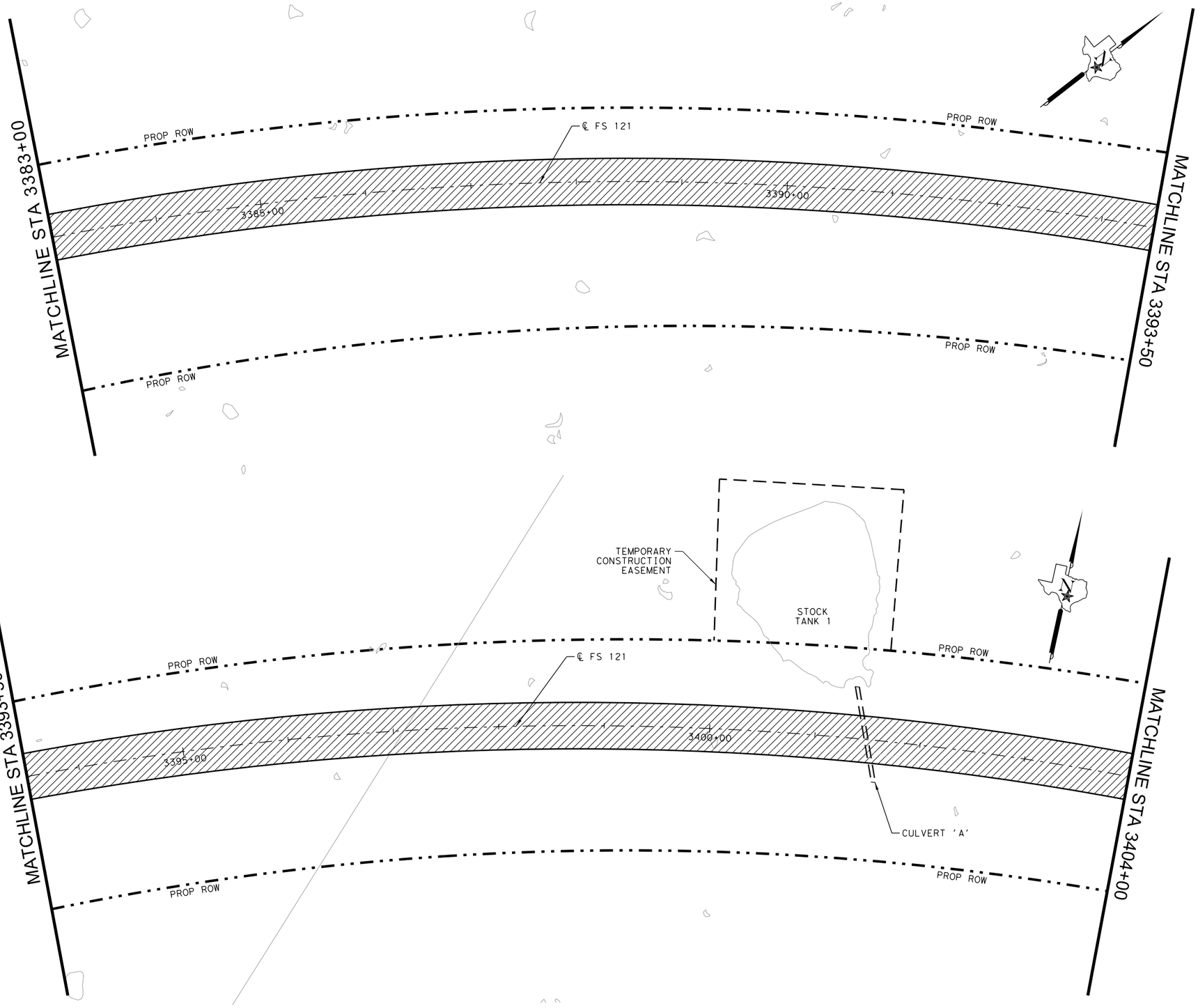
Texas Department of Transportation

FS 121

TRAFFIC CONTROL PLAN
PHASE 2
BEGIN - STA 3383+00

SHEET 1 OF 14

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	36



HORIZONTAL
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LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTED PREVIOUS PHASE
- TEMPORARY CONSTRUCTED PREVIOUS PHASE
- TRAFFIC FLOW
- PROPOSED TEMPORARY WALL
- SIGN
- BARRICADE TY III
- CONC TRAFFIC BARRIER (CTB)
- CHANNELIZING DEVICE
- CRASH CUSHION ATTENUATOR (CCA)
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- (D)/(DR) WK ZN PAV MRK (N-R)/(R)(W)8"(SLD)
- (E)/(ER) WK ZN PAV MRK (N-R)/(R)(W)24"(SLD)
- ARROW BOARD

STATE OF TEXAS
JENN-HWAN MA
83964
LICENSED PROFESSIONAL ENGINEER
7/15/2021

DATE	BY	REV	REVISION

CIVIL ASSOCIATES, INC.
CAI
9330 LBJ FRWY SUITE 1150
Dallas, Texas 75243
Firm Registration No. 6981

Texas Department of Transportation

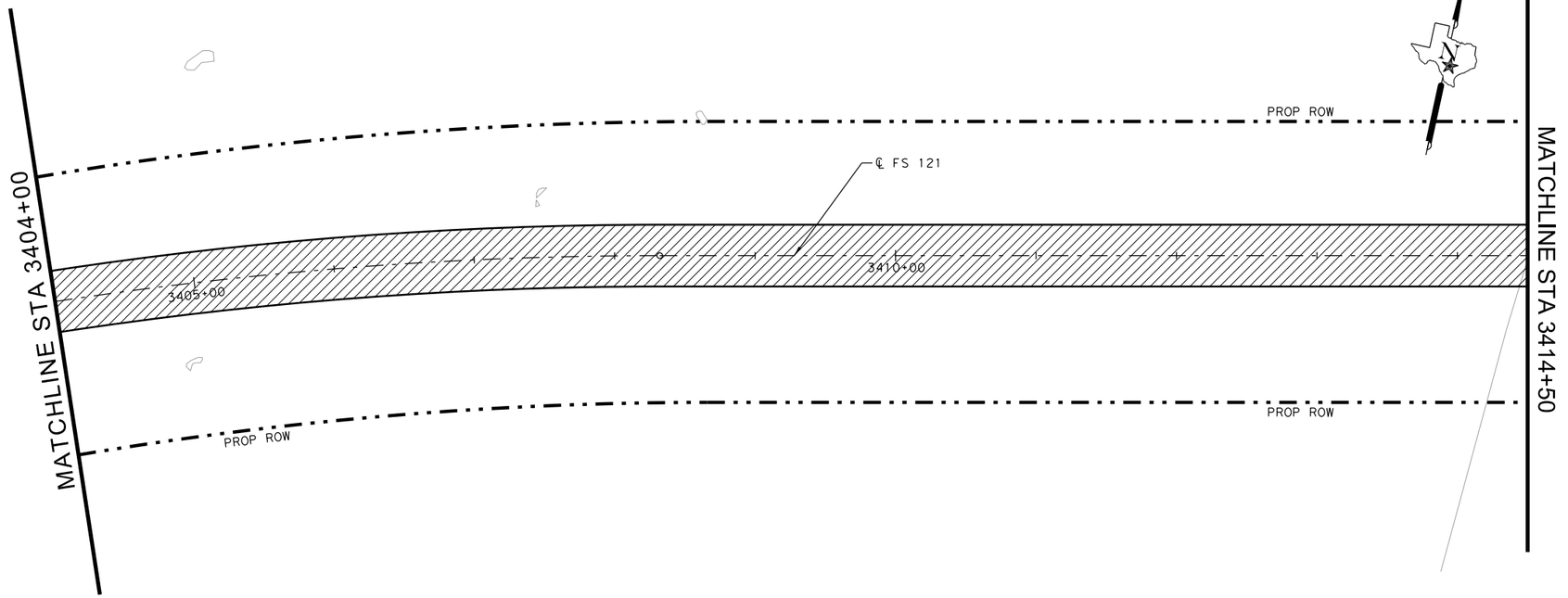
FS 121

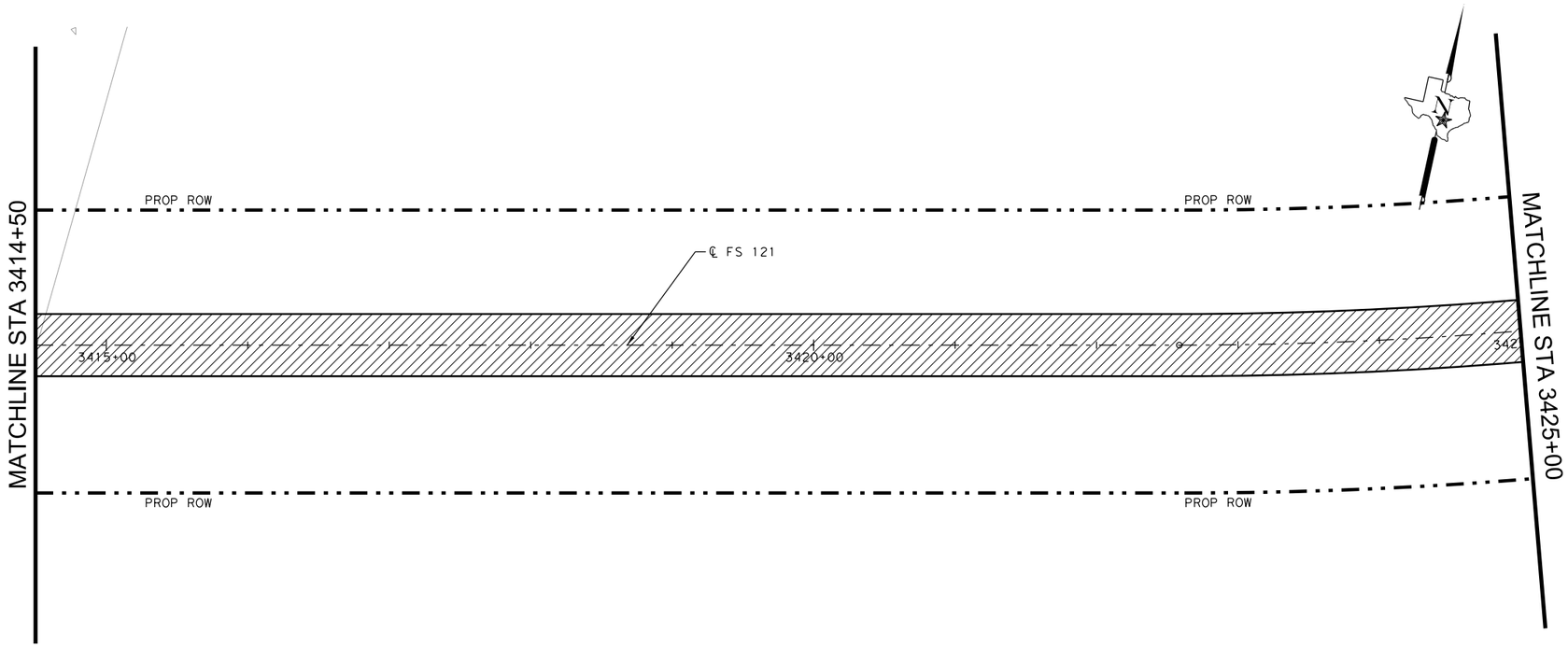
TRAFFIC CONTROL PLAN PHASE 2

STA 3383+00 - STA 3404+00

SHEET 2 OF 14

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	37





HORIZONTAL
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LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTED PREVIOUS PHASE
- TEMPORARY CONSTRUCTED PREVIOUS PHASE
- TRAFFIC FLOW
- PROPOSED TEMPORARY WALL
- SIGN
- BARRICADE TY III
- CONC TRAFFIC BARRIER (CTB)
- CHANNELIZING DEVICE
- CRASH CUSHION ATTENUATOR (CCA)
- (A)/(AR) WK ZN PAV MRK (N-R)/(R)(W)4"(BRK)
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- (D)/(DR) WK ZN PAV MRK (N-R)/(R)(W)8"(SLD)
- (E)/(ER) WK ZN PAV MRK (N-R)/(R)(W)24"(SLD)
- ARROW BOARD

STATE OF TEXAS
JENN-HWAN MA
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LICENSED PROFESSIONAL ENGINEER
7/15/2021

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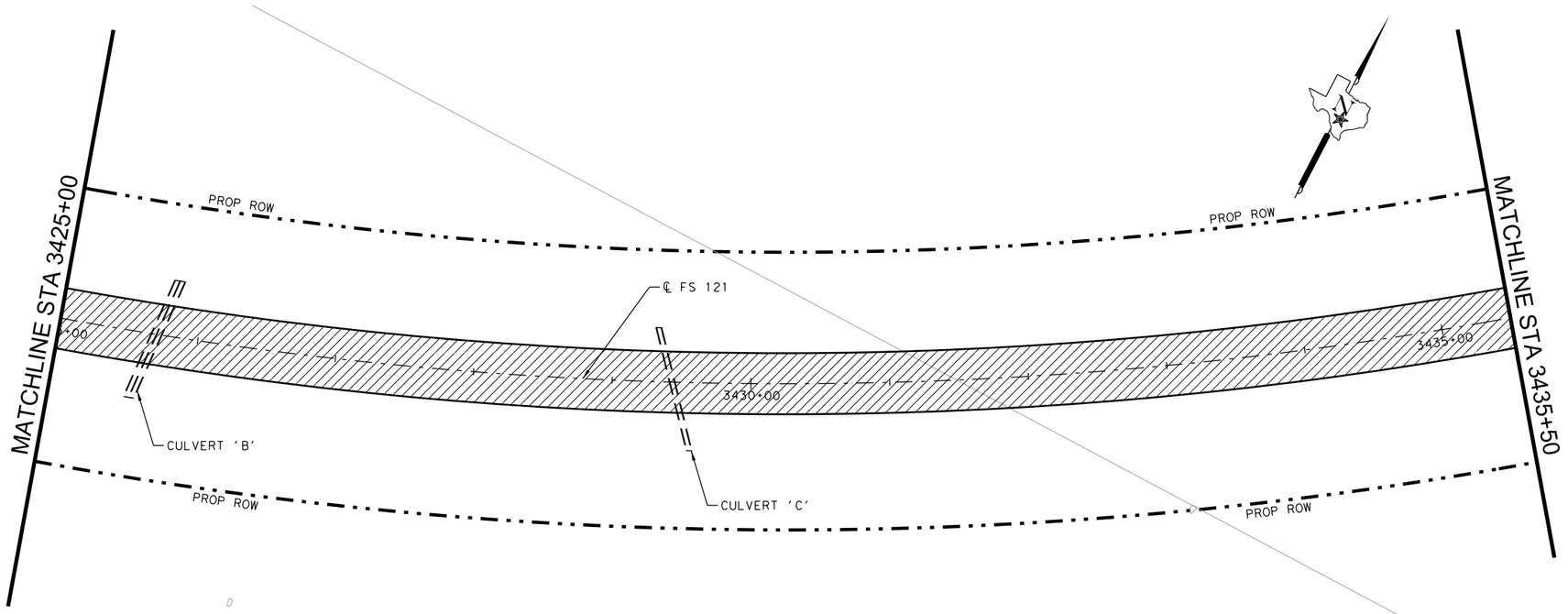
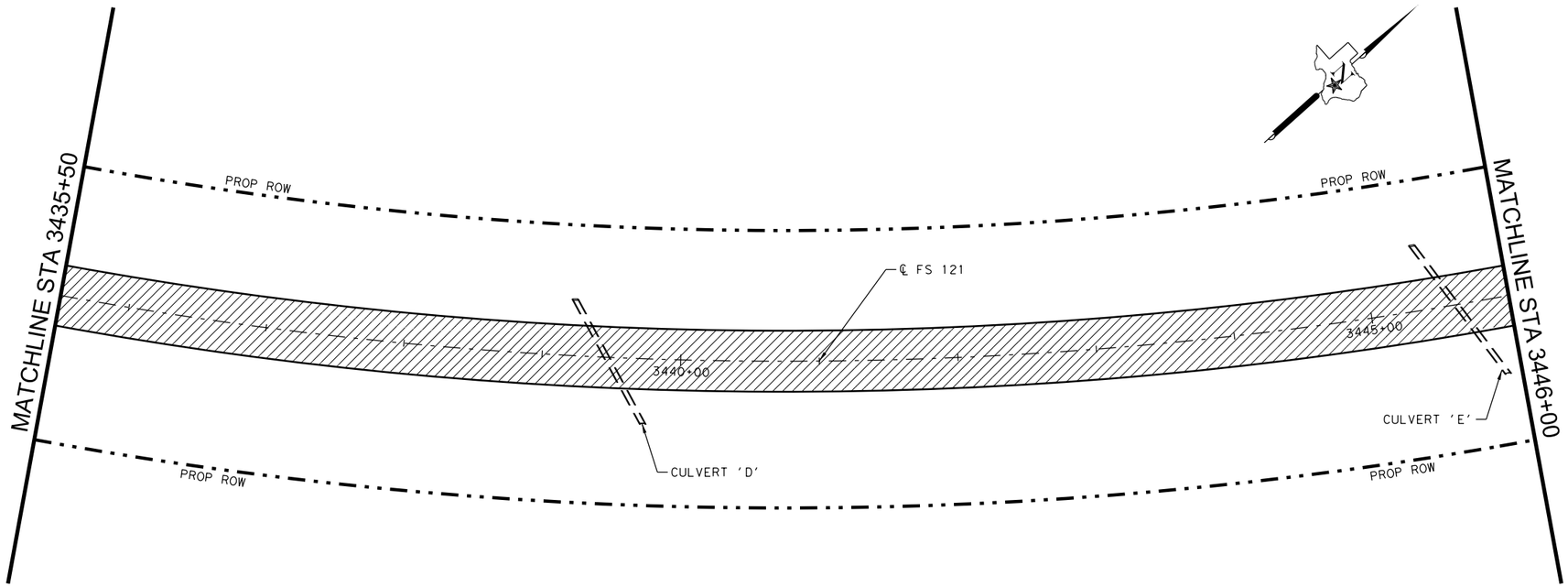
FS 121

TRAFFIC CONTROL PLAN
PHASE 2
STA 3404+00 - STA 3425+00

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	38





HORIZONTAL
50 0 50 100

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTED PREVIOUS PHASE
- TEMPORARY CONSTRUCTED PREVIOUS PHASE
- TRAFFIC FLOW
- PROPOSED TEMPORARY WALL
- SIGN
- BARRICADE TY III
- CONC TRAFFIC BARRIER (CTB)
- CHANNELIZING DEVICE
- CRASH CUSHION ATTENUATOR (CCA)
- (A)/(AR) WK ZN PAV MRK (N-R)/(R)(W)4"(BRK)
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- (D)/(DR) WK ZN PAV MRK (N-R)/(R)(W)8"(SLD)
- (E)/(ER) WK ZN PAV MRK (N-R)/(R)(W)24"(SLD)
- ARROW BOARD

STATE OF TEXAS
JENN-HWAN MA
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LICENSED PROFESSIONAL ENGINEER
7/15/2021

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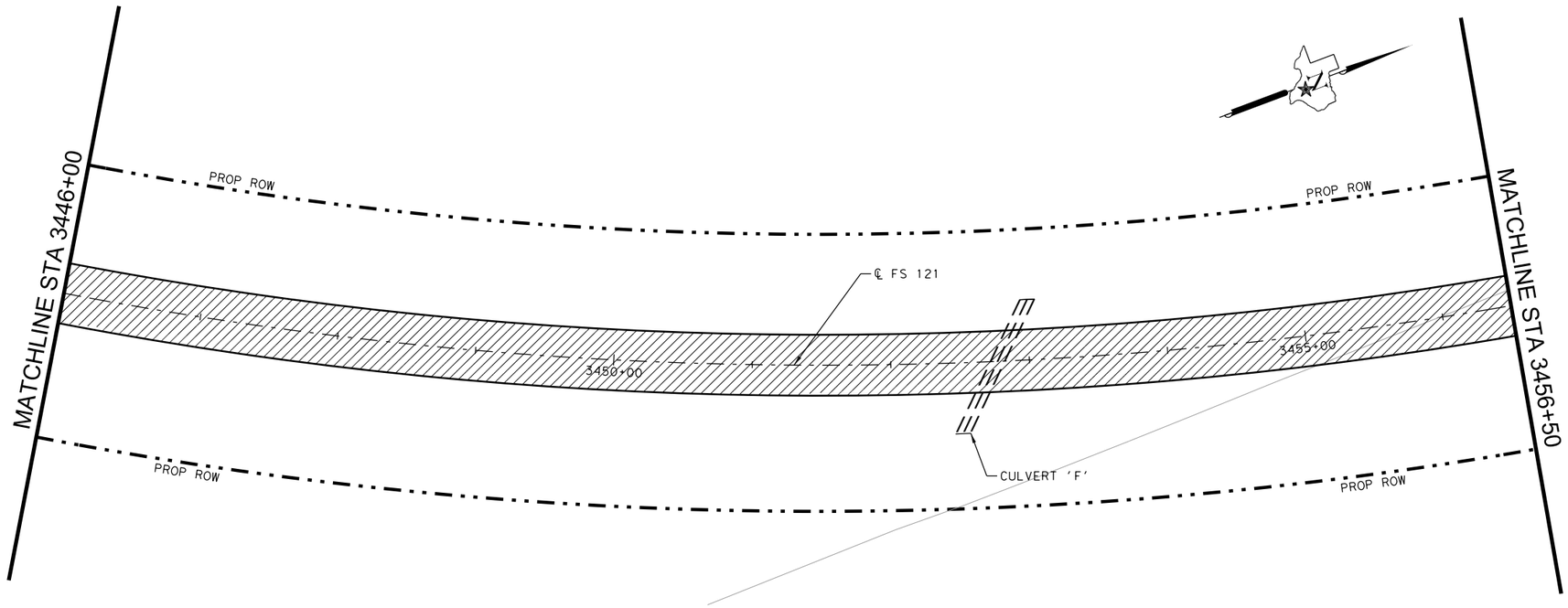
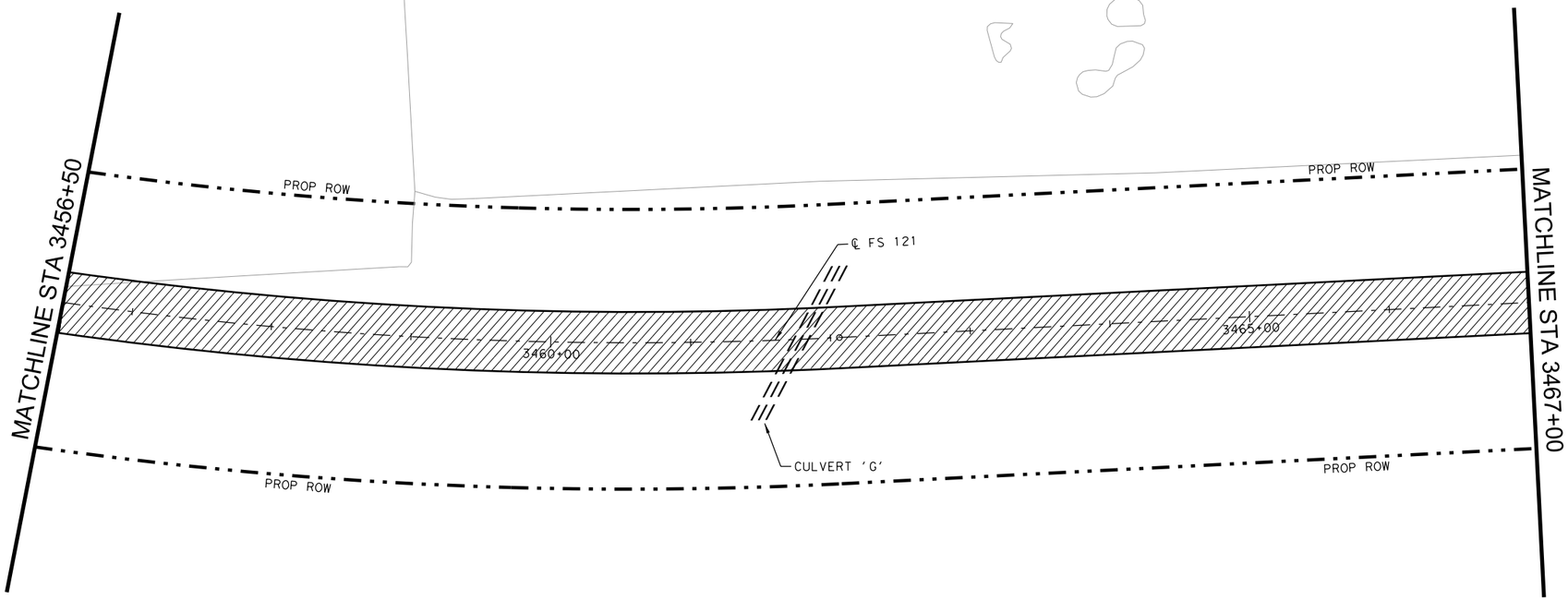
FS 121

TRAFFIC CONTROL PLAN
PHASE 2
STA 3425+00 - STA 3446+00

SHEET 4 OF 14

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	39





HORIZONTAL
50 0 50 100

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTED PREVIOUS PHASE
- TEMPORARY CONSTRUCTED PREVIOUS PHASE
- TRAFFIC FLOW
- PROPOSED TEMPORARY WALL
- SIGN
- BARRICADE TY III
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- (D)/(DR) WK ZN PAV MRK (N-R)/(R)(W)8"(SLD)
- (E)/(ER) WK ZN PAV MRK (N-R)/(R)(W)24"(SLD)
- ARROW BOARD

STATE OF TEXAS
JENN-HWAN MA
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LICENSED PROFESSIONAL ENGINEER
7/15/2021

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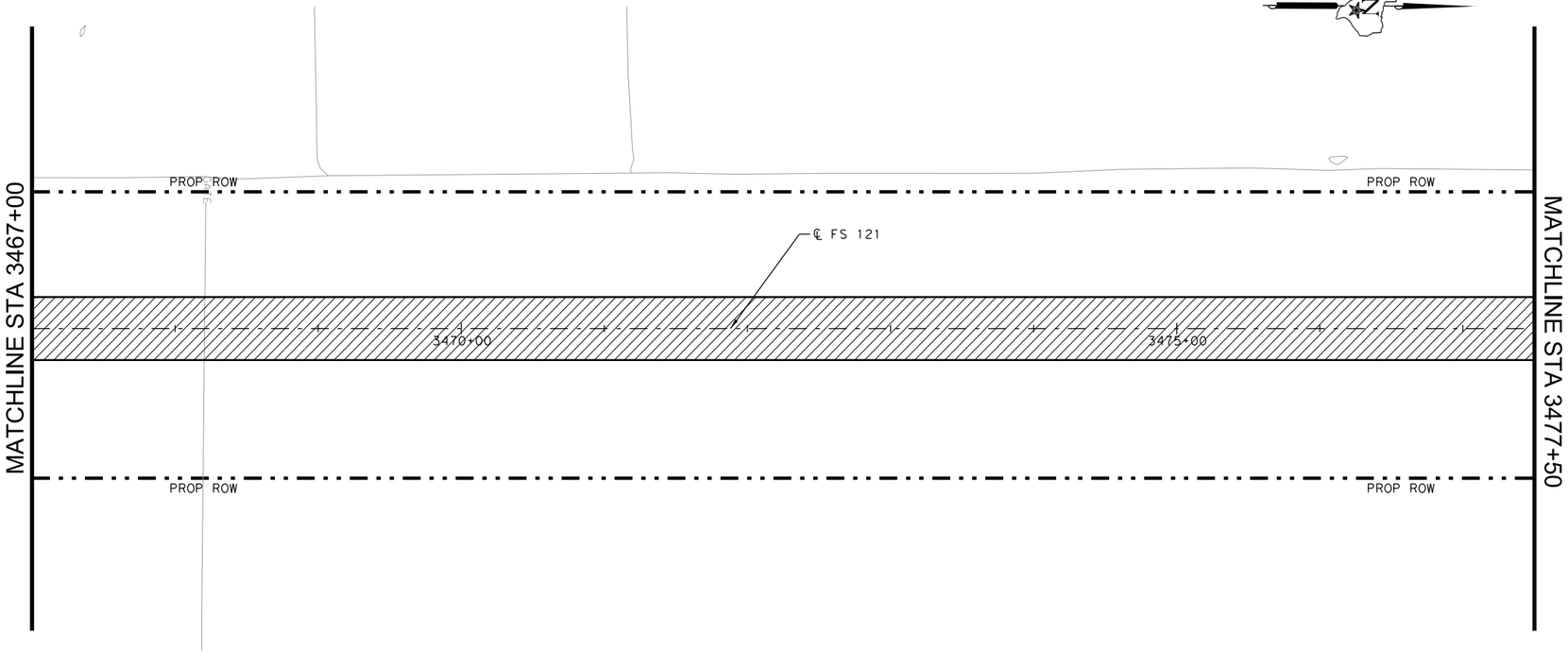
FS 121

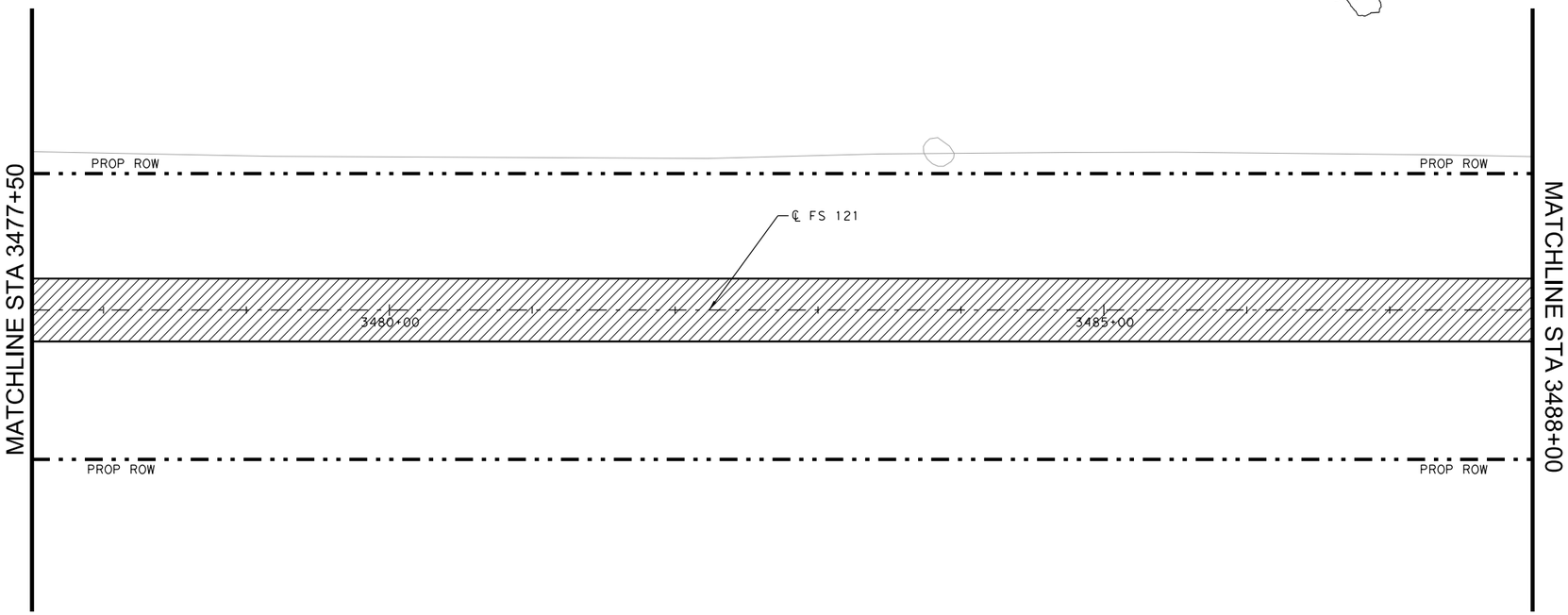
TRAFFIC CONTROL PLAN PHASE 2

STA 3446+00 - STA 3467+00

SHEET 5 OF 14

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	40





HORIZONTAL
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LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTED PREVIOUS PHASE
- TEMPORARY CONSTRUCTED PREVIOUS PHASE
- TRAFFIC FLOW
- PROPOSED TEMPORARY WALL
- SIGN
- BARRICADE TY III
- CONC TRAFFIC BARRIER (CTB)
- CHANNELIZING DEVICE
- CRASH CUSHION ATTENUATOR (CCA)
- (A)/(AR) WK ZN PAV MRK (N-R)/(R)(W)4"(BRK)
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- (E)/(ER) WK ZN PAV MRK (N-R)/(R)(W)24"(SLD)
- ARROW BOARD

STATE OF TEXAS
JENN-HWAN MA
83964
LICENSED PROFESSIONAL ENGINEER
7/15/2021

DATE	BY	REV	REVISION

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Dallas, Texas 75243
Firm Registration No. 6981

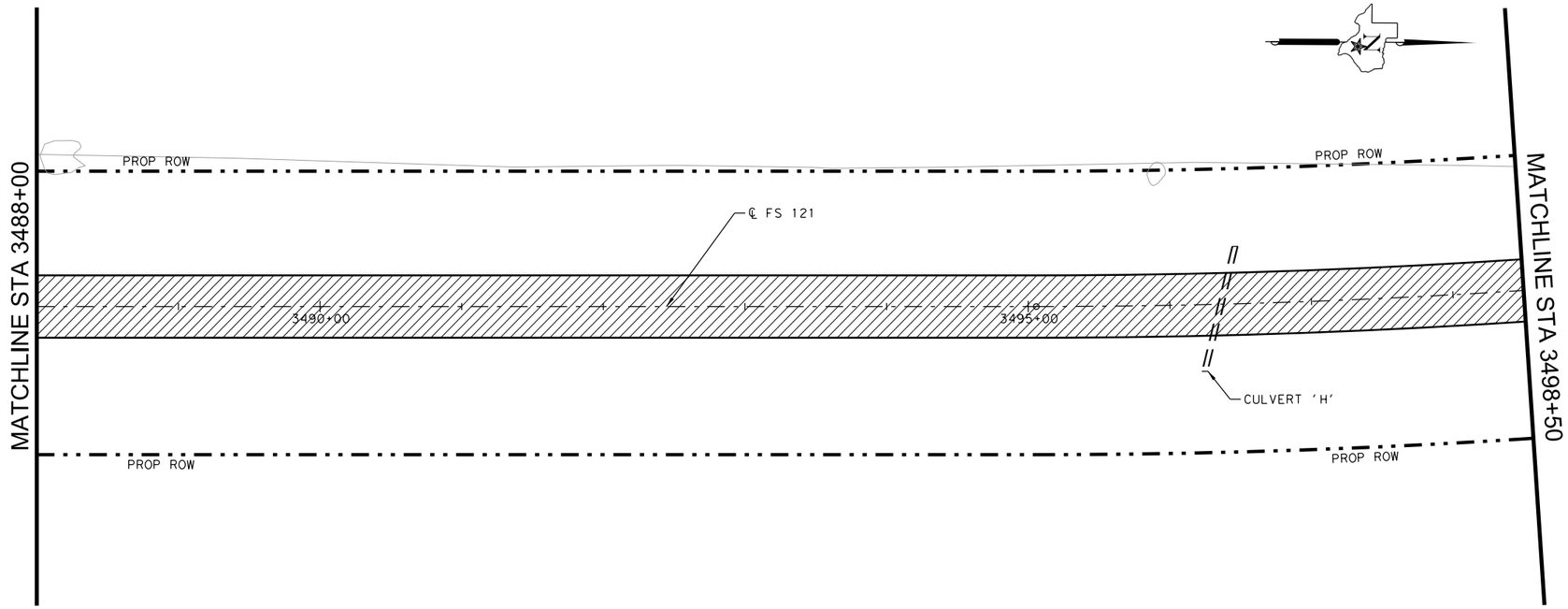
Texas Department of Transportation

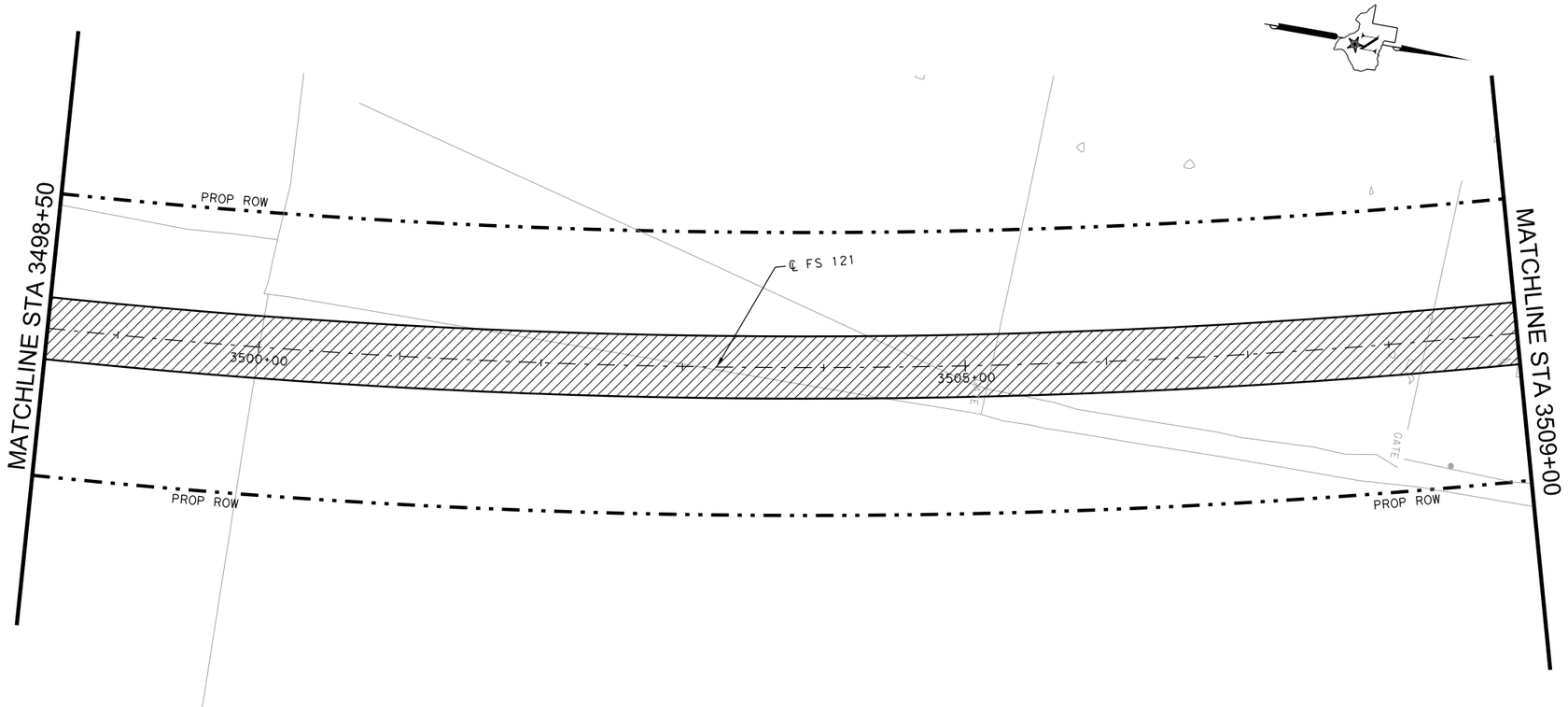
FS 121

TRAFFIC CONTROL PLAN
PHASE 2
STA 3467+00 -STA 3488+00

SHEET 6 OF 14

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	41





HORIZONTAL
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LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTED PREVIOUS PHASE
- TEMPORARY CONSTRUCTED PREVIOUS PHASE
- TRAFFIC FLOW
- PROPOSED TEMPORARY WALL
- SIGN
- BARRICADE TY III
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- CHANNELIZING DEVICE
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- (D)/(DR) WK ZN PAV MRK (N-R)/(R)(W)8"(SLD)
- (E)/(ER) WK ZN PAV MRK (N-R)/(R)(W)24"(SLD)
- ARROW BOARD

7/15/2021

DATE	BY	REV	REVISION

CIVIL ASSOCIATES, INC.
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Dallas, Texas 75243
Firm Registration No. 6981

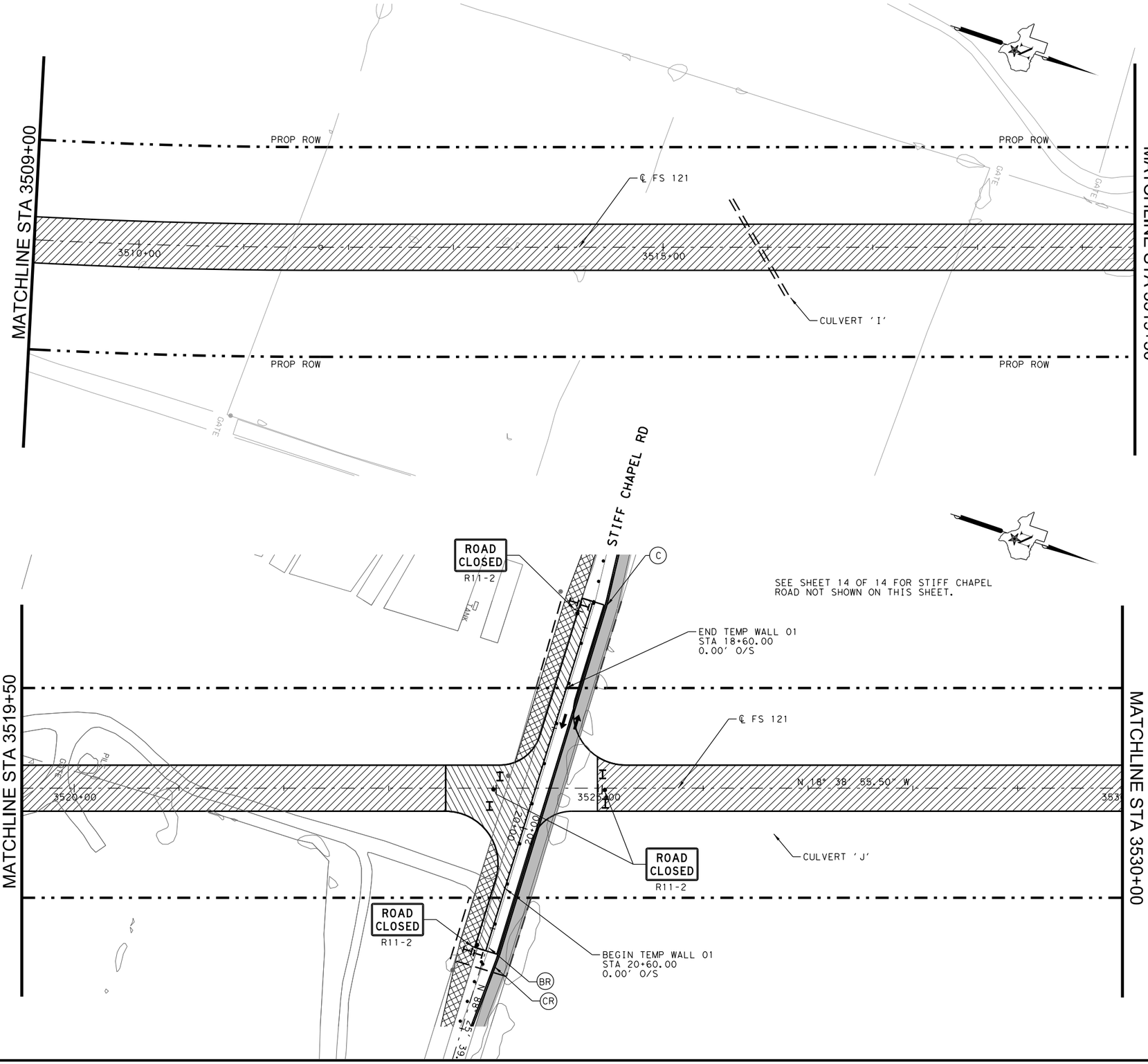
Texas Department of Transportation

FS 121

TRAFFIC CONTROL PLAN
PHASE 2
STA 3488+00 - STA 3509+00

SHEET 7 OF 14

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	42



HORIZONTAL
50 0 50 100

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTED PREVIOUS PHASE
- TEMPORARY CONSTRUCTED PREVIOUS PHASE
- TRAFFIC FLOW
- PROPOSED TEMPORARY WALL
- SIGN
- BARRICADE TY III
- CONC TRAFFIC BARRIER (CTB)
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- (E)/(ER) WK ZN PAV MRK (N-R)/(R)(W)24"(SLD)
- ARROW BOARD

STATE OF TEXAS
JENN-HWAN MA
83964
LICENSED PROFESSIONAL ENGINEER
7/15/2021

DATE	BY	REV	REVISION

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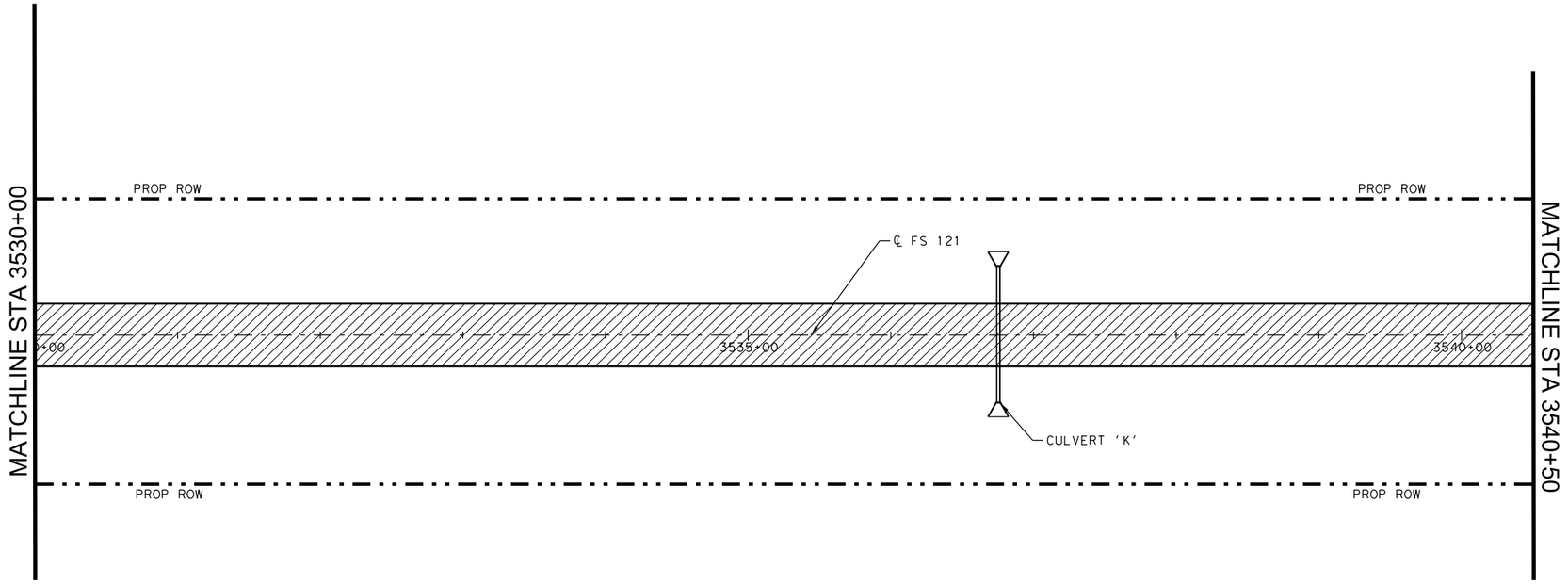
FS 121

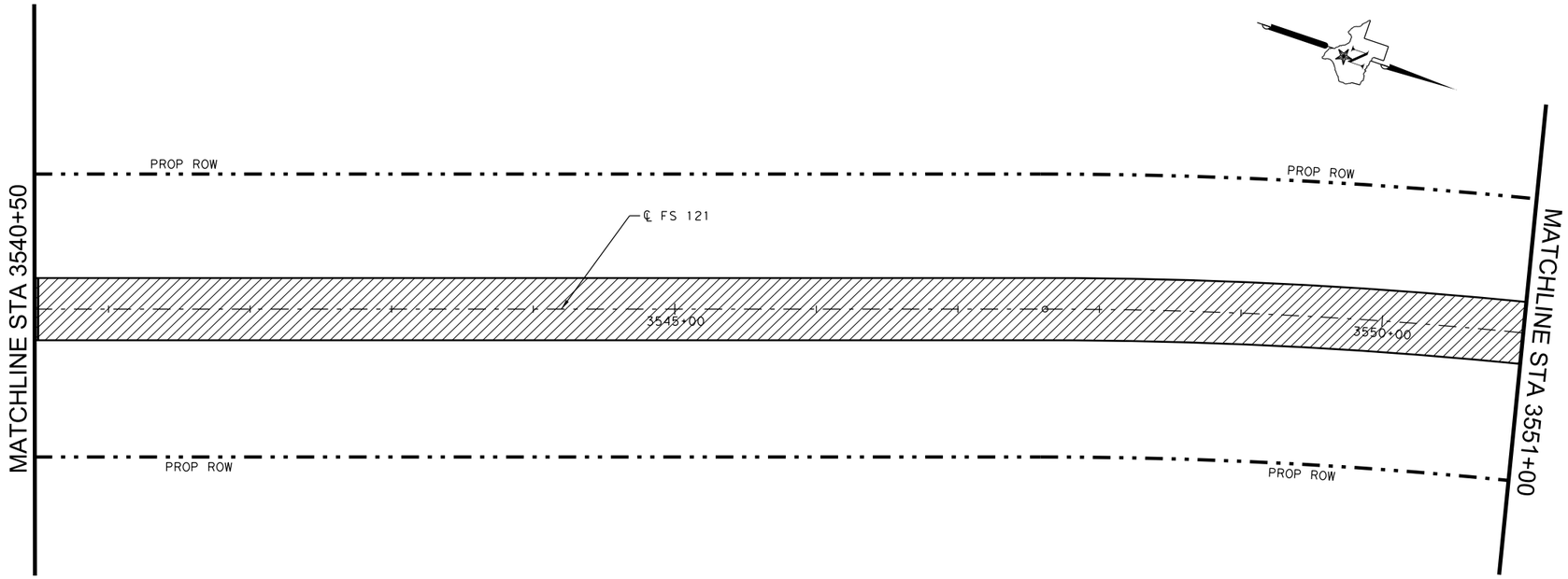
TRAFFIC CONTROL PLAN PHASE 2

STA 3509+00 - STA 3530+00

SHEET 8 OF 14

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	43





HORIZONTAL
50 0 50 100

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTED PREVIOUS PHASE
- TEMPORARY CONSTRUCTED PREVIOUS PHASE
- TRAFFIC FLOW
- PROPOSED TEMPORARY WALL
- SIGN
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- (E)/(ER) WK ZN PAV MRK (N-R)/(R)(W)24"(SLD)
- ARROW BOARD

STATE OF TEXAS
JENN-HWAN MA
83964
LICENSED PROFESSIONAL ENGINEER
7/15/2021

DATE	BY	REV	REVISION

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Dallas, Texas 75243
Firm Registration No. 6981

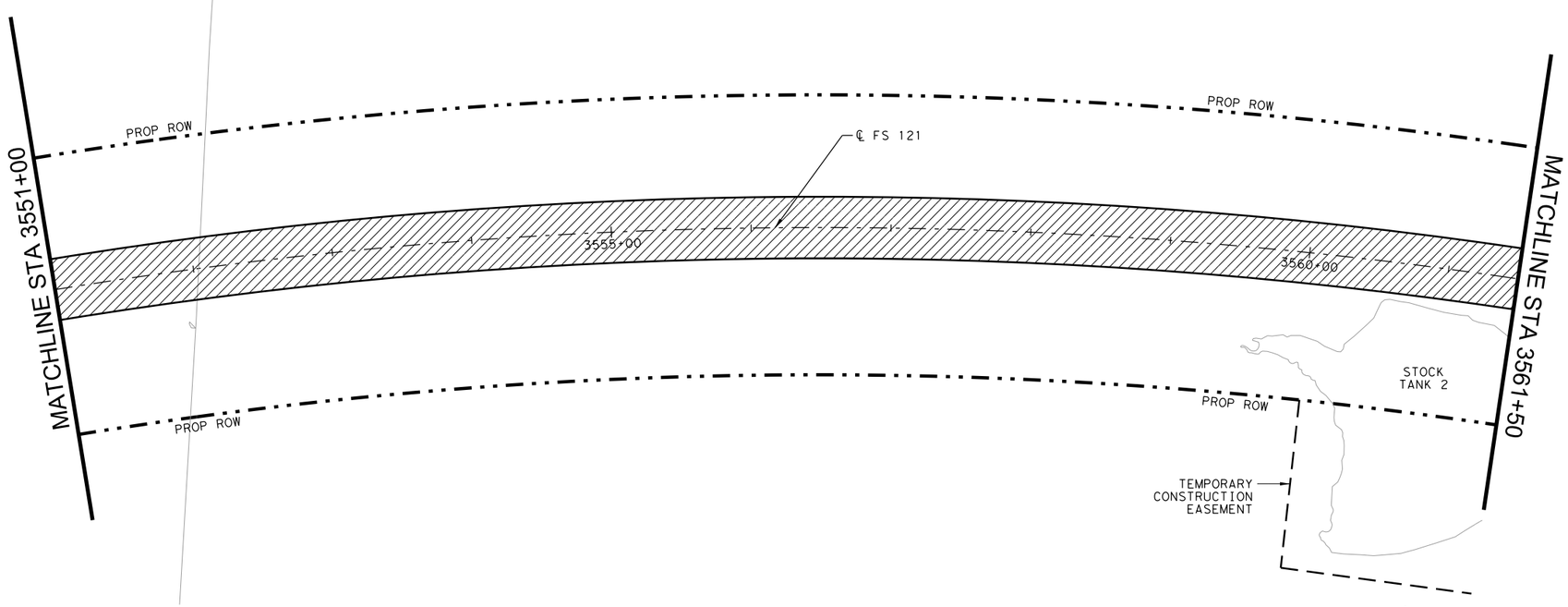
Texas Department of Transportation

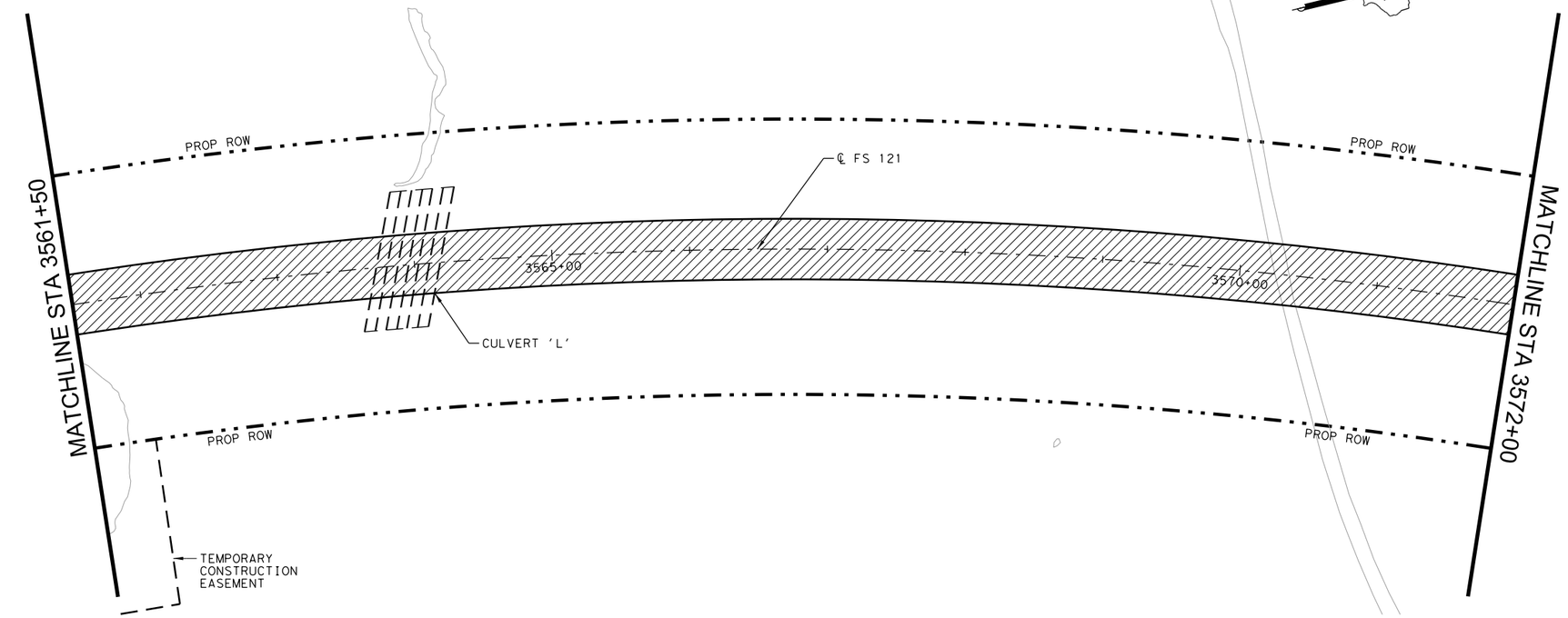
FS 121

TRAFFIC CONTROL PLAN
PHASE 2
STA 3530+00 - STA 3551+00

SHEET 9 OF 14

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	44





HORIZONTAL
50 0 50 100

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTED PREVIOUS PHASE
- TEMPORARY CONSTRUCTED PREVIOUS PHASE
- TRAFFIC FLOW
- PROPOSED TEMPORARY WALL
- SIGN
- BARRICADE TY III
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- CHANNELIZING DEVICE
- CRASH CUSHION ATTENUATOR (CCA)
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- (B)/(BR) WK ZN PAV MRK (N-R)/(R)(W)4"(SLD)
- (C)/(CR) WK ZN PAV MRK (N-R)/(R)(Y)4"(SLD)
- (D)/(DR) WK ZN PAV MRK (N-R)/(R)(W)8"(SLD)
- (E)/(ER) WK ZN PAV MRK (N-R)/(R)(W)24"(SLD)
- ARROW BOARD

STATE OF TEXAS
JENN-HWAN MA
83964
LICENSED PROFESSIONAL ENGINEER
7/15/2021

DATE	BY	REV	REVISION

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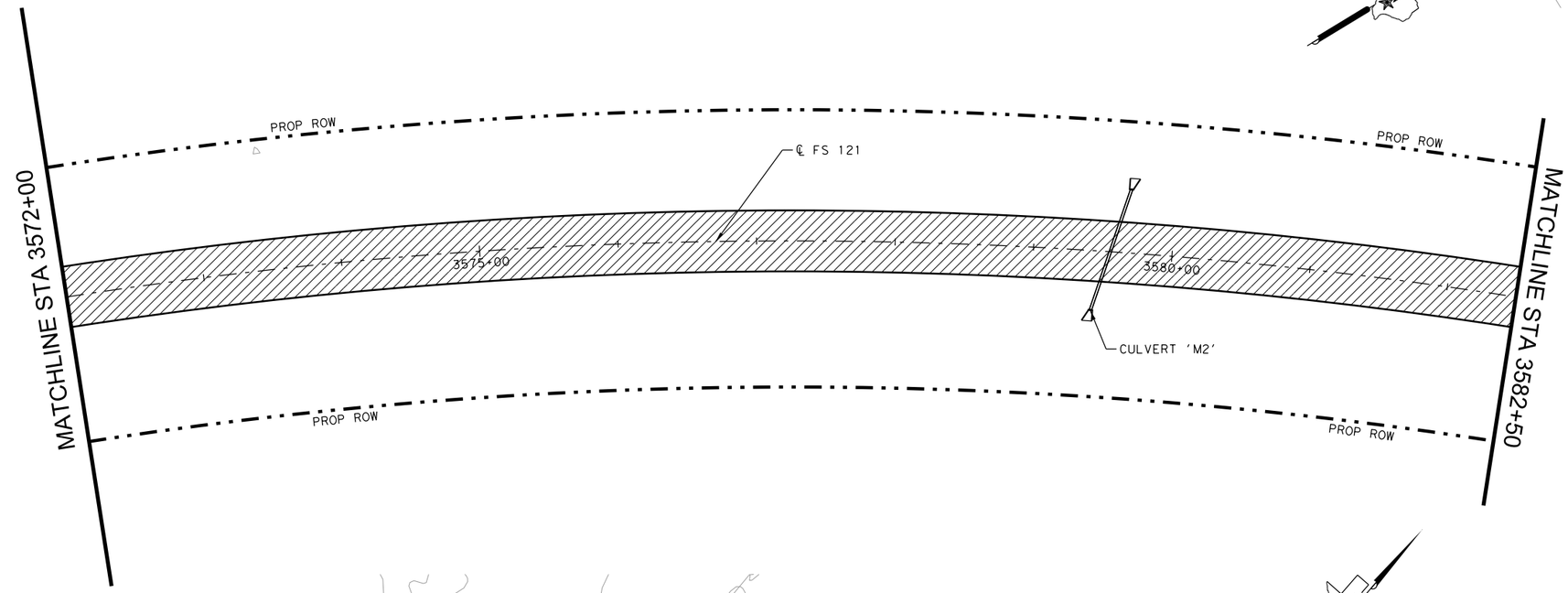
FS 121

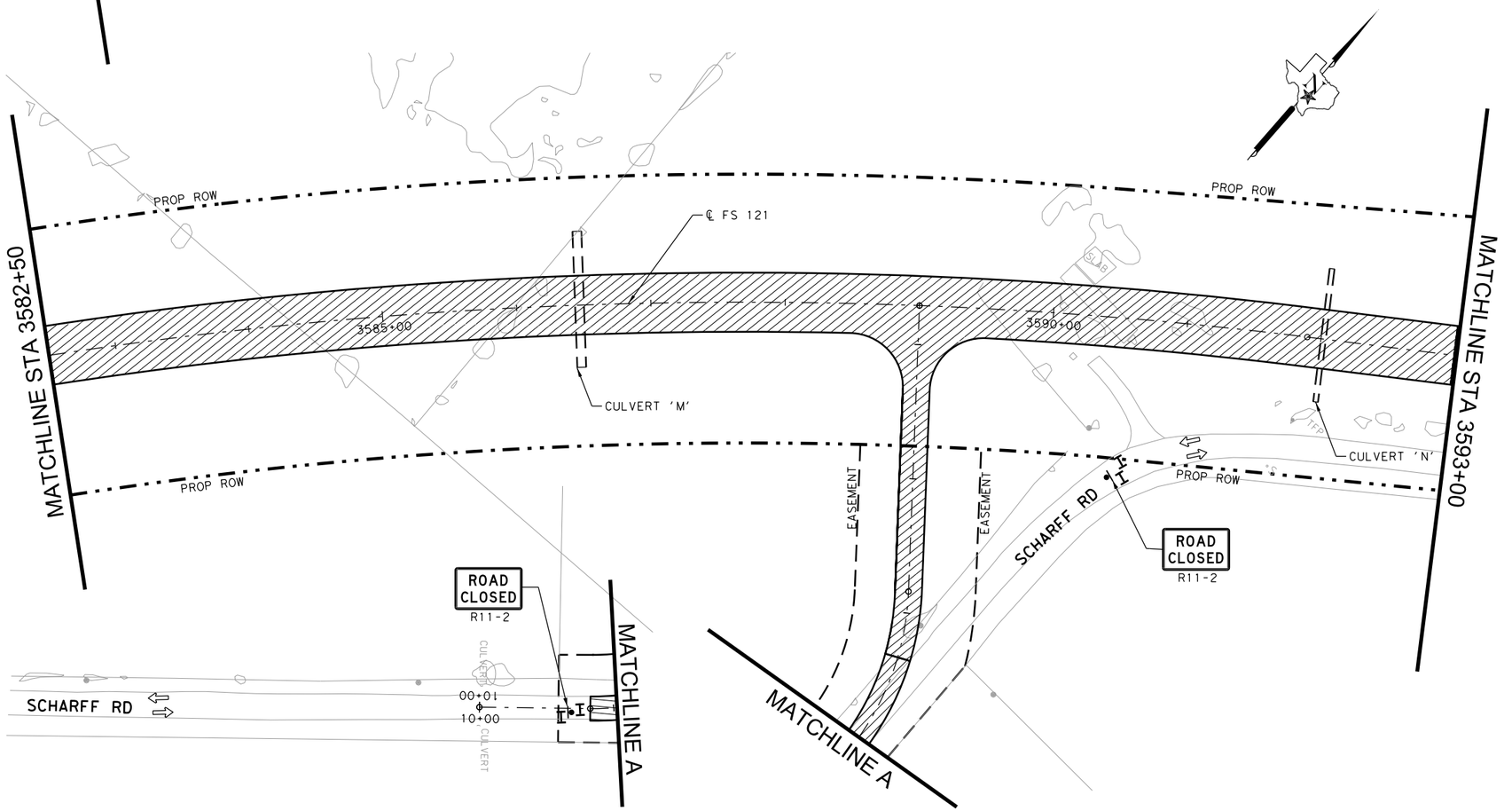
TRAFFIC CONTROL PLAN PHASE 2

STA 3551+00 - STA 3572+00

SHEET 10 OF 14

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	45





HORIZONTAL
50 0 50 100

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTED PREVIOUS PHASE
- TEMPORARY CONSTRUCTED PREVIOUS PHASE
- TRAFFIC FLOW
- PROPOSED TEMPORARY WALL
- SIGN
- BARRICADE TY III
- CONC TRAFFIC BARRIER (CTB)
- CHANNELIZING DEVICE
- CRASH CUSHION ATTENUATOR (CCA)
- (A)/(AR) WK ZN PAV MRK (N-R)/(R)(W)4"(BRK)
- (B)/(BR) WK ZN PAV MRK (N-R)/(R)(W)4"(SLD)
- (C)/(CR) WK ZN PAV MRK (N-R)/(R)(Y)4"(SLD)
- (D)/(DR) WK ZN PAV MRK (N-R)/(R)(W)8"(SLD)
- (E)/(ER) WK ZN PAV MRK (N-R)/(R)(W)24"(SLD)
- ARROW BOARD

STATE OF TEXAS
JENN-HWAN MA
83964
LICENSED PROFESSIONAL ENGINEER
7/15/2021

DATE	BY	REV	REVISION

CIVIL ASSOCIATES, INC.
CAI
9330 LBJ FRWY SUITE 1150
Dallas, Texas 75243
Firm Registration No. 6981

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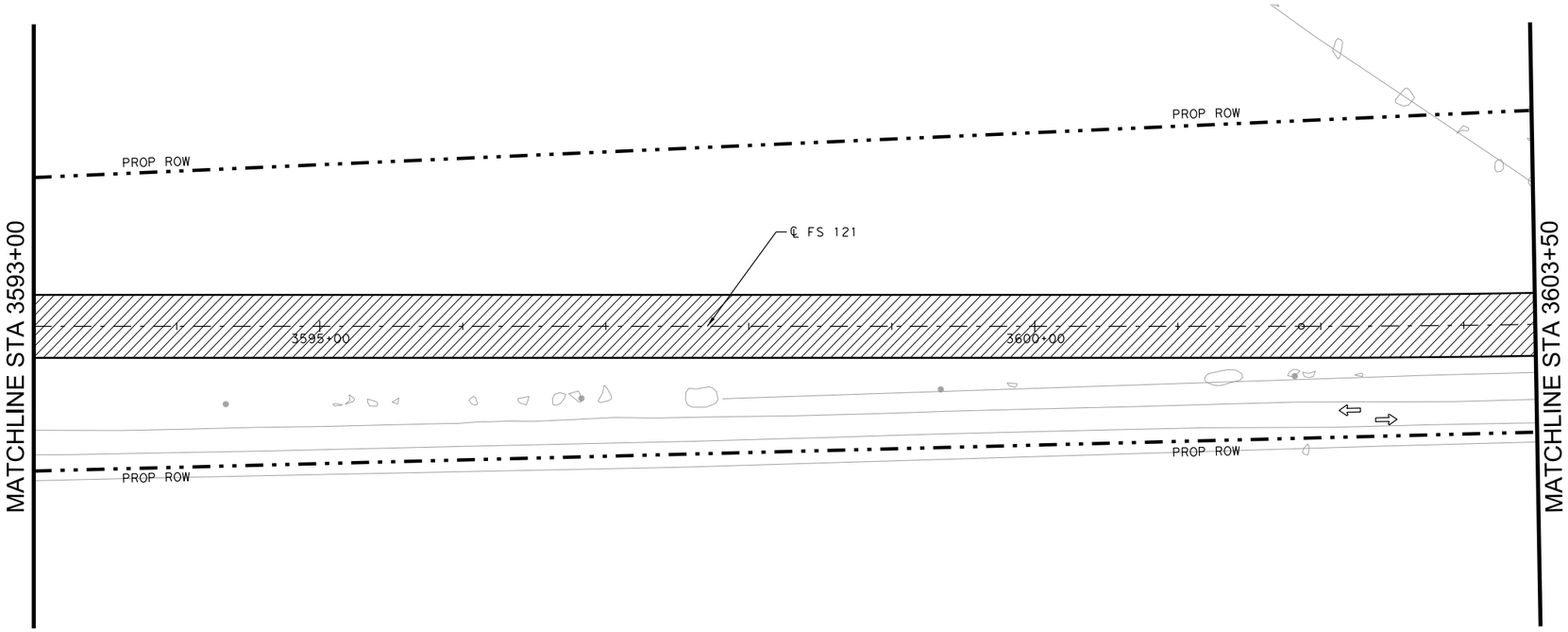
FS 121

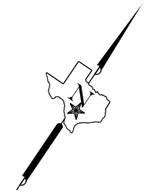
TRAFFIC CONTROL PLAN PHASE 2

STA 3572+00 - STA 3593+00

SCALE: 1" = 100' SHEET 11 OF 14

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	46





HORIZONTAL

50 0 50 100

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTED PREVIOUS PHASE
- TEMPORARY CONSTRUCTED PREVIOUS PHASE
- TRAFFIC FLOW
- PROPOSED TEMPORARY WALL
- SIGN
- BARRICADE TY III
- CONC TRAFFIC BARRIER (CTB)
- CHANNELIZING DEVICE
- CRASH CUSHION ATTENUATOR (CCA)
- (A)/(AR) WK ZN PAV MRK (N-R)/(R)(W)4"(BRK)
- (B)/(BR) WK ZN PAV MRK (N-R)/(R)(W)4"(SLD)
- (C)/(CR) WK ZN PAV MRK (N-R)/(R)(Y)4"(SLD)
- (D)/(DR) WK ZN PAV MRK (N-R)/(R)(W)8"(SLD)
- (E)/(ER) WK ZN PAV MRK (N-R)/(R)(W)24"(SLD)
- ARROW BOARD

7/15/2021

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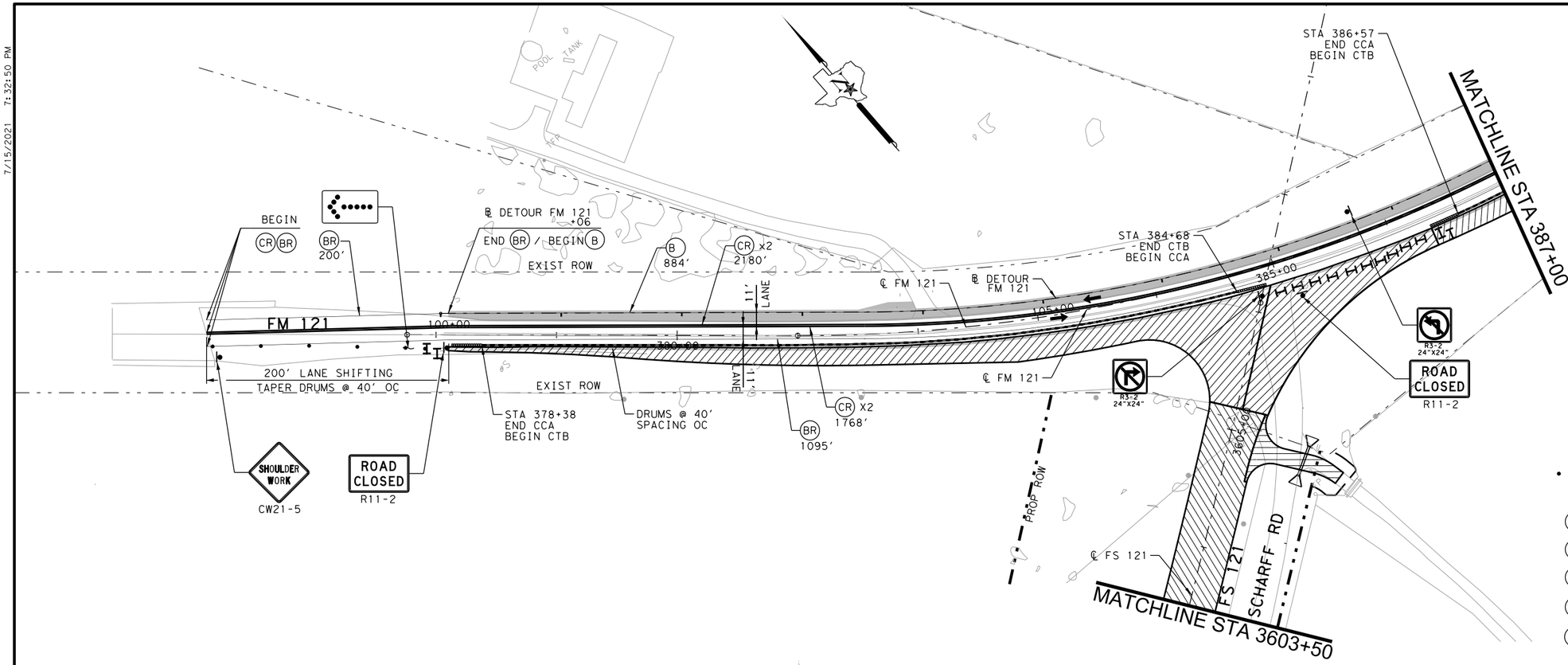
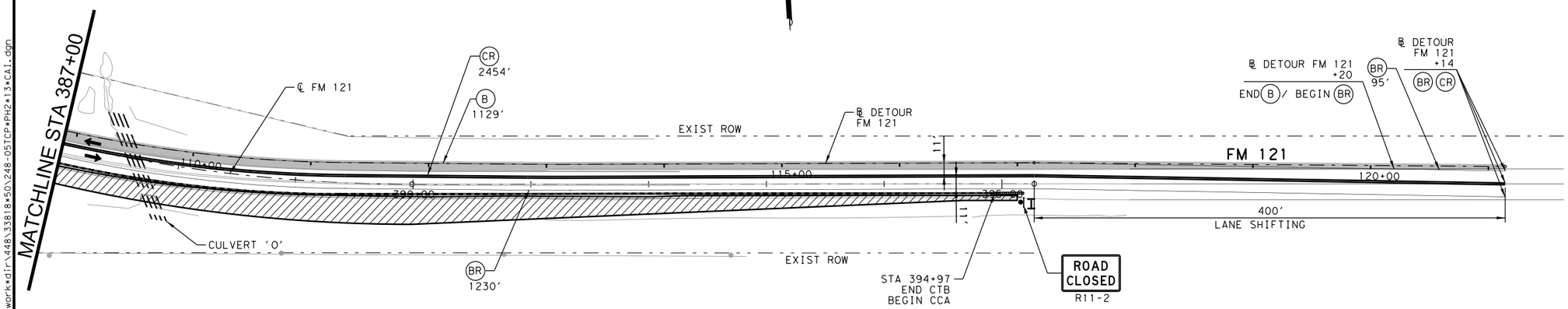
FS 121

TRAFFIC CONTROL PLAN
PHASE 2
STA 3593+00 - END

SHEET 12 OF 14

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	47





HORIZONTAL
50 0 50 100

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTED PREVIOUS PHASE
- TEMPORARY CONSTRUCTED PREVIOUS PHASE
- TRAFFIC FLOW
- PROPOSED TEMPORARY WALL
- SIGN
- BARRICADE TY III
- CONC TRAFFIC BARRIER (CTB)
- CHANNELIZING DEVICE
- CRASH CUSHION ATTENUATOR (CCA)
- (A)/(AR) WK ZN PAV MRK (N-R)/(R)(W)4"(BRK)
- (B)/(BR) WK ZN PAV MRK (N-R)/(R)(W)4"(SLD)
- (C)/(CR) WK ZN PAV MRK (N-R)/(R)(Y)4"(SLD)
- (D)/(DR) WK ZN PAV MRK (N-R)/(R)(W)8"(SLD)
- (E)/(ER) WK ZN PAV MRK (N-R)/(R)(W)24"(SLD)
- ARROW BOARD

STATE OF TEXAS
JENN-HWAN MA
83964
LICENSED PROFESSIONAL ENGINEER

7/15/2021

DATE	BY	REV	REVISION

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Firm Registration No. 6981

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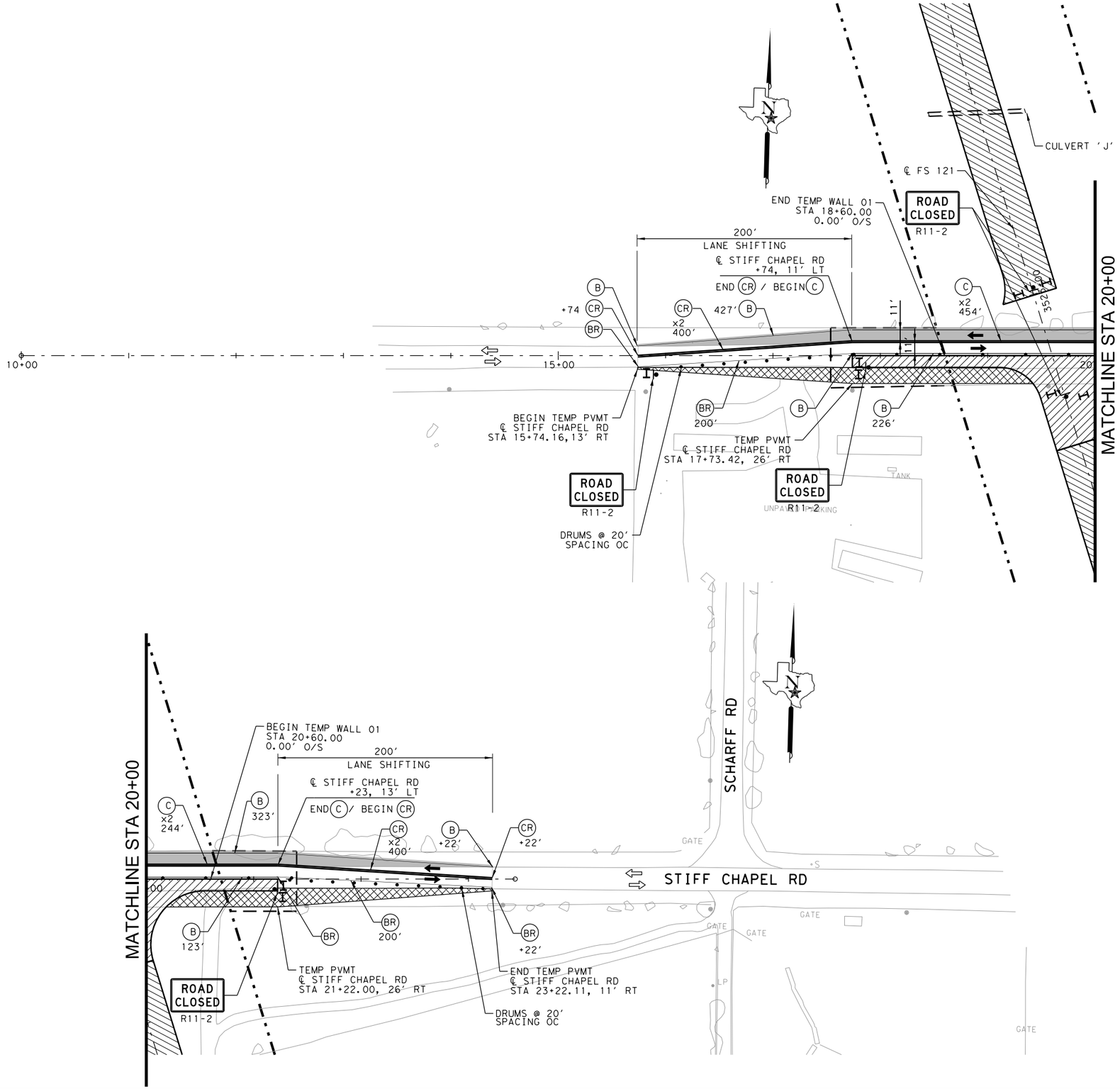
FS 121

TRAFFIC CONTROL PLAN PHASE 2
FM 121

SHEET 13 OF 14

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	48



HORIZONTAL

50 0 50 100

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTED PREVIOUS PHASE
- TEMPORARY CONSTRUCTED PREVIOUS PHASE
- TRAFFIC FLOW
- PROPOSED TEMPORARY WALL
- SIGN
- BARRICADE TY III
- CONC TRAFFIC BARRIER (CTB)
- CHANNELIZING DEVICE
- CRASH CUSHION ATTENUATOR (CCA)
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- (B)/(BR) WK ZN PAV MRK (N-R)/(R)(W)4"(SLD)
- (C)/(CR) WK ZN PAV MRK (N-R)/(R)(Y)4"(SLD)
- (D)/(DR) WK ZN PAV MRK (N-R)/(R)(W)8"(SLD)
- (E)/(ER) WK ZN PAV MRK (N-R)/(R)(W)24"(SLD)
- ARROW BOARD

STATE OF TEXAS
JENN-HWAN MA
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7/15/2021

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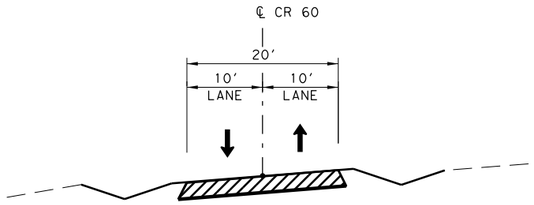
FS 121

TRAFFIC CONTROL PLAN PHASE 2

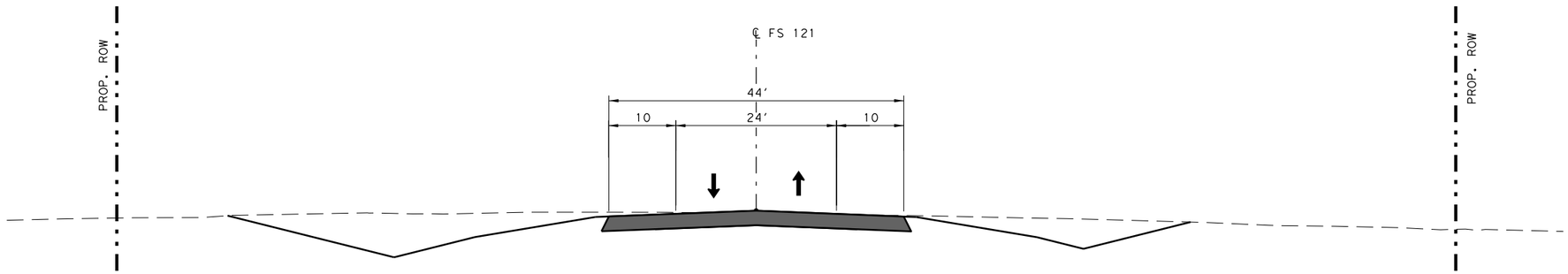
STIFF CHAPEL RD

SHEET 14 OF 14

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	49



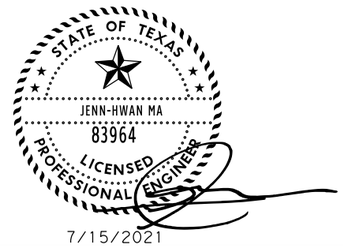
CR 60 PHASE 3



FM SPUR 121 PHASE 3
STA STA 3588+89.00 TO FM 121

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTED PREVIOUS PHASE
- TEMPORARY CONSTRUCTED PREVIOUS PHASE
- (A)/(AR) WK ZN PAV MRK (N-R)/(R)(W)4"(BRK)
- (B)/(BR) WK ZN PAV MRK (N-R)/(R)(W)4"(SLD)
- (C)/(CR) WK ZN PAV MRK (N-R)/(R)(Y)4"(SLD)
- (D)/(DR) WK ZN PAV MRK (N-R)/(R)(W)8"(SLD)
- (E)/(ER) WK ZN PAV MRK (N-R)/(R)(W)24"(SLD)



7/15/2021

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Firm Registration No. 6981

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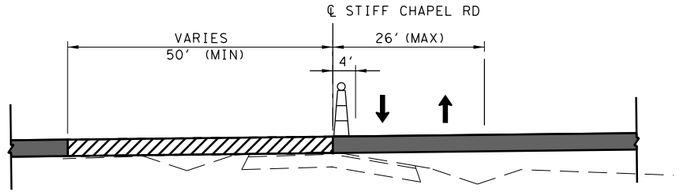
FS 121

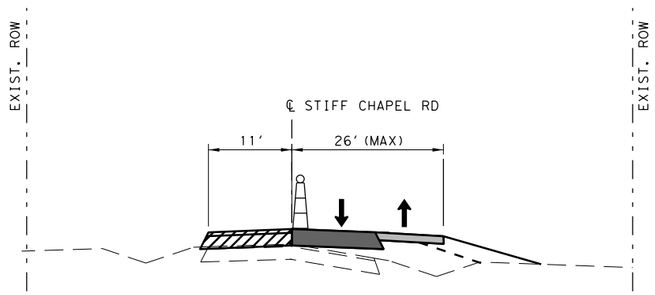
TRAFFIC CONTROL PLAN TYPICAL SECTIONS PHASE 3

SHEET 1 OF 2

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	50



STIFF CHAPEL RD PHASE 3
AT INTERSECTION



STIFF CHAPEL RD PHASE 3
BEYOND INTERSECTION

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTED PREVIOUS PHASE
- TEMPORARY CONSTRUCTED PREVIOUS PHASE
- (A)/(AR) WK ZN PAV MRK (N-R)/(R)(W)4"(BRK)
- (B)/(BR) WK ZN PAV MRK (N-R)/(R)(W)4"(SLD)
- (C)/(CR) WK ZN PAV MRK (N-R)/(R)(Y)4"(SLD)
- (D)/(DR) WK ZN PAV MRK (N-R)/(R)(W)8"(SLD)
- (E)/(ER) WK ZN PAV MRK (N-R)/(R)(W)24"(SLD)

STATE OF TEXAS
JENN-HWAN MA
83964
LICENSED PROFESSIONAL ENGINEER
7/15/2021

DATE	BY	REV	REVISION

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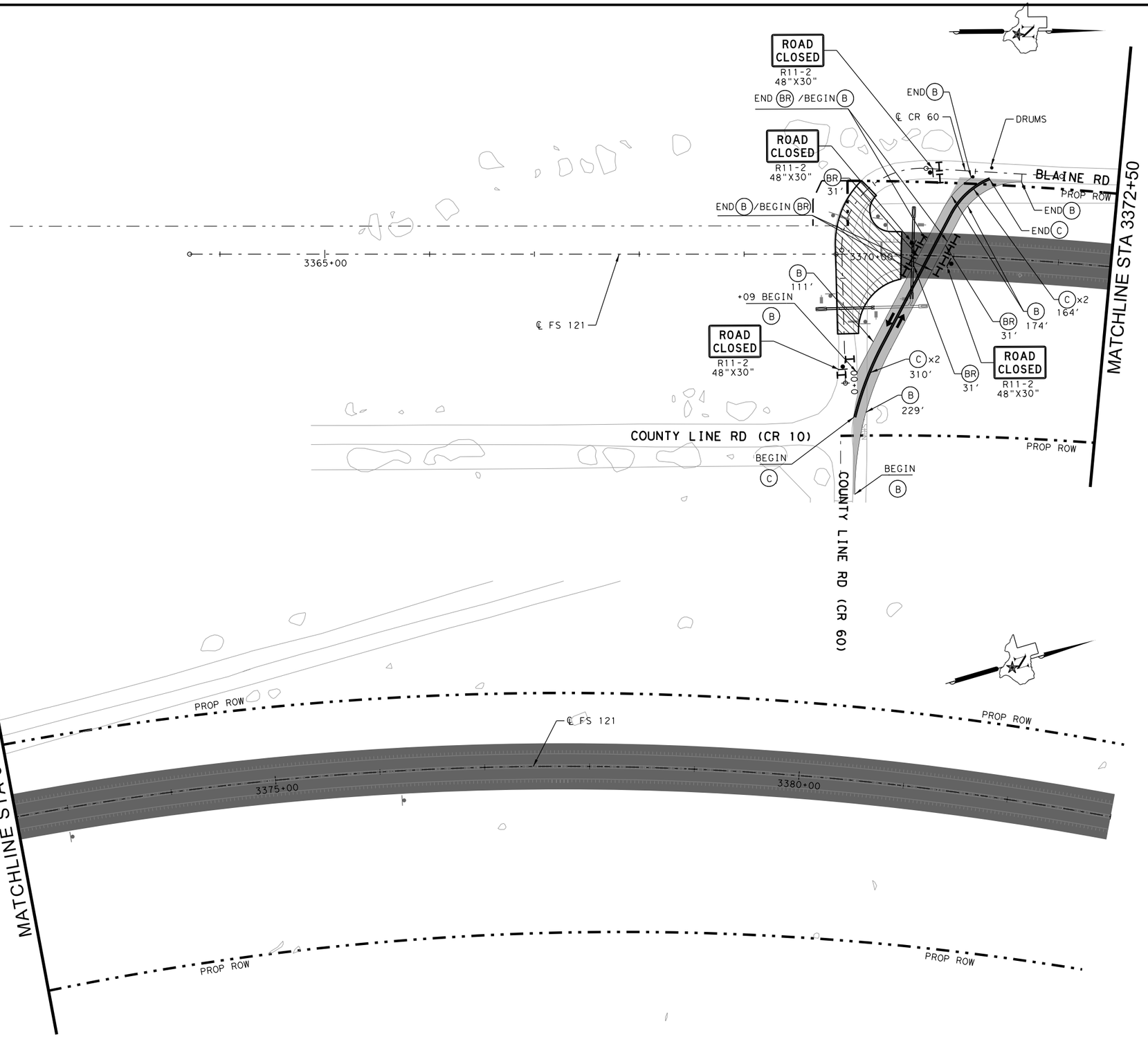
Firm Registration No. 6981

Texas Department of Transportation

FS 121

TRAFFIC CONTROL PLAN TYPICAL SECTIONS PHASE 3

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	51



HORIZONTAL
50 0 50 100

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTED PREVIOUS PHASE
- TEMPORARY CONSTRUCTED PREVIOUS PHASE
- TRAFFIC FLOW
- PROPOSED TEMPORARY WALL
- SIGN
- BARRICADE TY III
- CONC TRAFFIC BARRIER (CTB)
- CHANNELIZING DEVICE
- CRASH CUSHION ATTENUATOR (CCA)
- (A)/(AR) WK ZN PAV MRK (N-R)/(R)(W)4"(BRK)
- (B)/(BR) WK ZN PAV MRK (N-R)/(R)(W)4"(SLD)
- (C)/(CR) WK ZN PAV MRK (N-R)/(R)(Y)4"(SLD)
- (D)/(DR) WK ZN PAV MRK (N-R)/(R)(W)8"(SLD)
- (E)/(ER) WK ZN PAV MRK (N-R)/(R)(W)24"(SLD)
- ARROW BOARD

STATE OF TEXAS
JENN-HWAN MA
83964
LICENSED PROFESSIONAL ENGINEER
7/15/2021

DATE	BY	REV	REVISION

CIVIL ASSOCIATES, INC.
CAI
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Dallas, Texas 75243
Firm Registration No. 6981

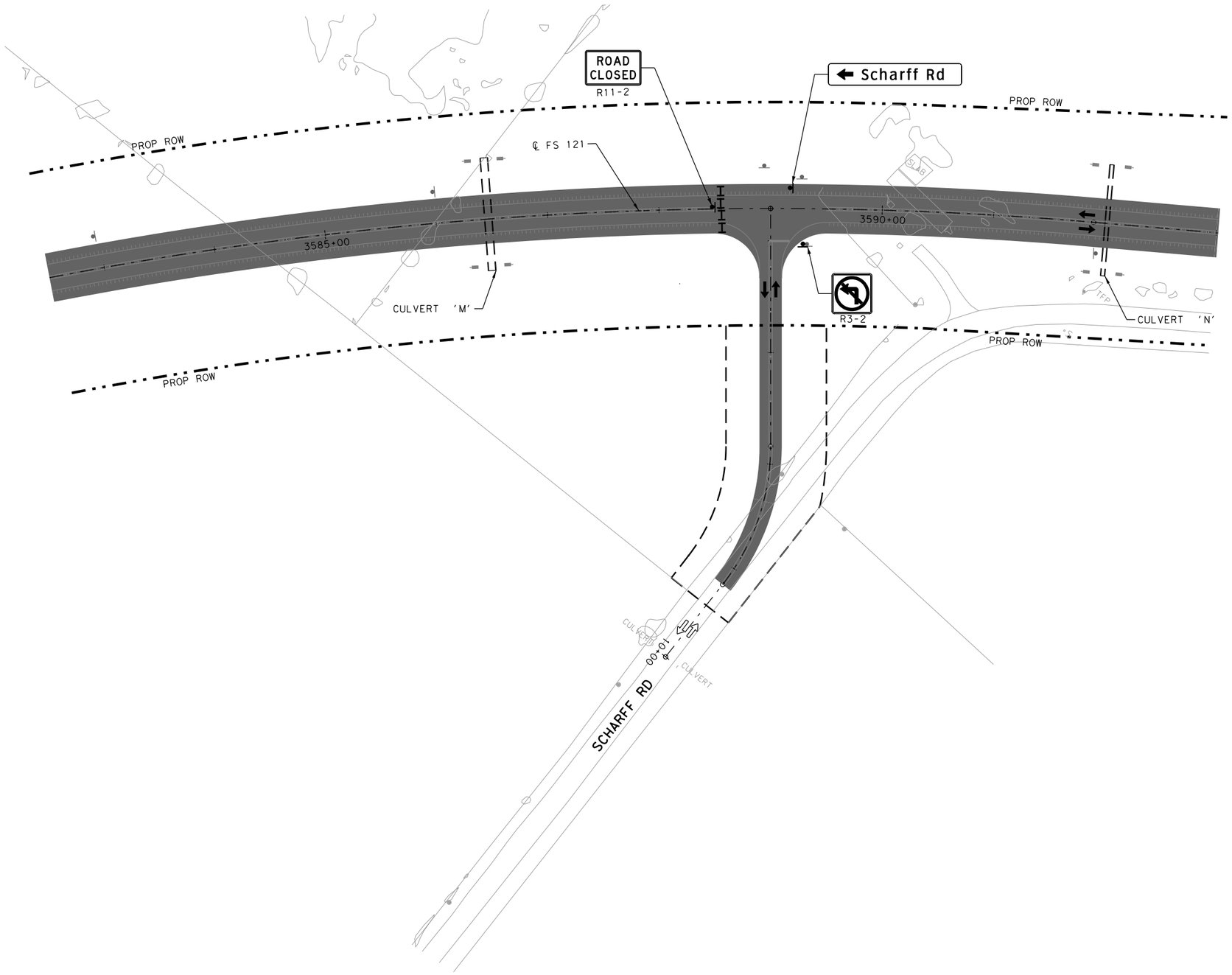
Texas Department of Transportation

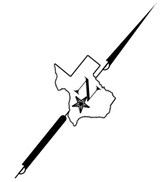
FS 121

TRAFFIC CONTROL PLAN
PHASE 3
CR 60 INTERSECTION

SCALE: 1" = 100' SHEET 1 OF 4

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	52





HORIZONTAL
50 0 50 100

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTED PREVIOUS PHASE
- TEMPORARY CONSTRUCTED PREVIOUS PHASE
- TRAFFIC FLOW
- PROPOSED TEMPORARY WALL
- SIGN
- BARRICADE TY III
- CONC TRAFFIC BARRIER (CTB)
- CHANNELIZING DEVICE
- CRASH CUSHION ATTENUATOR (CCA)
- (A)/(AR) WK ZN PAV MRK (N-R)/(R)(W)4"(BRK)
- (B)/(BR) WK ZN PAV MRK (N-R)/(R)(W)4"(SLD)
- (C)/(CR) WK ZN PAV MRK (N-R)/(R)(Y)4"(SLD)
- (D)/(DR) WK ZN PAV MRK (N-R)/(R)(W)8"(SLD)
- (E)/(ER) WK ZN PAV MRK (N-R)/(R)(W)24"(SLD)
- ARROW BOARD

7/15/2021

DATE	BY	REV	REVISION

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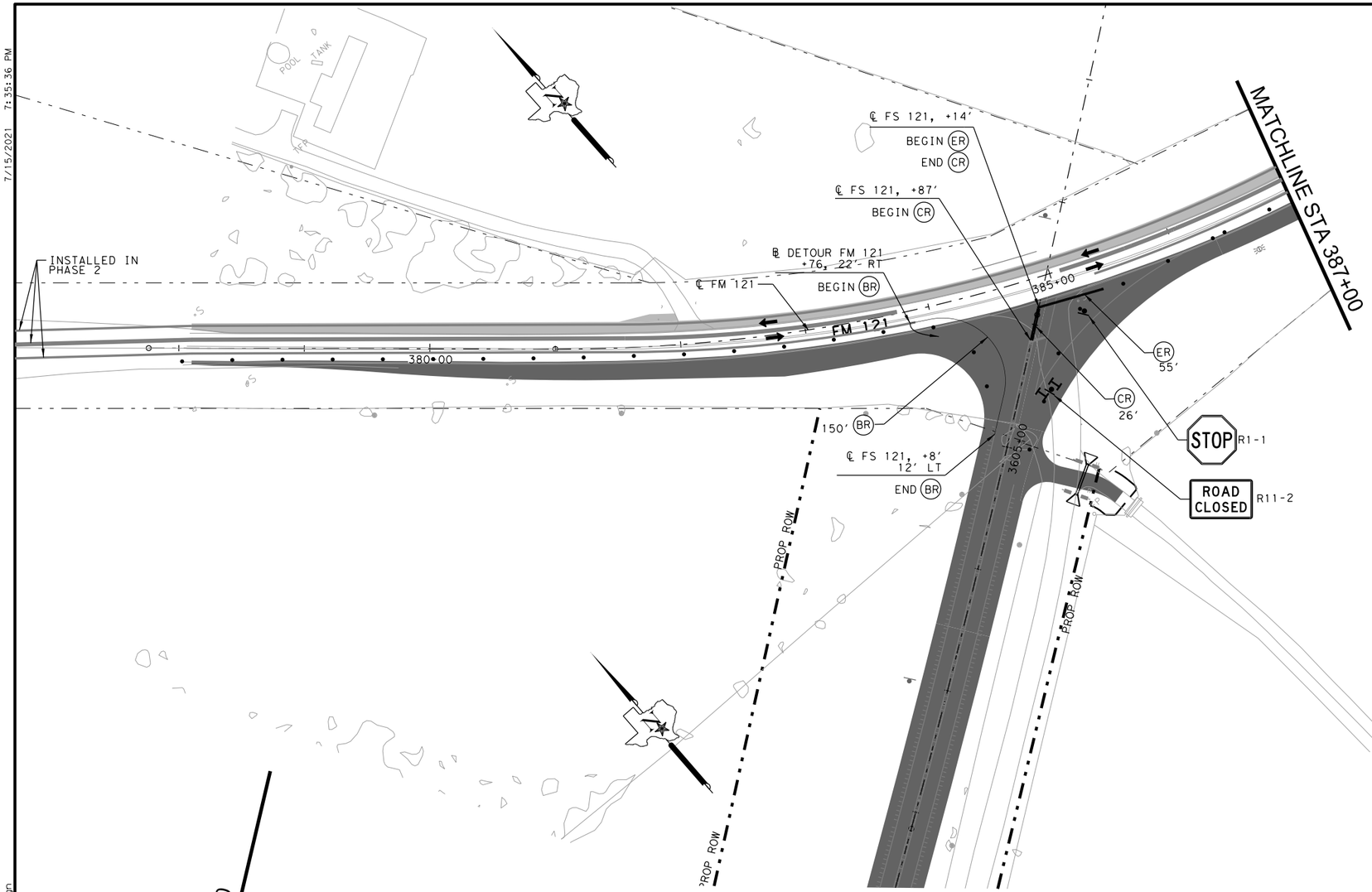
FS 121

TRAFFIC CONTROL PLAN PHASE 3

SCHARFF RD

SCALE: 1" = 100' SHEET 2 OF 4

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	53



HORIZONTAL
50 0 50 100

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTED PREVIOUS PHASE
- TEMPORARY CONSTRUCTED PREVIOUS PHASE
- TRAFFIC FLOW
- PROPOSED TEMPORARY WALL
- SIGN
- BARRICADE TY III
- CONC TRAFFIC BARRIER (CTB)
- CHANNELIZING DEVICE
- CRASH CUSHION ATTENUATOR (CCA)
- (A)/(AR) WK ZN PAV MRK (N-R)/(R)(W)4"(BRK)
- (B)/(BR) WK ZN PAV MRK (N-R)/(R)(W)4"(SLD)
- (C)/(CR) WK ZN PAV MRK (N-R)/(R)(Y)4"(SLD)
- (D)/(DR) WK ZN PAV MRK (N-R)/(R)(W)8"(SLD)
- (E)/(ER) WK ZN PAV MRK (N-R)/(R)(W)24"(SLD)
- ARROW BOARD

STATE OF TEXAS
JENN-HWAN MA
83964
LICENSED PROFESSIONAL ENGINEER

7/15/2021

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Firm Registration No. 6981

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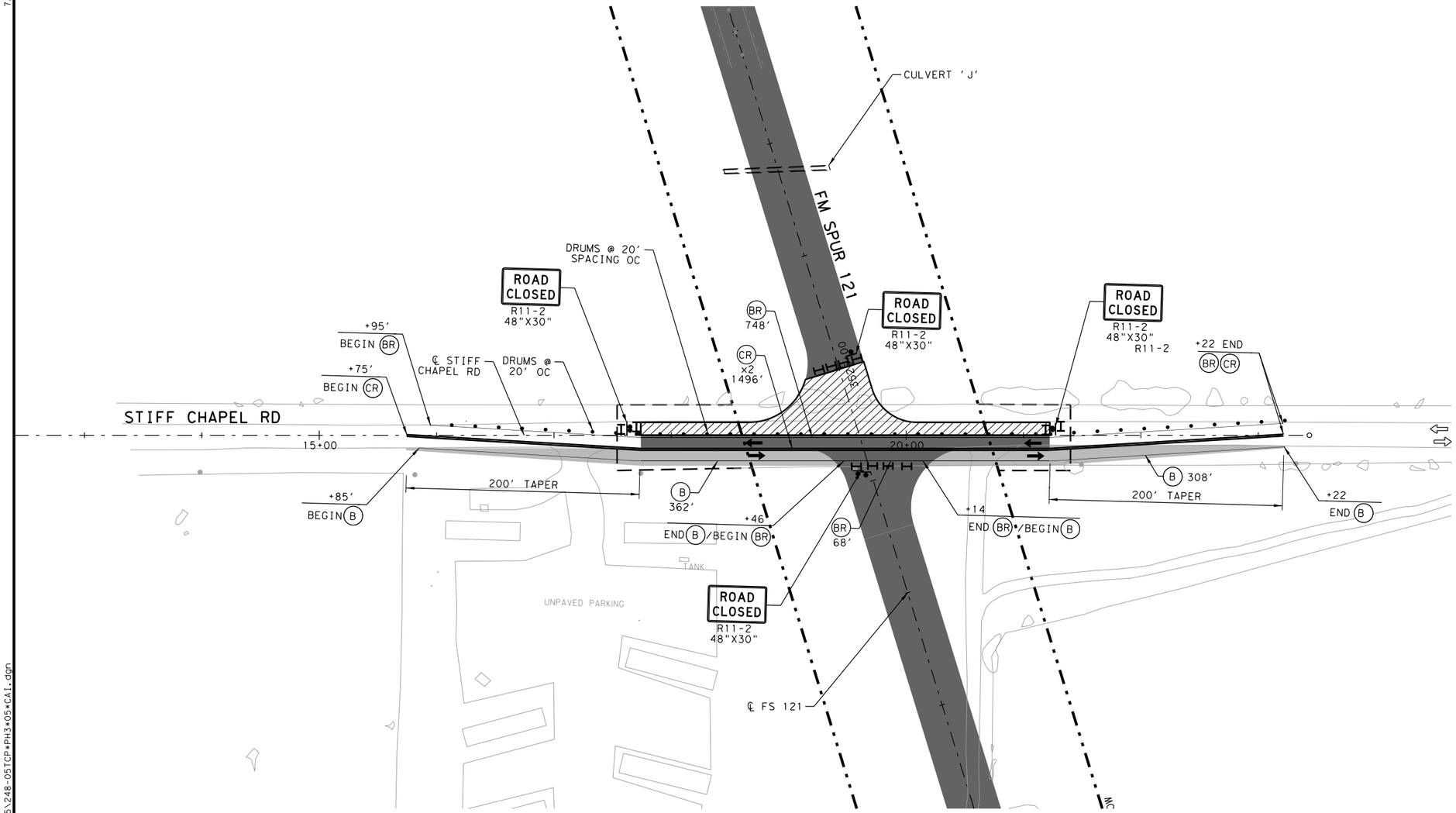
FS 121

TRAFFIC CONTROL PLAN PHASE 3

FM 121

SCALE: 1" = 100' SHEET 3 OF 4

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	54



HORIZONTAL

50 0 50 100

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTED PREVIOUS PHASE
- TEMPORARY CONSTRUCTED PREVIOUS PHASE
- TRAFFIC FLOW
- PROPOSED TEMPORARY WALL
- SIGN
- BARRICADE TY III
- CONC TRAFFIC BARRIER (CTB)
- CHANNELIZING DEVICE
- CRASH CUSHION ATTENUATOR (CCA)
- (A)/(AR) WK ZN PAV MRK (N-R)/(R)(W)4"(BRK)
- (B)/(BR) WK ZN PAV MRK (N-R)/(R)(W)4"(SLD)
- (C)/(CR) WK ZN PAV MRK (N-R)/(R)(Y)4"(SLD)
- (D)/(DR) WK ZN PAV MRK (N-R)/(R)(W)8"(SLD)
- (E)/(ER) WK ZN PAV MRK (N-R)/(R)(W)24"(SLD)
- ARROW BOARD

STATE OF TEXAS
JENN-HWAN MA
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7/15/2021

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Firm Registration No. 6981

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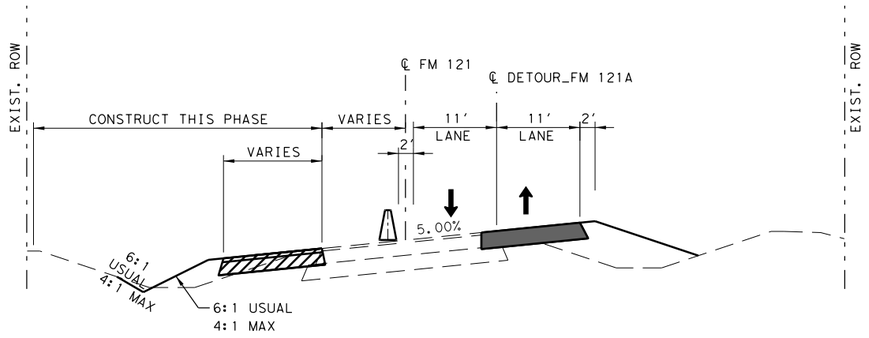
FS 121

TRAFFIC CONTROL PLAN PHASE 3

STIFF CHAPEL RD

SCALE: 1" = 100' SHEET 4 OF 4

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	55



FM 121 PHASE 4

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTED PREVIOUS PHASE
- TEMPORARY CONSTRUCTED PREVIOUS PHASE
- (A)/(AR) WK ZN PAV MRK (N-R)/(R)(W)4"(BRK)
- (B)/(BR) WK ZN PAV MRK (N-R)/(R)(W)4"(SLD)
- (C)/(CR) WK ZN PAV MRK (N-R)/(R)(Y)4"(SLD)
- (D)/(DR) WK ZN PAV MRK (N-R)/(R)(W)8"(SLD)
- (E)/(ER) WK ZN PAV MRK (N-R)/(R)(W)24"(SLD)

STATE OF TEXAS
JENN-HWAN MA
83964
LICENSED PROFESSIONAL ENGINEER
7/15/2021

DATE	BY	REV	REVISION

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Dallas, Texas 75243
Firm Registration No. 6981

Texas Department of Transportation

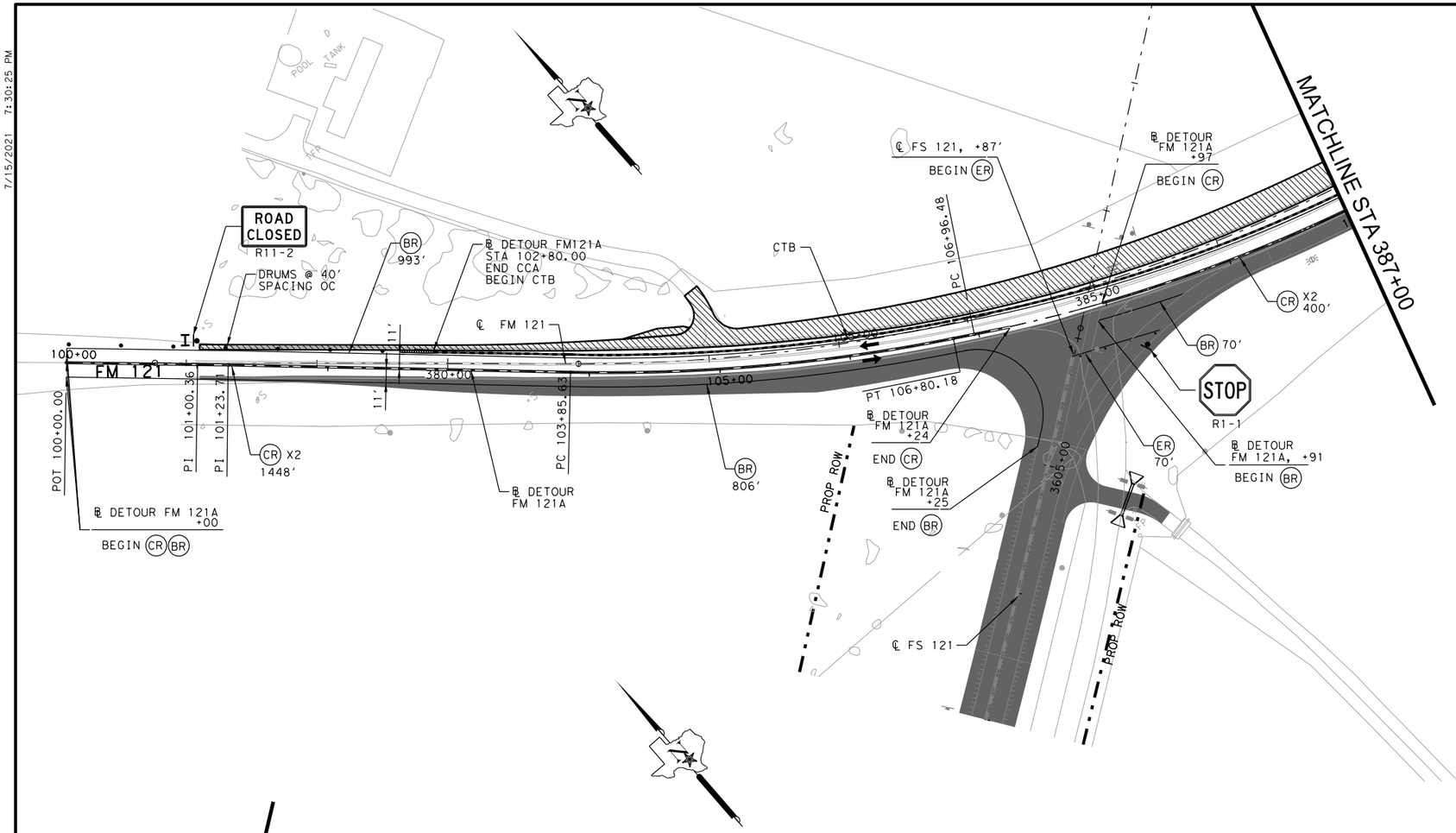
FS 121

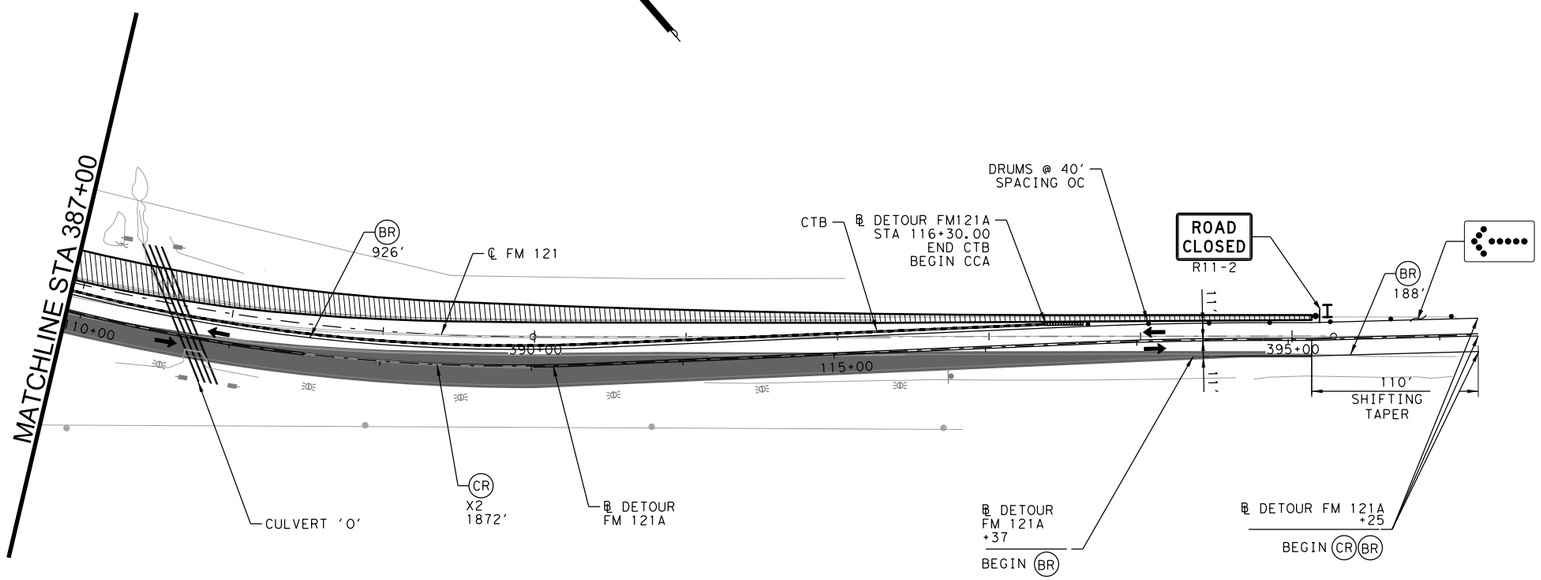
TRAFFIC CONTROL PLAN
TYPICAL SECTIONS
PHASE 4

SHEET 1 OF 1

STATE		HIGHWAY NO.
TEXAS		FS 121

STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	56





HORIZONTAL
50 0 50 100

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTED PREVIOUS PHASE
- TEMPORARY CONSTRUCTED PREVIOUS PHASE
- TRAFFIC FLOW
- PROPOSED TEMPORARY WALL
- SIGN
- BARRICADE TY III
- CONC TRAFFIC BARRIER (CTB)
- CHANNELIZING DEVICE
- CRASH CUSHION ATTENUATOR (CCA)
- (A)/(AR) WK ZN PAV MRK (N-R)/(R)(W)4"(BRK)
- (B)/(BR) WK ZN PAV MRK (N-R)/(R)(W)4"(SLD)
- (C)/(CR) WK ZN PAV MRK (N-R)/(R)(Y)4"(SLD)
- (D)/(DR) WK ZN PAV MRK (N-R)/(R)(W)8"(SLD)
- (E)/(ER) WK ZN PAV MRK (N-R)/(R)(W)24"(SLD)
- ARROW BOARD

STATE OF TEXAS
JENN-HWAN MA
83964
LICENSED PROFESSIONAL ENGINEER
7/15/2021

DATE	BY	REV	REVISION

CIVIL ASSOCIATES, INC.
CAI
9330 LBJ FRWY SUITE 1150
Dallas, Texas 75243
Firm Registration No. 6981

Texas Department of Transportation

FS 121

TRAFFIC CONTROL PLAN PHASE 4

FM 121

SHEET 1 OF 1

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	57

DETOUR FM121

<* 1 Describe Chain DETOUR*FM121

Chain DETOUR*FM121 contains:
112 CUR DETOUR*FM1211 CUR DETOUR*FM1212 113 114

Beginning chain DETOUR*FM121 description

Point 112 N 7,218,790.5734 E 2,483,505.2844 Sta 100+00.00

Course from 112 to PC DETOUR*FM1211 S 49° 15′ 15.16" E Dist 351.6204

Curve Data

Curve DETOUR*FM1211
P.I. Station 107+55.98 N 7,218,297.1449 E 2,484,078.0216
Delta = 38° 44′ 41.01" (LT)
Tangent = 404.3555
Length = 777.6565
Radius = 1,150.0000
External = 69.0174
Long Chord = 762.9241
Mid. Ord. = 65.1098
P.C. Station 103+51.62 N 7,218,561.0694 E 2,483,771.6766
P.T. Station 111+29.28 N 7,218,283.0256 E 2,484,482.1305
C.C. N 7,219,432.3243 E 2,484,522.2862
Back = S 49° 15′ 15.16" E
Ahead = S 87° 59′ 56.18" E
Chord Bear = S 68° 37′ 35.67" E

Course from PT DETOUR*FM1211 to PC DETOUR*FM1212 S 87° 59′ 56.18" E Dist 154.9162

Curve Data

Curve DETOUR*FM1212
P.I. Station 113+02.20 N 7,218,276.9874 E 2,484,654.9510
Delta = 0° 43′ 13.37" (LT)
Tangent = 18.0098
Length = 36.0191
Radius = 2,864.7890
External = 0.0566
Long Chord = 36.0188
Mid. Ord. = 0.0566
P.C. Station 112+84.19 N 7,218,277.6162 E 2,484,636.9522
P.T. Station 113+20.21 N 7,218,276.5848 E 2,484,672.9563
C.C. N 7,221,140.6582 E 2,484,736.9849
Back = S 87° 59′ 56.18" E
Ahead = S 88° 43′ 09.55" E
Chord Bear = S 88° 21′ 32.87" E

Course from PT DETOUR*FM1212 to 113 S 88° 43′ 09.55" E Dist 394.0151

Point 113 N 7,218,267.7785 E 2,485,066.8729 Sta 117+14.23

Course from 113 to 114 S 88° 03′ 33.66" E Dist 400.0061

Point 114 N 7,218,254.2326 E 2,485,466.6496 Sta 121+14.23

Ending chain DETOUR*FM121 description

DETOUR FM121A

<* 20 Describe Chain DETOUR*FM121A

Chain DETOUR*FM121A contains:
119 120 121 CUR DETOUR*FM121A1 CUR DETOUR*FM121A2 CUR DETOUR*FM121A3 122 123

Beginning chain DETOUR*FM121A description

Point 119 N 7,218,839.8979 E 2,483,421.5824 Sta 100+00.00

Course from 119 to 120 S 48° 13′ 06.91" E Dist 100.3602

Point 120 N 7,218,773.0288 E 2,483,496.4202 Sta 101+00.36

Course from 120 to 121 S 48° 28′ 24.54" E Dist 23.3460

Point 121 N 7,218,757.5512 E 2,483,513.8982 Sta 101+23.71

Course from 121 to PC DETOUR*FM121A1 S 47° 51′ 19.05" E Dist 261.9207

Curve Data

Curve DETOUR*FM121A1
P.I. Station 105+33.49 N 7,218,482.5833 E 2,483,817.7343
Delta = 12° 31′ 06.39" (LT)
Degree = 4° 15′ 00.03"
Tangent = 147.8642
Length = 294.5510
Radius = 1,348.1333
External = 8.0847
Long Chord = 293.9655
Mid. Ord. = 8.0365
P.C. Station 103+85.63 N 7,218,581.8010 E 2,483,708.1000
P.T. Station 106+80.18 N 7,218,409.4881 E 2,483,946.2679
C.C. N 7,219,581.3777 E 2,484,612.7047
Back = S 47° 51′ 19.05" E
Ahead = S 60° 22′ 25.44" E
Chord Bear = S 54° 06′ 52.24" E

Course from PT DETOUR*FM121A1 to PC DETOUR*FM121A2 S 60° 22′ 25.44" E Dist 16.2990

Curve Data

Curve DETOUR*FM121A2
P.I. Station 110+26.77 N 7,218,238.1521 E 2,484,247.5522
Delta = 30° 37′ 38.80" (LT)
Degree = 4° 45′ 00.03"
Tangent = 330.2962
Length = 644.7870
Radius = 1,206.2245
External = 44.4046
Long Chord = 637.1375
Mid. Ord. = 42.8280
P.C. Station 106+96.48 N 7,218,401.4308 E 2,483,960.4361
P.T. Station 113+41.26 N 7,218,243.9233 E 2,484,577.7979
C.C. N 7,219,449.9637 E 2,484,556.7216
Back = S 60° 22′ 25.44" E
Ahead = N 88° 59′ 55.76" E
Chord Bear = S 75° 41′ 14.84" E

Course from PT DETOUR*FM121A2 to PC DETOUR*FM121A3 N 88° 59′ 55.76" E Dist 319.9500

Curve Data

Curve DETOUR*FM121A3
P.I. Station 117+22.40 N 7,218,250.5828 E 2,484,958.8741
Delta = 2° 26′ 49.22" (RT)
Degree = 2° 00′ 00.01"
Tangent = 61.1843
Length = 122.3501
Radius = 2,864.7833
External = 0.6533
Long Chord = 122.3408
Mid. Ord. = 0.6531
P.C. Station 116+61.21 N 7,218,249.5138 E 2,484,897.6991
P.T. Station 117+83.56 N 7,218,249.0391 E 2,485,020.0390
C.C. N 7,215,385.1679 E 2,484,947.7553
Back = N 88° 59′ 55.76" E
Ahead = S 88° 33′ 15.01" E
Chord Bear = S 89° 46′ 39.62" E

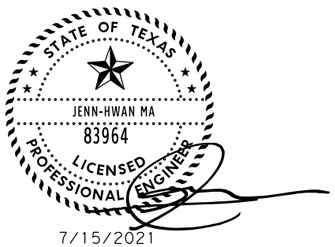
Course from PT DETOUR*FM121A3 to 122 S 88° 33′ 15.01" E Dist 31.9435

Point 122 N 7,218,248.2331 E 2,485,051.9723 Sta 118+15.51

Course from 122 to 123 N 89° 56′ 32.76" E Dist 109.9998

Point 123 N 7,218,248.3436 E 2,485,161.9720 Sta 119+25.51

Ending chain DETOUR*FM121A description



7/15/2021

DATE	BY	REV	REVISION

CIVIL ASSOCIATES, INC.
CAI
9330 LBJ FRWY SUITE 1150
Dallas, Texas 75243
Firm Registration No. 6981

Texas Department of Transportation

FS 121

TEMPORARY DETOUR

HORIZONATAL ALIGNMENT DATA

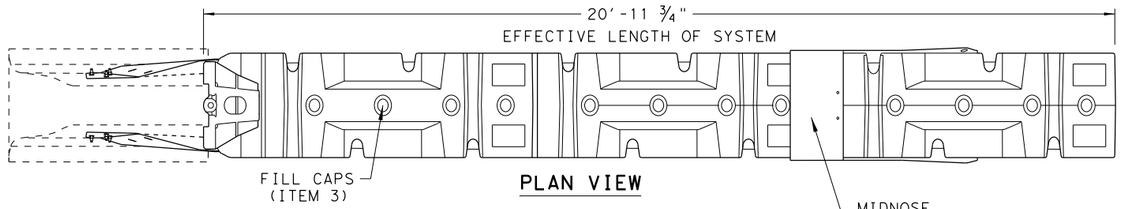
SCALE: N/A SHEET 1 OF 1

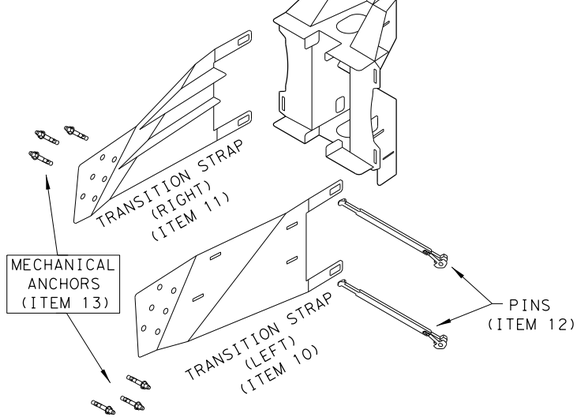
STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	58

DATE: 7/15/2021 7:40:32 PM
FILE: c:\pw\ics01\ICS\pdf*work*dir\449.33820*1\absorbm19.dgn

absorbm19.dgn

SYSTEM SHOWN - ABSORB-M TL-3





THE ABSORB-M IS A NON-REDIRECTIVE, GATING, CRASH CUSHION DESIGNED TO MEET THE LATEST TL-3 & TL-2 MASH REQUIREMENTS.

THE SYSTEM IS DESIGNED TO ACCOMMODATE A VARIETY OF F-SHAPE AND SINGLE SLOPE CONCRETE BARRIERS. CONTACT THE MANUFACTURER FOR GUIDANCE REGARDING OTHER ALLOWABLE SHAPES.

TEST LEVEL	NUMBER OF ELEMENTS	EFFECTIVE LENGTH	MAXIMUM LENGTH
TL-2	2	14'- 7 3/4"	17'- 4"
TL-3	3	20'- 11 3/4"	23'- 8"

NOTE:
CROSS SLOPES OF UP TO 8% (OR 1:12 SLOPE) CAN BE ACCOMMODATED WITH STANDARD HARDWARE SHOWN WITHIN THE INSTRUCTIONS MANUAL. FOR SLOPES WITH EXCESS OF 8% (OR 1:12) CONTACT, LINDSAY TRANSPORTATION SOLUTIONS.

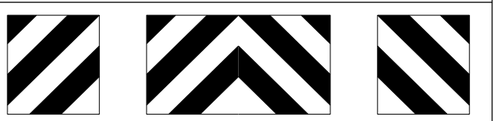
GENERAL NOTES

1. FOR SPECIFIC INFORMATION REGARDING THE INSTALLATION AND TECHNICAL GUIDANCE, CONTACT: LINDSAY TRANSPORTATION SOLUTIONS (LTS) - BARRIER SYSTEMS, INC. AT (707) 374-6800. 180 RIVER ROAD, RIO VISTA, CA 94571
2. THE ABSORB-M SYSTEM IS ONLY APPROVED FOR USE IN (TEMPORARY WORK ZONE) LOCATIONS.
3. THE ABSORB-M IS A WATER FILLED NON-REDIRECTIVE, GATING CRASH CUSHION THAT DOES NOT NEED TO BE ATTACHED TO A FOUNDATION AND CAN BE INSTALLED ON TOP OF CONCRETE, ASPHALT, OR ANY SURFACE CAPABLE OF BEARING THE WEIGHT OF THE SYSTEM.
4. MAXIMUM PERMISSIBLE CROSS-SLOPE IS 8%.
5. THE INSTALLATION AREA SHOULD BE FREE FROM CURBS, ELEVATED OBJECTS, OR DEPRESSIONS.
6. THE ABSORB-M SHOULD BE LOCATED APPROXIMATELY PARALLEL WITH THE BARRIER.
7. THE USE OF THE ABSORB-M IS RESTRICTED TO A BARRIER HEIGHT OF UP TO 42 INCHES.
8. DO NOT ADD WATER TO FRONT ELEMENT (TL-2 OR TL-3 UNIT).

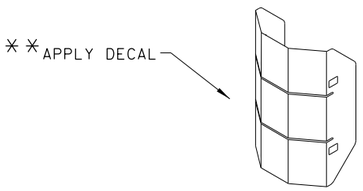
BILL OF MATERIALS (BOM) ABSORB-M TL-3 & TL-2 SYSTEMS			QTY	QTY
ITEM #	PART NUMBER	PART DESCRIPTION	TL-2 SYSTEM	TL-3 SYSTEM
1	BSI-1809036-00	TRANSITION-(GALV)	1	1
* 2	BSI-1808002-00	PRE-ASSEMBLED ABSORBING (ELEMENTS)	2	3
* 3	BSI-4004598	FILL CAPS	8	12
* 4	BSI-4004599	DRAIN PLUGS	2	3
* 5	BSI-1809053-00	TENSION STRAP-(GALV)	8	12
* 6	BSI-2001998	C-SCR FH 3/8-16 X 1 1/2 GR5 PLT	8	12
* 7	BSI-2001999	C-SCR FH 3/8-16 X 1 GR5 PLT	8	12
8	BSI-1809035-00	MIDNOSE-(GALV)	1	1
9	BSI-1808014-00	NOSE PLATE	1	1
10	BSI-1809037-00	TRANSITION STRAP (LEFT-HAND)-(GALV)	1	1
11	BSI-1809038-00	TRANSITION STRAP (RIGHT-HAND)-(GALV)	1	1
12	BSI-1808005-00	PIN ASSEMBLY	8	10
13	BSI-2002001	ANC MECH 5/8-11X5 (GALV)	6	6
14	ABSORB-M	INSTALLATION AND INSTRUCTIONS MANUAL	1	1

*COMPONENTS PRE-ASSEMBLED WITH ELEMENT ASSEMBLY

DELINEATION DECAL PLACEMENT GUIDE



TRAFFIC FLOW LEFT-SIDE BARRIER | TRAFFIC FLOW BOTH-SIDE BARRIER | TRAFFIC FLOW RIGHT-SIDE BARRIER



NOSE PLATE

** NOTE: (PROVIDED BY OTHERS)
ENGINEER OR CONTRACTOR SHALL COORDINATE WITH THE MANUFACTURER FOR THE CORRECT DECAL PER TRAFFIC FLOW, LEFT, RIGHT OR BOTH-SIDES.

NOTE:
APPLY A HIGH REFLECTIVE DECAL TO THE NOSE PLATE. DELINEATION DECAL ORIENTATION IS SHOWN ON THE CONSTRUCTION PLAN SET AND SHALL BE IN ACCORDANCE WITH THE TEXAS MUTCD FOR (TRAFFIC CONTROL DEVICES). DECALs ARE AVAILABLE FOR TRAFFIC FLOW ON THE LEFT-SIDE, BOTH -SIDES AND RIGHT-SIDE.

NOTE:
THIS STANDARD IS A BASIC REPRESENTATION OF THE ABSORB-M, IT IS NOT INTENDED TO REPLACE THE INSTALLATION INSTRUCTIONS MANUAL.

SACRIFICIAL

Texas Department of Transportation — Design Division Standard

LINDSAY TRANSPORTATION SOLUTIONS
CRASH CUSHION
(MASH TL-3 & TL-2)
TEMPORARY - WORK ZONE
ABSORB(M)-19

FILE: absorbm19	DN: TxDOT	CK: KM	DW: VP	CK:
© TxDOT: JULY 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0091	10	002	FS 121
	DIST	COUNTY		SHEET NO.
	PAR	GRAYSON		59

DATE:
FILE:

BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

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

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

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

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

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

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

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

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

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

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

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

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

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

WORKER SAFETY NOTES:

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

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

COMPLIANT WORKZONE TRAFFIC CONTROL DEVICES

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

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

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

Texas Department of Transportation

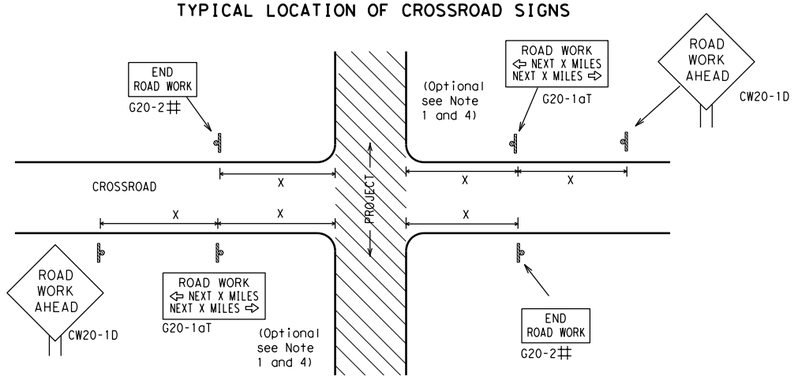
Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-03 7-13	0091	10	002	FS 121
9-07 8-14	DIST	COUNTY		SHEET NO.
5-10 5-21	PAR	GRAYSON		60

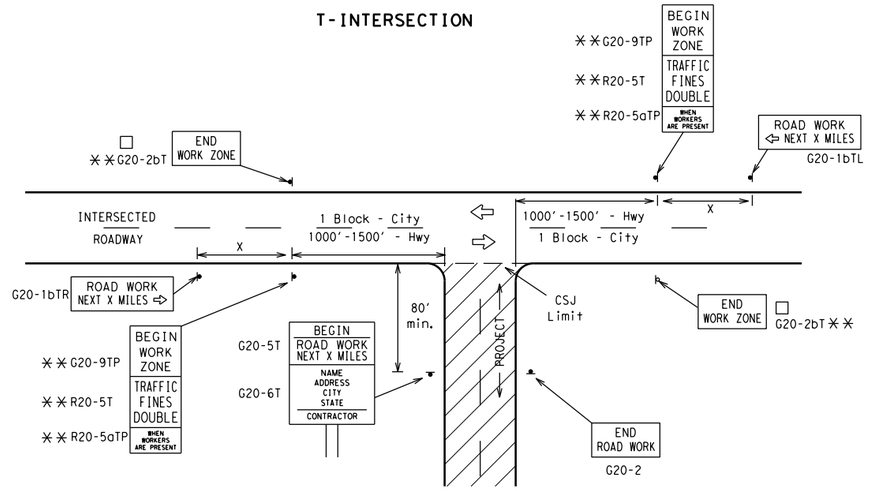
TYPICAL LOCATION OF CROSSROAD SIGNS



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

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

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

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

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

SIZE

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

SPACING

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

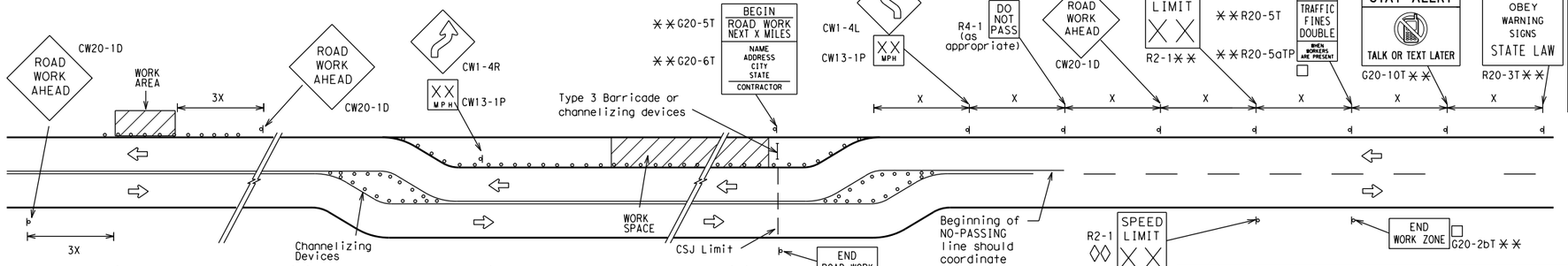
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

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

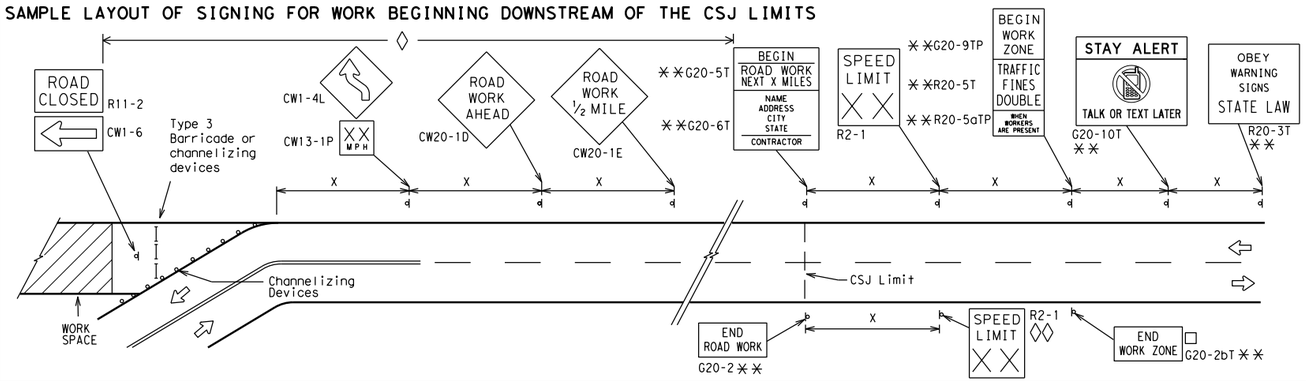
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



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

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS

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



NOTES

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

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

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0091	10	002	FS 121
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	PAR	GRAYSON		61

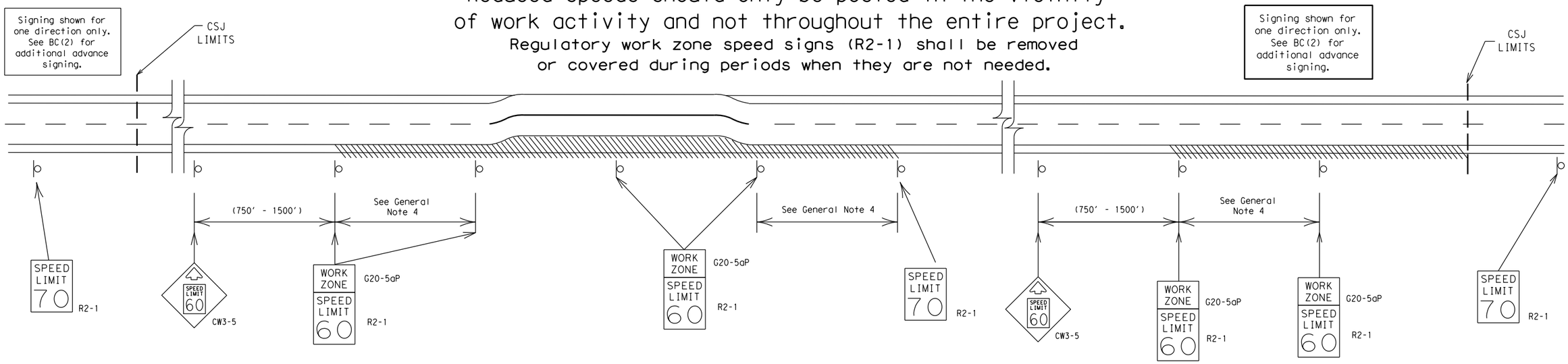
DATE:
FILE:

TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

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

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



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

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

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

SHORT TERM WORK ZONE SPEED LIMITS

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-21

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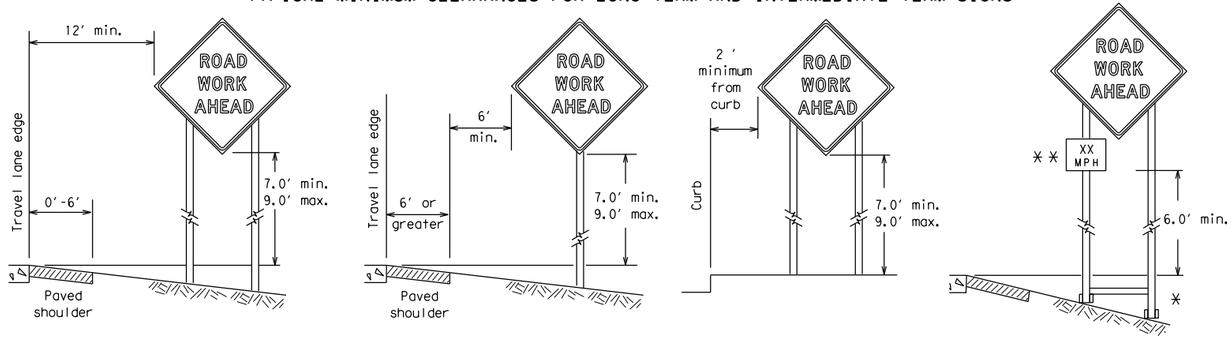
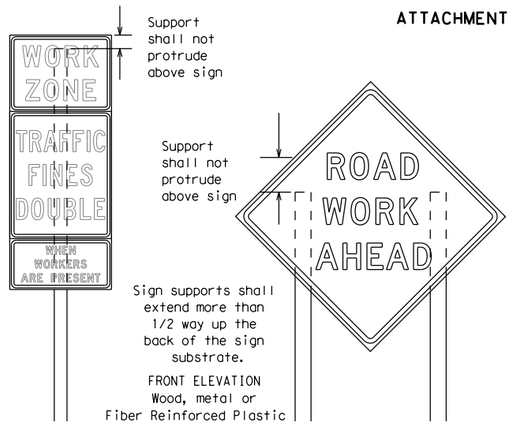
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

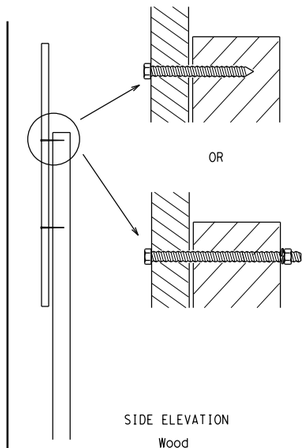


⁎ When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

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

ATTACHMENT FOR SIGN SUPPORTS





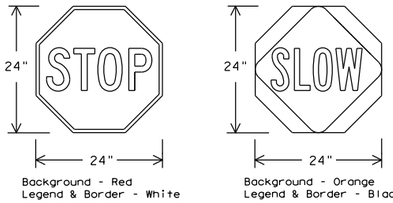
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

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

STOP/SLOW PADDLES

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



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

CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

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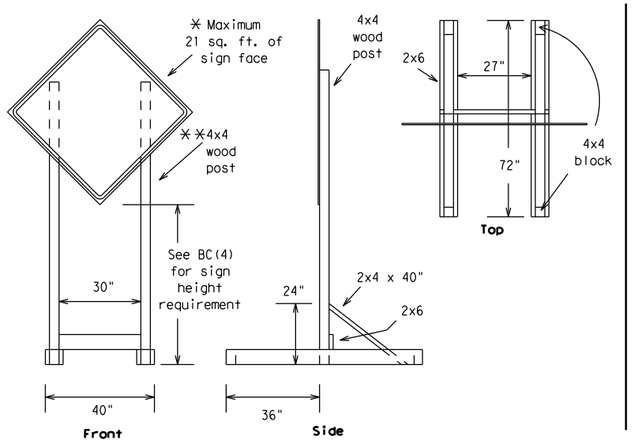
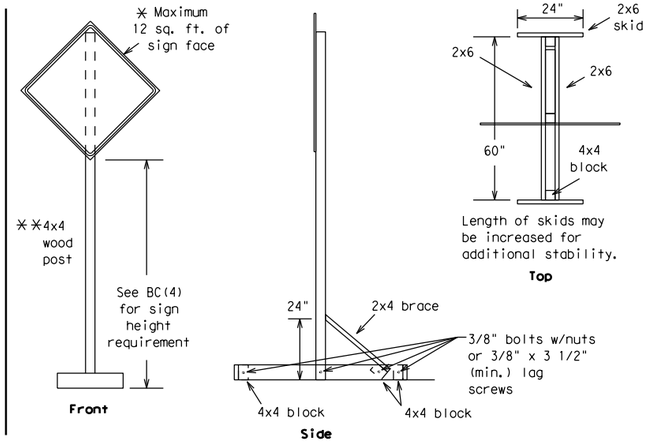
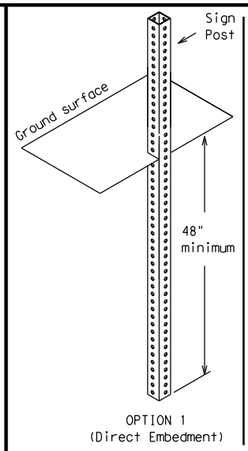
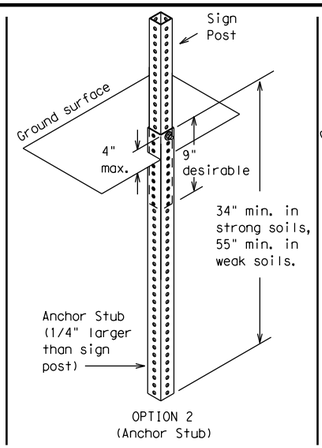


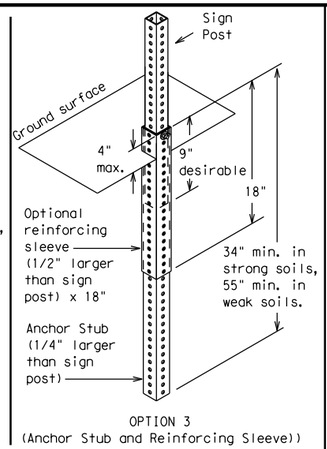


SKID MOUNTED WOOD SIGN SUPPORTS

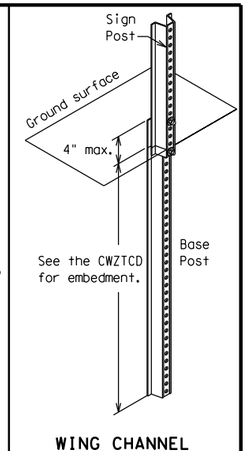
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS







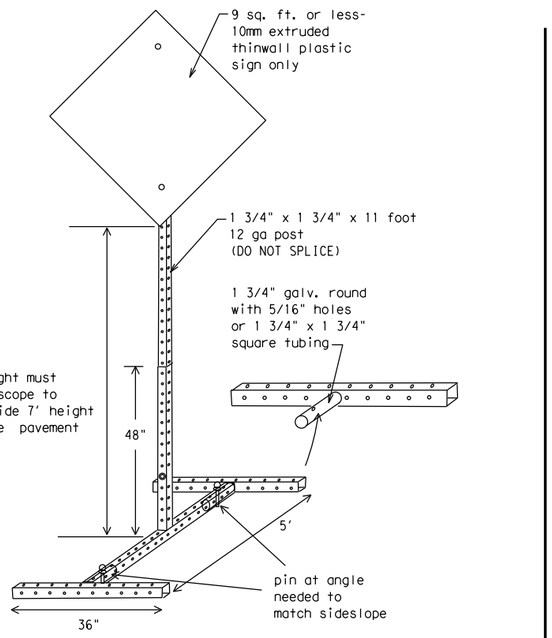
PERFORATED SQUARE METAL TUBING

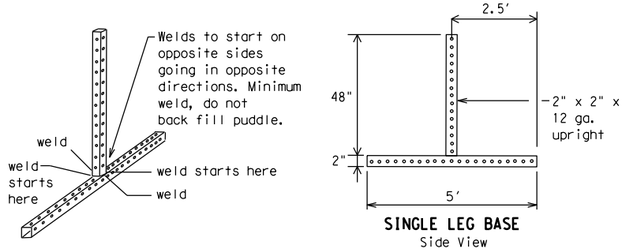


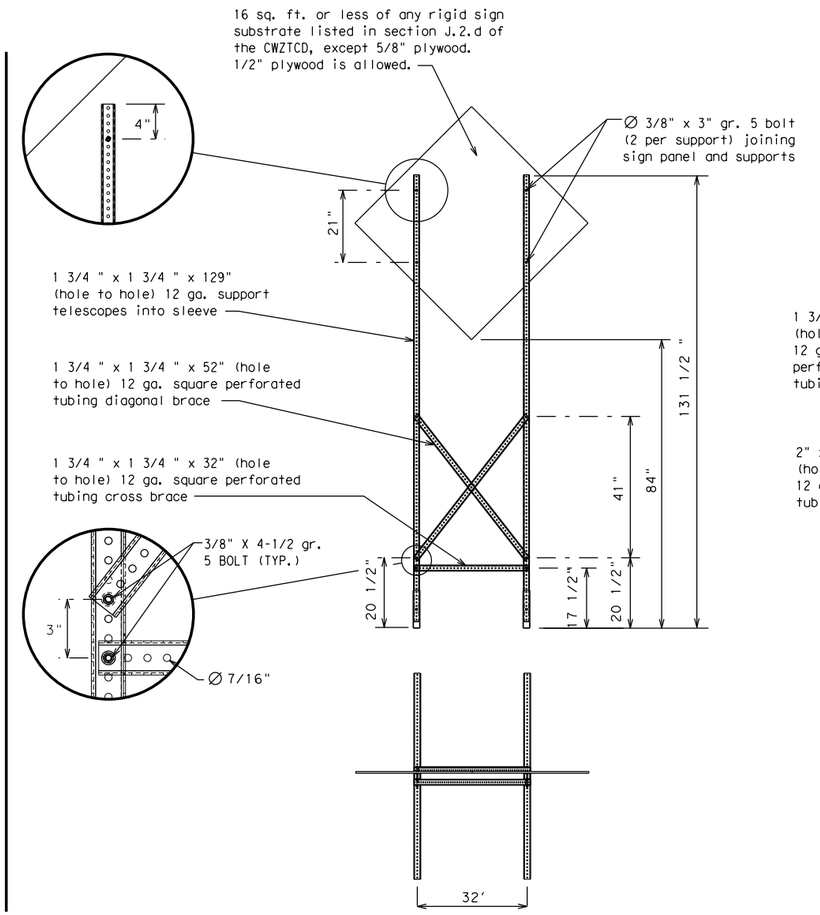
WING CHANNEL
Lap-splice/base bolted anchor

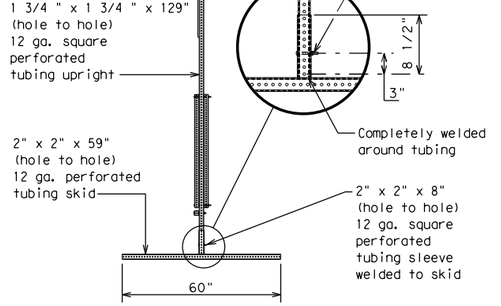
GROUND MOUNTED SIGN SUPPORTS

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









SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

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

WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

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

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

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

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

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Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-21

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

PORTABLE CHANGEABLE MESSAGE SIGNS

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

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

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

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

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

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

Other Condition List

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

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

Phase 2: Possible Component Lists

Action to Take/Effect on Travel List

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

Location List

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

Warning List

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

** Advance Notice List

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

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

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

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

WORDING ALTERNATIVES

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

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

FULL MATRIX PCMS SIGNS

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0091	10	002	FS 121
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	PAR	GRAYSON		65

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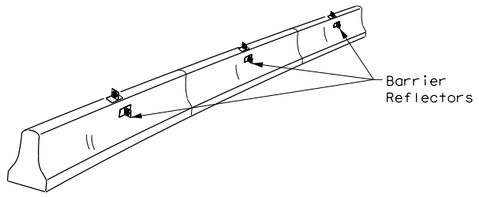
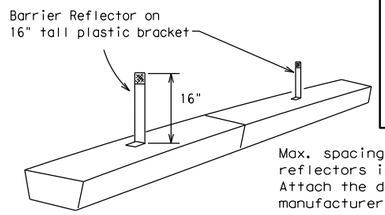
DATE:
FILE:

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



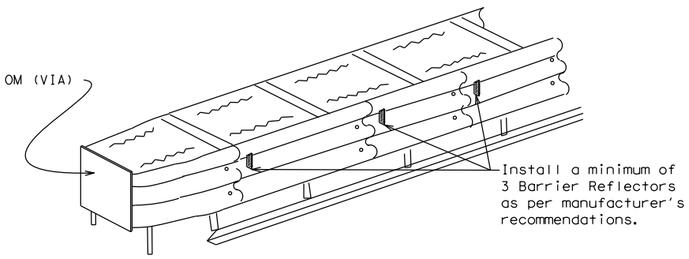
CONCRETE TRAFFIC BARRIER (CTB)

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



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

LOW PROFILE CONCRETE BARRIER (LPCB)



DELINEATION OF END TREATMENTS

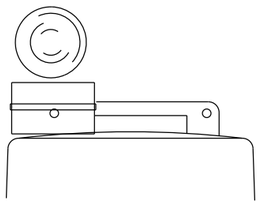
LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES

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

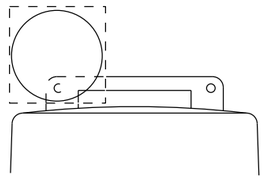
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



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



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

WARNING LIGHTS

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

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

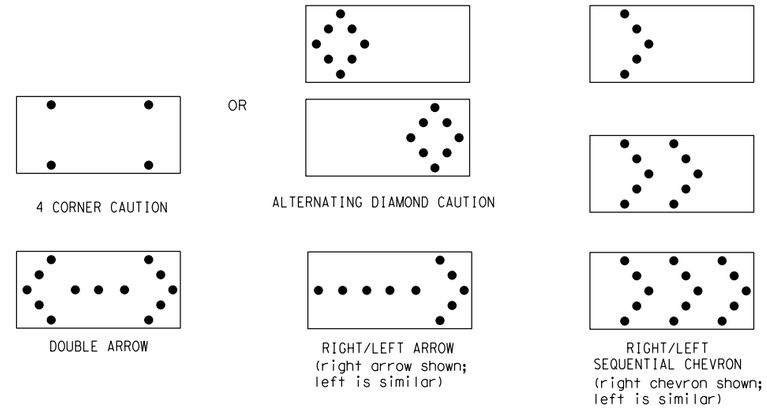
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

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

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

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

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



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

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

ATTENTION

Flashing Arrow Boards shall be equipped with automatic dimming devices.

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

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

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

Texas Department of Transportation

Traffic Safety Division Standard

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

BC(7)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0091	10	002	FS 121
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	PAR	GRAYSON		66

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DATE:
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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:

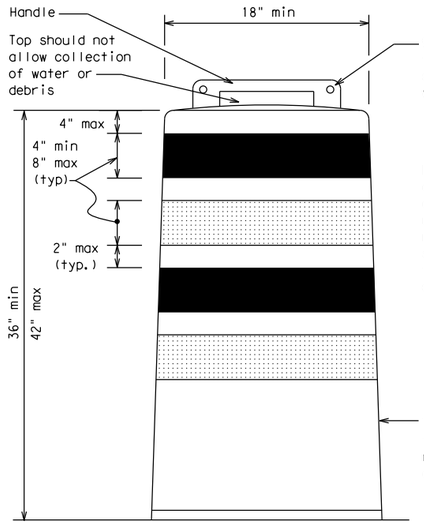
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

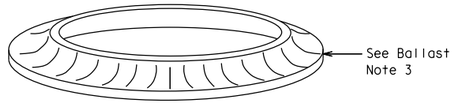
RETROREFLECTIVE SHEETING

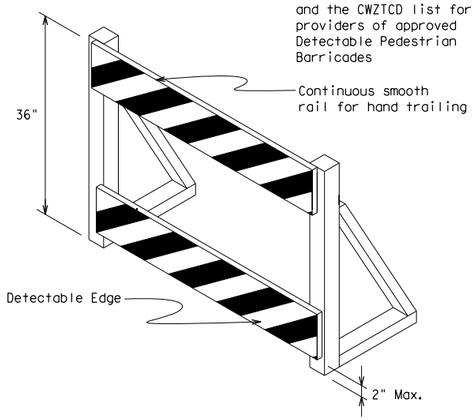
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall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

BALLAST

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

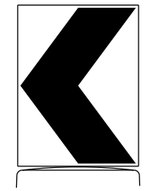




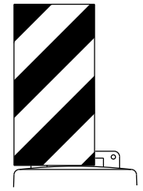


DETECTABLE PEDESTRIAN BARRICADES

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



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



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

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

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0091	10	002	FS 121
4-03 8-14	DIST	COUNTY		SHEET NO.
9-07 5-21	PAR	GRAYSON		67
7-13				

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DATE:
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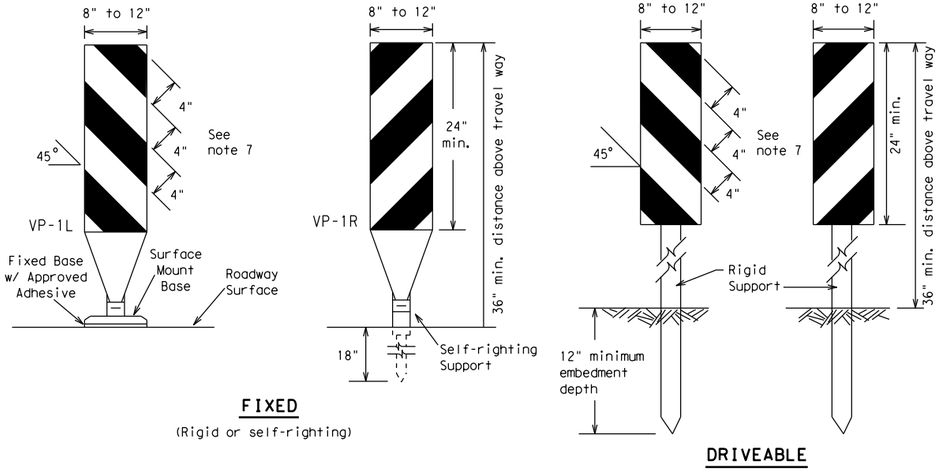
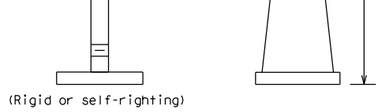


FIXED
(Rigid or self-righting)

DRIVEABLE

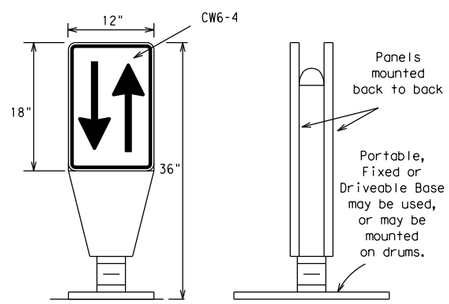


(Rigid or self-righting)

PORTABLE

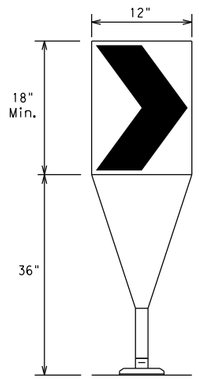
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is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

VERTICAL PANELS (VPs)



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

OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



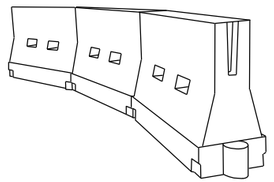
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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

CHEVRONS

GENERAL NOTES

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



LONGITUDINAL CHANNELIZING DEVICES (LCD)

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

WATER BALLASTED SYSTEMS USED AS BARRIERS

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

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

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

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

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-21

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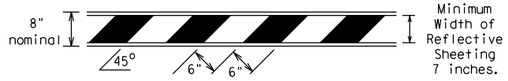
7-13 5-21	PAR	GRAYSON		68

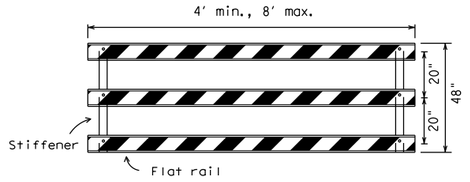
TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



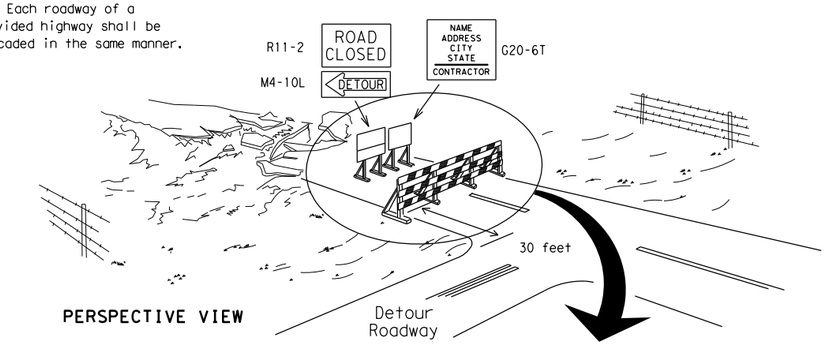
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

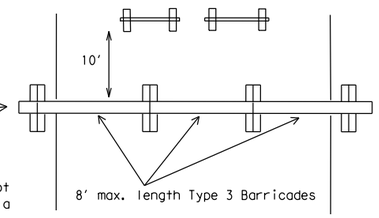
Each roadway of a divided highway shall be barricaded in the same manner.



PERSPECTIVE VIEW

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

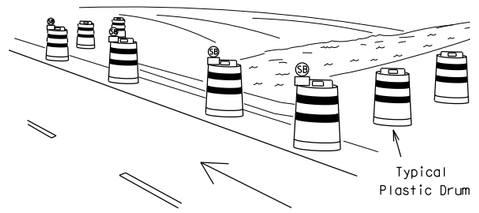
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

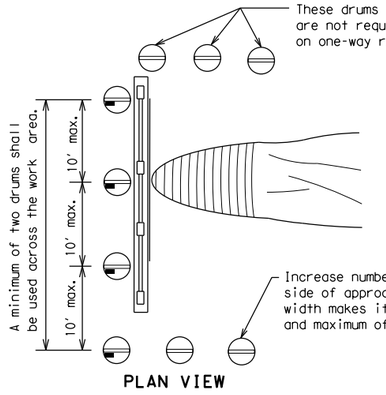
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

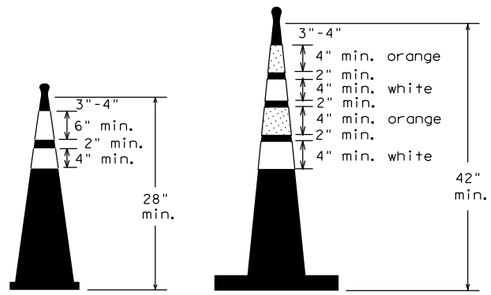
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder width is greater than 12 feet, steady-burn lights may be omitted if drums are used.
5. Drums must extend the length of the culvert widening.



PLAN VIEW

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

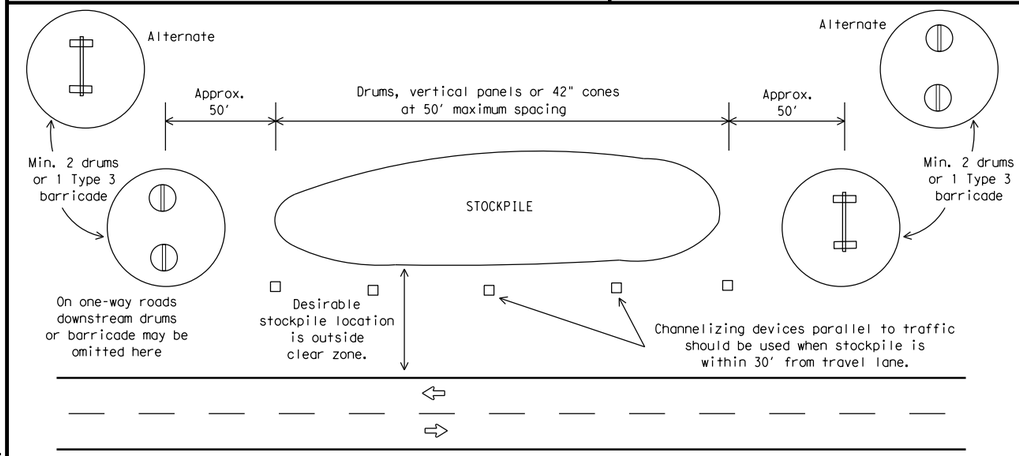
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



28" Cones shall have a minimum weight of 9 1/2 lbs.

42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

1. Traffic cones and tubular markers shall be predominantly orange, and meet the height and weight requirements shown above.
2. One-piece cones have the body and base of the cone molded in one consolidated unit. Two-piece cones have a cone shaped body and a separate rubber base, or ballast, that is added to keep the device upright and in place.
3. Two-piece cones may have a handle or loop extending up to 8" above the minimum height shown, in order to aid in retrieving the device.
4. Cones or tubular markers shall have white or white and orange reflective bands as shown above. The reflective bands shall have a smooth, sealed outer surface and meet the requirements of Departmental Material Specification DMS-8300 Type A or Type B.
5. 28" cones and tubular markers are generally suitable for short duration and short-term stationary work as defined on BC(4). These should not be used for intermediate-term or long-term stationary work unless personnel is on-site to maintain them in their proper upright position.
6. 42" two-piece cones, vertical panels or drums are suitable for all work zone durations.
7. Cones or tubular markers used on each project should be of the same size and shape.



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

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Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-21

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WORK ZONE PAVEMENT MARKINGS

GENERAL

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

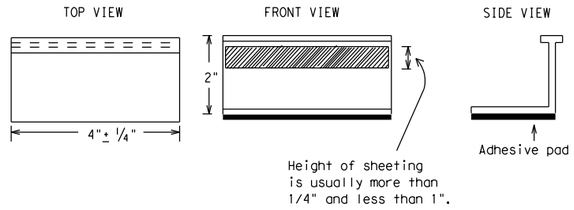
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

REMOVAL OF PAVEMENT MARKINGS

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

Temporary Flexible-Reflective Roadway Marker Tabs



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

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

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-21

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	DIST	COUNTY		SHEET NO.
	PAR	GRAYSON		70

DATE:
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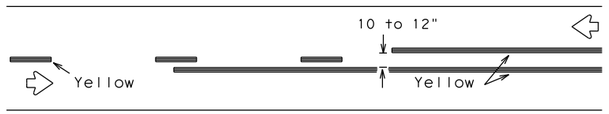
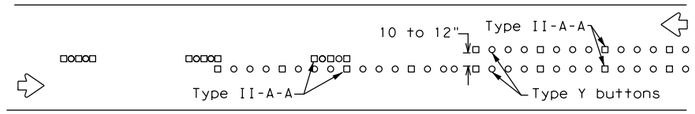
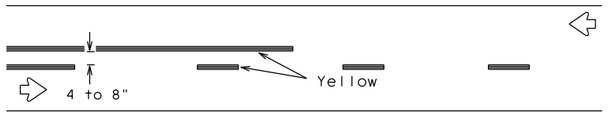
PAVEMENT MARKING PATTERNS



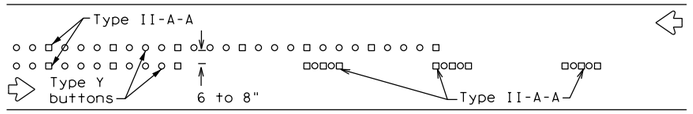
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



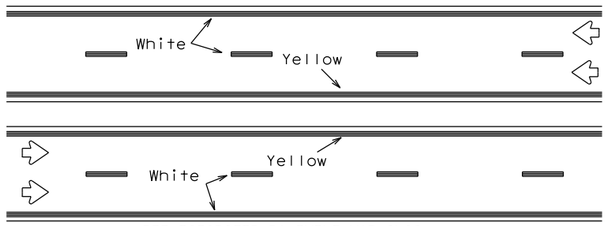
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



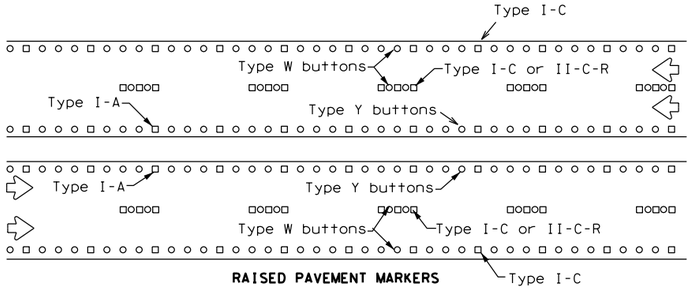
RAISED PAVEMENT MARKERS - PATTERN B

Pattern A is the TXDOT Standard, however Pattern B may be used if approved by the Engineer.
Prefabricated markings may be substituted for reflectorized pavement markings.

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



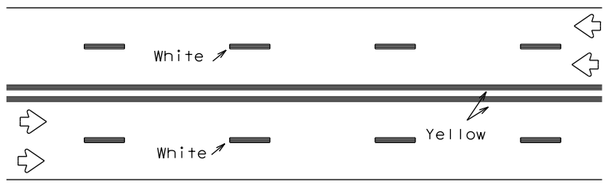
REFLECTORIZED PAVEMENT MARKINGS



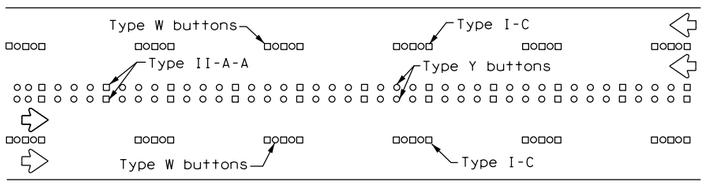
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



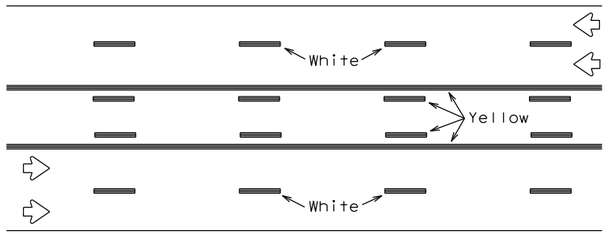
REFLECTORIZED PAVEMENT MARKINGS



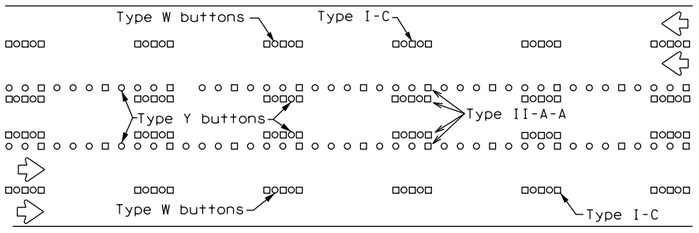
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

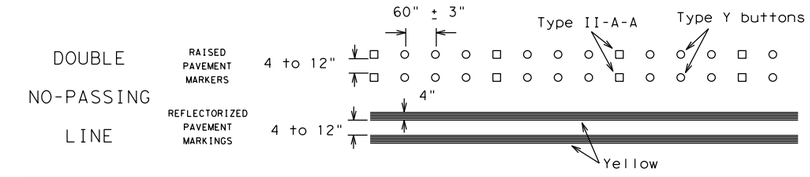
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

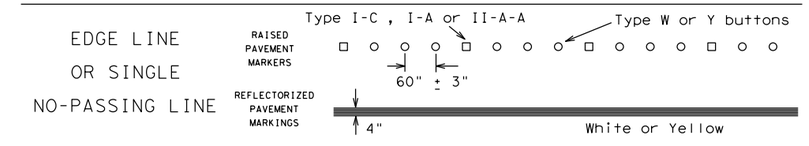
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

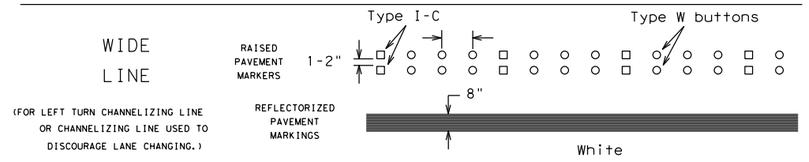


EDGE LINE OR SINGLE NO-PASSING LINE



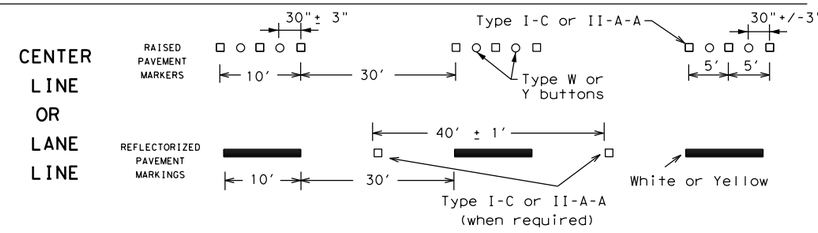
WIDE LINE

(FOR LEFT TURN CHANNELIZING LINE OR CHANNELIZING LINE USED TO DISCOURAGE LANE CHANGING.)

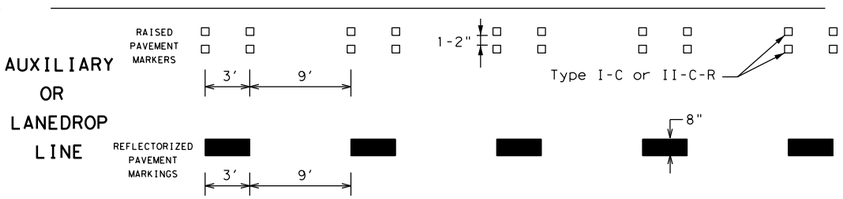


BROKEN LINES

CENTER LINE OR LANE LINE

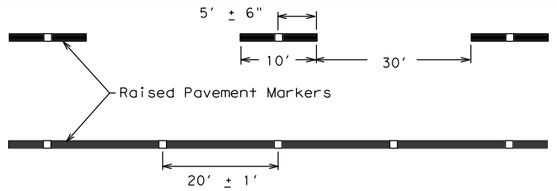


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

If raised pavement markers are used to supplement REMOVABLE markings, the markers shall be applied to the top of the tape at the approximate mid length of tape used for broken lines or at 20 foot spacing for solid lines. This allows an easier removal of raised pavement markers and tape.



Centerline only - not to be used on edge lines

Raised pavement markers used as standard pavement markings shall be from the approved products list and meet the requirements of Item 672 "RAISED PAVEMENT MARKERS."

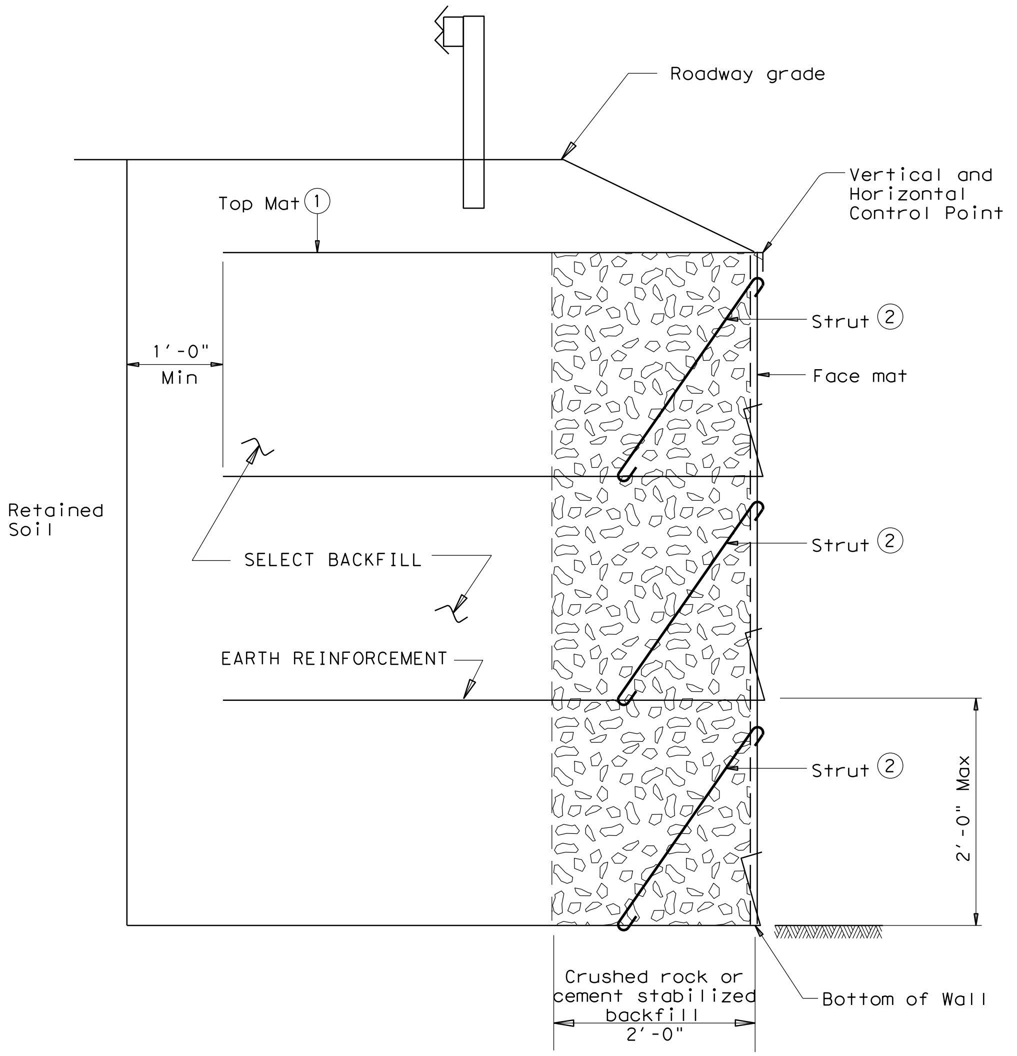
Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 1-97 9-07 5-21 2-98 7-13 11-02 8-14	0091	10	002	FS 121
	DIST	COUNTY		SHEET NO.
	PAR	GRAYSON		71

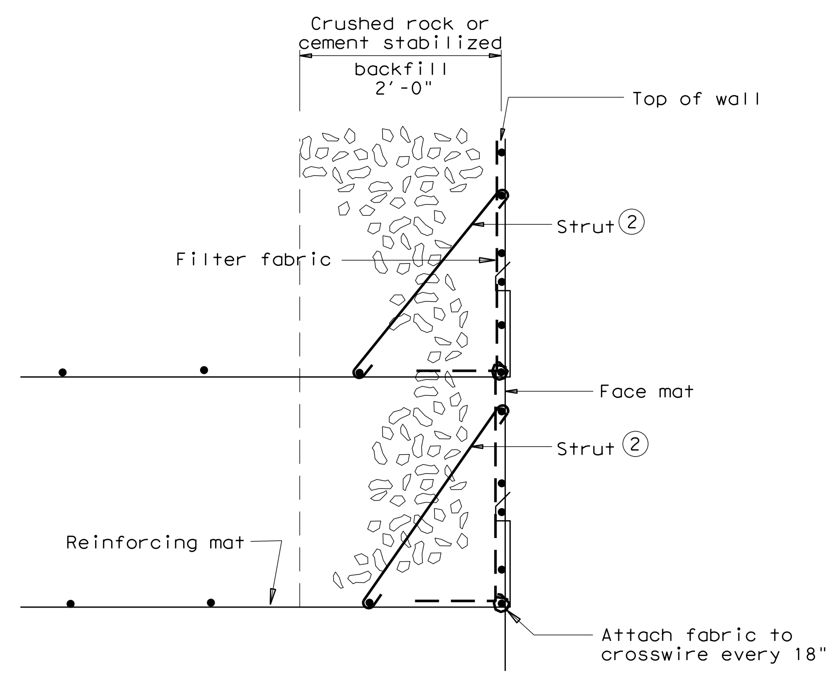


TYPICAL SECTION

(SHOWING TOP MAT OPTION)

(1) Provide top mat to stabilize top of wall. Contractor may propose alternate method to stabilize top of wall.

(2) Provide intermediate stuts as required to stabilize face.



DETAIL OF WALL FACE

(SHOWING STRUT OPTION)

EARTH REINFORCEMENTS:
The maximum vertical spacing of earth reinforcements shall be 24 inches.
The minimum length of earth reinforcements shall be 6 feet for walls 6 feet and shorter, and 8 feet for walls over 6 feet tall.
Minimum wire size for welded wire earth reinforcements shall be W4.5. Longitudinal wire spacing shall not exceed 12 inches. Transverse wire spacing shall not exceed 24 inches.
Earth reinforcement allowable stresses and pullout shall be calculated with current AASHTO Standard and Interim Specifications.
Factor of safety in pullout of the earth reinforcements shall be greater than 1.5 at each reinforcement level.
Temporary Earth Wall reinforcements that will be placed in the reinforced volume of a permanent MSE wall shall either be non-metallic or galvanized.

WALL FACE:
Minimum wire size for welded wire material used for all facing shall be W4.5. Spacing of the wire shall not exceed 6 inches in either the horizontal or vertical direction. The facing shall be designed to maintain a vertical position during wall backfilling. This may be accomplished with wire struts, external bracing, or other means which provide acceptable performance. If the face does not remain vertical during wall backfilling, work shall be stopped until the system is modified to meet this requirement.
Angled struts or a top mat shall be provided to stabilize the top basket face. Strut spacing shall not exceed 24 inches.

STABILITY CRITERIA:
Factor of safety in sliding along the base of the structure shall be greater than or equal to 1.5.
Factor of safety in overturning shall be greater than or equal to 2.0.
The base pressure resultant shall fall within the middle third of the retaining wall.

DESIGN PARAMETERS:
Structure shall be based on the following design parameters:
Random Backfill: Unit weight = 120 pcf.
(Embankment or Existing Soils) ø = 30° c = 0 psf
Select Backfill: Unit weight = 120 pcf
ø = 30° c = 0 psf

GENERAL NOTES:
Sections shown are for informational purposes only. Specific geometry is to be determined based on wall layouts and other plan information.
The select backfill specified for use within the Temporary Earth Wall Select Volume shall extend horizontally from the back of the 2' backfill zone to a minimum of 1' beyond the end of the earth reinforcements.

SPECIAL NOTE - FACE CONSTRUCTION

When constructing wire faced walls, it is critical that the area immediately behind the face mat be completely filled. Failure to fill and compact this area will result in bulging of the face mats and settlement of the top of wall. The filter fabric shall closely follow the contours of the face unit, with particular attention paid to the lower corner of the basket. The fabric shall be pulled into the corner and attached to the basket with hog rings or tie wire. The coarse rock or cement stabilized backfill in the two foot zone behind the face shall extend completely to the top of the face mat. Particular care shall be taken not to leave a gap or void below the next layer of earth reinforcement.

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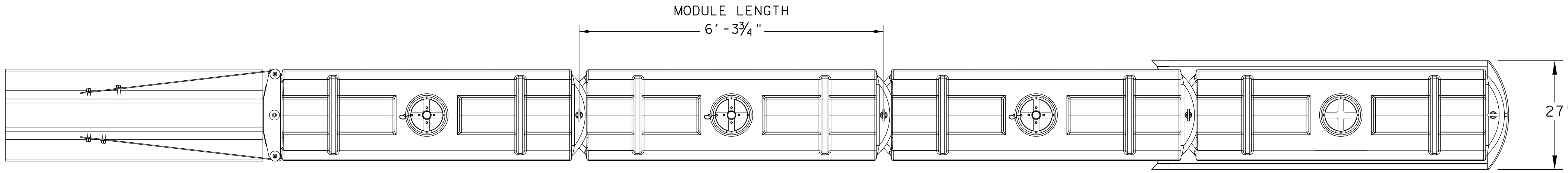
Texas Department of Transportation — Bridge Division Standard

TEMPORARY EARTH RETAINING WALL

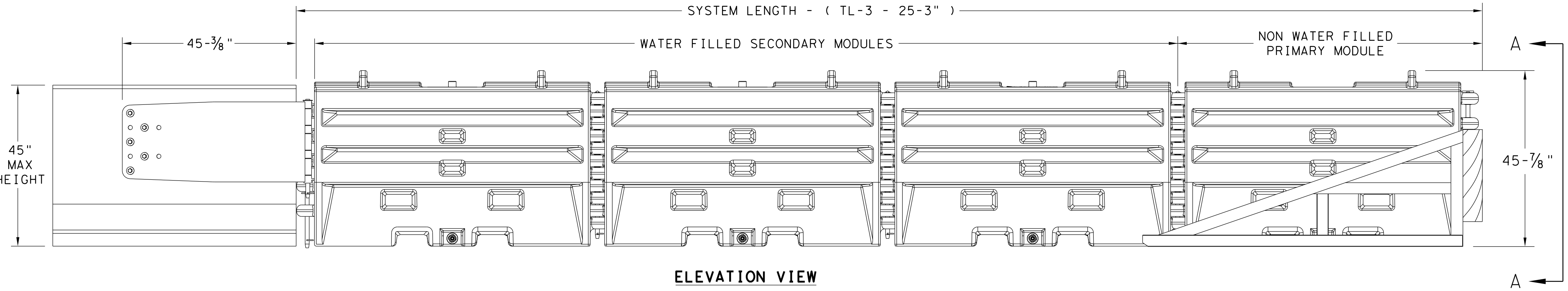
RW(TEW)

FILE: rwstde04.dgn	DN: TxDOT	CK: TxDOT	DW: GHO	CK: MPM
©TxDOT March 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	0091	10	002	FS 121
01-13: Added Struts.	DIST	COUNTY		SHEET NO.
	PAR	GRAYSON		72

sled19.dgn



PLAN VIEW

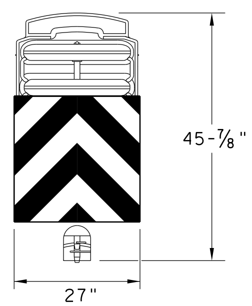


ELEVATION VIEW

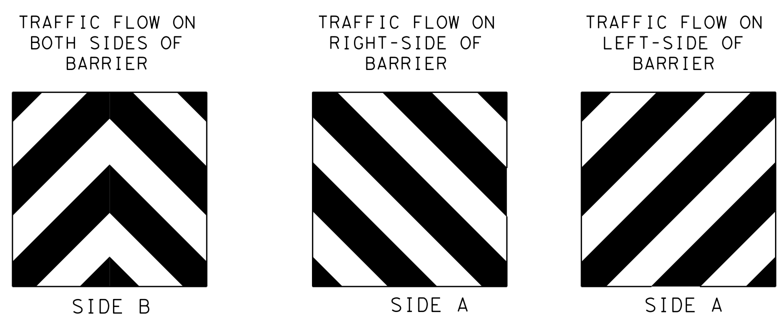
GENERAL NOTES

1. REFER TO THE INSTALLATION MANUAL FOR SPECIFIC SYSTEM ASSEMBLY AND MODULE ORIENTATION. FOR ADDITIONAL INFORMATION, CONTACT TRAFFIX, INC. AT (949) 361-5663.
2. THE SLED SYSTEM IS A MASH APPROVED TEST LEVEL 3 (TL-3) CRASH CUSHION APPROVED FOR USE IN TEMPORARY WORK ZONES. THE SLED SYSTEM IS A NON-REDIRECTIVE, GATING CRASH CUSHION THAT DOES NOT NEED TO BE ATTACHED TO THE GROUND AND CAN BE INSTALLED ON CONCRETE, ASPHALT, GRAVEL OR COMPACTED SOIL.
3. MAXIMUM PERMISSIBLE CROSS SLOPE IS 8° (DEGREES) (14%).
4. THE INSTALLATION AREA SHOULD BE FREE FROM CURBS, ELEVATED OBJECTS, OR DEPRESSIONS.
5. THE SLED SYSTEM CAN BE ATTACHED TO:
   - CONCRETE BARRIER, TEMPORARY OR PERMANENT, 45" MAXIMUM HEIGHT
   - STEEL BARRIER
   - PLASTIC BARRIER
   - CONCRETE BRIDGE ABUTMENTS
   - W-BEAM GUARD RAIL
   - THRIE BEAM GUARD RAIL

TEST LEVEL	NUMBER OF SECONDARY MODULES	SYSTEM LENGTH
TL-3	3	25' 3"



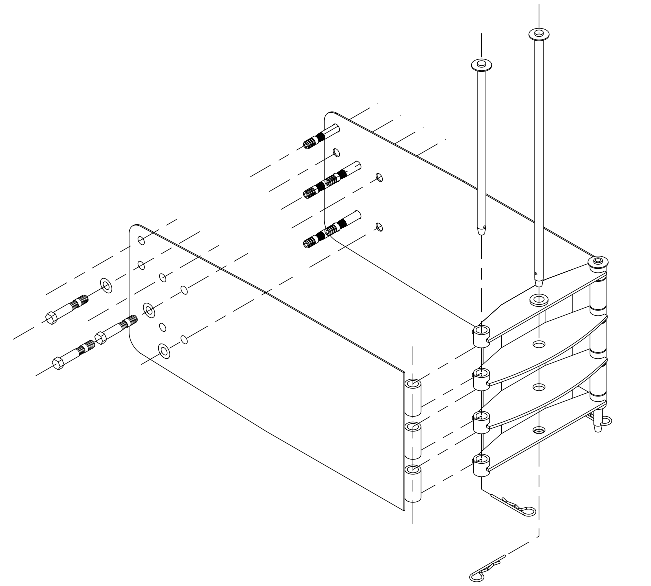
SECTION A-A



NOSE SHEETING PANEL DELINEATION

NOTE:
SEE INSTALLATION MANUAL FOR CUSTOMIZED DELINEATION NOSE SHEETING FOR DECAL PLACEMENT.

BILL OF MATERIAL		
PART NUMBER	DESCRIPTION	QTY: TL-3
45131	TRANSITION FRAME, GALVANIZED	1
45150	TRANSITION PANEL, GALVANIZED	2
45147-CP	TRANSITION SHORT DROP PIN W/ KEEPER PIN, GALVANIZED	2
45148-CP	TRANSITION LONG DROP PIN W/ KEEPER PIN, GALVANIZED	1
45050	ANCHOR BOLTS	9
12060	WASHER, 3/4" ID X 2" OD	9
45044-Y	SLED YELLOW WATER FILLED MODULE	3
45044-YH	SLED YELLOW "NO FILL" MODULE	1
45044-S	CIS (CONTAINMENT IMPACT SLED), GALVANIZED	1
45043-CP	T-PIN W/ KEEPER PIN	4
18009-B-I	FILL CAP W/ "DRIVE BY" FLOAT INDICATOR	3
45033-RC-B	DRAIN PLUG	3
45032-DPT	DRAIN PLUG REMOVAL TOOL	1



SLED TRANSITION COMPONENTS FOR ATTACHMENT TO CMB

NOTE:
SEE MANUFACTURER'S INSTALLATION MANUAL FOR FURTHER DETAILS.

TRANSITION OPTIONS
SLED TRANSITION TO CONCRETE TRAFFIC BARRIER (TEMPORARY OR PERMANENT)
SLED TRANSITION TO STEEL TRAFFIC BARRIER (CONTACT MFGR FOR PROPER TRANSITION)
SLED TRANSITION TO PLASTIC TRAFFIC BARRIER (CONTACT MFGR FOR PROPER TRANSITION)
SLED TRANSITION TO W-BEAM OR THRIE BEAM GUARD RAIL (CONTACT MFGR FOR PROPER TRANSITION)
SLED TRANSITION TO CONCRETE BRIDGE ABUTMENT

NOTE:
THIS STANDARD IS A BASIC REPRESENTATION OF THE SLED, IT IS NOT INTENDED TO REPLACE THE INSTALLATION INSTRUCTIONS MANUAL.

SACRIFICIAL

Texas Department of Transportation

Design Division Standard

SLED CRASH CUSHION TL-3 MASH COMPLIANT (TEMPORARY, WORK ZONE)

SLED-19

FILE: sled19.dgn	DN: TxDOT	CK: KM	DW: VP	CK:
© TxDOT: DECEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0091	10	002	FS 121
	DIST	COUNTY		SHEET NO.
	PAR	GRAYSON		73

DATE: 7/15/2021 7:43:20 PM
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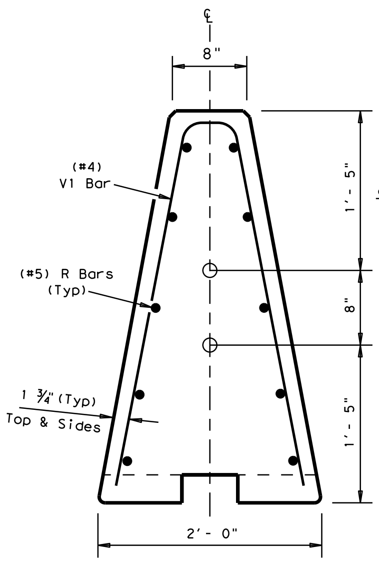
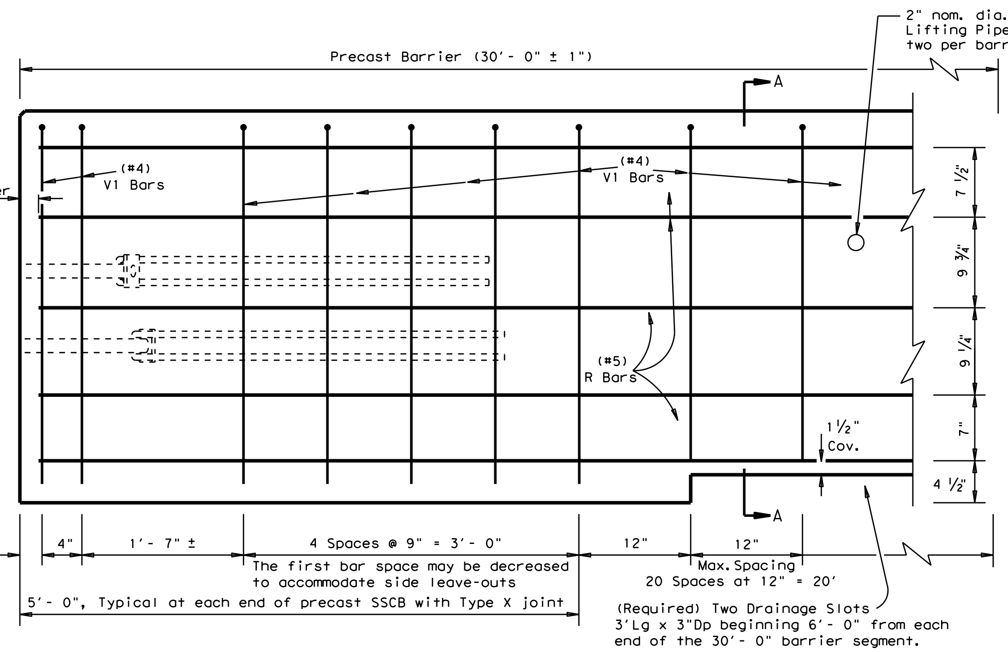


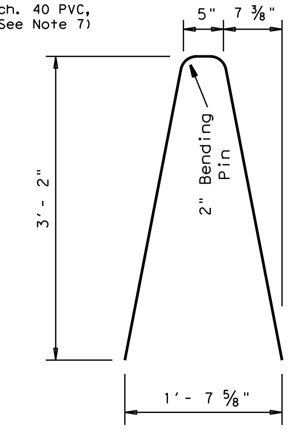
End View
Precast Barrier

Pipe locations for Joint Type X connection



Reinforcement for Precast (SSCB)
Single Slope Concrete Barrier (Type 1)

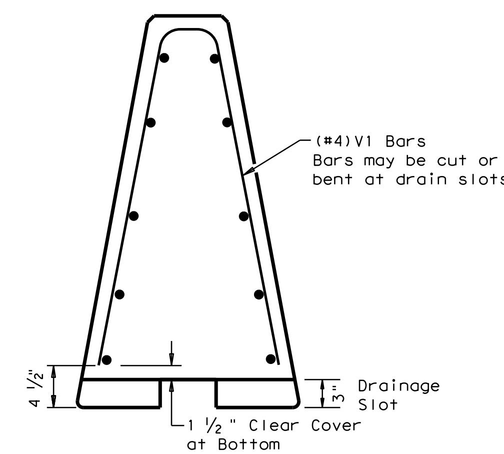
Showing reinforcement for Joint Connection (Type X)



V1 Bar

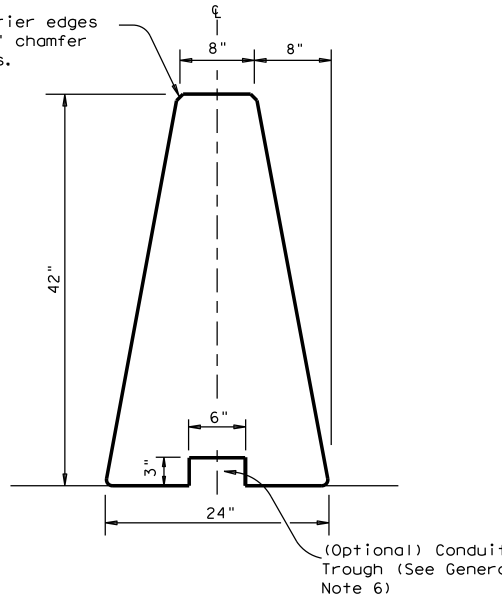
#4 Rebar

Note:
V1 Bars above the drainage slots may bent to accomodate 1 ½" clear cover as directed by the Engineer.



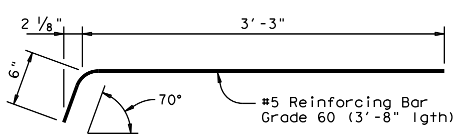
Section A-A

Steel Placement at (Required) Drainage Slots



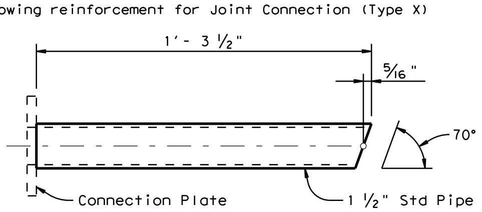
Single Slope Concrete Traffic Barrier

Precast SSCB barrier may be connected to cast-in-place SSBC. The joint connection "Types" may be used in the cast-in-place barrier, to match the precast barrier connection.



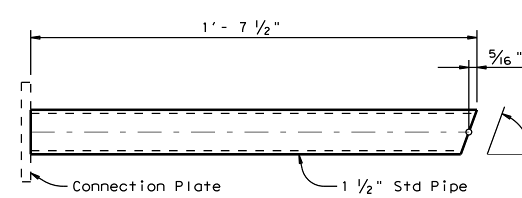
DEFORMED BAR ANCHOR DETAILS

Two (2) Bars required per assembly.
Eight (8) required per Joint.



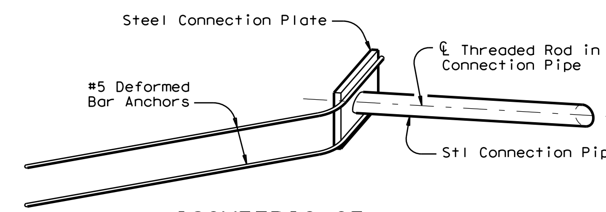
UPPER CONNECTION PIPE DETAILS

One (1) Steel Pipe required per Upper Assembly.
Two (2) required per Joint.



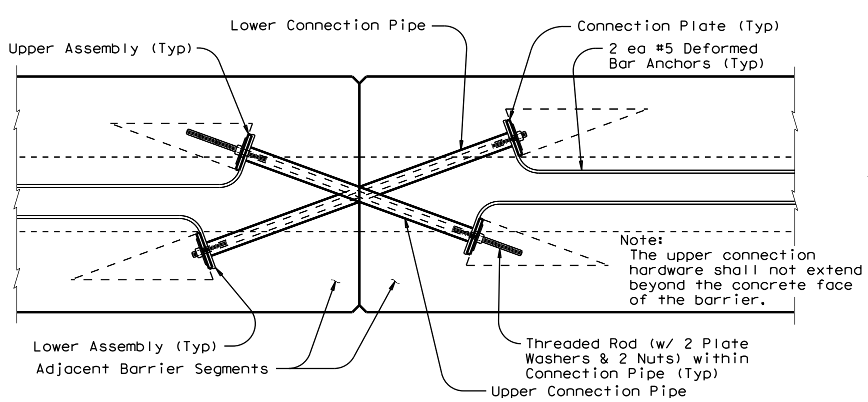
LOWER CONNECTION PIPE DETAILS

One (1) Steel Pipe required per Lower Assembly.
Two (2) required per Joint.



ISOMETRIC OF
TYPICAL WELDED ASSEMBLY

Four (4) [2 Upper & 2 Lower] Assemblies required per Joint.



TYPE X JOINT INSTALLATION DETAIL

Barrier reinforcing and Type X Joint Leave-Out dimensions not shown for clarity.

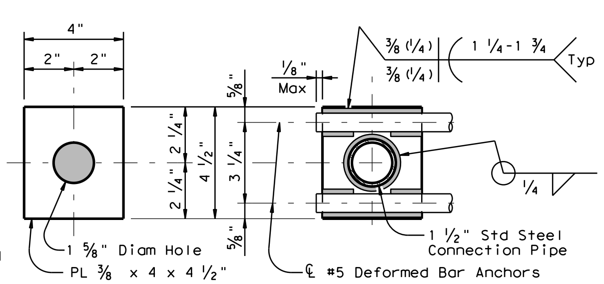
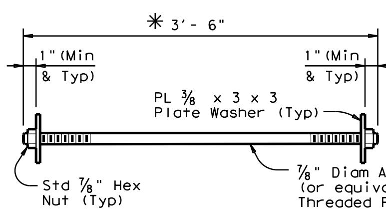


PLATE DIMENSIONS

WELDING DETAILS

CONNECTION PLATE DETAILS

One (1) Plate required per assembly.
Four (4) required per Joint. All steel fittings for joint Type X shall be galvanized after fabrication in accordance with Item 445.



✻ The connection hardware shall not extend beyond the concrete face of the barrier. Hex head bolts may be provided. The proper length of all hardware should be verified.

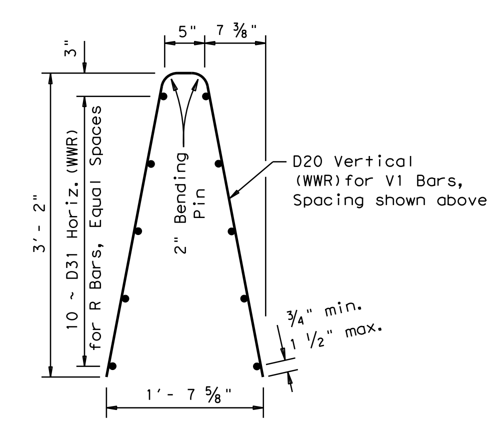
CONNECTION BOLT OR
THREADED ROD DETAIL

Two (2) Threaded Rods (Or Equivalent Hex Hd. Bolts) (w/ Two (2) PL ⅜ x 3 x 3 Plate Washers & Two (2) Std Hex Nuts) required per Joint.

Weight of one precast 30 ft. (SSCB) segment = Approx. 10.5 Tons or 717 lbs per ft.

