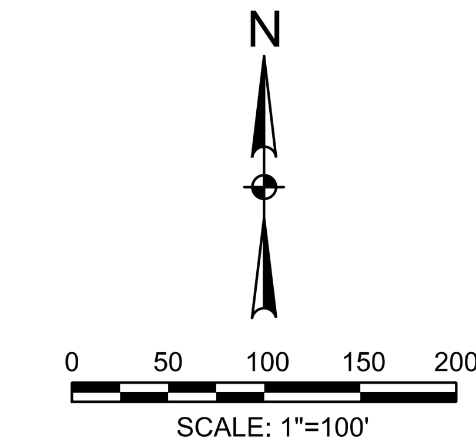
CITY OF SAN ANGELO, TEXAS

TOM GREEN COUNTY, TEXAS

PROJECT NO. ES-06-17
PLANS OF PROPOSED
COLLEGE HILLS BOULEVARD
FINAL SUBMITTAL
MARCH 2017



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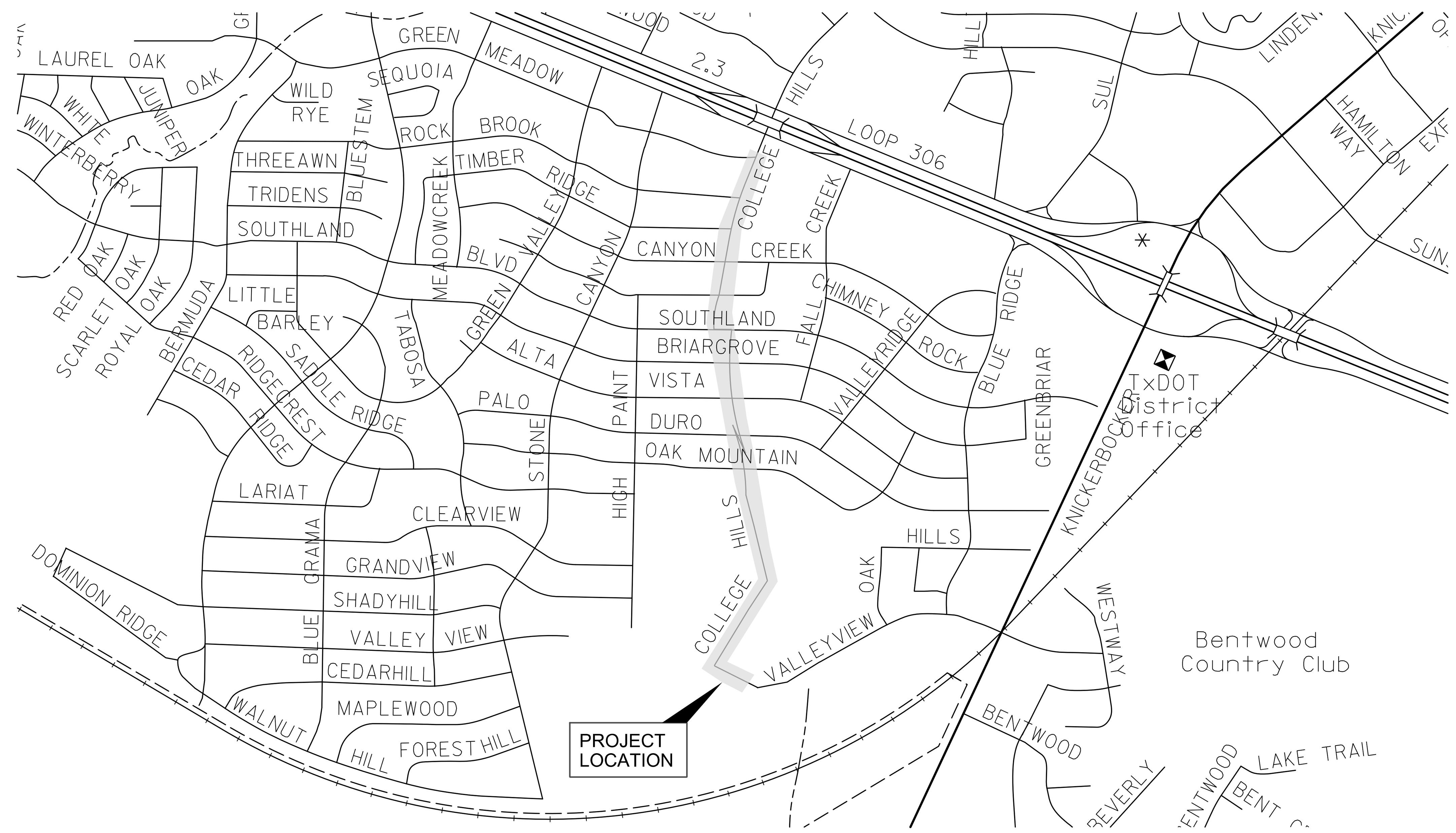

CITY MANAGER: DANIEL VALENZUELA
MAYOR: DWAIN MORRISON

COUNCIL MEMBERS:

1 - BILL RICHARDSON	4 - LUCY GONZALES
2 - MARTY SELF	5 - LANE CARTER
3 - HARRY THOMAS	6 - CHARLOTTE FARMER

PUBLIC WORKS DEPARTMENT
ENGINEERING SERVICES DIVISION
CITY ENGINEER: RUSSELL PEHL, P.E.

CITY OF SAN ANGELO, 72 WEST COLLEGE AVE., SAN ANGELO, TEXAS 76903

COLLEGE HILLS BOULEVARD REHABILITATION
LOOP 306 TO VALLEYVIEW
SAN ANGELO, TX

HALFF
4000 FOSSIL CREEK BLVD
FORT WORTH, TEXAS 76137-2797
TEL (817) 847-1422
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No.	Date	Description

KEITH L. FREEMAN 85454 LICENSED PROFESSIONAL ENGINEER
MAR. 22, 2017

Project No.:	31516
Issued:	3/23/2017
Drawn By:	
Checked By:	
Scale:	1" = 1'
Sheet Title	COVER SHEET
Sheet Number	C000

General Notes

All drawings in the construction plans are for illustration purposes only. Nothing shall be scaled from the construction drawings. The contractor shall refer to appropriate construction plan sheets for actual dimensions. For construction staking, the contractor shall utilize control points established by the City to establish location, dimensions, lines, and grades or any other aspect of work. The contractor shall perform all measurements in the field for quantity verification purposes, for bid preparation or for any other purpose. The City or Halff shall not be responsible for dimensions of any items where dimensions were obtained by scaling or measuring anything from the construction drawings. Should the contractor believe adequate surveying control does not exist, he shall provide for additional surveying in his bid to adequately provide the necessary control.

The general notes listed herein are grouped by general category or work, but are applicable to all items of work for the entire project.

As referred to herein, the City refers to the City of San Angelo, the Engineer, and/or any of their designated representatives.

The total bid submitted shall be the total compensation provided to the contractor for the work to be performed in this contract. Any work provided for herein and not paid for directly shall be considered subsidiary to the various bid items of the contract and no direct payment shall be made.

The contractor shall be required to maintain all areas throughout the duration of the project. All required maintenance of the completed work shall be the contractor's responsibility and shall be considered a part of this contract and at the contractor's expense until final acceptance by the City.

The contractor shall submit in writing for approval the procedure to be used for handling public claims and complaints including the time frame in which the contractor will respond to complaints.

Prior to beginning work, the contractor shall supply a toll free number of the insurance company or contractor's person responsible for processing complaints and claims.

Acquisition of all required permits, if any, shall be the responsibility of the contractor.

The contractor is expected to cooperate with other contractors and suppliers working on the same project.

The contractor is required to keep the project free from litter. At the request of the City, the contractor shall pick up all litter within the project regardless of the source of the litter. This is considered subsidiary to the various bid items of the contract.

The contractor shall perform the removal of any obstructions(s) on the site and in the street right of way and/or easements of any kind, not shown on the plans, and payment shall be considered subsidiary.

All materials removed from the project are the property of the contractor.

Should the contract drawings and contract specifications differ, the more stringent shall apply unless prior written approval is granted by the City.

Traffic Control Plan & Contract Time

The contractor shall maintain temporary traffic control measures throughout the project that are constantly in full compliance with the current version of the Texas Manual on Uniform Traffic Control Devices.

The traffic control plan shall comply with TxDOT's latest version of "Barricade and Construction General Notes and Requirements". The contractor shall utilize TxDOT's latest standard traffic control plan sheets.

The contractor shall maintain a minimum of two lanes with two-way traffic at all times during construction. No more than one consecutive intersection can be closed at a time. If complete street closure becomes necessary, the contractor shall submit his request to the Engineer at least two (2) weeks prior to closing any portion of the street.

The contractor shall submit for the City's review and acceptance a temporary and long-term traffic control plan showing the contractor's proposed means of compliance with this section. No work shall be performed until the contractor has received the City's approval of the temporary and long-term traffic control plan.

The City may order all work stopped if the contractor fails to comply with the temporary and long-term traffic control plan.

The contractor shall have one hundred eighty (180) calendar days to complete the project. For each calendar day that any work remains incomplete after the expiration of the one hundred eighty (180) days allotted for this project, an amount of eight hundred zero dollars and zero cents ($800.00) per calendar day will be assessed the contractor and deducted from the monies due or to become due the contractor, not as a penalty, but as liquidated damages. Work on Sundays and the eleven approved holidays: November 11, 2016; November 24 & 25, 2016, December 23 & 26, 2016; January 2, 2017; January 16, 2017; April 14, 2017; May 29, 2017; July 4, 2017; and September 4, 2017 will not be permitted.

The contractor shall not conduct any operations or perform any work pertaining to the project between the hours of 6:00pm and 7:00am without prior approval of the Engineer. All driveways and intersections shall be assessable during this time.

The contractor shall notify the Engineer at lease forty-eight (48) hours prior to commencement of work.

The contractor shall notify all adjacent property owners and businesses of lane closures, street closures, and of a proposed construction schedule.

The contractor shall make every effort to allow property owners and businesses access at all times.

The contractor shall be responsible for providing safe access for the delivery of mail by the U.S. Postal Service.

Progress Schedule

Before starting work on a construction contract, the contractor shall prepare and submit to the City a progress schedule based on the sequence of work and traffic control plan. At a minimum, prepare the progress schedule as a bar chart. Include all planned work activities and sequences and show contract completion within the number of working days specified. Incorporate major material procurements, known utility relocation, and other activities that may affect the completion of the contract in the progress schedule. Show a beginning date, ending date, and duration in number of working days for each activity. Do not use activities exceeding 20 working days, except for agreed upon activities. Show an estimated production rate per working day for each work activity.

Submit an updated progress schedule monthly, unless otherwise shown in the contract or as directed. Update the progress schedule by adding actual progress made during the previous update period, including approved changes to the sequence of work and the traffic control plan. If an updated progress schedule indicates the contract will not be completed within the number of working days specified, notify the City in writing whether the contractor will revise the progress schedule to meet the number of working days specified or exceed the number of working days specified.

Notify the City in writing of proposed changes in the progress schedule. Major changes are those that may affect compliance with the contract requirements or that change the critical path or controlling item of work. The City reserves the right to reject these proposed changes.

No direct compensation will be made for fulfilling these requirements, as this work is considered subsidiary to the items of the contract.

Payments & Quantities

The City will pay the contractor monthly based upon the work performed the previous month. The amount due the contractor for that month will be negotiated between the contractor and the City. In the event of a dispute, the City's estimate shall be final. From the amount due each month, the City will retain five percent (5%) until satisfactory completion of the entire work. The five percent (5%) retainage will be paid the contractor as a final payment when all work is completed to the City's satisfaction.

With prior approval of the City, payment will be made for material on hand, provided the material is stored on the project or at an approved location in a manner acceptable to the City. Payment will be made with the next monthly estimate payment, provided the contractor presents a true and valid paid receipt acceptable to the City, for the material.

The contractor shall satisfy himself that all quantities of material and work, whether paid for directly or considered subsidiary to the work, are adequate for completion of the work prior to bid submittal. The contractor shall visit the site and become familiar with the location and the work to be performed under this contract. The contractor shall verify both the quantities of materials and work in the plans and in the bidding documents. Submittal of a bid shall be considered proof that the contractor has complied with this item and all items contained herein. Any discrepancies found in the construction plans and/or construction specifications shall be called to the attention of the Engineer/City prior to bid submittal.

The contractor shall perform a quantity calculation from the construction plans to verify those quantities are in agreement with those contained in the Bid Estimate. Quantity disagreement shall not be a basis for a dispute or claim before, during, or after construction.

Construction Inspections

Construction inspection shall be at the discretion of the City within the requirements of the City. The contractor shall keep the entire project site accessible to the City and any other governmental entity that may exercise regulatory control of the project or any portion of the work.

Protection of Work

The contractor shall protect all areas, whether within or outside of the actual limits of construction. The contractor shall restore all disturbed areas to a condition as good as, or better than, that present prior to the construction. The City shall be the sole judge as to the acceptability of the restoration.

Permanent features to remain, indicated herein on the plans or otherwise, shall be identified, marked, and protected from damage or removal by the contractor.

All construction and construction equipment shall remain within the established work area unless the City has granted prior authorization.

Construction vehicles and equipment shall be limited to the areas to which work is to be performed. Any areas outside of the work area that has experienced damage (such as trees, or loss of vegetative cover) from the construction, storage of equipment and/or materials, or any other process associated with construction, shall be repaired by the contractor at his sole expense to the satisfaction of the City.

Any damage created by any equipment or any other means on the project or on adjacent properties and/or streets and roads shall be repaired to the City's satisfaction at the contractor's sole expense.

The contractor shall not cut or trim trees without consent of the City.

Large construction equipment (or any other equipment deemed large by the City) shall not be allowed on any roadway/parking area once it has been paved. Any damage created by any equipment on the subgrade, base course(s), structures, and/or pavement shall be repaired to the City's satisfaction at the contractor's sole expense.

Storm Water Pollution Prevention Plan

The contractor shall be responsible for establishing a Storm Water Pollution Prevention Plan (SWPPP) and complying with the requirements thereof for the project.

With the permission of the City, the contractor may establish a yard on the project provided adequate space is available.

The contractor is responsible for providing erosion and sediment control BMP's to prevent sediment from reaching paved areas, storm sewers systems, drainage courses, and adjacent properties. In the event the prevention measures are not effective, the contractor shall remove all debris, silt or mud and restore the right-of-way or original properties to a condition as good as, or better than the property was prior to the event and within 24 hours of the occurrence, unless approved by the Engineer.

Materials Testing

All required material testing and/or inspection shall be arranged for and paid for by the City. The contractor shall be required to pay for any retesting and/or reinspection of materials or work resulting from the failure of the initial test paid for by the City or any subsequent testing and/or inspection required because of failure of previously tested materials and/or work performed. Minimum testing requirements shall be as established by the City. The contractor shall pay for any quality control testing that is deemed necessary by the contractor.

Specifications

All items referenced herein referred to as "item" and/or "City Standard Specification item No(s)" shall be a reference to the items listed in the latest City of San Angelo Standard Specifications, Texas Department of Transportation Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges (2014) and Details for Construction and is incorporated herein by reference.

Instances where City Specifications conflict with those contained herein, the specifications contained herein shall take precedence.

In instances where conflict exists within these specifications the hierarchy shall be as follows:

1) Federal/State/Local Law, Rules or Ordinances

2) Construction Plans

3) General Notes

4) Individual Specifications

Survey Control & Construction Staking

The elevations shown on the plans were taken from a survey prepared by Halff Associates, Inc. The contractor shall provide all construction controls including, but not limited to, all construction staking required for control of work. The contractor shall take steps necessary to protect any pre-existing control points from damage or movement. The City may, at its discretion, replace any control points damaged or moved by the contractor's operation and the fee for replacing the control points will be deducted from any monies due the contractor. With prior approval of the City, the contractor may elect to retain a Registered Professional Land Surveyor to reset control points, provided the City is presented with a report under certification and seal of the surveyor that the points were set at their original position.

It is entirely the contractor's responsibility to verify the existing project control and if adequate control is not available, make provisions in his bid for establishing satisfactory control adequate to prosecute the work.

Utilities (Existing)

Any utilities shown in the plans are for informational purposes only and their locations are approximate. The contractor shall notify the appropriate utility to field-locate all installations. Furthermore, there may be other existing utilities in the project limits that are not shown on the plans. The contractor shall be responsible for contacting all utility companies that may be present within the project limits to locate their particular facility.

No work shall be performed near an existing facility without a representative from the affected utility being present for the duration of the work.

The contractor's attention is called to the fact that both overhead and underground utilities may be present in or near the project. It is the contractor's responsibility to comply with the Texas One-Call Notification System. The One-Call number is 1-800-DIG-TESS (1-800-344-8377). State law requires anyone digging or excavating with machine-powered equipment to a depth of more than 16" to call a notification center two (2) days before digging begins.

The contractor shall call the City of San Angelo Water Utilities Department to locate water and wastewater lines at 325-657-4295 two (2) days before digging begins.

It shall be the contractor's entire responsibility to repair and/or replace, at his entire expense, any utilities damages or otherwise disturbed as a result of his or his subcontractor's operations on the project regardless of whether or not those utilities were shown on the plans.

COLLEGE HILLS BOULEVARD REHABILITATION
LOOP 306 TO VALLEYVIEW
SAN ANGELO, TX

THE CITY OF SAN ANGELO ★ TEXAS ★

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FORT WORTH, TEXAS 76137-2797
TEL (817) 847-1422
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Revision No.	Date	Description

STATE OF TEXAS
KEITH L. FREEMAN
85454
LICENSED PROFESSIONAL ENGINEER
MAR. 22, 2017

Project No.:	31516
Issued:	3/23/2017
Drawn By:	
Checked By:	
Scale:	1" = 1'

Sheet Title
GENERAL NOTES

C010
Sheet Number

Item No.	Description	Unit	Quantity
FRONT END COSTS			
1	MOBILIZATION & START UP (5% CONSTRUCTION COST)	LS	1
PAVING IMPROVEMENTS			
2	REMOVE ASPHALTIC CONCRETE PAVEMENT	SY	8,900
3	REWORKING BASE MATERIAL (TYPE B)	SY	7,200
4	4-INCH TYPE B HMAC BASE	SY	1,142
5	2-INCH TYPE D HMAC SURFACE	SY	33,253
6	ASPHALT PRIME COAT (MC-30)	GAL	6,651
7	REFL PAV MRK TY I (WHITE) 4" (BRK) (100 MIL)	LF	2,104
8	REFL PAV MRK TY I (YELLOW) 4" (SOLID) (100 MIL)	LF	7,816
9	REFL PAV MRK TY II-C-R	EA	207
10	REFL PAV MRK TY II-A-A	EA	194
11	REFL PAV MRK TY I (WHITE) (100 MIL) DBL ARROW	EA	60
12	REFL PAV MRK TY I (WHITE) (100 MIL) BIKE SYMBOL	EA	60
13	STORM WATER POLLUTION PREVENTION PLAN	MO	9
14	EROSION CONTROL LOGS	LF	140
15	ADJUST WATER VALVE BOX	EA	50
16	ADJUST MANHOLE	EA	4
17	ADJUST CLEANOUT	EA	2
18	TRAFFIC CONTROL	MO	6

Item No.	Description	Unit	Quantity
UNDERDRAIN IMPROVEMENTS			
19	REMOVE CONCRETE (RIPRAP)	SY	65
20	REMOVE CONCRETE (CURB AND GUTTER)	LF	375
21	REMOVE ASPHALTIC CONCRETE PAVEMENT	SY	5
22	REMOVE CONCRETE VALLEY GUTTER	SY	6
23	REMOVE SIDEWALK PAVING	SY	4
24	ASHPALT PAVEMENT REPAIR	SY	6
25	CONCRETE VALLEY GUTTER REPAIR	LF	20
26	HEADER CURB	LF	60
27	CONC CURB & GUTTER	LF	375
28	PIPE (PVC)(SCH 40)(8 IN)	LF	10
29	PIPE UNDERDRAINS (TY 8) (6 IN)	LF	555
30	PIPE UNDERDRAINS (TY 8) (8 IN)	LF	406
31	RIPRAP (CONC)(5 IN)	CY	10
32	CONCRETE HEADWALL WITH 8 IN AUTOMATIC GATE	EA	1
33	CLEAN-OUTS	EA	19
34	SEEDING FOR EROSION CONTROL	SY	250

