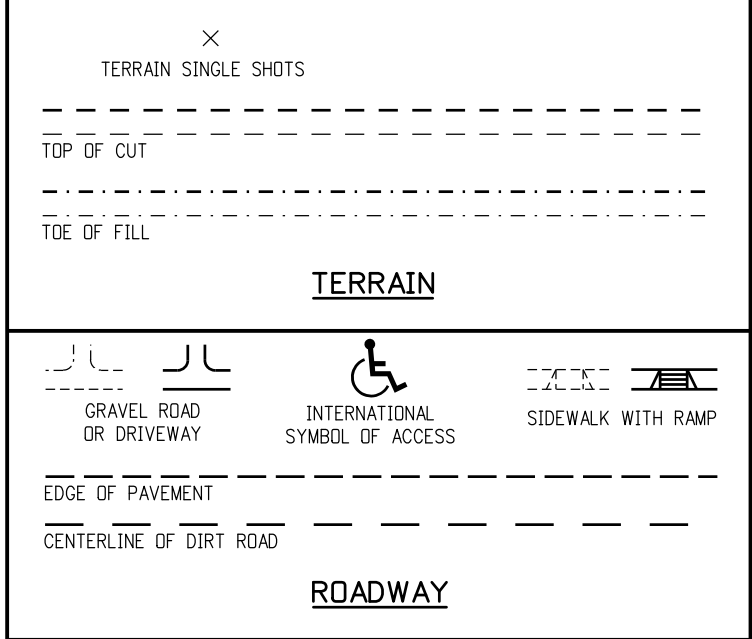
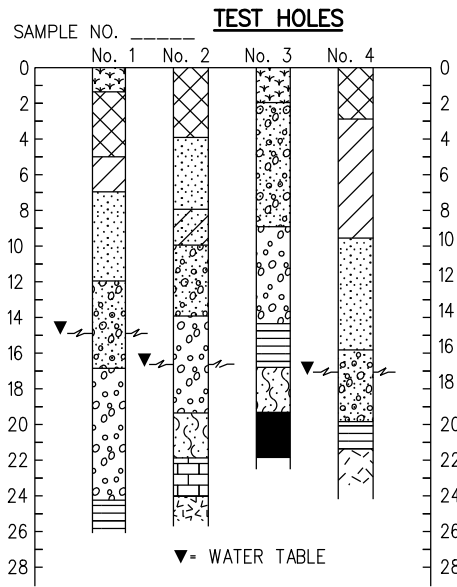
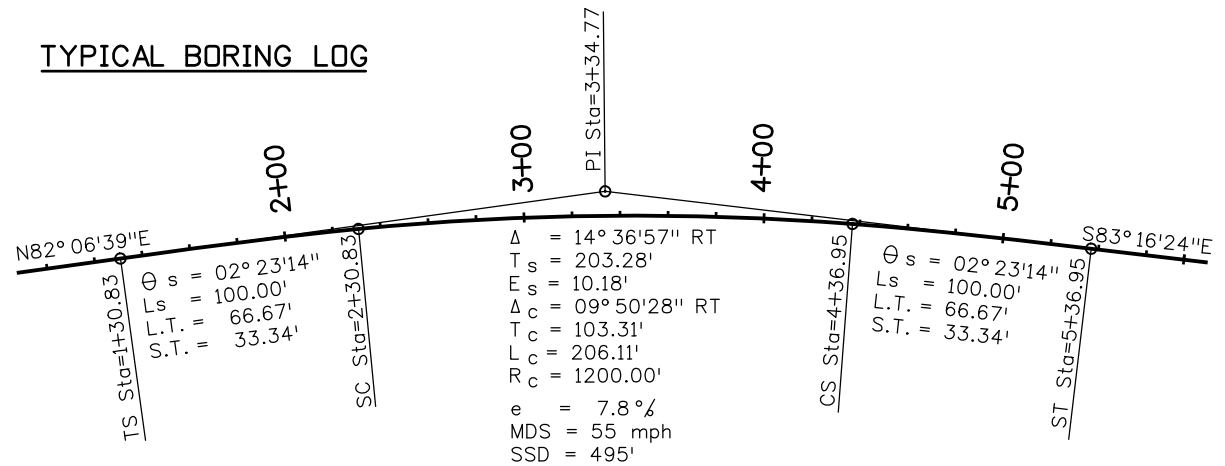
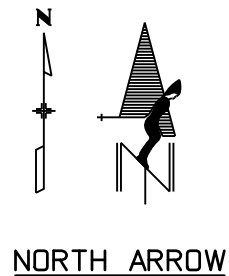


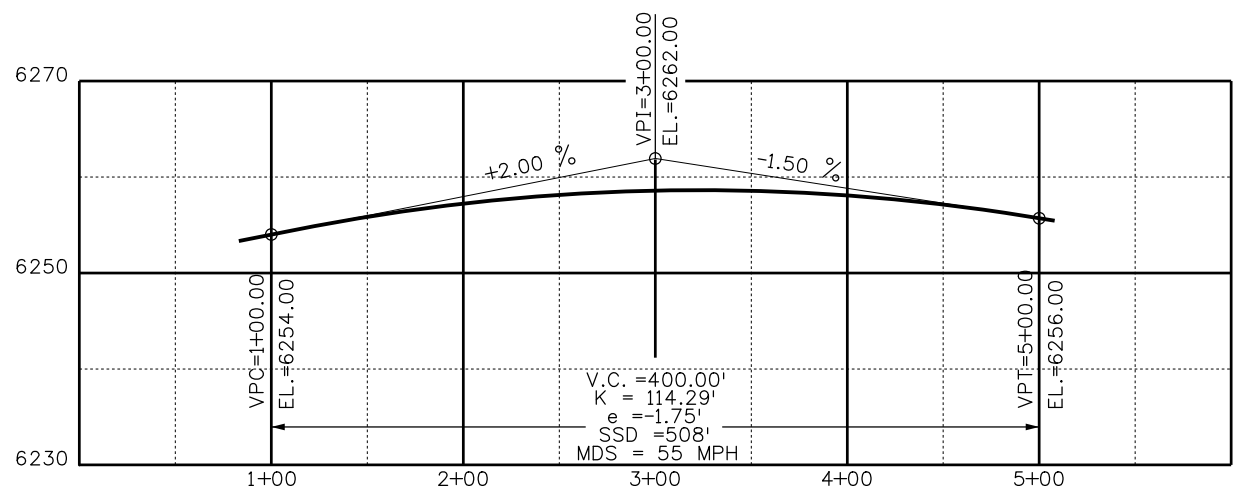
- LEGEND**
- TOPSOIL
 - OVERBURDEN
 - CLAY
 - SILT
 - SAND
 - GRAVEL
 - SHALE
 - LIMESTONE
 - SANDSTONE
 - SOLID ROCK (IGNEOUS)
 - SOLID ROCK (METAMORPHIC)
 - COAL
 - SANDY CLAY
- COMPOSITE MATERIALS ARE REPRESENTED BY COMBINATIONS OF THE ABOVE SYMBOLS, SUCH AS:



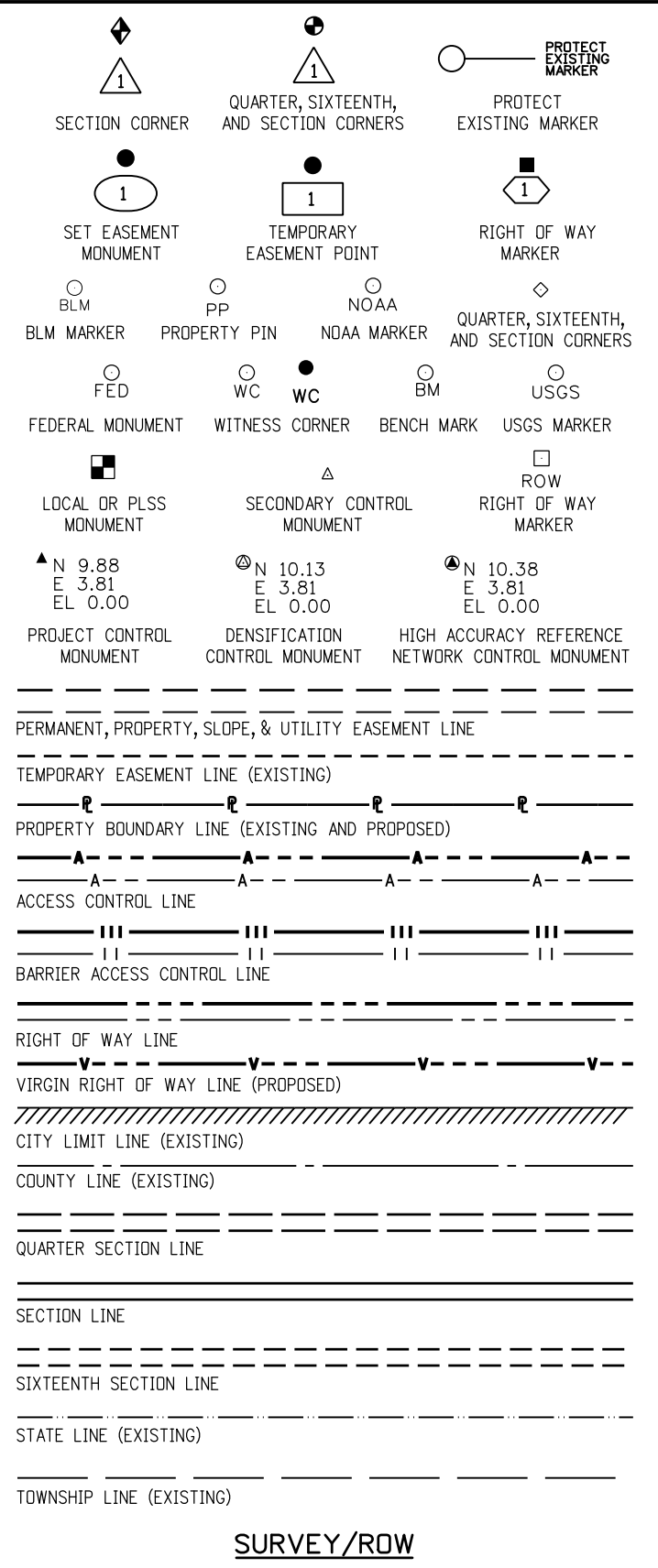
TYPICAL BORING LOG



TYPICAL HORIZONTAL CURVE

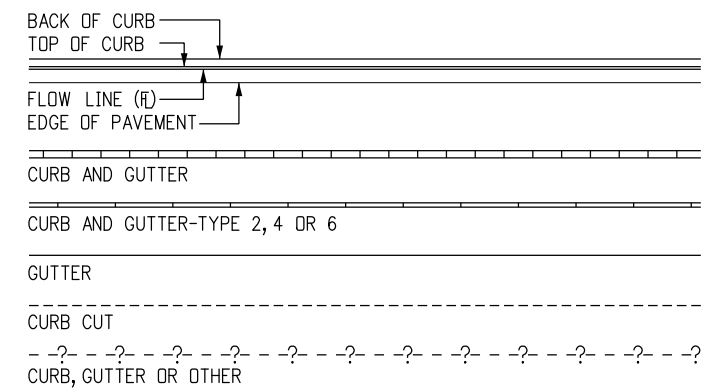


TYPICAL VERTICAL CURVE

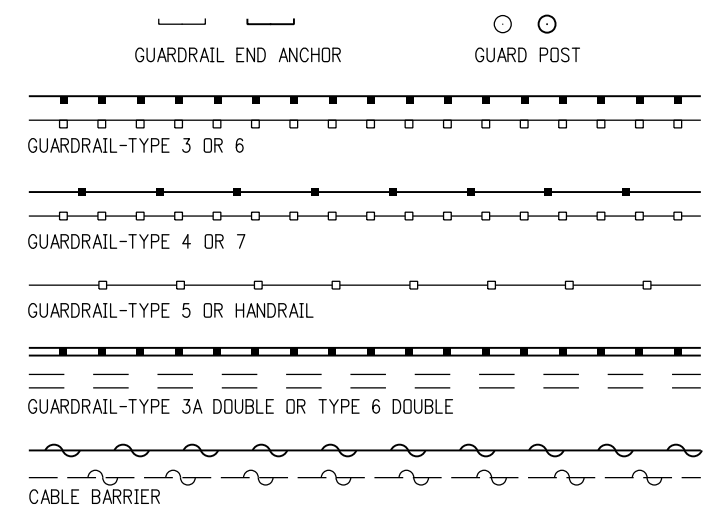


GENERAL NOTES

1. EXISTING FEATURES SHOWN AS SCREENED WEIGHT (LIGHT GRAY SCALE), EXCEPT AS NOTED WITH THE WORD (EXISTING). PROPOSED OR NEW FEATURES SHOWN AS FULL WEIGHT WITHOUT SCREENING, EXCEPT AS NOTED WITH THE WORD (PROPOSED).
2. THESE SYMBOLS ARE INTENDED TO EXPLAIN THE VARIOUS TOPOGRAPHIC FEATURES INVOLVED ON THE DESIGN PLAN SHEETS WHICH ARE PREPARED AT VARIOUS SCALES. NOTES ARE ADDED WHERE NECESSARY TO CLARIFY THE SYMBOL. A LEGEND IS PROVIDED IN THE PLANS FOR SYMBOLS NOT SHOWN ON THE STANDARD SYMBOLS SHEETS.
3. GUARDRAIL, CURB AND GUTTER, ETC., ARE REPRESENTED BY A SYMBOL WITH TYPE GIVEN BY NOTE.



CURB AND GUTTER



GUARDRAIL

Computer File Information

Creation Date: 07/04/12	Initials: DD
Last Modification Date: 07/04/12	Initials: LTA
Full Path: www.codot.gov/business/designsupport	
Drawing File Name: 100010103.dgn	
CAD Ver.: MicroStation V8	Scale: Not to Scale Units: English

Sheet Revisions

Date:	Comments
(R-X)	
(R-X)	
(R-X)	
(R-X)	

Colorado Department of Transportation

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STANDARD SYMBOLS

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M-100-1

Sheet No. 1 of 3

ROCK, MASONRY OR MECHANICALLY STABILIZED WALL (FACE)

BRIDGE CURB

BRIDGE RAIL

BRIDGE RAIL-TYPE 3A

FLOW LINE CBC

STRUCTURES MISCELLANEOUS

STRUCTURE

COMBINATION WIRE FENCE WITH GATE

CHAIN LINK FENCE WITH GATE

BARBED WIRE FENCE WITH GATE

SOUND OR BARRIER FENCE WITH GATE

DEER FENCE WITH GATE

WOOD FENCE WITH GATE

SNOW FENCE WITH GATE

PLASTIC FENCE

SILT FENCE

DEBRIS FENCE

FENCE

HAZARD WASTE MONITORING WELL

ENVIRONMENTAL CONCERN SITE

EROSION LOG

ROCK CHECK DAM

CONCRETE WASHOUT STRUCTURE

DROP INLET EROSION PROTECTION

TEMPORARY BERM

SOIL RETENTION BLANKET

PIPE INLET EROSION PROTECTION

RIGID INLET PROTECTION

STORM DRAIN INLET PROTECTION

EROSION CHECK

EROSION LOG DITCH CHECK

SILT DIKE

SEDIMENT TRAP/DEWATERING STRUCTURE

EXISTING WETLAND PATTERN

TEMPORARY SLOPE DRAIN

STABILIZED CONSTRUCTION ENTRANCE

LDA LDA LDA LDA LDA LDA

LIMITS OF DISTURBED AREA

ENVIRONMENTAL CONCERN

HAZARDOUS WASTE SITE

NOXIOUS WEED

ENVIRONMENTAL

METAL CONCRETE

PIPE WITH END SECTION

HEADWALL

PIPE MISCELLANEOUS

PIPES

CHECK DAM UNDER 4 FT

HEADGATE 1

DIVERSION BOX SYMBOL

SPRING SYMBOL

FLOW GAUGE

MISCELLANEOUS WATERWAYS

DITCH WITH FLOW

EDGE OF WATER, CANALS, PONDS, STREAM OR RIVER

DITCHES AND WATERWAY

MISCELLANEOUS BUILDING STRUCTURE (PRIMARY)

MISCELLANEOUS STRUCTURE (SECONDARY)

FOUNDATION OR PAD (CONCRETE OR BLOCK)

BUILDING STRUCTURES

RR TELEGRAPH POLE

RR SWITCH

RR GUY POLE

RR SIGNALS WITH OR WITHOUT GATE

RR CROSS BUCK SIGN

RR SIGNAL CONTROLLER CABINET

RR MISCELLANEOUS SYMBOL

RR TRACK CENTERLINE

RAILROAD

MISCELLANEOUS TREES

DECIDUOUS TREE

DECIDUOUS SHRUB

TEETER TOTTER SYMBOL

SWING SET SYMBOL

CONIFEROUS TREE

CONIFEROUS SHRUB

BENCH

SPRINKLER HEAD

TREES GROVE

HEDGE OR SHRUB GROVE

EDGE OF WETLANDS

LANDSCAPING

SA SA

SANITARY SEWER MANHOLE

SA

SANITARY SEWER MISCELLANEOUS SYMBOL

SIZE, MATERIAL, OWNER

SANITARY SEWER PIPE

SANITARY SEWER PIPE MISCELLANEOUS

SANITARY SEWER

INLET TYPE 13

INLET TYPE C

INLET TYPE D

INLET VANE GRATE

INLET TYPE R XX FT LENGTH

STORM SEWER MANHOLE

MANHOLE EXISTING

STORM SEWER MISCELLANEOUS

STORM SEWER PIPE

STORM SEWER PIPE MISCELLANEOUS

STORM SEWER

BOULDER UNDER 6FT

GEOLOGY MISC SYMBOL

MINESHAFT SYMBOL

ROCK OUTCROP

BOULDER FIELD OR ROCK OVERHANG

GEOLOGY

WATER SPIGOT

WATER VALVE

WATER MANHOLE

FIRE HYDRANT

WATER METER

WATER WELL SYMBOL

SIZE, MATERIAL, OWNER

WATER LINE

WATER MISCELLANEOUS LINE

WATER

Computer File Information

Creation Date: 07/04/12	Initials: DD
Last Modification Date: 07/04/12	Initials: LTA
Full Path: www.codot.gov/business/designsupport	
Drawing File Name: 100010203.dgn	
CAD Ver.: MicroStation V8	Scale: Not to Scale Units: English

Sheet Revisions

Date:	Comments
(R-X)	
(R-X)	
(R-X)	
(R-X)	

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STANDARD SYMBOLS

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STANDARD PLAN NO.

M-100-1

Sheet No. 2 of 3

GAS

PROPANE TANK, GAS JUNCTION BOX, GAS VAULT, GAS LINE MARKER OR AIR VENT, GAS METER LOW PRESSURE, GAS METER HIGH PRESSURE, GAS MISCELLANEOUS, GAS LIGHT, GAS VALVE HIGH OR LOW PRESSURE, GAS LINE LOW PRESSURE, GAS LINE HIGH PRESSURE, PROPANE GAS LINE, GAS LINES MISCELLANEOUS

LIGHTING

LIGHT STANDARD, HIGH MAST LIGHT STANDARD, SPOT OR FLOOD LIGHT

ELECTRICAL

ELECTRICAL PEDESTAL OR PULL BOX, TRANSMISSION TOWER, WIND POWERED GENERATOR, RELOCATED LIGHT STANDARD, DECORATIVE LIGHT STANDARD, CATENARY POLE FOUNDATION, ELECTRICAL MANHOLE, POWER POLE, TRANSFORMER ON POLE, ELECTRICAL OUTLET, ELECTRICAL MISCELLANEOUS, GUY WIRE, ELECTRICAL VAULT OR TRANSFORMER, GUY POST, FIRE ALARM BOX, ELECTRICAL UNDERGROUND LINE, ELECTRICAL OVERHEAD LINE, ELECTRICAL MISCELLANEOUS LINE

TELEPHONE

TELEPHONE GUY POLE, TELEPHONE MANHOLE, TELEPHONE MISCELLANEOUS, FIBER OPTIC CABLE MARKER, COMBINATION POLE-POWER, COMBINATION GUY POLE-POWER, TELEPHONE UNDERGROUND CONDUIT OR CABLE, FIBER OPTICS UNDERGROUND CABLE, TELEPHONE OVERHEAD LINE, TELEPHONE MISCELLANEOUS LINE

TRAFFIC CONTROL

TRAVEL DIRECTION, BARRIER LIGHT, FLAGGER, DELINEATOR-TYPE I, SEQUENCING ARROW PANEL, FLASHING BEACON, DELINEATOR-TYPE II, DELINEATOR-TYPE III, BUTTERFLY SIGN, HALF BUTTERFLY SIGN, IMPACT ATTENUATOR, SIGN ASSEMBLY, SINGLE POST SIGN, DOUBLE POST SIGN, SIGN-WITH FLASHING BEACON, ROAD CLOSURE GATE BEACON SYMBOL, ROAD CLOSURE GATE SYMBOL, DEER REFLECTORS, TRAFFIC CONTROL MISCELLANEOUS DEVICE, TRAFFIC CONTROL DEVICE

OIL

OIL METER HIGH AND LOW PRESSURE, OIL VALVE HIGH AND LOW PRESSURE, OIL MISCELLANEOUS, OIL LINE LOW OR HIGH PRESSURE, OIL MISCELLANEOUS LINE

INTELLIGENT TRANSPORTATION SYSTEM

FIBER MARKER DOME, FIBER MARKER SLATE, RWIS - REMOTE WEATHER SENSOR, VMS-BUTTERFLY, VMS-GROUND, VMS-CANTILEVER, VMS-SIGN BRIDGE, ITS CONDUIT

TRAFFIC SIGNAL

DOUBLE MAST ARM POLE, SIGNAL SPAN WIRE POLE, LUMINAIRE, SIGNAL FACE, SIGNAL POLE WITH MAST ARM, SIGNAL FACE WITH BACKPLATE, SIGNAL CONTROLLER AND CABINET (4 FT), TELEMETRY ANTENNA, PULL BOX, MICRODETECTOR, VIDEO DETECTION CAMERA, FIRE PREEMPTION UNIT AND TIMER, PEDESTRIAN SIGNAL FACE, PEDESTRIAN PUSH BUTTON, PEDESTAL POLE, PULL BOX SPECIAL, TRAFFIC CONDUIT

MISCELLANEOUS TOPOGRAPHY

GRAVE HEADSTONE SYMBOL, MAIL DROP BOX, FLAG POLE, TRASH BARREL POST, GRAVE SYMBOL, RADIO STATION ANTENNA, MISCELLANEOUS TOPOGRAPHY

TELEVISION

CABLE TV POLE, CABLE TV RISER, COMBINATION POLE-POWER, TELEPHONE, TV ANTENNA, TV MISCELLANEOUS, TV MANHOLE, TV UNDERGROUND CABLE, TV OVERHEAD CABLE, TV MISCELLANEOUS CABLE

TRAFFIC STRIPING

CENTER YELLOW SOLID DOUBLE, CENTER YELLOW SOLID BROKEN (NO PASS), 4 INCH WIDE, 8 INCH WIDE, LANE LINE BROKEN, LANE DROP, CHANNELIZING OR EDGE LINE, 4 INCH WIDE, 8 INCH WIDE, DOTTED BROKEN, STOP LINE, INTERNATIONAL SYMBOL OF ACCESS, RAILROAD CROSSING, BICYCLE PED ACCESS

CAMPING

CAMPSITE MARKER, TRAILER ELECTRIC HOOKUP, TRAILER DUMP STATION, CAMPFIRE RING, TRAILER SEWER INLET, TRAILER WATER HOOKUP, CAMPSITE GRILL, CAMPSITE TABLE

Computer File Information

Creation Date: 07/04/12	Initials: DD
Last Modification Date: 07/04/12	Initials: LTA
Full Path: www.codot.gov/business/designsupport	
Drawing File Name: 100010303.dgn	
CAD Ver.: MicroStation V8	Scale: Not to Scale Units: English

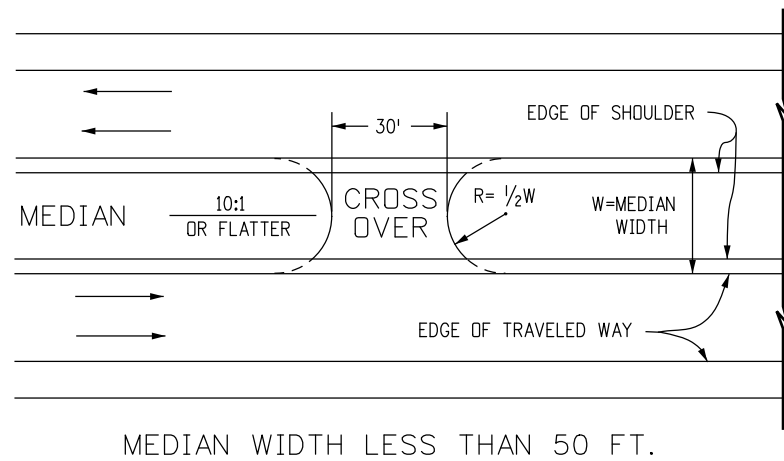
Sheet Revisions

Date:	Comments
(R-X)	
(R-X)	
(R-X)	
(R-X)	

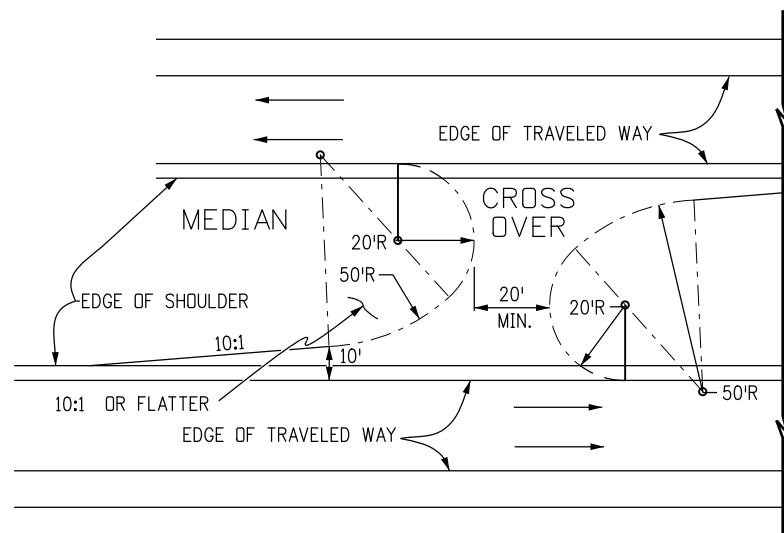
Colorado Department of Transportation
 2829 West Howard Place
 CDOT HQ, 3rd Floor
 Denver, CO 80204
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STANDARD SYMBOLS
 Issued By: Project Development Branch November 1, 2018

STANDARD PLAN NO.
 M-100-1
 Sheet No. 3 of 3



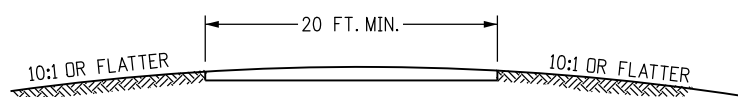
MEDIAN WIDTH LESS THAN 50 FT.



MEDIAN WIDTH GREATER THAN 50 FT.

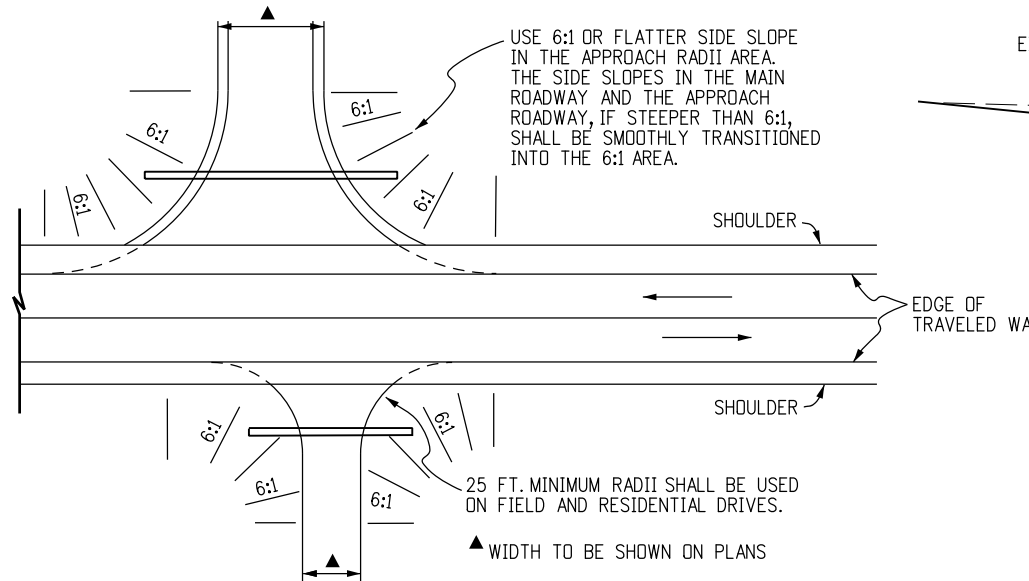
TYPICAL PLANS FOR EMERGENCY MEDIAN CROSS OVER

LOCATION OF RADIUS POINTS MAY BE ADJUSTED FOR BEST FIT



TYPICAL SECTION FOR MEDIAN CROSS OVER

ANY REQUIRED PIPE OR INLET FOR MEDIAN DRAINAGE SHALL HAVE A TRAVERSABLE DESIGN AS SPECIFIED ON THE PLANS

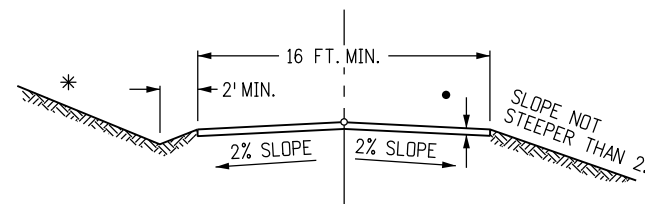


USE 6:1 OR FLATTER SIDE SLOPE IN THE APPROACH RADII AREA. THE SIDE SLOPES IN THE MAIN ROADWAY AND THE APPROACH ROADWAY, IF STEEPER THAN 6:1, SHALL BE SMOOTHLY TRANSITIONED INTO THE 6:1 AREA.

25 FT. MINIMUM RADII SHALL BE USED ON FIELD AND RESIDENTIAL DRIVES.

▲ WIDTH TO BE SHOWN ON PLANS

TYPICAL PLANS FOR SIDE APPROACH ROAD

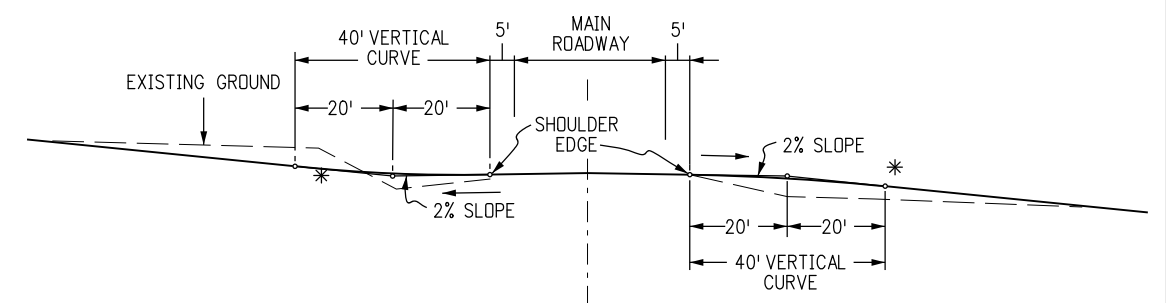


1/2 CUT SECTION 1/2 FILL SECTION

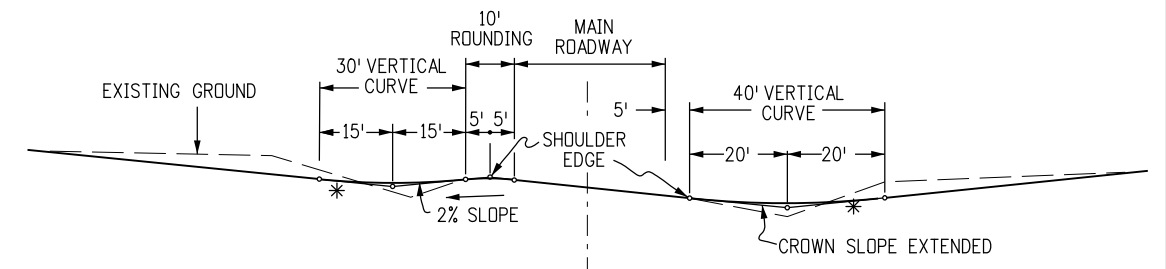
TYPICAL SECTION FOR APPROACH (ACCESS) ROAD

NOTE: ROAD APPROACHES WHICH REQUIRE HMA (ASPHALT) PAVEMENT SHALL BE PLACED AT THE FOLLOWING DISTANCES BACK FROM THE ROADWAY EDGE OF PAVEMENT:

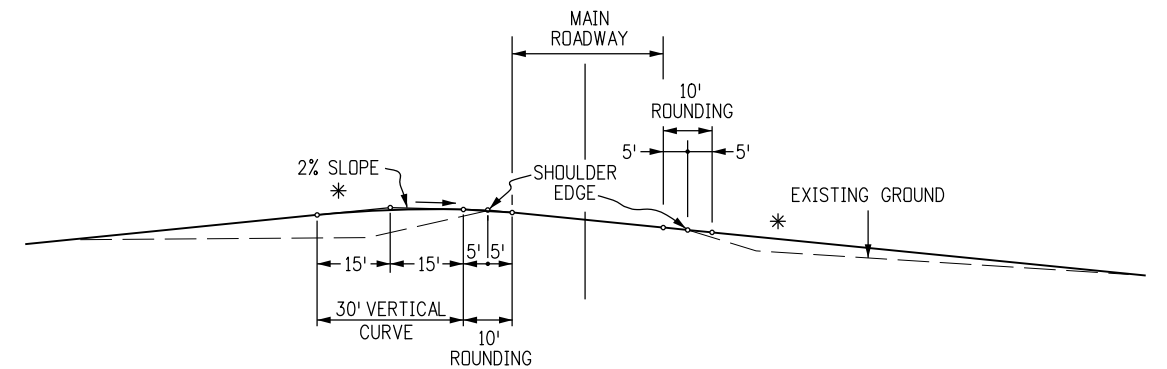
1. RESIDENTIAL OR AGRICULTURAL FIELD ENTRANCES - PAVE 4 FEET BACK.
2. THREE OR MORE RESIDENCES OR COMMERCIAL PROPERTY - PAVE 20 FEET BACK OR TO ROW LINE, WHICHEVER IS LESS.
3. PUBLIC STREET - PAVE 50 FEET BACK OR TO ROW LINE, WHICHEVER IS LESS.
4. IF EXISTING ACCESS IS PAVED, THEN FEATHER NEW ASPHALT OVERLAY A MINIMUM OF 2 FEET BACK OR AS DIRECTED BY THE ENGINEER.



1/2 CUT SECTION 1/2 FILL SECTION
STANDARD CROWNED SECTION



SUPERELEVATED CUT SECTION



SUPERELEVATED FILL SECTION

VERTICAL ALIGNMENT SIDE APPROACH ROADS INTERSECTING MAIN ROADWAY

* TANGENT SLOPE NOT STEEPER THAN 8% BEYOND THE VERTICAL CURVE. THE SLOPE MAY BE STEEPER, IF REQUIRED, TO MEET EXISTING APPROACH SLOPE. HOWEVER, APPROACH ROAD SLOPE SHOULD NOT BE STEEPER THAN EXISTING SLOPE.

Computer File Information

Creation Date: 07/04/12	Initials: DD
Last Modification Date: 07/08/13	Initials: LTA
Full Path: www.coloradodot.info/business/designsupport	(R-X)
Drawing File Name: 203010101.dgn	(R-X)
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	(R-X)

Sheet Revisions

Date:	Comments
07/08/13	Added notes to Approach Road Typ. Sec. detail.

Colorado Department of Transportation

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Denver, CO 80222
Phone: 303-757-9021 FAX: 303-757-9868

Division of Project Support DLM/LTA

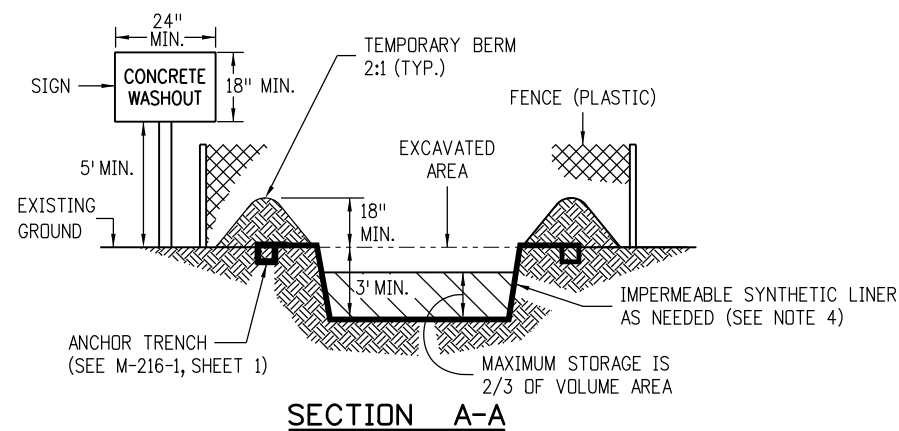
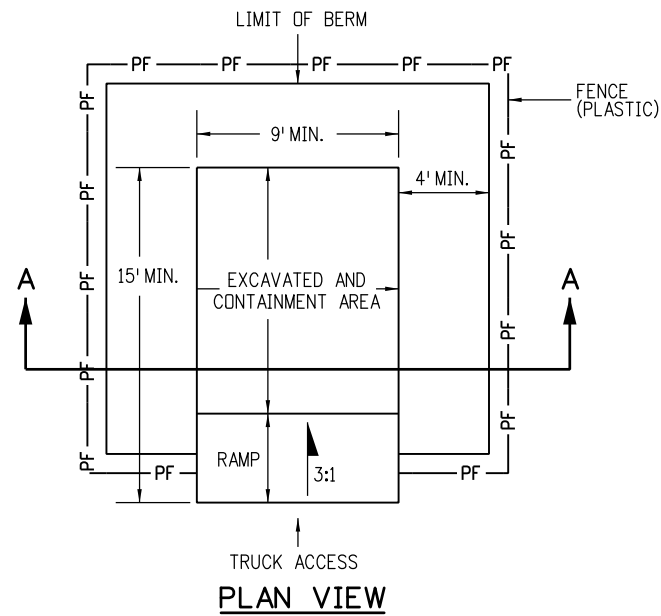
APPROACH ROADS

Issued By: Project Development Branch July 4, 2012

STANDARD PLAN NO.

M-203-1

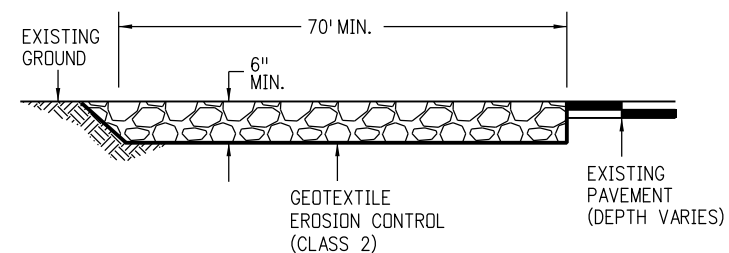
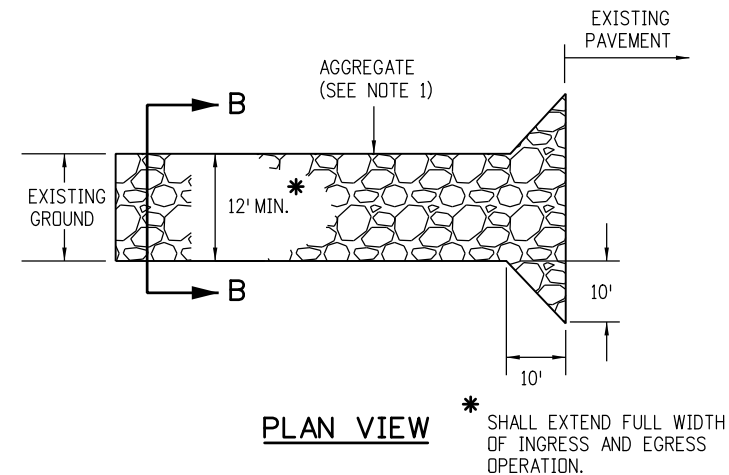
Sheet No. 1 of 1



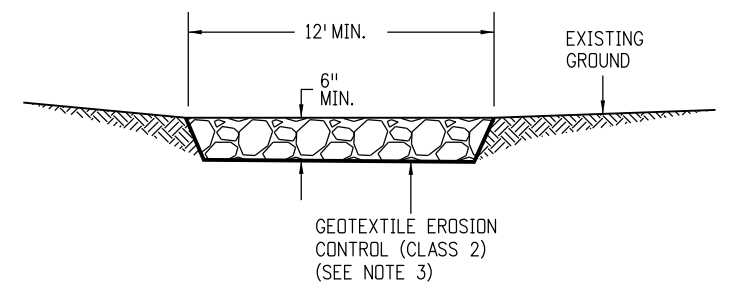
NOTES:

1. A FENCE (PLASTIC) CONFORMING TO SECTION 607 SHALL BE INSTALLED AROUND THE CONCRETE WASHOUT AREA, EXCEPT AT THE OPENING.
2. THE CONCRETE WASHOUT SIGN SHALL HAVE LETTERS AT LEAST 3 INCHES HIGH AND CONFORM TO SUBSECTION 630.02.
3. ALL MATERIALS AND LABOR TO COMPLETE THE CONCRETE WASHOUT STRUCTURE SHALL BE INCLUDED IN THE COST OF WORK AND NOT PAID FOR SEPARATELY.
4. THE BOTTOM OF EXCAVATION SHALL BE A MINIMUM OF FIVE FEET ABOVE GROUND WATER. IF NOT, IT SHALL BE LINED WITH AN IMPERMEABLE SYNTHETIC LINER THAT IS DESIGNED TO CONTROL SEEPAGE AT A MAXIMUM RATE OF 6 TO 10 CENTIMETERS PER SECOND.
5. THE PAY ITEM NUMBER FOR CONCRETE WASHOUT STRUCTURE (EACH) IS 208-00045.

CONCRETE WASHOUT STRUCTURE



ELEVATION SECTION



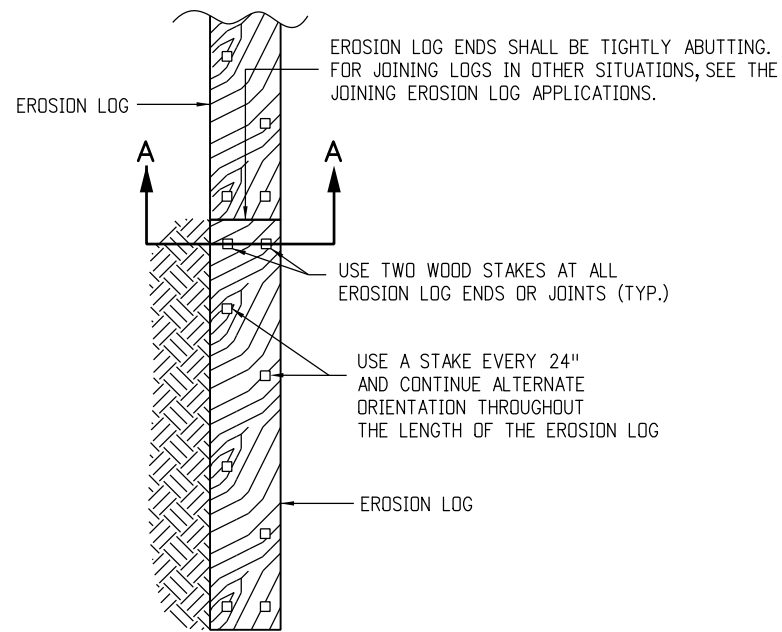
SECTION B-B

NOTES:

1. AGGREGATE SHALL CONFORM TO SUBSECTION 208.02 (K).
2. THE CONTRACTOR SHALL PROTECT CURB AND GUTTER THAT CROSSES THE ENTRANCE FROM DAMAGE. PROTECTION OF THE CURB AND GUTTER SHALL BE INCLUDED IN THE COST OF WORK AND NOT PAID FOR SEPARATELY.
3. GEOTEXTILE SHALL CONFORM TO SUBSECTION 712.08.
4. ALL MATERIALS AND LABOR TO COMPLETE THE VEHICLE TRACKING PAD SHALL BE INCLUDED IN THE COST OF WORK AND NOT PAID FOR SEPARATELY.
5. THE PAY ITEM NUMBER FOR VEHICLE TRACKING PAD (EACH) IS 208-00070.

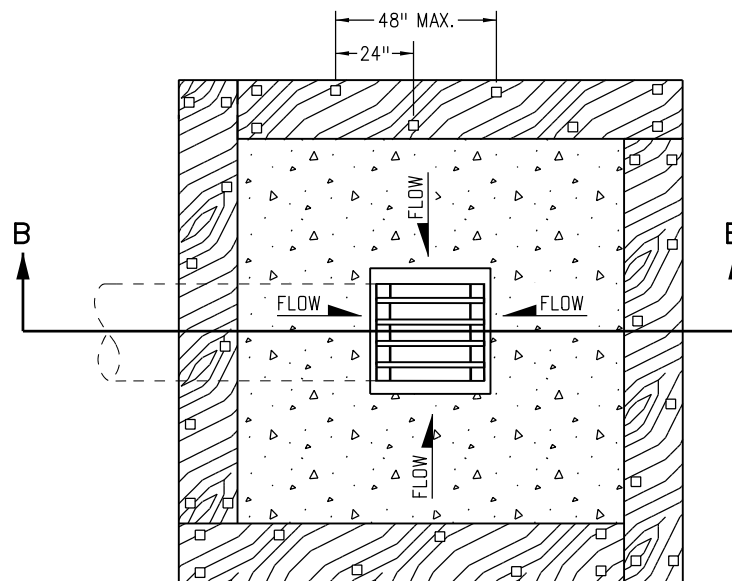
VEHICLE TRACKING PAD

Computer File Information		Sheet Revisions		Colorado Department of Transportation  4201 East Arkansas Avenue CDOT HQ, 4th Floor Denver, CO 80222 Phone: 303-757-9021 FAX: 303-757-9868 Division of Project Support JBK/LTA	<h1>TEMPORARY EROSION CONTROL</h1> <p>Issued By: Project Development Branch on July 4, 2012</p>	STANDARD PLAN NO.	
Creation Date: 07/04/12	Initials: JBK	Date:	Comments			<h2>M-208-1</h2>	
Last Modification Date: 08/10/17	Initials: LTA	(R-X) 07/16/15	Deleted the two Soil Retention Blanket detail sheets. They are now standard M-216-1 Soil Retention Covering.				
Full Path: www.coloradodot.info/business/designsupport		(R-X) 03/29/16	Minor revisions to some dimensions and General Notes.				
Drawing File Name: 2080101011.dgn		(R-X)				<h2>Sheet No. 1 of 11</h2>	
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English		(R-X)					

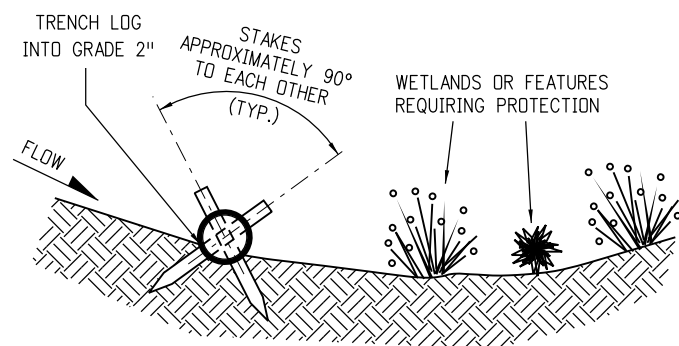


PLAN VIEW

EROSION LOGS PAY ITEMS	
NUMBER	DESCRIPTION
208-00012	TYPE 1 (9")
208-00002	TYPE 1 (12")
208-00013	TYPE 1 (20")
208-00007	TYPE 2 (8")
208-00008	TYPE 2 (12")
208-00009	TYPE 2 (18")

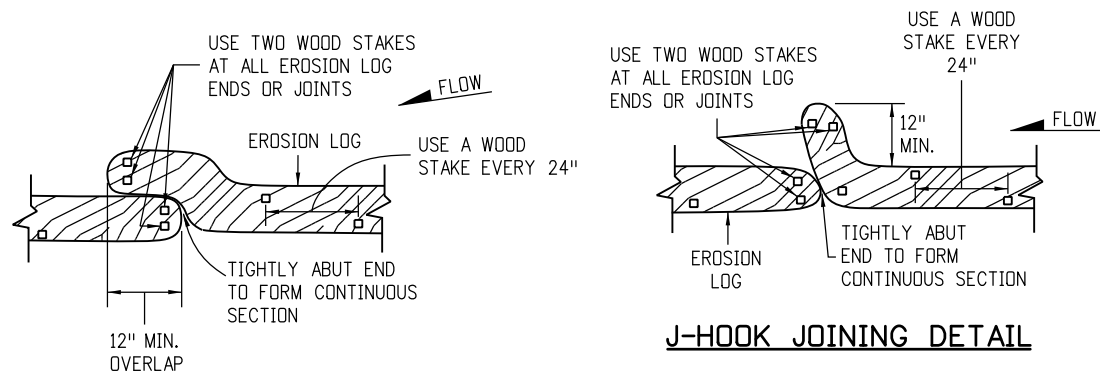


PLAN VIEW

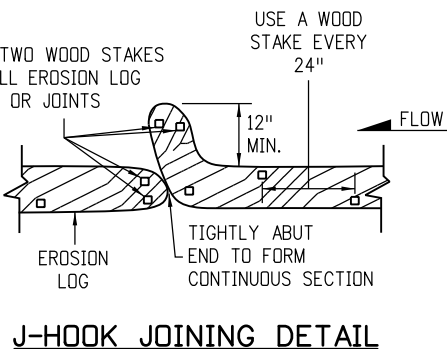


SECTION A-A

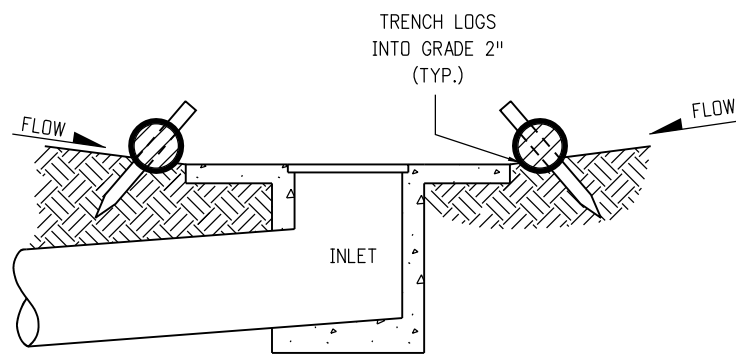
TYPICAL STAKE INSTALLATION



OVERLAP JOINING DETAIL



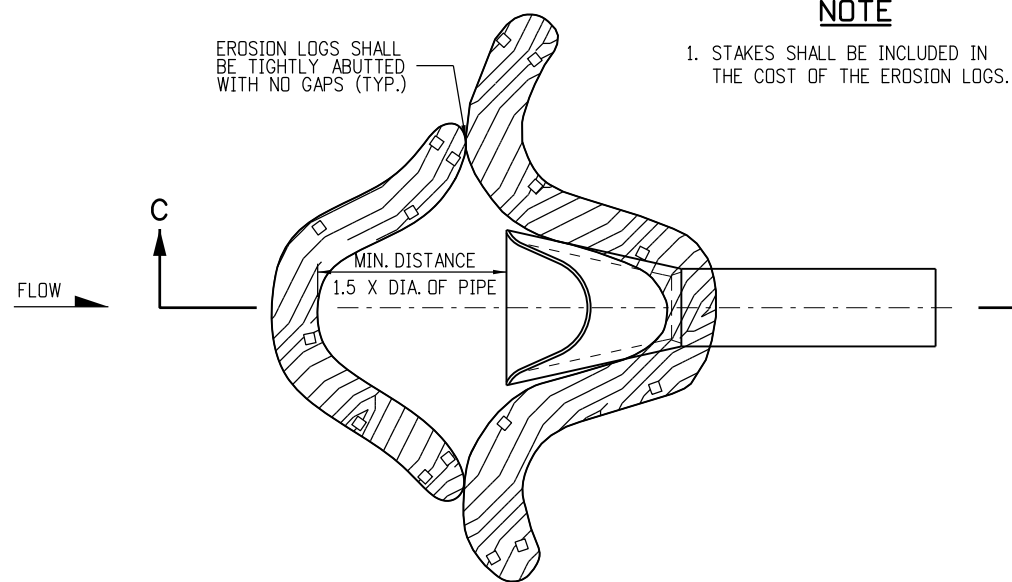
J-HOOK JOINING DETAIL



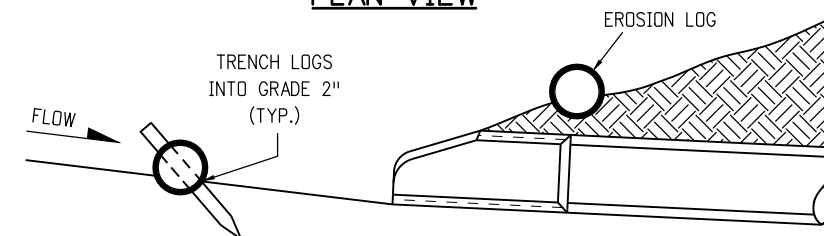
SECTION B-B

EROSION LOG FILTER AT DROP INLET

NOTE: LOCATE EROSION LOGS AT THE OUTSIDE EDGE OF THE CONCRETE APRON.

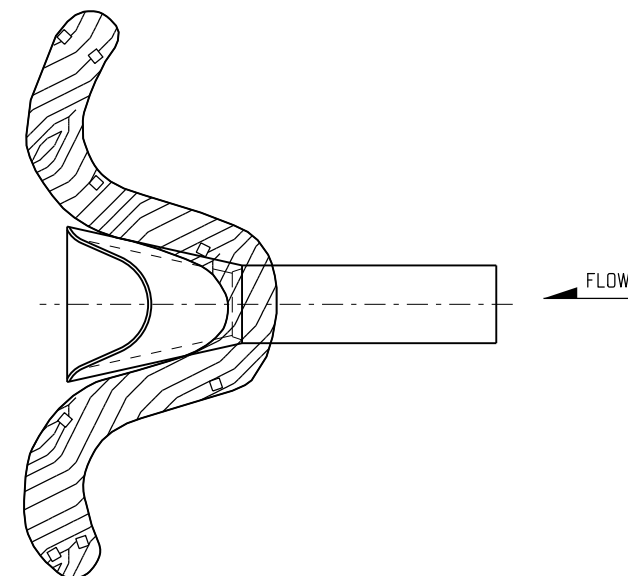


PLAN VIEW



SECTION C-C
(NOT ALL LOGS SHOWN)

EROSION LOG CULVERT INLET PROTECTION



EROSION LOG CULVERT OUTLET PROTECTION

EROSION LOG APPLICATIONS

JOINING EROSION LOG APPLICATIONS

Computer File Information	
Creation Date: 07/04/12	Initials: JBK
Last Modification Date: 08/10/17	Initials: LTA
Full Path: www.coloradodot.info/business/designsupport	
Drawing File Name: 2080102011.dgn	
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	

Sheet Revisions	
Date:	Comments
03/29/16	Minor revisions to some dimensions. Added Erosion Logs Pay Item table.

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 Division of Project Support JBK/LTA

**TEMPORARY
EROSION CONTROL**

Issued By: Project Development Branch on July 4, 2012

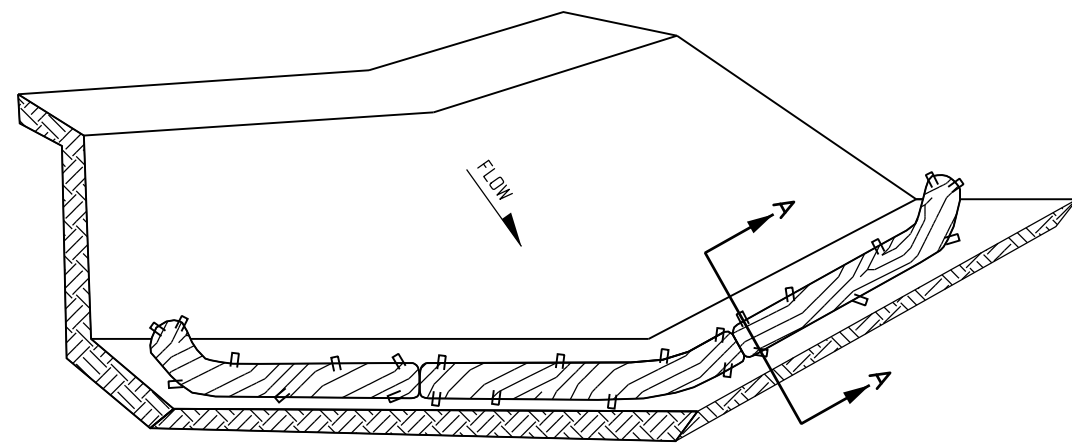
STANDARD PLAN NO.

M-208-1

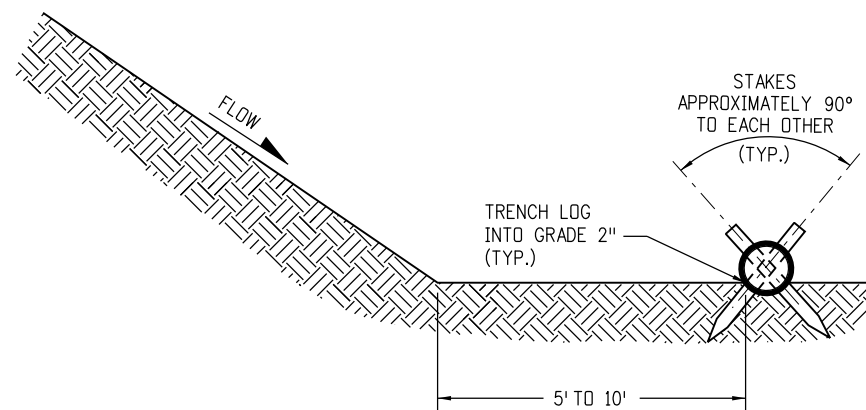
Sheet No. 2 of 11

NOTES

1. SILT FENCE SHALL HAVE A MAXIMUM DRAINAGE AREA OF ONE-QUARTER ACRE PER 100 FEET OF SILT FENCE LENGTH; MAXIMUM SLOPE LENGTH BEHIND BARRIER IS 100 FEET; MAXIMUM GRADIENT BEHIND THE BARRIER IS 2:1.
2. SILT FENCE USED AT TOE OF SLOPE SHALL BE PLACED 5 TO 10 FEET BEYOND TOE OF SLOPE TO PROVIDE STORAGE CAPACITY.
3. SILT FENCE SHALL BE PLACED ON THE CONTOUR WITH ENDS FLARED UP SLOPE.
4. THE MAXIMUM LENGTH OF EROSION LOGS OR SILT FENCES WITHOUT A FLARED END TURNING UPSLOPE IS 150 FEET.



ISOMETRIC VIEW



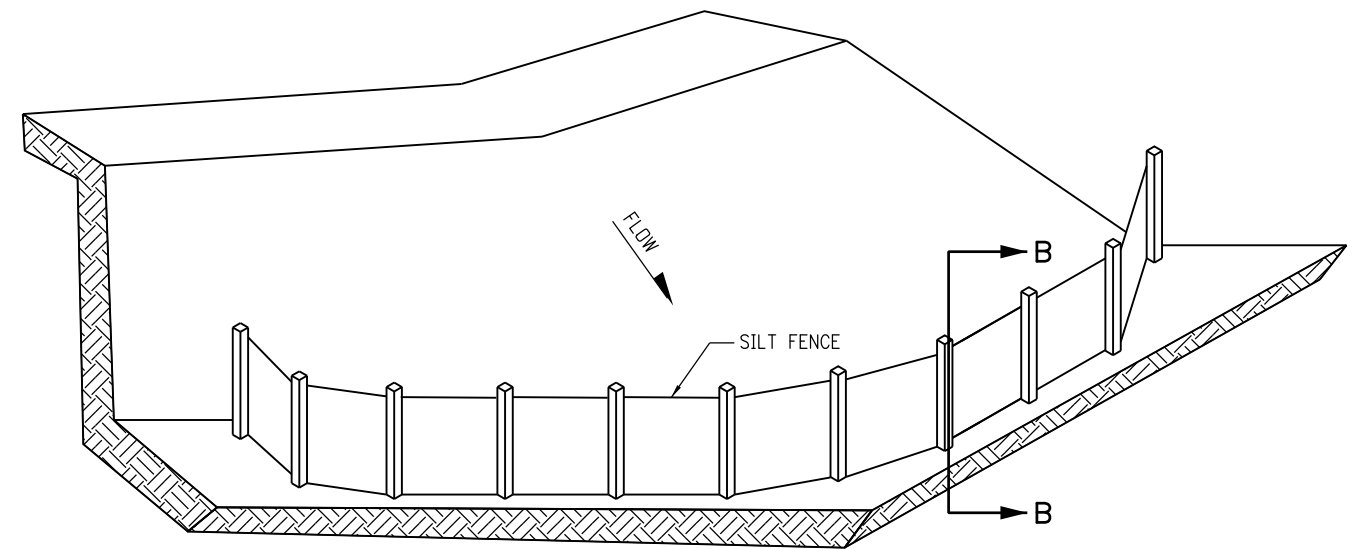
SECTION A-A

NOTES:

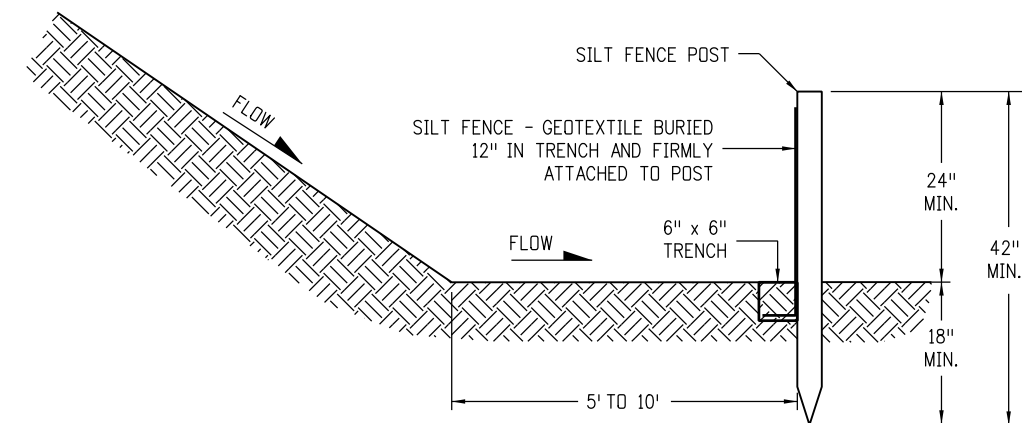
1. EROSION LOGS USED AT TOE OF SLOPE SHALL BE PLACED 5 TO 10 FEET BEYOND TOE OF SLOPE TO PROVIDE STORAGE CAPACITY.
2. EROSION LOGS SHALL BE PLACED ON THE CONTOUR WITH ENDS FLARED UP SLOPE.
3. SEE SHEET 2 OF 11 FOR JOINING LOGS DETAIL.

EROSION LOGS PAY ITEMS	
NUMBER	DESCRIPTION
208-00012	TYPE 1 (9")
208-00002	TYPE 1 (12")
208-00013	TYPE 1 (20")
208-00007	TYPE 2 (8")
208-00008	TYPE 2 (12")
208-00009	TYPE 2 (18")

EROSION LOG TOE OF SLOPE PROTECTION



ISOMETRIC VIEW



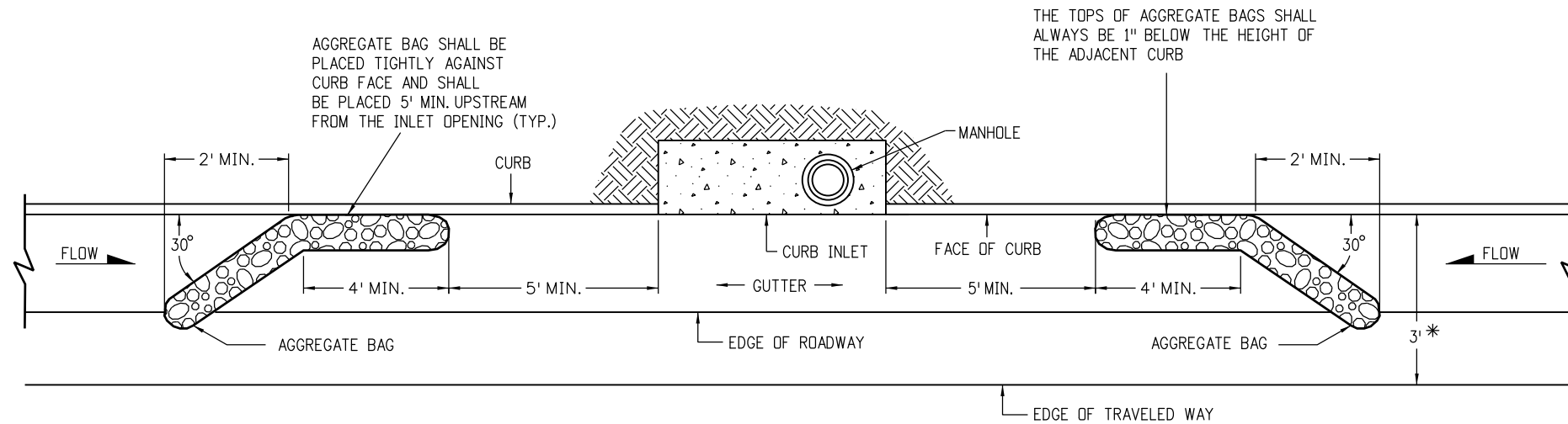
SECTION B-B

SILT FENCE TOE OF SLOPE PROTECTION

NOTE: THE PAY ITEM NUMBER FOR SILT FENCE (LF) IS 208-00020.

TOE OF SLOPE PROTECTION APPLICATIONS

Computer File Information Creation Date: 07/04/12 Initials: JBK Last Modification Date: 08/10/17 Initials: LTA Full Path: www.coloradodot.info/business/designsupport Drawing File Name: 2080103011.dgn CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English		Sheet Revisions <table border="1"> <thead> <tr> <th>Date:</th> <th>Comments</th> </tr> </thead> <tbody> <tr> <td>03/29/16</td> <td>Minor revisions to some dimensions. Added Erosion Logs Pay Item table.</td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> </tbody> </table>		Date:	Comments	03/29/16	Minor revisions to some dimensions. Added Erosion Logs Pay Item table.							Colorado Department of Transportation 4201 East Arkansas Avenue CDOT HQ, 4th Floor Denver, CO 80222 Phone: 303-757-9021 FAX: 303-757-9868 Division of Project Support JBK/LTA		<p style="text-align: center;">TEMPORARY EROSION CONTROL</p> Issued By: Project Development Branch on July 4, 2012		STANDARD PLAN NO. M-208-1 Sheet No. 3 of 11	
Date:	Comments																		
03/29/16	Minor revisions to some dimensions. Added Erosion Logs Pay Item table.																		

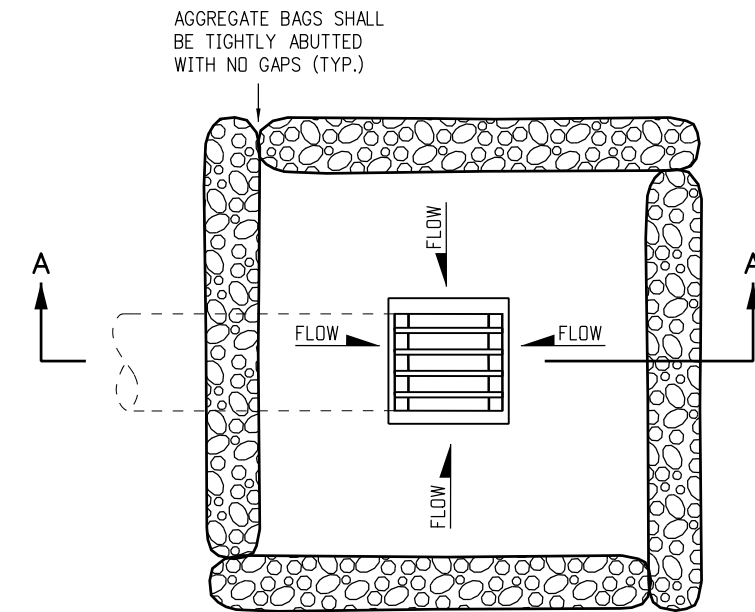


PLAN VIEW

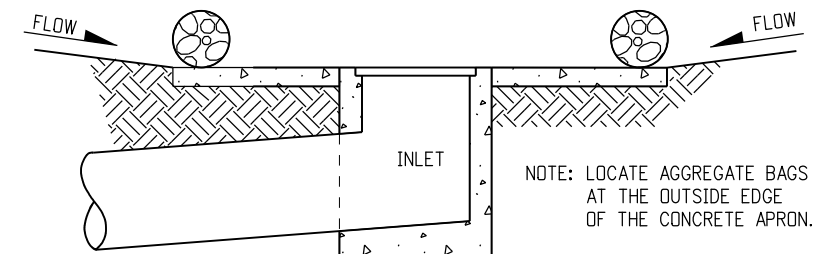
* NOTE: USE AGGREGATE BAGS ONLY WHEN THERE IS A MINIMUM CLEARANCE OF 3 FEET FROM THE EDGE OF THE TRAVELED WAY TO THE FACE OF CURB.

LENGTH OF INLET (L)	NUMBER OF AGGREGATE BAGS UPSTREAM OF INLET
0' - 5'	1
6' - 10'	2
L > 10'	3

AGGREGATE BAGS AT STORM DRAIN INLET (TYPE I)



PLAN VIEW



SECTION A-A

AGGREGATE BAGS AT DROP INLET

AGGREGATE BAG APPLICATIONS

NOTE: THE PAY ITEM NUMBER FOR AGGREGATE BAG (LF) IS 208-00035

Computer File Information	
Creation Date: 07/04/12	Initials: JBK
Last Modification Date: 08/10/17	Initials: LTA
Full Path: www.coloradodot.info/business/designsupport	
Drawing File Name: 2080104011.dgn	
CAD Ver.: MicroStation V8	Scale: Not to Scale Units: English

Sheet Revisions	
Date:	Comments
03/29/16	Added some dimensions and Note.

Colorado Department of Transportation

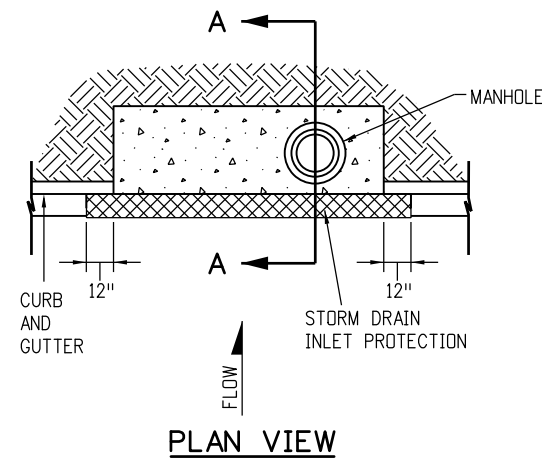
4201 East Arkansas Avenue
 CDOT HQ, 4th Floor
 Denver, CO 80222
 Phone: 303-757-9021 FAX: 303-757-9868

Division of Project Support **JBK/LTA**

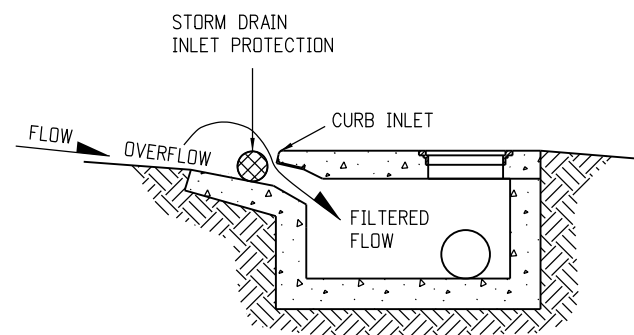
**TEMPORARY
 EROSION CONTROL**

Issued By: Project Development Branch on July 4, 2012

STANDARD PLAN NO.
M-208-1
Sheet No. 4 of 11



PLAN VIEW

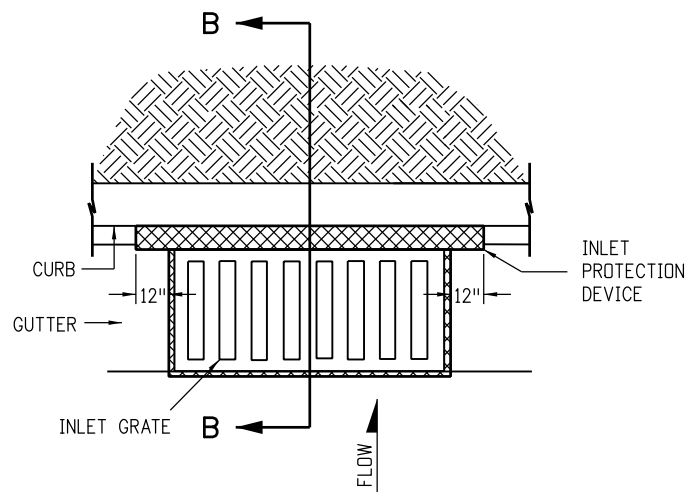


SECTION A-A

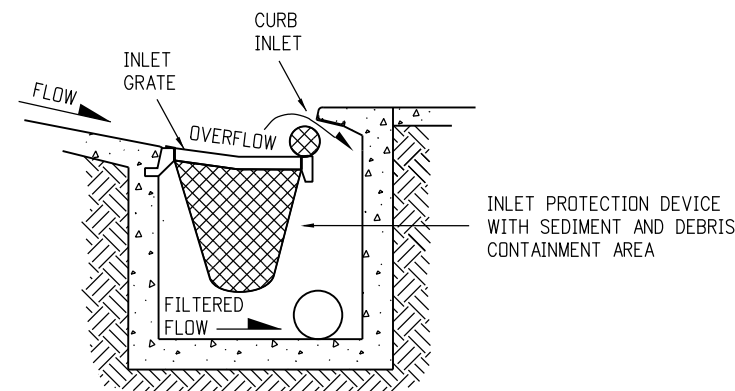
STORM DRAIN INLET PROTECTION (TYPE I)

NOTES

1. INLET PROTECTION DEVICE SHALL EXTEND 12 INCHES PAST EACH END OF THE INLET.
2. THE PAY ITEM NUMBERS FOR STORM DRAIN INLET PROTECTION (TYPE I) ARE 208-00051 (LF), 208-00053 84" (EACH), 208-00057 144" (EACH), AND 208-00058 204" (EACH).
3. FOR STORM DRAIN INLET TYPES I AND II, IF THERE IS A MINIMUM CLEARANCE OF 3 FEET FROM THE EDGE OF THE TRAVELED WAY TO THE FACE OF CURB, USE THE AGGREGATE BAGS AT STORM DRAIN INLET (TYPE I) DETAIL ON SHEET 4 INSTEAD.



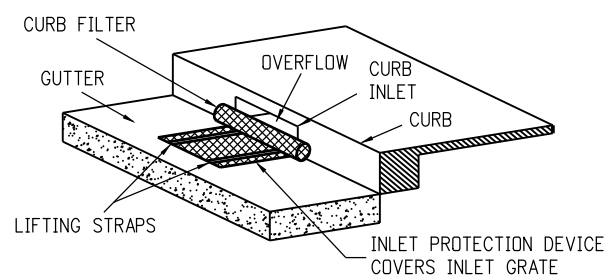
PLAN VIEW



SECTION B-B

OPTION A

STORM DRAIN INLET PROTECTION (TYPE II)

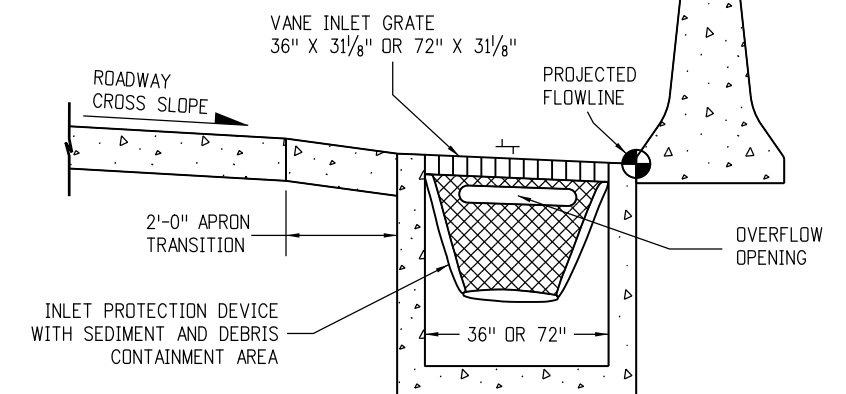


ISOMETRIC VIEW

OPTION B

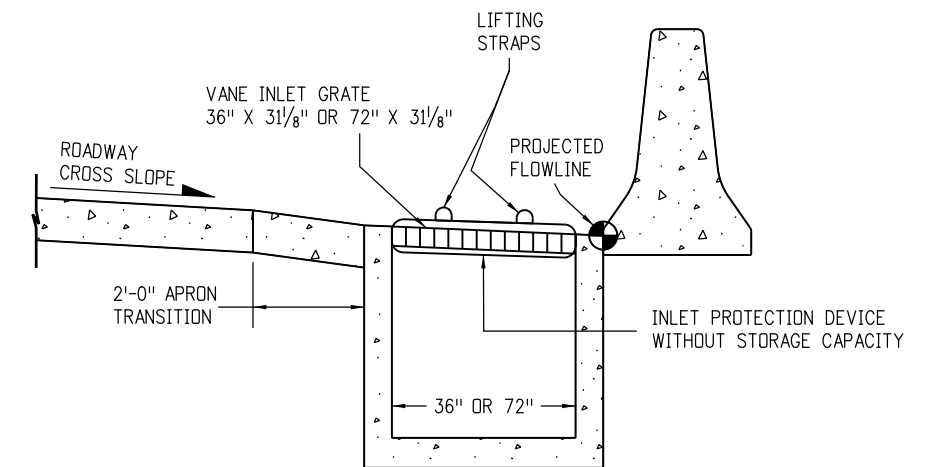
STORM DRAIN INLET PROTECTION (TYPE II)

NOTE: THE PAY ITEM NUMBERS FOR STORM DRAIN INLET PROTECTION (TYPE II) ARE 208-00052 (LF) AND 208-00054 (EACH).



OPTION A

STORM DRAIN INLET PROTECTION (TYPE III)



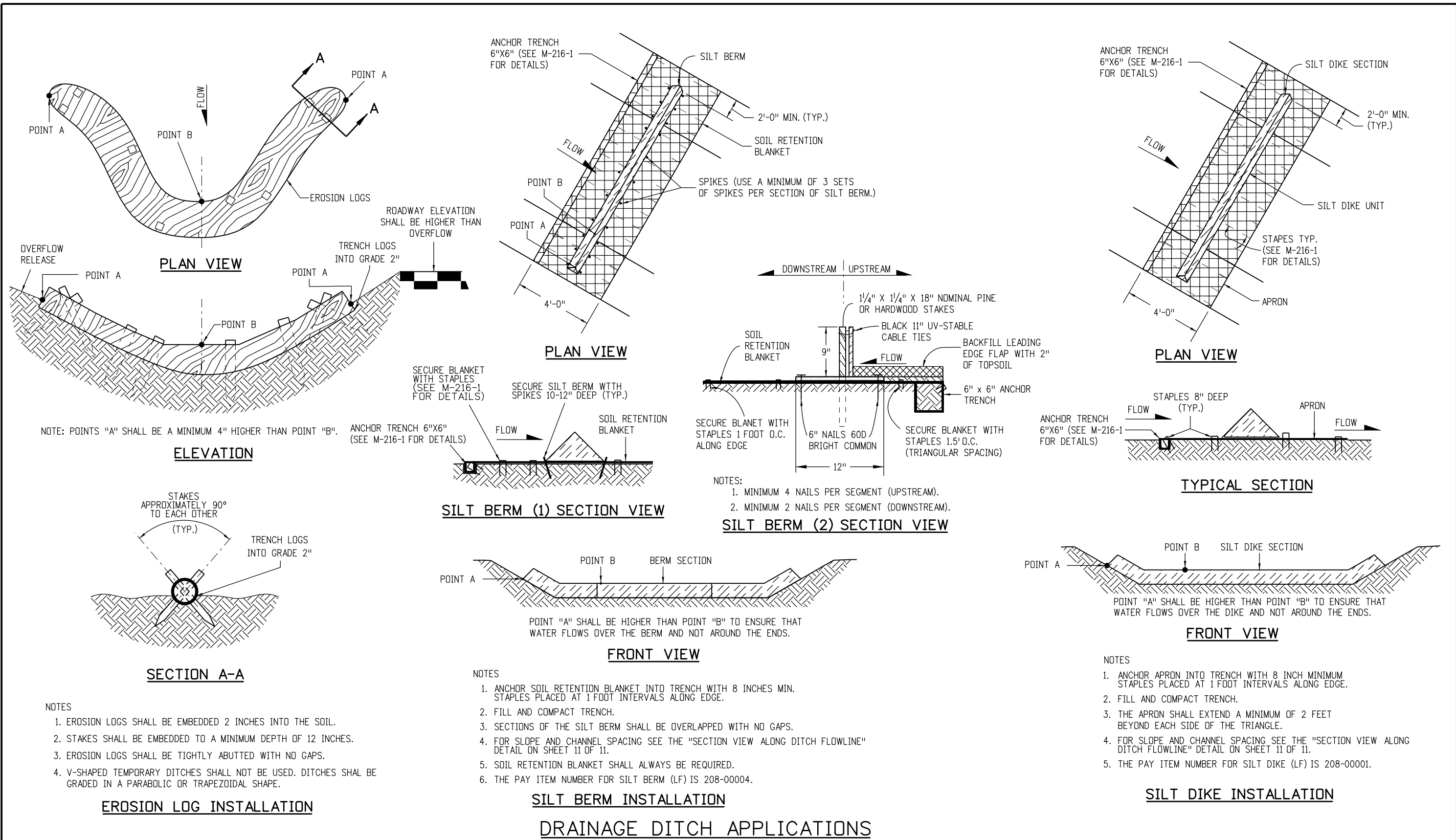
OPTION B

STORM DRAIN INLET PROTECTION (TYPE III)

NOTE: THE PAY ITEM NUMBER FOR STORM DRAIN INLET PROTECTION (TYPE III) (EACH) IS 208-00056.

STORM DRAIN INLET PROTECTION TYPES

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Creation Date: 07/04/12	Initials: JBK	Date:	Comments			M-208-1
Last Modification Date: 08/10/17	Initials: LTA	(R-X) 03/29/16	Added Note 3.			
Full Path: www.coloradodot.info/business/designsupport	(R-X) 08/10/17	(R-X)	Added new Pay Item numbers for Type I and II.			
Drawing File Name: 2080105011.dgn	(R-X)	(R-X)				
CAD Ver.: MicroStation V8	Scale: Not to Scale	Units: English	(R-X)		Issued By: Project Development Branch on July 4, 2012	Sheet No. 5 of 11



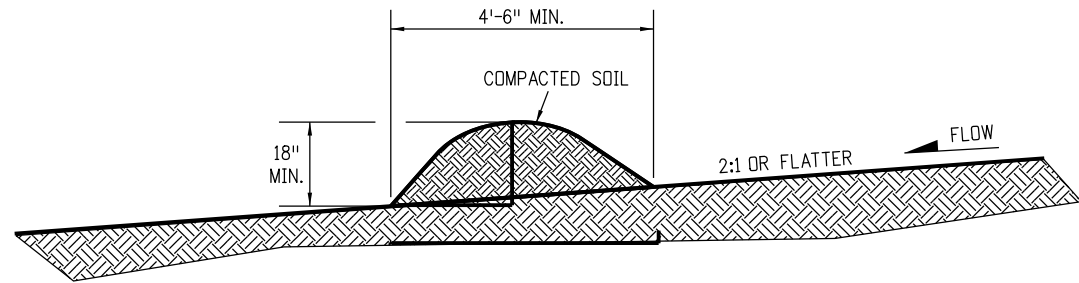
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CAD Ver.: MicroStation V8	Scale: Not to Scale Units: English

Sheet Revisions	
Date:	Comments
(R-X)	
(R-X)	
(R-X)	
(R-X)	

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TEMPORARY EROSION CONTROL
 Issued By: Project Development Branch on July 4, 2012

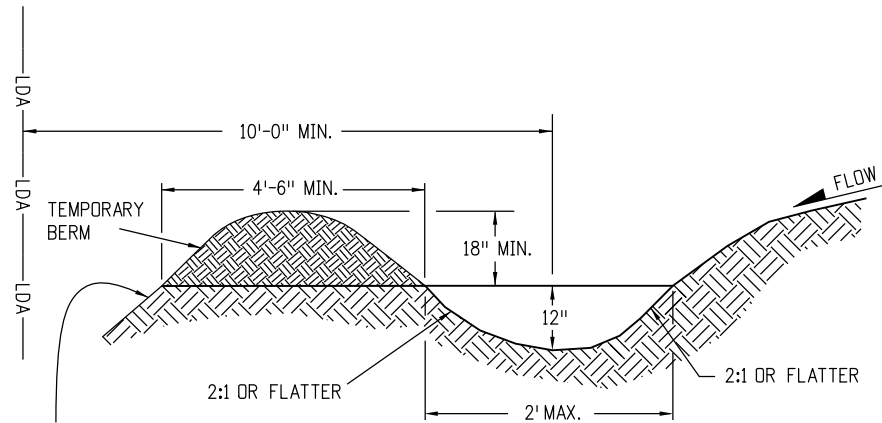
STANDARD PLAN NO.
M-208-1
 Sheet No. 6 of 11



NOTES:

1. BERMS SHALL HAVE A HEIGHT OF 18 INCHES, SIDE SLOPES OF 2:1 OR FLATTER AND A MINIMUM BASE WIDTH OF 4'-6" FEET.
2. BERMS SHALL BE USED TO INTERCEPT AND DIVERT DRAINAGE TO A DESIGNATED OUTLET.
3. BERMS SHALL NOT BE USED WHERE DRAINAGE AREA EXCEEDS 10 ACRES.
4. BERMS SHALL BE CONSTRUCTED OUT OF MATERIAL COMPACTED WITH AT LEAST A MINIMUM OF ONE WHEEL ROLLED COMPACTION.
5. THE PAY ITEM NUMBER FOR TEMPORARY BERM (LF) IS 208-00300.
6. BERMS SHALL BE CONSTRUCTED OUT OF ACCEPTABLE MATERIAL THAT CAN BE COMPACTED AND RECEIVE AT A MINIMUM HEAVY EQUIPMENT WHEEL ROLLED COMPACTION.

TEMPORARY BERM

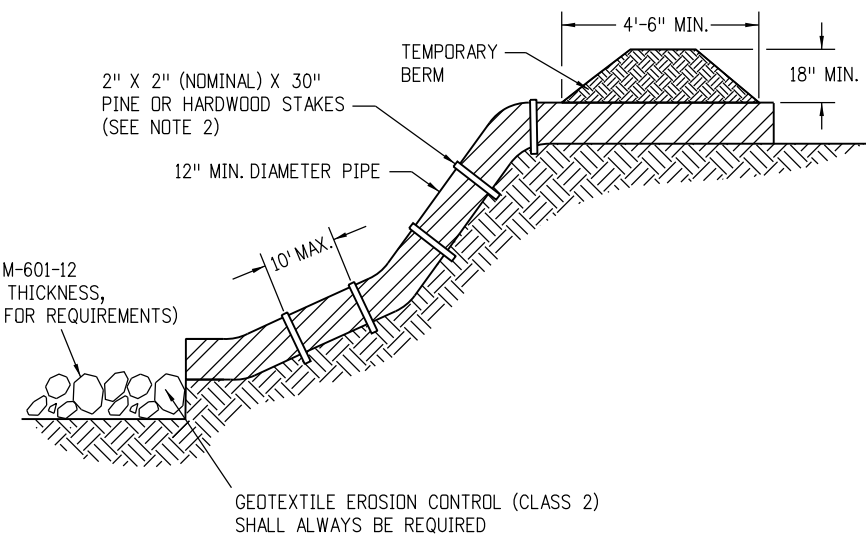


FOR BERMS TALLER THAN 2',
INSTALL TOE OF SLOPE BMP.
SEE SHEET 3 OF 11 FOR DETAILS.

NOTES

1. TEMPORARY DIVERSION DITCHES SHALL BE CONSTRUCTED ACROSS THE SLOPE TO INTERCEPT RUNOFF AND DIRECT IT TO A STABLE OUTLET OR SEDIMENT TRAP.
2. USE THE TEMPORARY DIVERSION DITCH IMMEDIATELY ABOVE A NEW CUT, FILL SLOPE, OR AROUND THE PERIMETER OF A DISTURBED AREA.
3. THE GRADIENT ALONG THE FLOW PATH SHALL HAVE A POSITIVE GRADE TO ASSURE DRAINAGE, BUT SHALL NOT BE SO STEEP AS TO RESULT IN EROSION DUE TO HIGH VELOCITY.
4. THE DIVERSION FLOWLINE SHALL ALWAYS BE LOCATED A MINIMUM 10 FEET FROM THE OUTSIDE LIMITS OF DISTURBED AREA BOUNDARY.
5. THE PAY ITEM NUMBER FOR TEMPORARY DIVERSION (LF) IS 208-00301.

TEMPORARY DIVERSION



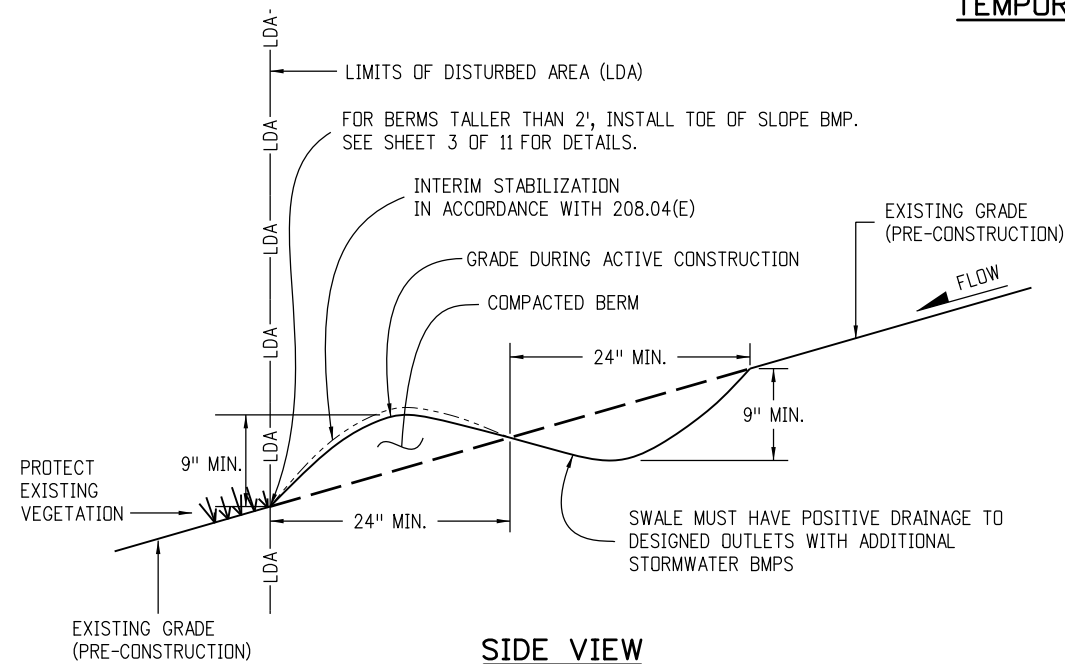
* RIPRAP OUTLET PROTECTION (SEE M-601-12 FOR MIN. HORIZONTAL LAYOUT AND THICKNESS, AND SPECIFICATION 506 "RIPRAP" FOR REQUIREMENTS)

* RIPRAP SIZE $D_{50} = 6$ IN. OR AS SHOWN ON THE PLANS.

NOTES

1. ANCHOR SIZE VARIES ACCORDING TO PIPE SIZE
2. TO SECURE THE PIPE, DRIVE STAKES INTO GROUND, THEN TIE A 12 GAUGE WIRE BETWEEN THEM ABOVE AND ACROSS THE PIPE'S WIDTH.
3. THE OUTLET SHALL BE ALIGNED WITH THE FLOW DIRECTION OF THE EXISTING GRADE. PERPENDICULAR DISCHARGE TO A CHANNEL SHALL NOT BE ACCEPTABLE.
4. THE GRADE AROUND THE INLET TO THE PIPE SHALL BE COMPACTED.
5. THE PAY ITEM NUMBER FOR TEMPORARY SLOPE DRAINS (LF) IS 208-00060.

TEMPORARY SLOPE DRAINS



SIDE VIEW

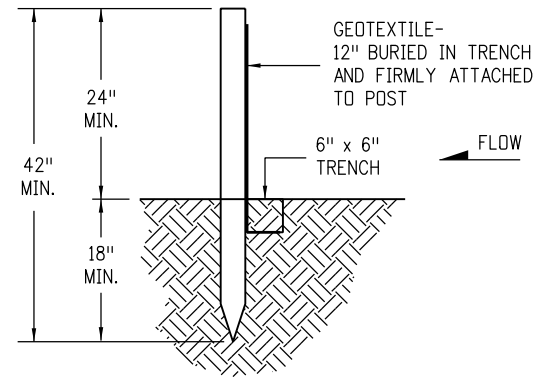
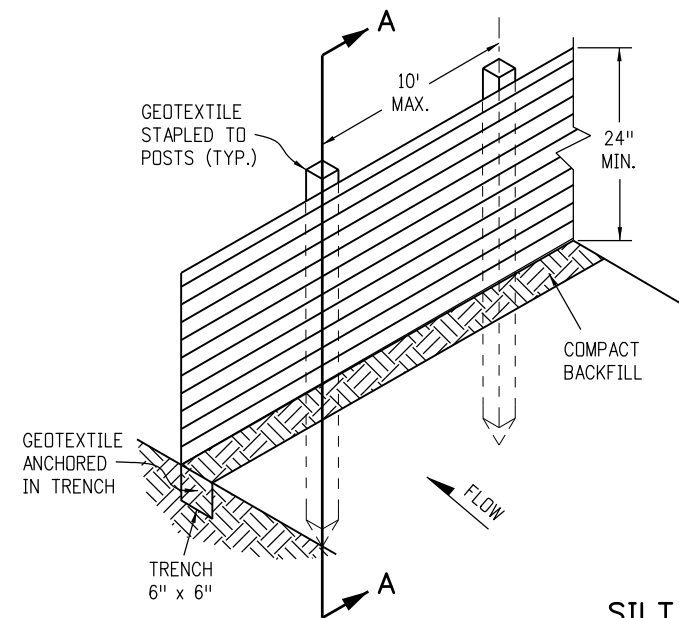
TEMPORARY BERM (AT EDGE OF DISTURBANCE)

NOTES:

1. BERMS CAN ONLY BE USED IF CONDITIONS ALLOW UNINTERRUPTED POSITIVE GRADE (MAXIMUM GRADIENT 3%) TO AN OUTLET PROTECTED WITH ADDITIONAL BMPs.
2. MAXIMUM DRAINAGE AREA FOR EACH OUTLET FROM THE SWALE SHALL BE LIMITED TO 2 ACRES.
3. CONTRACTOR SHALL SALVAGE TOPSOIL AND PLACE AFTER BERM IS REMOVED FOR FINAL SEEDING OF ALL DISTURBED AREAS.
4. ALL ACTIVITIES REQUIRED TO ACCOMPLISH TEMPORARY BERM (EXCLUDING SURFACE MULCHING) SHALL BE INCLUDED IN THE COST OF WORK AND WILL NOT BE PAID FOR SEPARATELY.
5. BERMS SHALL BE CONSTRUCTED OUT OF ACCEPTABLE MATERIAL THAT CAN BE COMPACTED AND RECEIVE AT A MINIMUM HEAVY EQUIPMENT WHEEL ROLLED COMPACTION.
6. THE PAY ITEM NUMBER FOR TEMPORARY BERM (LF) IS 208-00300.

GRADING APPLICATIONS

Computer File Information		Sheet Revisions		Colorado Department of Transportation 4201 East Arkansas Avenue CDOT HQ, 4th Floor Denver, CO 80222 Phone: 303-757-9021 FAX: 303-757-9868 Division of Project Support JBK/LTA	TEMPORARY EROSION CONTROL	STANDARD PLAN NO.
Creation Date: 07/04/12	Initials: JBK	Date:	Comments			M-208-1
Last Modification Date: 08/10/17	Initials: LTA	03/29/16	Revisions to some dimensions and Notes.			Sheet No. 7 of 11
Full Path: www.coloradodot.info/business/designsupport	(R-X)					
Drawing File Name: 2080107011.dgn	(R-X)					
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	(R-X)				Issued By: Project Development Branch on July 4, 2012	

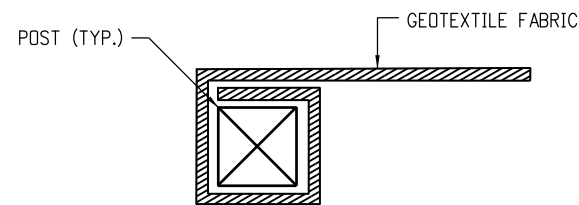


SECTION A-A

SILT FENCE

NOTES

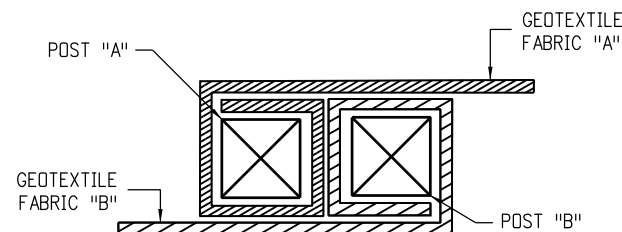
1. GEOTEXTILE SHALL BE ATTACHED TO WOOD POSTS WITH THREE OR MORE STAPLES PER POST. STAPLES SHALL BE HEAVY DUTY WIRE AND AT LEAST 1" INCH LONG
2. WOOD POST SHALL BE 1/2" X 1/2" NOMINAL.
3. THE PAY ITEM NUMBER FOR SILT FENCE (LF) IS 208-00020.
4. THE SILT FENCE SHALL BE PLACED ON THE CONTOUR (AT THE SAME ELEVATION ±6"). THE ENDS SHALL BE FLARED UP SLOPE (MINIMUM ELEVATION GAIN OF 18").



END SECTION DETAIL (PLAN VIEW)

NOTE

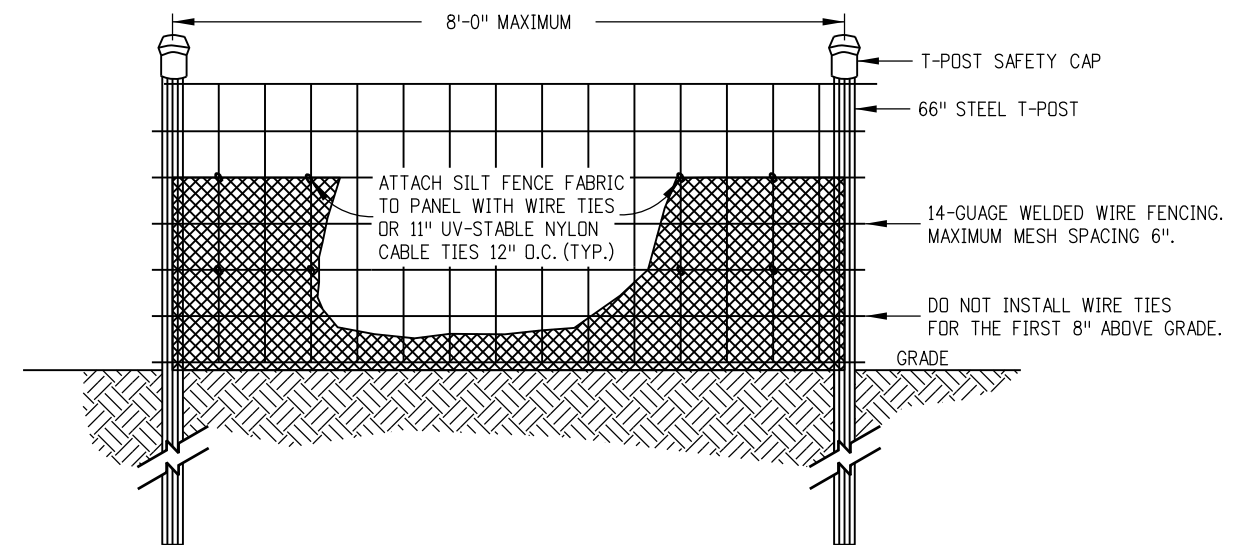
1. THE END OF THE SILT FENCE FABRIC SHALL BE WRAPPED APPROX. 6 INCHES AROUND A WOODEN POST ONE FULL TURN, THEN SECURED ALONG THE POST WITH 6 HEAVY DUTY WIRE STAPLES AT LEAST 1 INCH LONG.



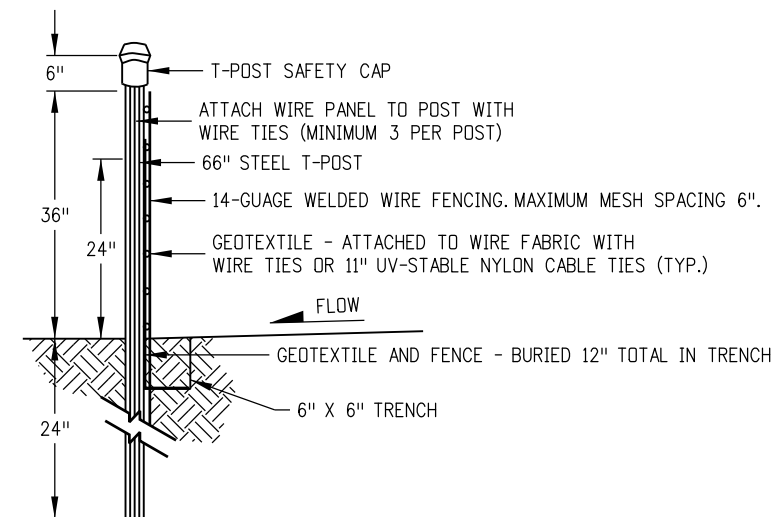
JOINING SECTION DETAIL (PLAN VIEW)

NOTES

1. THE ENDS OF THE SILT FENCE FABRIC SHALL BE JOINED TOGETHER BY WRAPPING APPROX. 6 INCHES OF EACH END AROUND A WOODEN POST ONE FULL TURN, THEN SECURED ALONG THE POST WITH 6 HEAVY DUTY WIRE STAPLES AT LEAST 1 INCH LONG.
2. POSTS SHALL BE TIGHTLY ABUTTED WITH NO GAPS TO PREVENT POTENTIAL FLOW-THROUGH OF SEDIMENT AT JOINT.



ELEVATION VIEW



SIDE VIEW

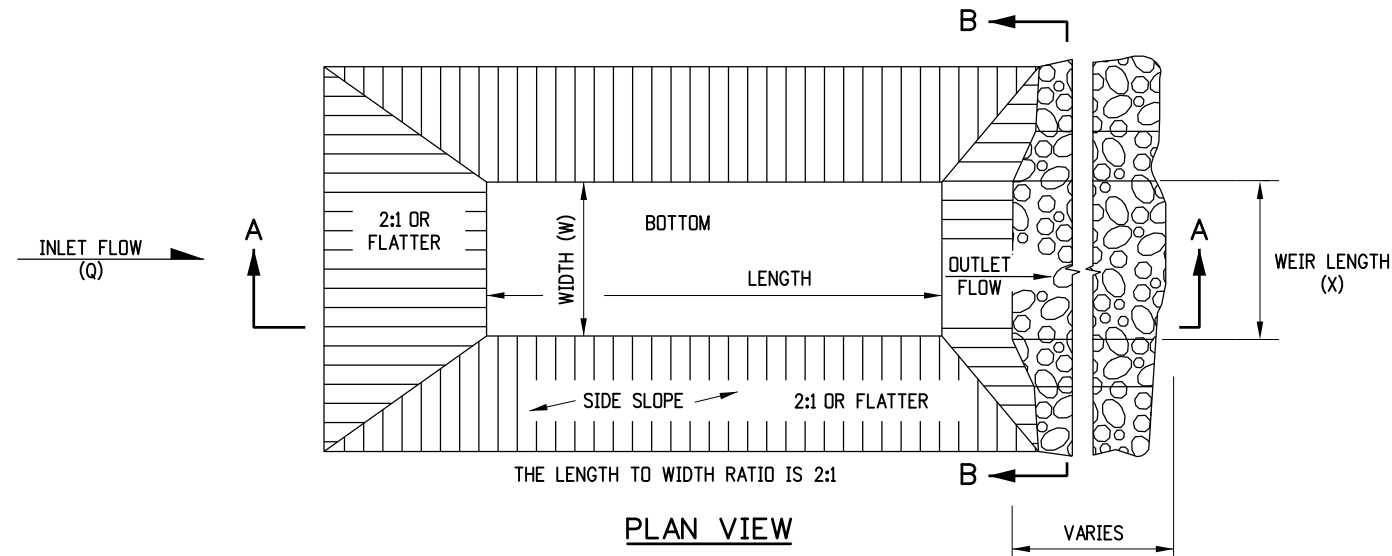
NOTES

1. THE ENDS OF THE SILT FENCE FABRIC SHALL BE JOINED TOGETHER BY WRAPPING APPROX. 6 INCHES OF EACH END AROUND A STEEL T-POST, THEN SECURED ALONG THE POST WITH WIRE TIES (MINIMUM 3 PER POST).
2. POSTS SHALL BE TIGHTLY ABUTTED WITH NO GAPS TO PREVENT POTENTIAL FLOW-THROUGH OF SEDIMENT AT JOINT.
3. SILT FENCES SHALL NOT BE USED FOR CHECK DAMS.
4. THE PAY ITEM NUMBER FOR SILT FENCE (REINFORCED) (LF) IS 208-00021.

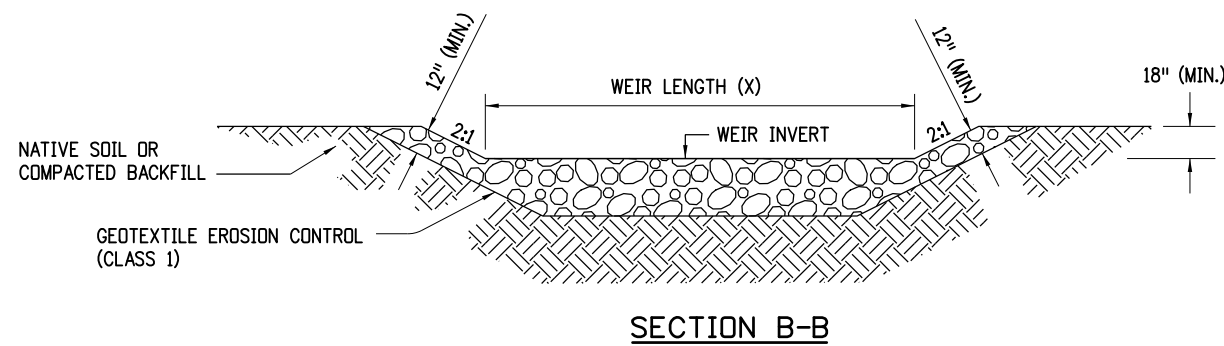
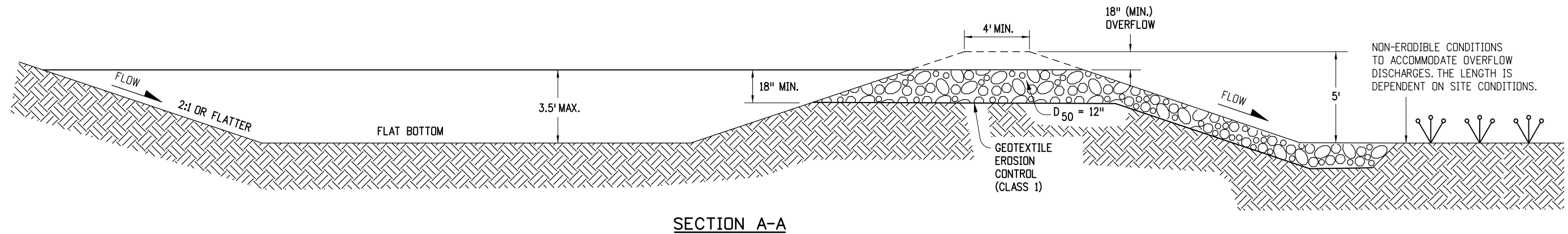
SILT FENCE (REINFORCED)

SILT FENCE APPLICATIONS

Computer File Information		Sheet Revisions		Colorado Department of Transportation 4201 East Arkansas Avenue CDOT HQ, 4th Floor Denver, CO 80222 Phone: 303-757-9021 FAX: 303-757-9868 Division of Project Support JBK/LTA	TEMPORARY EROSION CONTROL	STANDARD PLAN NO.
Creation Date: 07/04/12	Initials: JBK	Date:	Comments			M-208-1
Last Modification Date: 08/10/17	Initials: LTA	(R-X) 03/29/16	Minor revisions to some dimensions and Notes.			Sheet No. 8 of 11
Full Path: www.coloradodot.info/business/designsupport		(R-X) 05/26/16	Rewrote the notes for the Silt Fence (Reinforced) detail.			
Drawing File Name: 2080108011.dgn		(R-X)				
CAD Ver.: MicroStation V8	Scale: Not to Scale	Units: English	(R-X)	Issued By: Project Development Branch on July 4, 2012		



- NOTES**
1. THE MAXIMUM DRAINAGE AREA IS 5 ACRES.
 2. THE MAXIMUM STRUCTURE LIFE IS 2 YEARS.
 3. THE STORAGE AREA IS 1800 CUBIC FEET PER ACRE.
 4. THE MAXIMUM EMBANKMENT HEIGHT SHALL BE 5 FT. MEASURED ON THE DOWNSTREAM SIDE.
 5. THE LENGTH/WIDTH RATIO MAY BE ADJUSTED TO MEET SITE CONDITIONS WHEN APPROVED BY THE ENGINEER.
 6. WIDTH (W) OF SEDIMENT TRAP IS APPROXIMATELY EQUAL TO THE WEIR LENGTH (X).
 7. SEDIMENT TRAP DESIGN SHALL BE APPROVED BY THE ENGINEER.
 8. THE DOWN GRADE FROM WEIR SHALL BE STABLE AND NON-ERODIBLE.
 9. THE PAY ITEM NUMBER FOR SEDIMENT TRAP (LF) IS 208-00033.



DRAINAGE AREA (ACRES)	WEIR LENGTH (FEET)
1	4
2	6
3	8
4	10
5	12

WEIR LENGTH TABLE

SEDIMENT TRAP

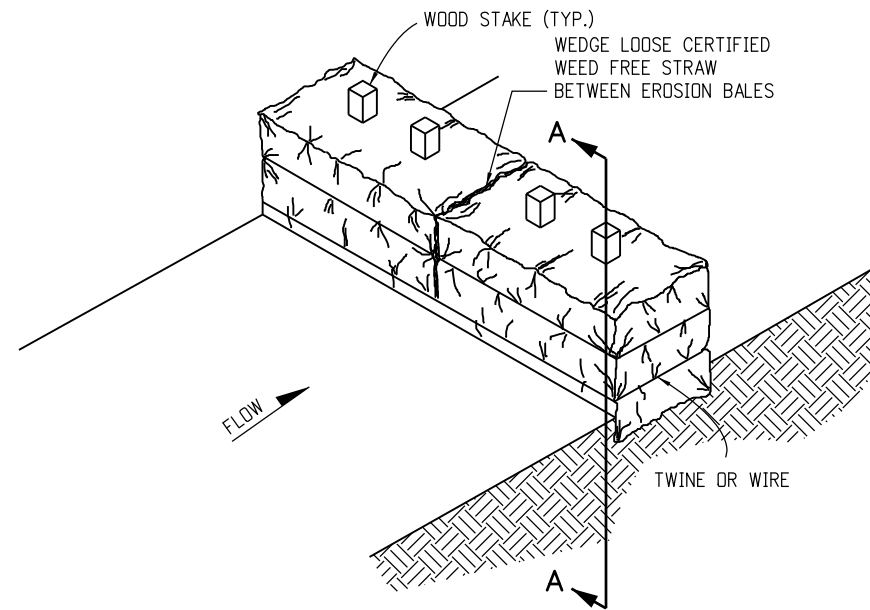
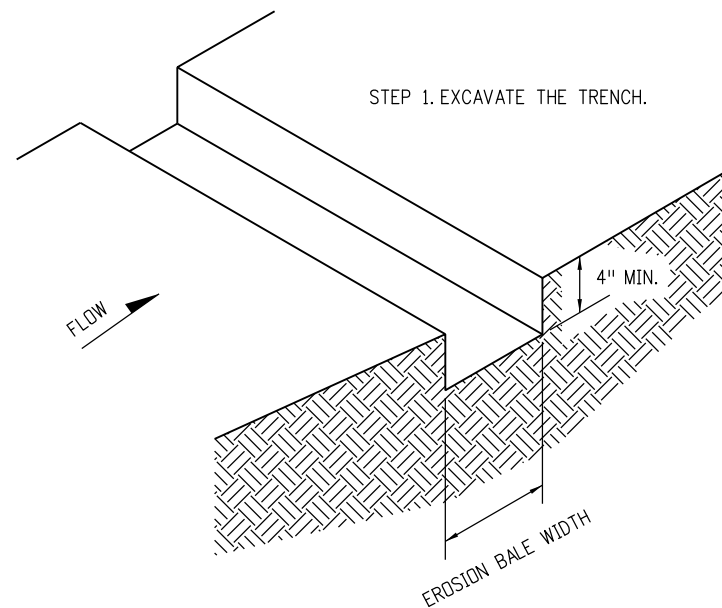
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Drawing File Name: 2080109010.dgn	
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	

Sheet Revisions	
Date:	Comments
03/29/16	Minor revisions to some dimensions.
(R-X)	
(R-X)	
(R-X)	
(R-X)	

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 Division of Project Support JBK/LTA

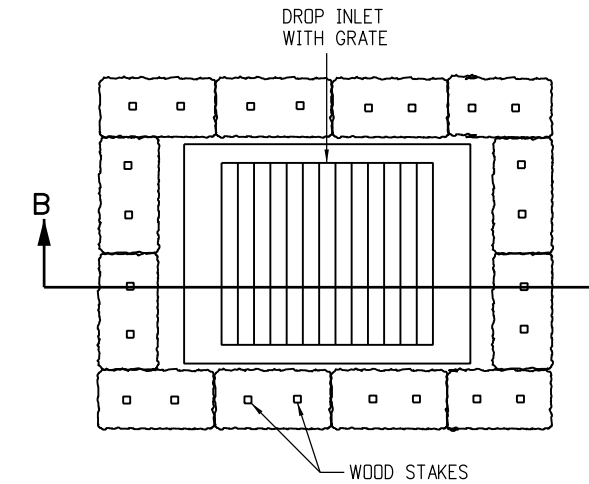
**TEMPORARY
 EROSION CONTROL**
 Issued By: Project Development Branch on July 4, 2012

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 Sheet No. 9 of 11

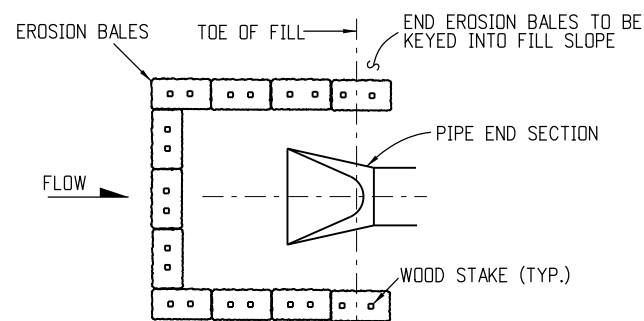


NOTES

1. STAKES SHALL BE WOOD AND SHALL BE 2" X 2" X 30" NOMINAL.
2. EROSION BALES SHALL BE 18" X 18" X 36".
3. EROSION BALES SHALL BE ENTRENCHED 4 IN. MINIMUM INTO THE SOIL, THIGHTLY ABUTTED WITH NO GAPS, STAKED, AND BACKFILLED AROUND THE ENTIRE OUTSIDE PERIMETER.
4. EROSION BALES CANNOT BE USED FOR CHECK DAMS.
5. THE PAY ITEM NUMBER FOR EROSION BALES (WEED FREE) (EA) IS 208-00011.

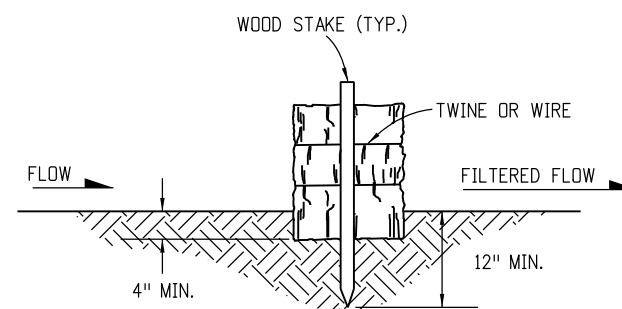


PLAN VIEW



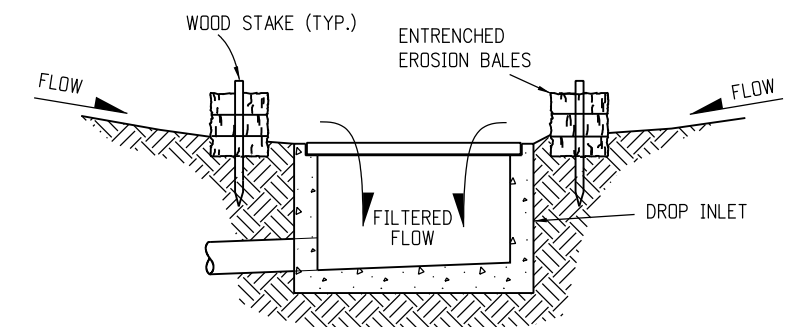
PLAN VIEW

EROSION BALE CULVERT INLET PROTECTION



SECTION A-A

EROSION BALE TRENCHING AND STAKING

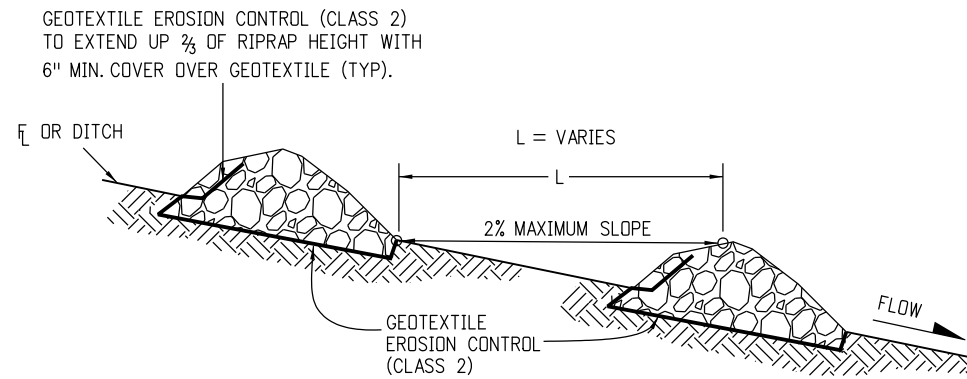


SECTION B-B

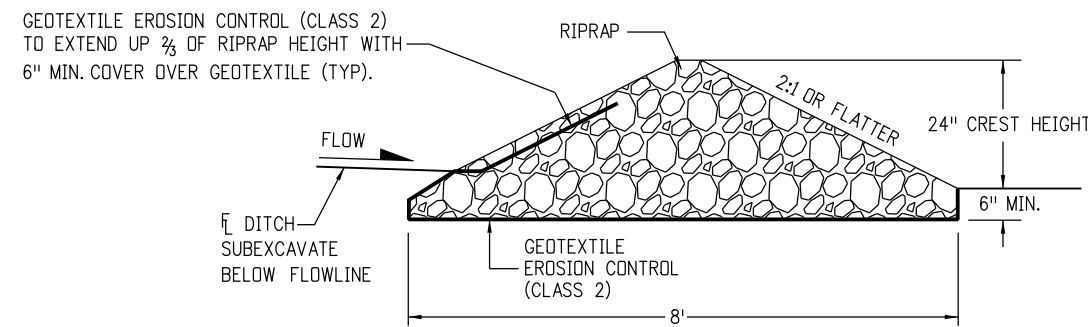
EROSION BALE FILTER AT DROP INLET

EROSION BALE APPLICATIONS

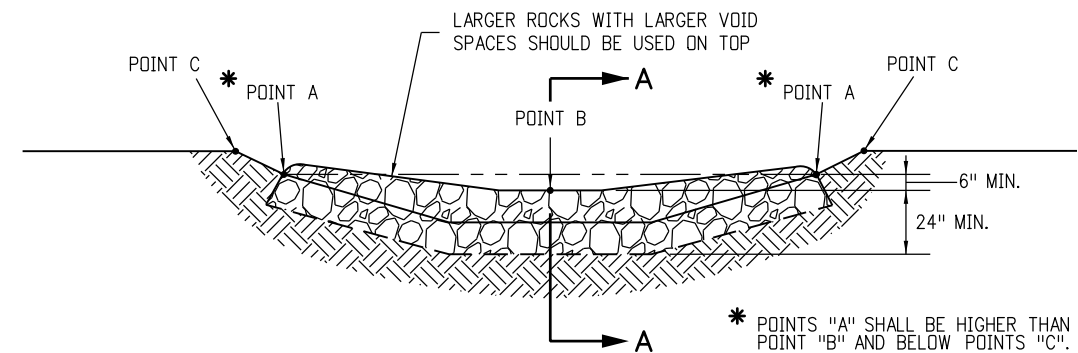
Computer File Information		Sheet Revisions		<p>Colorado Department of Transportation 4201 East Arkansas Avenue CDOT HQ, 4th Floor Denver, CO 80222 Phone: 303-757-9021 FAX: 303-757-9868 Division of Project Support JBK/LTA</p>	<p>TEMPORARY EROSION CONTROL</p> <p>Issued By: Project Development Branch on July 4, 2012</p>	STANDARD PLAN NO.	
Creation Date: 07/04/12	Initials: JBK	Date:	Comments			<p>M-208-1</p> <p>Sheet No. 10 of 11</p>	
Last Modification Date: 08/10/17	Initials: LTA	03/29/16	Minor revisions to some dimensions.				
Full Path: www.coloradodot.info/business/designsupport	(R-X)						
Drawing File Name: 20801010011.dgn	(R-X)						
CAD Ver.: MicroStation V8	Scale: Not to Scale	Units: English	(R-X)				



SECTION VIEW ALONG DITCH FLOWLINE



SECTION A-A



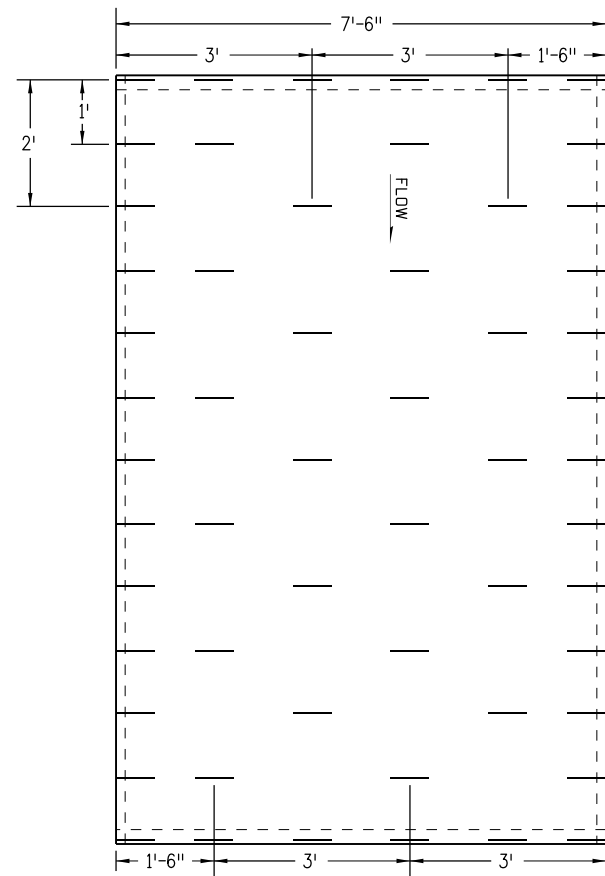
TYPICAL SECTION VIEW

NOTES:

1. RIPRAP SIZE $D_{50} = 6"$ OR AS SHOWN ON THE PLANS.
2. THE GEOTEXTILE EROSION CONTROL SHALL BE CLASS 2 AND CONFORM TO THE REQUIREMENTS OF SUBSECTION 712.08.
3. THE ENDS OF RIPRAP CHECK DAM SHALL BE A MINIMUM OF 6 IN. HIGHER THAN CENTER OF CHECK DAM.
4. FOR USE AS TEMPORARY CHECK DAMS ONLY AND NOT FOR PERMANENT INSTALLATIONS.
5. THE PAY ITEM NUMBER FOR ROCK CHECK DAM (EA) IS 208-00041.

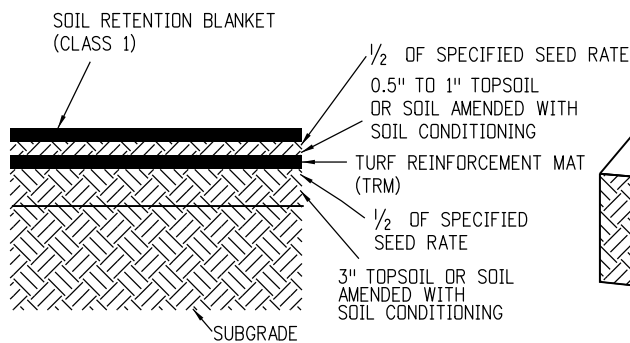
ROCK CHECK DAM

Computer File Information		Sheet Revisions		Colorado Department of Transportation  4201 East Arkansas Avenue CDOT HQ, 4th Floor Denver, CO 80222 Phone: 303-757-9021 FAX: 303-757-9868 Division of Project Support JBK/LTA	TEMPORARY EROSION CONTROL	STANDARD PLAN NO.
Creation Date: 07/04/12	Initials: JBK	Date:	Comments:			M-208-1
Last Modification Date: 08/10/17	Initials: LTA	03/29/16	Minor revisions to some Notes.			Sheet No. 11 of 11
Full Path: www.coloradodot.info/business/designsupport	(R-X)				Issued By: Project Development Branch on July 4, 2012	
Drawing File Name: 20801011011.dgn	(R-X)					
CAD Ver.: MicroStation V8	(R-X)					
Scale: Not to Scale						
Units: English						



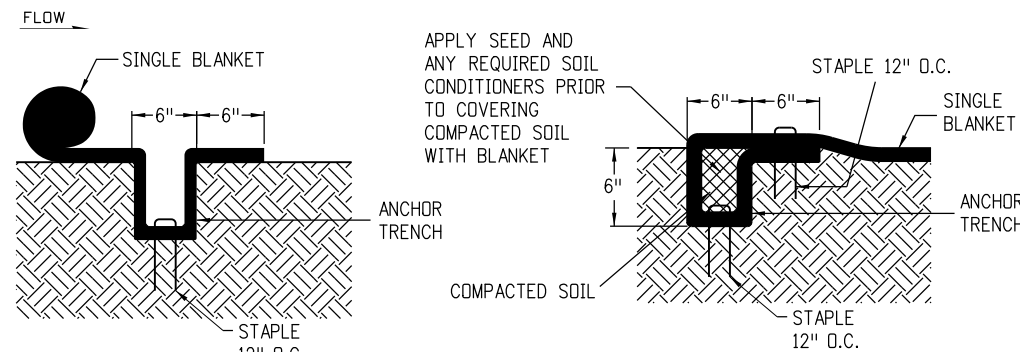
TYPICAL STAPLE PATTERN FOR CHANNEL APPLICATION

SEE SUBSECTION 216.05.



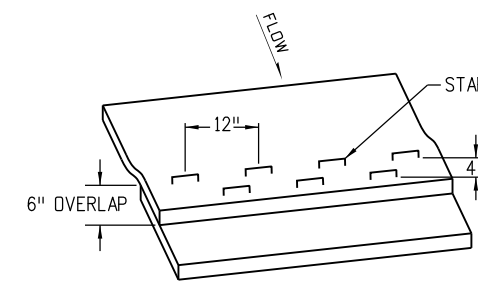
SOIL FILLED TRM APPLICATION

1. PLACE 3" TOPSOIL OR SOIL AMENDED WITH SOIL CONDITIONING.
2. APPLY SEED AND RAKE INTO SOIL.
3. INSTALL TRM.
4. PLACE 0.5" TO 1" TOPSOIL OR SOIL AMENDED WITH SOIL CONDITIONING.
5. APPLY SEED AND RAKE INTO SOIL.
6. INSTALL SOIL RETENTION BLANKET (CLASS 1).



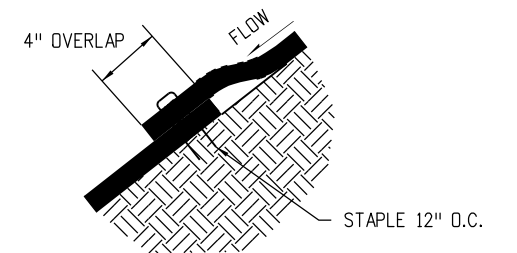
ANCHOR TRENCH (A)

TO BE USED AT THE BEGINNING AND END OF THE CHANNEL ACROSS IT'S ENTIRE WIDTH.



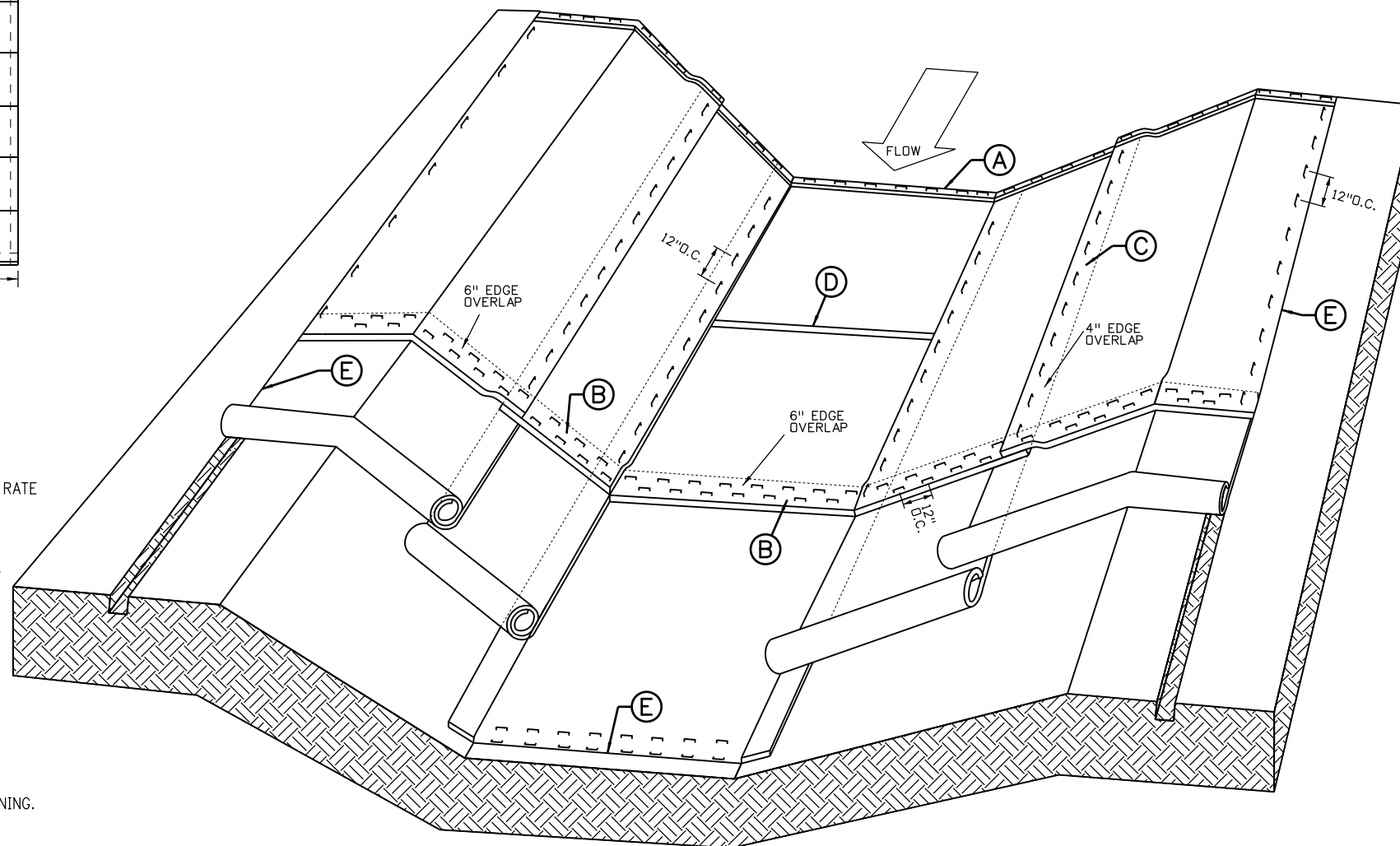
CONSECUTIVE ROLL OVERLAP (B)

TO BE USED WHEREVER ONE ROLL OF BLANKET ENDS AND ANOTHER BEGINS WITH UPSTREAM BLANKET PLACED ON TOP OF THE BLANKET ON THE DOWNSTREAM SIDE.



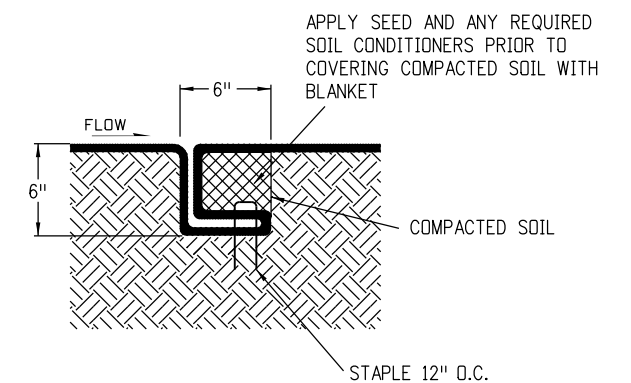
SIDE SEAM OVERLAP (C)

TO BE USED FOR OVERLAP WHEN 2 WIDTHS OF BLANKET ARE APPLIED SIDE BY SIDE WITH THE UPHILL BLANKET PLACED ON TOP OF THE BLANKET ON THE DOWNHILL SIDE.



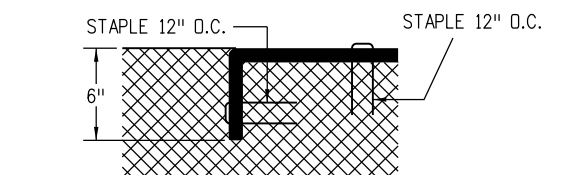
SOIL RETENTION BLANKETS/TURF REINFORCEMENT MATS (TRM) CHANNEL APPLICATION

IN ACCORDANCE WITH SECTION 216.



CHANNEL CHECK SLOT (D)

TO BE USED AT 30' INTERVALS IN CHANNEL FLOWLINE.