General Notes

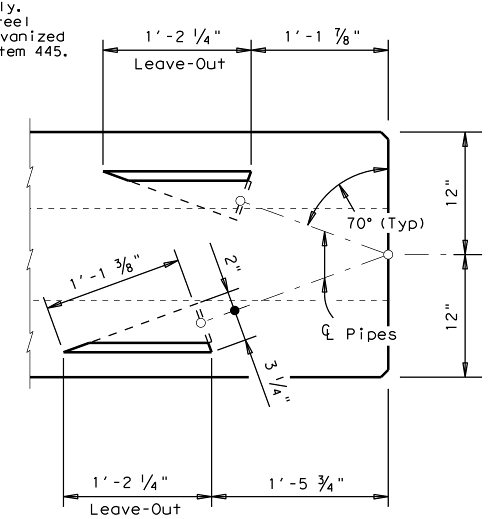
1. Concrete shall be Class H with a minimum compressive strength of 3,600 psi.
2. Where used, rebar reinforcement shall be Grade 60 and conform to ASTM A615.
3. Precast barrier length shall be 30 ft. unless otherwise specified on the plans.
4. All precast barrier edges shall have a ¾" chamfer or a tooled radius.
5. All concrete, reinforcement, joint connection systems, grout etc. as shown, are considered as part of the barrier payment.
6. Conduit trough when required shall be shown elsewhere on the plans, or as directed by the Engineer.
7. Regardless of the method of handling, barrier lifting points shall be approx. 7.5 feet from the ends of the barrier. Lifting devices and attachments to barrier sections shall be approved by the Engineer.
8. Surface finishing and grouting (where required) shall be two parts sand one part cement with enough water to make the mixture plastic. Grouting shall be done in a manner that will assure a smooth surface. Surface finishing shall be considered subsidiary to the various bid items.
9. All steel assemblies shall be galvanized after fabrication in accordance with Item 445,"Galvanizing."



Welded Wire Reinforcement
(WWR) Option for Bars R and V1

(WWR) General Notes

1. Deformed Welded Wire Reinforcement (WWR) shall conform to ASTM A497.
2. Welded wire cage may be cut or bent to accommodate the Type X joint connection and drainage slots, as directed by the Engineer.
3. All reinforcement shall comply with Item 440, "Reinforcing Steel."
4. Combinations of reinforcing steel and WWR will be permitted, as directed by the Engineer. The dimension from the end of the barrier section to the first wire shall not exceed 3".



BARRIER PLAN AT JOINT

SHEET 1 OF 2

Texas Department of Transportation — Design Division Standard

SINGLE SLOPE CONCRETE BARRIER

PRECAST BARRIER
(TYPE 1)

SSCB(2)-10

FILE: sscb210.dgn		DN: TxDOT	CK: AM	DW: BD	CK:
©TxDOT December 2010		CONT	SECT	JOB	HIGHWAY
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		DIST		COUNTY	SHEET NO.
		PAR		GRAYSON	74

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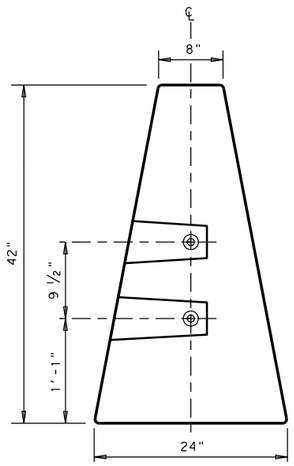
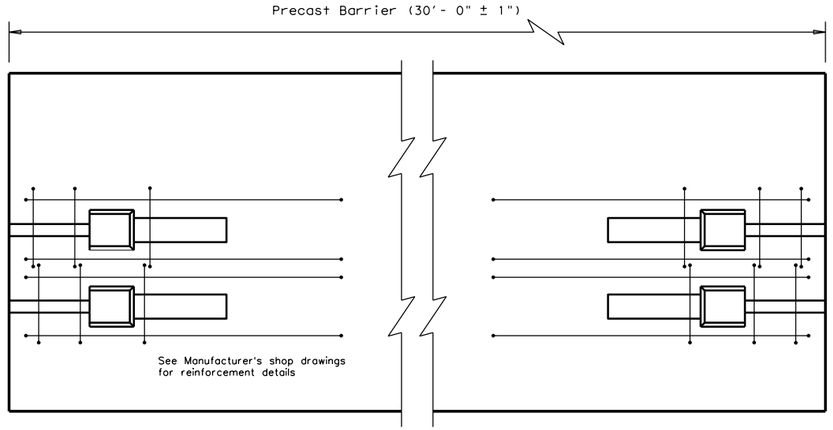
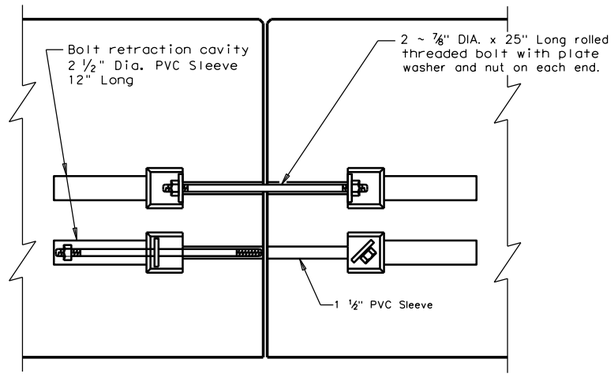


END VIEW
"QUICK-BOLT" POCKET LOCATIONS

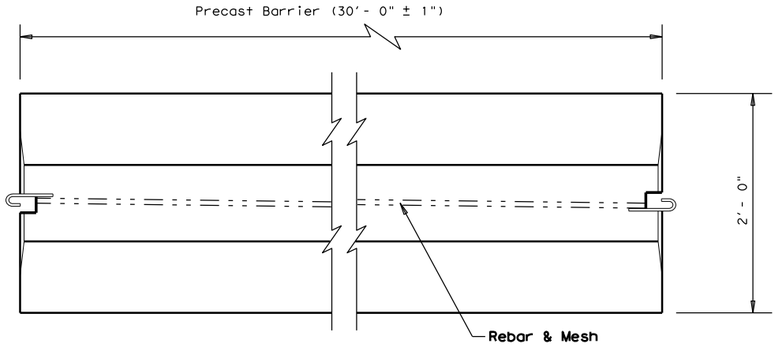


ELEVATION VIEW
"QUICK-BOLT" (SSCB)
See Manufacturer's shop drawing for additional details

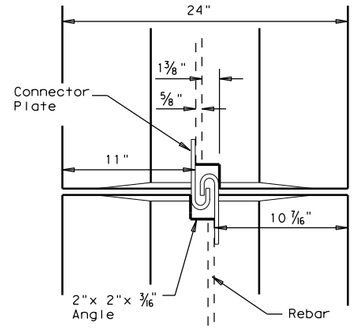


ELEVATION VIEW SHOWING JOINT CONNECTION
"QUICK-BOLT"

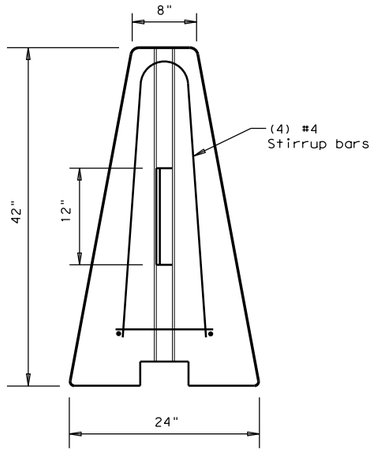
Joint Connection (Type Q)



TOP VIEW
PRECAST (SSCB) WITH J-J HOOKS
See Manufacturer's shop drawing for additional details



VIEW FROM ABOVE
J-J HOOK CONNECTION



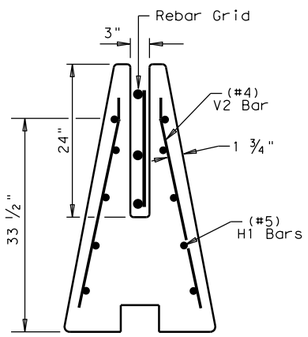
END VIEW

Proprietary Joint Connections (SSCB)

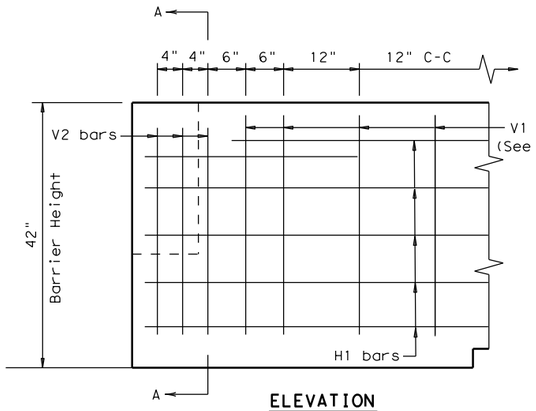
Two proprietary joint connections are acceptable as alternates to the (Type X) connection shown, here on. These joint connections types are:

J-J Hooks by Easi-Set Industries, (800)547-4045
Quick-Bolt by Bexar Concrete, (210)497-3773

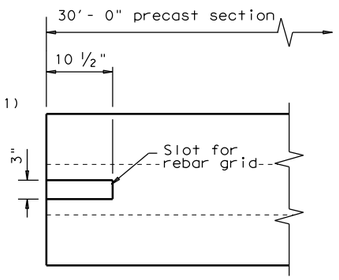
If one of these connection systems are exclusively specified in the plans, prior approval for sole source use must be obtained. Details of the connection components and barrier reinforcement for these systems, will be shown on the manufacturer's shop drawing(s) furnished to the Engineer.



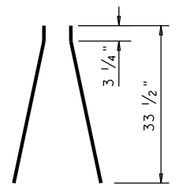
SECTION A-A
Showing (Type R) Rebar Grid



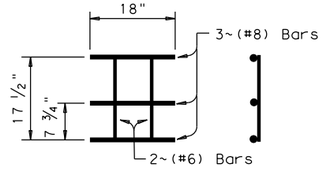
ELEVATION
V1 Bars (See Sheet 1)



TOP VIEW
JOINT CONNECTION
Typical at both ends of barrier segment



(#4) V2 BARS
6 ~ two piece bars per barrier segment



WELDED REBAR GRID

Joint Connection (Type R)

SHEET 2 OF 2

Texas Department of Transportation — Design Division Standard

SINGLE SLOPE CONCRETE BARRIER

PRECAST BARRIER
(TYPE 1)

SSCB(2)-10

FILE: sscb210.dgn	DN: TxDOT	CK: AM	DW: VP	CK:
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REVISIONS	0091	10	002	FS 121
	DIST	COUNTY		SHEET NO.
	PAR	GRAYSON		75

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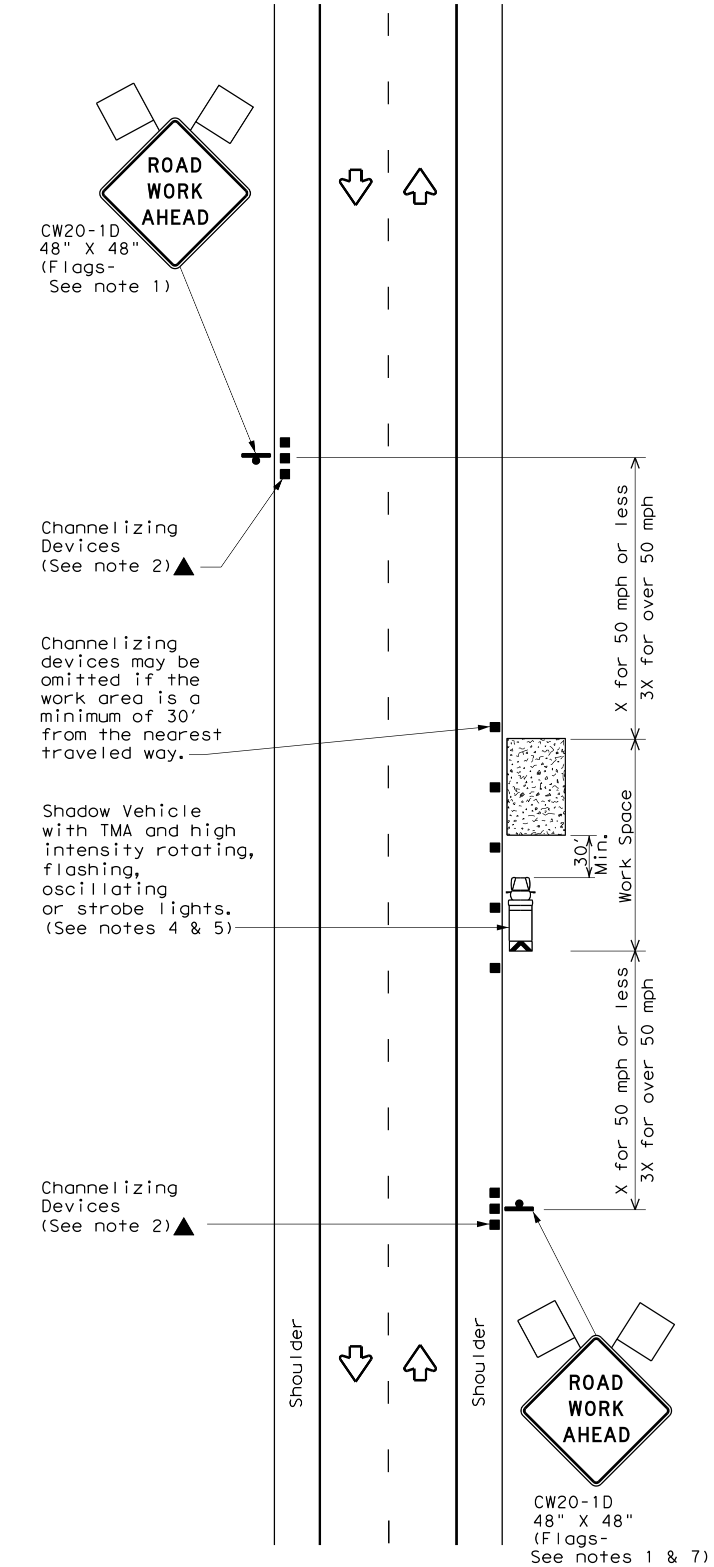
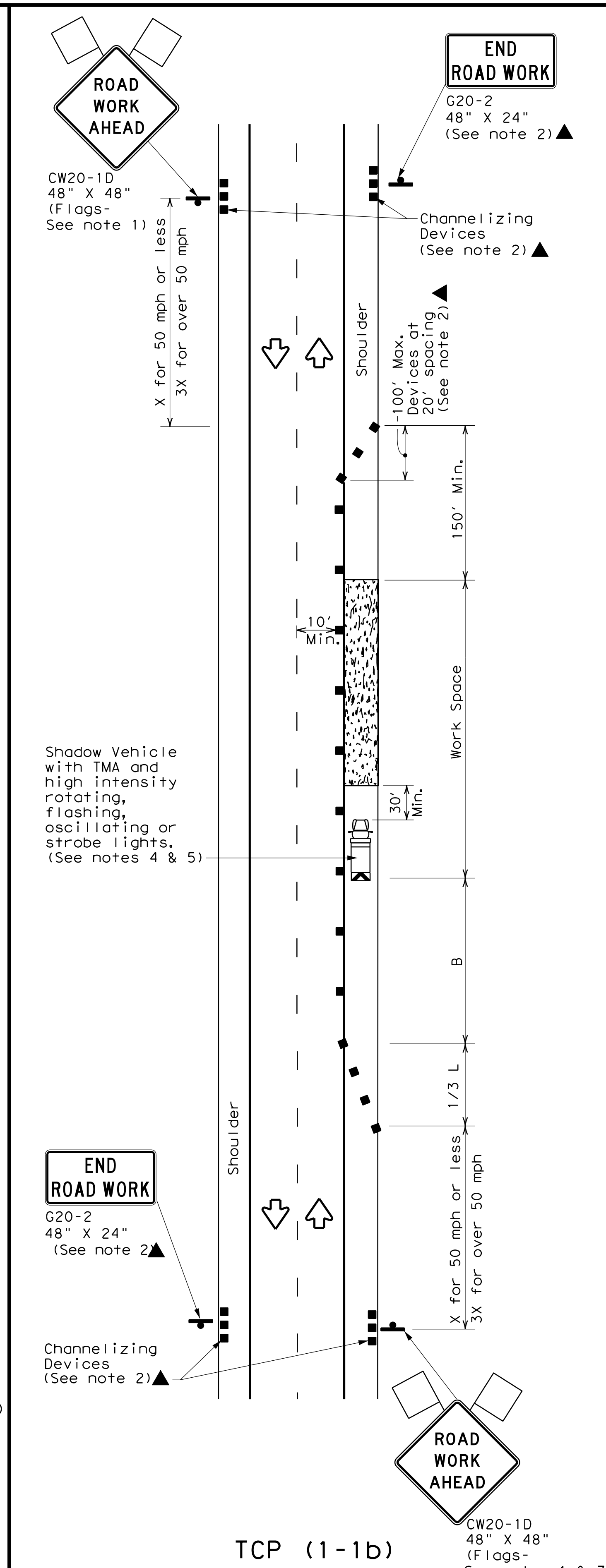


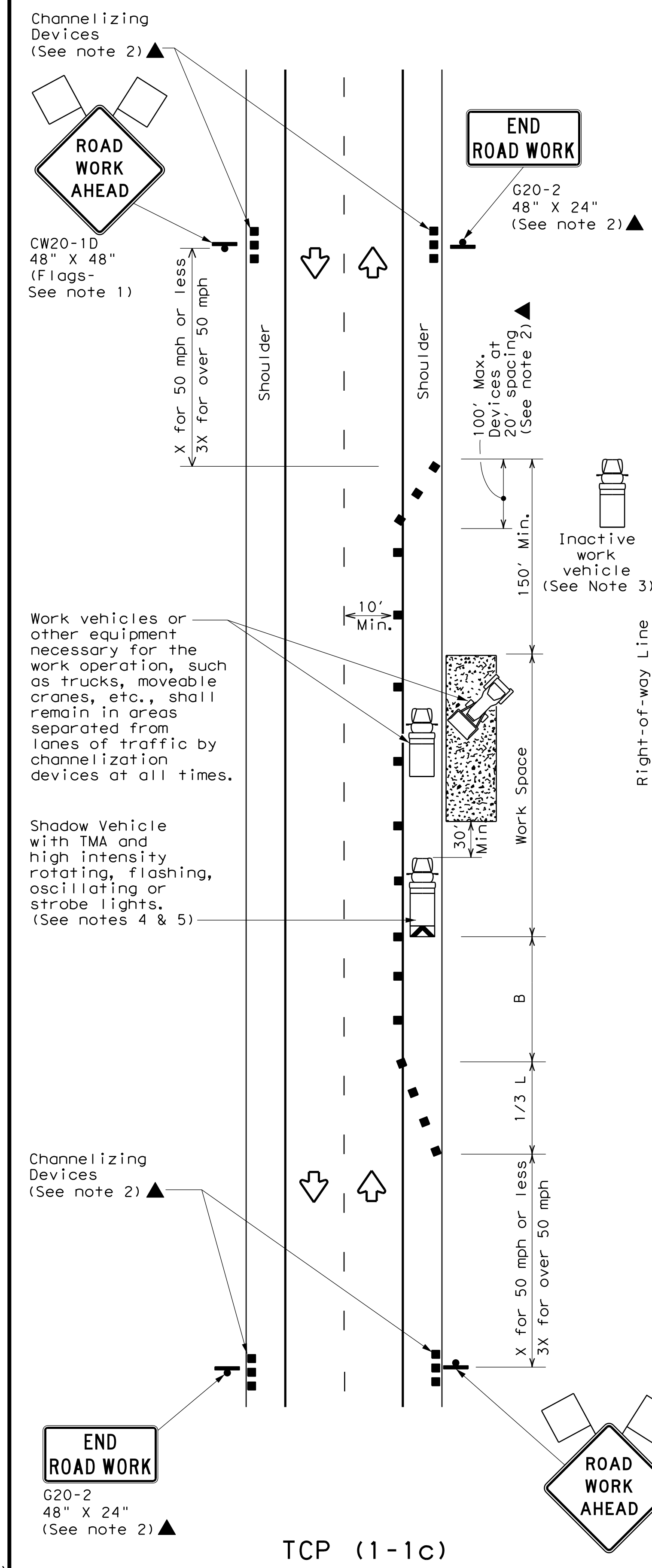
TCP (1-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (1-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (1-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

LEGEND

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

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

* Conventional Roads Only

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

TYPICAL USAGE

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

GENERAL NOTES

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. Inactive work vehicles or other equipment should be parked near the right-of-way line and not parked on the paved shoulder.
4. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
5. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.
6. See TCP(5-1)for shoulder work on divided highways, expressways and freeways.
7. CW21-5 "SHOULDER WORK" signs may be used in place of CW20-1D "ROAD WORK AHEAD" signs for shoulder work on conventional roadways.

Texas Department of Transportation — Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(1-1)-18

FILE: tcp1-1-18.dgn		DN:	CK:	DW:	CK:
© TxDOT December 1985		CONT	SECT	JOB	HIGHWAY
REVISIONS: 2-94 4-98, 8-95 2-12, 1-97 2-18		0091	10	002	FS 121
		DIST		COUNTY	SHEET NO.
		PAR		GRAYSON	76

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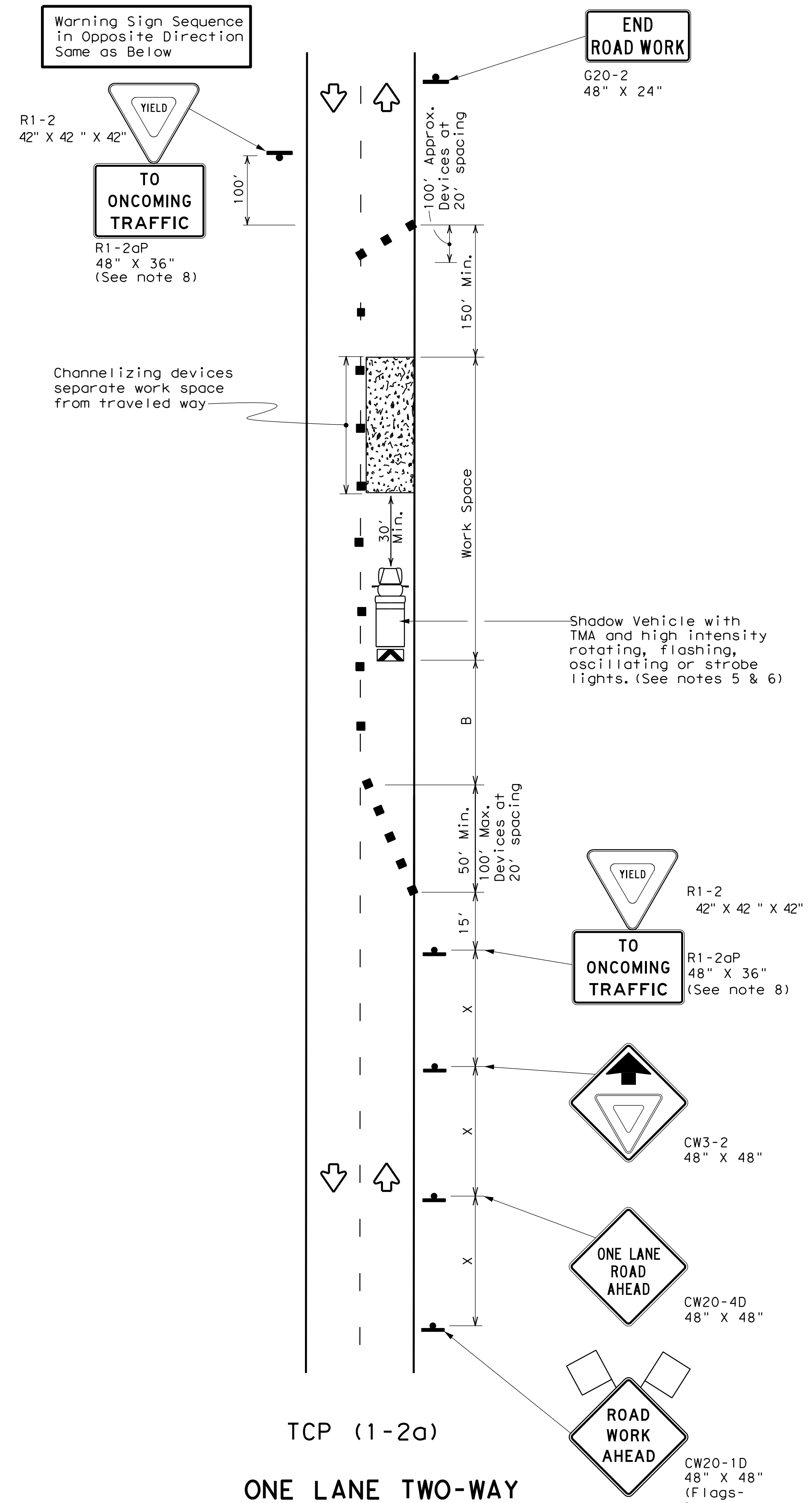
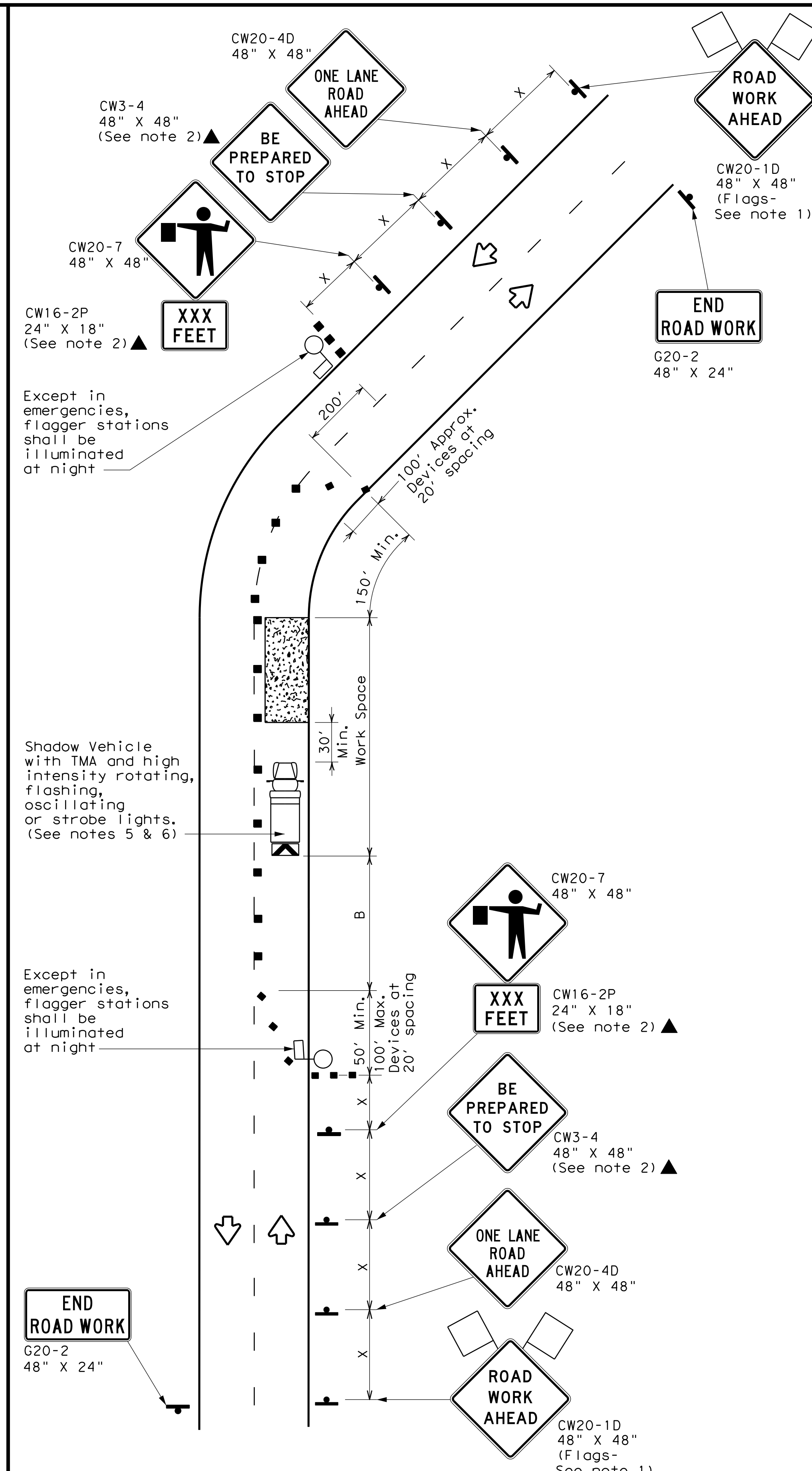


TCP (1-2a)

ONE LANE TWO-WAY
CONTROL WITH YIELD SIGNS
(Less than 2000 ADT - See note 7)



TCP (1-2b)

ONE LANE TWO-WAY
CONTROL WITH FLAGGERS

LEGEND

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

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

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

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

GENERAL NOTES

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

TCP (1-2a)

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

TCP (1-2b)

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

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
ONE-LANE TWO-WAY
TRAFFIC CONTROL

TCP(1-2)-18

FILE: tcp1-2-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
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4-90 4-98	DIST		COUNTY	SHEET NO.
2-94 2-12 1-97 2-18	PAR		GRAYSON	77

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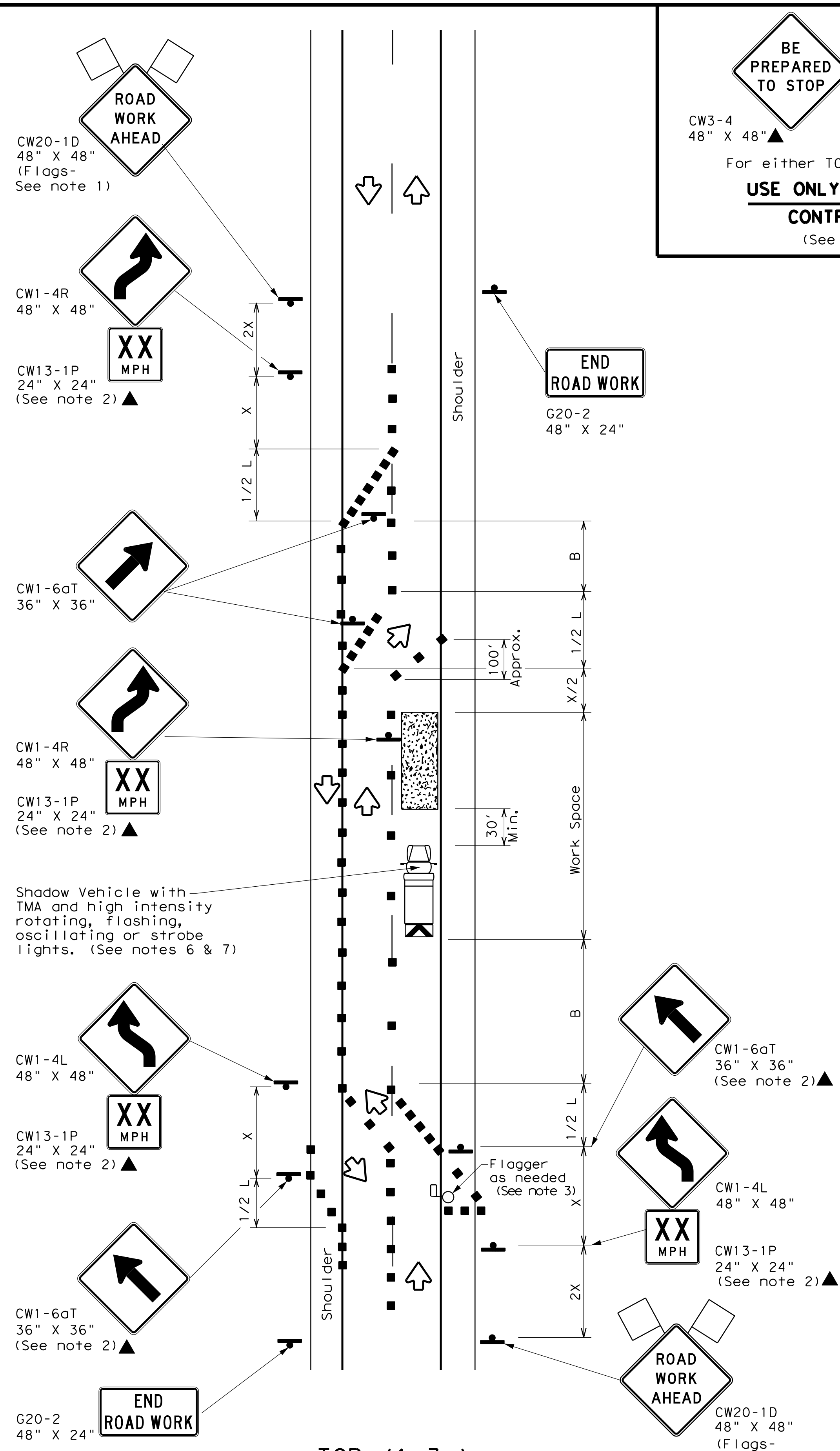
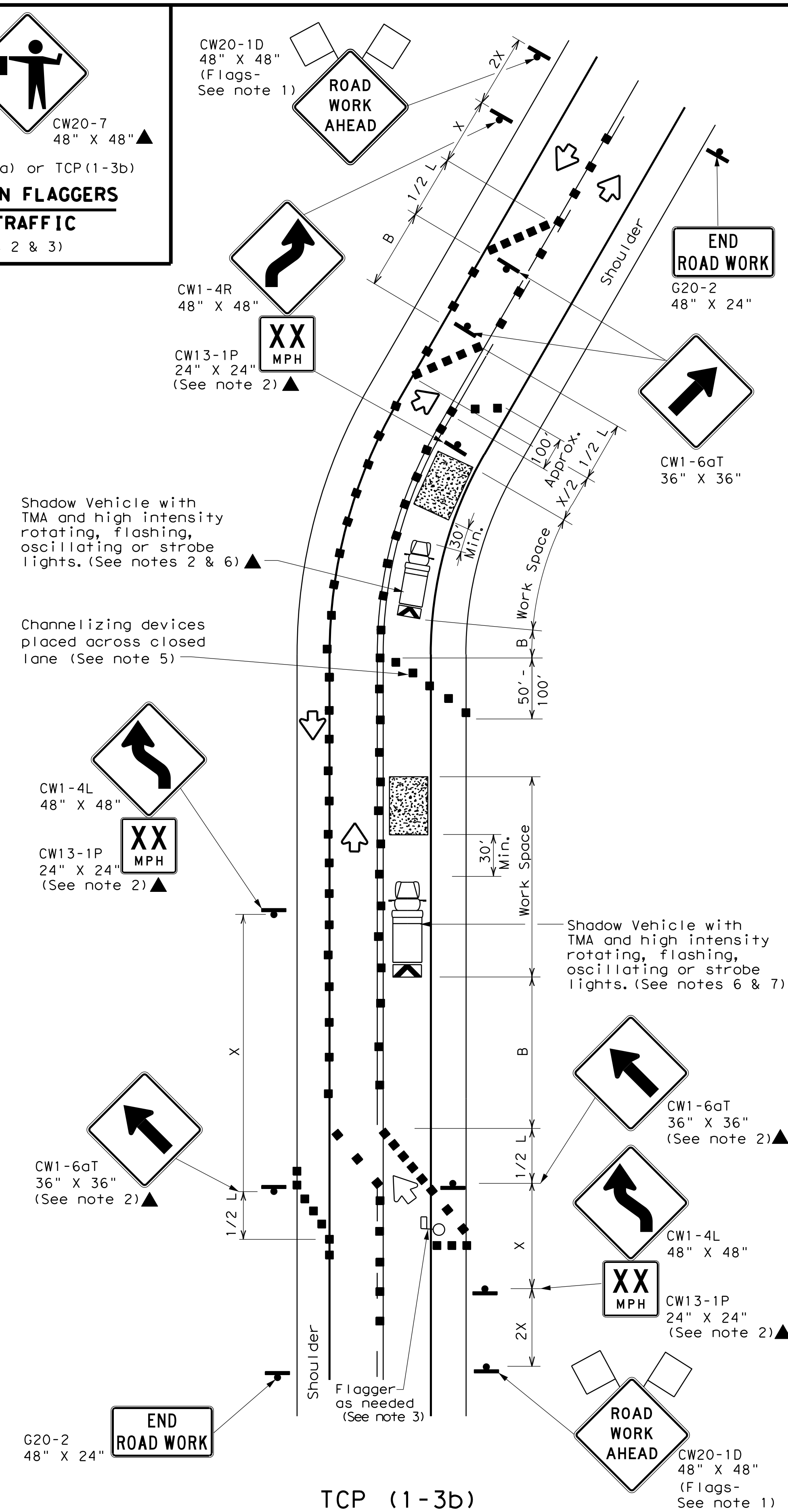


TCP (1-3a)
2-LANE ROADWAY WITH PAVED SHOULDERS
ONE LANE CLOSED
ADEQUATE FIELD OF VIEW

For either TCP(1-3a) or TCP(1-3b)

USE ONLY WHEN FLAGGERS CONTROL TRAFFIC

(See Notes 2 & 3)



TCP (1-3b)
2-LANE ROADWAY WITH PAVED SHOULDERS
ONE LANE CLOSED
INADEQUATE FIELD OF VIEW

LEGEND

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

Posted Speed *	Formula	Minimum Desirable Taper Lengths ** 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. Flagger control should NOT be used unless roadway conditions or heavy traffic volume require additional emphasis to safely control traffic. Additional flaggers may be positioned in advance of traffic queues to alert traffic to reduce speed.
4. DO NOT PASS, PASS WITH CARE and construction regulatory speed zone signs may be installed downstream of the ROAD WORK AHEAD signs.
5. When the work zone is made up of several work spaces, channelizing devices should be placed laterally across the closed lane to re-emphasize closure. Laterally placed channelizing devices should be repeated every 500 to 1000 feet in urban areas and every 1/4 to 1/2 mile in rural areas.
6. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
7. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.
8. Where traffic is directed over a yellow centerline, channelizing devices which separate two-way traffic should be spaced on tapers at 20', or 15' if posted speed are 35 mph or slower, and for tangent sections, at 1/2S where S is the speed in mph. This tighter device spacing is intended for the area of conflicting markings not the entire work zone.

Texas Department of Transportation — Traffic Operations Division Standard

TRAFFIC CONTROL PLAN TRAFFIC SHIFTS ON TWO LANE ROADS

TCP(1-3)-18

FILE: tcp1-3-18.dgn	DN:	CK:	DW:	CK:
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REVISIONS 2-94 4-98 8-95 2-12 1-97 2-18	DIST PAR		COUNTY GRAYSON	SHEET NO. 78

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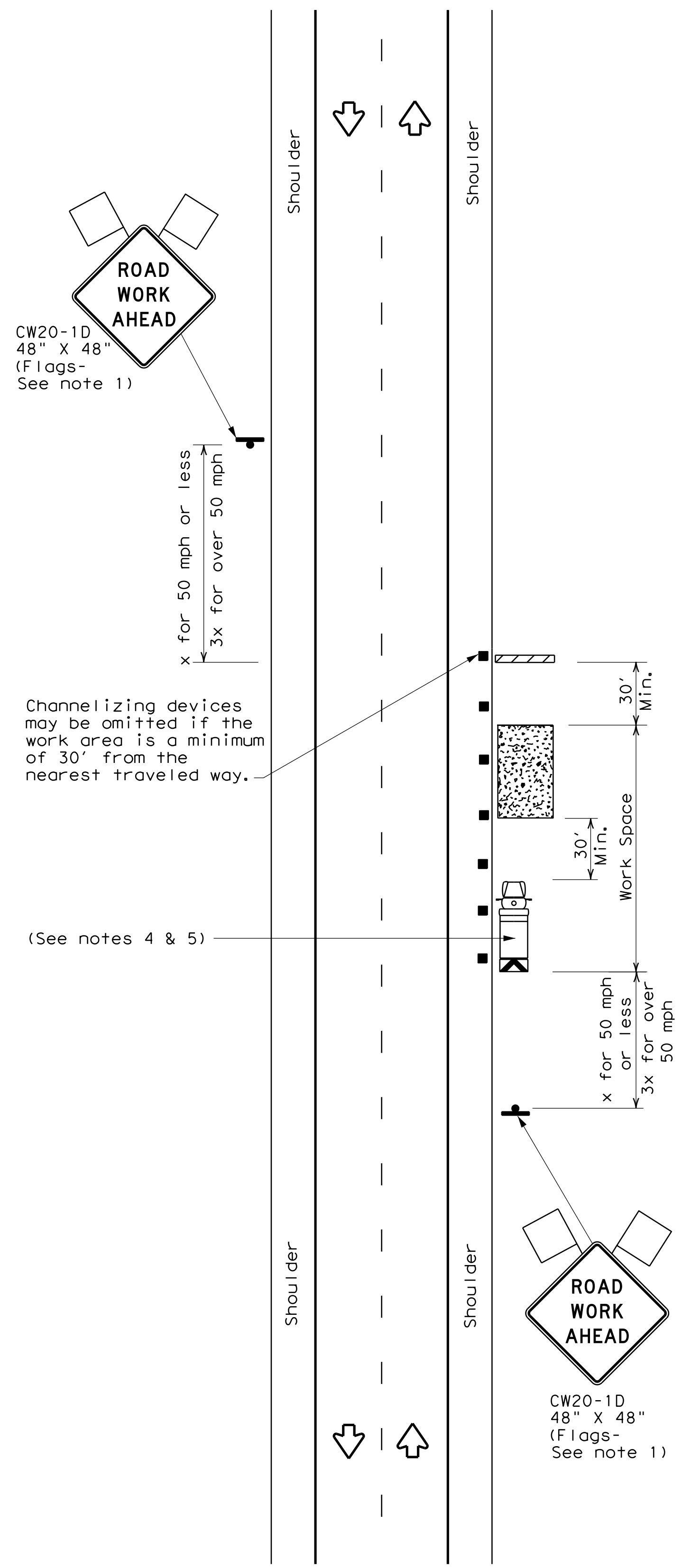
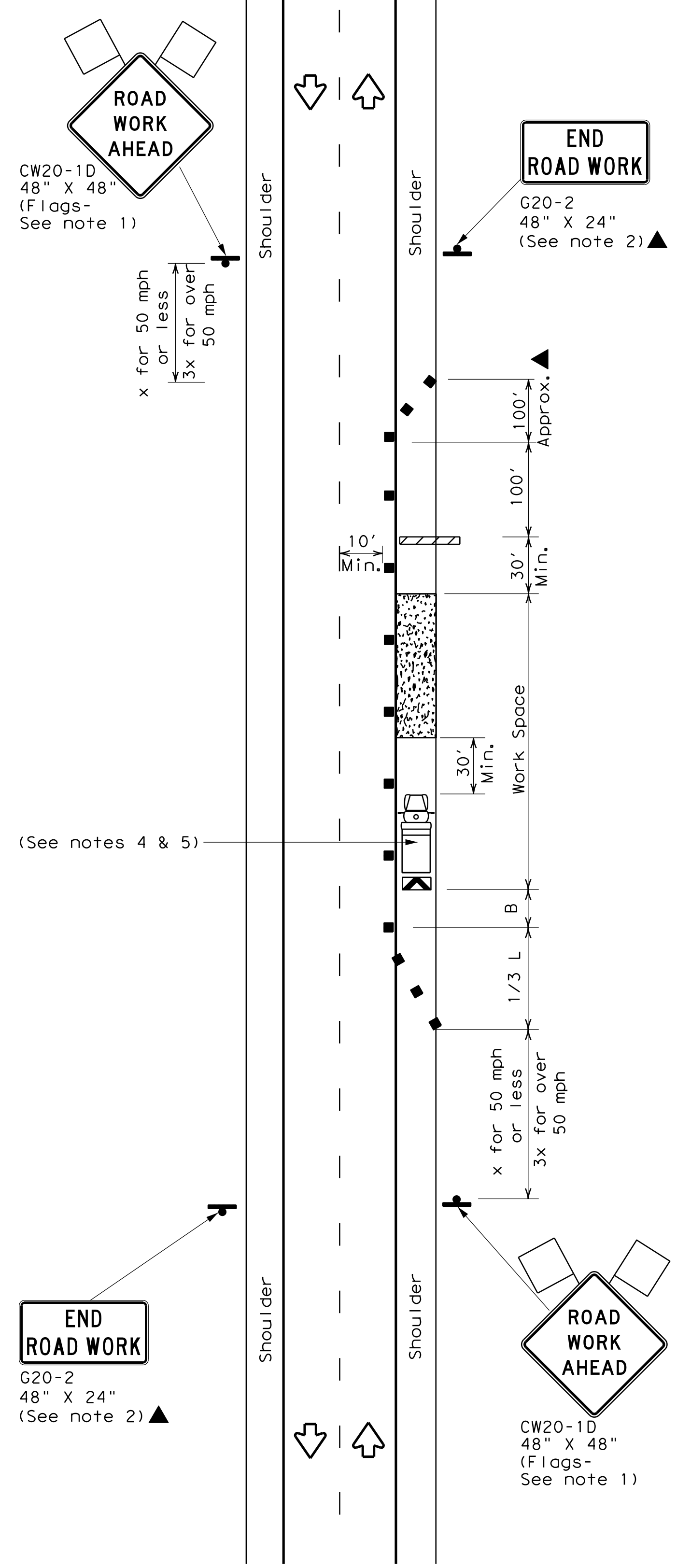


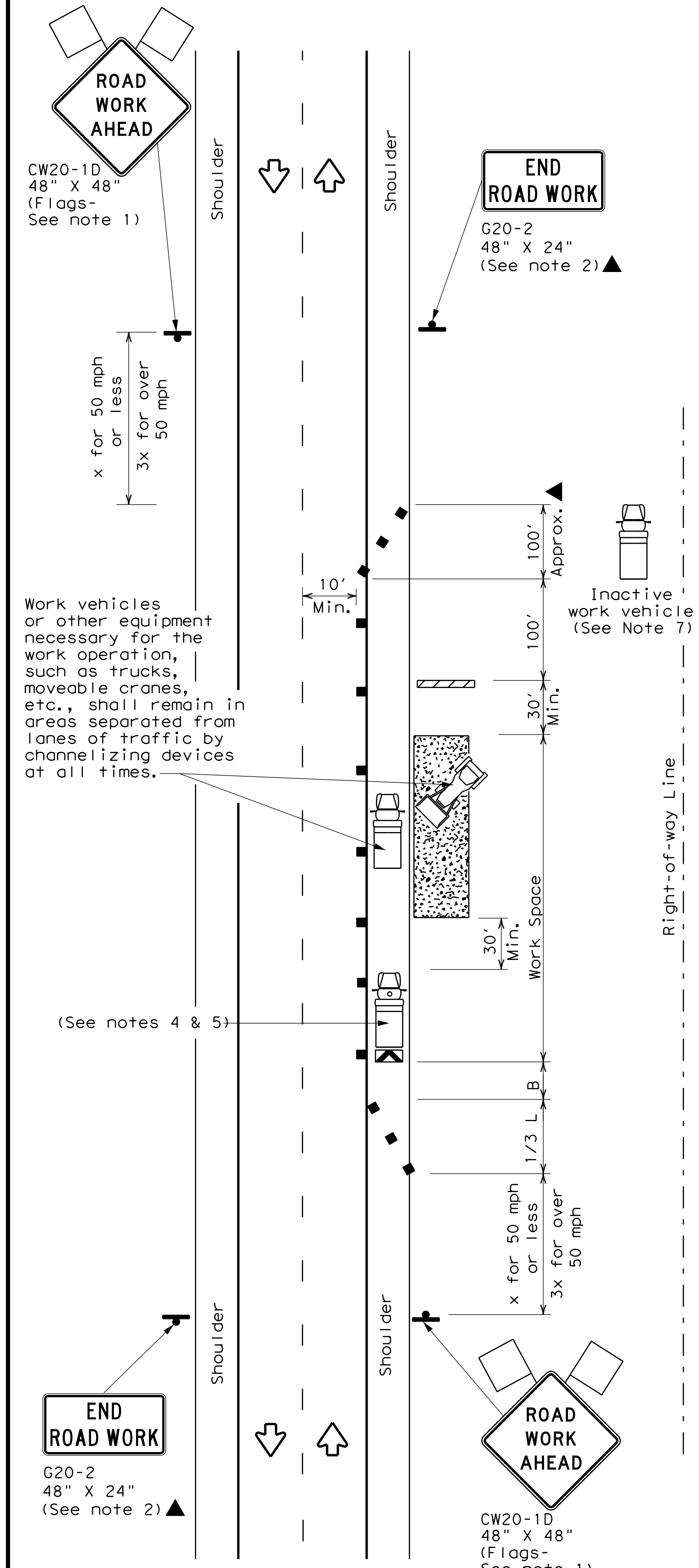
TCP (2-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (2-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (2-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

LEGEND

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

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

✱ Conventional Roads Only

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

TYPICAL USAGE

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

GENERAL NOTES

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

Texas Department of Transportation — Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(2-1)-18

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©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 2-12 1-97 2-18	0091	10	002	FS 121
	DIST		COUNTY	SHEET NO.
	PAR		GRAYSON	79

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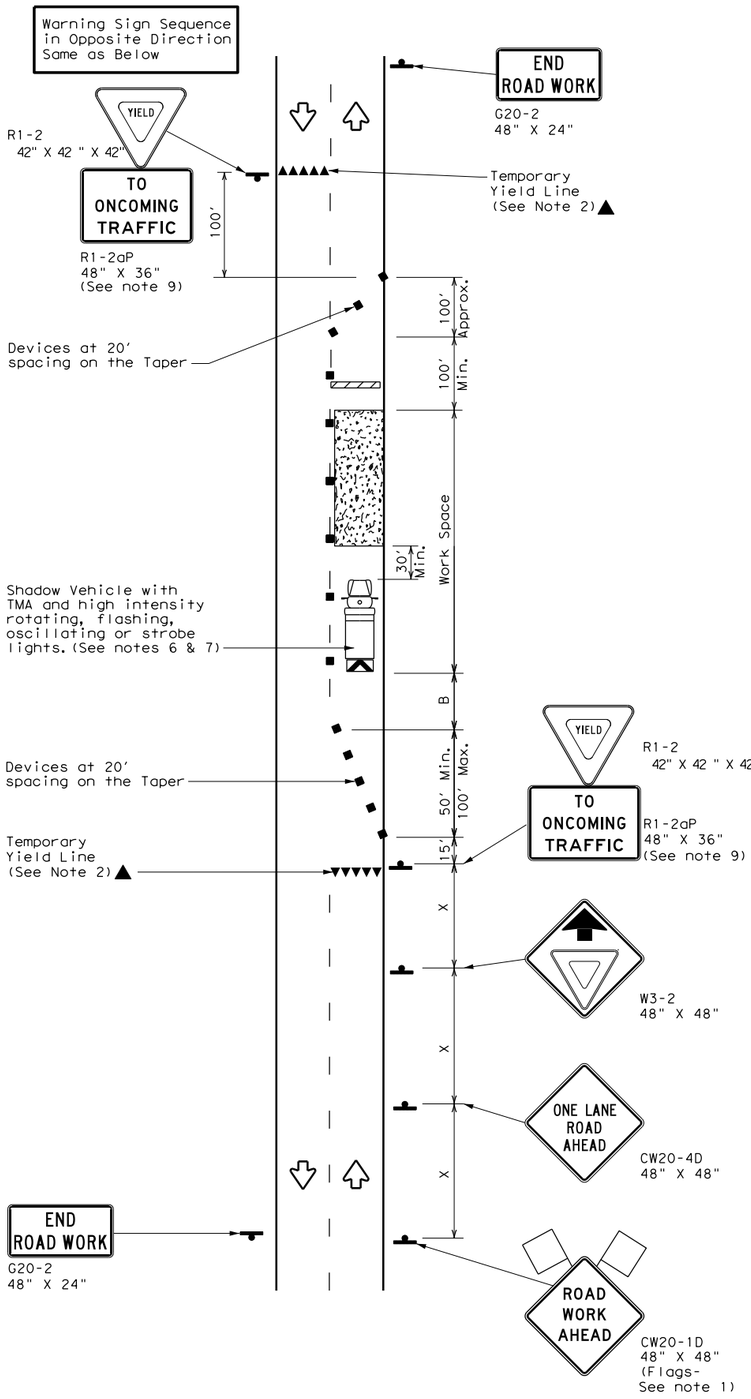
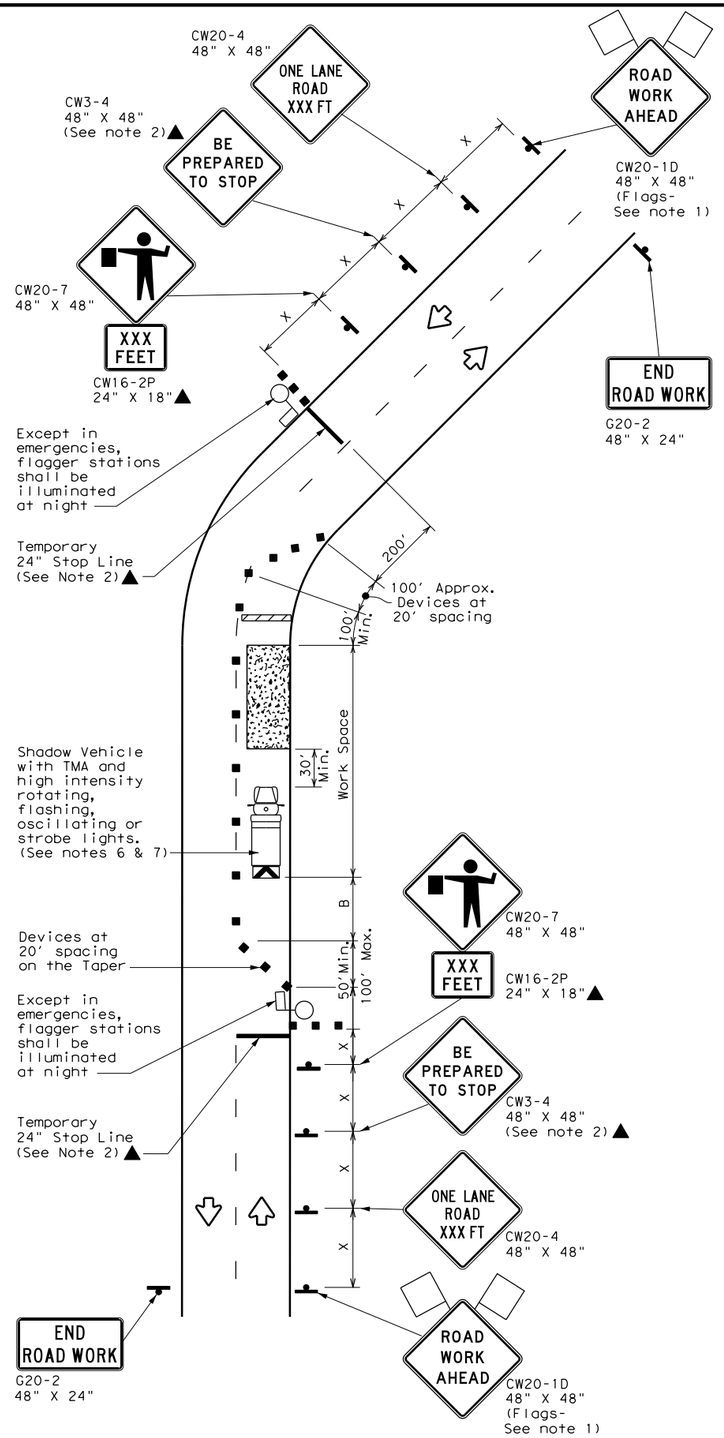


TCP (2-2a)
2-LANE ROADWAY WITHOUT PAVED SHOULDERS
ONE LANE TWO-WAY
CONTROL WITH YIELD SIGNS
(Less than 2000 ADT - See Note 9)



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

LEGEND

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

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

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

TYPICAL USAGE

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

GENERAL NOTES

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

TCP (2-2a)

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

TCP (2-2b)

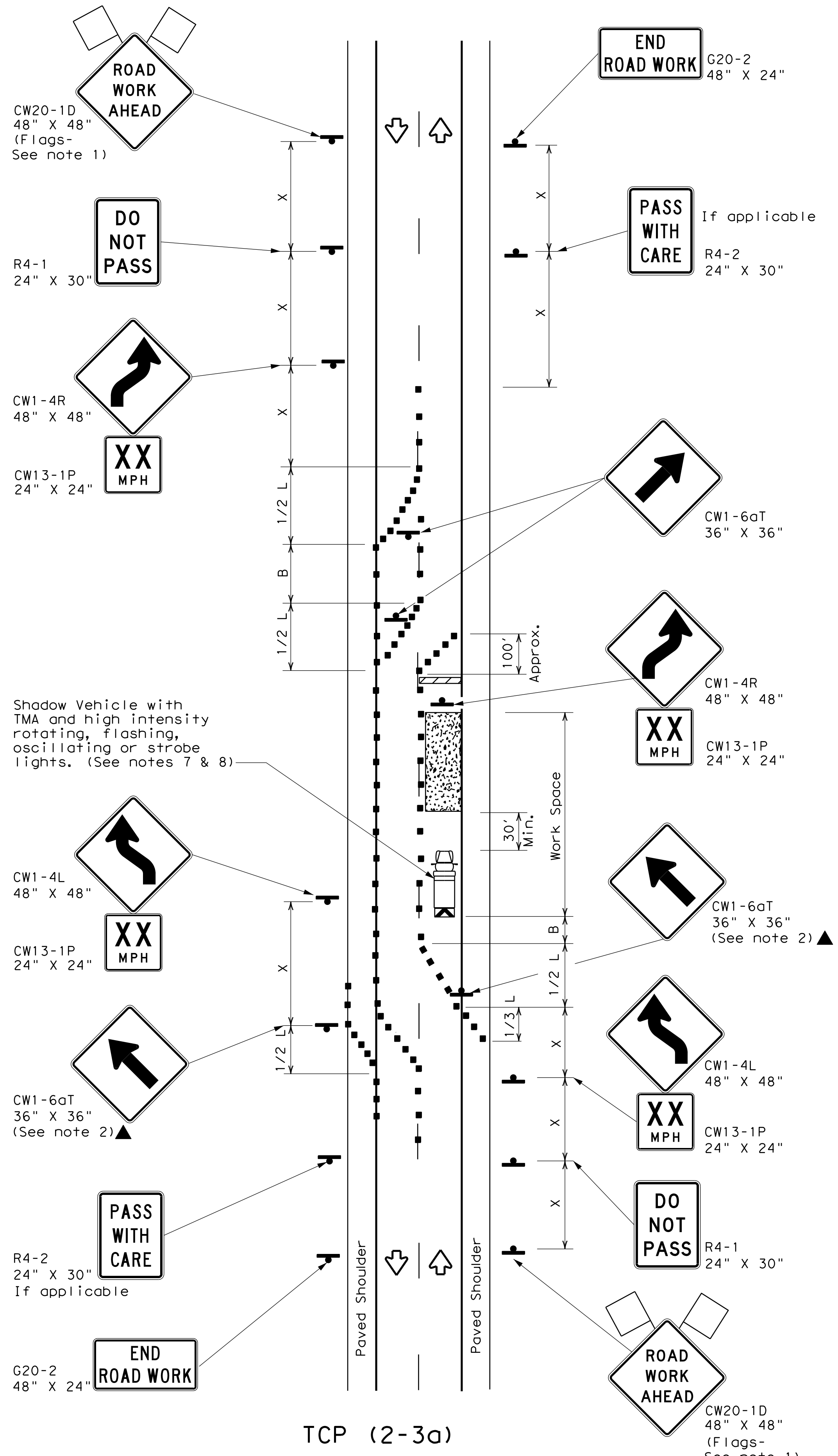
10. Channelizing devices on the center line may be omitted when a pilot car is leading traffic and approved by the Engineer.
11. If the work space is located near a horizontal or vertical curve, the buffer distances should be increased in order to maintain stopping sight distance to the flagger and a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

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
ONE-LANE TWO-WAY
TRAFFIC CONTROL

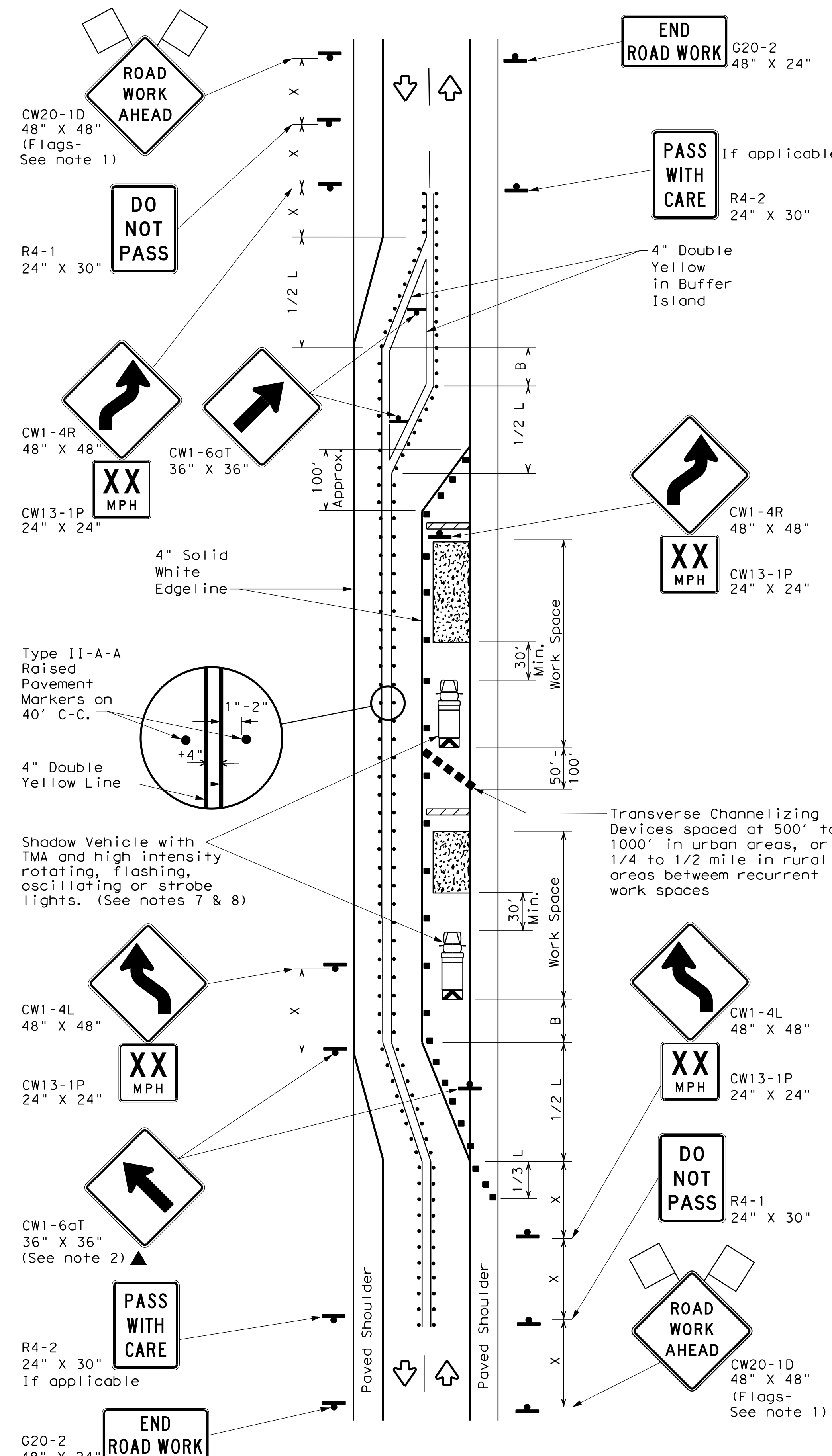
TCP(2-2)-18

FILE: tcp2-2-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0091	10	002	FS 121
8-95 3-03	DIST	COUNTY		SHEET NO.
1-97 2-12	PAR	GRAYSON		80
4-98 2-18				



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

ONE LANE CLOSED
ADEQUATE FIELD OF VIEW



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

ONE LANE CLOSED
INADEQUATE FIELD OF VIEW

LEGEND

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. When work space will be in place less than three days existing pavement markings may remain in place. Channelizing devices shall be used to separate traffic.
4. Flagger control should NOT be used unless roadway conditions or heavy traffic volume require additional emphasis to safely control traffic. Flagger should be positioned at end of traffic queue.
5. The R4-1 "DO NOT PASS," R4-2 " PASS WITH CARE" and construction regulatory speed zone signs may be installed within CW20-1D "ROAD WORK AHEAD" signs. Proper spacing of signs shall be maintained.
6. Conflicting pavement marking shall be removed for long term projects.
7. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted.
8. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect a wider work space.

TCP (2-3a)

9. Conflicting pavement markings shall be removed for long-term projects. For shorter durations where traffic is directed over a yellow centerline, channelizing devices which separate two-way traffic should be spaced on tapers at 20' or 15' if posted speeds are 35 mph or slower, and for tangent sections, at 1/2(S) where S is the speed in mph. This tighter device spacing is intended for the area of the conflicting markings, not the entire work zone.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN TRAFFIC SHIFTS ON TWO-LANE ROADS

TCP(2-3)-18

FILE: tcp(2-3)-18.dgn	DN:	CK:	DW:		CK:
© TxDOT December 1985	CONT	SECT	JOB		HIGHWAY
REVISIONS 8-95 3-03 1-97 2-12 4-98 2-18	0091	10	002		FS 121
	DIST	COUNTY			SHEET NO.
	PAR	GRAYSON			81

DATE: 7/15/2021 7:36:30 PM
FILE: pw\\ilicsO1\iCS\pdf\work\dir\449\33820\38\TCP(2-8)-20(PAR).dgn

LEGEND

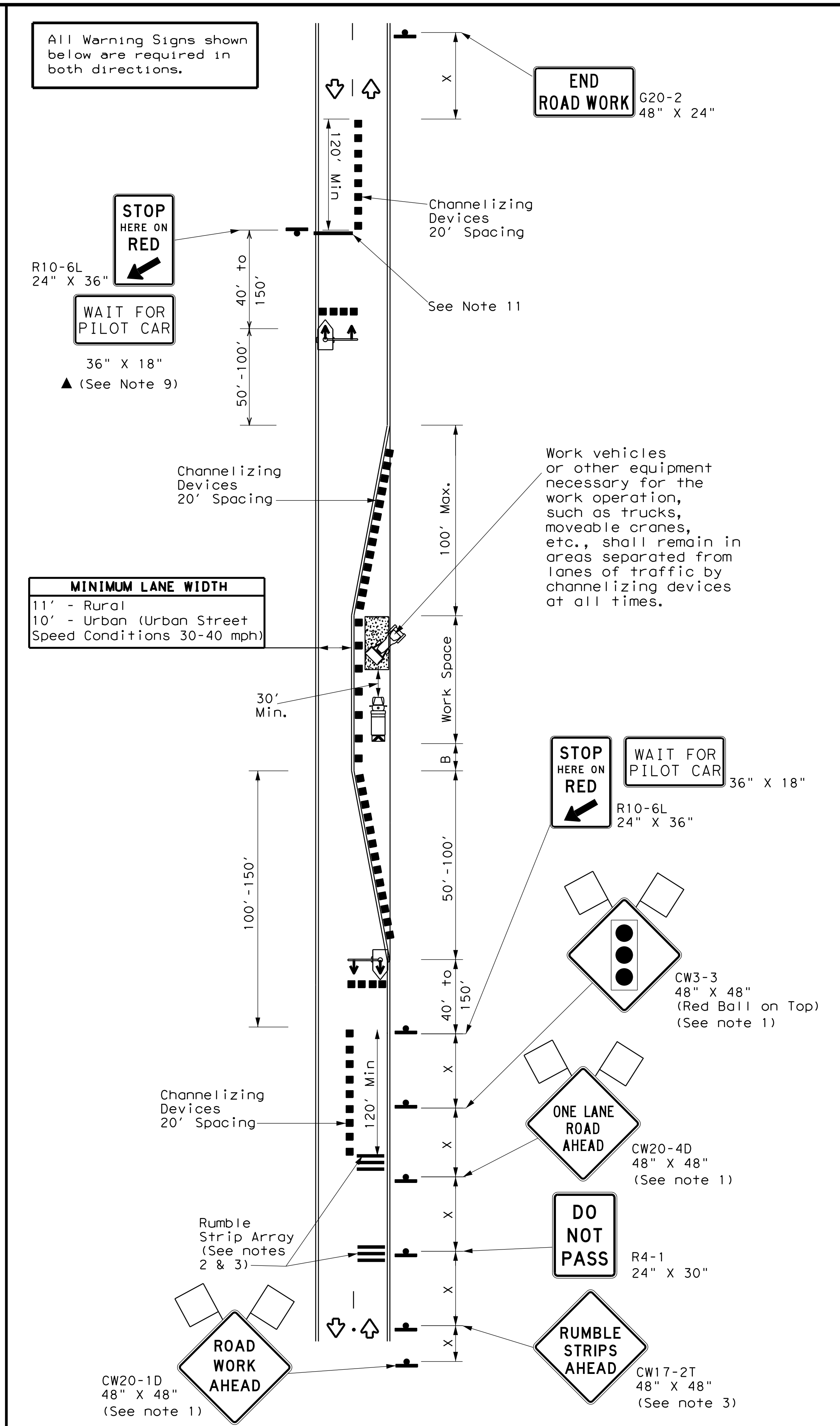
Symbol	Description	Symbol	Description
▨	Type 3 Barricade	■ ■	Channelizing Devices
⊥	Sign	⇦	Traffic Flow
◇	Flag	⊔O	Flagger
• • • •	Raised Pavement Markers Ty II-AA		Temporary or Portable Traffic Signal
	Heavy Work Vehicle		Truck Mounted Attenuator

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

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

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

TABLE 2	
Speed	Approximate distance between strips in an Array
≤ 40 MPH	10'
> 40 MPH & ≤ 55 MPH	15'
> 55 MPH	20'



ONE LANE TWO-WAY (WITH NO SHOULDERS)
TRAFFIC CONTROL WITH TRAFFIC SIGNAL

GENERAL NOTES

1. Flags attached to signs, where shown, are REQUIRED.
2. Each Rumble Strip Array should consist of three rumble strips spaced center to center at the spacing shown in Table 2, placed transverse across the lane at locations shown.
3. The CW17-2T "RUMBLE STRIPS AHEAD" sign should be located after the CW20-1D "ROAD WORK AHEAD sign and spaced as shown. If traffic is observed to be queuing, or is expected to queue beyond the Rumble Strips, the CW17-2T sign and the first Rumble Strip Array may be located upstream of the CW20-1D sign as necessary to provide needed warning.
4. Temporary Rumble Strips will be considered subsidiary to Item 502, and shall be a product listed on the Compliant Work Zone Traffic Control Devices.
5. Removal of the Temporary Rumble Strips should be accomplished before removing the advance warning signs.
6. Temporary Rumble Strips should not be used on horizontal curves, loose gravel, soft or bleeding asphalt, heavily rutted pavements or unpaved surfaces.
7. Temporary Rumble Strips shall be installed as per manufacturer's recommendations.
8. This standard sheet shall be used in conjunction with other appropriate TCP standard, TMUTCD typical application or project specific detail for the project.
9. A list of approved Portable Traffic Signals can be found in the "Compliant Work Zone Traffic Control Devices" list.
10. Portable traffic signals should be located to provide adequate stopping sight distance for approaching motorist (See table on left).
11. Shadow Vehicle with TMA and high intensity rotating, flashing, oscillating or strobe lights. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work.
12. Channelizing devices on the center line may be omitted when approved by the Engineer.

For construction or maintenance contract work, specific project requirements for shadow vehicles can be found in the project GENERAL NOTES for Item 502, Barricades, Signs and Traffic Handling.

Texas Department of Transportation
PARIS DISTRICT STANDARD

TRAFFIC CONTROL PLAN SHORT TERM ONE-LANE TWO-WAY CONTROL

TCP(2-8)-20 (PAR)

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS

CONT	SECT	JOB	HIGHWAY
0091	10	002	FS 121
DIST		COUNTY	SHEET NO.
PAR		GRAYSON	82

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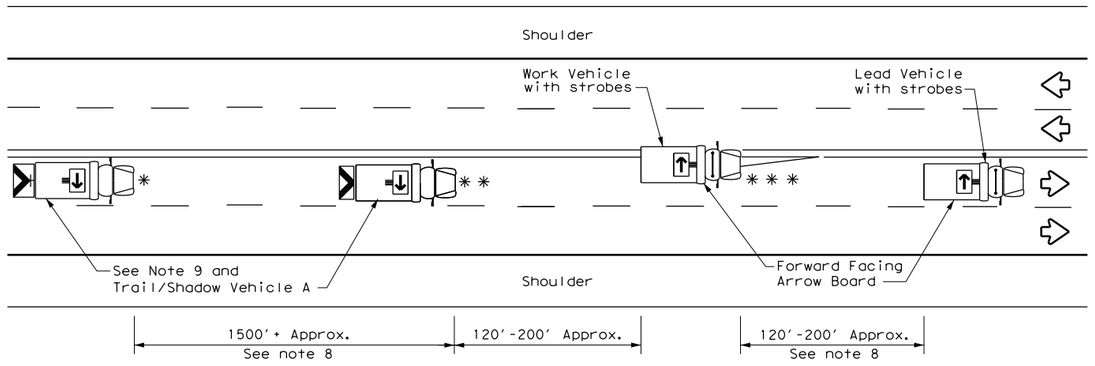
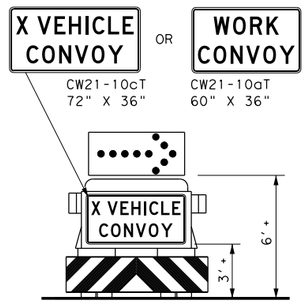


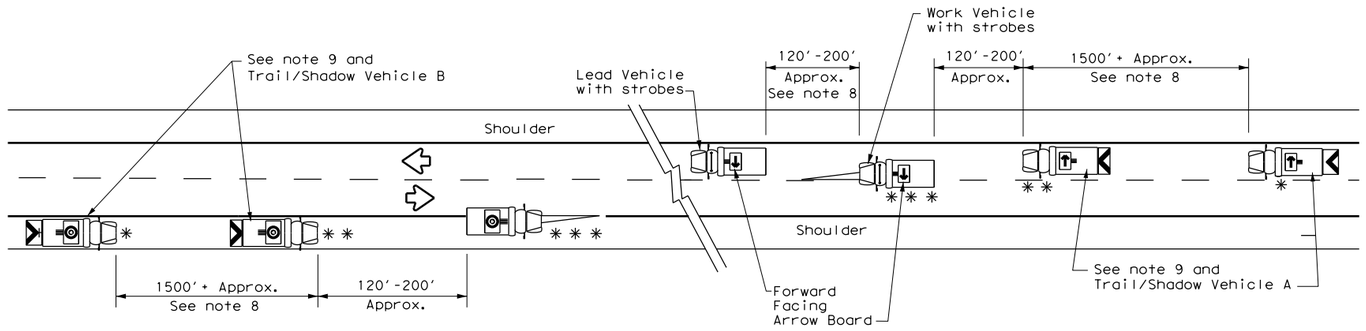
TCP (3-1a)

UNDIVIDED MULTILANE ROADWAY



TRAIL/SHADOW VEHICLE A

with RIGHT Directional display Flashing Arrow Board

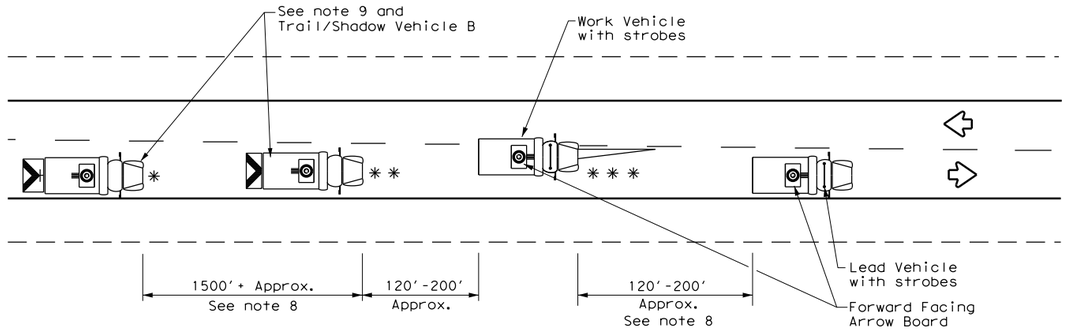


WORK ON SHOULDER

WORK ON TRAVEL LANE

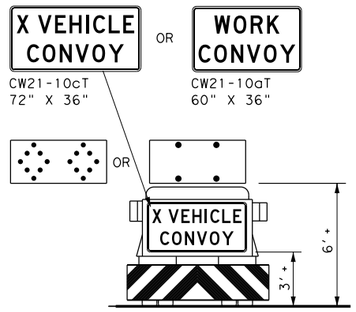
TCP (3-1b)

TWO-WAY ROADWAY WITH PAVED SHOULDERS



TCP (3-1c)

TWO-WAY ROADWAY WITHOUT PAVED SHOULDERS



TRAIL/SHADOW VEHICLE B

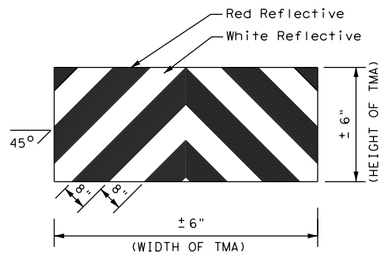
with Flashing Arrow Board in CAUTION display

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

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

GENERAL NOTES

1. TRAIL, SHADOW, and LEAD vehicles shall be equipped with arrow boards as illustrated. When a LEAD vehicle is not used the WORK vehicle must be equipped with an arrow board. The Engineer will determine if the LEAD VEHICLE and/or TRAIL VEHICLE are required based on prevailing roadway conditions, traffic volume, and sight distance restrictions.
2. The use of amber high intensity rotating, flashing, oscillating, or strobe lights on vehicles are required. Blue high intensity rotating, flashing, oscillating or strobe lights when mounted on the driver's side of the vehicle may be operated simultaneously with the amber beacons or strobe lights.
3. The use of truck mounted attenuators (TMA) on the SHADOW VEHICLE and TRAIL VEHICLE are required.
4. Reflective sheeting on the rear of the TMA shall meet or exceed the reflectivity and color requirements of DEPARTMENTAL MATERIAL SPECIFICATION DMS 8300, Type A.
5. Flashing arrow boards shall be Type B or Type C as per the Barricade and Construction (BC) standards. The board shall be controlled from inside the vehicle.
6. Each vehicle shall have two-way radio communication capability.
7. When work convoys must change lanes, the TRAIL VEHICLE should change lanes first to shadow the other convoy vehicles.
8. Vehicle spacing between the TRAIL VEHICLE and the SHADOW VEHICLE will vary depending on sight distance restrictions. Motorists approaching the work convoy should be able to see the TRAIL VEHICLE in time to slow down and/or change lanes as they approach the TRAIL VEHICLE. Vehicle spacing between the WORK VEHICLE and SHADOW VEHICLE and vehicle spacing between WORK VEHICLE and LEAD VEHICLE may vary according to terrain, work activity and other factors.
9. "X VEHICLE CONVOY" (CW21-10cT) or "WORK CONVOY" (CW21-10aT) signs shall be used on TRAIL VEHICLES and SHADOW VEHICLES as shown. As an option 48" X 48" diamond shaped "WORK CONVOY"(CW21-10T) or "X VEHICLE CONVOY" (CW21-10bT) signs may be used where adequate mounting space exists. When used, the X VEHICLE CONVOY sign shall have the number of the convoy vehicles displayed on the sign in the number designation "X" location. The "X VEHICLE CONVOY" sign shall not be used on the SHADOW VEHICLE if a TRAIL VEHICLE is used.
10. On two-lane two-way roadways, the work and protection vehicles should pull over periodically to allow motor vehicle traffic to pass. If motorists are not allowed to pass the work convoy, a "DO NOT PASS" (R4-1) sign should be placed on the back of the rearmost protection vehicle.



STRIPING FOR TMA

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS UNDIVIDED HIGHWAYS

TCP(3-1)-13

FILE: tcp3-1.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 7-13 1-97	0091	10	002	FS 121
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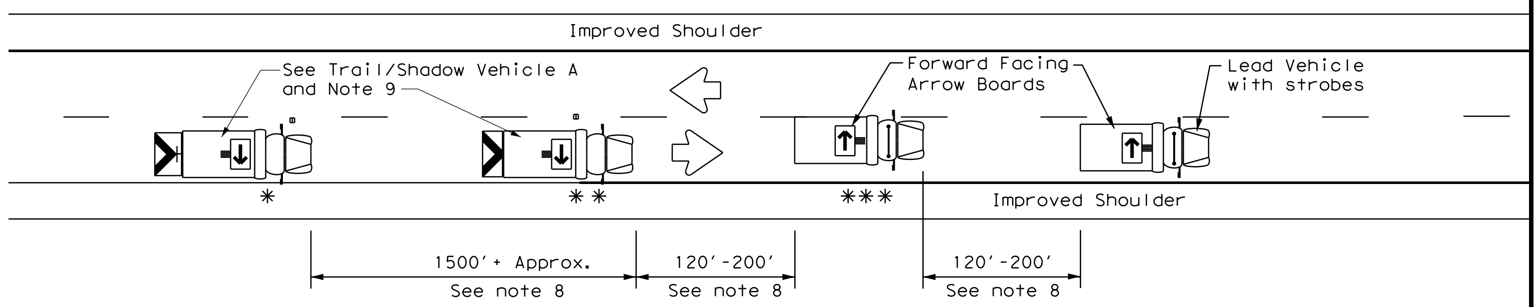
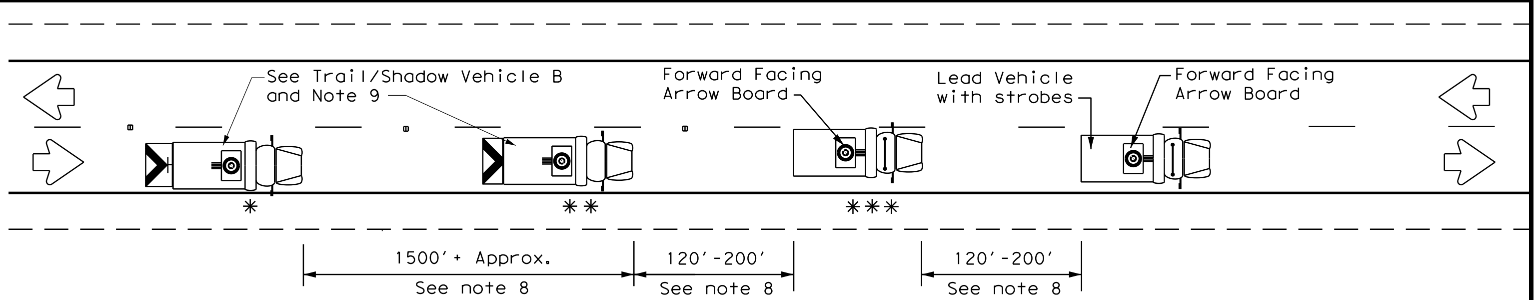
	PAR	GRAYSON		83



TCP (3-3a)

TWO LANE HIGHWAY WITH PAVED SHOULDERS

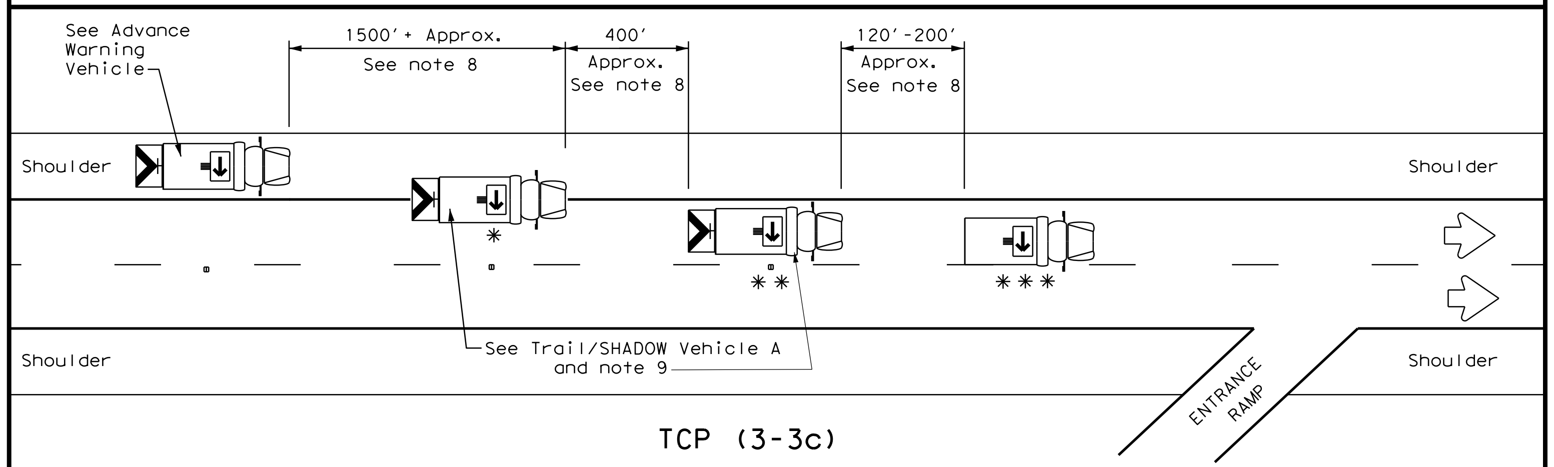
(WORK ON TRAVEL LANE)



TCP (3-3b)

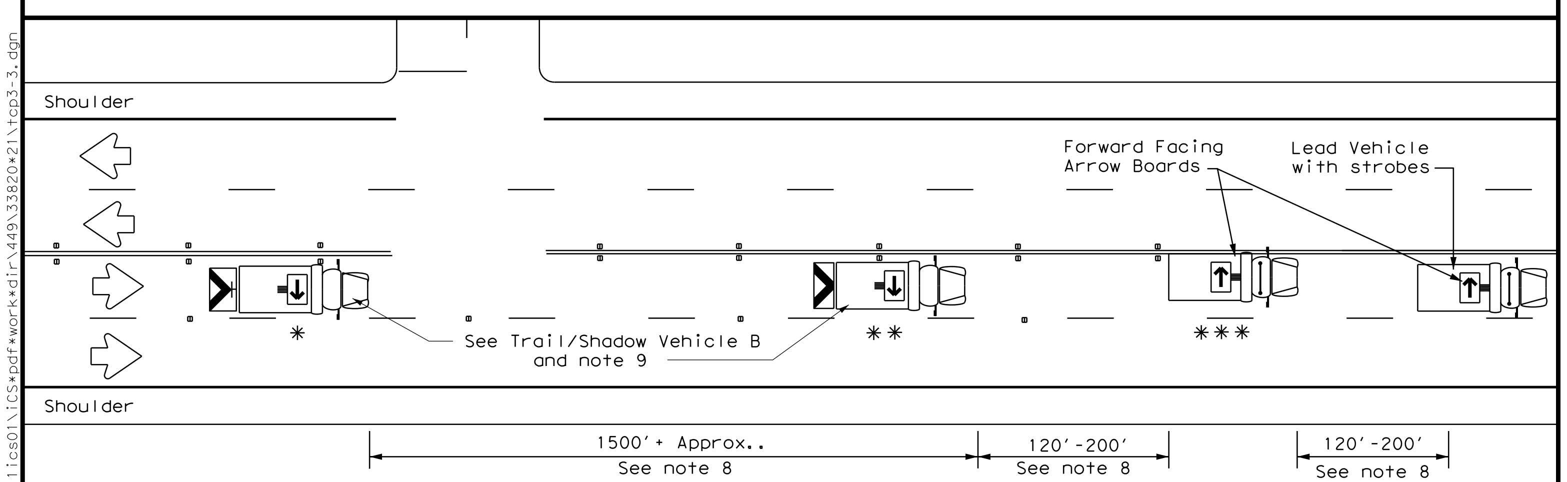
TWO LANE HIGHWAY WITHOUT PAVED SHOULDERS

(WORK ON TRAVEL LANE)



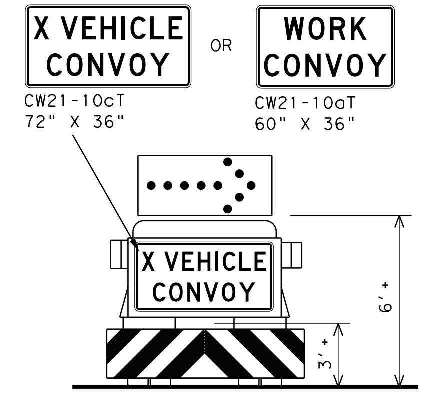
TCP (3-3c)

DIVIDED MULTILANE HIGHWAY



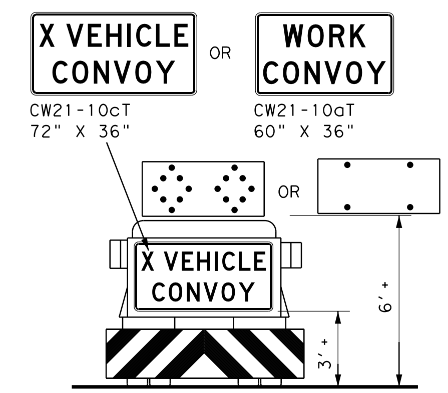
TCP (3-3d)

UNDIVIDED MULTILANE HIGHWAY



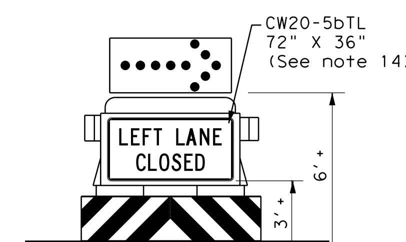
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display Flashing Arrow Board

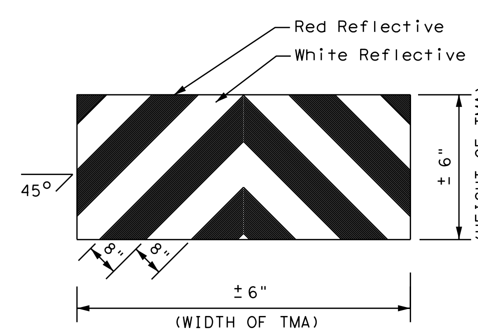


TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board in Caution Mode



ADVANCE WARNING VEHICLE



STRIPING FOR TMA

LEGEND

Symbol	Description	Symbol	ARROW BOARD DISPLAY
*	Trail Vehicle		
**	Shadow Vehicle		
***	Work Vehicle	[right arrow]	RIGHT Directional
[vehicle]	Heavy Work Vehicle	[left arrow]	LEFT Directional
[TMA]	Truck Mounted Attenuator (TMA)	[double arrow]	Double Arrow
[arrow]	Traffic Flow	[caution]	CAUTION (Alternating Diamond or 4 Corner Flash)

TYPICAL USAGE

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

GENERAL NOTES

1. TRAIL, SHADOW, and LEAD vehicles shall be equipped with arrow boards as illustrated. When a LEAD vehicle is not used on two way roads the WORK vehicle must have an arrow board. For divided roadways, the arrow board on the WORK vehicle is optional based on the type of work being performed. The Engineer will determine if the LEAD vehicle and/or TRAIL vehicle are required based on prevailing roadway conditions, traffic volume, and sight distance restrictions.
2. The use of amber high intensity rotating, flashing, oscillating, or strobe lights on vehicles are required. Blue high intensity rotating, flashing, oscillating, or strobe lights when mounted on the driver's side of the vehicle may be operated simultaneously with the amber beacons or strobe lights.
3. The use of truck mounted attenuators (TMA) on the SHADOW VEHICLE, ADVANCE WARNING and TRAIL VEHICLE are required.
4. Reflective sheeting on the rear of the TMA shall meet or exceed the reflectivity and color requirements of DEPARTMENTAL MATERIAL SPECIFICATION DMS 8300, Type A.
5. Flashing arrow boards shall be Type B or Type C as per the Barricade and Construction (BC) standards. The board shall be controlled from inside the vehicle.
6. Each vehicle shall have two-way radio communication capability.
7. When work convoys must change lanes, the TRAIL VEHICLE should change lanes first to shadow the other convoy vehicles.
8. Vehicle spacing between the TRAIL VEHICLE and the SHADOW VEHICLE will vary depending on sight distance restrictions. Motorists approaching the convoy should be able to see the TRAIL VEHICLE in time to slow down and/or change lanes as they approach the TRAIL VEHICLE. Vehicle spacing between the WORK VEHICLE and SHADOW VEHICLE and vehicle spacing between WORK VEHICLE and LEAD VEHICLE may vary according to terrain, work activity and other factors.
9. X VEHICLE CONVOY (CW21-10cT) or WORK CONVOY (CW21-10aT) signs shall be used on TRAIL VEHICLES and SHADOW VEHICLES as shown. As an option 48" x 48" diamond shaped WORK CONVOY (CW21-10T) or X VEHICLE CONVOY (CW21-10bT) signs may be used where adequate mounting space exists. When used, the X VEHICLE CONVOY sign shall have the number of the convoy vehicles displayed on the sign in the number designation "X" location. The X VEHICLE CONVOY sign shall not be used on the SHADOW VEHICLE if a TRAIL VEHICLE is used.
10. For divided highways with two or three lanes in one direction, the appropriate LEFT LANE CLOSED (CW20-5bTL), RIGHT LANE CLOSED (CW20-5bTR), or CENTER LANE CLOSED (CW20-5dT) sign should be used on the Advance Warning Vehicle. As an option, a portable changeable message sign (PCMS) or truck mounted changeable message sign (TMCMS) with a minimum character height of 12", and displaying the same legend may be substituted for these signs. An appropriate directional arrow display, simulating the size and legibility of the flashing arrow board may be used in the second phase of the PCMS/TMCMS message. When this is done, the arrow board will not be required on the Advance Warning Vehicle.
11. A double arrow shall not be displayed on the arrow board on the Advance Warning Vehicle.
12. For divided highways with three or four lanes in each direction, use TCP(3-2).
13. Standard diamond shape versions of the CW20-5 series signs may be used as an option if the rectangular signs shown are not available.
14. The Advance Warning Vehicle may straddle the edgeline when Shoulder width makes it necessary.
15. On two-lane two-way roadways, the work and protection vehicles should pull over periodically to allow motor vehicle traffic to pass. If motorists are not allowed to pass the work convoy, a DO NOT PASS (R4-1) sign should be placed on the back of the rearmost protection vehicle.

Texas Department of Transportation

Traffic Operations Division Standard

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

FILE: tcp3-3.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT September 1987	CONT	SECT	JOB	HIGHWAY
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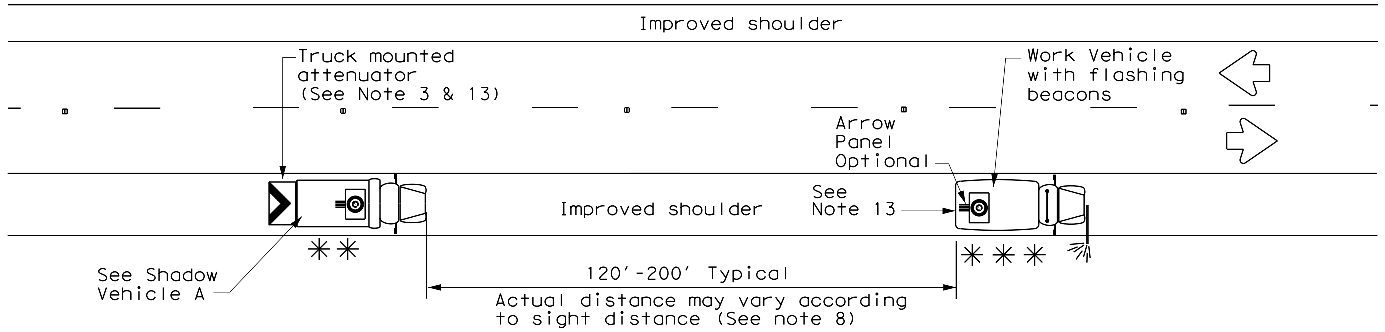
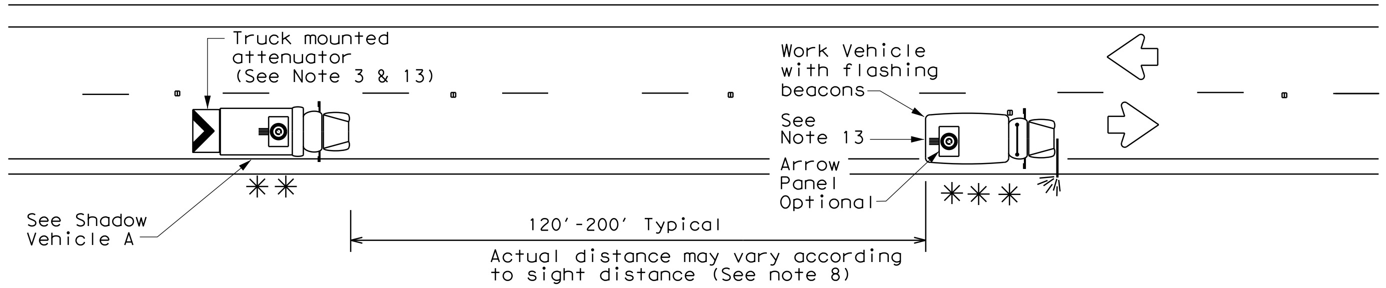
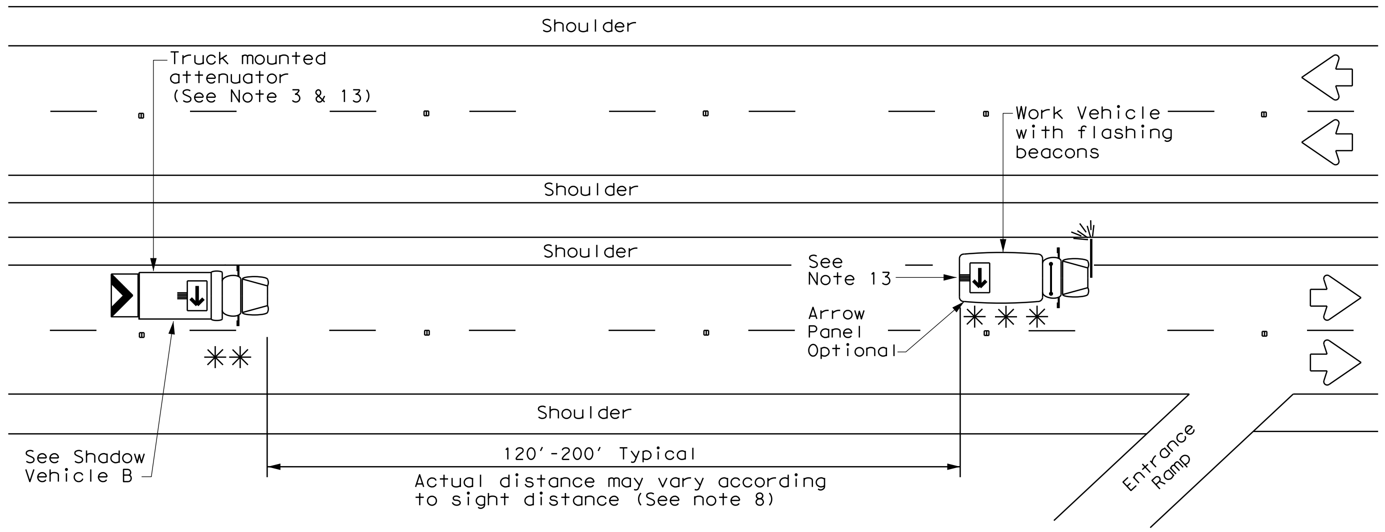
2-94 4-98 / 8-95 7-13 / 1-97 7-14	DIST		COUNTY	SHEET NO.
	PAR		GRAYSON	84



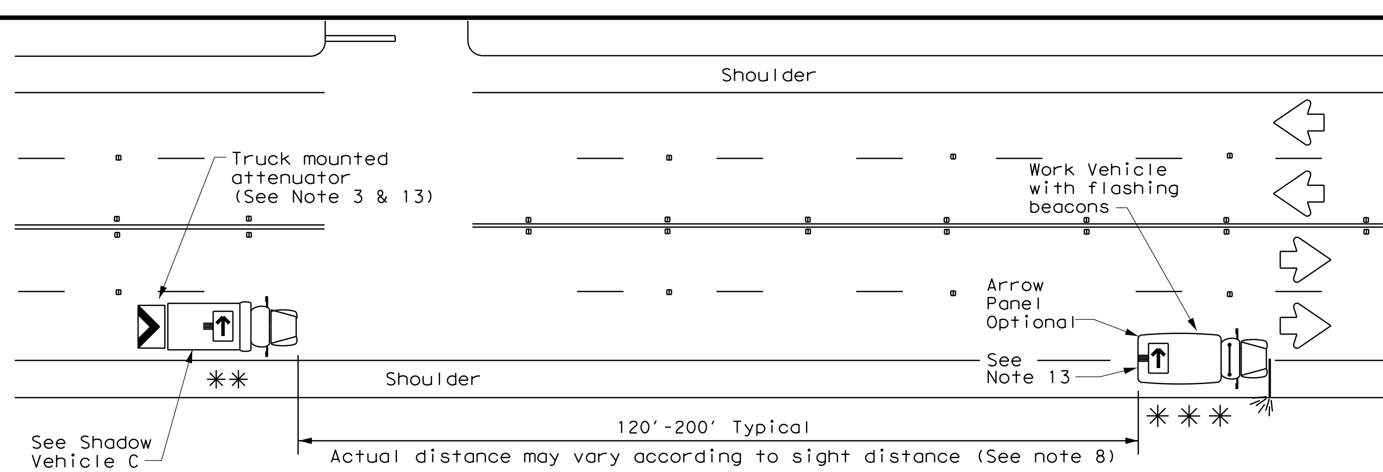
TWO LANE HIGHWAY WITH PAVED SHOULDERS MINIMUM 8'



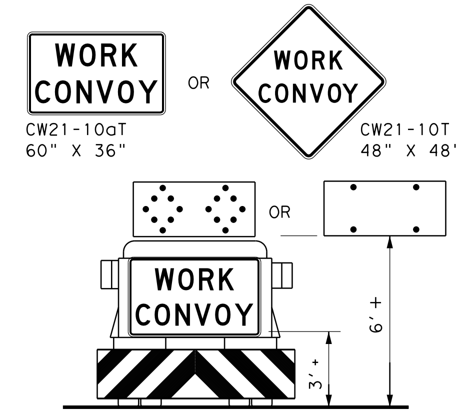
TWO LANE HIGHWAY WITH NO SHOULDER OR NARROW SHOULDER



MULTILANE HIGHWAY

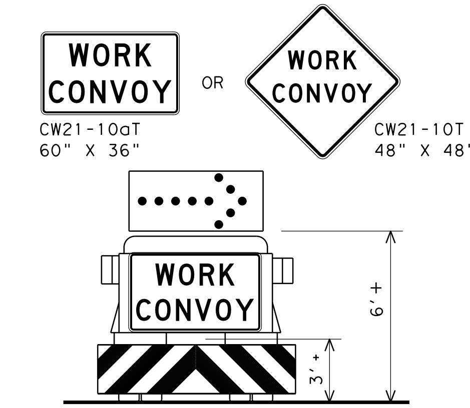


MULTILANE HIGHWAY



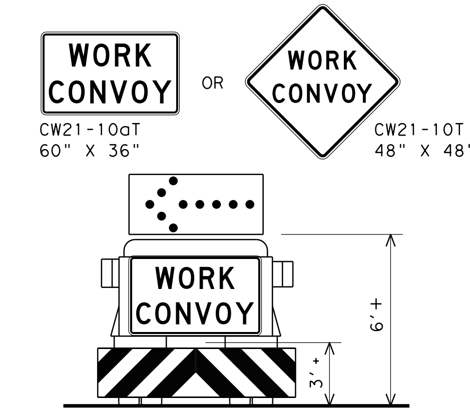
SHADOW VEHICLE A

with Flashing Arrow Board in Caution Mode



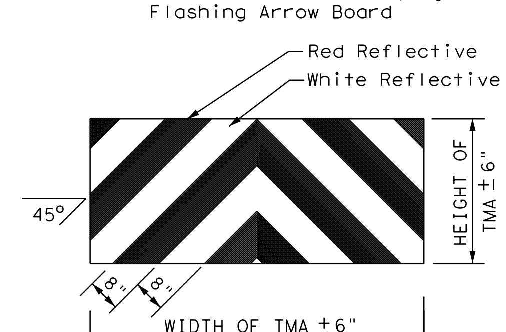
TYPICAL SHADOW VEHICLE B

with RIGHT Directional display Flashing Arrow Board



TYPICAL SHADOW VEHICLE C

with LEFT Directional display Flashing Arrow Board



STRIPING FOR TMA

LEGEND

Symbol	Description	Arrow Board Display	
✱✱	Shadow Vehicle		
✱✱✱	Work Vehicle		
	Sign		RIGHT Directional
	Heavy Work Vehicle		LEFT Directional
	Traffic Flow		Double Arrow
	Truck Mounted Attenuator (TMA) or Trailer Attenuator (TA)		CAUTION (Alternating Diamond or 4 Corner Flash)

TYPICAL USAGE

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

GENERAL NOTES

1. All traffic control devices shall be in accordance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD), latest edition.
2. The use of amber high intensity rotating, flashing, oscillating, or strobe lights on vehicles are required. Blue high intensity rotating, flashing, oscillating or strobe lights when mounted on the driver's side of the vehicle may be operated simultaneously with the amber beacons or strobe lights.
3. The use of truck mounted attenuators (TMA) on the Shadow Vehicle is required.
4. Striping on the back panel of all TMAs shall be 8" red reflective sheeting with white background, placed in an inverted "V" design. Reflective sheeting shall meet or exceed the reflectivity and color requirements of DEPARTMENTAL MATERIAL SPECIFICATION DMS-8300, TYPE A.
5. Flashing Arrow Panels shall be Type B or Type C as per BC Standards. The panel operation shall be controlled from inside the vehicle.
6. Each vehicle shall have two-way radio communication capability.
7. When the work convoy must change lanes, the Shadow Vehicle should change lanes first to protect the Work Vehicle.
8. Spacing between Shadow and Work Vehicle will vary depending on sight distance restrictions. Motorists approaching the work convoy should be able to see the Shadow Vehicle in time to slow down and/or change lanes as they approach the Work Convoy.
9. Use of an arrow panel on the Work Vehicle is optional except as provided in note 13, but may be required by the Engineer. If an arrow panel is not used, dual flashing beacons, mounted as high and as widely separated as practicable at the rear of the Work Vehicle shall be required.
10. On two-lane two-way roadways, the Work and Shadow Vehicles should pull over periodically to allow motor vehicle traffic to pass.
11. Work and Shadow Vehicles should stay on the shoulder of highways having 8' or wider shoulders when possible.
12. A Trail Vehicle may be added to the operation when approved by the Engineer. See TCP(3) series standards.
13. The shadow vehicle may be omitted on conventional roadways when a TMA or TA and arrow panel is mounted to the herbicide vehicle. A separate shadow vehicle will be required on expressways and Freeways.

Texas Department of Transportation — Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS HERBICIDE TRUCK OPERATIONS

TCP(3-5)-18

FILE: tcp3-5.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT July 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	0091	10	002	FS 121
4-18	DIST		COUNTY	SHEET NO.
	PAR		GRAYSON	85

edgecon.dgn

DEFINITION OF TREATMENT ZONES FOR VARIOUS EDGE CONDITIONS

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

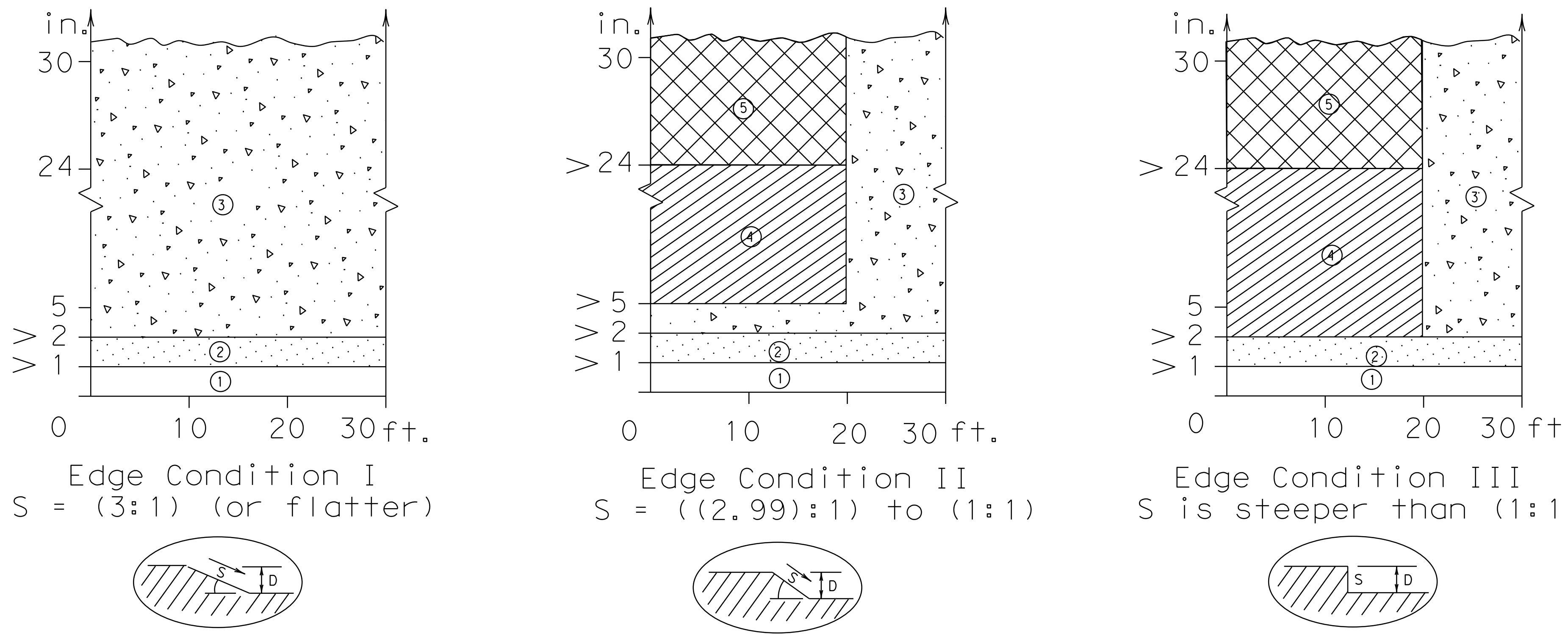
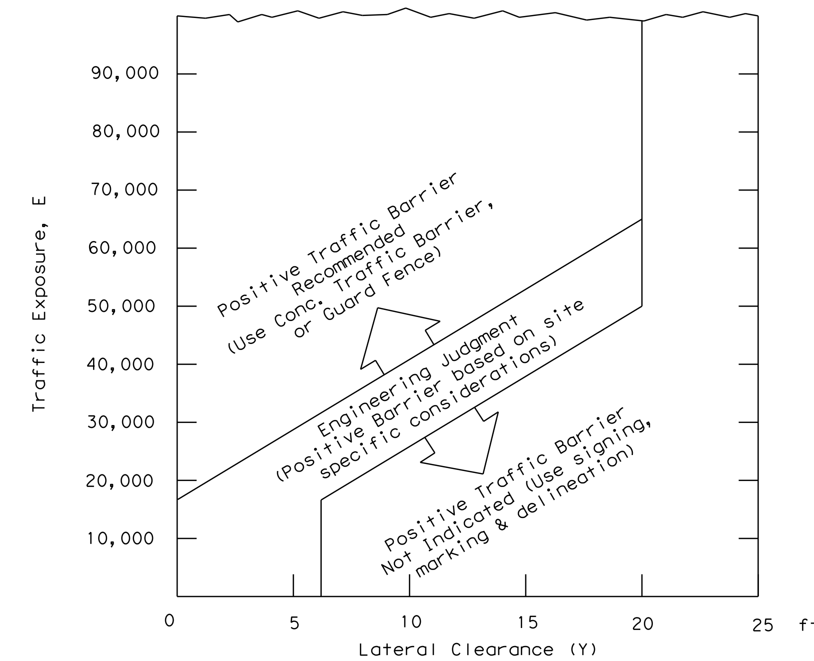


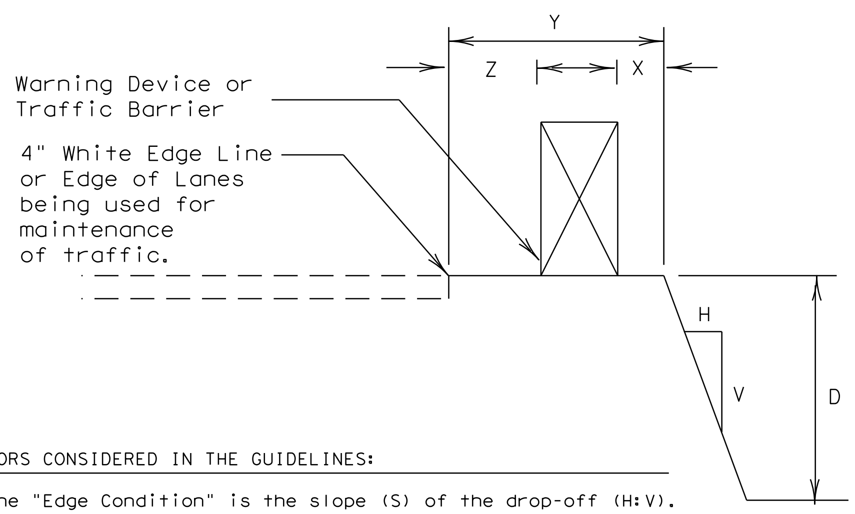
FIGURE-1: CONDITIONS INDICATING USE OF POSITIVE BARRIER FOR ZONE 5 ( )



1 E = ADT x T
Where ADT is that portion of the average daily traffic volume traveling within 20 feet (generally two adjacent lanes) of the edge dropoff condition; and, T is the duration time in years of the dropoff condition.

2 Figure-1 provides a practical approach to the use of positive barriers for the protection of vehicles from pavement drop-offs. Other factors, such as the presence of heavy machinery, construction workers, or the mix and volume of traffic may make the use of positive barriers appropriate, even when the edge condition alone may not justify the use of a barrier.

3 An approved end treatment should be provided for any positive barrier end located within a lateral offset of 20 feet from the edge of the travel lane.



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

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

FACTORS CONSIDERED IN THE GUIDELINES:

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

Edge Condition Notes:

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

Engineer's Seal

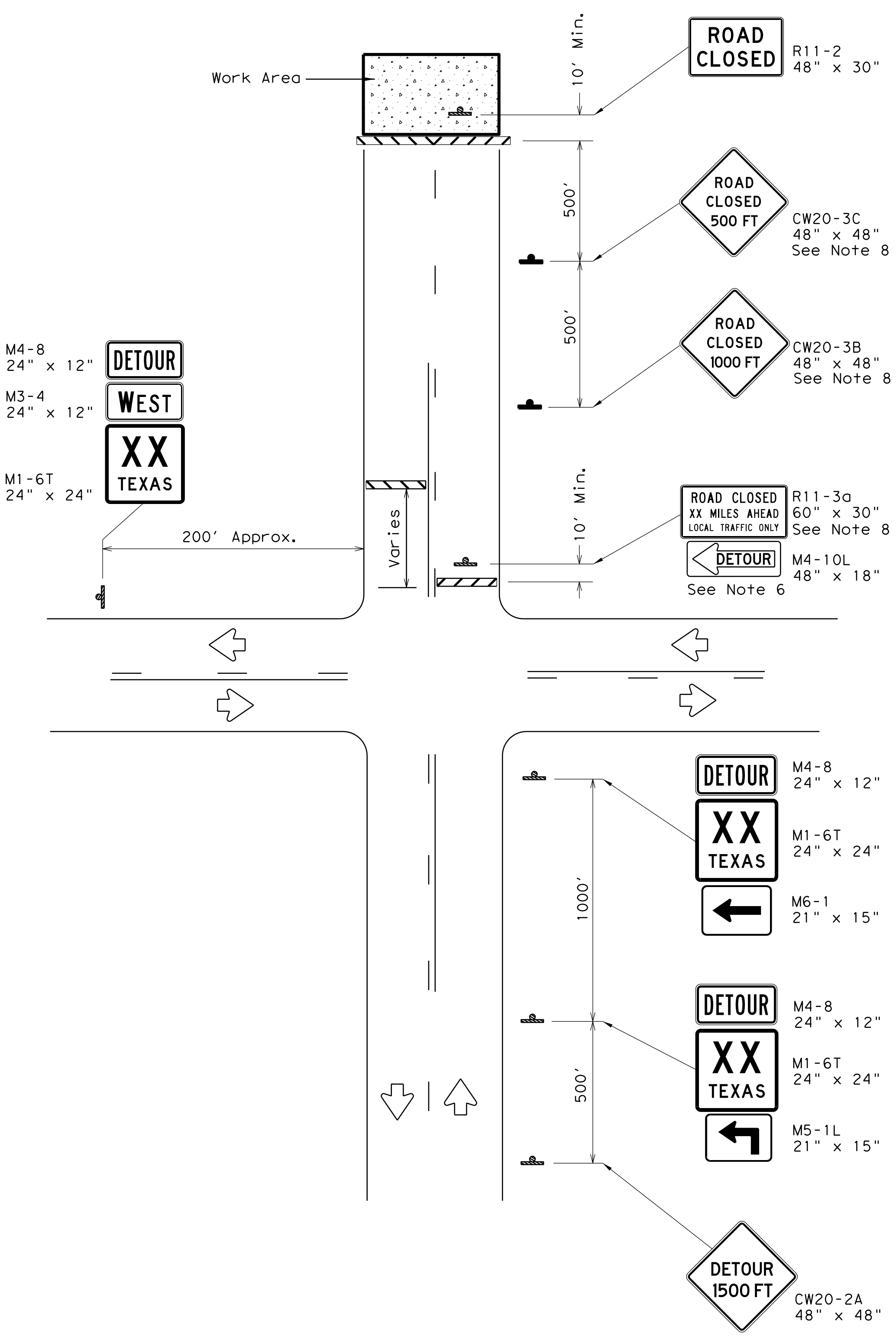
STATE OF TEXAS
JENN-HWAN MA
83964
LICENSED
PROFESSIONAL ENGINEER

Date 7/15/2021

Texas Department of Transportation
Traffic Operations Division

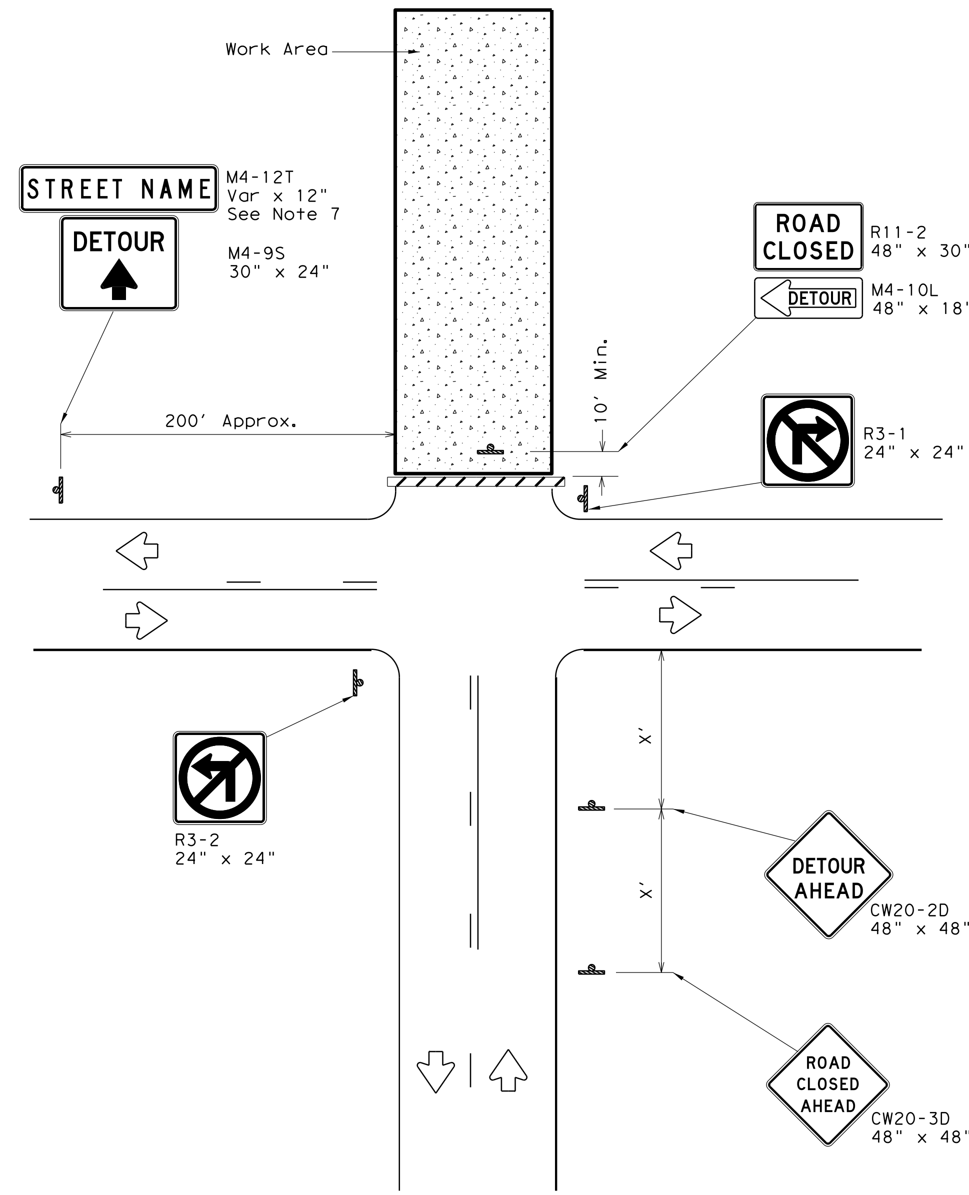
TREATMENT FOR VARIOUS EDGE CONDITIONS

©TxDOT August 2000	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
REVISIONS	CONT	SECT	JOB	HIGHWAY
03-01	0091	10	002	FS 121
08-01 correct typos	DIST		COUNTY	SHEET NO.
	PAR		GRAYSON	86



ROAD CLOSURE BEYOND THE INTERSECTION

Signing for a Numbered Route with an Off-Site Detour



ROAD CLOSURE AT THE INTERSECTION

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

LEGEND	
(barricade symbol)	Type 3 Barricade
(sign symbol)	Sign

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

* Conventional Roads Only

GENERAL NOTES

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

Texas Department of Transportation — Traffic Operations Division Standard

WORK ZONE ROAD CLOSURE DETAILS

WZ(RCD)-13

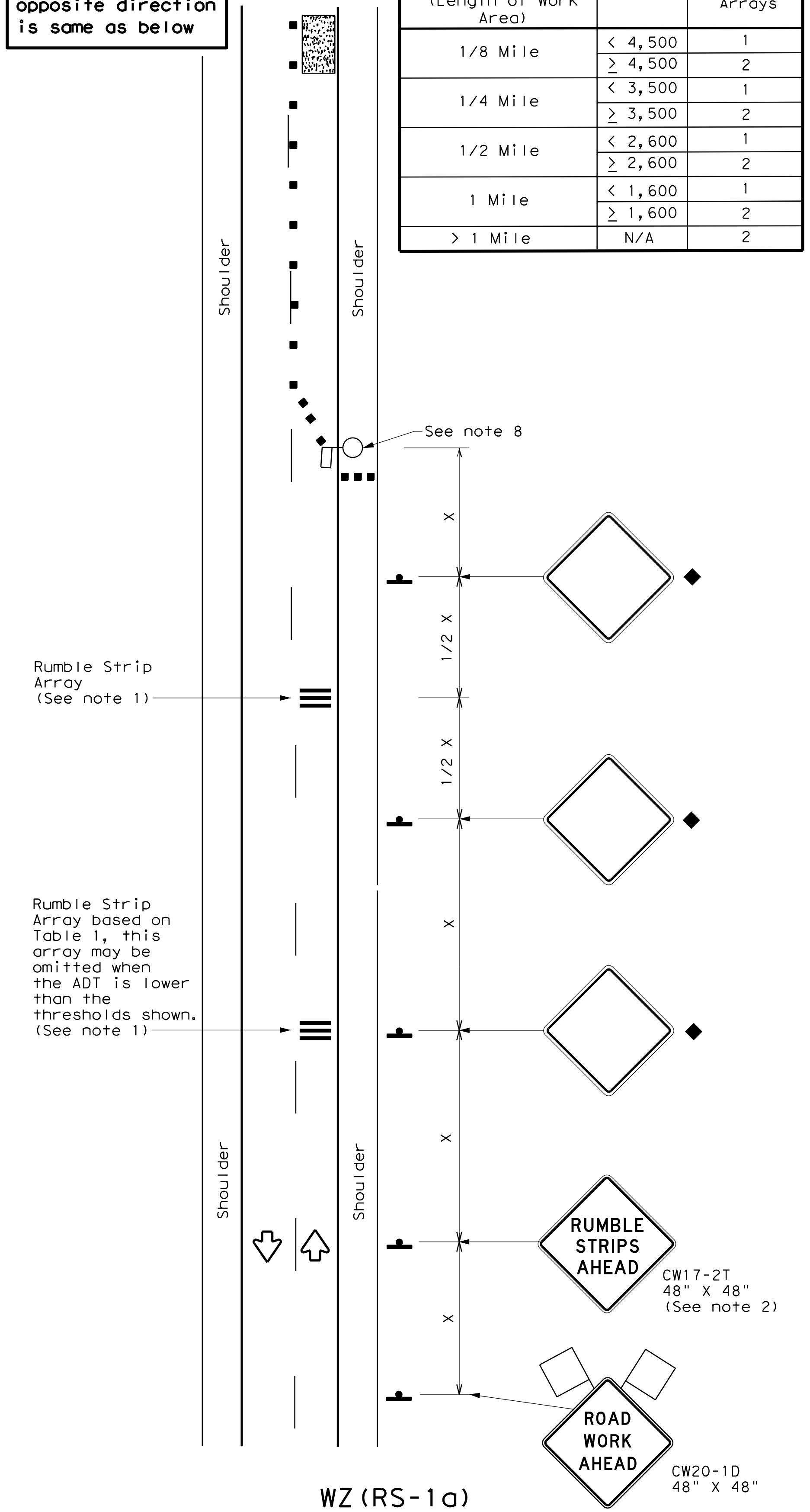
FILE: wzrcd-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT August 1995	CONT	SECT	JOB	HIGHWAY
REVISIONS 1-97 4-98 7-13 2-98 3-03	0091	10	002	FS 121
	DIST		COUNTY	SHEET NO.
	PAR		GRAYSON	87

113

Warning sign and rumble strip sequence in opposite direction is same as below

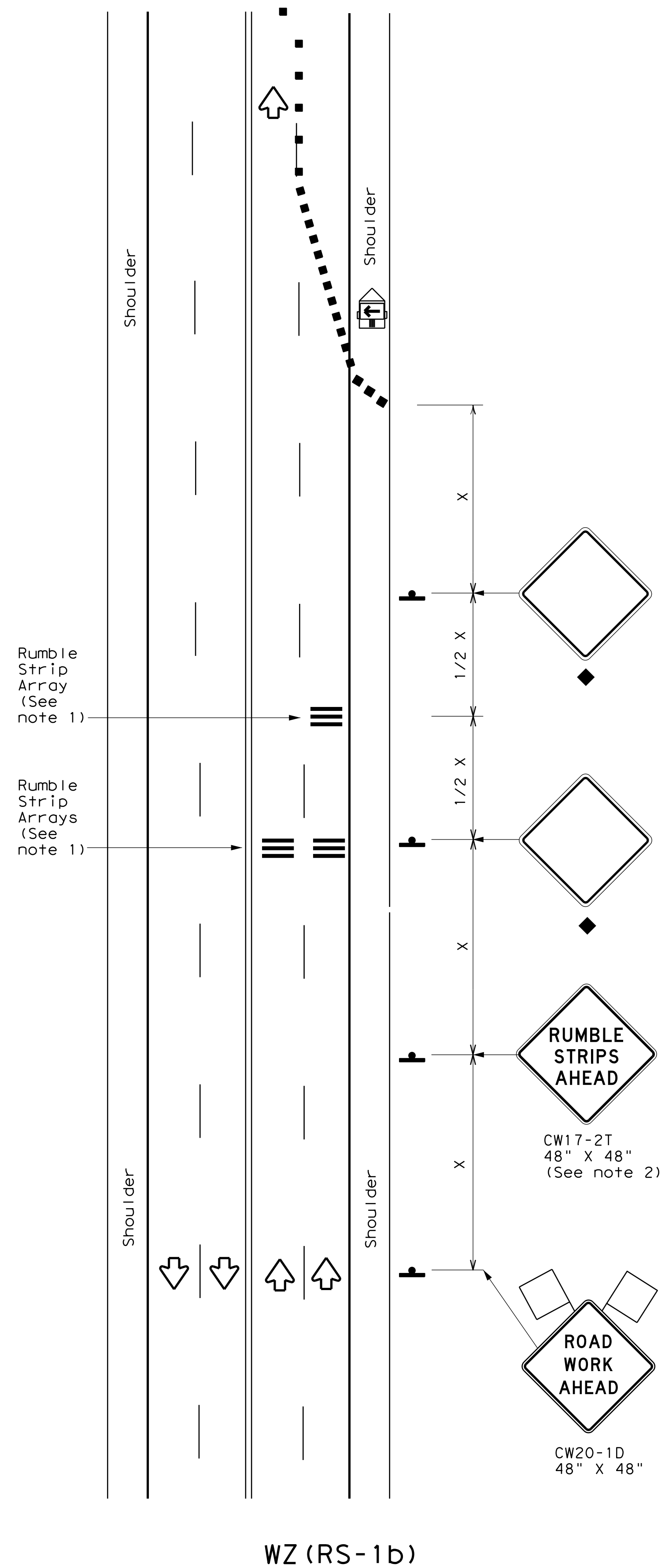
TABLE 1

Flagger to Flagger (Length of Work Area)	ADT	# of Rumble Strip Arrays
1/8 Mile	< 4,500	1
	≥ 4,500	2
1/4 Mile	< 3,500	1
	≥ 3,500	2
1/2 Mile	< 2,600	1
	≥ 2,600	2
1 Mile	< 1,600	1
	≥ 1,600	2
> 1 Mile	N/A	2



WZ(RS-1a)
75 mph or Less

RUMBLE STRIPS ON ONE-LANE TWO-WAY APPLICATION



WZ(RS-1b)
75 mph or Less

RUMBLE STRIPS FOR LANE CLOSURE ON CONVENTIONAL ROADWAY

GENERAL NOTES

1. Each Rumble Strip Array should consist of three rumble strips spaced center to center at the spacing shown in Table 2, placed transverse across the lane at locations shown.
2. The CW17-2T "RUMBLE STRIPS AHEAD" sign should be located after the CW20-1D "ROAD WORK AHEAD sign and spaced as shown. If traffic is observed to be queuing, or is expected to queue beyond the Rumble Strips, the CW17-2T sign and the first Rumble Strip Array may be located upstream of the CW20-1D sign as necessary to provide needed warning.
3. Temporary Rumble Strips will be considered subsidiary to Item 502, and shall be a product listed on the Compliant Work Zone Traffic Control Devices.
4. Removal of the Temporary Rumble Strips should be accomplished before removing the advance warning signs.
5. Temporary Rumble Strips should not be used on horizontal curves, loose gravel, soft or bleeding asphalt, heavily rutted pavements or unpaved surfaces.
6. Temporary Rumble Strips shall be installed and maintained as per manufacturer's recommendations.
7. This standard sheet shall be used in conjunction with other appropriate TCP standard, TMUTCD typical application or project specific detail for the project.
8. The one-lane two-way application may utilize a flagger, an AFAD or a portable traffic signal.
9. Temporary Rumble Strips may be used on freeways or expressways based on engineering judgment.

TABLE 2

Speed	Approximate distance between strips in an Array
≤ 40 MPH	10'
> 40 MPH & ≤ 55 MPH	15'
> 55 MPH	20'

LEGEND

Symbol	Description	Symbol	Description
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Panel	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
	✓	✓		

◆ **Signs are for illustrative purposes only. Signs required may vary depending on the TCP, TMUTCD Typical Application, or project specific details for the project.**

Texas Department of Transportation — Traffic Operations Division Standard

TEMPORARY RUMBLE STRIPS

WZ(RS)-16

FILE: wzrs16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2012	CONT 0091	SECT 10	JOB 002	HIGHWAY FS 121
REVISIONS 2-14 4-16	DIST PAR		COUNTY GRAYSON	SHEET NO. 88

117

DATE: 7:37:18 PM
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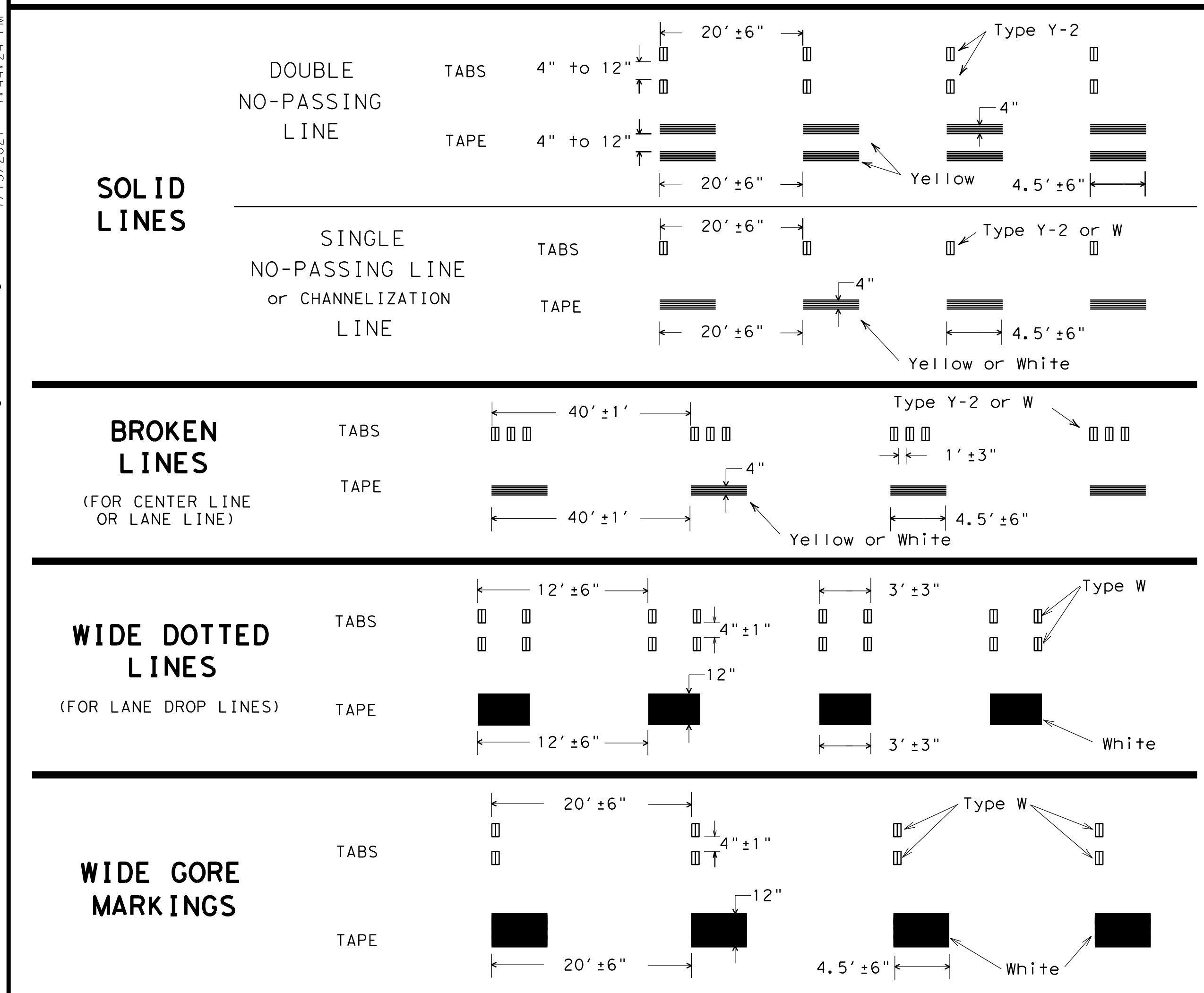
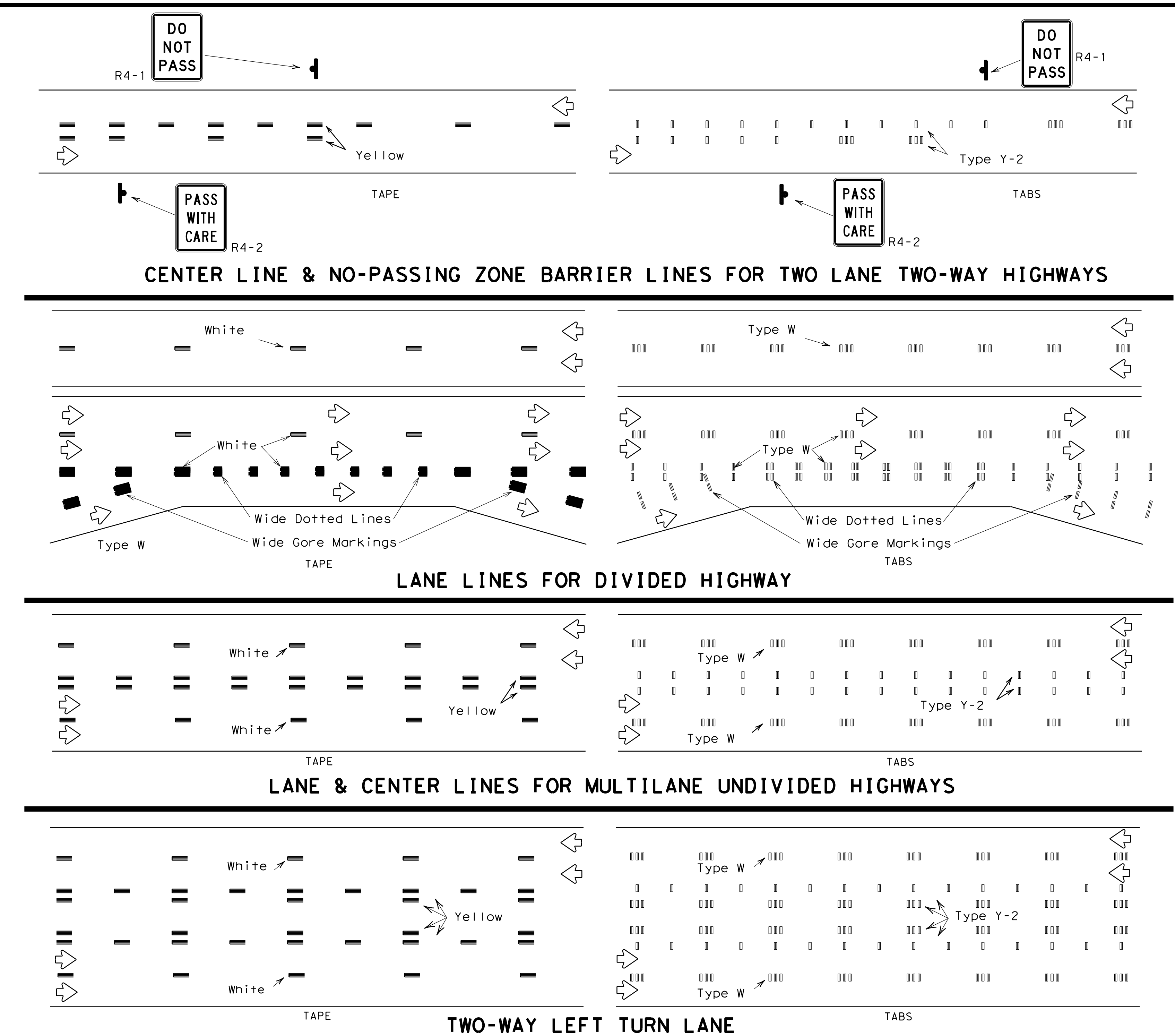
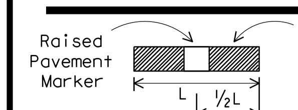
WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS



WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS





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

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.

PREFABRICATED PAVEMENT MARKINGS

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

RAISED PAVEMENT MARKERS

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

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

1. DMSs referenced above can be found along with embedded links to their respective MPLs at the following website:
http://www.txdot.gov/business/contractors_consultants/material_specifications/default.htm

Texas Department of Transportation

Traffic Operations Division Standard

WORK ZONE SHORT TERM PAVEMENT MARKINGS

WZ(STPM)-13

FILE: wzstpm-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS	0091	10	002	FS 121
1-97 3-03 7-13	DIST		COUNTY	SHEET NO.
	PAR		GRAYSON	89

111

DATE:
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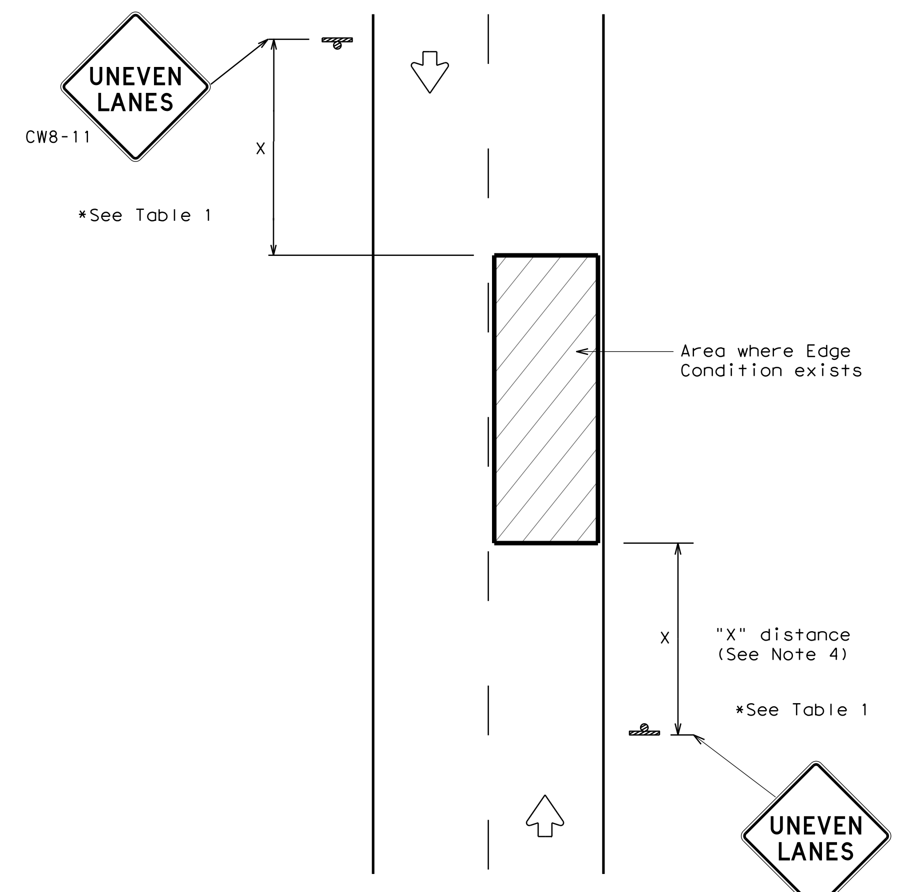
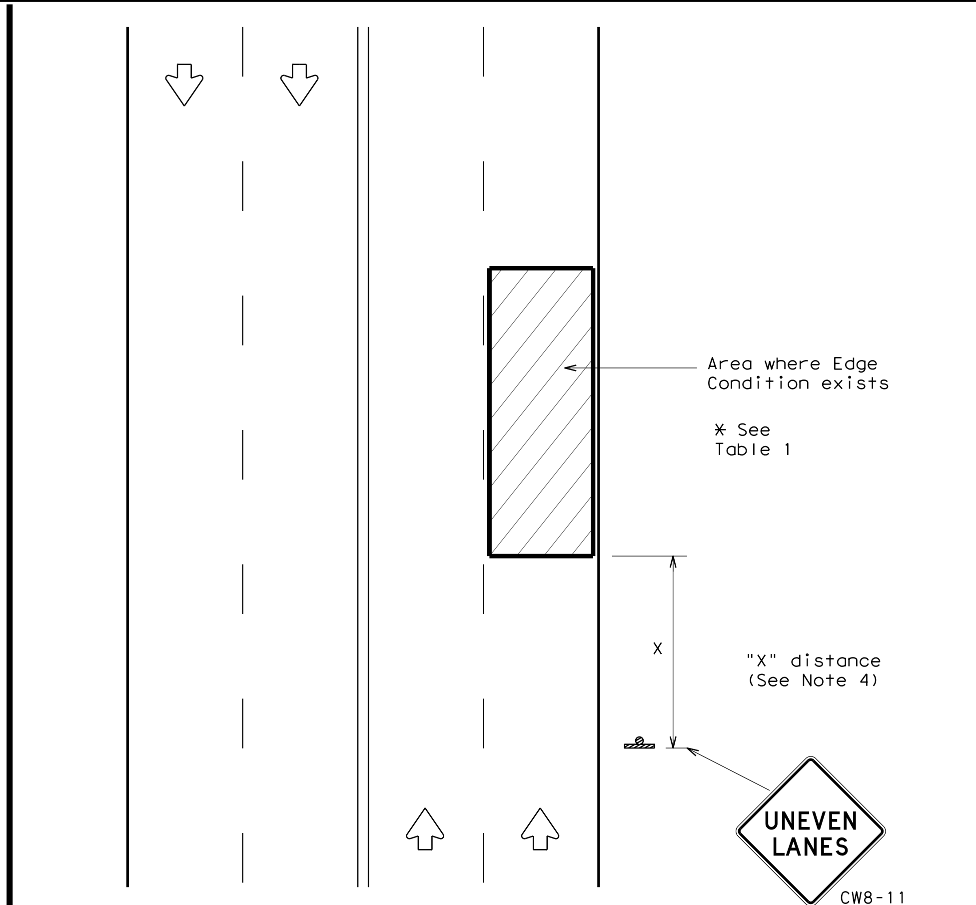
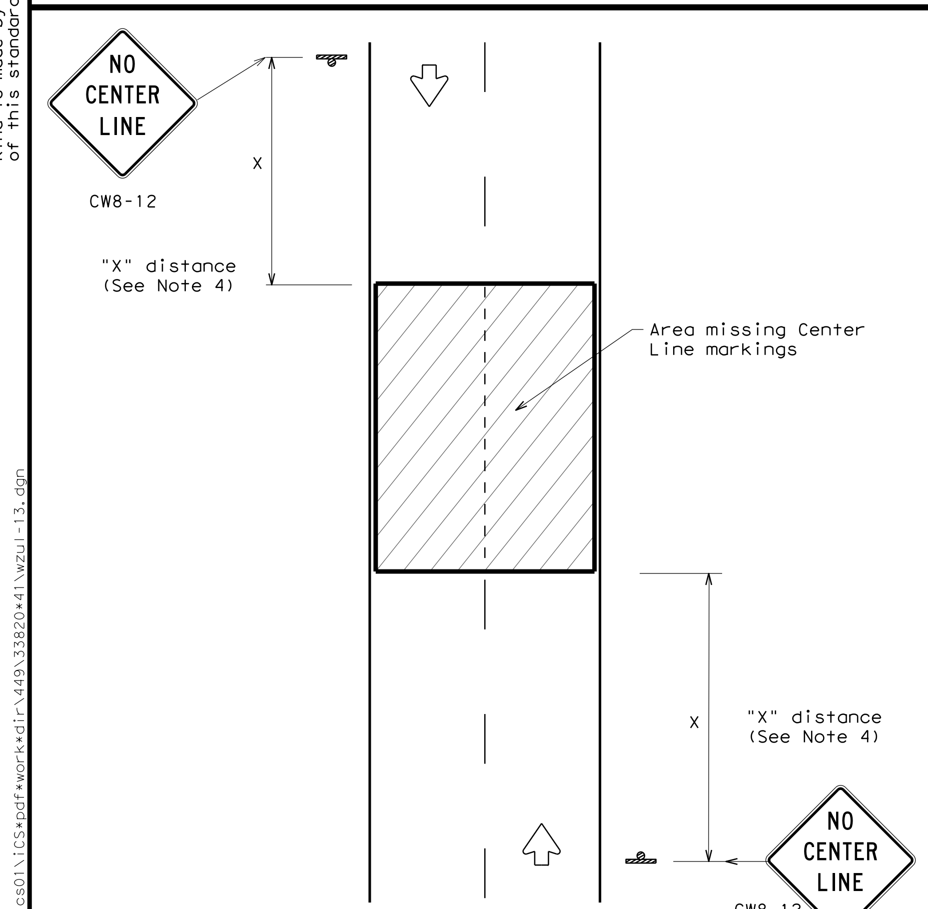


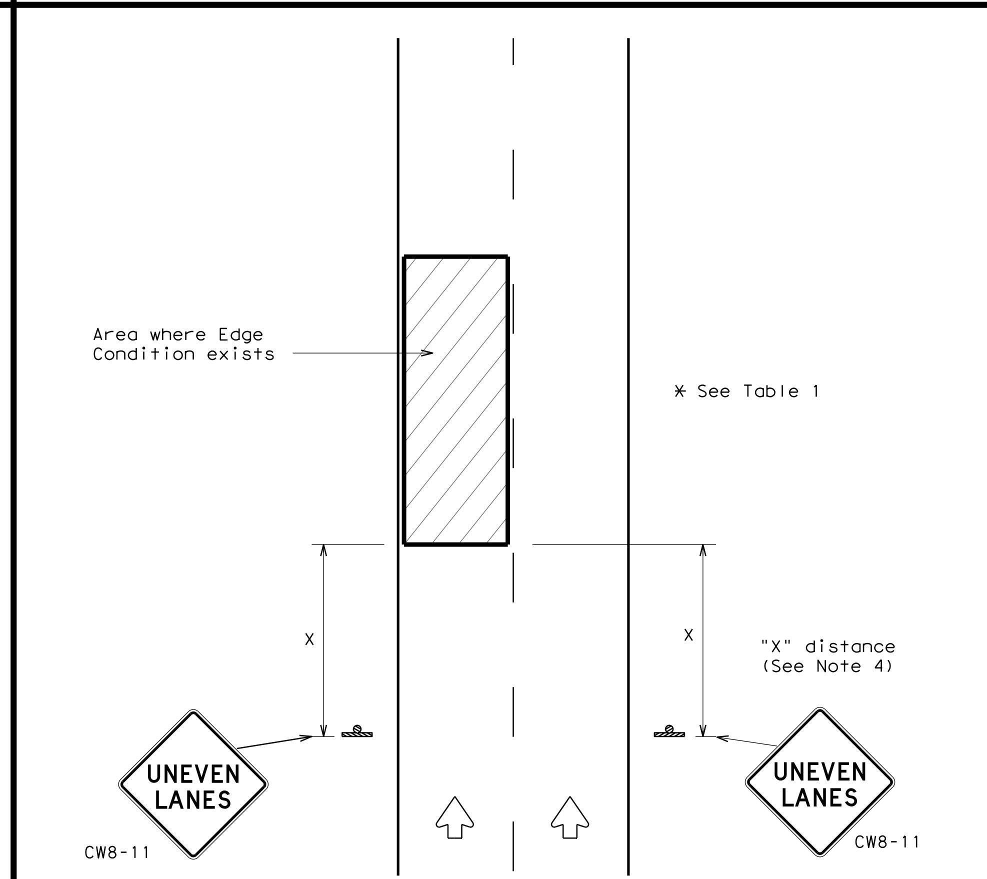
UNEVEN LANES
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
FOUR LANE CONVENTIONAL ROAD



NO CENTER LINE
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
DIVIDED ROADWAY

DEPARTMENTAL MATERIAL SPECIFICATIONS	
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY (REMOVABLE) PREFABRICATED PAVEMENT MARKINGS	DMS-8241
SIGN FACE MATERIALS	DMS-8300

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

GENERAL NOTES

1. If spalling or holes occur, ROUGH ROAD (CW8-8) signs should be placed in advance of the condition and be repeated every two miles where the condition persists.
2. UNEVEN LANES (CW8-11) signs shall be installed in advance of the condition and repeated every mile. Signs installed along the uneven lane condition may be supplemented with the NEXT XX MILES (CW7-3aP) plaque or Advisory Speed (CW13-1P) plaque.
3. NO CENTER LINE (CW8-12) signs and temporary pavement markings as per the WZ(STPM) standard shall be installed if yellow centerlines separating two way traffic are obscured or obliterated. Repeat NO CENTER LINE signs every two miles where the center line markings are not in place. The signs and markings shall remain in place until permanent pavement markings are installed.
4. Signs shall be spaced at the distances recommended as per BC standards.
5. Additional signs may be required as directed by the Engineer. Signs shall remain in place until final surface is applied. Signs shall be considered subsidiary to Item 502 "BARRICADES, SIGNS AND TRAFFIC HANDLING."
6. Signs shall be fabricated and mounted on supports as shown on the BC standards and/or listed on the "Compliant Work Zone Traffic Control Devices" list.
7. Short term markings shall not be used to simulate edge lines.
8. All signs shall be constructed in accordance with the details found in the "Standard Highway Sign Designs for Texas," latest edition.

TABLE 1

Edge Condition	Edge Height (D)	* Warning Devices
① (D)	Less than or equal to: $1\frac{1}{4}$" (maximum-planing) $1\frac{1}{2}$" (typical-overlay)	Sign: CW8-11
	Distance "D" may be a maximum of 1 1/4 " for planing operations and 2" for overlay operations if uneven lanes with edge condition 1 are open to traffic after work operations cease.	
② (>3, 1, D)	Less than or equal to 3"	Sign: CW8-11
③ (0" to 3/4", D, 12") Notched Wedge Joint	Distance "D" may be a maximum of 3" if uneven lanes with edge condition 2 or 3 are open to traffic after work operations cease. Uneven lanes should not be open to traffic when "D" is greater than 3".	

TRAFFIC CONTROL DURING PLANING, OVERLAY AND LEVELING OPERATIONS ARE SHOWN ELSEWHERE IN THE PLANS.

MINIMUM WARNING SIGN SIZE	
Conventional roads	36" x 36"
Freeways/expressways, divided roadways	48" x 48"

Texas Department of Transportation — Traffic Operations Division Standard

SIGNING FOR UNEVEN LANES

WZ(UL)-13

FILE: wzul-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 1992	CONT 0091	SECT 10	JOB 002	HIGHWAY FS 121
REVISIONS 8-95 2-98 7-13 1-97 3-03	DIST PAR		COUNTY GRAYSON	SHEET NO. 90

112

℄ FS 121

Point FS1211 N 7,198,777.9482 E 2,477,045.6758 Sta 3363+71.06

Course from FS1211 to PC FS121*3 N 0° 26′ 25.66" E Dist 616.6695

Curve Data

Curve FS121*3						
P.I. Station	3392+66.42	N	7,201,673.2179	E	2,477,067.9335	
Delta =	77° 17′ 14.59"	(RT)				
Degree =	2° 00′ 37.36"					
Tangent =	2,278.6857					
Length =	3,844.4202					
Radius =	2,850.0000					
External =	798.9599					
Long Chord =	3,559.5098					
Mid. Ord. =	624.0232					
P.C. Station	3369+87.73	N	7,199,394.5995	E	2,477,050.4164	
P.T. Station	3408+32.15	N	7,202,157.5651	E	2,479,294.5490	
C.C.		N	7,199,372.6904	E	2,479,900.3321	
Back = N	0° 26′ 25.66" E					
Ahead = N	77° 43′ 40.25" E					
Chord Bear = N	39° 05′ 02.95" E					

Course from PT FS121*3 to PC FS121*6 N 77° 43′ 40.25" E Dist 1,426.3352

Curve Data

Curve FS121*6						
P.I. Station	3446+06.86	N	7,202,959.9007	E	2,482,983.0044	
Delta =	78° 00′ 00.22"	(LT)				
Degree =	1° 58′ 32.58"					
Tangent =	2,348.3762					
Length =	3,947.9378					
Radius =	2,900.0000					
External =	831.6043					
Long Chord =	3,650.0606					
Mid. Ord. =	646.2777					
P.C. Station	3422+58.48	N	7,202,460.7404	E	2,480,688.2910	
P.T. Station	3462+06.42	N	7,205,308.2504	E	2,482,971.8473	
C.C.		N	7,205,294.4725	E	2,480,071.8800	
Back = N	77° 43′ 40.25" E					
Ahead = N	0° 16′ 19.97" W					
Chord Bear = N	38° 43′ 40.14" E					

Course from PT FS121*6 to PC FS121*9 N 0° 16′ 19.97" W Dist 3,299.2630

Curve Data

Curve FS121*9						
P.I. Station	3503+46.81	N	7,209,448.5903	E	2,482,952.1763	
Delta =	18° 22′ 35.54"	(LT)				
Degree =	1° 06′ 06.63"					
Tangent =	841.1237					
Length =	1,667.8017					
Radius =	5,200.0000					
External =	67.5885					
Long Chord =	1,660.6624					
Mid. Ord. =	66.7213					
P.C. Station	3495+05.69	N	7,208,607.4762	E	2,482,956.1725	
P.T. Station	3511+73.49	N	7,210,245.5522	E	2,482,683.2139	
C.C.		N	7,208,582.7710	E	2,477,756.2312	
Back = N	0° 16′ 19.97" W					
Ahead = N	18° 38′ 55.50" W					
Chord Bear = N	9° 27′ 37.74" W					

Course from PT FS121*9 to PC FS121*12 N 18° 38′ 55.50" W Dist 3,588.0785

Curve Data

Curve FS121*12						
P.I. Station	3573+52.69	N	7,216,100.3240	E	2,480,707.3181	
Delta =	74° 37′ 17.99"	(RT)				
Degree =	1° 41′ 06.61"					
Tangent =	2,591.1218					
Length =	4,428.1386					
Radius =	3,400.0000					
External =	874.7997					
Long Chord =	4,121.7436					
Mid. Ord. =	695.7797					
P.C. Station	3547+61.57	N	7,213,645.2447	E	2,481,535.8698	
P.T. Station	3591+89.70	N	7,217,550.2763	E	2,482,854.7702	
C.C.		N	7,214,732.4478	E	2,484,757.3585	
Back = N	18° 38′ 55.50" W					
Ahead = N	55° 58′ 22.48" E					
Chord Bear = N	18° 39′ 43.49" E					

Course from PT FS121*12 to PC FS121*15 N 55° 58′ 22.48" E Dist 996.7406

Curve Data

Curve FS121*15						
P.I. Station	3603+97.29	N	7,218,226.0219	E	2,483,855.5832	
Delta =	2° 34′ 01.72"	(LT)				
Degree =	0° 36′ 31.97"					
Tangent =	210.8433					
Length =	421.6160					
Radius =	9,410.0000					
External =	2.3618					
Long Chord =	421.5808					
Mid. Ord. =	2.3612					
P.C. Station	3601+86.45	N	7,218,108.0372	E	2,483,680.8420	
P.T. Station	3606+08.06	N	7,218,351.7149	E	2,484,024.8646	
C.C.		N	7,225,906.7921	E	2,478,415.1491	
Back = N	55° 58′ 22.48" E					
Ahead = N	53° 24′ 20.77" E					
Chord Bear = N	54° 41′ 21.62" E					

Course from PT FS121*15 to FS12117 N 53° 24′ 20.77" E Dist 1,816.8911

Point FS12117 N 7,219,434.8437 E 2,485,483.6055 Sta 3624+24.95

℄ CR 60

Point CO601 N 7,199,402.5907 E 2,477,173.5593 Sta 0+00.00

Course from CO601 to PC CO60*3 S 88° 52′ 34.08" W Dist 126.9611

Curve Data

Curve CO60*3						
P.I. Station	2+09.81	N	7,199,398.4756	E	2,476,963.7929	
Delta =	94° 56′ 07.42"	(RT)				
Degree =	75° 23′ 21.06"					
Tangent =	82.8456					
Length =	125.9271					
Radius =	76.0000					
External =	36.4251					
Long Chord =	112.0082					
Mid. Ord. =	24.6236					
P.C. Station	1+26.96	N	7,199,400.1005	E	2,477,046.6226	
P.T. Station	2+52.89	N	7,199,481.1379	E	2,476,969.3001	
C.C.		N	7,199,476.0859	E	2,477,045.1319	
Back = S	88° 52′ 34.08" W					
Ahead = N	3° 48′ 41.49" E					
Chord Bear = N	43° 39′ 22.21" W					

Course from PT CO60*3 to CO605 N 3° 48′ 41.49" E Dist 129.5775

Point CO605 N 7,199,610.4288 E 2,476,977.9137 Sta 3+82.47

℄ STIFF CHAPEL RD

Point 14 N 7,211,419.4744 E 2,481,318.3772 Sta 10+00.00

Course from 14 to 15 N 88° 25′ 39.67" E Dist 1,343.5116

Point 15 N 7,211,456.3385 E 2,482,661.3830 Sta 23+43.51

℄ SCHARFF RD

Point SCHARFF1 N 7,217,006.5738 E 2,482,800.8445 Sta 10+00.00

Course from SCHARFF1 to PC SCHARFF*3 N 0° 38′ 16.89" W Dist 82.5306

Curve Data

Curve SCHARFF*3						
P.I. Station	11+51.93	N	7,217,158.4901	E	2,482,799.1527	
Delta =	38° 16′ 15.88"	(LT)				
Degree =	28° 38′ 52.40"					
Tangent =	69.3952					
Length =	133.5913					
Radius =	200.0000					
External =	11.6972					
Long Chord =	131.1216					
Mid. Ord. =	11.0508					
P.C. Station	10+82.53	N	7,217,089.0992	E	2,482,799.9255	
P.T. Station	12+16.12	N	7,217,212.4895	E	2,482,755.5665	
C.C.		N	7,217,086.8721	E	2,482,599.9379	
Back = N	0° 38′ 16.89" W					
Ahead = N	38° 54′ 32.76" W					
Chord Bear = N	19° 46′ 24.83" W					

Course from PT SCHARFF*3 to SCHARFF5 N 38° 54′ 32.76" W Dist 212.8731

Point SCHARFF5 N 7,217,378.1353 E 2,482,621.8638 Sta 14+28.99

℄ FM 121

Point FM121 N 7,218,795.4726 E 2,483,472.6812 Sta 377+76.03

Course from FM121 to PC FM1211 S 48° 56′ 05.60" E Dist 323.9935

Curve Data

Curve FM1211						
P.I. Station	385+68.30	N	7,218,275.0180	E	2,484,070.0234	
Delta =	39° 37′ 09.42"	(LT)				
Degree =	4° 24′ 26.52"					
Tangent =	468.2759					
Length =	898.9330					
Radius =	1,300.0000					
External =	81.7678					
Long Chord =	881.1302					
Mid. Ord. =	76.9291					
P.C. Station	381+00.02	N	7,218,582.6360	E	2,483,716.9605	
P.T. Station	389+98.96	N	7,218,263.2025	E	2,484,538.1503	
C.C.		N	7,219,562.7886	E	2,484,570.9516	
Back = S	48° 56′ 05.60" E					
Ahead = S	88° 33′ 15.01" E					
Chord Bear = S	68° 44′ 40.30" E					

Course from PT FM1211 to FM122 S 88° 33′ 15.01" E Dist 528.4905

Point FM122 N 7,218,249.8677 E 2,485,066.4725 Sta 395+27.45

STATE OF TEXAS
ASHLEY C. BEYER
130809
PROFESSIONAL LICENSED ENGINEER
7/15/2021

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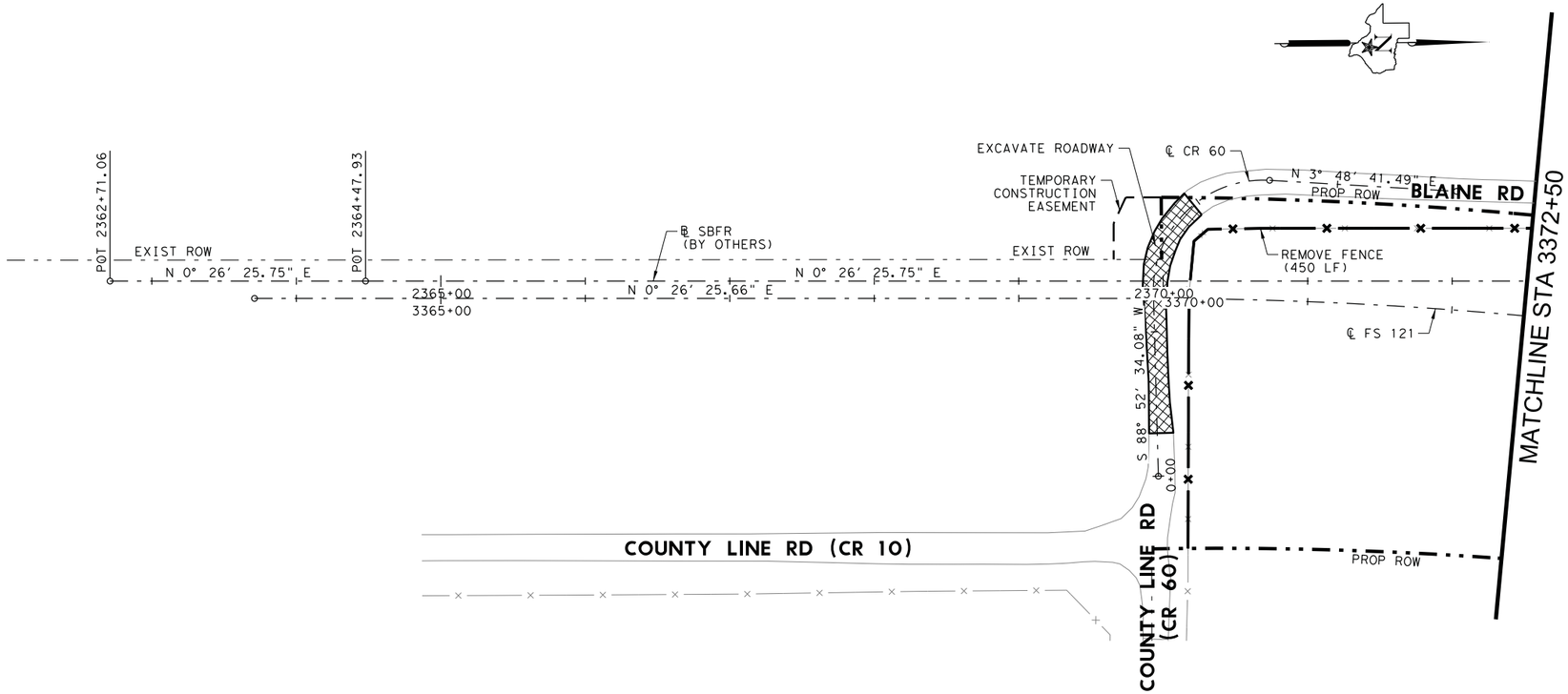
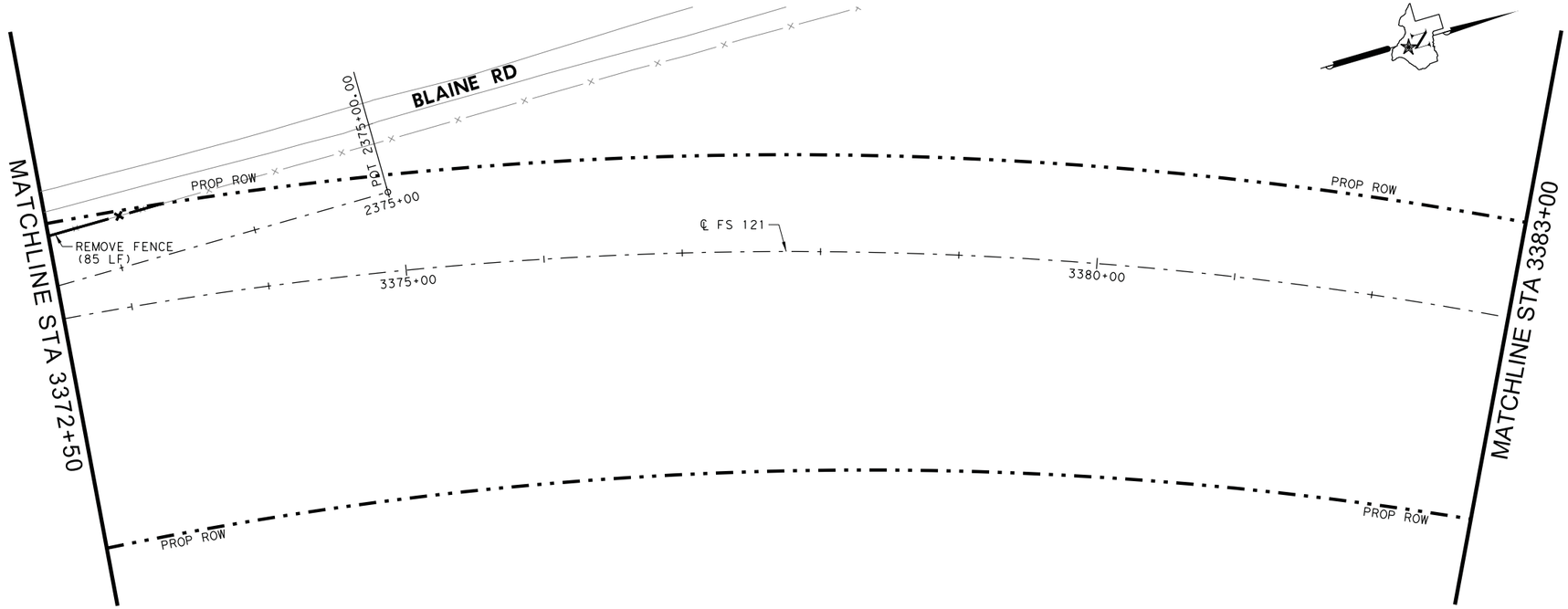
FS 121

HORIZONTAL ALIGNMENT DATA

SHEET 1 OF 1

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	91





HORIZONTAL
50 0 50 100
SCALE IN FEET

LEGEND

- EXCAVATION (ROADWAY)
- REMOVAL BY OTHER
- REMOVE FENCE

NOTES:

1. ROADWAY EXCAVATION QUANTITIES ARE INCLUDED IN THE EARTHWORK SUMMARY SHEET
2. SEE STOCK TANK DETAILS FOR ADDITIONAL INFORMATION

STATE OF TEXAS
SAMANTHA L. DELEON
136439
LICENSED
PROFESSIONAL ENGINEER

Samantha DeLeon
7/15/2021

DATE	BY	REV	REVISION

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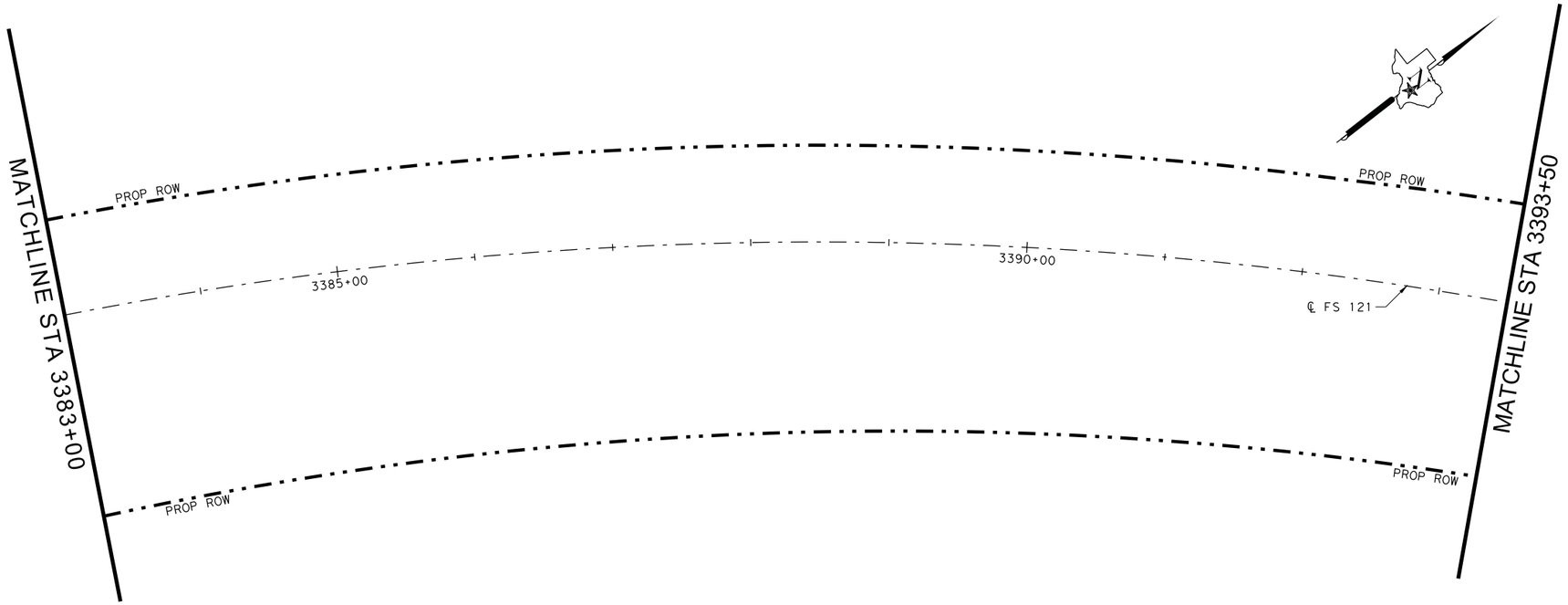
FS 121

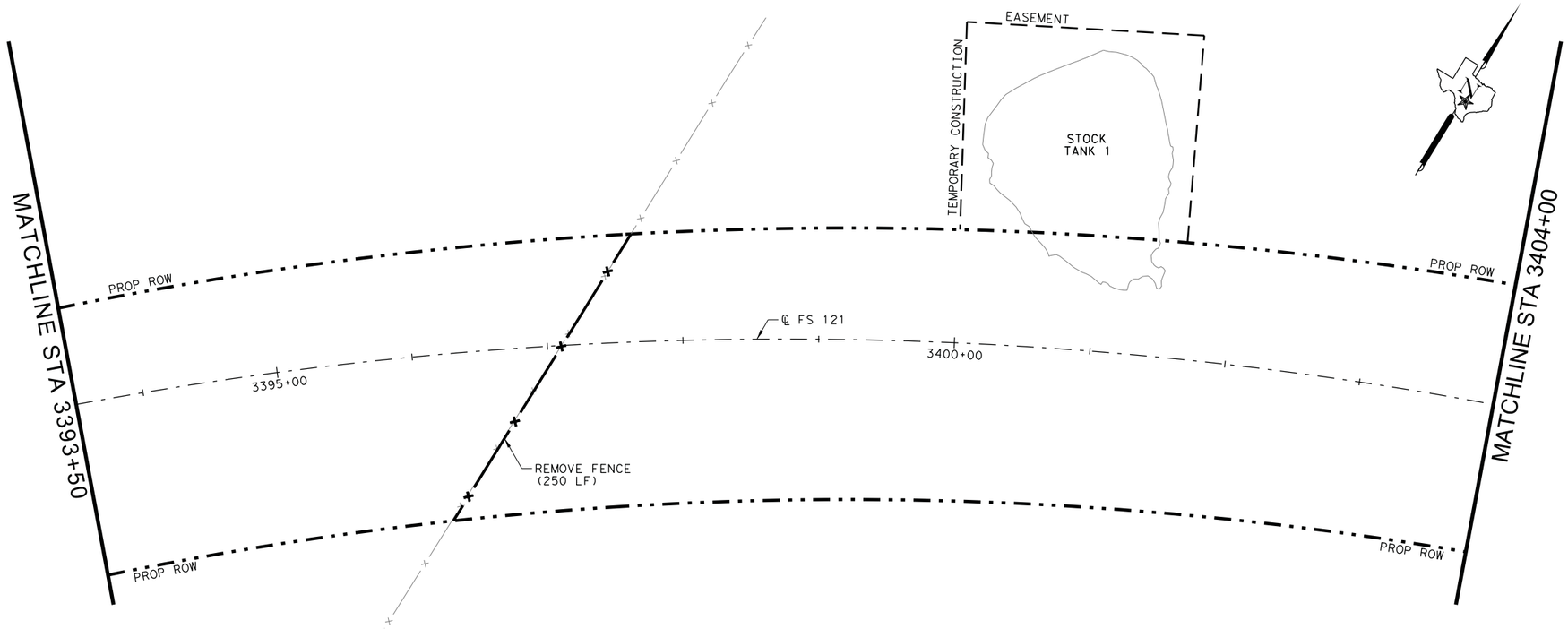
REMOVAL PLAN

BEGIN TO STA 3383+00

SCALE: 1" = 100' SHEET 1 OF 13

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	92





HORIZONTAL
50 0 50 100
SCALE IN FEET

LEGEND

- EXCAVATION (ROADWAY)
- REMOVAL BY OTHER
- REMOVE FENCE

NOTES:

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STATE OF TEXAS
SAMANTHA L. DELEON
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LICENSED
PROFESSIONAL ENGINEER

Samantha L DeLeon
7/15/2021

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FS 121

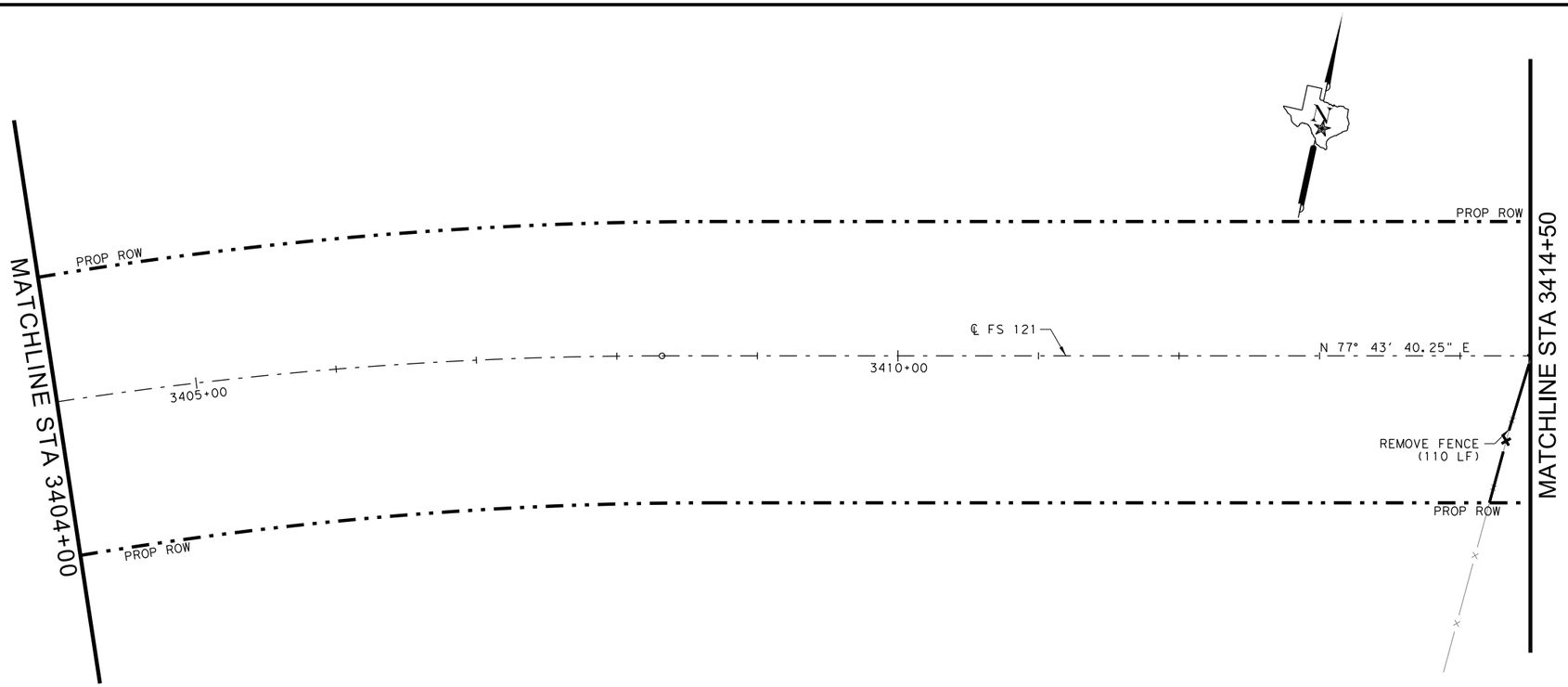
REMOVAL PLAN

STA 3383+00 - STA 3404+00

SCALE: 1" = 100' SHEET 2 OF 13

STATE		HIGHWAY NO.
TEXAS		FS 121

STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	93



HORIZONTAL
50 0 50 100
SCALE IN FEET

LEGEND

- EXCAVATION (ROADWAY)
- REMOVAL BY OTHER
- REMOVE FENCE

NOTES:

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2. SEE STOCK TANK DETAILS FOR ADDITIONAL INFORMATION

STATE OF TEXAS
SAMANTHA L. DELEON
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PROFESSIONAL ENGINEER

Samantha L DeLeon
7/15/2021

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FS 121

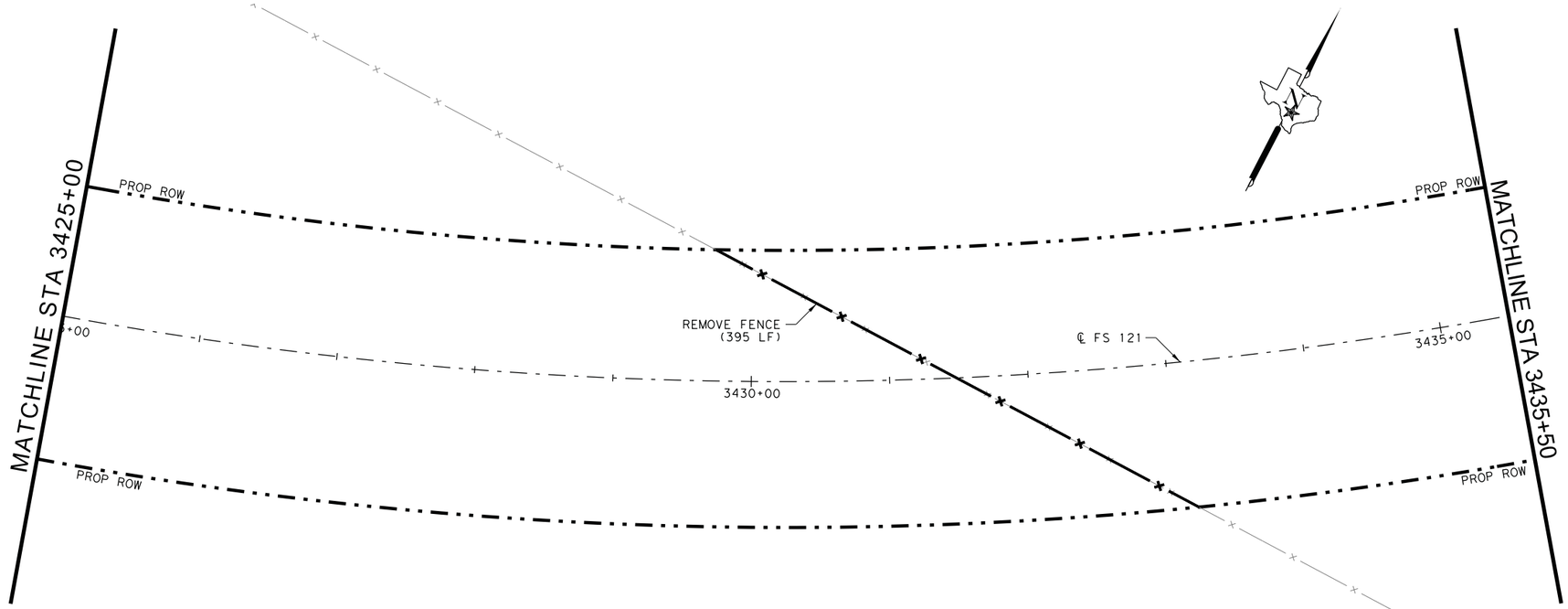
REMOVAL PLAN

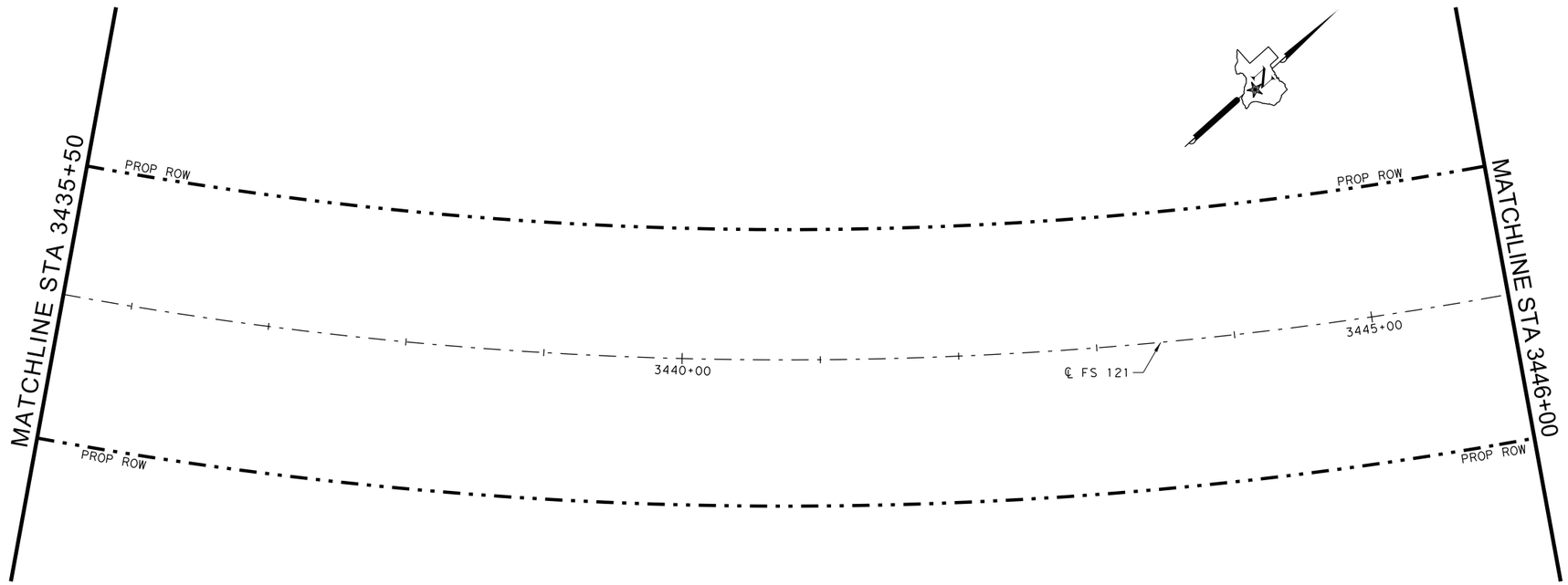
STA 3404+00 - STA 3425+00

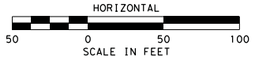
SCALE: 1" = 100' SHEET 3 OF 13

STATE		HIGHWAY NO.
TEXAS		FS 121

STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	94







LEGEND

- EXCAVATION (ROADWAY)
- REMOVAL BY OTHER
- REMOVE FENCE

NOTES:

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Samantha L DeLeon

7/15/2021

DATE	BY	REV	REVISION

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FS 121

REMOVAL PLAN

STA 3425+00 - STA 3446+00

SCALE: 1" = 100'

STATE		HIGHWAY NO.
TEXAS		FS 121

STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	95

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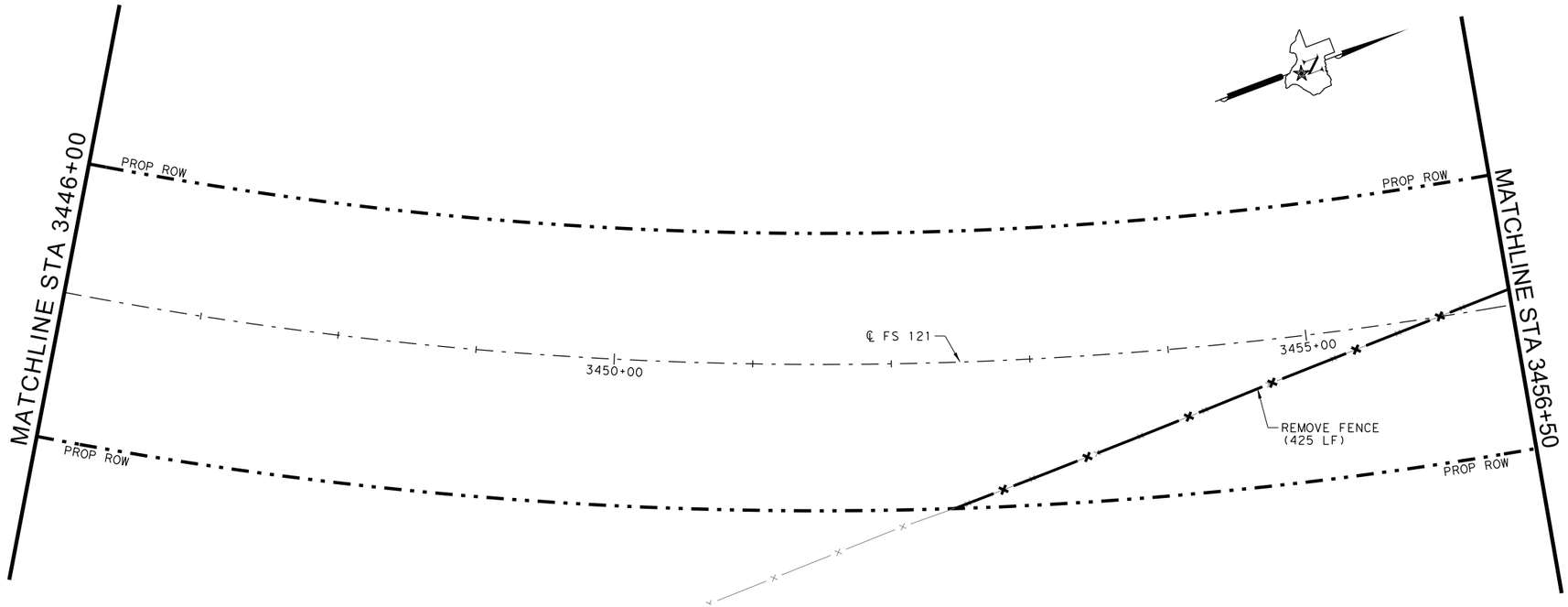

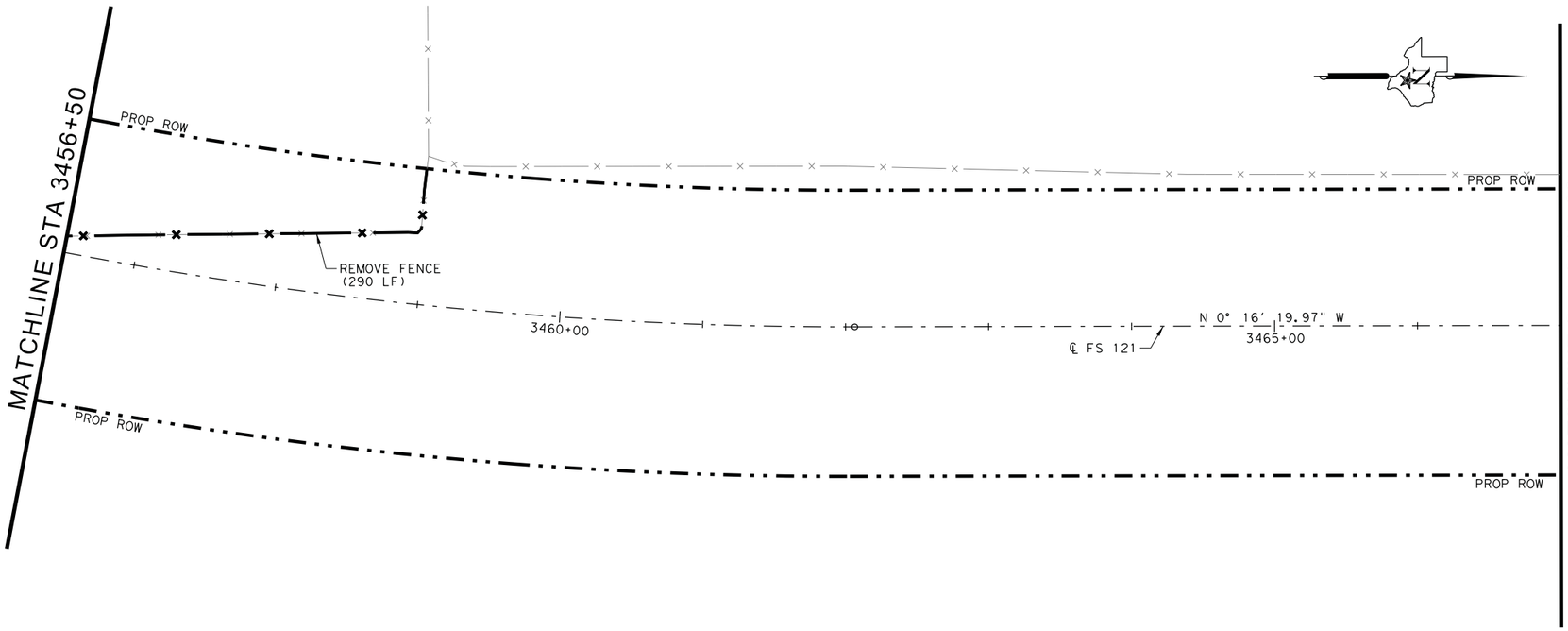

HORIZONTAL
50 0 50 100
SCALE IN FEET

LEGEND

- EXCAVATION (ROADWAY)
- REMOVAL BY OTHER
- REMOVE FENCE

NOTES:

1. ROADWAY EXCAVATION QUANTITIES ARE INCLUDED IN THE EARTHWORK SUMMARY SHEET
2. SEE STOCK TANK DETAILS FOR ADDITIONAL INFORMATION

STATE OF TEXAS
SAMANTHA L. DELEON
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Samantha DeLeon
7/15/2021

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FS 121

REMOVAL PLAN

STA 3446+00 - STA 3467+00

SCALE: 1" = 100' SHEET 5 OF 13

STATE		HIGHWAY NO.
TEXAS		FS 121

STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	96

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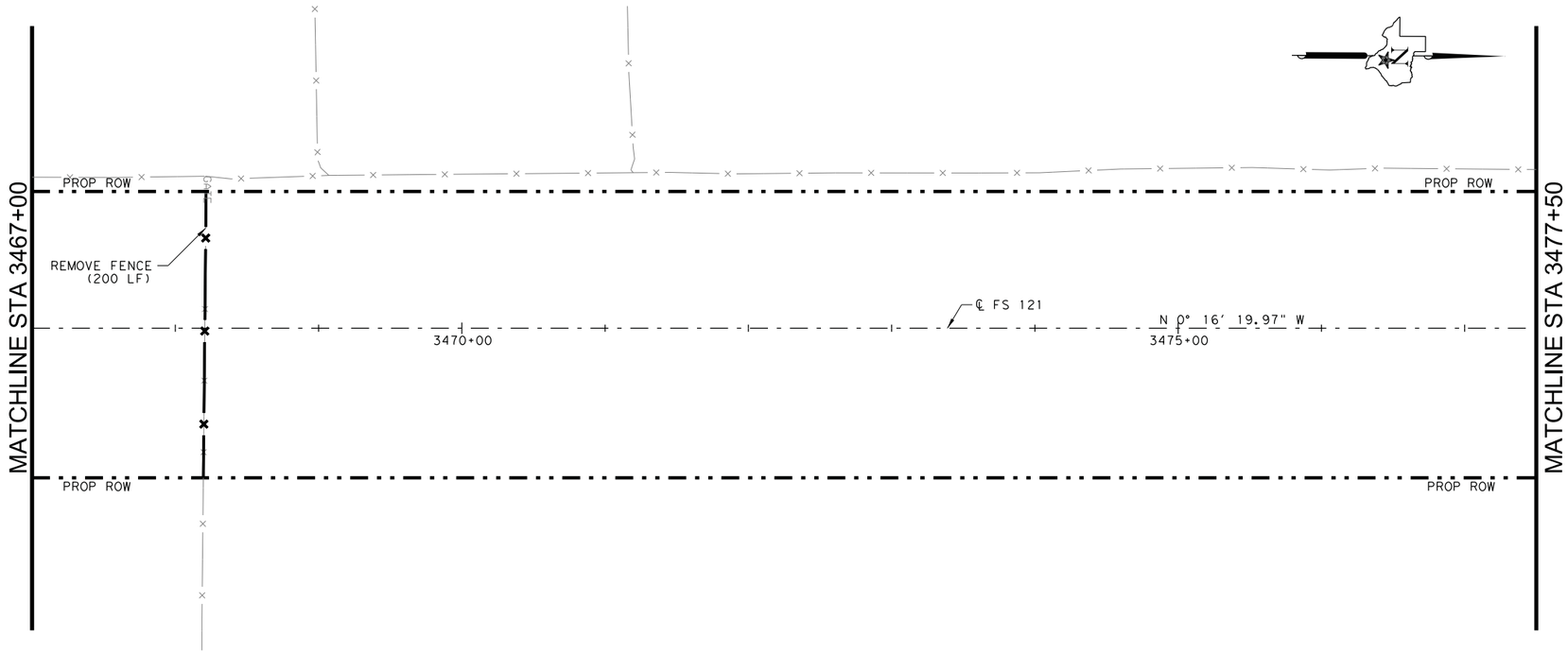

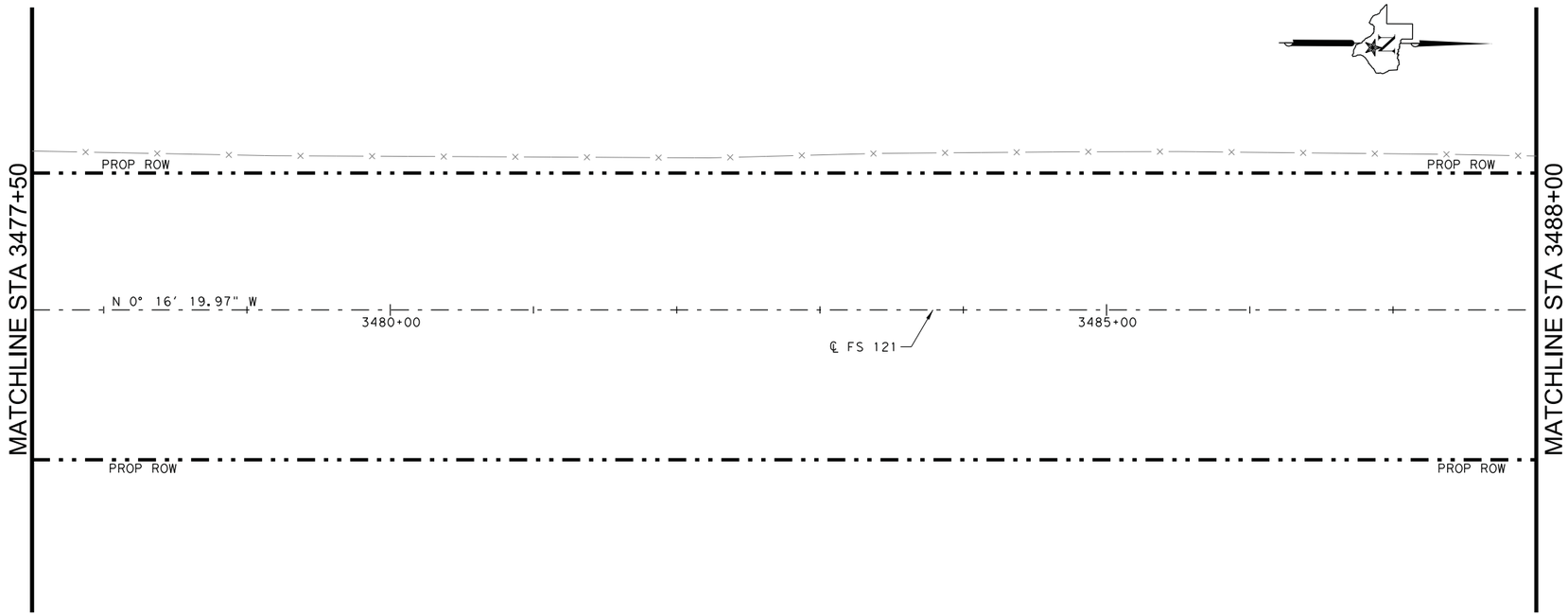

HORIZONTAL
50 0 50 100
SCALE IN FEET

LEGEND

- EXCAVATION (ROADWAY)
- REMOVAL BY OTHER
- REMOVE FENCE

NOTES:

1. ROADWAY EXCAVATION QUANTITIES ARE INCLUDED IN THE EARTHWORK SUMMARY SHEET
2. SEE STOCK TANK DETAILS FOR ADDITIONAL INFORMATION