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Revision

No.	Date	Description

STATE OF TEXAS
KEITH L. FREEMAN
85454
LICENSED PROFESSIONAL ENGINEER
Keith L. Freeman
MAR. 22, 2017

Project No.:	31516
Issued:	3/23/2017
Drawn By:	
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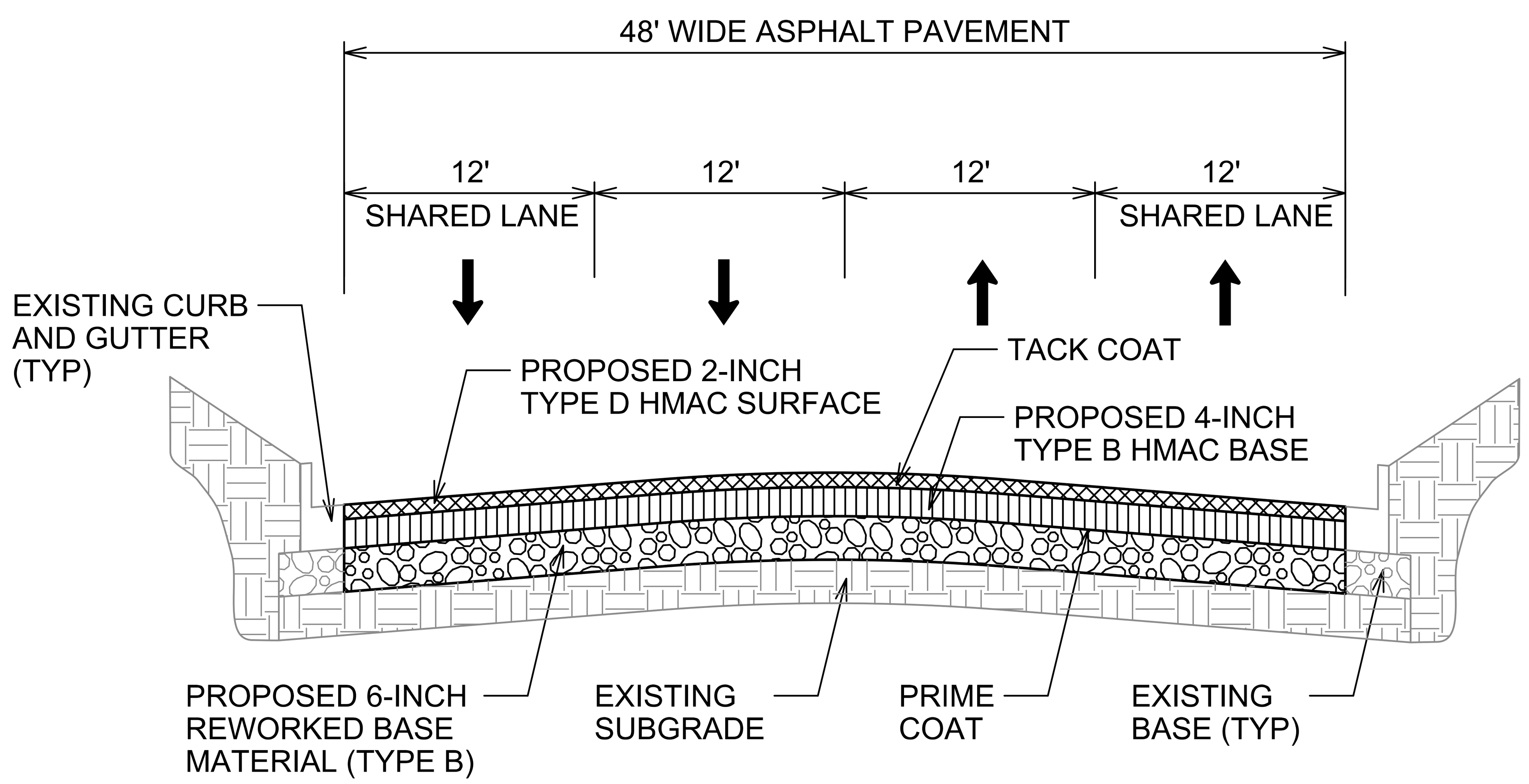
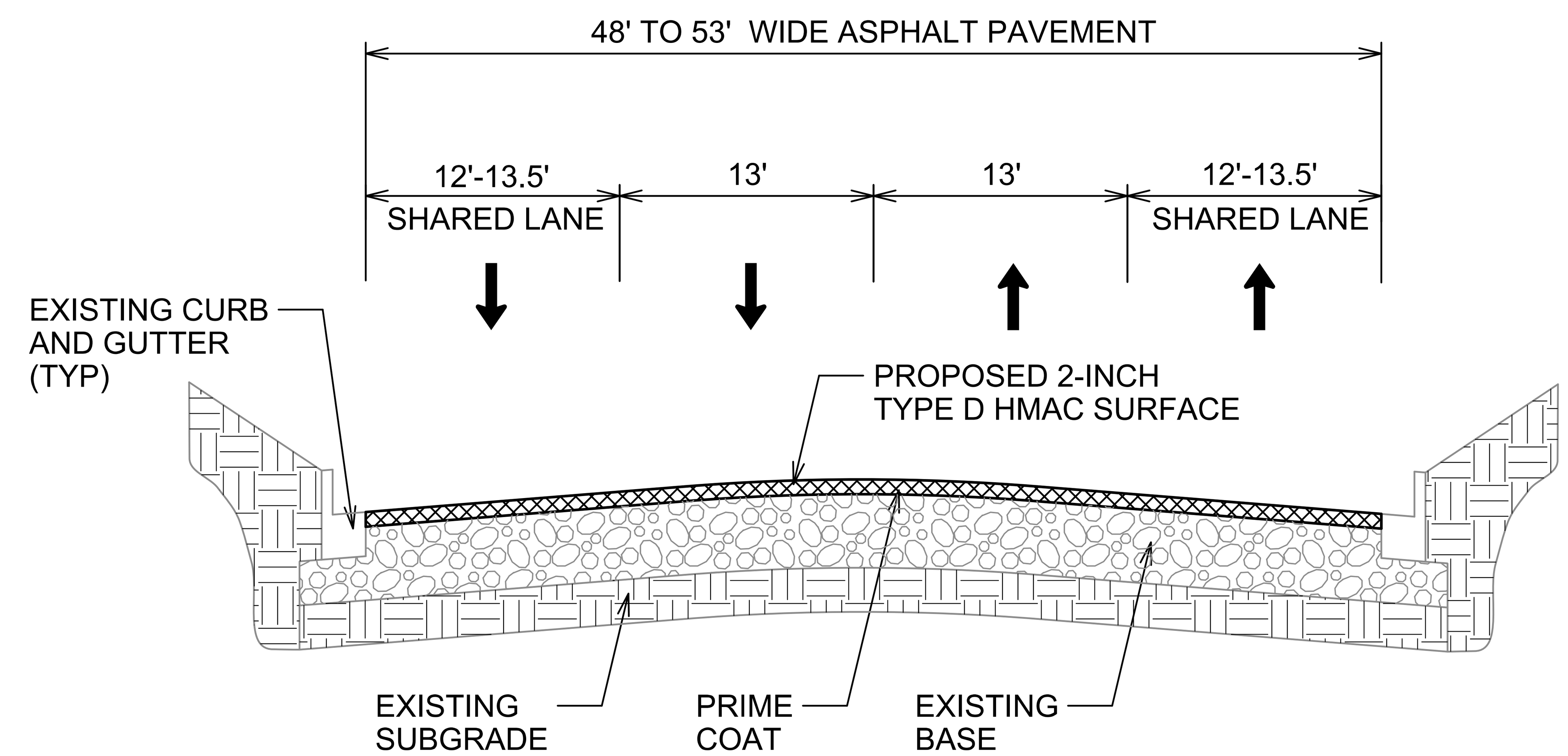
Sheet Title
ESTIMATED QUANTITIES

C020
Sheet Number



TYPICAL SECTION A
STATION 9+94 TO STATION 12+06

REMOVE ASPHALT PAVING ALL LANES
REWORK 6-INCH BASE COURSE
REPAVE WITH 4-INCH TYPE B BASE COURSE
AND WITH 2-INCH TYPE D SURFACE COURSE

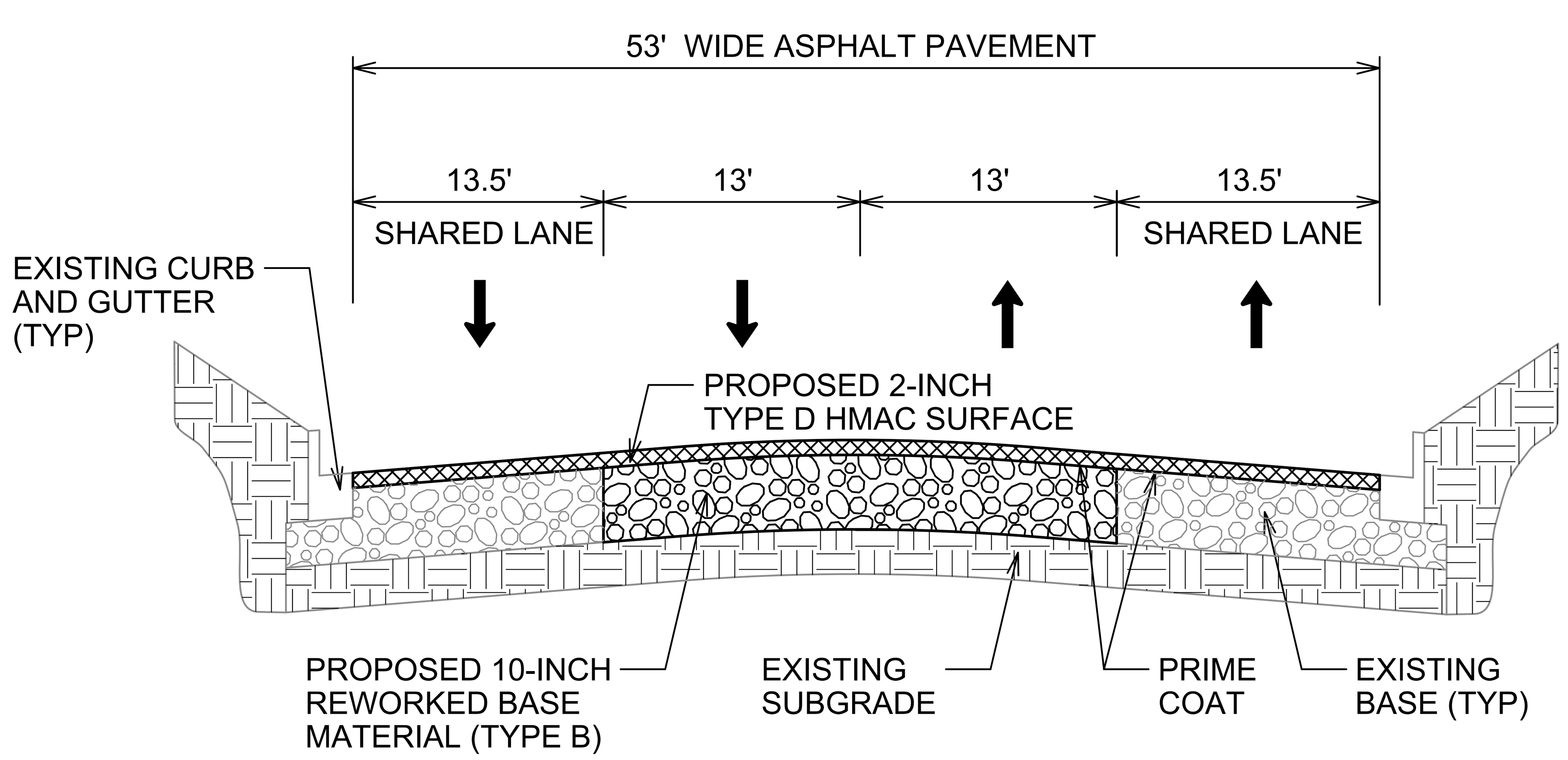


TYPICAL SECTION B
STATION 12+06 TO STATION 20+50
STATION 25+50 TO STATION 52+80

SURFACE MILL ALL LANES AND
REPAVE WITH 2-INCH ASPHALT OVERLAY

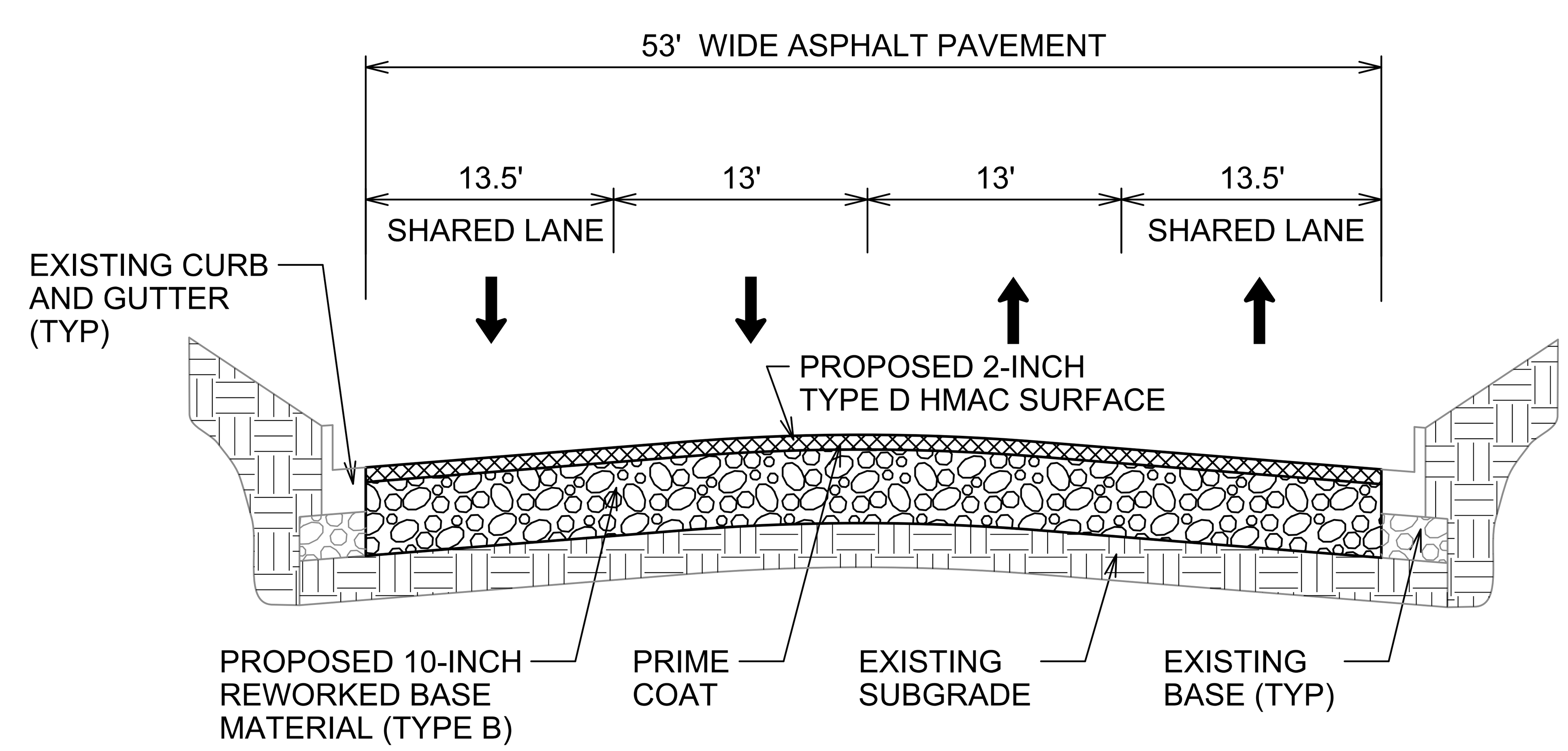
ALL SECTIONS

1) PROVIDE POSITIVE DRAINAGE
2) SEE CITY OF SAN ANGELO'S URBAN COLLECTOR STREETS STANDARD DETAIL S-C-1 FOR REFERENCE
3) THE REWORKED BASE MATERIAL SHALL BE COMPACTED BY DENSITY CONTROLL AS STATED IN CITY OF SAN ANGELO'S SPECIFICATION ITEM 251 - REWORKING BASE MATERIAL



TYPICAL SECTION C
STATION 52+80 TO STATION 57+40

REMOVE ASPHALT PAVING ALL LANES
REWORK 10-INCH BASE COURSE IN MIDDLE LANES AND
REPAVE ALL LANES WITH 2-INCH ASPHALT OVERLAY



TYPICAL SECTION D
STATION 20+50 TO STATION 25+50
STATION 57+40 TO STATION 60+80

REMOVE ASPHALT PAVING ALL LANES
REWORK 10-INCH BASE COURSE AND
REPAVE WITH 2-INCH ASPHALT OVERLAY

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KEITH L. FREEMAN
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LICENSED PROFESSIONAL ENGINEER
MAR. 22, 2017

Project No.:	31516
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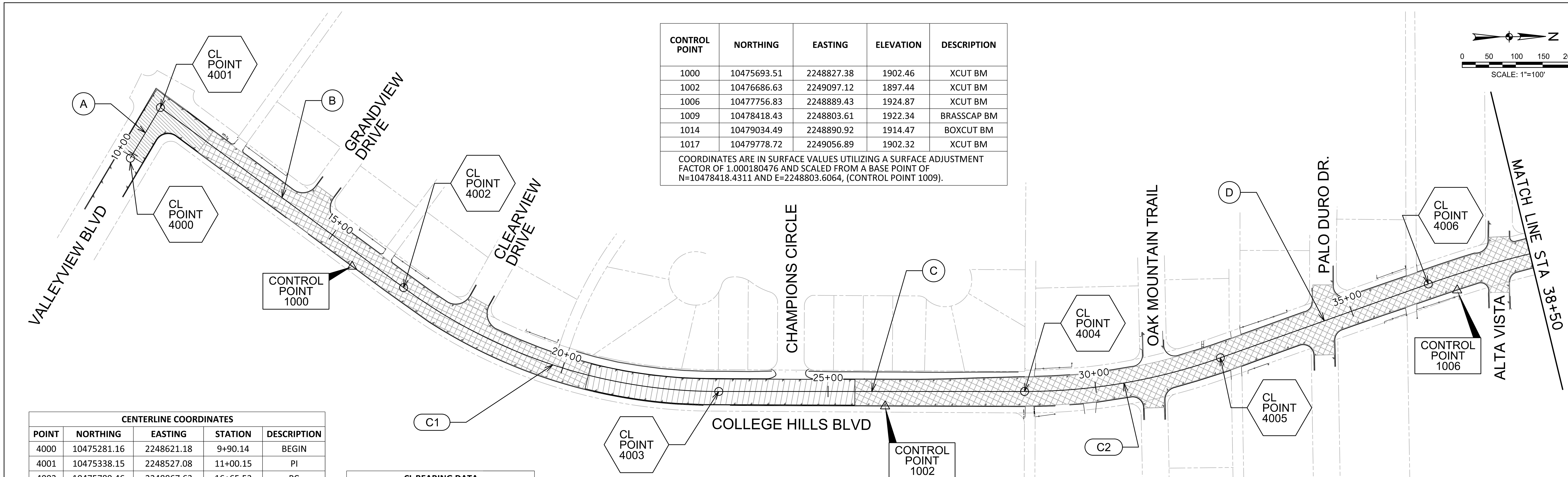
Scale:	1" = 1'
Sheet Title	TYPICAL SECTIONS
Sheet Number	C030



CONTROL POINT	NORTHING	EASTING	ELEVATION	DESCRIPTION
1000	10475693.51	2248827.38	1902.46	XCUT BM
1002	10476686.63	2249097.12	1897.44	XCUT BM
1006	10477756.83	2248889.43	1924.87	XCUT BM
1009	10478418.43	2248803.61	1922.34	BRASSCAP BM
1014	10479034.49	2248890.92	1914.47	BOXCUT BM
1017	10479778.72	2249056.89	1902.32	XCUT BM

COORDINATES ARE IN SURFACE VALUES UTILIZING A SURFACE ADJUSTMENT FACTOR OF 1.000180476 AND SCALED FROM A BASE POINT OF N=10478418.4311 AND E=2248803.6064, (CONTROL POINT 1009).

CENTERLINE COORDINATES

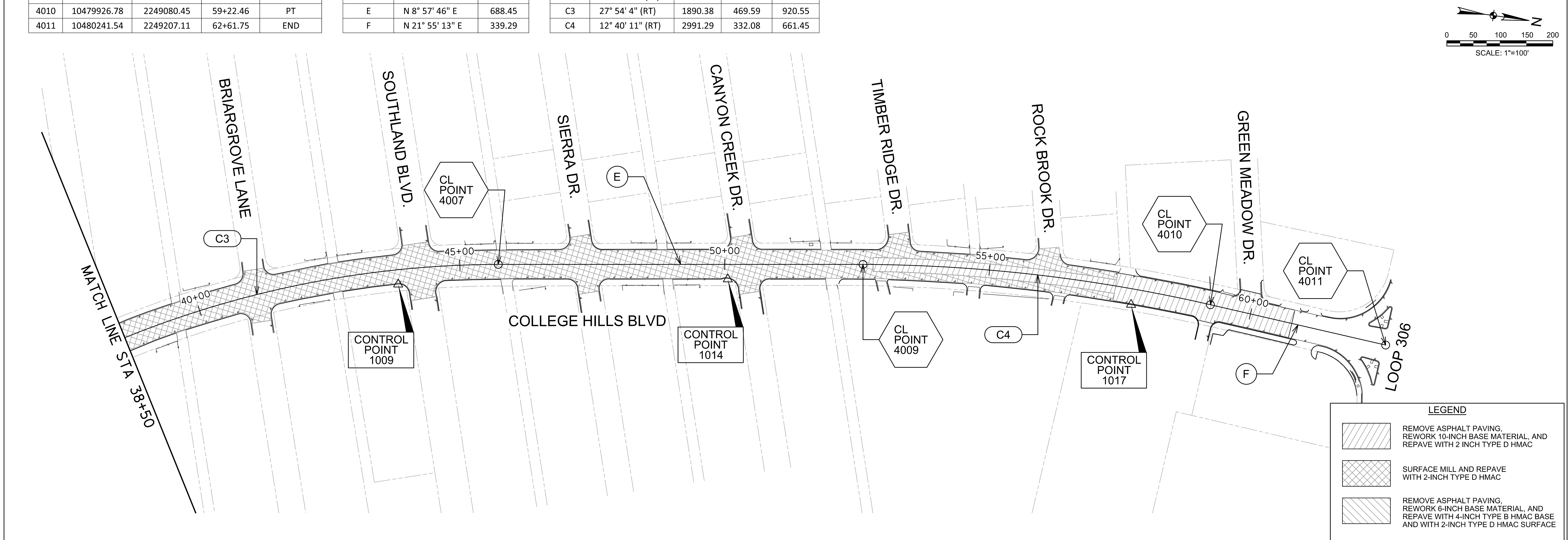
POINT	NORTHING	EASTING	STATION	DESCRIPTION
4000	10475281.16	2248621.18	9+90.14	BEGIN
4001	10475338.15	2248527.08	11+00.15	PI
4002	10475789.46	2248867.63	16+65.53	PC
4003	10476376.33	2249066.94	22+95.94	PT
4004	10476947.34	2249071.83	28+66.98	PC
4005	10477313.57	2249011.91	32+39.89	PT
4006	10477703.06	2248877.24	36+52.01	PC
4007	10478610.90	2248795.84	45+72.56	PT
4009	10479290.95	2248903.09	52+61.01	PC
4010	10479926.78	2249080.45	59+22.46	PT
4011	10480241.54	2249207.11	62+61.75	END

CL BEARING DATA

SEGMENT	BEARING	DISTANCE (FEET)
A	N 58° 48' 01" W	110.01
B	N 37° 02' 15" E	565.38
C	N 0° 29' 26" E	571.04
D	N 19° 04' 27" W	412.12
E	N 8° 57' 46" E	688.45
F	N 21° 55' 13" E	339.29

CL CURVE DATA

CURVE	DELTA (DIRECTION)	RADIUS	TANGENT	LENGTH
		Feet		
C1	36° 32' 7" (LT)	988.63	326.34	630.41
C2	19° 33' 53" (LT)	1092.07	188.29	372.91
C3	27° 54' 4" (RT)	1890.38	469.59	920.55
C4	12° 40' 11" (RT)	2991.29	332.08	661.45



LEGEND

- REMOVE ASPHALT PAVING, REWORK 10-INCH BASE MATERIAL, AND REPAVE WITH 2 INCH TYPE D HMAC
- SURFACE MILL AND REPAVE WITH 2-INCH TYPE D HMAC
- REMOVE ASPHALT PAVING, REWORK 6-INCH BASE MATERIAL, AND REPAVE WITH 4-INCH TYPE B HMAC BASE AND WITH 2-INCH TYPE D HMAC SURFACE

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Project No.:	31516
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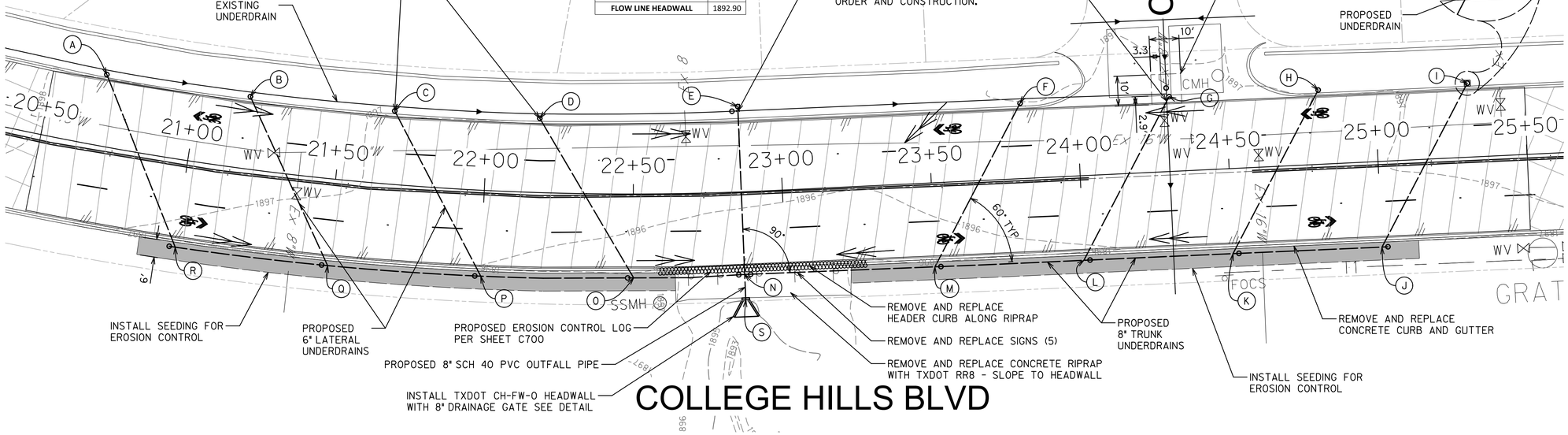
Sheet Number	C200

NOTES:

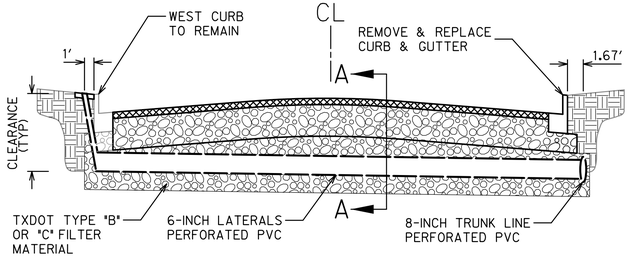
1. INSTALL UNDERDRAINS PER TXDOT ITEM 556 - PIPE UNDERDRAINS, TYPE 8
2. INSTALL 6" LATERAL UNDERDRAINS AND 8" TRUNK UNDERDRAINS AT A MINIMUM 0.5% SLOPE.
3. SEE CITY DETAIL S-Z-2 ON SHEET C-901 FOR CLEAN-OUT INSTALLATION