TERMINATION OF CHANNEL (E)

GENERAL NOTES

1. Z SHAPED FOLD TO BE USED ON SLOPE EVERY 35 FEET MAXIMUM.
2. STAPLE CHECK LOCATIONS SHOULD BE AT LEAST 15 FEET FROM THE BOTTOM OF SLOPE.

Computer File Information

Creation Date: 07/04/12	Initials: DLM
Last Modification Date: 07/16/15	Initials: LTA
Full Path: www.coloradodot.info/business/designsupport	
Drawing File Name: 2016010102.dgn	
CAD Ver.: MicroStation V8	Scale: Not to Scale Units: English

Sheet Revisions

Date:	Comments
(R-X)	
(R-X)	
(R-X)	
(R-X)	

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 Division of Project Support DLM/LTA

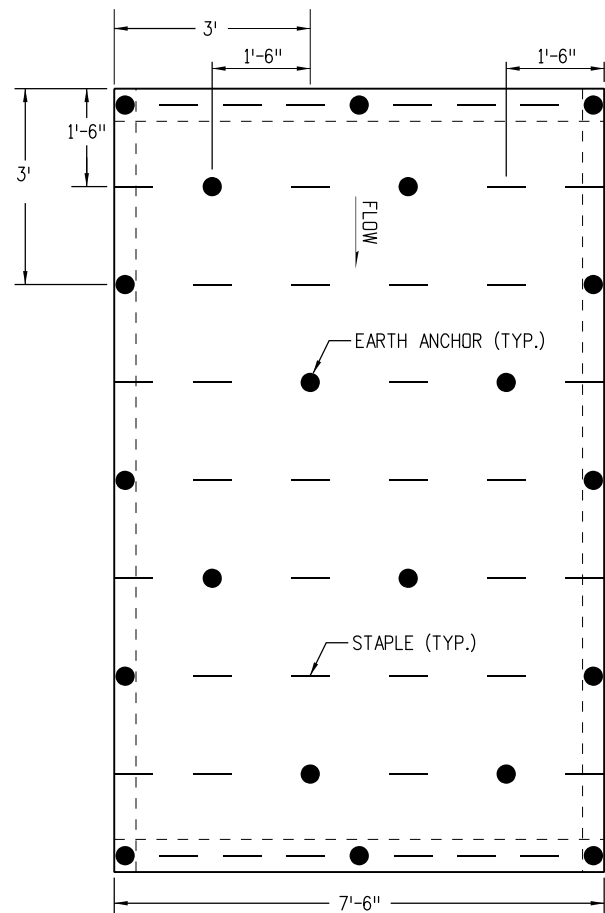
SOIL RETENTION COVERING

Issued By: Project Development Branch on July 16, 2015

STANDARD PLAN NO.

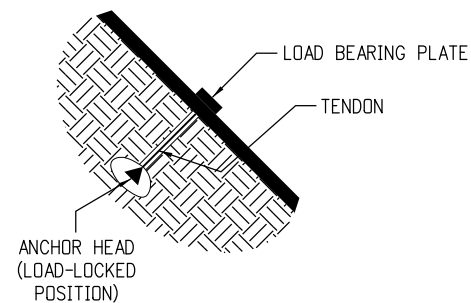
M-216-1

Sheet No. 1 of 2



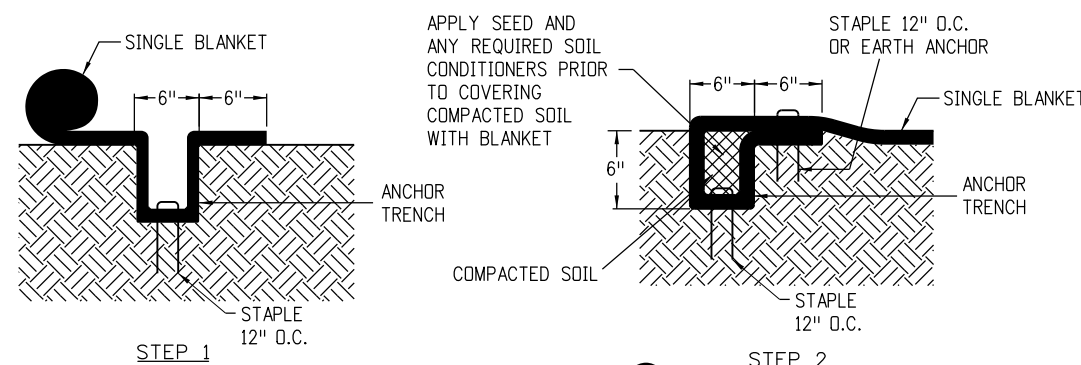
TYPICAL STAPLE OR EARTH ANCHOR PATTERN FOR SLOPE APPLICATION

IF EARTH ANCHORS ARE NOT SPECIFIED ON THE PLANS, ONLY STAPLES SHALL BE USED. SEE SUBSECTION 216.04



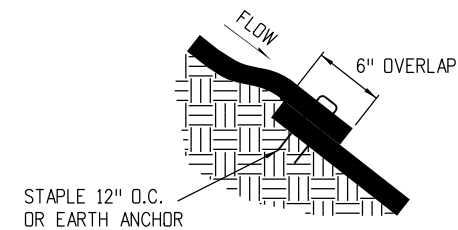
EARTH ANCHOR

- NOTES: 1. EARTH ANCHORS WILL BE USED INSTEAD OF STAPLES WHEN SPECIFIED IN THE PLANS.
2. EARTH ANCHORS SHALL BE PAID FOR SEPERATLY AS SPECIFIED IN SECTION 216.



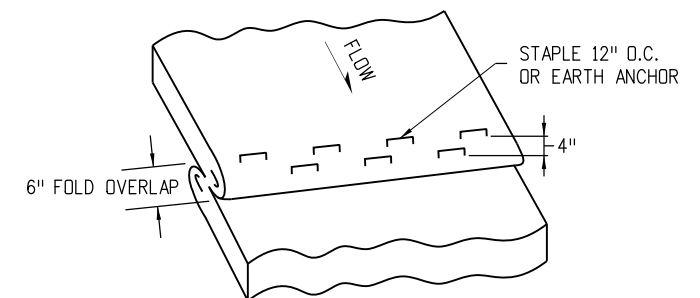
ANCHOR TRENCH (A)

TO BE USED AT THE UPSLOPE AND DOWNSLOPE ENDS OF BLANKET ACROSS THE ENTIRE WIDTH OF SLOPE UNLESS SLOPE RUNS INTO RECEIVING WATER. (SEE DOWNSLOPE END STAPLE CHECK).

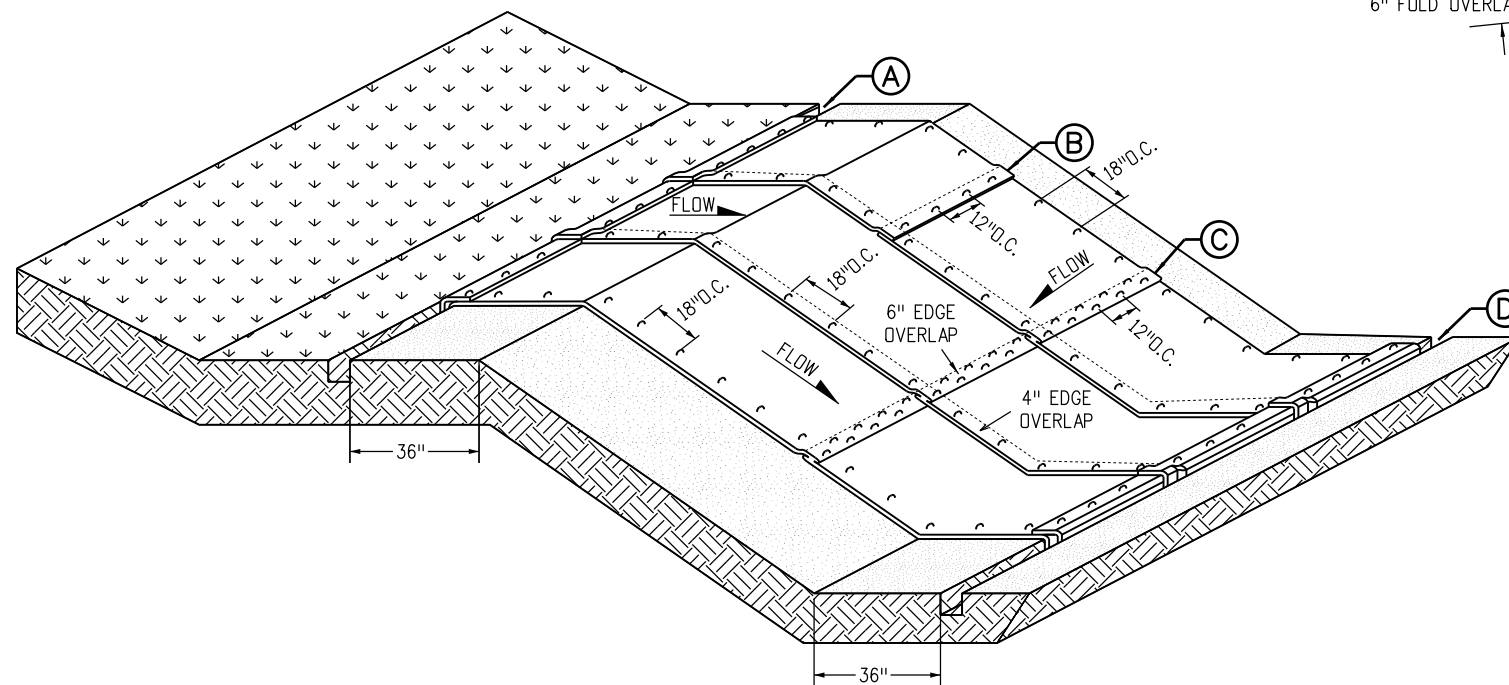


CONSECUTIVE ROLL OVERLAP (B)

TO BE USED WHEREVER ONE ROLL OF BLANKET ENDS AND ANOTHER BEGINS WITH THE UPHILL BLANKET PLACED ON TOP OF THE BLANKET ON THE DOWNHILL SIDE.

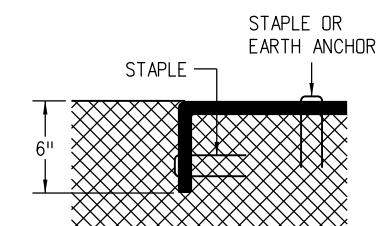


STAPLE CHECK (C)

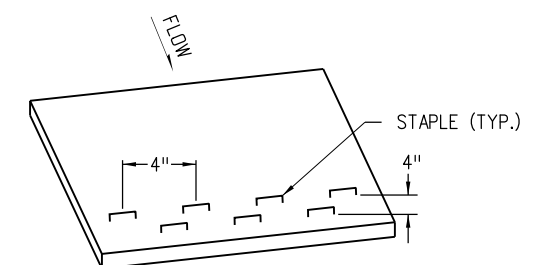


SOIL RETENTION BLANKETS/TURF REINFORCEMENT MATS (TRM) SLOPE APPLICATION

IN ACCORDANCE WITH SECTION 216.



TERMINATION OF CHANNEL (D)



DOWNSLOPE END STAPLE CHECK

TO BE USED WHEN SLOPE RUNS INTO A RECEIVING WATER AND CANNOT BE EXTENDED 3 FEET BEYOND SLOPE.

Computer File Information

Creation Date: 07/04/12	Initials: DLM
Last Modification Date: 07/16/15	Initials: LTA
Full Path: www.coloradodot.info/business/designsupport	(R-X)
Drawing File Name: 2016010202.dgn	(R-X)
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	(R-X)

Sheet Revisions

Date:	Comments

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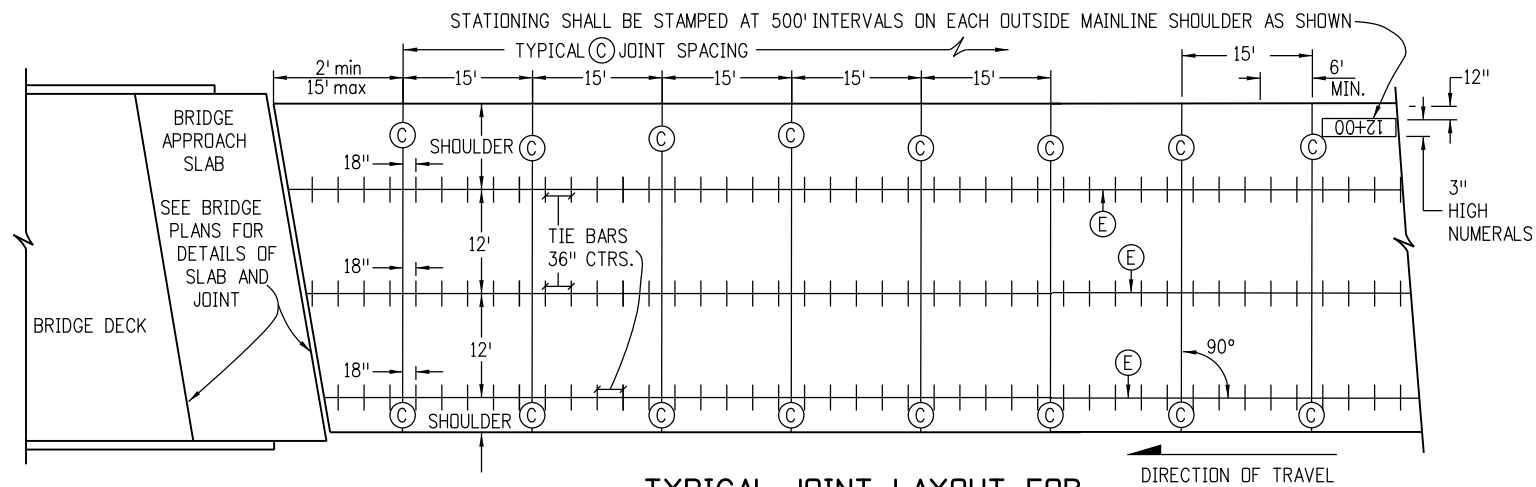
SOIL RETENTION COVERING

Issued By: Project Development Branch on July 16, 2015

STANDARD PLAN NO.

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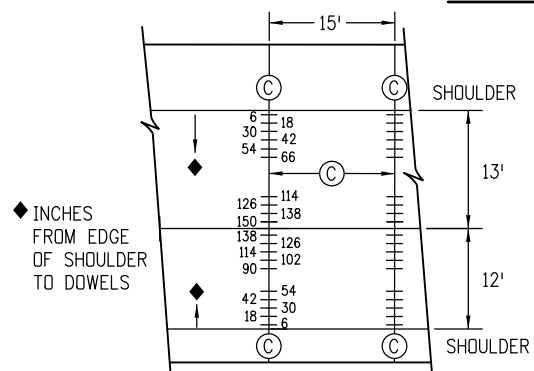
Sheet No. 2 of 2



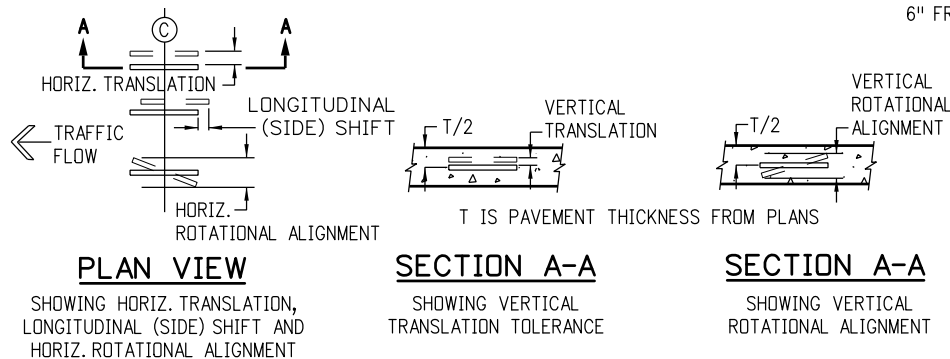
TYPICAL JOINT LAYOUT FOR CONCRETE ROADWAY WITH CONCRETE SHOULDERS

GENERAL NOTES

1. THIS STANDARD PLAN DOES NOT APPLY TO THIN CONCRETE OVERLAYS (WHITETOPPING).
2. TRANSVERSE CONSTRUCTION JOINTS SHALL BE LOCATED AT A (C) JOINT.
3. THIS JOINT LAYOUT SHALL BE USED AS A STANDARD OF THE JOINT LAYOUT FOR THE PROJECT. IF THE CONTRACTOR PROPOSES VARIATIONS FROM THIS STANDARD OR THE PROJECT HAS UNUSUAL OR IRREGULAR CONDITIONS NOT COVERED HEREIN, THE CONTRACTOR SHALL PREPARE A PAVEMENT JOINT LAYOUT FOR APPROVAL BY THE ENGINEER. SLABS 13 FT. IN WIDTH SHALL BE CONSTRUCTED ONLY WHERE DESIGNATED ON THE PLANS.
4. ON MULTILANE DIVIDED HIGHWAYS, THE MULTILANE DIRECTIONAL PAVEMENT AND BOTH SHOULDERS SHALL BE PLACED WITH (E) LONGITUDINAL SAWED CONTRACTION JOINTS.
5. ON MULTILANE DIVIDED HIGHWAYS SEPARATED BY A CONCRETE BARRIER, A (D) JOINT SHALL BE CONSTRUCTED AT ONE OF THE BARRIER FACES.
6. (D) JOINTS SHALL BE CONSTRUCTED BETWEEN THE TWO OPPOSING DIRECTIONS OF TRAVEL ON A MULTILANE UNDIVIDED HIGHWAY WHEN ALL OF THE FOLLOWING APPLY:
 - A. PAVEMENT IS CONTINUOUS ACROSS BOTH DIRECTIONS OF TRAVEL.
 - B. THERE IS NO MEDIAN BARRIER.
 - C. THE WIDTH OF THE PAVEMENT IN ONE DIRECTION IS GREATER THAN 80 FEET.
7. ON VARIABLE WIDTH SLABS, THE 2 FT. OR 4 FT. END OF SLAB WIDTH DIMENSION MAY VARY ±6 INCHES.
8. (L) JOINTS ARE TO BE USED WHEN A TRAFFIC LANE IS ADDED SEPARATELY, OR FOR TAPERS, OR FOR SPEED CHANGE LANES. ALTERNATIVE LONGITUDINAL JOINT LOCATIONS AT SPEED CHANGE LANES MAY BE USED IF APPROVED.
9. WHERE (C) JOINTS ARE SHOWN IN THE SHOULDER, THE DOWEL BARS WILL BE PLACED ON 12" CENTERS STARTING 6" FROM THE ROADWAY (E) JOINT.



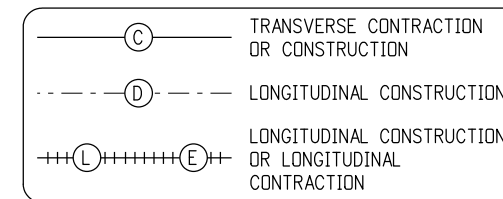
DOWEL BAR DETAIL FOR (C) JOINT WITH 13 FT. AND 12 FT. WIDE SLABS



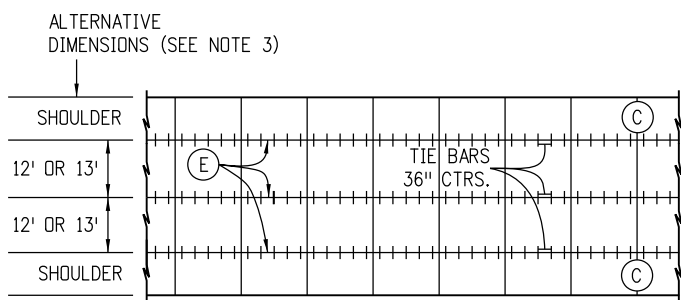
DETAILS ILLUSTRATING DOWEL PLACEMENT TOLERANCES
SEE SUBSECTION 412.13(b)2 FOR ALLOWED TOLERANCE VALUES.

JOINT LEGEND

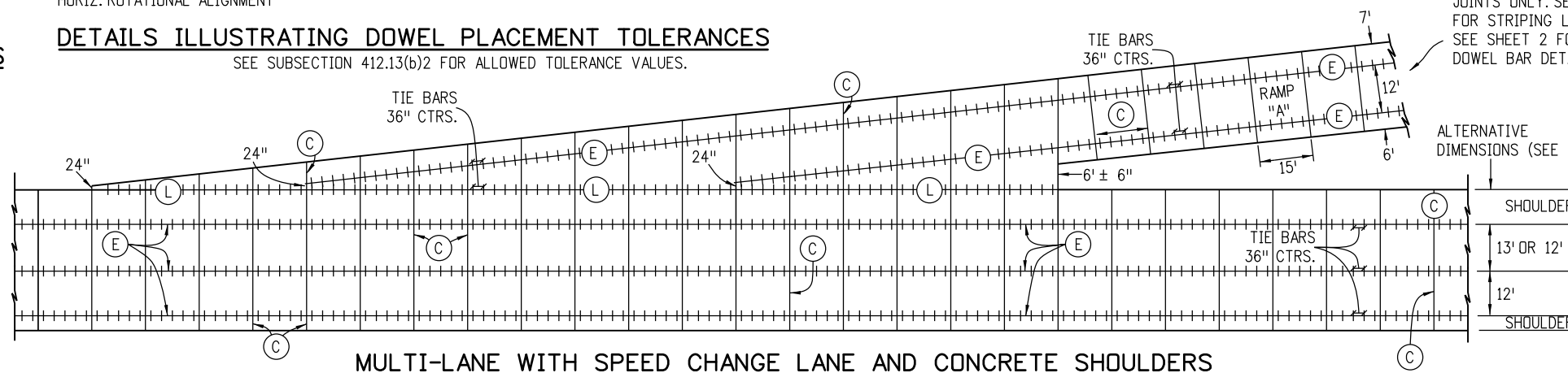
(SEE SHEET 5 FOR JOINT DETAILS)



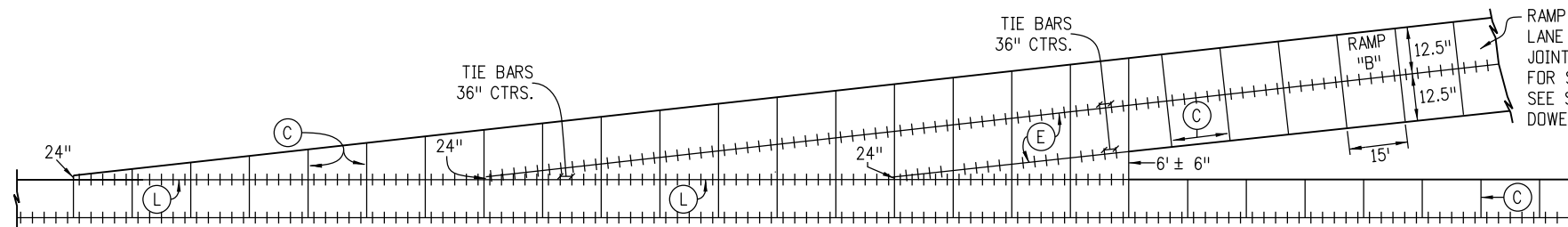
RAMP AND SPEED CHANGE LANE DIMENSIONING FOR JOINTS ONLY. SEE PLANS FOR STRIPING LOCATIONS. SEE SHEET 2 FOR RAMP DOWEL BAR DETAILS.



RURAL TWO-LANE



MULTI-LANE WITH SPEED CHANGE LANE AND CONCRETE SHOULDERS



OPTIONAL LONGITUDINAL JOINT IN CENTER FOR SINGLE LANE SPEED CHANGE LANE

RAMP AND SPEED CHANGE LANE DIMENSIONING FOR JOINTS ONLY. SEE PLANS FOR STRIPING LOCATIONS. SEE SHEET 2 FOR RAMP DOWEL BAR DETAILS.

Computer File Information

Creation Date: 07/04/12	Initials: JBK
Last Modification Date: 01/18/18	Initials: LTA
Full Path: www.coloradodot.info/business/designsupport	
Drawing File Name: 412010105.dgn	
CAD Ver.: MicroStation V8	Scale: Not to Scale Units: English

Sheet Revisions

Date:	Comments
07/24/12	Changed Tie Bar spacing from 30" to 36".
01/18/18	Changed all (CC) and (T) joints to (C) joints. Reduced all 14 foot slabs to 13 feet.

Colorado Department of Transportation



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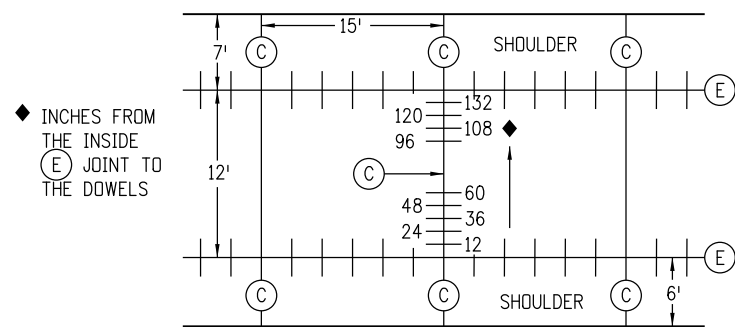
CONCRETE PAVEMENT JOINTS

Issued By: Project Development Branch on July 4, 2012

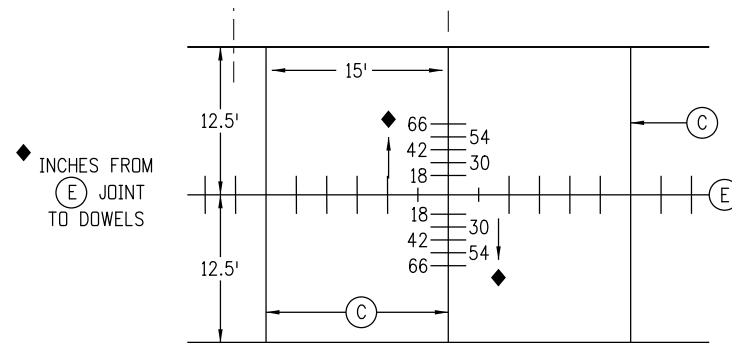
STANDARD PLAN NO.

M-412-1

Sheet No. 1 of 5



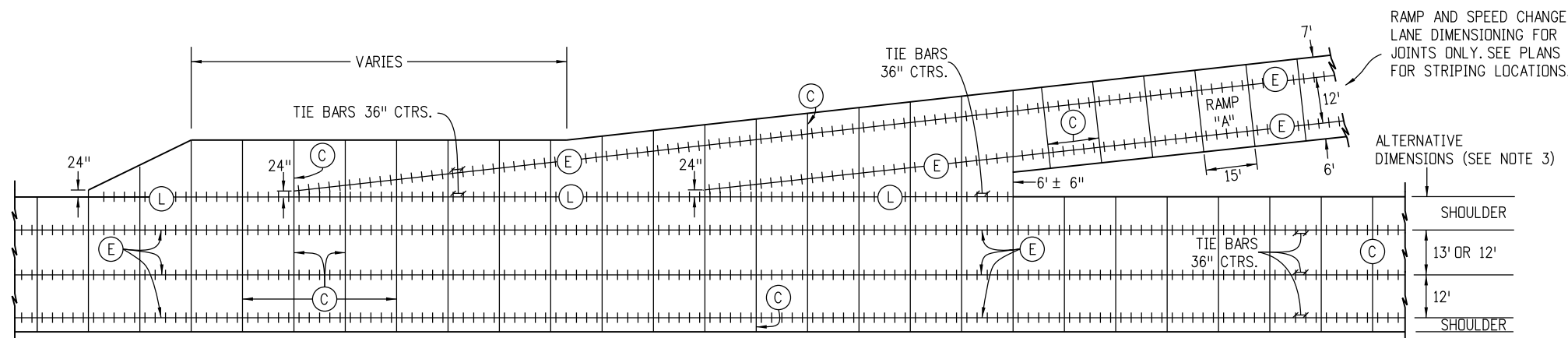
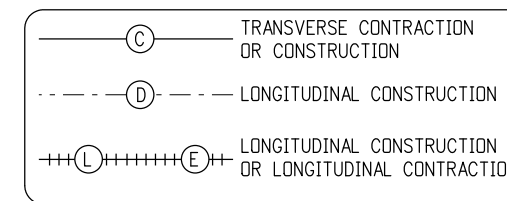
RAMP "A" DOWEL BAR DETAIL FOR C JOINT WITH A 12 FT. LANE



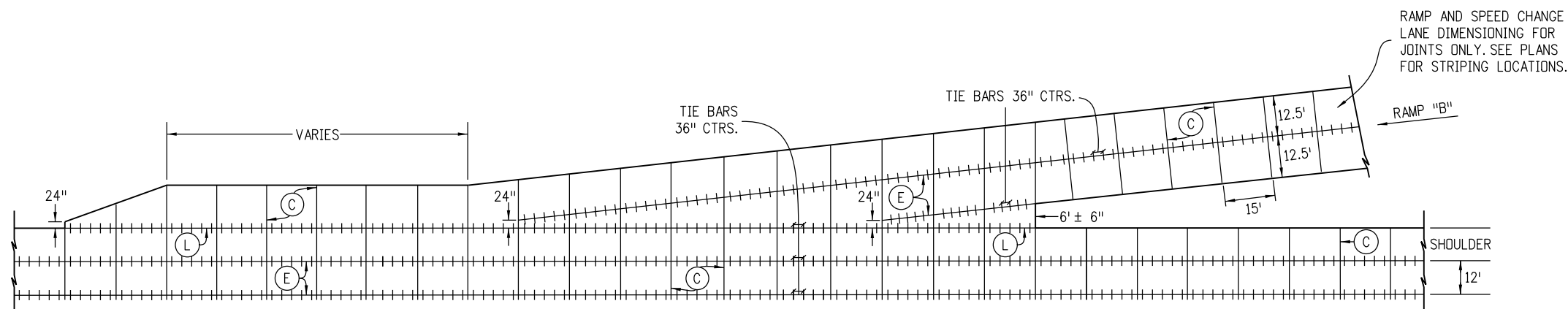
RAMP "B" DOWEL BAR DETAIL FOR C JOINT WITH CENTER LONGITUDINAL SPLIT LANE

JOINT LEGEND

(SEE SHEET 5 FOR JOINT DETAILS)



MULTI-LANE WITH ACCELERATION AND DECELERATION LANES AND CONCRETE SHOULDERS



OPTIONAL LONGITUDINAL JOINT IN CENTER FOR SINGLE LANE ACCELERATION AND DECELERATION LANE

Computer File Information

Creation Date: 07/04/12	Initials: JBK
Last Modification Date: 01/18/18	Initials: LTA
Full Path: www.coloradodot.info/business/designsupport	
Drawing File Name: 412010205.dgn	
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	

Sheet Revisions

Date:	Comments
07/24/12	Changed Tie Bar spacing from 30" to 36".
01/18/18	Changed all (D) and (T) joints to (C) joints. Reduced all 14 foot slabs to 13 feet.

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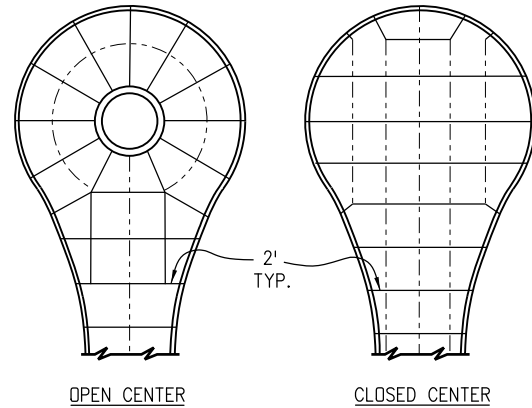
CONCRETE PAVEMENT JOINTS

Issued By: Project Development Branch on July 4, 2012

STANDARD PLAN NO.

M-412-1

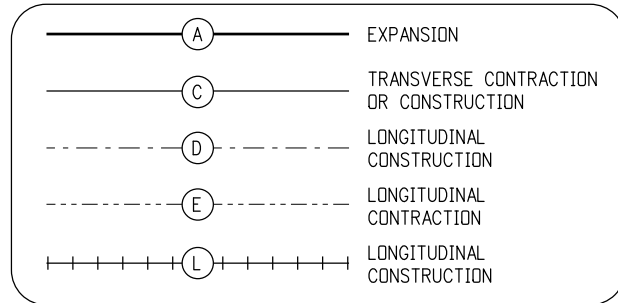
Sheet No. 2 of 5



CUL-DE-SAC

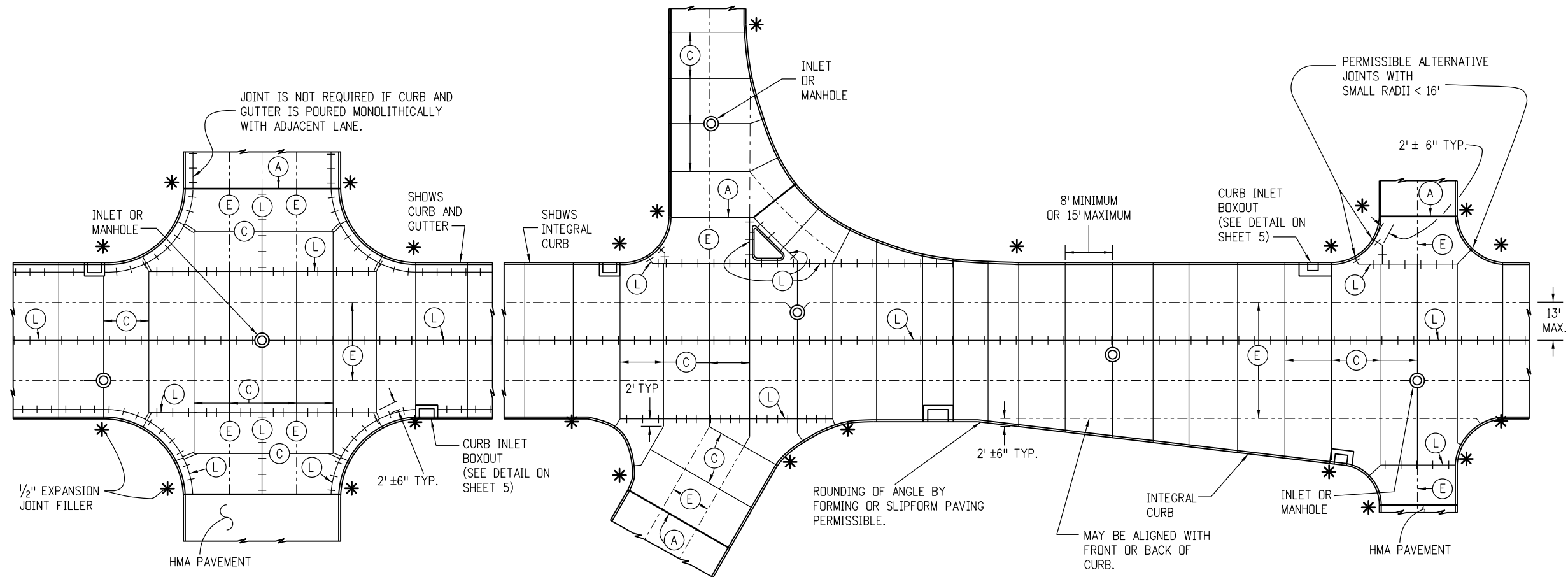
JOINT LEGEND

(SEE SHEET 5 FOR JOINT DETAILS)



NOTES

- LONGITUDINAL JOINTS SHALL BE PLACED ADJACENT TO LANE MARKINGS WHEN POSSIBLE, AND HAVE A MAXIMUM SPACING OF 13 FT. (15 FT. IS PERMITTED WITH MONOLITHIC CURB AND GUTTER).
- CONSTRUCT TRANSVERSE JOINTS PERPENDICULAR TO THE CENTERLINE OF PAVEMENT AND EXTEND THROUGH THE CURB OR CURB AND GUTTER.
- PLACE 1/2 IN. MIN. EXPANSION JOINT FILLER IN TOP 6 IN. OF CURB JOINT AT INTERSECTION RETURN RADIUS POINTS.
- THE CONTRACTOR SHALL, UNLESS OTHERWISE SHOWN ON THE PLANS, SELECT AND USE A BOND BREAKER AT INLETS, MANHOLES AND SIMILAR SIZE STRUCTURES. SMALLER STRUCTURES SUCH AS VALVE AND MONUMENT BOXES SHALL NOT REQUIRE A BOND BREAKER.
- WHERE A LONGITUDINAL JOINT PASSES LESS THAN 1 FT. FROM A CAST-IN-PAVEMENT MANHOLE OR SIMILAR SIZE STRUCTURE, A TYPICAL 2 FT. RADIAL JOINT, AS SHOWN IN THE DETAILS, SHALL BE USED.
- TRANSVERSE JOINTS SHALL EITHER INTERSECT THE CENTER OF CIRCULAR MANHOLES AND INLETS OR BE AT LEAST 4 FT. AWAY FROM THE EDGE OF CIRCULAR MANHOLES. SEE CURB INLET BOXOUT DETAIL ON SHEET 5.
- TRANSVERSE CONSTRUCTION JOINTS SHALL BE LOCATED AT A (C) JOINT.
- THE ENGINEERS SHALL HAVE AN OPTION TO USE INDIVIDUAL DOWELS IN THE (C) JOINT ON SHORT RUN (2' ± 6") TO CURB RADIUS RETURNS.

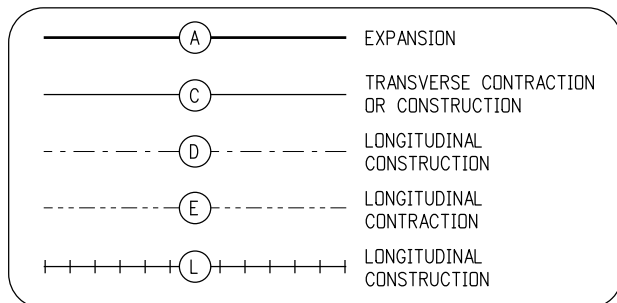


TYPICAL CURBED PAVEMENT JOINT LAYOUT

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Creation Date: 07/04/12	Initials: JBK	Date:	Comments			<p>M-412-1</p> <p>Sheet No. 3 of 5</p>	
Last Modification Date: 01/18/18	Initials: LTA	01/18/18	Changed all (C) and (T) joints to (C) joints. Reduced all 14 foot slabs to 13 feet.				
Full Path: www.coloradodot.info/business/designsupport	(R-X)						
Drawing File Name: 412010305.dgn	(R-X)						
CAD Ver.: MicroStation V8	Scale: Not to Scale	Units: English	(R-X)				

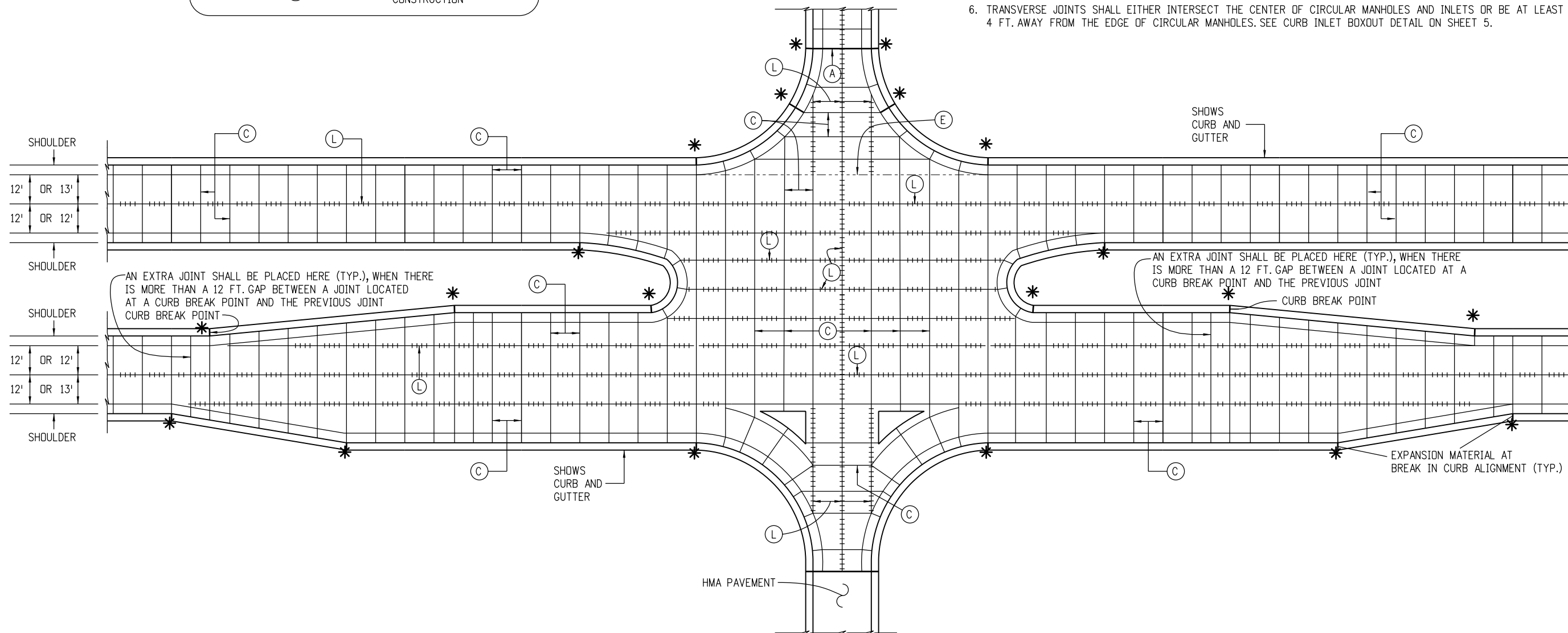
JOINT LEGEND

(SEE SHEET 5 FOR JOINT DETAILS)



NOTES

- LONGITUDINAL JOINTS SHALL BE PLACED ADJACENT TO LANE MARKINGS WHEN POSSIBLE, AND HAVE A MAXIMUM SPACING OF 13 FT. (15 FT. IS PERMITTED WITH MONOLITHIC CURB AND GUTTER).
- CONSTRUCT TRANSVERSE JOINTS PERPENDICULAR TO THE CENTERLINE OF PAVEMENT AND EXTEND THROUGH THE CURB OR CURB AND GUTTER.
- PLACE 1/2 IN. MIN. EXPANSION JOINT FILLER IN TOP 6 IN. OF CURB JOINT AT INTERSECTION RETURN RADIUS POINTS.
- THE CONTRACTOR SHALL, UNLESS OTHERWISE SHOWN ON THE PLANS, SELECT AND USE A BOND BREAKER AT INLETS, MANHOLES AND SIMILAR SIZE STRUCTURES. SMALLER STRUCTURES SUCH AS VALVE AND MONUMENT BOXES DO NOT REQUIRE A BOND BREAKER.
- WHERE A LONGITUDINAL JOINT WOULD PASS LESS THAN 1 FT. FROM A CAST-IN-PAVEMENT MANHOLE OR SIMILAR SIZE STRUCTURE, A TYPICAL 2 FT. RADIAL JOINT, AS SHOWN IN THE DETAILS, SHALL BE USED.
- TRANSVERSE JOINTS SHALL EITHER INTERSECT THE CENTER OF CIRCULAR MANHOLES AND INLETS OR BE AT LEAST 4 FT. AWAY FROM THE EDGE OF CIRCULAR MANHOLES. SEE CURB INLET BOXOUT DETAIL ON SHEET 5.



MULTI-LANE INTERSECTION WITH SPEED CHANGE LANE AND CONCRETE SHOULDERS

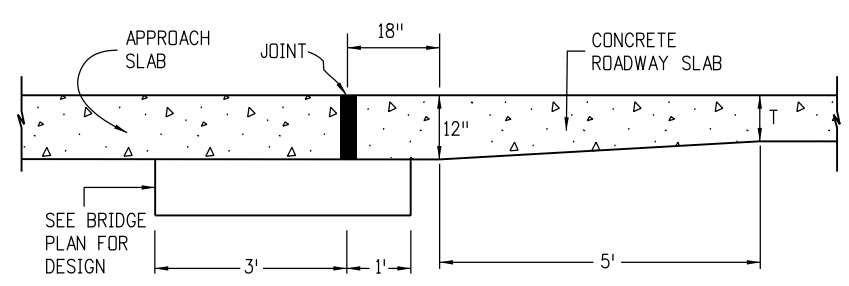
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Last Modification Date: 01/18/18	Initials: LTA
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Drawing File Name: 412010405.dgn	
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	

Sheet Revisions	
Date:	Comments
01/18/18	Changed all (C) and (T) joints to (C) joints. Reduced all 14 foot slabs to 13 feet.

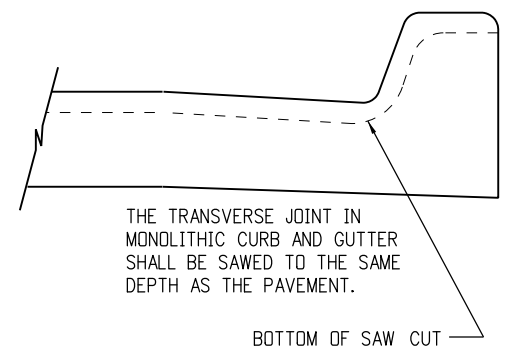
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**CONCRETE
PAVEMENT JOINTS**
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BRIDGE APPROACH



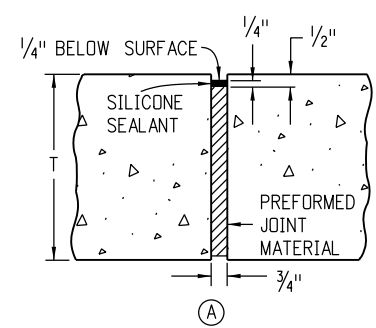
NOTE

PAVEMENT THICKNESS (T), SHALL BE AS SHOWN ON THE PLANS.

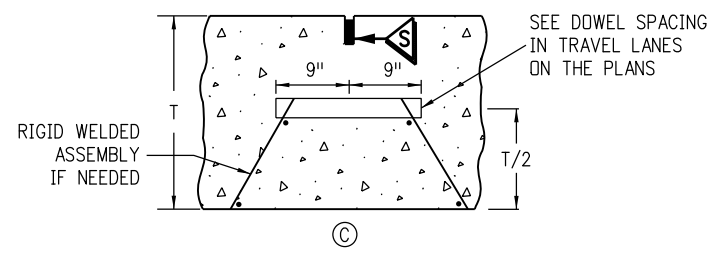
PAVEMENT THICKNESS (T)	DOWEL BAR DIAMETER
7 IN. ≤ T ≤ 8 IN.	1 IN.
8 IN. ≤ T ≤ 10 IN.	1.25 IN.
10 IN. < T ≤ 15 IN.	1.50 IN.

REINFORCING SIZE TABLE

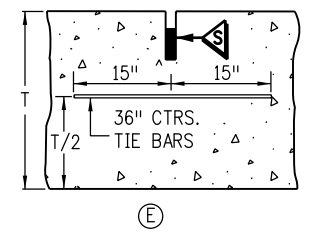
TIE BAR SIZE IS NO. 5 WHEN PAVEMENT IS PLACED ON UNBOUND BASES.
 TIE BAR IS NO. 6 WHEN PAVEMENT IS PLACED ON LIME TREATED SOIL, ASPHALT OR CEMENT TREATED, MILLED ASPHALT, OR RECYCLED ASPHALT BASES.



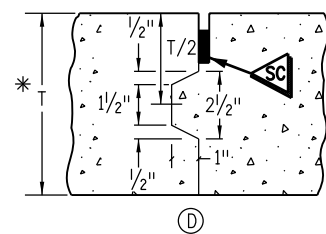
EXPANSION JOINT



DOWELED TRANSVERSE CONSTRUCTION OR CONTRACTION JOINT
(TRANSVERSE WEAKENED PLANE JOINT)

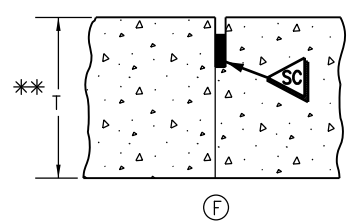


LONGITUDINAL CONTRACTION JOINT
(LONGITUDINAL WEAKENED PLANE JOINT)



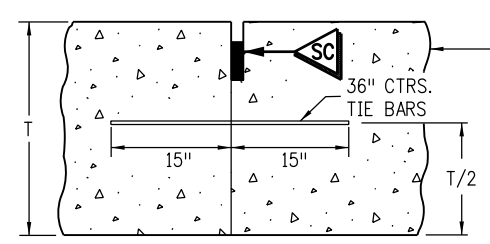
LONGITUDINAL CONSTRUCTION JOINT

* USE ONLY IF T ≥ 8 IN. FORM ONLY FEMALE KEYWAY



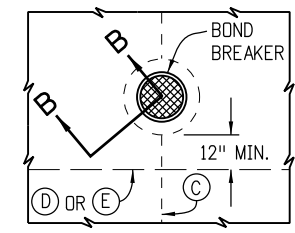
LONGITUDINAL CONSTRUCTION JOINT

** USE ONLY IF T < 8 IN.

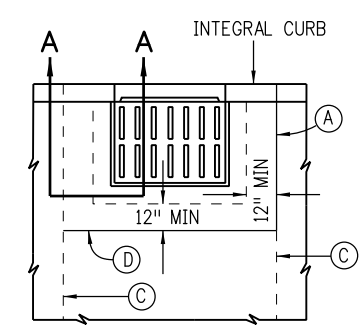


LONGITUDINAL CONSTRUCTION JOINT

A KEYWAY IS ALLOWED TO FACILITATE USE OF BENT TIE BARS OR APPROVED TWO PIECE CONNECTORS

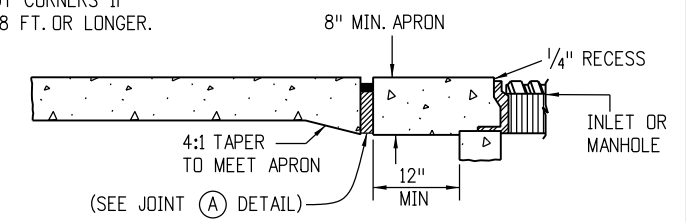


INLET OR MANHOLE CAST IN PAVEMENT

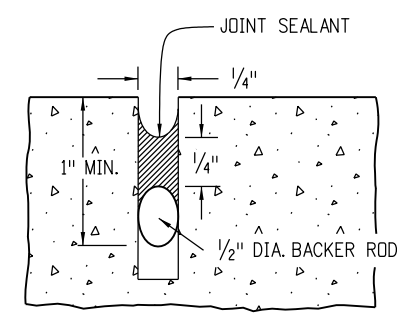


CURB INLET BOXOUT

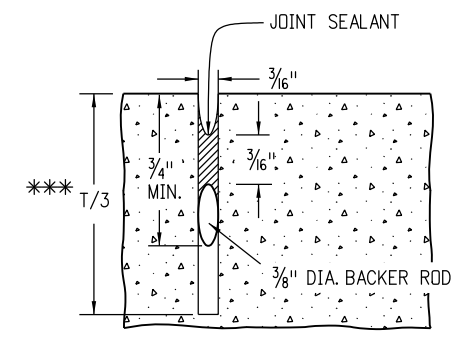
INSTALL TRANSVERSE JOINT AT BOTH BOXOUT CORNERS IF BOXOUT IS 8 FT. OR LONGER.



SECTION A-A

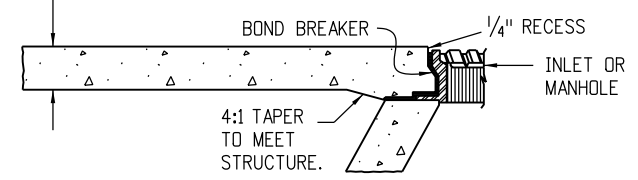


SEAL AT CONSTRUCTION JOINT



SAWED JOINT

*** USE T/4 WHEN T < 8 IN.



SECTION B-B

BOND BREAKER SHALL BE COMPOSED OF PLASTIC SHEET, BUILDING PAPER OR OTHER APPROVED MATERIAL THAT PREVENTS BONDING.

Computer File Information

Creation Date: 07/04/12	Initials: JBK
Last Modification Date: 01/18/18	Initials: LTA
Full Path: www.coloradodot.info/business/designsupport	
Drawing File Name: 412010505.dgn	
CAD Ver.: MicroStation V8	Scale: Not to Scale Units: English

Sheet Revisions

Date:	Comments
07/24/12	Changed Tie Bar spacing from 30" to 36".
	Modified the Reinforcing Size Table.
01/18/18	Changed all (C) and (T) joints to (C) joints.

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 Division of Project Support JBK/LTA

CONCRETE PAVEMENT JOINTS

Issued By: Project Development Branch on July 4, 2012

STANDARD PLAN NO.

M-412-1

Sheet No. 5 of 5

GENERAL NOTES

- ALL CONCRETE SHALL BE CLASS D (BOX CULVERT).
- ALL CONSTRUCTION JOINTS SHALL BE THOROUGHLY CLEANED BEFORE FRESH CONCRETE IS PLACED.
- ALL CONSTRUCTION JOINTS NOT SHOWN ON THE PLANS SHALL BE CONSTRUCTED ONLY IF APPROVED BY THE ENGINEER.
- THE CONTRACTOR SHALL MAINTAIN THE STABILITY OF THE STRUCTURE DURING CONSTRUCTION.
- STRUCTURE EXCAVATION AND BACKFILL SHALL BE IN ACCORDANCE WITH STANDARD PLAN M-206-1.
- FOR ANY CULVERT SPAN 20 FT. OR GREATER, A FOUNDATION INVESTIGATION AND REPORT ARE REQUIRED.
- BACKFILL SHALL NOT BEGIN UNTIL TOP SLAB HAS REACHED DESIGN STRENGTH, f'_c .
- SPLICE QUANTITIES FOR LONGITUDINAL AND TRANSVERSE BARS ARE NOT INCLUDED.
- REINFORCING STEEL SHALL BE GRADE 60.
- THE MINIMUM LAP SPLICE LENGTH FOR EPOXY COATED REINFORCING BARS SHALL BE:

BAR SIZE:	#4	#5	#6	#7	#8	#9	#10	#11
SPLICE LENGTH:	1'-3"	1'-7"	2'-5"	2'-10"	3'-8"	4'-8"	5'-11"	7'-3"

THE MINIMUM LAP SPLICE LENGTH FOR BLACK REINFORCING BARS SHALL BE:

BAR SIZE:	#4	#5	#6	#7	#8	#9	#10	#11
SPLICE LENGTH:	1'-1"	1'-4"	1'-7"	1'-11"	2'-6"	3'-1"	3'-11"	4'-10"

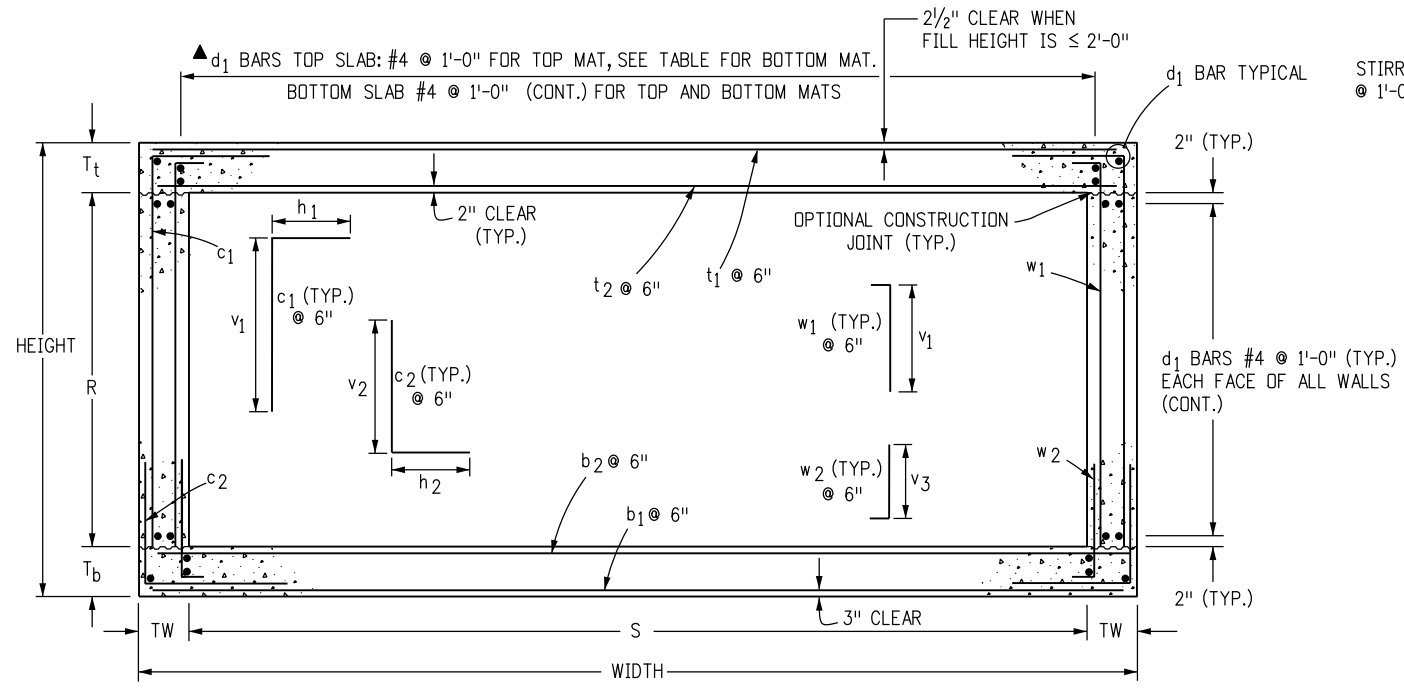
- THE ABOVE SPLICE LENGTHS ARE FOR CLASS B SPLICES.
- ALL DIMENSIONS ARE PERPENDICULAR TO THE CENTERLINE OF THE BOX.
 - WINGWALLS SHALL BE TIED TO CONCRETE BOX CULVERT IN ACCORDANCE WITH STANDARD PLAN M-601-20.
 - ALL TRANSVERSE REINFORCING SHALL BE NORMAL TO THE CENTERLINE OF THE BOX.
 - THE FILL HEIGHT IS THE DISTANCE MEASURED FROM THE TOP OF THE TOP SLAB TO THE TOP OF PAVEMENT.
 - ALL EXPOSED CONCRETE CORNERS SHALL BE CHAMFERED $\frac{3}{4}$ ".
 - FOR FILL HEIGHTS LESS THAN 2 FT. A WATERPROOFING MEMBRANE SHALL BE PROVIDED FOR THE TOP OF THE TOP SLAB AND 18 INCHES DOWN FROM THE TOP OF THE EXTERIOR WALLS.
 - FOR FILL HEIGHTS LESS THAN 2 FT, THE d_1 BARS FOR THE BOTTOM MAT OF THE TOP SLAB SHALL BE AS FOLLOWS:

S	6	8	10	12, 14, 16, 18, 20
BAR SIZE:	#5	#6	#6	#5
SPACING	1'-0"	1'-0"	0'-6"	0'-6"

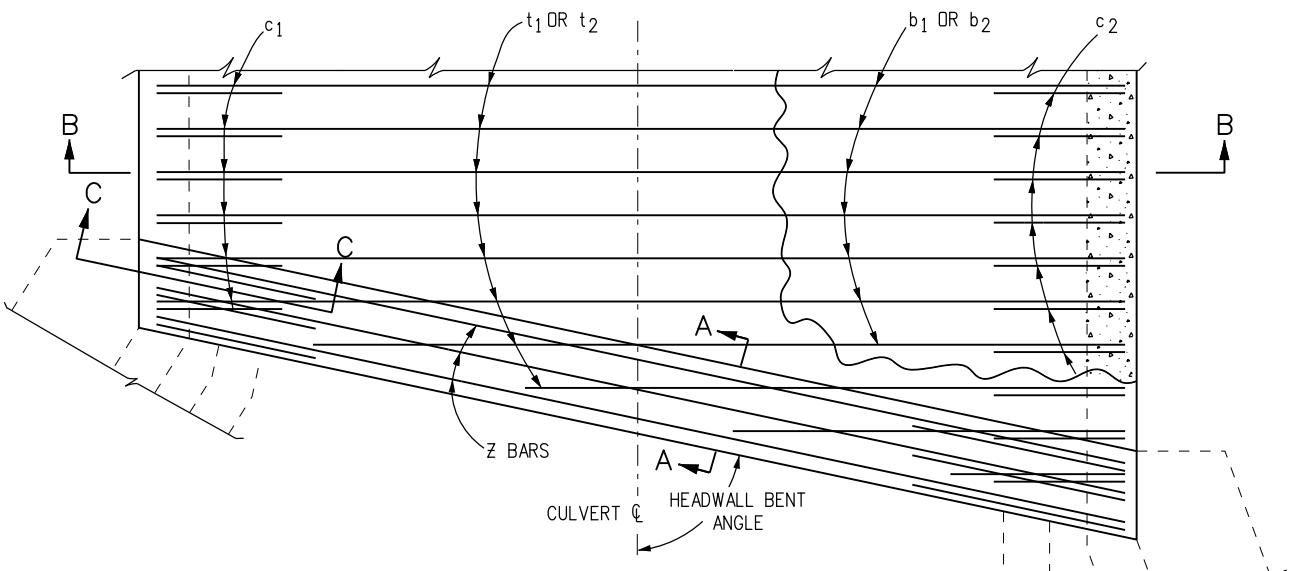
DESIGN DATA: 7TH EDITION, 2014, OF THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS
 RATING DATA: 2ND EDITION, 2011, OF THE AASHTO MANUAL FOR BRIDGE EVALUATION
 $f_y = 60,000$ psi.,
 $f'_c = 4,500$ psi.,

LOADING DATA:
 LIVE LOAD = AASHTO LRFD, HL-93 TRUCK, HL-93 TANDEM, COLORADO PERMIT TRUCK, AND NRL
 DEAD LOAD CASE 1: VERTICAL EARTH LOAD = 120 LBS./CU.FT.
 HORIZONTAL EARTH LOAD = 30 LBS./CU.FT.
 DEAD LOAD CASE 2: VERTICAL EARTH LOAD = 120 LBS./CU.FT.
 HORIZONTAL EARTH LOAD = 60 LBS./CU.FT.
 THRUST IS NOT CONSIDERED IN THIS STANDARD, I.E. THRUST = 0.
 WEARING SURFACE - 12 INCHES THICK CONCRETE PAVEMENT.
 DEAD LOAD - TYPE 7 BARRIER.
 EXTREME HEADWATER TO DEPTH RATIO IS IN ACCORDANCE WITH THE CDOT DRAINAGE MANUAL.
 EXTREME HEADWATER TO DEPTH RATIO WAS INCLUDED IN THE DESIGN BUT EXCLUDED FROM THE RATINGS AS PER THE AASHTO MANUAL FOR BRIDGE EVALUATION.
 LIVE LOAD SURCHARGE ON EXTERIOR WALLS = 2 FT. OF EARTH

- ★ IF HEADWALL MOUNT GUARDRAIL IS USED (SEE STANDARD PLAN M-606-1, SHEET 20, AND THE INFORMATION BELOW):
- ALL REINFORCING STEEL SHALL BE ACCORDING TO THIS BOX CULVERT PLAN.
 - ANY SPECIAL DESIGN FOR STIRRUPS WILL NOT BE MEASURED AND PAID FOR SEPARATELY BUT SHALL BE INCLUDED IN THE WORK.
 - HEADWALL DIMENSION AND CONCRETE QUANTITY SHALL BE ACCORDING TO STANDARD PLAN M-606-1, SHEET 20.
 - POST ANCHORS SHALL BE PROVIDED ACCORDING TO STANDARD PLAN M-606-1, SHEET 20.
 - POST ANCHORS AND CONCRETE FOR HEADWALL MOUNT OF GUARDRAIL WILL NOT BE MEASURED AND PAID FOR SEPARATELY BUT SHALL BE INCLUDED IN THE WORK.
 - POST ANCHORS WHEN REQUIRED AND ENCASED IN HEADWALL CONCRETE, SHALL CONFORM TO ASTM A 36 OR AASHTO M 169 STEEL.

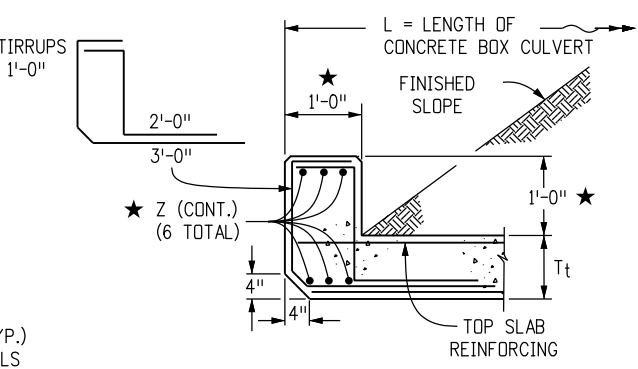


SECTION B-B

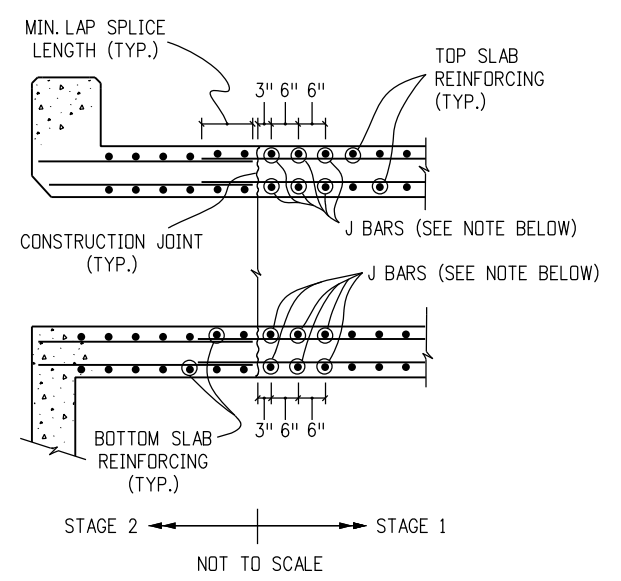


REINFORCING PLAN

BAR SIZE (#)	EPOXY X (FT.-IN.)	BLACK X (FT.-IN.)
4	2-4	1-11
5	2-10	2-4
6	3-5	2-10
7	4-1	3-3
8	5-3	4-3
9	6-8	5-5



SECTION A-A



CONSTRUCTION JOINT DETAIL FOR STAGED CONSTRUCTION

NOTE: THIS DETAIL IS FOR CONSTRUCTION JOINTS INSTALLED PERPENDICULAR TO THE ϕ OF THE BOX ONLY. THE CONTRACTOR CAN DESIGN AND INSTALL J BARS AT HIS EXPENSE TO SUPPORT TEMPORARY LIVE LOADS DURING STAGE 1 CONSTRUCTION. J BARS SHALL BE THE SAME SIZE AS THE TOP AND BOTTOM SLAB REINFORCING WHEN THERE ARE NO TEMPORARY LIVE LOADS TO SUPPORT.

SECTION C-C
HEADWALL CORNER REINFORCING DETAIL

Computer File Information

Creation Date: 07/04/12	Initials: DD
Last Modification Date: 11/25/15	Initials: JBE
Full Path: www.codot.gov/business/designsupport	
Drawing File Name: 601010102.dgn	
CAD Ver.: MicroStation V8	Scale: Not to Scale Units: English

Sheet Revisions

Date:	Comments
(R-1) 08/27/13	LRFD Design
(R-2) 08/01/15	Analysis Program Updates

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SINGLE CONCRETE BOX CULVERT
 Issued By: Project Development Branch July 4, 2012

STANDARD PLAN NO.
 M-601-1
 Sheet No. 1 of 2

SINGLE CONCRETE BOX CULVERT DIMENSIONS, QUANTITIES & RATING FACTORS (EXCLUDING HEADWALL & TOEWALL QUANTITIES)

BOX SIZE				FILL HEIGHT ALLOWED	SLAB & WALL THICKNESS (INHES)			BAR SIZES						d1▲	DIMENSIONS					QUANTITIES			RATING FACTORS			
S	R	HT.	WIDTH		Tt	Tb	TW	t1* & b1	t2	b2	w1* & w2	c1*	c2		NO.	h1	h2	v1	v2	v3	CONCRETE	REBAR STL	WATERPROOFING	HL-93 INENTORY	HL-93 OPERATING	COLORADO PERMIT
FT	FT	FT-IN	FT-IN	FT-FT	Tt	Tb	TW	#	#	#	#	#	#	FT-IN	FT-IN	FT-IN	FT-IN	FT-IN	CY/LF	LBS/LF	SY/LF					
6	7	8-8	7-8	< 2	10	10	10	4	6	6	4	5	5	64	3-5	4-4	7-7	3-1	1-11	0.905	215	1.185	1.23	1.59	2.03	2.09
		8-4.5	7-8	2 TO 8	8.5	8	10	4	5	5	4	5	5	64	3-10	4-4	7-6	2-11	1-9	0.823	199		1.67	2.17	2.51	2.58
		8-5	7-8	8 TO 15	8.5	8.5	10	4	5	5	4	5	5	64	3-8	2-4	7-6	3-0	1-9	0.834	190		◆	◆	◆	◆
		8-5	7-8	15 TO 20	8.5	8.5	10	4	5	5	4	5	5	64	3-8	2-4	7-6	3-0	1-9	0.834	190		◆	◆	◆	◆

HEADWALL AND TOEWALL QUANTITIES

HEADWALL BENT ANGLE	90° TO 75°			74° TO 60°			59° TO 45°		
	CLEAR SPAN (S)	Z	STIRRUPS	REBAR QUANT.	Z	STIRRUPS	REBAR QUANT.	Z	STIRRUPS
	#	#	LBS/LF	#	#	LBS/LF	#	#	LBS/LF
6	4	4	22.8	4	4	22.2	6	4	34.6
8	4	4	23.0	5	4	28.8	7	4	44.0
10	5	4	28.5	6	4	35.1	9	4	68.7
12	6	4	35.3	6	4	34.4	9	5	71.7
14	6	4	34.2	7	4	41.5	★	★	★
16	6	4	33.1	8	5	54.0	★	★	★
18	7	4	39.5	9	5	63.3	★	★	★
20	7	4	39.3	★	★	★	★	★	★

CONCRETE QUANTITY = 0.086 CY/LF

NOTES

- SIX INCH SPACING AT EACH END OF THE SPAN FOR A DISTANCE OF 1/4 OF THE SPAN LENGTH; 12 INCH SPACING ELSEWHERE.
- QUANTITIES ARE GIVEN FOR ONE HEADWALL AND ONE TOEWALL AND ARE BASED ON PER LINEAR FOOT OF HEADWALL. STEEL QUANTITIES INCLUDE ALL REINFORCING. QUANTITIES SHALL BE PAID FOR AS SHOWN ON THE PLANS.
- ★ SKEWED HEADWALLS ARE NOT RECOMMENDED FOR THESE SPANS. A SPECIAL DESIGN IS REQUIRED.
- FOR HEADWALL AND TOEWALL DETAILS SEE M-601-1, SHEET 1 OF 2.
- WHEN THE FILL HEIGHTS ARE LESS THAN OR EQUAL TO 2 FT, ALL REINFORCING BARS IN THE HEADWALL, ALL REINFORCING BARS DESIGNATED BY AN ASTERISK (*), AND THE d1 BARS IN THE TOP MAT OF THE TOP SLAB SHALL BE EPOXY COATED.
- REINFORCING QUANTITIES INCLUDE BOTH EPOXY-COATED AND UNCOATED BARS.
- WHEN A (RISE) R OF LESS THAN 6 FT IS REQUIRED, USE THE BAR SIZES AND THE SLAB AND WALL THICKNESSES FOR THE 6 FT RISE (IF AVAILABLE ON THE TABLE).
- ▲ FOR SIZE AND SPACING OF THE BOTTOM MAT BARS IN THE TOP SLAB SEE TABLE ON M-601-1, SHEET 1 OF 2. ALL OTHER d1 BARS ARE #4'S AT 1'-0" SPACING. THE NUMBER OF BARS REQUIRED IS LISTED ON THIS SHEET AND INCLUDES BOTH #4 BARS AND THOSE FROM THE TABLE.
- ◆ LIVE LOAD IS NEGLECTED AS PER AASHTO LRFD SECTION 3.6.1.2.6. FOR THESE STRUCTURES REFER TO THE CDOT RATING MANUAL.
- FOR ALL NEW CULVERT DESIGNS, A RATING IS REQUIRED. THE RATING SUMMARY SHEET SHOULD BE PRINTED FROM THE CDOT EXTERNAL WEBSITE AND SUBMITTED TO THE BRIDGE RATING UNIT OR INCLUDED AS PART OF A LARGER DESIGN PACKAGE. FOR ADDITIONAL INFORMATION, SEE THE CDOT RATING MANUAL.

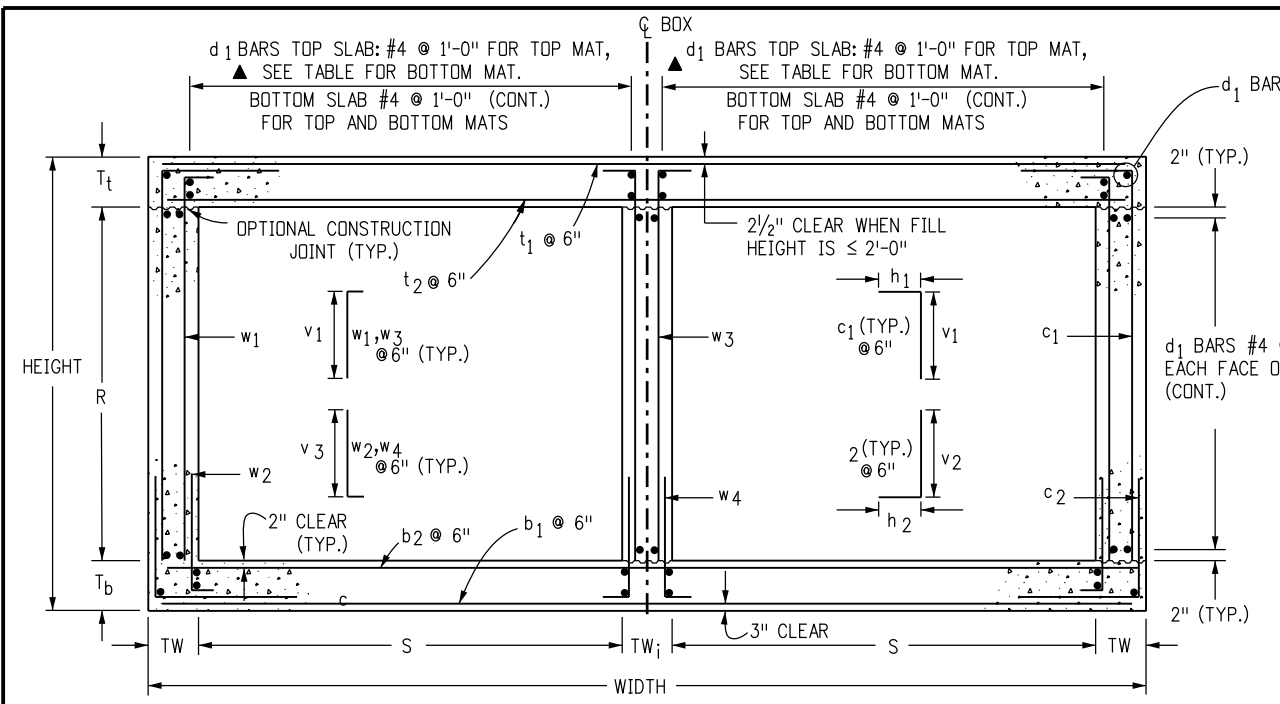
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Last Modification Date: 11/25/15	Initials: JBE
Full Path: www.codot.gov/business/designsupport	
Drawing File Name: 601010202.dgn	
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	

Sheet Revisions	
Date:	Comments
(R-1) 08/27/13	LRFD Design
(R-2) 08/01/15	Analysis Program Updates

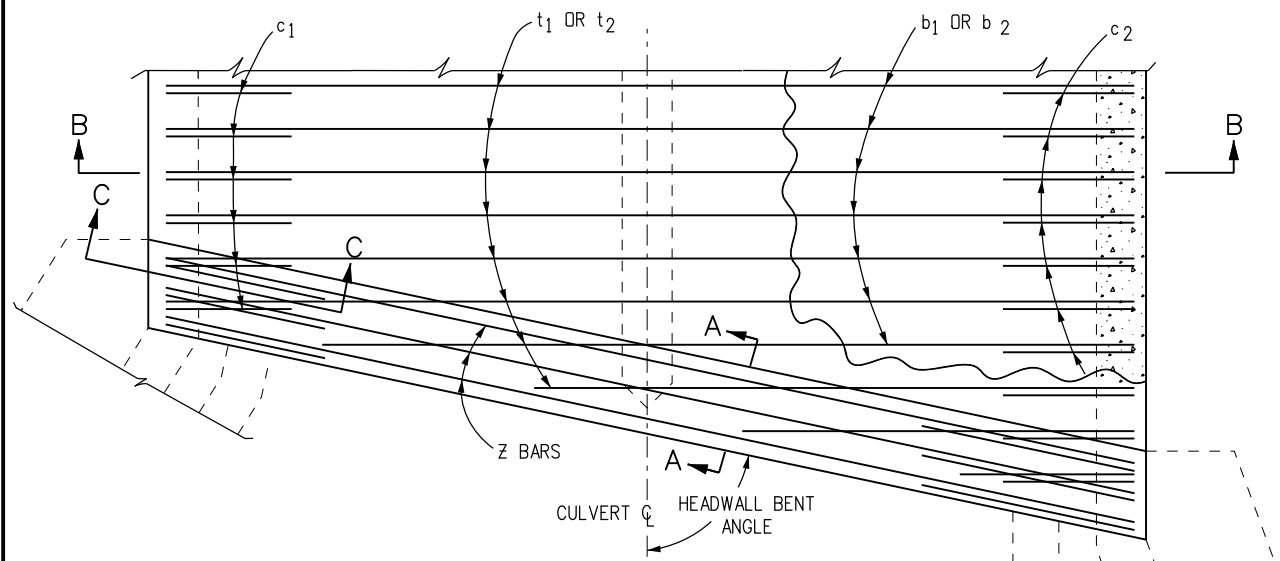
Colorado Department of Transportation
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 Division of Project Support DDG/Bridge

SINGLE CONCRETE BOX CULVERT
 Issued By: Project Development Branch July 4, 2012

STANDARD PLAN NO.
M-601-1
Sheet No. 2 of 2

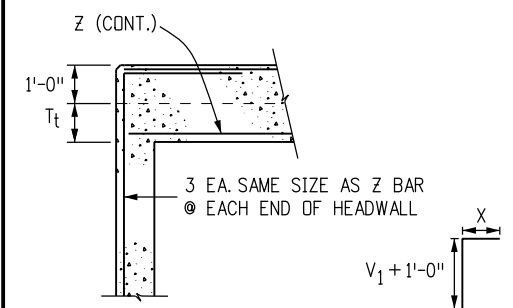


SECTION B-B

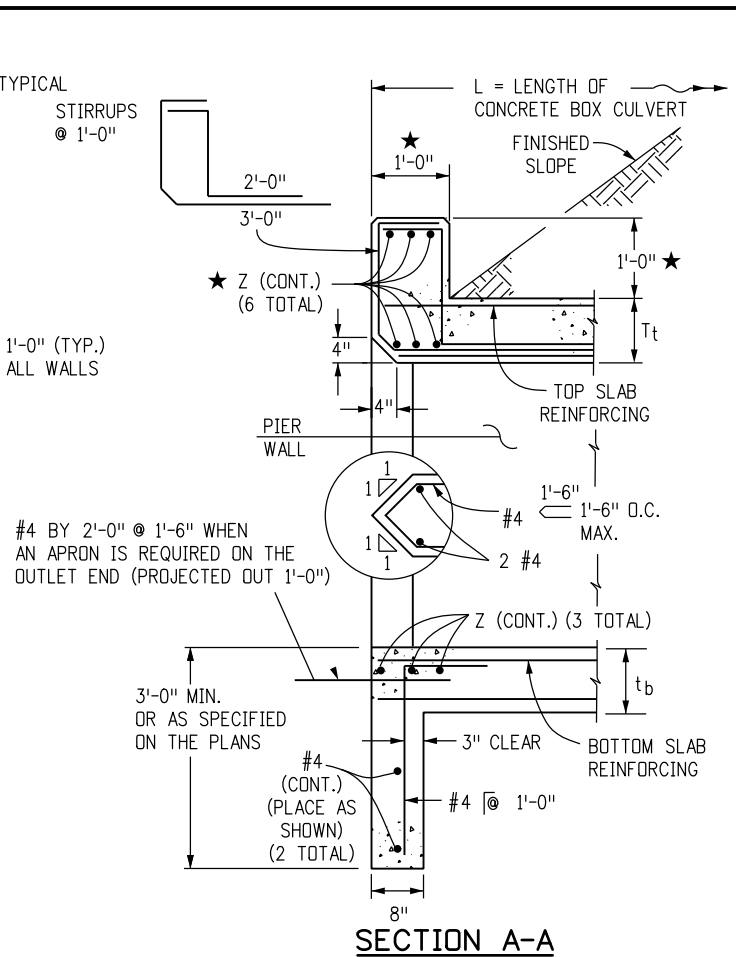


REINFORCING PLAN

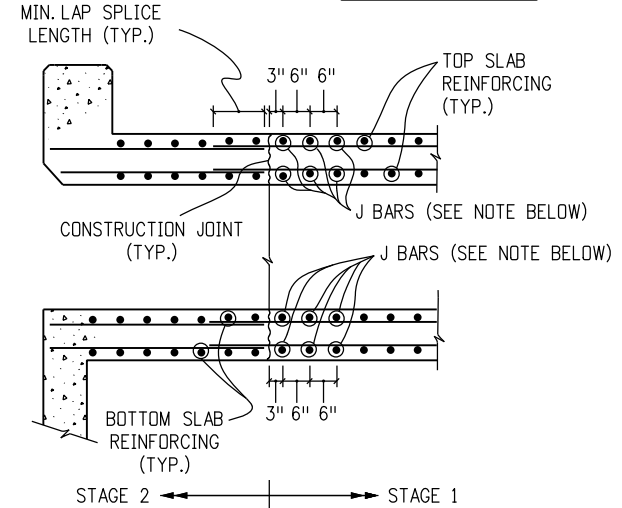
BAR SIZE (#)	EPOXY X (FT.-IN.)	BLACK X (FT.-IN.)
4	2-4	1-11
5	2-10	2-4
6	3-5	2-10
7	4-1	3-3
8	5-3	4-3
9	6-8	5-5



**SECTION C-C
HEADWALL CORNER REINFORCING DETAIL**



SECTION A-A



CONSTRUCTION JOINT DETAIL FOR STAGED CONSTRUCTION

NOTE: THIS DETAIL IS FOR CONSTRUCTION JOINTS INSTALLED PERPENDICULAR TO THE C OF THE BOX ONLY. THE CONTRACTOR CAN DESIGN AND INSTALL J BARS AT HIS EXPENSE TO SUPPORT TEMPORARY LIVE LOADS DURING STAGE 1 CONSTRUCTION. J BARS SHALL BE THE SAME SIZE AS THE TOP AND BOTTOM SLAB REINFORCING WHEN THERE ARE NO TEMPORARY LIVE LOADS TO SUPPORT.

GENERAL NOTES

- ALL CONCRETE SHALL BE CLASS D (BOX CULVERT).
- ALL CONSTRUCTION JOINTS SHALL BE THOROUGHLY CLEANED BEFORE FRESH CONCRETE IS PLACED.
- ALL CONSTRUCTION JOINTS NOT SHOWN ON THE PLANS SHALL BE CONSTRUCTED ONLY IF APPROVED BY THE ENGINEER.
- THE CONTRACTOR SHALL MAINTAIN THE STABILITY OF THE STRUCTURE DURING CONSTRUCTION.
- STRUCTURE EXCAVATION AND BACKFILL SHALL BE IN ACCORDANCE WITH STANDARD PLAN M-206-1.
- FOR ANY CULVERT SPAN 20 FT. OR GREATER, A FOUNDATION INVESTIGATION AND REPORT ARE REQUIRED.
- BACKFILL SHALL NOT BEGIN UNTIL TOP SLAB HAS REACHED DESIGN STRENGTH, f'c.
- SPLICE QUANTITIES FOR LONGITUDINAL AND TRANSVERSE BARS ARE NOT INCLUDED. REINFORCING STEEL SHALL BE GRADE 60.
- THE MINIMUM LAP SPLICE LENGTH FOR EPOXY COATED REINFORCING BARS SHALL BE:

BAR SIZE:	#4	#5	#6	#7	#8	#9	#10	#11
SPLICE LENGTH:	1'-3"	1'-7"	2'-5"	2'-10"	3'-8"	4'-8"	5'-11"	7'-3"

THE MINIMUM LAP SPLICE LENGTH FOR BLACK REINFORCING BARS SHALL BE:

BAR SIZE:	#4	#5	#6	#7	#8	#9	#10	#11
SPLICE LENGTH:	1'-1"	1'-4"	1'-7"	1'-11"	2'-6"	3'-1"	3'-11"	4'-10"

- THE ABOVE SPLICE LENGTHS ARE FOR CLASS B SPLICES.
- ALL DIMENSIONS ARE PERPENDICULAR TO THE CENTERLINE OF THE BOX.
 - WINGWALLS SHALL BE TIED TO CONCRETE BOX CULVERT IN ACCORDANCE WITH STANDARD PLAN M-601-20.
 - ALL TRANSVERSE REINFORCING SHALL BE NORMAL TO THE CENTERLINE OF THE BOX.
 - THE FILL HEIGHT IS THE DISTANCE MEASURED FROM THE TOP OF THE TOP SLAB TO THE TOP OF PAVEMENT.
 - ALL EXPOSED CONCRETE CORNERS SHALL BE CHAMFERED 3/4".
 - FOR FILL HEIGHTS LESS THAN 2 FT, A WATERPROOFING MEMBRANE SHALL BE PROVIDED FOR THE TOP OF THE TOP SLAB AND 18" DOWN ALONG THE TOPS OF THE EXTERIOR WALLS.
 - FOR FILL HEIGHTS LESS THAN 2 FT, THE d1 BARS FOR THE BOTTOM MAT OF THE TOP SLAB SHALL BE AS FOLLOWS:

S	6, 8	10, 12, 16	14, 18	20
BAR SIZE:	#4	#5	#6	#7
SPACING:	0'-6"	1'-0"	1'-2"	1'-2"

DESIGN DATA: 7TH EDITION, 2014, OF THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS
 RATING DATA: 2ND EDITION, 2011, OF THE AASHTO MANUAL FOR BRIDGE EVALUATION
 LOADING DATA: fy = 60,000 psi., fc = 4,500 psi.,
 LIVE LOAD = AASHTO LRFD, HL-93 TRUCK, HL-93 TANDEM, COLORADO PERMIT TRUCK AND NRL
 DEAD LOAD CASE 1: VERTICAL EARTH LOAD = 120 LBS./CU. FT. HORIZONTAL EARTH LOAD = 30 LBS./CU. FT.
 DEAD LOAD CASE 2: VERTICAL EARTH LOAD = 120 LBS./CU. FT. HORIZONTAL EARTH LOAD = 60 LBS./CU. FT.
 WEARING SURFACE - 12 IN. THICK CONCRETE PAVEMENT.
 DEAD LOAD - TYPE 7 BARRIER.
 THRUST IS NOT CONSIDERED IN THIS STANDARD, I.E. THRUST = 0.
 EXTREME HEADWATER TO DEPTH RATIO IS IN ACCORDANCE WITH THE CDOT DRAINAGE MANUAL.
 EXTREME HEADWATER TO DEPTH RATIO WAS INCLUDED IN THE CULVERT DESIGNS BUT EXCLUDED FROM THE RATINGS AS PER THE AASHTO MANUAL FOR BRIDGE EVALUATION.
 LIVE LOAD SURCHARGE ON EXTERIOR WALLS = 2 FT. OF EARTH

- ★ IF HEADWALL MOUNT GUARDRAIL IS USED (SEE STANDARD PLAN M-606-1, SHEET 19) AND THE NOTES BELOW:
- ALL REINFORCING STEEL SHALL BE ACCORDING TO THIS BOX CULVERT PLAN.
 - ANY SPECIAL DESIGN FOR STIRRUPS WILL NOT BE MEASURED AND PAID FOR SEPARATELY BUT SHALL BE INCLUDED IN THE WORK.
 - HEADWALL DIMENSION AND CONCRETE QUANTITY SHALL BE ACCORDING TO STANDARD PLAN M-606-1, SHEET 19.
 - POST ANCHORS SHALL BE PROVIDED ACCORDING TO STANDARD PLAN M-606-1, SHEET 19.
 - POST ANCHORS AND CONCRETE FOR HEADWALL MOUNT OF GUARDRAIL WILL NOT BE MEASURED AND PAID FOR SEPARATELY BUT SHALL BE INCLUDED IN THE WORK.
 - POST ANCHORS WHEN REQUIRED AND ENCASED IN HEADWALL CONCRETE, SHALL CONFORM TO ASTM A 36 OR AASHTO M 169 STEEL.

Computer File Information

Creation Date: 07/04/12	Initials: DD
Last Modification Date: 11/25/15	Initials: JBE
Full Path: www.codot.gov/business/designsupport	
Drawing File Name: 601020102.dgn	
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	

Sheet Revisions

Date:	Comments
08/27/13	LRFD Design
08/01/15	Analysis Program Updates

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**DOUBLE CONCRETE
BOX CULVERT**

Issued By: Project Development Branch July 4, 2012

STANDARD PLAN NO.

M-601-2

Sheet No. 1 of 2

DOUBLE CONCRETE BOX CULVERT DIMENSIONS, QUANTITIES & RATING FACTORS (EXCLUDING HEADWALL & TOEWALL QUANTITIES)

BOX SIZE				FILL HEIGHT ALLOWED	SLAB & WALL THICKNESS (INCHES)			BAR SIZES								DIMENSIONS					QUANTITIES			RATING FACTORS						
S	R	HT.	WIDTH	FT-FT	T ₁	T ₂	TW & TW ₁	t ₁ *	t ₂	b ₁	b ₂	w ₁ *	w ₂	w ₃ *	w ₄	c ₁ *	c ₂	d ₁ ▲	h ₁	h ₂	v ₁	v ₂	v ₃	CONCRETE	REBAR STL	MEMBRANE	HL-93 INVENTORY	HL-93 OPERATING	COLORADO PERMIT	NRL VEHICLE
FT	FT	FT-IN	FT-IN	FT-FT				#	#	#	#	#	#	#	#	#	#	NO.	FT-IN	FT-IN	FT-IN	FT-IN	FT-IN	CY/LF	LBS/LF	CY/LF				
6	6	7-9	14-6	< 2	11	10	10	5	6	5	6	4	4	5	5	114	3-5	2-4	6-8	3-1	1-11	1.495	338	1.944	1.27	1.65	2.09	2.05		
		7-7.5	14-6	2 TO 10	10	9.5	10	5	5	5	5	4	4	4	5	5	102	2-6	2-4	6-8	3-1	1-11	1.428	300	1.944	1.81	2.35	2.90	2.82	
		7-7.5	14-6	10 TO 12.8	10	9.5	10	4	4	4	4	4	4	4	4	5	102	2-6	2-4	6-8	3-1	1-11	1.428	258	1.944	4.53	5.88	6.42	7.36	
		7-8	14-6	12.8 TO 20	10	10	10	4	4	4	4	4	4	4	4	5	102	2-6	2-4	6-8	3-1	1-11	1.451	258	1.944	◆	◆	◆	◆	
		9-9	14-6	< 2	11	10	10	5	6	5	6	4	4	4	4	5	126	3-5	2-4	8-8	3-1	1-11	1.681	365	1.944	1.28	1.66	2.10	2.05	
		9-7.5	14-6	2 TO 10	10	9.5	10	5	5	5	5	4	4	4	4	5	114	2-6	2-4	8-8	3-1	1-11	1.613	327	1.944	1.82	2.36	2.85	2.77	
	8	9-7.5	14-6	10 TO 12.8	10	9.5	10	4	4	4	4	4	4	4	4	5	114	2-6	2-4	8-8	3-1	1-11	1.613	285	1.944	4.66	6.04	6.82	5.08	
		9-8	14-6	12.8 TO 20	10	10	10	4	5	5	5	4	4	4	4	5	114	2-6	2-4	8-8	3-1	1-11	1.636	317	1.944	◆	◆	◆	◆	
		11-9	14-6	< 2	11	10	10	5	6	5	6	4	4	4	4	5	138	3-5	2-4	10-8	3-1	1-11	1.866	392	1.944	1.28	1.67	1.00	2.06	
		11-7.5	14-6	2 TO 10	10	9.5	10	5	5	5	5	4	4	4	4	5	126	2-6	2-4	10-8	3-1	1-11	1.799	354	1.944	1.83	2.38	1.00	2.78	
		11-7.5	14-6	10 TO 12.8	10	9.5	10	4	4	4	4	4	4	4	4	5	126	2-6	2-4	10-8	3-1	1-11	1.799	312	1.944	2.22	2.88	2.79	1.96	
		11-8.5	14-10.5	12.8 TO 20	10	10.5	11.5	4	5	4	5	4	4	4	4	5	126	2-6	2-4	10-8	3-2	2-0	2.006	336	1.944	◆	◆	◆	◆	

HEADWALL AND TOEWALL QUANTITIES

HEADWALL BENT ANGLE	90° TO 75°			74° TO 60°			59° TO 45°		
	Z	STIRRUPS	REBAR QUANT.	Z	STIRRUPS	REBAR QUANT.	Z	STIRRUPS	REBAR QUANT.
CLEAR SPAN (S)	#	#	LBS/LF	#	#	LBS/LF	#	#	LBS/LF
6	4	4	20.8	4	4	20.4	6	4	31.2
8	4	4	19.9	5	4	24.3	7	4	36.2
10	5	4	25.0	6	4	30.6	9	4	57.8
12	6	4	30.0	6	4	29.6	9	5	61.3
14	6	4	29.7	7	4	35.7	★	★	★
16	6	4	29.0	8	5	46.7	★	★	★
18	7	4	35.0	9	5	54.9	★	★	★
20	7	4	34.4	★	★	★	★	★	★

CONCRETE QUANTITY = 0.086 CY/LF

NOTES

- SIX INCH SPACING AT EACH END OF THE SPAN FOR A DISTANCE OF 1/4 OF THE SPAN LENGTH; 12 INCH SPACING ELSEWHERE.
- QUANTITIES ARE GIVEN FOR ONE HEADWALL AND ONE TOEWALL AND ARE BASED ON PER LINEAR FOOT OF HEADWALL. STEEL QUANTITIES INCLUDE ALL REINFORCING. QUANTITIES SHALL BE PAID FOR AS SHOWN ON THE PLANS.
- ★ SKEWED HEADWALLS ARE NOT RECOMMENDED FOR THESE SPANS. A SPECIAL DESIGN IS REQUIRED.
- FOR HEADWALL AND TOEWALL DETAILS SEE M-601-2, SHEET 1 OF 2.
- WHEN THE FILL HEIGHTS ARE LESS THAN OR EQUAL TO 2 FT, ALL REINFORCING BARS IN THE HEADWALL, ALL REINFORCING BARS DESIGNATED BY AN ASTERISK (*), AND THE d₁ BARS IN THE TOP MAT OF THE TOP SLAB SHALL BE EPOXY COATED.
- REINFORCING QUANTITIES INCLUDE BOTH EPOXY-COATED AND UNCOATED BARS.
- WHEN A (RISE) R OF LESS THAN 6 FT IS REQUIRED, USE THE BAR SIZES AND THE SLAB AND WALL THICKNESSES FOR THE 6 FT RISE (IF AVAILABLE ON THE TABLE).
- ▲ FOR SIZE AND SPACING OF THE BOTTOM MAT BARS IN THE TOP SLAB SEE TABLE ON M-601-2, SHEET 1 OF 2. ALL OTHER d₁ BARS ARE #4'S AT 1'-0" SPACING. THE NUMBER OF BARS REQUIRED IS LISTED ON THIS SHEET AND INCLUDES BOTH #4 BARS AND THOSE FROM THE TABLE.
- ◆ LIVE LOAD IS NEGLECTED AS PER AASHTO LRFD SECTION 3.6.1.2.6. FOR THESE STRUCTURES REFER TO THE CDDT RATING MANUAL.
- FOR ALL NEW CULVERT DESIGNS, A RATING IS REQUIRED. THE RATING SUMMARY SHEET SHOULD BE PRINTED FROM THE CDDT EXTERNAL WEBSITE AND SUBMITTED TO THE BRIDGE RATING UNIT OR INCLUDED AS PART OF A LARGER DESIGN PACKAGE. FOR ADDITIONAL INFORMATION, SEE THE CDDT RATING MANUAL.

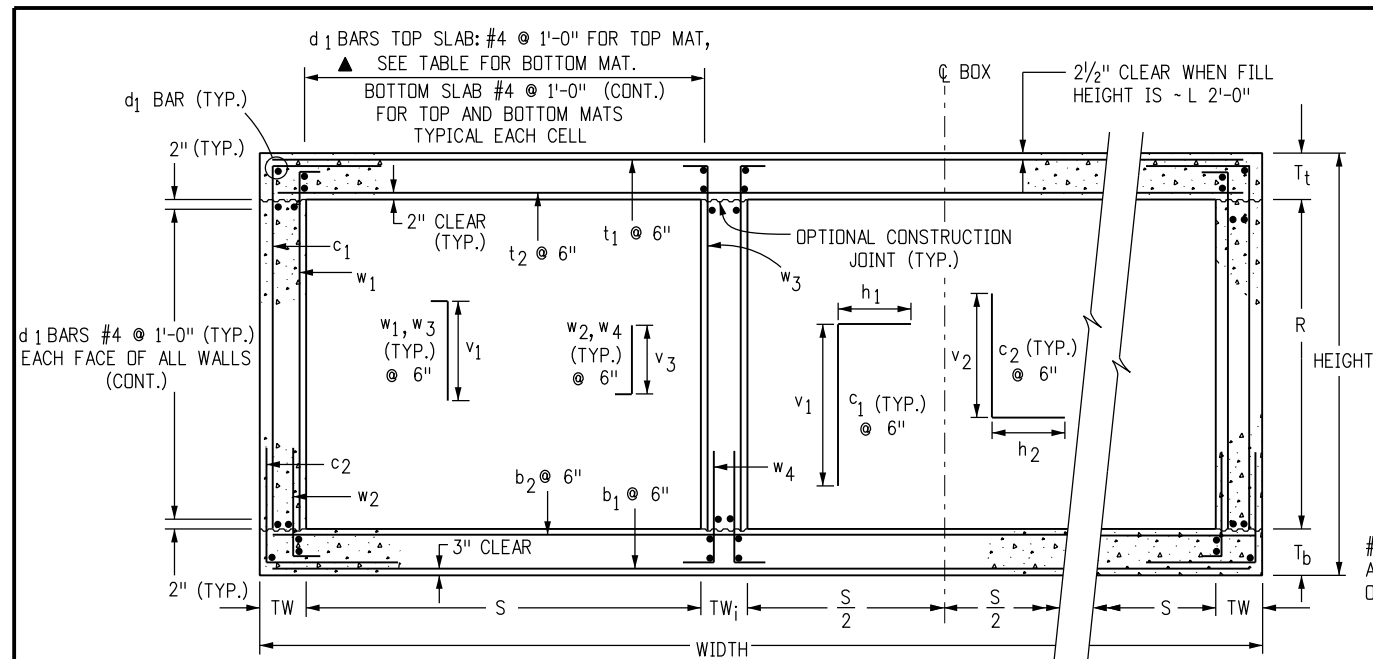
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Sheet Revisions	
Date:	Comments
(R-1) 08/27/13	LRFD Design
(R-2) 08/01/15	Analysis Program Updates

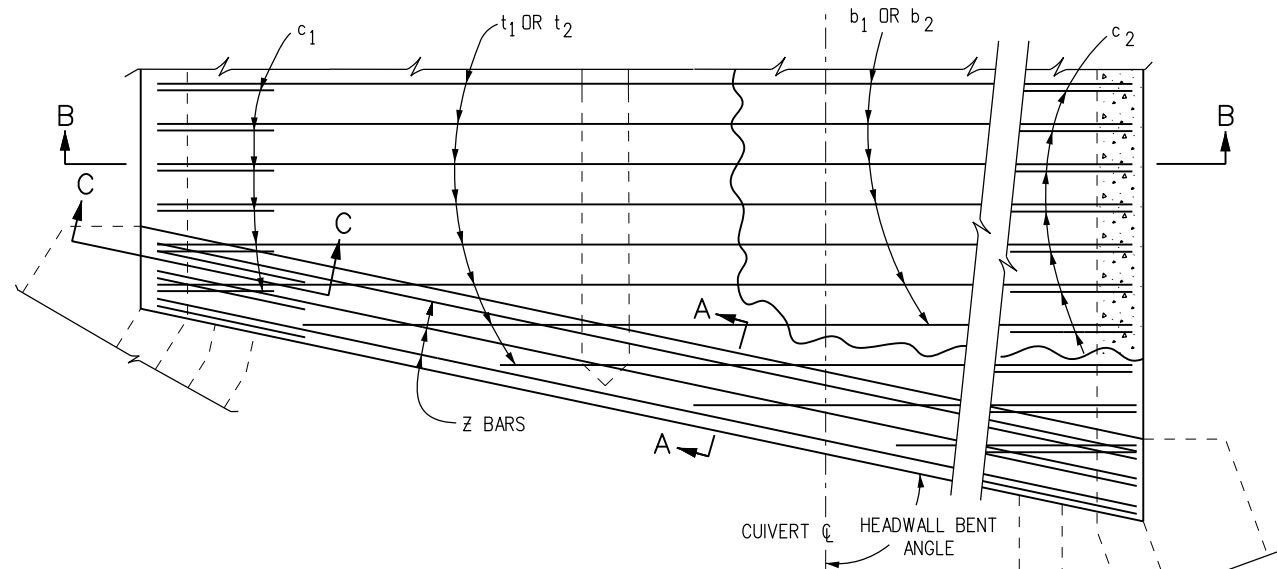
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DOUBLE CONCRETE BOX CULVERT
 Issued By: Project Development Branch July 4, 2012

STANDARD PLAN NO.
M-601-2
Sheet No. 2 of 2

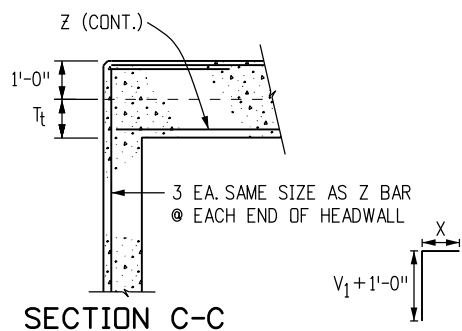


SECTION B-B

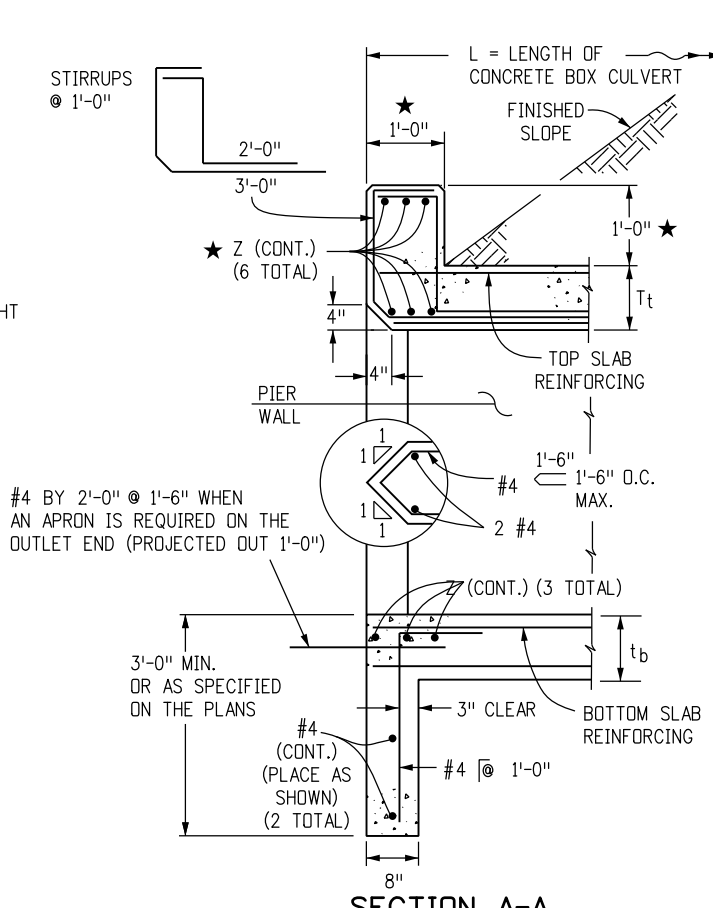


REINFORCING PLAN

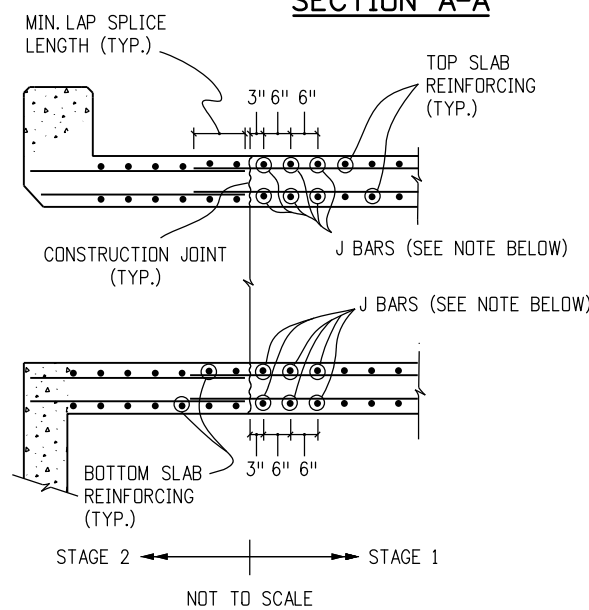
BAR SIZE (#)	EPDXY X (FT.-IN.)	BLACK X (FT.-IN.)
4	2-4	1-11
5	2-10	2-4
6	3-5	2-10
7	4-1	3-3
8	5-3	4-3
9	6-8	5-5



SECTION C-C HEADWALL CORNER REINFORCING DETAIL



SECTION A-A



CONSTRUCTION JOINT DETAIL FOR STAGED CONSTRUCTION

NOTE: THIS DETAIL IS FOR CONSTRUCTION JOINTS INSTALLED PERPENDICULAR TO THE C OF THE BOX ONLY. THE CONTRACTOR CAN DESIGN AND INSTALL J BARS AT HIS EXPENSE TO SUPPORT TEMPORARY LIVE LOADS DURING STAGE 1 CONSTRUCTION. J BARS SHALL BE THE SAME SIZE AS THE TOP AND BOTTOM SLAB REINFORCING WHEN THERE ARE NO TEMPORARY LIVE LOADS TO SUPPORT.

GENERAL NOTES

- ALL CONCRETE SHALL BE CLASS D (BOX CULVERT).
- ALL CONSTRUCTION JOINTS SHALL BE THOROUGHLY CLEANED BEFORE FRESH CONCRETE IS PLACED.
- ALL CONSTRUCTION JOINTS NOT SHOWN ON THE PLANS SHALL BE CONSTRUCTED ONLY IF APPROVED BY THE ENGINEER.
- THE CONTRACTOR SHALL MAINTAIN THE STABILITY OF THE STRUCTURE DURING CONSTRUCTION.
- STRUCTURE EXCAVATION AND BACKFILL SHALL BE IN ACCORDANCE WITH STANDARD PLAN M-206-1.
- FOR ANY CULVERT SPAN 20 FT. OR GREATER, A FOUNDATION INVESTIGATION AND REPORT ARE REQUIRED.
- BACKFILL SHALL NOT BEGIN UNTIL TOP SLAB HAS REACHED DESIGN STRENGTH, f'_c .
- SPLICE QUANTITIES FOR LONGITUDINAL AND TRANSVERSE BARS ARE NOT INCLUDED.
- REINFORCING STEEL SHALL BE GRADE 60.
- THE MINIMUM LAP SPLICE LENGTH FOR EPOXY COATED REINFORCING BARS SHALL BE:

BAR SIZE:	#4	#5	#6	#7	#8	#9	#10	#11
SPLICE LENGTH:	1'-3"	1'-7"	2'-5"	2'-10"	3'-8"	4'-8"	5'-11"	7'-3"

THE MINIMUM LAP SPLICE LENGTH FOR BLACK REINFORCING BARS SHALL BE:

BAR SIZE:	#4	#5	#6	#7	#8	#9	#10	#11
SPLICE LENGTH:	1'-1"	1'-4"	1'-7"	1'-11"	2'-6"	3'-1"	3'-11"	4'-10"

THE ABOVE SPLICE LENGTHS ARE FOR CLASS B SPLICES.

- ALL DIMENSIONS ARE PERPENDICULAR TO THE CENTERLINE OF THE BOX.
- WINGWALLS SHALL BE TIED TO CONCRETE BOX CULVERT IN ACCORDANCE WITH STANDARD PLAN M-601-20.
- ALL TRANSVERSE REINFORCING SHALL BE NORMAL TO THE CENTERLINE OF THE BOX.
- THE FILL HEIGHT IS THE DISTANCE MEASURED FROM THE TOP OF THE TOP SLAB TO THE TOP OF PAVEMENT.
- ALL EXPOSED CONCRETE CORNERS SHALL BE CHAMFERED $\frac{3}{4}$ IN.
- FOR FILL HEIGHTS LESS THAN 2 FT, A WATERPROOFING MEMBRANE SHALL BE PROVIDED FOR THE TOP OF THE TOP SLAB AND 18" DOWN ALONG THE TOPS OF THE EXTERIOR WALLS.
- FOR FILL HEIGHTS LESS THAN 2 FT. THE d_1 BARS FOR THE BOTTOM MAT OF THE TOP SLAB SHALL BE AS FOLLOWS:

S	8, 9, 10	14, 16, 18	20
BAR SIZE:	#5	#6	#7
SPACING	1'-0"	1'-0"	1'-0"

DESIGN DATA: 7TH EDITION, 2014, OF THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS
 RATING DATA: 2ND EDITION, 2011, OF THE AASHTO MANUAL FOR BRIDGE EVALUATION
 $f_y = 60,000$ psi,
 $f'_c = 4,500$ psi,
 LIVE LOAD = AASHTO LRFD, HL-93 TRUCK, HL-93 TANDEM, COLORADO PERMIT TRUCK AND NRL
 DEAD LOAD CASE 1: VERTICAL EARTH LOAD = 120 LBS./CU. FT.
 HORIZONTAL EARTH LOAD = 30 LBS./CU. FT.
 DEAD LOAD CASE 2: VERTICAL EARTH LOAD = 120 LBS./CU. FT.
 HORIZONTAL EARTH LOAD = 60 LBS./CU. FT.
 WEARING SURFACE - 12 IN. THICK CONCRETE PAVEMENT.
 DEAD LOAD - TYPE 7 BARRIER.
 THRUST IS NOT CONSIDERED IN THIS STANDARD, I.E. THRUST = 0.
 EXTREME HEADWATER TO DEPTH RATIO IS IN ACCORDANCE WITH THE CDOT DRAINAGE MANUAL.
 EXTREME HEADWATER TO DEPTH RATIO WAS INCLUDED IN THE CULVERT DESIGNS BUT EXCLUDED FROM THE RATINGS AS PER THE AASHTO MANUAL FOR BRIDGE EVALUATION.
 LIVE LOAD SURCHARGE ON EXTERIOR WALLS = 2 FT. OF EARTH

- ★ IF HEADWALL MOUNT GUARDRAIL IS USED (SEE STANDARD PLAN M-606-1, SHEET 19 AND NOTES BELOW):
 - ALL REINFORCING STEEL SHALL BE ACCORDING TO THIS BOX CULVERT PLAN.
 - ANY SPECIAL DESIGN FOR STIRRUPS WILL NOT BE MEASURED AND PAID FOR SEPARATELY BUT SHALL BE INCLUDED IN THE WORK.
 - HEADWALL DIMENSION AND CONCRETE QUANTITY SHALL BE ACCORDING TO STANDARD PLAN M-606-1, SHEET 19.
 - POST ANCHORS SHALL BE PROVIDED ACCORDING TO STANDARD PLAN M-606-1, SHEET 19.
 - POST ANCHORS AND CONCRETE FOR HEADWALL MOUNT OF GUARDRAIL WILL NOT BE MEASURED AND PAID FOR SEPARATELY BUT SHALL BE INCLUDED IN THE WORK.
 - POST ANCHORS WHEN REQUIRED AND ENCASED IN HEADWALL CONCRETE, SHALL CONFORM TO ASTM A 36 OR AASHTO M 169 STEEL.

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Creation Date: 07/04/12	Initials: DD
Last Modification Date: 11/25/15	Initials: JBE
Full Path: www.codot.gov/business/designsupport	
Drawing File Name: 601030102.dgn	
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	

Sheet Revisions	
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TRIPLE CONCRETE BOX CULVERT
 Issued By: Project Development Branch July 4, 2012

STANDARD PLAN NO.
M-601-3
 Sheet No. 1 of 2

TRIPLE CONCRETE BOX CULVERT DIMENSIONS, QUANTITIES & RATING FACTORS (EXCLUDING HEADWALL & TOEWALL QUANTITIES)

BOX SIZE				FILL HEIGHT ALLOWED FT-FT	SLAB & WALL THICKNESS (INCHES)			BAR SIZES						DIMENSIONS					QUANTITIES			RATING FACTORS							
S	R	HT.	WIDTH		T _t	T _b	TW & TW ₁	t1*	t2	b1	b2	w1*	w2	w3*	w4	c1*	c2	d1 [▲]	h1	h2	v1	v2	v3	CONCRETE CY/LF	REBAR STL LBS/LF	WATERPROOFING SY/LF	HL-93 INVENTORY	HL-93 OPERATING	COLORADO PERMIT
7-10.5	27-4	< 2	10	10	10	10	6	5	6	4	4	5	5	5	5	5	168	3-5	2-4	6-10	2-4	1-11	2,639	531	3,370	1.21	1.57	1.82	1.69
7-9.5	27-4	2 TO 8	10.5	11	10	10	4	5	4	5	4	5	5	5	5	5	168	2-6	2-4	6-8	3-2	2-0	2,555	429		1.47	1.90	2.07	1.83
8-0	27-4	8 TO 12	11	13	10	10	4	5	4	5	4	5	5	5	5	5	168	2-6	2-4	6-9	3-4	2-2	2,765	432		3.38	4.39	4.80	5.22
8-0	27-4	12 TO 16	11	13	10	10	5	4	4	4	5	5	5	5	5	5	168	2-6	2-4	6-9	3-4	2-2	2,765	462		6.80	8.81	9.35	8.63
8-0	27-4	16 TO 20	11	13	10	10	5	4	4	4	5	5	5	5	5	5	168	2-4	2-4	6-9	3-5	2-2	2,765	482		1.69	2.19	2.20	2.27
8-3.5	27-4	20 TO 25.9	13	14.5	10	10	5	5	5	5	5	5	5	5	5	5	168	2-6	2-4	6-11	2-4	2-3	3,061	523		6.80	8.82	8.50	5.95
8-4.5	27-10	26 TO 30	13.5	15	11.5	10	5	6	5	6	5	5	5	5	5	5	168	3-3	2-6	6-11	3-6	2-4	3,300	587		◆	◆	◆	◆
9-10.5	27-4	< 2	12.5	10	10	10	5	6	5	6	4	4	5	5	5	5	184	3-5	2-4	8-10	3-1	1-11	2,886	566	3,370	1.21	1.57	1.82	1.65
9-9.5	27-4	2 TO 8	10.5	11	10	10	4	5	4	5	4	4	5	5	5	5	175	2-6	2-4	8-8	3-2	2-0	2,801	461		1.46	1.89	2.00	1.82
10-0	27-4	8 TO 12	11	13	10	10	4	5	4	5	4	4	5	5	5	5	184	2-6	2-4	8-9	3-4	2-2	3,012	464		3.45	4.47	4.89	5.12
10-0	27-4	12 TO 16	11	13	10	10	5	4	4	5	4	4	5	5	5	5	184	2-6	2-4	8-9	2-4	2-2	3,012	460		2.53	3.27	3.47	3.73
10-4	27-4	16 TO 20	13.5	14.5	10	10	5	4	4	5	4	4	5	5	5	5	184	3-3	2-4	8-11	3-5	2-2	3,350	490		3.07	3.98	3.84	2.72
10-4	27-6	20 TO 25.9	13.5	14.5	10.5	10	5	6	5	5	6	6	5	5	5	5	184	3-3	2-4	8-11	3-6	2-3	3,414	675		1.78	2.32	2.23	1.56
10-4.5	27-10	26 TO 30	13.5	15	11.5	10	5	5	5	5	5	5	5	5	5	5	184	3-3	2-6	8-11	3-6	2-4	3,584	578		◆	◆	◆	◆

HEADWALL AND TOEWALL QUANTITIES

HEADWALL BENT ANGLE	90° TO 75°			74° TO 60°			59° TO 45°			
	CLEAR SPAN (S)	Z	STIRRUPS	REBAR QUANT.	Z	STIRRUPS	REBAR QUANT.	Z	STIRRUPS	REBAR QUANT.
	#	#	LBS/LF	#	#	LBS/LF	#	#	LBS/LF	
8	4	4	19.2	5	4	23.5	7	4	34.4	
10	5	4	23.9	6	4	28.7	9	4	54.0	
12	6	4	28.7	6	4	28.2	9	5	59.2	
14	6	4	27.9	7	4	33.5	★	★	★	
16	6	4	27.5	8	5	44.1	★	★	★	
18	7	4	33.0	9	5	51.8	★	★	★	
20	7	4	32.8	★	★	★	★	★	★	

CONCRETE QUANTITY = 0.086 CY/LF

NOTES

- SIX INCH SPACING AT EACH END OF THE SPAN FOR A DISTANCE OF 1/4 OF THE SPAN LENGTH; 12 INCH SPACING ELSEWHERE.
- QUANTITIES ARE GIVEN FOR ONE HEADWALL AND ONE TOEWALL AND ARE BASED ON PER LINEAR FOOT OF HEADWALL. STEEL QUANTITIES INCLUDE ALL REINFORCING. QUANTITIES SHALL BE PAID FOR AS SHOWN ON THE PLANS.
- ★ SKewed HEADWALLS ARE NOT RECOMMENDED FOR THESE SPANS. A SPECIAL DESIGN IS REQUIRED.
- FOR HEADWALL AND TOEWALL DETAILS SEE M-601-3, SHEET 1 OF 2.
- WHEN THE FILL HEIGHTS ARE LESS THAN OR EQUAL TO 2 FT, ALL REINFORCING BARS IN THE HEADWALL, ALL REINFORCING BARS DESIGNATED BY AN ASTERISK (*), AND THE d₁ BARS IN THE TOP MAT OF THE TOP SLAB SHALL BE EPOXY COATED.
- REINFORCING QUANTITIES INCLUDE BOTH EPOXY-COATED AND UNCOATED BARS.
- WHEN A (RISE) R OF LESS THAN 6 FT IS REQUIRED, USE THE BAR SIZES AND THE SLAB AND WALL THICKNESSES FOR THE 6 FT RISE (IF AVAILABLE ON THE TABLE).
- ▲ FOR SIZE AND SPACING OF THE BOTTOM MAT BARS IN THE TOP SLAB SEE TABLE ON M-601-3, SHEET 1 OF 2. ALL OTHER d₁ BARS ARE #4's AT 1'-0" SPACING. THE NUMBER OF BARS REQUIRED IS LISTED ON THIS SHEET AND INCLUDES BOTH #4 BARS AND THOSE FROM THE TABLE.
- ◆ LIVE LOAD IS NEGLECTED AS PER AASHTO LRFD SECTION 3.6.1.2.6. FOR THESE STRUCTURES REFER TO THE CDDT RATING MANUAL.
- FOR ALL NEW CULVERT DESIGNS, A RATING IS REQUIRED. THE RATING SUMMARY SHEET SHOULD BE PRINTED FROM THE CDDT EXTERNAL WEBSITE AND SUBMITTED TO THE BRIDGE RATING UNIT OR INCLUDED AS PART OF A LARGER DESIGN PACKAGE. FOR ADDITIONAL INFORMATION, SEE THE CDDT RATING MANUAL.

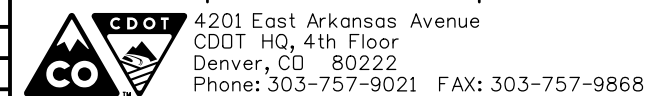
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Sheet Revisions

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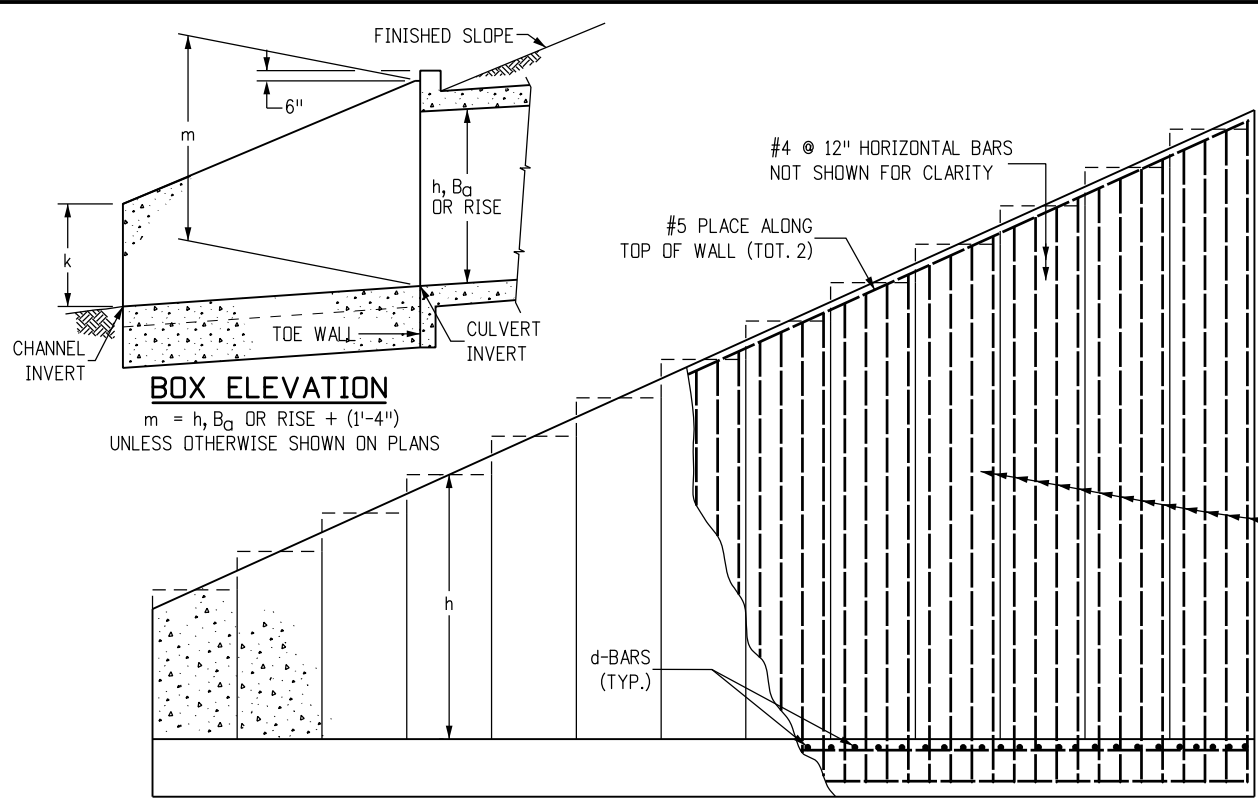
TRIPLE CONCRETE BOX CULVERT

Issued By: Project Development Branch July 4, 2012

STANDARD PLAN NO.

M-601-3

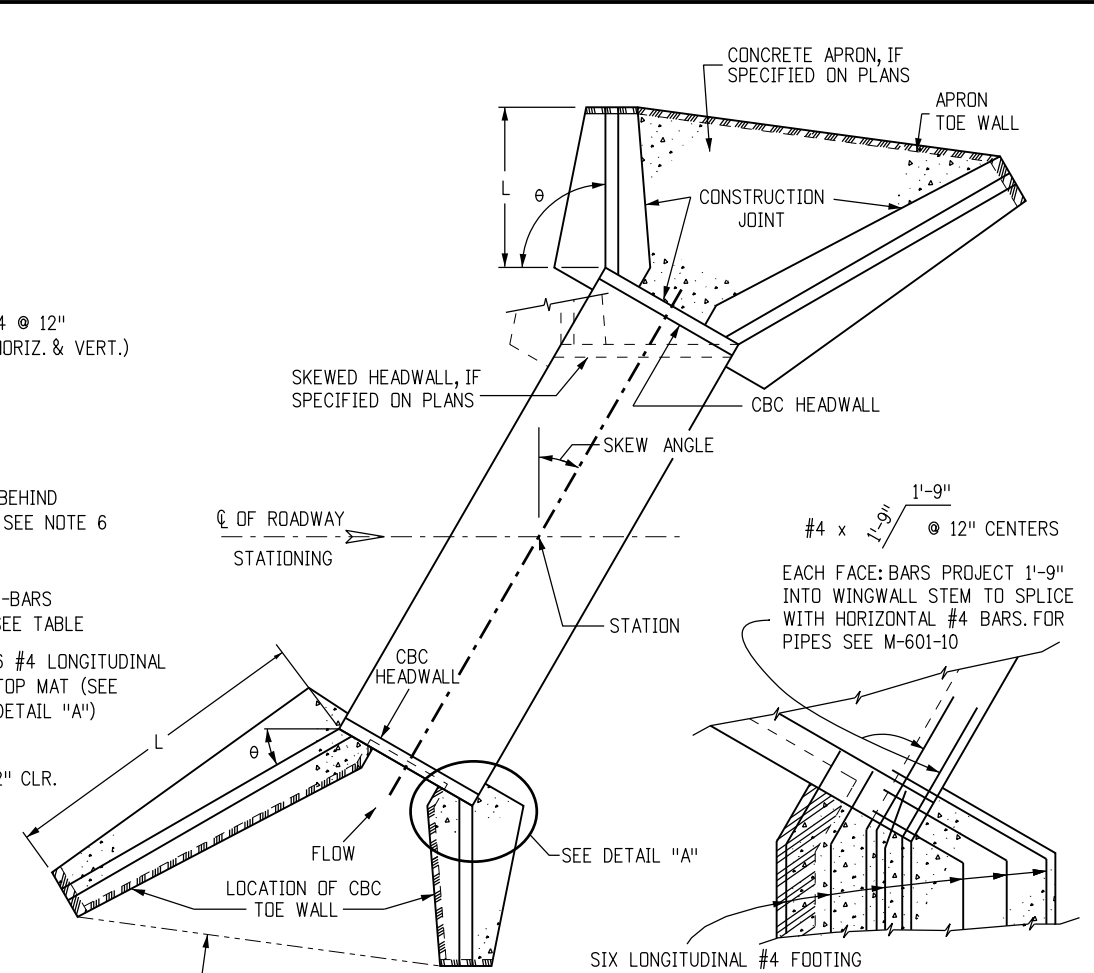
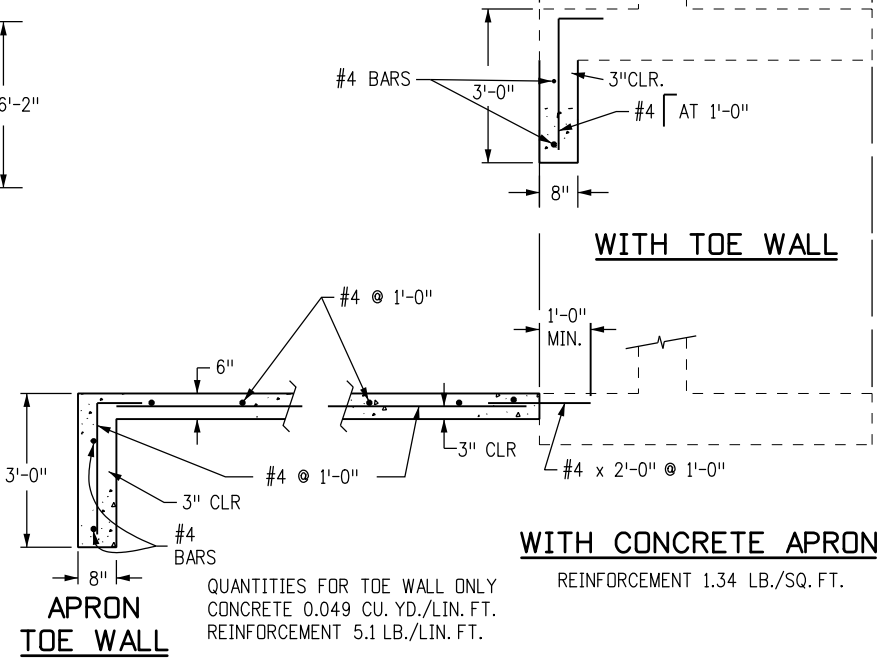
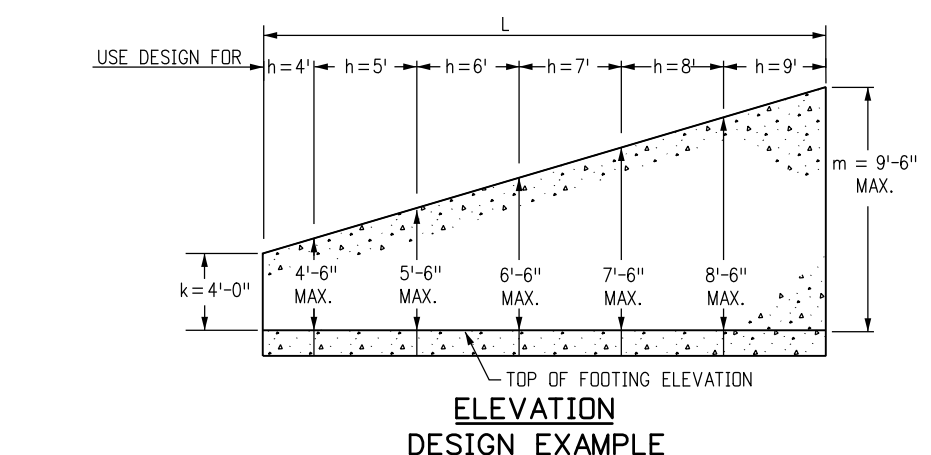
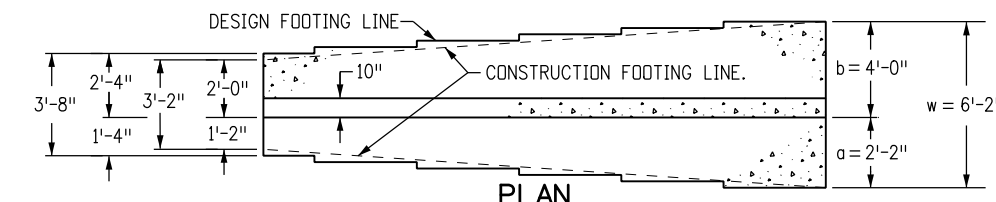
Sheet No. 2 of 2



h =	2'	3'	4'	5'	6'	7'	8'	9'	10'	11'	12'	13'	14'
a =	1'-0"	1'-2"	1'-4"	1'-6"	1'-8"	1'-10"	2'-0"	2'-2"	2'-4"	2'-6"	2'-8"	2'-10"	3'-0"
b =	1'-8"	2'-0"	2'-4"	2'-8"	3'-0"	3'-4"	3'-8"	4'-0"	4'-4"	4'-8"	5'-0"	5'-4"	5'-8"
w =	2'-8"	3'-2"	3'-8"	4'-2"	4'-8"	5'-2"	5'-8"	6'-2"	6'-8"	7'-2"	7'-8"	8'-2"	8'-8"
d-BARS	#4 @ 9"	#4 @ 9"	#4 @ 9"	#4 @ 9"	#4 @ 9"	#4 @ 9"	#5 @ 11"	#5 @ 10"	#5 @ 10"	#5 @ 8"	#6 @ 8"	#7 @ 9"	#7 @ 7"
* CONC. CY/LF	0.161	0.210	0.259	0.309	0.358	0.407	0.457	0.506	0.556	0.605	0.654	0.704	0.753

* DOES NOT INCLUDE TOE WALL QUANTITIES SEE SHEET 2 OF 2 FOR REINFORCING STEEL QUANTITY

■ REQUIRED DRAINAGE BEHIND WINGWALLS SEE NOTE 6



INLET APRON IS REQUIRED IF CBC IS USED AS AN ANIMAL PASS

SIX LONGITUDINAL #4 FOOTING BARS (TOP MAT), PROJECT 1'-9\"/>

DESIGN DATA:

AASHTO LRFD EIGHTH EDITION, 2017
 DESIGN METHOD: LOAD AND RESISTANCE FACTOR DESIGN, YIELD LINE METHOD

REINFORCED CONCRETE:
 CONCRETE CLASS D (BOX CULVERT): $f'_c = 4,500$ PSI
 REINFORCING STEEL: $f_y = 60,000$ PSI

LOADING:
 AT-REST EARTH (FLUID) PRESSURE FOR CONCRETE STEM DESIGN = 55 PCF FOR 2 (MIN.) : 1 SLOPED BACKFILL
 ACTIVE EARTH (FLUID) PRESSURE FOR CONCRETE FOOTING DESIGN = 40 PCF FOR 2 (MIN.) : 1 SLOPED BACKFILL
 LIVE LOAD SURCHARGE = 2'
 MINIMUM RESISTANCE FOR SOIL BEARING = 5.5 KSF
 SOIL BEARING RESISTANCE FACTOR = 0.45

GENERAL NOTES:

- ALL EXPOSED CONCRETE CORNERS SHALL BE CHAMFERED $\frac{3}{4}$ IN.
- WINGWALL FOOTING AND FLOOR OF BOX CULVERT SHALL BE PLACED MONOLITHICALLY.
- DIMENSIONS "h", "k", "L", "m" AND ANGLE "θ" FOR WINGWALL SHALL BE AS SHOWN ON THE PLANS.
- MINIMUM CLASS B LAP SPLICE LENGTH FOR BLACK REINFORCING BARS:
 BAR SIZE: #4 #5 #6 #7
 SPLICE LENGTH: 1'-6" 1'-11" 2'-3" 2'-7"
- DESIGN DOES NOT CONSIDER ANY SCOUR EFFECTS.
- WINGWALL DRAIN SHALL BE REQUIRED IF "h" ≥ 12.0 FT., SEE SHEET 2 OF 2 FOR DETAILS.

Computer File Information

Creation Date: 07/04/12	Initials: HHB
Last Modification Date: 09/04/18	Initials:
Full Path: www.codot.gov/business/designsupport	
Drawing File Name: 6010200102.dgn	
CAD Ver.: MicroStation V8	Scale: Not to Scale Units: English

Sheet Revisions

Date:	Comments
09/04/18	LRFD Design

Colorado Department of Transportation

2829 West Howard Place
 CDDT HQ, 3rd Floor
 Denver, CO 80204
 Phone: 303-757-9021 FAX: 303-757-9868

Division of Project Support HHB

WINGWALLS FOR PIPE OR BOX CULVERTS

Issued By: Project Development Branch July 4, 2012

STANDARD PLAN NO.

