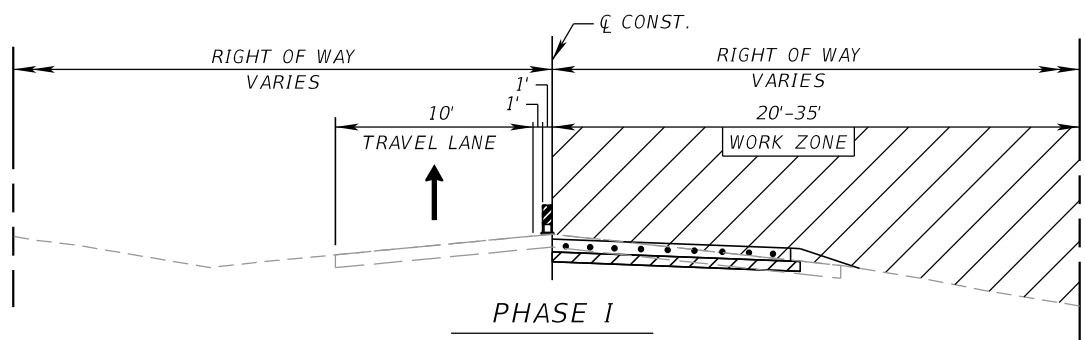
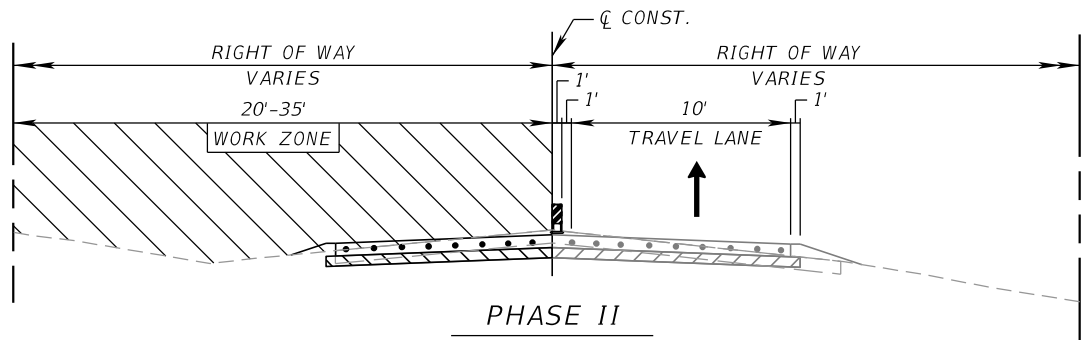


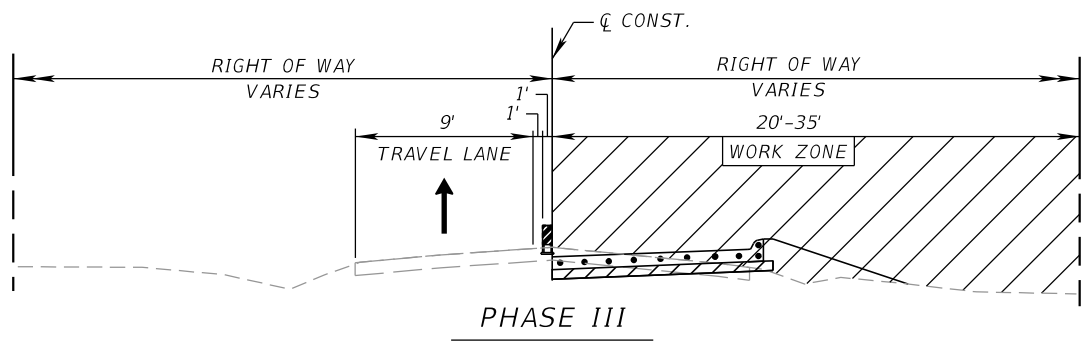
BLONDY JHUNE ROAD



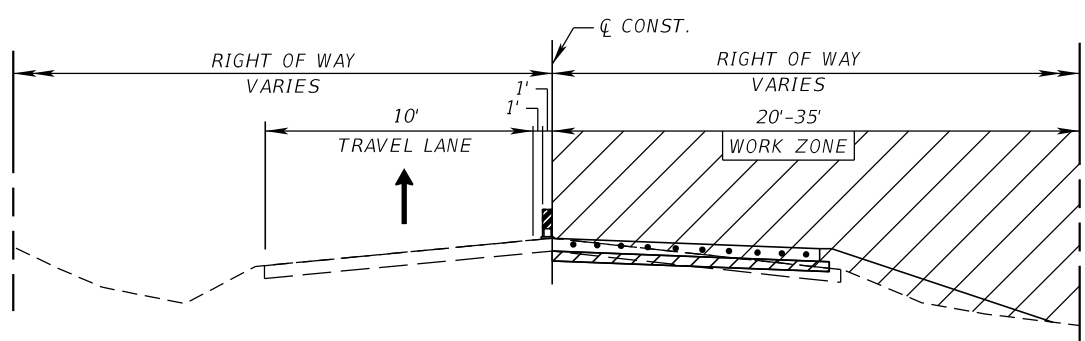
PHASE I  
STA. 108+45.13 TO STA. 143+77.44



PHASE II  
STA. 108+45.13 TO STA. 139+49.08



PHASE III  
STA. 143+77.44 TO STA. 160+00.00



PHASE III  
STA. 160+00.00 TO STA. 166+56.70  
STA. 170+69.76 TO STA. 176+71.08

LEGEND:

- WORK ZONE
- CHANNELIZING DEVICE

PHASE I: RECONSTRUCTION OF EASTBOUND BLONDY JHUNE ROAD (WEST OF MARY LEE LANE)

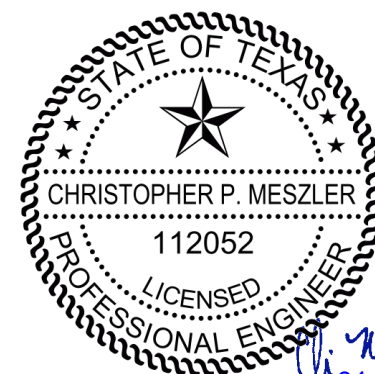
1. TWO WEEKS PRIOR TO CONSTRUCTION INSTALL ONE PCMS IN ADVANCE OF THE WORKZONE (TO THE EAST OF MARY LEE LN) USE MESSAGE GROUP B, MESSAGE 1 AND 2 (SEE TEMPORARY TRAFFIC CONTROL GENERAL NOTES).
2. ADJUST PCMS MESSAGE TO GROUP A (SEE TEMPORARY TRAFFIC CONTROL GENERAL NOTES).
3. SET UP DETOUR 1. MAINTAIN LOCAL VEHICULAR ACCESS TO ALL DRIVEWAYS AT ALL TIMES.
4. SHIFT EASTBOUND TRAFFIC TO THE LEFT LANE USING TXDOT STANDARD TCP(1-3)-12. WESTBOUND DIRECTION CLOSED TO TRAFFIC. ADD TYPE 3 BARRICADE AND ROAD CLOSED SIGN IN WESTBOUND LANE AT THE WORK ZONE. OMIT THE WESTBOUND LANE SHIFT SIGN CW1-4R AND CW-16AT.
5. MAINTAIN WORK ZONE IN ACCORDANCE WITH TXDOT STANDARD TCP (1-5)-12. ADD TYPE 3 BARRICADE AND ROAD CLOSED SIGN IN CLOSED LANE AT THE WORK ZONE.
6. CONSTRUCT EASTERN PORTION OF CULVERT 1, 2 AND 3. CONSTRUCT SUBGRADE, BASE, PAVEMENT, DRIVEWAYS, SIDE SLOPES, SIGNAGE, ETC. IN THE WORK ZONE. PLACE TEMPORARY PAVEMENT MARKINGS IN WORK ZONE FOR EASTBOUND TRAVEL AND NEWLY CONSTRUCTED BLONDY JHUNE TRAIL. DEMOLISH AND GRADE EXISTING BLONDY JHUNE TRAIL AS SHOWN IN PLANS.

PHASE II: RECONSTRUCTION OF WESTBOUND BLONDY JHUNE ROAD (WEST OF MARY LEE LANE)

1. TWO WEEKS PRIOR TO CONSTRUCTION INSTALL ONE PCMS IN ADVANCE OF THE WORK ZONE (TO THE EAST OF MARY LEE LN). USE MESSAGE GROUP B (SEE TEMPORARY TRAFFIC CONTROL GENERAL NOTES).
2. MAINTAIN PCMS MESSAGE GROUP A (SEE TEMPORARY TRAFFIC CONTROL GENERAL NOTES).
3. MAINTAIN DETOUR 1. MAINTAIN LOCAL VEHICULAR ACCESS TO ALL DRIVEWAYS AT ALL TIMES.
4. MAINTAIN WORK ZONE IN ACCORDANCE WITH TXDOT STANDARD TCP (1-5)-12. ADD TYPE 3 BARRICADE AND ROAD CLOSED SIGN IN CLOSED LANE AT THE WORK ZONE.
5. CONSTRUCT WESTERN PORTION/REMAINDER OF CULVERT 1, 2 AND 3. CONSTRUCT SUBGRADE, BASE, PAVEMENT, DRIVEWAYS, SIDE SLOPES, SIGNAGE, ETC. IN THE WORK ZONE. PLACE TEMPORARY PAVEMENT MARKINGS IN WORK ZONE FOR EASTBOUND TRAVEL. DEMOLISH AND GRADE EXISTING BLONDY JHUNE TRAIL.

PHASE III: RECONSTRUCTION OF EASTBOUND BLONDY JHUNE ROAD (EAST OF MARY LEE LANE)

1. TWO WEEKS PRIOR TO CONSTRUCTION INSTALL ONE PCMS IN ADVANCE OF THE PROJECT (TO THE EAST). USE MESSAGE GROUP B (SEE TEMPORARY TRAFFIC CONTROL GENERAL NOTES).
2. ADJUST PCMS MESSAGE TO GROUP A (SEE TEMPORARY TRAFFIC CONTROL GENERAL NOTES).
3. SET UP DETOUR 2. MAINTAIN LOCAL VEHICULAR ACCESS TO ALL DRIVEWAYS AT ALL TIMES.
4. SHIFT EASTBOUND TRAFFIC TO THE LEFT LANE USING TXDOT STANDARD TCP(1-3)-12. WESTBOUND DIRECTION CLOSED TO TRAFFIC. ADD TYPE 3 BARRICADE AND ROAD CLOSED SIGN IN WESTBOUND LANE AT THE WORK ZONE. OMIT THE WESTBOUND LANE SHIFT SIGN CW1-4R AND CW-16AT.
5. CONSTRUCT EASTERN PORTION OF CULVERTS 5, 6, 7 AND 8. CONSTRUCT SUBGRADE, BASE, PAVEMENT, DRIVEWAYS, SIDE SLOPES, SIGNAGE, ETC. IN THE WORK ZONE. PLACE TEMPORARY PAVEMENT MARKINGS IN WORK ZONE FOR EASTBOUND TRAVEL.



CALL BEFORE YOU DIG  
 TEXAS ONE CALL SYSTEM  
 1-800-DIG-1155  
 48 HOURS NOTICE BEFORE YOU DIG, DRILL, OR BLAST - STOP CALL

PLOTTED BY: hrementeria  
 PLOT DATE: 1/11/2019  
 LAST SAVED: 1:37:49 PM  
 LOCATION: C:\Transfer\17-113 Blondy Jhune\1800457\4 - Design\Plan Set\2. TCP\tcpypxs01.DGN

REVISIONS	
DATE	DESCRIPTION



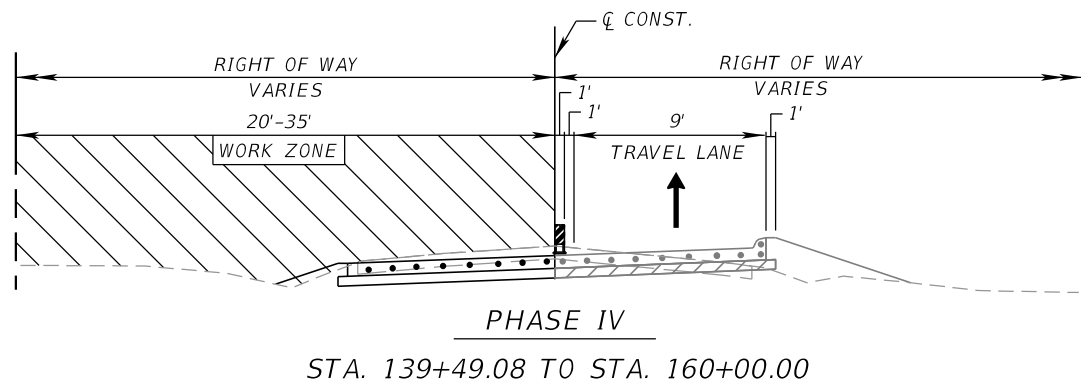
CHRISTOPHER P. MESZLER, P.E.  
 LIC. No. 112052  
 1903 CENTRAL DRIVE, SUITE #405  
 BEDFORD, TX 76021  
 PHONE: 817.618.3640  
 TBPE REG. F-15243

BLONDY JHUNE RD. RECONST.  
 CITY OF LUCAS  
 PUBLIC WORKS DEPARTMENT  
 665 COUNTRY CLUB ROAD  
 LUCAS, TX. 75002

TRAFFIC CONTROL PLANS  
 TYPICAL SECTIONS

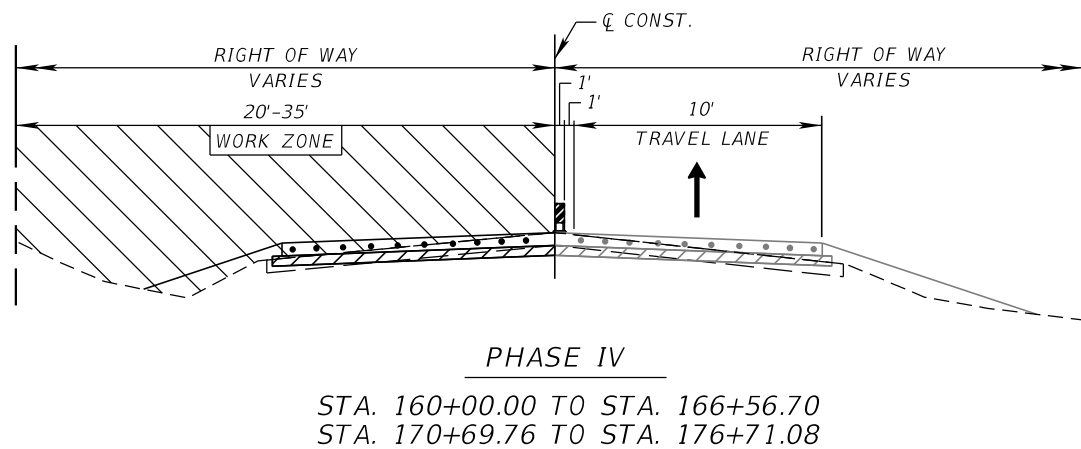
SHEET NO.  
 56

BLONDY JHUNE ROAD



PHASE IV: RECONSTRUCTION OF WESTBOUND BLONDY JHUNE ROAD (EAST OF MARY LEE LANE)

1. MAINTAIN PCMS MESSAGE GROUP A (SEE TEMPORARY TRAFFIC CONTROL GENERAL NOTES).
2. MAINTAIN DETOUR 2. MAINTAIN LOCAL VEHICULAR ACCESS TO ALL DRIVEWAYS AT ALL TIMES.
3. MAINTAIN WORK ZONE IN ACCORDANCE WITH TXDOT STANDARD TCP (1-5)-12. ADD TYPE 3 BARRICADE AND ROAD CLOSED SIGN IN CLOSED LANE AT THE WORK ZONE.
4. CONSTRUCT WESTERN PORTION/REMAINDER OF CULVERTS 5, 6, 7 AND 8. CONSTRUCT SUBGRADE, BASE, PAVEMENT, DRIVEWAYS, SIDE SLOPES, SIGNAGE, ETC. IN THE WORK ZONE. PLACE TEMPORARY PAVEMENT MARKINGS IN WORK ZONE FOR WESTBOUND TRAVEL.

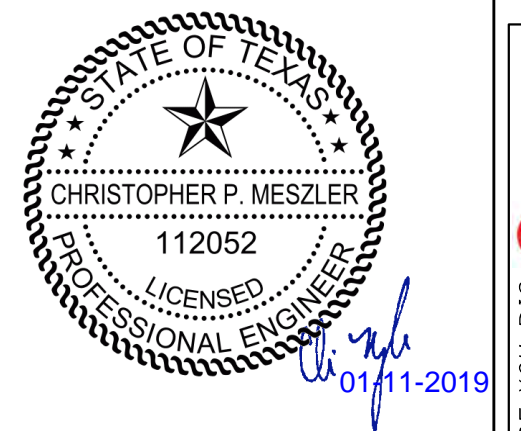


PHASE V: FINAL PAVEMENT MARKINGS (TYPICAL SECTION NOT SHOWN)

1. APPLY MILLED RUMBLE STRIPS WHERE SHOWN IN PLANS.
2. APPLY FINAL PAVEMENT MARKINGS UTILIZING TXDOT STANDARD TCP (3-1)-13 FOR MAINTENANCE OF TRAFFIC.
3. REPLACE 6" CONCRETE PAVEMENT AS DIRECTED BY THE ENGINEER.

LEGEND:

- WORK ZONE
- CHANNELIZING DEVICE



PLOTTED BY: hremptoria  
 PLOT DATE: 1/11/2019  
 LAST SAVED: 1:37:49 PM  
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REVISIONS	
DATE	DESCRIPTION



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 1903 CENTRAL DRIVE, SUITE #405  
 BEDFORD, TX 76021  
 PHONE: 817.618.3640  
 TBPE REG. F-15243

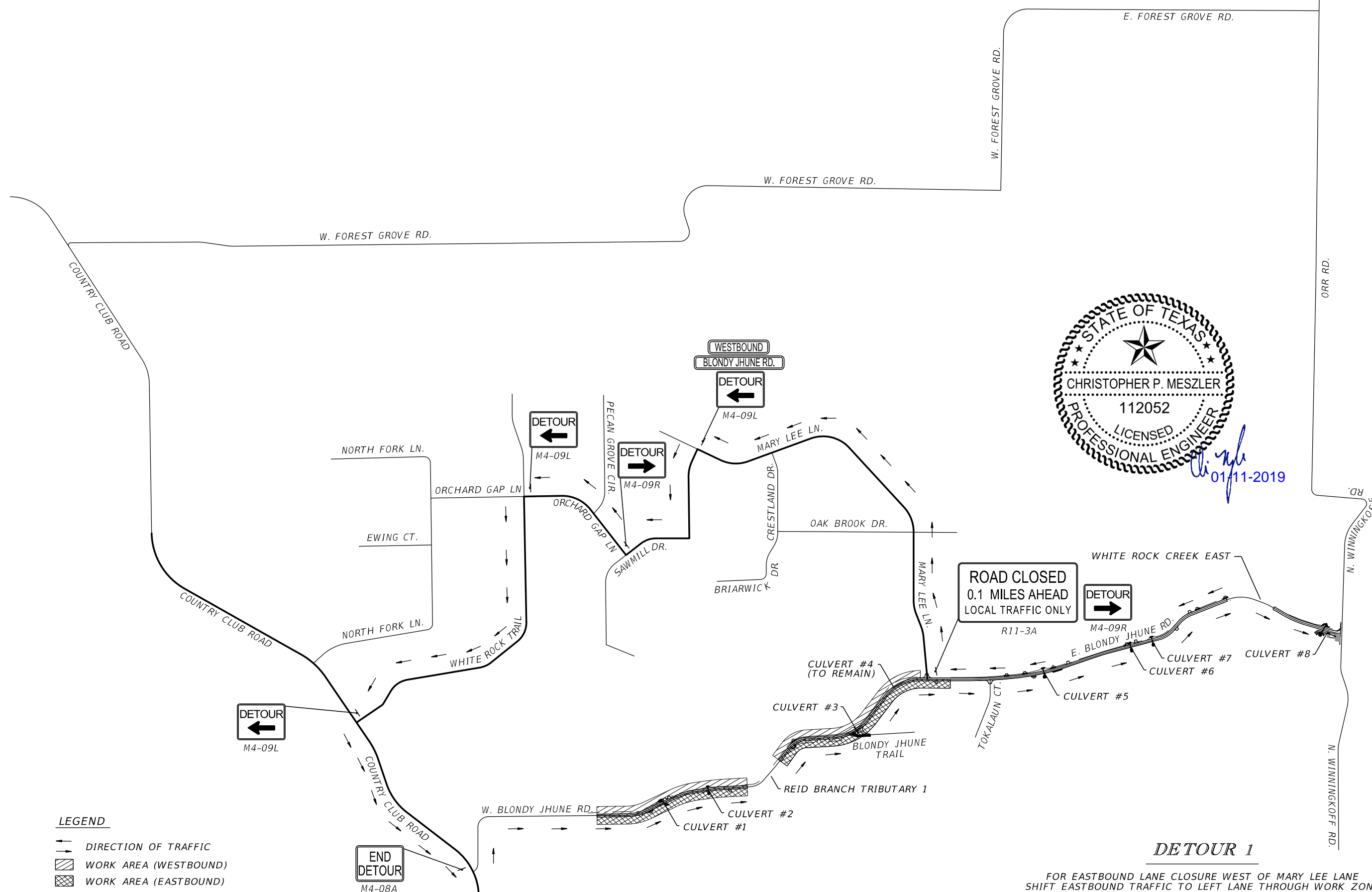
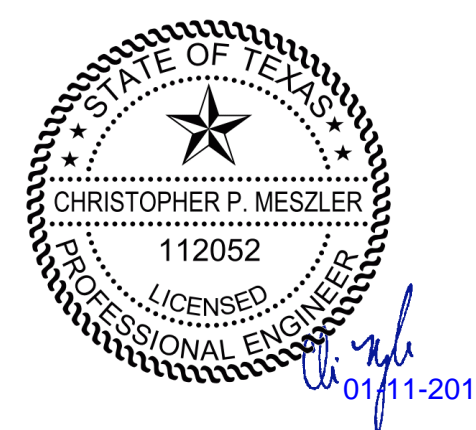


BLONDY JHUNE RD. RECONST.  
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 665 COUNTRY CLUB ROAD  
 LUCAS, TX. 75002

TRAFFIC CONTROL PLANS  
 TYPICAL SECTIONS

SHEET NO.  
 57

CALL BEFORE YOU DIG  
 TEXAS ONE CALL PARTICIPANTS REQUEST  
 48 HOURS NOTICE BEFORE YOU DIG, DRILL,  
 OR BLAST - STOP CALL  
 TEXAS ONE CALL SYSTEM  
 1-800-DIG-1155



**LEGEND**

- DIRECTION OF TRAFFIC
- WORK AREA (WESTBOUND)
- WORK AREA (EASTBOUND)

**ROAD CLOSED**  
0.1 MILES AHEAD  
LOCAL TRAFFIC ONLY

**DETOUR 1**

FOR EASTBOUND LANE CLOSURE WEST OF MARY LEE LANE  
SHIFT EASTBOUND TRAFFIC TO LEFT LANE THROUGH WORK ZONE

PLOTTED BY: hremeteria  
 PLOT DATE: 1/11/2019  
 LAST SAVED: 1:37:50 PM  
 LOCATION: C:\Transfer\17-113 Blondy Jhune\1800457\4 - Design\Plan Set\2. TCP\TCLRD02.DGN

REVISIONS	
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 1903 CENTRAL DRIVE, SUITE #405  
 BEDFORD, TX 76021  
 PHONE: 817.618.3640  
 TBPE REG. F-15243



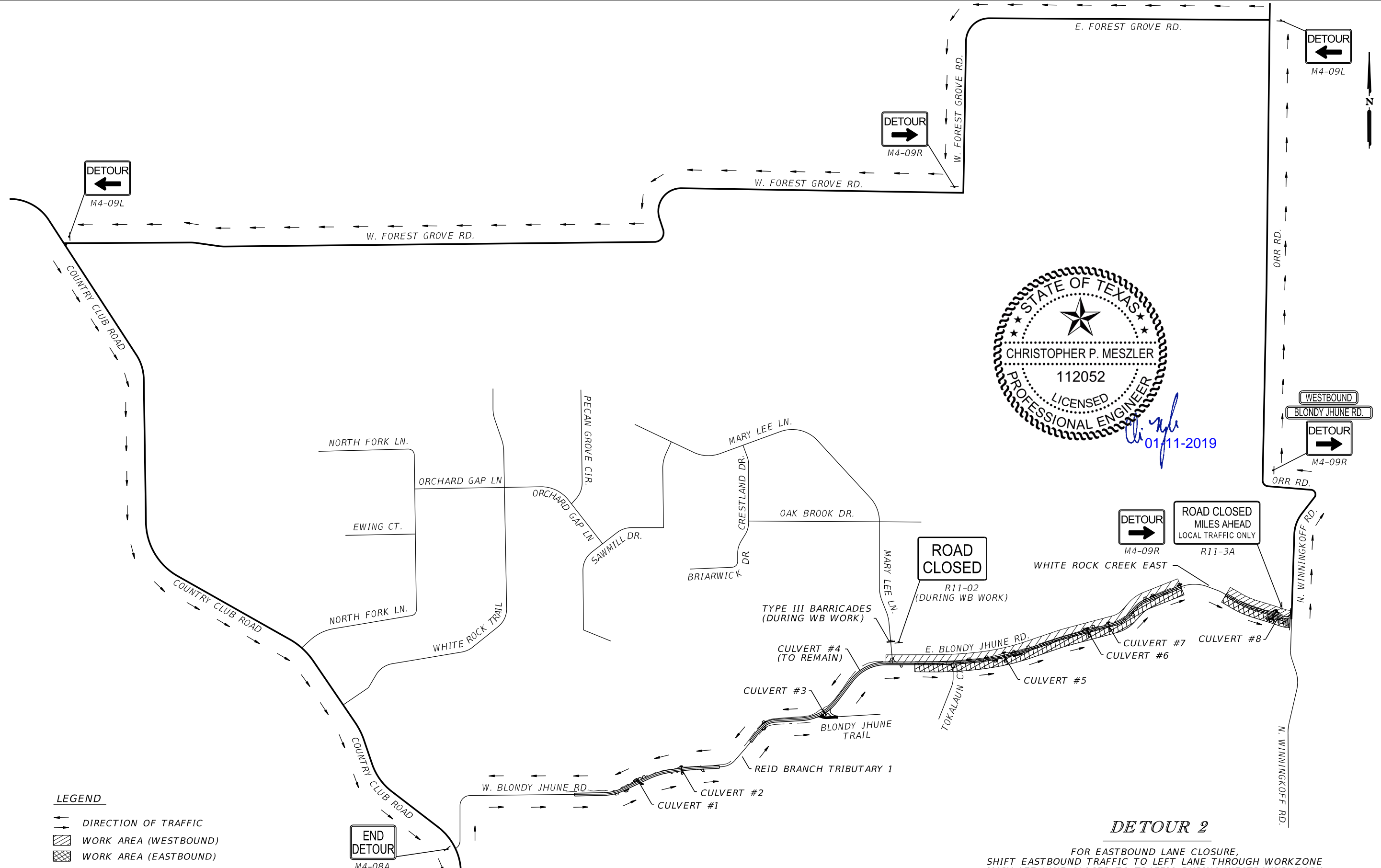
**BLONDY JHUNE RD. RECONST.**  
 CITY OF LUCAS  
 PUBLIC WORKS DEPARTMENT  
 665 COUNTRY CLUB ROAD  
 LUCAS, TX. 75002

**DETOUR LAYOUT**

SHEET NO.  
58

**CALL BEFORE YOU DIG**  
 TEXAS ONE CALL SYSTEM  
 1-800-DIG-1-ESS  
 TEXAS ONE CALL PARTICIPANTS REQUEST  
 48 HOURS NOTICE BEFORE YOU DIG, DRILL,  
 OR BLAST - STOP CALL

PLOTTED BY: hremateria  
 PLOT DATE: 1/11/2019  
 LAST SAVED: 1:37:54 PM  
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- LEGEND**
- DIRECTION OF TRAFFIC
  - WORK AREA (WESTBOUND)
  - WORK AREA (EASTBOUND)
  - TYPE III BARRICADES

**DETOUR 2**

FOR EASTBOUND LANE CLOSURE,  
 SHIFT EASTBOUND TRAFFIC TO LEFT LANE THROUGH WORKZONE  
 MARY LEE LANE CLOSED TO TRAFFIC DURING WESTBOUND WORK

REVISIONS	
DATE	DESCRIPTION



CHRISTOPHER P. MESZLER, P.E.  
 LIC. No. 112052  
 1903 CENTRAL DRIVE, SUITE #405  
 BEDFORD, TX 76021  
 PHONE: 817.618.3640  
 TBPE REG. F-15243



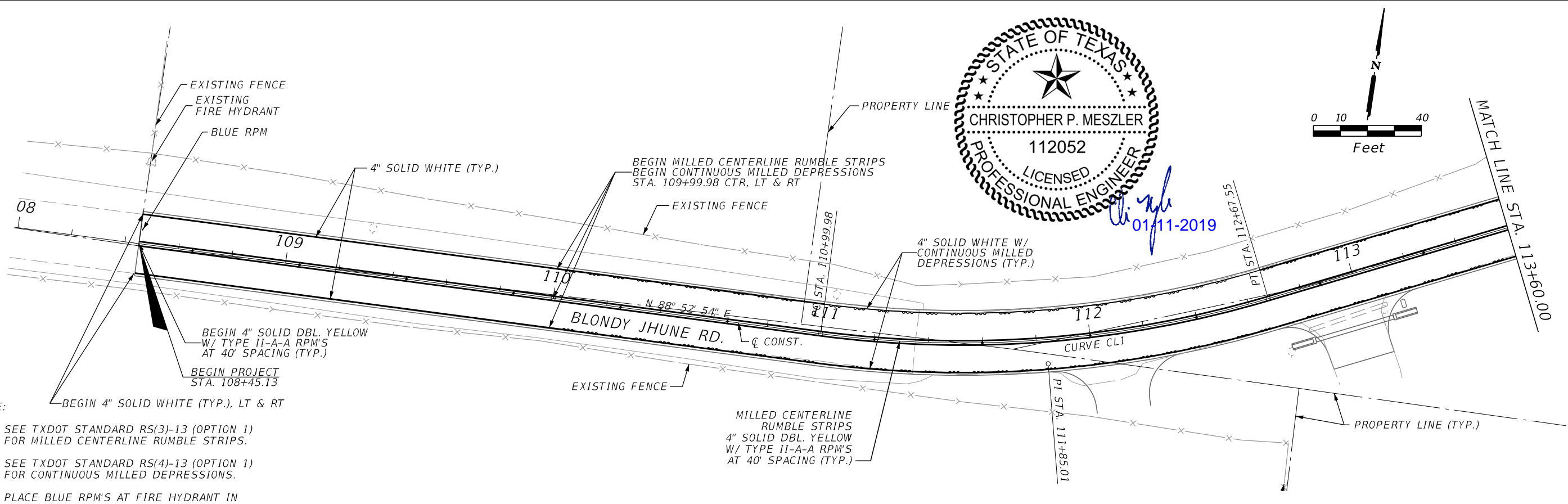
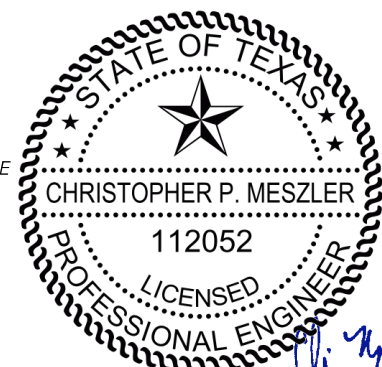
BLONDY JHUNE RD. RECONST.  
 CITY OF LUCAS  
 PUBLIC WORKS DEPARTMENT  
 665 COUNTRY CLUB ROAD  
 LUCAS, TX. 75002

**DETOUR LAYOUT**

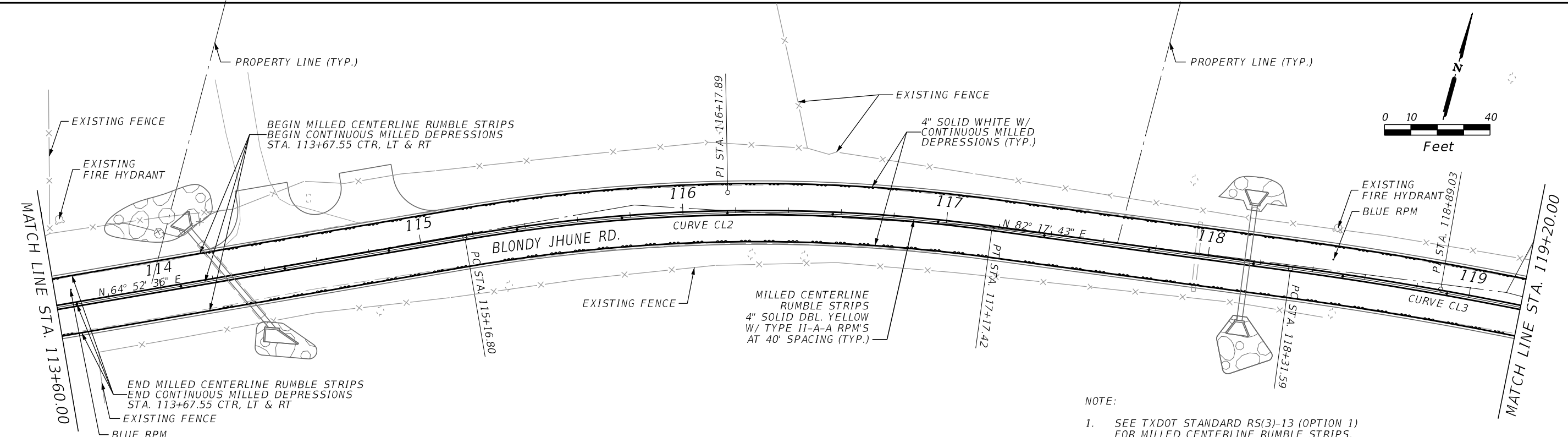
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**CALL BEFORE YOU DIG**  
 TEXAS ONE CALL SYSTEM  
 1-800-DIG-1-ESS  
 48 HOURS NOTICE BEFORE YOU DIG, DRILL,  
 OR BLAST - STOP CALL





- NOTE:
- SEE TXDOT STANDARD RS(3)-13 (OPTION 1) FOR MILLED CENTERLINE RUMBLE STRIPS.
  - SEE TXDOT STANDARD RS(4)-13 (OPTION 1) FOR CONTINUOUS MILLED DEPRESSIONS.
  - PLACE BLUE RPM'S AT FIRE HYDRANT IN THE CENTER OF THE NEAREST LANE.



- NOTE:
- SEE TXDOT STANDARD RS(3)-13 (OPTION 1) FOR MILLED CENTERLINE RUMBLE STRIPS.
  - SEE TXDOT STANDARD RS(4)-13 (OPTION 1) FOR CONTINUOUS MILLED DEPRESSIONS.
  - PLACE BLUE RPM'S AT FIRE HYDRANT IN THE CENTER OF THE NEAREST LANE.

PLOTTED BY: hremeteria  
 PLOT DATE: 1/11/2019  
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DATE	REVISIONS DESCRIPTION



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 1903 CENTRAL DRIVE, SUITE #405  
 BEDFORD, TX 76021  
 PHONE: 817.618.3640  
 TBPE REG. F-15243



BLONDY JHUNE RD. RECONST.  
 CITY OF LUCAS  
 PUBLIC WORKS DEPARTMENT  
 665 COUNTRY CLUB ROAD  
 LUCAS, TX. 75002

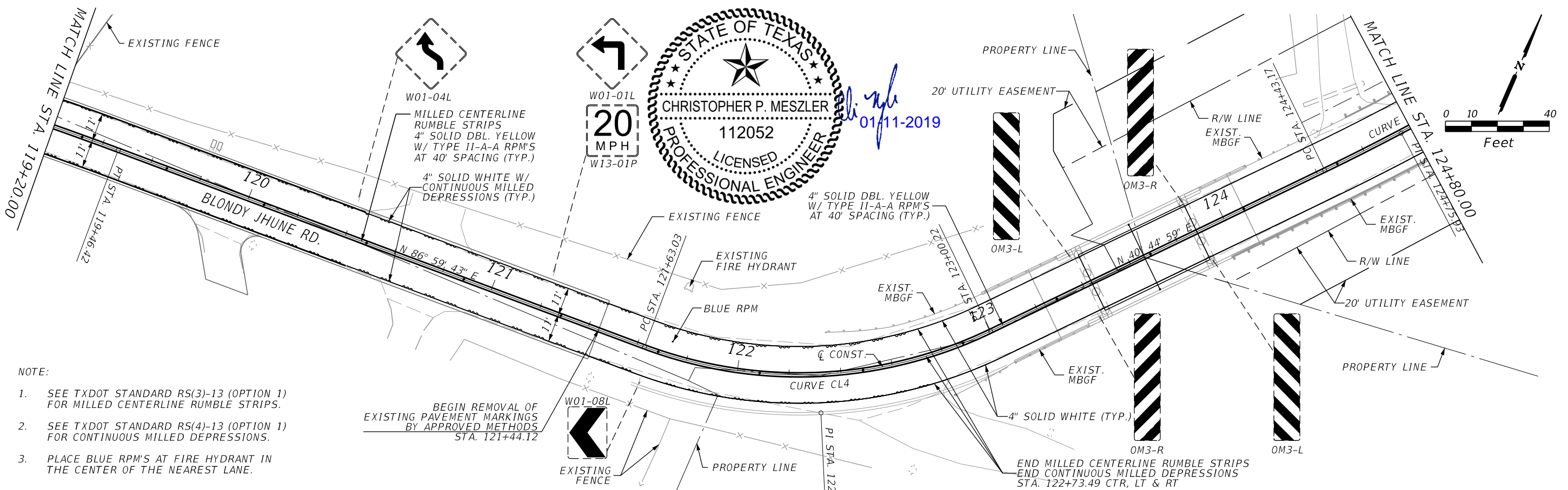
**SIGNING & PAVEMENT MARKINGS**

SHEET NO.  
 60

CALL BEFORE YOU DIG  
 TEXAS ONE CALL PARTICIPANTS REQUEST  
 48 HOURS NOTICE BEFORE YOU DIG, DRILL,  
 OR BLAST - STOP CALL  
 TEXAS ONE CALL SYSTEM  
 1-800-DIG-1-TESS



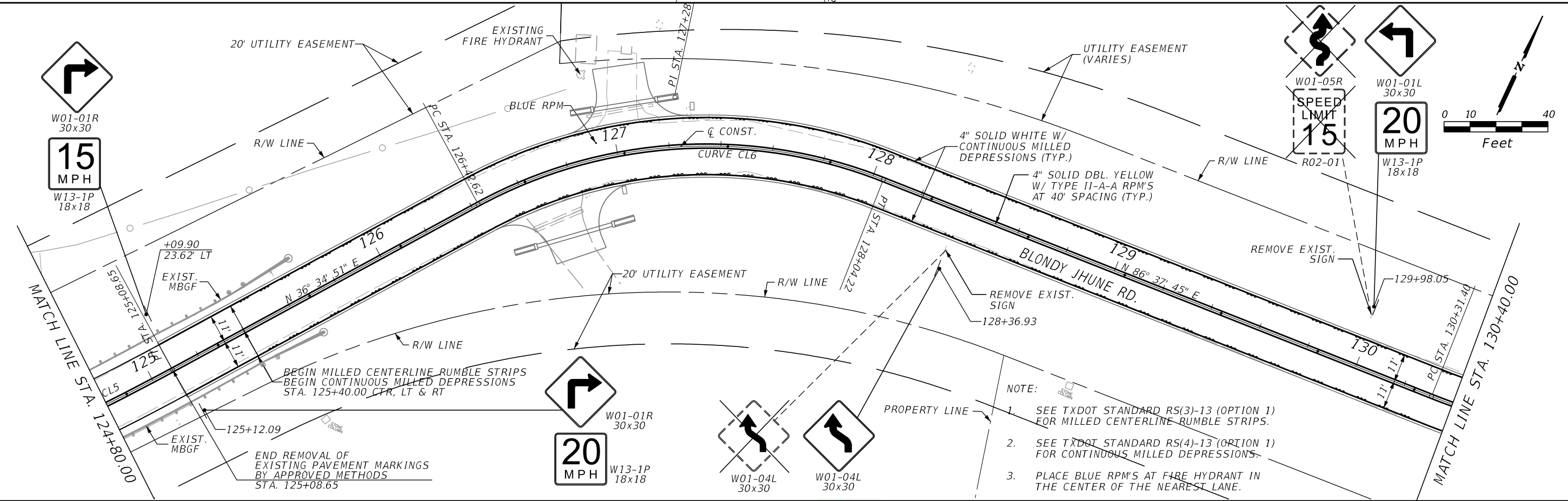
01/11/2019



- NOTE:
- SEE TXDOT STANDARD RS(3)-13 (OPTION 1) FOR MILLED CENTERLINE RUMBLE STRIPS.
  - SEE TXDOT STANDARD RS(4)-13 (OPTION 1) FOR CONTINUOUS MILLED DEPRESSIONS.
  - PLACE BLUE RPM'S AT FIRE HYDRANT IN THE CENTER OF THE NEAREST LANE.

BEGIN REMOVAL OF EXISTING PAVEMENT MARKINGS BY APPROVED METHODS STA. 121+44.12

END MILLED CENTERLINE RUMBLE STRIPS END CONTINUOUS MILLED DEPRESSIONS STA. 122+73.49 CTR, LT & RT



BEGIN MILLED CENTERLINE RUMBLE STRIPS BEGIN CONTINUOUS MILLED DEPRESSIONS STA. 125+40.00 CTR, LT & RT

END REMOVAL OF EXISTING PAVEMENT MARKINGS BY APPROVED METHODS STA. 125+08.65

- NOTE:
- SEE TXDOT STANDARD RS(3)-13 (OPTION 1) FOR MILLED CENTERLINE RUMBLE STRIPS.
  - SEE TXDOT STANDARD RS(4)-13 (OPTION 1) FOR CONTINUOUS MILLED DEPRESSIONS.
  - PLACE BLUE RPM'S AT FIRE HYDRANT IN THE CENTER OF THE NEAREST LANE.

PLOTTED BY: hremertaria  
 PLOT DATE: 1/11/2019  
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DATE	REVISIONS DESCRIPTION



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 LIC. No. 112052  
 1903 CENTRAL DRIVE, SUITE #405  
 BEDFORD, TX 76021  
 PHONE: 817.618.3640  
 TBPE REG. F-15243



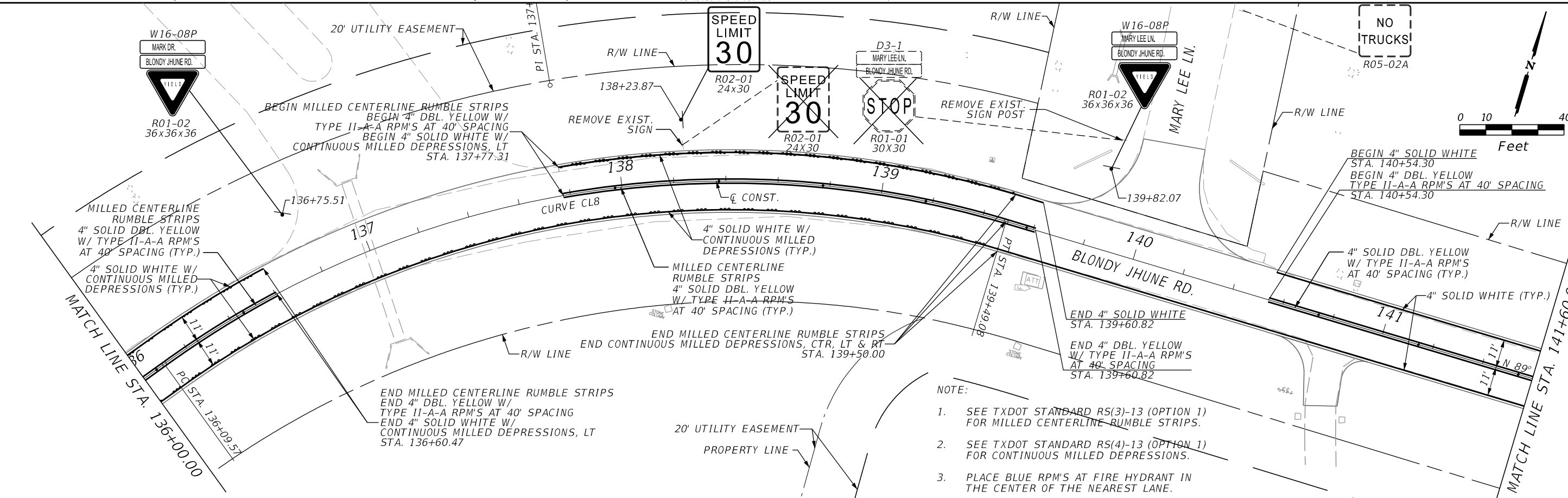
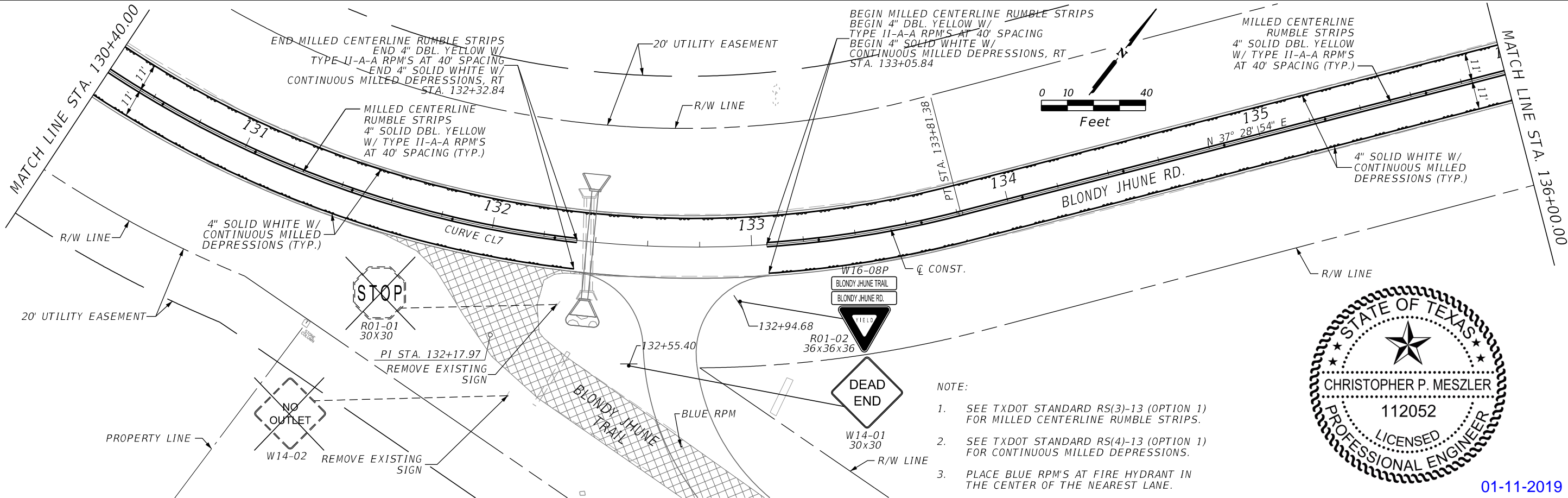
BLONDY JHUNE RD. RECONST.  
 CITY OF LUCAS  
 PUBLIC WORKS DEPARTMENT  
 665 COUNTRY CLUB ROAD  
 LUCAS, TX. 75002

SIGNING & PAVEMENT MARKINGS

SHEET NO.  
61

CALL BEFORE YOU DIG  
 TEXAS ONE CALL SYSTEM  
 1-800-DIG-1-ESS  
 48 HOURS NOTICE BEFORE YOU DIG, DRILL, OR BLAST - STOP CALL





PLOTTED BY: hremeteria  
 PLOT DATE: 1/11/2019  
 LAST SAVED: 1:37:57 PM  
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DATE	REVISIONS DESCRIPTION



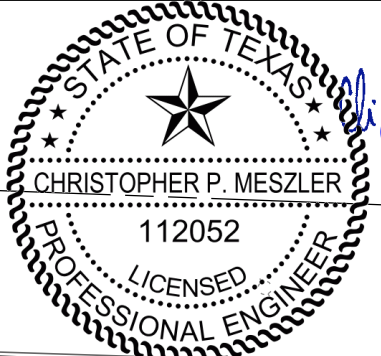
CHRISTOPHER P. MESZLER, P.E.  
 LIC. No. 112052  
 1903 CENTRAL DRIVE, SUITE #405  
 BEDFORD, TX 76021  
 PHONE: 817.618.3640  
 TBPE REG. F-15243

BLONDY JHUNE RD. RECONST.  
 CITY OF LUCAS  
 PUBLIC WORKS DEPARTMENT  
 665 COUNTRY CLUB ROAD  
 LUCAS, TX. 75002

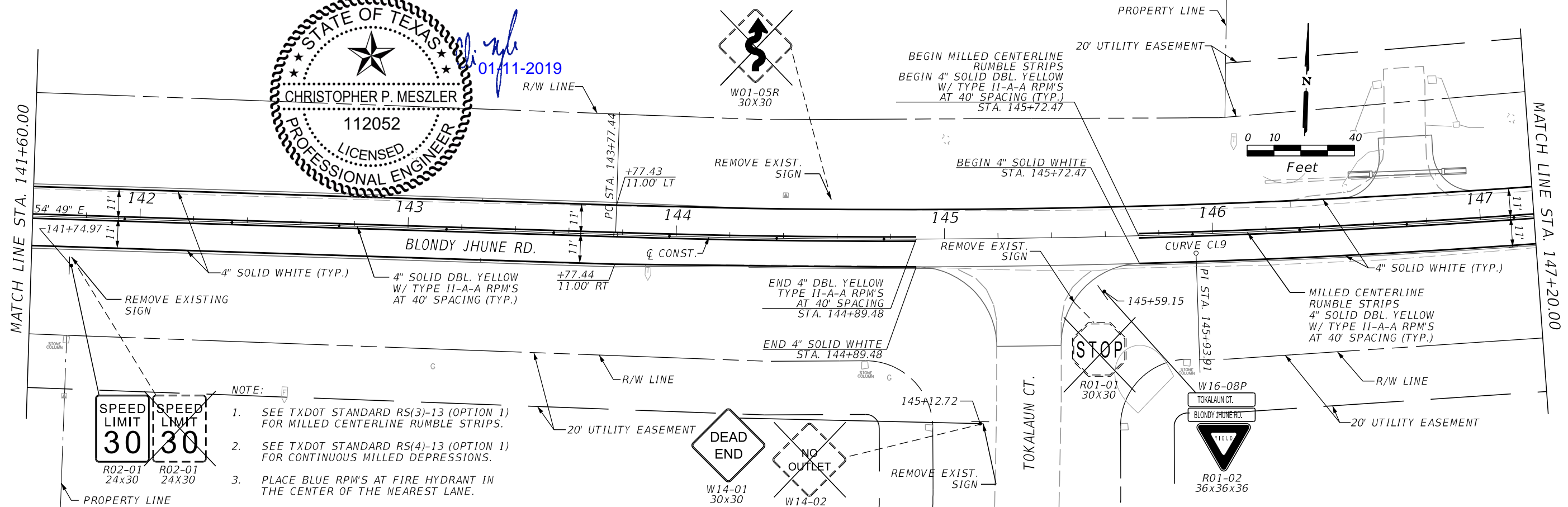
**SIGNING & PAVEMENT MARKINGS**

SHEET NO.  
62

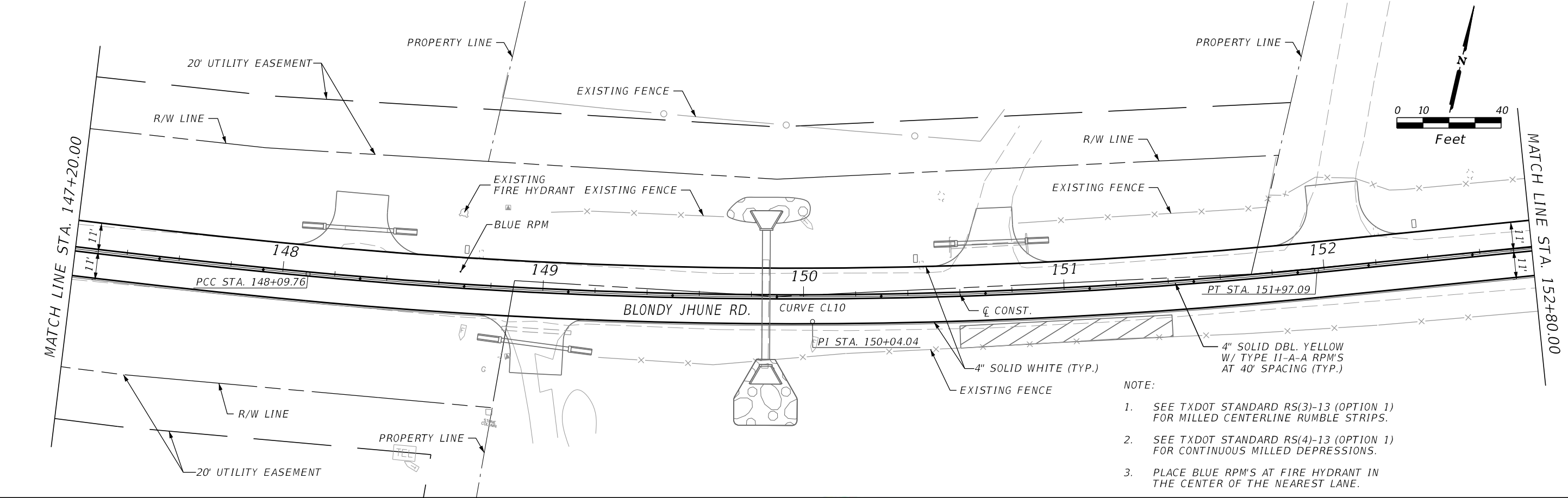
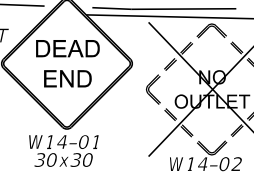
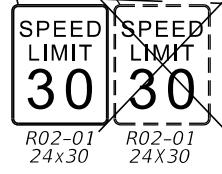
CALL BEFORE YOU DIG  
 TEXAS ONE CALL SYSTEM  
 1-800-DIG-1-ESS  
 48 HOURS NOTICE BEFORE YOU DIG, DRILL,  
 OR BLAST - STOP CALL



01/11/2019



- NOTE:
1. SEE TXDOT STANDARD RS(3)-13 (OPTION 1) FOR MILLED CENTERLINE RUMBLE STRIPS.
  2. SEE TXDOT STANDARD RS(4)-13 (OPTION 1) FOR CONTINUOUS MILLED DEPRESSIONS.
  3. PLACE BLUE RPM'S AT FIRE HYDRANT IN THE CENTER OF THE NEAREST LANE.



- NOTE:
1. SEE TXDOT STANDARD RS(3)-13 (OPTION 1) FOR MILLED CENTERLINE RUMBLE STRIPS.
  2. SEE TXDOT STANDARD RS(4)-13 (OPTION 1) FOR CONTINUOUS MILLED DEPRESSIONS.
  3. PLACE BLUE RPM'S AT FIRE HYDRANT IN THE CENTER OF THE NEAREST LANE.

PLOTTED BY: hrementeria  
 PLOT DATE: 1/11/2019  
 LAST SAVED: 1:37:57 PM  
 LOCATION: C:\Transfer\17-113 Blondy Jhune\1800457\4 - Design\Plan Set\3. Roadway\plansp04.DGN

DATE	REVISIONS DESCRIPTION



CHRISTOPHER P. MESZLER, P.E.  
 LIC. No. 112052  
 1903 CENTRAL DRIVE, SUITE #405  
 BEDFORD, TX 76021  
 PHONE: 817.618.3640  
 TBPE REG. F-15243



BLONDY JHUNE RD. RECONST.  
 CITY OF LUCAS  
 PUBLIC WORKS DEPARTMENT  
 665 COUNTRY CLUB ROAD  
 LUCAS, TX. 75002

**SIGNING & PAVEMENT MARKINGS**

SHEET NO.  
63

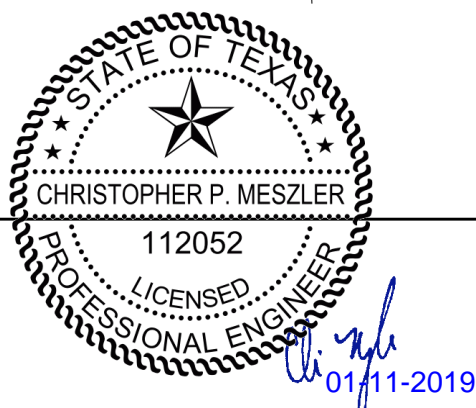
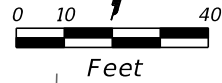
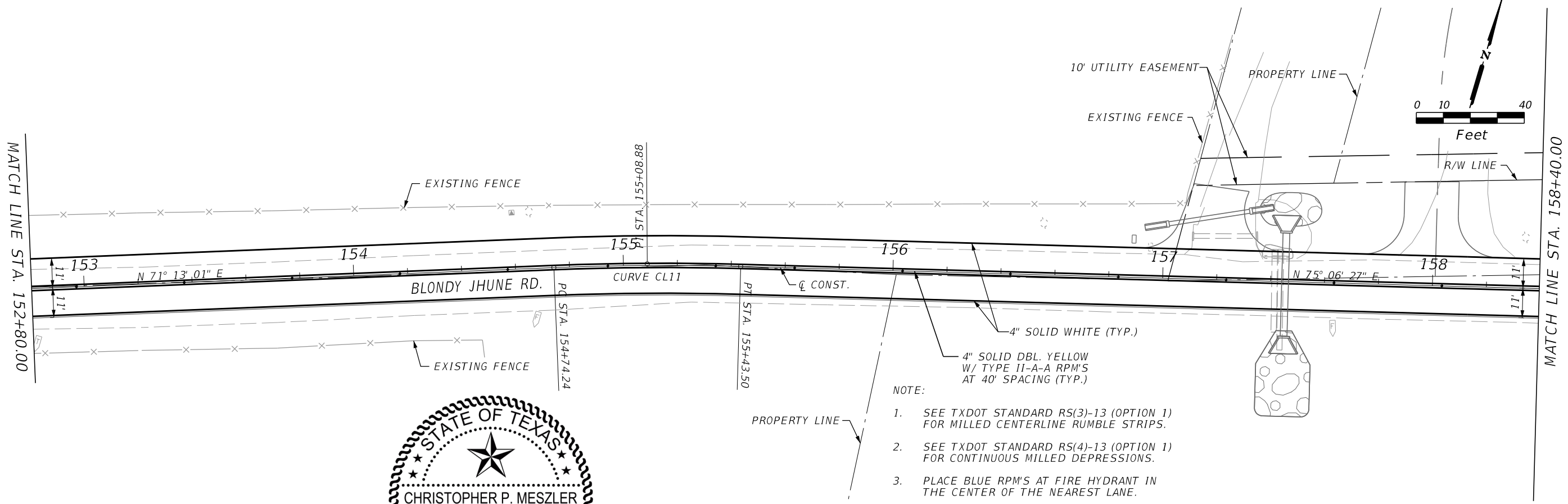
CALL BEFORE YOU DIG  
 TEXAS ONE CALL PARTICIPANTS REQUEST  
 48 HOURS NOTICE BEFORE YOU DIG, DRILL,  
 OR BLAST - STOP CALL  
 TEXAS ONE CALL SYSTEM  
 1-800-DIG-1155



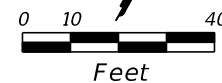
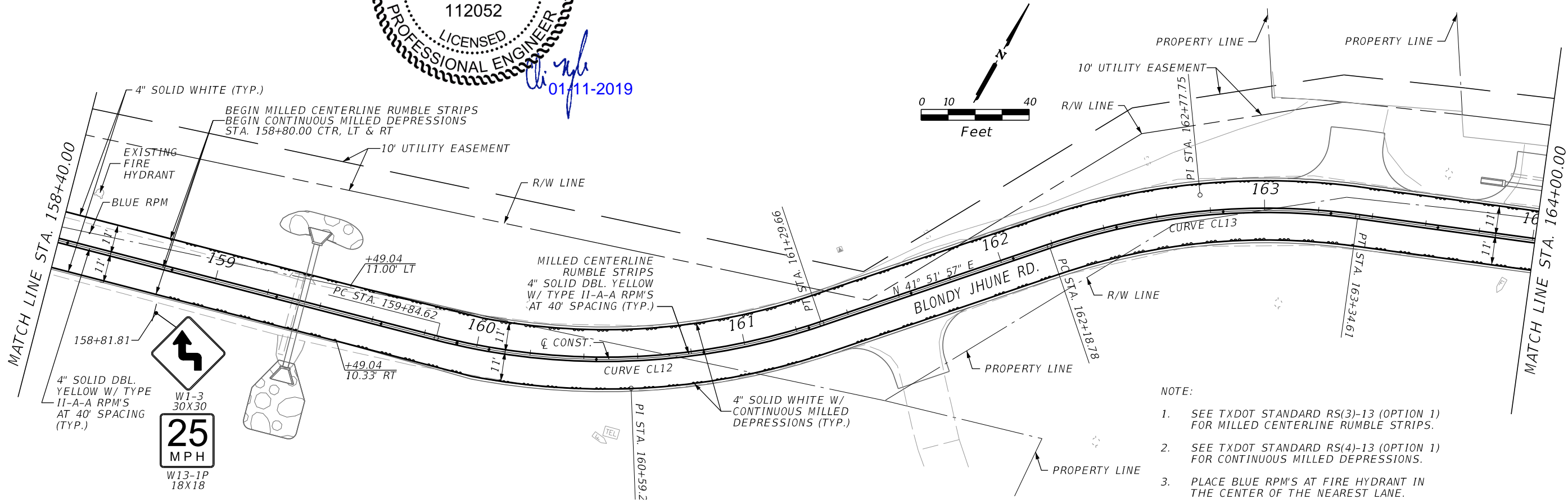
PLOTTED BY: hrementeria  
 PLOT DATE: 1/11/2019  
 LAST SAVED: 1:37:58 PM  
 LOCATION: C:\Transfer\17-113 Blondy Jhune\1800457\4 - Design\Plan Set\3. Roadway\plansp05.DGN

MATCH LINE STA. 152+80.00

MATCH LINE STA. 158+40.00



- NOTE:
- SEE TXDOT STANDARD RS(3)-13 (OPTION 1) FOR MILLED CENTERLINE RUMBLE STRIPS.
  - SEE TXDOT STANDARD RS(4)-13 (OPTION 1) FOR CONTINUOUS MILLED DEPRESSIONS.
  - PLACE BLUE RPM'S AT FIRE HYDRANT IN THE CENTER OF THE NEAREST LANE.



- NOTE:
- SEE TXDOT STANDARD RS(3)-13 (OPTION 1) FOR MILLED CENTERLINE RUMBLE STRIPS.
  - SEE TXDOT STANDARD RS(4)-13 (OPTION 1) FOR CONTINUOUS MILLED DEPRESSIONS.
  - PLACE BLUE RPM'S AT FIRE HYDRANT IN THE CENTER OF THE NEAREST LANE.