UNDERDRAIN JUNCTION TABLE									
JUNCTION	A	B	C	D	E	F	G	H	I
TOP CLEAN OUT ELEVATION	1898.25	1897.75	1897.43	1896.96	1897.21	1896.90	1896.74	1897.35	1897.63
CLEARANCE B// CURB & FLOW LINE	*2.00*	*2.00*	*2.00*	*2.00*	*2.55*	*2.00*	*1.50*	*2.00*	*2.00*
FLOW LINE 6" - US	1896.25	1895.75	1895.43	1894.96	1894.66	1894.90	1895.24	1895.35	1895.63
LATERAL SEGMENT	A-R	B-Q	C-P	D-O	E-N	F-M	G-L	H-K	I-J
LATERAL LENGTH (FT)	62.19	62.26	62.41	62.03	56.31	61.74	61.81	61.81	61.87
LATERAL SLOPE	1.50%	1.30%	1.49%	1.42%	2.49%	1.52%	1.44%	1.10%	1.05%
JUNCTION	R	Q	P	O	N*	M	L	K	J
TOP CLEAN OUT ELEVATION	1897.32	1896.94	1896.50	1896.08	1895.56	1896.16	1896.55	1896.77	1896.98
CLEARANCE B// CURB & FLOW LINE	*2.00*	*2.00*	*2.00*	*2.00*	*2.30*	*2.20*	*2.20*	*2.10*	*2.00*
FLOW LINE 6" - DS	1895.32	1894.94	1894.50	1894.08	1893.26	1893.96	1894.35	1894.67	1894.98
FLOW LINE 8"	1895.24	1894.86	1894.42	1894.00	1893.18	1893.88	1894.27	1894.59	1894.90
* = (1) TOP VALVE ELEVATION INCLUDES BOTH CLEAN-OUT VALVES, (2) LOCATED @ STATION 22+86.31, 27.69' RIGHT									
TRUNK LINE SEGMENT	R-Q	Q-P	P-O	O-N		N-M	M-L	L-K	K-J
TRUNK LENGTH (FT)	51.5	51.49	51.29	37.28		63.86	50.00	50.04	50.02
TRUNK SLOPE	0.74%	0.85%	0.82%	2.20%		1.10%	0.78%	0.64%	0.62%

OUTFALL SEGMENT	N-S
OUTFALL LENGTH (FT)	8.5
OUTFALL SLOPE	1.84%
JUNCTION	S
FLOW LINE 8" @ HEADWALL	1893.02
FLOW LINE HEADWALL	1892.90

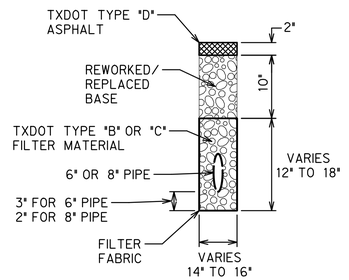


COLLEGE HILLS BLVD



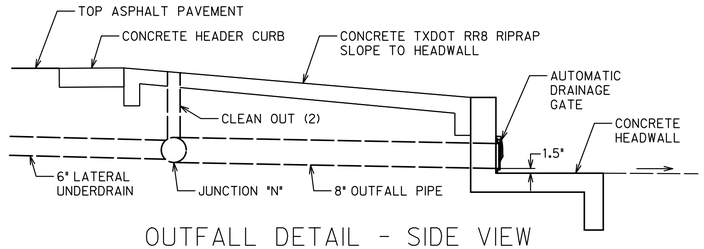
UNDERDRAINS
TRUNK LINE ALONG EAST BACK OF CURB

NTS



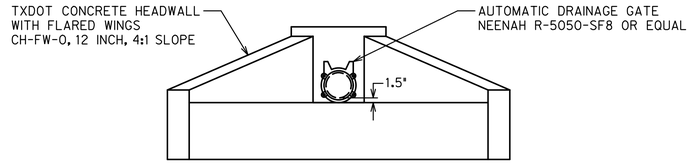
TYPICAL SECTION "A-A"
UNDERDRAIN
TRENCH DETAIL

NTS



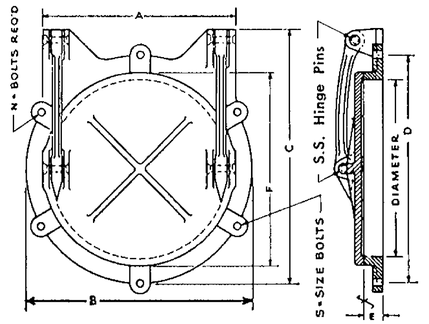
OUTFALL DETAIL - SIDE VIEW

NTS



OUTFALL DETAIL - FRONT VIEW

NTS



NEEMAH R-5050 AUTOMATIC DRAINAGE GATE									
CATALOG NO. TYPE SF	DIAMETER	A	B	C	D	E	F	N	S
R-5050-SF8	8	9-1/4	11	13	11	1-1/8	9-1/4	FOUR	5/8
DIMENSION IN INCHES									

AUTOMATIC DRAINAGE GATE DETAIL

NTS

COLLEGE HILLS BOULEVARD REHABILITATION
LOOP 306 TO VALLEYVIEW
SAN ANGELO, TX

THE CITY OF SAN ANGELO TEXAS

HALFF
4000 FOSSIL CREEK BLVD
FORT WORTH, TEXAS 76137-2797
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Revision No.	Date	Description

STATE OF TEXAS
KEITH L. FREEMAN
85454
LICENSED PROFESSIONAL ENGINEER
MAR. 22, 2017

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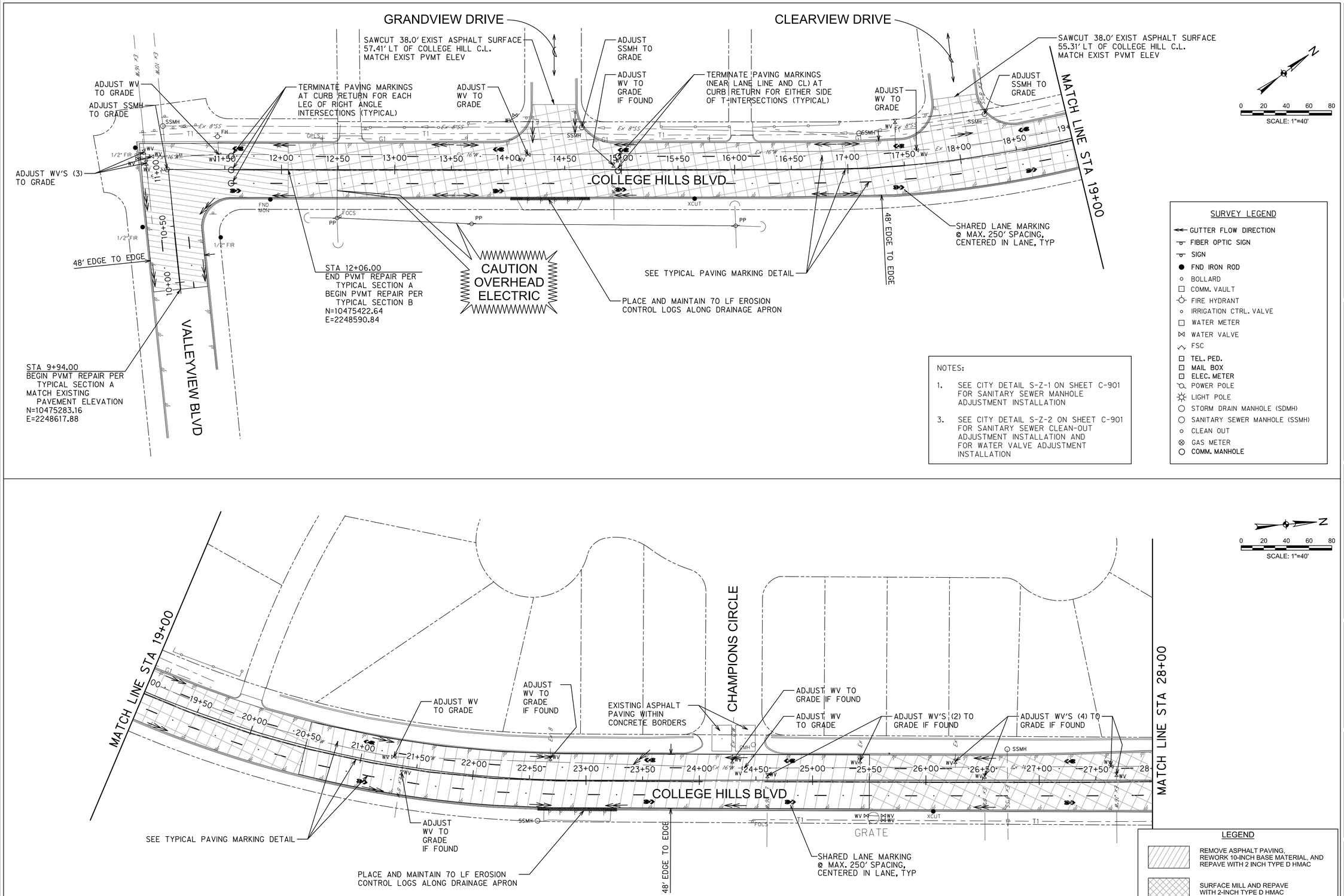
Sheet Title
UNDERDRAINS LAYOUT

C600
Sheet Number



NOTES:

1. SEE CITY DETAIL S-Z-1 ON SHEET C-901 FOR SANITARY SEWER MANHOLE ADJUSTMENT INSTALLATION
3. SEE CITY DETAIL S-Z-2 ON SHEET C-901 FOR SANITARY SEWER CLEAN-OUT ADJUSTMENT INSTALLATION AND FOR WATER VALVE ADJUSTMENT INSTALLATION

SURVEY LEGEND

- GUTTER FLOW DIRECTION
- FIBER OPTIC SIGN
- SIGN
- FND IRON ROD
- BOLLARD
- COMM. VAULT
- FIRE HYDRANT
- IRRIGATION CTRL. VALVE
- WATER METER
- WATER VALVE
- FSC
- TEL. PED.
- MAIL BOX
- ELEC. METER
- POWER POLE
- LIGHT POLE
- STORM DRAIN MANHOLE (SDMH)
- SANITARY SEWER MANHOLE (SSMH)
- CLEAN OUT
- GAS METER
- COMM. MANHOLE

LEGEND

- REMOVE ASPHALT PAVING, REWORK 10-INCH BASE MATERIAL, AND REPAVE WITH 2 INCH TYPE D HMAC
- SURFACE MILL AND REPAVE WITH 2-INCH TYPE D HMAC
- REMOVE ASPHALT PAVING, REWORK 6-INCH BASE MATERIAL, AND REPAVE WITH 4-INCH TYPE B HMAC BASE AND WITH 2-INCH TYPE D HMAC SURFACE

COLLEGE HILLS BOULEVARD REHABILITATION

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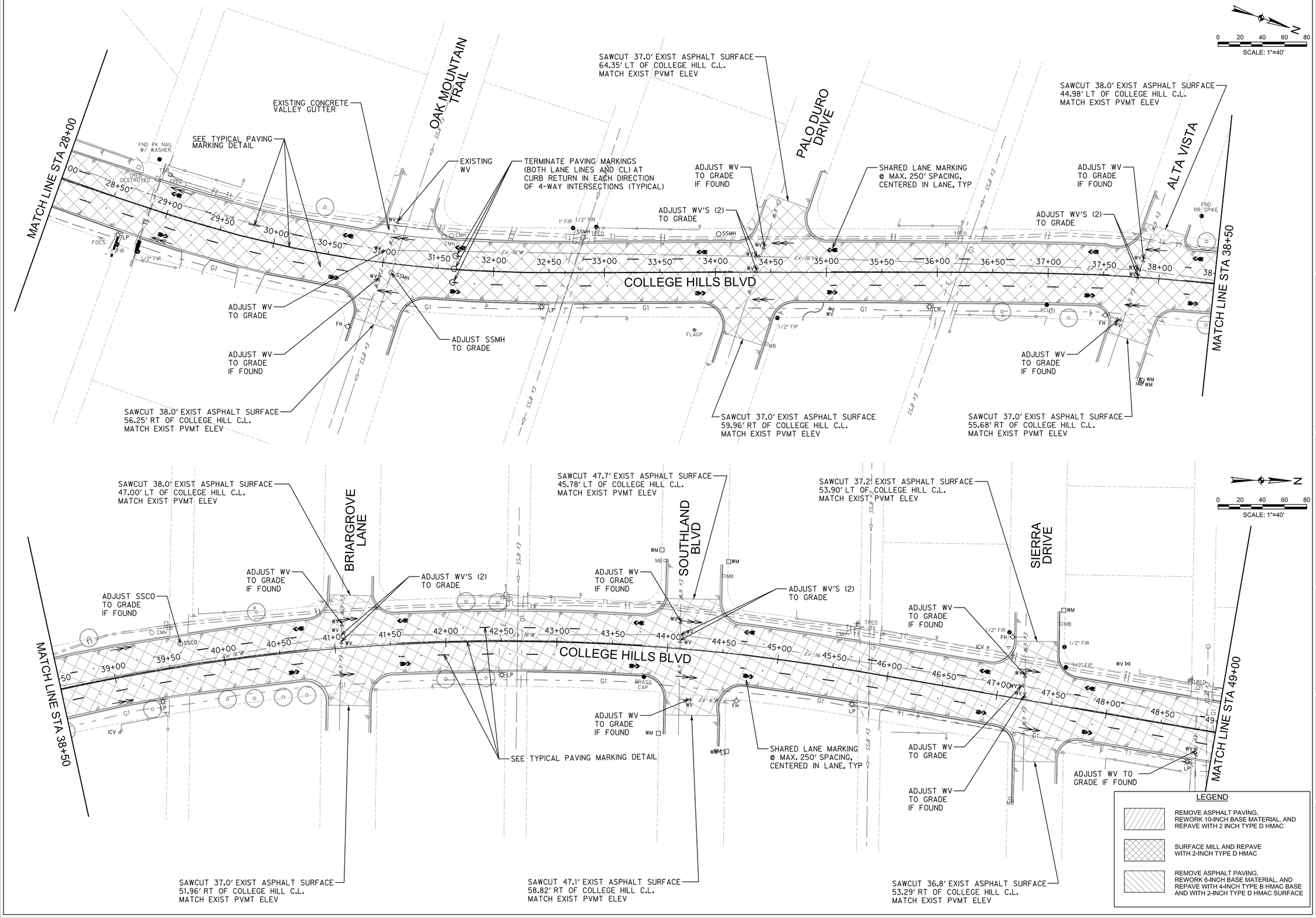
PAVING LAYOUT
BEGIN TO STA 28+00

C700
Sheet Number

COLLEGE HILLS BOULEVARD REHABILITATION

LOOP 306 TO VALLEYVIEW
SAN ANGELO, TX



LEGEND

- REMOVE ASPHALT PAVING, REWORK 10-INCH BASE MATERIAL, AND REPAVE WITH 2 INCH TYPE D HMAC
- SURFACE MILL AND REPAVE WITH 2-INCH TYPE D HMAC
- REMOVE ASPHALT PAVING, REWORK 6-INCH BASE MATERIAL, AND REPAVE WITH 4-INCH TYPE B HMAC BASE AND WITH 2-INCH TYPE D HMAC SURFACE

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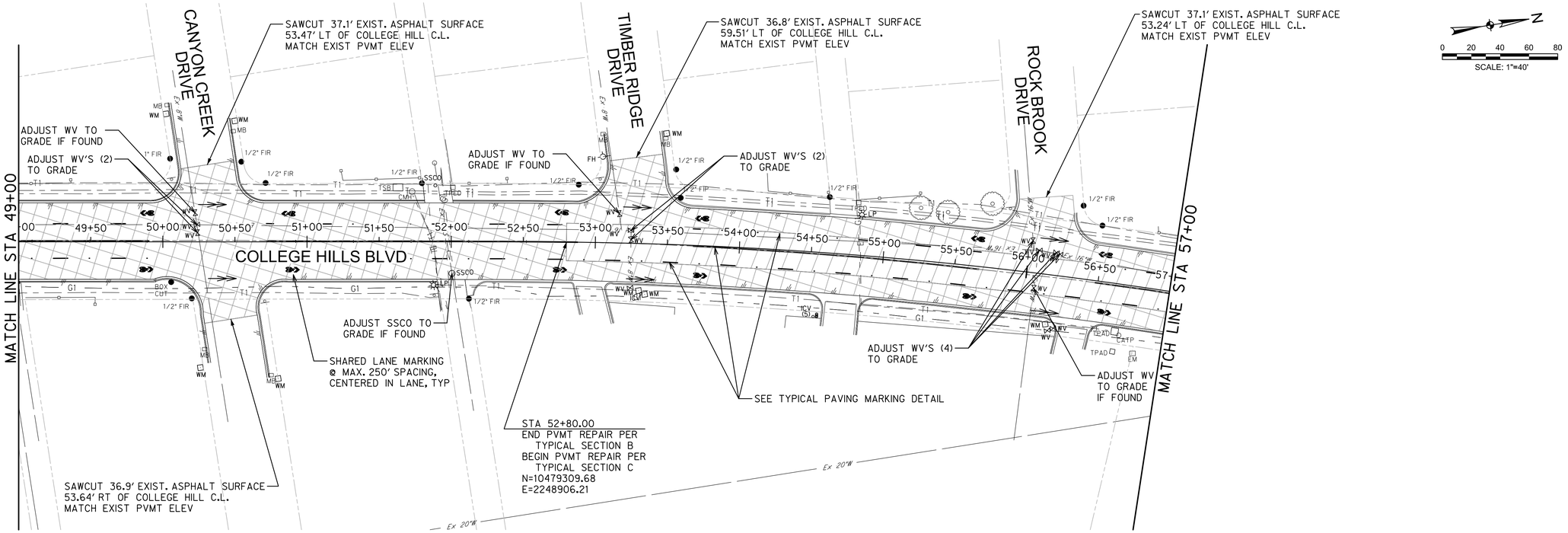
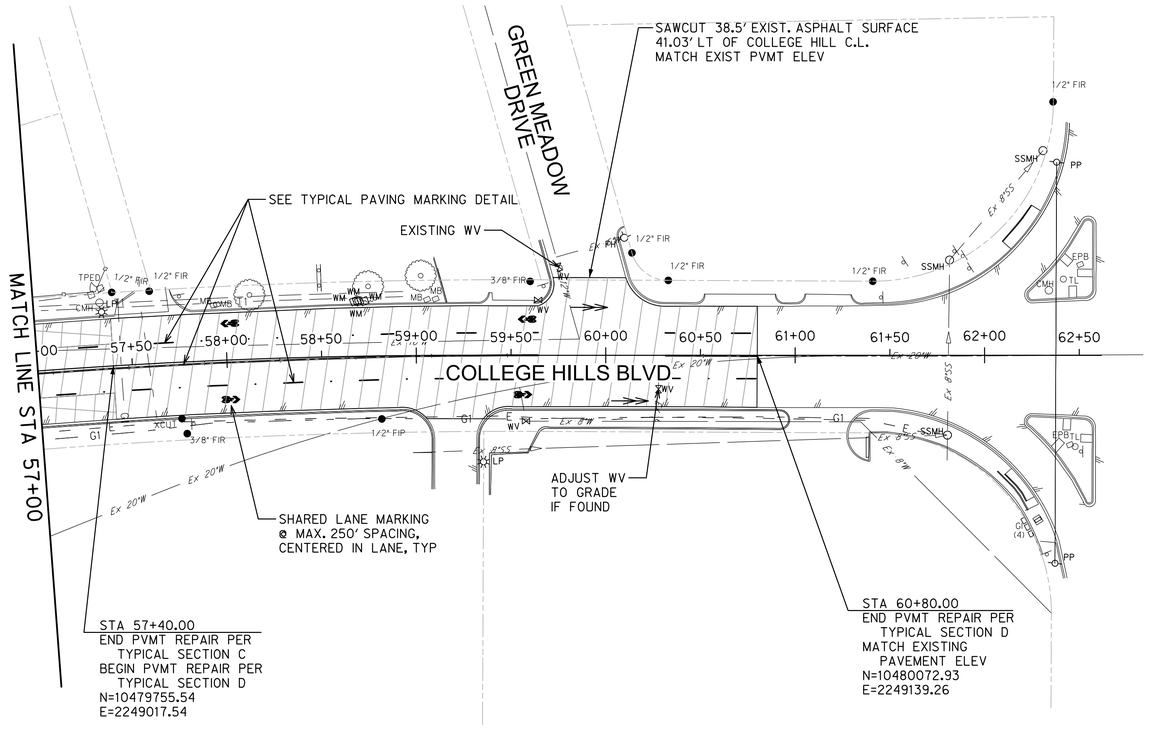
Sheet Title

PAVING LAYOUT
STA 28+00 TO STA 49+00

C701
Sheet Number





LOOP 306

LEGEND

- REMOVE ASPHALT PAVING, REWORK 10-INCH BASE MATERIAL, AND REPAVE WITH 2 INCH TYPE D HMAC
- SURFACE MILL AND REPAVE WITH 2-INCH TYPE D HMAC
- REMOVE ASPHALT PAVING, REWORK 6-INCH BASE MATERIAL, AND REPAVE WITH 4-INCH TYPE B HMAC BASE AND WITH 2-INCH TYPE D HMAC SURFACE

COLLEGE HILLS BOULEVARD REHABILITATION

LOOP 306 TO VALLEYVIEW
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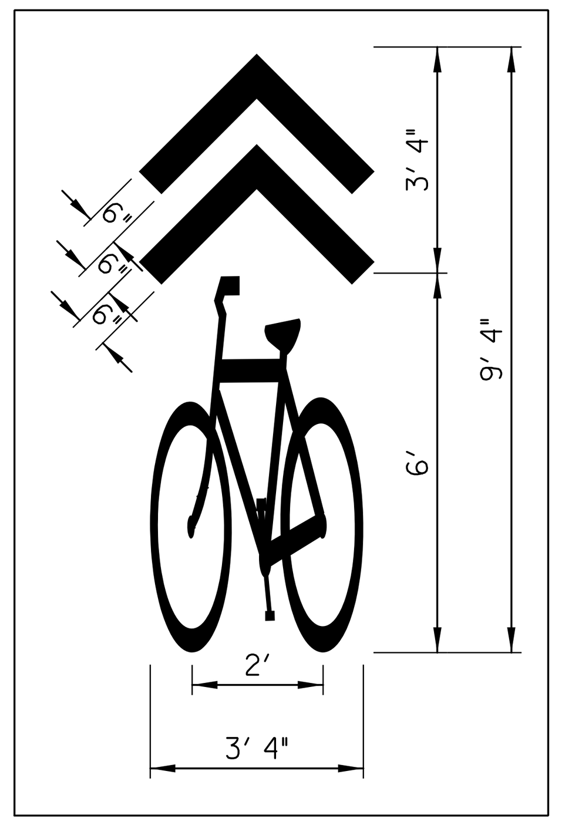
PAVING LAYOUT
STA 49+00 TO END