STATE OF TEXAS
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FS 121

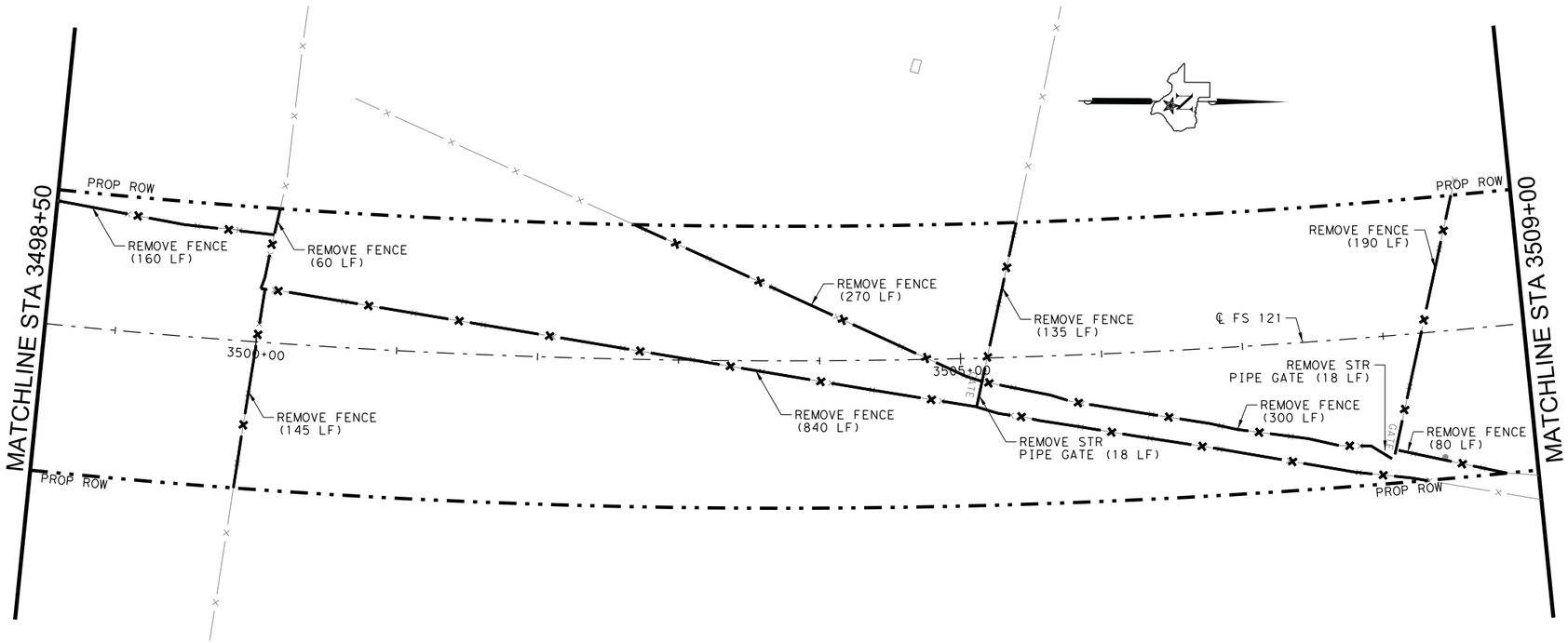
REMOVAL PLAN

STA 3467+00 - STA 3488+00

SCALE: 1" = 100' SHEET 6 OF 13

STATE		HIGHWAY NO.
TEXAS		FS 121

STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	97



HORIZONTAL
50 0 50 100
SCALE IN FEET

LEGEND

- EXCAVATION (ROADWAY)
- REMOVAL BY OTHER
- REMOVE FENCE

NOTES:

1. ROADWAY EXCAVATION QUANTITIES ARE INCLUDED IN THE EARTHWORK SUMMARY SHEET
2. SEE STOCK TANK DETAILS FOR ADDITIONAL INFORMATION

STATE OF TEXAS
SAMANTHA L. DELEON
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7/15/2021

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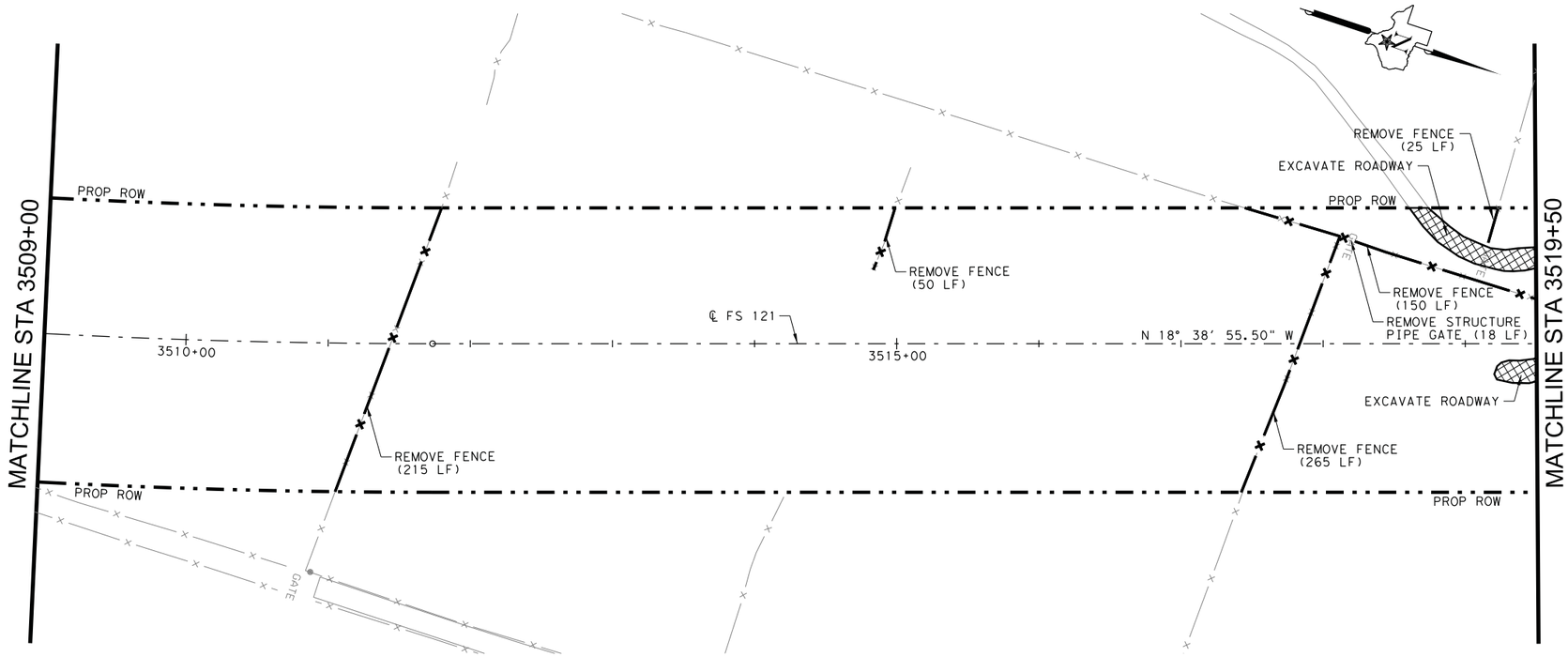
FS 121

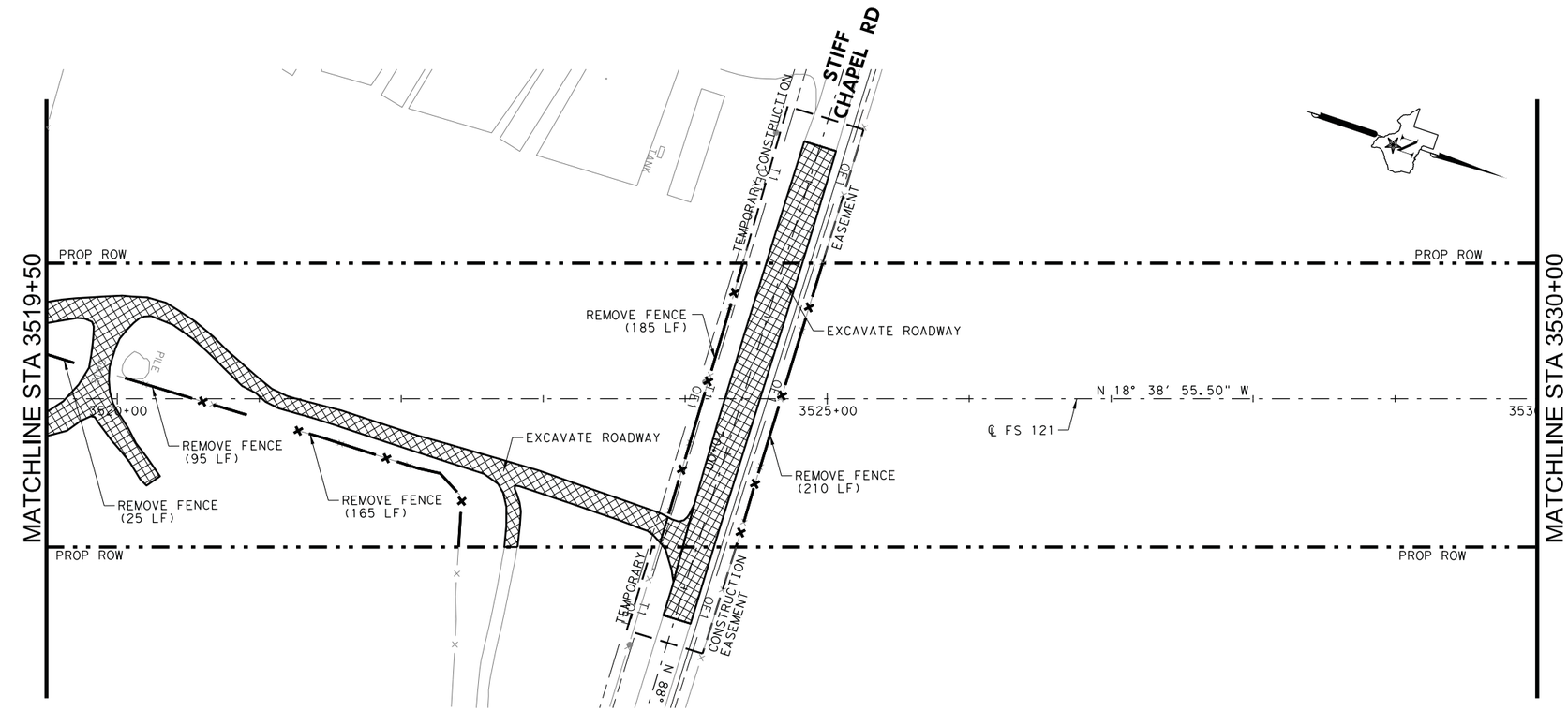
REMOVAL PLAN

STA 3488+00 - STA 3509+00

SCALE: 1" = 100' SHEET 7 OF 13

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	98





HORIZONTAL
50 0 50 100
SCALE IN FEET

LEGEND

- EXCAVATION (ROADWAY)
- REMOVAL BY OTHER
- REMOVE FENCE

NOTES:

1. ROADWAY EXCAVATION QUANTITIES ARE INCLUDED IN THE EARTHWORK SUMMARY SHEET
2. SEE STOCK TANK DETAILS FOR ADDITIONAL INFORMATION

STATE OF TEXAS
SAMANTHA L. DELEON
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7/15/2021

DATE	BY	REV	REVISION

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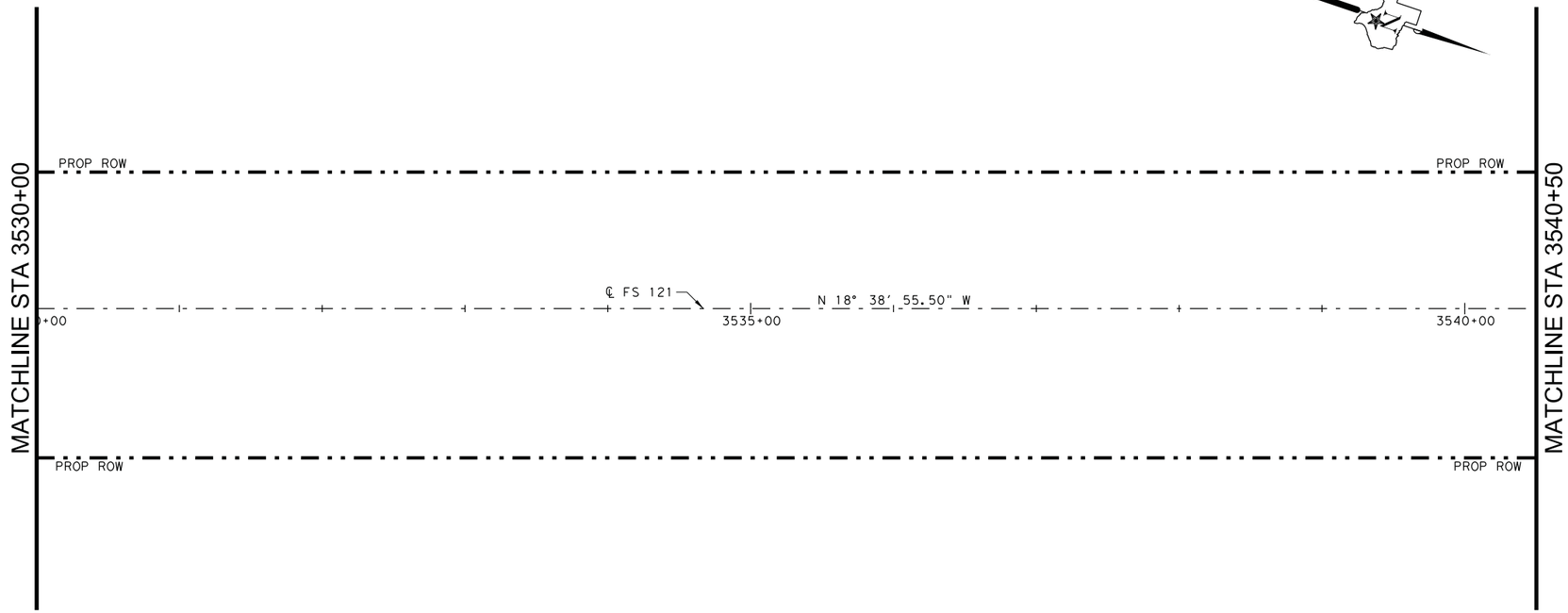
FS 121

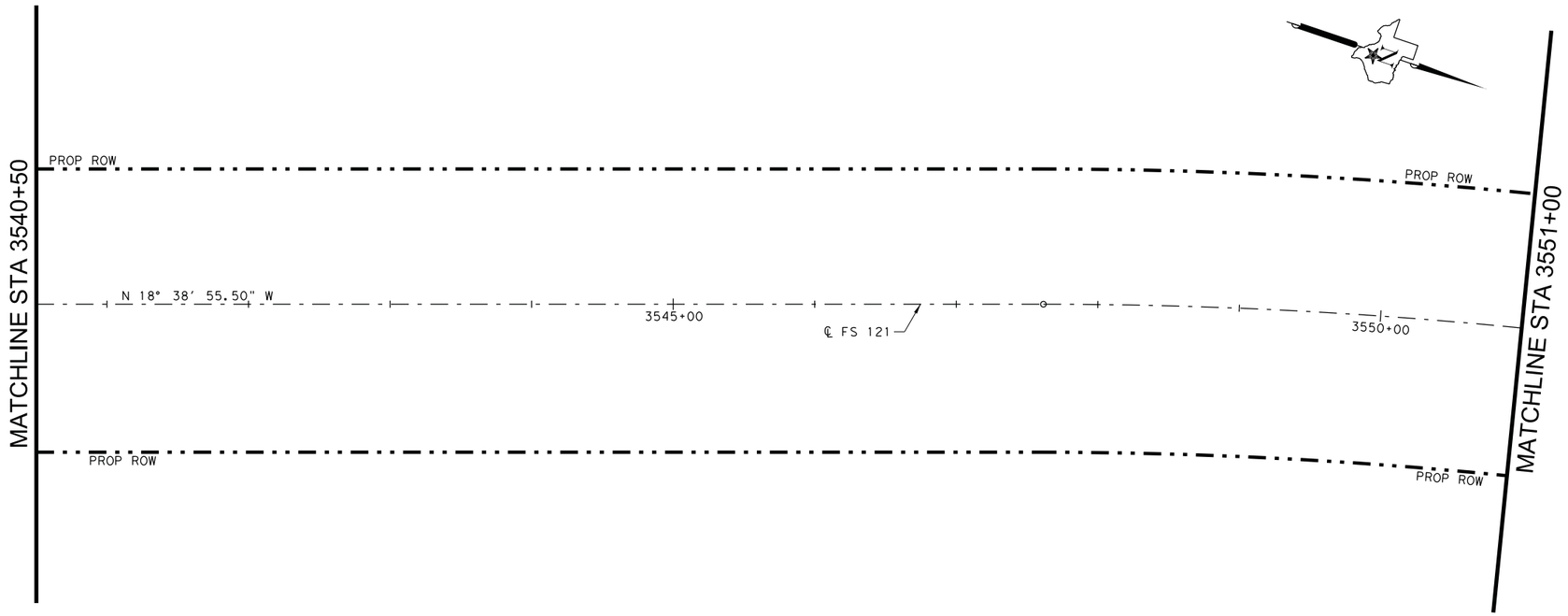
REMOVAL PLAN

STA 3509+00 - STA 3530+00

SCALE: 1" = 100' SHEET 8 OF 13

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	99





HORIZONTAL
50 0 50 100
SCALE IN FEET

LEGEND

- EXCAVATION (ROADWAY)
- REMOVAL BY OTHER
- REMOVE FENCE

NOTES:

1. ROADWAY EXCAVATION QUANTITIES ARE INCLUDED IN THE EARTHWORK SUMMARY SHEET
2. SEE STOCK TANK DETAILS FOR ADDITIONAL INFORMATION

STATE OF TEXAS
SAMANTHA L. DELEON
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Samantha DeLeon
7/15/2021

DATE	BY	REV	REVISION

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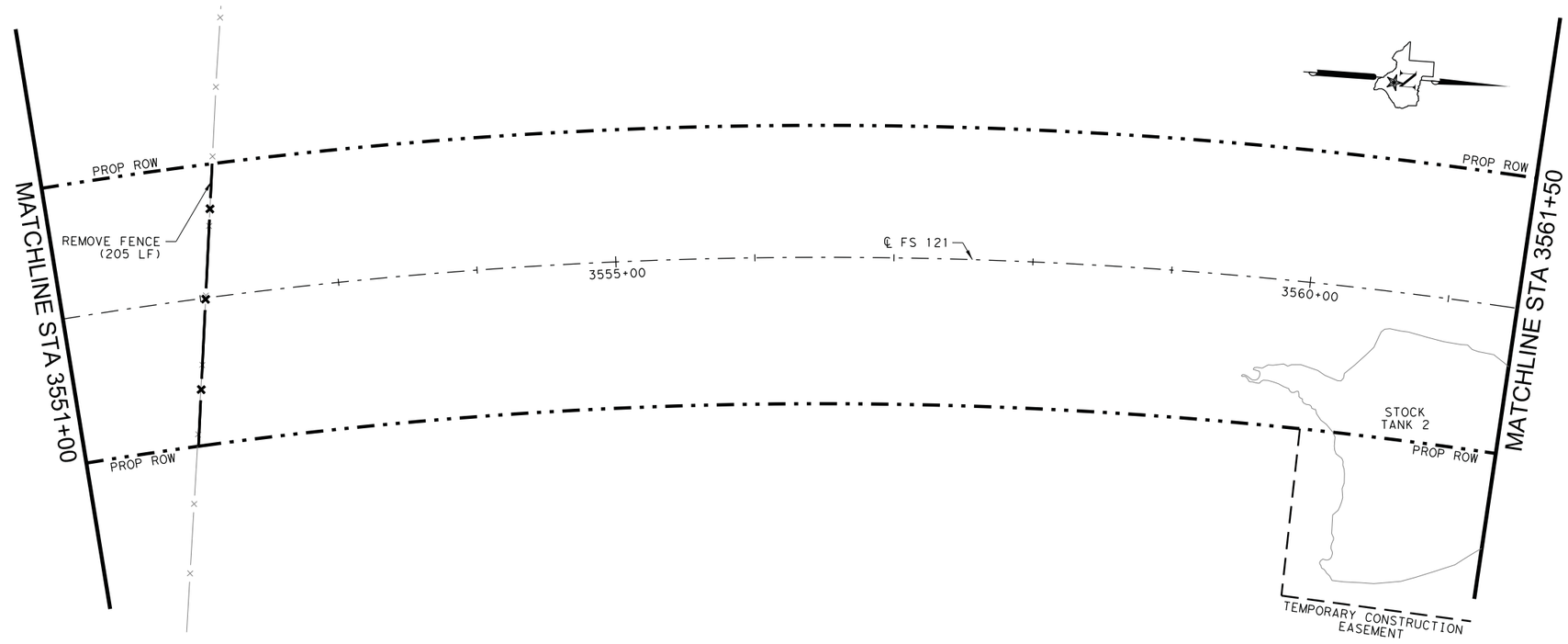
FS 121

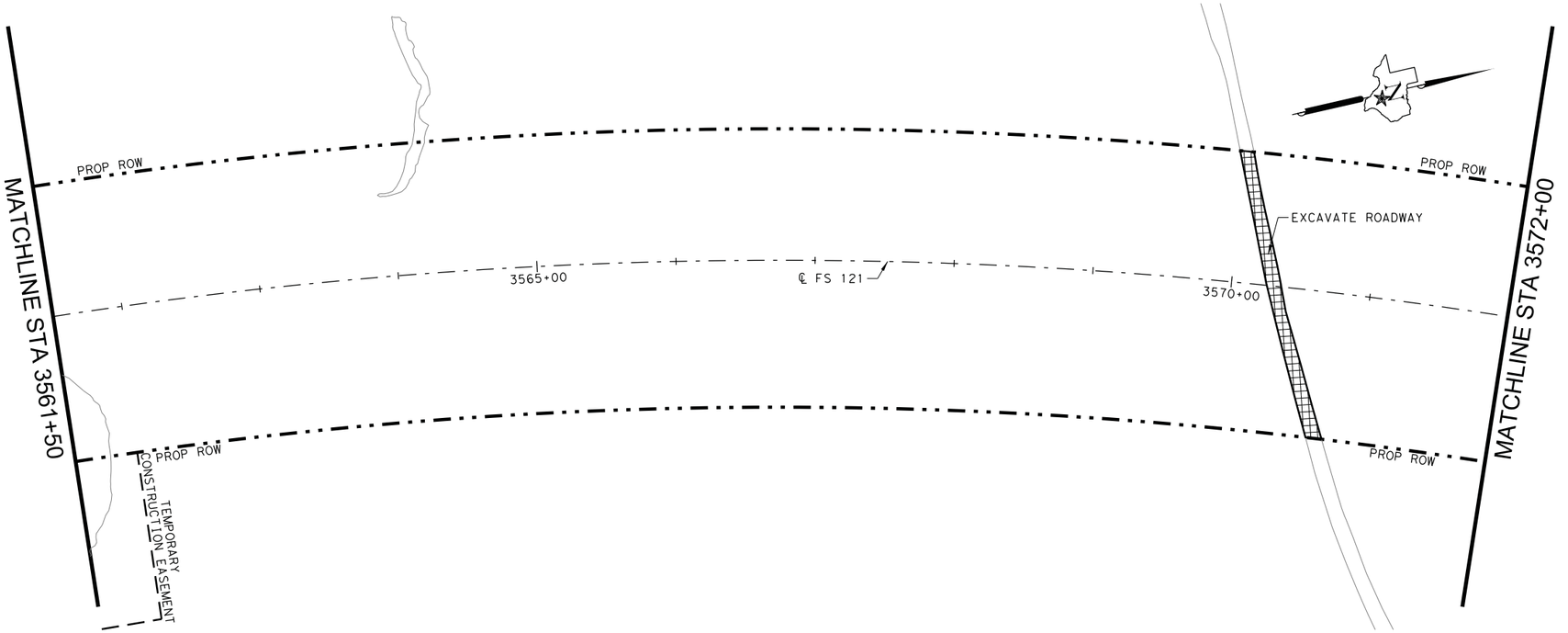
REMOVAL PLAN

STA 3530+00 - STA 3551+00

SCALE: 1" = 100' SHEET 9 OF 13

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	100





HORIZONTAL
50 0 50 100
SCALE IN FEET

LEGEND

- EXCAVATION (ROADWAY)
- REMOVAL BY OTHER
- REMOVE FENCE

NOTES:

1. ROADWAY EXCAVATION QUANTITIES ARE INCLUDED IN THE EARTHWORK SUMMARY SHEET
2. SEE STOCK TANK DETAILS FOR ADDITIONAL INFORMATION

STATE OF TEXAS
SAMANTHA L. DELEON
136439
LICENSED
PROFESSIONAL ENGINEER

Samantha L DeLeon
7/15/2021

DATE	BY	REV	REVISION

BGE, Inc.
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TBPE Registration No. F-1046

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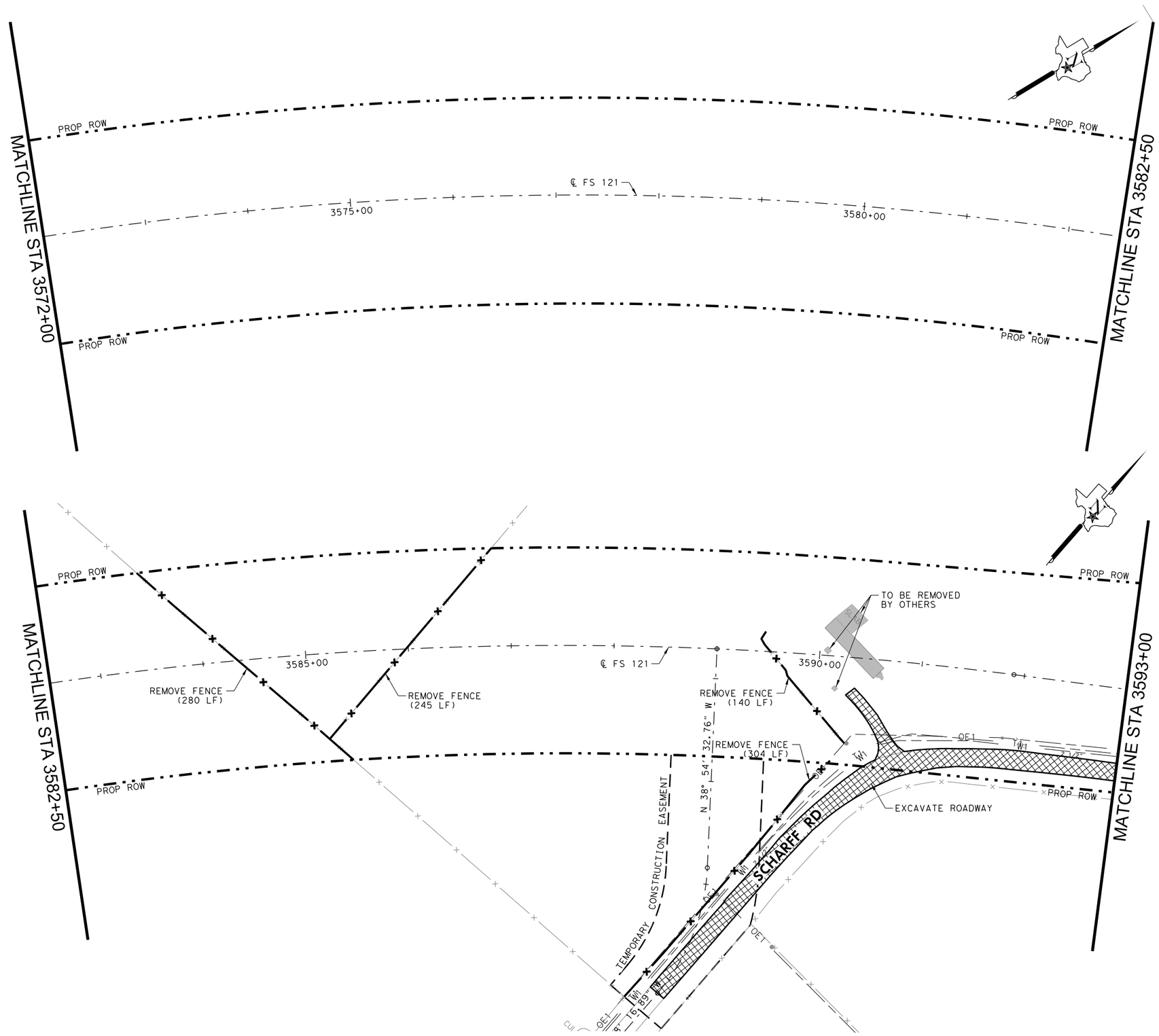
FS 121

REMOVAL PLAN

STA 3551+00 - STA 3572+00

SCALE: 1" = 100' SHEET 10 OF 13

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	101



HORIZONTAL
50 0 50 100
SCALE IN FEET

LEGEND

- EXCAVATION (ROADWAY)
- REMOVAL BY OTHER
- REMOVE FENCE

NOTES:

1. ROADWAY EXCAVATION QUANTITIES ARE INCLUDED IN THE EARTHWORK SUMMARY SHEET
2. SEE STOCK TANK DETAILS FOR ADDITIONAL INFORMATION

STATE OF TEXAS
SAMANTHA L. DELEON
136439
LICENSED
PROFESSIONAL ENGINEER

Samantha DeLeon
7/15/2021

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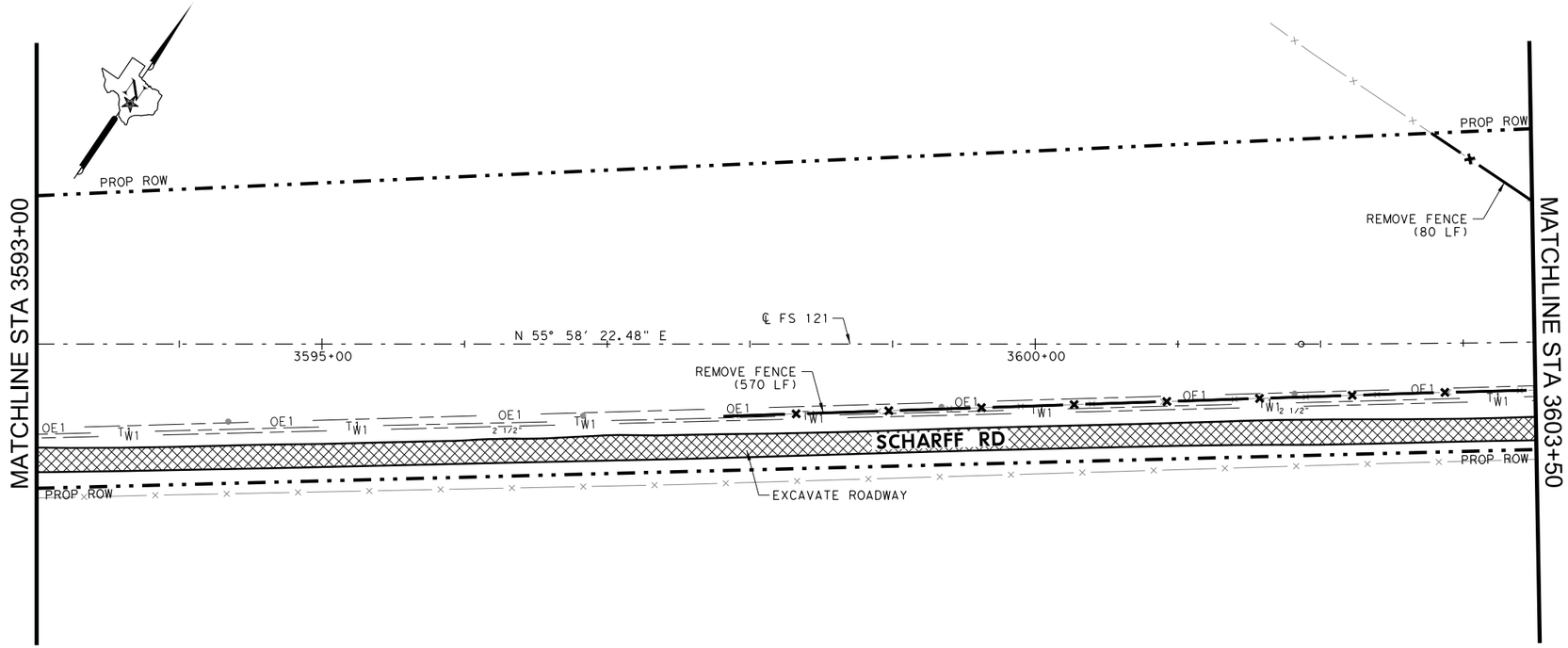
FS 121

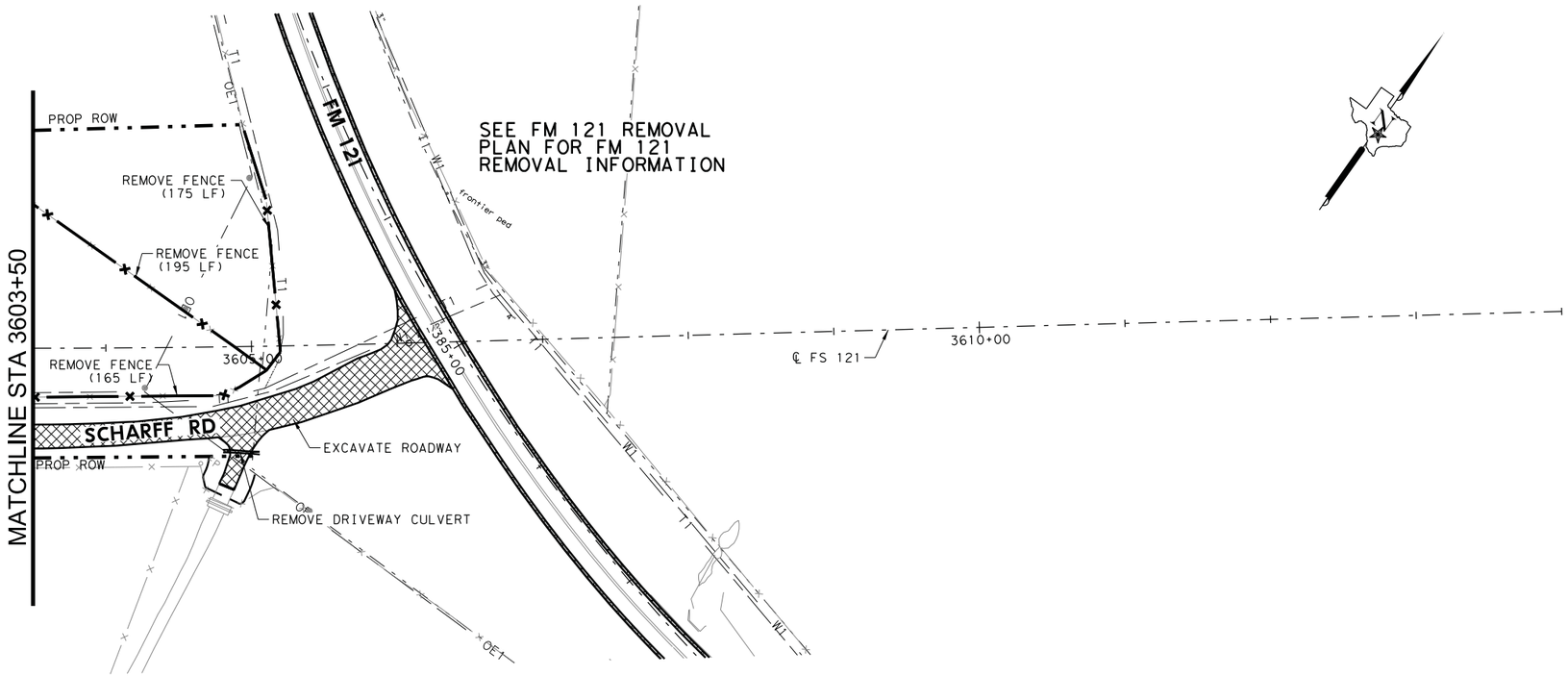
REMOVAL PLAN

STA 3572+00 - STA 3593+00

SCALE: 1" = 100' SHEET 11 OF 13

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	102





HORIZONTAL
50 0 50 100
SCALE IN FEET

LEGEND

- EXCAVATION (ROADWAY)
- REMOVAL BY OTHER
- REMOVE FENCE

NOTES:

1. ROADWAY EXCAVATION QUANTITIES ARE INCLUDED IN THE EARTHWORK SUMMARY SHEET
2. SEE STOCK TANK DETAILS FOR ADDITIONAL INFORMATION
3. REMOVAL OF DRIVEWAY CULVERT AND END TREATMENTS IS SUBSIDIARY TO ITEM 0496 6050

STATE OF TEXAS
SAMANTHA L. DELEON
136439
LICENSED
PROFESSIONAL ENGINEER

Samantha DeLeon
7/15/2021

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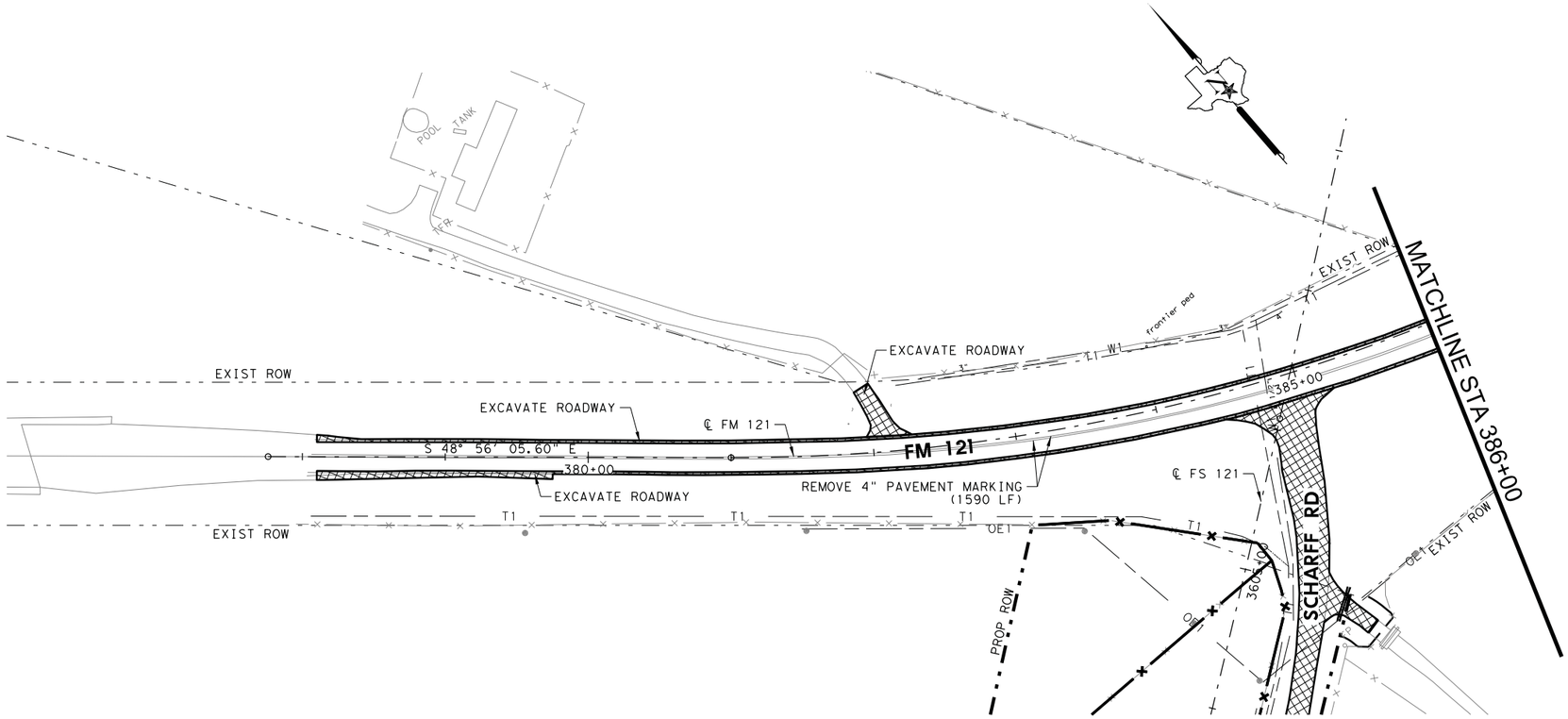
FS 121

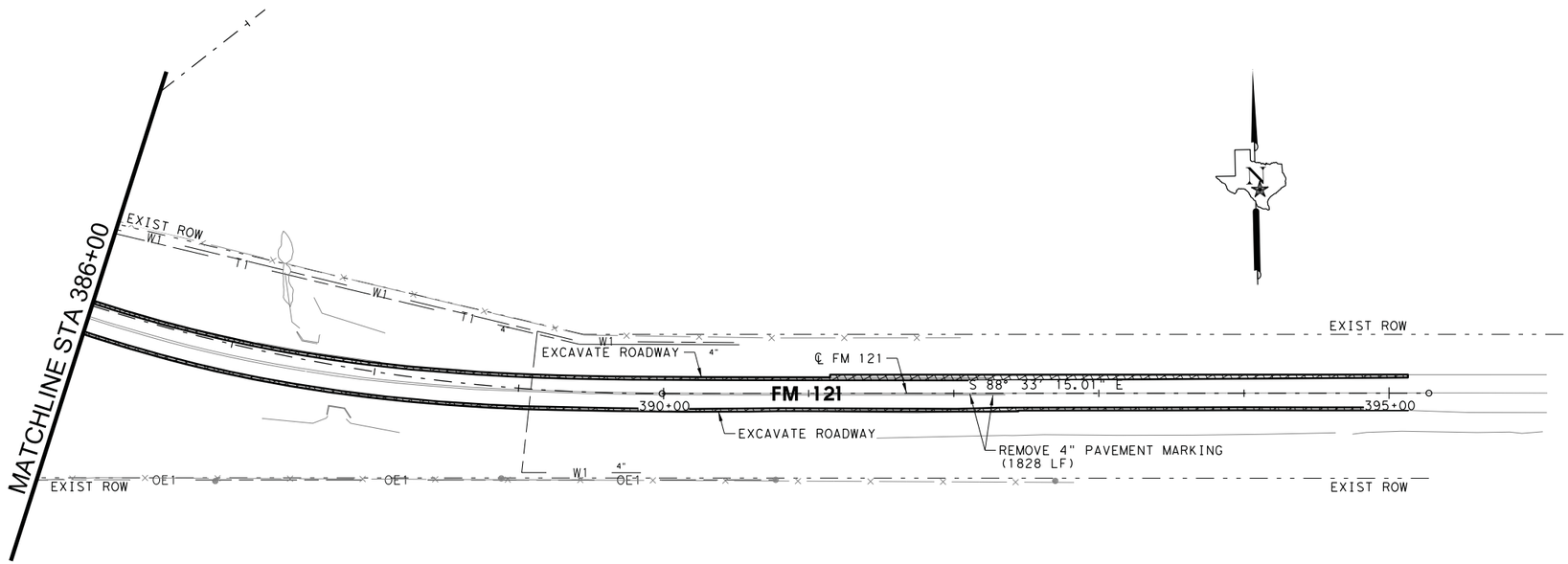
REMOVAL PLAN

STA 3593+00 - END

SCALE: 1" = 100'

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	103





HORIZONTAL
50 0 50 100
SCALE IN FEET

LEGEND

- EXCAVATION (ROADWAY)
- REMOVAL BY OTHER
- REMOVE FENCE

NOTES:

1. ROADWAY EXCAVATION QUANTITIES ARE INCLUDED IN THE EARTHWORK SUMMARY SHEET
2. SEE STOCK TANK DETAILS FOR ADDITIONAL INFORMATION

STATE OF TEXAS
SAMANTHA L. DELEON
136439
LICENSED
PROFESSIONAL ENGINEER

Samantha DeLeon
7/15/2021

DATE	BY	REV	REVISION

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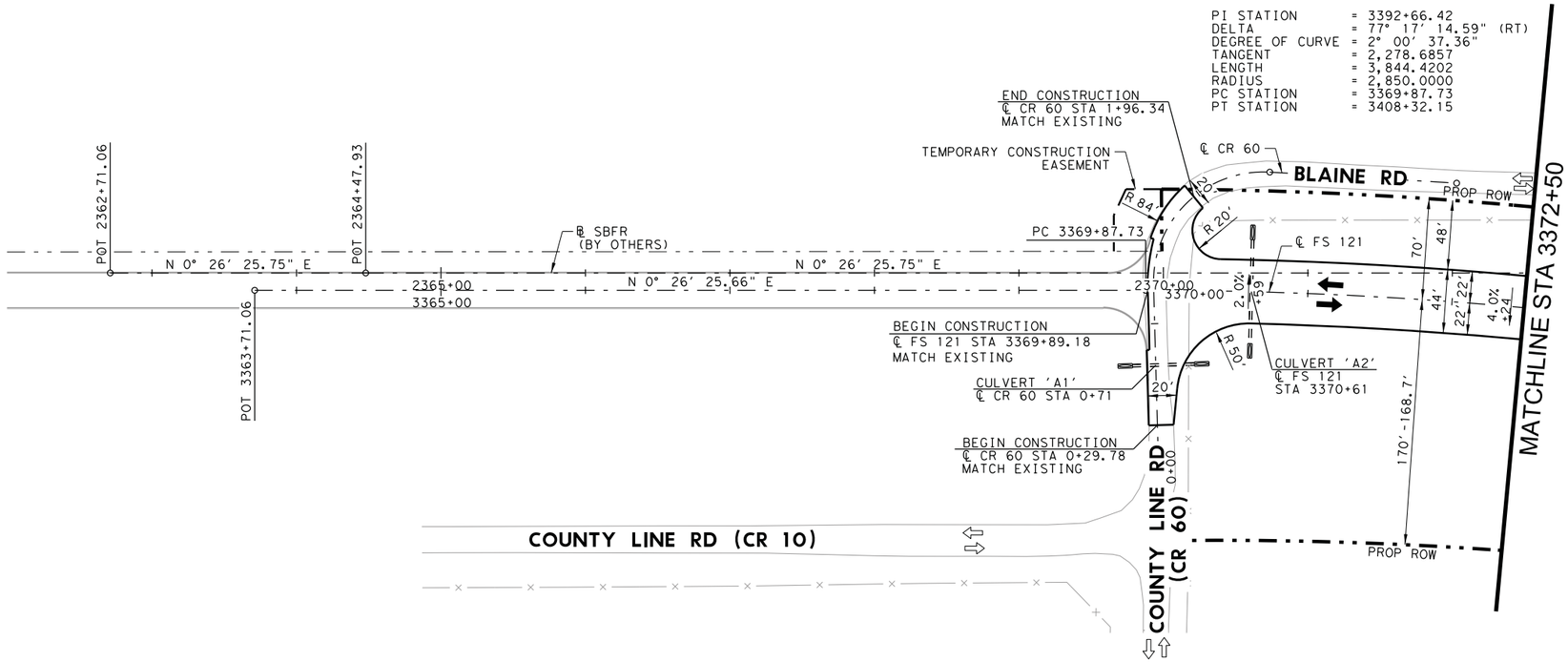
FS 121

REMOVAL PLAN

FM 121

SCALE: 1" = 100' SHEET 13 OF 13

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	104



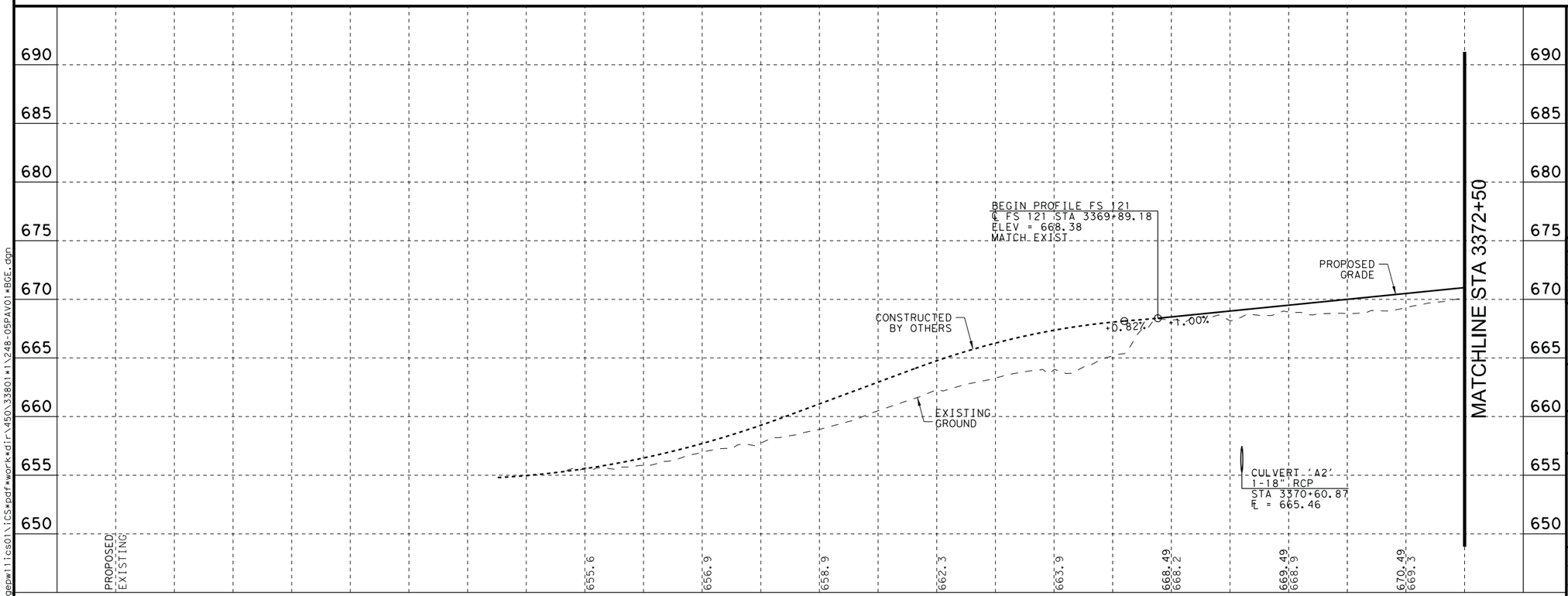
HORIZONTAL
50 0 50 100
VERTICAL
5 0 5 10
SCALE IN FEET

LEGEND

- EXISTING ROW
- PROPOSED ROW
- TEMPORARY CONSTRUCTION EASEMENT
- ALIGN_# CURVE ID
- EXIST TRAFFIC LANE
- PROP TRAFFIC LANE
- # DRIVEWAY #

NOTES:

1. ALL CALLOUTS REFER TO EDGE OF SHOULDER UNLESS OTHERWISE NOTED
2. SEE TYPICAL SECTION SHEETS FOR ADDITIONAL INFORMATION
3. SEE HORIZONTAL ALIGNMENT DATA SHEETS FOR ADDITIONAL INFORMATION
4. SEE STOCK TANK DETAILS FOR ADDITIONAL INFORMATION
5. USE BUTT JOINT WHERE PROPOSED PAVEMENT TIES TO EXISTING PAVEMENT. DETAIL SHOWN ON TYPICAL SECTIONS



ASHLEY C. BEYER
130809
LICENSED PROFESSIONAL ENGINEER
7/15/2021

DATE	BY	REV	REVISION

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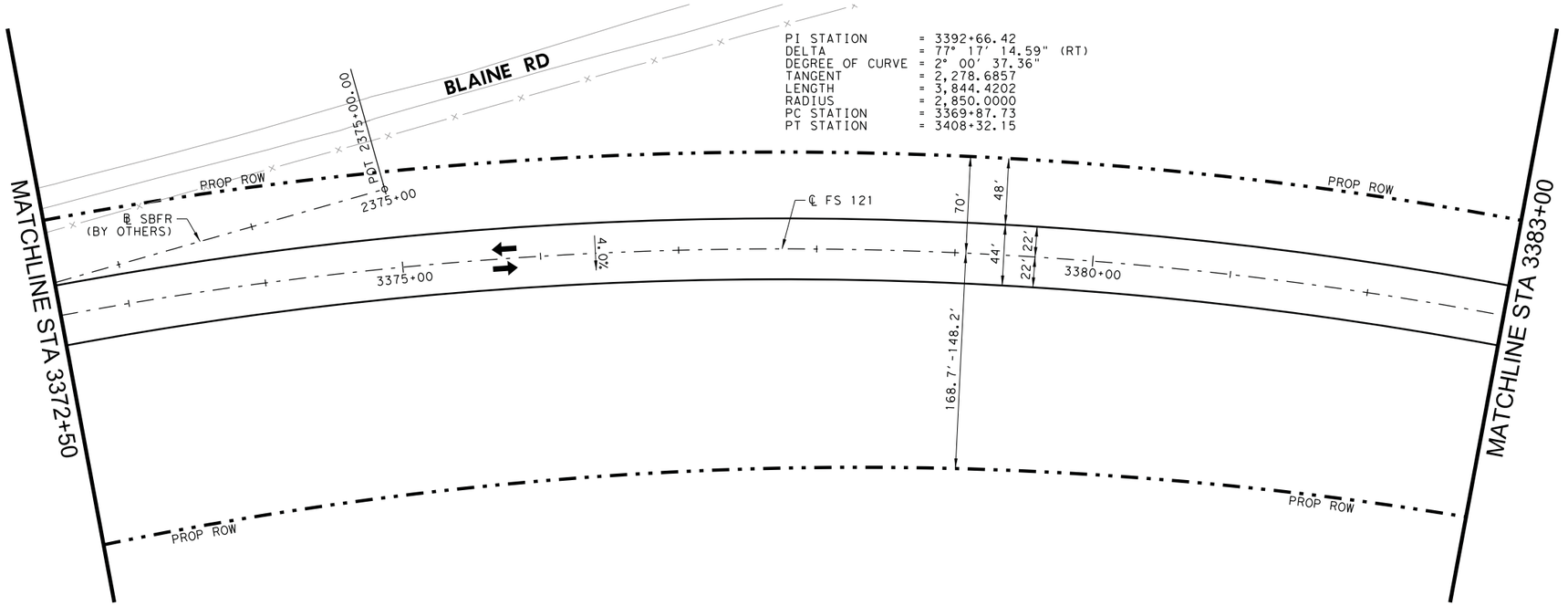
FS 121

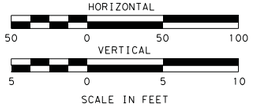
ROADWAY PLAN & PROFILE

BEGIN - STA 3372+50

SCALE: H:1"=100' V:1"=10' SHEET 1 OF 24

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	105



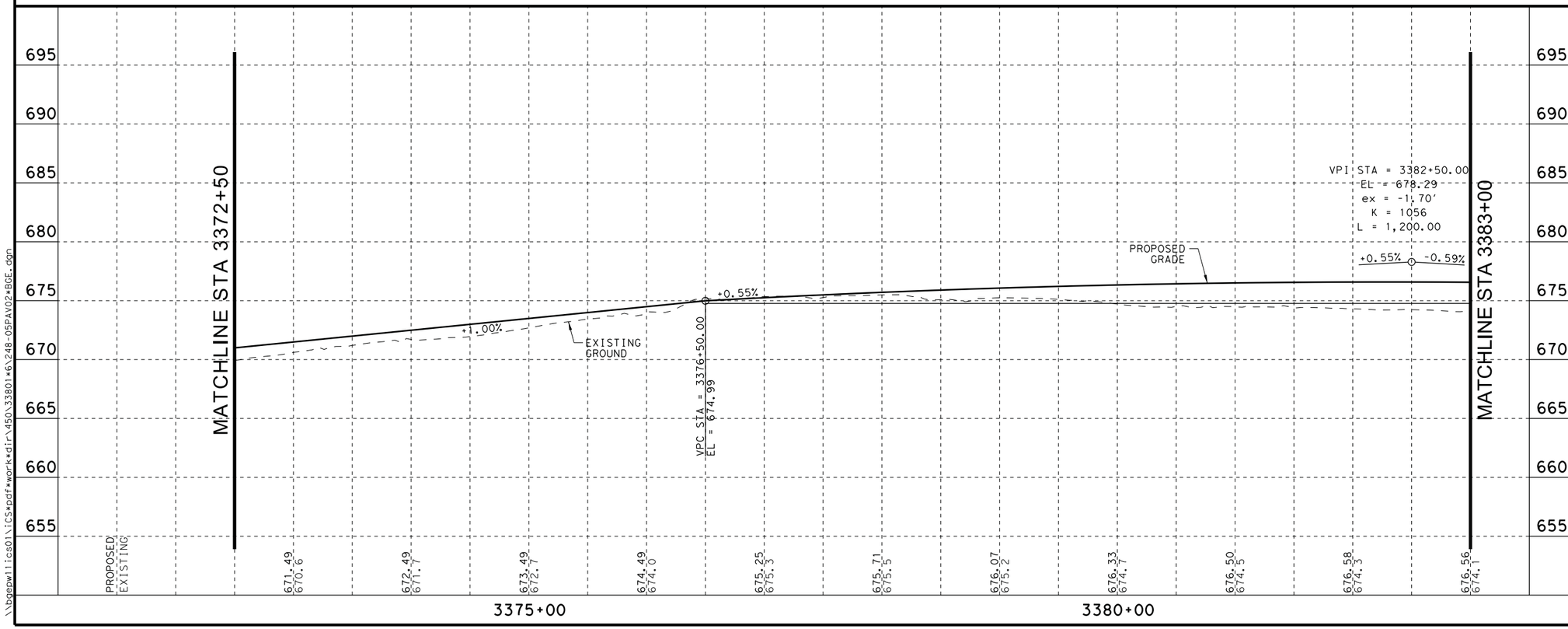


LEGEND

- EXISTING ROW
- PROPOSED ROW
- TEMPORARY CONSTRUCTION EASEMENT
- (ALIGN_#) CURVE ID
- EXIST TRAFFIC LANE
- PROP TRAFFIC LANE
- (#) DRIVEWAY #

NOTES:

1. ALL CALLOUTS REFER TO EDGE OF SHOULDER UNLESS OTHERWISE NOTED
2. SEE TYPICAL SECTION SHEETS FOR ADDITIONAL INFORMATION
3. SEE HORIZONTAL ALIGNMENT DATA SHEETS FOR ADDITIONAL INFORMATION
4. SEE STOCK TANK DETAILS FOR ADDITIONAL INFORMATION
5. USE BUTT JOINT WHERE PROPOSED PAVEMENT TIES TO EXISTING PAVEMENT. DETAIL SHOWN ON TYPICAL SECTIONS



DATE	BY	REV	REVISION

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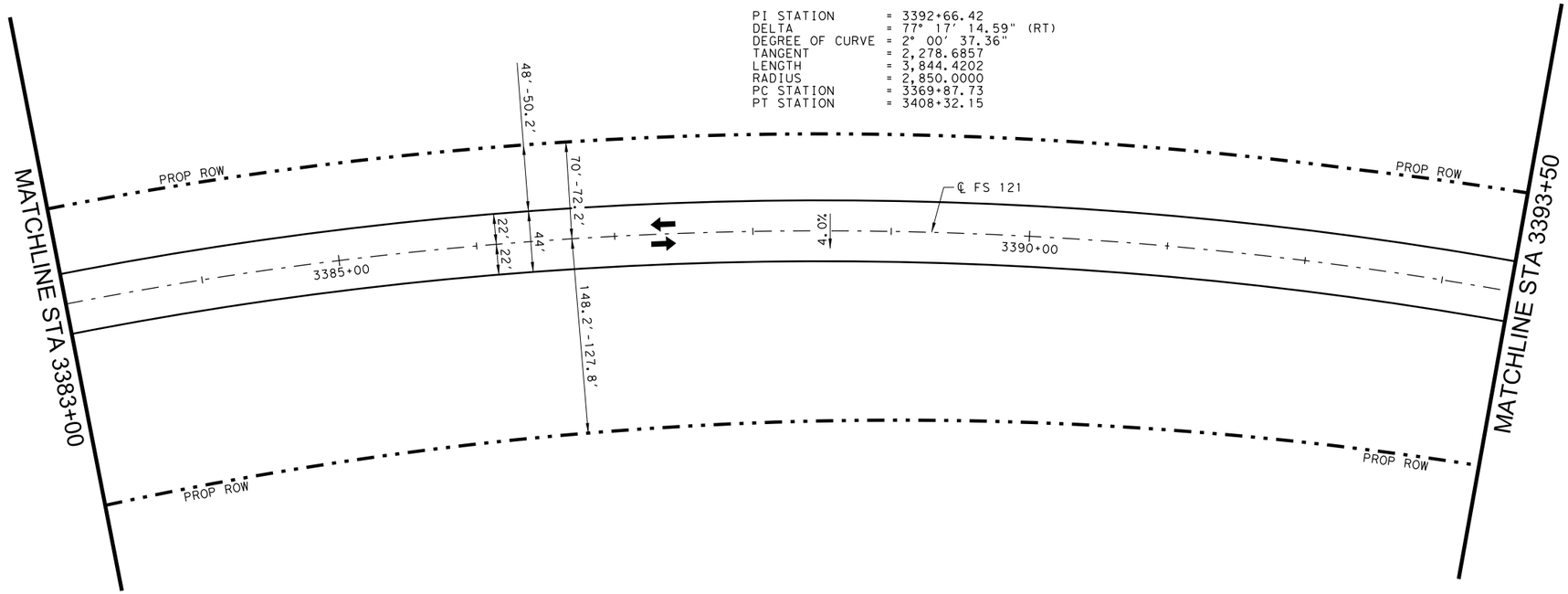
FS 121

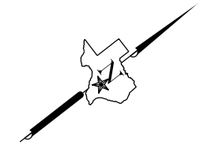
ROADWAY PLAN & PROFILE

STA 3372+50 - STA 3383+00

SCALE: H:1"=100'V:1" = 10' SHEET 2 OF 24

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	106





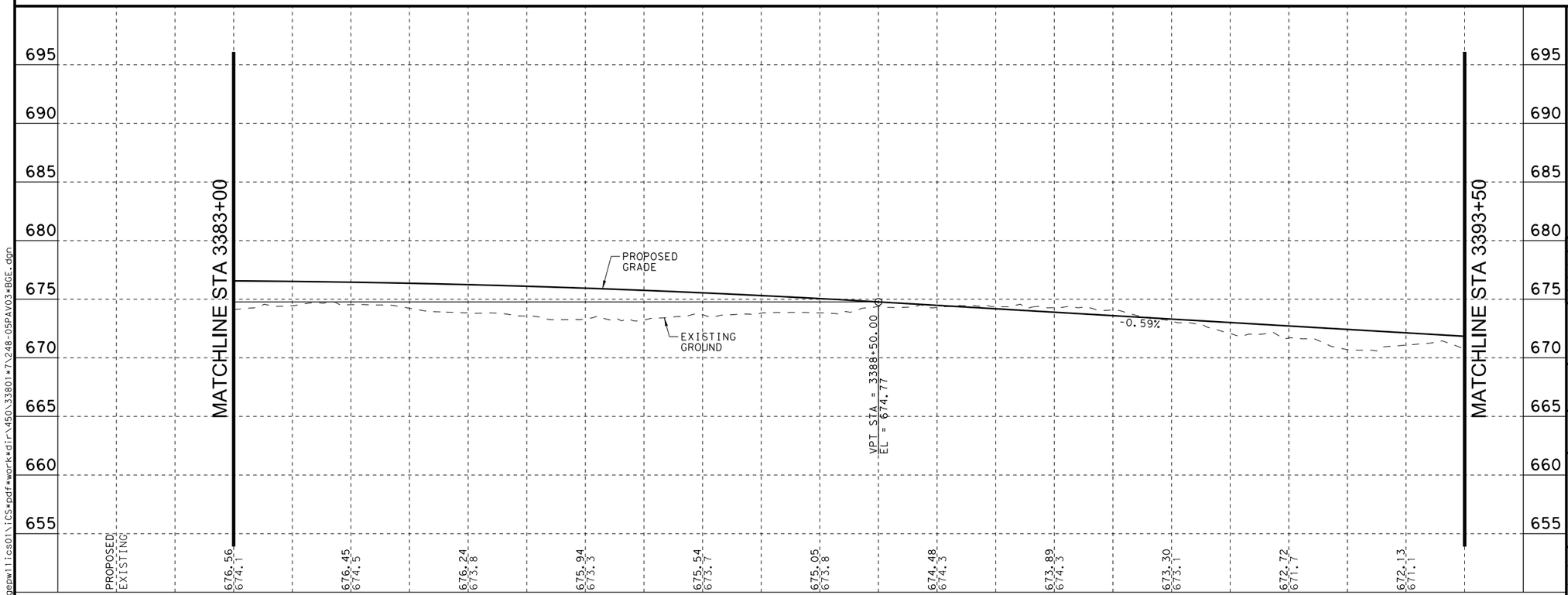
HORIZONTAL
50 0 50 100
VERTICAL
5 0 5 10
SCALE IN FEET

LEGEND

- EXISTING ROW
- PROPOSED ROW
- TEMPORARY CONSTRUCTION EASEMENT
- ALIGN_# CURVE ID
- EXIST TRAFFIC LANE
- PROP TRAFFIC LANE
- # DRIVEWAY #

NOTES:

1. ALL CALLOUTS REFER TO EDGE OF SHOULDER UNLESS OTHERWISE NOTED
2. SEE TYPICAL SECTION SHEETS FOR ADDITIONAL INFORMATION
3. SEE HORIZONTAL ALIGNMENT DATA SHEETS FOR ADDITIONAL INFORMATION
4. SEE STOCK TANK DETAILS FOR ADDITIONAL INFORMATION
5. USE BUTT JOINT WHERE PROPOSED PAVEMENT TIES TO EXISTING PAVEMENT. DETAIL SHOWN ON TYPICAL SECTIONS



STATE OF TEXAS
ASHLEY C. BEYER
130809
LICENSED PROFESSIONAL ENGINEER
7/15/2021

DATE	BY	REV	REVISION

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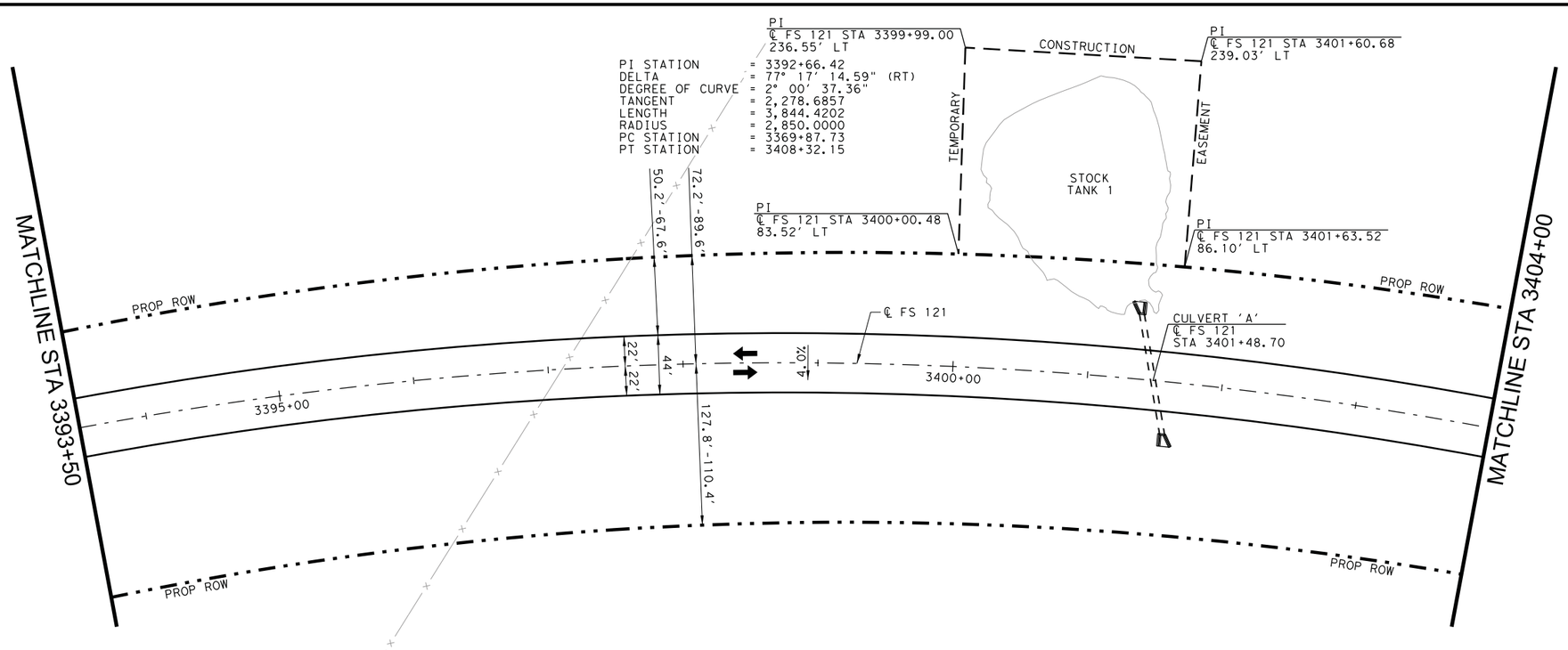
FS 121

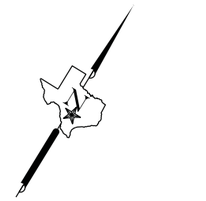
ROADWAY PLAN & PROFILE

STA 3383+00 - STA 3393+50

SCALE: H:1"=100' V:1"=10' SHEET 3 OF 24

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	107



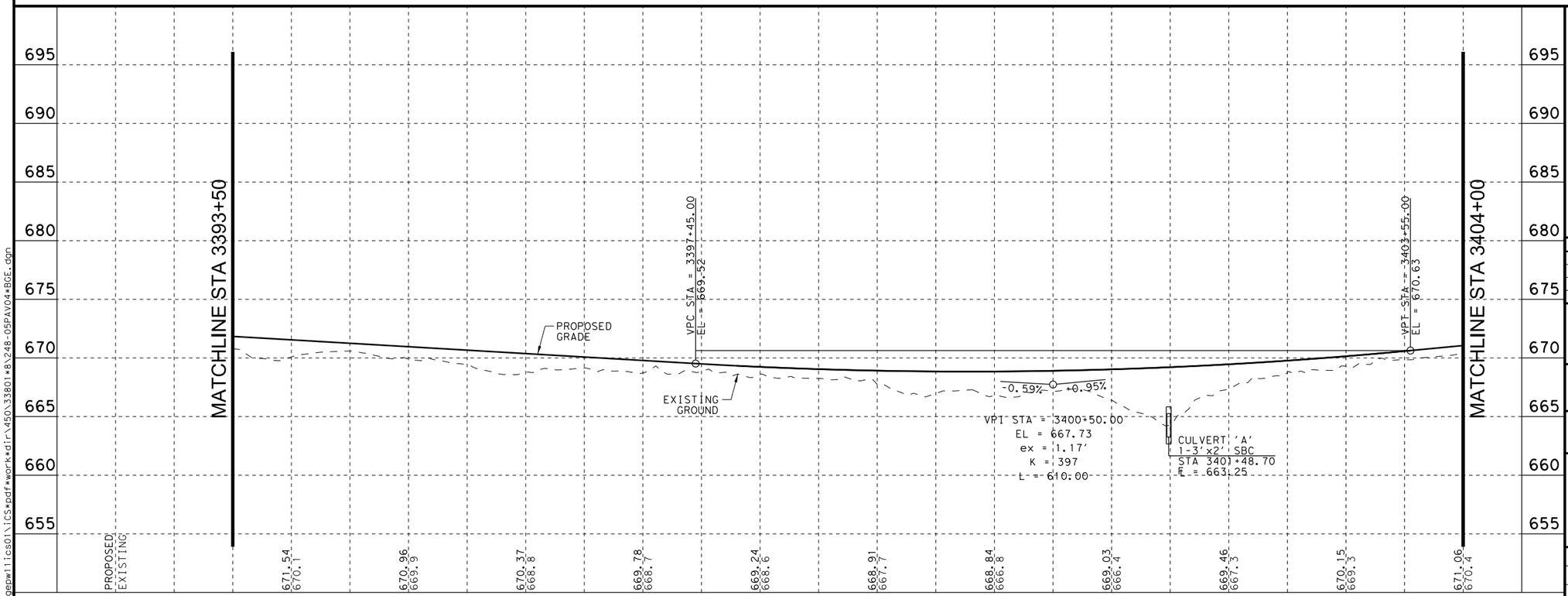


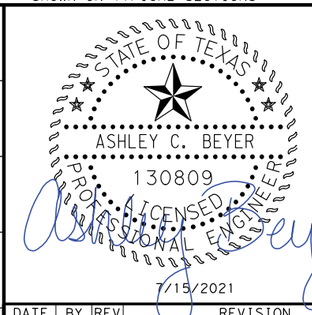
LEGEND

- EXISTING ROW
- PROPOSED ROW
- TEMPORARY CONSTRUCTION EASEMENT
- ALIGN_# — CURVE ID
- EXIST TRAFFIC LANE
- PROP TRAFFIC LANE
- # — DRIVEWAY #

NOTES:

1. ALL CALLOUTS REFER TO EDGE OF SHOULDER UNLESS OTHERWISE NOTED
2. SEE TYPICAL SECTION SHEETS FOR ADDITIONAL INFORMATION
3. SEE HORIZONTAL ALIGNMENT DATA SHEETS FOR ADDITIONAL INFORMATION
4. SEE STOCK TANK DETAILS FOR ADDITIONAL INFORMATION
5. USE BUTT JOINT WHERE PROPOSED PAVEMENT TIES TO EXISTING PAVEMENT. DETAIL SHOWN ON TYPICAL SECTIONS





DATE	BY	REV	REVISION

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FS 121

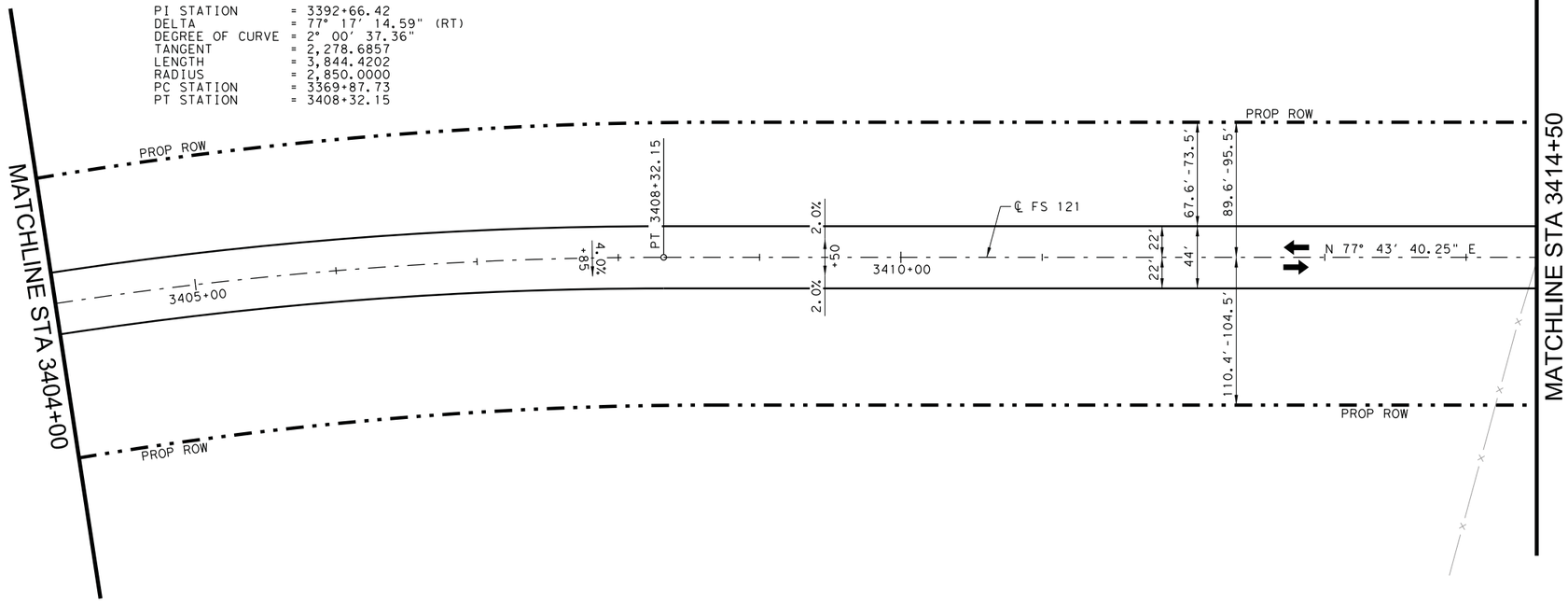
ROADWAY PLAN & PROFILE

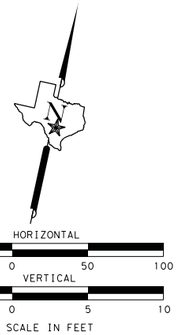
STA 3393+50 - STA 3404+00

SCALE: H:1"=100' V:1"=10' SHEET 4 OF 24

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	108

PI STATION = 3392+66.42
DELTA = 77° 17' 14.59" (RT)
DEGREE OF CURVE = 2° 00' 37.36"
TANGENT = 2,278.6857
LENGTH = 3,844.4202
RADIUS = 2,850.0000
PC STATION = 3369+87.73
PT STATION = 3408+32.15



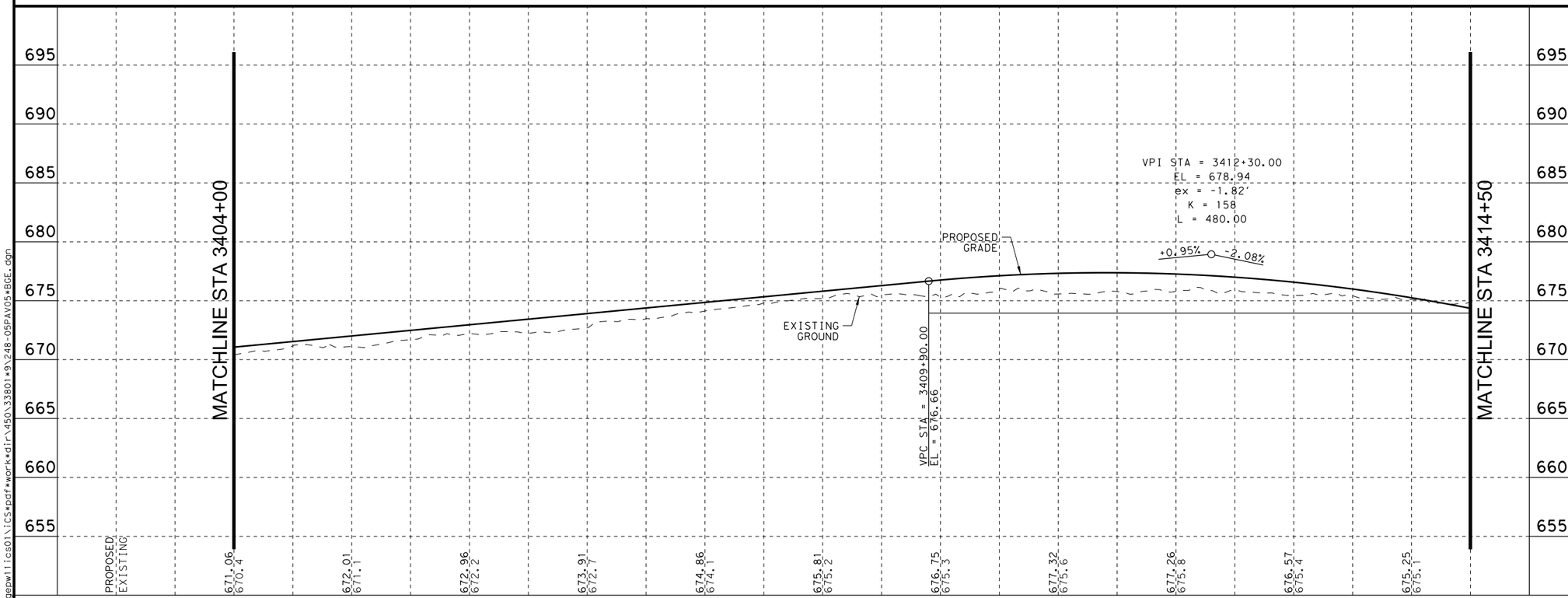


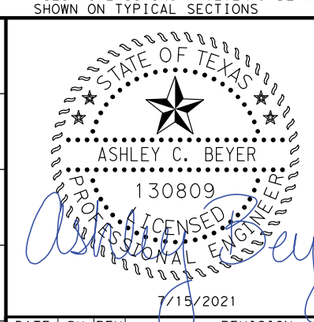
LEGEND

- EXISTING ROW
- PROPOSED ROW
- TEMPORARY CONSTRUCTION EASEMENT
- ALIGN_# — CURVE ID
- EXIST TRAFFIC LANE
- PROP TRAFFIC LANE
- # — DRIVEWAY #

NOTES:

1. ALL CALLOUTS REFER TO EDGE OF SHOULDER UNLESS OTHERWISE NOTED
2. SEE TYPICAL SECTION SHEETS FOR ADDITIONAL INFORMATION
3. SEE HORIZONTAL ALIGNMENT DATA SHEETS FOR ADDITIONAL INFORMATION
4. SEE STOCK TANK DETAILS FOR ADDITIONAL INFORMATION
5. USE BUTT JOINT WHERE PROPOSED PAVEMENT TIES TO EXISTING PAVEMENT. DETAIL SHOWN ON TYPICAL SECTIONS





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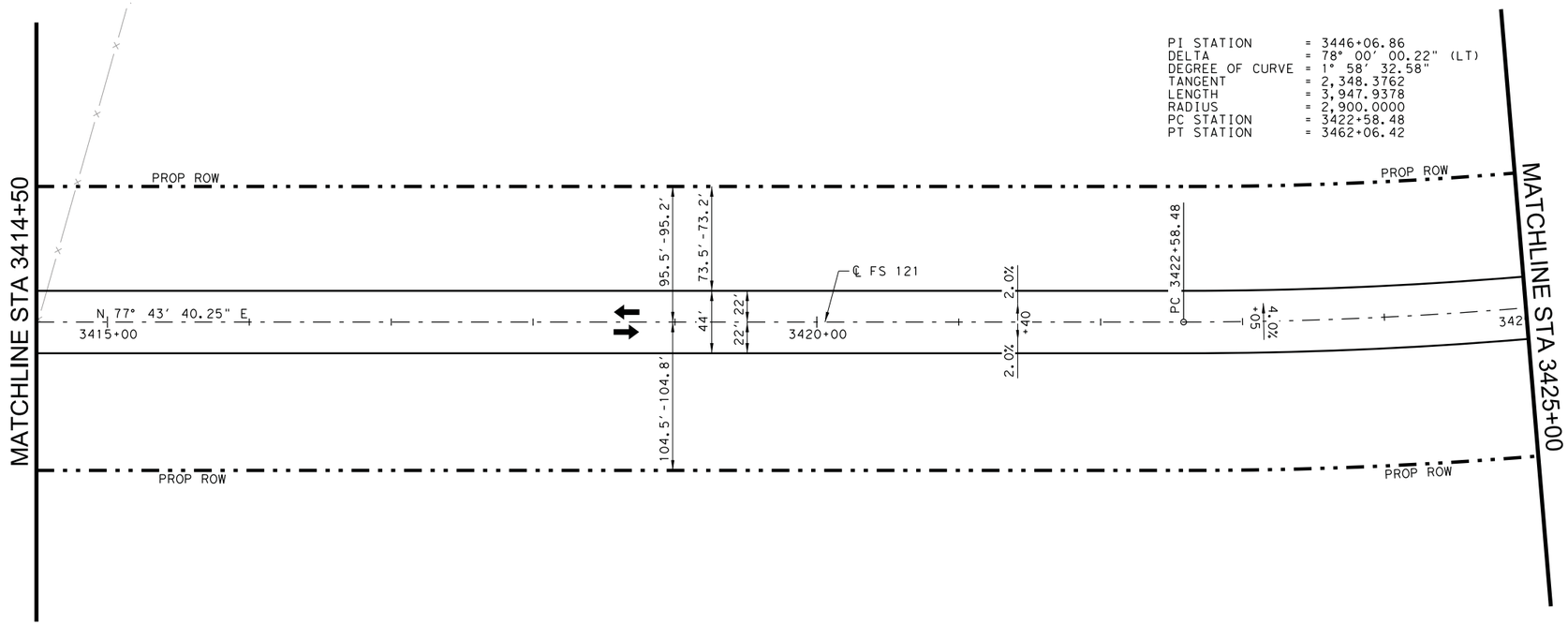
FS 121

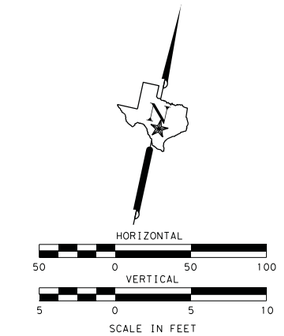
ROADWAY PLAN & PROFILE

STA 3404+00 - STA 3414+50

SCALE: H:1"=100' V:1"=10' SHEET 5 OF 24

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	109





LEGEND

- EXISTING ROW
- PROPOSED ROW
- TEMPORARY CONSTRUCTION EASEMENT
- ALIGN_# — CURVE ID
- EXIST TRAFFIC LANE
- PROP TRAFFIC LANE
- # — DRIVEWAY #

NOTES:

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3. SEE HORIZONTAL ALIGNMENT DATA SHEETS FOR ADDITIONAL INFORMATION
4. SEE STOCK TANK DETAILS FOR ADDITIONAL INFORMATION
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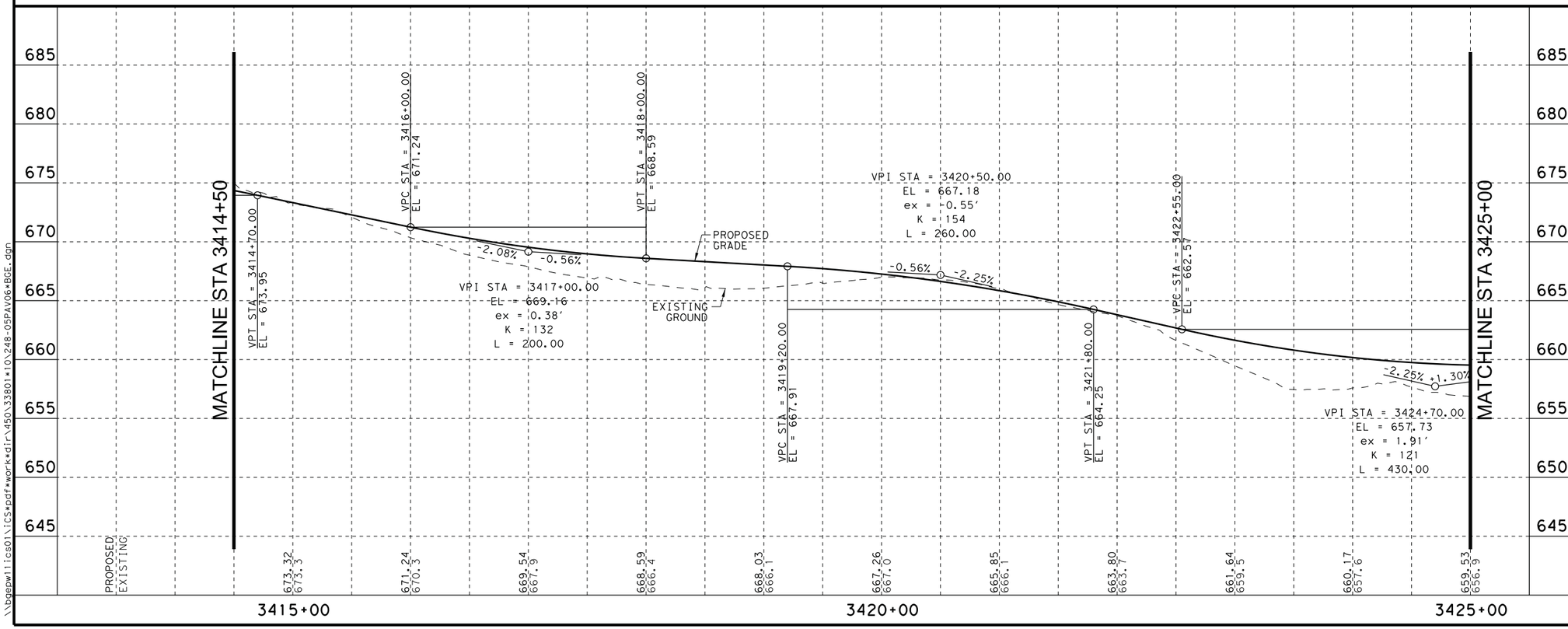

ASHLEY C. BEYER
130809
LICENSED PROFESSIONAL ENGINEER
7/15/2021

DATE	BY	REV	REVISION

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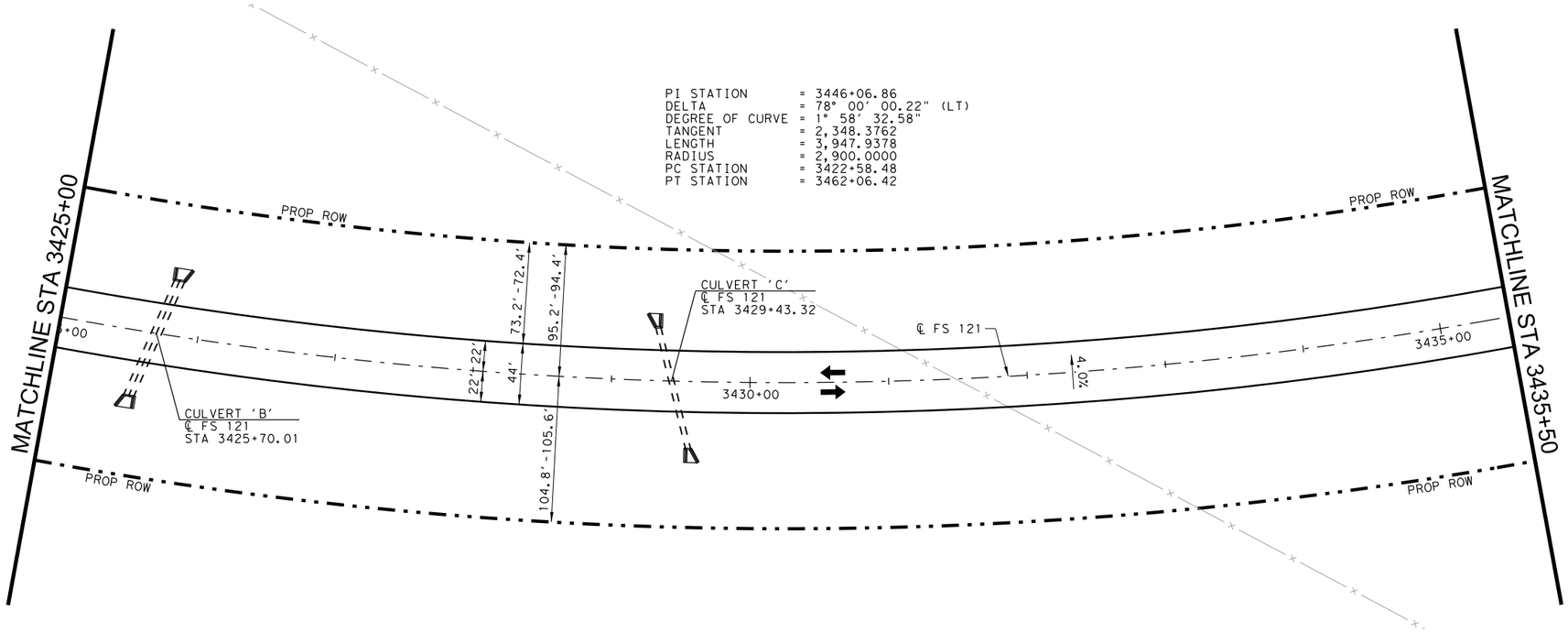
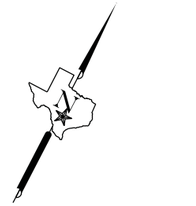
ROADWAY PLAN & PROFILE

STA 3414+50 - STA 3425+00

SCALE: H:1"=100' V:1"=10' SHEET 6 OF 24

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	110





LEGEND

- EXISTING ROW
- PROPOSED ROW
- TEMPORARY CONSTRUCTION EASEMENT
- (ALIGN_#) CURVE ID
- EXIST TRAFFIC LANE
- PROP TRAFFIC LANE
- (#) DRIVEWAY #

NOTES:

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3. SEE HORIZONTAL ALIGNMENT DATA SHEETS FOR ADDITIONAL INFORMATION
4. SEE STOCK TANK DETAILS FOR ADDITIONAL INFORMATION
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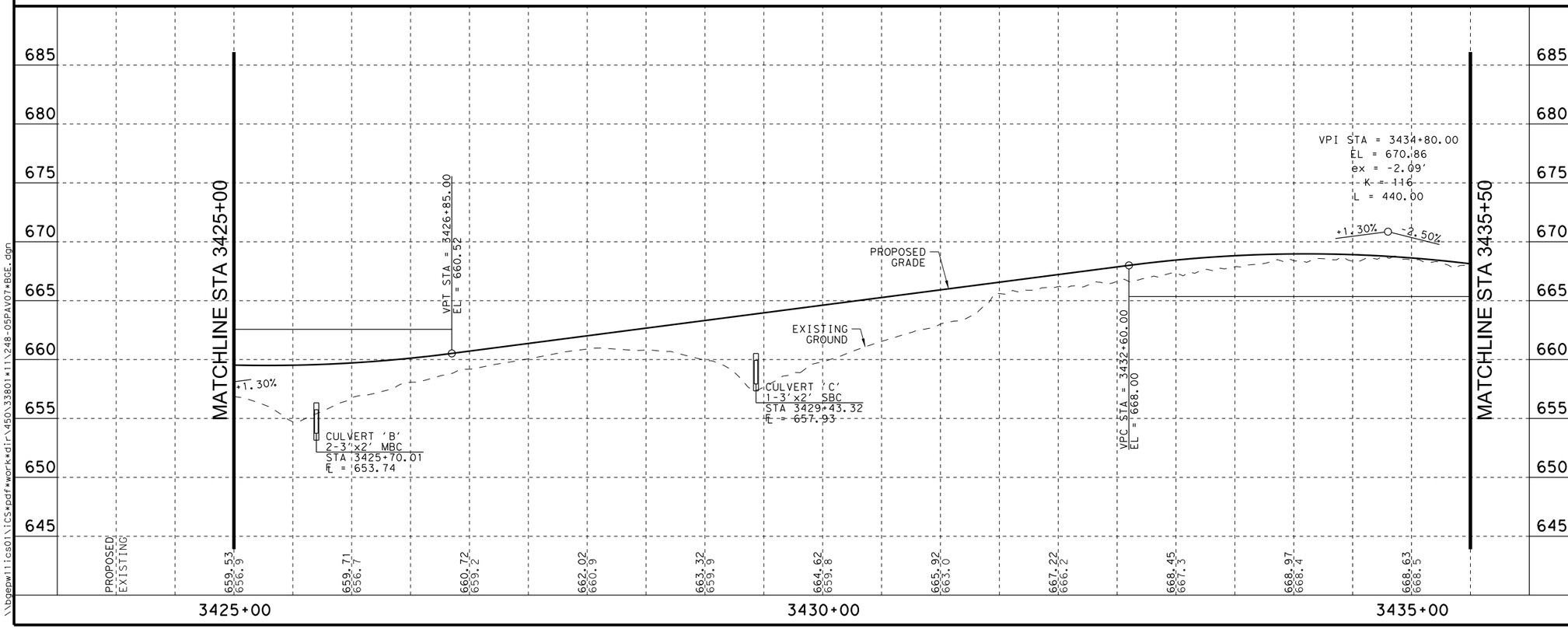

ASHLEY C. BEYER
130809
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7/15/2021

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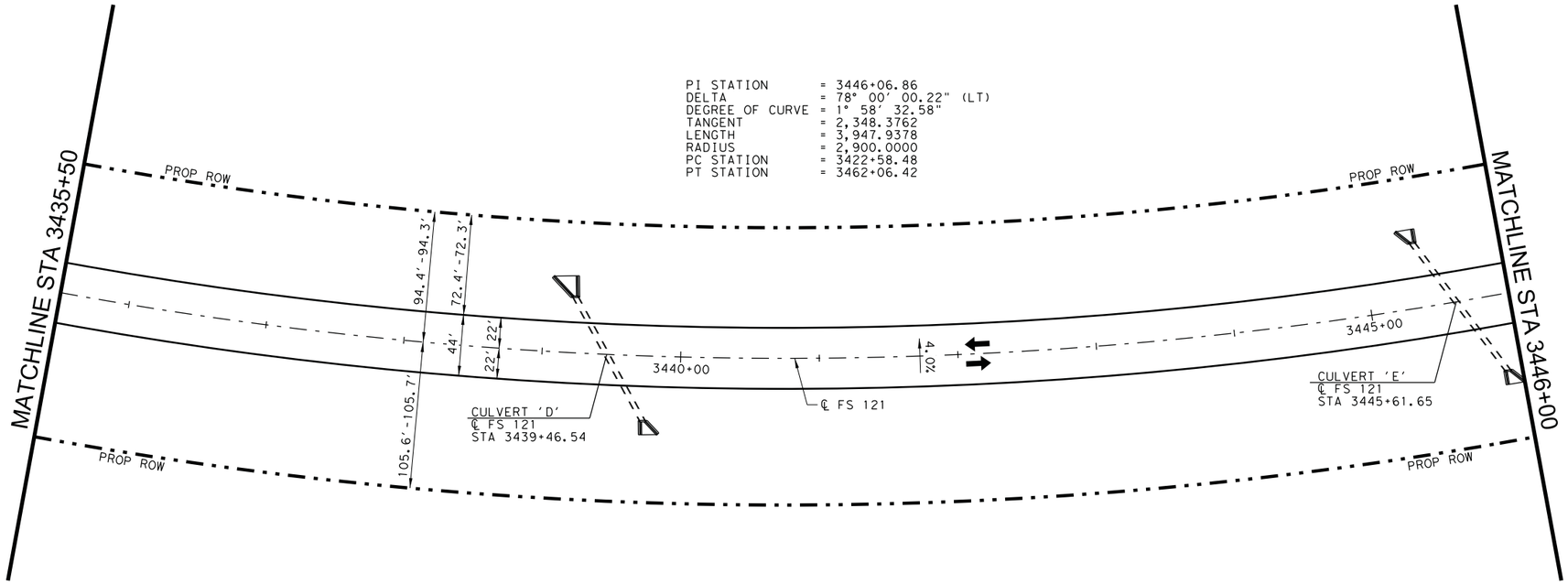
FS 121

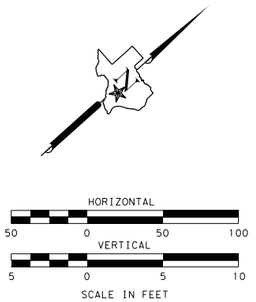
ROADWAY PLAN & PROFILE

STA 3425+00 - STA 3435+50

SCALE: H:1"=100' V:1"=10' SHEET 7 OF 24

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	111



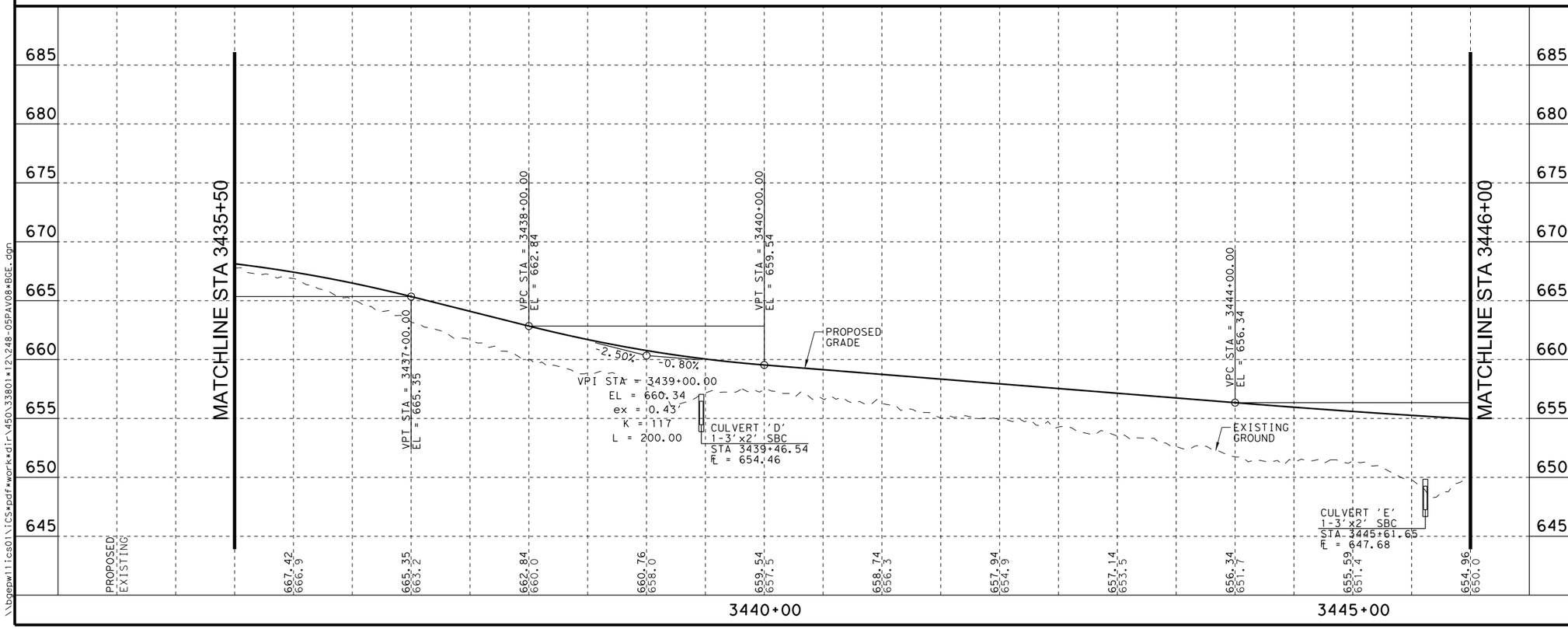


LEGEND

- EXISTING ROW
- PROPOSED ROW
- TEMPORARY CONSTRUCTION EASEMENT
- (ALIGN_#) CURVE ID
- EXIST TRAFFIC LANE
- PROP TRAFFIC LANE
- (#) DRIVEWAY #

NOTES:

1. ALL CALLOUTS REFER TO EDGE OF SHOULDER UNLESS OTHERWISE NOTED
2. SEE TYPICAL SECTION SHEETS FOR ADDITIONAL INFORMATION
3. SEE HORIZONTAL ALIGNMENT DATA SHEETS FOR ADDITIONAL INFORMATION
4. SEE STOCK TANK DETAILS FOR ADDITIONAL INFORMATION
5. USE BUTT JOINT WHERE PROPOSED PAVEMENT TIES TO EXISTING PAVEMENT. DETAIL SHOWN ON TYPICAL SECTIONS



STATE OF TEXAS
ASHLEY C. BEYER
130809
LICENSED PROFESSIONAL ENGINEER
7/15/2021

DATE	BY	REV	REVISION

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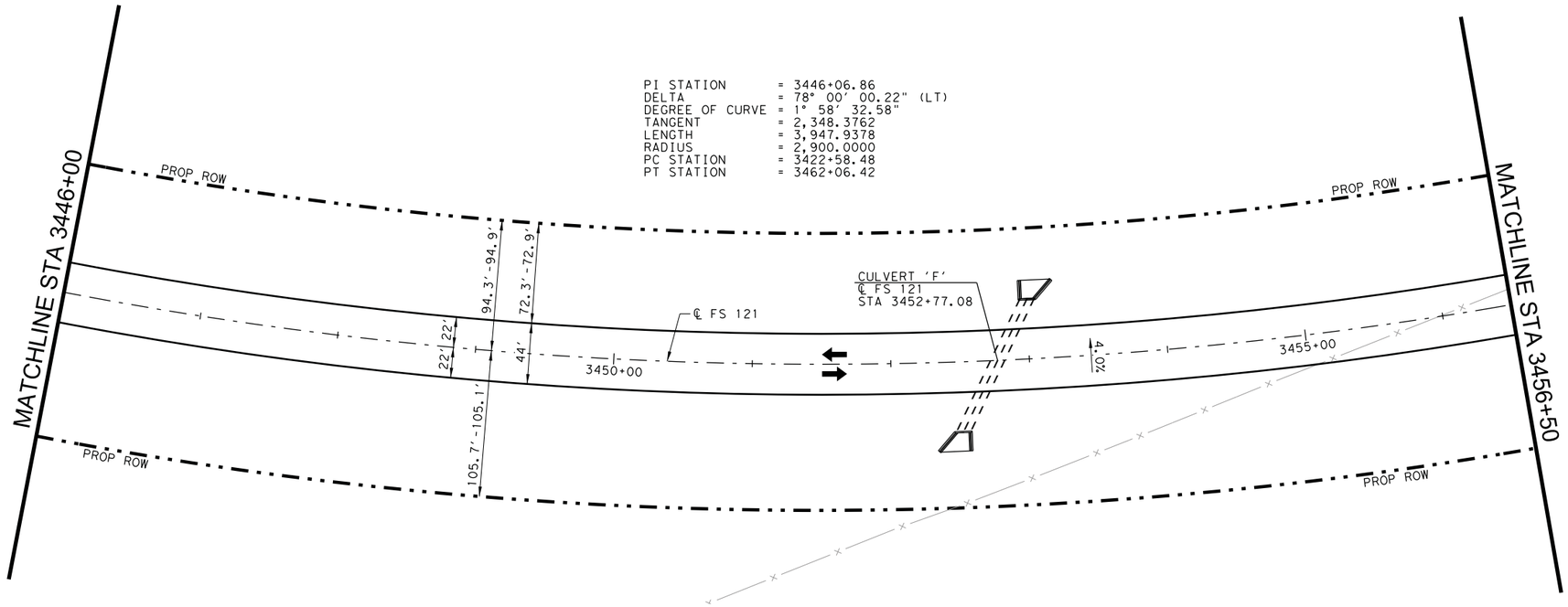
FS 121

ROADWAY PLAN & PROFILE

STA 3435+50 - STA 3446+00

SCALE: H:1"=100' V:1"=10' SHEET 8 OF 24

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	112



HORIZONTAL
50 0 50 100
VERTICAL
5 0 5 10
SCALE IN FEET

LEGEND

- EXISTING ROW
- PROPOSED ROW
- TEMPORARY CONSTRUCTION EASEMENT
- (ALIGN_#) CURVE ID
- EXIST TRAFFIC LANE
- PROP TRAFFIC LANE
- (#) DRIVEWAY #

NOTES:

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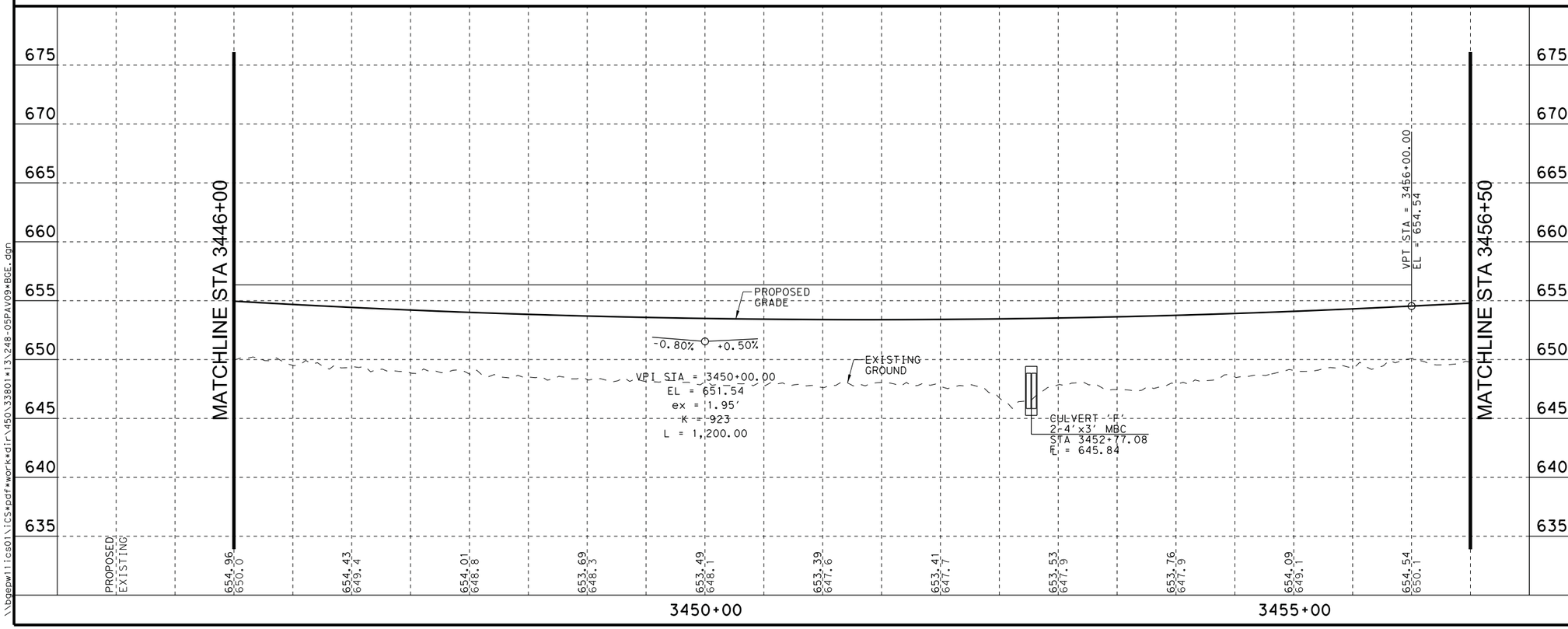
3. SEE HORIZONTAL ALIGNMENT DATA SHEETS FOR ADDITIONAL INFORMATION
4. SEE STOCK TANK DETAILS FOR ADDITIONAL INFORMATION
5. USE BUTT JOINT WHERE PROPOSED PAVEMENT TIES TO EXISTING PAVEMENT. DETAIL SHOWN ON TYPICAL SECTIONS



ASHLEY C. BEYER
130809
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS
7/15/2021

DATE	BY	REV	REVISION

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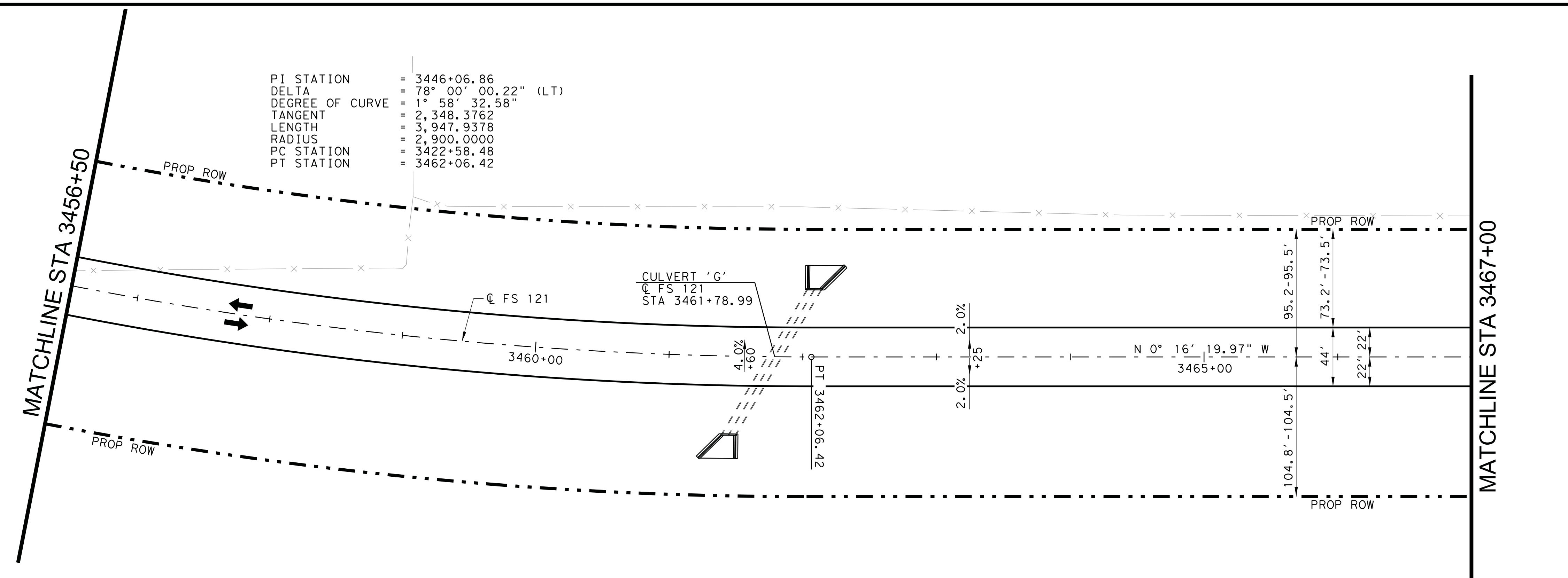
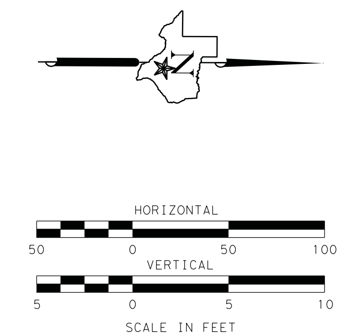
ROADWAY PLAN & PROFILE

STA 3446+00 - STA 3456+50

SCALE: H:1"=100' V:1"=10' SHEET 9 OF 24

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	113





LEGEND

— - - —	EXISTING ROW
— · · —	PROPOSED ROW
— — —	TEMPORARY CONSTRUCTION EASEMENT
ALIGN_#	CURVE ID
⇦	EXIST TRAFFIC LANE
⬅	PROP TRAFFIC LANE
#	DRIVEWAY #

NOTES:

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2. SEE TYPICAL SECTION SHEETS FOR ADDITIONAL INFORMATION
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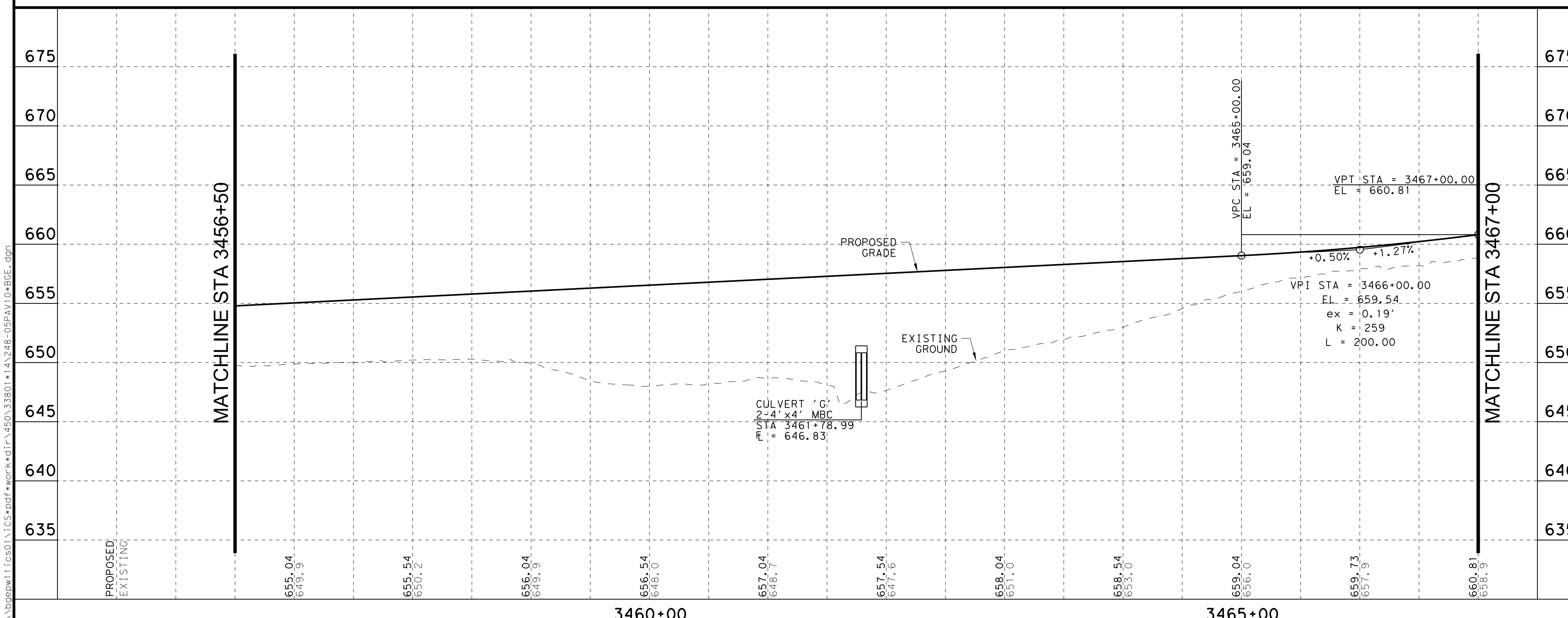

STATE OF TEXAS
ASHLEY C. BEYER
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7/15/2021

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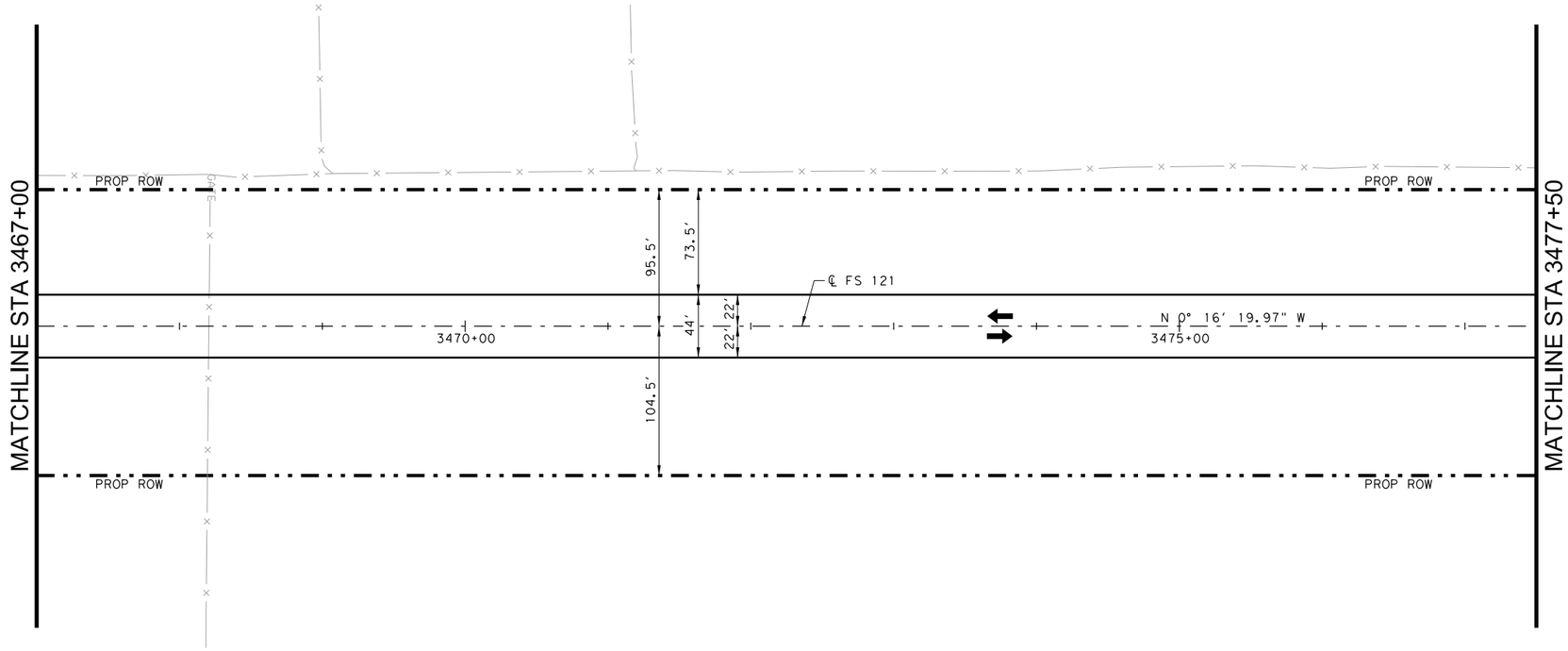
FS 121

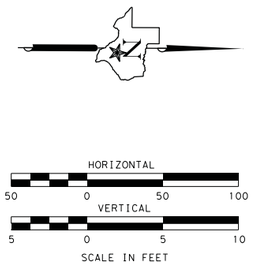
ROADWAY PLAN & PROFILE

STA 3456+50 - STA 3467+00

SCALE: H:1"=100' V:1"=10' SHEET 10 OF 24

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	114





LEGEND

- EXISTING ROW
- PROPOSED ROW
- TEMPORARY CONSTRUCTION EASEMENT
- ALIGN_# CURVE ID
- EXIST TRAFFIC LANE
- PROP TRAFFIC LANE
- # DRIVEWAY #

NOTES:

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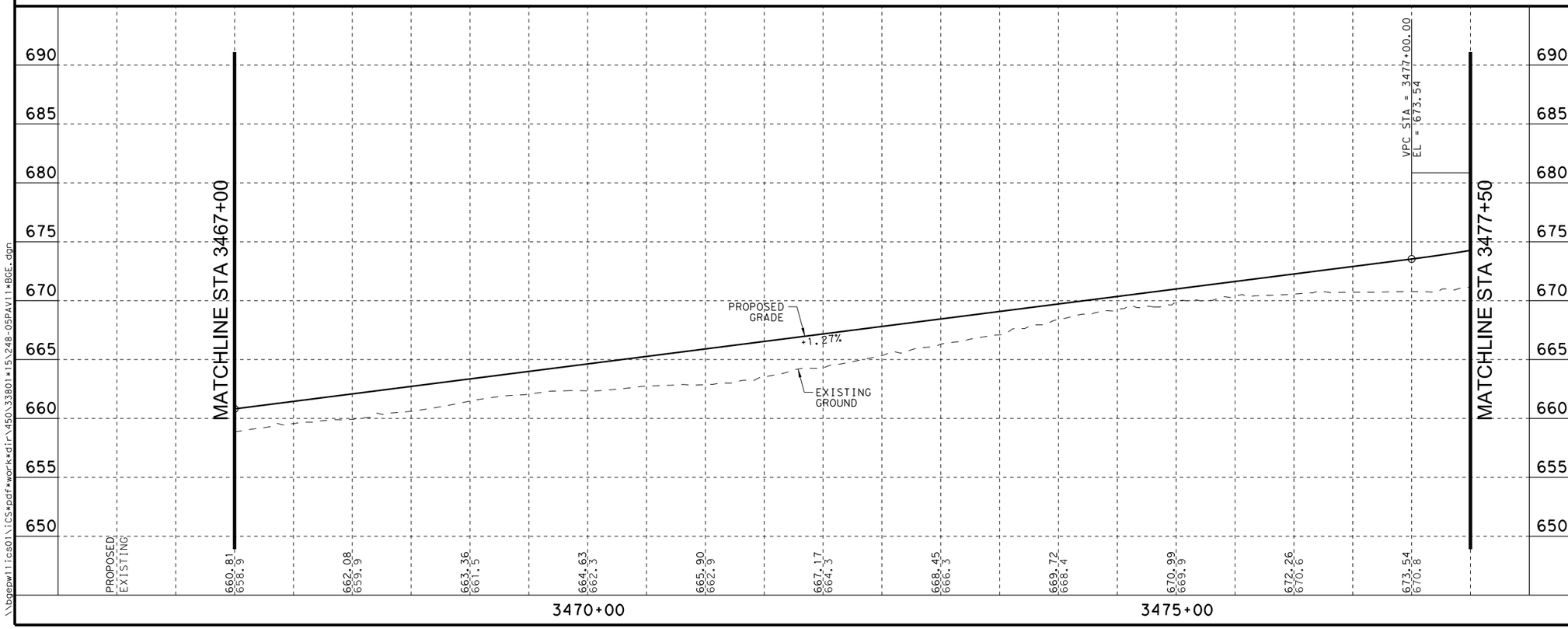
2. SEE TYPICAL SECTION SHEETS FOR ADDITIONAL INFORMATION
3. SEE HORIZONTAL ALIGNMENT DATA SHEETS FOR ADDITIONAL INFORMATION
4. SEE STOCK TANK DETAILS FOR ADDITIONAL INFORMATION
5. USE BUTT JOINT WHERE PROPOSED PAVEMENT TIES TO EXISTING PAVEMENT. DETAIL SHOWN ON TYPICAL SECTIONS



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ASHLEY C. BEYER
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7/15/2021

DATE	BY	REV	REVISION

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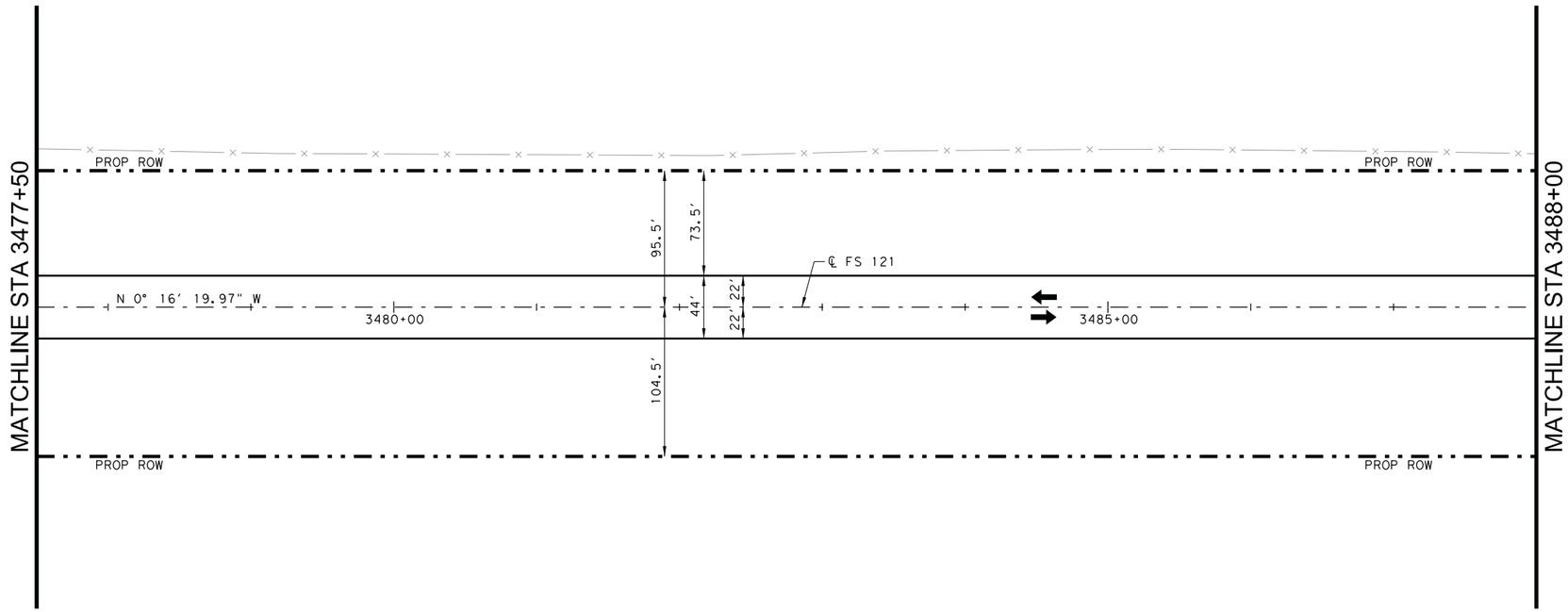
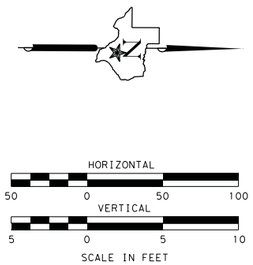
ROADWAY PLAN & PROFILE

STA 3467+00 - STA 3477+50

SCALE: H:1"=100' V:1"=10' SHEET 11 OF 24

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	115





LEGEND

- EXISTING ROW
- PROPOSED ROW
- TEMPORARY CONSTRUCTION EASEMENT
- ALIGN_# CURVE ID
- EXIST TRAFFIC LANE
- PROP TRAFFIC LANE
- # DRIVEWAY #

NOTES:

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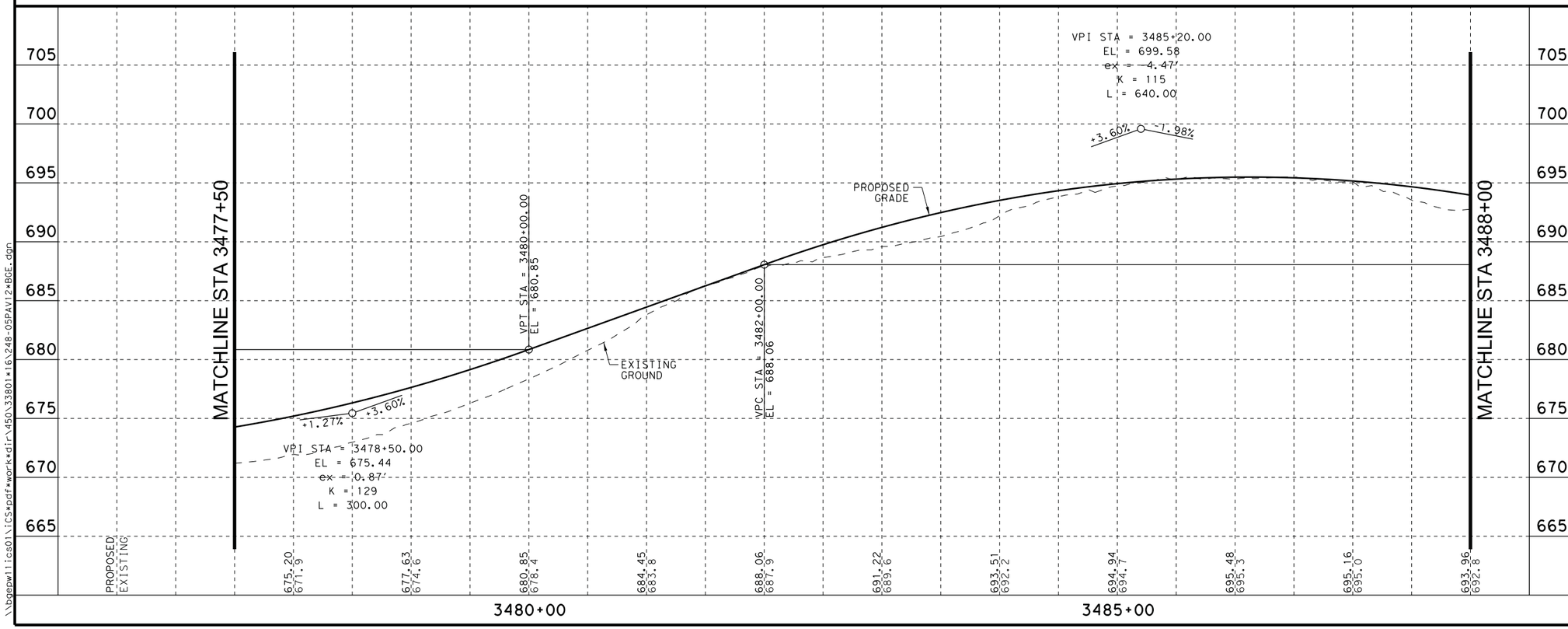
4. SEE STOCK TANK DETAILS FOR ADDITIONAL INFORMATION
5. USE BUTT JOINT WHERE PROPOSED PAVEMENT TIES TO EXISTING PAVEMENT. DETAIL SHOWN ON TYPICAL SECTIONS



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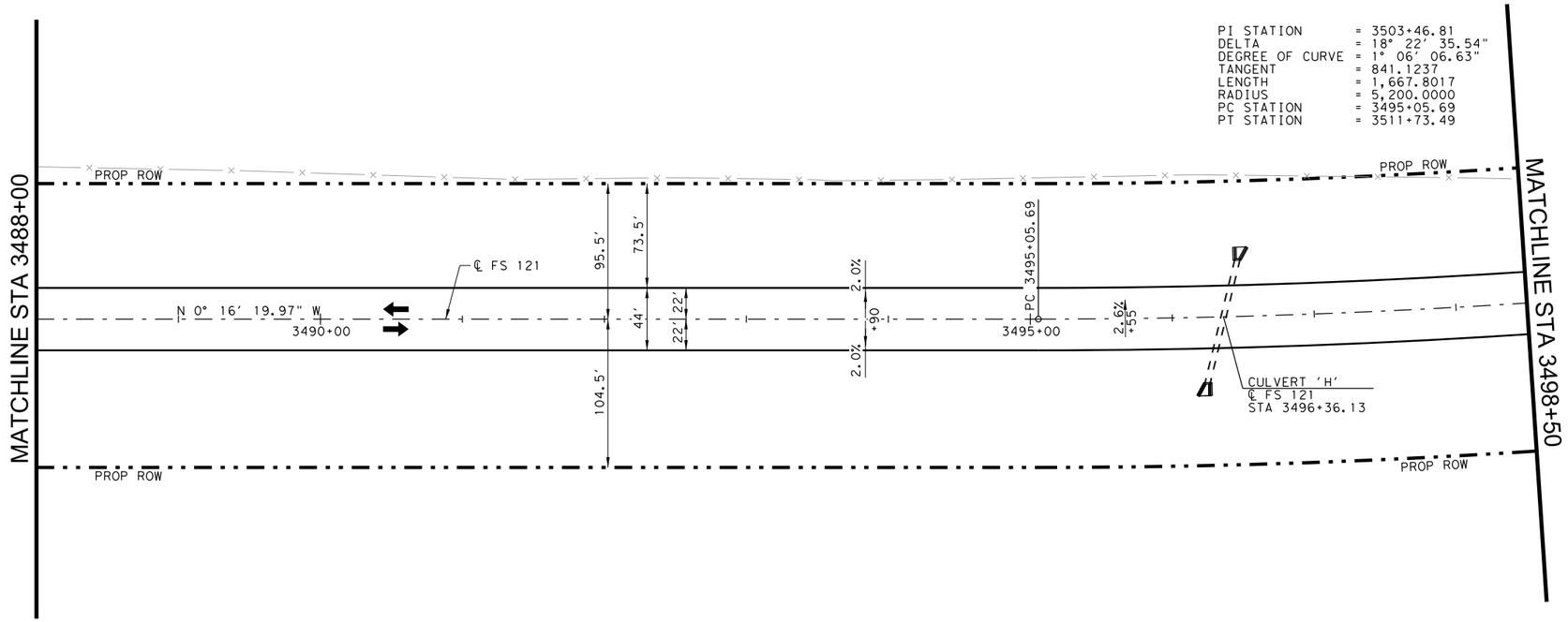
ROADWAY PLAN & PROFILE

STA 3477+50 - STA 3488+00

SCALE: H:1"=100' V:1"=10' SHEET 12 OF 24

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	116



LEGEND

- EXISTING ROW
- PROPOSED ROW
- TEMPORARY CONSTRUCTION EASEMENT
- ALIGN_# — CURVE ID
- EXIST TRAFFIC LANE
- PROP TRAFFIC LANE
- # — DRIVEWAY #

NOTES:

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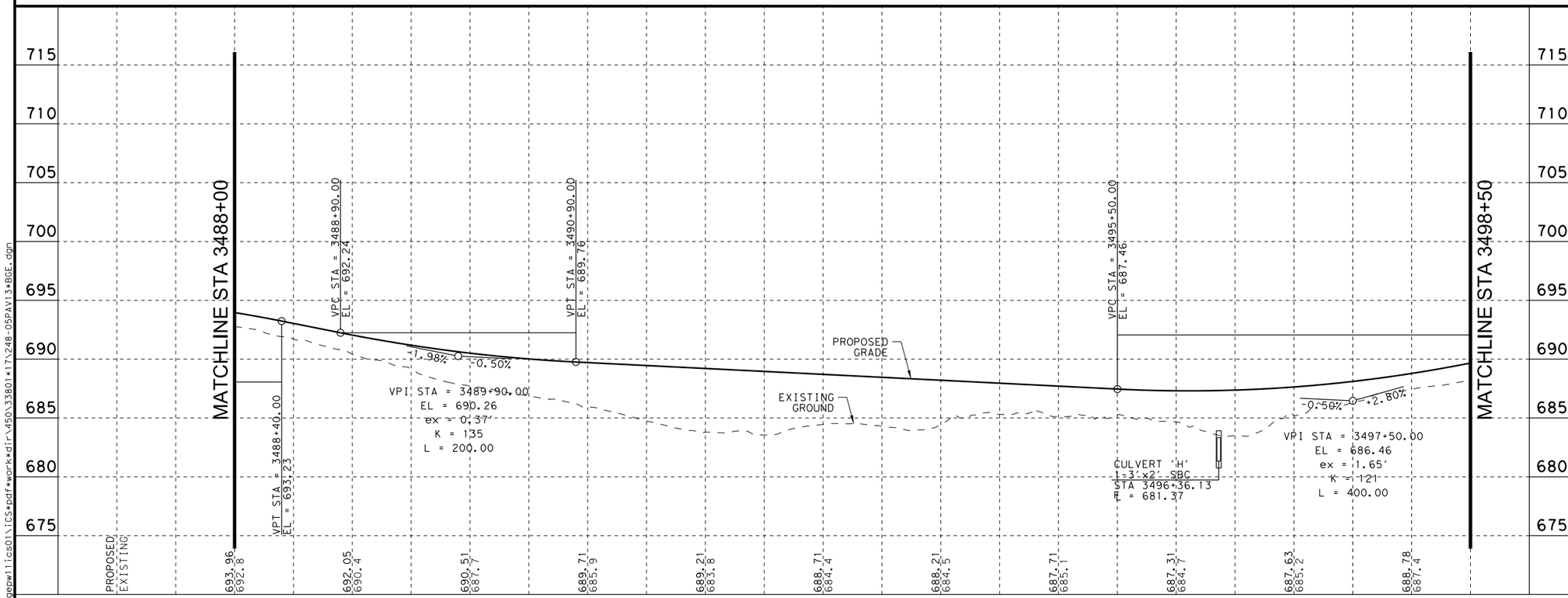
3. SEE HORIZONTAL ALIGNMENT DATA SHEETS FOR ADDITIONAL INFORMATION
4. SEE STOCK TANK DETAILS FOR ADDITIONAL INFORMATION
5. USE BUTT JOINT WHERE PROPOSED PAVEMENT TIES TO EXISTING PAVEMENT. DETAIL SHOWN ON TYPICAL SECTIONS



STATE OF TEXAS
ASHLEY C. BEYER
130809
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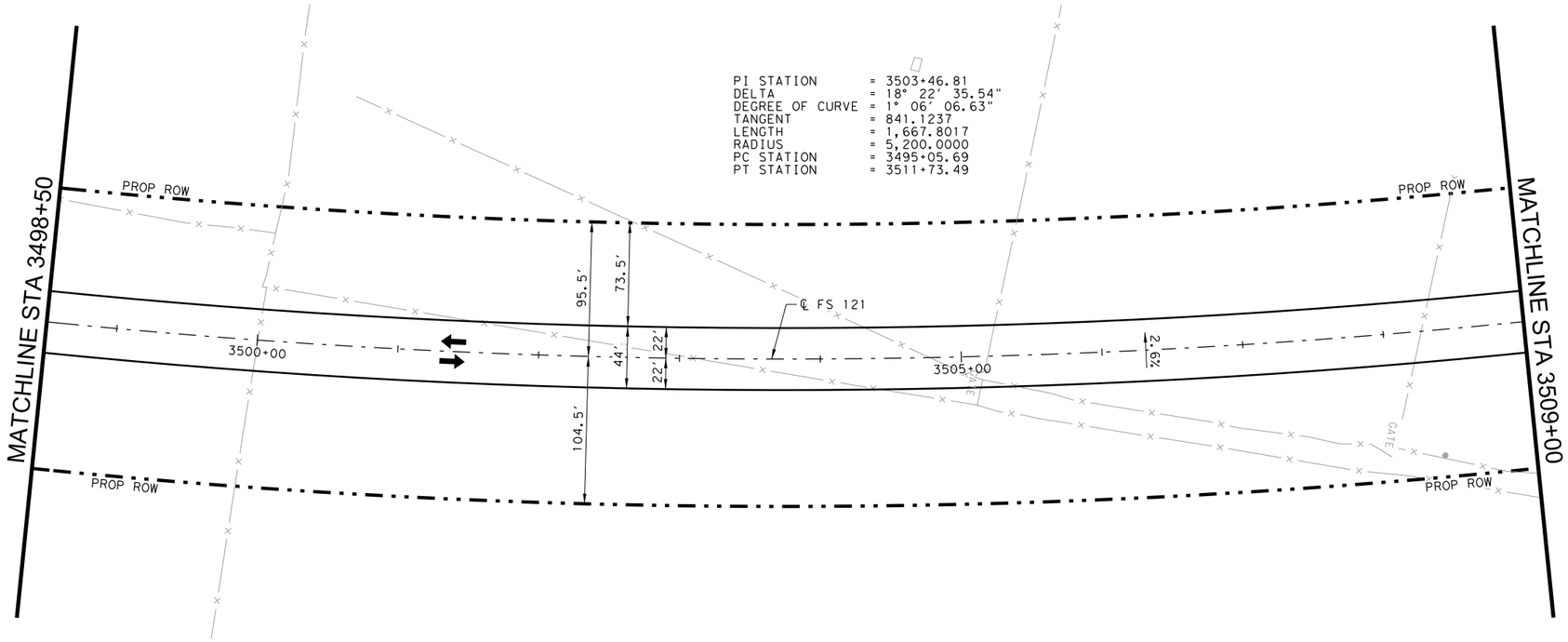
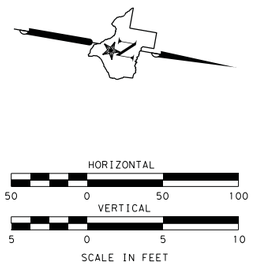
ROADWAY PLAN & PROFILE

STA 3488+00 - STA 3498+50

SCALE: H:1"=100' V:1"=10' SHEET 13 OF 24

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	117





LEGEND

- EXISTING ROW
- PROPOSED ROW
- TEMPORARY CONSTRUCTION EASEMENT
- ALIGN_# — CURVE ID
- EXIST TRAFFIC LANE
- PROP TRAFFIC LANE
- # — DRIVEWAY #

NOTES:

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4. SEE STOCK TANK DETAILS FOR ADDITIONAL INFORMATION
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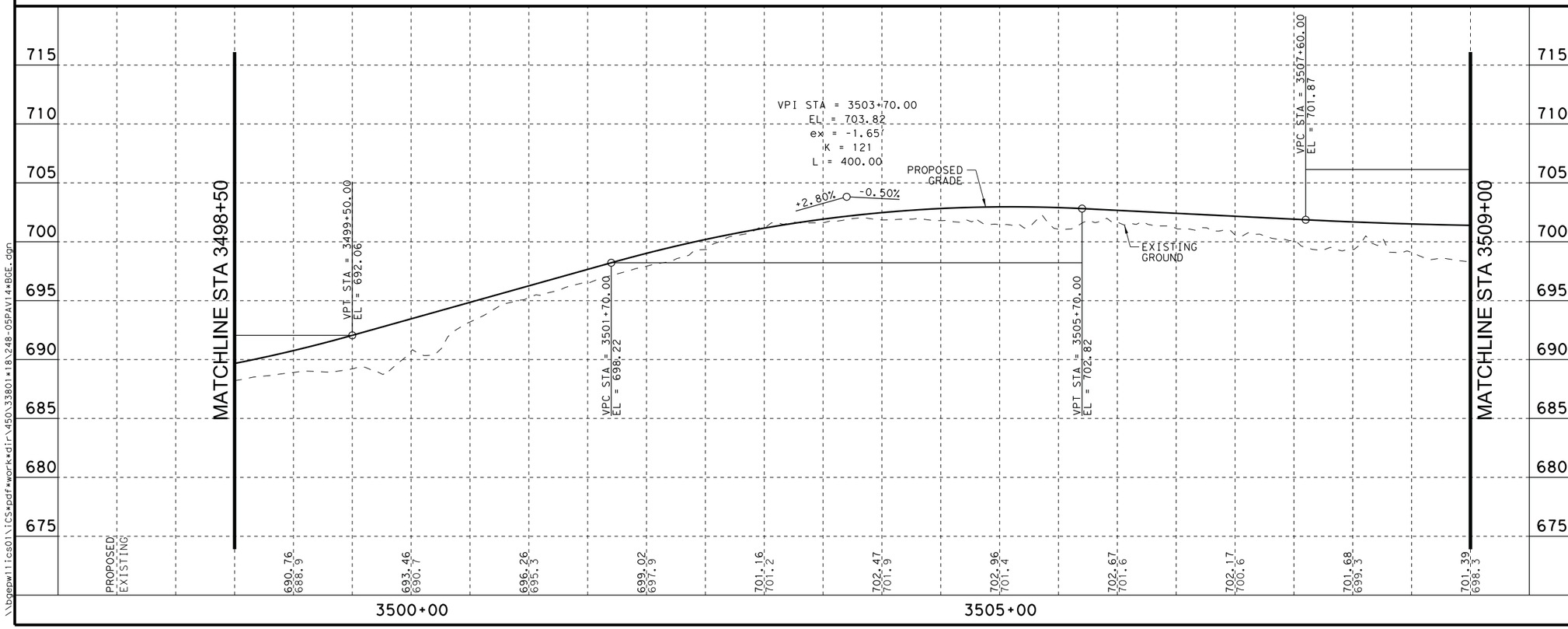

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130809
LICENSED PROFESSIONAL ENGINEER
7/15/2021

DATE	BY	REV	REVISION

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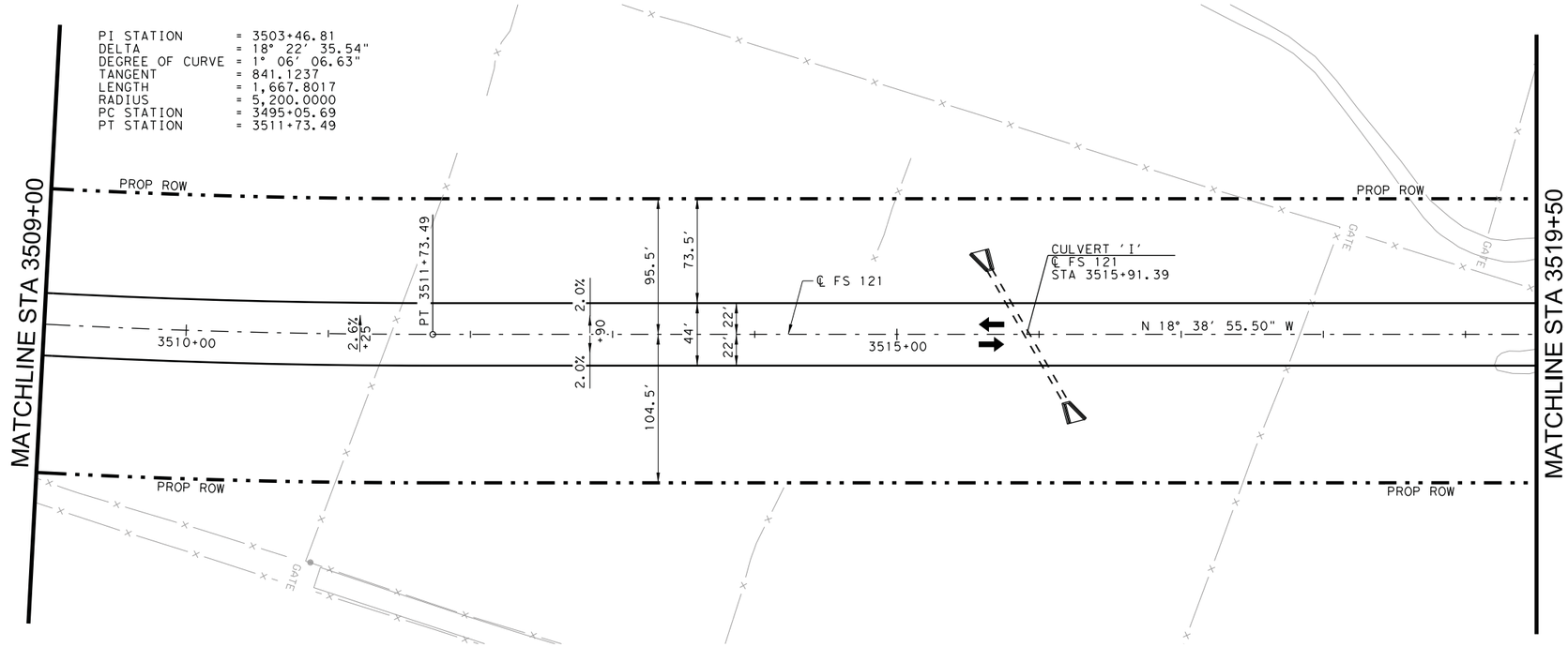
ROADWAY PLAN & PROFILE

STA 3498+50 - sta 3509+00

SCALE: H:1"=100' V:1"=10' SHEET 14 OF 24

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	118

PI STATION = 3503+46.81
DELTA = 18° 22' 35.54"
DEGREE OF CURVE = 1° 06' 06.63"
TANGENT = 841.1237
LENGTH = 1,667.8017
RADIUS = 5,200.0000
PC STATION = 3495+05.69
PT STATION = 3511+73.49



HORIZONTAL
50 0 50 100
VERTICAL
5 0 5 10
SCALE IN FEET

LEGEND

- EXISTING ROW
- PROPOSED ROW
- TEMPORARY CONSTRUCTION EASEMENT
- ALIGN_# CURVE ID
- EXIST TRAFFIC LANE
- PROP TRAFFIC LANE
- # DRIVEWAY #

NOTES:

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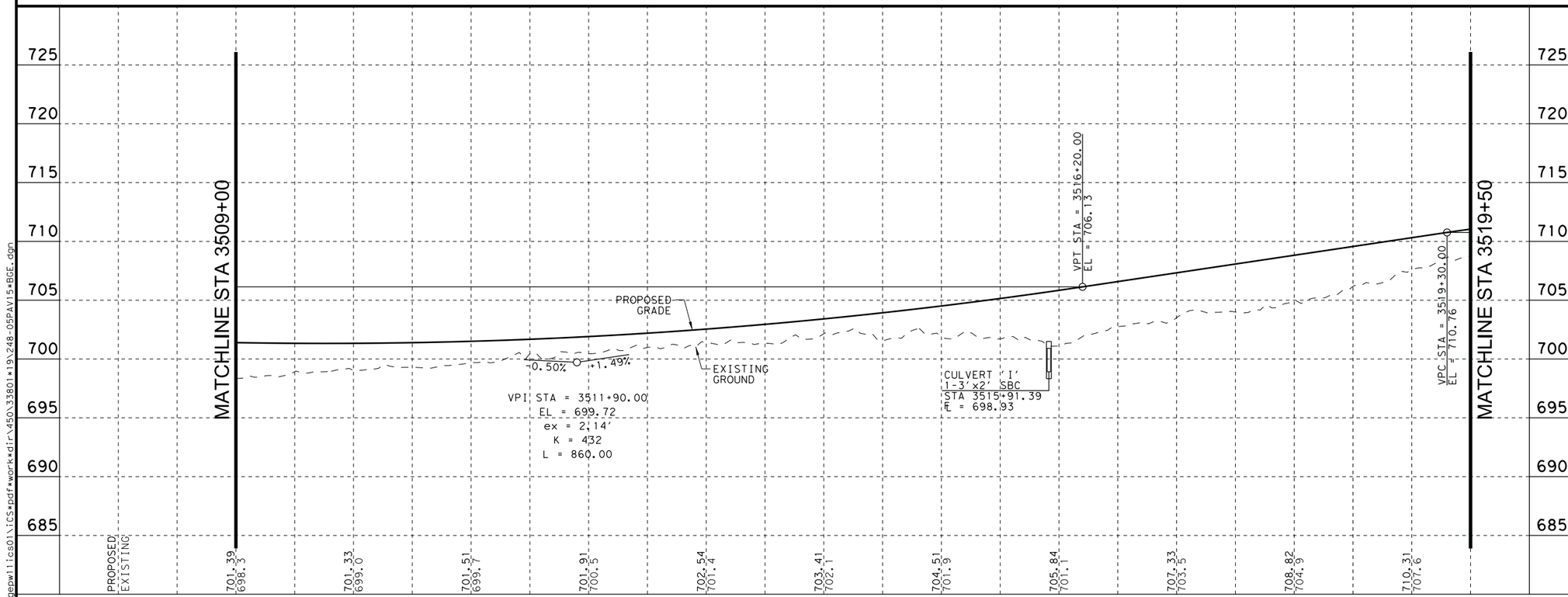
5. USE BUTT JOINT WHERE PROPOSED PAVEMENT TIES TO EXISTING PAVEMENT. DETAIL SHOWN ON TYPICAL SECTIONS



STATE OF TEXAS
ASHLEY C. BEYER
130809
LICENSED PROFESSIONAL ENGINEER
7/15/2021

DATE	BY	REV	REVISION

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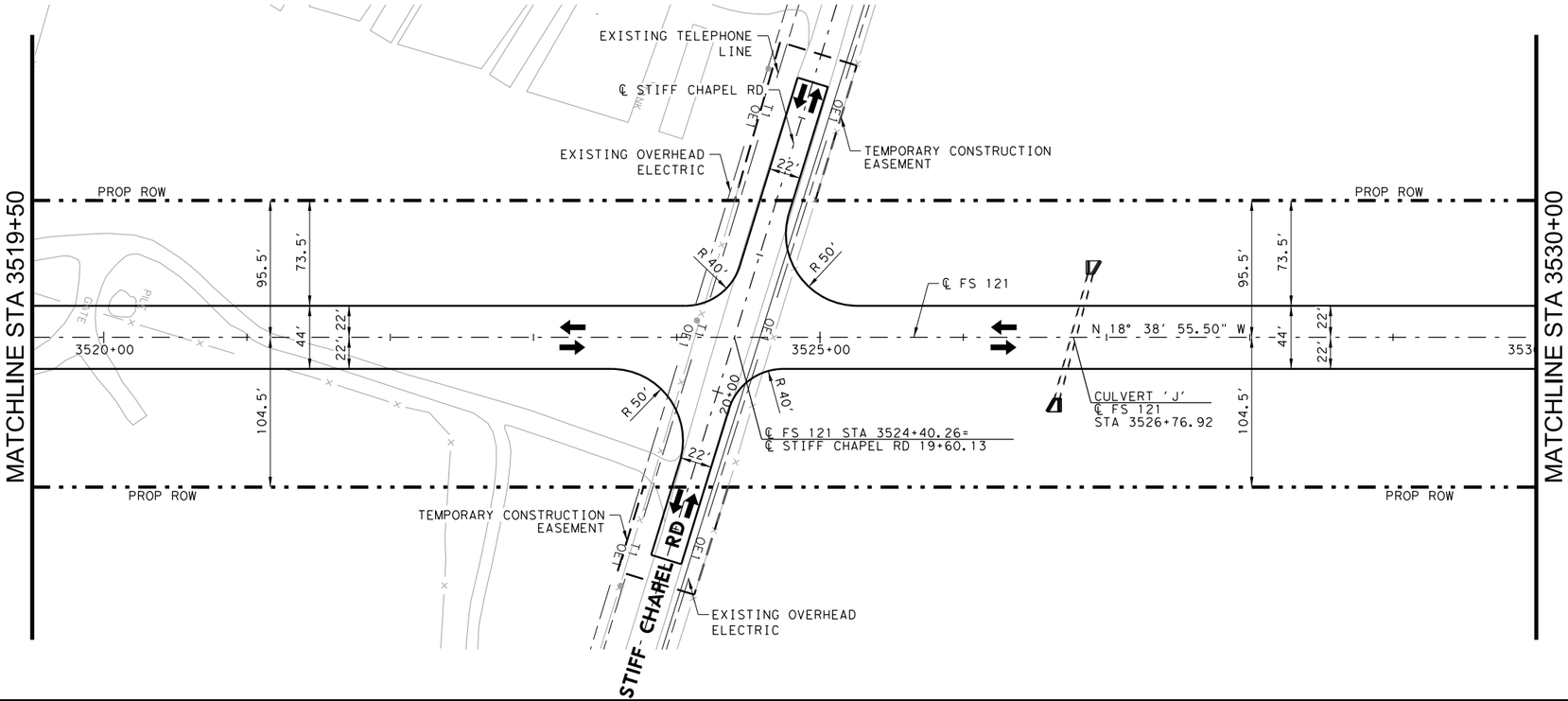
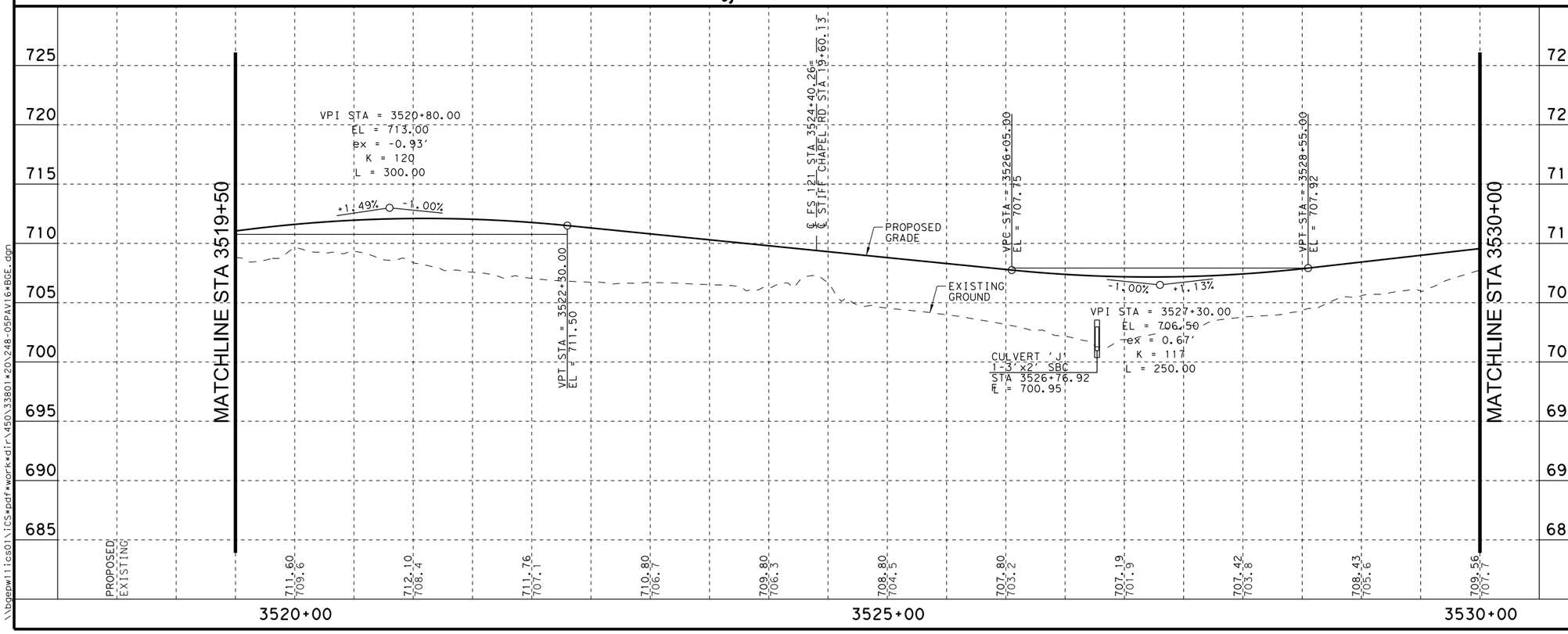
ROADWAY PLAN & PROFILE

STA 3509+00 - STA 3519+50

SCALE: H:1"=100' V:1"=10' SHEET 15 OF 24

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	119





LEGEND

- EXISTING ROW
- PROPOSED ROW
- TEMPORARY CONSTRUCTION EASEMENT
- (ALIGN_#) CURVE ID
- EXIST TRAFFIC LANE
- PROP TRAFFIC LANE
- (#) DRIVEWAY #

NOTES:

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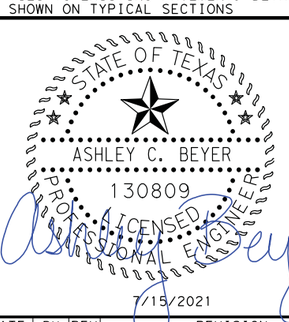
4. SEE STOCK TANK DETAILS FOR ADDITIONAL INFORMATION
5. USE BUTT JOINT WHERE PROPOSED PAVEMENT TIES TO EXISTING PAVEMENT. DETAIL SHOWN ON TYPICAL SECTIONS



DATE	BY	REV	REVISION

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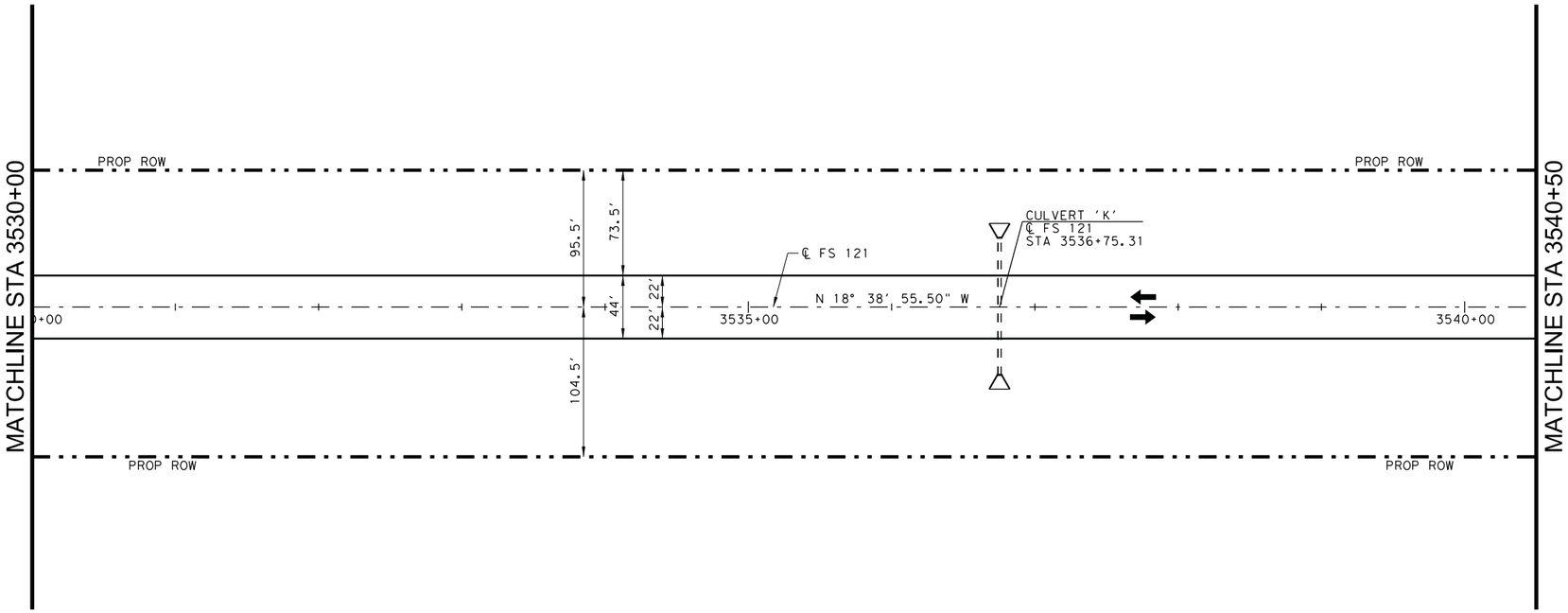
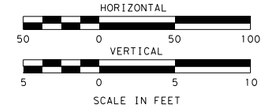
ROADWAY PLAN & PROFILE

STA 3519+50 - STA 3530+00

SCALE: H:1"=100' V:1"=10' SHEET 16 OF 24

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	120





LEGEND

- EXISTING ROW
- PROPOSED ROW
- TEMPORARY CONSTRUCTION EASEMENT
- ALIGN_# CURVE ID
- EXIST TRAFFIC LANE
- PROP TRAFFIC LANE
- # DRIVEWAY #

NOTES:

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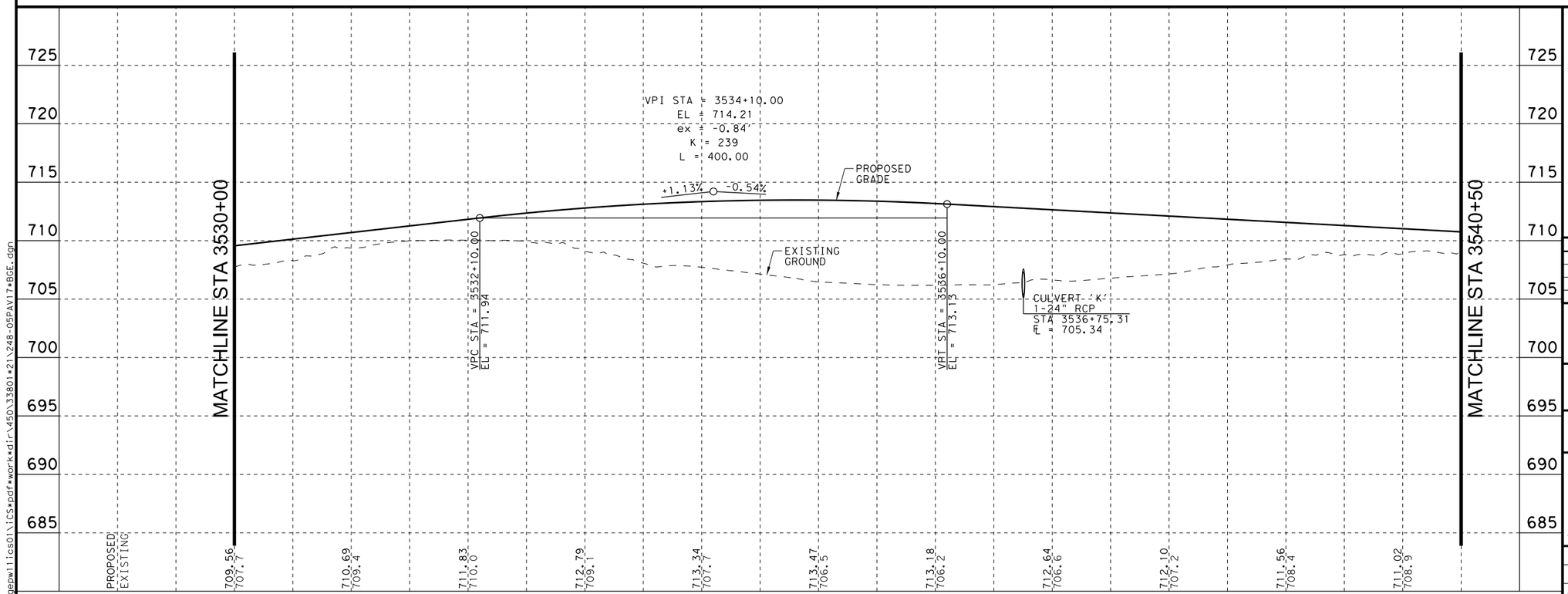
5. USE BUTT JOINT WHERE PROPOSED PAVEMENT TIES TO EXISTING PAVEMENT. DETAIL SHOWN ON TYPICAL SECTIONS



DATE	BY	REV	REVISION

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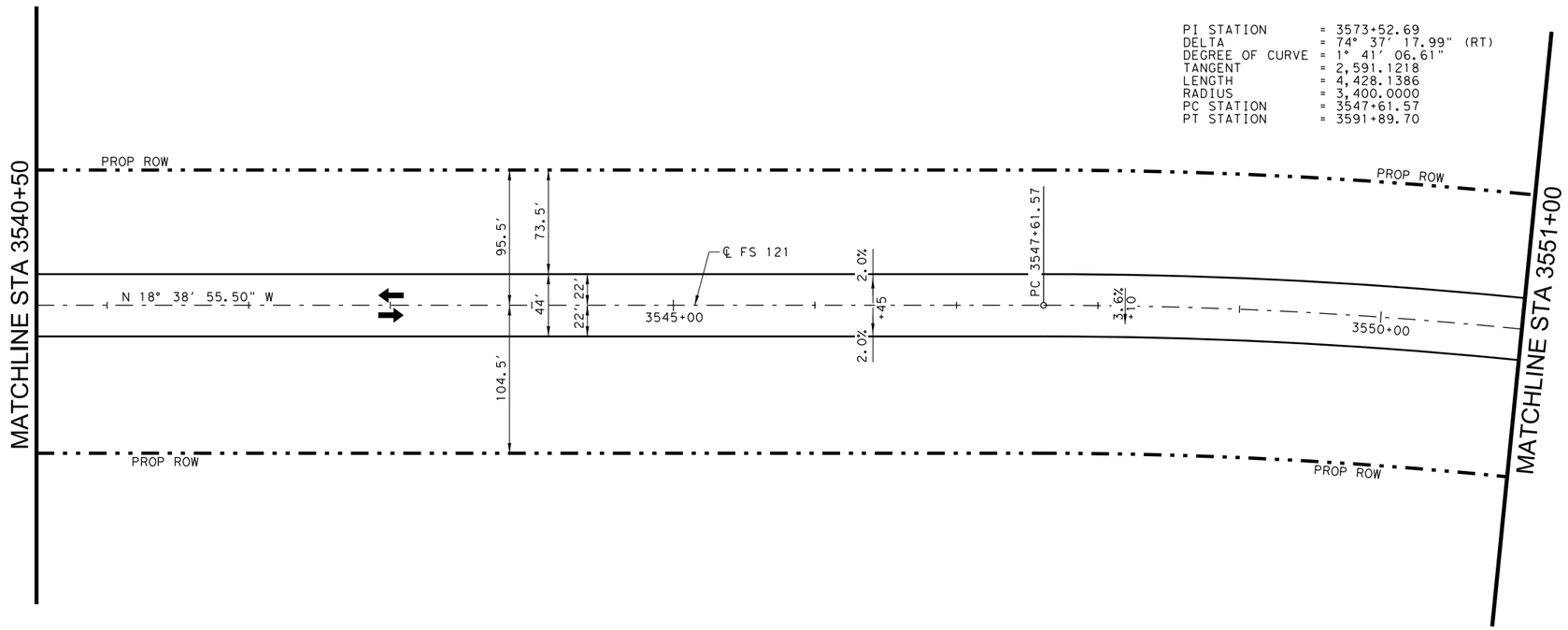
ROADWAY PLAN & PROFILE

STA 3530+00 - STA 3540+50

SCALE: H:1"=100' V:1"=10' SHEET 17 OF 24

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	121



HORIZONTAL
50 0 50 100
VERTICAL
5 0 5 10
SCALE IN FEET

LEGEND

- EXISTING ROW
- PROPOSED ROW
- TEMPORARY CONSTRUCTION EASEMENT
- ALIGN_# — CURVE ID
- EXIST TRAFFIC LANE
- PROP TRAFFIC LANE
- # — DRIVEWAY #

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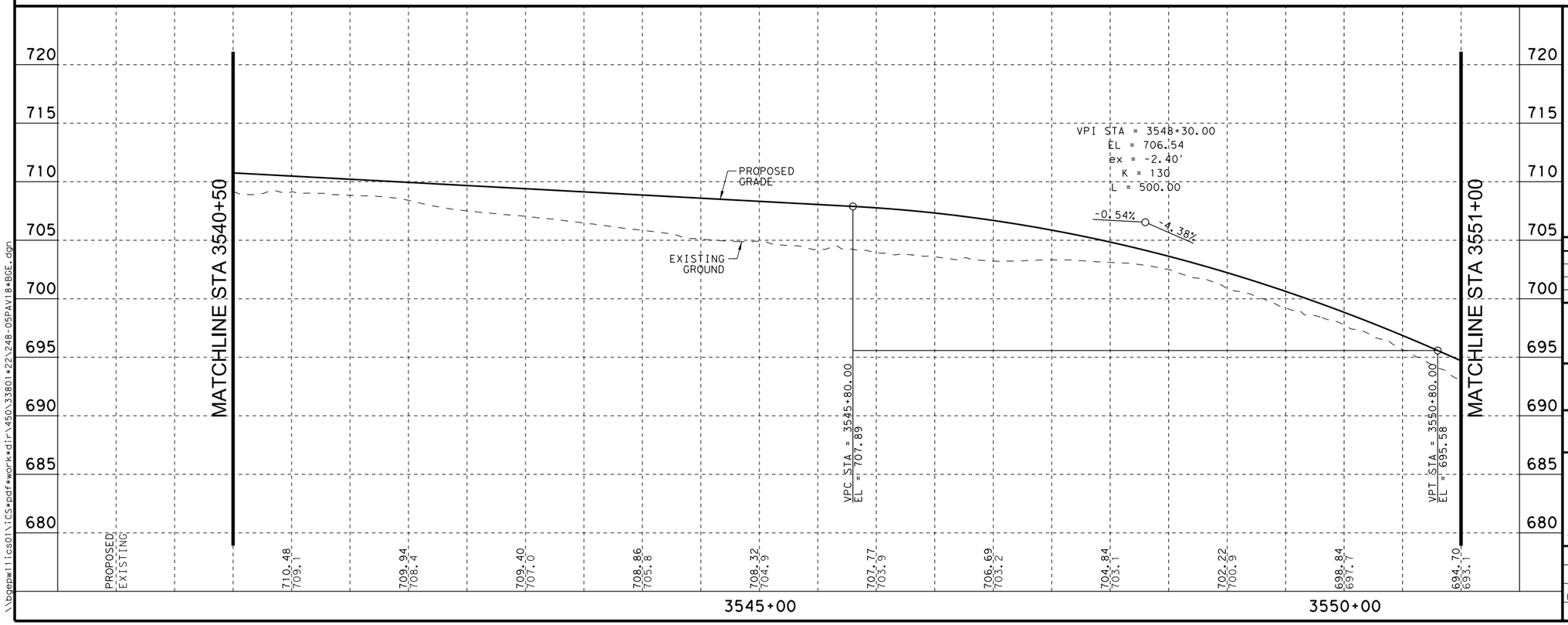
5. USE BUTT JOINT WHERE PROPOSED PAVEMENT TIES TO EXISTING PAVEMENT. DETAIL SHOWN ON TYPICAL SECTIONS



\\bgepwlfiles01\ICS*pdf*work*dir\450\33801*22\248-05PAV18*BGE.dgn

ASHLEY C. BEYER
130809
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS
7/15/2021

DATE	BY	REV	REVISION

BGE, Inc.
2595 Dallas Parkway, Suite 101, Frisco, TX 75034
Tel: 972-464-4800 • www.bgeinc.com
TBPE Registration No. F-1046

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FS 121

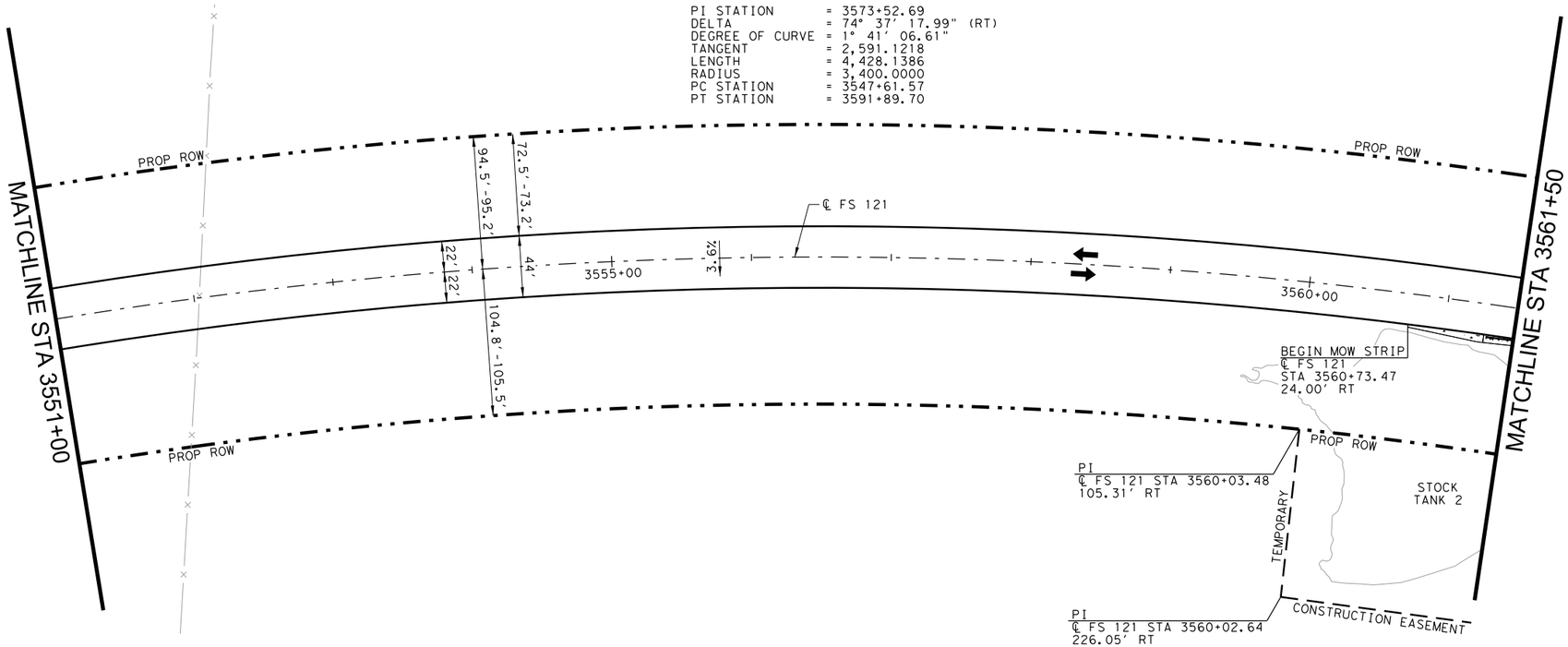
ROADWAY PLAN & PROFILE

STA 3540+50 - STA 3551+00

SCALE: H:1"=100' V:1"=10' SHEET 18 OF 24

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	122

PI STATION = 3573+52.69
DELTA = 74° 37′ 17.99" (RT)
DEGREE OF CURVE = 1° 41′ 06.61"
TANGENT = 2,591.1218
LENGTH = 4,428.1386
RADIUS = 3,400.0000
PC STATION = 3547+61.57
PT STATION = 3591+89.70

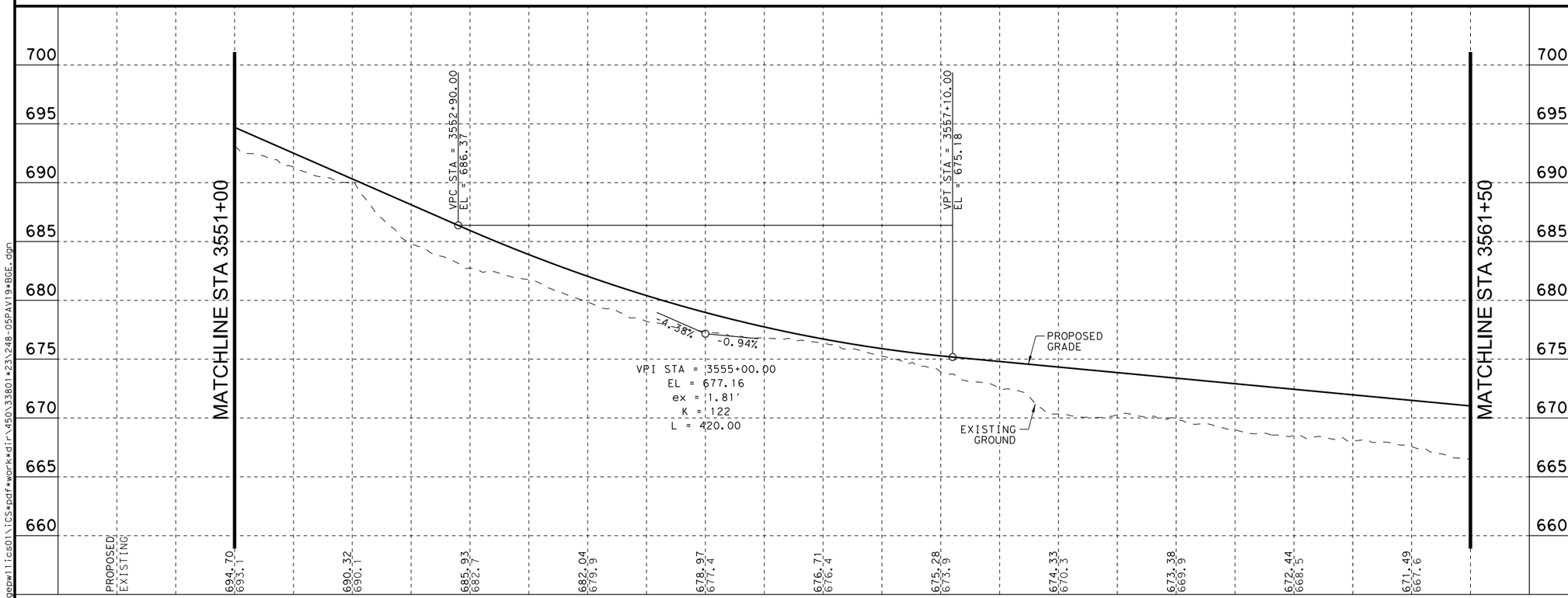


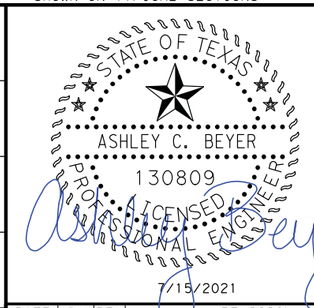
LEGEND

- EXISTING ROW
- PROPOSED ROW
- TEMPORARY CONSTRUCTION EASEMENT
- ALIGN_# CURVE ID
- EXIST TRAFFIC LANE
- PROP TRAFFIC LANE
- # DRIVEWAY #

NOTES:

1. ALL CALLOUTS REFER TO EDGE OF SHOULDER UNLESS OTHERWISE NOTED
2. SEE TYPICAL SECTION SHEETS FOR ADDITIONAL INFORMATION
3. SEE HORIZONTAL ALIGNMENT DATA SHEETS FOR ADDITIONAL INFORMATION
4. SEE STOCK TANK DETAILS FOR ADDITIONAL INFORMATION
5. USE BUTT JOINT WHERE PROPOSED PAVEMENT TIES TO EXISTING PAVEMENT. DETAIL SHOWN ON TYPICAL SECTIONS





DATE	BY	REV	REVISION

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TBPE Registration No. F-1046

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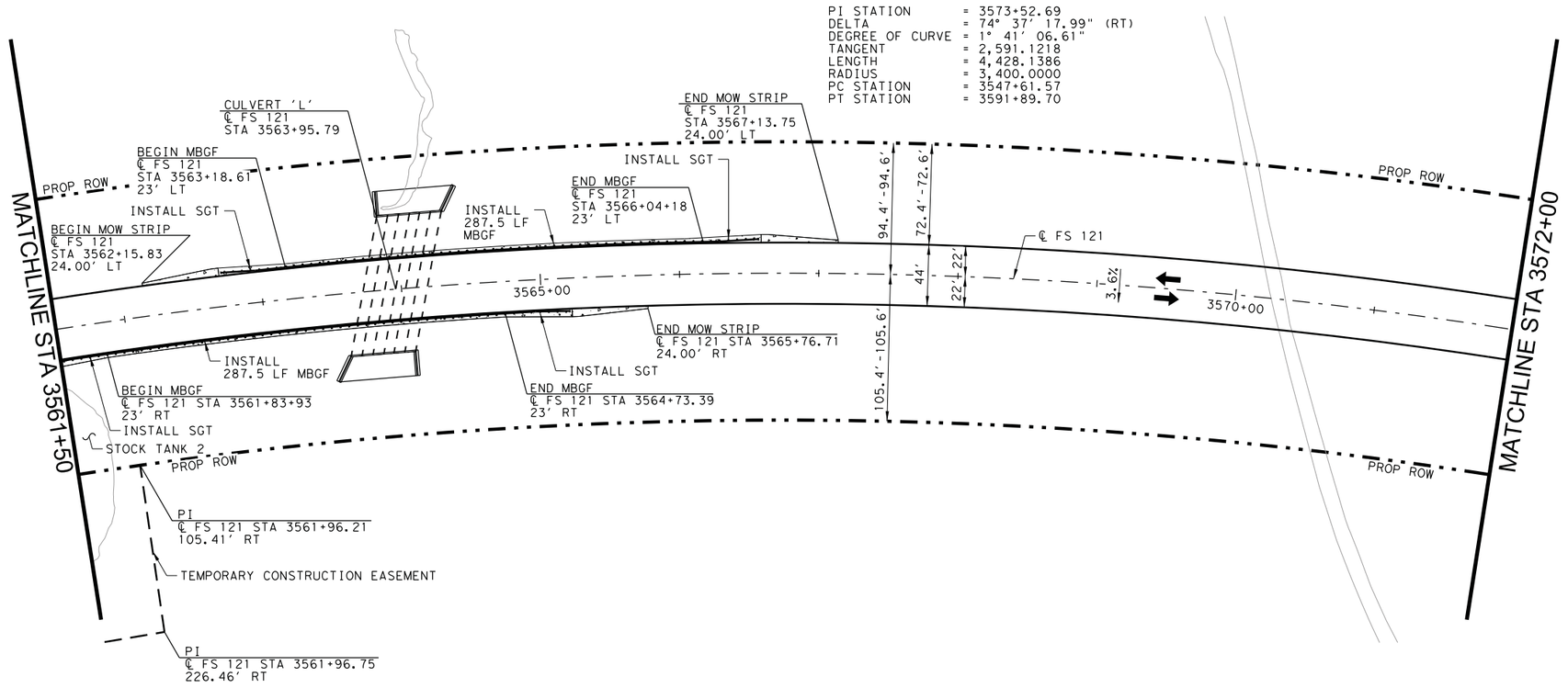
FS 121

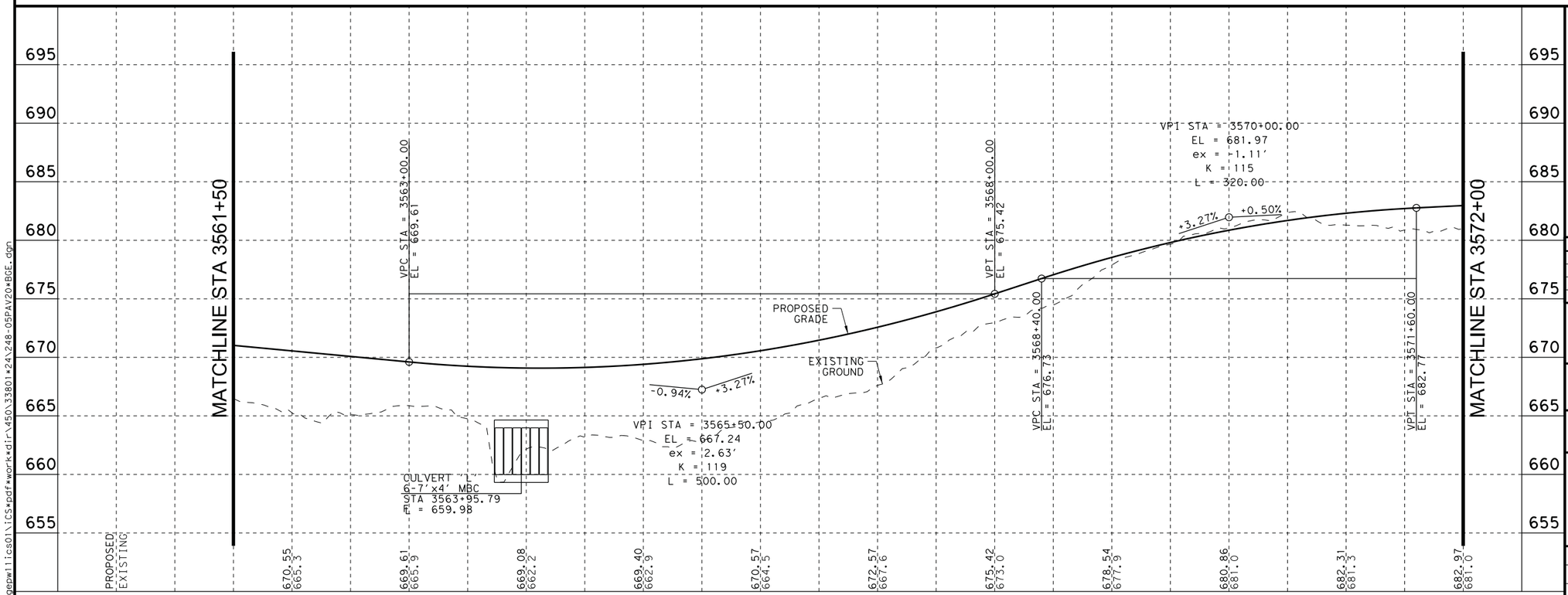
ROADWAY PLAN & PROFILE

STA 3551+00 - STA 3561+50

SCALE: H:1"=100′V:1"=10′ SHEET 19 OF 24

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	123





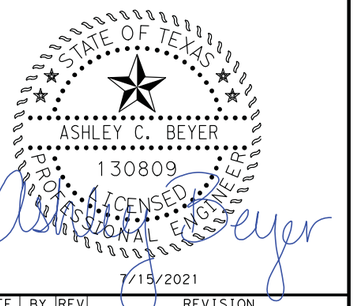
HORIZONTAL
50 0 50 100
VERTICAL
5 0 5 10
SCALE IN FEET

LEGEND

- EXISTING ROW
- PROPOSED ROW
- TEMPORARY CONSTRUCTION EASEMENT
- ALIGN_# — CURVE ID
- EXIST TRAFFIC LANE
- PROP TRAFFIC LANE
- # — DRIVEWAY #

NOTES:

1. ALL CALLOUTS REFER TO EDGE OF SHOULDER UNLESS OTHERWISE NOTED
2. SEE TYPICAL SECTION SHEETS FOR ADDITIONAL INFORMATION
3. SEE HORIZONTAL ALIGNMENT DATA SHEETS FOR ADDITIONAL INFORMATION
4. SEE STOCK TANK DETAILS FOR ADDITIONAL INFORMATION
5. USE BUTT JOINT WHERE PROPOSED PAVEMENT TIES TO EXISTING PAVEMENT. DETAIL SHOWN ON TYPICAL SECTIONS



DATE	BY	REV	REVISION

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TBPE Registration No. F-1046

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FS 121

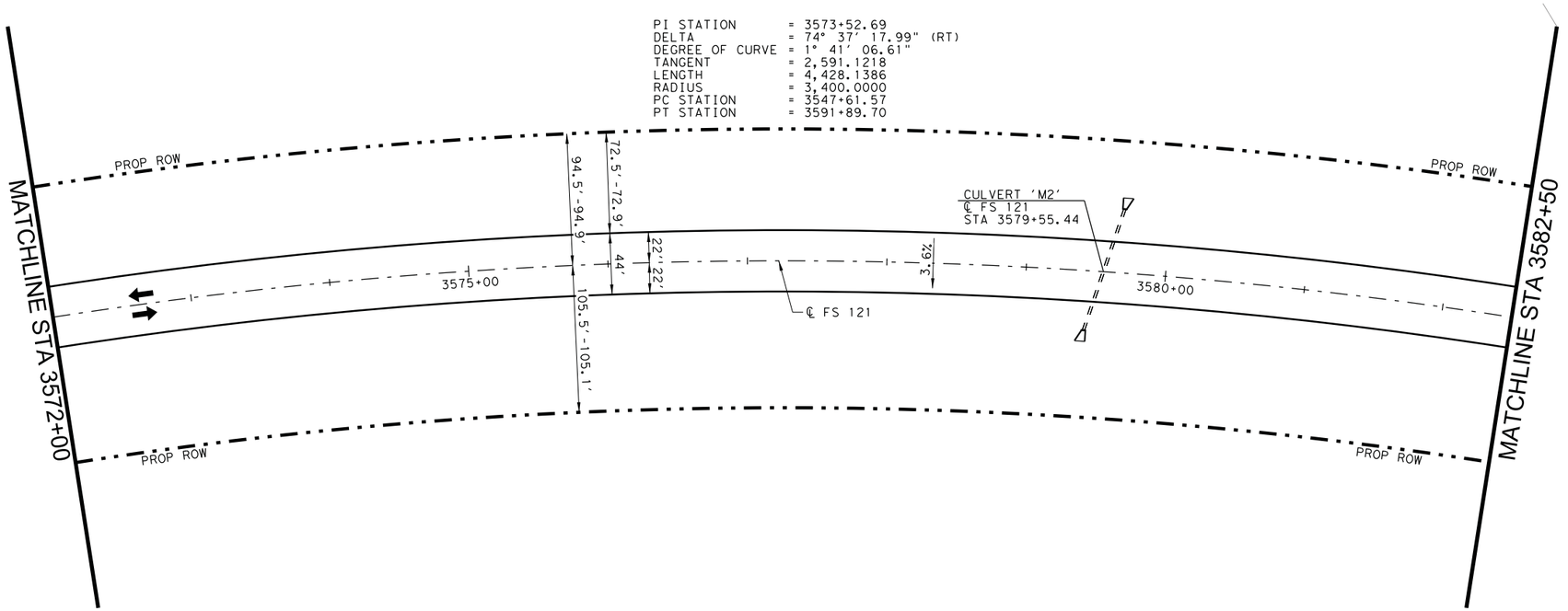
ROADWAY PLAN & PROFILE

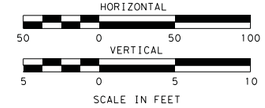
STA 3561+50 - STA 3572+00

SCALE: H:1"=100' V:1"=10' SHEET 20 OF 24

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	124

PI STATION = 3573+52.69
DELTA = 74° 37' 17.99" (RT)
DEGREE OF CURVE = 1° 41' 06.61"
TANGENT = 2,591.1218
LENGTH = 4,428.1386
RADIUS = 3,400.0000
PC STATION = 3547+61.57
PT STATION = 3591+89.70



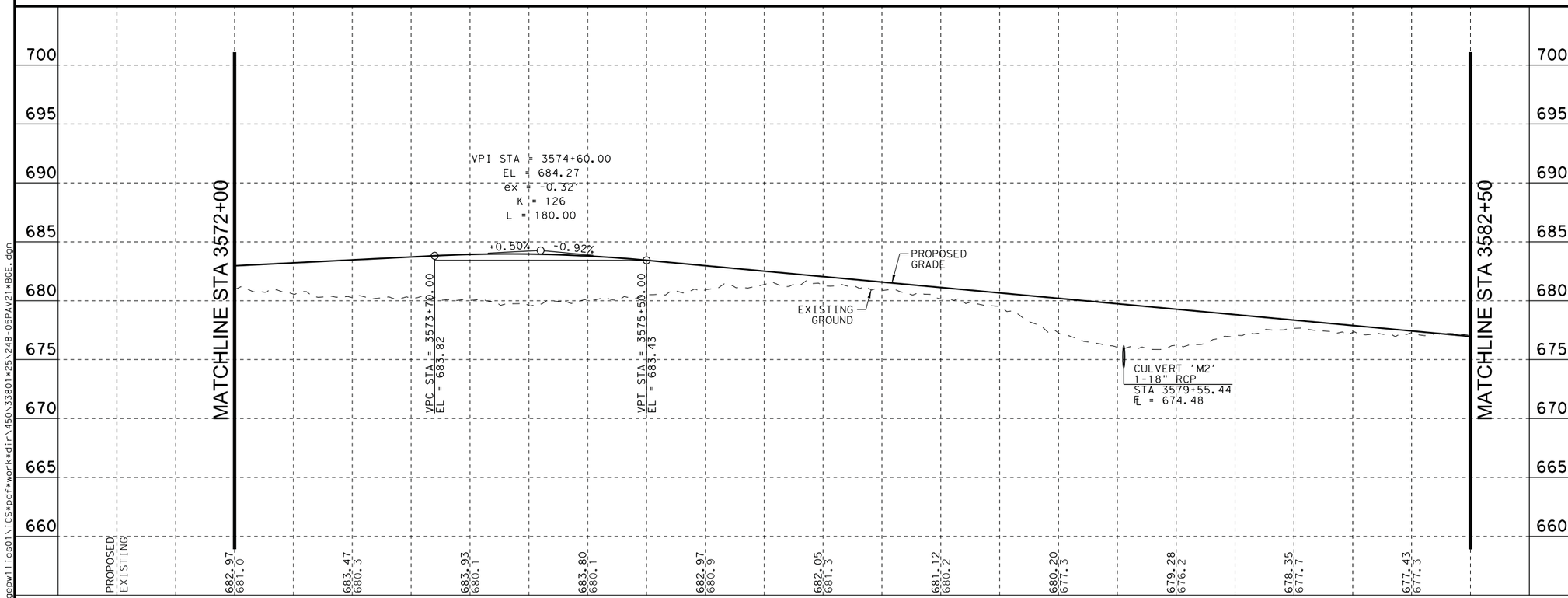


LEGEND

- EXISTING ROW
- PROPOSED ROW
- TEMPORARY CONSTRUCTION EASEMENT
- ALIGN_# — CURVE ID
- EXIST TRAFFIC LANE
- PROP TRAFFIC LANE
- # — DRIVEWAY #

NOTES:

1. ALL CALLOUTS REFER TO EDGE OF SHOULDER UNLESS OTHERWISE NOTED
2. SEE TYPICAL SECTION SHEETS FOR ADDITIONAL INFORMATION
3. SEE HORIZONTAL ALIGNMENT DATA SHEETS FOR ADDITIONAL INFORMATION
4. SEE STOCK TANK DETAILS FOR ADDITIONAL INFORMATION
5. USE BUTT JOINT WHERE PROPOSED PAVEMENT TIES TO EXISTING PAVEMENT. DETAIL SHOWN ON TYPICAL SECTIONS



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ASHLEY C. BEYER
130809
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS
7/15/2021

DATE	BY	REV	REVISION

BGE, Inc.
2595 Dallas Parkway, Suite 101, Frisco, TX 75034
Tel: 972-464-4800 • www.bgeinc.com
TBPE Registration No. F-1046

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FS 121

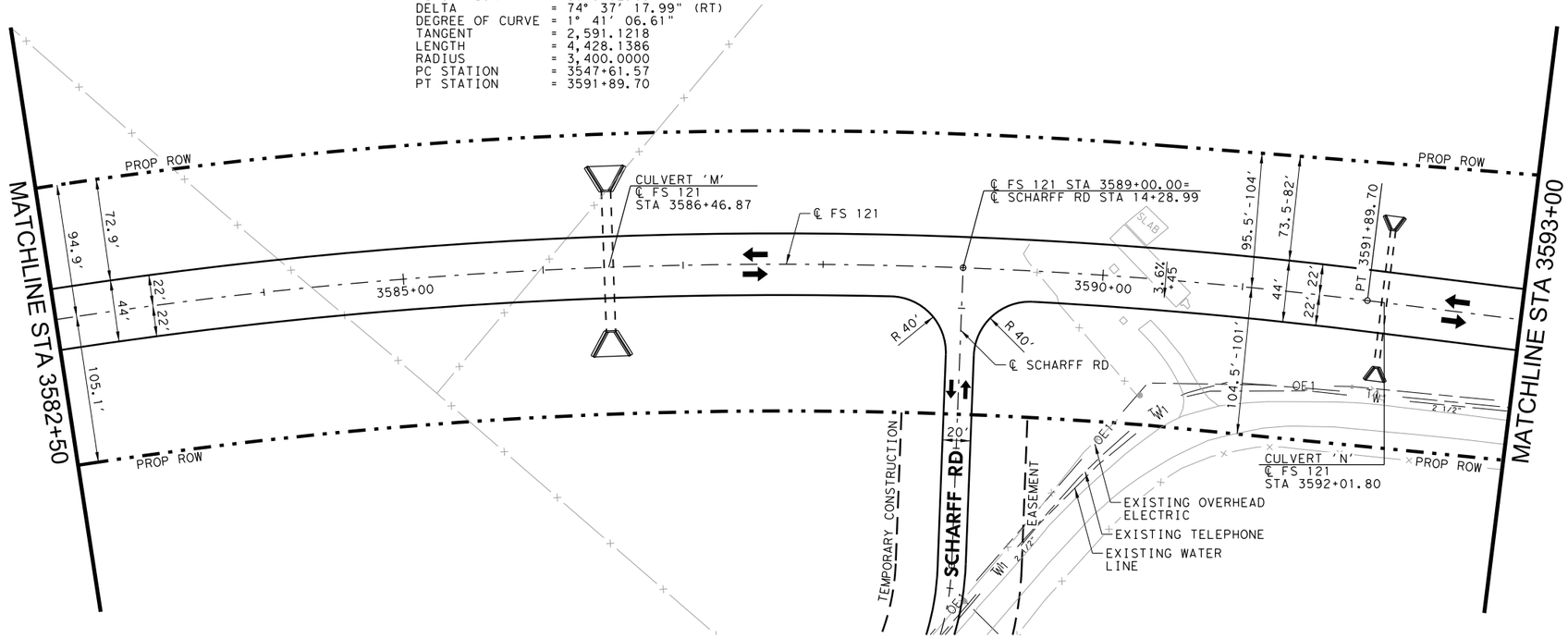
ROADWAY PLAN & PROFILE

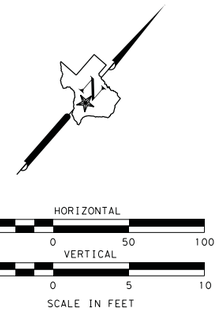
STA 3572+00 - STA 3582+50

SCALE: H:1"=100' V:1"=10' SHEET 21 OF 24

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	125

PI STATION = 3573+52.69
DELTA = 74° 37' 17.99" (RT)
DEGREE OF CURVE = 1° 41' 06.61"
TANGENT = 2,591.1218
LENGTH = 4,428.1386
RADIUS = 3,400.0000
PC STATION = 3547+61.57
PT STATION = 3591+89.70



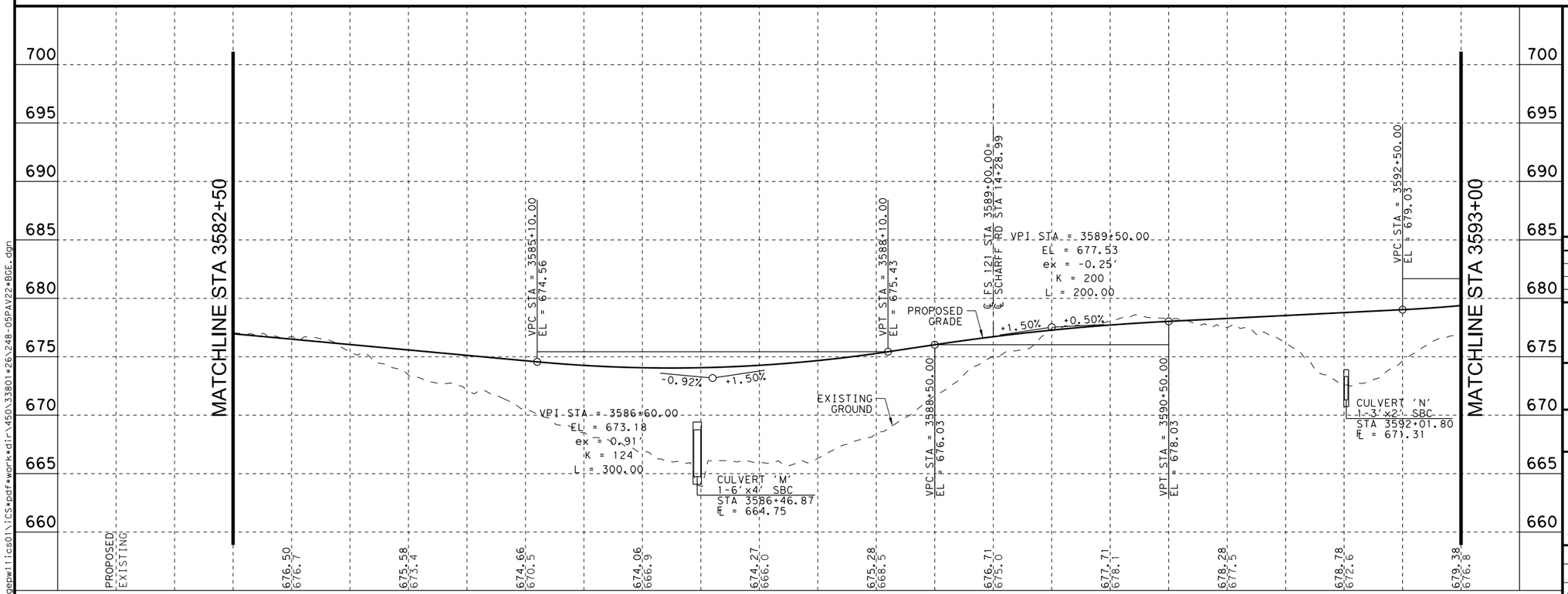


LEGEND

- EXISTING ROW
- PROPOSED ROW
- TEMPORARY CONSTRUCTION EASEMENT
- ALIGN_# — CURVE ID
- EXIST TRAFFIC LANE
- PROP TRAFFIC LANE
- # — DRIVEWAY #