DATE	REVISIONS DESCRIPTION



CHRISTOPHER P. MESZLER, P.E.  
 LIC. No. 112052  
 1903 CENTRAL DRIVE, SUITE #405  
 BEDFORD, TX 76021  
 PHONE: 817.618.3640  
 TPBE REG. F-15243

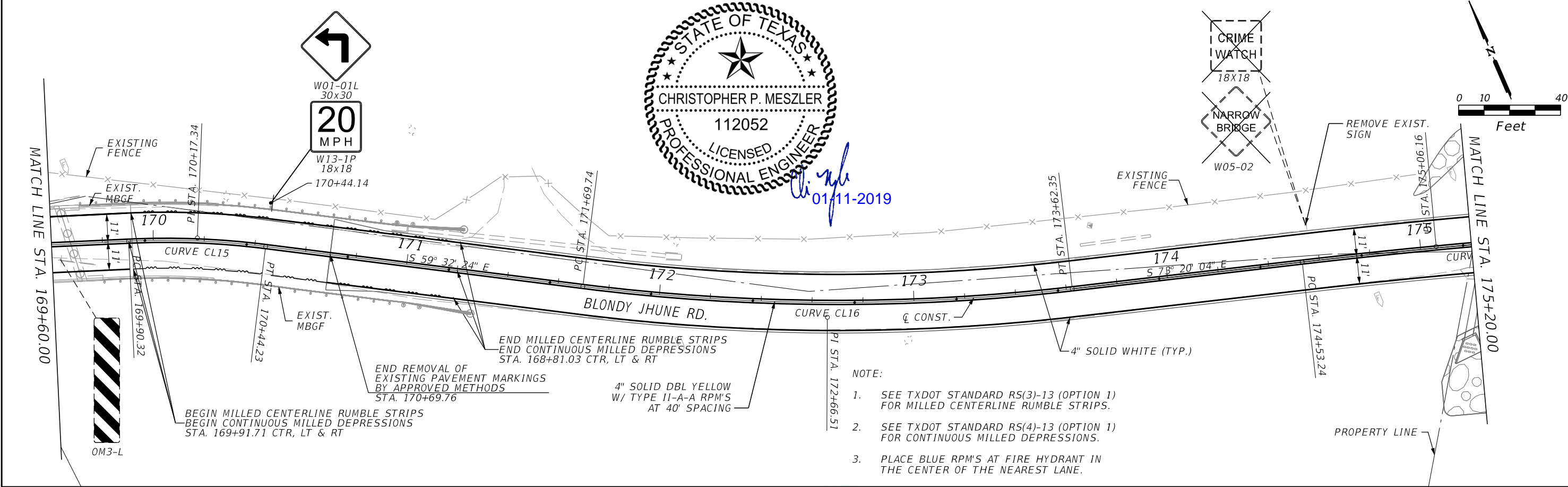
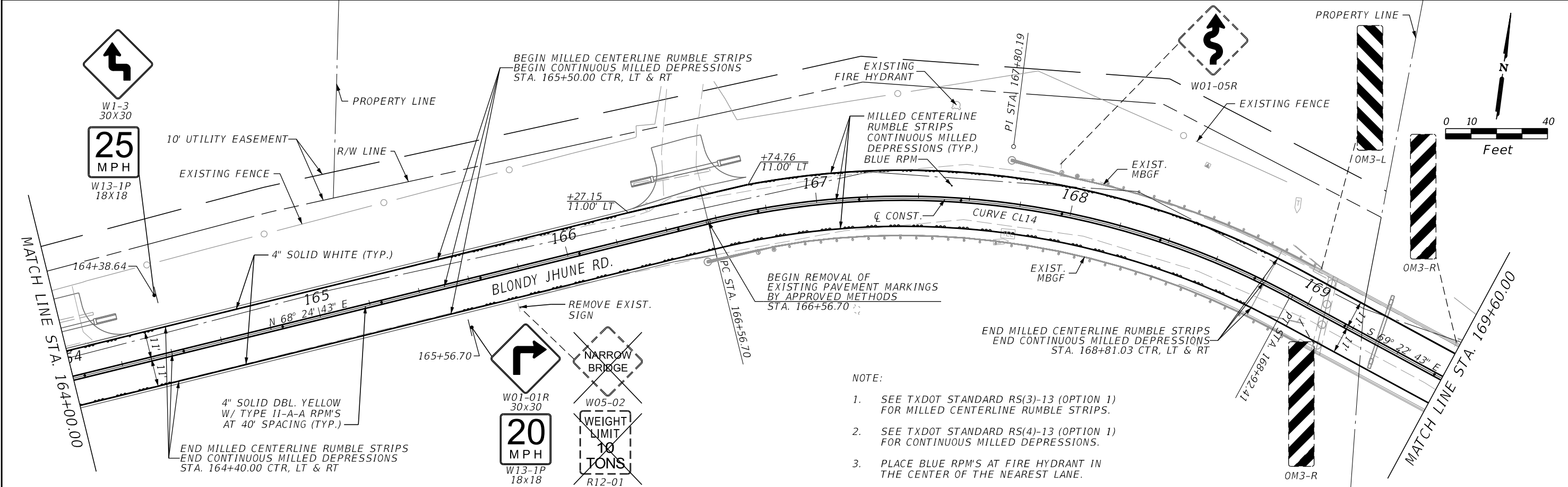


BLONDY JHUNE RD. RECONST.  
 CITY OF LUCAS  
 PUBLIC WORKS DEPARTMENT  
 665 COUNTRY CLUB ROAD  
 LUCAS, TX. 75002

**SIGNING & PAVEMENT MARKINGS**

SHEET NO.  
 64

CALL BEFORE YOU DIG  
 TEXAS ONE CALL SYSTEM  
 1-800-DIG-1-ESS  
 48 HOURS NOTICE BEFORE YOU DIG, DRILL, OR BLAST - STOP CALL



STATE OF TEXAS  
CHRISTOPHER P. MESZLER  
112052  
LICENSED PROFESSIONAL ENGINEER  
01-11-2019

Plotted by: hremateria  
Plot Date: 1/11/2019  
Last Saved: 1:37:58 PM  
Location: C:\Transfer\17-113 Blondy Jhune\1800457\4 - Design\Plan Set\3. Roadway\plansp06.DGN

DATE	REVISIONS DESCRIPTION

**LAKES ENGINEERING, INC.**

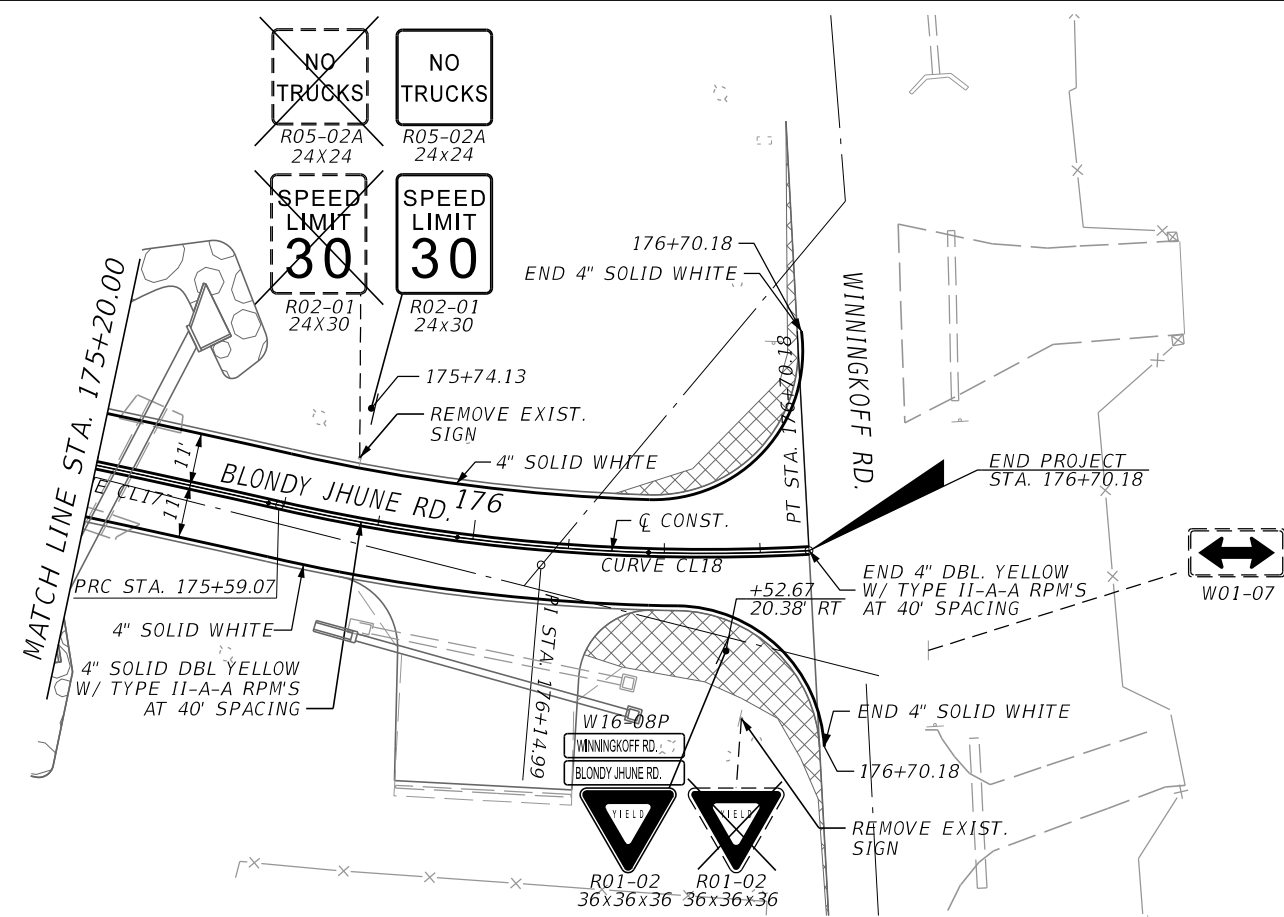
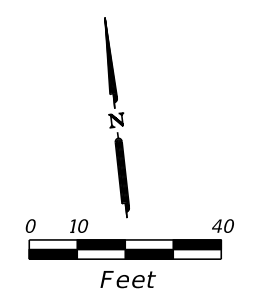
CHRISTOPHER P. MESZLER, P.E.  
LIC. No. 112052  
1903 CENTRAL DRIVE, SUITE #405  
BEDFORD, TX 76021  
PHONE: 817.618.3640  
TBPE REG. F-15243

BLONDY JHUNE RD. RECONST.  
CITY OF LUCAS  
PUBLIC WORKS DEPARTMENT  
665 COUNTRY CLUB ROAD  
LUCAS, TX. 75002

**SIGNING & PAVEMENT MARKINGS**

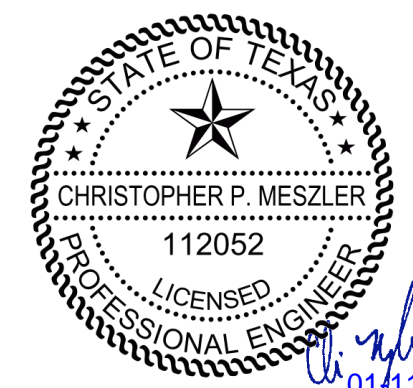
SHEET NO.  
65

CALL BEFORE YOU DIG  
TEXAS ONE CALL SYSTEM  
1-800-DIG-1-ESS  
48 HOURS NOTICE BEFORE YOU DIG, DRILL,  
OR BLAST - STOP CALL



**NOTE:**

1. SEE TXDOT STANDARD RS(3)-13 (OPTION 1) FOR MILLED CENTERLINE RUMBLE STRIPS.
2. SEE TXDOT STANDARD RS(4)-13 (OPTION 1) FOR CONTINUOUS MILLED DEPRESSIONS.
3. PLACE BLUE RPM'S AT FIRE HYDRANT IN THE CENTER OF THE NEAREST LANE.



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 PLOT DATE: 1/11/2019  
 LAST SAVED: 1:38:00 PM  
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REVISIONS	
DATE	DESCRIPTION



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 LIC. No. 112052  
 1903 CENTRAL DRIVE, SUITE #405  
 BEDFORD, TX 76021  
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 TBPE REG. F-15243



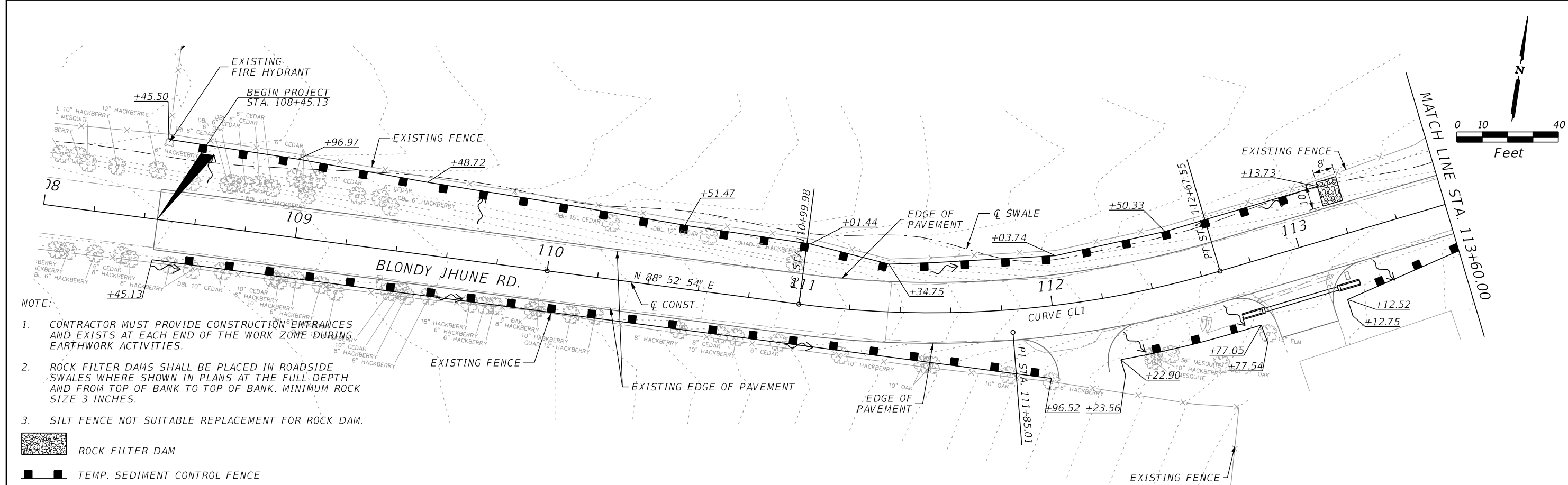
**BLONDY JHUNE RD. RECONST.**  
 CITY OF LUCAS  
 PUBLIC WORKS DEPARTMENT  
 665 COUNTRY CLUB ROAD  
 LUCAS, TX. 75002

*SIGNING & PAVEMENT MARKINGS*

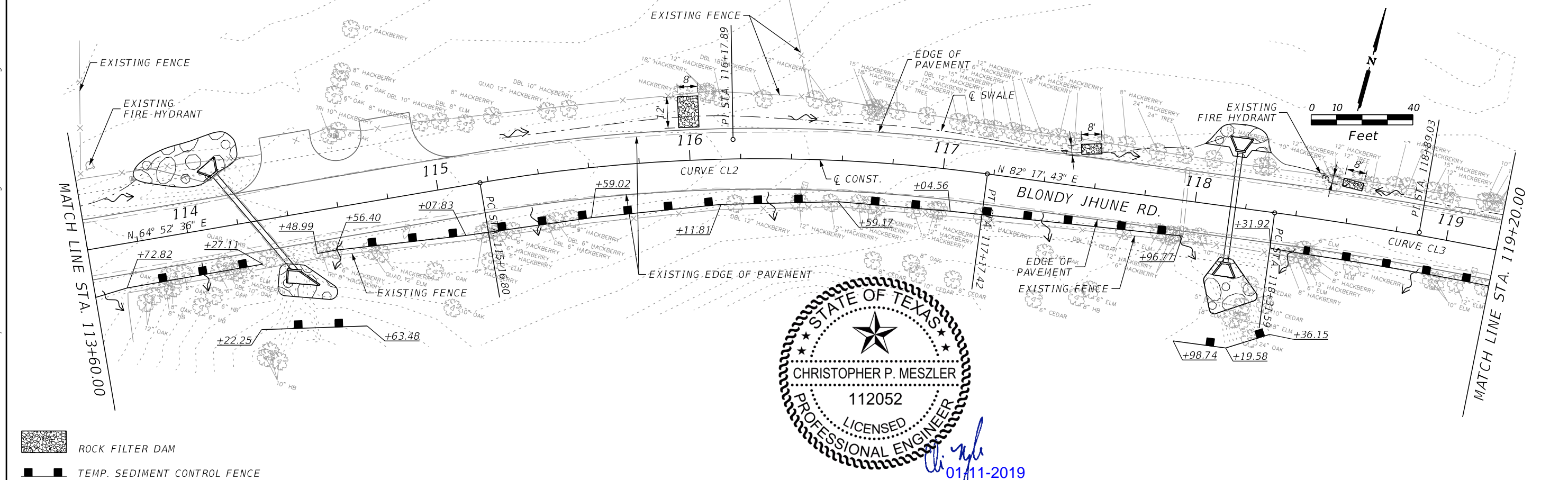
SHEET NO.  
 66

**CALL BEFORE YOU DIG**  
 TEXAS ONE CALL SYSTEM  
 1-800-DIG-1-ESS  
 48 HOURS NOTICE BEFORE YOU DIG, DRILL, OR BLAST - STOP CALL





- NOTE:
1. CONTRACTOR MUST PROVIDE CONSTRUCTION ENTRANCES AND EXISTS AT EACH END OF THE WORK ZONE DURING EARTHWORK ACTIVITIES.
  2. ROCK FILTER DAMS SHALL BE PLACED IN ROADSIDE SWALES WHERE SHOWN IN PLANS AT THE FULL DEPTH AND FROM TOP OF BANK TO TOP OF BANK. MINIMUM ROCK SIZE 3 INCHES.
  3. SILT FENCE NOT SUITABLE REPLACEMENT FOR ROCK DAM.



CHRISTOPHER P. MESZLER  
 112052  
 LICENSED PROFESSIONAL ENGINEER  
 01/11-2019

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REVISIONS	
DATE	DESCRIPTION



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 LIC. No. 112052  
 1903 CENTRAL DRIVE, SUITE #405  
 BEDFORD, TX 76021  
 PHONE: 817.618.3640  
 TBPE REG. F-15243

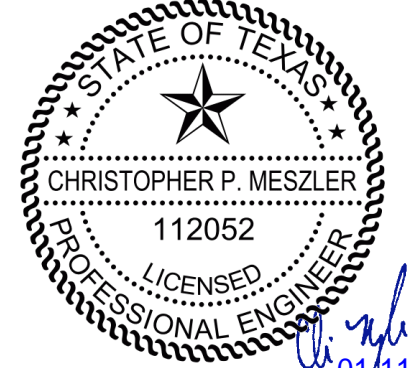
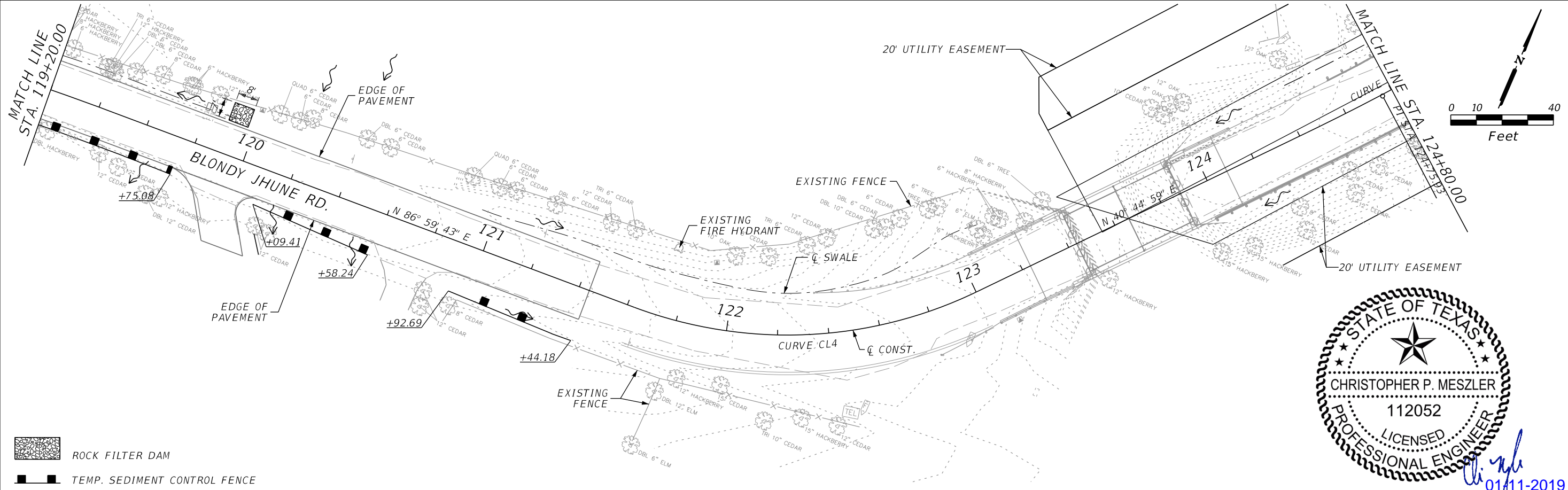
BLONDY JHUNE RD. RECONST.  
 CITY OF LUCAS  
 PUBLIC WORKS DEPARTMENT  
 665 COUNTRY CLUB ROAD  
 LUCAS, TX. 75002

EROSION CONTROL PLAN

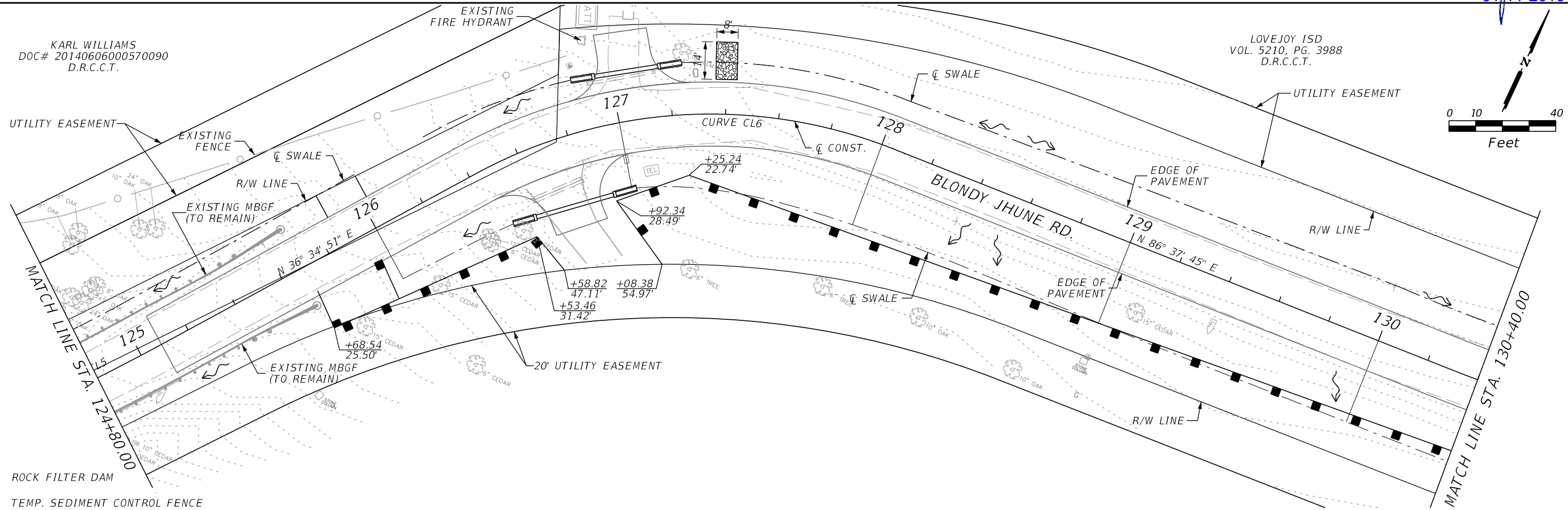
SHEET NO.  
 68

CALL BEFORE YOU DIG  
 TEXAS ONE CALL PARTICIPANTS REQUEST  
 48 HOURS NOTICE BEFORE YOU DIG, DRILL,  
 OR BLAST - STOP CALL  
  
 TEXAS ONE CALL SYSTEM  
 1-800-DIG-1-ESS





- ROCK FILTER DAM
- TEMP. SEDIMENT CONTROL FENCE



LOVEJOY ISD  
VOL. 5210, PG. 3988  
D.R.C.C.T.

- ROCK FILTER DAM
- TEMP. SEDIMENT CONTROL FENCE

PLOTTED BY: hremeteria  
 PLOT DATE: 1/11/2019  
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REVISIONS	
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 1903 CENTRAL DRIVE, SUITE #405  
 BEDFORD, TX 76021  
 PHONE: 817.618.3640  
 TBPE REG. F-15243

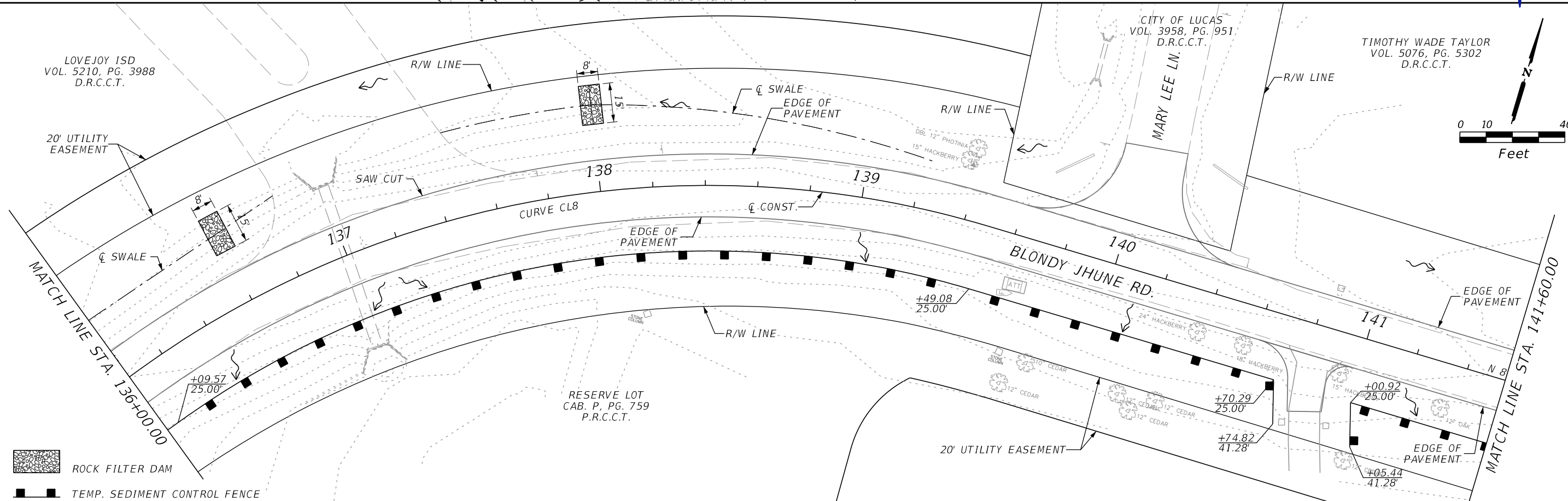
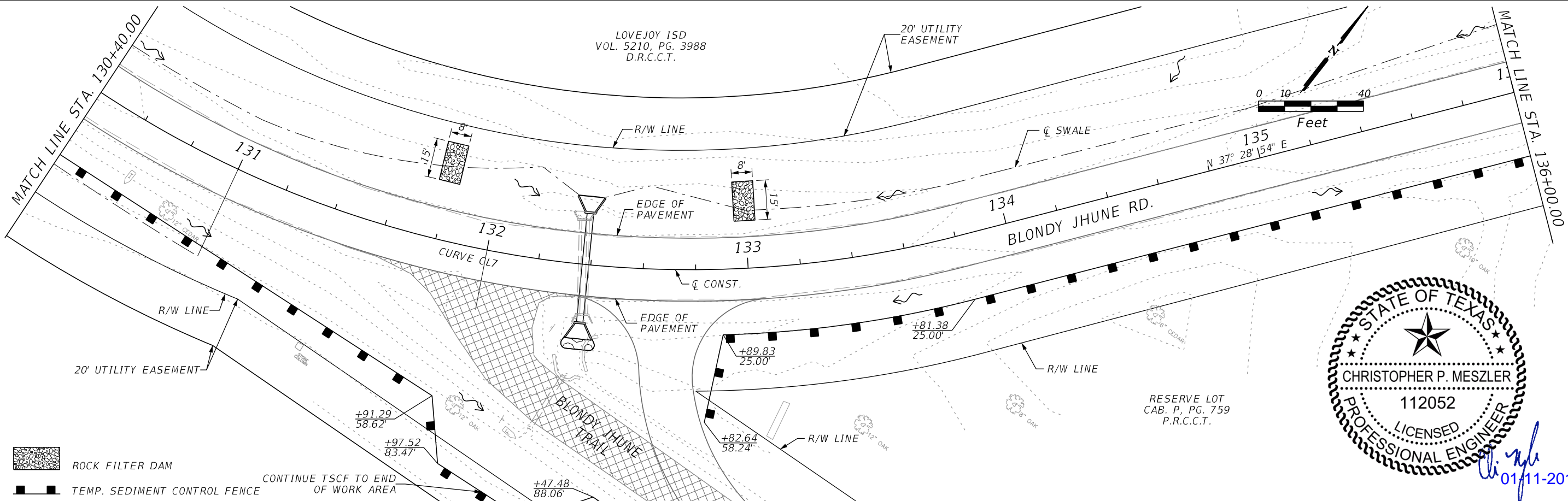


BLONDY JHUNE RD. RECONST.  
 CITY OF LUCAS  
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 665 COUNTRY CLUB ROAD  
 LUCAS, TX. 75002

EROSION CONTROL PLAN

SHEET NO.	69
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CALL BEFORE YOU DIG  
 TEXAS ONE CALL PARTICIPANTS REQUEST  
 48 HOURS NOTICE BEFORE YOU DIG, DRILL,  
 OR BLAST - STOP CALL



REVISIONS	
DATE	DESCRIPTION



CHRISTOPHER P. MESZLER, P.E.  
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 BEDFORD, TX 76021  
 PHONE: 817.618.3640  
 TBPE REG. F-15243



BLONDY JHUNE RD. RECONST.  
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EROSION CONTROL PLAN

SHEET NO.  
70

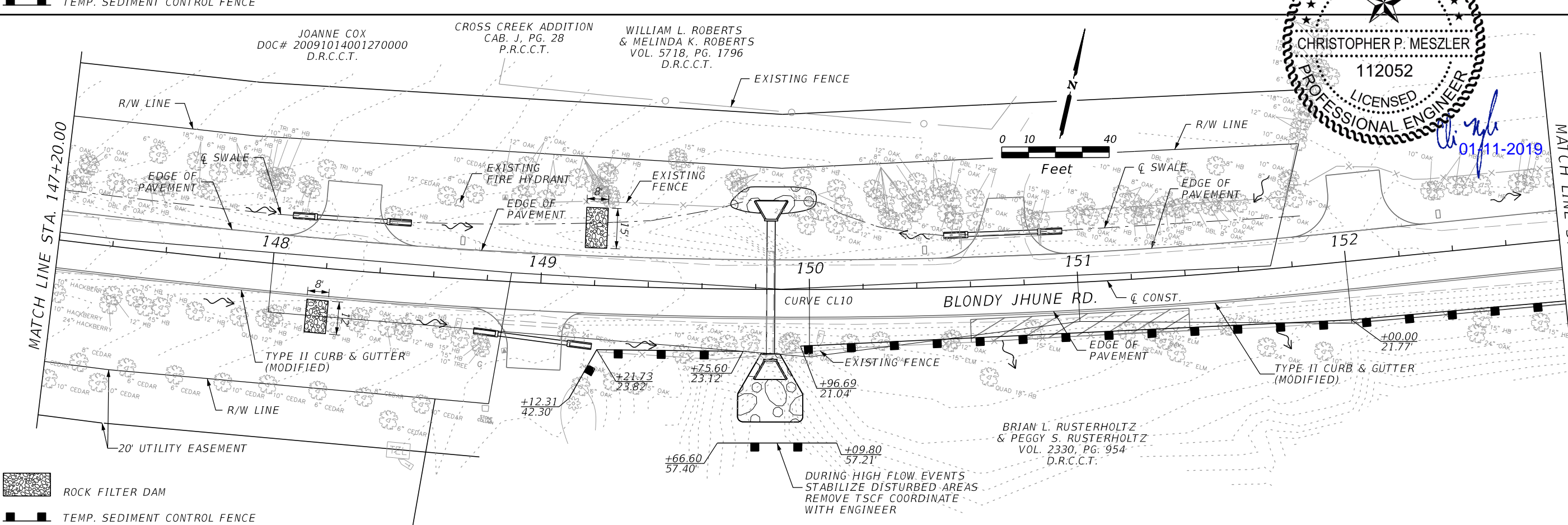
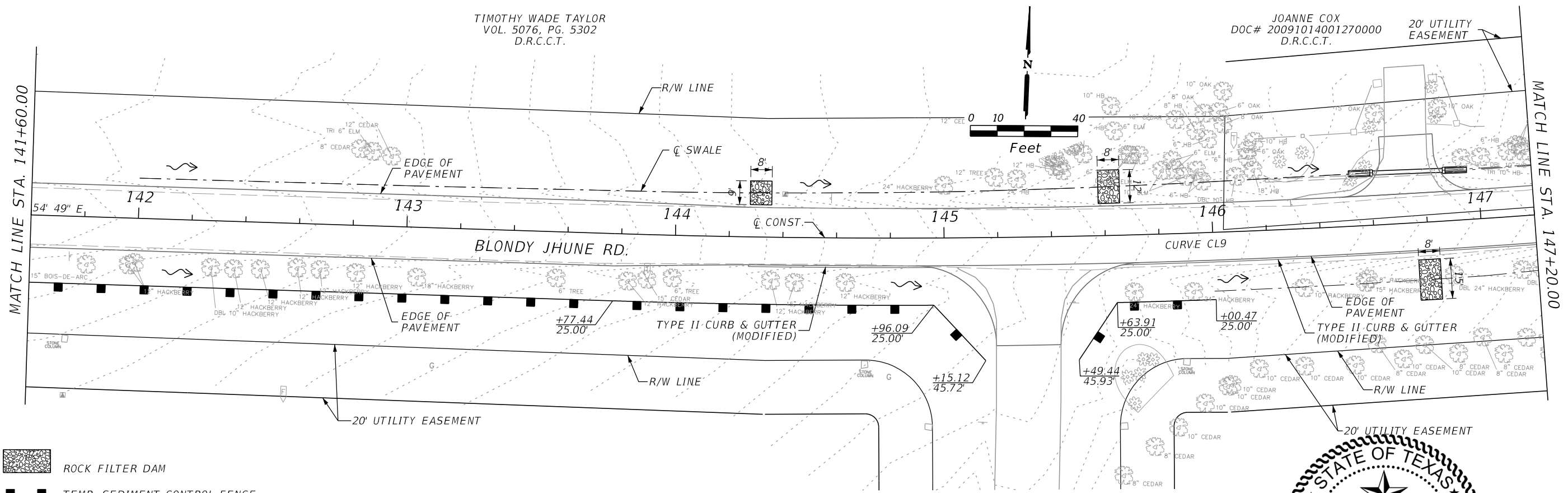
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**CALL BEFORE YOU DIG**  
 TEXAS ONE CALL SYSTEM  
 1-800-DIG-1-ESS  
 48 HOURS NOTICE BEFORE YOU DIG, DRILL,  
 OR BLAST - STOP CALL



TIMOTHY WADE TAYLOR  
VOL. 5076, PG. 5302  
D.R.C.C.T.

JOANNE COX  
DOC# 20091014001270000  
D.R.C.C.T.



STATE OF TEXAS  
CHRISTOPHER P. MESZLER  
112052  
LICENSED PROFESSIONAL ENGINEER  
01/11/2019

JOANNE COX  
DOC# 20091014001270000  
D.R.C.C.T.

CROSS CREEK ADDITION  
CAB. J. PG. 28  
P.R.C.C.T.

WILLIAM L. ROBERTS  
& MELINDA K. ROBERTS  
VOL. 5718, PG. 1796  
D.R.C.C.T.

BRIAN L. RUSTERHOLTZ  
& PEGGY S. RUSTERHOLTZ  
VOL. 2330, PG. 954  
D.R.C.C.T.

DATE	REVISIONS DESCRIPTION



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BLONDY JHUNE RD. RECONST.  
CITY OF LUCAS  
PUBLIC WORKS DEPARTMENT  
665 COUNTRY CLUB ROAD  
LUCAS, TX. 75002

EROSION CONTROL PLAN

SHEET NO.  
71

Plotted by: hremeteria  
Date: 1/11/2019  
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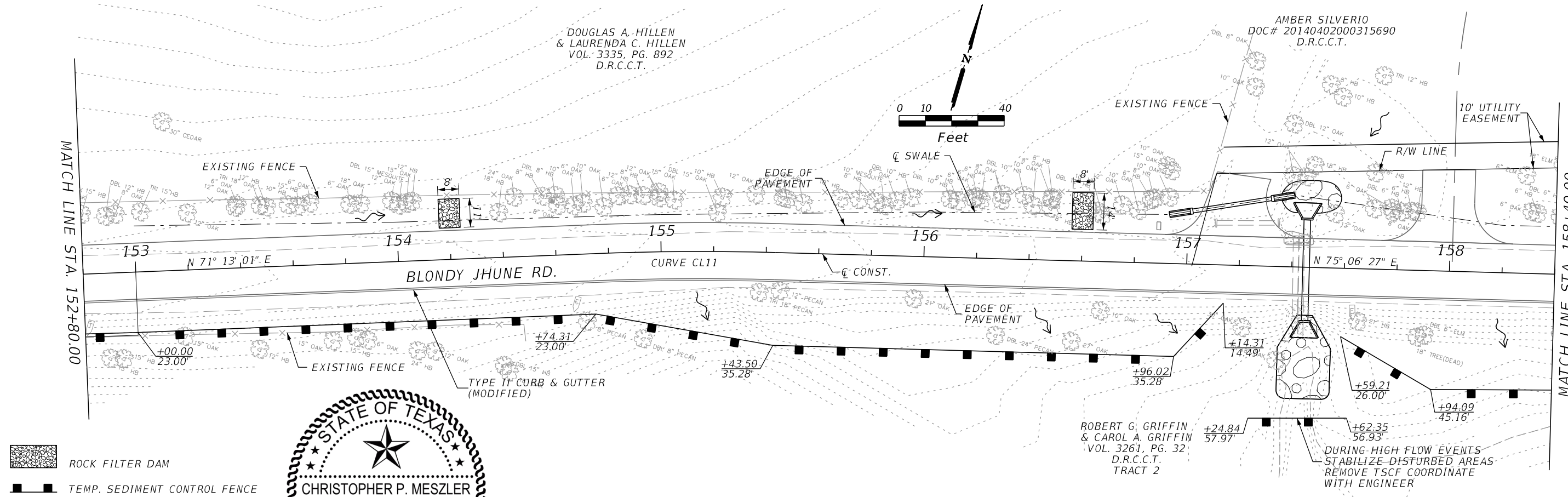
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TEXAS ONE CALL PARTICIPANTS REQUEST  
48 HOURS NOTICE BEFORE YOU DIG, DRILL,  
OR BLAST - STOP CALL

DOUGLAS A. HILLEN  
& LAURENDA C. HILLEN  
VOL. 3335, PG. 892  
D.R.C.C.T.

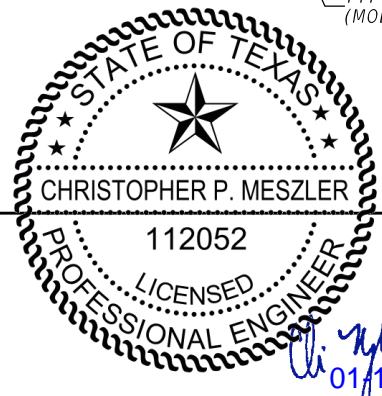
AMBER SILVERIO  
DOC# 20140402000315690  
D.R.C.C.T.

MATCH LINE STA. 152+80.00

MATCH LINE STA. 158+40.00



ROCK FILTER DAM  
 TEMP. SEDIMENT CONTROL FENCE



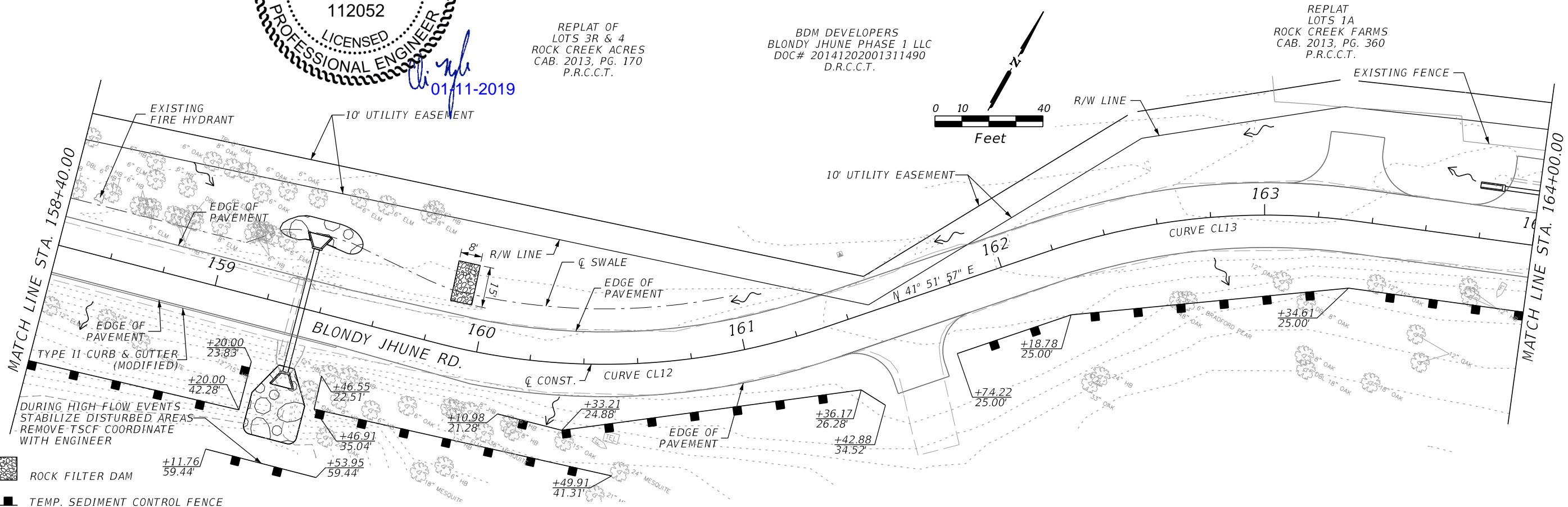
REPLAT OF  
LOTS 3R & 4  
ROCK CREEK ACRES  
CAB. 2013, PG. 170  
P.R.C.C.T.

BDM DEVELOPERS  
BLONDY JHUNE PHASE 1 LLC  
DOC# 20141202001311490  
D.R.C.C.T.

REPLAT  
LOTS 1A  
ROCK CREEK FARMS  
CAB. 2013, PG. 360  
P.R.C.C.T.

ROBERT G. GRIFFIN  
& CAROL A. GRIFFIN  
VOL. 3261, PG. 32  
D.R.C.C.T.  
TRACT 2

DURING HIGH FLOW EVENTS  
STABILIZE DISTURBED AREAS  
REMOVE TSCF COORDINATE  
WITH ENGINEER



ROCK FILTER DAM  
 TEMP. SEDIMENT CONTROL FENCE

Plotted By: hremeteria  
Plot Date: 1/11/2019  
Last Saved: 1:38:04 PM  
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REVISIONS	
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**LAKES**  
ENGINEERING, INC.

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LIC. No. 112052  
1903 CENTRAL DRIVE, SUITE #405  
BEDFORD, TX 76021  
PHONE: 817.618.3640  
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PUBLIC WORKS DEPARTMENT  
665 COUNTRY CLUB ROAD  
LUCAS, TX. 75002

EROSION CONTROL PLAN

SHEET  
NO.  
72

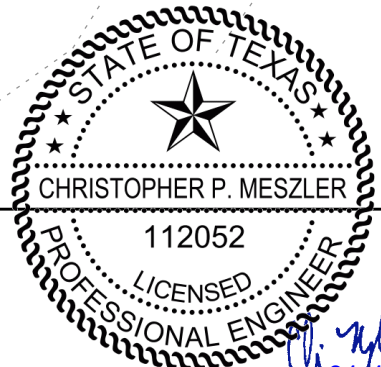
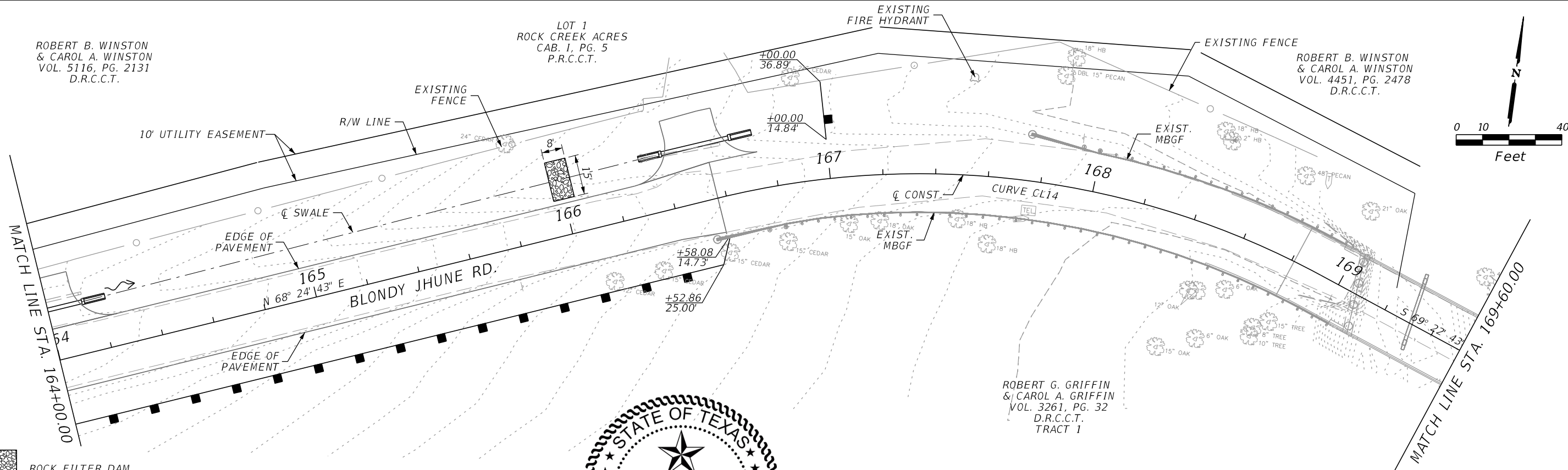
CALL BEFORE YOU DIG  
TEXAS ONE CALL SYSTEM  
1-800-DIG-TESS  
48 HOURS NOTICE BEFORE YOU DIG, DRILL,  
OR BLAST - STOP CALL



ROBERT B. WINSTON  
& CAROL A. WINSTON  
VOL. 5116, PG. 2131  
D.R.C.C.T.

LOT 1  
ROCK CREEK ACRES  
CAB. 1, PG. 5  
P.R.C.C.T.

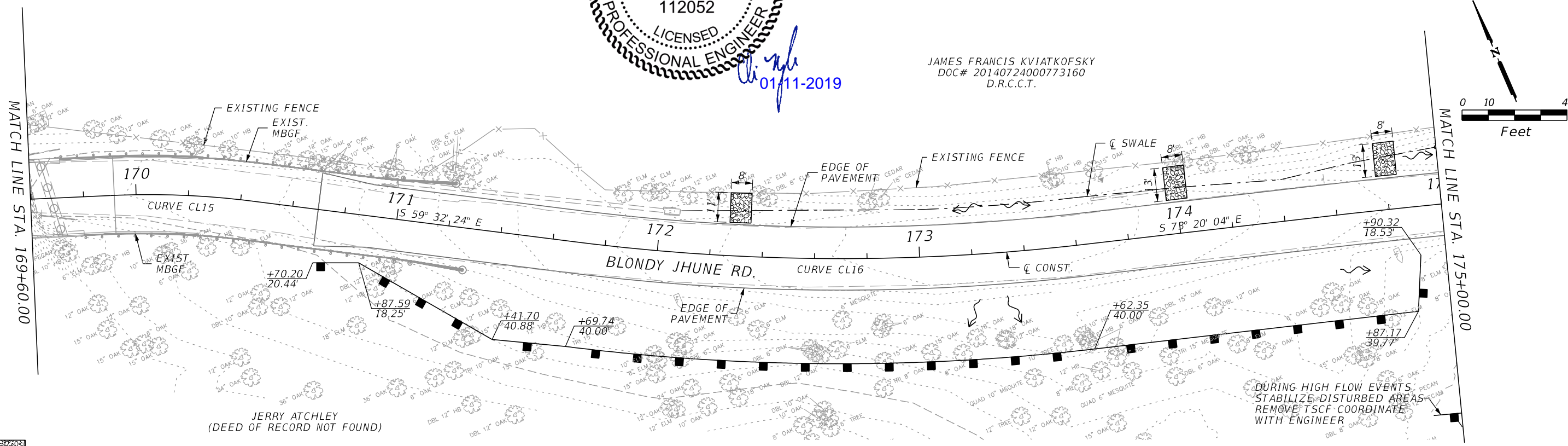
ROBERT B. WINSTON  
& CAROL A. WINSTON  
VOL. 4451, PG. 2478  
D.R.C.C.T.



*01/11-2019*

JAMES FRANCIS KVIATKOFSKY  
DOC# 20140724000773160  
D.R.C.C.T.

ROCK FILTER DAM  
 TEMP. SEDIMENT CONTROL FENCE



ROCK FILTER DAM  
 TEMP. SEDIMENT CONTROL FENCE

DURING HIGH FLOW EVENTS,  
STABILIZE DISTURBED AREAS  
REMOVE TSCF COORDINATE  
WITH ENGINEER

PLOTTED BY: hremeteria  
 PLOT DATE: 1/11/2019  
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LIC. No. 112052  
1903 CENTRAL DRIVE, SUITE #405  
BEDFORD, TX 76021  
PHONE: 817.618.3640  
TBPE REG. F-15243



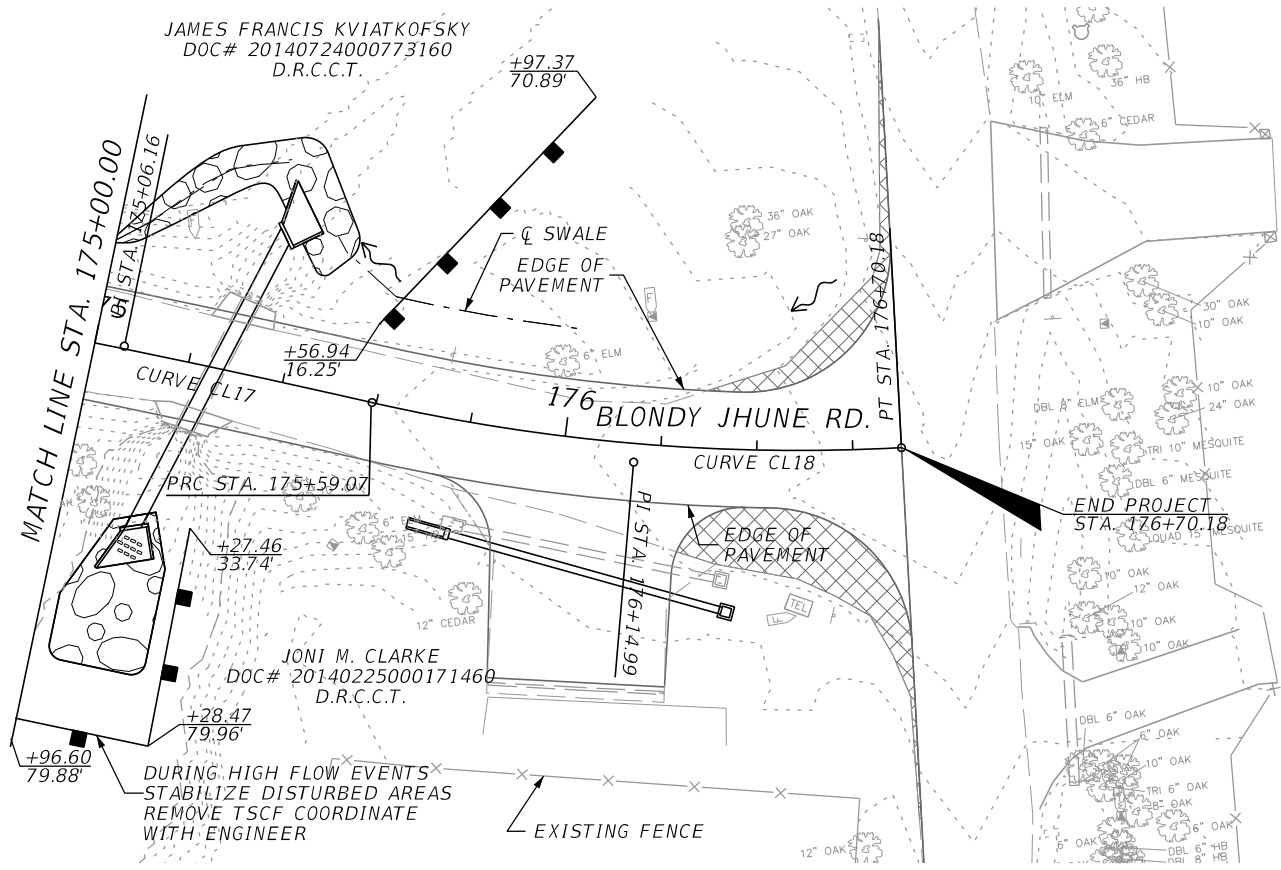
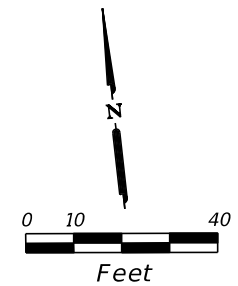
BLONDY JHUNE RD. RECONST.  
CITY OF LUCAS  
PUBLIC WORKS DEPARTMENT  
665 COUNTRY CLUB ROAD  
LUCAS, TX. 75002

EROSION CONTROL PLAN

SHEET NO.  
73

CALL BEFORE YOU DIG  
 TEXAS ONE CALL SYSTEM  
 1-800-DIG-1-ESS  
 48 HOURS NOTICE BEFORE YOU DIG, DRILL,  
 OR BLAST - STOP CALL

JAMES FRANCIS KVIATKOFSKY  
 DOC# 20140724000773160  
 D.R.C.C.T.



ROCK FILTER DAM

TEMP. SEDIMENT CONTROL FENCE



*Christopher P. Meszler*  
 01/11-2019

PLOTTED BY: hrementeria  
 PLOT DATE: 1/11/2019  
 LAST SAVED: 1:38:07 PM  
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 BEDFORD, TX 76021  
 PHONE: 817.618.3640  
 TBPE REG. F-15243



BLONDY JHUNE RD. RECONST.  
 CITY OF LUCAS  
 PUBLIC WORKS DEPARTMENT  
 665 COUNTRY CLUB ROAD  
 LUCAS, TX. 75002

*EROSION CONTROL PLAN*

SHEET NO.  
 74

CALL BEFORE YOU DIG  
 TEXAS ONE CALL SYSTEM  
 48 HOURS NOTICE BEFORE YOU DIG, DRILL,  
 OR BLAST - STOP-CALL  
 TEXAS ONE CALL SYSTEM  
 1-800-DIG-1ESS

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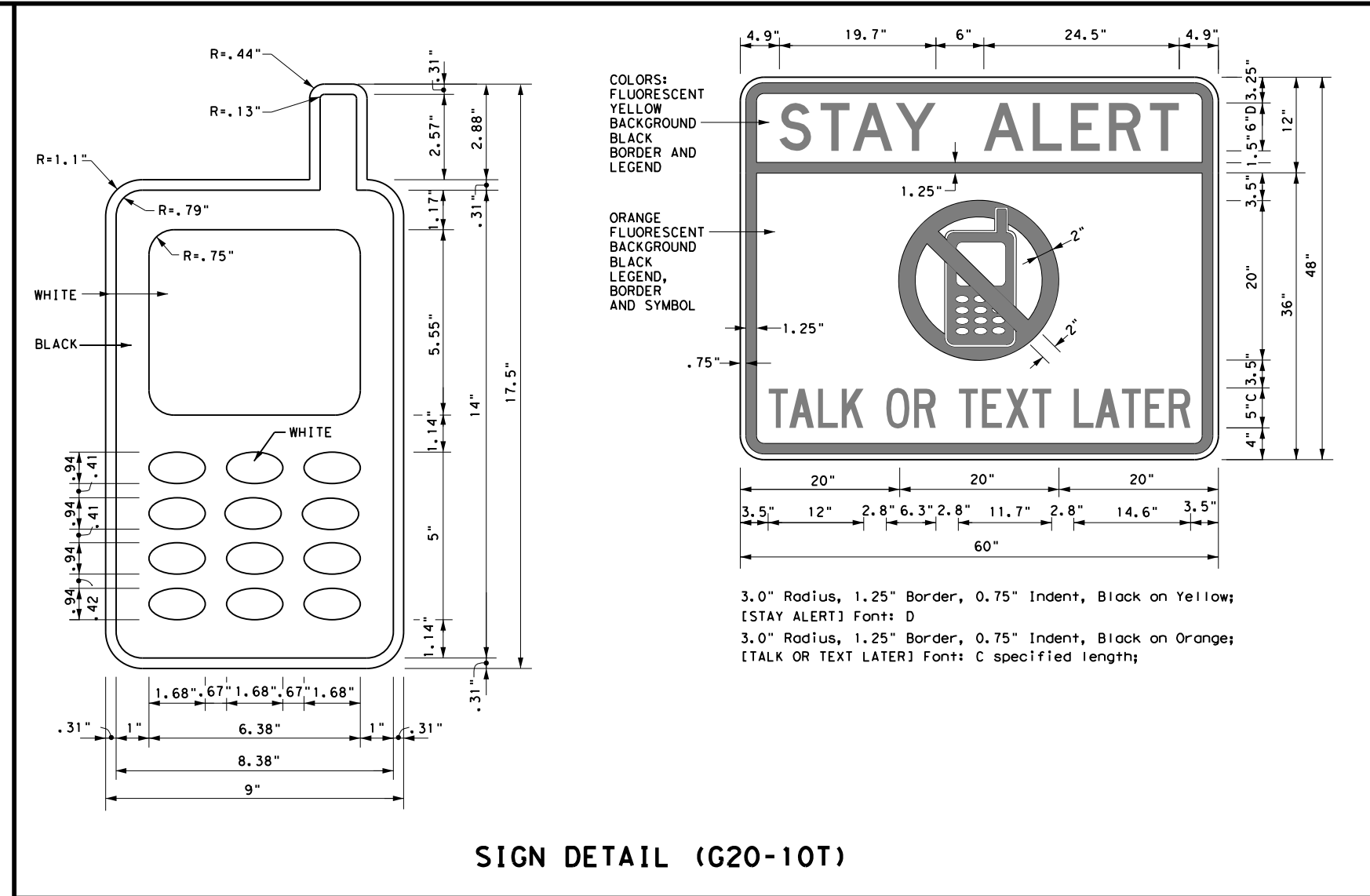
**BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:**

- 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).
- The development and design of the Traffic Control Plan (TCP) is the responsibility of the Engineer.
- 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.
- 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.
- 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.
- 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.
- 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.
- 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.
- 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.
- As shown on BC(2), the OBEY WARNING SIGNS STATE LAW sign, STAY ALERT TALK OR TEXT LATER (see Sign Detail G20-10T) and the WORK ZONE TRAFFIC FINES DOUBLE sign with plaque shall be erected in advance of the CSJ limits. However, the TRAFFIC FINES DOUBLE sign will not be required on projects consisting solely of mobile operation work, such as striping or milling edgeline rumble strips. The BEGIN ROAD WORK NEXT X MILES, CONTRACTOR and END ROAD WORK signs shall be erected at or near the CSJ limits.
- Except for devices required by Note 10, traffic control devices should be in place only while work is actually in progress or a definite need exists.
- The Engineer has the final decision on the location of all traffic control devices.
- Inactive equipment and work vehicles, including workers' private vehicles must be parked away from travel lanes. They should be as close to the right-of-way line as possible, or located behind a barrier or guardrail, or as approved by the Engineer.

**WORKER SAFETY APPAREL NOTES:**

- 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.

DATE:  
 FILE:



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

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

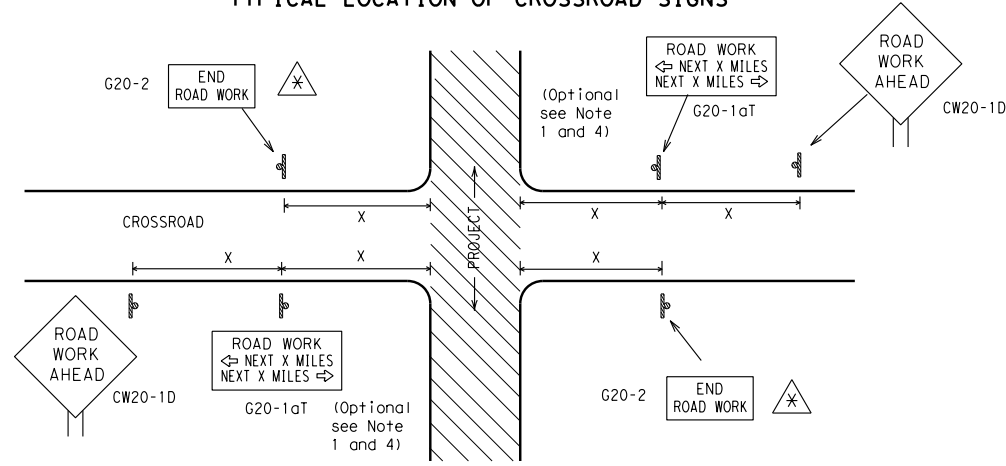
<b>THE DOCUMENTS BELOW CAN BE FOUND ON-LINE AT</b> <a href="http://www.txdot.gov">http://www.txdot.gov</a>
COMPLIANT WORK ZONE TRAFFIC CONTROL DEVICES LIST (CWZTCD)
DEPARTMENTAL MATERIAL SPECIFICATIONS (DMS)
MATERIAL PRODUCER LIST (MPL)
ROADWAY DESIGN MANUAL - SEE "MANUALS (ONLINE MANUALS)"
STANDARD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

SHEET 1 OF 12

		<i>Traffic Operations Division Standard</i>	
<b>BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS</b>			
<b>BC (1) - 14</b>			
FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
© TxDOT November 2002	CONT	SECT	JOB
REVISIONS			
4-03	5-10	8-14	
9-07	7-13		
DIST		COUNTY	SHEET NO.