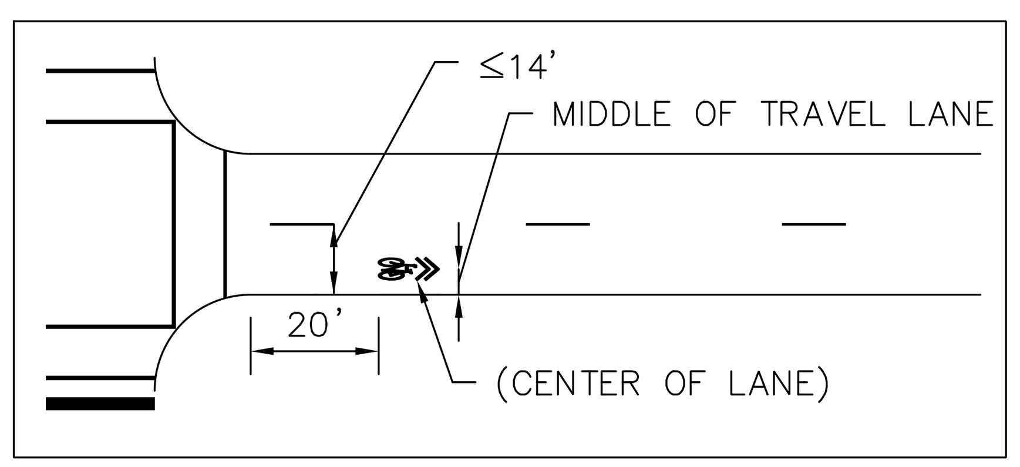
C702

Sheet Number

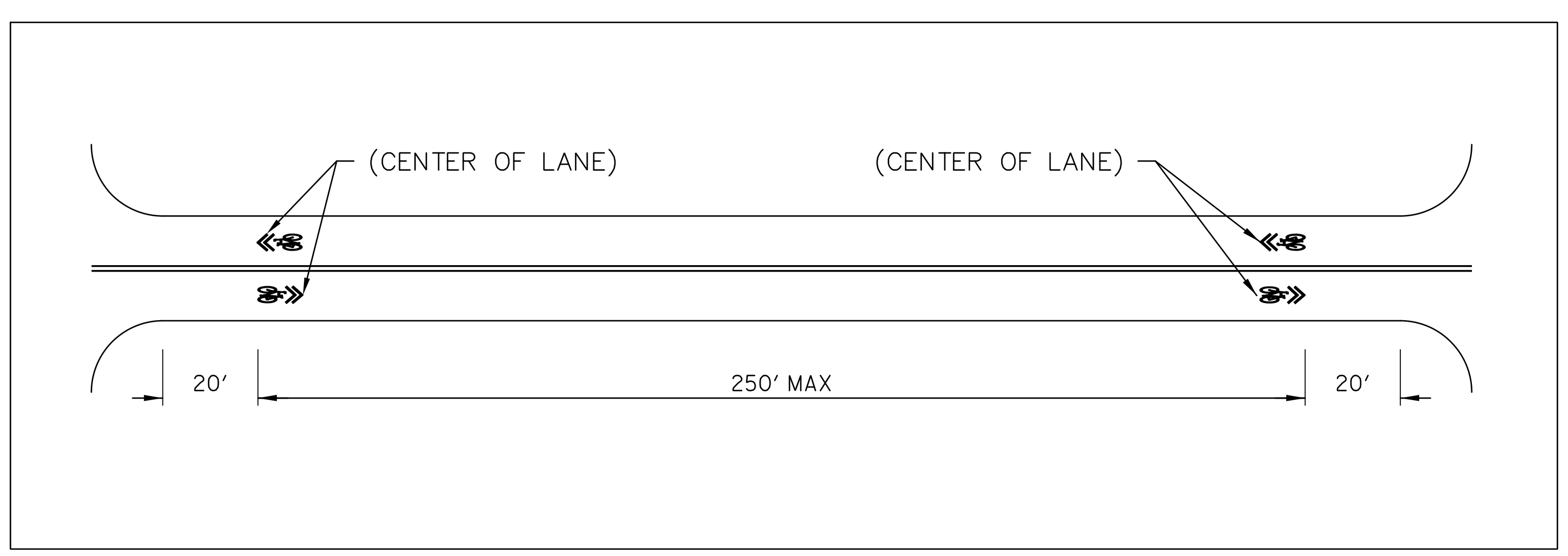
SHARED LANE MARKING



TRAVEL LANE ≤ 14'

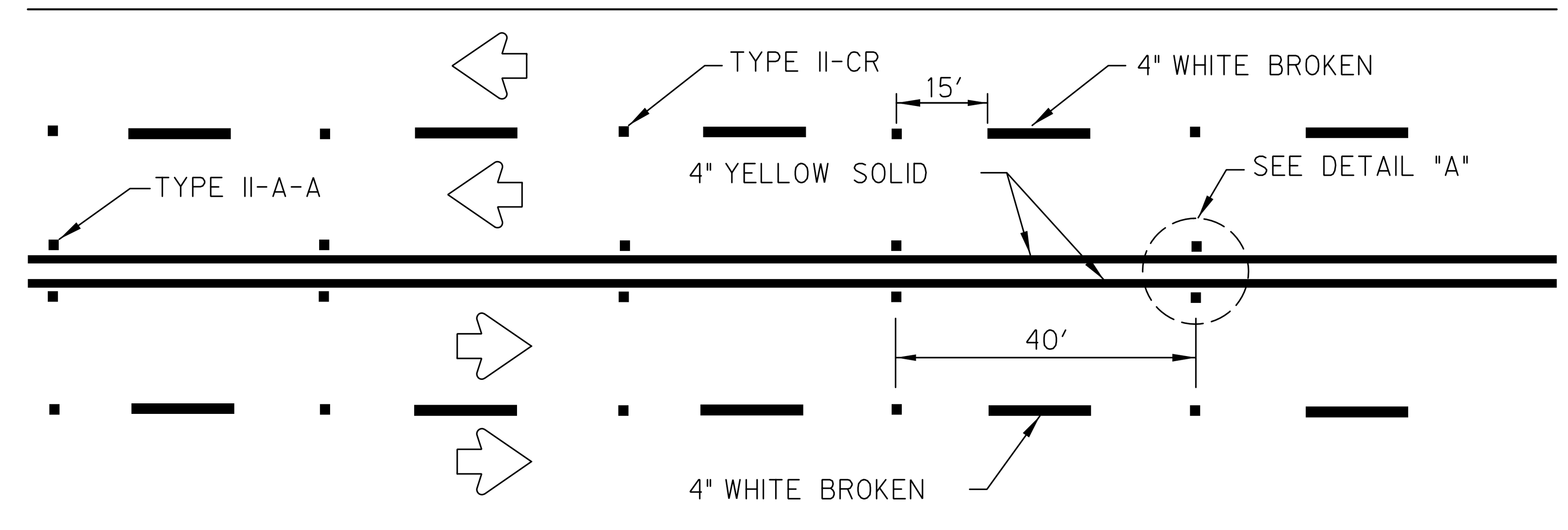


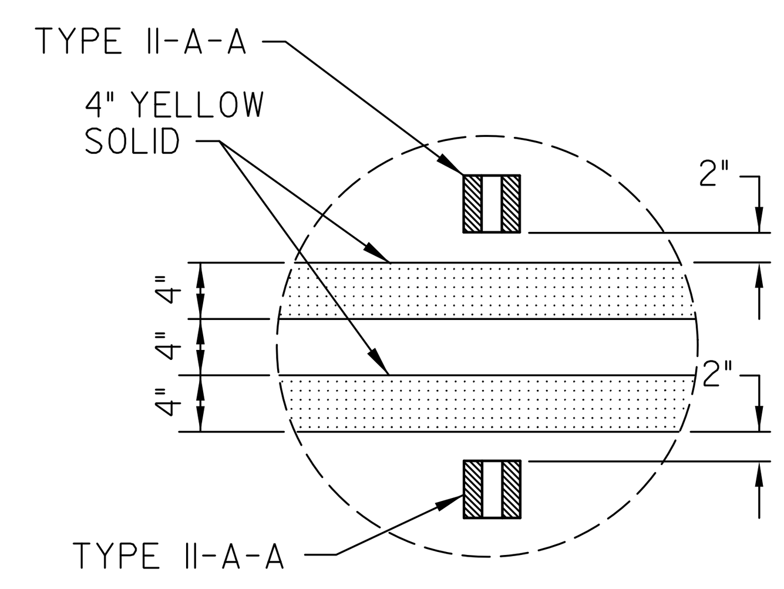
TYPICAL SHARED LANE MARKINGS TREATMENTS



TYPICAL SHARED LANE MARKING DETAIL

N.T.S.



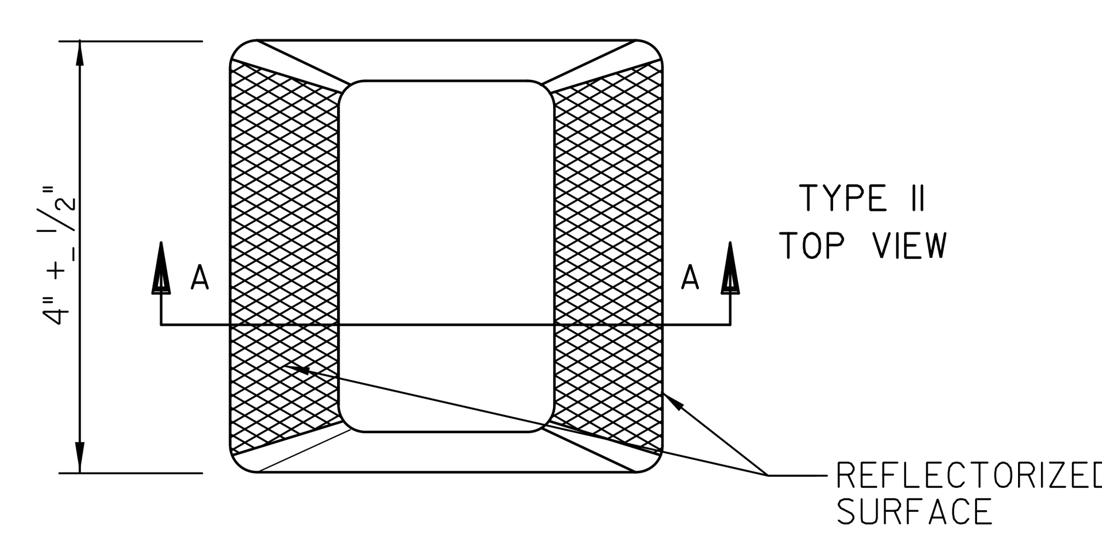


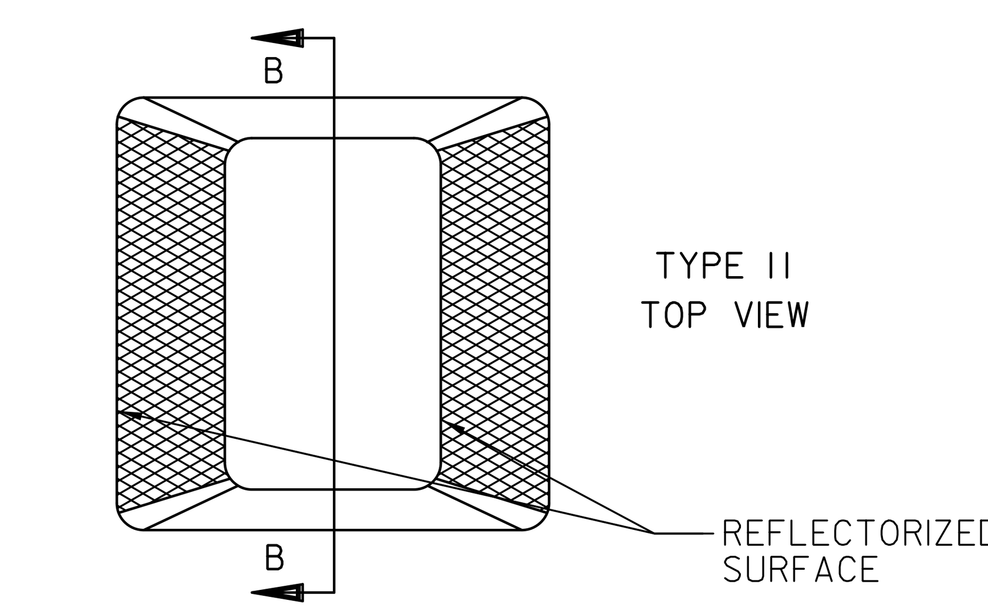
DETAIL "A"

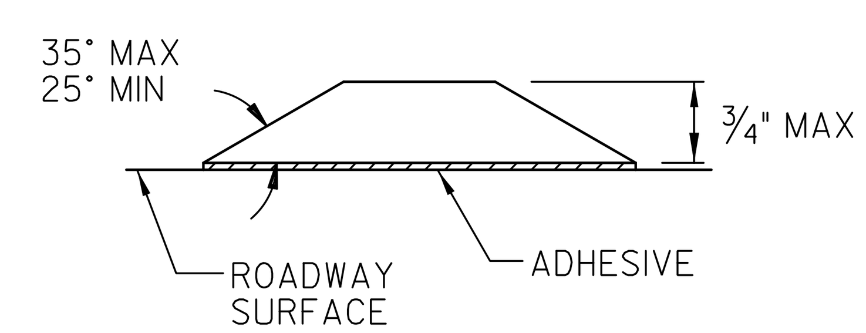
Raised pavement marker TYPE II-A-A shall contain two (2) reflective, faces (approach and trailing) each of which shall reflect amber light and shall be placed on 40-foot centers.

TYPICAL PAVING MARKING DETAIL (9+94 TO STA. 60+80)

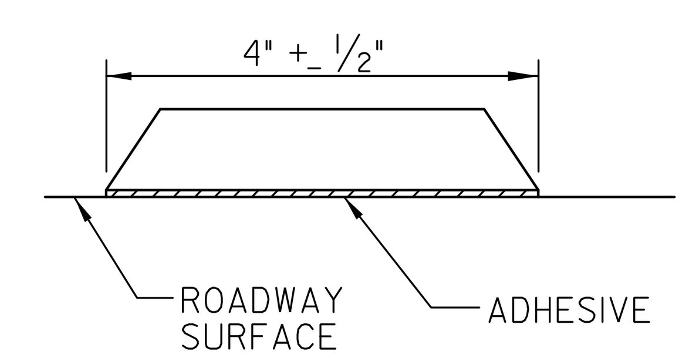
N.T.S.







SECTION A



SECTION B

RAISED PAVEMENT MARKERS (REFLECTORIZED)

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

GENERAL NOTES:

All raised pavement markers placed in broken lines shall be placed in line with and midway between the stripes.

All pavement markers installed on asphalt shall be installed using Bituminous adhesive.

All pavement marking materials shall meet the Texas Department of Transportation Material Specifications as specified by the plans.

SPECIFICATION REFERENCE TABLE
MATERIAL SPECIFICATIONS

PAVEMENT MARKERS (REFLECT.)	DMS-4200
EPOXY	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130

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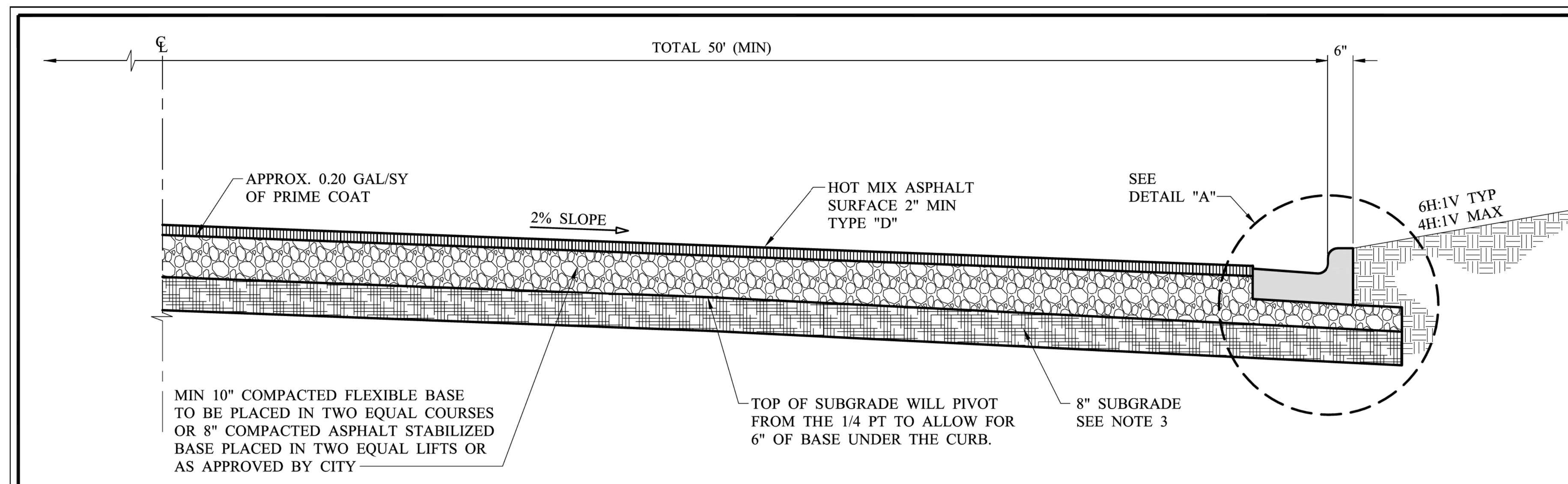
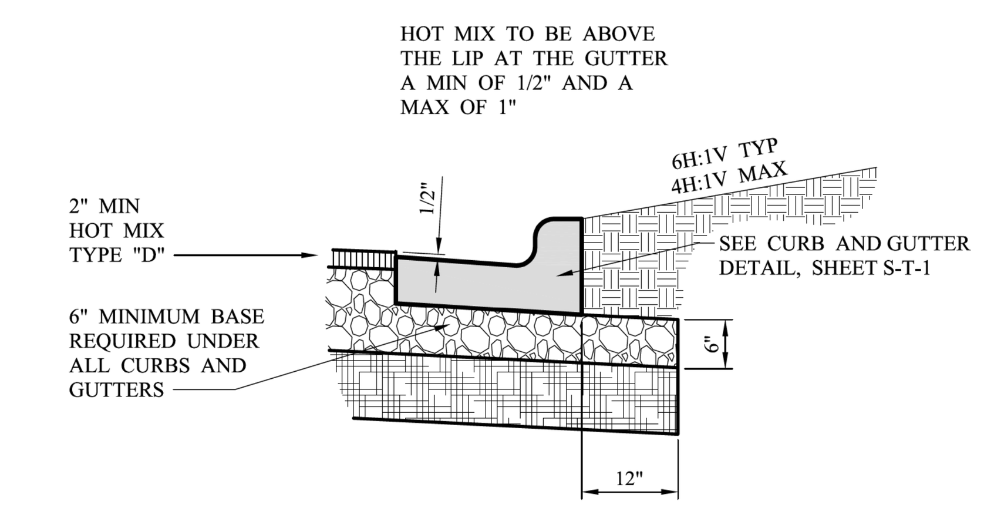
PAVING MARKING DETAILS

C800
Sheet Number

COLLEGE HILLS BOULEVARD REHABILITATION
LOOP 306 TO VALLEYVIEW
SAN ANGELO, TX



TYPICAL SECTION
NOT TO SCALE



DETAIL "A"

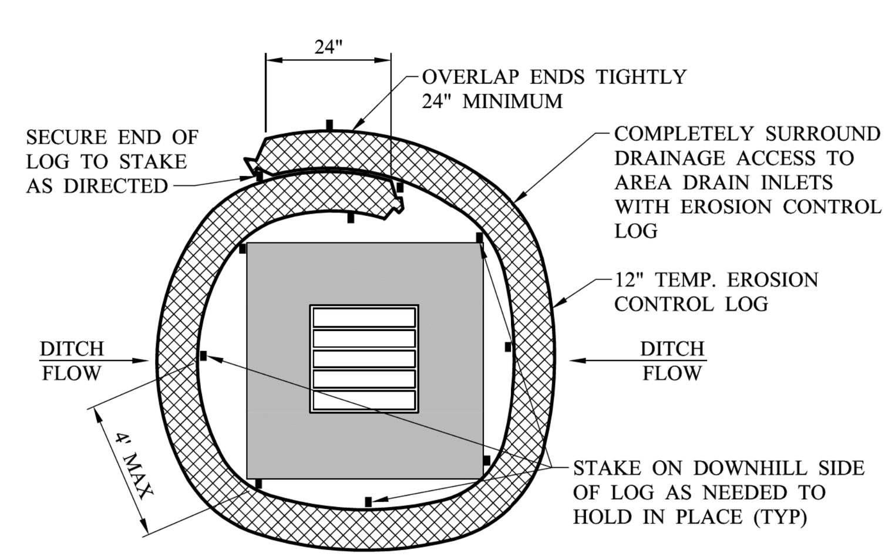
NOTES:

1. ALL BASE AND SUBGRADE WILL BE DENSITY CONTROLLED AND WILL MEET ALL SPECIFICATION REQUIREMENTS FOR THE CITY OF SAN ANGELO.
2. IT IS THE GOAL OF THE CITY TO DESIGN AND CONSTRUCT A STREET SYSTEM THAT WILL HAVE A LIFE EXPECTANCY OF TWENTY YEARS WITH NORMAL MAINTENANCE. STREETS THAT ARE CONSTRUCTED IN INDUSTRIAL AREAS WHERE HEAVY LOADS ARE EXPECTED WILL REQUIRE INDIVIDUAL DESIGN PROCESSES.
3. 8" ENGINEERED SUBGRADE. IF STABILIZATION IS REQUIRED, THE RATE WILL BE DETERMINED ACCORDING TO TEST RESULTS.

CITY OF SAN ANGELO

URBAN COLLECTOR STREETS

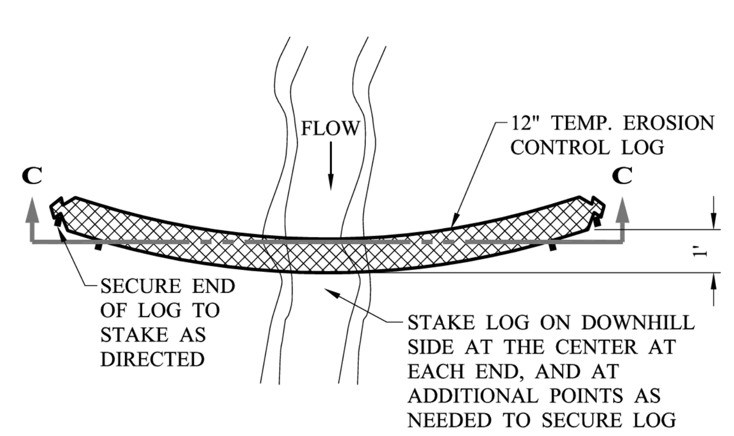
S-C-1



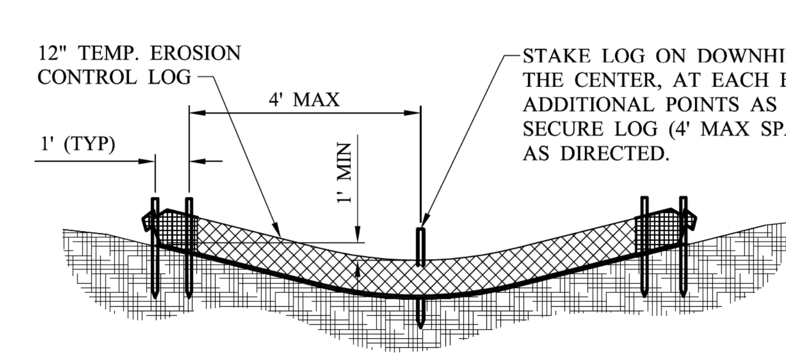
LOGS PLACED AT AREA DRAIN INLETS
NOT TO SCALE

GENERAL NOTES:

1. LENGTHS OF EROSION CONTROL LOGS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND AS REQUIRED FOR THE PURPOSE INTENDED. MAXIMUM LENGTH OF LOGS SHALL BE 60' FOR 18" DIAMETER OR 30' FOR 12" DIAMETER LOGS.
2. UNLESS OTHERWISE DIRECTED, USE BIODEGRADABLE OR PHOTODEGRADABLE CONTAINMENT MESH ONLY WHERE LOG WITH REMAIN IN PLACE AS PART OF A VEGETATIVE SYSTEM. FOR TEMPORARY INSTALLATIONS, USE RECYCLABLE CONTAINMENT MESH.
3. STUFF LOGS WITH SUFFICIENT FILTER MATERIAL TO ACHIEVE DENSITY THAT WILL HOLD SHAPE WITHOUT EXCESSIVE DEFORMATION.
4. STAKES SHALL BE 2" x 2" WOOD OR T-POSTS 4' LONG, EMBEDDED SUCH THAT 2" PROTRUDES ABOVE LOG, OR AS DIRECTED.
5. DO NOT PLACE STAKES THROUGH CONTAINMENT MESH.