NOTES:

1. ALL CALLOUTS REFER TO EDGE OF SHOULDER UNLESS OTHERWISE NOTED
2. SEE TYPICAL SECTION SHEETS FOR ADDITIONAL INFORMATION
3. SEE HORIZONTAL ALIGNMENT DATA SHEETS FOR ADDITIONAL INFORMATION
4. SEE STOCK TANK DETAILS FOR ADDITIONAL INFORMATION
5. USE BUTT JOINT WHERE PROPOSED PAVEMENT TIES TO EXISTING PAVEMENT. DETAIL SHOWN ON TYPICAL SECTIONS



DATE	BY	REV	REVISION

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TBPE Registration No. F-1046

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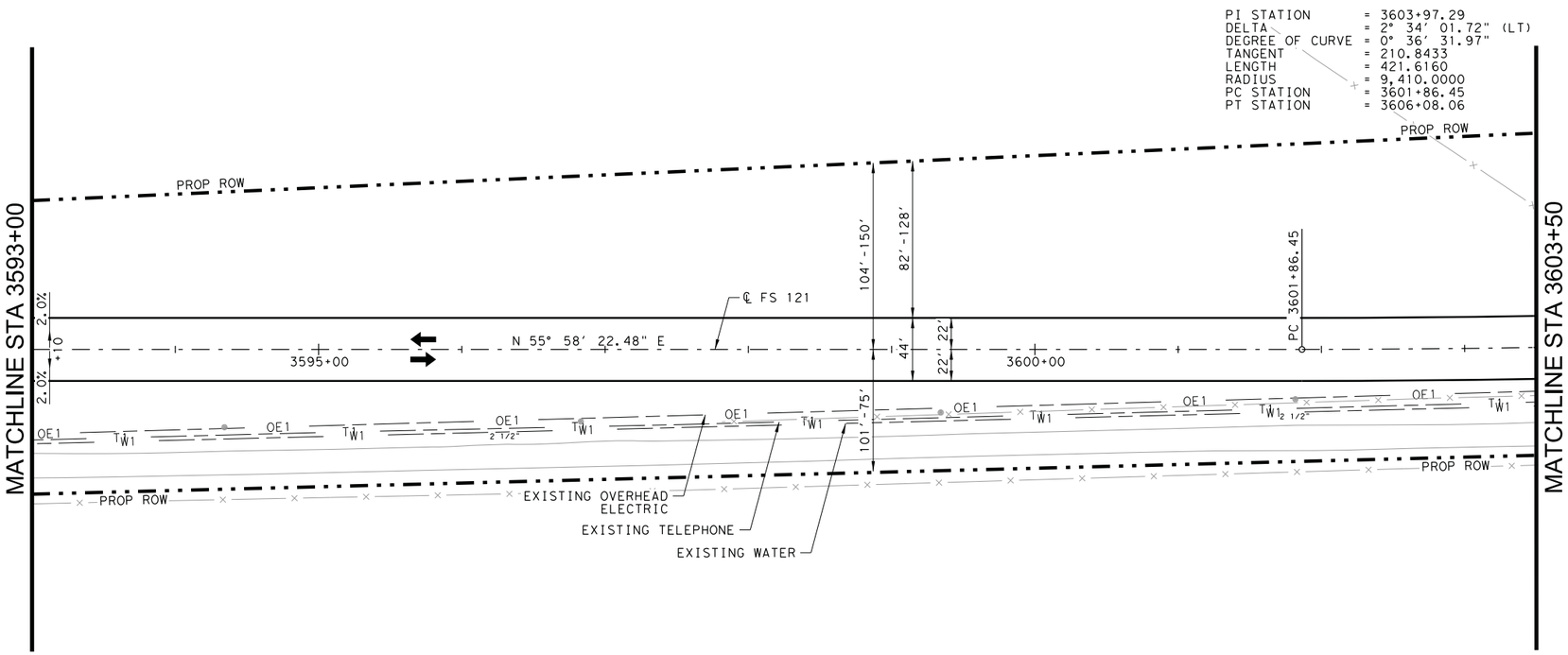
FS 121

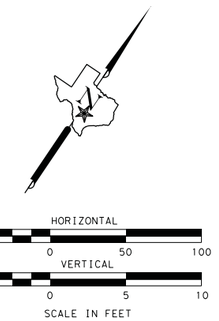
ROADWAY PLAN & PROFILE

STA 3582+50 - STA 3593+00

SCALE: H:1"=100' V:1"=10' SHEET 22 OF 24

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	126





LEGEND

- EXISTING ROW
- PROPOSED ROW
- TEMPORARY CONSTRUCTION EASEMENT
- ALIGN_# — CURVE ID
- EXIST TRAFFIC LANE
- PROP TRAFFIC LANE
- # — DRIVEWAY #

NOTES:

1. ALL CALLOUTS REFER TO EDGE OF SHOULDER UNLESS OTHERWISE NOTED
2. SEE TYPICAL SECTION SHEETS FOR ADDITIONAL INFORMATION
3. SEE HORIZONTAL ALIGNMENT DATA SHEETS FOR ADDITIONAL INFORMATION
4. SEE STOCK TANK DETAILS FOR ADDITIONAL INFORMATION
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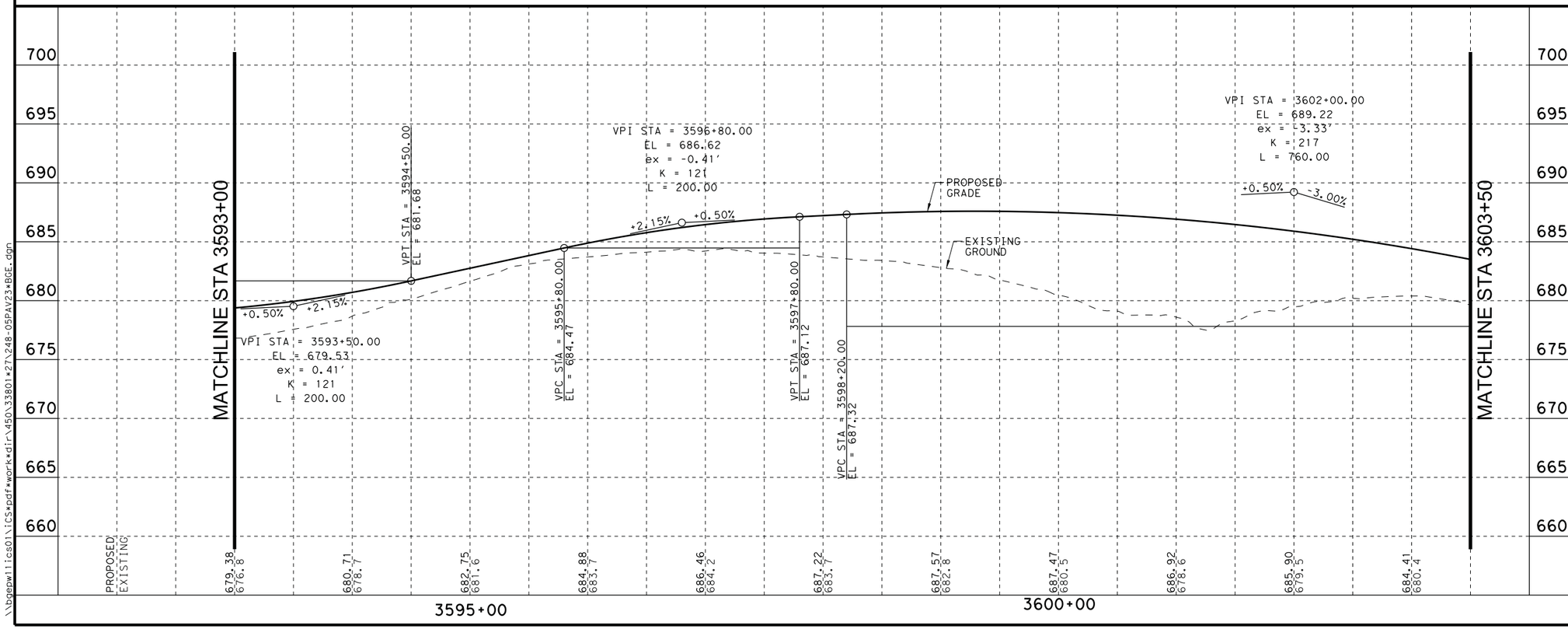

STATE OF TEXAS
ASHLEY C. BEYER
130809
LICENSED PROFESSIONAL ENGINEER
7/15/2021

DATE	BY	REV	REVISION

BGE, Inc.
2595 Dallas Parkway, Suite 101, Frisco, TX 75034
Tel: 972-464-4800 • www.bgeinc.com
TBPE Registration No. F-1046

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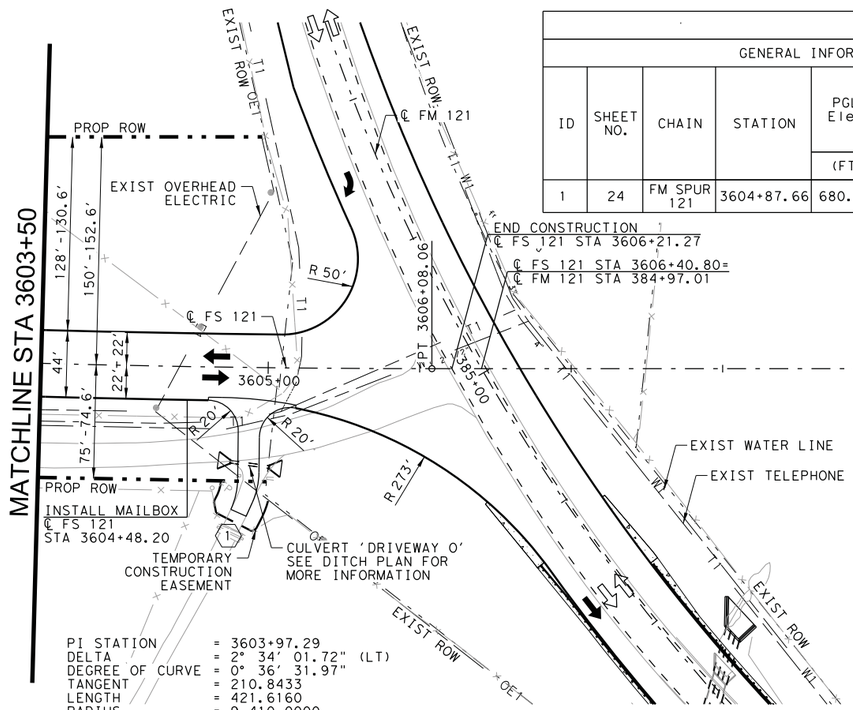
FS 121

ROADWAY PLAN & PROFILE

STA 3593+00 - STA 3603+50

SCALE: H:1"=100' V:1"=10' SHEET 23 OF 24

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	127

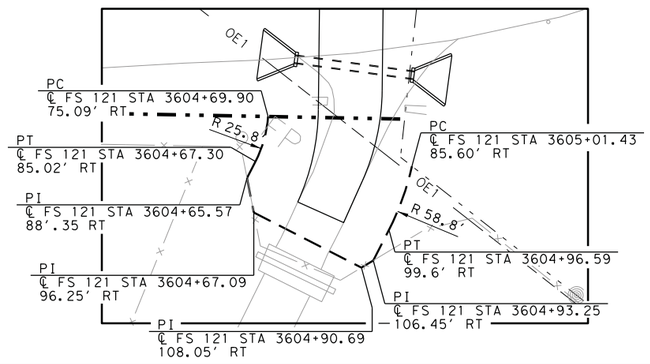


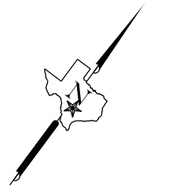
DRIVEWAY SUMMARY

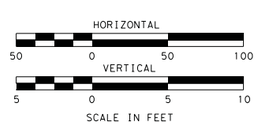
GENERAL INFORMATION								EDGE OF PAVEMENT TO ROW					DRIVEWAY RADII		PAYMENT INFO	
ID	SHEET NO.	CHAIN	STATION	PGL Elev	SKEW ANGLE AT BASELINE (DEG)	DRIVEWAY WIDTH (FT) "W"	DRIVEWAY LENGTH (FT) "L"	LENGTH (FT) "L1"	SLOPE (%) "G1"	LENGTH (FT) "L2"	SLOPE (%) "G2"	Elevation @ ROW	RADIUS - LEFT (FT) '"R"	RADIUS - RIGHT (FT) '"R"	MATERIAL	AREA (SY)
				(FT)	(DEG)	(FT)	(FT)	(FT)	(%)	(FT)	(%)	(FT)	(FT)	(FT)		(SY)
1	24	FM SPUR 121	3604+87.66	680.40	90.00	14.00	79.60	68.77	-2.61%	12.63	0.64%	678.16	20.00	20.00	CONCRETE	147.0

*SEE DRIVEWAY DETAIL SHEET FOR MORE INFORMATION

TEMPORARY CONSTRUCTION EASEMENT DETAIL





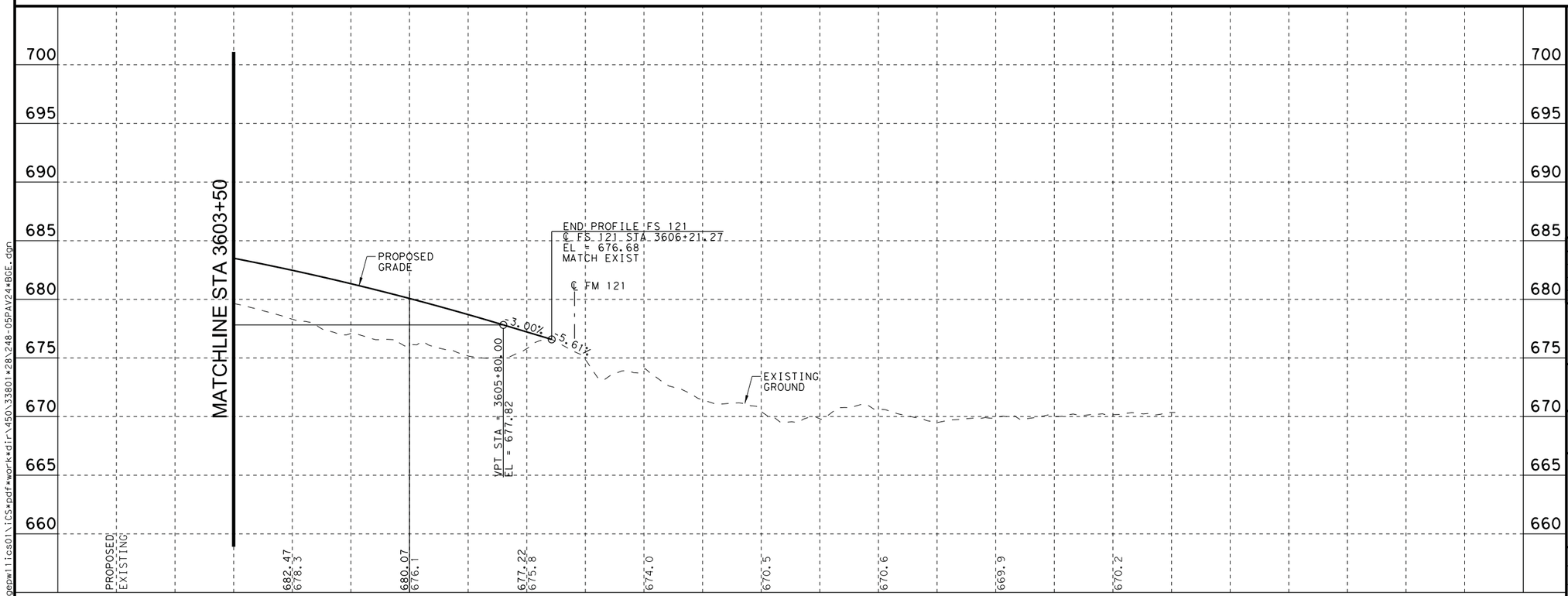


LEGEND

- EXISTING ROW
- PROPOSED ROW
- TEMPORARY CONSTRUCTION EASEMENT
- ALIGN_# — CURVE ID
- EXIST TRAFFIC LANE
- PROP TRAFFIC LANE
- # — DRIVEWAY #

NOTES:

1. ALL CALLOUTS REFER TO EDGE OF SHOULDER UNLESS OTHERWISE NOTED
2. SEE TYPICAL SECTION SHEETS FOR ADDITIONAL INFORMATION
3. SEE HORIZONTAL ALIGNMENT DATA SHEETS FOR ADDITIONAL INFORMATION
4. SEE STOCK TANK DETAILS FOR ADDITIONAL INFORMATION
5. USE BUTT JOINT WHERE PROPOSED PAVEMENT TIES TO EXISTING PAVEMENT. DETAIL SHOWN ON TYPICAL SECTIONS



DATE	BY	REV	REVISION

BGE, Inc.
2595 Dallas Parkway, Suite 101, Frisco, TX 75034
Tel: 972-464-4800 • www.bgeinc.com
TBPE Registration No. F-1046

Texas Department of Transportation © 2021

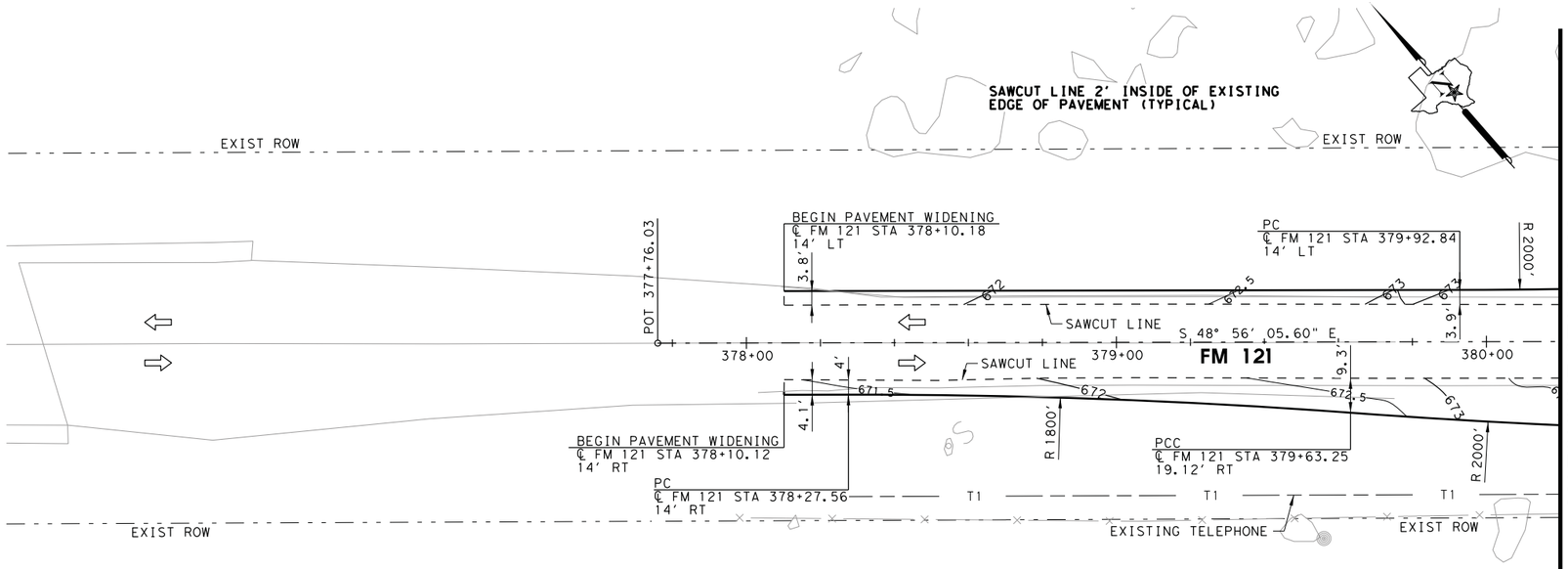
FS 121

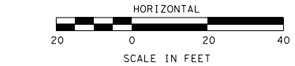
ROADWAY PLAN & PROFILE

STA 3603+50 - END

SCALE: H:1"=100' V:1"=10' SHEET 24 OF 24

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	128





LEGEND

- EXISTING ROW
- PROPOSED ROW
- TEMPORARY CONSTRUCTION EASEMENT
- ALIGN_# — CURVE ID
- EXIST TRAFFIC LANE
- PROP TRAFFIC LANE
- # — DRIVEWAY #

DRIVEWAY SUMMARY

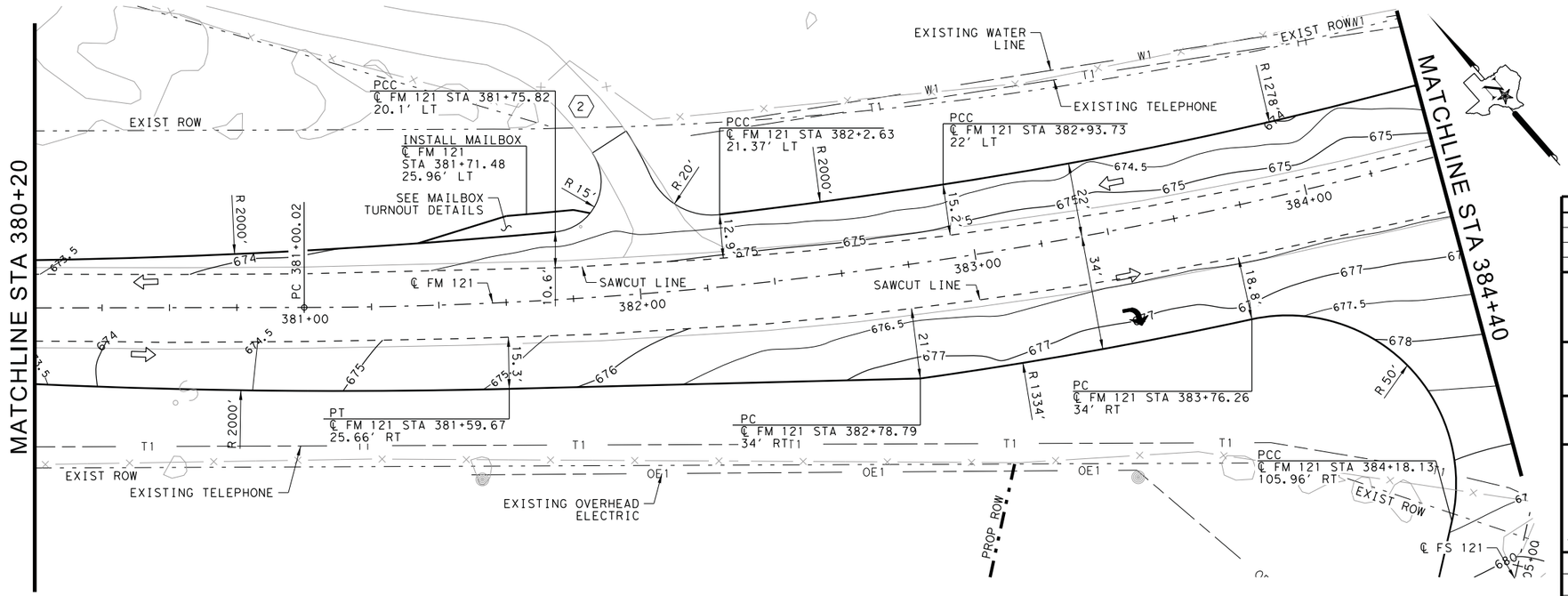
GENERAL INFORMATION								EDGE OF PAVEMENT TO ROW					DRIVEWAY RADII		PAYMENT INFO	
ID	SHEET NO.	CHAIN	STATION	PGL Elev	SKEW ANGLE AT BASELINE (DEG)	DRIVEWAY WIDTH (FT) "W"	DRIVEWAY LENGTH (FT) "L"	LENGTH (FT) "L1"	SLOPE (%) "G1"	LENGTH (FT) "L2"	SLOPE (%) "G2"	Elevation @ ROW	RADIUS - LEFT (FT) ' "RL"	RADIUS - RIGHT (FT) ' "RR"	MATERIAL	AREA (SY)
				(FT)	(DEG)	(FT)	(FT)	(FT)	(%)	(FT)	(%)		(FT)	(FT)		(SY)
2	1	FM 121	382+07.71	674.99	78.77	12.00	26.47	26.47	-4.49%	N/A	N/A	673.12	15.0	20.0	FLEXBASE	52.7

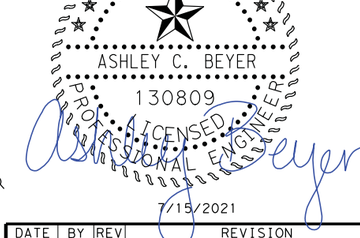
*SEE DRIVEWAY DETAIL SHEET FOR MORE INFORMATION

P.I. STATION = 385+68.30
DELTA = 39° 37' 09.42" (LT)
DEGREE OF CURVE = 4° 24' 26.52"
TANGENT = 468.2759
LENGTH = 898.9330
RADIUS = 1,300.0000
P.C. STATION = 381+00.02
P.T. STATION = 389+98.96

NOTES:

1. ALL CALLOUTS REFER TO EDGE OF SHOULDER UNLESS OTHERWISE NOTED
2. SEE TYPICAL SECTION SHEETS FOR ADDITIONAL INFORMATION
3. SEE HORIZONTAL ALIGNMENT DATA SHEETS FOR ADDITIONAL INFORMATION
4. SEE STOCK TANK DETAILS FOR ADDITIONAL INFORMATION
5. USE BUTT JOINT WHERE PROPOSED PAVEMENT TIES TO EXISTING PAVEMENT. DETAIL SHOWN ON TYPICAL SECTIONS





7/15/2021

DATE	BY	REV	REVISION

BGE, Inc.
2595 Dallas Parkway, Suite 101, Frisco, TX 75034
Tel: 972-464-4800 • www.bgeinc.com
TBPE Registration No. F-1046

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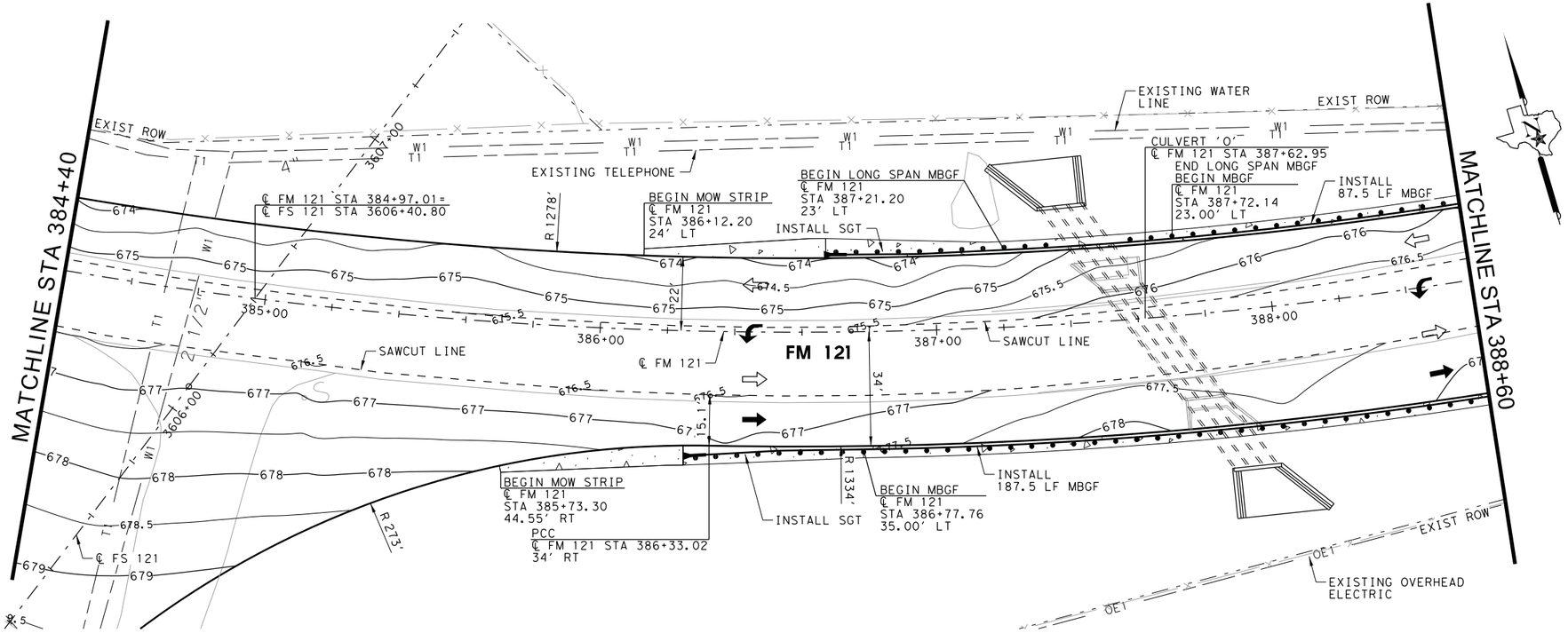
FS 121

PLAN
FM 121
BEGIN - STA 384+40

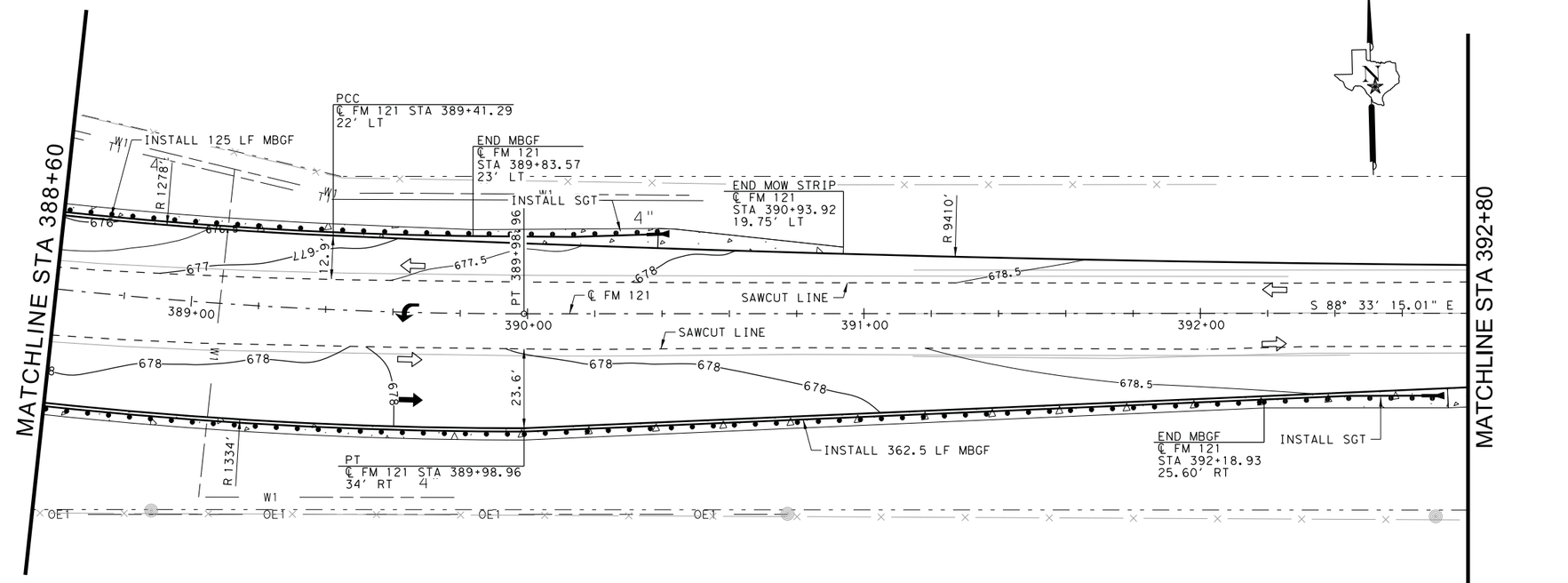
SCALE: 1" = 40' SHEET 1 OF 3

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	129



P.I. STATION = 385+68.30
DELTA = 39° 37' 09.42" (LT)
DEGREE OF CURVE = 4° 24' 26.52"
TANGENT = 468.2759
LENGTH = 898.9330
RADIUS = 1,300.0000
P.C. STATION = 381+00.02
P.T. STATION = 389+98.96

SAWCUT LINE 2' INSIDE OF EXISTING EDGE OF PAVEMENT (TYPICAL)



HORIZONTAL
20 0 20 40
SCALE IN FEET

LEGEND

- EXISTING ROW
- PROPOSED ROW
- TEMPORARY CONSTRUCTION EASEMENT
- ALIGN_# — CURVE ID
- EXIST TRAFFIC LANE
- PROP TRAFFIC LANE
- # — DRIVEWAY #

NOTES:

1. ALL CALLOUTS REFER TO EDGE OF SHOULDER UNLESS OTHERWISE NOTED
2. SEE TYPICAL SECTION SHEETS FOR ADDITIONAL INFORMATION
3. SEE HORIZONTAL ALIGNMENT DATA SHEETS FOR ADDITIONAL INFORMATION
4. SEE STOCK TANK DETAILS FOR ADDITIONAL INFORMATION
5. USE BUTT JOINT WHERE PROPOSED PAVEMENT TIES TO EXISTING PAVEMENT. DETAIL SHOWN ON TYPICAL SECTIONS

STATE OF TEXAS
ASHLEY C. BEYER
130809
LICENSED
PROFESSIONAL ENGINEER
7/16/2021

DATE	BY	REV	REVISION

BGE, Inc.
2595 Dallas Parkway, Suite 101, Frisco, TX 75034
Tel: 972-464-4800 • www.bgeinc.com
TBPE Registration No. F-1046

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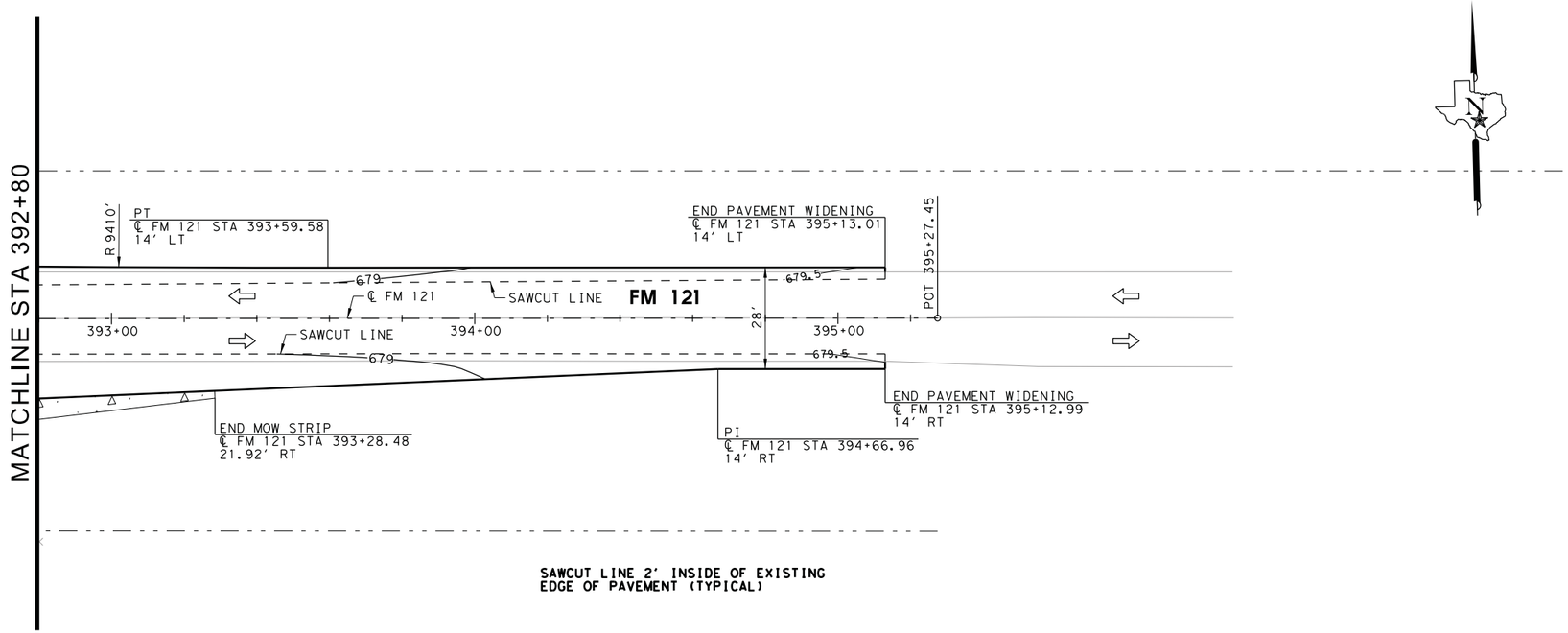
FS 121

PLAN
FM 121
STA 384+40 - STA 392+80

SCALE: 1" = 40' SHEET 2 OF 3

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	130



SAWCUT LINE 2' INSIDE OF EXISTING EDGE OF PAVEMENT (TYPICAL)

HORIZONTAL
20 0 20 40
SCALE IN FEET

LEGEND

- EXISTING ROW
- PROPOSED ROW
- TEMPORARY CONSTRUCTION EASEMENT
- (ALIGN_#) CURVE ID
- EXIST TRAFFIC LANE
- PROP TRAFFIC LANE
- (#) DRIVEWAY #

NOTES:

1. ALL CALLOUTS REFER TO EDGE OF SHOULDER UNLESS OTHERWISE NOTED
2. SEE TYPICAL SECTION SHEETS FOR ADDITIONAL INFORMATION
3. SEE HORIZONTAL ALIGNMENT DATA SHEETS FOR ADDITIONAL INFORMATION
4. SEE STOCK TANK DETAILS FOR ADDITIONAL INFORMATION
5. USE BUTT JOINT WHERE PROPOSED PAVEMENT TIES TO EXISTING PAVEMENT. DETAIL SHOWN ON TYPICAL SECTIONS

STATE OF TEXAS
ASHLEY C. BEYER
130809
PROFESSIONAL LICENSED ENGINEER
7/15/2021

DATE	BY	REV	REVISION

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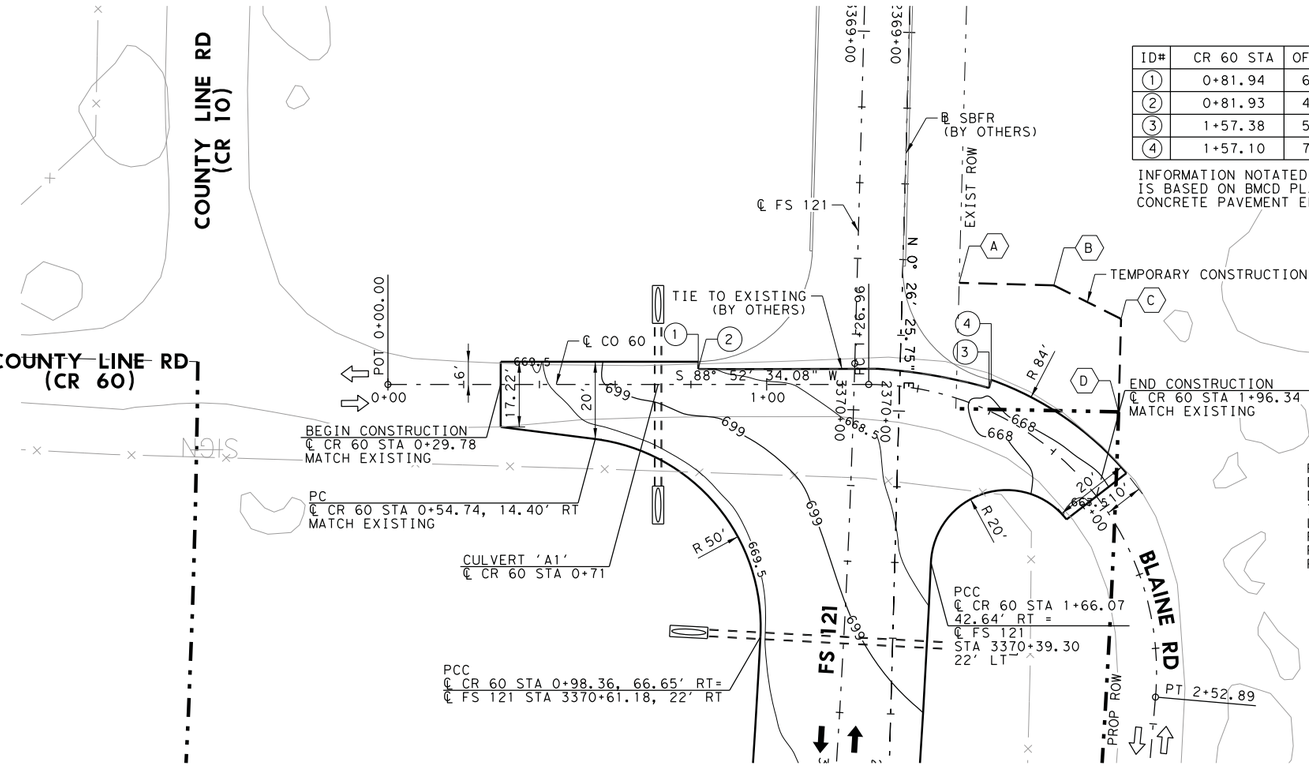
FS 121

PLAN
FM 121
STA 392+80 - END

SCALE: 1" = 40' SHEET 3 OF 3

STATE		HIGHWAY NO.
TEXAS		FS 121

STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	131



ID#	CR 60 STA	OFFSET	LT/RT
1	0+81.94	6.00'	LT
2	0+81.93	4.09'	LT
3	1+57.38	5.51'	LT
4	1+57.10	7.73'	LT

INFORMATION NOTATED WITHIN CHART IS BASED ON BMCD PLAN SET. MATCH CONCRETE PAVEMENT EDGE IN FIELD

P.I. STATION = 2+09.81
DELTA = 94° 6' 07.42" (RT)
DEGREE OF CURVE = 75° 23' 21.06"
TANGENT = 82.8456
LENGTH = 125.9271
RADIUS = 76.0000
P.C. STATION = 1+26.96
P.T. STATION = 2+52.89

TEMPORARY CONSTRUCTION EASEMENT POINTS			
ID#	CR 60 STA	OFFSET	LT/RT
Ⓐ	1+44.30	29.57	LT
Ⓑ	1+60.87	37.26	LT
Ⓒ	1+74.08	38.66	LT
Ⓓ	1+85.07	19.30	LT

HORIZONTAL
20 0 20 40
SCALE IN FEET

LEGEND

- EXISTING ROW
- PROPOSED ROW
- TEMPORARY CONSTRUCTION EASEMENT
- ALIGN_# CURVE ID
- EXIST TRAFFIC LANE
- PROP TRAFFIC LANE
- # DRIVEWAY #

NOTES:

1. ALL CALLOUTS REFER TO EDGE OF SHOULDER UNLESS OTHERWISE NOTED
2. SEE TYPICAL SECTION SHEETS FOR ADDITIONAL INFORMATION
3. SEE HORIZONTAL ALIGNMENT DATA SHEETS FOR ADDITIONAL INFORMATION
4. SEE STOCK TANK DETAILS FOR ADDITIONAL INFORMATION
5. USE BUTT JOINT WHERE PROPOSED PAVEMENT TIES TO EXISTING PAVEMENT. DETAIL SHOWN ON TYPICAL SECTIONS

STATE OF TEXAS
ASHLEY C. BEYER
130809
LICENSED PROFESSIONAL ENGINEER
7/15/2021

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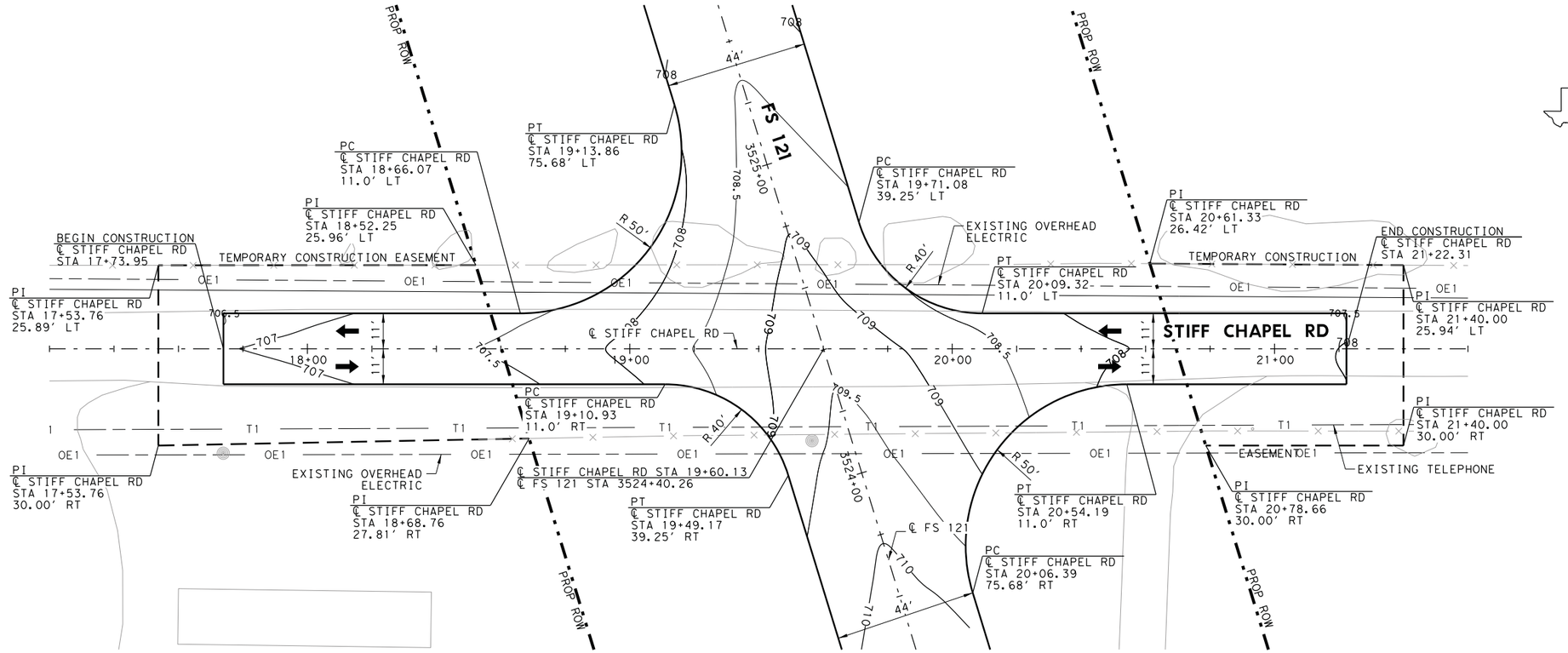
FS 121

PLAN
CR 60

SCALE: 1" = 40' SHEET 1 OF 1

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	132

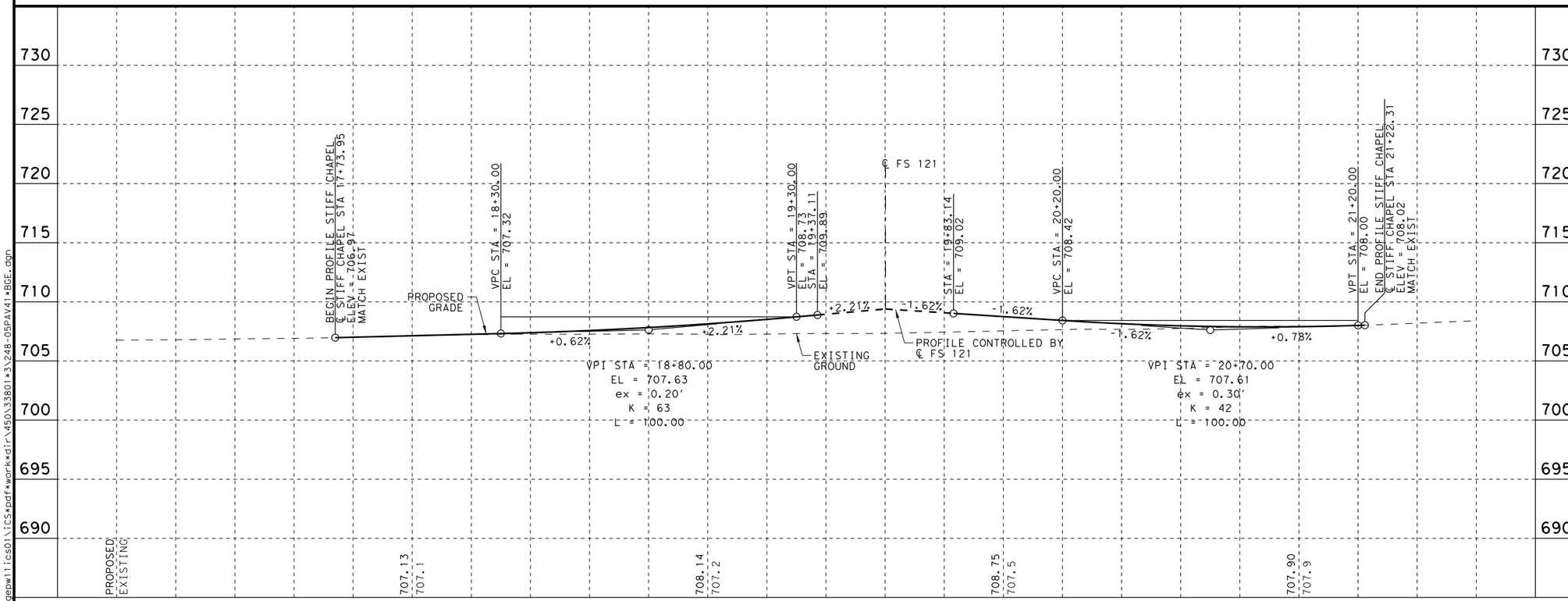


LEGEND

- EXISTING ROW
- PROPOSED ROW
- TEMPORARY CONSTRUCTION EASEMENT
- (ALIGN_#) CURVE ID
- EXIST TRAFFIC LANE
- PROP TRAFFIC LANE
- (#) DRIVEWAY #

NOTES:

1. ALL CALLOUTS REFER TO EDGE OF SHOULDER UNLESS OTHERWISE NOTED
2. SEE TYPICAL SECTION SHEETS FOR ADDITIONAL INFORMATION
3. SEE HORIZONTAL ALIGNMENT DATA SHEETS FOR ADDITIONAL INFORMATION
4. SEE STOCK TANK DETAILS FOR ADDITIONAL INFORMATION
5. USE BUTT JOINT WHERE PROPOSED PAVEMENT TIES TO EXISTING PAVEMENT. DETAIL SHOWN ON TYPICAL SECTIONS



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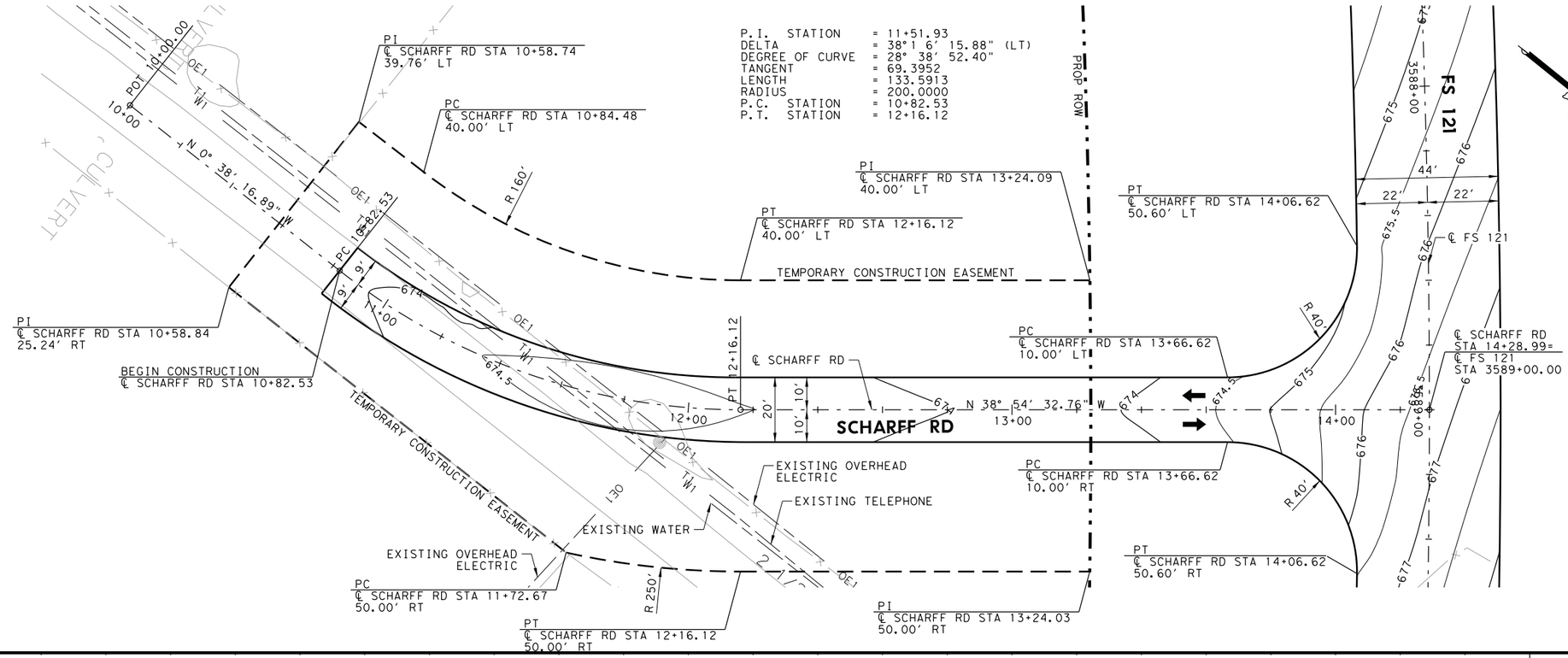
FS 121

PLAN & PROFILE STIFF CHAPEL ROAD

SCALE: H: 1"=40' V: 1"=20' SHEET 1 OF 1

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	133

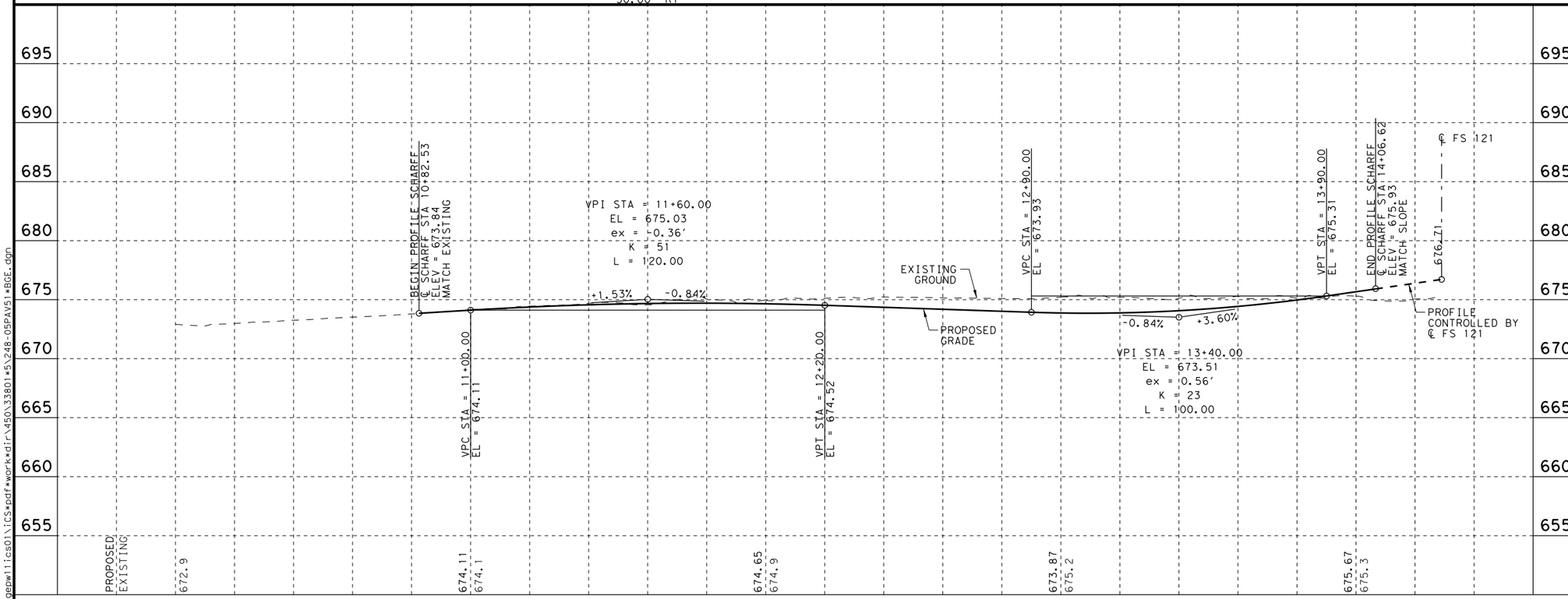


LEGEND

- EXISTING ROW
- PROPOSED ROW
- TEMPORARY CONSTRUCTION EASEMENT
- (ALIGN_#) CURVE ID
- EXIST TRAFFIC LANE
- PROP TRAFFIC LANE
- (#) DRIVEWAY #

NOTES:

1. ALL CALLOUTS REFER TO EDGE OF SHOULDER UNLESS OTHERWISE NOTED
2. SEE TYPICAL SECTION SHEETS FOR ADDITIONAL INFORMATION
3. SEE HORIZONTAL ALIGNMENT DATA SHEETS FOR ADDITIONAL INFORMATION
4. SEE STOCK TANK DETAILS FOR ADDITIONAL INFORMATION
5. USE BUTT JOINT WHERE PROPOSED PAVEMENT TIES TO EXISTING PAVEMENT. DETAIL SHOWN ON TYPICAL SECTIONS



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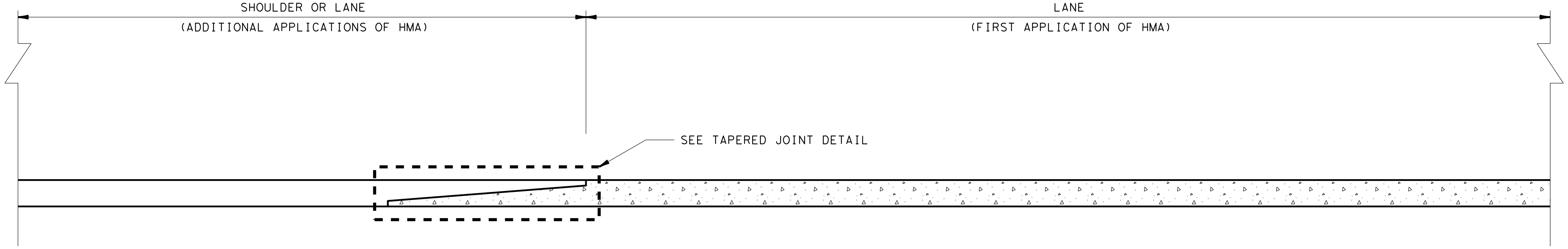
FS 121

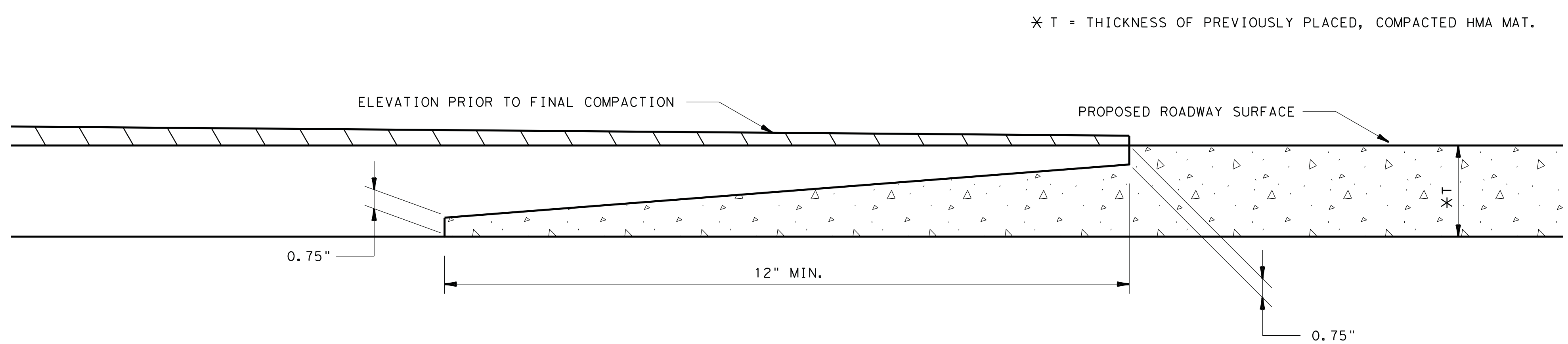
PLAN & PROFILE SCHARFF ROAD

SCALE: H: 1"=40' V: 1"=20' SHEET 1 OF 1

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	134



CROSS-SECTIONAL VIEW OF LONGITUDINAL JOINT



SEE TYPICAL SECTION FOR DEPTH AND TYPE OF HMA

TAPERED JOINT DETAIL

NOTES:

EXTEND THE TAPERED PORTION OF THE MAT BEYOND THE NORMAL LANE WIDTH.

CONSTRUCT THE TAPERED PORTION OF THE MAT USING AN APPROVED STRIKE-OFF DEVICE THAT WILL PROVIDE A UNIFORM SLOPE AND WILL NOT RESTRICT THE MAIN SCREED.

APPLY TACK COAT TO THE IN-PLACE TAPER BEFORE THE ADJACENT MAT IS PLACED. TACK COAT IS SUBSIDIARY TO HMA BID ITEM.

FINAL DENSITY REQUIREMENTS FOR THE ENTIRE PAVEMENT, INCLUDING THE TAPER AREA, WILL NOT CHANGE.

COMPACTION OF THE INITIAL TAPER SECTION WILL BE REQUIRED TO BE AS NEAR TO FINAL DENSITY AS POSSIBLE.

STATE OF TEXAS
ASHLEY C. BEYER
130809
LICENSED
PROFESSIONAL ENGINEER
7/16/2021

FS 121
HOTMIX LONGITUDINAL JOINT DETAIL

Texas Department of Transportation

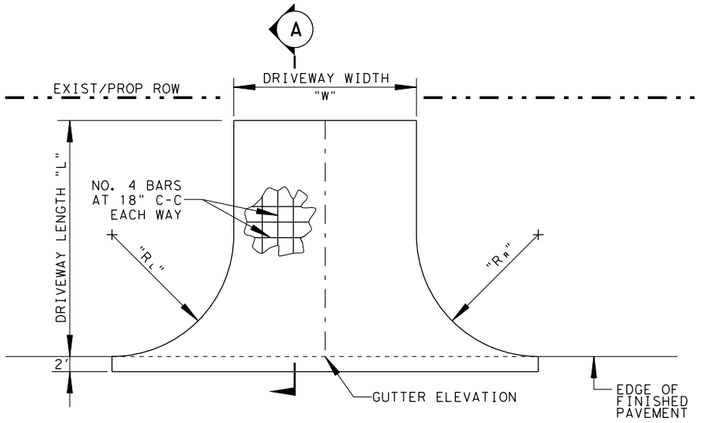
CONT	SECT	JOB	HIGHWAY
0091	10	002	FS 121
DIST		COUNTY	SHEET NO.
PAR		GRAYSON	135

DN: 7/16/2021 2:50:55 AM CK:

DATE:
FILE: pw\\lics01\\CS*pdf*work*dir\\505\\33801*70\\HOTMIX LONGITUDINAL JOINT DETAIL.dgn

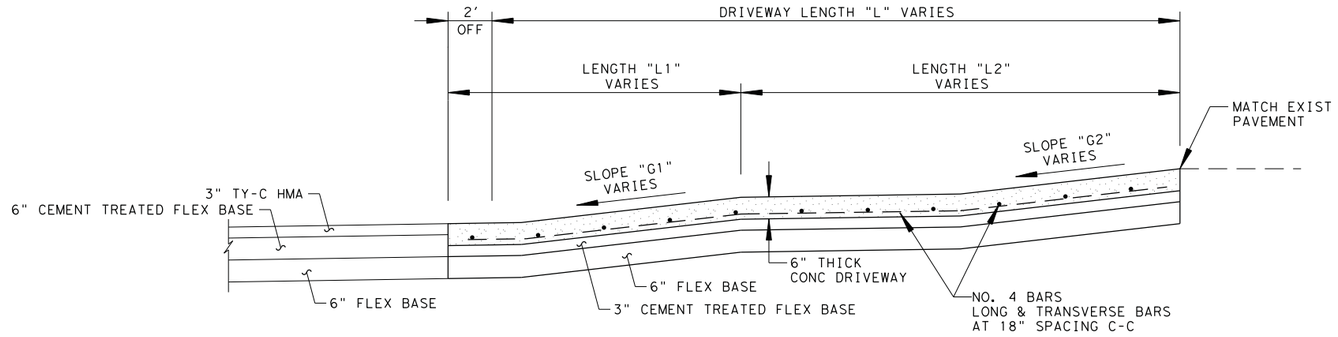
NOTE:

LETTER OF PERMISSION NEEDS TO BE OBTAINED FROM PROPERTY OWNWERS FOR THE CONSTRUCTION OF DRIVEWAYS THAT EXTEND ONTO PRIVATE PROPERTY. THE CONTRACTOR SHALL CONTACT EACH PROPERTY OWNER PRIOR TO CONSTRUCTION OF THESE DRIVEWAYS.



DRIVEWAY PLAN VIEW

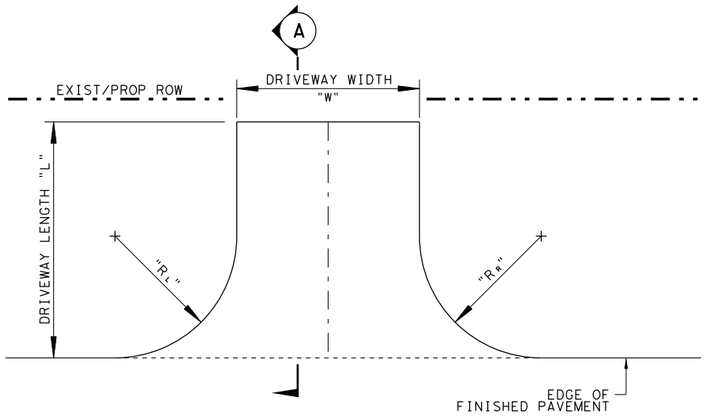
DRIVEWAY AND CURB DETAIL



SECTION A

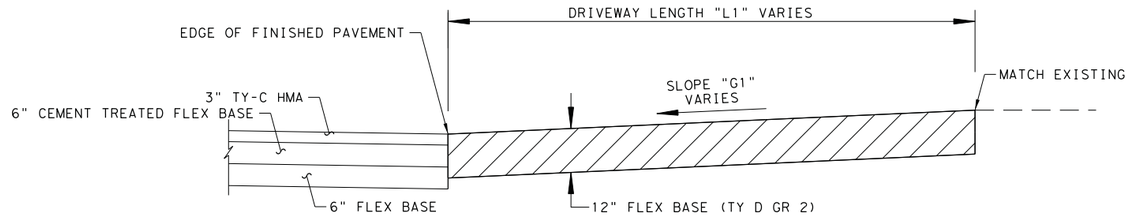
DRIVEWAY AND SIDEWALK DETAIL

CONCRETE DRIVEWAY DETAIL



DRIVEWAY PLAN VIEW

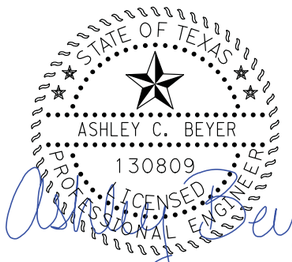
DRIVEWAY DETAIL



SECTION A

DRIVEWAY DETAIL

FLEXBASE DRIVEWAY DETAIL



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DRIVEWAY DETAIL

SCALE: N/A SHEET 1 OF 1

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	136

PROCEDURES FOR DISPOSITION OF EXISTING STOCK TANKS

FOR THE REMOVAL OF THE EXISTING STOCK TANKS. SEE STOCK POND EXCAVATION DETAILS FOR LOCATIONS.

THE CONTRACTOR WILL BE REQUIRED TO SUBMIT WRITTEN CONSTRUCTION PLANS FOR APPROVAL BY THE ENGINEER. THESE PLANS ARE TO OUTLINE, IN DETAIL, THE METHOD TO BE USED BY THE CONTRACTOR TO ACCOMPLISH THE REMOVAL OF THESE TANKS AND SHALL GENERALLY CONFORM TO THE FOLLOWING SEQUENCE:

1) INSTALL SEDIMENT CONTROL DEVICES, INCLUDING ROCK FILTER DAMS, DOWNSTREAM OF PUMP DISCHARGE, AS SHOWN IN THE SW3P AND AS DIRECTED BY THE ENGINEER.

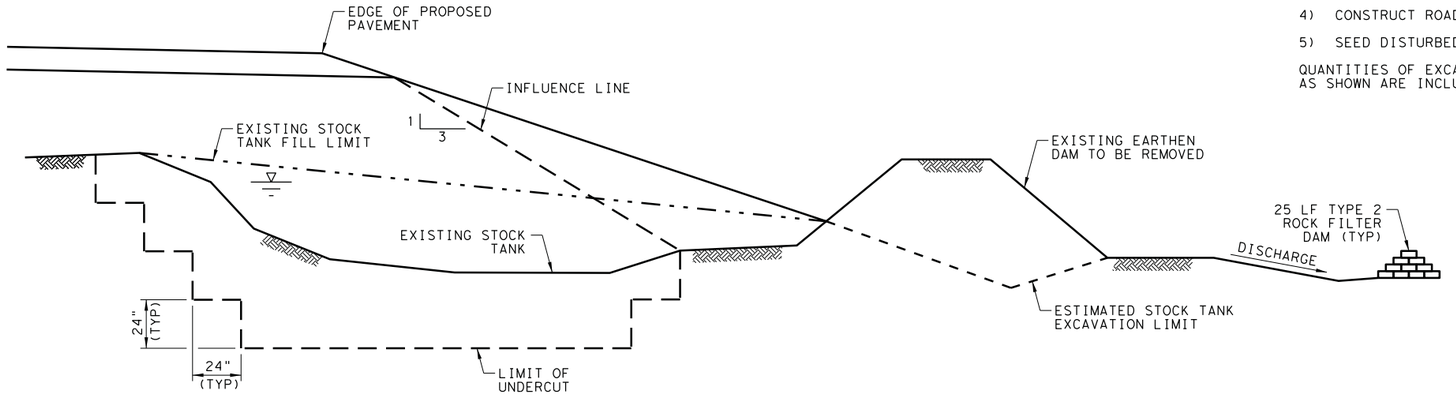
2) DRAIN STOCK TANKS AT A RATE THAT DOWNSTREAM FLOODING AND EROSION DOES NOT OCCUR. SURFACE TO BE GRADED TO PROVIDE POSITIVE DRAINAGE.

3) UNDERCUT DRAINED STOCK TANKS AS SHOWN ON THE STOCK TANK DISPOSITION DETAIL AND AS DIRECTED BY THE ENGINEER.

4) CONSTRUCT ROADWAY EMBANKMENT.

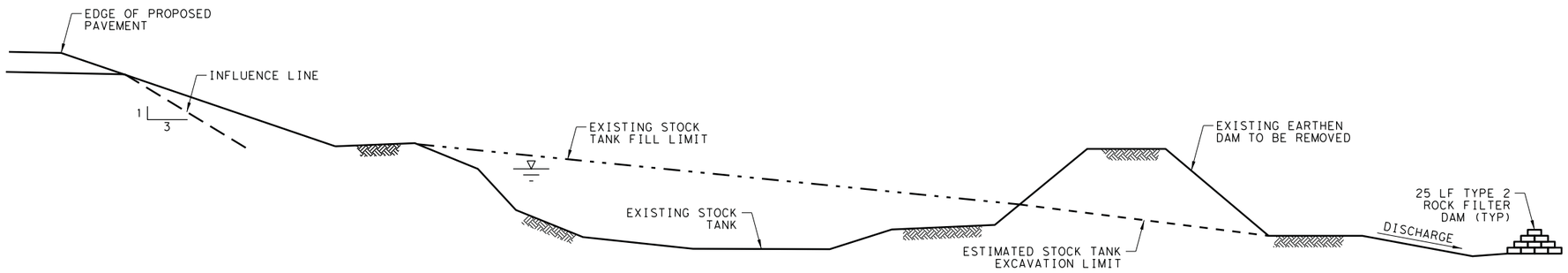
5) SEED DISTURBED AREAS AS DIRECTED BY THE ENGINEER.

QUANTITIES OF EXCAVATION AND EMBANKMENT REQUIRED FOR THE REMOVAL OF THE STOCK TANKS AS SHOWN ARE INCLUDED IN THE TOTAL SHOWN ON THE EARTHWORK SUMMARY SHEET.



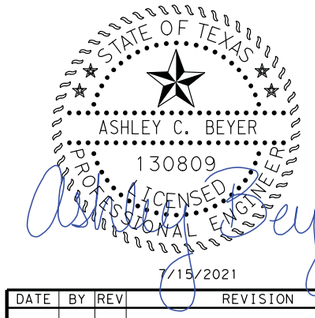
DISPOSITION OF STOCK TANK DETAIL - UNDER ROADWAY

N.T.S.



DISPOSITION OF STOCK TANK DETAIL - OUTSIDE ROADWAY FOOTPRINT

N.T.S.



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FS 121

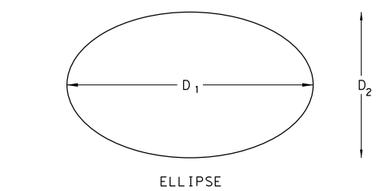
DISPOSITION OF STOCK TANKS

SCALE: N/A SHEET 1 OF 1

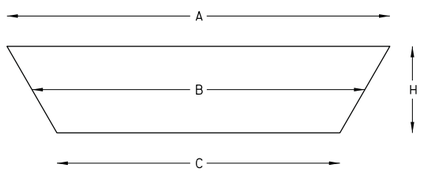
STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	137

STOCK POND EMBANKMENT													
POND		DIMENSIONS								AREAS			VOLUME
		A		B		C		HEIGHT H	SIDE SLOPE				
ID	DESCRIPTION	DIAMETER D_1	DIAMETER D_2	DIAMETER D_1	DIAMETER D_2	DIAMETER D_1	DIAMETER D_2			A	B	C	EMBANKMENT
		(FT)	(FT)	(FT)	(FT)	(FT)	(FT)	(FT)	X:1	(SF)	(SF)	(SF)	(CY)
POND 1	ELLIPTICAL	176	132	167	123	158	114	3	3	18237.12	16124.69	14139.42	1795
POND 2	ELLIPTICAL	198	138	189	129	180	120	3	3	21449.34	19139.09	16956.00	2130
STOCK POND EMBANKMENT = 3925 CY													

UNDERCUT EXCAVATION/EMBANKMENT												
DIMENSIONS							AREAS			VOLUME		COMMENTS
A		B		C		HEIGHT H + 6' MIN						
DIAMETER D_1	DIAMETER D_2	DIAMETER D_1	DIAMETER D_2	DIAMETER D_1	DIAMETER D_2		A	B	C	EMBANKMENT	UNDERCUT EXCAVATION	
(FT)	(FT)	(FT)	(FT)	(FT)	(FT)	(FT)	(SF)	(SF)	(SF)	(CY)	(CY)	
-	-					-	-	-	-	-	-	NO UNDERCUT REQUIRED - OUTSIDE OF INFLUENCE LINE
120	65	80	35	40	5	9	3061.50	1099.00	78.50	445	445	
UNDERCUT EMBANKMENT TOTAL = 445 CY											445 CY = UNDERCUT EXCAVATION TOTAL	



ELLIPSE



DETERMINING THE VOLUME OF A POND

1) USING THE BASIC FORMULA, CALCULATE THE SURFACE AREA.
   ELLIPSE: $E=(3.14)\times((D_1/2)\times(D_2/2))$

2) DETERMINE THE DIMENSIONS FOR THE BOTTOM OF THE POND (C) USING SIDE SLOPE RATIO.

3) DETERMINE THE AREA (THE FORMULA FOR E) OF THE BOTTOM, MIDDLE, AND TOP OF THE POND (C, B, AND A RESPECTIVELY).

4) DETERMINE THE TOTAL VOLUME (V) OF THE POND IN CUBIC YARDS.
   V = ((((A+B)/2)x(H/2))+(((B+C)/2)x(H/2)))/27
   V = VOLUME OF EMBANKMENT
   A = AREA AT GROUND LEVEL IN SQUARE FEET (sq ft)
   B = AREA AT THE MIDDLE DEPTH OF THE POND (sq ft)
   C = AREA AT THE BOTTOM OF THE POND (sq ft)
   H = AVERAGE DEPTH OF THE POND (feet)
   27 = CONVERSION FACTOR (cubic feet to yards)

STATE OF TEXAS
ASHLEY C. BEYER
130809
LICENSED
PROFESSIONAL ENGINEER
7/15/2021

DATE	BY	REV	REVISION

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STOCK TANK EXCAVATION

SCALE: N/A SHEET 1 OF 1

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	138

DATE: 7/15/2021 7:54:17 PM

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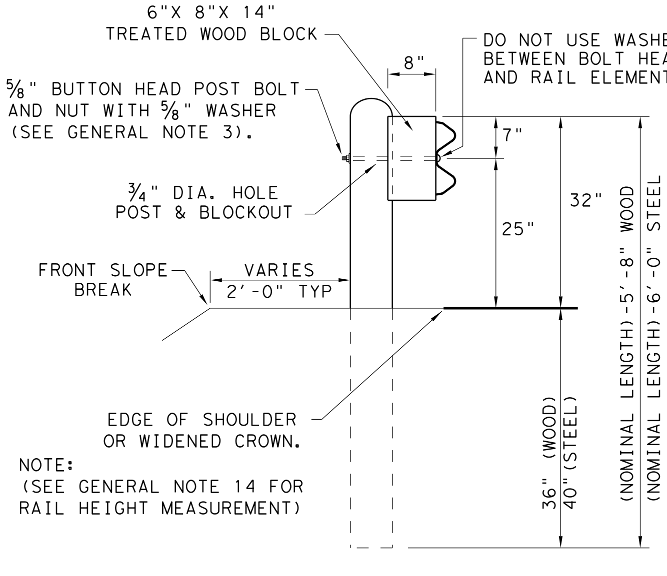
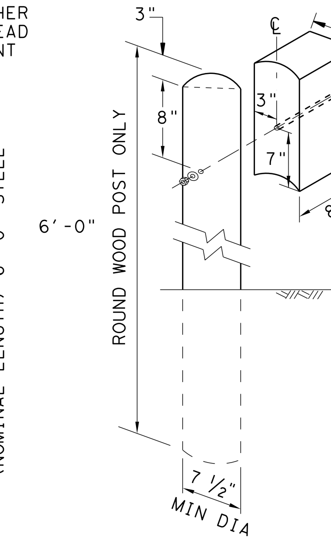


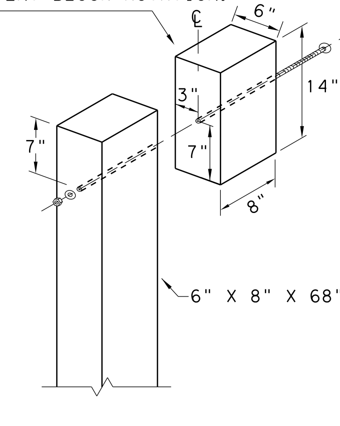
TYPICAL POST PLACEMENT



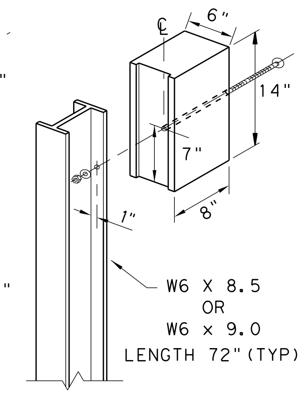
WOOD BLOCK TO ROUND WOOD POST

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

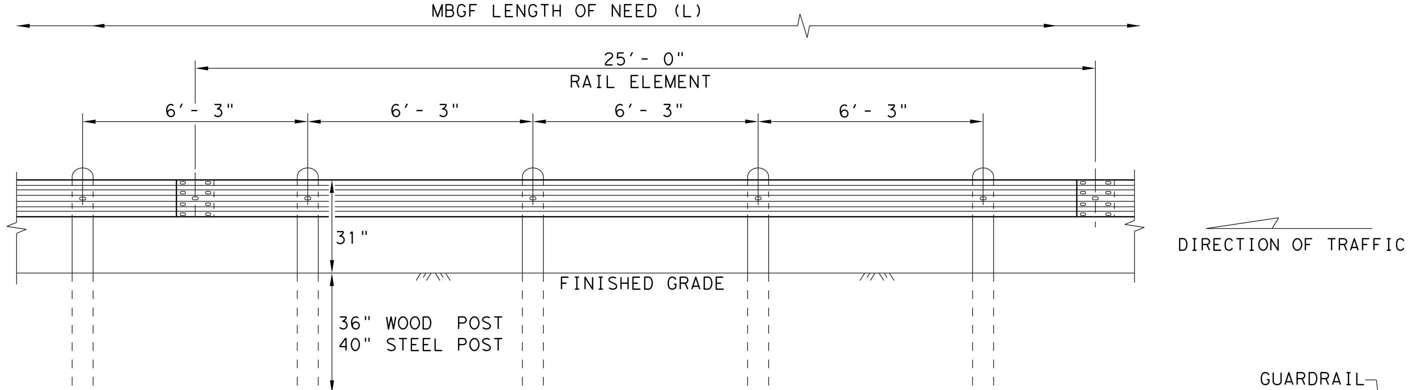
NOTE: TOENAIL WITH ONE 16D GALV. NAIL TO PREVENT BLOCK ROTATION.



WOOD BLOCK TO RECTANGULAR WOOD POST

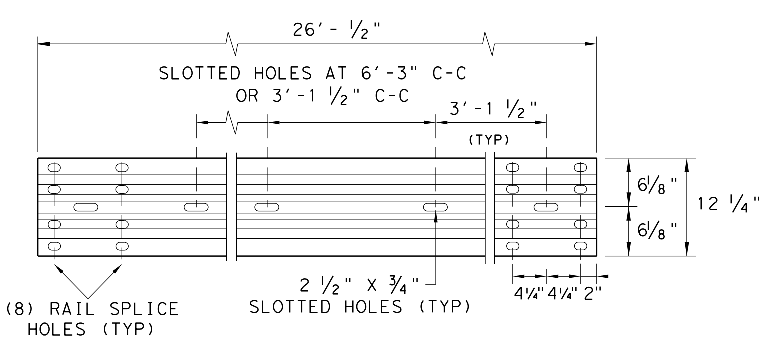


ROUTED WOOD BLOCK TO I-BEAM STEEL POST



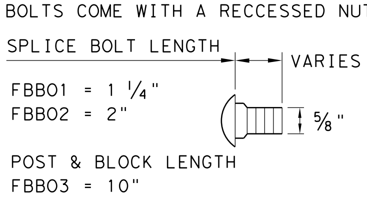
ELEVATION
MID-SPAN RAIL SPLICE

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



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

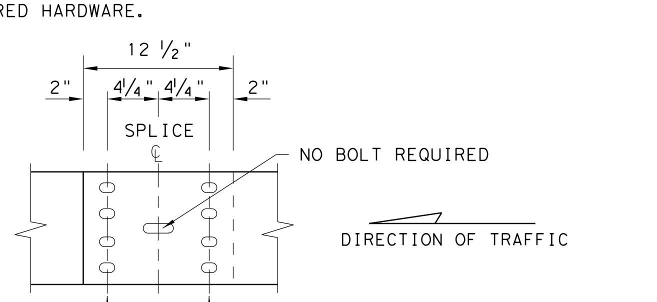
NOTES: SEE GENERAL NOTE 2 FOR ALLOWABLE RAIL TYPES.
SEE RAIL SPLICE DETAIL FOR REQUIRED HARDWARE.



NOTE:
FOUR TYPES OF BUTTON-HEAD GUARD RAIL BOLTS COME WITH A RECCESSED NUT.

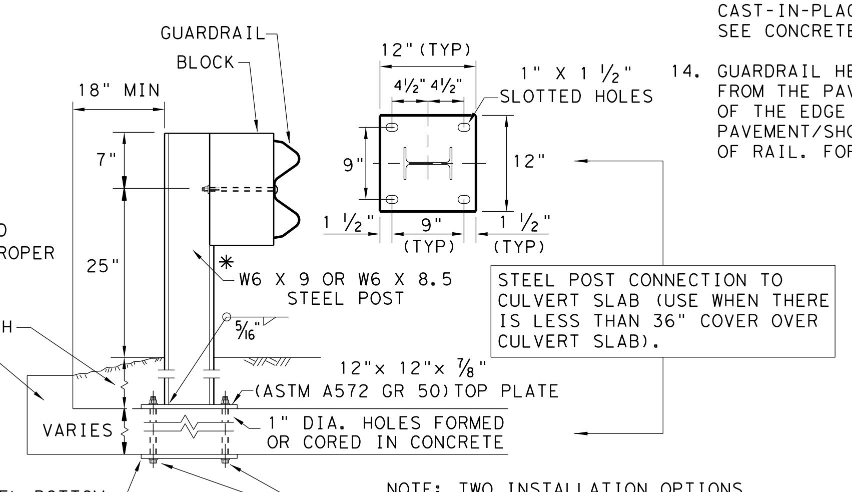
BUTTON HEAD BOLT

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



MID-SPAN RAIL SPLICE DETAIL

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



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

LOW FILL CULVERT POST

NOTE: TWO INSTALLATION OPTIONS.

1. BOLT-THROUGH OPTION: REQUIRES A 6" MIN. SLAB THICKNESS. 7/8" DIA (ASTM A449) HEAVY HEX BOLTS WITH TWO HARDENED WASHER EACH AND HEAVY HEX NUTS.
NOTE: BOLT LENGTH = SLAB PLUS 2 1/4" MIN.

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

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

GENERAL NOTES

1. THE TYPE OF POST (ROUND WOOD POST, RECTANGULAR WOOD POST, OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. THE EXACT POSITION OF MBGF SHALL BE SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER. STEEL POSTS TO BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING."
2. RAIL ELEMENTS SHALL MEET THE REQUIREMENTS OF ITEM 540, "METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED IN THE PLANS. THE CONTRACTOR MAY FURNISH RAIL ELEMENTS OF 25'- 0", OR 12'- 6" (NOM.) LENGTHS. RAIL ELEMENTS MAY HAVE SLOTTED HOLES AT 3'-1 1/2" C-C OR 6'-3" C-C. A SPECIAL LENGTH OF RAIL MAY BE MANUFACTURED TO ACCOMMODATE THE DOWNSTREAM ANCHOR TERMINAL (DAT) AND THE TRANSITION SECTIONS OF GUARDRAIL.
3. BUTTON HEAD "POST BOLTS & NUTS" SHALL MEET THE REQUIREMENTS OF (ASTM A307), AND SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT AND 5/8" WASHER (FWC16a) AND NOT MORE THAN 1" BEYOND IT. TRIM REMAINING BOLT LENGTH TO MEET REQUIRED LENGTH.
4. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING." FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
5. CROWN SHALL BE WIDENED TO ACCOMMODATE THE METAL BEAM GUARD FENCE.
6. THE LATERAL APPROACH TO THE GUARD FENCE, SHALL HAVE A MAXIMUM SLOPE OF 1V:10H.
7. IF SHOWN ELSEWHERE IN THE PLANS OR AS DIRECTED BY THE ENGINEER, THE GUARD FENCE MAY BE FLARED AT A RATE OF 25:1 OR FLATTER.
8. UNLESS OTHERWISE SHOWN IN THE PLANS, GUARD FENCE PLACED IN THE VICINITY OF CURBS SHALL BE POSITIONED SO THAT THE FACE OF CURB IS LOCATED DIRECTLY BELOW OR BEHIND THE FACE OF THE RAIL. RAIL PLACED OVER CURBS SHALL BE INSTALLED SO THAT THE POST BOLT IS LOCATED APPROXIMATELY 25 INCHES ABOVE THE GUTTER PAN OR EDGE OF SHOULDER.
9. APPLICATIONS IN SOLID ROCK ARE ONLY ALLOWED WITH STEEL POSTS. IF SOLID ROCK IS ENCOUNTERED WITHIN 0 TO 18" OF THE FINISHED GRADE, DRILL A 24" DIA. HOLE, 24" INTO THE ROCK. IF SOLID ROCK IS ENCOUNTERED BELOW 18", DRILL A 12" DIA. HOLE, 12" INTO THE ROCK OR TO THE STANDARD EMBEDMENT DEPTH, WHICHEVER MAYBE LESS. ANY EXCESS POST LENGTH, AFTER MEETING THESE DEPTHS, MAY BE FIELD CUT TO ENSURE PROPER GUARDRAIL MOUNTING HEIGHT. BACKFILL WITH COARSE AGGREGATE MATERIAL.
10. POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
11. SPECIAL FABRICATION WILL BE REQUIRED AT INSTALLATION LOCATIONS HAVING A CURVATURE OF LESS THAN 150 FT. RADIUS.
12. UNLESS OTHERWISE SHOWN IN THE PLANS, A COMPOSITE MATERIAL BLOCK THAT MEETS THE REQUIREMENTS OF DMS-7210, "COMPOSITE MATERIAL POSTS AND BLOCKS FOR METAL BEAM GUARD FENCE" MAY BE SUBSTITUTED FOR BLOCKS OF SIMILAR DIMENSIONS. THE CONSTRUCTION DIVISION, TXDOT MAINTAINS A MATERIAL PRODUCER LIST (MPL) FOR PRODUCERS OF MATERIALS CONFORMING TO DMS-7210 ONLY PRODUCERS ON THE MPL MAY FURNISH COMPOSITE MATERIAL BLOCKS.
13. FOR THE LOW FILL CULVERT OPTION, POSTS LOCATED PARTIALLY OR WHOLLY BETWEEN PRECAST BOX CULVERT UNITS, THE USE OF A CAST-IN-PLACE CONCRETE CLOSURE BETWEEN BOXES IS REQUIRED. THE LENGTH OF THE CAST-IN-PLACE CONCRETE CLOSURE SHALL ACCOMMODATE THE PLACEMENT OF THE LOW FILL CULVERT OPTION. SEE CONCRETE CLOSURE DETAILS ON BRIDGE STANDARD SCP-MD.
14. GUARDRAIL HEIGHT MEASUREMENT: WHEN THE GUARDRAIL IS LOCATED ABOVE PAVEMENT, MEASURE THE HEIGHT FROM THE PAVEMENT TO THE TOP OF THE W-BEAM RAIL. WHEN THE GUARDRAIL IS LOCATED UP TO 2 FT. OFF OF THE EDGE OF PAVEMENT OR FOR A PAVEMENT OVERLAY, USE A 10-FOOT STRAIGHTEDGE TO EXTEND THE PAVEMENT/SHOULDER SLOPE TO THE BACK OF RAIL, MEASURE FROM THE BOTTOM OF STRAIGHTEDGE TO THE TOP OF RAIL. FOR GUARDRAIL LOCATED DOWN A 10:1 SLOPE, MEASURE FROM THE NOMINAL TERRAIN.

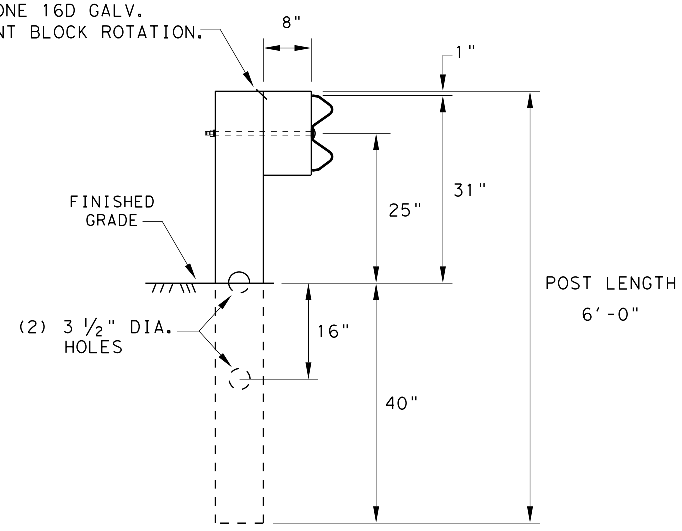
NOTE: TRANSISTIONS TO BRIDGE RAILS OR TRAFFIC BARRIERS.
SEE GF(31)TL3 TR STANDARD FOR HIGH-SPEED TL-3 TRANSITIONS.
SEE GF(31)TL2 TR STANDARD FOR LOW-SPEED TL-2 TRANSITIONS.

Texas Department of Transportation — Design Division Standard

METAL BEAM GUARD FENCE
TL-3 MASH COMPLIANT
GF(31)-19

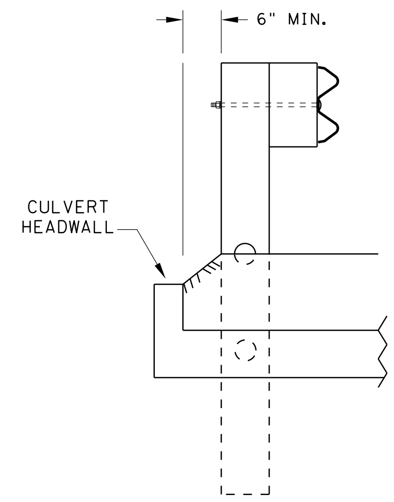
FILE: gf3119.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
	CONT	SECT	JOB	HIGHWAY
REVISIONS	0091	10	002	FS 121
	DIST		COUNTY	SHEET NO.
	PAR		GRAYSON	139

FILE: \\bwl1\icsO1\ICS\pdf\work\dir\451\33802\4\gf3119.dgn



RECTANGULAR CRT POST (6"X 8" X 6' LONG)

(6) CRT REQUIRED
SEE ELEVATION DETAIL FOR LOCATIONS

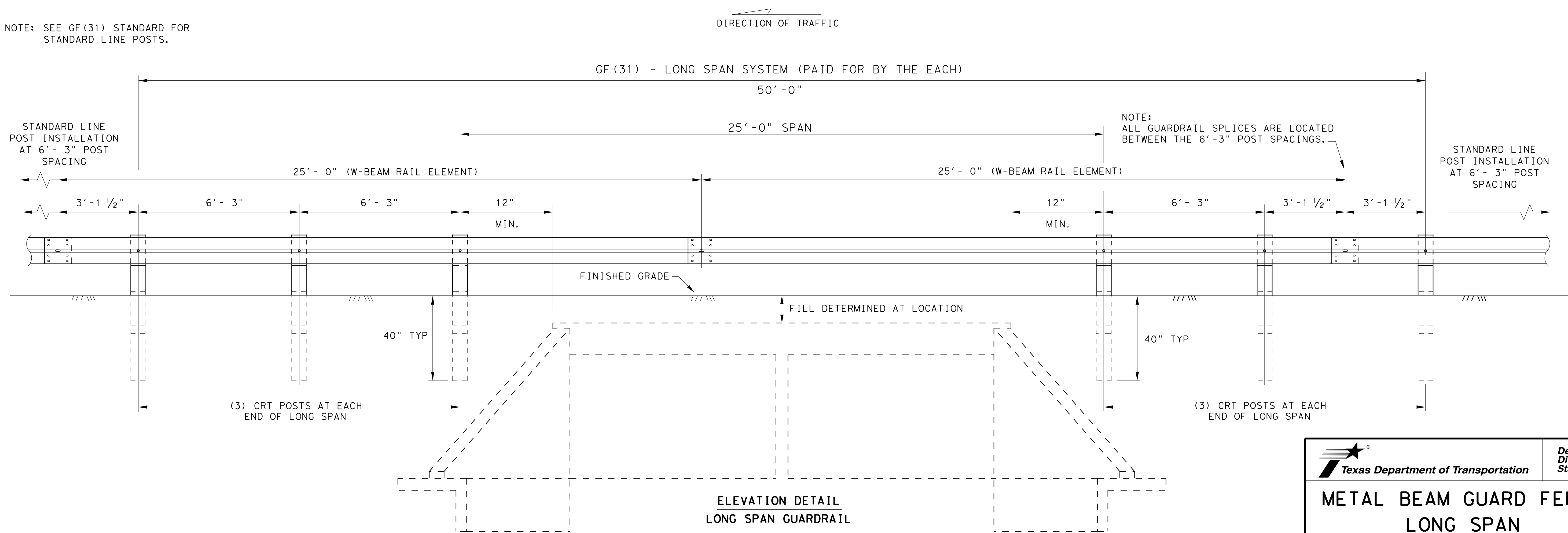


LATERAL OFFSET BETWEEN THE GUARDRAIL AND THE CULVERT HEADWALL

GENERAL NOTES

1. THE TYPE OF LINE POST (ROUND WOOD POST, RECTANGULAR WOOD POST, OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. THE EXACT POSITION OF THE TRANSITIONS SHALL BE AS SHOWN 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 ALL REQUIREMENTS OF ITEM 540, "METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED ON THE PLANS. THE CONTRACTOR MAY FURNISH RAIL ELEMENTS OF 12'- 6" OR 25'- 0" NOMINAL LENGTHS.
3. RAIL POST HOLES ARE OFFSET 3'- 1 ½" FROM STANDARD GUARDRAIL TO ACCOMMODATE THE MIDSPAN SPLICING.
4. BUTTON HEAD "POST BOLTS & NUTS" SHALL MEET THE REQUIREMENTS OF (ASTM A307), AND SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT AND ⅝" WASHER (FWC16a) AND NO MORE THAN 1" BEYOND IT.
5. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
6. WHERE SOLID ROCK IS ENCOUNTERED, CONTACT THE DESIGN DIVISION FOR ADDITIONAL GUIDANCE. (512) 416-2678
7. POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
8. REFER TO GF(31) STANDARD SHEET FOR ADDITIONAL DETAILS.
9. FLAME CUTTING OF HOLES IN GUARDRAIL SHALL NOT BE PERMITTED. IF YOU ENCOUNTER MIS-ALIGNED BOLT HOLES IN GUARDRAIL CONTACT THE DESIGN DIVISION FOR ADDITIONAL INFORMATION & OPTIONS.

NOTE: SEE GF(31) STANDARD FOR STANDARD LINE POSTS.



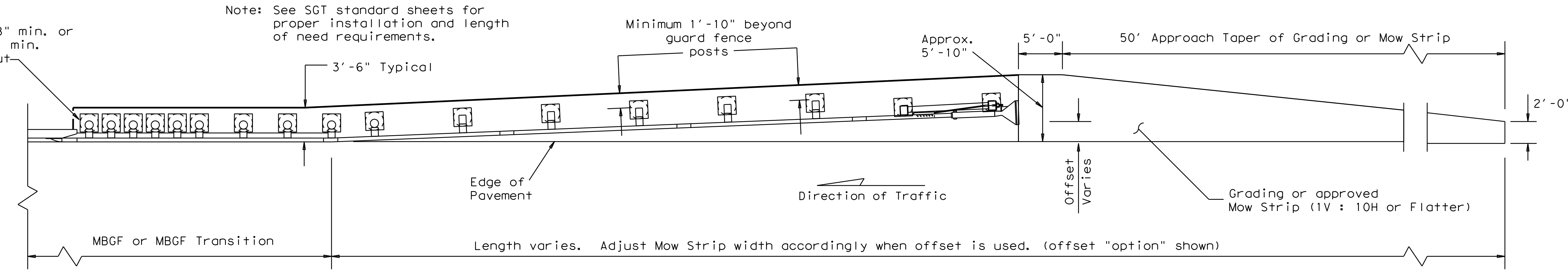
ELEVATION DETAIL
LONG SPAN GUARDRAIL

Texas Department of Transportation | Design Division Standard

METAL BEAM GUARD FENCE LONG SPAN TL-3 MASH COMPLIANT

GF(31)LS-19

FILE: gf31ls19.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG	
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0091	10	002	FS 121	
	DIST	COUNTY		SHEET NO.	
	PAR	GRAYSON		140	

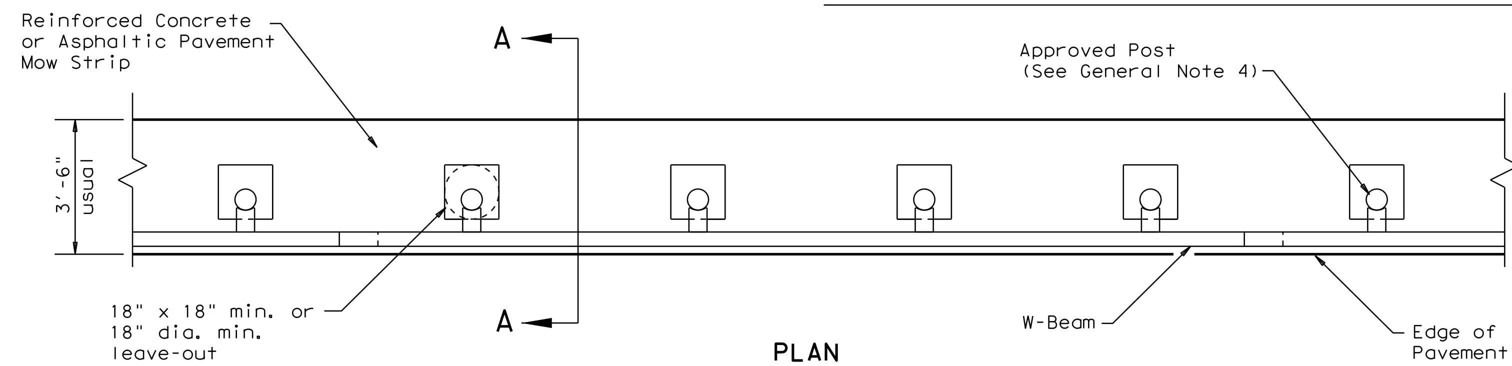


GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS

Note: Site Condition(s)

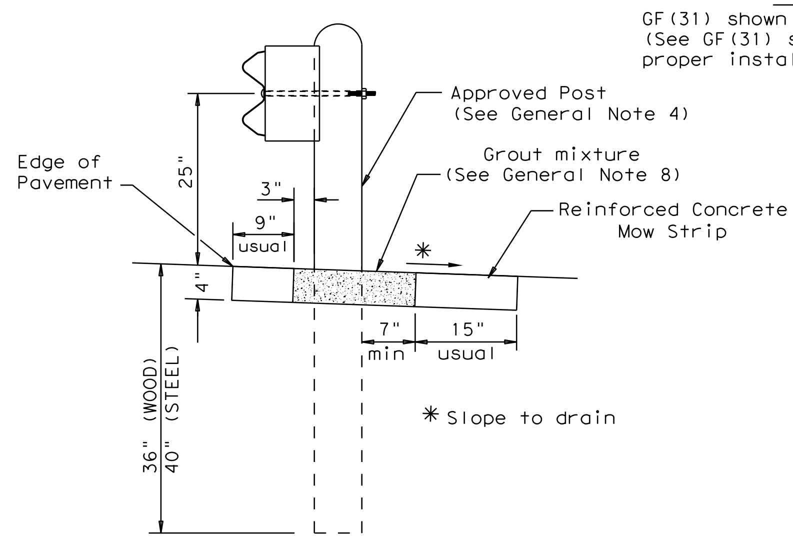
Site conditions may exist where grading is required for the proper installation of metal guard fence and end treatments.

Approach grading or mow strip may be decreased or eliminated, as directed by the Engineer.



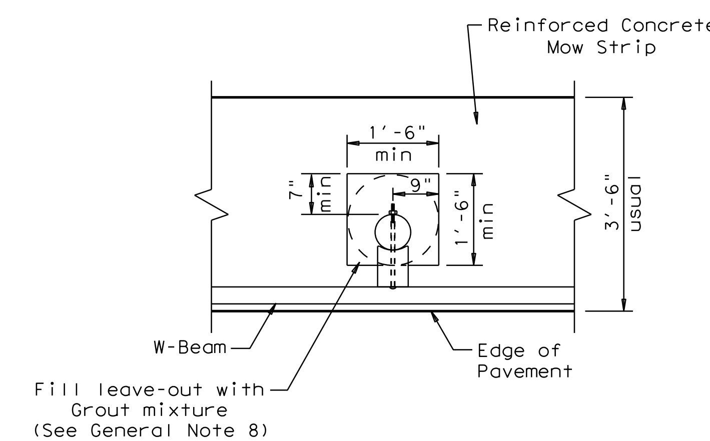
PLAN

GF(31) shown with Mow Strip (See GF(31) standard sheet for proper installation)



SECTION A-A

Typical

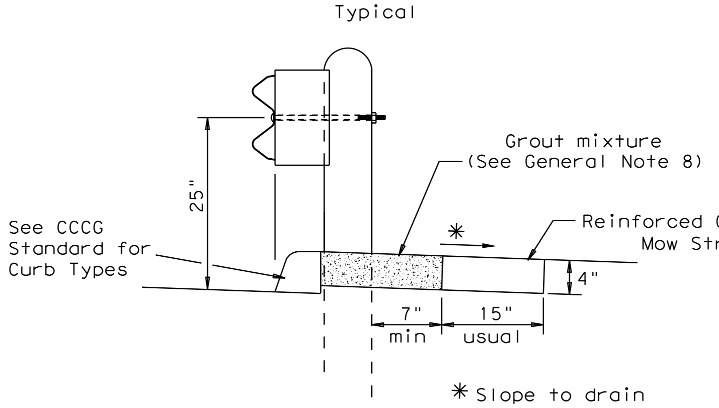


MOW STRIP DETAIL

Reinforced Concrete Mow Strip with 18" x 18" Square or 18" Dia. minimum leave-out.

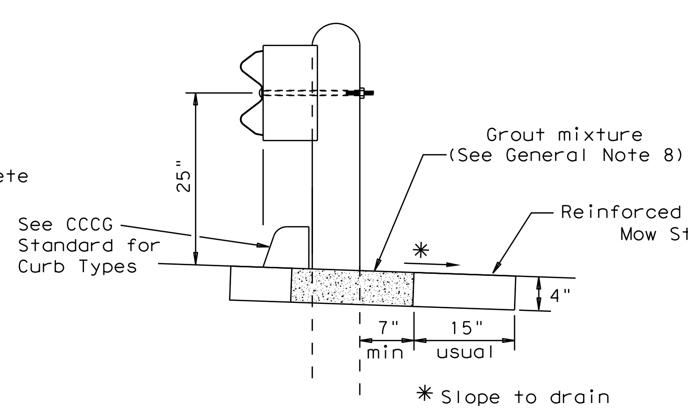
GENERAL NOTES

1. This mow strip design is for use with metal beam guard fence, guard fence transitions, and guard fence end treatments. See applicable GF(31) MBGF or GF(31) Transition Standard sheet for additional information.
2. Mow strips shall be reinforced concrete with (wire mesh or synthetic fiber), as shown on the plans and will be paid for under the pertinent bid item. Reinforced concrete shall be placed in accordance with Item 432, "Riprap." The use of the synthetic fiber in lieu of steel reinforcing is acceptable, provided the fiber producer is on the Department Material Producer List (MPL), maintained by TxDOT, Construction Division.
3. The leave-out behind the post shall be a minimum of 7".
4. Only steel (W6 x 8.5 or W6 x 9.0), or 7 1/2" Dia. round wood posts are acceptable for use in the mow strip. See GF(31) Standard for additional details.
5. Other curb placement options may be used. Curbs are not considered part of the mow strip and will be paid for under other pertinent bid item.
6. Thickness of the mow strip will be 4".
7. The limits of payment for reinforced concrete will include leave-outs for the posts.
8. The leave-outs shall be filled with a Grout mixture consisting of: 2719 pounds sand, 188 pounds Type 1 or II cement, and 550 pounds of water per cubic yard, with a 28-day compressive strength of approximately 230 psi or less. Provide grout with a consistency that will flow into and completely fill all voids. Due to auger size, larger leave-out dimensions are acceptable from both an impact performance and maintenance repair standpoint (Suggested Maximum leave-out of 20"). Payment for furnishing and placing the grout mixture will be subsidiary to the pay item of riprap mow strip.



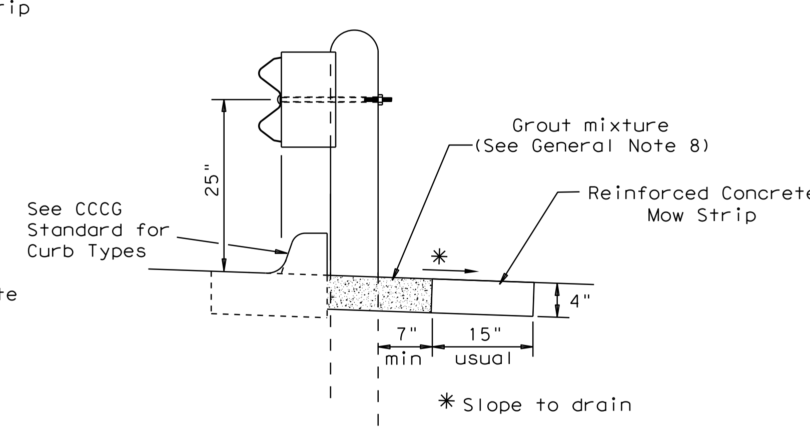
CURB OPTION (1)

This option will increase the post embedment throughout the system.



CURB OPTION (2)

Curb shown on top of mow strip



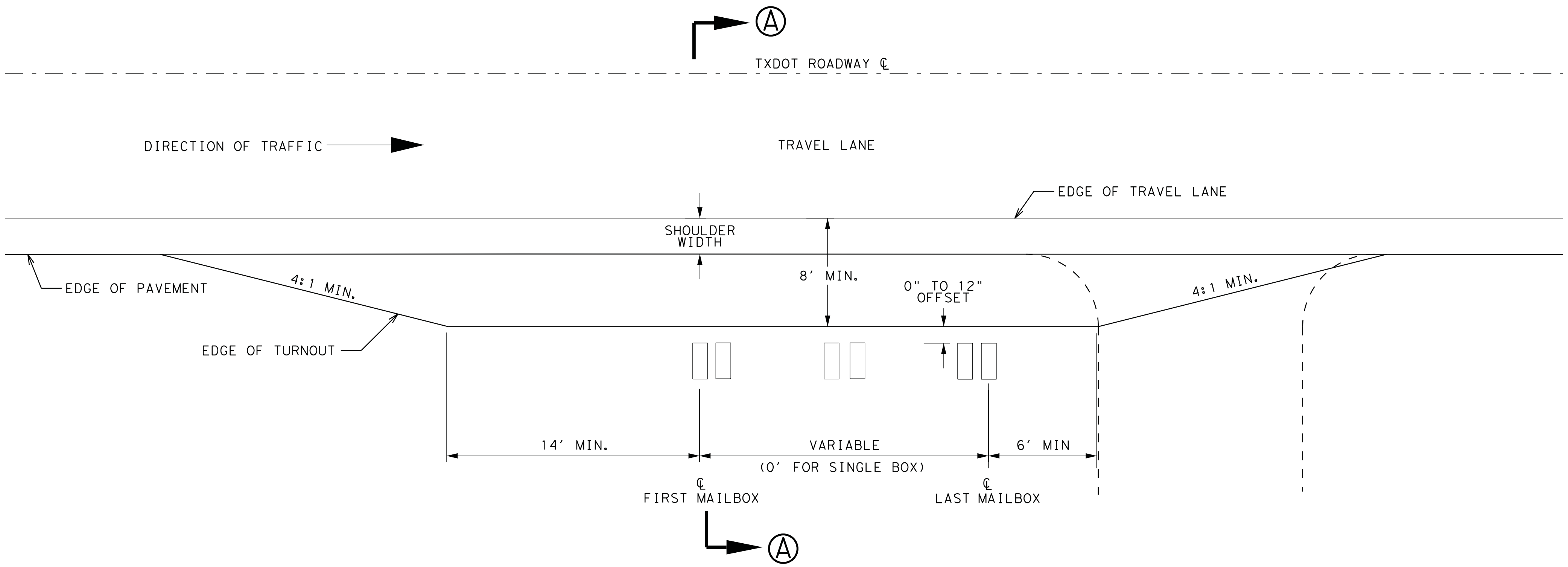
CURB OPTION (3)

Texas Department of Transportation — Design Division Standard

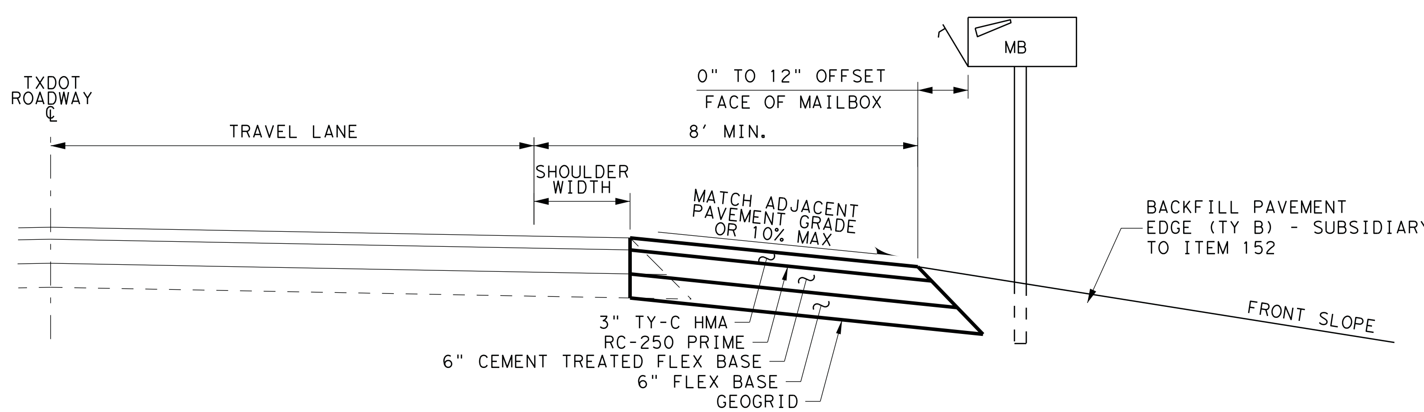
METAL BEAM GUARD FENCE (MOW STRIP) TL-3 MASH COMPLIANT

GF(31)MS-19

FILE: gf31ms19.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0091	10	002	FS 121
	DIST		COUNTY	SHEET NO.
	PAR		GRAYSON	141



MAILBOX TURNOUT
PLAN



MAILBOX TURNOUT
SECTION A-A

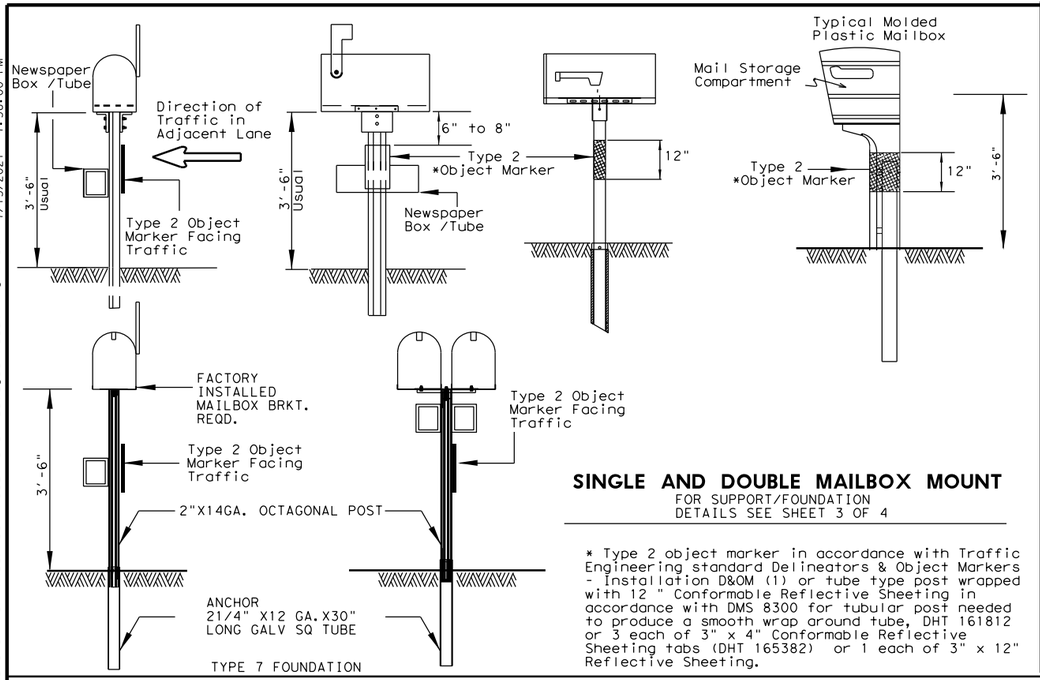
STATE OF TEXAS
ASHLEY C. BEYER
130809
LICENSED
PROFESSIONAL ENGINEER
7/16/2021

MAILBOX TURNOUT DETAILS

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0091	10	002	FS 121
DIST		COUNTY	SHEET NO.
PAR		GRAYSON	142

DATE: 7/16/2021 12:31:19 AM
FILE: ...\MAILBOX TURNOUT DETAILS 04.15.20.dgn



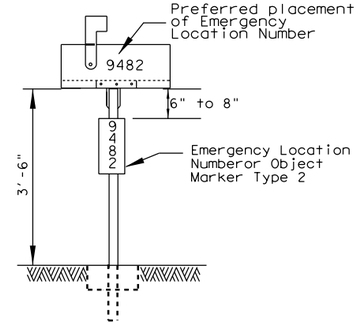
SINGLE AND DOUBLE MAILBOX MOUNT

FOR SUPPORT/FOUNDATION DETAILS SEE SHEET 3 OF 4

* Type 2 object marker in accordance with Traffic Engineering standard Delineators & Object Markers - Installation D&OM (1) or tube type post wrapped with 12 " Conformable Reflective Sheeting in accordance with DMS 8300 for tubular post needed to produce a smooth wrap around tube, DHT 161812 or 3 each of 3" x 4" Conformable Reflective Sheeting tabs (DHT 165382) or 1 each of 3" x 12" Reflective Sheeting.

Note: Mailbox installations in sidewalk areas shall be in accordance with the latest TxDOT Pedestrian Facilities Curb ramps standard *PED-XX for pedestrian facilities.

*PED-XX: XX is the standard year for example PED- 12 , PED-13,etc.



PLACEMENT OF EMERGENCY LOCATION NUMBER

Location Number shall be placed on: 1. A yellow, type A plate with class 1 flat surface reflective sheeting in accordance with DMS 8600. The color of numbers shall be black. or 2: A green or blue plate with white numbers attached to post beside the object marker. Other contrasting color configuration, as approved , may be used. (Use Same type plate as used for the type 2 Object Marker. Recommended sign size is 6" by 15")

TYPICAL MAILBOX SIZE				LIGHT WEIGHT MATERIAL	
				SHEET METAL	**PLASTIC
SIZE	LENGTH (INCHES)	WIDTH (INCHES)	HEIGHT (INCHES)	MAXIMUM WEIGHT (POUNDS)	
SMALL	19 1/2	6	7	5	5
MEDIUM	22 1/2	8	11 1/2	7	7
LARGE	23 1/2*	11 1/2*	13 1/2*	10	10

* Maximum allowed dimensions for mailbox
** Excluding Molded Plastic on 4 X 4 Post

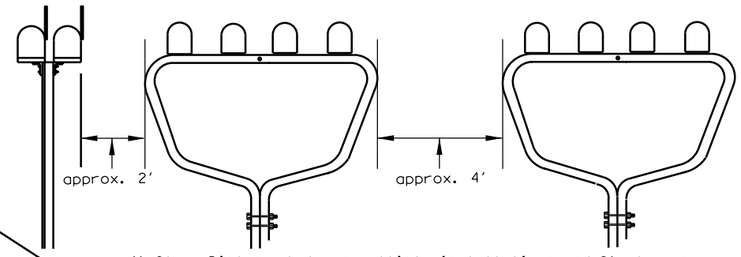
LOCKABLE ARCHITECTURAL MAILBOX SIZE (INCHES)					
VIEW	TOP	BOTTOM	FRONT SIDE	BACK SIDE	WEIGHT (POUNDS)
SIDE	18	15	18.3	15	22.4
BACK	11 1/2	11 1/2		15	

SEE TOP RIGHT CORNER OF SHEET 2 OF 4

MAILBOX SIZES

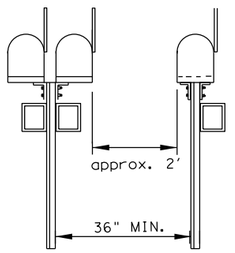
Mailboxes shall be made of light weight sheet metal or light weight plastic. Lockable architectural mailboxes shall meet the requirements of the above table.

Heavy steel, cast iron or decorative mailboxes shall not be used on the state highway system.



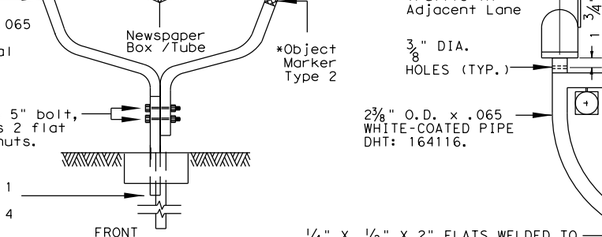
4' Clear Distance between multiple installations and 2' clearance between double or single installations and the multiple installation. DHT #'s 164116 or 149339.

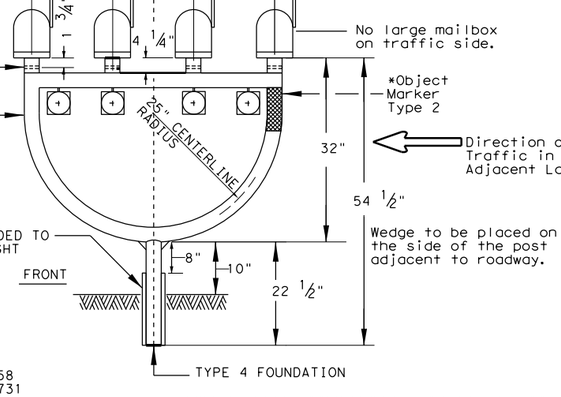
MULTIPLE MAILBOX PLACEMENT

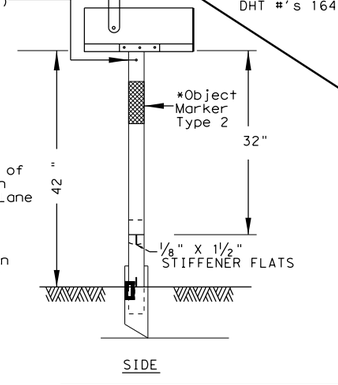


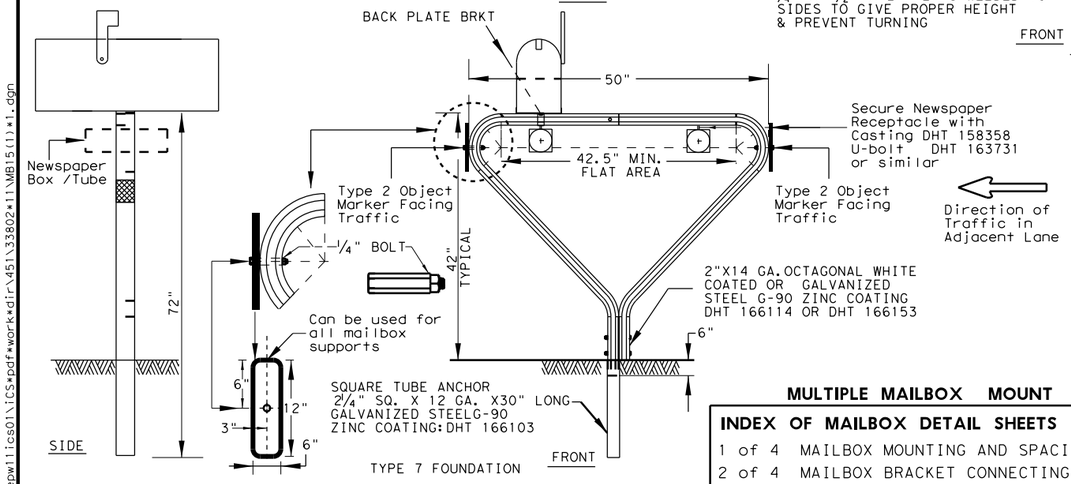
Clear Distance between single or double mounted posts. (Normally when 3 or more mailboxes are in one location, a multiple support is used).

SINGLE & DOUBLE MAILBOX PLACEMENT









DOUBLE AND MULTIPLE MAILBOX MOUNT

FOR SUPPORT/FOUNDATION DETAILS SEE SHEET 3 OF 4 FOR DHT NUMBERS SEE SHEET 4 OF 4

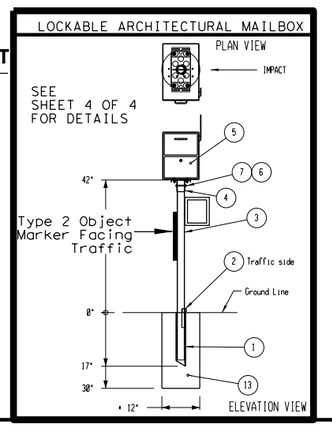
MULTIPLE MAILBOX MOUNT

INDEX OF MAILBOX DETAIL SHEETS

NEWSPAPER RECEPTACLE

A light weight receptacle for newspaper delivery can be attached to mailbox posts as shown on this page if the receptacle:

- Does not touch the mailbox.
- Does not present a hazard to traffic or delivery of the mail.
- Does not extend beyond the front of the mailbox.
- Does not display advertising, except the publication title.
- Newspaper receptacles on separate supports are prohibited.

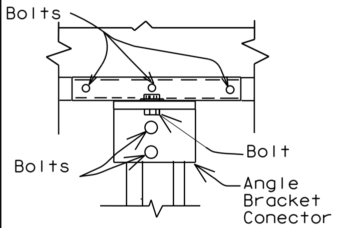


Texas Department of Transportation — Maintenance Division Standard

MAILBOX MOUNTING AND SPACING

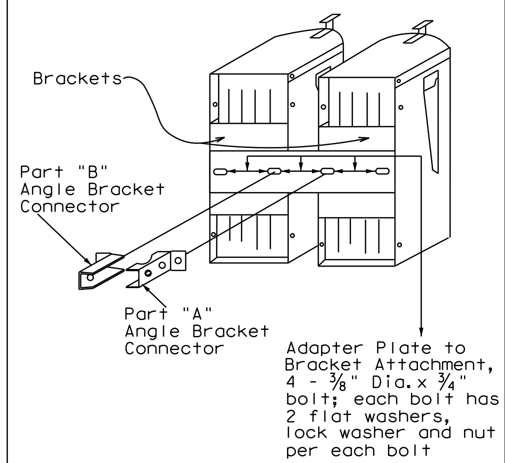
MB-15(1)

FILE: MB14(1).DGN	DN: JEO	CK: JEO	DW:	CK:
© TxDOT APRIL 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS: Added additional newspaper receptacle for double mailbox support	0091	10	002	FS 121
	DIST	COUNTY		SHEET NO.
	PAR	GRAYSON		143



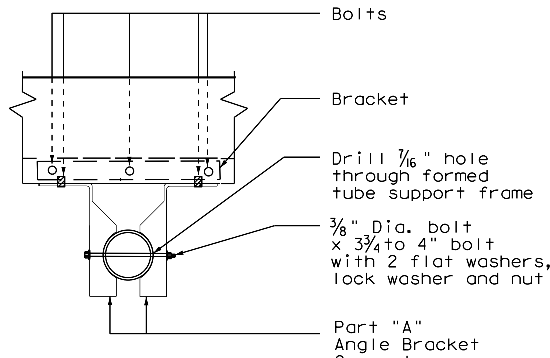
For bolt sizes see details below for "SMALL MAILBOX" and "MEDIUM AND LARGE MAILBOXES"

SINGLE MAILBOX

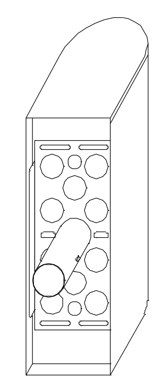


(Not permitted for Large Mailboxes)

DOUBLE MAILBOX

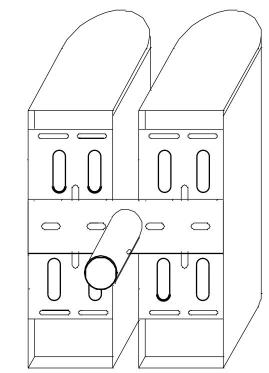


MULTIPLE MAILBOX



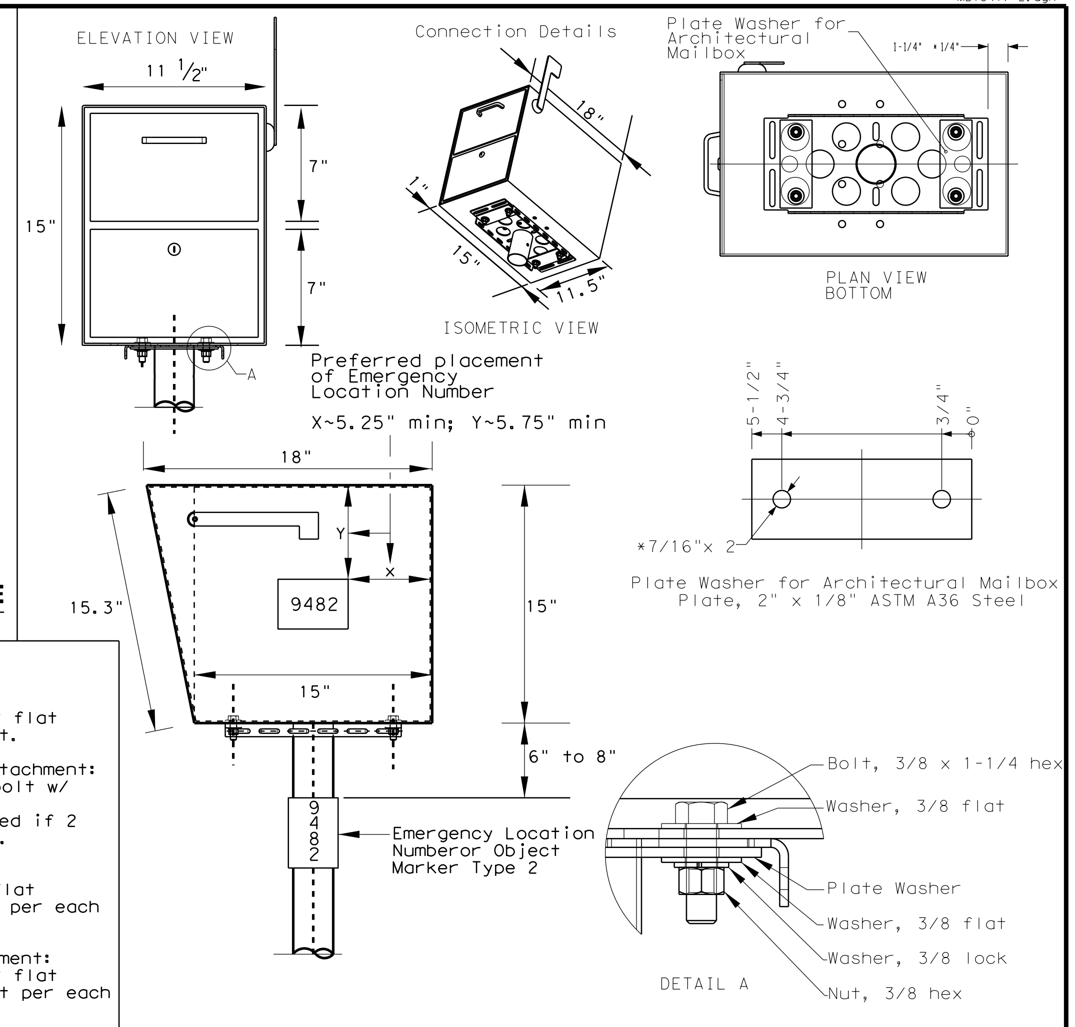
To be used with 2 3/8" OD RR or thinwall Steel posts.

WELDED SINGLE MAILBOXBRACKET

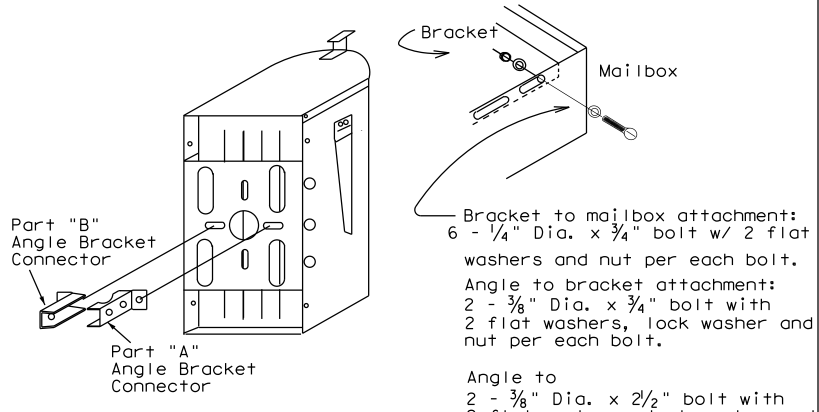


To be used with thinwall Steel posts. Not to be used with RR posts.

WELDED DOUBLE MAILBOX BRACKET WITHADAPTER PLATE



LOCKABLE ARCHITECTURAL MAILBOX CONNECTION DETAILS

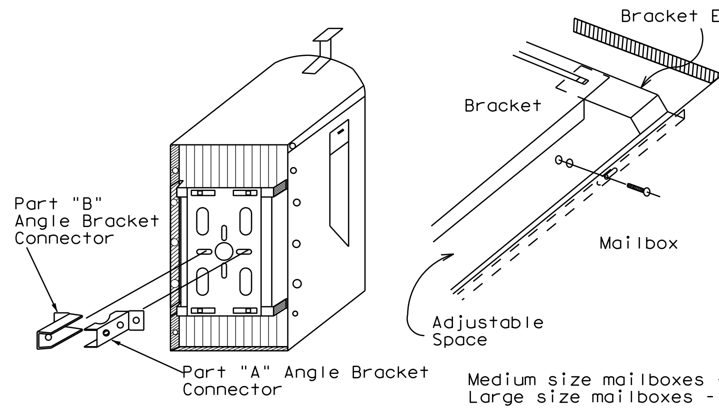


Bracket to mailbox attachment:
6 - 1/4" Dia. x 3/4" bolt w/ 2 flat washers and nut per each bolt.

Angle to bracket attachment:
2 - 3/8" Dia. x 3/4" bolt with 2 flat washers, lock washer and nut per each bolt.

Angle to
2 - 3/8" Dia. x 2 1/2" bolt with 2 flat washers, lock washer and nut per each bolt.

SMALL MAILBOX



Use both Parts "A" and "B" Angle Bracket Connectors for Winged Channel Posts

Bracket to mailbox attachment:
6 - 1/4" Dia. x 3/4" bolt w/2 flat washers and nut per each bolt.

Bracket to bracket extension attachment:
2 - 1/4" Dia. x 3/4" carriage bolt w/ flat washer, lock washer and nut per bolt (4 bolts required if 2 bracket extensions are used).

Angle to bracket attachment:
2 - 3/8" Dia. x 3/4" bolt w/2 flat washers, lock washer and nut per each bolt.

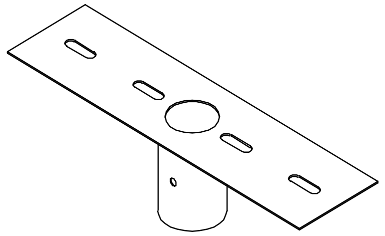
Angle to mailbox support attachment:
2 - 3/8" Dia. x 2 1/2" bolt w/2 flat washers, lock washer, and nut per each bolt.

Medium size mailboxes - one extension bracket
Large size mailboxes - two extension brackets

MEDIUM AND LARGE MAILBOXES

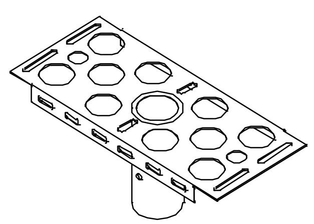
GENERAL NOTES

1. Connecting hardware detailed on this sheet is for the hardware that the Department stocks at the Regional Warehouses. This hardware is available to the contractor only when so stated elsewhere in the plans or specification.
2. Hardware for mounting mailboxes to the support/foundation furnished by industry should be used when shown on the Maintenance Divisions "Approved Products List." Only mailbox hardware that have been crash tested in accordance with NCHRP Report 350, will be on the approved list.
3. Hardware furnished by industry shall be erected in accordance with the manufacturer's recommendation.
4. Bracket and bracket extension shall be constructed of 14 gauge galvanized steel sheet metal.
5. The angles, brackets and adapter plates shall be constructed of 12 gauge galvanized steel sheet metal.
6. Items with evidence of damage to the galvanized coating or wet storage stains (white rust) will not be accepted.



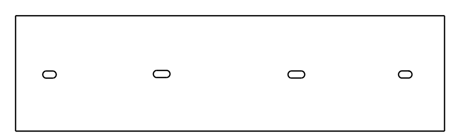
DHT 162323

For use with galvanized thinwall steel posts DHT # 143426 or powder-coated thinwall steel post DHT # 162911.



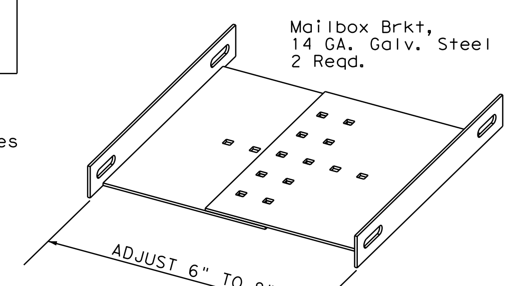
DHT 161443

For use with RCR post DHT # 161442 or galvanized thinwall steel post DHT # 143426 or powder-coated thinwall steel post. DHT # 162911.

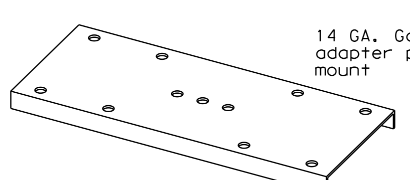


DHT #3789

Used for mounting two Mailboxes on the same post.

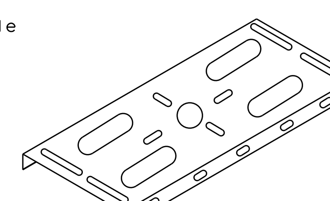


DHT 166105



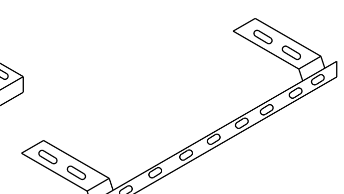
14 GA. Galv. Steel adapter plate for double mount

DHT 166108



DHT 148939

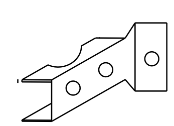
Mailbox Bracket



DHT 148938

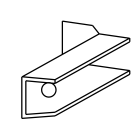
Used for extending 6" wide bracket to attach larger mailboxes.

Bracket Extension



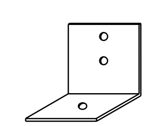
DHT 159489

Part "A"
Angle Bracket
Connector



DHT 159490

Part "B"
Angle Bracket
Connector



DHT 2917

Angle Bracket
For Temporary
Mailbox

HARDWARE AT TXDOT REGIONAL WAREHOUSES

Brackets and adapter plate shown in this section should be available to the Contractor when stated elsewhere in plans or specifications.

See Table of Applicable DHT Numbers on sheet 4 of 4 for DHT description and unit of measure.

SHEET 2 OF 4

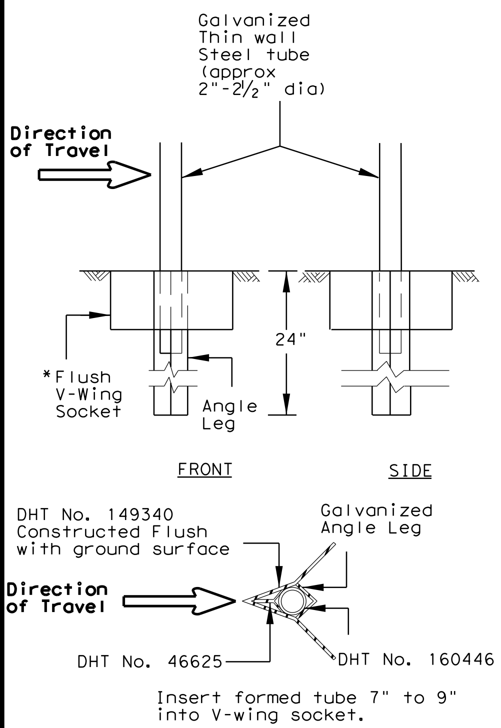
Texas Department of Transportation

Maintenance Division Standard

MAILBOX BRACKET CONNECTING DETAILS

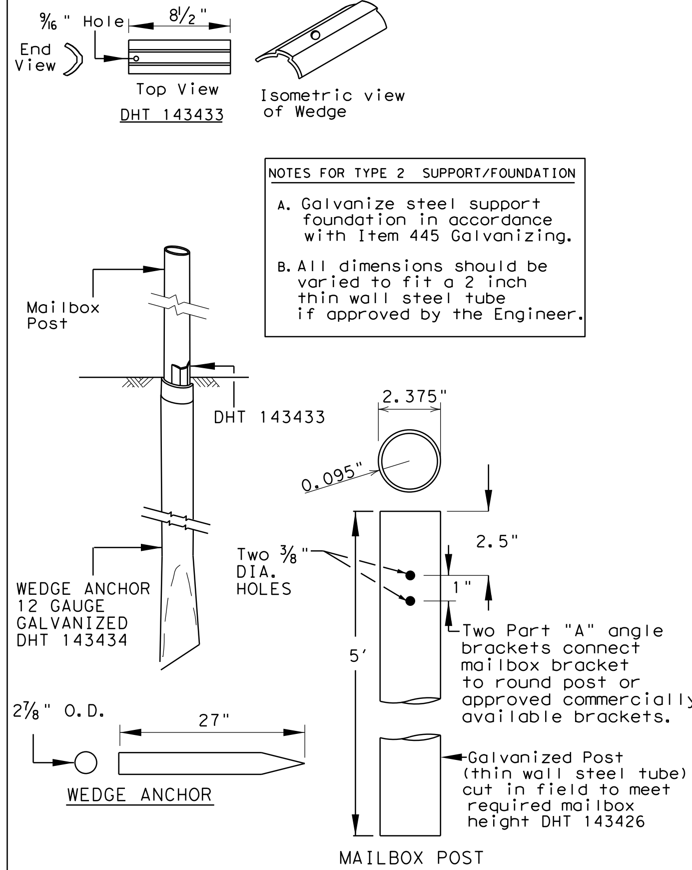
MB-15(1)

FILE: MB14(1).DGN	DN: JEO	CK:	DW: JEO	CK:
© TxDOT APRIL 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS ADDED DHT 163730	0091	10	002	FS 121
	DIST		COUNTY	SHEET NO.
	PAR		GRAYSON	144



TYPE 1 SUPPORT/FOUNDATION

THIN WALL STEEL TUBE w/ V-LOC ANCHORAGE



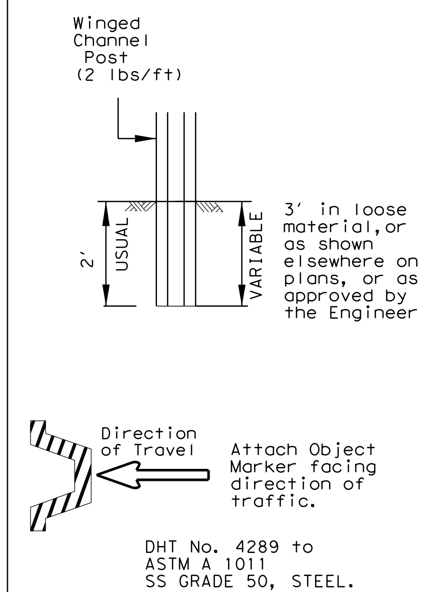
NOTES FOR TYPE 2 SUPPORT/FOUNDATION

A. Galvanize steel support foundation in accordance with Item 445 Galvanizing.

B. All dimensions should be varied to fit a 2 inch thin wall steel tube if approved by the Engineer.

TYPE 2 SUPPORT/FOUNDATION

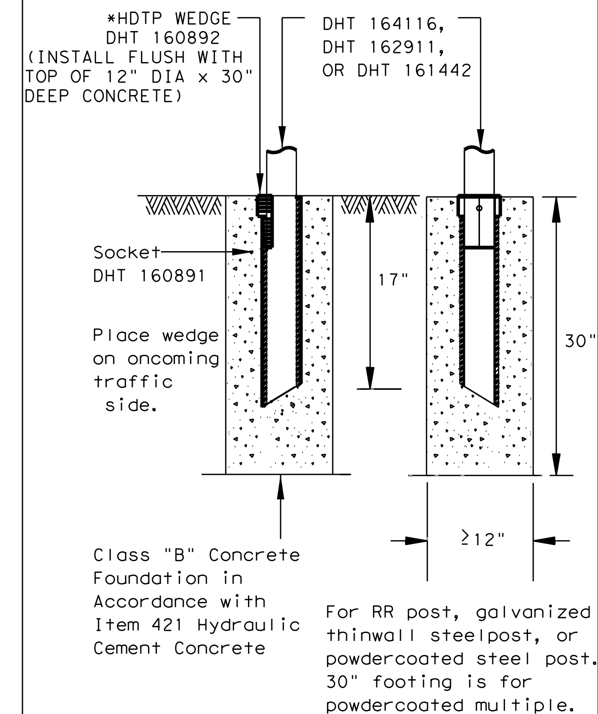
THIN WALL STEEL TUBE w/ WEDGE ANCHOR SYSTEM



TYPE 3 SUPPORT/FOUNDATION

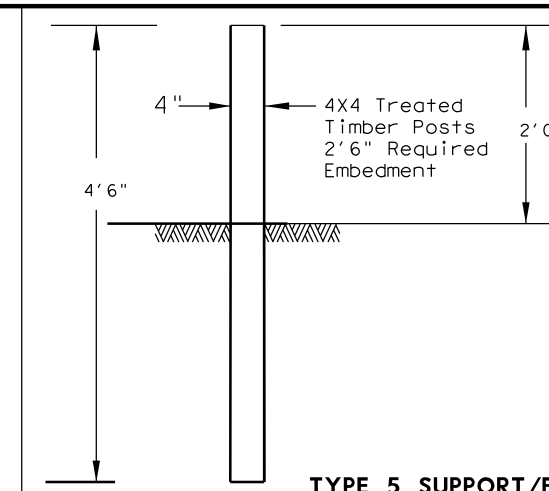
WINGED CHANNEL POST

Note on DHT Number
See Table of Applicable DHT Numbers on this sheet 4 for DHT description.



TYPE 4 SUPPORT/FOUNDATION

FOR WHITECOATED STEEL POST, MULTIPLE POST, AND RECYCLED RUBBER.

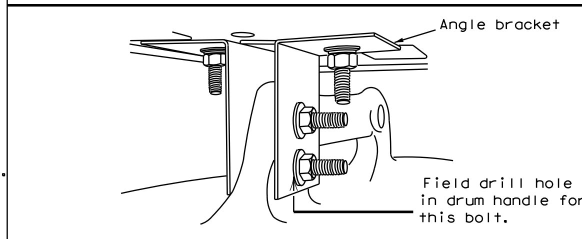


TYPE 5 SUPPORT/FOUNDATION

FOR ONE PIECE MOLDED PLASTIC MAILBOX

ONE PIECE MOLDED PLASTIC MAILBOXES

Molded Plastic Mailboxes shall be installed on 4"x4" treated timber posts only. The use of steel pipe or structural tubing in place of timber post is prohibited.



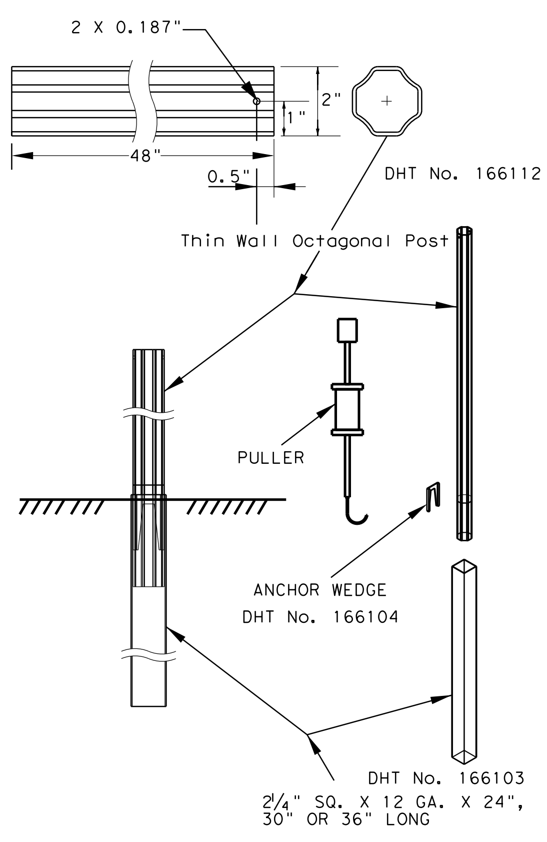
Placed on approved plastic drum as shown in the Compliant Work Zone Traffic Control Devices (CWZTCD).
Existing attachment hardware shall be used unless damaged. Damaged hardware shall be replaced.

TYPE 6 TEMPORARY MAILBOX SUPPORT

CONNECTION DETAIL

GENERAL NOTES

1. Erect post plumb or vertical.
2. When galvanized part is required galvanize in accordance with Item 445.
3. type 1, 2, 3, 4 or 7 supports or foundation can be used for single or double mailbox installations. The RCR post should be used only for a single installation with a small mailbox. The Type 5 support/foundation is used for the single molded plastic mailbox. The Type 4 support/foundation is used for the 2.375" O.D. RR post, thin wall steel post, and white multiple mailbox post.
4. The Type 1 or type 7 support/foundation can be used for a multiple mailbox mount.
5. The Type 4 support should be used with thin wall steel pipe for the medium, large and double mailbox installations.
6. Use a concrete footing as shown or when directed. Concrete footing will be required when soils do not hold the support/foundations in a stable condition.



TYPE 7 MAILBOX SUPPORT/FOUNDATION

CONNECTION DETAIL

MB-(X) ASSM TY (XXX) (X) (XX) (OPTIONAL)

Type of Mailbox
- S = Single
- D = Double
- M = Multiple
- SP = Single Plastic

Type of Post
- WC = Winged Channel Post
- RR = Recycled Rubber
- TWW = Thin Walled White Tubing
- TWG = Thin Walled Galvanized Tubing
- TIM = Timber

Type of Foundation
- Ty 1 = V-Loc
- Ty 2 = Wedge Anchor Steel System
- Ty 3 = Winged Channel post
- Ty 4 = Wedge Anchor Plastic System
- Ty 5 = 4 X 4 Post
- Ty 7 = Wedge Anchor

Type of Bracket
- AB = Angle Bracket.
- TB = 2.375" Tube Bracket

DOUBLE AND LARGE MAILBOXES MUST BE ON STEEL POST.

*HDTP: High density thermoplastic polyesters

SHEET 3 OF 4

Texas Department of Transportation — Maintenance Division Standard

MAILBOX SUPPORT AND FOUNDATION

MB-15(1)

FILE: MB14(1).DGN	DN: JEO	CK:	DW: JEO	CK:
© TxDOT APRIL 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	0091	10	002	FS 121
	DIST		COUNTY	SHEET NO.
	PAR		GRAYSON	145

LOCKABLE ARCHITECTURAL MAILBOX

SINGLE-MOUNT INSTALLATION PARTS			
#	PART NAME	PART/DHT #	QTY
1	SOCKET, TYPE 4 FOUNDATION	160891	1
2	WEDGE FOR TYPE 4 FOUNDATION	160892	1
3	THIN-WALL WHITE STEEL TUBE 2.375 OD	162911	1
4	BRACKET FOR ATTACHING MAILBOX	161443	1
5	ARCHITECTURAL MAILBOX	SEE NOTE	1
6	NUT, 5/16" HEX	NUT, 5/16" HEX	1
7	BOLT, 5/16 X 3 HEX	GRADE 5	1
8	PLATE WASHER FOR ARCHITECTURAL MAILBOX	SEE SEE SHEET 2	2
9	WASHER, 3/8 FLAT		8
10	WASHER, 3/8 LOCK		4
11	NUT, 3/8 HEX		4
12	BOLT, 3/8 X 1-1/4 HEX	GRADE 5	4
13	CONCRETE, CLASS B (2000 PSI)		1

LOCKABLE ARCHITECTURAL MAILBOX DETAILS

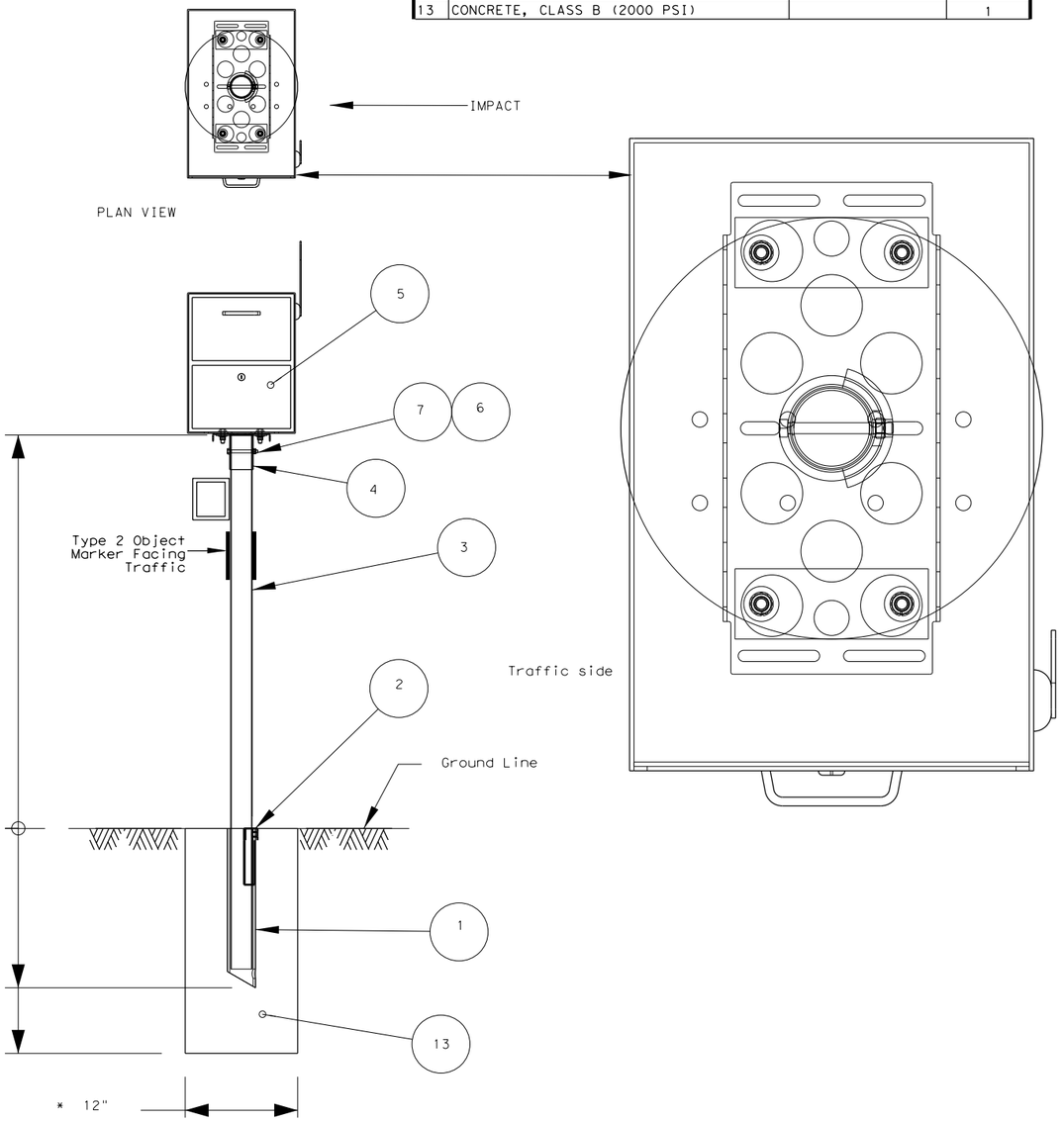


TABLE OF APPLICABLE DHT NUMBERS	
DHT NUMBER	DESCRIPTION
	FOUNDATIONS
46625	WEDGE FOR V-WING SOCKET FOR TYPE 1 FOUNDATION
149340	V-WING SOCKET FOR TYPE 1 FOUNDATION
143433	WEDGE FOR TYPE 2 FOUNDATION
143434	ANCHOR FOR TYPE 2 FOUNDATION
166103	ANCHOR FOR TYPE 7 FOUNDATION
160891	SOCKET FOR TYPE 4 FOUNDATION
160892	WEDGE FOR TYPE 4 FOUNDATION
166104	WEDGE FOR TYPE 7 FOUNDATION
	POSTS
4289	WINGED CHANNEL MAILBOX POST
149339	MULTIPLE MAILBOX POST (GALVANIZED TUBING)
164116	MULTIPLE MAILBOX POST (WHITE COATED)
166114	MULTIPLE MAILBOX POST (WHITE COATED OCTAGONAL)
166153	MULTIPLE MAILBOX POST (GALVANIZED OCTAGONAL)
161442	RECYCLED RUBBER POST. FOR SMALL MAILBOX ONLY
143426	THIN-WALL GALVANIZED STEEL TUBE 2.375" OUTER DIAMETER
162911	THINWALL WHITE STEEL TUBE 2.375" OUTER DIAMETER
166152	SINGLE OR DOUBLE THIN-WALL MAILBOX POST GALVANIZED 2" OCTAGONAL
166112	SINGLE OR DOUBLE THIN-WALL MAILBOX POST WHITECOATED 2" OCTAGONAL
	REFLECTIVE SHEETING
161812	REFLECTIVE SHEETING FOR EMERGENCY LOCATION NUMBER PANEL
	CONNECTING HARDWARE
2917	ANGLE BRACKET USED FOR TEMPORARY MAILBOX SUPPORT
166105	BRACKET FOR SINGLE MOUNTING OF MAILBOXES (MOUNTING KIT)
3789	PLATE FOR DOUBLE MOUNTING OF MAILBOXES
166108	BRACKET FOR DOUBLE MOUNTING OF MAILBOXES (MOUNTING KIT)
166111	BRACKET FOR MULTIPLE MOUNTING OF MAILBOXES (MOUNTING KIT)
148939	BRACKET FOR ATTACHING SMALL OR MEDIUM SIZE MAIL BOX
148938	EXTENDER TO BRACKET FOR ATTACHING LARGE MAILBOX
159489	ANGLE BRACKET PART A
159490	ANGLE BRACKET PART B
162323	BRACKET FOR DOUBLE MOUNTING OF MAILBOXES ON THINWALL STEEL POST, GALVANIZED OR POWDERCOATED.
161443	BRACKET FOR ATTACHING MAILBOX TO RECYCLED RUBBER POST AND TO MULTIPLE WHITE MAILBOX POST
158358	CASTING (NEWSPAPER RECEPTACLE BRACKET)
163731	U-BOLT (NEWSPAPER RECEPTACLE BRACKET)
160698	BOLT;HEX HEAD, GALV;3/8"DIA X 3/4"L HD, W/2-FLAT WASHERS
163750	BOLT;HEX HEAD, GALV;3/8" X 1-1/2, 16 NC, W/WASHERS
160701	BOLT;HEX HEAD, GALV;3/8"DIA X 2-1/2"L, HD, W/2-FLAT WASHERS
163730	BOLT;HEX HEAD, GALV;3/8" X 3-1/2", NC, W/NUT, 2 FLAT WASHERS
160699	BOLT;HEX HEAD, GALV;3/8"DIA X 3-3/4"L HD, W/2-FLAT WASHERS
160700	BOLT;HEX HEAD, GALV;3/8"DIA X 4"L HD, W/2-FLAT WASHERS

Texas Department of Transportation — Maintenance Division Standard

DHT NUMBERS TABLE

MB-15(1)

FILE:MB14(1).DGN	DN:	CK:	DW:	CK:
© TxDOT APRIL 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	0091	10	002	FS 121
	DIST	COUNTY		SHEET NO.
	PAR	GRAYSON		146

DATE: 7/15/2021 7:56:10 PM
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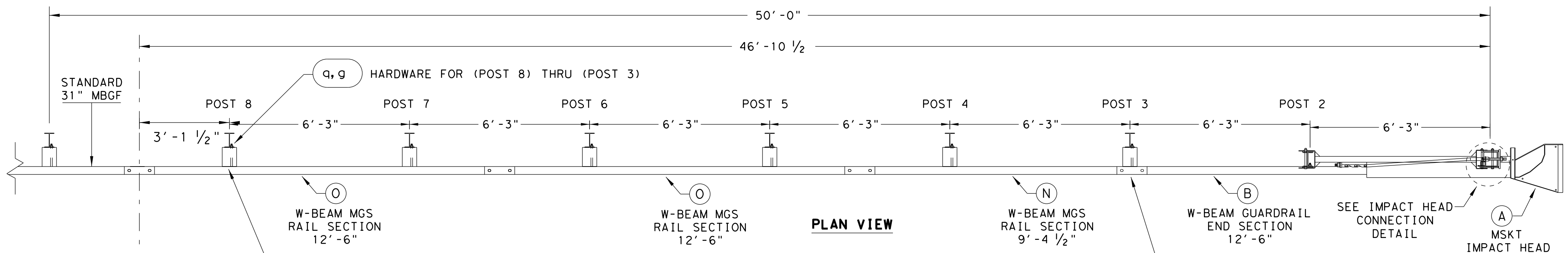
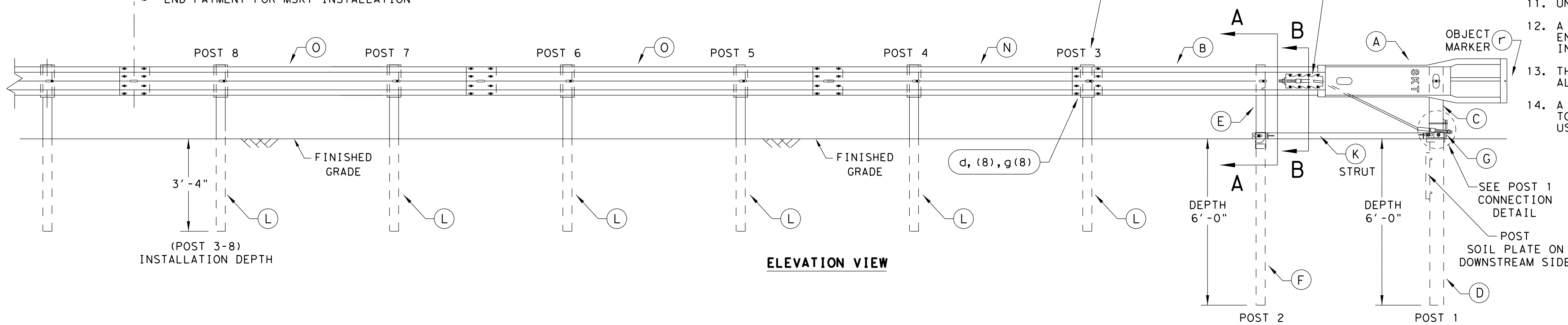
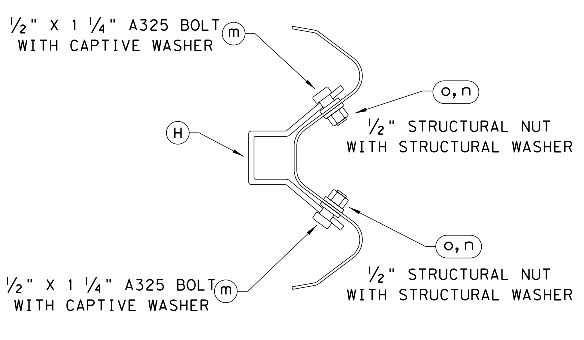
sgt12s3118.dgn



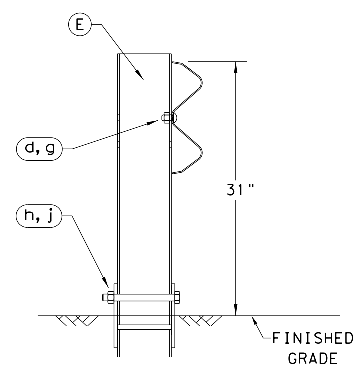
* NOTES:
1. ITEM (M) COMPOSITE BLOCKOUTS INSTALLED AT LINE POST(8) THRU LINE POST(3).
2. ITEM (P) WOOD BLOCKOUTS CAN BE USED AS ALTERNATE.



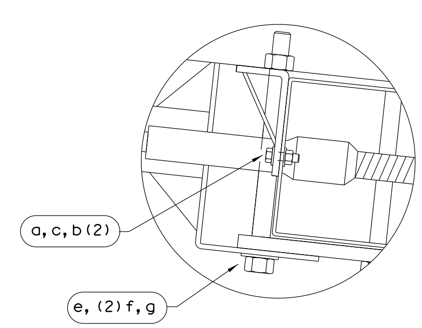
NOTE: SEE (GENERAL NOTE 14) FOR DRIVING CAP INFORMATION.



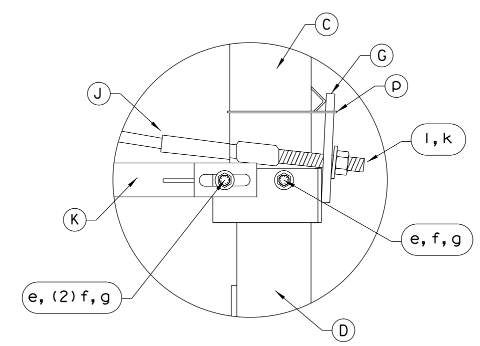
SECTION B-B
ANCHOR BRACKET



POST 2
SECTION A-A



IMPACT HEAD
CONNECTION DETAIL



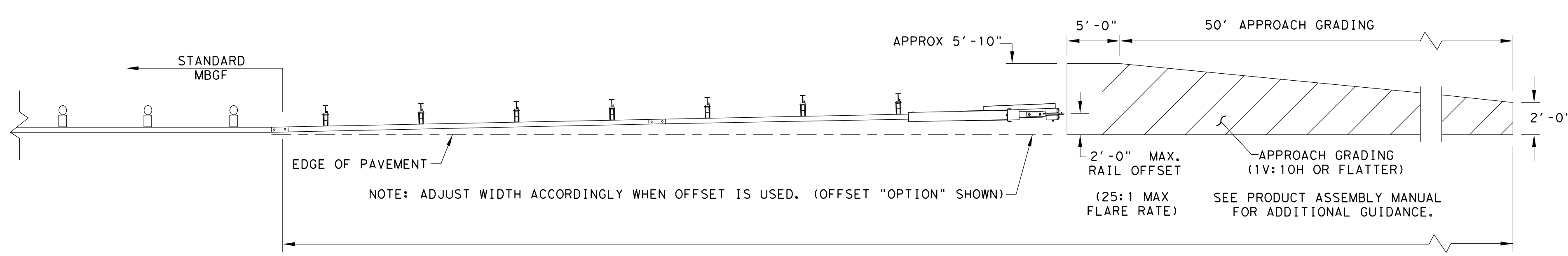
POST 1
CONNECTION DETAIL

GENERAL NOTES

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

ITEM	QTY	MAIN SYSTEM COMPONENTS	ITEM NUMBERS
A	1	MSKT IMPACT HEAD	MS3000
B	1	W-BEAM GUARDRAIL END SECTION, 12 Ga.	SF1303
C	1	POST 1 - TOP (6" X 6" X 1/8" TUBE)	MTPHP1A
D	1	POST 1 - BOTTOM (6' W6X15)	MTPHP1B
E	1	POST 2 - ASSEMBLY TOP	UHP2A
F	1	POST 2 - ASSEMBLY BOTTOM (6' W6X9)	HP2B
G	1	BEARING PLATE	E750
H	1	CABLE ANCHOR BOX	S760
J	1	BCT CABLE ANCHOR ASSEMBLY	E770
K	1	GROUND STRUT	MS785
L	6	W6x9 OR W6x8.5 STEEL POST	P621
M	6	COMPOSITE BLOCKOUTS	CBSP-14
N	1	W-BEAM MGS RAIL SECTION (9'-4 1/2")	G12025
O	2	W-BEAM MGS RAIL SECTION (12'-6")	G1203A
P	6	WOOD BLOCKOUT 6" X 8" X 14"	P675
Q	1	W-BEAM MGS RAIL SECTION (25'-0")	G1209
		SMALL HARDWARE	
a	2	5/16" x 1" HEX BOLT (GRD 5)	B5160104A
b	4	5/16" WASHER	W0516
c	2	5/16" HEX NUT	N0516
d	25	5/8" Dia. x 1 1/4" SPLICE BOLT (POST 2)	B580122
e	2	5/8" Dia. x 9" HEX BOLT (GRD A449)	B580904A
f	3	5/8" WASHER	W050
g	33	5/8" Dia. H.G.R NUT	N050
h	1	3/4" Dia. x 8 1/2" HEX BOLT (GRD A449)	B340854A
j	1	3/4" Dia. HEX NUT	N030
k	2	1 ANCHOR CABLE HEX NUT	N100
l	2	1 ANCHOR CABLE WASHER	W100
m	8	1/2" x 1 1/4" A325 BOLT WITH CAPTIVE WASHER	SB12A
n	8	1/2" STRUCTURAL NUTS	N012A
o	8	1 1/16" O.D. x 9/16" I.D. STRUCTURAL WASHERS	W012A
p	1	BEARING PLATE RETAINER TIE	CT-100ST
q	6	5/8" x 10" H.G.R. BOLT	B581002
r	1	OBJECT MARKER 18" X 18"	E3151

SEE NOTES: * (M)
ALTERNATIVE ITEMS NOT SHOWN. ** (P, Q)
* ITEM(P) 8" WOOD-BLOCKOUT
** ITEM(Q) 25' GUARD FENCE PANEL



APPROACH GRADING AT GUARDRAIL END TREATMENTS

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

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

Texas Department of Transportation — Design Division Standard

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

FILE: sgt12s3118.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CL
© TxDOT: APRIL 2018	CONT	SECT	JOB	HIGHWAY
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	DIST		COUNTY	SHEET NO.
	PAR		GRAYSON	147

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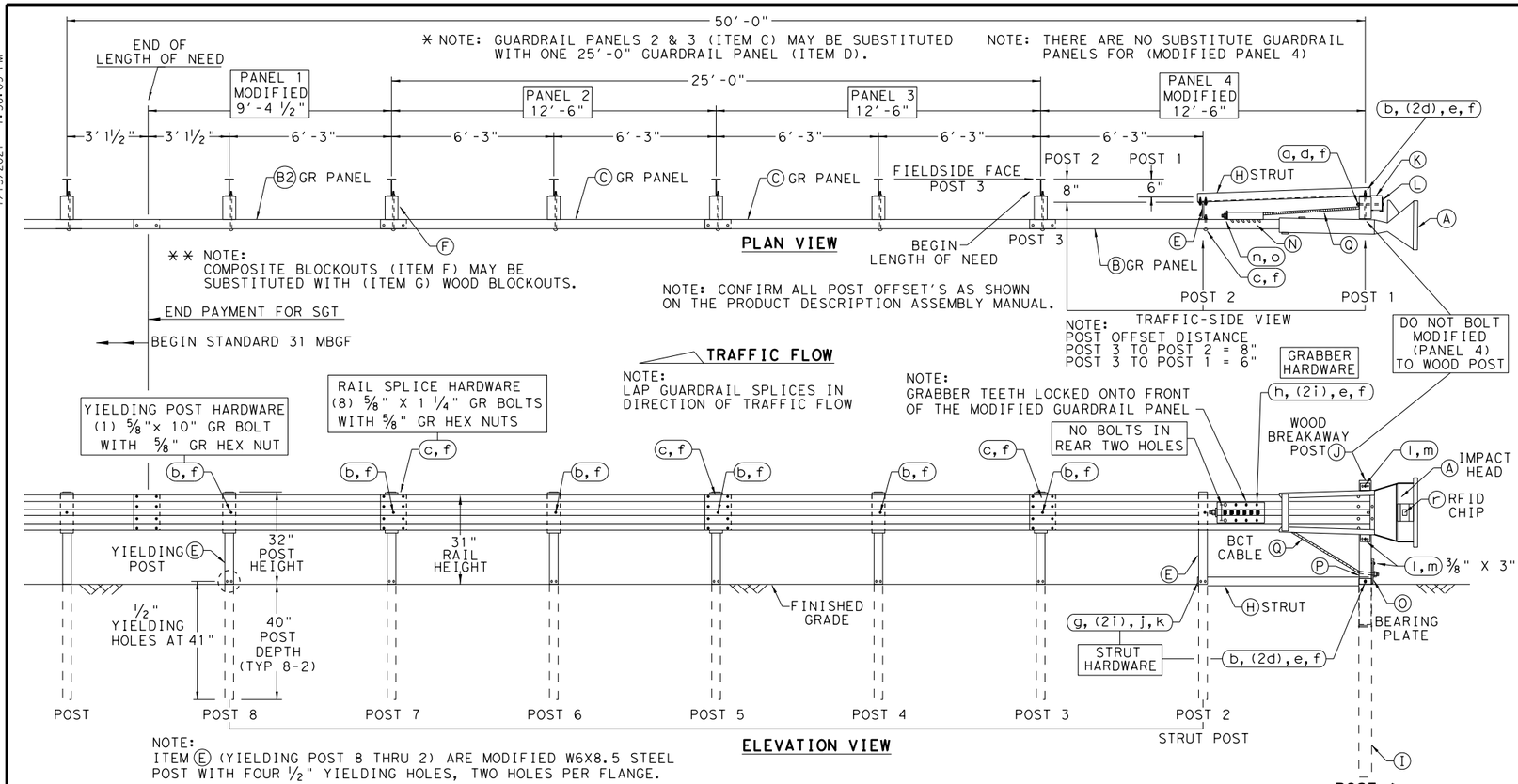
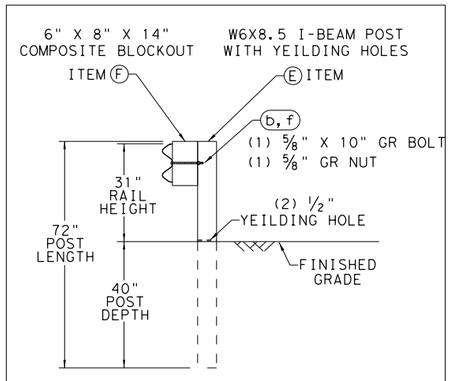


GENERAL NOTES

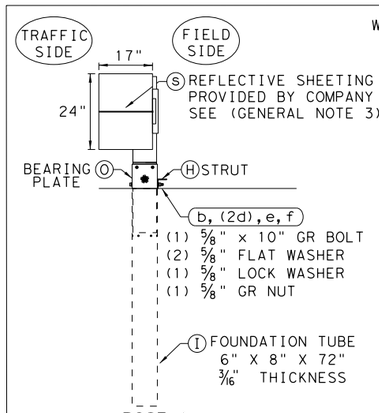
1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: SPIG INDUSTRY, INC. AT 1(267) 644-9510. 14675 INDUSTRIAL PARK RD; BRISTOL, VA 24202
2. FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE MANUFACTURER'S; SGET END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY MANUAL.
3. MANUFACTURER WILL APPLY HIGH INTENSITY REFLECTIVE SHEETING, "OBJECT MARKER" TO THE FACE PLATE OF THE DEVICE PER MANUFACTURER'S RECOMMENDATIONS. THE OBJECT MARKER SHALL CONFORM TO THE STANDARDS REQUIRED IN TEXAS MUTCD.
4. THE NOMINAL HEIGHT OF THE GUARDRAIL BEAM IS 31 INCHES WITH A TOLERANCE OF +/- ONE INCH.
5. FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TXDOT'S LATEST ROADWAY MOW STRIP STANDARD.
6. (POST 2 THROUGH POST 8) ARE MODIFIED STEEL-YIELDING POSTS WITH YIELDING HOLES AT GROUND LEVEL. THERE ARE NO SUBSTITUTE POSTS.
7. POSTS SHALL NOT BE SET IN CONCRETE.
8. IF SOLID ROCK IS ENCOUNTERED FOR ANY OF THE POSTS IN THE SYSTEM, CONTACT THE MANUFACTURER FOR SPECIFIC INSTALLATION GUIDANCE.
9. HARDWARE (BOLTS, NUTS, & WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445,"GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
10. A COMPOSITE MATERIAL BLOCKOUT THAT MEETS DMS-7210 REQUIREMENTS MAY BE SUBSTITUTED FOR AN APPROVED WOOD BLOCKOUT. SEE CONSTRUCTION DIVISION MATERIAL PRODUCER LIST (MPL) FOR CERTIFIED PRODUCERS.
11. THE ENTIRE SYSTEM MUST BE INSTALLED IN A STRAIGHT LINE WITHOUT ANY CURVE. HOWEVER, THE SYSTEM CAN BE OFFSET BY TWO FEET AS SHOWN ON THE APPROACH GRADING DETAIL TO HELP OFF-SET THE IMPACT HEAD FROM SHOULDER OF THE ROAD.

ITEM	QTY	MAIN SYSTEM COMPONENTS	ITEM #
A	1	SGET IMPACT HEAD	SIH1A
B	1	MODIFIED GUARDRAIL PANEL 12'-6" 12GA	126SPZGP
B2	1	MODIFIED GUARDRAIL PANEL 9'-4 1/2" 12GA	GP94
C	2	STANDARD GUARDRAIL PANEL 12'-6" 12GA	GP126
D	1	STANDARD GUARDRAIL PANEL 25'-0" 12GA	GP25
E	7	MODIFIED YIELDING I-BEAM POST W6x8.5	YP6MOD
F	6	COMPOSITE BLOCKOUT 6" X 8" X 14"	CBO8
G	6	WOOD BLOCKOUT 6" X 8" X 14"	WBO8
H	1	STRUT 3" X 3" X 80" x 1/4" A36 ANGLE	STR80
I	1	FOUNDATION TUBE 6" X 8" X 72" x 3/16"	FNDT6
J	1	WOOD BREAKAWAY POST 5 1/2" x 7 1/2" x 50"	WBRK50
K	1	WOOD STRIKE BLOCK	WSBLK14
L	1	STRIKE PLATE 1/4" A36 BENT PLATE	SPLT8
M	1	REINFORCEMENT PLATE 12 GA. GR55	REPLT17
N	1	GUARDRAIL GRABBER 2 1/2" X 2 1/2" X 16 1/2"	GGR17
O	1	BEARING PLATE 8" X 8 5/8" X 5/8" A36	BPLT8
P	1	PIPE SLEEVE 4 1/4" X 2 3/8" O.D. (2 1/8" I.D.)	PSLV4
Q	1	BCT CABLE 3/4" X 81" LENGTH	CBL81
		SMALL HARDWARE	
a	1	5/8" X 12" GUARDRAIL BOLT 307A HDG	12GRBLT
b	7	5/8" X 10" GUARDRAIL BOLT 307A HDG	10GRBLT
c	33	5/8" X 1 1/4" GR SPLICE BOLTS 307A HDG	1GRBLT
d	3	5/8" FLAT WASHER F436 A325 HDG	58FW436
e	1	5/8" LOCK WASHER HDG	58LW
f	39	5/8" GUARDRAIL HEX NUT HDG	58HN563
g	2	1/2" X 2" STRUT BOLT A325 HDG	2BLT
h	6	1/2" X 1 1/4" PLATE BOLT A325 HDG	125BLT
i	16	1/2" FLAT WASHER F436 A325 HDG	12FWF436
j	8	1/2" LOCK WASHER HDG	12LW
k	8	1/2" HEX NUT A563 HDG	12HN563
l	4	3/8" X 3" HEX LAG SCREW GR5 HDG	38LS
m	4	3/8" FLAT WASHER F436 A325 HDG	38FW844
n	2	1" FLAT WASHER F436 A325 HDG	1FWF436
o	2	1" HEX NUT A563DH HDG	1HN563
p	1	18" TO 24" LONG ZIP TIE RATED 175-200LB	ZPT18
q	1	1 1/2" X 4" SCH-40 PVC PIPE	PSPCR4
r	1	RFID CHIP RATED MIL-STD-810F	RFID810F
s	1	IMPACT HEAD REFLECTIVE SHEETING	RS30M

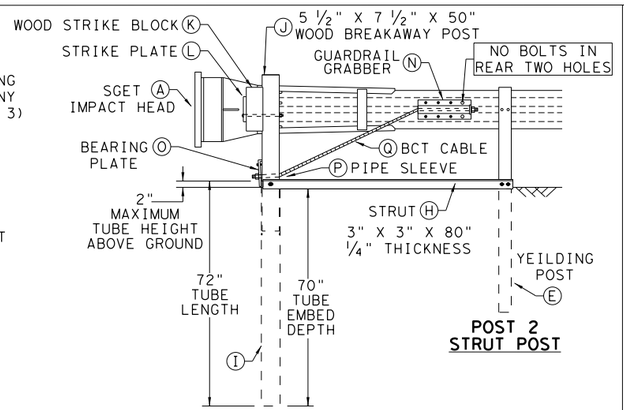
ALTERNATIVE ITEMS NOTE: SEE PLAN VIEW
* D
** G



SIDE VIEW
POST 8 - POST 3 (TYP)

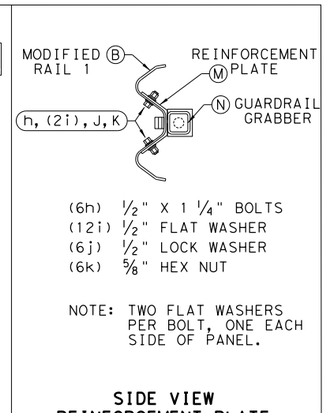


POST 1
FRONT END VIEW

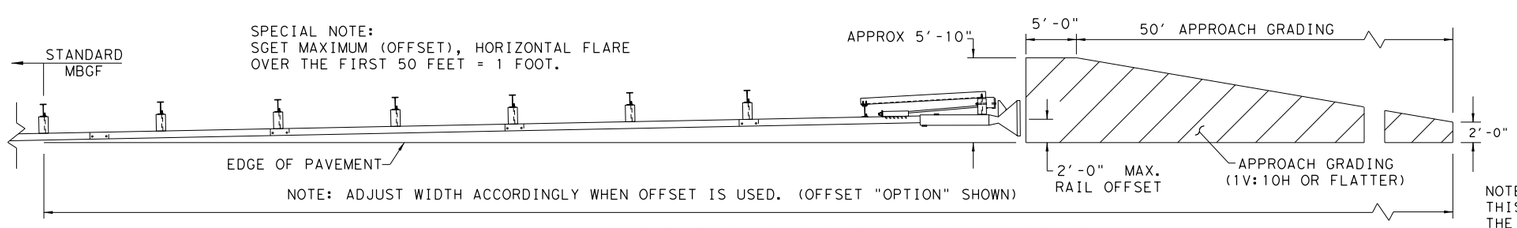


POST 1
FIELD SIDE VIEW

POST 2
STRUT POST



SIDE VIEW
REINFORCEMENT PLATE
WITH GUARDRAIL GRABBER



APPROACH GRADING AT GUARDRAIL END TREATMENTS

NOTE:
THIS STANDARD IS A BASIC REPRESENTATION OF THE SGET TERMINAL SYSTEM AND IS NOT INTENDED TO REPLACE THE MANUFACTURER'S ASSEMBLY MANUAL.

Texas Department of Transportation — Design Division Standard

SPIG INDUSTRY, LLC
SINGLE GUARDRAIL TERMINAL
SGET - TL-3 - MASH
SGT(15)31-20

FILE: sgt153120.dgn	DN: TxDOT	CK: KM	DW: VP	CK: VP		
©TxDOT: APRIL 2020	CONT	SECT	JOB		HIGHWAY	
REVISIONS	0091	10	002		FS 121	
	DIST	COUNTY			SHEET NO.	
	PAR	GRAYSON			148	

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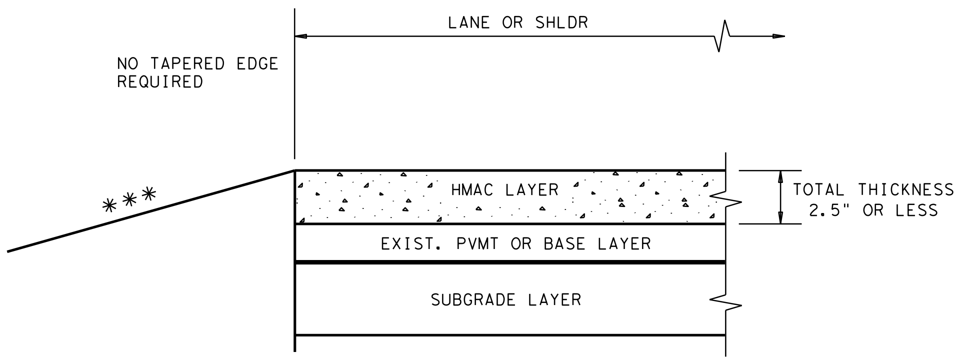
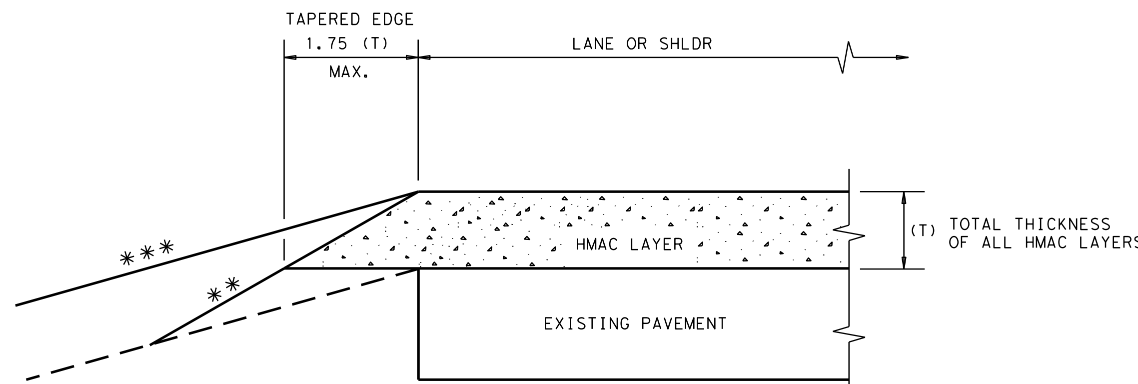


*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

CONDITION - 1

THIN HMAC SURFACES OR HMAC OVERLAY WITH THICKNESS OF 2.5" OR LESS

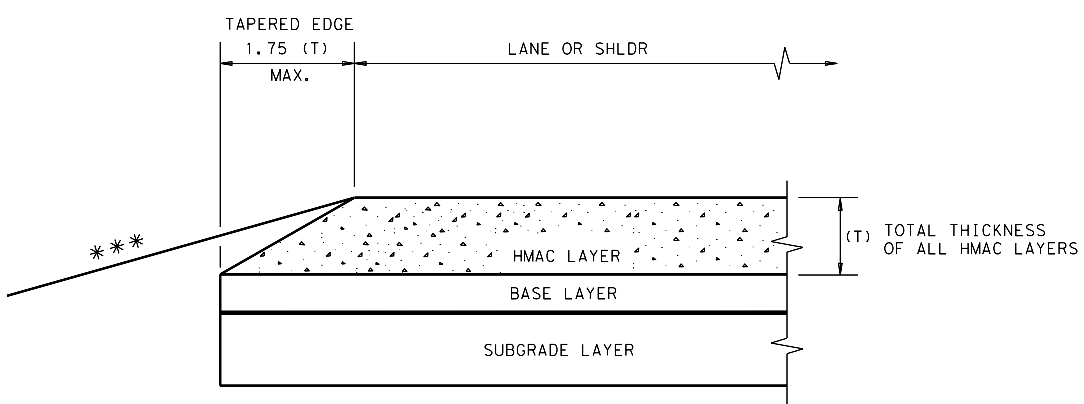


** EXISTING ROADSIDE EMBANKMENT TO BE GRADED TO PRODUCE A SMOOTH LEVEL SURFACE FOR PLACEMENT OF TAPERED EDGE. THIS WORK IS SUBSIDIARY TO THE VARIOUS BID ITEMS.

*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

CONDITION - 2

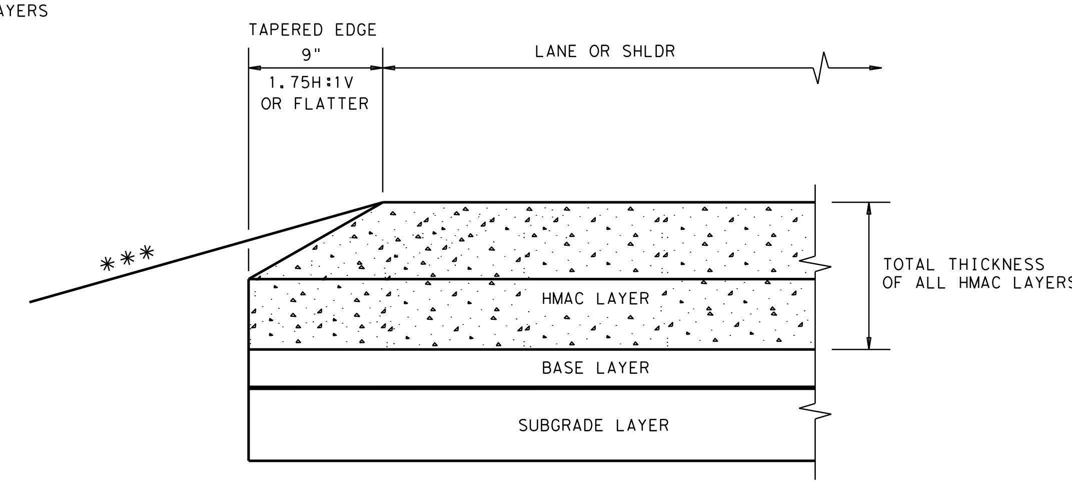
OVERLAY OF EXISTING PAVEMENT HMAC THICKNESS 2.5" TO 5"



*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

CONDITION - 3

NEW OR RECONSTRUCTED PAVEMENT HMAC THICKNESS 2.5" TO 5"



***** SEE TYPICAL SECTION FOR ROADSIDE DETAILS**

CONDITION - 4

NEW OR RECONSTRUCTED PAVEMENT HMAC THICKNESS 5" OR GREATER

GENERAL NOTES

1. UNLESS OTHERWISE SHOWN IN THE PLANS, A VERTICAL EDGE IS PERMISSIBLE FOR HMAC PLACED GREATER THAN 5" BELOW THE EDGE OF PAVEMENT AND FOR THICKNESS OF HMAC LESS THAN 2.5".
2. FOR FURTHER INFORMATION REGARDING THE ROADSIDE AND PAVEMENT DETAILS, SEE TYPICAL SECTIONS.
3. PAYMENT FOR TAPERED EDGE WILL BE IN ACCORDANCE WITH APPLICABLE ITEMS IN THE CONTRACT.
4. THE SLOPE OF THE TAPERED EDGE SHALL BE 1.75H:1V OR FLATTER.
5. THE TAPERED EDGE SHALL BE PRODUCED BY USE OF A SCREED ATTACHMENT CAPABLE OF PRODUCING A SMOOTH COMPACTED SURFACE. ADDITIONAL COMPACTING EFFORT BEHIND THE SCREED IS NOT REQUIRED.