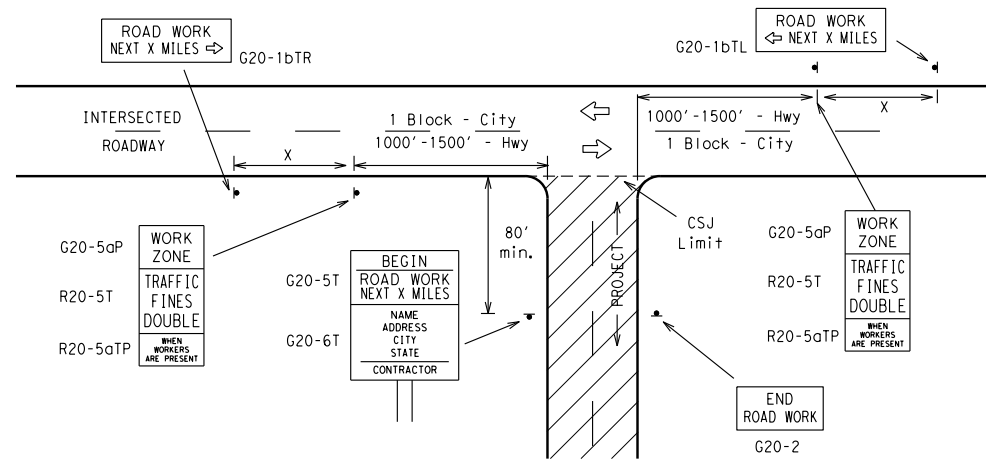
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**TYPICAL LOCATION OF CROSSROAD SIGNS**



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

**T-INTERSECTION**



**CSJ LIMITS AT T-INTERSECTION**

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

**TYPICAL CONSTRUCTION WARNING SIGN SIZE AND SPACING<sup>1,5,6</sup>**

Sign Number or Series	SIZE		SPACING	
	Conventional Road	Expressway/Freeway	Posted Speed MPH	Sign Δ Spacing "X" Feet (Apprx.)
CW20 <sup>4</sup>	48" x 48"	48" x 48"	30	120
CW21			35	160
CW22			40	240
CW23			45	320
CW25			50	400
CW1, CW2, CW7, CW8, CW9, CW11, CW14	36" x 36"	48" x 48"	55	500 <sup>2</sup>
CW3, CW4, CW5, CW6, CW8-3, CW10, CW12	48" x 48"	48" x 48"	60	600 <sup>2</sup>
			65	700 <sup>2</sup>
			70	800 <sup>2</sup>
			75	900 <sup>2</sup>
			80	1000 <sup>2</sup>
			*	* <sup>3</sup>

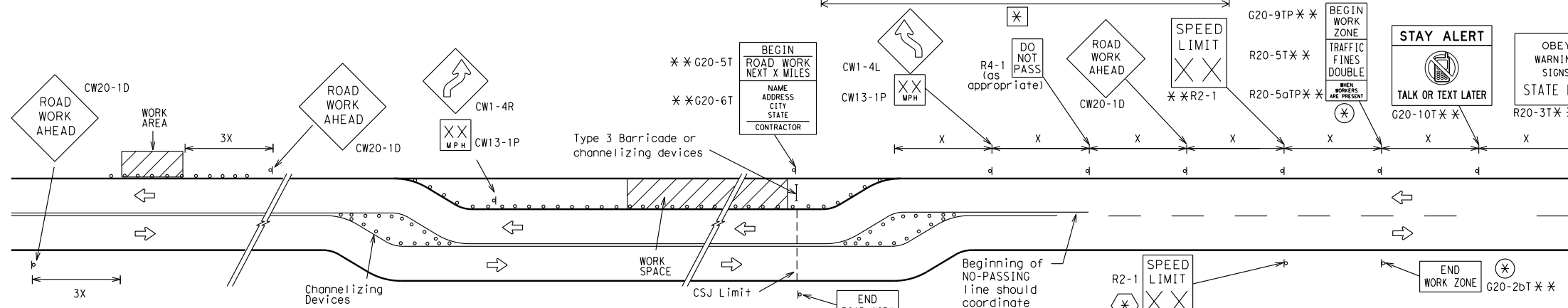
\* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

**GENERAL NOTES**

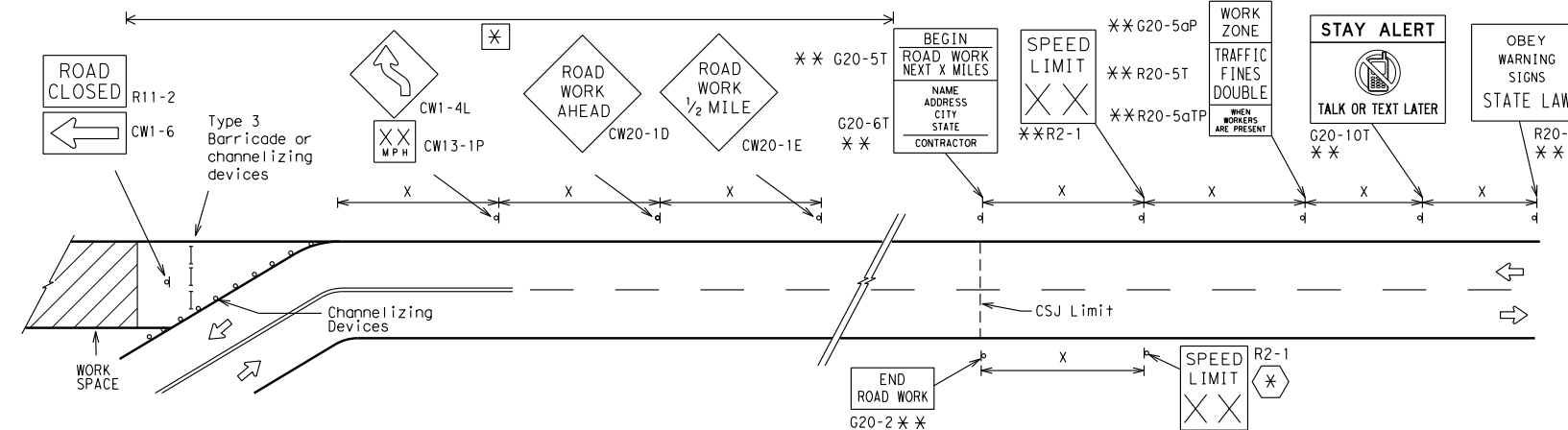
- Special or larger size signs may be used as necessary.
- Distance between signs should be increased as required to have 1500 feet advance warning.
- Distance between signs should be increased as required to have 1/2 mile or more advance warning.
- 36" x 36" "ROAD WORK AHEAD" (CW20-1D) signs may be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

**WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS**

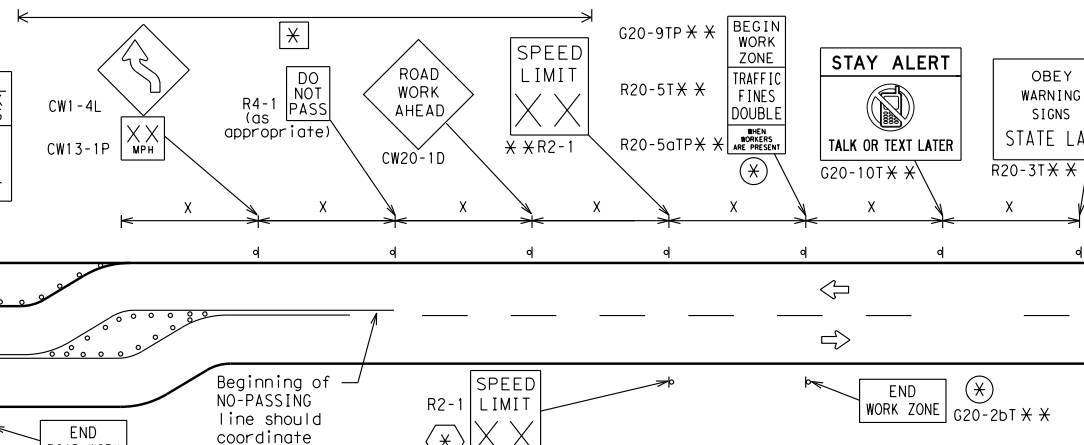


When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD" (CW20-1D) signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing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

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



**SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS**



**NOTES**

- The Contractor shall determine the appropriate distance to be placed on the G20-1 series signs and "BEGIN ROAD WORK NEXT X MILES" (G20-5T) sign for each specific project. This distance shall replace the "X" and shall be rounded to the nearest whole mile with the approval of the Engineer. No decimals shall be used.
- ⊗ The "BEGIN WORK ZONE" (G20-9TP) and "END WORK ZONE" (G20-2bT) shall be used as shown on the sample layout when advance signs are required outside the CSJ Limits. They inform the motorist of entering or leaving a part of the work zone lying outside the CSJ Limits where traffic fines may double if workers are present.
- \*\* Required CSJ Limit signing. See Note 10 on BC(1). TRAFFIC FINES DOUBLE signs will not be required on projects consisting solely of mobile operations work.
- ⊗ Area for placement of "ROAD WORK AHEAD" (CW20-1D) sign and other signs or devices as called for on the Traffic Control Plan.
- ⊗ Contractor will install a regulatory speed limit sign at the end of the work zone.

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

SHEET 2 OF 12



**BARRICADE AND CONSTRUCTION PROJECT LIMIT**

**BC(2)-14**

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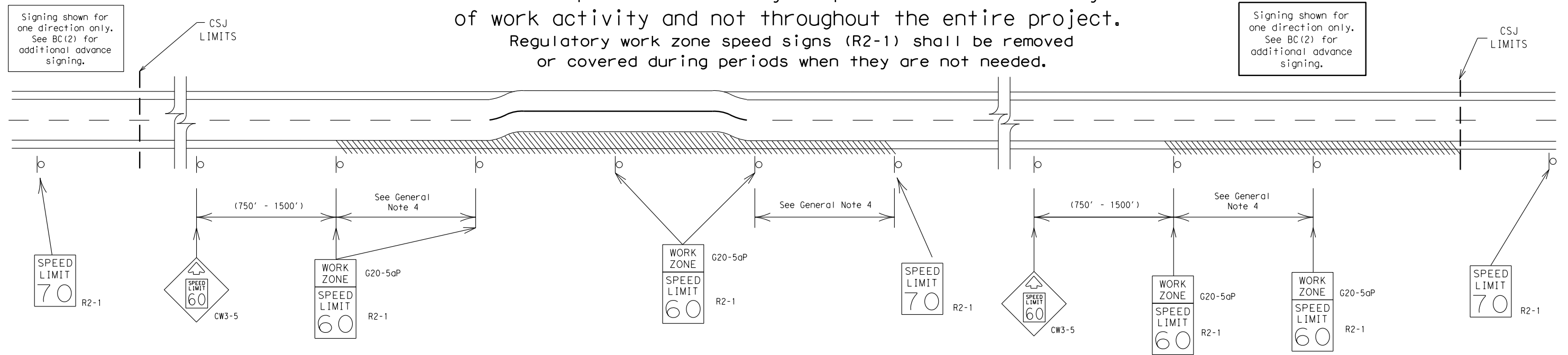
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# TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

Reduced speeds should only be posted in the vicinity of work activity and not throughout the entire project. Regulatory work zone speed signs (R2-1) shall be removed or covered during periods when they are not needed.



## GUIDANCE FOR USE:

### LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

- rough road or damaged pavement surface
- substantial alteration of roadway geometrics (diversions)
- construction detours
- grade
- width
- other conditions readily apparent to the driver

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

### SHORT TERM WORK ZONE SPEED LIMITS

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

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

## GENERAL NOTES

- Regulatory work zone speed limits should be used only for sections of construction projects where speed control is of major importance.
- Regulatory work zone speed limit signs shall be placed on supports at a 7 foot minimum mounting height.
- Speed zone signs are illustrated for one direction of travel and are normally posted for each direction of travel.
- Frequency of work zone speed limit signs should be:
 

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

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SHEET 3 OF 12



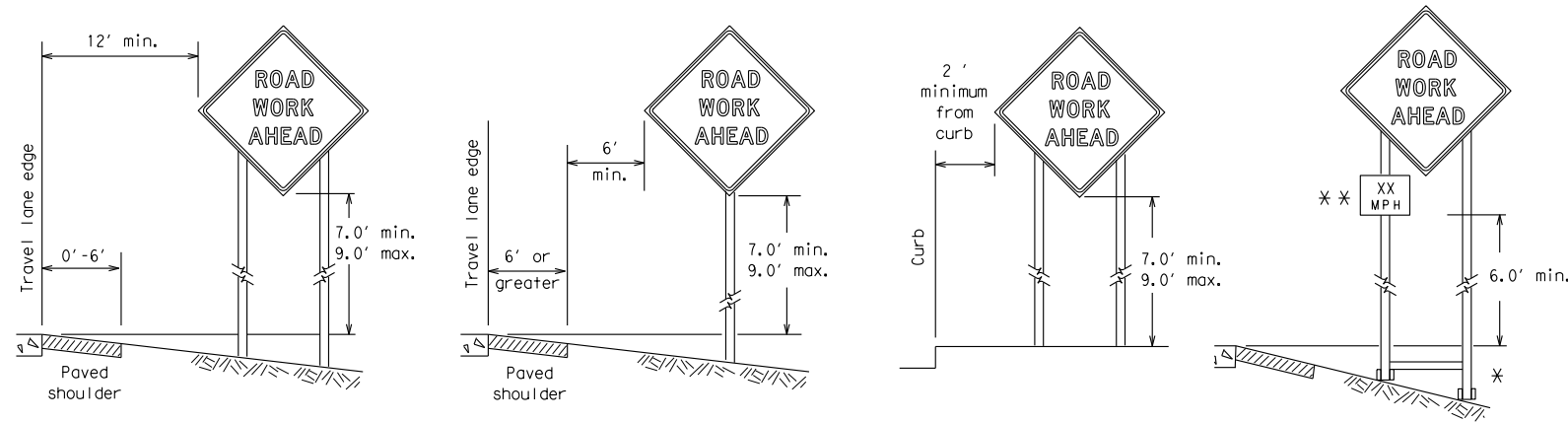
## BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC (3) - 14

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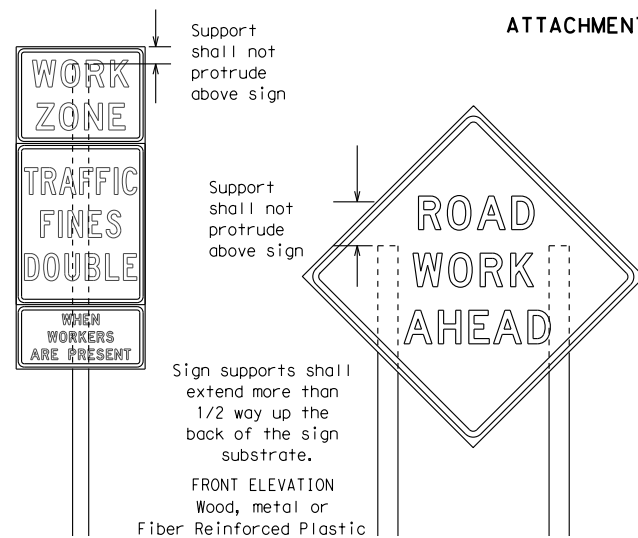
### TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



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

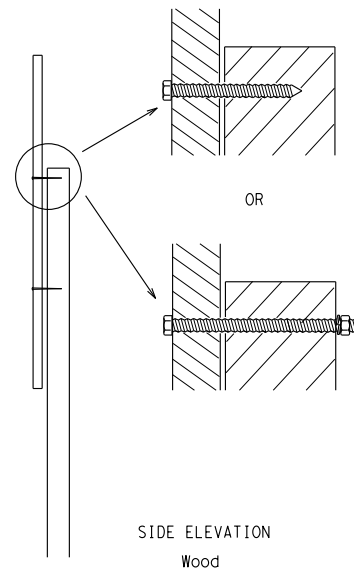
\*\* When plaques are placed on dual-leg supports, they should be attached to the upright nearest the travel lane. Supplemental plaques (advisory or distance) should not cover the surface of the parent sign.

### ATTACHMENT FOR SIGN SUPPORTS



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

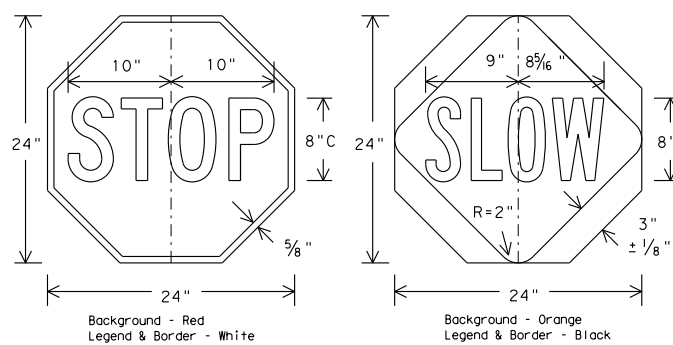
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports



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

### STOP/SLOW PADDLES

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



### CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

- Contractor shall install and maintain signs in a straight and plumb condition and/or as directed by the Engineer.
  - Wooden sign posts shall be painted white.
  - Barricades shall NOT be used as sign supports.
  - All signs shall be installed in accordance with the plans or as directed by the Engineer. Signs shall be used to regulate, warn, and guide the traveling public safely through the work zone.
  - The Contractor may furnish either the sign design shown in the plans or in the "Standard Highway Sign Designs for Texas" (SHSD). The Engineer/Inspector may require the Contractor to furnish other work zone signs that are shown in the TMUTCD but may have been omitted from the plans. Any variation in the plans shall be documented by written agreement between the Engineer and the Contractor's Responsible Person. All changes must be documented in writing before being implemented. This can include documenting the changes in the Inspector's TxDOT diary and having both the Inspector and Contractor initial and date the agreed upon changes.
  - The Contractor shall furnish sign supports listed in the "Compliant Work Zone Traffic Control Device List" (CWZTCD). The Contractor shall install the sign support in accordance with the manufacturer's recommendations. If there is a question regarding installation procedures, the Contractor shall furnish the Engineer a copy of the manufacturer's installation recommendations so the Engineer can verify the correct procedures are being followed.
  - The Contractor is responsible for installing signs on approved supports and replacing signs with damaged or cracked substrates and/or damaged or marred reflective sheeting as directed by the Engineer/Inspector.
  - Identification markings may be shown only on the back of the sign substrate. The maximum height of letters and/or company logos used for identification shall be 1 inch.
  - The Contractor shall replace damaged wood posts. New or damaged wood sign posts shall not be spliced.
- DURATION OF WORK (as defined by the "Texas Manual on Uniform Traffic Control Devices" Part 6)**
- The types of sign supports, sign mounting height, the size of signs, and the type of sign substrates can vary based on the type of work being performed. The Engineer is responsible for selecting the appropriate size sign for the type of work being performed. The Contractor is responsible for ensuring the sign support, sign mounting height and substrate meets manufacturer's recommendations in regard to crashworthiness and duration of work requirements.
    - Long-term stationary - work that occupies a location more than 3 days.
    - Intermediate-term stationary - work that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than one hour.
    - Short-term stationary - daytime work that occupies a location for more than 1 hour in a single daylight period.
    - Short, duration - work that occupies a location up to 1 hour.
    - Mobile - work that moves continuously or intermittently (stopping for up to approximately 15 minutes.)

### SIGN MOUNTING HEIGHT

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

### SIZE OF SIGNS

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

### SIGN SUBSTRATES

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

### REFLECTIVE SHEETING

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

### SIGN LETTERS

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

### REMOVING OR COVERING

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

### SIGN SUPPORT WEIGHTS

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

### FLAGS ON SIGNS

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

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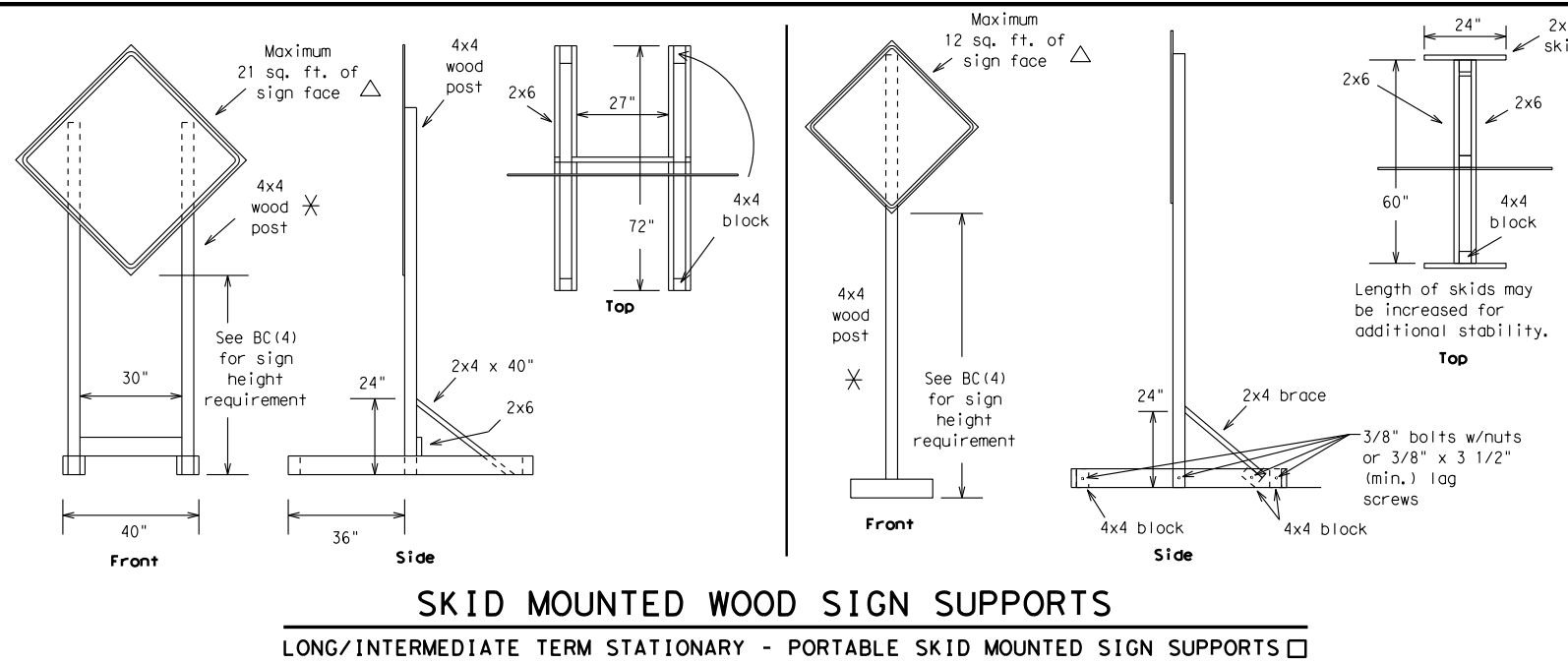
Traffic Operations Division Standard

## BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

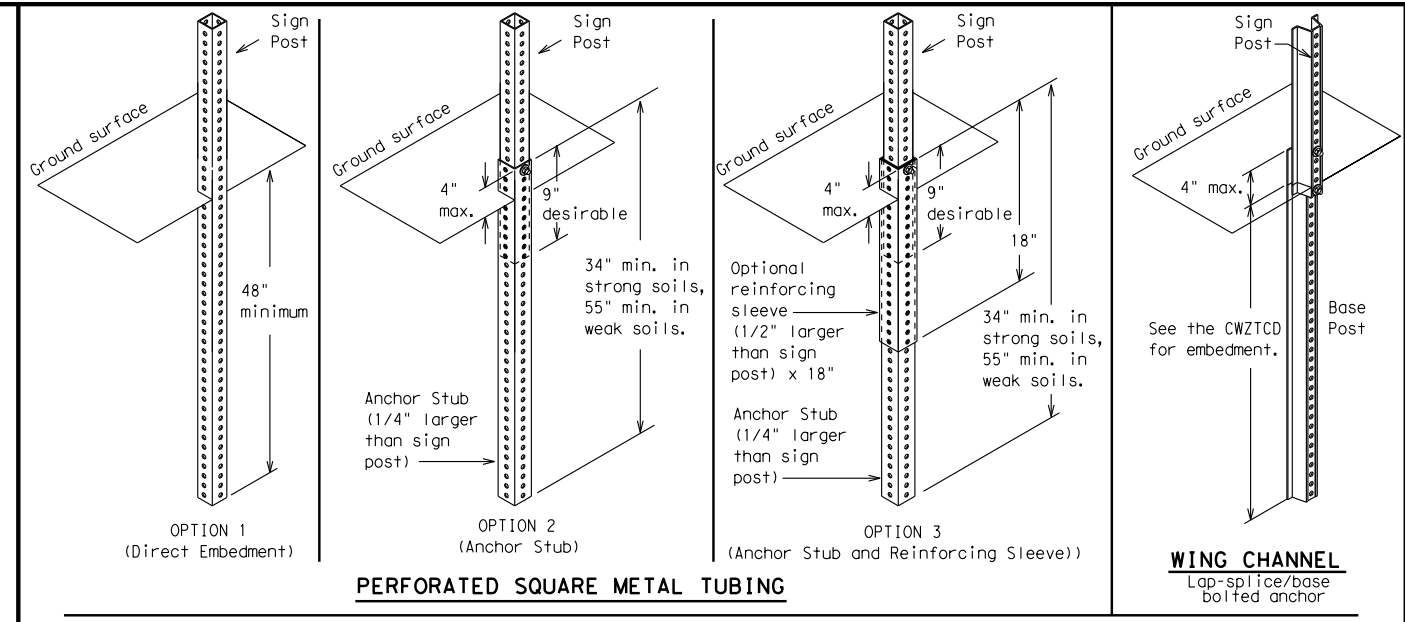
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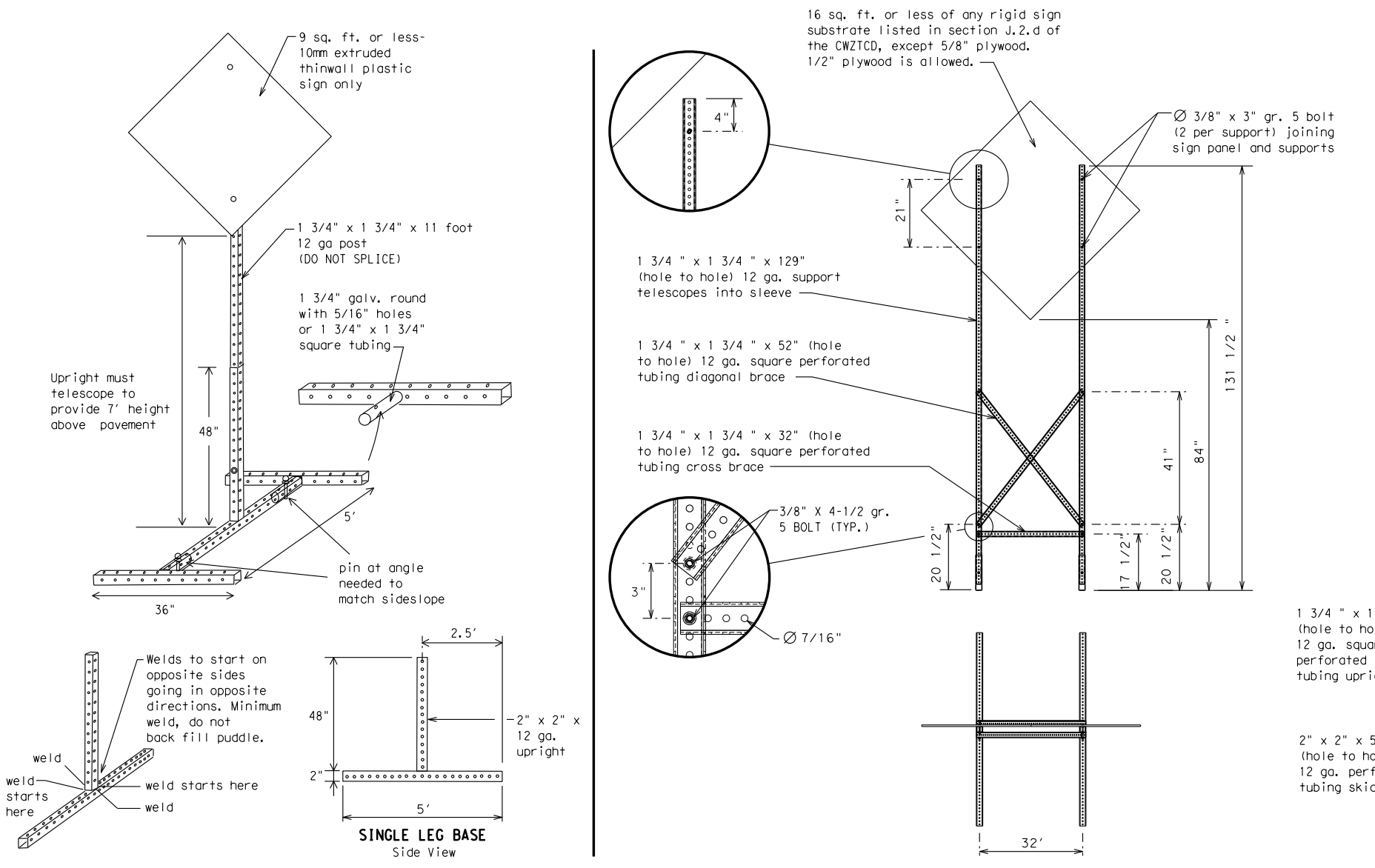
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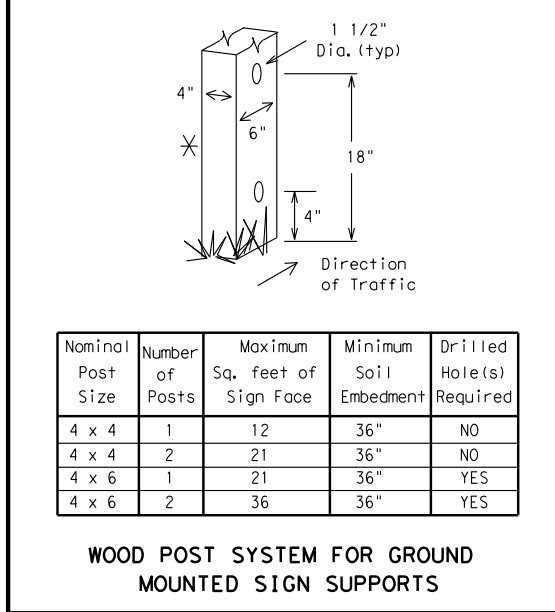
**SKID MOUNTED WOOD SIGN SUPPORTS**  
LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS □



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



**SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS**



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

**WOOD POST SYSTEM FOR GROUND MOUNTED SIGN SUPPORTS**

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

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

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

- See BC(4) for definition of "Work Duration."
- ✕ Wood sign posts MUST be one piece. Splicing will NOT be allowed. Posts shall be painted white.
- △ See the CWZTCD for the type of sign substrate that can be used for each approved sign support.

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**BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT**

BC(5) - 14

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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

# RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

## PORTABLE CHANGEABLE MESSAGE SIGNS

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

## Phase 1: Condition Lists

### Road/Lane/Ramp Closure List

FREEWAY CLOSED X MILE
ROAD CLOSED AT SH XXX
ROAD CLSD AT FM XXXX
RIGHT X LANES CLOSED
CENTER LANE CLOSED
NIGHT LANE CLOSURES
VARIOUS LANES CLOSED
EXIT CLOSED
MALL DRIVEWAY CLOSED
XXXXXXXX BLVD CLOSED

### Other Condition List

FRONTAGE ROAD CLOSED
SHOULDER CLOSED XXX FT
RIGHT LN CLOSED XXX FT
RIGHT X LANES OPEN
DAYTIME LANE CLOSURES
I-XX SOUTH EXIT CLOSED
EXIT XXX CLOSED X MILE
RIGHT LN TO BE CLOSED
X LANES CLOSED TUE - FRI

ROADWORK XXX FT
FLAGGER XXXX FT
RIGHT LN NARROWS XXXX FT
MERGING TRAFFIC XXXX FT
LOOSE GRAVEL XXXX FT
DETOUR X MILE
ROADWORK PAST SH XXXX
BUMP XXXX FT
TRAFFIC SIGNAL XXXX FT

ROAD REPAIRS XXXX FT
LANE NARROWS XXXX FT
TWO-WAY TRAFFIC XX MILE
CONST TRAFFIC XXX FT
UNEVEN LANES XXXX FT
ROUGH ROAD XXXX FT
ROADWORK NEXT FRI-SUN
US XXX EXIT X MILES
LANES SHIFT *

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

## Phase 2: Possible Component Lists

### Action to Take/Effect on Travel List

MERGE RIGHT
DETOUR NEXT X EXITS
USE EXIT XXX
STAY ON US XXX SOUTH
TRUCKS USE US XXX N
WATCH FOR TRUCKS
EXPECT DELAYS
REDUCE SPEED XXX FT
USE OTHER ROUTES
STAY IN LANE *

### Location List

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

### Warning List

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

### \*\* Advance Notice List

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

\*\* See Application Guidelines Note 6.

## APPLICATION GUIDELINES

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

## WORDING ALTERNATIVES

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

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

## FULL MATRIX PCMS SIGNS

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

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DATE: FILE:

WORD OR PHRASE	ABBREVIATION	WORD OR PHRASE	ABBREVIATION
Access Road	ACCS RD	Major	MAJ
Alternate	ALT	Miles	MI
Avenue	AVE	Miles Per Hour	MPH
Best Route	BEST RTE	Minor	MNR
Boulevard	BLVD	Monday	MON
Bridge	BRDG	Normal	NORM
Canal	CANT	North	N
Center	CTR	Northbound	(route) N
Construction Ahead	CONST AHD	Parking	PKING
CROSSING	XING	Road	RD
Detour Route	DETOUR RTE	Right Lane	RT LN
Do Not	DONT	Saturday	SAT
East	E	Service Road	SERV RD
Eastbound	(route) E	Shoulder	SHLDR
Emergency	EMER	Slippery	SLIP
Emergency Vehicle	EMER VEH	South	S
Entrance, Enter	ENT	Southbound	(route) S
Express Lane	EXP LN	Speed	SPD
Expressway	EXPWY	Street	ST
XXXX Feet	XXXX FT	Sunday	SUN
Fog Ahead	FOG AHD	Telephone	PHONE
Freeway	FRWY, FWY	Temporary	TEMP
Freeway Blocked	FWY BLKD	Thursday	THURS
Friday	FRI	To Downtown	TO DWNTN
Hazardous Driving	HAZ DRIVING	Traffic	TRAF
Hazardous Material	HAZMAT	Travelers	TRVLR
High-Occupancy Vehicle	HOV	Tuesday	TUES
Highway	Hwy	Time Minutes	TIME MIN
Hour(s)	HR, HRS	Upper Level	UPR LEVEL
Information	INFO	Vehicles (s)	VEH, VEHS
It Is	ITS	Warning	WARN
Junction	JCT	Wednesday	WED
Left	LFT	Weight Limit	WT LIMIT
Left Lane	LFT LN	West	W
Lane Closed	LN CLOSED	Westbound	(route) W
Lower Level	LWR LEVEL	Wet Pavement	WET PVMT
Maintenance	MAINT	Will Not	WONT

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



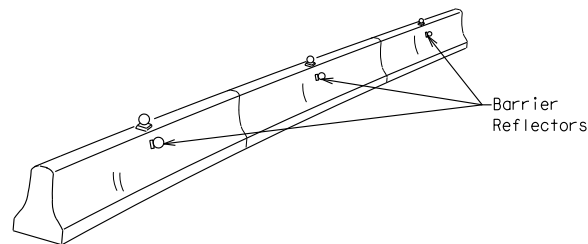
## BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC (6) - 14

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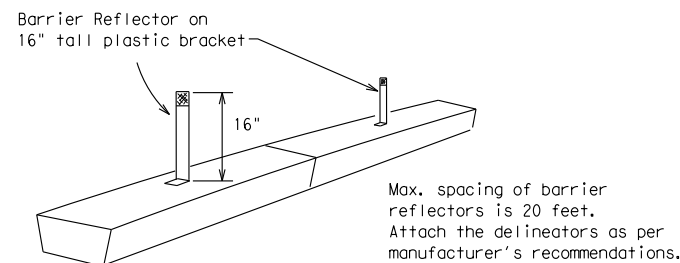
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- Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
- Color of Barrier Reflectors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

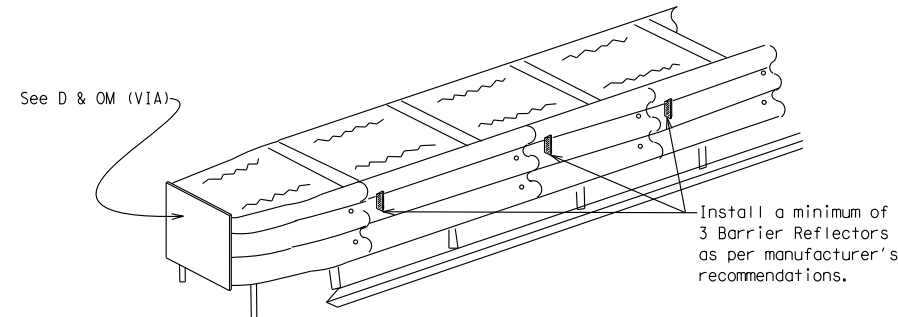


**CONCRETE TRAFFIC BARRIER (CTB)**

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



**LOW PROFILE CONCRETE BARRIER (LPCB)**



**DELINEATION OF END TREATMENTS**

**END TREATMENTS FOR CTB'S USED IN WORK ZONES**  
 End treatments used on CTB's in work zones shall meet crashworthy standards as defined in the National Cooperative Highway Research Report 350. Refer to the CWZTCD List for approved end treatments and manufacturers.

**BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS**

**WARNING LIGHTS**

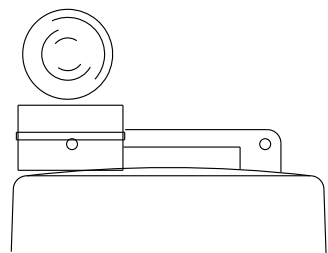
- Warning lights shall meet the requirements of the TMUTCD.
- Warning lights shall NOT be installed on barricades.
- Type A-Low Intensity Flashing Warning Lights are commonly used with drums. They are intended to warn of or mark a potentially hazardous area. Their use shall be as indicated on this sheet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

**WARNING LIGHTS MOUNTED ON PLASTIC DRUMS**

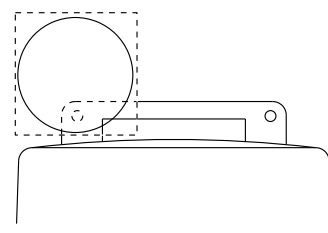
- Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
- Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
- A series of sequential flashing warning lights placed on channelizing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

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

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



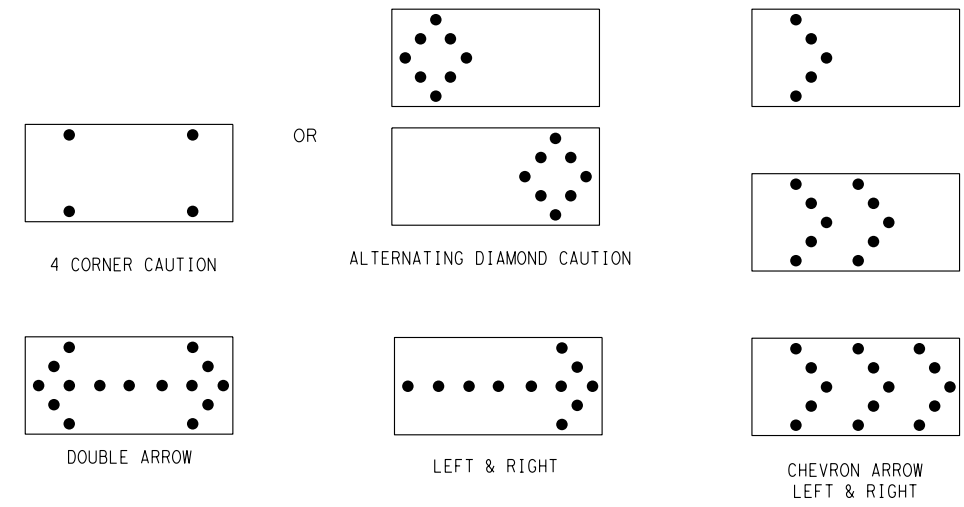
Type C Warning Light or approved substitute mounted on a drum adjacent to the travel way.



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

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

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



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

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

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

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

**FLASHING ARROW BOARDS**

SHEET 7 OF 12

**TRUCK-MOUNTED ATTENUATORS**

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



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

**BC (7) - 14**

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**GENERAL NOTES**

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

**GENERAL DESIGN REQUIREMENTS**

Pre-qualified plastic drums shall meet the following requirements:

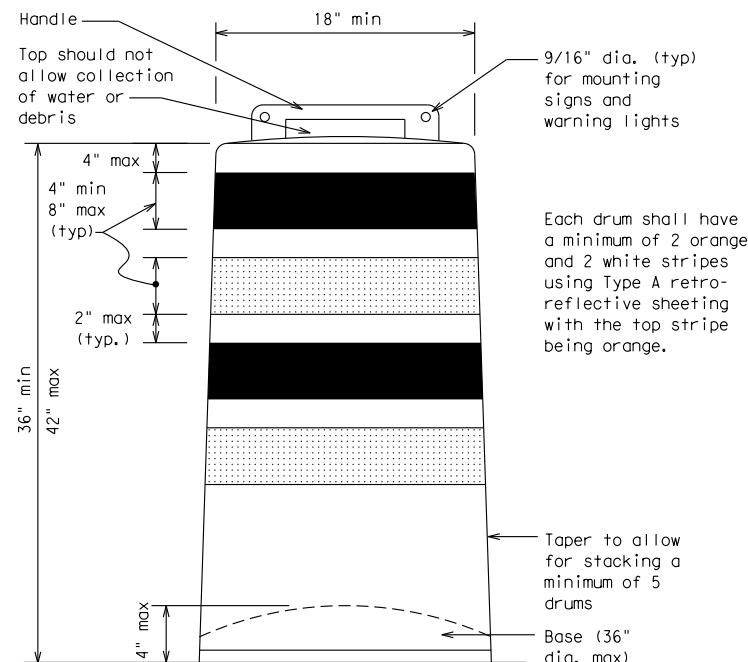
- Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
- The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

**RETROREFLECTIVE SHEETING**

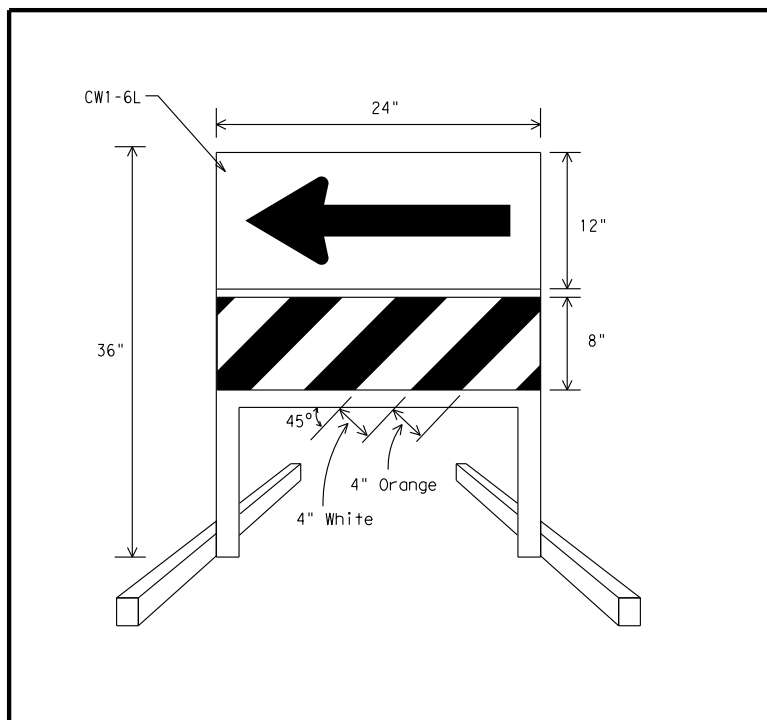
- The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A reflective sheeting shall be supplied unless otherwise specified in the plans.
- The sheeting shall be suitable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

**BALLAST**

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

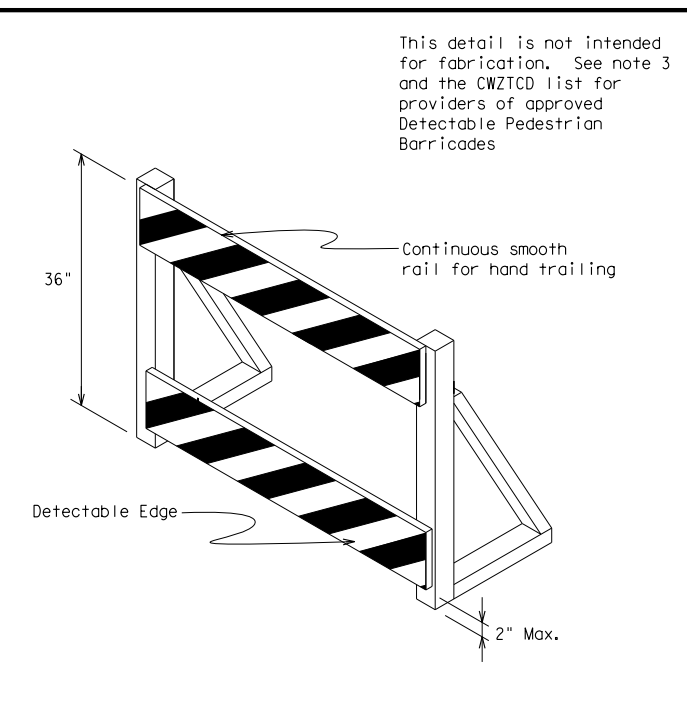


Each drum shall have a minimum of 2 orange and 2 white stripes using Type A retro-reflective sheeting with the top stripe being orange.



**DIRECTION INDICATOR BARRICADE**

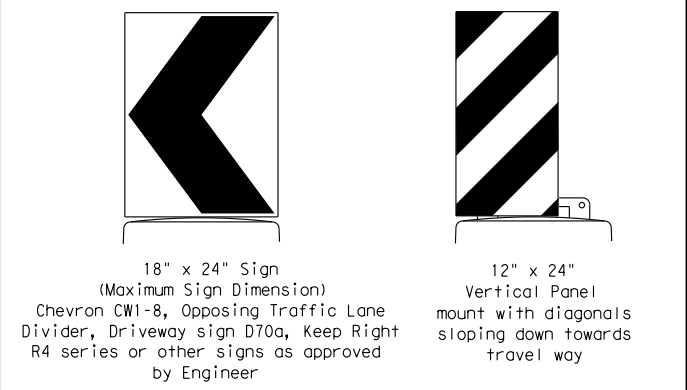
- The Direction Indicator Barricade may be used in tapers, transitions, and other areas where specific directional guidance to drivers is necessary.
- If used, the Direction Indicator Barricade should be used in series to direct the driver through the transition and into the intended travel lane.
- The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



**DETECTABLE PEDESTRIAN BARRICADES**

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

This detail is not intended for fabrication. See note 3 and the CWZTCD list for providers of approved Detectable Pedestrian Barricades



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

**SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS**

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

SHEET 8 OF 12



**BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES**

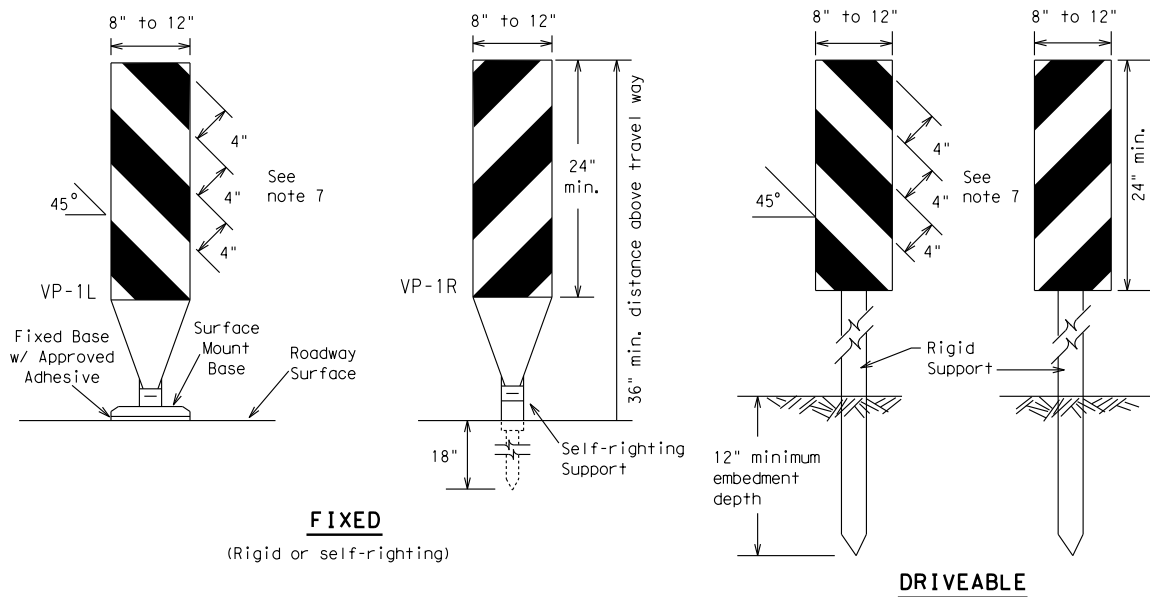
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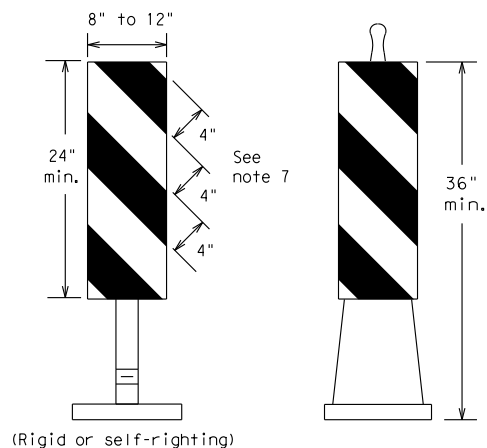


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**FIXED**  
(Rigid or self-righting)

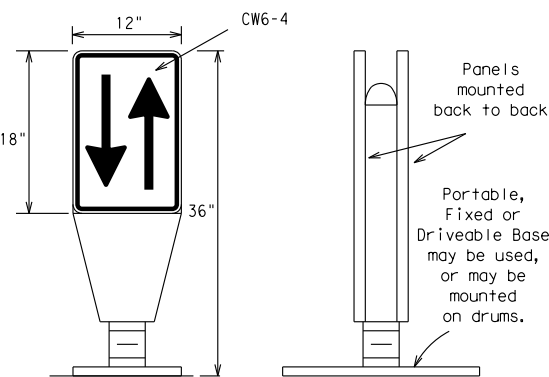
**DRIVEABLE**



**PORTABLE**

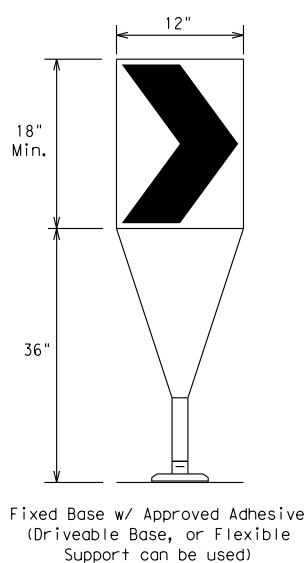
**VERTICAL PANELS (VPs)**

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



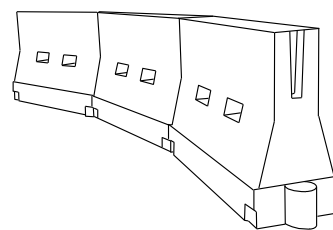
**OPPOSING TRAFFIC LANE DIVIDERS (OTLD)**

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



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

**CHEVRONS**



**LONGITUDINAL CHANNELIZING DEVICES (LCD)**

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

**WATER BALLASTED SYSTEMS USED AS BARRIERS**

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

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

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

**GENERAL NOTES**

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

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

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

**SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS**

SHEET 9 OF 12



**BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES**

BC (9) - 14

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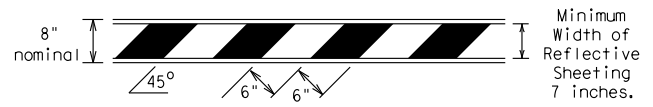
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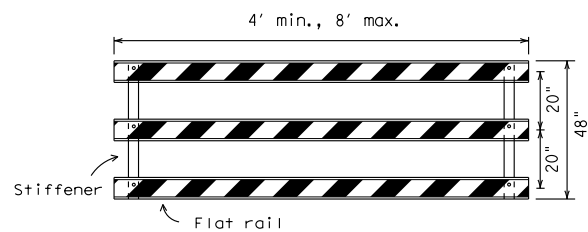
**TYPE 3 BARRICADES**

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

Barricades shall NOT be used as a sign support.

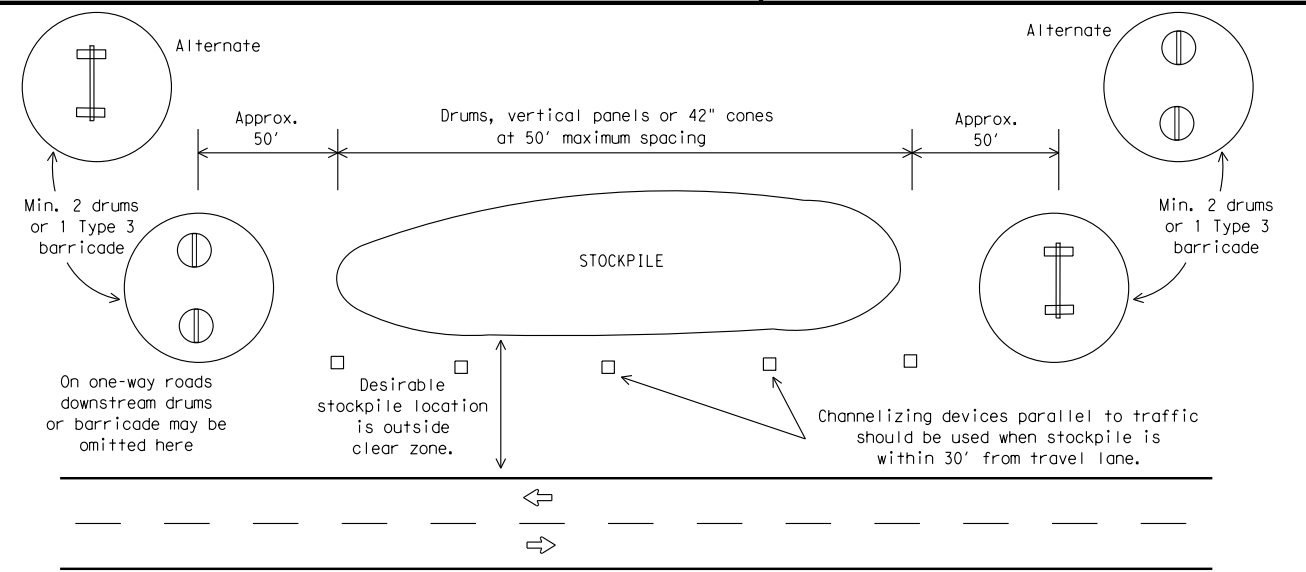


**TYPICAL STRIPING DETAIL FOR BARRICADE RAIL**



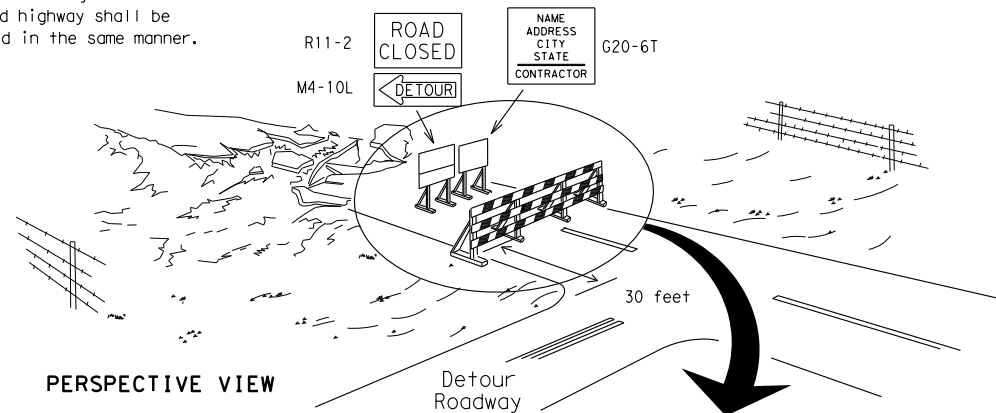
Stiffener may be inside or outside of support, but no more than 2 stiffeners shall be allowed on one barricade.

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



**TRAFFIC CONTROL FOR MATERIAL STOCKPILES**

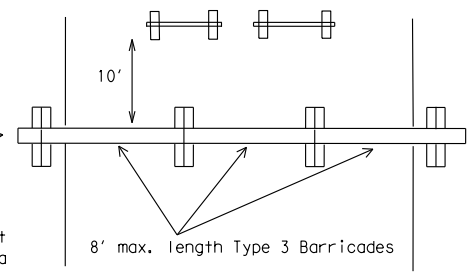
Each roadway of a divided highway shall be barricaded in the same manner.



PERSPECTIVE VIEW

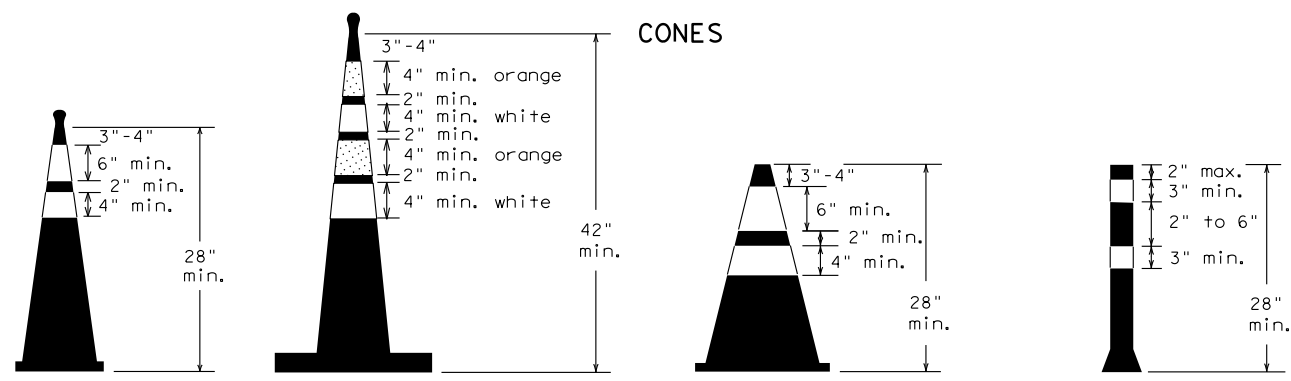
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic. Barricade striping should slant downward in the direction of detour.

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.



PLAN VIEW

**TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION**



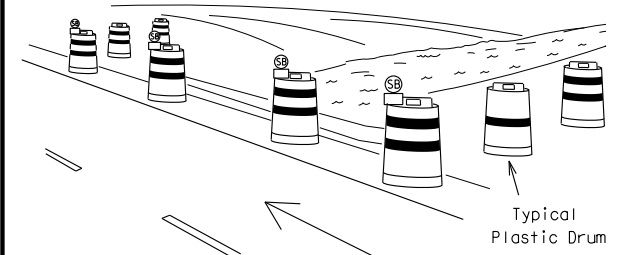
Two-Piece cones

One-Piece cones

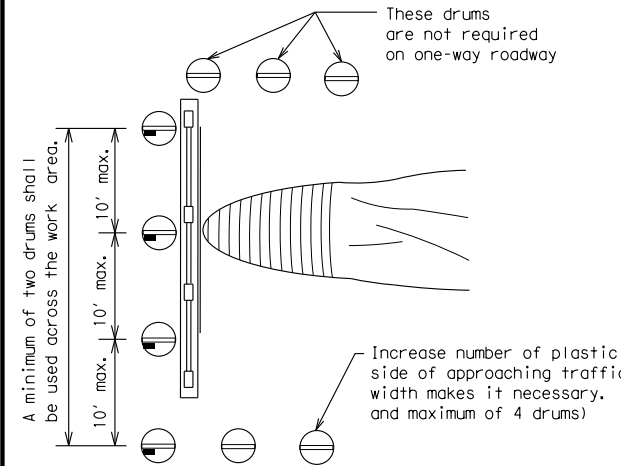
Tubular Marker

28" Cones shall have a minimum weight of 9 1/2 lbs.  
42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

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



PERSPECTIVE VIEW



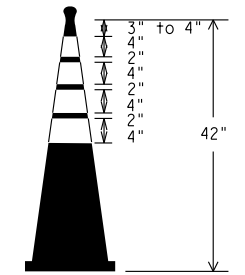
PLAN VIEW

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

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

**CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS**

THIS DEVICE SHALL NOT BE USED ON PROJECTS LET AFTER MARCH 2014.



EDGE LINE CHANNELIZER

1. This device is intended only for use in place of a vertical panel to channelize traffic by indicating the edge of the travel lane. It is not intended to be used in transitions or tapers.
2. This device shall not be used to separate lanes of traffic (opposing or otherwise) or warn of objects.
3. This device is based on a 42 inch, two-piece cone with an alternate striping pattern: four 4 inch retroreflective bands, with an approximate 2 inch gap between bands. The color of the band should correspond to the color of the edgeline (yellow for left edgeline, white for right edgeline) for which the device is substituted or for which it supplements. The reflectorized bands shall be retroreflective Type A conforming to Departmental Material Specification DMS-8300, unless otherwise noted.
4. The base must weigh a minimum of 30 lbs.

**BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES**

**BC (10) - 14**

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## WORK ZONE PAVEMENT MARKINGS

### GENERAL

- 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.
- Color, patterns and dimensions shall be in conformance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
- Additional supplemental pavement marking details may be found in the plans or specifications.
- Pavement markings shall be installed in accordance with the TMUTCD and as shown on the plans.
- 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).
- 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.
- All work zone pavement markings shall be installed in accordance with Item 662, "Work Zone Pavement Markings."

### RAISED PAVEMENT MARKERS

- Raised pavement markers are to be placed according to the patterns on BC(12).
- 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

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

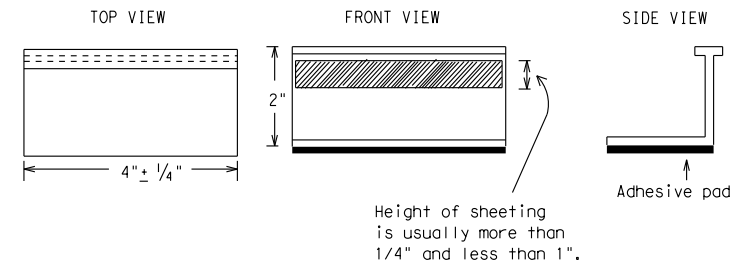
### MAINTAINING WORK ZONE PAVEMENT MARKINGS

- The Contractor will be responsible for maintaining work zone pavement markings within the work limits.
- 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.
- 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.
- 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

- 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.
- 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.
- 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".
- The removal of pavement markings may require resurfacing or seal coating portions of the roadway as described in Item 677.
- Subject to the approval of the Engineer, any method that proves to be successful on a particular type pavement may be used.
- Blast cleaning may be used but will not be required unless specifically shown in the plans.
- Over-painting of the markings SHALL NOT BE permitted.
- Removal of raised pavement markers shall be as directed by the Engineer.
- 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.
- 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**

- Temporary flexible-reflective roadway marker tabs used as guidemarks shall meet the requirements of DMS-8242.
- 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.
  - 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.
  - 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.
- Small design variances may be noted between tab manufacturers.
- 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

- Raised pavement markers used as guidemarks shall be from the approved product list, and meet the requirements of DMS-4200.
- All temporary construction raised pavement markers provided on a project shall be of the same manufacturer.
- 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).

SHEET 11 OF 12



## BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

**BC(11) - 14**

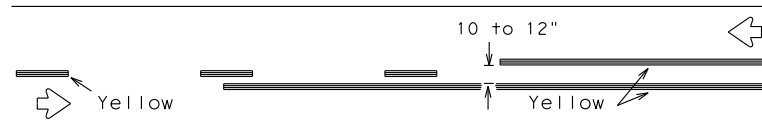
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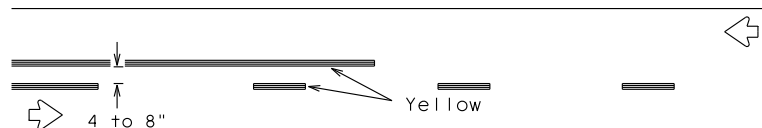
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## PAVEMENT MARKING PATTERNS

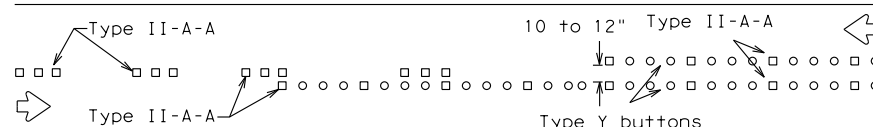


REFLECTORIZED PAVEMENT MARKINGS - PATTERN A

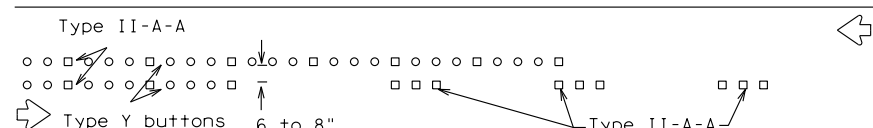


REFLECTORIZED PAVEMENT MARKINGS - PATTERN B

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

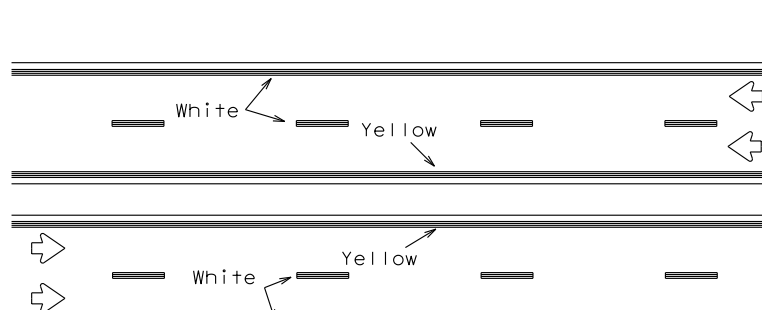


RAISED PAVEMENT MARKERS - PATTERN A



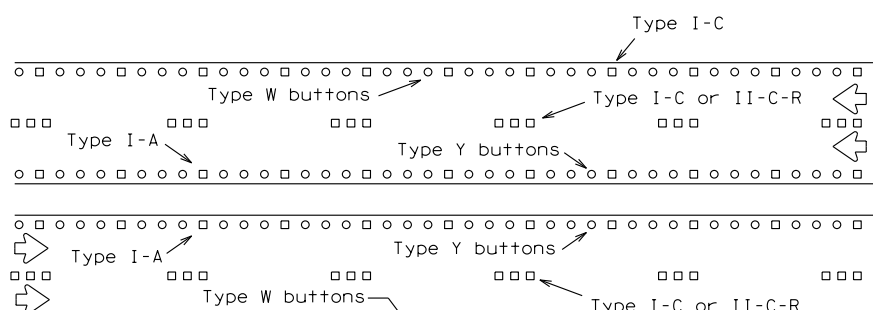
RAISED PAVEMENT MARKERS - PATTERN B

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



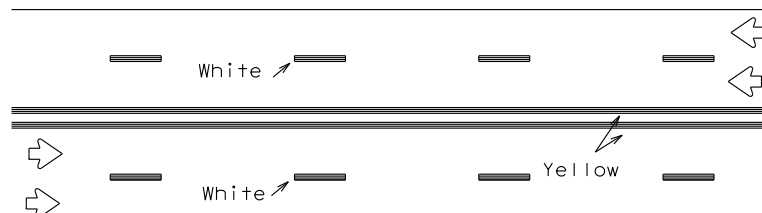
REFLECTORIZED PAVEMENT MARKINGS

Prefabricated markings may be substituted for reflectORIZED pavement markings.