PLAN VIEW
NOT TO SCALE



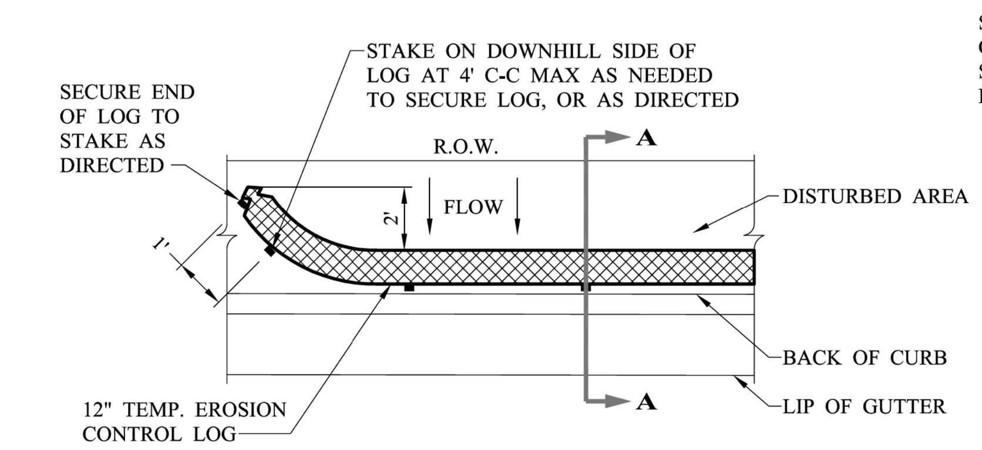
SECTION C-C
NOT TO SCALE

EROSION CONTROL LOG CHECK DAM
NOT TO SCALE

CITY OF SAN ANGELO

TEMPORARY EROSION CONTROL LOGS

S-CC-4



PLAN VIEW
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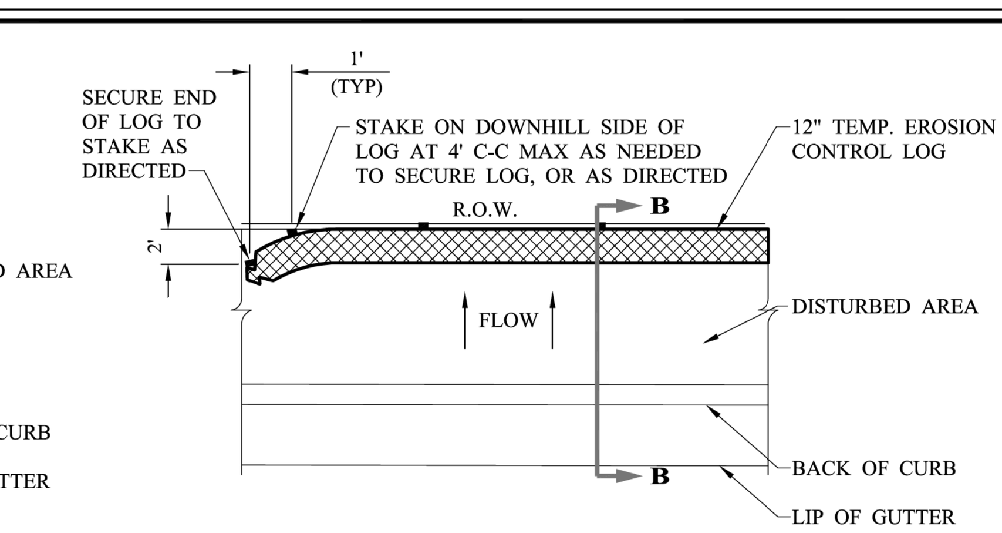
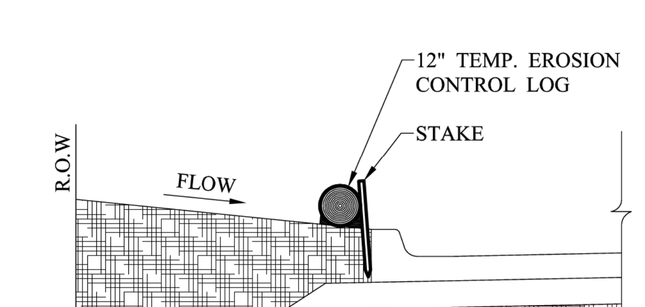
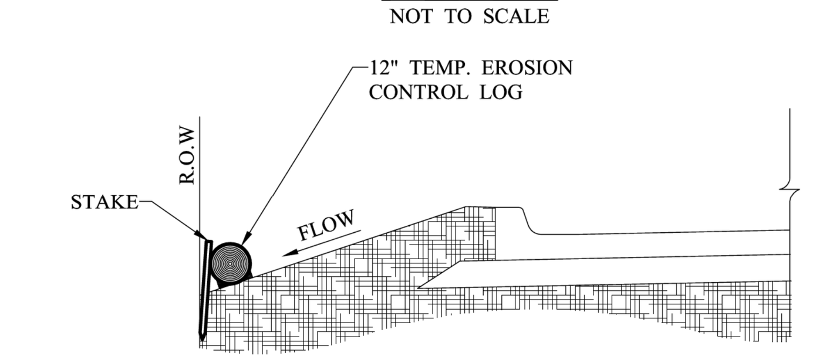


PLAN VIEW
NOT TO SCALE



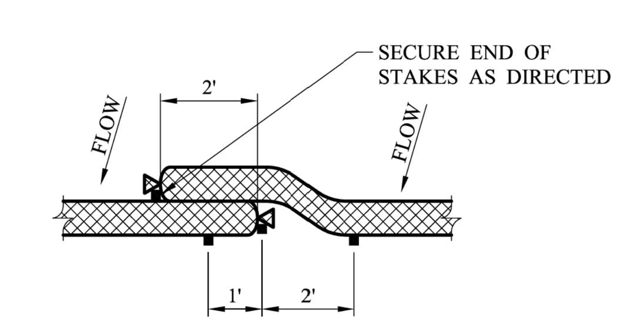
SECTION A-A

LOG PLACED AT BACK OF CURB
NOT TO SCALE



SECTION B-B

LOG PLACED AT EDGE OF RIGHT-OF-WAY
NOT TO SCALE



LAP DETAIL
NOT TO SCALE

NOTES

SEE SHEET S-CC-4 FOR GENERAL NOTES.

CITY OF SAN ANGELO

TEMPORARY EROSION CONTROL LOGS

S-CC-5

THE CITY OF SAN ANGELO ★ TEXAS ★

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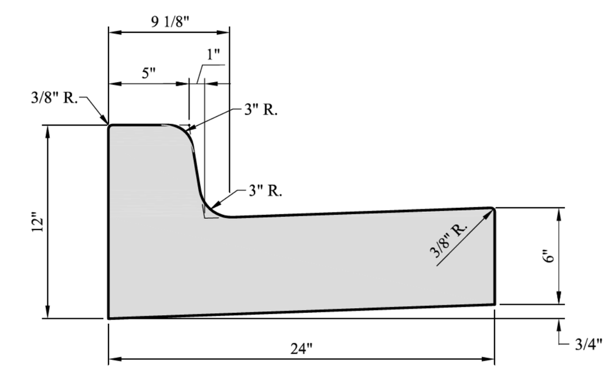
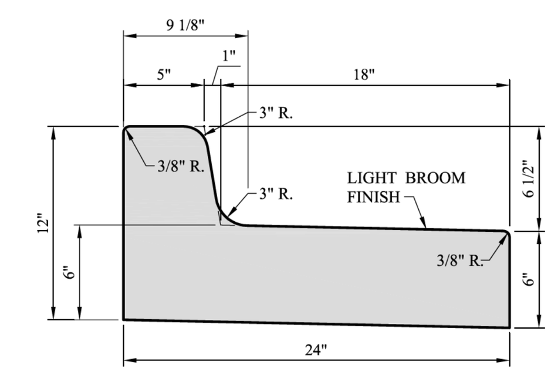
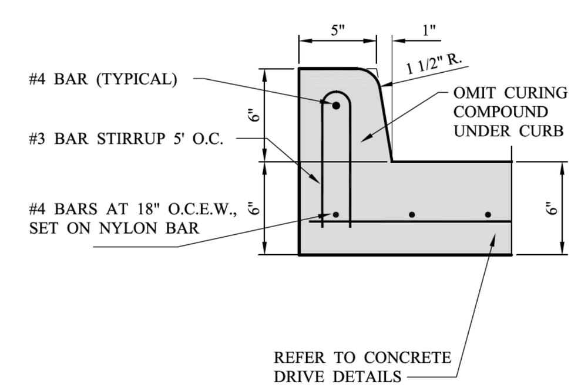
C900
Sheet Number



STANDARD CURB & GUTTER
NOT TO SCALE



SPILL CURB AND GUTTER
NOT TO SCALE

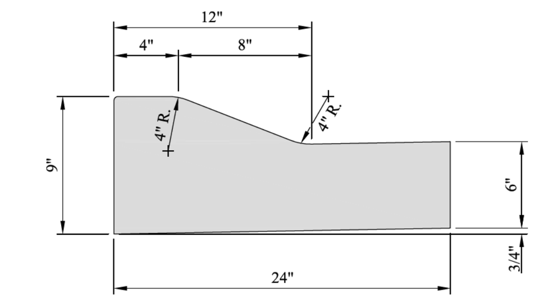


STANDARD MONOLITHIC CURB
ON CONCRETE DRIVEWAY
NOT TO SCALE

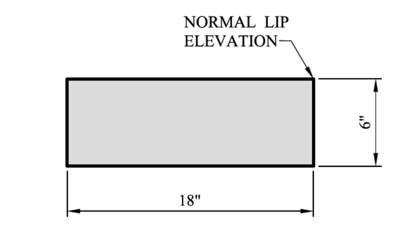
NOTES:

1. DIMENSIONS HEREIN SHOWN ARE MINIMUM REQUIRED. THE DESIGNER MAY ADJUST WIDTH ACCORDING TO THE NEED. CONCRETE FOR CURB AND GUTTER SHALL BE CLASS "A" CONCRETE EXCEPT FOR STANDARD MONOLITHIC CURB WHICH IS CLASS "P". THE USE OF MORTAR TOPPING IS OPTIONAL. IF NOT MACHINE LAID, A "MULE" FINISING TOOL SHALL BE USED.
2. ALL TOOLED CONTRACTION JOINTS WILL BE ON 10' SPACING AT 1-1/2" MINIMUM DEPTHS. 1/2" EXPANSION JOINTS ON 50' SPACING OR AT BEGINNING OF RADII, OR AT INTERSECTIONS. LIGHT BROOM FINISH.
3. EXTRUDED CONCRETE MAY USE A MODIFIED GRADATION FOR MACHINE LAID CURB AND GUTTER AS APPROVED BY THE CITY ENGINEER.
4. IF MACHINE LAID, A MAXIMUM 1" FLARE AT THE BOTTOM IS PERMITTED.

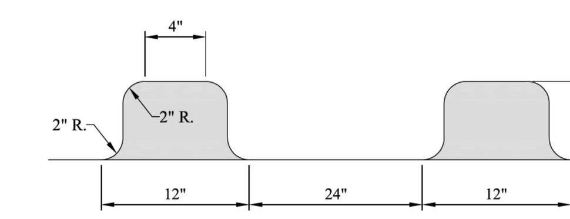
CITY OF SAN ANGELO
CONCRETE CURB & GUTTERS
S-T-1



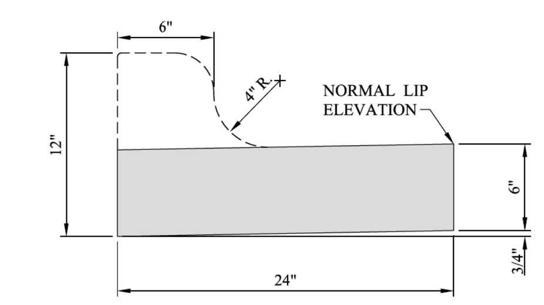
MOUNTABLE CURB
NOT TO SCALE



HEADER CURB
NOT TO SCALE



FRONT VIEW
NOT TO SCALE

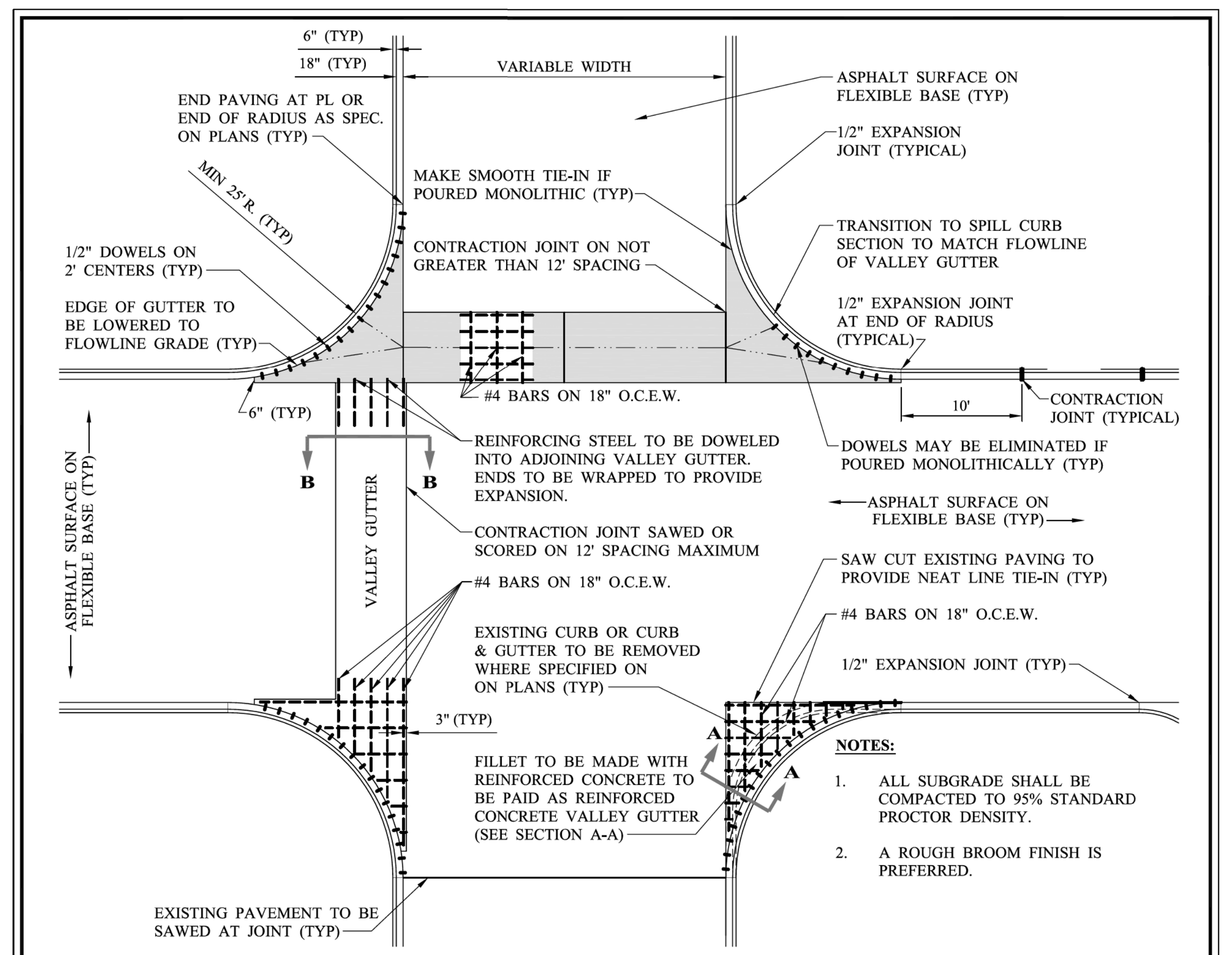


SIDE VIEW
SAWTOOTH CURB
NOT TO SCALE

NOTES:

1. DIMENSIONS HEREIN SHOWN ARE MINIMUM REQUIRED. THE DESIGNER MAY ADJUST WIDTH ACCORDING TO THE NEED. CONCRETE FOR CURB AND GUTTER SHALL BE CLASS "A" CONCRETE EXCEPT FOR STANDARD MONOLITHIC CURB WHICH IS CLASS "P". THE USE OF MORTAR TOPPING IS OPTIONAL. IF NOT MACHINE LAID, A "MULE" FINISING TOOL SHALL BE USED.
2. ALL TOOLED CONTRACTION JOINTS WILL BE ON 10' SPACING AT 1-1/2" MINIMUM DEPTHS. 1/2". EXPANSION JOINTS ON 50' SPACING OR AT BEGINNING OF RADII, OR AT INTERSECTIONS. LIGHT BROOM FINISH.
3. EXTRUDED CONCRETE MAY USE A MODIFIED GRADATION FOR MACHINE LAID CURB AND GUTTER AS APPROVED BY THE CITY ENGINEER.
4. IF MACHINE LAID, A MAXIMUM 1" FLARE AT THE BOTTOM IS PERMITTED.

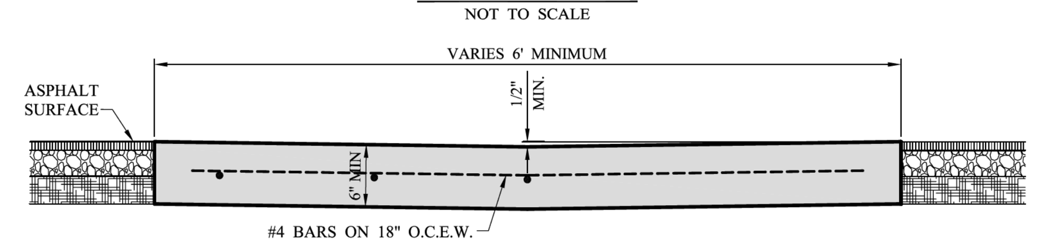
CITY OF SAN ANGELO
CONCRETE CURB & GUTTERS
S-T-2



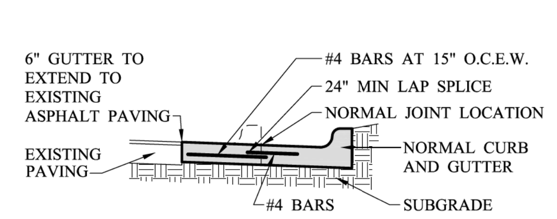
NOTES:

1. ALL SUBGRADE SHALL BE COMPACTED TO 95% STANDARD PROCTOR DENSITY.
2. A ROUGH BROOM FINISH IS PREFERRED.

TYPICAL SECTION
NOT TO SCALE



SECTION B - B
VALLEY GUTTER DETAIL
NOT TO SCALE

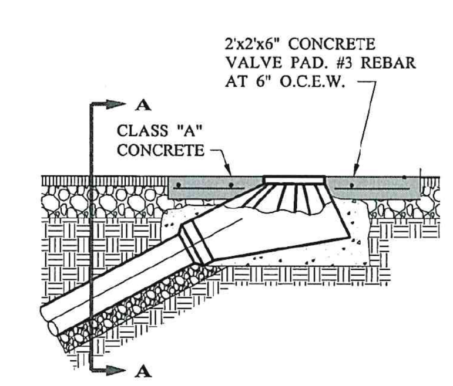


SECTION A - A
CONCRETE VALLEY GUTTER FILLET
NOT TO SCALE

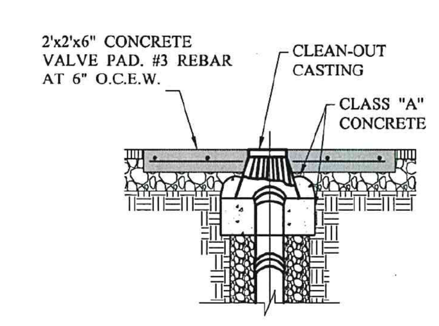
LAP SPLICE LENGTHS:

#3 - 21"
#4 - 24"