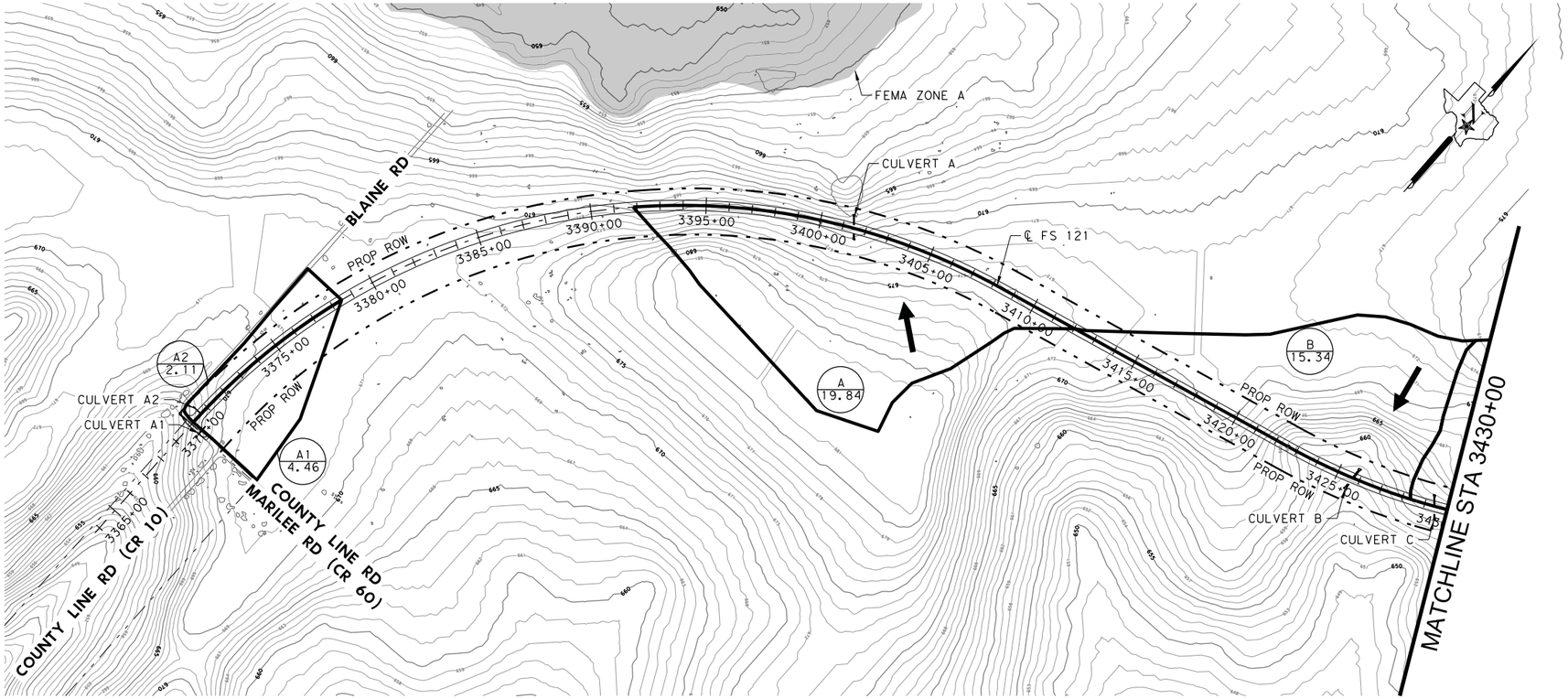
(NOT TO SCALE)

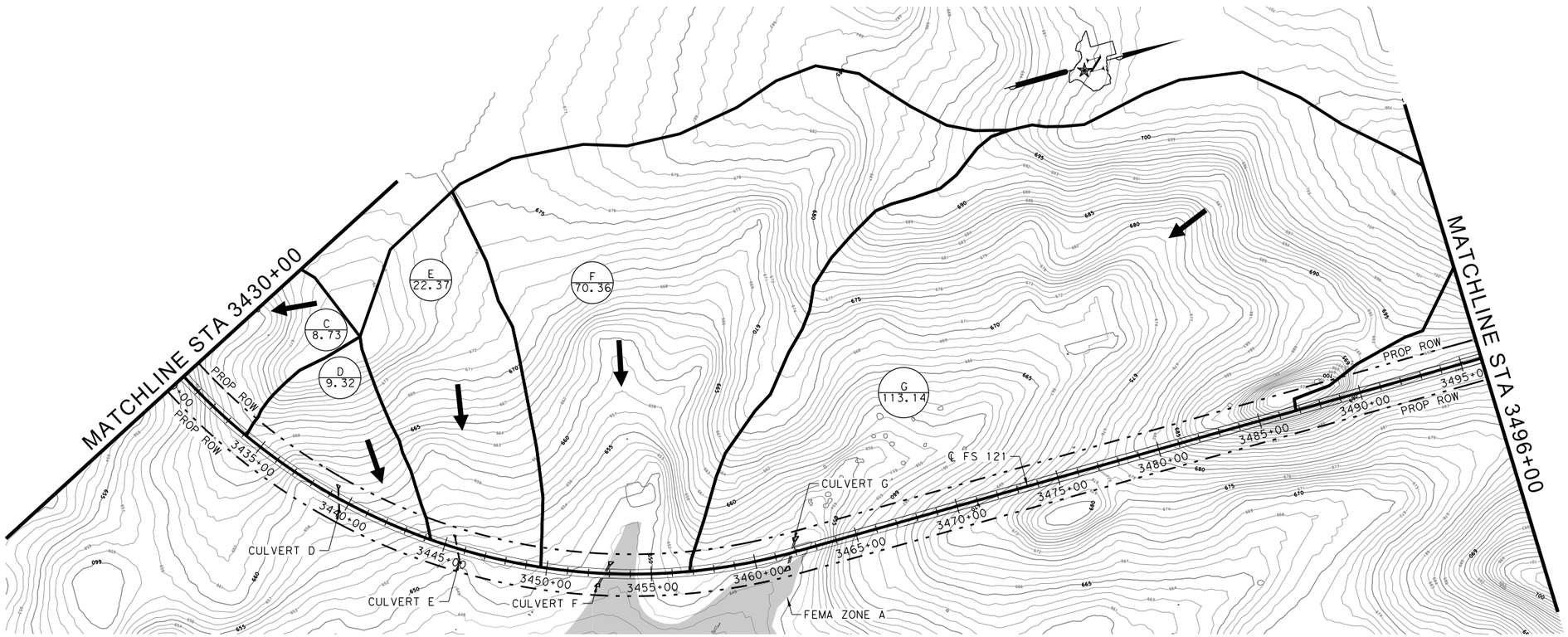
Texas Department of Transportation — Design Division Standard

TAPERED EDGE DETAILS
HMAC PAVEMENT

TE(HMAC)-11

FILE: tehmac11.dgn	DN: TxDOT		CK: RL	DW: KB		CK:
©TxDOT January 2011	CONT	SECT	JOB		HIGHWAY	
REVISIONS	0091	10	002		FS 121	
	DIST		COUNTY			SHEET NO.
	PAR		GRAYSON			149





HORIZONTAL
300 0 300 600
SCALE IN FEET

LEGEND

- X / XX.XX — DRAINAGE AREA ACRES
- FLOW ARROWS
- FEMA ZONE A

STATE OF TEXAS
CURTIS KESTILA
111513
LICENSED
PROFESSIONAL ENGINEER
7/15/2021

DATE	BY	REV	REVISION

BGE, Inc.
2595 Dallas Parkway, Suite 101, Frisco, TX 75034
Tel: 972-464-4800 • www.bgeinc.com
TBPE Registration No. F-1046

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FS 121

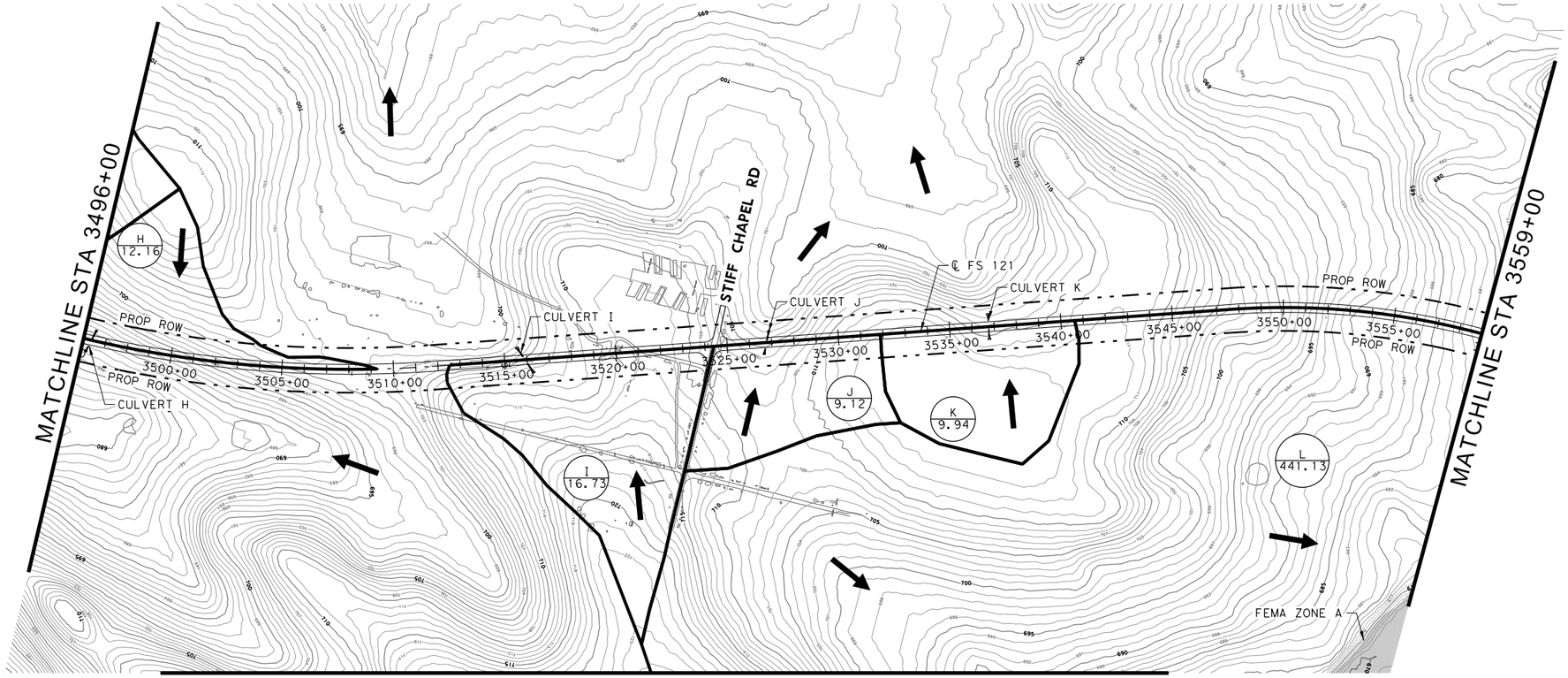
DRAINAGE AREA MAP

BEGIN - STA 3496+00

SCALE: 1" = 600' SHEET 1 OF 3

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	150

HORIZONTAL
300 0 300 600
SCALE IN FEET



LEGEND

- X / XX.XX — DRAINAGE AREA ACRES
- FLOW ARROWS
- FEMA ZONE A

STATE OF TEXAS
CURTIS KESTILA
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FS 121

DRAINAGE AREA MAP

STA 3496+00 - STA 3559+00

SCALE: 1" = 600' SHEET 2 OF 3

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	151

HORIZONTAL
300 0 300 600
SCALE IN FEET

LEGEND

- X / XX.XX — DRAINAGE AREA ACRES
- FLOW ARROWS
- FEMA ZONE A

STATE OF TEXAS
CURTIS KESTILA
111513
LICENSED
PROFESSIONAL ENGINEER
7/15/2021

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FS 121

DRAINAGE AREA MAP

STA 3559+00 - END

SCALE: 1" = 600' SHEET 3 OF 3

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	152

DRAINAGE AREA	STA	TIME OF CONCENTRATION	COMPOSITE AREA	COMPOSITE C VALUE	50% AEP (2 YR)		20% AEP (5 YR)		10% AEP (10 YR)		4% AEP (25 YR)		2% AEP (50 YR)		1% AEP (100 YR)	
					INTENSITY	DISCHARGE	INTENSITY	DISCHARGE	INTENSITY	DISCHARGE	INTENSITY	DISCHARGE	INTENSITY	DISCHARGE	INTENSITY	DISCHARGE
		(MIN)	(ACRES)		(IN/HR)	(CFS)	(IN/HR)	(CFS)	(IN/HR)	(CFS)	(IN/HR)	(CFS)	(IN/HR)	(CFS)	(IN/HR)	(CFS)
A1	0+71.33	42.41	4.46	0.40	2.13	3.80	2.66	4.75	3.17	5.66	3.74	6.68	4.28	7.63	4.83	8.61
A2	3370+60.87	41.52	2.11	0.40	2.16	1.83	2.70	2.28	3.22	2.72	3.80	3.21	4.34	3.67	4.89	4.14
A	3401+48.70	43.26	19.84	0.40	2.10	16.69	2.62	20.83	3.13	24.86	3.70	29.33	4.22	33.50	4.76	37.80
B	3425+70.01	20.85	15.34	0.40	3.36	20.59	4.16	25.52	4.95	30.39	5.82	35.69	6.63	40.71	7.47	45.87
C	3429+43.32	23.58	8.73	0.40	3.12	10.88	3.87	13.50	4.61	16.08	5.41	18.90	6.18	21.56	6.96	24.30
D	3439+46.54	20.69	9.32	0.40	3.37	12.57	4.18	15.57	4.97	18.54	5.84	21.78	6.66	24.84	7.51	27.98
E	3445+61.65	35.68	22.37	0.40	2.39	21.42	2.98	26.68	3.56	31.82	4.19	37.49	4.78	42.80	5.40	48.28
F	3452+77.08	40.21	70.36	0.40	2.21	62.20	2.76	77.57	3.29	92.55	3.88	109.14	4.43	124.63	5.00	140.61
G	3461+78.99	39.45	113.14	0.40	2.24	101.32	2.79	126.33	3.33	150.73	3.93	177.72	4.48	202.93	5.06	228.95
H	3496+36.13	23.97	12.16	0.40	3.08	15.00	3.83	18.61	4.56	22.17	5.36	26.06	6.12	29.74	6.89	33.51
I	3515+91.39	35.74	16.73	0.40	2.39	16.00	2.98	19.93	3.55	23.77	4.19	28.01	4.78	31.98	5.39	36.07
J	3526+76.92	30.11	9.12	0.40	2.67	9.76	3.33	12.14	3.96	14.47	4.67	17.03	5.32	19.44	6.00	21.91
K	3536+75.31	32.89	9.94	0.40	2.53	10.04	3.14	12.50	3.75	14.90	4.41	17.55	5.04	20.03	5.68	22.59
M2	3579+55.44	45.15	5.30	0.40	2.04	4.33	2.55	5.41	3.04	6.45	3.59	7.62	4.10	8.70	4.63	9.82
M	3586+46.87	42.95	64.74	0.40	2.11	54.74	2.64	68.30	3.15	81.52	3.71	96.17	4.24	109.83	4.79	123.94
N	3592+01.80	39.83	13.18	0.40	2.22	11.72	2.77	14.62	3.31	17.44	3.90	20.57	4.46	23.48	5.03	26.50
O	387+62.10	62.86	78.53	0.40	1.62	50.92	2.03	63.77	2.43	76.22	2.87	90.14	3.28	103.02	3.71	116.41

DISCHARGE SUMMARY - NRCS METHOD

DRAINAGE AREA	STA	TIME OF CONCENTRATION	COMPOSITE AREA		COMPOSITE CURVE NUMBER	50% AEP (2 YR)		20% AEP (5 YR)		10% AEP (10 YR)		4% AEP (25 YR)		2% AEP (50 YR)		1% AEP (100 YR)	
						TOTAL OUTFALL	DISCHARGE	TOTAL OUTFALL	DISCHARGE	TOTAL OUTFALL	DISCHARGE	TOTAL OUTFALL	DISCHARGE	TOTAL OUTFALL	DISCHARGE	TOTAL OUTFALL	DISCHARGE
		(HOURS)	(ACRES)	(SQ MI)		(IN)	(CFS)	(IN)	(CFS)	(IN)	(CFS)	(IN)	(CFS)	(IN)	(CFS)	(IN)	(CFS)
L	3536+95.79	1.06	441.1	0.689	81	2.15	492.2	3.07	683.3	3.89	845.2	5.09	1067.4	6.06	1236.1	7.1	1406.000

DATE	BY	REV	REVISION

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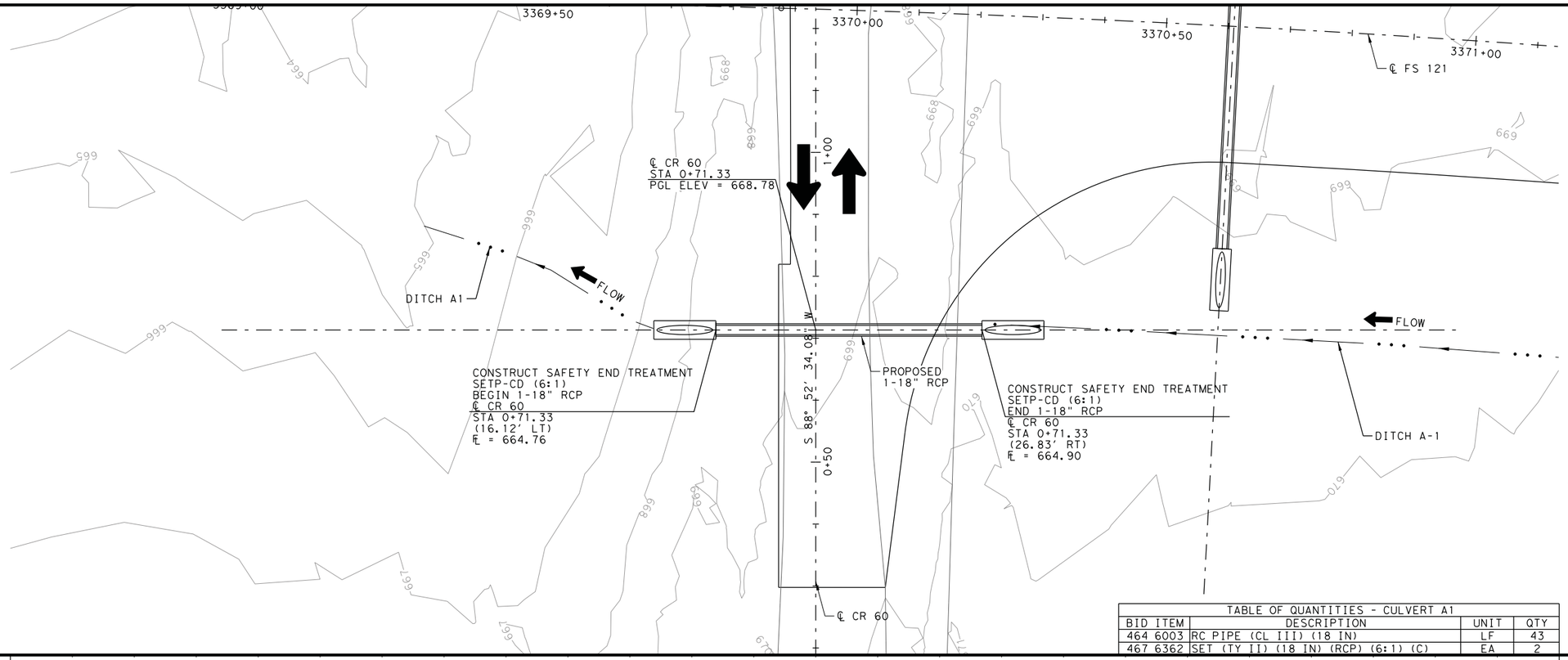
FS 121

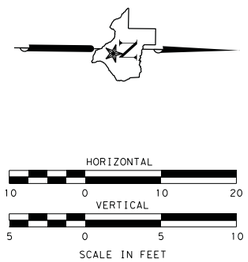
DRAINAGE CALCULATIONS

SCALE: N/A SHEET 1 OF 1

STATE		HIGHWAY NO.
TEXAS		FS 121

STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	153





HYDRAULIC DATA

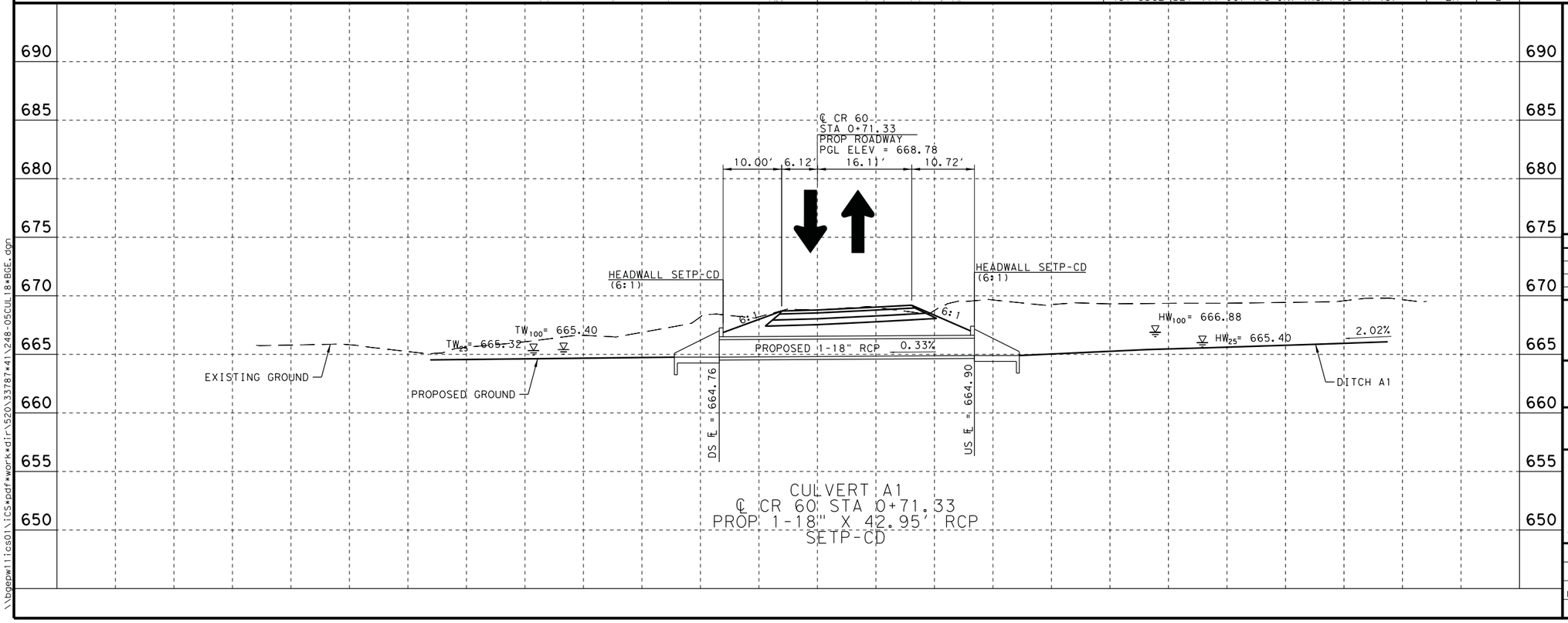
Q_{25} =6.68 CFS	Q_{100} =8.61 CFS
TW_{25} =665.32 FT	TW_{100} =665.40 FT
HW_{25} =665.55 FT	HW_{100} =666.88 FT
V_{25} =5.35 FT/S	V_{100} =6.02 FT/S

GENERAL NOTES:

1. SEE OVERALL DRAINAGE AREA MAP FOR ADDITIONAL INFORMATION
2. SEE DRAINAGE CALCULATIONS FOR ADDITIONAL INFORMATION
3. ALL SLOPES ARE NORMAL UNLESS STATED OTHERWISE

TABLE OF QUANTITIES - CULVERT A1

BID ITEM	DESCRIPTION	UNIT	QTY
464 6003	RC PIPE (CL III) (18 IN)	LF	43
467 6362	SET (TY II) (18 IN) (RCP) (6:1) (C)	EA	2



CULVERT A1
℄ CR 60 STA 0+71.33
PROP 1-18" X 42.95' RCP
SETP-CD

STATE OF TEXAS
CURTIS KESTILA
111513
PROFESSIONAL ENGINEER
LICENSED
7/16/2021

DATE	BY	REV	REVISION

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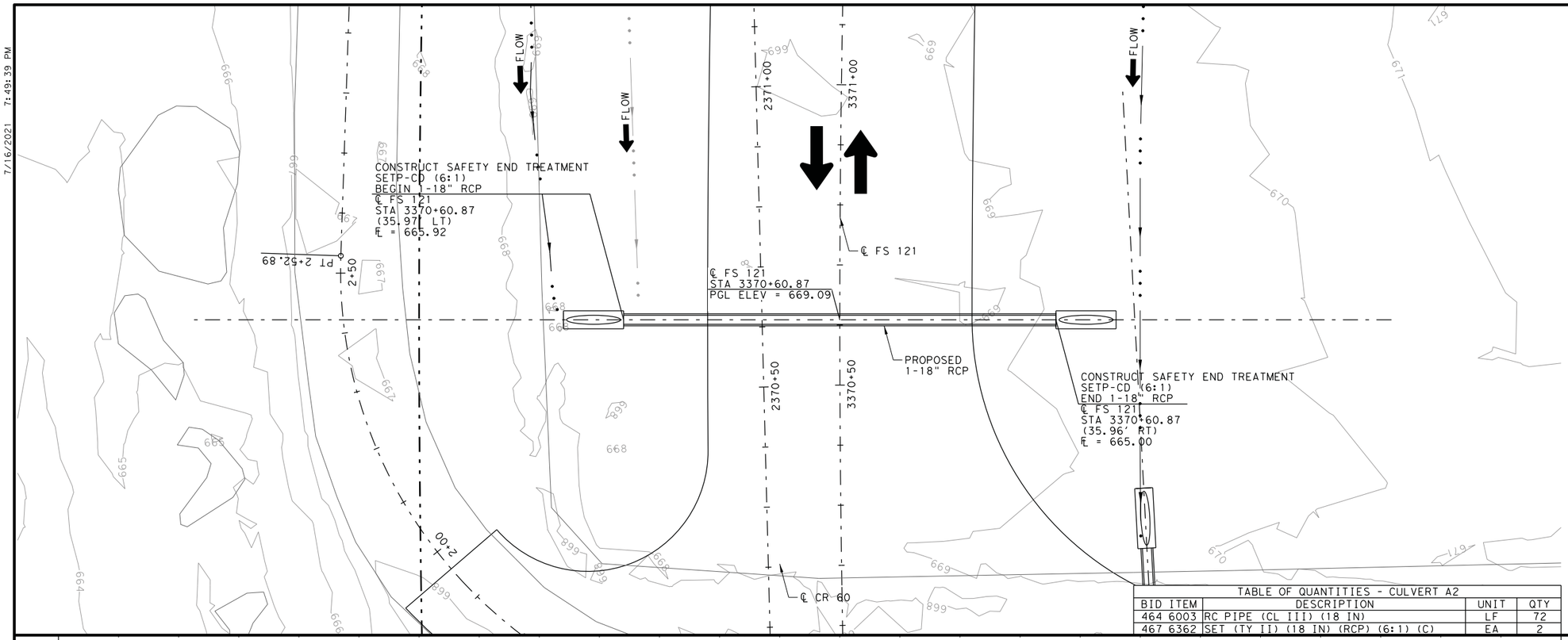
FS 121

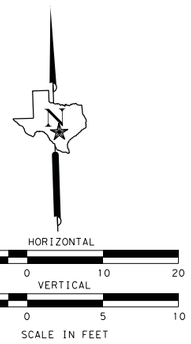
CULVERT PLAN & PROFILE

CULVERT 'A1'

SCALE: H: 1"=20' V: 1"=10' SHEET 1 OF 1

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	154





HYDRAULIC DATA

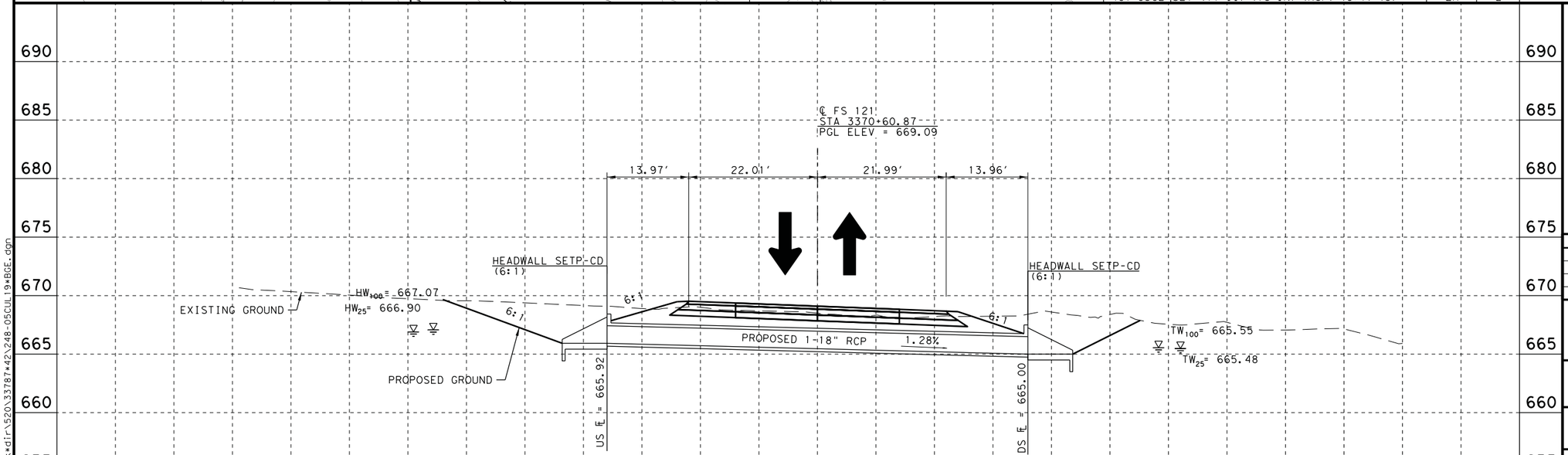
Q_{25} =3.21 CFS	Q_{100} =4.14 CFS
TW_{25} =665.48 FT	TW_{100} =665.48 FT
HW_{25} =666.90 FT	HW_{100} =666.99 FT
V_{25} =5.80 FT/S	V_{100} =6.19 FT/S

GENERAL NOTES:

1. SEE OVERALL DRAINAGE AREA MAP FOR ADDITIONAL INFORMATION
2. SEE DRAINAGE CALCULATIONS FOR ADDITIONAL INFORMATION
3. ALL SLOPES ARE NORMAL UNLESS STATED OTHERWISE

TABLE OF QUANTITIES - CULVERT A2

BID ITEM	DESCRIPTION	UNIT	QTY
464 6003	RC PIPE (CL III) (18 IN)	LF	72
467 6362	SET (TY II) (18 IN) (RCP) (6:1) (C)	EA	2



CULVERT A2
℄ FS 121 STA 3370+60.87
PROP 1-18" X 71.96' RCP
SETP-CD

STATE OF TEXAS
CURTIS KESTILA
111513
LICENSED
PROFESSIONAL ENGINEER
7/16/2021

DATE	BY	REV	REVISION

BGE, Inc.
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TBPE Registration No. F-1046

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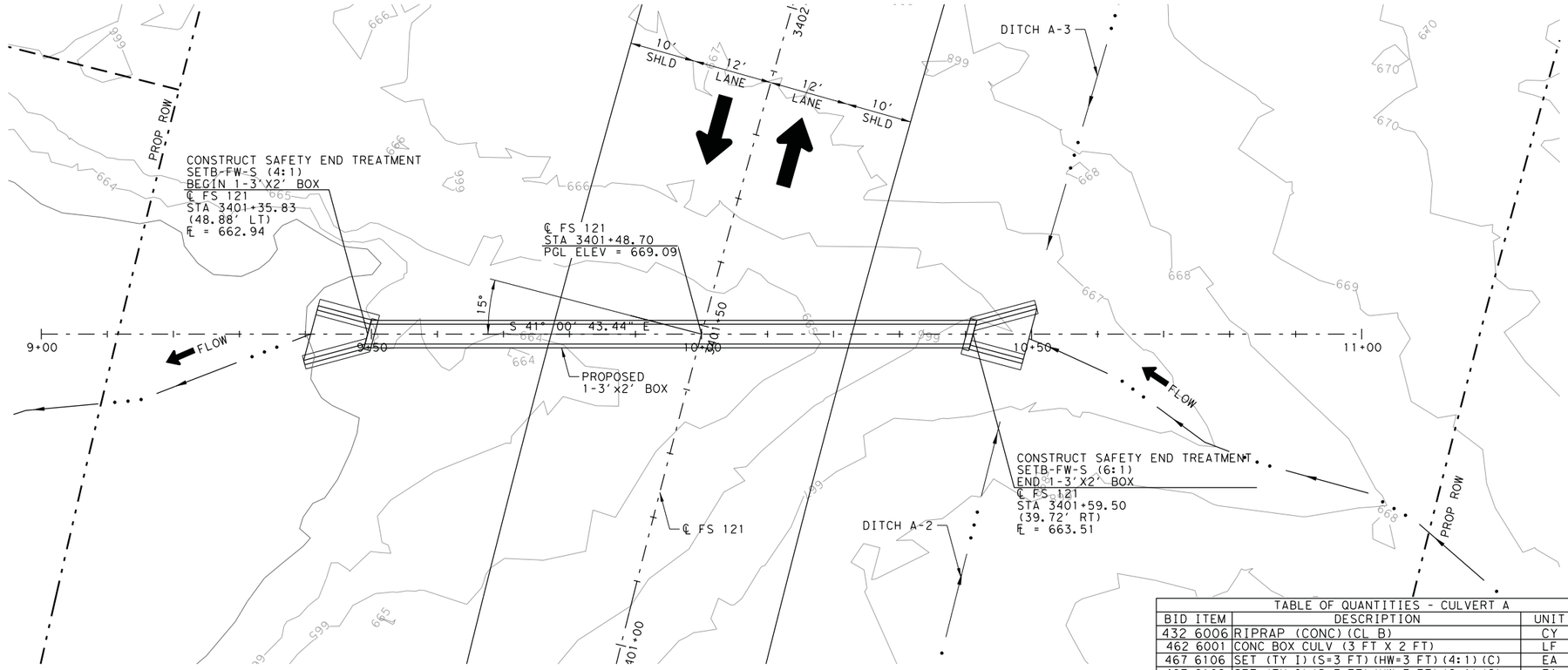
FS 121

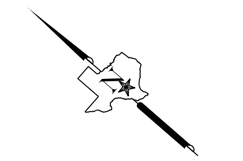
CULVERT PLAN & PROFILE

CULVERT 'A2'

SCALE: H:1"=20' V:1"=10' SHEET 1 OF 1

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	155





HYDRAULIC DATA

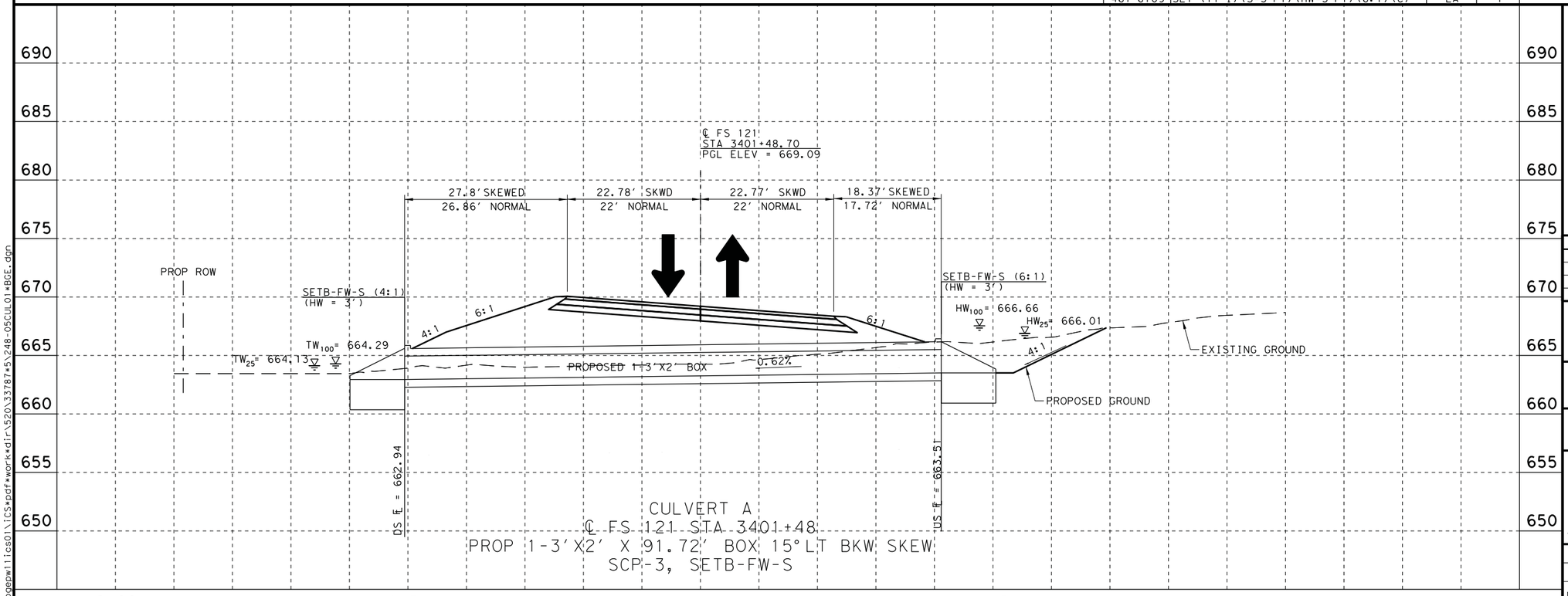
Q_{25} =29.33 CFS	Q_{100} =37.80 CFS
TW_{25} =664.13 FT	TW_{100} =664.29 FT
HW_{25} =666.01 FT	HW_{100} =666.66 FT
V_{25} =7.60 FT/S	V_{100} =8.13 FT/S

GENERAL NOTES:

1. SEE OVERALL DRAINAGE AREA MAP FOR ADDITIONAL INFORMATION
2. SEE DRAINAGE CALCULATIONS FOR ADDITIONAL INFORMATION
3. ALL SLOPES ARE NORMAL UNLESS STATED OTHERWISE

TABLE OF QUANTITIES - CULVERT A

BID ITEM	DESCRIPTION	UNIT	QTY
432 6006	RIPRAP (CONC)(CL B)	CY	2
462 6001	CONC BOX CULV (3 FT X 2 FT)	LF	92
467 6106	SET (TY I)(S=3 FT)(HW=3 FT)(4:1)(C)	EA	1
467 6109	SET (TY I)(S=3 FT)(HW=3 FT)(6:1)(C)	EA	1



DATE	BY	REV	REVISION

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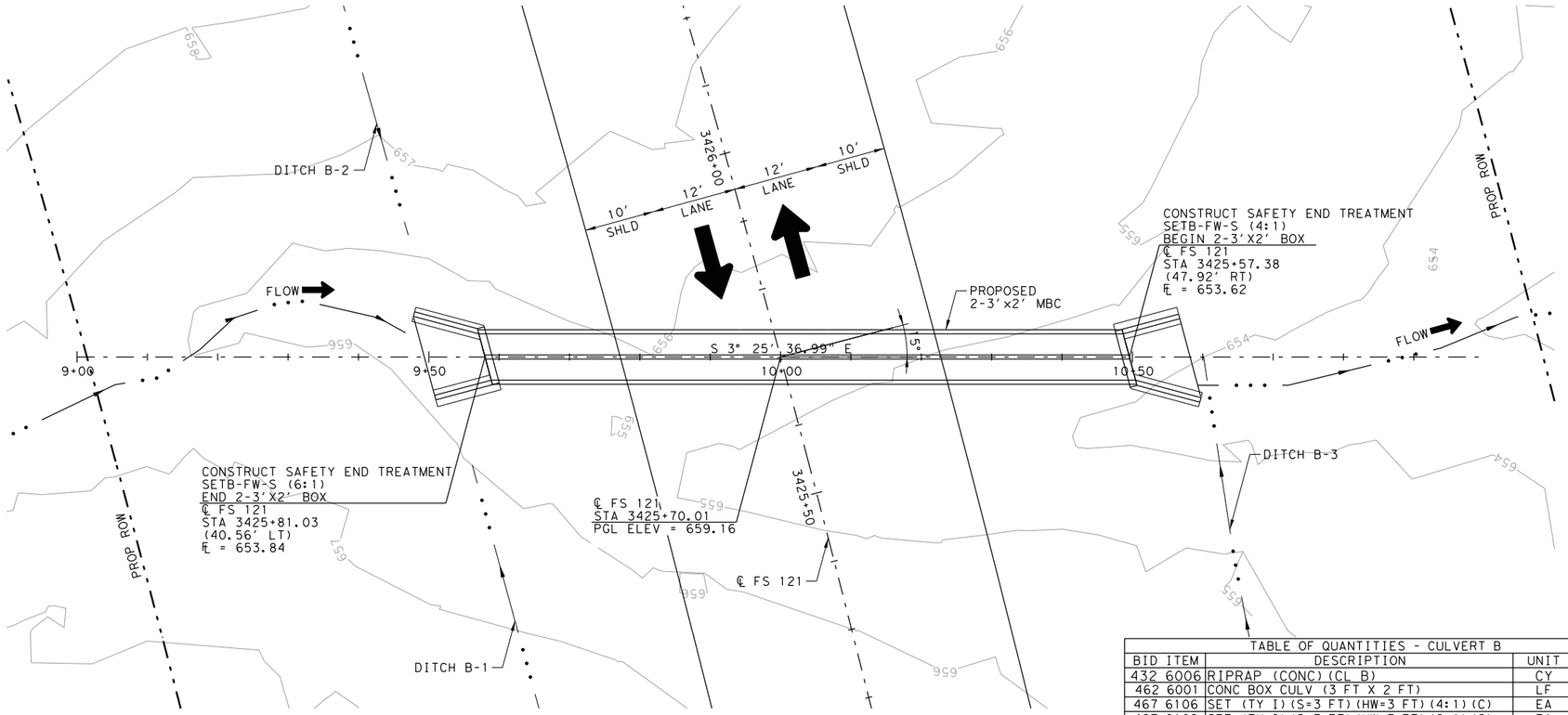
FS 121

CULVERT PLAN & PROFILE
CULVERT 'A'

SCALE: H:1"=20' V:1"=10' SHEET 1 OF 1

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	156



HYDRAULIC DATA

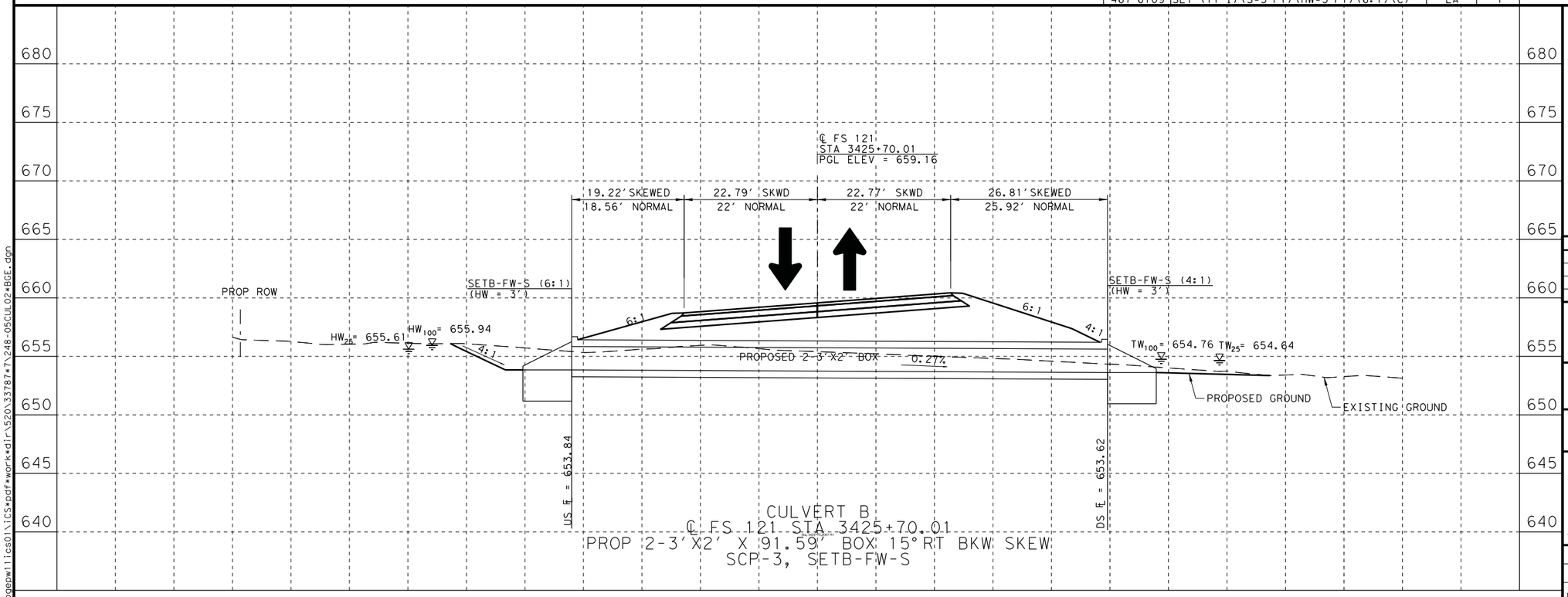
Q_{25} =35.69 CFS	Q_{100} =45.87 CFS
TW_{25} =654.64 FT	TW_{100} =654.76 FT
HW_{25} =655.61 FT	HW_{100} =655.94 FT
V_{25} =5.76 FT/S	V_{100} =6.27 FT/S

GENERAL NOTES:

1. SEE OVERALL DRAINAGE AREA MAP FOR ADDITIONAL INFORMATION
2. SEE DRAINAGE CALCULATIONS FOR ADDITIONAL INFORMATION
3. ALL SLOPES ARE NORMAL UNLESS STATED OTHERWISE

TABLE OF QUANTITIES - CULVERT B

BID ITEM	DESCRIPTION	UNIT	QTY
432 6006	RIPRAP (CONC) (CL B)	CY	3
462 6001	CONC BOX CULV (3 FT X 2 FT)	LF	184
467 6106	SET (TY I) (S=3 FT) (HW=3 FT) (4:1) (C)	EA	1
467 6109	SET (TY I) (S=3 FT) (HW=3 FT) (6:1) (C)	EA	1



CULVERT B
℄ FS 121 STA 3425+70.01
PROP 2-3'X2' X 91.59' BOX 15°RT BKW SKEW
SCP-3, SETB-FW-S

DATE	BY	REV	REVISION

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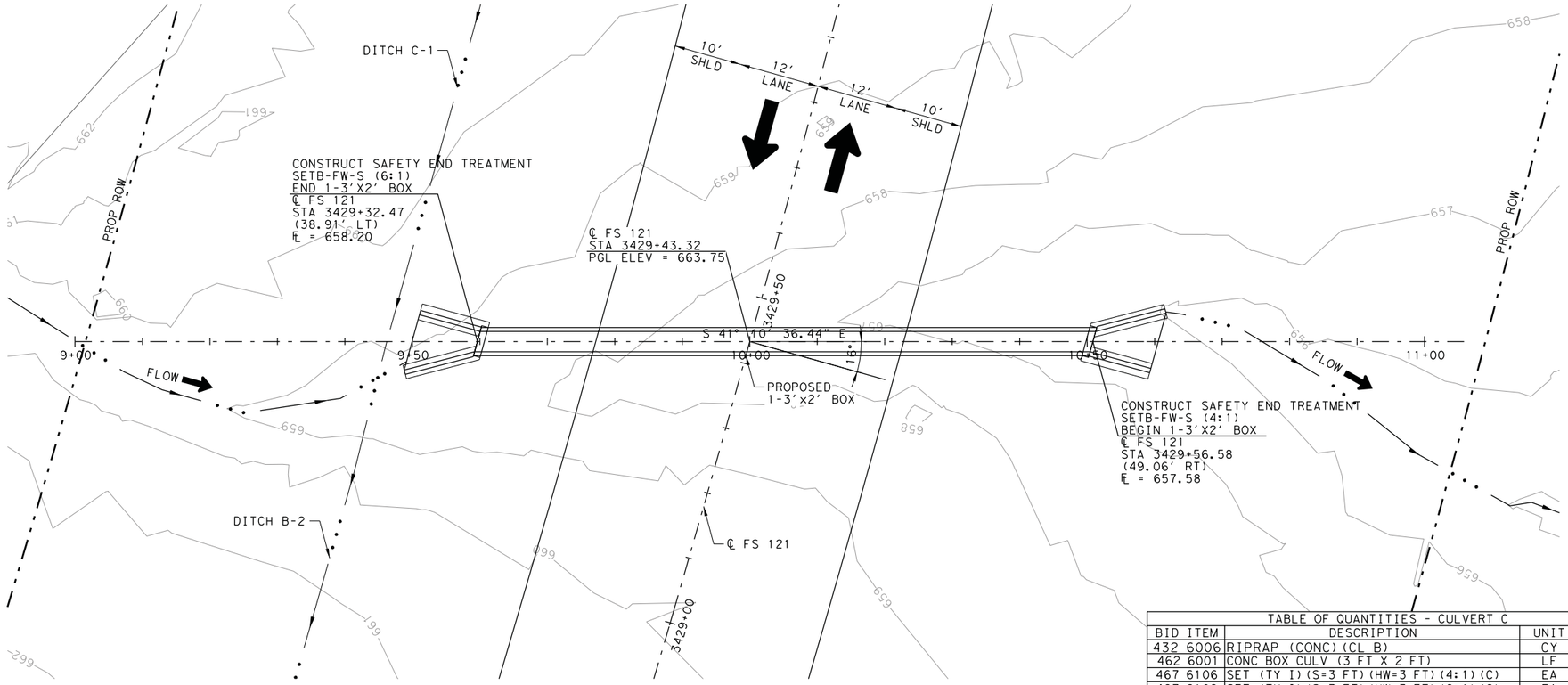
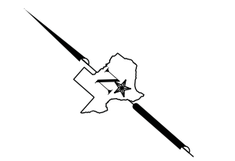
FS 121

CULVERT PLAN & PROFILE
CULVERT 'B'

SCALE: H:1"=20' V:1"=10' SHEET 1 OF 1

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	157





HYDRAULIC DATA

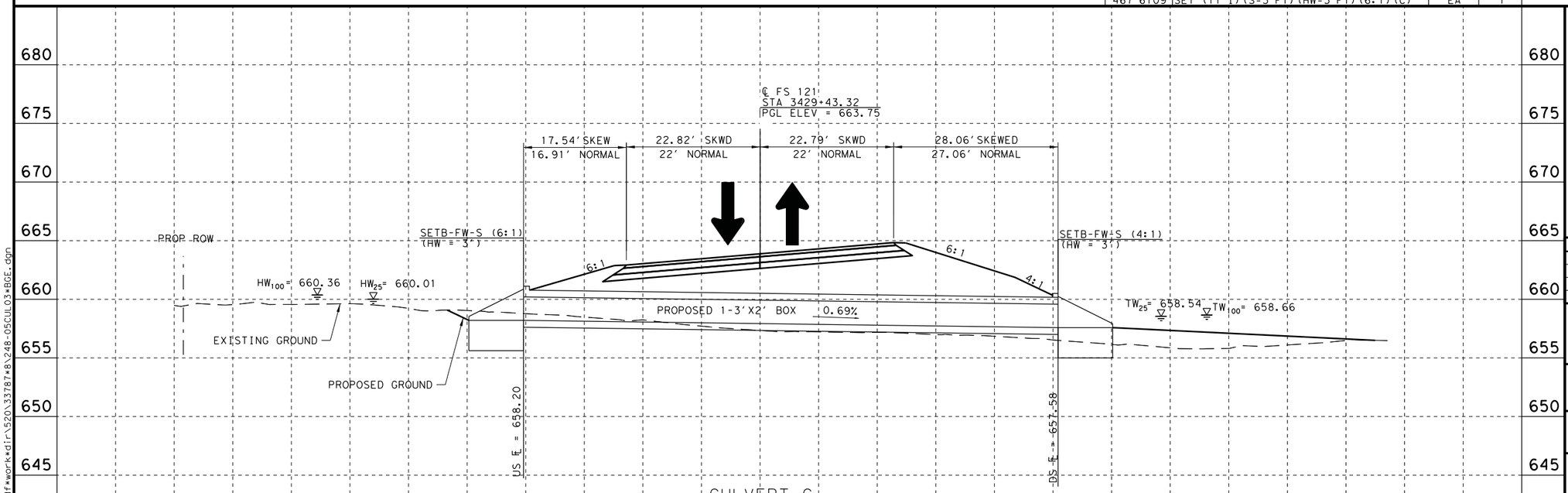
Q_{25} =18.90 CFS		Q_{100} =24.30 CFS	
TW_{25} =658.54 FT		TW_{100} =658.66 FT	
HW_{25} =660.01 FT		HW_{100} =660.36 FT	
V_{25} =6.93 FT/S		V_{100} =7.45 FT/S	

GENERAL NOTES:

1. SEE OVERALL DRAINAGE AREA MAP FOR ADDITIONAL INFORMATION
2. SEE DRAINAGE CALCULATIONS FOR ADDITIONAL INFORMATION
3. ALL SLOPES ARE NORMAL UNLESS STATED OTHERWISE

TABLE OF QUANTITIES - CULVERT C

BID ITEM	DESCRIPTION	UNIT	QTY
432 6006	RIPRAP (CONC)(CL B)	CY	2
462 6001	CONC BOX CULV (3 FT X 2 FT)	LF	92
467 6106	SET (TY I)(S=3 FT)(HW=3 FT)(4:1)(C)	EA	1
467 6109	SET (TY I)(S=3 FT)(HW=3 FT)(6:1)(C)	EA	1



CULVERT C
℄ FS 121 STA 3429+43.32
PROP 1-3'X2' X 91.23' BOX 15°RT FWD SKEW
SCP-3, SETB-FW-S

DATE	BY	REV	REVISION

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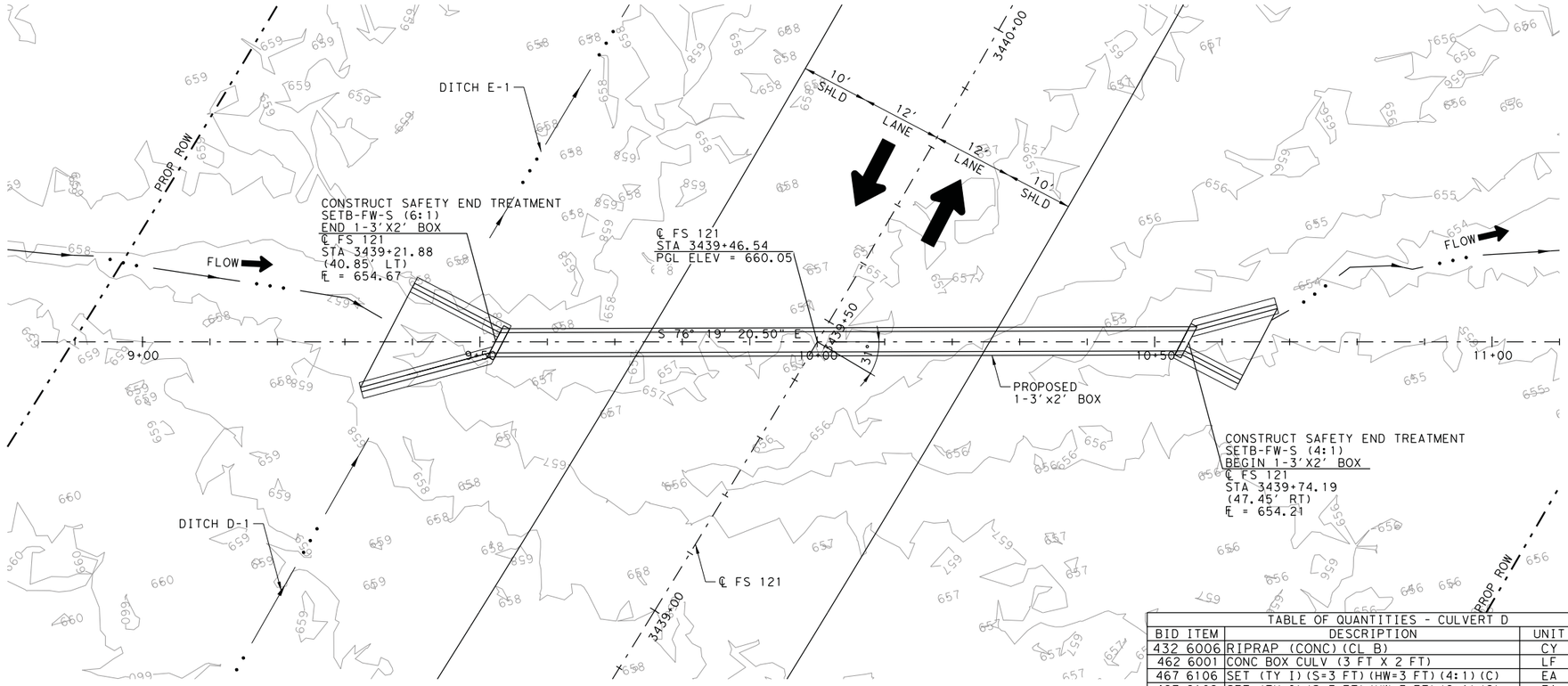
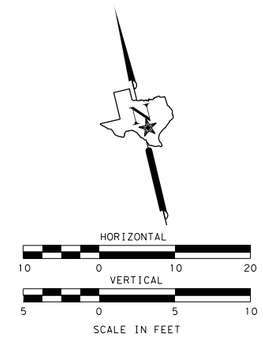
FS 121

CULVERT PLAN & PROFILE
CULVERT 'C'

SCALE: H:1"=20' V:1"=10' SHEET 1 OF 1

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	158





HYDRAULIC DATA

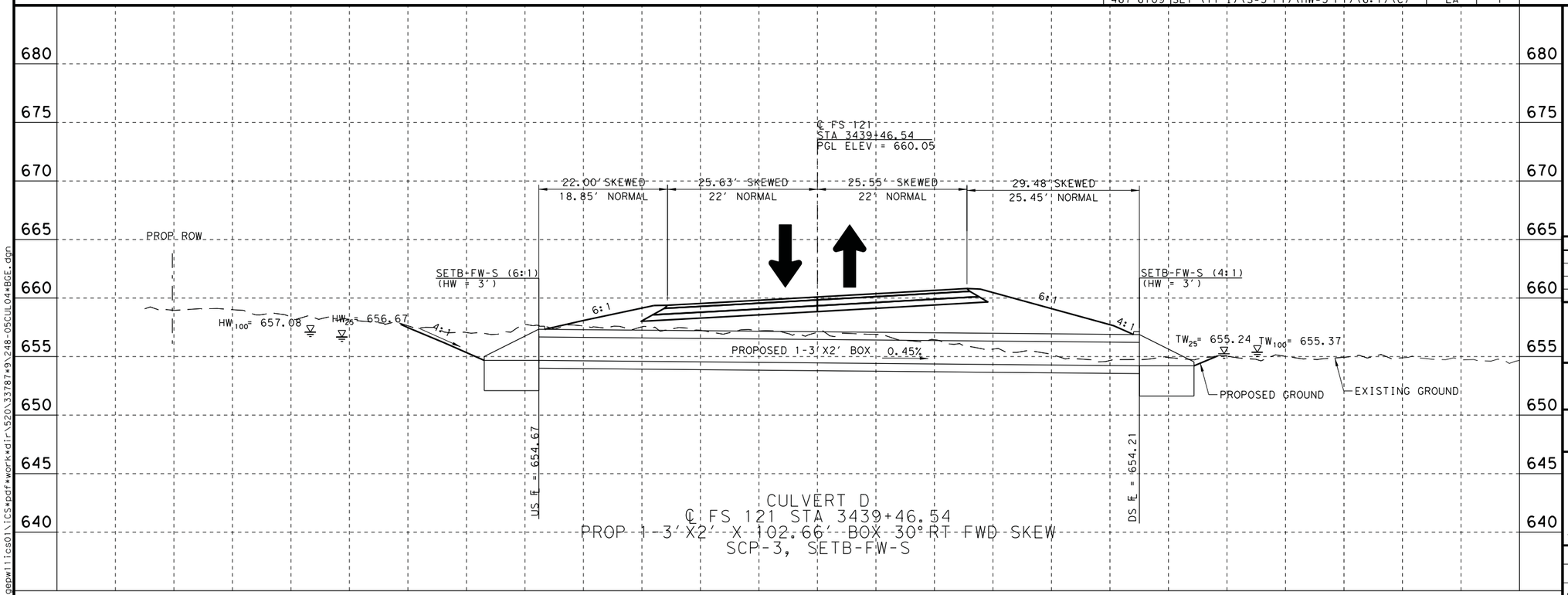
Q_{25} =21.78 CFS	Q_{100} =27.98 CFS
TW_{25} =655.24 FT	TW_{100} =655.37 FT
HW_{25} =656.67 FT	HW_{100} =657.08 FT
V_{25} =6.42 FT/S	V_{100} =6.86 FT/S

GENERAL NOTES:

1. SEE OVERALL DRAINAGE AREA MAP FOR ADDITIONAL INFORMATION
2. SEE DRAINAGE CALCULATIONS FOR ADDITIONAL INFORMATION
3. ALL SLOPES ARE NORMAL UNLESS STATED OTHERWISE

TABLE OF QUANTITIES - CULVERT D

BID ITEM	DESCRIPTION	UNIT	QTY
432 6006	RIPRAP (CONC)(CL B)	CY	3
462 6001	CONC BOX CULV (3 FT X 2 FT)	LF	103
467 6106	SET (TY I)(S=3 FT)(HW=3 FT)(4:1)(C)	EA	1
467 6109	SET (TY I)(S=3 FT)(HW=3 FT)(6:1)(C)	EA	1



DATE	BY	REV	REVISION

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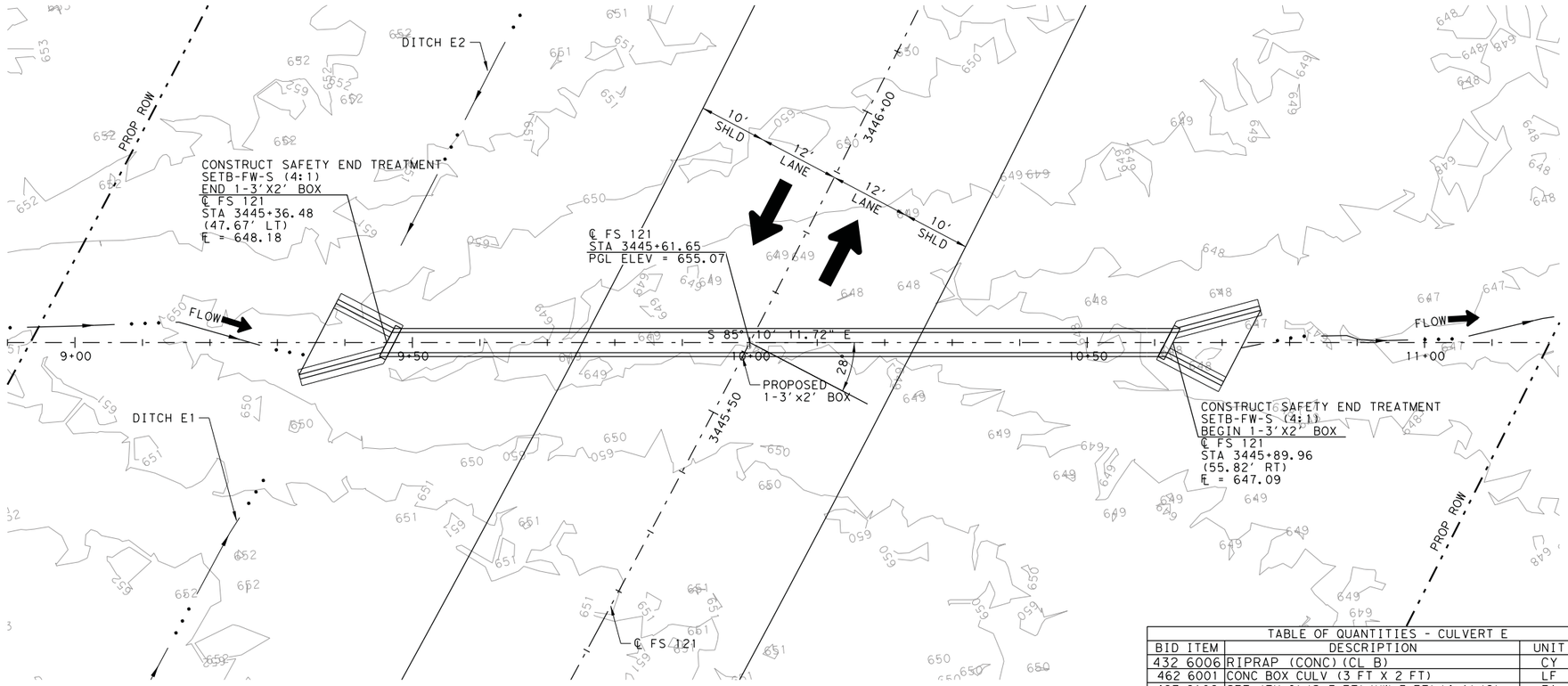
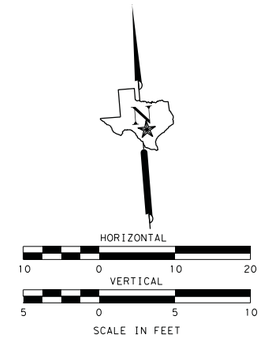
FS 121

CULVERT PLAN & PROFILE
CULVERT 'D'

SCALE: H:1"=20' V:1"=10' SHEET 1 OF 1

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	159





HYDRAULIC DATA

Q_{25} =37.49 CFS	Q_{100} =48.28 CFS
TW_{25} =648.36 FT	TW_{100} =648.53 FT
HW_{25} =651.30 FT	HW_{100} =652.34 FT
V_{25} =9.36 FT/S	V_{100} =9.96 FT/S

GENERAL NOTES:

1. SEE OVERALL DRAINAGE AREA MAP FOR ADDITIONAL INFORMATION
2. SEE DRAINAGE CALCULATIONS FOR ADDITIONAL INFORMATION
3. ALL SLOPES ARE NORMAL UNLESS STATED OTHERWISE

TABLE OF QUANTITIES - CULVERT E

BID ITEM	DESCRIPTION	UNIT	QTY
432 6006	RIPRAP (CONC) (CL B)	CY	2
462 6001	CONC BOX CULV (3 FT X 2 FT)	LF	116
467 6106	SET (TY I) (S=3 FT) (HW=3 FT) (4:1) (C)	EA	2

CULVERT E
℄ FS 121 STA 3445+61.65
PROP 1-3'X2' X 115.41' BOX 30° RT FWD SKEW
SCP-3, SETB-FW-S

DATE	BY	REV	REVISION

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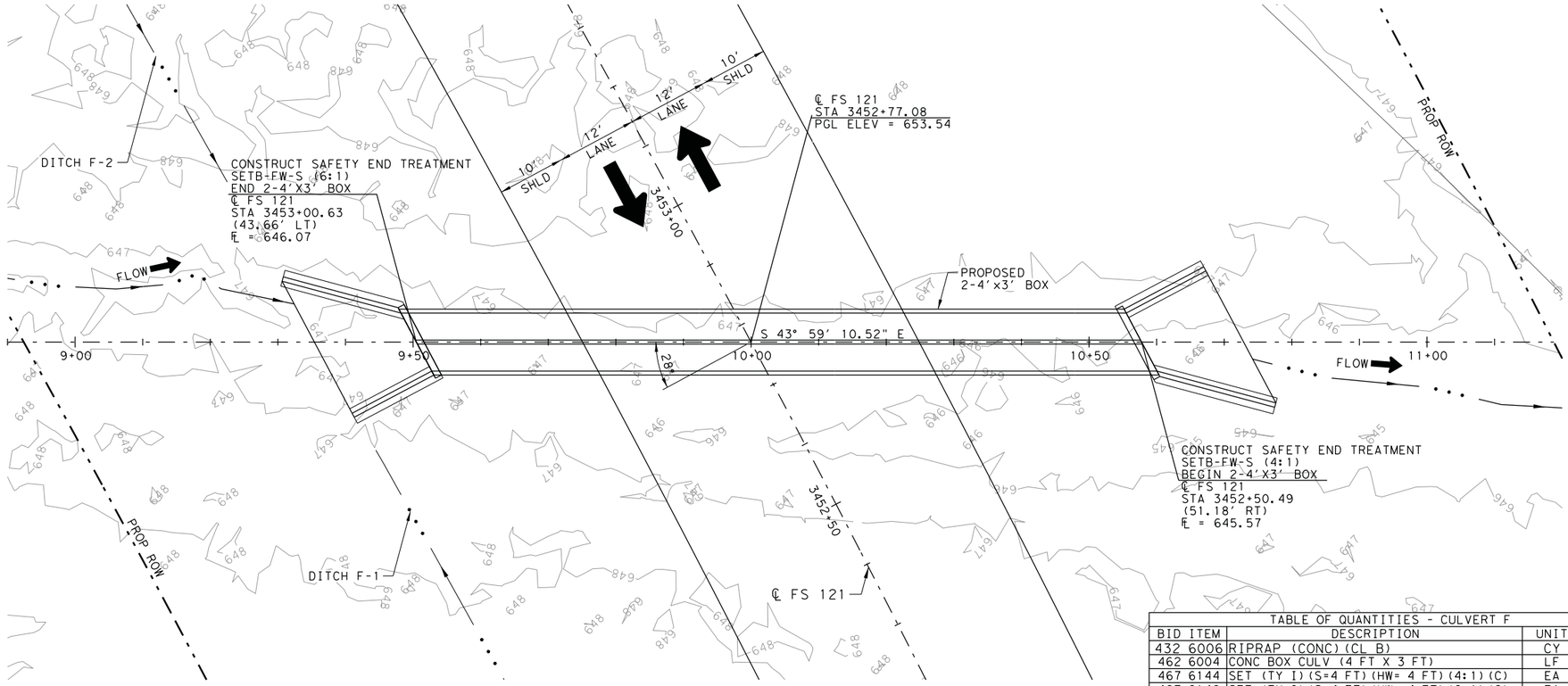
FS 121

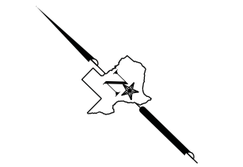
CULVERT PLAN & PROFILE

CULVERT 'E'

SCALE: H:1"=20' V:1"=10' SHEET 1 OF 1

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	160





HYDRAULIC DATA

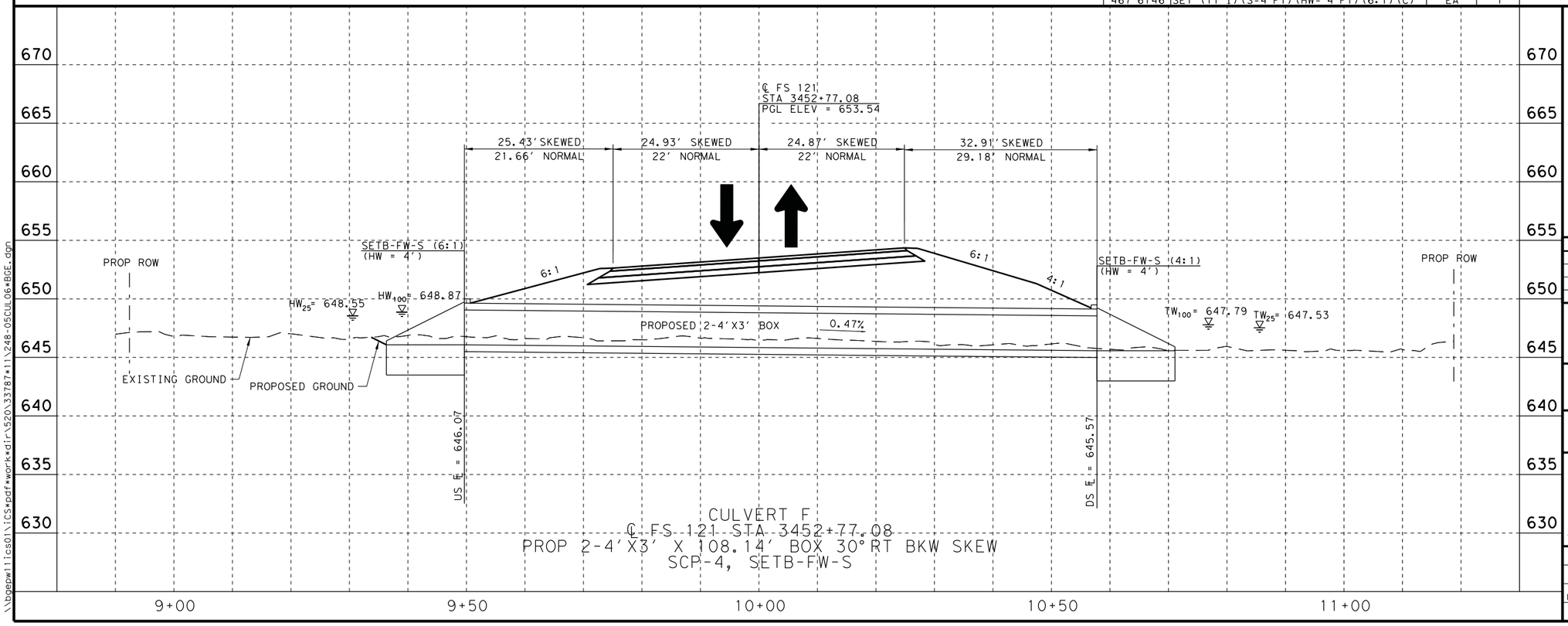
Q_{25} =109.14 CFS	Q_{100} =140.61 CFS
TW_{25} =647.53 FT	TW_{100} =647.79 FT
HW_{25} =648.55 FT	HW_{100} =648.87 FT
V_{25} =6.96 FT/S	V_{100} =7.93 FT/S

GENERAL NOTES:

1. SEE OVERALL DRAINAGE AREA MAP FOR ADDITIONAL INFORMATION
2. SEE DRAINAGE CALCULATIONS FOR ADDITIONAL INFORMATION.
3. ALL SLOPES ARE NORMAL UNLESS STATED OTHERWISE

TABLE OF QUANTITIES - CULVERT F

BID ITEM	DESCRIPTION	UNIT	QTY
432 6006	RIPRAP (CONC)(CL B)	CY	8
462 6004	CONC BOX CULV (4 FT X 3 FT)	LF	218
467 6144	SET (TY I)(S=4 FT)(HW= 4 FT)(4:1)(C)	EA	1
467 6146	SET (TY I)(S=4 FT)(HW= 4 FT)(6:1)(C)	EA	1



CULVERT F
℄ FS 121 STA 3452+77.08
PROP 2-4'X3' X 108.14' BOX 30° RT BKW SKEW
SCP-4, SETB-FW-S

STATE OF TEXAS
CURTIS KESTILA
111513
LICENSED
PROFESSIONAL ENGINEER
7/16/2021

DATE	BY	REV	REVISION

BGE, Inc.
2595 Dallas Parkway, Suite 101, Frisco, TX 75034
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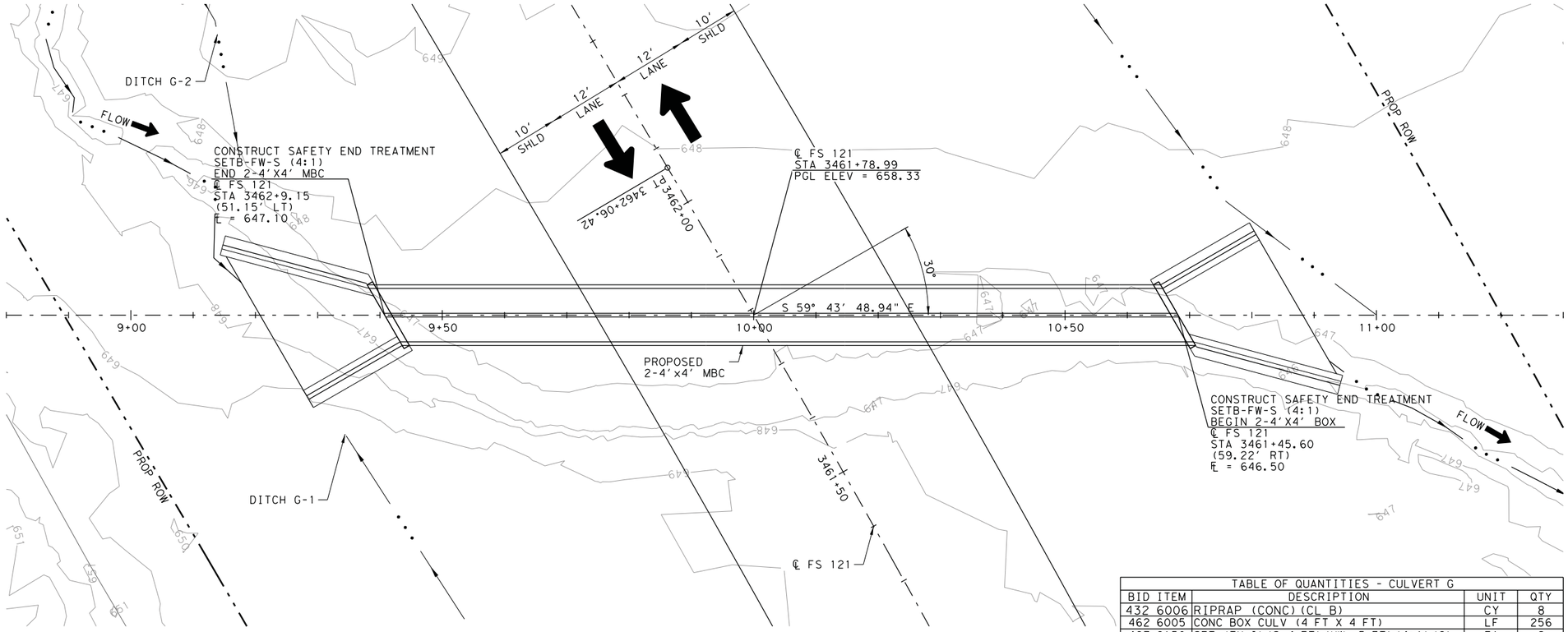
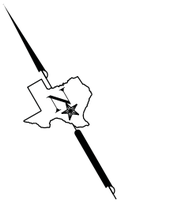
FS 121

CULVERT PLAN & PROFILE
CULVERT 'F'

SCALE: H:1"=20' V:1"=10' SHEET 1 OF 1

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	161





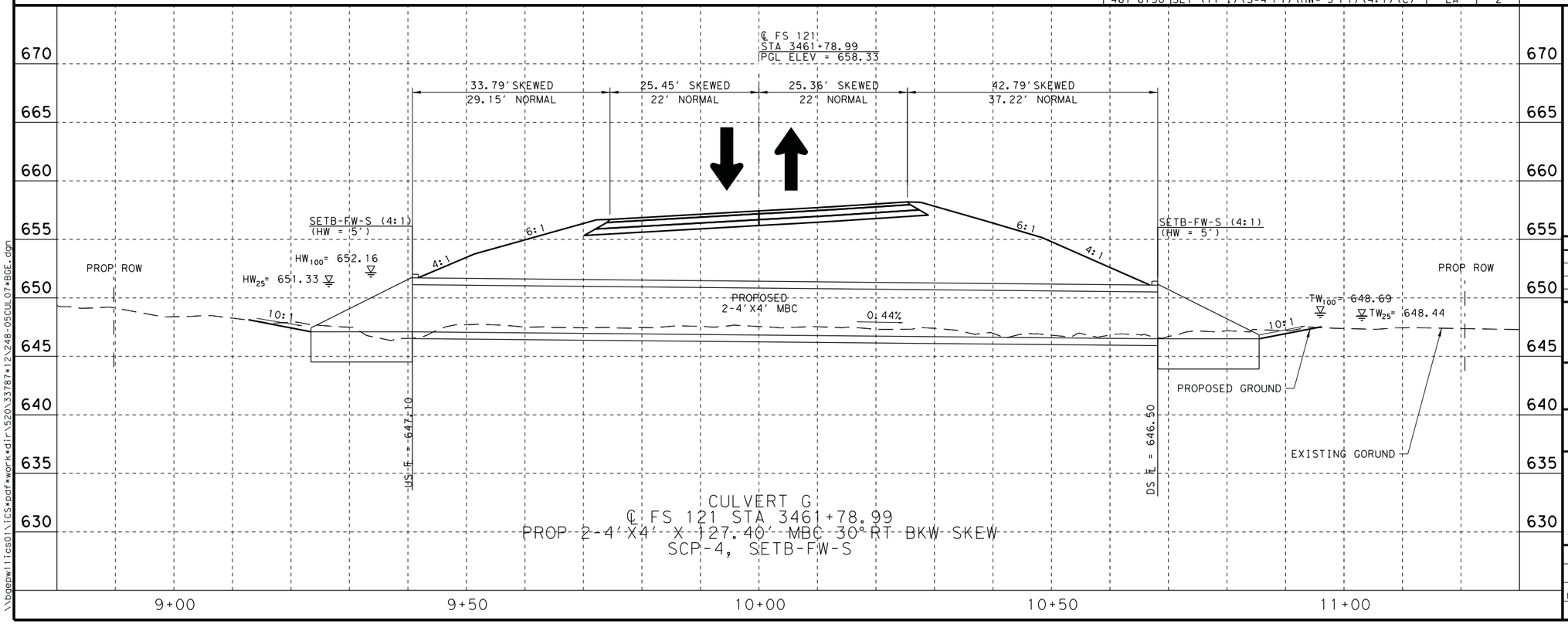
HYDRAULIC DATA

Q_{25} =177.72 CFS	Q_{100} =228.95 CFS
TW_{25} =648.44 FT	TW_{100} =648.69 FT
HW_{25} =651.33 FT	HW_{100} =652.16 FT
V_{25} =8.94 FT/S	V_{100} =9.73 FT/S

GENERAL NOTES:

1. SEE OVERALL DRAINAGE AREA MAP FOR ADDITIONAL INFORMATION
2. SEE DRAINAGE CALCULATIONS FOR ADDITIONAL INFORMATION
3. ALL SLOPES ARE NORMAL UNLESS STATED OTHERWISE

TABLE OF QUANTITIES - CULVERT G			
BID ITEM	DESCRIPTION	UNIT	QTY
432 6006	RIPRAP (CONC) (CL B)	CY	8
462 6005	CONC BOX CULV (4 FT X 4 FT)	LF	256
467 6150	SET (TY I) (S=4 FT) (HW= 5 FT) (4:1) (C)	EA	2



CULVERT G
℄ FS 121 STA 3461+78.99
PROP 2-4'X4' X 127.40' MBC 30° RT BKW SKEW
SCP-4, SETB-FW-S

DATE	BY	REV	REVISION

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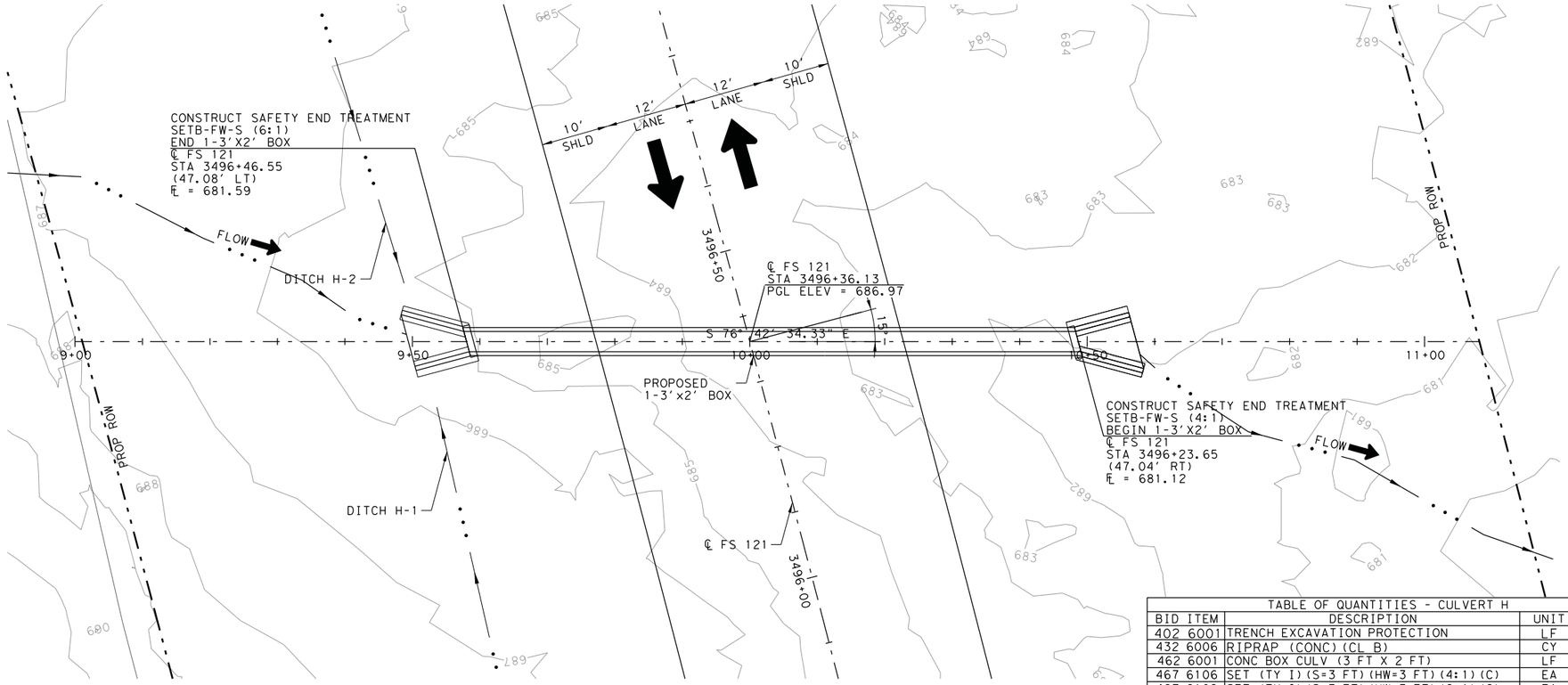
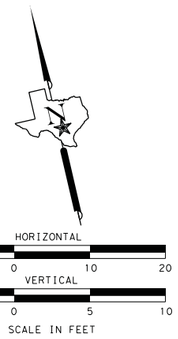
FS 121

CULVERT PLAN & PROFILE
CULVERT 'G'

SCALE: H:1"=20' V:1"=10' SHEET 1 OF 1

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	162





HYDRAULIC DATA

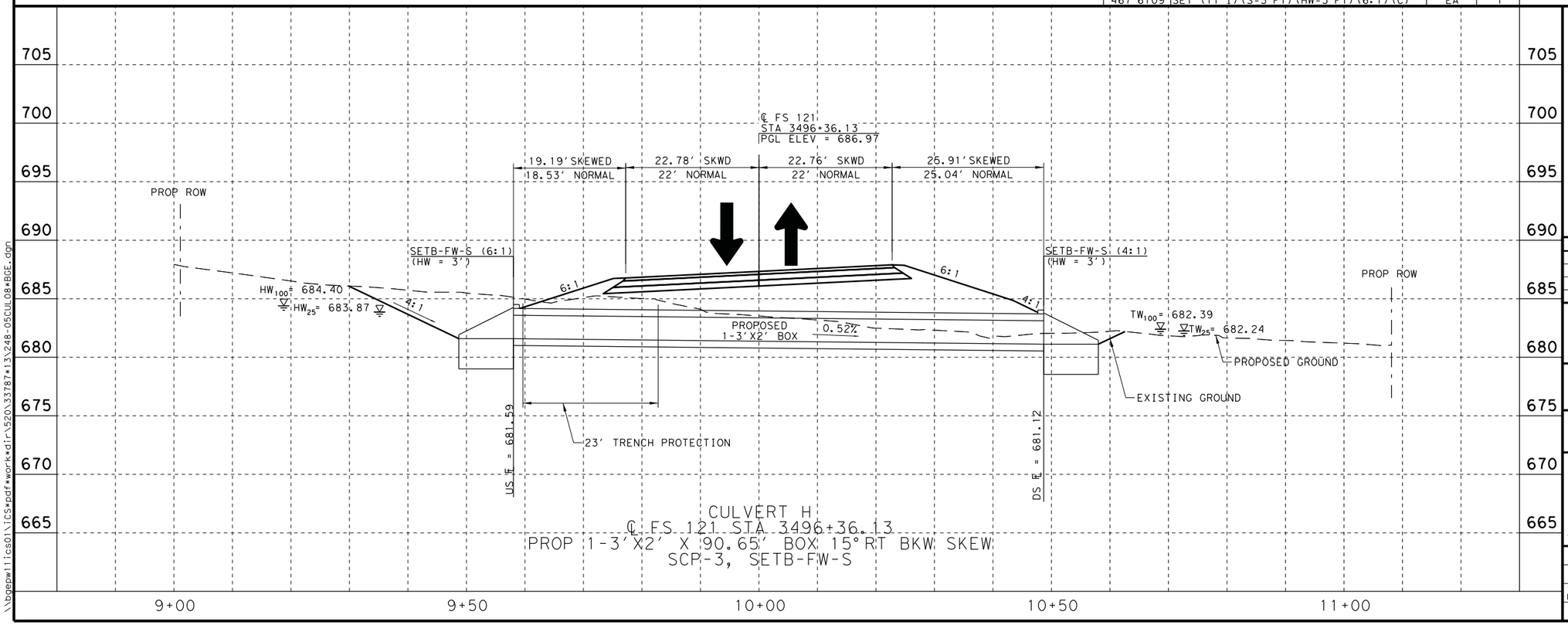
Q_{25} =26.06 CFS	Q_{100} =33.51 CFS
TW_{25} =682.24 FT	TW_{100} =682.39 FT
HW_{25} =683.87 FT	HW_{100} =684.40 FT
V_{25} =7.11 FT/S	V_{100} =7.59 FT/S

GENERAL NOTES:

1. SEE OVERALL DRAINAGE AREA MAP FOR ADDITIONAL INFORMATION
2. SEE DRAINAGE CALCULATIONS FOR ADDITIONAL INFORMATION
3. ALL SLOPES ARE NORMAL UNLESS STATED OTHERWISE

TABLE OF QUANTITIES - CULVERT H

BID ITEM	DESCRIPTION	UNIT	QTY
402 6001	TRENCH EXCAVATION PROTECTION	LF	23
432 6006	RIPRAP (CONC) (CL B)	CY	2
462 6001	CONC BOX CULV (3 FT X 2 FT)	LF	91
467 6106	SET (TY I) (S=3 FT) (HW=3 FT) (4:1) (C)	EA	1
467 6109	SET (TY I) (S=3 FT) (HW=3 FT) (6:1) (C)	EA	1



CULVERT H
℄ FS 121 STA 3496+36.13
PROP 1-3'X2' X 90.65' BOX 15° RT BKW SKEW
SCP-3, SETB-FW-S

DATE	BY	REV	REVISION

BGE, Inc.
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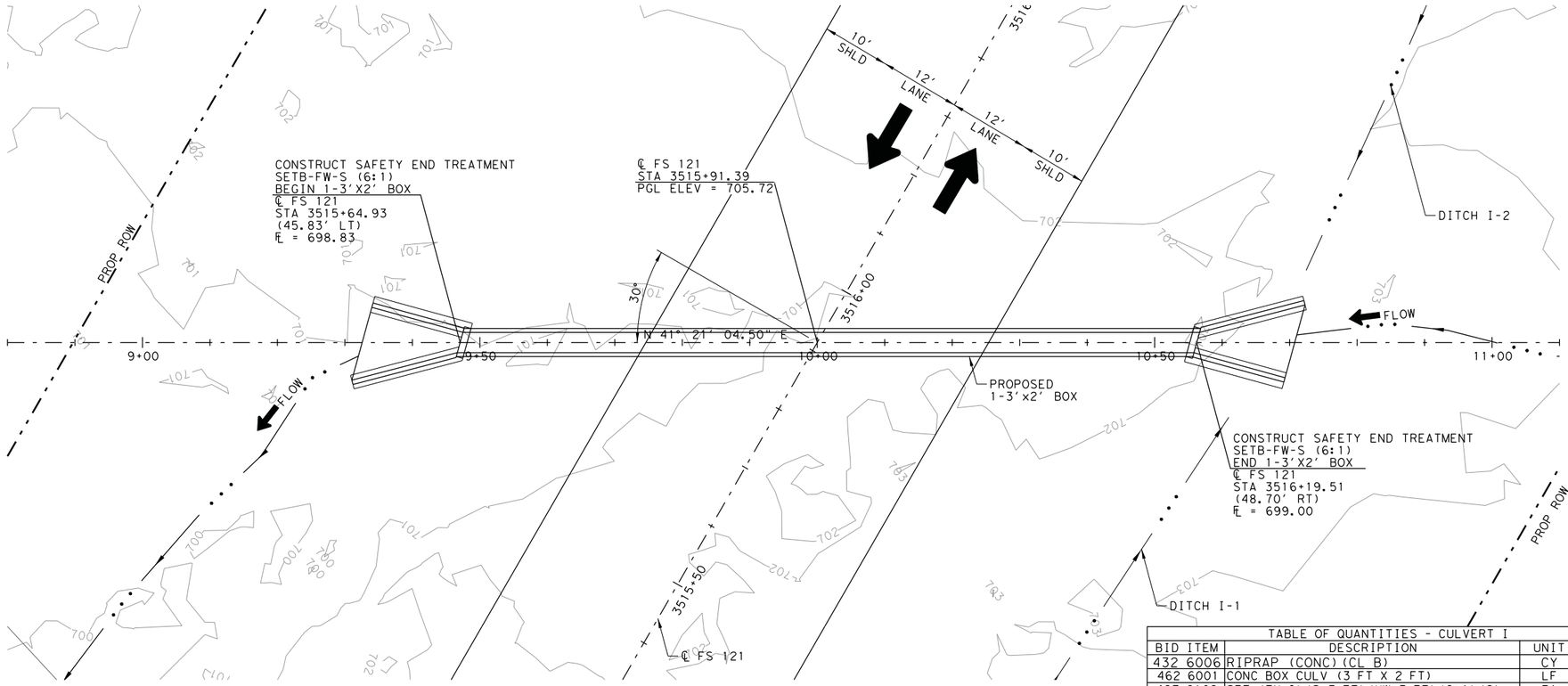
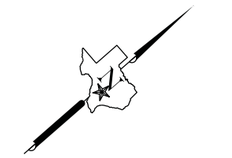
FS 121

CULVERT PLAN & PROFILE
CULVERT 'H'

SCALE: H:1"=20' V:1"=10' SHEET 1 OF 1

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	163





HYDRAULIC DATA

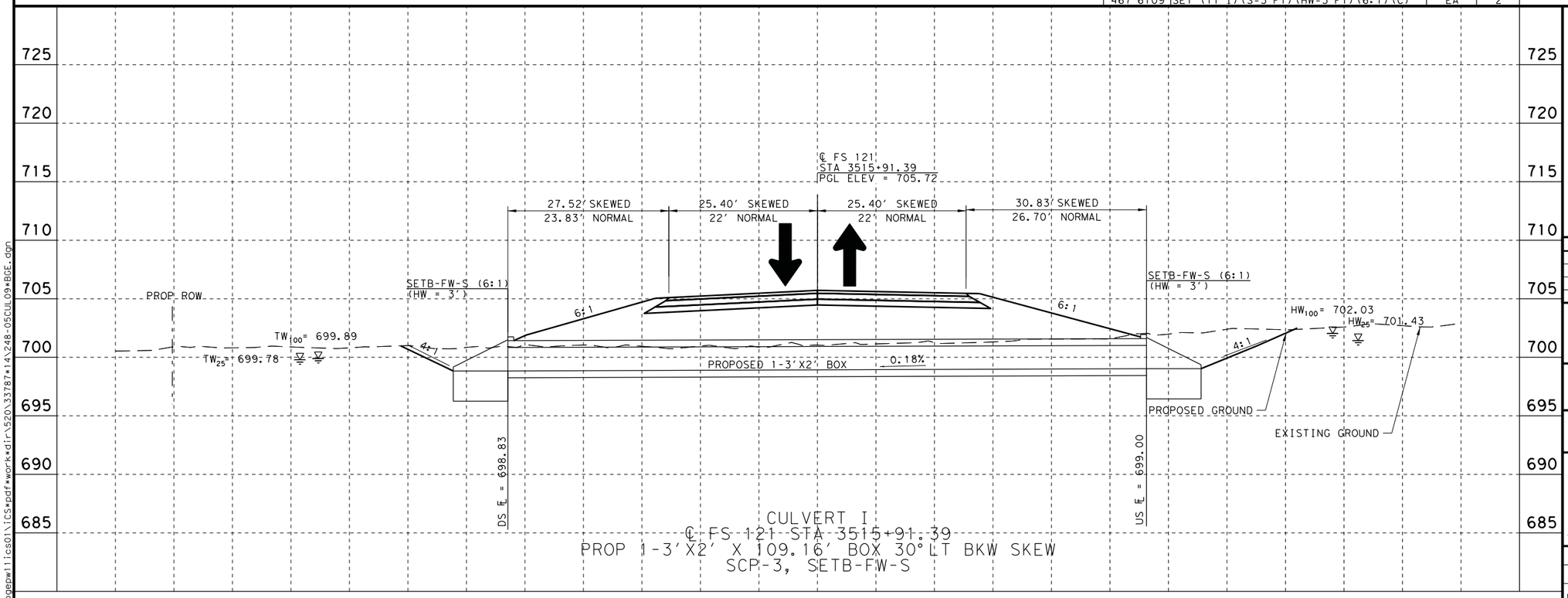
Q_{25} =28.01 CFS	Q_{100} =36.07 CFS
TW_{25} =699.78 FT	TW_{100} =699.89 FT
HW_{25} =701.43 FT	HW_{100} =702.03 FT
V_{25} =6.70 FT/S	V_{100} =7.29 FT/S

GENERAL NOTES:

1. SEE OVERALL DRAINAGE AREA MAP FOR ADDITIONAL INFORMATION
2. SEE DRAINAGE CALCULATIONS FOR ADDITIONAL INFORMATION
3. ALL SLOPES ARE NORMAL UNLESS STATED OTHERWISE

TABLE OF QUANTITIES - CULVERT I

BID ITEM	DESCRIPTION	UNIT	QTY
432 6006	RIPRAP (CONC) (CL B)	CY	2
462 6001	CONC BOX CULV (3 FT X 2 FT)	LF	110
467 6109	SET (TY I) (S=3 FT) (HW=3 FT) (6:1) (C)	EA	2



DATE	BY	REV	REVISION

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TBPE Registration No. F-1046

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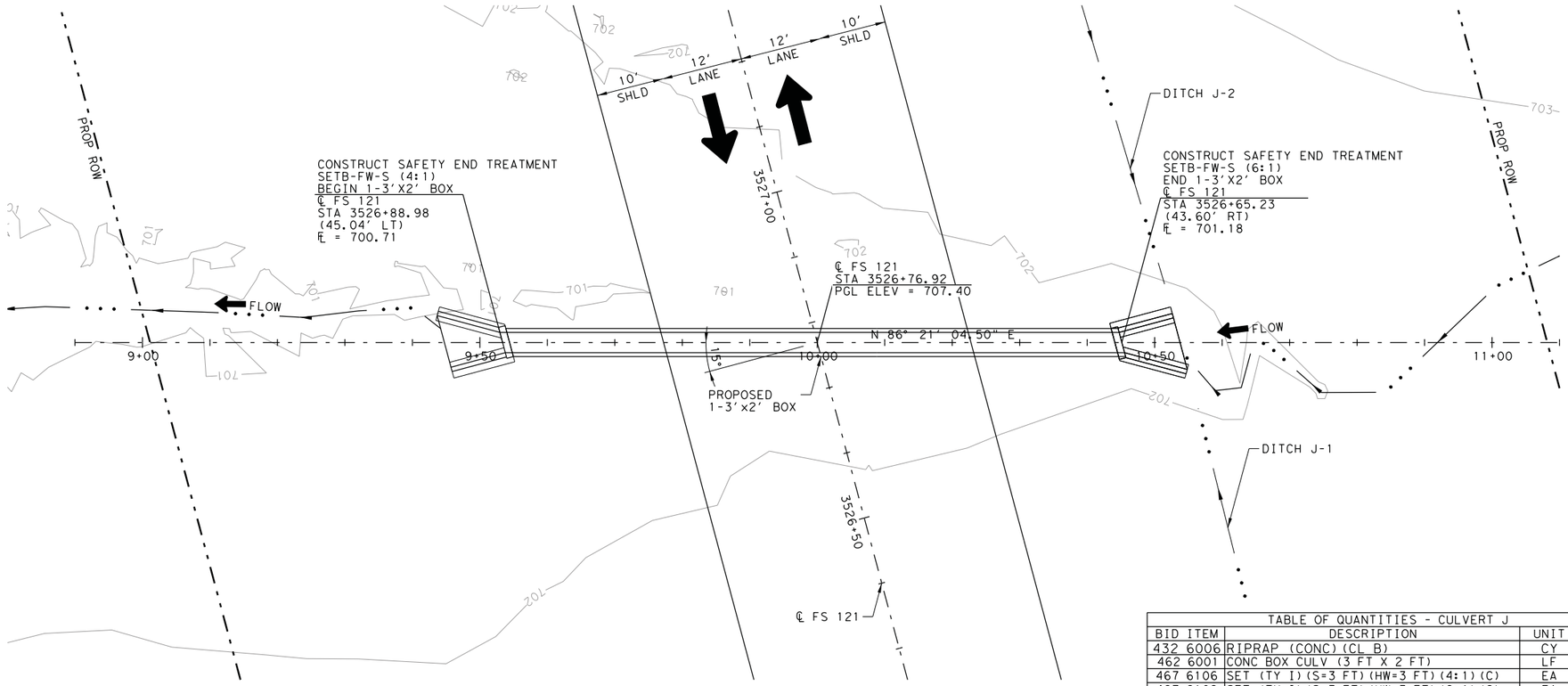
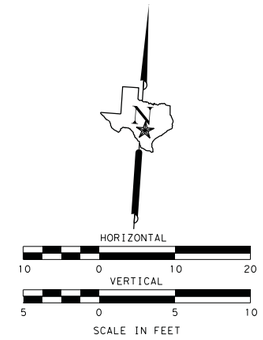
FS 121

CULVERT PLAN & PROFILE
CULVERT 'I'

SCALE: H:1"=20' V:1"=10' SHEET 1 OF 1

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	164





HYDRAULIC DATA

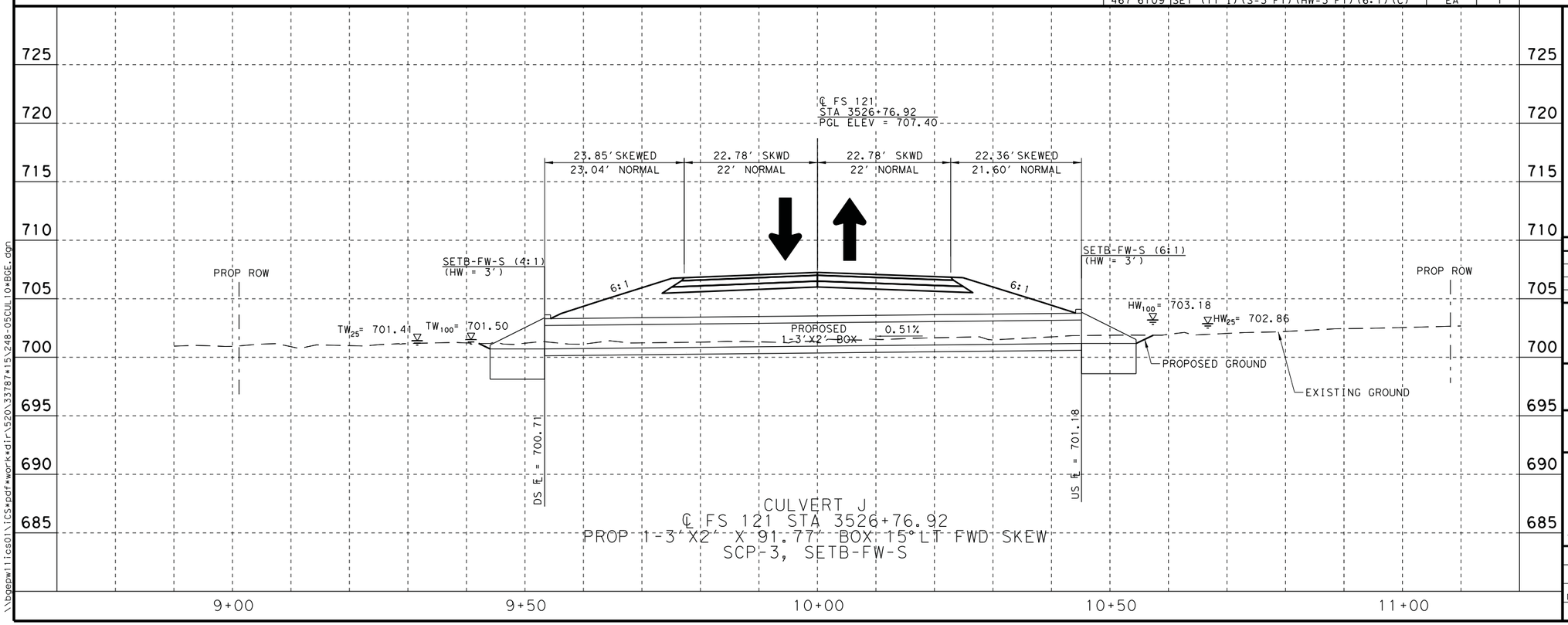
Q_{25} =17.03 CFS	Q_{100} =21.91 CFS
TW_{25} =701.41 FT	TW_{100} =701.50 FT
HW_{25} =702.86 FT	HW_{100} =703.18 FT
V_{25} =6.29 FT/S	V_{100} =6.75 FT/S

GENERAL NOTES:

1. SEE OVERALL DRAINAGE AREA MAP FOR ADDITIONAL INFORMATION
2. SEE DRAINAGE CALCULATIONS FOR ADDITIONAL INFORMATION
3. ALL SLOPES ARE NORMAL UNLESS STATED OTHERWISE

TABLE OF QUANTITIES - CULVERT J

BID ITEM	DESCRIPTION	UNIT	QTY
432 6006	RIPRAP (CONC)(CL B)	CY	2
462 6001	CONC BOX CULV (3 FT X 2 FT)	LF	92
467 6106	SET (TY I)(S=3 FT)(HW=3 FT)(4:1)(C)	EA	1
467 6109	SET (TY I)(S=3 FT)(HW=3 FT)(6:1)(C)	EA	1



DATE	BY	REV	REVISION

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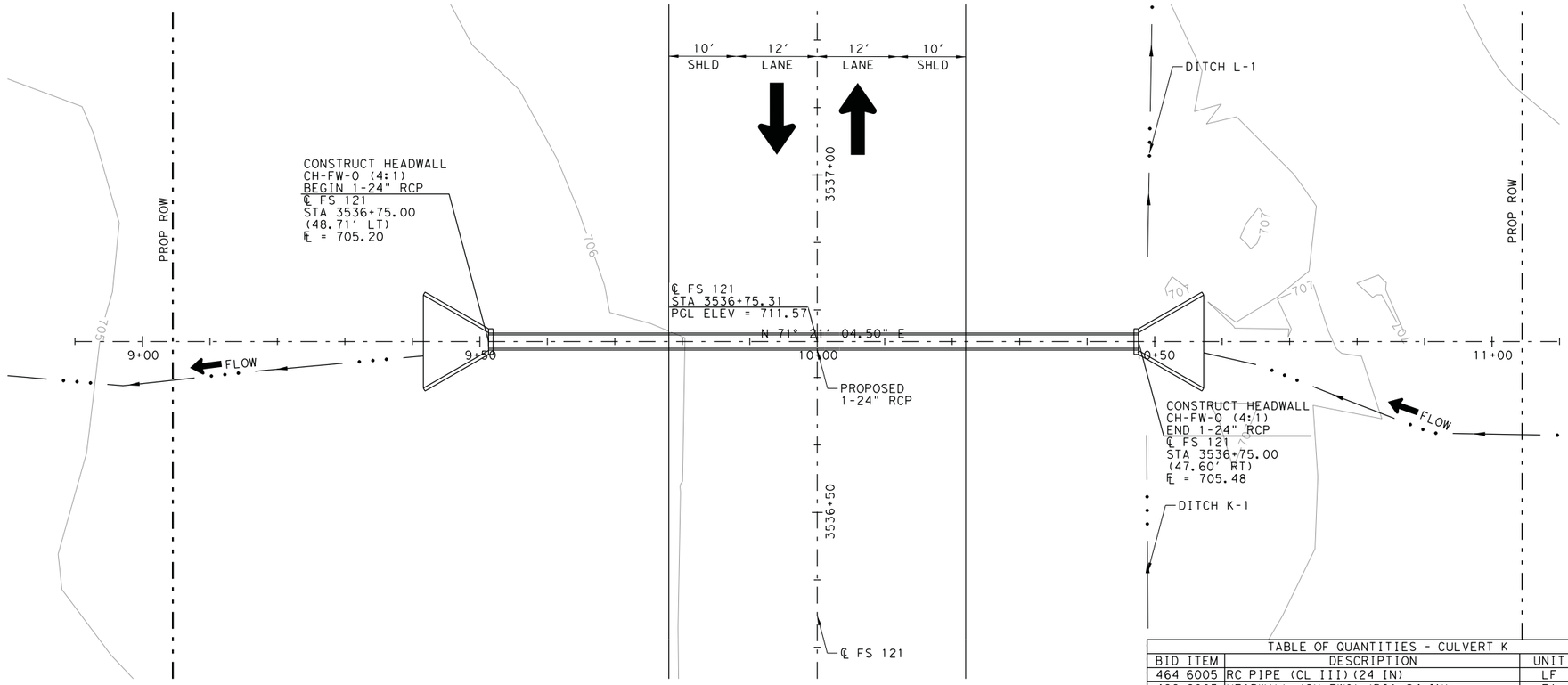
FS 121

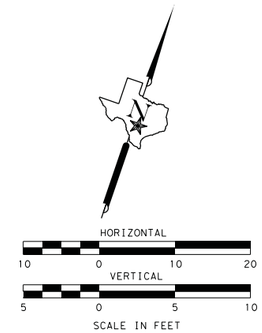
CULVERT PLAN & PROFILE

CULVERT 'J'

SCALE: H:1"=20' V:1"=10' SHEET 1 OF 1

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	165





HYDRAULIC DATA

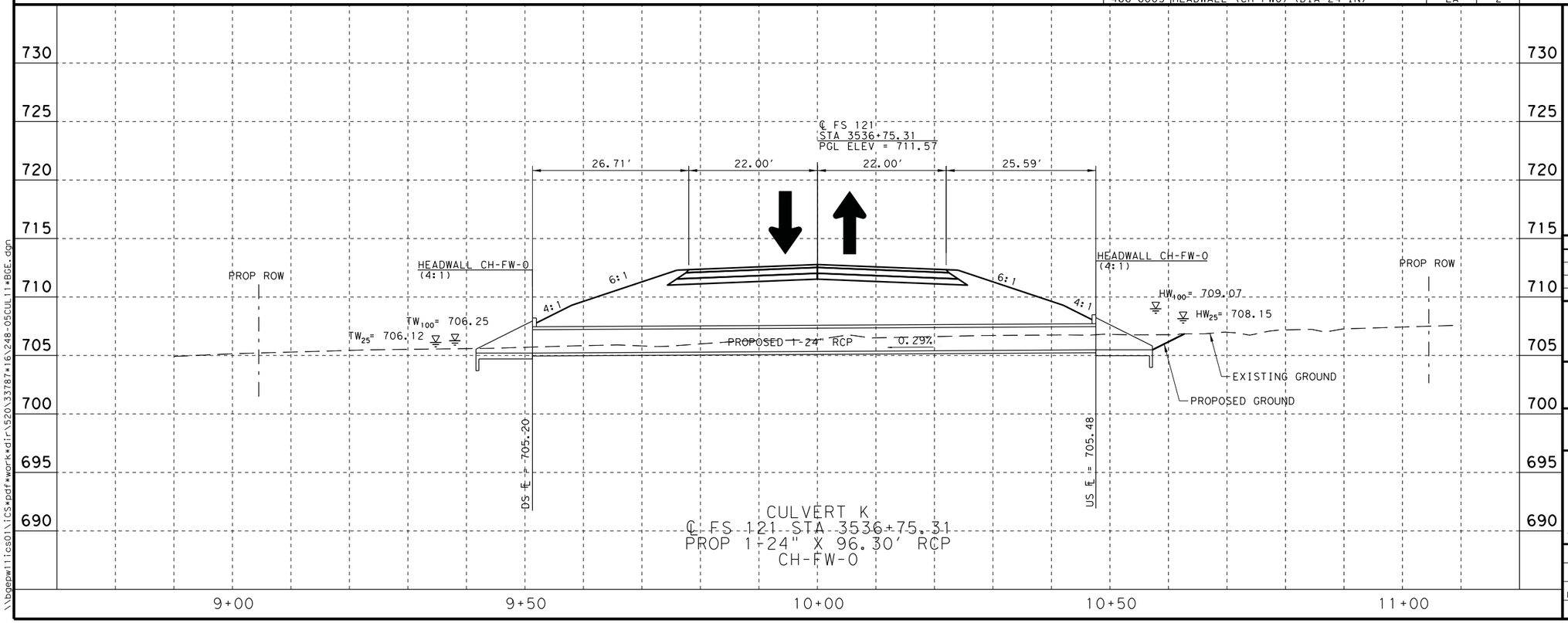
Q_{25} =17.55 CFS	Q_{100} =22.59 CFS
TW_{25} =706.12 FT	TW_{100} =706.25 FT
HW_{25} =708.15 FT	HW_{100} =709.07 FT
V_{25} =6.91 FT/S	V_{100} =7.97 FT/S

GENERAL NOTES:

1. SEE OVERALL DRAINAGE AREA MAP FOR ADDITIONAL INFORMATION
2. SEE DRAINAGE CALCULATIONS FOR ADDITIONAL INFORMATION
3. ALL SLOPES ARE NORMAL UNLESS STATED OTHERWISE

TABLE OF QUANTITIES - CULVERT K

BID ITEM	DESCRIPTION	UNIT	QTY
464 6005	RC PIPE (CL III) (24 IN)	LF	97
466 6005	HEADWALL (CH-FW0) (DIA=24 IN)	EA	2



CULVERT K
℄ FS 121 STA 3536+75.31
PROP 1-24" X 96.30' RCP
CH-FW-0

DATE	BY	REV	REVISION

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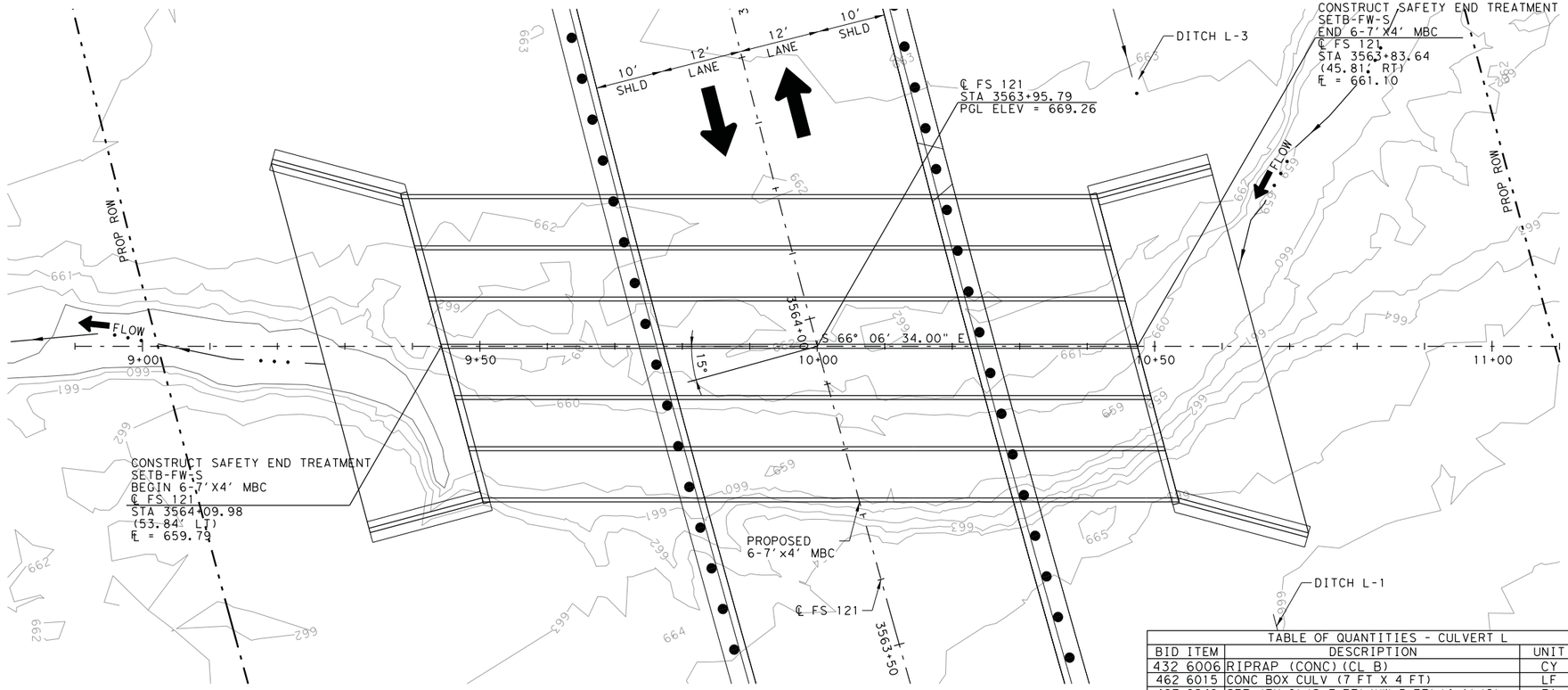
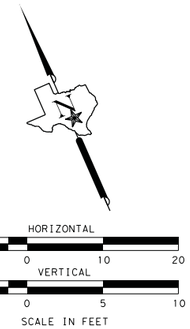
FS 121

CULVERT PLAN & PROFILE
CULVERT 'K'

SCALE: H:1"=20' V:1"=10' SHEET 1 OF 1

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	166





HYDRAULIC DATA

Q_{25} =1040.00 CFS	Q_{100} =1432.60 CFS
TW_{25} =662.90 FT	TW_{100} =663.50 FT
HW_{25} =664.75 FT	HW_{100} =666.19 FT
V_{25} =7.99 FT/S	V_{100} =9.19 FT/S

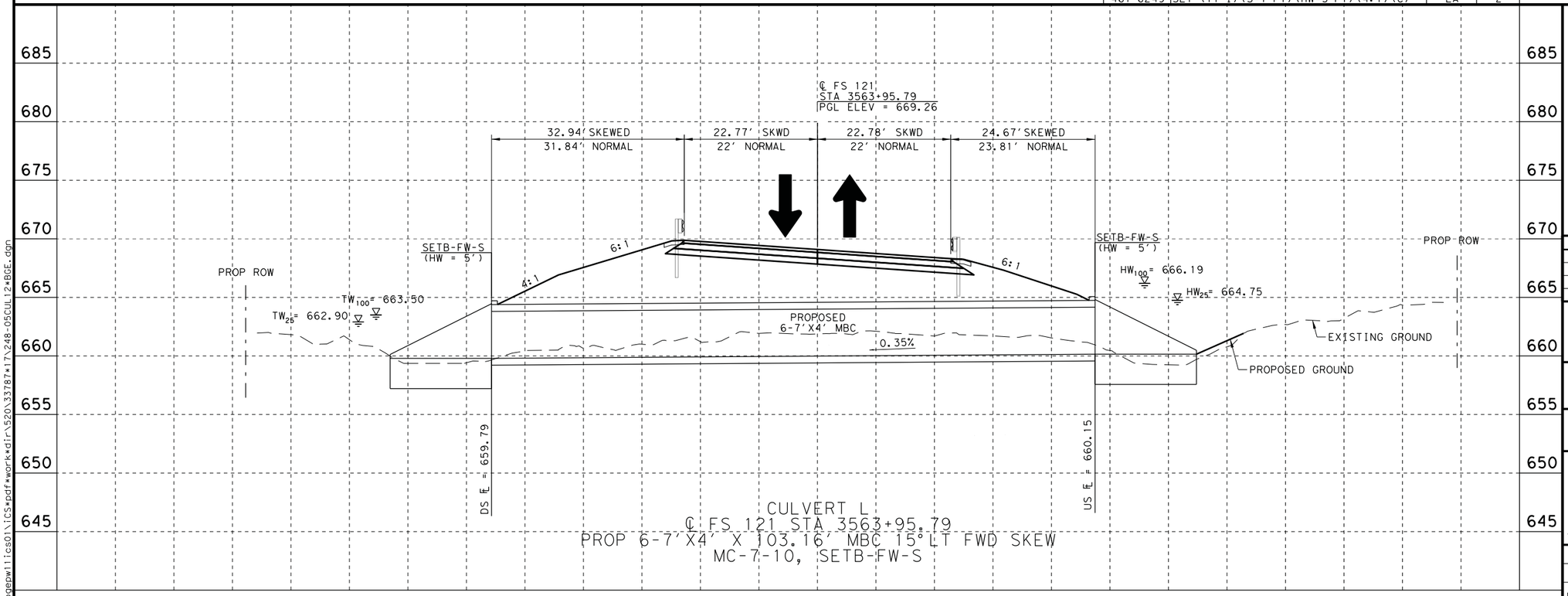
GENERAL NOTES:

1. SEE OVERALL DRAINAGE AREA MAP FOR ADDITIONAL INFORMATION
2. SEE DRAINAGE CALCULATIONS FOR ADDITIONAL INFORMATION
3. ALL SLOPES ARE NORMAL UNLESS STATED OTHERWISE

TABLE OF QUANTITIES - CULVERT L

BID ITEM	DESCRIPTION	UNIT	QTY
432 6006	RIPRAP (CONC) (CL B)	CY	25
462 6015	CONC BOX CULV (7 FT X 4 FT)	LF	624
467 6249	SET (TY I) (S=7 FT) (HW=5 FT) (4:1) (C)	EA	2

NBI #: XXX XXX XXXX



CULVERT L
℄ FS 121 STA 3563+95.79
PROP 6-7'X4' X 103.16' MBC 15° LT FWD SKEW
MC-7-10, SETB-FW-S

STATE OF TEXAS
CURTIS KESTILA
111513
LICENSED
PROFESSIONAL ENGINEER
7/16/2021

DATE	BY	REV	REVISION

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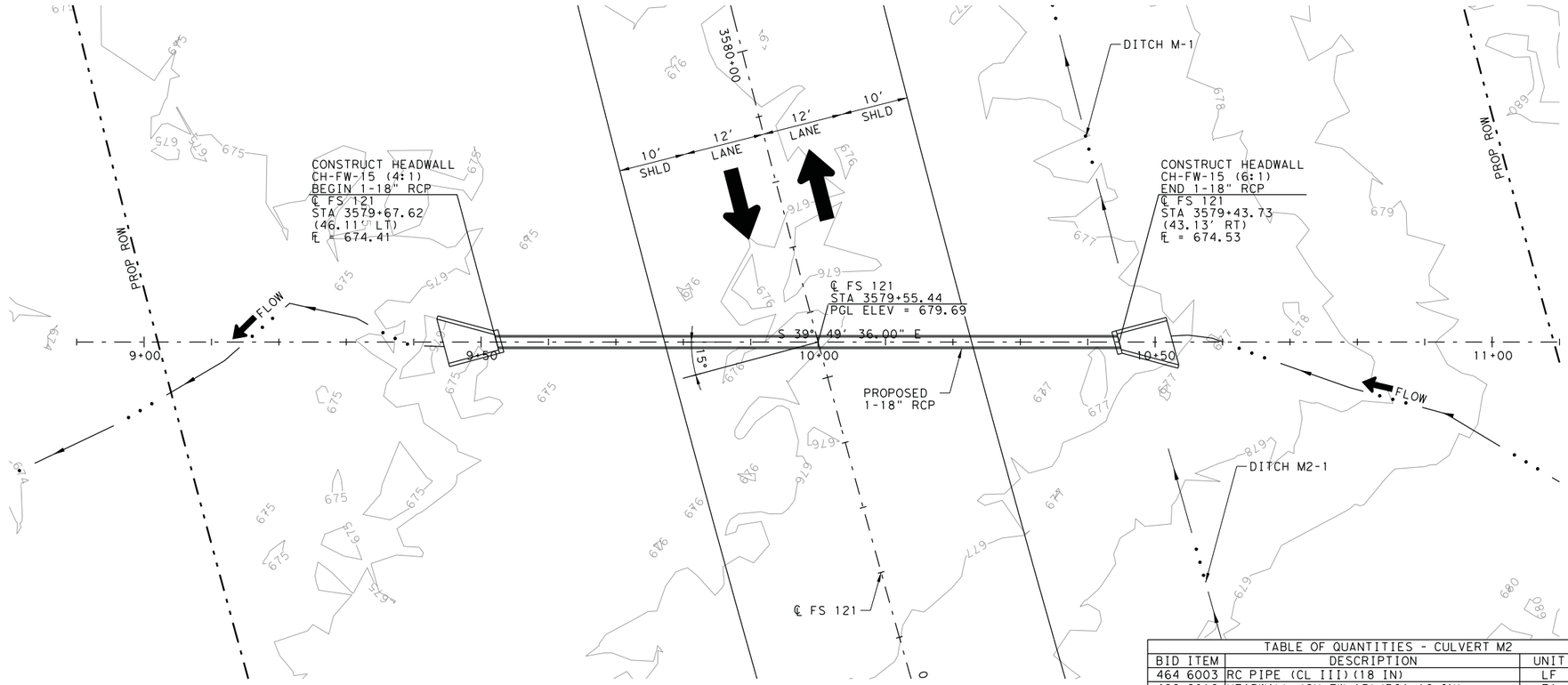
FS 121

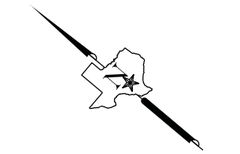
CULVERT PLAN & PROFILE

CULVERT 'L'

SCALE: H:1"=20' V:1"=10' SHEET 1 OF 1

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	167





HYDRAULIC DATA

Q_{25} =7.62 CFS	Q_{100} =9.82 CFS
TW_{25} =675.18 FT	TW_{100} =675.26 FT
HW_{25} =676.51 FT	HW_{100} =677.17 FT
V_{25} =5.67 FT/S	V_{100} =6.44 FT/S

GENERAL NOTES:

1. SEE OVERALL DRAINAGE AREA MAP FOR ADDITIONAL INFORMATION
2. SEE DRAINAGE CALCULATIONS FOR ADDITIONAL INFORMATION.
3. ALL SLOPES ARE NORMAL UNLESS STATED OTHERWISE

TABLE OF QUANTITIES - CULVERT M2

BID ITEM	DESCRIPTION	UNIT	QTY
464 6003	RC PIPE (CL III)(18 IN)	LF	93
466 6018	HEADWALL (CH-FW-15)(DIA=18 IN)	EA	2

CULVERT M2
℄ FS 121 STA 3579+55.44
PROP 1-18" X 92.39' RCP 15° LT FWD SKEW
CH-FW-15

STATE OF TEXAS
CURTIS KESTILA
111513
LICENSED
PROFESSIONAL ENGINEER
7/16/2021

DATE	BY	REV	REVISION

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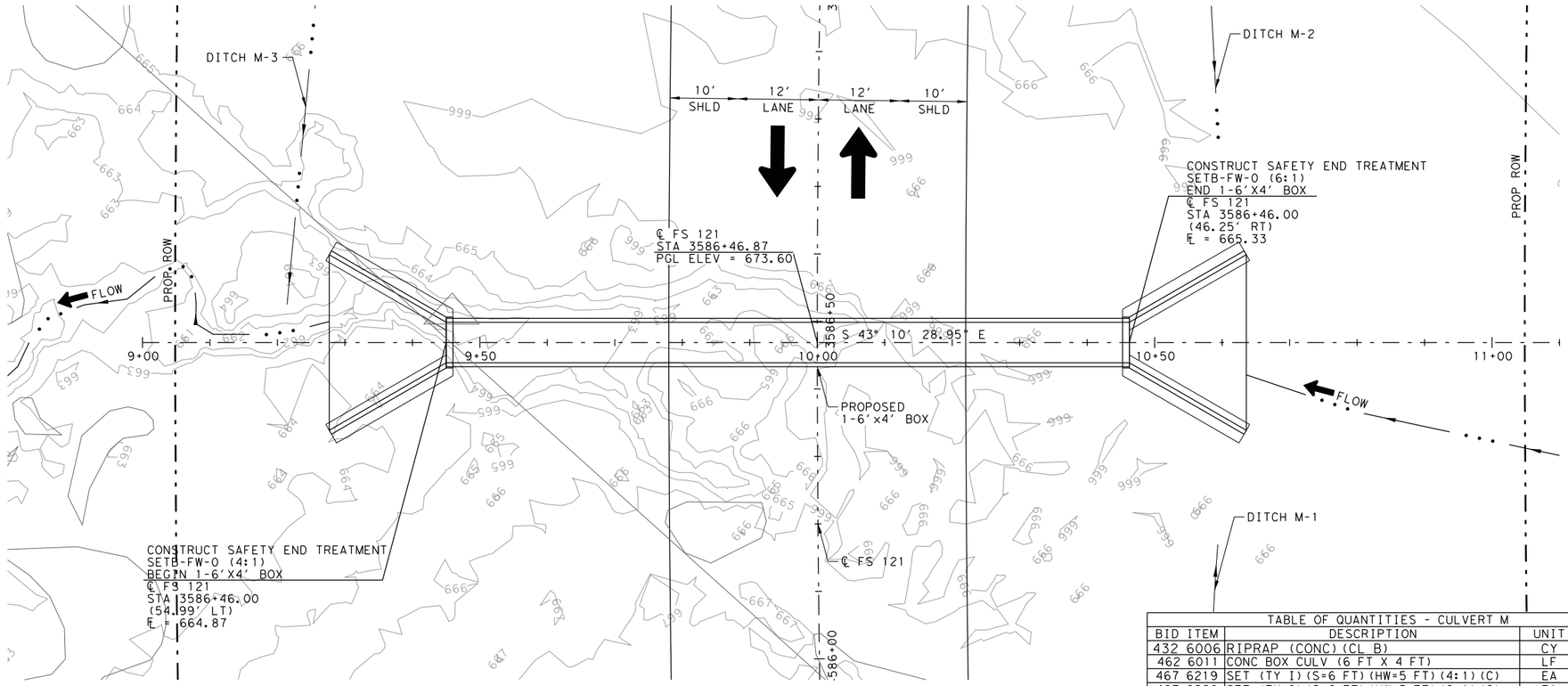
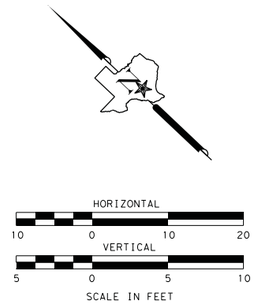
CULVERT PLAN & PROFILE

CULVERT 'M2'

SCALE: H:1"=20' V:1"=10' SHEET 1 OF 1

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	168





HYDRAULIC DATA

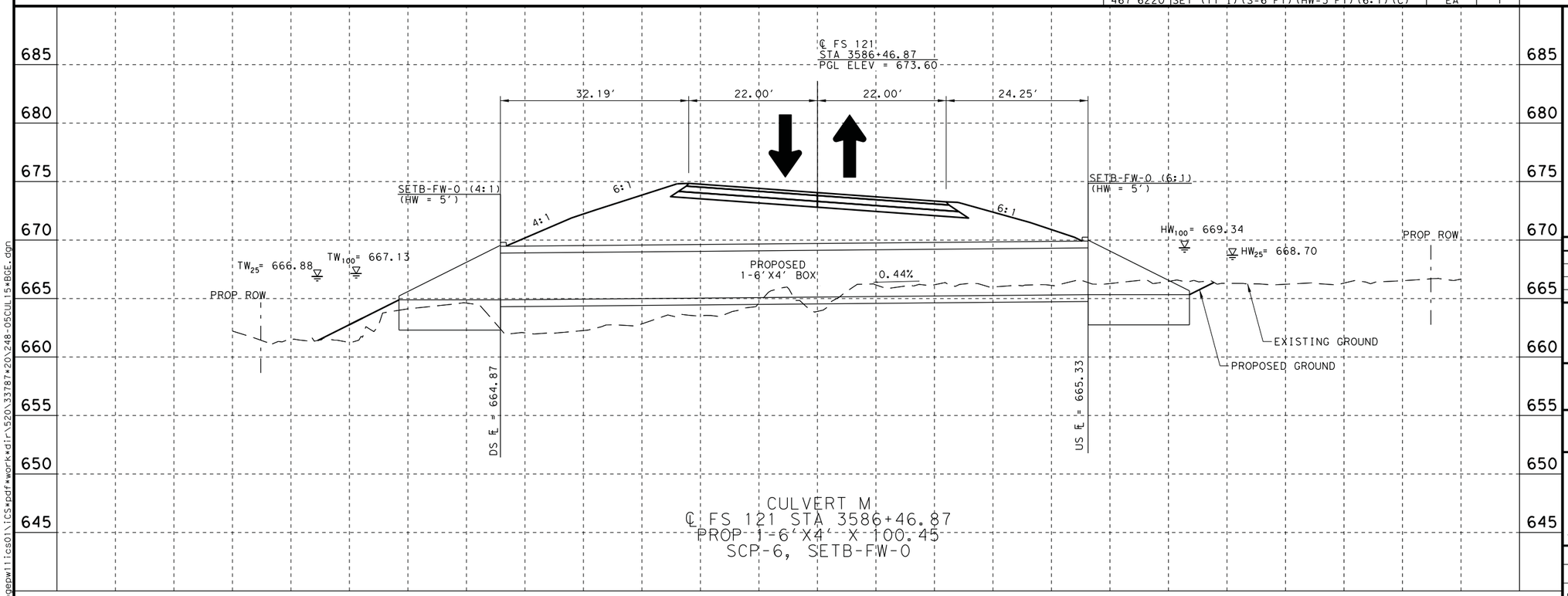
Q_{25} =96.17 CFS	Q_{100} =123.94 CFS
TW_{25} =666.88 FT	TW_{100} =667.13 FT
HW_{25} =668.70 FT	HW_{100} =669.34 FT
V_{25} =8.88 FT/S	V_{100} =9.55 FT/S

GENERAL NOTES:

1. SEE OVERALL DRAINAGE AREA MAP FOR ADDITIONAL INFORMATION
2. SEE DRAINAGE CALCULATIONS FOR ADDITIONAL INFORMATION
3. ALL SLOPES ARE NORMAL UNLESS STATED OTHERWISE

TABLE OF QUANTITIES - CULVERT M

BID ITEM	DESCRIPTION	UNIT	QTY
432 6006	RIPRAP (CONC)(CL B)	CY	11
462 6011	CONC BOX CULV (6 FT X 4 FT)	LF	101
467 6219	SET (TY I)(S=6 FT)(HW=5 FT)(4:1)(C)	EA	1
467 6220	SET (TY I)(S=6 FT)(HW=5 FT)(6:1)(C)	EA	1



CULVERT M
℄ FS 121 STA 3586+46.87
PROP 1-6'X4' X 100.45
SCP-6, SETB-FW-0

DATE	BY	REV	REVISION

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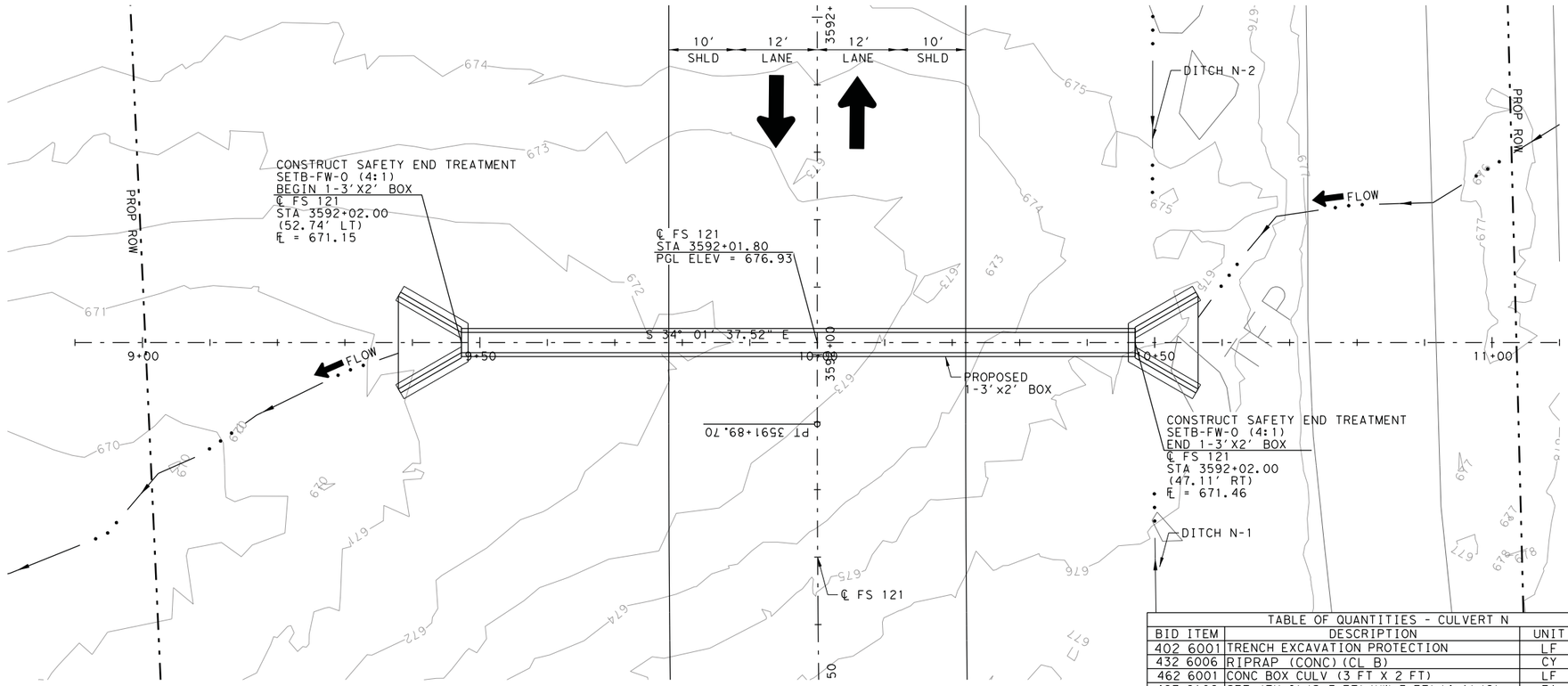
FS 121

CULVERT PLAN & PROFILE
CULVERT 'M'

SCALE: H:1"=20' V:1"=10' SHEET 1 OF 1

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	169



HYDRAULIC DATA

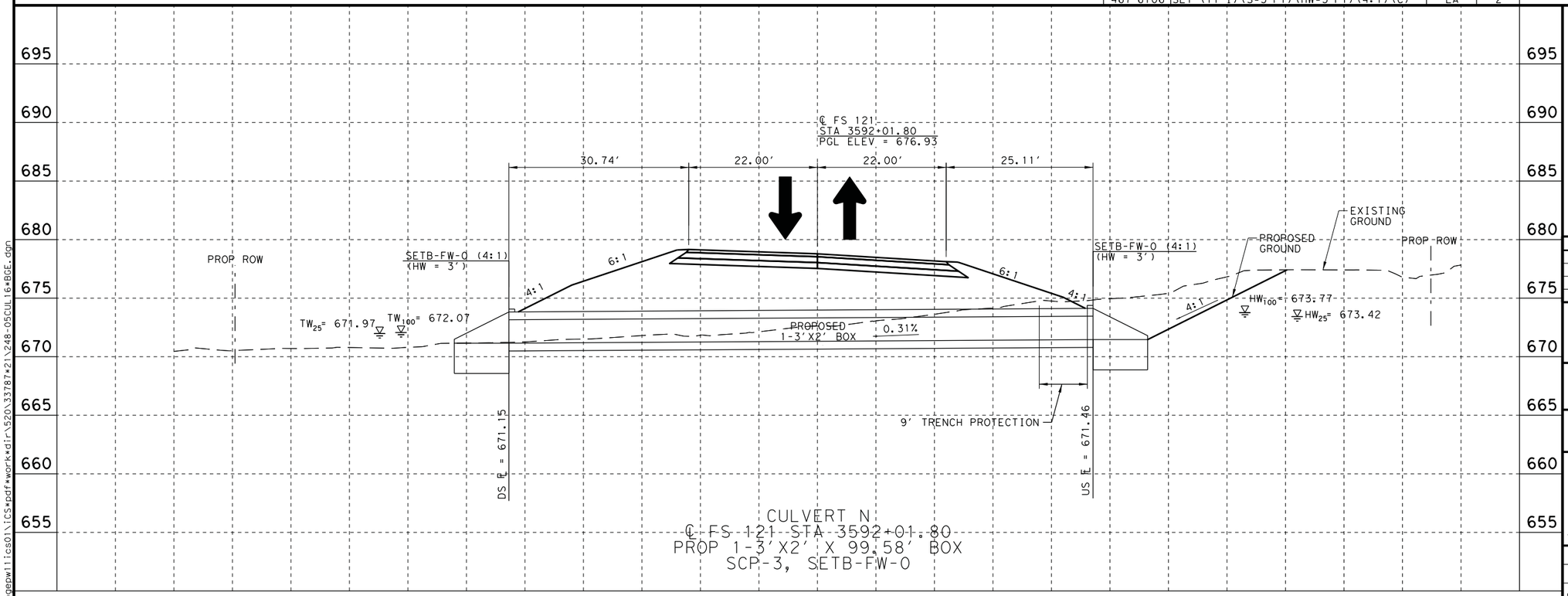
Q_{25}	=20.57 CFS	Q_{100}	=26.50 CFS
TW_{25}	=671.97 FT	TW_{100}	=672.07 FT
HW_{25}	=673.42 FT	HW_{100}	=673.77 FT
V_{25}	=6.04 FT/S	V_{100}	=6.58 FT/S

GENERAL NOTES:

1. SEE OVERALL DRAINAGE AREA MAP FOR ADDITIONAL INFORMATION
2. SEE DRAINAGE CALCULATIONS FOR ADDITIONAL INFORMATION
3. ALL SLOPES ARE NORMAL UNLESS STATED OTHERWISE

TABLE OF QUANTITIES - CULVERT N

BID ITEM	DESCRIPTION	UNIT	QTY
402 6001	TRENCH EXCAVATION PROTECTION	LF	9
432 6006	RIPRAP (CONC) (CL B)	CY	2
462 6001	CONC BOX CULV (3 FT X 2 FT)	LF	100
467 6106	SET (TY I) (S=3 FT) (HW=3 FT) (4:1) (C)	EA	2



CULVERT N
℄ FS 121 STA 3592+01.80
PROP 1-3'X2' X 99.58' BOX
SCP-3, SETB-FW-0

STATE OF TEXAS
CURTIS KESTILA
111513
LICENSED
PROFESSIONAL ENGINEER
7/16/2021

DATE	BY	REV	REVISION

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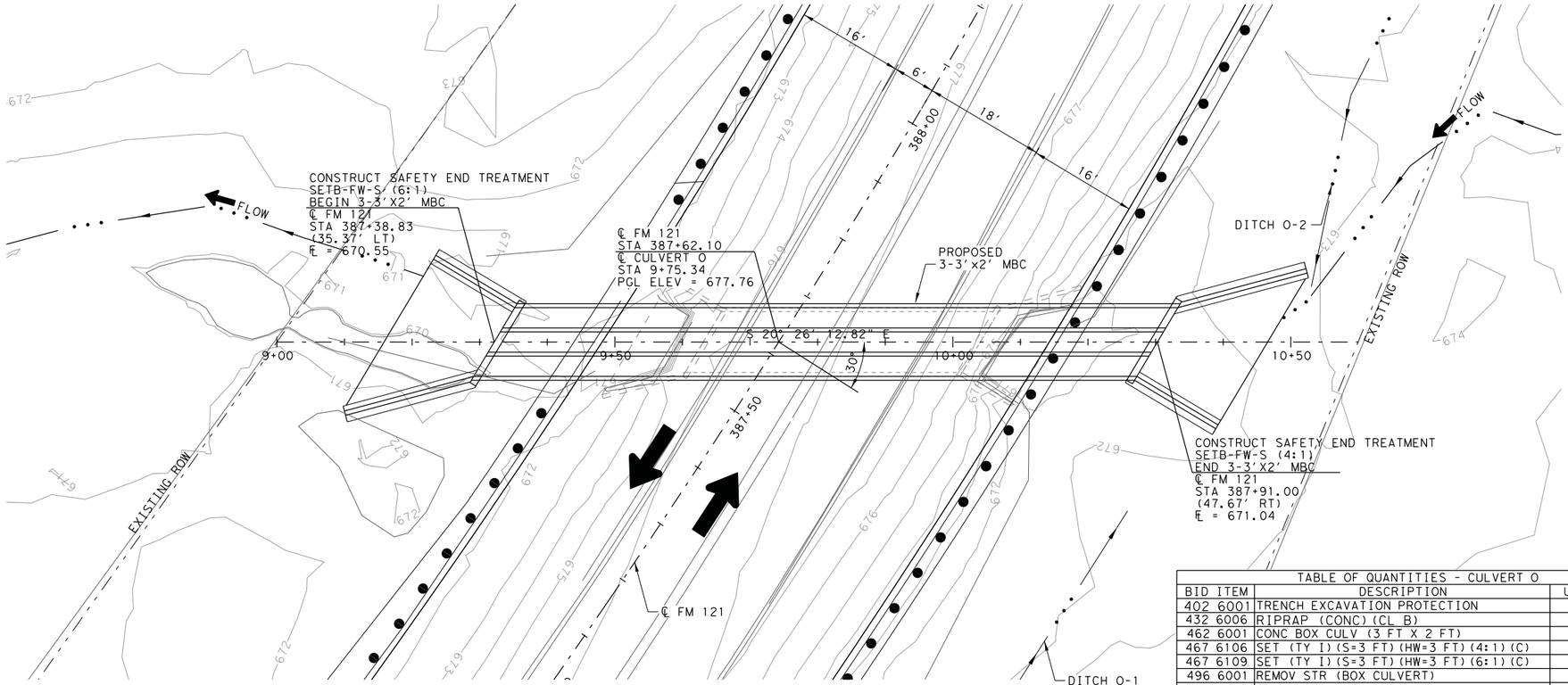
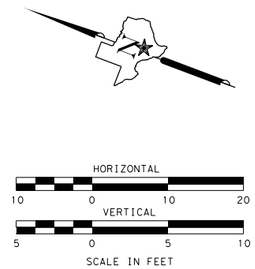
FS 121

CULVERT PLAN & PROFILE
CULVERT 'N'

SCALE: H:1"=20' V:1"=10' SHEET 1 OF 1

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	170





HYDRAULIC DATA

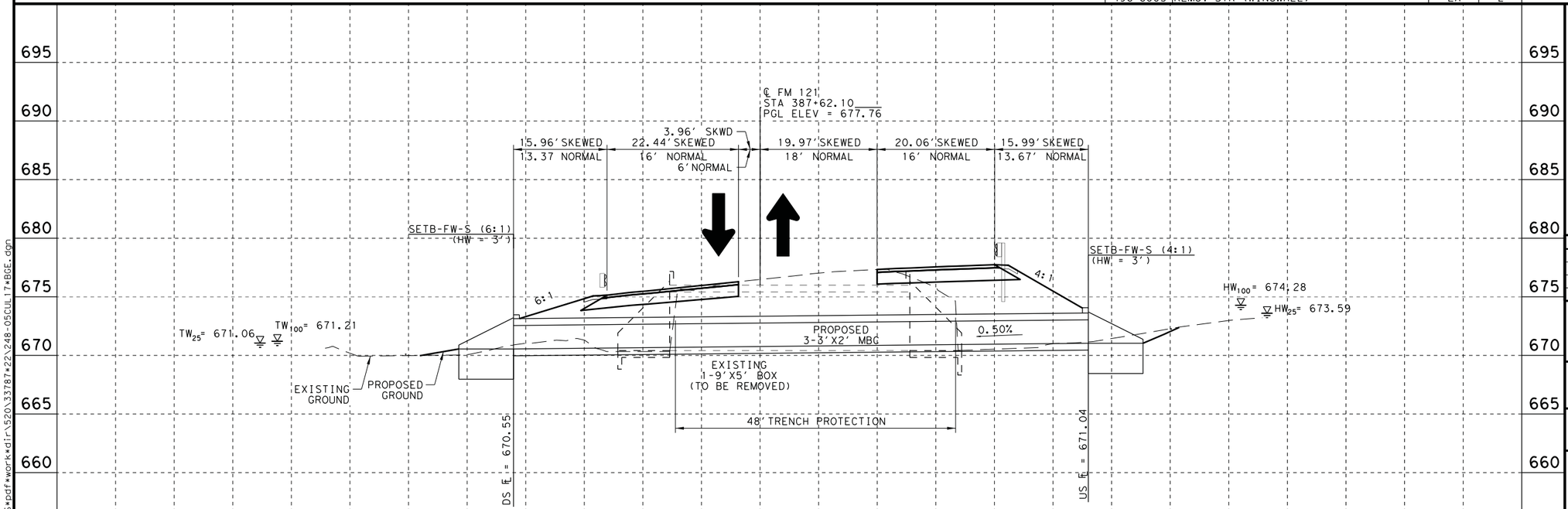
Q_{25}	=90.14 CFS	Q_{100}	=116.41 CFS
TW_{25}	=671.06 FT	TW_{100}	=671.21 FT
HW_{25}	=673.59 FT	HW_{100}	=674.28 FT
V_{25}	=7.28 FT/S	V_{100}	=7.54 FT/S

GENERAL NOTES:

1. SEE OVERALL DRAINAGE AREA MAP FOR ADDITIONAL INFORMATION
2. SEE DRAINAGE CALCULATIONS FOR ADDITIONAL INFORMATION
3. ALL SLOPES ARE NORMAL UNLESS STATED OTHERWISE

TABLE OF QUANTITIES - CULVERT O

BID ITEM	DESCRIPTION	UNIT	QTY
402 6001	TRENCH EXCAVATION PROTECTION	LF	48
432 6006	RIPRAP (CONC)(CL B)	CY	12
462 6001	CONC BOX CULV (3 FT X 2 FT)	LF	297
467 6106	SET (TY I)(S=3 FT)(HW=3 FT)(4:1)(C)	EA	1
467 6109	SET (TY I)(S=3 FT)(HW=3 FT)(6:1)(C)	EA	1
496 6001	REMOV STR (BOX CULVERT)	EA	1
496 6005	REMOV STR (WINGWALL)	EA	2



CULVERT O
℄ FM 121 STA 387+62.10
PROP 3-3'X2' X 98.11' BOX 30° LT BKW SKEW
SCP-3, SETB-FW-S

STATE OF TEXAS
CURTIS KESTILA
111513
LICENSED
PROFESSIONAL ENGINEER
7/16/2021

DATE	BY	REV	REVISION

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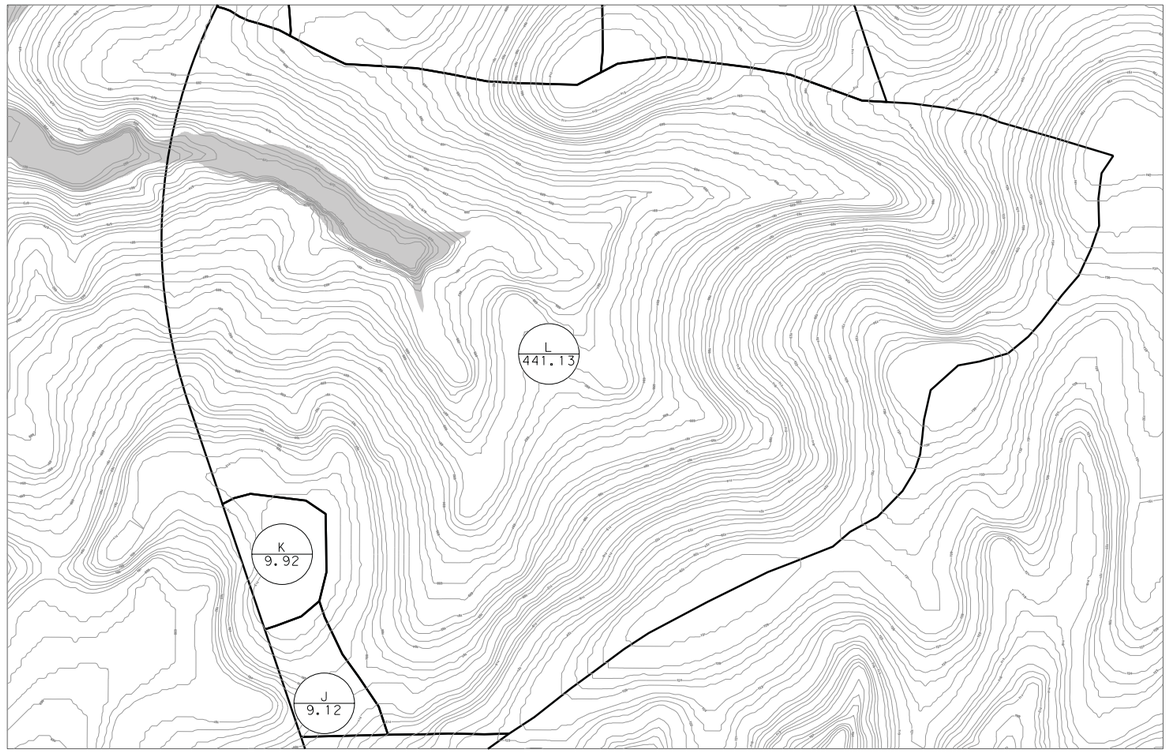
FS 121

CULVERT PLAN & PROFILE

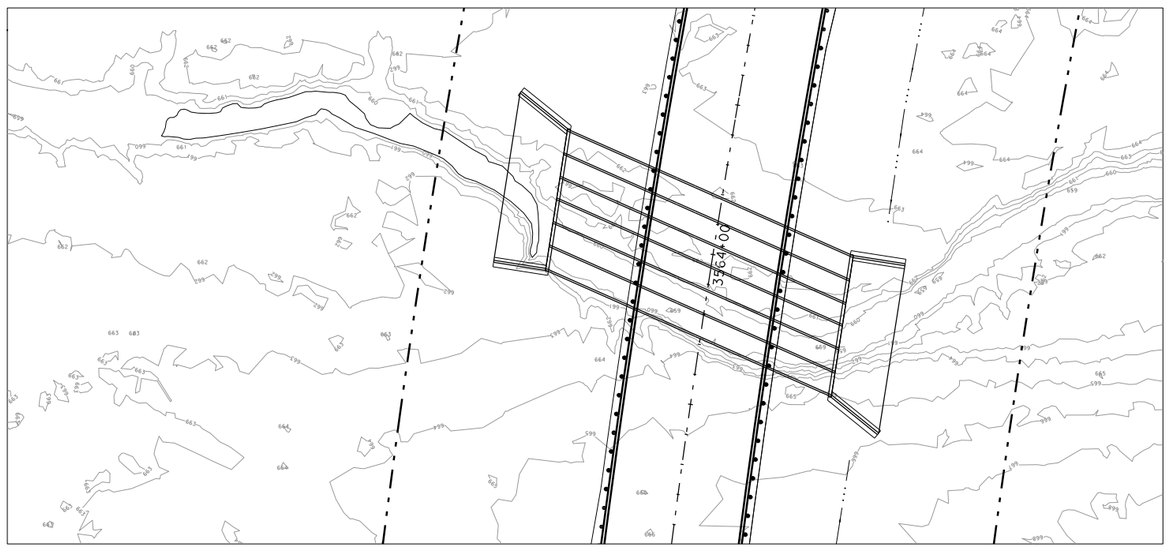
CULVERT 'O'

SCALE: H:1"=20' V:1"=10' SHEET 1 OF 1

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	171



DRAINAGE AREA MAP
SCALE: 1"=1000'



CULVERT PLAN VIEW
SCALE: 1"=50'

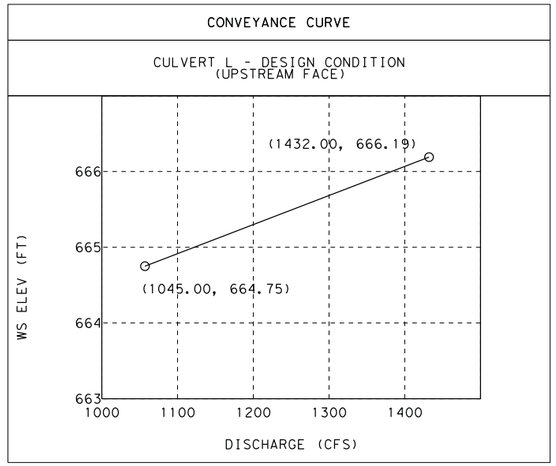
DISCHARGE NAMES	TOTAL DISCHARGE	CULVERT DISCHARGE	HEADWATER ELEVATION (FT)	INLET CONTROL DEPTH	OUTLET CONTROL DEPTH	FLOW TYPE	NORMAL DEPTH (FT)	CRITICAL DEPTH (FT)	OUTLET DEPTH (FT)	TAILWATER DEPTH (FT)	OUTLET VELOCITY (FT/S)	TAILWATER VELOCITY (FT/S)	TAILWATER ELEVATION (FT)
2-YR	416.20	416.20	662.62	2.47	1.65	1-JS1†	1.33	1.45	1.84	1.84	5.39	4.09	661.63
5-YR	659.80	659.80	663.48	3.33	2.47	1-JS1†	1.83	1.97	2.40	2.40	6.55	4.78	662.19
10-YR	809.10	809.10	663.97	3.82	2.99	1-JS1†	2.11	2.26	2.69	2.69	7.15	5.11	662.48
25-YR	1045.00	1045.00	664.75	4.60	3.84	5-JS1†	2.53	2.68	3.11	3.11	7.99	5.55	662.90
50-YR	1231.00	1231.00	665.40	5.25	4.56	5-JS1†	2.85	2.99	3.41	3.41	8.59	5.85	663.20
100-YR	1432.60	1432.60	666.19	6.04	5.77	5-S1†	3.19	3.31	3.71	3.71	9.19	6.14	663.50

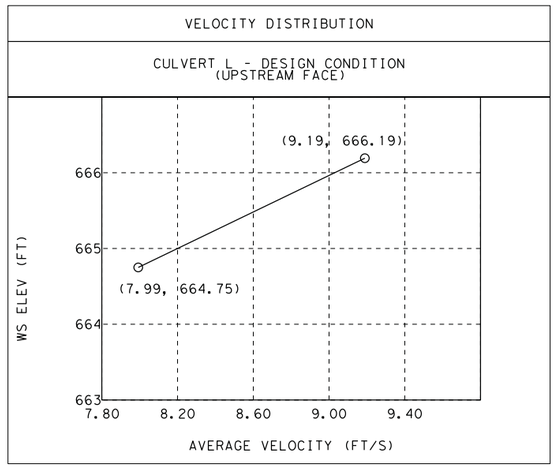
HYDROLOGIC DATA NRCS RUNOFF CURVE NUMBER METHOD	
DRAINAGE AREA	L
DRAINAGE AREA (SQ MI)	0.689
LAG TIME (HRS)	0.64
RAINFALL DISTRIBUTION TYPE	TYPE III
SOIL GROUP CLASSIFICATION	C, D
RUNOFF CURVE NUMBER	81
ANTECEDENT MOISTURE CONDITIONS	TYPE II
ACCUMULATED RAINFALL (P) 25-YR	4.81
ACCUMULATED RAINFALL (P) 100-YR	7.25
PONDING FACTOR	0
Q25 (CFS)	1045
Q100 (CFS)	1432.6

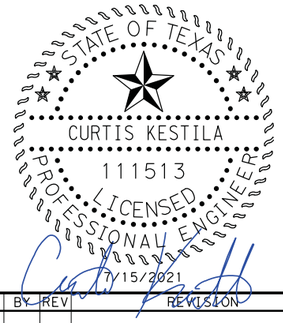
NOTE: HY-8 USED FOR HYDRAULIC ANALYSIS AND DESIGN

NOTE: N VALUES (CHANNEL) = 0.05

NAD 1983 STAE PLANE COORDINATE SYSTEM WAS USED







DATE	BY	REV	REVISION

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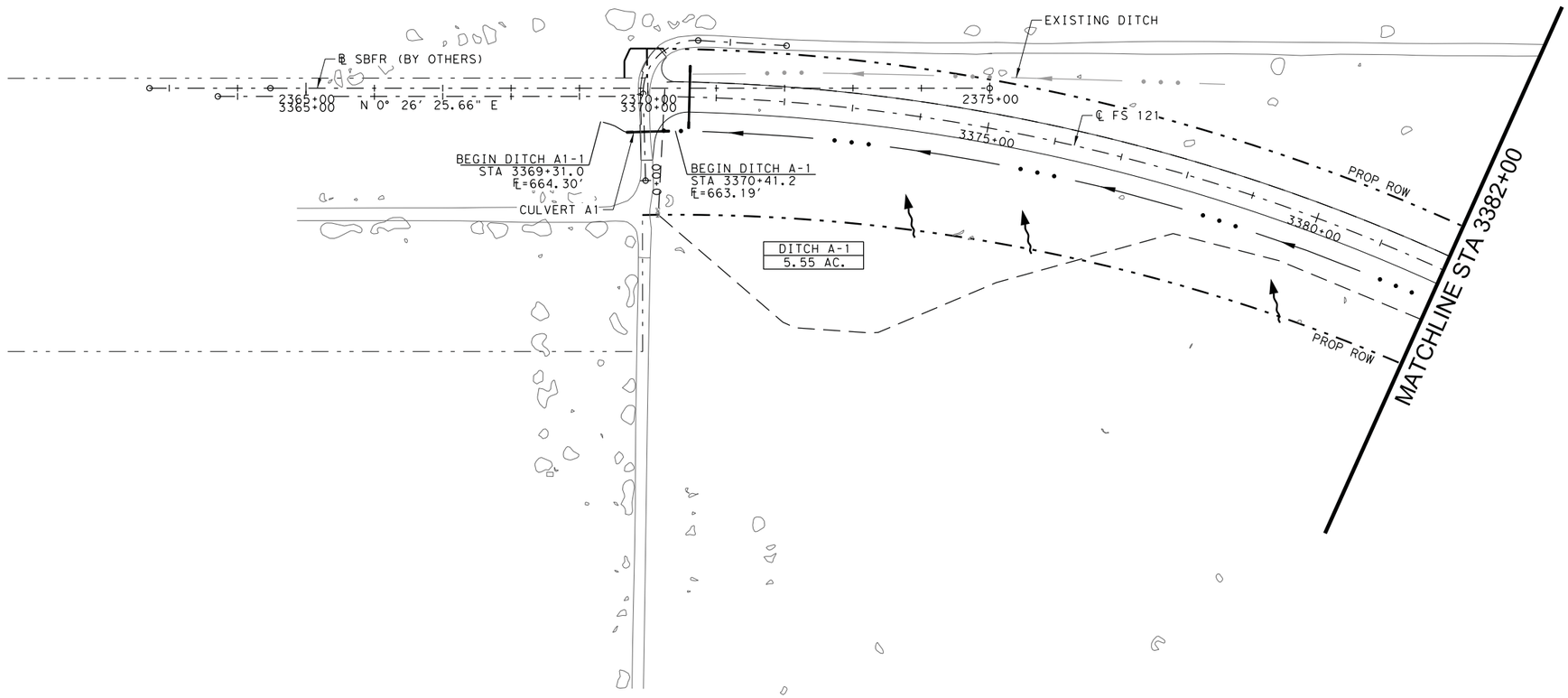
FS 121

HYDRAULIC DATA SHEET

SCALE: N/A SHEET 1 OF 1

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	172



HORIZONTAL

100 0 100 200

SCALE IN FEET

DITCH LEGEND

XXXXXXXX	DITCH NAME
XXXXXXXX	DRAINAGE AREA

-CENTERLINE DITCH

-SUB-BASIN BOUNDARY

-FLOW ARROW

NOTE

REFER TO TYPICAL SECTIONS & CROSS SECTION SHEETS FOR DITCH DESIGN AND OFFSET

STATE OF TEXAS
CURTIS KESTILA
111513
LICENSED
PROFESSIONAL ENGINEER
7/15/2021

DATE	BY	REV	REVISION

BGE, Inc.
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TBPE Registration No. F-1046

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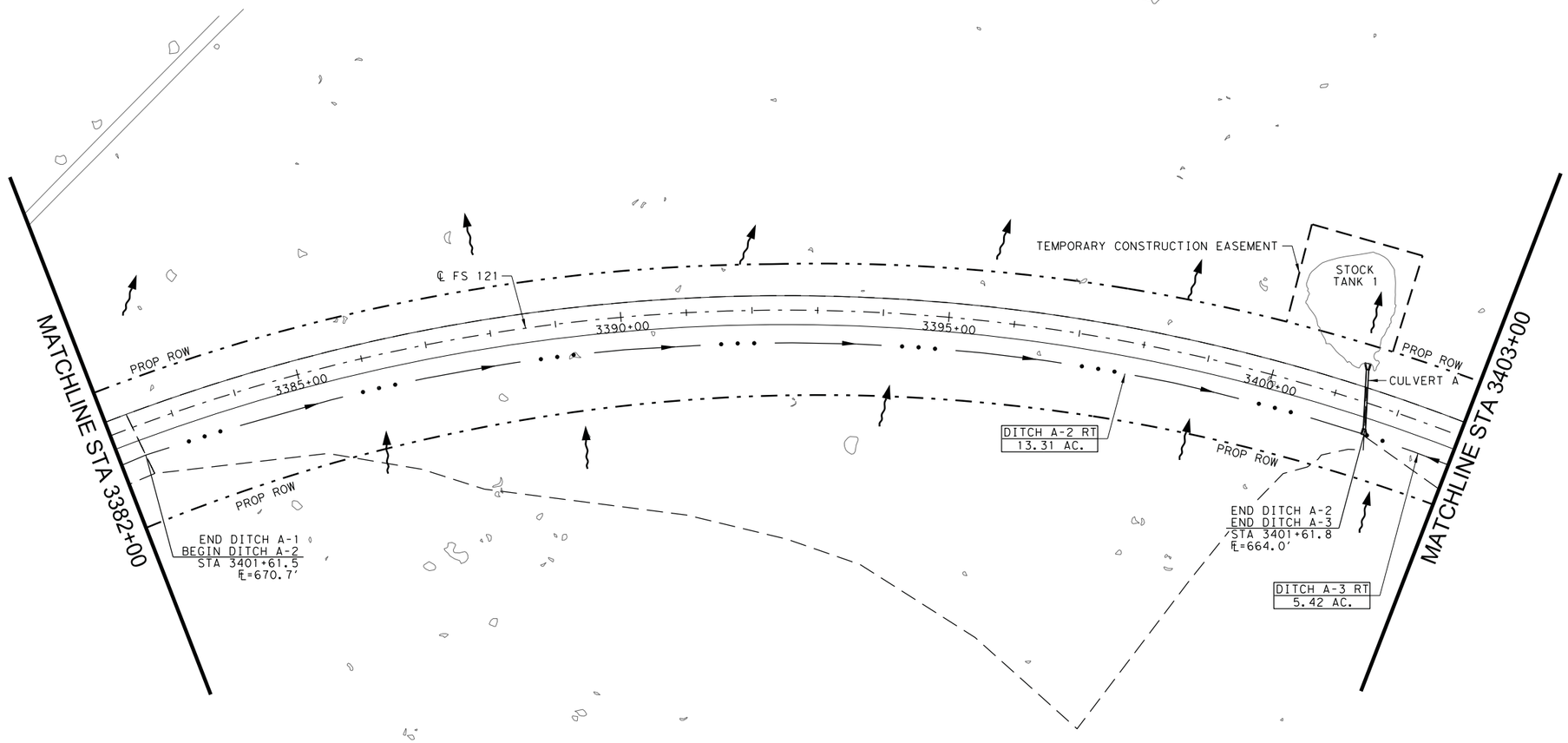
FS 121

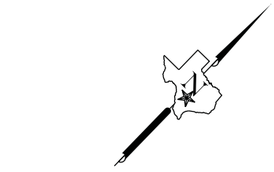
DITCH PLAN

BEGIN TO STA 3382+00

SCALE: 1" = 200' SHEET 1 OF 12

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	173





HORIZONTAL

100 0 100 200

SCALE IN FEET

DITCH LEGEND

XXXXXXXX	DITCH NAME
XXXXXXXX	DRAINAGE AREA

-CENTERLINE DITCH

-SUB-BASIN BOUNDARY

-FLOW ARROW

NOTE

REFER TO TYPICAL SECTIONS & CROSS SECTION SHEETS FOR DITCH DESIGN AND OFFSET

STATE OF TEXAS
CURTIS KESTILA
111513
LICENSED
PROFESSIONAL ENGINEER
7/15/2021

DATE	BY	REV	REVISION

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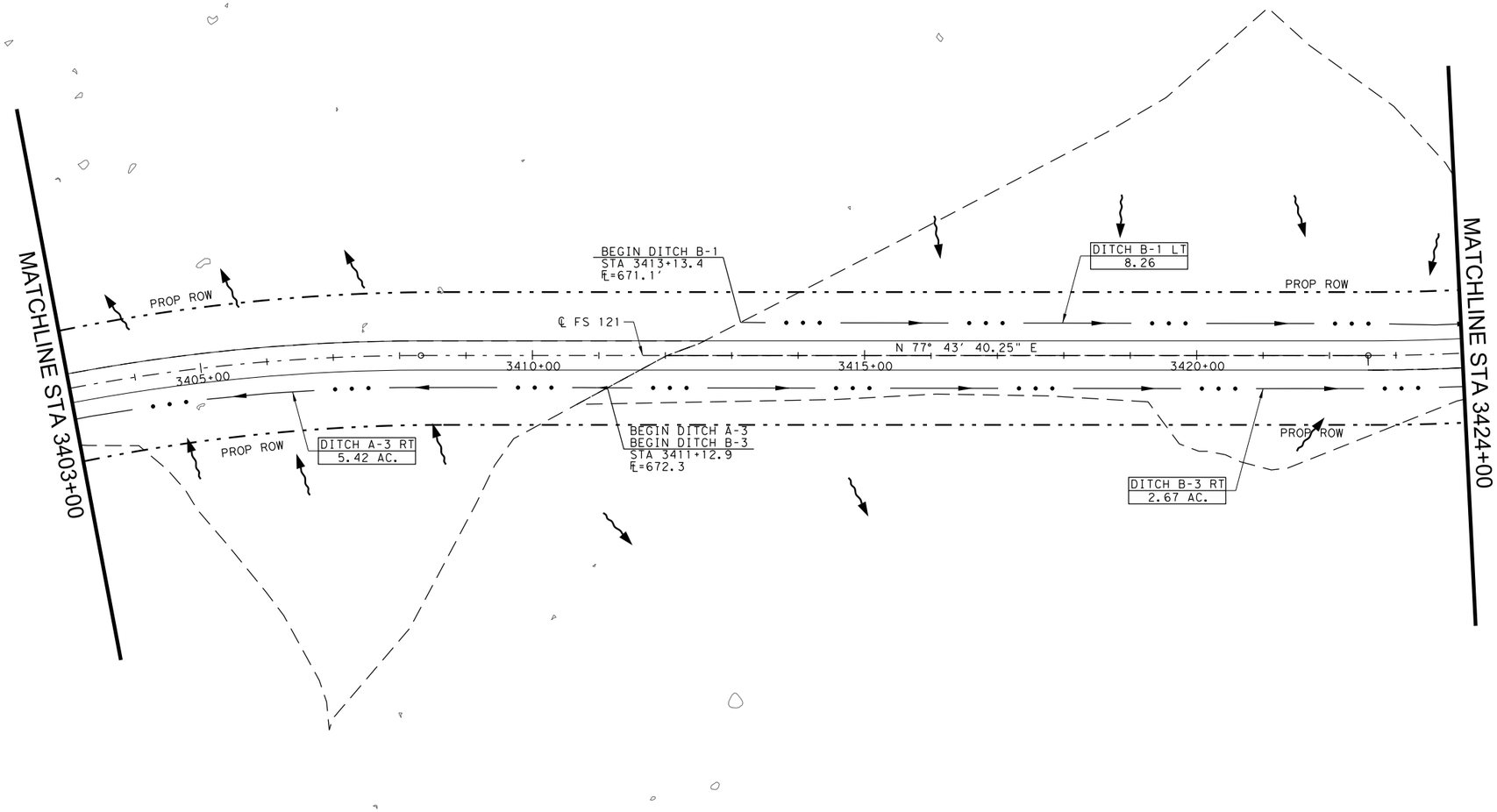
FS 121

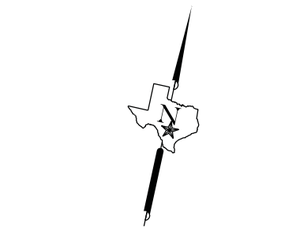
DITCH PLAN

STA 3382+00 TO STA 34303+00

SCALE: 1" = 200' SHEET 2 OF 12

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	174





DITCH LEGEND

XXXXXXXX	DITCH NAME
XXXXXXXX	DRAINAGE AREA

-CENTERLINE DITCH

-SUB-BASIN BOUNDARY

-FLOW ARROW

NOTE

REFER TO TYPICAL SECTIONS & CROSS SECTION SHEETS FOR DITCH DESIGN AND OFFSET

STATE OF TEXAS
CURTIS KESTILA
111513
LICENSED
PROFESSIONAL ENGINEER
7/15/2021

DATE	BY	REV	REVISION

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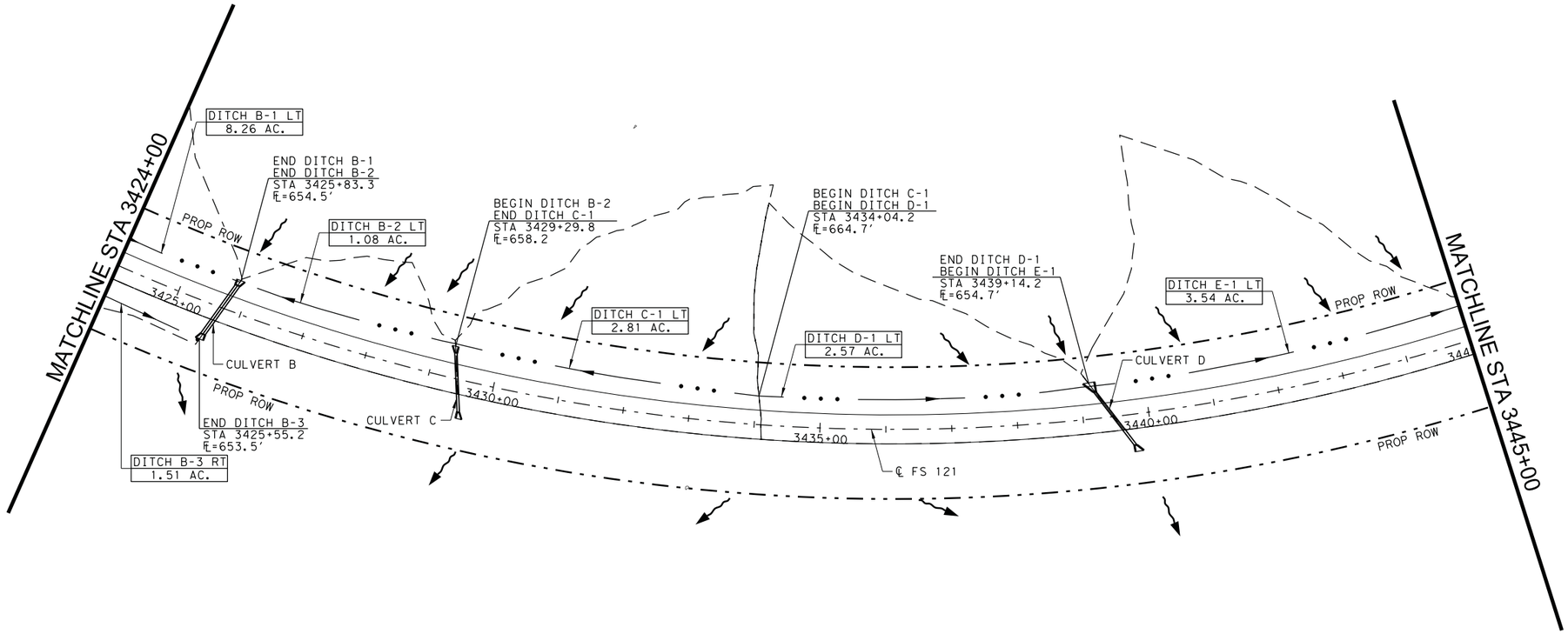
FS 121

DITCH PLAN

STA 3403+00 TO STA 3424+00

SCALE: 1" = 200' SHEET 3 OF 12

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	175



HORIZONTAL

100 0 100 200

SCALE IN FEET

DITCH LEGEND

XXXXXXXX	DITCH NAME
XXXXXXXX	DRAINAGE AREA

-CENTERLINE DITCH

-SUB-BASIN BOUNDARY

-FLOW ARROW

NOTE

REFER TO TYPICAL SECTIONS & CROSS SECTION SHEETS FOR DITCH DESIGN AND OFFSET

STATE OF TEXAS
CURTIS KESTILA
111513
LICENSED
PROFESSIONAL ENGINEER
7/15/2021

DATE	BY	REV	REVISION

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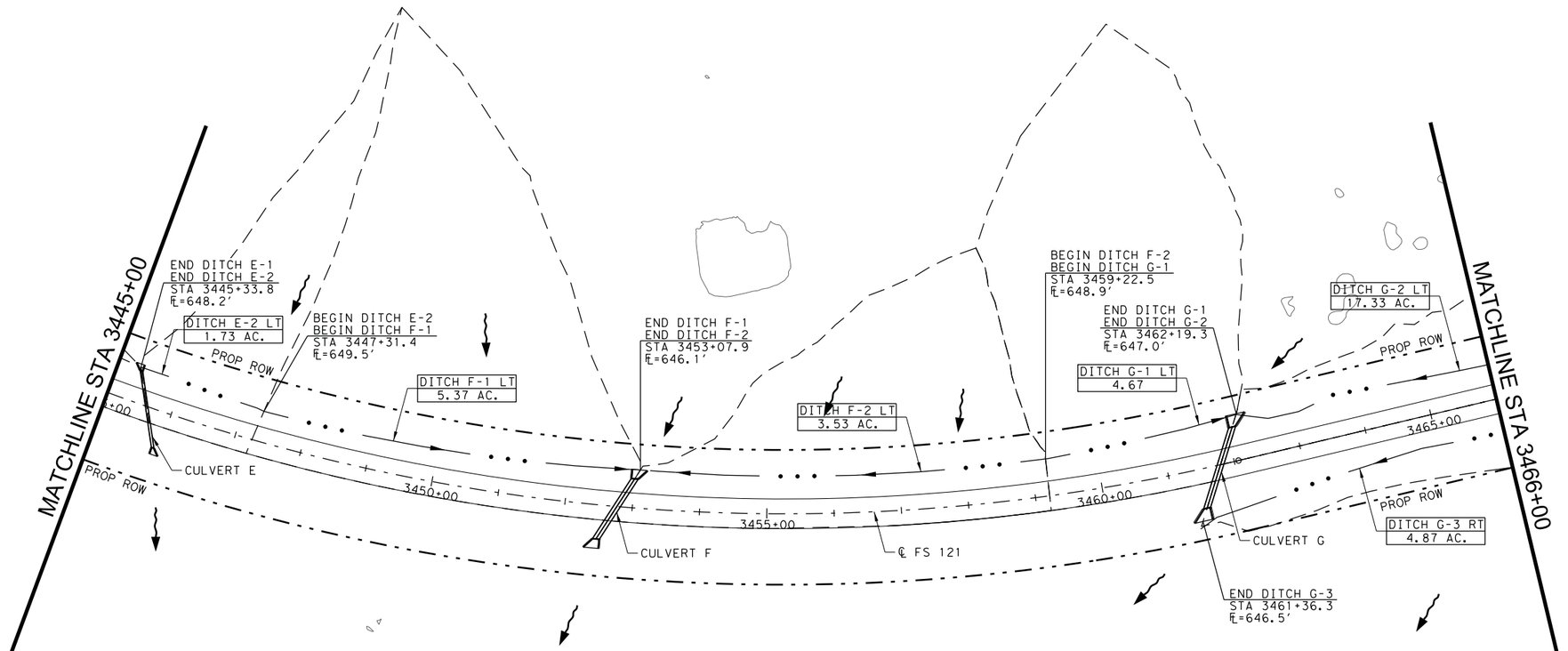
FS 121

DITCH PLAN

STA 3424+00 TO STA 3445+00

SCALE: 1" = 200' SHEET 4 OF 12

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	176



HORIZONTAL

100 0 100 200

SCALE IN FEET

DITCH LEGEND

XXXXXXXX	DITCH NAME
XXXXXXXX	DRAINAGE AREA

-CENTERLINE DITCH

-SUB-BASIN BOUNDARY

-FLOW ARROW

NOTE

REFER TO TYPICAL SECTIONS & CROSS SECTION SHEETS FOR DITCH DESIGN AND OFFSET

STATE OF TEXAS
CURTIS KESTILA
111513
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7/15/2021

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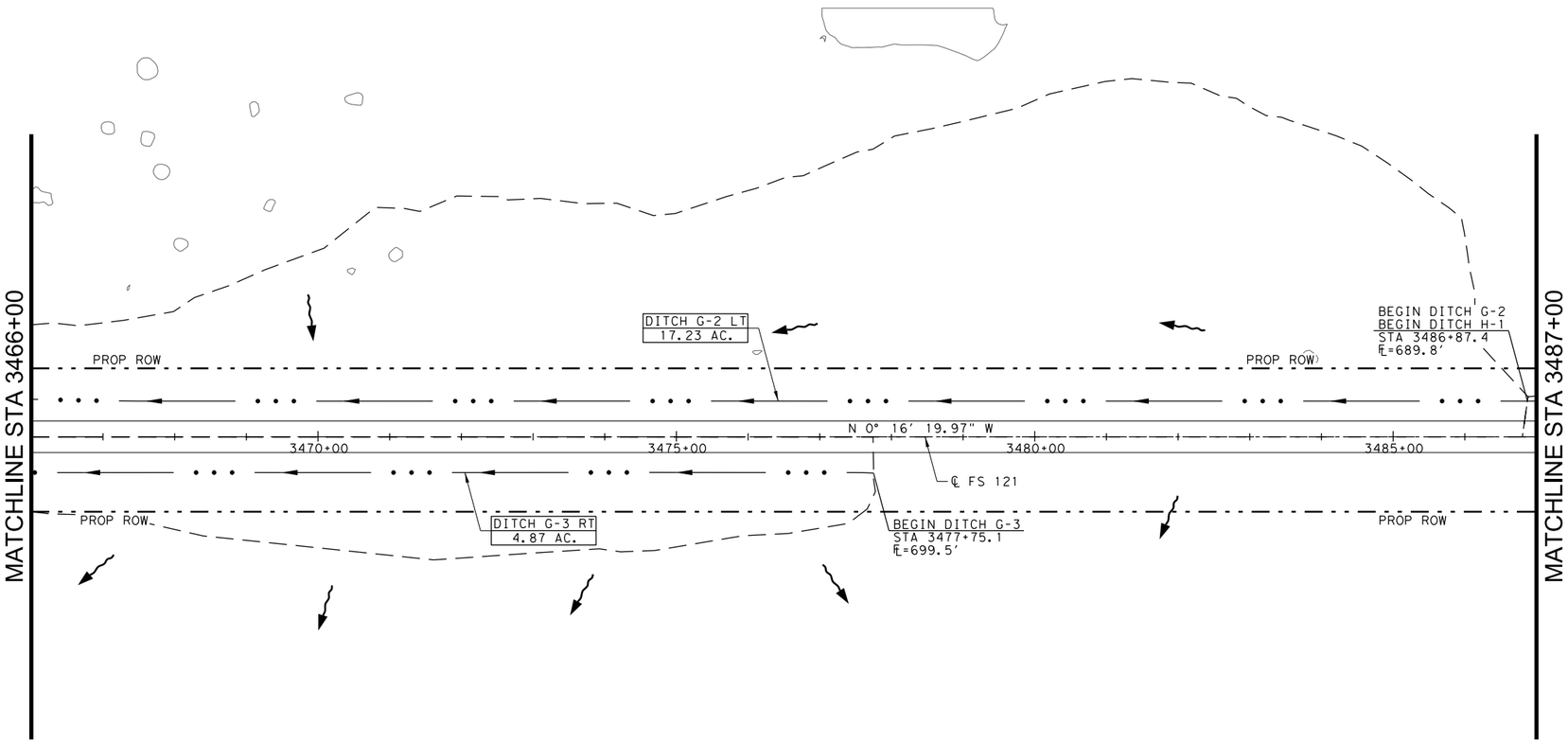
FS 121

DITCH PLAN

STA 3445+00 TO STA 3466+00

SCALE: 1" = 200' SHEET 5 OF 12

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	177



HORIZONTAL

100 0 100 200

SCALE IN FEET

DITCH LEGEND

XXXXXXXX	DITCH NAME
XXXXXXXX	DRAINAGE AREA

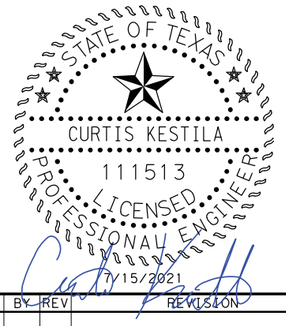
-CENTERLINE DITCH

-SUB-BASIN BOUNDARY

-FLOW ARROW

NOTE

REFER TO TYPICAL SECTIONS & CROSS SECTION SHEETS FOR DITCH DESIGN AND OFFSET



DATE	BY	REV	REVISION

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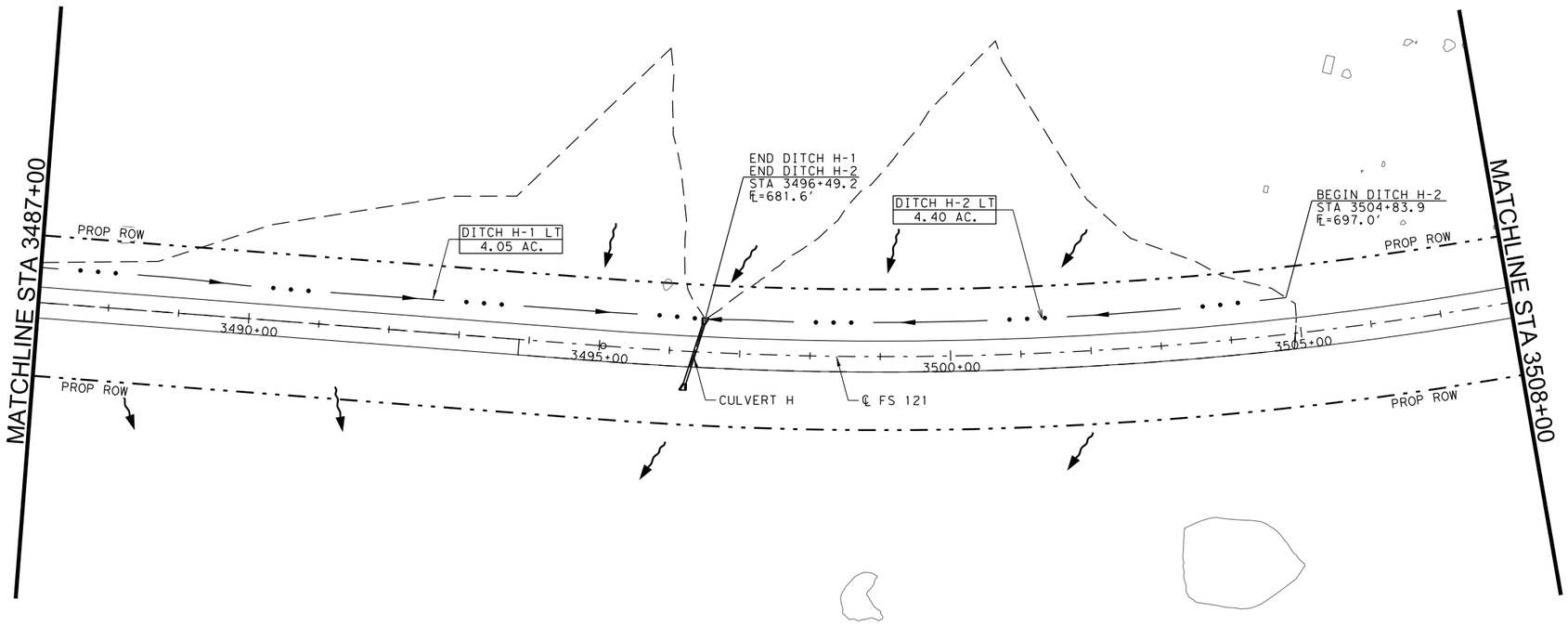
FS 121

DITCH PLAN

STA 3466+00 TO STA 3487+00

SCALE: 1" = 200' SHEET 6 OF 12

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	178



HORIZONTAL

100 0 100 200

SCALE IN FEET

DITCH LEGEND

XXXXXXXX	DITCH NAME
XXXXXXXX	DRAINAGE AREA

-CENTERLINE DITCH

-SUB-BASIN BOUNDARY

-FLOW ARROW

NOTE

REFER TO TYPICAL SECTIONS & CROSS SECTION SHEETS FOR DITCH DESIGN AND OFFSET

STATE OF TEXAS
CURTIS KESTILA
111513
LICENSED
PROFESSIONAL ENGINEER
7/15/2021

DATE	BY	REV	REVISION

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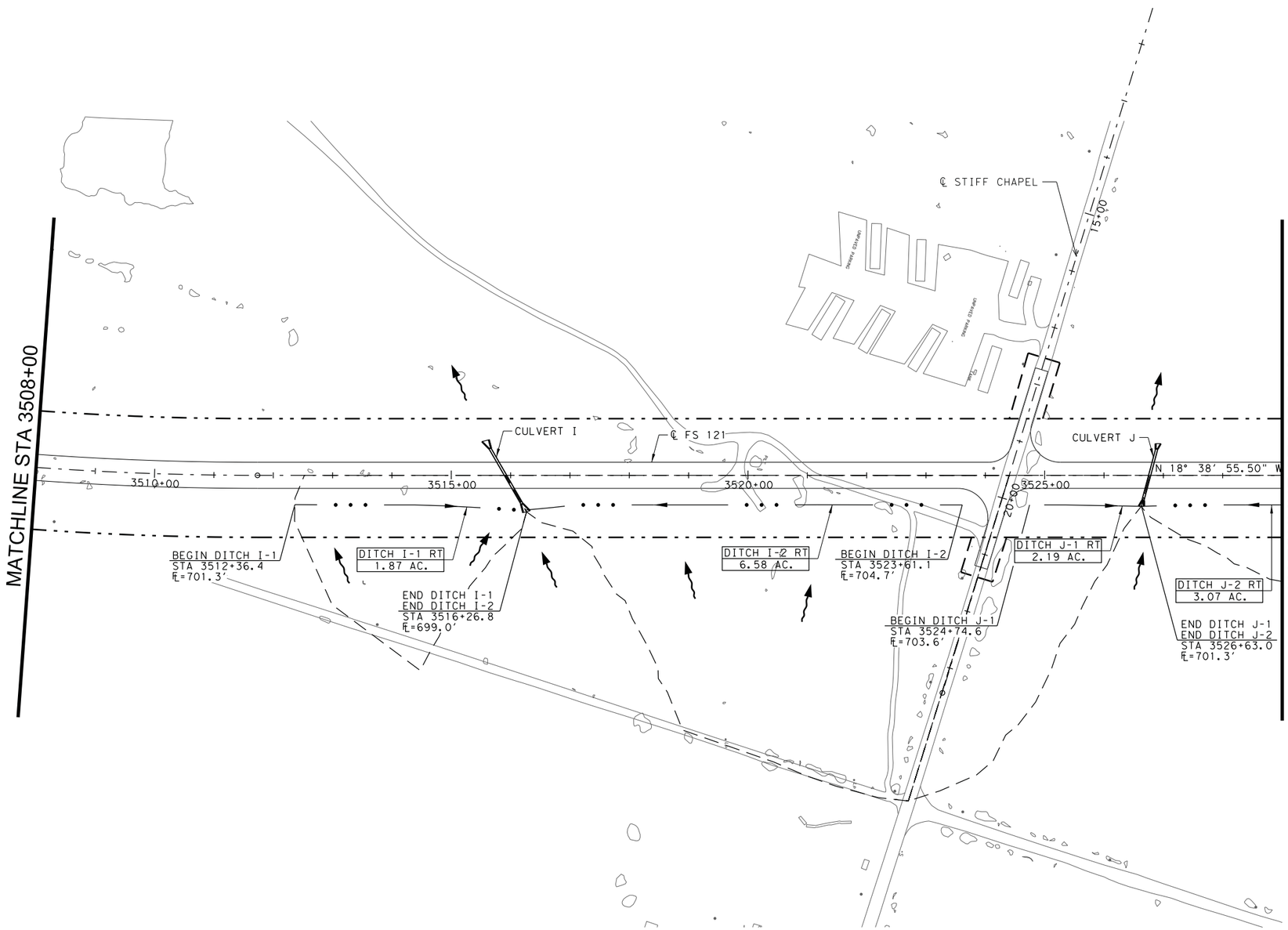
FS 121

DITCH PLAN

STA 3487+00 TO STA 3508+00

SCALE: 1" = 200' SHEET 7 OF 12

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	179



HORIZONTAL
100 0 100 200
SCALE IN FEET

DITCH LEGEND

XXXXXXXX	DITCH NAME
XXXXXXXX	DRAINAGE AREA

-CENTERLINE DITCH

-SUB-BASIN BOUNDARY

-FLOW ARROW

NOTE

REFER TO TYPICAL SECTIONS & CROSS SECTION SHEETS FOR DITCH DESIGN AND OFFSET

STATE OF TEXAS
CURTIS KESTILA
111513
LICENSED
PROFESSIONAL ENGINEER
7/15/2021

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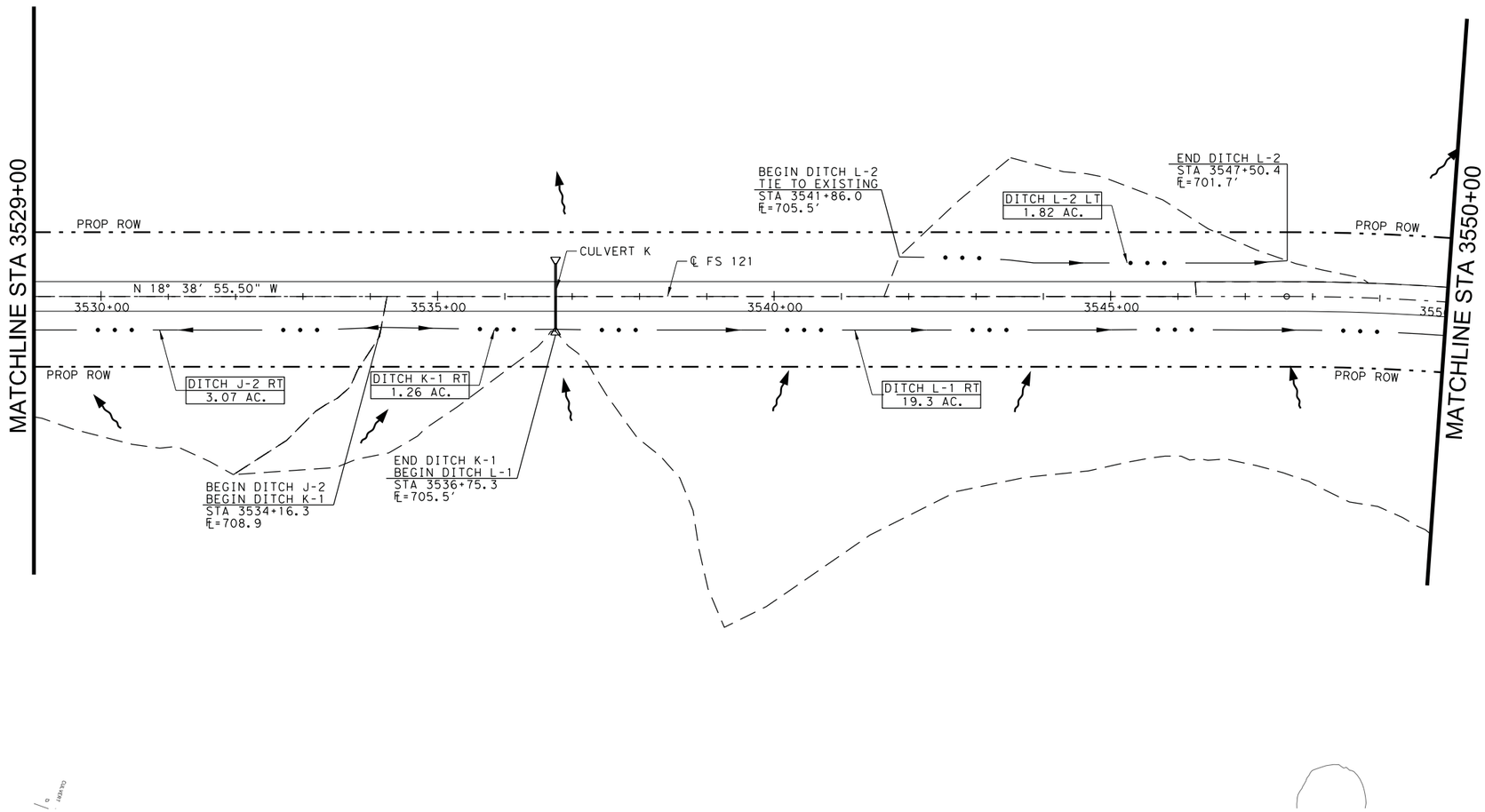
FS 121

DITCH PLAN

STA 3508+00 TO STA 3529+00

SCALE: 1" = 200'

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	180



HORIZONTAL

100 0 100 200

SCALE IN FEET

DITCH LEGEND

XXXXXXXX	DITCH NAME
XXXXXXXX	DRAINAGE AREA

-CENTERLINE DITCH

-SUB-BASIN BOUNDARY

-FLOW ARROW

NOTE

REFER TO TYPICAL SECTIONS & CROSS SECTION SHEETS FOR DITCH DESIGN AND OFFSET

STATE OF TEXAS
CURTIS KESTILA
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PROFESSIONAL ENGINEER
7/15/2021

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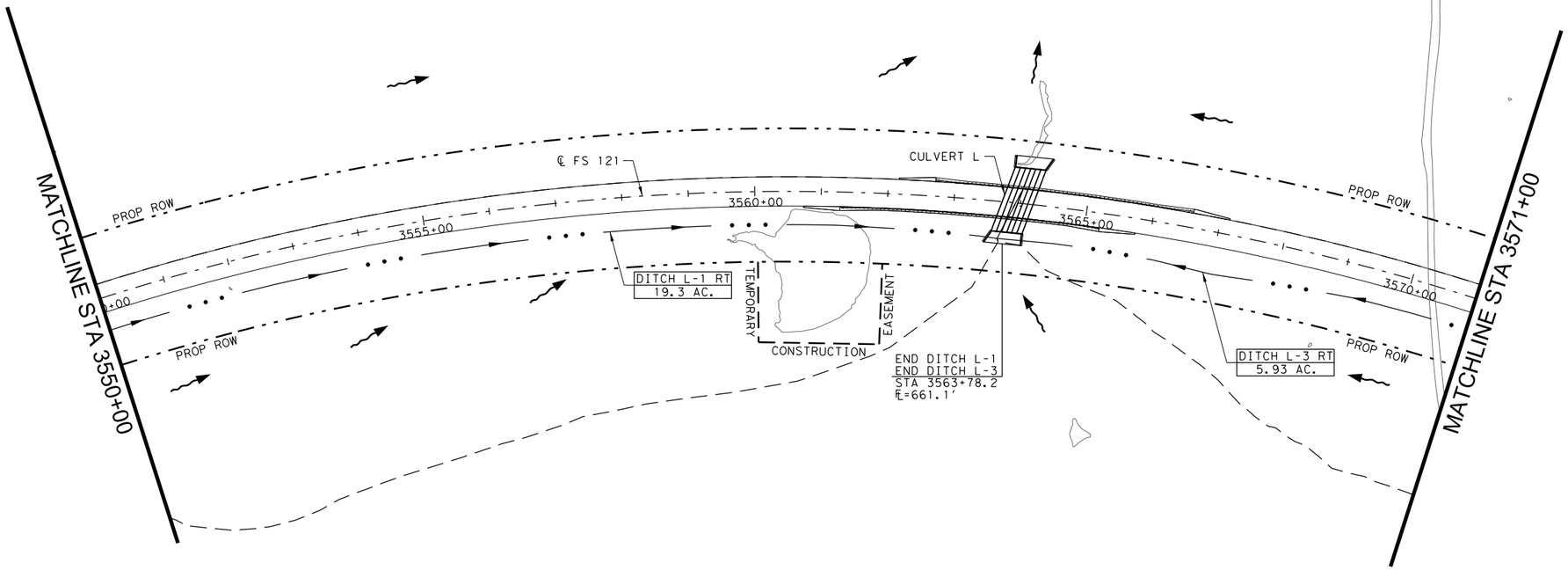
FS 121

DITCH PLAN

STA 3529+00 TO STA 3550+00

SCALE: 1" = 200' SHEET 9 OF 12

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	181



HORIZONTAL

100 0 100 200

SCALE IN FEET

DITCH LEGEND

XXXXXXXX	DITCH NAME
XXXXXXXX	DRAINAGE AREA

-CENTERLINE DITCH

-SUB-BASIN BOUNDARY

-FLOW ARROW

NOTE

REFER TO TYPICAL SECTIONS & CROSS SECTION SHEETS FOR DITCH DESIGN AND OFFSET

STATE OF TEXAS
CURTIS KESTILA
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PROFESSIONAL ENGINEER
7/15/2021

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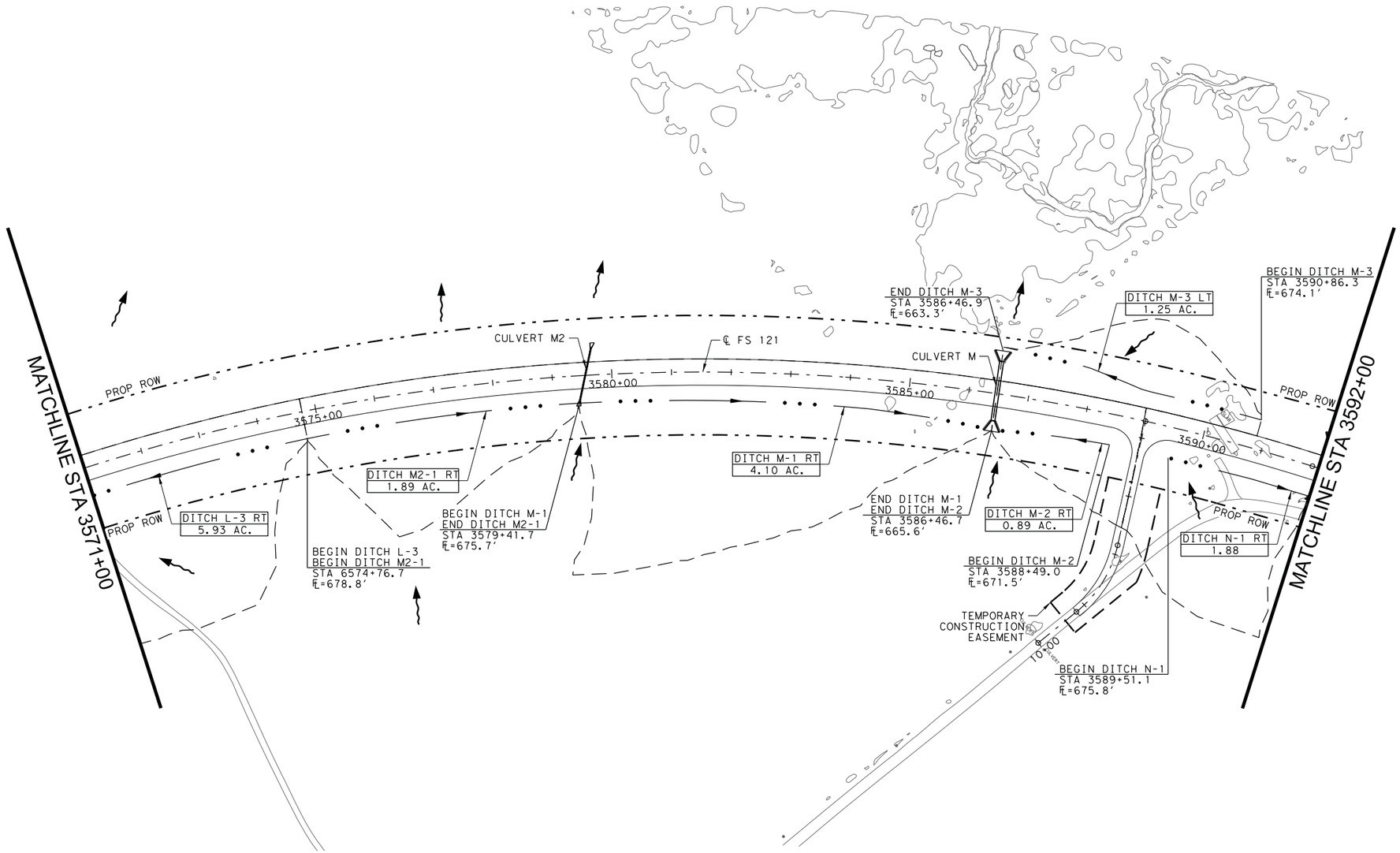
FS 121

DITCH PLAN

STA 3550+00 TO STA 3571+00

SCALE: 1" = 200' SHEET 10 OF 12

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	182



HORIZONTAL

100 0 100 200

SCALE IN FEET

DITCH LEGEND

XXXXXXXX	DITCH NAME
XXXXXXXX	DRAINAGE AREA

-CENTERLINE DITCH

-SUB-BASIN BOUNDARY

-FLOW ARROW

NOTE

REFER TO TYPICAL SECTIONS & CROSS SECTION SHEETS FOR DITCH DESIGN AND OFFSET

STATE OF TEXAS
CURTIS KESTILA
111513
LICENSED
PROFESSIONAL ENGINEER
7/15/2021

DATE	BY	REV	REVISION

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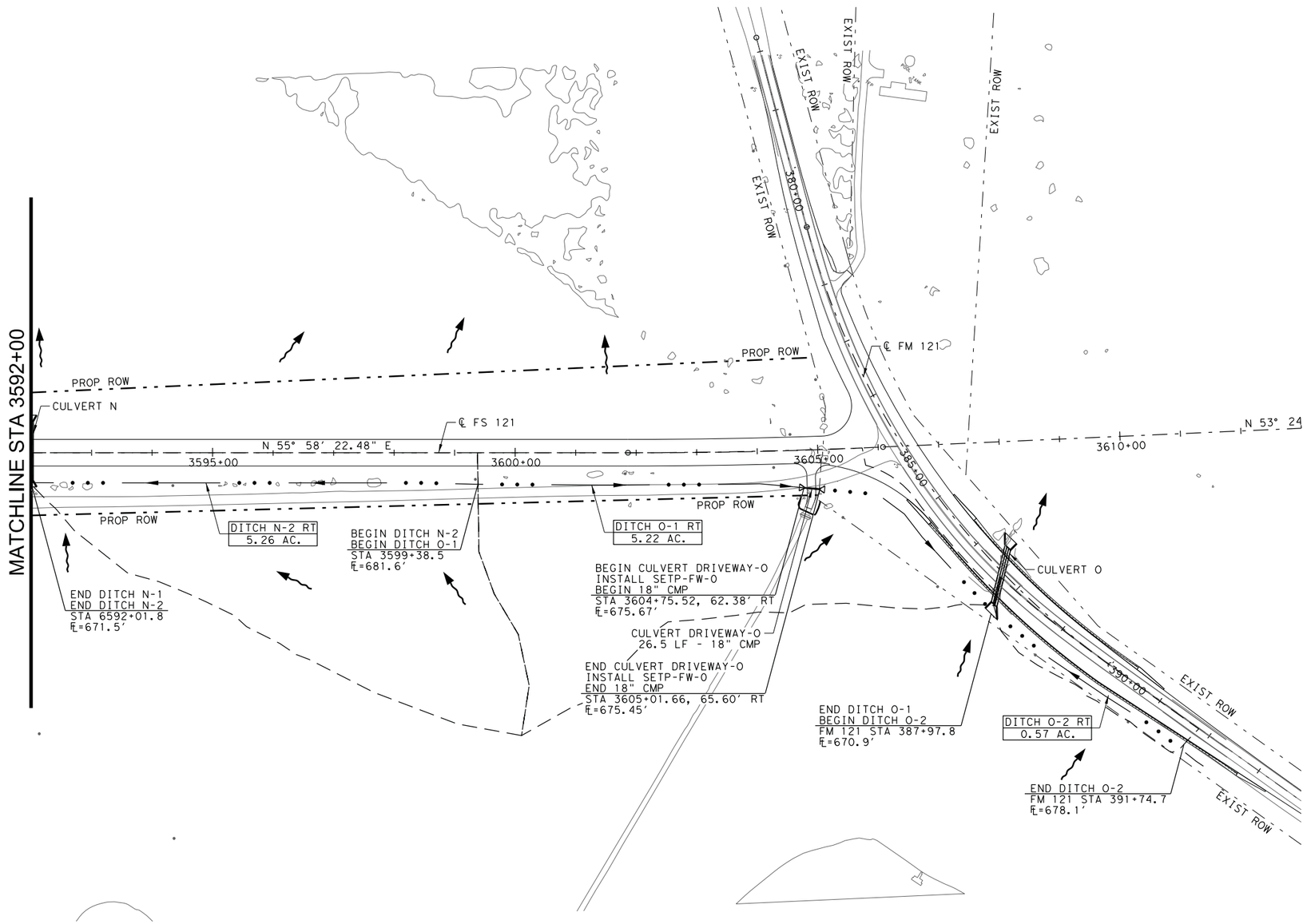
FS 121

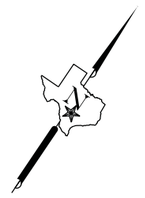
DITCH PLAN

STA 3550+00 TO STA 3592+00

SCALE: 1" = 200' SHEET 11 OF 12

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	183





DITCH LEGEND

XXXXXXXX	DITCH NAME
XXXXXXXX	DRAINAGE AREA

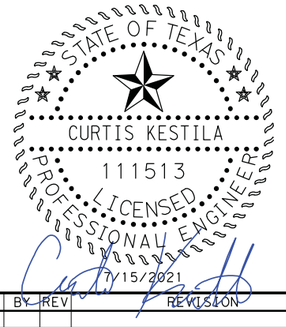
-CENTERLINE DITCH

-SUB-BASIN BOUNDARY

-FLOW ARROW

NOTE

REFER TO TYPICAL SECTIONS & CROSS SECTION SHEETS FOR DITCH DESIGN AND OFFSET



DATE	BY	REV	REVISION

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FS 121

DITCH PLAN

STA 3592+00 TO STA 3613+00

SCALE: 1" = 200' SHEET 12 OF 12

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	184

bcsstde1-20.dgn

Culvert Station and/or Creek Name followed by applicable end (Lt, Rt or Both)	Description of Box Culvert No. Spans ~ Span X Height	Max Fill Height (Ft)	Applicable Box Culvert Standard (4)	Applicable Wingwall or End Treatment Standard	Skew Angle (0°,15°, 30° or 45°)	Side Slope or Channel Slope Ratio (SL:1)	T Culvert Top Slab Thickness (In)	U Culvert Wall Thickness (In)	C Estimated Curb Height (Ft)	Hw (1) Height of Wingwall (Ft)	A Curb to End of Wingwall (Ft)	B Offset of End of Wingwall (Ft)	Lw Length of Longest Wingwall (Ft)	Ltw Culvert Toewall Length (Ft)	Atw Anchor Toewall Length (Ft)	Riprap Apron (CY)	Class "C" Conc (Curb) (2) (CY)	Class "C" Conc (Wingwall) (3) (CY)	Total Wingwall Area (SF)
STA 3401+48.70 - CULVERT A (Lt)	1 ~ 3'x 2'	5'	SCP-3	SETB-FW-S	15°	4:1	4"	4"	0.250'	2.333'	8.000'	4.619'	9.238'	N/A	7.725'	0.4	0.0	2.6	N/A
STA 3401+48.70 - CULVERT A (Rt)	1 ~ 3'x 2'	5'	SCP-3	SETB-FW-S	15°	6:1	4"	4"	0.250'	2.333'	12.000'	6.928'	13.856'	N/A	10.034'	0.8	0.0	3.8	N/A
STA 3425+70.01 - CULVERT B (Lt)	2 ~ 3'x 2'	5'	SCP-3	SETB-FW-S	15°	6:1	4"	4"	0.250'	2.333'	12.000'	6.928'	13.856'	N/A	14.348'	1.5	0.1	4.1	N/A
STA 3425+70.01 - CULVERT B (Rt)	2 ~ 3'x 2'	5'	SCP-3	SETB-FW-S	15°	4:1	4"	4"	0.250'	2.333'	8.000'	4.619'	9.238'	N/A	12.038'	0.8	0.1	2.9	N/A
STA 3429+43.32 - CULVERT C (Lt)	1 ~ 3'x 2'	5'	SCP-3	SETB-FW-S	15°	6:1	4"	4"	0.250'	2.333'	12.000'	6.928'	13.856'	N/A	10.034'	0.8	0.0	3.8	N/A
STA 3429+43.32 - CULVERT C (Rt)	1 ~ 3'x 2'	6'	SCP-3	SETB-FW-S	15°	4:1	4"	4"	0.250'	2.333'	8.000'	4.619'	9.238'	N/A	7.725'	0.4	0.0	2.6	N/A
STA 3439+46.54 - CULVERT D (Lt)	1 ~ 3'x 2'	5'	SCP-3	SETB-FW-S	30°	6:1	4"	4"	0.250'	2.333'	12.000'	12.000'	16.971'	N/A	15.464'	1.2	0.0	4.6	N/A
STA 3439+46.54 - CULVERT D (Rt)	1 ~ 3'x 2'	5'	SCP-3	SETB-FW-S	30°	4:1	4"	4"	0.250'	2.333'	8.000'	8.000'	11.314'	N/A	11.464'	0.6	0.0	3.1	N/A
STA 3445+61.65 - CULVERT E (Both)	1 ~ 3'x 2'	5'	SCP-3	SETB-FW-S	30°	4:1	4"	4"	0.250'	2.333'	8.000'	8.000'	11.314'	N/A	11.464'	1.2	0.0	6.2	N/A
STA 3452+77.08 - CULVERT F (Lt)	2 ~ 4'x 3'	5'	SCP-4	SETB-FW-S	30°	6:1	5"	5"	0.250'	3.417'	18.500'	18.500'	26.163'	N/A	29.277'	4.8	0.1	8.1	N/A
STA 3452+77.08 - CULVERT F (Rt)	2 ~ 4'x 3'	5'	SCP-4	SETB-FW-S	30°	4:1	5"	5"	0.250'	3.417'	12.333'	12.333'	17.442'	N/A	23.111'	2.6	0.1	5.6	N/A
STA 3461+78.99 - CULVERT G (Both)	2 ~ 4'x 4'	7'	SCP-4	SETB-FW-S	30°	4:1	5"	5"	0.250'	4.417'	16.333'	16.333'	23.099'	N/A	27.111'	7.6	0.2	16.6	N/A
STA 3496+36.13 - CULVERT H (Lt)	1 ~ 3'x 2'	5'	SCP-3	SETB-FW-S	15°	6:1	4"	4"	0.250'	2.333'	12.000'	6.928'	13.856'	N/A	10.034'	0.8	0.0	3.8	N/A
STA 3496+36.13 - CULVERT H (Rt)	1 ~ 3'x 2'	5'	SCP-3	SETB-FW-S	15°	4:1	4"	4"	0.250'	2.333'	8.000'	4.619'	9.238'	N/A	7.725'	0.4	0.0	2.6	N/A
STA 3515+91.39 - CULVERT I (Both)	1 ~ 3'x 2'	5'	SCP-3	SETB-FW-S	30°	4:1	4"	4"	0.250'	2.333'	8.000'	8.000'	11.314'	N/A	11.464'	1.2	0.0	6.2	N/A
STA 3526+76.92 - CULVERT J (Lt)	1 ~ 3'x 2'	6'	SCP-3	SETB-FW-S	15°	4:1	4"	4"	0.250'	2.333'	8.000'	4.619'	9.238'	N/A	7.725'	0.4	0.0	2.6	N/A
STA 3526+76.92 - CULVERT J (Rt)	1 ~ 3'x 2'	6'	SCP-3	SETB-FW-S	15°	6:1	4"	4"	0.250'	2.333'	12.000'	6.928'	13.856'	N/A	10.034'	0.8	0.0	3.8	N/A
STA 3563+95.79 - CULVERT L (Both)	6 ~ 7'x 4'	6'	MC-7-10	SETB-FW-S	15°	4:1	8"	7"	0.250'	4.667'	17.333'	10.007'	20.015'	N/A	56.509'	24.8	0.8	20.8	N/A
STA 3586+46.87 - CULVERT M (Lt)	1 ~ 6'x 4'	7'	SCP-6	SETB-FW-0	0°	4:1	7"	7"	0.250'	4.583'	17.000'	9.815'	19.630'	N/A	25.630'	3.2	0.1	8.5	N/A
STA 3586+46.87 - CULVERT M (Rt)	1 ~ 6'x 4'	7'	SCP-6	SETB-FW-0	0°	6:1	7"	7"	0.250'	4.583'	25.500'	14.722'	29.445'	N/A	35.445'	6.7	0.1	12.6	N/A
STA 3592+01.80 - CULVERT N (Both)	1 ~ 3'x 2'	6'	SCP-3	SETB-FW-0	0°	4:1	4"	4"	0.250'	2.333'	8.000'	4.619'	9.238'	N/A	12.238'	1.2	0.0	6.2	N/A
FM 121/W MAIN ST - CULVERT O (Lt)	3 ~ 3'x 2'	5'	SCP-3	SETB-FW-S	30°	6:1	4"	4"	0.250'	2.333'	12.000'	12.000'	16.971'	N/A	25.087'	2.8	0.1	5.3	N/A
FM 121/W MAIN ST - CULVERT O (Rt)	3 ~ 3'x 2'	5'	SCP-3	SETB-FW-S	30°	4:1	4"	4"	4.250'	6.333'	24.000'	24.000'	33.941'	N/A	37.087'	7.7	2.2	14.5	N/A

NOTES:
Skew = 0° on SW-0, FW-0, SETB-CD, SETB-SW-0, and SETB-FW-0 standard sheets;
30° maximum for safety end treatment

SL:1 = Horizontal : 1 Vertical
- Side slope at culvert for flared or straight wingwalls.
- Channel slope for parallel wingwalls.
- Slope must be 3:1 or flatter for safety end treatments.