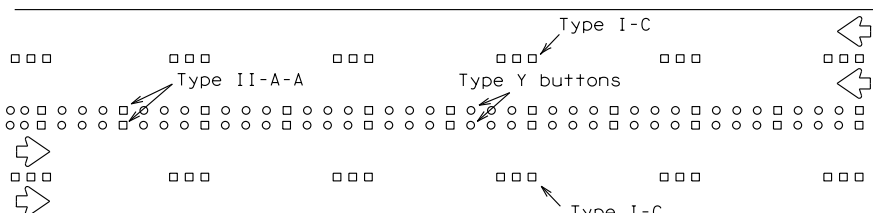
RAISED PAVEMENT MARKERS

## EDGE & LANE LINES FOR DIVIDED HIGHWAY



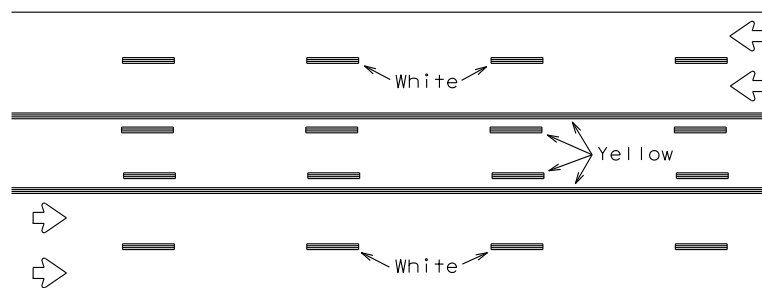
REFLECTORIZED PAVEMENT MARKINGS

Prefabricated markings may be substituted for reflectORIZED pavement markings.



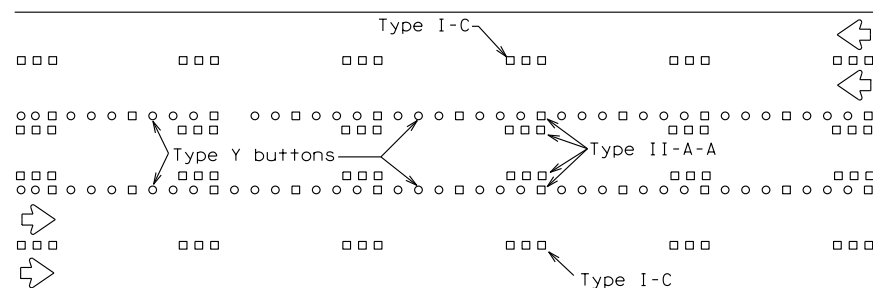
RAISED PAVEMENT MARKERS

## LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS

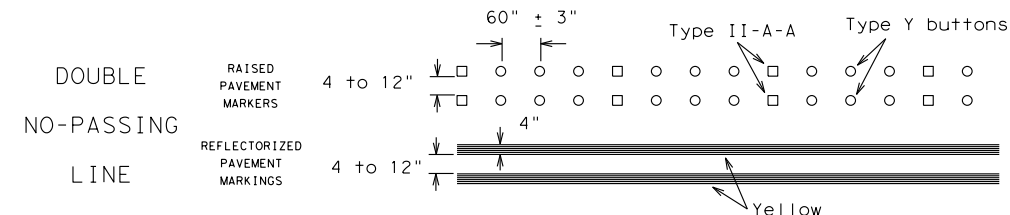
Prefabricated markings may be substituted for reflectORIZED pavement markings.



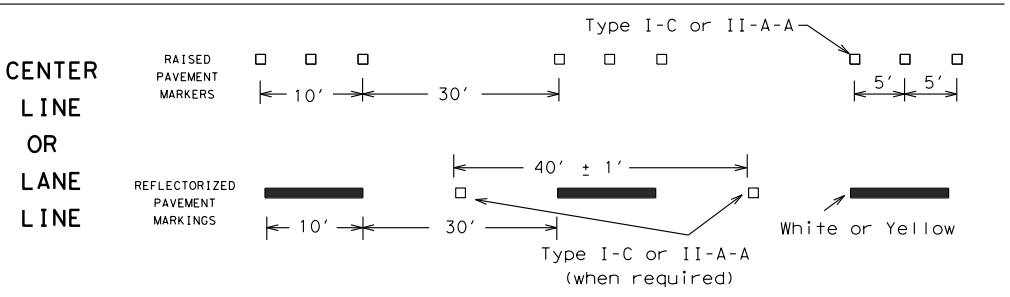
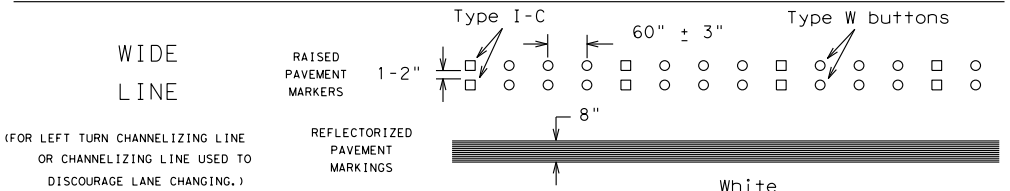
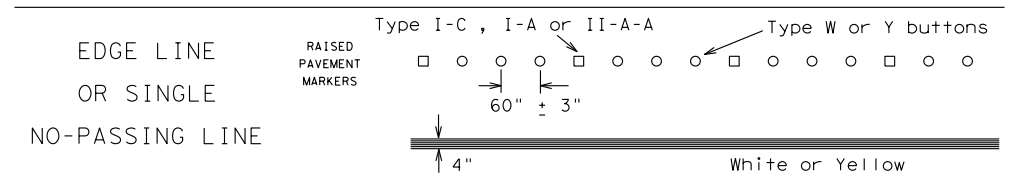
RAISED PAVEMENT MARKERS

## TWO-WAY LEFT TURN LANE

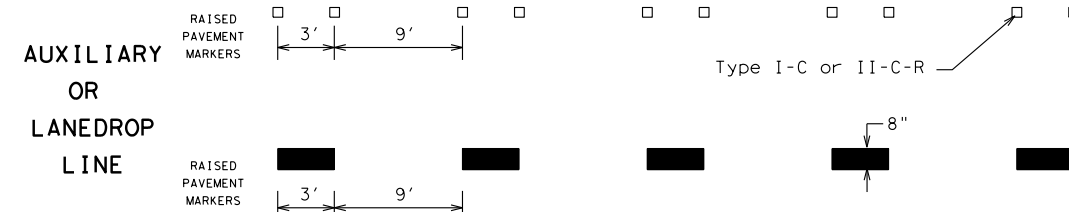
## STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS



### SOLID LINES

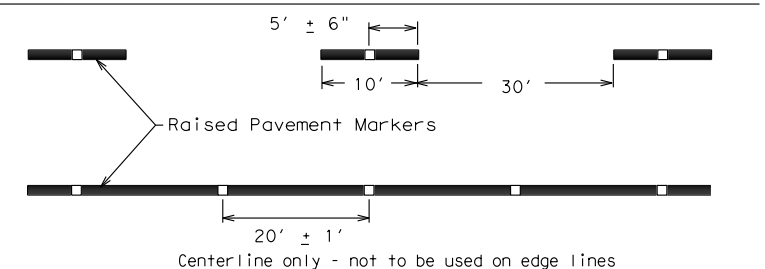


### BROKEN LINES



### REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

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



SHEET 12 OF 12



## BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC (12) - 14

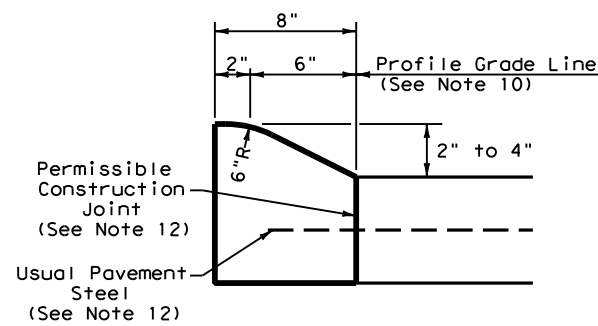
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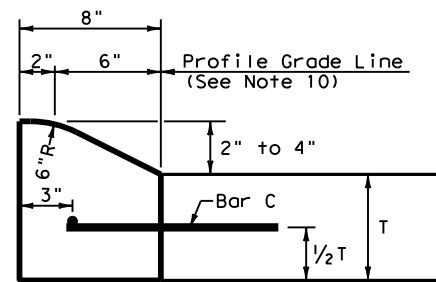
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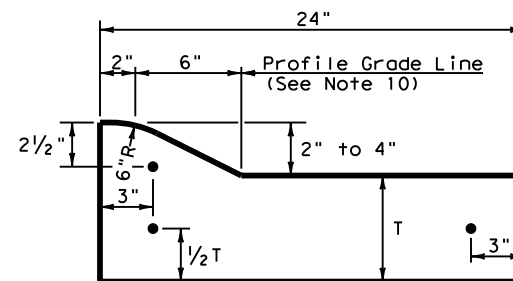
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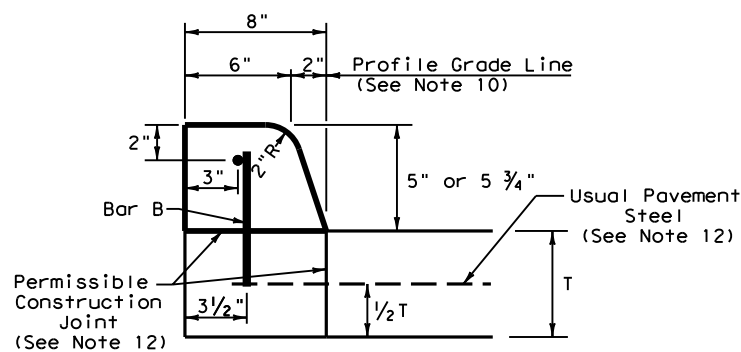
**TYPE I CURB (MONOLITHIC)**  
2" - 4" HEIGHT



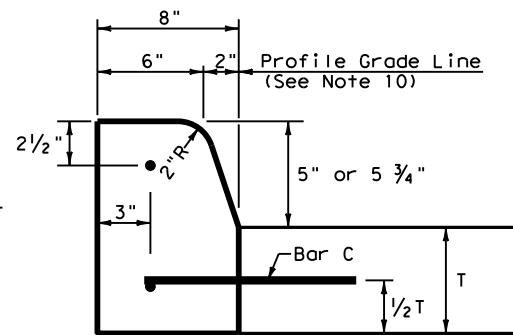
**TYPE I CURB**  
2" - 4" HEIGHT



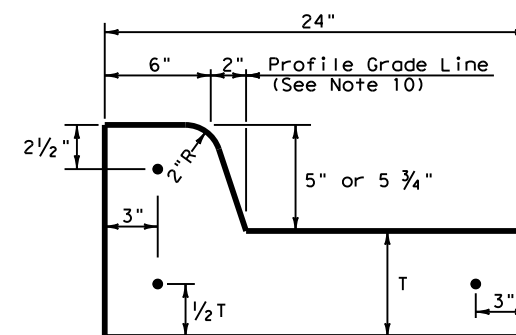
**TYPE I CURB AND GUTTER**  
2" - 4" HEIGHT



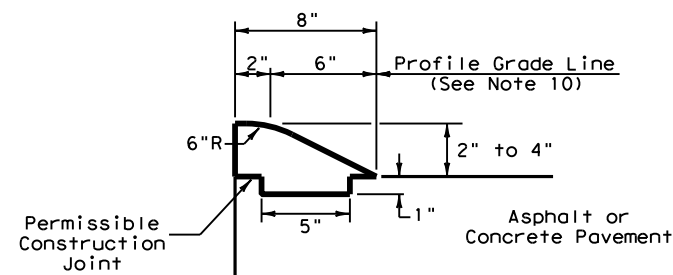
**TYPE II CURB (MONOLITHIC)**  
5" - 5 3/4" HEIGHT



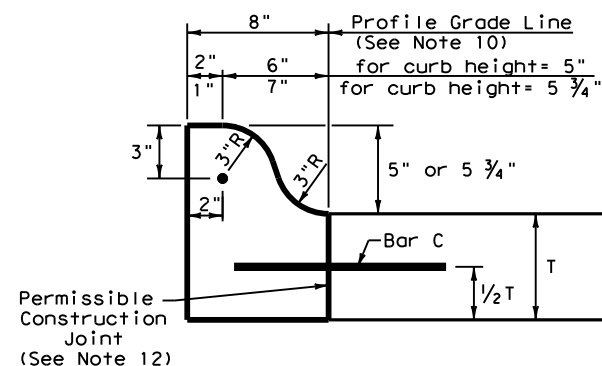
**TYPE II CURB**  
5" - 5 3/4" HEIGHT



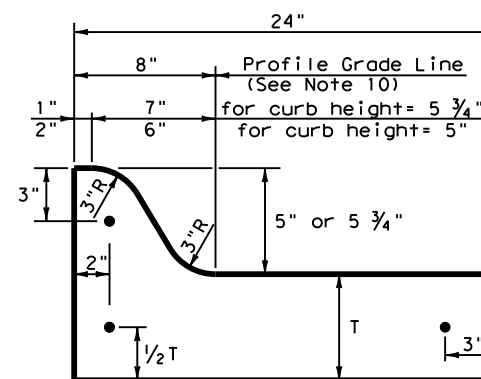
**TYPE II CURB AND GUTTER**  
5" - 5 3/4" HEIGHT



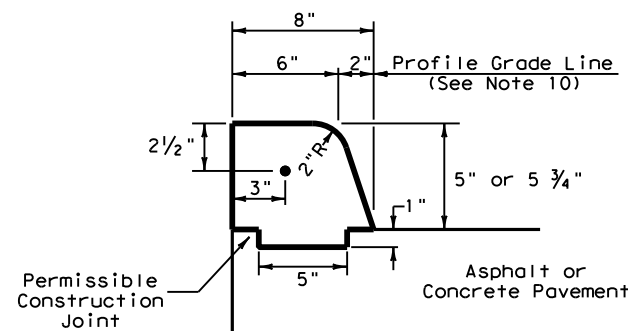
**TYPE III CURB (KEYED)**  
2" - 4" HEIGHT



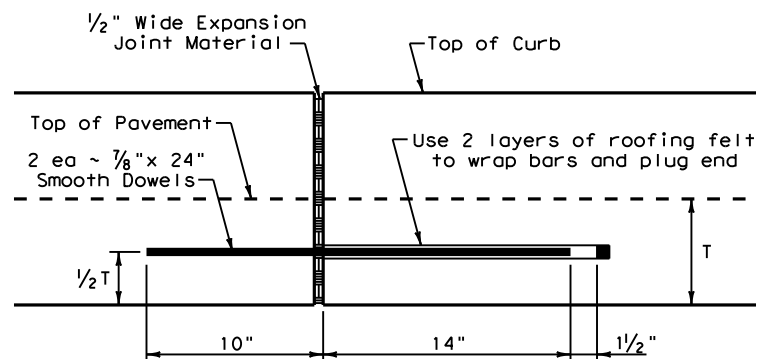
**TYPE IIa CURB**  
5" - 5 3/4" HEIGHT



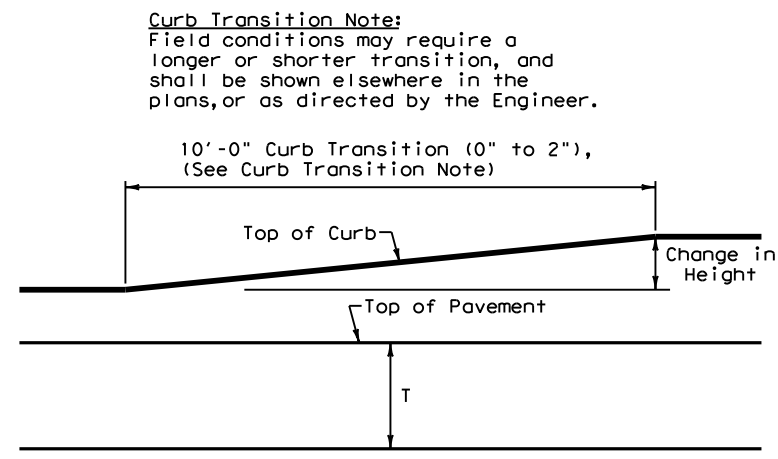
**TYPE IIa CURB AND GUTTER**  
5" - 5 3/4" HEIGHT



**TYPE IV CURB (KEYED)**  
5" - 5 3/4" HEIGHT



**EXPANSION JOINT DETAIL**

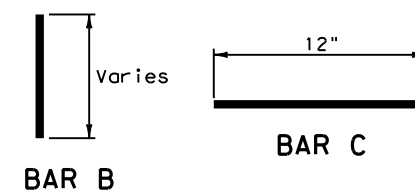


**CURB TRANSITION**

Note: To be paid for as Highest Curb

**General Notes**

1. All materials and construction shall be in accordance with Item 529, "Concrete Curb, Gutter, and Combined Curb and Gutter."
2. Concrete shall be Class A.
3. When reinforcing bars are used, they shall be No.4 unless otherwise shown. The use of synthetic fiber in lieu of steel reinforcing is acceptable, provided the fiber producer is on the Department Producer List (MPL), maintained by TxDOT, Construction Division.
4. Round exposed sharp edges with a rounding tool, to a minimum radius of 1/4 inch.
5. All existing curbs and driveways to be removed shall be sawed or removed at existing joints.
6. Where concrete curb is placed on existing concrete pavement, the pavement shall be drilled and the reinforcing bars grouted in place.
7. Expansion and contraction joints shall be constructed to match pavement joints in all curbs and curb and gutter adjacent to jointed concrete pavement. Where placement of curb or curb and gutter is not adjacent to concrete pavement, expansion joints shall be provided at structures, curb returns at streets, and at locations directed by The Engineer.
8. Vertical and horizontal dowel bars and transverse reinforcing bars shall be placed at four feet C-C.
9. Dimension 'T' shown is the thickness of concrete pavement. When curb is installed adjacent to flexible pavement dimension 'T' is 8" maximum.
10. Usual profile grade line. Refer to typical sections and plan-profile sheets for exact locations.
11. One-half inch expansion joint material shall be provided where curb or curb and gutter is adjacent to sidewalk or riprap.
12. When vertical permissible construction joints are used, resulting in a longitudinal construction joint in the pavement, the longitudinal pavement steel shall be placed in accordance with pavement details shown elsewhere in the plans for longitudinal construction joints. Reinforcing steel for curb section shall then conform to that required for concrete curb.

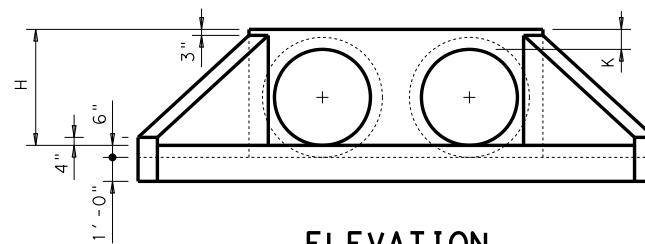


**Curb Transition Note:**  
Field conditions may require a longer or shorter transition, and shall be shown elsewhere in the plans, or as directed by the Engineer.

		<b>Design Division Standard</b>	
<h2>CONCRETE CURB AND GUTTER</h2> <h3>CCCG-12</h3>			
FILE: ccog12.dgn	DN: TxDOT	CK: AM	DW: VP
© TxDOT: 1995	CONT	SECT	JOB
UPDATED 2012 - VP	REVISIONS		HIGHWAY
DIST	COUNTY	SHEET NO.	

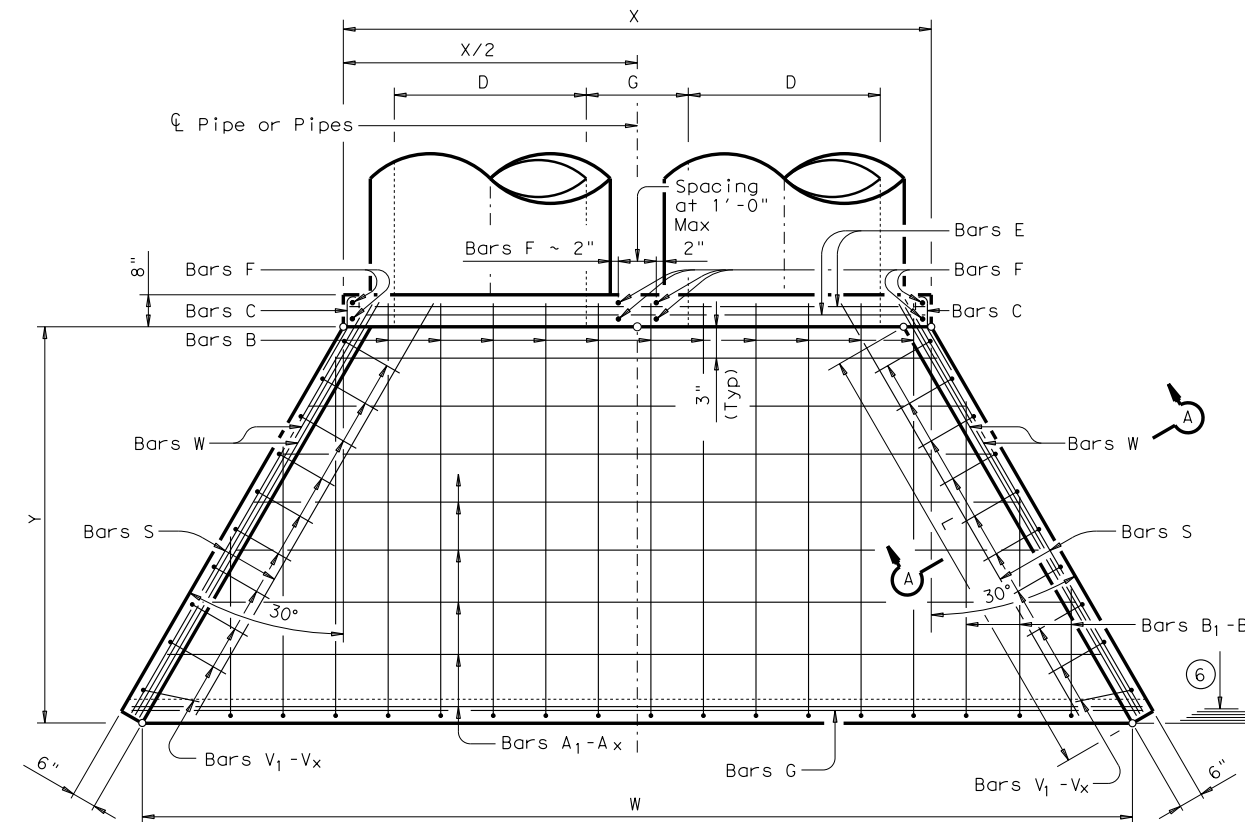
**TABLE OF VARIABLE DIMENSIONS AND QUANTITIES FOR ONE HEADWALL** (4)

SLOPE DIA OF PIPE, D	Values for one Pipe					Values to be added for each add'l Pipe			
	W	X	Y	L	Reinf (Lbs)	Conc (CY) (1)	X and W	Reinf (Lbs)	Conc (CY) (1)
12"	4'-7 1/2"	2'-6"	2'-10"	3'-3 1/4"	84	0.6	1'-9"	20	0.2
15"	5'-5 3/4"	2'-9 1/2"	3'-4"	3'-10 1/4"	99	0.7	2'-2"	24	0.3
18"	6'-4 1/4"	3'-1"	3'-10"	4'-5"	120	0.9	2'-8"	32	0.3
21"	7'-2 3/4"	3'-4 1/2"	4'-4"	5'-0"	137	1.1	3'-1"	43	0.4
24"	8'-2 1/2"	3'-9 1/2"	4'-10"	5'-7"	158	1.3	3'-7"	50	0.5
27"	9'-1"	4'-1"	5'-4"	6'-2"	173	1.5	3'-11"	56	0.6
30"	9'-11 1/2"	4'-4 1/2"	5'-10"	6'-8 3/4"	197	1.7	4'-4"	65	0.8
33"	10'-10"	4'-8"	6'-4"	7'-3 3/4"	216	2.0	4'-8"	71	0.9
36"	11'-8 1/4"	4'-11 1/2"	6'-10"	7'-10 3/4"	241	2.2	5'-1"	81	1.0
42"	13'-5 1/4"	5'-6 1/2"	7'-10"	9'-0 1/2"	290	2.8	5'-10"	97	1.3
48"	15'-9"	6'-1 1/2"	9'-4"	10'-9 1/4"	350	3.8	6'-7"	117	1.7
54"	17'-5 3/4"	6'-8 1/2"	10'-4"	11'-11 1/4"	415	4.5	7'-6"	151	2.1
60"	19'-2 3/4"	7'-3 1/2"	11'-4"	13'-1"	469	5.3	8'-3"	174	2.5
66"	20'-11 1/2"	7'-10 1/2"	12'-4"	14'-3"	530	6.2	8'-9"	194	2.9
72"	22'-8 1/2"	8'-5 1/2"	13'-4"	15'-4 3/4"	587	7.1	9'-4"	213	3.3
12"	6'-3"	2'-6"	4'-3"	4'-11"	114	0.8	1'-9"	22	0.2
15"	7'-5"	2'-9 1/2"	5'-0"	5'-9 1/4"	133	1.1	2'-2"	28	0.3
18"	8'-6 3/4"	3'-1"	5'-9"	6'-7 3/4"	166	1.3	2'-8"	37	0.5
21"	9'-8 3/4"	3'-4 1/2"	6'-6"	7'-6"	189	1.6	3'-1"	48	0.6
24"	11'-0"	3'-9 1/2"	7'-3"	8'-4 1/2"	221	2.0	3'-7"	58	0.7
27"	12'-2"	4'-1"	8'-0"	9'-2 3/4"	245	2.3	3'-11"	67	0.8
30"	13'-4"	4'-4 1/2"	8'-9"	10'-1 1/4"	287	2.7	4'-4"	77	1.0
33"	14'-5 3/4"	4'-8"	9'-6"	10'-11 3/4"	310	3.1	4'-8"	84	1.2
36"	15'-7 3/4"	4'-11 1/2"	10'-3"	11'-10"	343	3.5	5'-1"	96	1.4
42"	17'-11 1/2"	5'-6 1/2"	11'-9"	13'-6 3/4"	424	4.5	5'-10"	119	1.7
48"	21'-1 3/4"	6'-1 1/2"	14'-0"	16'-2"	527	6.1	6'-7"	146	2.3
54"	23'-5 1/2"	6'-8 1/2"	15'-6"	17'-10 3/4"	618	7.3	7'-6"	186	2.9
60"	25'-9 1/4"	7'-3 1/2"	17'-0"	19'-7 1/2"	707	8.7	8'-3"	219	3.4
66"	28'-1"	7'-10 1/2"	18'-6"	21'-4 1/4"	797	10.1	8'-9"	242	3.9
72"	30'-4 3/4"	8'-5 1/2"	20'-0"	23'-1 1/4"	910	11.7	9'-4"	272	4.4
12"	7'-10 3/4"	2'-6"	5'-8"	6'-6 1/2"	144	1.1	1'-9"	24	0.3
15"	9'-4"	2'-9 1/2"	6'-8"	7'-8 1/2"	177	1.5	2'-2"	32	0.4
18"	10'-9 1/2"	3'-1"	7'-8"	8'-10 1/4"	217	1.9	2'-8"	42	0.5
21"	12'-2 3/4"	3'-4 1/2"	8'-8"	10'-0"	254	2.3	3'-1"	57	0.7
24"	13'-9 1/2"	3'-9 1/2"	9'-8"	11'-2"	295	2.8	3'-7"	67	0.9
27"	15'-3"	4'-1"	10'-8"	12'-3 3/4"	328	3.3	3'-11"	77	1.0
30"	16'-8 1/4"	4'-4 1/2"	11'-8"	13'-5 3/4"	379	3.8	4'-4"	89	1.3
33"	18'-1 3/4"	4'-8"	12'-8"	14'-7 1/2"	417	4.5	4'-8"	101	1.4
36"	19'-7"	4'-11 1/2"	13'-8"	15'-9 1/4"	464	5.1	5'-1"	115	1.7
42"	22'-5 3/4"	5'-6 1/2"	15'-8"	18'-1"	575	6.5	5'-10"	141	2.1
48"	26'-6 1/4"	6'-1 1/2"	18'-8"	21'-6 3/4"	720	8.9	6'-7"	175	2.8
54"	29'-5"	6'-8 1/2"	20'-8"	23'-10 1/4"	863	10.7	7'-6"	226	3.6
60"	32'-3 3/4"	7'-3 1/2"	22'-8"	26'-2"	984	12.7	8'-3"	264	4.3
66"	35'-2 1/2"	7'-10 1/2"	24'-8"	28'-5 3/4"	1126	14.9	8'-9"	300	4.9
72"	38'-1 1/4"	8'-5 1/2"	26'-8"	30'-9 1/2"	1283	17.3	9'-4"	334	5.6
12"	11'-2"	2'-6"	8'-6"	9'-9 3/4"	220	1.9	1'-9"	28	0.4
15"	13'-2 1/4"	2'-9 1/2"	10'-0"	11'-6 1/2"	264	2.5	2'-2"	37	0.5
18"	15'-2 1/2"	3'-1"	11'-6"	13'-3 1/4"	326	3.2	2'-8"	50	0.7
21"	17'-2 3/4"	3'-4 1/2"	13'-0"	15'-0 1/4"	381	3.9	3'-1"	69	0.9
24"	19'-4 1/2"	3'-9 1/2"	14'-6"	16'-9"	447	4.8	3'-7"	80	1.2
27"	21'-4 3/4"	4'-1"	16'-0"	18'-5 3/4"	506	5.7	3'-11"	96	1.4
30"	23'-5 1/4"	4'-4 1/2"	17'-6"	20'-2 1/2"	587	6.7	4'-4"	110	1.7
33"	25'-5 1/2"	4'-8"	19'-0"	21'-11 1/4"	667	7.8	4'-8"	127	2.0
36"	27'-5 3/4"	4'-11 1/2"	20'-6"	23'-8"	727	9.0	5'-1"	144	2.3
42"	31'-6 1/4"	5'-6 1/2"	23'-6"	27'-1 1/2"	914	11.5	5'-10"	179	3.0
48"	37'-3 1/2"	6'-1 1/2"	28'-0"	32'-4"	1181	15.9	6'-7"	231	4.0
54"	41'-4 1/4"	6'-8 1/2"	31'-0"	35'-9 1/2"	1412	19.2	7'-6"	300	5.0
60"	45'-4 3/4"	7'-3 1/2"	34'-0"	39'-3"	1619	22.9	8'-3"	353	6.0

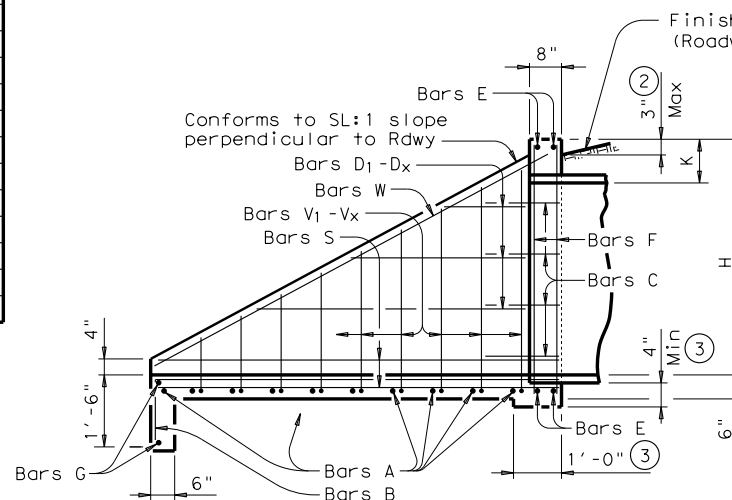


**ELEVATION**  
Showing dimensions

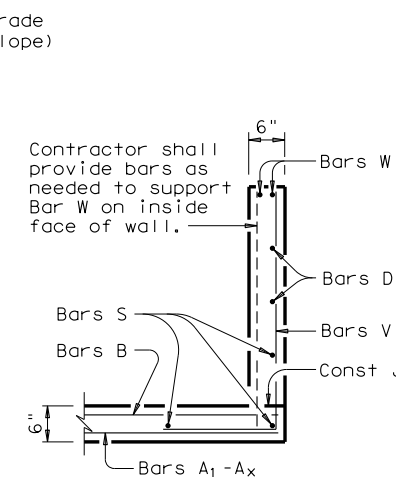
- Quantities shown are for concrete pipe and will increase slightly for metal pipe installations.
- For vehicle safety, curbs shall project no more than 3" above finished grade. Curb heights shall be reduced, if necessary, to meet these requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
- Provide a 1'-0" footing as shown where required to maintain 4" Min cover for pipes.
- Quantities shown are for one structure end only (one headwall).
- Min Length =  $6" + 3" \times \left(\frac{12 \times H - 7}{12 \times L}\right)$   
Max Length =  $12 \times H - 3" \times \left(\frac{12 \times H - 7}{12 \times L}\right) - 1"$
- Lengths of wings based on SL:1 Slope along this line.



**PLAN**



**TYPICAL WING ELEVATION**



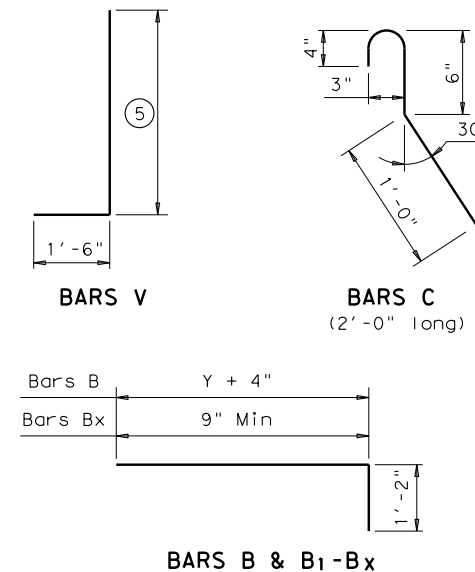
**SECTION A-A**

**TABLE OF REINFORCING STEEL** (4)

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	H
12"	9"	1'-0"	2'-0"
15"	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"



**GENERAL NOTES:**  
 Designed according to AASHTO LRFD Specifications.  
 Reinforcing steel shall be placed with the center of the outside layer of bars 2" from the surface of the concrete.  
 All reinforcing steel shall be Grade 60.  
 All concrete shall be Class "C" and shall have a minimum compressive strength of 3600 psi.  
 No bridge rails of any type may be mounted directly to these culvert headwalls.

**Texas Department of Transportation** Bridge Division Standard

**CONCRETE HEADWALLS WITH FLARED WINGS FOR 0° SKEW PIPE CULVERTS**

**CH-FW-0**

FILE: chfw00se.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: GAF
©TxDOT February 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	DIST	COUNTY	SHEET NO.	

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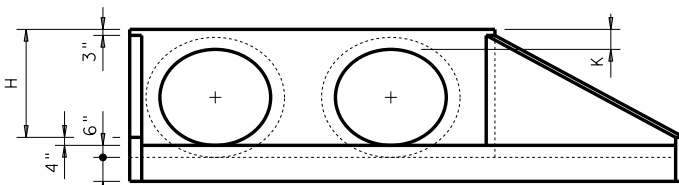


**TABLE OF VARIABLE DIMENSIONS AND QUANTITIES FOR ONE HEADWALL** (4)

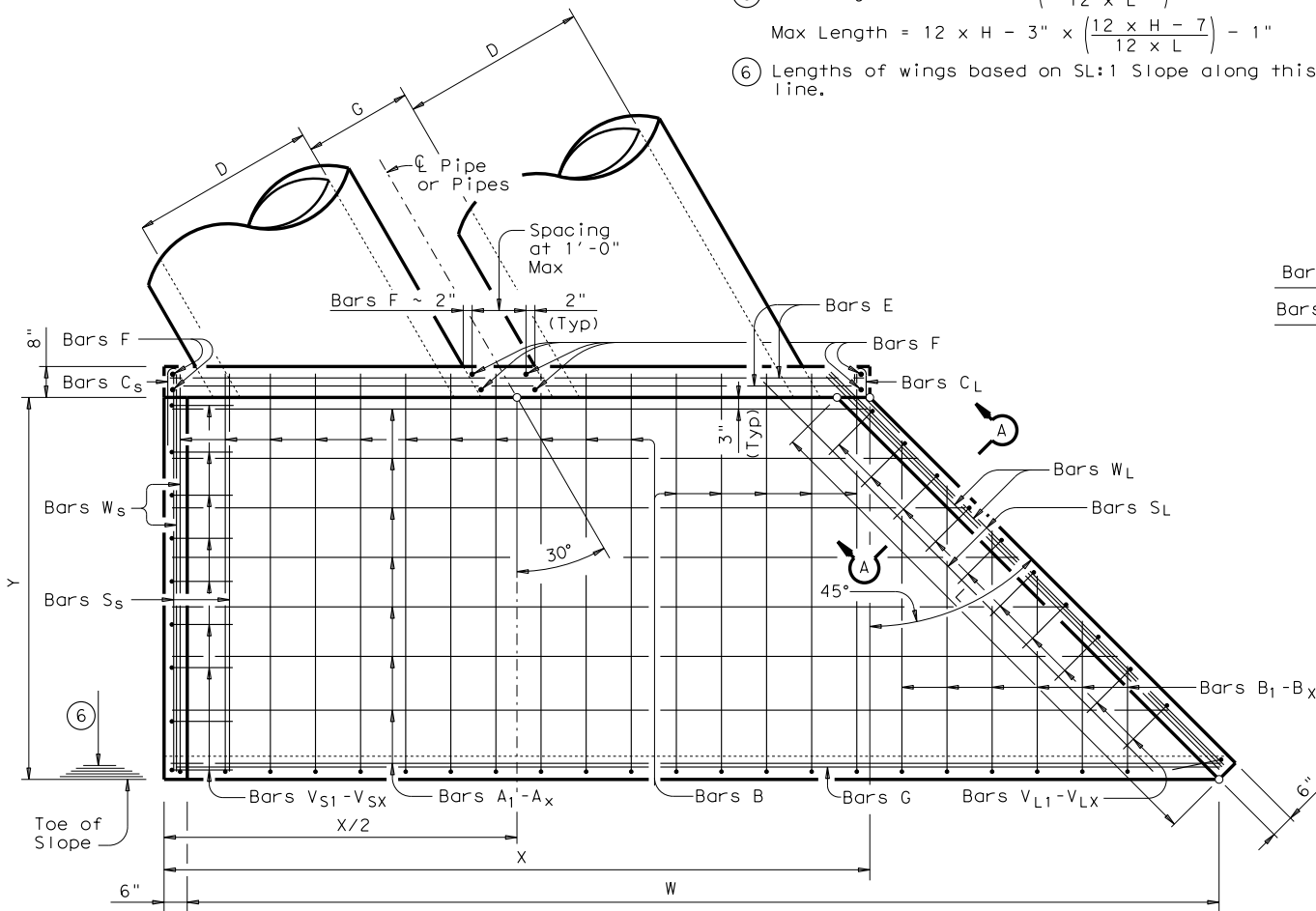
SLOPE	DIA OF PIPE, D	Values for one Pipe				Values to be added for each add'l Pipe				
		W	X	Y	L	Reinf (Lbs)	Conc (CY)	X and W	Reinf (Lbs)	Conc (CY)
2:1	12"	4'-9"	3'-1 1/2"	2'-10"	4'-0"	90	0.6	2'-0 1/4"	22	0.2
	15"	5'-6 3/4"	3'-5 1/4"	3'-4"	4'-8 1/2"	102	0.8	2'-6"	28	0.3
	18"	6'-4 3/4"	3'-9 1/4"	3'-10"	5'-5"	129	0.9	3'-1"	41	0.4
	21"	7'-2 3/4"	4'-1 1/4"	4'-4"	6'-1 1/2"	144	1.1	3'-6 3/4"	47	0.5
	24"	8'-2 1/2"	4'-7"	4'-10"	6'-10"	164	1.4	4'-1 3/4"	57	0.6
	27"	9'-0 1/2"	4'-11"	5'-4"	7'-6 1/2"	178	1.6	4'-6 1/4"	62	0.7
	30"	9'-10 1/2"	5'-3"	5'-10"	8'-3"	212	1.8	5'-0"	72	0.9
	33"	10'-8 3/4"	5'-7"	6'-4"	8'-11 1/2"	225	2.1	5'-4 3/4"	79	1.0
	36"	11'-6 3/4"	5'-11 1/4"	6'-10"	9'-8"	250	2.4	5'-10 1/2"	90	1.2
	42"	13'-2 3/4"	6'-7 1/4"	7'-10"	11'-1"	304	3.0	6'-8 3/4"	109	1.5
	48"	15'-4 3/4"	7'-3 1/4"	9'-4"	13'-2 1/2"	369	4.0	7'-7 1/4"	142	2.0
	54"	17'-1"	7'-11 1/2"	10'-4"	14'-7 1/4"	429	4.7	8'-8"	170	2.5
60"	18'-9"	8'-7 1/2"	11'-4"	16'-0 1/4"	484	5.6	9'-6 1/4"	194	2.9	
66"	20'-5"	9'-3 1/2"	12'-4"	17'-5 1/4"	550	6.5	10'-1 1/4"	217	3.3	
72"	22'-1 1/4"	9'-11 3/4"	13'-4"	18'-10 1/4"	614	7.5	10'-9 1/4"	239	3.7	
3:1	12"	6'-2"	3'-1 1/2"	4'-3"	6'-0"	118	0.9	2'-0 1/4"	24	0.3
	15"	7'-2 3/4"	3'-5 1/4"	5'-0"	7'-0 3/4"	142	1.1	2'-6"	31	0.4
	18"	8'-3 3/4"	3'-9 1/4"	5'-9"	8'-1 1/2"	179	1.4	3'-1"	46	0.5
	21"	9'-4 3/4"	4'-1 1/4"	6'-6"	9'-2 1/4"	197	1.7	3'-6 3/4"	53	0.7
	24"	10'-7 1/2"	4'-7"	7'-3"	10'-3"	227	2.1	4'-1 3/4"	65	0.8
	27"	11'-8 1/2"	4'-11"	8'-0"	11'-3 3/4"	255	2.4	4'-6 1/4"	75	1.0
	30"	12'-9 1/2"	5'-3"	8'-9"	12'-4 1/2"	298	2.8	5'-0"	86	1.2
	33"	13'-10 3/4"	5'-7"	9'-6"	13'-5 1/4"	322	3.2	5'-4 3/4"	94	1.3
	36"	14'-11 3/4"	5'-11 1/4"	10'-3"	14'-6"	355	3.7	5'-10 1/2"	108	1.5
	42"	17'-1 3/4"	6'-7 1/4"	11'-9"	16'-7 1/2"	441	4.6	6'-8 3/4"	133	2.0
	48"	20'-0 3/4"	7'-3 1/4"	14'-0"	19'-9 1/2"	542	6.2	7'-7 1/4"	176	2.7
	54"	22'-3"	7'-11 1/2"	15'-6"	21'-11"	626	7.5	8'-8"	211	3.3
60"	24'-5"	8'-7 1/2"	17'-0"	24'-0 1/2"	725	8.9	9'-6 1/4"	246	3.9	
66"	26'-7"	9'-3 1/2"	18'-6"	26'-2"	821	10.4	10'-1 1/4"	274	4.5	
72"	28'-9 1/4"	9'-11 3/4"	20'-0"	28'-3 1/2"	930	12.0	10'-9 1/4"	309	5.1	
4:1	12"	7'-7"	3'-1 1/2"	5'-8"	8'-0 1/4"	156	1.2	2'-0 1/4"	28	0.3
	15"	8'-10 3/4"	3'-5 1/4"	6'-8"	9'-5 1/4"	183	1.5	2'-6"	36	0.5
	18"	10'-2 3/4"	3'-9 1/4"	7'-8"	10'-10"	228	1.9	3'-1"	52	0.6
	21"	11'-6 3/4"	4'-1 1/4"	8'-8"	12'-3"	264	2.3	3'-6 3/4"	63	0.8
	24"	13'-0 1/2"	4'-7"	9'-8"	13'-8"	301	2.8	4'-1 3/4"	75	1.0
	27"	14'-4 1/2"	4'-11"	10'-8"	15'-1"	339	3.4	4'-6 1/4"	87	1.2
	30"	15'-8 1/2"	5'-3"	11'-8"	16'-6"	394	3.9	5'-0"	99	1.4
	33"	17'-0 3/4"	5'-7"	12'-8"	17'-11"	432	4.5	5'-4 3/4"	112	1.7
	36"	18'-4 3/4"	5'-11 1/4"	13'-8"	19'-4"	479	5.2	5'-10 1/2"	128	1.9
	42"	21'-0 3/4"	6'-7 1/4"	15'-8"	22'-1 3/4"	587	6.6	6'-8 3/4"	158	2.5
	48"	24'-8 3/4"	7'-3 1/4"	18'-8"	26'-4 3/4"	738	8.9	7'-7 1/4"	211	3.3
	54"	27'-5"	7'-11 1/2"	20'-8"	29'-2 3/4"	871	10.8	8'-8"	257	4.1
60"	30'-1"	8'-7 1/2"	22'-8"	32'-0 3/4"	999	12.8	9'-6 1/4"	297	4.9	
66"	32'-9"	9'-3 1/2"	24'-8"	34'-10 1/2"	1139	14.9	10'-1 1/4"	340	5.6	
72"	35'-5 1/4"	9'-11 3/4"	26'-8"	37'-8 1/2"	1290	17.3	10'-9 1/4"	378	6.4	
6:1	12"	10'-5"	3'-1 1/2"	8'-6"	12'-0 1/4"	223	1.9	2'-0 1/4"	32	0.4
	15"	12'-2 3/4"	3'-5 1/4"	10'-0"	14'-1 3/4"	273	2.5	2'-6"	43	0.6
	18"	14'-0 3/4"	3'-9 1/4"	11'-6"	16'-3 1/4"	336	3.2	3'-1"	61	0.8
	21"	15'-10 3/4"	4'-1 1/4"	13'-0"	18'-4 1/2"	396	3.9	3'-6 3/4"	76	1.1
	24"	17'-10 1/2"	4'-7"	14'-6"	20'-6"	450	4.8	4'-1 3/4"	91	1.4
	27"	19'-8 1/2"	4'-11"	16'-0"	22'-7 1/2"	519	5.7	4'-6 1/4"	108	1.6
	30"	21'-6 1/2"	5'-3"	17'-6"	24'-9"	595	6.6	5'-0"	124	2.0
	33"	23'-4 3/4"	5'-7"	19'-0"	26'-10 1/2"	674	7.7	5'-4 3/4"	143	2.3
	36"	25'-2 3/4"	5'-11 1/4"	20'-6"	29'-0"	737	8.8	5'-10 1/2"	162	2.7
	42"	28'-10 3/4"	6'-7 1/4"	23'-6"	33'-2 3/4"	920	11.3	6'-8 3/4"	202	3.5
	48"	34'-0 3/4"	7'-3 1/4"	28'-0"	39'-7 1/4"	1189	15.5	7'-7 1/4"	274	4.6

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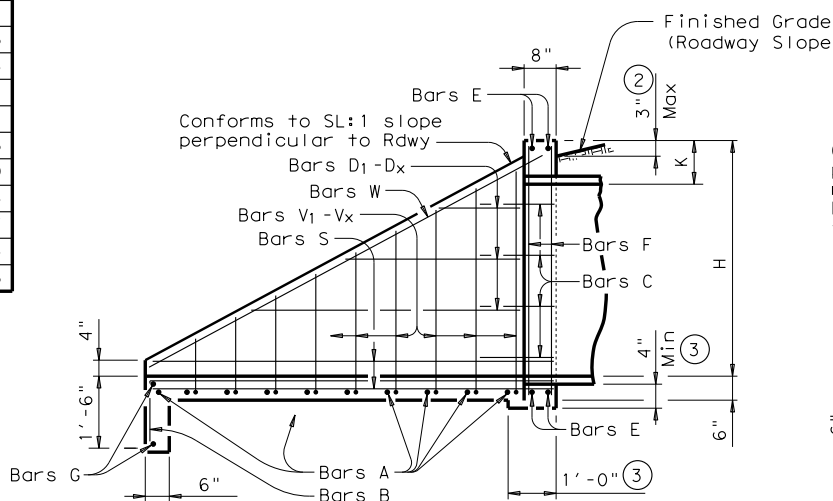
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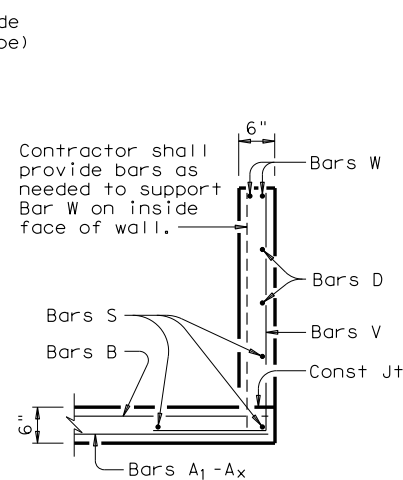
**ELEVATION**  
Showing dimensions



**PLAN**



**TYPICAL WING ELEVATION**



**SECTION A-A**

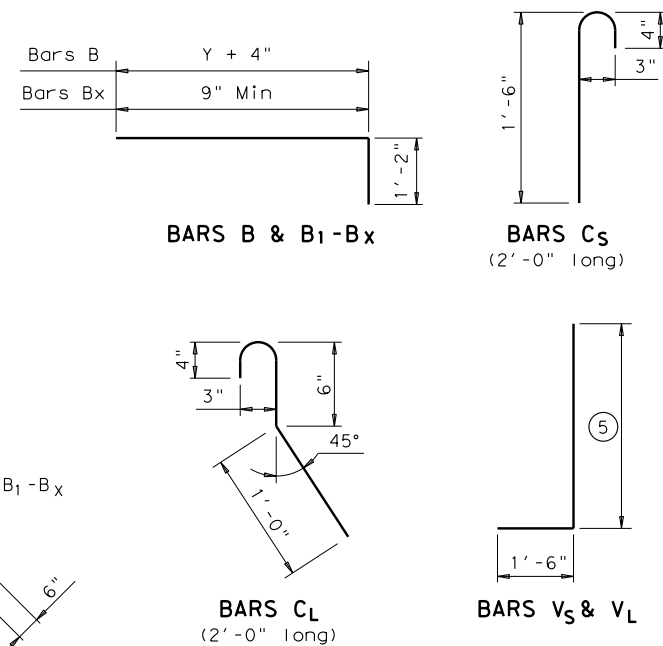
- Quantities shown are for concrete pipe and will increase slightly for metal pipe installations.
- For vehicle safety, curbs shall project no more than 3" above finished grade. Curb heights shall be reduced, if necessary, to meet these requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
- Provide a 1'-0" footing as shown where required to maintain 4" Min cover for pipes.
- Quantities shown are for one structure end only (one headwall).
- Min Length =  $6" + 3" \times \left( \frac{12 \times H - 7}{12 \times L} \right)$   
Max Length =  $12 \times H - 3" \times \left( \frac{12 \times H - 7}{12 \times L} \right) - 1"$
- Lengths of wings based on SL:1 Slope along this line.

**TABLE OF REINFORCING STEEL** (4)

Bar	Size	Spa	No.
A	# 4	1'-0"	~
B	# 3	1'-6"	~
CL	# 4	1'-0"	~
CS	# 4	1'-0"	~
D	# 3	1'-0"	~
E	# 5	~	4
F	# 5	~	~
G	# 3	~	2
SL	# 4	~	3
SS	# 4	~	3
V	# 4	1'-0"	~
WL	# 5	~	2
WS	# 5	~	2

**TABLE OF CONSTANT DIMENSIONS**

DIA OF PIPE, D	G	K	H
12"	9"	1'-0"	2'-0"
15"	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"



**GENERAL NOTES:**

Designed according to AASHTO LRFD Specifications.  
 Reinforcing steel shall be placed with the center of the outside layer of bars 2" from the surface of the concrete.  
 All reinforcing steel shall be Grade 60.  
 All concrete shall be Class "C" and shall have a minimum compressive strength of 3600 psi.  
 No bridge rails of any type may be mounted directly to these culvert headwalls.

**Bridge Division Standard**

**CONCRETE HEADWALLS WITH FLARED WINGS FOR 30° SKEW PIPE CULVERTS**

**CH-FW-30**

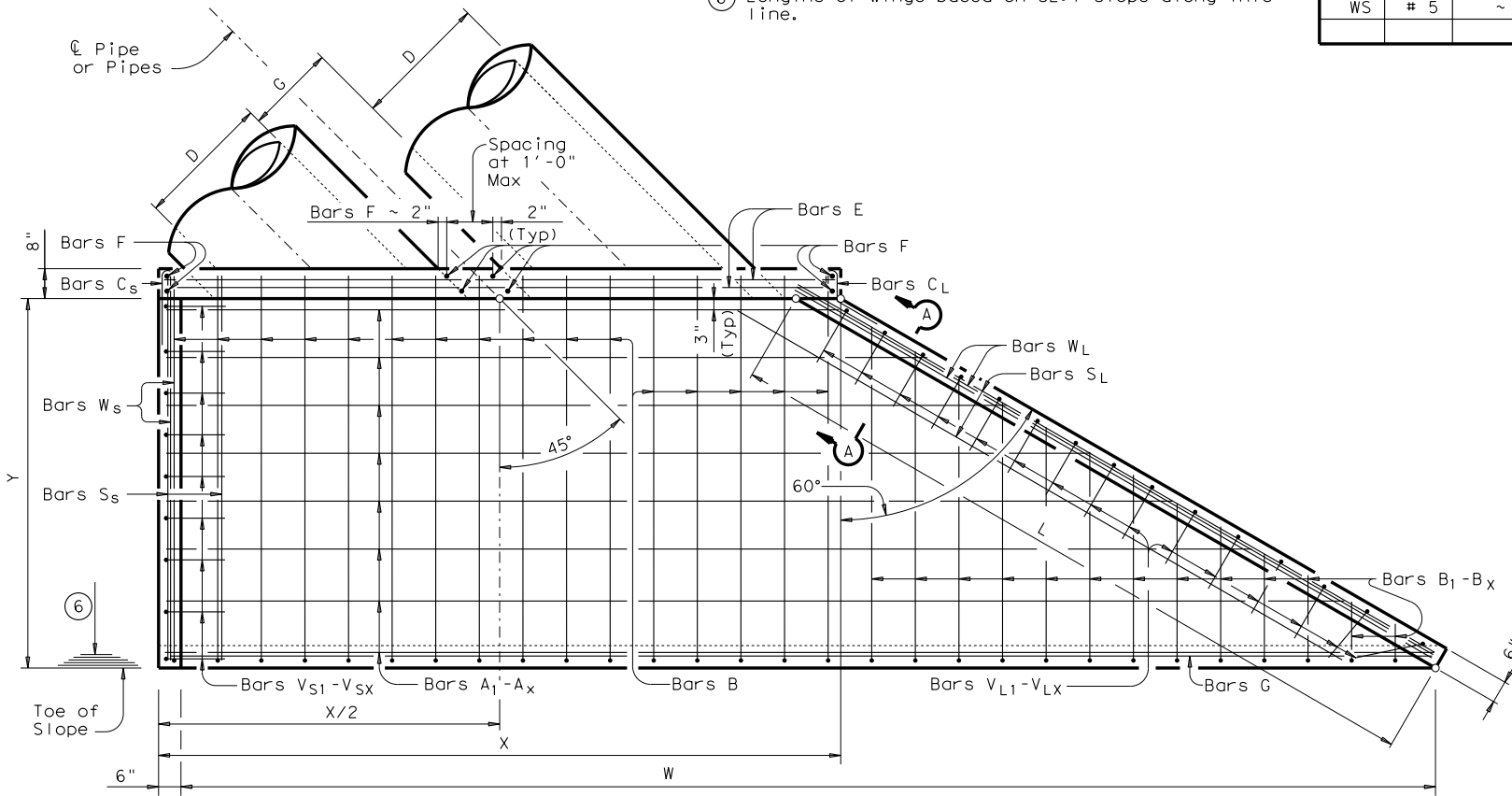
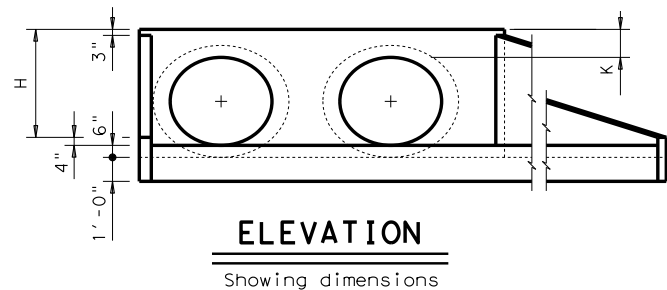
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REVISIONS				
	DIST	COUNTY		SHEET NO.

**TABLE OF VARIABLE DIMENSIONS AND QUANTITIES FOR ONE HEADWALL** (4)

SLOPE DIA OF PIPE, D	Values for one Pipe				Values to be added for each add'l Pipe				
	W	X	Y	L	Reinf (Lbs)	Conc (CY)	X and W	Reinf (Lbs)	Conc (CY)
12"	7'-7 3/4"	4'-3"	2'-10"	5'-8"	115	0.9	2'-5 3/4"	26	0.3
15"	8'-10 1/2"	4'-7 1/4"	3'-4"	6'-8"	131	1.1	3'-0 3/4"	32	0.4
18"	10'-1 1/4"	4'-11 1/2"	3'-10"	7'-8"	163	1.3	3'-9 1/4"	48	0.5
21"	11'-3 3/4"	5'-3 3/4"	4'-4"	8'-8"	181	1.6	4'-4 1/4"	54	0.6
24"	12'-6 1/2"	5'-8"	4'-10"	9'-8"	208	1.8	5'-0 3/4"	67	0.8
27"	13'-9"	6'-0 1/4"	5'-4"	10'-8"	225	2.1	5'-6 1/2"	73	0.9
30"	14'-11 3/4"	6'-4 1/2"	5'-10"	11'-8"	259	2.5	6'-1 1/2"	86	1.1
33"	16'-3"	6'-9 1/2"	6'-4"	12'-8"	284	2.8	6'-7 1/4"	92	1.2
36"	17'-6 1/4"	7'-2 1/4"	6'-10"	13'-8"	316	3.2	7'-2 1/4"	107	1.4
42"	20'-1"	8'-0 1/4"	7'-10"	15'-8"	383	4.0	8'-3"	138	1.8
48"	23'-6"	8'-10 1/4"	9'-4"	18'-8"	468	5.4	9'-3 3/4"	167	2.4
54"	26'-0 3/4"	9'-8"	10'-4"	20'-8"	549	6.4	10'-7 1/4"	198	3.0
60"	28'-7 1/2"	10'-6"	11'-4"	22'-8"	620	7.5	11'-8"	243	3.6
66"	31'-2 1/4"	11'-3 3/4"	12'-4"	24'-8"	710	8.8	12'-4 1/2"	269	4.0
72"	33'-8 3/4"	12'-1 3/4"	13'-4"	26'-8"	789	10.1	13'-2 1/2"	303	4.6
12"	10'-1 1/4"	4'-3"	4'-3"	8'-6"	154	1.3	2'-5 3/4"	28	0.3
15"	11'-9 1/4"	4'-7 1/4"	5'-0"	10'-0"	184	1.6	3'-0 3/4"	37	0.5
18"	13'-5"	4'-11 1/2"	5'-9"	11'-0"	225	2.0	3'-9 1/4"	55	0.6
21"	15'-0 3/4"	5'-3 3/4"	6'-6"	13'-0"	254	2.4	4'-4 1/4"	62	0.8
24"	16'-8 3/4"	5'-8"	7'-3"	14'-6"	291	2.8	5'-0 3/4"	77	1.0
27"	18'-4 1/2"	6'-0 1/4"	8'-0"	16'-0"	329	3.3	5'-6 1/2"	88	1.2
30"	20'-0 1/4"	6'-4 1/2"	8'-9"	17'-6"	377	3.9	6'-1 1/2"	103	1.4
33"	21'-8 3/4"	6'-9 1/2"	9'-6"	19'-0"	413	4.4	6'-7 1/4"	111	1.6
36"	23'-5 1/2"	7'-2 1/4"	10'-3"	20'-6"	462	5.1	7'-2 1/4"	126	1.9
42"	26'-10 1/2"	8'-0 1/4"	11'-9"	23'-6"	571	6.4	8'-3"	168	2.4
48"	31'-7 1/4"	8'-10 1/4"	14'-0"	28'-0"	712	8.7	9'-3 3/4"	210	3.2
54"	35'-0 1/4"	9'-8"	15'-6"	31'-0"	830	10.5	10'-7 1/4"	249	4.0
60"	38'-5 1/4"	10'-6"	17'-0"	34'-0"	954	12.4	11'-8"	306	4.8
66"	41'-10 1/4"	11'-3 3/4"	18'-6"	37'-0"	1092	14.5	12'-4 1/2"	338	5.5
12"	12'-6 3/4"	4'-3"	5'-8"	11'-4"	203	1.7	2'-5 3/4"	32	0.4
15"	14'-7 3/4"	4'-7 1/4"	6'-8"	13'-4"	242	2.2	3'-0 3/4"	43	0.6
18"	16'-8 3/4"	4'-11 1/2"	7'-8"	15'-4"	296	2.8	3'-9 1/4"	61	0.8
21"	18'-9 3/4"	5'-3 3/4"	8'-8"	17'-4"	343	3.4	4'-4 1/4"	73	1.0
24"	20'-10 3/4"	5'-8"	9'-8"	19'-4"	394	4.0	5'-0 3/4"	90	1.3
27"	23'-0"	6'-0 1/4"	10'-8"	21'-4"	445	4.8	5'-6 1/2"	103	1.5
30"	25'-1"	6'-4 1/2"	11'-8"	23'-4"	510	5.5	6'-1 1/2"	120	1.8
33"	27'-2 3/4"	6'-9 1/2"	12'-8"	25'-4"	572	6.4	6'-7 1/4"	134	2.0
36"	29'-4 1/2"	7'-2 1/4"	13'-8"	27'-4"	631	7.3	7'-2 1/4"	152	2.4
42"	33'-8"	8'-0 1/4"	15'-8"	31'-4"	781	9.4	8'-3"	198	3.0
48"	39'-8"	8'-10 1/4"	18'-8"	37'-4"	991	12.8	9'-3 3/4"	255	4.0
12"	17'-5 3/4"	4'-3"	8'-6"	17'-0"	295	2.9	2'-5 3/4"	38	0.5
15"	20'-5"	4'-7 1/4"	10'-0"	20'-0"	367	3.7	3'-0 3/4"	51	0.8
18"	23'-4 1/2"	4'-11 1/2"	11'-6"	23'-0"	445	4.7	3'-9 1/4"	73	1.0
21"	26'-4"	5'-3 3/4"	13'-0"	26'-0"	531	5.8	4'-4 1/4"	89	1.3
24"	29'-3 1/4"	5'-8"	14'-6"	29'-0"	605	7.0	5'-0 3/4"	110	1.7
27"	32'-2 3/4"	6'-0 1/4"	16'-0"	32'-0"	702	8.3	5'-6 1/2"	129	2.0
30"	35'-2 1/4"	6'-4 1/2"	17'-6"	35'-0"	801	9.7	6'-1 1/2"	150	2.4
33"	38'-2 1/4"	6'-9 1/2"	19'-0"	38'-0"	913	11.3	6'-7 1/4"	170	2.8

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- Quantities shown are for concrete pipe and will increase slightly for metal pipe installations.
- For vehicle safety, curbs shall project no more than 3" above finished grade. Curb heights shall be reduced, if necessary, to meet these requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
- Provide a 1'-0" footing as shown where required to maintain 4" Min cover for pipes.
- Quantities shown are for one structure end only (one headwall).
- Min Length =  $6" + 3" \times \left(\frac{12 \times H - 7}{12 \times L}\right)$   
Max Length =  $12 \times H - 3" \times \left(\frac{12 \times H - 7}{12 \times L}\right) - 1"$
- Lengths of wings based on SL:1 Slope along this line.