CITY OF SAN ANGELO
CONCRETE VALLEY GUTTERS
S-W-1

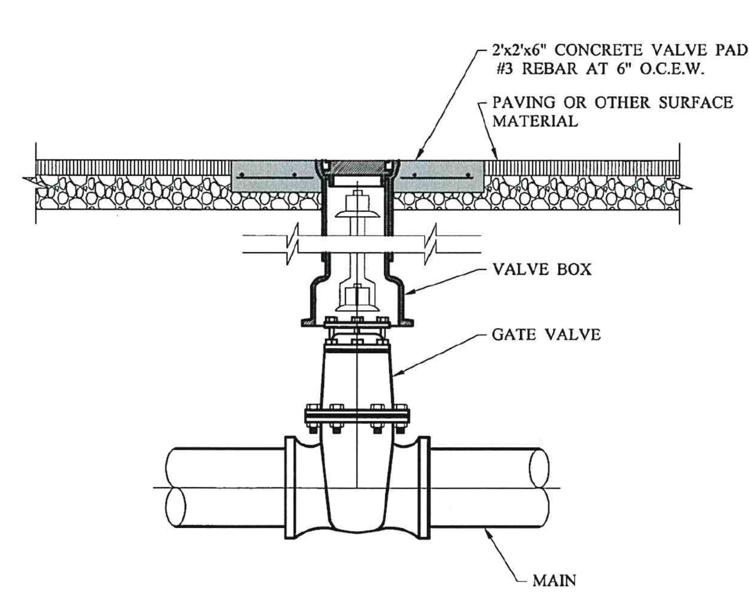


PROFILE VIEW



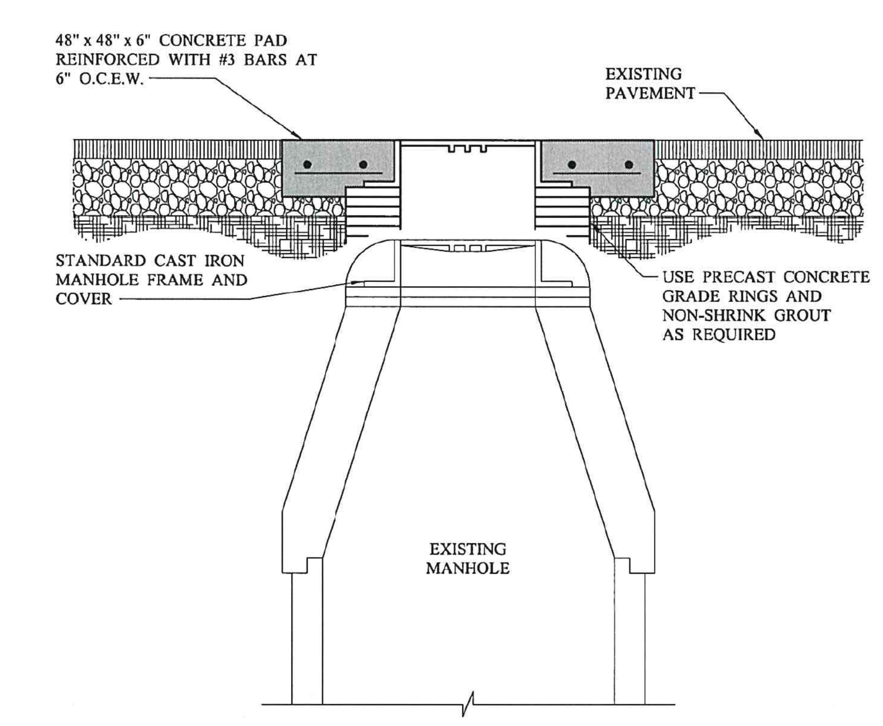
SECTION A-A

WASTEWATER MAIN CLEAN-OUT
NOT TO SCALE



GATE VALVE BOX AND
EXTENSION SYSTEM
NOT TO SCALE

CITY OF SAN ANGELO
GATE VALVE BOX AND MAIN CLEAN-OUT
S-Z-2



MANHOLE ADJUSTMENT DETAIL
NOT TO SCALE

CITY OF SAN ANGELO
MANHOLE ADJUSTMENT DETAIL
S-Z-1

COLLEGE HILLS BOULEVARD REHABILITATION

LOOP 306 TO VALLEYVIEW
SAN ANGELO, TX

THE CITY OF SAN ANGELO ★ TEXAS ★

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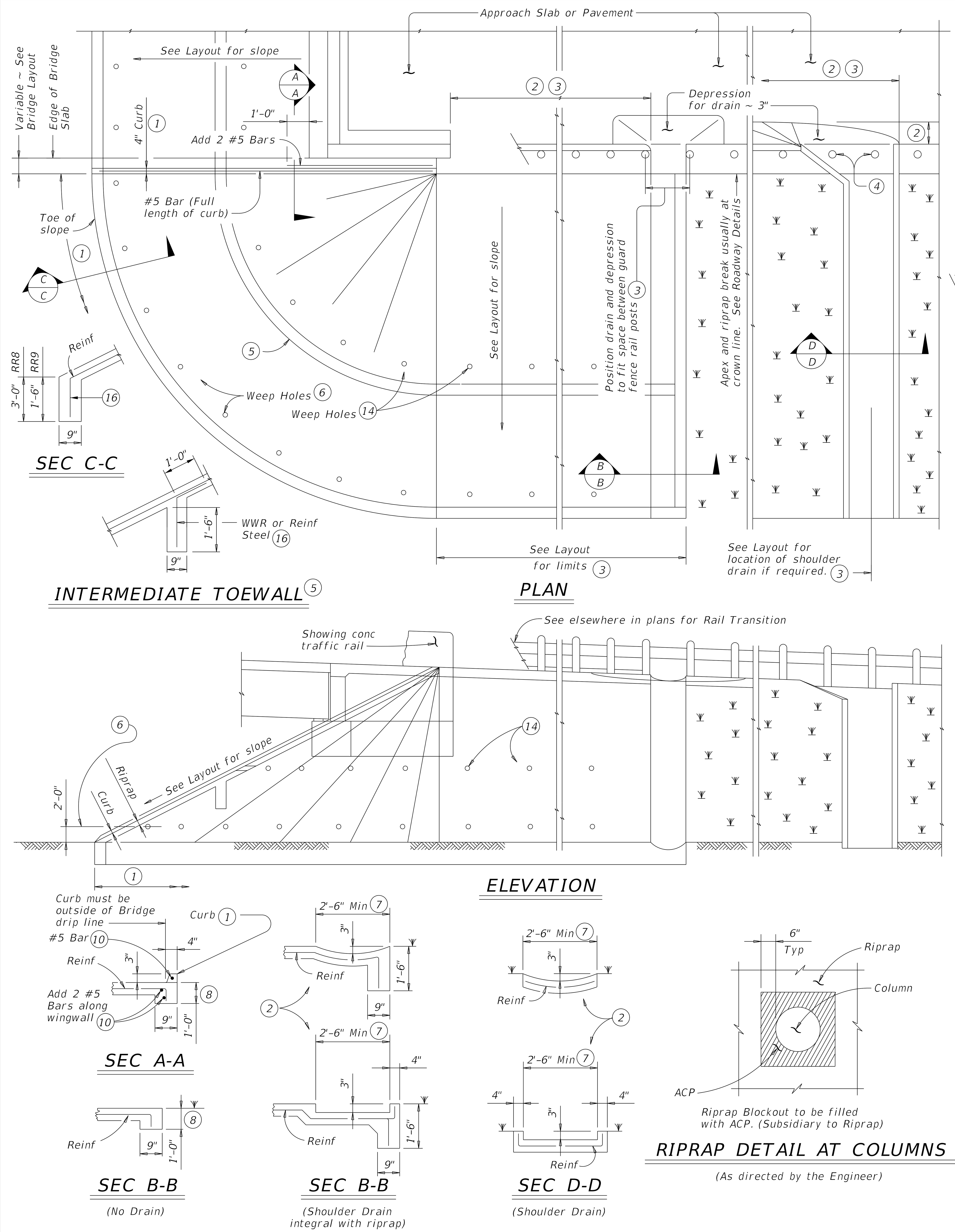
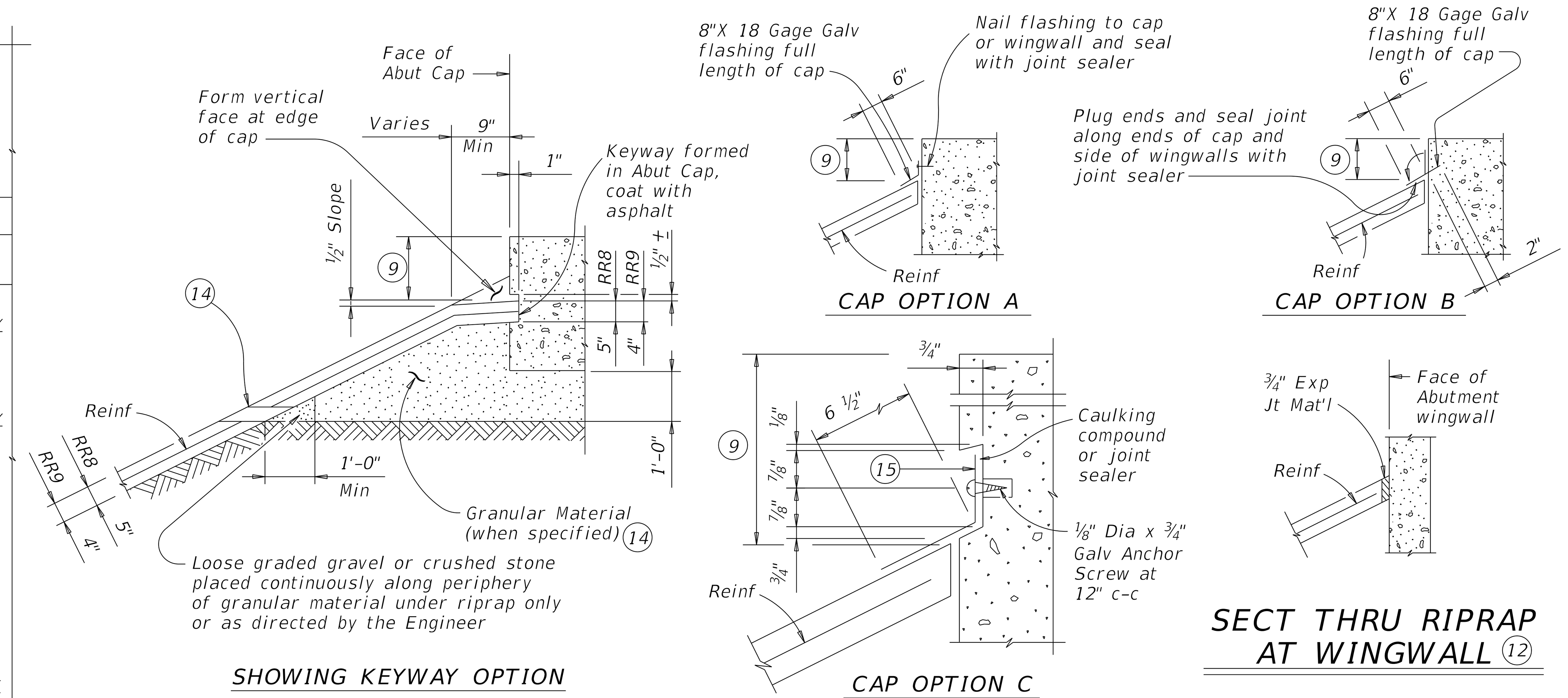
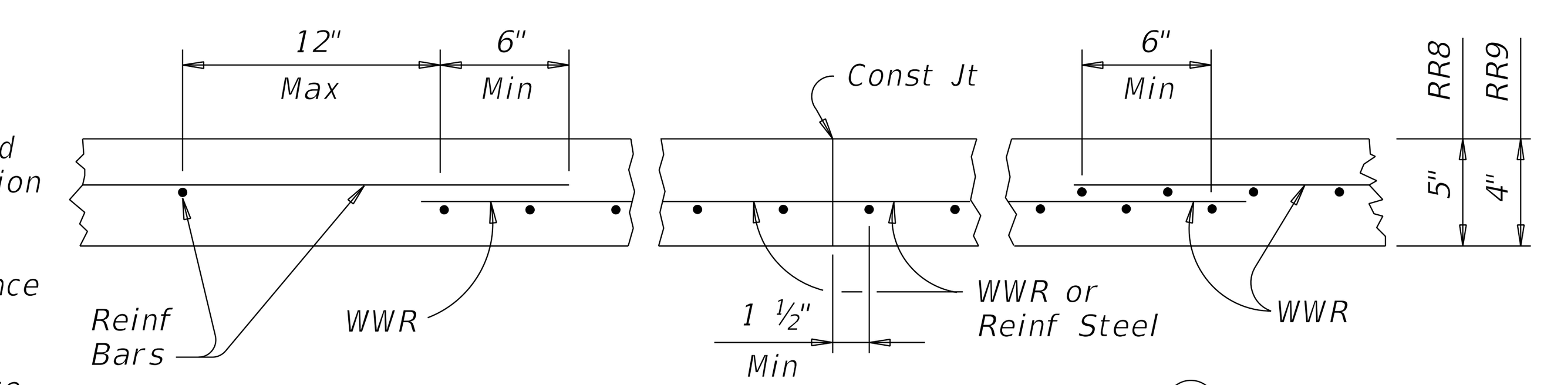
Revision No.	Date	Description

STATE OF TEXAS
KEITH L. FREEMAN
85454
LICENSED
PROFESSIONAL ENGINEER
Keith L. Freeman
MAR. 22, 2017

Project No.:	31516
Issued:	3/23/2017
Drawn By:	
Checked By:	
Scale:	NTS
Sheet Title	PAVING DETAILS
Sheet Number	C901







REINFORCEMENT DETAILS (13)

See General Notes for optional sythetic fiber reinforcement.

1. When riprap is shown extended around header on layout, extend slab and toewall as shown and eliminate 4" curb.
2. Limits and configuration of drains and depressions are as shown elsewhere in plans or as directed by the Engineer.
3. Location of shoulder drain must consider limitations imposed by rail transition. Do not locate shoulder drains at expansion joints between approach slab and concrete pavement.
4. See details elsewhere in plans for installation of guard fence posts through concrete riprap.
5. Provide intermediate toewall only when designated elsewhere in the plans or included in the specifications.
6. Provide lower level of 2" Dia weep holes at 10' c-c backed by 1 CF packet of gravel and galvanized hardware cloth at all locations unless directed by the Engineer to eliminate.
7. Use wider or other drain configurations if shown elsewhere in plans or if directed by the Engineer.
8. Wall extension may be reduced or modified if approved by the Engineer. Increase wall extension to 1'-6" whenever the optional intermediate toewall is called for in the plans.
9. Top of cap to top of riprap dimension varies as directed by the Engineer. Should be 9" Min for beam/slab type bridges and 1'-6" for slab span, box beam, or slab beam bridges.
10. #5 bars shown are required even when synthetic fiber reinforcing option is selected.
11. Provide sealing option for joint between the face of cap and riprap as designated by the Engineer or as shown elsewhere on plans.
12. Flashing (shown in Cap Option A) may be used at wingwall in addition to Exp Jt Mat'l if shown on plans or directed by the Engineer.
13. Provide #3 reinforcing bars at 18" Spa c-c. Provide Welded Wire Reinforcement (WWR) as 6x6-D3xD3. Combinations of WWR and reinforcing bars may be used if both are permitted. Use lap splices of a minimum 6 inches, measured from the transverse wire of WWR, and the ends of reinforcing bars.
14. If granular material is specified, provide upper level of 2" Dia weep holes at 10' c-c backed by galvanized hardware cloth.
15. 8" x 18 Gage Galv Sheet Metal
16. Provide WWR or #3 bars, with 1'-0" extension into slope.

GENERAL NOTES:

Provide Class "B" concrete with a minimum compressive strength of 2,000 psi unless noted elsewhere in plans.
Provide Grade 60 reinforcing steel.
Provide synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) in lieu of steel reinforcing in riprap concrete unless noted otherwise.
Install construction joints or grooved joints extending the full slant slope height at intervals of approximately 20 feet unless otherwise directed by the Engineer.
Hardware cloth, loose grade stone behind weep holes, flashing, or other sealing material are subsidiary to the bid item "Riprap".
Use reinforcing bars, deformed Welded Wire Reinforcing (WWR), or any suitable combination of both types for riprap reinforcing, unless specified elsewhere in the plans.
See Layout for limits of riprap.
RR8 is to be used on stream crossings.
RR9 is to be used on other embankments.

FOR CONTRACTOR'S INFORMATION ONLY:
5" of RR8 = 0.015 CY/SF
4" of RR9 = 0.012 CY/SF
#3 Reinf at 18" c-c = 0.501 Lbs/SF
6x6-D3xD3 = 0.408 Lbs/SF

Texas Department of Transportation — Bridge Division Standard

CONCRETE RIPRAP AND SHOULDER DRAINS
EMBANKMENTS AT BRIDGE ENDS (TYPES RR8 & RR9)

CRR

FILE: crrstde1.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT January 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	DIST	COUNTY		SHEET NO.

COLLEGE HILLS BOULEVARD REHABILITATION
LOOP 306 TO VALLEYVIEW
SAN ANGELO, TX

THE CITY OF SAN ANGELO ★ TEXAS ★

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4000 FOSSIL CREEK BLVD
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Revision No.	Date	Description

STATE OF TEXAS — KEITH L. FREEMAN — 85454 — LICENSED PROFESSIONAL ENGINEER
MAR. 22, 2017

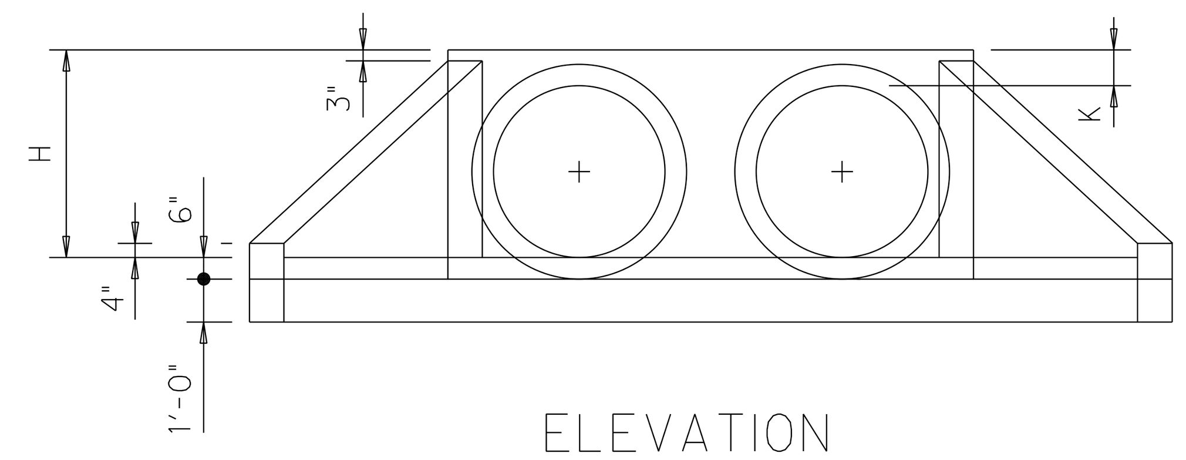
Project No.:	31516
Issued:	3/23/2017
Drawn By:	
Checked By:	
Scale:	NTS

Sheet Title
TXDOT RIPRAP
CRR DETAIL

C902
Sheet Number

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

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



ELEVATION

Showing dimensions

PIPE OPENING SHALL BE CONSTRUCTED FOR 8-INCH DIAMETER IN LIEU OF 12-INCH DIAMETER

1. Quantities shown are for concrete pipe and will increase slightly for metal pipe installations.
2. 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.
3. Provide a 1′-0" footing as shown where required to maintain 4" Min cover for pipes.
4. Quantities shown are for one structure end only (one headwall).
5. Min Length = 6" 3‡x $\left(\frac{12 \times H - 7}{12 \times L}\right)$

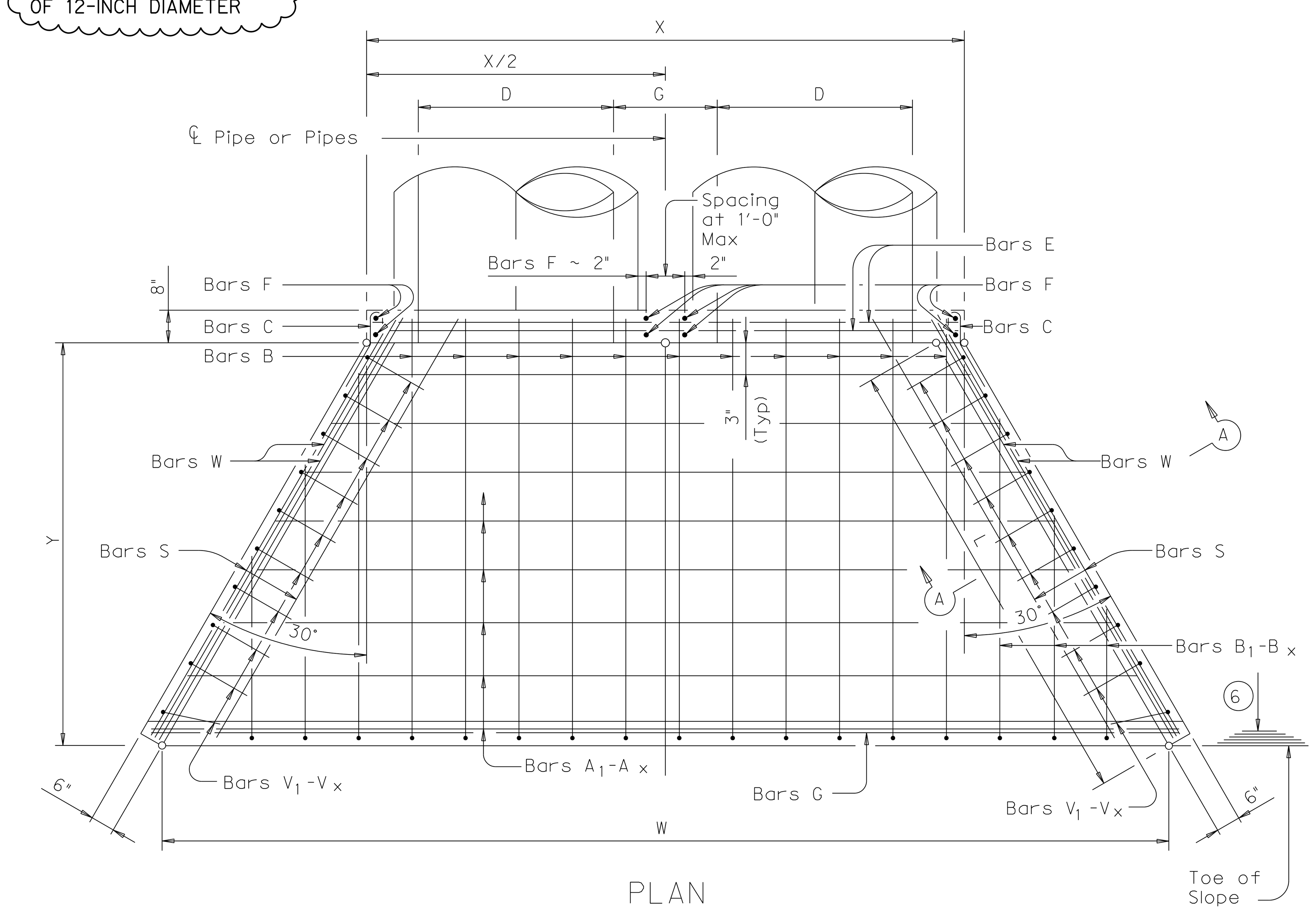
   Max Length = 12 x H −3" x $\left(\frac{12 \times H - 7}{12 \times L}\right) - 1"$
6. Lengths of wings based on SL:1 Slope along this line.

TABLE OF REINFORCING STEEL (4)

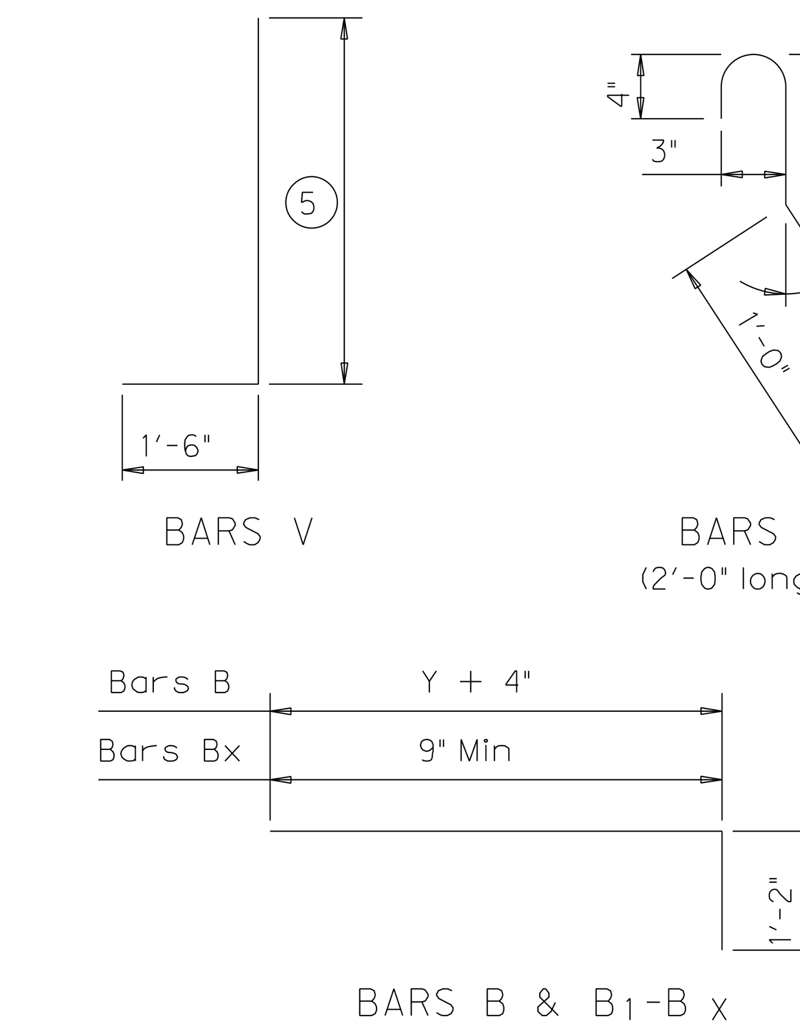
Bar	Size	Spa	No.
A	# 4	1′-0"	*
B	# 3	1′-6"	*
C	# 4	1′-0"	*
D	# 3	1′-0"	*
E	# 5	*	4
F	# 5	*	*
G	# 3	*	2
S	# 4	*	6
V	# 4	1′-0"	*
W	# 5	*	4

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"



PLAN



GENERAL NOTES:

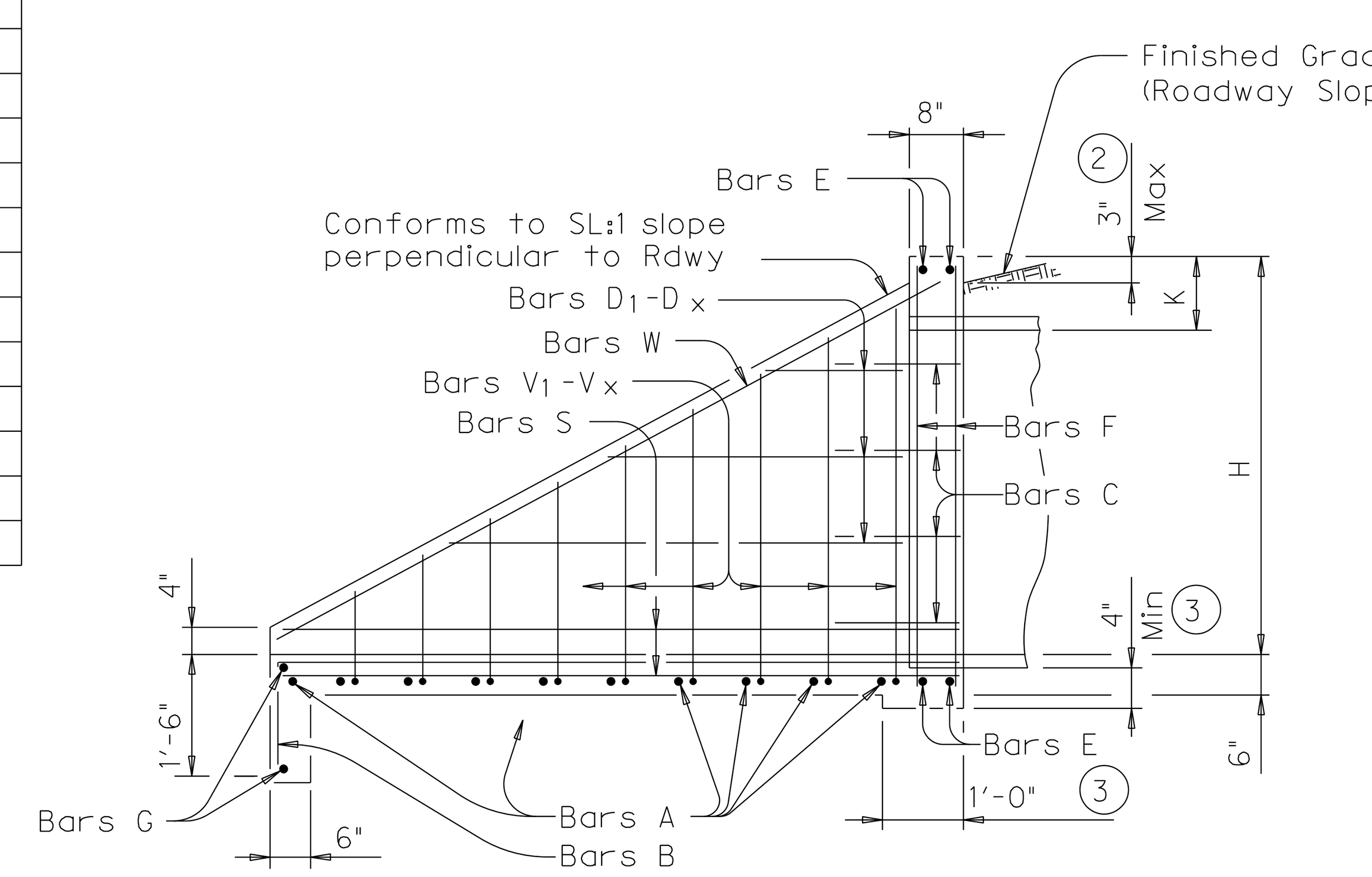
Designed according to AASHTO LRFD Specifications.