T = Box culvert top slab thickness. Dimension can be found on the applicable box culvert standard sheet.

U = Box culvert wall thickness. Dimension can be found on the applicable box culvert standard sheet.

C = Curb height

See applicable wing or end treatment standard sheets for calculations of Hw, A, B, Lw, Ltw, Atw, and Total Wingwall Area.

Hw = Height of wingwall

A = Distance from face of curb to end of wingwall (not applicable to parallel or straight wingwalls)

B = Offset of end of wingwall (not applicable to parallel or straight wingwalls)

Lw = Length of longest wingwall.

Ltw = Length of culvert toewall (not applicable when using riprap apron)

Atw = Length of anchor toewall (applicable to safety end treatment only)
Total Wingwall Area = Wingwall area in sq. ft. for two wingwalls (one structure end) if Lt or Rt.
Area for four wingwalls (two structure ends) if Both.

(1) Round the wall heights shown to the nearest foot for bidding purposes.

(2) Concrete volume shown is for box culvert curb only. For curbs using the Box Culvert Rail Mounting Details (RAC) standard sheet quantities shown must be increased by a factor of 2.25. If Class S concrete is required for the top slab of the culvert, also provide Class S concrete for the curb. Curb concrete is considered part of the Box Culvert for payment.

(3) Concrete volume shown is total of wings, footings, culvert toewall (if any), anchor toewalls (if any) and wingwall toewalls. Riprap aprons, culverts, and curb quantities are not included.

(4) Regardless of the type of culvert shown on this sheet, the Contractor has the option of furnishing cast-in-place or precast culverts unless otherwise shown elsewhere on the plans. If the Contractor elects to provide culverts of a different type than those shown on this sheet, it is the Contractor's responsibility to make the necessary adjustments to the dimensions and quantities shown.

STATE OF TEXAS
CURTIS KESTILA
111513
LICENSED
PROFESSIONAL ENGINEER
7/15/2021

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Texas Department of Transportation — Bridge Division Standard

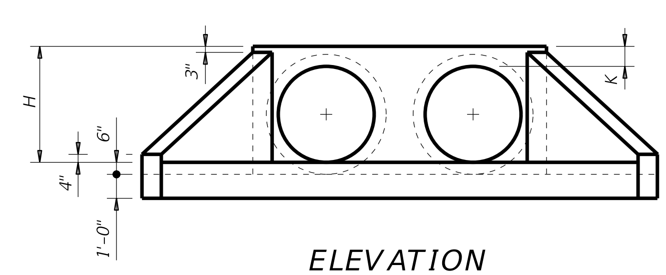
BOX CULVERT SUPPLEMENT
WINGS AND END TREATMENTS

BCS

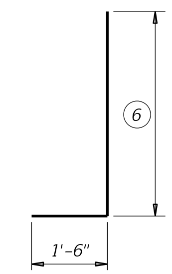
FILE: bcsstde1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0091	10	002	FS 121
	DIST		COUNTY	SHEET NO.
	PAR		GRAYSON	185

TABLE OF VARIABLE DIMENSIONS AND QUANTITIES FOR ONE HEADWALL (5)

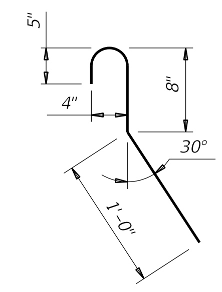
Slope	Dia of Pipe (D)	Values for One Pipe: W	X	Y	L	Reinf (Lbs)	Conc (CY) (1)	Values to be Added for Each Addt'l Pipe: X and W	Reinf (Lbs)	Conc (CY) (1)
2:1	12"	4' - 7 ½"	2' - 6"	2' - 10"	3' - 3 ¼"	88	0.6	1' - 9"	20	0.2
	15"	5' - 5 ¾"	2' - 9 ½"	3' - 4"	3' - 10 ¼"	103	0.7	2' - 2"	24	0.3
	18"	6' - 4 ¼"	3' - 1"	3' - 10"	4' - 5"	124	0.9	2' - 8"	32	0.3
	21"	7' - 2 ¾"	3' - 4 ½"	4' - 4"	5' - 0"	143	1.1	3' - 1"	43	0.4
	24"	8' - 2 ½"	3' - 9 ½"	4' - 10"	5' - 7"	164	1.3	3' - 7"	50	0.5
	27"	9' - 1"	4' - 1"	5' - 4"	6' - 2"	179	1.5	3' - 11"	56	0.6
	30"	9' - 11 ½"	4' - 4 ½"	5' - 10"	6' - 8 ¾"	203	1.7	4' - 4"	65	0.8
	33"	10' - 10"	4' - 8"	6' - 4"	7' - 3 ¾"	224	2.0	4' - 8"	71	0.9
	36"	11' - 8 ¼"	4' - 11 ½"	6' - 10"	7' - 10 ¾"	249	2.2	5' - 1"	81	1.0
	42"	13' - 5 ¼"	5' - 6 ½"	7' - 10"	9' - 0 ½"	298	2.8	5' - 10"	97	1.3
	48"	15' - 9"	6' - 1 ½"	9' - 4"	10' - 9 ¼"	360	3.8	6' - 7"	117	1.7
	54"	17' - 5 ¾"	6' - 8 ½"	10' - 4"	11' - 11 ¼"	427	4.5	7' - 6"	151	2.1
	60"	19' - 2 ¾"	7' - 3 ½"	11' - 4"	13' - 1"	481	5.3	8' - 3"	174	2.5
	66"	20' - 11 ½"	7' - 10 ½"	12' - 4"	14' - 3"	544	6.2	8' - 9"	194	2.9
	72"	22' - 8 ½"	8' - 5 ½"	13' - 4"	15' - 4 ¾"	601	7.1	9' - 4"	213	3.3
3:1	12"	6' - 3"	2' - 6"	4' - 3"	4' - 11"	118	0.8	1' - 9"	22	0.2
	15"	7' - 5"	2' - 9 ½"	5' - 0"	5' - 9 ¼"	137	1.1	2' - 2"	28	0.3
	18"	8' - 6 ¾"	3' - 1"	5' - 9"	6' - 7 ¾"	170	1.3	2' - 8"	37	0.5
	21"	9' - 8 ¾"	3' - 4 ½"	6' - 6"	7' - 6"	195	1.6	3' - 1"	48	0.6
	24"	11' - 0"	3' - 9 ½"	7' - 3"	8' - 4 ½"	227	2.0	3' - 7"	58	0.7
	27"	12' - 2"	4' - 1"	8' - 0"	9' - 2 ¾"	251	2.3	3' - 11"	67	0.8
	30"	13' - 4"	4' - 4 ½"	8' - 9"	10' - 1 ¼"	293	2.7	4' - 4"	77	1.0
	33"	14' - 5 ¾"	4' - 8"	9' - 6"	10' - 11 ¾"	318	3.1	4' - 8"	84	1.2
	36"	15' - 7 ¾"	4' - 11 ½"	10' - 3"	11' - 10"	351	3.5	5' - 1"	96	1.4
	42"	17' - 11 ½"	5' - 6 ½"	11' - 9"	13' - 6 ¾"	432	4.5	5' - 10"	119	1.7
	48"	21' - 1 ¾"	6' - 1 ½"	14' - 0"	16' - 2"	537	6.1	6' - 7"	146	2.3
	54"	23' - 5 ½"	6' - 8 ½"	15' - 6"	17' - 10 ¾"	630	7.3	7' - 6"	186	2.9
	60"	25' - 9 ¼"	7' - 3 ½"	17' - 0"	19' - 7 ½"	719	8.7	8' - 3"	219	3.4
	66"	28' - 1"	7' - 10 ½"	18' - 6"	21' - 4 ¼"	811	10.1	8' - 9"	242	3.9
	72"	30' - 4 ¾"	8' - 5 ½"	20' - 0"	23' - 1 ¼"	924	11.7	9' - 4"	272	4.4
4:1	12"	7' - 10 ¾"	2' - 6"	5' - 8"	6' - 6 ½"	148	1.1	1' - 9"	24	0.3
	15"	9' - 4"	2' - 9 ½"	6' - 8"	7' - 8 ½"	181	1.5	2' - 2"	32	0.4
	18"	10' - 9 ½"	3' - 1"	7' - 8"	8' - 10 ¼"	221	1.9	2' - 8"	42	0.5
	21"	12' - 2 ¾"	3' - 4 ½"	8' - 8"	10' - 0"	260	2.3	3' - 1"	57	0.7
	24"	13' - 9 ½"	3' - 9 ½"	9' - 8"	11' - 2"	301	2.8	3' - 7"	67	0.9
	27"	15' - 3"	4' - 1"	10' - 8"	12' - 3 ¾"	334	3.3	3' - 11"	77	1.0
	30"	16' - 8 ¼"	4' - 4 ½"	11' - 8"	13' - 5 ¾"	385	3.8	4' - 4"	89	1.3
	33"	18' - 1 ¾"	4' - 8"	12' - 8"	14' - 7 ½"	425	4.5	4' - 8"	101	1.4
	36"	19' - 7"	4' - 11 ½"	13' - 8"	15' - 9 ¼"	472	5.1	5' - 1"	115	1.7
	42"	22' - 5 ¾"	5' - 6 ½"	15' - 8"	18' - 1"	583	6.5	5' - 10"	141	2.1
	48"	26' - 6 ¼"	6' - 1 ½"	18' - 8"	21' - 6 ¾"	730	8.9	6' - 7"	175	2.8
	54"	29' - 5"	6' - 8 ½"	20' - 8"	23' - 10 ¼"	875	10.7	7' - 6"	226	3.6
	60"	32' - 3 ¾"	7' - 3 ½"	22' - 8"	26' - 2"	996	12.7	8' - 3"	264	4.3
	66"	35' - 2 ½"	7' - 10 ½"	24' - 8"	28' - 5 ¾"	1,140	14.9	8' - 9"	300	4.9
	72"	38' - 1 ¼"	8' - 5 ½"	26' - 8"	30' - 9 ½"	1,297	17.3	9' - 4"	334	5.6
6:1	12"	11' - 2"	2' - 6"	8' - 6"	9' - 9 ¾"	224	1.9	1' - 9"	28	0.4
	15"	13' - 2 ¼"	2' - 9 ½"	10' - 0"	11' - 6 ½"	268	2.5	2' - 2"	37	0.5
	18"	15' - 2 ½"	3' - 1"	11' - 6"	13' - 3 ¼"	330	3.2	2' - 8"	50	0.7
	21"	17' - 2 ¾"	3' - 4 ½"	13' - 0"	15' - 0 ¼"	387	3.9	3' - 1"	69	0.9
	24"	19' - 4 ½"	3' - 9 ½"	14' - 6"	16' - 9"	453	4.8	3' - 7"	80	1.2
	27"	21' - 4 ¾"	4' - 1"	16' - 0"	18' - 5 ¾"	512	5.7	3' - 11"	96	1.4
	30"	23' - 5 ¼"	4' - 4 ½"	17' - 6"	20' - 2 ½"	593	6.7	4' - 4"	110	1.7
	33"	25' - 5 ½"	4' - 8"	19' - 0"	21' - 11 ¼"	675	7.8	4' - 8"	127	2.0
	36"	27' - 5 ¾"	4' - 11 ½"	20' - 6"	23' - 8"	735	9.0	5' - 1"	144	2.3
	42"	31' - 6 ¼"	5' - 6 ½"	23' - 6"	27' - 1 ½"	922	11.5	5' - 10"	179	3.0
	48"	37' - 3 ½"	6' - 1 ½"	28' - 0"	32' - 4"	1,191	15.9	6' - 7"	231	4.0
	54"	41' - 4 ¼"	6' - 8 ½"	31' - 0"	35' - 9 ½"	1,424	19.2	7' - 6"	300	5.0
	60"	45' - 4 ¾"	7' - 3 ½"	34' - 0"	39' - 3"	1,631	22.9	8' - 3"	353	6.0



ELEVATION
(Showing dimensions.)



BARS V



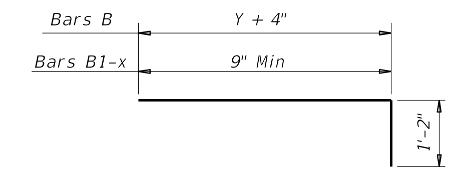
BARS CL
(Length = 2'-5")

TABLE OF REINFORCING STEEL (5)

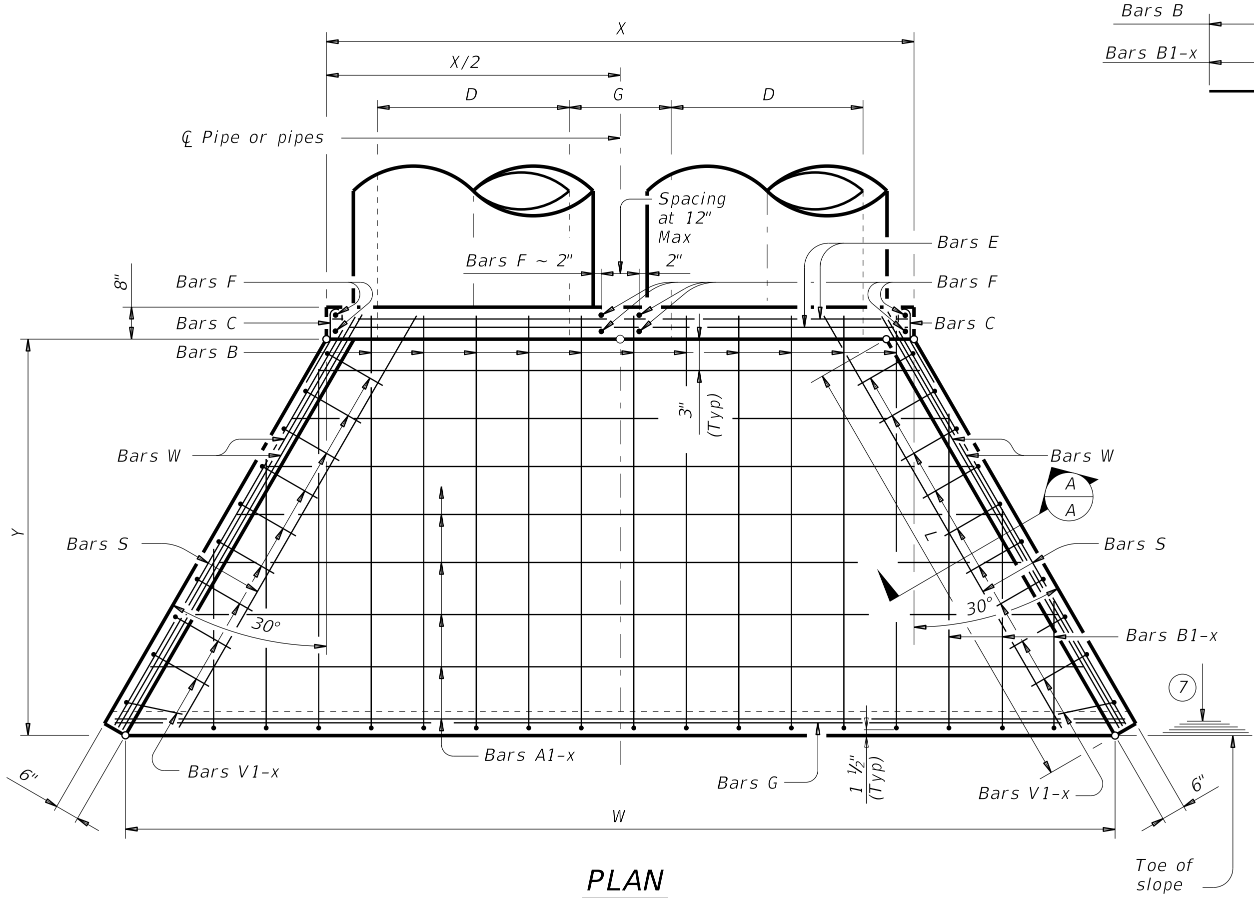
Bar	Size	Spa	No.
A	#4	1' - 0"	~
B	#3	1' - 6"	~
C	#4	1' - 0"	~
D	#3	1' - 0"	~
E	#5	~	4
F	#5	~	~
G	#3	~	2
S	#4	~	6
V	#4	1' - 0"	~
W	#5	~	4

TABLE OF CONSTANT DIMENSIONS

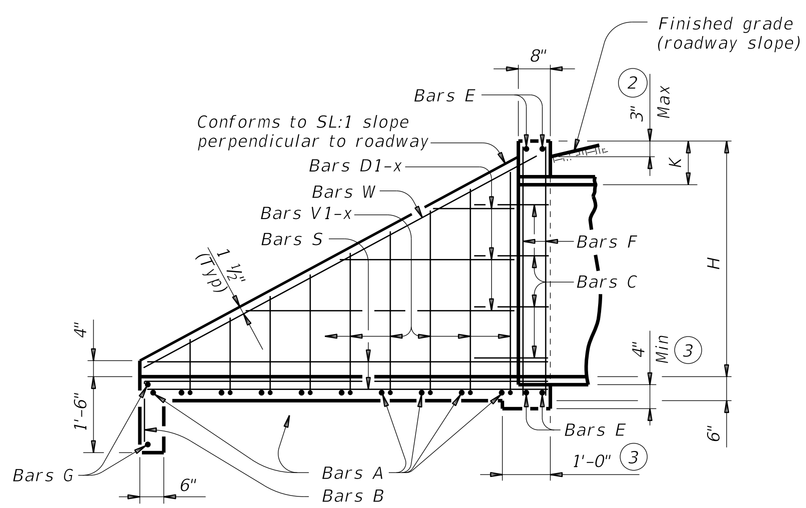
Dia of Pipe (D)	G	K (4)	H
12"	0' - 9"	1' - 0"	2' - 0"
15"	0' - 11"	1' - 0"	2' - 3"
18"	1' - 2"	1' - 0"	2' - 6"
21"	1' - 4"	1' - 0"	2' - 9"
24"	1' - 7"	1' - 0"	3' - 0"
27"	1' - 8"	1' - 0"	3' - 3"
30"	1' - 10"	1' - 0"	3' - 6"
33"	1' - 11"	1' - 0"	3' - 9"
36"	2' - 1"	1' - 0"	4' - 0"
42"	2' - 4"	1' - 0"	4' - 6"
48"	2' - 7"	1' - 3"	5' - 3"
54"	3' - 0"	1' - 3"	5' - 9"
60"	3' - 3"	1' - 3"	6' - 3"
66"	3' - 3"	1' - 3"	6' - 9"
72"	3' - 4"	1' - 3"	7' - 3"



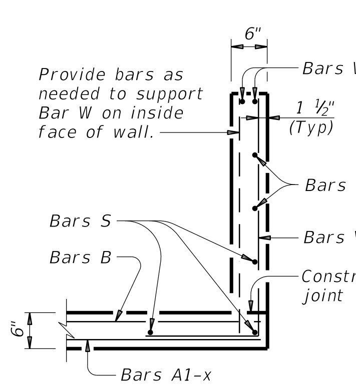
BARS B and B1-x



PLAN



TYPICAL WING ELEVATION



SECTION A-A

(1) Quantities shown are for concrete pipe and will increase slightly for metal pipe installations.

(2) For vehicle safety, construct curbs no more than 3" above finished grade. Reduce curb heights, if necessary, to meet these requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

(3) Provide a 1'-0" footing as shown where required to maintain 4" minimum cover for pipes.

(4) Dimenisions shown are usual and maximum.

(5) Quantities shown are for one structure end only (one headwall).

(6) $\text{Min Length} = 6" + 3" \times \left(\frac{12 \times H - 7}{12 \times L}\right)$

$\text{Max Length} = 12 \times H - 3" \times \left(\frac{12 \times H - 7}{12 \times L}\right) - 1"$

(7) Lengths of wings based on SL:1 slope along this line.

MATERIAL NOTES:
Provide Grade 60 reinforcing steel.
Provide Class C concrete (f'c = 3,600 psi).

GENERAL NOTES:
Designed according to AASHTO LRFD Bridge Design Specifications.
Do not mount bridge rails of any type directly to these culvert headwalls.
This standard may not be used for wall heights, H, exceeding the values shown.

Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing dimensions are out-to-out of bars.

Texas Department of Transportation | Bridge Division Standard

CONCRETE HEADWALLS WITH FLARED WINGS FOR 0° SKEW PIPE CULVERTS

CH-FW-0

FILE: chfw00se-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0091	10	002	FS 121
	DIST	COUNTY		SHEET NO.
	PAR	GRAYSON		186

DATE: 7/15/2021 8:10:38 PM
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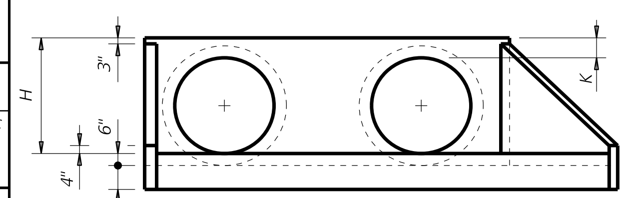
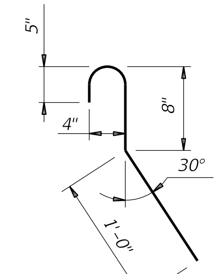
TABLE OF VARIABLE DIMENSIONS AND QUANTITIES FOR ONE HEADWALL (5)

Slope	Dia of Pipe (D)	Values for One Pipe: W	X	Y	L	Reinf (Lbs)	Conc (CY) (1)	Values to be Added for Each Addt'l Pipe: X and W	Reinf (Lbs)	Conc (CY) (1)
2:1	12"	3' - 3 ½"	2' - 8 ¾"	2' - 10"	3' - 3 ¼"	85	0.5	1' - 9 ¾"	20	0.2
	15"	3' - 10 ½"	3' - 0 ¼"	3' - 4"	3' - 10 ¼"	97	0.6	2' - 3"	25	0.3
	18"	4' - 5 ½"	3' - 4"	3' - 10"	4' - 5"	119	0.8	2' - 9 ¼"	32	0.4
	21"	5' - 0 ¾"	3' - 7 ½"	4' - 4"	5' - 0"	134	0.9	3' - 2 ¼"	43	0.5
	24"	5' - 9 ¼"	4' - 0 ¾"	4' - 10"	5' - 7"	154	1.1	3' - 8 ½"	51	0.6
	27"	6' - 4 ½"	4' - 4 ½"	5' - 4"	6' - 2"	164	1.3	4' - 0 ¾"	57	0.7
	30"	6' - 11 ½"	4' - 8"	5' - 10"	6' - 8 ¾"	187	1.5	4' - 5 ¾"	67	0.8
	33"	7' - 6 ½"	4' - 11 ¾"	6' - 4"	7' - 3 ¾"	205	1.7	4' - 10"	73	0.9
	36"	8' - 1 ¾"	5' - 3 ¼"	6' - 10"	7' - 10 ¾"	231	1.9	5' - 3 ¼"	82	1.1
	42"	9' - 3 ¾"	5' - 10 ½"	7' - 10"	9' - 0 ½"	271	2.4	6' - 0 ½"	100	1.4
	48"	10' - 9 ½"	6' - 5 ¾"	9' - 4"	10' - 9 ¼"	325	3.2	6' - 9 ¾"	121	1.8
	54"	11' - 11 ¾"	7' - 1"	10' - 4"	11' - 11 ¼"	384	3.8	7' - 9 ¼"	154	2.2
	60"	13' - 1 ¾"	7' - 8 ¼"	11' - 4"	13' - 1"	431	4.5	8' - 6 ½"	178	2.6
	66"	14' - 4"	8' - 3 ½"	12' - 4"	14' - 3"	489	5.3	9' - 0 ¾"	198	3.0
	72"	15' - 6 ¼"	8' - 10 ¾"	13' - 4"	15' - 4 ¾"	537	6.1	9' - 8"	220	3.3
3:1	12"	4' - 1 ¼"	2' - 8 ¾"	4' - 3"	4' - 11"	108	0.7	1' - 9 ¾"	23	0.2
	15"	4' - 10"	3' - 0 ¼"	5' - 0"	5' - 9 ¼"	127	0.9	2' - 3"	29	0.3
	18"	5' - 7"	3' - 4"	5' - 9"	6' - 7 ¾"	156	1.1	2' - 9 ¼"	37	0.5
	21"	6' - 3 ¾"	3' - 7 ½"	6' - 6"	7' - 6"	177	1.3	3' - 2 ¼"	49	0.6
	24"	7' - 2"	4' - 0 ¾"	7' - 3"	8' - 4 ½"	204	1.6	3' - 8 ½"	59	0.7
	27"	7' - 11"	4' - 4 ½"	8' - 0"	9' - 2 ¾"	225	1.9	4' - 0 ¾"	68	0.9
	30"	8' - 7 ¾"	4' - 8"	8' - 9"	10' - 1 ¼"	260	2.2	4' - 5 ¾"	79	1.0
	33"	9' - 4 ½"	4' - 11 ¾"	9' - 6"	10' - 11 ¾"	282	2.5	4' - 10"	86	1.2
	36"	10' - 1 ¼"	5' - 3 ¼"	10' - 3"	11' - 10"	313	2.9	5' - 3 ¼"	97	1.4
	42"	11' - 7"	5' - 10 ½"	11' - 9"	13' - 6 ¾"	379	3.7	6' - 0 ½"	122	1.8
	48"	13' - 5 ¾"	6' - 5 ¾"	14' - 0"	16' - 2"	465	4.9	6' - 9 ¾"	152	2.4
	54"	14' - 11 ½"	7' - 1"	15' - 6"	17' - 10 ¾"	544	5.9	7' - 9 ¼"	190	3.0
	60"	16' - 5"	7' - 8 ¼"	17' - 0"	19' - 7 ½"	616	7.0	8' - 6 ½"	224	3.5
	66"	17' - 10 ¾"	8' - 3 ½"	18' - 6"	21' - 4 ¼"	701	8.1	9' - 0 ¾"	248	4.0
	72"	19' - 4 ¼"	8' - 10 ¾"	20' - 0"	23' - 1 ¼"	786	9.4	9' - 8"	281	4.6
4:1	12"	4' - 11"	2' - 8 ¾"	5' - 8"	6' - 6 ½"	136	0.9	1' - 9 ¾"	26	0.3
	15"	5' - 9 ½"	3' - 0 ¼"	6' - 8"	7' - 8 ½"	162	1.2	2' - 3"	33	0.4
	18"	6' - 8 ¼"	3' - 4"	7' - 8"	8' - 10 ¼"	198	1.5	2' - 9 ¼"	43	0.6
	21"	7' - 6 ¾"	3' - 7 ½"	8' - 8"	10' - 0"	232	1.8	3' - 2 ¼"	57	0.7
	24"	8' - 6 ¾"	4' - 0 ¾"	9' - 8"	11' - 2"	264	2.2	3' - 8 ½"	68	0.9
	27"	9' - 5 ¼"	4' - 4 ½"	10' - 8"	12' - 3 ¾"	292	2.6	4' - 0 ¾"	79	1.1
	30"	10' - 4"	4' - 8"	11' - 8"	13' - 5 ¾"	333	3.0	4' - 5 ¾"	91	1.3
	33"	11' - 2 ½"	4' - 11 ¾"	12' - 8"	14' - 7 ½"	368	3.5	4' - 10"	104	1.5
	36"	12' - 1"	5' - 3 ¼"	13' - 8"	15' - 9 ¼"	411	4.0	5' - 3 ¼"	115	1.7
	42"	13' - 10"	5' - 10 ½"	15' - 8"	18' - 1"	495	5.1	6' - 0 ½"	144	2.2
	48"	16' - 2 ¼"	6' - 5 ¾"	18' - 8"	21' - 6 ¾"	612	6.8	6' - 9 ¾"	183	3.0
	54"	17' - 11 ¼"	7' - 1"	20' - 8"	23' - 10 ¾"	729	8.2	7' - 9 ¼"	231	3.7
	60"	19' - 8 ¼"	7' - 8 ¼"	22' - 8"	26' - 2"	824	9.8	8' - 6 ½"	270	4.4
	66"	21' - 5 ½"	8' - 3 ½"	24' - 8"	28' - 5 ¾"	947	11.4	9' - 0 ¾"	305	5.0
	72"	23' - 2 ½"	8' - 10 ¾"	26' - 8"	30' - 9 ½"	1,060	13.2	9' - 8"	342	5.7
6:1	12"	6' - 6 ¾"	2' - 8 ¾"	8' - 0"	9' - 9 ¾"	192	1.4	1' - 9 ¾"	30	0.4
	15"	7' - 8 ¾"	3' - 0 ¼"	10' - 0"	11' - 6 ½"	230	1.9	2' - 3"	40	0.5
	18"	8' - 10 ¾"	3' - 4"	11' - 6"	13' - 3 ¼"	281	2.4	2' - 9 ¼"	51	0.7
	21"	10' - 0 ¾"	3' - 7 ½"	13' - 0"	15' - 0 ¼"	334	2.9	3' - 2 ¼"	69	1.0
	24"	11' - 4 ¼"	4' - 0 ¾"	14' - 6"	16' - 9"	377	3.5	3' - 8 ½"	83	1.3
	27"	12' - 6 ¼"	4' - 4 ½"	16' - 0"	18' - 5 ¾"	428	4.2	4' - 0 ¾"	98	1.5
	30"	13' - 8 ¼"	4' - 8"	17' - 6"	20' - 2 ½"	488	4.9	4' - 5 ¾"	113	1.8
	33"	14' - 10 ¼"	4' - 11 ¾"	19' - 0"	21' - 11 ¼"	551	5.7	4' - 10"	130	2.0
	36"	16' - 0 ¼"	5' - 3 ¼"	20' - 6"	23' - 8"	606	6.5	5' - 3 ¼"	145	2.4
	42"	18' - 4 ½"	5' - 10 ½"	23' - 6"	27' - 1 ½"	740	8.4	6' - 0 ½"	184	3.1
	48"	21' - 6 ¾"	6' - 5 ¾"	28' - 0"	32' - 4"	946	11.4	6' - 9 ¾"	240	4.1
	54"	23' - 10 ¾"	7' - 1"	31' - 0"	35' - 9 ½"	1,124	13.8	7' - 9 ¼"	303	5.2
	60"	26' - 2 ¾"	7' - 8 ¼"	34' - 0"	39' - 3"	1,278	16.4	8' - 6 ½"	358	6.2

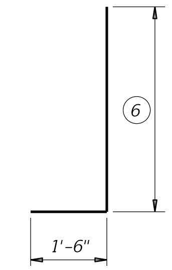


ELEVATION

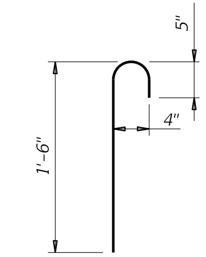
(Showing dimensions.)



BARS CL
(Length = 2'-5")



BARS VL and VS



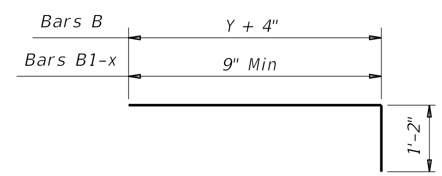
BARS CS
(Length = 2'-3")

TABLE OF REINFORCING STEEL (5)

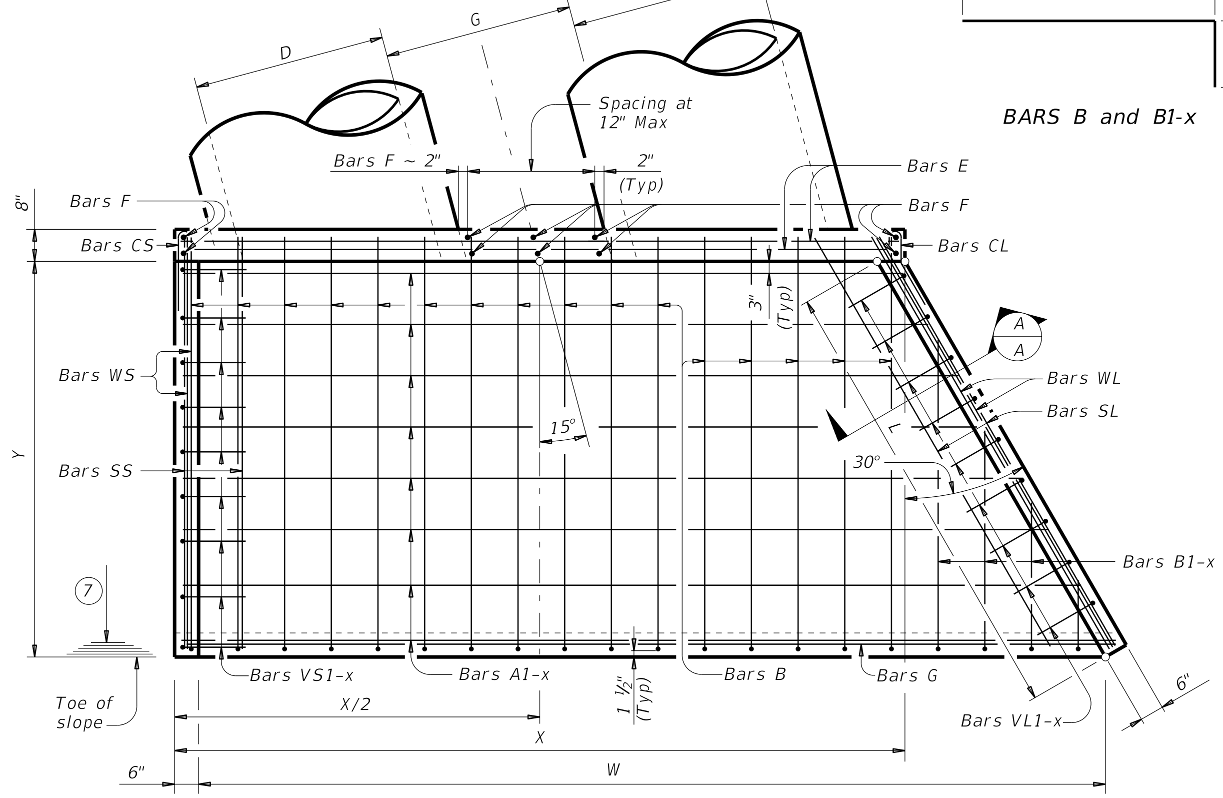
Bar	Size	Spa	No.
A	#4	1' - 0"	~
B	#3	1' - 6"	~
CL & CS	#4	1' - 0"	~
D	#3	1' - 0"	~
E	#5	~	4
F	#5	~	~
G	#3	~	2
SL & SS	#4	~	6
VL & VS	#4	1' - 0"	~
WL & WS	#5	~	4

TABLE OF CONSTANT DIMENSIONS

Dia of Pipe (D)	G	K (4)	H
12"	0' - 9"	1' - 0"	2' - 0"
15"	0' - 11"	1' - 0"	2' - 3"
18"	1' - 2"	1' - 0"	2' - 6"
21"	1' - 4"	1' - 0"	2' - 9"
24"	1' - 7"	1' - 0"	3' - 0"
27"	1' - 8"	1' - 0"	3' - 3"
30"	1' - 10"	1' - 0"	3' - 6"
33"	1' - 11"	1' - 0"	3' - 9"
36"	2' - 1"	1' - 0"	4' - 0"
42"	2' - 4"	1' - 0"	4' - 6"
48"	2' - 7"	1' - 3"	5' - 3"
54"	3' - 0"	1' - 3"	5' - 9"
60"	3' - 3"	1' - 3"	6' - 3"
66"	3' - 3"	1' - 3"	6' - 9"
72"	3' - 4"	1' - 3"	7' - 3"



BARS B and B1-x



PLAN

(1) Quantities shown are for concrete pipe and will increase slightly for metal pipe installations.

(2) For vehicle safety, construct curbs no more than 3" above finished grade. Reduce curb heights, if necessary, to meet these requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

(3) Provide a 1'-0" footing as shown where required to maintain 4" minimum cover for pipes.

(4) Dimensions shown are usual and maximum.

(5) Quantities shown are for one structure end only (one headwall).

(6) Min Length = 6" + 3" x $\left(\frac{12 \times H - 7}{12 \times L}\right)$

Max Length = 12 x H - 3" x $\left(\frac{12 \times H - 7}{12 \times L}\right)$ - 1"

(7) Lengths of wings based on SL:1 slope along this line.

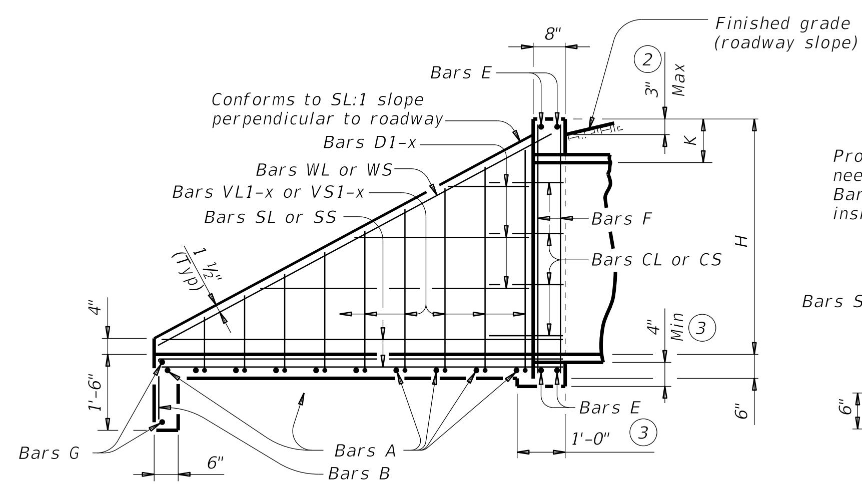
MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
Provide Class C concrete (f'c = 3,600 psi).

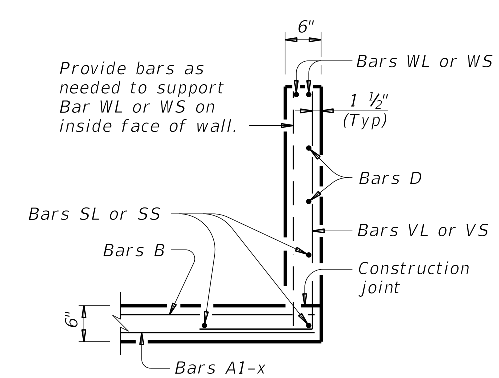
GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
Do not mount bridge rails of any type directly to these culvert headwalls.
This standard may not be used for wall heights, H, exceeding the values shown.

Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing dimensions are out-to-out of bars.



TYPICAL WING ELEVATION



SECTION A-A

Texas Department of Transportation
Bridge Division Standard

CONCRETE HEADWALLS WITH FLARED WINGS FOR 15° SKEW PIPE CULVERTS

CH-FW-15

FILE: chfw15se-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT 0091	SECT 10	JOB 002	HIGHWAY FS 121
REVISIONS	DIST PAR		COUNTY GRAYSON	SHEET NO. 187

DATE: 7/15/2021 8:09:44 PM
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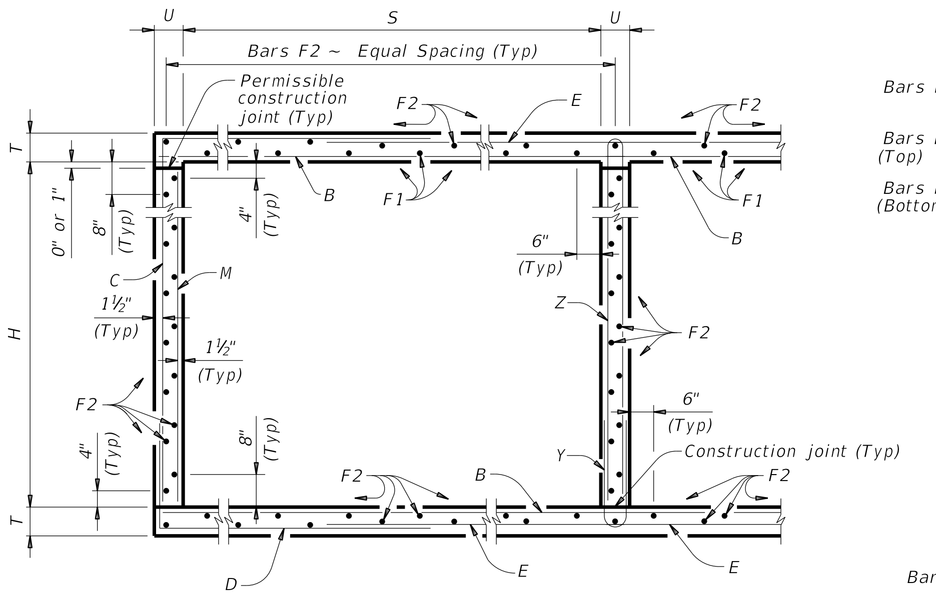
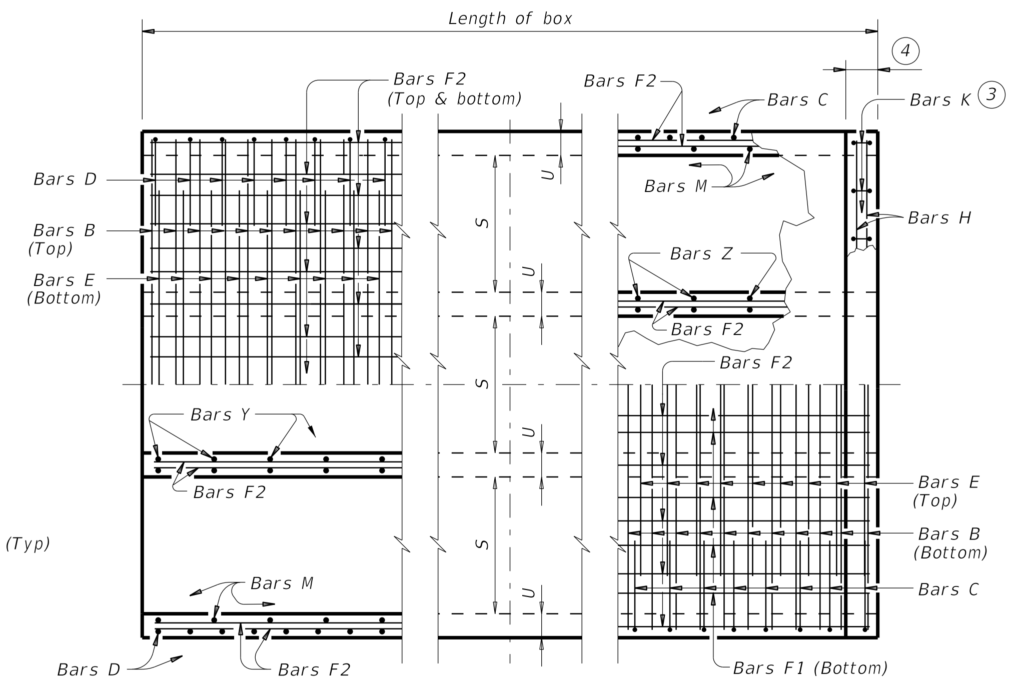


TYPICAL SECTION



BOTTOM SLAB

TOP SLAB

PART PLANS

(1) 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Rail Anchorage Curb (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.

(2) For vehicle safety, the following requirements must be met:
- For structures without bridge rail, construct curbs no more than 3" above finished grade.
- For structures with bridge rail, construct curbs flush with finished grade.

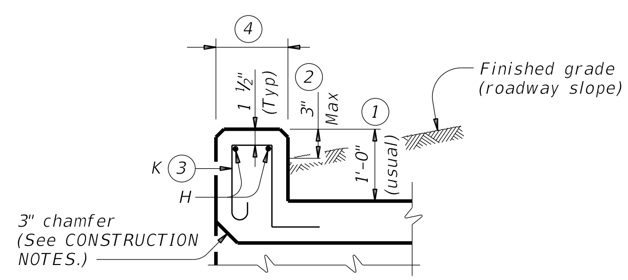
Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

(3) For curbs less than 1'-0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.

(4) 1'-0" typical. 2'-3" when the Rail Anchorage Curb (RAC) standard sheet is referred to elsewhere in the plans.

The Contractor may replace Bars B, C, D, E, F1, F2, M, Y, and/or Z with deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064. The area of required reinforcement may be reduced by the ratio of 60 ksi / 70 ksi. Spacing of WWR is limited to 4" Min and 18" Max. When required, provide lap splices in the WWR of the same length required for the equivalent bar size, rounded up for wire sizes between conventional bar sizes. The lap length required for WWR is never less than the lap length required for uncoated #4 bars.

Example conversion: Replacing No. 6 Gr 60 at 6" Spacing with WWR
Required WWR = (0.44 sq. in. per 0.5 ft.) x (60 ksi / 70 ksi) = 0.755 sq. in. per ft.
If D30.6 wire is used to meet the 0.755 sq. in. per ft. requirement in this example, the required spacing = (0.306 sq. in.) / (0.755 sq. in. per ft.) x (12 in. per ft.) = 4.86" Max spacing. Required lap length for the provided D30.6 wire is 2'-1" (the same minimum lap length required for uncoated #5 bars, as listed under MATERIAL NOTES).



SECTION THRU CURB

TABLE OF BAR DIMENSIONS

H	"X"	"Y"
3'-0"	3'-6 ½"	4'-5"
4'-0"	4'-6 ½"	4'-5"
5'-0"	5'-6 ½"	4'-5"
6'-0"	6'-6 ½"	4'-5"
7'-0"	7'-6 ½"	4'-5"

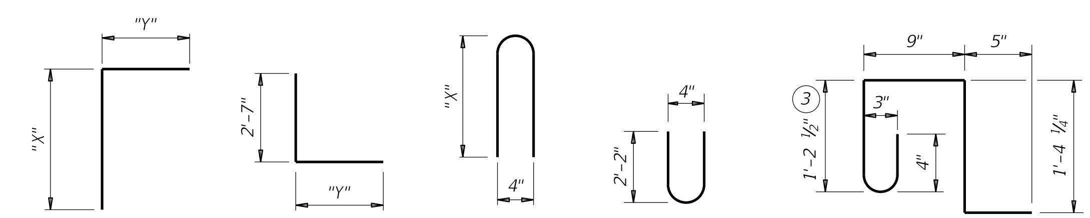
CONSTRUCTION NOTES:
Do not use permanent forms.
Chamfer the bottom edge of the top slab 3" at the entrance.
Optionally, raise construction joints shown at the flow line by a maximum of 6". If this option is taken, Bars M may be cut off or raised, Bars C and D may be reversed, and Bars Y and Z may be reversed.

MATERIAL NOTES:
Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Provide Class C concrete (f'c = 3,600 psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete (f'c = 4,000 psi) for top slabs of:
- culverts with overlay,
- culverts with 1-to-2 course surface treatment, or
- culverts with the top slab as the final riding surface.

Provide bar laps, where required, as follows:
- Uncoated or galvanized ~ #4 = 1'-8" Min
- Uncoated or galvanized ~ #5 = 2'-1" Min
- Uncoated or galvanized ~ #6 = 2'-6" Min

GENERAL NOTES:
Designed according to AASHTO LRFD Bridge Design Specifications for the range of fill heights shown.
See the Multiple Box Culverts Cast-In-Place Miscellaneous Detail (MC-MD) standard sheet for details pertaining to skewed ends, angle sections, and lengthening.

Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.



BARS C BARS D BARS Z BARS Y BARS K (#4)
(Spa = 1'-0" Max)
(Length = 4'-2")

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation — Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE
7'-0" SPAN
0' TO 10' FILL

MC-7-10

FILE: mc710ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT 0091	SECT 10	JOB 002	HIGHWAY FS 121
REVISIONS	DIST PAR	COUNTY GRAYSON		SHEET NO. 188

NUMBER OF SPANS	SECTION DIMENSIONS				BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																																								QUANTITIES					
					Bars B					Bars C & D							Bars E					Bars F1 ~ #4				Bars F2 ~ #4				Bars M ~ #4				Bars Y & Z ~ #4						Bars H 4 ~ #4		Bars K		Per Foot of Barrel		Curb		Total	
													Bars C		Bars D																					Bars Y		Bars Z											
	S	H	T	U	No.	Size	Spa	Length	Wt	No.	Size	Spa	Length	Wt	Length	Wt	No.	Size	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	Length	Wt	Length	Wt	No.	Wt	Conc (CY)	Renf (Lb)	Conc (CY)	Renf (Lb)	Conc (CY)	Renf (Lb)
2	7' - 0"	3' - 0"	8"	7"	108	#6	9"	15' - 6"	2,514	162	#5	6"	7' - 11"	1,338	7' - 0"	1,183	108	#6	9"	11' - 5"	1,852	10	18"	39' - 9"	266	54	18"	39' - 9"	1,434	108	9"	3' - 0"	216	54	9"	4' - 7"	165	7' - 3"	262	15' - 6"	41	34	95	0.972	230.8	1.2	136	40.0	9,366
3	7' - 0"	3' - 0"	8"	7"	108	#6	9"	23' - 1"	3,744	162	#5	6"	7' - 11"	1,338	7' - 0"	1,183	108	#6	9"	19' - 0"	3,082	15	18"	39' - 9"	398	77	18"	39' - 9"	2,045	108	9"	3' - 0"	216	108	9"	4' - 7"	331	7' - 3"	523	23' - 1"	62	50	139	1.412	321.5	1.7	201	58.2	13,061
4	7' - 0"	3' - 0"	8"	7"	108	#6	9"	30' - 8"	4,975	162	#5	6"	7' - 11"	1,338	7' - 0"	1,183	108	#6	9"	26' - 7"	4,312	20	18"	39' - 9"	531	100	18"	39' - 9"	2,655	108	9"	3' - 0"	216	162	9"	4' - 7"	496	7' - 3"	785	30' - 8"	82	64	178	1.851	412.3	2.3	260	76.3	16,751
5	7' - 0"	3' - 0"	8"	7"	108	#6	9"	38' - 3"	6,205	162	#5	6"	7' - 11"	1,338	7' - 0"	1,183	108	#6	9"	34' - 2"	5,542	25	18"	39' - 9"	664	123	18"	39' - 9"	3,266	108	9"	3' - 0"	216	216	9"	4' - 7"	661	7' - 3"	1,046	38' - 3"	102	80	223	2.290	503.0	2.8	325	94.4	20,446
6	7' - 0"	3' - 0"	8"	7"	108	#6	9"	45' - 10"	7,435	162	#5	6"	7' - 11"	1,338	7' - 0"	1,183	108	#6	9"	41' - 9"	6,773	30	18"	39' - 9"	797	146	18"	39' - 9"	3,877	108	9"	3' - 0"	216	270	9"	4' - 7"	827	7' - 3"	1,308	45' - 10"	122	94	262	2.729	593.9	3.4	384	112.6	24,138
2	7' - 0"	4' - 0"	8"	7"	108	#6	9"	15' - 6"	2,514	162	#5	6"	8' - 11"	1,507	7' - 0"	1,183	108	#6	9"	11' - 5"	1,852	10	18"	39' - 9"	266	54	18"	39' - 9"	1,434	108	9"	4' - 0"	289	54	9"	4' - 7"	165	9' - 3"	334	15' - 6"	41	34	95	1.037	238.6	1.2	136	42.6	9,680
3	7' - 0"	4' - 0"	8"	7"	108	#6	9"	23' - 1"	3,744	162	#5	6"	8' - 11"	1,507	7' - 0"	1,183	108	#6	9"	19' - 0"	3,082	15	18"	39' - 9"	398	77	18"	39' - 9"	2,045	108	9"	4' - 0"	289	108	9"	4' - 7"	331	9' - 3"	667	23' - 1"	62	50	139	1.498	331.2	1.7	201	61.6	13,447
4	7' - 0"	4' - 0"	8"	7"	108	#6	9"	30' - 8"	4,975	162	#5	6"	8' - 11"	1,507	7' - 0"	1,183	108	#6	9"	26' - 7"	4,312	20	18"	39' - 9"	531	100	18"	39' - 9"	2,655	108	9"	4' - 0"	289	162	9"	4' - 7"	496	9' - 3"	1,001	30' - 8"	82	64	178	1.959	423.7	2.3	260	80.6	17,209
5	7' - 0"	4' - 0"	8"	7"	108	#6	9"	38' - 3"	6,205	162	#5	6"	8' - 11"	1,507	7' - 0"	1,183	108	#6	9"	34' - 2"	5,542	25	18"	39' - 9"	664	123	18"	39' - 9"	3,266	108	9"	4' - 0"	289	216	9"	4' - 7"	661	9' - 3"	1,335	38' - 3"	102	80	223	2.420	516.3	2.8	325	99.6	20,977
6	7' - 0"	4' - 0"	8"	7"	108	#6	9"	45' - 10"	7,435	162	#5	6"	8' - 11"	1,507	7' - 0"	1,183	108	#6	9"	41' - 9"	6,773	30	18"	39' - 9"	797	146	18"	39' - 9"	3,877	108	9"	4' - 0"	289	270	9"	4' - 7"	827	9' - 3"	1,668	45' - 10"	122	94	262	2.881	608.9	3.4	384	118.6	24,740
2	7' - 0"	5' - 0"	8"	7"	108	#6	9"	15' - 6"	2,514	162	#5	6"	9' - 11"	1,676	7' - 0"	1,183	108	#6	9"	11' - 5"	1,852	10	18"	39' - 9"	266	60	18"	39' - 9"	1,593	108	9"	5' - 0"	361	54	9"	4' - 7"	165	11' - 3"	406	15' - 6"	41	34	95	1.102	250.4	1.2	136	45.2	10,152
3	7' - 0"	5' - 0"	8"	7"	108	#6	9"	23' - 1"	3,744	162	#5	6"	9' - 11"	1,676	7' - 0"	1,183	108	#6	9"	19' - 0"	3,082	15	18"	39' - 9"	398	85	18"	39' - 9"	2,257	108	9"	5' - 0"	361	108	9"	4' - 7"	331	11' - 3"	812	23' - 1"	62	50	139	1.584	346.1	1.7	201	65.1	14,045
4	7' - 0"	5' - 0"	8"	7"	108	#6	9"	30' - 8"	4,975	162	#5	6"	9' - 11"	1,676	7' - 0"	1,183	108	#6	9"	26' - 7"	4,312	20	18"	39' - 9"	531	110	18"	39' - 9"	2,921	108	9"	5' - 0"	361	162	9"	4' - 7"	496	11' - 3"	1,217	30' - 8"	82	64	178	2.067	441.8	2.3	260	85.0	17,932
5	7' - 0"	5' - 0"	8"	7"	108	#6	9"	38' - 3"	6,205	162	#5	6"	9' - 11"	1,676	7' - 0"	1,183	108	#6	9"	34' - 2"	5,542	25	18"	39' - 9"	664	135	18"	39' - 9"	3,585	108	9"	5' - 0"	361	216	9"	4' - 7"	661	11' - 3"	1,623	38' - 3"	102	80	223	2.549	537.5	2.8	325	104.8	21,825
6	7' - 0"	5' - 0"	8"	7"	108	#6	9"	45' - 10"	7,435	162	#5	6"	9' - 11"	1,676	7' - 0"	1,183	108	#6	9"	41' - 9"	6,773	30	18"	39' - 9"	797	160	18"	39' - 9"	4,248	108	9"	5' - 0"	361	270	9"	4' - 7"	827	11' - 3"	2,029	45' - 10"	122	94	262	3.032	633.2	3.4	384	124.7	25,713
2	7' - 0"	6' - 0"	8"	7"	108	#6	9"	15' - 6"	2,514	162	#5	6"	10' - 11"	1,845	7' - 0"	1,183	108	#6	9"	11' - 5"	1,852	10	18"	39' - 9"	266	66	18"	39' - 9"	1,752	108	9"	6' - 0"	433	54	9"	4' - 7"	165	13' - 3"	478	15' - 6"	41	34	95	1.167	262.2	1.2	136	47.8	10,624
3	7' - 0"	6' - 0"	8"	7"	108	#6	9"	23' - 1"	3,744	162	#5	6"	10' - 11"	1,845	7' - 0"	1,183	108	#6	9"	19' - 0"	3,082	15	18"	39' - 9"	398	93	18"	39' - 9"	2,469	108	9"	6' - 0"	433	108	9"	4' - 7"	331	13' - 3"	956	23' - 1"	62	50	139	1.671	361.0	1.7	201	68.6	14,642
4	7' - 0"	6' - 0"	8"	7"	108	#6	9"	30' - 8"	4,975	162	#5	6"	10' - 11"	1,845	7' - 0"	1,183	108	#6	9"	26' - 7"	4,312	20	18"	39' - 9"	531	120	18"	39' - 9"	3,186	108	9"	6' - 0"	433	162	9"	4' - 7"	496	13' - 3"	1,434	30' - 8"	82	64	178	2.175	459.9	2.3	260	89.3	18,655
5	7' - 0"	6' - 0"	8"	7"	108	#6	9"	38' - 3"	6,205	162	#5	6"	10' - 11"	1,845	7' - 0"	1,183	108	#6	9"	34' - 2"	5,542	25	18"	39' - 9"	664	147	18"	39' - 9"	3,903	108	9"	6' - 0"	433	216	9"	4' - 7"	661	13' - 3"	1,912	38' - 3"	102	80	223	2.679	558.7	2.8	325	110.0	22,673
6	7' - 0"	6' - 0"	8"	7"	108	#6	9"	45' - 10"	7,435	162	#5	6"	10' - 11"	1,845	7' - 0"	1,183	108	#6	9"	41' - 9"	6,773	30	18"	39' - 9"	797	174	18"	39' - 9"	4,620	108	9"	6' - 0"	433	270	9"	4' - 7"	827	13' - 3"	2,390	45' - 10"	122	94	262	3.183	657.6	3.4	384	130.7	26,687
2	7' - 0"	7' - 0"	8"	7"	108	#6	9"	15' - 6"	2,514	162	#5	6"	11' - 11"	2,014	7' - 0"	1,183	108	#6	9"	11' - 5"	1,852	10	18"	39' - 9"	266	66	18"	39' - 9"	1,752	108	9"	7' - 0"	505	54	9"	4' - 7"	165	15' - 3"	550	15' - 6"	41	34	95	1.231	270.0	1.2	136	50.4	10,937
3	7' - 0"	7' - 0"	8"	7"	108	#6	9"	23' - 1"	3,744	162	#5	6"	11' - 11"	2,014	7' - 0"	1,183	108	#6	9"	19' - 0"	3,082	15	18"	39' - 9"	398	93	18"	39' - 9"	2,469	108	9"	7' - 0"	505	108	9"	4' - 7"	331	15' - 3"	1,100	23' - 1"	62	50	139	1.757	370.7	1.7	201	72.0	15,027
4	7' - 0"	7' - 0"	8"	7"	108	#6	9"	30' - 8"	4,975	162	#5	6"	11' - 11"	2,014	7' - 0"	1,183	108	#6	9"	26' - 7"	4,312	20	18"	39' - 9"	531	120	18"	39' - 9"	3,186	108	9"	7' - 0"	505	162	9"	4' - 7"	496	15' - 3"	1,650	30' - 8"	82	64	178	2.283	471.3	2.3	260	93.6	19,112
5	7' - 0"	7' - 0"	8"	7"	108	#6	9"	38' - 3"	6,205	162	#5	6"	11' - 11"	2,014	7' - 0"	1,183	108	#6	9"	34' - 2"	5,542	25	18"	39' - 9"	664	147	18"	39' - 9"	3,903	108	9"	7' - 0"	505	216	9"	4' - 7"	661	15' - 3"	2,200	38' - 3"	102	80	223	2.809	571.9	2.8	325	115.2	23,202
6	7' - 0"	7' - 0"	8"	7"	108	#6	9"	45' - 10"	7,435	162	#5	6"	11' - 11"	2,014	7' - 0"	1,183	108	#6	9"	41' - 9"	6,773	30	18"	39' - 9"	797	174	18"	39' - 9"	4,620	108	9"	7' - 0"	505	270	9"	4' - 7"	827	15' - 3"	2,750	45' - 10"	122	94	262	3.334	672.6	3.4	384	136.8	27,288

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HL93 LOADING   SHEET 2 OF 2

Texas Department of Transportation   Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE

7'-0" SPAN
0' TO 10' FILL

MC-7-10

FILE: mc710ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0091	10	002	FS 121
	DIST		COUNTY	SHEET NO.
	PAR		GRAYSON	189

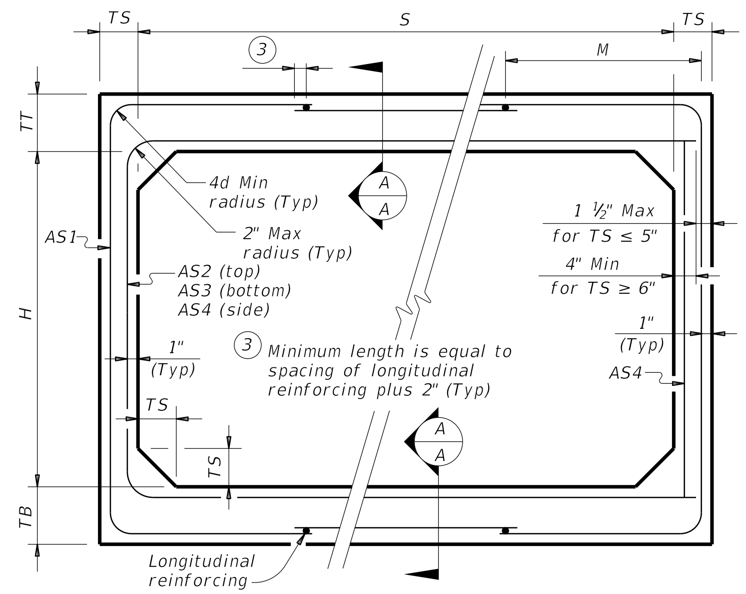
DATE: 7/15/2021 8:11:41 PM
FILE: \\epwl1\ics01\ICS*pdf*work*dir\453\33788*15\scp03sts-20.dgn

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

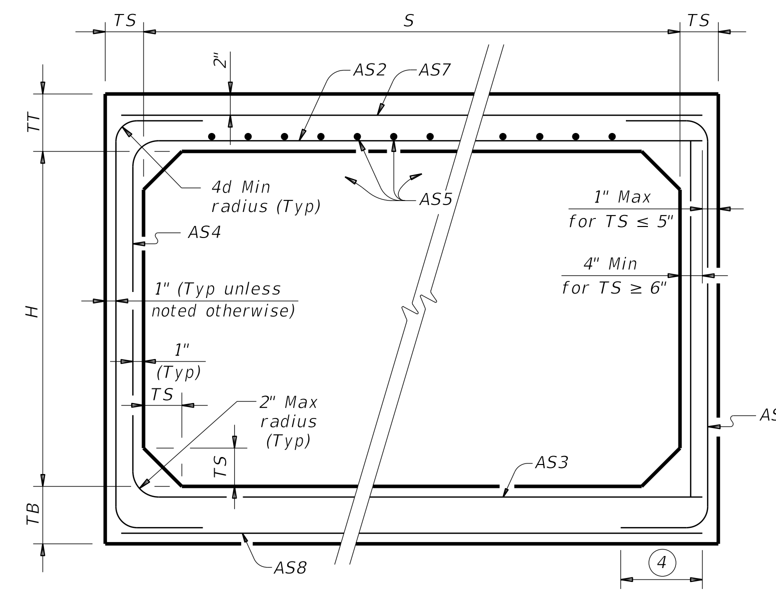
(1) For box length = 8'-0"

(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"

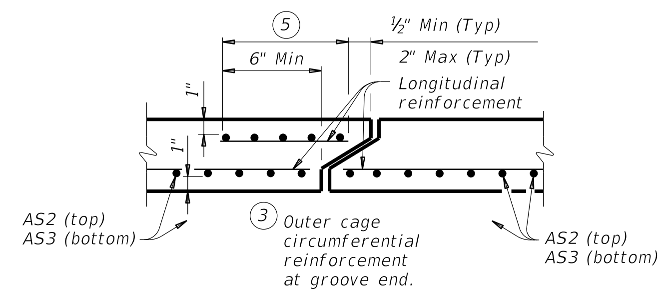
FILL HEIGHT 2 FT AND GREATER



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

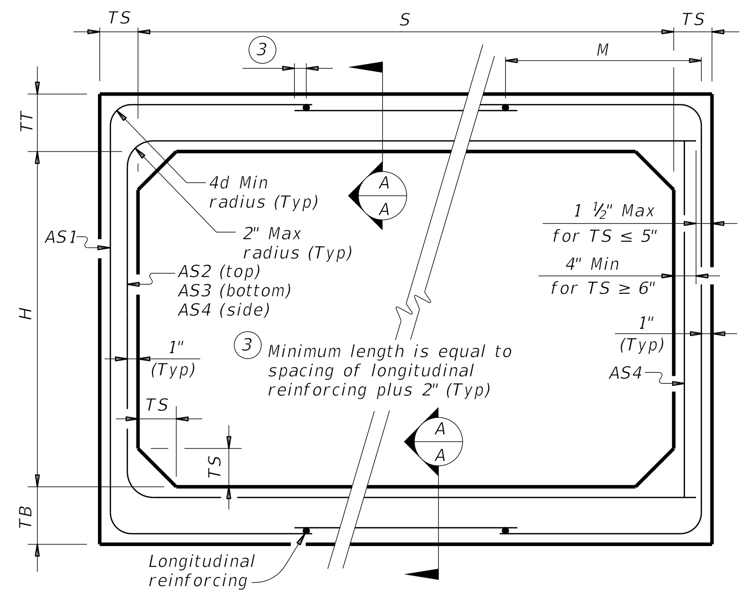
FILE: scp03sts-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0091	10	002	FS 121
	DIST	COUNTY		SHEET NO.
	PAR	GRAYSON		190

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

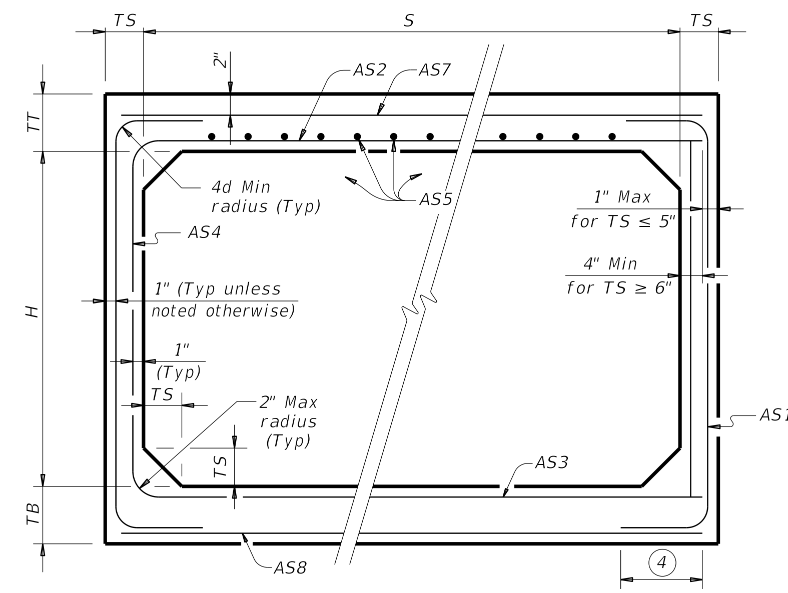
(1) For box length = 8'-0"

(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"

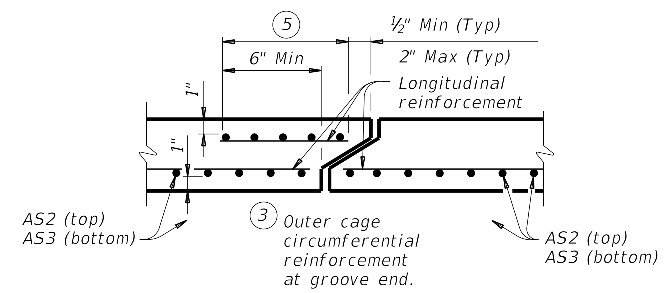
FILL HEIGHT 2 FT AND GREATER



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

4'-0" SPAN

SCP-4

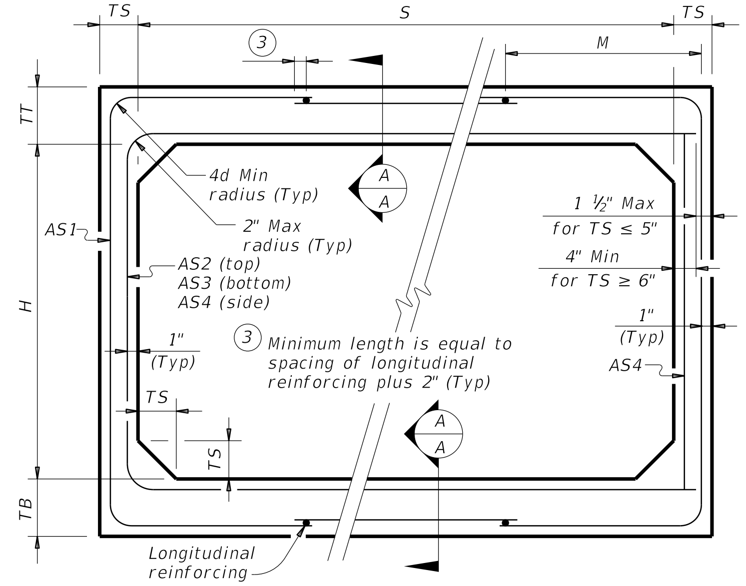
FILE: scp04sts-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0091	10	002	FS 121
	DIST		COUNTY	SHEET NO.
	PAR		GRAYSON	191

BOX DATA

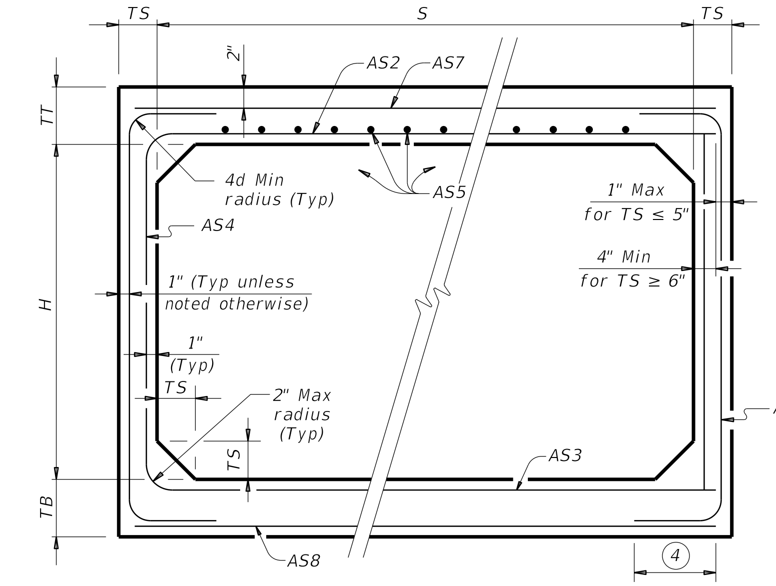
SECTION DIMENSIONS					Fill Height	M (Min)	REINFORCING (sq. in. / ft.) (2)							(1) Lift Weight
S (ft.)	H (ft.)	TT (in.)	TB (in.)	TS (in.)	(ft.)	(in.)	AS1	AS2	AS3	AS4	AS5	AS7	AS8	(tons)
6	2	8	7	7	< 2	–	0.23	0.27	0.19	0.17	0.19	0.19	0.17	7.2
6	2	7	7	7	2 < 3	43	0.25	0.21	0.17	0.17	–	–	–	6.8
6	2	7	7	7	3 – 5	43	0.20	0.17	0.17	0.17	–	–	–	6.8
6	2	7	7	7	10	39	0.20	0.17	0.17	0.17	–	–	–	6.8
6	2	7	7	7	15	39	0.26	0.20	0.20	0.17	–	–	–	6.8
6	2	7	7	7	20	39	0.34	0.26	0.26	0.17	–	–	–	6.8
6	2	7	7	7	25	39	0.43	0.32	0.32	0.17	–	–	–	6.8
6	2	7	7	7	30	39	0.52	0.38	0.39	0.17	–	–	–	6.8
6	3	8	7	7	< 2	–	0.20	0.31	0.22	0.17	0.19	0.19	0.17	7.9
6	3	7	7	7	2 < 3	43	0.21	0.24	0.19	0.17	–	–	–	7.5
6	3	7	7	7	3 – 5	39	0.17	0.18	0.17	0.17	–	–	–	7.5
6	3	7	7	7	10	39	0.17	0.18	0.19	0.17	–	–	–	7.5
6	3	7	7	7	15	38	0.22	0.24	0.24	0.17	–	–	–	7.5
6	3	7	7	7	20	38	0.28	0.31	0.31	0.17	–	–	–	7.5
6	3	7	7	7	25	38	0.35	0.38	0.39	0.17	–	–	–	7.5
6	3	7	7	7	30	38	0.42	0.46	0.46	0.17	–	–	–	7.5
6	4	8	7	7	< 2	–	0.19	0.34	0.25	0.17	0.19	0.19	0.17	8.6
6	4	7	7	7	2 < 3	43	0.19	0.27	0.21	0.17	–	–	–	8.2
6	4	7	7	7	3 – 5	39	0.17	0.21	0.19	0.17	–	–	–	8.2
6	4	7	7	7	10	39	0.17	0.20	0.21	0.17	–	–	–	8.2
6	4	7	7	7	15	38	0.18	0.27	0.27	0.17	–	–	–	8.2
6	4	7	7	7	20	38	0.24	0.34	0.35	0.17	–	–	–	8.2
6	4	7	7	7	25	38	0.29	0.43	0.42	0.17	–	–	–	8.2
6	4	7	7	7	30	38	0.35	0.51	0.52	0.17	–	–	–	8.2
6	5	8	7	7	< 2	–	0.19	0.37	0.28	0.17	0.19	0.19	0.17	9.3
6	5	7	7	7	2 < 3	43	0.17	0.30	0.24	0.17	–	–	–	8.9
6	5	7	7	7	3 – 5	43	0.17	0.23	0.21	0.17	–	–	–	8.9
6	5	7	7	7	10	39	0.17	0.22	0.23	0.17	–	–	–	8.9
6	5	7	7	7	15	38	0.17	0.28	0.29	0.17	–	–	–	8.9
6	5	7	7	7	20	38	0.20	0.37	0.38	0.17	–	–	–	8.9
6	5	7	7	7	25	38	0.25	0.45	0.46	0.17	–	–	–	8.9
6	5	7	7	7	30	38	0.30	0.54	0.55	0.17	–	–	–	8.9
6	6	8	7	7	< 2	–	0.19	0.38	0.30	0.17	0.19	0.19	0.17	10
6	6	7	7	7	2 < 3	52	0.17	0.32	0.26	0.17	–	–	–	9.6
6	6	7	7	7	3 – 5	52	0.17	0.24	0.22	0.17	–	–	–	9.6
6	6	7	7	7	10	43	0.17	0.23	0.24	0.17	–	–	–	9.6
6	6	7	7	7	15	39	0.17	0.29	0.31	0.17	–	–	–	9.6
6	6	7	7	7	20	39	0.18	0.38	0.39	0.17	–	–	–	9.6
6	6	7	7	7	25	38	0.23	0.46	0.48	0.17	–	–	–	9.6
6	6	7	7	7	30	38	0.27	0.55	0.57	0.17	–	–	–	9.6

(1) For box length = 8'-0"

(2) AS1 thru AS4, AS7 and AS8 are minimum required areas of reinforcement per linear foot of box length. AS5 is minimum required area of reinforcement per linear foot of box width.

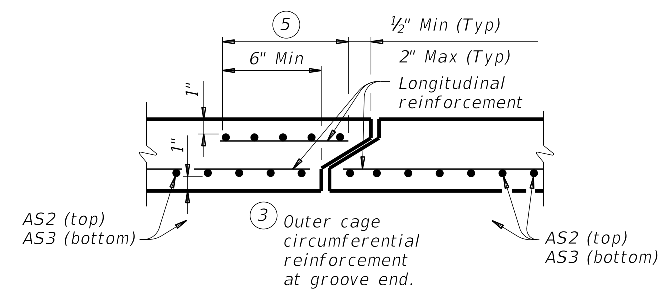


FILL HEIGHT 2 FT AND GREATER



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 6'-0" SPAN

SCP-6

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REVISIONS	0091	10	002	FS 121
	DIST	COUNTY		SHEET NO.
	PAR	GRAYSON		192

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TABLE OF DIMENSIONS AND REINFORCING STEEL
(Wings for One Structure End)

Dimensions					Variable Reinforcing				Estimated Quantities per ft of wing length (Two~Wings) (3)	
					Bars J1		Bars J2			
Maximum Wingwall Height Hw (9)	W	X	Y	Z	Size	Spa	Size	Spa	Reinf (Lb/Ft)	Conc (CY/Ft)
2'-6"	2'- 5"	1'- 0"	9"	7"	#4	1'-0"	#4	1'-0"	33.73	0.248
3'-0"	2'- 5"	1'- 0"	9"	7"	#4	1'-0"	#4	1'-0"	37.07	0.261
3'-6"	2'- 5"	1'- 0"	9"	7"	#4	1'-0"	#4	1'-0"	37.74	0.273
4'-0"	2'- 5"	1'- 0"	9"	7"	#4	1'-0"	#4	1'-0"	38.41	0.285
4'-6"	3'- 2"	1'- 6"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	41.75	0.330
5'-0"	3'- 2"	1'- 6"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	45.09	0.343
5'-6"	3'- 2"	1'- 6"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	45.75	0.355
6'-0"	3'- 2"	1'- 6"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	46.42	0.367
7'-0"	3'- 8"	1'- 9"	1'- 3"	7"	#4	1'-0"	#4	1'-0"	52.77	0.414
8'-0"	4'- 2"	2'- 0"	1'- 6"	8"	#5	1'-0"	#4	1'-0"	60.19	0.486
9'-0"	4'- 8"	2'- 3"	1'- 9"	8"	#4	6"	#4	6"	81.49	0.535
10'-0"	5'- 2"	2'- 6"	2'- 0"	8"	#5	6"	#4	6"	97.25	0.584
11'-0"	5'- 8"	2'- 9"	2'- 3"	8"	#6	6"	#5	6"	133.65	0.634
12'-0"	6'- 2"	3'- 0"	2'- 6"	9"	#7	6"	#5	6"	162.29	0.721

TABLE OF WING WALL REINFORCING (Two~Wings)

Bar	Size	No.	Spa
D	#5	~	1'-0"
E	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	4	~
M	#4	4	~
P	#4	~	1'-0"
R	#5	6	~
V	#4	~	1'-0"

TABLE OF ESTIMATED CULVERT TOEWALL QUANTITIES

Bar	Size	No.	Spa
L	#4	~	1'-6"
Q	#4	1	~
Reinf (Lb/Ft)			2.45
Conc (CY/Ft)			0.037

TABLE OF ESTIMATED ANCHOR TOEWALL QUANTITIES

Bar	Size	No.	Spa
K	#4	~	1'-0"
N	#5	6	~
OL	#4	6	~
Reinf (Lb/Ft)			9.82
Conc (CY/Ft)			0.074

(1) Extend Bars P 3'-0" Min into bottom slab of box culvert.

(2) Adjust to fit as necessary to maintain 1 1#2" clear cover and 4" Min between bars.

(3) Quantities shown are based on an average wing height for two wings (one structure end). To determine total quantities for two wings multiply the tabulated values by Lw.

(4) Recommended values of slope are: 3:1, 4:1, and 6:1. Provide 3:1 or flatter slope.

(5) When shown elsewhere on the plans, construct 5" deep concrete riprap. Payment for riprap is as required by Item 432, "Riprap". Unless otherwise shown on the plans or directed by the Engineer, extend construction joints or grooved joints, oriented in the direction of flow, across the full distance of the riprap, at intervals of approximately 20'. When such riprap is provided, the culvert toewall shown in SECTION B-B is not required.

(6) At Contractor's option, end the culvert toewall flush with wingwall toewall. Adjust reinforcing as needed.

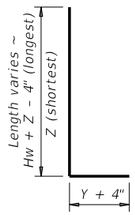
(7) 3" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures without railing and curbs taller than 1'-0", refer to the Extend Curb Details (ECD) standard sheet.

(8) For vehicle safety, reduce curb heights, if necessary, to provide a maximum 3" projection above finished grade. No changes will be made in quantities and no additional compensation will be allowed for this work.

(9) See Table of Maximum Wing Heights for various slopes. Height is limited based on a 33'-6" maximum safety pipe runner length.

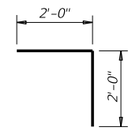
TABLE OF MAXIMUM WING HEIGHTS (9)

Side Slope	Hw Max
3:1	11'- 5"
4:1	8'-10"
6:1	6'- 1"

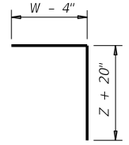


BARS J1

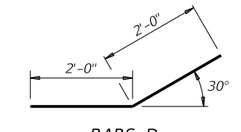
BARS V



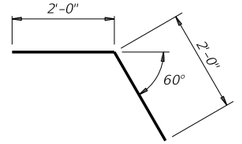
BARS L



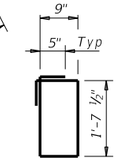
BARS J2



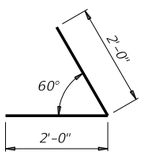
BARS D



BARS R



BARS K
(Length = 5'-5")



BARS OL

WING DIMENSION CALCULATIONS:

Hw = H + T + C - 0.250' (9)
A = (Hw - 0.333') (SL)
B = (A) (tan (30°))
Lw = (A) ÷ cos (30°))

For cast-in-place culverts:
Ltw = (N) (S) + (N + 1) (U)
For precast culverts:
Ltw = (N) (2U + S) + (N - 1) (0.500')

Lc = (Ltw) - (2U)
Atw = (Lc) + (2B)
Total Wingwall Area (two wings ~ SF) = (Hw + 0.333') (Lw)

Hw = Height of wingwall (feet)
Atw = Anchor toewall length (feet)
Lw = Length of wingwall (feet)
N = Number of culvert barrels
SL:1 = Side slope ratio (horizontal : 1 vertical)
Ltw = Culvert toewall length (feet)
Lc = Culvert curb between wings (feet)

See applicable box culvert standard for H, S, T, and U values.
See Table of Maximum Wall Heights for limits on Hw.

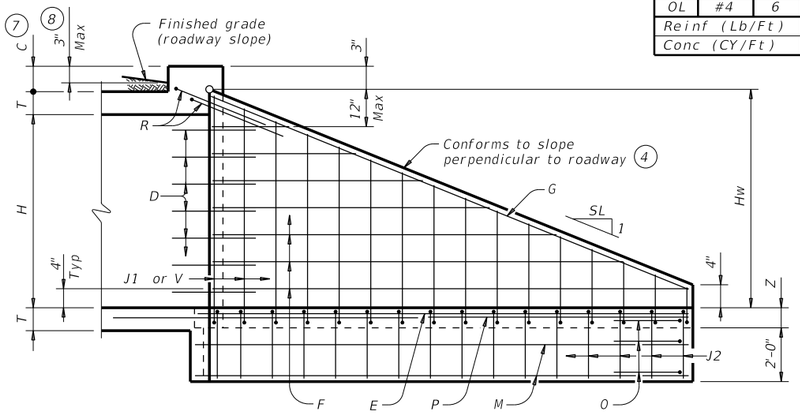
MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in 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.
Provide Class "C" concrete (f`c = 3,600 psi).
Adjust reinforcing as necessary to provide a minimum clear cover of 1 ½".
Provide pipe runners and anchor pipes meeting the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr B, or API 5LX52.
Provide ASTM A307 bolts and nuts.
Provide ASTM A36 steel plates.
Galvanize all steel components, except reinforcing unless required elsewhere in the plans, after fabrication.
Repair galvanizing damaged during transport or construction in accordance with the Item 445, "Galvanizing".
For optional adhesive anchors, install adhesive anchorages in accordance with the manufacturer's instructions including hole size, drilling equipment and method, hole cleaning equipment and method, mixing and dispensing adhesive, and anchor insertion. Do not alter the manufacturer's mixing nozzle or dispenser. Provide anchorage rods that are clean and free of grease, oil, or any other foreign material. Demonstrate hole cleaning method to the Engineer for approval and continue the approved process for all anchorage locations. Test adhesive anchors in accordance with Item 450.3.3, "Tests." Test 3 anchors per 100 anchors installed.

GENERAL NOTES:

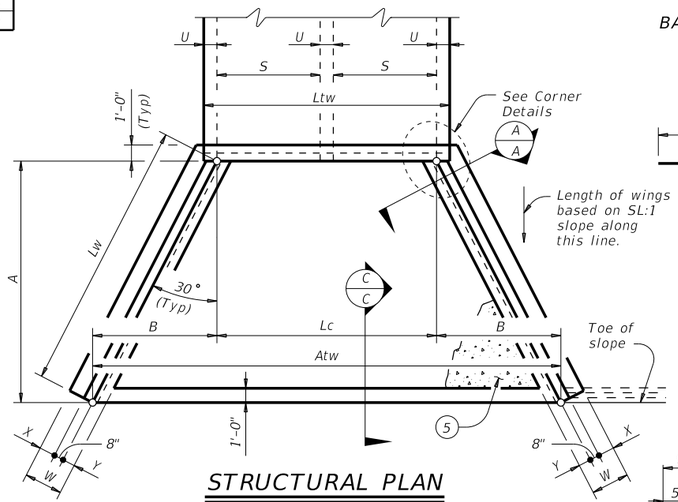
Designed according to AASHTO LRFD Bridge Design Specifications.
The safety end treatments shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the pipe runners.
Pipe runners are designed for a traversing load of 1,800 pounds at yield as recommended by Research Report 280-1, "Safety Treatment of Roadside Cross-Drainage Structures", Texas Transportation Institute, March 1981.
When structure is founded on solid rock, depth of toewalls for culverts and wingwalls may be reduced or eliminated as directed by the Engineer.
All bolts, nuts, washers, brackets, angles, and pipe runners are considered parts of the safety end treatment for payment.
The quantities for pipe runners, reinforcing steel, and concrete, resulting from the formulas given herein are for Contractor's information only.
See the Box Culvert Supplement (BCS) standard sheet for additional dimensions and information.

Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing dimensions are out-to-out of bars.



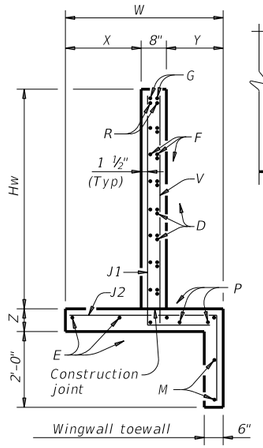
INSIDE ELEVATION OF WINGWALL

(Showing reinforcing. Culvert and culvert toewall reinforcing not shown for clarity.)

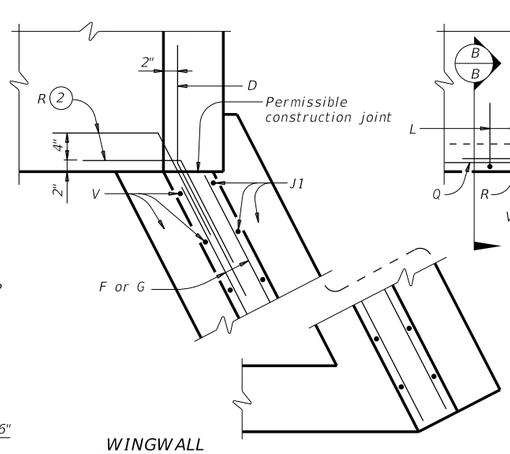


STRUCTURAL PLAN

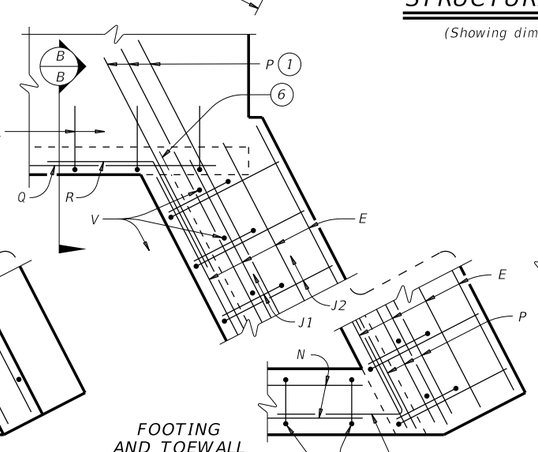
(Showing dimensions.)



SECTION A-A



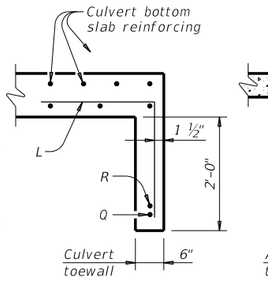
WINGWALL



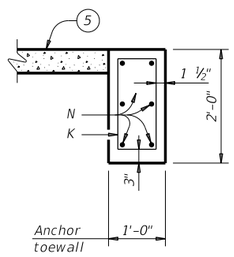
FOOTING AND TOEWALL

CORNER DETAILS

(Culvert and culvert toewall reinforcing not shown for clarity.)



SECTION B-B (5)



SECTION C-C

SHEET 1 OF 3

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT WITH FLARED WINGS

FOR 0° SKEW BOX CULVERTS
TYPE I ~ CROSS DRAINAGE

SETB-FW-0

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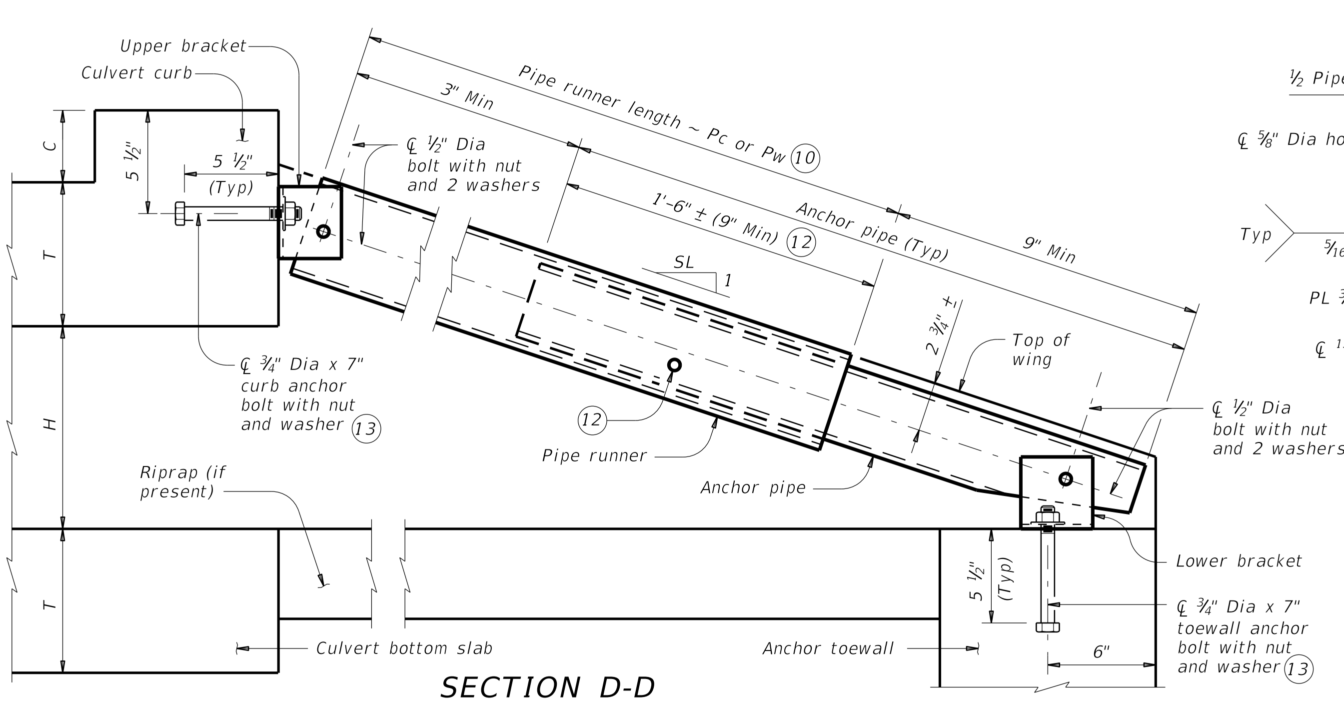
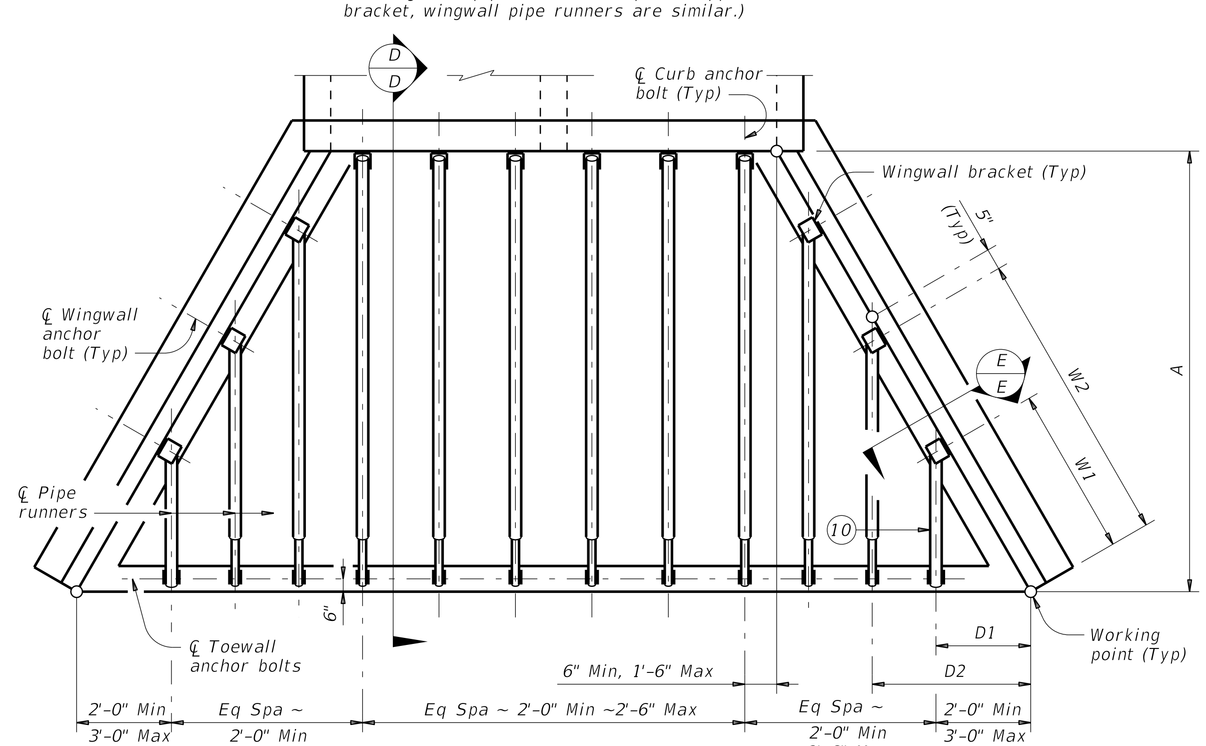
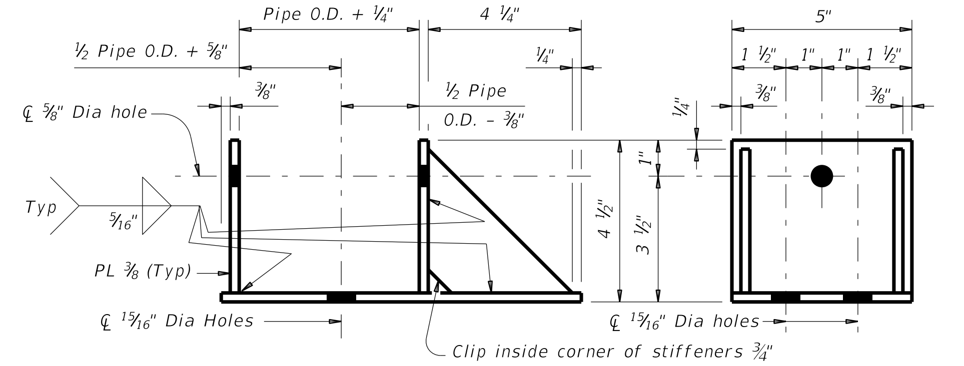


SECTION D-D

(Showing curb pipe runner. Except for upper bracket, wingwall pipe runners are similar.)

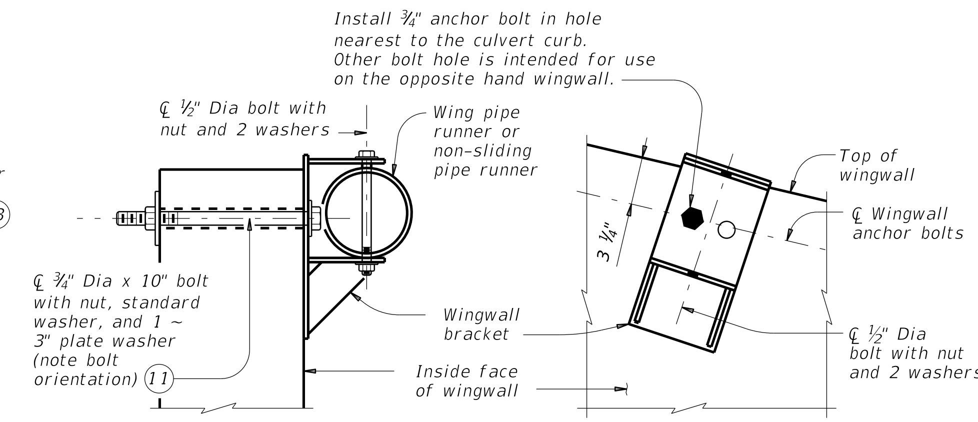


PIPE RUNNER PLAN



ELEVATION

SIDE VIEW

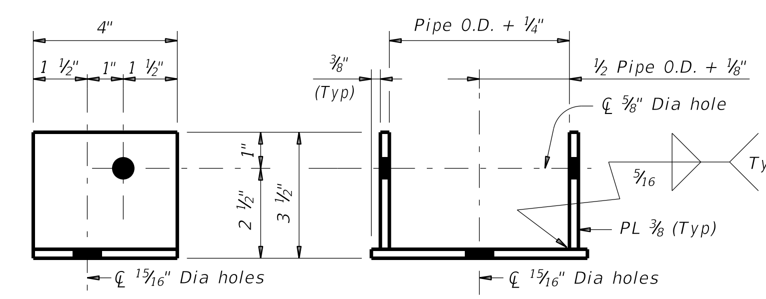


SECTION E-E
(Showing installed bracket.)

ELEVATION
(Showing installed bracket normal to wall. Pipe not shown for clarity.)

Note: Match wingwall bracket to the upper curb bracket size.

WINGWALL BRACKET DETAILS



SIDE VIEW

ELEVATION

Note: Match upper and lower brackets, except for the brackets used with non-sliding pipe runners, to the required pipe diameters as shown in the table.

UPPER AND LOWER BRACKET DETAILS

MAXIMUM PIPE RUNNER LENGTHS AND REQUIRED PIPE RUNNER SIZES						
Maximum Pipe Runner Length (Pc or Pw)	Required Pipe Runner Size			Required Anchor Pipe Size		
	Pipe Size	Pipe O.D.	Pipe I.D.	Pipe Size	Pipe O.D.	Pipe I.D.
9'-4"	3" STD	3.500"	3.068"	2" STD	2.375"	2.067"
19'-0"	4" STD	4.500"	4.026"	3" STD	3.500"	3.068"
33'-6"	5" STD	5.563"	5.047"	4" STD	4.500"	4.026"

(10) If pipe runner length (Pw) is 1'-9" or less replace the normal pipe runner and anchor pipe with a single non-sliding pipe runner. See Non-Sliding Pipe Runner Details for additional information.

(11) At Contractor's option, 7/8" diameter hole may be formed or cored drilled. Percussion drilling is not permitted. Adjust placement of reinforcing steel as necessary to avoid bolt holes.

(12) After installation of pipe runner, use the 1/2" inspection hole to ensure that the lap of the anchor pipe with the pipe runner is adequate.

(13) At Contractor's option, an adhesive anchor may be used. Provide 3/4" Dia adhesive anchors that meet the requirements of ASTM A307 Gr A fully threaded rods. Embed threaded rods into curb, wingwalls, and toewall using a Type III, Class C, D, E, or F anchor adhesive. Minimum embedment depth is 5 1/2". Provide anchor adhesive able to achieve a basic bond strength in tension, Nba, of 20 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.

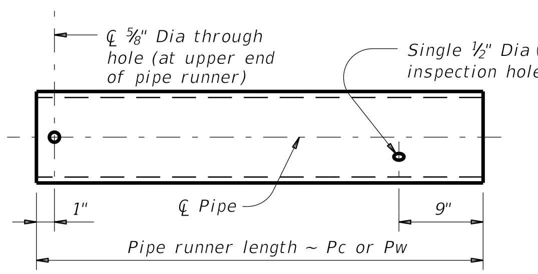
PIPE RUNNER DIMENSION CALCULATIONS:

Wn = (2.000) (Dn) - (0.416')
Pwn = (Dn) (K2) - (2.063')
Pw1 Non-Sliding Pipe Runner (If required) = (D1) (K2) - (0.563')
Pc = (A) (K1) - (1.688')

Wn = Distance from working point to centerline anchor bolt measured along bottom inside face of wing (feet)
Dn = Distance from working point to centerline pipe runner measured along outside face of anchor toewall (feet)
Pw = Wingwall pipe runner length (feet)
Pc = Curb pipe runner length (feet)
K = Constant values for use in formulas

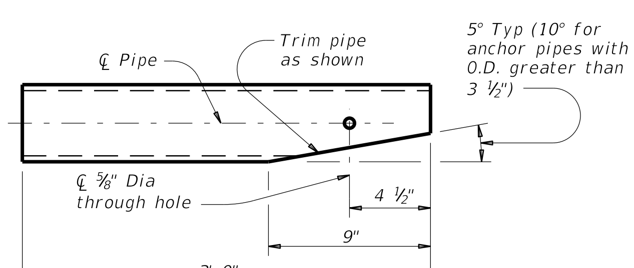
Slope SL:1	K1	K2
3:1	1.054	1.826
4:1	1.031	1.785
6:1	1.014	1.756

n = Wing pipe runner number

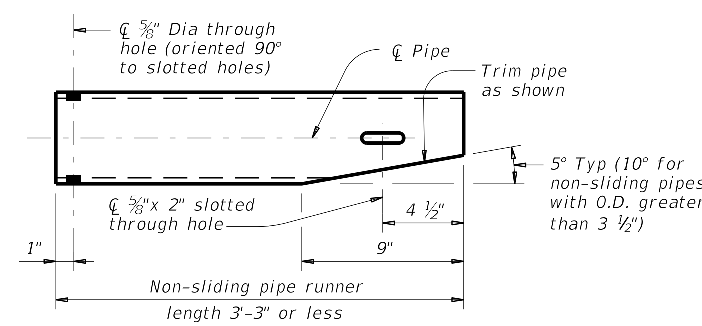


Note: Pipe diameter required for curb pipe runner is also used for wingwall pipe runner.

PIPE RUNNER DETAILS



ANCHOR PIPE DETAILS



Note: Pipe size is the same as required for curb pipe runner. Adjust the corresponding lower bracket accordingly.

NON-SLIDING PIPE RUNNER DETAILS

Texas Department of Transportation — Bridge Division Standard

SAFETY END TREATMENT WITH FLARED WINGS

FOR 0° SKEW BOX CULVERTS
TYPE I ~ CROSS DRAINAGE

SETB-FW-0

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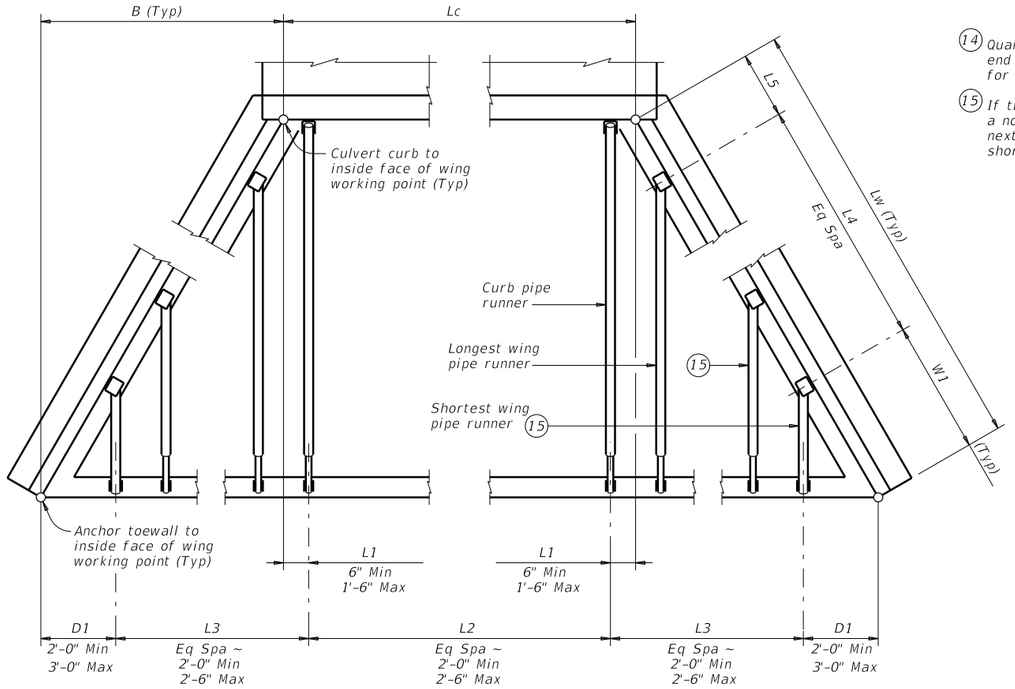
Culvert Station and/or Creek name followed by applicable end (Lt, Rt or Both) (14)	Lc (Ft)	L1 (Ft)	L2 No. Spa	L2 Spa at (Ft)	L2 Overall Length (Ft)	D1 (Ft)	L3 No. Spa	L3 Spa at (Ft)	L3 Overall Length (Ft)	W1 (Ft)	L4 No. Spa	L4 Spa at (Ft)	L4 Overall Length (Ft)	L5 (Ft)	Curb Pipe Runner (Pc) No.	Curb Pipe Runner (Pc) Length (Ft)	Longest Wing Pipe Runner (Pw) (Ft)	Shortest Wing Pipe Runner (Pw) (Ft)	Non-Sliding Wing Pipe Runner (if applicable) (Ft)	Curb, Wing, and/or Non-Sliding Pipe Runners Size (3",4" or 5")	Curb, Wing, and/or Non-Sliding Pipe Runners Total (14) Length (Ft)	3'-0" Anchor Pipe Size (2",3" or 4")	3'-0" Anchor Pipe Total (14) Length (Ft)
STA 3586+46.87 - CULVERT M (Lt)	6.000'	0.500'	2	2.500'	5.000'	3.000'	3	2.438'	7.315'	5.583'	2	4.877'	9.753'	4.293'	3	15.833'	12.000'	3.292'	N/A	4"	93.375'	3"	27.000'
STA 3586+46.87 - CULVERT M (Rt)	6.000'	0.500'	2	2.500'	5.000'	3.000'	5	2.444'	12.222'	5.583'	4	4.889'	19.556'	4.306'	3	24.604'	20.750'	3.292'	N/A	5"	194.021'	4"	39.000'
STA 3592+01.80 - CULVERT N (Both)	3.000'	0.500'	1	2.000'	2.000'	3.000'	1	2.119'	2.119'	5.583'	0	4.238'	0.000'	3.654'	2	6.563'	3.292'	N/A	N/A	3"	39.417'	2"	24.000'



PIPE RUNNER LAYOUT

(14) Quantities shown are for one structure end if Lt or Rt. Quantities shown are for two structure ends if Both.

(15) If the outermost wing pipe runner is a non-sliding pipe runner, consider the next outermost wing pipe runner as the shortest.

STATE OF TEXAS
CURTIS KESTILA
111513
LICENSED
PROFESSIONAL ENGINEER
7/15/2021

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT WITH FLARED WINGS

FOR 0° SKEW BOX CULVERTS TYPE I ~ CROSS DRAINAGE

SETB-FW-0

FILE: setbf0se-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	0091	10	002	FS 121
	DIST	COUNTY		SHEET NO.
	PAR	GRAYSON		195

TABLE OF DIMENSIONS AND REINFORCING STEEL
(Wings for One Structure End)

Dimensions					Variable Reinforcing				Estimated Quantities (3) per ft of wing length (Two~Wings)	
					Bars J1		Bars J2			
Maximum Wingwall Height (10) Hw	W	X	Y	Z	Size	Spa	Size	Spa	Reinf (Lb/Ft)	Conc (CY/Ft)
2'-6"	2'- 5"	1'- 0"	9"	7"	#4	1'-0"	#4	1'-0"	33.73	0.248
3'-0"	2'- 5"	1'- 0"	9"	7"	#4	1'-0"	#4	1'-0"	37.07	0.261
3'-6"	2'- 5"	1'- 0"	9"	7"	#4	1'-0"	#4	1'-0"	37.74	0.273
4'-0"	2'- 5"	1'- 0"	9"	7"	#4	1'-0"	#4	1'-0"	38.41	0.285
4'-6"	3'- 2"	1'- 6"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	41.75	0.330
5'-0"	3'- 2"	1'- 6"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	45.09	0.343
5'-6"	3'- 2"	1'- 6"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	45.75	0.355
6'-0"	3'- 2"	1'- 6"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	46.42	0.367
7'-0"	3'- 8"	1'- 9"	1'- 3"	7"	#4	1'-0"	#4	1'-0"	52.77	0.414
8'-0"	4'- 2"	2'- 0"	1'- 6"	8"	#5	1'-0"	#4	1'-0"	60.19	0.486
9'-0"	4'- 8"	2'- 3"	1'- 9"	8"	#4	6"	#4	6"	81.49	0.535
10'-0"	5'- 2"	2'- 6"	2'- 0"	8"	#5	6"	#4	6"	97.25	0.584
11'-0"	5'- 8"	2'- 9"	2'- 3"	8"	#6	6"	#5	6"	133.65	0.634
12'-0"	6'- 2"	3'- 0"	2'- 6"	9"	#7	6"	#5	6"	162.29	0.721

TABLE OF WINGWALL REINFORCING (Two~Wings)

Bar	Size	No.	Spa
DL & DS	#5	~	1'-0"
E	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	4	~
M	#4	4	~
P	#4	~	1'-0"
RL	#5	3	~
RS	#5	3	~
V	#4	~	1'-0"

TABLE OF ESTIMATED CULVERT TOEWALL QUANTITIES

Bar	Size	No.	Spa
L	#4	~	1'-6"
Q	#4	1	~
Reinf (Lb/Ft)			2.45
Conc (CY/Ft)			0.037

TABLE OF ESTIMATED ANCHOR TOEWALL QUANTITIES

Bar	Size	No.	Spa
K	#4	~	1'-0"
N	#5	6	~
OL	#4	3	~
OS	#4	3	~
Reinf (Lb/Ft)			9.82
Conc (CY/Ft)			0.074

(1) Extend Bars P 3'-0" Min into bottom slab of box culvert.

(2) Adjust to fit as necessary to maintain 11#2" clearcover and 4" Min between bars.

(3) Quantities shown are based on an average wing height for two wings (one structure end). To determine total quantities for two wings multiply the tabulated values by 0.5 (A+Lw).

(4) Recommended values of slope are: 3:1, 4:1, and 6:1. Provide 3:1 or flatter slope.

(5) When shown elsewhere on the plans, construct 5" deep concrete riprap. Payment for riprap is as required by Item 432, "Riprap". Unless otherwise shown on the plans or directed by the Engineer, extend construction joints or grooved joints, oriented in the direction of flow, across the full distance of the riprap, at intervals of approximately 20'. When such riprap is provided, the culvert toewall shown in SECTION B-B is not required.

(6) At Contractor's option, end the culvert toewall flush with wingwall toewall. Adjust reinforcing as needed.

(7) 3" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures without railing and curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet.

(8) For vehicle safety, reduce curb heights, if necessary, to provide a maximum 3" projection above finished grade. No changes will be made in quantities and no additional compensation will be allowed for this work.

(9) Culvert skew (limit to 15° or 30°)

(10) See Table of Maximum Wing Heights for various slopes. Height is limited based on a 33'-6" maximum safety pipe runner length.

(11) Typical wingwall angle for all skews.

TABLE OF MAXIMUM WING HEIGHTS (10)

Side Slope	Hw Max
3:1	11'- 5"
4:1	8'-10"
6:1	6'- 1"

WING DIMENSION CALCULATIONS:

Formulas:

$Hw = H + T + C - 0.250'$ (10)

$A = (Hw - 0.333')(SL)$

$B = (A)[\tan(\theta + 15°)]$

$Lw = (A) \div [\cos(\theta + 15°)]$

For cast-in-place culverts:

$Ltw = [(N)(S) + (N + 1)(U)] \div (\cos\theta)$

For precast culverts:

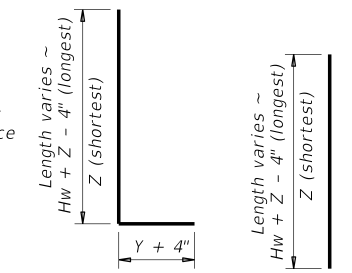
$Ltw = [(N)(2U + S) + (N - 1)(0.500')] \div (\cos\theta)$

$Lc = (Ltw) - (2U) \div (\cos\theta)$

$Atw = (Lc) + (B)$

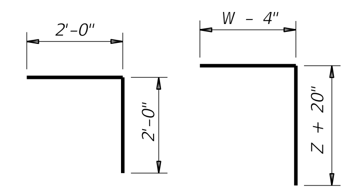
Total Wingwall Area (two wings ~ S.F.) $= (0.5)(Hw + 0.333')(Lw + A)$

Hw = Height of wingwall (feet)
SL:1 = Side slope ratio (horizontal : 1 vertical)
Lw = Length of wingwall (feet)
Ltw = Culvert toewall length (feet)
Lc = Culvert curb between wings (feet)
Atw = Anchor toewall length (feet)
N = Number of culvert spans
θ = Culvert skew
See applicable box culvert standard for H, S, T, and U values.
See Table of Maximum Wall Heights for limits on Hw.



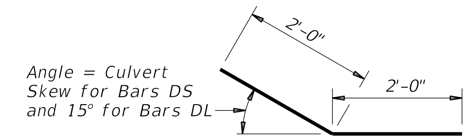
BARS J1

BARS V

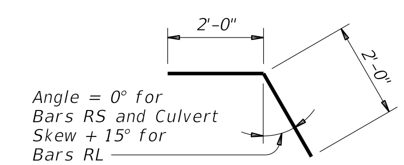


BARS L

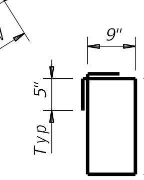
BARS J2



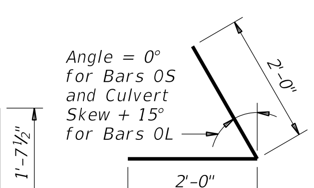
BARS DS and DL
(DS ~ Short wing and DL ~ Long wing)



BARS RS and RL
(RS ~ Short wing and RL ~ Long wing)



BARS K
(Length = 5'-5")



BARS OS and OL
(OS ~ Short wing and OL ~ Long wing)

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.

Provide galvanized reinforcing steel if required elsewhere in 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.

Provide Class "C" concrete (f`c = 3,600 psi).

Adjust reinforcing as necessary to provide a minimum clear cover of 1 ½".

Provide pipe runners and anchor pipes meeting the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr B, or API 5LX52.

Provide ASTM A307 bolts and nuts.

Provide ASTM A36 steel plates.

Galvanize all steel components, except reinforcing unless required elsewherein the plans, after fabrication.

Repair galvanizing damaged during transport or construction in accordance with the Item 445, "Galvanizing".

For optional adhesive anchors, install adhesive anchorages in accordance with the manufacturer's instructions including hole size, drilling equipment and method, hole cleaning equipment and method, mixing and dispensing adhesive, and anchor insertion. Do not alter the manufacturer's mixing nozzle or dispenser. Provide anchorage rods that are clean and free of grease, oil, or any other foreign material. Demonstrate hole cleaning method to the Engineer for approval and continue the approved process for all anchorage locations. Test adhesive anchors in accordance with Item 450.3.3, "Tests." Test 3 anchors per 100 anchors installed.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

The safety end treatments shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the pipe runners.

Pipe runners are designed for a traversing load of 1,800 pounds at yield as recommended by Research Report 280-1, "Safety Treatment of Roadside Cross-Drainage Structures", Texas Transportation Institute, March 1981.

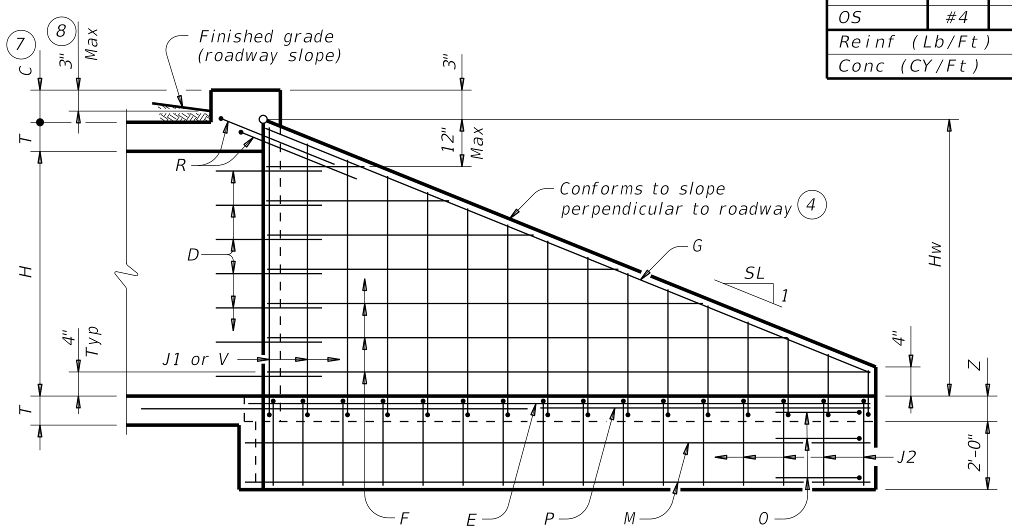
When structure is founded on solid rock, depth of toewalls for culverts and wingwalls may be reduced or eliminated as directed by the Engineer.

All bolts, nuts, washers, brackets, angles, and pipe runners are considered parts of the safety end treatment for payment

The quantities for pipe runners, reinforcing steel, and concrete, resulting from the formulas given herein are for Contractor's information only.

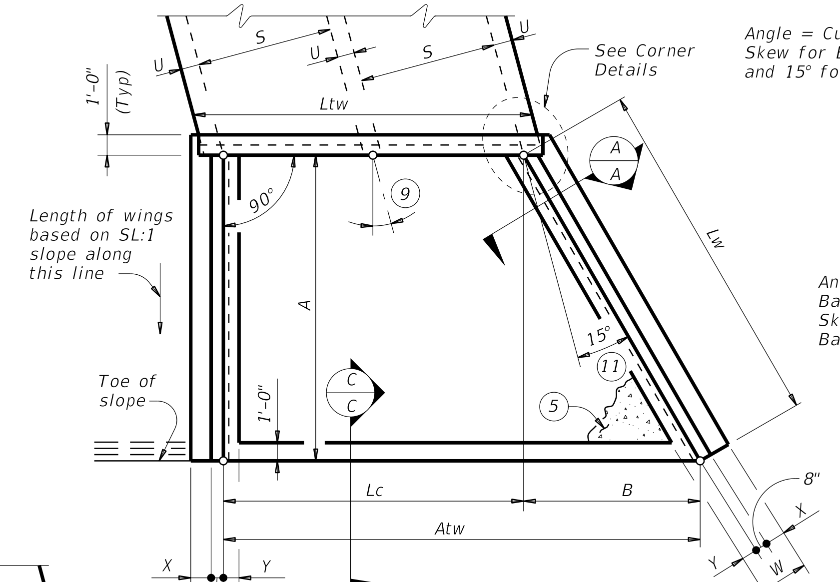
See Box Culvert Supplement (BCS) standard sheet for additional dimensions and information.

Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing dimensions are out-to-out of bars.



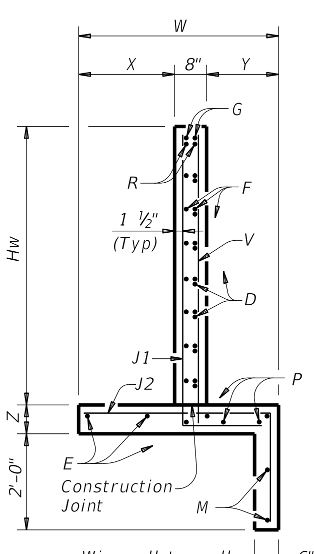
INSIDE ELEVATION OF WINGWALL

(Showing reinforcing. Culvert and culvert toewall reinforcing not shown for clarity.)

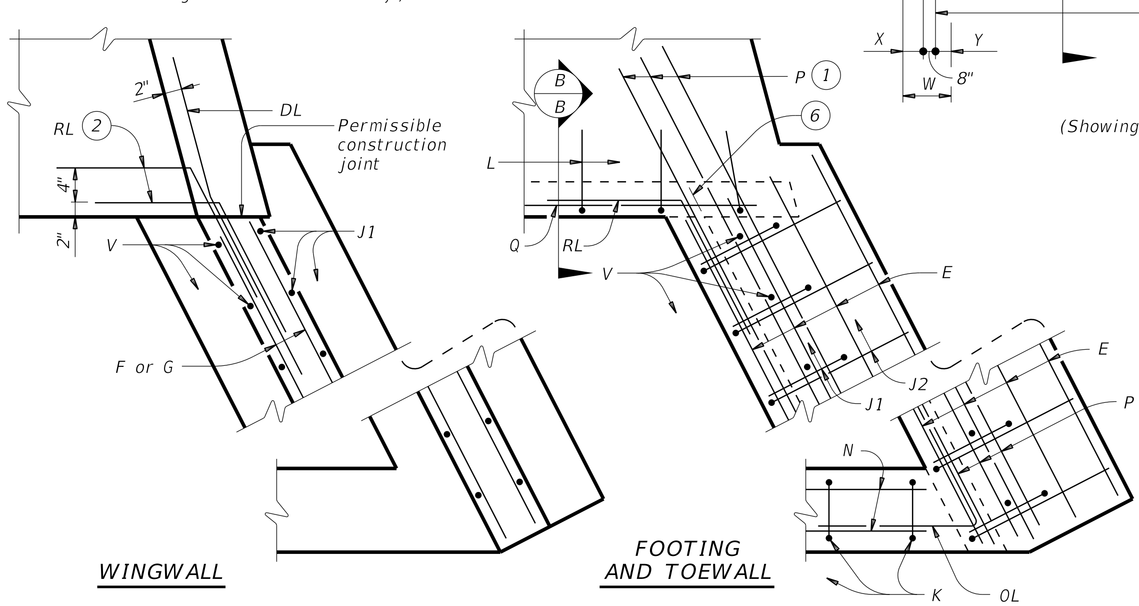


PLAN

(Showing dimensions and 15° skew.)

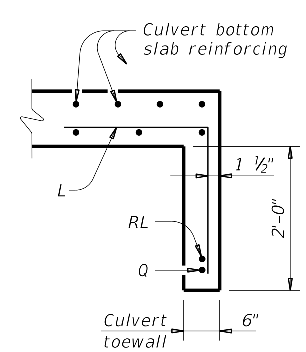


SECTION A-A

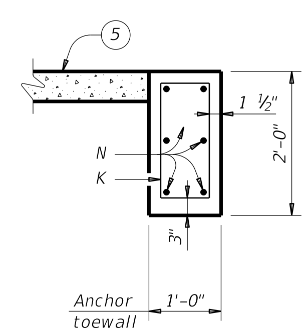


CORNER DETAILS

(Culvert and culvert toewall reinforcing not shown for clarity.)



SECTION B-B (5)



SECTION C-C

SHEET 1 OF 3

Texas Department of Transportation — Bridge Division Standard

SAFETY END TREATMENT WITH FLARED WINGS

FOR 15° AND 30° SKEW BOX CULVERTS TYPE I ~ CROSS DRAINAGE

SETB-FW-S

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		PAR		GRAYSON	196

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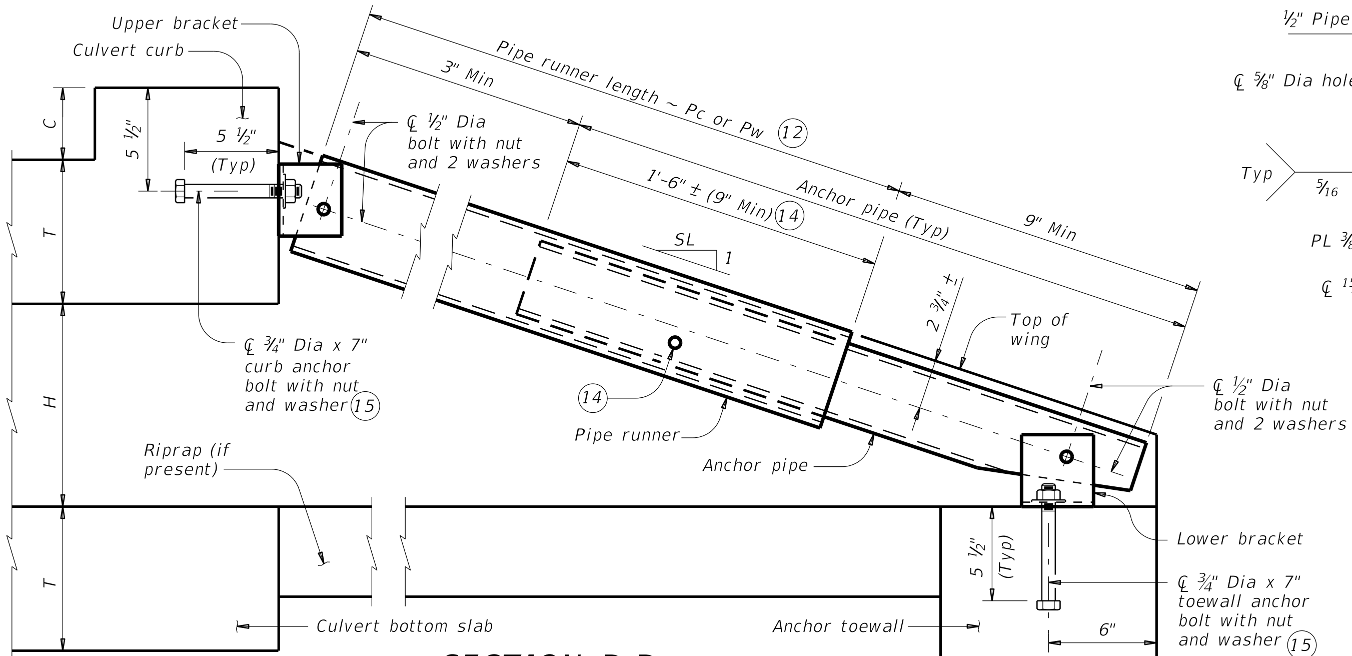
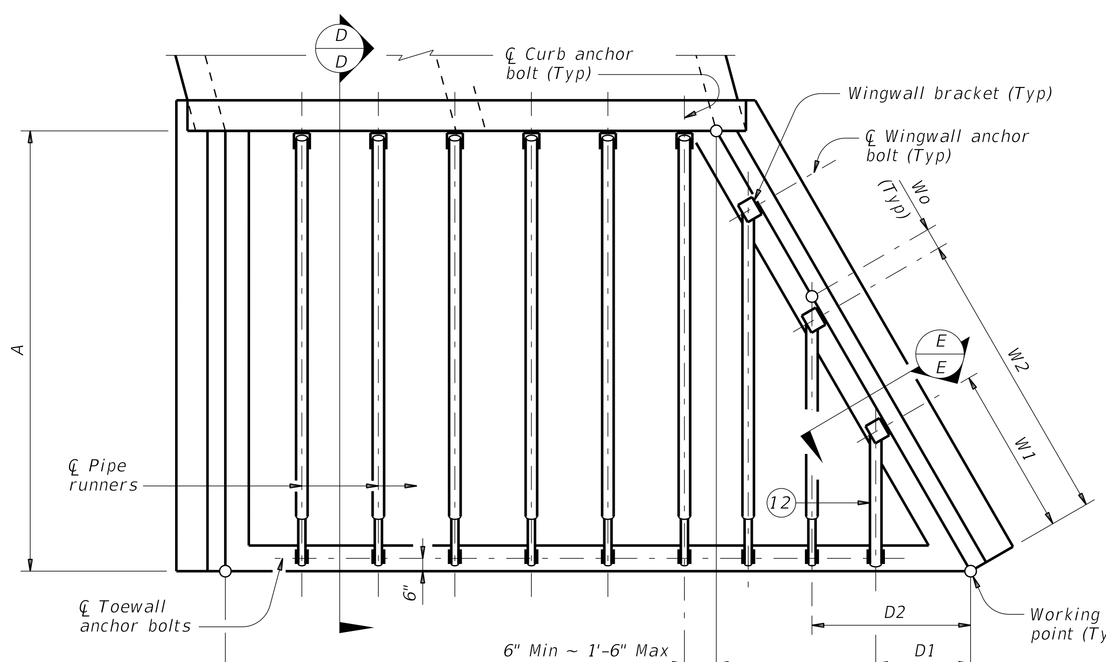
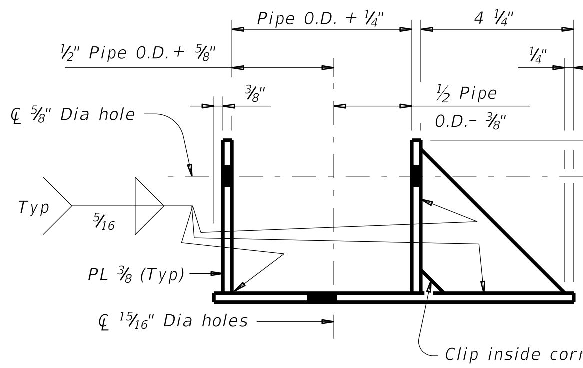


SECTION D-D

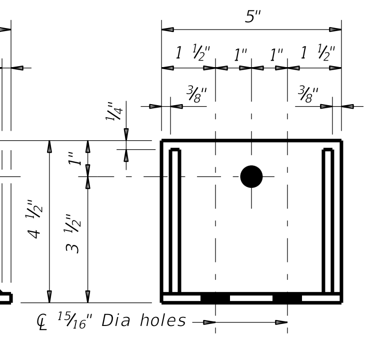
(Showing curb pipe runner. Except for upper bracket, wingwall pipe runners are similar.)



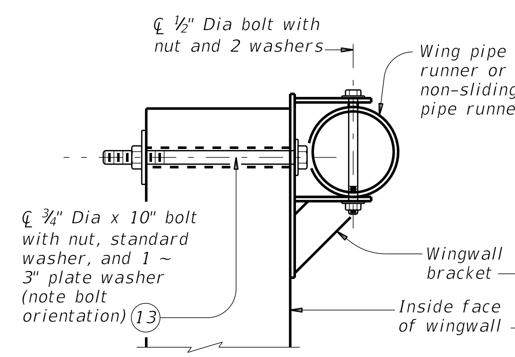
PIPE RUNNER PLAN



ELEVATION

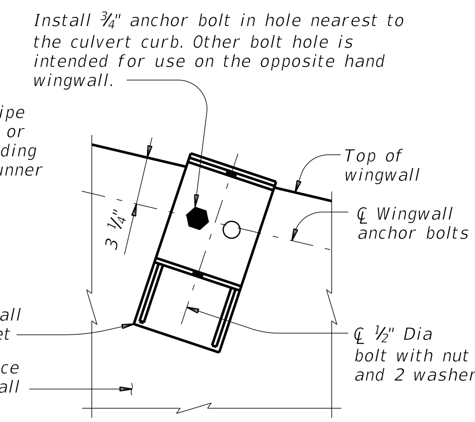


SIDE VIEW



SECTION E-E

(Showing installed bracket.)

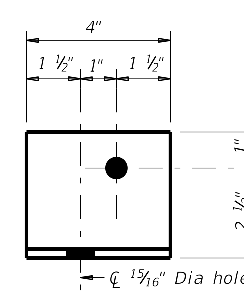


ELEVATION

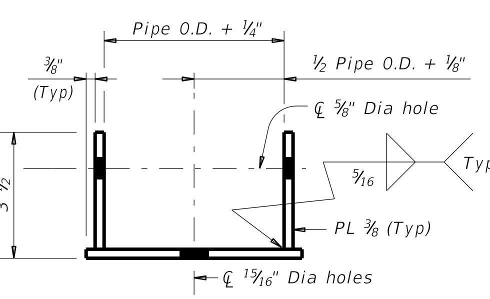
(Showing installed bracket normal to wall. Pipe not shown for clarity.)

Note: Match wingwall bracket to the upper curb bracket size.

WINGWALL BRACKET DETAILS



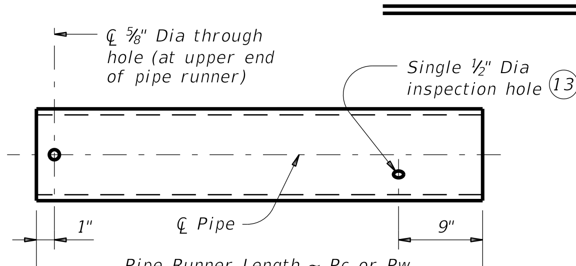
SIDE VIEW



ELEVATION

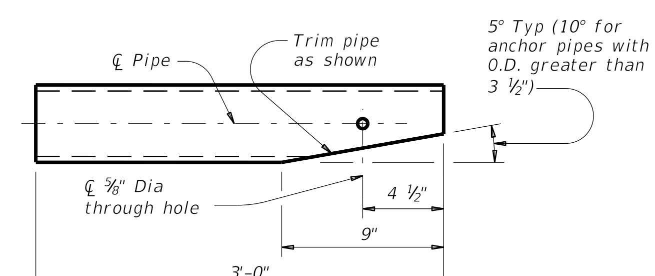
Note: Match upper and lower brackets, except for the brackets used with non-sliding pipe runners, to the required pipe diameters as shown in the table.

UPPER AND LOWER BRACKET DETAILS

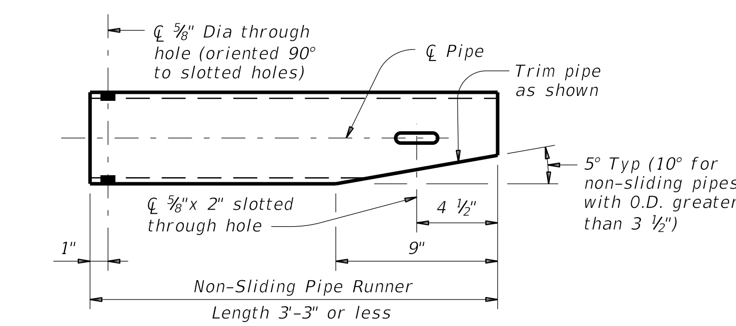


Note: Use pipe diameter required for curb pipe runner for wingwall pipe runner.

PIPE RUNNER DETAILS



ANCHOR PIPE DETAILS



Note: Pipe size is the same as required for curb pipe runner. Adjust the corresponding lower bracket accordingly.

NON-SLIDING PIPE RUNNER DETAILS

MAXIMUM PIPE RUNNER LENGTHS AND REQUIRED PIPE RUNNER AND ANCHOR PIPE SIZES

Maximum Pipe Runner Length (Pc or Pw)	Required Pipe Runner Size			Required Anchor Pipe Size		
	Pipe Size	Pipe O.D.	Pipe I.D.	Pipe Size	Pipe O.D.	Pipe I.D.
9'-4"	3" STD	3.500"	3.068"	2" STD	2.375"	2.067"
19'-0"	4" STD	4.500"	4.026"	3" STD	3.500"	3.068"
33'-6"	5" STD	5.563"	5.047"	4" STD	4.500"	4.026"

(12) If pipe runner length (Pw) is 1'-9" or less, replace the normal pipe runner and anchor pipe with a single non-sliding pipe runner. See Non-Sliding Pipe Runner Details for additional information.

(13) At Contractor's option, ⅞" diameter hole may be formed or cored drilled. Percussion drilling is not permitted. Adjust placement of reinforcing steel as necessary to avoid bolt holes.

(14) After installation of pipe runner, use the ½" inspection hole to ensure that the lap of the anchor pipe with the pipe runner is adequate.

(15) At Contractor's option, an adhesive anchor may be used. Provide ¾" Dia adhesive anchors that meet the requirements of ASTM A307, Gr A fully threaded rods. Embed threaded rods into curb, wingwalls, and toewall using a Type III, Class C, D, E, or F anchor adhesive. Minimum embedment depth is 5 ½". Provide anchor adhesive able to achieve a basic bond strength in tension, Nba, of 20 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.

PIPE RUNNER DIMENSION CALCULATIONS:

Wn = (K3) (Dn) - (Wo)
Pwn = (Dn) (K2) - (2.063')
Pw1 Non-Sliding Pipe Runner (If required) = (D1) (K2) - (0.563')
Pc = (A) (K1) - (1.688')

Wn = Distance from working point to centerline anchor bolt measured along bottom inside face of wing (feet)
Dn = Distance from working point to centerline pipe runner measured along outside face of anchor toewall (feet)
Pw = Wingwall pipe runner length (feet)
Pc = Curb pipe runner length (feet)
K = Constant values for use in formulas

Slope SL:1	K1	K2~15° Skew	K2~30° Skew
3:1	~ 1.054	~ 1.826	~ 1.054
4:1	~ 1.031	~ 1.785	~ 1.031
6:1	~ 1.014	~ 1.756	~ 1.014

K3 = 15° Skew ~ 2.000
30° Skew ~ 1.414
n = Wing pipe runner number
Wo = 15° Skew ~ 5"
30° Skew ~ 2 ½"

SHEET 2 OF 3

Texas Department of Transportation — Bridge Division Standard

SAFETY END TREATMENT WITH FLARED WINGS

FOR 15° AND 30° SKEW BOX CULVERTS TYPE I ~ CROSS DRAINAGE

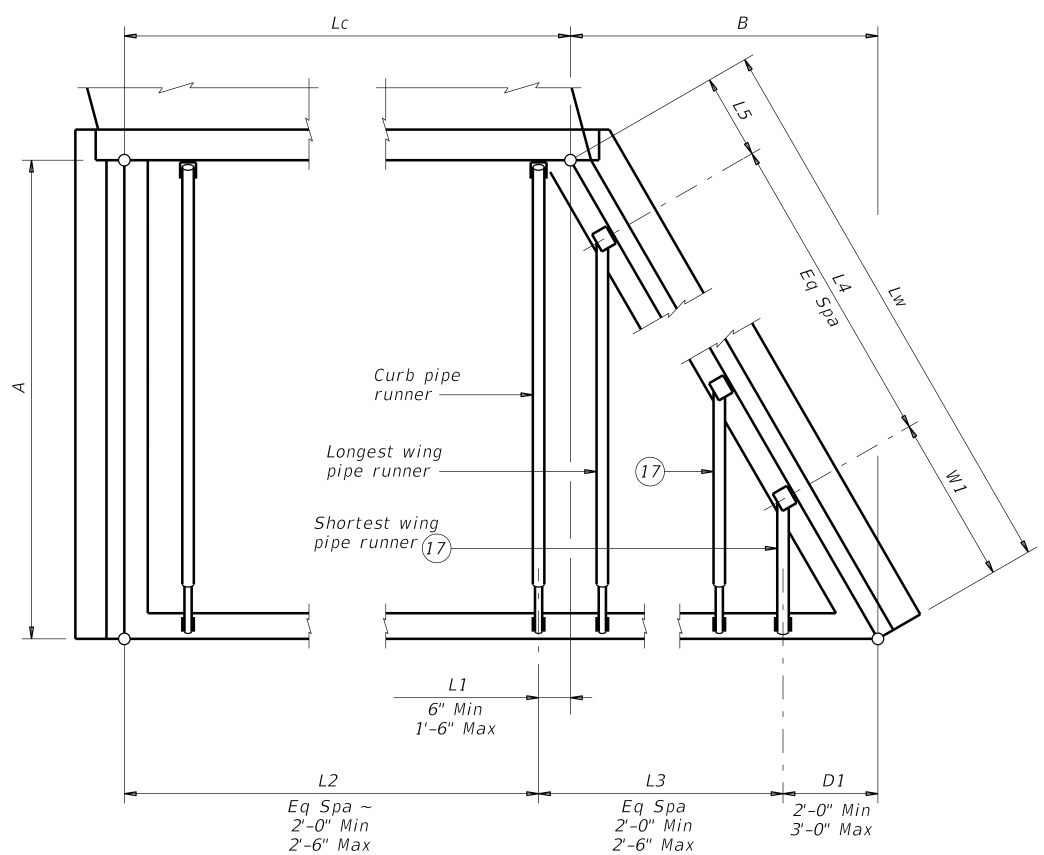
SETB-FW-S

FILE: setbfsse-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT 0091	SECT 10	JOB 002	HIGHWAY FS 121
REVISIONS	DIST PAR	COUNTY GRAYSON		SHEET NO. 197

Culvert Station and/or Creek name followed by applicable end (Lt, Rt or Both) (16)	Lc	L1	L2			D1	L3			W1	L4			L5	Curb Pipe Runner (Pc)		Longest Wing Pipe Runner (Pw)	Shortest Wing Pipe Runner (Pw)	Non-Sliding Wing Pipe Runner (if applicable)	Curb, Wing, and/or Non-Sliding Pipe Runners		3'-0" Anchor Pipe	
	(Ft)	(Ft)	No. Spa	Spa at (Ft)	Overall Length (Ft)	(Ft)	No. Spa	Spa at (Ft)	Overall Length (Ft)	(Ft)	No. Spa	Spa at (Ft)	Overall Length (Ft)	(Ft)	No.	Length (Ft)	(Ft)	(Ft)	(Ft)	Size (3",4" or 5")	Total Length (Ft) (16)	Size (2",3" or 4")	Total Length (Ft) (16)
STA 3401+48.70 - CULVERT A (Lt)	3.106'	0.750'	1	2.356'	2.356'	3.000'	1	2.369'	2.369'	5.583'	0	4.738'	0.000'	3.654'	1	6.563'	3.292'	N/A	N/A	3"	9.854'	2"	6.000'
STA 3401+48.70 - CULVERT A (Rt)	3.106'	1.000'	1	2.106'	2.106'	3.000'	2	2.464'	4.928'	5.583'	1	4.928'	4.928'	3.345'	1	10.479'	7.542'	3.208'	N/A	4"	21.229'	3"	9.000'
STA 3425+70.01 - CULVERT B (Lt)	7.419'	0.500'	3	2.306'	6.919'	3.000'	2	2.214'	4.428'	5.583'	1	4.428'	4.428'	3.845'	3	10.479'	7.083'	3.208'	N/A	4"	41.729'	3"	15.000'
STA 3425+70.01 - CULVERT B (Rt)	7.419'	0.500'	3	2.306'	6.919'	3.000'	1	2.119'	2.119'	5.583'	0	4.238'	0.000'	3.654'	3	6.563'	3.292'	N/A	N/A	3"	22.979'	2"	12.000'
STA 3429+43.32 - CULVERT C (Lt)	3.106'	1.000'	1	2.106'	2.106'	3.000'	2	2.464'	4.928'	5.583'	1	4.928'	4.928'	3.345'	1	10.479'	7.542'	3.208'	N/A	4"	21.229'	3"	9.000'
STA 3429+43.32 - CULVERT C (Rt)	3.106'	0.750'	1	2.356'	2.356'	3.000'	1	2.369'	2.369'	5.583'	0	4.738'	0.000'	3.654'	1	6.563'	3.292'	N/A	N/A	3"	9.854'	2"	6.000'
STA 3439+46.54 - CULVERT D (Lt)	3.464'	1.000'	1	2.464'	2.464'	3.000'	4	2.500'	10.000'	4.034'	3	3.535'	10.605'	2.332'	1	10.479'	8.583'	3.521'	2.479'	4"	31.115'	3"	12.000'
STA 3439+46.54 - CULVERT D (Rt)	3.464'	1.000'	1	2.464'	2.464'	3.000'	3	2.000'	6.000'	4.034'	2	2.828'	5.656'	1.624'	1	6.563'	5.146'	3.083'	2.521'	3"	17.313'	2"	9.000'
STA 3445+61.65 - CULVERT E (Both)	3.464'	1.000'	1	2.464'	2.464'	3.000'	3	2.000'	6.000'	4.034'	2	2.828'	5.656'	1.624'	1	6.563'	5.146'	3.083'	2.521'	3"	34.625'	2"	18.000'
STA 3452+77.08 - CULVERT F (Lt)	10.777'	0.500'	5	2.055'	10.277'	3.000'	7	2.286'	16.000'	4.034'	6	3.232'	19.392'	2.737'	5	17.063'	14.875'	3.292'	2.479'	4"	142.292'	3"	33.000'
STA 3452+77.08 - CULVERT F (Rt)	10.777'	0.500'	5	2.055'	10.277'	3.000'	4	2.458'	9.833'	4.034'	3	3.476'	10.428'	2.980'	5	11.021'	8.625'	3.563'	2.521'	4"	75.906'	3"	24.000'
STA 3461+78.99 - CULVERT G (Both)	10.777'	0.500'	5	2.055'	10.277'	3.000'	6	2.306'	13.833'	4.034'	5	3.260'	16.300'	2.765'	5	15.146'	12.917'	3.417'	2.521'	4"	238.167'	3"	60.000'
STA 3496+36.13 - CULVERT H (Lt)	3.106'	1.000'	1	2.106'	2.106'	3.000'	2	2.464'	4.928'	5.583'	1	4.928'	4.928'	3.345'	1	10.479'	7.542'	3.208'	N/A	4"	21.229'	3"	9.000'
STA 3496+36.13 - CULVERT H (Rt)	3.106'	0.750'	1	2.356'	2.356'	3.000'	1	2.369'	2.369'	5.583'	0	4.738'	0.000'	3.654'	1	6.563'	3.292'	N/A	N/A	3"	9.854'	2"	6.000'
STA 3515+91.39 - CULVERT I (Both)	3.464'	1.000'	1	2.464'	2.464'	3.000'	3	2.000'	6.000'	4.034'	2	2.828'	5.656'	1.624'	1	6.563'	5.146'	3.083'	2.521'	3"	34.625'	2"	18.000'
STA 3526+76.92 - CULVERT J (Lt)	3.106'	0.750'	1	2.356'	2.356'	3.000'	1	2.369'	2.369'	5.583'	0	4.738'	0.000'	3.654'	1	6.563'	3.292'	N/A	N/A	3"	9.854'	2"	6.000'
STA 3526+76.92 - CULVERT J (Rt)	3.106'	1.000'	1	2.106'	2.106'	3.000'	2	2.464'	4.928'	5.583'	1	4.928'	4.928'	3.345'	1	10.479'	7.542'	3.208'	N/A	4"	21.229'	3"	9.000'
STA 3563+95.79 - CULVERT L (Both)	46.501'	1.000'	19	2.395'	45.501'	3.000'	4	2.002'	8.007'	5.583'	3	4.004'	12.011'	2.420'	19	16.188'	14.021'	3.292'	N/A	4"	684.375'	3"	138.000'
FM 121/W MAIN ST - CULVERT O (Lt)	13.087'	0.500'	6	2.098'	12.587'	3.000'	4	2.375'	9.500'	4.034'	3	3.358'	10.075'	2.862'	6	10.479'	8.208'	3.396'	2.479'	4"	82.760'	3"	27.000'
FM 121/W MAIN ST - CULVERT O (Rt)	13.087'	0.500'	6	2.098'	12.587'	3.000'	9	2.389'	21.500'	4.034'	8	3.378'	27.023'	2.884'	6	23.063'	20.729'	3.500'	2.521'	5"	237.813'	4"	42.000'

(16) Quantities shown are for one structure end if Lt or Rt. Quantities shown are for two structure ends if Both.

(17) If the outermost wing pipe runner is a non-sliding pipe runner, consider the next outermost wing pipe runner as the shortest.



PIPE RUNNER LAYOUT

Note: Right forward culvert skew shown, actual culvert skew may be opposite hand.

STATE OF TEXAS
CURTIS KESTILA
111513
LICENSED PROFESSIONAL ENGINEER
7/15/2021

SHEET 3 OF 3

Texas Department of Transportation — Bridge Division Standard

SAFETY END TREATMENT WITH FLARED WINGS

FOR 15° AND 30° SKEW BOX CULVERTS
TYPE I ~ CROSS DRAINAGE

SETB-FW-S

FILE: setbfsse-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT 0091	SECT 10	JOB 002	HIGHWAY FS 121
REVISIONS	DIST PAR	COUNTY GRAYSON		SHEET NO. 198

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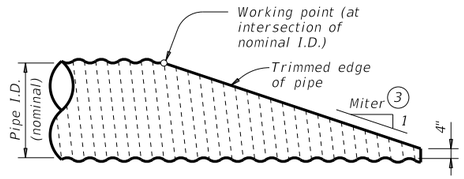
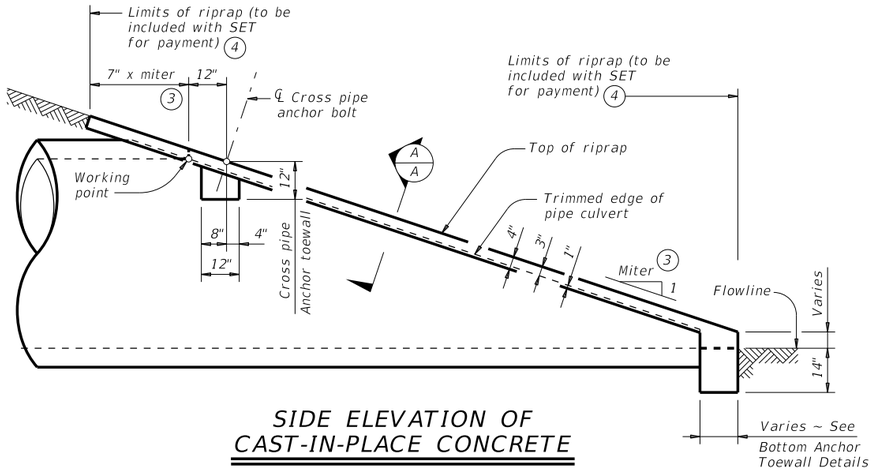


NOTE: All pipe runners, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

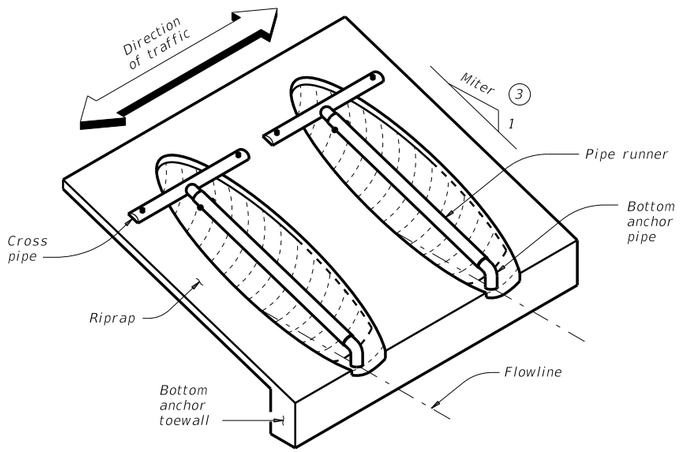
SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

(Showing corrugated metal pipe (CMP) culvert.
Details of reinforced concrete pipe (RCP) culvert are similar.)



SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

(Showing reinforced concrete pipe (RCP) culvert.
Details of corrugated metal pipe (CMP) culvert
are similar. Pipe runners not shown for clarity)



ISOMETRIC VIEW OF TYPICAL INSTALLATION

(Showing installation with no skew.)

CROSS PIPE LENGTHS AND PIPE RUNNER LENGTHS (1) (2)

Nominal Culvert I.D.	Pipe Culvert Spa ~ G	Cross Pipe Length	Pipe Runner Length											
			3:1 Side Slope				4:1 Side Slope				6:1 Side Slope			
			0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew
24"	1' – 7"	3' – 5"	N/A	N/A	N/A	5' – 10"	N/A	N/A	N/A	8' – 1"	N/A	N/A	N/A	12' – 9"
27"	1' – 8"	3' – 8"	N/A	N/A	5' – 5"	6' – 11"	N/A	N/A	7' – 7"	9' – 7"	N/A	N/A	11' – 11"	14' – 11"
30"	1' – 10"	3' – 11"	N/A	N/A	6' – 4"	8' – 0"	N/A	N/A	8' – 9"	11' – 0"	N/A	N/A	13' – 8"	17' – 0"
33"	1' – 11"	4' – 2"	6' – 2"	6' – 5"	7' – 3"	9' – 1"	8' – 6"	8' – 10"	10' – 0"	12' – 5"	13' – 3"	13' – 9"	15' – 5"	19' – 2"
36"	2' – 1"	4' – 5"	6' – 11"	7' – 3"	8' – 2"	10' – 2"	9' – 6"	9' – 11"	11' – 2"	13' – 10"	14' – 9"	15' – 3"	17' – 2"	21' – 3"
42"	2' – 4"	4' – 11"	8' – 6"	8' – 10"	9' – 11"	12' – 4"	11' – 7"	12' – 0"	13' – 6"	16' – 8"	17' – 9"	18' – 5"	20' – 8"	25' – 7"
48"	2' – 7"	5' – 5"	10' – 1"	10' – 5"	11' – 9"	N/A	13' – 7"	14' – 2"	15' – 10"	N/A	20' – 9"	21' – 6"	24' – 2"	N/A
54"	3' – 0"	5' – 11"	11' – 8"	12' – 1"	N/A	N/A	15' – 8"	16' – 3"	N/A	N/A	23' – 10"	24' – 8"	N/A	N/A
60"	3' – 3"	6' – 5"	13' – 3"	N/A	N/A	N/A	17' – 9"	N/A	N/A	N/A	26' – 10"	N/A	N/A	N/A

TYPICAL PIPE CULVERT MITERS (3)

Side Slope	0° Skew	15° Skew	30° Skew	45° Skew
3:1	3:1	3.106:1	3.464:1	4.243:1
4:1	4:1	4.141:1	4.619:1	5.657:1
6:1	6:1	6.212:1	6.928:1	8.485:1

CONDITIONS WHERE PIPE RUNNERS ARE NOT REQUIRED (2)

Nominal Culvert I.D.	Single Pipe Culvert	Multiple Pipe Culverts
12" thru 21"	Skews thru 45°	Skews thru 45°
24"	Skews thru 45°	Skews thru 30°
27"	Skews thru 30°	Skews thru 15°
30"	Skews thru 15°	Skews thru 15°
33"	Skews thru 15°	Always required
36"	Normal (no skew)	Always required
42" thru 60"	Always required	Always required

STANDARD PIPE SIZES AND MAX PIPE RUNNER LENGTHS (1)

Pipe Size	Pipe O.D.	Pipe I.D.	Max Pipe Runner Length
2" STD	2.375"	2.067"	N/A
3" STD	3.500"	3.068"	10' – 0"
4" STD	4.500"	4.026"	19' – 8"
5" STD	5.563"	5.047"	34' – 2"

ESTIMATED CONCRETE RIPRAP QUANTITIES (CY) (5)

Nominal Culvert I.D.	3:1 Side Slope				4:1 Side Slope				6:1 Side Slope			
	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew
12"	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.6	0.7	0.7	0.7	0.8
15"	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.9
18"	0.5	0.5	0.6	0.6	0.6	0.7	0.7	0.8	0.8	0.8	0.9	1.0
21"	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.9	0.9	0.9	1.0	1.2
24"	0.6	0.7	0.7	0.8	0.8	0.8	0.8	1.0	1.0	1.0	1.1	1.3
27"	0.7	0.7	0.8	0.9	0.8	0.9	0.9	1.1	1.1	1.1	1.2	1.4
30"	0.8	0.8	0.8	0.9	0.9	0.9	1.0	1.2	1.2	1.2	1.3	1.6
33"	0.8	0.8	0.9	1.0	1.0	1.0	1.1	1.3	1.3	1.4	1.5	1.7
36"	0.9	0.9	0.9	1.1	1.1	1.1	1.2	1.4	1.4	1.5	1.6	1.8
42"	1.0	1.0	1.1	1.3	1.2	1.3	1.3	1.6	1.6	1.7	1.8	2.1
48"	1.1	1.1	1.2	N/A	1.4	1.4	1.5	N/A	1.9	1.9	2.1	N/A
54"	1.3	1.3	N/A	N/A	1.6	1.6	N/A	N/A	2.1	2.1	N/A	N/A
60"	1.4	N/A	N/A	N/A	1.7	N/A	N/A	N/A	2.3	N/A	N/A	N/A

(1) Provide pipe runner of the size shown in the tables. Provide cross pipe of the same size as the pipe runner. Provide cross pipe stub out and bottom anchor pipe of the next smaller size pipe as shown in the Standard Pipe Sizes and Max Pipe Runner Lengths table.

(2) This standard allows for the placement of only one pipe runner across each culvert pipe opening. In order to limit the clear opening to be traversed by an errant vehicle, the following conditions must be met:

For 60" culvert pipes, the skew must not exceed 0°.
For 54" culvert pipes, the skew must not exceed 15°.
For 48" culvert pipes, the skew must not exceed 30°.
For all culvert pipe sizes 42" and less, the skew must not exceed 45°.

If the above conditions cannot be met, the designer should consider using a safety end treatment with flared wings. For further information, refer to the TxDOT Roadway Design Manual.

(3) Miter = slope of mitered end of pipe culvert.

(4) Riprap placed beyond the limits shown will be paid for as concrete riprap in accordance with Item 432, "Riprap".

(5) Quantities shown are for one end of one reinforced concrete pipe (RCP) culvert. For multiple pipe culverts or for corrugated metal pipe (CMP) culverts, quantities will need to be adjusted. Riprap quantities are for Contractor's information only.

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

FOR 12" DIA TO 60" DIA
PIPE CULVERTS
TYPE II ~ CROSS DRAINAGE

SETP-CD

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©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	PAR	GRAYSON		199

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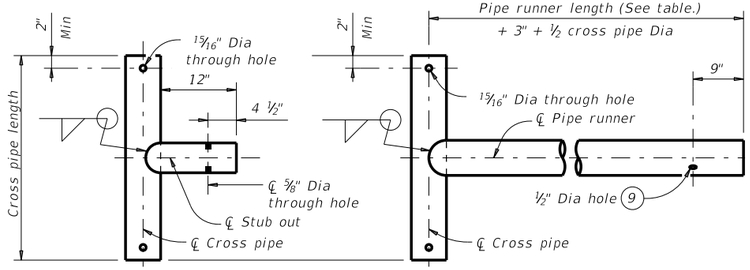
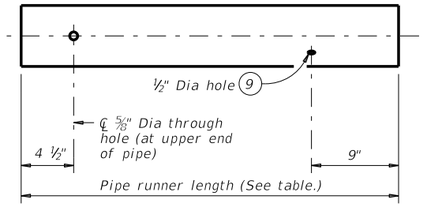


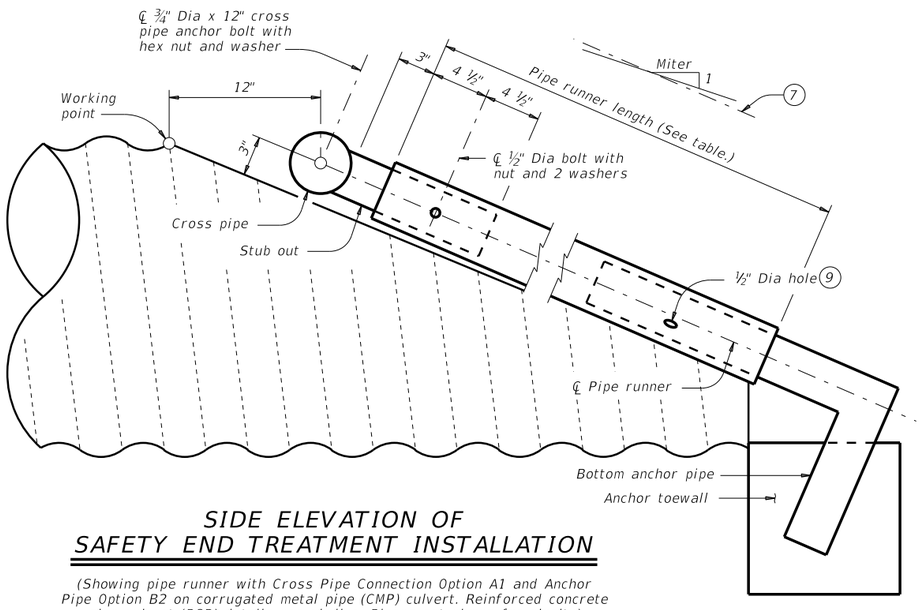
OPTION A1 OPTION A2

CROSS PIPE AND CONNECTIONS DETAILS



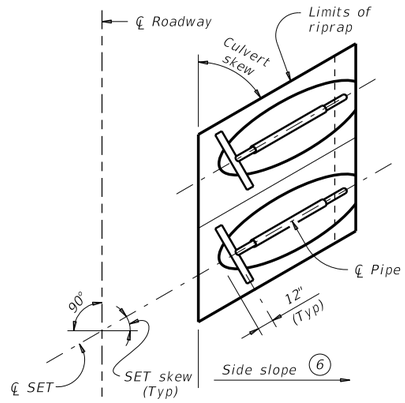
NOTE: The separate pipe runner shown is required when Cross Pipe Connection Option A1 is used.

PIPE RUNNER DETAILS

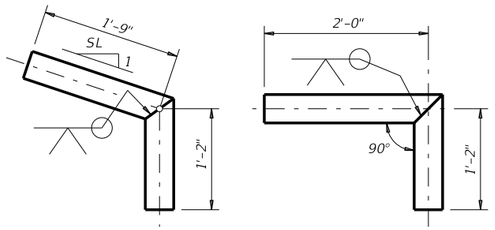


SIDE ELEVATION OF SAFETY END TREATMENT INSTALLATION

(Showing pipe runner with Cross Pipe Connection Option A1 and Anchor Pipe Option B2 on corrugated metal pipe (CMP) culvert. Reinforced concrete pipe culvert (RCP) details are similar. Riprap not shown for clarity)

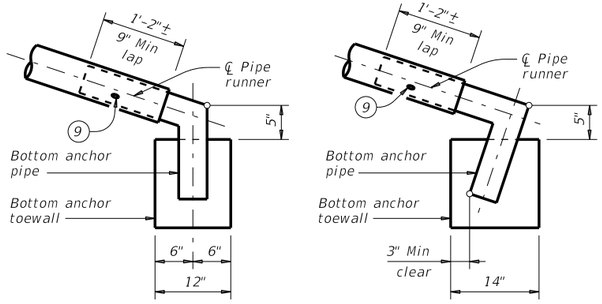


PLAN OF SKEWED INSTALLATION



OPTION B1 OPTION B2

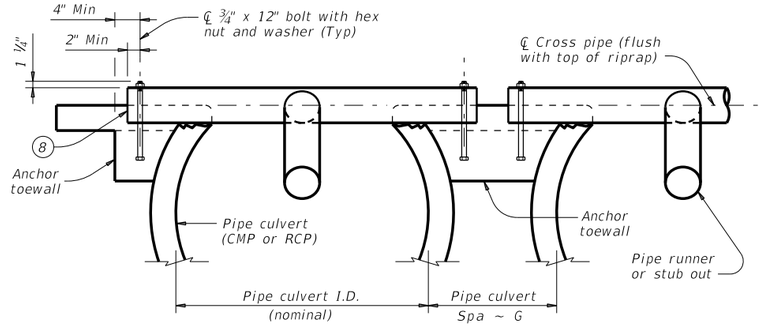
BOTTOM ANCHOR PIPE DETAILS (10)



OPTION B1 OPTION B2

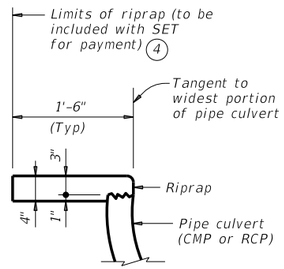
BOTTOM ANCHOR TOEWALL DETAILS

(Culvert and riprap not shown for clarity.)



SHOWING CROSS PIPE AND ANCHOR TOEWALL

SECTION A-A



SHOWING TYPICAL PIPE CULVERT AND RIPRAP

(4) Riprap placed beyond the limits shown will be paid for as concrete riprap in accordance with Item 432, "Riprap".

(6) Recommended values of side slope are 3:1, 4:1, and 6:1. All quantities, calculations, and dimensions shown herein are based on these recommended values. Slope of 3:1 or flatter is required for vehicle safety.

(7) Note that actual slope of pipe runner may vary slightly from side slope of riprap and trimmed culvert pipe edge.

(8) Ensure that riprap concrete does not flow into the cross pipe so as to permit disassembly of the bolted connection to allow cleanout access.

(9) After installation, inspect the 1/2" hole to ensure that the lap of the pipe runner with the bottom anchor pipe is adequate.

(10) At fabricator's option, a heat bend to a smooth 5" radius or a manufactured elbow (of the same material as the runner) may be substituted for the mitered and welded joint in the bottom anchor pipe.

MATERIAL NOTES:

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

Provide pipe runners, cross pipes, and anchor pipes conforming to the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr B, or API 5LX52.

Provide ASTM A307 bolts and nuts.

Galvanize all steel components, except concrete reinforcing, after fabrication.

Repair galvanizing damaged during transport or construction in accordance with the specifications.

GENERAL NOTES:

Pipe runners are designed for a traversing load of 1,800 pounds at yield as recommended by Research Report 280-1, "Safety Treatment of Roadside Cross-Drainage Structures", Texas Transportation Institute, March 1981.

Safety end treatments (SET) shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the pipe runners.

Payment for riprap and toewall is included in the price bid for each safety end treatment.

Construct concrete riprap and all necessary inverts in accordance with the requirements of Item 432, "Riprap".

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

FOR 12" DIA TO 60" DIA
PIPE CULVERTS
TYPE II ~ CROSS DRAINAGE

SETP-CD

FILE: setpcdse-20.dgn	DN: GAF	CK: CAT	DW: JRP	CK: GAF
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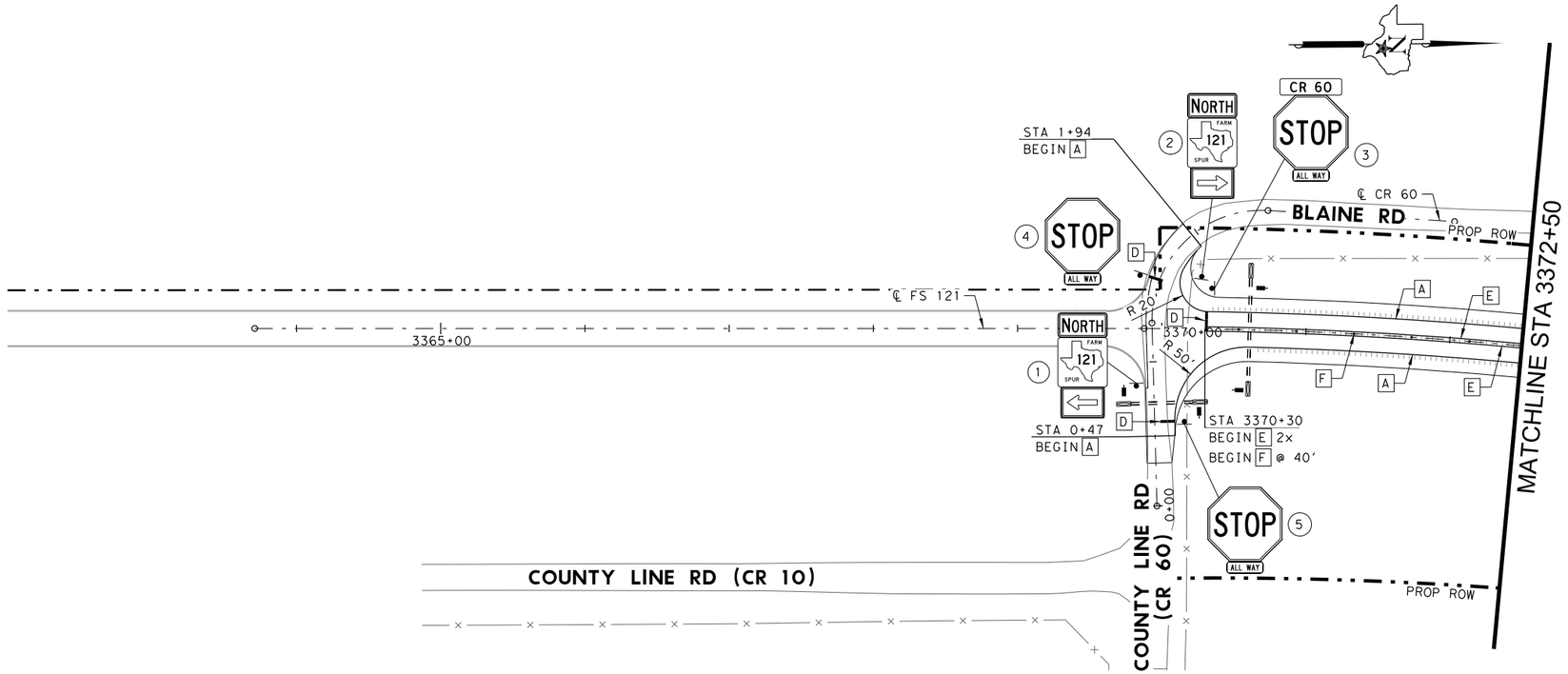
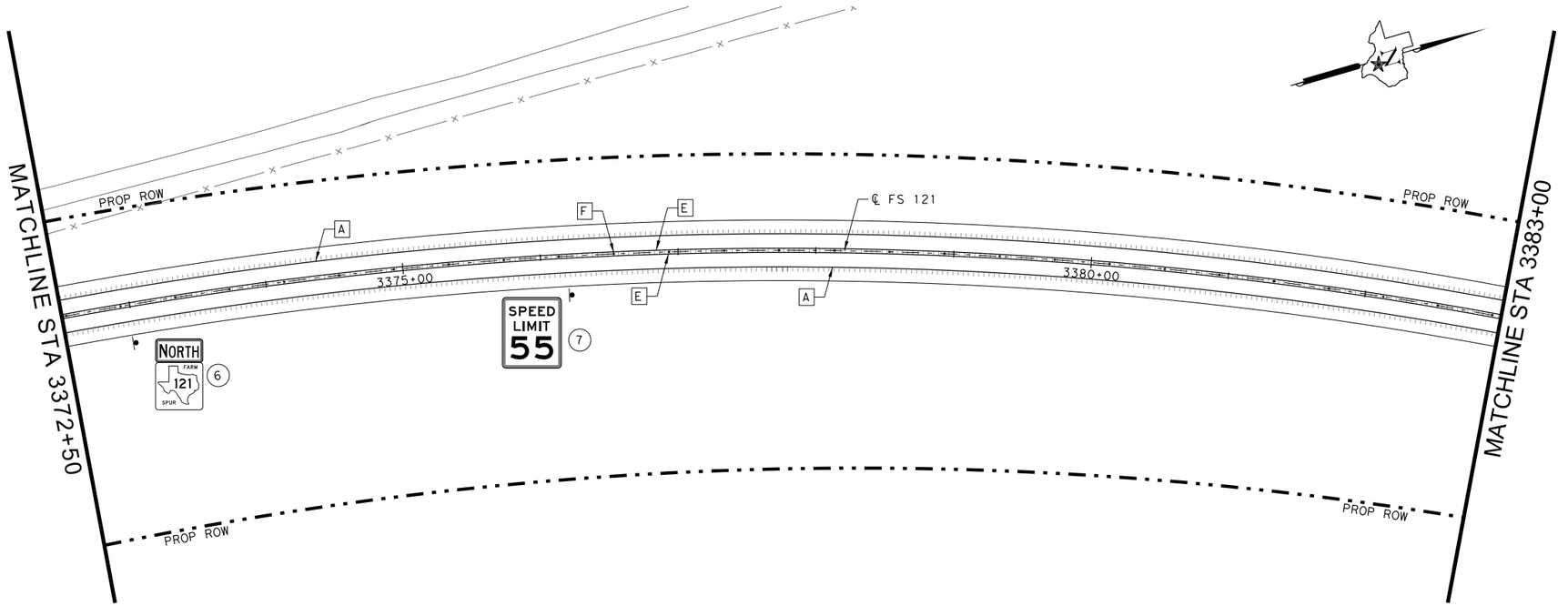
REVISIONS	0091	10	002	FS 121
	DIST	COUNTY		SHEET NO.
	PAR	GRAYSON		200





HORIZONTAL
50 0 50 100
SCALE IN FEET

LEGEND

- A RE PM W/RET REQ TY I (W)4"(SLD)
- B REFL PAV MRK TY I (W)8"(SLD)
- C REFL PAV MRK TY I (W)8"(DOT)
- D REFL PAV MRK TY I (W)24"(SLD)
- E RE PM W/RET REQ TY I (Y)4"(SLD)
- F REFL PAV MRKR TY II-A-A
- G REFL PAV MRKR TY I-C
- H REFL PAV MRK TY I (W)(ARROW)
- J REFL PAV MRK TY I (W)(WORD)
- K REFL PAV MRK TY I (Y)12"(SLD)
- DEL ASSM (D-SW)SZ 1 (BRF)GF2(BI)
- OM ASSM (OM-2Y) (WC)GND
- SMALL SIGN ASSEMBLY

NOTES:

1. ALL LANE WIDTHS SHALL BE 12' UNLESS OTHERWISE CALLED OUT.
2. SEE SUMMARY OF SMALL SIGNS SHEET FOR SIGNS SIZES AND DESIGNATIONS.
3. RUMBLE STRIPS TO BE INSTALLED ALONG THE CENTERLINE AND SHOULDERS OF FS 121.

STATE OF TEXAS
STEPHEN T. SKROVANEK
138388
LICENSED
PROFESSIONAL ENGINEER
7/15/2021

DATE	BY	REV	REVISION

BGE, Inc.
2595 Dallas Parkway, Suite 101, Frisco, TX 75034
Tel: 972-464-4800 • www.bgeinc.com
TBPE Registration No. F-1046

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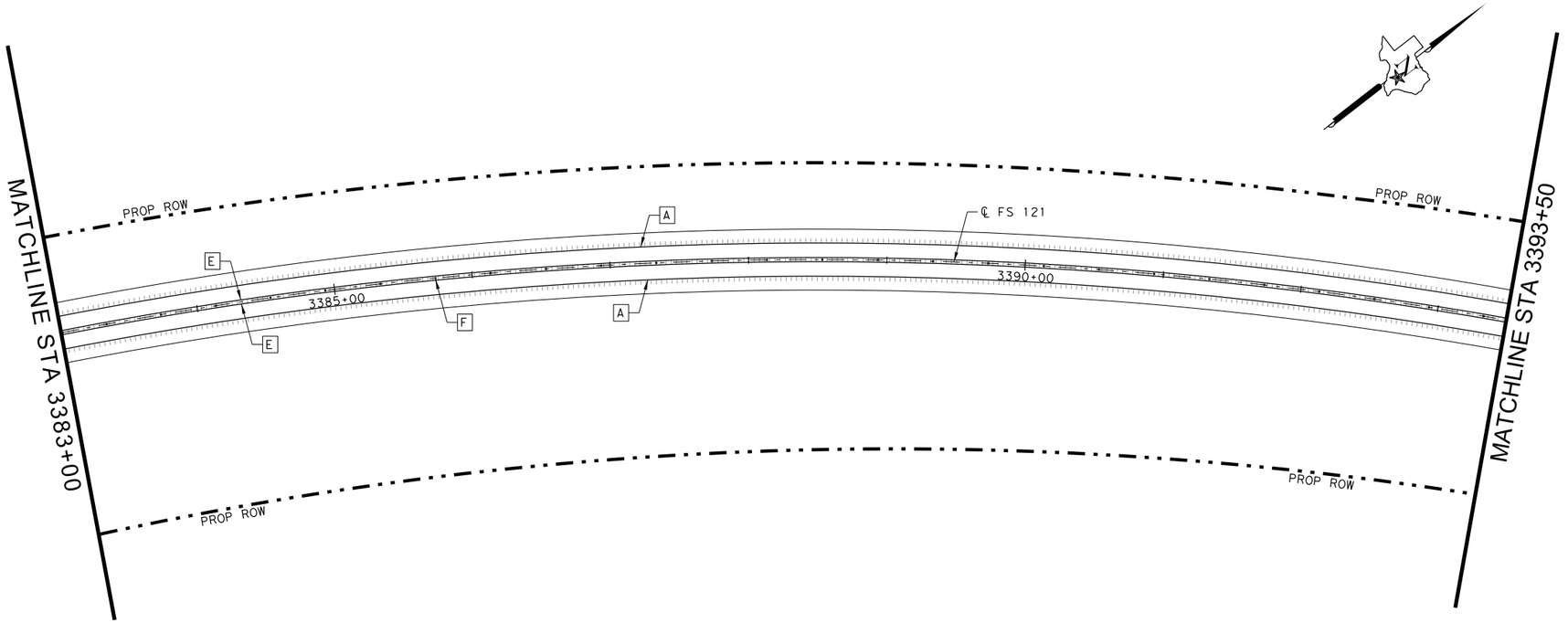
FS 121

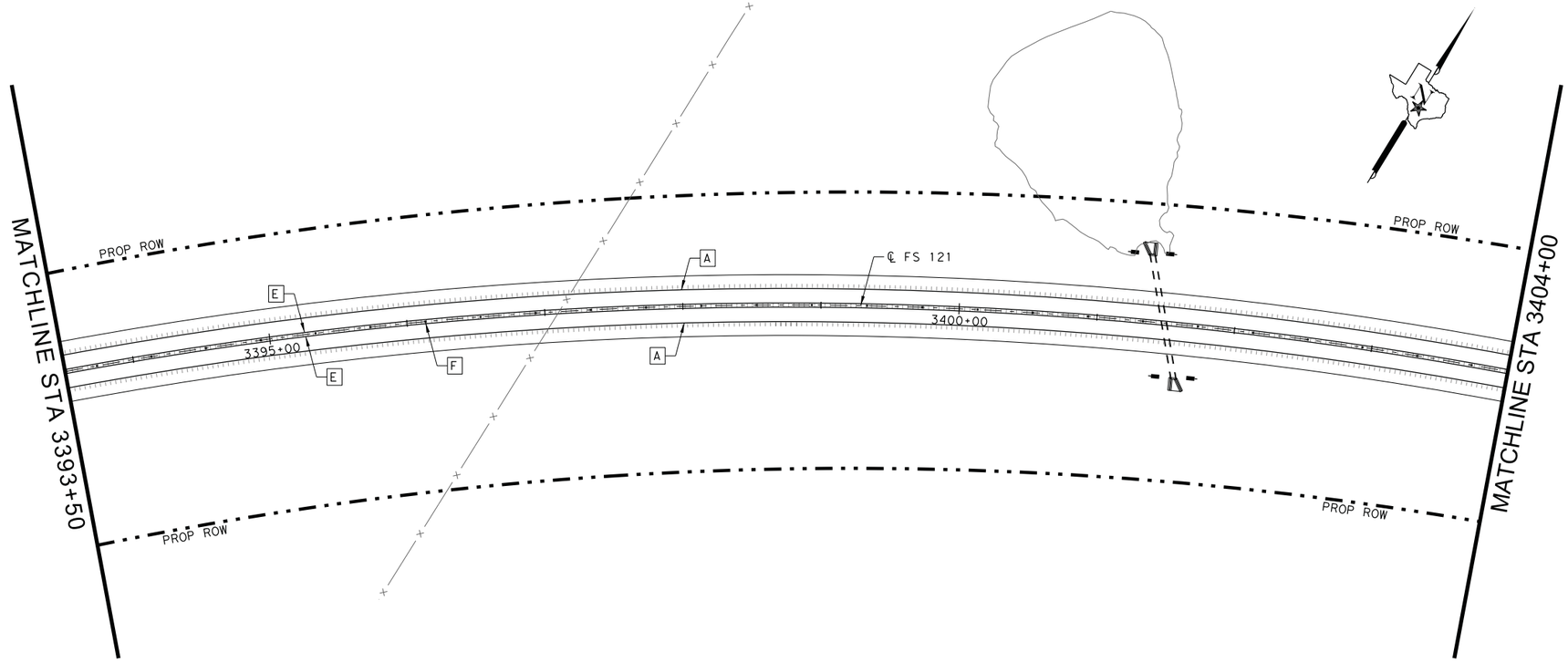
SIGNING & PAVEMENT MARKINGS

BEGIN - STA 3383+00

SCALE: 1" = 100' SHEET 1 OF 14

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	201





HORIZONTAL
50 0 50 100
SCALE IN FEET

LEGEND

- [A] RE PM W/RET REQ TY I (W)4"(SLD)
- [B] REFL PAV MRK TY I (W)8"(SLD)
- [C] REFL PAV MRK TY I (W)8"(DOT)
- [D] REFL PAV MRK TY I (W)24"(SLD)
- [E] RE PM W/RET REQ TY I (Y)4"(SLD)
- [F] REFL PAV MRKR TY II-A-A
- [G] REFL PAV MRKR TY I-C
- [H] REFL PAV MRK TY I (W)(ARROW)
- [J] REFL PAV MRK TY I (W)(WORD)
- [K] REFL PAV MRK TY I (Y)12"(SLD)
- DEL ASSM (D-SW)SZ 1 (BRF)GF2(BI)
- OM ASSM (OM-2Y) (WC)GND
- SMALL SIGN ASSEMBLY

NOTES:

1. ALL LANE WIDTHS SHALL BE 12' UNLESS OTHERWISE CALLED OUT.
2. SEE SUMMARY OF SMALL SIGNS SHEET FOR SIGNS SIZES AND DESIGNATIONS.
3. RUMBLE STRIPS TO BE INSTALLED ALONG THE CENTERLINE AND SHOULDERS OF FS 121.