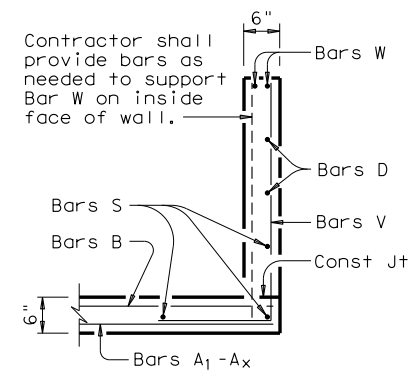
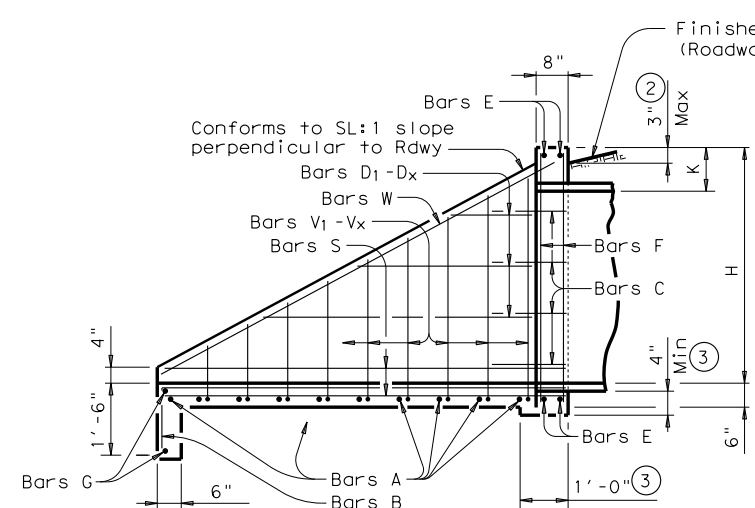
**TABLE OF REINFORCING STEEL** (4)

Bar	Size	Spa	No.
A	# 4	1'-0"	~
B	# 3	1'-6"	~
CL	# 4	1'-0"	~
CS	# 4	1'-0"	~
D	# 3	1'-0"	~
E	# 5	~	4
F	# 5	~	~
G	# 3	~	2
SL	# 4	~	3
SS	# 4	~	3
V	# 4	1'-0"	~
WL	# 5	~	2
WS	# 5	~	2

**TABLE OF CONSTANT DIMENSIONS**

DIA OF PIPE, D	G	K	H
12"	9"	1'-0"	2'-0"
15"	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"

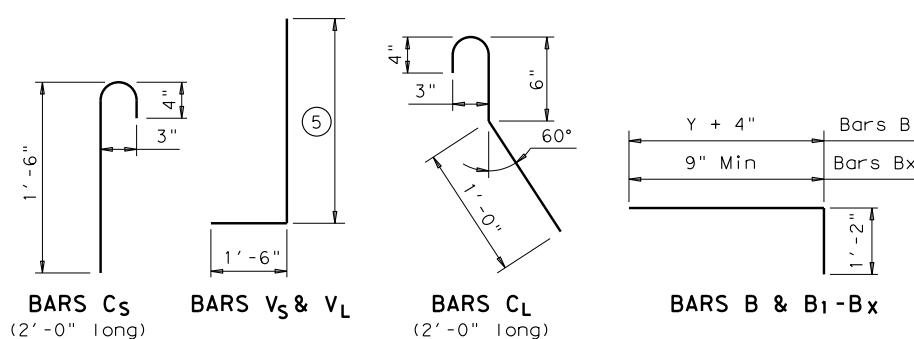
**PLAN**



**TYPICAL WING ELEVATION**

**SECTION A-A**

**GENERAL NOTES:**  
 Designed according to AASHTO LRFD Specifications.  
 Reinforcing steel shall be placed with the center of the outside layer of bars 2" from the surface of the concrete.  
 All reinforcing steel shall be Grade 60.  
 All concrete shall be Class "C" and shall have a minimum compressive strength of 3600 psi.  
 No bridge rails of any type may be mounted directly to these culvert headwalls.



**BARS Cs** (2'-0" long)  
**BARS Vs & Vx**  
**BARS CL** (2'-0" long)  
**BARS B & B1-Bx**

Texas Department of Transportation  
 Bridge Division Standard

**CONCRETE HEADWALLS WITH FLARED WINGS FOR 45° SKEW PIPE CULVERTS**

**CH-FW-45**

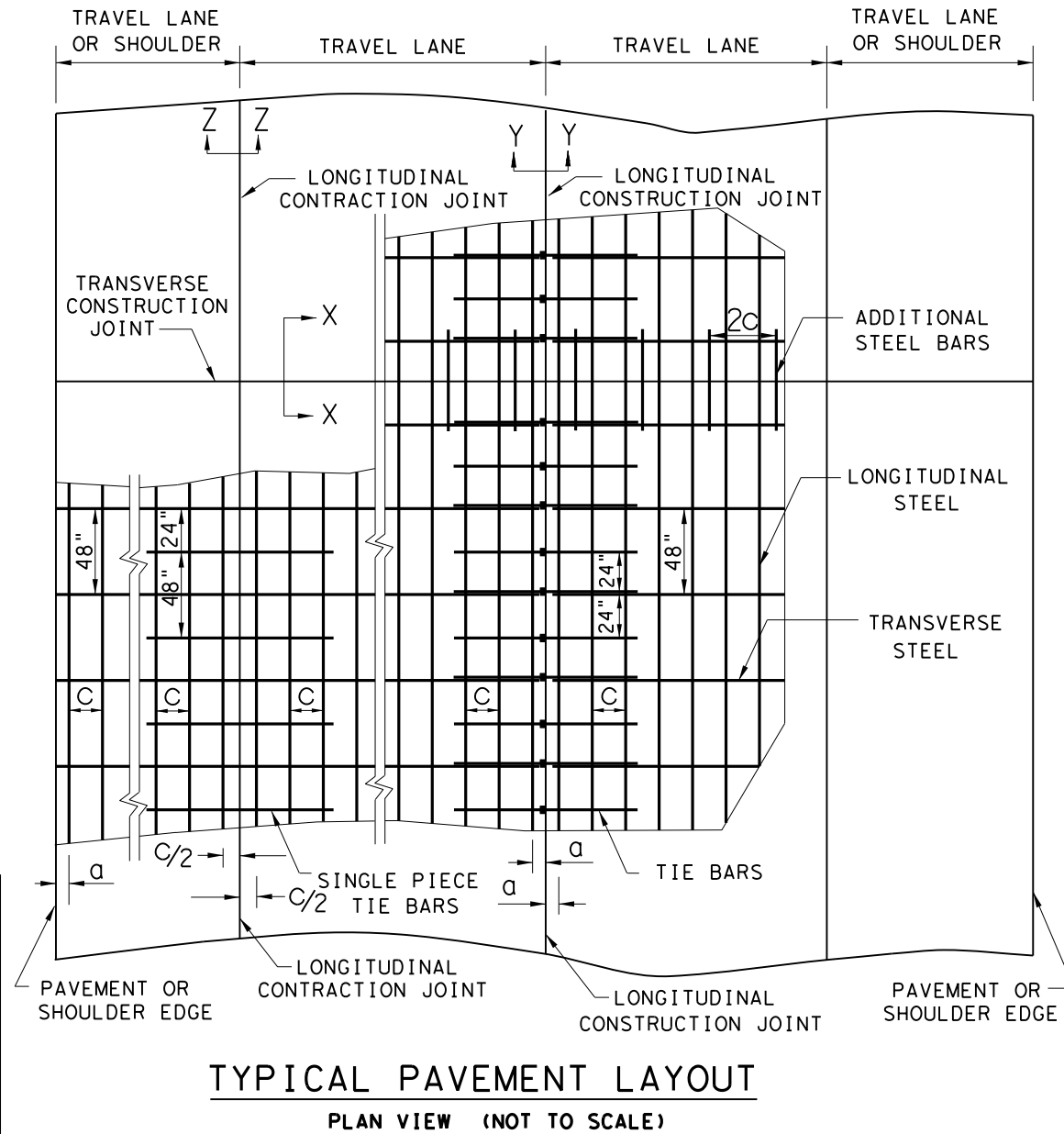
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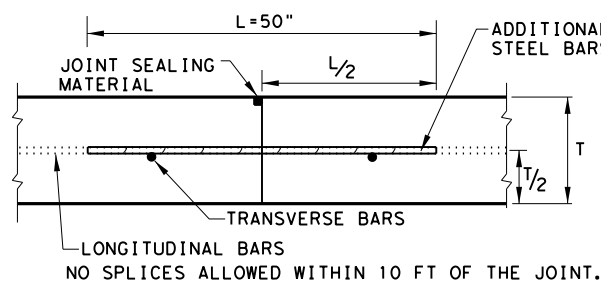
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TABLE NO. 1 LONGITUDINAL STEEL					
SLAB THICKNESS AND BAR SIZE		REGULAR STEEL BARS	FIRST SPACING AT EDGE OR JOINT	ADDITIONAL STEEL BARS AT TRANSVERSE CONSTRUCTION JOINT (SECTION X-X)	
T (IN.)	BAR SIZE	SPACING C (IN.)	SPACING a (IN.)	SPACING 2 x C (IN.)	LENGTH L (IN.)
7.0	#5	6.5	3 TO 4	13	50
7.5	#5	6.0	3 TO 4	12	50
8.0	#6	9.0	3 TO 4	18	50
8.5	#6	8.5	3 TO 4	17	50
9.0	#6	8.0	3 TO 4	16	50
9.5	#6	7.5	3 TO 4	15	50
10.0	#6	7.0	3 TO 4	14	50
10.5	#6	6.75	3 TO 4	13.5	50
11.0	#6	6.5	3 TO 4	13	50
11.5	#6	6.25	3 TO 4	12.5	50
12.0	#6	6.0	3 TO 4	12	50
12.5	#6	5.75	3 TO 4	11.5	50
13.0	#6	5.5	3 TO 4	11	50

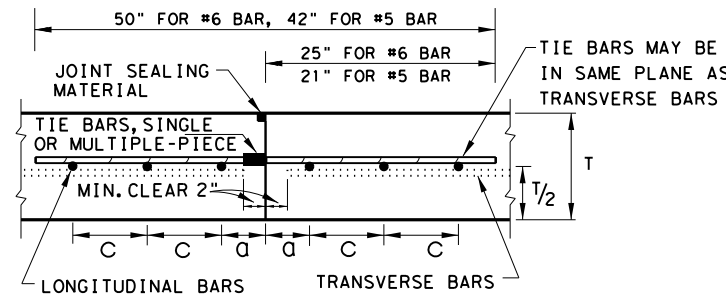
TABLE NO. 2 TRANSVERSE STEEL AND TIE BARS						
SLAB THICKNESS (IN.)	TRANSVERSE STEEL		TIE BARS AT LONGITUDINAL CONSTRUCTION JOINT (SECTION Z-Z)		TIE BARS AT LONGITUDINAL CONSTRUCTION JOINT (SECTION Y-Y)	
	BAR SIZE	SPACING (IN.)	BAR SIZE	SPACING (IN.)	BAR SIZE	SPACING (IN.)
7.0 - 7.5	#5	48	#5	48	#5	24
8.0 - 13.0	#5	48	#6	48	#6	24



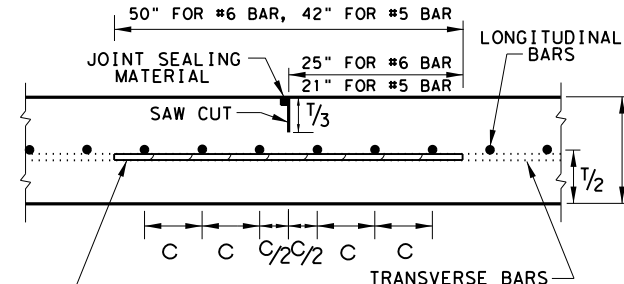
1. DETAILS FOR PAVEMENT WIDTH, PAVEMENT THICKNESS AND THE CROWN CROSS-SLOPE SHALL BE SHOWN ELSEWHERE IN THE PLANS. PAVEMENTS WIDER THAN 100 FT. WITHOUT A FREE LONGITUDINAL JOINT ARE NOT COVERED BY THIS STANDARD.
2. USE COARSE AGGREGATES WITH A RATED COEFFICIENT OF THERMAL EXPANSION (COTE) OF NOT MORE THAN  $5.5 \times 10^{-6}$  IN/IN/°F AS LISTED IN THE CONCRETE RATED SOURCE QUALITY CATALOG (CRSQC).
3. ALL THE REINFORCING STEEL AND TIE BARS SHALL BE DEFORMED STEEL BARS CONFORMING TO ASTM A 615 (GRADE 60) OR ASTM A 996 (GRADE 60) OR ABOVE. STEEL BAR SIZES AND SPACINGS SHALL CONFORM TO TABLE NO. 1 AND TABLE NO. 2.
4. WHEN COARSE AGGREGATE WITH A RATED COTE OF NOT MORE THAN  $4.3 \times 10^{-6}$  IN/IN/°F IS USED, TABLE NO. 1A MAY BE USED FOR LONGITUDINAL STEEL AS APPROVED BY THE ENGINEER.
5. STEEL BAR PLACEMENT TOLERANCE SHALL BE +/- 1 IN. HORIZONTALLY AND +/- 0.5 IN. VERTICALLY. CALCULATED AVERAGE BAR SPACING (CONCRETE PLACEMENT WIDTH / NUMBER OF LONGITUDINAL BARS) SHALL CONFORM TO TABLE NO. 1 OR TABLE NO. 1A.
6. PAVEMENT WIDTHS OF MORE THAN 15 FT. SHALL HAVE A LONGITUDINAL JOINT (SECTION Z-Z OR SECTION Y-Y). THESE JOINTS SHALL BE LOCATED WITHIN 6 IN. OF THE LANE LINE UNLESS THE JOINT LOCATION IS SHOWN ELSEWHERE ON THE PLANS.
7. THE SAW CUT DEPTH FOR THE LONGITUDINAL CONTRACTION JOINT (SECTION Z-Z) SHALL BE ONE THIRD OF THE SLAB THICKNESS (T/3).
8. WHEN TYING CONCRETE GUTTER AT A LONGITUDINAL JOINT, THE TIE BAR LENGTH OR POSITION MAY BE ADJUSTED. PROVIDE 3 IN. OF CONCRETE COVER FROM THE BACK OF GUTTER TO THE END OF TIE BAR.
9. REPLACE MISSING OR DAMAGED TIE BARS WITHOUT ADDITIONAL COMPENSATION BY DRILLING MIN. 10 IN. DEEP AND GROUTING TIE BARS WITH TYPE III, CLASS C EPOXY. MEET THE PULL-OUT TEST REQUIREMENTS IN ITEM 361.
10. OMIT TIE BARS LOCATED WITHIN 18-IN. OF THE TRANSVERSE CONSTRUCTION JOINTS (SECTION X-X). USE HAND-OPERATED IMMERSION VIBRATORS TO CONSOLIDATE THE CONCRETE ADJACENT TO ALL FORMED JOINTS.
11. LONGITUDINAL REINFORCING STEEL SPLICES SHALL BE A MINIMUM OF 25 IN. STAGGER THE LAP LOCATIONS SO THAT NO MORE THAN 1/3 OF THE LONGITUDINAL STEEL IS SPLICED IN ANY GIVEN 12-FT. WIDTH AND 2-FT. LENGTH OF THE PAVEMENT.
12. THE DETAIL FOR THE JOINT SEALANT AND RESERVOIR IS SHOWN ON STANDARD SHEET "CONCRETE PAVING DETAILS, JOINT SEALS."



TRANSVERSE CONSTRUCTION JOINT  
SECTION X - X



LONGITUDINAL CONSTRUCTION JOINT  
SECTION Y - Y



LONGITUDINAL CONTRACTION JOINT  
SECTION Z - Z

GENERAL NOTES

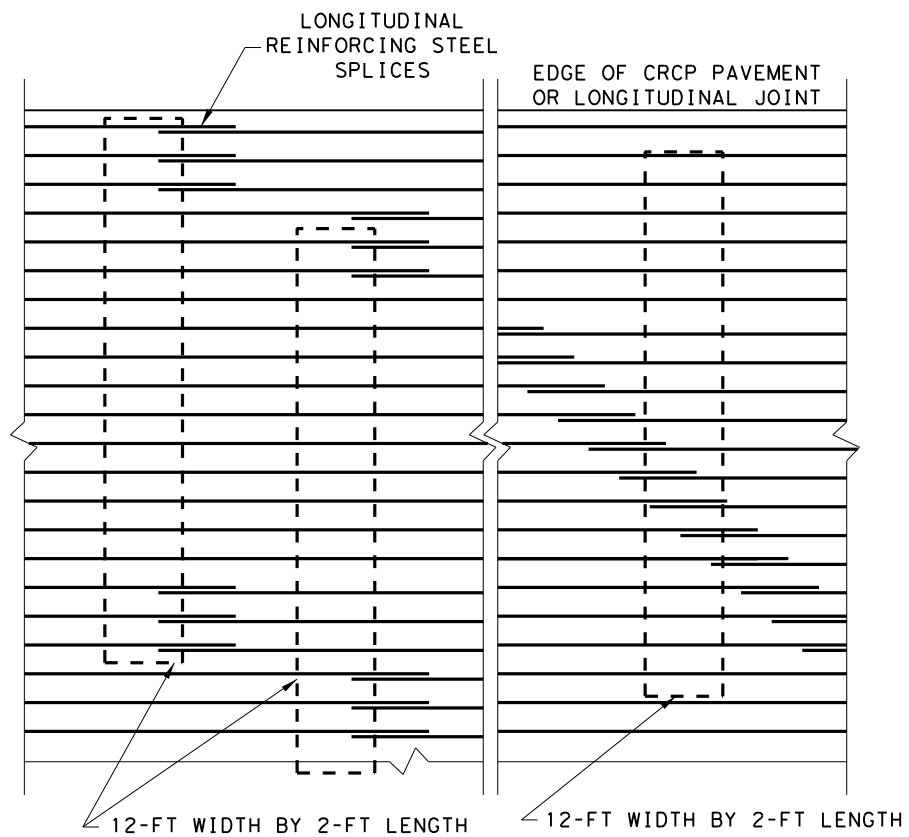
		Design Division Standard	
<b>CONTINUOUSLY REINFORCED CONCRETE PAVEMENT</b> <b>ONE LAYER STEEL BAR PLACEMENT</b> <b>T - 7 to 13 INCHES</b> <b>CRCP (1) - 17</b>			
FILE: crcp117.dgn	DN: TxDOT	CK: AN	DW: HC
© TxDOT: May 2017	CONT	SECT	JOB
10/10/2011 ADD GN #12			HIGHWAY
04/09/2013 REMOVE 6" AND 6.5" ADD CTE REQUIREMENTS	DIST	COUNTY	SHEET NO.
05/05/2017 COTE AS RATED 4.3			



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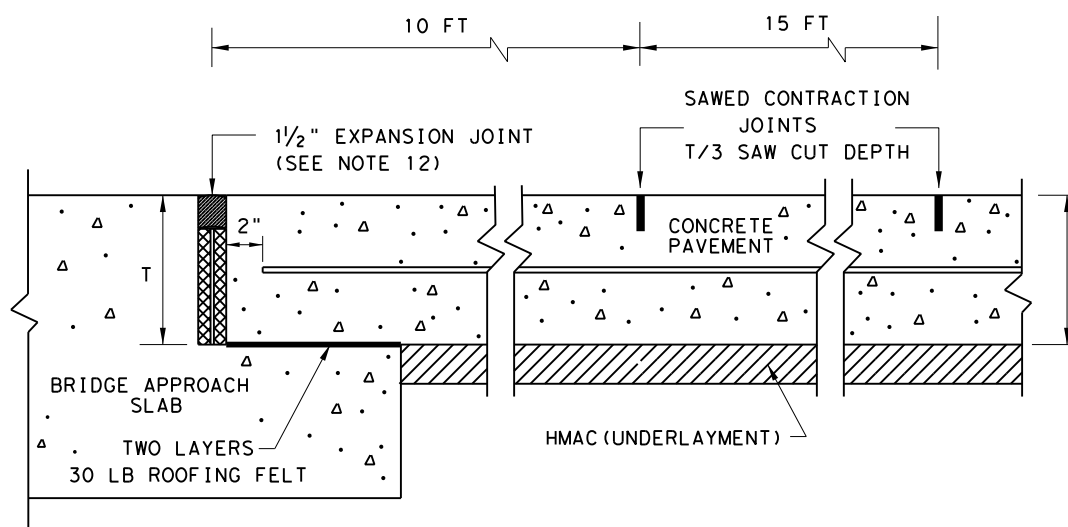
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TABLE NO. 1A LONGITUDINAL STEEL FOR LOW COTE CONCRETE AS APPROVED BY THE ENGINEER					
SLAB THICKNESS AND BAR SIZE		REGULAR STEEL BARS	FIRST SPACING AT EDGE OR JOINT	ADDITIONAL STEEL BARS AT TRANSVERSE CONSTRUCTION JOINT (SECTION X-X)	
T (IN.)	BAR SIZE	SPACING C (IN.)	SPACING d (IN.)	SPACING 2 x c (IN.)	LENGTH L (IN.)
7.0	#5	7.5	3 TO 4	15	50
7.5	#5	7.0	3 TO 4	14	50
8.0	#6	10.0	3 TO 4	20	50
8.5	#6	9.5	3 TO 4	19	50
9.0	#6	9.0	3 TO 4	18	50
9.5	#6	8.5	3 TO 4	17	50
10.0	#6	8.0	3 TO 4	16	50
10.5	#6	7.5	3 TO 4	15	50
11.0	#6	7.0	3 TO 4	14	50
11.5	#6	6.75	3 TO 4	13.5	50
12.0	#6	6.50	3 TO 4	13	50
12.5	#6	6.25	3 TO 4	12.5	50
13.0	#6	6.0	3 TO 4	12	50

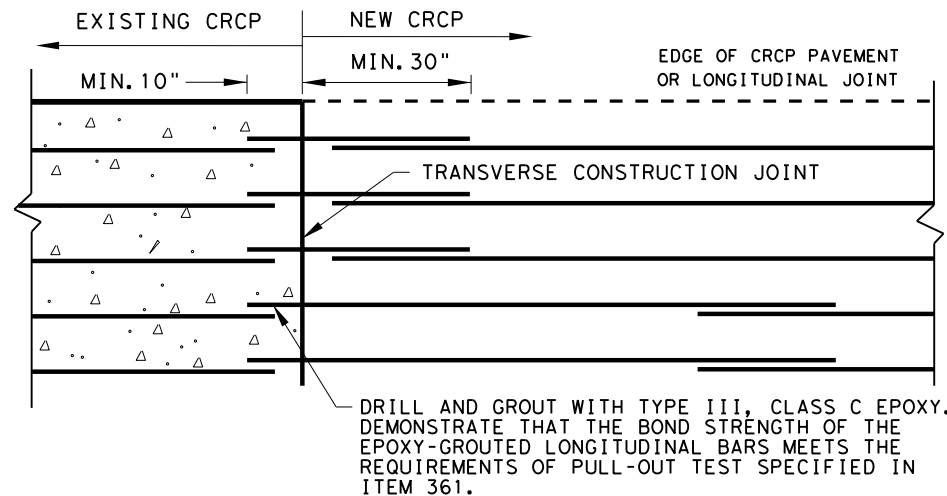


STAGGER THE LAP LOCATIONS SO THAT NO MORE THAN 1/3 OF THE LONGITUDINAL STEEL IS SPLICED IN ANY GIVEN 12-FT. WIDTH AND 2-FT. LENGTH OF THE PAVEMENT. ANY OTHER LAP CONFIGURATION MEETING THIS REQUIREMENT WILL BE ALLOWED.

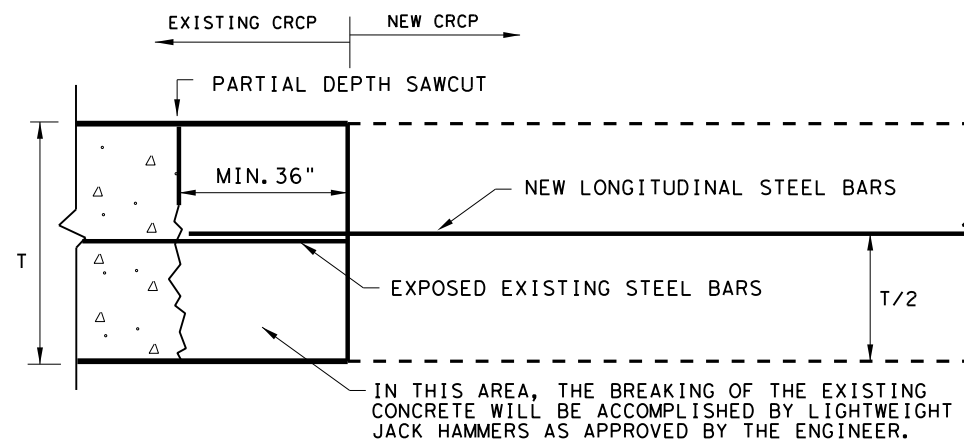
**EXAMPLES OF LAP CONFIGURATION**  
PLAN VIEW (NOT TO SCALE)



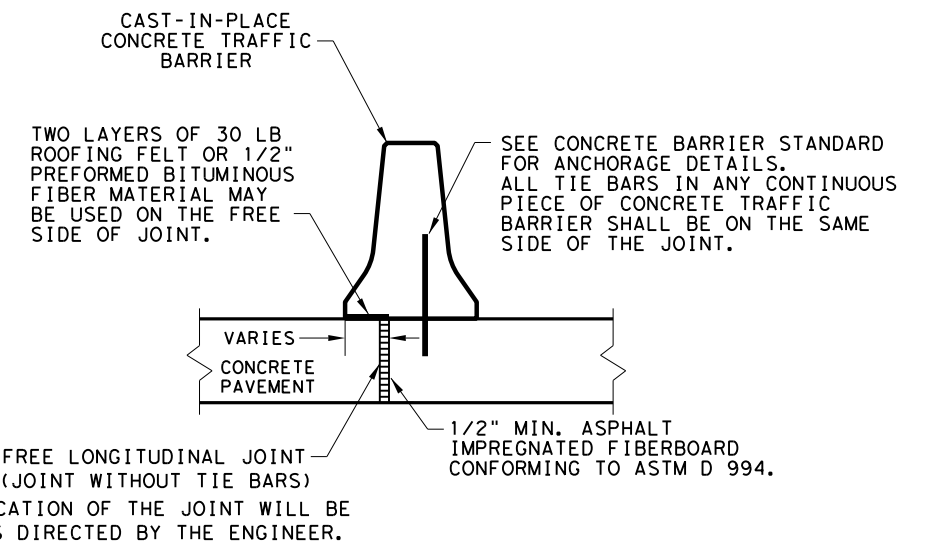
**TRANSVERSE EXPANSION JOINT DETAIL AT BRIDGE APPROACH**



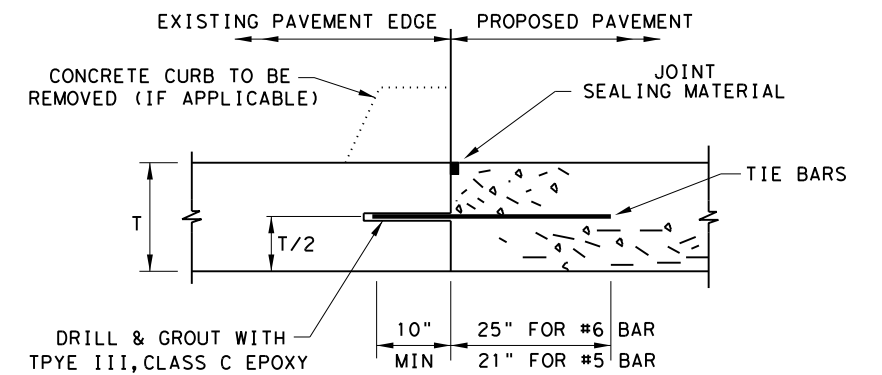
**OPTION A: DRILL AND EPOXY**  
PLAN VIEW (NOT TO SCALE)



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



**FREE LONGITUDINAL JOINT DETAIL**



1. BEFORE WIDENING WORK, DEMONSTRATE THAT THE BOND STRENGTH OF THE EPOXY-GROUTED TIE BARS MEETS THE REQUIREMENTS OF PULL-OUT TEST SPECIFIED IN ITEM 361.
2. SPACE TIE BARS AT 24" SPACING. USE #6 TIE BARS FOR 8" AND THICKER SLABS, USE #5 TIE BARS FOR LESS THAN 8" THICK SLABS.

**LONGITUDINAL WIDENING JOINT DETAIL**

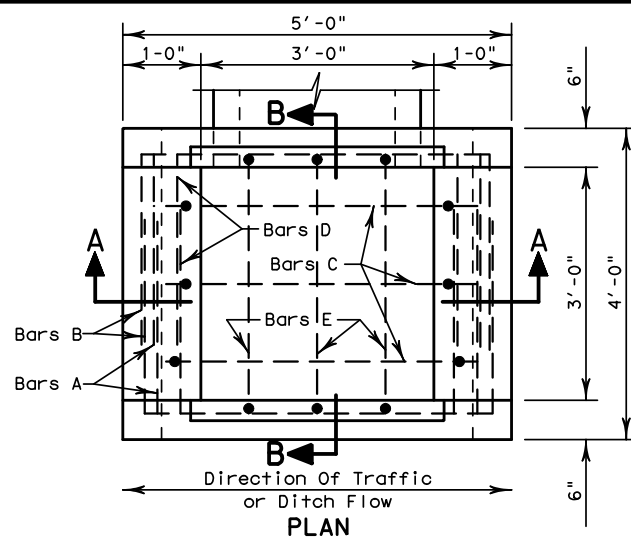
SHEET 2 OF 2

		Design Division Standard	
<b>CONTINUOUSLY REINFORCED CONCRETE PAVEMENT</b> <b>ONE LAYER STEEL BAR PLACEMENT</b> <b>T - 7 to 13 INCHES</b> <b>CRCP(1)-17</b>			
FILE: crcp117.dgn	DN: TxDOT	CK: AN	DW: HC
©TxDOT: May 2017	CONT	SECT	JOB
REVISIONS			HIGHWAY
	DIST	COUNTY	SHEET NO.

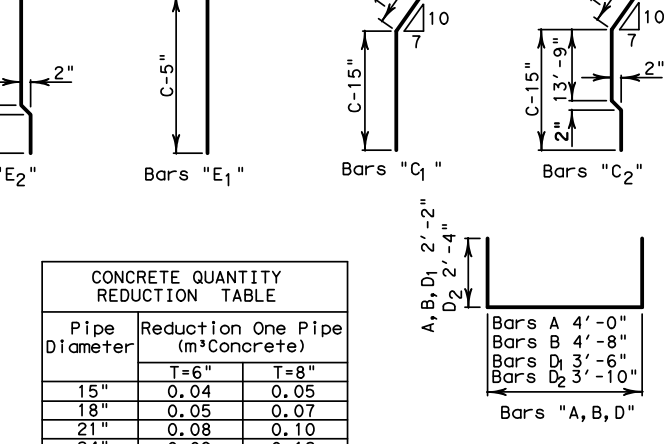
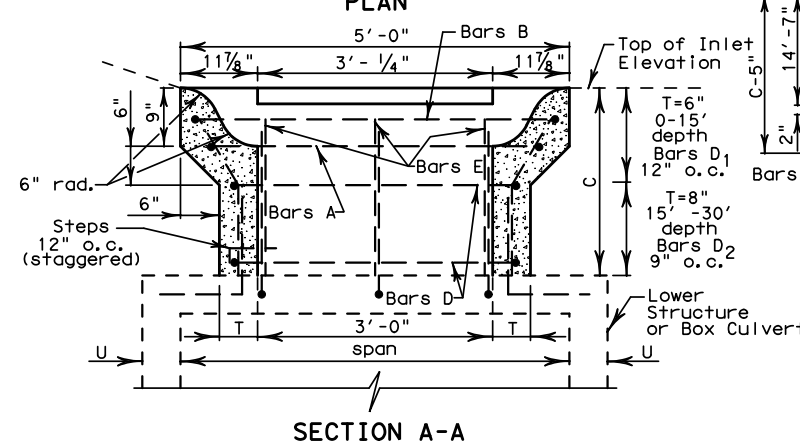
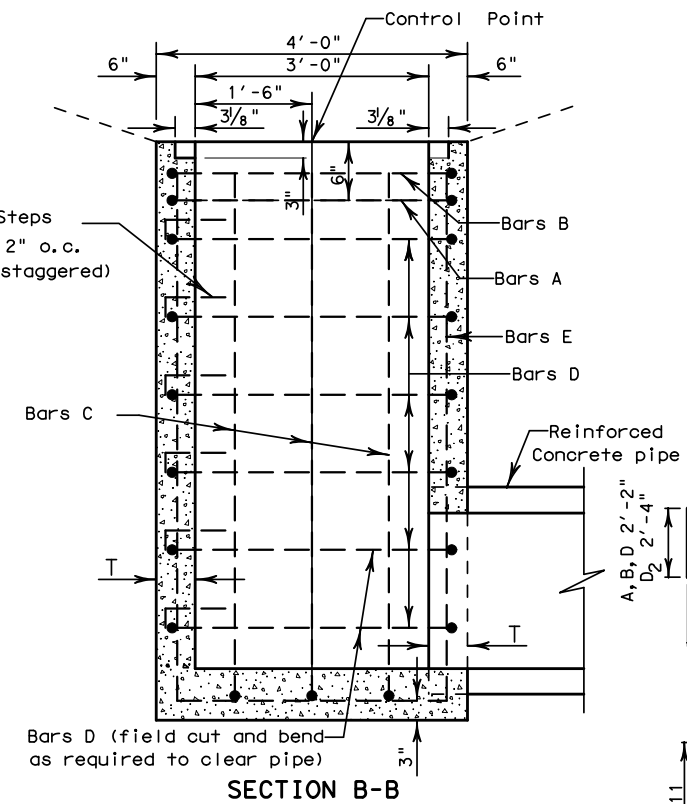
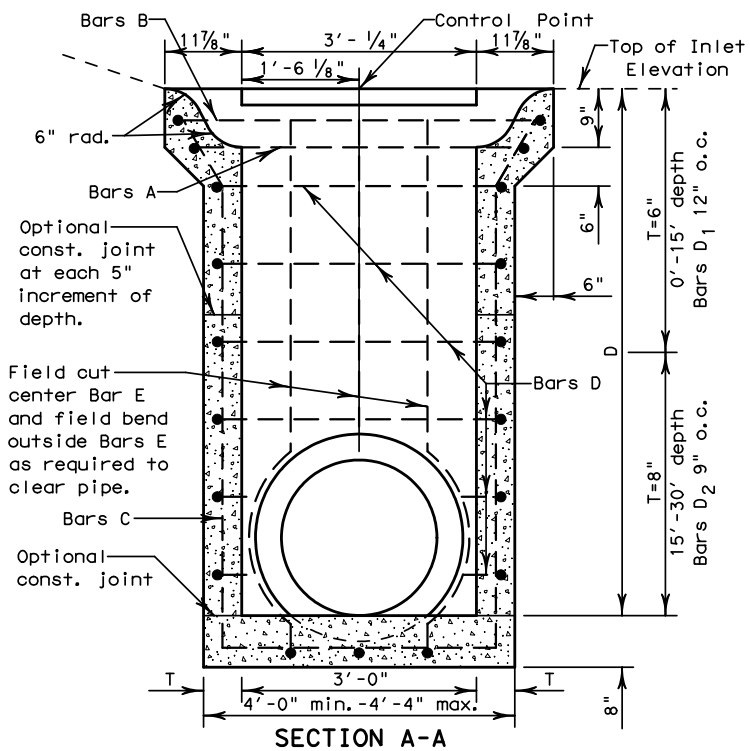
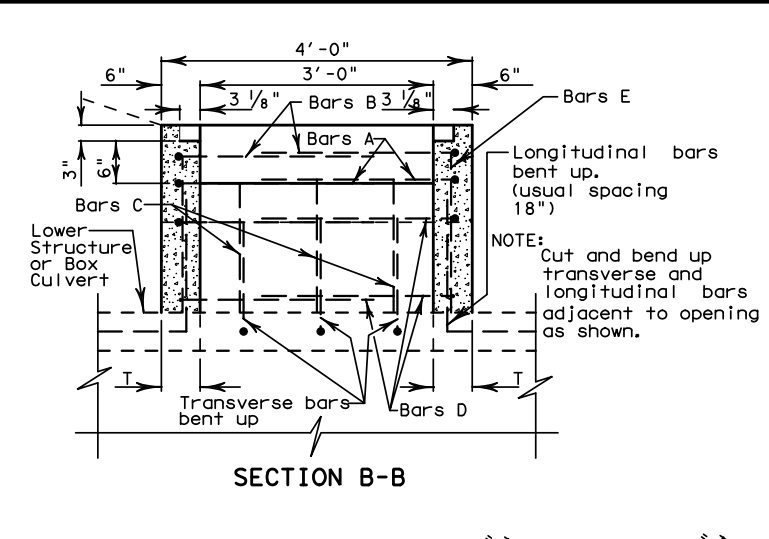
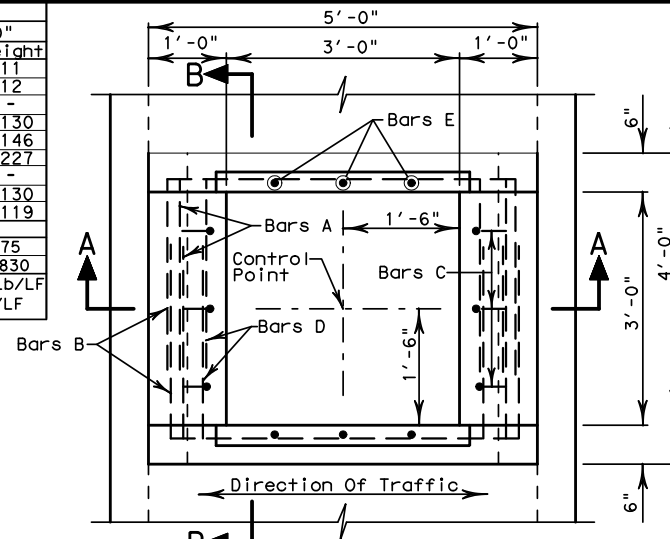
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http://www.dot.state.tx.us/ftw/specinfo/standard.htm di102fw.dgn

LEVELS DISPLAYED  
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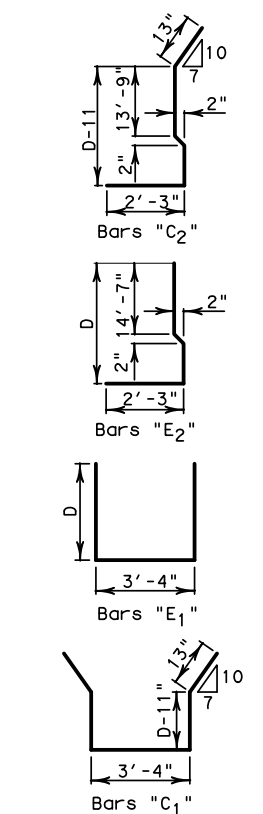
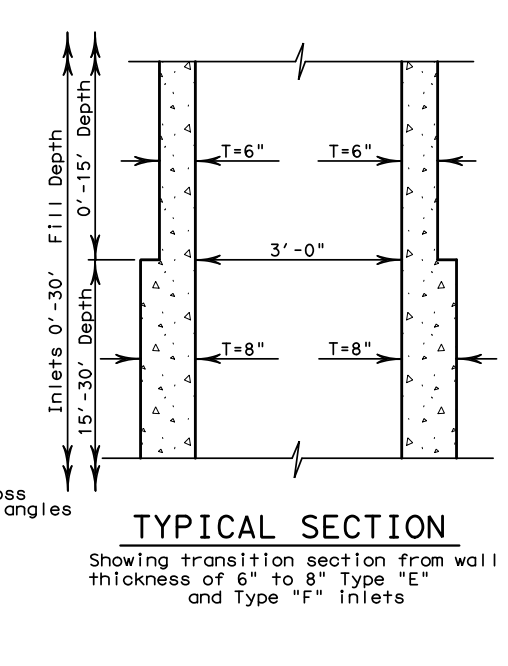
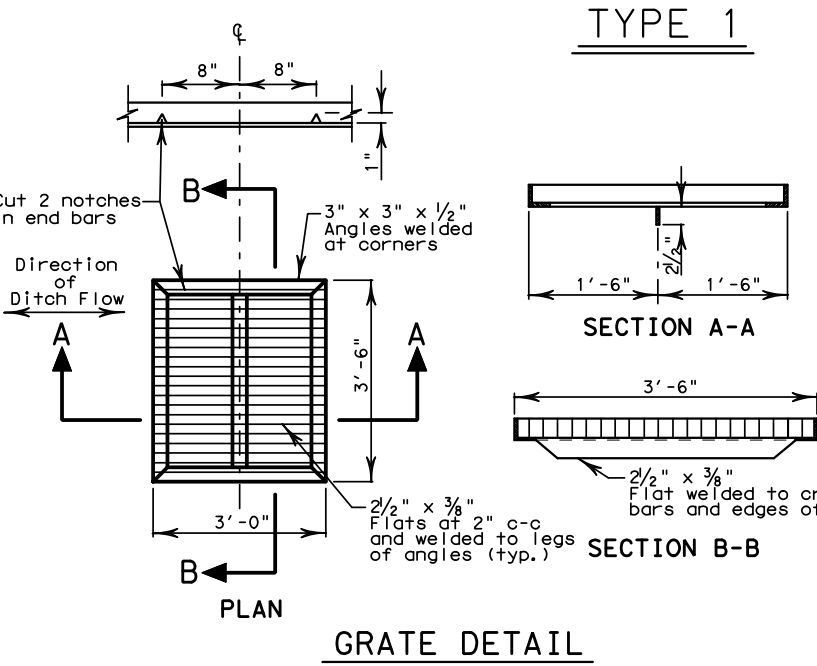
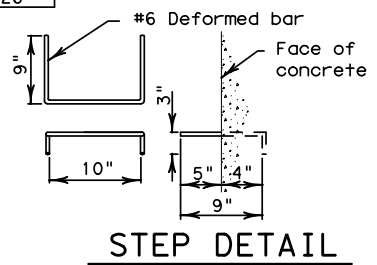


Bar	Size	Spacing	D=3'-0"		D=10'-0"		D=20'-0"		D=30'-0"	
			No.	Length Weight	No.	Length Weight	No.	Length Weight	No.	Length Weight
A	4	-	2	8'-4" 11	2	8'-4" 11	2	8'-4" 11	2	8'-4" 11
B	4	-	2	9'-0" 12	2	9'-0" 12	2	9'-0" 12	2	9'-0" 12
C1	4	12"	3	9'-8" 19	3	23'-8" 47	-	-	-	-
C2	4	12"	-	-	-	-	6	22'-6" 90	6	32'-6" 130
D1	4	12"	4	7'-10" 21	18	7'-10" 94	28	7'-10" 146	28	7'-10" 146
D2	4	9"	-	-	-	-	14	8'-6" 79	40	8'-6" 227
E1	4	12"	3	9'-4" 19	3	23'-4" 47	-	-	-	-
E2	4	12"	-	-	-	-	6	22'-4" 89	6	32'-4" 130
Steps	6	12"	1	2'-10" 4	8	2'-10" 34	18	2'-10" 77	28	2'-10" 119
Total Steel - Lbs.			86		245		505		775	
Class "A" Concrete - Cu. Yds.			1.223		3.036		6.210		9.830	
D=3'-0" Steel			86.35 Lb + 22.73 Lb/LF		D>15'-0" Steel		364.49 Lb + 27.03 Lb/LF			
D=3'-0" Conc.			1.223 CY + 0.259 CY/LF		D>15'-0" Conc.		4.400CY + 0.362 CY/LF			



Pipe Diameter	Reduction One Pipe (m <sup>3</sup> Concrete)	
	T=6"	T=8"
15"	0.04	0.05
18"	0.05	0.07
21"	0.08	0.10
24"	0.09	0.12
27"	0.11	0.15
30"	0.14	0.18
33"	0.17	0.22
36"	0.20	0.26

Bar	Size	Spacing	C-1'-3"		C-10'-0"		C-20'-0"		C-30'-0"	
			No.	Length Wt.	No.	Length Wt.	No.	Length Wt.	No.	Length Wt.
A	4	-	2	8'-4" 11	2	8'-4" 11	2	8'-4" 11	2	8'-4" 11
B	4	-	2	9'-0" 12	2	9'-0" 12	2	9'-0" 12	2	9'-0" 12
C1	4	12"	-	-	6	9'-10" 39	-	-	-	-
C2	4	12"	-	-	-	-	6	19'-11" 80	6	29'-11" 120
D1	4	12"	-	-	18	7'-10" 94	28	7'-10" 146	28	7'-10" 146
D2	4	9"	-	-	-	-	14	8'-6" 80	40	8'-6" 227
E1	4	12"	-	-	6	9'-7" 38	-	-	-	-
E2	4	12"	-	-	-	-	6	19'-8" 79	6	29'-8" 119
Steps	6	12"	-	-	8	2'-10" 34	18	2'-10" 77	28	2'-10" 119
Total Steel (Lbs)			23		228		485		754	
Class "A" Conc. - Cu. Yds.			0.375		2.641		5.746		9.366	
C=1'-3" Steel			30.84 Lb + 22.73 Lb/LF		C=10'-0" Steel		343.38 Lb + 27.03 Lb/LF			
C=1'-3" Conc.			0.375 CY + 0.259 CY/LF		C >15'-0" Conc.		3.936 CY + 0.362 CY/LF			

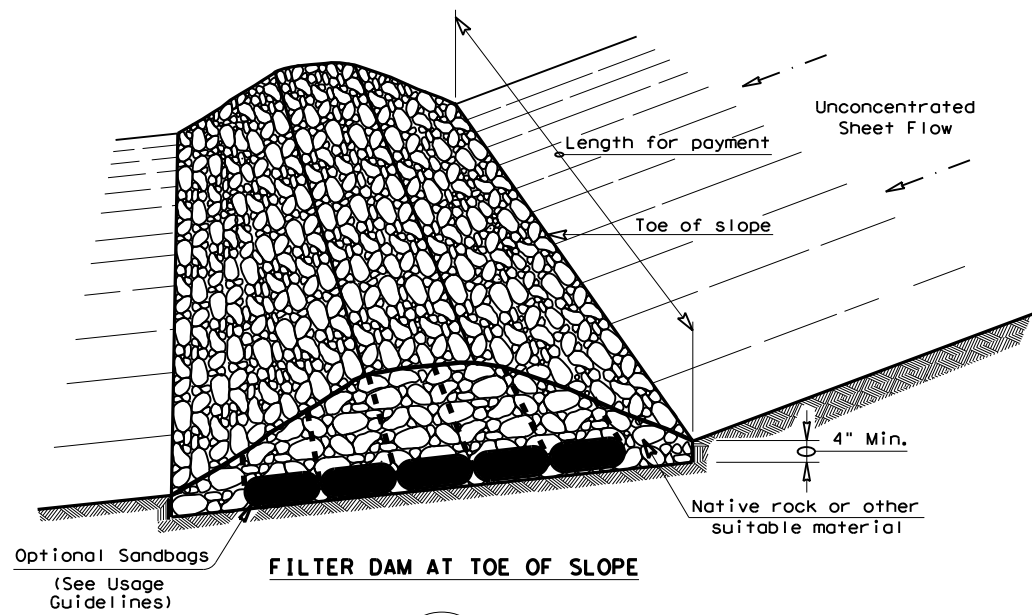


- GENERAL NOTES**
- All concrete shall be Class "A".
  - All dimensions relating to reinforcing steel are to centers of bars. Reinforcing steel shall be placed with the centers of outside layers of bars 3" from the concrete surface where the wall thickness, T, is 6" and shall be placed with the centers of outside layers of bars 4" from the concrete surface where the wall thickness, T, is 8" unless otherwise noted.
  - Grate shall conform to Item 471.
  - Location of inlet as shown in the plans refers to control point shown on this sheet. Inlet shall be aligned so that grate vanes are parallel to ditch flow. For type 1-C structures not on culverts, lower structure may be positioned as required to align with top structure, storm drain pipes, or other adjacent structures.
  - When used with junction box, measure and pay for drop inlet and junction box separately.

<p>REVISIONS: 10/09-Added note to pay for junction box separately.</p>					
<p>Texas Department of Transportation FORT WORTH DISTRICT © 2002 by Texas Department of Transportation All Rights Reserved</p>					
<p>DROP INLET DETAILS TYPES 1 &amp; 1-C DI-1-02 (FW)</p>					
ORIG DRAW DATE: 8/02	DESIGN: CHECKED:	FED. REG. 6	STATE TEXAS	PROJ NO.	HIGHWAY
	DRAWN: CHECKED:	DISTRICT	COUNTY	CONTROL SECTION	JOB SHEET
		FTW			

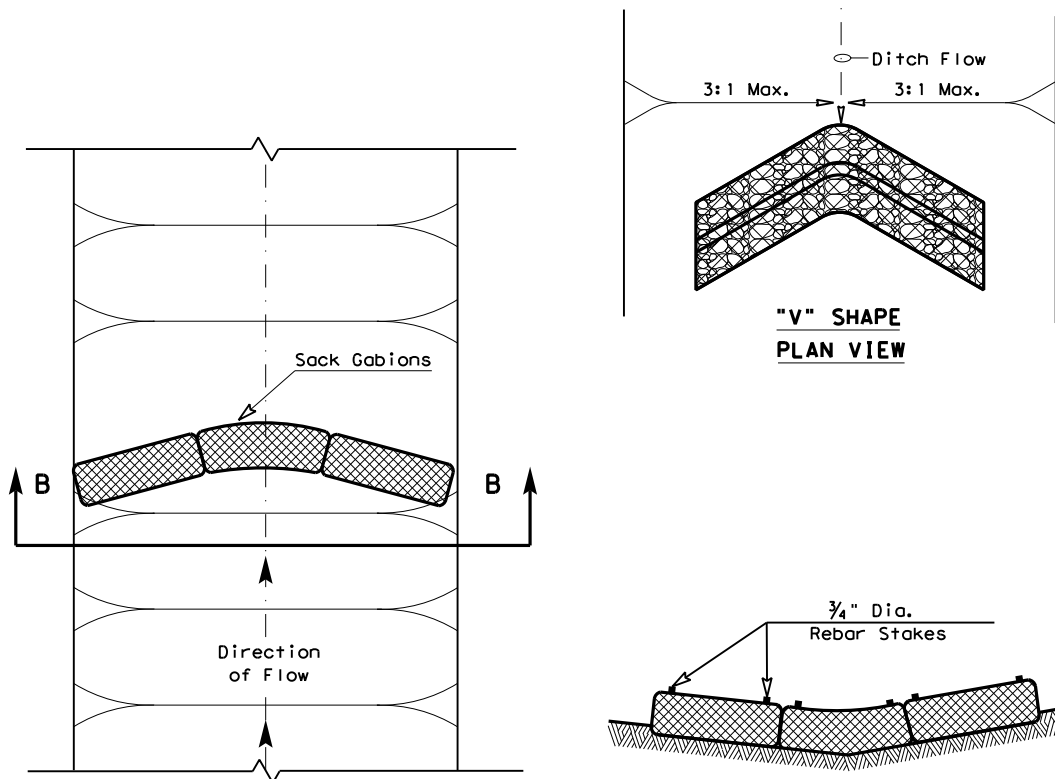
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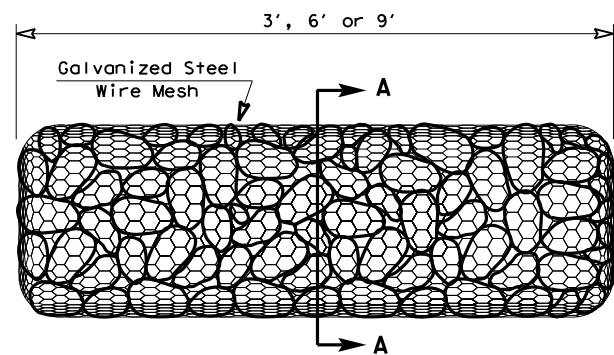
**FILTER DAM AT TOE OF SLOPE**

(RFD1)



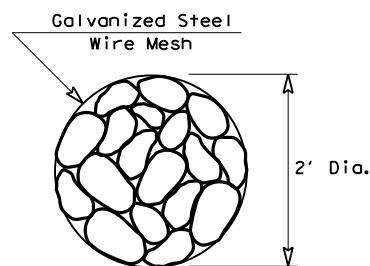
**PLAN VIEW**

**SECTION B-B**

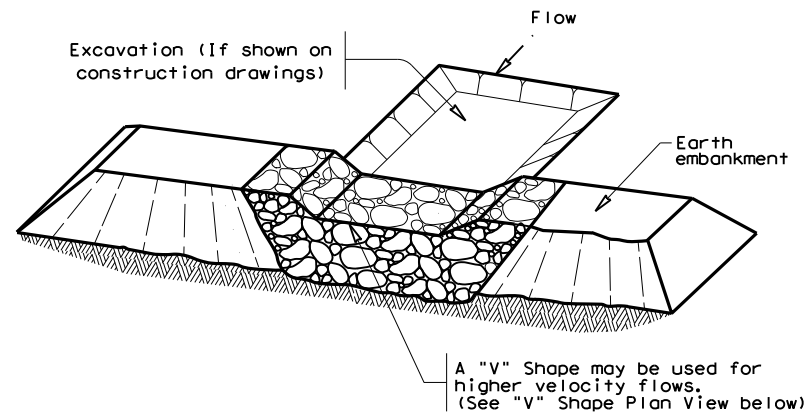


**TYPE 4 (SACK GABIONS)**

(RFD4)

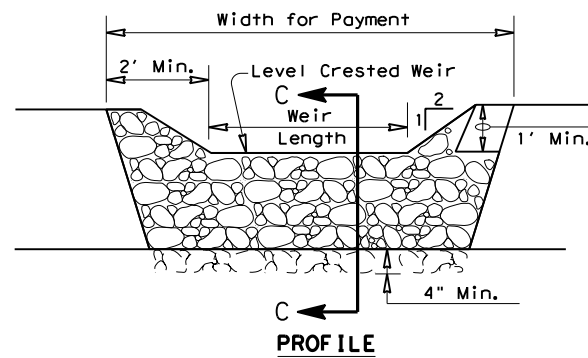


**SECTION A-A**

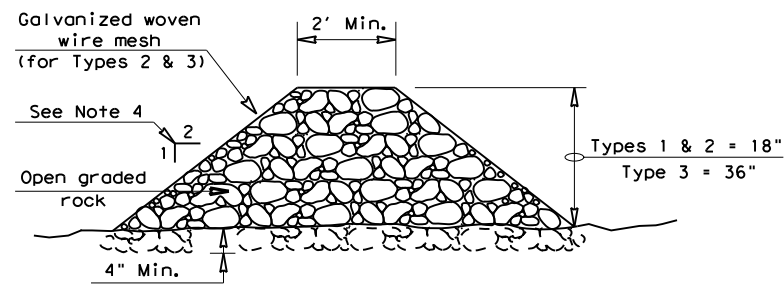


**FILTER DAM AT SEDIMENT TRAP**

(RFD2) OR (RFD1)



**PROFILE**



**SECTION C-C**

**ROCK FILTER DAM USAGE GUIDELINES**

Rock Filter Dams should be constructed downstream from disturbed areas to intercept sediment from overland runoff and/or concentrated flow. The dams should be sized to filter a maximum flow through rate of 60 GPM/FT<sup>2</sup> of cross sectional area. A 2 year storm frequency may be used to calculate the flow rate.

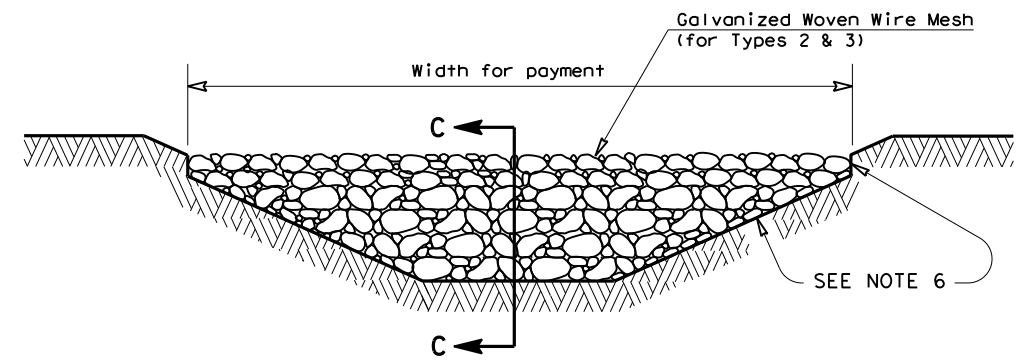
**Type 1 (18" high with no wire mesh) (3" to 6" aggregate):** Type 1 may be used at the toe of slopes, around inlets, in small ditches, and at dike or swale outlets. This type of dam is recommended to control erosion from a drainage area of 5 acres or less. Type 1 may not be used in concentrated high velocity flows (approximately 8 Ft/Sec or more) in which aggregate wash out may occur. Sandbags may be used at the embedded foundation (4" deep min.) for better filtering efficiency of low flows if called for on the plans or directed by the Engineer.

**Type 2 (18" high with wire mesh) (3" to 6" aggregate):** Type 2 may be used in ditches and at dike or swale outlets.

**Type 3 (36" high with wire mesh) (4" to 8" aggregate):** Type 3 may be used in stream flow and should be secured to the stream bed.

**Type 4 (Sack gabions) (3" to 6" aggregate):** Type 4 May be used in ditches and smaller channels to form an erosion control dam.

**Type 5:** Provide rock filter dams as shown on plans.



**FILTER DAM AT CHANNEL SECTIONS**

(RFD3) OR (RFD2) OR (RFD1)

**GENERAL NOTES**

1. If shown on the plans or directed by the Engineer, filter dams should be placed near the toe of slopes where erosion is anticipated, upstream and/or downstream at drainage structures, and in roadway ditches and channels to collect sediment.
2. Materials (aggregate, wire mesh, sandbags, etc.) shall be as indicated by the specification for "Rock Filter Dams for Erosion and Sedimentation Control".
3. The rock filter dam dimensions shall be as indicated on the SW3P plans.
4. Side slopes should be 2:1 or flatter. Dams within the safety zone shall have sideslopes of 6:1 or flatter.
5. Maintain a minimum of 1' between top of rock filter dam weir and top of embankment for filter dams at sediment traps.
6. Filter dams should be embedded a minimum of 4" into existing ground.
7. The sediment trap for ponding of sediment laden runoff shall be of the dimensions shown on the plans.
8. Rock filter dam types 2 & 3 shall be secured with 20 gauge galvanized woven wire mesh with 1" diameter hexagonal openings. The aggregate shall be placed on the mesh to the height & slopes specified. The mesh shall be folded at the upstream side over the aggregate and tightly secured to itself on the downstream side using wire ties or hog rings. For in stream use, the mesh should be secured or staked to the stream bed prior to aggregate placement.
9. Sack Gabions should be staked down with 3/4" dia. rebar stakes, and have a double-twisted hexagonal weave with a nominal mesh opening of 2 1/2" x 3 1/4".
10. Flow outlet should be onto a stabilized area (vegetation, rock, etc.).
11. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

**PLAN SHEET LEGEND**

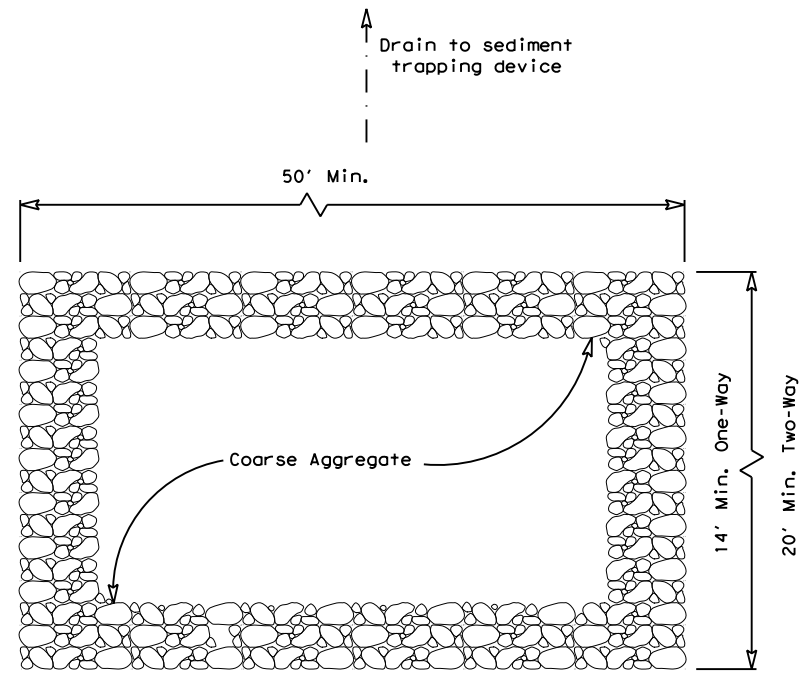
- Type 1 Rock Filter Dam (RFD1)
- Type 2 Rock Filter Dam (RFD2)
- Type 3 Rock Filter Dam (RFD3)
- Type 4 Rock Filter Dam (RFD4)

		Design Division Standard	
<b>TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES</b> <b>ROCK FILTER DAMS</b> <b>EC(2) - 16</b>			
FILE: ec216	DN: TxDOT	CK: KM	DW: VP
© TxDOT: JULY 2016	CONT	SECT	JOB
REVISIONS			HIGHWAY
	DIST	COUNTY	SHEET NO.