Reinforcing steel shall be placed with the center of the outside layer of bars 2" from the surface of the concrete.

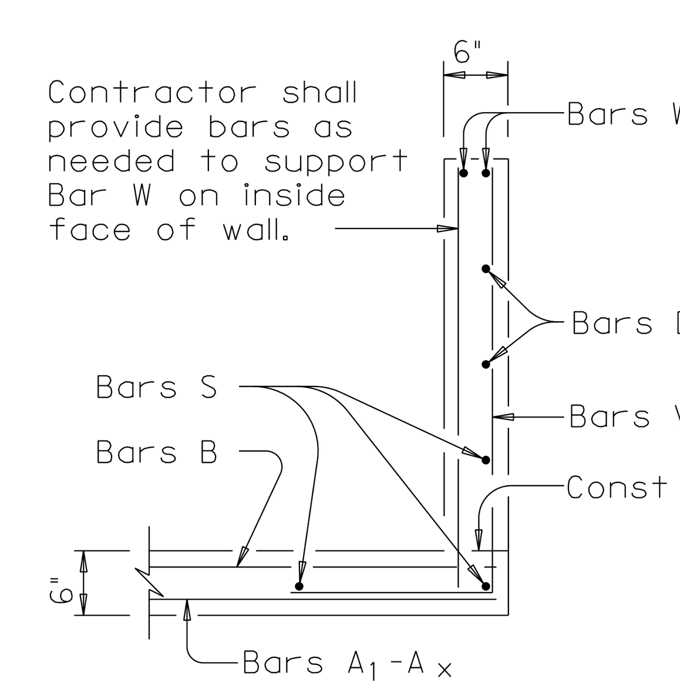
All reinforcing steel shall be Grade 60.

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.



TYPICAL WING ELEVATION



SECTION A-A

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
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REVISIONS	DIST	COUNTY		SHEET NO.

DATE:
FILE:

COLLEGE HILLS BOULEVARD REHABILITATION

LOOP 306 TO VALLEYVIEW
SAN ANGELO, TX

THE CITY OF SAN ANGELO ★ TEXAS ★

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No.	Date	Revision Description

STATE OF TEXAS
KEITH L. FREEMAN
85454
LICENSED PROFESSIONAL ENGINEER
MAR. 22, 2017

Project No.:	31516
Issued:	3/23/2017
Drawn By:	
Checked By:	
Scale:	NTS

Sheet Title

TXDOT HEADWALL CH-FW-0 DETAIL

C903

Sheet Number

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

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

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

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

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

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

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

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

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

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

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

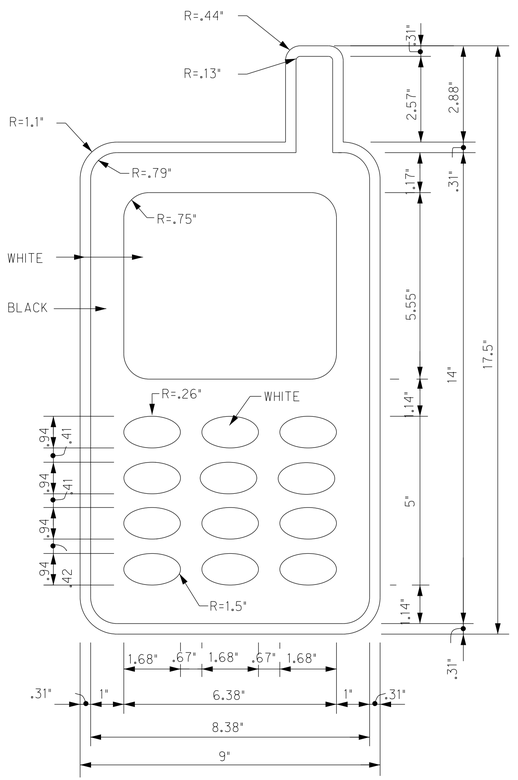
11. Except for devices required by Note 10, traffic control devices should be in place only while work is actually in progress or a definite need exists.

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

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

WORKER SAFETY APPAREL NOTES:

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



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

SIGN DETAIL (G20-10T)

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

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

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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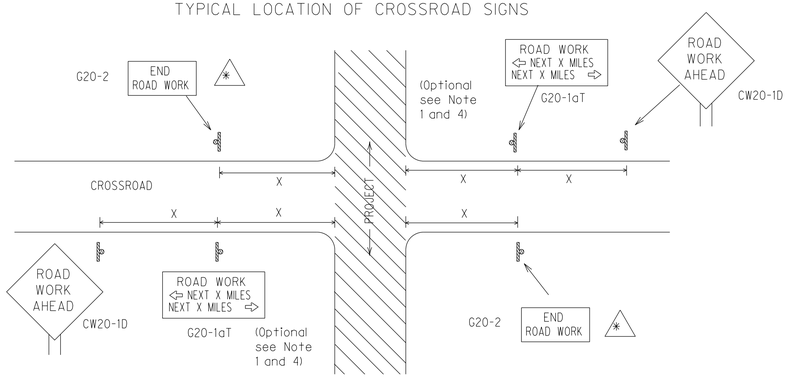
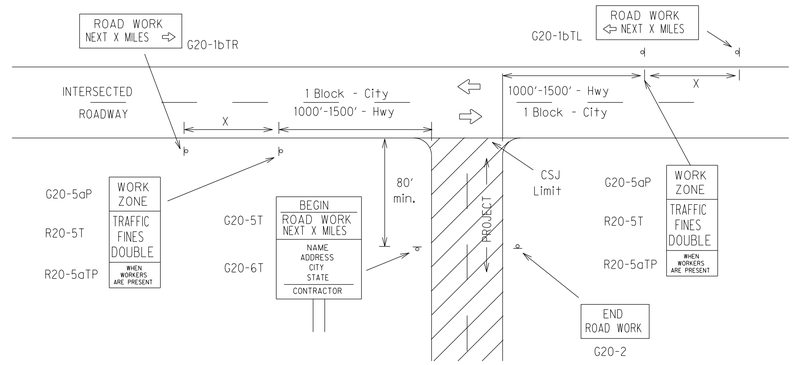
TYPICAL LOCATION OF CROSSROAD SIGNS



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

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

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

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

TYPICAL CONSTRUCTION WARNING SIGN SIZE AND SPACING

1.5.6

SIZE

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

SPACING

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

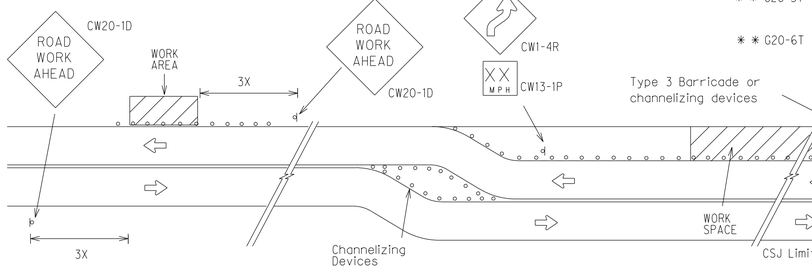
✱ For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

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

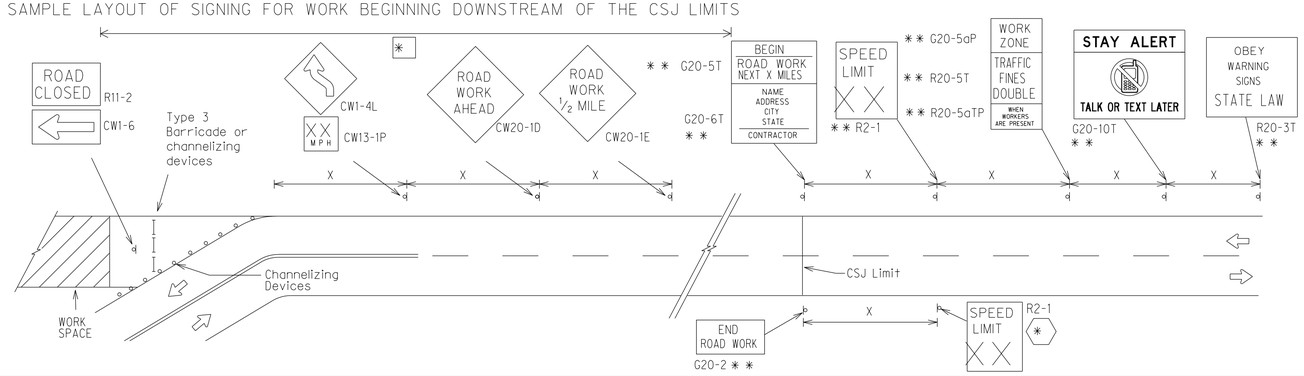
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



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

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS

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



NOTES

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

✱ 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.

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-14

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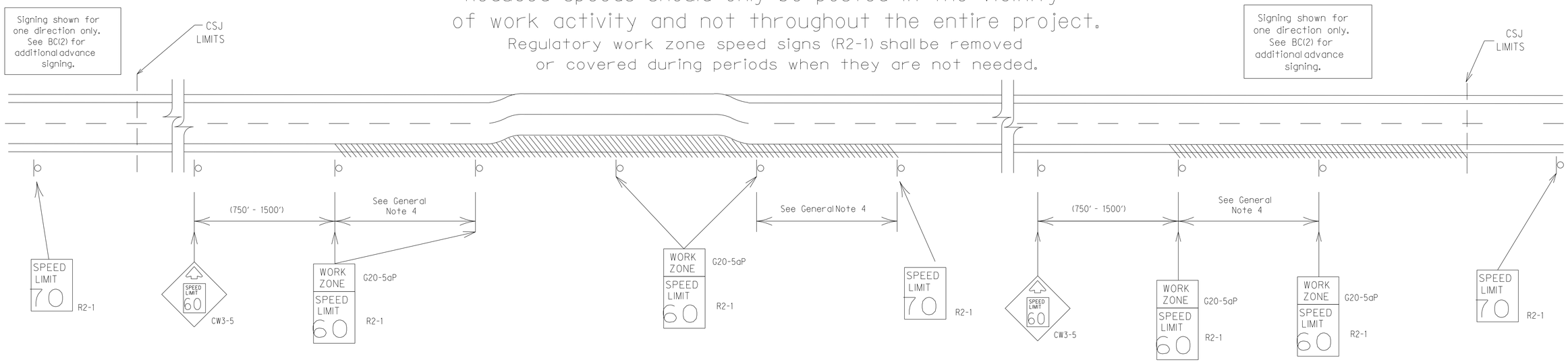
TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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:

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

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

SHORT TERM WORK ZONE SPEED LIMITS

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-14

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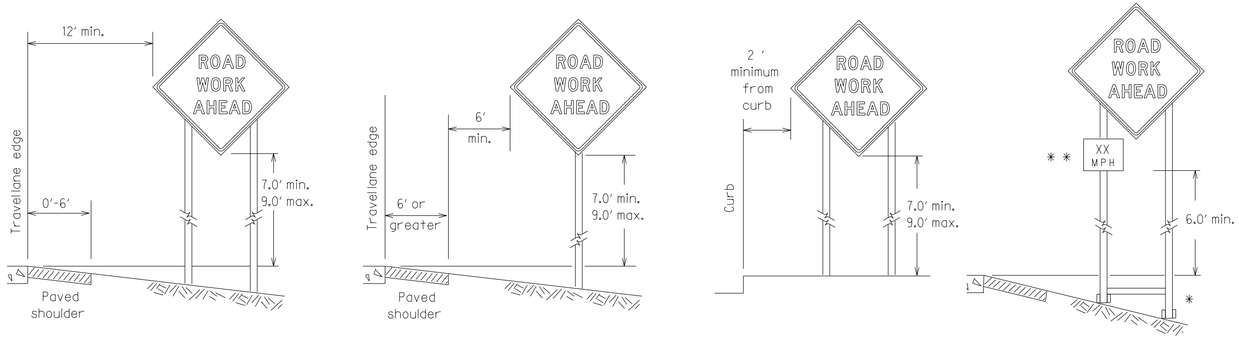
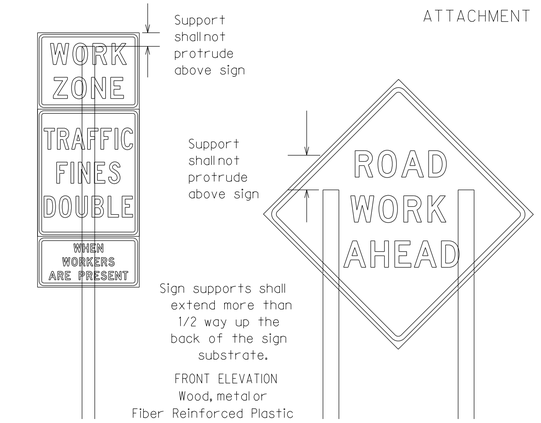
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



* 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.

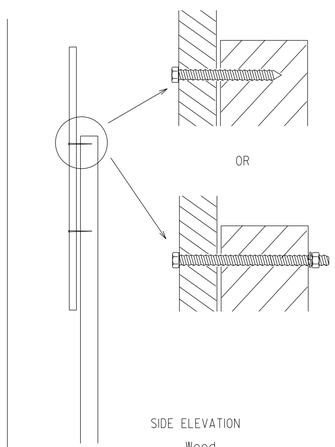
* * When plaques are placed on dual-leg supports, they should be attached to the upright nearest the travellane. Supplemental plaques (advisory or distance) should not cover the surface of the parent sign.

ATTACHMENT FOR SIGN SUPPORTS



FRONT ELEVATION
Wood, metal or
Fiber Reinforced Plastic

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



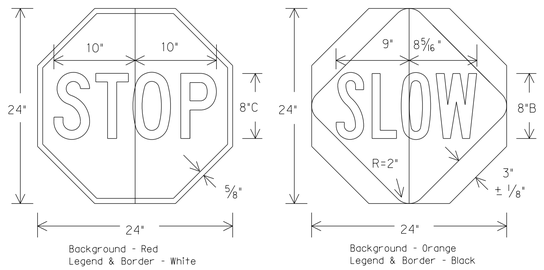
SIDE ELEVATION
Wood

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

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

STOP/SLOW PADDLES

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



CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-14

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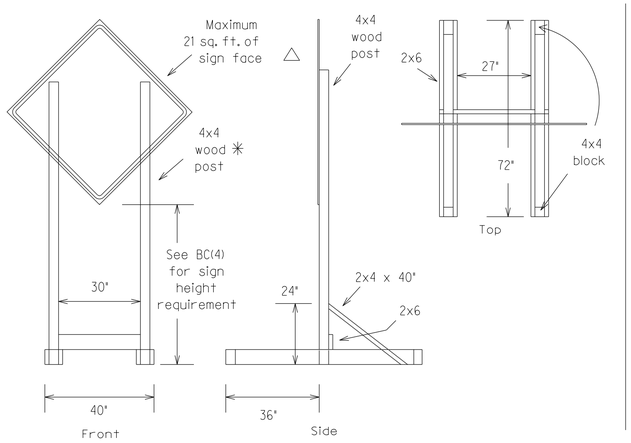
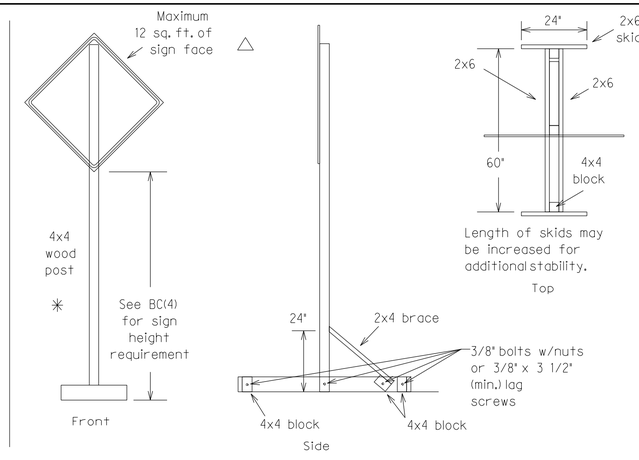
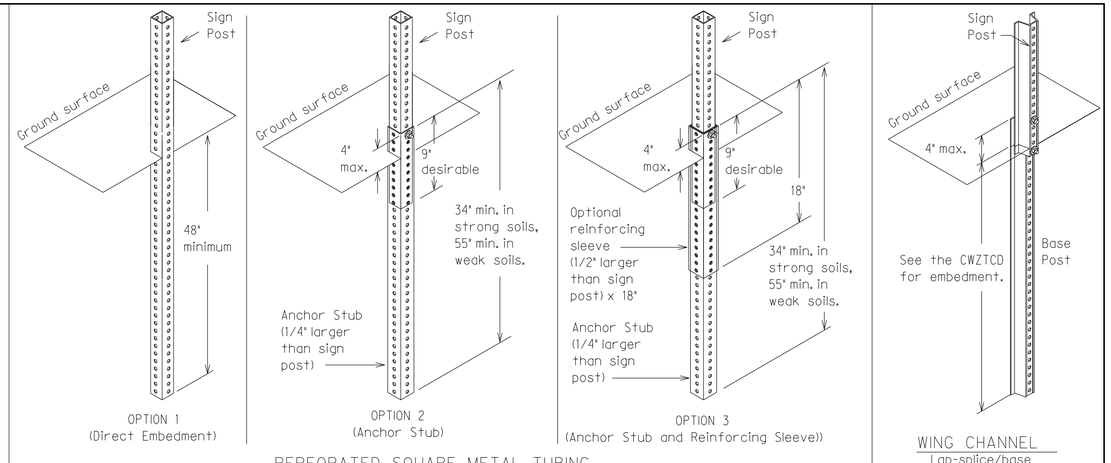




SKID MOUNTED WOOD SIGN SUPPORTS

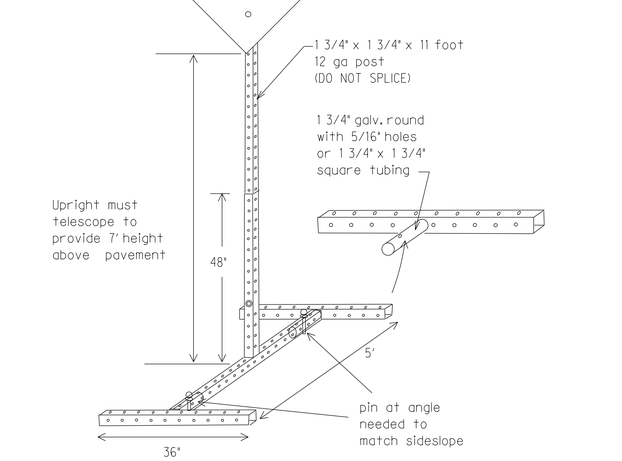
LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS □

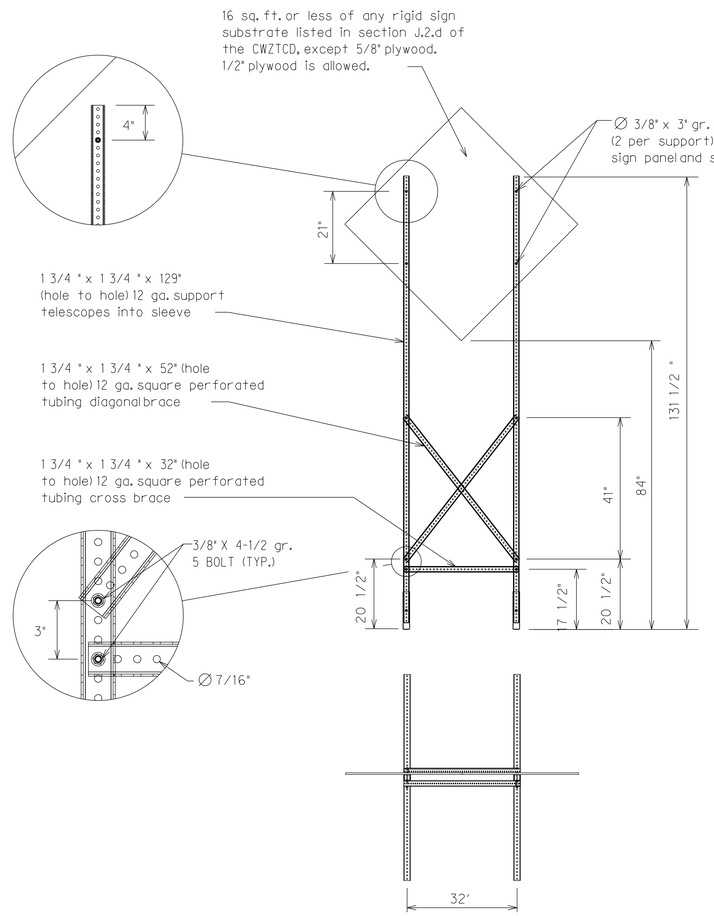


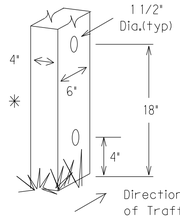
PERFORATED SQUARE METAL TUBING

GROUND MOUNTED SIGN SUPPORTS

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

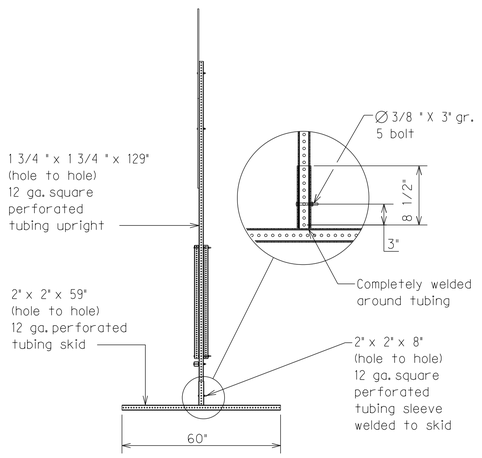






Nominal Post Size	Number of Posts	Maximum Sq. feet of Sign Face	Minimum Soil Embedment	Drilled Hole(s) Required
4 x 4	1	12	36"	NO
4 x 4	2	21	36"	NO
4 x 6	1	21	36"	YES
4 x 6	2	36	36"	YES