STATE OF TEXAS
STEPHEN T. SKROVANEK
138388
LICENSED
PROFESSIONAL ENGINEER
7/15/2021

DATE	BY	REV	REVISION

BGE, Inc.
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TBPE Registration No. F-1046

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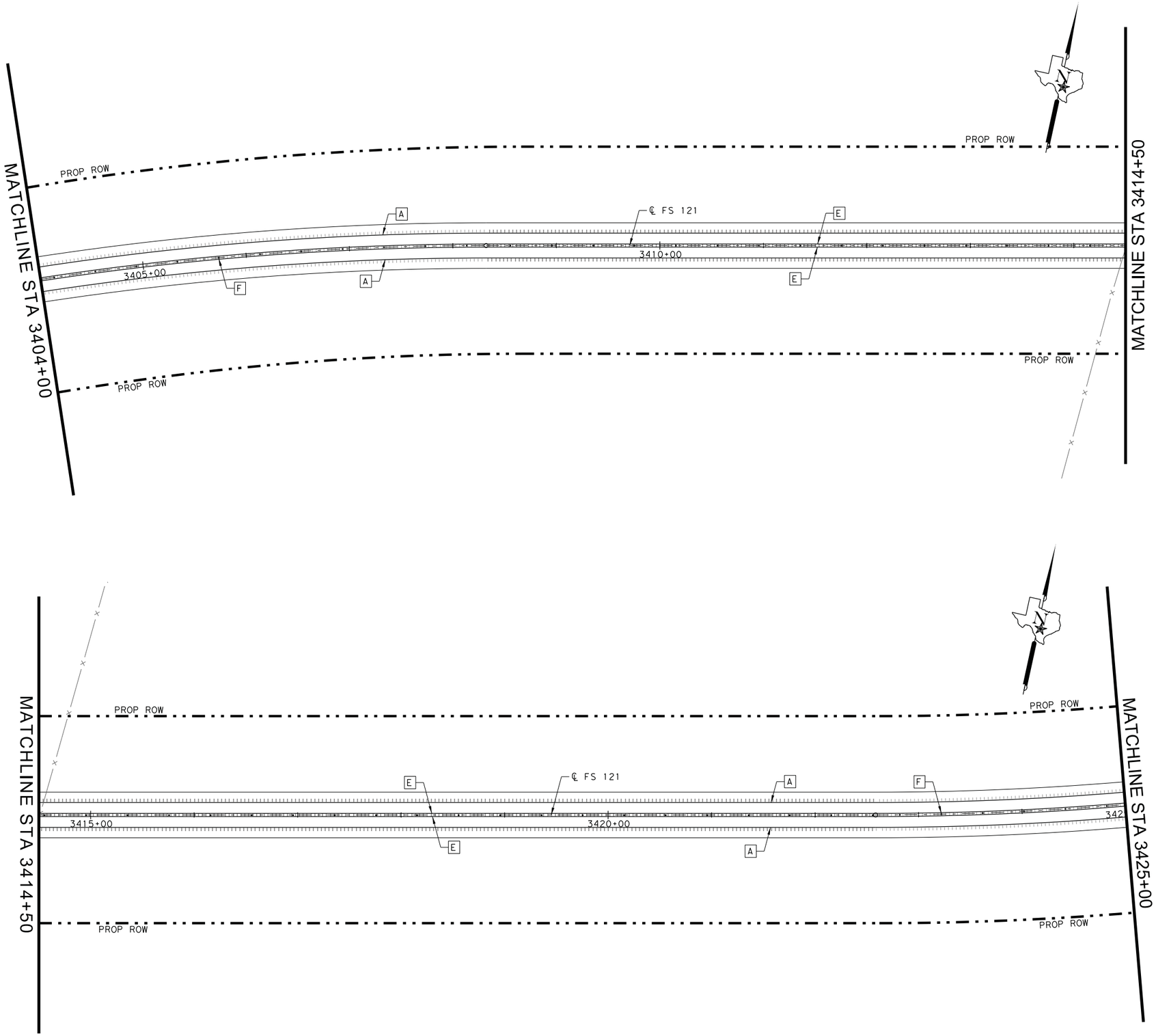
FS 121

SIGNING & PAVEMENT MARKINGS

STA 3383+00 - STA 3404+00

SCALE: 1" = 100' SHEET 2 OF 14

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	202



HORIZONTAL
50 0 50 100
SCALE IN FEET

LEGEND

- A RE PM W/RET REQ TY I (W)4"(SLD)
- B REFL PAV MRK TY I (W)8"(SLD)
- C REFL PAV MRK TY I (W)8"(DOT)
- D REFL PAV MRK TY I (W)24"(SLD)
- E RE PM W/RET REQ TY I (Y)4"(SLD)
- F REFL PAV MRKR TY II-A-A
- G REFL PAV MRKR TY I-C
- H REFL PAV MRK TY I (W)(ARROW)
- J REFL PAV MRK TY I (W)(WORD)
- K REFL PAV MRK TY I (Y)12"(SLD)
- DEL ASSM (D-SW)SZ 1 (BRF)GF2(BI)
- OM ASSM (OM-2Y) (WC)GND
- SMALL SIGN ASSEMBLY

NOTES:

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FS 121

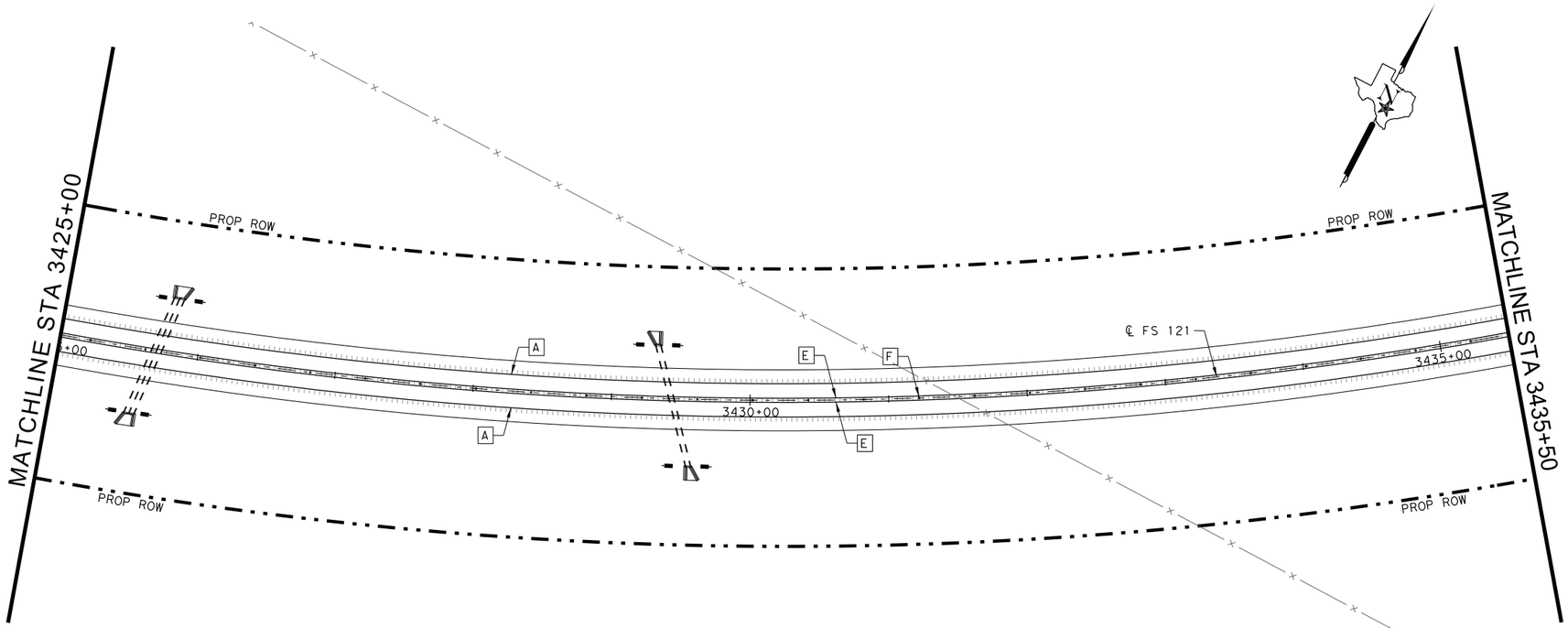
SIGNING & PAVEMENT MARKINGS

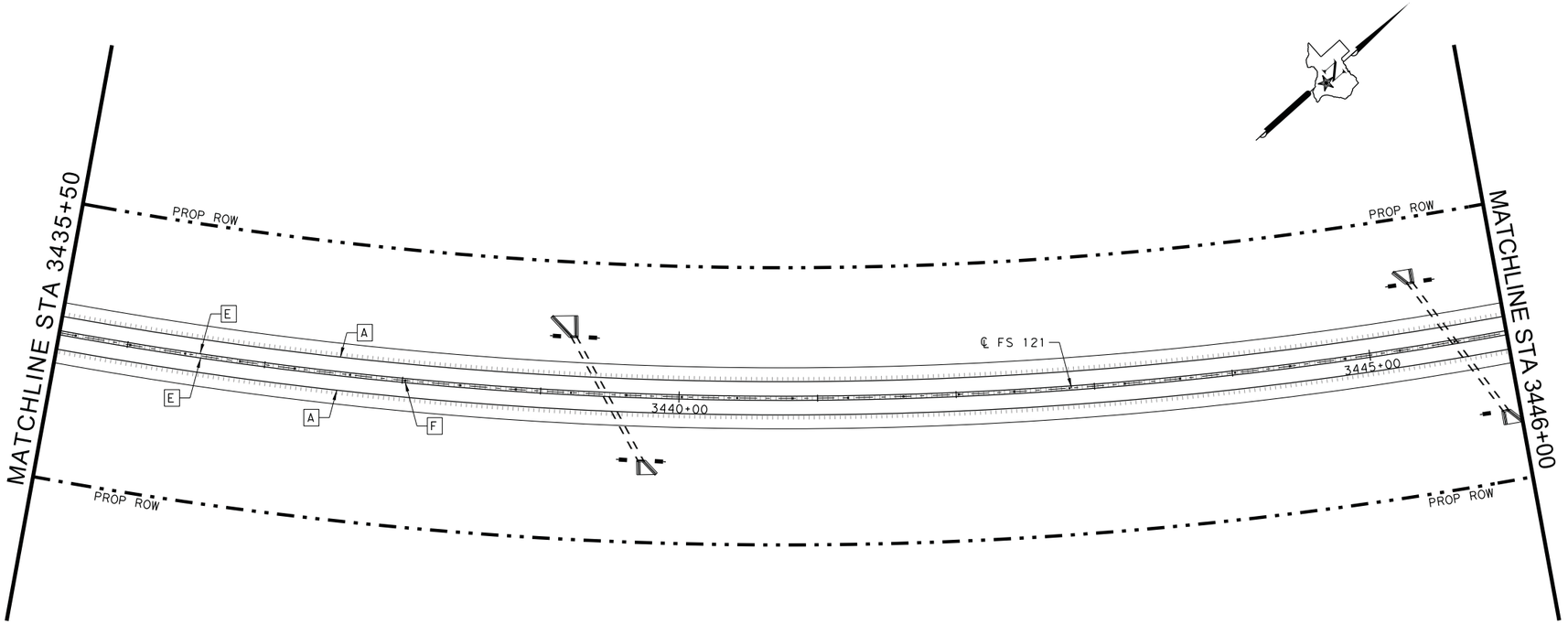
STA 3404+00 - STA 3425+00

SCALE: 1" = 100' SHEET 3 OF 14

STATE		HIGHWAY NO.
TEXAS		FS 121

STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	203





HORIZONTAL
50 0 50 100
SCALE IN FEET

LEGEND

- [A] RE PM W/RET REQ TY I (W)4"(SLD)
- [B] REFL PAV MRK TY I (W)8"(SLD)
- [C] REFL PAV MRK TY I (W)8"(DOT)
- [D] REFL PAV MRK TY I (W)24"(SLD)
- [E] RE PM W/RET REQ TY I (Y)4"(SLD)
- [F] REFL PAV MRKR TY II-A-A
- [G] REFL PAV MRKR TY I-C
- [H] REFL PAV MRK TY I (W)(ARROW)
- [J] REFL PAV MRK TY I (W)(WORD)
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- SMALL SIGN ASSEMBLY

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FS 121

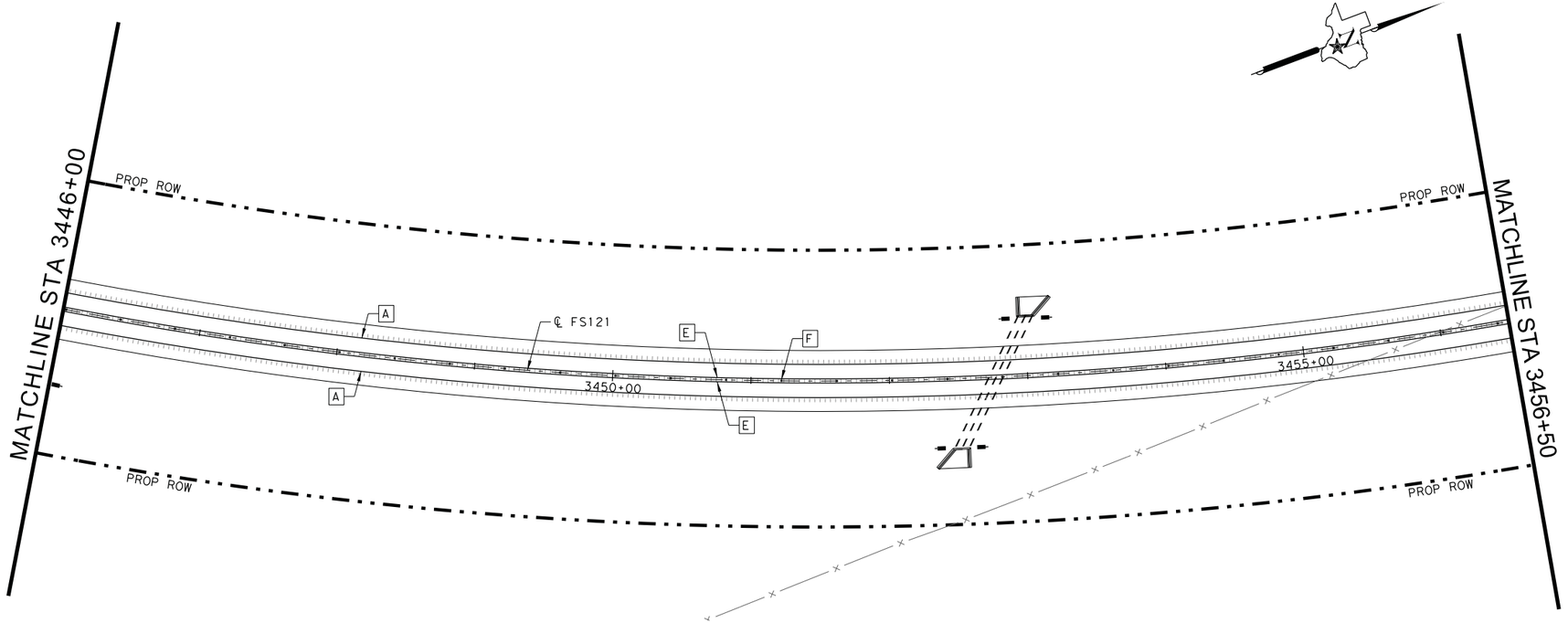
SIGNING & PAVEMENT MARKINGS

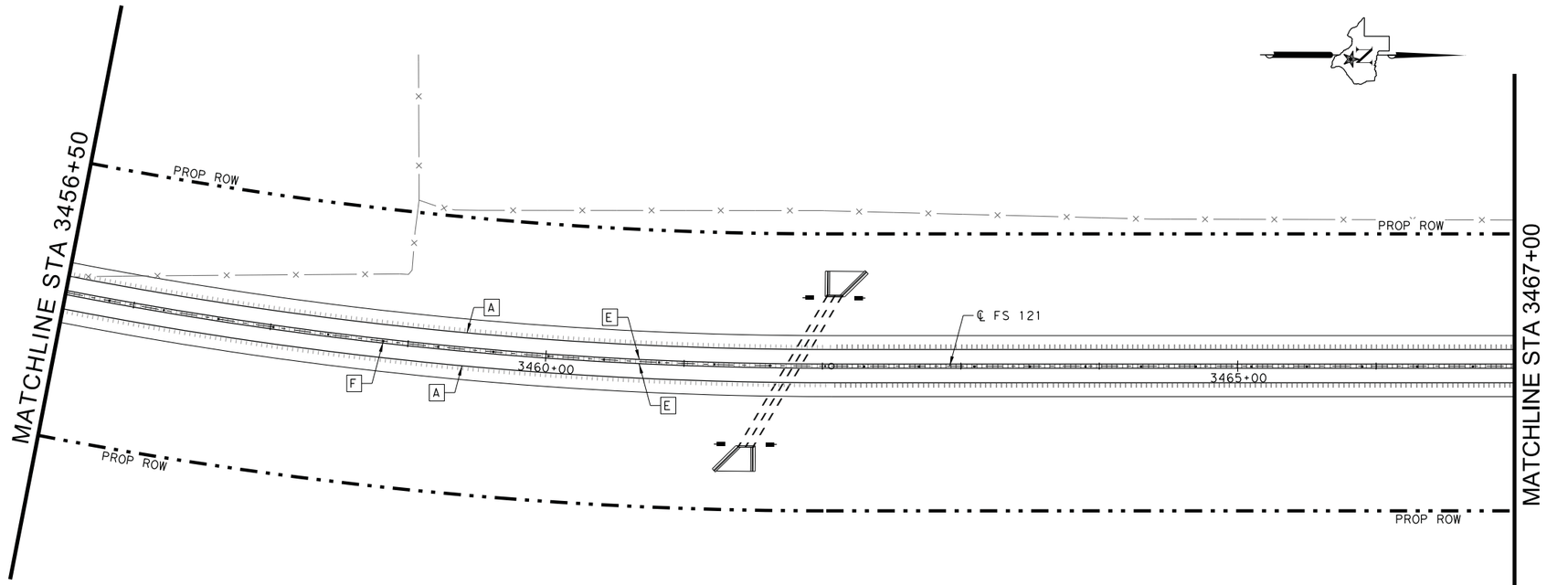
STA 3425+00 - STA 3446+00

SCALE: 1" = 100' SHEET 4 OF 14

STATE		HIGHWAY NO.
TEXAS		FS 121

STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	204





HORIZONTAL
50 0 50 100
SCALE IN FEET

LEGEND

- [A] RE PM W/RET REQ TY I (W)4"(SLD)
- [B] REFL PAV MRK TY I (W)8"(SLD)
- [C] REFL PAV MRK TY I (W)8"(DOT)
- [D] REFL PAV MRK TY I (W)24"(SLD)
- [E] RE PM W/RET REQ TY I (Y)4"(SLD)
- [F] REFL PAV MRKR TY II-A-A
- [G] REFL PAV MRKR TY I-C
- [H] REFL PAV MRK TY I (W)(ARROW)
- [J] REFL PAV MRK TY I (W)(WORD)
- [K] REFL PAV MRK TY I (Y)12"(SLD)
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FS 121

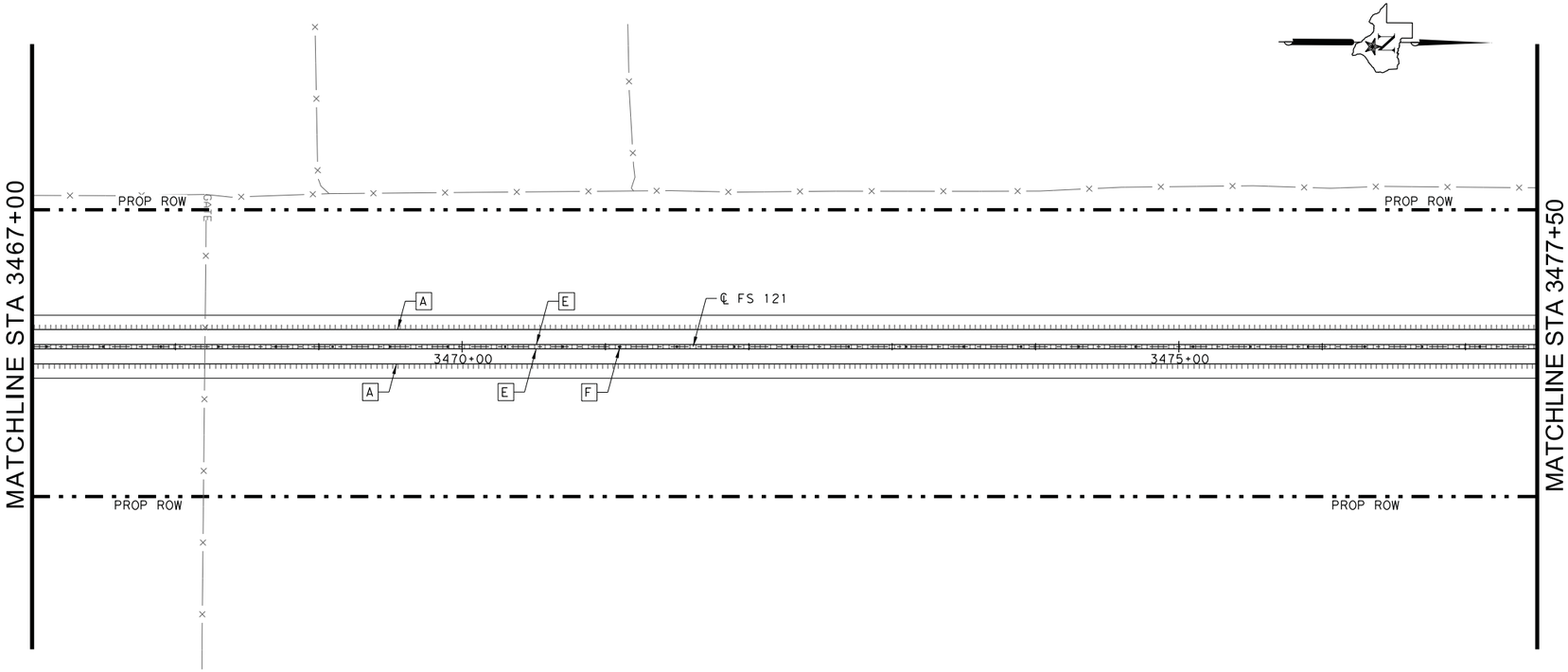
SIGNING & PAVEMENT MARKINGS

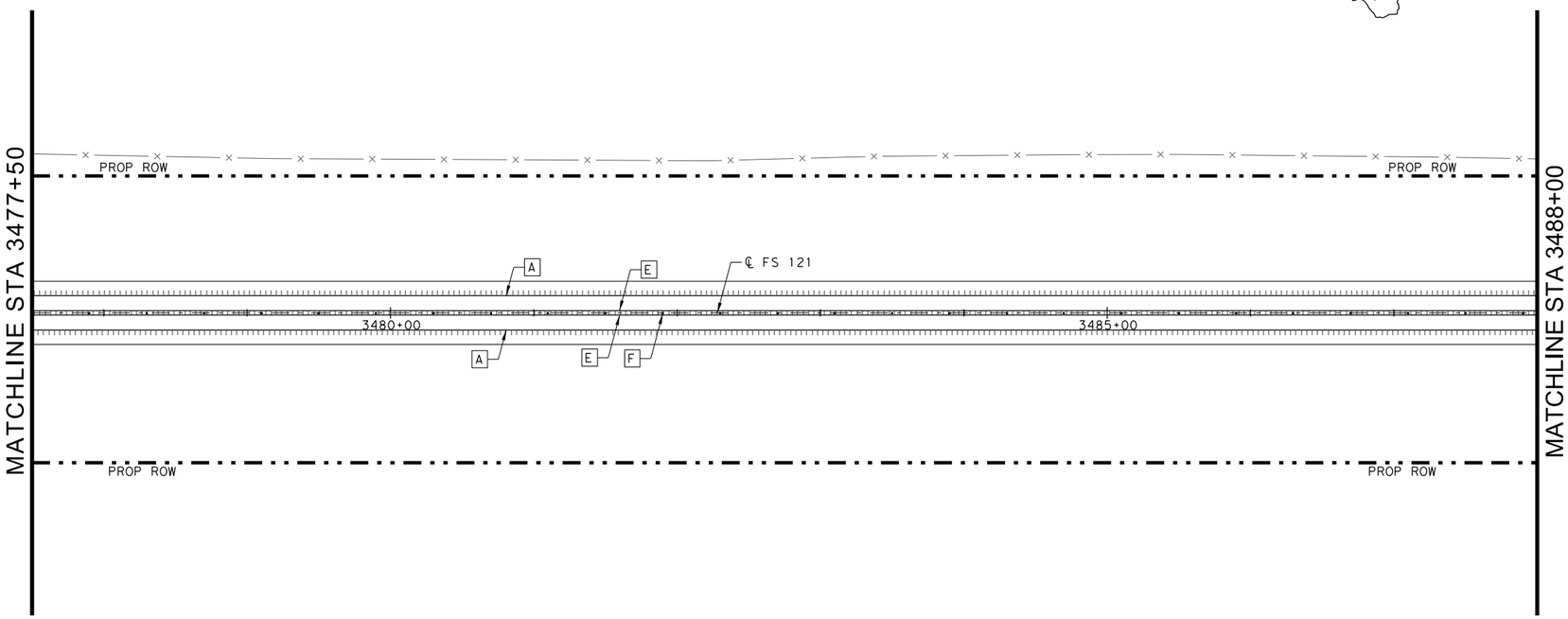
STA 3446+00 - STA 3467+00

SCALE: 1" = 100' SHEET 5 OF 14

STATE		HIGHWAY NO.
TEXAS		FS 121

STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	205





HORIZONTAL
50 0 50 100
SCALE IN FEET

LEGEND

- [A] RE PM W/RET REQ TY I (W)4"(SLD)
- [B] REFL PAV MRK TY I (W)8"(SLD)
- [C] REFL PAV MRK TY I (W)8"(DOT)
- [D] REFL PAV MRK TY I (W)24"(SLD)
- [E] RE PM W/RET REQ TY I (Y)4"(SLD)
- [F] REFL PAV MRKR TY II-A-A
- [G] REFL PAV MRKR TY I-C
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- [J] REFL PAV MRK TY I (W)(WORD)
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FS 121

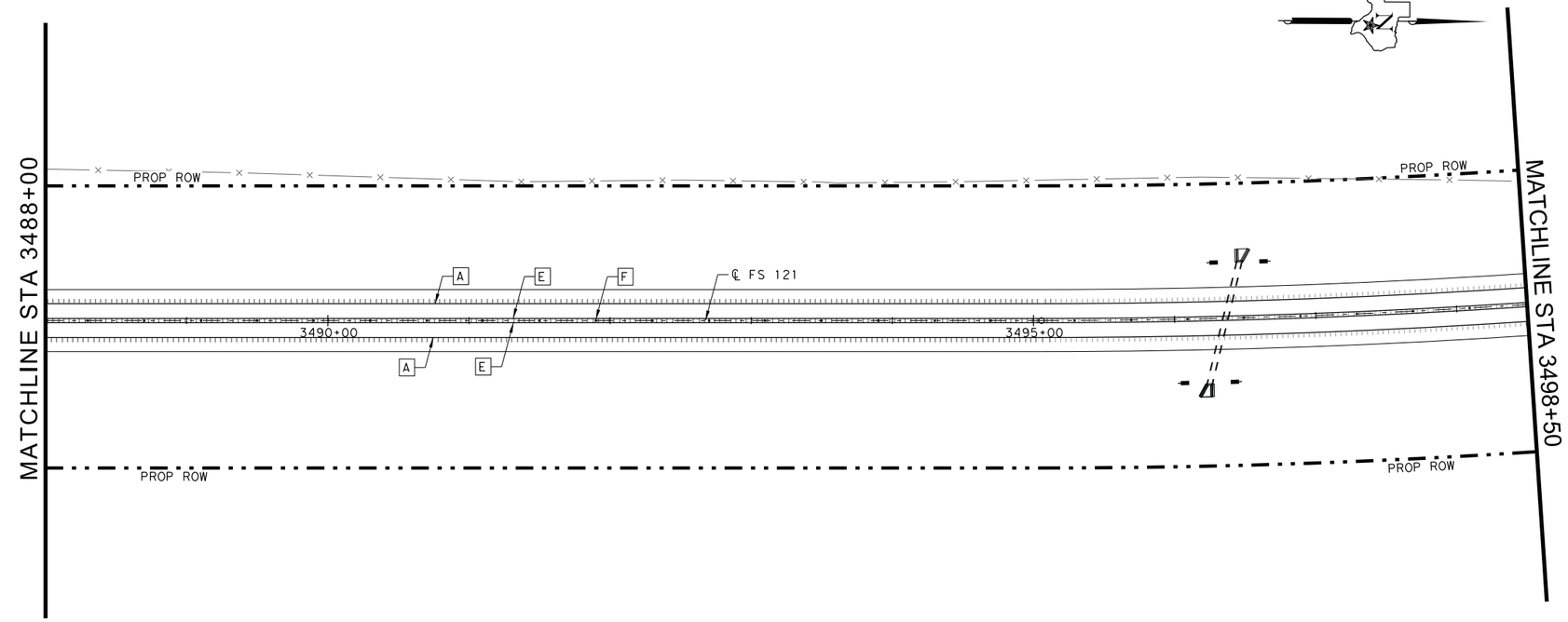
SIGNING & PAVEMENT MARKINGS

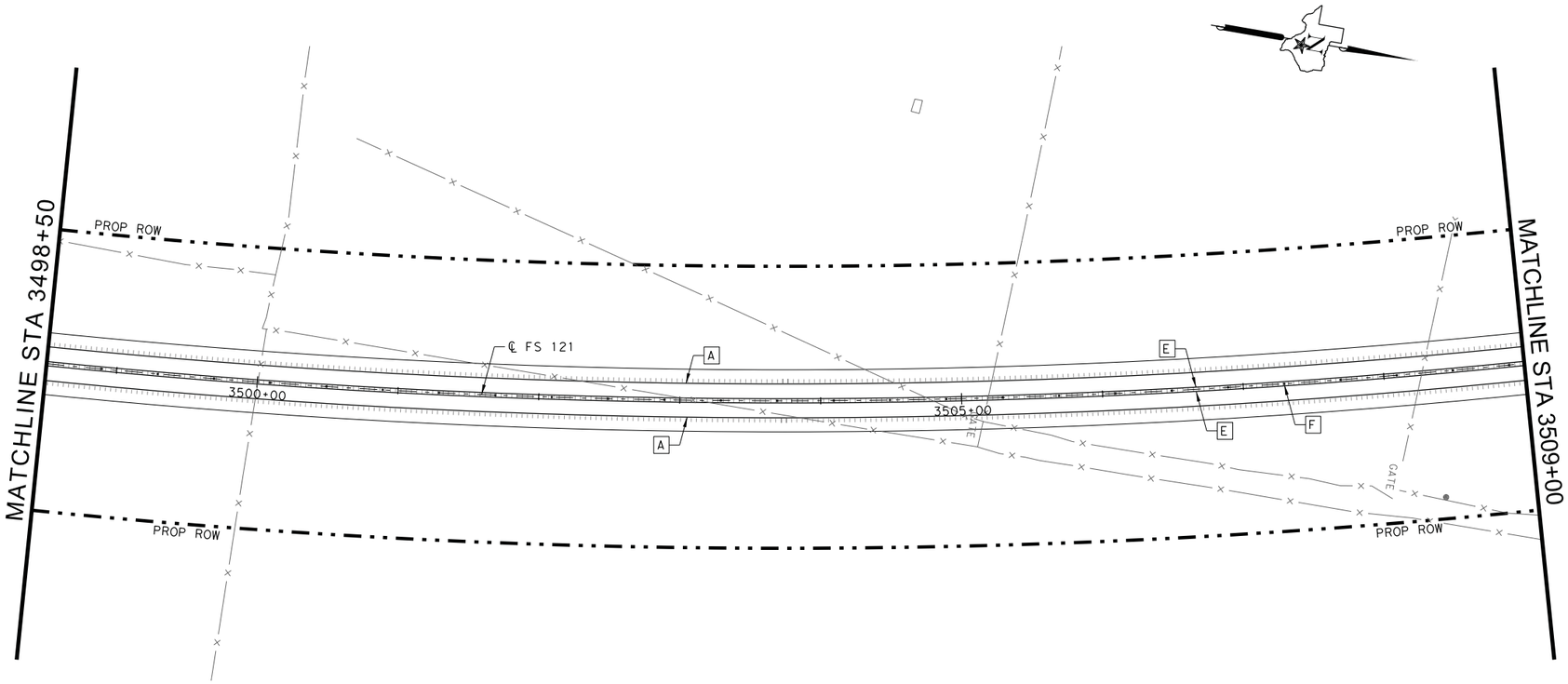
STA 3467+00 - STA 3488+00

SCALE: 1" = 100' SHEET 6 OF 14

STATE		HIGHWAY NO.
TEXAS		FS 121

STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	206





HORIZONTAL
50 0 50 100
SCALE IN FEET

LEGEND

- [A] RE PM W/RET REQ TY I (W)4"(SLD)
- [B] REFL PAV MRK TY I (W)8"(SLD)
- [C] REFL PAV MRK TY I (W)8"(DOT)
- [D] REFL PAV MRK TY I (W)24"(SLD)
- [E] RE PM W/RET REQ TY I (Y)4"(SLD)
- [F] REFL PAV MRKR TY II-A-A
- [G] REFL PAV MRKR TY I-C
- [H] REFL PAV MRK TY I (W)(ARROW)
- [J] REFL PAV MRK TY I (W)(WORD)
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FS 121

SIGNING & PAVEMENT MARKINGS

STA 3488+00 - STA 3509+00

SCALE: 1" = 100' SHEET 7 OF 14

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	207

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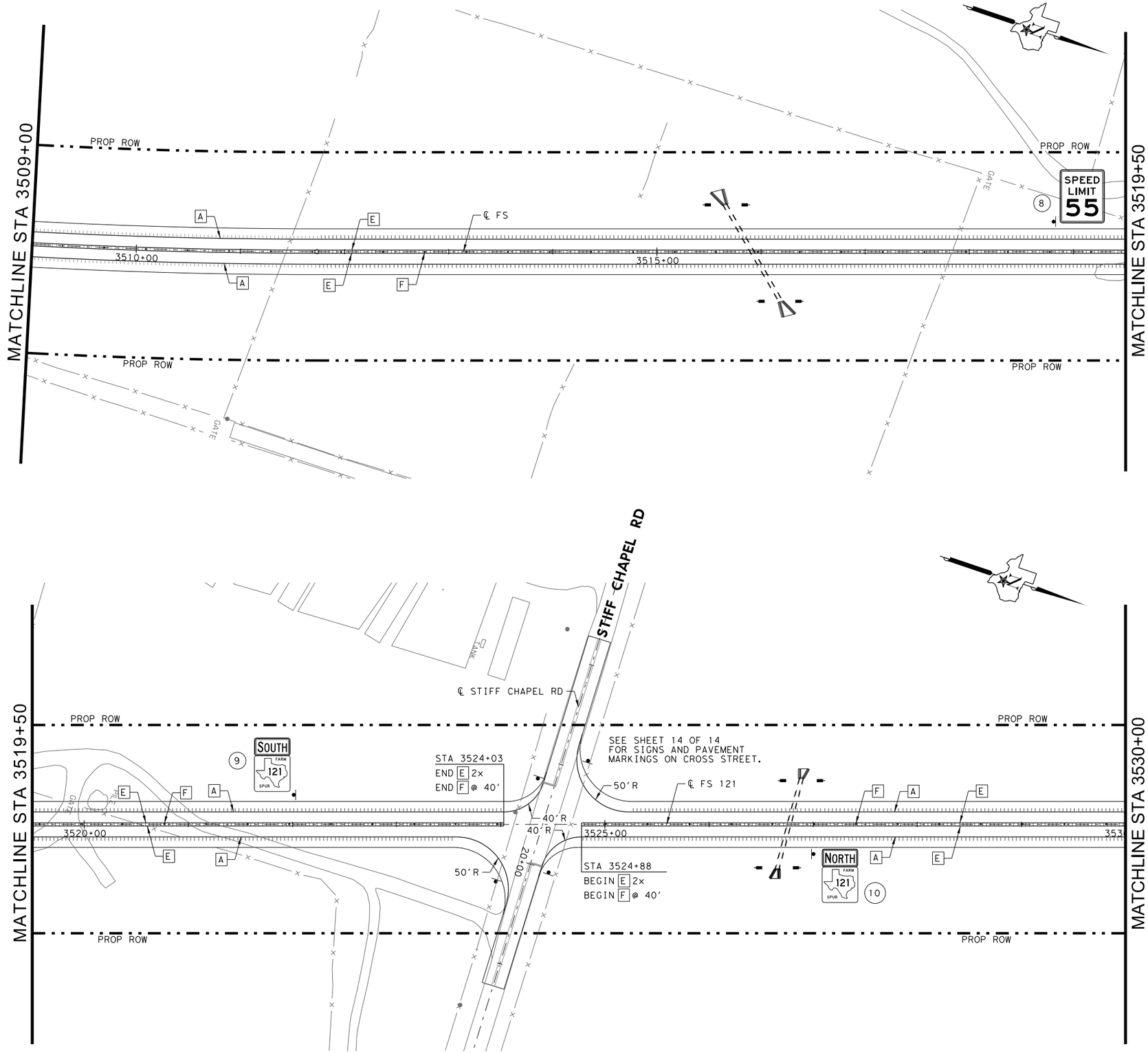

LEGEND

- A RE PM W/RET REQ TY I (W)4"(SLD)
- B REFL PAV MRK TY I (W)8"(SLD)
- C REFL PAV MRK TY I (W)8"(DOT)
- D REFL PAV MRK TY I (W)24"(SLD)
- E RE PM W/RET REQ TY I (Y)4"(SLD)
- F REFL PAV MRKR TY II-A-A
- G REFL PAV MRKR TY I-C
- H REFL PAV MRK TY I (W)(ARROW)
- J REFL PAV MRK TY I (W)(WORD)
- K REFL PAV MRK TY I (Y)12"(SLD)
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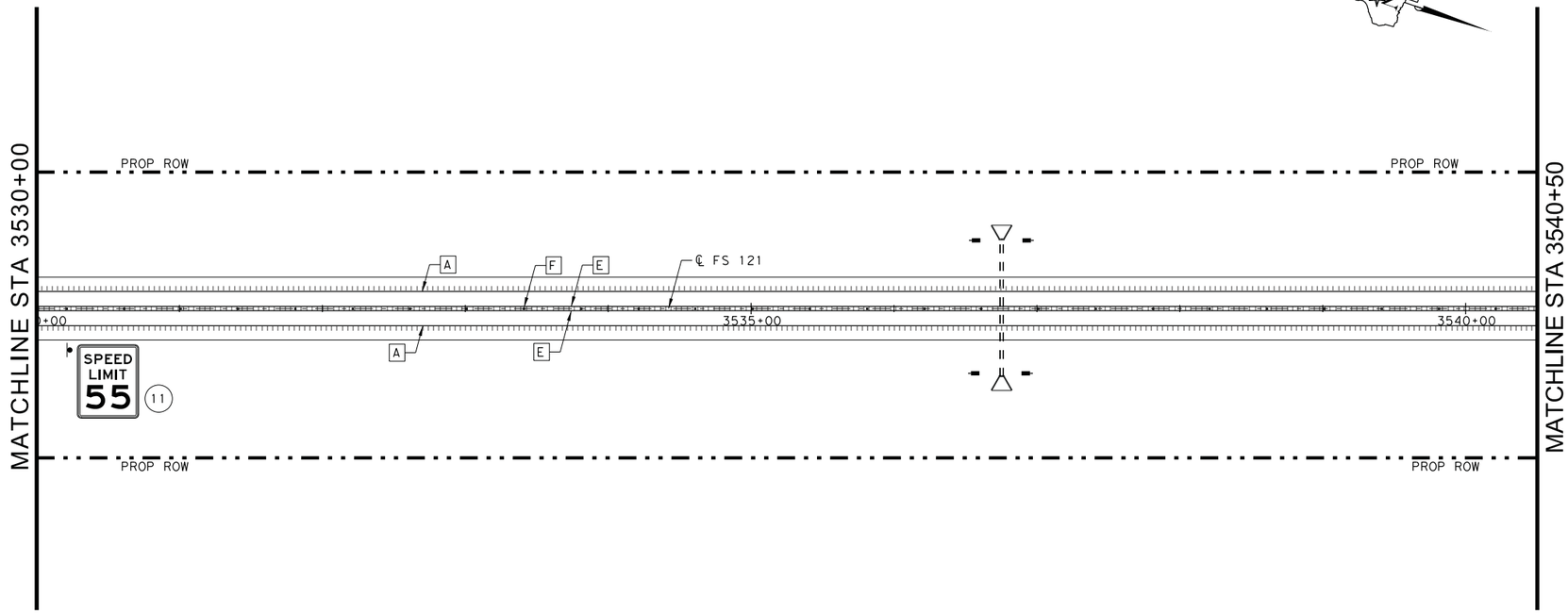
FS 121

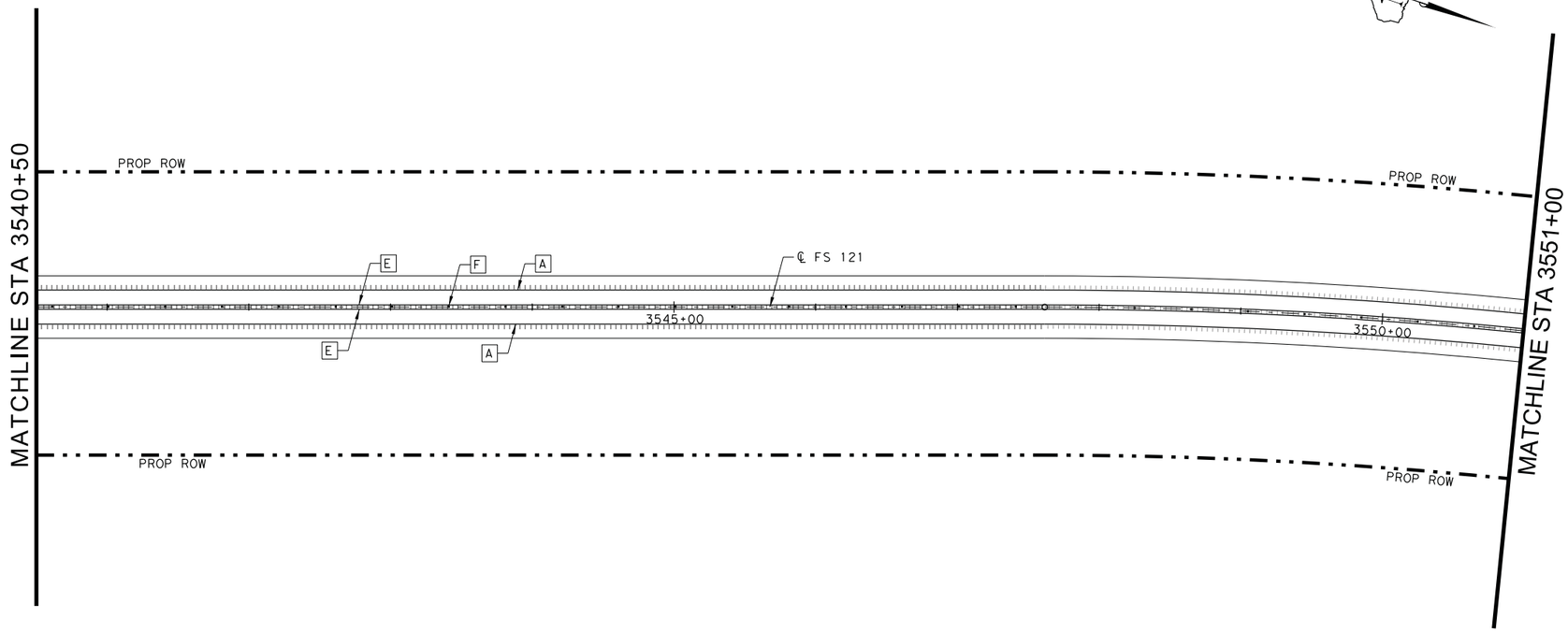
SIGNING & PAVEMENT MARKINGS

STA 3509+00 - STA 3530+00

SCALE: 1" = 100' SHEET 8 OF 14

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	208





HORIZONTAL
50 0 50 100
SCALE IN FEET

LEGEND

- A RE PM W/RET REQ TY I (W)4"(SLD)
- B REFL PAV MRK TY I (W)8"(SLD)
- C REFL PAV MRK TY I (W)8"(DOT)
- D REFL PAV MRK TY I (W)24"(SLD)
- E RE PM W/RET REQ TY I (Y)4"(SLD)
- F REFL PAV MRKR TY II-A-A
- G REFL PAV MRKR TY I-C
- H REFL PAV MRK TY I (W)(ARROW)
- J REFL PAV MRK TY I (W)(WORD)
- K REFL PAV MRK TY I (Y)12"(SLD)
- DEL ASSM (D-SW)SZ 1 (BRF)GF2(BI)
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FS 121

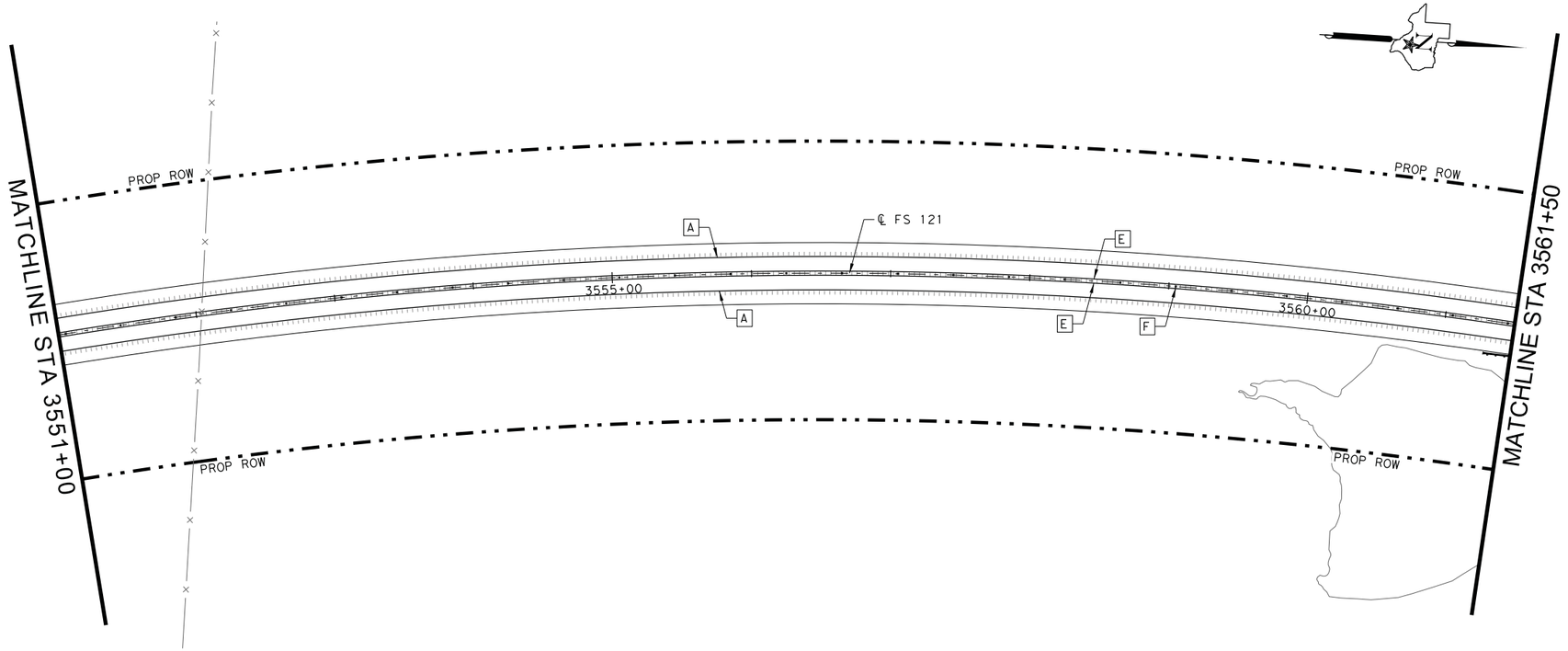
SIGNING & PAVEMENT MARKINGS

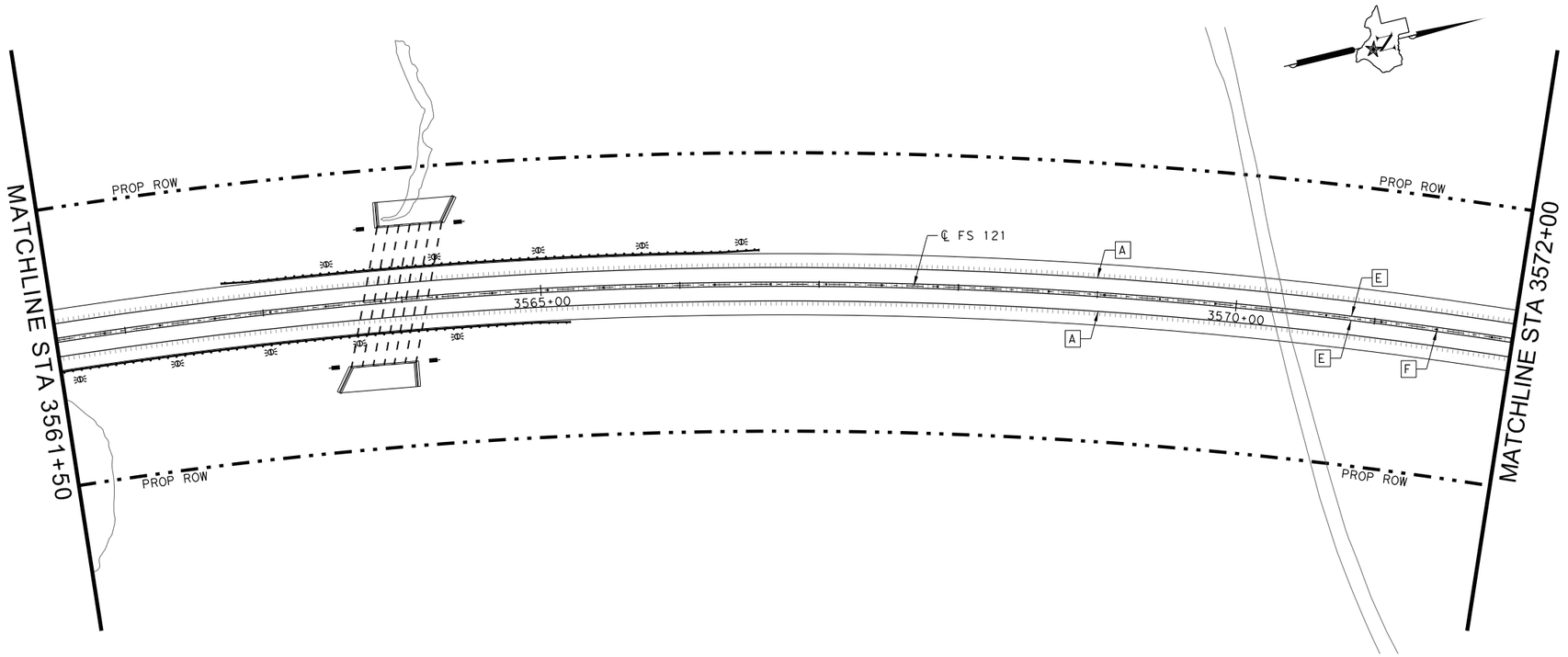
STA 3530+00 - STA 3551+00

SCALE: 1" = 100' SHEET 9 OF 14

STATE		HIGHWAY NO.
TEXAS		FS 121

STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	209





HORIZONTAL
50 0 50 100
SCALE IN FEET

LEGEND

- [A] RE PM W/RET REQ TY I (W)4"(SLD)
- [B] REFL PAV MRK TY I (W)8"(SLD)
- [C] REFL PAV MRK TY I (W)8"(DOT)
- [D] REFL PAV MRK TY I (W)24"(SLD)
- [E] RE PM W/RET REQ TY I (Y)4"(SLD)
- [F] REFL PAV MRKR TY II-A-A
- [G] REFL PAV MRKR TY I-C
- [H] REFL PAV MRK TY I (W)(ARROW)
- [J] REFL PAV MRK TY I (W)(WORD)
- [K] REFL PAV MRK TY I (Y)12"(SLD)
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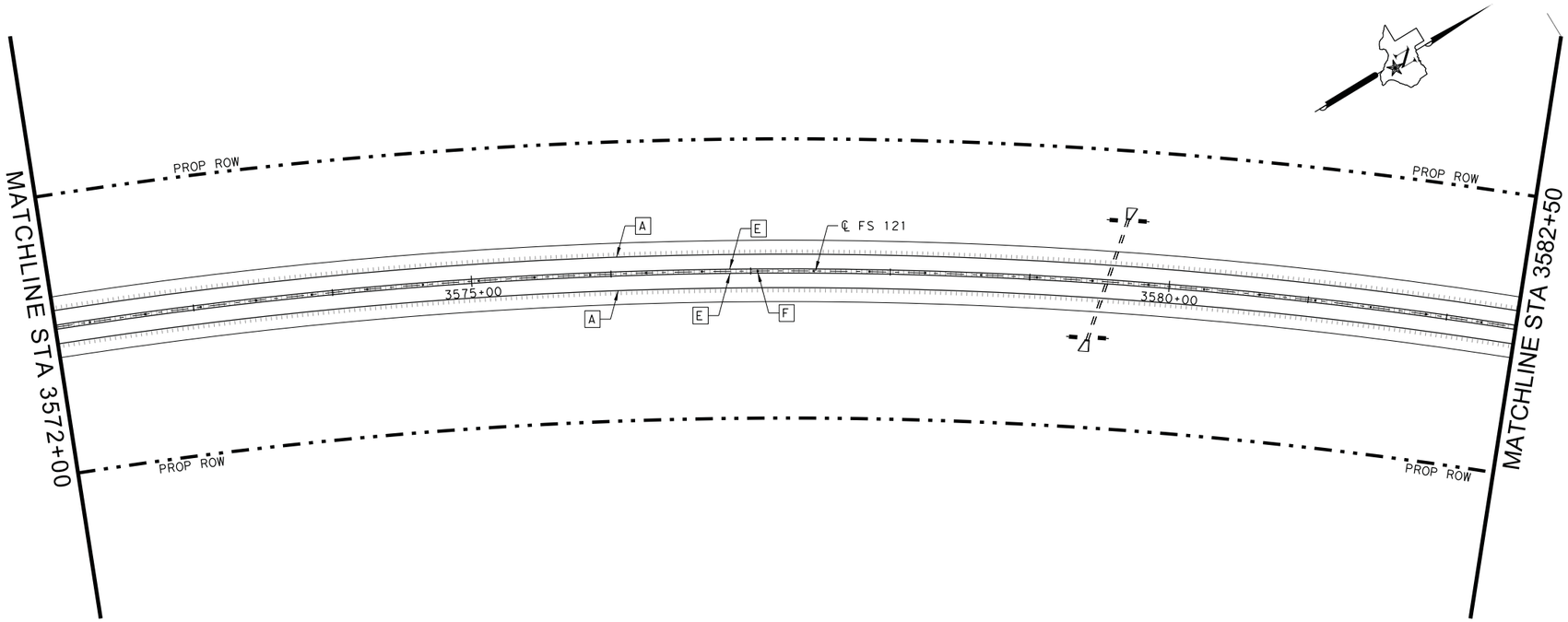
FS 121

SIGNING & PAVEMENT MARKINGS

STA 3551+00 - STA 3572+00

SCALE: 1" = 100' SHEET 10 OF 14

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	210



HORIZONTAL
50 0 50 100
SCALE IN FEET

LEGEND

- A RE PM W/RET REQ TY I (W)4"(SLD)
- B REFL PAV MRK TY I (W)8"(SLD)
- C REFL PAV MRK TY I (W)8"(DOT)
- D REFL PAV MRK TY I (W)24"(SLD)
- E RE PM W/RET REQ TY I (Y)4"(SLD)
- F REFL PAV MRKR TY II-A-A
- G REFL PAV MRKR TY I-C
- H REFL PAV MRK TY I (W)(ARROW)
- J REFL PAV MRK TY I (W)(WORD)
- K REFL PAV MRK TY I (Y)12"(SLD)
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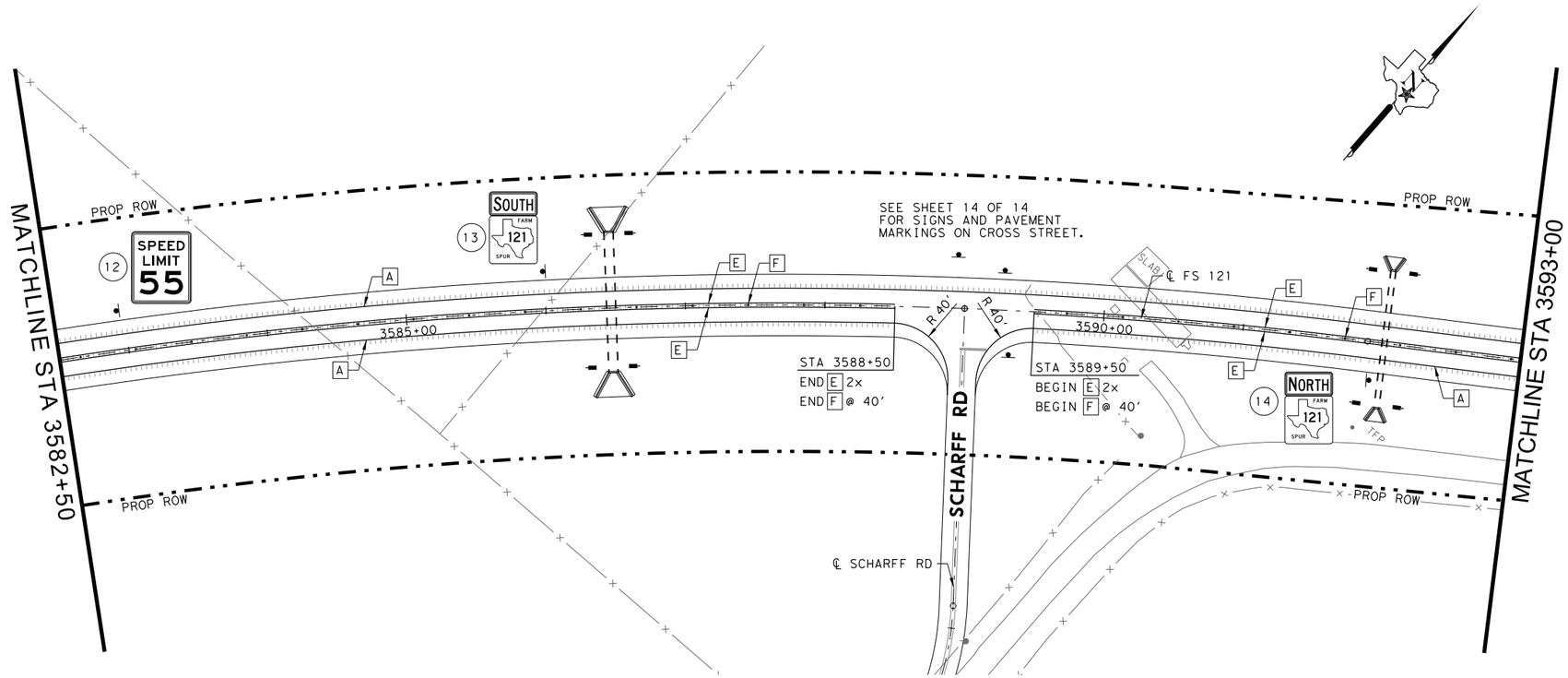

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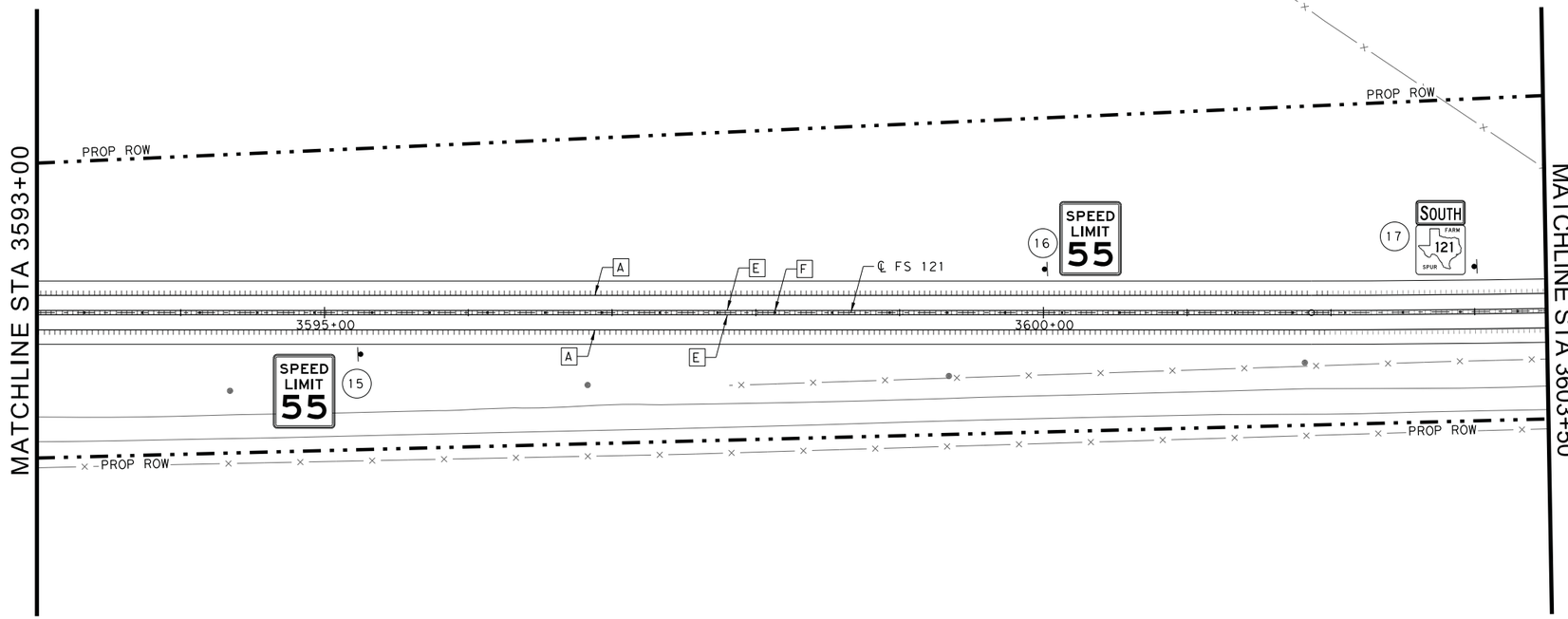
FS 121

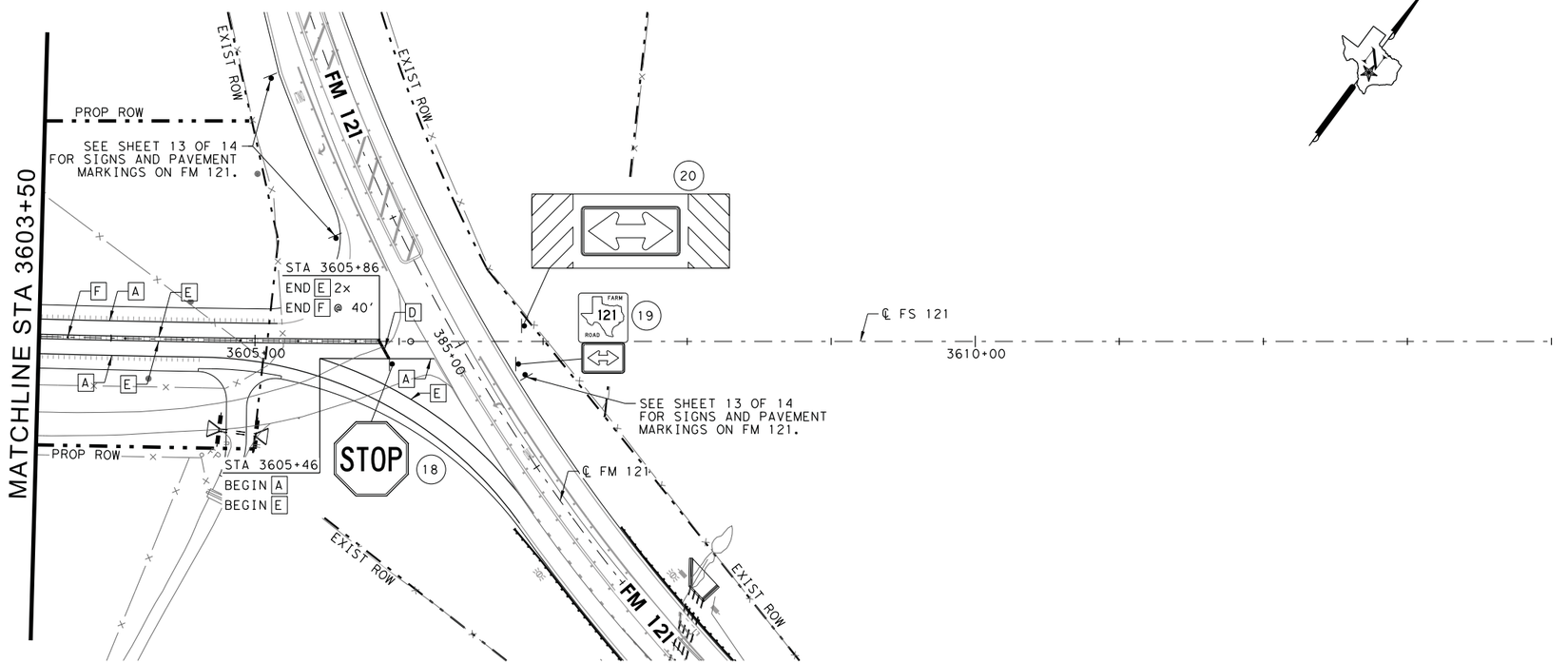
SIGNING & PAVEMENT MARKINGS

STA 3572+00 - STA 3593+00

SCALE: 1" = 100' SHEET 11 OF 14

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	211





HORIZONTAL
50 0 50 100
SCALE IN FEET

LEGEND

- [A] RE PM W/RET REQ TY I (W)4"(SLD)
- [B] REFL PAV MRK TY I (W)8"(SLD)
- [C] REFL PAV MRK TY I (W)8"(DOT)
- [D] REFL PAV MRK TY I (W)24"(SLD)
- [E] RE PM W/RET REQ TY I (Y)4"(SLD)
- [F] REFL PAV MRKR TY II-A-A
- [G] REFL PAV MRKR TY I-C
- [H] REFL PAV MRK TY I (W)(ARROW)
- [J] REFL PAV MRK TY I (W)(WORD)
- [K] REFL PAV MRK TY I (Y)12"(SLD)
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1. ALL LANE WIDTHS SHALL BE 12' UNLESS OTHERWISE CALLED OUT.
2. SEE SUMMARY OF SMALL SIGNS SHEET FOR SIGNS SIZES AND DESIGNATIONS.
3. RUMBLE STRIPS TO BE INSTALLED ALONG THE CENTERLINE AND SHOULDERS OF FS 121.

STATE OF TEXAS
STEPHEN T. SKROVANEK
138388
LICENSED
PROFESSIONAL ENGINEER
7/15/2021

DATE	BY	REV	REVISION

BGE, Inc.
2595 Dallas Parkway, Suite 101, Frisco, TX 75034
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TBPE Registration No. F-1046

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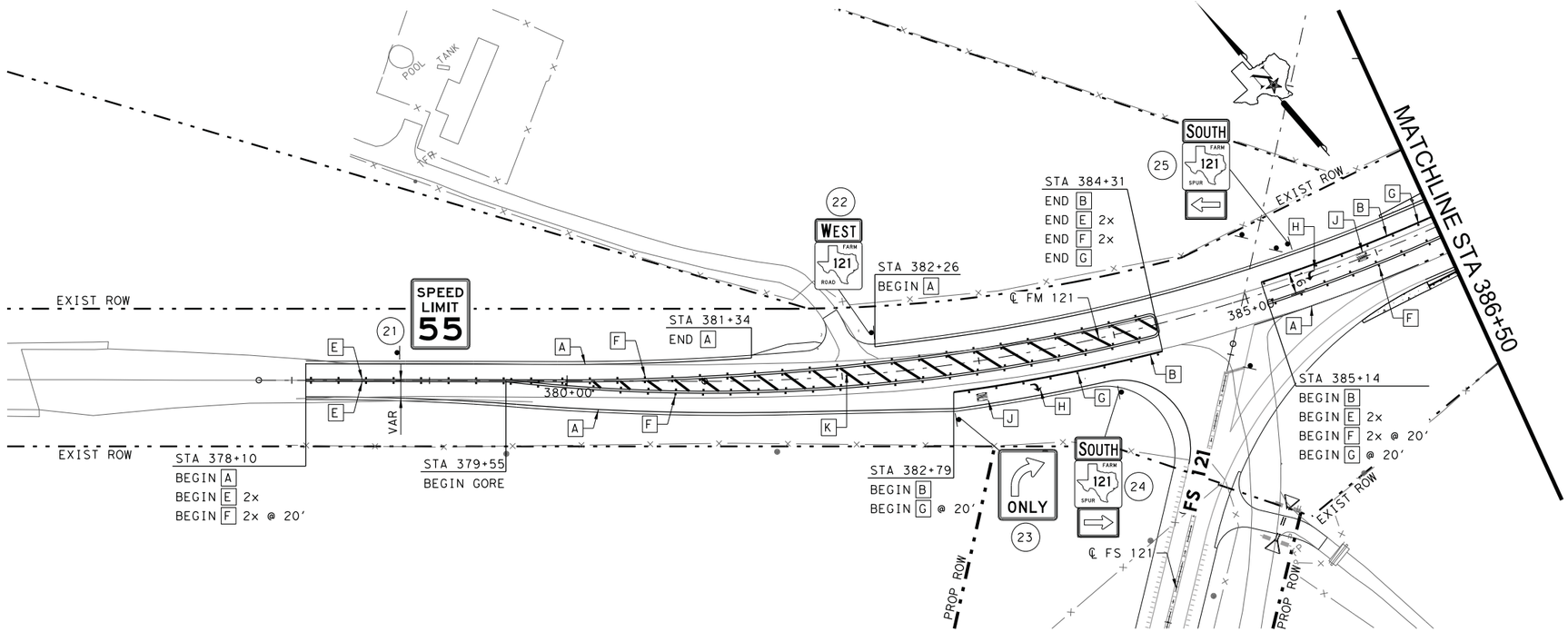
FS 121

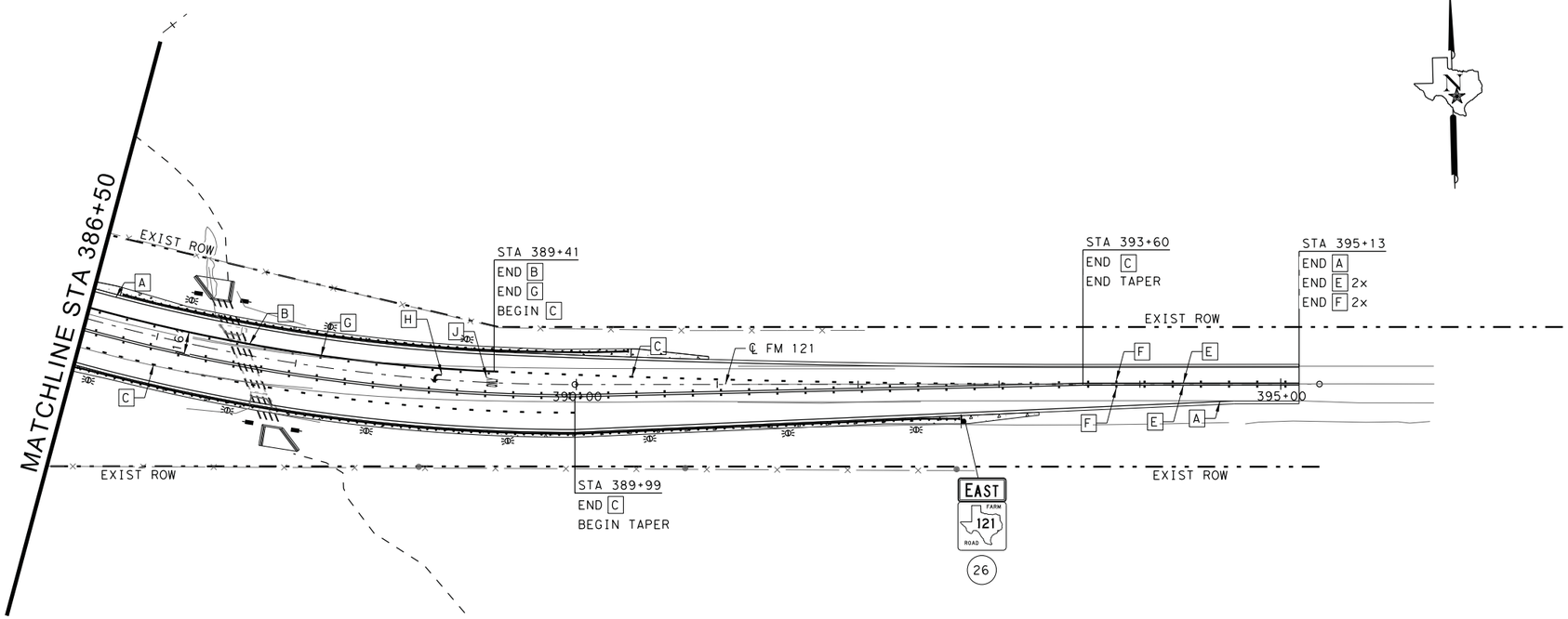
SIGNING & PAVEMENT MARKINGS

STA 3593+00 - END

SCALE: 1" = 100' SHEET 12 OF 14

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	212





HORIZONTAL
50 0 50 100
SCALE IN FEET

LEGEND

- A RE PM W/RET REQ TY I (W)4"(SLD)
- B REFL PAV MRK TY I (W)8"(SLD)
- C REFL PAV MRK TY I (W)8"(DOT)
- D REFL PAV MRK TY I (W)24"(SLD)
- E RE PM W/RET REQ TY I (Y)4"(SLD)
- F REFL PAV MRKR TY II-A-A
- G REFL PAV MRKR TY I-C
- H REFL PAV MRK TY I (W)(ARROW)
- J REFL PAV MRK TY I (W)(WORD)
- K REFL PAV MRK TY I (Y)12"(SLD)
- DEL ASSM (D-SW)SZ 1 (BRF)GF2(BI)
- OM ASSM (OM-2Y) (WC)GND
- SMALL SIGN ASSEMBLY

NOTES:

1. ALL LANE WIDTHS SHALL BE 12' UNLESS OTHERWISE CALLED OUT.
2. SEE SUMMARY OF SMALL SIGNS SHEET FOR SIGNS SIZES AND DESIGNATIONS.
3. RUMBLE STRIPS TO BE INSTALLED ALONG THE CENTERLINE AND SHOULDERS OF FS 121.

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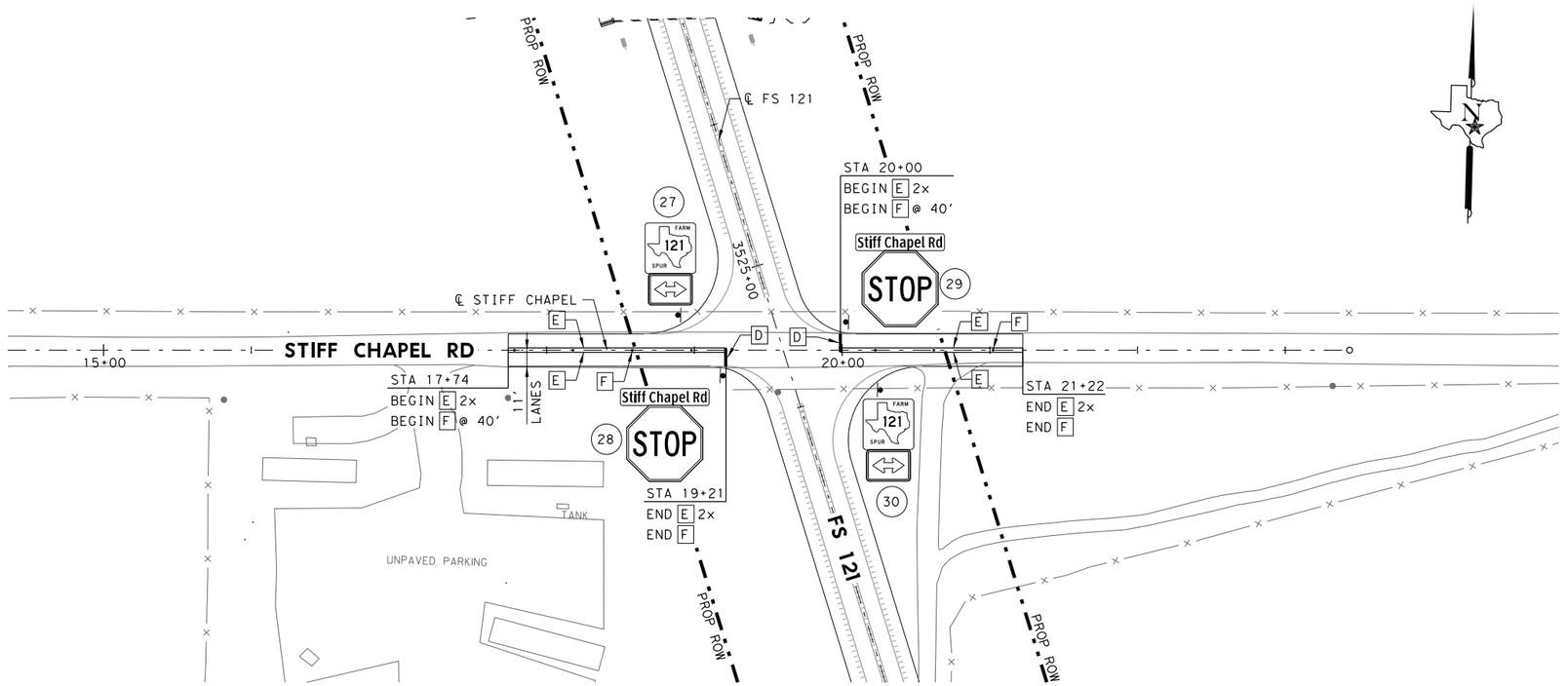
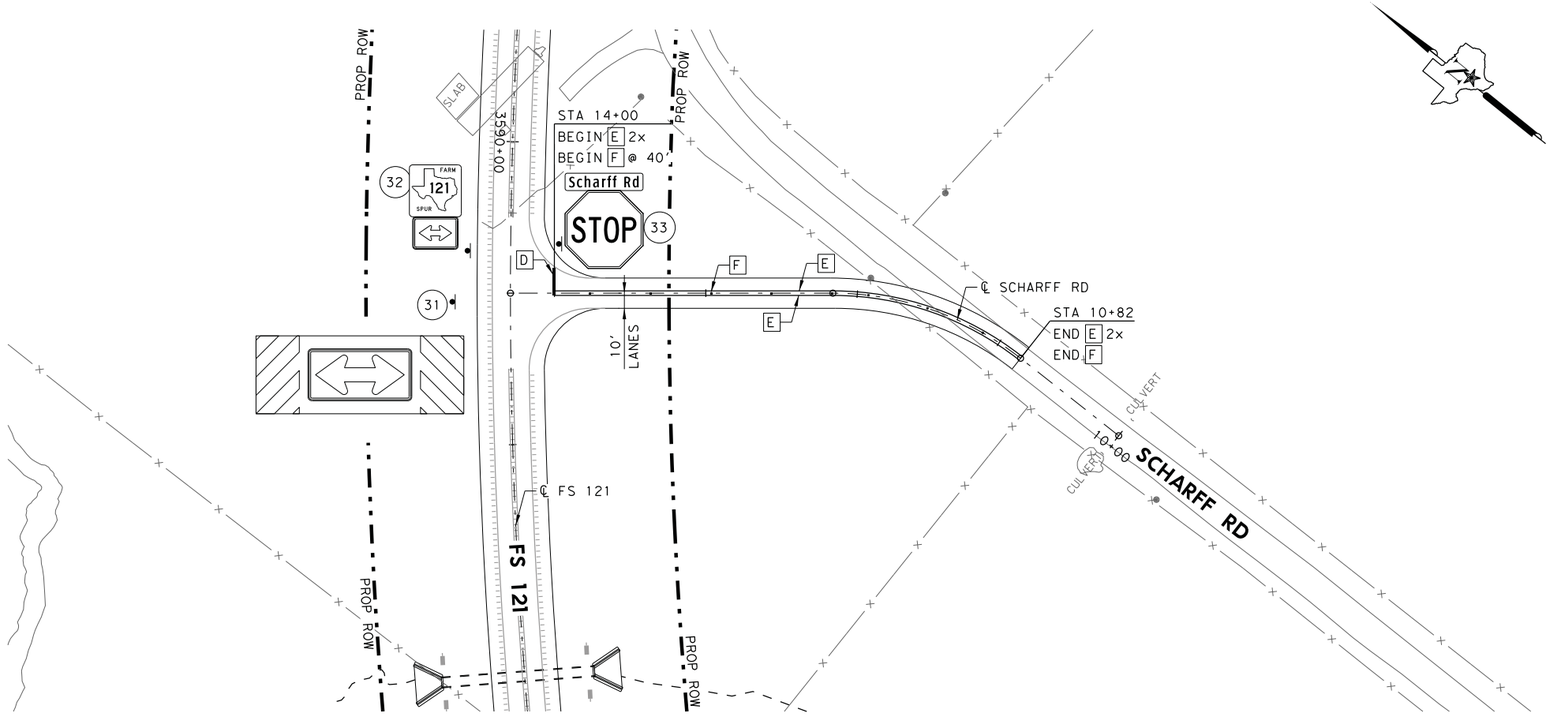
FS 121

SIGNING & PAVEMENT MARKINGS
FM 121

SCALE: 1" = 100' SHEET 13 OF 14

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	213





HORIZONTAL
50 0 50 100
SCALE IN FEET

LEGEND

- A RE PM W/RET REQ TY I (W)4"(SLD)
- B REFL PAV MRK TY I (W)8"(SLD)
- C REFL PAV MRK TY I (W)8"(DOT)
- D REFL PAV MRK TY I (W)24"(SLD)
- E RE PM W/RET REQ TY I (Y)4"(SLD)
- F REFL PAV MRKR TY II-A-A
- G REFL PAV MRKR TY I-C
- H REFL PAV MRK TY I (W)(ARROW)
- J REFL PAV MRK TY I (W)(WORD)
- K REFL PAV MRK TY I (Y)12"(SLD)
- DEL ASSM (D-SW)SZ 1 (BRF)GF2(BI)
- OM ASSM (OM-2Y) (WC)GND
- SMALL SIGN ASSEMBLY

NOTES:

1. ALL LANE WIDTHS SHALL BE 12' UNLESS OTHERWISE CALLED OUT.
2. SEE SUMMARY OF SMALL SIGNS SHEET FOR SIGNS SIZES AND DESIGNATIONS.
3. RUMBLE STRIPS TO BE INSTALLED ALONG THE CENTERLINE AND SHOULDERS OF FS 121.

STATE OF TEXAS
STEPHEN T. SKROVANEK
138388
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PROFESSIONAL ENGINEER
7/15/2021

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FS 121

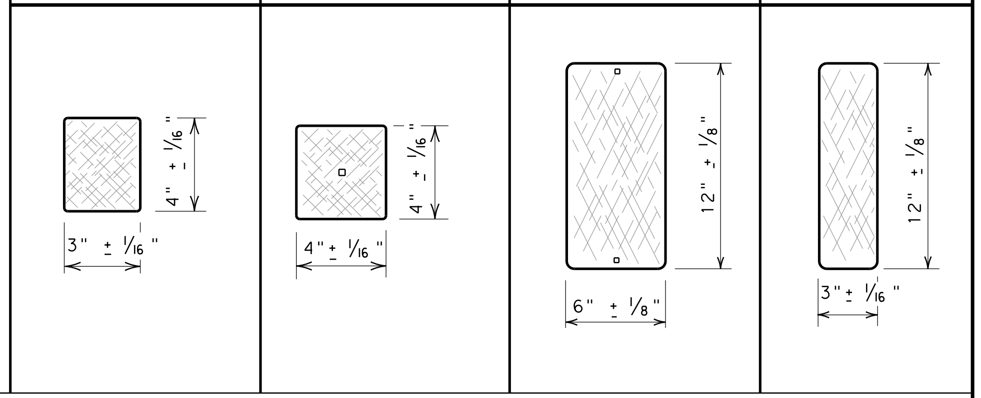
SIGNING & PAVEMENT MARKINGS

STIFF CHAPEL / SCHARFF RD

SCALE: 1" = 100' SHEET 14 OF 14

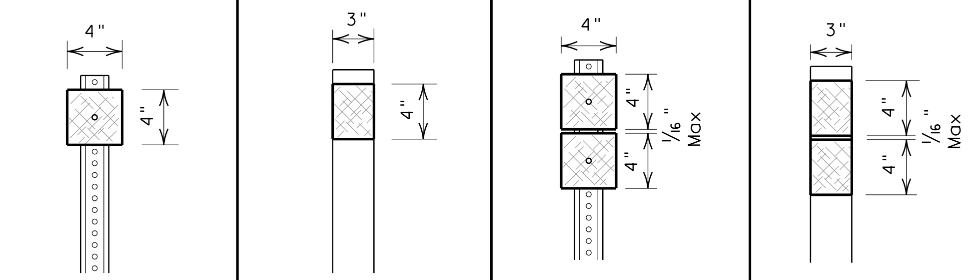
STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	214

REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

	SIZE 1	SIZE 2	SIZE 3	SIZE 4
DEVICE				
SHEETING	Yellow, White or Red Type B or C reflective sheeting			
NOTE	1. Size 1 and 4 - Direct applied reflective sheeting for use on flexible post (flx). 2. Size 2 and 3 - For use on wing channel (wc) post only. Use approved metal, plastic or fiberglass backplate with 17/64" mounting holes.			

DELINEATORS

	SINGLE		DOUBLE	
DEVICE	1-Size 2 reflector unit	1-Size 1 reflector unit	2-Size 2 reflector units	2-Size 1 reflector units
SHEETING	Yellow, White or Red Type B or C Reflective Sheeting			
POST TYPE	WC	YFLX, WFLX	WC	YFLX, WFLX
MOUNT TYPE	GND	GND, SRF	GND	GND, SRF



D & OM DESCRIPTIVE CODES

INSTL DEL ASSM (D-XX)SZ X (XXXX)XXX(XX)

NUMBER OF REFLECTORS
S = Single
D = Double

COLOR OF REFLECTORS
W = White
Y = Yellow
R = Red

REFLECTOR UNIT SIZE
1 or 2

TYPE OF POST OR DELINEATOR
WC = Wing Channel Post
YFLX = Yellow Flexible Post
WFLX = White Flexible Post
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) (XXXX)XXX(XX)

TYPE OF OBJECT MARKER
1, 2, 3, or 4

NUMBER OF REFLECTORS OR DIRECTION
X = 3-Size 2 reflector units (Type 2 only)
Y = 1-Size 3 reflector unit (Type 2 only)
Z = 3-Size 1 or 1-Size 4 reflector unit(s)(Type 2 only)
L = Left Side (Type 3 Object Marker only)
R = Right Side (Type 3 Object Marker only)
C = Center (Type 3 Object Marker only)

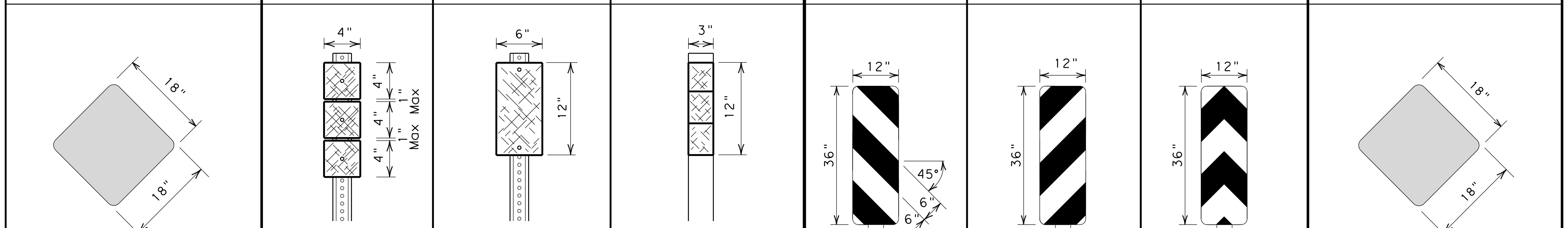
TYPE OF POST
WC = Wing Channel Post
WFLX = White Flexible Post
TWT = Thin Walled Tubing

TYPE OF MOUNT
GND = Embedded (drivable)
SRF = Surface Mount
WAS = Wedge Anchor Steel
WAP = Wedge Anchor Plastic

DIRECTION
If Required
BI = Bi-Directional

OBJECT MARKERS

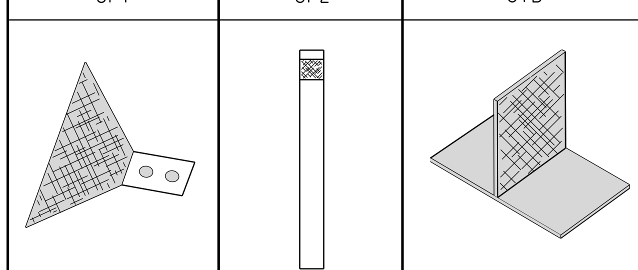
	Type 1 (OM-1)	Type 2 (OM-2)			Type 3 (OM-3)			Type 4 (OM-4)
	OM-1	OM-2X	OM-2Y	OM-2Z	OM-3L	OM-3R	OM-3C	OM-4
DEVICE		3-Size 2 reflector units	1-Size 3 reflector unit	3-Size 1 reflector units or 1-Size 4 reflector unit				
SHEETING	Yellow-Type B_{FL} or C_{FL} Sheeting	Yellow - Type B or C Sheeting			Alternating acrylic black and retroflective yellow - Type B_{FL} or C_{FL} Sheeting			Red -Type B_{FL} or C_{FL} Sheeting
POST TYPE	TWT	WC	WC	WFLX	TWT			TWT
MOUNT TYPE	WAS, WAP	GND	GND	GND, SRF	WAS, WAP			WAS, WAP



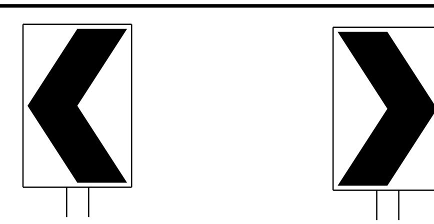
DEPARTMENTAL MATERIAL SPECIFICATIONS

FLEXIBLE DELINEATOR & OBJECT MARKER POSTS (EMBEDDED & SURFACE MOUNT TYPES)	DMS-4400
SIGN FACE MATERIALS	DMS-8300
DELINEATORS, OBJECT MARKERS AND BARRIER REFLECTORS	DMS-8600

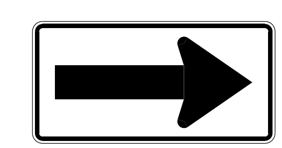
BARRIER REFLECTORS (BRF)

	GF1	GF2	CTB
DEVICE			
	1. Barrier reflectors shall meet the requirements of DMS 8600. 2. Approved Barrier Reflectors are listed on the "Barrier Reflectors" Material Producer List at: www.txdot.gov.		
SHEETING	Yellow, White, Red		
NOTE	1. Reflective sheeting shall have a minimum dimension of 3 inches and minimum surface area of 9 square inches.		

CHEVRONS

DEVICE	 W1-8			
SIZE (W x L)	18"x 24" (Conventional)	24"x 30" (Conventional Oversize)	30"x 36" (Expressway)	36" x 48" (Freeway)
MOUNTING HEIGHT	4'-0" or 7'-0"		7'-0" Only	

ONE DIRECTION LARGE ARROW

DEVICE	 W1-6	
SIZE (W x L)	48" x 24" (Conventional)	60" x 30" (Expressway & Freeway)
MOUNTING HEIGHT	7'-0"	

NOTE

1. CHEVRON (W1-8) signs and ONE DIRECTION LARGE ARROW (W1-6) Signs shall be installed per Sign Mounting Details (SMD) Standard Sheets and paid under Item 644 (Small Roadside Sign Assemblies).
2. When there is a need to increase conspicuity, the Texas version of the ONE DIRECTION LARGE ARROW sign (W1-9T) may be used instead of the ONE DIRECTION LARGE ARROW (W1-6).

NOTE:

Delineator and object marker substrates and sign substrates shall be 0.080" Aluminum sign blank to conform to ASTM B-209 Alloy 6061-T6 or approved alternative.

Texas Department of Transportation — Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION

D & OM(1)-20

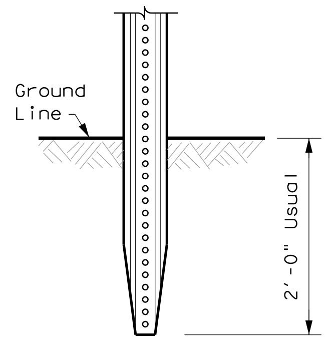
FILE: dom1-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0091	10	002	FS 121
10-09 3-15	DIST		COUNTY	SHEET NO.
4-10 7-20	PAR		GRAYSON	215

20A

POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

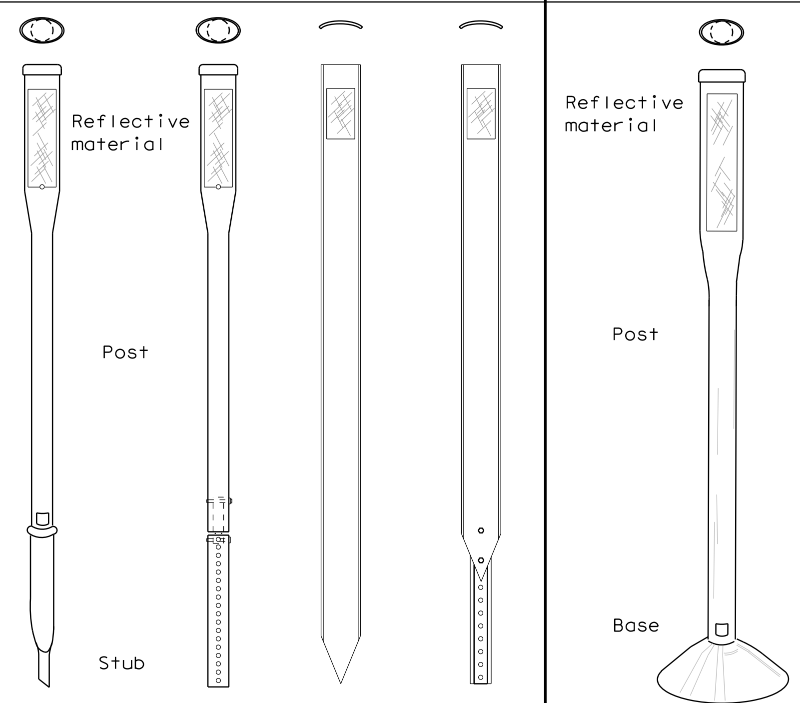


NOTES

1. Embedded Wing Channel (WC) post option may be used for Type 2 Object Markers and Delineators only.
2. 1.12 lbs/ft steel per ASTM A 1011 SS Gr. 50, or ASTM A499.

FLEXIBLE POSTS (YFLX, WFLX)

GND / SRF



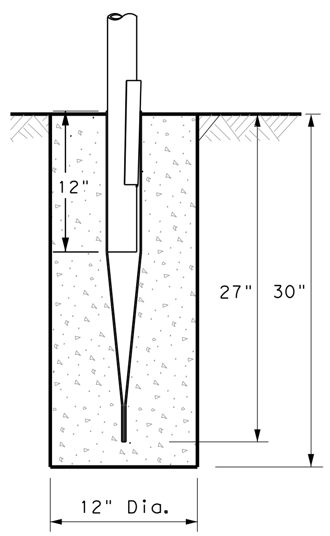
EMBEDDED | SURFACE MOUNT

NOTES

1. See "Flexible Delineator and Object Marker Posts" Material Producer List for approved devices.
2. Install per manufacturer's recommendations.
3. Post length may vary to meet field conditions.
4. When using yellow delineators with flexible posts to separate opposing direction of travel, such as centerline or median use, the flexible posts shall be yellow.

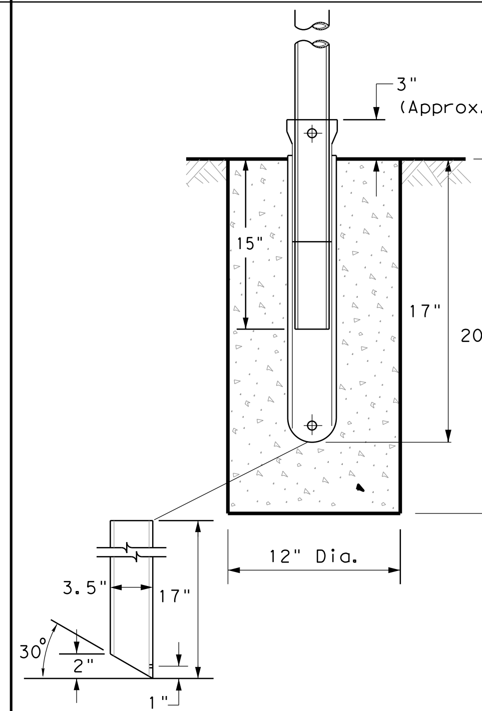
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

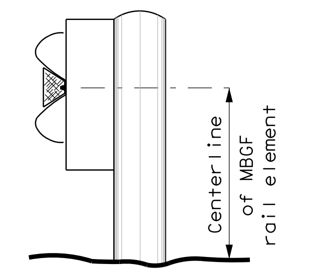
NOTE

1. Install per manufacturer's recommendations.

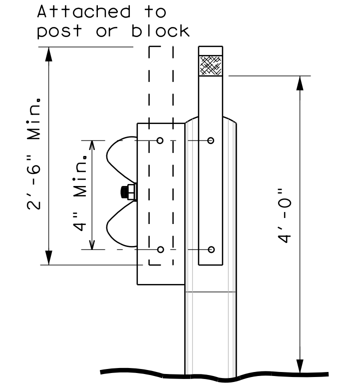
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

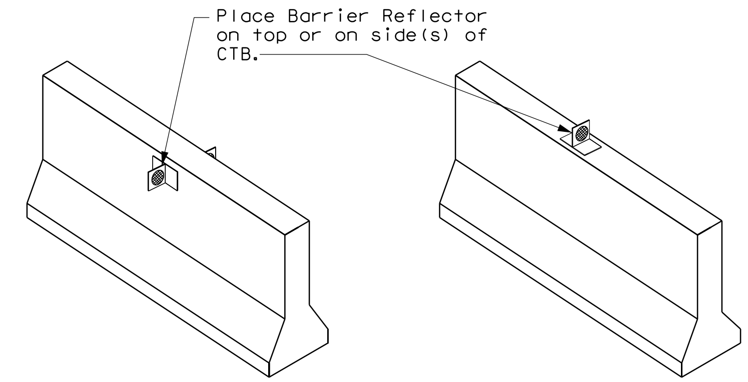
GF1



GF2



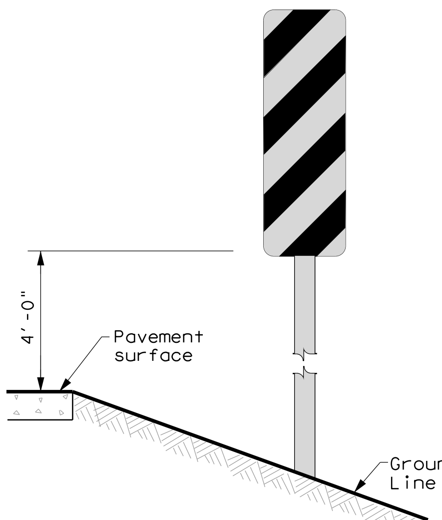
CONCRETE TRAFFIC BARRIER (CTB)



GENERAL NOTES

1. Place delineators on a section of roadway at a consistent distance from the edge of pavement.
2. Where a restriction prevents consistent placement from the pavement edge, place the affected object markers in line with the innermost edge of the obstruction.
3. When Type 2 object markers and delineators are more than 8'-0" from the edge of the pavement, it may not be possible to maintain a height of approximately 4'-0". If this is the case, place the object marker or delineator as close to the desired height as possible.
4. Install all delineators, object markers and barrier reflectors in accordance with the manufacturer's recommendation.
5. Barrier reflectors should be installed a minimum of 18 inches above the edge of the pavement surface.
6. Diagonal stripes on Type 3 object markers shall slope down toward the intended travel lane.

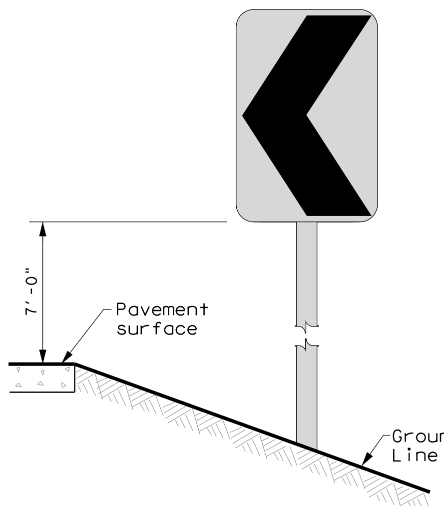
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



NOTE

Mounting at 4 feet to the bottom of the chevron is permitted for chevrons that will not exceed a height of 6'-6" to the top of the chevron (sizes 24" x 30" and smaller)

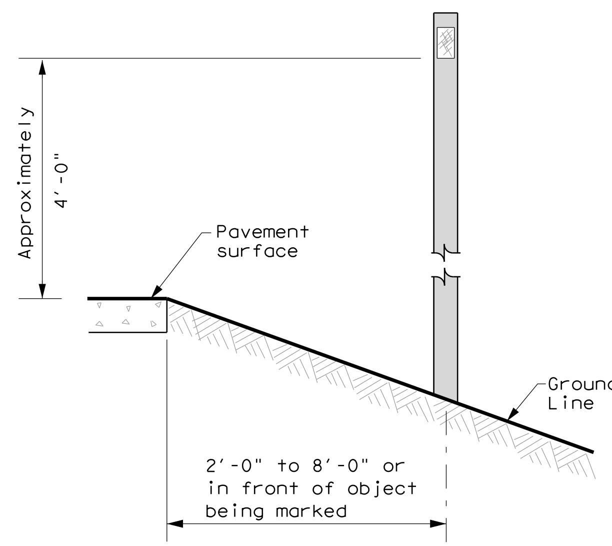
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



NOTE

Chevrons 30" x 36" and larger shall be mounted at a height of 7' to the bottom of the chevron. Chevron sign and ONE DIRECTION LARGE ARROW sign (W1-9T) shall be installed per SMD standard sheets and paid under item 644.

DELINEATORS AND TYPE 2 OBJECT MARKERS



See general notes 1, 2 and 3.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER INSTALLATION

D & OM(2)-20

FILE: dom2-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT	
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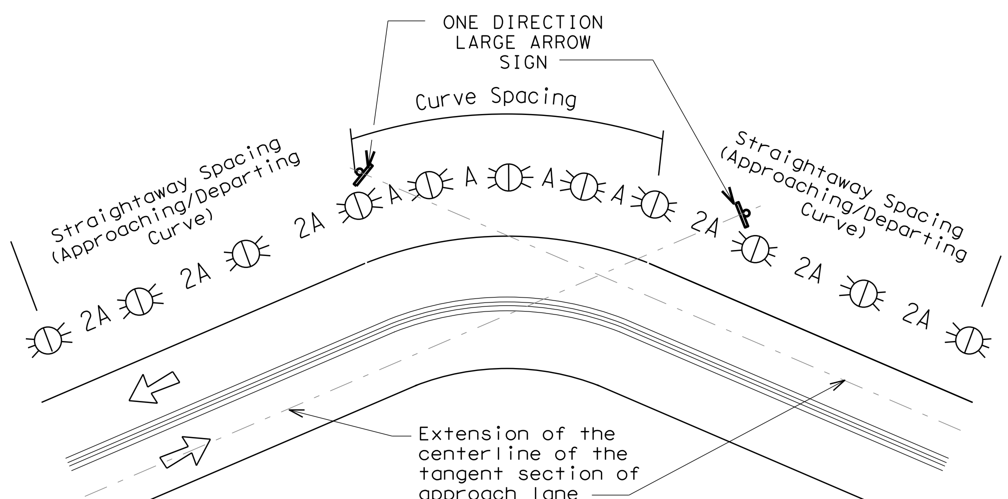
REVISIONS	0091	10	002	FS 121	
10-09 3-15	DIST	COUNTY		SHEET NO.	
4-10 7-20	PAR	GRAYSON		216	

20B

MINIMUM WARNING DEVICES AT CURVES WITH ADVISORY SPEEDS

Amount by which Advisory Speed is less than Posted Speed	Curve Advisory Speed: Turn (30 MPH or less)	Curve Advisory Speed: Curve (35 MPH or more)
5 MPH & 10 MPH	• RPMs	• RPMs
15 MPH & 20 MPH	• RPMs and One Direction Large Arrow sign	• RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons.
25 MPH & more	• RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons	• RPMs and Chevrons

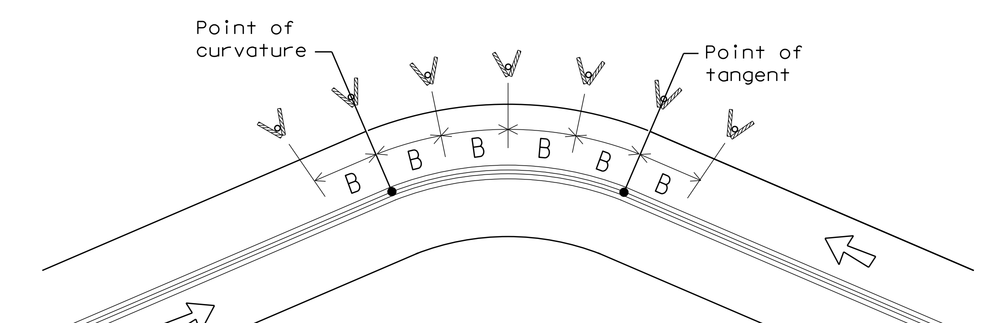
SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



NOTE

ONE DIRECTION LARGE ARROW (W1-6) sign should be located at approximately and perpendicular to the extension of the centerline of the tangent section of approach lane.

SUGGESTED SPACING FOR CHEVRONS ON HORIZONTAL CURVES



NOTE

At least one chevron pair is installed beyond the point of tangent in tangent section.

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS KNOWN

Degree of Curve	Radius of Curve (FEET)	Spacing in Curve (FEET)	Spacing in Straightaway (FEET)	Chevron Spacing in Curve (FEET)
		A	2A	B
1	5730	225	450	—
2	2865	160	320	—
3	1910	130	260	200
4	1433	110	220	160
5	1146	100	200	160
6	955	90	180	160
7	819	85	170	160
8	716	75	150	160
9	637	75	150	120
10	573	70	140	120
11	521	65	130	120
12	478	60	120	120
13	441	60	120	120
14	409	55	110	80
15	382	55	110	80
16	358	55	110	80
19	302	50	100	80
23	249	40	80	80
29	198	35	70	40
38	151	30	60	40
57	101	20	40	40

Curve delineator approach and departure spacing should include 3 delineators spaced at 2A. This spacing should be used during design preparation or when the degree of curve is known.

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS NOT KNOWN

Advisory Speed (MPH)	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
	A	2xA	B
65	130	260	200
60	110	220	160
55	100	200	160
50	85	170	160
45	75	150	120
40	70	140	120
35	60	120	120
30	55	110	80
25	50	100	80
20	40	80	80
15	35	70	40

If the degree of curve is not known, delineator spacing may be determined based on the Advisory Speed of the curve. Use the delineator curve spacing for each Advisory Speed (MPH).

DELINEATOR AND OBJECT MARKER APPLICATION AND SPACING

CONDITION	REQUIRED TREATMENT	MINIMUM SPACING
Frwy./Exp. Tangent	RPMs	See PM-series and FPM-series standard sheets
Frwy./Exp. Curve	Single delineators on right side	See delineator spacing table
Frwy/Exp.Ramp	Single delineators on at least one side of ramp (should be on outside of curves) (see Detail 3 on D&OM(4))	100 feet on ramp tangents Use delineator spacing table for ramp curves ("straightway spacing" does not apply to ramp curves)
Acceleration/Deceleration Lane	Double delineators (see Detail 3 on D&OM(4))	100 feet (See Detail 3 on D & OM (4))
Truck Escape Ramp	Single red delineators on both sides	50 feet
Bridge Rail (steel or concrete)and Metal Beam Guard Fence	Bi-Directional Delineators when undivided with one lane each direction Single Delineators when multiple lanes each direction	Equal spacing (100'max) but not less than 3 delineators
Concrete Traffic Barrier (CTB) or Steel Traffic Barrier	Barrier reflectors matching the color of the edge line	Equal spacing 100' max
Cable Barrier	Reflectors matching the color of the edge line	Every 5th cable barrier post (up to 100'max)
Guard Rail Terminus/Impact Head	Divided highway - Object marker on approach end Undivided 2-lane highways - Object marker on approach and departure end	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5) and D & OM (6)
Bridges with no Approach Rail	Type 3 Object Marker (OM-3) at end of rail and 3 single delineators approaching rail	See D & OM(5)
Reduced Width Approaches to Bridge Rail	Type 2 and Type 3 Object Markers (OM-3) and 3 single delineators approaching bridge	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5)
Culverts without MBGF	Type 2 Object Markers	See Detail 2 on D & OM(4)
Crossovers	Double yellow delineators and RPMs	See Detail 1 on D & OM (4)
Pavement Narrowing (lane merge) on Freeways/Expressway	Single delineators adjacent to affected lane for full length of transition	100 feet

NOTES

1. Unless indicated otherwise, the delineator or barrier reflector color shall conform to the color of the pavement edge line on the side of the road where the delineators or barrier reflectors are placed.
2. Barrier reflectors may be used to replace required delineators.
3. Single red delineators may be mounted on the back side of delineator posts for wrong way driver applications

LEGEND

Symbol	Description
	Bi-directional Delineator
	Delineator
	Sign

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(3)-20

FILE: dom3-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT 0091	SECT 10	JOB 002	HIGHWAY FS 121
REVISIONS 3-15 8-15 8-15 7-20	DIST PAR		COUNTY GRAYSON	SHEET NO. 217

20C

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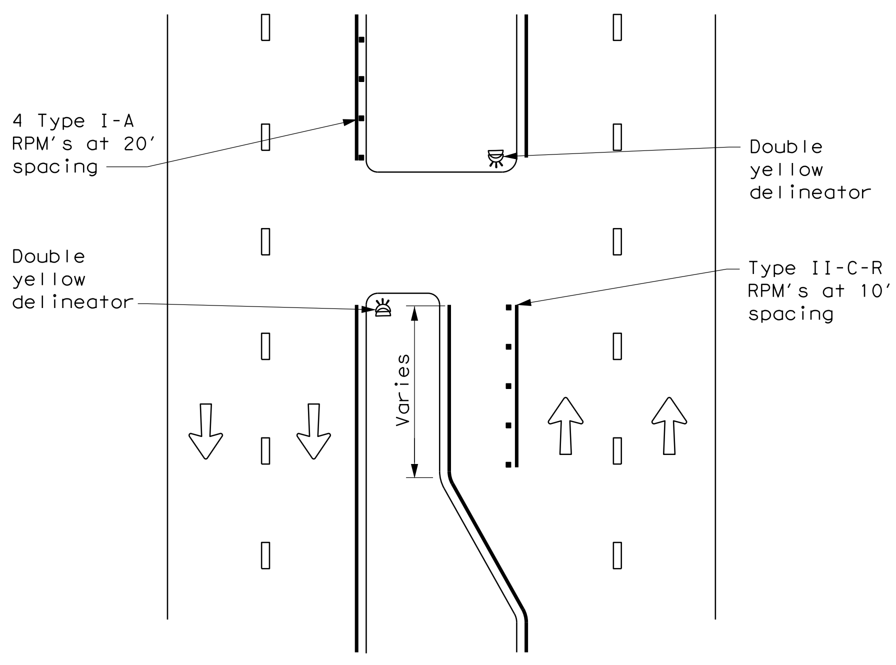
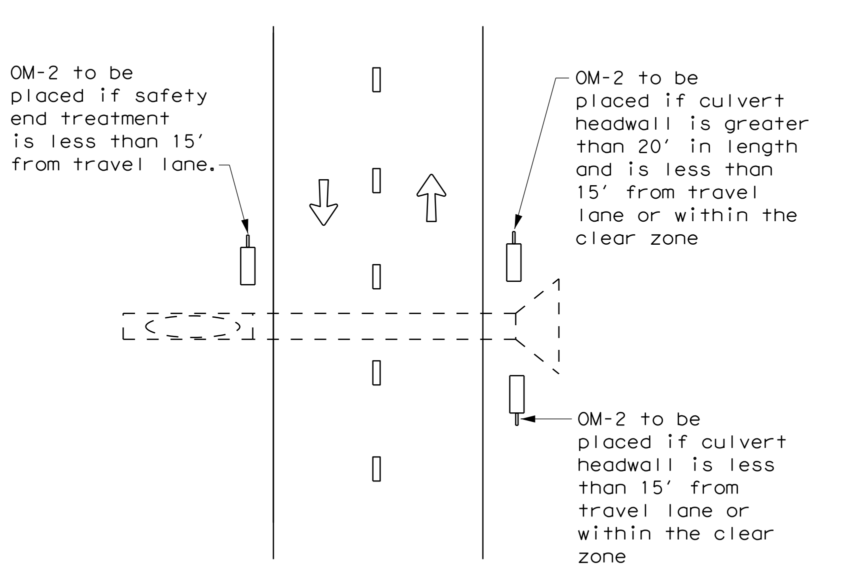
CROSSOVERS



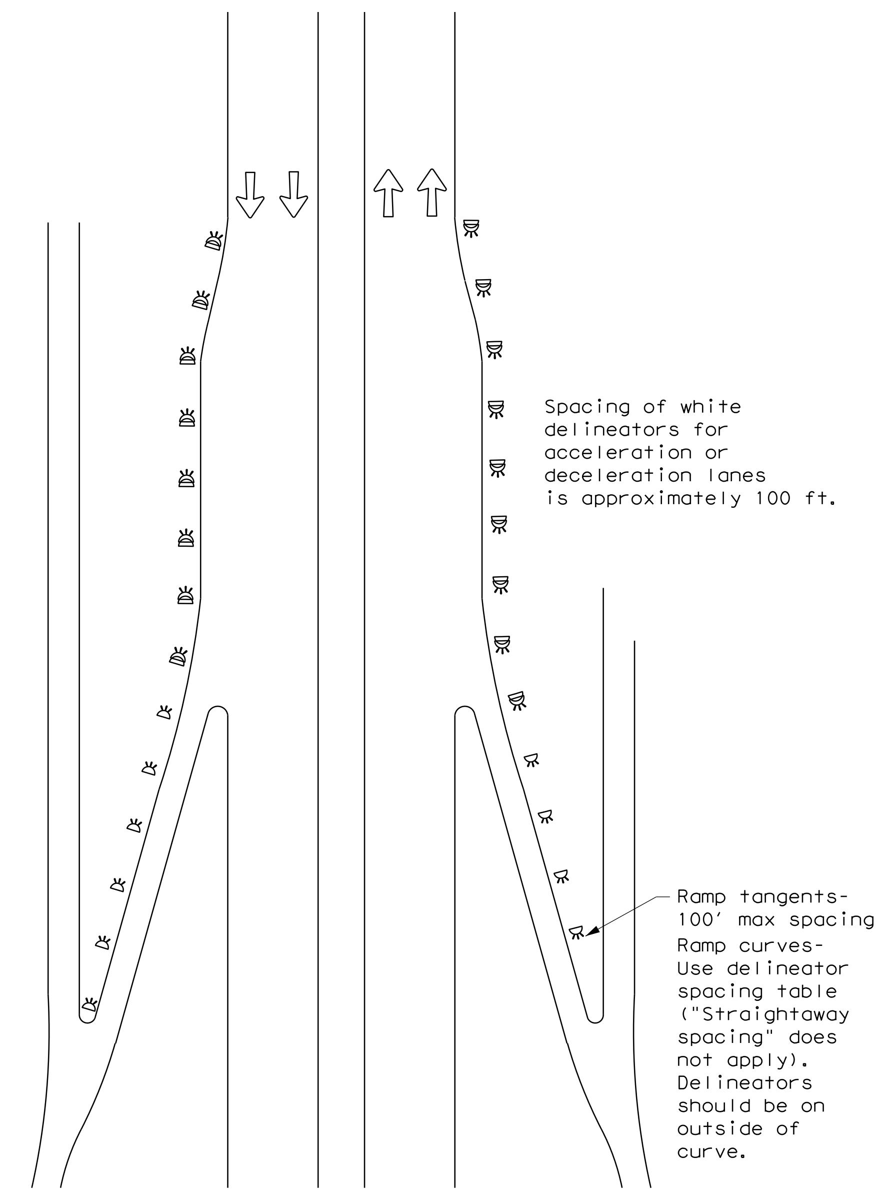
DETAIL 1

FOR CULVERTS WITHOUT MBGF



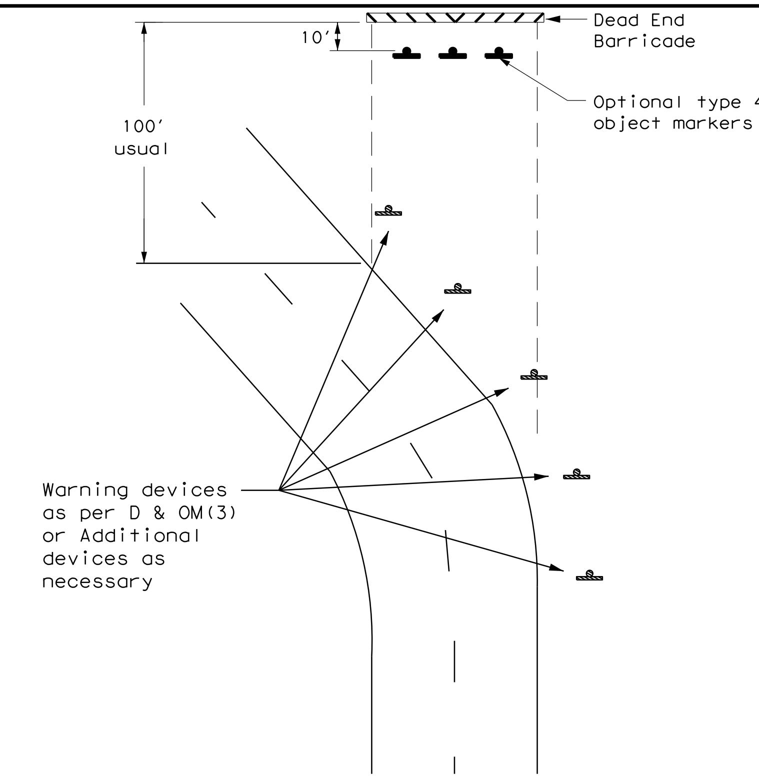
DETAIL 2

FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES



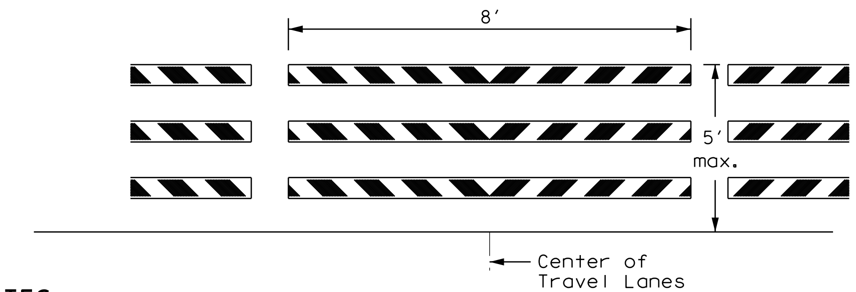
DETAIL 3

TYPICAL APPLICATION OF DEAD END BARRICADE



DETAIL 4

TYPICAL DEAD END BARRICADE INSTALLATION



NOTES

1. Barricade striping shall be red and white reflective sheeting for all permanent road closures.
2. Barricade striping is red and white sloping toward the center of the roadway.
3. Type 3 Barricade Supports should be anchored to soil or pavement as described in compliant Work Zone Traffic Control Devices List, section D.2.f and D.2.g.

DETAIL 5

LEGEND

- Bidirectional Delineator
- Delineator
- OM-3
- Barricade
- Sign
- OM-2
- Double Delineator

Texas Department of Transportation

Traffic Safety Division Standard

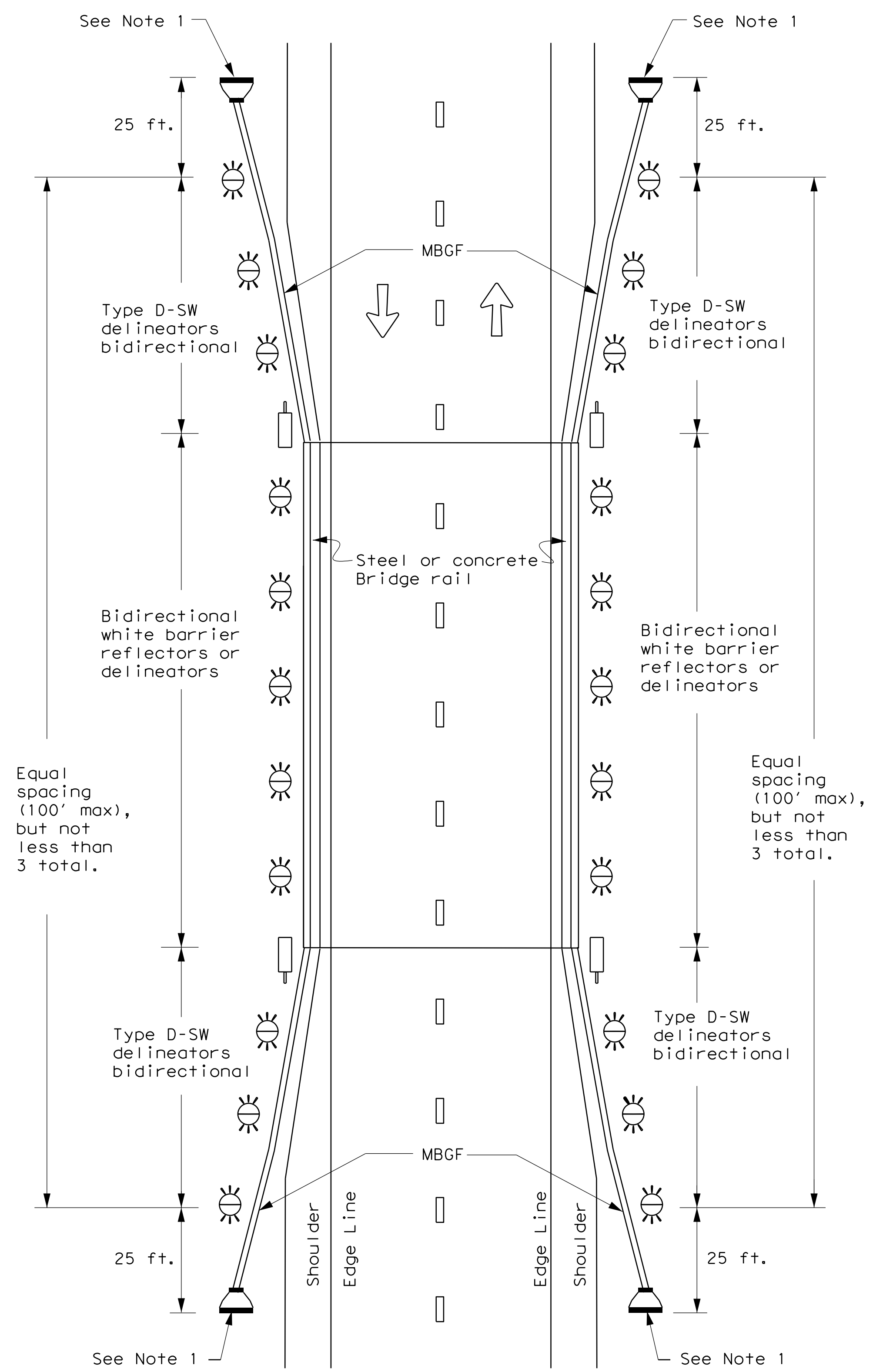
DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(4)-20

FILE: dom4-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS 3-15 7-20	0091	10	002	FS 121
	DIST		COUNTY	SHEET NO.
	PAR		GRAYSON	218

20D

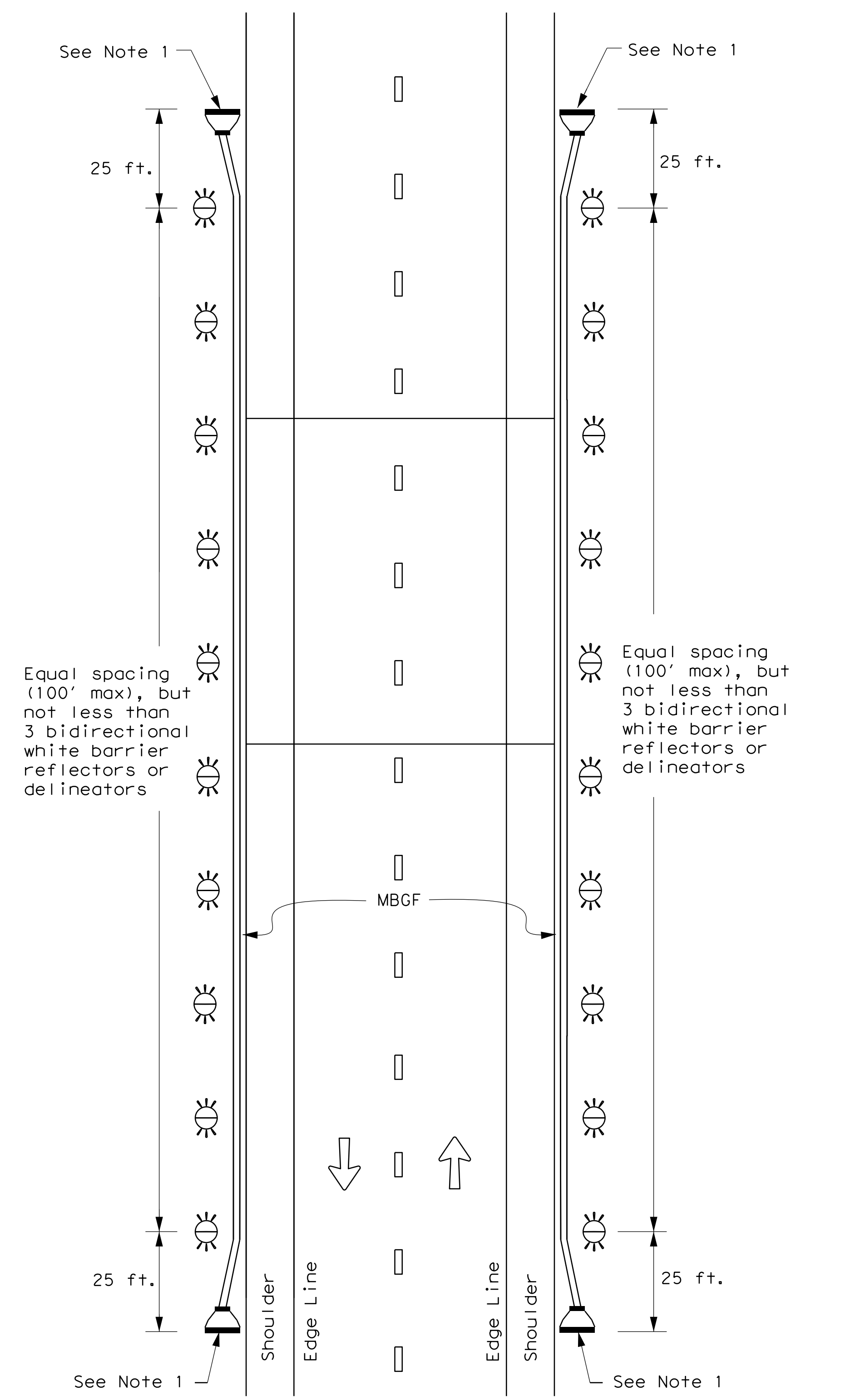
TWO-WAY, TWO LANE ROADWAY WITH REDUCED WIDTH APPROACH RAIL



NOTE:

1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

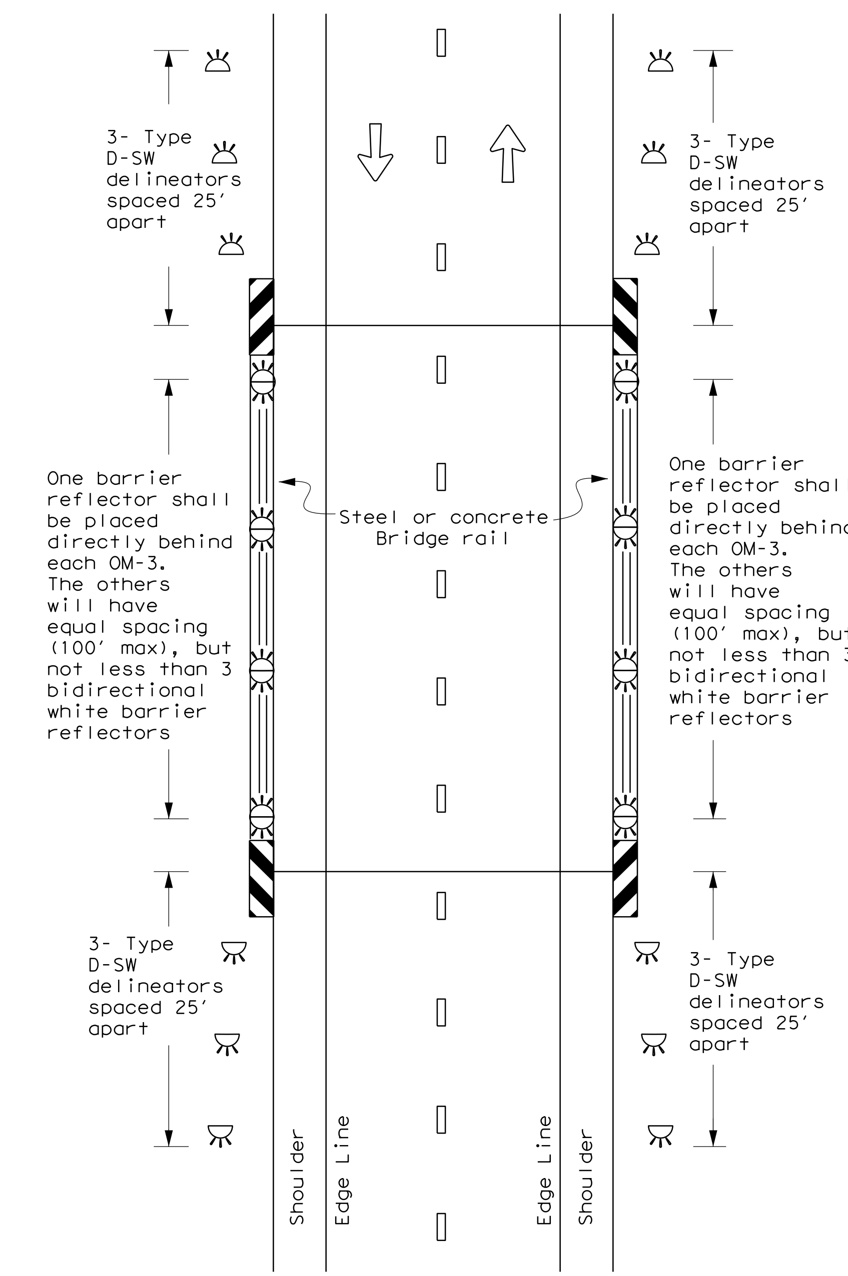
TWO-WAY, TWO LANE ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



NOTE:

1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

TWO-WAY, TWO LANE ROADWAY BRIDGE WITH NO APPROACH RAIL



LEGEND

(symbol)	Bidirectional Delineator
(symbol)	Delineator
(symbol)	OM-3
(symbol)	OM-2
(symbol)	Terminal End
(symbol)	Traffic Flow

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(5)-20

FILE: dom5-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	0091	10	002	FS 121
7-20	DIST		COUNTY	SHEET NO.
	PAR		GRAYSON	219

20E

DATE:
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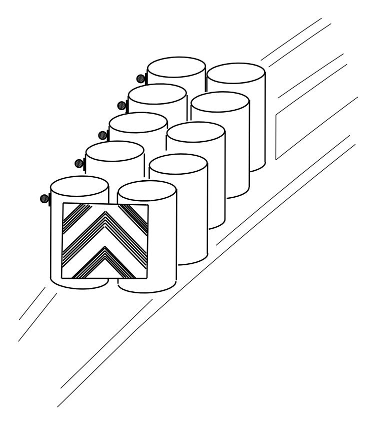
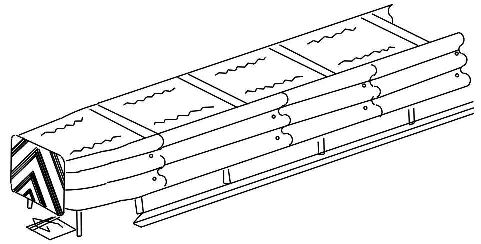
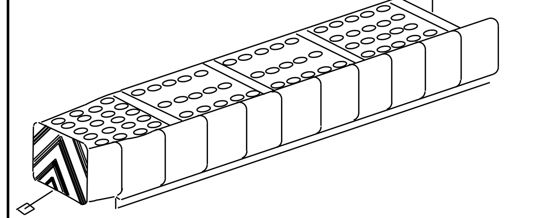
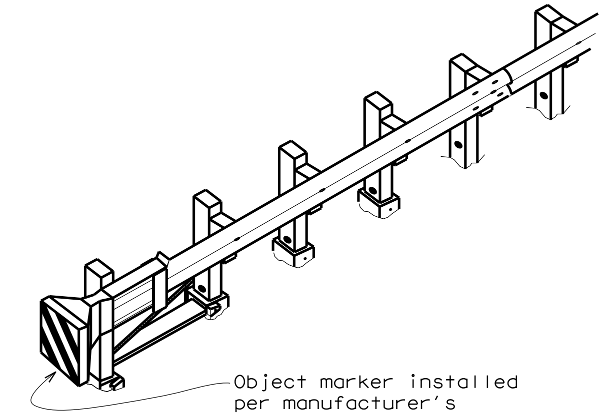
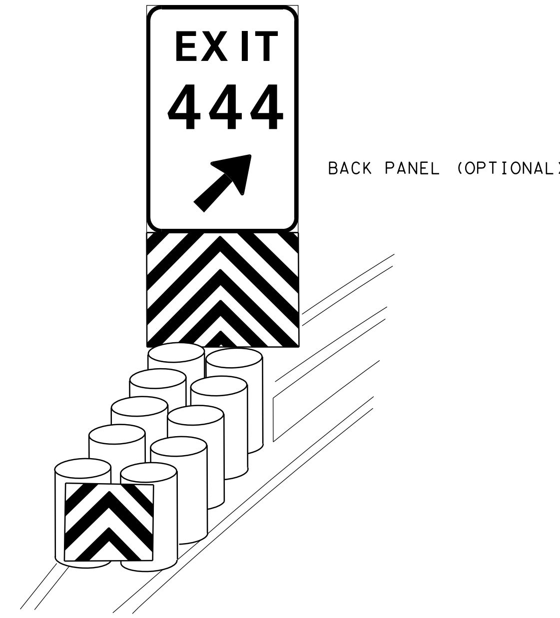
domvia-20.dgn

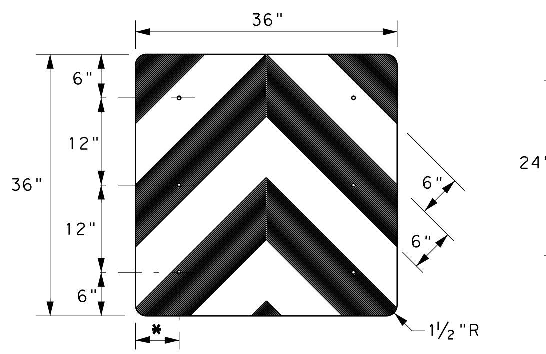


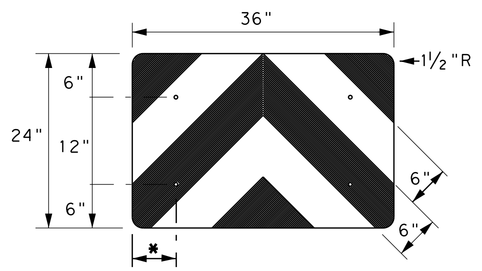




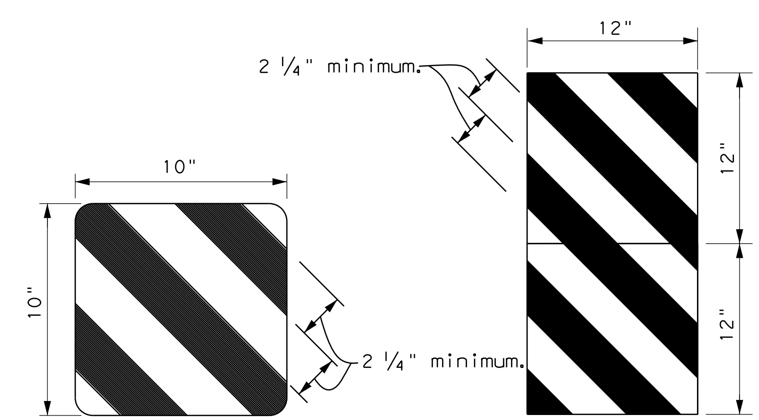




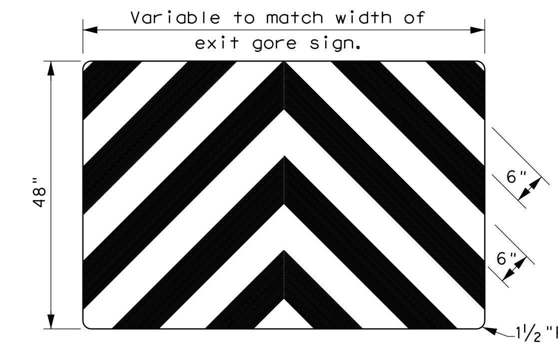


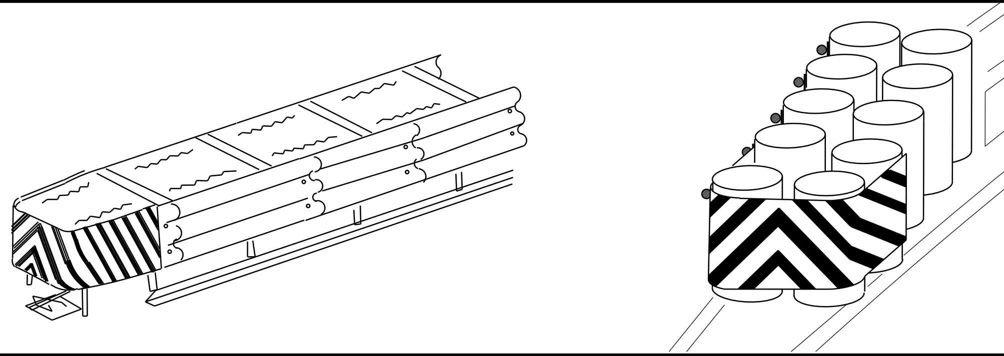


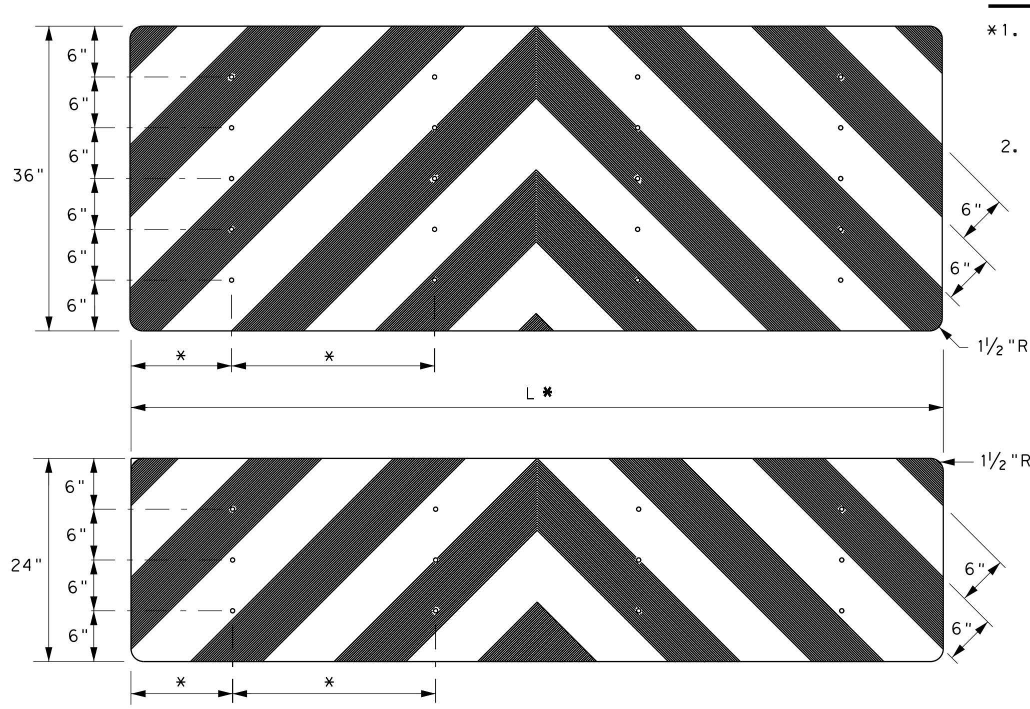
✱ Adjust to fit attenuator per manufacturer's recommendation, or as directed by the Engineer



OBJECT MARKERS SMALLER THAN 3 FT²







NOTES

*1. Spacing should be adjusted to attach through centerline of drum, per attenuator manufacturers recommendation, or as directed by the Engineer.

2. Mounting should be flush with top of attenuator. Minimum size 96" x 24".

NOTES

1. Object Markers shall conform to the Texas MUTCD and meet the color and reflectivity requirement of Department Material Specification DMS 8300. Background shall be yellow reflective sheeting (Type B or C) and Chevron shall be black.

2. Object Markers may be fabricated from adhesive backed reflective sheeting applied directly to guardrail end treatment, or applied directly to an "end cap" as per the manufacturer's recommendation. Direct applied sheeting shall provide a smooth surface and have no wrinkles, air bubbles, cuts or tears. A radius at the corners is not required for direct applied sheeting.

3. Object Marker size may be reduced to fit smaller devices. Width of alternating black and yellow stripes are typically 6". Object Markers smaller than 3ft may have reduced width stripes of a minimum of 2 ¼".

4. Pop rivets, screws, or nuts and bolts may be used to attach object markers and reflectors. Holes, slots or other openings may be cut or drilled through object markers to allow cable or other attachments.

5. Object Marker at nose of attenuator is subsidiary to the attenuator.

6. See D & OM (1-4) for required barrier reflectors.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS

D & OM(VIA)-20

FILE: domvia20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT December 1989	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-92 8-04 8-95 3-15 4-98 7-20	0091	10	002	FS 121
	DIST		COUNTY	SHEET NO.
	PAR		GRAYSON	220

20G

DATE:
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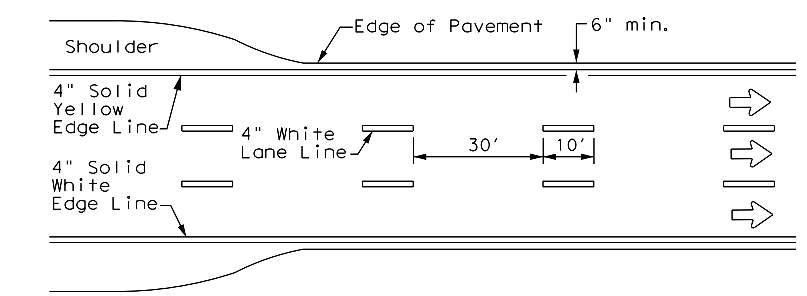
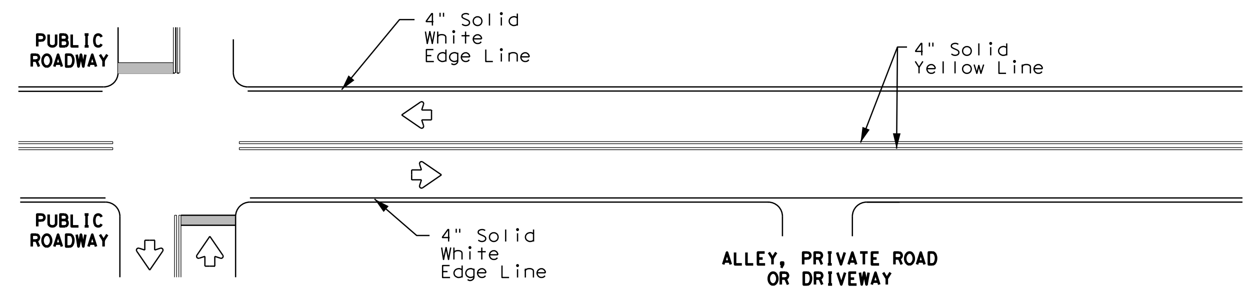
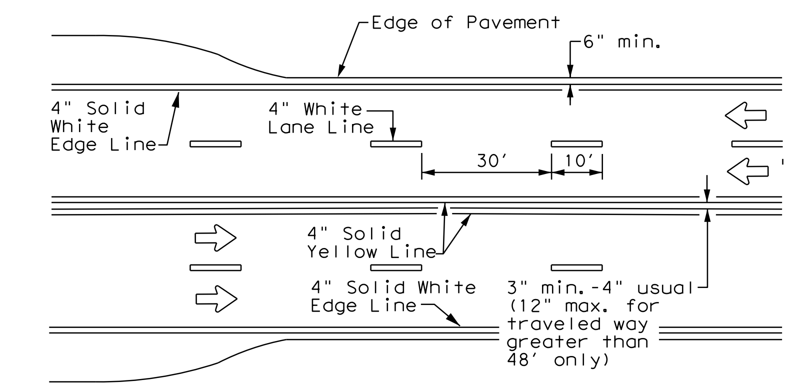


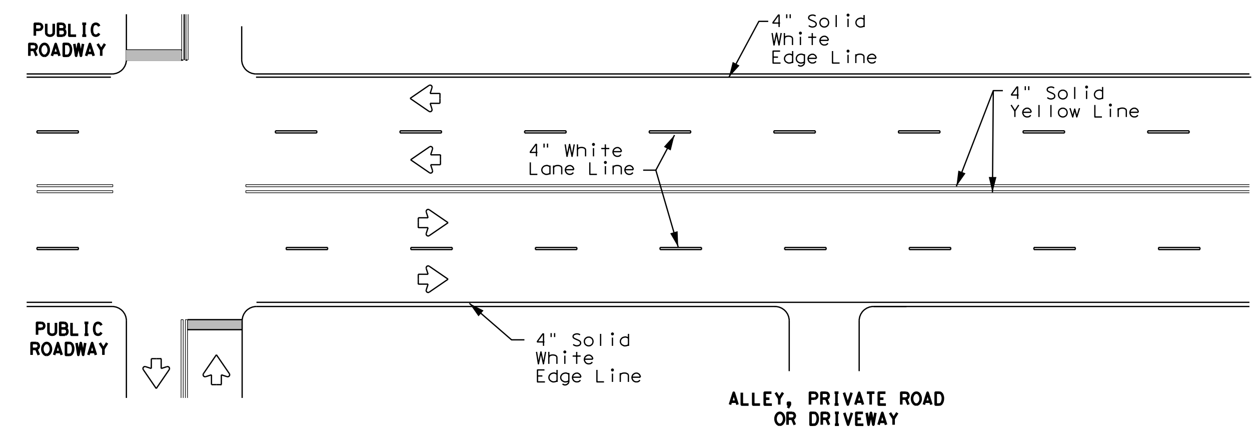
EDGE LINE AND LANE LINES
ONE-WAY ROADWAY
WITH OR WITHOUT SHOULDERS



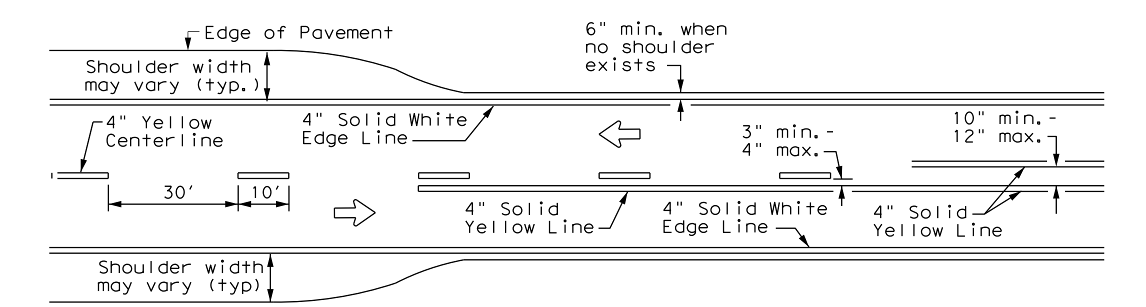
TYPICAL TWO-LANE, TWO-WAY PAVEMENT
MARKINGS THROUGH INTERSECTIONS



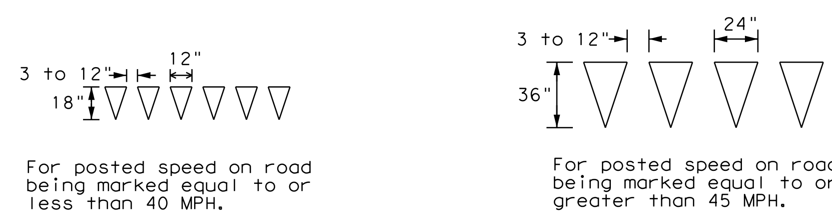
CENTERLINE AND LANE LINES
FOUR LANE TWO-WAY ROADWAY
WITH OR WITHOUT SHOULDERS



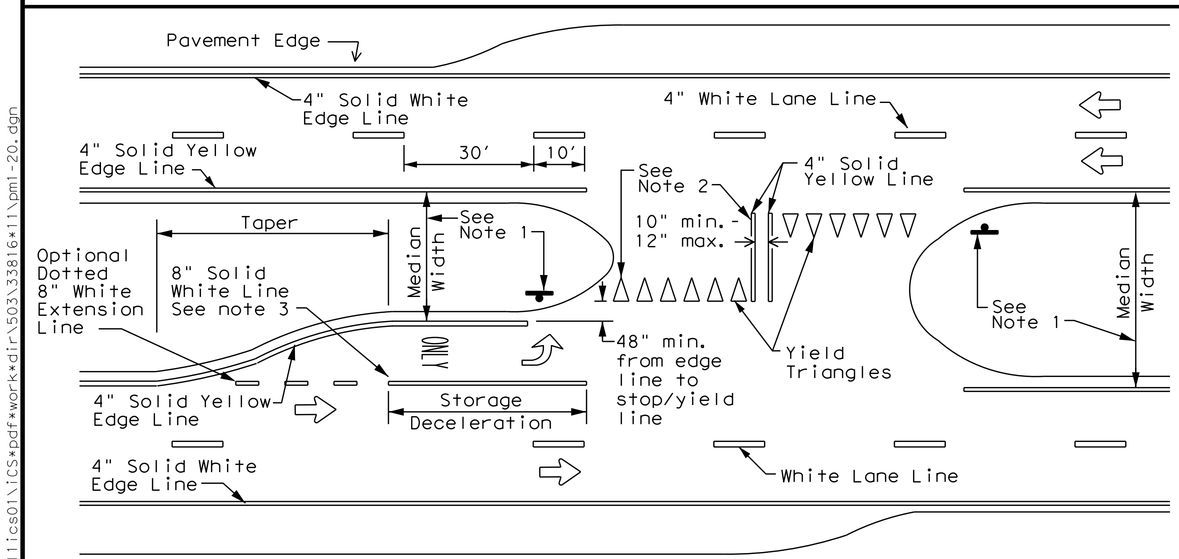
TYPICAL MULTI-LANE, TWO-WAY PAVEMENT
MARKINGS THROUGH INTERSECTIONS



TWO LANE TWO-WAY ROADWAY
WITH OR WITHOUT SHOULDERS



YIELD LINES



FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTES

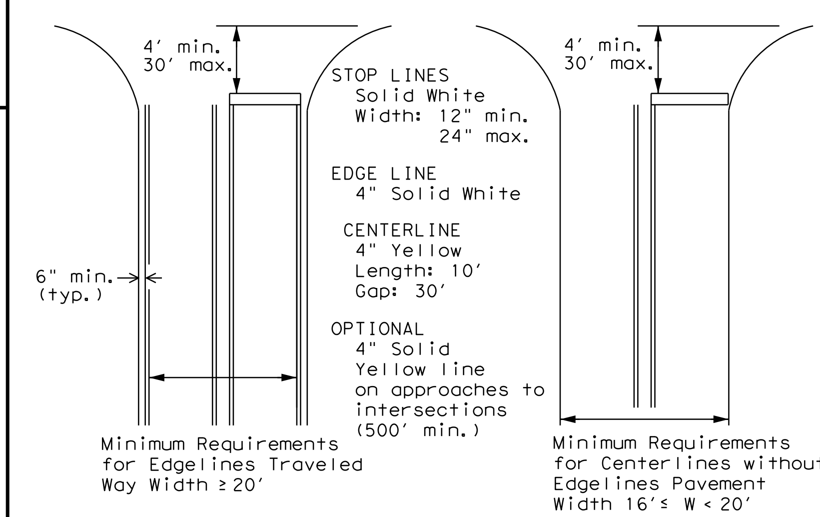
1. Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections. Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling width to determine if signs are required. Yield signs are the typical intersection control. Stop signs are optional as determined by the Engineer.
2. Install median striping (double yellow centerlines and stop bars/yield triangles) when a 50' or greater median centerline can be placed. Stop bars shall only be used with stop signs. Yield traingles shall only be used with yield signs.
3. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.

GENERAL NOTES

1. Edgeline striping shall be as shown in the plans or as directed by the Engineer. The edgeline should not be placed less less than 6 inches from the edge of pavement. This distance may vary due to pavement raveling or other conditions. Edgelines are not required in curb and gutter sections of roadways.
2. The traveled way includes only that portion of the roadway used for vehicular travel. It does not include the parking lanes, sidewalks, berms and shoulders. The traveled ways shall be measured from the inside of edgeline to the inside of edgeline of a two lane roadway.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



GUIDE FOR PLACEMENT OF STOP LINES,
EDGE LINE & CENTERLINE
Based on Traveled Way and Pavement Widths for Undivided Highways

Texas Department of Transportation — Traffic Safety Division Standard

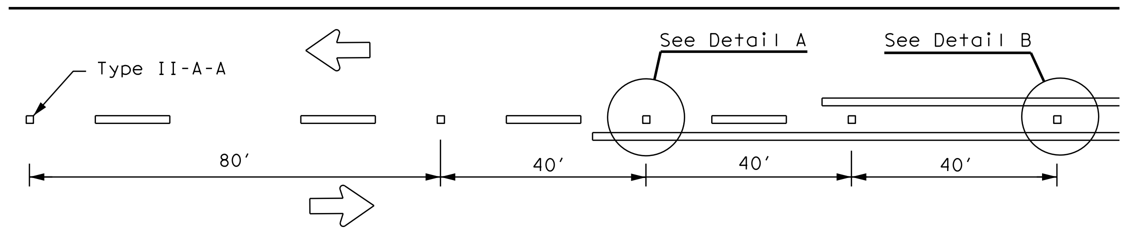
TYPICAL STANDARD PAVEMENT MARKINGS

PM(1)-20

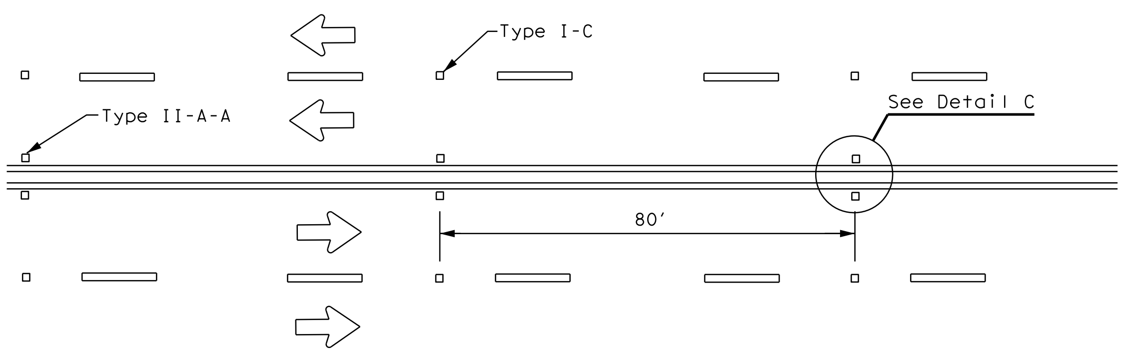
FILE: pm1-20.dgn	DN:	CK:	DW:	CK:
© TxDOT November 1978	CONT 0091	SECT 10	JOB 002	HIGHWAY FS 121
REVISIONS 8-95 3-03 / 5-00 2-12 / 8-00 6-20	DIST PAR		COUNTY GRAYSON	SHEET NO. 221

22A

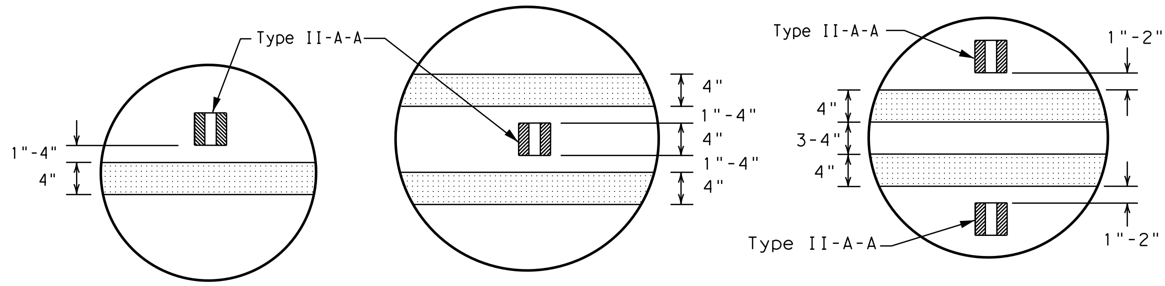
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE



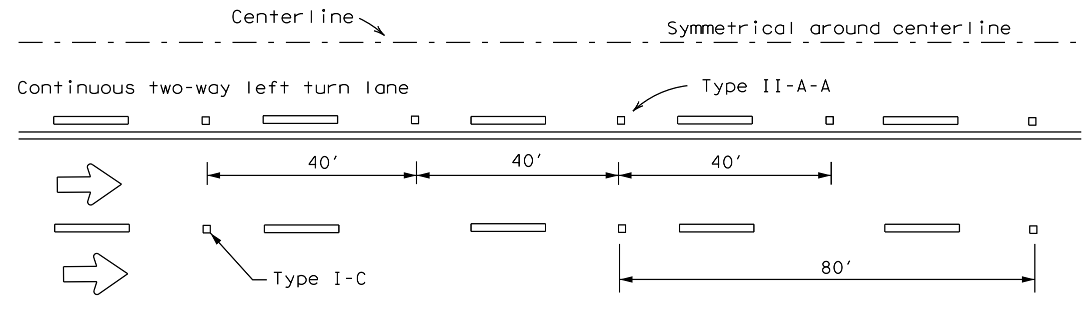
CENTERLINE FOR ALL TWO LANE ROADWAYS



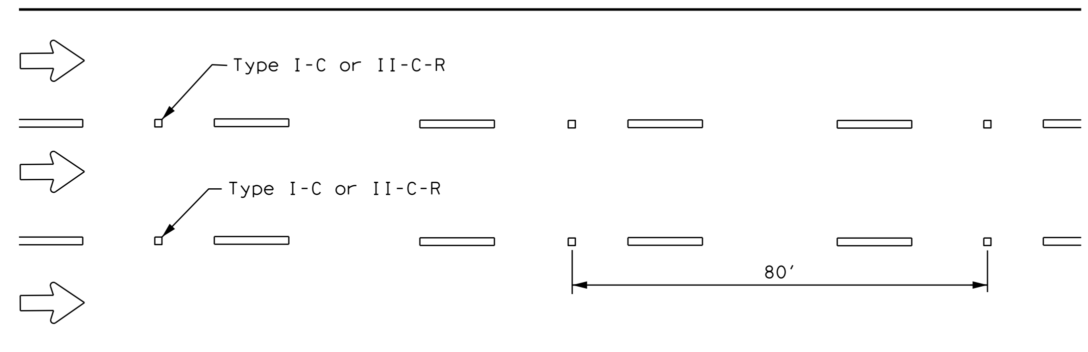
CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY HIGHWAYS



DETAIL "A" DETAIL "B" DETAIL "C"



CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE

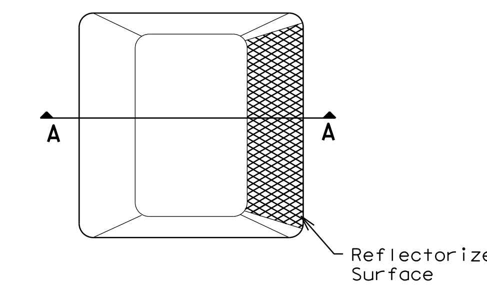


LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

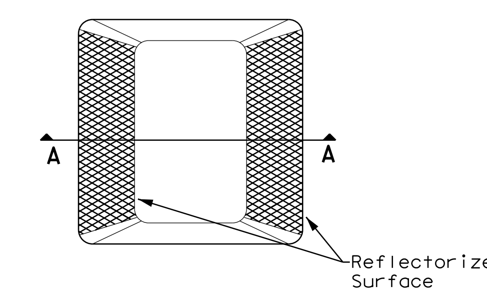
Raised pavement markers Type II-C-R shall have clear face toward normal traffic and red face toward wrong-way traffic.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

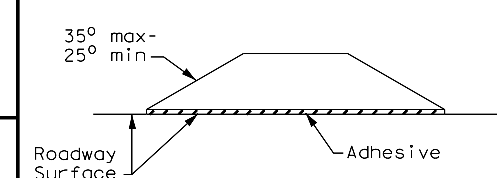
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)

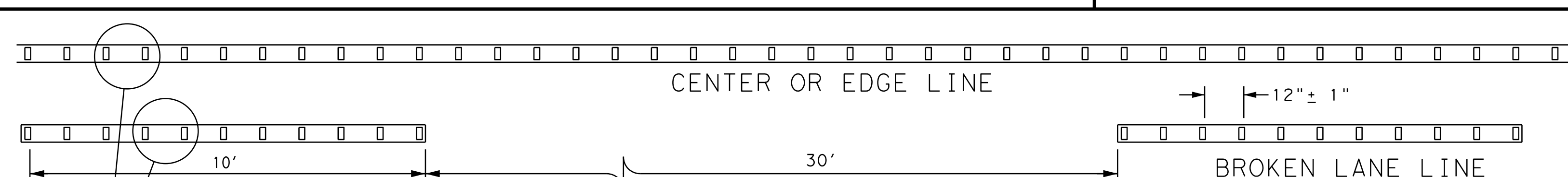


Type II (Top View)



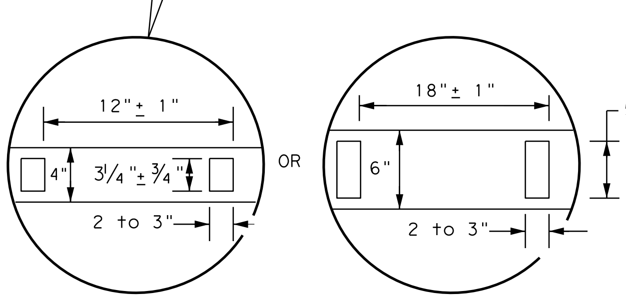
SECTION A

RAISED PAVEMENT MARKERS



REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS



4" EDGE LINE, CENTER LINE OR LANE LINE

OPTIONAL 6" EDGE LINE, CENTER LINE OR LANE LINE

A quick field check for the thickness of base line and profile marking is approximately equal to a stack of 5 quarters to a maximum height of 7 quarters.

NOTE

Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

1. All raised pavement markers placed in broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.

Texas Department of Transportation

Traffic Safety Division Standard

POSITION GUIDANCE USING RAISED MARKERS RELECTORIZED PROFILE MARKINGS PM(2)-20

FILE: pm2-20.dgn	DN:	CK:	DW:	CK:
©TxDOT April 1977	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-92 2-10 5-00 2-12 8-00 6-20	0091	10	002	FS 121
	DIST		COUNTY	SHEET NO.
	PAR		GRAYSON	222

228

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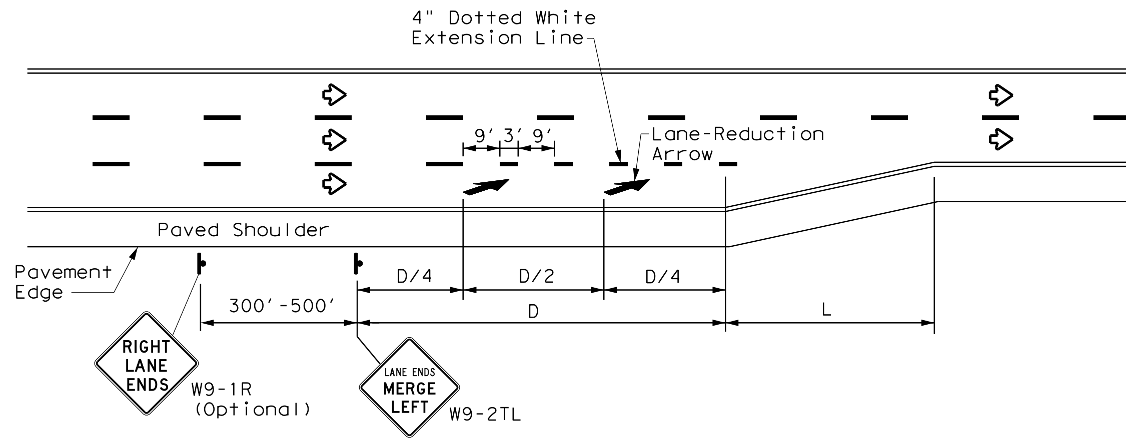


LANE REDUCTION

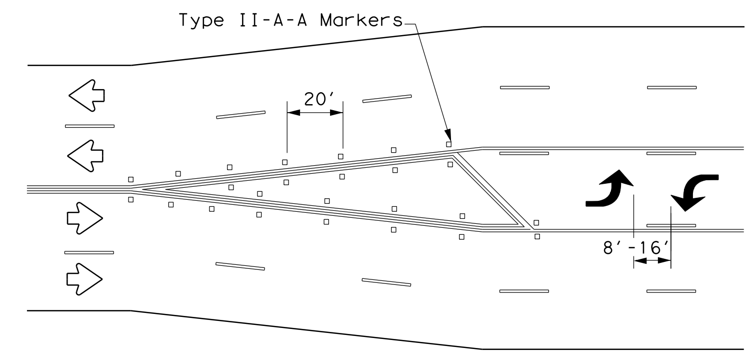
Posted Speed	D (ft)	L (ft)
30 MPH	460	$L = \frac{WS^2}{60}$
35 MPH	565	
40 MPH	670	
45 MPH	775	L=WS
50 MPH	885	
55 MPH	990	
60 MPH	1,100	
65 MPH	1,200	
70 MPH	1,250	
75 MPH	1,350	

NOTES

1. Lane reduction pavement markings are used where the number of through lanes is reduced because of narrowing of the roadway or because of a section of on-street parking in what would otherwise be a through lane. For Texas Super 2 Passing Lanes, see TS2(PL) standard sheets.
2. On divided highways, an additional W9-1R "RIGHT LANE ENDS" sign may be installed in the median aligned with the W9-1R sign on the right side of the highway.
3. Lane reduction arrows are required for speeds of 45 mph or greater. An optional third lane reduction arrow may be added based on engineering judgement. If used, the optional third lane reduction arrow should be centered between the first and last lane reduction arrows.
4. For lane reductions on Freeways and Expressways, signing shall conform to the TxDOT Freeway Signing Handbook.

GENERAL NOTES

1. Lane use word and arrow markings shall be used where through lanes approaching an intersection become mandatory turn lanes. Lane use word and arrow markings should be used in auxiliary lanes of substantial length. Lane use arrow markings or word and arrow markings may be used in other lanes and turn bays for emphasis. Details for words and arrows are as shown in the Standard Highway Sign Designs for Texas.
2. When lane-use words and arrow markings are used, two sets of arrows should be used if the length of the bay is greater than 180 feet. When a single lane use arrow or word and arrow marking is used for a short turn lane, it should be located at or near the upstream end of the full-width turn lane.
3. Use raised pavement marker Type I-C with undivided highways, flush medians and two way left turn lanes. Use raised pavement marker Type II-C-R with divided highways and raised medians.
4. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.

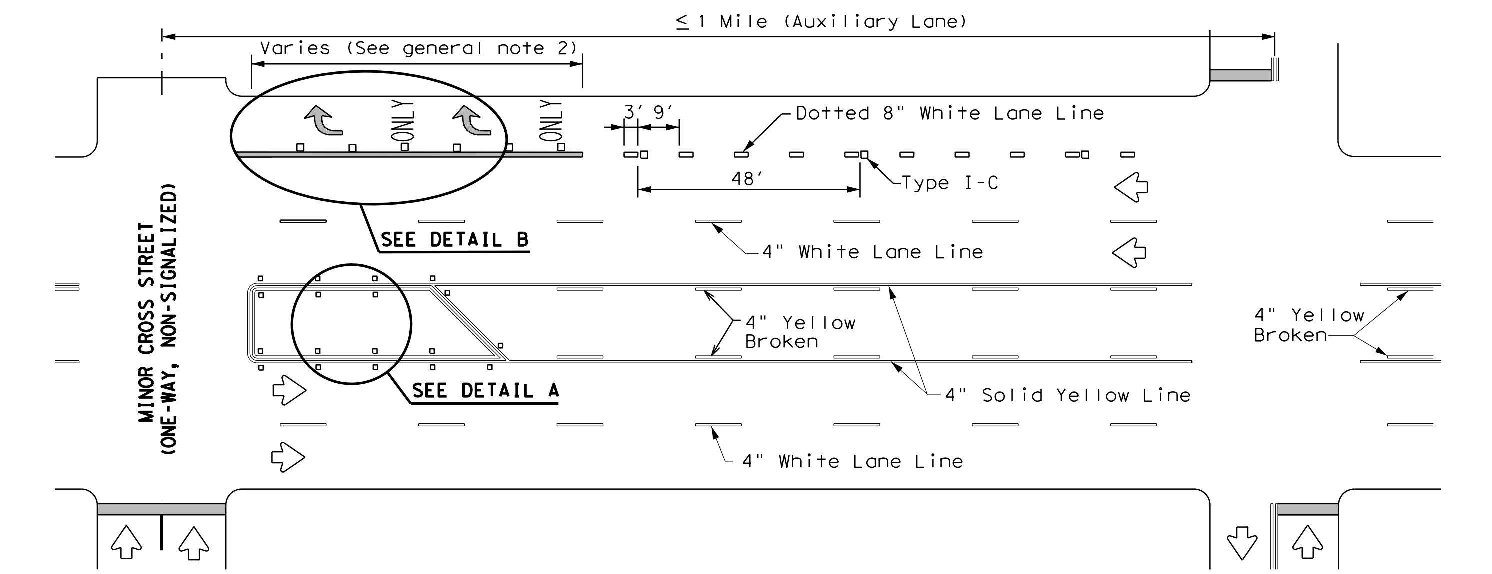


A two-way left-turn (TWLT) lane-use arrow pavement marking should be used at or just downstream from the beginning of a two-way left-turn lane within a corridor. Repeating the marking after each intersection or dedicated turn bay is not required unless stated elsewhere in the plans.

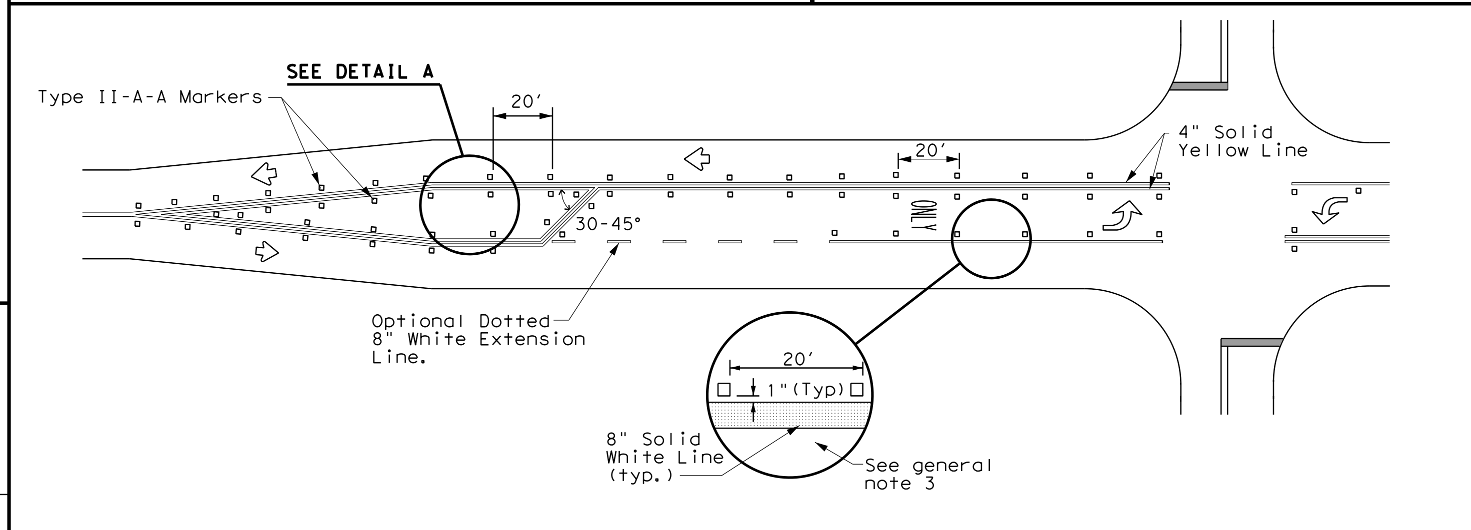
TYPICAL TRANSITION FOR TWLTL AND DIVIDED HIGHWAY

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

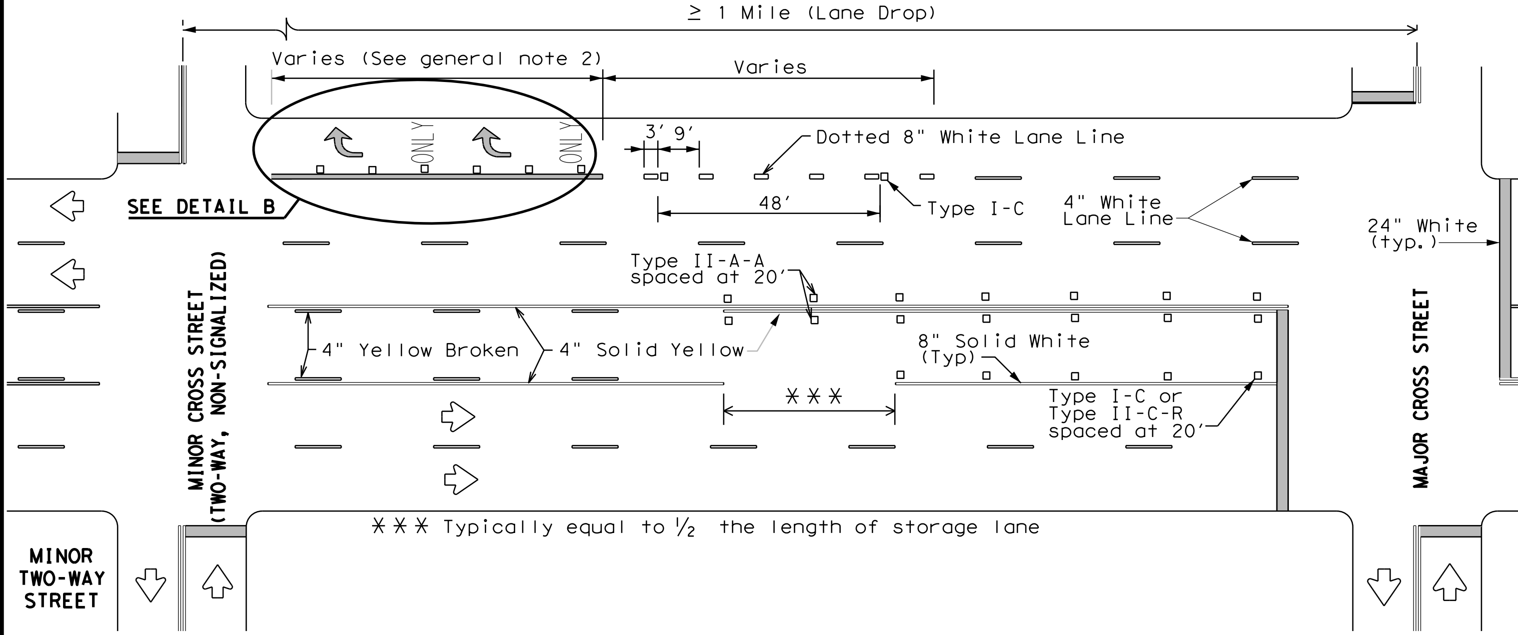
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



TYPICAL TWLTL AT ONE-WAY STREET AND RIGHT TURN AUXILIARY LANE

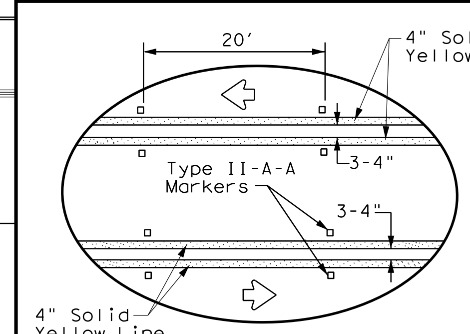


TYPICAL TWO-LANE HIGHWAY INTERSECTION WITH LEFT TURN BAYS

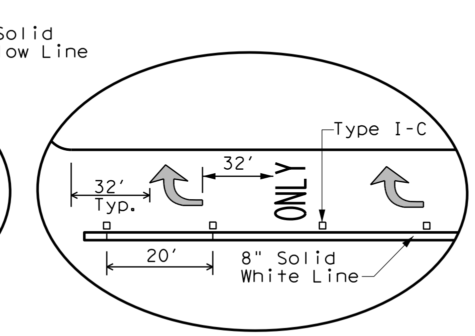


* * * Typically equal to ½ the length of storage lane

TYPICAL TWLTL AT TWO-WAY CROSS STREET AND RIGHT TURN LANE DROP



DETAIL A



DETAIL B

Texas Department of Transportation — Traffic Safety Division Standard

TWO-WAY LEFT TURN LANES, RURAL LEFT TURN BAYS, AND LANE REDUCTION PAVEMENT MARKINGS

PM(3)-20

FILE: pm3-20.dgn	DN:	CK:	DW:	CK:
©TxDOT April 1998	CONT 0091	SECT 10	JOB 002	HIGHWAY FS 121
REVISIONS 5-00 2-10, 8-00 2-12, 3-03 6-20	DIST PAR		COUNTY GRAYSON	SHEET NO. 223

22C

DATE:
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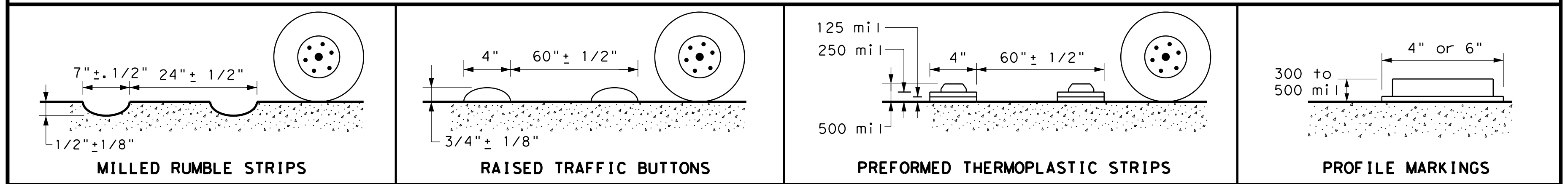
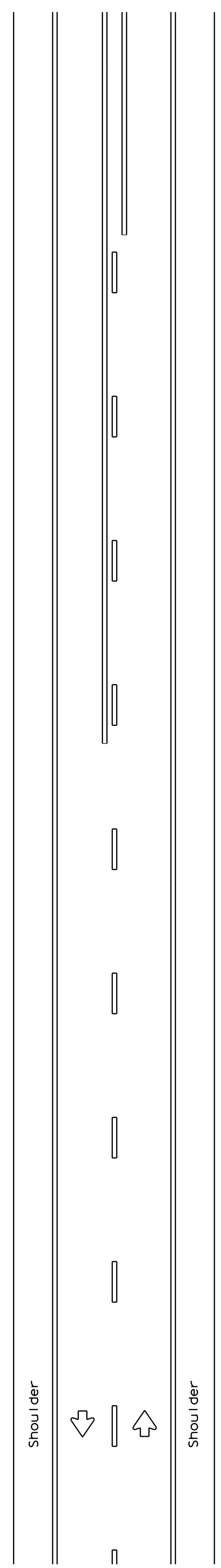
pm3-20.dgn

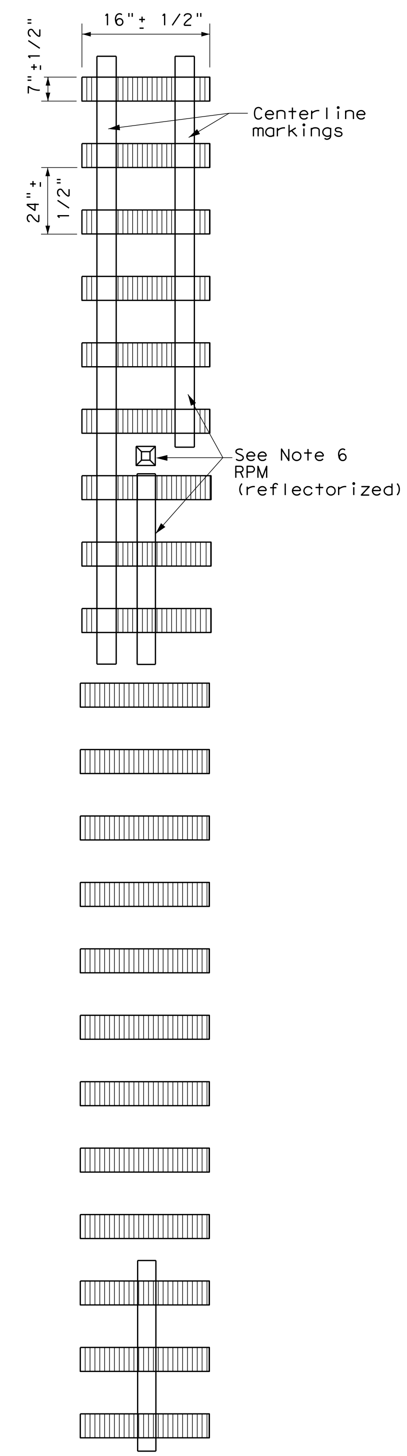
CENTERLINE RUMBLE STRIPS



PROFILE VIEW



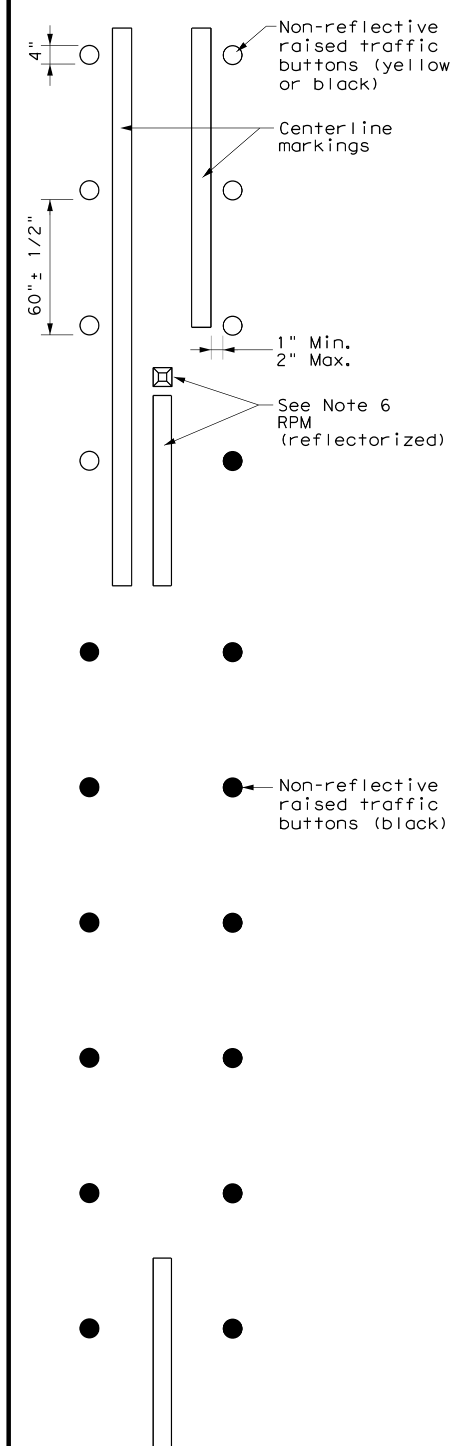
TWO LANE TWO-WAY ROADWAYS



PLAN VIEW

OPTION 1

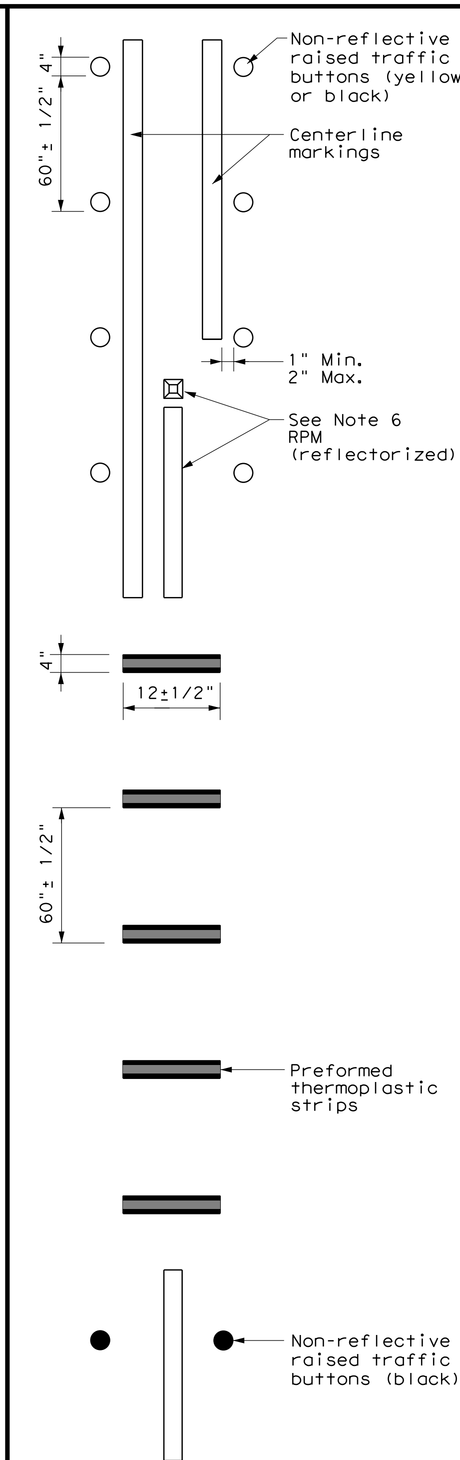
MILLED CENTERLINE RUMBLE STRIPS



PLAN VIEW

OPTION 2

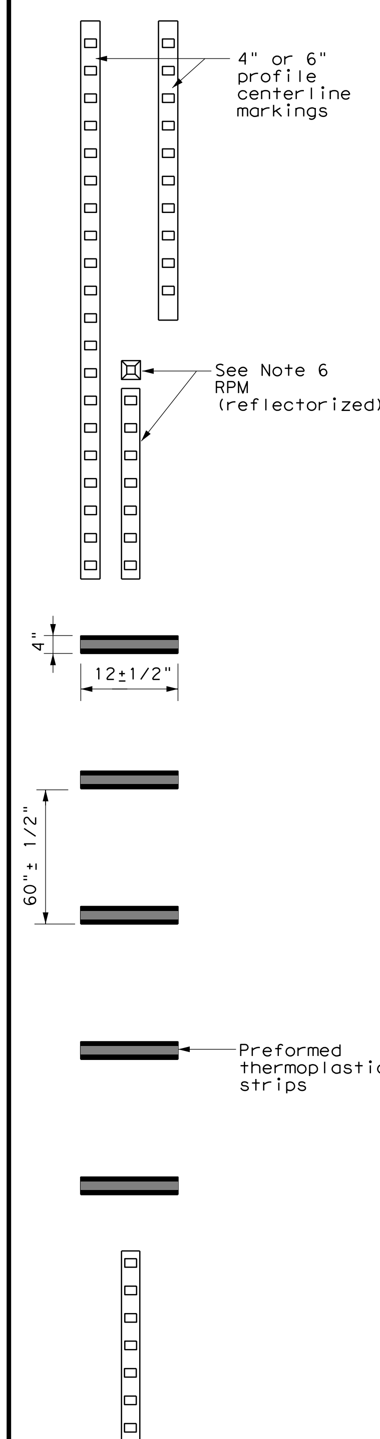
RAISED CENTERLINE RUMBLE STRIPS



PLAN VIEW

OPTION 3

RAISED CENTERLINE RUMBLE STRIPS AND PREFORMED THERMOPLASTIC STRIPS



PLAN VIEW

OPTION 4

PROFILE CENTERLINE MARKINGS AND PREFORMED THERMOPLASTIC STRIPS

GENERAL NOTES

1. This standard sheet provides guidelines for installing centerline rumble strips on two-lane highways with or without shoulders.
2. Centerline and edgeline rumble strips or profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
3. Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
4. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Operations Division.
5. Breaks in milled centerline rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections and driveways with high usage of large trucks.
6. Use Standard Sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, and dimensions pavement markings and profile markings.
7. Consideration should be given to noise levels when centerline rumble strips are installed near residential areas, schools, churches, etc. A minimum of 3/8 inch depth of milled rumble strip may be considered in these areas.
8. Pavement markings must be applied over milled centerline rumble strips.

WHEN INSTALLING CENTERLINE RUMBLE STRIPS:

9. Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per manufacturer's recommendations.
10. When using non-reflective raised traffic buttons as a centerline rumble strip, the button shall be placed adjacent to the pavement marking delineating the centerline. The buttons will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
11. The color of the button should be yellow for a continuous no passing roadway. Black buttons should be used in areas where passing is allowed.

WHEN INSTALLING EDGELINE RUMBLE STRIPS WITH OR WITHOUT CENTERLINE RUMBLE STRIPS ON UNDIVIDED HIGHWAYS:

12. See standard sheet RS(4).

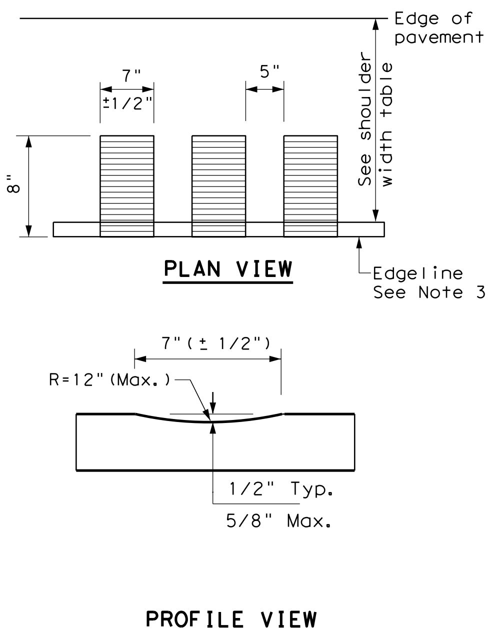
Texas Department of Transportation®

Traffic Operations Division Standard

CENTERLINE RUMBLE STRIPS ON TWO LANE TWO-WAY HIGHWAYS

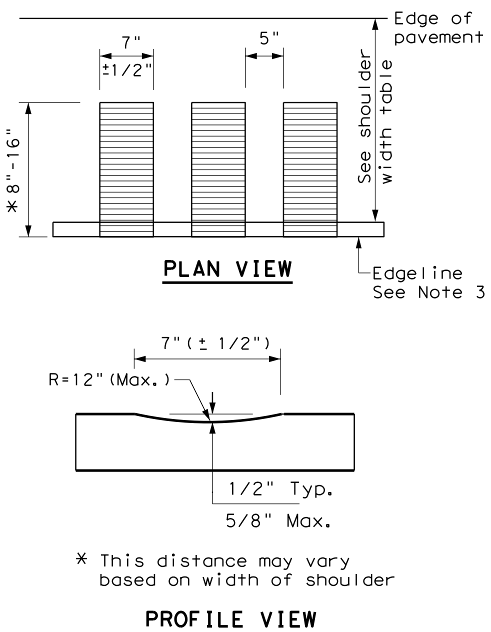
RS(3)-13

FILE: rs(3)-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2013	CONT	SECT	JOB	HIGHWAY
REVISIONS	0091	10	002	FS 121
	DIST		COUNTY	SHEET NO.
	PAR		GRAYSON	224



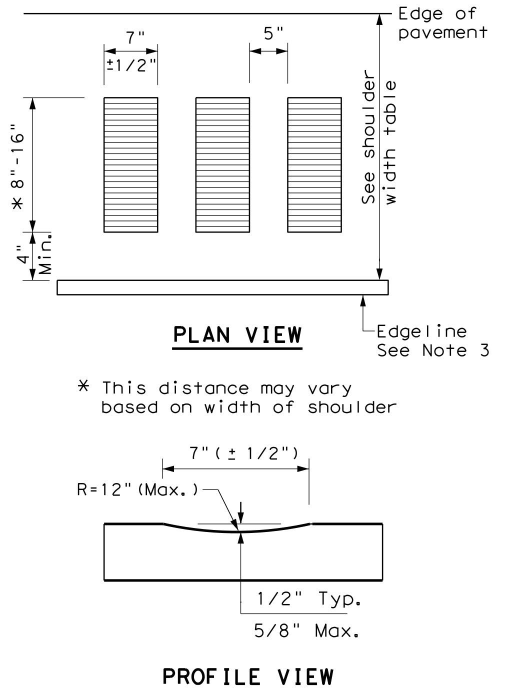
OPTION 1

CONTINUOUS MILLED DEPRESSIONS (Rumble Stripes)



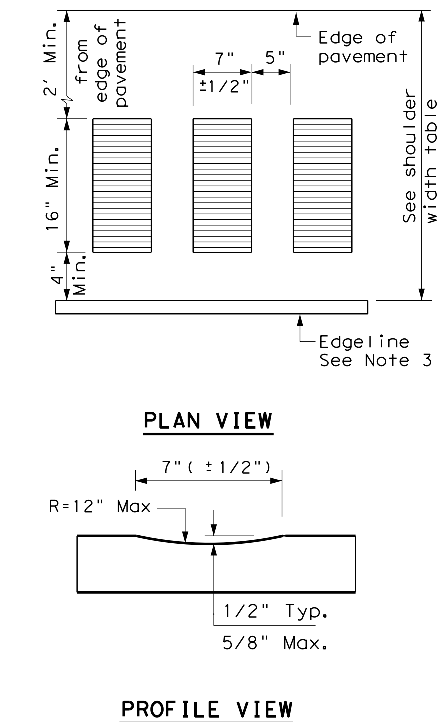
OPTION 2

CONTINUOUS MILLED DEPRESSIONS (Rumble Stripes)



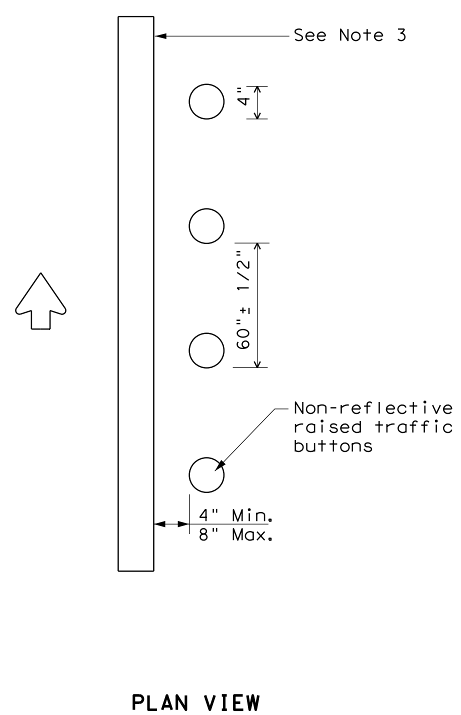
OPTION 3

CONTINUOUS MILLED DEPRESSIONS (Rumble Strips)



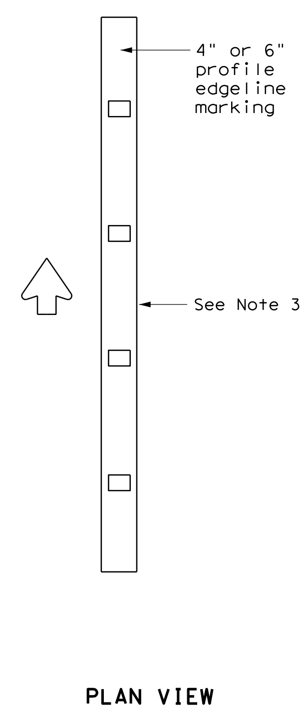
OPTION 4

CONTINUOUS MILLED DEPRESSIONS (Rumble Strips)



OPTION 5

RAISED EDGELINE RUMBLE STRIPS



OPTION 6

PROFILE EDGELINE MARKINGS

SHOULDER WIDTH TABLE		
EQUAL TO OR LESS THAN 2 FEET	GREATER THAN 2 FEET LESS THAN 4 FEET	EQUAL TO OR GREATER THAN 4 FEET
Option 1, 5 OR 6	Option 1, 2, 3 5 OR 6	Option 2, 4, 5 OR 6

GENERAL NOTES

1. Rumble strips and profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
2. Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
3. Use Standard Sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, pavement markings, and profile markings.
4. See the table below for determining what options may be used for edgeline rumble strips.

WHEN INSTALLING MILLED DEPRESSION EDGELINE RUMBLE STRIPS:

5. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Operations Division.
6. Pavement markings can be applied over milled shoulder rumble strips to create an edgeline rumble stripe.
7. Breaks in edgeline rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections and driveways with high usage of large trucks when installed on conventional highways.
8. Rumble strips shall not be placed across exit or entrance ramps, acceleration and deceleration lanes, crossovers, gore areas or intersections with other roadways.
9. Consideration should be given to noise levels when edgeline rumble strips are installed near residential areas, schools, churches, etc. A minimum of 3/8 inches depth of milled rumble strip may be considered in these areas.
10. On roadways with high bicycle activity, consideration should be given before the installation of edgeline rumble strips. Things to consider include size of rumble strips, rumble strip material and location of rumble strips on the shoulder. If the designer determines that gaps are needed in the rumble strips due to bicycle use of the road, then follow the requirement shown in FHWA Technical Advisory T5040.39, or latest version. A detail of the spacing shall be included in the plans.

WHEN INSTALLING RAISED OR PROFILE EDGELINE RUMBLE STRIPS:

11. Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per the manufacturer's recommendations.
12. Non-reflective traffic buttons shall be placed adjacent to the pavement marking delineating the edgeline when used as a rumble strip. The color of the button should match the color of the adjacent edgeline marking (white or yellow). The buttons will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
13. Non-reflective traffic buttons shall not be placed across exit or entrance ramps, acceleration and deceleration lanes, crossovers, gore areas or intersections with other roadways.
14. Breaks in edgeline rumble strips using raised traffic buttons shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossing, intersections and driveways with high usage of large trucks when installed on conventional highways.
15. The minimum distance between the edgeline and the buttons should be used if the shoulder is less than 8 feet in width.
16. Raised profile thermoplastic markings used as edgelines may substitute for buttons.

Texas Department of Transportation — Traffic Operations Division Standard

EDGELINE RUMBLE STRIPS ON UNDIVIDED OR TWO LANE HIGHWAYS RS(4)-13

FILE: rs(4)-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2013	CONT 0091	SECT 10	JOB 002	HIGHWAY FS 121
REVISIONS	DIST PAR	COUNTY GRAYSON		SHEET NO. 225

SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

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

Post Type

- FRP = Fiberglass Reinforced Plastic Pipe (see SMD(FRP))
- TWT = Thin-Walled Tubing (see SMD(TWT))
- 10BWG = 10 BWG Tubing (see SMD(SLIP-1) to (SLIP-3))
- S80 = Schedule 80 Pipe (see SMD(SLIP-1) to (SLIP-3))

Number of Posts (1 or 2)

Anchor Type

- UA = Universal Anchor - Concreted (see SMD(FRP) and (TWT))
- UB = Universal Anchor - Bolted down (see SMD(FRP) and (TWT))
- WS = Wedge Anchor Steel - (see SMD(TWT))
- WP = Wedge Anchor Plastic (see SMD(TWT))
- SA = Slipbase - Concreted (see SMD(SLIP-1) to (SLIP-3))
- SB = Slipbase - Bolted Down (see SMD(SLIP-1) to (SLIP-3))

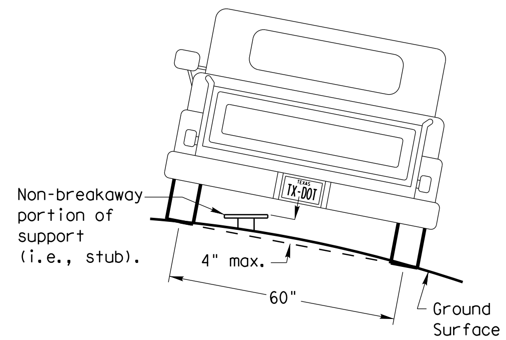
Sign Mounting Designation

- P = Prefab. "Plain" (see SMD(SLIP-1) to (SLIP-3), (TWT), (FRP))
- T = Prefab. "T" (see SMD(SLIP-1) to (SLIP-3), (TWT))
- U = Prefab. "U" (see SMD(SLIP-1) to (SLIP-3))

IF REQUIRED

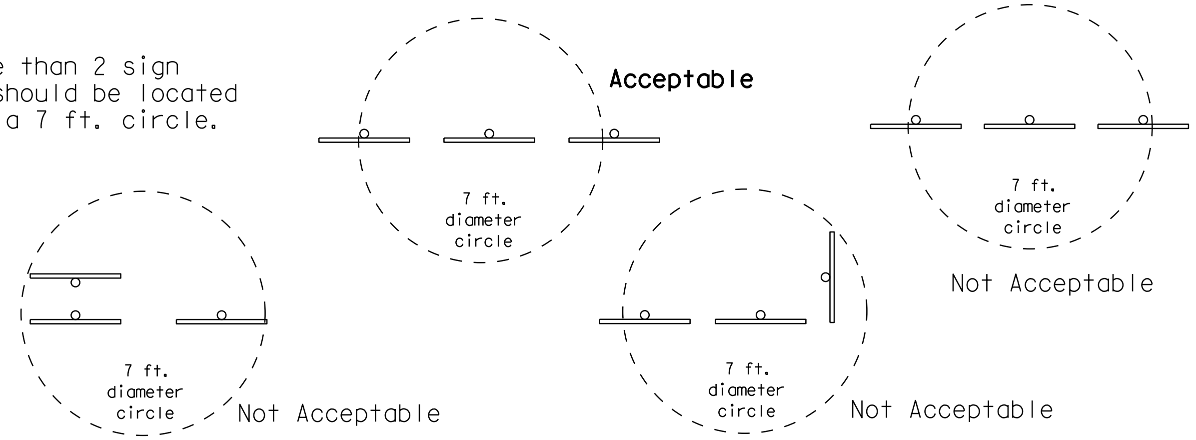
- 1EXT or 2EXT = Number of Extensions (see SMD(SLIP-1) to (SLIP-3), (TWT))
- BM = Extruded Wind Beam (see SMD(SLIP-1) to (SLIP-3))
- WC = 1.12 #/ft Wing Channel (see SMD(SLIP-1) to (SLIP-3))
- EXAL = Extruded Aluminum Sign Panels (see SMD(SLIP-3))

REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



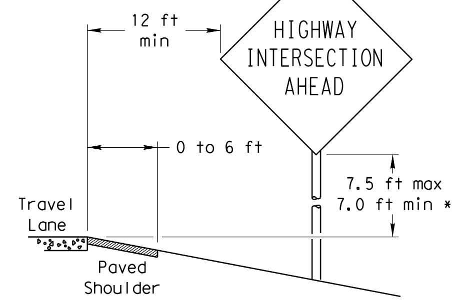
To avoid vehicle undercarriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).

No more than 2 sign posts should be located within a 7 ft. circle.



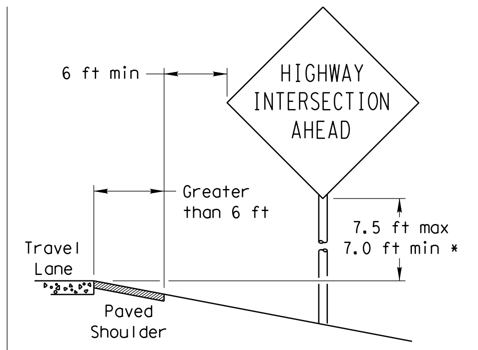
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

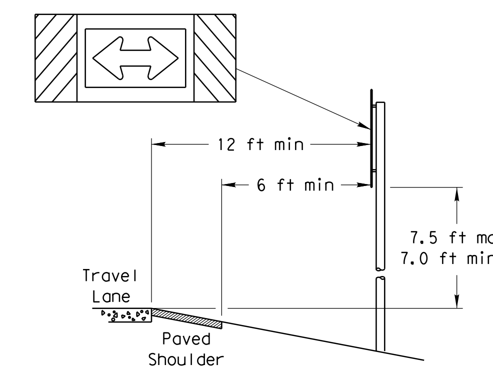
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



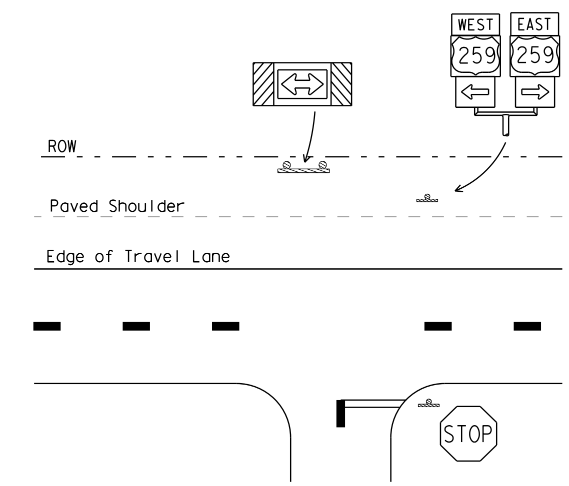
GREATER THAN 6 FT. WIDE

When the shoulder is greater than 6 ft in width, the sign must be placed at least 6 ft. from the edge of the shoulder.

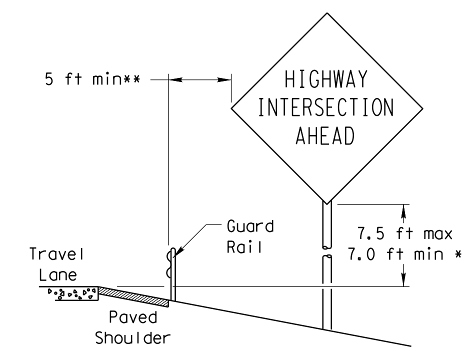
T-INTERSECTION



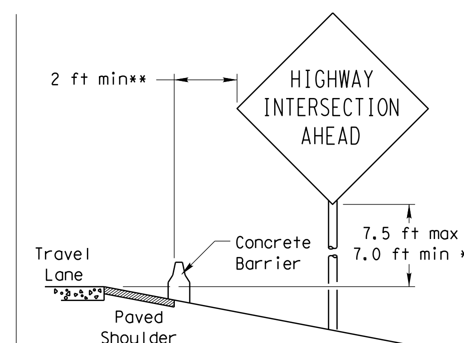
When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.



BEHIND BARRIER



BEHIND GUARDRAIL



BEHIND CONCRETE BARRIER

**Sign clearance based on distance required for proper guard rail or concrete barrier performance.

* Signs shall be mounted using the following condition that results in the greatest sign elevation:

(1) a minimum of 7 to a maximum of 7.5 feet above the edge of the travel lane or

(2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.

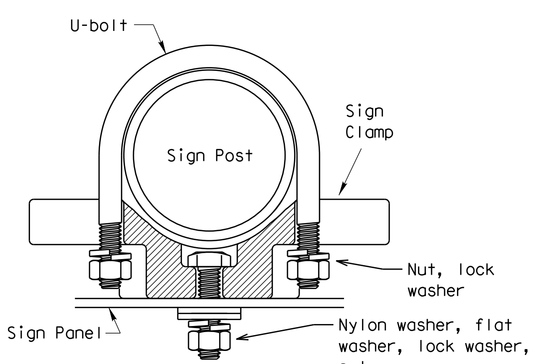
The maximum values may be increased when directed by the Engineer.

See the Traffic Operations Division website for detailed drawings of sign clamps, Triangular Slipbase System components and Wedge Anchor System components.

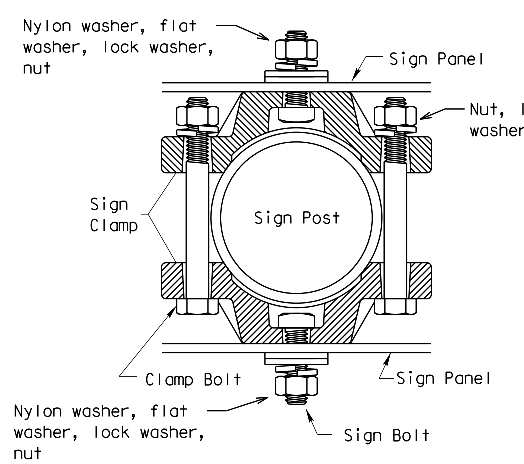
The website address is:
http://www.txdot.gov/publications/traffic.htm

TYPICAL SIGN ATTACHMENT DETAIL

Single Signs



Back-to-Back Signs



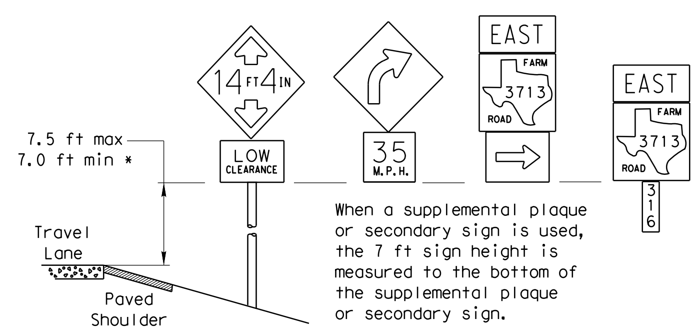
Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

When two sign clamps are used to mount signs back-to-back, use a 5/16-18 UNC galvanized hex head per ASTM A307 with nut and helical-spring lock washer. The approximate bolt lengths for various post sizes and sign clamp types are given in the table at right. The bolt length may need to be adjusted depending upon field conditions.

Sign clamps may be either the specific size clamp or the universal clamp.

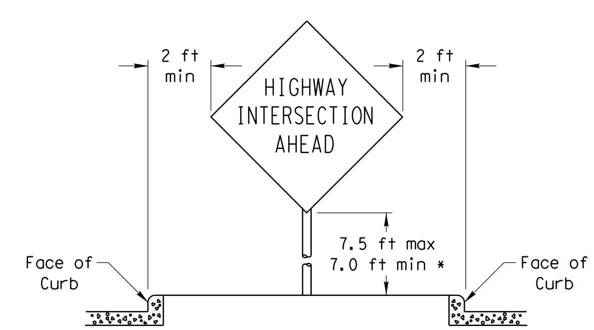
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



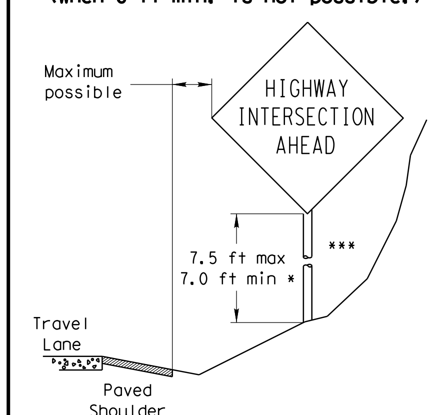
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

CURB & GUTTER OR RAISED ISLAND



RESTRICTED RIGHT-OF-WAY

(When 6 ft min. is not possible.)



Right-of-way restrictions may be created by rocks, water, vegetation, forest, buildings, a narrow island, or other factors.

In situations where a lateral restriction prevents the minimum horizontal clearance from the edge of the travel lane, signs should be placed as far from the travel lane as practical.

*** Post may be shorter if protected by guardrail or if Engineer determines the post could not be hit due to extreme slope.

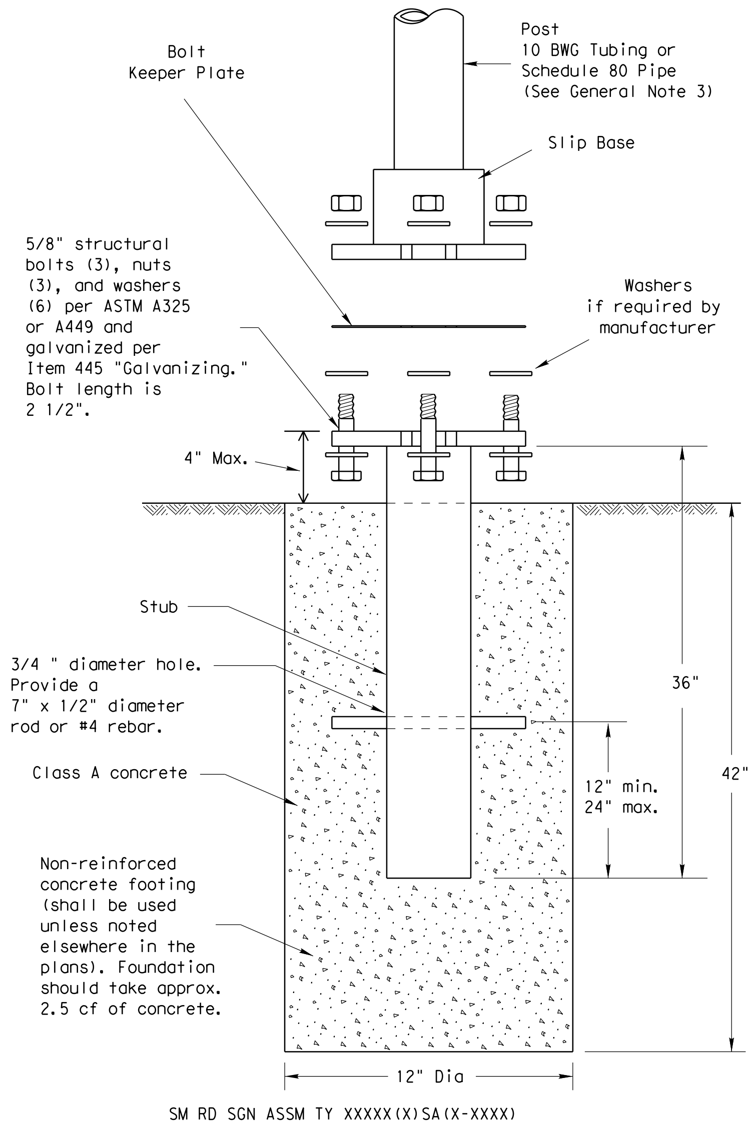
Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD(GEN)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
REVISIONS: 9-08			
CONT	SECT	JOB	HIGHWAY
0091	10	002	FS 121
DIST		COUNTY	SHEET NO.
PAR		GRAYSON	226

TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS



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

NOTE

There are various devices approved for the Triangular Slipbase System. Please reference the Material Producer List for approved slip base systems. http://www.txdot.gov/business/producer_list.htm The devices shall be installed per manufacturers' recommendations. Installation procedures shall be provided to the Engineer by Contractor.