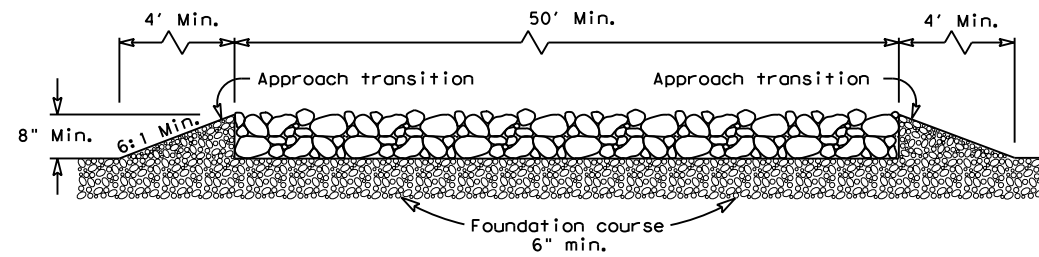


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DATE: \$DATES  
FILE: \$FILES



PLAN VIEW

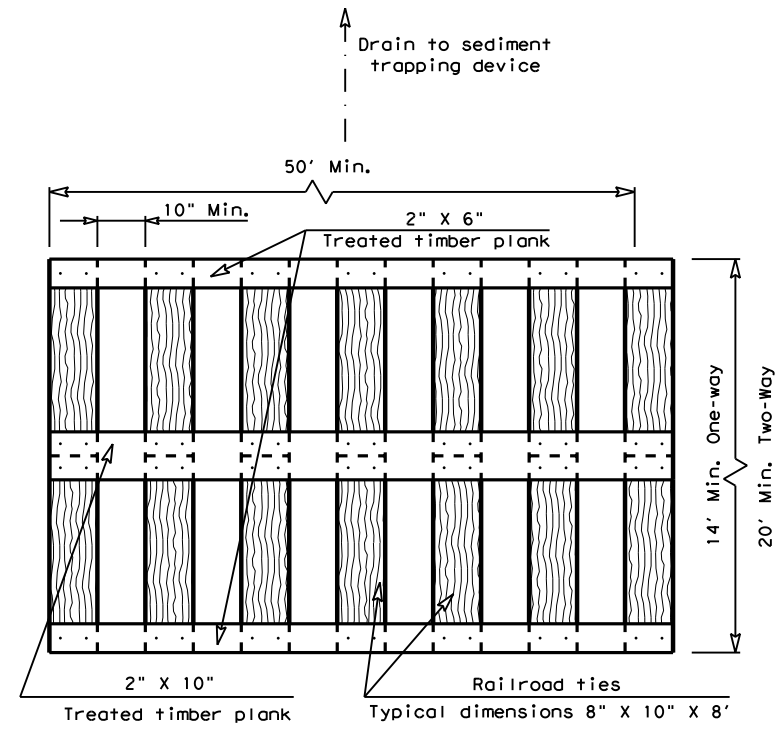


ELEVATION VIEW

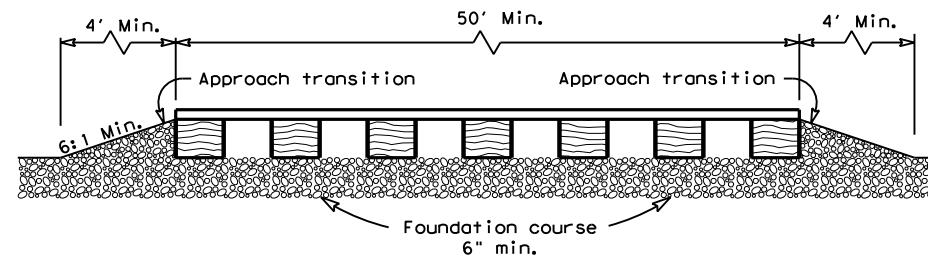
CONSTRUCTION EXIT (TYPE 1)  
ROCK CONSTRUCTION (LONG TERM)

**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 materials 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.



PLAN VIEW

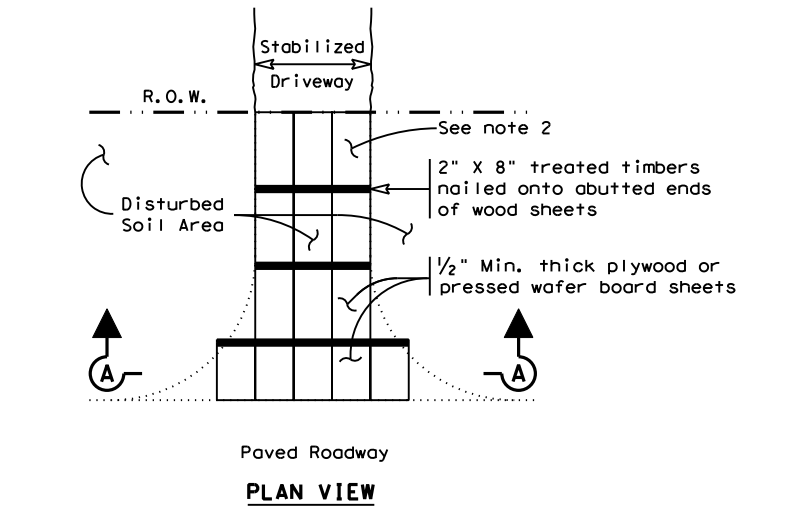


ELEVATION VIEW

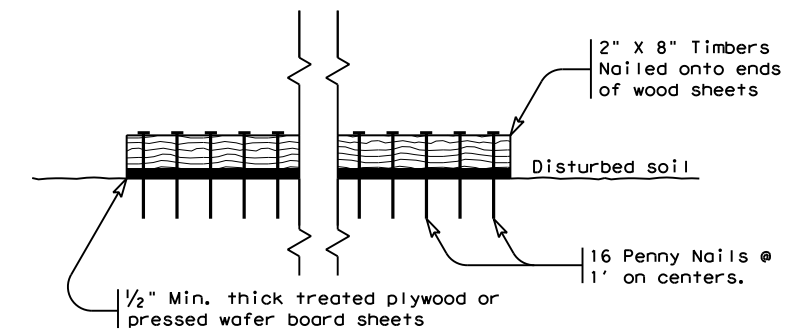
CONSTRUCTION EXIT (TYPE 2)  
TIMBER CONSTRUCTION (LONG TERM)

**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 1/2" 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.



PLAN VIEW



SECTION A-A  
CONSTRUCTION EXIT (TYPE 3)  
SHORT TERM

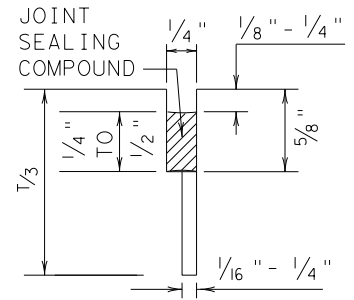
**GENERAL NOTES (TYPE 3)**

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.

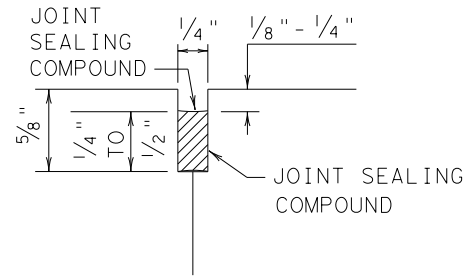
		<i>Design Division Standard</i>	
<b>TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES CONSTRUCTION EXITS EC(3)-16</b>			
FILE: ec316	DN: TxDOT	CK: KM	DW: VP
© TxDOT: JULY 2016	CONT: SECT	JOB: HIGHWAY	DN/CK: LS
REVISIONS			
\$CS	\$SS	\$JS	\$HWY
DIST	COUNTY	SHEET NO.	
\$DST	\$CTY	\$EC	\$A-16

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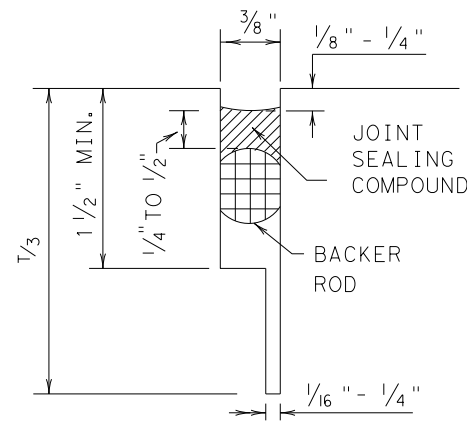
METHOD B: JOINT SEALING COMPOUND



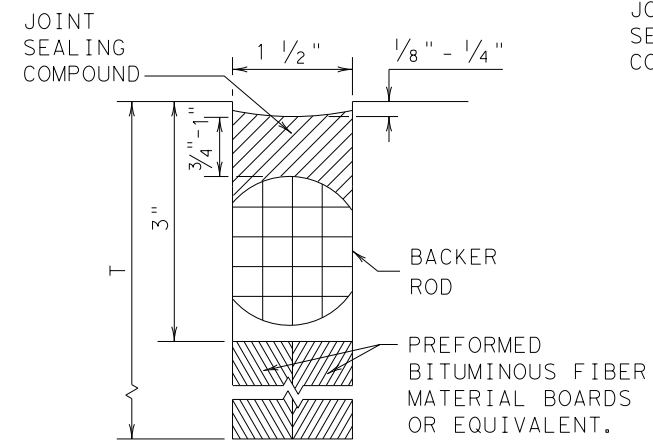
LONGITUDINAL SAWED CONTRACTION JOINT



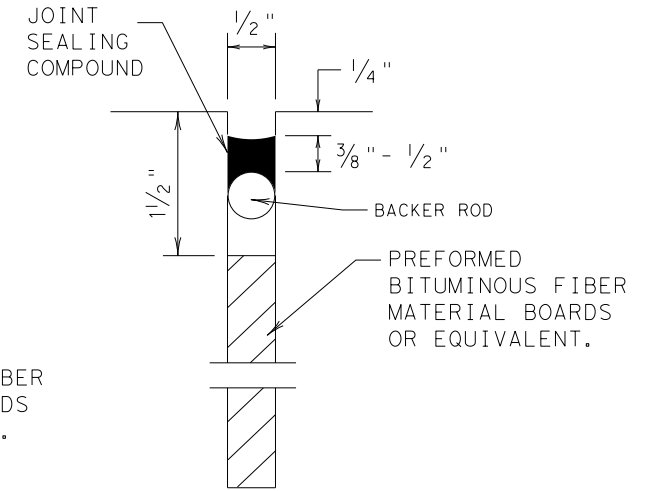
LONGITUDINAL OR TRANSVERSE CONSTRUCTION JOINT



TRANSVERSE SAWED CONTRACTION JOINT

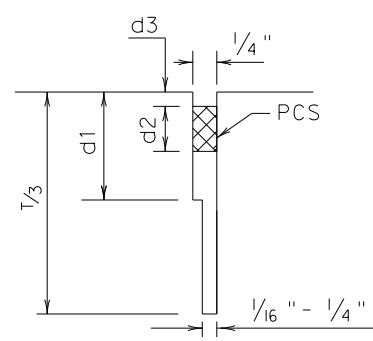


TRANSVERSE FORMED EXPANSION JOINT

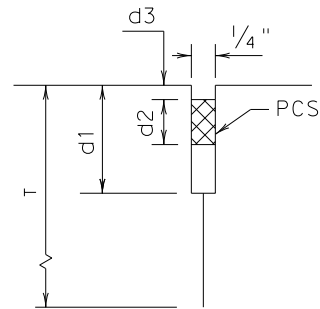


FORMED ISOLATION JOINT

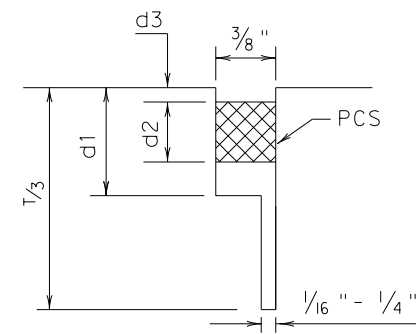
METHOD A: PREFORMED COMPRESSION SEALS (PCS) (DMS-6310 CLASS 6)



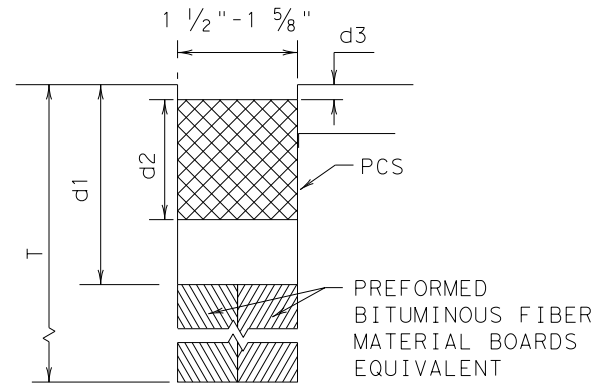
LONGITUDINAL SAWED CONTRACTION JOINT



LONGITUDINAL CONSTRUCTION JOINT



TRANSVERSE SAWED CONTRACTION JOINT



TRANSVERSE FORMED EXPANSION JOINT

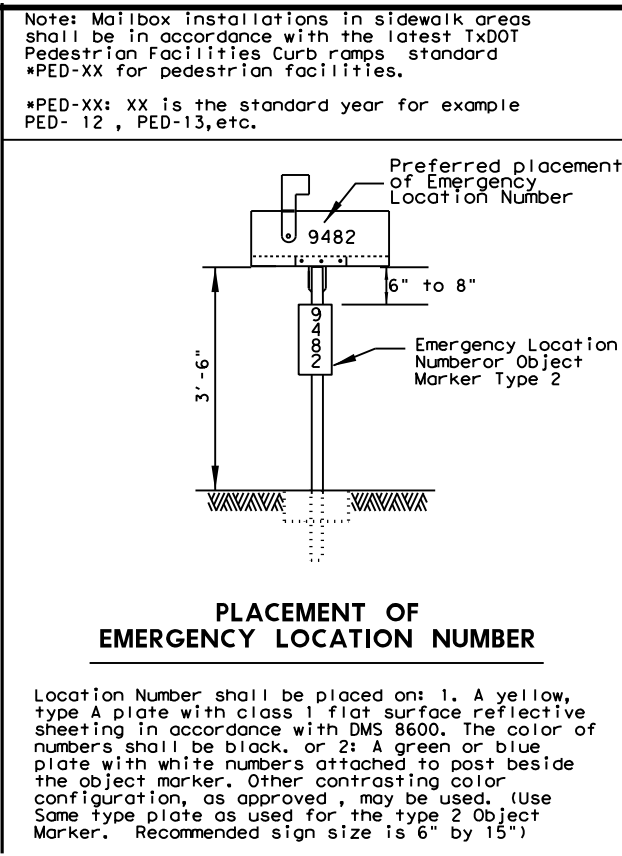
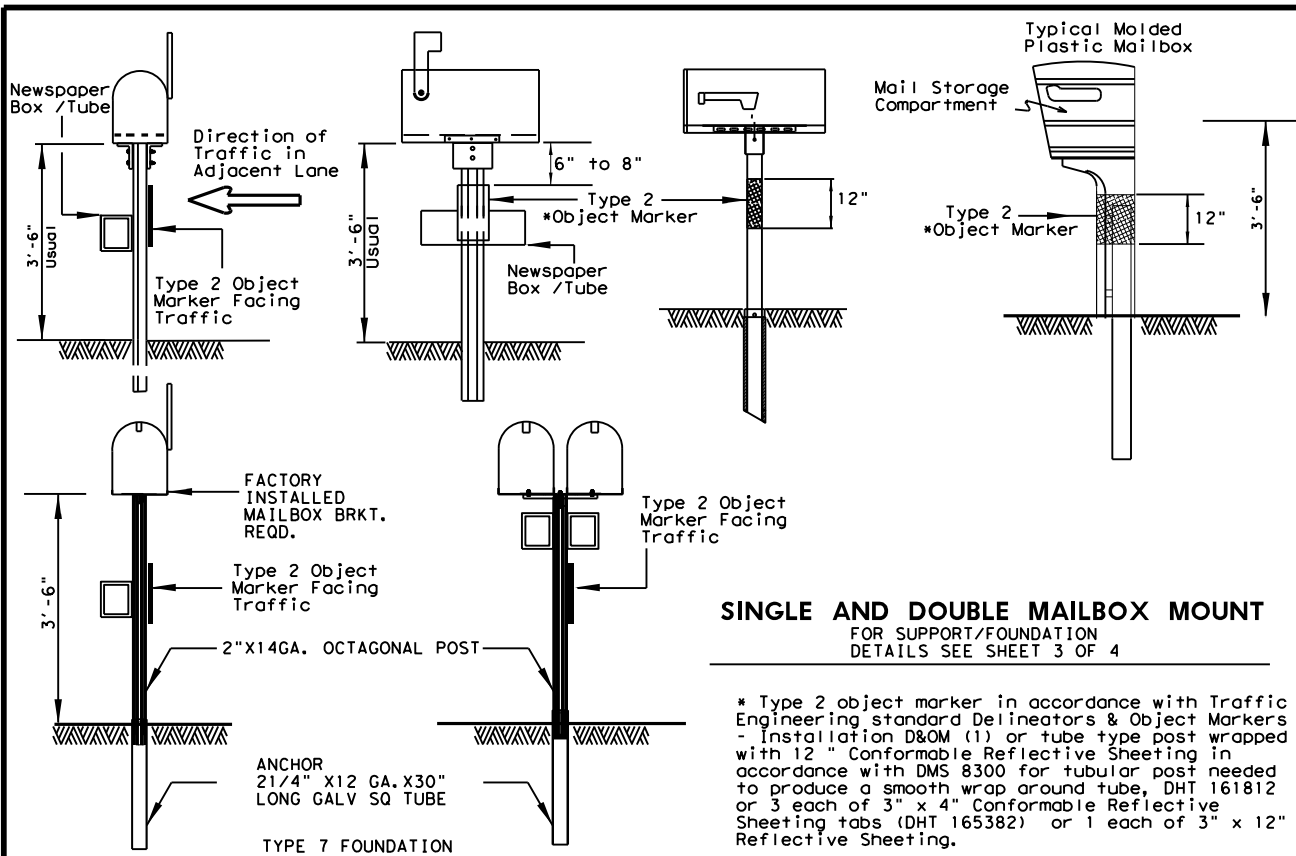
GENERAL NOTES

- UNLESS OTHERWISE SHOWN IN THE PLANS, EITHER METHOD "A" OR METHOD "B" MAY BE USED.
- THE LOCATION OF JOINTS SHALL BE AS SHOWN ELSEWHERE IN THE PLANS.
- THE JOINT RESERVOIR FOR SEALANT OR PCS SHALL BE SAWED UNLESS OTHERWISE SHOWN ON THE PLANS FOR THE LONGITUDINAL AND TRANSVERSE CONSTRUCTION JOINTS AND THE SAWED JOINTS.
- DIMENSIONS d1, d2, AND d3 SHOWN IN METHOD A SHALL BE IN ACCORDANCE WITH THE PREFORMED COMPRESSION SEAL MANUFACTURER'S RECOMMENDATION.
- REFER TO DMS-6310 "JOINT SEALANTS AND FILLERS" FOR THE CLASSIFICATIONS.
- FOR SAWED LONGITUDINAL JOINT, LONGITUDINAL OR TRANSVERSE CONSTRUCTION JOINT, USE JOINT SEALANT CLASS 5 OR 8 UNLESS OTHERWISE SHOWN ON THE PLAN OR APPROVED.
- FOR TRANSVERSE SAWED CONTRACTION, TRANSVERSE FORMED EXPANSION JOINT, AND ISOLATION JOINT USE JOINT SEALANT CLASS 5 OR 8 AT NEW JOINTS. USE JOINT SEALANT CLASS 4,5,7,OR 8 FOR MAINTAINING EXISTING JOINTS.
- THE JOINTS SHALL BE CLEANED IN ACCORDANCE WITH THE ITEM 438 "CLEANING AND SEALING JOINTS" OR ITEM 713 "CLEANING AND SEALING JOINTS AND CRACKS (CONCRETE PAVEMENT)".
- ISOLATION JOINTS ACCOMMODATE HORIZONTAL AND VERTICAL MOVEMENTS THAT OCCUR BETWEEN A PAVEMENT AND A STRUCTURE. ISOLATION JOINTS MAY BE USED FOR BRIDGE ABUTMENTS, INTERSECTIONS, CURB AND GUTTER, OLD AND NEW PAVEMENTS, OR AROUND DRAINAGE INLETS, MANHOLES, FOOTINGS AND LIGHTING STRUCTURES.

DATE:  
FILE:

		<b>Design Division Standard</b>	
<b>CONCRETE PAVING DETAILS</b> <b>JOINT SEALS</b> <b>JS-14</b>			
FILE: js14.dgn	DN: TxDOT	DN: HC	CK: AN
© TxDOT: DECEMBER 2014	CONT	SECT	HIGHWAY
REVISIONS			
DIST	COUNTY	SHEET NO.	

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SIZE	TYPICAL MAILBOX SIZE			LIGHT WEIGHT MATERIAL	
	LENGTH	WIDTH	HEIGHT	SHEET METAL	**PLASTIC
	INCHES			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

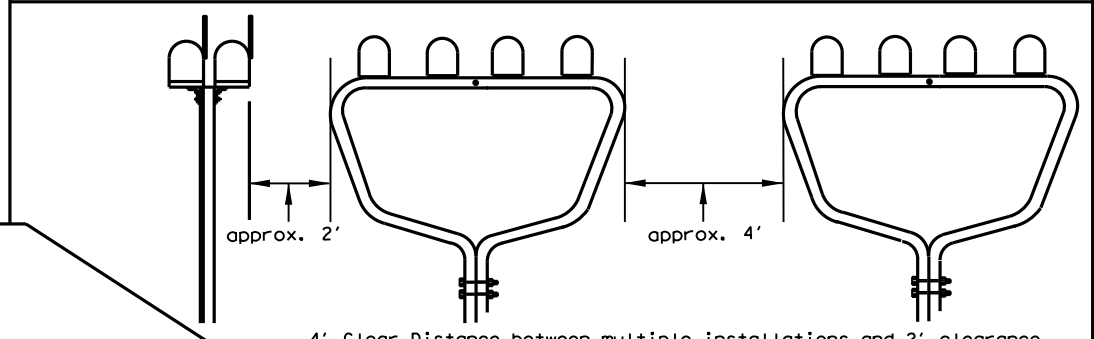
\* Maximum allowed dimensions for mailbox  
\*\* Excluding Molded Plastic on 4 X 4 Post

LOCKABLE ARCHITECTURAL MAILBOX SIZE (INCHES)					
VIEW	TOP	BOTTOM	FRONT SIDE	BACK SIDE	WEIGHT
SIDE	18	15	18.3	15	(POUNDS)
BACK	11 1/2	11 1/2		15	22.4

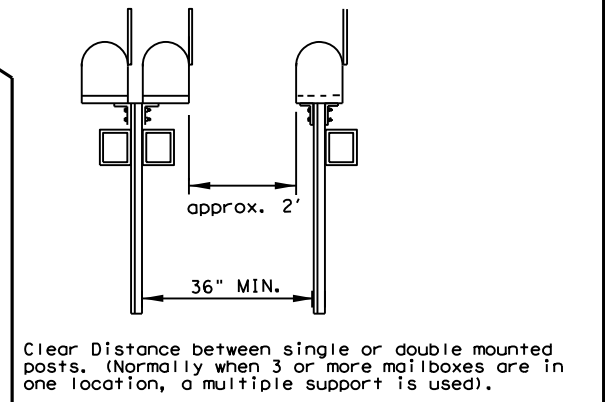
SEE TOP RIGHT CORNER OF SHEET 2 OF 4

**MAILBOX SIZES**

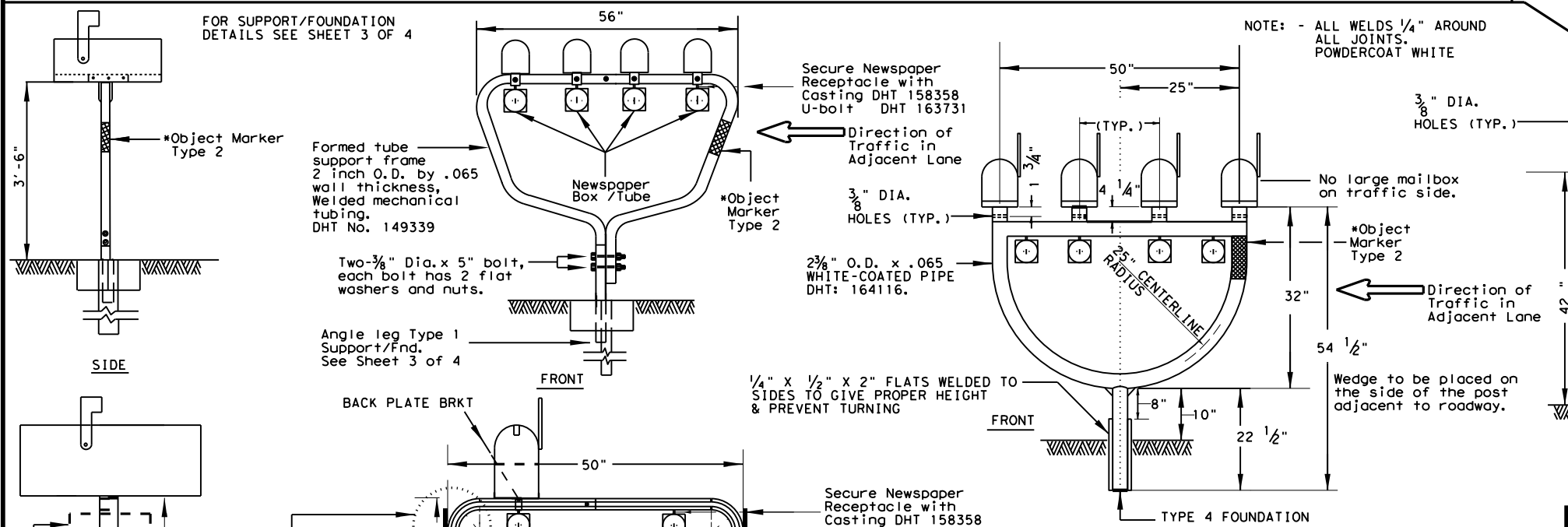
Mailboxes shall be made of light weight sheet metal or light weight plastic. Lockable architectural mailboxes shall meet the requirements of the above table. Heavy steel, cast iron or decorative mailboxes shall not be used on the state highway system.



**MULTIPLE MAILBOX PLACEMENT**



**SINGLE & DOUBLE MAILBOX PLACEMENT**



**MULTIPLE MAILBOX MOUNT**

**INDEX OF MAILBOX DETAIL SHEETS**

- 1 of 4 MAILBOX MOUNTING AND SPACING
- 2 of 4 MAILBOX BRACKET CONNECTING DETAILS
- 3 of 4 MAILBOX SUPPORT / FOUNDATION
- 4 of 4 TABLE OF DHT NUMBERS

**DOUBLE AND MULTIPLE MAILBOX MOUNT**

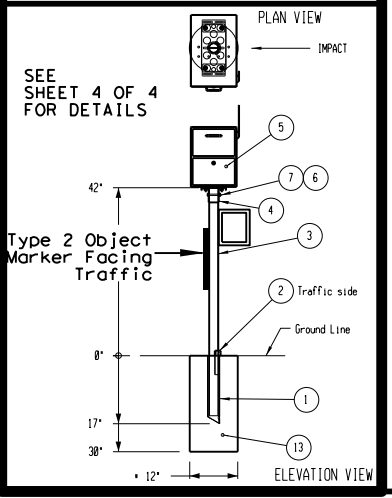
FOR SUPPORT/FOUNDATION DETAILS SEE SHEET 3 OF 4 FOR DHT NUMBERS SEE SHEET 4 OF 4

**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.

**LOCKABLE ARCHITECTURAL MAILBOX**

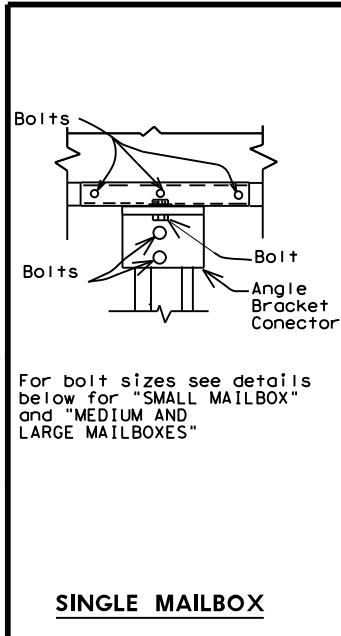


**MAILBOX MOUNTING AND SPACING MB-15(1)**

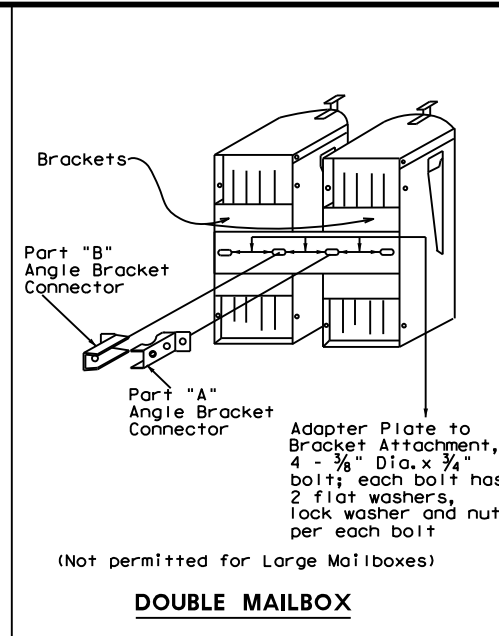
FILE:MB14(1).DGN	DW: JEO	CK: JEO	DW:	CK:
© TxDOT APRIL 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS:				
Added additional newspaper receptacle for double mailbox support	DIST	COUNTY		SHEET NO.



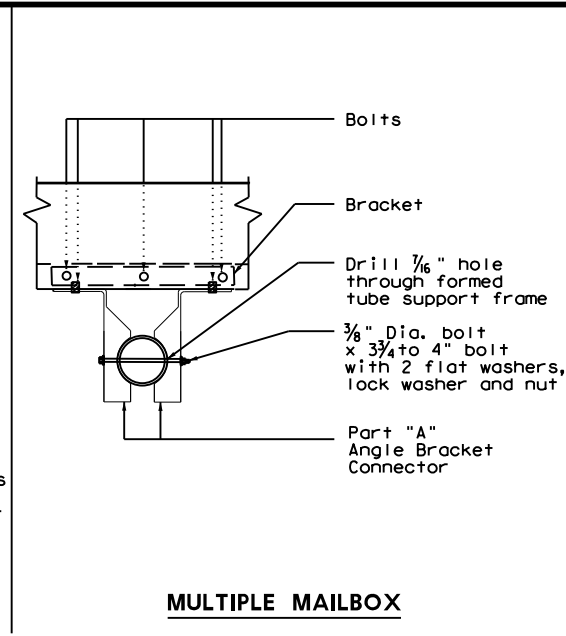
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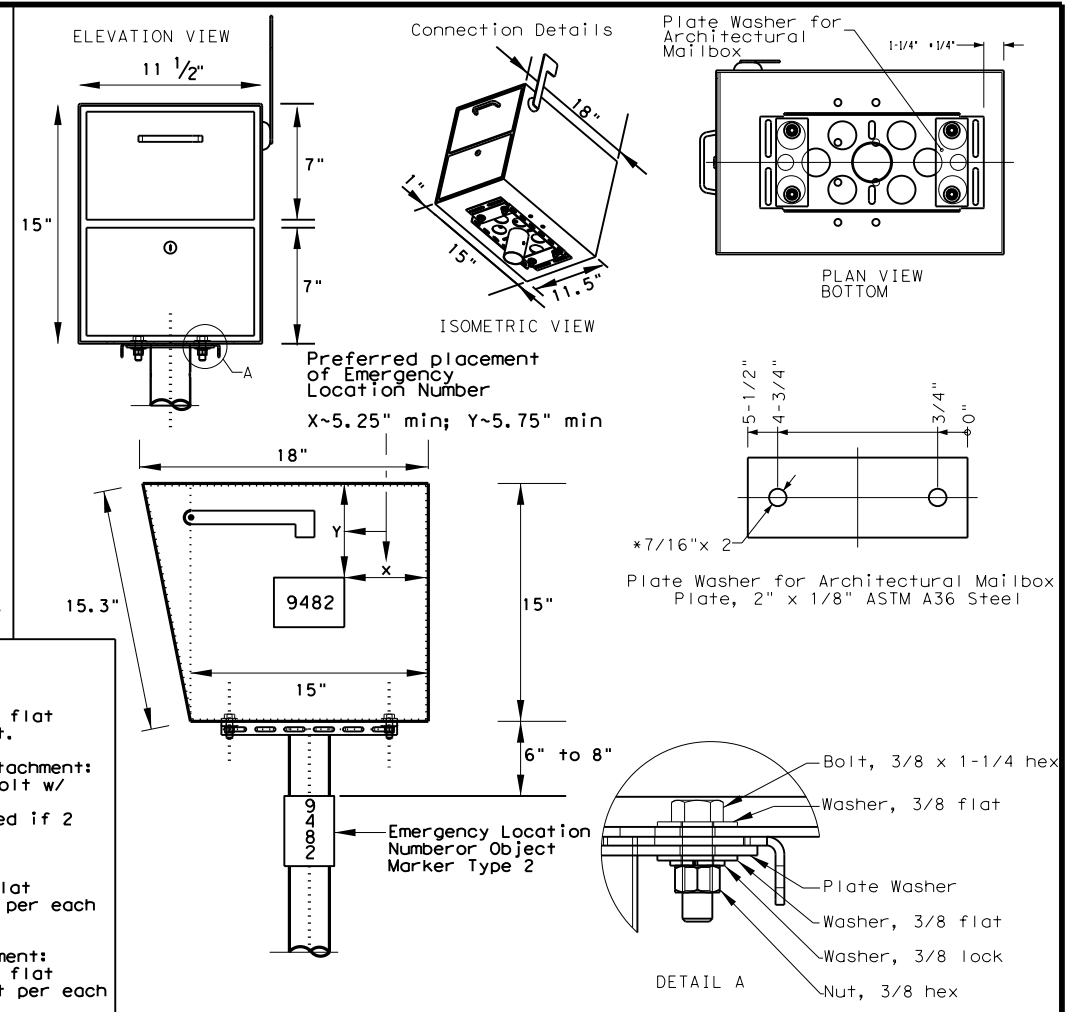
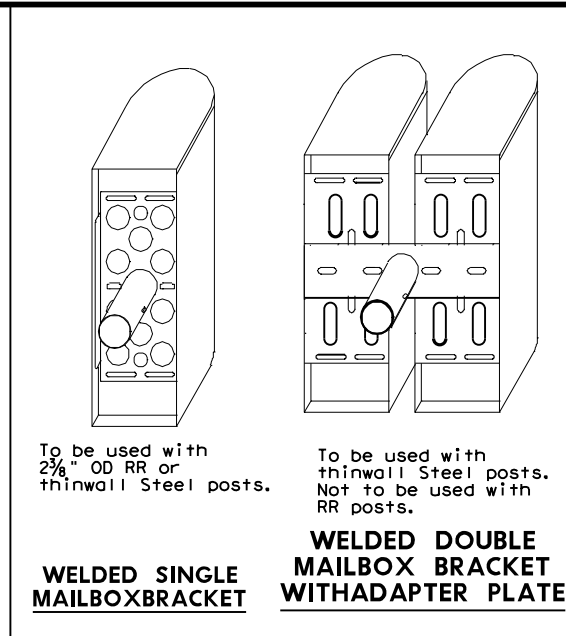
**SINGLE MAILBOX**



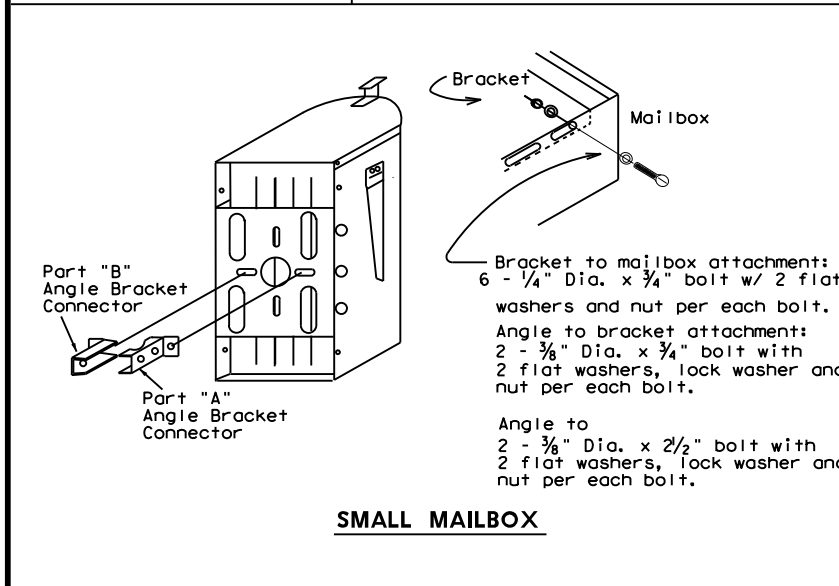
**DOUBLE MAILBOX**



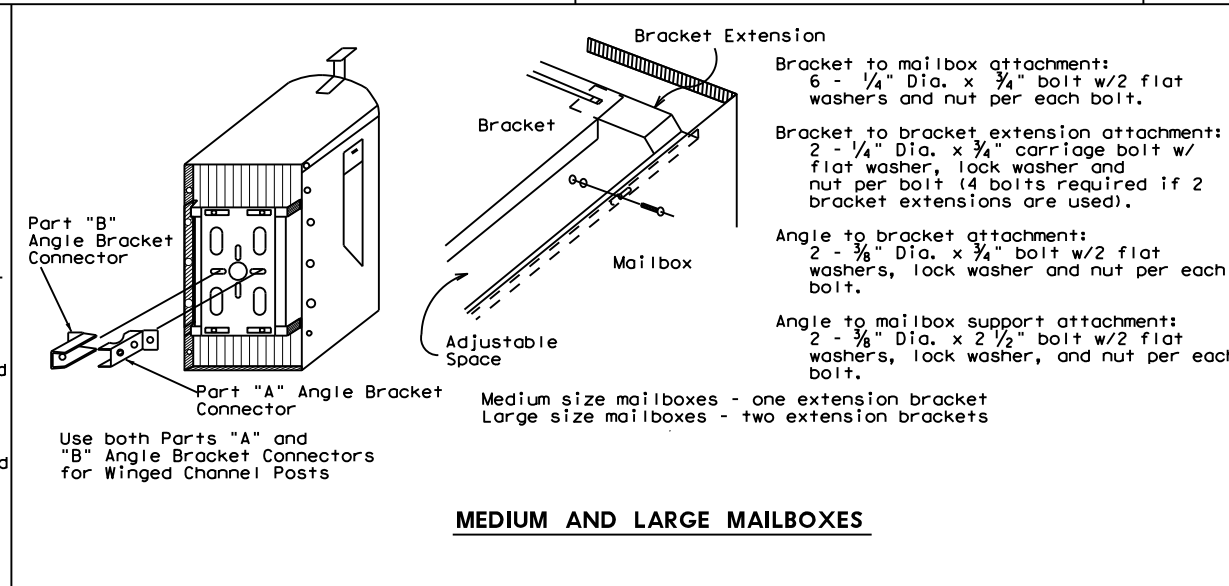
**MULTIPLE MAILBOX**



**LOCKABLE ARCHITECTURAL MAILBOX CONNECTION DETAILS**



**SMALL MAILBOX**



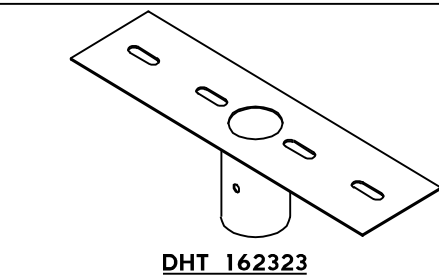
**MEDIUM AND LARGE MAILBOXES**

**GENERAL NOTES**

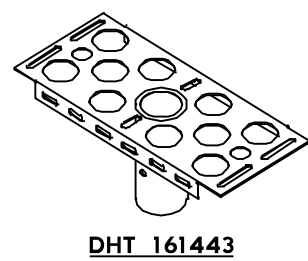
1. Connecting hardware detailed on this sheet is for the hardware that the Department stocks at the Regional Warehouses. This hardware is available to the contractor only when so stated elsewhere in the plans or specification.
2. Hardware for mounting mailboxes to the support/foundation furnished by 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.



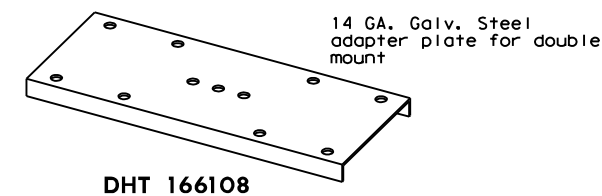
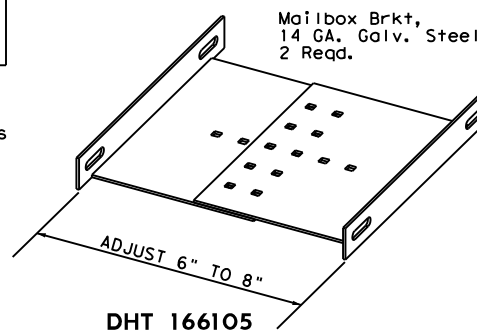
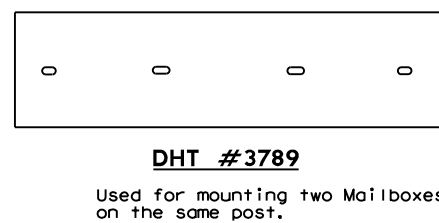
**MAILBOX BRACKET CONNECTING DETAILS**  
**MB-15(1)**



For use with galvanized thinwall steel posts DHT # 143426 or powder-coated thinwall steel post DHT # 162911.

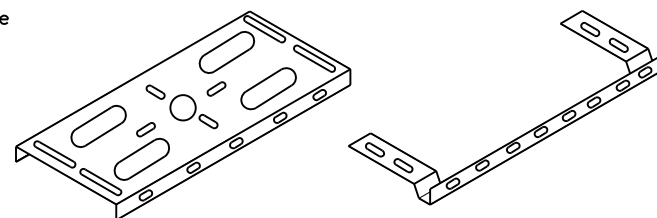


For use with RCR post DHT # 161442 or galvanized thinwall steel post DHT # 143426 or powder-coated thinwall steel post. DHT # 162911.



**HARDWARE AT TXDOT REGIONAL WAREHOUSES**

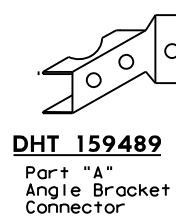
Brackets and adapter plate shown in this section should be available to the Contractor when stated elsewhere in plans or specifications.



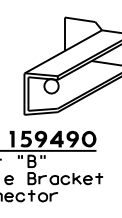
**DHT 148939**

Mailbox Bracket

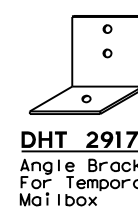
Used for extending 6" wide bracket to attach larger mailboxes.  
Bracket Extension



**DHT 159489**  
Part "A" Angle Bracket Connector



**DHT 159490**  
Part "B" Angle Bracket Connector

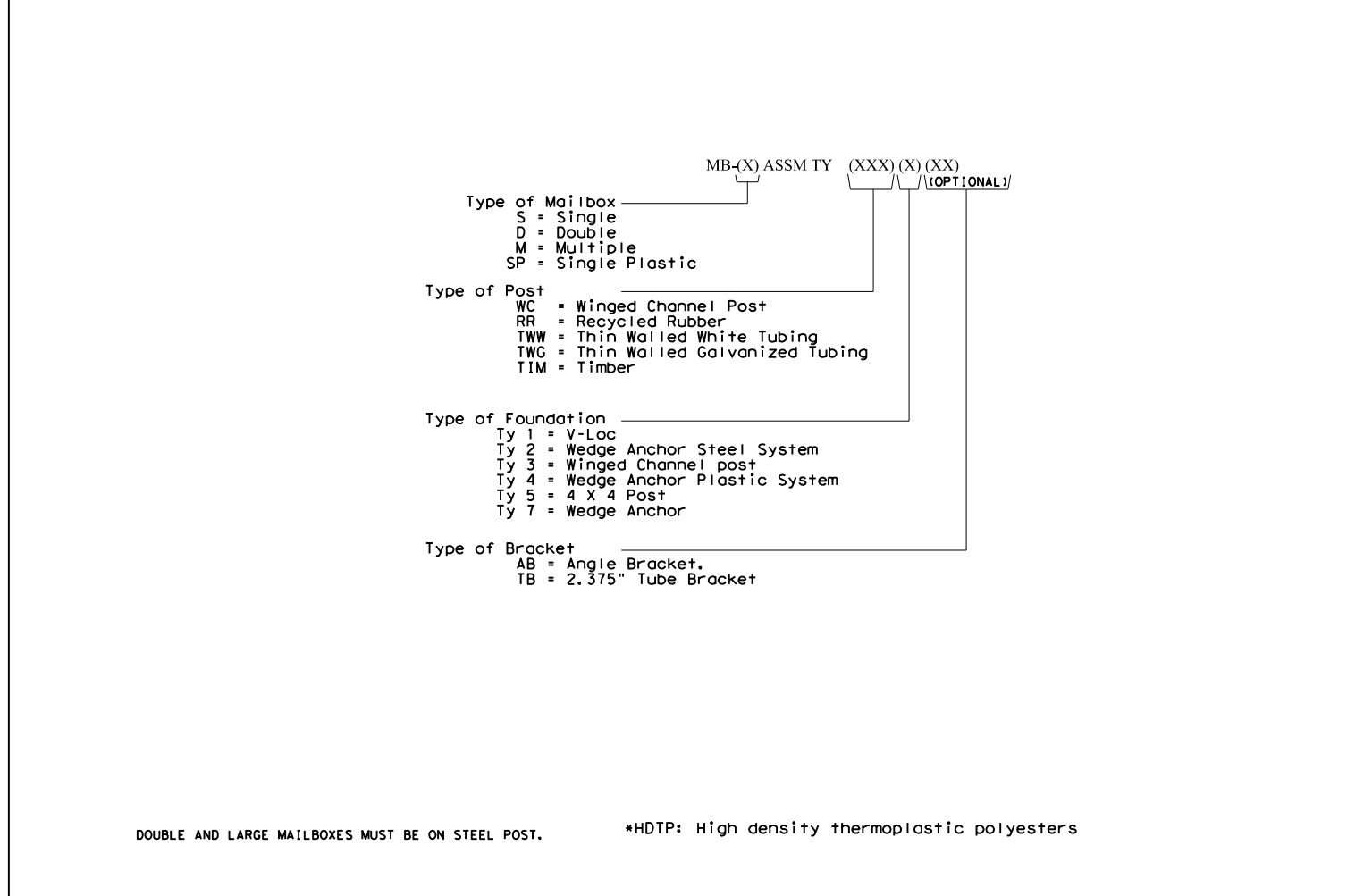
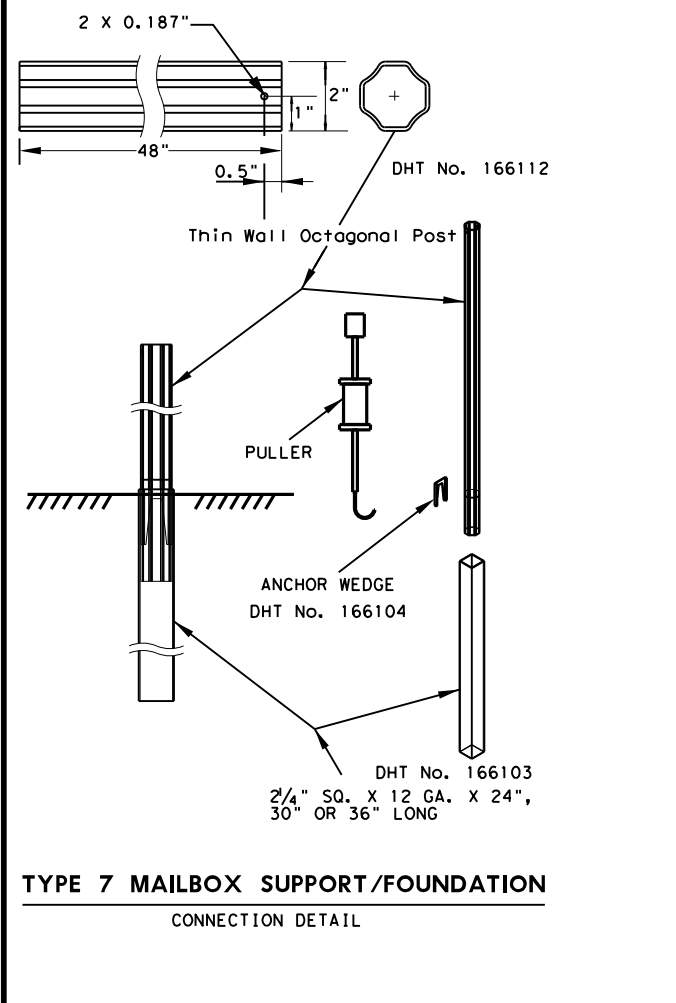
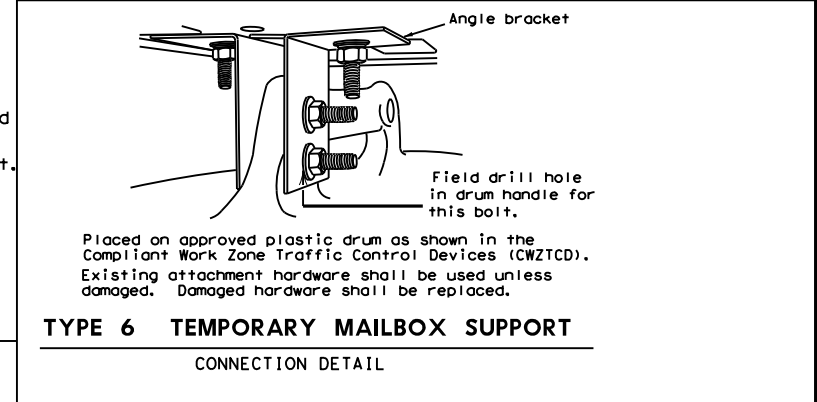
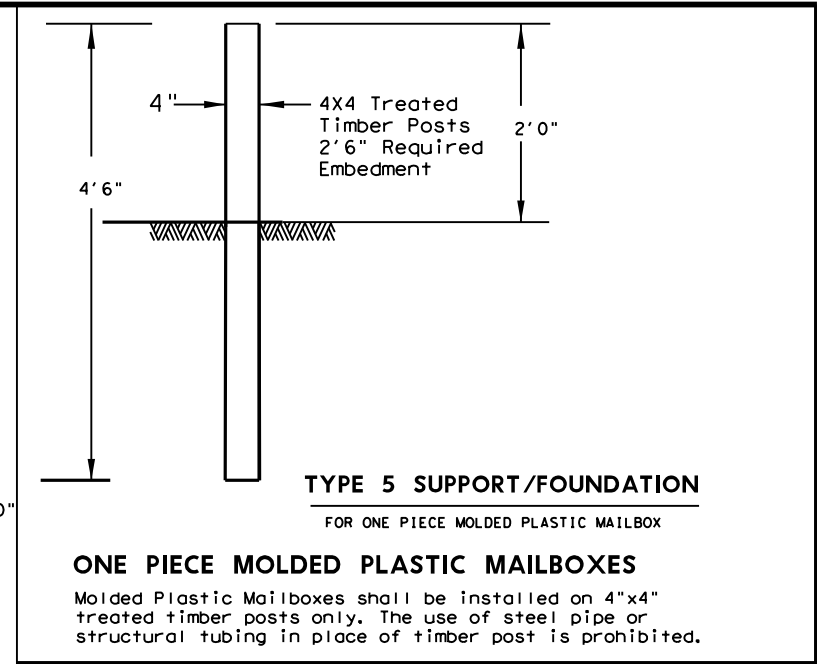
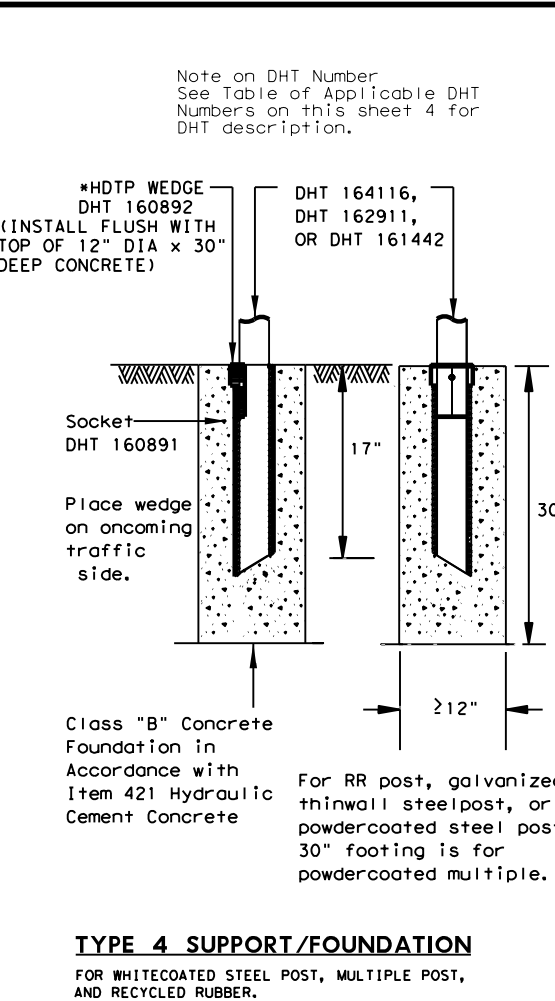
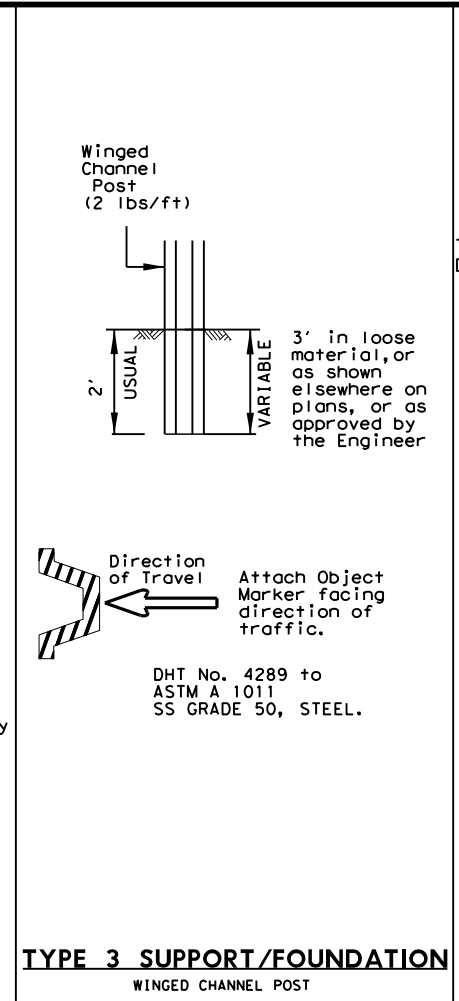
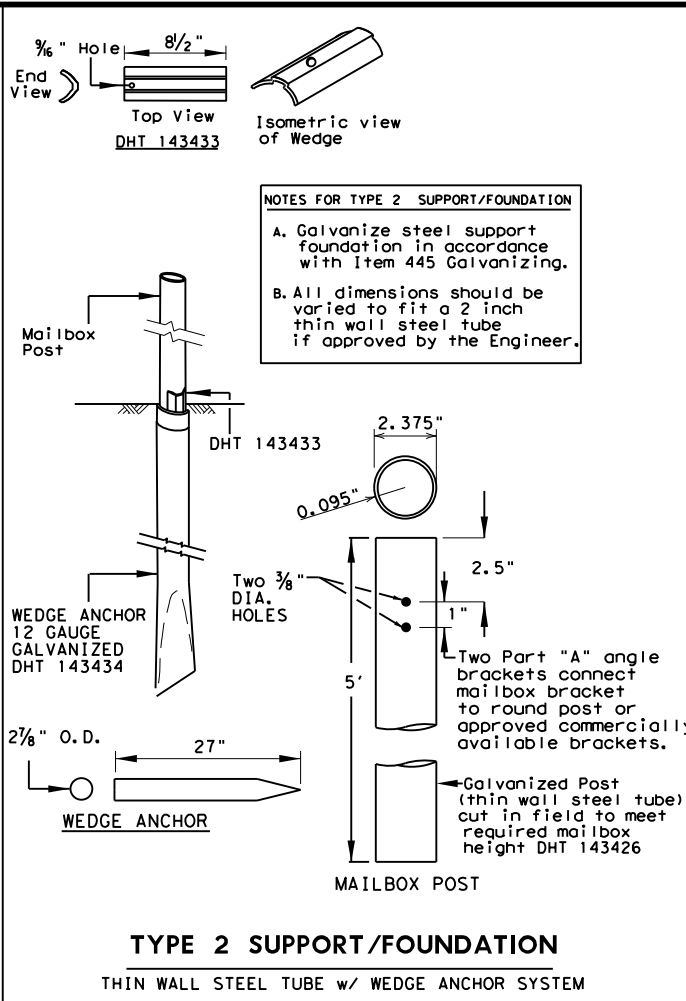
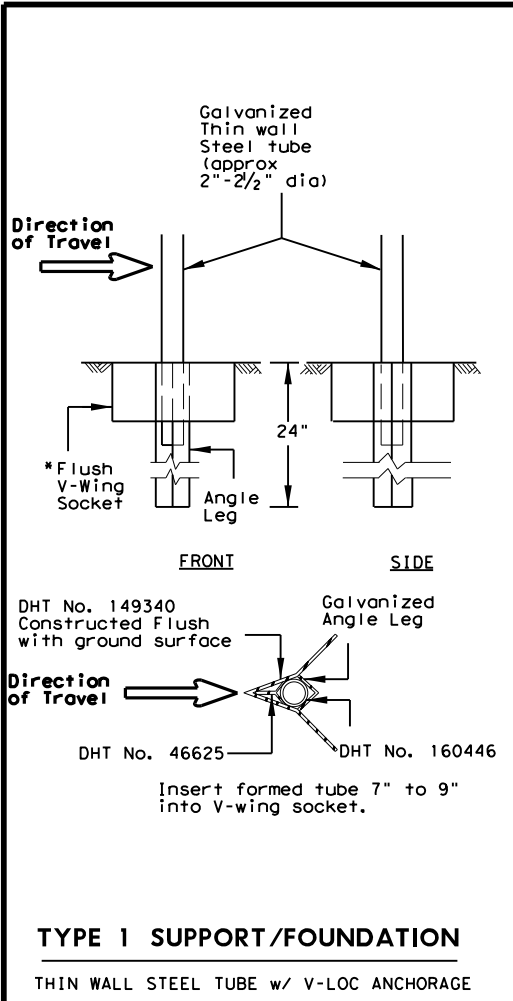


**DHT 2917**  
Angle Bracket For Temporary Mailbox

See Table of Applicable DHT Numbers on sheet 4 of 4 for DHT description and unit of measure.

FILE:MB14(1).DGN	DN: JEO	CK:	DW: JEO	CK:
© TxDOT APRIL 2015	CONT	SECT	JOB	HIGHWAY
ADDED DHT 163730	REVISIONS			
DIST	COUNTY		SHEET NO.	

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- GENERAL NOTES**
- Erect post plumb or vertical.
  - When galvanized part is required galvanize in accordance with Item 445.
  - 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.
  - The Type 1 or type 7 support/foundation can be used for a multiple mailbox mount.
  - The Type 4 support should be used with thin wall steel pipe for the medium, large and double mailbox installations.
  - 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.

SHEET 3 OF 4

Maintenance Division Standard

**MAILBOX SUPPORT AND FOUNDATION**  
**MB-15(1)**

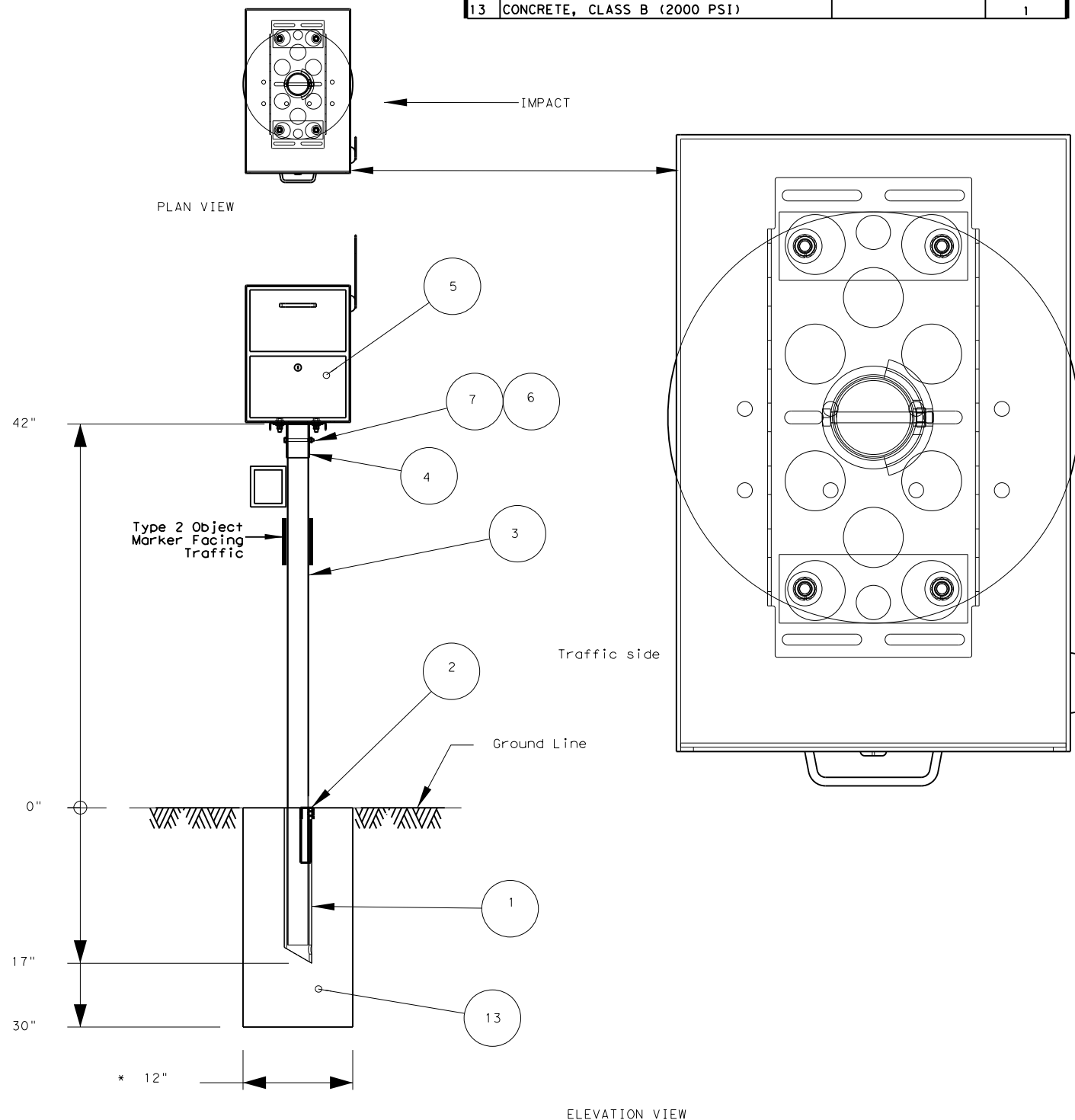
FILE: MB14(1).DGN	DN: JEO	CK:	DW: JEO	CK:
© TxDOT APRIL 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS				
	DIST	COUNTY		SHEET NO.