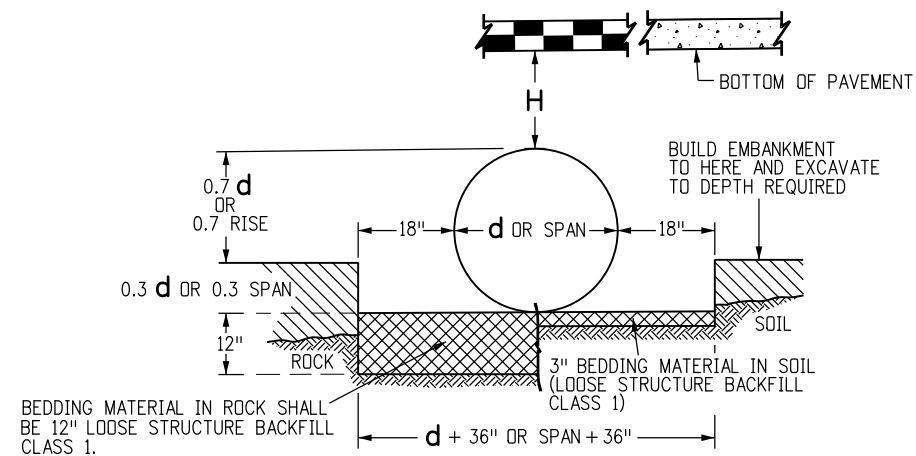
M-601-20

Sheet No. 1 of 2

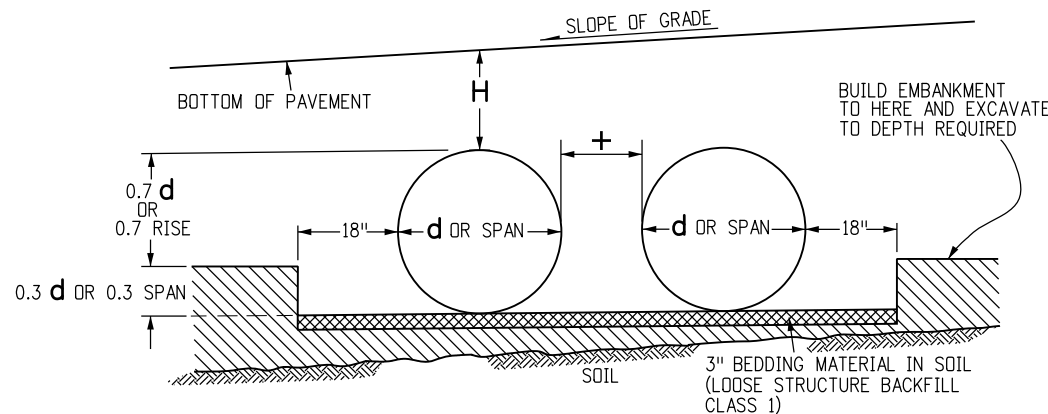
c-BARS AND REINFORCING STEEL QUANTITY (EXCLUDE TOE WALL)

* REINFORCING STEEL QUANTITY INCLUDES STEM AND FOOTING QUANTITIES, BUT DOES NOT INCLUDE TOE WALL QUANTITIES.

L (MULTIPLE OF m)		≤ (1.0 x m)		≤ (1.25 x m)		≤ (1.5 x m)		≤ (1.75 x m)		≤ (2.0 x m)		≤ (2.25 x m)		≤ (2.5 x m)		≤ (2.75 x m)		≤ (3.0 x m)		≤ (3.25 x m)		≤ (3.5 x m)	
m (FT)	k (FT)	c-BARS	* REINF. LB./L.F.	c-BARS	* REINF. LB./L.F.	c-BARS	* REINF. LB./L.F.	c-BARS	* REINF. LB./L.F.	c-BARS	* REINF. LB./L.F.	c-BARS	* REINF. LB./L.F.	c-BARS	* REINF. LB./L.F.	c-BARS	* REINF. LB./L.F.	c-BARS	* REINF. LB./L.F.	c-BARS	* REINF. LB./L.F.	c-BARS	* REINF. LB./L.F.
14	4	#4 @ 10"	53.60	#5 @ 10"	57.95	#5 @ 10"	57.10	#5 @ 8"	60.22	#5 @ 7"	62.43	#5 @ 7"	62.09	#5 @ 6"	65.38	#5 @ 6"	65.15	#6 @ 8"	67.10	#6 @ 8"	66.94	#6 @ 7"	70.66
	5	#4 @ 10"	55.86	#5 @ 10"	60.46	#5 @ 10"	59.60	#5 @ 8"	62.89	#5 @ 7"	65.23	#5 @ 7"	64.88	#5 @ 6"	68.34	#5 @ 6"	68.11	#6 @ 8"	70.17	#6 @ 8"	70.00	#6 @ 7"	73.90
	6	#5 @ 10"	64.43	#6 @ 10"	70.60	#6 @ 10"	69.69	#6 @ 8"	74.93	#6 @ 8"	74.45	#6 @ 7"	78.30	#6 @ 6"	83.64	#6 @ 6"	83.40	#6 @ 6"	83.22	#6 @ 6"	83.05	#7 @ 7"	89.64
	7	#5 @ 10"	67.29	#6 @ 10"	73.76	#6 @ 10"	72.83	#6 @ 8"	78.32	#6 @ 8"	77.84	#6 @ 7"	81.87	#6 @ 6"	87.45	#6 @ 6"	87.21	#6 @ 6"	87.02	#6 @ 6"	86.86	#7 @ 7"	93.73
	8	#5 @ 8"	74.71	#6 @ 8"	83.46	#6 @ 7"	87.09	#6 @ 6"	92.54	#7 @ 7"	99.47	#7 @ 7"	99.08	#7 @ 6"	107.11	#7 @ 6"	106.86	#7 @ 6"	106.66	#7 @ 6"	106.49	#7 @ 6"	106.35
9	#5 @ 8"	78.10	#6 @ 8"	87.23	#6 @ 7"	91.03	#6 @ 6"	96.72	#7 @ 7"	103.93	#7 @ 7"	103.54	#7 @ 6"	111.90	#7 @ 6"	111.65	#7 @ 6"	111.45	#7 @ 6"	111.28	#7 @ 6"	111.13	
13	4	#4 @ 10"	50.51	#4 @ 10"	49.25	#5 @ 10"	53.71	#5 @ 10"	53.09	#5 @ 10"	52.36	#5 @ 9"	53.85	#5 @ 8"	55.54	#5 @ 7"	57.85	#5 @ 7"	57.67	#5 @ 7"	57.51	#6 @ 9"	59.93
	5	#4 @ 10"	52.66	#4 @ 10"	51.37	#5 @ 10"	56.09	#5 @ 10"	55.46	#5 @ 10"	54.99	#5 @ 9"	56.29	#5 @ 8"	58.08	#5 @ 7"	60.51	#5 @ 7"	60.33	#5 @ 7"	60.17	#6 @ 9"	62.72
	6	#4 @ 10"	54.92	#5 @ 10"	59.48	#5 @ 9"	60.31	#6 @ 9"	67.56	#6 @ 9"	67.08	#6 @ 9"	66.70	#6 @ 8"	69.53	#6 @ 8"	69.28	#6 @ 7"	73.12	#6 @ 7"	72.95	#6 @ 7"	72.81
	7	#4 @ 10"	57.36	#5 @ 10"	62.16	#5 @ 9"	63.05	#6 @ 9"	70.66	#6 @ 9"	70.16	#6 @ 9"	69.78	#6 @ 8"	72.75	#6 @ 8"	72.50	#6 @ 7"	76.52	#6 @ 7"	76.35	#6 @ 7"	76.20
	8	#5 @ 10"	66.39	#6 @ 10"	72.82	#6 @ 8"	77.97	#6 @ 7"	81.68	#6 @ 7"	81.19	#6 @ 6"	86.67	#6 @ 6"	86.37	#7 @ 7"	93.18	#7 @ 7"	92.97	#7 @ 7"	92.80	#7 @ 7"	92.64
9	#5 @ 10"	69.37	#6 @ 10"	76.10	#6 @ 8"	81.49	#6 @ 7"	85.37	#6 @ 7"	84.87	#6 @ 6"	90.59	#6 @ 6"	90.29	#7 @ 7"	97.39	#7 @ 7"	97.18	#7 @ 7"	97.00	#7 @ 7"	96.85	
12	2	#4 @ 10"	43.91	#4 @ 10"	42.65	#4 @ 10"	41.82	#4 @ 10"	41.22	#4 @ 10"	40.78	#4 @ 9"	41.29	#5 @ 10"	44.61	#5 @ 10"	44.37	#5 @ 10"	44.18	#5 @ 10"	44.01	#5 @ 10"	43.87
	3	#4 @ 10"	45.82	#4 @ 10"	44.55	#4 @ 10"	43.71	#4 @ 10"	43.11	#4 @ 10"	42.66	#4 @ 9"	43.22	#5 @ 10"	46.75	#5 @ 10"	46.51	#5 @ 10"	46.32	#5 @ 10"	46.15	#5 @ 10"	46.01
	4	#4 @ 10"	47.80	#4 @ 10"	46.51	#4 @ 10"	45.65	#5 @ 10"	50.06	#5 @ 10"	49.59	#5 @ 10"	49.23	#5 @ 10"	48.94	#5 @ 10"	48.69	#5 @ 9"	50.00	#5 @ 8"	51.72	#5 @ 8"	51.57
	5	#4 @ 10"	49.84	#4 @ 10"	48.53	#4 @ 10"	47.66	#5 @ 10"	52.33	#5 @ 10"	51.85	#5 @ 10"	51.48	#5 @ 10"	51.19	#5 @ 10"	50.94	#5 @ 9"	52.33	#5 @ 8"	54.14	#5 @ 8"	54.00
	6	#4 @ 10"	51.99	#4 @ 10"	50.65	#5 @ 10"	55.34	#5 @ 8"	58.41	#5 @ 8"	57.93	#6 @ 10"	60.60	#6 @ 10"	60.29	#6 @ 9"	62.42	#6 @ 9"	62.22	#6 @ 9"	62.04	#6 @ 8"	64.89
	7	#4 @ 10"	54.30	#5 @ 10"	58.80	#5 @ 10"	57.87	#5 @ 8"	61.10	#5 @ 8"	60.61	#6 @ 10"	63.43	#6 @ 10"	63.11	#6 @ 9"	65.35	#6 @ 9"	65.15	#6 @ 9"	64.97	#6 @ 8"	67.96
	8	#5 @ 10"	62.91	#5 @ 10"	61.45	#5 @ 7"	67.46	#5 @ 6"	70.68	#5 @ 6"	70.20	#6 @ 7"	76.44	#6 @ 7"	76.13	#6 @ 7"	75.87	#6 @ 6"	81.30	#6 @ 6"	81.12	#6 @ 6"	80.98
	9	#5 @ 10"	65.64	#5 @ 10"	64.15	#5 @ 7"	70.44	#5 @ 6"	73.82	#5 @ 6"	73.33	#6 @ 7"	79.86	#6 @ 7"	79.54	#6 @ 7"	79.28	#6 @ 6"	84.95	#6 @ 6"	84.77	#6 @ 6"	84.62
	11	2	#4 @ 10"	41.70	#4 @ 10"	40.42	#4 @ 10"	39.57	#4 @ 10"	38.96	#4 @ 10"	38.50	#4 @ 10"	38.15	#4 @ 10"	37.87	#4 @ 10"	37.63	#4 @ 9"	38.25	#5 @ 10"	41.46	#5 @ 10"
3		#4 @ 10"	43.57	#4 @ 10"	42.27	#4 @ 10"	41.40	#4 @ 10"	40.79	#4 @ 10"	40.33	#4 @ 10"	39.97	#4 @ 10"	39.69	#4 @ 10"	39.45	#4 @ 9"	40.12	#5 @ 10"	43.54	#5 @ 10"	43.39
4		#4 @ 10"	45.48	#4 @ 10"	44.16	#4 @ 10"	43.28	#4 @ 10"	42.66	#4 @ 9"	43.09	#5 @ 10"	46.57	#5 @ 10"	46.27	#5 @ 10"	46.02	#5 @ 10"	45.82	#5 @ 10"	45.65	#5 @ 10"	45.50
5		#4 @ 10"	47.46	#4 @ 10"	46.10	#4 @ 10"	45.21	#4 @ 10"	44.58	#4 @ 9"	45.06	#5 @ 10"	48.74	#5 @ 10"	48.44	#5 @ 10"	48.19	#5 @ 10"	47.99	#5 @ 10"	47.81	#5 @ 10"	47.67
6		#4 @ 10"	49.52	#4 @ 10"	48.14	#4 @ 9"	48.23	#5 @ 10"	51.88	#5 @ 10"	51.38	#5 @ 9"	52.57	#5 @ 9"	52.27	#5 @ 8"	53.99	#5 @ 8"	53.79	#5 @ 7"	56.16	#5 @ 7"	56.01
7		#4 @ 10"	51.73	#4 @ 10"	50.31	#4 @ 9"	50.43	#5 @ 10"	54.29	#5 @ 10"	53.78	#5 @ 9"	55.04	#5 @ 9"	54.73	#5 @ 8"	56.55	#5 @ 8"	56.35	#5 @ 7"	58.84	#5 @ 7"	58.70
8		#4 @ 10"	54.00	#5 @ 10"	58.44	#5 @ 10"	57.45	#5 @ 8"	60.64	#5 @ 7"	62.92	#5 @ 6"	66.25	#5 @ 6"	65.94	#5 @ 6"	65.69	#6 @ 8"	67.76	#6 @ 8"	67.57	#6 @ 7"	71.45
9		#4 @ 10"	56.20	#5 @ 10"	60.87	#5 @ 10"	59.85	#5 @ 8"	63.21	#5 @ 7"	65.60	#5 @ 6"	69.09	#5 @ 6"	68.78	#5 @ 6"	68.52	#6 @ 8"	70.69	#6 @ 8"	70.51	#6 @ 7"	74.57
10		2	#4 @ 10"	39.84	#4 @ 10"	38.53	#4 @ 10"	37.65	#4 @ 10"	37.03	#4 @ 10"	36.57	#4 @ 10"	36.20	#4 @ 10"	35.91	#4 @ 10"	35.67	#4 @ 10"	35.48	#4 @ 9"	36.07	#4 @ 9"
	3	#4 @ 10"	41.68	#4 @ 10"	40.35	#4 @ 10"	39.47	#4 @ 10"	38.84	#4 @ 10"	38.36	#4 @ 10"	38.00	#4 @ 10"	37.71	#4 @ 10"	37.46	#4 @ 10"	37.27	#4 @ 9"	37.91	#4 @ 9"	37.76
	4	#4 @ 10"	43.58	#4 @ 10"	42.22	#4 @ 10"	41.31	#4 @ 10"	40.67	#4 @ 10"	40.19	#4 @ 10"	39.82	#4 @ 10"	39.53	#4 @ 10"	39.28	#4 @ 10"	39.08	#4 @ 9"	39.77	#4 @ 9"	39.63
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	7	#4 @ 10"	49.79	#4 @ 10"	48.31	#4 @ 10"	47.34	#5 @ 10"	51.97	#5 @ 10"	51.45	#5 @ 10"	51.04	#5 @ 9"	52.29	#5 @ 9"	52.03	#5 @ 8"	53.79	#5 @ 8"	53.61	#5 @ 7"	56.00
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	9	#4 @ 10"	54.43	#4 @ 10"	52.85	#4 @ 10"	51.85	#5 @ 10"	55.83	#5 @ 10"	55.30	#5 @ 10"	54.88	#5 @ 9"	56.21	#5 @ 9"	55.94	#5 @ 8"	57.63	#5 @ 8"	57.44	#5 @ 7"	59.87
9	2	#4 @ 10"	38.01	#4 @ 10"	36.75	#4 @ 10"	35.85	#4 @ 10"	35.21	#4 @ 10"	34.73	#4 @ 10"	34.36	#4 @ 10"	34.06	#4 @ 10"	33.81	#4 @ 10"	33.61	#4 @ 10"	33.44	#4 @ 10"	33.30
	3	#4 @ 10"	39.93	#4 @ 10"	38.56	#4 @ 10"	37.64	#4 @ 10"	36.99	#4 @ 10"	36.51	#4 @ 10"	36.13	#4 @ 10"	35.83	#4 @ 10"	35.58	#4 @ 10"	35.38	#4 @ 10"	35.21	#4 @ 10"	35.06
	4	#4 @ 10"	41.81	#4 @ 10"	40.40	#4 @ 10"	39.47	#4 @ 10"	38.81	#4 @ 10"	38.31	#4 @ 10"	37.93	#4 @ 10"	37.63	#4 @ 10"	37.37	#4 @ 10"	37.17	#4 @ 10"	36.99	#4 @ 10"	36.84
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	7	#4 @ 10"	48.04	#4 @ 10"	46.50	#4 @ 10"	45.49	#4 @ 10"	44.77	#5 @ 10"	49.29	#5 @ 10"	48.86	#5 @ 10"	48.53	#5 @ 10"	48.24	#5 @ 10"	48.03	#5 @ 10"	47.84	#5 @ 10"	47.67
	8	#4 @ 10"	50.43	#4 @ 10"	48.84	#4 @ 10"	47.80	#4 @ 10"	47.06	#5 @ 10"	51.83	#5 @ 10"	51.40	#5 @ 10"	51.05	#5 @ 10"	50.77	#5 @ 10"	50.54	#5 @ 10"	50.35	#5 @ 10"	50.18
8	2	#4 @ 10"	36.41	#4 @ 10"	35.01	#4 @ 10"	34.08	#4 @ 10"	33.42	#4 @ 10"	32.92	#4 @ 10"	32.54	#4 @ 10"	32.23	#4 @ 10"	31.97	#4 @ 10"	31.77	#4 @ 10"	31.59	#4 @ 10"	31.44
	3	#4 @ 10"	38.23	#4 @ 10"	36.80	#4 @ 10"	35.85	#4 @ 10"	35.18	#4 @ 10"	34.67	#4 @ 10"	34.28	#4 @ 10"	33.97	#4 @ 10"	33.70	#4 @ 10"	33.50	#4 @ 10"	33.32	#4 @ 10"	33.17
	4	#4 @ 10"	40.09	#4 @ 10"	38.61	#4 @ 10"	37.64	#4 @ 10"	36.95	#4 @ 10"	36.44	#4 @ 10"	36.04	#4 @ 10"	35.72	#4 @ 10"	35.45	#4 @ 10"	35.25	#4 @ 10"	35.07	#4 @ 10"	34.91
	5	#4 @ 10"	41.99	#4 @ 10"	40.47	#4 @ 10"	39.47	#4 @ 10"	38.76	#4 @ 10"	38.24	#4 @ 10"	37.83	#4 @ 10"	37.50	#4 @ 10"	37.23	#4 @ 10"	37.02	#4 @ 10"	36.84	#4 @ 10"	36.68
	6	#4 @ 10"	43.97	#4 @ 10"	42.40	#4 @ 10"	41.36	#4 @ 10"	40.64	#4 @ 10"	40.10	#4 @ 10"	39.68	#4 @ 10"	39.35	#4 @ 10"	39.07	#4 @ 9"	43.33	#5 @ 10"	43.13	#5 @ 10"	42.96
	7	#4 @ 10"	46.19	#4 @ 10"	44.56	#4 @ 10"	43.49	#4 @ 10"	42.74	#4 @ 10"	42.18	#4 @ 10"	41.75	#4 @ 10"	41.41	#4 @ 10"	41.13	#4 @ 9"	45.65	#5 @ 10"	45.45	#5 @ 10"	45.28
	8	#4 @ 10"	48.66	#4 @ 10"	46.97	#4 @ 10"	45.83	#4 @ 10"	45.06	#5 @ 10"	49.53	#5 @ 10"	49.10	#5 @ 10"	48.76	#5 @ 10"	48.47	#5 @ 10"	48.24	#5 @ 10"	48.03	#5 @ 10"	47.86
7	2	#4 @ 10"	34.90	#4 @ 10"	33.44	#4 @ 10"	32.47	#4 @ 10"	31.78	#4 @ 10"	31.27	#4 @ 10"	30.86	#4 @ 10"	30.54	#4 @ 10"	30.27	#4 @ 10"	30.06	#4 @ 10"	29.88	#4 @ 10"	29.72
	3	#4 @ 10"	36.73	#4 @ 10"	35.23	#4 @ 10"	34.23	#4 @ 10"	33.53														



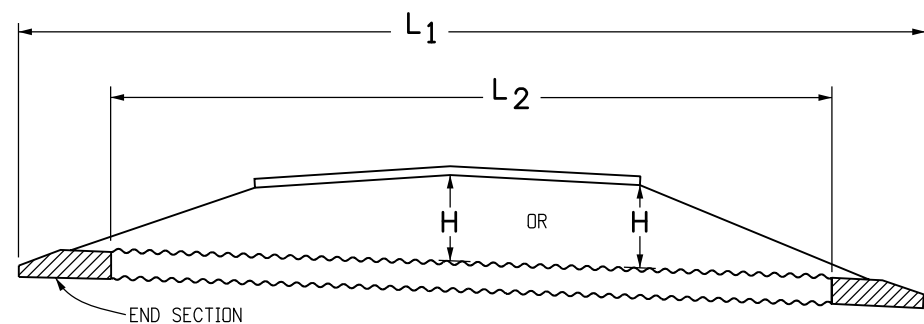
INSTALLATION OF METAL PIPE



INSTALLATION OF MULTIPLE METAL PIPES

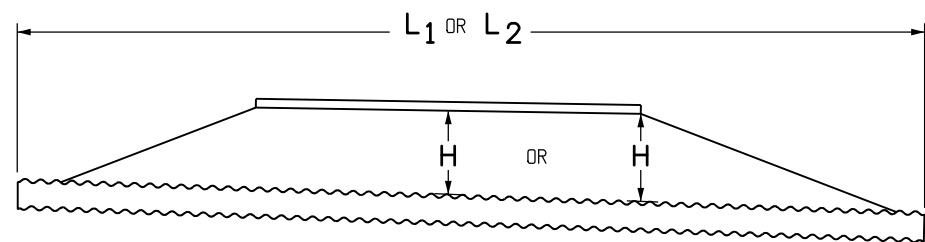
GENERAL NOTES

1. STEEL PIPES SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M36. ALUMINUM PIPES SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M196. ALUMINIZED STEEL SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M274.
2. MINIMUM COVER SHALL BE PROVIDED DURING CONSTRUCTION TO PROTECT THE STRUCTURE FROM DAMAGE.
3. PIPE SHALL BE PLACED WITH LONGITUDINAL SEAMS AT THE SIDES OR QUARTER POINTS BUT NOT ALONG TOP OF VERTICAL AXIS.
4. STRUCTURAL PLATE PIPES OF EQUAL OR GREATER DIAMETER THAT CONFORM TO SECTION 510 MAY BE SUBSTITUTED FOR THE PIPES ON THESE SHEETS AT THE CONTRACTOR'S EXPENSE.
5. WHEN A PIPE IS TO BE EXTENDED, THE SAME PIPE MATERIAL AND SIZE AS IN THE ORIGINAL INSTALLATION SHALL BE USED.
6. EXTENSIONS FOR CMP ARCH PIPE SHALL MATCH THE CORRUGATIONS, AND THE SPAN AND RISE DIMENSIONS OF THE PIPE TO BE EXTENDED.
7. WHEN INSTALLING A GUARDRAIL OR A SIGN POST DIRECTLY ABOVE A PIPE, THE BOTTOM OF THE POST MUST BE AT LEAST 1 FOOT ABOVE THE TOP OF THE PIPE. THE HOLE FOR THE POST SHALL BE DRILLED INTO THE SOIL.
8. PIPE ARCH WITH EQUAL PERIPHERY AND WITH SPAN AND RISE DIMENSIONS APPROXIMATELY EQUAL TO THOSE SPECIFIED ON THE PLANS WILL BE PERMITTED.
9. PIPE ARCH IS INTENDED FOR USE WHERE MINIMUM COVER REQUIREMENTS FOR ROUND PIPE CANNOT BE MET. WHEN COVER EXCEEDS 11 FT. USE ROUND PIPE.
10. PIPE COVER GREATER THAN 90 FT. SHALL REQUIRE AN INVESTIGATION OF THE FOUNDATION MATERIAL.



METAL PIPE WITH END SECTIONS

NOTE: USE THE H THAT IS GREATER FOR MAXIMUM ALLOWABLE FILL HEIGHT.

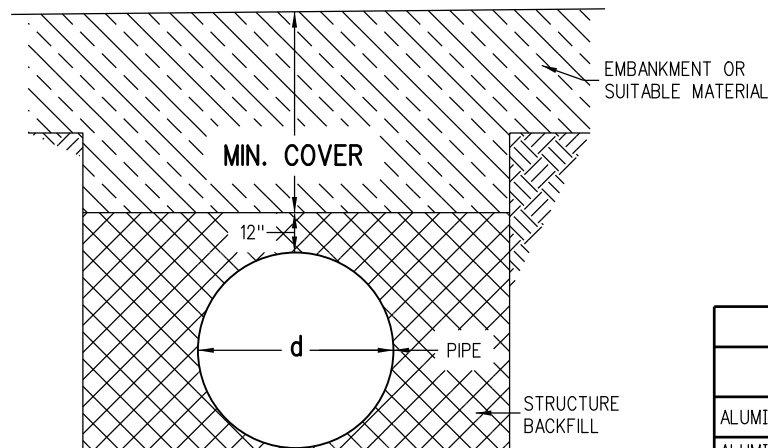


METAL PIPE WITHOUT END SECTIONS

NOTE: USE THE H THAT IS GREATER FOR MAXIMUM ALLOWABLE FILL HEIGHT.

PIPE SPAN (IN.)	MINIMUM COVER (IN.) FOR INDICATED AXLE LOADS, kips			
	18.0 - 50.0	50.0 - 75.0	75.0 - 110.0	110.0 - 150.0
12.0 - 42.0	24	30	36	36
48.0 - 72.0	36	36	42	48
78.0 - 120.0	36	42	48	48
126.0 - 144.0	42	48	54	54

MINIMUM COVER FOR CONSTRUCTION LOADS



CONSTRUCTION MINIMUM COVER FOR PIPE

LEGEND

H = THE MAXIMUM ALLOWABLE HEIGHTS OF FILL OVER THE TOP OF THE PIPE, EXCLUDING PAVEMENT THICKNESS, ARE SHOWN IN THE TABLES OF THIS STANDARD.

THE MINIMUM COVER SHALL BE AS SHOWN ON THESE TABLES OR CONFORM TO AASHTO REQUIREMENTS, WHICHEVER IS GREATER.

THE MINIMUM COVER FOR PIPE IS MEASURED FROM THE TOP OF THE PIPE TO THE BOTTOM OF THE PAVEMENT: HMA OR PCCP.

THE MINIMUM COVER IS MEASURED FROM THE TOP OF THE PIPE TO THE TOP OF THE SUBGRADE FOR CONSTRUCTION LOADS.

L₁ = LENGTH OF PIPE TO BE MEASURED WHEN PLACED IN ACCORDANCE WITH SECTION 624.

L₂ = LENGTH OF PIPE TO BE MEASURED WHEN PLACED IN ACCORDANCE WITH SECTION 603.

+ = THE MINIMUM SPACING BETWEEN THE OUTSIDE WALLS OF MULTIPLE PIPES OR END SECTIONS IS 18" OR 1/2 d, WHICHEVER IS GREATER, BUT NOT TO EXCEED 36".

CONVERSION OF NOMINAL GAGE TO THICKNESS

GAGE NO.	16	14	12	10	8
ALUMINUM THICKNESS - IN.	0.060	0.075	0.105	0.135	0.164
ALUMINIZED OR GALVANIZED STEEL THICKNESS - IN.	0.064	0.079	0.109	0.138	0.168

ALLOWED WALL THICKNESS

Computer File Information

Creation Date: 07/04/12 Initials: DLM
 Last Modification Date: 10/02/14 Initials: LTA
 Full Path: www.coloradodot.info/business/designsupport
 Drawing File Name: 603010104.dgn
 CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English

Sheet Revisions

Date:	Comments
03/05/14	Deleted "H MIN." dim. Revised Gen Note 2 and 1st note in Legend.
04/29/14	Added applicable coating types notes to all sheets.

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Division of Project Support DLM/LTA

METAL PIPE

Issued By: Project Development Branch on July 4, 2012

STANDARD PLAN NO.

M-603-1

Sheet No. 1 of 4

THESE TABLES ARE APPLICABLE FOR THE FOLLOWING LIST OF CORRUGATED STEEL PIPE:

1. GALVANIZED CORRUGATED STEEL PIPE (CSP)
2. ALUMINIZED CORRUGATED STEEL PIPE TYPE 2 (ALT2 CSP)
3. BITUMINOUS COATED CORRUGATED STEEL PIPE (BIT. CO. CSP)
4. ARAMID FIBER BONDED CORRUGATED STEEL PIPE (A.F. BO. CSP)
5. PRECOATED CORRUGATED STEEL PIPE (PCSP- BOTH SIDES)

DIAMETER (IN.)	H MINIMUM COVER (IN.)	PIPE GAGE				
		H MAXIMUM OF COVER (FT.)				
		16	14	12	10	8
12	24	207	259			
15	24	165	207			
18	24	138	172	242		
21	24	118	148	207		
24	24	103	129	181		
30	24	82	103	145		
36	24	68	86	120	155	
42	24	58	73	103	133	163
48	36	51	64	90	103	142
54	36		57	80	93	126
60	36			72	84	114
66	36				77	103
72	36					94
78	36					84
84	36					72

2-2/3" X 1/2" CORRUGATIONS CORRUGATED STEEL PIPE

SPAN X RISE (IN. X IN.)	ROUND EQUIVALENT (IN.)	H MINIMUM COVER (IN.)	PIPE GAGE	H MAXIMUM COVER (FT.)
17 X 13	15	24	16	13
21 X 15	18	24	16	12
24 X 18	21	24	16	13
28 X 20	24	24	16	12
35 X 24	30	24	16	12
42 X 29	36	24	16	12
49 X 33	42	24	14	12
57 X 38	48	36	12	12
64 X 43	54	36	12	12
71 X 47	60	36	10	12
77 X 52	66	36	8	12
83 X 57	72	36	8	12

2-2/3" X 1/2" CORRUGATIONS * CORRUGATED STEEL PIPE ARCH

* CORNER BEARING PRESSURE OF 2 TONS PER SQ. FT.

DIAMETER (IN.)	H MINIMUM COVER (IN.)	PIPE GAGE	
		H MAXIMUM OF COVER (FT.)	
		16	14
6	24	408	509
8	24	306	382
10	24	244	305

1-1/2" X 1/4" CORRUGATIONS CORRUGATED STEEL PIPE

DIAMETER (IN.)	H MINIMUM COVER (IN.)	PIPE GAGE				
		H MAXIMUM OF COVER (FT.)				
		16	14	12	10	8
48	36	59	74	104	134	164
54	36	52	65	92	119	146
60	36	47	59	83	107	131
66	36	42	53	75	97	119
72	36	39	49	69	89	109
78	36		45	63	82	101
84	36		42	59	76	93
90	36			55	71	87
96	36			51	66	81
102	36			48	62	77
108	36				59	72
114	36				56	68
120	36				53	65
126	42					62

3" X 1" CORRUGATIONS CORRUGATED STEEL PIPE

SPAN X RISE (IN. X IN.)	ROUND EQUIVALENT (IN.)	H MINIMUM COVER (IN.)	PIPE GAGE	H MAXIMUM COVER (FT.)
53 X 41	48	36	14	12
60 X 46	54	36	14	20
66 X 51	60	36	14	20
73 X 55	66	36	14	20
81 X 59	72	36	14	17
87 X 63	78	36	14	16
95 X 67	84	36	14	16
103 X 71	90	36	12	16
112 X 75	96	36	12	16
117 X 79	102	36	12	16

3" X 1" CORRUGATIONS * CORRUGATED STEEL PIPE ARCH

Computer File Information

Creation Date: 07/04/12	Initials: DLM
Last Modification Date: 10/02/14	Initials: LTA
Full Path: www.coloradodot.info/business/designsupport	
Drawing File Name: 603010204.dgn	
CAD Ver.: MicroStation V8	Scale: Not to Scale Units: English

(R-X)
(R-X)
(R-X)
(R-X)

Sheet Revisions

Date:	Comments
03/05/14	Revised detail titles and added "H" to tables.

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 Division of Project Support **DLM/LTA**

METAL PIPE

Issued By: Project Development Branch on July 4, 2012

STANDARD PLAN NO.

M-603-1

Sheet No. 2 of 4

DIAMETER (IN.)	H MINIMUM COVER (IN.)	PIPE GAGE				
		H MAXIMUM OF COVER (FT.)				
		16	14	12	10	8
54	36	46	58	82	106	129
60	36		52	74	95	116
66	36		47	66	86	106
72	36			61	79	97
78	36			56	73	89
84	36			53	68	83
90	36				63	77
96	36				59	72
102	36				55	68
108	36					64

5" X 1" CORRUGATIONS
CORRUGATED STEEL PIPE

THESE TABLES ARE APPLICABLE FOR THE FOLLOWING LIST
OF CORRUGATED STEEL PIPE:

1. GALVANIZED CORRUGATED STEEL PIPE (CSP)
2. ALUMINIZED CORRUGATED STEEL PIPE TYPE 2 (ALT2 CSP)
3. BITUMINOUS COATED CORRUGATED STEEL PIPE (BIT. CO. CSP)
4. ARAMID FIBER BONDED CORRUGATED STEEL PIPE (A.F. BO. CSP)
5. PRECOATED CORRUGATED STEEL PIPE (PCSP- BOTH SIDES)

SPAN X RISE (IN. X IN.)	ROUND EQUIVALENT (IN.)	H MINIMUM COVER (IN.)	PIPE GAGE	H MAXIMUM COVER (FT.)
81 X 59	72	36	12	17
87 X 63	78	36	12	16
95 X 67	84	36	12	16

5" X 1" CORRUGATIONS
CORRUGATED STEEL PIPE ARCH *

DIAMETER (IN.)	H MINIMUM COVER (IN.)	PIPE GAGE			
		H MAXIMUM OF COVER (FT.)			
		16	14	12	10
18	24	90	126		
21	24	77	108	181	
24	24	67	95	158	
30	24	54	75	126	
36	24	45	63	105	
42	24	38	54	90	
48	36	33	47	78	114
54	36	29	41	70	101
60	36		37	63	91
66	36		34	57	83
72	36			52	76
78	36			48	70
84	36			44	65
90	36				60
96	36				56
102	36				50

3/4" X 3/4 7-1/2" CORRUGATIONS
CORRUGATED STEEL PIPE

* CORNER BEARING PRESSURE OF 2 TONS PER SQ. FT.

SPAN X RISE (IN. X IN.)	ROUND EQUIVALENT (IN.)	H MINIMUM COVER (IN.)	PIPE GAGE	H MAXIMUM COVER (FT.)
20 X 16	18	24	16	16
23 X 19	21	24	16	15
27 X 21	24	24	16	13
33 X 26	30	24	16	13
40 X 31	36	24	16	14
46 X 36	42	24	12	13
53 X 41	48	36	12	13
60 X 46	54	36	12	20
66 X 51	60	36	12	20

3/4" X 3/4 7-1/2" CORRUGATIONS
CORRUGATED STEEL PIPE ARCH *

Computer File Information	
Creation Date: 07/04/12	Initials: DLM
Last Modification Date: 10/02/14	Initials: LTA
Full Path: www.coloradodot.info/business/designsupport	
Drawing File Name: 603010304.dgn	
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	

Sheet Revisions	
Date:	Comments
03/05/14	Revised detail titles and added "H" to tables.
(R-X)	
(R-X)	
(R-X)	
(R-X)	

Colorado Department of Transportation



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METAL PIPE

Issued By: Project Development Branch on July 4, 2012

STANDARD PLAN NO.
M-603-1
Sheet No. 3 of 4

THESE TABLES ARE APPLICABLE FOR THE FOLLOWING LIST OF CORRUGATED STEEL PIPE:
 1. GALVANIZED CORRUGATED STEEL PIPE (CSP)
 2. ALUMINIZED CORRUGATED STEEL PIPE TYPE 2 (ALT2 CSP)
 3. BITUMINOUS COATED CORRUGATED STEEL PIPE (BIT. CO. CSP)
 4. ARAMID FIBER BONDED CORRUGATED STEEL PIPE (A.F. BO. CSP)
 5. PRECOATED CORRUGATED STEEL PIPE (PCSP- BOTH SIDES)

DIAMETER (IN.)	H MINIMUM COVER (IN.)	PIPE GAGE	
		H MAXIMUM OF COVER (FT.)	
		16	
6	24	247	
8	24	185	
10	24	148	

1-1/2" X 1/4" CORRUGATIONS CORRUGATED ALUMINUM PIPE

DIAMETER (IN.)	H MINIMUM COVER (IN.)	PIPE GAGE			
		H MAXIMUM OF COVER (FT.)			
		16	14	12	10
18	24	43	61		
21	24	38	52	84	
24	24	33	45	73	
30	24	26	36	58	
36	24	21	30	49	69
42	24		25	41	59
48	36			36	51
54	36			32	46
60	36			29	41
66	36				37
72	36				34

3/4" X 3/4" 7-1/2" CORRUGATIONS CORRUGATED ALUMINUM PIPE

SPAN X RISE (IN. X IN.)	ROUND EQUIVALENT (IN.)	H MINIMUM COVER (IN.)	PIPE GAGE			
			H MAXIMUM OF COVER (FT.)			
			16	14	12	10
20 X 16	18	24	16			
23 X 19	21	24	15			
27 X 21	24	24	13	13		
33 X 26	30	24	13	13	13	
40 X 31	36	24		13	13	
46 X 36	42	24			13	13
53 X 41	48	36			13	13
60 X 46	54	36			20	20
66 X 51	60	36				20

3/4" X 3/4" 7-1/2" CORRUGATIONS CORRUGATED ALUMINUM PIPE ARCH *

DIAMETER (IN.)	H MINIMUM COVER (IN.)	PIPE GAGE				
		H MAXIMUM OF COVER (FT.)				
		16	14	12	10	8
12	24	125	157			
15	24	100	125			
18	24	83	104			
21	24	71	89			
24	24	62	78	109		
27	24		69	97		
30	24		62	87		
36	24		51	73	94	
42	24			62	80	
48	36			54	70	85
54	36			48	62	76
60	36				52	64
66	36					52
72	36					43

2-2/3" X 1/2" CORRUGATIONS CORRUGATED ALUMINUM PIPE

SPAN X RISE (IN. X IN.)	ROUND EQUIVALENT (IN.)	H MINIMUM COVER (IN.)	PIPE GAGE	H MAXIMUM COVER (FT.)
17 X 13	15	24	16	13
21 X 15	18	24	16	12
24 X 18	21	24	16	13
28 X 20	24	24	16	12
35 X 24	30	24	16	12
42 X 29	36	24	16	12
49 X 33	42	24	14	12
57 X 38	48	36	12	12
64 X 43	54	36	12	12
71 X 47	60	36	10	12

2-2/3" X 1/2" CORRUGATIONS CORRUGATED ALUMINUM PIPE ARCH *

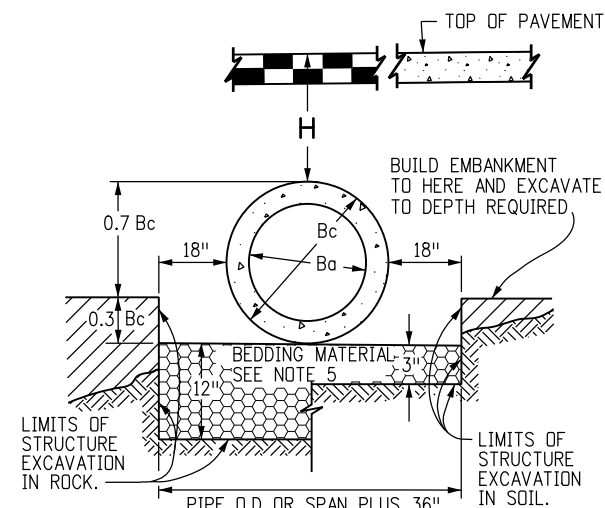
* CORNER BEARING PRESSURE OF 2 TONS PER SQ. FT.

DIAMETER (IN.)	H MINIMUM COVER (IN.)	PIPE GAGE				
		H MAXIMUM OF COVER (FT.)				
		16	14	12	10	8
30	24	57	72	101	135	159
36	24	47	60	84	112	132
42	24	40	51	72	96	113
48	36	35	44	62	84	99
54	36	31	39	55	74	88
60	36	28	35	50	67	79
66	36	25	32	45	61	72
72	36	23	29	41	56	66
78	36		27	38	51	61
84	36			35	48	56
90	36			33	44	52
96	36			31	41	49
102	36				39	46
108	36				37	43
114	36					39
120	36					36

3" X 1" CORRUGATIONS CORRUGATED ALUMINUM PIPE

SPAN X RISE (IN. X IN.)	ROUND EQUIVALENT (IN.)	H MINIMUM COVER (IN.)	PIPE GAGE	H MAXIMUM COVER (FT.)
60 X 46	54	36	14	20
66 X 51	60	36	14	20
73 X 55	66	36	14	20
81 X 59	72	36	12	16
87 X 63	78	36	12	16
95 X 67	84	36	12	16
103 X 71	90	36	10	16
112 X 75	96	36	8	16

3" X 1" CORRUGATIONS CORRUGATED ALUMINUM PIPE ARCH *



NOTE: Bc IS THE OUTSIDE DIMENSION FOR DIAMETER, SPAN OR RISE.

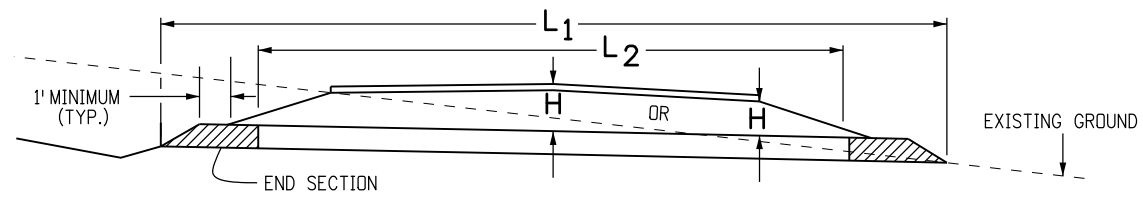
PIPE INSTALLATION
(WITH 0.7 PROJECTION RATIO)

CIRCULAR (CIR)			VERTICAL ELLIPTICAL (VE)				HORIZONTAL ELLIPTICAL (HE)			
PIPE SIZE = Ba (INSIDE DIA)	WALL THICKNESS	0.3 Bc (OUTSIDE DIA)	SPAN	RISE	WALL THICKNESS	0.3 OUTSIDE RISE	SPAN	RISE	WALL THICKNESS	0.3 OUTSIDE RISE
IN.		FT.	IN.				IN.			
			FT.				FT.			
12	2	0.40					23	14	2-3/4	0.49
15	2-1/4	0.49								
18	2-1/2	0.58								
21	2-3/4	0.66					30	19	3-1/4	0.66
24	3	0.75					34	22	3-1/2	0.73
27	3-1/4	0.84								
30	3-1/2	0.92					38	24	3-3/4	0.79
33	3-3/4	1.01								
36	4	1.10	29	45	4-1/2	1.35	45	29	4-1/2	0.95
42	4-1/2	1.28	34	53	5	1.58	53	34	5	1.10
48	5	1.45	38	60	5-1/2	1.78	60	38	5-1/2	1.23
54	5-1/2	1.62	43	68	6	2.00	68	43	6	1.38
60	6	1.80	48	76	6-1/2	2.23	76	48	6-1/2	1.53
66	6-1/2	1.97	53	83	7	2.43	83	53	7	1.68
72	7	2.15	58	91	7-1/2	2.65	91	58	7-1/2	1.83
78	7-1/2	2.32	63	98	8	2.85	98	63	8	1.98
84	8	2.50	68	106	8-1/2	3.08	106	68	8-1/2	2.13
90	8-1/2	2.68	72	113	9	3.28	113	72	9	2.25
96	9	2.85	77	121	9-1/2	3.50	121	77	9-1/2	2.40
102	9-1/2	3.02	82	128	9-3/4	3.69	128	82	9-3/4	2.54
108	10	3.20	87	136	10	3.90	136	87	10	2.68

△ ALSO EQUIVALENT ROUND DIMENSION FOR ELLIPTICAL PIPE.

DIMENSIONS FOR REINFORCED CONCRETE PIPE

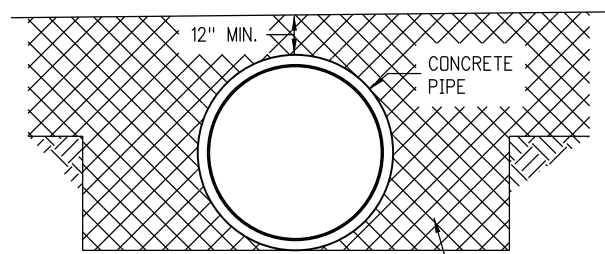
(FOR INFORMATION ONLY)



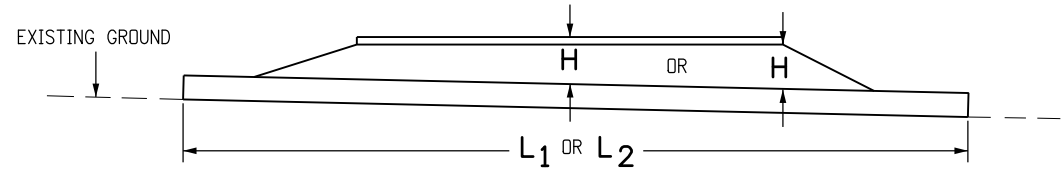
CONCRETE PIPE WITH END SECTIONS

NOTE: USE THE H THAT IS GREATER FOR MAXIMUM ALLOWABLE FILL HEIGHT.

- H = HEIGHT OF FILL OVER TOP OF PIPE, INCLUDING PAVEMENT THICKNESS.
- L1 = LENGTH OF PIPE TO BE MEASURED WHEN PLACED IN ACCORDANCE WITH SECTION 624.
- L2 = LENGTH OF PIPE TO BE MEASURED WHEN PLACED IN ACCORDANCE WITH SECTION 603.



CONSTRUCTION MINIMUM COVER FOR RIGID PIPE



CONCRETE PIPE WITHOUT END SECTIONS

NOTE: USE THE H THAT IS GREATER FOR MAXIMUM ALLOWABLE FILL HEIGHT.

TYPE OF PIPE	HEIGHT OF FILL OVER TOP OF PIPE, H (FEET)				
	CLASS OF PIPE (0.01 IN. CRACK D-LOAD)				
	CLASS CIR II CLASS VE II 1000 D	CLASS CIR III CLASS VE III 1350 D	CLASS CIR IV CLASS VE IV 2000 D	CLASS CIR V CLASS VE V 3000 D	CLASS VE VI 4000 D
CIRCULAR (CIR)	1 TO 18	1 TO 25	± 25 TO 37	± 37 TO 45	
VERTICAL ELLIPTICAL (VE)	1 TO 18	1 TO 25	± 25 TO 37	± 37 TO 45	± 45 TO 62
HORIZONTAL ELLIPTICAL (HE)	1 TO 18	1 TO 25	± 25 TO 37		

ALLOWABLE RANGE OF HEIGHTS FOR FILL OVER REINFORCED CONCRETE PIPE

(ALL SIZES)

GENERAL NOTES
REINFORCED CONCRETE PIPE

- FILL HEIGHTS GREATER THAN MAXIMUM ALLOWED IN THE HEIGHTS OF FILL TABLE ON THIS SHEET REQUIRE SPECIAL DESIGN OF STRUCTURE.
- PIPE DESIGN IS BASED ON SAFETY FACTOR OF 1.33 ON ULTIMATE STRENGTH.
- THE HEIGHTS OF FILL OVER TOP OF PIPE ARE BASED ON UNIT WEIGHT OF SOIL AT 135 LBS. PER CUBIC FT.
- PIPE CLASS IS DETERMINED FROM 0.01 IN. CRACK D-LOAD.
- BEDDING IS CLASS B (MODIFIED) (FROM CONCRETE PIPE DESIGN MANUAL-AMERICAN CONCRETE PIPE ASSOCIATION) WITH SETTLEMENT RATIO R = 0.0_{sd} (YIELDING BED). BEDDING MATERIAL FOR RIGID PIPE IN SOIL SHALL BE 3 IN. LOOSE THICKNESS STRUCTURE BACKFILL CLASS 2. BEDDING MATERIAL FOR RIGID PIPE IN ROCK SHALL BE 12 IN. LOOSE THICKNESS STRUCTURE BACKFILL CLASS 1.
- CHANGES IN DESIGN FACTORS REQUIRE COMPENSATING CHANGES IN PIPE DESIGN.
- MINIMUM WALL THICKNESS DIMENSIONS ARE BASED ON AASHTO M 170 (WALL B) FOR CIRCULAR PIPE, AND AASHTO M 207 FOR ELLIPTICAL PIPE.
- SPACING FOR MULTIPLE PIPE INSTALLATIONS SHALL CONFORM TO THE DETAILS SHOWN ON STANDARD PLAN M-206-1.
- WHEN A PIPE IS TO BE EXTENDED, THE SAME PIPE MATERIAL AND SIZE AS IN THE ORIGINAL PIPE INSTALLATION SHALL BE USED.

NONREINFORCED CONCRETE PIPE

- AT THE OPTION OF THE CONTRACTOR, NONREINFORCED CONCRETE PIPE CONFORMING TO AASHTO M 86 MAY BE USED IN LIEU OF REINFORCED CONCRETE PIPE FOR ALL SIZES 36 INCHES IN DIAMETER AND SMALLER. THE NONREINFORCED CONCRETE PIPE SHALL MEET THE SAME D-LOAD TO PRODUCE THE ULTIMATE LOAD UNDER THE THREE-EDGE BEARING METHOD AS SPECIFIED FOR REINFORCED CONCRETE PIPE IN CONFORMANCE WITH AASHTO M 170. THE CONTRACTOR SHALL PROVIDE WRITTEN CERTIFICATION OF CONFORMANCE. THE WALL THICKNESS OF THE NONREINFORCED PIPE MAY BE INCREASED AS REQUIRED TO MEET D-LOAD REQUIREMENT.
- ALL REQUIREMENTS FOR REINFORCED CONCRETE PIPE, EXCEPT THOSE REFERRING TO REINFORCEMENT, SHALL APPLY TO NONREINFORCED CONCRETE PIPE.

Computer File Information	
Creation Date: 07/04/12	Initials: DLM
Last Modification Date: 10/02/14	Initials: LTA
Full Path: www.coloradodot.info/business/designsupport	
Drawing File Name: 603020101.dgn	
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	

Sheet Revisions	
Date:	Comments
3/25/14	Made Min. Cover for Rigid Pipe detail like others. Deleted Gen Note 1 & renumbered.
4/11/14	Changed "Min." to 1 in Heights table.

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 Division of Project Support DLM/LTA

REINFORCED CONCRETE PIPE
 Issued By: Project Development Branch on July 4, 2012

STANDARD PLAN NO.
M-603-2
 Sheet No. 1 of 1

LEGEND

H = MAXIMUM ALLOWABLE HEIGHT OF COVER OVER THE TOP OF THE PIPE, EXCLUDING PAVEMENT THICKNESS.

FILL HEIGHTS AND DESIGN ASSUMPTIONS ARE BASED ON AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 4TH EDITION, SECTION 12, FOR 900 PSI LONG TERM STRENGTH OF HDPE, AND AASHTO T180 MINIMUM RELATIVE COMPACTION OF 95% OR 90%.

FILL HEIGHTS ARE BASED ON AASHTO M294 FOR POLYETHYLENE AND AASHTO M330 FOR POLYPROPYLENE, TYPE S PIPES WITH OUTER, CORRUGATED WALLS AND SMOOTH INNER LINEARS.

FILL HEIGHTS, FOR INSTALLATION WITH HIGH WATER TABLE, REQUIRE A SPECIAL DESIGN. THE MAXIMUM HEIGHT IN HIGHWATER LOCATIONS SHOULD BE 15 FEET OR BASED ON AASHTO LRFD DESIGN SPECIFICATIONS.

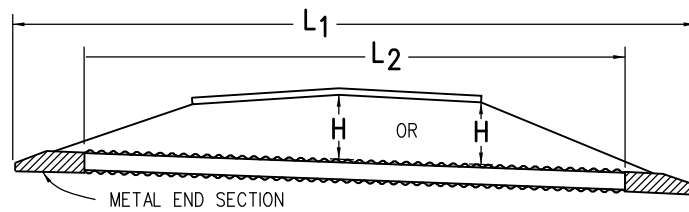
THE MINIMUM COVER SHALL BE AS SHOWN ON THESE TABLES OR CONFORM TO AASHTO REQUIREMENTS, WHICHEVER IS GREATER. THE MINIMUM COVER FOR PIPE IS MEASURED FROM THE TOP OF THE PIPE TO THE BOTTOM OF THE PAVEMENT: HMA OR PCCP.

THE MINIMUM COVER IS MEASURED FROM THE TOP OF THE PIPE TO THE TOP OF THE SUBGRADE DURING CONSTRUCTION. THE MINIMUM COVER IS BASED ON DUAL AXLE LOADS UP TO 50,000 POUNDS.

L₁ = LENGTH OF PIPE TO BE MEASURED WHEN PLACED IN ACCORDANCE WITH SECTION 624.

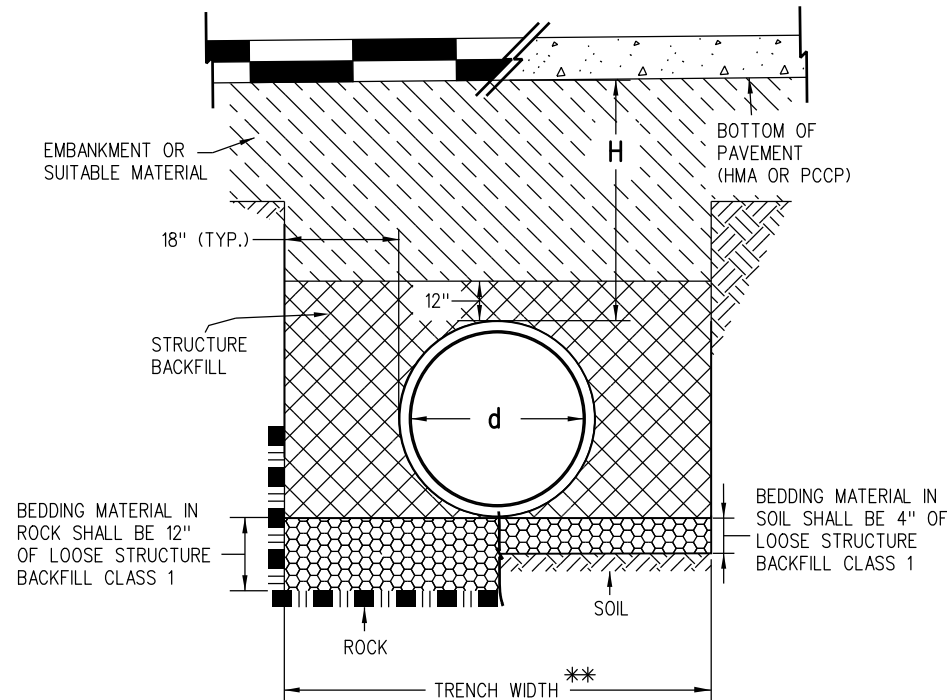
L₂ = LENGTH OF PIPE TO BE MEASURED WHEN PLACED IN ACCORDANCE WITH SECTION 603.

+ = THE MINIMUM SPACING BETWEEN THE OUTSIDE WALLS OF MULTIPLE PIPES OR END SECTIONS IS 18" OR 1/2(d), WHICHEVER IS GREATER.

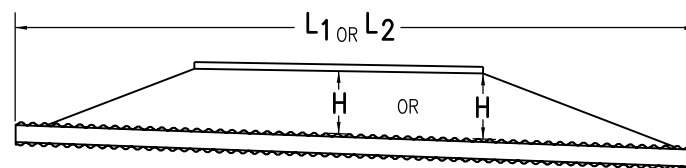


NOTE: USE THE H THAT IS GREATER FOR MAXIMUM ALLOWABLE FILL HEIGHT.

PIPE WITH END SECTIONS

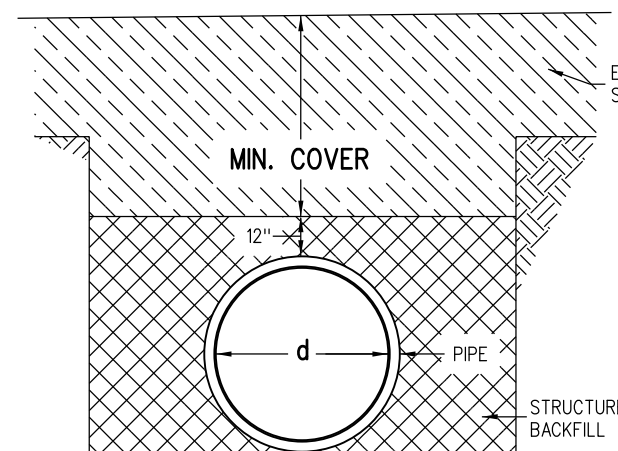


INSTALLATION OF PIPE



NOTE: USE THE H THAT IS GREATER FOR MAXIMUM ALLOWABLE FILL HEIGHT.

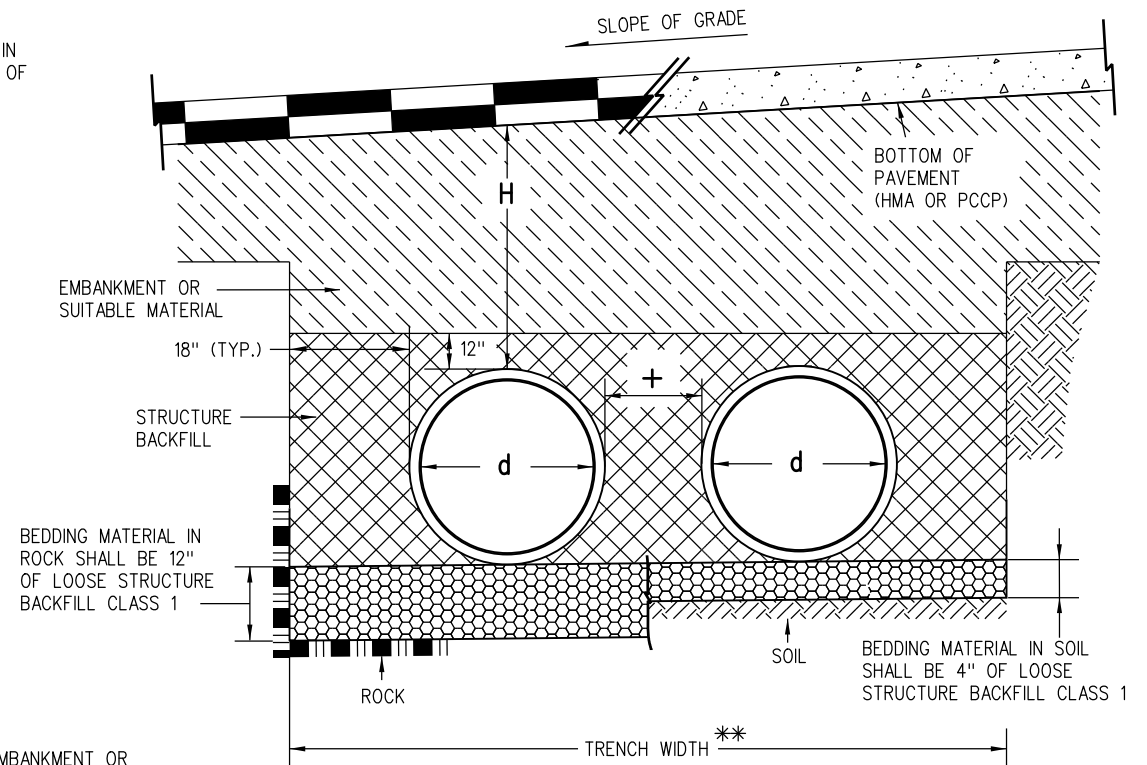
PIPE WITHOUT END SECTIONS



CONSTRUCTION MINIMUM COVER FOR PIPE

GENERAL NOTES

- ALL PIPES SHALL MEET THE REQUIREMENTS OF AASHTO M294 FOR POLYETHYLENE AND AASHTO M330 FOR POLYPROPYLENE, TYPE S FOR HIGH DENSITY CORRUGATED POLYETHYLENE PIPE (HDPE) AND POLYPROPYLENE PIPE (PP) RESPECTIVELY, WITH SMOOTH INNER SURFACE.
- WHEN A PIPE IS TO BE EXTENDED, THE SAME PIPE MATERIAL AND SIZE AS IN THE ORIGINAL INSTALLATION SHALL BE USED.
- MINIMUM COVER SHALL BE PROVIDED DURING CONSTRUCTION TO PROTECT THE PIPE FROM DAMAGE.
- WHEN INSTALLING A GUARDRAIL OR A SIGN POST DIRECTLY ABOVE A PIPE, THE POST'S BOTTOM MUST BE AT LEAST 1 FOOT ABOVE THE TOP OF THE PIPE. THE HOLE FOR THE POST SHALL BE DRILLED INTO THE SOIL.
- STRUCTURE BACKFILL MATERIAL SHALL BE CLASS 1.
- FOR PIPES 24 INCHES OR LESS IN DIAMETER, H MIN. MAY BE REDUCED TO ONE FOOT FOR LOW VOLUME APPROACH ROADS NOT ON STATE HIGHWAYS.



INSTALLATION OF MULTIPLE PIPES

** TRENCH WIDTH ASSUMES STABLE IN-SITU SIDE WALL

PIPE DIAMETER, d (IN.)	H MINIMUM HEIGHT OF COVER (FT.)		H MAXIMUM HEIGHT OF COVER (FT.)			
	95% COMPACTION	90% COMPACTION	95% COMPACTION	90% COMPACTION	95% COMPACTION	90% COMPACTION
12	2	2	27	25	19	17
15	2	2	29	27	20	20
18	2	2	24	23	17	17
24	2	2	21	20	15	14
30	2	2	18	23	12	17
36	2	2	20	20	13	14
42	2	2	19	18	13	13
48	3	2	17	20	12	13
60	3	2.5	20	21	13	14

NOTE: THE VALUES FOR POLYPROPYLENE PIPES (AASHTO M330) ARE SHOWN IN ITALICS.

MINIMUM AND MAXIMUM COVER

NOMINAL PIPE DIAMETER (IN.)	MINIMUM COVER (IN.) FOR INDICATED AXLE LOADS (KIPS)			
	18.0-50.0	50.0-75.0	75.0-110.0	110.0-150.0
24 - 36	24.0	30.0	36.0	36.0
42 - 48	36.0	36.0	42.0	48.0
54 - 60	36.0	36.0	42.0	48.0

AASHTO MINIMUM COVER FOR CONSTRUCTION LOADS

Computer File Information

Creation Date: 07/04/12 Initials: DLM
Last Modification Date: 10/02/14 Initials: LTA
Full Path: www.coloradodot.info/business/designsupport
Drawing File Name: 603040101.dgn
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English

Sheet Revisions

Date:	Comments
11/07/13	Edited Legend and General Notes, Details, and Min. and Max. Cover table for addition of the Polypropylene pipe.

Colorado Department of Transportation

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Division of Project Support DLM/LTA

CORRUGATED
POLYETHYLENE PIPE (AASHTO M294)
AND
POLYPROPYLENE PIPE (AASHTO M330)

Issued By: Project Development Branch on July 4, 2012

STANDARD PLAN NO.

M-603-4

Sheet No. 1 of 1

LEGEND

H = MAXIMUM ALLOWABLE HEIGHT OF COVER OVER THE TOP OF THE PIPE, EXCLUDING PAVEMENT THICKNESS.

FILL HEIGHTS ARE BASED ON AASHTO M304 POLYVINYL CHLORIDE (PVC) PIPE WITH OUTER, RIBBED WALL AND SMOOTH INNER WALL, AND ON AASHTO T180 MINIMUM RELATIVE COMPACTION OF 95% OR 90%.

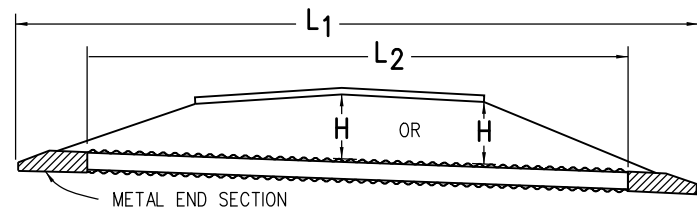
FILL HEIGHTS, FOR INSTALLATION WITH HIGH WATER TABLE, REQUIRE A SPECIAL DESIGN. THE MAXIMUM HEIGHT IN HIGHWATER LOCATIONS SHOULD BE 15 FEET OR BASED ON AASHTO LRFD DESIGN SPECIFICATIONS.

THE MINIMUM COVER SHALL BE AS SHOWN ON THESE TABLES OR CONFORM TO AASHTO REQUIREMENTS, WHICHEVER IS GREATER. THE MINIMUM COVER FOR PIPE IS MEASURED FROM THE TOP OF THE PIPE TO THE BOTTOM OF THE PAVEMENT: HMA OR PCCP.

THE MINIMUM COVER IS MEASURED FROM THE TOP OF THE PIPE TO THE TOP OF THE SUBGRADE DURING CONSTRUCTION. THE MINIMUM COVER IS BASED ON DUAL AXLE LOADS UP TO 50,000 POUNDS.

L₁ = LENGTH OF PIPE TO BE MEASURED WHEN PLACED IN ACCORDANCE WITH SECTION 624.

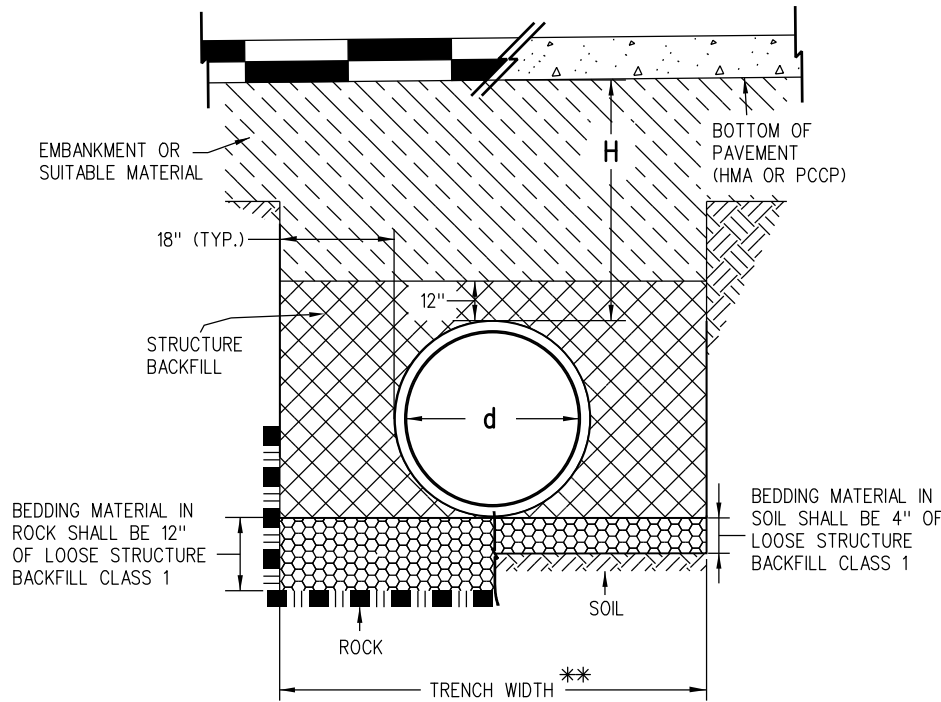
L₂ = LENGTH OF PIPE TO BE MEASURED WHEN PLACED IN ACCORDANCE WITH SECTION 603.



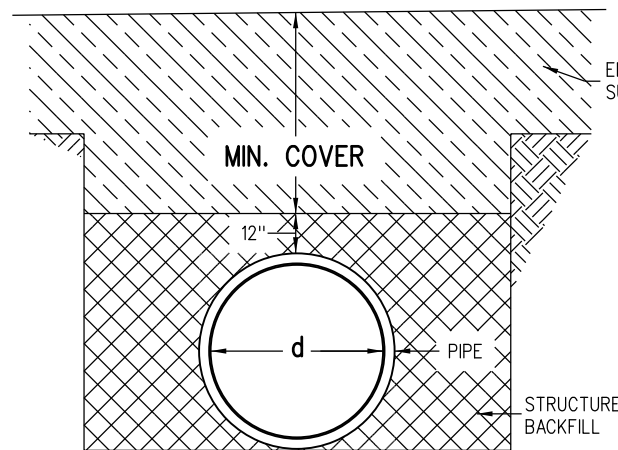
NOTE: USE THE **H** THAT IS GREATER FOR MAXIMUM ALLOWABLE FILL HEIGHT.
PIPE WITH END SECTIONS

PIPE DIAMETER, d (IN.)	H MINIMUM HEIGHT OF COVER (FT.)	H MAXIMUM HEIGHT OF COVER (FT.)	
		95% COMPACTION	90% COMPACTION
12	2	65	55
15	2	59	51
18	2	63	53
21	2	58	49
24	2	58	49
30	2	56	47
36	2	56	47

MINIMUM AND MAXIMUM COVER



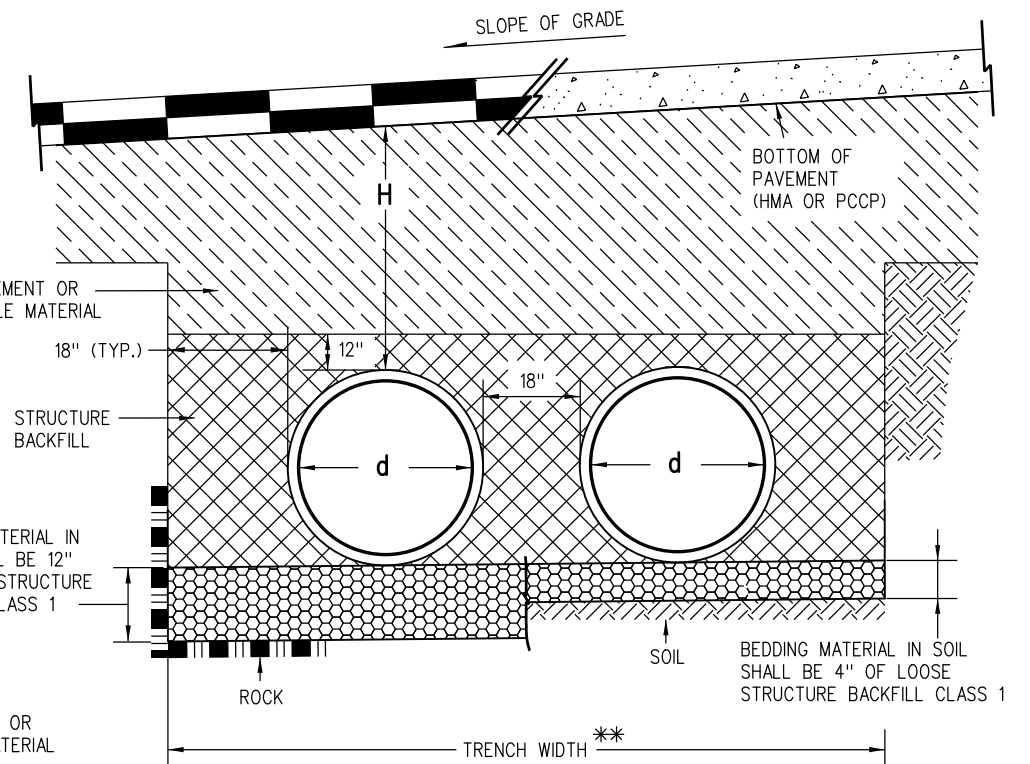
INSTALLATION OF PIPE



CONSTRUCTION MINIMUM COVER FOR PIPE

GENERAL NOTES

1. ALL PIPES SHALL MEET THE REQUIREMENTS OF AASHTO M304 FOR POLYVINYL CHLORIDE (PVC) PROFILE WALL DRAIN PIPE WITH 46 PSI WALL STIFFNESS PER ASTM F949.
2. FOR PIPES WITH DIAMETERS OF 15 INCHES OR LESS, SOLID WALL PVC PIPES MEETING AASHTO M278 MAY BE USED.
3. WHEN A PIPE IS TO BE EXTENDED, THE SAME PIPE MATERIAL AND SIZE AS IN THE ORIGINAL INSTALLATION SHALL BE USED.
4. MINIMUM COVER SHALL BE PROVIDED DURING CONSTRUCTION TO PROTECT THE PIPE FROM DAMAGE.
5. WHEN INSTALLING A GUARDRAIL OR A SIGN POST DIRECTLY ABOVE A PIPE, THE POST'S BOTTOM MUST BE AT LEAST 1 FOOT ABOVE THE TOP OF THE PIPE. THE HOLE FOR THE POST SHALL BE DRILLED INTO THE SOIL.
6. STRUCTURE BACKFILL MATERIAL SHALL BE CLASS 1.
7. FOR PIPES 24 INCHES OR LESS IN DIAMETER, H MIN. MAY BE REDUCED TO ONE FOOT FOR LOW VOLUME APPROACH ROADS NOT ON STATE HIGHWAYS.



INSTALLATION OF MULTIPLE PIPES

** TRENCH WIDTH ASSUMES STABLE IN-SITU SIDE WALL

NOMINAL PIPE DIAMETER (IN.)	MINIMUM COVER (IN.) FOR INDICATED AXLE LOADS (KIPS)			
	18.0-50.0	50.0-75.0	75.0-110.0	110.0-150.0
24 - 36	24.0	30.0	36.0	36.0

AASHTO MINIMUM COVER FOR CONSTRUCTION LOADS

Computer File Information

Creation Date: 07/04/12 Initials: DLM
 Last Modification Date: 10/02/14 Initials: LTA
 Full Path: www.coloradodot.info/business/designsupport
 Drawing File Name: 603050101.dgn
 CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English

Sheet Revisions

Date:	Comments
1/07/13	Edited Legend and General Notes.

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 Division of Project Support DLM/LTA

POLYVINYL CHLORIDE (PVC) PIPE (AASHTO M304)

Issued By: Project Development Branch on July 4, 2012

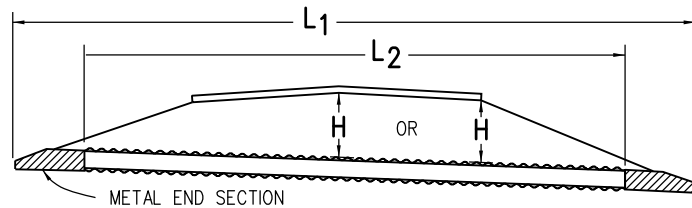
STANDARD PLAN NO.

M-603-5

Sheet No. 1 of 1

LEGEND

- H** = MAXIMUM ALLOWABLE HEIGHT OF COVER OVER THE TOP OF THE PIPE, EXCLUDING PAVEMENT THICKNESS.
- FILL HEIGHTS AND DESIGN ASSUMPTIONS ARE BASED ON AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 7TH EDITION, SECTION 12.7.
- FILL HEIGHTS ARE BASED ON AASHTO MP 20, TYPE S PIPES WITH RIBBED REINFORCED STEEL WALLS.
- FILL HEIGHTS FOR INSTALLATION WITH HIGH WATER TABLE REQUIRE A SPECIAL DESIGN.
- THE MINIMUM COVER SHALL BE AS SHOWN ON THESE TABLES OR CONFORM TO AASHTO REQUIREMENTS, WHICHEVER IS GREATER. THE MINIMUM COVER FOR PIPE IS MEASURED FROM THE TOP OF THE PIPE TO THE BOTTOM OF THE PAVEMENT: HMA OR PCCP.
- THE MINIMUM COVER IS MEASURED FROM THE TOP OF THE PIPE TO THE TOP OF THE SUBGRADE DURING CONSTRUCTION. THE MINIMUM COVER IS BASED ON DUAL AXLE LOADS UP TO 50,000 POUNDS.
- L₁** = LENGTH OF PIPE TO BE MEASURED WHEN PLACED IN ACCORDANCE WITH SECTION 624.
- L₂** = LENGTH OF PIPE TO BE MEASURED WHEN PLACED IN ACCORDANCE WITH SECTION 603.
- +** = THE MINIMUM SPACING BETWEEN THE OUTSIDE WALLS OF MULTIPLE PIPES OR END SECTIONS IS 18" OR d/2, WHICHEVER IS GREATER.



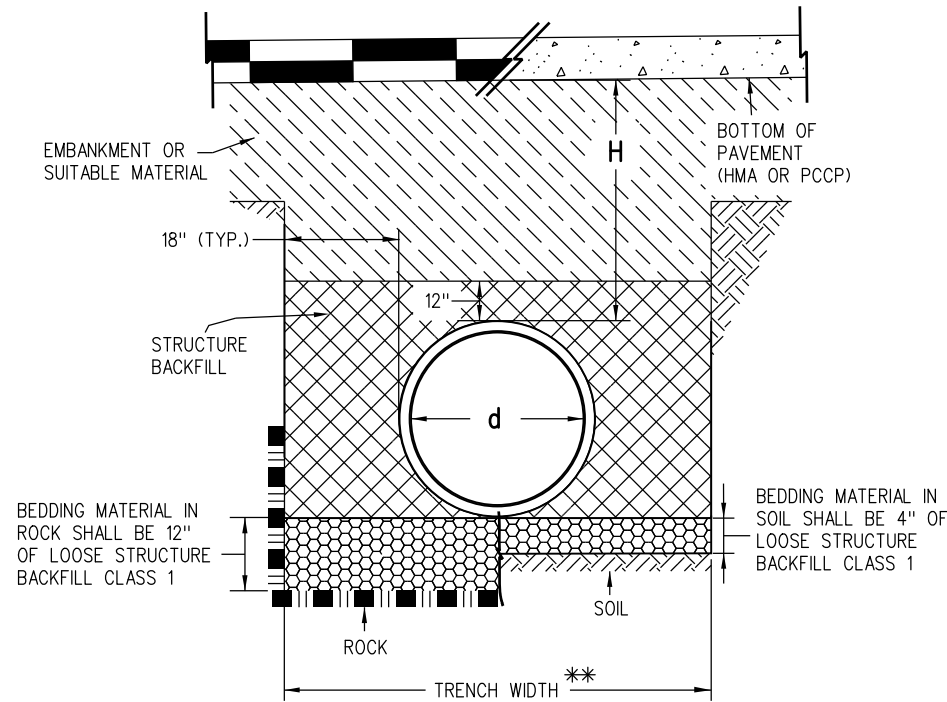
NOTE: USE THE H THAT IS GREATER FOR MAXIMUM ALLOWABLE FILL HEIGHT.

PIPE WITH END SECTIONS

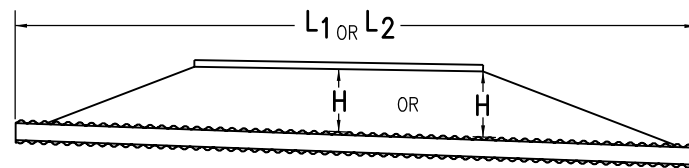
PIPE DIAMETER, d (IN.)	H MINIMUM HEIGHT OF COVER (FT.)	H MAXIMUM HEIGHT* OF COVER (FT.)
30	2	50
36	2	50
42	2	50
48	2	30
54	2	30
60	2.5	30

* A MANUFACTURER'S CERTIFICATION OF MAXIMUM ALLOWABLE FILL HEIGHT IS REQUIRED PRIOR TO INSTALLATION.

MINIMUM AND MAXIMUM COVER

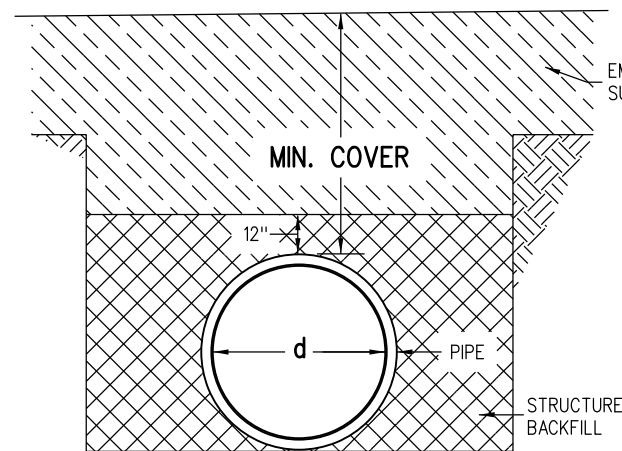


INSTALLATION OF PIPE



NOTE: USE THE H THAT IS GREATER FOR MAXIMUM ALLOWABLE FILL HEIGHT.

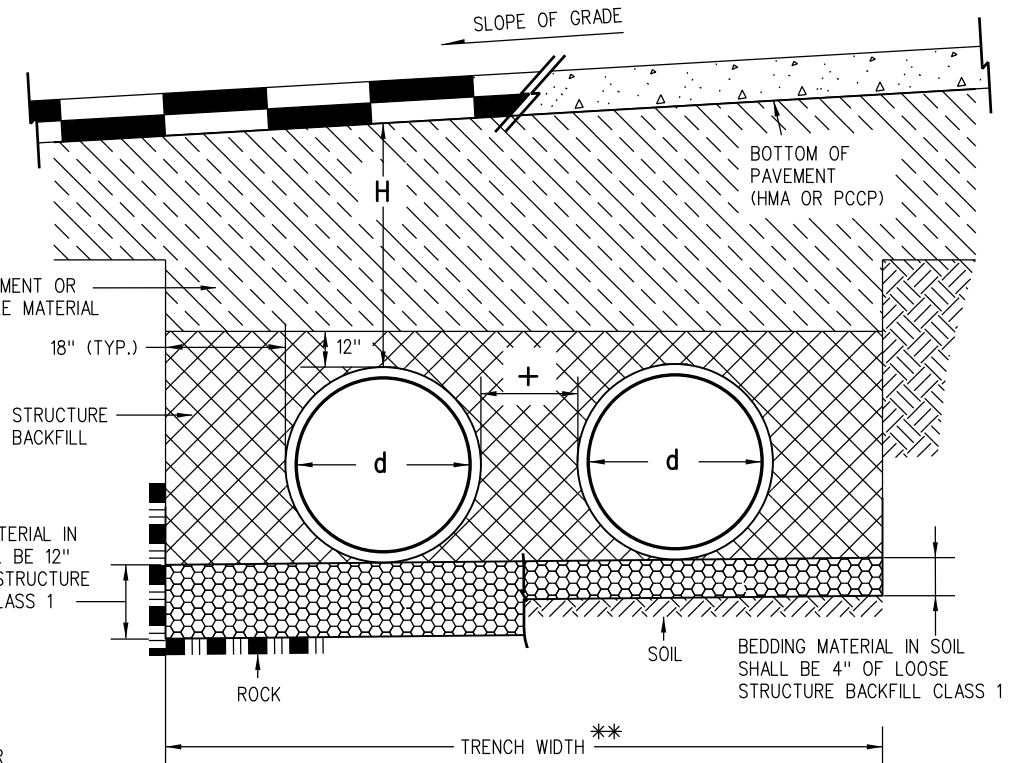
PIPE WITHOUT END SECTIONS



CONSTRUCTION MINIMUM COVER FOR PIPE

GENERAL NOTES

- ALL PIPES SHALL MEET THE REQUIREMENTS OF AASHTO MP 20 FOR STEEL REINFORCED, POLYETHYLENE, TYPE S RIBBED PIPE WITH SMOOTH INNER SURFACE. INSTALLATION SHALL CONFORM TO AASHTO LRFD BRIDGE CONSTRUCTION SPECIFICATIONS, 3RD EDITION, SECTION 26.
- WHEN A PIPE IS TO BE EXTENDED, THE SAME PIPE MATERIAL AND SIZE AS IN THE ORIGINAL INSTALLATION SHALL BE USED.
- MINIMUM COVER SHALL BE PROVIDED DURING CONSTRUCTION TO PROTECT THE PIPE FROM DAMAGE.
- WHEN INSTALLING A GUARDRAIL OR A SIGN POST DIRECTLY ABOVE A PIPE, THE POST'S BOTTOM MUST BE AT LEAST 1 FOOT ABOVE THE TOP OF THE PIPE. THE HOLE FOR THE POST SHALL BE DRILLED INTO THE SOIL.
- STRUCTURE BACKFILL MATERIAL SHALL BE CLASS 1.



INSTALLATION OF MULTIPLE PIPES

** TRENCH WIDTH ASSUMES STABLE IN-SITU SIDE WALL

NOMINAL PIPE DIAMETER (IN.)	MINIMUM COVER (IN.) FOR INDICATED AXLE LOADS (KIPS)			
	18.0-50.0	50.0-75.0	75.0-110.0	110.0-150.0
30 - 36	24.0	30.0	36.0	36.0
42 - 48	36.0	36.0	42.0	48.0
54 - 60	36.0	36.0	42.0	48.0

AASHTO MINIMUM COVER FOR CONSTRUCTION LOADS

Computer File Information	
Creation Date: 03/06/15	Initials: DLM
Last Modification Date: 04/30/15	Initials: LTA
Full Path: www.coloradodot.info/business/designsupport	(R-X)
Drawing File Name: 603060101.dgn	(R-X)
CAD Ver.: MicroStation V8	Scale: Not to Scale Units: English

Sheet Revisions	
Date:	Comments
03/06/15	Created M-603-6
04/30/15	Revised 4th and 6th paragraph in Legend. Deleted Gen. Note 6. Added footnote and revised quantities in Min. and Max. Cover Table. Change dia from 24 to 30 in AASHTO Min. Cover for Construction Loads table.

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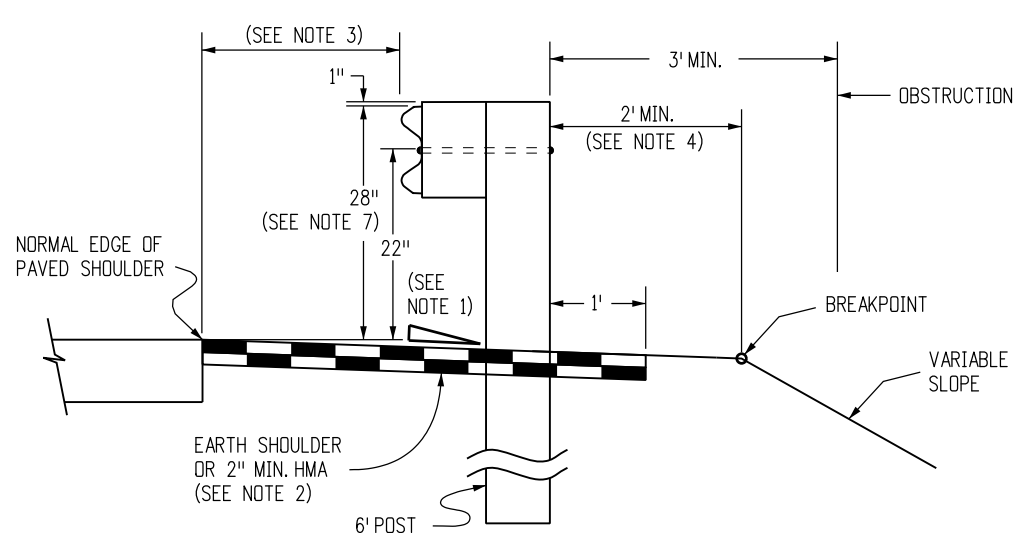
**STEEL REINFORCED
POLYETHYLENE RIBBED PIPE
(AASHTO MP 20)**

Issued By: Project Development Branch on March 6, 2015

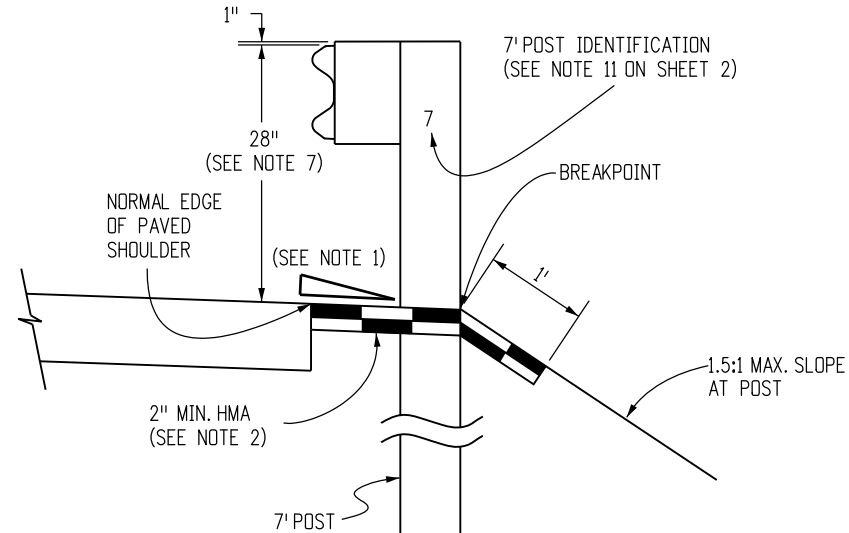
STANDARD PLAN NO.

M-603-6

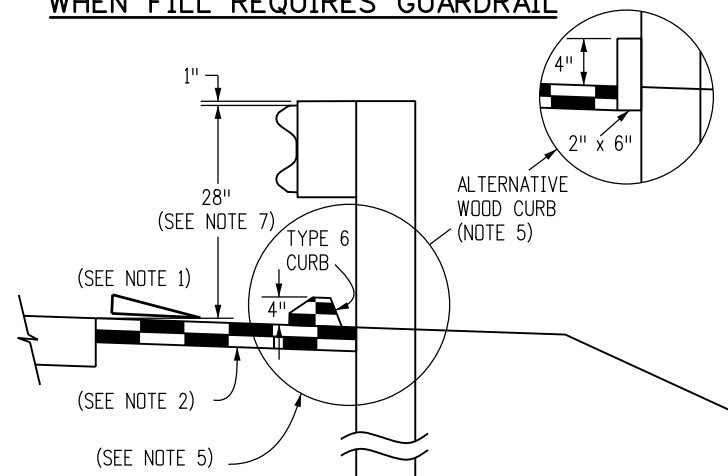
Sheet No. 1 of 1



NORMAL ROADSIDE INSTALLATION WHEN FILL REQUIRES GUARDRAIL

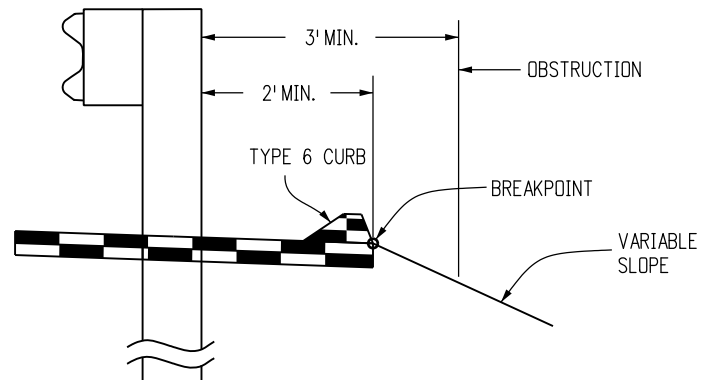


RESTRICTIVE ROADSIDE INSTALLATION WITH 7 FOOT GUARDRAIL POSTS

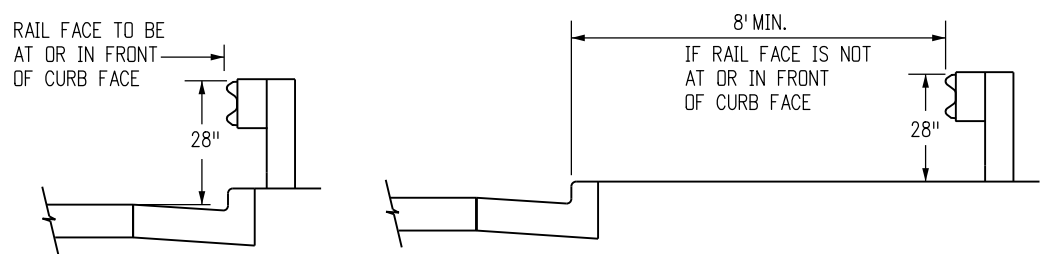


OPTION A

ROADSIDE INSTALLATION WITH EROSION CONTROL CURB



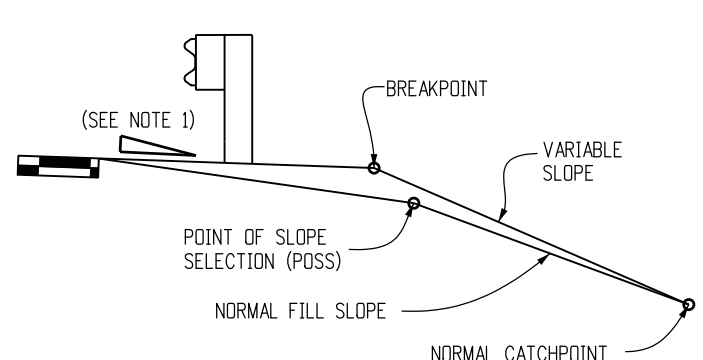
OPTION B



URBAN ROADSIDE INSTALLATION WITH CURB AND GUTTER

LOCATION	SPACING
ALL LOCATIONS EXCEPT BRIDGE RAIL LOCATIONS	6'-3"
BRIDGE OR STRUCTURE APPROACH	SEE SHEETS 12 & 20

NORMAL CENTER-TO-CENTER POST SPACING



EMBANKMENT WITH GUARDRAIL

(NOTE: THE CATCHPOINT REMAINS THE SAME AS THAT FOR "NORMAL" FILL SLOPE. FOR THE WIDER "Z" DISTANCES, THE VARIABLE SLOPE MAY "CATCH" AT THE POSS.)

GENERAL NOTES

- RATE OF SLOPE DEPENDS ON GUARDRAIL LOCATION:
 - FOR GUARDRAIL FACE 2 FT. OR LESS FROM THE NORMAL EDGE OF PAVED SHOULDER, CONTINUE THE RATE OF SLOPE OF THE NORMAL PAVED SHOULDER TO THE BREAKPOINT.
 - FOR GUARDRAIL FACE MORE THAN 2 FT. FROM THE NORMAL EDGE OF THE PAVED SHOULDER, THE SLOPE SHALL BE 10:1 OR FLATTER.
- WHEN SPECIFIED ON THE PLANS, EXTEND A 2 IN. MINIMUM THICKNESS PAVED SURFACE TO 1 FT. BEHIND THE GUARDRAIL POSTS OR TO THE EROSION CONTROL CURB AS SHOWN ON PLANS. ASPHALT CUTTING & PATCHING OR OTHER APPROVED METHOD SHALL BE USED TO MINIMIZE DAMAGE TO ALL PAVED SURFACES UNDER GUARDRAIL INSTALLATIONS. ALL REPAIRS TO THE PAVED AREA WILL NOT BE MEASURED AND PAID FOR SEPARATELY BUT SHALL BE INCLUDED IN THE COST OF THE WORK. A MINIMUM 3 IN. THICK FIBER REINFORCED CONCRETE PAVEMENT MAY ALSO BE USED FOR PAVING BENEATH THE GUARDRAIL. INSTALL THE POST IN A 1/2 IN. OVERSIZED FORMED HOLE FOR GUARDRAIL RUNS AND TERMINALS AS DIRECTED. PAYMENT FOR THIS PAVED SURFACE WILL BE MADE UNDER A PAVEMENT OR CONCRETE PAY ITEM WITH QUANTITIES SHOWN ON THE PLANS.
- THE MINIMUM GUARDRAIL OFFSET FROM PAVED SHOULDER EDGE SHALL BE:
 - 0 FT. FOR SHOULDERS 8 FT. OR WIDER
 - 2 FT. FOR SHOULDERS 6 FT. OR LESS
 THE GUARDRAIL OFFSET FROM PAVED INSIDE SHOULDER EDGE OF A DIVIDED HIGHWAY SHALL BE:
 - 0 FT. MINIMUM FOR SHOULDERS 6 FT. OR WIDER
 - 2 FT. DESIRABLE FOR 4 FT. SHOULDERS
 THE ABOVE 2 FT. GUARDRAIL TO SHOULDER OFFSET IS DESIRABLE BUT NOT REQUIRED FOR:
 - FOR AN EXISTING HIGHWAY WITH A DESIGN SPEED LESS THAN 50 MPH, THE MINIMUM OFFSET IS 4 FT. FROM THE TRAVELED WAY.
 - FOR A ONE-WAY ONE-LANE RAMP, AND WHERE ONE OR MORE OF THE FOLLOWING ARE TRUE:
 - THE NON-OFFSET GUARDRAIL BEGINS AT LEAST 100 FT. BEYOND RAMP NOSE.
 - THE NON-OFFSET GUARDRAIL IS NOT LOCATED ON THE RAMP EXIT OR ENTRANCE CURVE CONNECTION TO THE MAJOR HIGHWAY.
 - THE RAMP SHOULDERS ARE 4 FT. OR WIDER.
 USE OF GREATER THAN MINIMUM OFFSET DIMENSIONS IS ENCOURAGED TO MEET THE DESIRABLE GOAL OF PLACING THE GUARDRAIL AS FAR AS POSSIBLE FROM THE TRAVEL WAY, EVEN FOR SHORT DISTANCES, WHILE PROVIDING A SMOOTH CHANGE IN GUARDRAIL ALIGNMENT.
- IF 2 FT. CANNOT BE PROVIDED BETWEEN THE BACK OF THE GUARDRAIL POST AND THE BREAKPOINT, USE 7 FT. GUARDRAIL POSTS. REFER TO THE "RESTRICTIVE ROADSIDE INSTALLATION" DETAIL.
- WHEN SPECIFIED ON THE PLANS, INSTALL 4 IN. HIGH TYPE 6 CURB WITH ITS FACE AT OR BEHIND THE RAIL FACE. AS AN ALTERNATIVE WHEN SPECIFIED ON THE PLANS, INSTALL A 2 IN. x 6 IN. TREATED (AASHTO M 133) WOOD CURB. FASTEN WITH A 4 IN. LAG BOLT AND WASHER AT EACH WOOD POST, OR WITH A 1/4 IN. DIA. BOLT WITH WASHER AND NUT AT EACH STEEL POST. IF THE 2 IN. x 6 IN. WOOD CURB IS SPECIFIED, IT WILL BE INCLUDED IN THE COST OF THE GUARDRAIL. IF APPROVED BY THE ENGINEER, A 2 IN. x 4 IN. TREATED WOOD CURB MAY BE SUBSTITUTED FOR THE 2 IN. x 6 IN. CURB AND SET ON TOP OF PAVEMENT SURFACE AND ATTACHED AS DESCRIBED ABOVE. NO SPLICING SHALL BE ALLOWED IN WOOD CURBS. ADJACENT BOARDS SHALL BE BUTTED TOGETHER AND BOLTED AT A POST LOCATION. JOINTS SHALL BE LOCATED AT THE POSTS.
- SEE SHEET 7 FOR CURB TREATMENTS AT GUARDRAIL TERMINALS.
- RESET GUARDRAIL IF THIS DIMENSION WILL BE LESS THAN 25 IN.
- ALL W-BEAM SPLICES, AND SPLICES OF TERMINAL CONNECTORS TO W-BEAM SHALL BE LAPPED IN THE DIRECTION OF TRAFFIC UNLESS OTHERWISE NOTED.
- MATERIAL TYPE AND SHAPE OF POSTS AND BLOCKS SHALL BE THE SAME THROUGHOUT THE PROJECT EXCEPT WHEN SPECIFIC POSTS AND BLOCKS ARE SPECIFIED, I.E. AT END ANCHORAGES AND BOX CULVERTS.
- CONCRETE MAY BE READY-MIXED OR FIELD-MIXED AND SHALL CONSIST OF A MINIMUM OF 1 PART CEMENT TO 6 PARTS AGGREGATE BY VOLUME.

THE GENERAL NOTES ARE CONTINUED ON SHEET 2.

Computer File Information	
Creation Date: 07/04/12	Initials: DLM
Last Modification Date: 10/27/14	Initials: LTA
Full Path: www.coloradodot.info/business/designsupport	
Drawing File Name: 6010101020.dgn	
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	

Sheet Revisions	
Date:	Comments
(R-X) 10/09/14	Added details of the X-Lite flared and non-flared end terminals to sheets 6 and 8.
(R-X) 10/27/14	Removed the Et-Plus End Anchorage (non-flared) from sheet 8.

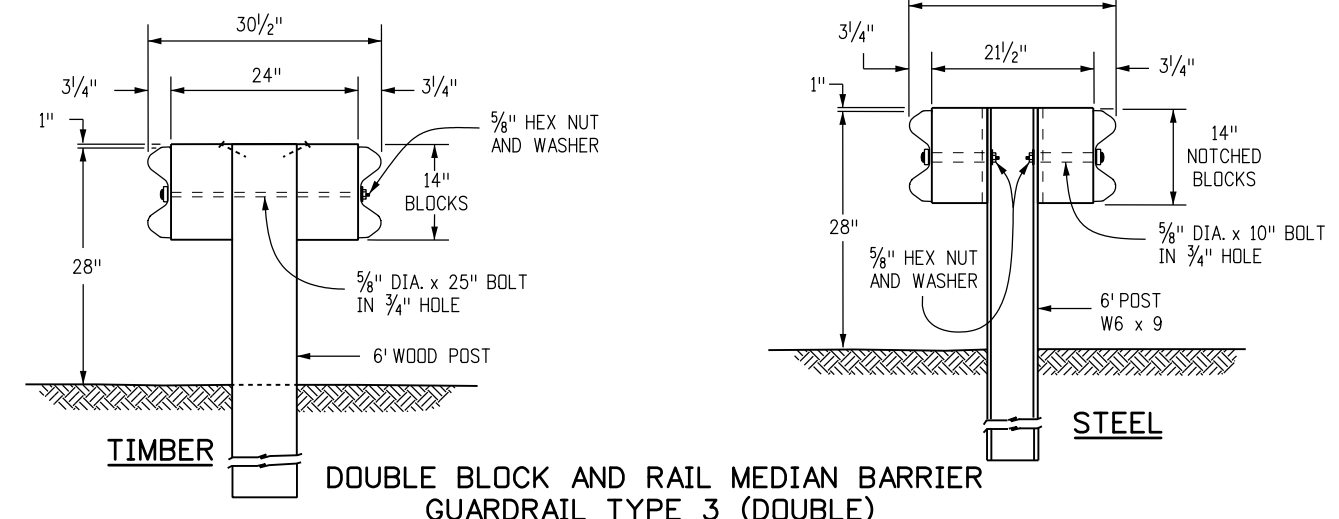
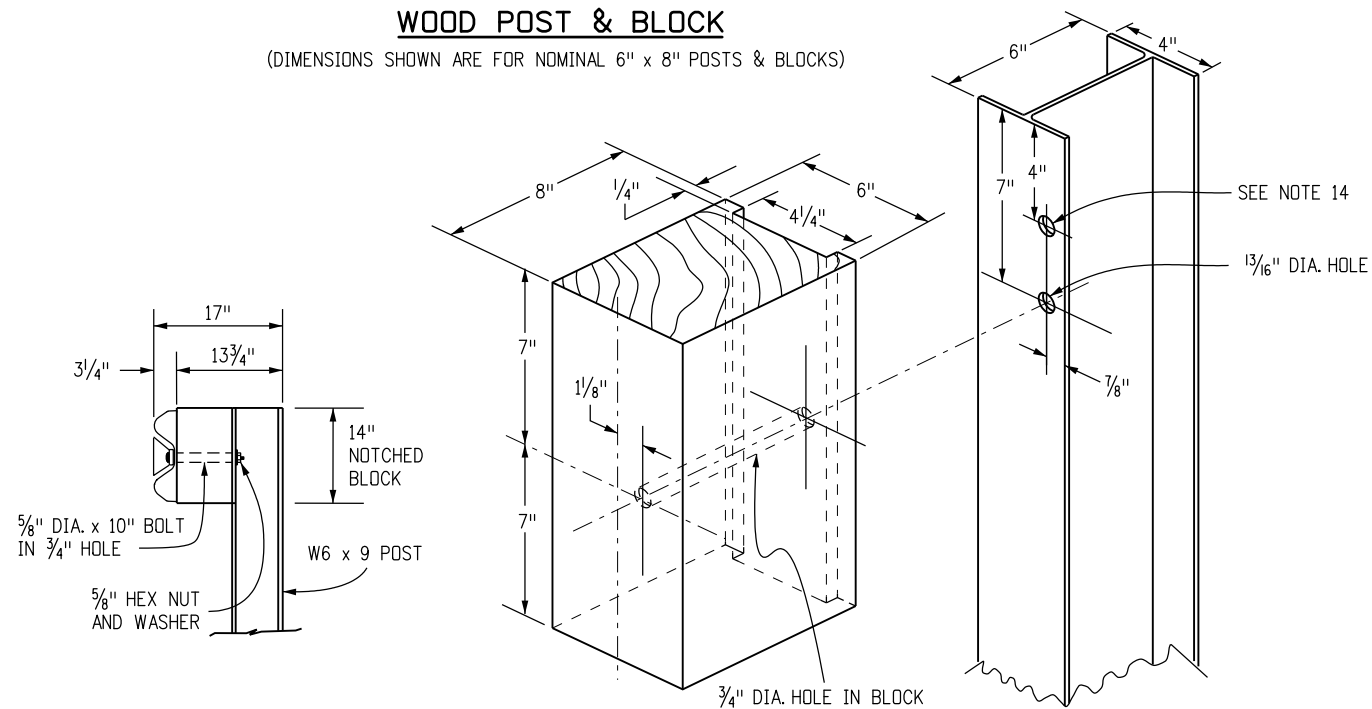
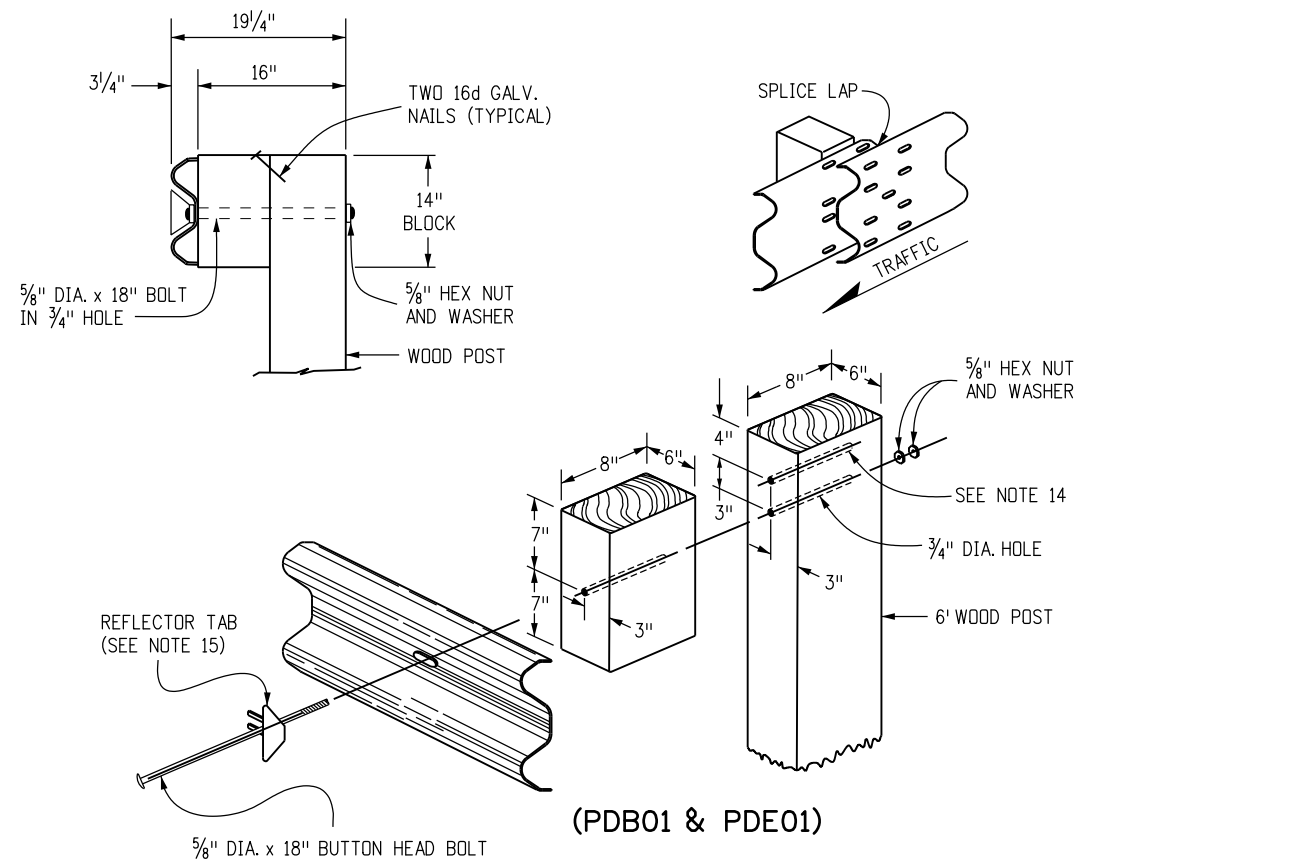
Colorado Department of Transportation
 4201 East Arkansas Avenue
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 Phone: 303-757-9021 FAX: 303-757-9868
 Division of Project Support DLM/LTA

GUARDRAIL TYPE 3
W-BEAM
 Issued By: Project Development Branch July 4, 2012

STANDARD PLAN NO.
M-606-1
 Sheet No. 1 of 20

GENERAL NOTES (CONTINUED FROM SHEET 1)

10. CONCRETE MAY BE READY-MIXED OR FIELD-MIXED AND SHALL CONSIST OF A MINIMUM OF 1 PART CEMENT TO 6 PARTS AGGREGATE BY VOLUME.
11. WHEN SPECIFIED IN THE CONTRACT, 7 FT. POSTS SHALL BE INSTALLED INSTEAD OF THE STANDARD 6 FT. POSTS. THE 7 FT. POSTS SHALL BE MARKED WITH THE NUMBER 7 TO ENSURE PERMANENT IDENTIFICATION. STEEL POSTS SHALL BE STAMPED PRIOR TO GALVANIZING. THE NUMBER 7 SHALL BE A MINIMUM 2 IN. TALL AND LOCATED AS SHOWN ON THE ELEVATION VIEW ON SHEET 1.
12. THE STANDARD 3 IN. X 1 3/4 IN. X 3/16 IN. RECTANGULAR WASHER USED UNDER POST BOLT HEADS IN THE PAST MAY REMAIN IN EXISTING INSTALLATIONS BUT SHALL NOT BE USED IN NEW CONSTRUCTION, REPAIRS, OR RESETTING OF RAIL, EXCEPT WHEN SPECIFICALLY IDENTIFIED ON THE STANDARD PLAN.
13. STANDARD GALVANIZED ROUND STEEL WASHERS SHALL BE USED UNDER ALL NUTS IN CONTACT WITH WOOD POSTS.
14. AN ADDITIONAL HOLE SHALL BE PROVIDED IN THE POSTS TO FACILITATE FUTURE RAISING OF THE RAIL ELEMENTS AND BLOCKS FOR OVERLAYS.
15. RETROREFLECTOR TABS SHALL BE INSTALLED AT 25 FT. INTERVALS (SEE SHEETS 6 AND 8 FOR EXCEPTIONS). RETROREFLECTOR TABS WILL NOT BE PAID FOR SEPARATELY BUT SHALL BE INCLUDED IN THE WORK. THE TABS SHALL BE MOUNTED SO THE BOLT SLOT FACES AWAY FROM TRAFFIC, AND THE RETROREFLECTOR SURFACE FACES THE APPROACHING TRAFFIC FOR ONE-WAY ROADS. FOR TWO-WAY ROADS, BOTH SIDES OF THE TABS SHALL BE RETROREFLECTIVE, SO THAT DELINEATION IS PROVIDED FOR BOTH DIRECTIONS OF TRAVEL. THE RETROREFLECTIVE SHEETING COLOR SHALL MATCH THE COLOR OF THE ADJACENT TRAVEL WAY EDGE LINE. SEE THE RETROREFLECTOR TAB DETAIL ON SHEET 3.
16. AT THE TIME OF INSTALLATION, WOOD POSTS OR BLOCKS WITH SEASONING CHECKS GREATER THAN 1/4 IN. SHALL NOT BE USED WHEN THE CHECK EXTENDS THE FULL LENGTH OF THE PIECE.
17. WOOD BLOCKS SHALL BE CUT FROM THE SAME CROSS-SECTION, SPECIES, AND GRADE, AND SHALL RECEIVE THE SAME PRESERVATIVE TREATMENT AS THE POSTS WHEN WOOD POSTS ARE USED.
18. REFERENCES SUCH AS ØØPDB01", ØØPDE01", AND ØØPWE01" IN THIS STANDARD PLAN SPECIFY HARDWARE DETAILS FROM ØØA GUIDE TO STANDARDIZED HIGHWAY BARRIER HARDWARE" PREPARED BY THE AASHTO-AGC-ARTBA JOINT COOPERATIVE COMMITTEE.
19. NOTCHED RAIL BLOCKS MANUFACTURED FROM SYNTHETIC MATERIAL WILL BE ACCEPTED AS ALTERNATIVES TO WOOD NOTCHED BLOCKS FOR USE WITH STEEL POSTS PROVIDED THAT THE BLOCKS HAVE RECEIVED FHWA APPROVAL AND ARE CERTIFIED AS IDENTICAL TO THE SPECIMENS USED FOR TESTING AND APPROVAL.
20. WOOD POSTS SHALL BE MADE OF TIMBER WITH AN EXTREME FIBER STRESS IN BENDING OF 1200 PSI STRESS GRADING AND POST DIMENSIONS SHALL CONFORM WITH THE RULES OF THE WEST COAST INSPECTION BUREAU, OR THE SOUTHERN PINE BUREAU, OR THE WESTERN WOOD PRODUCTS ASSOCIATION. TIMBER FOR POSTS SHALL BE EITHER ROUGH SAWN (UNPLANED) OR S4S (SURFACED FOUR SIDES) WITH NOMINAL DIMENSIONS INDICATED. ONLY ONE TYPE OF SURFACE FINISH SHALL BE USED FOR POSTS AND BLOCKS IN ANY ONE CONTINUOUS LENGTH OF GUARDRAIL.
21. GLULAM POSTS AND BLOCKS WILL BE ACCEPTED AS ALTERNATIVES PROVIDED THAT THE SUPPLIED MATERIALS HAVE RECEIVED FHWA APPROVAL AND ARE CERTIFIED AS IDENTICAL TO THE SPECIMENS USED FOR TESTING AND APPROVAL.
22. PRESSURE TREATMENT OF POSTS AND BLOCKS SHALL CONFORM TO AASHTO M 133 EXCEPT THAT BLOCKS NEED NOT BE INCISED. PRESERVATION ASSAY RETENTION REPORTS SHALL BE SUBMITTED TO THE ENGINEER. THE CONTRACTOR SHALL CERTIFY THAT THE SPECIES AND GRADE MEET THE REQUIREMENTS OF THE CONTRACT.
23. W-BEAM AND THRIE-BEAM GUARDRAIL POSTS SHALL BE MANUFACTURED USING AASHTO M 270 (ASTM A 709) GRADE 36 STEEL UNLESS CORROSION RESISTANT STEEL IS REQUIRED, IN WHICH CASE THE POST SHALL BE MANUFACTURED FROM AASHTO M 270 (ASTM A 709) GRADE 50W STEEL. THE DIMENSIONS OF THE CROSS-SECTION SHALL CONFORM TO A W6 X 9 SECTION AS DEFINED IN AASHTO M 160 (ASTM A 6). W6 X 8.5 WIDE FLANGE STEEL POSTS ARE AN ACCEPTABLE ALTERNATIVE TO THE W6 X 9.
24. AFTER THE SECTION IS CUT AND ALL HOLES ARE DRILLED OR PUNCHED THE COMPONENT SHALL BE ZINC-COATED CONFORMING TO AASHTO M 111 (ASTM A 123) UNLESS CORROSION-RESISTANT STEEL IS USED. WHEN CORROSION-RESISTANT STEEL IS USED THE PORTION OF THE POST TO BE EMBEDDED IN SOIL SHALL BE ZINC-COATED CONFORMING TO AASHTO M 111 (ASTM A 123) AND THE PORTION ABOVE THE SOIL SHALL NOT BE ZINC-COATED, PAINTED OR OTHERWISE TREATED.
25. FIELD MODIFICATION TO RAIL ELEMENTS ONLY IS ALLOWED BY SAWING AND DRILLING OF HOLES. FLAME CUTTING IS NOT PERMITTED. POSTS SHALL NOT BE MODIFIED. COMPONENTS ON WHICH THE SPECTER COATING HAS BEEN DAMAGED SHALL BE EITHER REGALVANIZED OR RECOATED IN CONFORMANCE WITH AASHTO M 36, OR PAINTED WITH ONE FULL BRUSH COAT OF ZINC RICH PAINT CONFORMING TO MILITARY SPECIFICATION DOD-P-21035A.



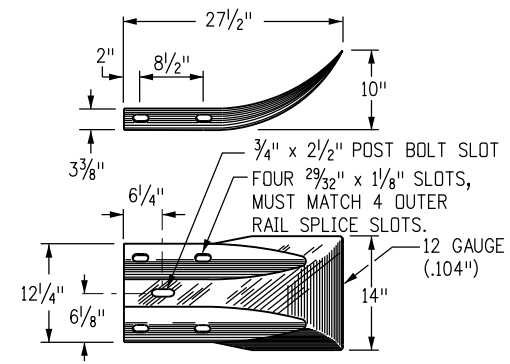
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Sheet Revisions	
Date:	Comments
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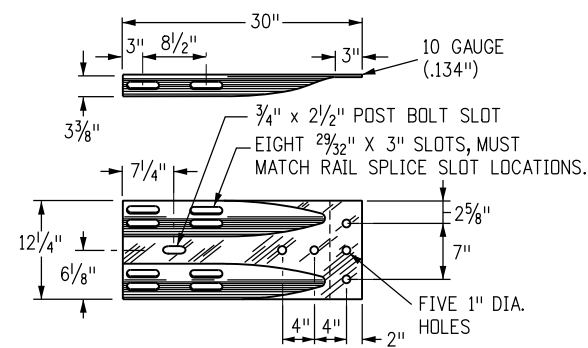
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GUARDRAIL TYPE 3
W-BEAM
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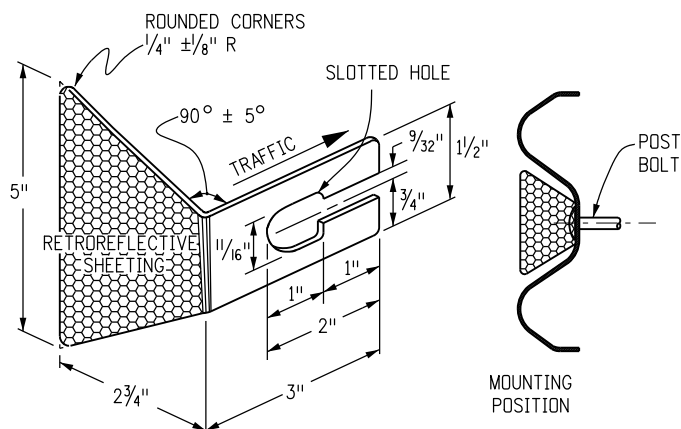
STANDARD PLAN NO.
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 Sheet No. 2 of 20



TERMINAL SECTION (FLARED)

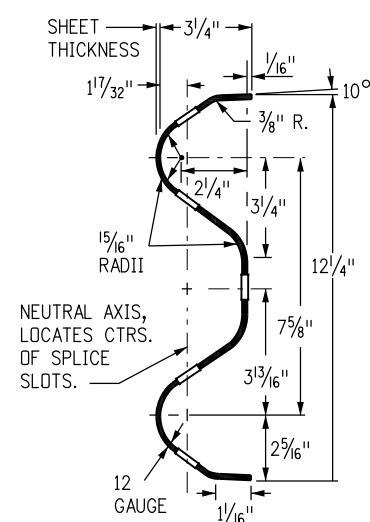


TERMINAL SECTION (CONNECTOR)

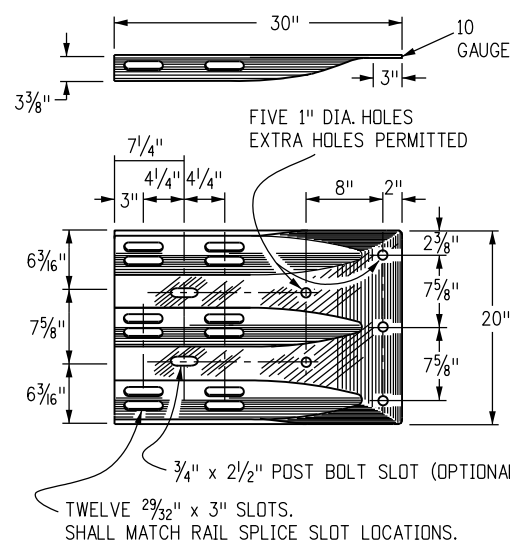


RETROREFLECTOR TAB

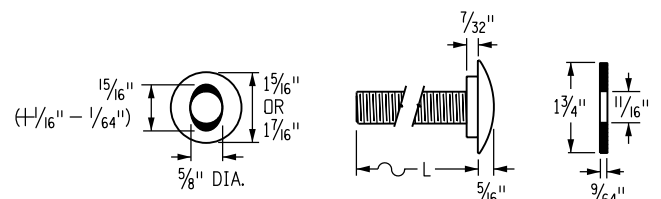
NOTE: RETROREFLECTOR TABS SHALL BE MANUFACTURED FROM 12 TO 14 GAUGE STEEL AND SHALL CONFORM TO THE REQUIREMENTS OF S STANDARD S-612-1.



W-BEAM RAIL SECTION

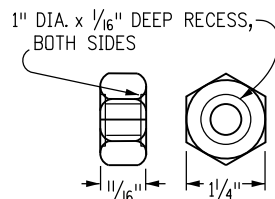


THRIE BEAM TERMINAL SECTION (CONNECTOR)

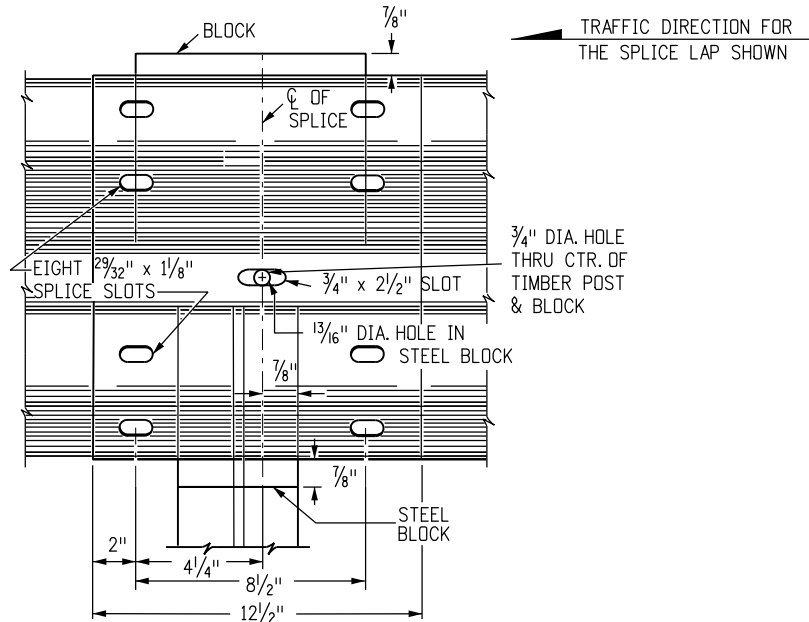


BUTTON HEAD BOLT WITH OVAL SHOULDER

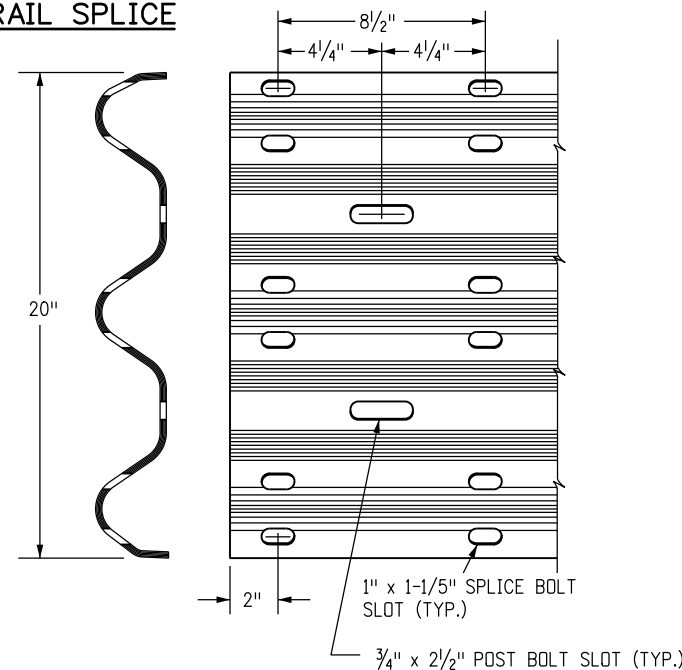
WASHER



HEX NUT



RAIL SPLICE

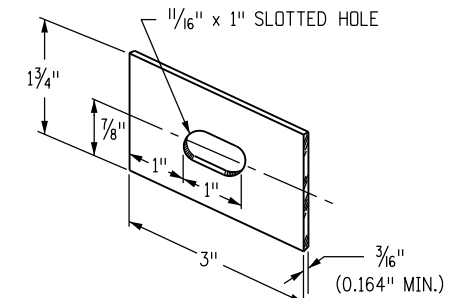


THRIE BEAM DETAIL

PART	MATERIAL SPEC.	GALVANIZING SPEC.	CORROSION-RESISTANT SPEC.
W-BEAM RAIL & TERMINAL SECTIONS	AASHTO M 180, CLASS A OR B	AASHTO M 180, TYPE 1 OR 2	AASHTO M 180, TYPE 4
BASE PLATE	ASTM A 36	AASHTO M 111	N.A.
NUTS, BOLTS & STUDS FOR GENERAL USE	ASTM A 307		
HIGH STRENGTH BOLTS & NUTS	ASTM A 325		AASHTO M 232, CLASS C
HIGH STRENGTH STUDS & NUTS	ASTM A 449		OR
ROUND STEEL WASHERS	ASTM F 436		ASTM B 695 CLASS 50 TYPE 1
RECTANGULAR WASHERS	AASHTO M 180		
OTHER FITTINGS	ASTM A 36	AASHTO M 111	

THE TABULATION OF GUARDRAIL WILL SPECIFY THE TYPE OF CORROSION PROTECTION: GALVANIZED OR CORROSION - RESISTANT STEEL.

STEEL POSTS SHALL HAVE THE SAME CORROSION PROTECTION AS SPECIFIED FOR THE METAL BEAM RAIL. PUNCHING, DRILLING, CUTTING, OR WELDING OF POSTS WILL NOT BE PERMITTED AFTER GALVANIZING.



RECTANGULAR WASHER
(TO BE USED ONLY WHERE SPECIFIED.)

DIAMETER & TYPE (INCHES)	LENGTH L (INCHES)	THREAD LENGTH (INCHES)	INTENDED USE	AASHTO-AGC-ARTBA STANDARD NUMBER	NO. BOLTS, NUTS & WASHERS
5/8	1/4	FULL (1 1/32)	ALL RAIL SPLICES	FBB01	8 PER SPLICE*
OVAL	18	MIN. 2 1/2	SINGLE BLOCK & POST (TIMBER)	FBB04	1 PER POST
SHLDR.	25	MIN. 2	DOUBLE BLOCK & POST (TIMBER)	FBB05	1 PER POST
	10	MIN. 2	FASTEN NOTCHED BLOCK TO STEEL POST	FBB03	1 PER BLOCK

* WASHERS NOT USED AT RAIL SPLICES

Computer File Information

Creation Date: 07/04/12 Initials: DLM
 Last Modification Date: 10/27/14 Initials: LTA
 Full Path: www.coloradodot.info/business/designsupport
 Drawing File Name: 6060103020.dgn
 CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English

Sheet Revisions

Date:	Comments
(R-X)	
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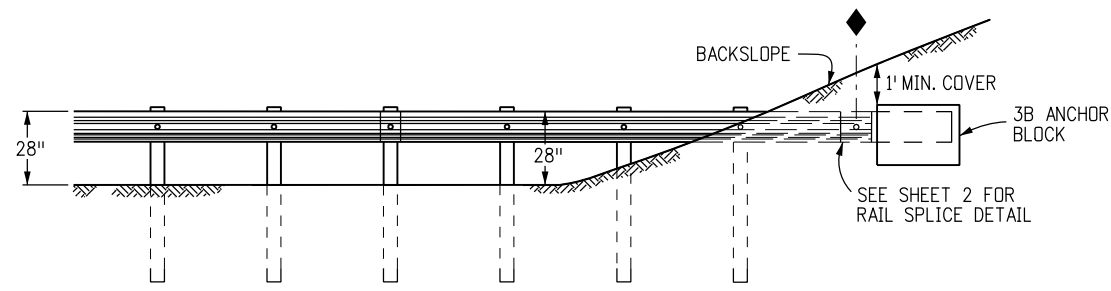
**GUARDRAIL TYPE 3
W-BEAM**

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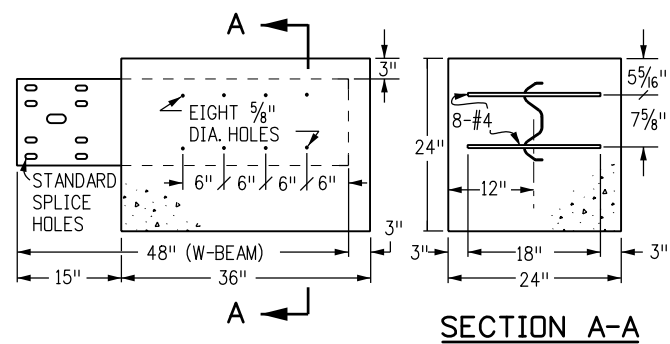
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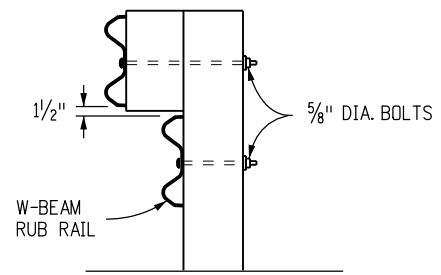


SEE TYPE 3B (RUB RAIL) PLAN VIEW FOR ALIGNMENT. THE 100 FT. FLARE LENGTH MAY BE SHORTENED IF THE SLOPE IS LESS THAN 8 FT. WIDE.