GENERAL NOTES:

1. Slip base shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to approval of the TxDOT Traffic Standards Engineer.
2. Material used as post with this system shall conform to the following specifications:
   10 BWG Tubing (2.875" outside diameter)
   - 0.134" nominal wall thickness
   - Seamless or electric-resistance welded steel tubing or pipe
   - Steel shall be HSLAS Gr 55 per ASTM A1011 or ASTM A1008
   - Other steels may be used if they meet the following:
     - 55,000 PSI minimum yield strength
     - 70,000 PSI minimum tensile strength
     - 20% minimum elongation in 2"
   - Wall thickness (uncoated) shall be within the range of 0.122" to 0.138"
   - Outside diameter (uncoated) shall be within the range of 2.867" to 2.883"
   - Galvanization per ASTM A123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.

   Schedule 80 Pipe (2.875" outside diameter)
   - 0.276" nominal wall thickness
   - Steel tubing per ASTM A500 Gr C
   - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
     - 46,000 PSI minimum yield strength
     - 62,000 PSI minimum tensile strength
     - 21% minimum elongation in 2"
   - Wall thickness (uncoated) shall be within the range of 0.248" to 0.304"
   - Outside diameter (uncoated) shall be within the range of 2.855" to 2.895"
   - Galvanization per ASTM A123
3. See the Traffic Operations Division website for detailed drawings of sign clamps and Texas Universal Triangular Slipbase System components. The website address is: http://www.txdot.gov/publications/traffic.htm
4. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.

ASSEMBLY PROCEDURE

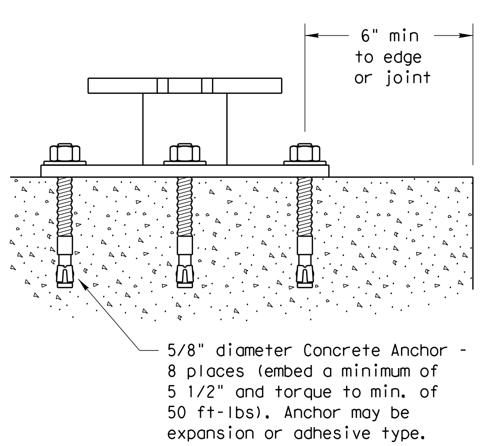
Foundation

1. Prepare 12-inch diameter by 42-inch deep hole. If solid rock is encountered, the depth of the foundation may be reduced such that it is embedded a minimum of 18 inches into the solid rock.
2. The Engineer may permit batches of concrete less than 2 cubic yards to be mixed with a portable, motor-driven concrete mixer. For small placements less than 0.5 cubic yards, hand mixing in a suitable container may be allowed by Engineer. Concrete shall be Class A.
3. Push the pipe end of the slip base stub into the center of the concrete. Rotate the stub back and forth while pushing it down into the concrete to assure good contact between the concrete and stub. Continue to work the stub into the concrete until it is between 2 to 4 inches above the ground.
4. Plumb the stub. Allow a minimum of 4 days to set, unless otherwise directed by the Engineer.
5. The triangular slipbase system is multidirectional and is designed to release when struck from any direction.

Support

1. Cut support so that the bottom of the sign will be 7 to 7.5 feet above the edge of the travelway (i.e., edge of the closest lane) when slip plate is below the edge of pavement or 7 to 7.5 feet above slip plate when the slip plate is above the edge of the travelway. The cut shall be plumb and straight.
2. Attach sign to support using connections shown. When multiple signs are installed on the same support, ensure the minimum clearance between each sign is maintained. See SMD(SLIP-2) for clearances based on sign types.

CONCRETE ANCHOR



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

Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. Heavy hex nut per ASTM A563, and hardened washer per ASTM F436. The stud bolt shall have a minimum yield and ultimate tensile strength of 50 and 75 KSI, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Adhesive type anchors shall have stud bolts installed with Type III epoxy per DMS-6100, "Epoxies and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations. Top of bolt shall extend at least flush with top of the nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 5 1/2" minimum embedment, shall have a minimum allowable tension and shear of 3900 and 3100 psi, respectively.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-1)-08

©TxDOT July 2002	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
REVISIONS	CONT	SECT	JOB	HIGHWAY
9-08	0091	10	002	FS 121
	DIST		COUNTY	SHEET NO.
	PAR		GRAYSON	227

26B

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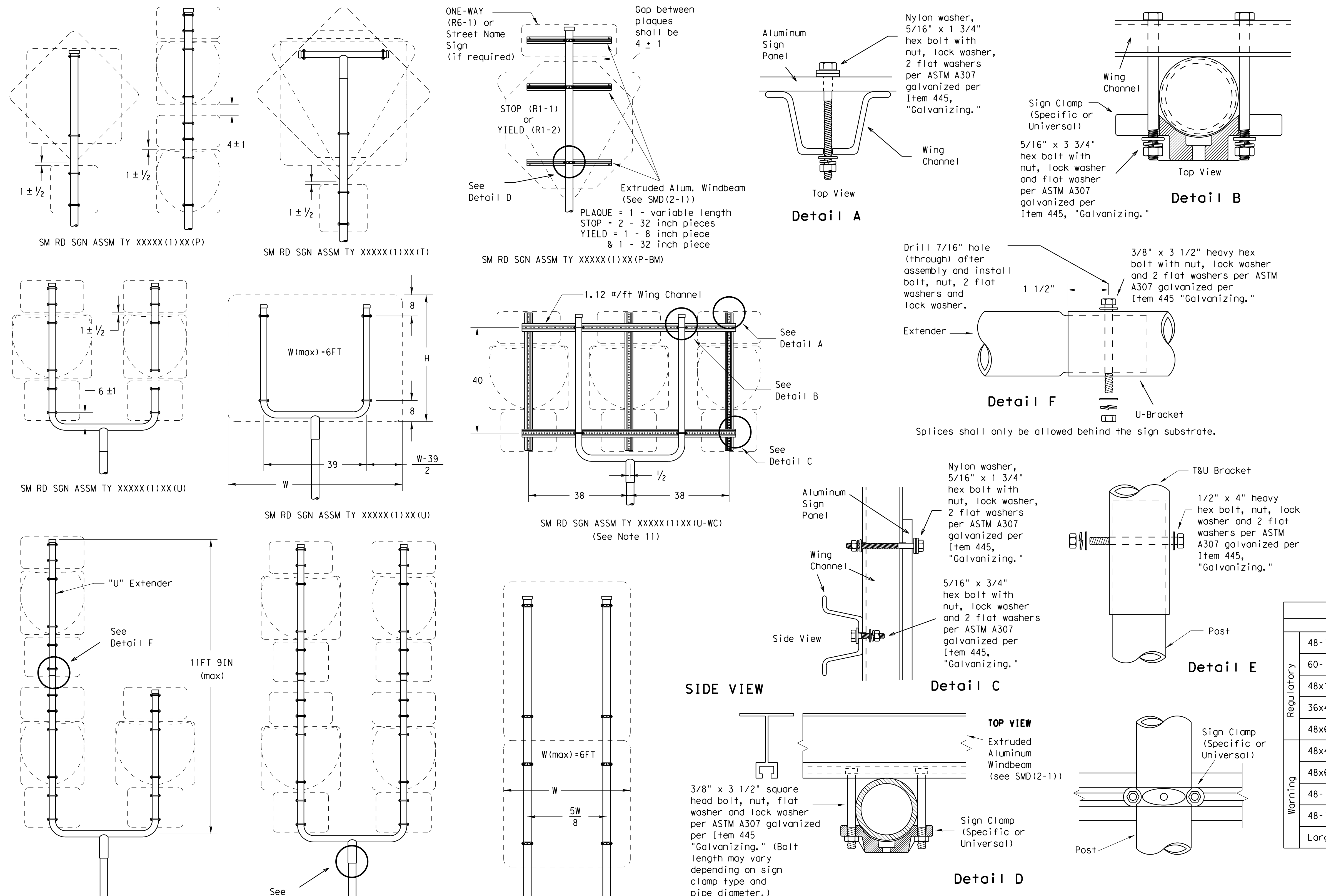
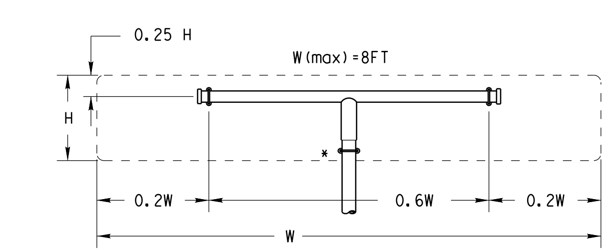
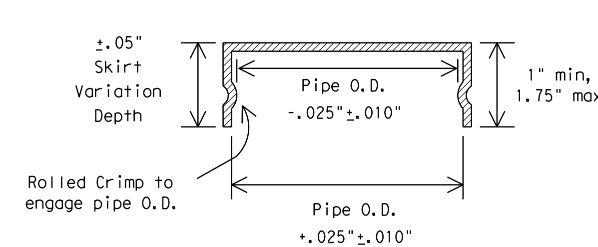




SM RD SGN ASSM TY XXXXX(1)XX(T)
(* - See Note 12)

All dimensions are in english unless detailed otherwise.

FRICTION CAP DETAIL



Friction caps may be manufactured from hot rolled or cold rolled steel sheets. The minimum sheet metal thickness shall be 24 gauge for all cap sizes.

The rim edges shall be reasonably straight and smooth. Caps shall be sized and formed in such a manner as to produce a drive-on friction fit and have no tendency to rock when seated on the pipe. The depth shall be sufficient to give positive protection against entrance of rainwater. They shall be free of sharp creases or indentations and show no evidence of metal fracture.

Caps shall have an electrodeposited coating of zinc in accordance with the requirements of ASTM B633 Class FE/ZN 8.

GENERAL NOTES:

1.

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

2. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
3. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
4. Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
5. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
6. For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
7. When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
8. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
9. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
10. Additional route markers may be added vertically, provided the total sign area does not exceed the maximum allowable amount per Note 1.
11. Additional sign clamp required on the "T-bracket" post for 24 inch height signs. Place the clamp 3 inches above bottom of sign when possible.
12. Post open ends shall be fitted with Friction Caps.
13. Sign blanks shall be the sizes and shapes shown on the plans.

REQUIRED SUPPORT

	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
Warning	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)

Texas Department of Transportation
Traffic Operations Division

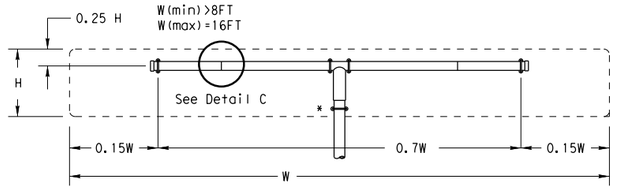
SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-2)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT	
REVISIONS: 9-08	CONT	SECT	JOB	HIGHWAY
	0091	10	002	FS 121
	DIST	COUNTY		SHEET NO.
	PAR	GRAYSON		228

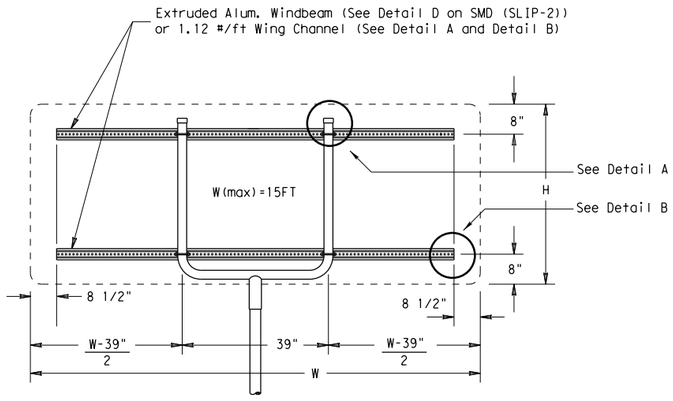
26C

DATE:
FILE: pw\ics01\CS\pdf\work\dir\503\33816\6\smds2.dgn

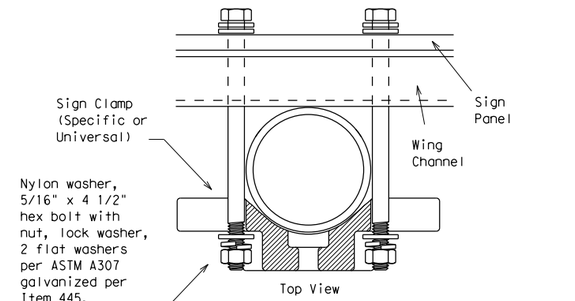


SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)

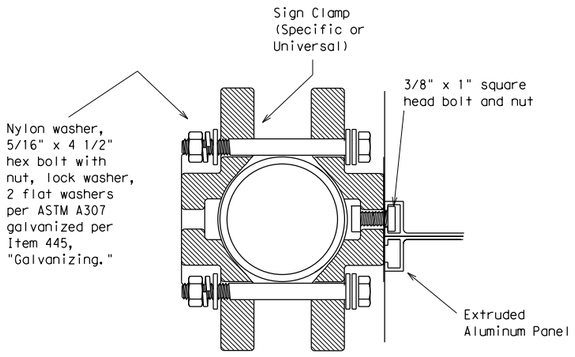
(* - See Note 12)



SM RD SGN ASSM TY XXXXX(1)XX(U-XX)

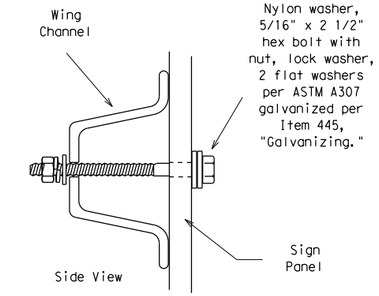


Detail A

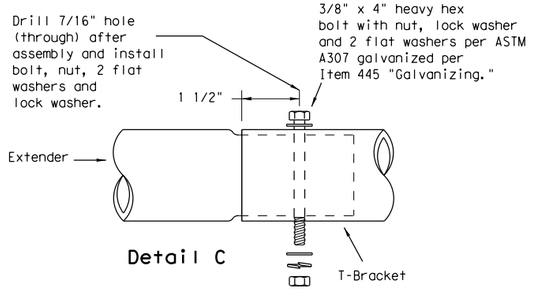


Detail D

EXTRUDED ALUMINUM SIGN WITH T BRACKET

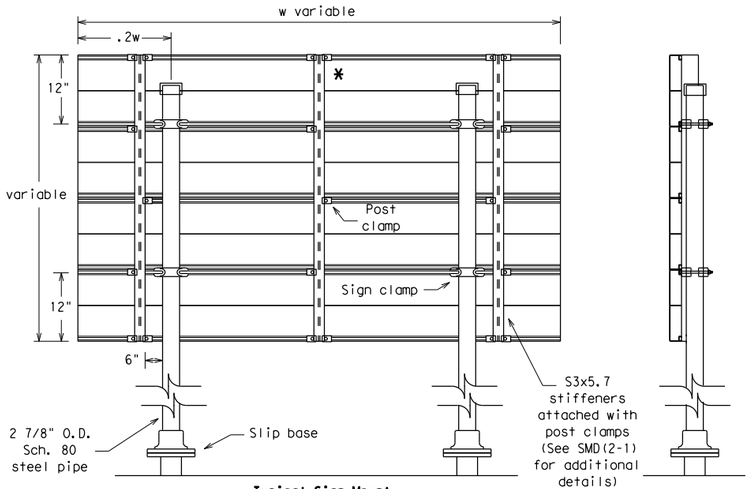


Detail B



Detail C

Splices shall only be allowed behind the sign substrate.

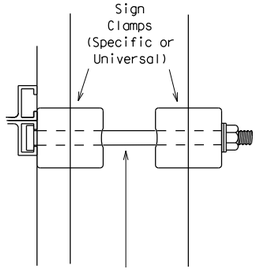


Typical Sign Mount

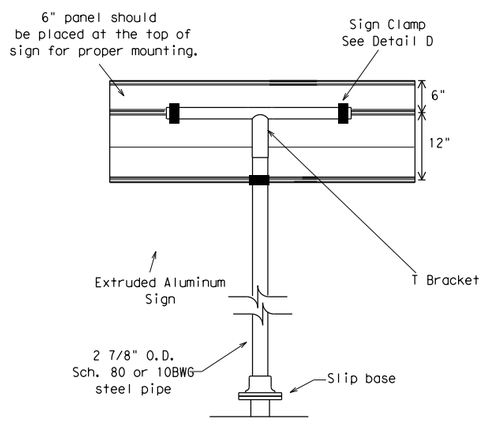
SM RD SGN ASSM TY S80(2)XX(P-EXAL)

* Additional stiffener placed at approximate center of signs when sign width is greater than 10'.

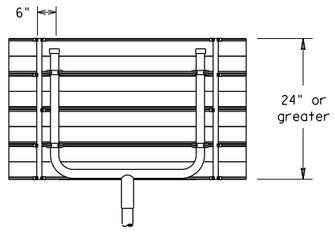
See Detail E
for clamp installation



Detail E



Extruded Aluminum Sign
With T Bracket



Use Extruded Alum. Windbeam as stiffeners
See SMD (2-1) for additional details

See Detail E
for clamp installation

GENERAL NOTES:

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

1. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
2. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
3. Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
4. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
5. For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
6. When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
7. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
8. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
9. Sign blanks shall be the sizes and shapes shown on the plans.
10. Additional sign clamp required on the "T-bracket" post for 24 inch high signs. Place the clamp 3 inches above bottom of sign when possible.
11. Post open ends shall be fitted with Friction Caps.

REQUIRED SUPPORT		
	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
Warning	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-3)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS
9-08

CONT	SECT	JOB	HIGHWAY
0091	10	002	FS 121
DIST	COUNTY		SHEET NO.
PAR	GRAYSON		229

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SUMMARY OF SMALL SIGNS

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

STATION	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	MOUNTING DESIGNATION 1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
℄ CR 60 0+85, LT	1	M3-1	NORTH	24"x12"	X		10BWG	1	SA	P		
		M1-6FS	FARM SPUR 121	24"x24"	X							
		M6-1L	<-	21"x15"	X							
℄ CR 60 1+66, RT	2	M3-1	NORTH	24"x12"	X		10BWG	1	SA	P		
		M1-6FS	FARM SPUR 121	24"x24"	X							
		M6-1R	->	21"x15"	X							
℄ FS 121 3370+35, LT	3	D3-3T	CR 60	30"x8"	X		10BWG	1	SA	P		
		R1-1	STOP	36"x36"	X							
		R1-3P	ALL WAY	18"x6"	X							
℄ CR 60 1+59, LT	4	R1-1	STOP	36"x36"	X		10BWG	1	SA	P		
		R1-3P	ALL WAY	18"x6"	X							
℄ CR 60 0+58, LT	5	R1-1	STOP	36"x36"	X		10BWG	1	SA	P		
		R1-3P	ALL WAY	18"x6"	X							
℄ FS 121 3373+00, RT	6	M3-1	NORTH	24"x12"	X		10BWG	1	SA	P		
		M1-6FS	FARM SPUR 121	24"x24"	X							
℄ FS 121 3376+20, RT	7	R2-1	SPEED LIMIT 55	30"x36"	X		10BWG	1	SA	P		
℄ FS 121 3518+80, LT	8	R2-1	SPEED LIMIT 55	30"x36"	X		10BWG	1	SA	P		
℄ FS 121 3522+00, LT	9	M3-3	SOUTH	24"x12"	X		10BWG	1	SA	P		
		M1-6FS	FARM SPUR 121	24"x24"	X							
℄ FS 121 3527+00, RT	10	M3-1	NORTH	24"x12"	X		10BWG	1	SA	P		
		M1-6FS	FARM SPUR 121	24"x24"	X							
℄ FS 121 3530+20, RT	11	R2-1	SPEED LIMIT 55	30"x36"	X		10BWG	1	SA	P		
℄ FS 121 3583+00, LT	12	R2-1	SPEED LIMIT 55	30"x36"	X		10BWG	1	SA	P		
℄ FS 121 3586+00, LT	13	M3-3	SOUTH	24"x12"	X		10BWG	1	SA	P		
		M1-6FS	FARM SPUR 121	24"x24"	X							
℄ FS 121 3591+95, RT	14	M3-1	NORTH	24"x12"	X		10BWG	1	SA	P		
		M1-6FS	FARM SPUR 121	24"x24"	X							
℄ FS 121 3595+25, RT	15	R2-1	SPEED LIMIT 55	30"x36"	X		10BWG	1	SA	P		
℄ FS 121 3600+00, LT	16	R2-1	SPEED LIMIT 55	30"x36"	X		10BWG	1	SA	P		
℄ FS 121 3603+00, LT	17	M3-3	SOUTH	24"x12"	X		10BWG	1	SA	P		
		M1-6FS	FARM SPUR 121	24"x24"	X							
℄ FS 121 3605+95, RT	18	R1-1	STOP	36"x36"	X		10BWG	1	SA	P		
℄ FS 121 3606+82, RT	19	M1-6F	FARM ROAD 121	24"x24"	X		10BWG	1	SA	P		
		M6-4	<->	21"x15"	X							
℄ FS 121 3606+90, LT	20	W1-7T	///<->\\\	96"x36"	X		S80	1	SA	T		
℄ FM 121 378+75, LT	21	R2-1	SPEED LIMIT 55	30"x36"	X		10BWG	1	SA	P		
℄ FM 121 381+30, LT	22	M3-4	WEST	24"x12"	X		10BWG	1	SA	P		
		M1-6F	FARM ROAD 121	24"x24"	X							
℄ FM 121 382+79, RT	23	R3-5R	RIGHT ONLY	30"x36"	X		10BWG	1	SA	P		
℄ FM 121 383+95, RT	24	M3-3	SOUTH	24"x12"	X		10BWG	1	SA	P		
		M1-6FS	FARM SPUR 121	24"x24"	X							
		M6-1R	->	21"x15"	X							
℄ FM 121 385+43, LT	25	M3-3	SOUTH	24"x12"	X		10BWG	1	SA	P		
		M1-6FS	FARM SPUR 121	24"x24"	X							
		M6-1L	<-	21"x15"	X							
℄ FM 121 391+75, RT	26	M3-2	EAST	24"x12"	X		10BWG	1	SA	P		
		M1-6F	FARM ROAD 121	24"x24"	X							
℄ STIFF CHAPEL 18+90, LT	27	M1-6FS	FARM SPUR 121	24"x24"	X		10BWG	1	SA	P		
		M6-4	<->	21"x15"	X							
℄ STIFF CHAPEL 19+20, RT	28	D3-4aT	STIFF CHAPEL RD	42"x8"	X		10BWG	1	SA	P		
		R1-1	STOP	36"x36"	X							
℄ STIFF CHAPEL 20+00, LT	29	D3-4aT	STIFF CHAPEL RD	42"x8"	X		10BWG	1	SA	P		
		R1-1	STOP	36"x36"	X							
℄ STIFF CHAPEL 20+25, RT	30	M1-6FS	FARM SPUR 121	24"x24"	X		10BWG	1	SA	P		
		M6-4	<->	21"x15"	X							
℄ FS 121 3588+95, LT	31	W1-7T	///<->\\\	96"x36"	X		S80	1	SA	T		
℄ FS 121 3589+25, LT	32	M1-6FS	FARM SPUR 121	24"x24"	X		10BWG	1	SA	P		
		M6-4	<->	21"x15"	X							
℄ SCHARFF RD 14+00, LT	33	D3-4aT	SCHARFF RD	36"x8"	X		10BWG	1	SA	P		
		R1-1	STOP	36"x36"	X							

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/

NOTE:

1. Sign supports shall be located as shown on the plans, except that the Engineer may shift the sign supports, within design guidelines, where necessary to secure a more desirable location or to avoid conflict with utilities. Unless otherwise shown on the plans, the Contractor shall stake and the Engineer will verify all sign support locations.
2. For installation of bridge mount clearance signs, see Bridge Mounted Clearance Sign Assembly (BMCS) Standard Sheet.
3. For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD(GEN).

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Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-16 8-16	0091	10	002	FS 121
	DIST		COUNTY	SHEET NO.
	PAR		GRAYSON	230

A. GENERAL SITE DATA

1. PROJECT LIMITS:

Begin Project Coordinates : Latitude (N) : 34.469948 *Longitude (W) :* -99.056250

From North of County Rd 60 to South of FM 121

2. PROJECT SITE MAPS:

- *Project Location Map: The Title Sheet*
- *Drainage Patterns: Drainage Area Maps (Sheets 149-151)*
- *Slopes Anticipated After Major Gradings or Areas of Soil Disturbance: Typical Sections (Sheets 10-15)*
- *Location of Erosion and Sediment Controls: SW3P Site Maps (Sheets 232-250)*
- *Surface Waters and Discharge Locations: Drainage and Culvert Layouts (Sheets 153-170 & 172-183)*
- *Project Specific Location(s) (PSL): To be determined by the project Construction Personnel. Location(s) shown on SW3P Site Map (if PSL location(s) is within one mile of project) and information located in project SW3P Binder (Reference Item #10 below).*

3. PROJECT DESCRIPTION:

Construction of 2-lane undivided FM SPUR 121 consisting of paving, grading, ditches, culverts, signing, and pavement markings

4. MAJOR SOIL DISTURBING ACTIVITIES:

Excavating subgrade. contructing embankment, roadway ditch grading.

5. EXISTING CONDITION OF SOIL & VEGETATIVE COVER AND % OF EXISTING VEGETATIVE COVER:

Eagle Ford clay found at this project. Existing vegetative cover is at aprroximately 85%

6. TOTAL PROJECT AREA: *110.50* Acres

7. TOTAL AREA TO BE DISTURBED: *65.79* Acres (*60 %*)

8. WEIGHTED RUNOFF COEFFICIENT

BEFORE CONSTRUCTION: *0.35*
AFTER CONSTRUCTION: *0.50*

9. NAME OF RECEIVING WATERS:

Tributary of Lake Ray Roberts and their associated wetlands.
No water quality impairments. Trinity River Basin Segment Number 0840.

10. PROJECT SW3P Binder:

A. For projects disturbing one to five acres, TxDOT will maintain a SW3P Binder at the project field office (if there is not a project field office, should be kept at the Area Office) which contains the following: Index Sheet, TCEQ Signature Authority, TxDOT's and Contractor's Small Construction Site Notice, SW3P Inspector Qualification Statements, EPIC Sheet, SW3P Sheet, Site Location Maps, Inspection and Maintenance Reports (Form 2118), Construction Stage Gate Checklist(s) (CSGC), Stored Material Lists specifying associated control measures and the Appendix which contains the TPDES Construction General Permit, TxDOT and Contractor MS4 Operator Notification(s) and the Construction PSL Permits per all applicable requirements.

B. For projects disturbing 5 acres or more, TxDOT will follow the actions listed in (10.A.) above with the addition of the following: TxDOT and Contractor Notice Of Intent (N.O.I.) and Fee Payment Form, TxDOT and Contractor Large Construction Site Notice (to be used instead of Small Site Notice), and TPDES Permit Coverage Notice.

C. For projects disturbing less than one acre, actions described in (10.A.) and (10.B.) above are not required. Acreage is calculated by adding Total Area To Be Disturbed Acres on project (See #7 above) and the PSL(s) acreage located within one mile of project.

B. EROSION AND SEDIMENT CONTROLS

1. SOIL STABILIZATION PRACTICES: (Select T = Temporary or P = Permanent, as applicable)

T	TEMPORARY SEEDING	P	PRESERVATION OF NATURAL RESOURCES
____	MULCHING (Hay or Straw)	____	FLEXIBLE CHANNEL LINER
____	BUFFER ZONES	____	RIGID CHANNEL LINER
____	PLANTING	____	SOIL RETENTION BLANKET
P	SEEDING	____	COMPOST MANUFACTURED TOPSOIL
____	SODDING	____	VERTICAL TRACKING
		____	OTHER:

2. STRUCTURAL PRACTICES: (Select T = Temporary or P = Permanent, as applicable)

T	SILT FENCES
____	EROSION CONTROL LOGS
____	EROSION CONTROL COMPOST BERMS (Low Velocity)
T	ROCK FILTER DAMS
____	DIVERSION, INTERCEPTOR, OR PERIMETER DIKES
____	DIVERSION, INTERCEPTOR, OR PERIMETER SWALES
____	DIVERSION DIKE AND SWALE COMBINATIONS
____	PIPE SLOPE DRAINS
____	PAVED FLUMES
T	ROCK BEDDING AT CONSTRUCTION EXIT
____	TIMBER MATTING AT CONSTRUCTION EXIT
____	CHANNEL LINERS
____	SEDIMENT TRAPS
____	SEDIMENT BASINS
____	STORM INLET SEDIMENT TRAP
P	STONE OUTLET STRUCTURES
____	CURBS AND GUTTERS
____	STORM SEWERS
____	VELOCITY CONTROL DEVICES
____	OTHER:

NOTE: TOP OF BMP'S SHOULD NOT BE HIGHER THAN ROADWAY ELEVATION AS NOT TO FLOOD ROADWAY UNLESS PRIOR APPROVAL FROM ENGINEER IS OBTAINED.

3. STORM WATER MANAGEMENT:

A. Storm water drainage will be provided by ditches, inlets, and storm water systems which carry drainage within the R.O.W. to the lows within the roadway and project site which drains to natural facilities.

B. Other permanent erosion controls include hydraulic design to limit structure outlet velocities and grading design generally consisting of 4 :1 or flatter slopes with permanent vegetative cover.

4. STORM WATER MANAGEMENT ACTIVITIES: (Sequence of Construction)

See construction progress schedule for durations and schedule of relevant soil disturbance and stabilization activities.

1. *Place temporary sediment control devices prior to construction of temporary pavement and roadway embankment.*
2. *Construct temporary pavement.*
3. *Place additional temporary sediment control devices after roadway embankment.*
4. *Construct proposed pavement and place erosion control logs at curb inlets & place seeding.*
5. *Remove BMPs after soil is stabilized.*

Sedimentation basins are not provided due to the narrow Right of Way. Alternative BMPs have been provided for equivalent sedimentation control.

5. NON-STORM WATER DISCHARGES:

Filter non-storm water discharges, or hold in retention basins, before being allowed to mix with storm water. These discharges consist of, but not limited to, non-polluted ground water, spring water, foundation or footing drain water, water used for dust control or pavement washing and vehicle washwater containing no detergents.

C. OTHER REQUIREMENTS & PRACTICES

1. MAINTENANCE:

Maintain all erosion and sediment controls in good working order. Perform any necessary cleaning/repairs/replacements at the earliest possible date prior to next rain event, but no later than 7 calendar days. Ensure the surrounding ground has dried sufficiently to prevent damage from equipment. "Too Wet" is the only reason for not adhering to timeframes described. When construction activities permanently or temporarily cease and are not expected to resume for 14 or more days on a disturbed portion of the site, stabilization measures must be initiated immediately.

2. INSPECTION:

A TxDOT Inspector will perform a regularly scheduled SW3P inspection every 7 calendar days. An Inspection and Maintenance Report, signed by the TxDOT Inspector and the Contractor, will be filed for each inspection. Revise/clean/repair/replace each BMP control device in accordance with the current Field Inspection and Maintenance Report (Form 2118) and Item 1 (Maintenance) above.

3. WASTE MATERIALS:

On a daily basis, or as may be directed, collect all waste materials, trash and debris from the construction site and deposit into a metal dumpster having a secure cover and which meets all state and local city solid waste management requirements. Empty the dumpster as required by regulation, or as may be directed, at a local approved landfill site. Do not bury construction waste on the construction project site.

4. HAZARDOUS WASTE & SPILL REPORTING:

As a minimum, any products in the following categories are considered to be hazardous: Paints, Acids, Solvents, Fuels, Asphalt Products, Chemical Additives for Soil Stabilization, and Concrete Curing Compounds or Additives. When storing hazardous material on the project site, or at a Project Specific Location, take all practicable precaution to prevent and/or contain any spillage of these materials. In the event of a spill, contact the spill coordinator immediately.

5. SANITARY WASTE:

Use a licensed sanitary waste management contractor to collect all sanitary waste from portable units as may be required by local regulation, or as directed.

6. CONSTRUCTION VEHICLE TRACKING:

On a regular basis, or as may be directed, dampen haul roads for dust control and construct construction entrances/exits. Provide for a motorized broom or vacuum type sweeper to be available on a daily basis, or as may be directed, to remove sediment from paved roadways on project, abutting and traversing the project site.

7. MANAGEMENT PRACTICES:

A. Construct disposal areas, stockpiles, haul roads and PSL's in a manner that will minimize and control the amount of sediment that may enter receiving waters. Do not locate disposal areas in any wetland, waterbody or streambed.

B. Locate construction staging areas, vehicle maintenance and PSL's areas in a manner to minimize the runoff of pollutants.

C. When working in or near a wetland, install and maintain operating soil erosion and sediment controls at all times during construction and isolate the work from the wetland.

D. Clear all waterways as soon as practicable of temporary embankment, temporary bridges, matting, falsework, piling, debris or other obstructions placed during construction operations that are not a part of the finished work.

E. Procedures and/or practices should be taken to control dust.

F. Sediment to be removed from roadways daily or when work begins after weather events if construction activities have ceased due to weather event.

CIVIL ASSOCIATES, INC.
CAI
9330 LBJ FRWY SUITE 1150
Dallas, Texas 75243
Firm Registration No. 6981

STATE OF TEXAS
JENN-HWAN MA
83964
LICENSED PROFESSIONAL ENGINEER

7/15/2021
, P.E.
Signature of Registrant & Date

Texas Department of Transportation

STORM WATER POLLUTION PREVENTION PLAN (SW3P)

DESIGN	FED.RD. DIV.NO.			HIGHWAY NO.
DF				FS 121
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
DF				
CHECK	TEXAS	PARIS	GRAYSON	
TT	CONTROL	SECTION	JOB	231
CHECK				
JM	0091	10	002	

FILE NAME
DATE
DESIGNER

I. STORMWATER POLLUTION PREVENTION-CLEAN WATER ACT SECTION 402

TPDES TXR 150000: Stormwater Discharge Permit or Construction General Permit required for projects with 1 or more acres disturbed soil. Projects with any disturbed soil must protect for erosion and sedimentation in accordance with Item 506.

List MS4 Operator(s) that may receive discharges from this project. They may need to be notified prior to construction activities.

1.

2.

[x] No Action Required [ ] Required Action

Action No.

1. Prevent stormwater pollution by controlling erosion and sedimentation in accordance with TPDES Permit TXR 150000
2. Comply with the SW3P and revise when necessary to control pollution or required by the Engineer.
3. Post Construction Site Notice (CSN) with SW3P information on or near the site, accessible to the public and TCEQ, EPA or other inspectors.
4. When Contractor project specific locations (PSL's) increase disturbed soil area to 5 acres or more, submit NOI to TCEQ and the Engineer.

II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS CLEAN WATER ACT SECTIONS 401 AND 404

USACE Permit required for filling, dredging, excavating or other work in any water bodies, rivers, creeks, streams, wetlands or wet areas.

The Contractor must adhere to all of the terms and conditions associated with the following permit(s):

[ ] No Permit Required

[x] Nationwide Permit 14 - PCN not Required (less than 1/10th acre waters or wetlands affected)

[ ] Nationwide Permit 14 - PCN Required (1/10 to <1/2 acre, 1/3 in tidal waters)

[ ] Individual 404 Permit Required

[ ] Other Nationwide Permit Required: NWP# ______

Required Actions: List waters of the US permit applies to, location in project and check Best Management Practices planned to control erosion, sedimentation and post-project TSS.

1.

2.

3.

4.

The elevation of the ordinary high water marks of any areas requiring work to be performed in the waters of the US requiring the use of a nationwide permit can be found on the Bridge Layouts.

Best Management Practices:

Erosion	Sedimentation	Post-Construction TSS
[x] Temporary Vegetation	[x] Silt Fence	[ ] Vegetative Filter Strips
[ ] Blankets/Matting	[x] Rock Berm	[ ] Retention/Irrigation Systems
[ ] Mulch	[ ] Triangular Filter Dike	[ ] Extended Detention Basin
[ ] Sodding	[ ] Sand Bag Berm	[ ] Constructed Wetlands
[ ] Interceptor Swale	[ ] Straw Bale Dike	[ ] Wet Basin
[ ] Diversion Dike	[ ] Brush Berms	[ ] Erosion Control Compost
[ ] Erosion Control Compost	[ ] Erosion Control Compost	[ ] Mulch Filter Berm and Socks
[ ] Mulch Filter Berm and Socks	[ ] Mulch Filter Berm and Socks	[ ] Compost Filter Berm and Socks
[ ] Compost Filter Berm and Socks	[ ] Compost Filter Berm and Socks	[x] Vegetation Lined Ditches
	[ ] Stone Outlet Sediment Traps	[ ] Sand Filter Systems
	[ ] Sediment Basins	[ ] Grassy Swales

III. CULTURAL RESOURCES

Refer to TxDOT Standard Specifications in the event historical issues or archeological artifacts are found during construction. Upon discovery of archeological artifacts (bones, burnt rock, flint, pottery, etc.) cease work in the immediate area and contact the Engineer immediately.

[x] No Action Required [ ] Required Action

Action No.

1.

2.

3.

4.

IV. VEGETATION RESOURCES

Preserve native vegetation to the extent practical.
Contractor must adhere to Construction Specification Requirements Specs 162, 164, 192, 193, 506, 730, 751, 752 in order to comply with requirements for invasive species, beneficial landscaping, and tree/brush removal commitments.

[x] No Action Required [ ] Required Action

Action No.

1.

2.

3.

4.

V. FEDERAL LISTED, PROPOSED THREATENED, ENDANGERED SPECIES, CRITICAL HABITAT, STATE LISTED SPECIES, CANDIDATE SPECIES AND MIGRATORY BIRDS.

[x] No Action Required [ ] Required Action

Action No.

1.

2.

3.

4.

If any of the listed species are observed, cease work in the immediate area, do not disturb species or habitat and contact the Engineer immediately. The work may not remove active nests from bridges and other structures during nesting season of the birds associated with the nests. If caves or sinkholes are discovered, cease work in the immediate area, and contact the Engineer immediately.

LIST OF ABBREVIATIONS

BMP:	Best Management Practice	SPCC:	Spill Prevention Control and Countermeasure
CGP:	Construction General Permit	SW3P:	Storm Water Pollution Prevention Plan
DSHS:	Texas Department of State Health Services	PCN:	Pre-Construction Notification
FHWA:	Federal Highway Administration	PSL:	Project Specific Location
MOA:	Memorandum of Agreement	TCEQ:	Texas Commission on Environmental Quality
MOU:	Memorandum of Understanding	TPDES:	Texas Pollutant Discharge Elimination System
MS4:	Municipal Separate Stormwater Sewer System	TPWD:	Texas Parks and Wildlife Department
MBTA:	Migratory Bird Treaty Act	TxDOT:	Texas Department of Transportation
NOT:	Notice of Termination	T&E:	Threatened and Endangered Species
NWP:	Nationwide Permit	USACE:	U.S. Army Corps of Engineers
NOI:	Notice of Intent	USFWS:	U.S. Fish and Wildlife Service

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

General (applies to all projects):

Comply with the Hazard Communication Act (the Act) for personnel who will be working with hazardous materials by conducting safety meetings prior to beginning construction and making workers aware of potential hazards in the workplace. Ensure that all workers are provided with personal protective equipment appropriate for any hazardous materials used.

Obtain and keep on-site Material Safety Data Sheets (MSDS) for all hazardous products used on the project, which may include, but are not limited to the following categories: Paints, acids, solvents, asphalt products, chemical additives, fuels and concrete curing compounds or additives. Provide protected storage, off bare ground and covered, for products which may be hazardous. Maintain product labelling as required by the Act.

Maintain an adequate supply of on-site spill response materials, as indicated in the MSDS. In the event of a spill, take actions to mitigate the spill as indicated in the MSDS, in accordance with safe work practices, and contact the District Spill Coordinator immediately. The Contractor shall be responsible for the proper containment and cleanup of all product spills.

Contact the Engineer if any of the following are detected:

* Dead or distressed vegetation (not identified as normal)
* Trash piles, drums, canister, barrels, etc.
* Undesirable smells or odors
* Evidence of leaching or seepage of substances

Hazardous Materials or Contamination Issues Specific to this Project:

[ ] No Action Required [x] Required Action

Asbestos Containing Material:

1. Asbestos Containing Materials (ACM's) were identifed in the texture coating on the abutment wall, piers, pier caps, and barrier wall under bridge at piers.
2. TxDOT will be responsible for contracting a specialty subcontractor to abate ACM's in accordance with TxDOT 2014 Standard Specification 6.10 and applicable regulatory requirements, including 40 CFR 61.145 (Renovation and Demolition of Structures - Asbestos NESHAP) and OSHA 29 CFR 1926.1101 (Asbestos Standard for Construction), prior to dismantling the bridge.

Lead-Containing Paint:

1. Concentrations of lead were identified in the grey paint on the metal barrier rail on the bridge, and in the grey paint on the metal I-beams. The Contractor is responsible to identify locations on the bridge that will require torch cutting, grinding, sawing, etc. Once the locations are identified the Contractor shall notify the Project Engineer.
2. TxDOT will be responsible for contracting a specialty subcontractor to spot abate these locations by stripping back the paint in accordance with TxDOT 2014 Standard Specification 6.10 and TxDOT Bridge Division special provisions (SP 006-030 and SP 006-031) prior to dismantling the bridge.
3. The Contractor shall any torch cut, grind, or saw steel elements at locations where the lead-containing paint has been stripped back to expose uncoated steel.
4. The Contractor will be responsible for recycling the portions of the bridge that contain lead-containing paint in accordance with all applicable State and Federal guidelines, including Item 6.10.2-Removal & Disposal of Painted Steel (2014 Standard Specifications).

Does the project involve the demolition of a span bridge?

[ ] Yes [x] No (No further action required)

VII. OTHER ENVIRONMENTAL ISSUES

(includes regional issues such as Edwards Aquifer District, etc.)

[x] No Action Required [ ] Required Action

INTERIM REVIEW
THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF B. RYAN BELL, PE 92578 ON 7/15/2021
IT IS NOT TO BE USED FOR CONSTRUCTION PURPOSES.

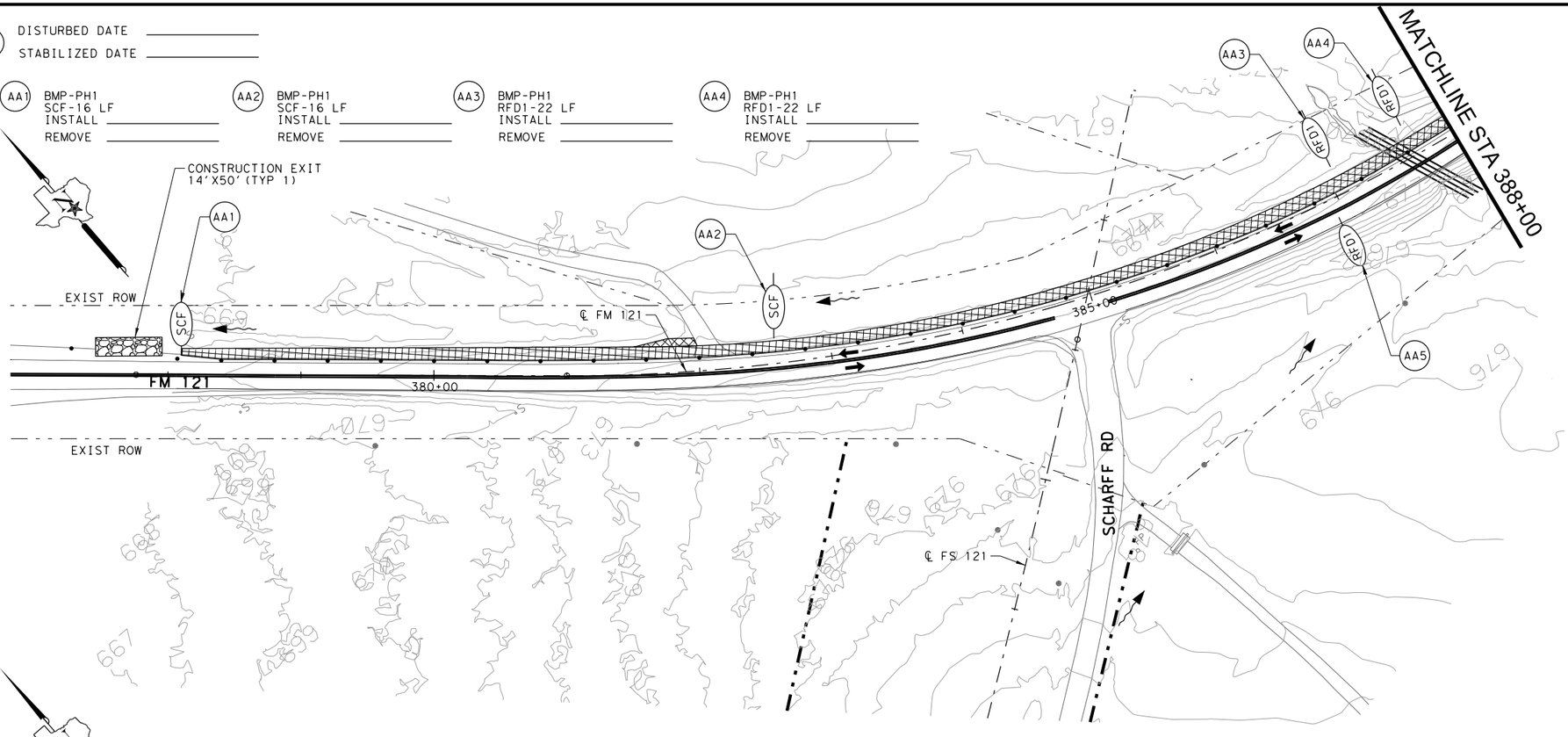
Texas Department of Transportation — Design Division Standard

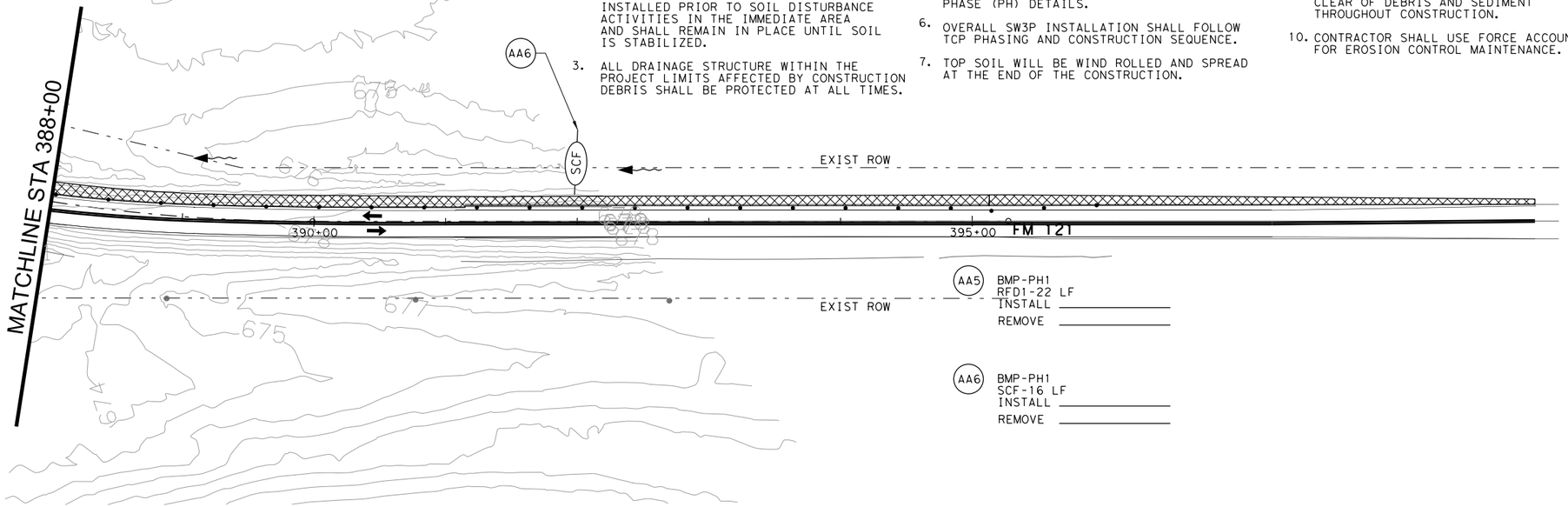
ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

EPIC

FILE: epic.dgn	DN: TxDOT	CK: RG	DW: VP	CK: AR	
© TxDOT: February 2015	CONT	SECT	JOB	HIGHWAY	
REVISIONS 12-12-2011 (DS) 05-07-14 ADDED NOTE SECTION IV. 01-23-2015 SECTION I (CHANGED ITEM 1122 TO ITEM 506, ADDED GRASSY SWALES.	0091	10	002	FS 121	
	DIST	COUNTY		SHEET NO.	
	PAR	GRAYSON		232	

DATE: 7/15/2021 8:18:15 PM
FILE: epic.dgn





HORIZONTAL
50 0 50 100

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTED PREVIOUS PHASE
- TEMPORARY CONSTRUCTED PREVIOUS PHASE
- DISTURBED AND PERM. SEEDING AREA
- CONSTRUCTION EXIT
- RFD1 — ROCK FILTER DAMS (TYPE 1)
- RFD2 — ROCK FILTER DAMS (TYPE 2)
- SCF — SEDMT CONT FENCE
- RFD1 — ROCK FILTER DAMS (TYPE 1) INSTALL IN PREVIOUSS PHASE
- RFD2 — ROCK FILTER DAMS (TYPE 2) INSTALL IN PREVIOUS PHASE
- SCF — SEDMT CONT FENCE INSTALL IN PREVIOUS PHASE
- XX — DISTURBED AREA NAME
- FLOW ARROW

NOTES:

1. LOCATIONS OF EROSION CONTROL DEVICES ARE APPROXIMATIONS. ACTUAL LOCATIONS TO BE DETERMINED IN THE FIELD BY THE ENGINEER.
2. EROSION CONTROL DEVICES SHALL BE INSTALLED PRIOR TO SOIL DISTURBANCE ACTIVITIES IN THE IMMEDIATE AREA AND SHALL REMAIN IN PLACE UNTIL SOIL IS STABILIZED.
3. ALL DRAINAGE STRUCTURE WITHIN THE PROJECT LIMITS AFFECTED BY CONSTRUCTION DEBRIS SHALL BE PROTECTED AT ALL TIMES.
4. EROSION CONTROL DEVICE INSTALLATION, MAINTENANCE, AND REMOVAL SHALL BE IN ACCORDANCE WITH TXDOT STANDARDS FOR EROSION CONTROL.
5. REFER TO TRAFFIC CONTROL PLAN FOR PHASE (PH) DETAILS.
6. OVERALL SW3P INSTALLATION SHALL FOLLOW TCP PHASING AND CONSTRUCTION SEQUENCE.
7. TOP SOIL WILL BE WIND ROLLED AND SPREAD AT THE END OF THE CONSTRUCTION.
8. CONSTRUCTION EXITS CAN BE PLACED AND RELOCATED ACCORDING TO CONSTRUCTION PHASING WITH APPROVAL OF THE ENGINEER.
9. CONTRACTOR TO MAINTAIN ALL ROADS CLEAR OF DEBRIS AND SEDIMENT THROUGHOUT CONSTRUCTION.
10. CONTRACTOR SHALL USE FORCE ACCOUNT FOR EROSION CONTROL MAINTENANCE.

STATE OF TEXAS
JENN-HWAN MA
83964
LICENSED PROFESSIONAL ENGINEER
7/15/2021

DATE	BY	REV	REVISION

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CAI
9330 LBJ FRWY SUITE 1150
Dallas, Texas 75243
Firm Registration No. 6981

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FS 121

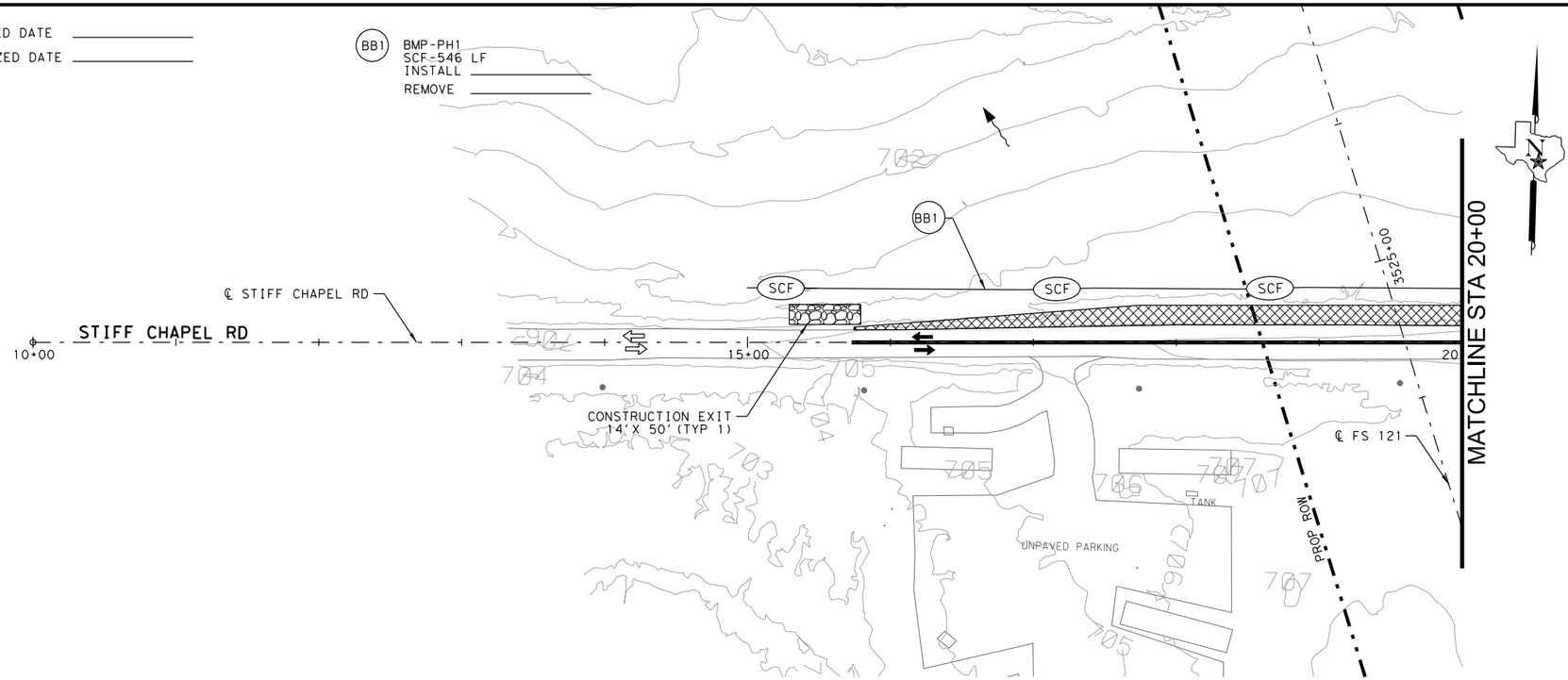
SW3P
PHASE 1
FM 121

SHEET 1 OF 2

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	233

(BB) DISTURBED DATE _____
STABILIZED DATE _____

(BB1) BMP-PH1
SCF-546 LF
INSTALL _____
REMOVE _____



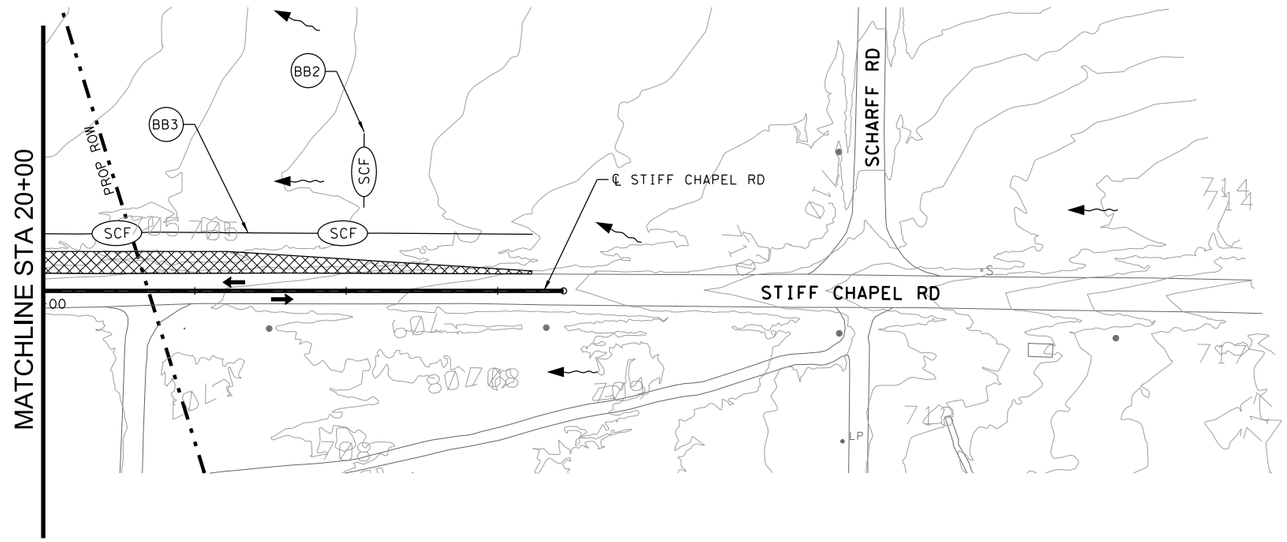
HORIZONTAL
50 0 50 100

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTED PREVIOUS PHASE
- TEMPORARY CONSTRUCTED PREVIOUS PHASE
- DISTURBED AND PERM. SEEDING AREA
- CONSTRUCTION EXIT
- (RFD1) ROCK FILTER DAMS (TYPE 1)
- (RFD2) ROCK FILTER DAMS (TYPE 2)
- (SCF) SEDMT CONT FENCE
- (RFD1) ROCK FILTER DAMS (TYPE 1) INSTALL IN PREVIOUSS PHASE
- (RFD2) ROCK FILTER DAMS (TYPE 2) INSTALL IN PREVIOUS PHASE
- (SCF) SEDMT CONT FENCE INSTALL IN PREVIOUS PHASE
- (XX) DISTURBED AREA NAME
- FLOW ARROW

(BB2) BMP-PH1
SCF-14 LF
INSTALL _____
REMOVE _____

(BB3) BMP-PH1
SCF-174 LF
INSTALL _____
REMOVE _____



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JENN-HWAN MA
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PROFESSIONAL ENGINEER
7/15/2021

DATE	BY	REV	REVISION

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Texas Department of Transportation

FS 121

SW3P
PHASE 1
STIFF CHAPEL RD

SHEET 2 OF 2

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	234

(A) DISTURBED DATE _____
STABILIZED DATE _____

(A1) BMP-PH2
SCF-475 LF
INSTALL _____
REMOVE _____

(A2) BMP-PH2
SCF-15 LF
INSTALL _____
REMOVE _____

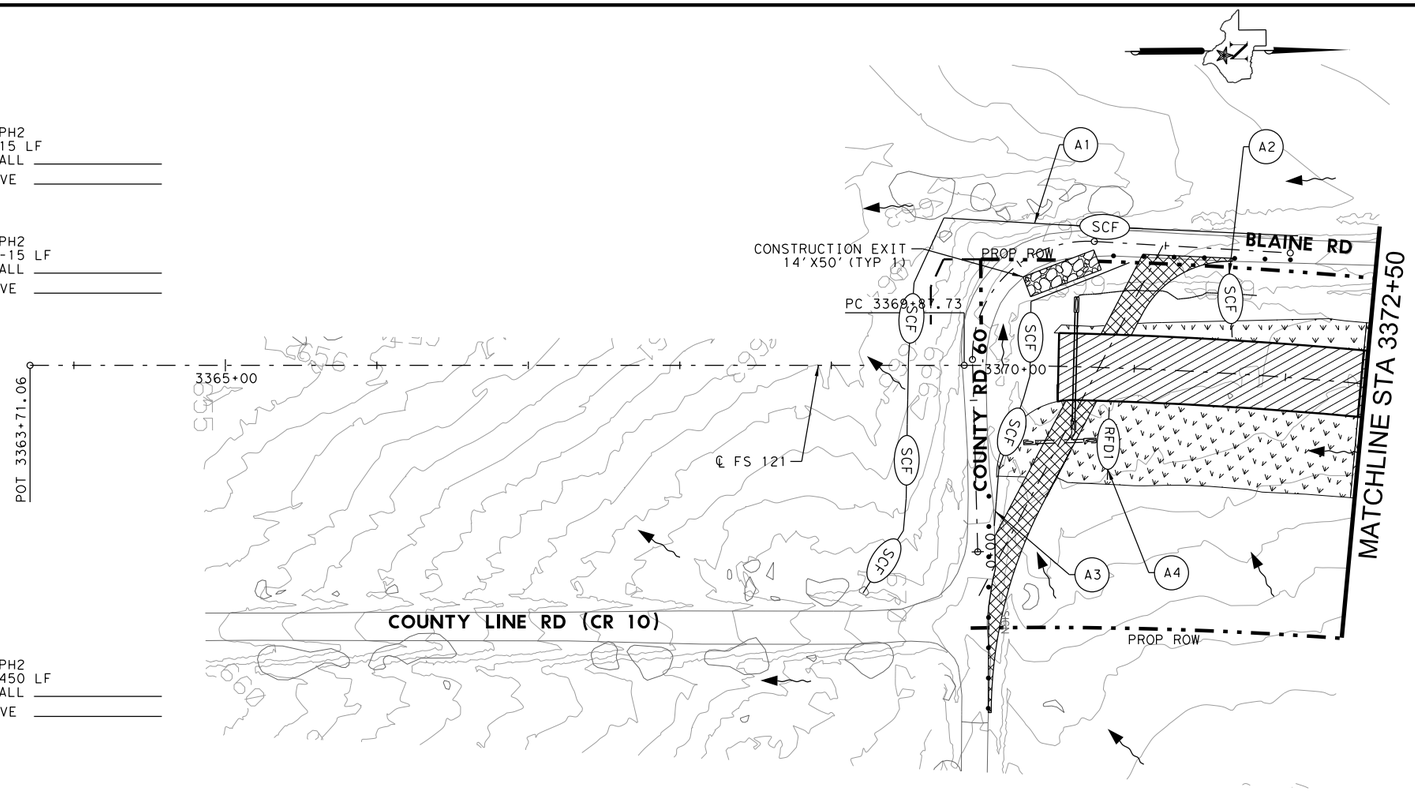
(A3) BMP-PH2
SCF-227 LF
INSTALL _____
REMOVE _____

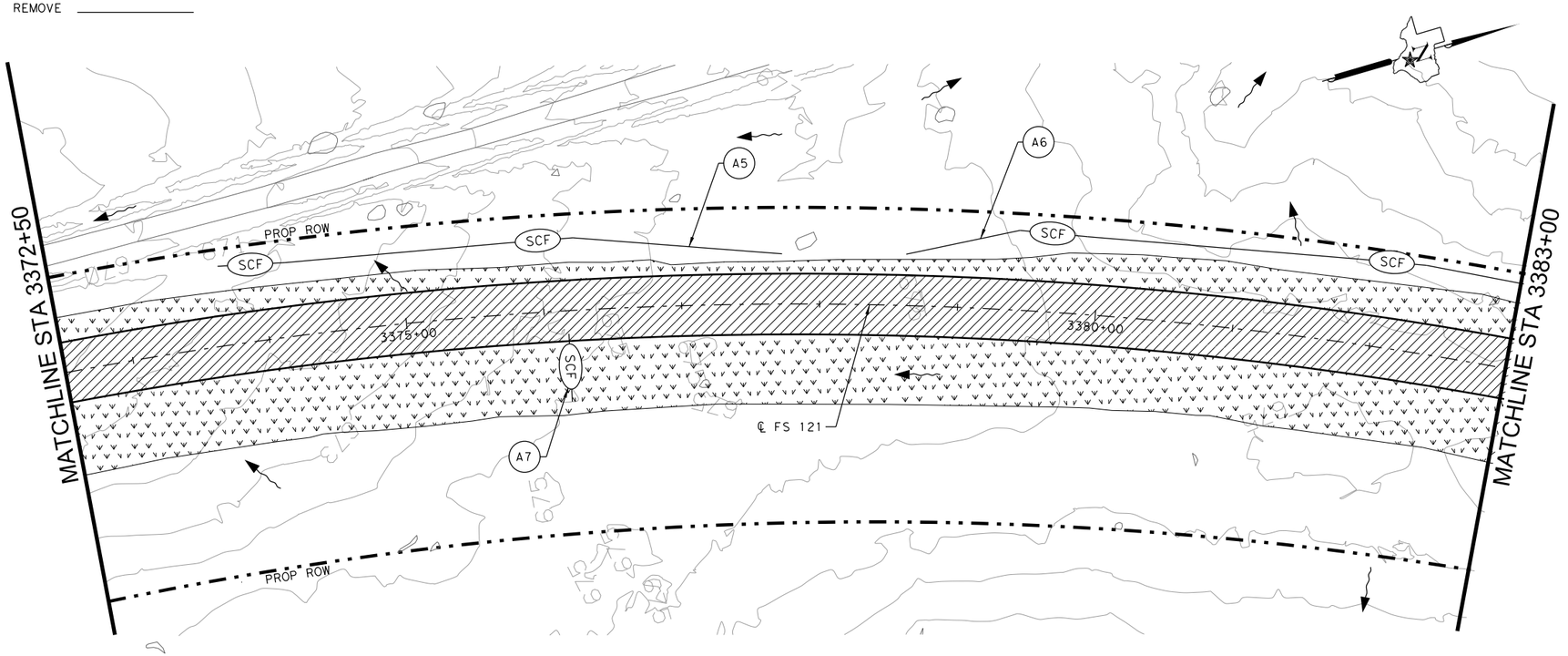
(A4) BMP-PH2
RFD1-15 LF
INSTALL _____
REMOVE _____

(A5) BMP-PH2
SCF-415 LF
INSTALL _____
REMOVE _____

(A6) BMP-PH2
SCF-450 LF
INSTALL _____
REMOVE _____

(A7) BMP-PH2
SCF-45 LF
INSTALL _____
REMOVE _____





HORIZONTAL
50 0 50 100

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTED PREVIOUS PHASE
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STATE OF TEXAS
JENN-HWAN MA
83964
LICENSED PROFESSIONAL ENGINEER
7/15/2021

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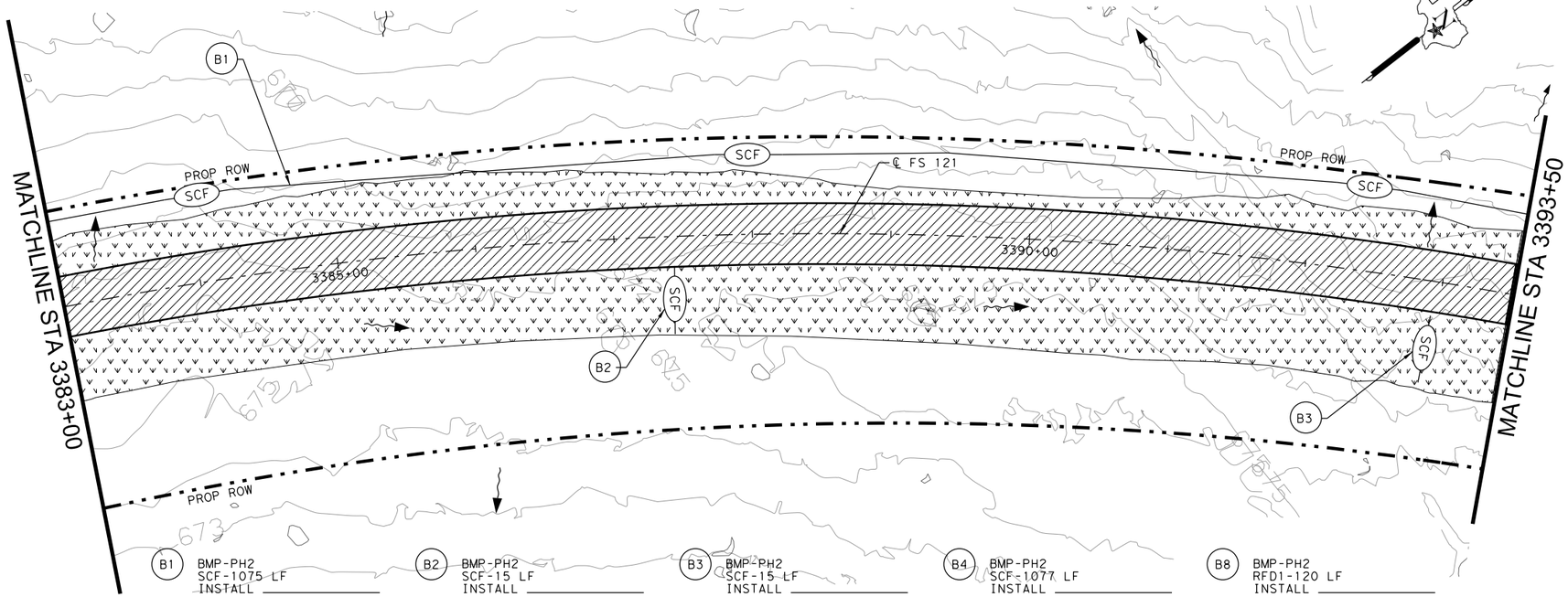
FS 121

SW3P
PHASE 2
BEGIN - STA 3383+00

SCALE: 1" = 100' SHEET 1 OF 14

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	235

(B) DISTURBED DATE _____
STABILIZED DATE _____



(B1) BMP-PH2
SCF-1075 LF
INSTALL _____
REMOVE _____

(B2) BMP-PH2
SCF-15 LF
INSTALL _____
REMOVE _____

(B3) BMP-PH2
SCF-15 LF
INSTALL _____
REMOVE _____

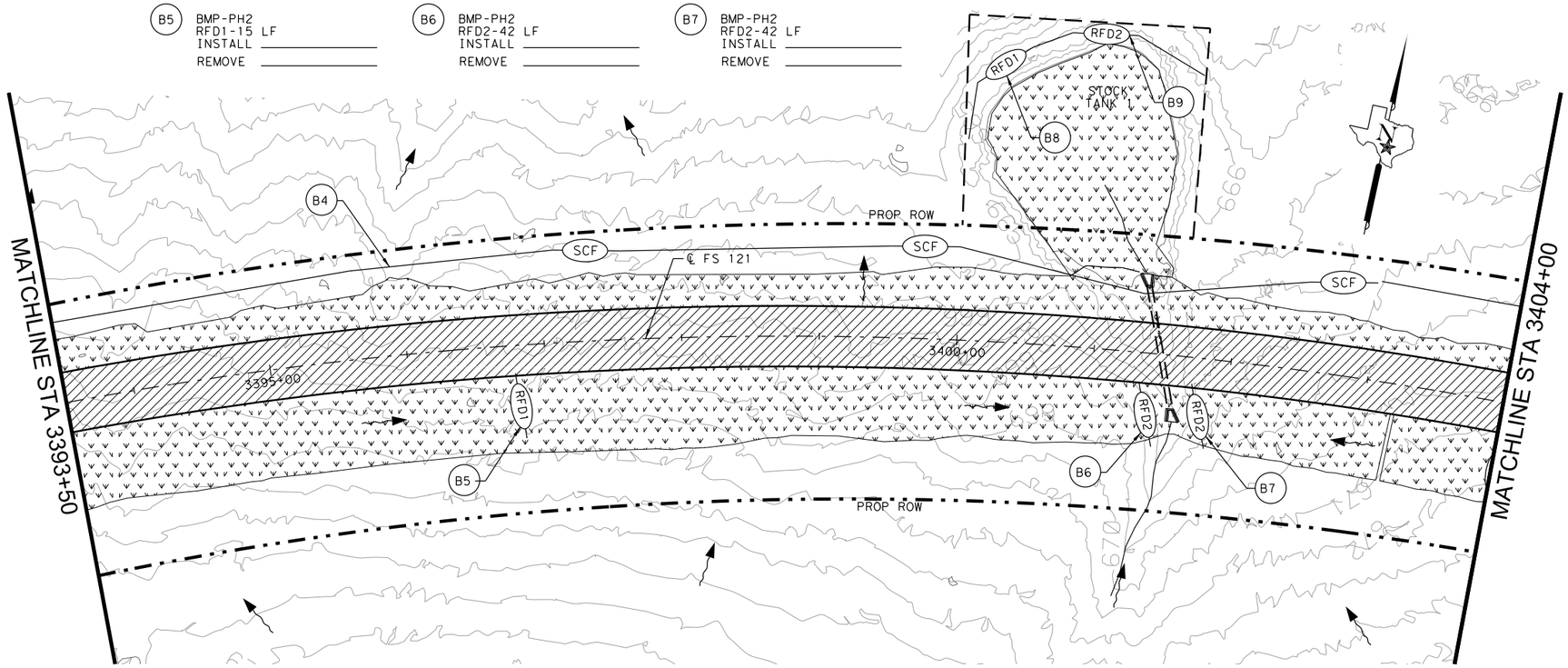
(B4) BMP-PH2
SCF-1077 LF
INSTALL _____
REMOVE _____

(B8) BMP-PH2
RFD1-120 LF
INSTALL _____
REMOVE _____

(B5) BMP-PH2
RFD1-15 LF
INSTALL _____
REMOVE _____

(B6) BMP-PH2
RFD2-42 LF
INSTALL _____
REMOVE _____

(B7) BMP-PH2
RFD2-42 LF
INSTALL _____
REMOVE _____



(B9) BMP-PH2
RFD2-120 LF
INSTALL _____
REMOVE _____

HORIZONTAL
50 0 50 100

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTED PREVIOUS PHASE
- TEMPORARY CONSTRUCTED PREVIOUS PHASE
- DISTURBED AND PERM. SEEDING AREA
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- (XX) DISTURBED AREA NAME
- FLOW ARROW

7/15/2021

DATE	BY	REV	REVISION

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FS 121

SW3P
PHASE 2
STA 3383+00 - STA 3404+00

SHEET 2 OF 14

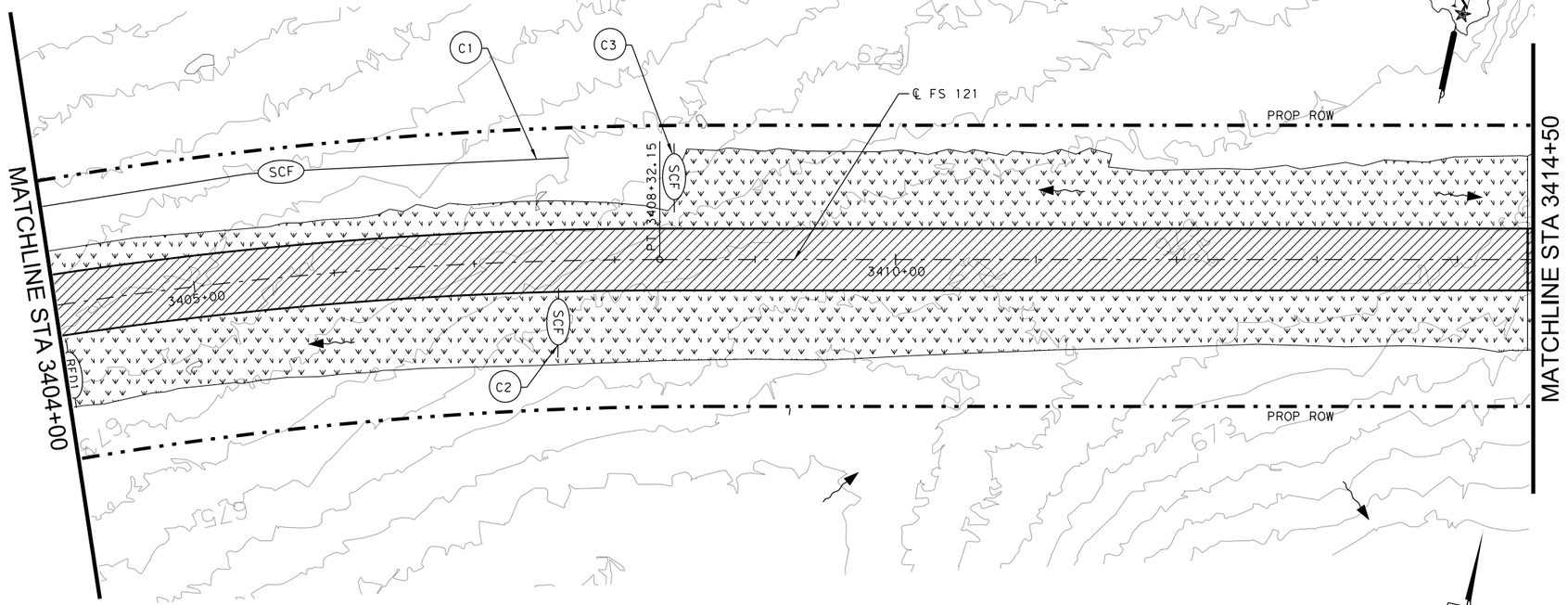
STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	236

C DISTURBED DATE _____
STABILIZED DATE _____

C1 BMP-PH2
SCF-379 LF
INSTALL _____
REMOVE _____

C2 BMP-PH2
SCF-30 LF
INSTALL _____
REMOVE _____

C3 BMP-PH2
SCF-30 LF
INSTALL _____
REMOVE _____



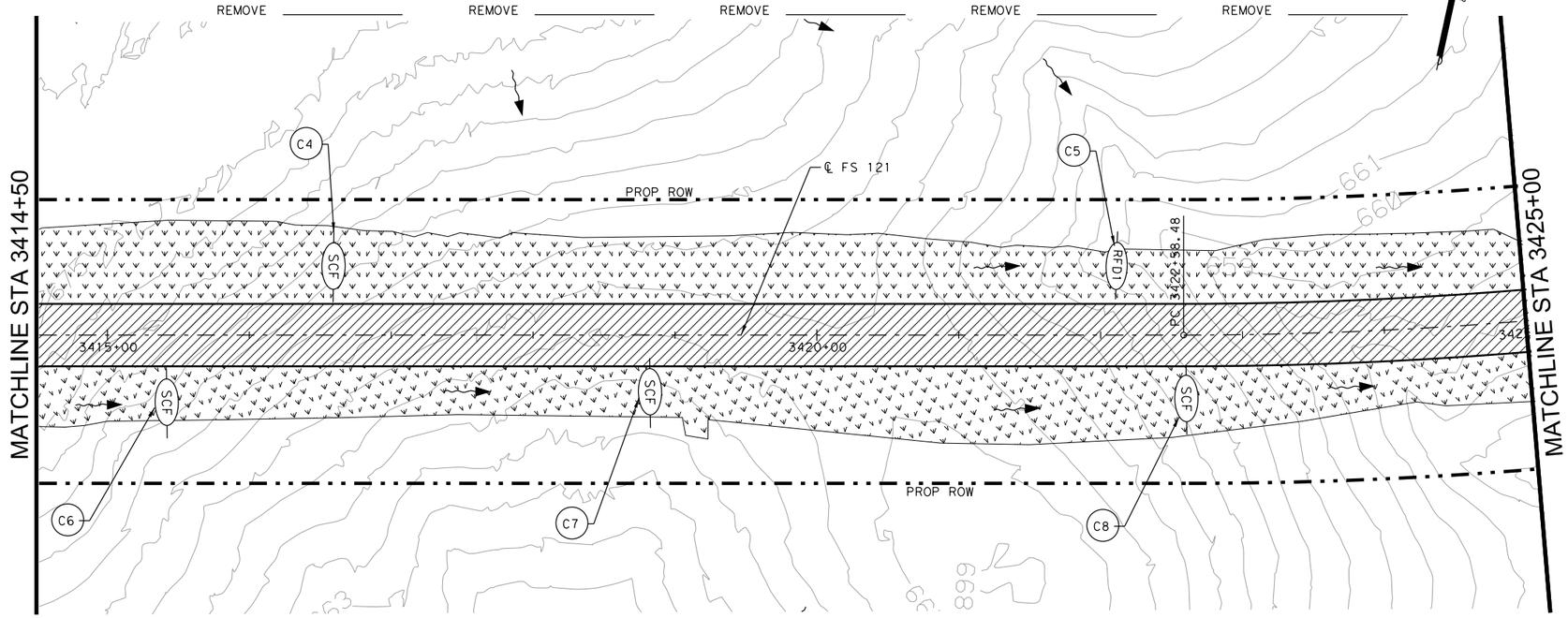
C4 BMP-PH2
SCF-50 LF
INSTALL _____
REMOVE _____

C5 BMP-PH2
RFD1-30 LF
INSTALL _____
REMOVE _____

C6 BMP-PH2
SCF-15 LF
INSTALL _____
REMOVE _____

C7 BMP-PH2
SCF-15 LF
INSTALL _____
REMOVE _____

C8 BMP-PH2
SCF-15 LF
INSTALL _____
REMOVE _____



HORIZONTAL
50 0 50 100

LEGEND

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- SCF — SEDMT CONT FENCE
- RFD1 — ROCK FILTER DAMS (TYPE 1) INSTALL IN PREVIOUSS PHASE
- RFD2 — ROCK FILTER DAMS (TYPE 2) INSTALL IN PREVIOUS PHASE
- SCF — SEDMT CONT FENCE INSTALL IN PREVIOUS PHASE
- XX — DISTURBED AREA NAME
- FLOW ARROW

STATE OF TEXAS
JENN-HWAN MA
83964
LICENSED PROFESSIONAL ENGINEER
7/15/2021

DATE	BY	REV	REVISION

CIVIL ASSOCIATES, INC.
CAI
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Dallas, Texas 75243
Firm Registration No. 6981

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FS 121

SW3P
PHASE 2
STA 3404+00 - STA 3425+00

SCALE: 1" = 100' SHEET 3 OF 14

STATE				HIGHWAY NO.
TEXAS				FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	237

(D) DISTURBED DATE _____
STABILIZED DATE _____

(D1) BMP-PH2
RFD2-22 LF
INSTALL _____
REMOVE _____

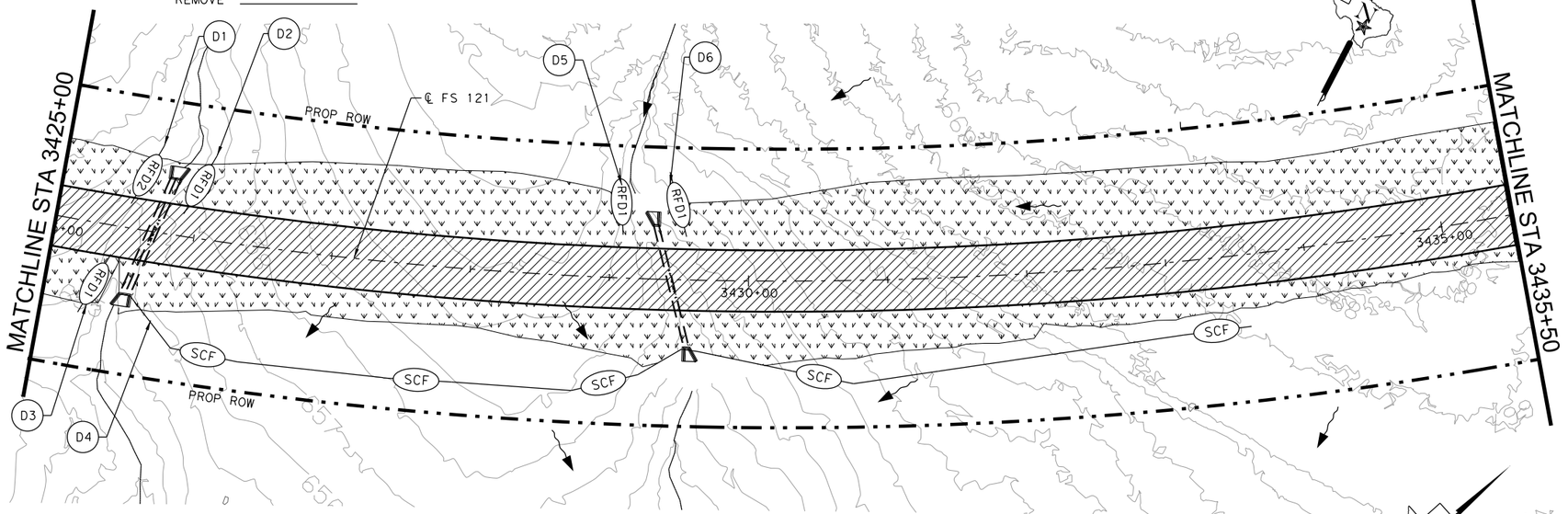
(D2) BMP-PH2
RFD1-22 LF
INSTALL _____
REMOVE _____

(D3) BMP-PH2
RFD1-16 LF
INSTALL _____
REMOVE _____

(D4) BMP-PH2
SCF-837 LF
INSTALL _____
REMOVE _____

(D5) BMP-PH2
RFD1-30 LF
INSTALL _____
REMOVE _____

(D6) BMP-PH2
RFD1-22 LF
INSTALL _____
REMOVE _____



HORIZONTAL
50 0 50 100

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTED PREVIOUS PHASE
- TEMPORARY CONSTRUCTED PREVIOUS PHASE
- DISTURBED AND PERM. SEEDING AREA
- CONSTRUCTION EXIT
- RFD1 — ROCK FILTER DAMS (TYPE 1)
- RFD2 — ROCK FILTER DAMS (TYPE 2)
- SCF — SEDMT CONT FENCE
- RFD1 — ROCK FILTER DAMS (TYPE 1) INSTALL IN PREVIOUSS PHASE
- RFD2 — ROCK FILTER DAMS (TYPE 2) INSTALL IN PREVIOUS PHASE
- SCF — SEDMT CONT FENCE INSTALL IN PREVIOUS PHASE
- XX — DISTURBED AREA NAME
- FLOW ARROW

(D7) BMP-PH2
RFD2-22 LF
INSTALL _____
REMOVE _____

(D8) BMP-PH2
RFD1-22 LF
INSTALL _____
REMOVE _____

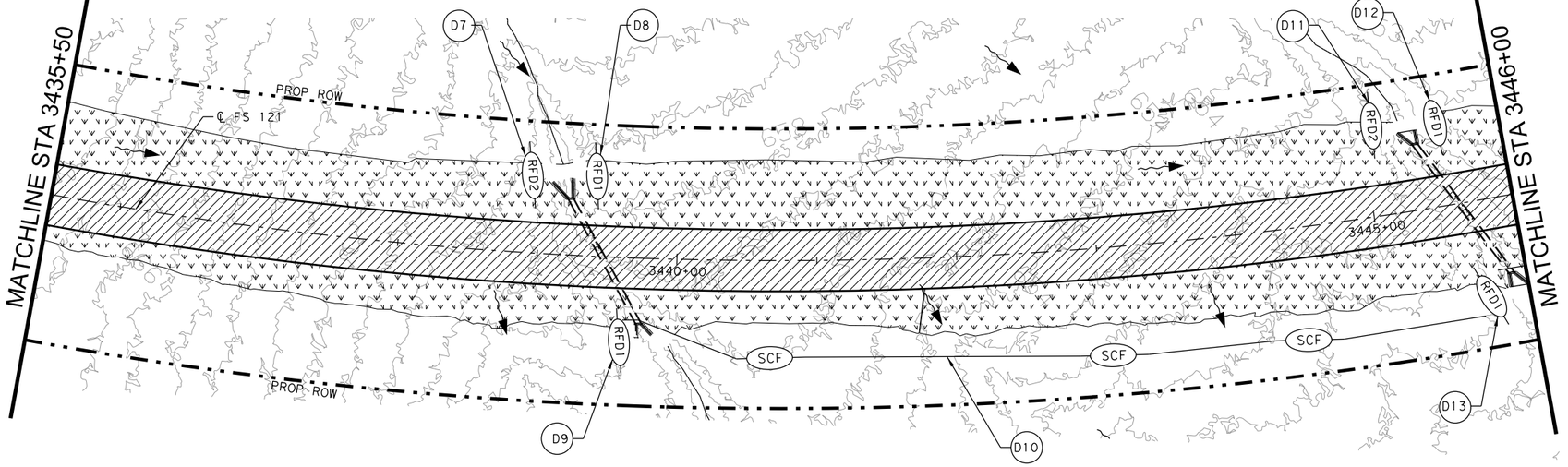
(D9) BMP-PH2
RFD1-16 LF
INSTALL _____
REMOVE _____

(D10) BMP-PH2
SCF-613 LF
INSTALL _____
REMOVE _____

(D11) BMP-PH2
RFD2-22 LF
INSTALL _____
REMOVE _____

(D12) BMP-PH2
RFD1-22 LF
INSTALL _____
REMOVE _____

(D13) BMP-PH2
RFD1-22 LF
INSTALL _____
REMOVE _____



JENN-HWAN MA
83964
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS
7/15/2021

DATE	BY	REV	REVISION

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FS 121

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PHASE 2
STA 3425+00 - STA 3446+00

SCALE: 1" = 100' SHEET 4 OF 14

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	238

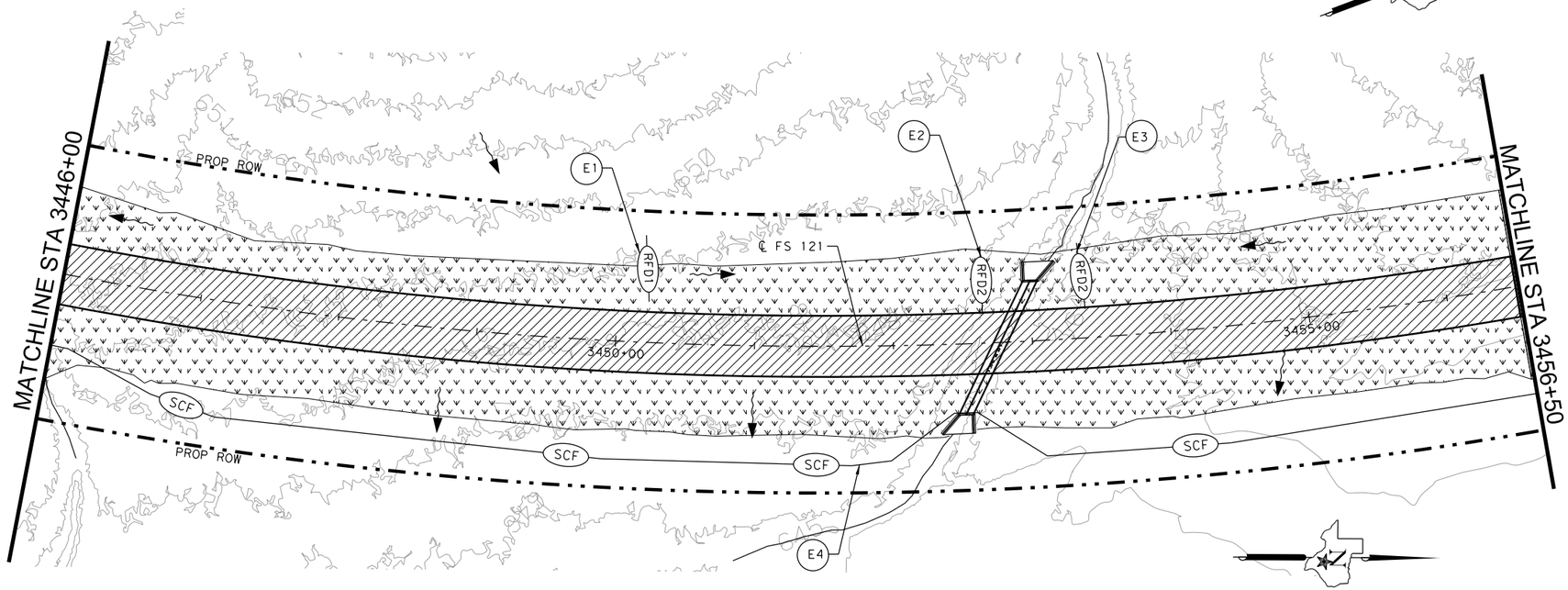
(E) DISTURBED DATE _____
STABILIZED DATE _____

(E1) BMP-PH2
RFD1-18 LF
INSTALL _____
REMOVE _____

(E2) BMP-PH2
RFD2-20 LF
INSTALL
REMOVE _____

(E3) BMP-PH2
RFD2-20 LF
INSTALL _____
REMOVE _____

(E4) BMP-PH2
SCF-1106 LF
INSTALL _____
REMOVE _____



HORIZONTAL
50 0 50 100

LEGEND

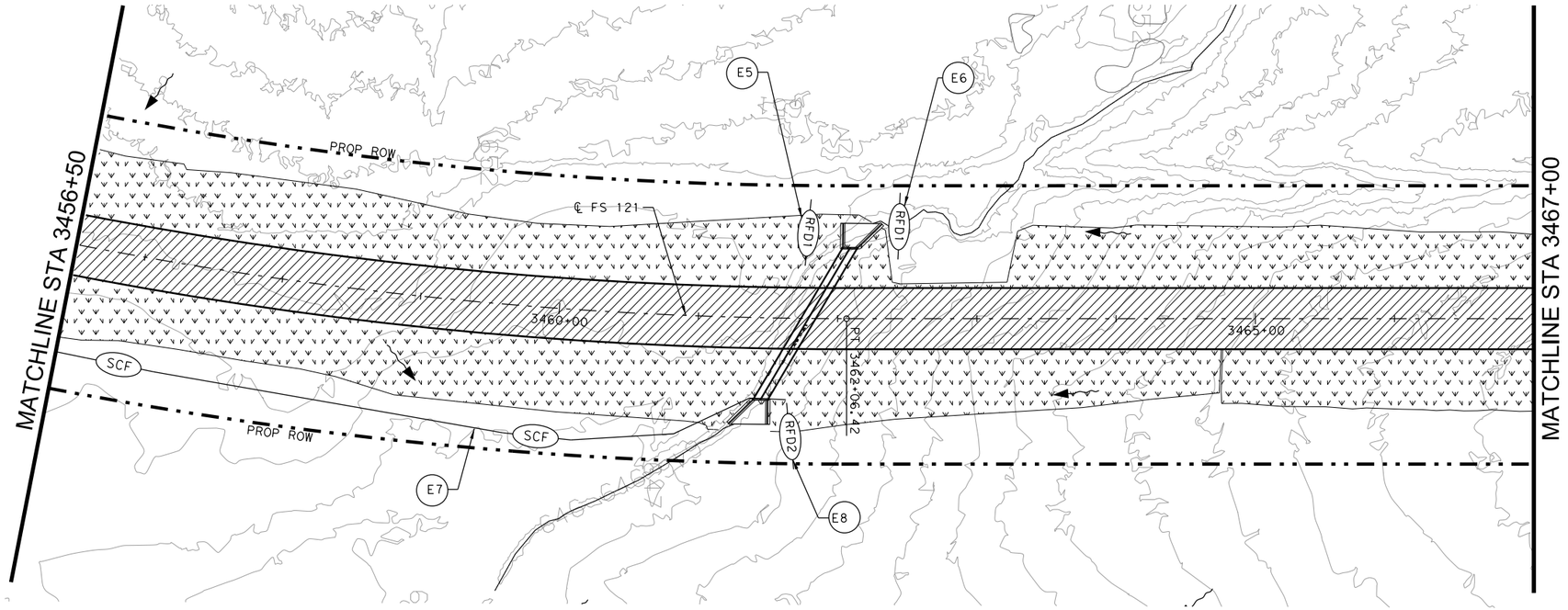
- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTED PREVIOUS PHASE
- TEMPORARY CONSTRUCTED PREVIOUS PHASE
- DISTURBED AND PERM. SEEDING AREA
- CONSTRUCTION EXIT
- RFD1 — ROCK FILTER DAMS (TYPE 1)
- RFD2 — ROCK FILTER DAMS (TYPE 2)
- SCF — SEDMT CONT FENCE
- RFD1 — ROCK FILTER DAMS (TYPE 1) INSTALL IN PREVIOUSS PHASE
- RFD2 — ROCK FILTER DAMS (TYPE 2) INSTALL IN PREVIOUS PHASE
- SCF — SEDMT CONT FENCE INSTALL IN PREVIOUS PHASE
- XX — DISTURBED AREA NAME
- FLOW ARROW

(E5) BMP-PH2
RFD1-24 LF
INSTALL _____
REMOVE _____

(E6) BMP-PH2
RFD1-24 LF
INSTALL _____
REMOVE _____

(E7) BMP-PH2
SCF-536 LF
INSTALL _____
REMOVE _____

(E8) BMP-PH2
RFD2-12 LF
INSTALL _____
REMOVE _____



DATE	BY	REV	REVISION

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Firm Registration No. 6981

Texas Department of Transportation

FS 121

SW3P
PHASE 2
STA 3446+00 - STA 3467+00

SCALE: 1" = 100' SHEET 5 OF 14

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	239

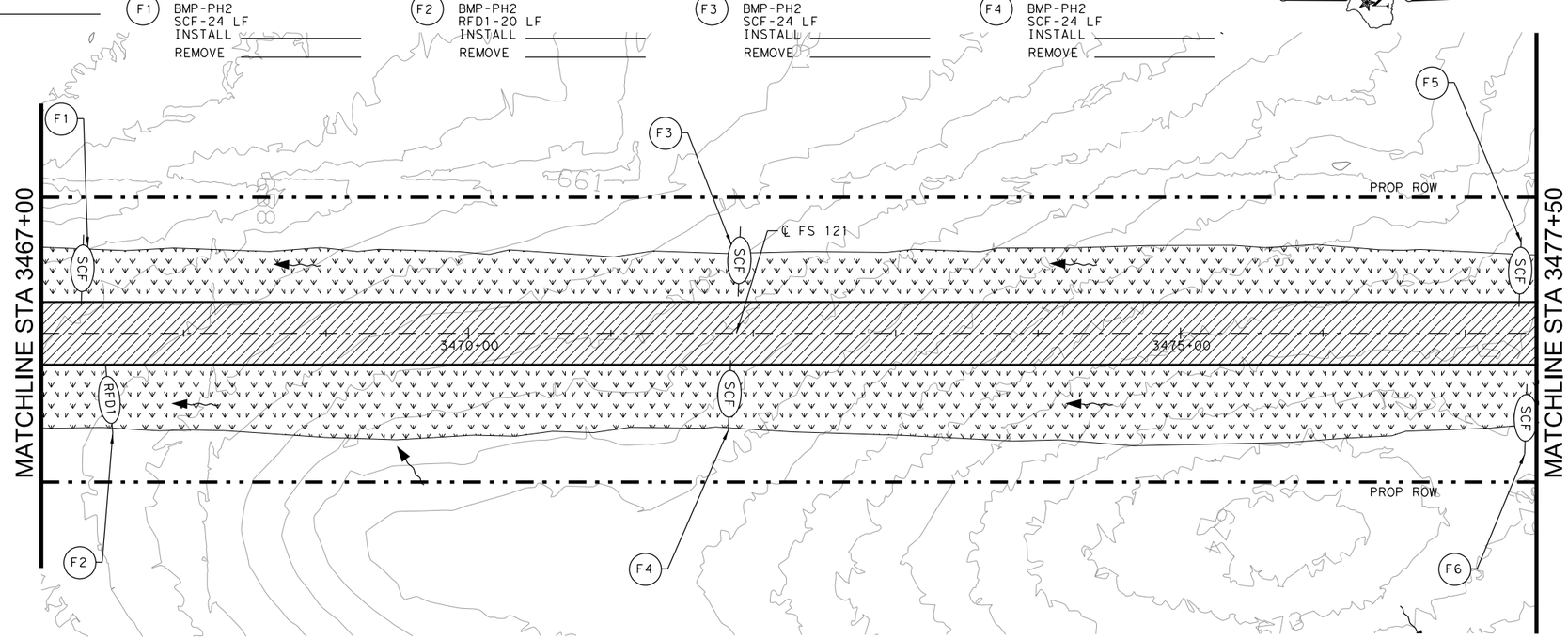
F DISTURBED DATE _____
STABILIZED DATE _____

F1 BMP-PH2 SCF-24 LF
INSTALL _____
REMOVE _____

F2 BMP-PH2 RFD1-20 LF
INSTALL _____
REMOVE _____

F3 BMP-PH2 SCF-24 LF
INSTALL _____
REMOVE _____

F4 BMP-PH2 SCF-24 LF
INSTALL _____
REMOVE _____

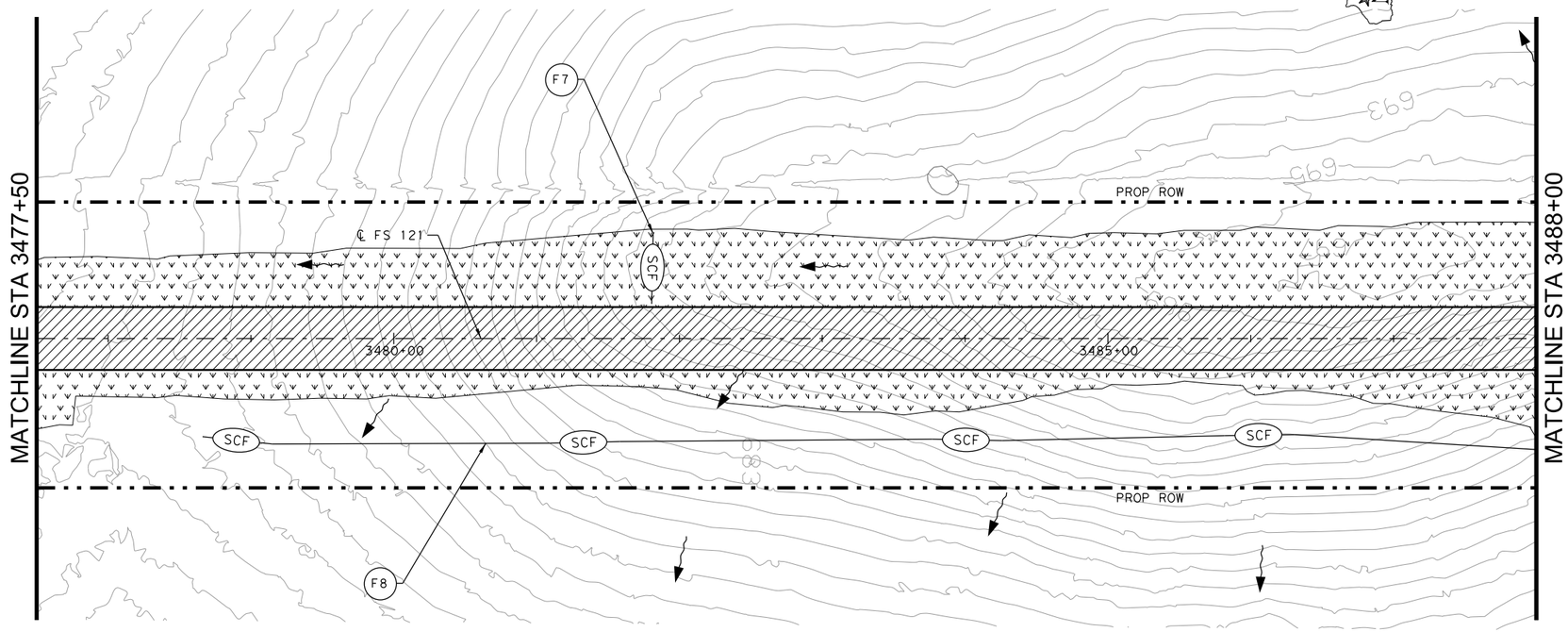


F5 BMP-PH2 SCF-24 LF
INSTALL _____
REMOVE _____

F6 BMP-PH2 SCF-24 LF
INSTALL _____
REMOVE _____

F7 BMP-PH2 SCF-24 LF
INSTALL _____
REMOVE _____

F8 BMP-PH2 SCF-935 LF
INSTALL _____
REMOVE _____



HORIZONTAL
50 0 50 100

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTED PREVIOUS PHASE
- TEMPORARY CONSTRUCTED PREVIOUS PHASE
- DISTURBED AND PERM. SEEDING AREA
- CONSTRUCTION EXIT
- RFD1 — ROCK FILTER DAMS (TYPE 1)
- RFD2 — ROCK FILTER DAMS (TYPE 2)
- SCF — SEDMT CONT FENCE
- RFD1 — ROCK FILTER DAMS (TYPE 1) INSTALL IN PREVIOUSS PHASE
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- SCF — SEDMT CONT FENCE INSTALL IN PREVIOUS PHASE
- XX — DISTURBED AREA NAME
- FLOW ARROW

STATE OF TEXAS
JENN-HWAN MA
83964
LICENSED PROFESSIONAL ENGINEER
7/15/2021

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Firm Registration No. 6981

Texas Department of Transportation

FS 121

SW3P
PHASE 2
STA 3467+00 - STA 3488+00

SHEET 6 OF 14

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	240

G DISTURBED DATE _____
STABILIZED DATE _____

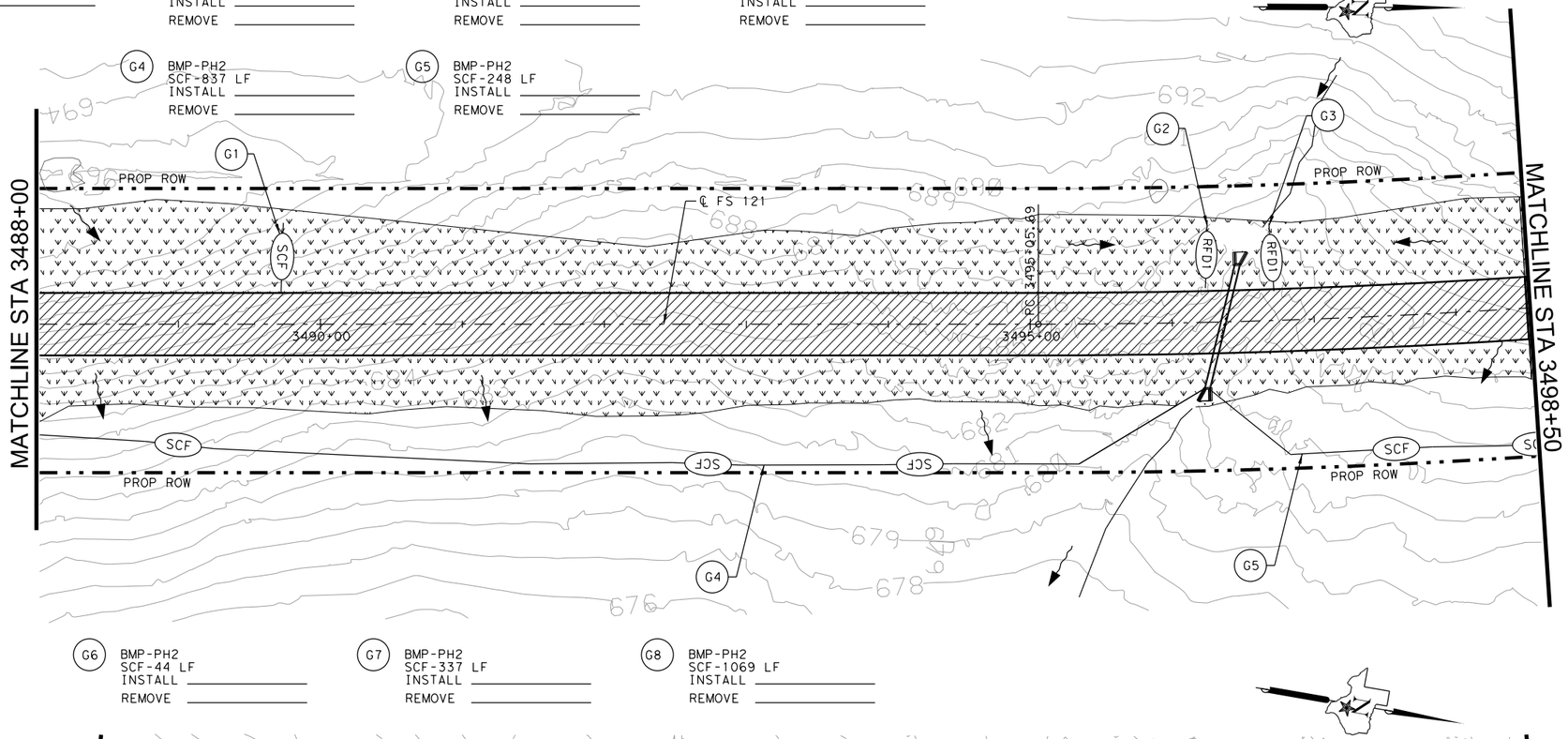
G1 BMP-PH2
SCF-50 LF
INSTALL _____
REMOVE _____

G2 BMP-PH2
RFD1-40 LF
INSTALL _____
REMOVE _____

G3 BMP-PH2
RFD1-40 LF
INSTALL _____
REMOVE _____

G4 BMP-PH2
SCF-837 LF
INSTALL _____
REMOVE _____

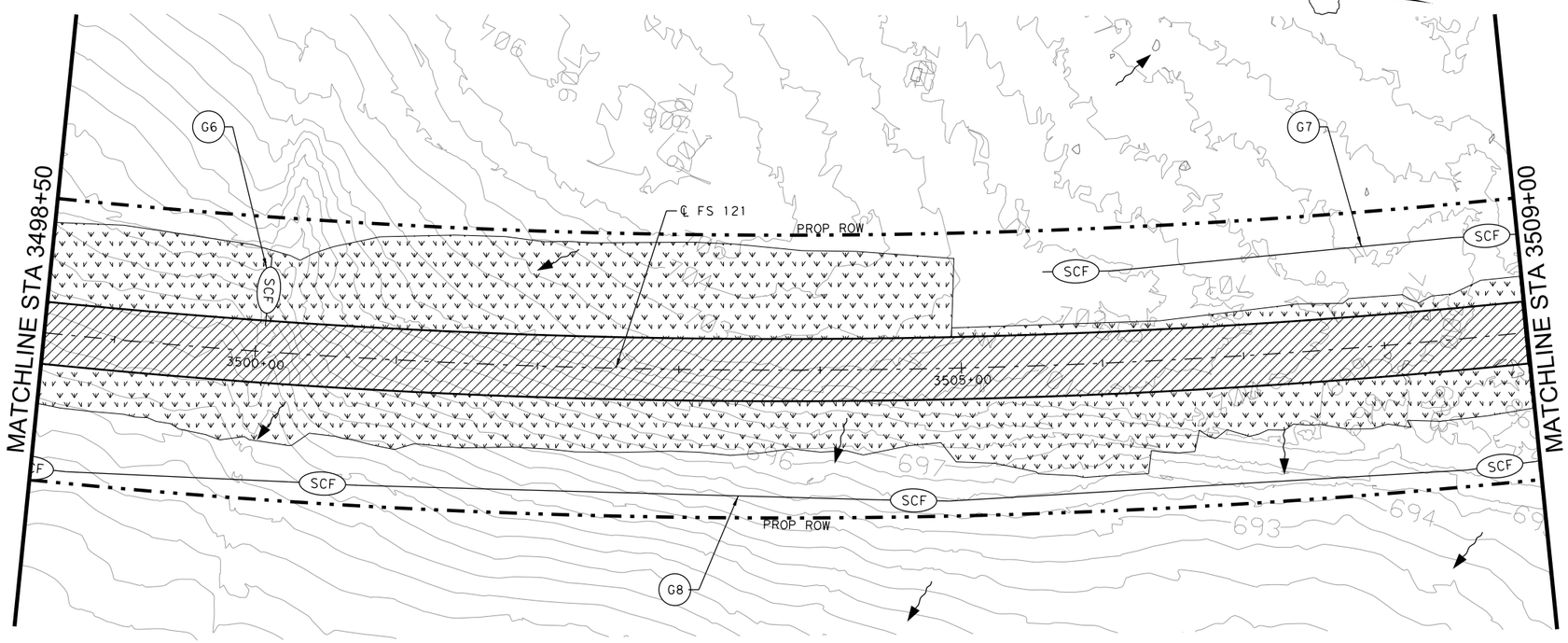
G5 BMP-PH2
SCF-248 LF
INSTALL _____
REMOVE _____



G6 BMP-PH2
SCF-44 LF
INSTALL _____
REMOVE _____

G7 BMP-PH2
SCF-337 LF
INSTALL _____
REMOVE _____

G8 BMP-PH2
SCF-1069 LF
INSTALL _____
REMOVE _____



HORIZONTAL
50 0 50 100

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTED PREVIOUS PHASE
- TEMPORARY CONSTRUCTED PREVIOUS PHASE
- DISTURBED AND PERM. SEEDING AREA
- CONSTRUCTION EXIT
- RFD1 — ROCK FILTER DAMS (TYPE 1)
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- RFD1 — ROCK FILTER DAMS (TYPE 1) INSTALL IN PREVIOUSS PHASE
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- SCF — SEDMT CONT FENCE INSTALL IN PREVIOUS PHASE
- XX — DISTURBED AREA NAME
- FLOW ARROW

STATE OF TEXAS
JENN-HWAN MA
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7/15/2021

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PHASE 2
STA 3488+00 - 3509+00

SHEET 7 OF 14

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	241

H DISTURBED DATE _____
STABILIZED DATE _____

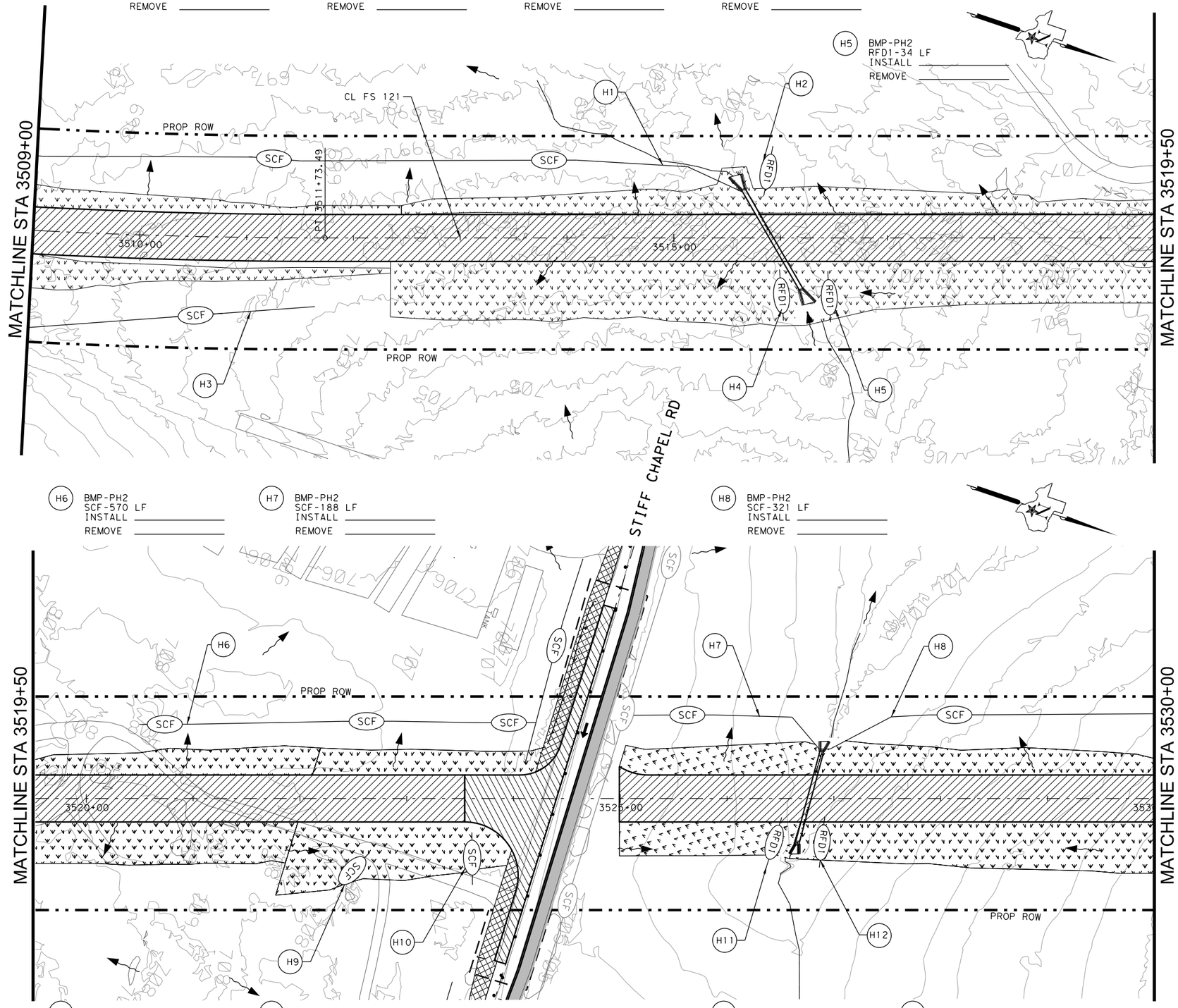
H1 BMP-PH2
SCF-665 LF
INSTALL _____
REMOVE _____

H2 BMP-PH2
RFD1-34 LF
INSTALL _____
REMOVE _____

H3 BMP-PH2
SCF-271 LF
INSTALL _____
REMOVE _____

H4 BMP-PH2
RFD1-34 LF
INSTALL _____
REMOVE _____

H5 BMP-PH2
RFD1-34 LF
INSTALL _____
REMOVE _____



H6 BMP-PH2
SCF-570 LF
INSTALL _____
REMOVE _____

H7 BMP-PH2
SCF-188 LF
INSTALL _____
REMOVE _____

H8 BMP-PH2
SCF-321 LF
INSTALL _____
REMOVE _____

H9 BMP-PH2
SCF-34 LF
INSTALL _____
REMOVE _____

H10 BMP-PH2
SCF-34 LF
INSTALL _____
REMOVE _____

H11 BMP-PH2
RFD1-26 LF
INSTALL _____
REMOVE _____

H12 BMP-PH2
RFD1-26 LF
INSTALL _____
REMOVE _____

HORIZONTAL
50 0 50 100

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTED PREVIOUS PHASE
- TEMPORARY CONSTRUCTED PREVIOUS PHASE
- DISTURBED AND PERM. SEEDING AREA
- CONSTRUCTION EXIT
- RFD1 ROCK FILTER DAMS (TYPE 1)
- RFD2 ROCK FILTER DAMS (TYPE 2)
- SCF SEDMT CONT FENCE
- RFD1 ROCK FILTER DAMS (TYPE 1) INSTALL IN PREVIOUSS PHASE
- RFD2 ROCK FILTER DAMS (TYPE 2) INSTALL IN PREVIOUS PHASE
- SCF SEDMT CONT FENCE INSTALL IN PREVIOUS PHASE
- XX DISTURBED AREA NAME
- FLOW ARROW

STATE OF TEXAS
JENN-HWAN MA
83964
LICENSED PROFESSIONAL ENGINEER
7/15/2021

DATE	BY	REV	REVISION

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Firm Registration No. 6981

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FS 121

SW3P
PHASE 2
STA 3509+00 - STA 3530+00

SHEET 8 OF 14

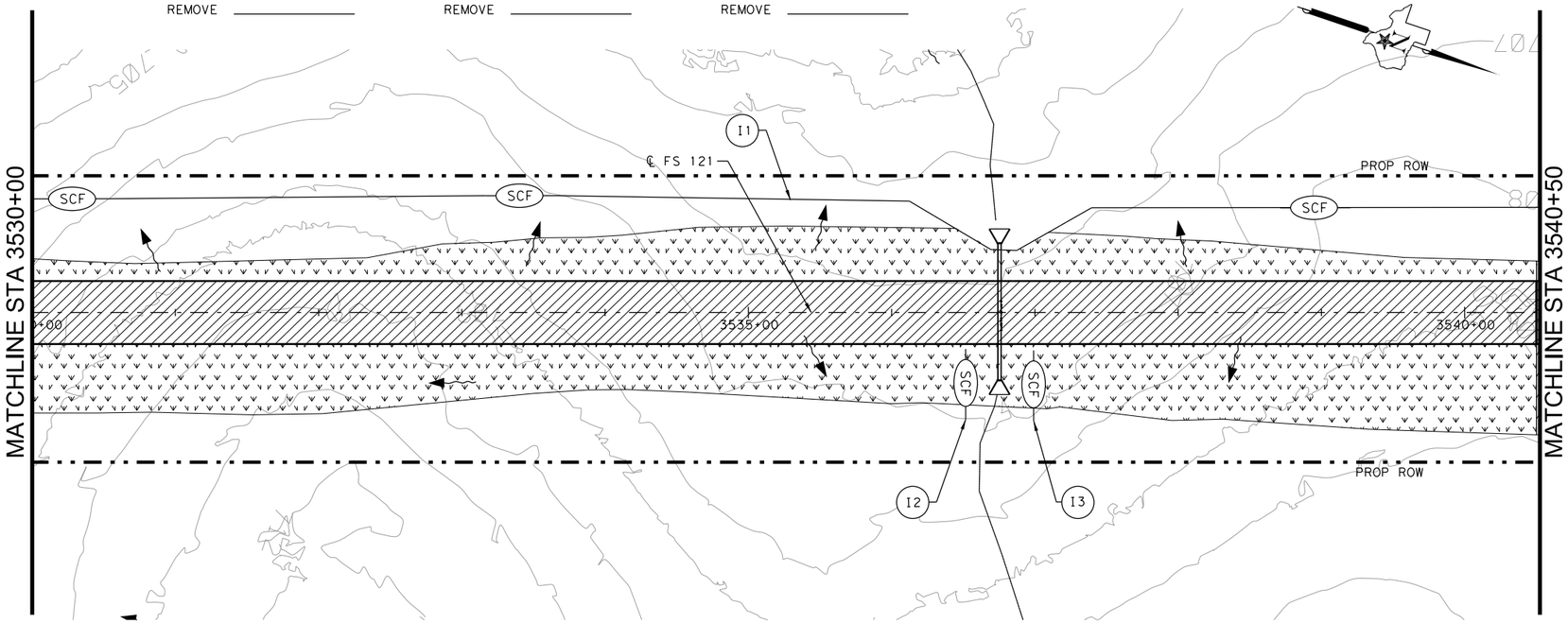
STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	242

(I) DISTURBED DATE _____
STABILIZED DATE _____

(I1) BMP-PH2
SCF-1067 LF
INSTALL _____
REMOVE _____

(I2) BMP-PH2
SCF-14 LF
INSTALL _____
REMOVE _____

(I3) BMP-PH2
SCF-14 LF
INSTALL _____
REMOVE _____



(I4) BMP-PH2
SCF-293 LF
INSTALL _____
REMOVE _____

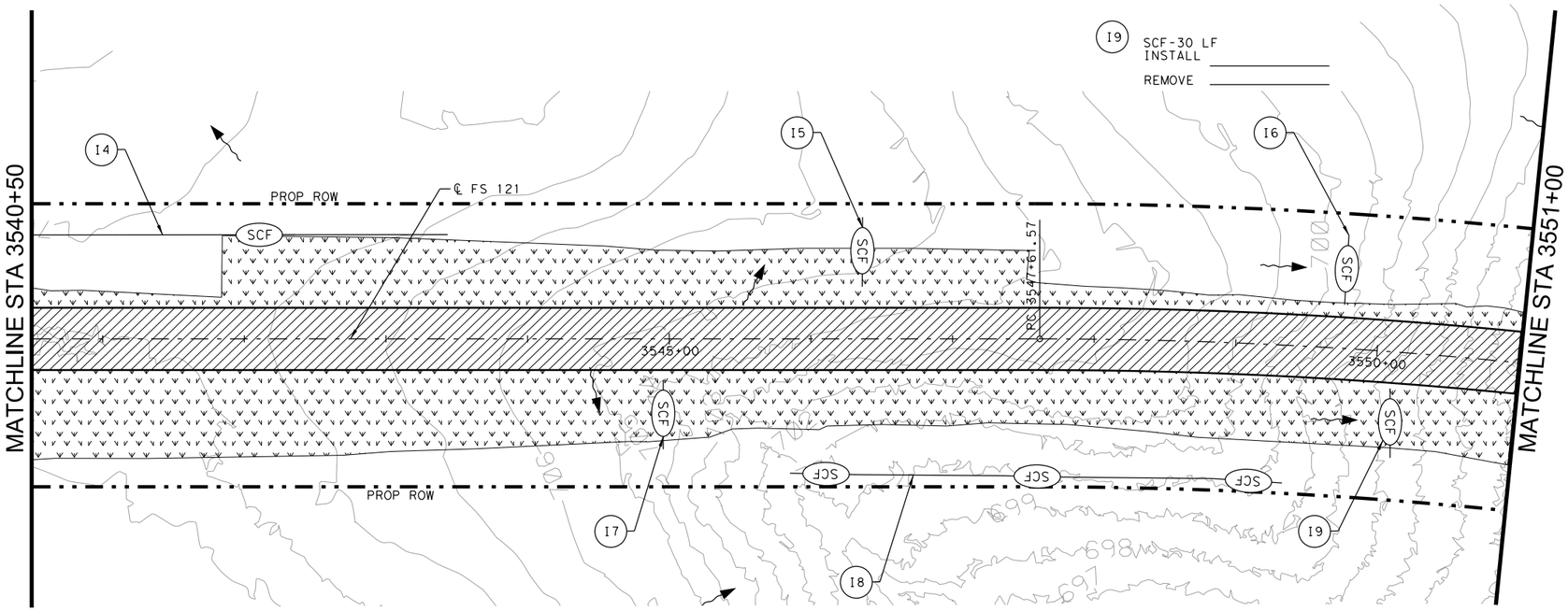
(I5) BMP-PH2
SCF-30 LF
INSTALL _____
REMOVE _____

(I6) BMP-PH2
SCF-30 LF
INSTALL _____
REMOVE _____

(I7) BMP-PH2
SCF-30 LF
INSTALL _____
REMOVE _____

(I8) BMP-PH2
SCF-344 LF
INSTALL _____
REMOVE _____

(I9) SCF-30 LF
INSTALL _____
REMOVE _____



HORIZONTAL
50 0 50 100

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTED PREVIOUS PHASE
- TEMPORARY CONSTRUCTED PREVIOUS PHASE
- DISTURBED AND PERM. SEEDING AREA
- CONSTRUCTION EXIT
- RFD1 — ROCK FILTER DAMS (TYPE 1)
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- SCF — SEDMT CONT FENCE
- RFD1 — ROCK FILTER DAMS (TYPE 1) INSTALL IN PREVIOUSS PHASE
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- SCF — SEDMT CONT FENCE INSTALL IN PREVIOUS PHASE
- XX — DISTURBED AREA NAME
- FLOW ARROW

STATE OF TEXAS
JENN-HWAN MA
83964
LICENSED PROFESSIONAL ENGINEER
7/15/2021

DATE	BY	REV	REVISION

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FS 121

SW3P
PHASE 2
STA 3530+00 - STA 3551+00

SHEET 9 OF 14

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	243

(J) DISTURBED DATE _____
STABILIZED DATE _____

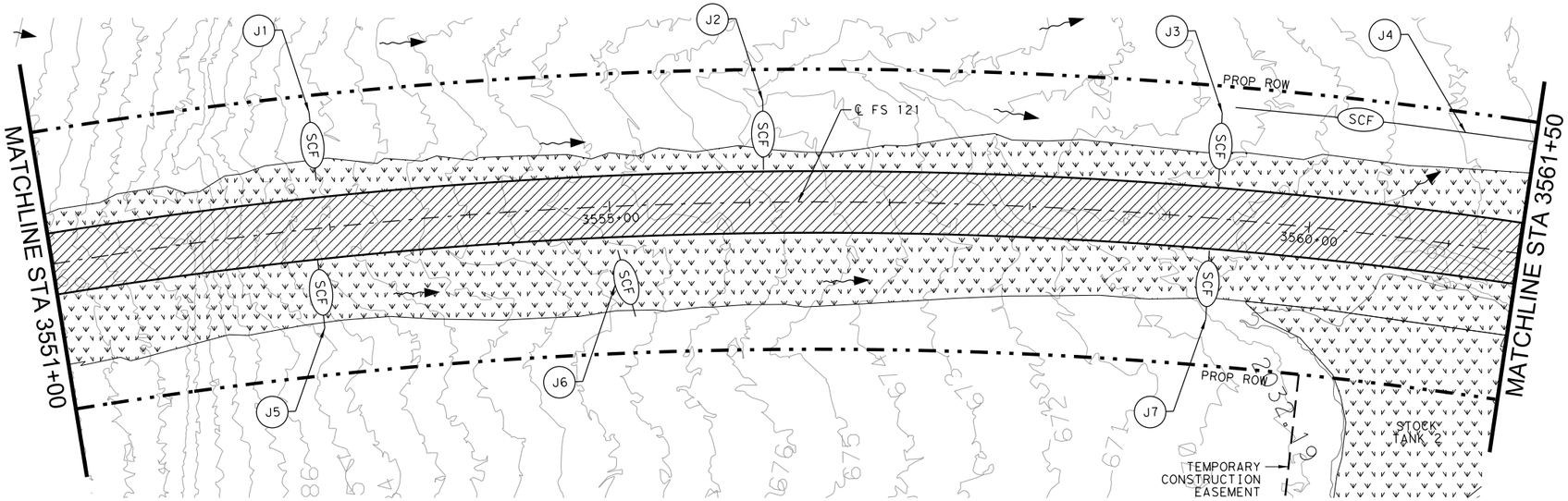
(J1) BMP-PH2
SCF-30 LF
INSTALL _____
REMOVE _____

(J2) BMP-PH2
SCF-22 LF
INSTALL _____
REMOVE _____

(J3) BMP-PH2
SCF-30 LF
INSTALL _____
REMOVE _____

(J4) BMP-PH2
SCF-214 LF
INSTALL _____
REMOVE _____

(J5) BMP-PH2
SCF-30 LF
INSTALL _____
REMOVE _____



(J6) BMP-PH2
SCF-30 LF
INSTALL _____
REMOVE _____

(J7) BMP-PH2
SCF-30 LF
INSTALL _____
REMOVE _____

(J8) BMP-PH2
RFD2-22 LF
INSTALL _____
REMOVE _____

(J9) BMP-PH2
RFD2-22 LF
INSTALL _____
REMOVE _____

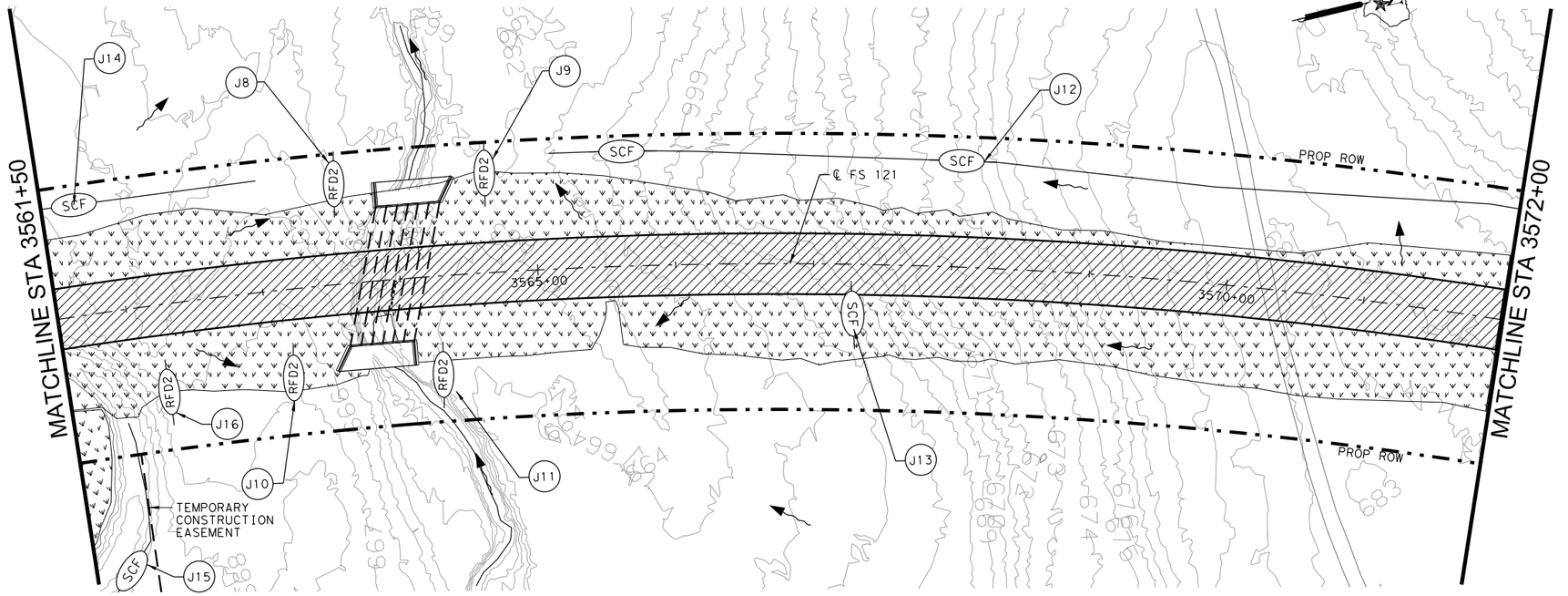
(J10) BMP-PH2
RFD2-22 LF
INSTALL _____
REMOVE _____

(J11) BMP-PH2
RFD2-22 LF
INSTALL _____
REMOVE _____

(J12) BMP-PH2
SCF-735 LF
INSTALL _____
REMOVE _____

(J13) BMP-PH2
SCF-30 LF
INSTALL _____
REMOVE _____

(J14) BMP-PH2
SCF-157 LF
INSTALL _____
REMOVE _____



(J15) BMP-PH2
SCF-132 LF
INSTALL _____
REMOVE _____

(J16) BMP-PH2
RFD2-22 LF
INSTALL _____
REMOVE _____

HORIZONTAL
50 0 50 100

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTED PREVIOUS PHASE
- TEMPORARY CONSTRUCTED PREVIOUS PHASE
- DISTURBED AND PERM. SEEDING AREA
- CONSTRUCTION EXIT
- RFD1 — ROCK FILTER DAMS (TYPE 1)
- RFD2 — ROCK FILTER DAMS (TYPE 2)
- SCF — SEDMT CONT FENCE
- RFD1 — ROCK FILTER DAMS (TYPE 1) INSTALL IN PREVIOUSS PHASE
- RFD2 — ROCK FILTER DAMS (TYPE 2) INSTALL IN PREVIOUS PHASE
- SCF — SEDMT CONT FENCE INSTALL IN PREVIOUS PHASE
- XX — DISTURBED AREA NAME
- FLOW ARROW

STATE OF TEXAS
JENN-HWAN MA
83964
LICENSED PROFESSIONAL ENGINEER
7/15/2021

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FS 121

SW3P
PHASE 2
STA 3551+00 - STA 3572+00

SHEET 10 OF 14

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	244

(K) DISTURBED DATE _____
STABILIZED DATE _____

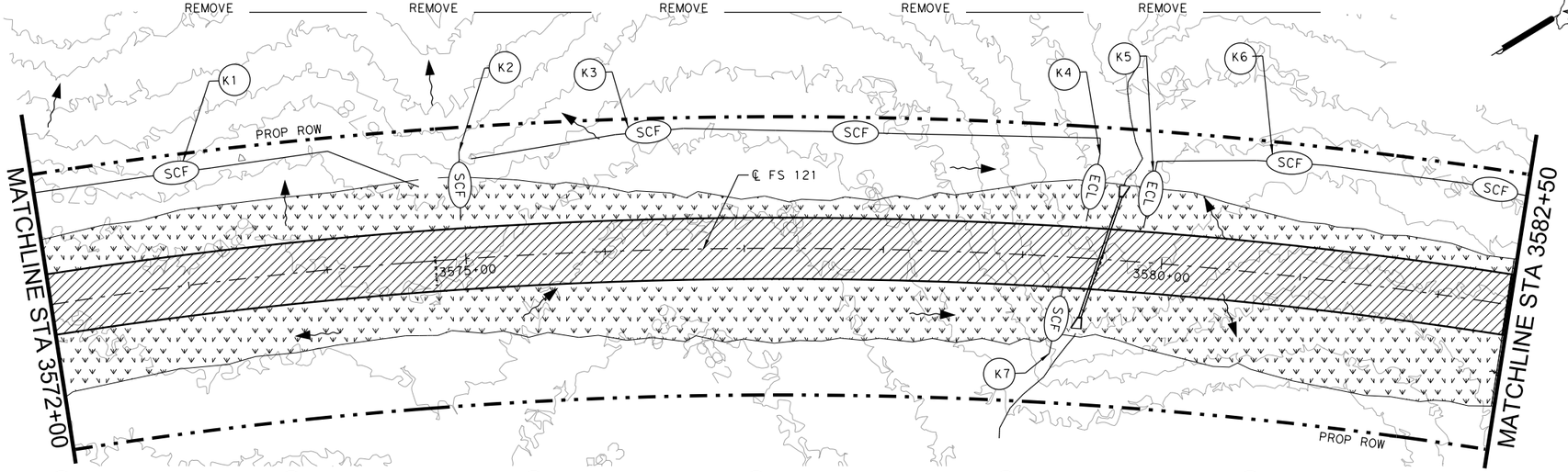
(K1) BMP-PH2 SCF-282 LF INSTALL _____ REMOVE _____

(K2) BMP-PH2 SCF-14 LF INSTALL _____ REMOVE _____

(K3) BMP-PH2 SCF-465 LF INSTALL _____ REMOVE _____

(K4) BMP-PH2 SCF-10 LF INSTALL _____ REMOVE _____

(K5) BMP-PH2 SCF-10 LF INSTALL _____ REMOVE _____



(K6) BMP-PH2 SCF-267 LF INSTALL _____ REMOVE _____

(K7) BMP-PH2 SCF-32 LF INSTALL _____ REMOVE _____

(K8) BMP-PH2 SCF-285 LF INSTALL _____ REMOVE _____

(K9) BMP-PH2 RFD1-20 LF INSTALL _____ REMOVE _____

(K10) BMP-PH2 RFD1-20 LF INSTALL _____ REMOVE _____

(K11) BMP-PH2 RFD1-26 LF INSTALL _____ REMOVE _____

(K12) BMP-PH2 RFD1-26 LF INSTALL _____ REMOVE _____

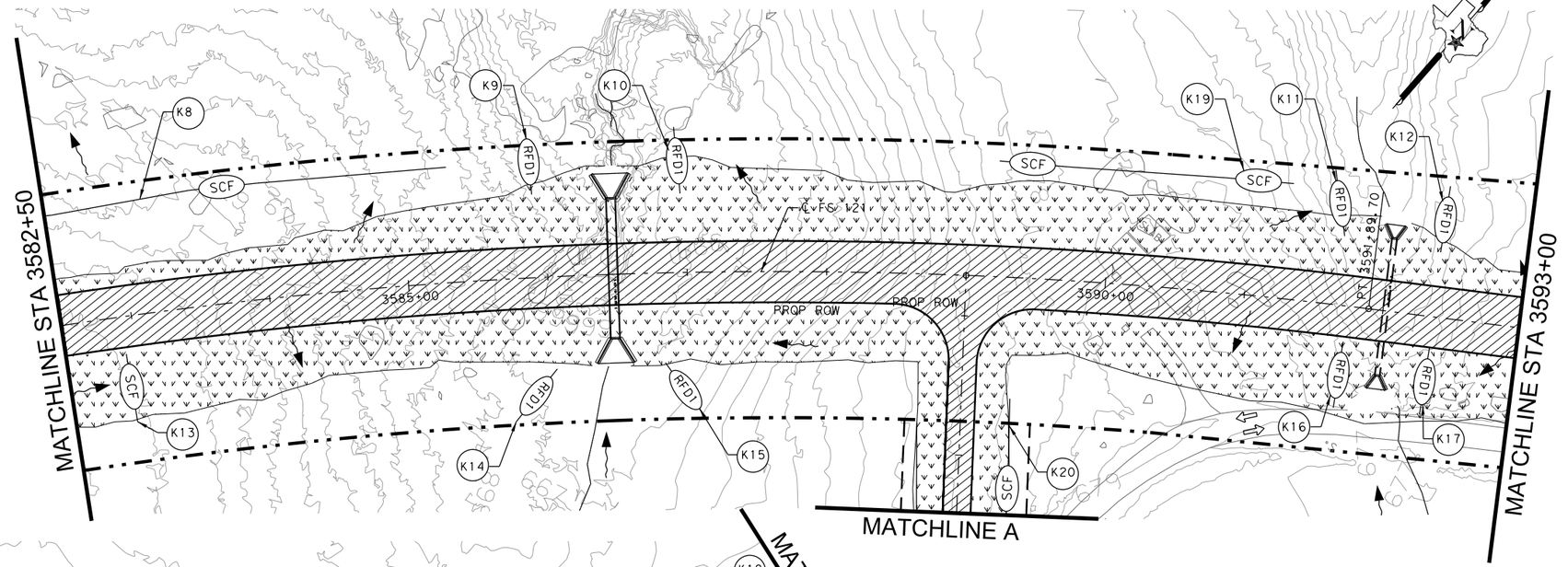
(K13) BMP-PH2 SCF-12 LF INSTALL _____ REMOVE _____

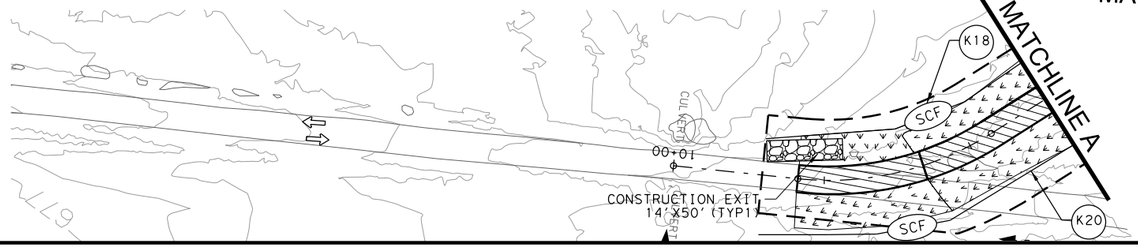
(K14) BMP-PH2 RFD1-28 LF INSTALL _____ REMOVE _____

(K15) BMP-PH2 RFD1-28 LF INSTALL _____ REMOVE _____

(K16) BMP-PH2 RFD1-28 LF INSTALL _____ REMOVE _____

(K17) BMP-PH2 RFD1-28 LF INSTALL _____ REMOVE _____





(K18) BMP-PH2 SCF-181 LF INSTALL _____ REMOVE _____

(K19) BMP-PH2 SCF-212 LF INSTALL _____ REMOVE _____

(K20) BMP-PH2 SCF-84 LF INSTALL _____ REMOVE _____

HORIZONTAL
50 0 50 100

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTED PREVIOUS PHASE
- TEMPORARY CONSTRUCTED PREVIOUS PHASE
- DISTURBED AND PERM. SEEDING AREA
- CONSTRUCTION EXIT
- (RFD1) ROCK FILTER DAMS (TYPE 1)
- (RFD2) ROCK FILTER DAMS (TYPE 2)
- (SCF) SEDMT CONT FENCE
- (RFD1) ROCK FILTER DAMS (TYPE 1) INSTALL IN PREVIOUSS PHASE
- (RFD2) ROCK FILTER DAMS (TYPE 2) INSTALL IN PREVIOUS PHASE
- (SCF) SEDMT CONT FENCE INSTALL IN PREVIOUS PHASE
- (XX) DISTURBED AREA NAME
- FLOW ARROW

DATE	BY	REV	REVISION

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FS 121

SW3P
PHASE 2
STA 3572+00 - STA 3593+00

SHEET 11 OF 14

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	245

(L) DISTURBED DATE _____
STABILIZED DATE _____

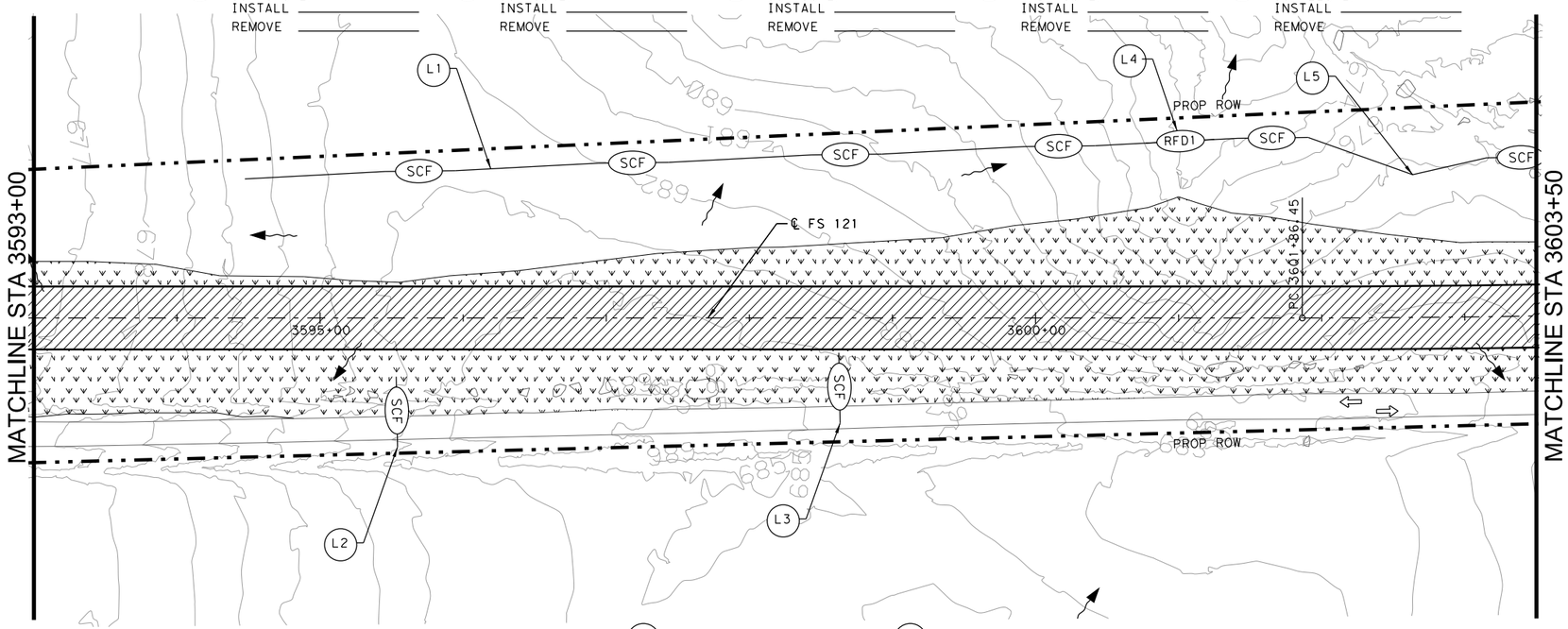
(L1) BMP-PH2
SCF-649 LF
INSTALL _____
REMOVE _____

(L2) BMP-PH2
SCF-36 LF
INSTALL _____
REMOVE _____

(L3) BMP-PH2
SCF-36 LF
INSTALL _____
REMOVE _____

(L4) BMP-PH2
RFD1-36 LF
INSTALL _____
REMOVE _____

(L5) BMP-PH2
SCF-223 LF
INSTALL _____
REMOVE _____



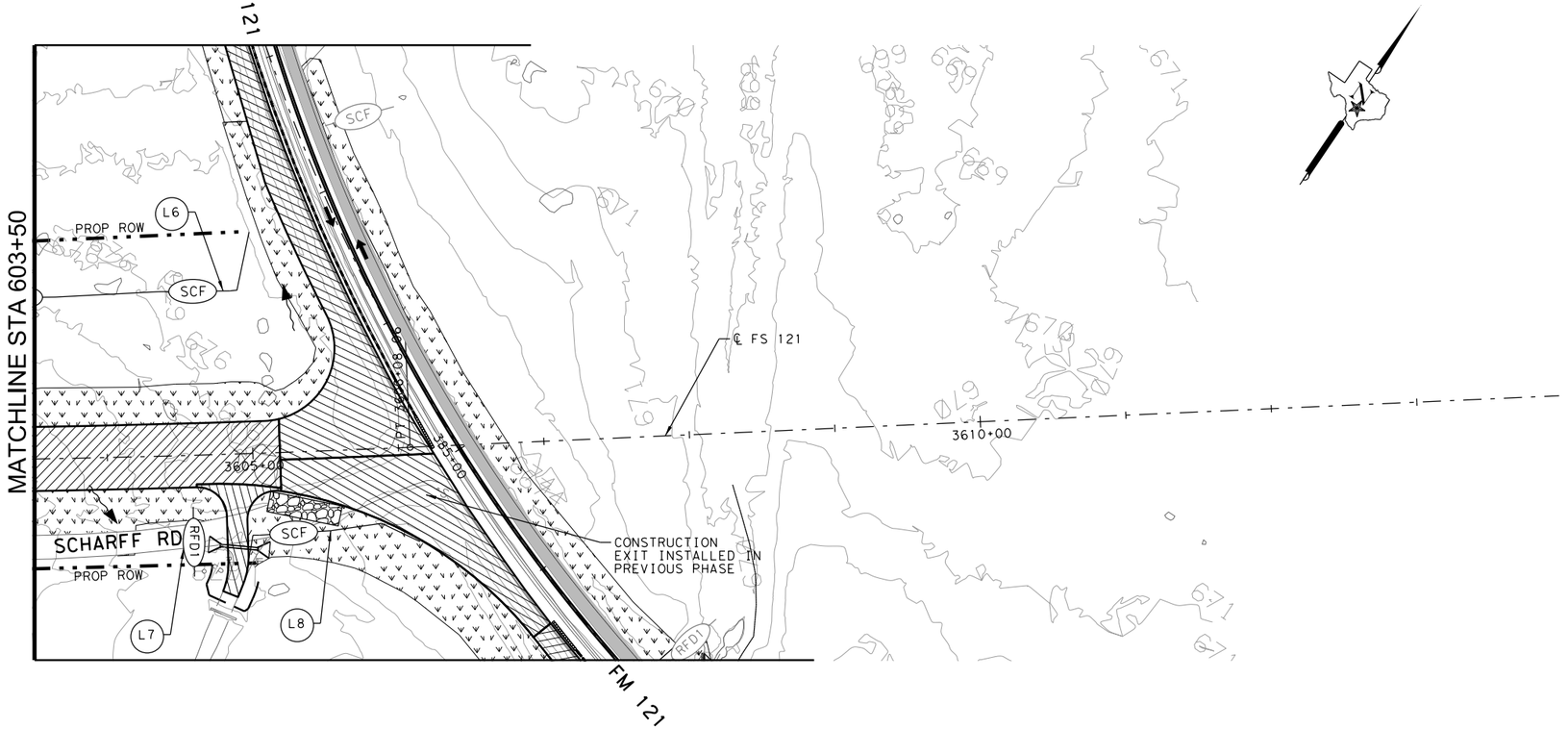
HORIZONTAL
50 0 50 100

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTED PREVIOUS PHASE
- TEMPORARY CONSTRUCTED PREVIOUS PHASE
- DISTURBED AND PERM. SEEDING AREA
- CONSTRUCTION EXIT
- (RFD1) ROCK FILTER DAMS (TYPE 1)
- (RFD2) ROCK FILTER DAMS (TYPE 2)
- (SCF) SEDMT CONT FENCE
- (RFD1) ROCK FILTER DAMS (TYPE 1) INSTALL IN PREVIOUSS PHASE
- (RFD2) ROCK FILTER DAMS (TYPE 2) INSTALL IN PREVIOUS PHASE
- (SCF) SEDMT CONT FENCE INSTALL IN PREVIOUS PHASE
- (XX) DISTURBED AREA NAME
- FLOW ARROW

(L7) BMP-PH2
RFD1-49 LF
INSTALL _____
REMOVE _____

(L8) BMP-PH2
SCF-134 LF
INSTALL _____
REMOVE _____



STATE OF TEXAS
JENN-HWAN MA
83964
LICENSED PROFESSIONAL ENGINEER
7/15/2021

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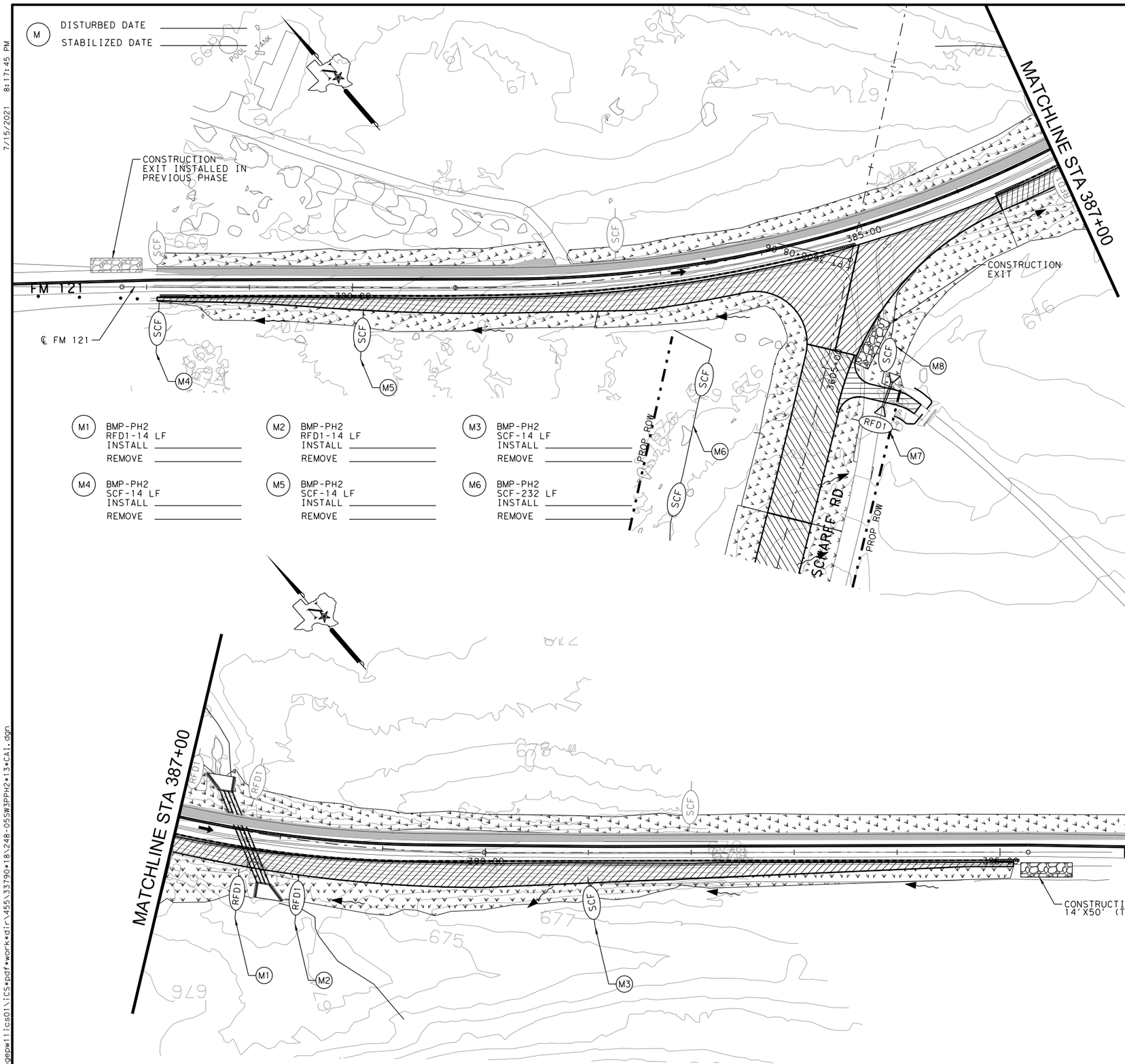
FS 121

SW3P
PHASE 2
STA 3593+00 TO END

SCALE: 1" = 100' SHEET 12 OF 14

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	246

M DISTURBED DATE
STABILIZED DATE



M1 BMP-PH2
RFD1-14 LF
INSTALL
REMOVE

M2 BMP-PH2
RFD1-14 LF
INSTALL
REMOVE

M3 BMP-PH2
SCF-14 LF
INSTALL
REMOVE

M4 BMP-PH2
SCF-14 LF
INSTALL
REMOVE

M5 BMP-PH2
SCF-14 LF
INSTALL
REMOVE

M6 BMP-PH2
SCF-232 LF
INSTALL
REMOVE

HORIZONTAL
50 0 50 100

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTED PREVIOUS PHASE
- TEMPORARY CONSTRUCTED PREVIOUS PHASE
- DISTURBED AND PERM. SEEDING AREA
- CONSTRUCTION EXIT
- RFD1 — ROCK FILTER DAMS (TYPE 1)
- RFD2 — ROCK FILTER DAMS (TYPE 2)
- SCF — SEDMT CONT FENCE
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- RFD2 — ROCK FILTER DAMS (TYPE 2) INSTALL IN PREVIOUS PHASE
- SCF — SEDMT CONT FENCE INSTALL IN PREVIOUS PHASE
- XX — DISTURBED AREA NAME
- FLOW ARROW

STATE OF TEXAS
JENN-HWAN MA
83964
LICENSED PROFESSIONAL ENGINEER
7/15/2021

DATE	BY	REV	REVISION

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FS 121

SW3P
PHASE 2
FM 121

SHEET 13 OF 14

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	247

(N) DISTURBED DATE _____
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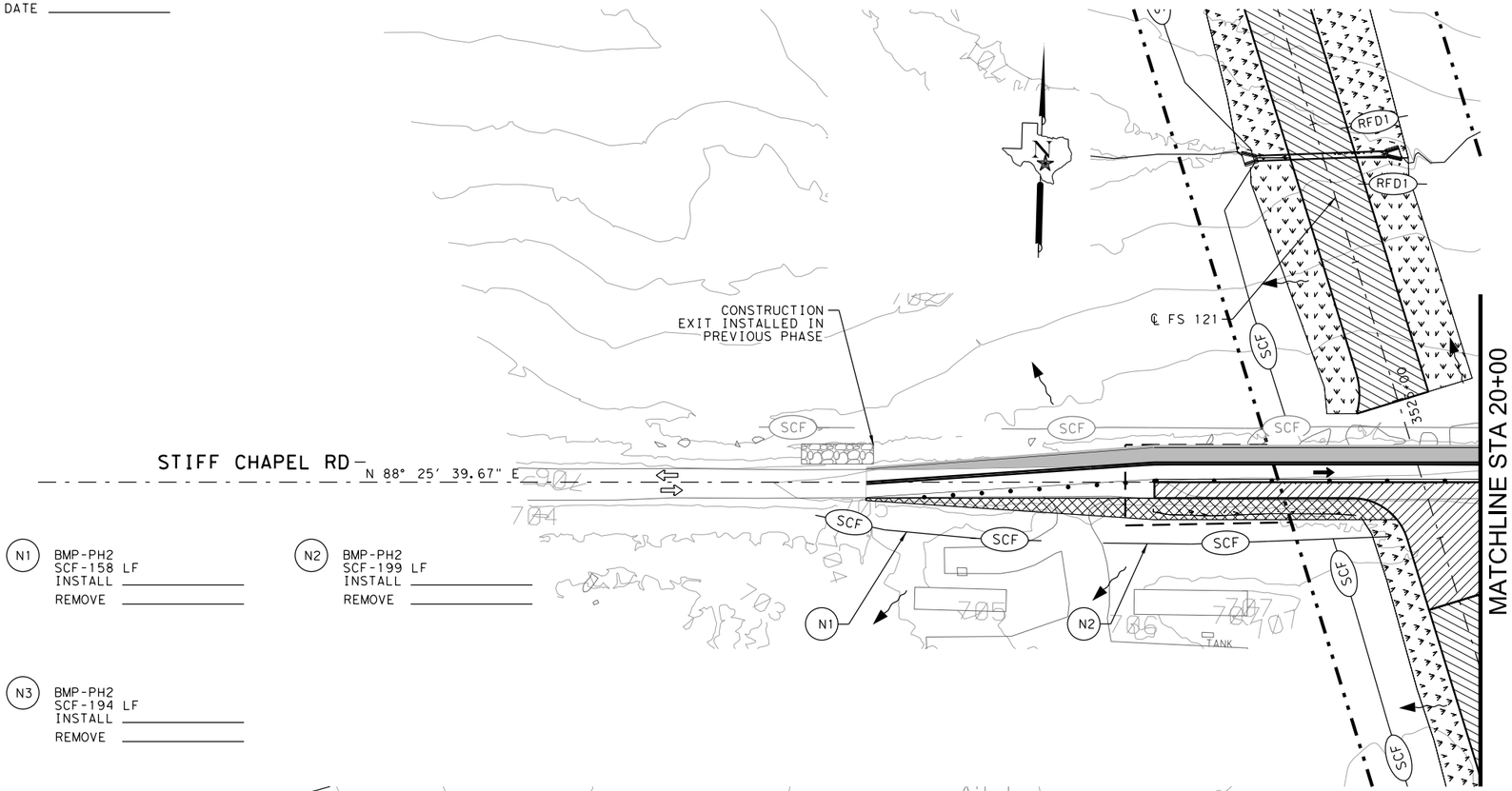
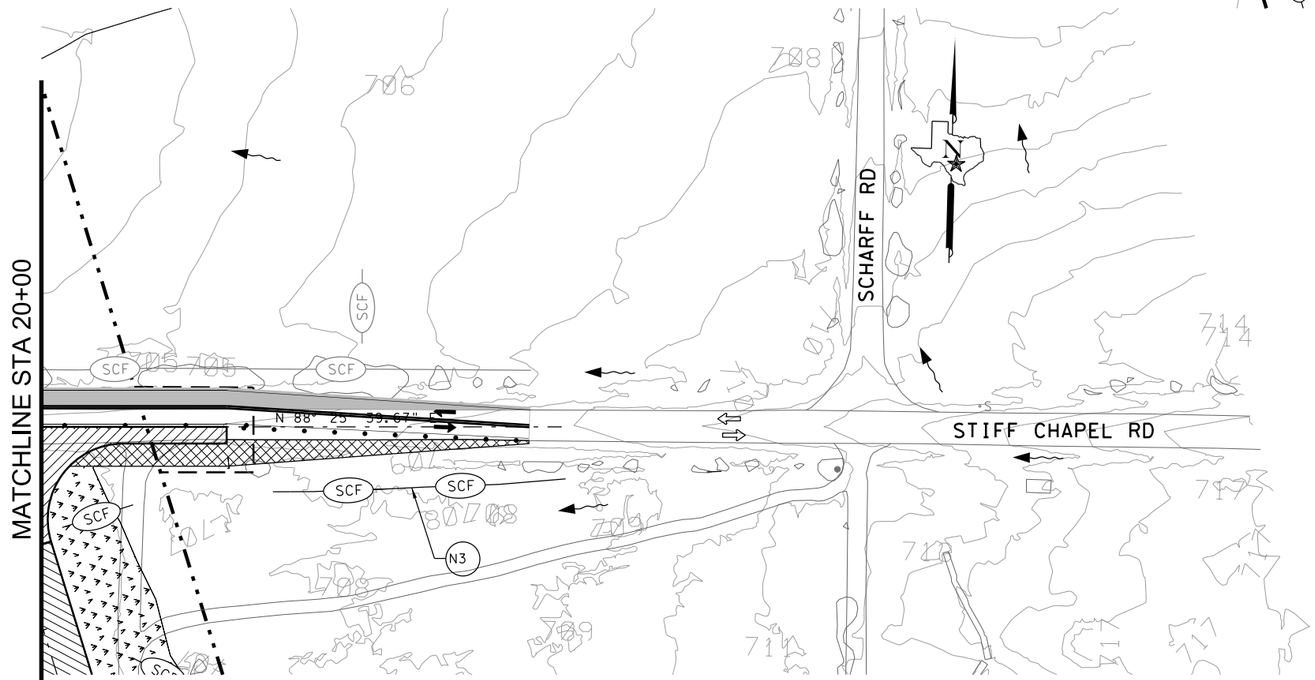


(N1) BMP-PH2
SCF-158 LF
INSTALL _____
REMOVE _____

(N2) BMP-PH2
SCF-199 LF
INSTALL _____
REMOVE _____

(N3) BMP-PH2
SCF-194 LF
INSTALL _____
REMOVE _____



HORIZONTAL
50 0 50 100

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTED PREVIOUS PHASE
- TEMPORARY CONSTRUCTED PREVIOUS PHASE
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- SCF — SEDMT CONT FENCE INSTALL IN PREVIOUS PHASE
- XX — DISTURBED AREA NAME
- FLOW ARROW

STATE OF TEXAS
JENN-HWAN MA
83964
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7/15/2021

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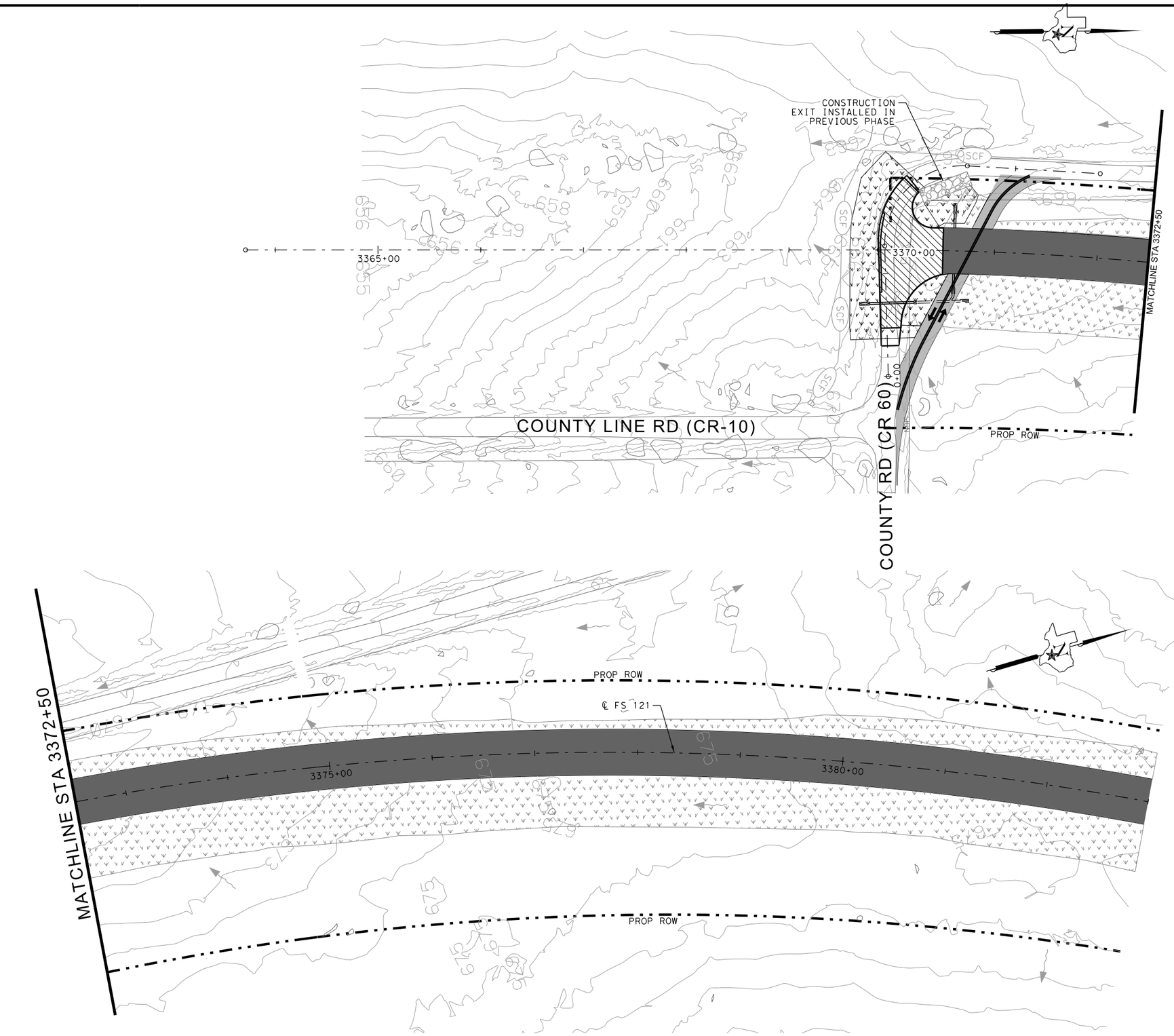
FS 121

SW3P
PHASE 2
STIFF CHAPEL RD

SHEET 14 OF 14

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	248



HORIZONTAL

50 0 50 100

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTED PREVIOUS PHASE
- TEMPORARY CONSTRUCTED PREVIOUS PHASE
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- SCF — SEDMT CONT FENCE INSTALL IN PREVIOUS PHASE
- XX — DISTURBED AREA NAME
- FLOW ARROW

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JENN-HWAN MA
83964
LICENSED PROFESSIONAL ENGINEER
7/15/2021

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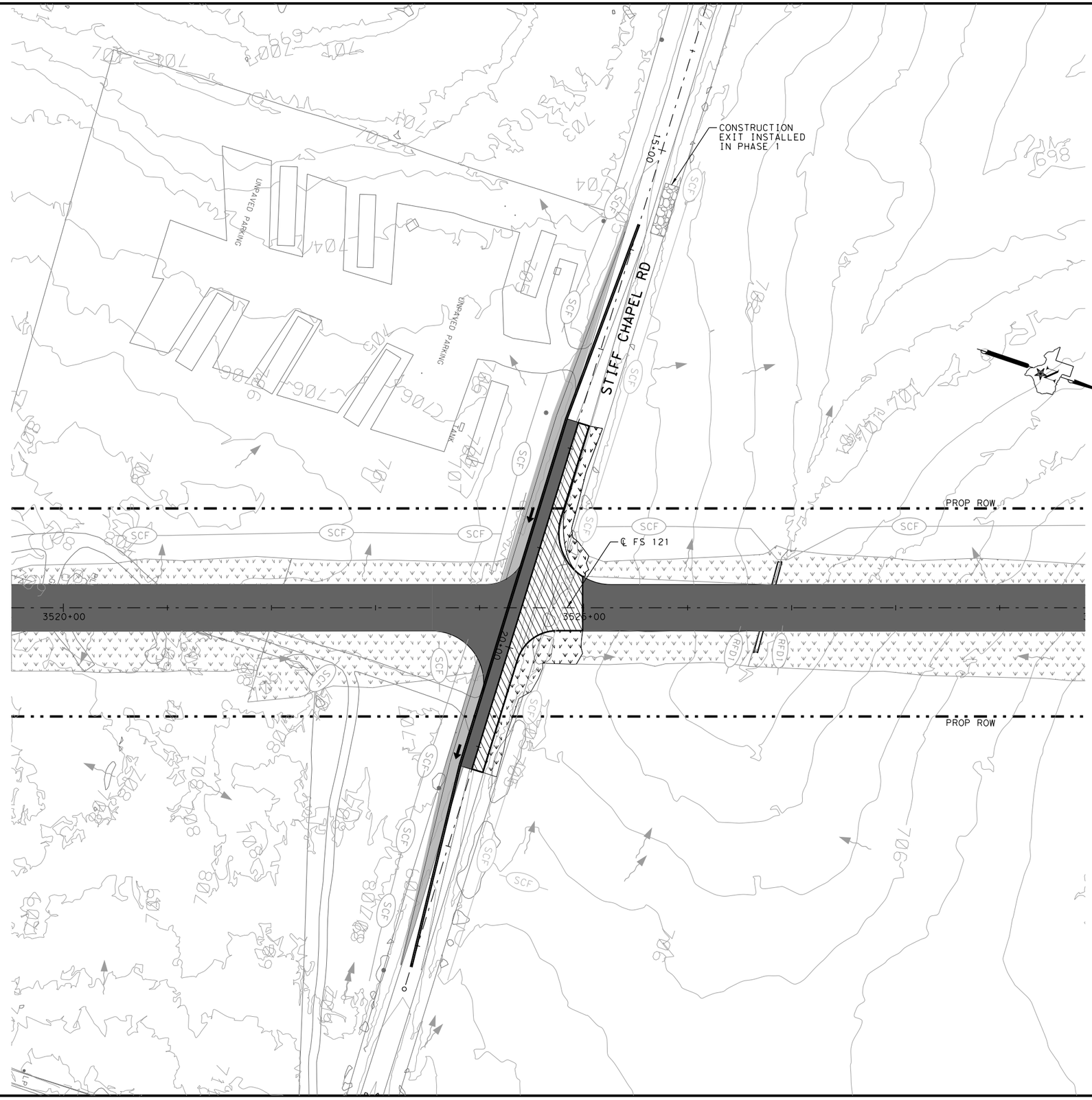
Texas Department of Transportation

FS 121

SW3P
PHASE 3
COUNTY LINE RD 60

SCALE: 1" = 100' SHEET 1 OF 2

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	249



HORIZONTAL

50 0 50 100

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTED PREVIOUS PHASE
- TEMPORARY CONSTRUCTED PREVIOUS PHASE
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- XX — DISTURBED AREA NAME
- FLOW ARROW

STATE OF TEXAS
JENN-HWAN MA
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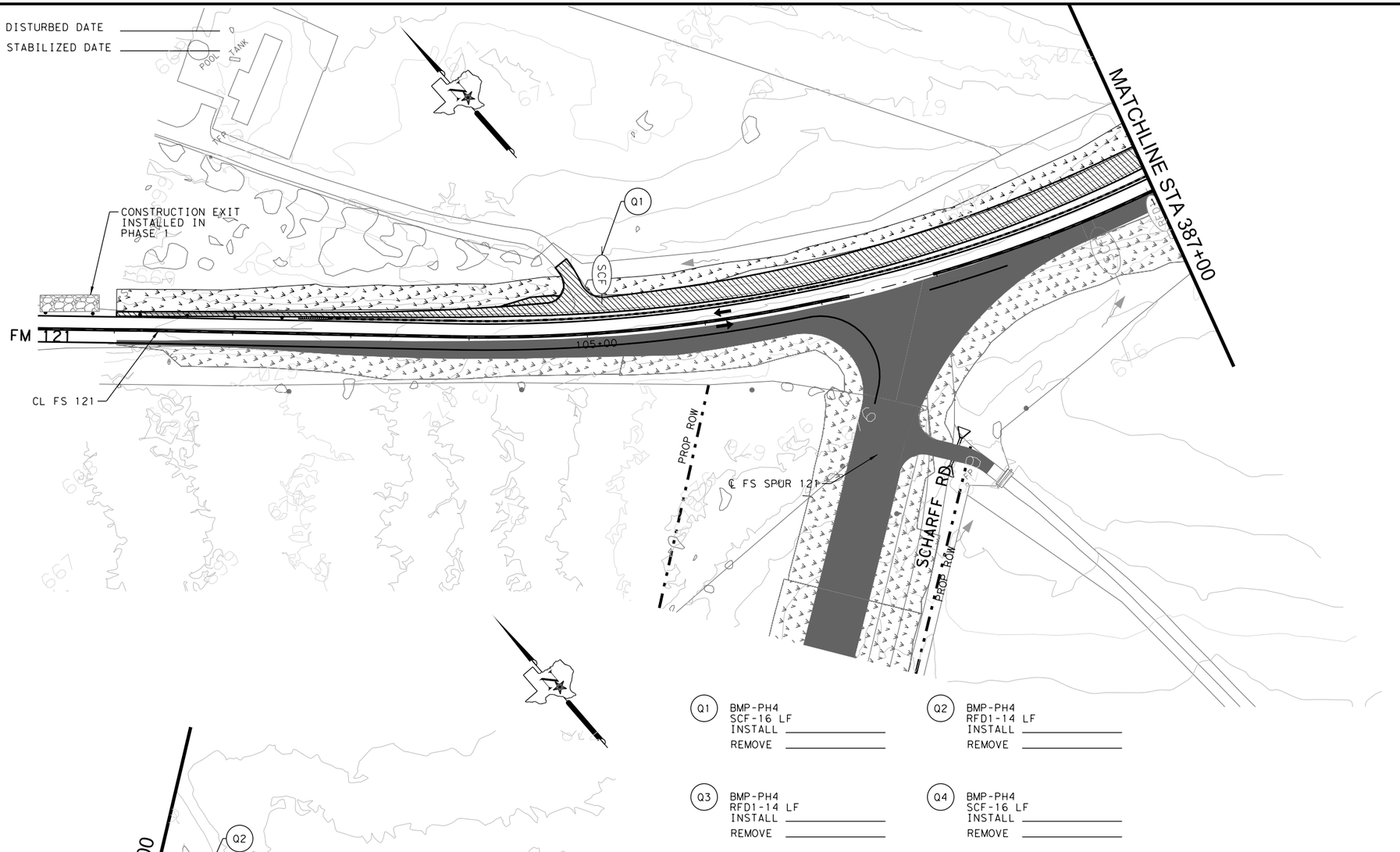
FS 121

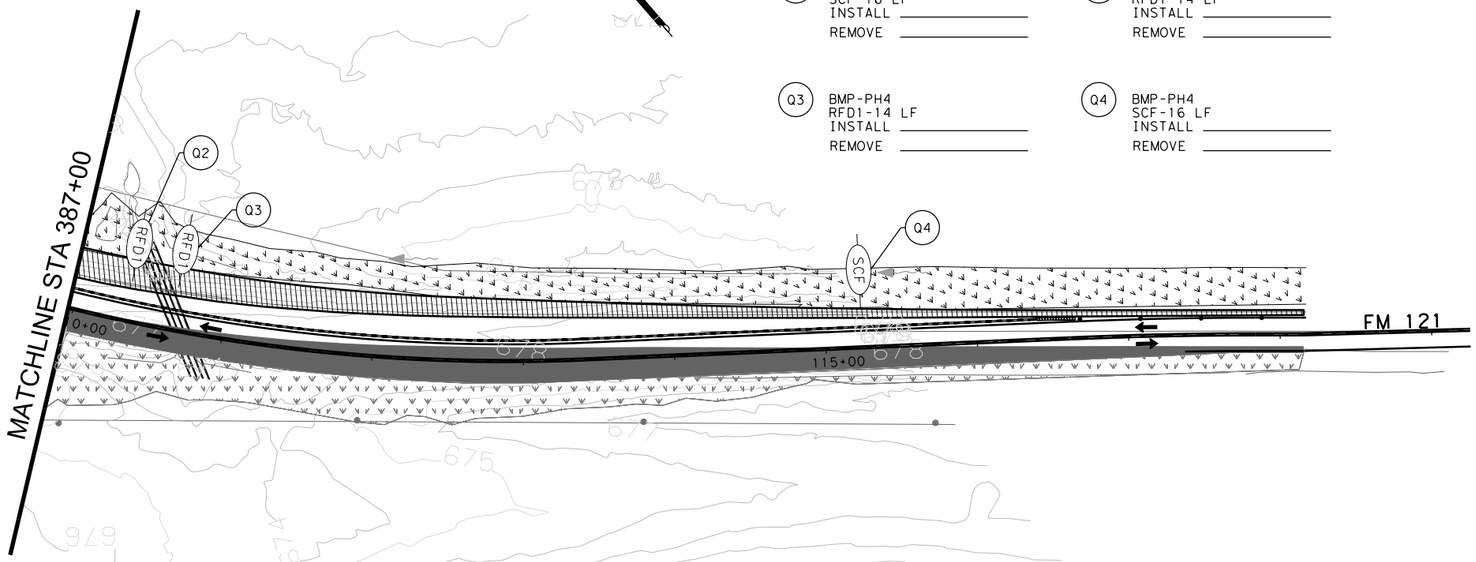
SW3P
PHASE 3
STIFF CHAPEL RD

SCALE: 1" = 100' SHEET 2 OF 2

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	250

Q DISTURBED DATE
STABILIZED DATE





Q1 BMP-PH4
SCF-16 LF
INSTALL _____
REMOVE _____

Q2 BMP-PH4
RFD1-14 LF
INSTALL _____
REMOVE _____

Q3 BMP-PH4
RFD1-14 LF
INSTALL _____
REMOVE _____

Q4 BMP-PH4
SCF-16 LF
INSTALL _____
REMOVE _____

HORIZONTAL
50 0 50 100

LEGEND

- PERMANENT CONSTRUCTION THIS PHASE
- TEMPORARY CONSTRUCTION THIS PHASE
- PERMANENT CONSTRUCTED PREVIOUS PHASE
- TEMPORARY CONSTRUCTED PREVIOUS PHASE
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- XX — DISTURBED AREA NAME
- FLOW ARROW

STATE OF TEXAS
JENN-HWAN MA
83964
LICENSED
PROFESSIONAL ENGINEER
7/15/2021

DATE	BY	REV	REVISION

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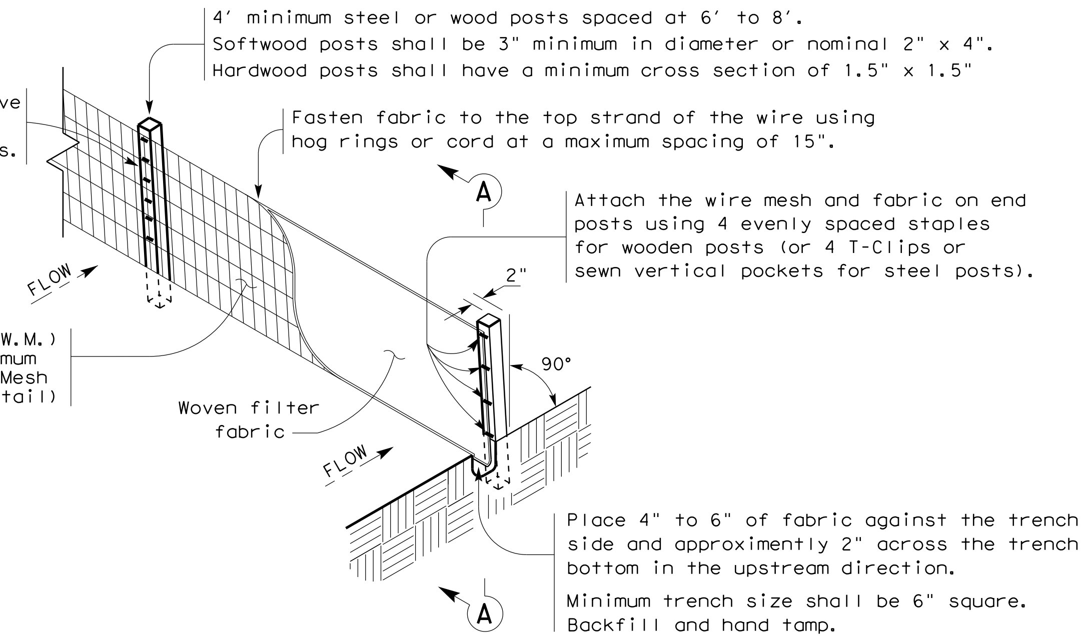
FS 121

SW3P
PHASE 4
FM 121

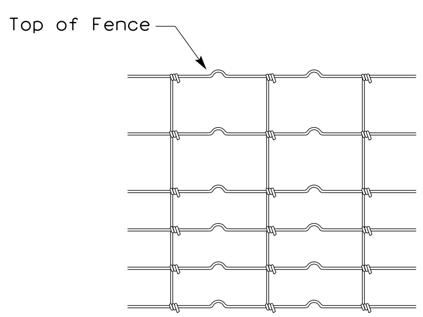
SHEET 1 OF 1

STATE					HIGHWAY NO.
TEXAS					FS 121
STATE DISTRICT	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
PAR	GRAYSON	0091	10	002	251



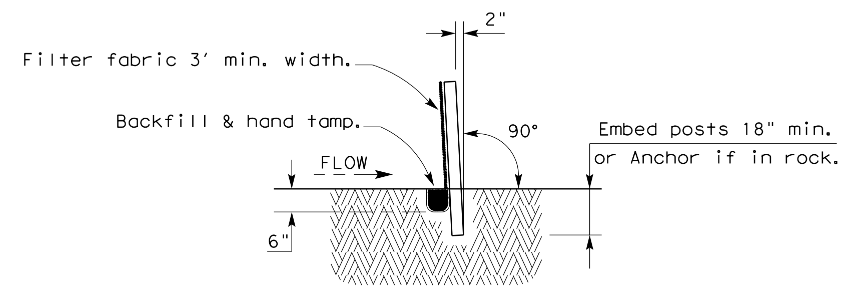
TEMPORARY SEDIMENT CONTROL FENCE

SCF



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.



SECTION A-A

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.

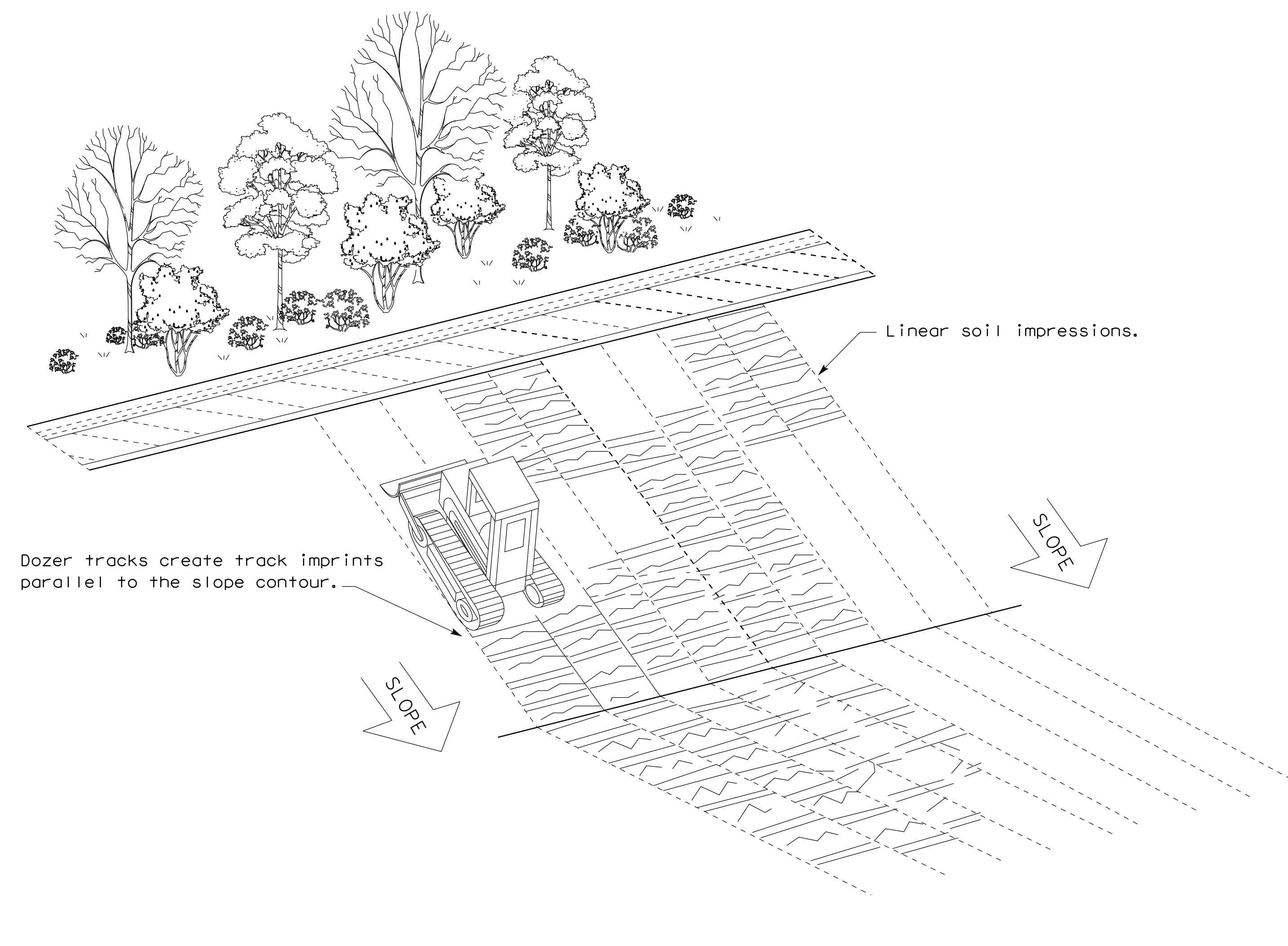
LEGEND

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	0091	10	002	FS 121
	DIST		COUNTY	SHEET NO.
	PAR		GRAYSON	252

DATE: 7/15/2021 8:17:03 PM
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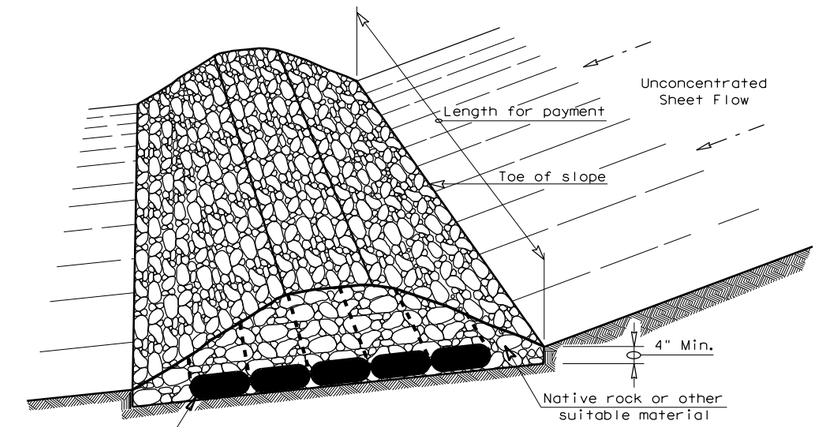
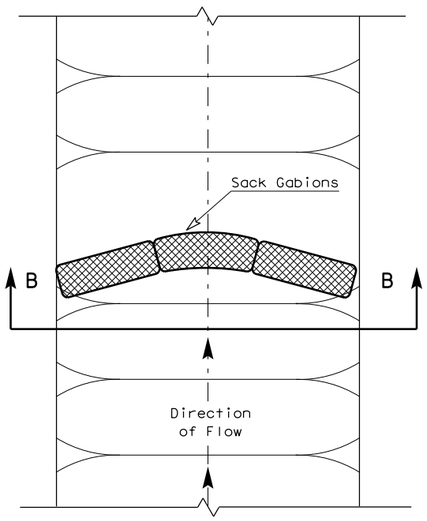
ec216.dgn

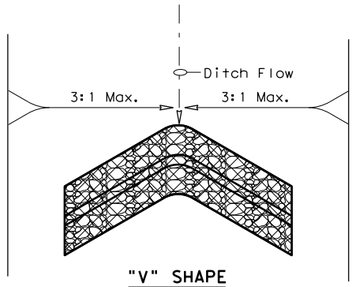


FILTER DAM AT TOE OF SLOPE

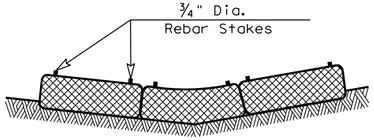
RFD1



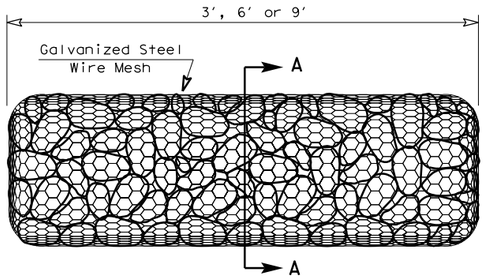
PLAN VIEW



"V" SHAPE PLAN VIEW

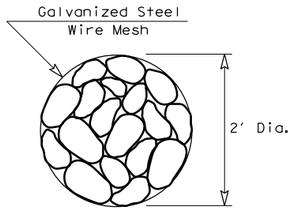


SECTION B-B

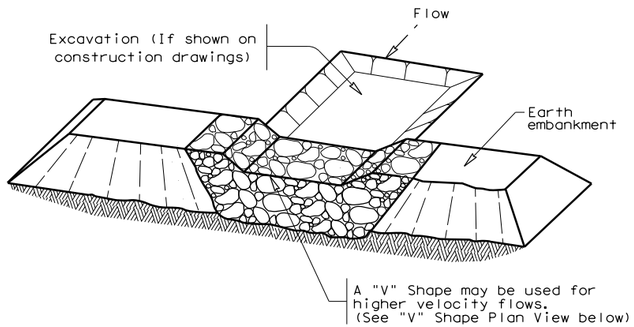


TYPE 4 (SACK GABIONS)

RFD4

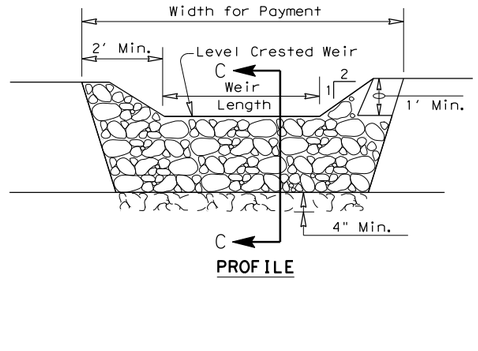


SECTION A-A

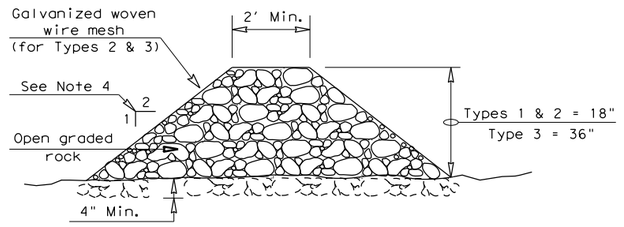


FILTER DAM AT SEDIMENT TRAP

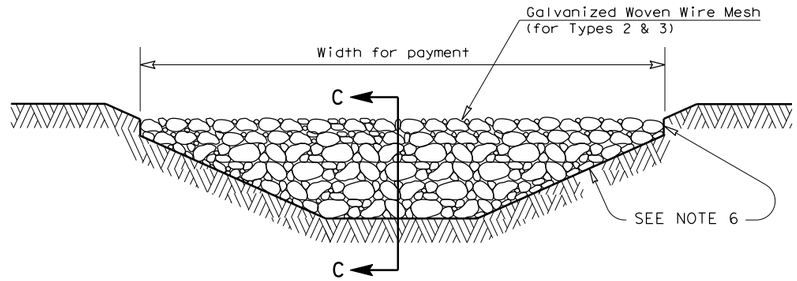
RFD1 — OR — RFD2



PROFILE



SECTION C-C



FILTER DAM AT CHANNEL SECTIONS

RFD1 — OR — RFD2 — OR — RFD3

ROCK FILTER DAM USAGE GUIDELINES

Rock Filter Dams should be constructed downstream from disturbed areas to intercept sediment from overland runoff and/or concentrated flow. The dams should be sized to filter a maximum flow through rate of 60 GPM/FT^2 of cross sectional area. A 2 year storm frequency may be used to calculate the flow rate.

Type 1 (18" high with no wire mesh) (3" to 6" aggregate): Type 1 may be used at the toe of slopes, around inlets, in small ditches, and at dike or swale outlets. This type of dam is recommended to control erosion from a drainage area of 5 acres or less. Type 1 may not be used in concentrated high velocity flows (approximently 8 Ft/Sec or more) in which aggregate wash out may occur. Sandbags may be used at the embedded foundation (4" deep min.) for better filtering efficiency of low flows if called for on the plans or directed by the Engineer.

Type 2 (18" high with wire mesh) (3" to 6" aggregate): Type 2 may be used in ditches and at dike or swale outlets.

Type 3 (36" high with wire mesh) (4" to 8" aggregate): Type 3 may be used in stream flow and should be secured to the stream bed.

Type 4 (Sack gabions) (3" to 6" aggregate): Type 4 May be used in ditches and smaller channels to form an erosion control dam.

Type 5: Provide rock filter dams as shown on plans.

GENERAL NOTES

1. If shown on the plans or directed by the Engineer, filter dams should be placed near the toe of slopes where erosion is anticipated, upstream and/or downstream at drainage structures, and in roadway ditches and channels to collect sediment.
2. Materials (aggregate, wire mesh, sandbags, etc.) shall be as indicated by the specification for "Rock Filter Dams for Erosion and Sedimentation Control".
3. The rock filter dam dimensions shall be as indicated on the SW3P plans.
4. Side slopes should be 2:1 or flatter. Dams within the safety zone shall have sideslopes of 6:1 or flatter.
5. Maintain a minimum of 1' between top of rock filter dam weir and top of embankment for filter dams at sediment traps.
6. Filter dams should be embedded a minimum of 4" into existing ground.
7. The sediment trap for ponding of sediment laden runoff shall be of the dimensions shown on the plans.
8. Rock filter dam types 2 & 3 shall be secured with 20 gauge galvanized woven wire mesh with 1" diameter hexagonal openings. The aggregate shall be placed on the mesh to the height & slopes specified. The mesh shall be folded at the upstream side over the aggregate and tightly secured to itself on the downstream side using wire ties or hog rings. For in stream use, the mesh should be secured or staked to the stream bed prior to aggregate placement.
9. Sack Gabions should be staked down with ¾" dia. rebar stakes, and have a double-twisted hexagonal weave with a nominal mesh opening of 2 ½" x 3 ¼"
10. Flow outlet should be onto a stabilized area (vegetation, rock, etc.).
11. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

PLAN SHEET LEGEND

Type 1 Rock Filter Dam	RFD1
Type 2 Rock Filter Dam	RFD2
Type 3 Rock Filter Dam	RFD3
Type 4 Rock Filter Dam	RFD4

Texas Department of Transportation — Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

ROCK FILTER DAMS

EC(2)-16

FILE: ec216	DN: TxDOT	CK: KM	DW: VP		DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY
REVISIONS	0091	10	002		FS 121
	DIST	COUNTY			SHEET NO.
	PAR	GRAYSON			253

DATE: 7/15/2021 8:19:03 PM
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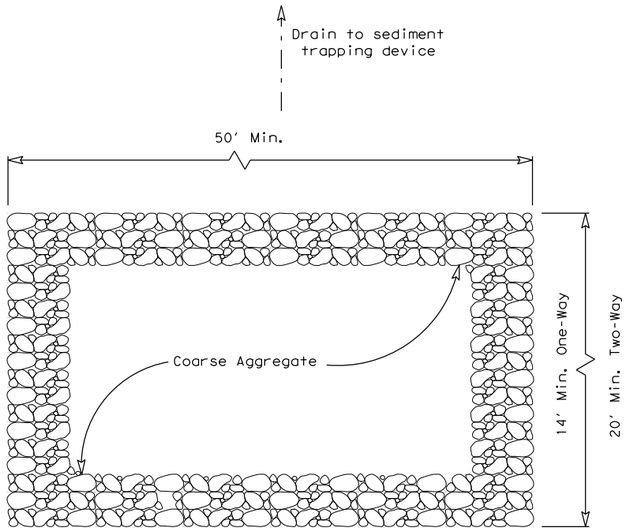
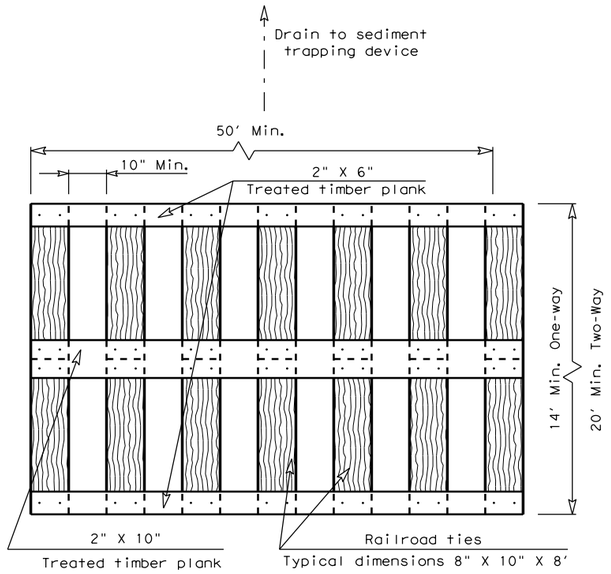
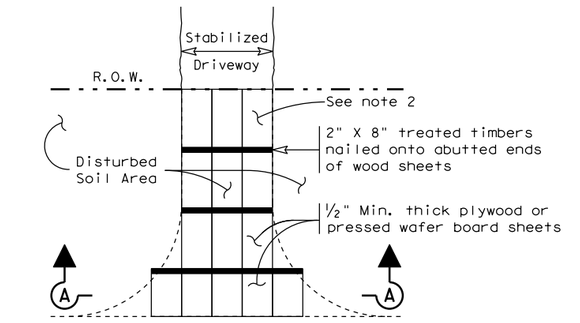
CK: KM



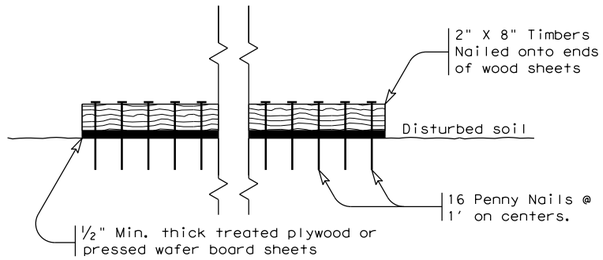
PLAN VIEW



PLAN VIEW



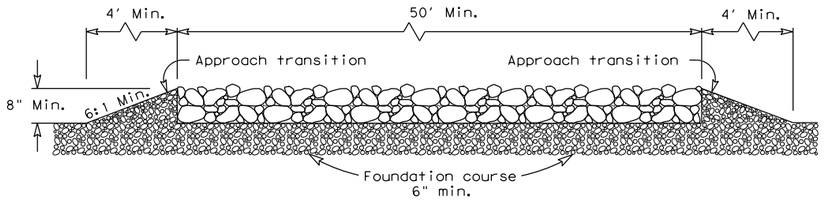
PLAN VIEW



SECTION A-A

CONSTRUCTION EXIT (TYPE 3)

SHORT TERM



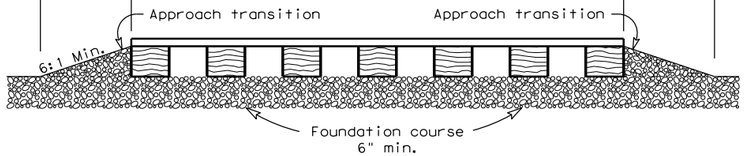
ELEVATION VIEW

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
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	PAR	GRAYSON		254