**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



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**TABLE OF APPLICABLE DHT NUMBERS**

DHT NUMBER	DESCRIPTION
<b>FOUNDATIONS</b>	
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
<b>POSTS</b>	
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
	SINGLE OR DOUBLE THIN-WALL MAILBOX POST GALVANIZED
166152	2" OCTAGONAL
	SINGLE OR DOUBLE THIN-WALL MAILBOX POST WHITECOATED
166112	2" OCTAGONAL
<b>REFLECTIVE SHEETING</b>	
161812	REFLECTIVE SHEETING FOR EMERGENCY LOCATION NUMBER PANEL
<b>CONNECTING HARDWARE</b>	
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
	BRACKET FOR DOUBLE MOUNTING OF MAILBOXES ON THINWALL
162323	STEEL POST, GALVANIZED OR POWDERCOATED.
	BRACKET FOR ATTACHING MAILBOX TO RECYCLED RUBBER POST
161443	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

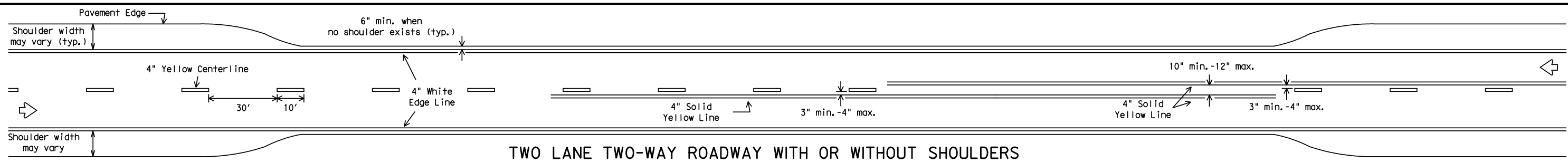


**DHT NUMBERS TABLE  
MB-15(1)**

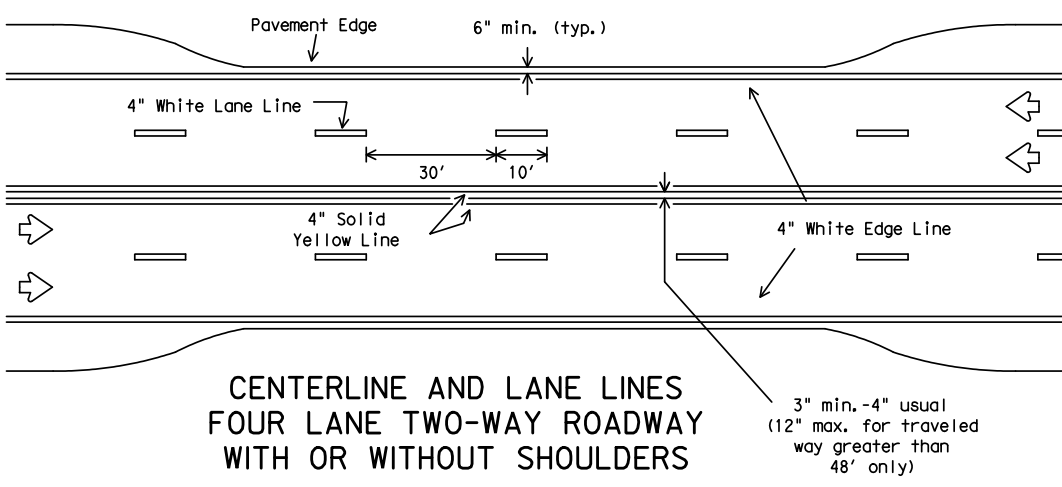
FILE:MB14(1).DGN	DN:	CK:	DW:	CK:
© TxDOT APRIL 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	DIST	COUNTY	SHEET NO.	



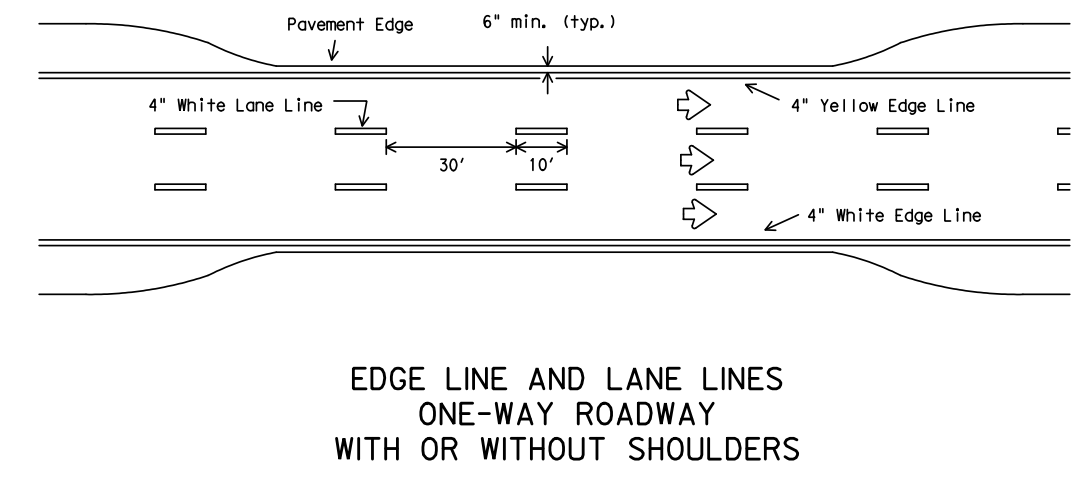
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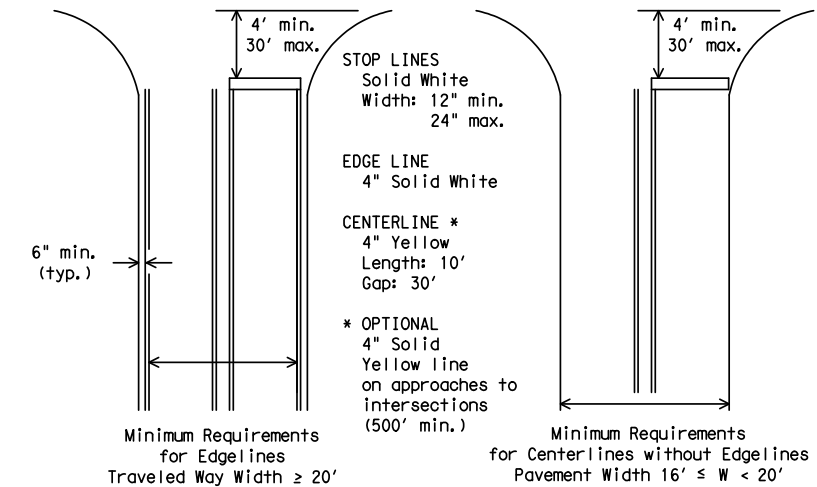
TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



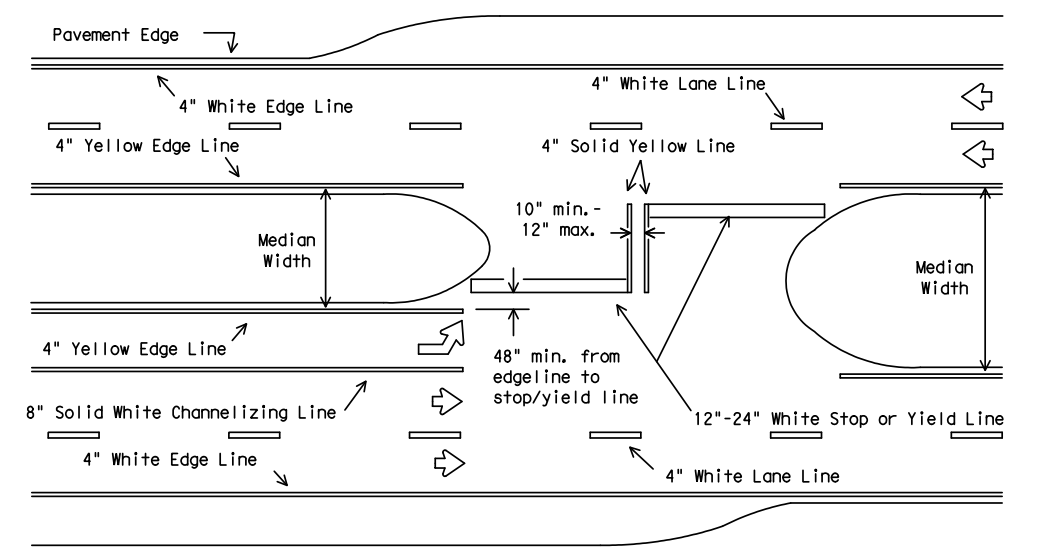
CENTERLINE AND LANE LINES  
FOUR LANE TWO-WAY ROADWAY  
WITH OR WITHOUT SHOULDERS



EDGE LINE AND LANE LINES  
ONE-WAY ROADWAY  
WITH OR WITHOUT SHOULDERS

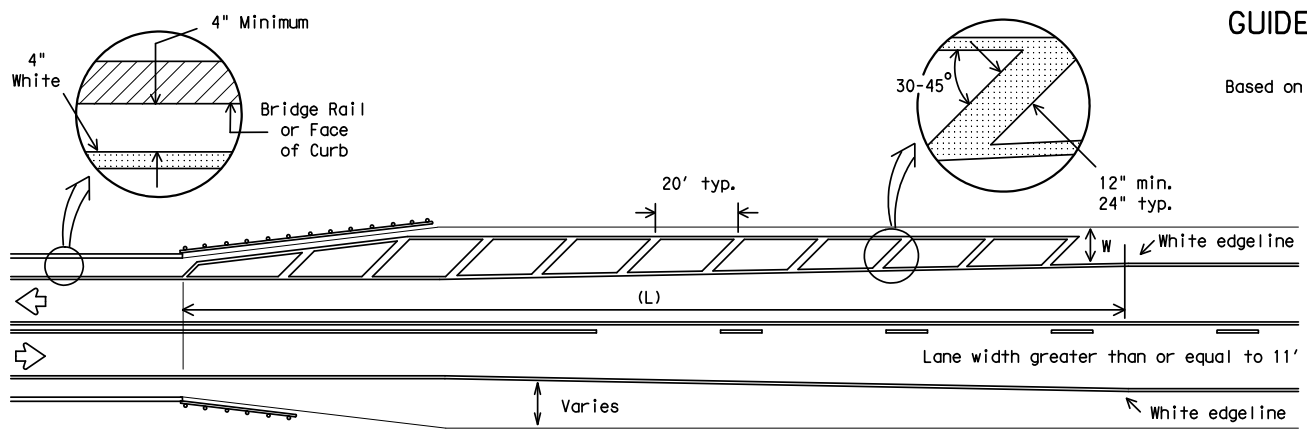


GUIDE FOR PLACEMENT OF STOP LINES,  
EDGE LINE & CENTERLINE  
Based on Traveled Way and Pavement Widths for Undivided Highways



FOUR LANE DIVIDED ROADWAY INTERSECTIONS

All medians shall be field measured to determine the location of necessary striping. Stop/Yield bars and centerlines shall be placed when the median width is greater than 30 ft. The median width is defined as the area between two roadways of a divided highway measured from edge of traveled way to edge of traveled way. The median excludes turn lanes. The median width might be different between intersections, interchanges and of opposite approaches of the same intersection. The narrow median width will be the controlling width to determine if markings are required.



ROADWAYS WITH REDUCED SHOULDER  
WIDTHS ACROSS BRIDGE OR CULVERT

- NOTES:
- No-passing zone on bridge approach is optional but if used, it shall be a minimum 500 feet long.
  - For crosshatching length (L) see Table 1.
  - The width of the offset (W) and the required crosshatching width is the full shoulder width in advance of the bridge.
  - The crosshatching is not required if delineators or barrier reflectors are used along the structure.
  - For guard fence details, refer elsewhere in the plans.

TABLE 1 - TYPICAL LENGTH (L)

Posted Speed *	Formula
≤ 40	$L = \frac{WS^2}{60}$
≥ 45	$L = WS$

\* 85th Percentile Speed may be used on roads where traffic speeds normally exceed the posted speed limit. Crosshatching length should be rounded up to nearest 5 foot increment.  
L=Length of Crosshatching (FT.) W=Width of Offset (FT.)  
S=Posted Speed (MPH)

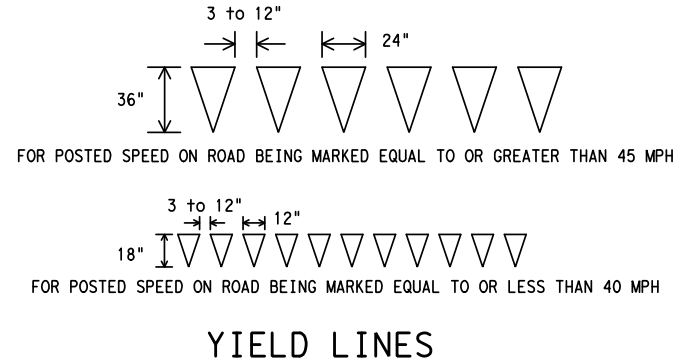
EXAMPLES:  
An 8 foot shoulder in advance of a bridge reduces to 4 feet on a 70 MPH roadway. The length of the crosshatching should be:  
 $L = 8 \times 70 = 560$  ft.  
A 4 foot shoulder in advance of a bridge reduces to 2 feet on a 40 MPH roadway. The length of the crosshatching should be:  
 $L = 4(40)^2 / 60 = 106.67$  ft. rounded to 110 ft.

GENERAL NOTES

- Edgeline striping shall be as shown in the plans or as directed by the Engineer. The edgeline should typically be placed a minimum of 6 inches from the edge of pavement. This distance may vary due to pavement raveling or other conditions. Edgelines are not required in curb and gutter sections of roadways.
- The traveled way includes only that portion of the roadway used for vehicular travel and not the parking lanes, sidewalks, berms and shoulders. The traveled ways shall be measured from the inside of edgeline to inside of edgeline of a two lane roadway.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



YIELD LINES

Texas Department of Transportation  
Traffic Operations Division

TYPICAL STANDARD  
PAVEMENT MARKINGS

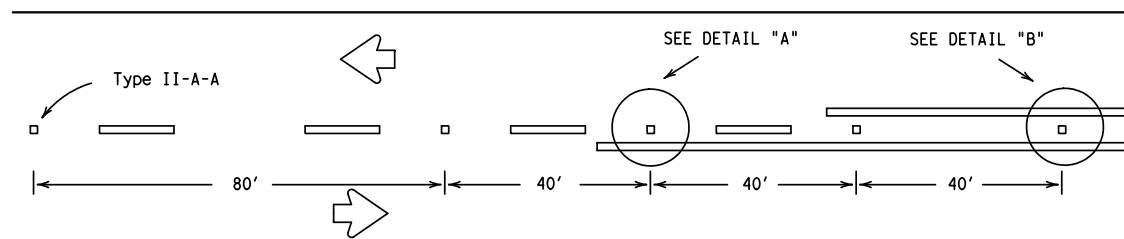
PM(1)-12

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8-00				
3-03	DIST	COUNTY		SHEET NO.
22A				

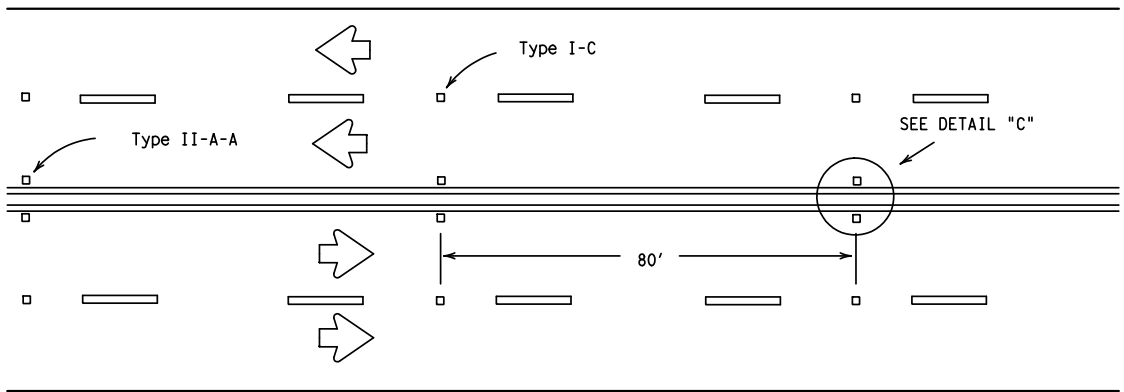
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FILE:

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## REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE

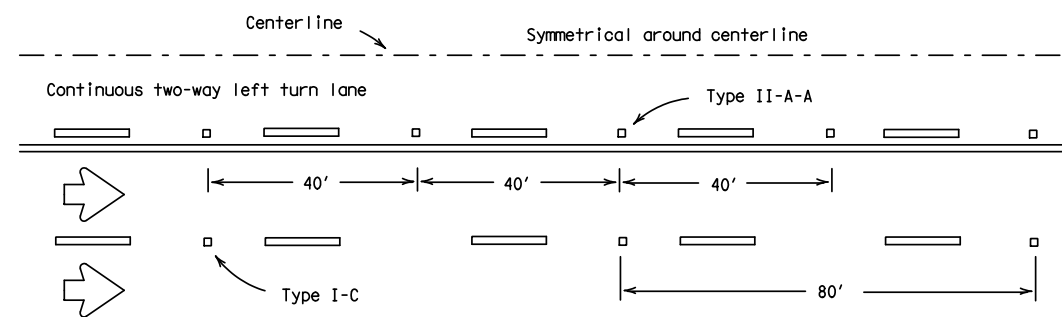


**CENTERLINE FOR ALL TWO LANE ROADWAYS**

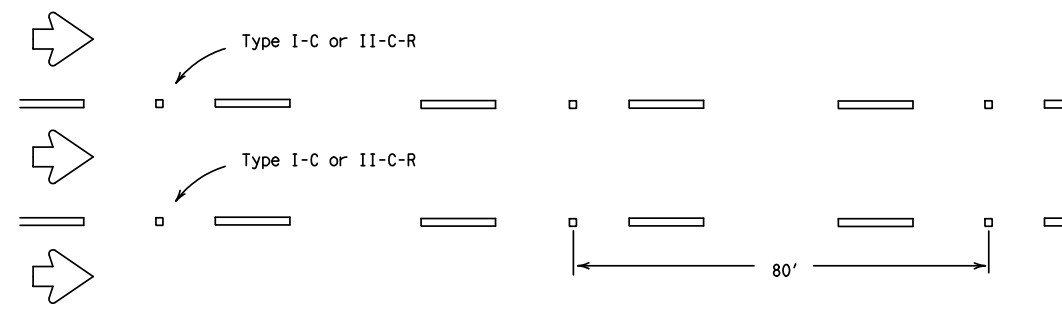


**CENTERLINE & LANE LINES  
FOR FOUR LANE TWO-WAY HIGHWAYS**

Raised pavement marker Type I-C, clear face toward normal traffic, shall be placed on 80-foot centers.

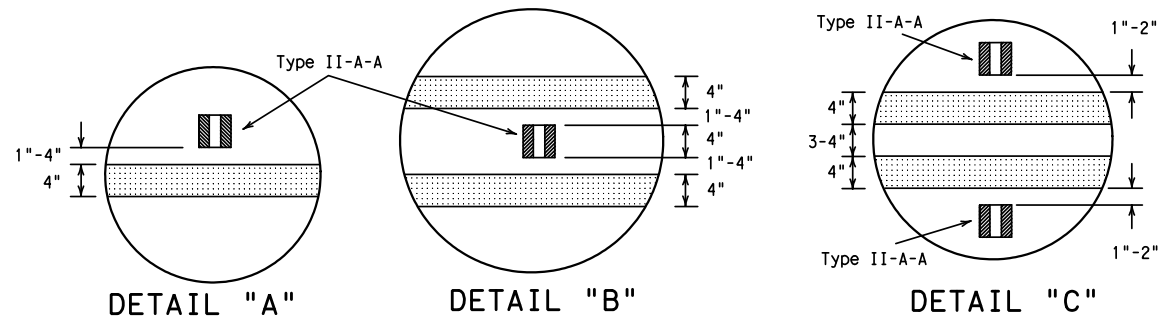


**CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE**



**LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)**

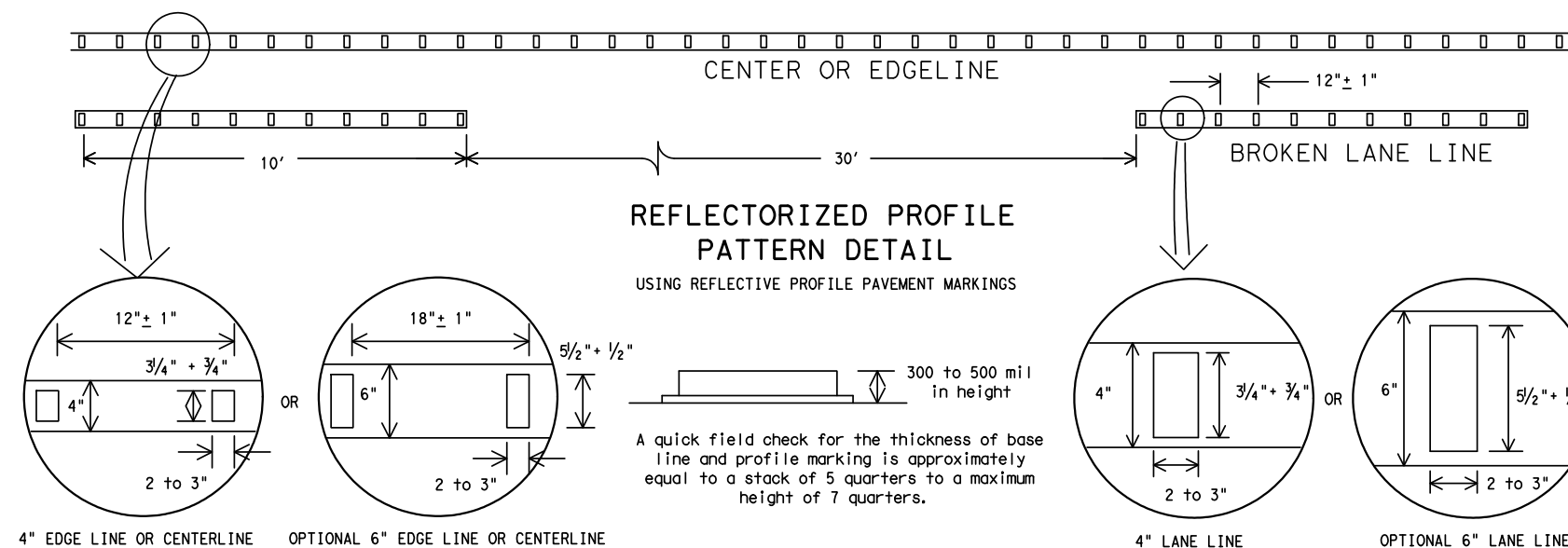
Raised pavement markers Type II-C-R shall have clear face toward normal traffic and red face toward wrong-way traffic.



**DETAIL "A"**

**DETAIL "B"**

**DETAIL "C"**



**REFLECTORIZED PROFILE  
PATTERN DETAIL**

USING REFLECTIVE PROFILE PAVEMENT MARKINGS

A quick field check for the thickness of base line and profile marking is approximately equal to a stack of 5 quarters to a maximum height of 7 quarters.

**NOTE:**

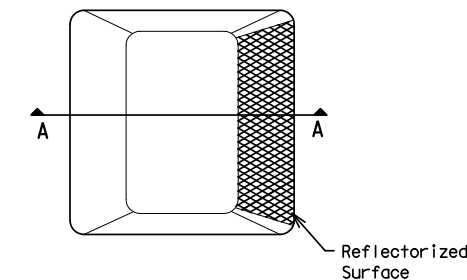
Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

**GENERAL NOTES**

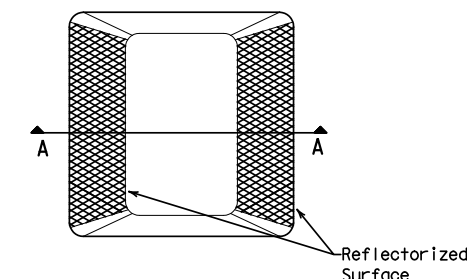
1. All raised pavement markers placed in broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

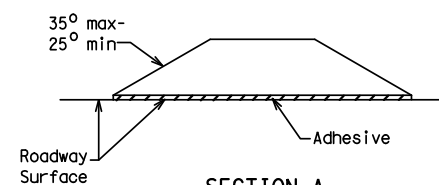
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



**Type I (Top View)**



**Type II (Top View)**



**SECTION A**

**RAISED PAVEMENT MARKERS**

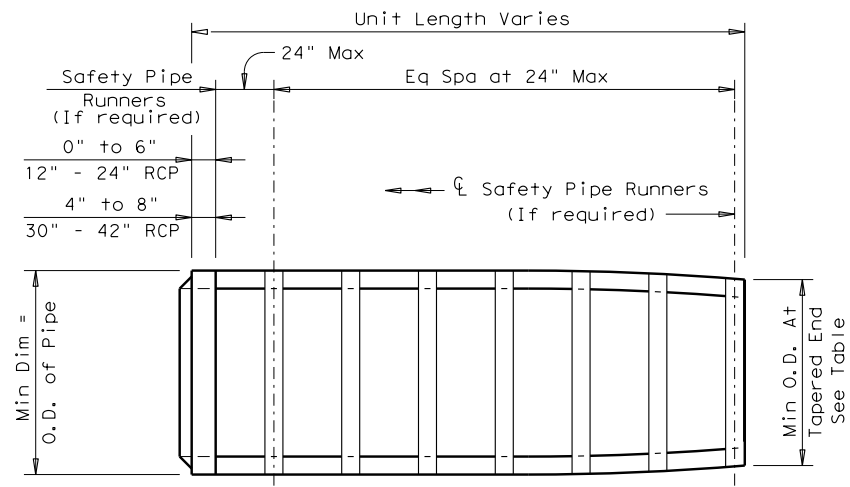
**Texas Department of Transportation**  
Traffic Operations Division

**POSITION GUIDANCE USING  
RAISED MARKERS  
REFLECTORIZED PROFILE  
MARKINGS**

**PM(2)-12**

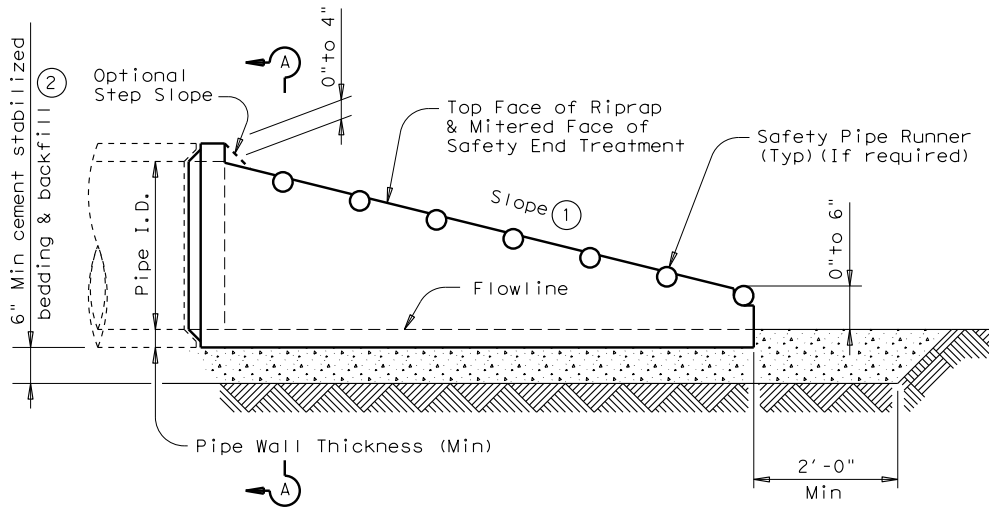
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REVISIONS		CONT	SECT	JOB	HIGHWAY
4-92	2-10				
5-00	2-12				
8-00					
2-08					
		DIST	COUNTY		SHEET NO.

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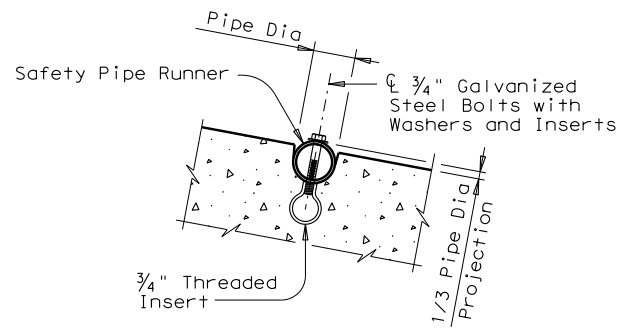


**PLAN VIEW - 12" THRU 24"**

- ① Slope as shown elsewhere in the plans. Slope of 6:1 or flatter is required for vehicle safety.
- ② Cement stabilized bedding and backfill shall be in accordance with the Item, "Excavation and Backfill for Structures". Bedding and backfill shall be considered subsidiary to the Item "Safety End Treatment". When concrete riprap is specified around the Safety End Treatment backfill shall be as directed by Engineer.
- ③ The top 4" of void between Precast End Treatments shall be filled with concrete Riprap and shall be considered subsidiary to Safety End Treatment.
- ④ Clear distance between pipes shall be adjusted to provide for the minimum distance between safety end treatments.

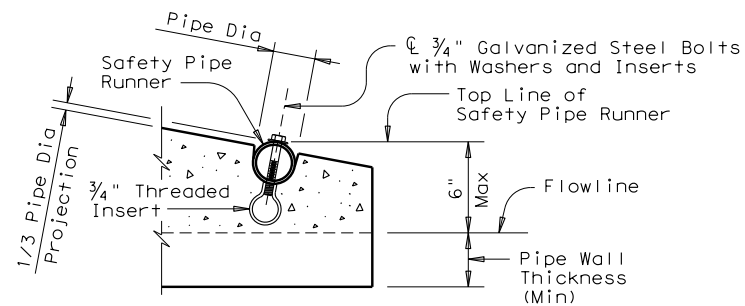


**LONGITUDINAL ELEVATION - 12" THRU 24"**

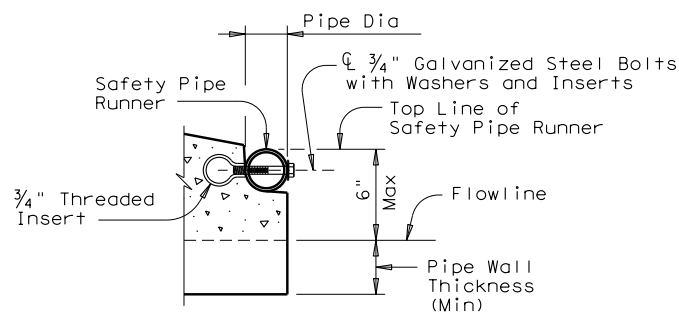


**INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS**

(If required)



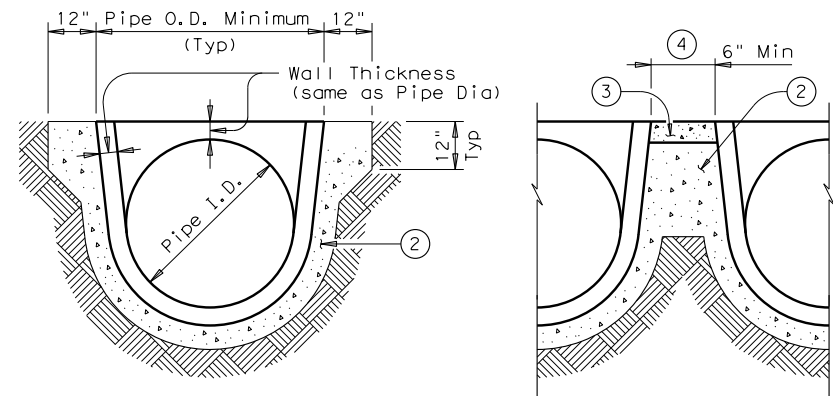
**OPTION A**



**OPTION B**

**END DETAILS FOR INSTALLATION OF SAFETY PIPE RUNNERS**

(If required)



**SECTION A-A**

**MULTIPLE PIPE INSTALLATION**

PIPE I.D.	MINIMUM WALL THICKNESS	MINIMUM O.D.	MIN O.D. AT TAPERED END	MIN REINF REQUIREMENTS (Sq in/ft of pipe)	MAXIMUM SLOPE	MINIMUM LENGTH OF UNIT	PIPE RUNNERS REQUIRED		REQUIRED PIPE RUNNER SIZES		
							SINGLE PIPE	MULTIPLE PIPE	NOMINAL DIA.	O.D.	I.D.
12"	2"	16"	16"	0.07 CIRC.	6:1	4'-0"	No	Yes, for >2 pipes	3" STD	3.500"	3.068"
15"	2 1/4"	19 1/2"	19"	0.07 CIRC.	6:1	5'-8"	No	Yes, for >2 pipes	3" STD	3.500"	3.068"
18"	2 1/2"	23"	21 1/2"	0.07 CIRC.	6:1	7'-3"	No	Yes, for >2 pipes	3" STD	3.500"	3.068"
24"	3"	30"	27"	0.07 CIRC.	6:1	10'-6"	No	Yes, for >2 pipes	3" STD	3.500"	3.068"
30"	3 1/2"	37"	31"	0.18 CIRC.	6:1	12'-1"	No	Yes	4" STD	4.500"	4.026"
36"	4"	44"	36"	0.19 ELIP.	6:1	15'-4"	Yes	Yes	4" STD	4.500"	4.026"
42"	4 1/2"	51"	41 1/2"	0.23 ELIP.	6:1	18'-7"	Yes	Yes	4" STD	4.500"	4.026"

**GENERAL NOTES:**

Precast safety end treatment for reinforced concrete pipe may be used for TYPE II end treatment as specified in Item "Safety End Treatment". When Precast Safety End Treatment is used as a Contractor's alternate to mitered RCP, Riprap will not be required unless noted otherwise on the plans.

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

All precast concrete end sections shall be manufactured in accordance with Item "Reinforced Concrete Pipe" and in accordance with ASTM Specification C-76, Class III, Wall B for circular pipe.

Precast concrete end sections shall be provided with a spigot or bell end for compatibility to upstream or downstream end conditions with sufficient annular space to allow for mortar, cold applied asphalt joint compound or pre-formed plastic gasket material.

Methods of lifting shall be provided by the manufacturer for ease of loading, unloading and installation.

Pipe Runners are designed for a traversing load of 10,000 Lbs at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.

Pipe Runners shall conform to the requirements of ASTM A53 (Type E or S, Grade B), ASTM A500 (Grade B), or API 5LX52.

All steel components except reinforcing, shall be galvanized after fabrication. Galvanizing damaged during transport or construction shall be repaired in accordance with the specifications.

**Texas Department of Transportation** Bridge Division Standard

**PRECAST SAFETY END TREATMENT TYPE II ~ PARALLEL DRAINAGE**

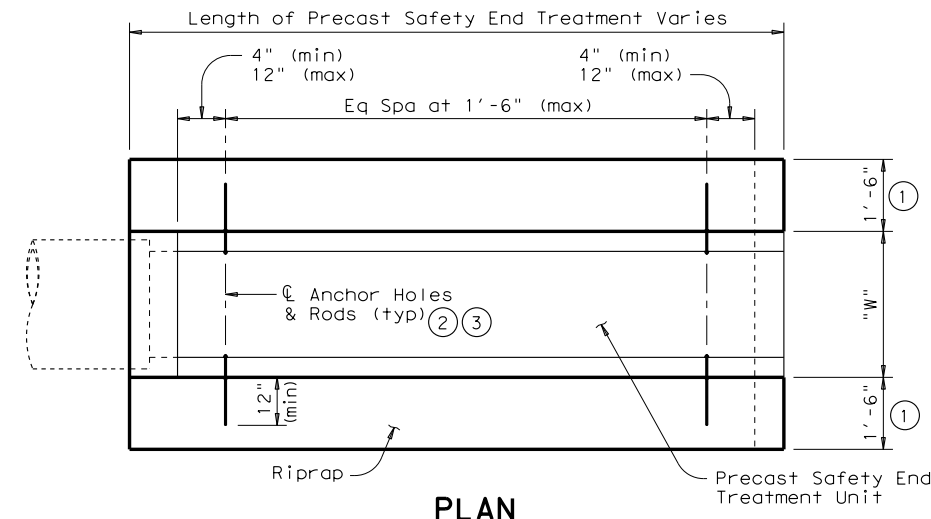
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REVISIONS				
11-10: Add note for synthetic fibers.	DIST	COUNTY	SHEET NO.	

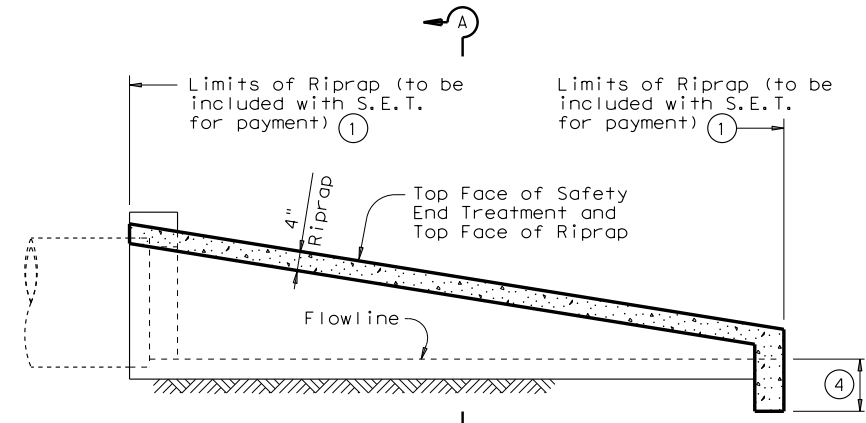
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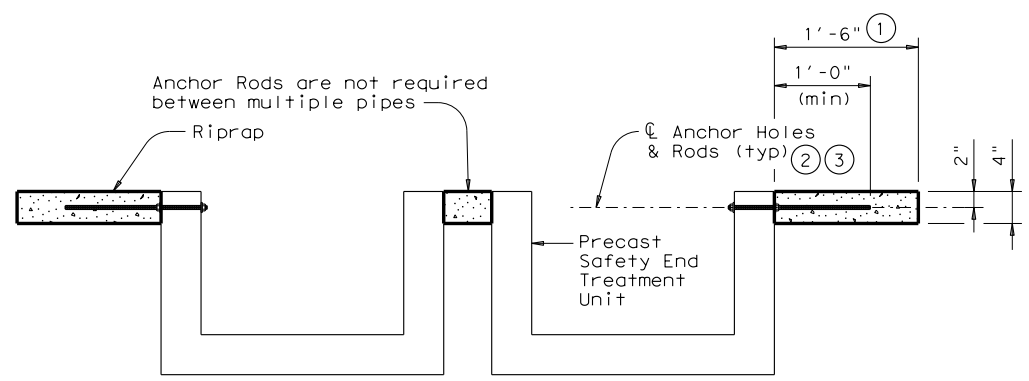
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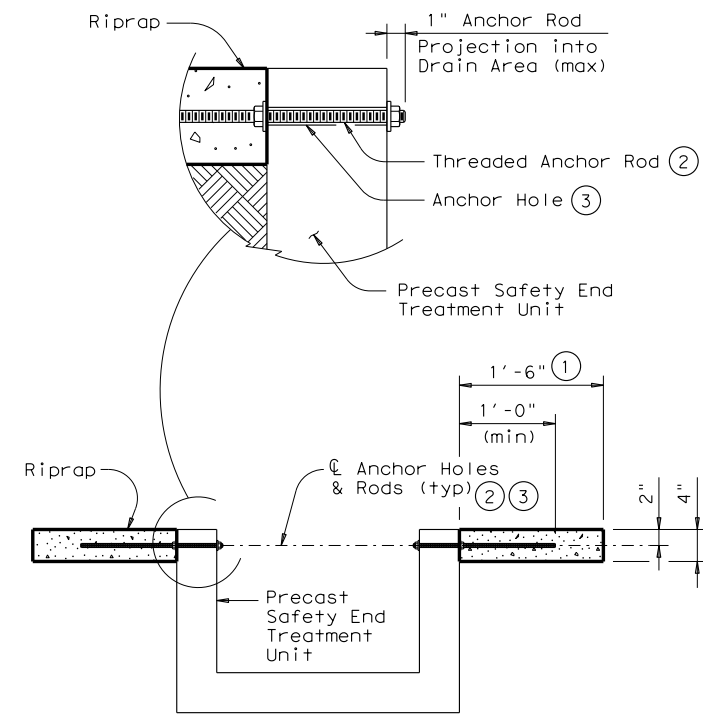
**PLAN**



**LONGITUDINAL ELEVATION**



**MULTIPLE PIPE INSTALLATION**



**SINGLE PIPE INSTALLATION**

**SECTION A-A**

ESTIMATED CONCRETE RIPRAP QUANTITIES (CY) ⑤								
Nominal Culvert (Pipe) I.D.	PSET-SC & PSET-SP Standards				PSET-RC & PSET-RP Standards			
	Unit Width "W"	Side Slope			Unit Width "W"	Side Slope		
		3:1	4:1	6:1		3:1	4:1	6:1
12"	23.0"	0.1	0.2	0.2	16.0"	0.1	0.1	0.2
15"	26.5"	0.2	0.2	0.3	19.5"	0.1	0.2	0.2
18"	30.0"	0.2	0.2	0.3	23.0"	0.2	0.2	0.3
24"	37.0"	0.3	0.3	0.5	30.0"	0.2	0.3	0.4
30"	44.5"	0.3	0.4	0.6	37.0"	0.3	0.3	0.5
36"	51.5"	0.4	0.5	0.7	44.0"	0.3	0.4	0.6
42"	58.5"	0.5	0.6	0.8	51.0"	0.4	0.5	0.7

- ① Riprap placed beyond the limits shown will be paid as Concrete Riprap in accordance with Item 432, "Riprap". When Riprap is cast integrally with the Precast Safety End Treatment, this dimension shall be 1'-0" minimum.
- ② 1/2" Diam A307 Gr.A threaded Anchor Rod w/ 2 nuts & 2 washers. All components shall be galvanized in accordance with Item 445, "Galvanizing". Galvanizing that is damaged during transport or construction shall be repaired in accordance with the specifications.
- ③ 3/4" through holes in walls of Safety End Treatment for Riprap Anchor Rods may be drilled with rotary (coring or masonry) type drilling equipment or may be formed. Percussive (star) type drilling equipment shall not be used. If holes are drilled, spalls in the inside face of the wall exceeding 1/2" from the holes shall be patched.
- ④ Provide Riprap Toe Wall when dimension is shown elsewhere in the plans or when field conditions require a Toe Wall.
- ⑤ Quantities shown are for one end of one reinforced concrete pipe culvert. For multiple pipe culverts, quantities will need to be adjusted. Riprap quantities are for Contractor's information only. Quantities are based on the minimum unit lengths shown on the Precast S.E.T. standards.

**GENERAL NOTES:**


Precast Safety End Treatment for reinforced concrete pipe may be used for TYPE II end treatment as specified in Item 467, "Safety End Treatment". Riprap shall be Class "B" Riprap in accordance with Item 432, "Riprap". Payment for Riprap and Toewalls is included in the Price Bid for each Safety End Treatment.

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. The anchor rods shown are always required. Refer to PSET-SC or PSET-SP standard sheets for details of square Safety End Treatments not shown. Refer to PSET-RC or PSET-RP standard sheets for details of round Safety End Treatments not shown.

For precast units with integrally cast Riprap, reinforcing steel in the amount on 0.26 sq in/ft minimum shall be substituted for the threaded anchor rods shown. When requested, sealed engineering drawings shall be submitted for approval prior to construction. Shop drawings will not be required. Note that a proprietary precast unit with integral Riprap is available from L&R Precast Concrete Works, Inc. (956) 583-6293 or www.lrpcast.com.

These Riprap details are only applicable when notes that require placement of Riprap with Precast Safety End Treatments are shown elsewhere in the plans.

Precast units with integrally cast Riprap shall be permitted unless noted otherwise on the plans.



**Bridge Division Standard**

**PRECAST SAFETY END TREATMENT TYPE II RIPRAP DETAILS**

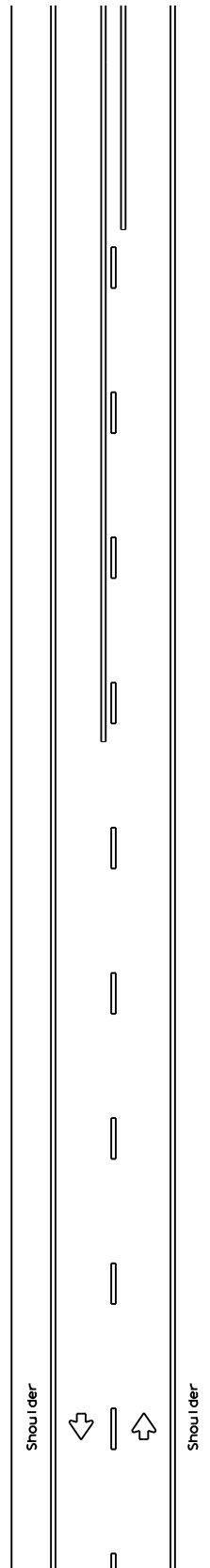
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11-10: Add note for synthetic fibers.	DIST	COUNTY	SHEET NO.	



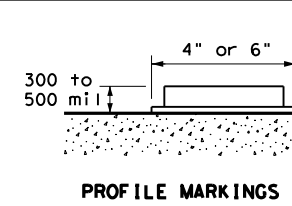
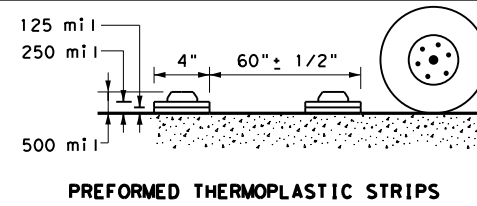
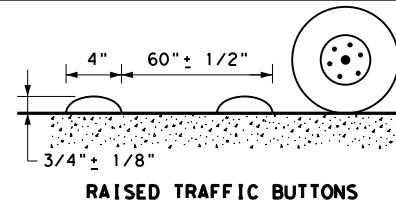
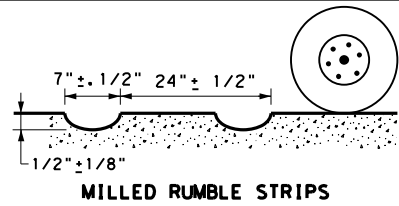
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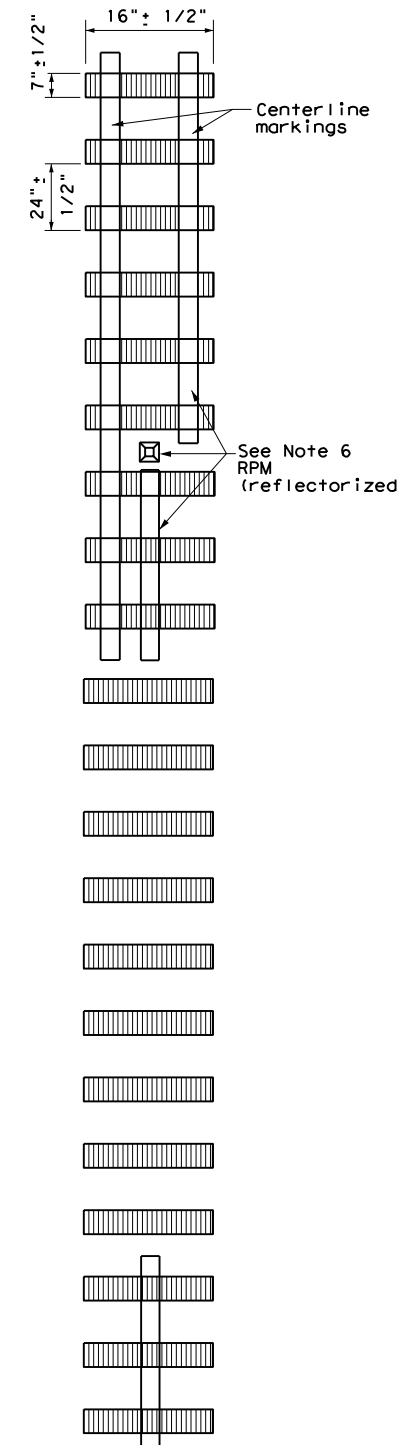


**TWO LANE TWO-WAY ROADWAYS**

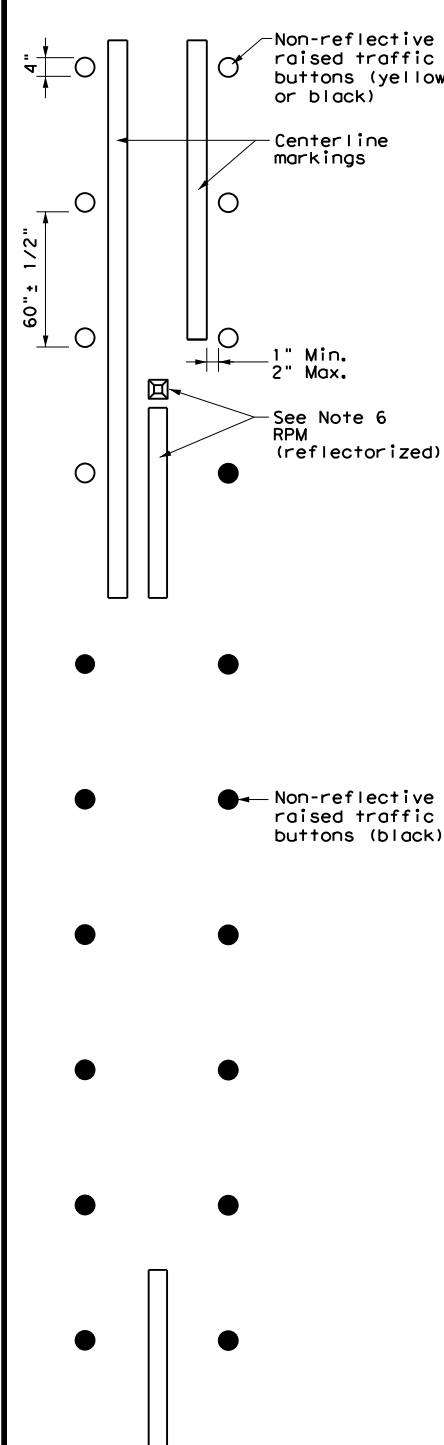
**CENTERLINE RUMBLE STRIPS**



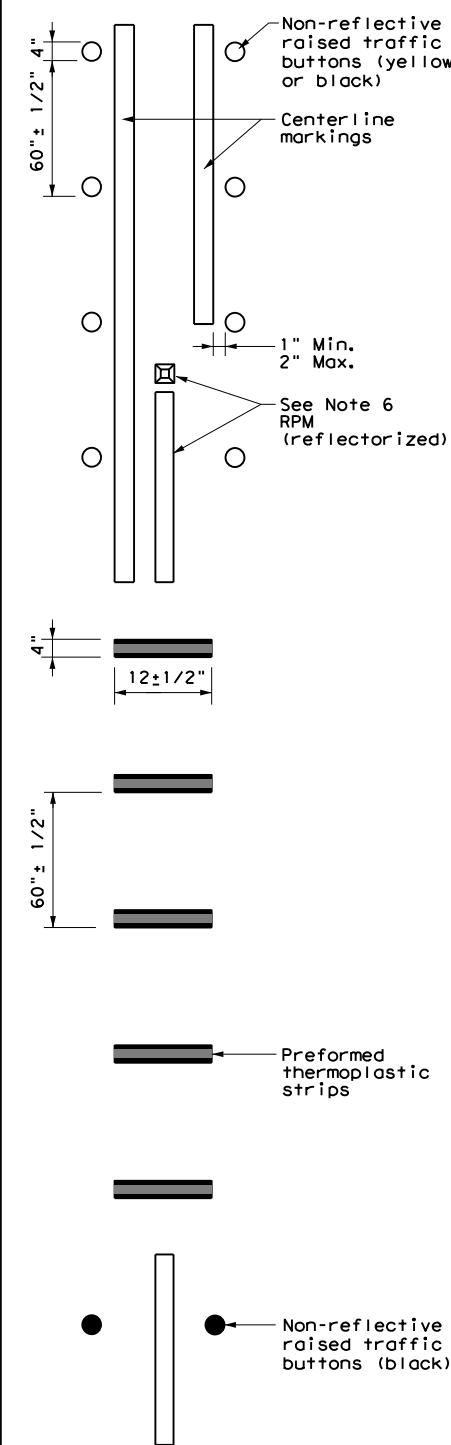
**PROFILE VIEW**



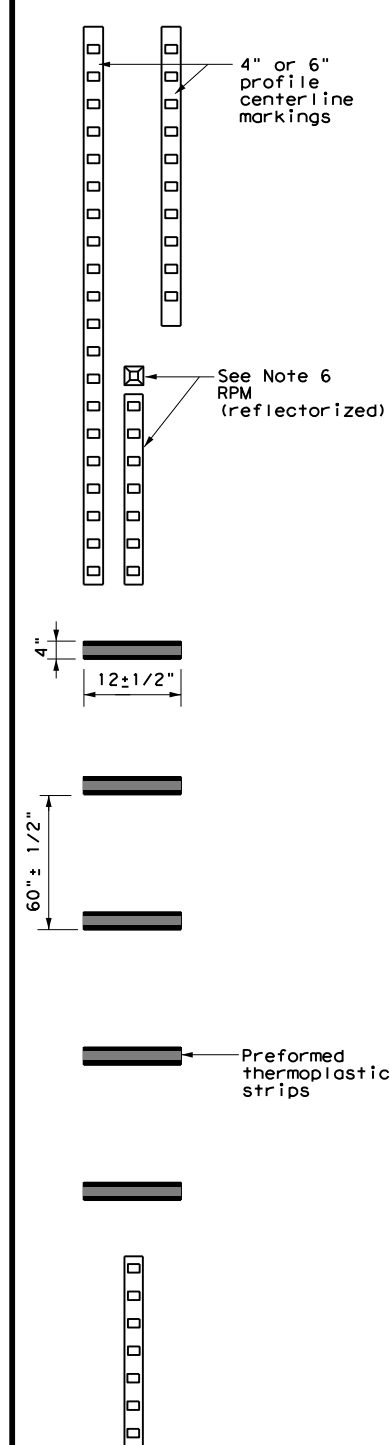
**MILLED CENTERLINE RUMBLE STRIPS**



**RAISED CENTERLINE RUMBLE STRIPS**



**RAISED CENTERLINE RUMBLE STRIPS AND PREFORMED THERMOPLASTIC STRIPS**



**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 STRIPS WITH OR WITHOUT CENTERLINE RUMBLE STRIPS ON UNDIVIDED HIGHWAYS:**

12. See standard sheet RS(4).



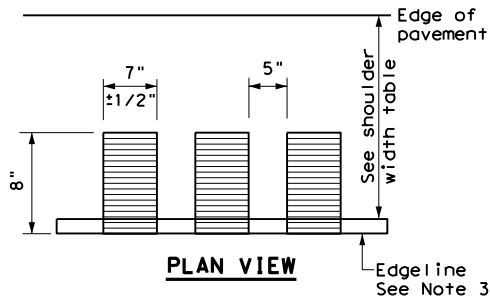
**CENTERLINE RUMBLE STRIPS ON TWO LANE TWO-WAY HIGHWAYS**

**RS(3) - 13**

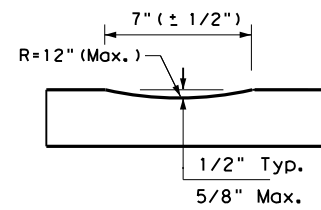
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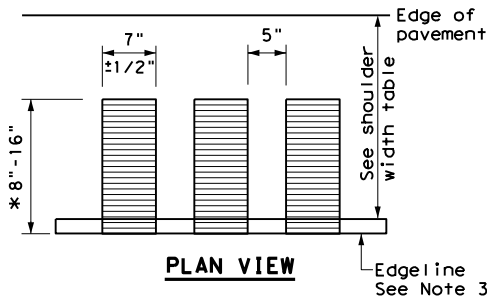


PLAN VIEW

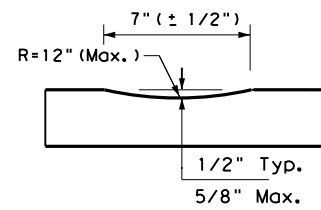


PROFILE VIEW  
OPTION 1

CONTINUOUS MILLED  
DEPRESSIONS  
(Rumble Strips)

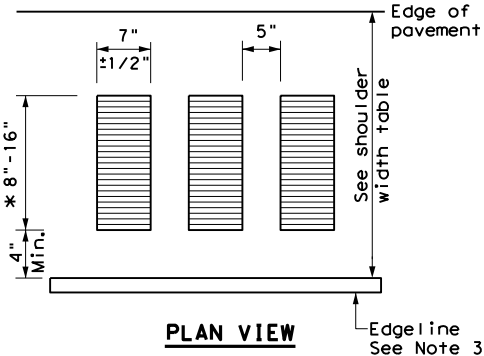


PLAN VIEW



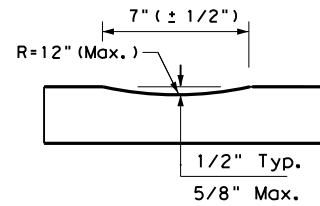
PROFILE VIEW  
OPTION 2

CONTINUOUS MILLED  
DEPRESSIONS  
(Rumble Strips)



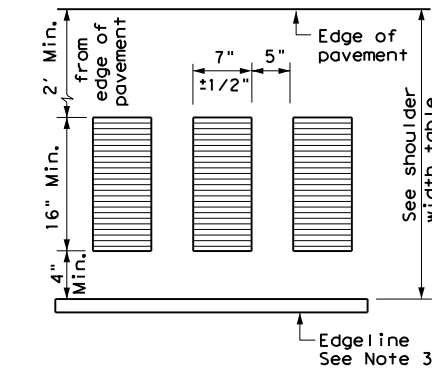
PLAN VIEW

\* This distance may vary based on width of shoulder

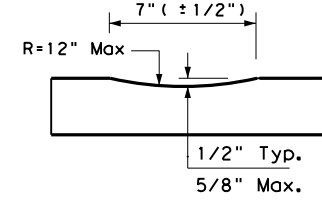


PROFILE VIEW  
OPTION 3

CONTINUOUS MILLED  
DEPRESSIONS  
(Rumble Strips)

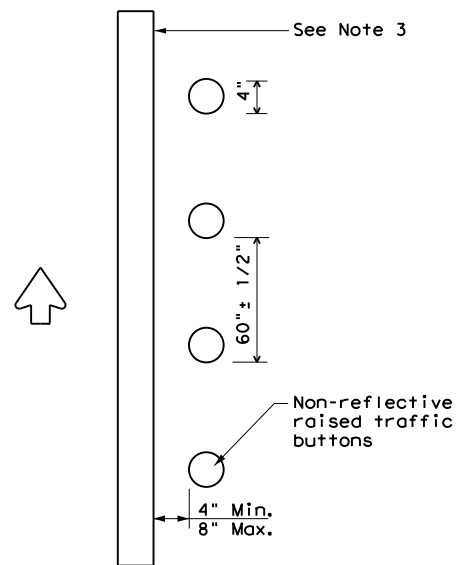


PLAN VIEW



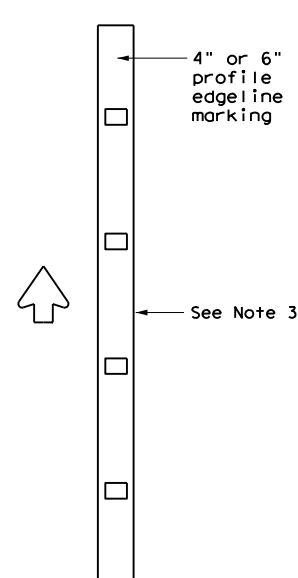
PROFILE VIEW  
OPTION 4

CONTINUOUS MILLED  
DEPRESSIONS  
(Rumble Strips)



PLAN VIEW  
OPTION 5

RAISED EDGELINE  
RUMBLE STRIPS



PLAN VIEW  
OPTION 6

PROFILE EDGELINE  
MARKINGS

SHOULDER WIDTH TABLE		
EQUAL TO OR LESS THAN 2 FEET	GREATER THAN 2 FEET LESS THAN 4 FEET	EQUAL TO OR GREATER THAN 4 FEET
Option 1, 5 OR 6	Option 1, 2, 3 5 OR 6	Option 2, 4, 5 OR 6

GENERAL NOTES

- Rumble strips and profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
- 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.
- Use Standard Sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, pavement markings, and profile markings.
- See the table below for determining what options may be used for edgeline rumble strips.

WHEN INSTALLING MILLED DEPRESSION EDGELINE RUMBLE STRIPS:

- See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Operations Division.
- Pavement markings can be applied over milled shoulder rumble strips to create an edgeline rumble stripe.
- 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.
- Rumble strips shall not be placed across exit or entrance ramps, acceleration and deceleration lanes, crossovers, gore areas or intersections with other roadways.
- 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.

- 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:

- 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.
- 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.
- 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.
- 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.
- The minimum distance between the edgeline and the buttons should be used if the shoulder is less than 8 feet in width.
- Raised profile thermoplastic markings used as edgelines may substitute for buttons.

		Traffic Operations Division Standard	
<b>EDGELINE RUMBLE STRIPS ON UNDIVIDED OR TWO LANE HIGHWAYS RS(4)-13</b>			
FILE: rs(4)-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
© TxDOT October 2013	CONT	SECT	JOB
REVISIONS			HIGHWAY
	DIST	COUNTY	SHEET NO.

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## SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

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

### Post Type

FRP = Fiberglass Reinforced Plastic Pipe (see SMD(FRP))  
 TWT = Thin-Walled Tubing (see SMD(TWT))  
 10BWG = 10 BWG Tubing (see SMD(SLIP-1) to (SLIP-3))  
 S80 = Schedule 80 Pipe (see SMD(SLIP-1) to (SLIP-3))

### Number of Posts (1 or 2)

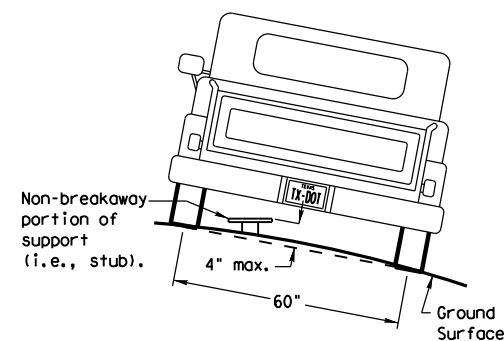
### Anchor Type

UA = Universal Anchor - Concreted (see SMD(FRP) and (TWT))  
 UB = Universal Anchor - Bolted down (see SMD(FRP) and (TWT))  
 WS = Wedge Anchor Steel - (see SMD(TWT))  
 WP = Wedge Anchor Plastic (see SMD(TWT))  
 SA = Slipbase - Concreted (see SMD(SLIP-1) to (SLIP-3))  
 SB = Slipbase - Bolted Down (see SMD(SLIP-1) to (SLIP-3))

### Sign Mounting Designation

P = Prefab. "Plain" (see SMD(SLIP-1) to (SLIP-3), (TWT), (FRP))  
 T = Prefab. "T" (see SMD(SLIP-1) to (SLIP-3), (TWT))  
 U = Prefab. "U" (see SMD(SLIP-1) to (SLIP-3))  
 IF REQUIRED  
 1EXT or 2EXT = Number of Extensions (see SMD(SLIP-1) to (SLIP-3), (TWT))  
 BM = Extruded Wind Beam (see SMD(SLIP-1) to (SLIP-3))  
 WC = 1.12 #/ft Wing Channel (see SMD(SLIP-1) to (SLIP-3))  
 EXAL = Extruded Aluminum Sign Panels (see SMD(SLIP-3))

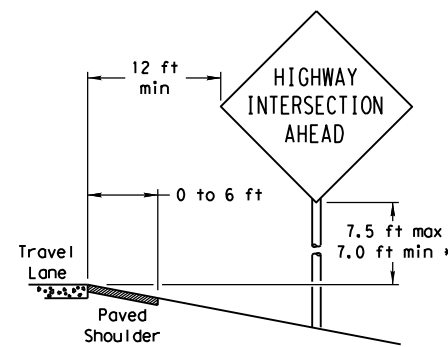
## REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



To avoid vehicle undercarriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).