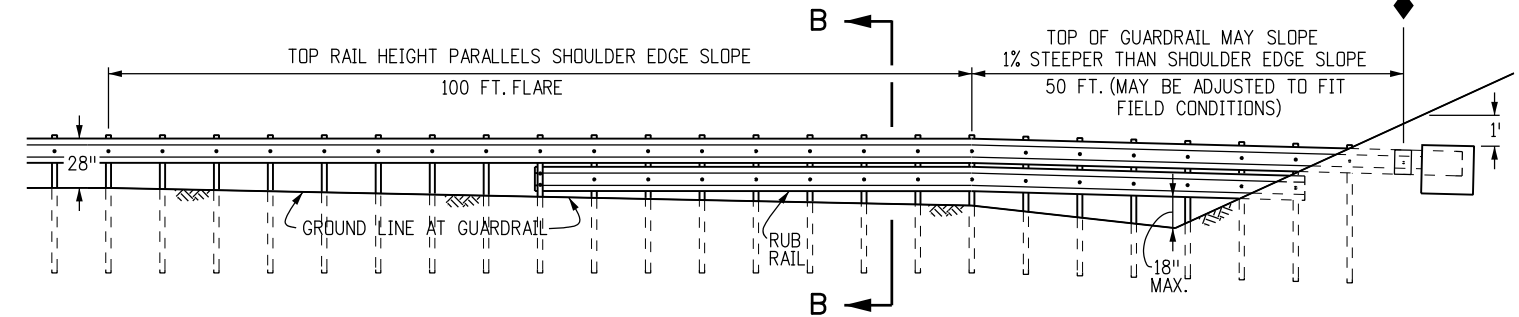
END ANCHORAGE TYPE 3B
(WITHOUT ROADSIDE DITCH AT GUARDRAIL)



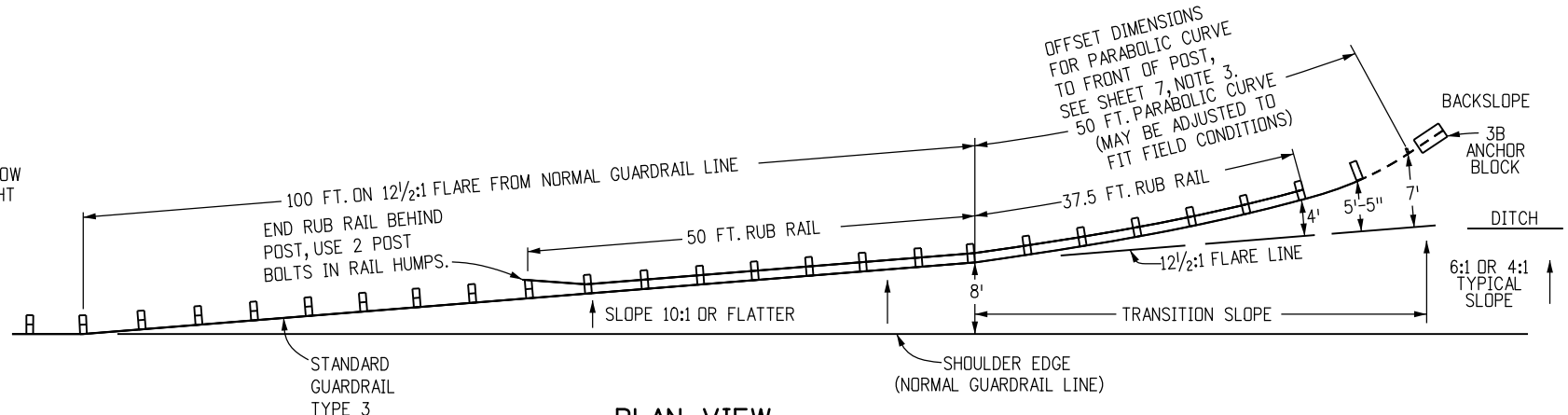
TYPE 3B ANCHOR BLOCK DETAIL



SECTION B-B
MOUNT A W-BEAM RUB RAIL 1/2 IN. BELOW THE TOP RAIL WHEN THE TOP RAIL HEIGHT EXCEEDS 33 IN. ABOVE THE GROUND



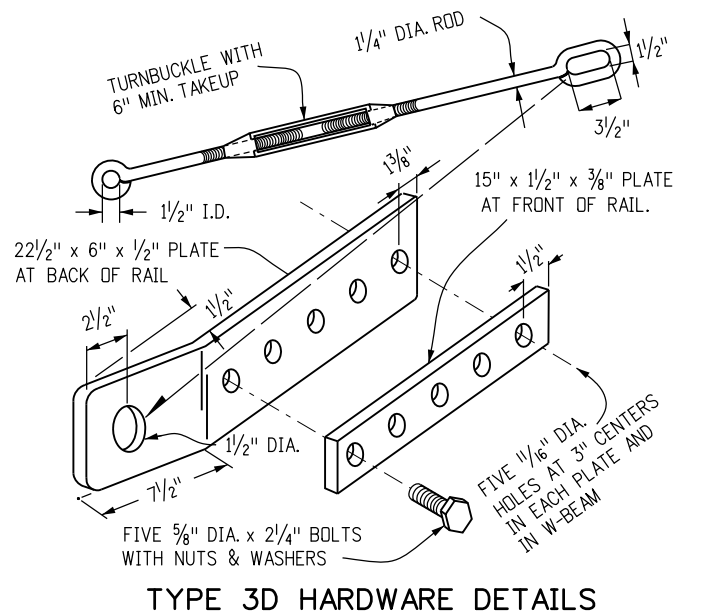
ELEVATION VIEW



PLAN VIEW

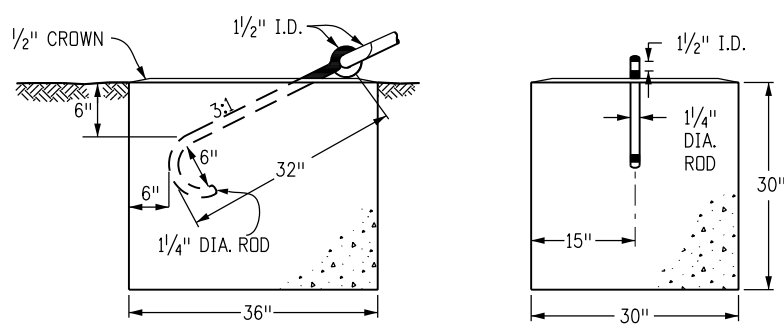
END ANCHORAGE TYPE 3B (RUB RAIL)

(WITH ROADSIDE DITCH AT GUARDRAIL)

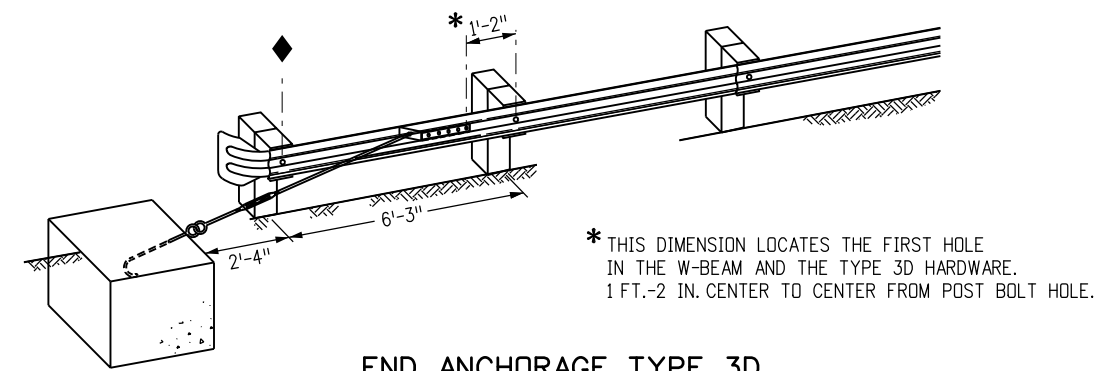


TYPE 3D HARDWARE DETAILS

NOTE: ALL PARTS SHALL BE GALVANIZED



FRONT
END
TYPE 3D ANCHOR BLOCK DETAIL



END ANCHORAGE TYPE 3D DEPARTURE TERMINAL

Computer File Information

Creation Date: 07/04/12	Initials: DLM
Last Modification Date: 10/27/14	Initials: LTA
Full Path: www.coloradodot.info/business/designsupport	(R-X)
Drawing File Name: 6060104020.dgn	(R-X)
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	(R-X)

Sheet Revisions

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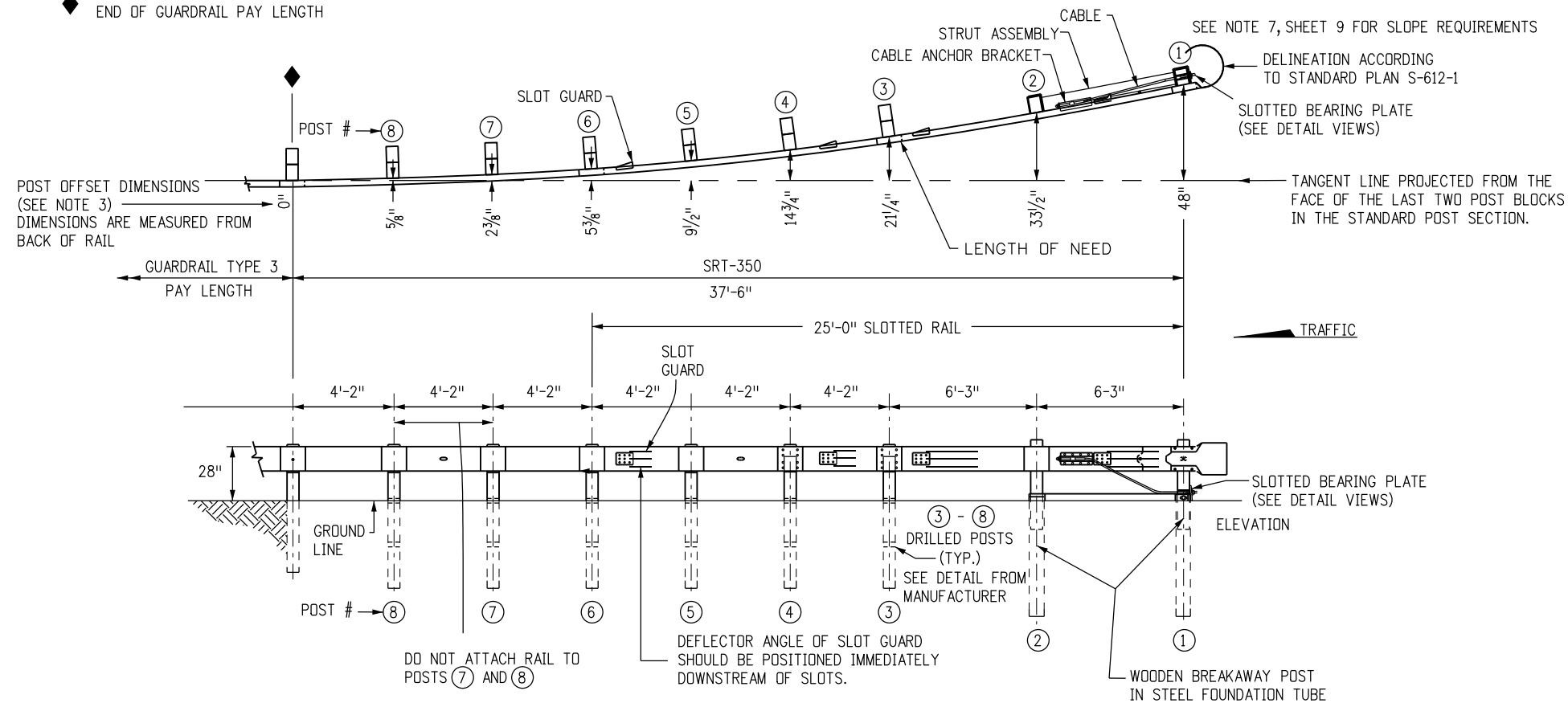
GUARDRAIL TYPE 3
W-BEAM

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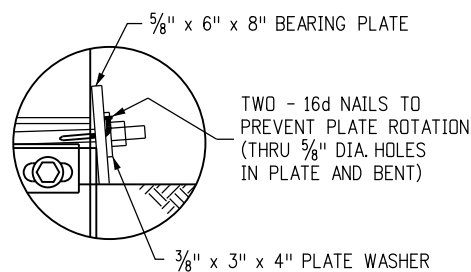
STANDARD PLAN NO.

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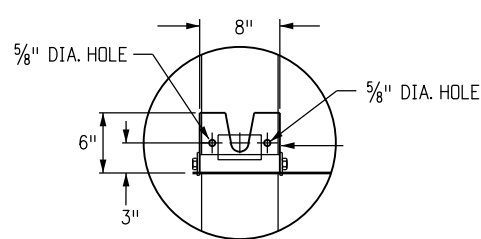
◆ END OF GUARDRAIL PAY LENGTH



SLOTTED RAIL TERMINAL (SRT)



SRT DETAIL VIEW




SRT FRONT VIEW

SLOTTED BEARING PLATE DETAIL

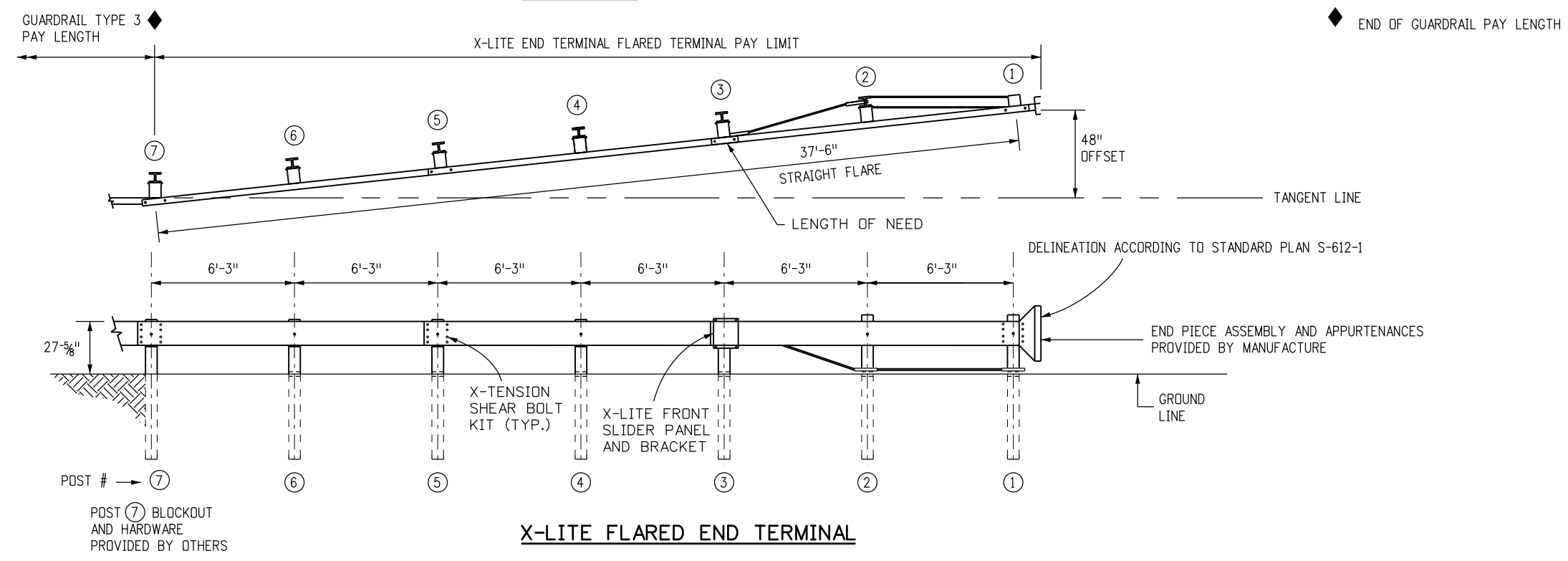
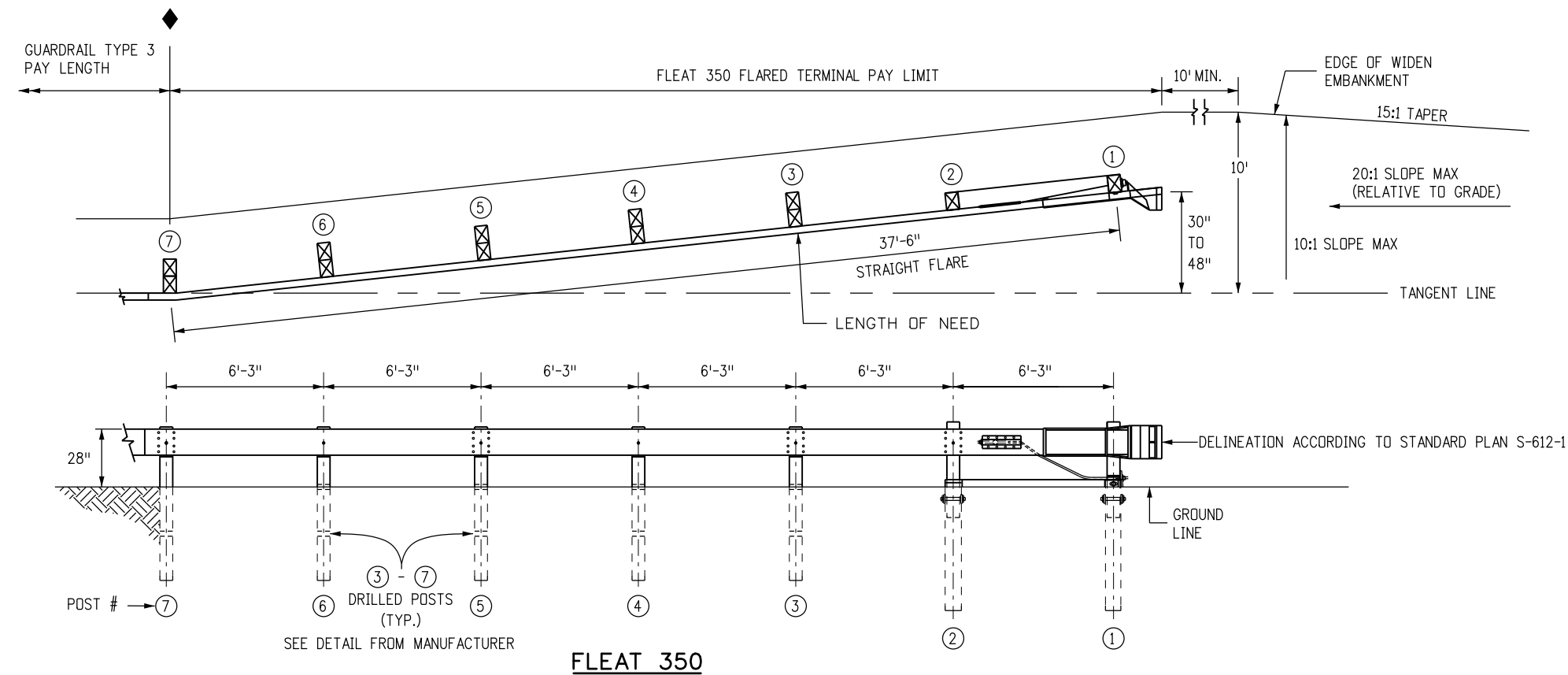
END ANCHORAGE (FLARED)

NOTES FOR FLARED

1. THE END ANCHORAGE (FLARED) SHALL EITHER BE THE SLOTTED RAIL TERMINAL (SRT-350), AS MANUFACTURED BY TRINITY INDUSTRIES, INC. (TELEPHONE #: 800-772-7976), THE FLEAT-350, AS MANUFACTURED BY ROAD SYSTEMS INC. (TELEPHONE #: 432-263-2435), OR THE X-LITE AS MANUFACTURED BY BARRIER SYSTEMS, INC. (TELEPHONE #: 888-800-3691). ONE END ANCHORAGE (FLARED) SHALL INCLUDE ALL POST, RAIL, AND ALL HARDWARE ITEMS REQUIRED FOR A COMPLETE UNIT. THE END ANCHORAGE (FLARES) SHALL BE INSTALLED CONFORMING TO THE MANUFACTURER'S RECOMMENDATIONS. THE CONTRACTOR SHALL PROVIDE A COPY OF THE MANUFACTURER'S INSTALLATION INSTRUCTIONS AND PARTS LIST TO THE ENGINEER PRIOR TO INSTALLATION OF THE DEVICE.
2. IN HEAVY SNOW LOCATIONS, TRIM POSTS ① AND ② FLUSH WITH RAIL TOP AND TREAT END WITH SEALANT, IN CONFORMANCE WITH AASHTO M 133.
3. THE POST OFFSET DIMENSIONS ARE GIVEN TO THE CENTER OF THE TRAFFIC FACE OF THE BLOCKOUTS FROM THE PROJECTED RAIL TANGENT LINE, EXCEPT AT THE FIRST TWO POSTS WHERE THE DIMENSION IS TO THE CENTER OF THE TRAFFIC FACE OF THE POST. OFFSET POINTS SHALL BE LOCATED BY CHORD MEASUREMENTS AT THE BACK OF THE RAIL AND BE EQUAL TO THE NOMINAL POST SPACINGS SHOWN. POSTS ARE TO BE SET APPROXIMATELY RADIAL TO THE RAILING AT EACH POST LOCATION.
4. THE SRT SLOTTED BEARING PLATE SHALL BE INSTALLED WITH THE SLOT FACING UP.
5. POSTS SHALL BE DRILLED FOR BREAKAWAY ACCORDING TO THE MANUFACTURER'S INSTRUCTIONS.
6. SEE SHEETS 1, 3 AND 4 FOR STANDARD GUARDRAIL TYPE 3 AND INSTALLATION DETAILS.
7. RETROREFLECTOR TABS SHALL NOT BE USED ON POSTS ① THROUGH ⑧.
8. SRT PANELS SHALL BE SUPPLIED IN EITHER THREE 12 FT. - 6 IN. RAIL PANELS, OR ONE 25 FT. - 0 IN. AND ONE 12 FT. - 6 IN. RAIL PANELS.
9. SRT - STRAIGHT FLARED OPTION. SEE MANUFACTURER'S DETAILS.
10. HINGED BREAK AWAY (HBA) STEEL POSTS MAY BE USED AS AN ALTERNATIVE ON THE SRT FOR POSTS ② THRU ⑧. SEE MANUFACTURER'S DETAILS.
11. HINGED BREAK AWAY (HBA) STEEL POSTS OR WELDED POSTS (PW) MAY BE USED AS AN ALTERNATIVE ON THE FLEAT FOR POSTS ③ THRU ⑦. SEE MANUFACTURER'S DETAILS.
12. USE MANUFACTURE'S SUPPLIED POSTS FOR X-LITE END ANCHORAGE AS FOLLOWS:
 POST 1 - X-LITE, CRIMPED POST SLOTS, GALVANIZED.
 POST 2 - X-LITE, POST II, GALVANIZED.
 POSTS 3 THRU 6 - X-LITE, CRIMPED POST HOLES, GALVANIZED.
13. DELINEATION SHALL BE APPLIED TO THE END PIECE, AND SHALL NOT BE PAID FOR SEPARATELY BUT SHALL BE INCLUDED IN THE WORK.

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Creation Date: 07/04/12	Initials: DLM	Date:	Comments			M-606-1
Last Modification Date: 10/27/14	Initials: LTA	10/09/14	Moved FLEAT 350 To Sheet 6.			
Full Path: www.coloradodot.info/business/designsupport	(R-X)	10/09/14	Added Gen Note 12.			
Drawing File Name: 6060105020.dgn	(R-X)					
CAD Ver.: MicroStation V8	Scale: Not to Scale	Units: English			Issued By: Project Development Branch July 4, 2012	Sheet No. 5 of 20

SEE M-606-1, SHEET 5 OF 20, FOR "NOTES".



END ANCHORAGES (FLARED)

Computer File Information	
Creation Date: 07/04/12	Initials: DLM
Last Modification Date: 10/27/14	Initials: LTA
Full Path: www.coloradodot.info/business/designsupport	
Drawing File Name: 6060106020.dgn	
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	

Sheet Revisions	
Date:	Comments
10/09/14	Added X-Lite End Terminal
10/09/14	Moved Notes to Sheet 5 of 20

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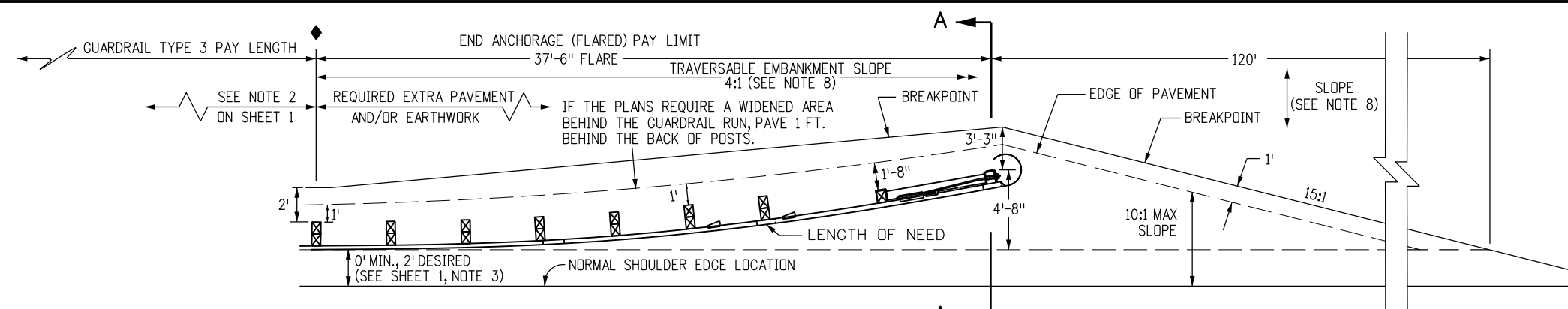
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GUARDRAIL TYPE 3

W-BEAM

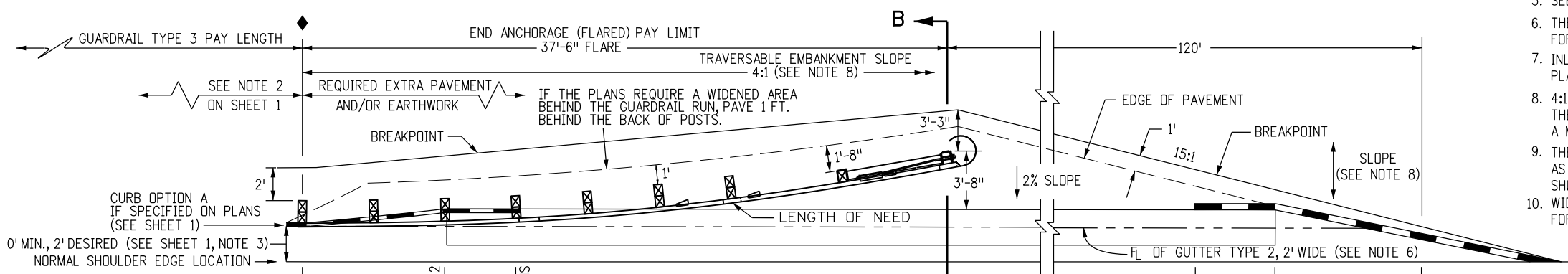
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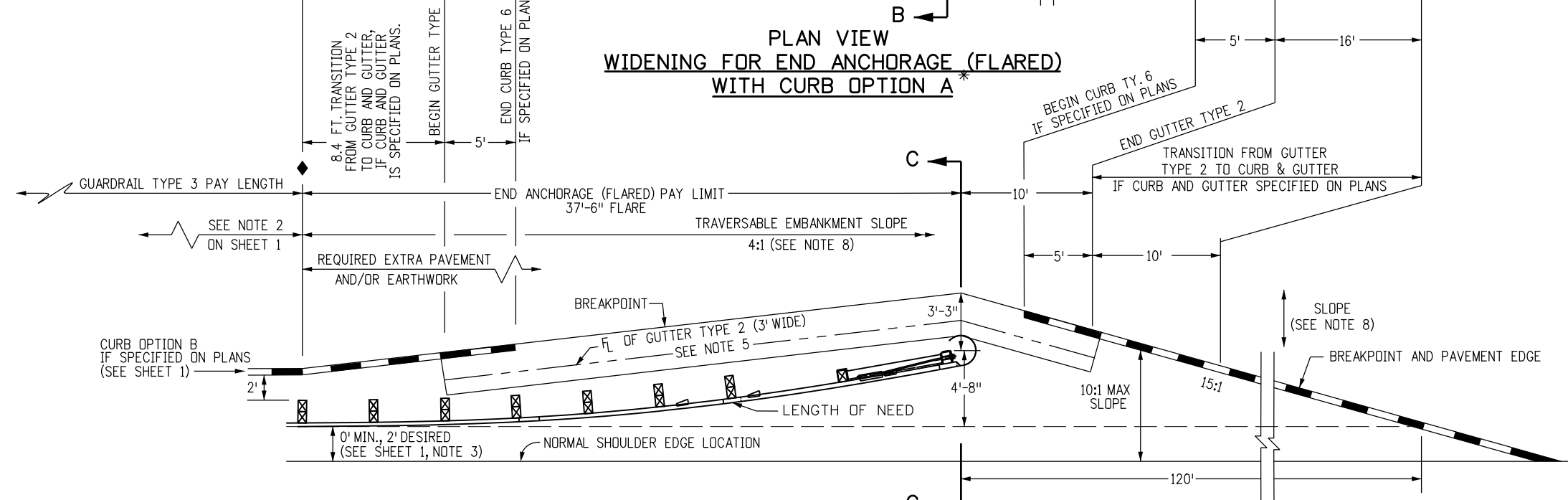


**PLAN VIEW
WIDENING FOR END ANCHORAGE (FLARED)***

* THIS PLAN VIEW SHOWS ONLY THE SRT. THE FLEAT-350 USES THE SAME WIDENING DETAILS.

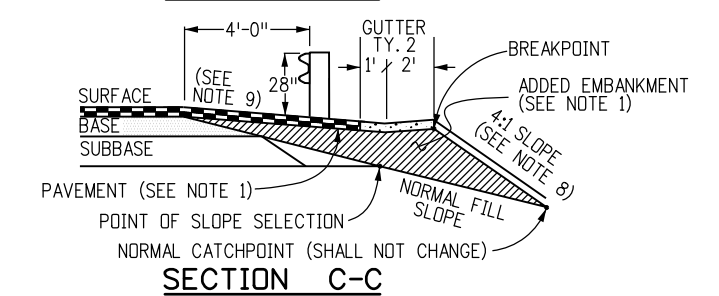
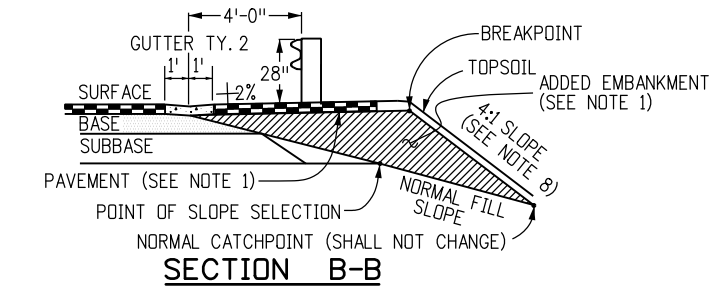
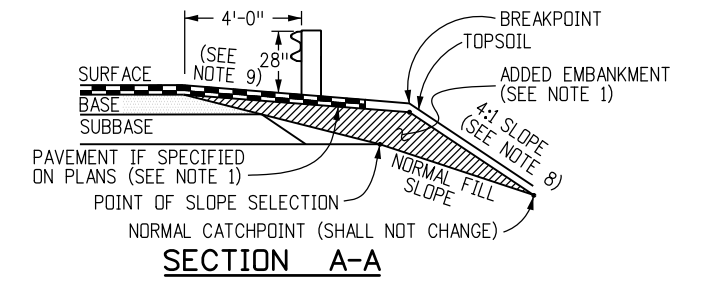


**PLAN VIEW
WIDENING FOR END ANCHORAGE (FLARED)
WITH CURB OPTION A***



**PLAN VIEW
WIDENING FOR END ANCHORAGE (FLARED) WITH CURB OPTION B***

- NOTES**
- PAYMENT FOR THE ADDED EMBANKMENT (APPROXIMATELY 45 CU. YDS.) FOR THE FLARE SHALL BE AS FOLLOWS:
 - A. UNDER PAY ITEM 203 WHEN THE CONTRACT PLAN INCLUDES PAY ITEM 203
 - B. INCLUDED IN THE COST OF THE END ANCHORAGE (FLARED) WHEN THE CONTRACT PLANS DO NOT INCLUDE PAY ITEM 203. THE ADDED EMBANKMENT SHALL BE CONSTRUCTED IN ACCORDANCE WITH SUBSECTION 203.07, AASHTO T 99.
 - WHEN THE WIDENED AREA IS PAVED, PAYMENT FOR THE PAVEMENT (APPROX. 70 SQ. YDS.) SHALL BE AS FOLLOWS:
 - A. UNDER PAY ITEM 403 OR 412 WHEN THE CONTRACT PLAN INCLUDES PAY ITEM 403 OR 412
 - B. INCLUDED IN THE COST OF THE END ANCHORAGE (FLARED) WHEN THE CONTRACT PLAN DOES NOT INCLUDE PAY ITEM 403 OR 412 (SEE SHEET 1, NOTE 2 FOR PAVEMENT TYPES)
 - CONCRETE PAVED AREAS SHALL HAVE THEIR TAPERED ENDS SQUARED OFF AS DIRECTED BY THE ENGINEER.
 - WHEN OVERLAY PAVING, THE FINISHED SURFACE AT EACH POST SHALL NOT BE ABOVE THE TOP BREAKAWAY HOLE OR STRUT ASSEMBLY. THE WIDENED AREA AT THE FLARED END ANCHORAGE SHOULD NOT BE OVERLAYED UNLESS PAVEMENT CONDITIONS WARRANT IT BEING OVERLAYED. ANY OVERLAY PAVEMENT ABUTTING THE FLARED END ANCHORAGE SHALL BE TAPERED TO PREVENT A DROP IN THE PAVED SURFACE BELOW THE RAIL.
 - SEE SHEETS 1, 3 AND 4 FOR STANDARD TYPE 3 GUARDRAIL AND INSTALLATION DETAILS.
 - THE COST OF THE GUTTER WILL BE PAID FOR AS "GUTTER TYPE 2 (2 FT.)" FOR A LENGTH OF 134 FT. OR "GUTTER TY. 2 (3 FT.)" FOR A LENGTH OF 40 FT.
 - INLETS OR RUNDOWNS MAY BE USED INSTEAD OF THE GUTTER IF SPECIFIED ON THE PLANS. NO ADDITIONAL CURB SHALL BE ADDED IN THE VICINITY OF THE END ANCHORAGE.
 - 4:1 OR FLATTER SLOPES IN THE TRAVERSABLE AREA SHALL BE USED BEHIND THE END ANCHORAGE, AND IN ADVANCE OF POST (1). IF THIS IS NOT POSSIBLE, A MINIMUM 3:1 SLOPE MAY BE USED IF APPROVED BY THE ENGINEER.
 - THE WIDENED AREA, EXCEPT FOR CURB OPTION A, SHALL HAVE THE SAME GRADING AS THE ADJACENT GUARDRAIL: 10:1 OR FLATTER IF MORE THAN 2 FT. FROM SHOULDER OR SLOPE EQUAL TO ROADWAY SLOPE IF 2 FT. OR LESS FROM SHOULDER.
 - WIDENING FOR END ANCHORAGES SHALL BE PAVED ON INTERSTATES AND FREEWAYS. FOR OTHER HIGHWAYS, PAVING SHALL BE AS SHOWN ON THE PLANS.



Computer File Information

Creation Date: 07/04/12	Initials: DLM
Last Modification Date: 10/27/14	Initials: LTA
Full Path: www.coloradodot.info/business/designsupport	
Drawing File Name: 6060107020.dgn	
CAD Ver.: MicroStation V8	Scale: Not to Scale Units: English

Sheet Revisions

Date:	Comments:
(R-X)	
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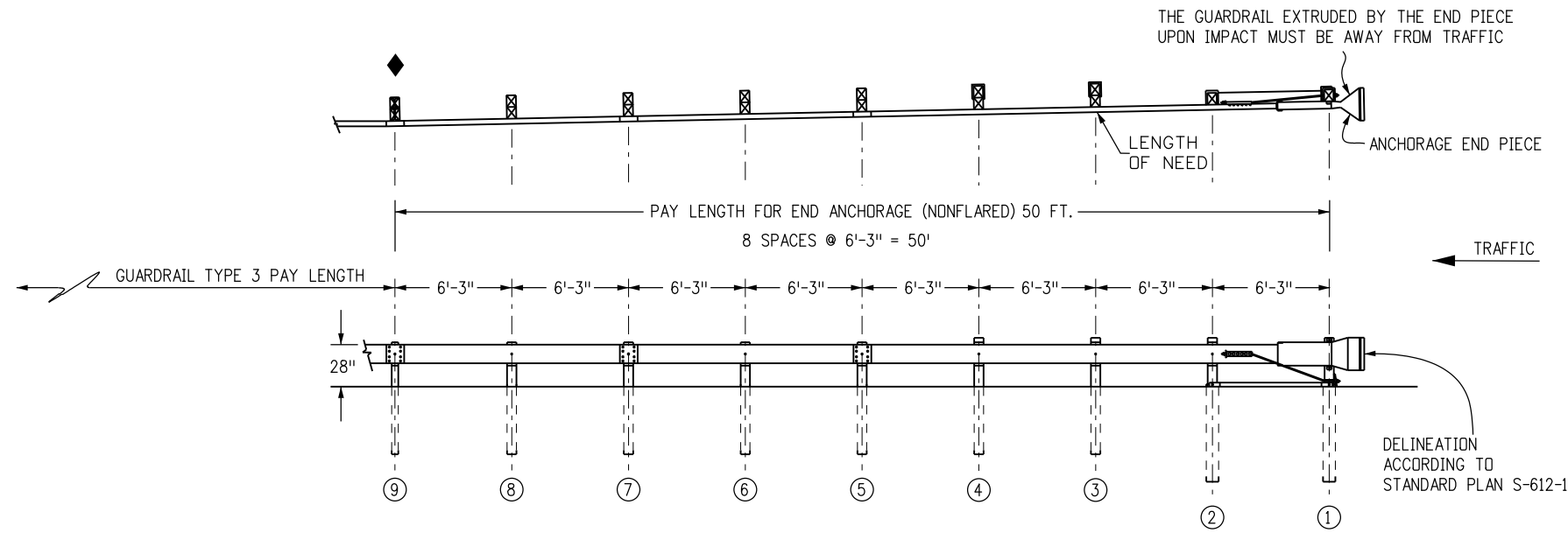
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**GUARDRAIL TYPE 3
W-BEAM**
 Issued By: Project Development Branch July 4, 2012

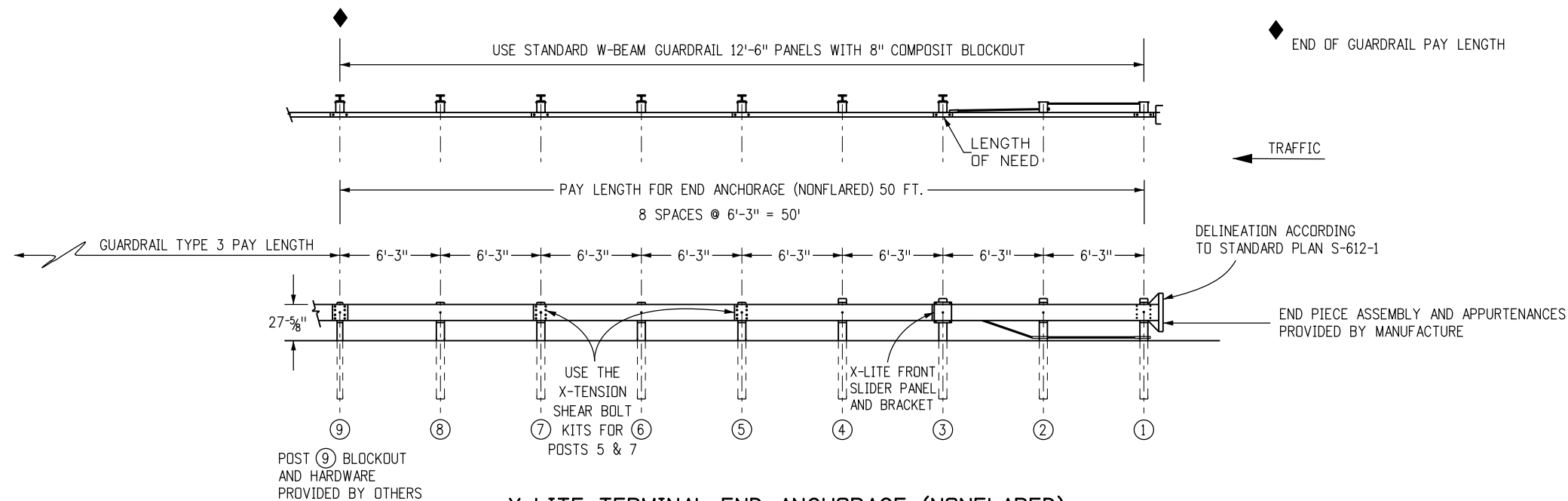
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NOTES FOR NONFLARED

1. THE END ANCHORAGE (NONFLARED) SHALL EITHER BE THE SKT GUARDRAIL AS MANUFACTURED BY ROAD SYSTEMS, INC. (TEL. #: 432-263-2435), OR THE X-LITE AS MANUFACTURED BY BARRIER SYSTEMS, INC. (TEL. #: 888-800-3691). THE END ANCHORAGE (NONFLARED) SHALL INCLUDE ALL POST, RAIL, AND HARDWARE ITEMS REQUIRED FOR A COMPLETE UNIT. THE END ANCHORAGE (NONFLARED) SHALL BE INSTALLED CONFORMING TO THE MANUFACTURER'S RECOMMENDATIONS. THE CONTRACTOR SHALL PROVIDE A COPY OF THE MANUFACTURER'S INSTALLATION INSTRUCTIONS AND PARTS LIST TO THE ENGINEER PRIOR TO THE INSTALLATION OF THE DEVICE.
2. WOOD POSTS SHALL BE DRILLED FOR BREAKAWAY CONFORMING TO THE MANUFACTURER'S INSTRUCTIONS.
3. HINGED BREAK AWAY (HBA) STEEL POSTS MAY BE USED CONFORMING TO THE MANUFACTURER'S INSTRUCTIONS.
4. RETROREFLECTOR TABS SHALL NOT BE USED ON THE LAST SEVEN POSTS OF THE END ANCHORAGE (NONFLARED).
5. USE THE MANUFACTURER'S SPECIFIED STEEL FOUNDATION TUBE FOR POSTS ① AND ② FOR SKT END ANCHORAGES (NONFLARED).
6. USE THE MANUFACTURER'S SUPPLIED POSTS FOR X-LITE END ANCHORAGE AS FOLLOWS:
 POST 1 - X-LITE, CRIMPED POST SLOTS, GALVANIZED.
 POST 2 - X-LITE, POST II, GALVANIZED.
 POST 3 - X-LITE, CRIMPED POST HOLES, GALVANIZED.
 FOR POSTS 4 THRU 8 - USE STANDARD LINE POST, GALVANIZED.
7. DELINEATION SHALL BE APPLIED TO THE END PIECE AND SHALL NOT BE PAID FOR SEPARATELY BUT BE INCLUDED IN THE COST OF THE WORK. SEE STANDARD PLAN S-612-1.



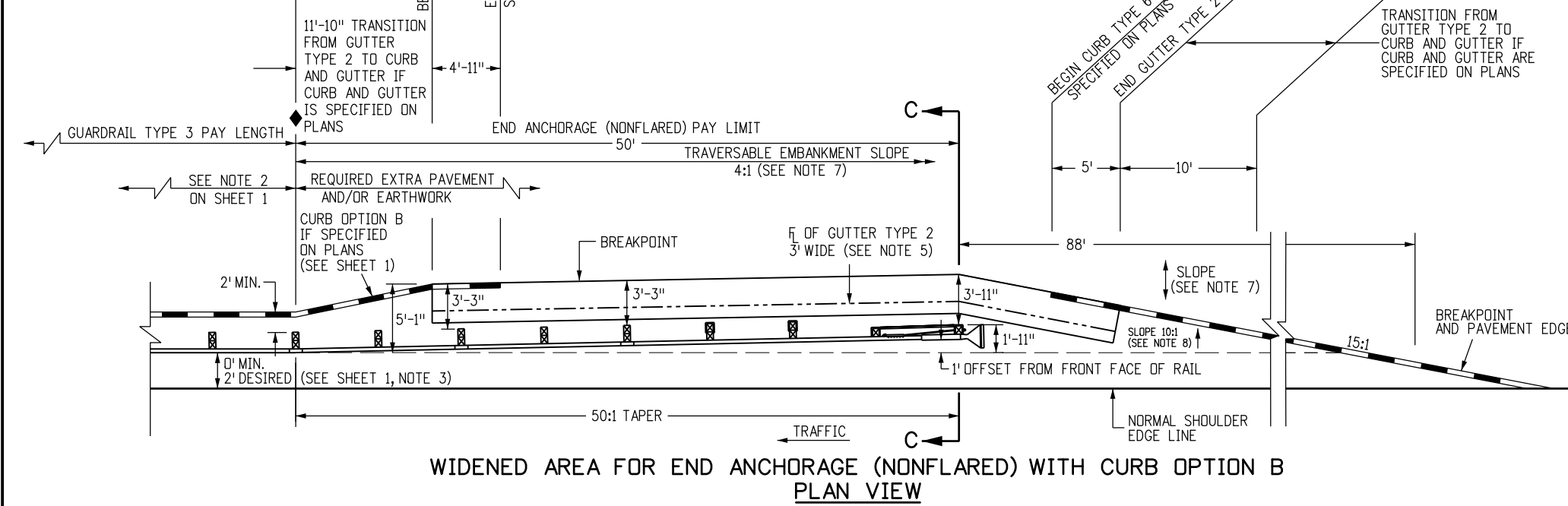
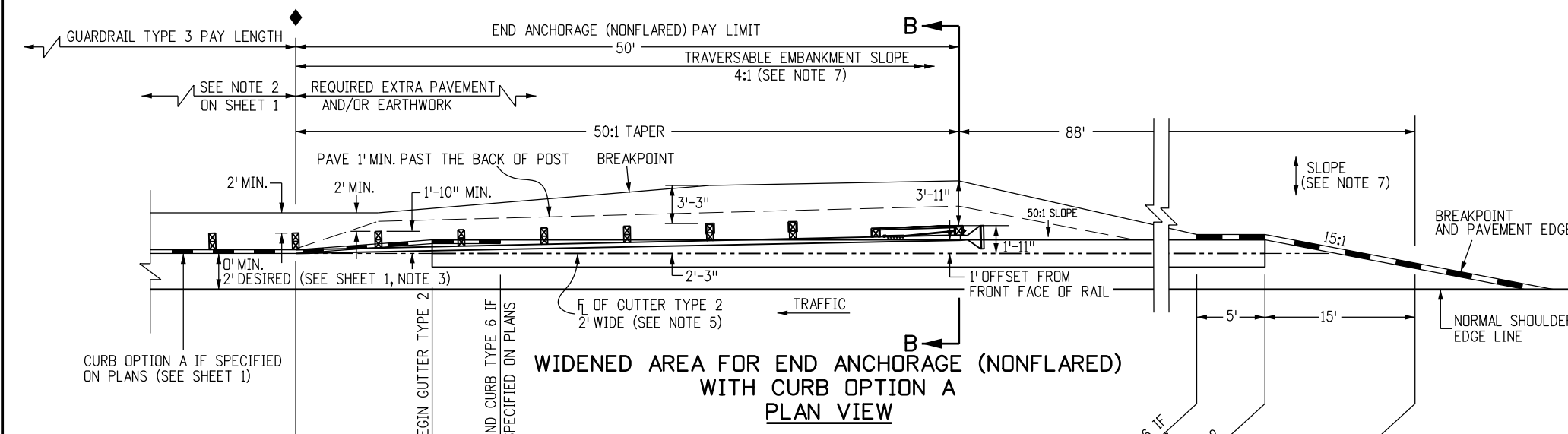
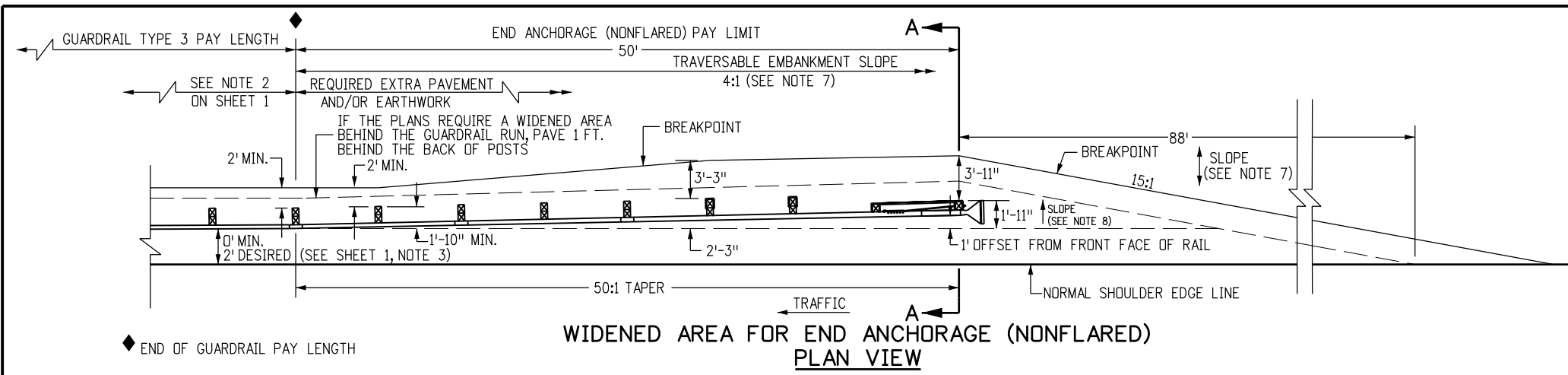
SKT END ANCHORAGE (NONFLARED)



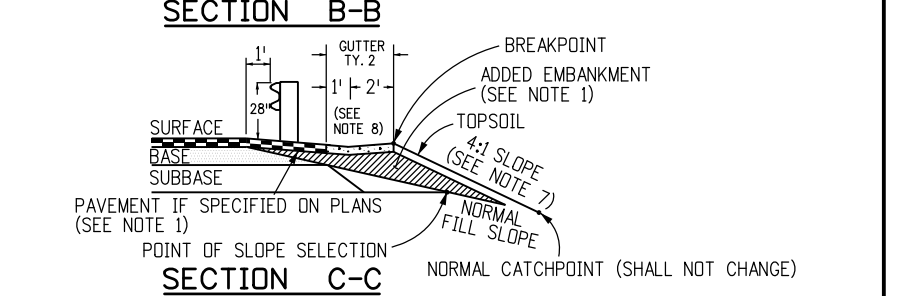
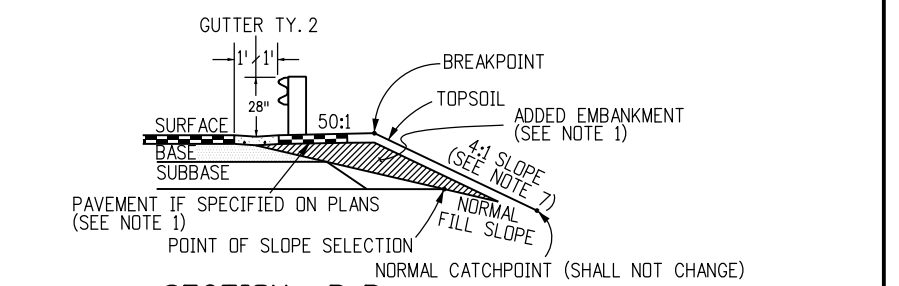
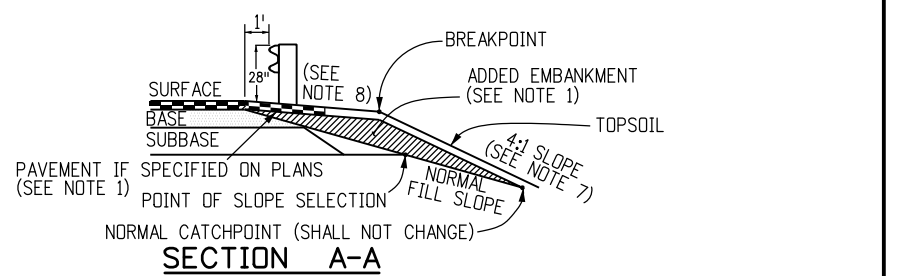
X-LITE TERMINAL END ANCHORAGE (NONFLARED)

END ANCHORAGES (NONFLARED)

Computer File Information		Sheet Revisions		Colorado Department of Transportation  4201 East Arkansas Avenue CDOT HQ, 4th Floor Denver, CO 80222 Phone: 303-757-9021 FAX: 303-757-9868 Division of Project Support DLM/LTA	GUARDRAIL TYPE 3 W-BEAM	STANDARD PLAN NO.
Creation Date: 07/04/12	Initials: DLM	Date:	Comments			M-606-1
Last Modification Date: 10/27/14	Initials: LTA	(R-X) 10/09/14	Added X-Lite End Terminal			Sheet No. 8 of 20
Full Path: www.coloradodot.info/business/designsupport		(R-X) 10/09/14	Added Gen Note 6			
Drawing File Name: 60600108020.dgn		(R-X) 10/27/14	Removed the ET-Plus End Anchorage (non-flared).			Issued By: Project Development Branch July 4, 2012
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- NOTES**
- PAYMENT FOR THE ADDED EMBANKMENT (APPROXIMATELY 25 CU. YDS.) FOR THE FLARE SHALL BE AS FOLLOWS:
A. UNDER PAY ITEM 203 WHEN THE CONTRACT PLAN INCLUDES PAY ITEM 203.
B. INCLUDED IN THE COST OF THE END ANCHORAGE (NONFLARED) WHEN THE CONTRACT PLANS DOES NOT INCLUDE PAY ITEM 203. THE ADDED EMBANKMENT SHALL BE CONSTRUCTED IN ACCORDANCE WITH SUBSECTION 203.07, AASHTO T 99.
 - WHEN THE WIDENED AREA IS PAVED, PAYMENT FOR THE PAVEMENT (APPROX. 39 SQ. YDS.) SHALL BE AS FOLLOWS:
A. UNDER PAY ITEM 403 OR 412 WHEN THE CONTRACT PLAN INCLUDES PAY ITEM 403 OR 412.
B. INCLUDED IN THE COST OF THE END ANCHORAGE (NONFLARED) WHEN THE CONTRACT PLAN DOES NOT INCLUDE PAY ITEM 403 OR 412, (SEE SHEET 1, NOTE 2 FOR PAYMENT TYPES).
 - WHEN OVERLAY PAVING, THE FINISHED SURFACE AT EACH POST SHALL NOT BE ABOVE THE TOP BREAKWAY HOLE OR STRUT ASSEMBLY. THE WIDENED AREA AT THE END ANCHORAGE (NONFLARED) SHALL NOT BE OVERLAYED UNLESS PAVEMENT CONDITIONS WARRANT IT BEING OVERLAYED. ANY OVERLAY PAVEMENT ABUTTING THE END ANCHORAGE (NONFLARED) SHALL BE TAPERED TO PREVENT A DROP IN THE PAVED SURFACE BELOW THE RAIL.
 - SEE SHEETS 1, 2 AND 3 FOR STANDARD TYPE 3 GUARDRAIL AND INSTALLATIONS DETAILS.
 - THE COST OF THE GUTTER WILL BE PAID FOR AS "GUTTER TYPE 2 (2 FT.)" FOR A LENGTH OF 111 FT., OR "GUTTER TY. 2 (3 FT.)" FOR A LENGTH OF 50 FT.
 - INLETS OR RUNDOWNS MAY BE USED INSTEAD OF THE GUTTER IF SPECIFIED ON THE PLANS. NO ADDITIONAL CURB SHALL BE ADDED IN THE VICINITY OF THE END TREATMENT.
 - 4:1 OR FLATTER SLOPES IN THE TRAVERSABLE AREA SHALL BE USED BEHIND THE END ANCHORAGE AREA, AND IN ADVANCE OF POST ①. IF THIS IS NOT POSSIBLE A MINIMUM 3:1 SLOPE MAY BE USED IF APPROVED BY THE ENGINEER.
 - THE WIDENED AREA, EXCEPT FOR CURB OPTION A, SHALL HAVE THE SAME GRADING AS BENEATH THE ADJACENT GUARDRAIL: 10:1 OR FLATTER IF MORE THAN 2 FT. FROM SHOULDER, OR SLOPE EQUAL TO ROADWAY SLOPE IF 2 FT. OR LESS FROM SHOULDER.
 - WIDENING FOR END ANCHORAGES SHALL BE PAVED ON INTERSTATES AND FREEWAYS. FOR OTHER HIGHWAYS, PAVING SHALL BE AS SHOWN ON THE PLANS.
 - HINGED BREAK AWAY (HBA) STEEL POSTS MAY BE USED. SEE MANUFACTURER'S DETAILS.



Computer File Information

Creation Date: 07/04/12	Initials: DLM
Last Modification Date: 10/27/14	Initials: LTA
Full Path: www.coloradodot.info/business/designsupport	
Drawing File Name: 6060109020.dgn	
CAD Ver.: MicroStation V8	Scale: Not to Scale Units: English

Sheet Revisions

Date:	Comments
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GUARDRAIL TYPE 3

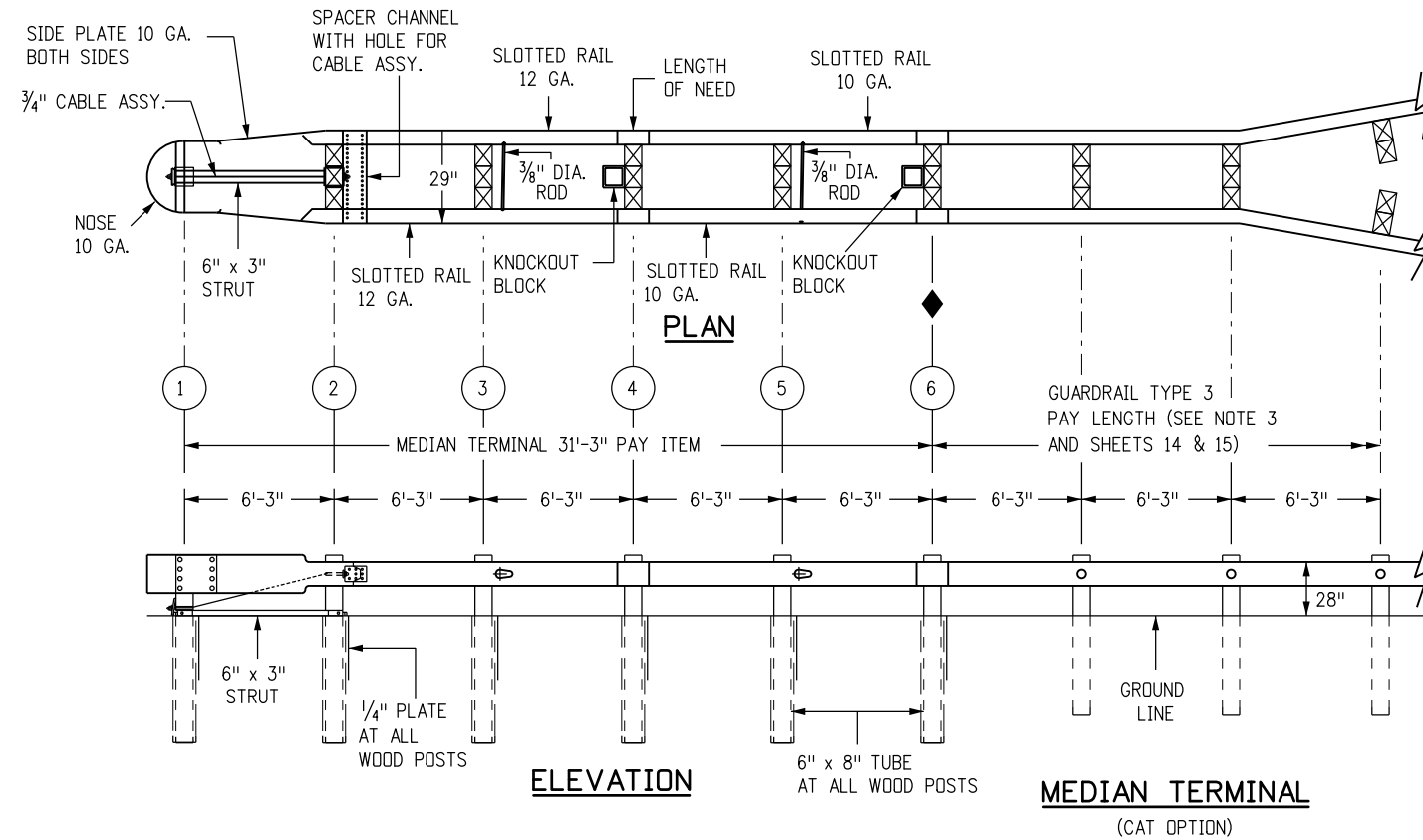
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STANDARD PLAN NO.

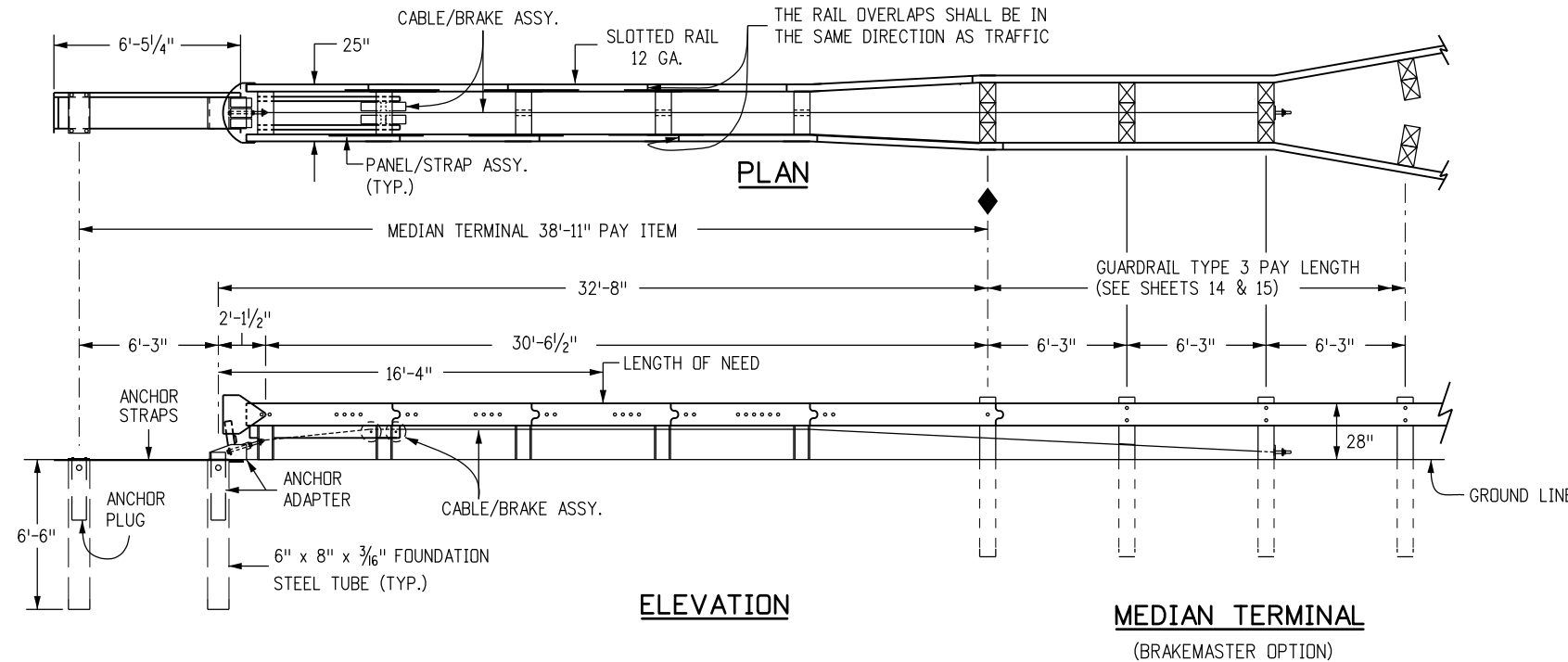
M-606-1

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MEDIAN TERMINAL NOTES

1. THE MEDIAN TERMINAL SHALL BE THE CAT 350 AS MANUFACTURED BY TRINITY INDUSTRIES INC. (TEL #: 800-722-7976), OR THE BRAKEMASTER AS MANUFACTURED BY ENERGY ABSORPTION SYSTEMS, INC. AS DISTRIBUTED BY INTERWEST SAFETY SUPPLY (TEL #: 303-733-8447), OR THE FLEAT-MT MEDIAN TERMINAL AS MANUFACTURED BY ROAD SYSTEM INC. (TEL. #: 432-263-2435).
2. ONE MEDIAN TERMINAL SHALL INCLUDE ALL POSTS, RAIL, AND HARDWARE ITEMS REQUIRED FOR A COMPLETE UNIT. THE DEVICE SHALL BE INSTALLED IN CONFORMANCE WITH THE MANUFACTURER'S INSTRUCTIONS. THE CONTRACTOR SHALL PROVIDE A COPY OF THE MANUFACTURER'S INSTALLATION INSTRUCTIONS AND PARTS LISTS TO THE ENGINEER PRIOR TO THE INSTALLATION OF THE DEVICE.
3. UNLESS OTHERWISE SPECIFIED ON THE PLANS, THE MEDIAN TERMINAL SHALL BE INSTALLED FOR BIDIRECTIONAL TRAFFIC APPLICATION.
4. MEDIAN GUARDRAIL POSTS MAY BE STEEL OR WOOD.
5. EACH INSTALLATION SHALL BE SUPERVISED AND CERTIFIED AS CORRECT UPON COMPLETION BY A REPRESENTATIVE OF THE DEVICE MANUFACTURER OR BY AN EMPLOYEE OF THE CONTRACTOR WHO IS A CERTIFIED INSTALLER. THE CERTIFIED INSTALLER SHALL HAVE COMPLETED DEVICE TRAINING AND SHALL BE REGISTERED WITH THE MANUFACTURER AS A CERTIFIED INSTALLER.
6. DELINEATION, IF REQUIRED, SHALL BE APPLIED TO THE END PIECE AND WILL NOT BE PAID FOR SEPARATELY BUT SHALL BE INCLUDED IN THE COST OF THE WORK. SEE STANDARD PLAN S-612-1.



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Creation Date: 07/04/12	Initials: DLM
Last Modification Date: 10/27/14	Initials: LTA
Full Path: www.coloradodot.info/business/designsupport	
Drawing File Name: 60601010020.dgn	
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	

Sheet Revisions	
Date:	Comments
(R-X)	
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GUARDRAIL TYPE 3

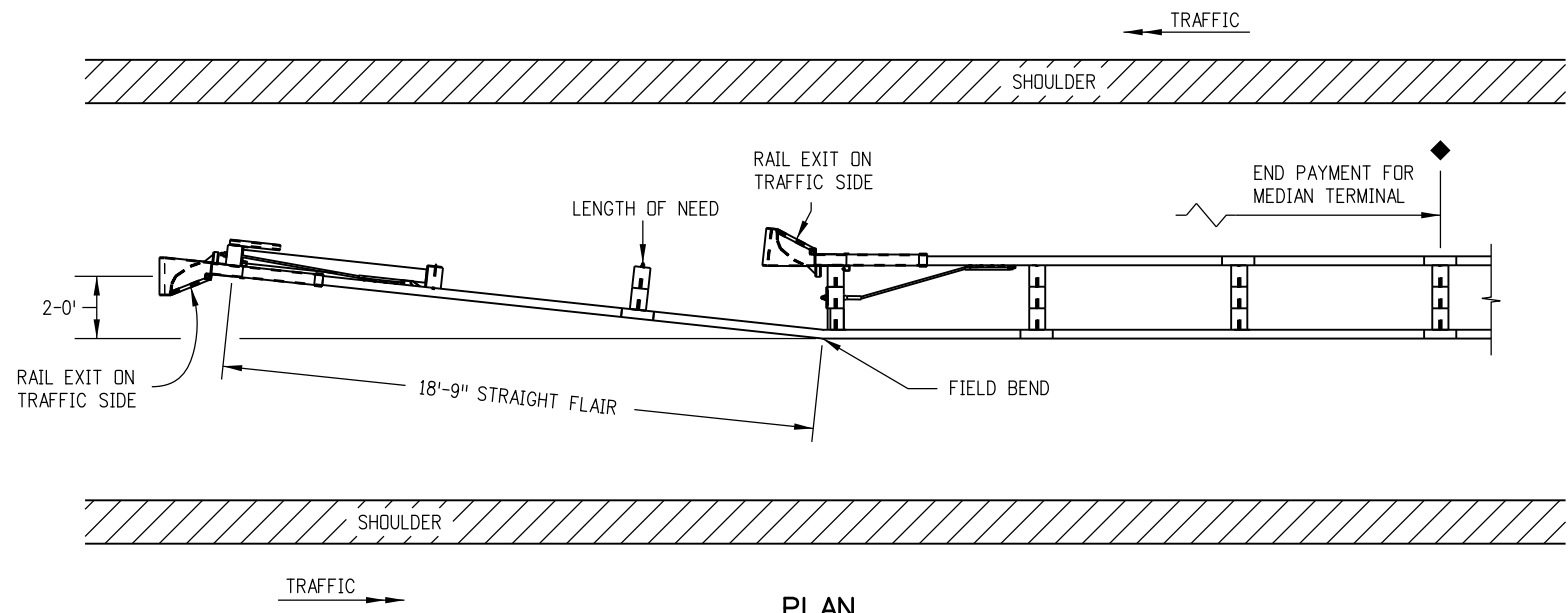
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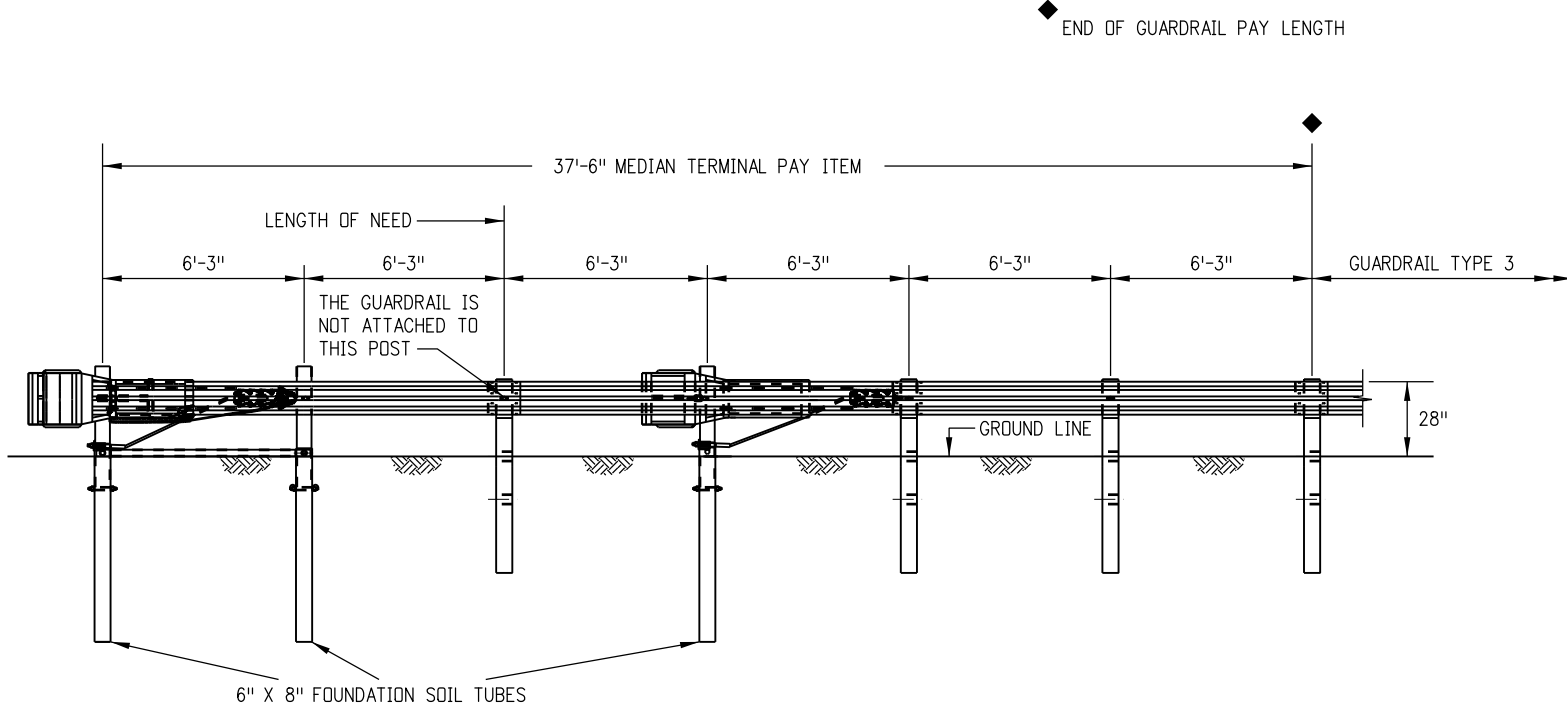
STANDARD PLAN NO.

M-606-1

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PLAN



ELEVATION

MEDIAN TERMINAL
(FLEAT-MT OPTION)

FLEAT- MT NOTES

1. THE FLEAT-MT MAY BE SELECTED AS A MEDIAN TERMINAL UNLESS OTHERWISE SHOWN IN THE PLANS.
2. BREAKAWAY POSTS ARE REQUIRED WITH THE FLEAT-MT.
3. THE SOIL TUBES SHALL NOT PROTRUDE MORE THAN 4 INCHES ABOVE GROUND (MEASURED ALONG A 5 FEET CORD). SITE GRADING MAY BE NECESSARY TO MEET THIS REQUIREMENT.
4. THE SOIL TUBES SHALL BE DRIVEN WITH AN APPROVED DRIVING HEAD AND NOT BE DRIVEN WITH THE POST IN THE TUBE. IF THE TUBES ARE PLACED IN DRILLED HOLES, THE BACKFILL MATERIAL MUST BE SATISFACTORILY COMPACTED TO PREVENT SETTLEMENT.
5. WHEN ROCK IS ENCOUNTERED DURING EXCAVATION, A 12 INCH DIA. POST HOLE, 20 INCH DEEP MAY BE USED IF APPROVED BY THE ENGINEER. GRANULAR MATERIAL SHALL BE PLACED IN THE BOTTOM OF THE HOLE APPROX. 2 1/2 INCH DEEP TO PROVIDE DRAINAGE. THE SOIL TUBES SHALL BE FIELD CUT TO LENGTH, PLACED IN THE HOLE AND BACKFILLED WITH ADEQUATELY COMPACTED MATERIAL EXCAVATED FROM THE HOLE.
6. THE BREAKAWAY CABLE ASSEMBLY MUST BE TAUT. DO NOT TWIST THE CABLE WHEN TIGHTENING NUTS.

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Creation Date: 07/04/12	Initials: DLM
Last Modification Date: 10/27/14	Initials: LTA
Full Path: www.coloradodot.info/business/designsupport	
Drawing File Name: 60601011020.dgn	
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	

Sheet Revisions	
Date:	Comments
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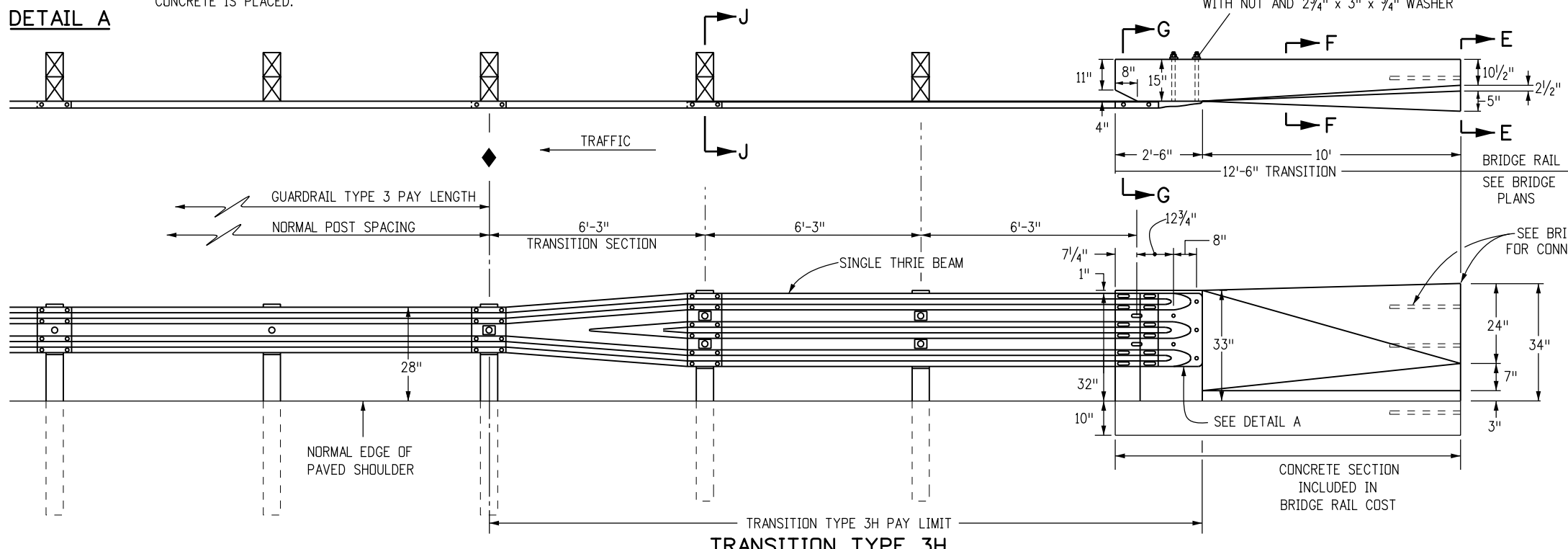
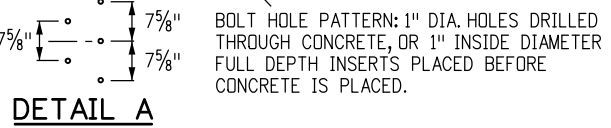
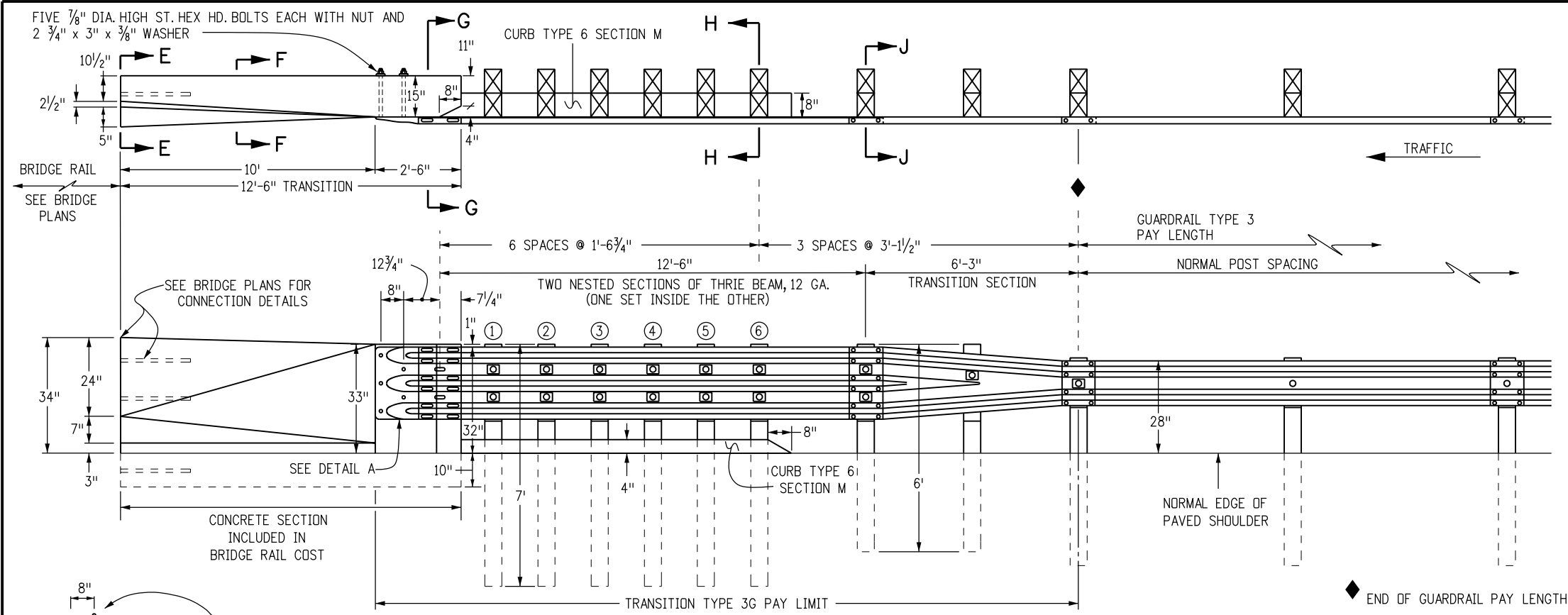
Division of Project Support **DLM/LTA**

GUARDRAIL TYPE 3

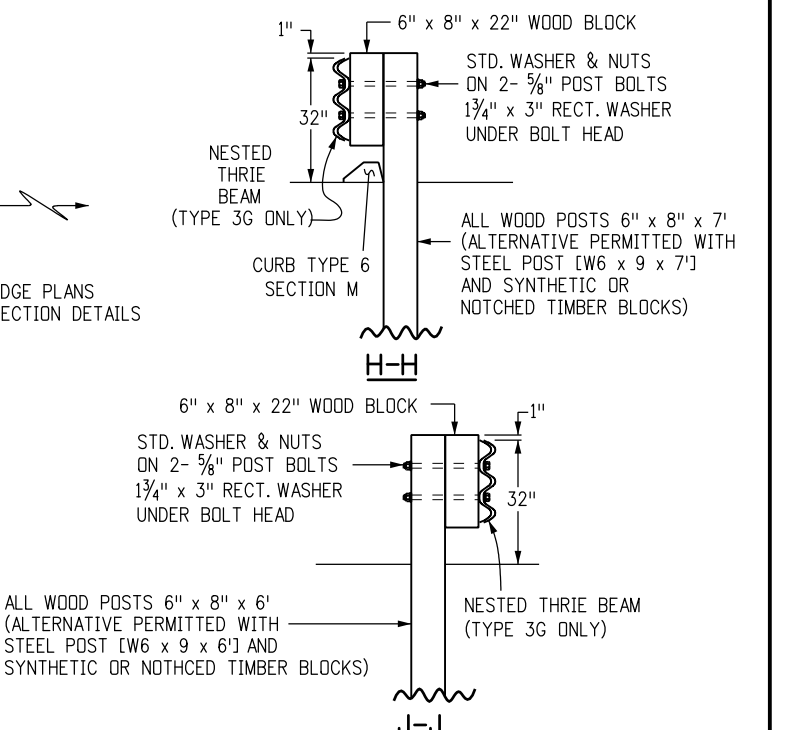
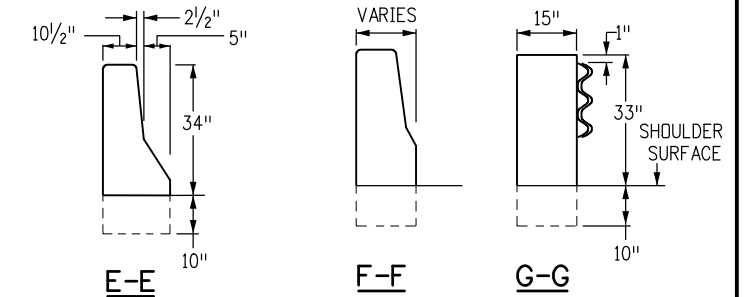
W-BEAM

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M-606-1
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- ### NOTES
1. TRANSITION TYPE 3G IS FOR USE AT BOTH ENDS OF BRIDGES ON TWO-WAY HIGHWAYS AND AT THE APPROACH END OF BRIDGES ON ONE-WAY HIGHWAYS.
 2. TRANSITION TYPE 3H IS FOR USE AT THE TRAILING END OF BRIDGES ON ONE-WAY HIGHWAYS.
 3. THE THRIE BEAM SECTION IN TRANSITIONS TYPES 3G AND 3H MAY BE SHOP BENT TO FIT CURVES THAT ARE GREATER THAN OR EQUAL TO A 10 FT. RADIUS. HOWEVER, THE 6 FT.-3 IN. TRANSITION SECTION SHALL NOT BE BENT.
 4. A 12 FT.-6 IN. CONCRETE TRANSITION IS REQUIRED BETWEEN THE TYPE 3G OR 3H AND TYPE 7 BRIDGE RAIL. SEE STANDARD PLAN M-606-13 FOR THE TRANSITION BETWEEN TYPE 3 GUARDRAIL AND TYPE 7 GUARDRAIL.
 5. TRANSITIONS TYPE 3G AND TYPE 3H ARE ALSO USED TO CONNECT TO TYPE 8 AND TYPE 10 BRIDGE RAIL. SEE BRIDGE PLANS FOR CONNECTION DETAILS.
 6. BACKUP PLATE IS NOT REQUIRED AT POSTS ON TYPE 3G AND 3H.
 7. [Symbol] THIS SYMBOL IN THE ELEVATION DRAWINGS SHOWS THE LOCATIONS WHERE A RECTANGULAR WASHER IS REQUIRED UNDER THE POST BOLT HEAD.
 8. CURB TYPE 6 SECTION M, MAY BE ASPHALT OR CONCRETE. THE COST OF CURB IS INCLUDED IN THE WORK, UNLESS A SEPARATE PAY ITEM IS INCLUDED IN THE BID SCHEDULE.
 9. POSTS ① THRU ⑥ ARE 7 FT. LONG. ALL OTHER POSTS SHALL BE STANDARD 6 FT. IN LENGTH UNLESS OTHERWISE SPECIFIED IN THE CONTRACT.
 10. NOTCHED RAIL BLOCKS MANUFACTURED FROM SYNTHETIC MATERIAL WILL BE ACCEPTED AS ALTERNATIVES TO WOOD NOTCHED BLOCKS FOR USE WITH STEEL POSTS PROVIDED THAT THE BLOCKS HAVE RECEIVED FHWA APPROVAL AND ARE CERTIFIED AS IDENTICAL TO THE SPECIMENS USED FOR TESTING AND APPROVAL. STEEL BLOCKS ARE NOT ALLOWED.



Computer File Information	
Creation Date: 07/04/12	Initials: DLM
Last Modification Date: 10/27/14	Initials: LTA
Full Path: www.coloradodot.info/business/designsupport	
Drawing File Name: 60601012020.dgn	
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	

Sheet Revisions	
Date:	Comments
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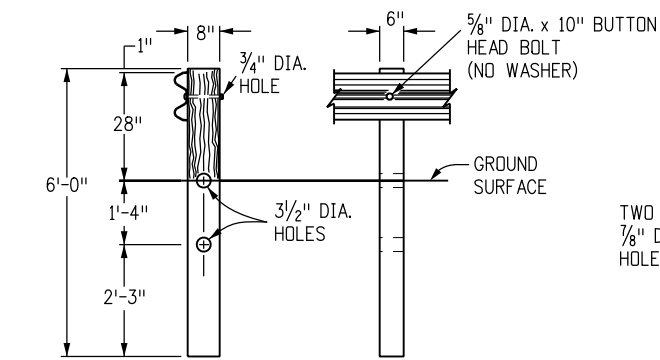
GUARDRAIL TYPE 3 W-BEAM

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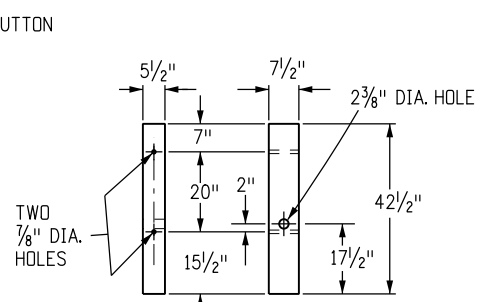
STANDARD PLAN NO.

M-606-1

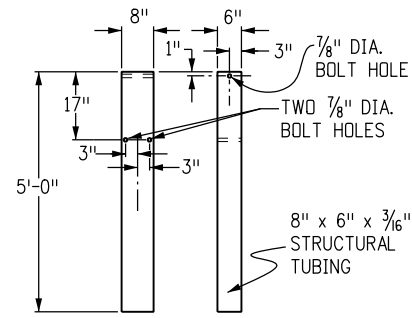
Sheet No. 12 of 20



CONTROLLED RELEASING TERMINAL (CRT) POST ①



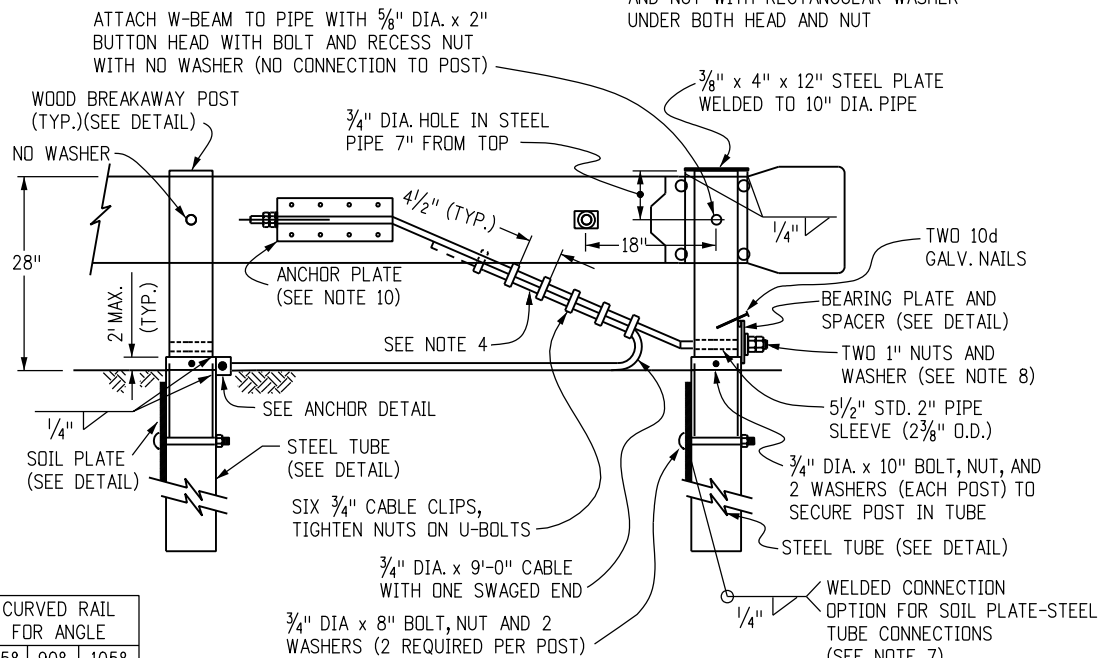
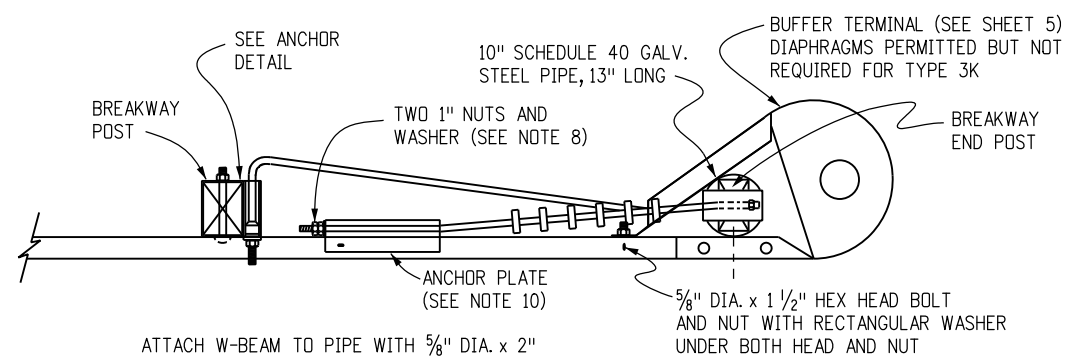
WOOD BREAKAWAY POST ②



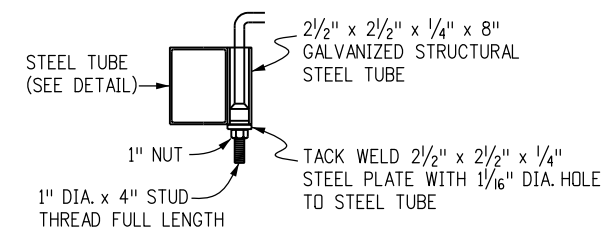
STEEL TUBE

POST	DIMENSIONS	TYPE
①	6" x 8" x 6'	CRT
②	5 1/2" x 7 1/2" x 42 1/2"	BREAKAWAY

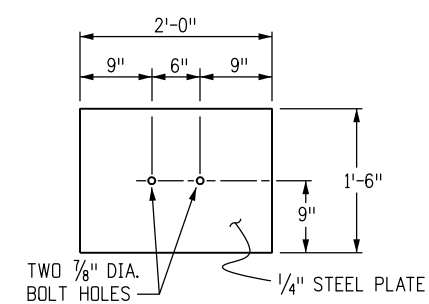
POSTS



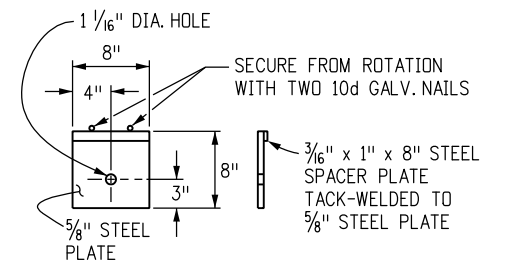
LOW SPEED END ANCHORAGE - TYPE 3K



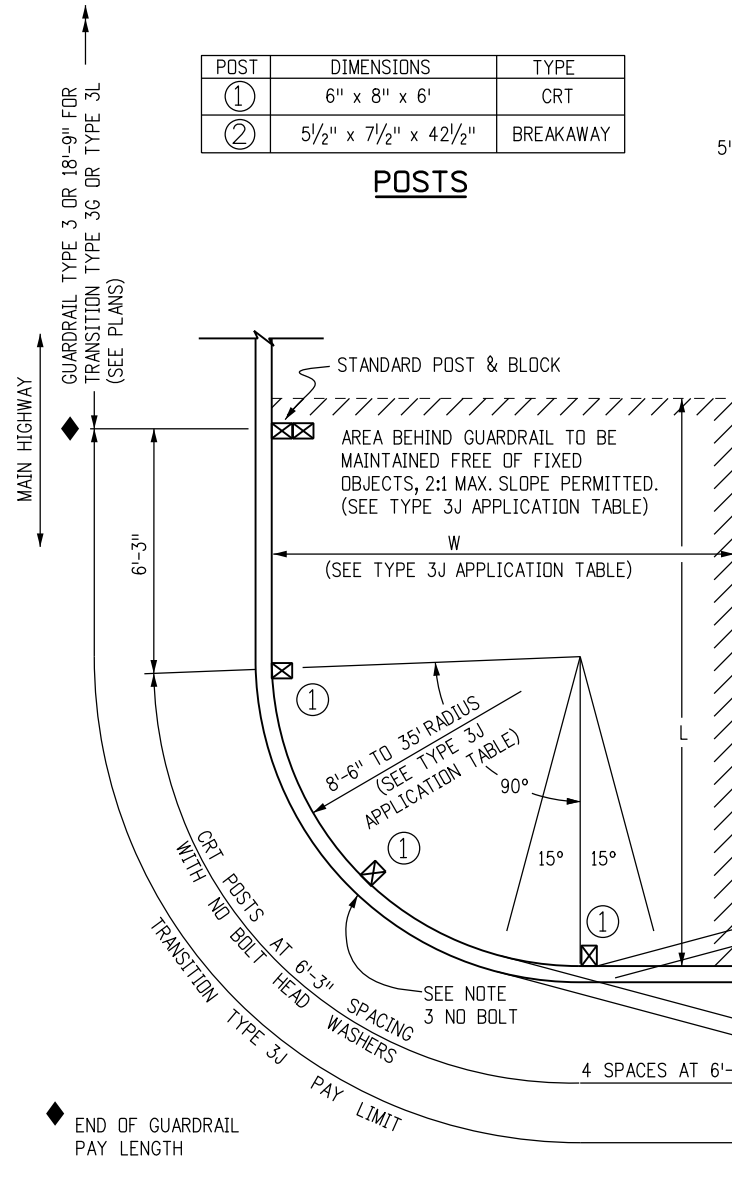
ANCHOR DETAIL



SOIL PLATE



BEARING PLATE FOR STEEL TUBE



INTERSECTING ROADWAYS TRANSITION - TYPE 3J TRANSITION

RADIUS	ANGLE	NO. CRT POSTS	AREA FREE OF FIXED OBJECTS		CURVED RAIL FOR ANGLE		
			L	W	75°	90°	105°
8'-6"	75°-105°	5	25'	15'	11'	13'	15'
	75°-90°	6	30'	15'	22'	27'	31'
	91°-105°	7					
17'	75°-85°	7	40'	20'	33'	40'	47'
	86°-95°	8					
	96°-105°	9					
	75°-85°	9					
25'-6"	86°-95°	8	50'	20'	46'	55'	64'
	96°-105°	10					
	96°-105°	11					

TRANSITION TYPE 3J APPLICATION

NOTES

- APPLICATION: THE TRANSITION TYPE 3J MAY BE USED TO SHIELD HAZARDS AT THE INTERSECTION OF TWO ROADWAYS. TYPICAL APPLICATIONS INCLUDE, BUT ARE NOT LIMITED TO, THE FOLLOWING:
 - CANAL SERVICE ROADS AT BRIDGE ENDS.
 - INTERRUPTIONS IN GUARDRAIL RUNS BY INTERSECTING ROADWAYS, ETC..

THE LOW SPEED (<45 MPH) END ANCHORAGE TYPE 3K SHALL BE USED ONLY ON DRIVEWAYS AND LOW SPEED SERVICE ROADS. WHEN AN APPROVED CRASH-TESTED END TREATMENT IS REQUIRED USE THE END ANCHORAGE (FLARED) OR (NONFLARED) WITH 37 FT.-6 IN. LENGTH.
- GRADING AND PAVING FOR THE 3J & 3K SHALL MATCH THE GRADING AND PAVING OF THE GUARDRAIL TO WHICH THEY ARE ATTACHED, AND SHALL BE IN ACCORDANCE WITH SHEET ONE OF THIS STANDARD. MAXIMUM FILL SLOPE SHALL BE 2:1.
- THE RAIL IS NOT BOLTED TO THE CRT POST AT THE CENTER OF THE CURVE FOR THE 8 FT.-6 IN., 17 FT., AND 25 FT.-6 IN. RADII. PLATES SHALL CONFORM TO ASTM A 36, AND THE STRUCTURAL TUBING TO ASTM A 500.
- THE 3/4 IN. GALVANIZED WIRE ROPE (CABLE) SHALL CONFORM TO AASHTO M 30 TYPE II.
- PLATES SHALL CONFORM TO ASTM A 36, AND STRUCTURAL TUBING TO ASTM A 500. WELDING SHALL MEET ALL REQUIREMENTS OF THE AMERICAN WELDING SOCIETY.
- ALL STRUCTURAL STEEL SHALL BE GALVANIZED IN CONFORMANCE WITH ASTM A 123. POSTS SHALL NOT BE PUNCHED, DRILLED, CUT, OR WELDED AFTER GALVANIZING.
- WHEN THE SOIL PLATE WELDED OPTION IS SELECTED, SOIL PLATE CONNECTION BOLT HOLES ARE NOT REQUIRED.
- OUTSIDE NUT SHALL BE TORQUED AGAINST INSIDE NUT WITH THE CABLE INSTALLED TAUT BETWEEN THE ANCHOR PLATE AND FIRST POST.
- ALL CURVED GUARDRAIL SHALL BE SHOP BENT.
- SEE SHEET 4 FOR ANCHOR PLATE AND OTHER DETAILS.
- THE STEEL TUBE MAY BE DRIVEN WITH WOOD POST INSERTED IF NO DAMAGE OCCURS TO THE POST OR BOLTS.

Computer File Information

Creation Date: 07/04/12	Initials: DLM
Last Modification Date: 10/27/14	Initials: LTA
Full Path: www.coloradodot.info/business/designsupport	(R-X)
Drawing File Name: 60601013020.dgn	(R-X)
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	(R-X)

Sheet Revisions

Date:	Comments

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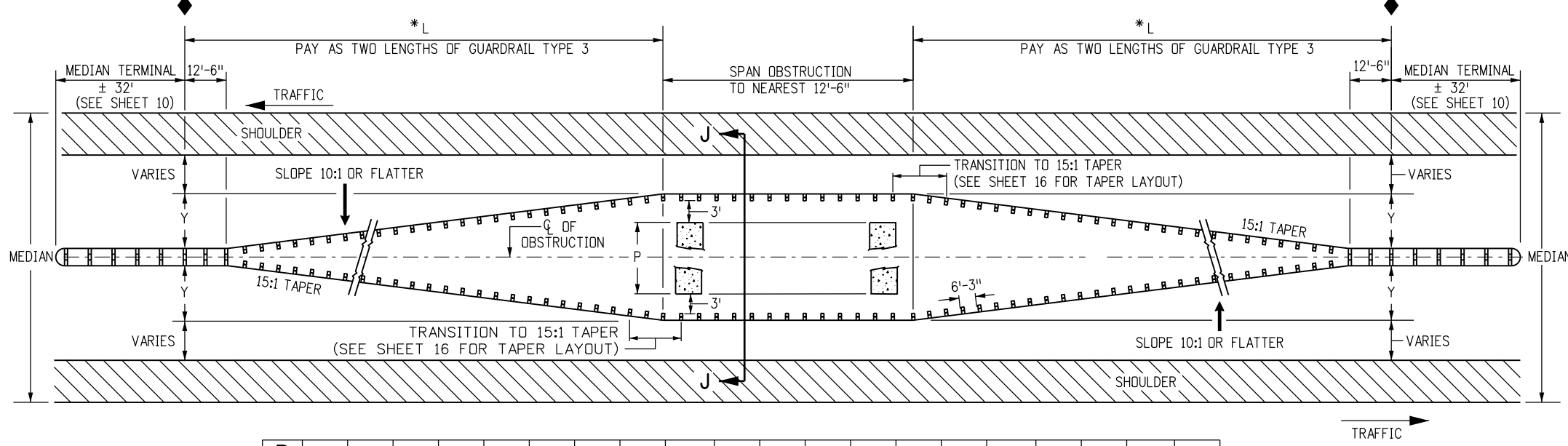
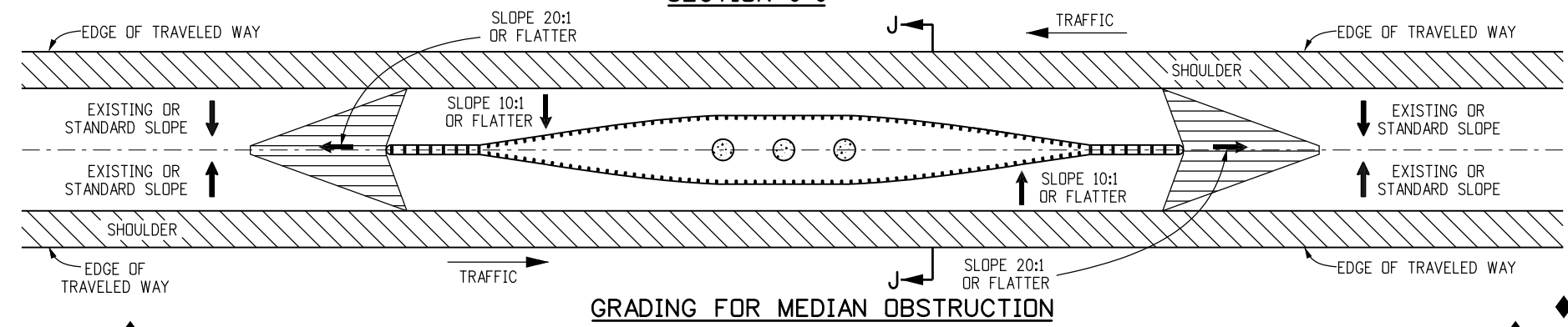
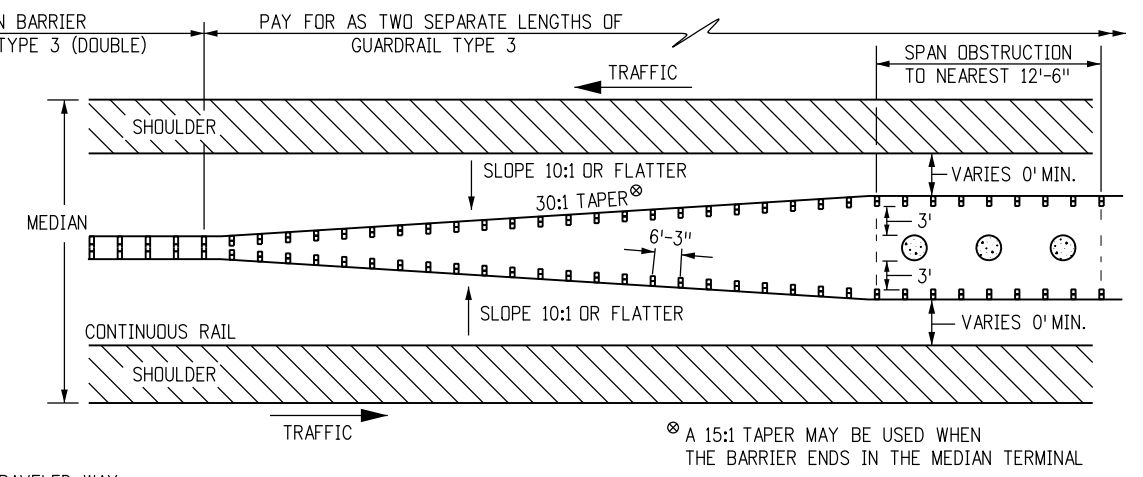
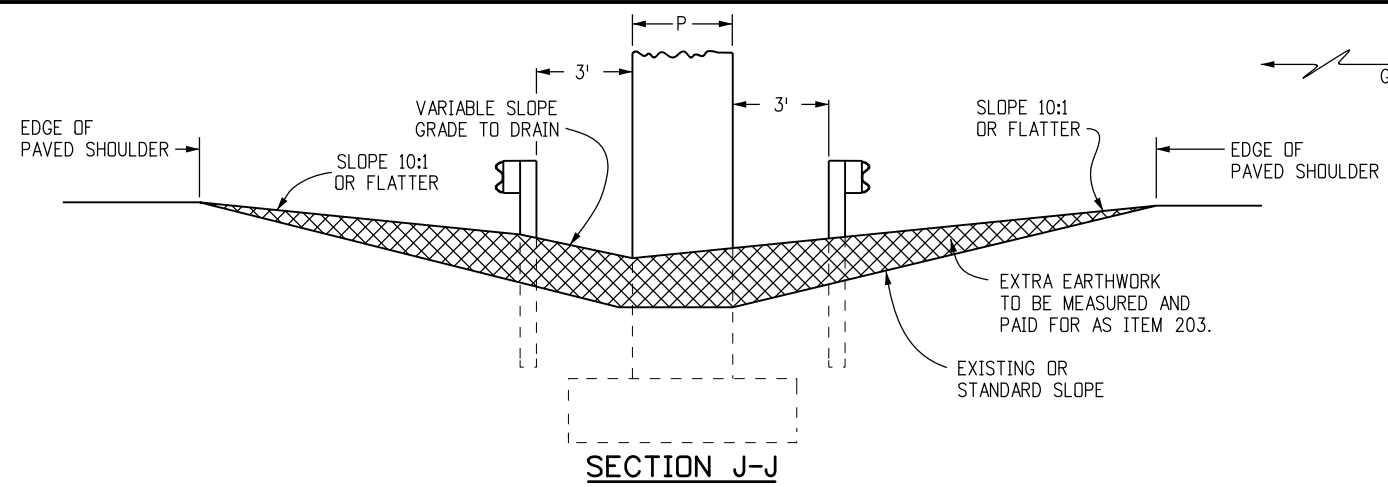
**GUARDRAIL TYPE 3
W-BEAM**

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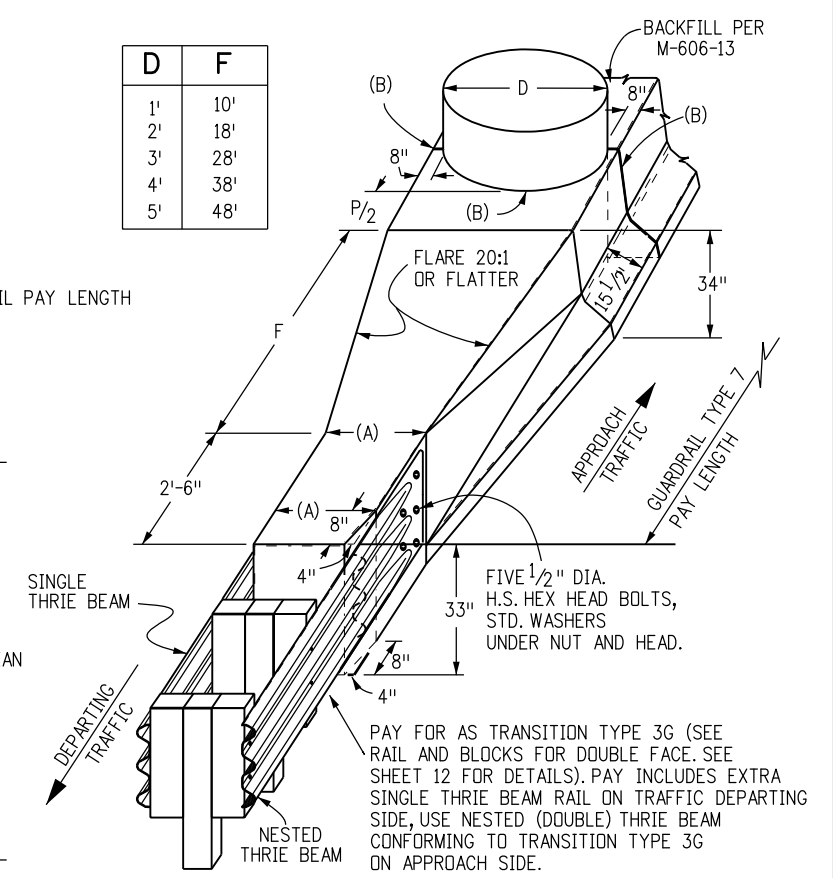
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P	1'	2'	3'	4'	5'	6'	7'	8'	9'	10'	11'	12'	13'	14'	15'	16'	17'	18'	19'	20'
Y	4'-1"	4'-7"	5'-1"	5'-7"	6'-1"	6'-7"	7'-1"	7'-7"	8'-1"	8'-7"	9'-1"	9'-7"	10'-1"	10'-7"	11'-1"	11'-7"	12'-1"	12'-7"	13'-1"	13'-7"
L	75'	87'-6"	100'	112'-6"	125'	137'-6"	150'	162'-6"	175'	187'-6"	200'	212'-6"	225'							

GUARDRAIL FOR OBSTRUCTION IN MEDIANS WIDER THAN 30 FT.
NOTE: FOR OBSTRUCTIONS (P) THAT ARE WIDER THAN 20 FT. IN MEDIANS USE SHEET 17.



- (A). TIMBER POSTS 2 FT., STEEL POSTS 1 FT.-9/2 IN.
- (B). 1/2 IN. PREFORMED JOINT MATERIAL

NARROW MEDIAN DETAIL
USUALLY LESS THAN 30 FT. WIDE MEDIAN WITH ALL PAVED SURFACE

* L IS MEASURED ALONG FACE OF GUARDRAIL

OBSTRUCTIONS IN MEDIANS

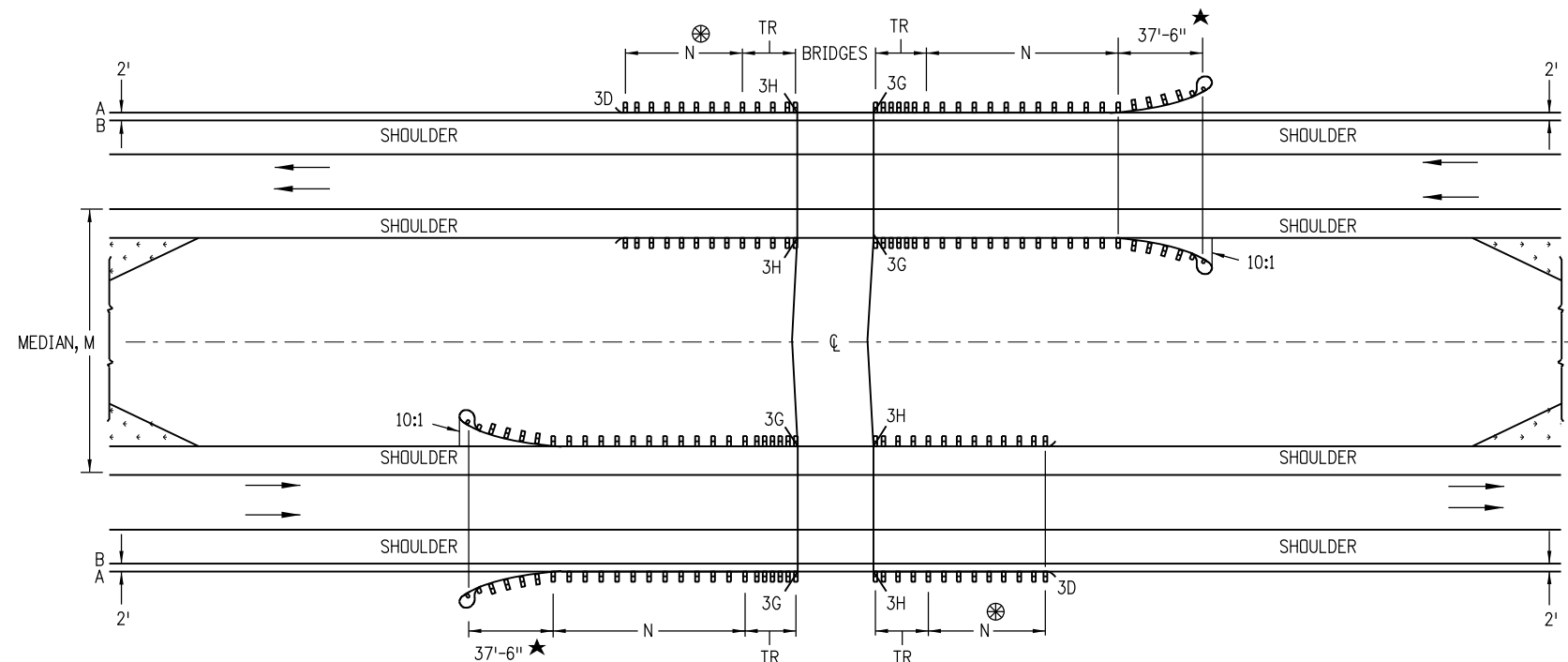
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**GUARDRAIL TYPE 3
W-BEAM**
 Issued By: Project Development Branch July 4, 2012

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 Sheet No. 14 of 20



MULTILANE DIVIDED HIGHWAYS FOR STEEP EMBANKMENTS IN MEDIAN

NOTES:

- MEDIAN BARRIERS TANGENT TO THE ROADWAY MAY BE USED WHERE THE SHOULDER SLOPES IN THE MEDIAN ARE STEEP.
- BARRIER LENGTHS SHALL BE INCREASED TO ACCOUNT FOR STEEP EMBANKMENTS OR OTHER HAZARDS WITHIN CLOSE PROXIMITY OF BRIDGES.

⊗ - DO NOT CONSTRUCT THE TR AND GUARDRAIL ON THE TRAILING BRIDGE ENDS IF SITE CONDITIONS DO NOT WARRANT THE USE OF GUARDRAIL.

N - SHOWN ON PLANS. LENGTH TO SHIELD ALL HAZARDS IS BASED ON GUARDRAIL'S LENGTH OF NEED COMPUTATION. SEE AASHTO ROADWAY DESIGN GUIDE. THE MINIMUM SHALL BE 12 FT. - 6 IN., WHERE SITE CONDITIONS ALLOW. THE TOTAL LENGTH OF NEED WILL INCLUDE THE LENGTH OF TRANSITION, THE LENGTH OF RAIL (N), AND ANY REDIRECTIVE LENGTH IN THE RAIL END TREATMENT.

TR - 18 FT.-9 IN. FOR 3G AND 3H.

A - EDGE OF 8 FT. OR 10 FT. SHOULDER.

B - EDGE OF 6 FT. OR LESS SHOULDER.

★ - END ANCHORAGE CAN BE FLARED OR NONFLARED.

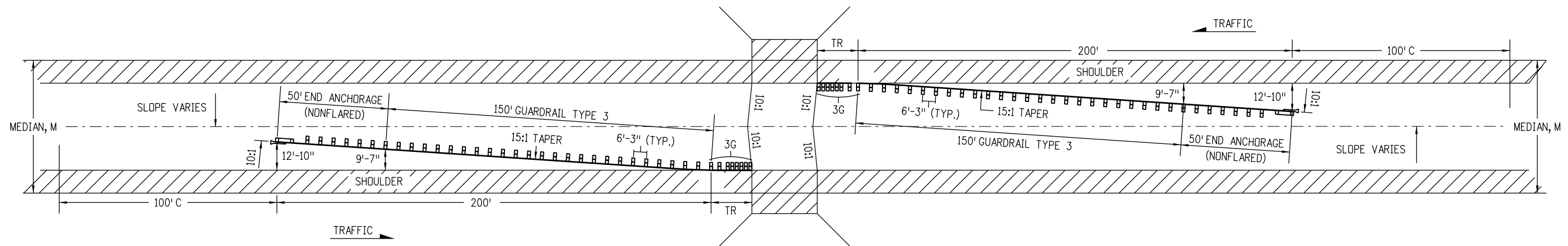
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Sheet Revisions	
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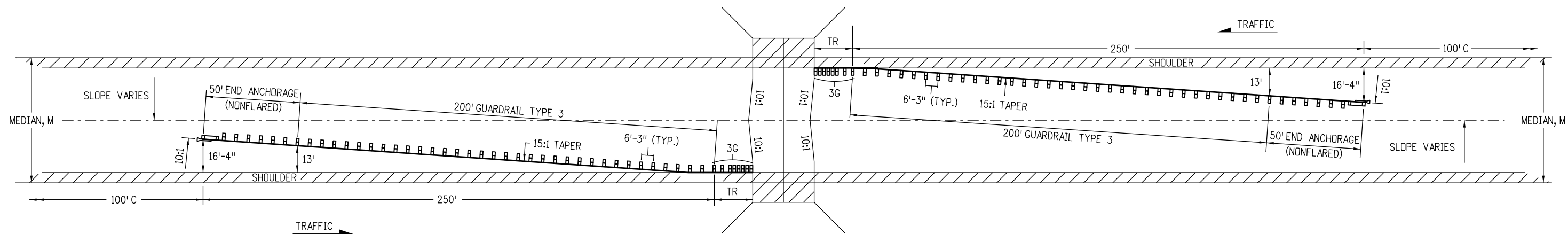
GUARDRAIL TYPE 3
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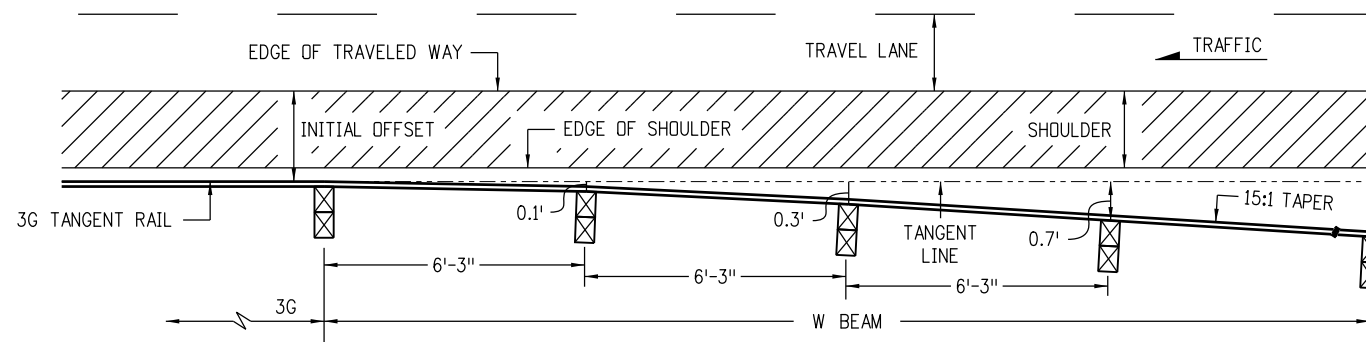


MEDIANS 60 FT. AND OVER WITH 10 FT. OR WIDER SHOULDERS.

TR = 18 FT.-9 IN FOR TRANSITION TYPE 3G.
 C = CHANGE: 100 FT. TRANSITION TO NORMAL SLOPE.
 M = WIDTH OF MEDIAN.



MEDIANS 60 FT. AND OVER WITH 4 TO 8 FT. SHOULDERS.



TRANSITION TO TYPICAL 15:1 TAPER

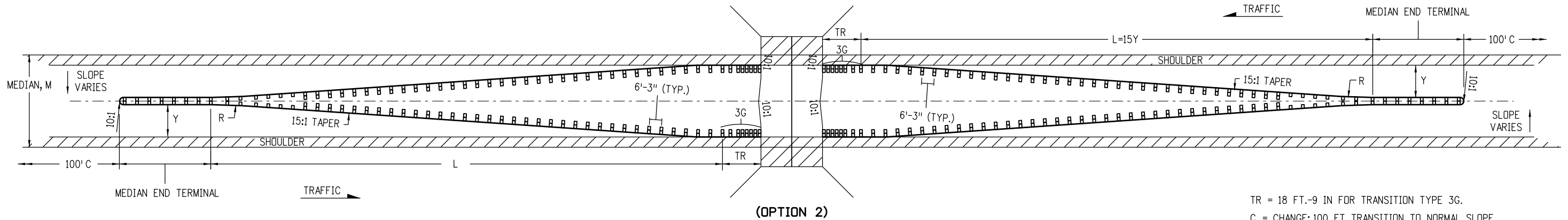
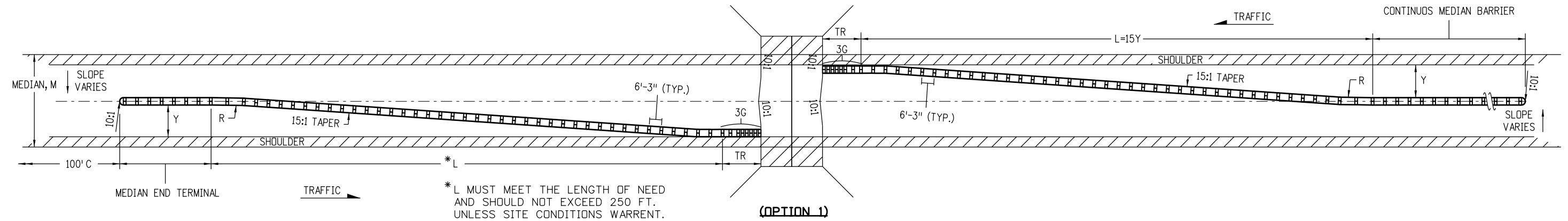
- NOTES:
1. GUARDRAIL TRANSITIONS FROM PARALLEL TO ROADWAY SHOULDER AT 3G SEGMENT TO 15:1 TAPER WITHIN 18'-9" BASED ON POST OFFSET DIMENSIONS SHOWN.
 2. SEE SHEET 15 FOR THE RIGHT SHOULDER GUARDRAIL LAYOUT.

MULTILANE DIVIDED HIGHWAYS - (DEPRESSED MEDIANS, 60 FT. AND OVER WITH OPEN HAZARDS OR OBSTRUCTIONS)

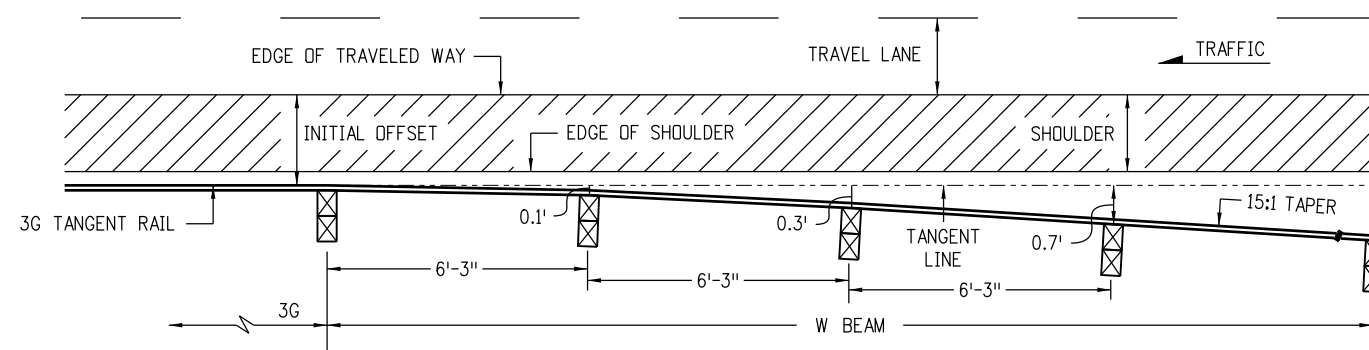
Computer File Information		Sheet Revisions		Colorado Department of Transportation 4201 East Arkansas Avenue CDOT HQ, 4th Floor Denver, CO 80222 Phone: 303-757-9021 FAX: 303-757-9868 Division of Project Support DLM/LTA	GUARDRAIL TYPE 3 W-BEAM	STANDARD PLAN NO.
Creation Date: 07/04/12	Initials: DLM	Date:	Comments:			M-606-1
Last Modification Date: 10/27/14	Initials: LTA					
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NOTES

1. GUARDRAIL TRANSITIONS FROM PARALLEL TO ROADWAY SHOULDER AT 3G SEGMENT TO 15:1 TAPER WITHIN 18'-9" BASED ON POST OFFSET DIMENSIONS SHOWN.
2. THE OPTION 1 LAYOUT SHALL BE USED WHEN "Y" EXCEEDS 16 FEET OR WHEN MEDIAN BARRIER IS CONTINUOUS.
3. THE OPTION 2 LAYOUT SHALL BE USED WHEN "Y" IS 16 FEET OR LESS.
4. SEE SHEET 15 FOR RIGHT SHOULDER GUARDRAIL LAYOUT.



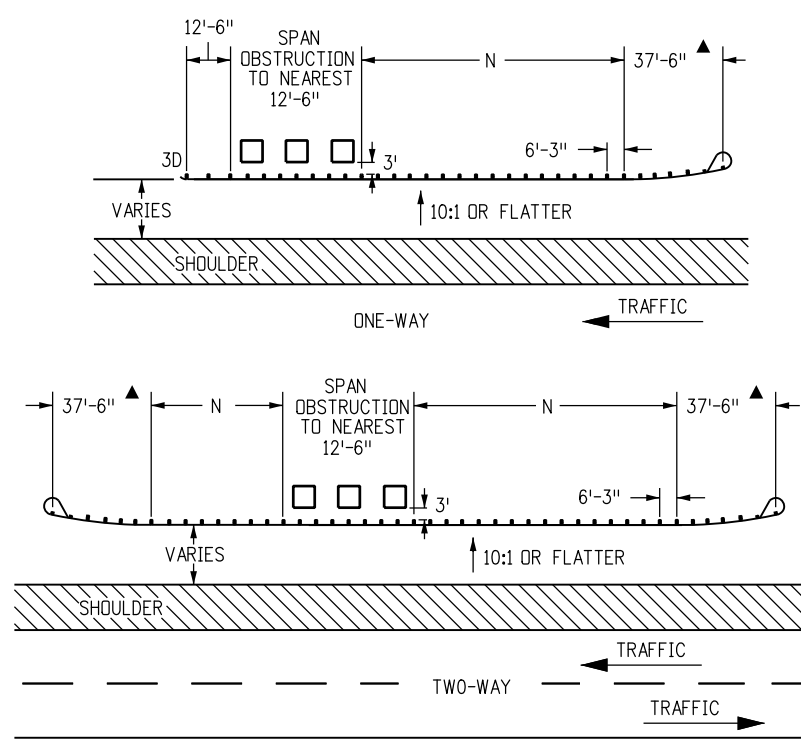
TR = 18 FT.-9 IN FOR TRANSITION TYPE 3G.
 C = CHANGE: 100 FT. TRANSITION TO NORMAL SLOPE.
 M = WIDTH OF MEDIAN.
 L = TOTAL LENGTH PAID AS GUARDRAIL TYPE 3.
 Y = FINAL OFFSET AT END.



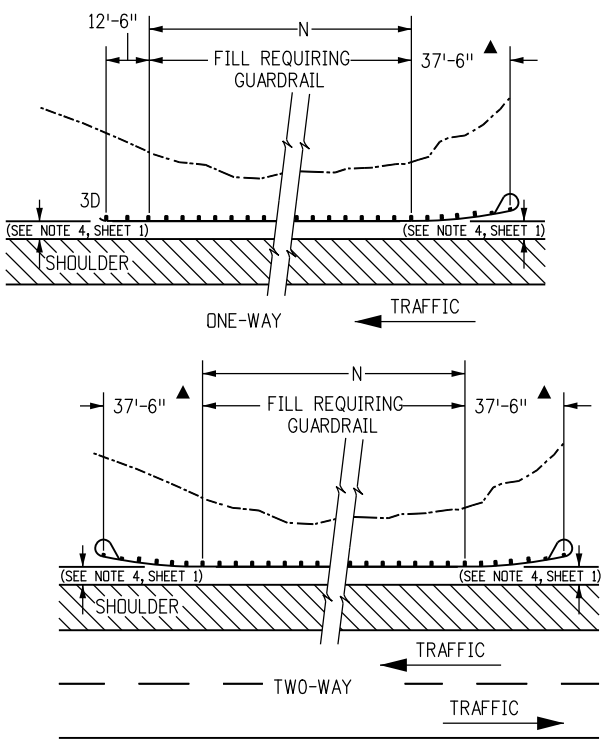
TRANSITION TO TYPICAL 15:1 TAPER

MULTILANE DIVIDED HIGHWAYS - (DEPRESSED MEDIANS, 21 - 59 FT. WITH OPEN HAZARDS OR OBSTRUCTIONS)

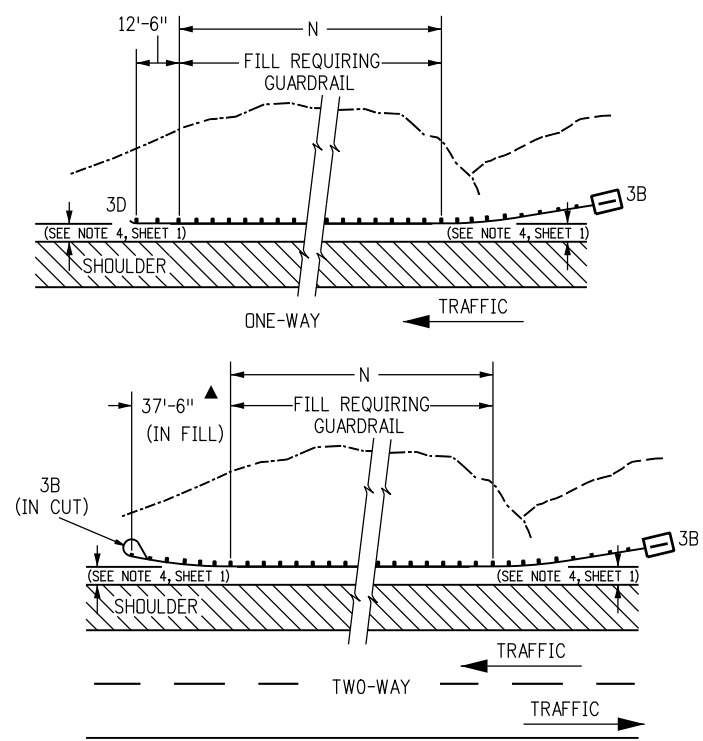
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GUARDRAIL FOR ROADSIDE OBSTRUCTIONS



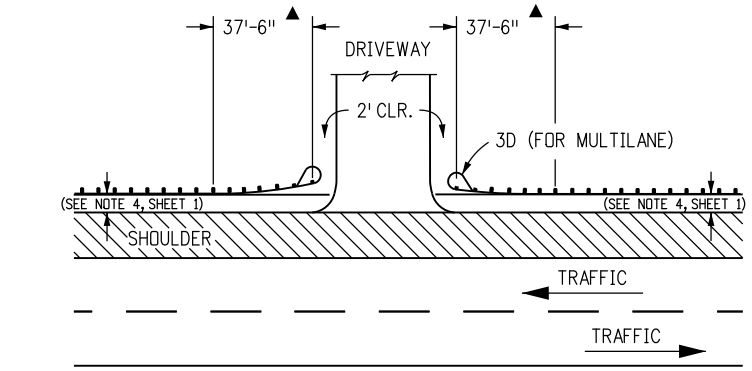
GUARDRAIL FOR ROADSIDE FILL CONSTRUCTION



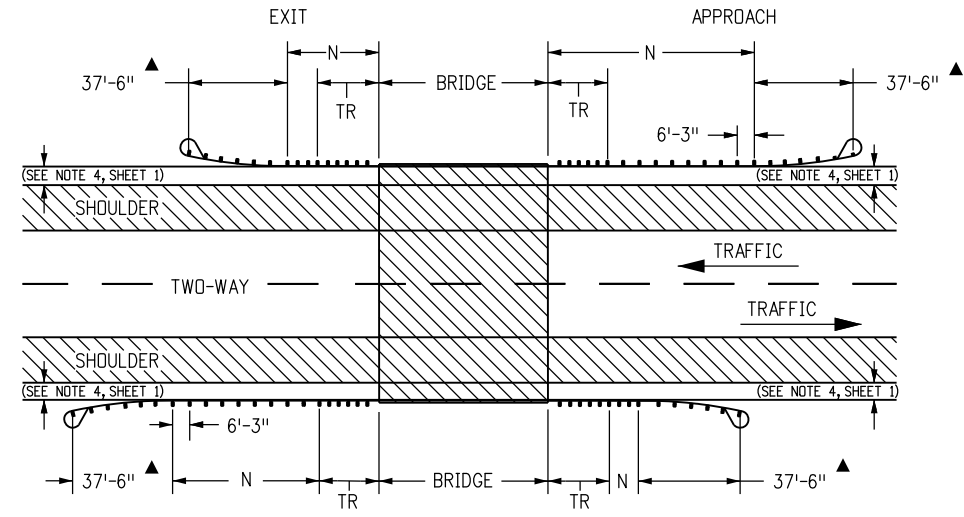
GUARDRAIL FOR ROADSIDE CUT-TO-FILL CONDITION

- NOTES**
1. THE TYPE 3G OR 3H TRANSITIONS (SEE SHEET 12) SHALL BE USED TO CONNECT A TYPE 3 W-BEAM TO TYPE 7 CONCRETE BARRIER OR TO A TYPE 7, 8, OR 10 BRIDGE RAIL. FOR A TRANSITION FROM A ROADWAY TYPE 3 W-BEAM TO A BRIDGE RAIL TYPE 3 WITH BACKING TUBES, THE TRANSITION TYPE 3L SHOWN ON SHEET 20 SHALL BE USED.
 2. "TR" WILL BE 18 FT.-9 IN. FOR THE TRANSITIONS TYPE 3G AND 3H, AND 25 FT. FOR THE TRANSITION TYPE 3L.
 3. THE GUARDRAIL LENGTH DIMENSION "N" IS THE LENGTH AS DETERMINED BY THE LENGTH OF NEED COMPUTATION AND IS SHOWN ON THE PLANS. THE MINIMUM IS 12 FT.-6 IN. WHERE SITE CONDITIONS ALLOW. THE OVERALL REQUIRED LENGTH OF NEED CAN INCLUDE THE LENGTH OF TRANSITION, THE LENGTH OF RAIL (N), AND ANY REDIRECTIVE LENGTH IN THE RAIL END TREATMENT. A TRAVERSABLE SLOPE SHALL BE PROVIDED BEHIND THE TERMINAL TO DIMENSION "N" PRIOR TO THE OBSTRUCTION UNLESS OTHERWISE APPROVED BY THE ENGINEER.

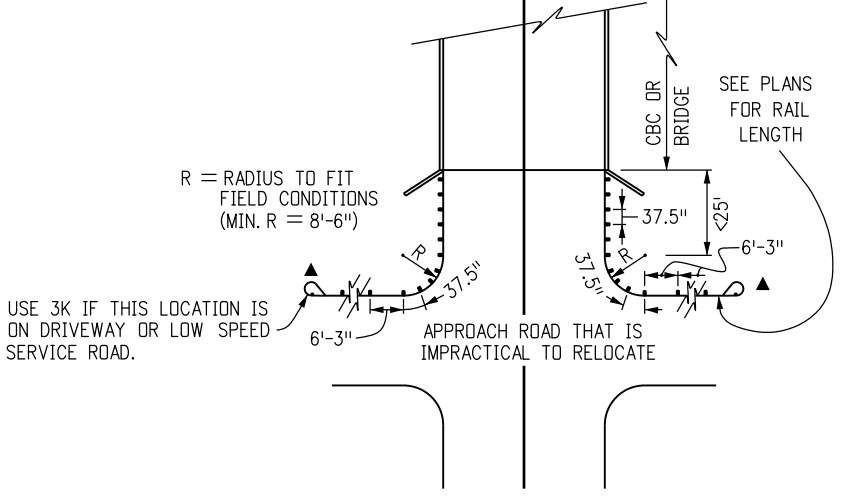
▲ END ANCHORAGE CAN BE FLARED OR NONFLARED



LAYOUT FOR DRIVEWAY APPROACH



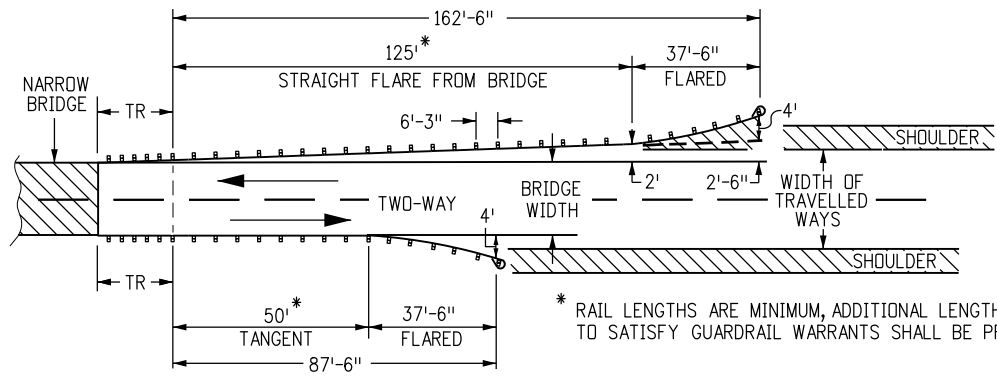
2-WAY NORMAL BRIDGE APPLICATION



GUARDRAIL TYPE 3 WITH BLOCKED OUT POSTS SPACED AT 3'-1 1/2" FROM STRUCTURE AROUND CURVE.