WOOD POST SYSTEM FOR GROUND MOUNTED SIGN SUPPORTS



SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

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

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

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

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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WHEN NOT IN USE, REMOVE THE PCMS FROM THE RIGHT-OF-WAY OR PLACE THE PCMS BEHIND BARRIER OR GUARDRAIL WITH SIGN PANEL TURNED PARALLEL TO TRAFFIC

PORTABLE CHANGEABLE MESSAGE SIGNS

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

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

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

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

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

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

Other Condition List

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

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

Phase 2: Possible Component Lists

Action to Take/Effect on Travel List

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

Location List

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

Warning List

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

** Advance Notice List

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

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

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

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

WORDING ALTERNATIVES

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

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

FULL MATRIX PCMS SIGNS

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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7-13				C950F

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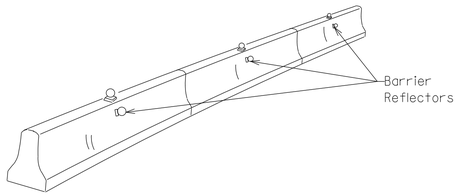
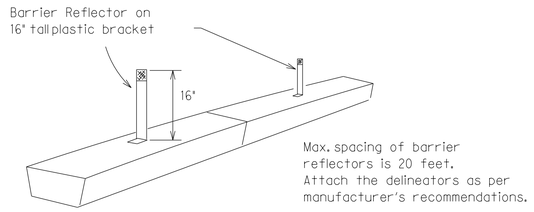
1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost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

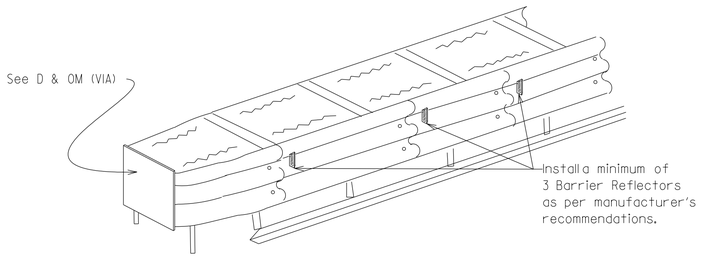


CONCRETE TRAFFIC BARRIER (CTB)

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



LOW PROFILE CONCRETE BARRIER (LPCB)

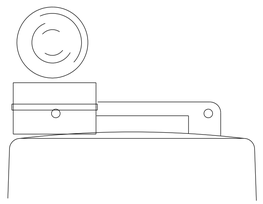


DELINEATION OF END TREATMENTS

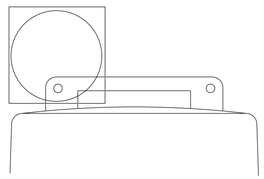
END TREATMENTS FOR
CTB'S USED
IN WORK ZONES

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

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



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



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

WARNING LIGHTS

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

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

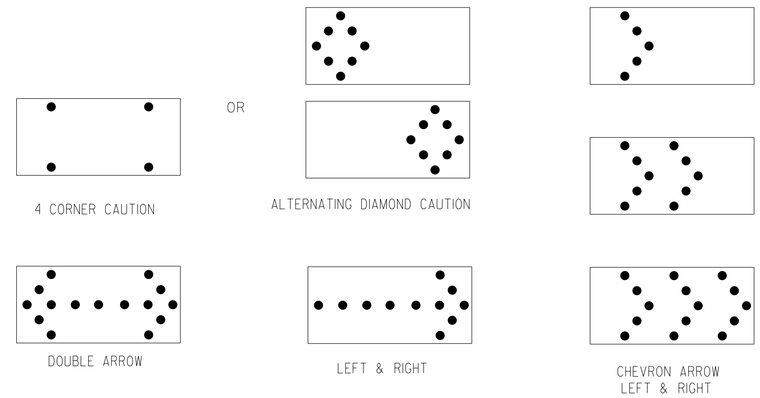
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

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

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

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

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



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

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

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

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

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

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

Texas Department of Transportation

Traffic Operations Division Standard

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

BC(7)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS 9-07 8-14 7-13	DIST	COUNTY		SHEET NO. C950G

DATE:
FILE:

GENERAL NOTES

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

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

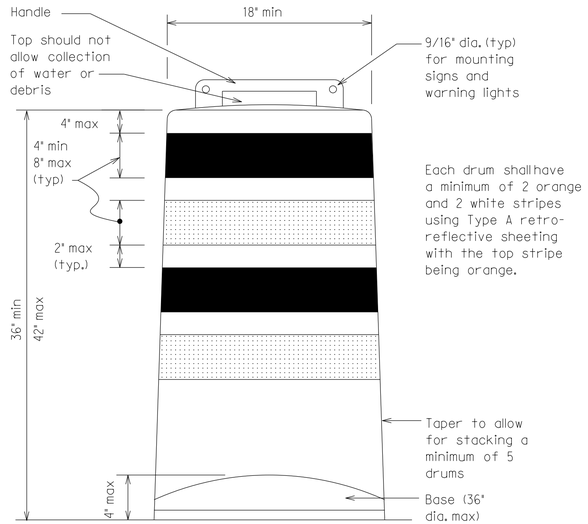
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

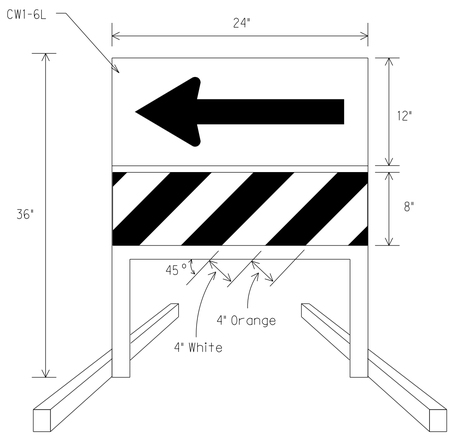
RETROREFLECTIVE SHEETING

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

BALLAST

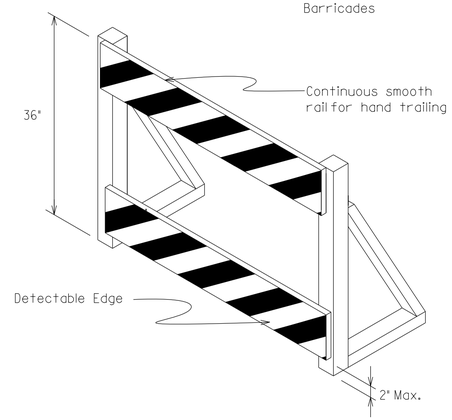
1. Unballasted bases shall be large enough to hold up to 50 lbs. of sand. This base, when filled with the ballast material, should weigh between 35 lbs (minimum) and 50 lbs (maximum). The ballast may be sand in one to three sandbags separate from the base, sand in a sand-filled plastic base, or other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





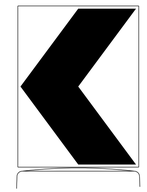
DIRECTION INDICATOR BARRICADE

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

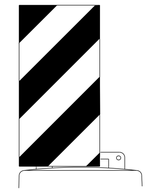


DETECTABLE PEDESTRIAN BARRICADES

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



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



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

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

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-14

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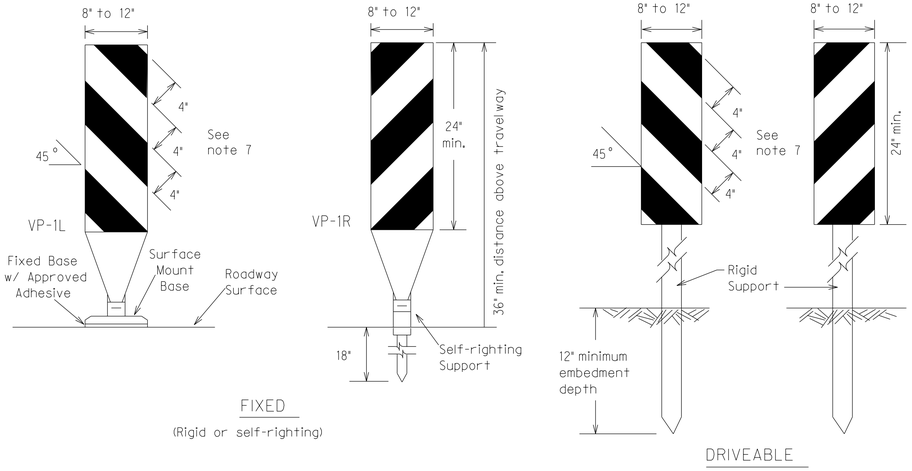
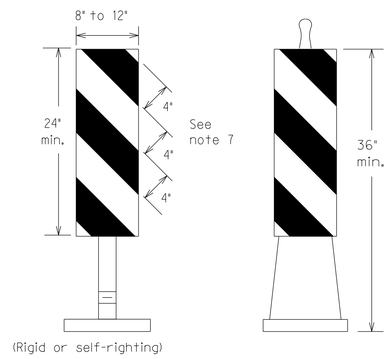


FIXED

(Rigid or self-righting)

DRIVEABLE

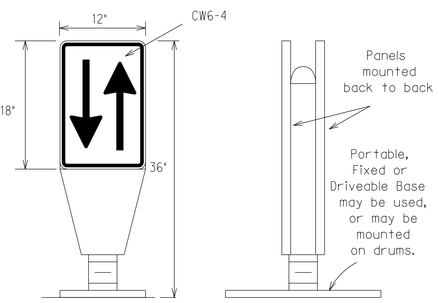


(Rigid or self-righting)

PORTABLE

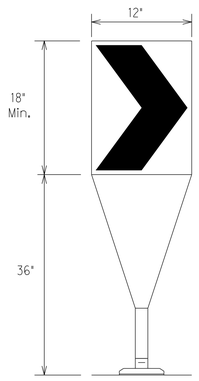
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is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

VERTICAL PANELS (VPs)



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

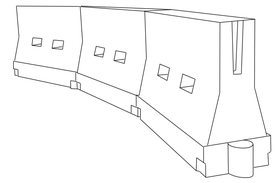
OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



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

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

CHEVRONS



LONGITUDINAL CHANNELIZING DEVICES (LCD)

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

WATER BALLASTED SYSTEMS USED AS BARRIERS

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

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

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

GENERAL NOTES

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

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

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

SHEET 9 OF 12

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-14

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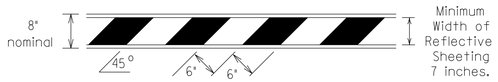
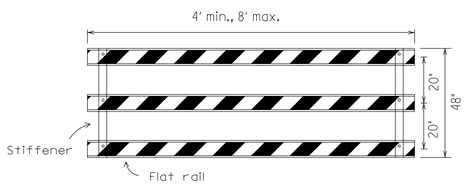
TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



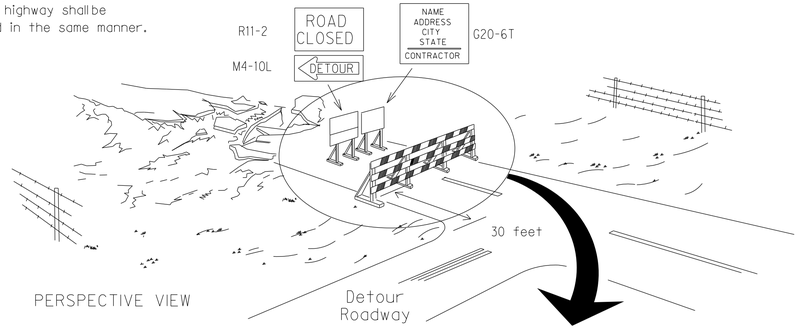
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

TYPICAL PANEL DETAIL
FOR SKID OR POST TYPE BARRICADES

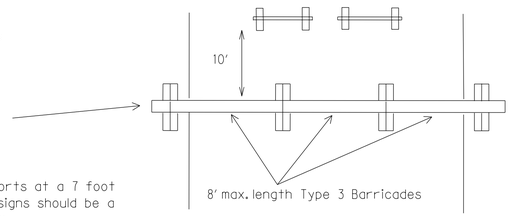
Each roadway of a divided highway shall be barricaded in the same manner.



PERSPECTIVE VIEW

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

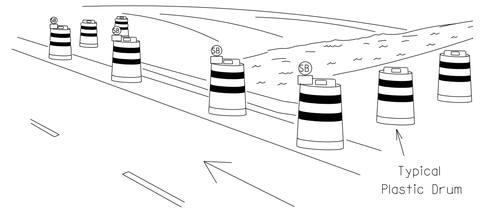
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

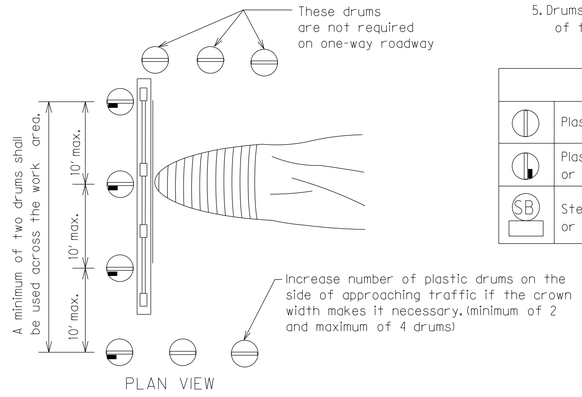
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

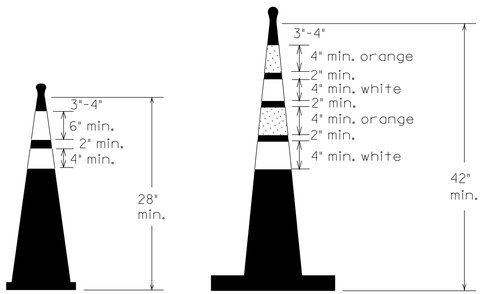
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



PLAN VIEW

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

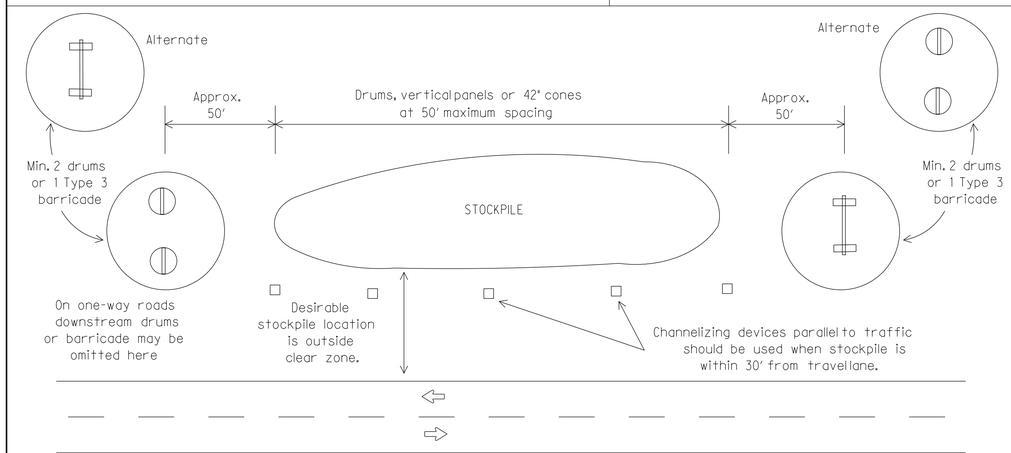
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



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

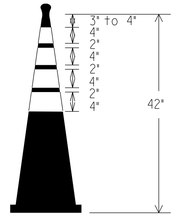
42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

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



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

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



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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-14

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WORK ZONE PAVEMENT MARKINGS

GENERAL

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

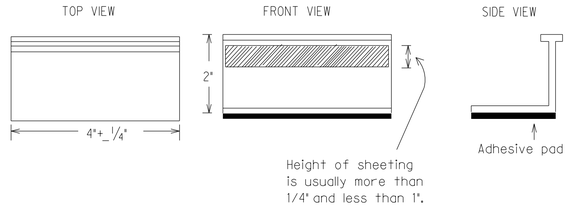
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

REMOVAL OF PAVEMENT MARKINGS

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

Temporary Flexible-Reflective Roadway Marker Tabs



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

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

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-14

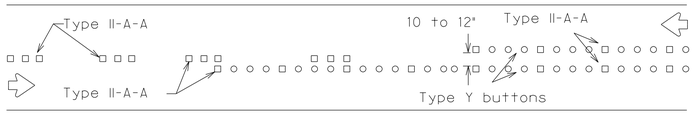
FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS				
2-98 9-07	DIST	COUNTY		SHEET NO.
1-02 7-13				C950K
11-02 8-14				

105

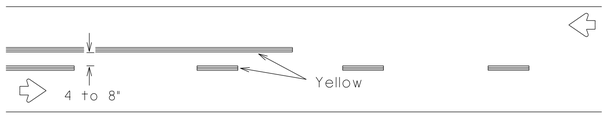
DATE:
FILE:

PAVEMENT MARKING PATTERNS

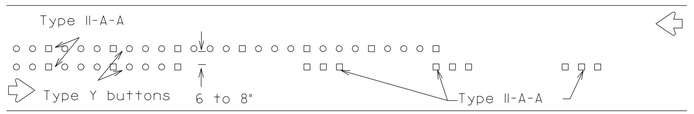
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



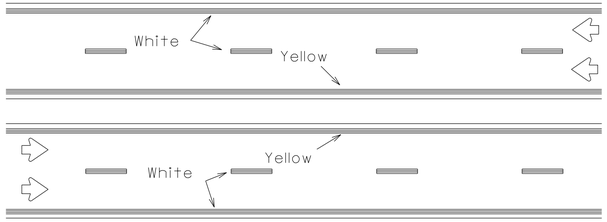
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



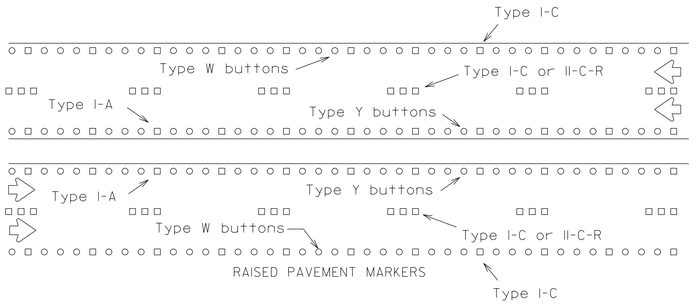
RAISED PAVEMENT MARKERS - PATTERN B

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

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



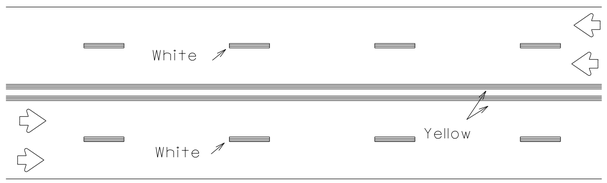
REFLECTORIZED PAVEMENT MARKINGS



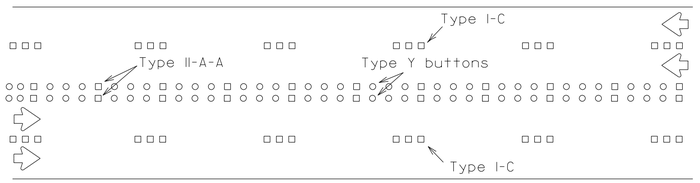
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



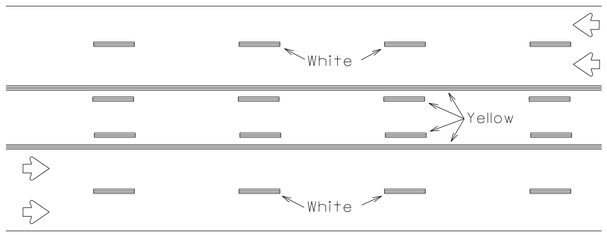
REFLECTORIZED PAVEMENT MARKINGS



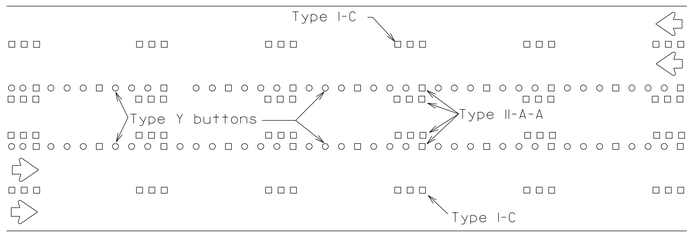
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

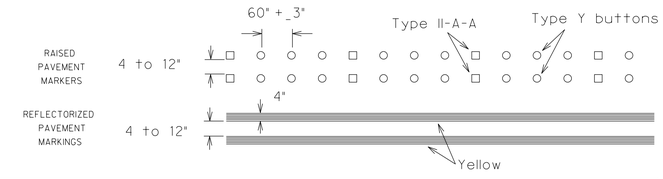
TWO-WAY LEFT TURN LANE

DATE:
FILE:

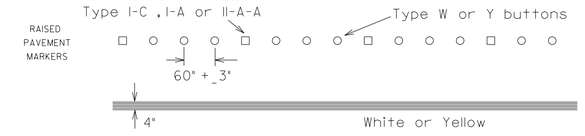
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

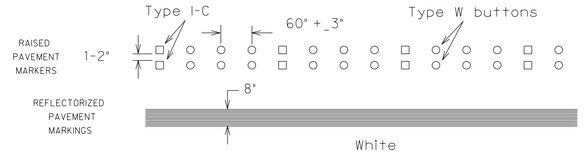


EDGE LINE OR SINGLE NO-PASSING LINE



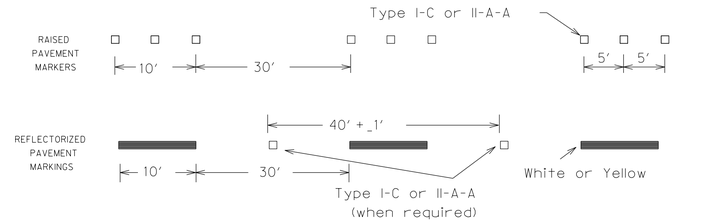
WIDE LINE

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

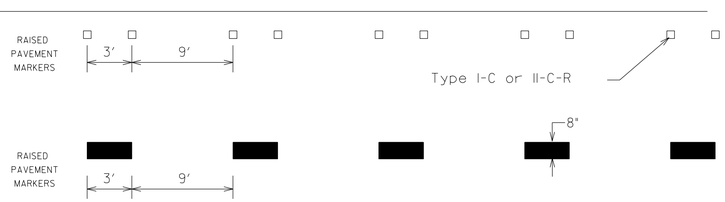


BROKEN LINES

CENTER LINE OR LANE LINE

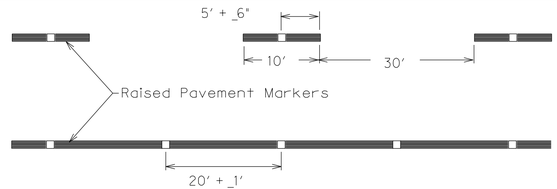


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

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



Centerline only - not to be used on edge lines

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS				
1-97 9-07	DIST	COUNTY		SHEET NO.
2-98 7-13				C950L
11-02 8-14				