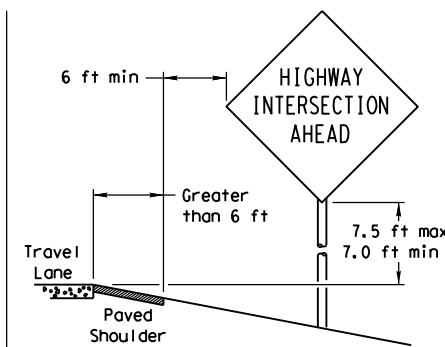
## SIGN LOCATION

### PAVED SHOULDERS



#### LESS THAN 6 FT. WIDE

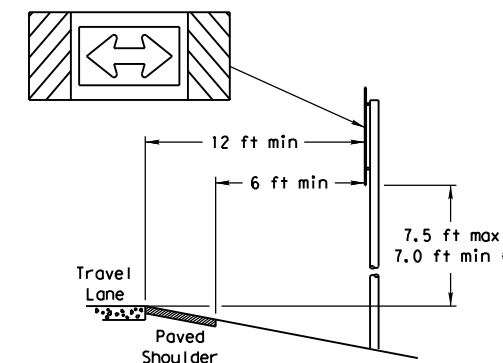
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



#### GREATER THAN 6 FT. WIDE

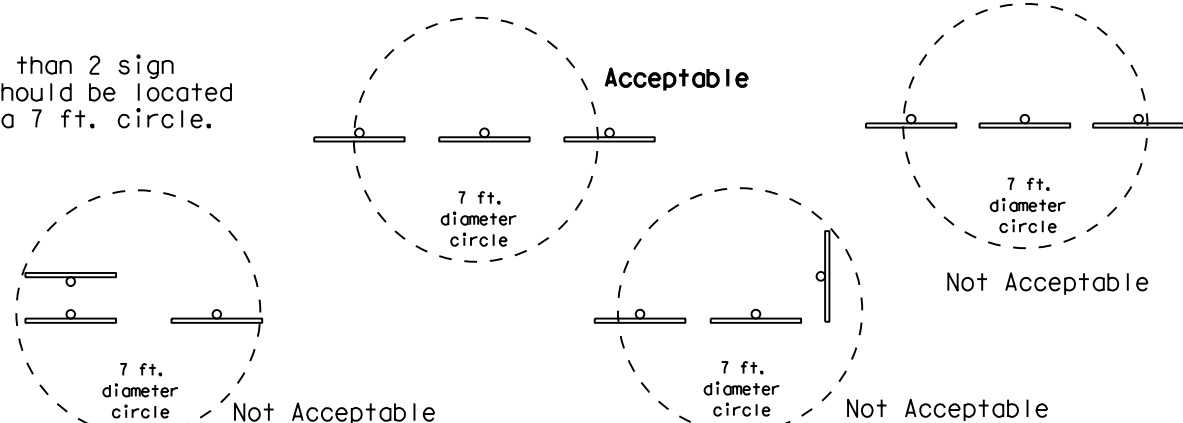
When the shoulder is greater than 6 ft. in width, the sign must be placed at least 6 ft. from the edge of the shoulder.

### T-INTERSECTION

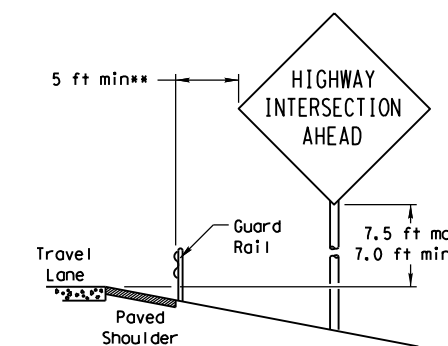


When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.

No more than 2 sign posts should be located within a 7 ft. circle.

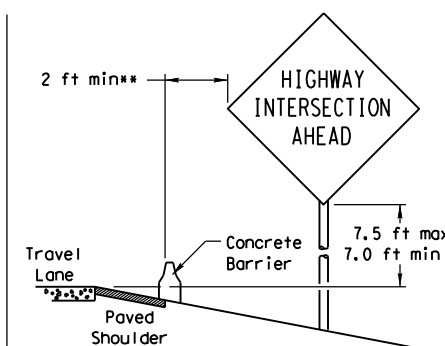


### BEHIND BARRIER

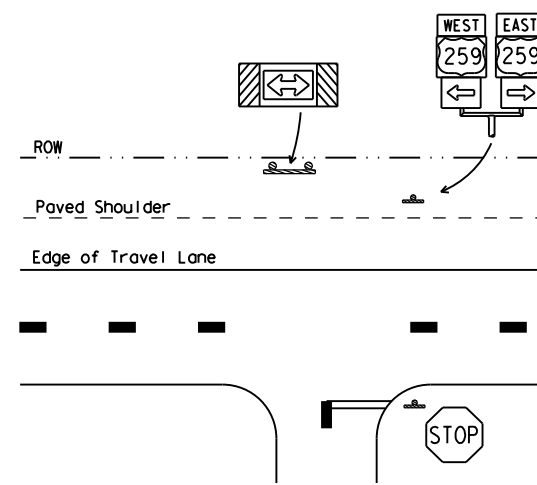


#### BEHIND GUARDRAIL

\*\*Sign clearance based on distance required for proper guard rail or concrete barrier performance.



#### BEHIND CONCRETE BARRIER



\* Signs shall be mounted using the following condition that results in the greatest sign elevation:

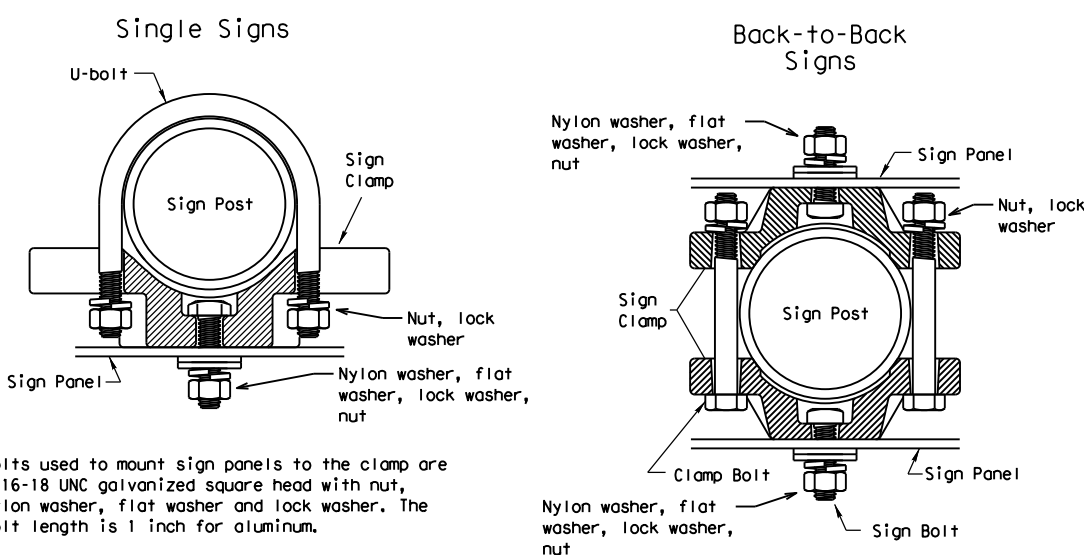
- (1) a minimum of 7 to a maximum of 7.5 feet above the edge of the travel lane or
- (2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.

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



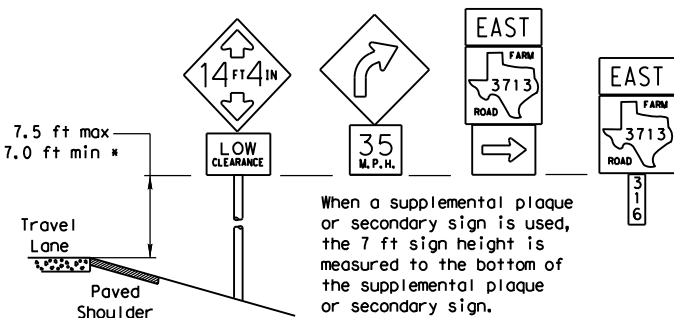
Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

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.

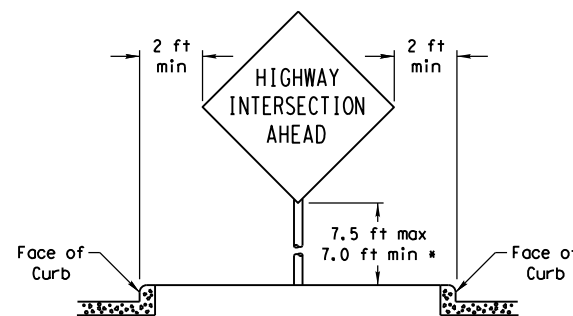
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

### SIGNS WITH PLAQUES

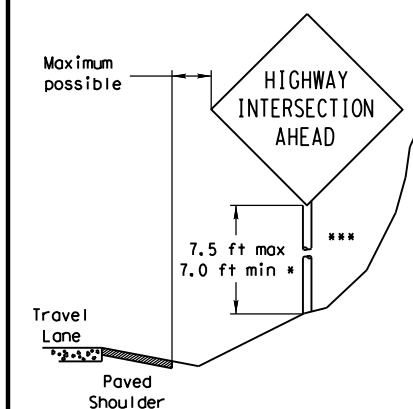


When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

### 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.

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 Traffic Operations Division

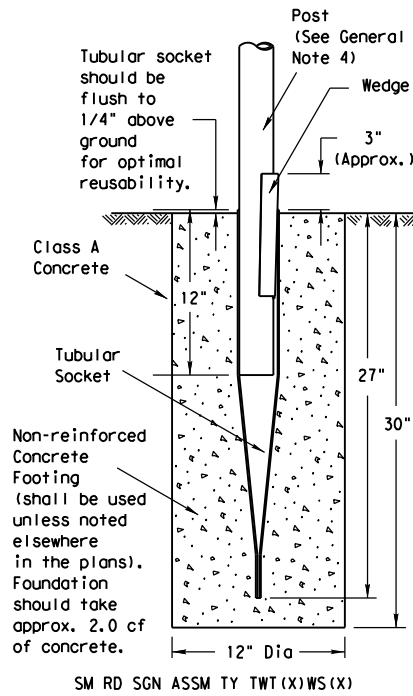
## SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD (GEN) - 08

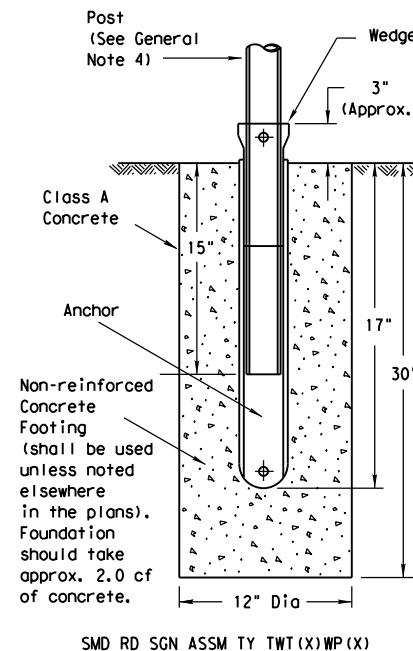
© TxDOT July 2002	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
9-08	REVISIONS	CONT	SECT	JOB
				HIGHWAY
		DIST	COUNTY	SHEET NO.

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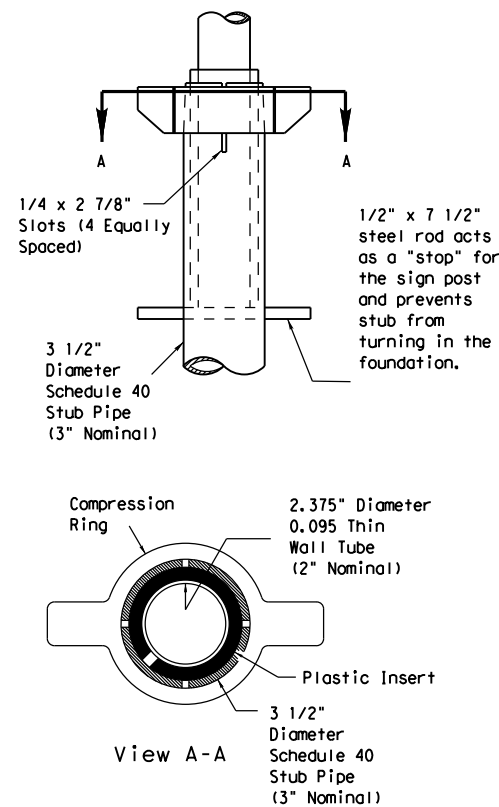
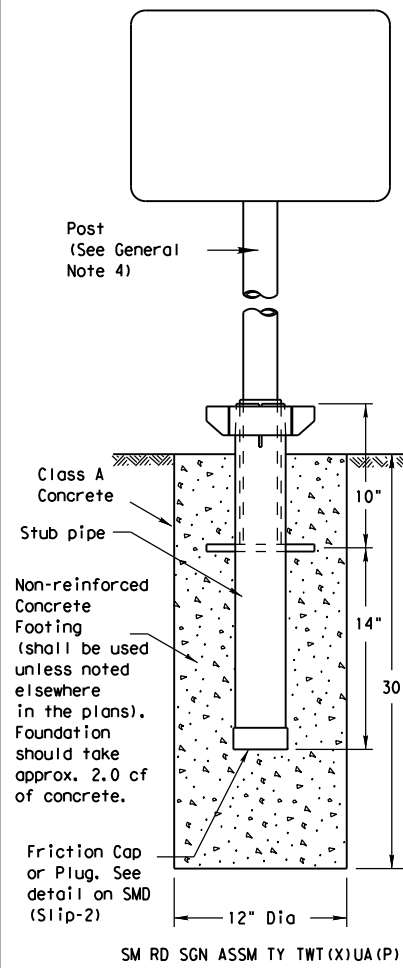
### Wedge Anchor Steel System



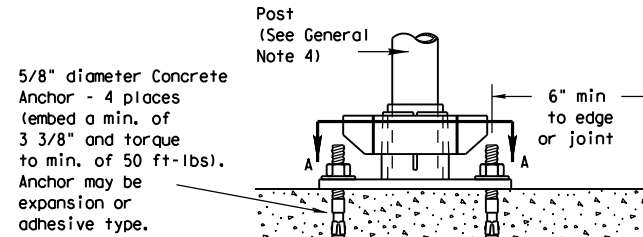
### Wedge Anchor High Density Polyethylene (HDPE) System



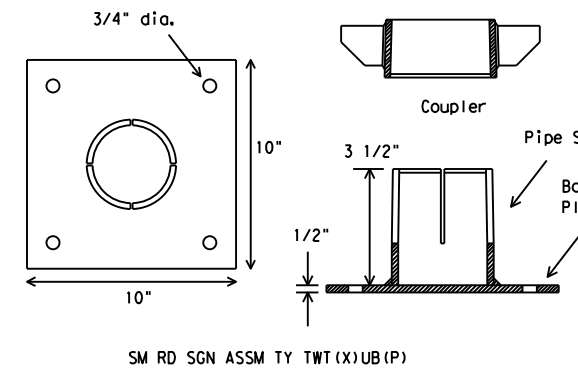
### Universal Anchor System with Thin-Walled Tubing Post



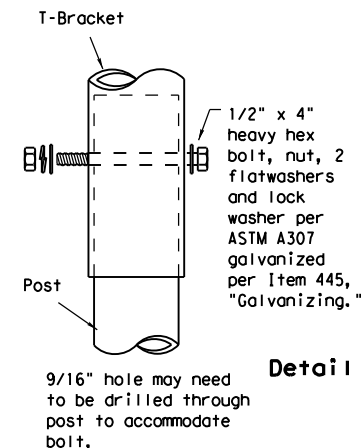
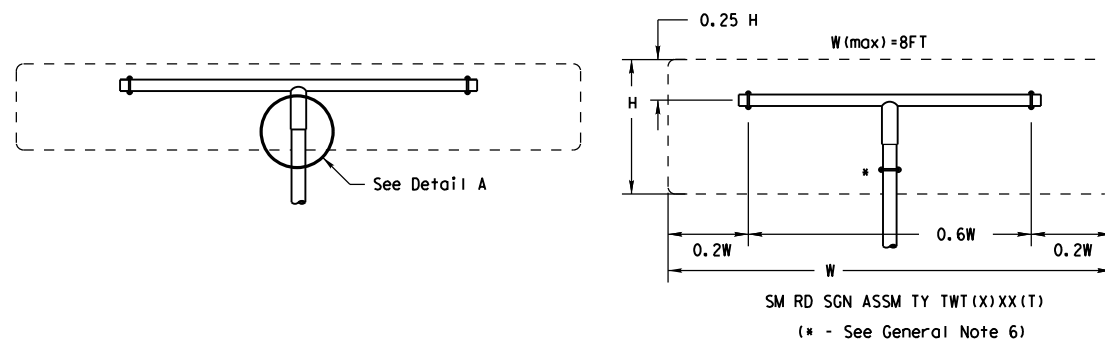
Plastic insert must be used when using the TWT with either the Universal Anchor System or the Bolt Down Universal Anchor System. The insert should be approx. 10" long and cover the tubing from just above the top of the stub pipe to the bottom of the sign post when using the Universal Anchor System. The insert should be cut to approx. 4 1/2" when used with the Bolt Down Universal Anchor System.



Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. A heavy hex nut per ASTM A563 and hardened washer per ASTM F436. The stud bolt shall have minimum yield and ultimate tensile strengths of 50 and 75 ksi, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Top of bolt shall extend at least flush with top of nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 3 3/8" minimum embedment, shall have a minimum allowable tension and shear of 2450 and 1525 psi, respectively. Adhesive type anchors shall have stud bolts installed with Type III epoxy per DMS-6100, "Epoxy and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations.



### Sign Installation Using a Prefabricated T-Bracket for Thin-Wall Tubing Post



NOTE  
The devices shall be installed per manufacturer's recommendations. Installation procedures shall be provided to the Engineer by Contractor.

#### GENERAL NOTES:

- The Wedge Anchor System and the Universal Anchor System with thin wall tubing post may be used to support up to 10 square feet of sign area.
- The tubular socket, wedge and prefabricated T-bracket shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to the approval of the TxDOT Traffic Standards Engineer.
- Except for posts (13 BWG Tubing), clamps, nuts and bolts, all components shall be prequalified. A list of prequalified vendors may be obtained from the Material Producer List web page. The website address is: [http://www.txdot.gov/business/producer\\_list.htm](http://www.txdot.gov/business/producer_list.htm)
- Material used as post with this system shall conform to the following specifications:  
13 BWG Tubing (2.375" outside diameter) (TWT)  
0.095" nominal wall thickness  
Seamless or electric-resistance welded steel tubing  
Steel shall be HSLA 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  
18% minimum elongation in 2"  
Wall thickness (uncoated) shall be within the range of .083" to .099"  
Outside diameter (uncoated) shall be within the range of 2.369" to 2.381"  
Galvanization per ASTM 123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.
- Sign blanks shall be the sizes and shapes shown on the plans.
- Additional sign clamp required on the "T-bracket" post for 24" high signs. Place clamp at least 3" above bottom of sign when possible.
- Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
- See the Traffic Operations Division website for detailed drawings of sign clamps and Wedge Anchor System components. The website address is: <http://www.txdot.gov/publications/traffic.htm>

#### WEDGE ANCHOR SYSTEM INSTALLATION PROCEDURE

- Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18". When solid rock is encountered below ground level, the foundation shall extend in the solid rock a minimum depth of 18" or provide a minimum foundation depth of 30". If solid rock is encountered, the socket/stub may be reduced in length as required to a minimum length of 18". Any material removed from the socket/stub shall be from the bottom and the clearance requirements given on SMD(GEN) must be followed. The inner surfaces of the socket/stub must remain free of concrete or other debris.
- 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. Place concrete into hole until it is approximately flush with the ground. Concrete shall be Class A.
- Insert tubular socket into concrete until top of socket is approximately 1/4" above the concrete footing.
- Plumb the socket. Allow a minimum 4 days for concrete to set, unless otherwise directed by Engineer.
- Attach the sign to the sign post.
- Insert the sign post into socket and align sign face with roadway.
- Drive the wedge into the socket to secure post. This will leave approximately 3 inches of the wedge exposed.

#### UNIVERSAL ANCHOR SYSTEM INSTALLATION PROCEDURE

- Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18". When solid rock is encountered below ground level, the foundation shall extend in the solid rock a minimum depth of 18" or provide a minimum foundation depth of 30". If solid rock is encountered, the socket/stub may be reduced in length as required to a minimum length of 18". Any material removed from the socket/stub shall be from the bottom and the clearance requirements given on SMD(GEN) must be followed. The inner surfaces of the socket/stub must remain free of concrete or other debris.
- Insert base post in hole to depths shown and backfill hole with concrete.
- Level and plumb the base post using a torpedo level and allow concrete adequate time to set. The bottom of the slots provided in the stub pipe shall remain above the top of the concrete foundation.
- Attach the sign to the sign post.
- Install plastic insert around bottom of post.
- Insert sign post into base post. Lower until the post comes to rest on steel rod.
- Seat compression ring using a hammer. Typically, the top of compression ring will be approximately level with top of stub post when optimally installed.
- Check sign post by hand to ensure it is unable to turn. If loose, increase the tightening of the compression ring.

Texas Department of Transportation  
Traffic Operations Division

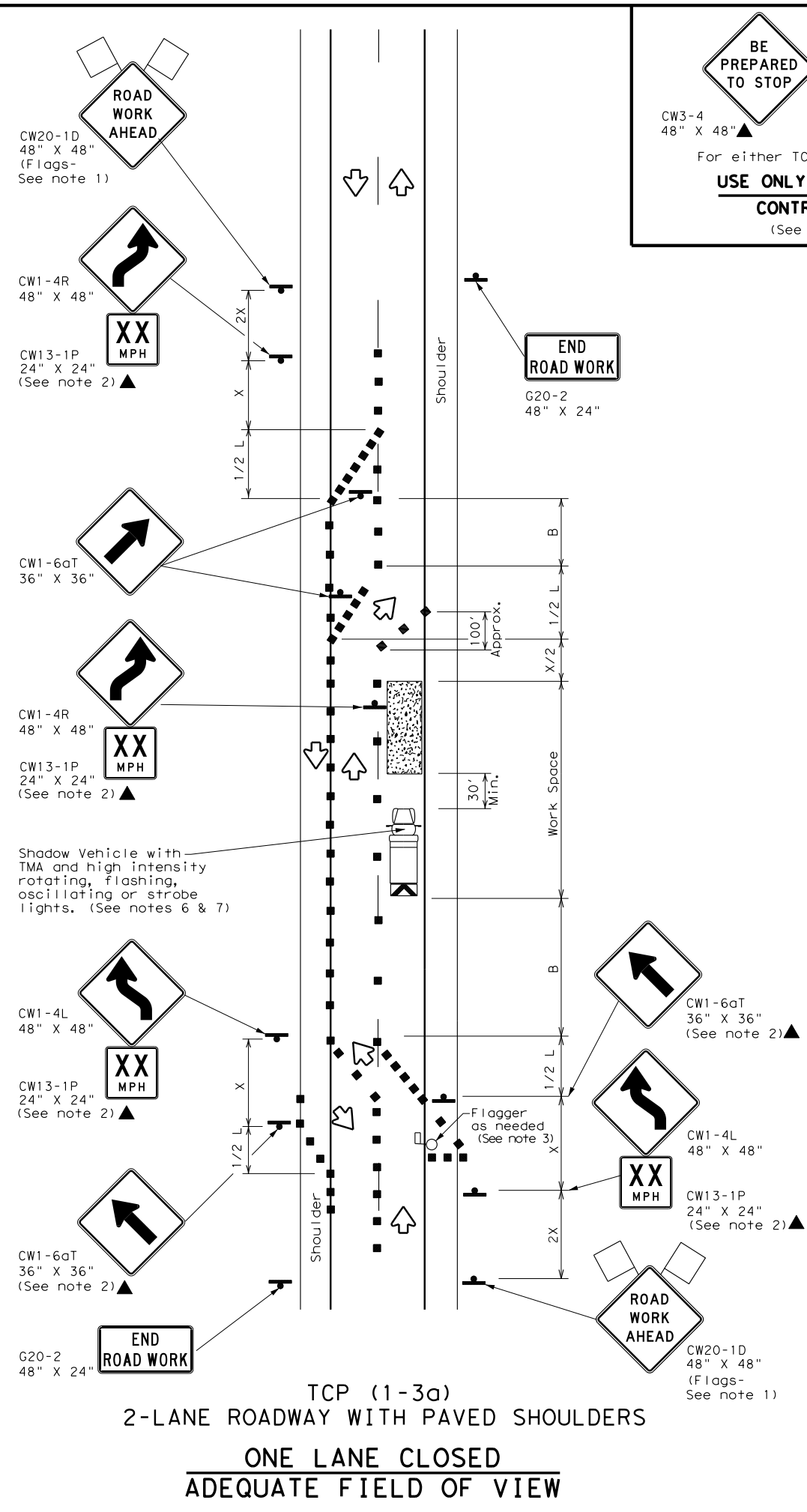
## SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS WEDGE & UNIVERSAL ANCHOR WITH THIN WALL TUBING POST SMD (TWT) -08

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DATE: FILE:



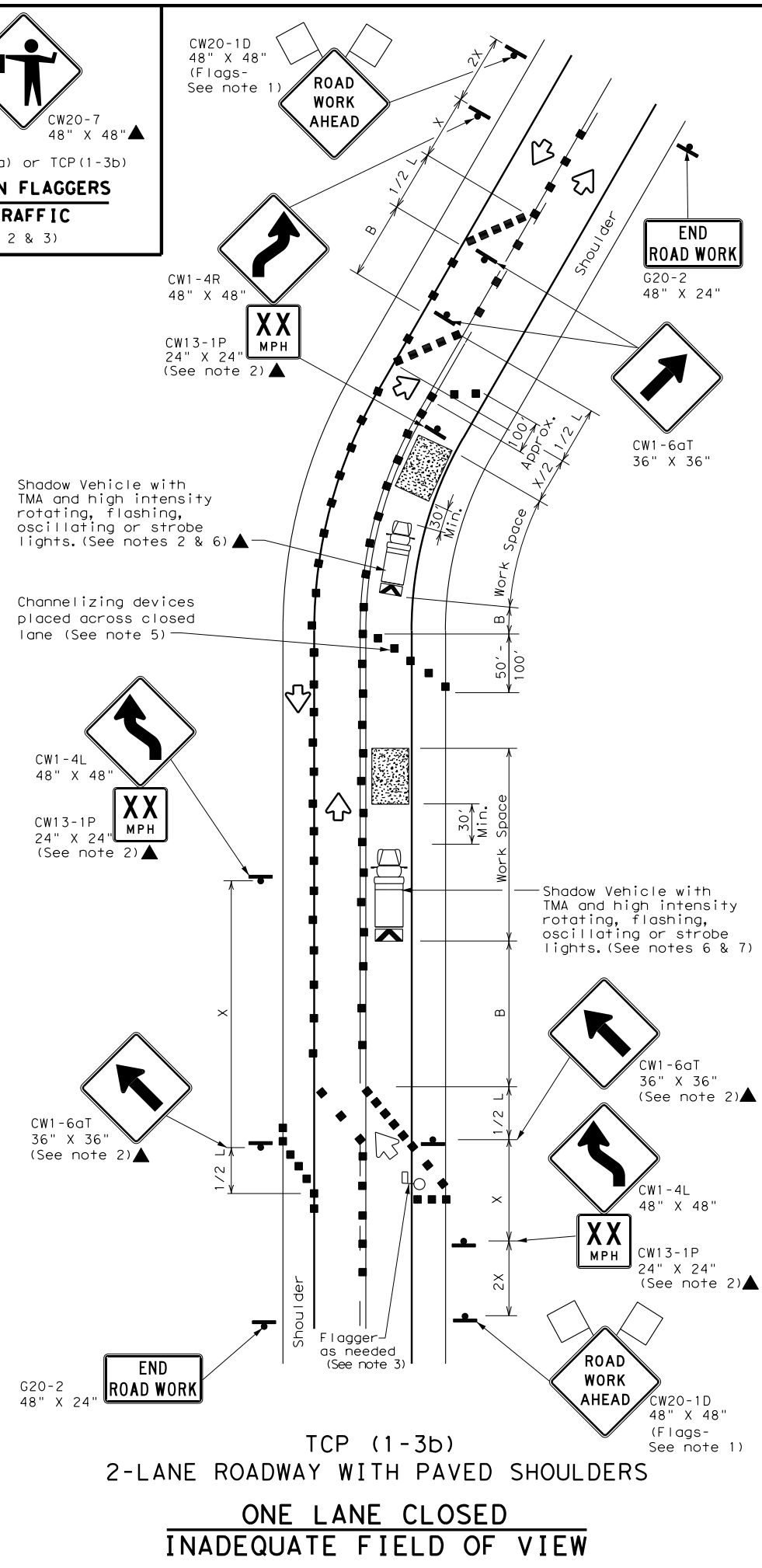
**BE PREPARED TO STOP**

CW3-4 48" X 48" ▲ CW20-7 48" X 48" ▲

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

**USE ONLY WHEN FLAGGERS CONTROL TRAFFIC**

(See Notes 2 & 3)



**LEGEND**

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

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

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

**TYPICAL USAGE**

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

- GENERAL NOTES**
- Flags attached to signs where shown are REQUIRED.
  - All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
  - 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.
  - DO NOT PASS, PASS WITH CARE and construction regulatory speed zone signs may be installed downstream of the ROAD WORK AHEAD signs.
  - 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.
  - A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
  - Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.
  - 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.

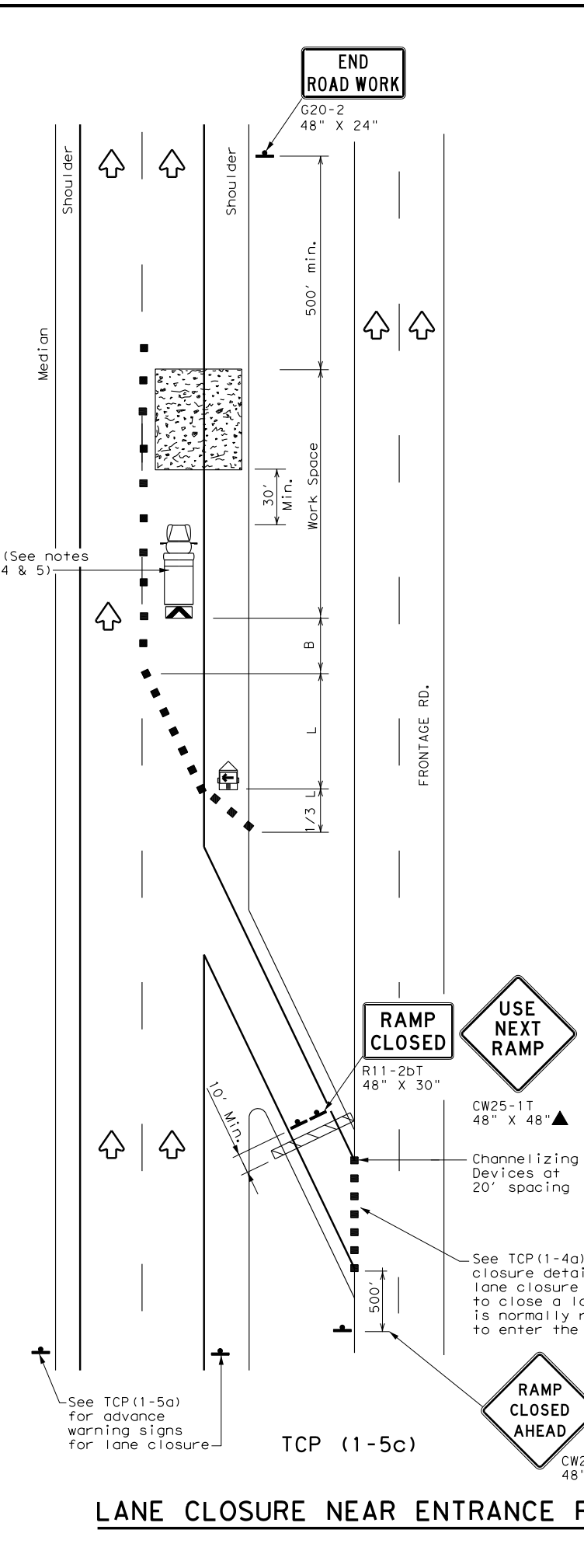
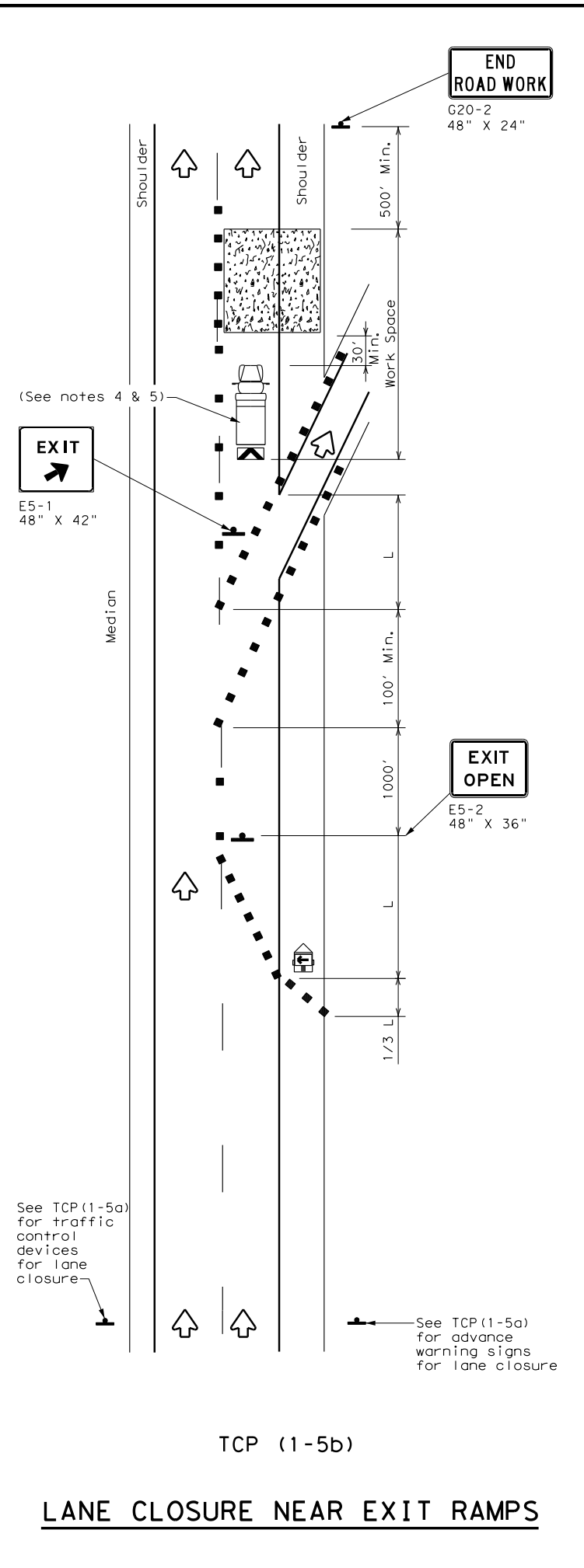
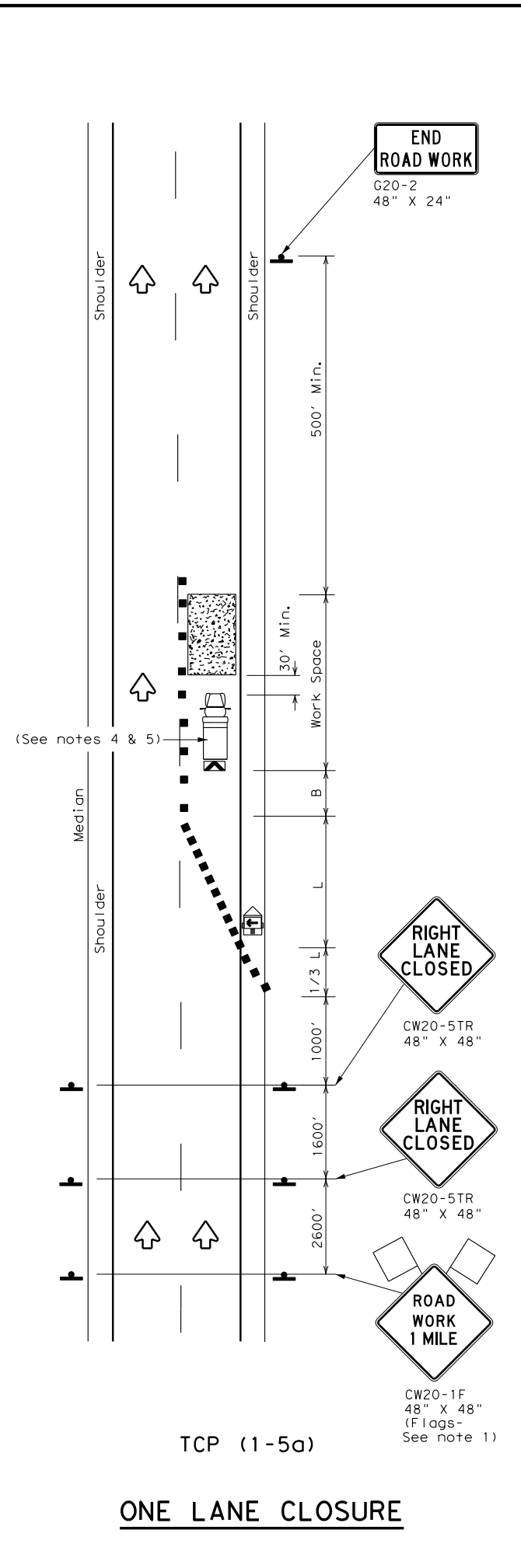
**Texas Department of Transportation** Traffic Operations Division Standard

**TRAFFIC CONTROL PLAN**  
**TRAFFIC SHIFTS ON**  
**TWO LANE ROADS**  
**TCP(1-3)-18**

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

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

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

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

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

- GENERAL NOTES**
- Flags attached to signs where shown, are REQUIRED.
  - All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
  - Channelizing devices used to close lanes may be supplemented with the Chevron Alignment Sign placed on every other channelizing device. Chevrons may be attached to plastic drums as per BC Standards.
  - Shadow Vehicle with TMA and high intensity rotating, flashing, oscillating or strobe lights. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
  - Additional Shadow Vehicles with TMAs may be positioned in each closed lane, on the shoulder or off the paved surface, next to those shown in order to protect a wider work space.

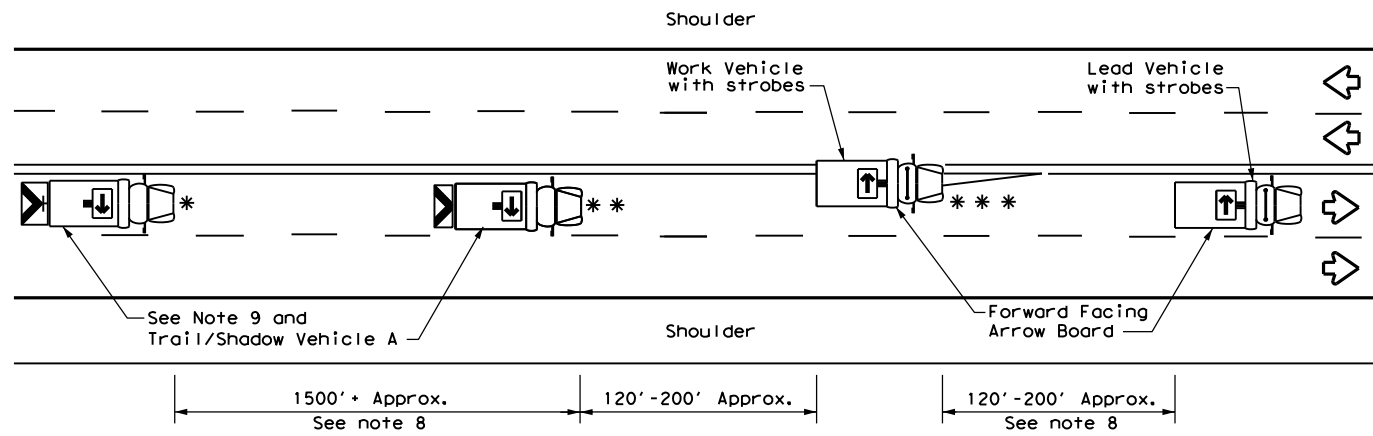


**TRAFFIC CONTROL PLAN  
LANE CLOSURES FOR  
DIVIDED HIGHWAYS**

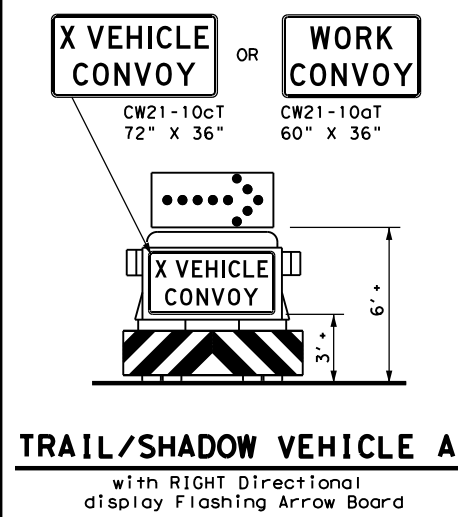
**TCP (1-5) - 18**

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**TCP (3-1a)**  
**UNDIVIDED MULTILANE ROADWAY**



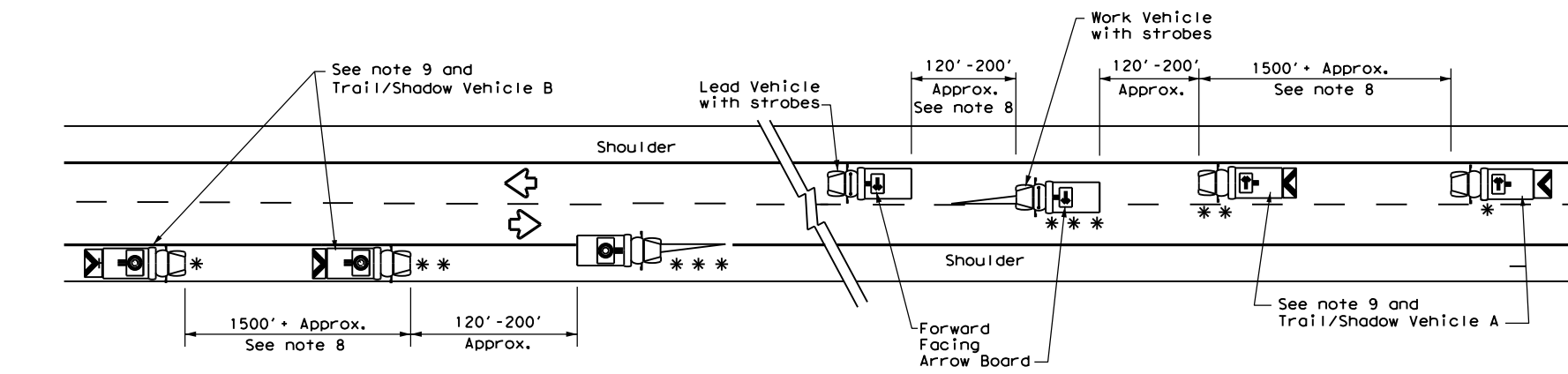
**TRAIL/SHADOW VEHICLE A**  
with RIGHT Directional display Flashing Arrow Board

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)

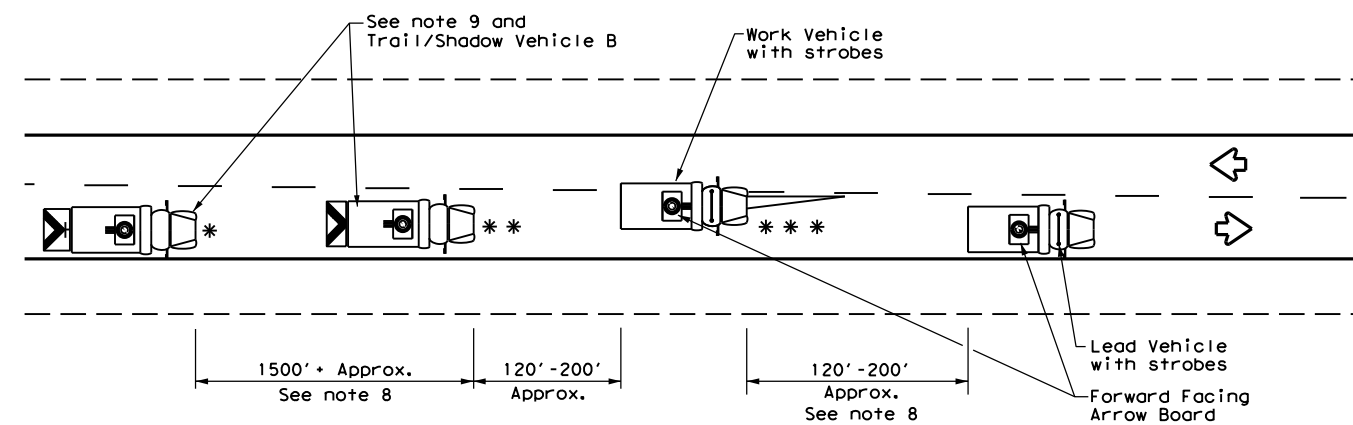
TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
✓				

**GENERAL NOTES**

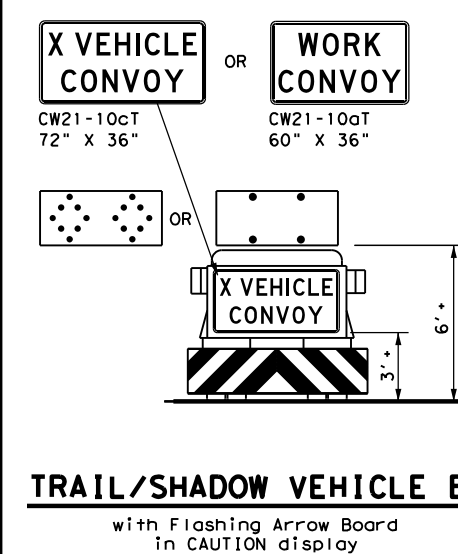
- TRAIL, SHADOW, and LEAD vehicles shall be equipped with arrow boards as illustrated. When a LEAD vehicle is not used the WORK vehicle must be equipped with an arrow board. The Engineer will determine if the LEAD VEHICLE and/or TRAIL VEHICLE are required based on prevailing roadway conditions, traffic volume, and sight distance restrictions.
- The use of amber high intensity rotating, flashing, oscillating, or strobe lights on vehicles are required. Blue high intensity rotating, flashing, oscillating or strobe lights when mounted on the driver's side of the vehicle may be operated simultaneously with the amber beacons or strobe lights.
- The use of truck mounted attenuators (TMA) on the SHADOW VEHICLE and TRAIL VEHICLE are required.
- 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.
- 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.
- Each vehicle shall have two-way radio communication capability.
- When work convoys must change lanes, the TRAIL VEHICLE should change lanes first to shadow the other convoy vehicles.
- Vehicle spacing between the TRAIL VEHICLE and the SHADOW VEHICLE will vary depending on sight distance restrictions. Motorists approaching the work convoy should be able to see the TRAIL VEHICLE in time to slow down and/or change lanes as they approach the TRAIL VEHICLE. Vehicle spacing between the WORK VEHICLE and SHADOW VEHICLE and vehicle spacing between WORK VEHICLE and LEAD VEHICLE may vary according to terrain, work activity and other factors.
- "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.
- 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.



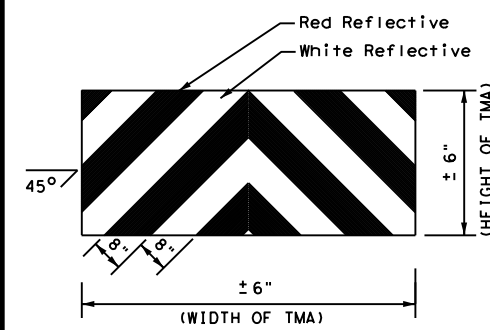
**TCP (3-1b)**  
**TWO-WAY ROADWAY WITH PAVED SHOULDERS**



**TCP (3-1c)**  
**TWO-WAY ROADWAY WITHOUT PAVED SHOULDERS**



**TRAIL/SHADOW VEHICLE B**  
with Flashing Arrow Board in CAUTION display



**STRIPING FOR TMA**



**TRAFFIC CONTROL PLAN  
MOBILE OPERATIONS  
UNDIVIDED HIGHWAYS**

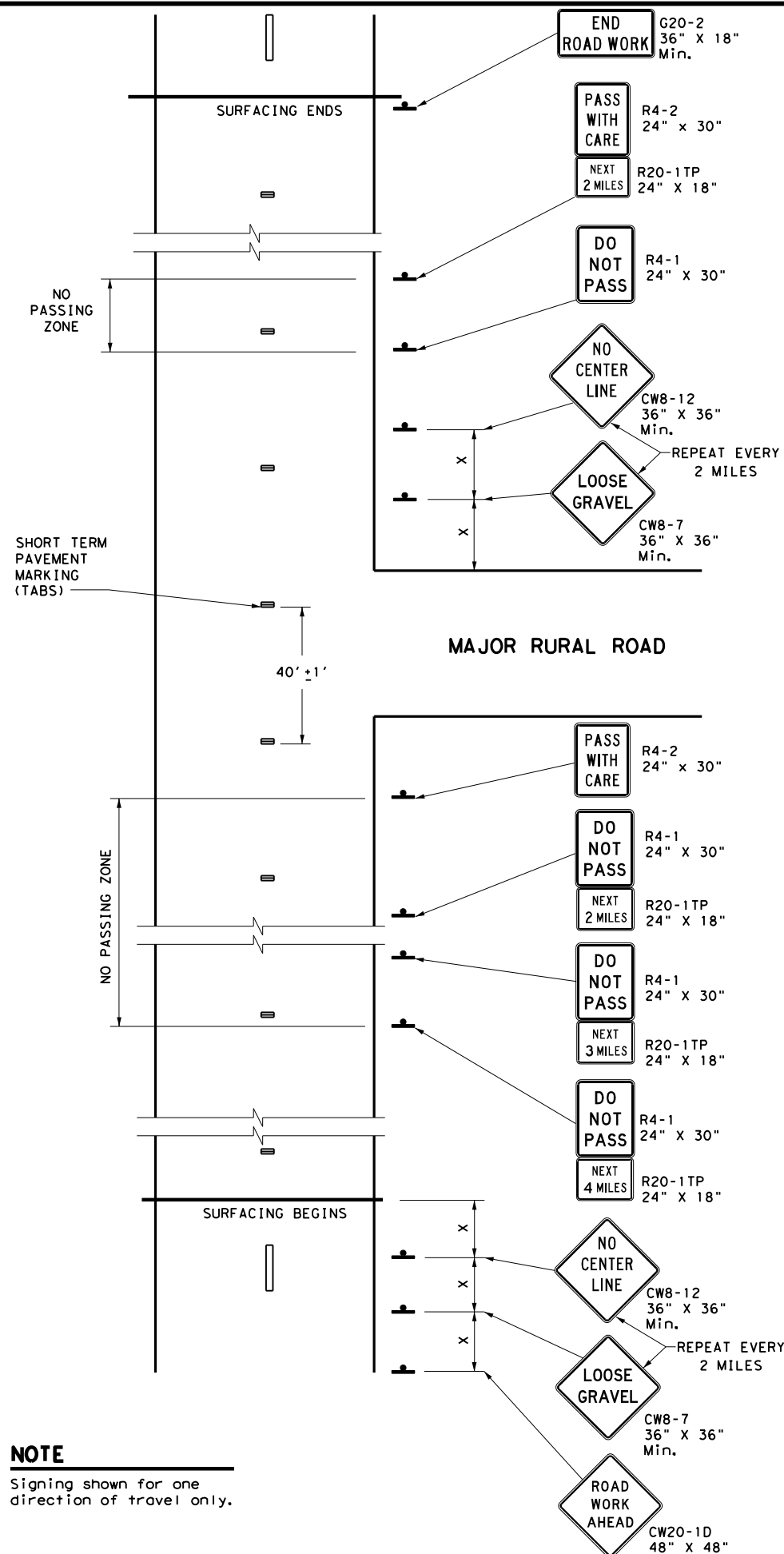
**TCP (3-1)-13**

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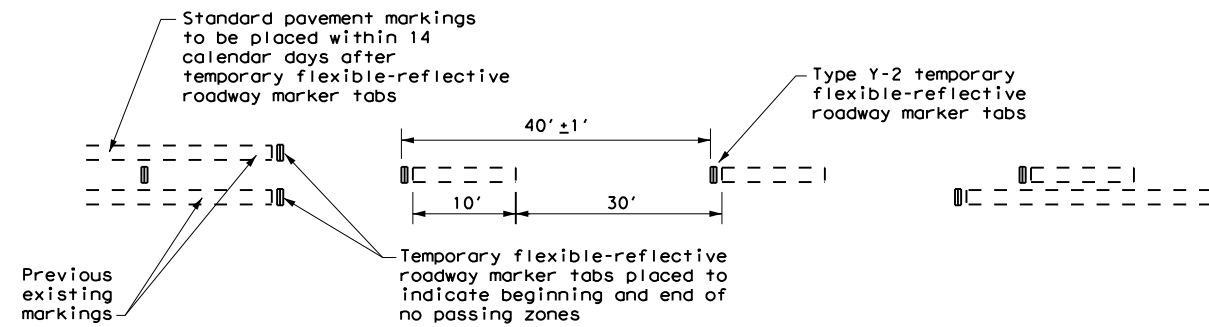
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**NOTE**  
Signing shown for one direction of travel only.

**NO PASSING ZONES ON TWO-LANE TWO-WAY ROADS**



**TABS ON CENTERLINES OF TWO-LANE TWO-WAY ROADS**  
For seal coat, micro-surface or similar operations

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

- A. Prior to the beginning of construction, all currently striped no-passing zones shall be signed with the DO NOT PASS (R4-1) signs and PASS WITH CARE (R4-2) signs placed at the beginning and end of each zone for each direction of travel except as otherwise provided herein. Signs marking these individual no-passing zones need not be covered prior to construction if the signs supplement the existing pavement markings.
- B. At the discretion of the Engineer, in areas of numerous no-passing zones, several zones may be combined as a single zone. If passing is to be prohibited over one or more lengthy sections, a DO NOT PASS sign and a NEXT XX MILES (R20-1TP) plaque may be used at the beginning of such zones. The DO NOT PASS sign and the NEXT XX MILES plaque should be repeated every mile to the end of the no-passing zone. In areas where there is considerable distance between no-passing zones, the end of the no-passing zone may be signed with a PASS WITH CARE sign and a NEXT XX MILES plaque.
- C. Depending on traffic volumes and length of sections, it may be desirable to prohibit passing throughout the project to prevent damage to windshield and lights. The DO NOT PASS sign and NEXT XX MILES plaque should be used and repeated as often as necessary for this purpose. Where several existing zones are to be combined into one individual no-passing zone, the sign at the beginning of the zone should be covered until the surfacing operation has passed this location so as not to have the DO NOT PASS sign conflict with the existing pavement markings. Also, unless one days operation completes the entire length of such combined zones, appropriate DO NOT PASS and PASS WITH CARE signs should be placed at the beginning and end of the no-passing zones where the surfacing operation has stopped for the day.
- D. R4-1 and R4-2 are to remain in place until standard pavement markings are installed.

**"NO CENTER LINE" SIGN (CW8-12)**

- A. Center line markings are yellow pavement markings that delineate the separation of travel lanes that have opposite directions of travel on a roadway. Divided highways do not typically have center line markings.
- B. At the time construction activity obliterates the existing center line markings (low volume roads may not have an existing centerline), a NO CENTER LINE (CW8-12) sign should be erected at the beginning of the work area, at approximately 2 mile intervals within the work area, beyond major intersections and other locations deemed necessary by the Engineer.
- C. The NO CENTER LINE signs are to remain in place until standard pavement markings are installed.

**"LOOSE GRAVEL" SIGN (CW8-7)**

- A. When construction begins, a LOOSE GRAVEL (CW8-7) sign should be erected at each end of the work area and repeated at intervals of approximately 2 miles in rural areas and closer in urban areas.
- B. The LOOSE GRAVEL signs are to remain in place until the condition no longer exists.

**PAVEMENT MARKINGS**

- A. Temporary markings for surfacing projects shall be Temporary Flexible-reflective Roadway Marker Tabs unless otherwise approved by the Engineer. Tabs are to be installed to provide true alignment for striping crews or as directed by the Engineer. Tabs will be placed at the spacing indicated. Tabs should be applied to the pavement no more than two (2) days before the surfacing is applied. After the surfacing is rolled and swept, the cover over the reflective strip shall be removed.
- B. Tabs shall not be used to simulate edge lines.
- C. Tab placement for overlay/inlay operations shall be as shown on the WZ(STPM) standard sheet.

**COORDINATION OF SIGN LOCATIONS**

- A. The location of warning signs at the beginning and end of a work area are to be coordinated with other signing typically shown on the Barricade and Construction Standards for project limits to ensure adequate sign spacing.
- B. Where possible the ROAD WORK AHEAD (CW20-1D), LOOSE GRAVEL (CW8-7), and NO CENTER LINE (CW8-12) signs should be placed in the sequence shown following the OBEY WARNING SIGNS STATE LAW (R20-3T) and the TRAFFIC FINES DOUBLE (R20-5T) sign, and one "X" sign spacing prior to the CONTRACTOR (G20-6T) sign typically located at or near the limits of surfacing. LOOSE GRAVEL and NO CENTER LINE signs will then be repeated as described above.

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

\* Conventional Roads Only

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

**GENERAL NOTES**

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



**TRAFFIC CONTROL DETAILS FOR SURFACING OPERATIONS**

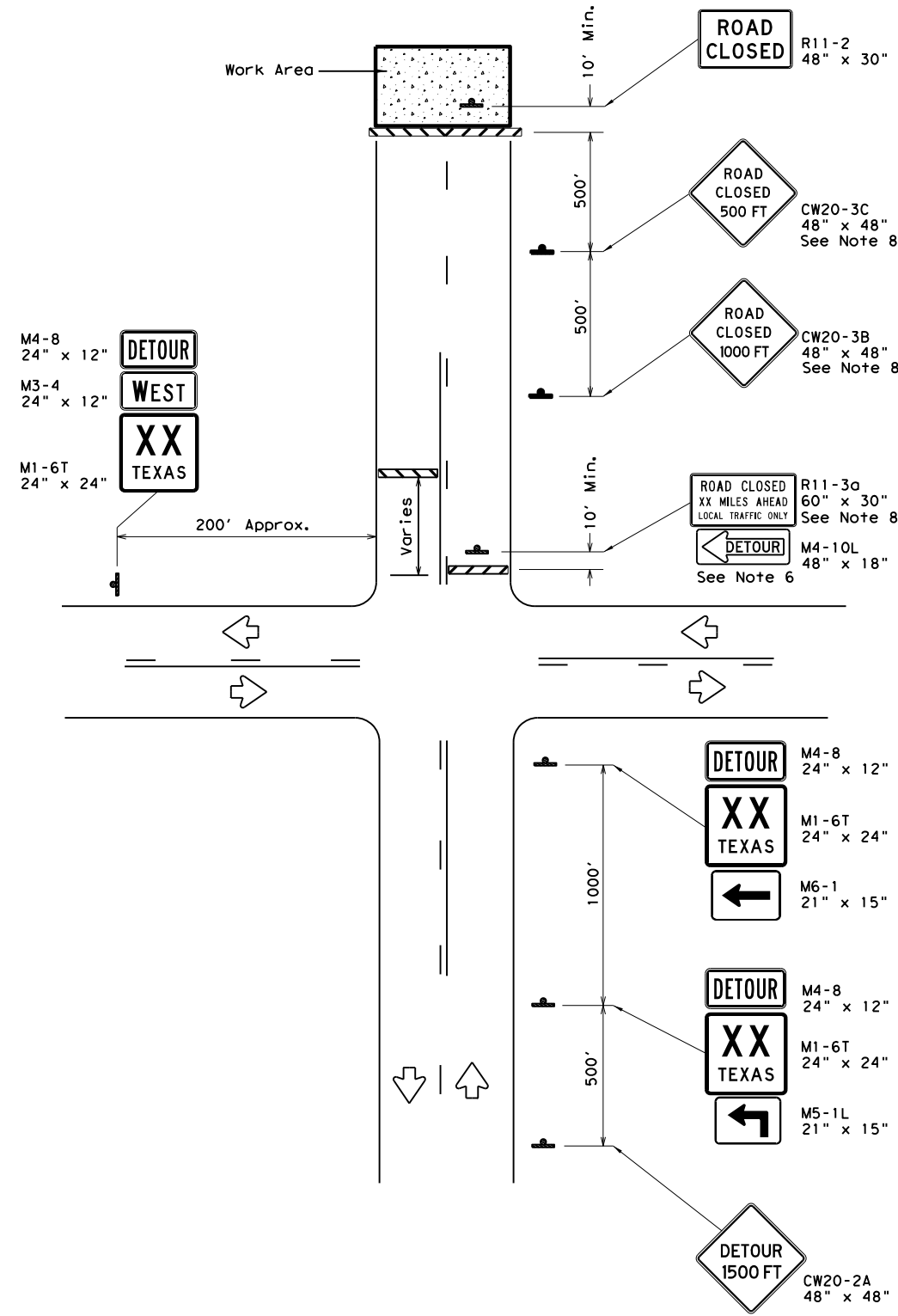
**TCP (7-1) - 13**

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4-92 4-98				
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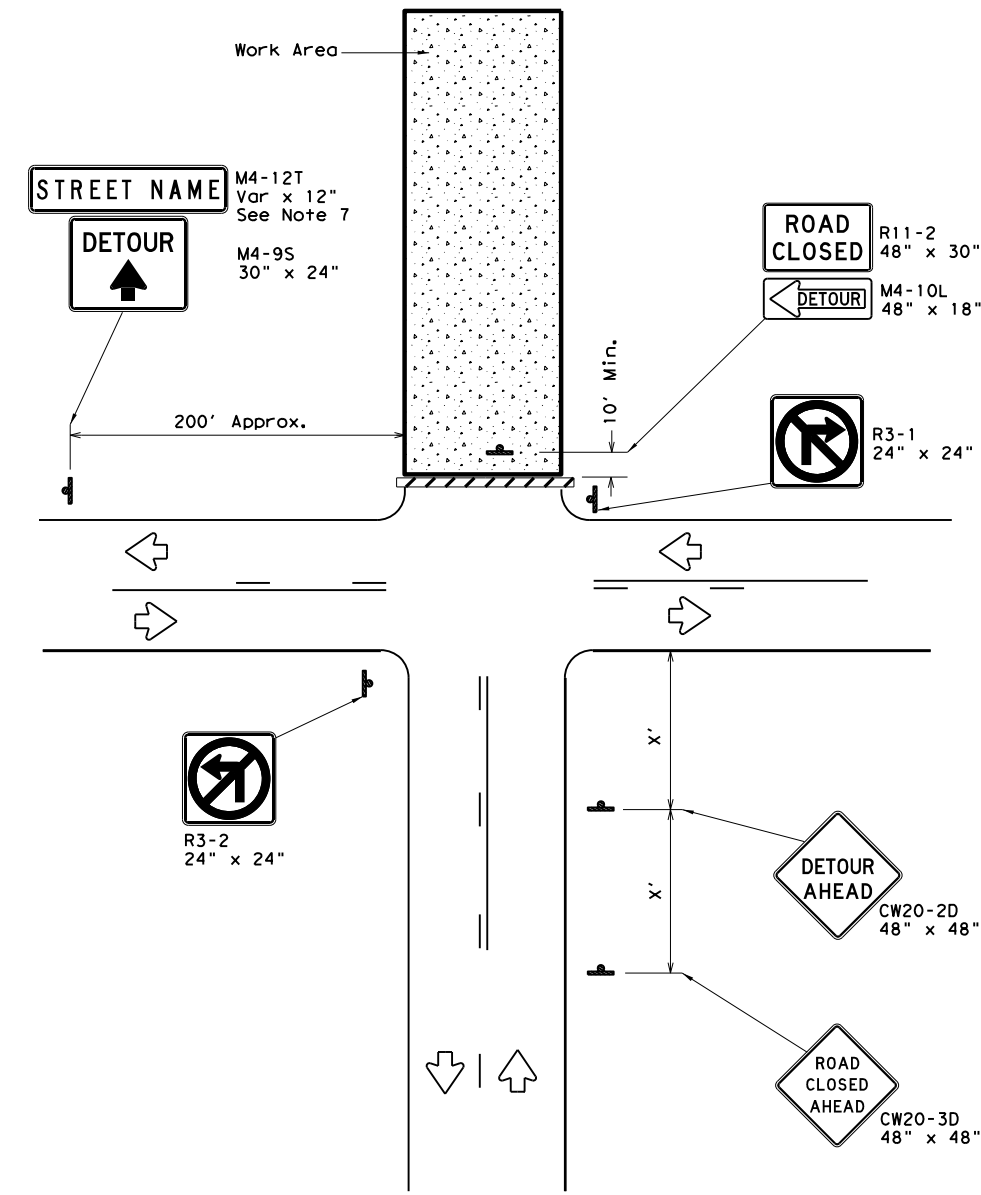


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**ROAD CLOSURE BEYOND THE INTERSECTION**  
Signing for a Numbered Route with an Off-Site Detour



**ROAD CLOSURE AT THE INTERSECTION**  
Signing for an Un-numbered Route with an Off-Site Detour

LEGEND	
	Type 3 Barricade
	Sign

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

\* Conventional Roads Only

**GENERAL NOTES**

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

Texas Department of Transportation Traffic Operations Division Standard

**WORK ZONE ROAD CLOSURE DETAILS**

**WZ (RCD) - 13**

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