INTERRUPTED STRUCTURE APPROACH

(USE TYPE 3J ON SHEET 13 WHEN PRACTICAL)



2-WAY NARROW APPLICATION

* RAIL LENGTHS ARE MINIMUM, ADDITIONAL LENGTH TO SATISFY GUARDRAIL WARRANTS SHALL BE PROVIDED

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Full Path: www.coloradodot.info/business/designsupport	
Drawing File Name: 60601018020.dgn	
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Sheet Revisions	
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GUARDRAIL TYPE 3

W-BEAM

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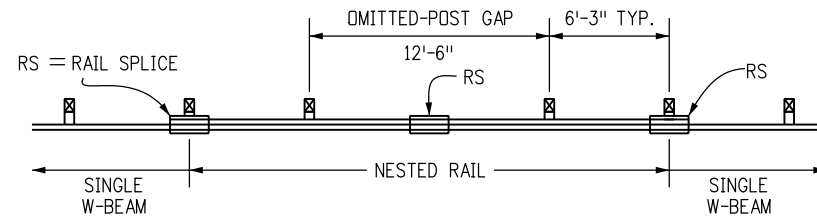
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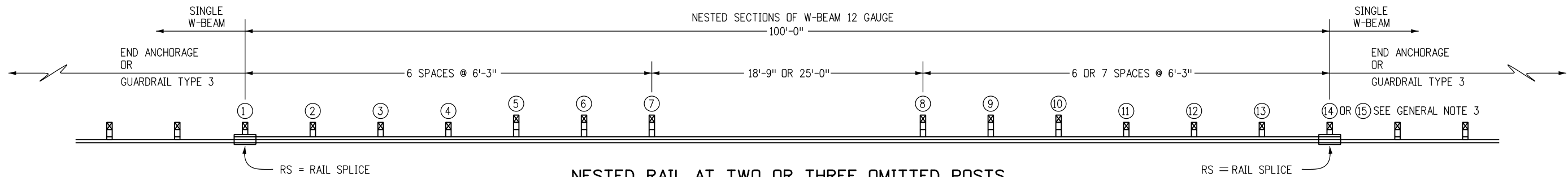
Sheet No. 18 of 20

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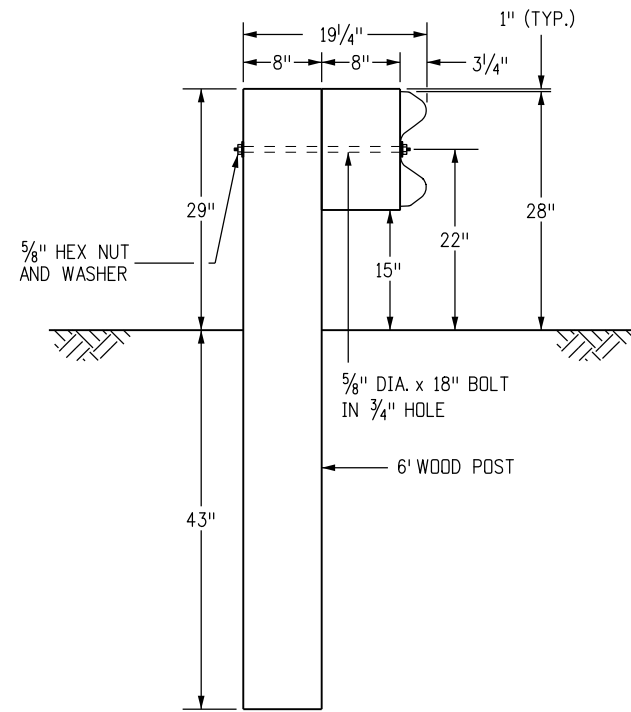
- FOR ONE OMITTED POST IN THE GUARDRAIL RUN, i.e. AT A PIPE CULVERT WITH MINIMUM COVER, SEE THE "NESTED RAIL AT ONE OMITTED POST" DETAIL ON THIS SHEET. THE W-BEAM RAILS SPANNING THE OMITTED-POST GAP SHALL BE DOUBLED (ONE RAIL NESTED IN THE OTHER), AND SHALL EXTEND A MINIMUM OF 6 FT.-3 IN. ON EITHER SIDE OF THE GAP. USING 12 FT.-6 IN. SECTIONS OF RAIL, AND DEPENDING ON THE SPLICE LOCATION, ONE OMITTED POST SECTION REQUIRES EITHER 25 FT. OR 37 FT. - 6 IN. OF NESTED RAIL.
- FOR TWO OR THREE OMITTED POSTS, SEE THE "NESTED RAIL AT TWO OR THREE OMITTED POSTS" DETAIL ON THIS SHEET. RAIL SPLICES IN THE 100 FT. NESTED SECTION MAY BE PLACED TO FACILITATE CONSTRUCTABILITY. HOWEVER ONLY ONE RAIL SPLICE MAY BE PLACED IN THE OMITTED POSTS SECTION, AND ONLY AT THE MIDPOINT OF THE 25 FT. LENGTH.
- POST ⑮ REQUIRED WHEN TWO POSTS ARE OMITTED FOR THE 18 FT.-9 IN. LENGTH.
- ONLY TIMBER POSTS AND BLOCKS ARE ALLOWED FOR WEAKENED POSTS 5 THROUGH 10.



NESTED RAIL AT ONE OMITTED POST

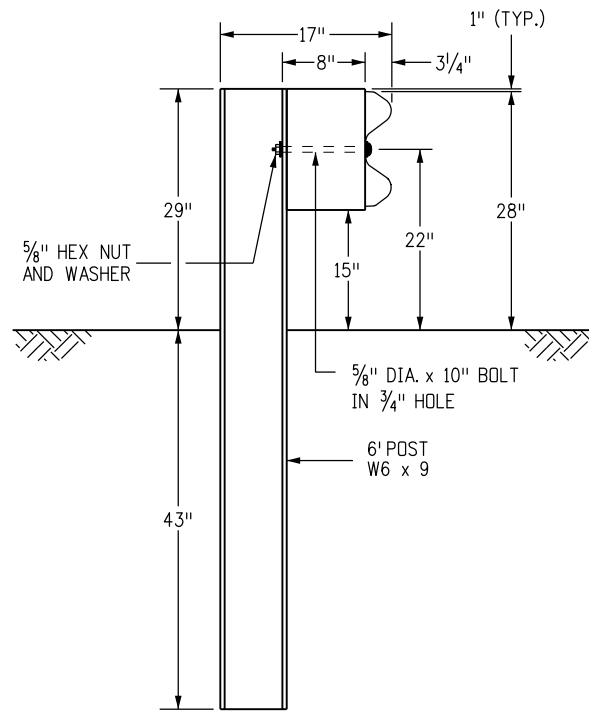


NESTED RAIL AT TWO OR THREE OMITTED POSTS



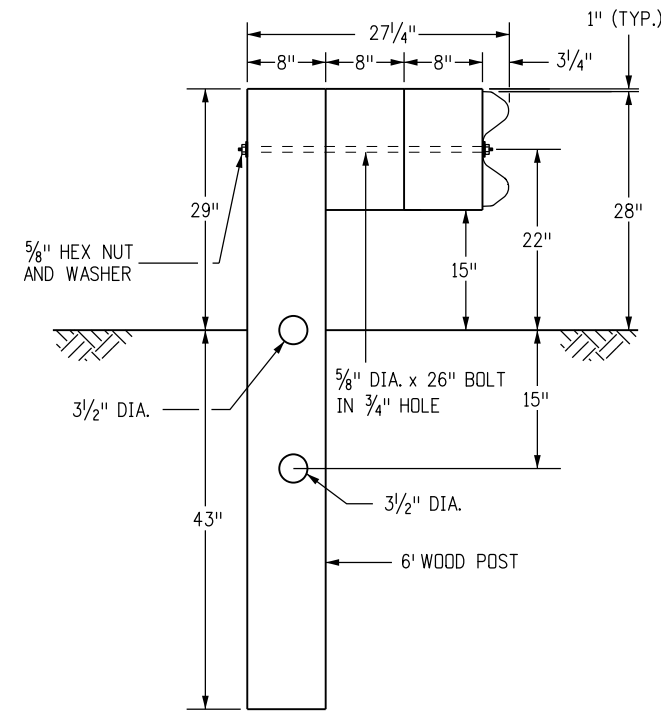
TIMBER

POSTS ① - ④ AND ⑪ - ⑮



STEEL

POSTS ① - ④ AND ⑪ - ⑮



TIMBER

POSTS ⑤ - ⑩

Computer File Information

Creation Date: 07/04/12 Initials: DLM
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 Drawing File Name: 60601019020.dgn
 CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English

Sheet Revisions

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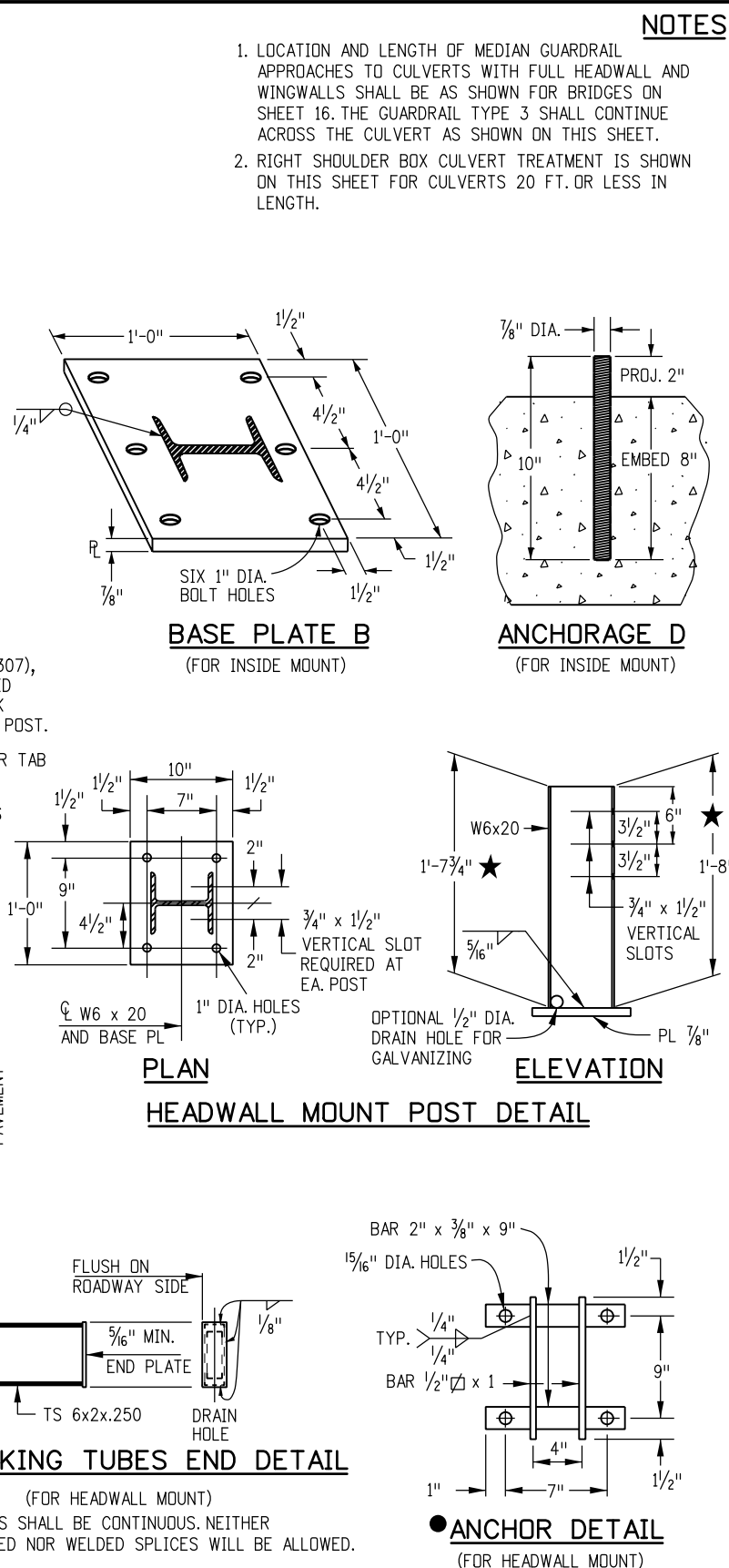
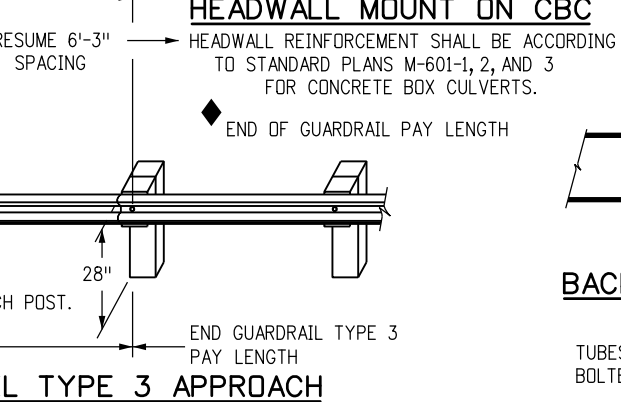
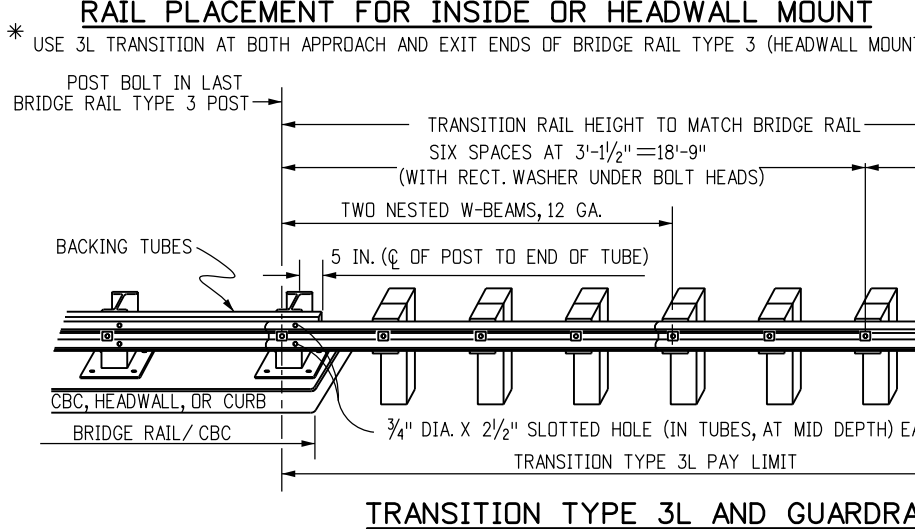
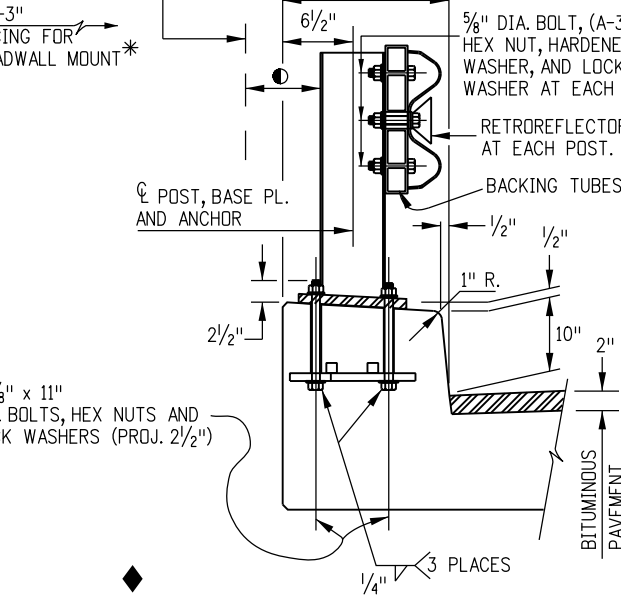
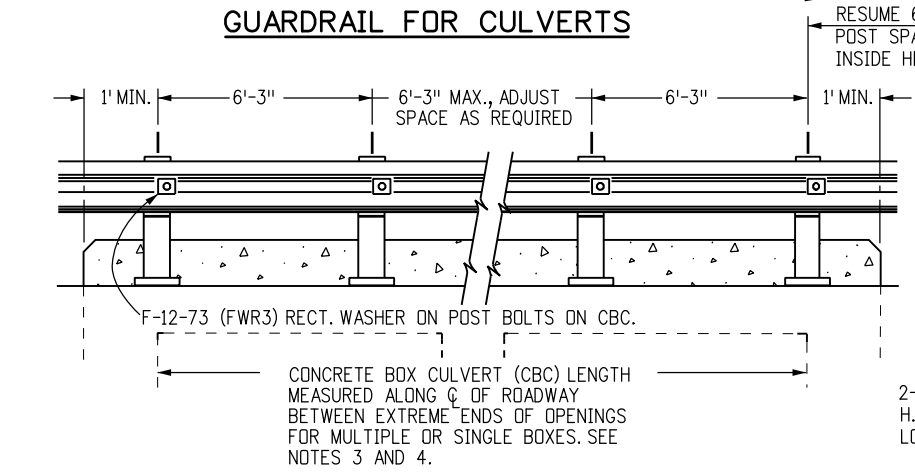
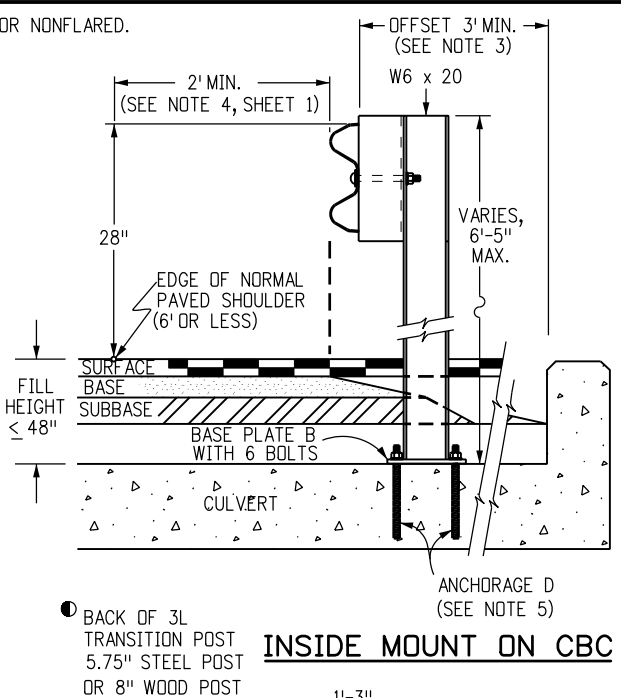
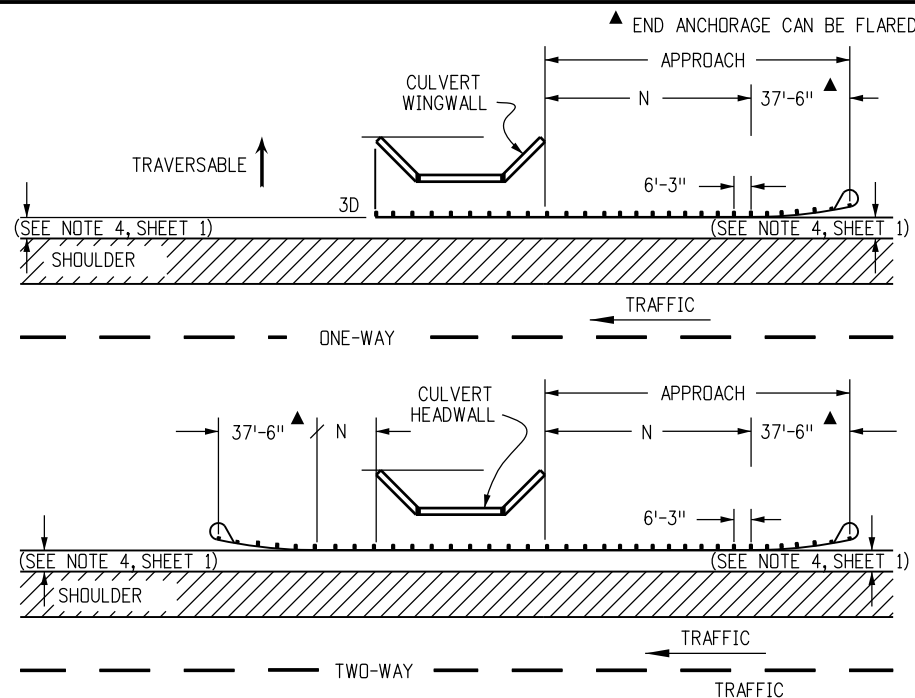
**GUARDRAIL TYPE 3
W-BEAM**

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- NOTES**
- LOCATION AND LENGTH OF MEDIAN GUARDRAIL APPROACHES TO CULVERTS WITH FULL HEADWALL AND WINGWALLS SHALL BE AS SHOWN FOR BRIDGES ON SHEET 16. THE GUARDRAIL TYPE 3 SHALL CONTINUE ACROSS THE CULVERT AS SHOWN ON THIS SHEET.
 - RIGHT SHOULDER BOX CULVERT TREATMENT IS SHOWN ON THIS SHEET FOR CULVERTS 20 FT. OR LESS IN LENGTH.
 - GUARDRAIL ACROSS CULVERTS WITH A LENGTH OF 20 FT. OR LESS SHALL BE AS FOLLOWS:
 - FILL HEIGHT AT GUARDRAIL POST 48 IN. OR GREATER: CONSTRUCTION AND PAYMENT WILL BE AS GUARDRAIL TYPE 3.
 - FILL HEIGHT AT GUARDRAIL POST LESS THAN 48 IN. AND BLOCK FACE TO HEADWALL OFFSET OF 3 FT. OR GREATER: CONSTRUCTION AND PAYMENT AS GUARDRAIL TYPE 3.
 - FILL HEIGHT AT GUARDRAIL POST 48 IN. OR LESS AND BLOCK FACE TO HEADWALL OFFSET LESS THAN 3 FT.: CONSTRUCTION ACCORDING TO HEADWALL MOUNT DETAILS AND PAYMENT AS BRIDGE RAIL TYPE 3.
 - GUARDRAIL ACROSS CULVERTS WITH LENGTH GREATER THAN 20 FT. SHALL BE AS FOLLOWS:
 - FILL HEIGHT AT GUARDRAIL POSTS 48 IN. OR GREATER: CONSTRUCTION AND PAYMENT WILL BE FOR STANDARD GUARDRAIL TYPE 3.
 - FILL HEIGHT AT GUARDRAIL POSTS 48 IN. OR LESS: CONSTRUCTION AND PAYMENT IN ACCORDANCE WITH THE CONTRACT BRIDGE PLANS. WHEN BLOCK FACE TO HEADWALL OFFSET IS 3 FT. OR GREATER: CONSTRUCTION AND PAYMENT AS GUARDRAIL TYPE 3.
 - ANCHORAGE D: SIX BOLTS FOR BASE PLATE "B" WITH INSIDE MOUNT. THE BOLTS SHALL BE 7/8 IN. DIA. X 10 IN. HIGH STRENGTH RODS THREADED FULL LENGTH AND ALL GALVANIZED. RODS SHALL BE CAST-IN-PLACE FOR A NEW STRUCTURE. FOR AN EXISTING STRUCTURE, THE RODS SHALL BE INSTALLED IN 1-1/4 IN. DIA HOLES WITH NON-SHRINK GROUT OR EPOXY CONFORMING TO ASTM C 881.
 - TYPE 3L POSTS SHALL BE STEEL OR WOOD TO MATCH POSTS USED ON THE APPROACH GUARDRAIL.
 - THE GUARDRAIL LENGTH DIMENSION "N" IS THE LENGTH AS DETERMINED BY THE LENGTH OF NEED COMPUTATION AND IS SHOWN ON THE PLANS. THE MINIMUM IS 12 FT.-6 IN. WHERE SITE CONDITIONS ALLOW. THE OVERALL REQUIRED LENGTH OF NEED CAN INCLUDE THE LENGTH OF TRANSITION, THE LENGTH OF RAIL (N), AND ANY REDIRECTIVE LENGTH IN THE RAIL END TREATMENT.
 - ALL BRIDGE RAIL TYPE 3 BACKING TUBES SHALL BE FABRICATED FROM ASTM A 500 GRADE B. ALL POSTS, BASE PLATES, AND ANCHOR BOLTS SHALL BE FABRICATED FROM ASTM A 36 STEEL. THE ABOVE MATERIAL, W-BEAM, AND ALL ANCHOR BOLTS AND MISCELLANEOUS BOLTS, NUTS, AND WASHERS SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH SECTION 509. CONCRETE, REINFORCING STEEL, AND STRUCTURAL STEEL ELEMENTS SHALL BE IN ACCORDANCE WITH SECTIONS 601, 602, AND 509, RESPECTIVELY.
 - POST ANCHORS, ENCASED IN CONCRETE, SHALL BE ASTM A 36 STEEL, AND NEED NOT BE GALVANIZED.
 - PRIOR TO FABRICATION OF BRIDGE RAIL, THREE SETS OF WORKING DRAWINGS WHICH COMPLY WITH THE REQUIREMENTS OF SECTION 105 SHALL BE SUBMITTED TO THE ENGINEER FOR INFORMATION ONLY.
 - IF HEADWALL MOUNT GUARDRAIL IS USED, SEE STANDARD PLAN M-601, AND NOTES BELOW:
 - ALL ITEMS ABOVE TOP OF CBC HEADWALL WILL BE MEASURED AND PAID FOR AS LINEAR FEET OF BRIDGE RAIL TYPE 3.
 - HEADWALL MOUNTING OF RAIL WILL NOT BE MEASURED AND PAID FOR SEPARATELY BUT SHALL BE INCLUDED IN THE WORK.
- ★ FOR STANDARD 12 IN. HEADWALL WITH NO PAVEMENT, THE POST HEIGHT SHALL BE 1 FT.- 6 IN. ADJUST POST HEIGHT FOR PAVEMENT THICKNESS.
- ONE ANCHOR ASSEMBLY SHALL BE PLACED FOR EACH RAIL POST.

Computer File Information

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GUARDRAIL TYPE 3

W-BEAM

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STANDARD PLAN NO.

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GENERAL NOTES (CONTINUE ON SHEET 2)

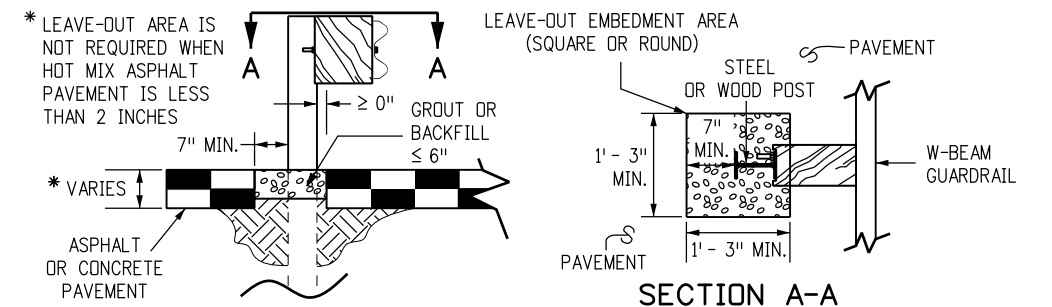
- TOLERANCE FOR TOP OF GUARDRAIL BEAM IS ±1 IN.
- RATE OF SLOPE DEPENDS ON GUARDRAIL LOCATION:
 - FOR GUARDRAIL FACE 2 FT. OR LESS FROM THE NORMAL EDGE OF PAVED SHOULDER, CONTINUE THE RATE OF SLOPE OF THE NORMAL PAVED SHOULDER TO THE BREAKPOINT.
 - FOR GUARDRAIL FACE MORE THAN 2 FT. FROM THE NORMAL EDGE OF THE PAVED SHOULDER, THE SLOPE SHALL BE 10:1 OR FLATTER.
- WHEN SPECIFIED ON THE PLANS, EXTEND A 2 IN. MINIMUM THICKNESS PAVED SURFACE TO 1 FT. BEHIND THE GUARDRAIL POSTS OR TO THE EROSION CONTROL CURB AS SHOWN ON PLANS. ASPHALT CUTTING & PATCHING OR OTHER APPROVED METHOD SHALL BE USED TO MINIMIZE DAMAGE TO ALL PAVED SURFACES UNDER GUARDRAIL INSTALLATIONS. ALL REPAIRS TO THE PAVED AREA WILL NOT BE MEASURED AND PAID FOR SEPARATELY BUT SHALL BE INCLUDED IN THE COST OF THE WORK. A MINIMUM 3 IN. THICK FIBER REINFORCED CONCRETE PAVEMENT MAY ALSO BE USED FOR PAVING BENEATH THE GUARDRAIL. INSTALL THE POST IN A 1/2 IN. OVERSIZED FORMED HOLE FOR GUARDRAIL RUNS AND TERMINALS AS DIRECTED. PAYMENT FOR THIS PAVED SURFACE WILL BE MADE UNDER A PAVEMENT OR CONCRETE PAY ITEM WITH QUANTITIES SHOWN ON THE PLANS.

- THE MINIMUM GUARDRAIL OFFSET FROM PAVED SHOULDER EDGE SHALL BE:
 - 0 FT. FOR SHOULDERS 8 FT. OR WIDER
 - 2 FT. FOR SHOULDERS 6 FT. OR LESS
- THE GUARDRAIL OFFSET FROM PAVED INSIDE SHOULDER EDGE OF A DIVIDED HIGHWAY SHALL BE:
 - 0 FT. MINIMUM FOR SHOULDERS 6 FT. OR WIDER
 - 2 FT. DESIRABLE FOR 4 FT. SHOULDERS

- THE ABOVE 2 FT. GUARDRAIL TO SHOULDER OFFSET IS DESIRABLE BUT NOT REQUIRED FOR:
- FOR AN EXISTING HIGHWAY WITH A DESIGN SPEED LESS THAN 50 MPH, THE MINIMUM OFFSET IS 4 FT. FROM THE TRAVELED WAY.
 - FOR A ONE-WAY ONE-LANE RAMP, AND WHERE ONE OR MORE OF THE FOLLOWING ARE TRUE:
 - THE NON-OFFSET GUARDRAIL BEGINS AT LEAST 100 FT. BEYOND RAMP NOSE.
 - THE NON-OFFSET GUARDRAIL IS NOT LOCATED ON THE RAMP EXIT OR ENTRANCE CURVE CONNECTION TO THE MAJOR HIGHWAY.
 - THE RAMP SHOULDERS ARE 4 FT. OR WIDER.

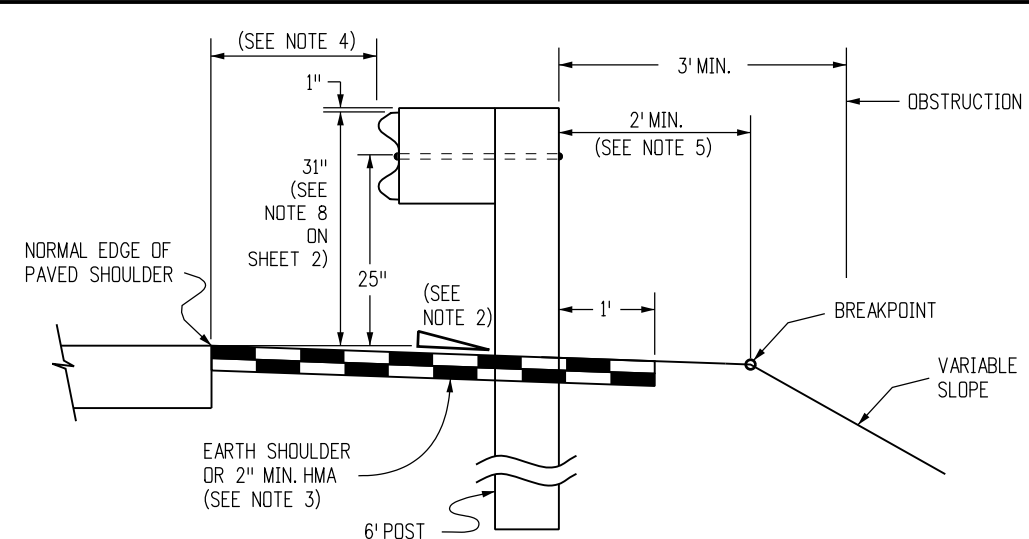
USE OF GREATER THAN MINIMUM OFFSET DIMENSIONS IS ENCOURAGED TO MEET THE DESIRABLE GOAL OF PLACING THE GUARDRAIL AS FAR AS POSSIBLE FROM THE TRAVEL WAY, EVEN FOR SHORT DISTANCES, WHILE PROVIDING A SMOOTH CHANGE IN GUARDRAIL ALIGNMENT.

- IF 2 FT. CANNOT BE PROVIDED BETWEEN THE BACK OF THE GUARDRAIL POST AND THE BREAKPOINT, USE 7 FT. GUARDRAIL POSTS. REFER TO THE "RESTRICTIVE ROADSIDE INSTALLATION" DETAIL.
- WHEN SPECIFIED ON THE PLANS, INSTALL 4 IN. HIGH TYPE 6 CURB WITH ITS FACE AT OR BEHIND THE RAIL FACE. AS AN ALTERNATIVE WHEN SPECIFIED ON THE PLANS, INSTALL A 2 IN. x 6 IN. TREATED (AASHTO M 133) WOOD CURB. FASTEN WITH A 4 IN. LAG BOLT AND WASHER AT EACH WOOD POST, OR WITH A 1#4 IN. DIA. BOLT WITH WASHER AND NUT AT EACH STEEL POST. IF THE 2 IN. x 6 IN. WOOD CURB IS SPECIFIED, IT WILL BE INCLUDED IN THE COST OF THE GUARDRAIL. IF APPROVED BY THE ENGINEER, A 2 IN. x 4 IN. TREATED WOOD CURB MAY BE SUBSTITUTED FOR THE 2 IN. x 6 IN. CURB AND SET ON TOP OF PAVEMENT SURFACE AND ATTACHED AS DESCRIBED ABOVE. NO SPLICING SHALL BE ALLOWED IN WOOD CURBS. ADJACENT BOARDS SHALL BE BUTTED TOGETHER AND BOLTED AT A POST LOCATION. JOINTS SHALL BE LOCATED AT THE POSTS.

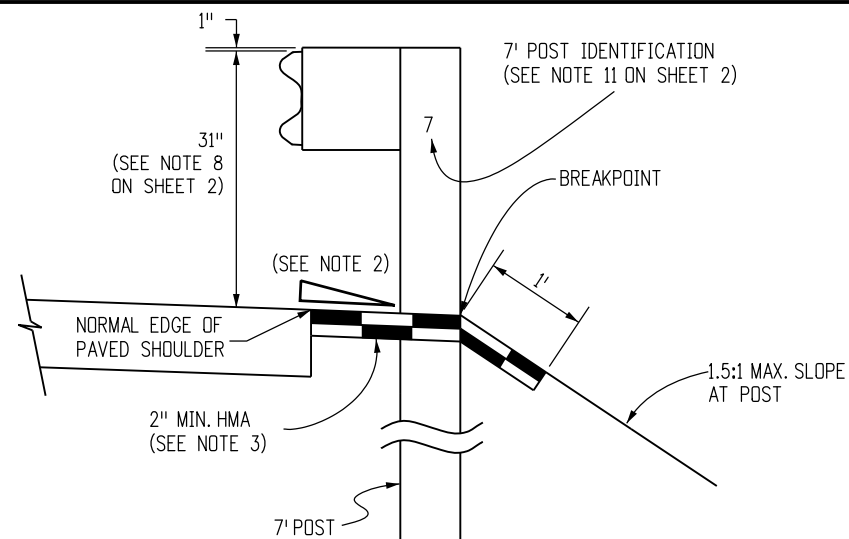


LEAVE-OUT AREA FOR GUARDRAIL POSTS LOCATED IN PAVEMENT

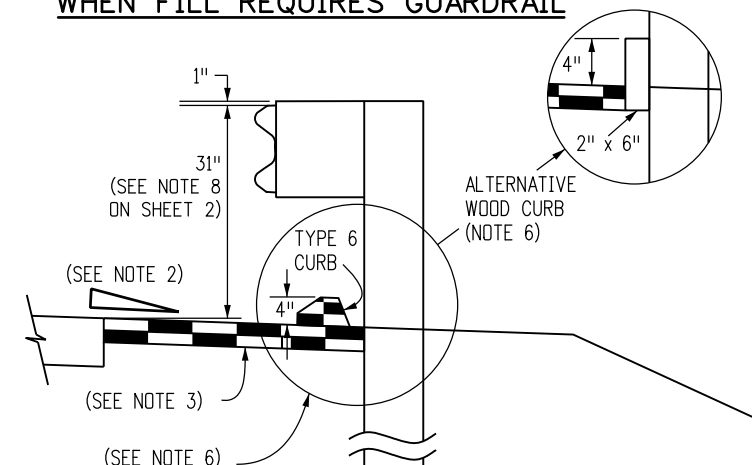
NOTE: LEAVE-OUT AREAS SHALL BE PROVIDED FOR ALL GUARDRAIL POSTS LOCATED IN PAVEMENT* TO ALLOW THE POSTS TO ROTATE IN THEIR EMBEDMENT SUCH THAT VEHICLE IMPACT LOADS ARE DISTRIBUTED THROUGH THE POST INTO THE EMBEDMENT MATERIAL PRIOR TO THE POSTS BREAKING PREMATURELY.



NORMAL ROADSIDE INSTALLATION WHEN FILL REQUIRES GUARDRAIL

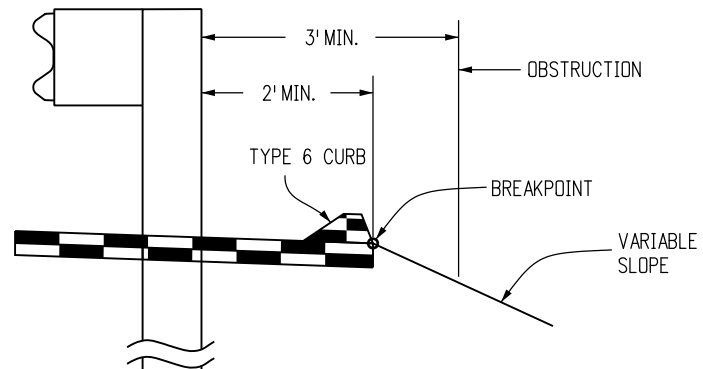


RESTRICTIVE ROADSIDE INSTALLATION WITH 7 FOOT GUARDRAIL POSTS

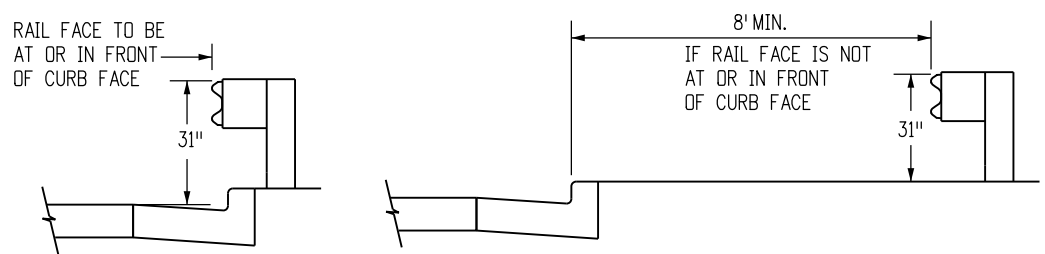


OPTION A

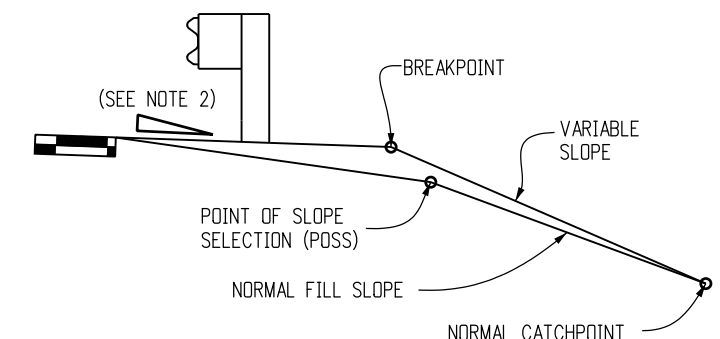
ROADSIDE INSTALLATION WITH EROSION CONTROL CURB



OPTION B



URBAN ROADSIDE INSTALLATION WITH CURB AND GUTTER



EMBANKMENT WITH GUARDRAIL

(NOTE: THE CATCHPOINT REMAINS THE SAME AS THAT FOR "NORMAL" FILL SLOPE. FOR THE WIDER "Z" DISTANCES, THE VARIABLE SLOPE MAY "CATCH" AT THE POSS.)

LOCATION	SPACING
ALL LOCATIONS EXCEPT BRIDGE RAIL LOCATIONS	6'-3"
BRIDGE OR STRUCTURE APPROACH	SEE SHEETS 12 & 20

NORMAL CENTER-TO-CENTER POST SPACING

Computer File Information

Creation Date: 08/19/15	Initials: JBK
Last Modification Date: 02/08/18	Initials: LTA
Full Path: www.codot.gov/business/designsupport	
Drawing File Name: 6010101020.dgn	
CAD Ver.: MicroStation V8	Scale: Not to Scale Units: English

Sheet Revisions

Date	Comments
12/29/15	Raised guardrail heights to 31" and revised general notes and details.
11/29/17	Added the "Leave-Out Area...." detail.
01/18/18	Clarified the Leave-Out area requirement.

Colorado Department of Transportation

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Division of Project Support

JBK/LTA

MIDWEST GUARDRAIL SYSTEM (MGS) TYPE 3 W-BEAM 31 INCHES

Issued By: Project Development Branch July 4, 2012

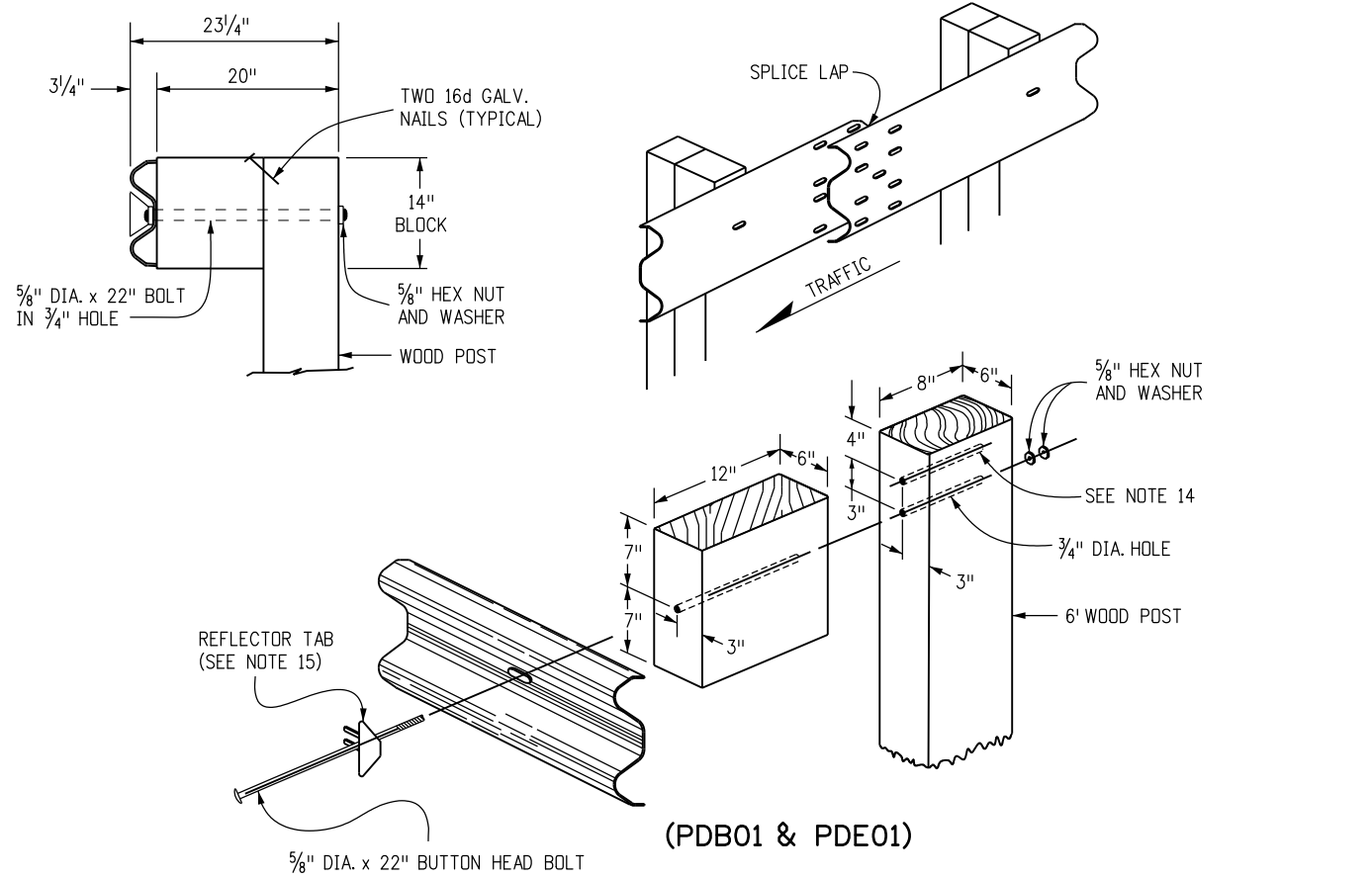
STANDARD PLAN NO.

M-606-1

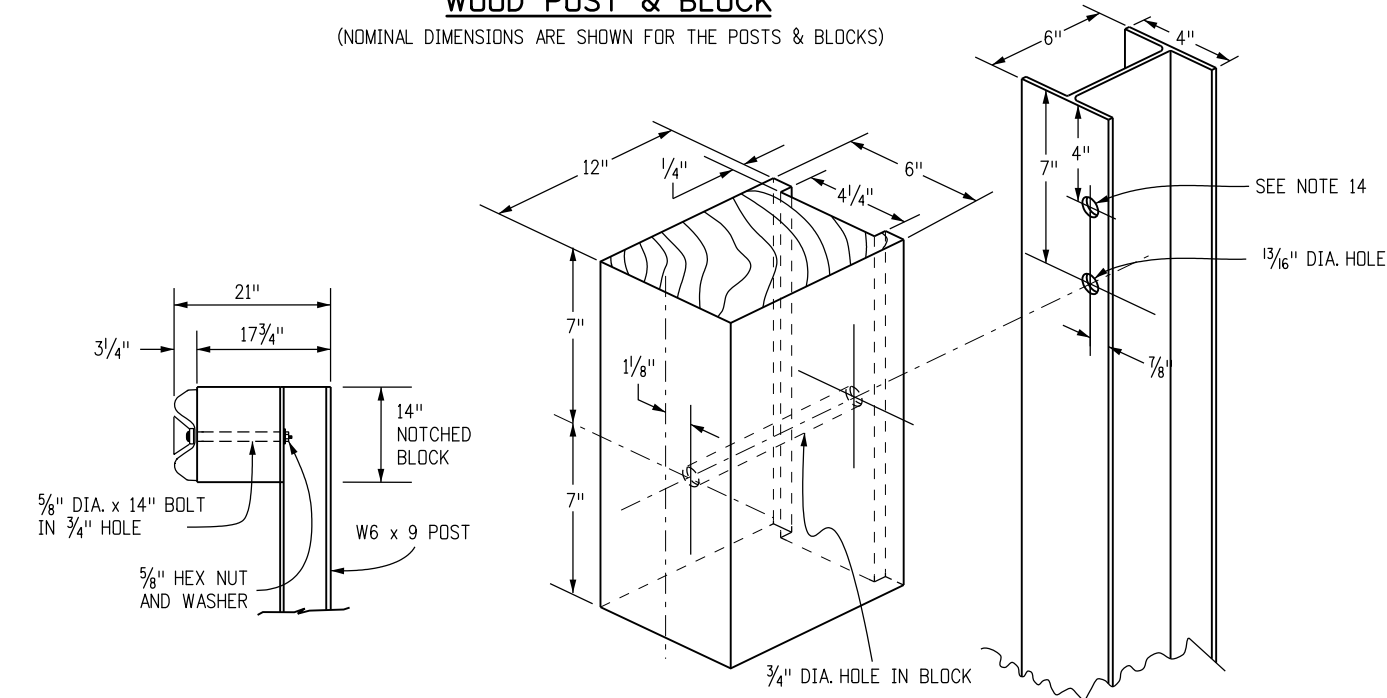
Sheet No. 1 of 20

GENERAL NOTES (CONTINUED FROM SHEET 1)

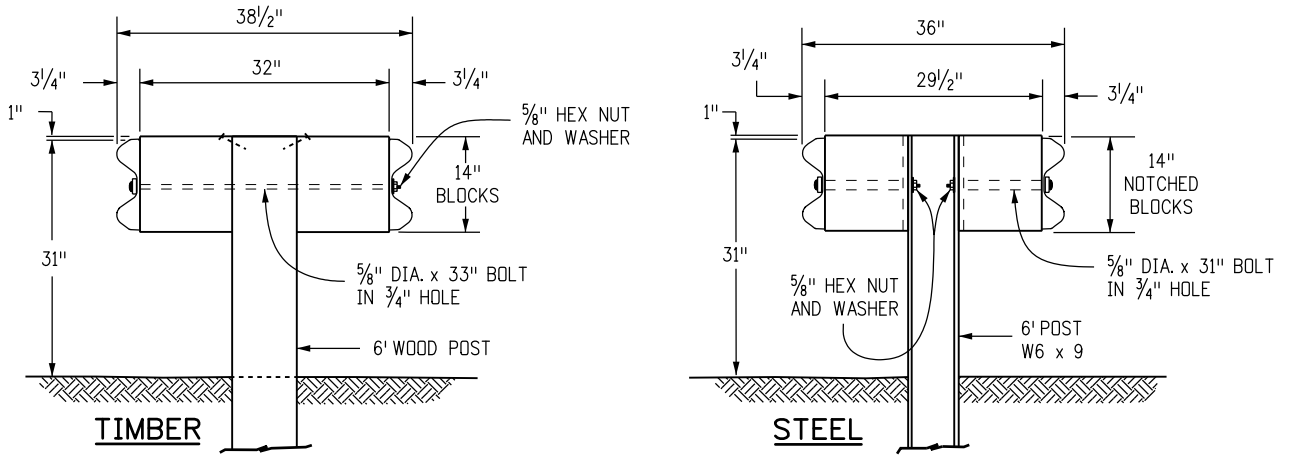
7. SEE SHEETS 7 AND 9 FOR CURB TREATMENTS AT GUARDRAIL TERMINALS.
8. IF THIS DIMENSION WILL BE LESS THAN 28 INCHES, RESET GUARDRAIL HEIGHT TO 28 INCHES OR ABOVE.
9. ALL W-BEAM SPLICES, AND SPLICES OF TERMINAL CONNECTORS TO W-BEAM SHALL BE LAPPED IN THE DIRECTION OF TRAFFIC UNLESS OTHERWISE NOTED.
10. MATERIAL TYPE AND SHAPE OF POSTS AND BLOCKS SHALL BE THE SAME THROUGHOUT THE PROJECT EXCEPT WHEN SPECIFIC POSTS AND BLOCKS ARE SPECIFIED, i.e. AT END ANCHORAGES AND BOX CULVERTS.
11. WHEN SPECIFIED IN THE CONTRACT, 7 FT. POSTS SHALL BE INSTALLED INSTEAD OF THE STANDARD 6 FT. POSTS. THE 7 FT. POSTS SHALL BE MARKED WITH THE NUMBER 7 TO ENSURE PERMANENT IDENTIFICATION. STEEL POSTS SHALL BE STAMPED PRIOR TO GALVANIZING. THE NUMBER 7 SHALL BE A MINIMUM 2 IN. TALL AND LOCATED AS SHOWN ON THE ELEVATION VIEW ON SHEET 1.
12. THE STANDARD 3 IN. X 1 3/4 IN. X 3/16 IN. RECTANGULAR WASHER USED UNDER POST BOLT HEADS IN THE PAST MAY REMAIN IN EXISTING INSTALLATIONS BUT SHALL NOT BE USED IN NEW CONSTRUCTION, REPAIRS, OR RESETTING OF RAIL, EXCEPT WHEN SPECIFICALLY IDENTIFIED ON THE STANDARD PLAN.
13. STANDARD GALVANIZED ROUND STEEL WASHERS SHALL BE USED UNDER ALL NUTS IN CONTACT WITH WOOD POSTS.
14. AN ADDITIONAL HOLE SHALL BE PROVIDED IN THE POSTS TO FACILITATE FUTURE RAISING OF THE RAIL ELEMENTS AND BLOCKS FOR OVERLAYS.
15. RETROREFLECTOR TABS SHALL BE INSTALLED AT 25 FT. INTERVALS (SEE SHEETS 6 AND 8 FOR EXCEPTIONS). RETROREFLECTOR TABS WILL NOT BE PAID FOR SEPARATELY BUT SHALL BE INCLUDED IN THE WORK. THE TABS SHALL BE MOUNTED SO THE BOLT SLOT FACES AWAY FROM TRAFFIC, AND THE RETROREFLECTOR SURFACE FACES THE APPROACHING TRAFFIC FOR ONE-WAY ROADS. FOR TWO-WAY ROADS, BOTH SIDES OF THE TABS SHALL BE RETROREFLECTIVE, SO THAT DELINEATION IS PROVIDED FOR BOTH DIRECTIONS OF TRAVEL. THE RETROREFLECTIVE SHEETING COLOR SHALL MATCH THE COLOR OF THE ADJACENT TRAVEL WAY EDGE LINE. SEE THE RETROREFLECTOR TAB DETAIL ON SHEET 3.
16. AT THE TIME OF INSTALLATION, WOOD POSTS OR BLOCKS WITH SEASONING CHECKS GREATER THAN 1/4 IN. SHALL NOT BE USED WHEN THE CHECK EXTENDS THE FULL LENGTH OF THE PIECE.
17. WOOD BLOCKS SHALL BE CUT FROM THE SAME CROSS-SECTION, SPECIES, AND GRADE, AND SHALL RECEIVE THE SAME PRESERVATIVE TREATMENT AS THE POSTS WHEN WOOD POSTS ARE USED.
18. REFERENCES SUCH AS 00PDB01", 00PDE01", AND 00PWE01" IN THIS STANDARD PLAN SPECIFY HARDWARE DETAILS FROM 00A GUIDE TO STANDARDIZED HIGHWAY BARRIER HARDWARE" PREPARED BY THE AASHTO-AGC-ARTBA JOINT COOPERATIVE COMMITTEE.
19. NOTCHED RAIL BLOCKS MANUFACTURED FROM SYNTHETIC MATERIAL WILL BE ACCEPTED AS ALTERNATIVES TO WOOD NOTCHED BLOCKS FOR USE WITH STEEL POSTS PROVIDED THAT THE BLOCKS HAVE RECEIVED FHWA APPROVAL AND ARE CERTIFIED AS IDENTICAL TO THE SPECIMENS USED FOR TESTING AND APPROVAL.
20. WOOD POSTS SHALL BE MADE OF TIMBER WITH AN EXTREME FIBER STRESS IN BENDING OF 1200 PSI STRESS GRADING AND POST DIMENSIONS SHALL CONFORM WITH THE RULES OF THE WEST COAST INSPECTION BUREAU, OR THE SOUTHERN PINE BUREAU, OR THE WESTERN WOOD PRODUCTS ASSOCIATION. TIMBER FOR POSTS SHALL BE EITHER ROUGH SAWN (UNPLANED) OR S4S (SURFACED FOUR SIDES) WITH NOMINAL DIMENSIONS INDICATED. ONLY ONE TYPE OF SURFACE FINISH SHALL BE USED FOR POSTS AND BLOCKS IN ANY ONE CONTINUOUS LENGTH OF GUARDRAIL.
21. GLULAM POSTS AND BLOCKS WILL BE ACCEPTED AS ALTERNATIVES PROVIDED THAT THE SUPPLIED MATERIALS HAVE RECEIVED FHWA APPROVAL AND ARE CERTIFIED AS IDENTICAL TO THE SPECIMENS USED FOR TESTING AND APPROVAL.
22. PRESSURE TREATMENT OF POSTS AND BLOCKS SHALL CONFORM TO AASHTO M 133 EXCEPT THAT BLOCKS NEED NOT BE INCISED. PRESERVATION ASSAY RETENTION REPORTS SHALL BE SUBMITTED TO THE ENGINEER. THE CONTRACTOR SHALL CERTIFY THAT THE SPECIES AND GRADE MEET THE REQUIREMENTS OF THE CONTRACT.
23. W-BEAM AND THRIE-BEAM GUARDRAIL POSTS SHALL BE MANUFACTURED USING AASHTO M 270 (ASTM A 709) GRADE 36 STEEL UNLESS CORROSION RESISTANT STEEL IS REQUIRED, IN WHICH CASE THE POST SHALL BE MANUFACTURED FROM AASHTO M 270 (ASTM A 709) GRADE 50W STEEL. THE DIMENSIONS OF THE CROSS-SECTION SHALL CONFORM TO A W6 X 9 SECTION AS DEFINED IN AASHTO M 160 (ASTM A 6). W6 X 8.5 WIDE FLANGE STEEL POSTS ARE AN ACCEPTABLE ALTERNATIVE TO THE W6 X 9.
24. AFTER THE SECTION IS CUT AND ALL HOLES ARE DRILLED OR PUNCHED THE COMPONENT SHALL BE ZINC-COATED CONFORMING TO AASHTO M 111 (ASTM A 123) UNLESS CORROSION-RESISTANT STEEL IS USED. WHEN CORROSION-RESISTANT STEEL IS USED THE PORTION OF THE POST TO BE EMBEDDED IN SOIL SHALL BE ZINC-COATED CONFORMING TO AASHTO M 111 (ASTM A 123) AND THE PORTION ABOVE THE SOIL SHALL NOT BE ZINC-COATED, PAINTED OR OTHERWISE TREATED.
25. FIELD MODIFICATION TO RAIL ELEMENTS ONLY IS ALLOWED BY SAWING AND DRILLING OF HOLES. FLAME CUTTING IS NOT PERMITTED. POSTS SHALL NOT BE MODIFIED. COMPONENTS ON WHICH THE SPELTER COATING HAS BEEN DAMAGED SHALL BE EITHER REGALVANIZED OR RECOATED IN CONFORMANCE WITH AASHTO M 36, OR PAINTED WITH ONE FULL BRUSH COAT OF ZINC RICH PAINT CONFORMING TO MILITARY SPECIFICATION DOD-P-21035A.



WOOD POST & BLOCK
(NOMINAL DIMENSIONS ARE SHOWN FOR THE POSTS & BLOCKS)

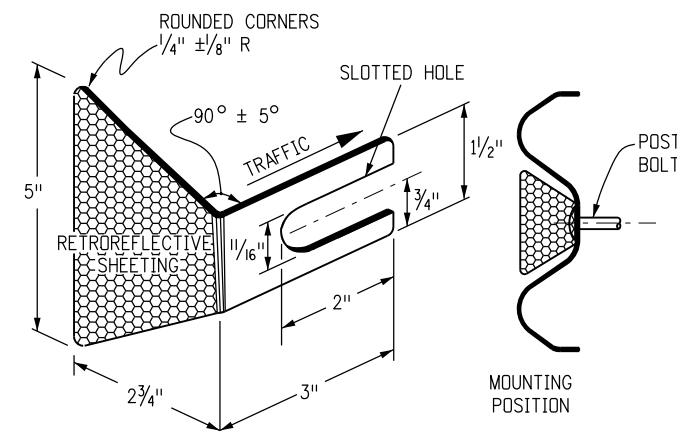
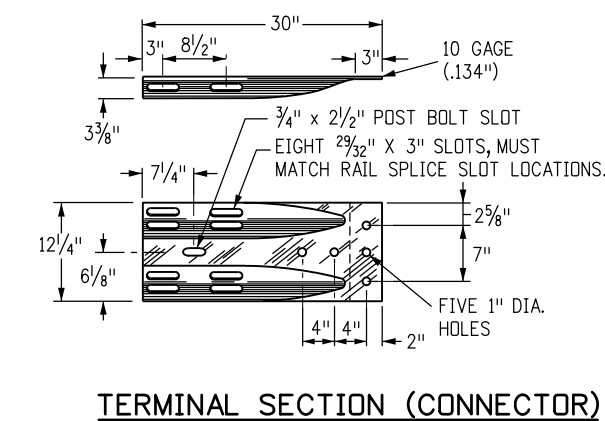
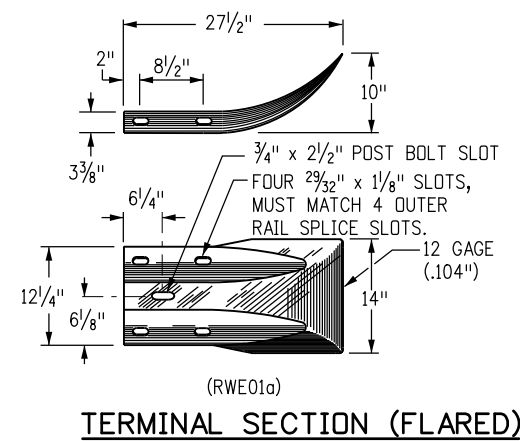


STEEL POST & NOTCHED BLOCK
(NOMINAL DIMENSIONS ARE SHOWN FOR THE POSTS & BLOCKS)

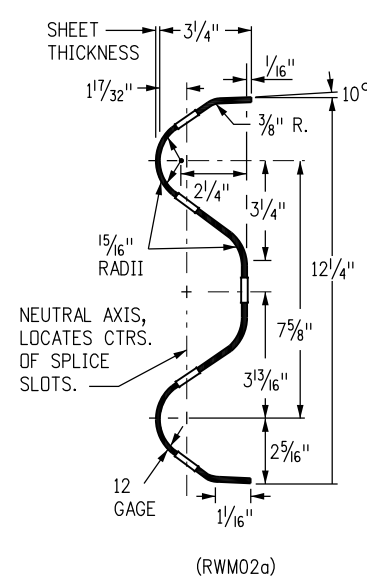


DOUBLE BLOCK AND GUARDRAIL TYPE 3 (DOUBLE) FOR MEDIAN BARRIER

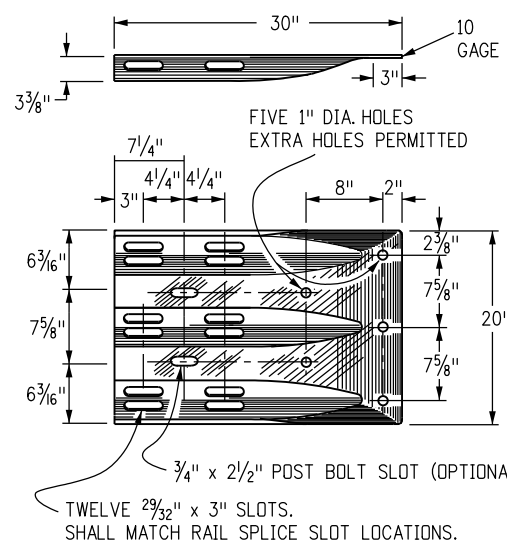
Computer File Information		Sheet Revisions		Colorado Department of Transportation  4201 East Arkansas Avenue CDOT HQ, 4th Floor Denver, CO 80222 Phone: 303-757-9021 FAX: 303-757-9868 Division of Project Support JBK/LTA	MIDWEST GUARDRAIL SYSTEM (MGS) TYPE 3 W-BEAM 31 INCHES Issued By: Project Development Branch July 4, 2012	STANDARD PLAN NO. M-606-1 Sheet No. 2 of 20
Creation Date: 08/19/15	Initials: JBK	Date:	Comments			
Last Modification Date: 02/08/18	Initials: LTA	12/29/15	Raised guardrail height to 31". Increased offset blocks to 12". Renumbered Gen Notes.			
Full Path: www.codot.gov/business/designsupport	(R-X)					
Drawing File Name: 6060102020.dgn	(R-X)					
CAD Ver.: MicroStation V8	Scale: Not to Scale	Units: English	(R-X)			



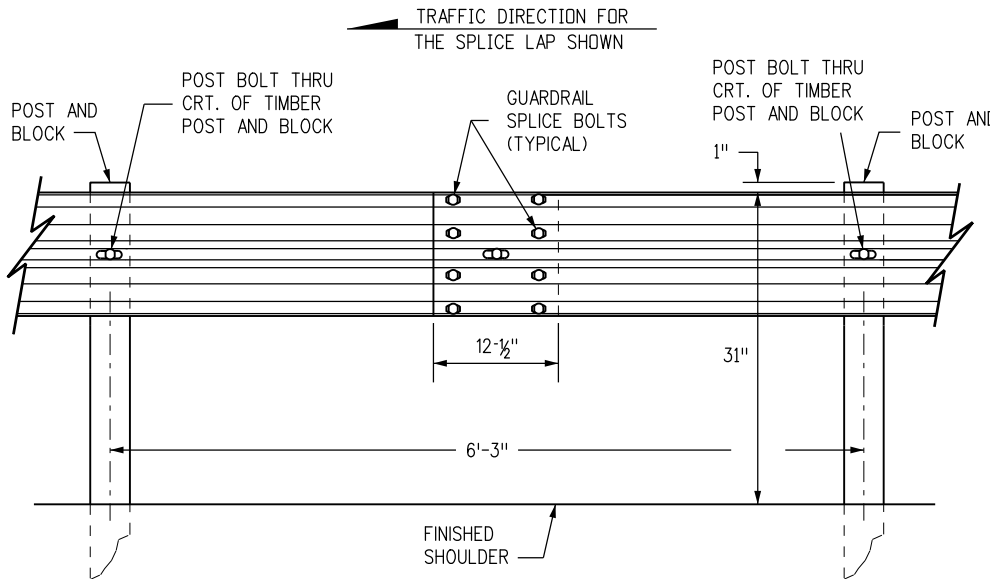
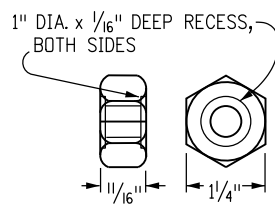
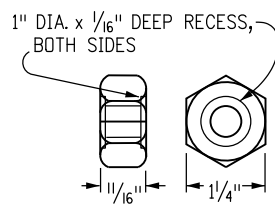
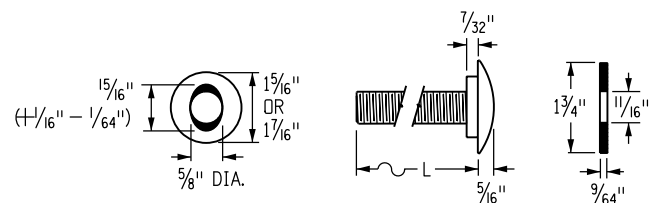
NOTE: RETROREFLECTOR TABS SHALL BE MANUFACTURED FROM 12 TO 14 GAUGE STEEL AND SHALL CONFORM TO THE REQUIREMENTS OF S STANDARD S-612-1.



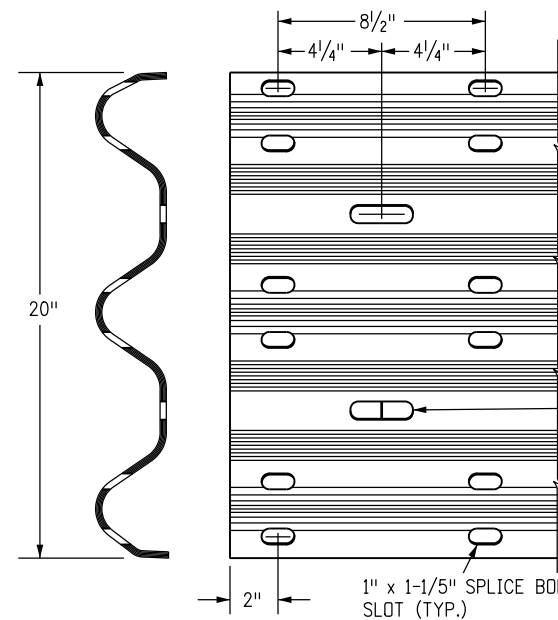
W-BEAM RAIL SECTION



THRIE BEAM TERMINAL SECTION (CONNECTOR)



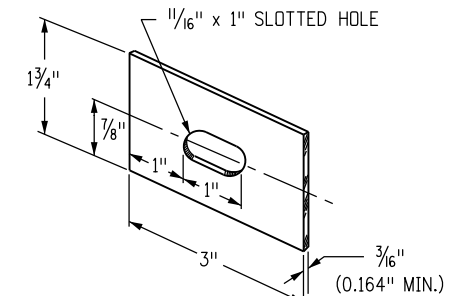
W-BEAM RAIL SPLICE



THRIE BEAM DETAIL

PART	MATERIAL SPEC.	GALVANIZING SPEC.	CORROSION-RESISTANT SPEC.
W-BEAM RAIL & TERMINAL SECTIONS	AASHTO M 180, CLASS A OR B	AASHTO M 180, TYPE 1 OR 2	AASHTO M 180, TYPE 4
BASE PLATE	ASTM A 36	AASHTO M 111	N.A.
NUTS, BOLTS & STUDS FOR GENERAL USE	ASTM A 307		
HIGH STRENGTH BOLTS & NUTS	ASTM A 325		AASHTO M 232, CLASS C
HIGH STRENGTH STUDS & NUTS	ASTM A 449		OR
ROUND STEEL WASHERS	ASTM F 436		ASTM B 695 CLASS 50 TYPE 1
RECTANGULAR WASHERS	AASHTO M 180		
OTHER FITTINGS	ASTM A 36	AASHTO M 111	

THE TABULATION OF GUARDRAIL WILL SPECIFY THE TYPE OF CORROSION PROTECTION: GALVANIZED OR CORROSION - RESISTANT STEEL.
STEEL POSTS SHALL HAVE THE SAME CORROSION PROTECTION AS SPECIFIED FOR THE METAL BEAM RAIL. PUNCHING, DRILLING, CUTTING, OR WELDING OF POSTS WILL NOT BE PERMITTED AFTER GALVANIZING.



RECTANGULAR WASHER
(TO BE USED ONLY WHERE SPECIFIED.)

DIAMETER & TYPE (INCHES)	12" BLOCKS L = LENGTH (INCHES)	THREAD LENGTH (INCHES)	INTENDED USE	AASHTO-AGC-ARTBA STANDARD NUMBER	NO. BOLTS, NUTS & WASHERS
5/8	1/4	FULL (1 1/32)	ALL RAIL SPLICES	FBB01	8 PER SPLICE*
BUTTONHEAD OVAL SHLDR.	22	MIN. 2 1/2	SINGLE BLOCK & POST (TIMBER)	FBB04	1 PER POST
	33	MIN. 2	DOUBLE BLOCK & POST (TIMBER)	FBB05	1 PER POST
	14	MIN. 2	FASTEN NOTCHED BLOCK TO STEEL POST	FBB03	1 PER BLOCK

WASHERS NOT USED AT RAIL SPLICES

Computer File Information

Creation Date: 08/19/15 Initials: JBK
Last Modification Date: 02/08/18 Initials: LTA
Full Path: www.codot.gov/business/designsupport
Drawing File Name: 6060103020.dgn
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English

Sheet Revisions

Date:	Comments
12/29/15	Raised guardrail heights to 31" and changed splice to between posts.

Colorado Department of Transportation

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Division of Project Support **JBK/LTA**

**MIDWEST
GUARDRAIL SYSTEM (MGS)
TYPE 3 W-BEAM 31 INCHES**

Issued By: Project Development Branch July 4, 2012

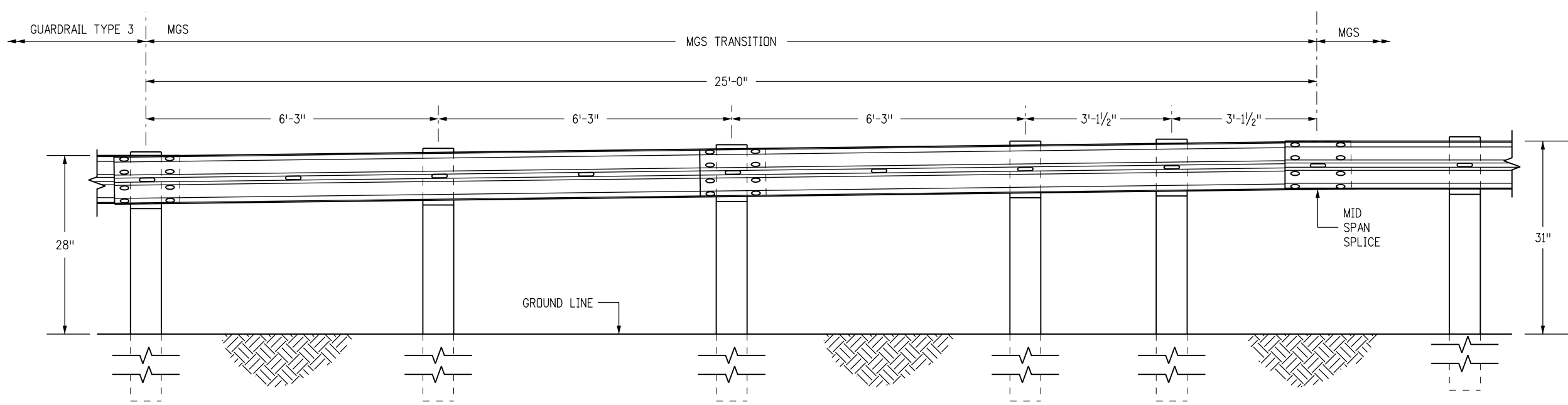
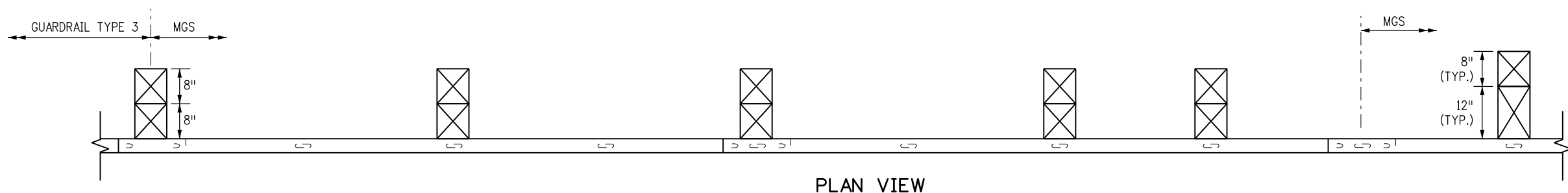
STANDARD PLAN NO.

M-606-1

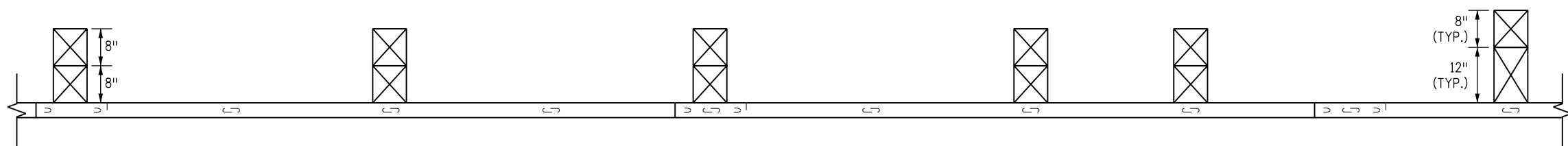
Sheet No. 3 of 20

NOTES

1. THE MGS TRANSITION FROM A TYPE 3 GUARDRAIL SHALL BE COMPLETED OUTSIDE THE MGS END ANCHORAGE LIMITS.



TRANSITION FROM 28 INCH GUARDRAIL TO 31 INCH MGS



Computer File Information	
Creation Date: 08/19/15	Initials: JBK
Last Modification Date: 02/08/18	Initials: LTA
Full Path: www.codot.gov/business/designsupport	
Drawing File Name: 6060104020.dgn	
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	

Sheet Revisions	
Date:	Comments
11/29/17	Added this sheet.

Colorado Department of Transportation



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Division of Project Support **JBK/LTA**

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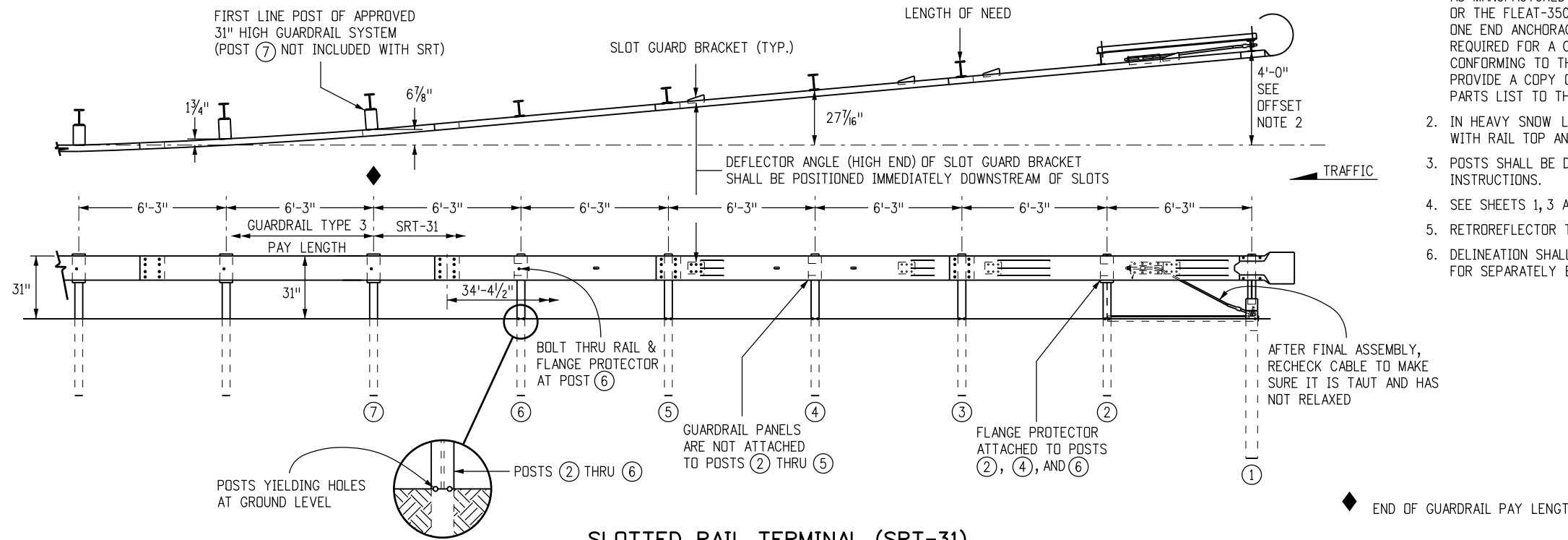
STANDARD PLAN NO.
M-606-1
Sheet No. 4 of 20

OFFSET NOTES

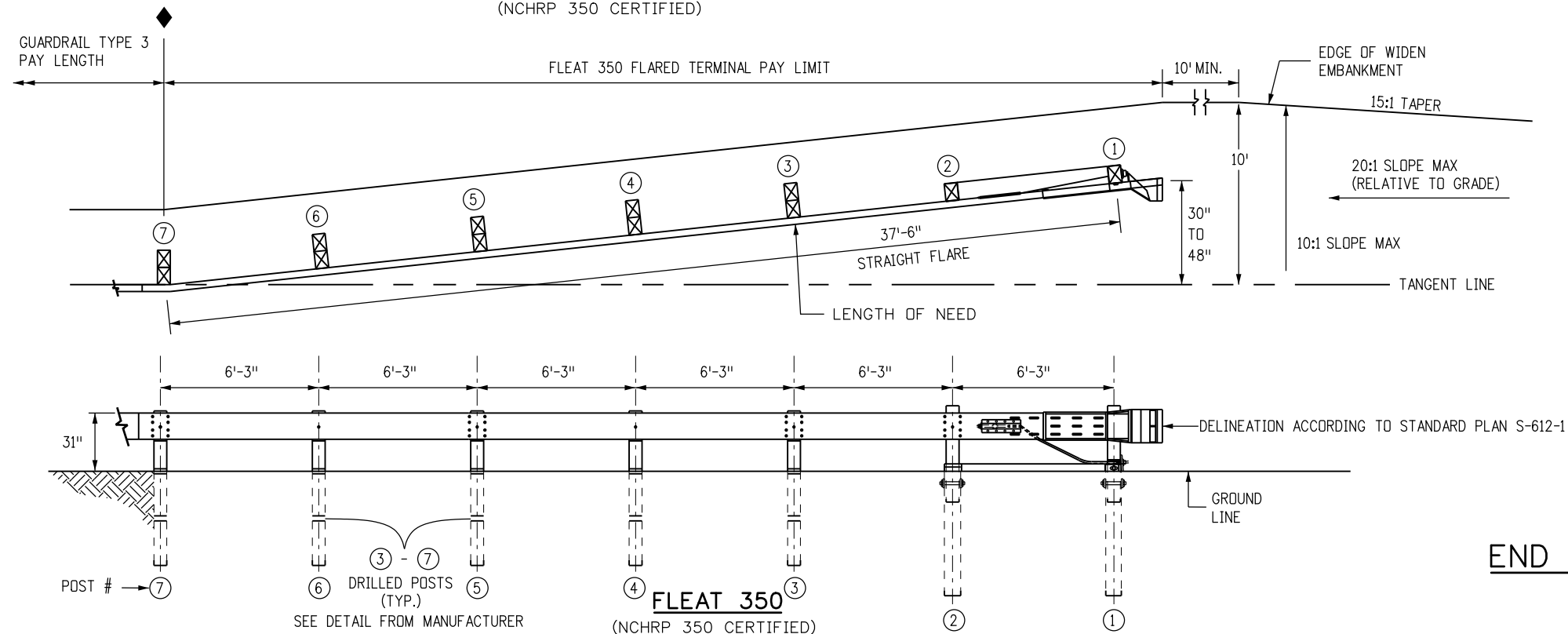
1. POST OFFSET DIMENSIONS ARE GIVEN TO THE CENTER OF THE TRAFFIC FACE OF POSTS.
2. THE GUARDRAIL BETWEEN POST ① THRU ⑦ IS ON A STRAIGHT LINE FLARE.

NOTES


1. THE END ANCHORAGES (FLARED) SHALL EITHER BE THE SLOTTED RAIL TERMINAL SRT-31 AS MANUFACTURED BY TRINITY HIGHWAY PRODUCTS LLC (TELEPHONE #: 800-772-7976), OR THE FLEAT-350, AS MANUFACTURED BY ROAD SYSTEMS INC. (TELEPHONE #: 432-263-2435). ONE END ANCHORAGE (FLARED) SHALL INCLUDE ALL POST, RAIL, AND ALL HARDWARE ITEMS REQUIRED FOR A COMPLETE UNIT. THE END ANCHORAGE (FLARES) SHALL BE INSTALLED CONFORMING TO THE MANUFACTURER'S RECOMMENDATIONS. THE CONTRACTOR SHALL PROVIDE A COPY OF THE MANUFACTURER'S INSTALLATION INSTRUCTIONS AND PARTS LIST TO THE ENGINEER PRIOR TO INSTALLATION OF THE DEVICE.
2. IN HEAVY SNOW LOCATIONS, TRIM POSTS ① AND ② (IF THEY ARE WOODEN) FLUSH WITH RAIL TOP AND TREAT END WITH SEALANT, IN CONFORMANCE WITH AASHTO M 133.
3. POSTS SHALL BE DRILLED FOR BREAKAWAY ACCORDING TO THE MANUFACTURER'S INSTRUCTIONS.
4. SEE SHEETS 1, 3 AND 5 FOR STANDARD GUARDRAIL TYPE 3 AND INSTALLATION DETAILS.
5. RETROREFLECTOR TABS SHALL NOT BE USED ON END ANCHORAGE POSTS.
6. DELINEATION SHALL BE APPLIED TO THE END PIECE, AND SHALL NOT BE PAID FOR SEPARATELY BUT SHALL BE INCLUDED IN THE WORK.

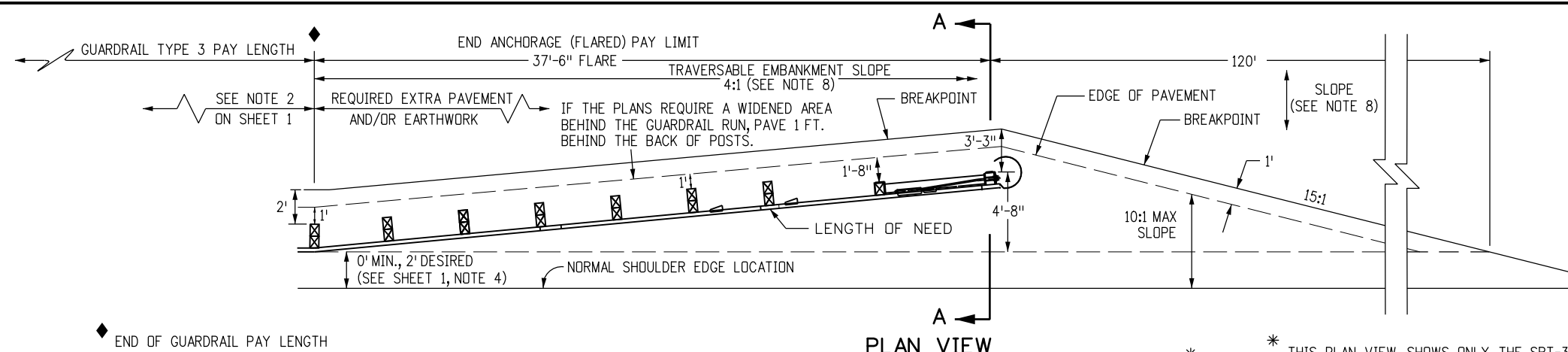


SLOTTED RAIL TERMINAL (SRT-31)
(NCHRP 350 CERTIFIED)



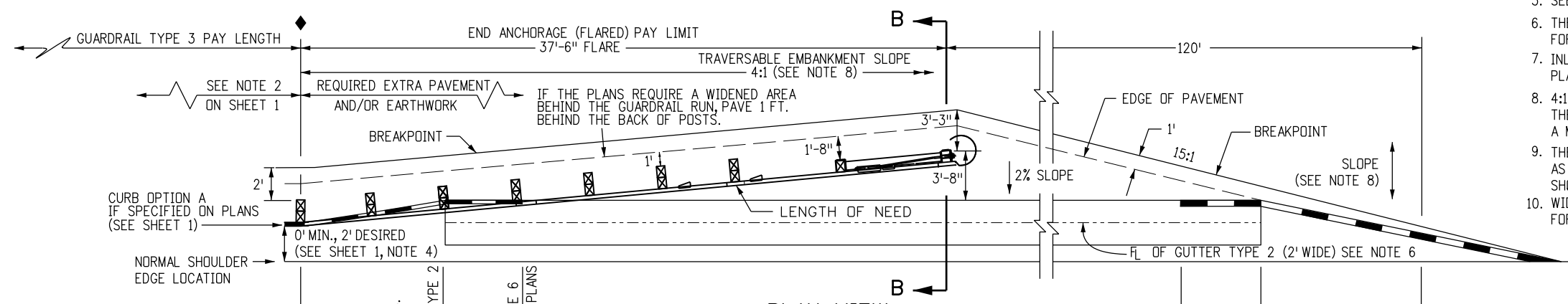
END ANCHORAGES (FLARED)

Computer File Information Creation Date: 08/19/15 Initials: JBK Last Modification Date: 02/08/18 Initials: LTA Full Path: www.codot.gov/business/designsupport Drawing File Name: 6060106020.dgn CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English		Sheet Revisions <table border="1"> <tr> <th>Date:</th> <th>Comments</th> </tr> <tr> <td>12/29/15</td> <td>New SRT End Anchorages 31" high.</td> </tr> <tr> <td>11/29/17</td> <td>Deleted the SRT M10 and added the FLEAT-350 to this sheet. Revised the General Notes.</td> </tr> </table>		Date:	Comments	12/29/15	New SRT End Anchorages 31" high.	11/29/17	Deleted the SRT M10 and added the FLEAT-350 to this sheet. Revised the General Notes.	Colorado Department of Transportation  4201 East Arkansas Avenue CDOT HQ, 4th Floor Denver, CO 80222 Phone: 303-757-9021 FAX: 303-757-9868 Division of Project Support JBK/LTA		MIDWEST GUARDRAIL SYSTEM (MGS) TYPE 3 W-BEAM 31 INCHES Issued By: Project Development Branch July 4, 2012		STANDARD PLAN NO. M-606-1 Sheet No. 6 of 20	
Date:	Comments														
12/29/15	New SRT End Anchorages 31" high.														
11/29/17	Deleted the SRT M10 and added the FLEAT-350 to this sheet. Revised the General Notes.														

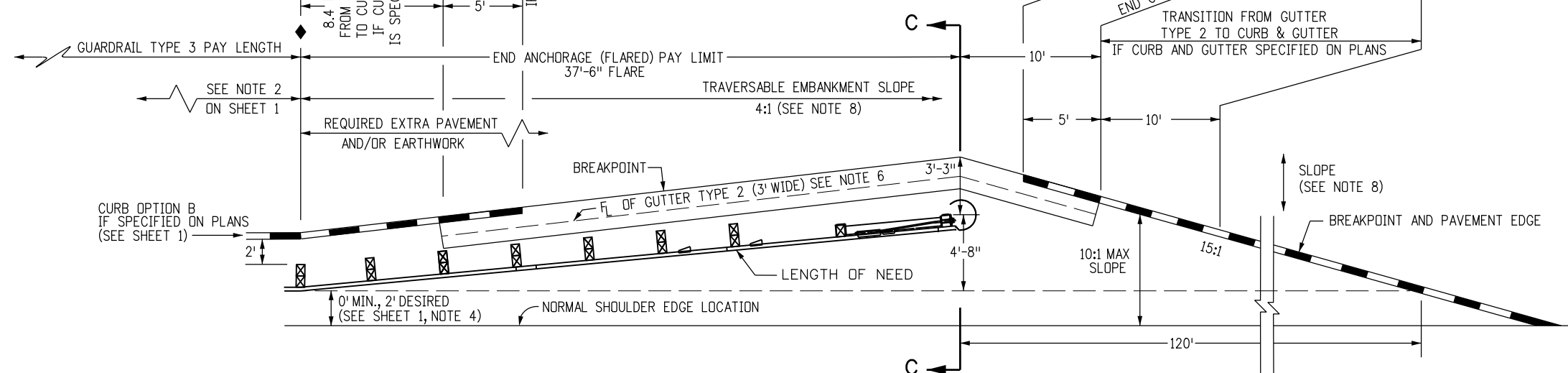


**PLAN VIEW
WIDENING FOR END ANCHORAGE (FLARED)***

* THIS PLAN VIEW SHOWS ONLY THE SRT-31. THE FLEAT-350 USES THE SAME WIDENING DETAILS.

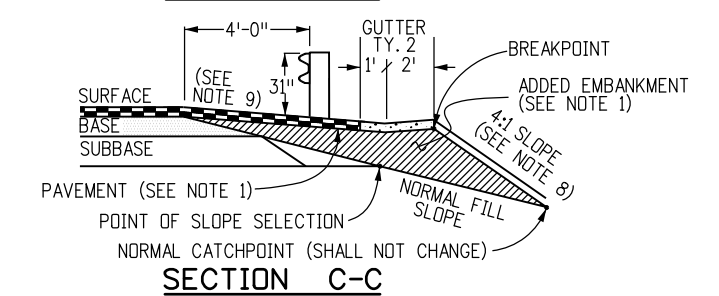
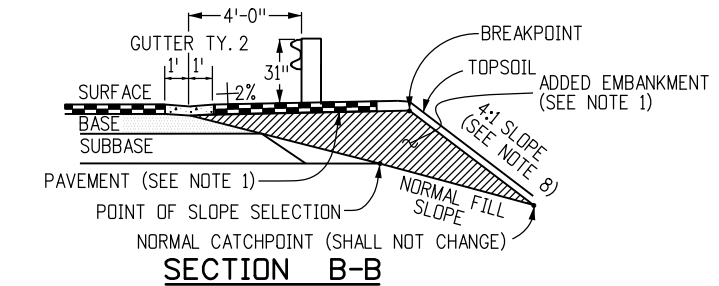
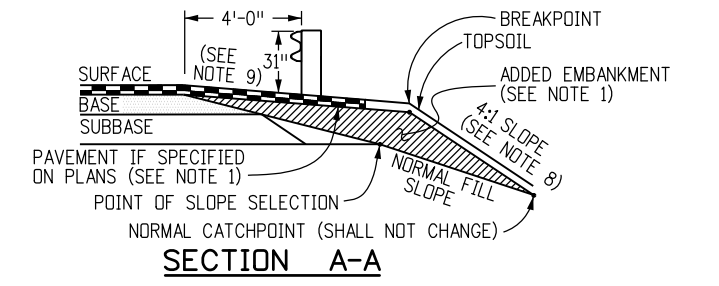


**PLAN VIEW
WIDENING FOR END ANCHORAGE (FLARED)
WITH CURB OPTION A***



**PLAN VIEW
WIDENING FOR END ANCHORAGE (FLARED) WITH CURB OPTION B***

- NOTES**
- PAYMENT FOR THE ADDED EMBANKMENT (APPROXIMATELY 45 CU. YDS.) FOR THE FLARE SHALL BE AS FOLLOWS:
 - A. UNDER PAY ITEM 203 WHEN THE CONTRACT PLAN INCLUDES PAY ITEM 203
 - B. INCLUDED IN THE COST OF THE END ANCHORAGE (FLARED) WHEN THE CONTRACT PLANS DO NOT INCLUDE PAY ITEM 203. THE ADDED EMBANKMENT SHALL BE CONSTRUCTED IN ACCORDANCE WITH SUBSECTION 203.07, AASHTO T 99.
 - WHEN THE WIDENED AREA IS PAVED, PAYMENT FOR THE PAVEMENT (APPROX. 70 SQ. YDS.) SHALL BE AS FOLLOWS:
 - A. UNDER PAY ITEM 403 OR 412 WHEN THE CONTRACT PLAN INCLUDES PAY ITEM 403 OR 412
 - B. INCLUDED IN THE COST OF THE END ANCHORAGE (FLARED) WHEN THE CONTRACT PLAN DOES NOT INCLUDE PAY ITEM 403 OR 412 (SEE SHEET 1, NOTE 2 FOR PAVEMENT TYPES)
 - CONCRETE PAVED AREAS SHALL HAVE THEIR TAPERED ENDS SQUARED OFF AS DIRECTED BY THE ENGINEER.
 - WHEN OVERLAY PAVING, THE FINISHED SURFACE AT EACH POST SHALL NOT BE ABOVE THE TOP BREAKAWAY HOLE OR STRUT ASSEMBLY. THE WIDENED AREA AT THE FLARED END ANCHORAGE SHOULD NOT BE OVERLAYED UNLESS PAVEMENT CONDITIONS WARRANT IT BEING OVERLAYED. ANY OVERLAY PAVEMENT ABUTTING THE FLARED END ANCHORAGE SHALL BE TAPERED TO PREVENT A DROP IN THE PAVED SURFACE BELOW THE RAIL.
 - SEE SHEETS 1, 2, 3, AND 5 FOR STANDARD TYPE 3 GUARDRAIL INSTALLATION DETAILS.
 - THE COST OF THE GUTTER WILL BE PAID FOR AS "GUTTER TYPE 2 (2 FT.)" FOR A LENGTH OF 134 FT. OR "GUTTER TY. 2 (3 FT.)" FOR A LENGTH OF 40 FT.
 - INLETS OR RUNDOWNS MAY BE USED INSTEAD OF THE GUTTER IF SPECIFIED ON THE PLANS. NO ADDITIONAL CURB SHALL BE ADDED IN THE VICINITY OF THE END ANCHORAGE.
 - 4:1 OR FLATTER SLOPES IN THE TRAVERSABLE AREA SHALL BE USED BEHIND THE END ANCHORAGE, AND IN ADVANCE OF POST (1). IF THIS IS NOT POSSIBLE, A MINIMUM 3:1 SLOPE MAY BE USED IF APPROVED BY THE ENGINEER.
 - THE WIDENED AREA, EXCEPT FOR CURB OPTION A, SHALL HAVE THE SAME GRADING AS THE ADJACENT GUARDRAIL: 10:1 OR FLATTER IF MORE THAN 2 FT. FROM SHOULDER OR SLOPE EQUAL TO ROADWAY SLOPE IF 2 FT. OR LESS FROM SHOULDER.
 - WIDENING FOR END ANCHORAGES SHALL BE PAVED ON INTERSTATES AND FREEWAYS. FOR OTHER HIGHWAYS, PAVING SHALL BE AS SHOWN ON THE PLANS.



Computer File Information

Creation Date: 08/19/15	Initials: JBK
Last Modification Date: 02/08/18	Initials: LTA
Full Path: www.codot.gov/business/designsupport	
Drawing File Name: 6060107020.dgn	
CAD Ver.: MicroStation V8	Scale: Not to Scale Units: English

Sheet Revisions

Date:	Comments
12/29/15	Raised guardrail height to 31".

Colorado Department of Transportation

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Division of Project Support **JBK/LTA**

**MIDWEST
 GUARDRAIL SYSTEM (MGS)
 TYPE 3 W-BEAM 31 INCHES**

Issued By: Project Development Branch July 4, 2012

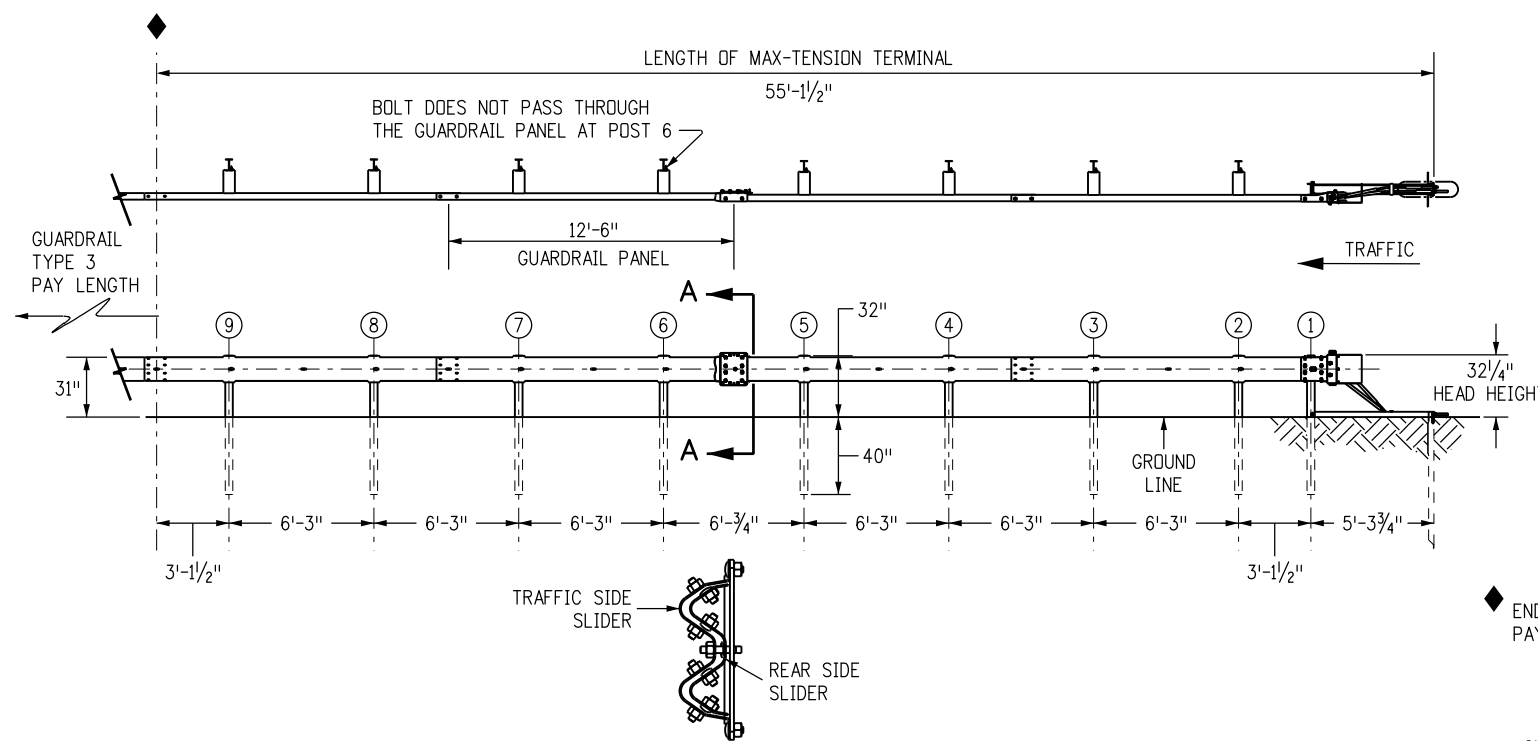
STANDARD PLAN NO.

M-606-1

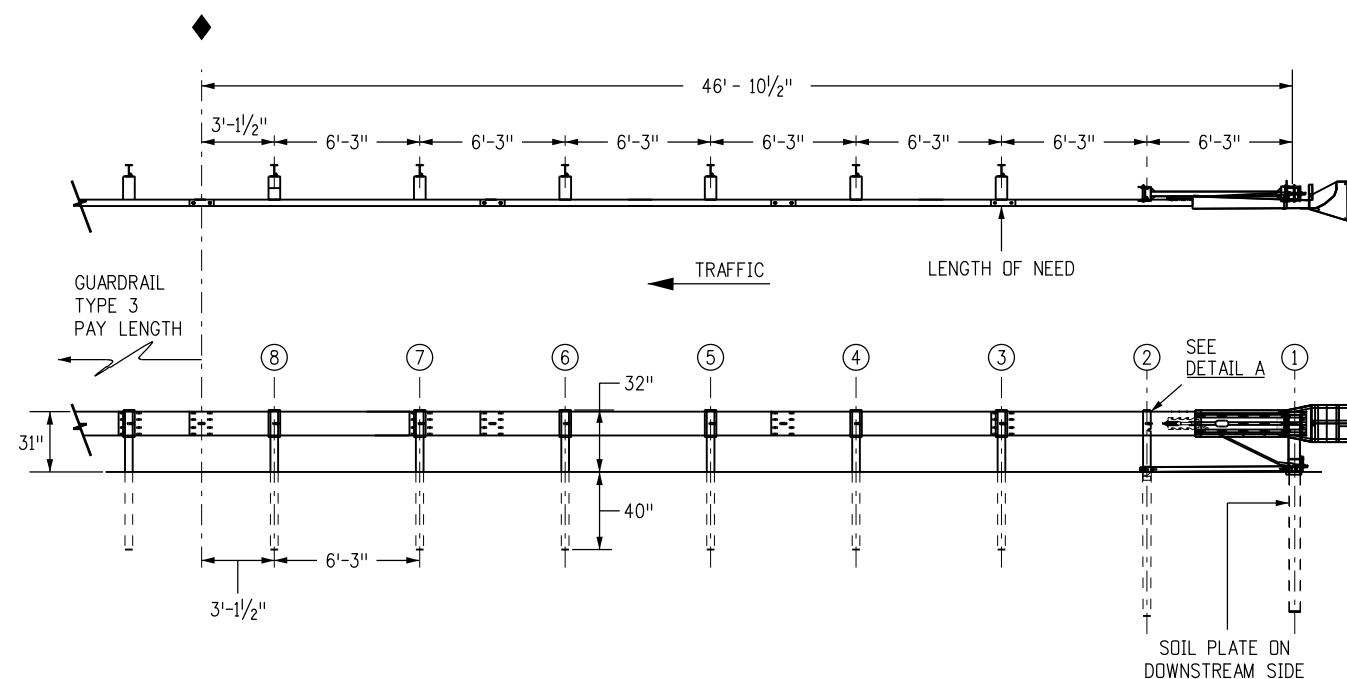
Sheet No. 7 of 20

NOTES FOR NONFLARED

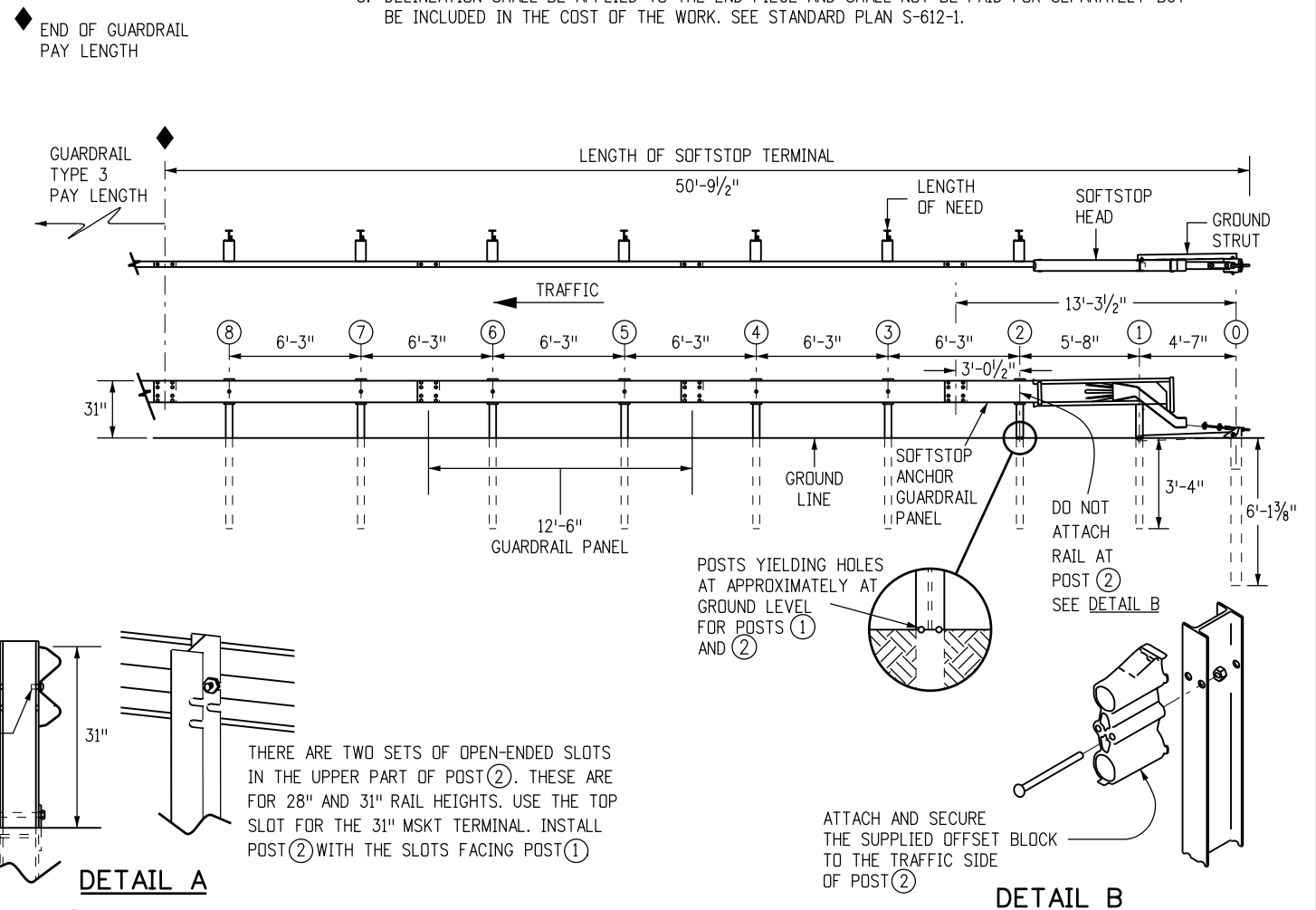
1. THE END ANCHORAGE (NONFLARED) SHALL EITHER BE THE SOFTSTOP AS MANUFACTURED BY TRINITY INDUSTRIES, INC. (TEL. #: 800-772-7976), OR THE MAX-TENSION AS MANUFACTURED BY LINDSAY TRANSPORTATION SOLUTIONS (TEL. #: 402-829-6800), OR THE MSKT AS MANUFACTURED BY ROAD SYSTEMS, INC. (TEL. #: 432-263-2435). THE END ANCHORAGE (NONFLARED) SHALL INCLUDE ALL POST, RAIL, AND HARDWARE ITEMS REQUIRED FOR A COMPLETE UNIT. THE END ANCHORAGE (NONFLARED) SHALL BE INSTALLED CONFORMING TO THE MANUFACTURER'S RECOMMENDATIONS. THE CONTRACTOR SHALL PROVIDE A COPY OF THE MANUFACTURER'S INSTALLATION INSTRUCTIONS AND PARTS LIST TO THE ENGINEER PRIOR TO THE INSTALLATION OF THE DEVICE.
2. DO NOT ATTACH THESE END ANCHORAGES DIRECTLY TO A RIGID BARRIER (EX. CONCRETE BARRIER, STEEL BARRIER, CONCRETE STRUCTURE) WITHOUT A PROPER TRANSITION.
3. CONNECTIONS TO W-BEAMS WHERE THE SPLICE IS NOT AT MID-SPAN BUT AT A POST CAN BE MADE USING A 3'-1/2", 9'-4 1/2", OR 15'-7 1/2" W-BEAM PANEL DOWNSTREAM OF TRAFFIC.
4. FOR MSKT END ANCHORAGES (NONFLARED), USE THE MANUFACTURER'S SPECIFIED STEEL FOUNDATION TUBES FOR POSTS ① AND ②.
5. HINGED BREAK AWAY (HBA) STEEL POSTS MAY BE USED CONFORMING TO THE MANUFACTURER'S INSTRUCTIONS.
6. RETROREFLECTOR TABS SHALL NOT BE USED ON END ANCHORAGE POSTS.
7. DELINEATION SHALL BE APPLIED TO THE END PIECE AND SHALL NOT BE PAID FOR SEPARATELY BUT BE INCLUDED IN THE COST OF THE WORK. SEE STANDARD PLAN S-612-1.



SECTION A-A
MAX-TENSION TERMINAL END ANCHORAGE (NONFLARED)
(MASH CERTIFIED)



MSKT TERMINAL END ANCHORAGE (NONFLARED)
(MASH CERTIFIED)



SOFTSTOP TERMINAL END ANCHORAGE (NONFLARED)
(MASH CERTIFIED)

END ANCHORAGES (NONFLARED)

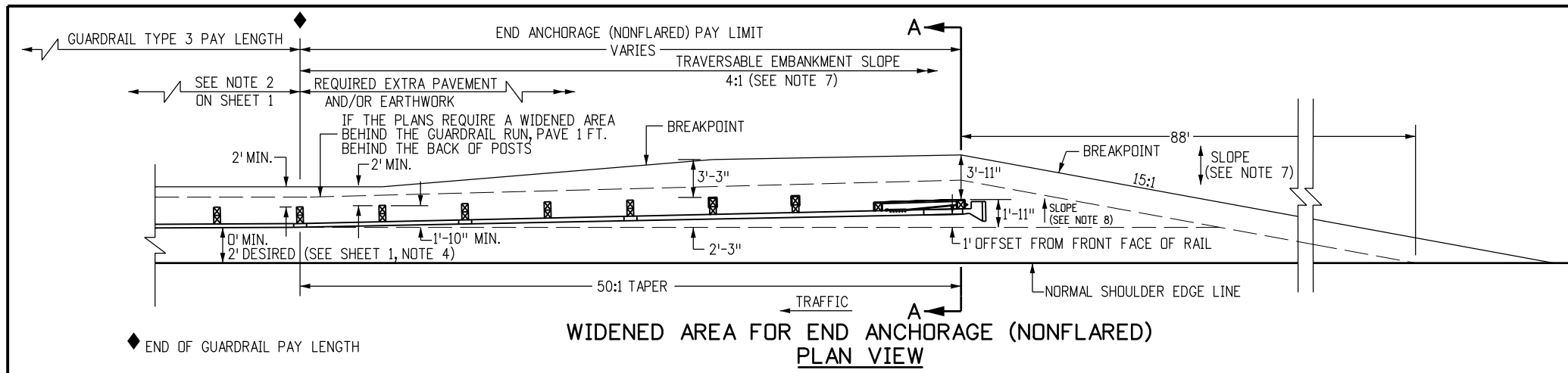
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Last Modification Date: 02/08/18	Initials: LTA
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Drawing File Name: 60600108020.dgn	
CAD Ver.: MicroStation V8	Scale: Not to Scale Units: English

Sheet Revisions	
Date:	Comments
11/29/17	Deleted the SKT and X-LITE and added the MAX-TENSION and MSKT.
(R-X)	
(R-X)	
(R-X)	
(R-X)	

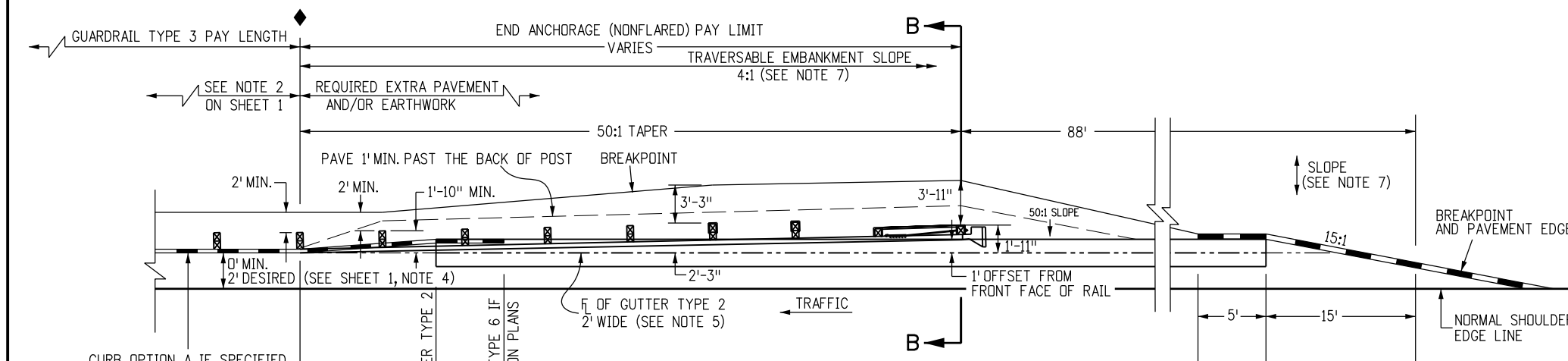
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 Division of Project Support JBK/LTA

MIDWEST
GUARDRAIL SYSTEM (MGS)
TYPE 3 W-BEAM 31 INCHES
 Issued By: Project Development Branch July 4, 2012

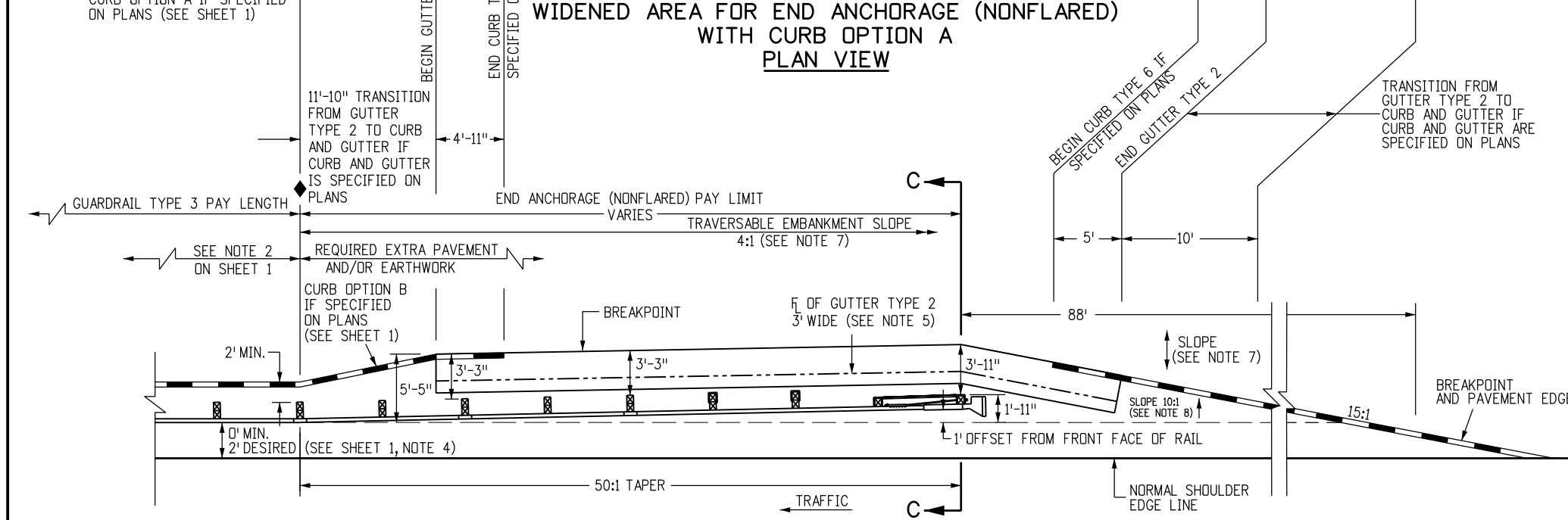
STANDARD PLAN NO.
M-606-1
 Sheet No. 8 of 20



**WIDENED AREA FOR END ANCHORAGE (NONFLARED)
PLAN VIEW**

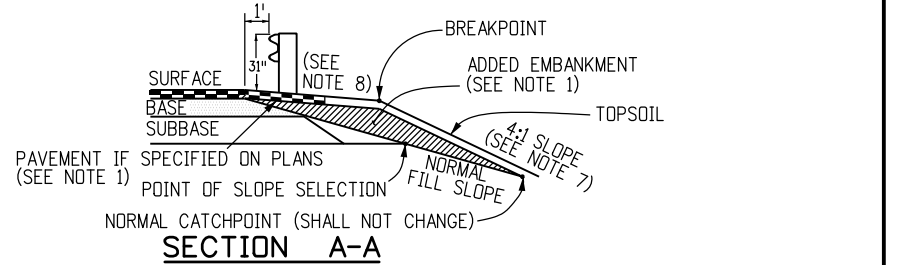


**WIDENED AREA FOR END ANCHORAGE (NONFLARED)
WITH CURB OPTION A
PLAN VIEW**

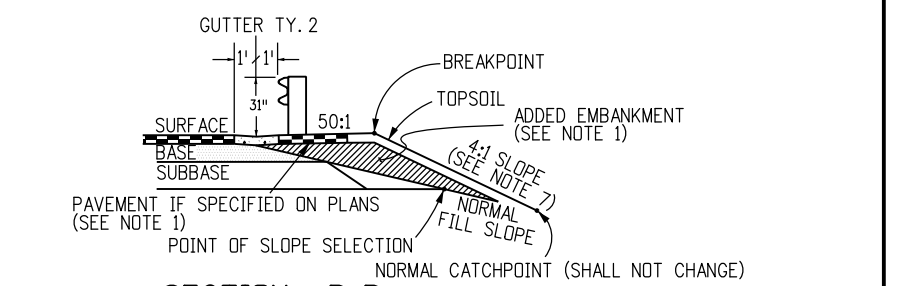


**WIDENED AREA FOR END ANCHORAGE (NONFLARED) WITH CURB OPTION B
PLAN VIEW**

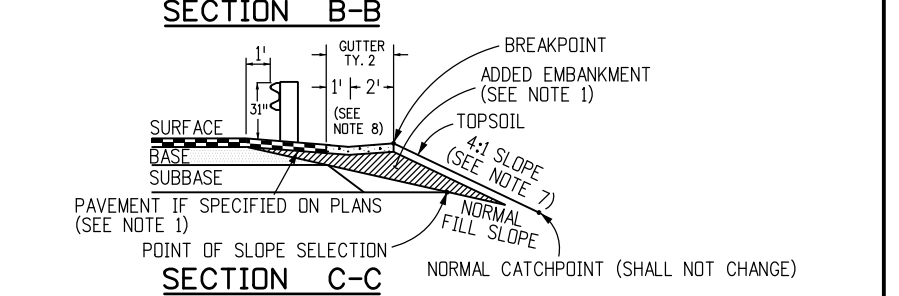
- NOTES**
- PAYMENT FOR THE ADDED EMBANKMENT (APPROXIMATELY 25 CU. YDS.) FOR THE FLARE SHALL BE AS FOLLOWS:
A. UNDER PAY ITEM 203 WHEN THE CONTRACT PLAN INCLUDES PAY ITEM 203.
B. INCLUDED IN THE COST OF THE END ANCHORAGE (NONFLARED) WHEN THE CONTRACT PLAN DOES NOT INCLUDE PAY ITEM 203. THE ADDED EMBANKMENT SHALL BE CONSTRUCTED IN ACCORDANCE WITH SUBSECTION 203.07, AASHTO T 99.
 - WHEN THE WIDENED AREA IS PAVED, PAYMENT FOR THE PAVEMENT (APPROX. 39 SQ. YDS.) SHALL BE AS FOLLOWS:
A. UNDER PAY ITEM 403 OR 412 WHEN THE CONTRACT PLAN INCLUDES PAY ITEM 403 OR 412.
B. INCLUDED IN THE COST OF THE END ANCHORAGE (NONFLARED) WHEN THE CONTRACT PLAN DOES NOT INCLUDE PAY ITEM 403 OR 412, (SEE SHEET 1, NOTE 2 FOR PAYMENT TYPES).
 - WHEN OVERLAY PAVING, THE FINISHED SURFACE AT EACH POST SHALL NOT BE ABOVE THE TOP BREAKWAY HOLE OR STRUT ASSEMBLY. THE WIDENED AREA AT THE END ANCHORAGE (NONFLARED) SHALL NOT BE OVERLAYED UNLESS PAVEMENT CONDITIONS WARRANT IT BEING OVERLAYED. ANY OVERLAY PAVEMENT ABUTTING THE END ANCHORAGE (NONFLARED) SHALL BE TAPERED TO PREVENT A DROP IN THE PAVED SURFACE BELOW THE RAIL.
 - SEE SHEETS 1, 2, 3, AND 5 FOR STANDARD TYPE 3 GUARDRAIL INSTALLATION DETAILS.
 - THE COST OF THE GUTTER WILL BE PAID FOR AS "GUTTER TYPE 2 (2 FT.)" FOR A LENGTH OF 111 FT., OR "GUTTER TY. 2 (3 FT.)" FOR A LENGTH OF 50 FT.
 - INLETS OR RUNDOWNS MAY BE USED INSTEAD OF THE GUTTER IF SPECIFIED ON THE PLANS. NO ADDITIONAL CURB SHALL BE ADDED IN THE VICINITY OF THE END TREATMENT.
 - 4:1 OR FLATTER SLOPES IN THE TRAVERSABLE AREA SHALL BE USED BEHIND THE END ANCHORAGE AREA, AND IN ADVANCE OF POST ①. IF THIS IS NOT POSSIBLE A MINIMUM 3:1 SLOPE MAY BE USED IF APPROVED BY THE ENGINEER.
 - THE WIDENED AREA, EXCEPT FOR CURB OPTION A, SHALL HAVE THE SAME GRADING AS BENEATH THE ADJACENT GUARDRAIL: 10:1 OR FLATTER IF MORE THAN 2 FT. FROM SHOULDER, OR SLOPE EQUAL TO ROADWAY SLOPE IF 2 FT. OR LESS FROM SHOULDER.
 - WIDENING FOR END ANCHORAGES SHALL BE PAVED ON INTERSTATES AND FREEWAYS. FOR OTHER HIGHWAYS, PAVING SHALL BE AS SHOWN ON THE PLANS.
 - HINGED BREAK AWAY (HBA) STEEL POSTS MAY BE USED. SEE MANUFACTURER'S DETAILS.



SECTION A-A



SECTION B-B



SECTION C-C

Computer File Information	
Creation Date: 08/19/15	Initials: JBK
Last Modification Date: 02/08/18	Initials: LTA
Full Path: www.codot.gov/business/designsupport	
Drawing File Name: 6060109020.dgn	
CAD Ver.: MicroStation V8	Scale: Not to Scale Units: English

Sheet Revisions	
Date:	Comments
12/29/15	Raised guardrail height to 31".

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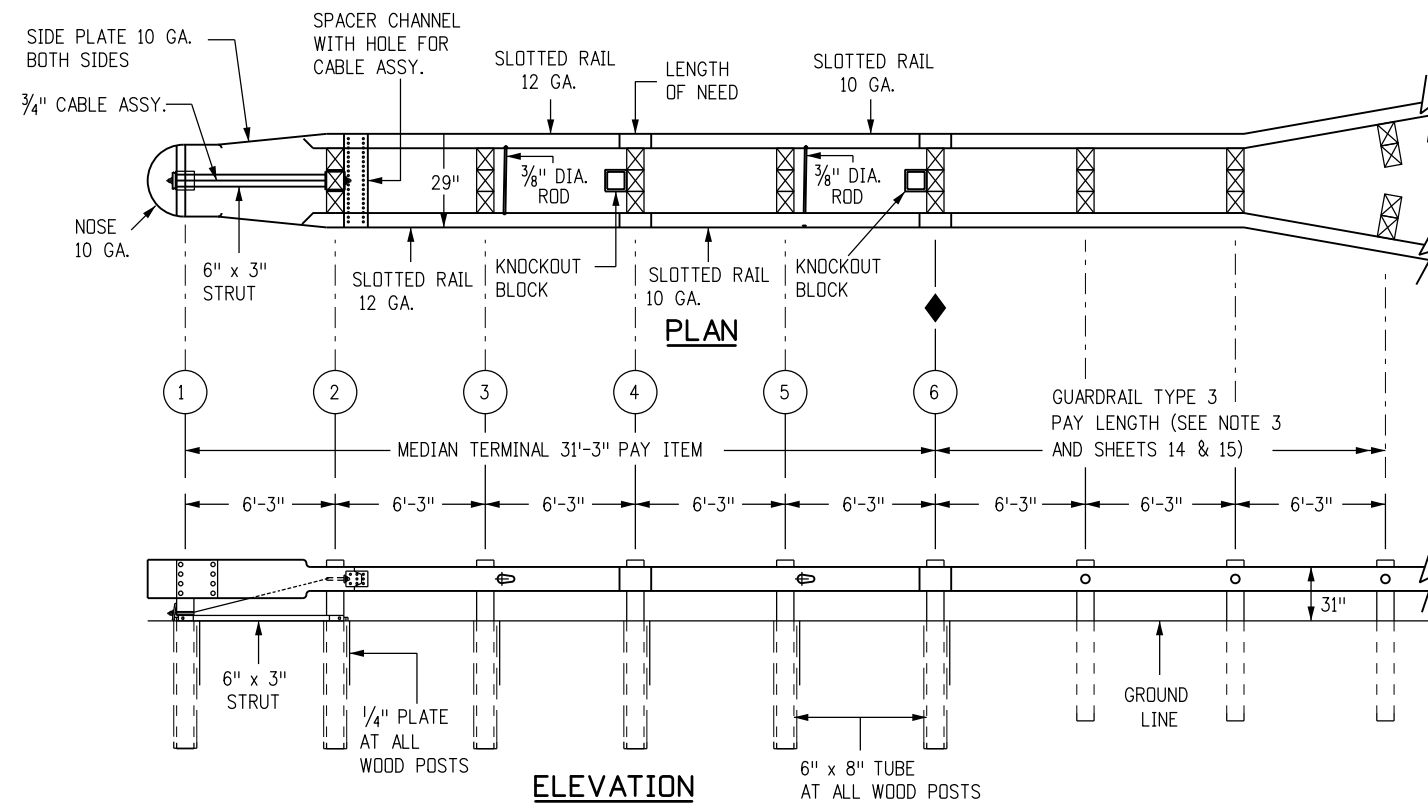
**MIDWEST
GUARDRAIL SYSTEM (MGS)
TYPE 3 W-BEAM 31 INCHES**

Issued By: Project Development Branch July 4, 2012

STANDARD PLAN NO.

M-606-1

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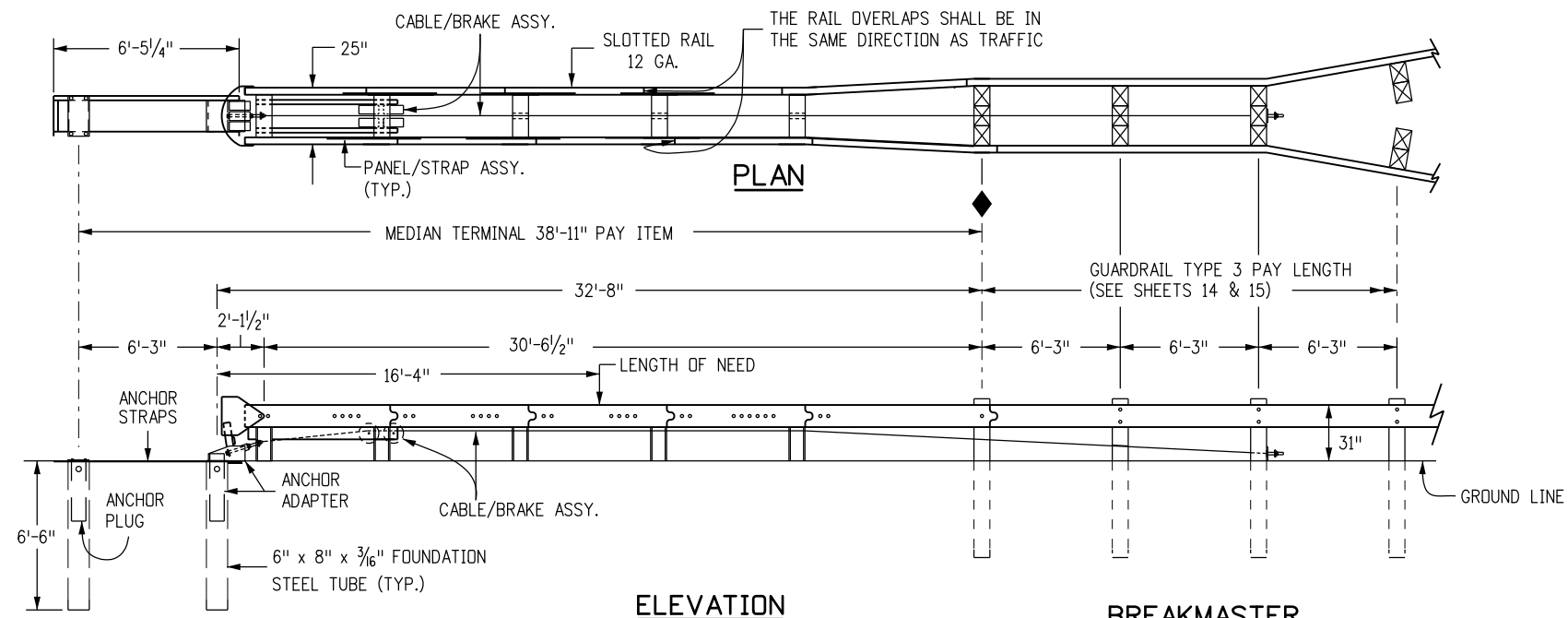


CAT 350
(NCHRP 350 CERTIFIED)

◆ END OF GUARDRAIL PAY LENGTH

MEDIAN TERMINAL NOTES

1. THE MEDIAN TERMINAL SHALL BE THE CAT 350 AS MANUFACTURED BY TRINITY INDUSTRIES INC. (TEL #: 800-722-7976), OR THE BRAKEMASTER AS MANUFACTURED BY ENERGY ABSORPTION SYSTEMS, INC. AS DISTRIBUTED BY INTERWEST SAFETY SUPPLY (TEL #: 303-733-8447), OR THE FLEAT-MT MEDIAN TERMINAL AS MANUFACTURED BY ROAD SYSTEM INC. (TEL. #: 432-263-2435).
2. ONE MEDIAN TERMINAL SHALL INCLUDE ALL POSTS, RAIL, AND HARDWARE ITEMS REQUIRED FOR A COMPLETE UNIT. THE DEVICE SHALL BE INSTALLED IN CONFORMANCE WITH THE MANUFACTURER'S INSTRUCTIONS. THE CONTRACTOR SHALL PROVIDE A COPY OF THE MANUFACTURER'S INSTALLATION INSTRUCTIONS AND PARTS LISTS TO THE ENGINEER PRIOR TO THE INSTALLATION OF THE DEVICE.
3. UNLESS OTHERWISE SPECIFIED ON THE PLANS, THE MEDIAN TERMINAL SHALL BE INSTALLED FOR BIDIRECTIONAL TRAFFIC APPLICATION.
4. MEDIAN GUARDRAIL POSTS MAY BE STEEL OR WOOD.
5. EACH INSTALLATION SHALL BE SUPERVISED AND CERTIFIED AS CORRECT UPON COMPLETION BY A REPRESENTATIVE OF THE DEVICE MANUFACTURER OR BY AN EMPLOYEE OF THE CONTRACTOR WHO IS A CERTIFIED INSTALLER. THE CERTIFIED INSTALLER SHALL HAVE COMPLETED DEVICE TRAINING AND SHALL BE REGISTERED WITH THE MANUFACTURER AS A CERTIFIED INSTALLER.
6. DELINEATION, IF REQUIRED, SHALL BE APPLIED TO THE END PIECE AND WILL NOT BE PAID FOR SEPARATELY BUT SHALL BE INCLUDED IN THE COST OF THE WORK. SEE STANDARD PLAN S-612-1.
7. IF THE MEDIAN TERMINAL IS LESS THAN 31 INCHES HIGH, A TRANSITIONAL PIECE SHALL BE INSTALLED TO REACH THE 31 INCHES MGS HEIGHT. SEE SHEET 4.



BREAKMASTER
(NCHRP 350 CERTIFIED)

MEDIAN TERMINALS

Computer File Information

Creation Date: 08/19/15	Initials: JBK
Last Modification Date: 02/08/18	Initials: LTA
Full Path: www.codot.gov/business/designsupport	
Drawing File Name: 60601010020.dgn	
CAD Ver.: MicroStation V8	Scale: Not to Scale Units: English

Sheet Revisions

Date:	Comments
12/29/15	Raised guardrail height to 31".

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Division of Project Support

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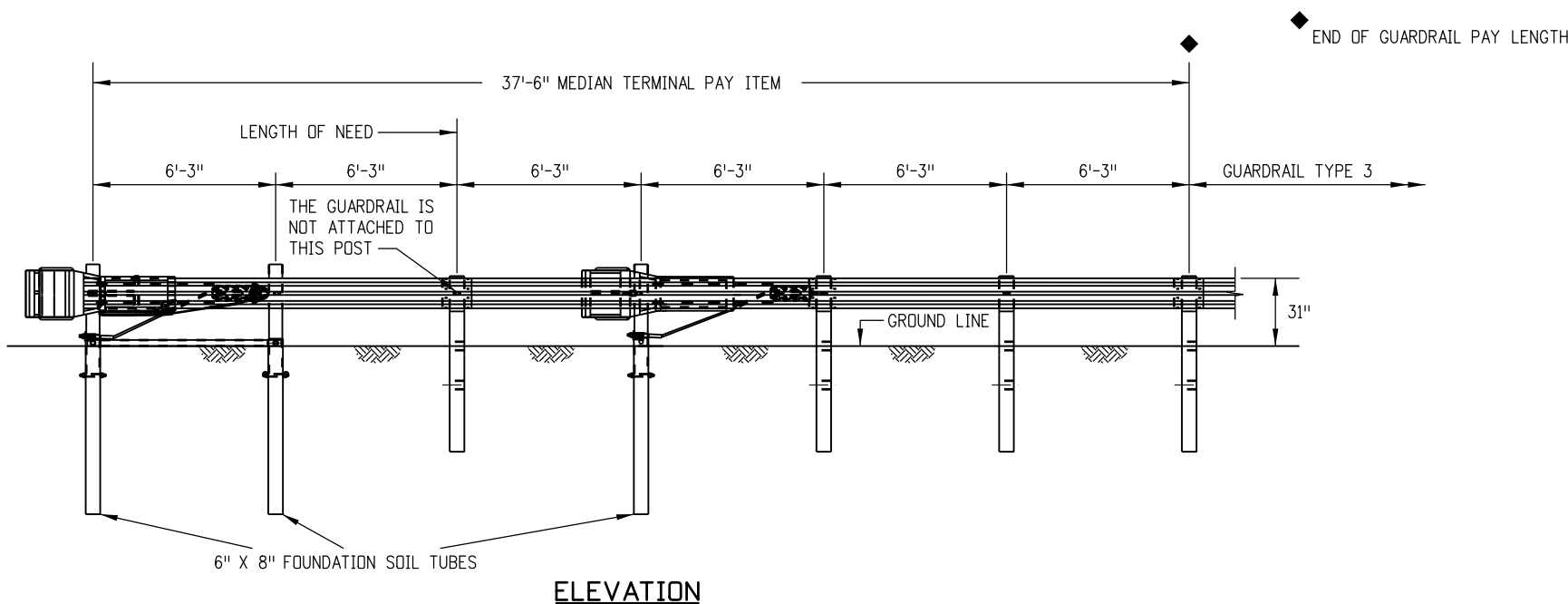
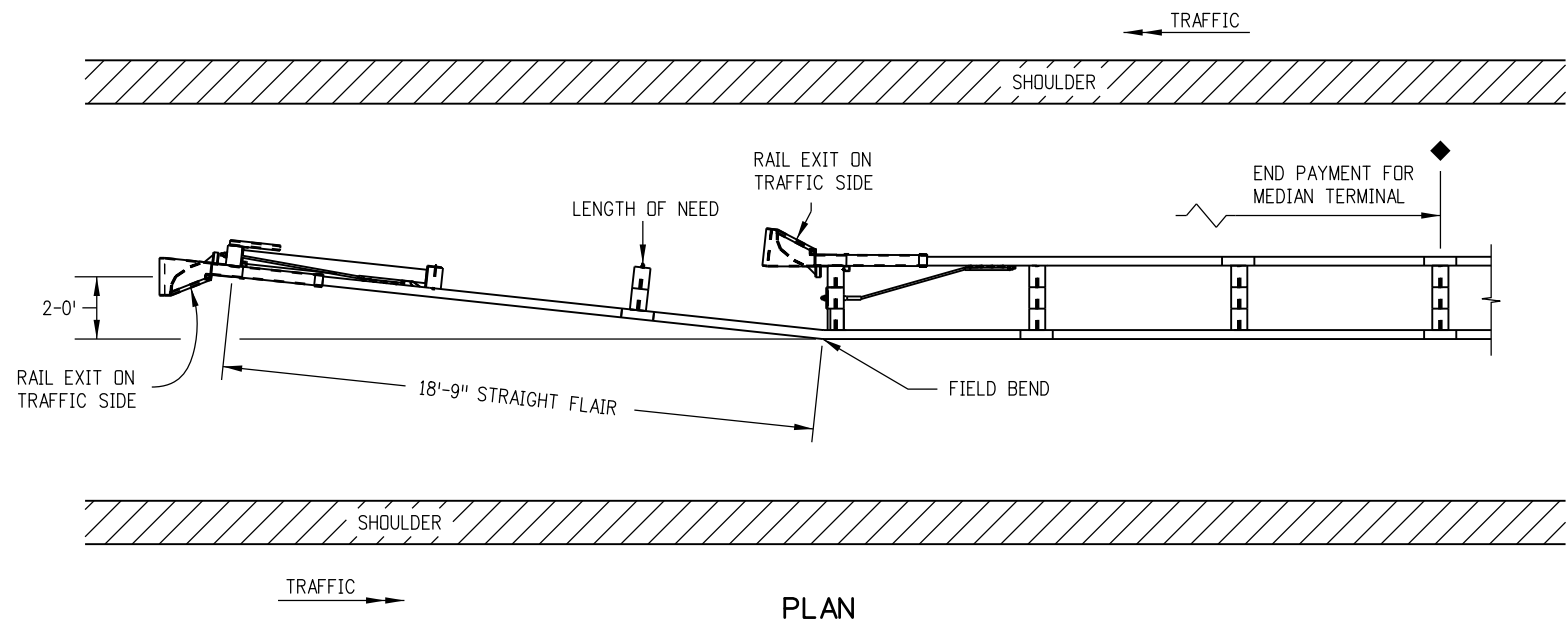
**MIDWEST
GUARDRAIL SYSTEM (MGS)
TYPE 3 W-BEAM 31 INCHES**

Issued By: Project Development Branch July 4, 2012

STANDARD PLAN NO.

M-606-1

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FLEAT-MT
(NCHRP 350 CERTIFIED)

MEDIAN TERMINAL

FLEAT- MT NOTES

1. THE FLEAT-MT MAY BE SELECTED AS A MEDIAN TERMINAL UNLESS OTHERWISE SHOWN IN THE PLANS.
2. BREAKAWAY POSTS ARE REQUIRED WITH THE FLEAT-MT.
3. THE SOIL TUBES SHALL NOT PROTRUDE MORE THAN 4 INCHES ABOVE GROUND (MEASURED ALONG A 5 FEET CORD). SITE GRADING MAY BE NECESSARY TO MEET THIS REQUIREMENT.
4. THE SOIL TUBES SHALL BE DRIVEN WITH AN APPROVED DRIVING HEAD AND NOT BE DRIVEN WITH THE POST IN THE TUBE. IF THE TUBES ARE PLACED IN DRILLED HOLES, THE BACKFILL MATERIAL MUST BE SATISFACTORILY COMPACTED TO PREVENT SETTLEMENT.
5. WHEN ROCK IS ENCOUNTERED DURING EXCAVATION, A 12 INCH DIA. POST HOLE, 20 INCH DEEP MAY BE USED IF APPROVED BY THE ENGINEER. GRANULAR MATERIAL SHALL BE PLACED IN THE BOTTOM OF THE HOLE APPROX. 2½ INCH DEEP TO PROVIDE DRAINAGE. THE SOIL TUBES SHALL BE FIELD CUT TO LENGTH, PLACED IN THE HOLE AND BACKFILLED WITH ADEQUATELY COMPACTED MATERIAL EXCAVATED FROM THE HOLE.
6. THE BREAKAWAY CABLE ASSEMBLY MUST BE TAUT. DO NOT TWIST THE CABLE WHEN TIGHTENING NUTS.

Computer File Information	
Creation Date: 08/19/15	Initials: JBK
Last Modification Date: 02/08/18	Initials: LTA
Full Path: www.codot.gov/business/designsupport	
Drawing File Name: 60601011020.dgn	
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	

Sheet Revisions	
Date:	Comments
12/29/15	Raised guardrail height to 31".
(R-X)	
(R-X)	
(R-X)	
(R-X)	

Colorado Department of Transportation

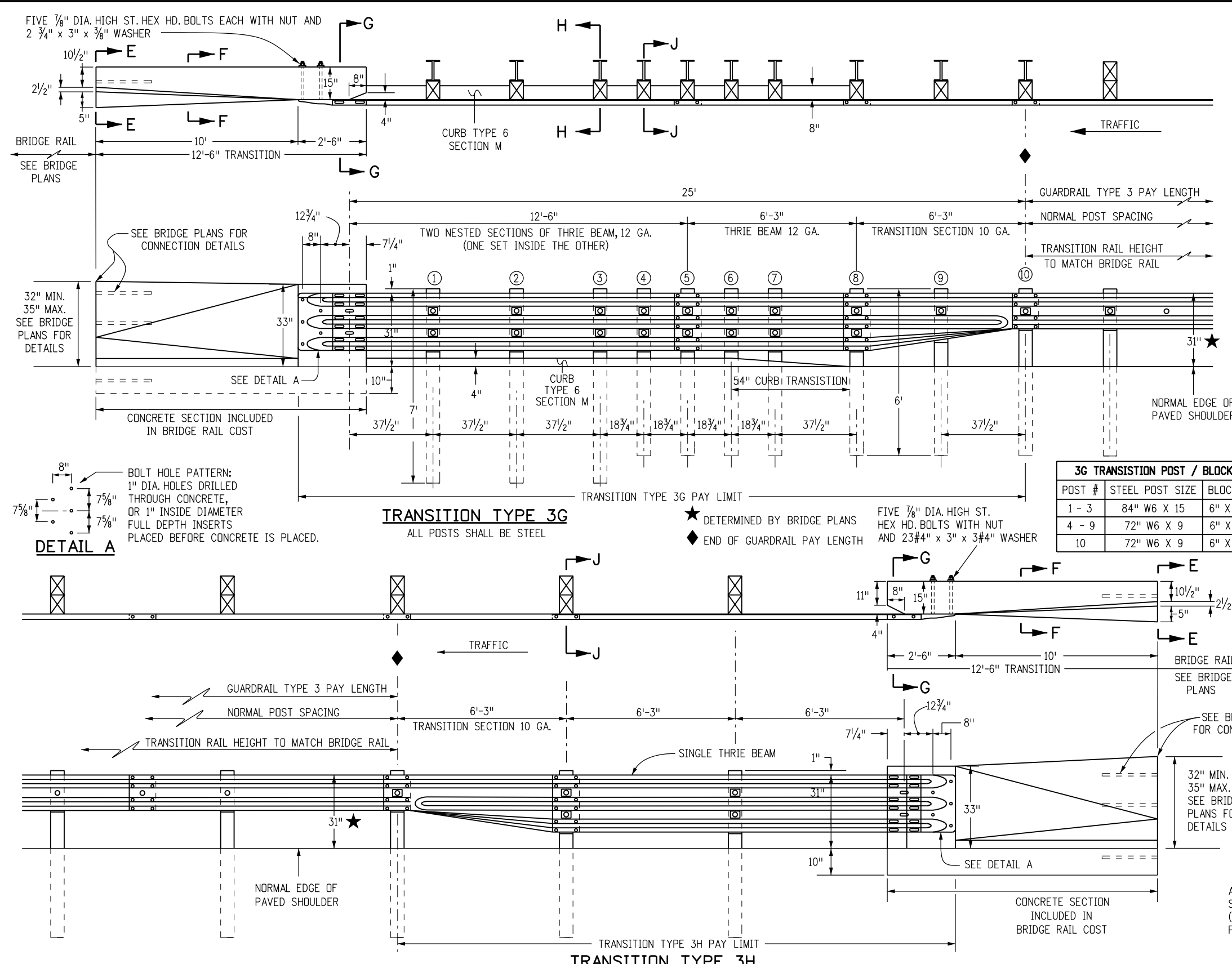
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Division of Project Support **JBK/LTA**

MIDWEST
GUARDRAIL SYSTEM (MGS)
TYPE 3 W-BEAM 31 INCHES

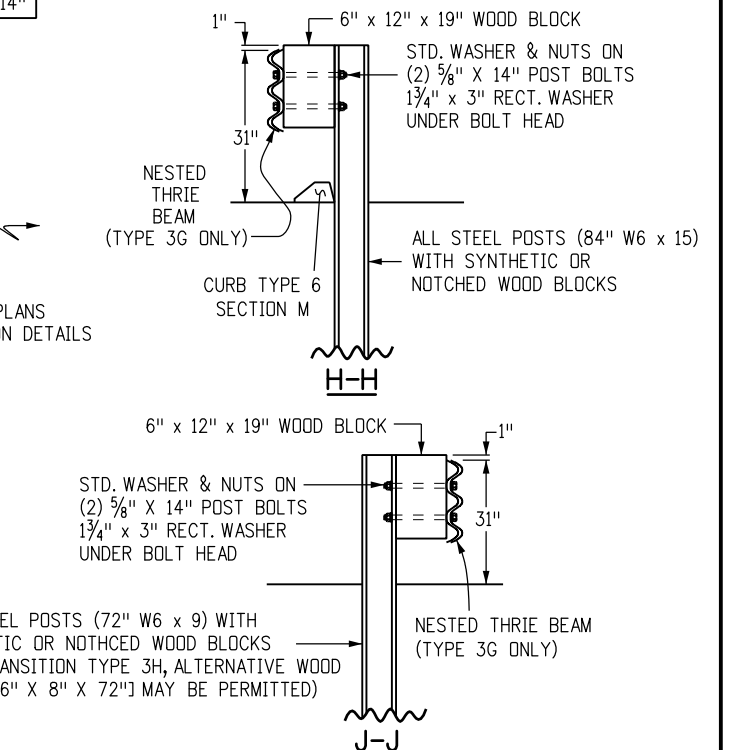
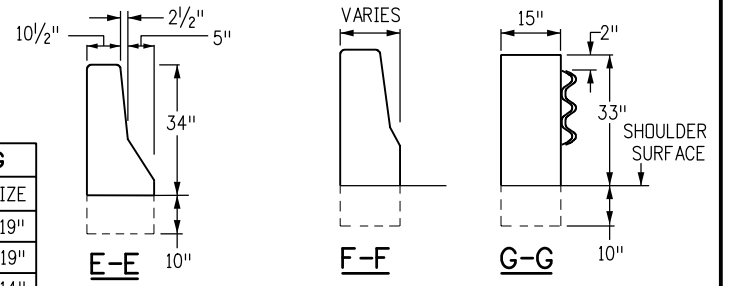
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- ### NOTES
1. TRANSITION TYPE 3G IS FOR USE AT BOTH ENDS OF BRIDGES ON TWO-WAY HIGHWAYS AND AT THE APPROACH END OF BRIDGES ON ONE-WAY HIGHWAYS.
 2. TRANSITION TYPE 3H IS FOR USE AT THE TRAILING END OF BRIDGES ON ONE-WAY HIGHWAYS.
 3. THE THRIE BEAM SECTION IN TRANSITIONS TYPES 3G AND 3H MAY BE SHOP BENT TO FIT CURVES THAT ARE GREATER THAN OR EQUAL TO A 10 FT. RADIUS. HOWEVER, THE 6 FT.-3 IN. TRANSITION SECTION SHALL NOT BE BENT.
 4. A 12 FT.-6 IN. CONCRETE TRANSITION IS REQUIRED BETWEEN THE TYPE 3G OR 3H AND TYPE 7 BRIDGE RAIL. SEE STANDARD PLAN M-606-13 FOR THE TRANSITION BETWEEN TYPE 3 GUARDRAIL AND TYPE 7 GUARDRAIL.
 5. TRANSITIONS TYPE 3G AND TYPE 3H ARE ALSO USED TO CONNECT TO TYPE 8 AND TYPE 10 BRIDGE RAIL. SEE BRIDGE PLANS FOR CONNECTION DETAILS.
 6. BACKUP PLATE IS NOT REQUIRED AT POSTS ON TYPE 3G AND 3H.
 7. [Symbol] THIS SYMBOL IN THE ELEVATION DRAWINGS SHOWS THE LOCATIONS WHERE A RECTANGULAR WASHER IS REQUIRED UNDER THE POST BOLT HEAD.
 8. CURB TYPE 6 SECTION M, MAY BE ASPHALT OR CONCRETE. THE COST OF CURB IS INCLUDED IN THE WORK, UNLESS A SEPARATE PAY ITEM IS INCLUDED IN THE BID SCHEDULE.
 9. FOR TYPE 3G, POSTS ① THRU ③ ARE 7 FT. LONG. ALL OTHER POSTS SHALL BE A STANDARD 6 FT. LONG UNLESS OTHERWISE SPECIFIED IN THE CONTRACT.
 10. NOTCHED RAIL BLOCKS MANUFACTURED FROM SYNTHETIC MATERIAL WILL BE ACCEPTED AS ALTERNATIVES TO WOOD NOTCHED BLOCKS FOR USE WITH STEEL POSTS PROVIDED THAT THE BLOCKS HAVE RECEIVED FHWA APPROVAL AND ARE CERTIFIED AS IDENTICAL TO THE SPECIMENS USED FOR TESTING AND APPROVAL. STEEL BLOCKS ARE NOT ALLOWED.

POST #	STEEL POST SIZE	BLOCKOUT SIZE
1 - 3	84" W6 X 15	6" X 12" X 19"
4 - 9	72" W6 X 9	6" X 12" X 19"
10	72" W6 X 9	6" X 12" X 14"



Creation Date: 08/19/15	Initials: JBK
Last Modification Date: 02/08/18	Initials: LTA
Full Path: www.codot.gov/business/designsupport	
Drawing File Name: 60601012020.dgn	
CAD Ver.: MicroStation V8	Scale: Not to Scale Units: English

Date	Comments
12/29/15	Raised height to 31" and revised Types 3G and 3H.
11/29/17	Revised dimensions for Bridge Rails.
11/29/17	Added the 6'-3" Thrie Beam 12 GA piece for Type 3G.
01/18/18	Revised post spacings for the Type 3G transition.
02/08/18	Added table and note to Type 3G. Revised H-H and J-J details

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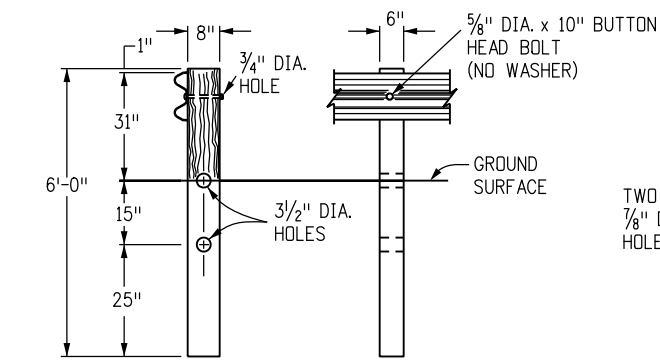
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Division of Project Support JBK/LTA

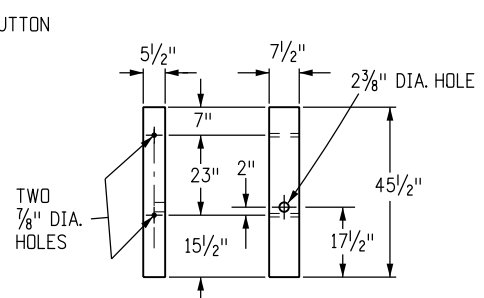
MIDWEST
 GUARDRAIL SYSTEM (MGS)
 TYPE 3 W-BEAM 31 INCHES

Issued By: Project Development Branch July 4, 2012

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 M-606-1
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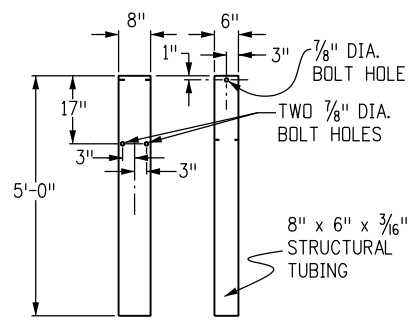
CONTROLLED RELEASING TERMINAL (CRT) POST ①



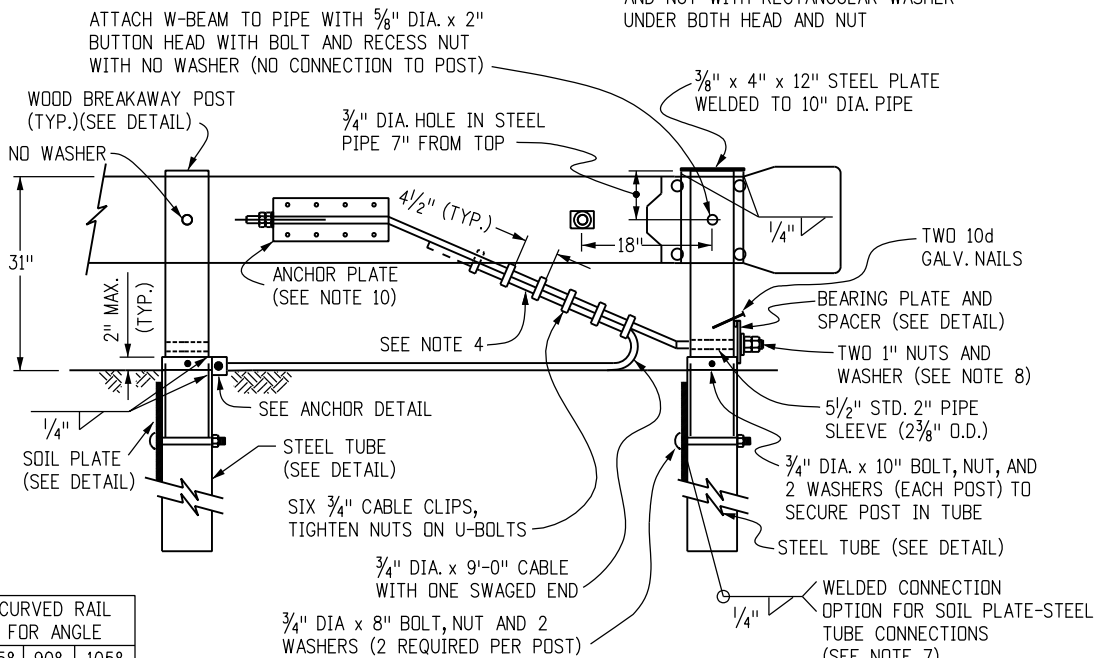
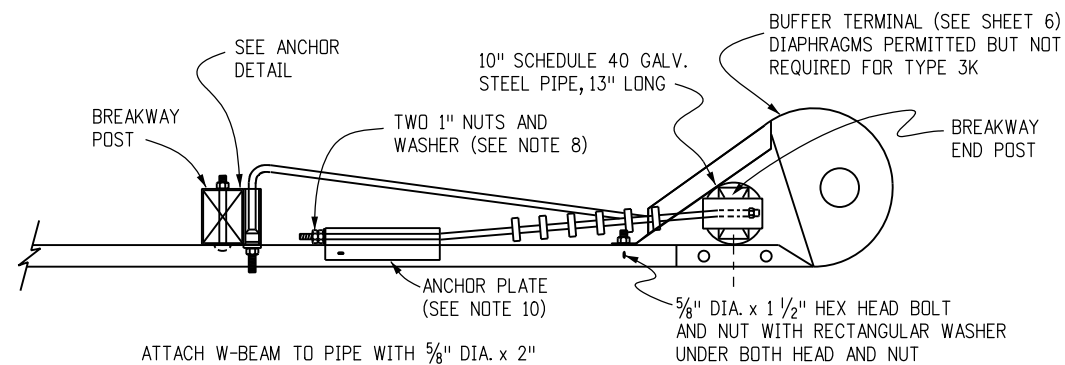
WOOD BREAKAWAY POST ②

POST	DIMENSIONS	TYPE
①	6" x 8" x 6'	CRT
②	5 1/2" x 7 1/2" x 45 1/2"	BREAKAWAY

POSTS



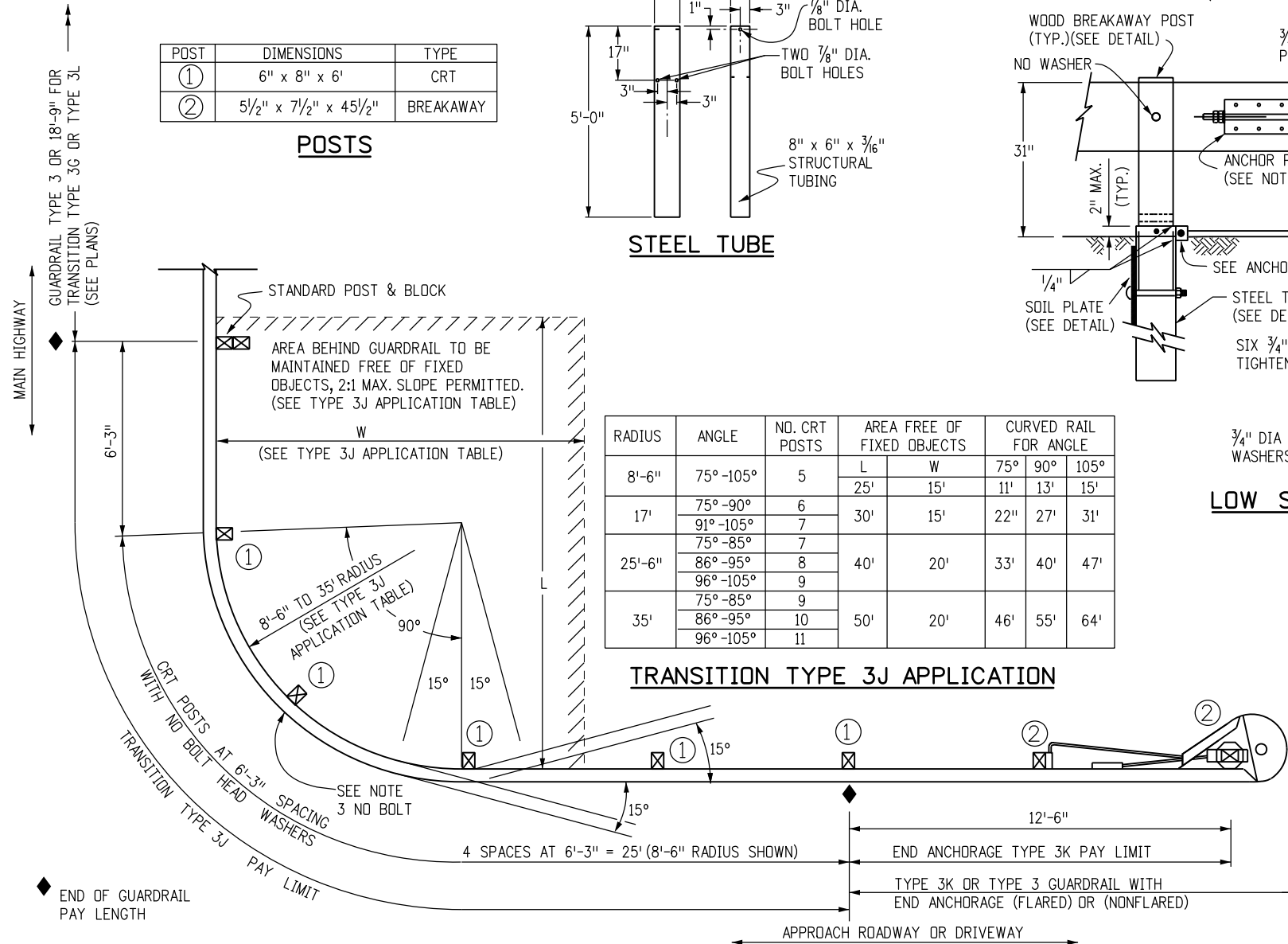
STEEL TUBE



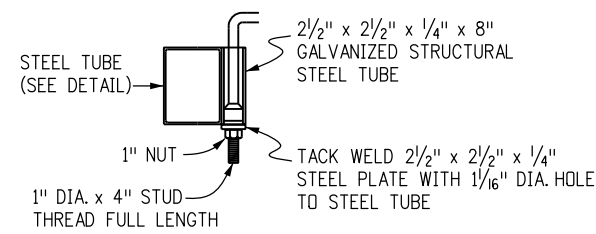
LOW SPEED END ANCHORAGE - TYPE 3K

RADIUS	ANGLE	NO. CRT POSTS	AREA FREE OF FIXED OBJECTS		CURVED RAIL FOR ANGLE		
			L	W	75°	90°	105°
8'-6"	75°-105°	5	25'	15'	11'	13'	15'
	75°-90°	6	30'	15'	22"	27'	31'
	91°-105°	7					
17'	75°-85°	7	40'	20'	33'	40'	47'
	86°-95°	8					
	96°-105°	9					
	75°-85°	9					
25'-6"	86°-95°	10	50'	20'	46'	55'	64'
	96°-105°	11					

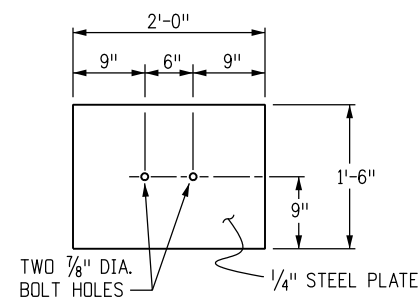
TRANSITION TYPE 3J APPLICATION



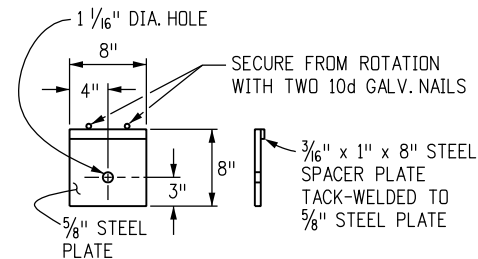
INTERSECTING ROADWAYS TRANSITION - TYPE 3J TRANSITION



ANCHOR DETAIL



SOIL PLATE



BEARING PLATE FOR STEEL TUBE

NOTES

- APPLICATION: THE TRANSITION TYPE 3J MAY BE USED TO SHIELD HAZARDS AT THE INTERSECTION OF TWO ROADWAYS. TYPICAL APPLICATIONS INCLUDE, BUT ARE NOT LIMITED TO, THE FOLLOWING:
 - CANAL SERVICE ROADS AT BRIDGE ENDS.
 - INTERRUPTIONS IN GUARDRAIL RUNS BY INTERSECTING ROADWAYS, ETC..

THE LOW SPEED (<45 MPH) END ANCHORAGE TYPE 3K SHALL BE USED ONLY ON DRIVEWAYS AND LOW SPEED SERVICE ROADS. WHEN AN APPROVED CRASH-TESTED END TREATMENT IS REQUIRED USE THE END ANCHORAGE (FLARED) OR (NONFLARED) WITH 37 FT.-6 IN. LENGTH.
- GRADING AND PAVING FOR THE 3J & 3K SHALL MATCH THE GRADING AND PAVING OF THE GUARDRAIL TO WHICH THEY ARE ATTACHED, AND SHALL BE IN ACCORDANCE WITH SHEET ONE OF THIS STANDARD. MAXIMUM FILL SLOPE SHALL BE 2:1.
- THE RAIL IS NOT BOLTED TO THE CRT POST AT THE CENTER OF THE CURVE FOR THE 8 FT.-6 IN., 17 FT., AND 25 FT.-6 IN. RADII. PLATES SHALL CONFORM TO ASTM A 36, AND THE STRUCTURAL TUBING TO ASTM A 500.
- THE 3/4 IN. GALVANIZED WIRE ROPE (CABLE) SHALL CONFORM TO AASHTO M 30 TYPE II.
- PLATES SHALL CONFORM TO ASTM A 36, AND STRUCTURAL TUBING TO ASTM A 500. WELDING SHALL MEET ALL REQUIREMENTS OF THE AMERICAN WELDING SOCIETY.
- ALL STRUCTURAL STEEL SHALL BE GALVANIZED IN CONFORMANCE WITH ASTM A 123. POSTS SHALL NOT BE PUNCHED, DRILLED, CUT, OR WELDED AFTER GALVANIZING.
- WHEN THE SOIL PLATE WELDED OPTION IS SELECTED, SOIL PLATE CONNECTION BOLT HOLES ARE NOT REQUIRED.
- OUTSIDE NUT SHALL BE TORQUED AGAINST INSIDE NUT WITH THE CABLE INSTALLED TAUT BETWEEN THE ANCHOR PLATE AND FIRST POST.
- ALL CURVED GUARDRAIL SHALL BE SHOP BENT.
- SEE SHEET 5 FOR ANCHOR PLATE AND OTHER DETAILS.
- THE STEEL TUBE MAY BE DRIVEN WITH WOOD POST INSERTED IF NO DAMAGE OCCURS TO THE POST OR BOLTS.

Computer File Information

Creation Date: 08/19/15	Initials: JBK
Last Modification Date: 02/08/18	Initials: LTA
Full Path: www.codot.gov/business/designsupport	
Drawing File Name: 60601013020.dgn	
CAD Ver.: MicroStation V8	Scale: Not to Scale Units: English

Sheet Revisions

Date:	Comments
12/29/15	Raised guardrail height to 31".

Colorado Department of Transportation

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 CDOT HQ, 4th Floor
 Denver, CO 80222
 Phone: 303-757-9021 FAX: 303-757-9868

Division of Project Support **JBK/LTA**

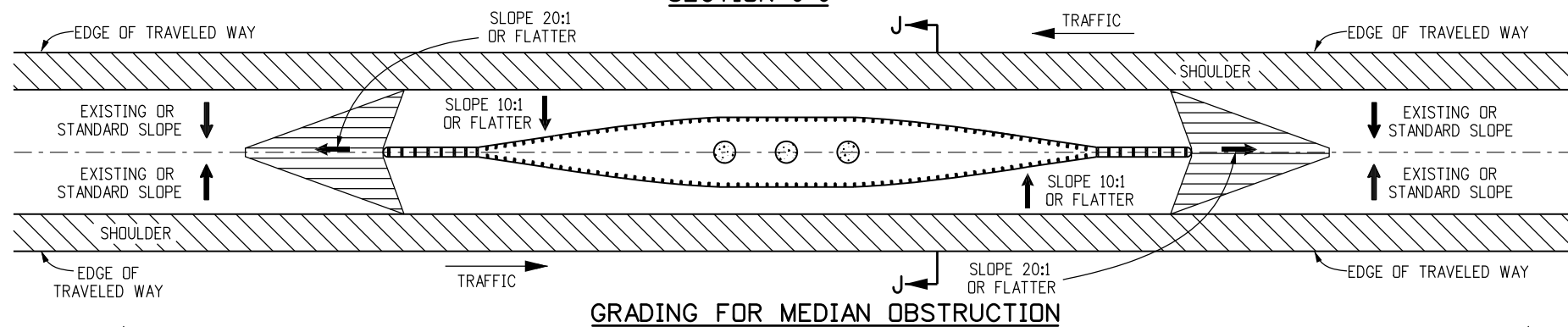
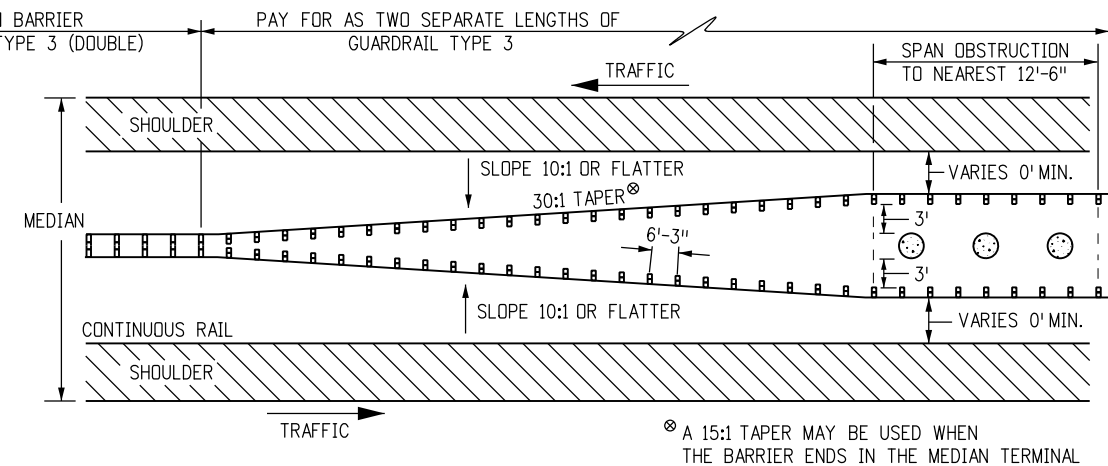
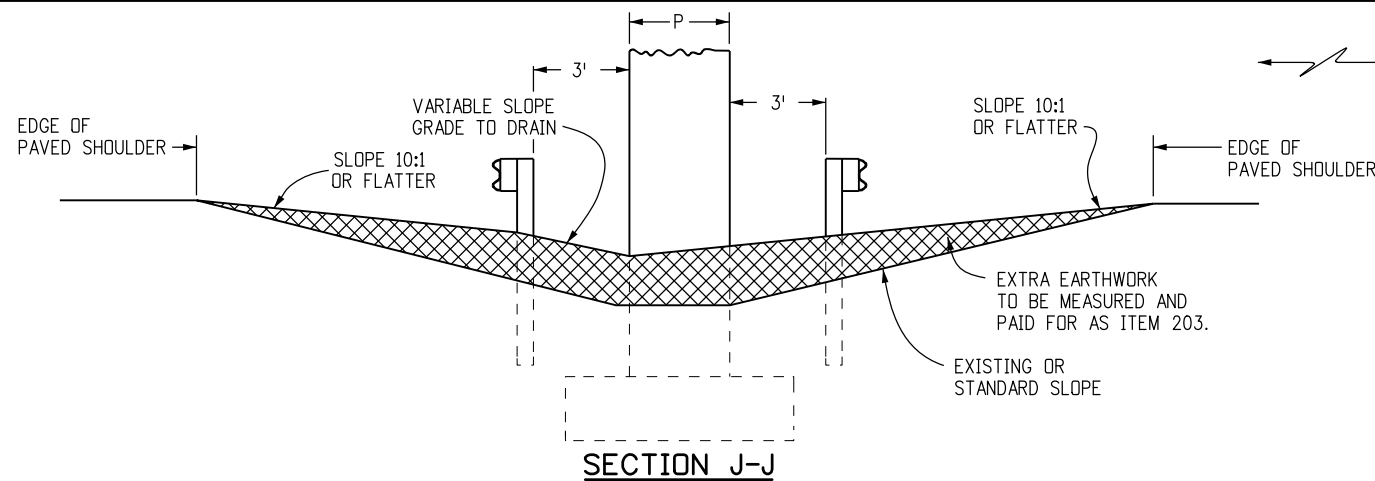
**MIDWEST
 GUARDRAIL SYSTEM (MGS)
 TYPE 3 W-BEAM 31 INCHES**

Issued By: Project Development Branch July 4, 2012

STANDARD PLAN NO.

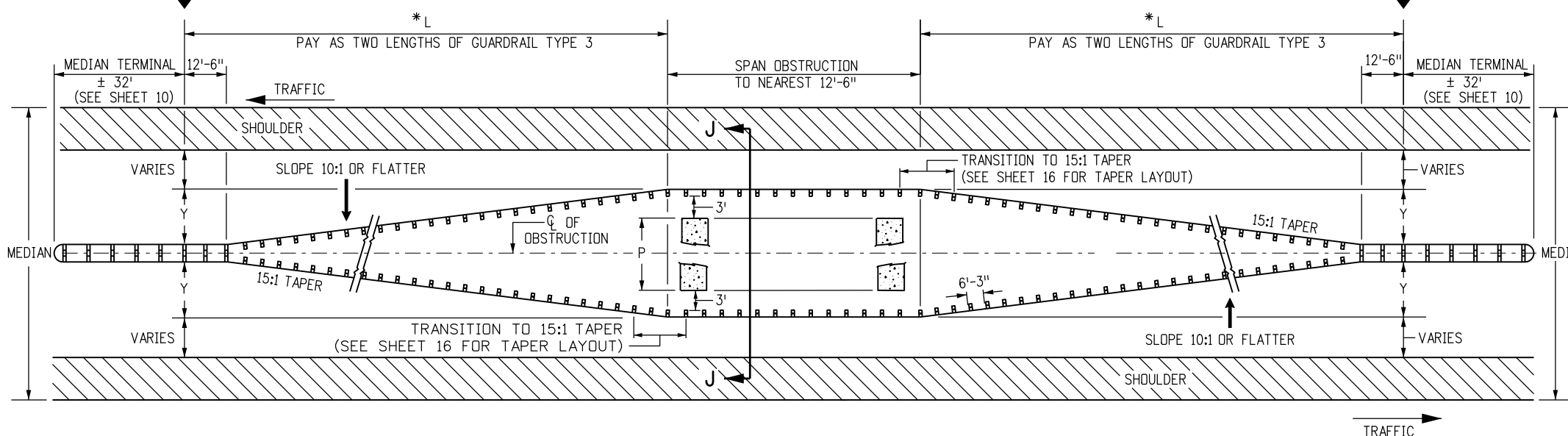
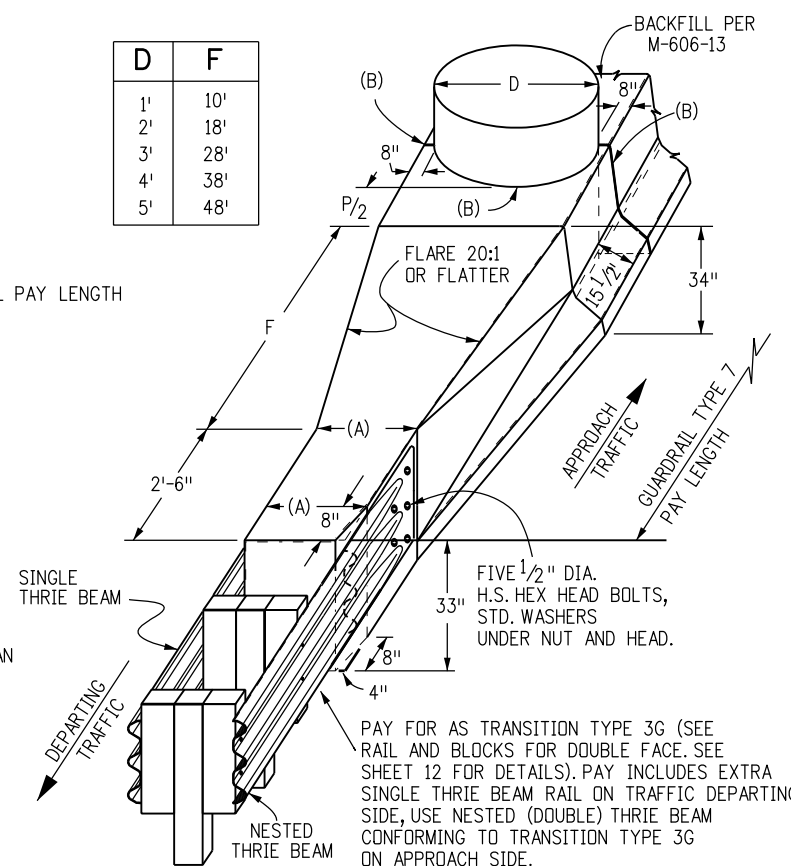
M-606-1

Sheet No. 13 of 20



OBSTRUCTION IN MEDIAN 30 FT. WIDE OR LESS

D	F
1'	10'
2'	18'
3'	28'
4'	38'
5'	48'



P	1'	2'	3'	4'	5'	6'	7'	8'	9'	10'	11'	12'	13'	14'	15'	16'	17'	18'	19'	20'
Y	4'-1"	4'-7"	5'-1"	5'-7"	6'-1"	6'-7"	7'-1"	7'-7"	8'-1"	8'-7"	9'-1"	9'-7"	10'-1"	10'-7"	11'-1"	11'-7"	12'-1"	12'-7"	13'-1"	13'-7"
L	75'	87'-6"	100'	112'-6"	125'	137'-6"	150'	162'-6"	175'	187'-6"	200'	212'-6"	225'							

GUARDRAIL FOR OBSTRUCTION IN MEDIANS WIDER THAN 30 FT.

NOTE: FOR OBSTRUCTIONS (P) THAT ARE WIDER THAN 20 FT. IN MEDIANS USE SHEET 17.

- (A). TIMBER POSTS 2 FT., STEEL POSTS 1 FT.-9/2 IN.
- (B). 1/2 IN. PREFORMED JOINT MATERIAL

NARROW MEDIAN DETAIL

USUALLY LESS THAN 30 FT. WIDE MEDIAN WITH ALL PAVED SURFACE

OBSTRUCTIONS IN MEDIANS

Computer File Information Creation Date: 08/19/15 Initials: JBK Last Modification Date: 02/08/18 Initials: LTA Full Path: www.codot.gov/business/designsupport Drawing File Name: 60601014020.dgn CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English		Sheet Revisions <table border="1"> <tr> <th>Date:</th> <th>Comments:</th> </tr> <tr> <td>(R-X)</td> <td></td> </tr> <tr> <td>(R-X)</td> <td></td> </tr> <tr> <td>(R-X)</td> <td></td> </tr> <tr> <td>(R-X)</td> <td></td> </tr> </table>		Date:	Comments:	(R-X)		(R-X)		(R-X)		(R-X)		Colorado Department of Transportation 4201 East Arkansas Avenue CDOT HQ, 4th Floor Denver, CO 80222 Phone: 303-757-9021 FAX: 303-757-9868 Division of Project Support		MIDWEST GUARDRAIL SYSTEM (MGS) TYPE 3 W-BEAM 31 INCHES Issued By: Project Development Branch July 4, 2012		STANDARD PLAN NO. M-606-1 Sheet No. 14 of 20	
Date:	Comments:																		
(R-X)																			
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NOTES

1. MEDIAN BARRIERS TANGENT TO THE ROADWAY MAY BE USED WHERE THE SHOULDER SLOPES IN THE MEDIAN ARE STEEP.
2. BARRIER LENGTHS SHALL BE INCREASED TO ACCOUNT FOR STEEP EMBANKMENTS OR OTHER HAZARDS WITHIN CLOSE PROXIMITY OF BRIDGES.

⊗ — DO NOT CONSTRUCT THE TR AND GUARDRAIL ON THE TRAILING BRIDGE ENDS IF SITE CONDITIONS DO NOT WARRANT THE USE OF GUARDRAIL.

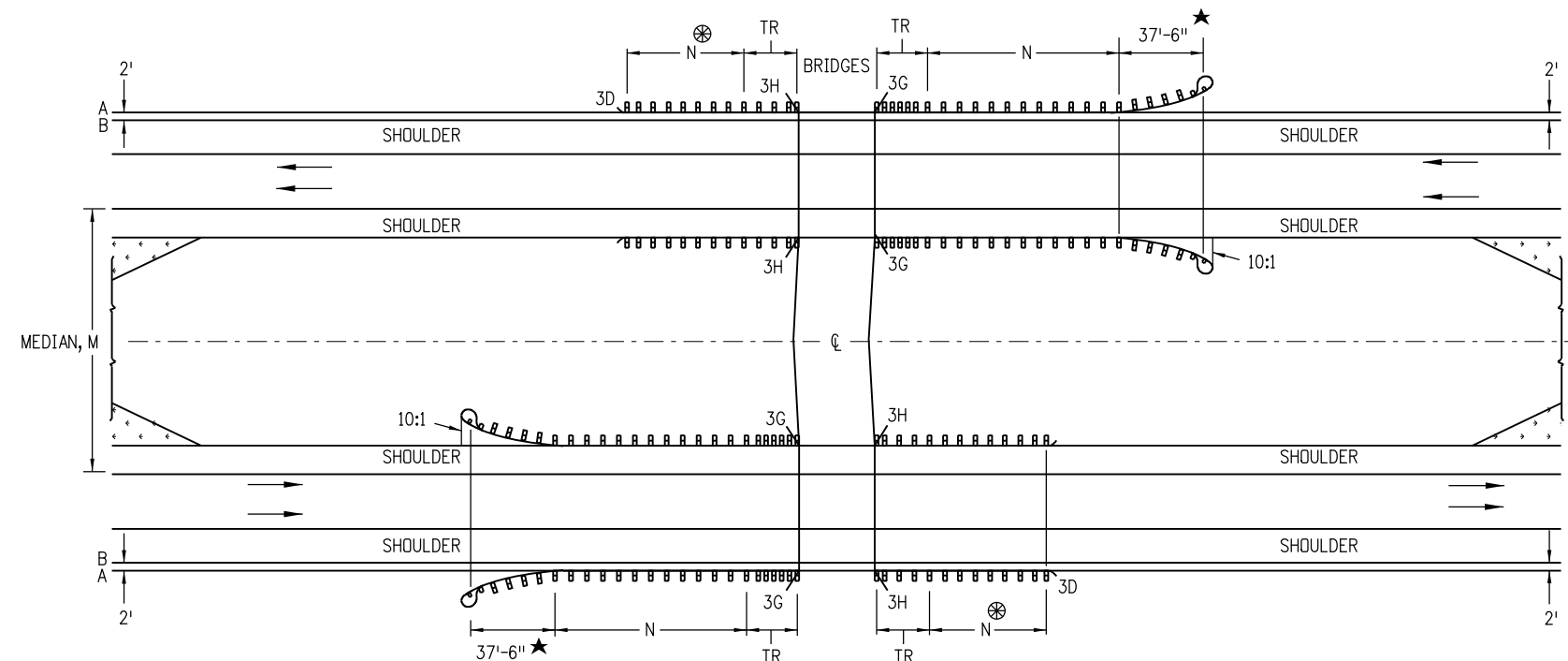
N — SHOWN ON PLANS. LENGTH TO SHIELD ALL HAZARDS IS BASED ON GUARDRAIL'S LENGTH OF NEED COMPUTATION. SEE AASHTO ROADWAY DESIGN GUIDE. THE MINIMUM SHALL BE 12 FT. - 6 IN., WHERE SITE CONDITIONS ALLOW. THE TOTAL LENGTH OF NEED WILL INCLUDE THE LENGTH OF TRANSITION, THE LENGTH OF RAIL (N), AND ANY REDIRECTIVE LENGTH IN THE RAIL END TREATMENT.

TR — 18 FT.-9 IN. FOR 3G AND 3H.

A — EDGE OF 8 FT. OR 10 FT. SHOULDER.

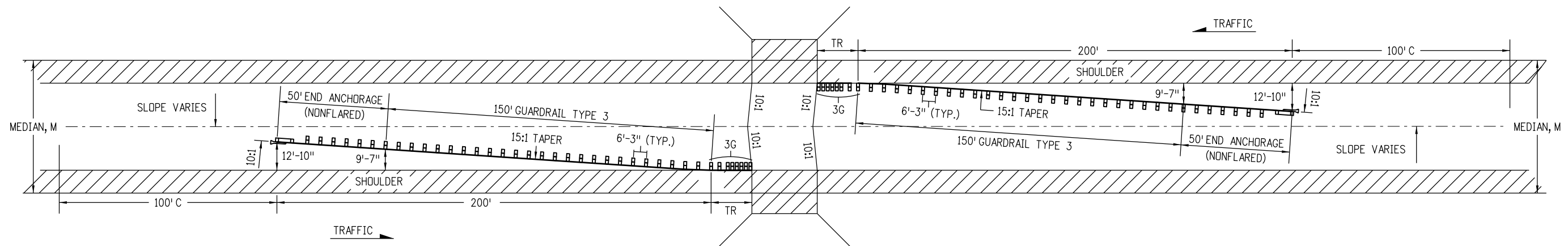
B — EDGE OF 6 FT. OR LESS SHOULDER.

★ — END ANCHORAGE CAN BE FLARED OR NONFLARED.



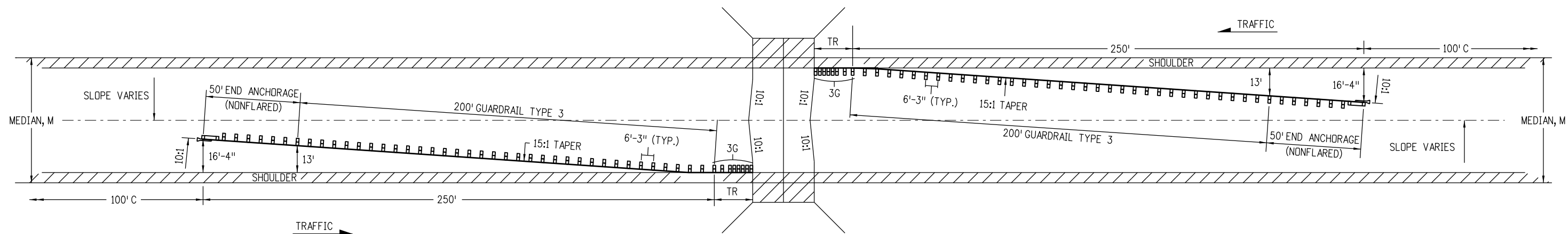
MULTILANE DIVIDED HIGHWAYS FOR STEEP EMBANKMENTS IN MEDIAN

Computer File Information		Sheet Revisions	Colorado Department of Transportation	MIDWEST	STANDARD PLAN NO.	
Creation Date: 08/19/15	Initials: JBK	Date:	4201 East Arkansas Avenue CDOT HQ, 4th Floor Denver, CO 80222 Phone: 303-757-9021 FAX: 303-757-9868	GUARDRAIL SYSTEM (MGS)	M-606-1	
Last Modification Date: 02/08/18	Initials: LTA	Comments:		TYPE 3 W-BEAM 31 INCHES		
Full Path: www.codot.gov/business/designsupport	(R-X)			Division of Project Support	Issued By: Project Development Branch July 4, 2012	
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CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	(R-X)					

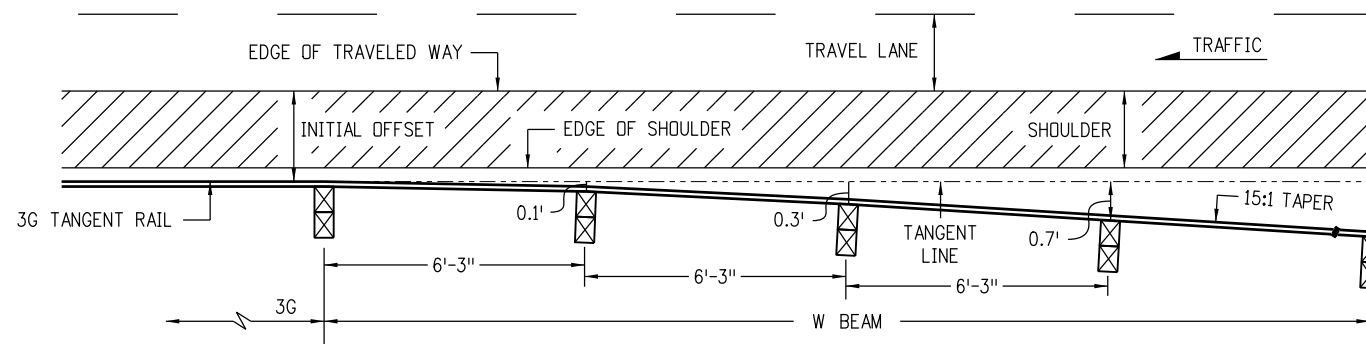


MEDIANS 60 FT. AND OVER WITH 10 FT. OR WIDER SHOULDERS.

TR = 18 FT.-9 IN FOR TRANSITION TYPE 3G.
 C = CHANGE: 100 FT. TRANSITION TO NORMAL SLOPE.
 M = WIDTH OF MEDIAN.



MEDIANS 60 FT. AND OVER WITH 4 TO 8 FT. SHOULDERS.



TRANSITION TO TYPICAL 15:1 TAPER

NOTES

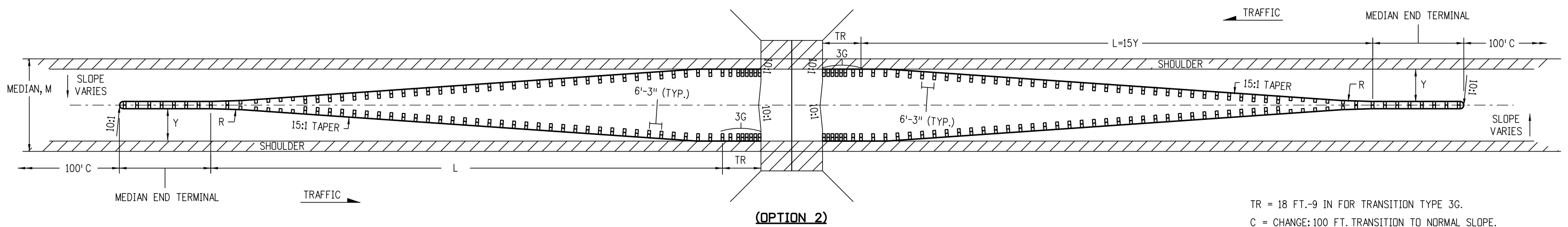
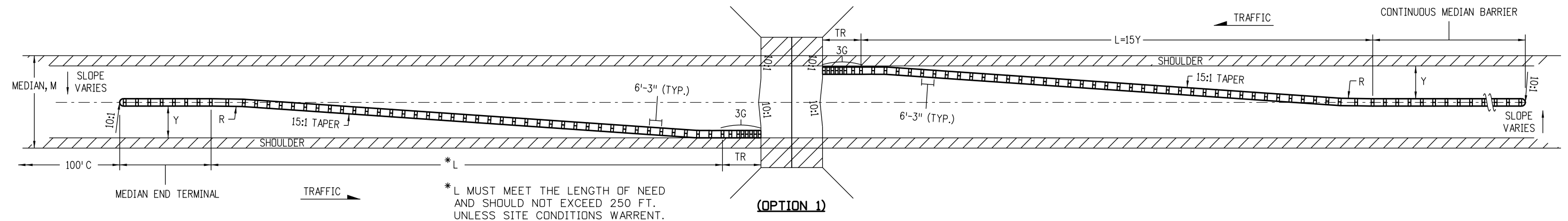
1. GUARDRAIL TRANSITIONS FROM PARALLEL TO ROADWAY SHOULDER AT 3G SEGMENT TO 15:1 TAPER WITHIN 18'-9" BASED ON POST OFFSET DIMENSIONS SHOWN.
2. SEE SHEET 15 FOR THE RIGHT SHOULDER GUARDRAIL LAYOUT.

MULTILANE DIVIDED HIGHWAYS - (DEPRESSED MEDIANS, 60 FT. AND OVER WITH OPEN HAZARDS OR OBSTRUCTIONS)

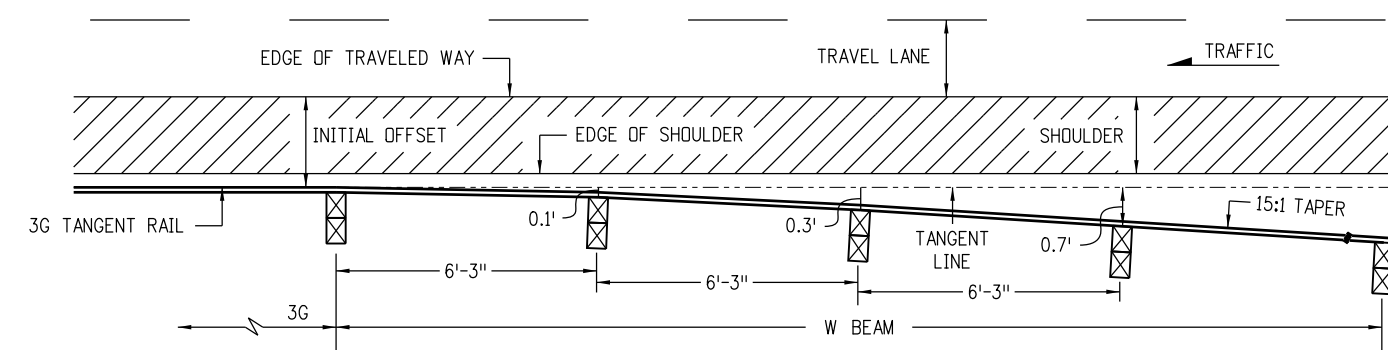
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Creation Date: 08/19/15	Initials: JBK	Date:	Comments:			M-606-1
Last Modification Date: 02/08/18	Initials: LTA	(R-X)				
Full Path: www.codot.gov/business/designsupport		(R-X)				
Drawing File Name: 60601016020.dgn		(R-X)				
CAD Ver.: MicroStation V8	Scale: Not to Scale	Units: English	(R-X)		Sheet No. 16 of 20	

NOTES

1. GUARDRAIL TRANSITIONS FROM PARALLEL TO ROADWAY SHOULDER AT 3G SEGMENT TO 15:1 TAPER WITHIN 18'-9" BASED ON POST OFFSET DIMENSIONS SHOWN.
2. THE OPTION 1 LAYOUT SHALL BE USED WHEN "Y" EXCEEDS 16 FEET OR WHEN MEDIAN BARRIER IS CONTINUOUS.
3. THE OPTION 2 LAYOUT SHALL BE USED WHEN "Y" IS 16 FEET OR LESS.
4. SEE SHEET 15 FOR RIGHT SHOULDER GUARDRAIL LAYOUT.

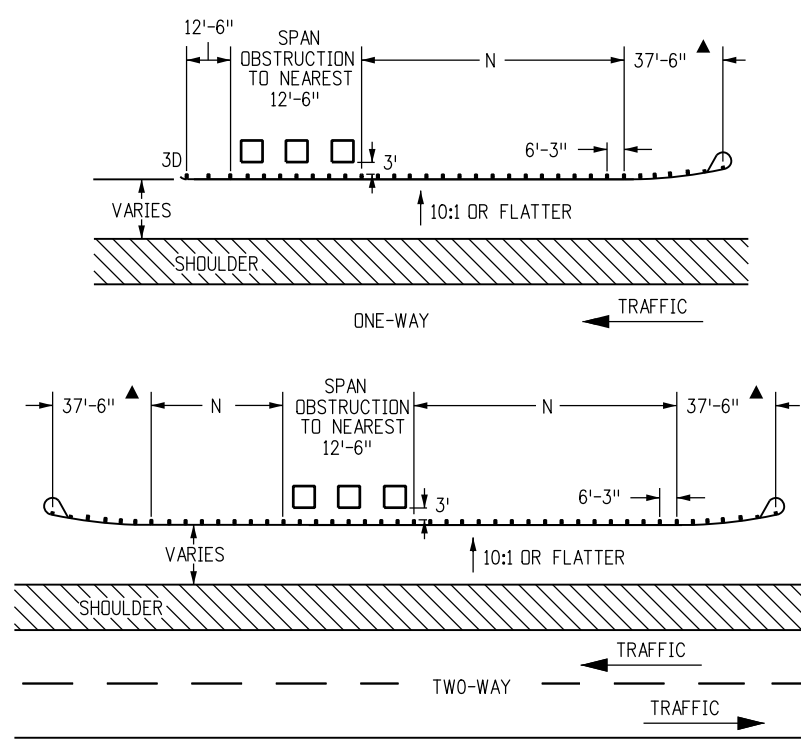


TR = 18 FT.-9 IN FOR TRANSITION TYPE 3G.
 C = CHANGE: 100 FT. TRANSITION TO NORMAL SLOPE.
 M = WIDTH OF MEDIAN.
 L = TOTAL LENGTH PAID AS GUARDRAIL TYPE 3.
 Y = FINAL OFFSET AT END.

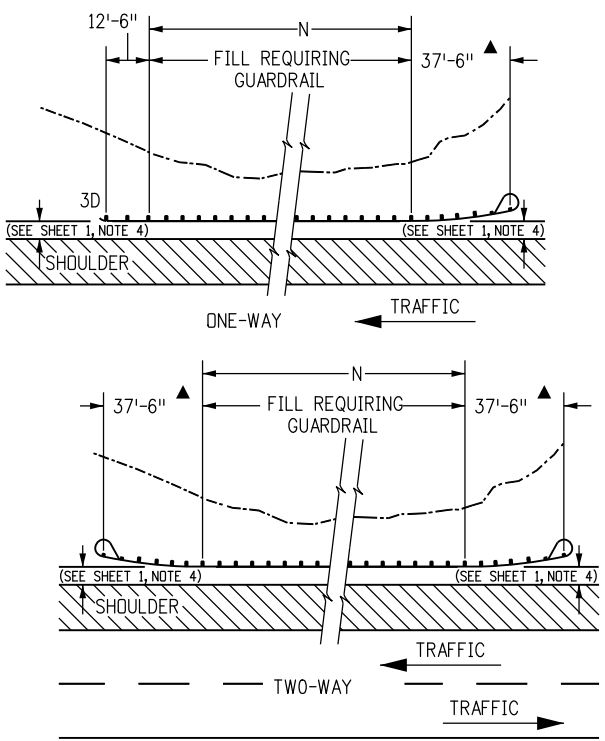


MULTILANE DIVIDED HIGHWAYS - (DEPRESSED MEDIANS, 21 - 59 FT. WITH OPEN HAZARDS OR OBSTRUCTIONS)

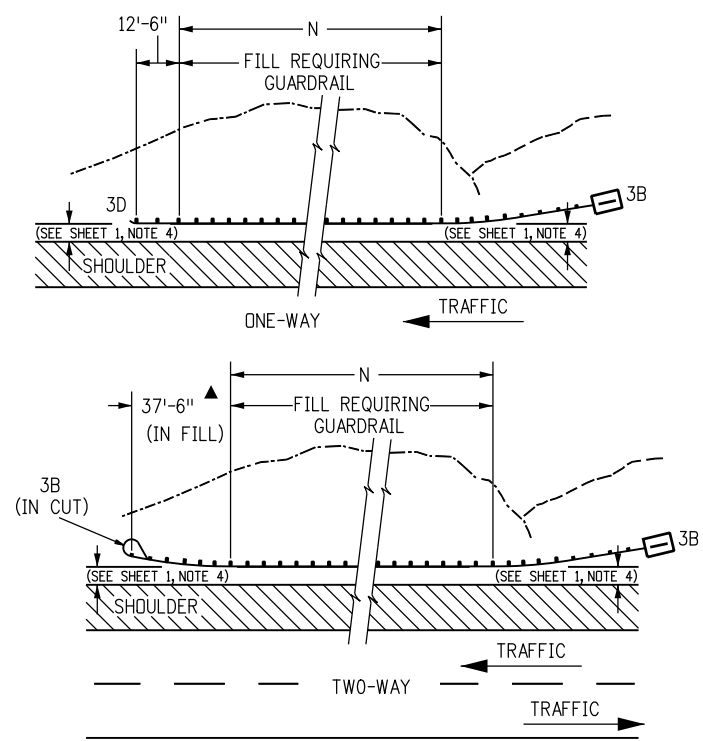
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Date:	Comments																		
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GUARDRAIL FOR ROADSIDE OBSTRUCTIONS



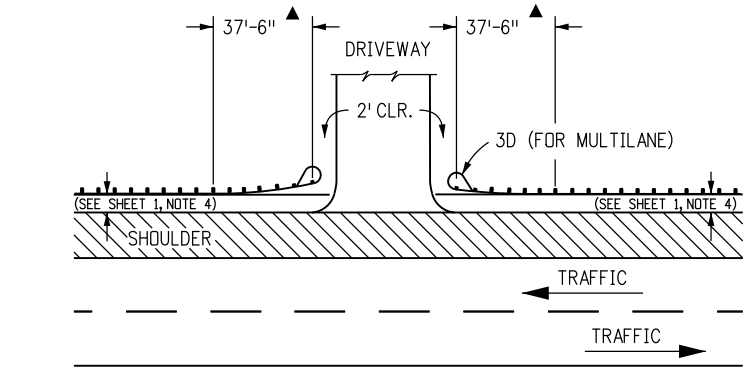
GUARDRAIL FOR ROADSIDE FILL CONSTRUCTION



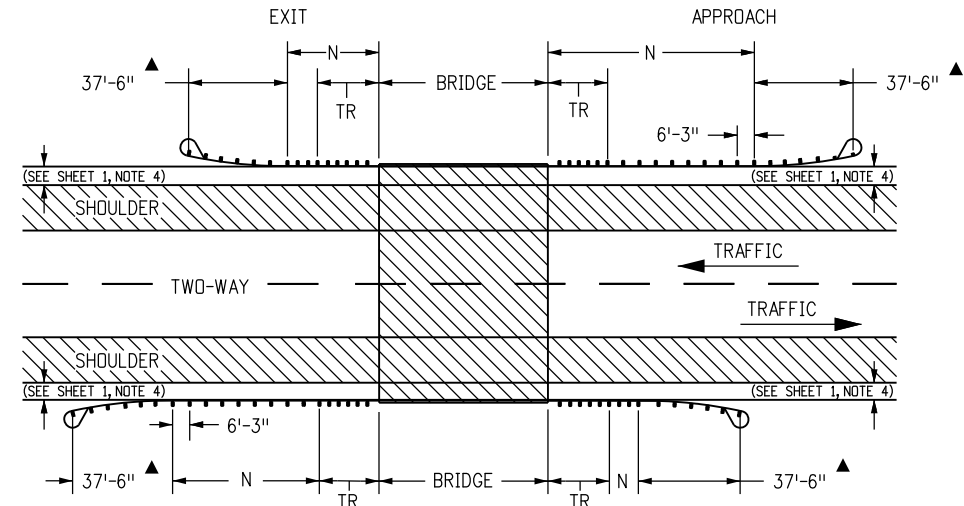
GUARDRAIL FOR ROADSIDE CUT-TO-FILL CONDITION

- NOTES**
1. THE TYPE 3G OR 3H TRANSITIONS (SEE SHEET 12) SHALL BE USED TO CONNECT A TYPE 3 W-BEAM TO TYPE 7 CONCRETE BARRIER OR TO A TYPE 7, 8, OR 10 BRIDGE RAIL. FOR A TRANSITION FROM A ROADWAY TYPE 3 W-BEAM TO A BRIDGE RAIL TYPE 3 WITH BACKING TUBES, THE TRANSITION TYPE 3L SHOWN ON SHEET 20 SHALL BE USED.
 2. "TR" WILL BE 18 FT.-9 IN. FOR THE TRANSITIONS TYPE 3G AND 3H, AND 25 FT. FOR THE TRANSITION TYPE 3L.
 3. THE GUARDRAIL LENGTH DIMENSION "N" IS THE LENGTH AS DETERMINED BY THE LENGTH OF NEED COMPUTATION AND IS SHOWN ON THE PLANS. THE MINIMUM IS 12 FT.-6 IN. WHERE SITE CONDITIONS ALLOW. THE OVERALL REQUIRED LENGTH OF NEED CAN INCLUDE THE LENGTH OF TRANSITION, THE LENGTH OF RAIL (N), AND ANY REDIRECTIVE LENGTH IN THE RAIL END TREATMENT. A TRAVERSABLE SLOPE SHALL BE PROVIDED BEHIND THE TERMINAL TO DIMENSION "N" PRIOR TO THE OBSTRUCTION UNLESS OTHERWISE APPROVED BY THE ENGINEER.

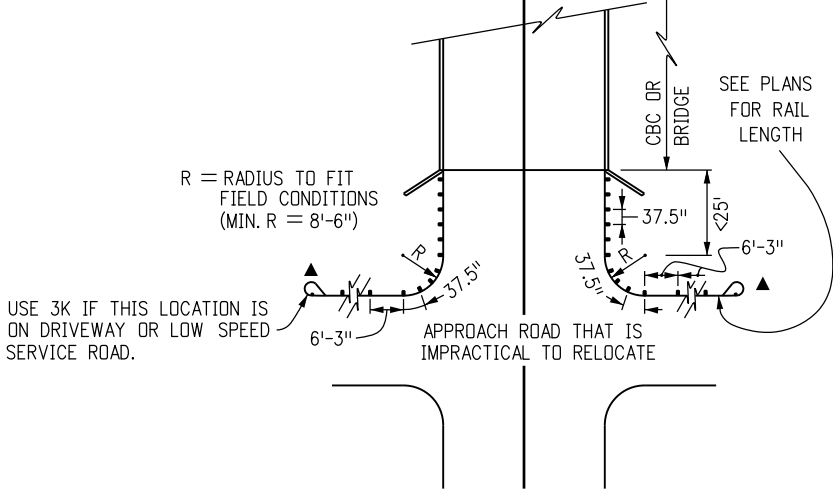
▲ END ANCHORAGE CAN BE FLARED OR NONFLARED



LAYOUT FOR DRIVEWAY APPROACH



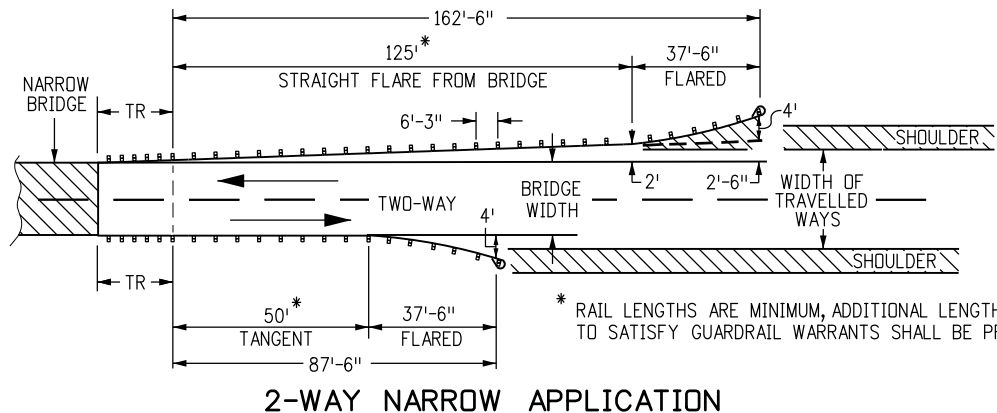
2-WAY NORMAL BRIDGE APPLICATION



GUARDRAIL TYPE 3 WITH BLOCKED OUT POSTS SPACED AT 3'-1 1/2" FROM STRUCTURE AROUND CURVE.

INTERRUPTED STRUCTURE APPROACH

(USE TYPE 3J ON SHEET 13 WHEN PRACTICAL)



2-WAY NARROW APPLICATION

* RAIL LENGTHS ARE MINIMUM, ADDITIONAL LENGTH TO SATISFY GUARDRAIL WARRANTS SHALL BE PROVIDED

Computer File Information	
Creation Date: 08/19/15	Initials: JBK
Last Modification Date: 02/08/18	Initials: LTA
Full Path: www.codot.gov/business/designsupport	
Drawing File Name: 60601018020.dgn	
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	

Sheet Revisions	
Date:	Comments
(R-X)	
(R-X)	
(R-X)	
(R-X)	

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Division of Project Support **JBK/LTA**

MIDWEST
GUARDRAIL SYSTEM (MGS)
TYPE 3 W-BEAM 31 INCHES

Issued By: Project Development Branch July 4, 2012

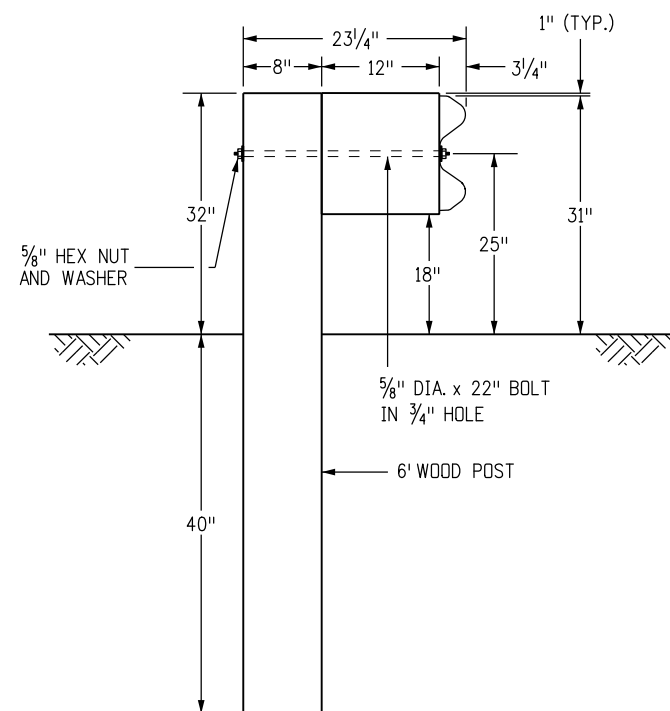
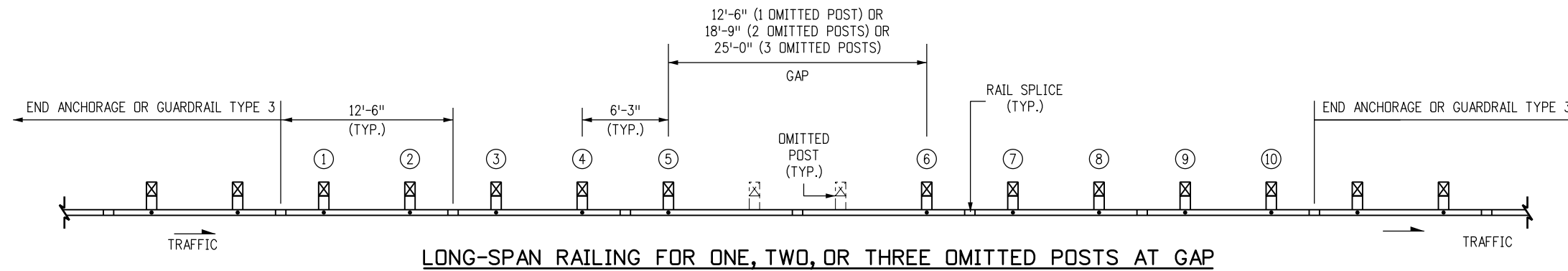
STANDARD PLAN NO.

M-606-1

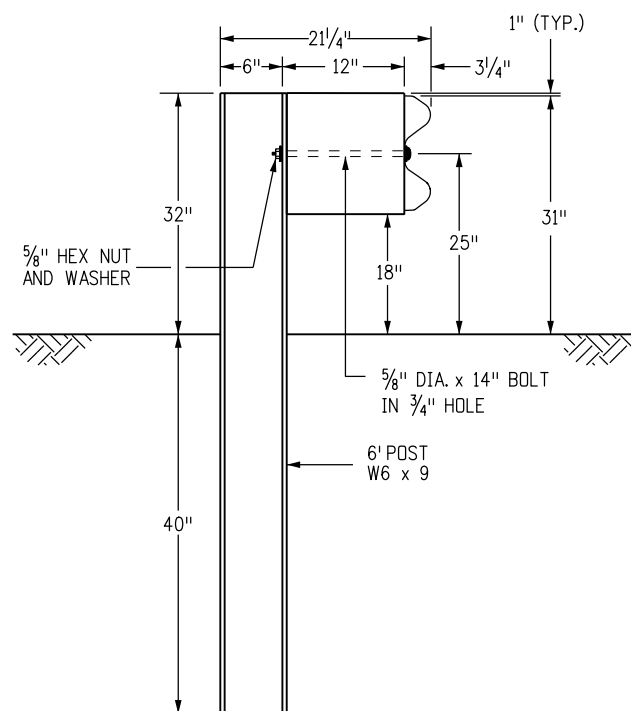
Sheet No. 18 of 20

NOTES

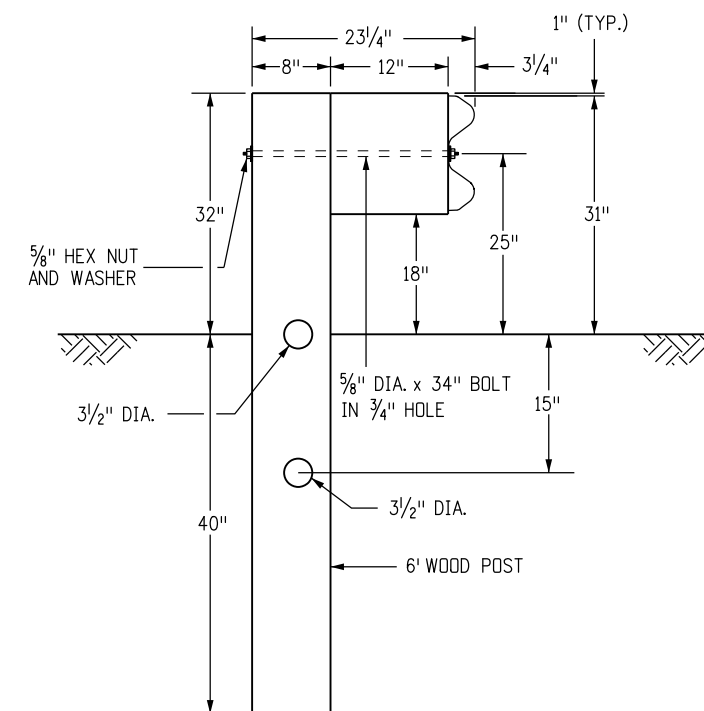
- POSTS ①, ②, ⑨, and ⑩ MAY BE TIMBER OR STEEL.
- THE NUMBER OF OMITTED POSTS IS DEPENDENT ON THE LENGTH OF THE GAP.



POSTS ①-② AND ⑨-⑩
(SEE NOTE 1)



POSTS ①-② AND ⑨-⑩
(SEE NOTE 1)



POSTS ③ - ⑧

Computer File Information

Creation Date: 08/19/15 Initials: JBK
 Last Modification Date: 02/08/18 Initials: LTA
 Full Path: www.codot.gov/business/designsupport
 Drawing File Name: 60601019020.dgn
 CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English

Sheet Revisions

Date:	Comments
12/29/15	Raised guardrail height to 31".
12/29/15	Deleted Nested Rails details. Revised General Notes. Combined 1, 2, and 3 omitted posts details into one detail.

Colorado Department of Transportation



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Division of Project Support

JBK/LTA

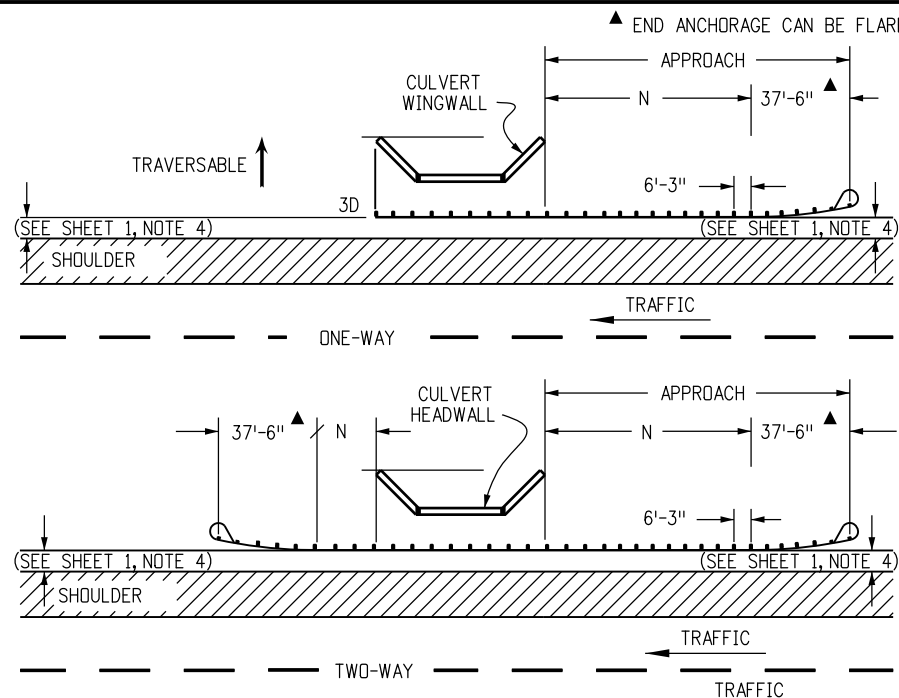
**MIDWEST
 GUARDRAIL SYSTEM (MGS)
 TYPE 3 W-BEAM 31 INCHES**

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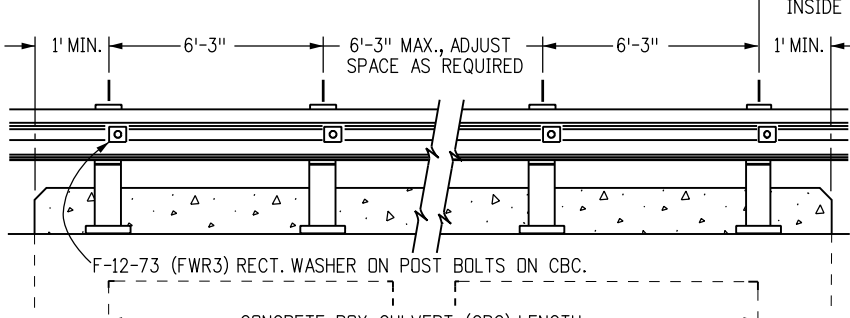
STANDARD PLAN NO.

M-606-1

Sheet No. 19 of 20



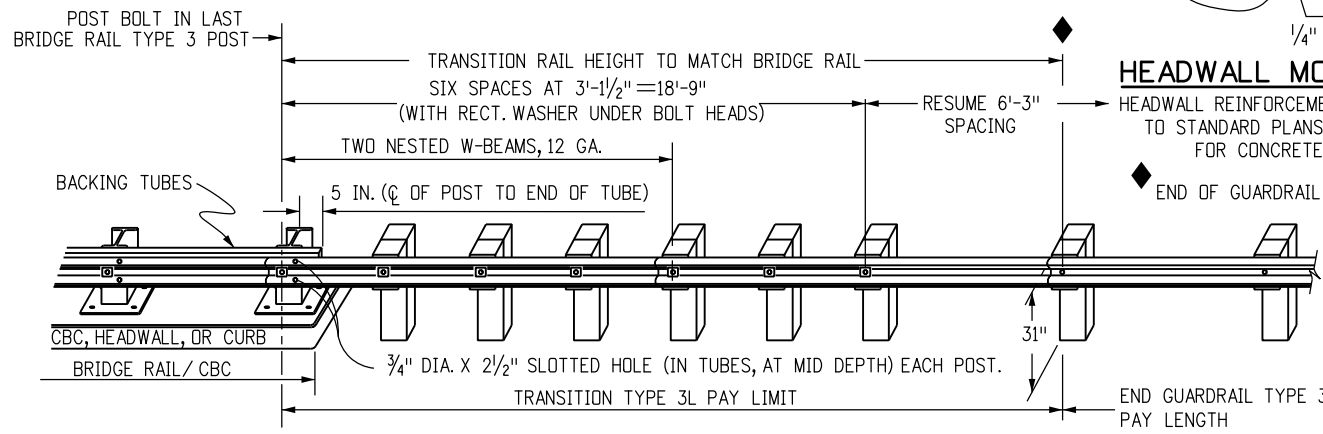
GUARDRAIL FOR CULVERTS



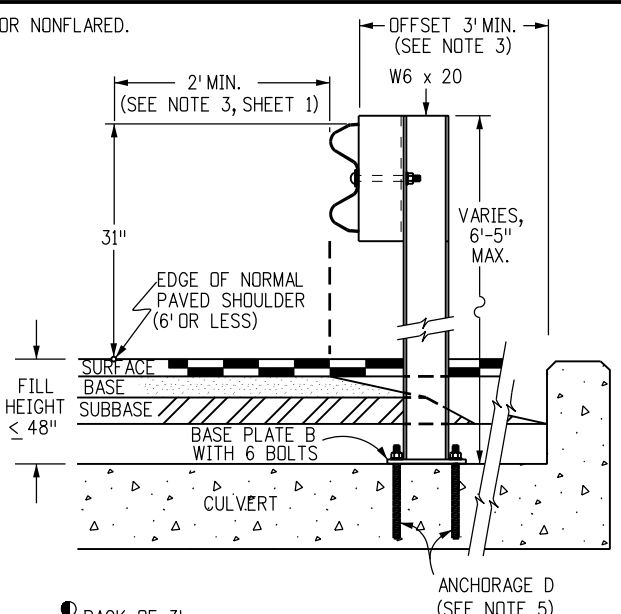
CONCRETE BOX CULVERT (CBC) LENGTH MEASURED ALONG C OF ROADWAY BETWEEN EXTREME ENDS OF OPENINGS FOR MULTIPLE OR SINGLE BOXES. SEE NOTES 3 AND 4.

RAIL PLACEMENT FOR INSIDE OR HEADWALL MOUNT

* USE 3L TRANSITION AT BOTH APPROACH AND EXIT ENDS OF BRIDGE RAIL TYPE 3 (HEADWALL MOUNT)

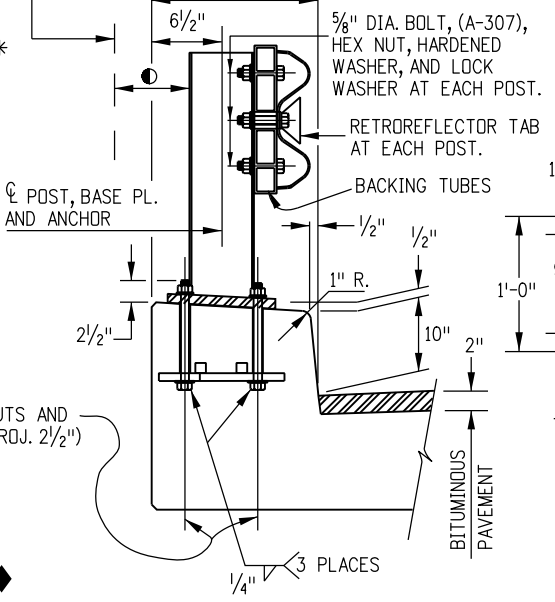


TRANSITION TYPE 3L AND GUARDRAIL TYPE 3 APPROACH



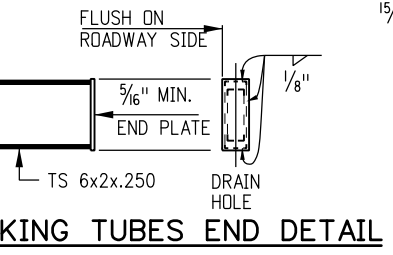
INSIDE MOUNT ON CBC

BACK OF 3L TRANSITION POST 5.75" STEEL POST OR 8" WOOD POST



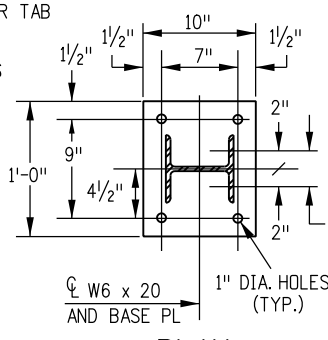
HEADWALL MOUNT ON CBC

HEADWALL REINFORCEMENT SHALL BE ACCORDING TO STANDARD PLANS M-601-1, 2, AND 3 FOR CONCRETE BOX CULVERTS.

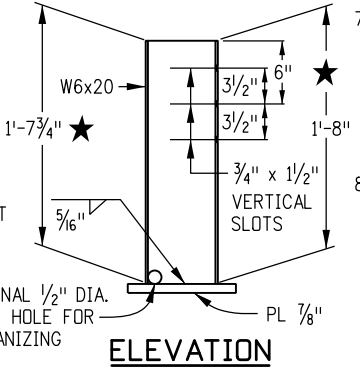


BACKING TUBES END DETAIL

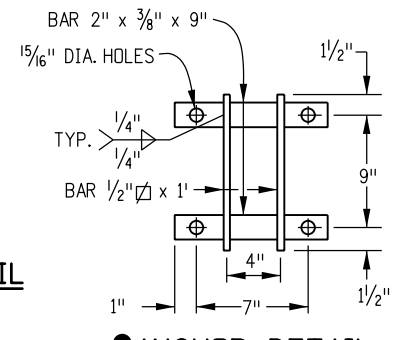
(FOR HEADWALL MOUNT)
TUBES SHALL BE CONTINUOUS. NEITHER BOLTED NOR WELDED SPLICES WILL BE ALLOWED.



PLAN HEADWALL MOUNT POST DETAIL

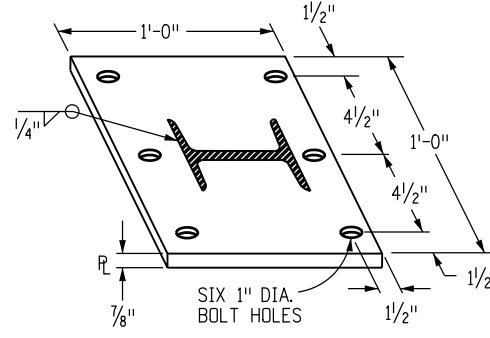


ELEVATION HEADWALL MOUNT POST DETAIL

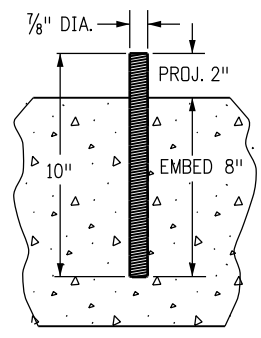


ANCHOR DETAIL (FOR HEADWALL MOUNT)

BASE PLATE B (FOR INSIDE MOUNT)



ANCHORAGE D (FOR INSIDE MOUNT)



NOTES

- LOCATION AND LENGTH OF MEDIAN GUARDRAIL APPROACHES TO CULVERTS WITH FULL HEADWALL AND WINGWALLS SHALL BE AS SHOWN FOR BRIDGES ON SHEET 16. THE GUARDRAIL TYPE 3 SHALL CONTINUE ACROSS THE CULVERT AS SHOWN ON THIS SHEET.
- RIGHT SHOULDER BOX CULVERT TREATMENT IS SHOWN ON THIS SHEET FOR CULVERTS 20 FT. OR LESS IN LENGTH.
- GUARDRAIL ACROSS CULVERTS WITH A LENGTH OF 20 FT. OR LESS SHALL BE AS FOLLOWS:
 - FILL HEIGHT AT GUARDRAIL POST 48 IN. OR GREATER: CONSTRUCTION AND PAYMENT WILL BE AS GUARDRAIL TYPE 3.
 - FILL HEIGHT AT GUARDRAIL POST LESS THAN 48 IN. AND BLOCK FACE TO HEADWALL OFFSET OF 3 FT. OR GREATER: CONSTRUCTION AND PAYMENT AS GUARDRAIL TYPE 3.
 - FILL HEIGHT AT GUARDRAIL POST 48 IN. OR LESS AND BLOCK FACE TO HEADWALL OFFSET LESS THAN 3 FT.: CONSTRUCTION ACCORDING TO HEADWALL MOUNT DETAILS AND PAYMENT AS BRIDGE RAIL TYPE 3.
- GUARDRAIL ACROSS CULVERTS WITH LENGTH GREATER THAN 20 FT. SHALL BE AS FOLLOWS:
 - FILL HEIGHT AT GUARDRAIL POSTS 48 IN. OR GREATER: CONSTRUCTION AND PAYMENT WILL BE FOR STANDARD GUARDRAIL TYPE 3.
 - FILL HEIGHT AT GUARDRAIL POSTS 48 IN. OR LESS: CONSTRUCTION AND PAYMENT IN ACCORDANCE WITH THE CONTRACT BRIDGE PLANS. WHEN BLOCK FACE TO HEADWALL OFFSET IS 3 FT. OR GREATER: CONSTRUCTION AND PAYMENT AS GUARDRAIL TYPE 3.
- ANCHORAGE D: SIX BOLTS FOR BASE PLATE "B" WITH INSIDE MOUNT. THE BOLTS SHALL BE 7/8 IN. DIA X 10 IN. HIGH STRENGTH RODS THREADED FULL LENGTH AND ALL GALVANIZED. RODS SHALL BE CAST-IN-PLACE FOR A NEW STRUCTURE. FOR AN EXISTING STRUCTURE, THE RODS SHALL BE INSTALLED IN 1-1/4 IN. DIA HOLES WITH NON-SHRINK GROUT OR EPOXY CONFORMING TO ASTM C 881.
- TYPE 3L POSTS SHALL BE STEEL OR WOOD TO MATCH POSTS USED ON THE APPROACH GUARDRAIL.
- THE GUARDRAIL LENGTH DIMENSION "N" IS THE LENGTH AS DETERMINED BY THE LENGTH OF NEED COMPUTATION AND IS SHOWN ON THE PLANS. THE MINIMUM IS 12 FT.-6 IN. WHERE SITE CONDITIONS ALLOW. THE OVERALL REQUIRED LENGTH OF NEED CAN INCLUDE THE LENGTH OF TRANSITION, THE LENGTH OF RAIL (N), AND ANY REDIRECTIVE LENGTH IN THE RAIL END TREATMENT.
- ALL BRIDGE RAIL TYPE 3 BACKING TUBES SHALL BE FABRICATED FROM ASTM A 500 GRADE B. ALL POSTS, BASE PLATES, AND ANCHOR BOLTS SHALL BE FABRICATED FROM ASTM A 36 STEEL. THE ABOVE MATERIAL, W-BEAM, AND ALL ANCHOR BOLTS AND MISCELLANEOUS BOLTS, NUTS, AND WASHERS SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH SECTION 509. CONCRETE, REINFORCING STEEL, AND STRUCTURAL STEEL ELEMENTS SHALL BE IN ACCORDANCE WITH SECTIONS 601, 602, AND 509, RESPECTIVELY.
- POST ANCHORS, ENCASED IN CONCRETE, SHALL BE ASTM A 36 STEEL, AND NEED NOT BE GALVANIZED.
- PRIOR TO FABRICATION OF BRIDGE RAIL, THREE SETS OF WORKING DRAWINGS WHICH COMPLY WITH THE REQUIREMENTS OF SECTION 105 SHALL BE SUBMITTED TO THE ENGINEER FOR INFORMATION ONLY.
- IF HEADWALL MOUNT GUARDRAIL IS USED, SEE STANDARD PLAN M-601, AND NOTES BELOW:
 - ALL ITEMS ABOVE TOP OF CBC HEADWALL WILL BE MEASURED AND PAID FOR AS LINEAR FEET OF BRIDGE RAIL TYPE 3.
 - HEADWALL MOUNTING OF RAIL WILL NOT BE MEASURED AND PAID FOR SEPARATELY BUT SHALL BE INCLUDED IN THE WORK.

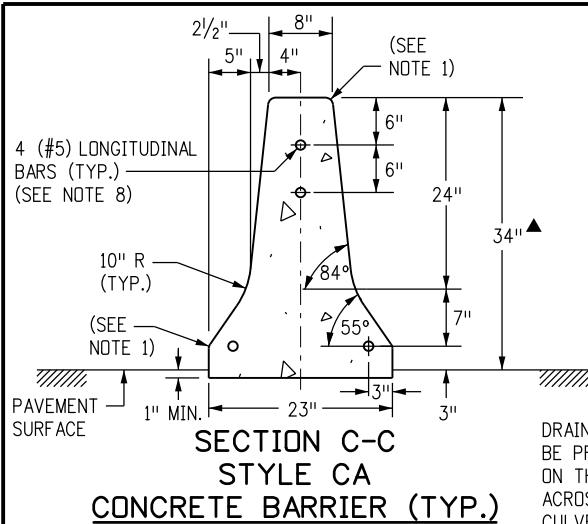
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Drawing File Name: 60601020020.dgn	
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	

Sheet Revisions	
Date:	Comments
(R-X) 12/29/15	Raised guardrail height to 31".
(R-X) 01/18/18	Revised bar dim. in Anchor detail.

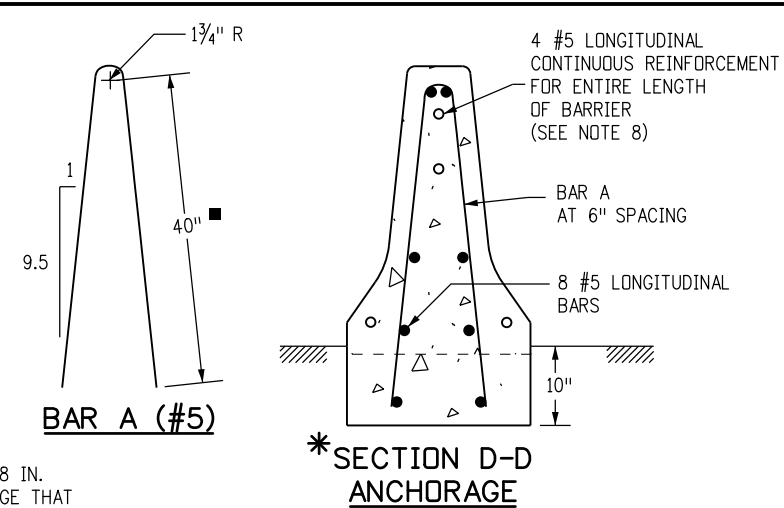
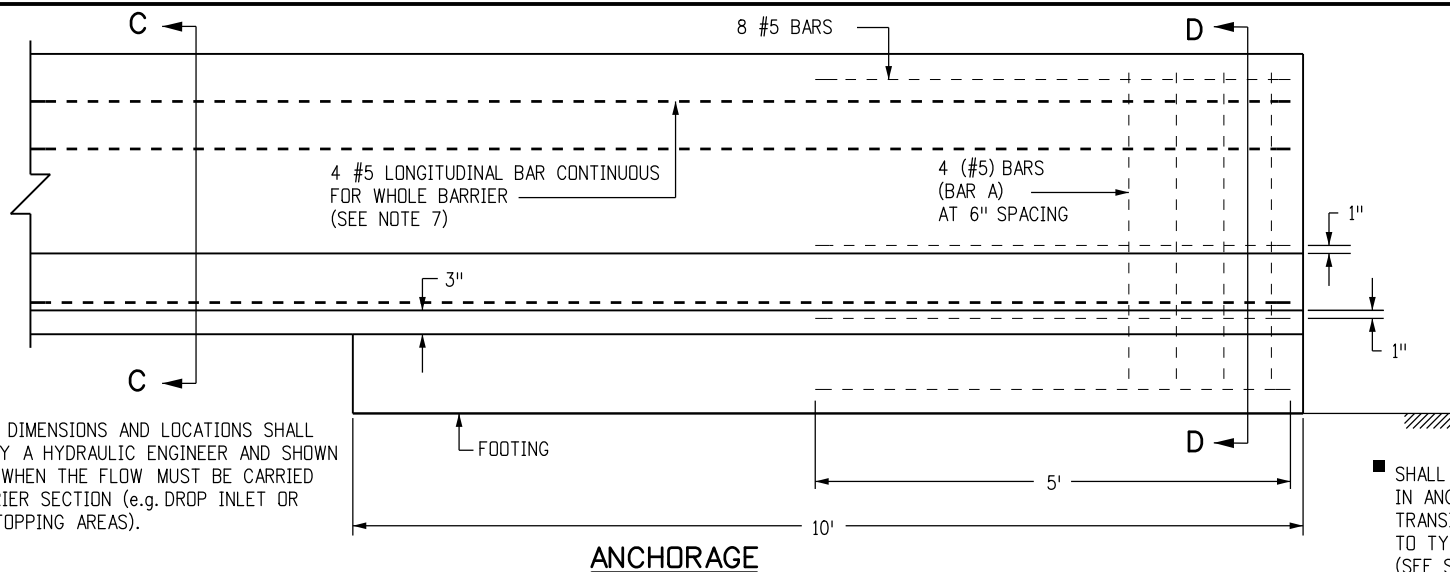
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MIDWEST
 GUARDRAIL SYSTEM (MGS)
 TYPE 3 W-BEAM 31 INCHES
 Issued By: Project Development Branch July 4, 2012

STANDARD PLAN NO.
 M-606-1
 Sheet No. 20 of 20



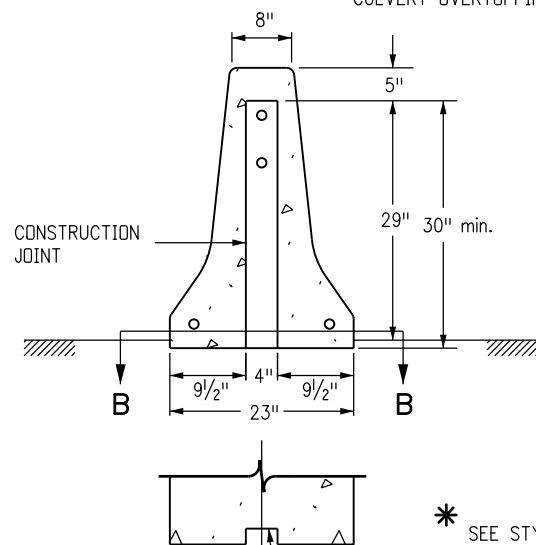
DRAINAGE SLOT DIMENSIONS AND LOCATIONS SHALL BE PROVIDED BY A HYDRAULIC ENGINEER AND SHOWN ON THE PLANS WHEN THE FLOW MUST BE CARRIED ACROSS A BARRIER SECTION (e.g. DROP INLET OR CULVERT OVERTOPPING AREAS).



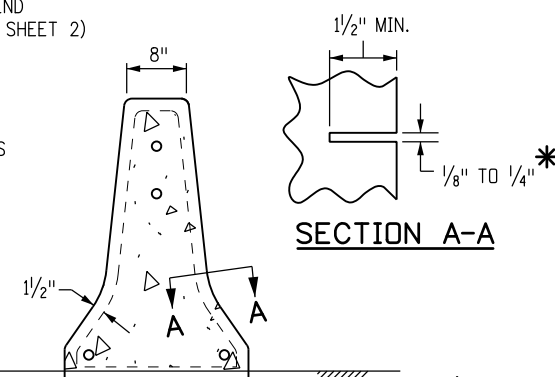
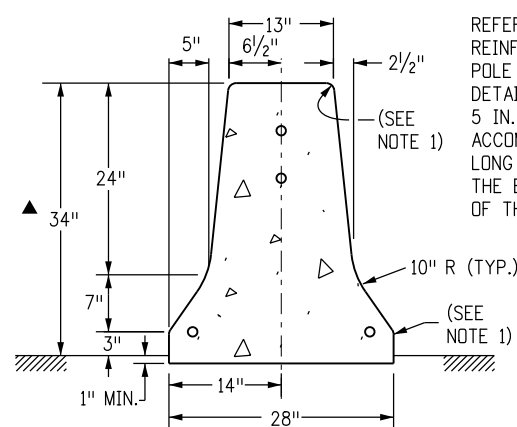
SHALL BE 38 IN. IN ANCHORAGE THAT TRANSITIONS FROM TYPE 7 TO TYPE 3G-THREE BEAM (SEE SHEET 2)

GENERAL NOTES

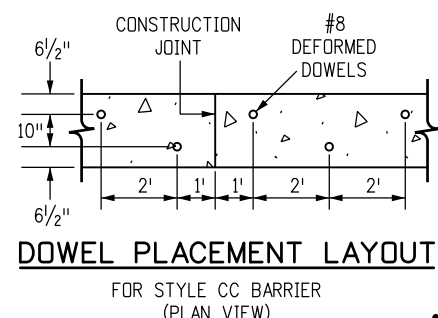
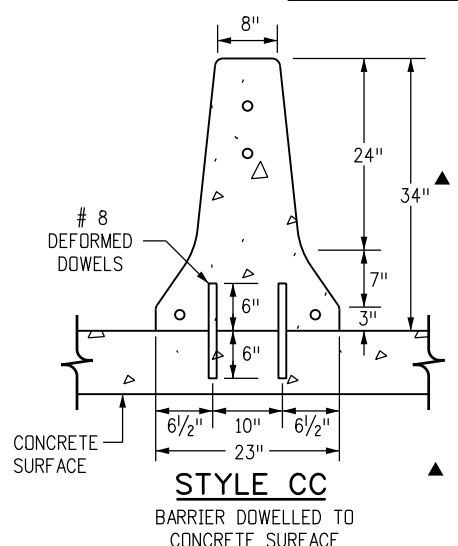
- ALL EDGES SHALL BE ROUNDED WITH A 1 IN. RADIUS EXCEPT AS SHOWN.
- THE BARRIER SHALL BE ANCHORED AT THE ENDS AND AT INTERRUPTIONS WITH THE 10 FT. REINFORCED ANCHORAGE. THE FOOTING AND END BARRIER MAY BE MONOLITHIC OR THE BARRIER MAY BE CONNECTED TO THE 10 IN. DEEP FOOTING USING TEN #8 REBAR DOWELS (10 IN. LONG) SET TWO IN LINE AT 24 IN. SPACING.
- BARRIER MAY BE CAST-IN-PLACE, SLIP FORMED, OR PRECAST (SEE STANDARD PLAN M-606-14).
- BARRIER FOUNDATION SHALL BE PAVEMENT, OR COMPACTED AGGREGATE BASE, OR EMBANKMENT MATERIAL.
- NO FOOTING IS REQUIRED (TYP.) EXCEPT FOR 10 FT. ANCHORAGE.
- CONSTRUCTION JOINTS SHALL BE USED ON ALL BARRIER TYPES SHOWN, AT THE END OF THE DAY'S POUR OR AFTER ANY INTERRUPTION LONGER THAN 30 MINUTES. ALL CONSTRUCTION JOINTS SHALL BE THOROUGHLY CLEANED BEFORE FRESH CONCRETE IS POURED.
- REINFORCING STEEL IN ANCHORAGE SHALL BE GRADE 60 EPOXY COATED DEFORMED BARS.
- CONTINUOUS LONGITUDINAL REINFORCEMENT SHALL BE EITHER GRADE 60 EPOXY COATED DEFORMED BARS OR WIRE STRAND WITH MINIMUM ULTIMATE TENSILE STRENGTH OF 28,000 LBS. AND CLASS C GALVANIZING ACCORDING TO ASTM A 603.
- TRANSITION TO EXISTING CONCRETE BARRIER INSTALLATIONS OF DISSIMILAR SHAPE SHALL BE ACCOMPLISHED IN ONE 10 FT. LONG SEGMENT OF BARRIER.
- CONCRETE SHALL BE CLASS D.
- ADDITIONAL MATERIAL FOR BARRIER EMBEDMENT GREATER THAN 1 IN. WILL NOT BE MEASURED AND PAID FOR SEPARATELY BUT SHALL BE INCLUDED IN THE WORK.
- EPOXY COATED LONGITUDINAL REBAR SHALL HAVE A MINIMUM LAP SPLICE OF 38 IN. WIRE STRAND LONGITUDINAL REINFORCEMENT SHALL BE BUTT WELDED OR MECHANICALLY SPLICED TO MAINTAIN 100 PERCENT OF THE MINIMUM REQUIRED TENSILE STRENGTH.
- ALL INCIDENTAL WORK AND MATERIAL SUCH AS DOWELS, GROUT, ANCHORS, BOLTS, PINS, JOINT MATERIAL, EXCAVATION FOR BASES, CONTINUOUS LONGITUDINAL REINFORCEMENT, SHALL BE INCLUDED IN THE COST OF GUARDRAIL.
- RETROREFLECTORIZATION IS REQUIRED ON ALL BARRIER TYPES. SEE BARRIER RETROREFLECTOR NOTES ON STANDARD PLAN S-612-1.



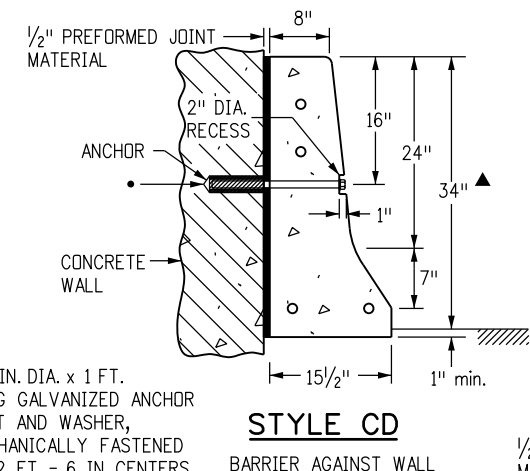
BARRIER ELEVATION VIEW INCLUDING REINFORCED ANCHORAGE AT END (FOR ANCHORAGE THAT TRANSITIONS TO BRIDGE RAIL OR THREE BEAM, SEE SHEET 2)



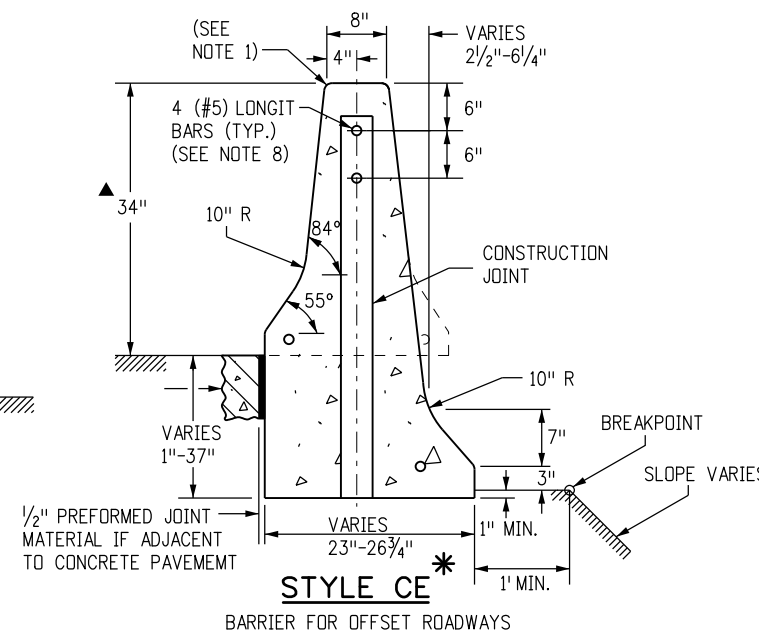
SECTION B-B CONSTRUCTION JOINT



IN FUTURE OVERLAYS, AN OVERALL MINIMUM HEIGHT OF 31 IN. IS REQUIRED.



1/2 IN. DIA. x 1 FT. LONG GALVANIZED ANCHOR BOLT AND WASHER, MECHANICALLY FASTENED AT 2 FT. - 6 IN. CENTERS. USE ONLY WHEN CALLED FOR ON PLANS.



Computer File Information

Creation Date: 07/04/12	Initials: DM
Last Modification Date: 08/30/13	Initials: LTA
Full Path: www.coloradodot.info/business/designsupport	
Drawing File Name: 6060130104.dgn	
CAD Ver.: MicroStation V8	Scale: Not to Scale Units: English

Sheet Revisions

Date:	Comments
08/30/13	Revised Sheet 2 of 4.
(R-X)	
(R-X)	
(R-X)	
(R-X)	

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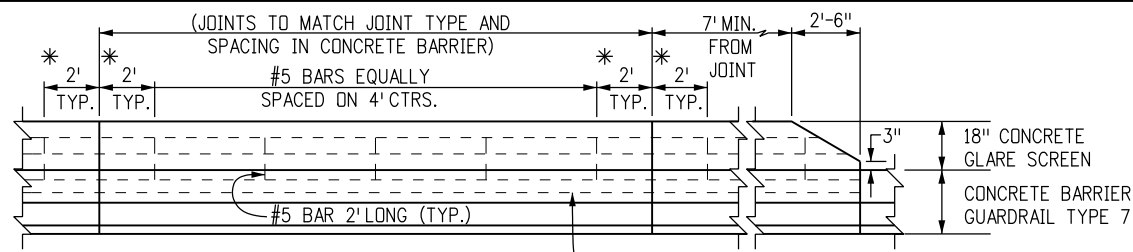
GUARDRAIL TYPE 7
F-SHAPE BARRIER

Issued By: Project Development Branch July 4, 2012

STANDARD PLAN NO.

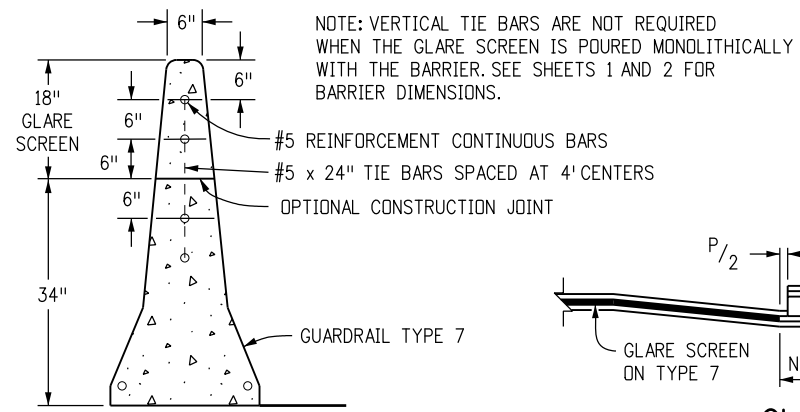
M-606-13

Sheet No. 1 of 4

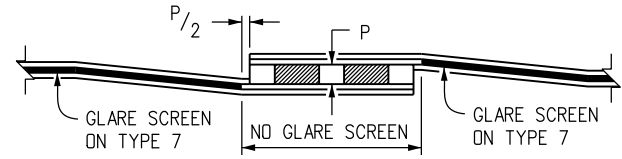


ELEVATION #5 REINFORCEMENT CONTINUOUS BARS

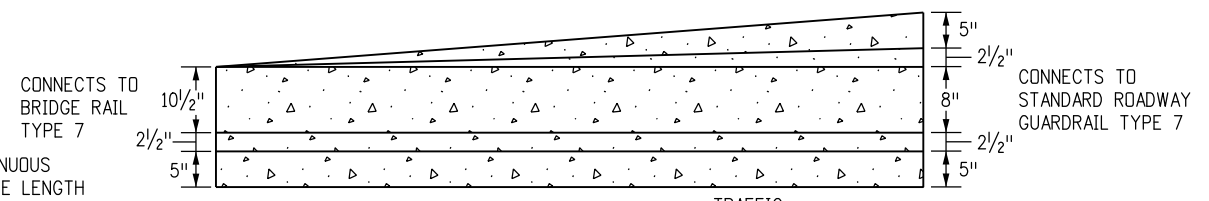
* 2 FT. IS TYPICAL FOR CAST-IN-PLACE BARRIERS.
1 FT. IS TYPICAL FOR PRECAST BARRIERS.
THE MINIMUM ACCEPTABLE DIMENSION IS 6 IN.



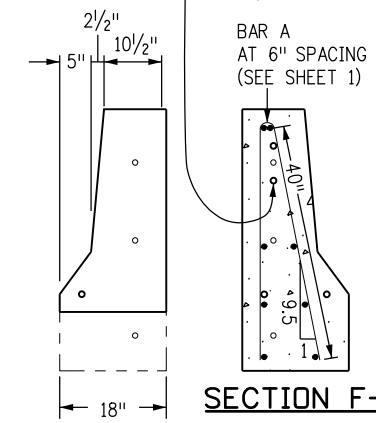
CONCRETE GLARE SCREEN



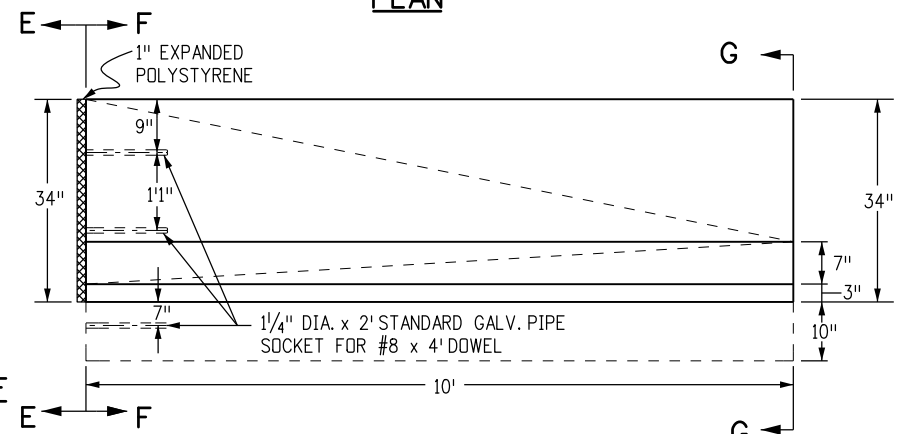
GLARE SCREEN AT MEDIAN OBSTRUCTIONS



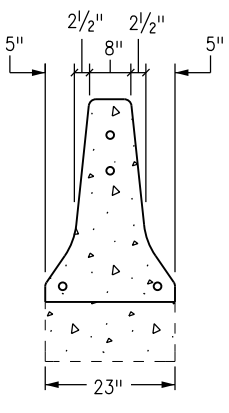
PLAN



SECTION E-E



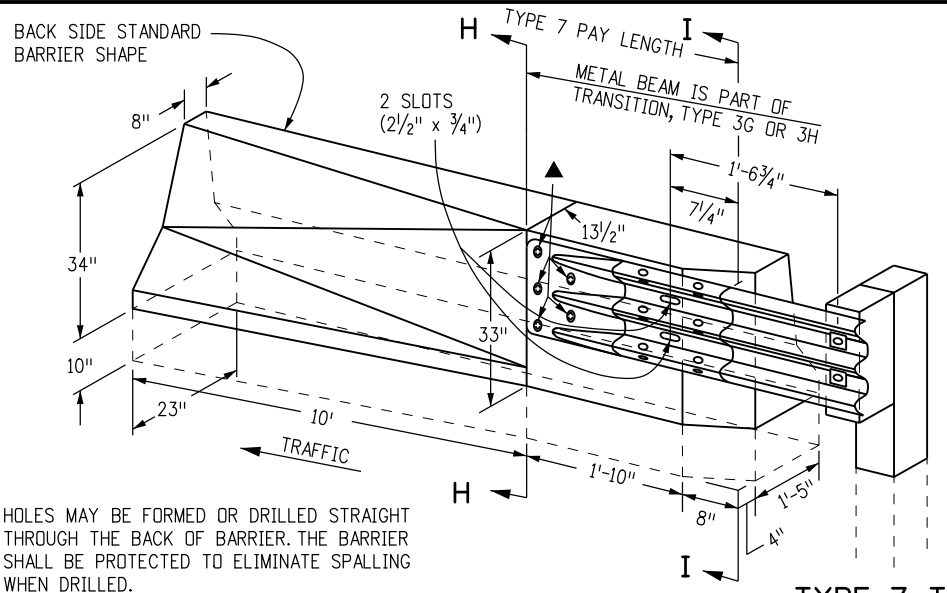
ELEVATION



SECTION G-G

THIS SECTION PROVIDES A TRANSITION FOR THE SHAPE OF THE BRIDGE RAIL TYPE 7 TO THE ROADWAY GUARDRAIL TYPE 7. MEASURED AND PAID FOR AS GUARDRAIL TYPE 7.
(SEE ANCHORAGE DETAIL ON SHEET 1 FOR REINFORCEMENT INFORMATION)

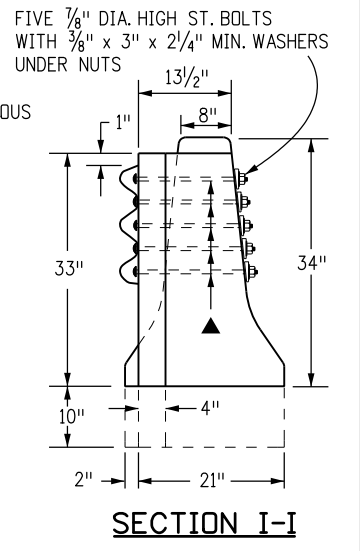
BRIDGE RAIL TYPE 7 TO ROADWAY SHOULDER TYPE 7 TRANSITION AND ANCHORAGE



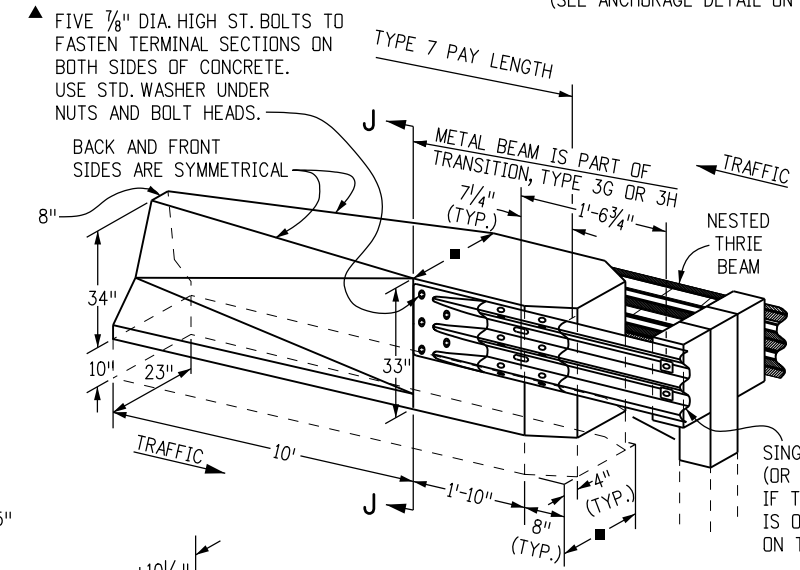
▲ HOLES MAY BE FORMED OR DRILLED STRAIGHT THROUGH THE BACK OF BARRIER. THE BARRIER SHALL BE PROTECTED TO ELIMINATE SPALLING WHEN DRILLED.

SECTION H-H

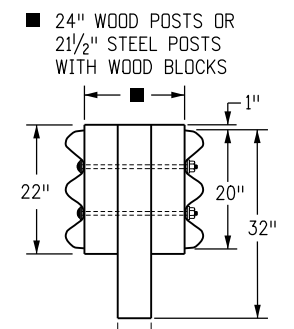
TYPE 7 TO SINGLE TYPE 3G TRANSITION AND ANCHORAGE
(SEE ANCHORAGE DETAIL ON SHEET 1 FOR REINFORCEMENT INFORMATION)



SECTION I-I



TYPE 7 TO DOUBLE TYPE 3G TRANSITION AND ANCHORAGE
(SEE ANCHORAGE DETAIL ON SHEET 1 FOR REINFORCEMENT INFORMATION)



SECTION J-J

Computer File Information	
Creation Date: 07/04/12	Initials: DM
Last Modification Date: 08/30/13	Initials: LTA
Full Path: www.coloradodot.info/business/designsupport	
Drawing File Name: 6060130204.dgn	
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	

Sheet Revisions	
Date:	Comments
08/30/13	Revised some dimensions in the Type 7 to Type 3G transition details for consistency with M-606-1, Guardrail Type 3 W-Beam.

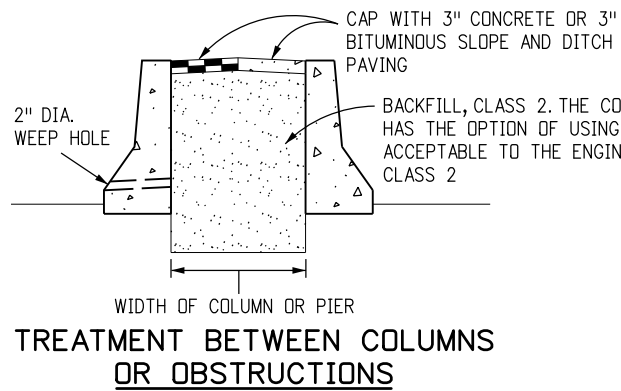
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Division of Project Support **DLM/LTA**

GUARDRAIL TYPE 7
F-SHAPE BARRIER

Issued By: Project Development Branch July 4, 2012

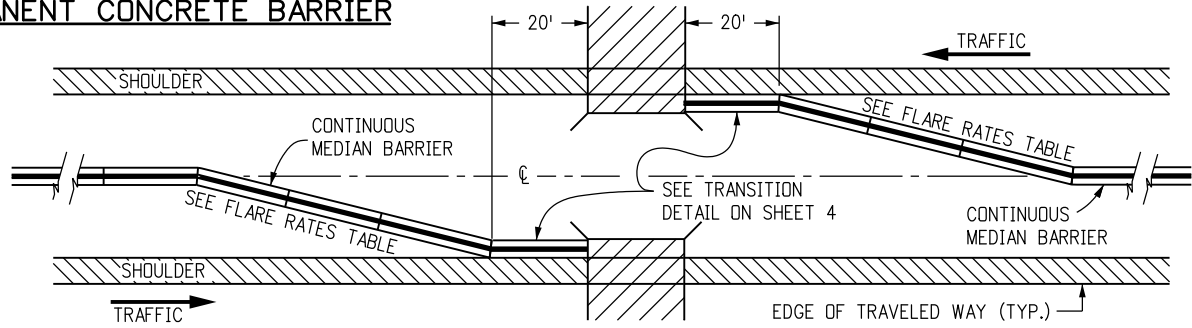
STANDARD PLAN NO.
M-606-13
Sheet No. 2 of 4



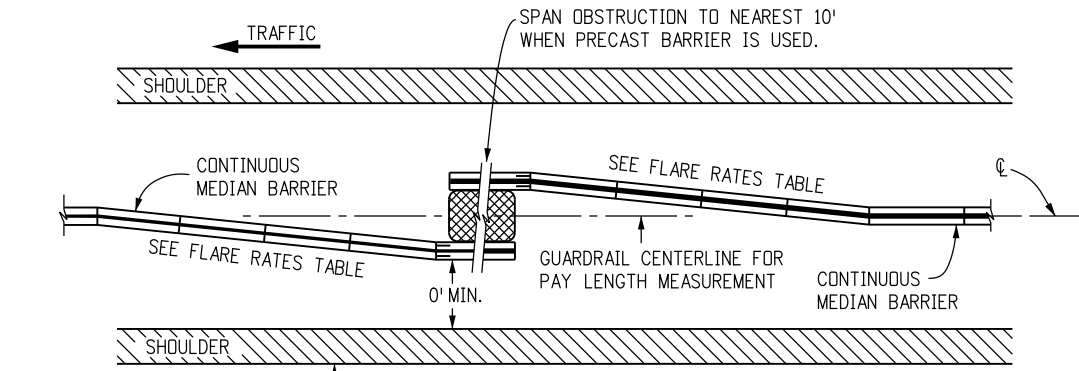
DESIGN SPEED (MPH)	SHY LINE OFFSET (FT.)*	FLARE RATE FOR BARRIER INSIDE SHY LINE	FLARE RATE FOR BARRIER OUTSIDE SHY LINE
80	12	30:1	20:1
75	10	30:1	20:1
70	9	30:1	20:1
60	8	26:1	18:1
55	7	24:1	16:1
50	6.5	21:1	14:1
45	6	18:1	12:1
40	5	16:1	10:1
30	4	13:1	8:1

- NOTES**
1. THE MEDIAN IN THESE APPLICATIONS SHALL BE PAVED ON A SLOPE CONTINUED FROM THE ADJACENT PAVED SHOULDER OR A 10:1 OR FLATTER SLOPE.
 2. THE PAY LENGTH FOR BARRIER ON BOTH SIDES OF AN OBSTRUCTION WILL BE DETERMINED BY ONE LINEAR MEASUREMENT ALONG THE GUARDRAIL CENTERLINE. THE BACKFILL AND CAP BETWEEN COLUMNS OR OBSTRUCTIONS WILL NOT BE MEASURED AND PAID FOR SEPARATELY BUT SHALL BE INCLUDED IN THE WORK.
 3. GUARDRAIL BETWEEN COLUMNS OR OBSTRUCTIONS MAY BE STYLES CD OR CA AS SHOWN ON THE PLANS.

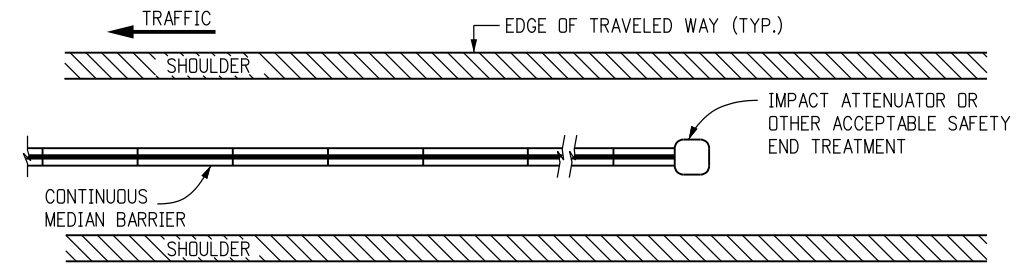
TABLE OF FLARE RATES FOR PERMANENT CONCRETE BARRIER



BRIDGE APPROACH

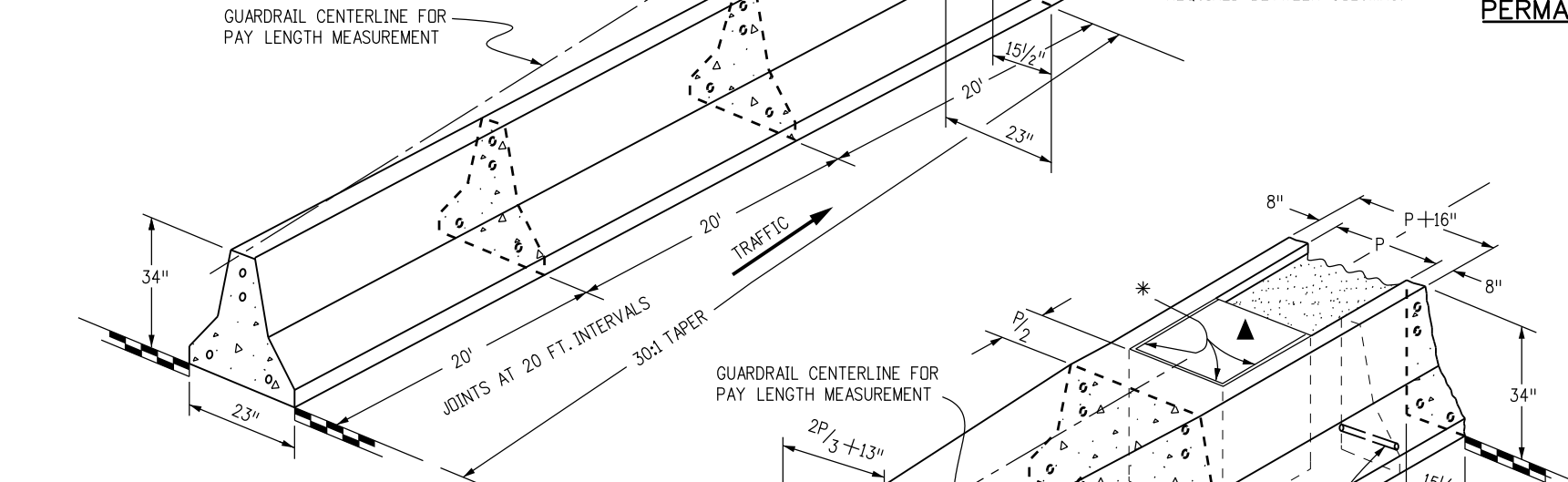


STYLE CA AT OBSTRUCTION
(OBSTRUCTION NOT SUITABLE FOR TYPE CD)



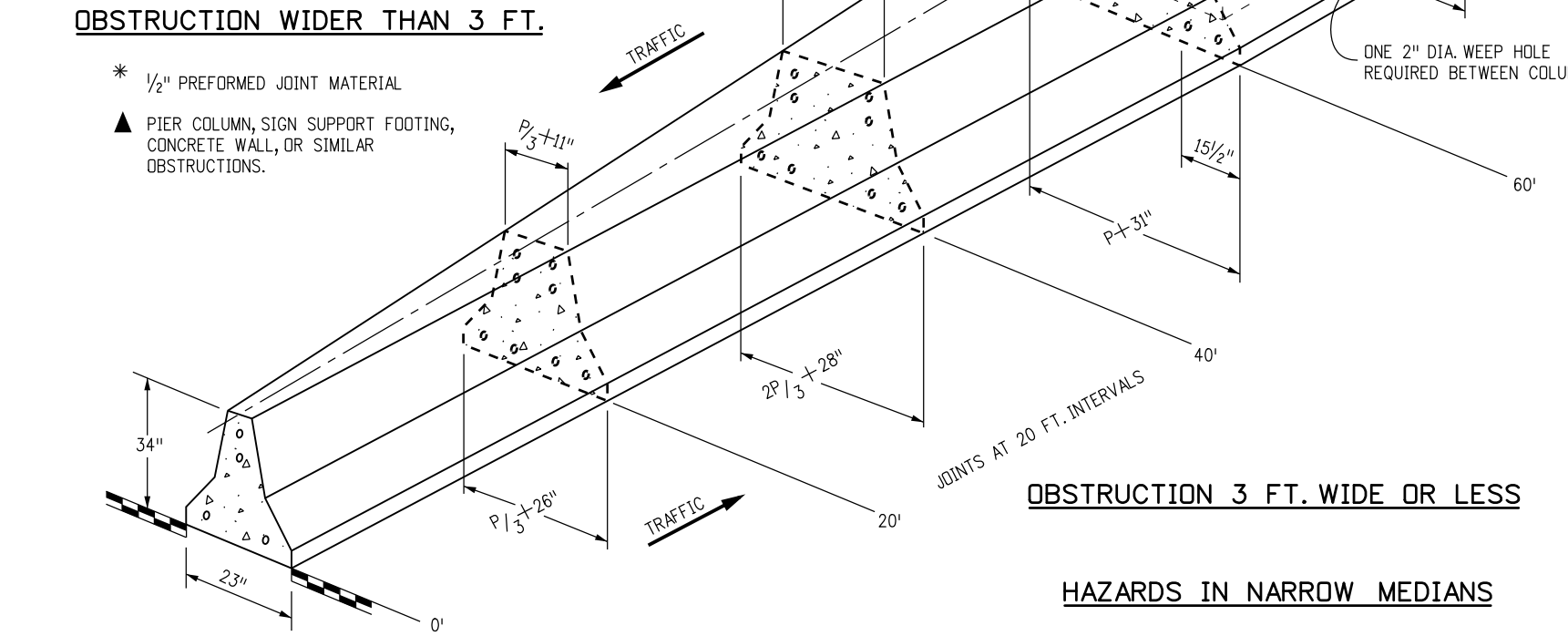
MEDIAN BARRIER END TREATMENT

TREATMENT BETWEEN COLUMNS OR OBSTRUCTIONS



OBSTRUCTION WIDER THAN 3 FT.

- * 1/2" PREFORMED JOINT MATERIAL
- ▲ PIER COLUMN, SIGN SUPPORT FOOTING, CONCRETE WALL, OR SIMILAR OBSTRUCTIONS.



OBSTRUCTION 3 FT. WIDE OR LESS

HAZARDS IN NARROW MEDIANS

Computer File Information

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Last Modification Date: 07/04/12	Initials: LTA
Full Path: www.coloradodot.info/business/designsupport	(R-X)
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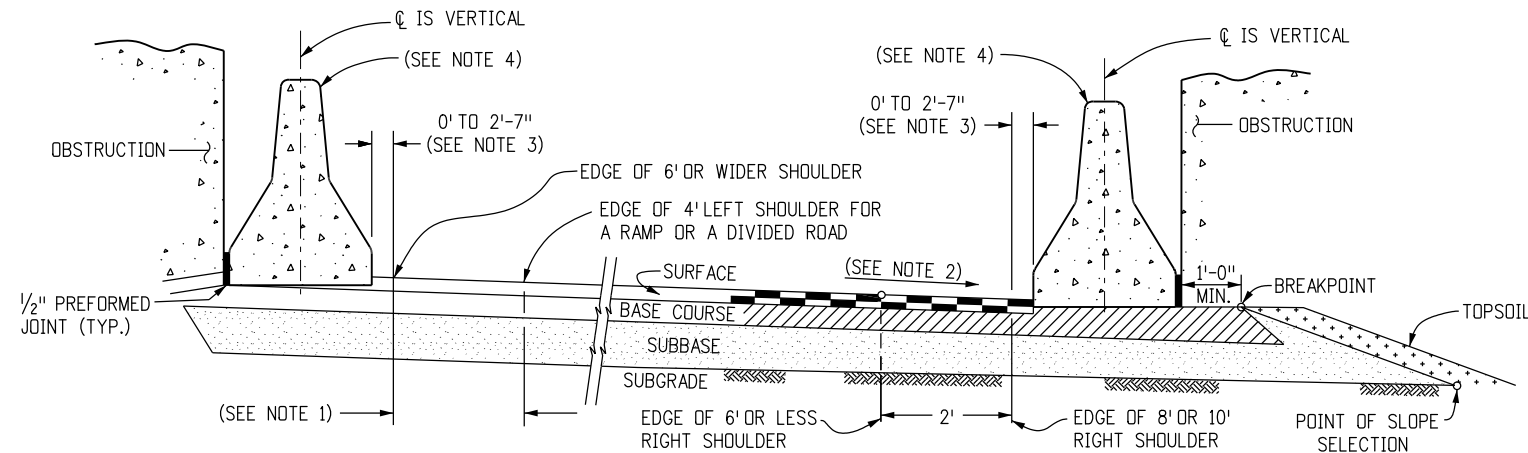
Sheet Revisions

Date:	Comments

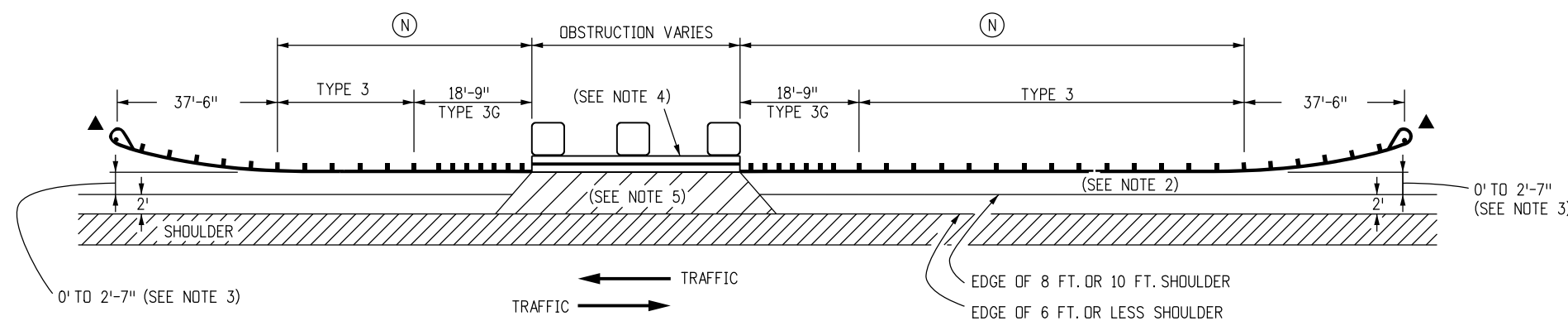
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**GUARDRAIL TYPE 7
F-SHAPE BARRIER**
 Issued By: Project Development Branch July 4, 2012

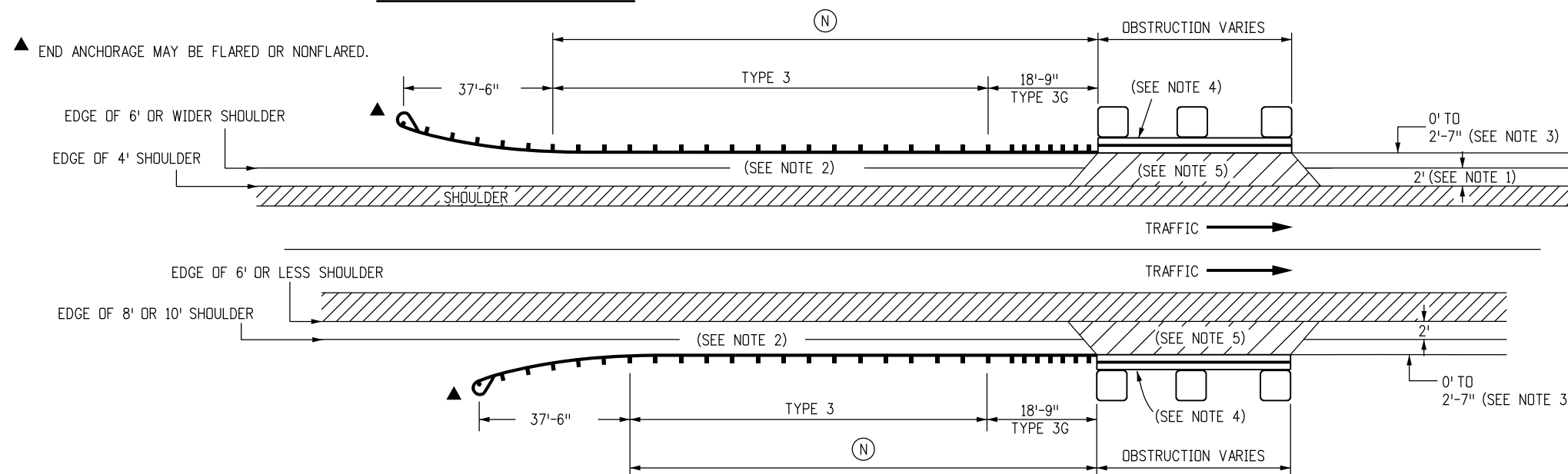
STANDARD PLAN NO.
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TYPE 7 ON LEFT AND RIGHT SHOULDERS AT OBSTRUCTIONS



2-LANE 2-WAY ROADS

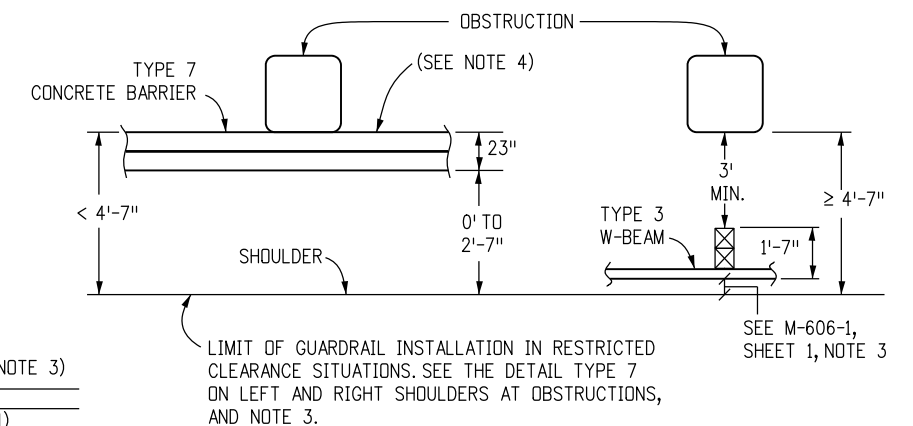


DIRECTIONAL ROADWAYS AND RAMPS

HAZARDS ON ROADSIDES

NOTES

1. TWO FT. IS DESIRABLE FOR THIS DIMENSION WITH A 4 FT. LEFT SHOULDER. THE MINIMUM IS 0 FT., WHICH IS ACCEPTABLE FOR 6 FT. OR WIDER SHOULDERS.
 2. RATE OF SLOPE DEPENDS ON GUARDRAIL LOCATION:
 - A. FOR GUARDRAIL FACE 2 FT. OR LESS FROM THE NORMAL EDGE OF PAVED SHOULDER, CONTINUE THE RATE OF SLOPE OF THE NORMAL PAVED SHOULDER TO THE BREAKPOINT.
 - B. FOR GUARDRAIL FACE MORE THAN 2 FT. FROM THE NORMAL EDGE OF THE PAVED SHOULDER, THE SLOPE SHALL BE 10:1 OR FLATTER.
 3. IF THE DISTANCE FROM THE EDGE OF SHOULDER TO THE OBSTRUCTION EXCEEDS 4 FT.-7 IN., TYPE 3-W BEAM GUARDRAIL MAY BE SPECIFIED ON THE PLANS INSTEAD OF TYPE 7 (SEE PLANS, AND DETAIL BELOW).
 4. STYLE CA BARRIERS ARE SHOWN. STYLE CD MAY BE USED AS APPROPRIATE. SEE SHEET 2 FOR TYPE 7 TO SINGLE TYPE 3G TRANSITION.
 5. THE AREA BETWEEN SHOULDER AND THE TYPE 7 SHALL BE PAVED. PAYMENT FOR THE PAVED SURFACE WILL BE MADE UNDER A PAVEMENT PAY ITEM, HMA OR CONCRETE, WITH QUANTITIES SHOWN ON THE PLANS.
- (N) THE GUARDRAIL LENGTH DIMENSION "N" IS THE LENGTH AS DETERMINED BY THE LENGTH OF NEED COMPUTATION AND AS SHOWN ON THE PLANS. MINIMUM SHALL BE 12 FT.-6 IN. WHERE SITE CONDITIONS ALLOW.



LIMIT OF GUARDRAIL INSTALLATION IN RESTRICTED CLEARANCE SITUATIONS. SEE THE DETAIL TYPE 7 ON LEFT AND RIGHT SHOULDERS AT OBSTRUCTIONS, AND NOTE 3.

Computer File Information

Creation Date: 07/04/12	Initials: DD
Last Modification Date: 07/04/12	Initials: LTA
Full Path: www.coloradodot.info/business/designsupport	
Drawing File Name: 6060130404.dgn	
CAD Ver.: MicroStation V8	Scale: Not to Scale Units: English

Sheet Revisions

Date:	Comments
(R-X)	
(R-X)	
(R-X)	
(R-X)	

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Division of Project Support

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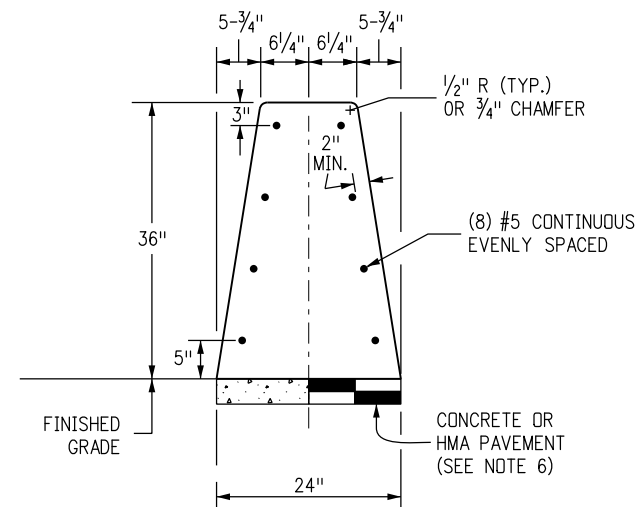
**GUARDRAIL TYPE 7
F-SHAPE BARRIER**

Issued By: Project Development Branch July 4, 2012

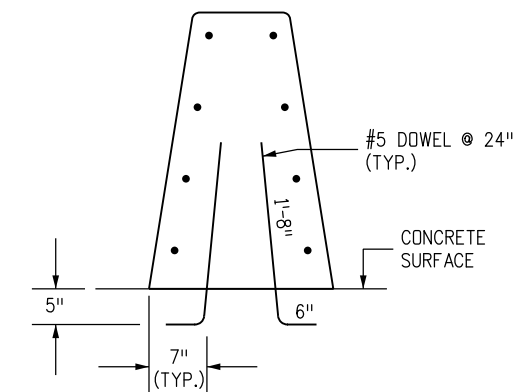
STANDARD PLAN NO.

M-606-13

Sheet No. 4 of 4

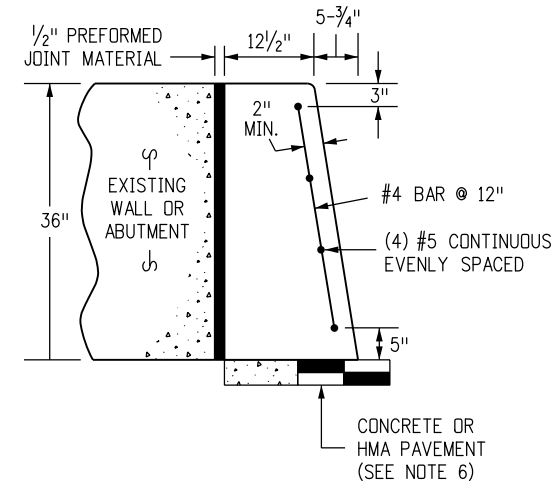


CONCRETE BARRIER STYLE CA



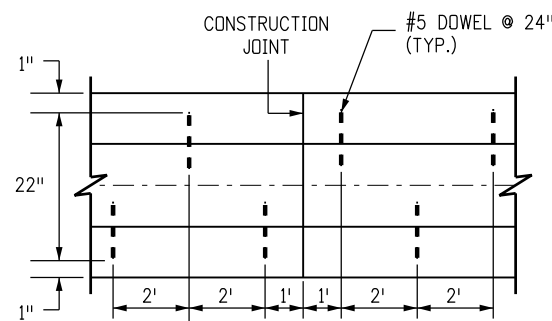
CONCRETE BARRIER STYLE CC

DETAILS SIMILAR TO STYLE CA EXCEPT AS NOTED. BARRIER DOWELLED TO CONCRETE SURFACES.



CONCRETE BARRIER STYLE CD

BARRIER AGAINST WALLS.



DOWEL PLACEMENT LAYOUT

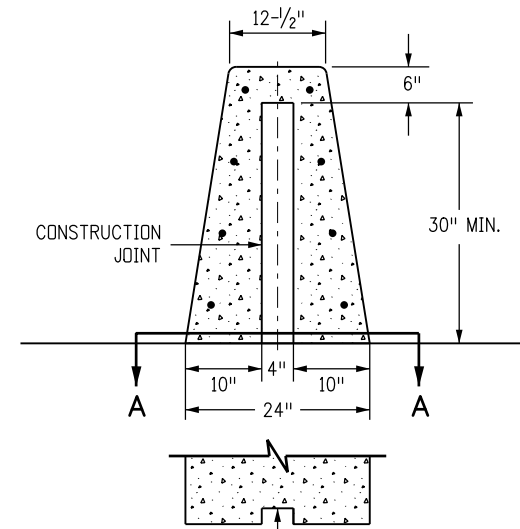
* FOR SURFACES OFFSETS LESS THAN OR EQUAL TO 3 INCHES, NO ADDITIONAL REINFORCEMENT IS REQUIRED.

SURFACE OFFSETS GREATER THAN 3 INCHES WILL REQUIRE ADDITIONAL REINFORCEMENT AS SHOWN.

THE LOWEST LAYER OF TWO #4 SHALL BE 3 INCHES ABOVE THE BOTTOM OF THE BARRIER. EACH VERTICAL INCREMENT OF 8 INCHES MEASURED FROM THE LOWEST LAYER OF REINFORCEMENT SHALL INCLUDE AN ADDITIONAL TWO #4.

FOR BARRIER TRANSITIONING IN HEIGHT MAINTAIN THE BOTTOM REINFORCEMENT LAYER COVER AND DISCONTINUE/ADD INCREMENTAL REINFORCING PARALLEL TO THE BARRIER AS HEIGHT REQUIRES.

■ REINFORCING STIRRUP NOT REQUIRED FOR ROADBED OFFSETS LESS THAN 1 FOOT.

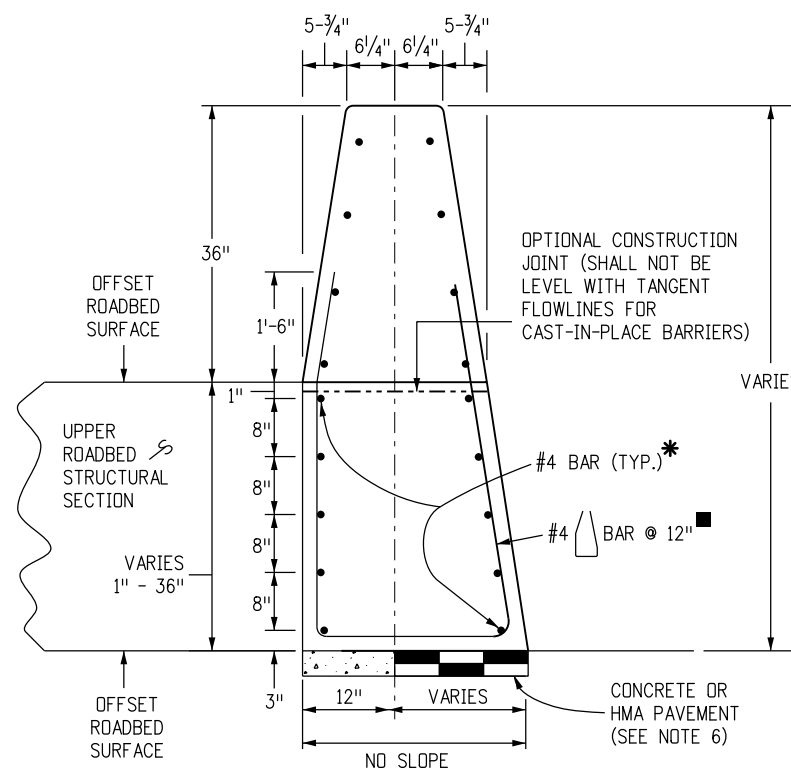


**SECTION A-A
CONSTRUCTION JOINT**

DETAILS SIMILAR TO STYLE CA EXCEPT AS NOTED. SEE NOTE 15.

GENERAL NOTES

- SEE SHEET 2 FOR DETAILS OF CONCRETE BARRIER STYLE CA END ANCHOR CONNECTIONS TO STRUCTURES OR TRANSITION TO GUARDRAIL TYPE 7.
- SEE SHEET 6 FOR CONCRETE BARRIER STYLE CA TRANSITIONS AT BRIDGE COLUMNS AND SIGN PEDESTALS IN MEDIANS.
- WHERE GLARE SCREENS ARE REQUIRED, USE CONCRETE BARRIER STYLE CG ON SHEET 4.
- WHERE ROADBED OFFSET IS GREATER THAN 1 1/2 INCH, SEE CONCRETE BARRIER STYLE CE
- BARRIER MAY BE CAST-IN-PLACE OR SLIP FORMED.
- BARRIER FOUNDATION SHALL BE PAVEMENT, OR COMPACTED AGGREGATE BASE, OR COMPACTED EMBANKMENT MATERIAL.
- NO ANCHORAGE IS REQUIRED (TYP.) EXCEPT FOR THE 10 FOOT ANCHORAGE. SEE SHEETS 2 AND 3 FOR DETAILS.
- CONSTRUCTION JOINTS SHALL BE USED ON ALL BARRIER TYPES SHOWN, AT THE END OF THE DAY'S POUR OR AFTER ANY INTERRUPTION LONGER THAN 30 MINUTES. ALL CONSTRUCTION JOINTS SHALL BE THOROUGHLY CLEANED BEFORE FRESH CONCRETE IS POURED.
- ALL REINFORCING STEEL SHALL BE GRADE 60 EPOXY COATED DEFORMED BARS AND SHALL BE A MINIMUM OF 2 INCHES IN FROM THE NEAREST CONCRETE SURFACE, UNLESS OTHERWISE NOTED.
- CONTINUOUS LONGITUDINAL REINFORCEMENT SHALL BE EITHER GRADE 60 EPOXY COATED DEFORMED BARS OR WIRE STRAND WITH MINIMUM ULTIMATE TENSILE STRENGTH OF 28,000 LBS. AND CLASS C GALVANIZING ACCORDING TO ASTM A 603.
- TRANSITION TO EXISTING CONCRETE BARRIER INSTALLATIONS OF DISSIMILAR SHAPE SHALL BE ACCOMPLISHED IN ONE 15 FOOT LONG SEGMENT OF BARRIER.
- CONCRETE SHALL BE CLASS D.
- ADDITIONAL MATERIAL FOR BARRIER EMBEDMENT GREATER THAN 1 INCH WILL NOT BE MEASURED AND PAID FOR SEPARATELY BUT SHALL BE INCLUDED IN THE WORK.
- EPOXY COATED LONGITUDINAL REBAR SHALL HAVE A MINIMUM LAP SPLICE OF 38 INCHES. WIRE STRAND LONGITUDINAL REINFORCEMENT SHALL BE BUTT WELDED OR MECHANICALLY SPLICED TO MAINTAIN 100 PERCENT OF THE MINIMUM REQUIRED TENSILE STRENGTH.
- CONSTRUCTION JOINTS SHALL BE USED ON ALL BARRIER TYPES AT THE END OF THE DAY'S POUR OR AFTER ANY INTERRUPTION LONGER THAN 30 MINUTES. ALL CONSTRUCTION JOINTS SHALL BE THOROUGHLY CLEANED BEFORE FRESH CONCRETE IS POURED.
- ALL INCIDENTAL WORK AND MATERIAL SUCH AS DOWELS, GROUT, ANCHORS, BOLTS, PINS, JOINT MATERIAL, EXCAVATION FOR BASES, CONTINUOUS LONGITUDINAL REINFORCEMENT, SHALL BE INCLUDED IN THE COST OF GUARDRAIL.
- RETROREFLECTORIZATION IS REQUIRED ON ALL BARRIER TYPES. SEE BARRIER RETROREFLECTOR NOTES ON STANDARD PLAN S-612-1.



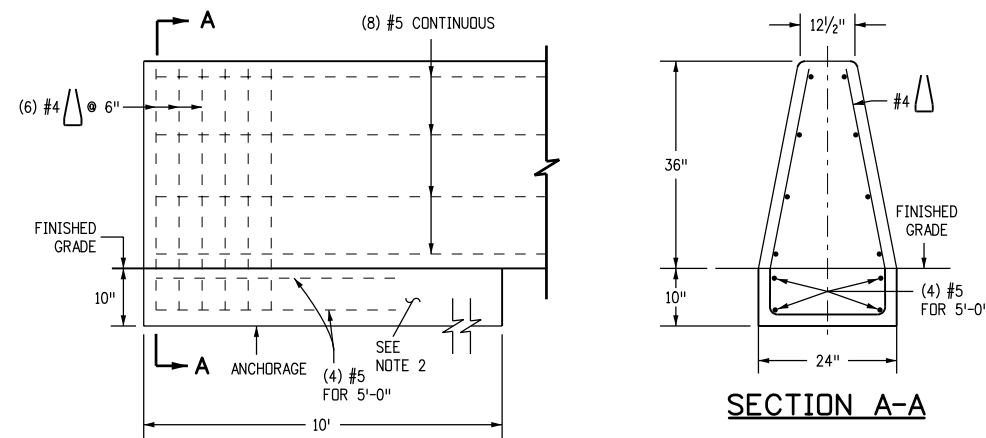
CONCRETE BARRIER STYLE CE

DETAILS SIMILAR TO STYLE CA EXCEPT AS NOTED. USE CONCRETE BARRIER END ANCHOR WHEN NECESSARY. SHOWN 36 INCH ROADBED SURFACES OFFSET.

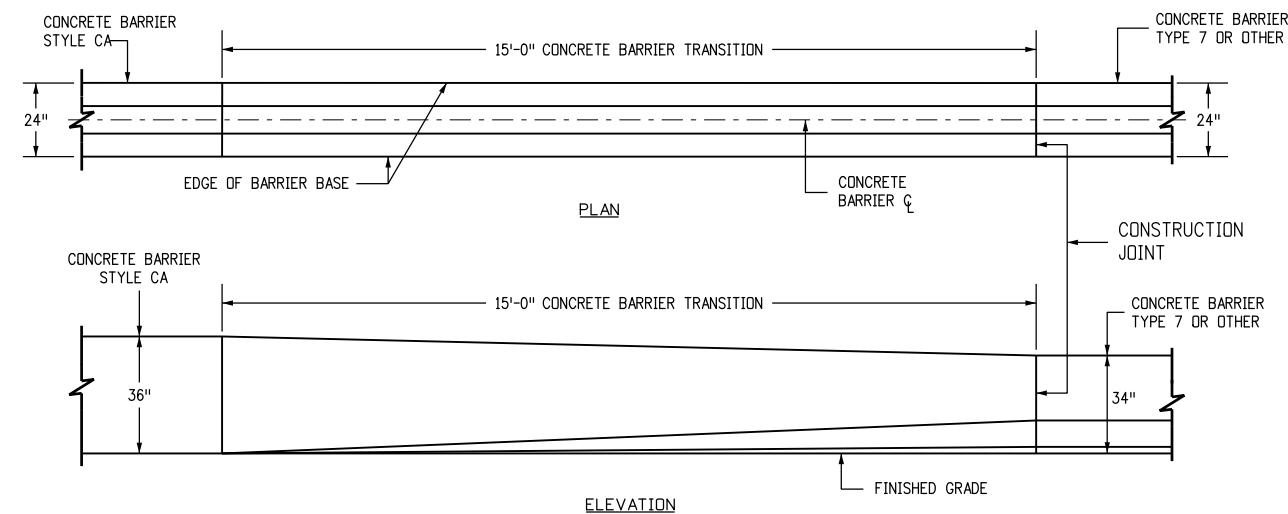
Computer File Information		Sheet Revisions		Colorado Department of Transportation 2829 West Howard Place CDOT HQ, 3rd Floor Denver, CO 80204 Phone: 303-757-9021 FAX: 303-757-9868 Division of Project Support	GUARDRAIL TYPE 9 SINGLE SLOPE BARRIER Issued By: Project Development Branch July 4, 2012	STANDARD PLAN NO.	
Creation Date: 06/29/18	Initials: JBK	Date:	Comments:			M-606-15	
Last Modification Date: 07/16/18	Initials: LTA						
Full Path: www.coloradodot.info/business/designsupport							
Drawing File Name: 60601501011.dgn						Sheet No. 1 of 11	
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English							

NOTES

1. SEE SHEET 3 FOR END ANCHORAGE REQUIREMENTS. AT A MINIMUM, THE BARRIER SHALL BE ANCHORED AT THE ENDS AND AT INTERRUPTIONS WITH THE A 10 FOOT ANCHORAGE. THE ANCHORAGE SHALL BE MONOLITHIC OR DOWELED WITH 2-#8 X 8" @ 2'-0 BARS.
2. SEE SHEET 1 FOR CONCRETE BARRIER STYLE CA AND STYLE CC.
3. TRANSITION TO EXISTING CONCRETE BARRIER INSTALLATIONS OF DISSIMILAR SHAPE SHALL BE ACCOMPLISHED IN ONE 15 FOOT LONG SEGMENT OF BARRIER.
4. SEE SHEET 6 FOR CONCRETE BARRIER STYLE CA TRANSITIONS AT BRIDGE COLUMNS AND SIGN PEDESTALS IN MEDIANS.
5. FOR STYLE CA CONNECTIONS TO STRUCTURES, SEE THE BRIDGE PLANS.



END ANCHORAGE



TRANSITION CONCRETE BARRIER TYPE 9 TO CONCRETE BARRIER TYPE 7 OR EXISTING

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Last Modification Date: 07/16/18	Initials: LTA
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 Denver, CO 80204
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Division of Project Support **JBK/LTA**

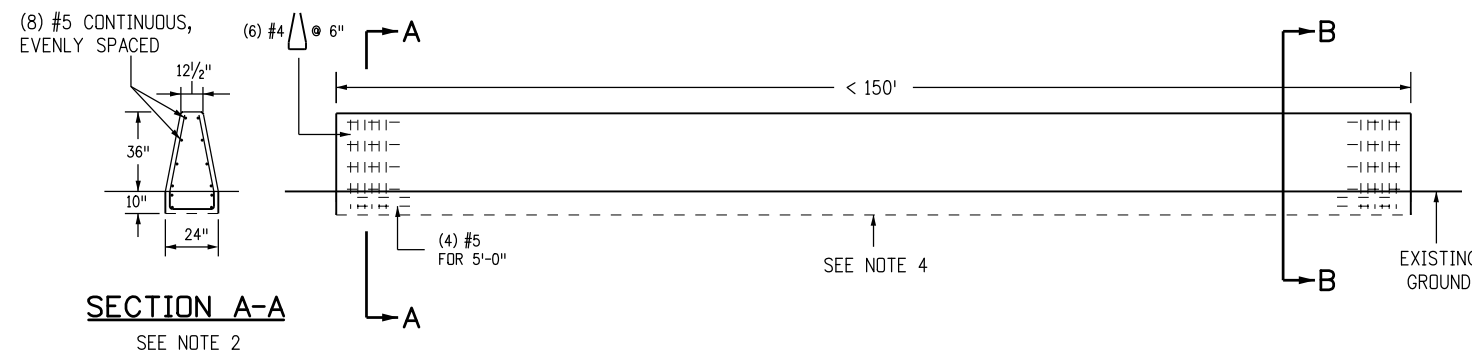
**GUARDRAIL TYPE 9
 SINGLE SLOPE BARRIER**

Issued By: Project Development Branch July 4, 2012

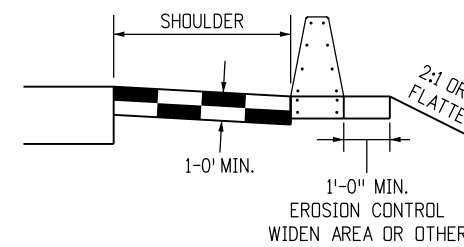
STANDARD PLAN NO.
M-606-15
Sheet No. 2 of 11

NOTES

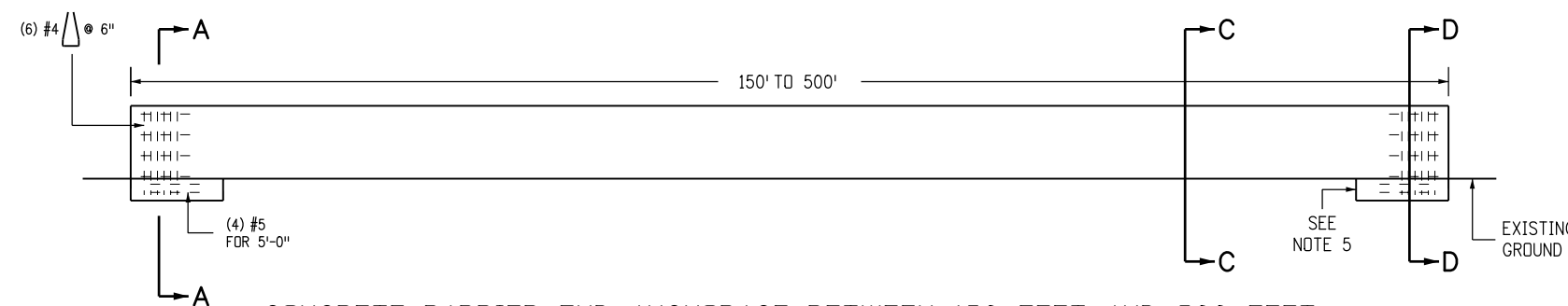
1. SEE PLANS FOR CONCRETE BARRIER LENGTHS LESS THAN 150 FEET AND/OR HINGE WIDTHS EQUAL TO OR LESS THAN 1 FOOT BEHIND THE CONCRETE BARRIER.
2. SEE SHEET 2 FOR REINFORCING BAR DETAILS.
3. NEW CONCRETE BARRIERS UNDER 150 FEET SHALL BE DOWELED INTO EXISTING CONCRETE BRIDGE BARRIERS OR WINGWALLS TO MINIMIZE ROTATIONS TO ANY OF THEM. SEE SHEET 1 FOR DOWEL PLACEMENT LAYOUT.
4. FOR END ANCHORAGES UNDER 150 FEET, CONSTRUCT THE ANCHORAGE FOR THE ENTIRE LENGTH OF THE CONCRETE BARRIER.
5. FOR CONCRETE BARRIER RUNS GREATER THAN 150 FEET BUT LESS THAN 500 FEET, THE RUN SHALL BE ANCHORED AT THE ENDS AND AT GAPS, SUCH AS AN EMERGENCY ACCESS.
6. FOR END ANCHORAGES OVER 500 FEET, CONSTRUCT ANCHORAGES EVERY 250 FEET.
7. REINFORCING STEEL IN ANCHORAGE SHALL BE GRADE 60 EPOXY COATED DEFORMED BARS.
8. CONCRETE SHALL BE CLASS D.
9. ALL INCIDENTAL WORK AND ADDITIONAL MATERIALS SHALL BE INCLUDED IN THE COST OF THE CONCRETE BARRIER.



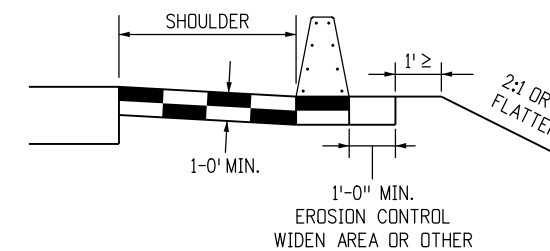
CONCRETE BARRIER END ANCHORAGE UNDER 150 FEET



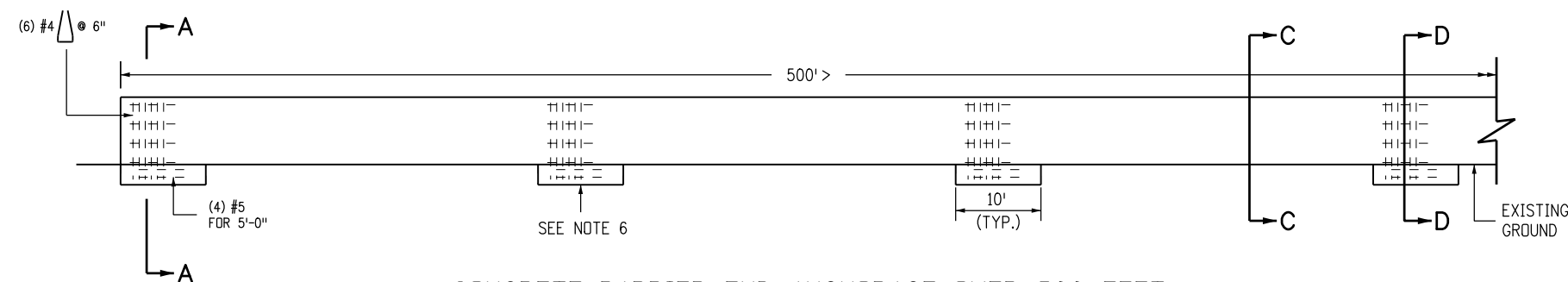
SECTION B-B



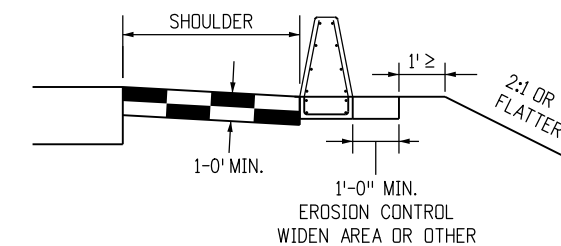
CONCRETE BARRIER END ANCHORAGE BETWEEN 150 FEET AND 500 FEET



SECTION C-C



CONCRETE BARRIER END ANCHORAGE OVER 500 FEET

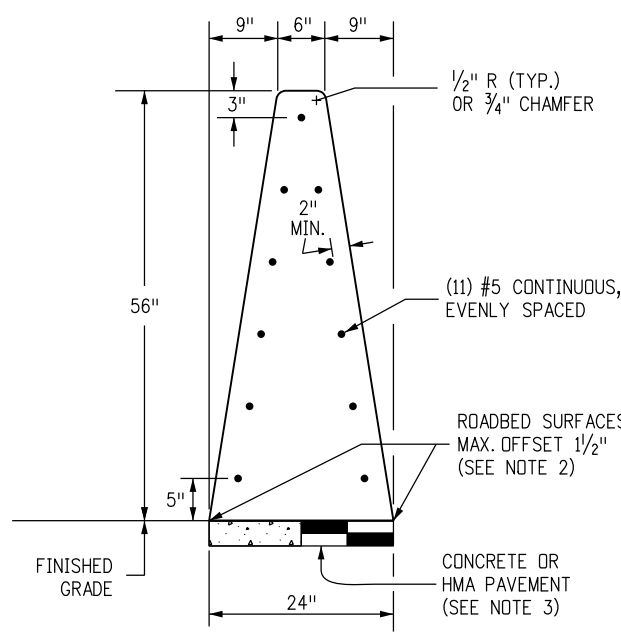


SECTION D-D

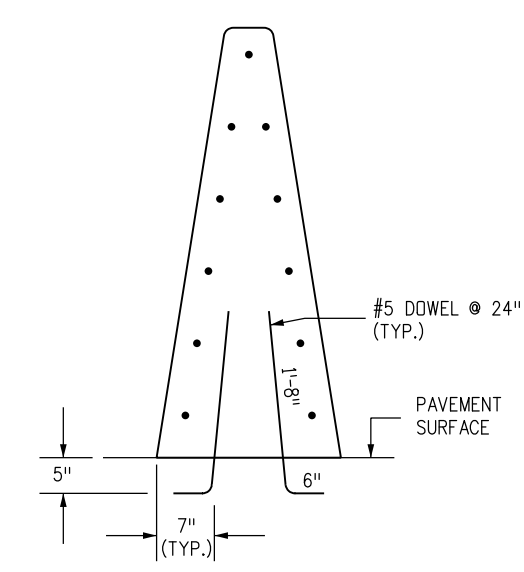
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Creation Date: 06/29/18	Initials: JBK	Date:	Comments:	 2829 West Howard Place CDOT HQ, 3rd Floor Denver, CO 80204 Phone: 303-757-9021 FAX: 303-757-9868	SINGLE SLOPE BARRIER		M-606-15			
Last Modification Date: 07/16/18	Initials: LTA						Issued By: Project Development Branch July 4, 2012		Sheet No. 3 of 11	
Full Path: www.coloradodot.info/business/designsupport										
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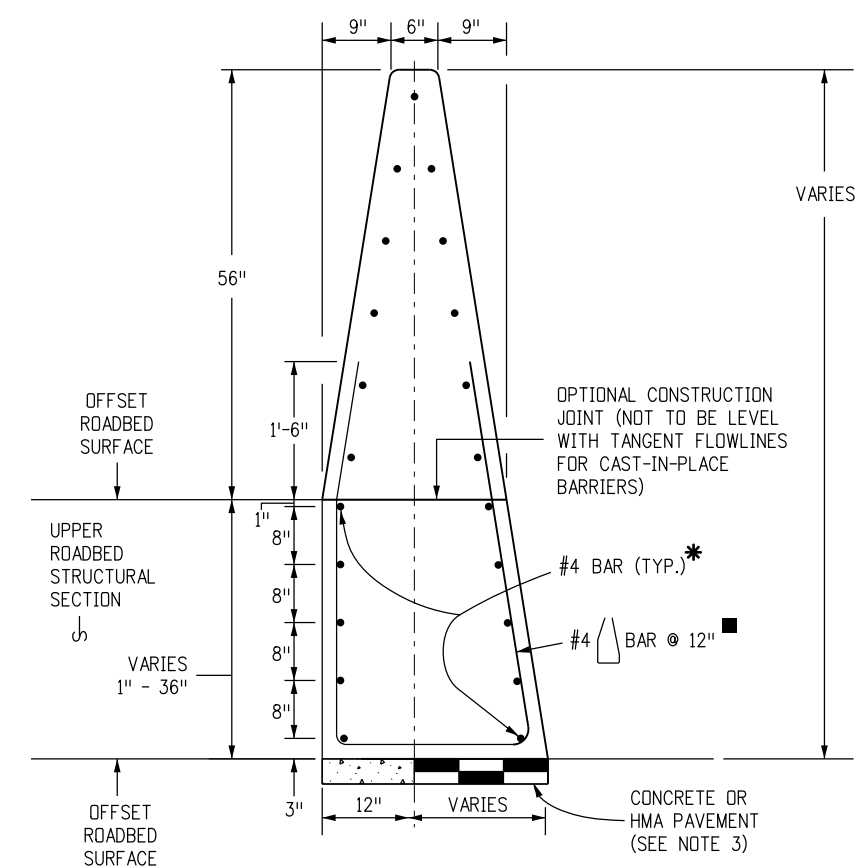
1. SEE SHEET 5 FOR DETAILS OF CONCRETE BARRIER STYLE CEG/CG END ANCHORS CONNECTIONS TO STRUCTURES AND TRANSITIONS TO GUARDRAIL TYPE 7.
2. WHERE ROADBED OFFSET IS GREATER THAN 1/2 INCH, SEE CONCRETE BARRIER TYPE CGE.
3. BARRIER FOUNDATION SHALL BE PAVEMENT, OR COMPACTED AGGREGATE BASE, OR COMPACTED EMBANKMENT MATERIAL.
4. RETROREFLECTORIZATION IS REQUIRED ON ALL BARRIER TYPES. SEE THE BARRIER RETROREFLECTOR NOTES ON STANDARD PLAN S-612-1.



CONCRETE BARRIER STYLE CG (56")
MONOLITHIC CONCRETE GLARE SCREEN/BARRIER





CONCRETE BARRIER STYLE CGC
DETAILS SIMILAR TO STYLE CG EXCEPT AS NOTED. BARRIER DOWELLED TO CONCRETE SURFACES.



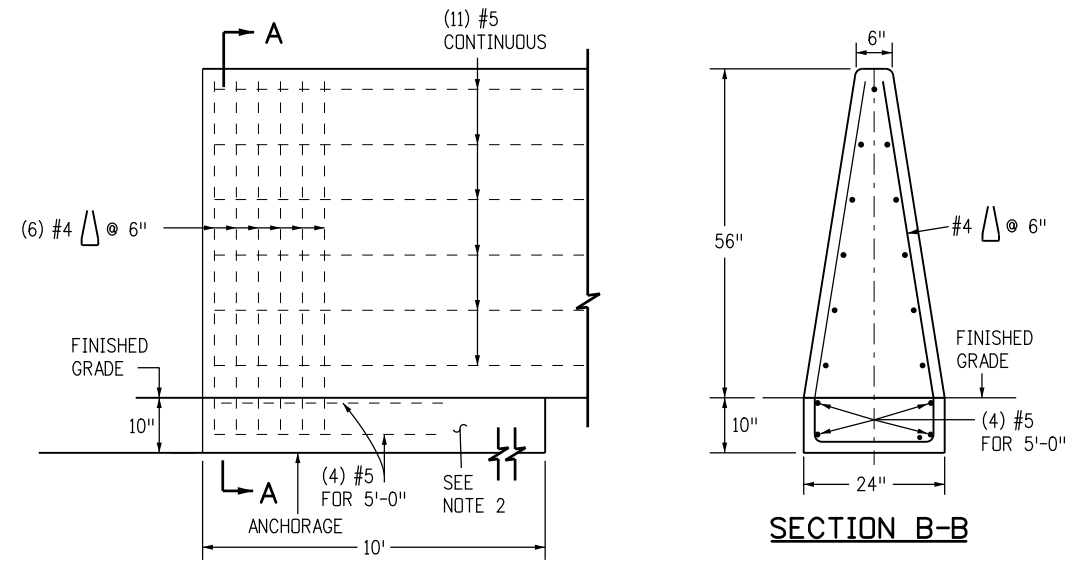
CONCRETE BARRIER STYLE CGE
DETAILS SIMILAR TO STYLE CE EXCEPT AS NOTED. USE CONCRETE BARRIER END ANCHOR WHEN NECESSARY. SHOWN WITH A 36 INCH ROADBED SURFACES OFFSET. BARRIER FOR OFFSET ROADWAYS.

- * FOR SURFACES OFFSETS LESS THAN OR EQUAL TO 3 INCHES, NO ADDITIONAL REINFORCEMENT IS REQUIRED. SURFACE OFFSETS GREATER THAN 3 INCHES WILL REQUIRE ADDITIONAL REINFORCEMENT AS SHOWN.
- THE LOWEST LAYER OF TWO #4 SHALL BE 3 INCHES ABOVE THE BOTTOM OF THE BARRIER. EACH VERTICAL INCREMENT OF 8 INCHES MEASURED FROM THE LOWEST LAYER OF REINFORCEMENT SHALL INCLUDE AN ADDITIONAL TWO #4.
- REINFORCING STIRRUP NOT REQUIRED FOR ROADBED OFFSETS LESS THAN 1 FOOT.

Computer File Information Creation Date: 06/29/18 Initials: JBK Last Modification Date: 07/16/18 Initials: LTA Full Path: www.coloradodot.info/business/designsupport Drawing File Name: 60601504011.dgn CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English		Sheet Revisions <table border="1"> <thead> <tr> <th>Date:</th> <th>Comments</th> </tr> </thead> <tbody> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </tbody> </table>		Date:	Comments									Colorado Department of Transportation  2829 West Howard Place CDOT HQ, 3rd Floor Denver, CO 80204 Phone: 303-757-9021 FAX: 303-757-9868 Division of Project Support		GUARDRAIL TYPE 9 SINGLE SLOPE BARRIER Issued By: Project Development Branch July 4, 2012		STANDARD PLAN NO. M-606-15 Sheet No. 4 of 11	
Date:	Comments																		
				JBK/LTA															

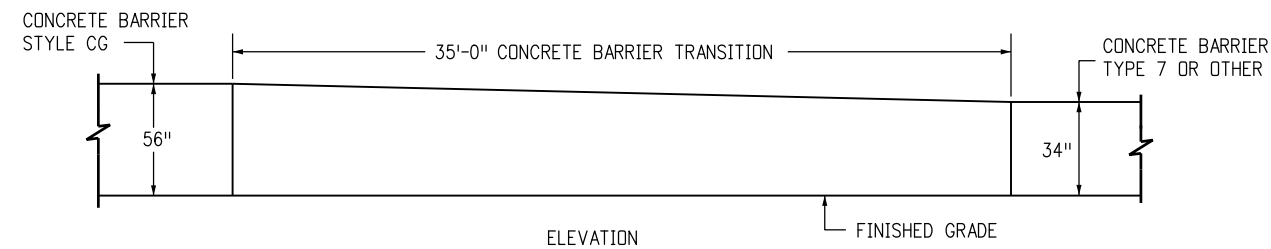
NOTES

1. SEE SHEET 3 FOR END ANCHORAGE REQUIREMENTS. AT A MINIMUM, THE BARRIER SHALL BE ANCHORED AT THE ENDS AND AT INTERRUPTIONS WITH THE 10 FOOT ANCHORAGE. ANCHORAGE SHALL BE MONOLITHIC OR DOWELED WITH 2-#8 X 8" @ 2'-0 BARS.
2. SEE SHEET 4 FOR CONCRETE BARRIER STYLE CG AND STYLE CGC.
3. SEE SHEET 9 FOR TRANSITION TO THRIE BEAMS.
4. TRANSITION TO EXISTING CONCRETE BARRIER INSTALLATIONS OF DISSIMILAR SHAPE SHALL BE ACCOMPLISHED IN ONE 15 FOOT LONG SEGMENT OF BARRIER.
5. SEE SHEET 6 FOR CONCRETE BARRIER STYLE CA TRANSITIONS AT BRIDGE COLUMNS AND SIGN PEDESTALS IN MEDIANS.
6. FOR STYLE CG CONNECTIONS TO STRUCTURES, SEE THE BRIDGE PLANS.



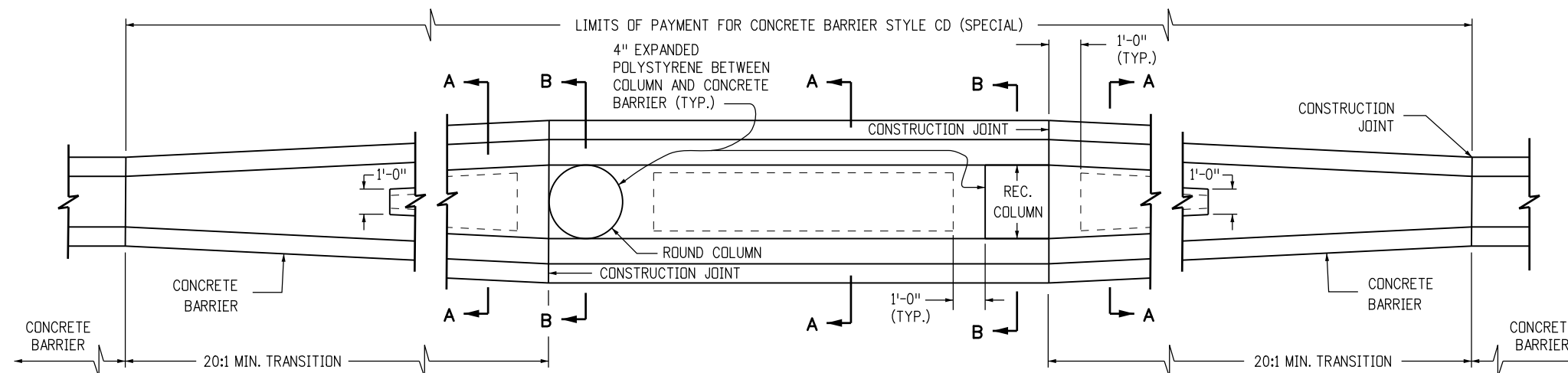
ANCHORAGE

BARRIER ELEVATION VIEW INCLUDING REINFORCED ANCHORAGE AT END.

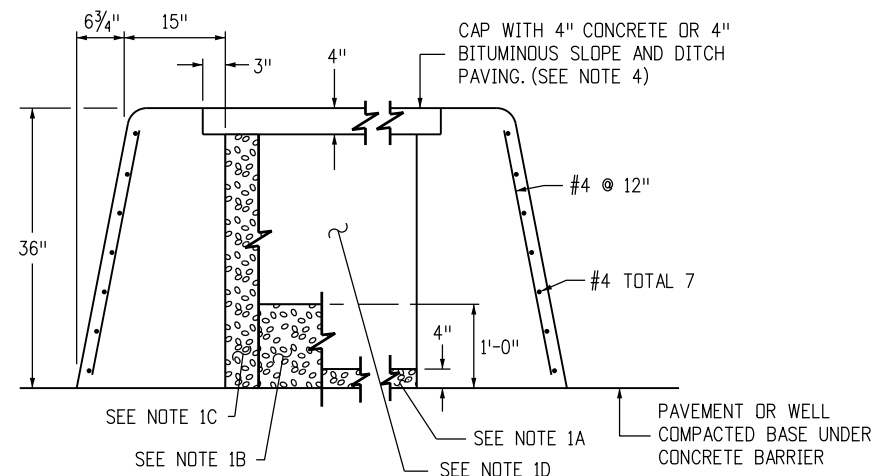


TRANSITION CONCRETE BARRIER STYLE CEG/CG TO CONCRETE BARRIER TYPE 7 OR EXISTING

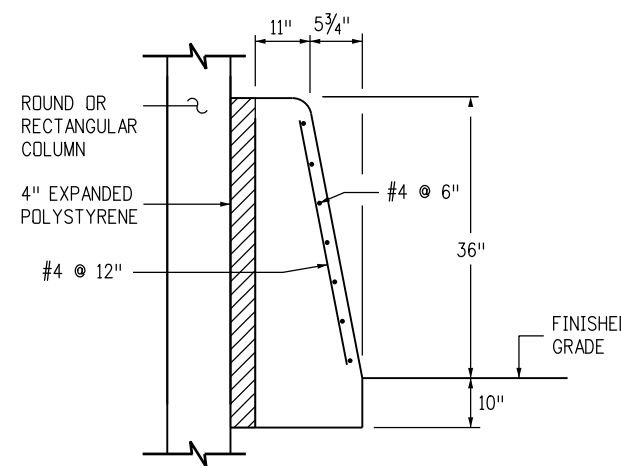
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Creation Date: 06/29/18	Initials: JBK	Date:	Comments:			M-606-15
Last Modification Date: 07/16/18	Initials: LTA	(R-X)				Sheet No. 5 of 11
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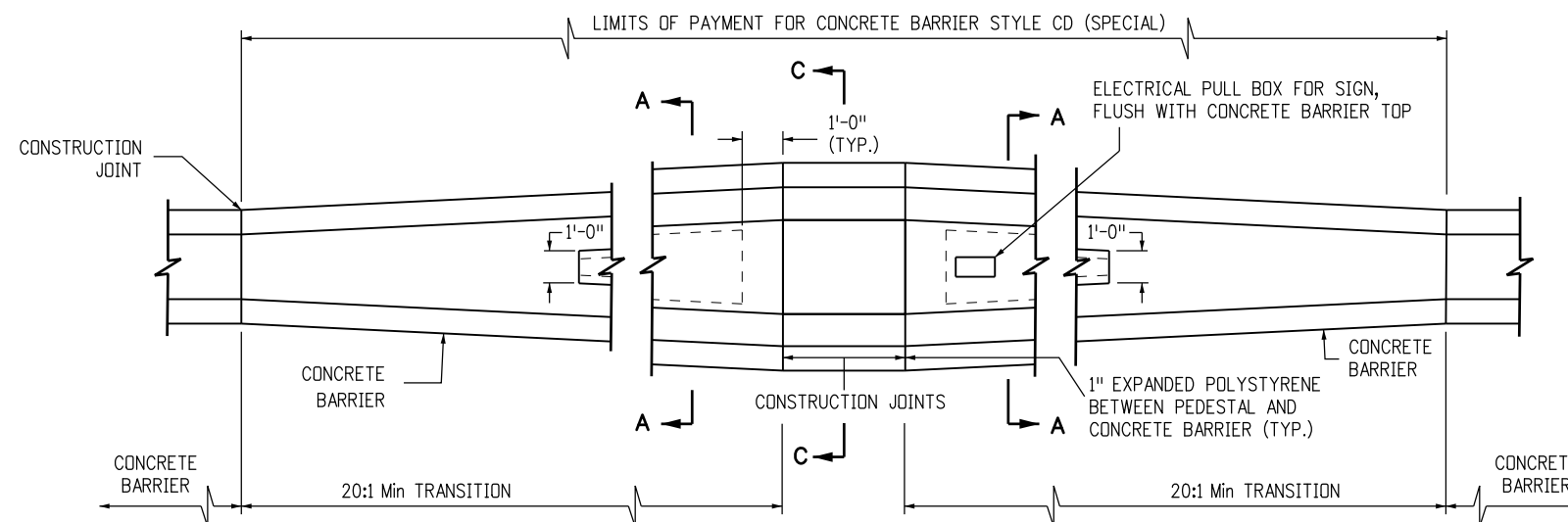
CONCRETE BARRIER TRANSITION AT BRIDGE COLUMNS



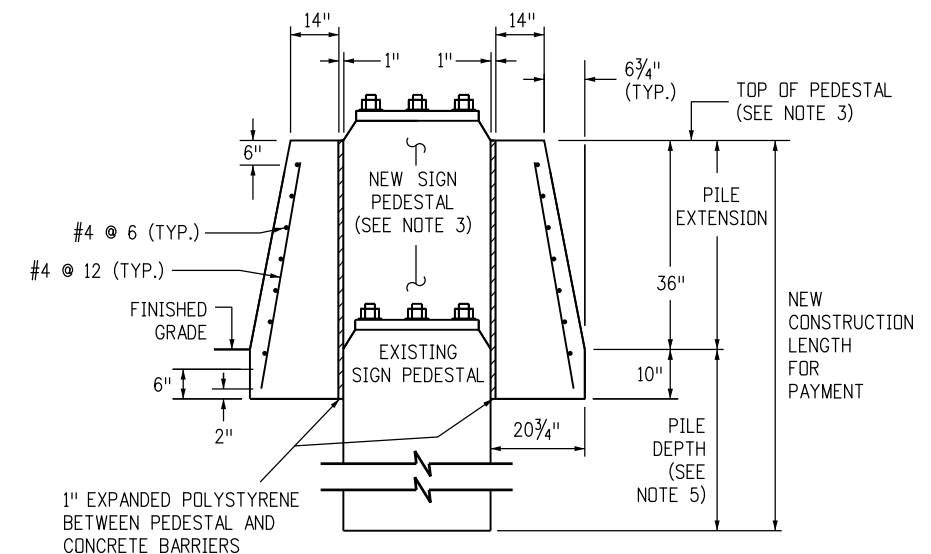
SECTION A-A



SECTION B-B



CONCRETE BARRIER TRANSITION AT SIGN PEDESTAL



SECTION C-C

NOTES

1. THE CONTRACTOR'S OPTIONS FOR FILL BETWEEN CONCRETE BARRIER WALLS:
 - A. PLACE 4 INCHES OF POLYSTYRENE AT BASE BETWEEN CONCRETE BARRIER WALLS.
 - B. PLACE 1 FOOT OF GRANULAR MATERIAL AT BASE BETWEEN WALLS.
 - C. PLACE GRANULAR MATERIAL FROM BASE TO BOTTOM OF 4 INCH CAP.
 - D. MONOLITHIC CONCRETE WITH FOAM BLOCKOUTS IS NOT PERMITTED.
2. REINFORCING STEEL SHALL EXTEND CONTINUOUS THROUGH CONSTRUCTION JOINTS.
3. SEE OVERHEAD SIGN PLANS FOR SIGN PEDESTAL ELEVATIONS FOR NEW CONSTRUCTION.
4. ADJUST HEIGHT OF CONCRETE BARRIER WALL ON LOW SIDE OF OFFSET OR SUPERELEVATED ROADWAYS TO PROVIDE LEVEL GRADE ACROSS TOP OF CONCRETE BARRIER CAP.
5. FOR OVERHEAD SIGNS, SEE STANDARD PLAN S-614-60.

Computer File Information	
Creation Date: 06/29/18	Initials: JBK
Last Modification Date: 07/16/18	Initials: LTA
Full Path: www.coloradodot.info/business/designsupport	
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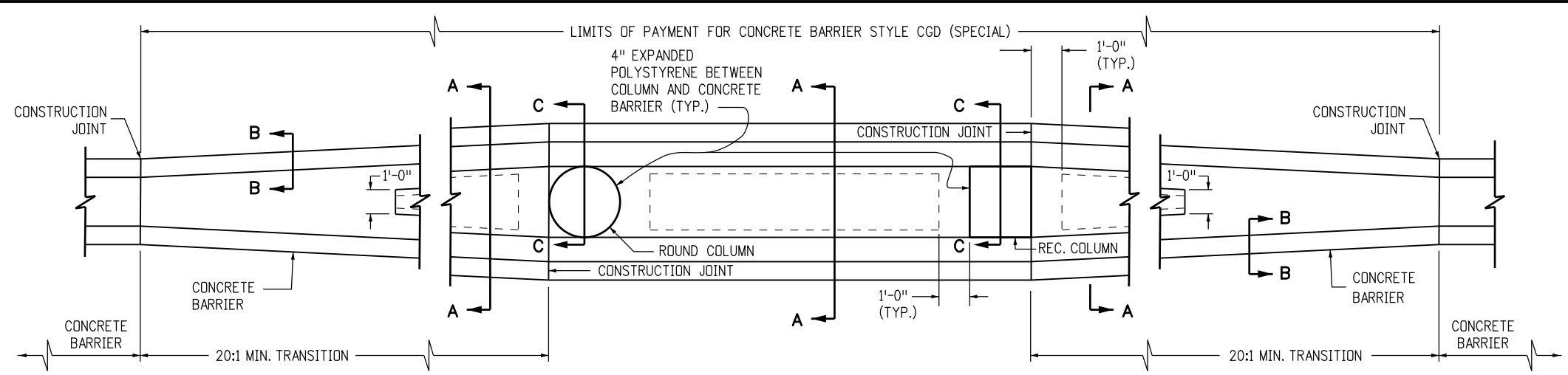
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GUARDRAIL TYPE 9
SINGLE SLOPE BARRIER

Issued By: Project Development Branch July 4, 2012

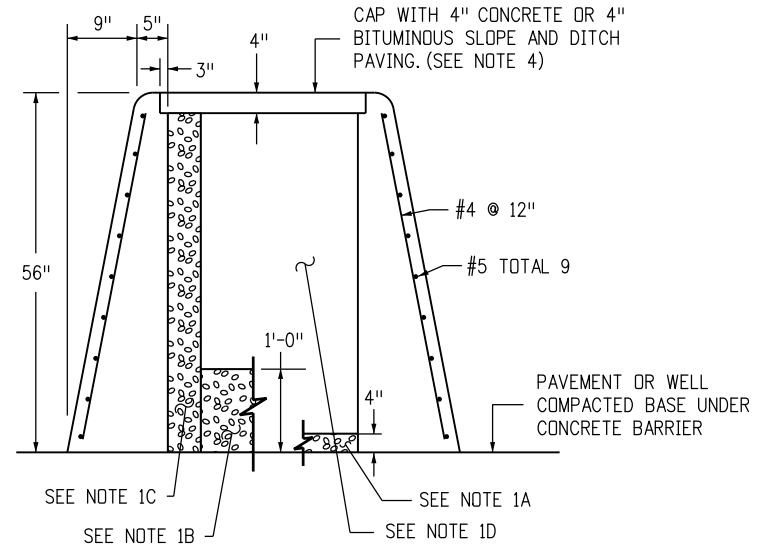
STANDARD PLAN NO.
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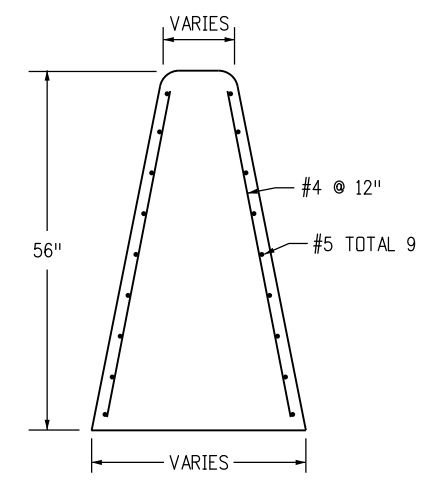
CONCRETE BARRIER TRANSITION AT BRIDGE COLUMNS

NOTES

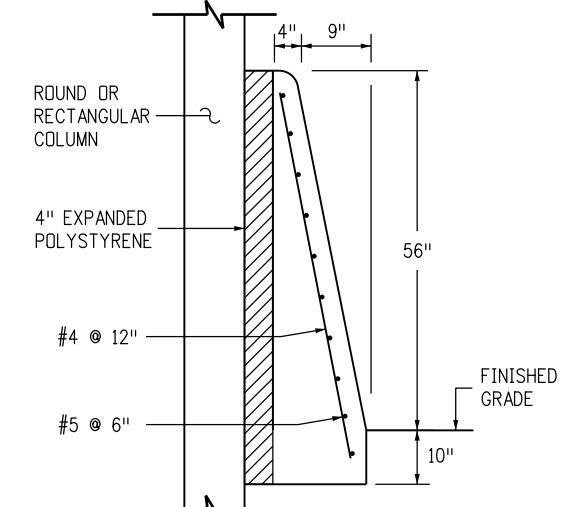
1. THE CONTRACTOR'S OPTIONS FOR FILL BETWEEN CONCRETE BARRIER WALLS:
 - A. PLACE 4 INCHES OF POLYSTYRENE AT BASE BETWEEN CONCRETE BARRIER WALLS.
 - B. PLACE 1 FOOT OF GRANULAR MATERIAL AT BASE BETWEEN WALLS.
 - C. PLACE GRANULAR MATERIAL FROM BASE TO BOTTOM OF 4 INCH CAP.
 - D. MONOLITHIC CONCRETE WITH FOAM BLOCKOUTS IS NOT PERMITTED.
2. REINFORCING STEEL SHALL EXTEND CONTINUOUS THROUGH CONSTRUCTION JOINTS.
3. SEE OVERHEAD SIGN PLANS FOR SIGN PEDESTAL ELEVATIONS FOR NEW CONSTRUCTION.
4. ADJUST HEIGHT OF CONCRETE BARRIER WALL ON LOW SIDE OF OFFSET OR SUPERELEVATED ROADWAYS TO PROVIDE LEVEL GRADE ACROSS TOP OF CONCRETE BARRIER CAP.
5. FOR OVERHEAD SIGNS, SEE STANDARD PLAN S-614-60.



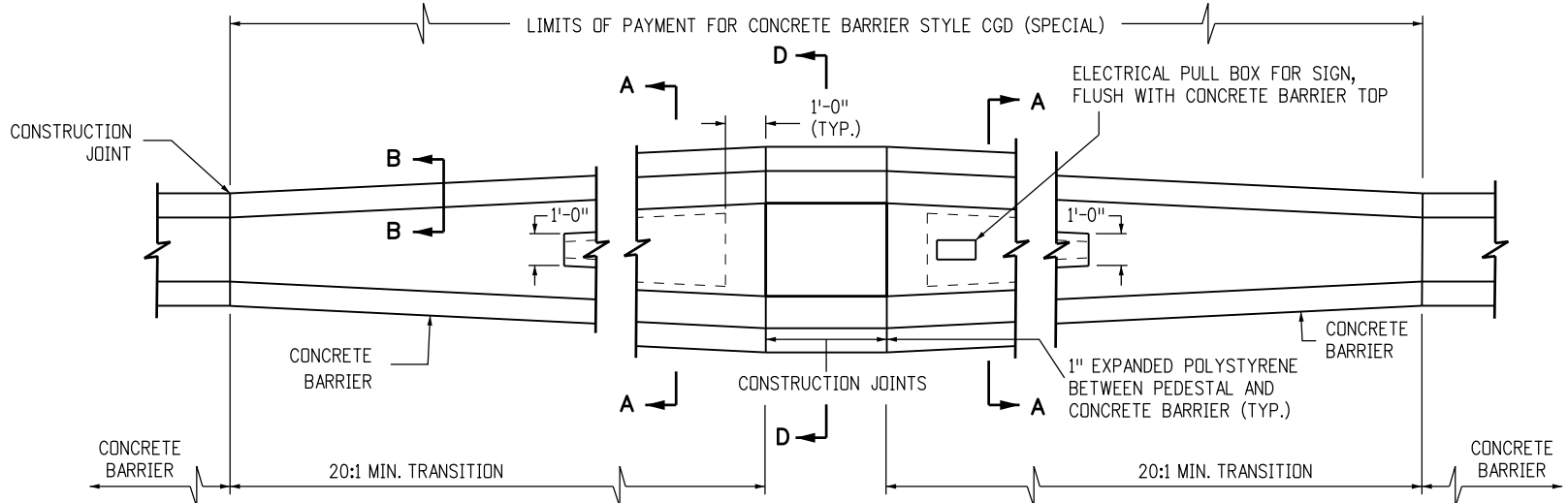
SECTION A-A



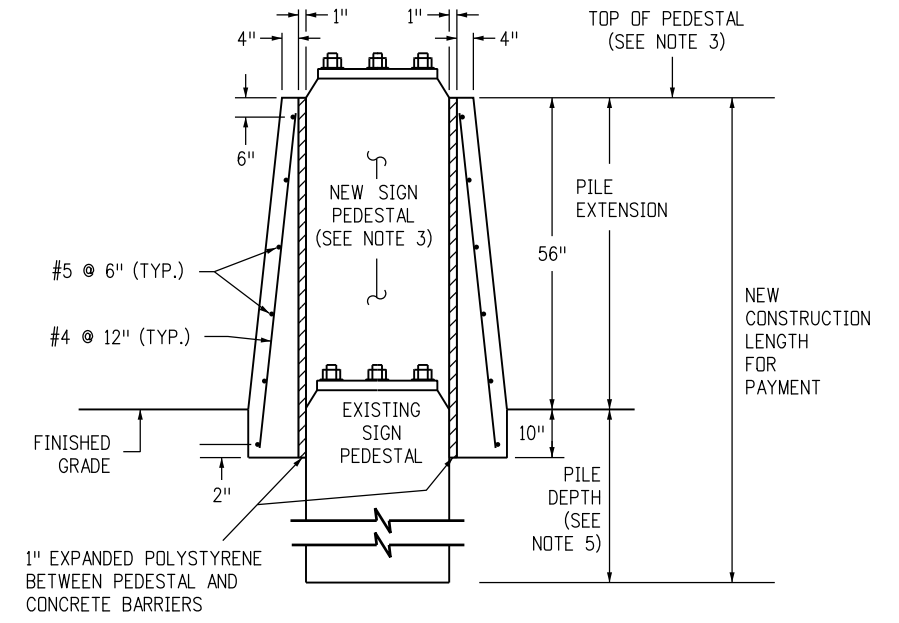
SECTION B-B



SECTION C-C



CONCRETE BARRIER TRANSITION AT SIGN PEDESTAL



SECTION D-D

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Last Modification Date: 07/16/18	Initials: LTA
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Division of Project Support JBK/LTA

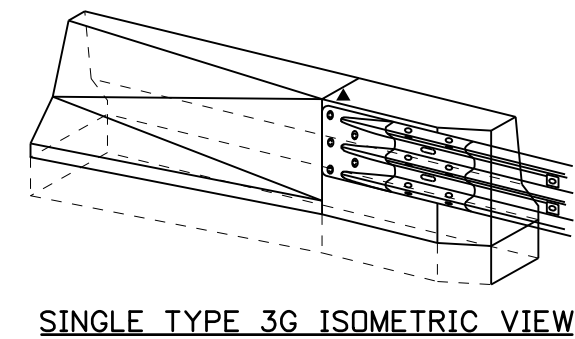
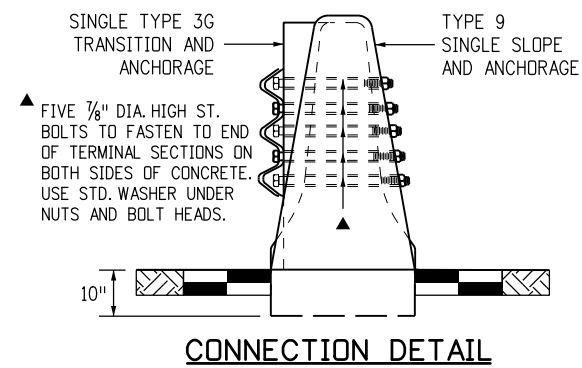
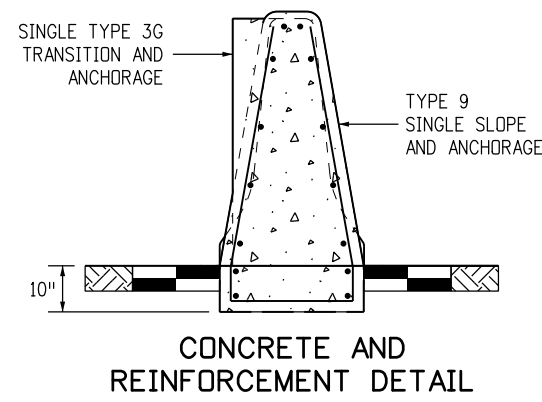
**GUARDRAIL TYPE 9
 SINGLE SLOPE BARRIER**

Issued By: Project Development Branch July 4, 2012

STANDARD PLAN NO.

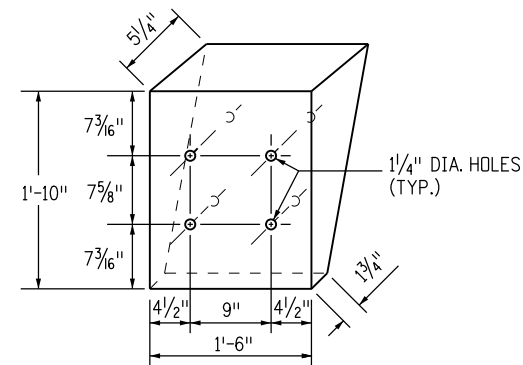
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Sheet No. 7 of 11

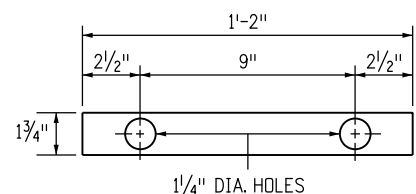


TYPE 9 TO SINGLE TYPE 3G TRANSITION AND ANCHORAGE OPTION
 SEE SHEET 1 FOR REINFORCEMENT INFORMATION AND SHEET 3 FOR ANCHORAGE DETAILS

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Creation Date: 06/29/18	Initials: JBK	Date:	Comments:			M-606-15
Last Modification Date: 07/16/18	Initials: LTA					
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Drawing File Name: 60601508011.dgn	(R-X)					
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	(R-X)					



DETAIL A
BEVELED METAL BOX SPACE
(SEE NOTE 1)



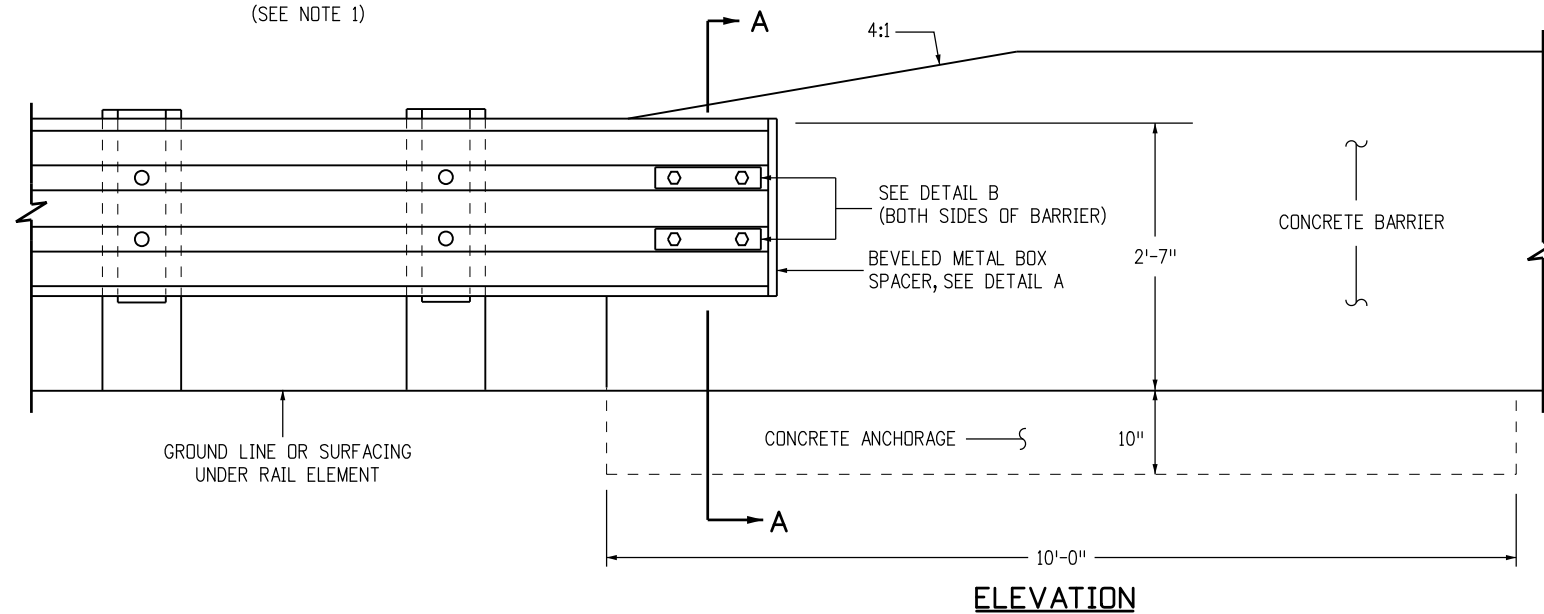
DETAIL B
PLATE A

LEGEND

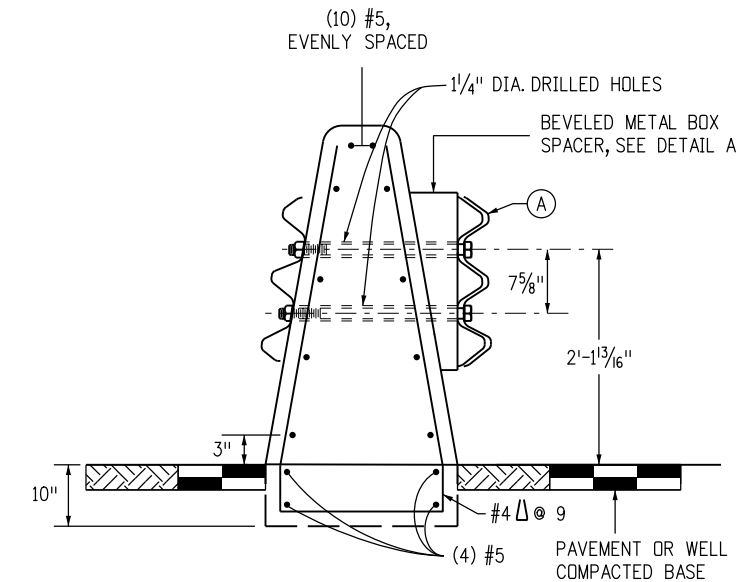
- (A) NESTED THRIE BEAM ELEMENTS (ONE 12 GAUGE ELEMENT NESTED OVER ONE 10 GAUGE ELEMENT).
- (B) ONE 10 GAUGE THRIE BEAM ELEMENT.
- (C) ONE 12 GAUGE THRIE BEAM ELEMENT.
- 10 GAUGE = 0.135" THICK
- 12 GAUGE = 0.108" THICK

NOTES

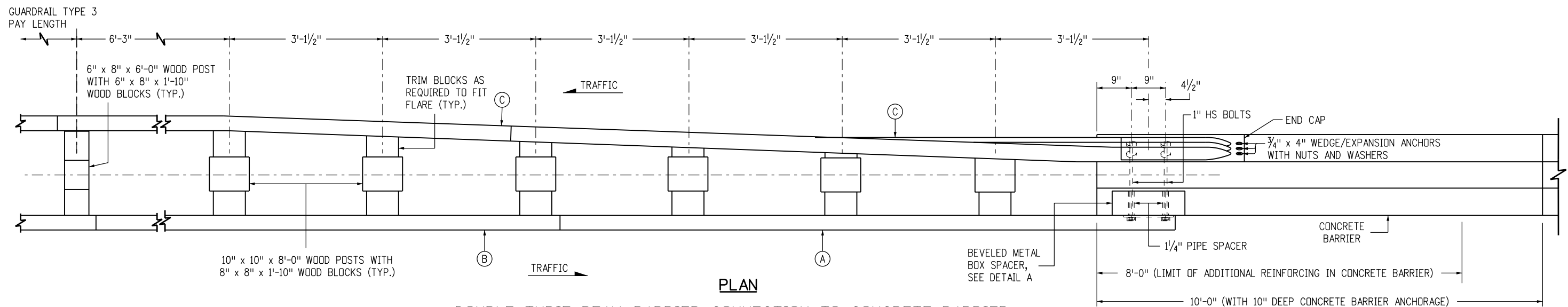
1. WHERE BEVELED METAL BOX SPACERS ARE INSTALLED, PLACE A 1 1/4 INCH X 3/4 INCH AND A 1/4 INCH X 2 INCH PIPE SPACERS ON 1 INCH HS BOLTS PASSING THROUGH THE INTERIOR OF BOX.
2. ALL METAL BOXES SHALL BE GALVANIZED.



ELEVATION



SECTION A-A



PLAN

DOUBLE THRIE BEAM BARRIER CONNECTION TO CONCRETE BARRIER

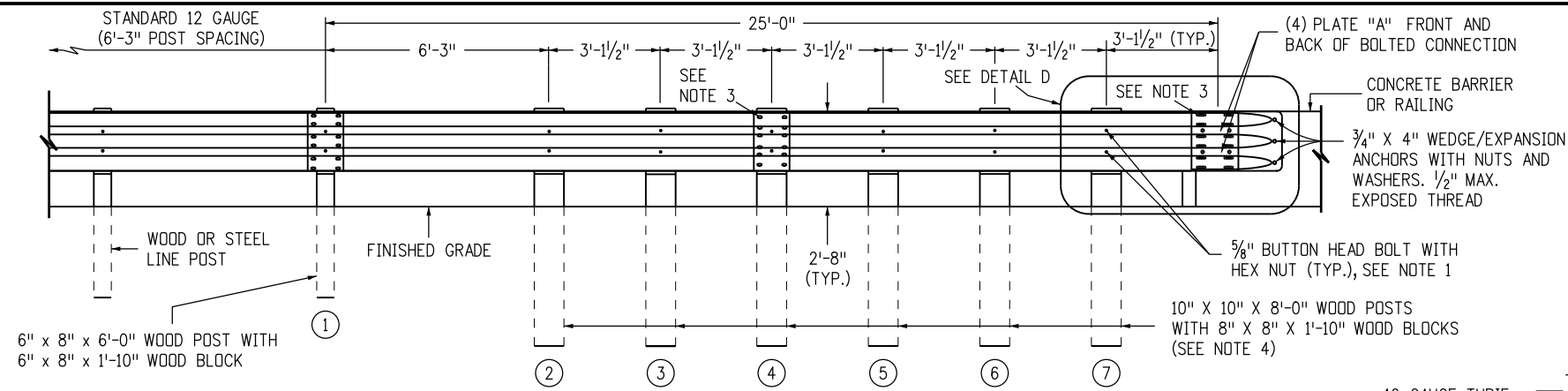
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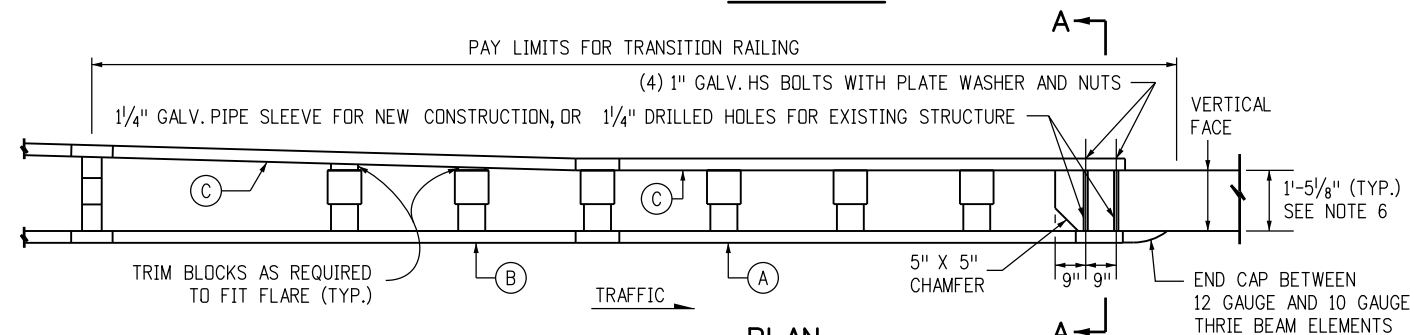
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GUARDRAIL TYPE 9
SINGLE SLOPE BARRIER
 Issued By: Project Development Branch July 4, 2012

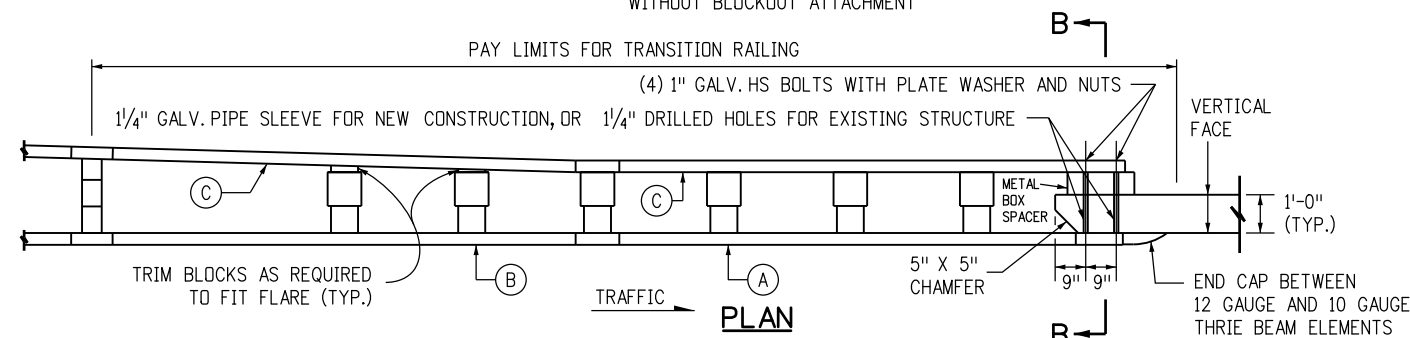
STANDARD PLAN NO.
M-606-15
Sheet No. 9 of 11



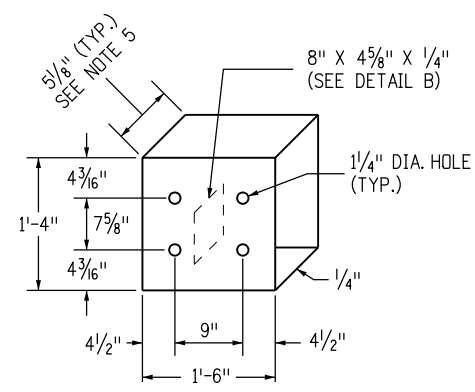
ELEVATION



PLAN TRANSITION RAILING WITHOUT BLOCKOUT ATTACHMENT

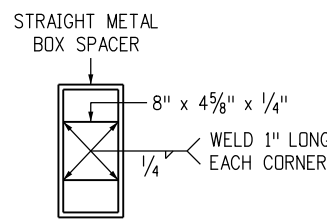


PLAN TRANSITION RAILING WITH BLOCKOUT ATTACHMENT



DETAIL A

PLACEMENT OF HOLES FOR FRONT AND BACK PANELS



DETAIL B

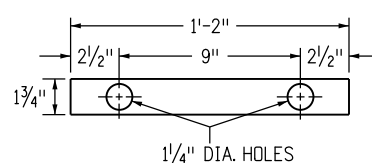
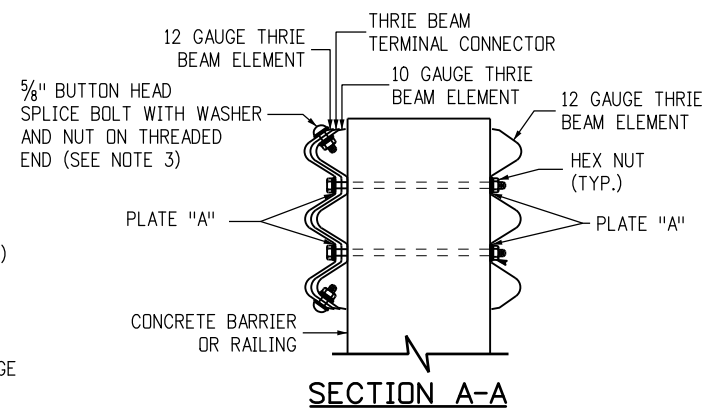
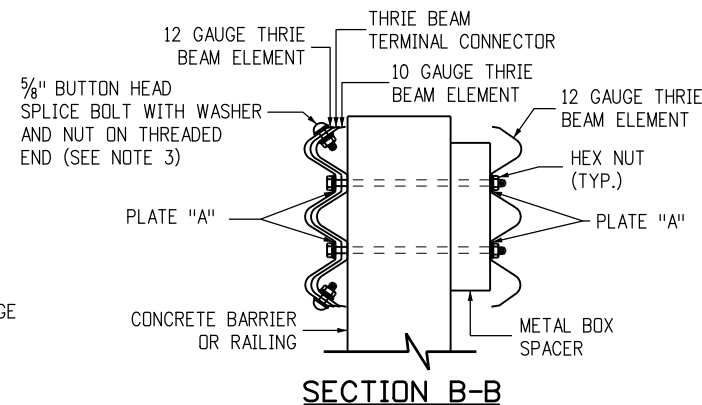


PLATE "A" DETAIL C

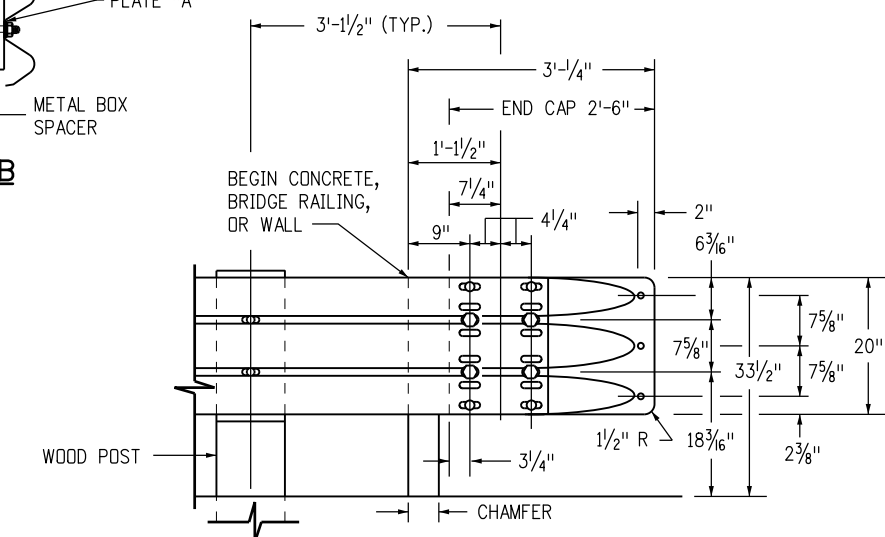
STRAIGHT METAL BOX SPACER



SECTION A-A



SECTION B-B



DETAIL D

SEE MANUFACTURER'S DETAILS FOR EXACT DIMENSIONS

LEGEND

- (A) NESTED THRIE BEAM ELEMENTS (ONE 12 GAUGE ELEMENT NESTED OVER ONE 10 GAUGE ELEMENT)
 - (B) ONE 10 GAUGE THRIE BEAM ELEMENT
 - (C) ONE 12 GAUGE THRIE BEAM ELEMENT
- 10 GAUGE = 0.135" THICK
12 GAUGE = 0.108" THICK

NOTES

1. USE 5/8" BUTTON HEAD BOLTS AND HEX NUTS FOR CONNECTIONS TO POSTS. NO WASHER ON RAIL FACE FOR BOLTED CONNECTIONS TO POST.
2. THE NESTED RAIL ELEMENTS, END CAP AND SINGLE 10 GAUGE THRIE BEAM ELEMENT, MAY BE SPLICED TOGETHER PRIOR TO BOLTING THE ELEMENTS TO THE WOOD POST AND CONCRETE BARRIER OR RAILING.
3. EXTERIOR SPLICE BOLT HOLES FOR RAIL ELEMENT SPLICES AT POST (4) AND THE CONNECTION TO THE CONCRETE BARRIER OR RAILING SHALL BE THE STANDARD 2 9/32" X 1 1/8" SLOT SIZE. INTERIOR SPLICE BOLT HOLES AT THESE LOCATIONS MAY BE INCREASED UP TO 1 1/4". ONLY THE TOP TWO AND THE BOTTOM TWO SPLICE BOLTS WITH WASHERS AND NUTS ARE REQUIRED FOR RAIL SPLICES AT POST (4) AND THE CONNECTION TO THE CONCRETE BARRIER OR RAILING.
4. THE TOP ELEVATION OF POSTS (1) THROUGH (7) SHALL NOT PROJECT MORE THAN 1 INCH ABOVE THE TOP ELEVATION OF THE RAIL ELEMENT.
5. THE DEPTH OF THE METAL BOX SPACER VARIES FROM THE 5/8" TO 1 1/2" AND IS DEPENDENT ON THE WIDTH OF THE CONCRETE RAILING OR WALL. THE COMBINED DIMENSION FOR THE DEPTH OF THE METAL BOX SPACER PLUS THE WIDTH OF RAILING OR WALL IS TYPICALLY 17 7/8". WHERE THE SPACE BETWEEN THE BACKSIDE OF THE CONCRETE RAILING OR WALL AND THE REAR THRIE BEAM ELEMENT IS LESS THAN 1 1/2", METAL PLATES SIMILAR TO PLATE "A" ARE BE USED AS SPACERS.
6. WHERE THE WIDTH OF THE CONCRETE RAILING OR WALL IS GREATER THAN 17 7/8", WOOD BLOCKS ARE TO BE USED TO FILL THE SPACE CREATED BETWEEN THE BACKSIDE OF POST (4) THROUGH NO. (7) AND THE REAR THRIE BEAM ELEMENT. THESE WOOD BLOCKS SHALL BE 8 INCHES IN WIDTH AND ONE FOOT-TWO INCHES IN LENGTH. THE DIMENSION BETWEEN THE FRONT THRIE BEAM ELEMENT AND THE REAR THRIE BEAM ELEMENT IS TO MATCH THE WIDTH OF THE CONCRETE RAILING OR WALL.

Computer File Information

Creation Date: 06/29/18	Initials: JBK
Last Modification Date: 07/16/18	Initials: LTA
Full Path: www.coloradodot.info/business/designsupport	
Drawing File Name: 606015010011.dgn	
CAD Ver.: MicroStation V8	Scale: Not to Scale Units: English

Sheet Revisions

Date:	Comments
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(R-X)	
(R-X)	

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Division of Project Support

JBK/LTA

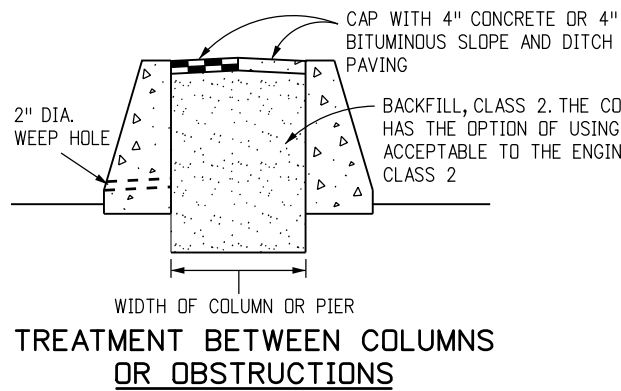
**GUARDRAIL TYPE 9
SINGLE SLOPE BARRIER**

Issued By: Project Development Branch July 4, 2012

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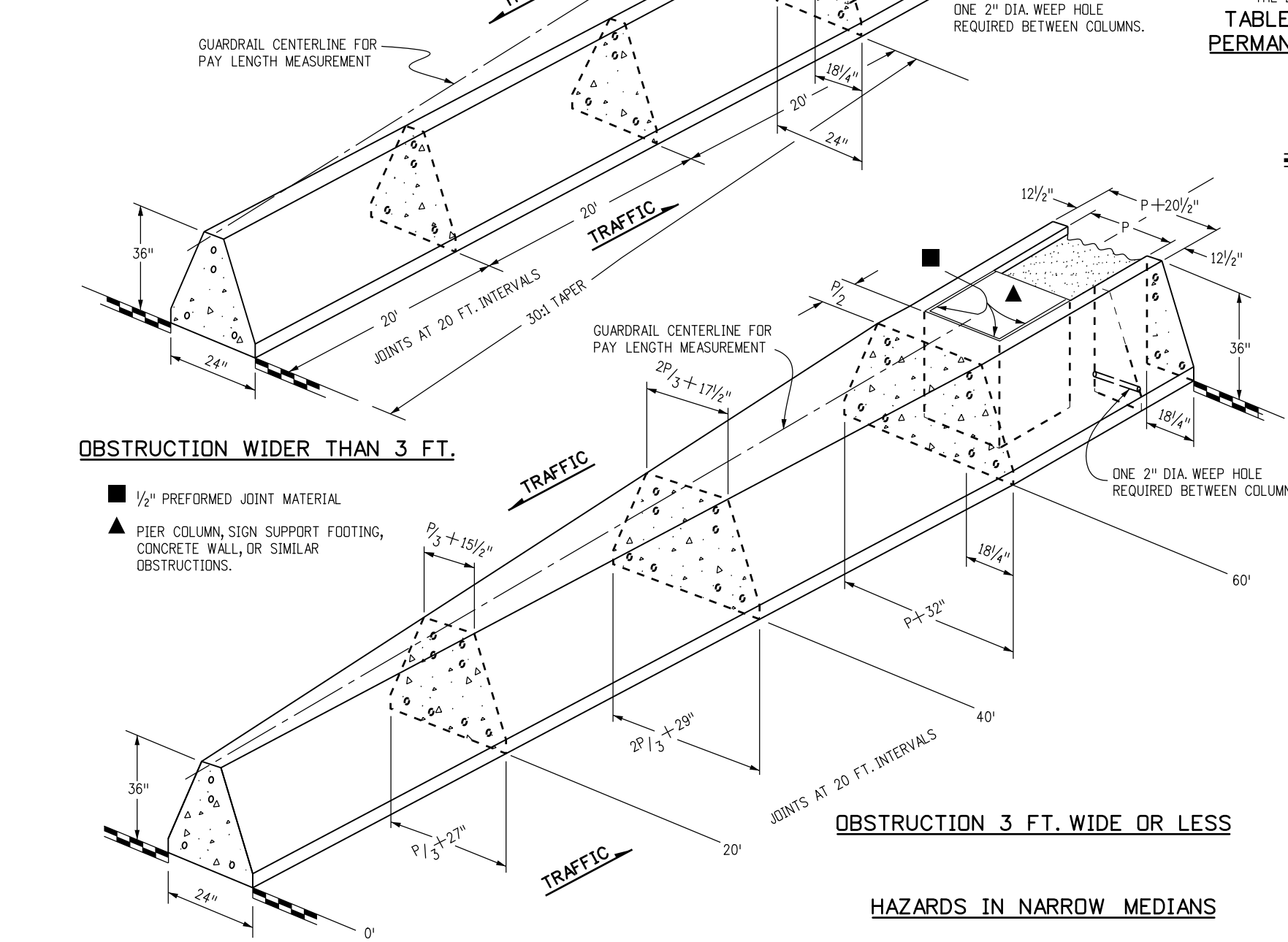
TREATMENT BETWEEN COLUMNS OR OBSTRUCTIONS

DESIGN SPEED (MPH)	SHY LINE OFFSET (FT.) *	FLARE RATE FOR BARRIER INSIDE SHY LINE	FLARE RATE FOR BARRIER OUTSIDE SHY LINE
80	12	30:1	20:1
75	10	30:1	20:1
70	9	30:1	20:1
60	8	26:1	18:1
55	7	24:1	16:1
50	6.5	21:1	14:1
45	6	18:1	12:1
40	5	16:1	10:1
30	4	13:1	8:1

* THE SHY LINE OFFSET IS MEASURED FROM THE EDGE OF THE TRAVELED WAY.

TABLE OF FLARE RATES FOR PERMANENT CONCRETE BARRIER

- NOTES**
1. THE MEDIAN IN THESE APPLICATIONS SHALL BE PAVED ON A SLOPE CONTINUED FROM THE ADJACENT PAVED SHOULDER OR A 10:1 OR FLATTER SLOPE.
 2. THE PAY LENGTH FOR BARRIER ON BOTH SIDES OF AN OBSTRUCTION WILL BE DETERMINED BY ONE LINEAR MEASUREMENT ALONG THE GUARDRAIL CENTERLINE. THE BACKFILL AND CAP BETWEEN COLUMNS OR OBSTRUCTIONS WILL NOT BE MEASURED AND PAID FOR SEPARATELY BUT SHALL BE INCLUDED IN THE WORK.
 3. GUARDRAIL BETWEEN COLUMNS OR OBSTRUCTIONS MAY BE STYLES CA OR CD AS SHOWN ON THE PLANS.

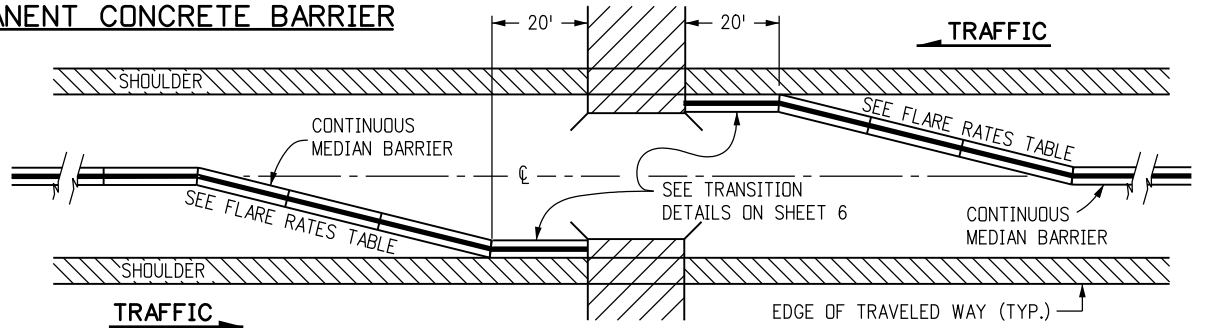


OBSTRUCTION WIDER THAN 3 FT.

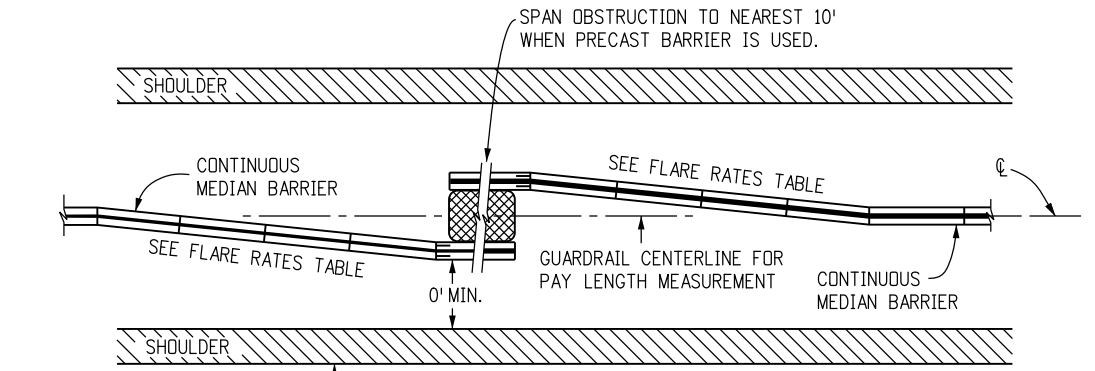
- 1/2" PREFORMED JOINT MATERIAL
- ▲ PIER COLUMN, SIGN SUPPORT FOOTING, CONCRETE WALL, OR SIMILAR OBSTRUCTIONS.

OBSTRUCTION 3 FT. WIDE OR LESS

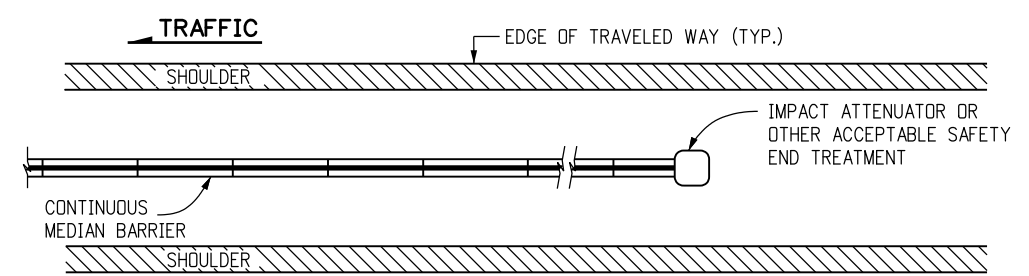
HAZARDS IN NARROW MEDIANS



BRIDGE APPROACH



STYLE CA AT OBSTRUCTION
(OBSTRUCTION NOT SUITABLE FOR STYLE CD)



MEDIAN BARRIER END TREATMENT

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Creation Date: 06/29/18	Initials: JBK
Last Modification Date: 07/16/18	Initials: LTA
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Sheet Revisions

Date:	Comments
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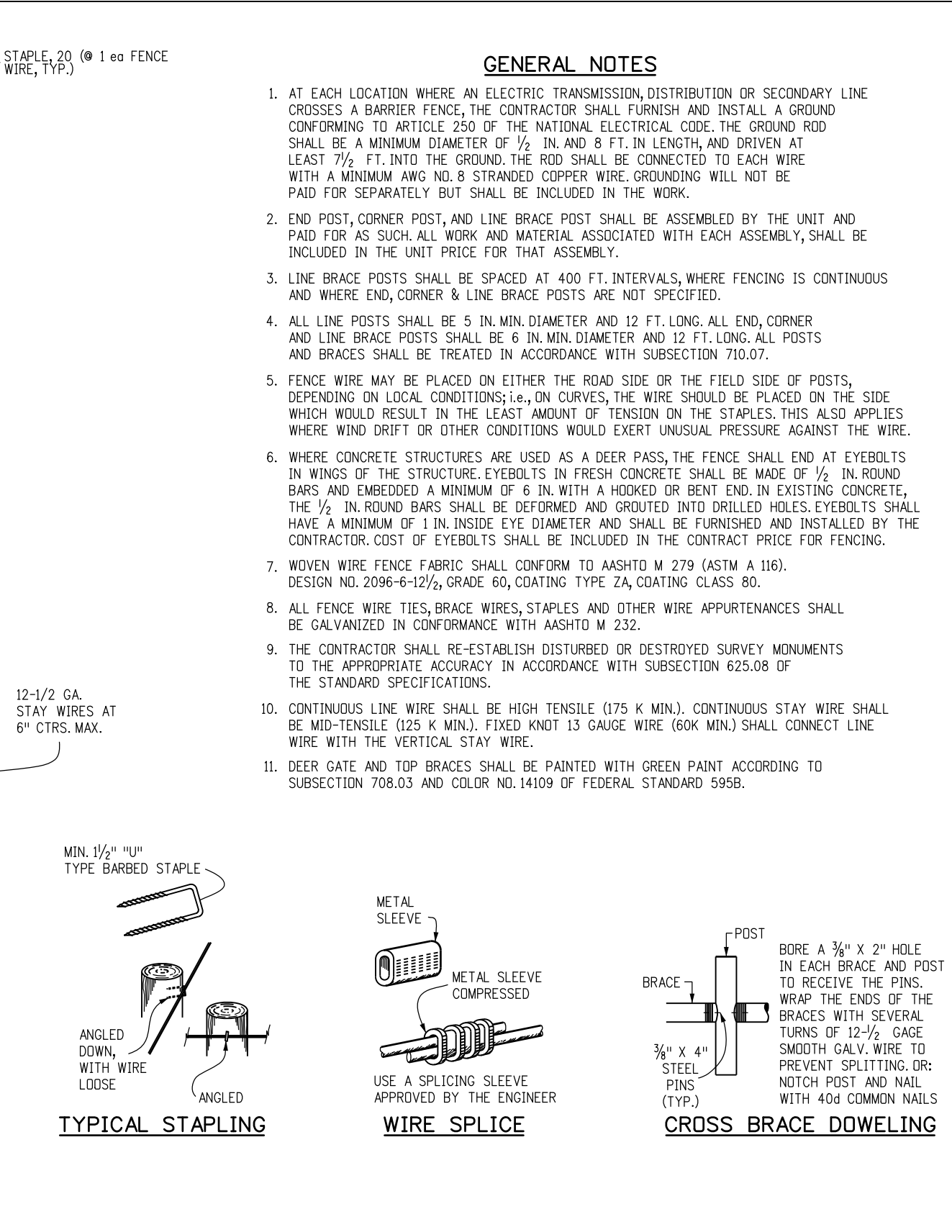
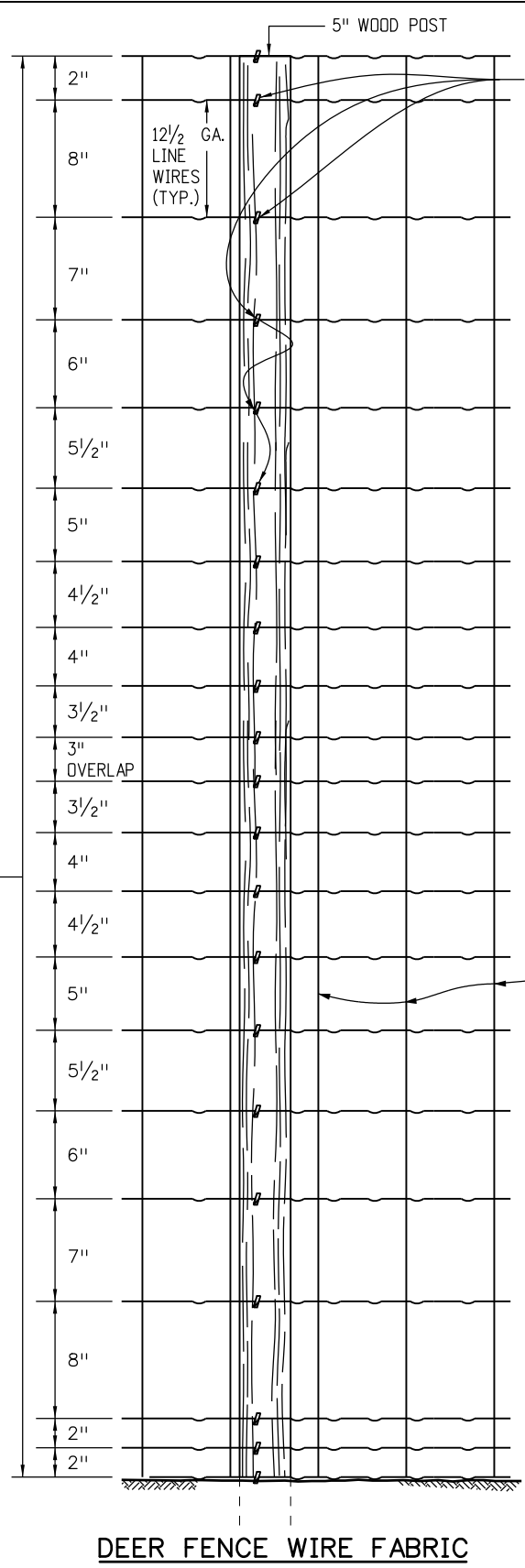
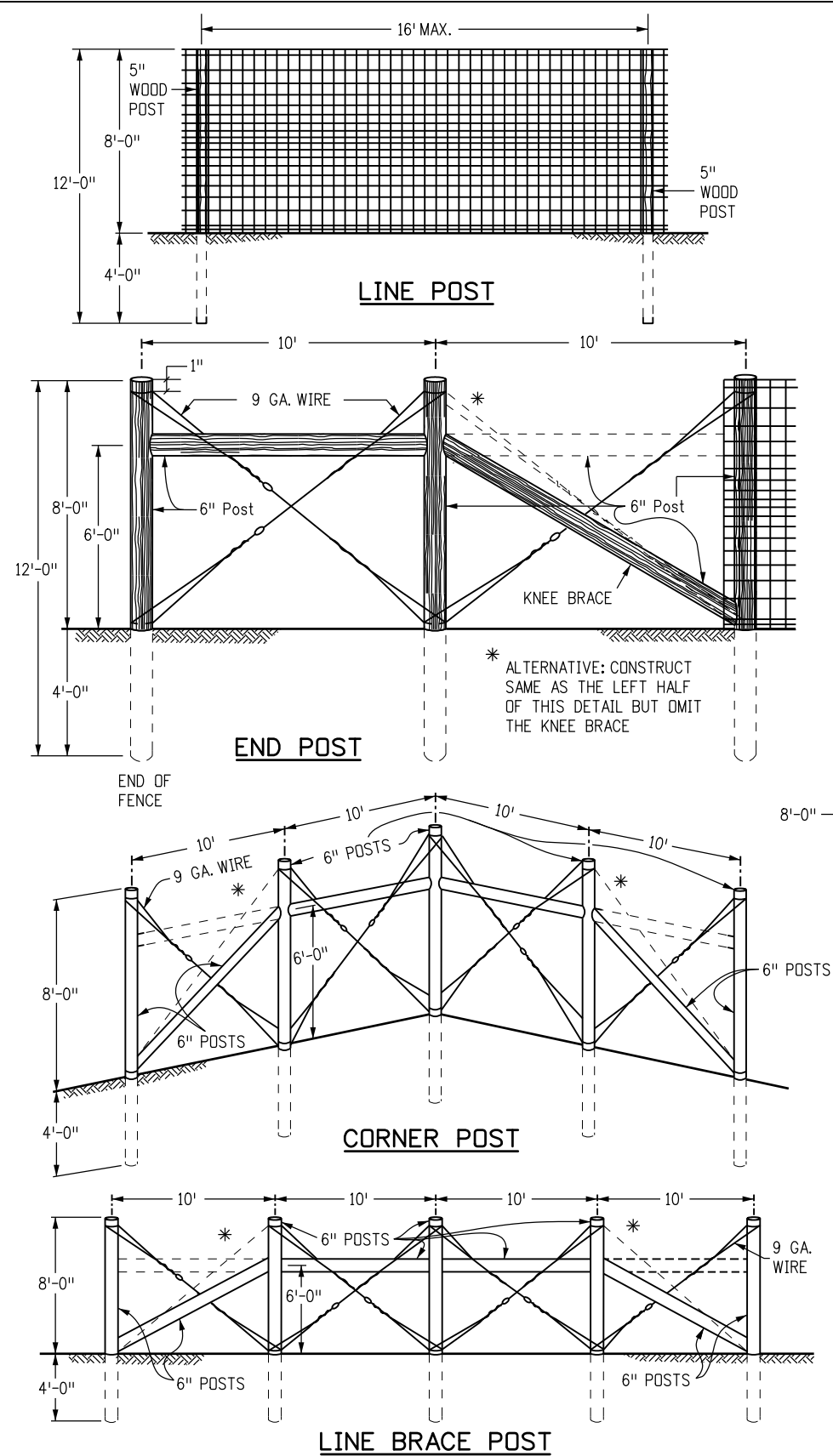
**GUARDRAIL TYPE 9
SINGLE SLOPE BARRIER**

Issued By: Project Development Branch July 4, 2012

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Creation Date: 07/04/12	Initials: DLM
Last Modification Date: 04/30/15	Initials: LTA
Full Path: www.coloradodot.info/business/designsupport	
Drawing File Name: 607040105.dgn	
CAD Ver.: MicroStation V8	Scale: Not to Scale Units: English

Sheet Revisions

Date:	Comments
04/30/15	Created new M Standard: M-607-4 - Deer Fence, Gates, and Game Ramps
(R-X)	
(R-X)	
(R-X)	
(R-X)	

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Division of Project Support **DLM/LTA**

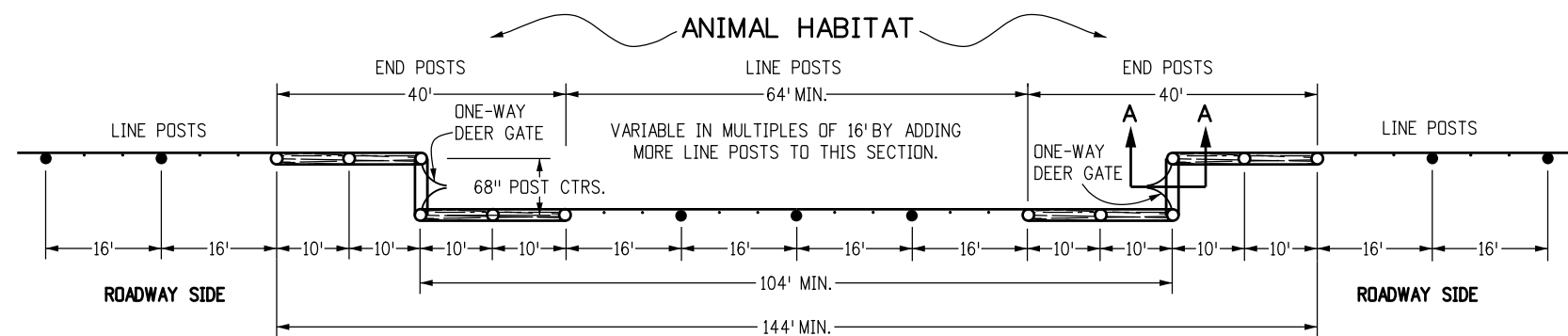
DEER FENCE, GATES, AND GAME RAMPS

Issued By: Project Development Branch March 4, 2015

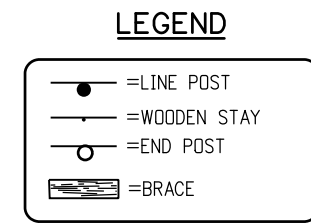
STANDARD PLAN NO.

M-607-4

Sheet No. 1 of 5

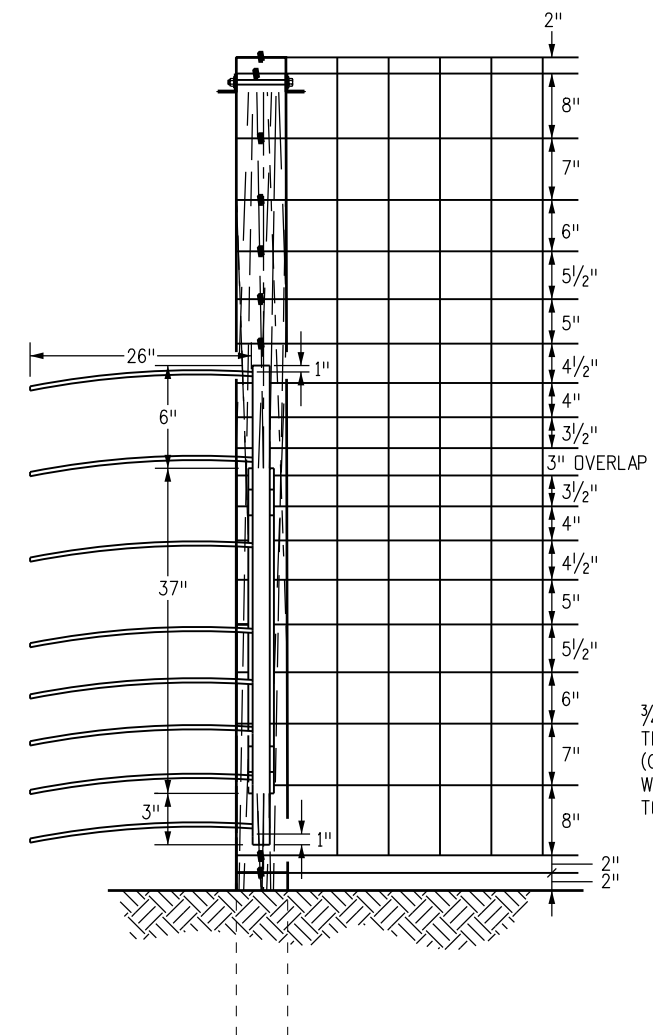


PLAN VIEW - TYPICAL DEER GATE INSTALLATION

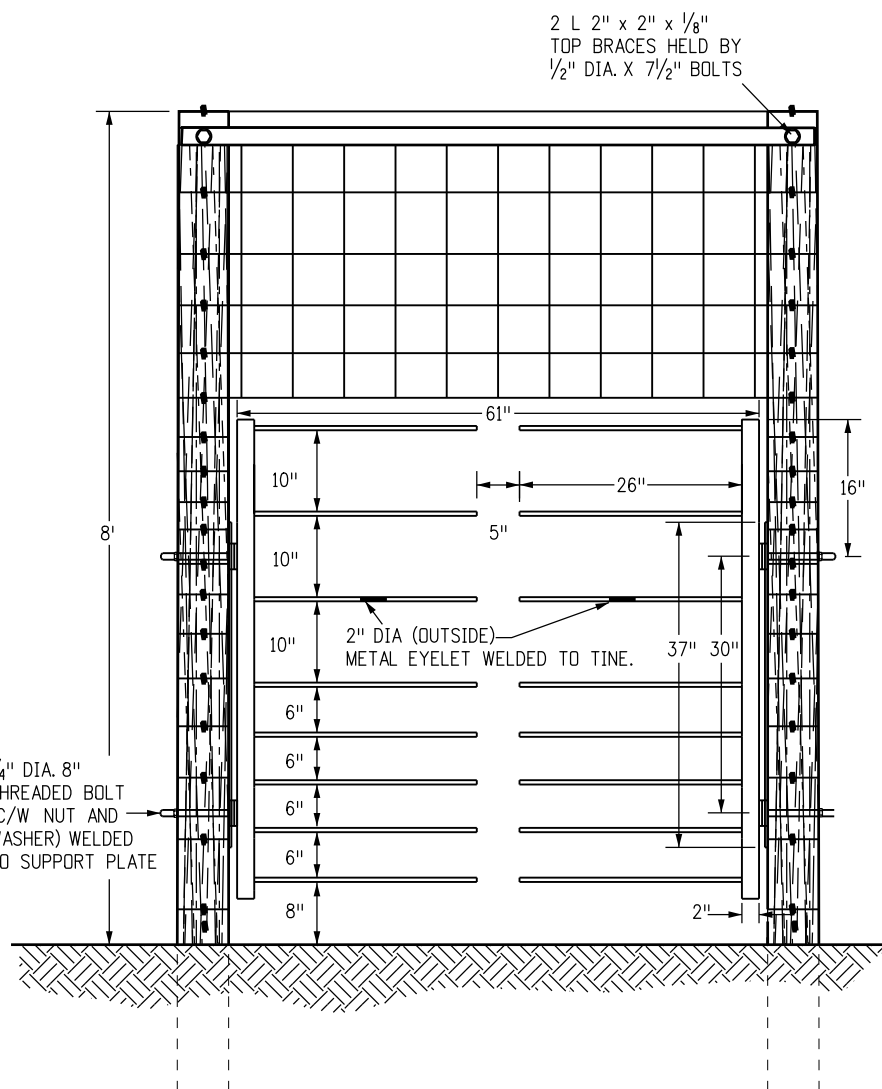


LEGEND

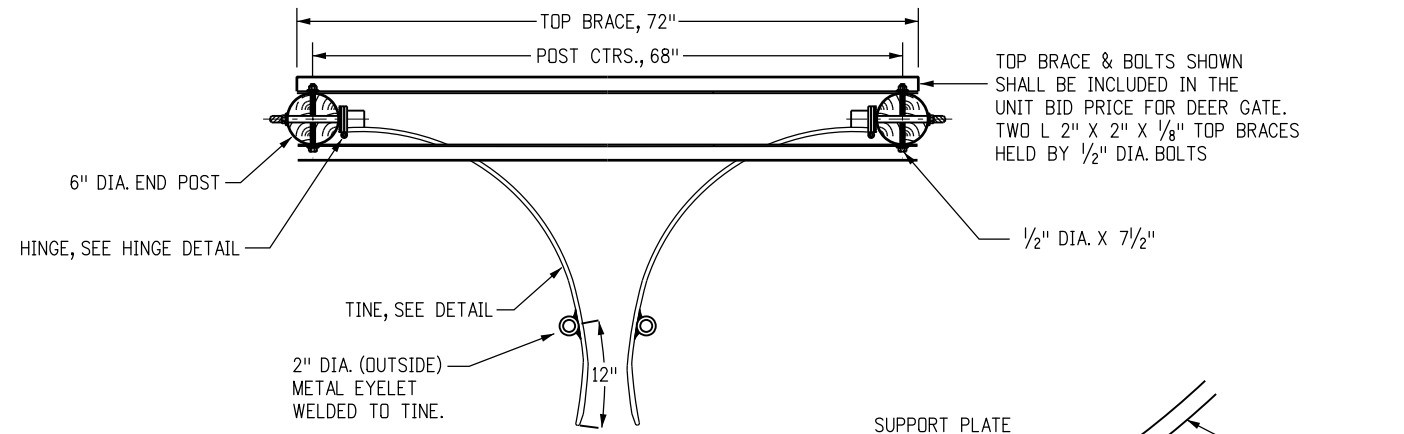
- NOTES**
- SIX IN. DOUBLE ACTING SPRING DOOR HINGE WITH FLAT BUTTON TIPS CUT IN TWO SHALL BE USED AS A SINGLE SWING HINGE AND BE PROVIDED WITH A GREASING NIPPLE AND WELDED TO SUPPORT PLATE.
 - TINES SHALL BE MOLDED IN ONE PIECE OF STEEL (AASHTO M 169, GRADE 1050), WITH NO WELDS ALLOWED.



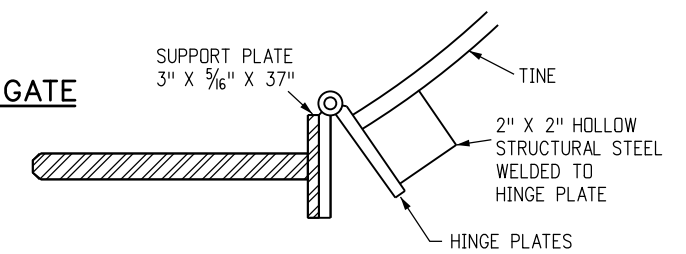
SECTION A-A



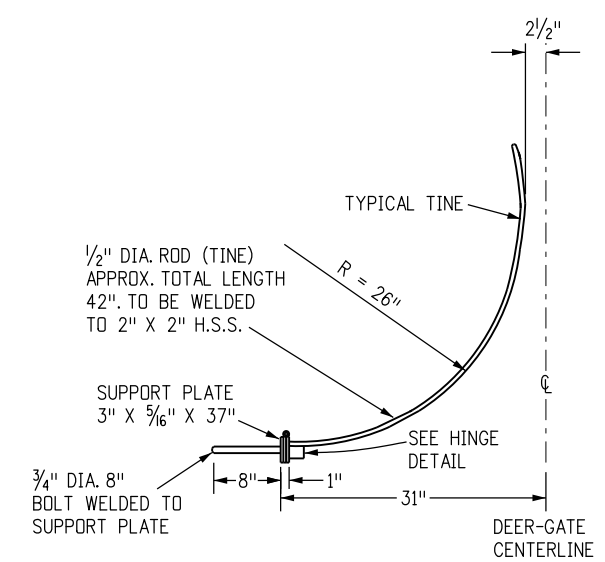
FRONT VIEW - DEER GATE



TOP VIEW - DEER GATE



TYPICAL HINGE DETAIL



TYPICAL TINE DETAIL

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Last Modification Date: 04/30/15	Initials: LTA
Full Path: www.coloradodot.info/business/designsupport	
Drawing File Name: 607040205.dgn	
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	

Sheet Revisions	
Date:	Comments
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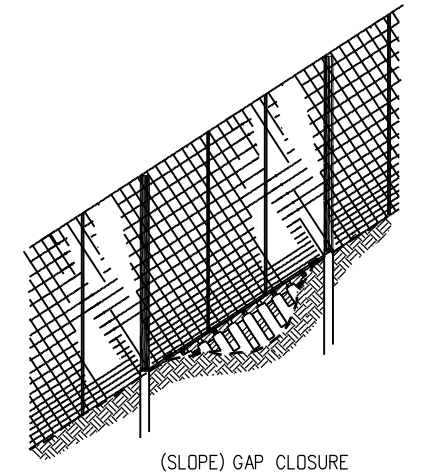
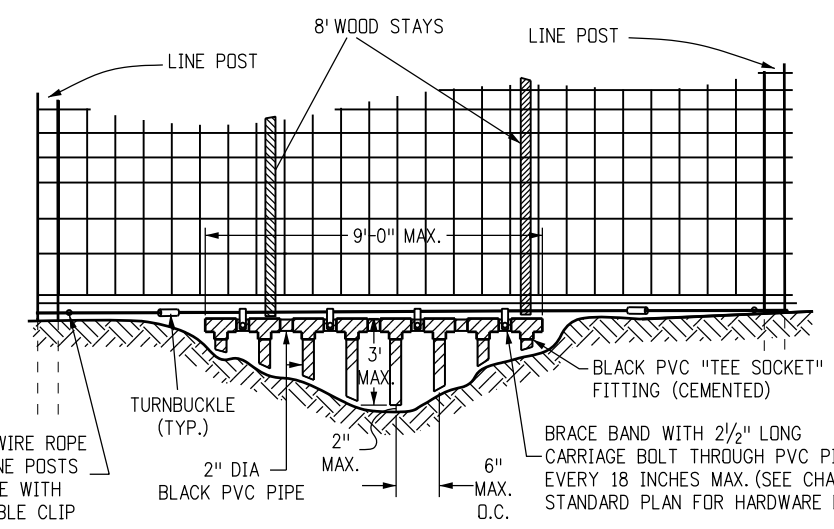
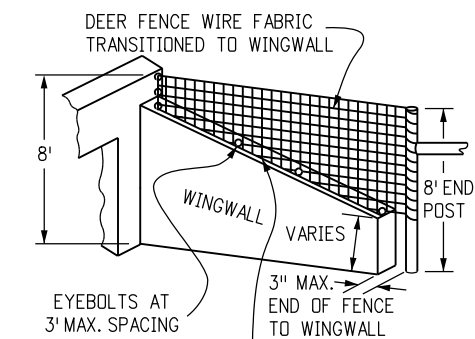
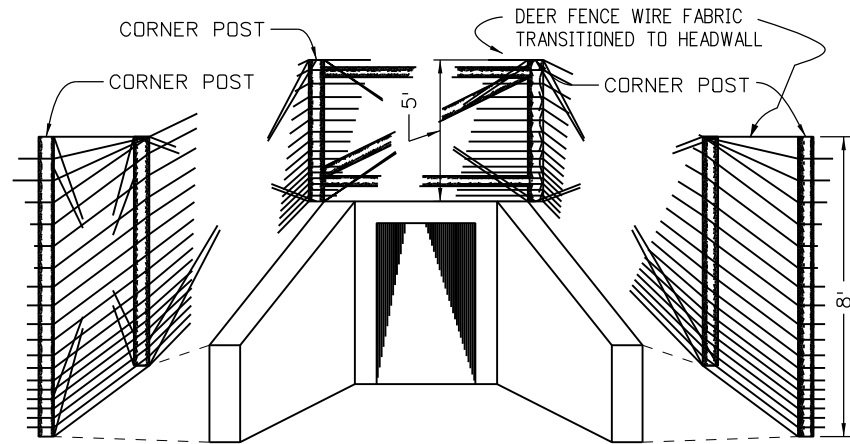
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**DEER FENCE, GATES,
AND GAME RAMPS**
 Issued By: Project Development Branch March 4, 2015

STANDARD PLAN NO.
M-607-4
Sheet No. 2 of 5

NOTES

1. LOCATIONS OF DEER FENCE IN THE CLEAR ZONE SHALL BE SHOWN IN THE PLANS.
2. POSTS WITHIN THE CLEAR ZONE SHALL BE DRILLED.
3. DRILL HOLES PERPENDICULAR TO THE ROADWAY.
4. KNEE BRACE SHALL BE OMITTED FROM ANY END POST OR CORNER POST WITHIN THE CLEAR ZONE.



FENCE DEER (SPECIAL) OVER CONCRETE BOX CULVERT

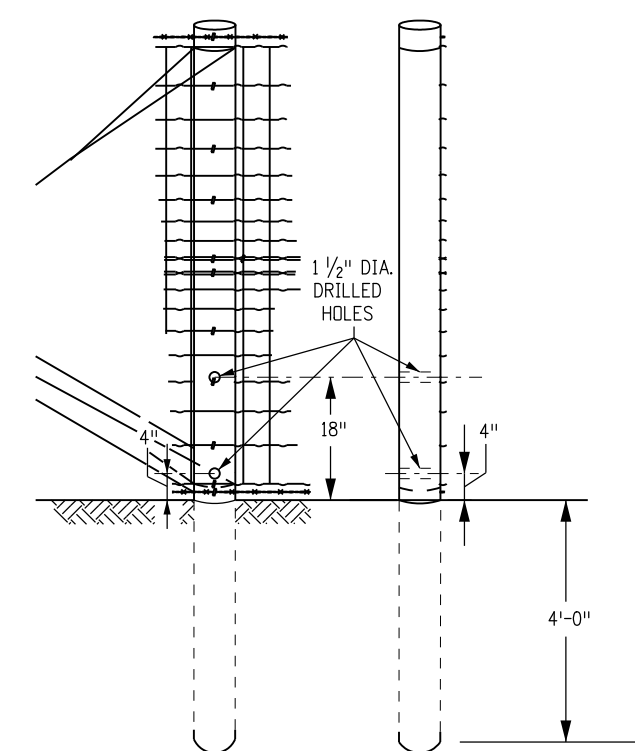
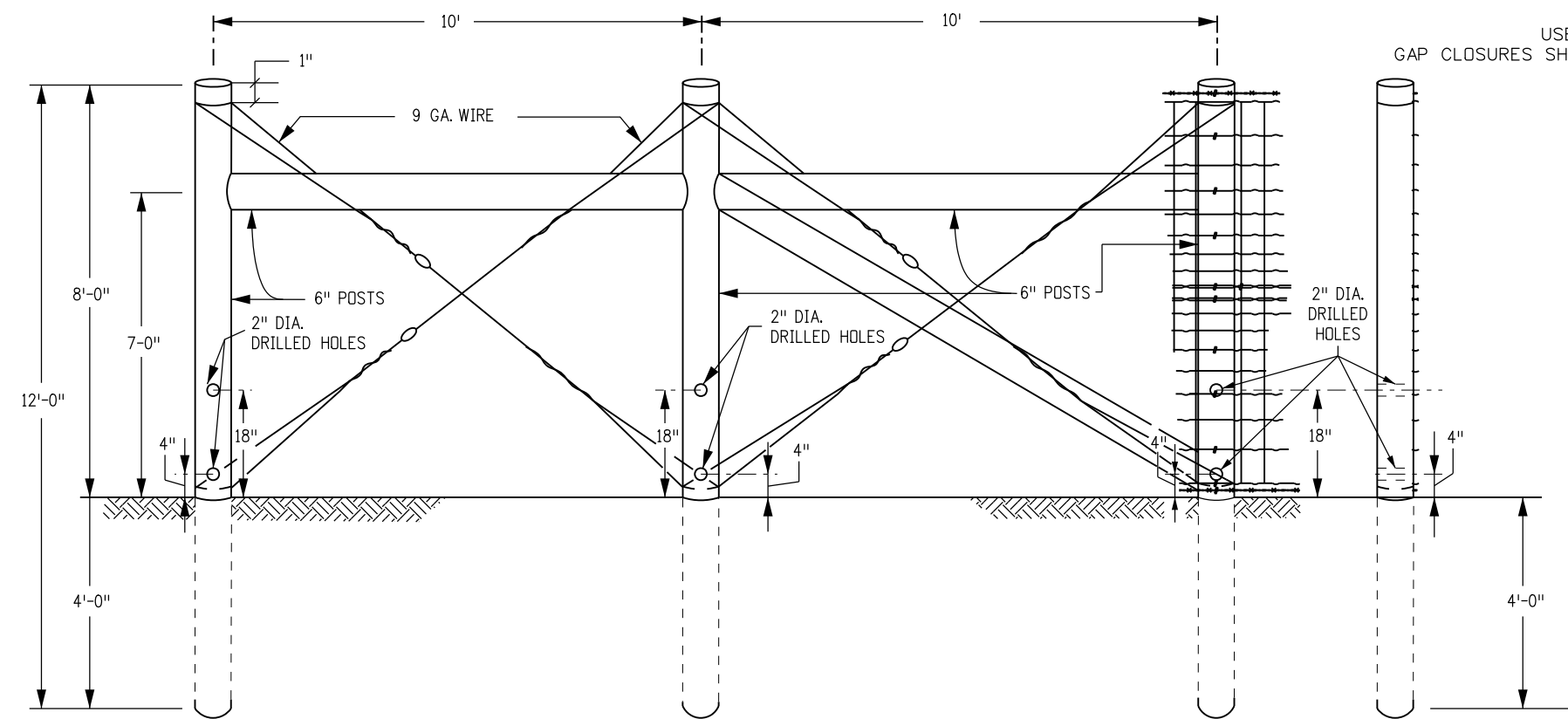
FIVE FOOT POSTS AND WIRE FABRIC SHALL BE INSTALLED WHERE THE FENCE PASSES OVER A CBC AT LOCATIONS SHOWN IN THE PLANS. THIS WORK WILL BE PAID FOR AS FENCE DEER (SPECIAL).

INSTALL 9 GA. WIRE THROUGH EYEBOLTS AND ATTACH FENCE FABRIC TO WIRE AT 1 FT. INTERVALS

WRAP 1/2" WIRE ROPE AROUND LINE POSTS AND SECURE WITH U-BOLT CABLE CLIP

GAP CLOSURE

USE THIS DETAIL TO CLOSE ALL GAPS BETWEEN 6 INCHES AND 3 FEET. GAP CLOSURES SHALL BE INCLUDED IN THE PRICE OF THE FENCE AND NOT BE PAID FOR SEPARATELY.



END POST AND CORNER POST

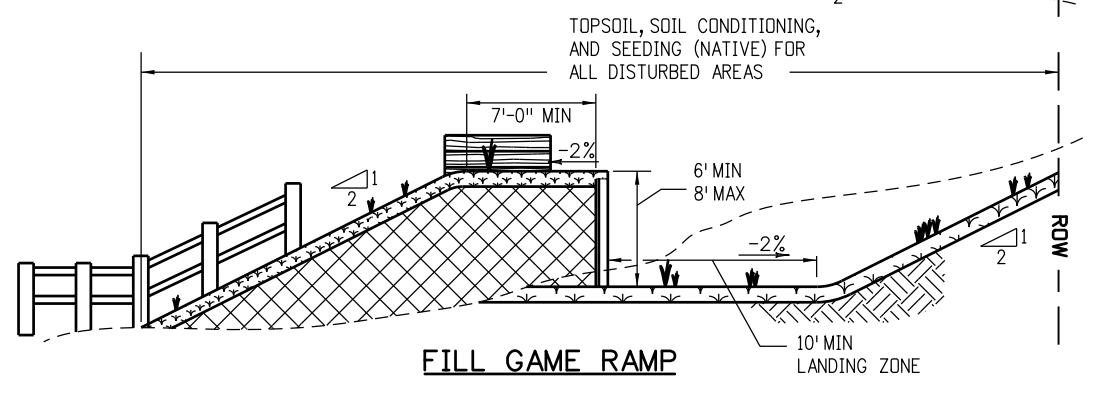
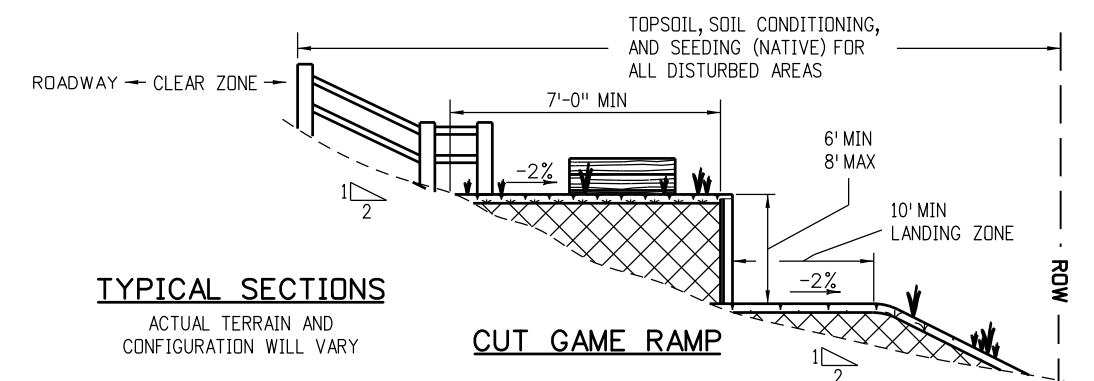
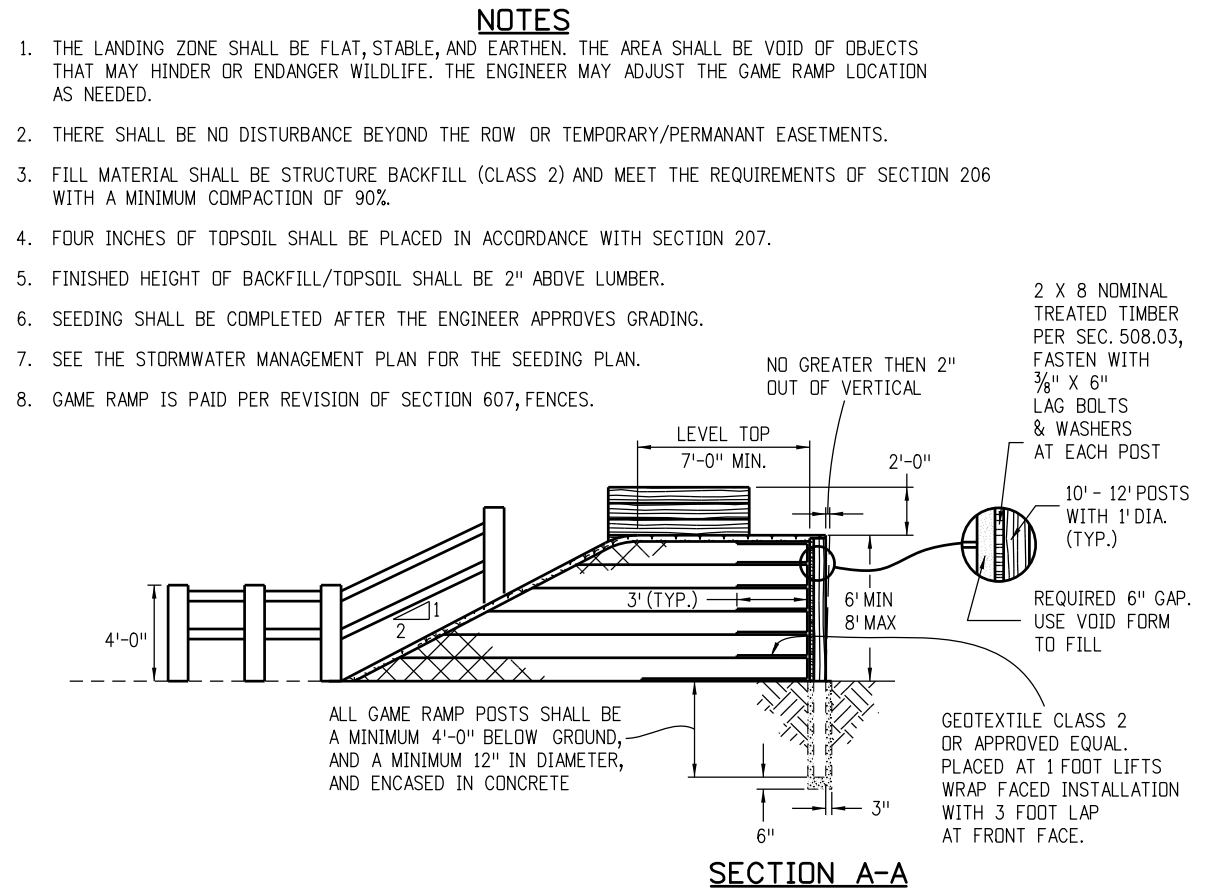
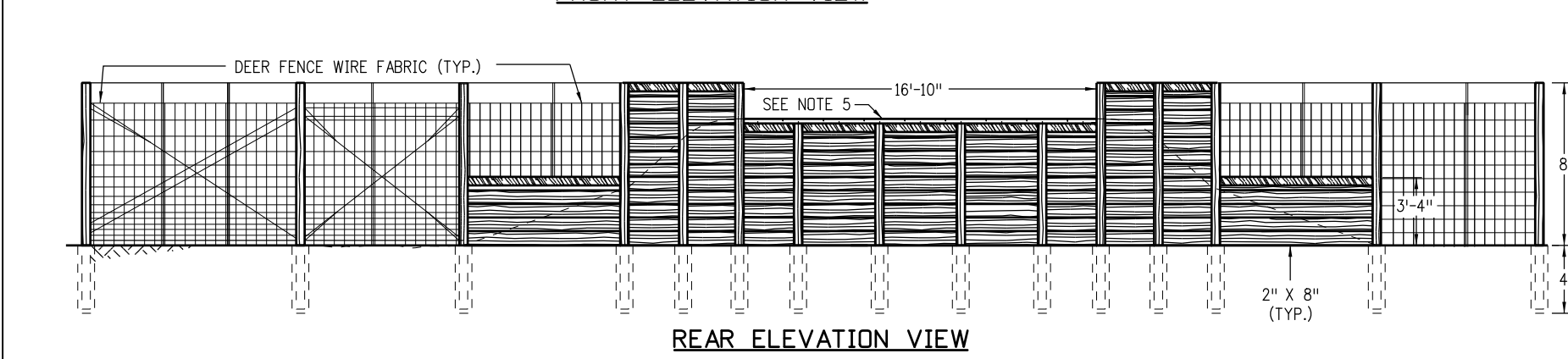
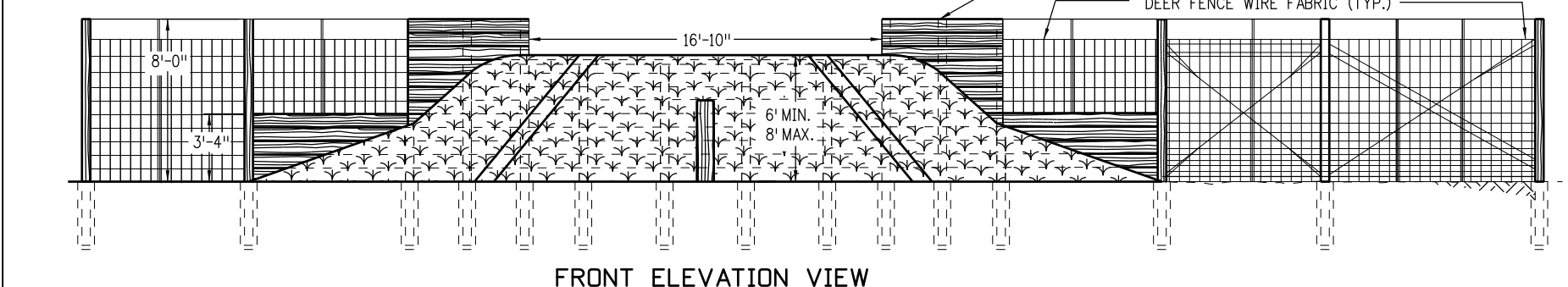
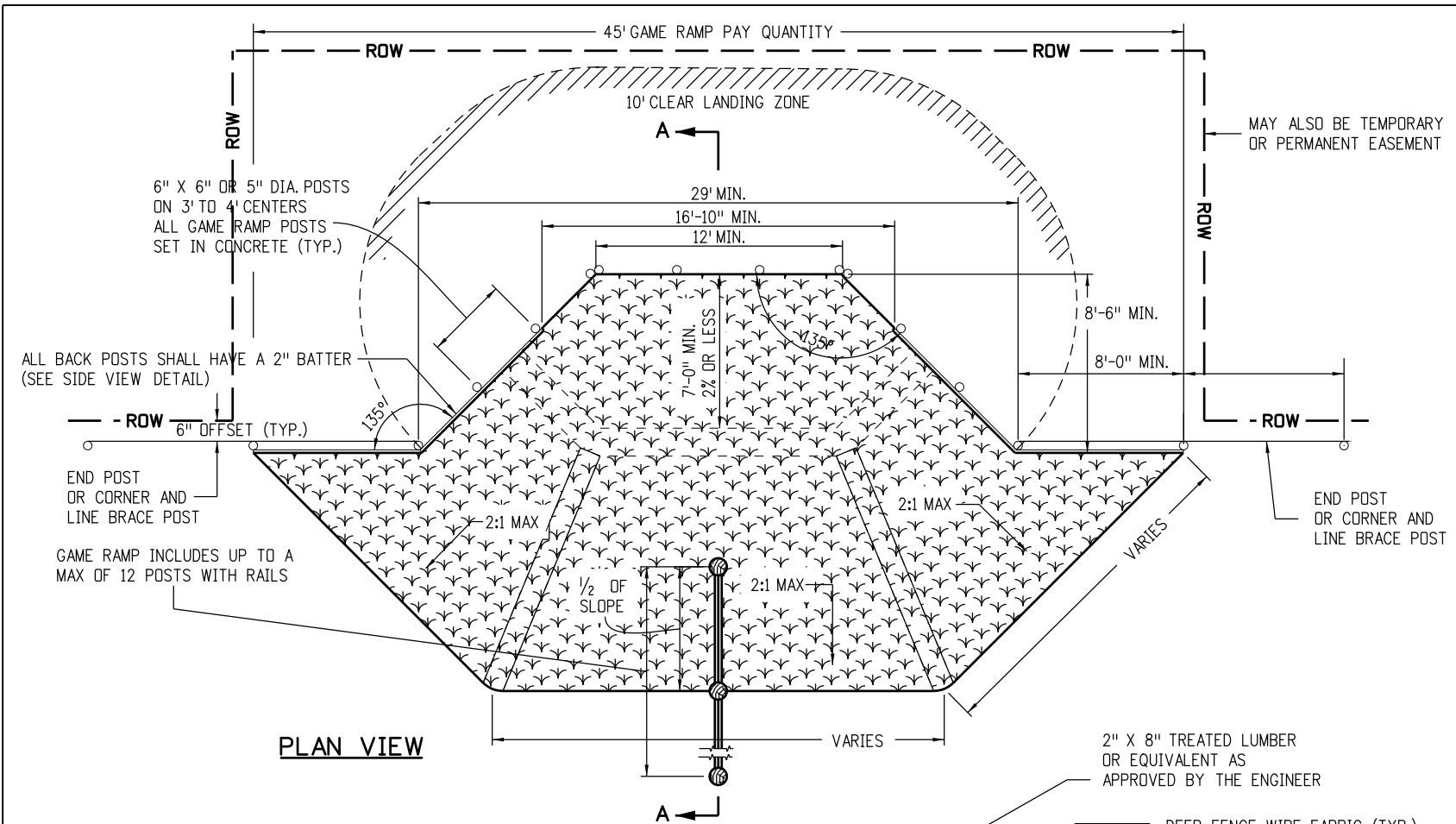
SIDE VIEW

FRONT VIEW SIDE VIEW

5 IN. LINE POST

MODIFIED FOR PLACEMENT WITHIN ROADWAY CLEAR ZONE

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Date:	Comments																
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Computer File Information	
Creation Date: 07/04/12	Initials: DLM
Last Modification Date: 04/30/15	Initials: LTA
Full Path: www.coloradodot.info/business/designsupport	
Drawing File Name: 607040405.dgn	
CAD Ver.: MicroStation V8	Scale: Not to Scale Units: English

Sheet Revisions	
Date:	Comments
04/30/15	Created new M Standard: M-607-4 - Deer Fence, Gates, and Game Ramps
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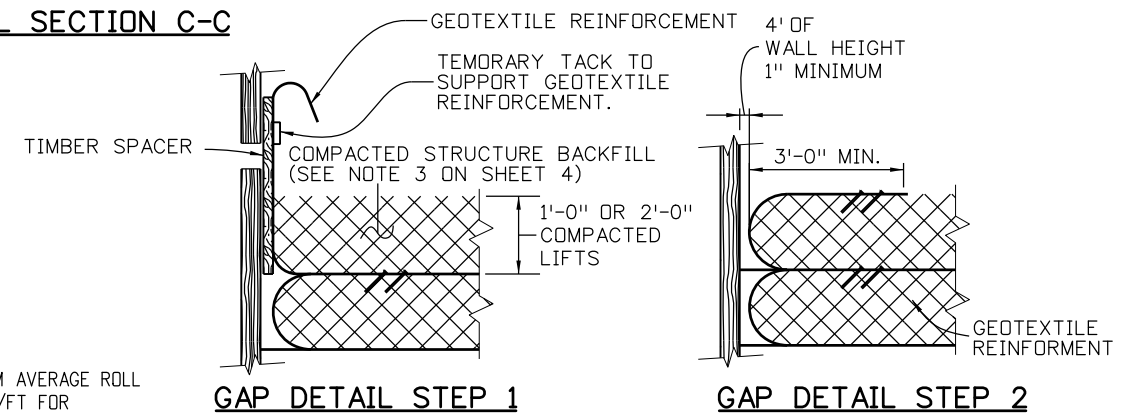
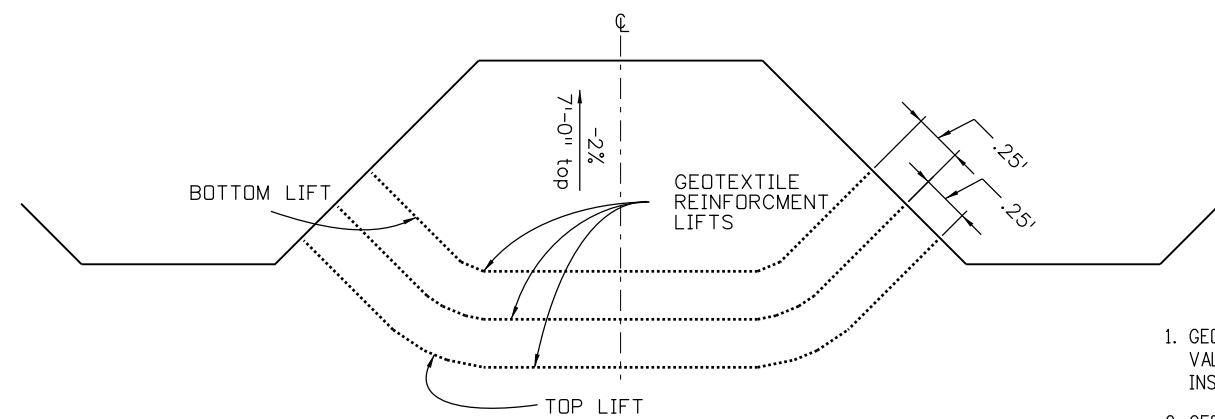
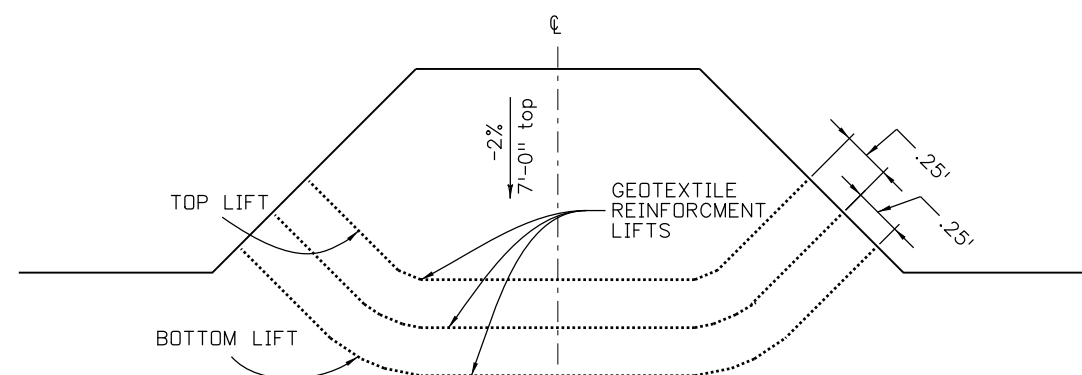
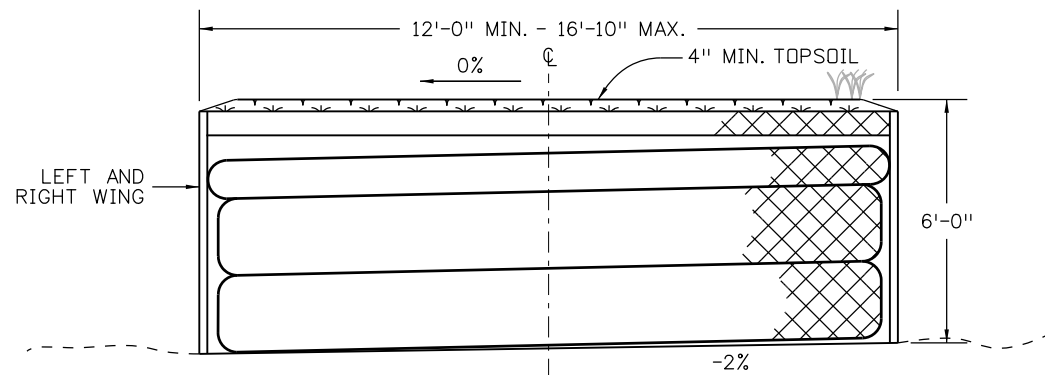
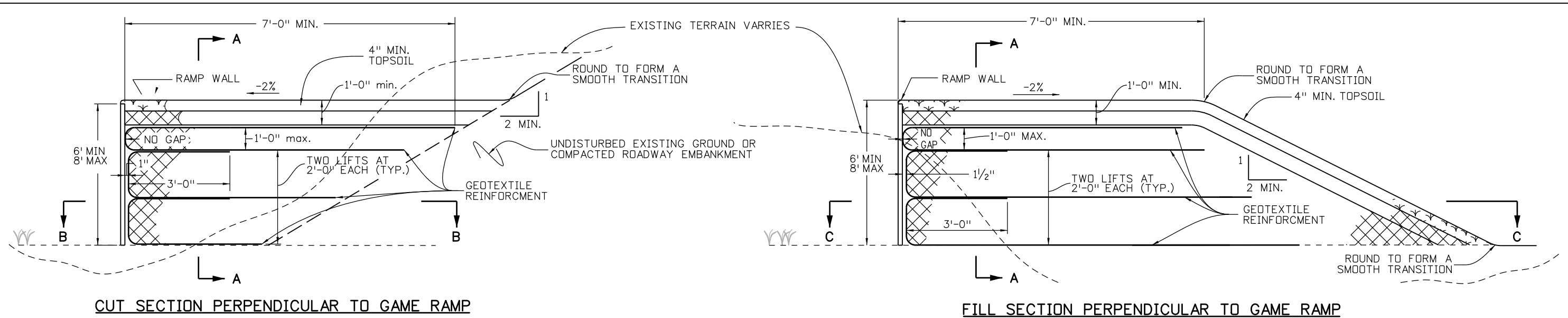
DEER FENCE, GATES, AND GAME RAMPS

Issued By: Project Development Branch March 4, 2015

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NOTES

1. GEOTEXTILE REINFORCEMENT SHALL BE WOVEN FABRIC WITH A MINIMUM AVERAGE ROLL VALUE OF 4800 LB/FT FOR INSTALLATIONS WITH A GAP AND 2400 LB/FT FOR INSTALLATIONS WITHOUT A GAP BASED ON ASTM D4595.
2. GEOTEXTILE REINFORCEMENT SHALL BE PLACED BY ALTERNATING MACHINE DIRECTION (MD) WITH CROSS MACHINE DIRECTION (XD) FROM LAYER TO LAYER.
3. THE GEOTEXTILE REINFORCEMENT WRAP AT BACK FACE OF GAME RAMP SHALL BE PULLED BACK SLACK FREE WITH ITS END ANCHORED TO SOIL UNDERNEATH WITH STAPLES OR PINS.
4. MINIMUM SPLICE OF ALL GEOTEXTILE SHALL CONSIST OF 1 FOOT OF OVERLAP.
5. GEOTEXTILE REINFORCEMENT WRAP AT BACK FACE OF GAME RAMP WALL SHALL BE TEMPORARILY HUNG WITH A SPACER BOARD AND TACK STRIP. AFTER REACHING A TOTAL OF 2'-0" COMPACTED LIFT, THE TACK STRIP SHALL BE REMOVED AND GEOTEXTILE REINFORCEMENT SHALL BE PULLED BACK SLACK FREE WITH ITS END ANCHORED TO SOIL UNDERNEATH WITH STAPLE OR PINS BEFORE THE SPACER BOARD IS PULLED.
6. DO NOT USE SPACER FOR THE TOP LIFT (FINAL LIFT). TOP LIFT SHALL ABUT THE GAME RAMP WALL.

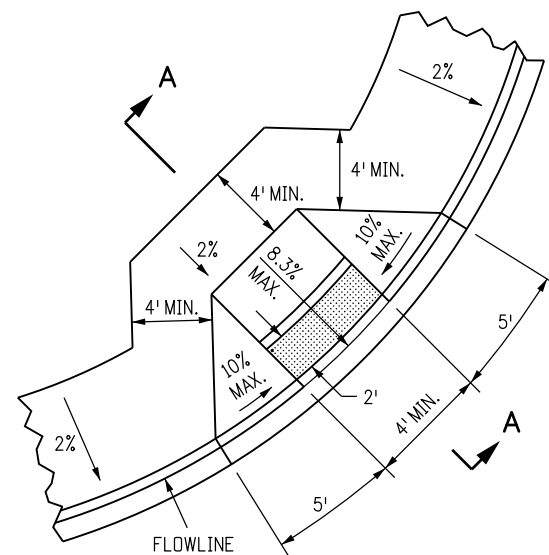
Computer File Information		Sheet Revisions		Colorado Department of Transportation  4201 East Arkansas Avenue CDOT HQ, 4th Floor Denver, CO 80222 Phone: 303-757-9021 FAX: 303-757-9868 Division of Project Support DLM/LTA	DEER FENCE, GATES, AND GAME RAMPS		STANDARD PLAN NO.
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Last Modification Date: 04/30/15	Initials: LTA	04/30/15	Created new M Standard: M-607-4 - Deer Fence, Gates, and Game Ramps				
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CAD Ver.: MicroStation V8	Scale: Not to Scale	Units: English	(R-X)				

GENERAL NOTES

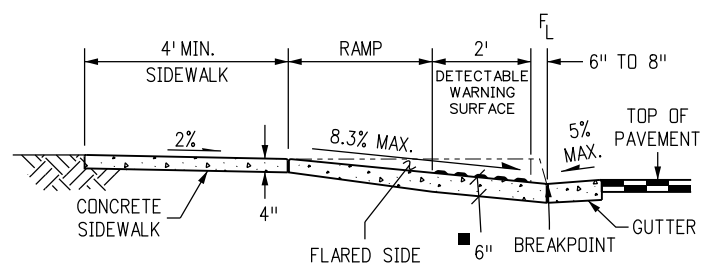
1. THE DETECTABLE WARNINGS SHALL BE INSTALLED AT SIDEWALK TO STREET TRANSITIONS. THEY SHALL HAVE A TRUNCATED DOME SURFACE. THE DOMES SHALL BE IN A SQUARE GRID PATTERN AND ALIGNED WITH PEDESTRIAN TRAFFIC.
2. ALL DETECTABLE WARNING SURFACES SHALL START A MINIMUM OF 6 INCHES FROM THE FLOWLINE OF THE CURB AND NOT BE MORE THAN A MAXIMUM OF 8 INCHES FROM ANY POINT ON THE FLOWLINE OF THE CURB, WITH EXCEPTION FOR TYPES 1B MODIFIED AND 3B MODIFIED CURB RAMPS AS THIS DIMENSION MAY BE GREATER THAN 8 INCHES ON ONE SIDE OF THE RADIUS.
3. THE RAMP SLOPE AND DETECTABLE WARNING SURFACE SHALL BE 8.3% OR FLATTER.
4. TOLERANCE LIMITS ON THE RAMP RUNNING SLOPE AND FLARED SIDE SLOPES SHALL BE +0.5% MAXIMUM. THE DEPARTMENT WILL MEASURE THE SLOPES AND THOSE EXCEEDING THE MAXIMUM TOLERANCE WILL NOT BE ACCEPTED.
5. THE MINIMUM WIDTH FOR SIDEWALK IS 4 FEET.
6. DRAINAGE STRUCTURES, TRAFFIC SIGNAL EQUIPMENT, OR OTHER OBSTRUCTIONS SHALL NOT BE INSTALLED IN THE CURB RAMP OR TURNING SPACE AREAS.
7. CONSTRUCTION OF THE CONCRETE PEDESTRIAN CURB SHALL BE INCLUDED IN THE BID PRICE OF THE CONCRETE CURB RAMP.
8. IF THE PLACEMENT OF THE PEDESTRIAN PUSH BUTTON ASSEMBLY ON A TRAFFIC SIGNAL MAST POLE WILL NOT BE WITHIN EASY REACH (10 INCHES OR LESS AND UNOBSTRUCTED) OF ALL PEDESTRIANS (IN ACCORDANCE WITH THE AMERICANS WITH DISABILITIES ACT), THEN A SEPARATE PEDESTRIAN PUSH BUTTON POST ASSEMBLY (PPBPA) SHALL BE INSTALLED WITHIN ADA REACH RANGES. THE PPBPA SHALL MEET THE PROVISIONS FOUND IN "SECTION 4E.08 THROUGH 4E.13 - PEDESTRIAN DETECTORS" OF THE 2009 MUTCD MANUAL WITH REVISIONS 1 AND 2.
9. DIAGONAL CURB RAMPS (ON THE APEX) ARE NOT PREFERRED IN NEW CONSTRUCTION. A SINGLE DIAGONAL CURB RAMP (ON THE APEX) WILL ONLY BE PERMITTED DURING RECONSTRUCTION OR ALTERATION WHERE PHYSICAL OR SITE CONSTRAINTS PREVENT TWO CURB RAMPS FROM BEING INSTALLED. THE ENGINEER SHALL PROVIDE APPROVED JUSTIFICATION DOCUMENTATION (CDOT CURB RAMP DESIGN VARIANCE REQUEST FORM). ALL CURB RAMPS INSTALLED ON THE APEX MUST MEET THE STANDARDS AS DEFINED IN M-608-1.
10. CURB RAMPS (EXCLUDING FLARED SIDES OR BLENDED TRANSITIONS) SHALL BE WHOLLY CONTAINED WITHIN THE WIDTH OF THE CROSSWALK AND/OR THE PEDESTRIAN STREET CROSSING THEY SERVE.
11. ALL CURB RAMP JOINTS AND GRADE BREAKS SHALL BE FLUSH ($0'' \pm \frac{1}{8}''$). THE JOINT BETWEEN THE ROADWAY SURFACE AND GUTTER PAN SHALL BE FLUSH.
12. THE CONTRACTOR SHALL VERIFY REMOVAL LIMITS ARE SUFFICIENT TO PROVIDE POSITIVE DRAINAGE, MAINTAIN EXISTING DRAINAGE PATTERNS, AND AVOID PONDING IN THE FINAL CONFIGURATION.
13. TO AVOID CHASING GRADE INDEFINITELY WHEN TRAVERSING THE HEIGHT OF CURB, THE RAMP LENGTH SHALL NOT EXCEED 15 FEET. ADJUST THE RAMP SLOPE AS NEEDED TO PROVIDE ACCESS TO THE MAXIMUM EXTENT TECHNICALLY FEASIBLE.
14. THE CHANGE IN GRADE AT THE BOTTOM OF THE CURB RAMP AND ADJOINING ROAD SURFACE SHALL NOT EXCEED AN ALGEBRAIC DIFFERENCE OF 13.33%. THE COUNTER SLOPE OF THE GUTTER OR ROAD AT THE FOOT OF A CURB RAMP, TURNING SPACE, OR BLENDED TRANSITION SHALL NOT EXCEED 5.0%.
15. FLARED SIDE SLOPES MAY EXCEED 10% ONLY WHERE THEY ABUT A NON-WALKABLE SURFACE OR THE ADJACENT CIRCULATION PATH IS BLOCKED.
16. THE STANDARD TURNING SPACE IS 4 FEET BY 4 FEET. WHERE THE TURNING SPACE IS CONSTRAINED, THE TURNING SPACE SHALL BE 4 FEET MINIMUM BY 5 FEET MINIMUM. THE 5 FOOT DIMENSION SHALL BE PROVIDED IN THE DIRECTION OF THE RAMP RUN.

PERCENT SLOPE	1.0%	2.0%	5.0%	7.1%	8.3%	10.0%
EQUIVALENT SLOPE	100:1	50:1	20:1	14:1	12:1	10:1

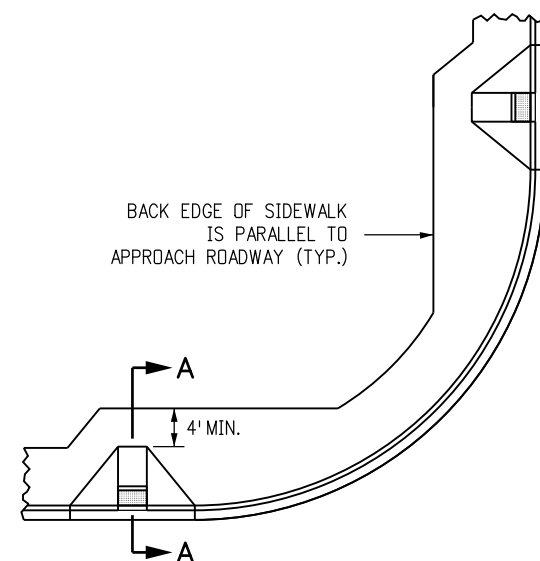
SLOPE TABLE



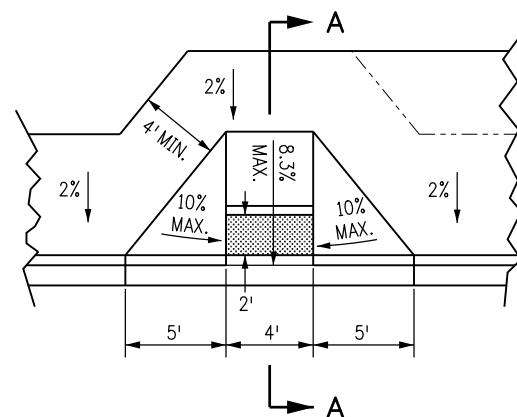
CURB RAMP TYPE 1A
SEE NOTE 9.



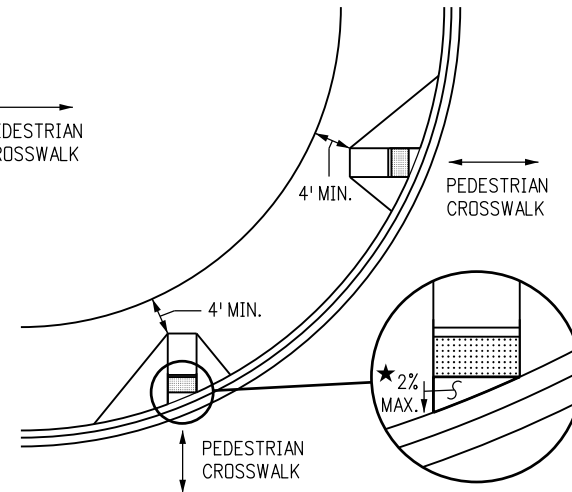
SECTION A-A
INCREASES TO 8" FOR BRICK PAVERS.



CURB RAMP TYPE 1B

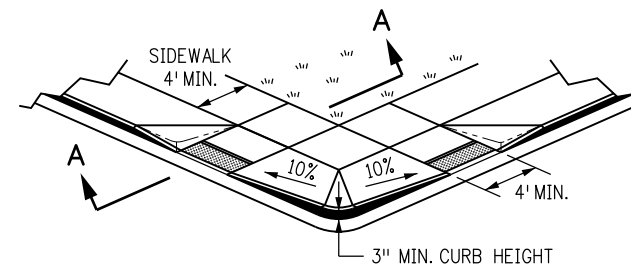


CURB RAMP TYPE 1B DETAIL
MAY BE USED IN MID-BLOCK.

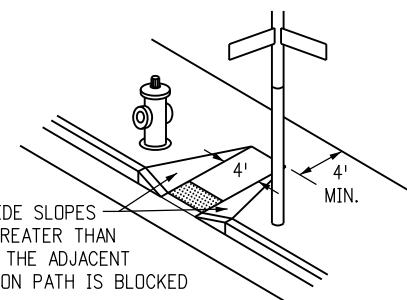


CURB RAMP TYPE 1B MODIFIED

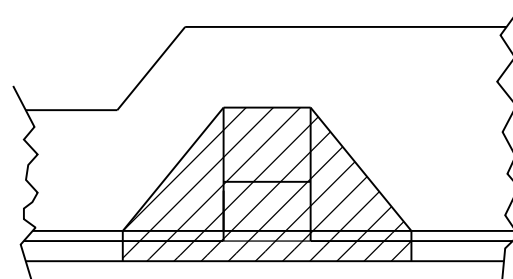
NOTE: GRADE BREAKS SHALL NOT BE PERMITTED IN RAMPS, TURNING SPACES, AND SURFACE SLOPES.



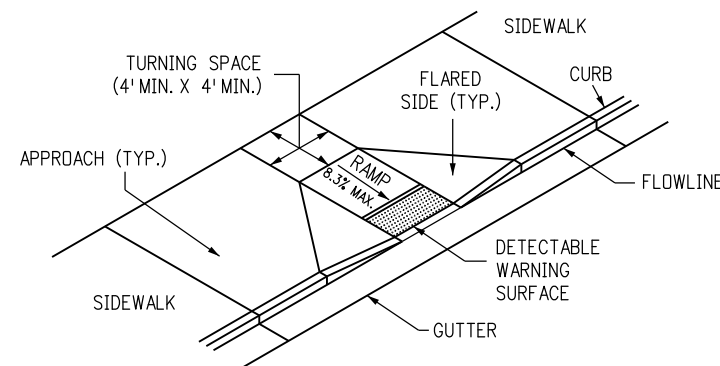
CURB RAMP TYPE 1B OR 3B REDUCED CURB HEIGHT



STEEP FLARED SIDE SLOPES
SEE NOTE 15.



RAMP PAY AREA
FOR CURB RAMPS TYPES 1A AND 1B.



ISOMETRIC VIEW

Computer File Information

Creation Date: 07/04/12	Initials: JBK
Last Modification Date: 02/23/17	Initials: LTA
Full Path: www.coloradodot.info/business/designsupport	
Drawing File Name: 6080101010.dgn	
CAD Ver.: MicroStation V8	Scale: Not to Scale Units: English

Sheet Revisions

Date:	Comments
02/23/17	Added and revised the Curb Ramp details and General Notes.

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CURB RAMPS

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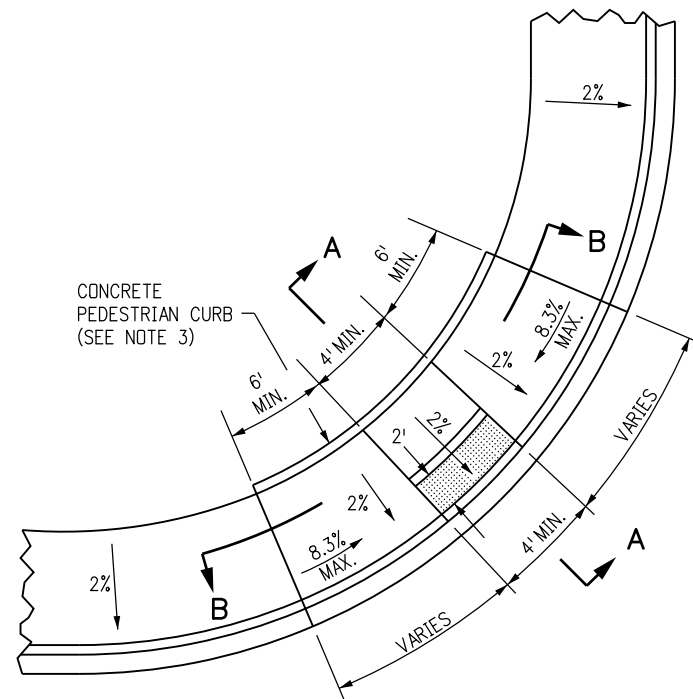
STANDARD PLAN NO.

M-608-1

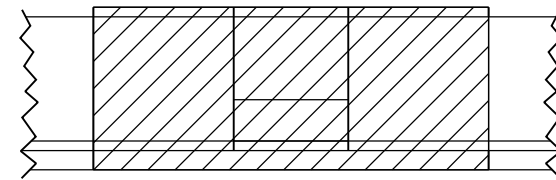
Sheet No. 1 of 10

NOTES

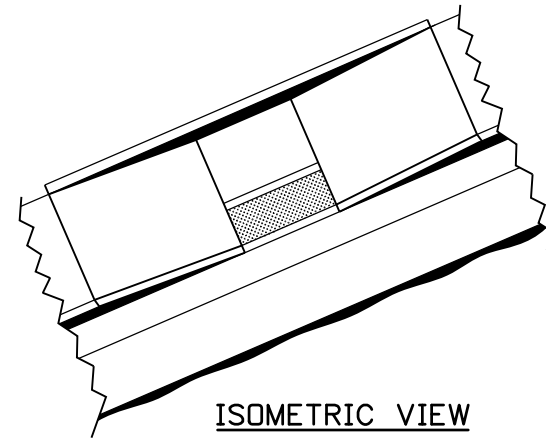
1. CURB RAMP TYPE 2B MAY BE USED IN MID-BLOCK.
2. DIAGONAL CURB RAMPS (ON THE APEX) ARE NOT PREFERRED IN NEW CONSTRUCTION. A SINGLE DIAGONAL CURB RAMP (ON THE APEX) WILL ONLY BE PERMITTED DURING RECONSTRUCTION OR ALTERATION WHERE PHYSICAL OR SITE CONSTRAINTS PREVENT TWO CURB RAMPS FROM BEING INSTALLED. THE ENGINEER SHALL PROVIDE APPROVED JUSTIFICATION DOCUMENTATION (CDOT CURB RAMP DESIGN VARIANCE REQUEST FORM). ALL CURB RAMPS INSTALLED ON THE APEX MUST MEET THE STANDARDS AS DEFINED IN M-608-1.
3. THE PEDESTRIAN CURB MAY BE OMITTED IF THE GROUND SURFACE AT THE BACK OF THE CURB RAMP OR LANDING IS THE SAME ELEVATION AS THE CURB RAMP OR LANDING AND THERE IS NO MATERIAL TO RETAIN.



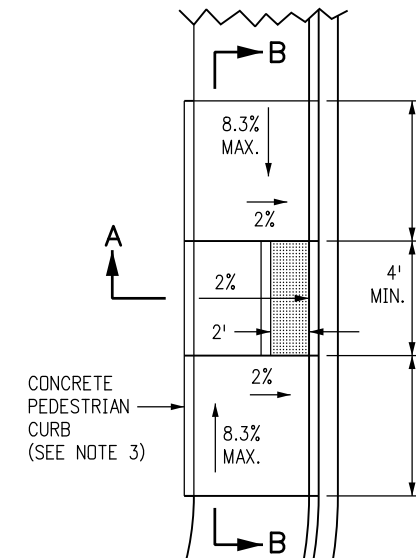
CURB RAMP TYPE 2A
SEE NOTE 2.



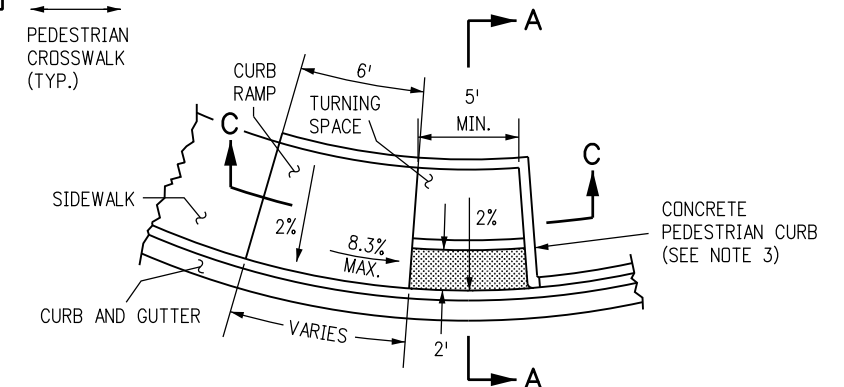
RAMP PAY AREA
FOR CURB RAMP TYPES 2A AND 2B.



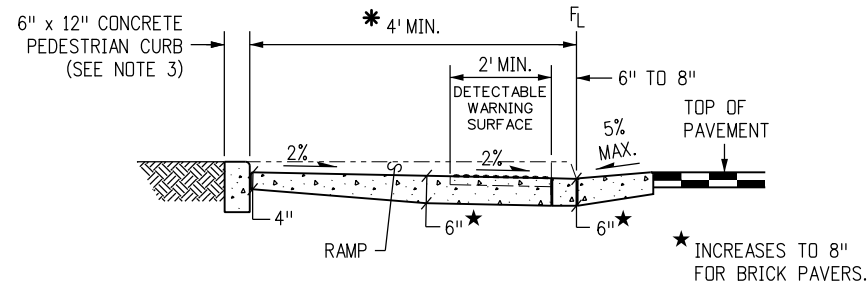
ISOMETRIC VIEW



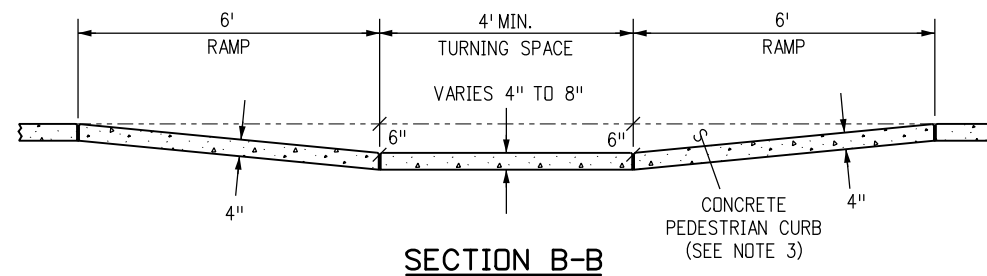
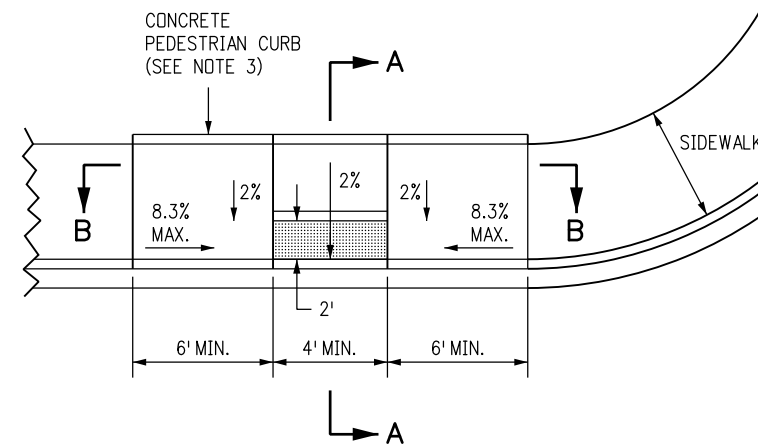
CURB RAMP TYPE 2B
SEE NOTE 1.



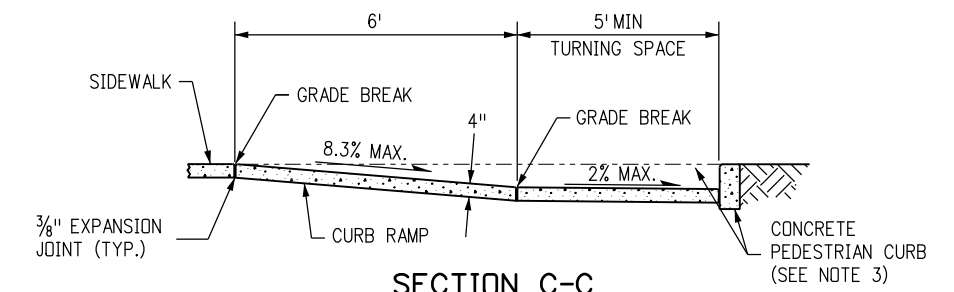
CURB RAMP TYPE 2C



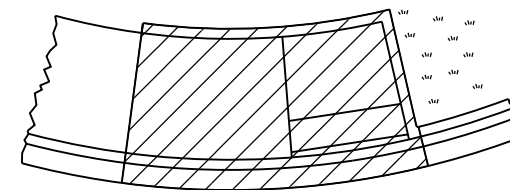
SECTION A-A
* SEE NOTE 16 ON SHEET 1.



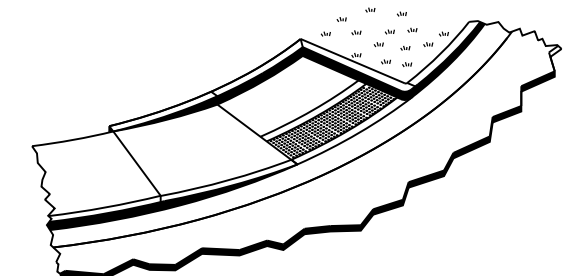
SECTION B-B



SECTION C-C



RAMP PAY AREA
FOR CURB RAMP TYPES 2C.



ISOMETRIC VIEW

Computer File Information

Creation Date: 12/01/16	Initials: JBK
Last Modification Date: 02/23/17	Initials: LTA
Full Path: www.coloradodot.info/business/designsupport	(R-X)
Drawing File Name: 6080102010.dgn	(R-X)
CAD Ver.: MicroStation V8	(R-X)
Scale: Not to Scale	Units: English

Sheet Revisions

Date:	Comments
02/23/17	Added and revised the Curb Ramp details and General Notes.

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Project Development Branch JBK/LTA

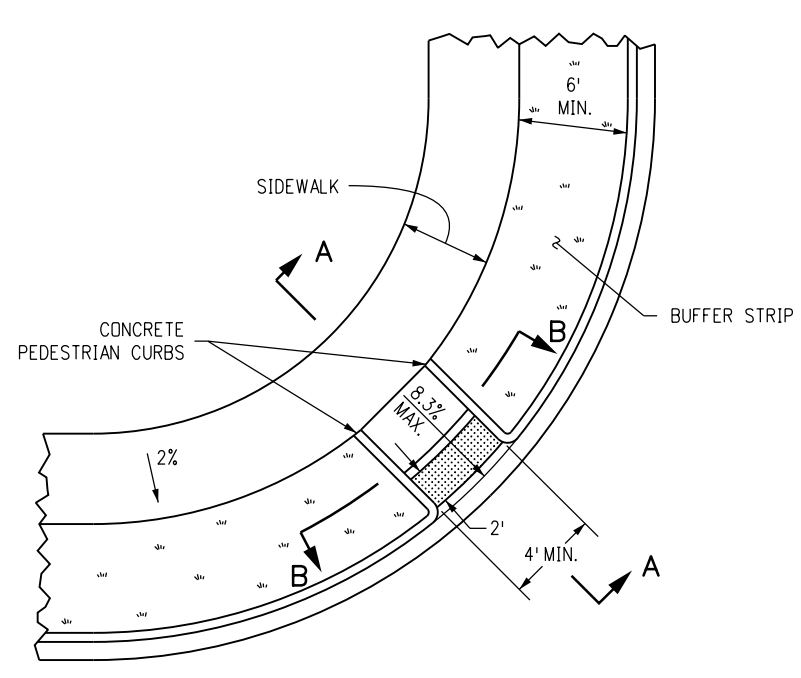
CURB RAMPS

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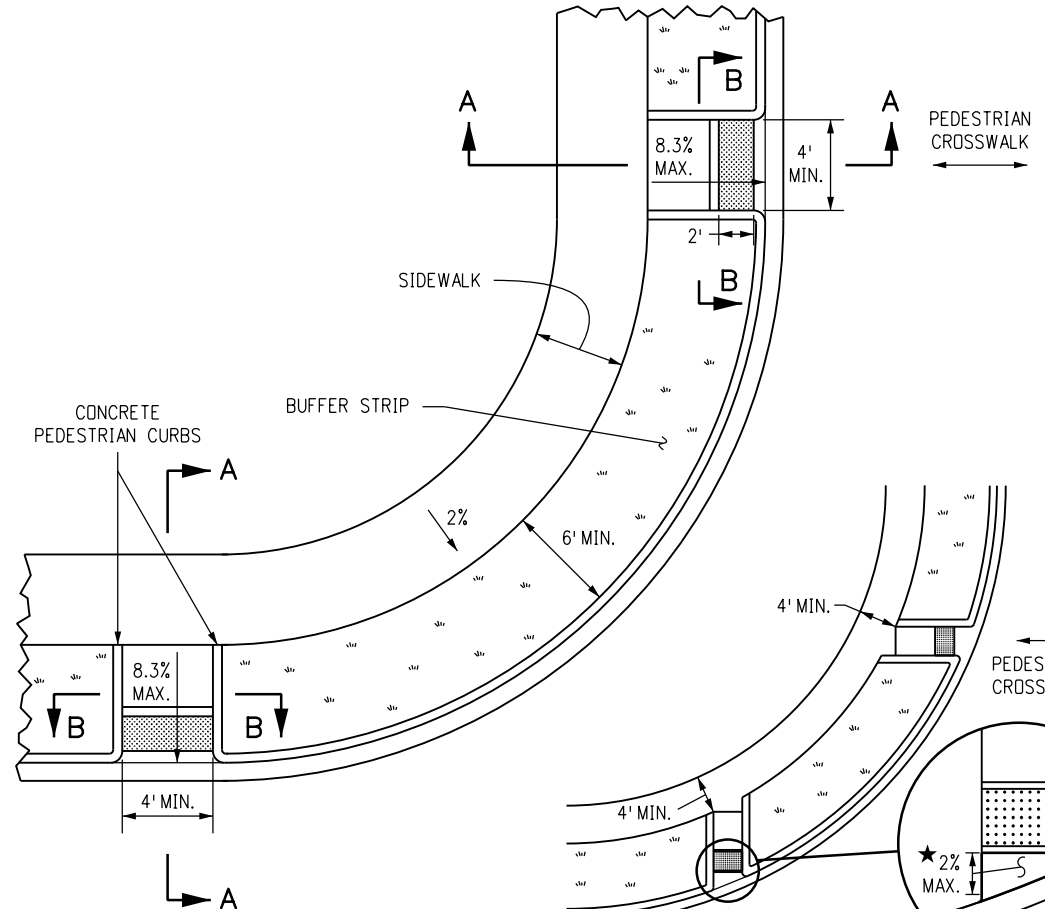
STANDARD PLAN NO.

M-608-1

Sheet No. 2 of 10

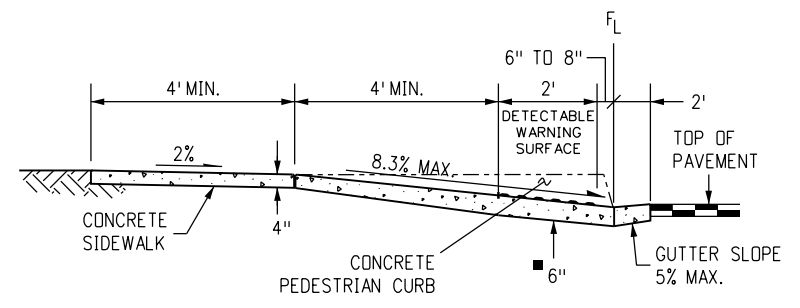


CURB RAMP TYPE 3A
SEE NOTE 2.

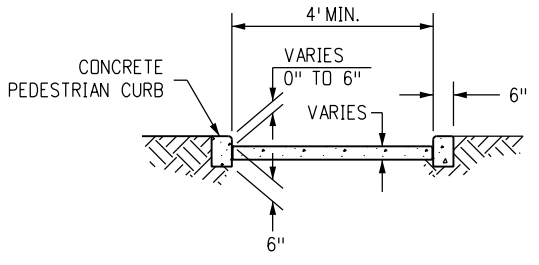


CURB RAMP TYPE 3B
SEE NOTE 1.

- NOTES**
- CURB RAMP TYPE 3B MAY BE USED IN MID-BLOCK.
 - DIAGONAL CURB RAMPS (ON THE APEX) ARE NOT PREFERRED IN NEW CONSTRUCTION. A SINGLE DIAGONAL CURB RAMP (ON THE APEX) WILL ONLY BE PERMITTED DURING RECONSTRUCTION OR ALTERATION WHERE PHYSICAL OR SITE CONSTRAINTS PREVENT TWO CURB RAMPS FROM BEING INSTALLED. THE ENGINEER SHALL PROVIDE APPROVED JUSTIFICATION DOCUMENTATION (CDOT CURB RAMP DESIGN VARIANCE REQUEST FORM). ALL CURB RAMPS INSTALLED ON THE APEX MUST MEET THE STANDARDS AS DEFINED IN M-608-1.

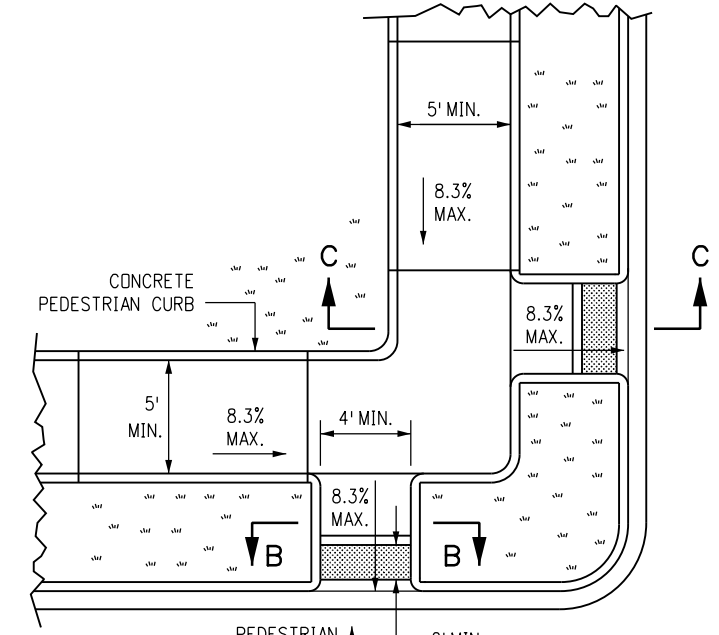


SECTION A-A

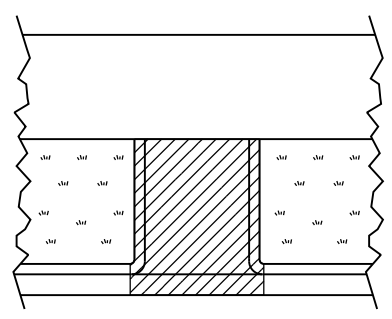


SECTION B-B

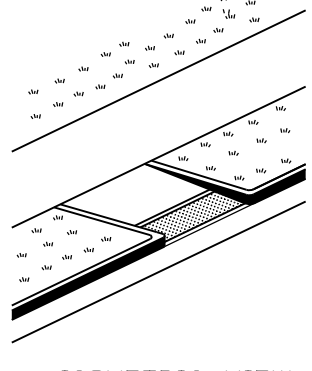
CURB RAMP TYPE 3B MODIFIED



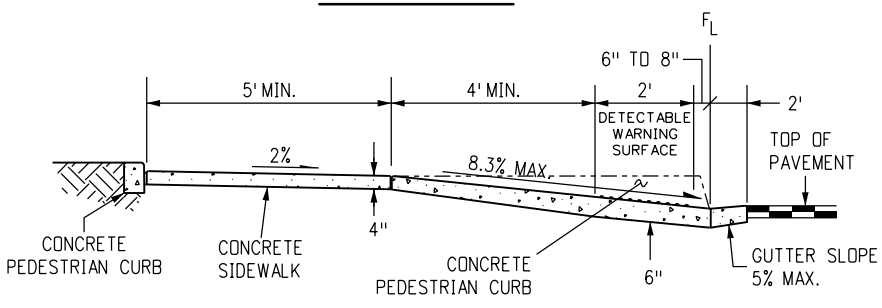
PLAN VIEW



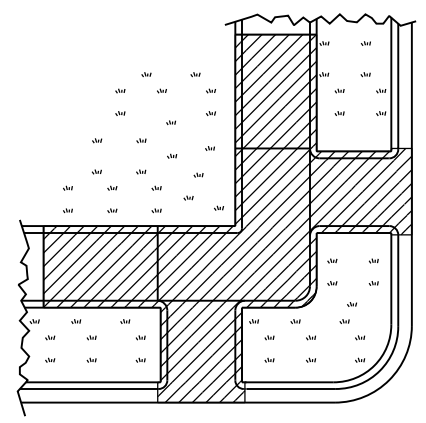
RAMP PAY AREA



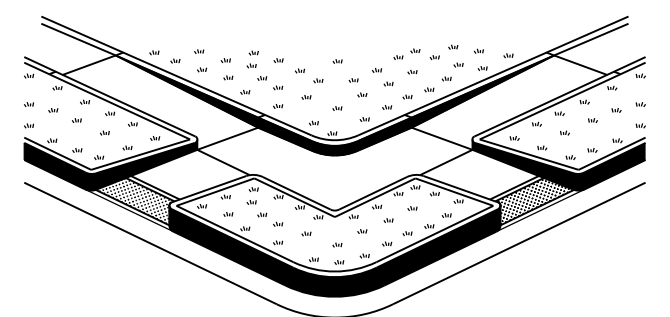
ISOMETRIC VIEW



SECTION C-C



RAMP PAY AREA



ISOMETRIC VIEW

CURB RAMP TYPE 3C (COMBINATION)

Computer File Information

Creation Date: 07/04/12	Initials: JBK
Last Modification Date: 02/23/17	Initials: LTA
Full Path: www.coloradodot.info/business/designsupport	
Drawing File Name: 6080103010.dgn	
CAD Ver.: MicroStation V8	Scale: Not to Scale Units: English

Sheet Revisions

Date:	Comments
02/23/17	Added and revised the Curb Ramp details and General Notes.

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CURB RAMPS

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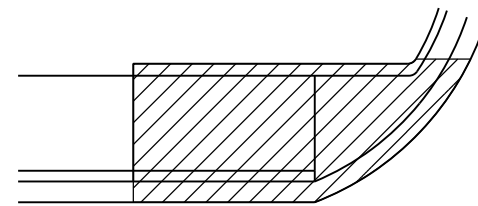
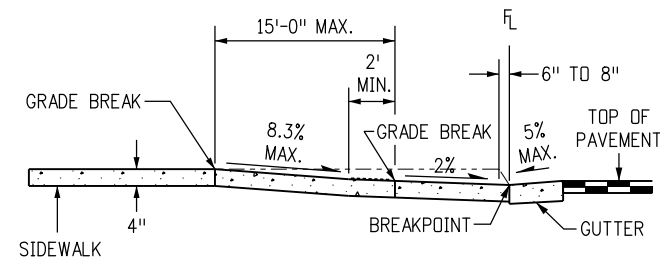
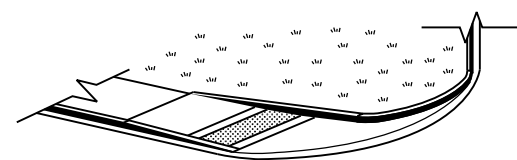
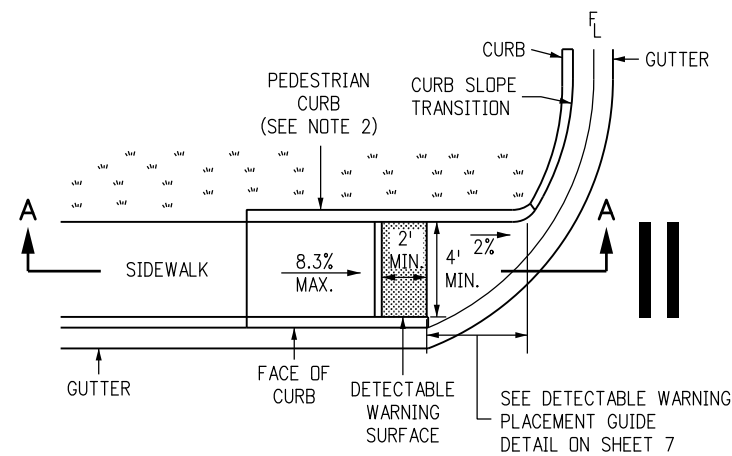
STANDARD PLAN NO.

M-608-1

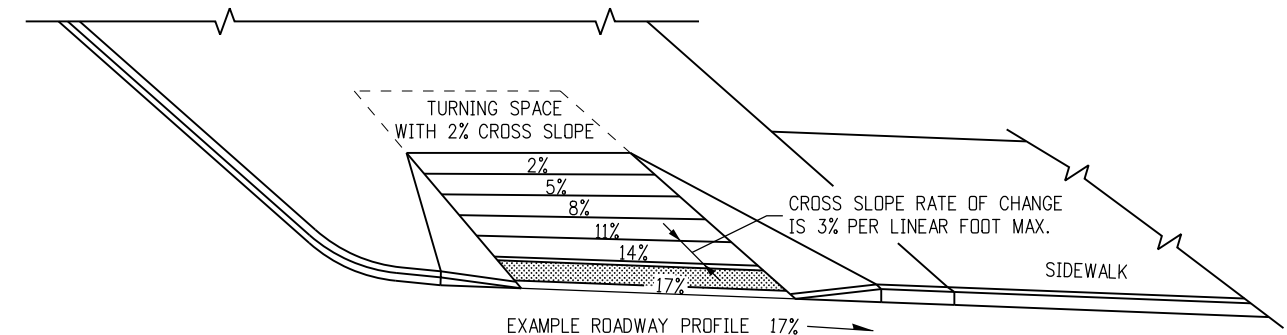
Sheet No. 3 of 10

NOTES

1. RAMP GRADE BREAKS SHALL BE PERPENDICULAR TO THE RUNNING SLOPE.
2. PEDESTRIAN CURB MAY BE OMITTED IF THE GROUND SURFACE AT THE BACK OF THE CURB RAMP AND TURNING SPACE WILL BE AT THE SAME ELEVATION AS THE CURB RAMP AND TURNING SPACE, OR THERE WILL NOT BE ANY MATERIAL TO RETAIN.

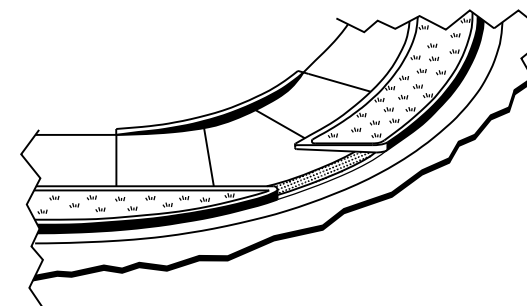
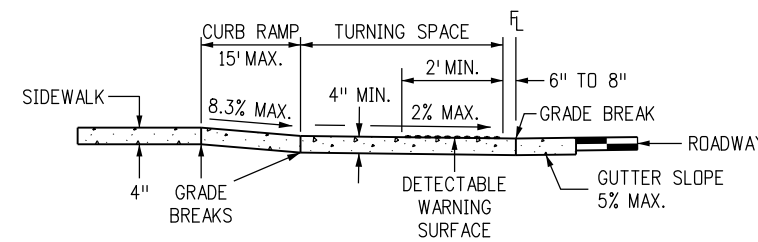
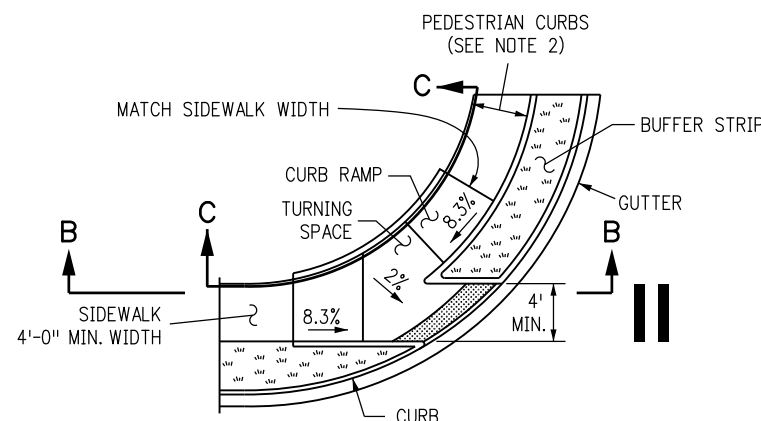


CURB RAMP TYPE 4A

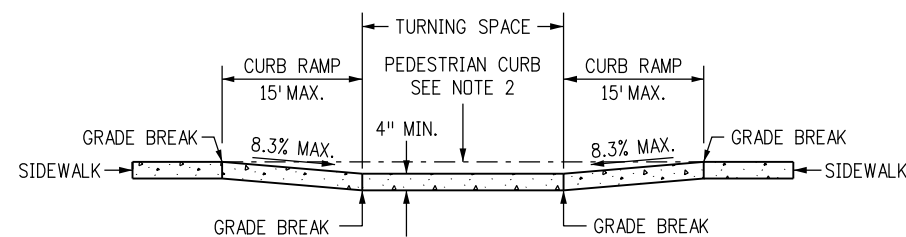


RAMP CROSS SLOPE TRANSITION TO MATCH ROADWAY PROFILE (APPLICABLE TO ALL CURB RAMP TYPES)

- CURB RAMP CROSS SLOPES AND TURNING SPACES SHALL BE:
- A. 2% MAX. WHEN A YIELD OR STOP CONTROL IS PRESENT.
 - B. PERMITTED TO EQUAL THE ROADWAY GRADE WHEN THERE IS NO YIELD OR STOP CONTROL, WHEN A TRAFFIC SIGNAL IS PRESENT, OR AT A MIDBLOCK CROSSING LOCATION.



RAMP PAY AREA



CURB RAMP TYPE 4B

FOR USE WHERE PEDESTRIAN CROSSING IS IN ONE DIRECTION ONLY.

Computer File Information

Creation Date: 12/01/16	Initials: JBK
Last Modification Date: 02/23/17	Initials: LTA
Full Path: www.coloradodot.info/business/designsupport	
Drawing File Name: 6080104010.dgn	
CAD Ver.: MicroStation V8	Scale: Not to Scale Units: English

Sheet Revisions

Date:	Comments
02/23/17	Added and revised the Curb Ramp details and General Notes.

Colorado Department of Transportation



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CURB RAMPS

Issued By: Project Development Branch on July 4, 2012

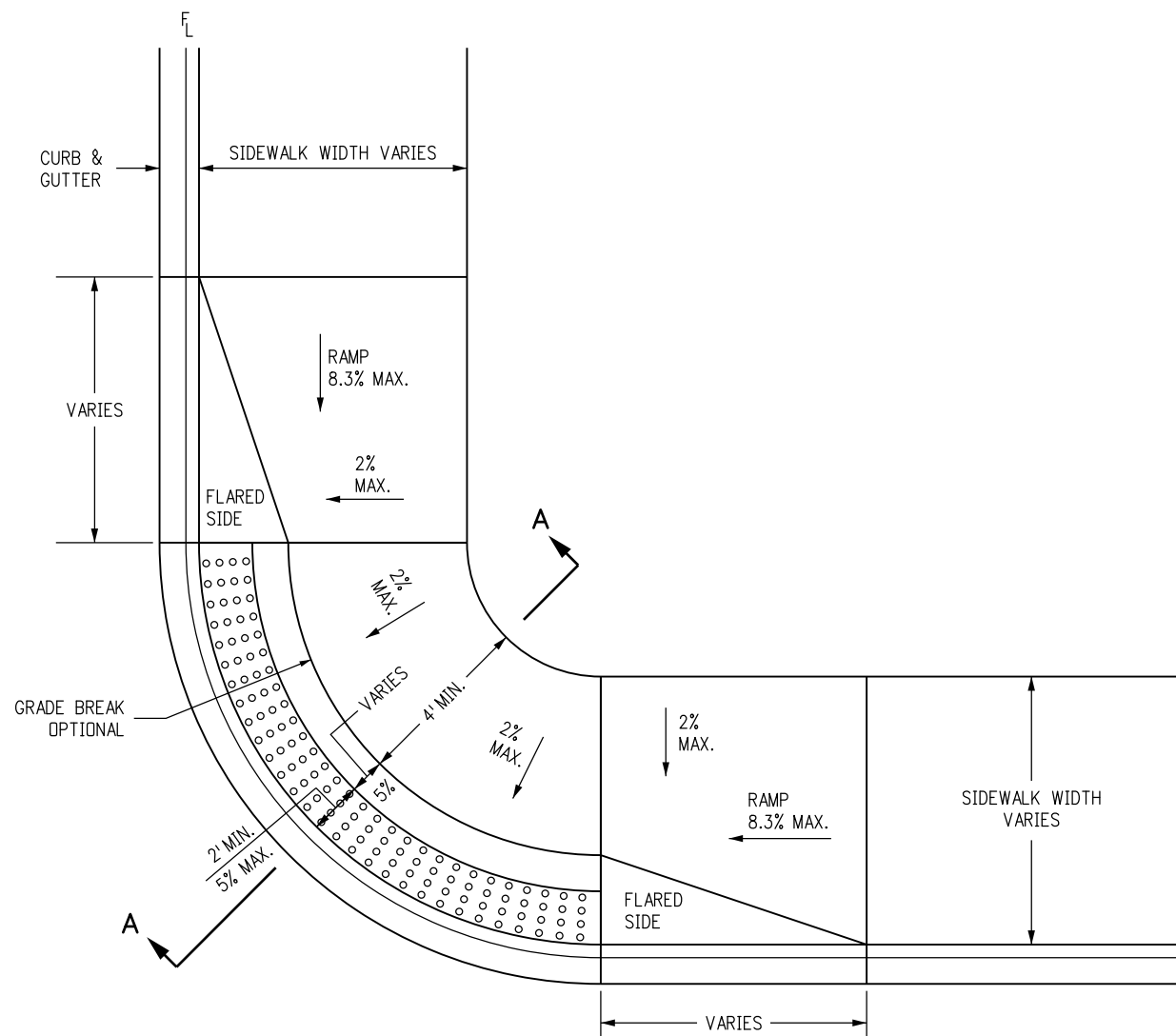
STANDARD PLAN NO.

M-608-1

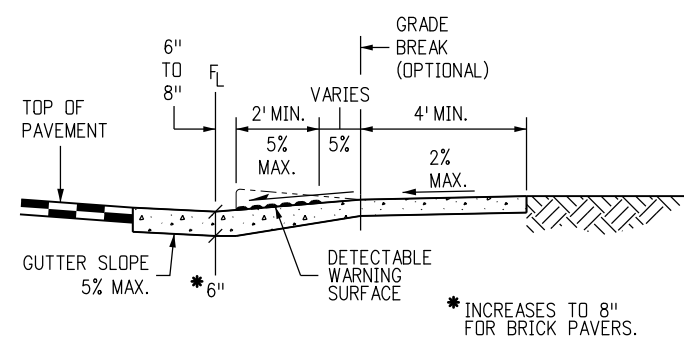
Sheet No. 4 of 10

NOTES

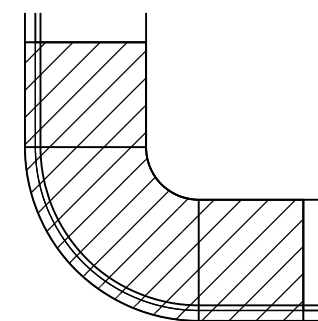
1. SLOPES SHOWN AS TYPICAL IN SECTION A-A MAY BE ADJUSTED IF NECESSARY TO FIT EXISTING CONDITIONS BUT MAY NOT EXCEED 5% SLOPE UNDER ANY CONDITIONS.
2. ALL TRUNCATED DOME PANELS OR PAVERS PLACED AT THE SAME CORNER SHALL BE MADE UP OF THE SAME UNIFORM MATERIAL TYPE.
3. DEPRESSED CORNERS WITH LARGE SPANS CAN MAKE THE STREET TRANSITION DIFFICULT TO DETECT FOR PEDESTRIANS AND MOTORISTS. LIMIT THE SIZE AND DELINEATE WITH DETECTABLE WARNINGS. SHOULD A LARGE DEPRESSED CORNER BE AN EXISTING CONDITION, CONSIDER ADDING INTERMITTENT BARRIERS, SUCH AS PLANTING BOXES OR BOLLARDS NEXT TO THE CURB TO PREVENT VEHICLES FROM TRAVELING ONTO THE SIDEWALK WHEN TURNING THE CORNER. SPACE THE BARRIERS AT LEAST 36 INCHES APART TO PERMIT WHEELCHAIR USERS TO PASS.



BLENDED TRANSITION (DEPRESSED CORNER) TYPE 5A



SECTION A-A



RAMP PAY AREA

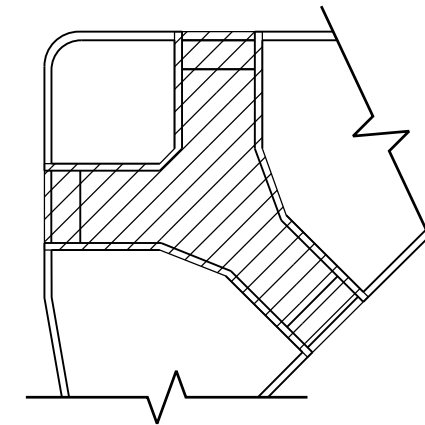
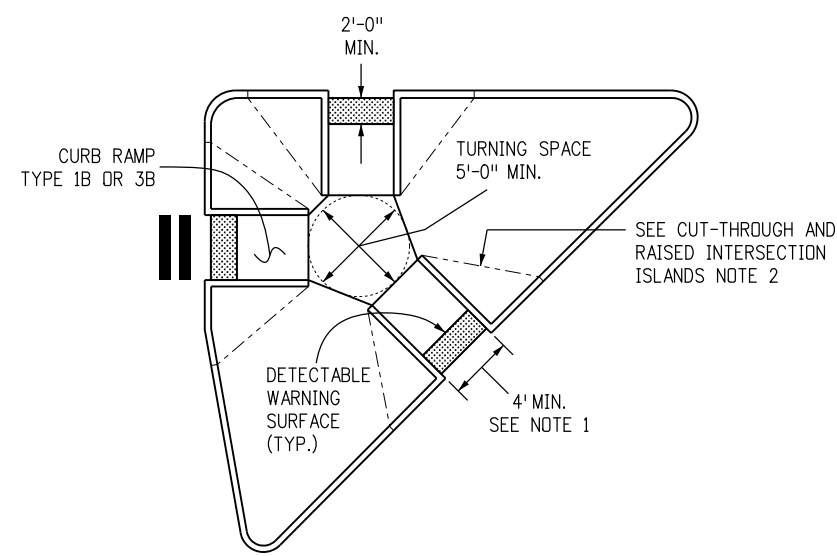
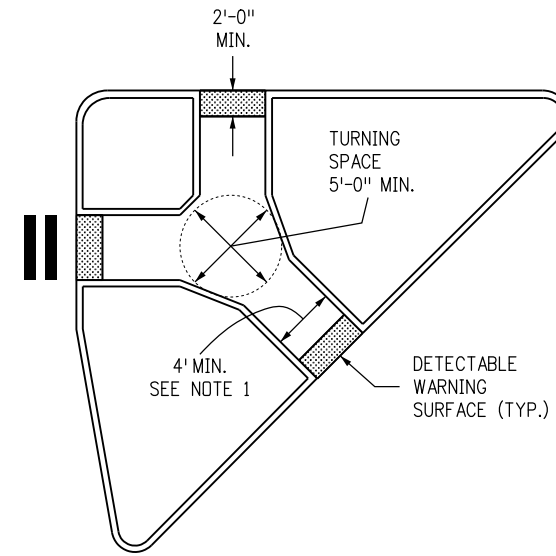
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Creation Date: 12/01/16	Initials: JBK
Last Modification Date: 02/23/17	Initials: LTA
Full Path: www.coloradodot.info/business/designsupport	
Drawing File Name: 6080105010.dgn	
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	

Sheet Revisions	
Date:	Comments
02/23/17	Added and revised the Curb Ramp details and General Notes.

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CURB RAMPS
 Issued By: Project Development Branch on July 4, 2012

STANDARD PLAN NO.
M-608-1
Sheet No. 5 of 10



NOTE

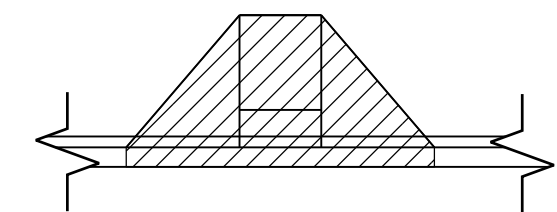
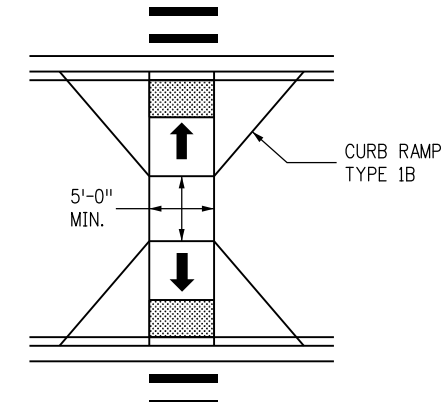
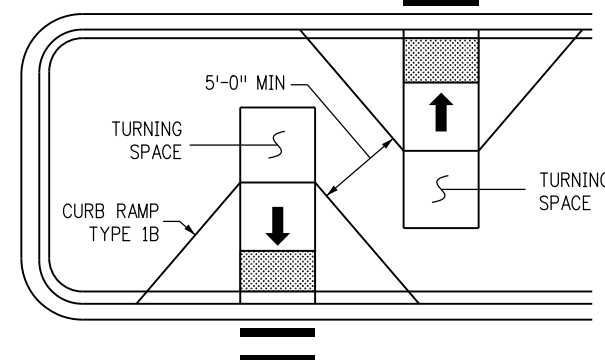
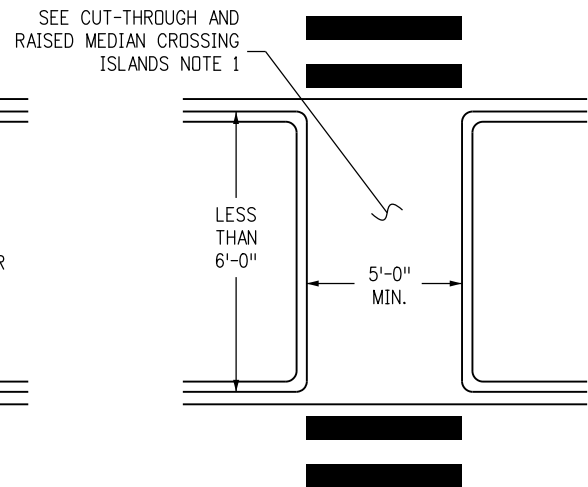
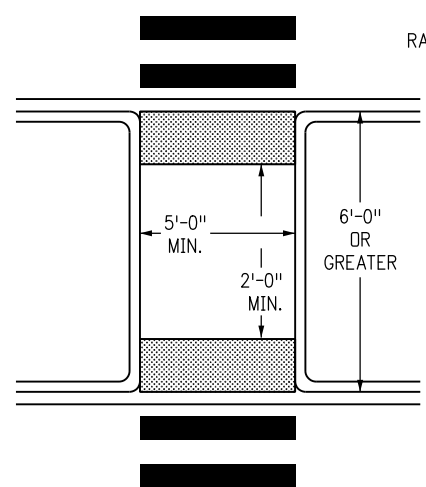
1. CURB RAMP AND CUT-THROUGH WIDTHS SHOULD BE THE SAME WIDTH AS ANY SIDEWALK OR MULTI-USE PATHS WHICH THEY SERVE.

CUT-THROUGH AND RAISED INTERSECTION ISLANDS

- FOR CUT-THROUGH INTERSECTION ISLANDS, THE DETECTABLE WARNING SURFACES SHALL BE AT THE FLOWLINE. FOR RAISED INTERSECTION ISLANDS, THE DETECTABLE WARNING SURFACES SHALL BE 6 TO 8 INCHES BACK FROM THE FLOWLINE (SEE SHEET 7).
- FLARED SIDES ARE PREFERENTIAL ON RAISED INTERSECTION ISLANDS AND SHOULD BE PROVIDED FOR ISLANDS WHICH SERVE MULTI-USE PATHS OR AT LOCATIONS WHERE BICYCLE USE IS EXPECTED.

RAMP PAY AREA

(WILL INCLUDE FLARED SIDES IF CONSTRUCTED)
SEE CURB RAMP TYPE 3B ON SHEET 3,
OR CURB RAMP TYPE 1B ON SHEET 1.



RAMP PAY AREA

SEE CURB RAMP TYPE 1B ON SHEET 1.

CUT-THROUGH AND RAISED MEDIAN CROSSING ISLANDS

- FOR CUT-THROUGH MEDIAN CROSSING ISLANDS, DETECTABLE WARNING SURFACES SHALL BE PLACED AT THE EDGES OF THE ISLAND AND BE SEPARATED BY A MINIMUM 2 FOOT SPACE WITHOUT DETECTABLE WARNING SURFACES. IF A 2 FOOT SEPARATION BETWEEN DETECTABLE WARNING SURFACES CANNOT BE PROVIDED, THEN NO DETECTABLE WARNING SURFACES SHALL BE INSTALLED.

PERPENDICULAR CURB RAMPS FOR CROSSING ISLANDS

Computer File Information	
Creation Date: 12/01/12	Initials: JBK
Last Modification Date: 02/23/17	Initials: LTA
Full Path: www.coloradodot.info/business/designsupport	
Drawing File Name: 6080106010.dgn	
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	

Sheet Revisions	
Date:	Comments
02/23/17	Added and revised the Curb Ramp details and General Notes.

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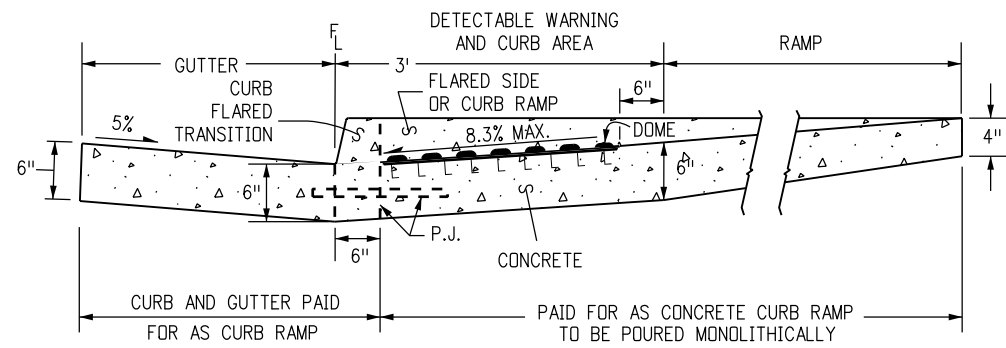
CURB RAMPS

Issued By: Project Development Branch on July 4, 2012

STANDARD PLAN NO.
M-608-1
Sheet No. 6 of 10

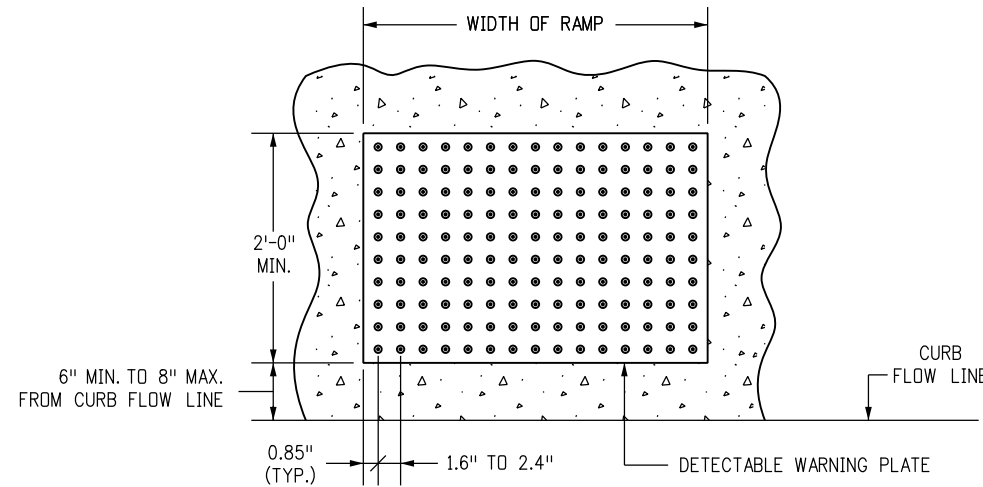
NOTES

1. THE TRUNCATED DOME PLATE SHALL BE EMBEDDED IN THE CONCRETE CURB RAMP WHILE CONCRETE IS PLASTIC.
2. THE TRUNCATED DOME PLATE TO BE USED SHALL BE ON THE CDOT APPROVED PRODUCT LIST.
3. WHEN THE DETECTABLE WARNING SURFACE IS CUT, GRIND OFF THE REMAINING PORTION OF ANY CUT DOMES. SEAL ALL CUT PANEL EDGES WITH AN APPROVED PRODUCT LIST (APL) SEALANT TO PREVENT WATER DAMAGE.
4. THE DETECTABLE WARNING SURFACE SHALL SPAN THE ENTIRE WIDTH OF THE RAMP. IF CONDITIONS DO NOT ALLOW THE ENTIRE SPAN, THE DETECTABLE WARNING SURFACE SPAN SHALL NOT BE MORE THAN 2 INCHES AWAY FROM EACH SIDE OF RAMP.

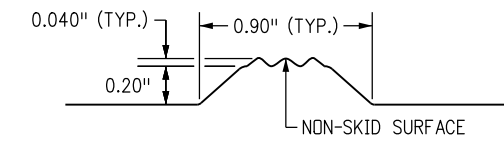


P.J. = PERMISSIBLE JOINT WITH EPOXY-COATED DEFORMED NO. 4 BY 18 IN. BARS CONFORMING TO AASHTO M 284 AT 18 IN. SPACING.

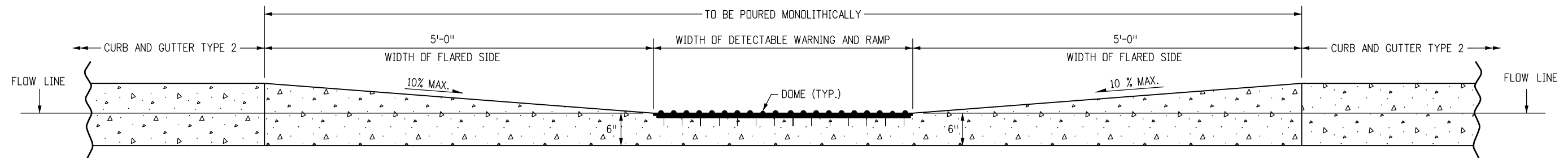
SECTION VIEW FOR TYPES 1 AND 3 CURB RAMPS



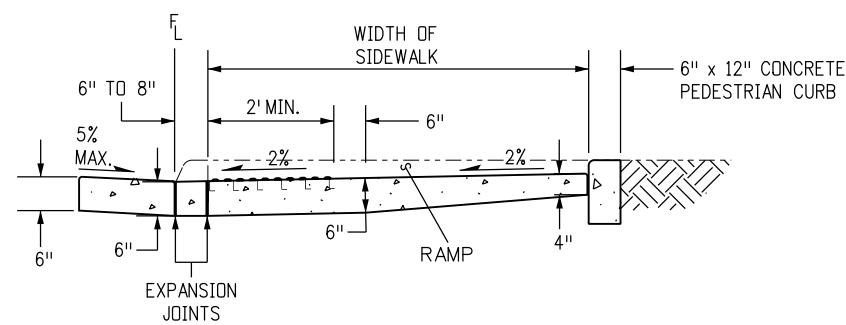
PLAN VIEW OF DETECTABLE WARNING SURFACE



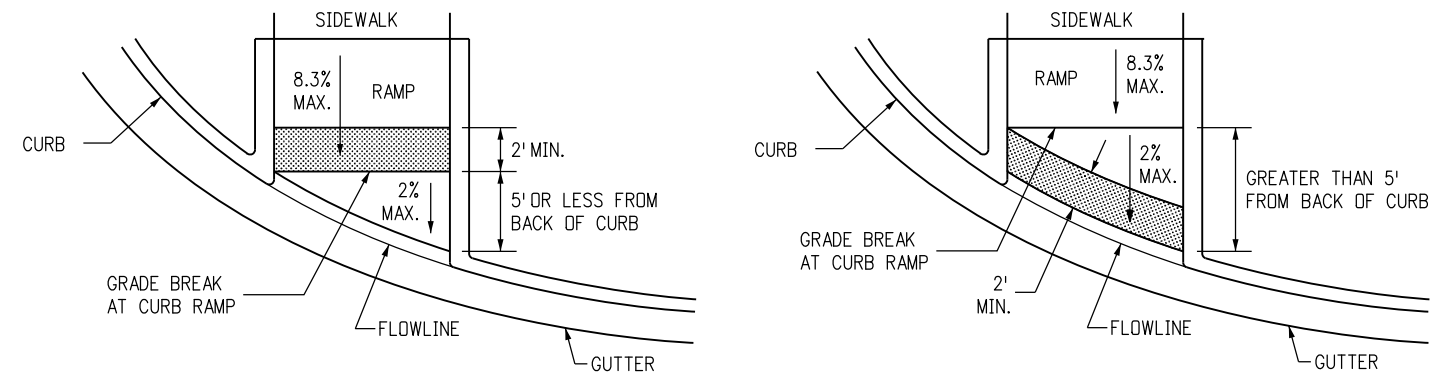
ELEVATION VIEW OF DETECTABLE WARNING PLATE



SECTION VIEW OF CURB RAMP TYPE 1



SECTION VIEW FOR TYPE 2 CURB RAMP




DETECTABLE WARNING PLACEMENT GUIDE FOR PAVERS AND PLATES

CURB RAMP TYPES WITH SURFACE PLATES

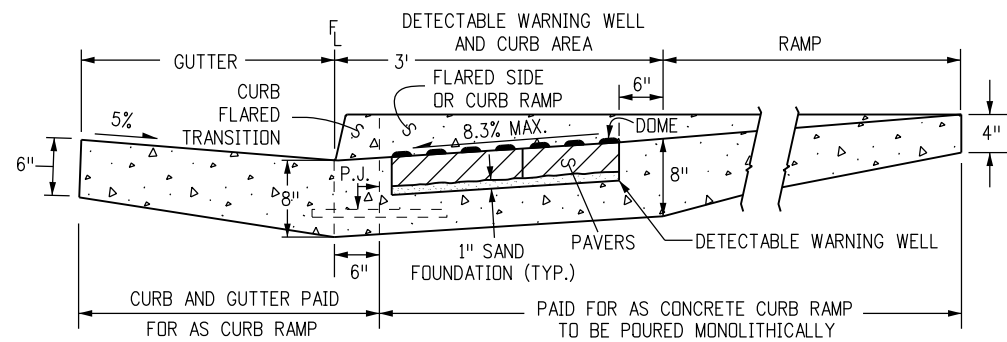
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Last Modification Date: 02/23/17	Initials: LTA
Full Path: www.coloradodot.info/business/designsupport	
Drawing File Name: 6080107010.dgn	
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	

Sheet Revisions	
Date:	Comments
02/23/17	Added and revised the Curb Ramp details and General Notes.
(R-X)	
(R-X)	
(R-X)	
(R-X)	

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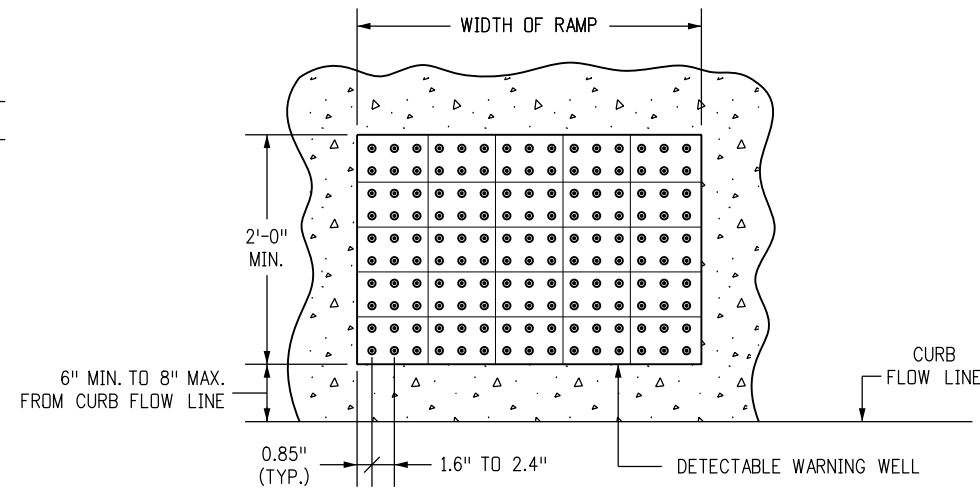
CURB RAMPS
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Sheet No. 7 of 10



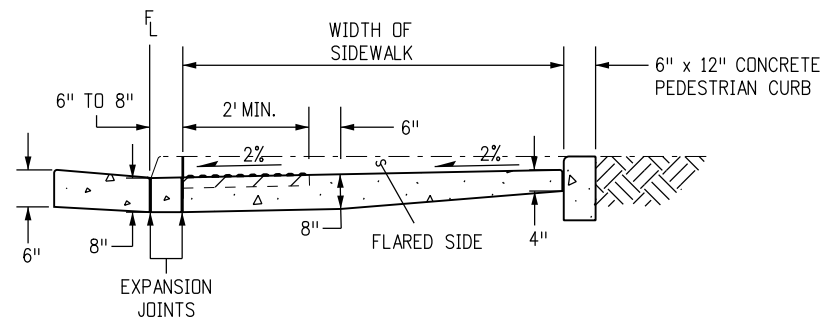
P.J. = PERMISSIBLE JOINT WITH EPOXY-COATED DEFORMED NO. 4 BY 18 IN. BARS CONFORMING TO AASHTO M 284 AT 18 IN. SPACING.

SECTION VIEW FOR TYPES 1 AND 3 CURB RAMPS

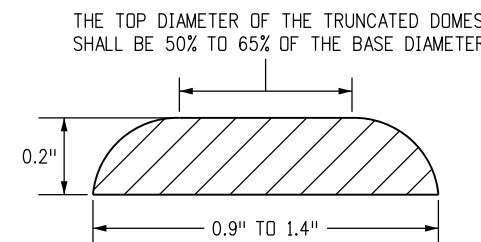


PLAN VIEW OF DETECTABLE WARNING AND WELL
(PAVERS NOT DRAWN TO SCALE)

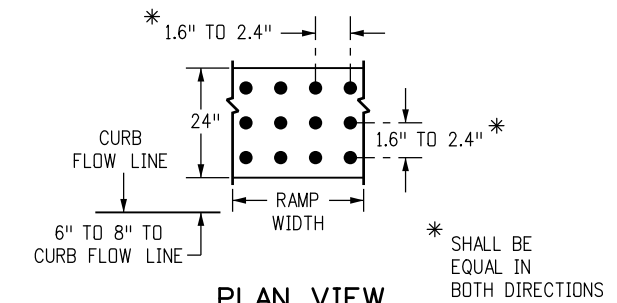
- NOTES**
1. THE DETECTABLE WARNINGS SHALL BE MADE OF PAVERS WITH A TRUNCATED DOME SURFACE.
 2. THE TOP OF THE DRAINAGE WEEP HOLE SHALL BE LOCATED AT THE LOWEST POINT OF THE DETECTABLE WARNING WELL.
 3. THE DETECTABLE WARNING SURFACE SHALL SPAN THE ENTIRE WIDTH OF THE RAMP. IF CONDITIONS DO NOT ALLOW THE ENTIRE SPAN, THE DETECTABLE WARNING SURFACE SPAN SHALL NOT BE MORE THAN 2 INCHES AWAY FROM EACH SIDE OF RAMP.



DETAIL FOR TYPE 2 CURB RAMP

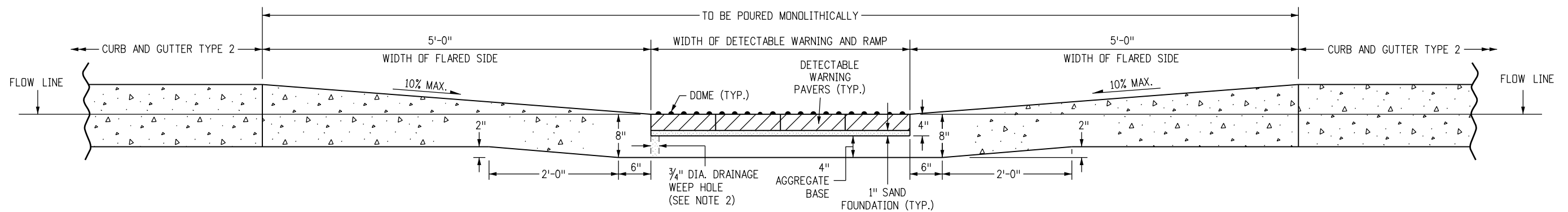


ELEVATION VIEW OF SINGLE DOME



PLAN VIEW

DOME AND DETECTABLE WARNING DETAILS



SECTION VIEW OF CURB RAMP TYPE 1

CURB RAMP TYPES WITH PAVERS

Computer File Information	
Creation Date: 12/01/16	Initials: JBK
Last Modification Date: 02/23/17	Initials: LTA
Full Path: www.coloradodot.info/business/designsupport	
Drawing File Name: 6080108010.dgn	
CAD Ver.: MicroStation V8	Scale: Not to Scale Units: English

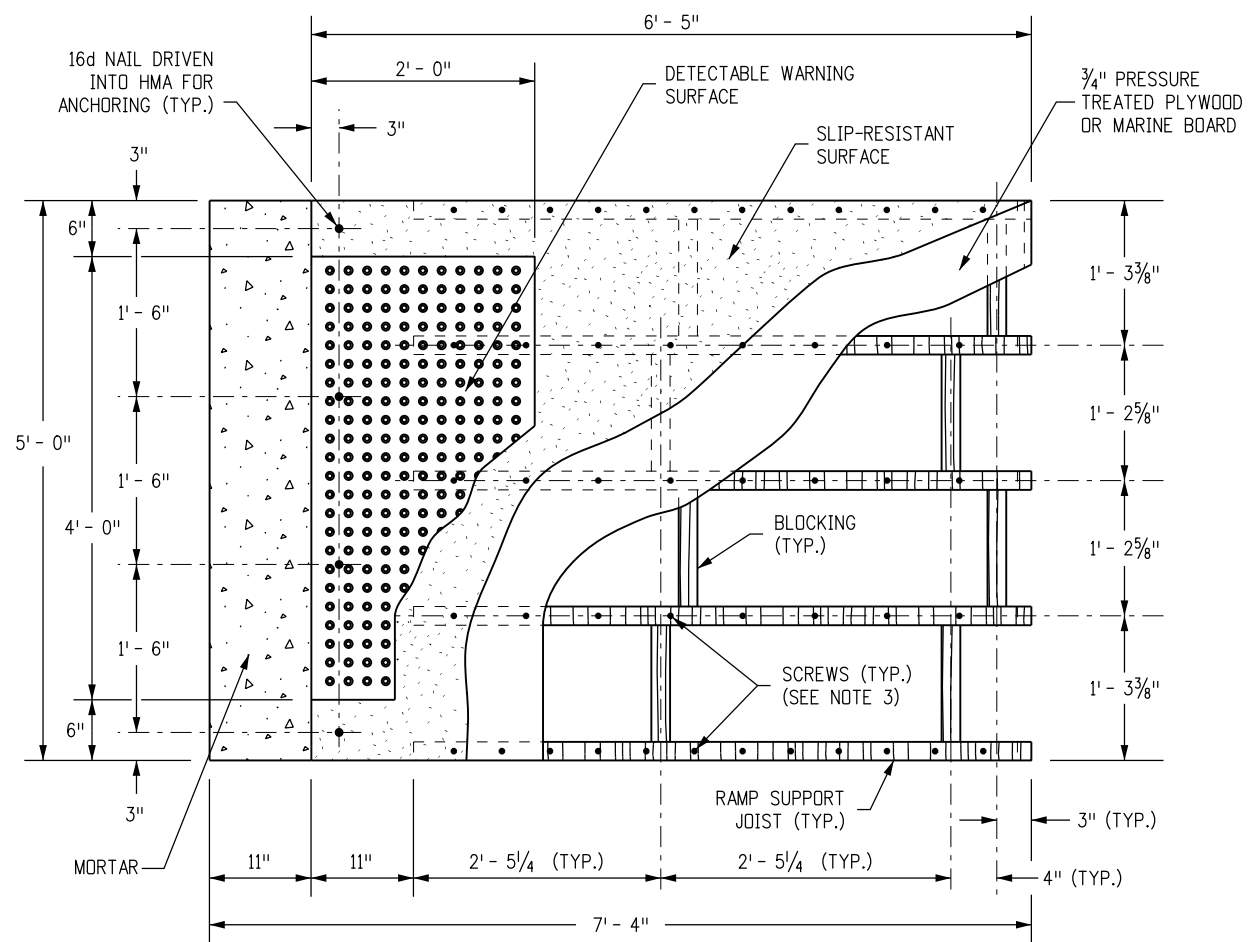
Sheet Revisions	
Date:	Comments
02/23/17	Added and revised the Curb Ramp details and General Notes.

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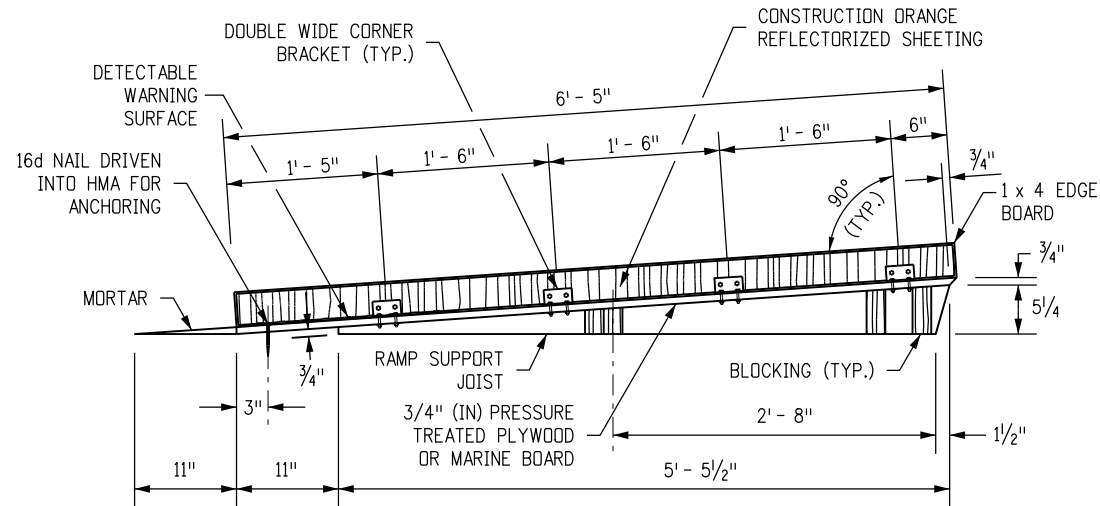
CURB RAMPS

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STANDARD PLAN NO.
 M-608-1
 Sheet No. 8 of 10

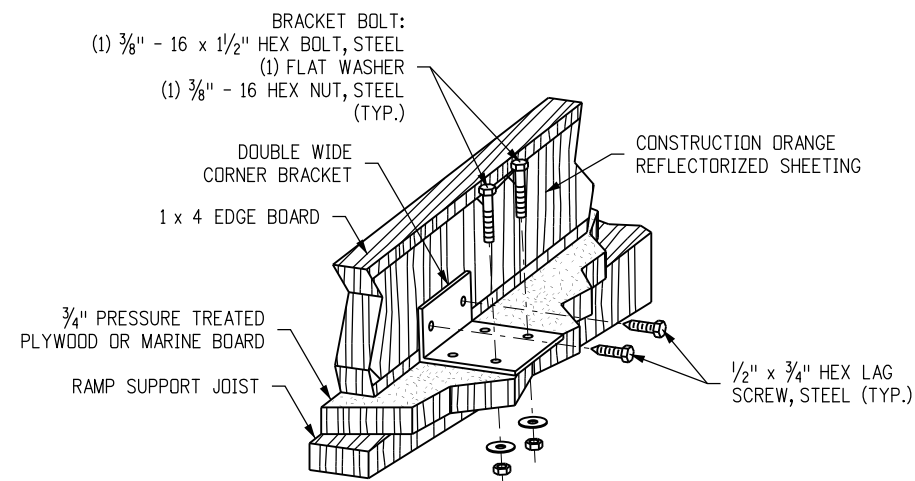


TOP VIEW

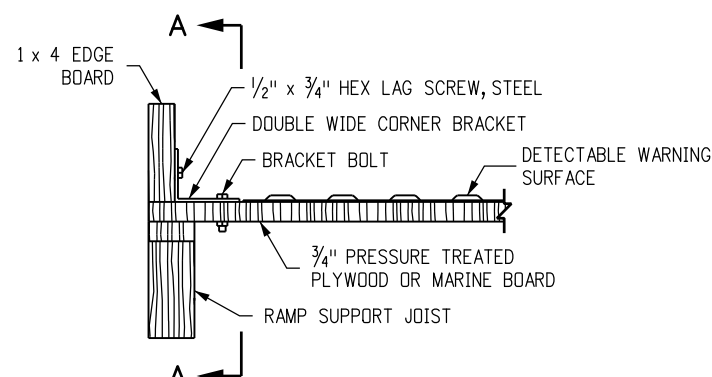


**SIDE VIEW
RAMP AND EDGE BOARD**

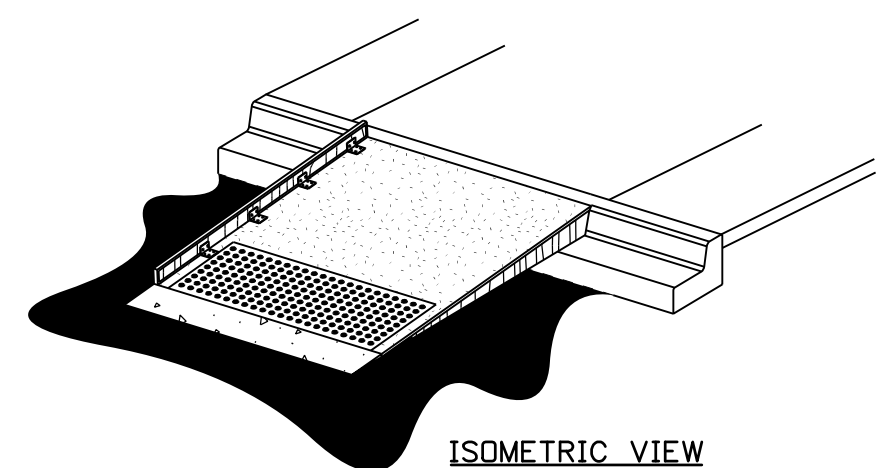
- NOTES**
1. A TEMPORARY PEDESTRIAN ACCESS ROUTE SHALL BE PROVIDED WHENEVER THE EXISTING PEDESTRIAN ACCESS ROUTE IN THE PUBLIC RIGHT-OF-WAY IS BLOCKED BY CONSTRUCTION, ALTERATION, MAINTENANCE, OR OTHER TEMPORARY CONDITIONS. FOR FURTHER WORK ZONE INFORMATION, PLEASE REFER TO CDOT'S WEBPAGE TITLED "ADA IN WORK ZONES".
 2. THIS DESIGN ASSUMES OPTIMAL CONDITIONS AND A STANDARD CURB HEIGHT OF 6 INCHES. INSTALLED RAMPS SHALL BE NO STEEPER THAN 8.3% AND SHALL HAVE A CROSS-SLOPE OF 2.0% OR LESS. USE SHIMS OR GROUT AS REQUIRED TO ADJUST FOR EXISTING CONDITIONS AND TO PREVENT ROCKING. SHIMS SHALL BE NO HIGHER THAN 1 INCH AND SHALL BE SECURED TO THE RAMP. FOR CURBS SHORTER THAN 6 INCHES, INSTALL A RAMP ON THE SIDEWALK NO STEEPER THAN 8.3%, AND MADE OF GROUT OR AS APPROVED BY THE ENGINEER. ADJUSTMENTS TO THE RAMP DIMENSIONS SHOWN MAY BE REQUIRED TO MATCH EXISTING CONDITIONS.
 3. SCREWS SHALL BE USED TO SECURE THE RAMP SURFACE. SPACING SHALL BE IN ACCORDANCE WITH THE CURRENT BUILDING CODE.
 4. USE A SLIP-RESISTANT TREATMENT FOR THE SURFACE OF RAMP.
 5. ALL FASTENERS SHALL BE GALVANIZED.
 6. DO NOT INSTALL A HAND RAILING IF USING THE EDGE BOARD OPTION.



**SECTION A-A
PERSPECTIVE VIEW**



END VIEW



ISOMETRIC VIEW

TEMPORARY PERPENDICULAR CURB RAMP

Computer File Information

Creation Date: 12/01/16	Initials: JBK
Last Modification Date: 02/23/17	Initials: LTA
Full Path: www.coloradodot.info/business/designsupport	
Drawing File Name: 6080109010.dgn	
CAD Ver.: MicroStation V8	Scale: Not to Scale Units: English

Sheet Revisions

Date:	Comments
02/23/17	Added this sheet.

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CURB RAMPS

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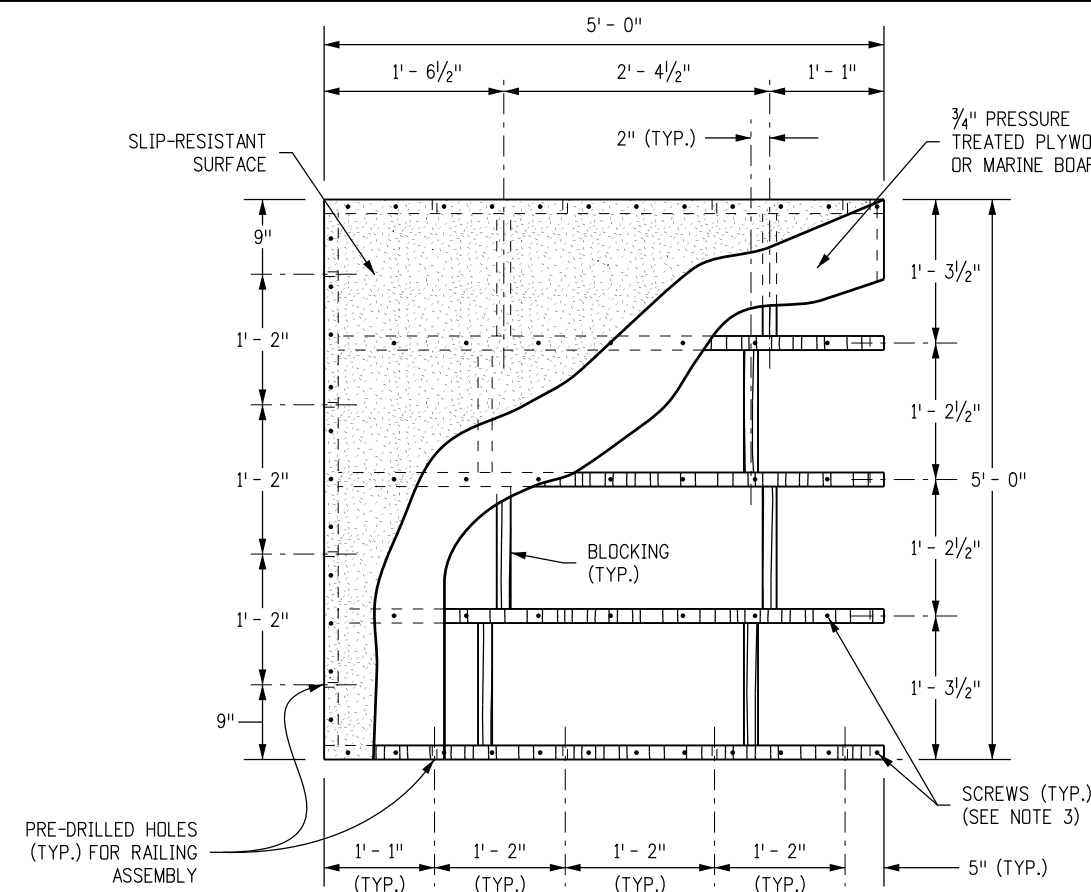
STANDARD PLAN NO.

M-608-1

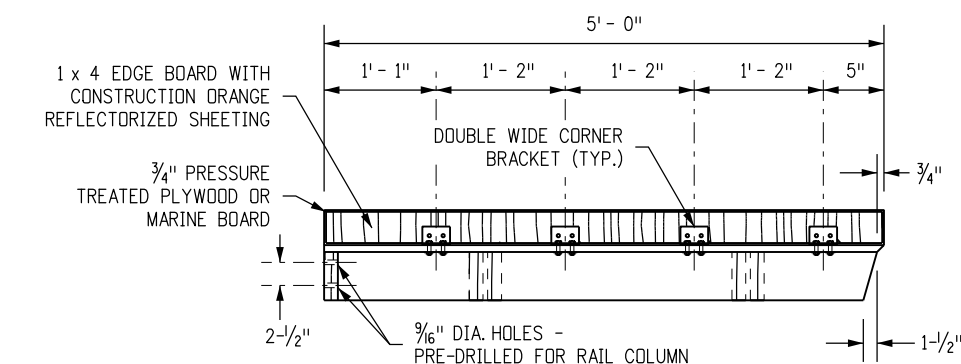
Sheet No. 9 of 10

NOTES

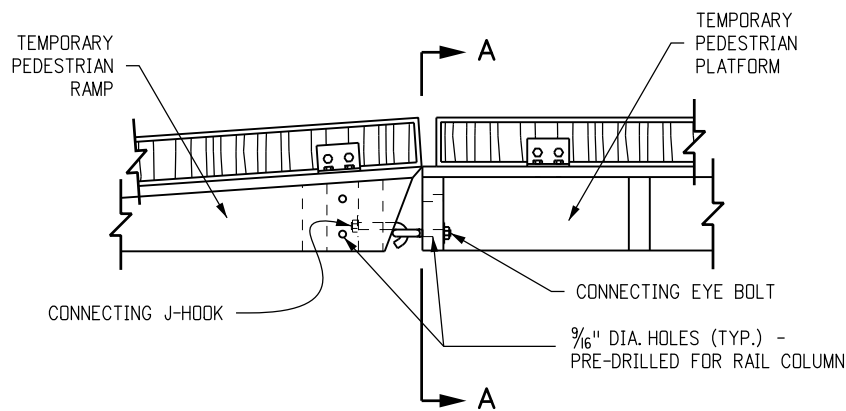
1. ALL HOLES SHOWN SHALL BE DRILLED TO FACILITATE RE-USE AND FLEXIBLE EXPANSION.
2. THIS DESIGN ASSUMES OPTIMAL CONDITIONS AND A STANDARD CURB HEIGHT OF 6 INCHES. INSTALLED RAMPS SHALL BE NO STEEPER THAN 8.3% AND SHALL HAVE A CROSS-SLOPE OF 2.0% OR LESS. USE SHIMS OR GROUT AS REQUIRED TO ADJUST FOR EXISTING CONDITIONS AND TO PREVENT ROCKING. SHIMS SHALL BE NO HIGHER THAN 1 INCH AND SHALL BE SECURED TO THE RAMP AND/OR PLATFORM. FOR CURBS SHORTER THAN 6 INCHES, INSTALL A RAMP ON THE SIDEWALK, NO STEEPER THAN 8.3%, AND MADE OF GROUT OR AS APPROVED BY THE ENGINEER. ADJUSTMENTS TO THE PLATFORM DIMENSIONS SHOWN MAY BE REQUIRED TO MATCH EXISTING CONDITIONS.
3. SCREWS SHALL BE USED TO SECURE THE RAMP SURFACE. SPACING SHALL BE IN ACCORDANCE WITH THE CURRENT BUILDING CODE.
4. USE A SLIP-RESISTANT TREATMENT FOR SURFACE OF RAMP.
5. ALL FASTENERS SHALL BE GALVANIZED.



PLAN VIEW



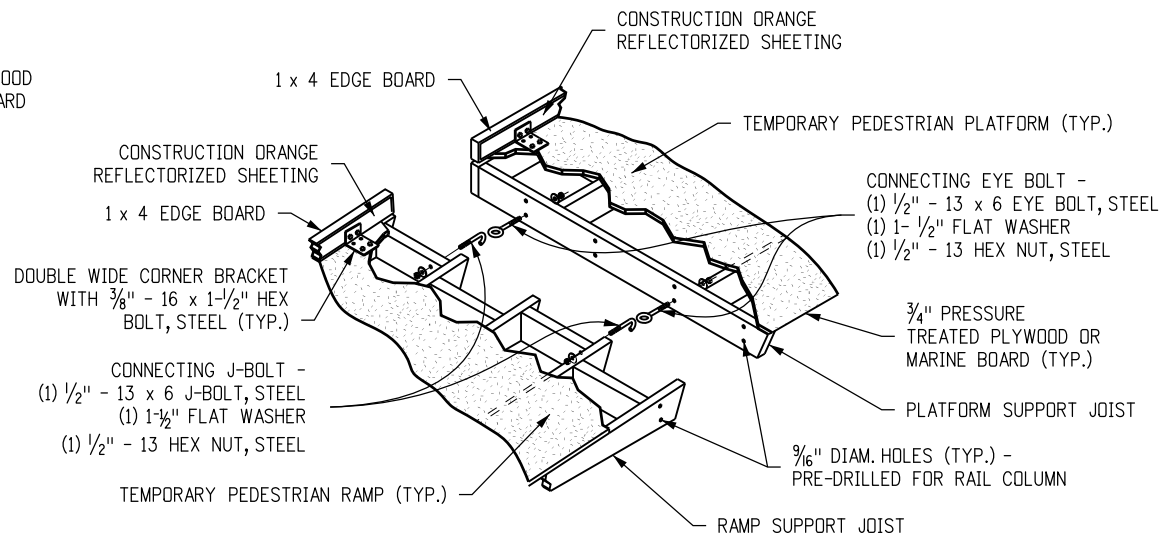
ELEVATION VIEW



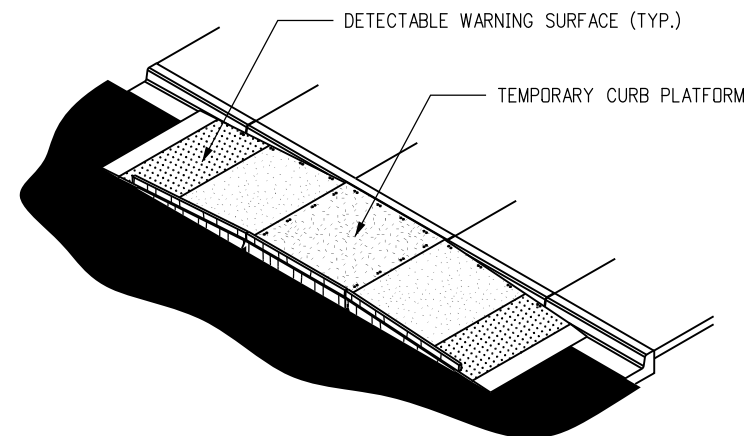
SIDE VIEW

PLATFORM DETAILS

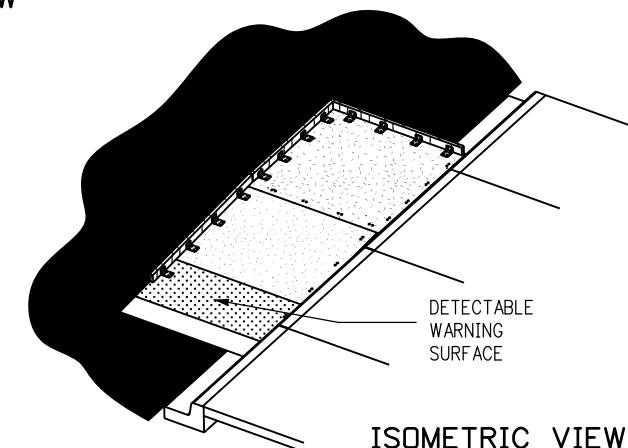
TEMPORARY PARALLEL CURB RAMPS (SINGLE OR DUAL)



**SECTION A-A
PERSPECTIVE VIEW**



**ISOMETRIC VIEW
DUAL RAMP**



**ISOMETRIC VIEW
SINGLE RAMP**

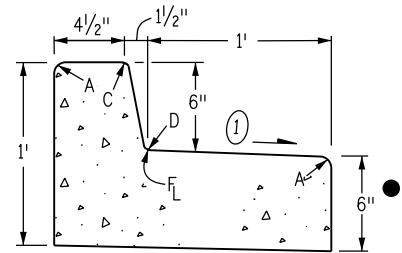
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Sheet Revisions	
Date:	Comments
02/23/17	Added this sheet.

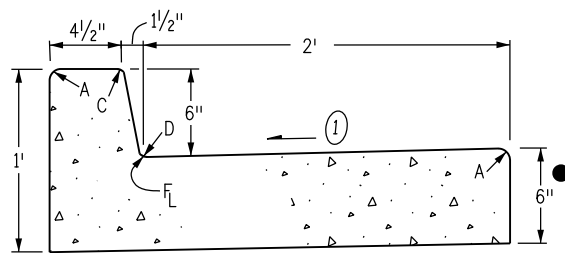
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CURB RAMPS
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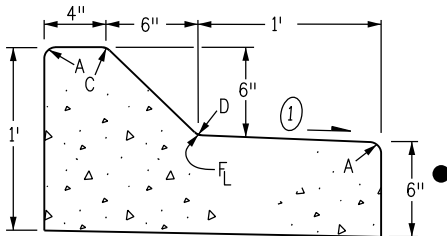
STANDARD PLAN NO.
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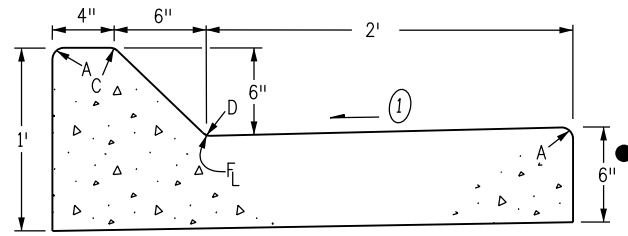
CURB AND GUTTER TYPE 2
(SECTION IB)
(6 IN. BARRIER - 1 FT. GUTTER)



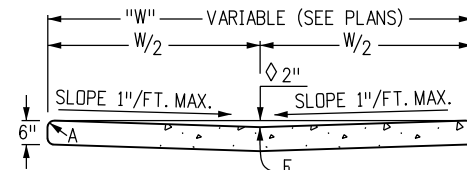
CURB AND GUTTER TYPE 2
(SECTION IIB)
(6 IN. BARRIER - 2 FT. GUTTER)



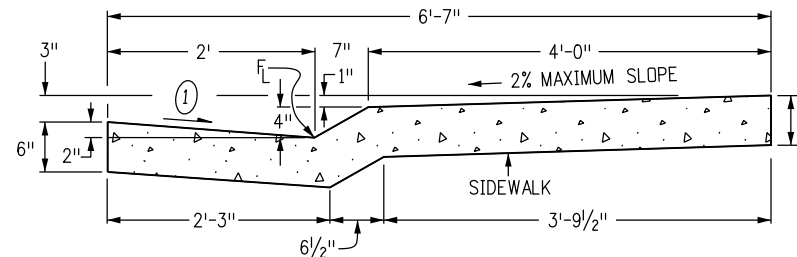
CURB AND GUTTER TYPE 2
(SECTION IM)
(6 IN. MOUNTABLE - 1 FT. GUTTER)



CURB AND GUTTER TYPE 2
(SECTION IIM)
(6 IN. MOUNTABLE - 2 FT. GUTTER)



GUTTER TYPE 2

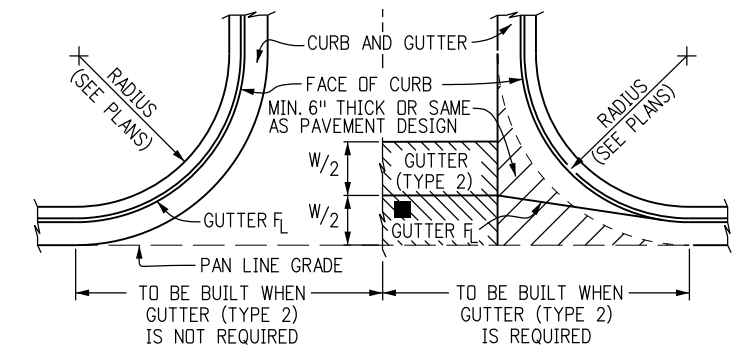


CURB AND GUTTER TYPE 2
(SECTION MS)
(4 IN. MOUNTABLE WITH SIDEWALK)

GENERAL NOTES

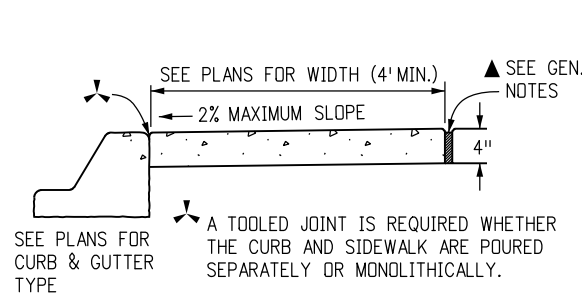
- ON ROADWAY CURVES WITH A RADIUS OF 1,900 FT. OR LESS, CURBS AND GUTTERS ARE TO BE PLACED ON THE ARC OF THE CURVE, UNLESS OTHERWISE NOTED ON THE PLANS. A MAXIMUM CHORD LENGTH OF 10 FT. MAY BE USED WHEN THE CURVE RADIUS IS GREATER THAN 1,900 FT.
 - CONCRETE SHALL BE CLASS B.
 - PROFILE GRADE OF CURBS AND GUTTERS SHALL BE LOCATED AT THE FLOW LINE.
 - CURB TYPE 4 (KEY-WAY) MAY BE USED IN LIEU OF CURB AND GUTTER TYPE 2 (SECTIONS IB AND IM) UNLESS OTHERWISE SPECIFIED ON THE PLANS.
 - GUTTER CROSS SLOPES MAY BE ADJUSTED TO FACILITATE DRAINAGE FOR PROFILE GRADES AS SHOWN ON THE PLANS.
 - THICKNESS OF CURB AND GUTTER SECTION SHALL MATCH CONCRETE PAVEMENT THICKNESS IF SHOWN ON THE PLANS. CURB AND GUTTER SHALL BE CLASS P CONCRETE IF PLACED MONOLITHICALLY WITH CONCRETE PAVEMENT.
 - INCREASE SIDEWALK THICKNESS TO 6 IN. AT LOCATIONS SHOWN ON THE PLANS.
 - MINIMUM SIDEWALK WIDTH IS 4 FT.
- EXPANSION JOINTS SHALL BE INSTALLED WHEN ABUTTING EXISTING CONCRETE OR FIXED STRUCTURE. EXPANSION JOINT MATERIAL SHALL BE 1/2 IN. THICK AND SHALL EXTEND THE FULL DEPTH OF CONTACT SURFACE.
 - GUTTER CROSS SLOPES SHALL BE 1/2 IN./FT. WHEN DRAINING AWAY FROM CURB AND 1 IN./FT. WHEN DRAINING TOWARD CURB (WITH EXCEPTION TO IMMEDIATELY ADJACENT TO CURB RAMPS - SEE STANDARD PLAN M-608-1 FOR SLOPE REQUIREMENTS).
 - WHEN TIE BARS ARE REQUIRED, THE GUTTER THICKNESS SHALL BE INCREASED TO THE PAVEMENT THICKNESS (T). BARS SHALL BE EPOXY-COATED #4 CONFORMING TO AASHTO M 284 AND SPACED AT 3 FT. INTERVALS. THEY SHALL BE INSERTED T/2 AND 1#2 LENGTH INTO THE GUTTER.

LEGEND FOR RADII	
A	= 1/8" TO 1/4"
B	= 1"
C	= 1 1/2"
D	= 1 1/2" TO 2"

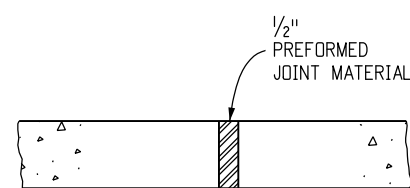


- THIS AREA SHALL BE POURED MONOLITHICALLY WITH CURB AND GUTTER AND PAID FOR AS "CONCRETE PAVEMENT".
- FLOW LINE LOCATION WILL BE ESTABLISHED BY W/2 SHOWN ON PLANS.

CONSTRUCTION OF CONCRETE GUTTERS AT INTERSECTION



CONCRETE SIDEWALK



- NOTES:
- EXPANSION JOINTS SHALL BE PLACED IN THE SIDEWALK AT INTERVALS OF NOT MORE THAN 500 FT.
 - EXPANSION JOINTS MAY BE SEALED WHEN SPECIFIED ON THE PLANS.

SIDEWALK EXPANSION JOINT

Computer File Information

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Last Modification Date: 05/16/14	Initials: LTA
Full Path: www.coloradodot.info/business/designsupport	
Drawing File Name: 609010104.dgn	
CAD Ver.: MicroStation V8	Scale: Not to Scale Units: English

Sheet Revisions

Date:	Comments
07/24/12	Changed Tie Bar spacing from 30" to 36".
05/16/14	Revised Gutter Cross Slope Note to exclude ADA Ramp

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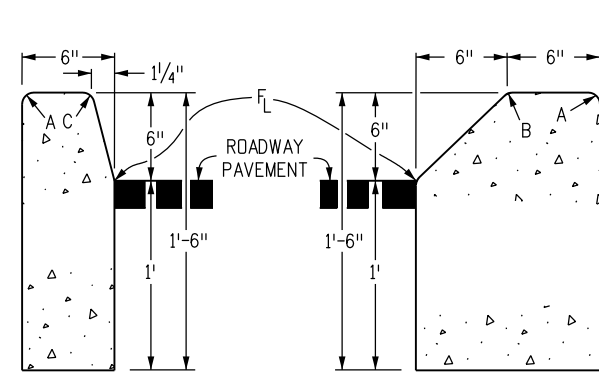
CURB, GUTTERS, AND SIDEWALKS

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STANDARD PLAN NO.

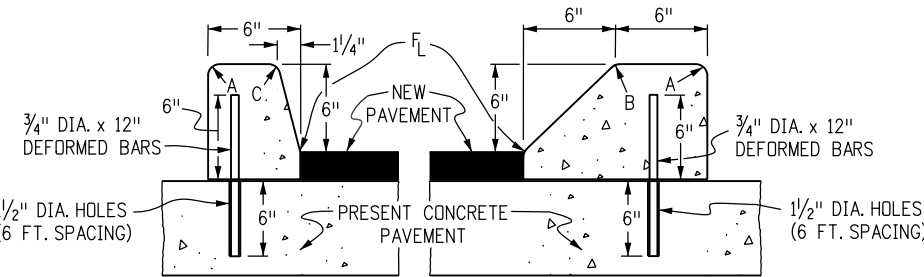
M-609-1

Sheet No. 1 of 4



CURB TYPE 2
(SECTION B)
6 IN. BARRIER

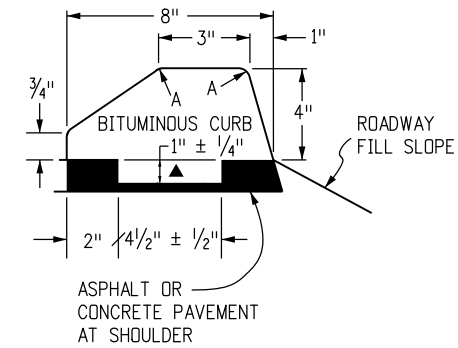
CURB TYPE 2
(SECTION M)
6 IN. MOUNTABLE



CURB TYPE 4
(SECTION B)
6 IN. BARRIER

CURB TYPE 4
(SECTION M)
6 IN. MOUNTABLE

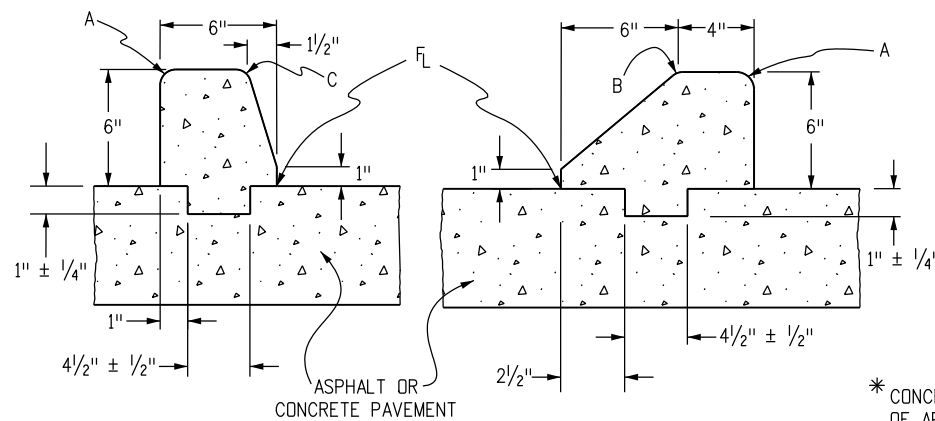
3/4" DIA. x 12" DEFORMED REINFORCING BARS AT 6 FT. SPACING SHALL BE GROUTED IN 1/4" DIA. HOLES IN EXISTING CONCRETE. GROUT SHALL CONSIST OF 2 PARTS CLEAN SAND AND 1 PART CEMENT. COST OF INSTALLATION SHALL BE INCLUDED IN THE PRICE BID FOR CURB.



CURB TYPE 6
(SECTION M)
4 IN. MOUNTABLE

NOTE: BITUMINOUS OR CONCRETE* UNLESS OTHERWISE SPECIFIED ON THE PLANS.

▲ KEY-WAY MAY BE OMITTED WHEN PLACED UNDER GUARDRAIL.



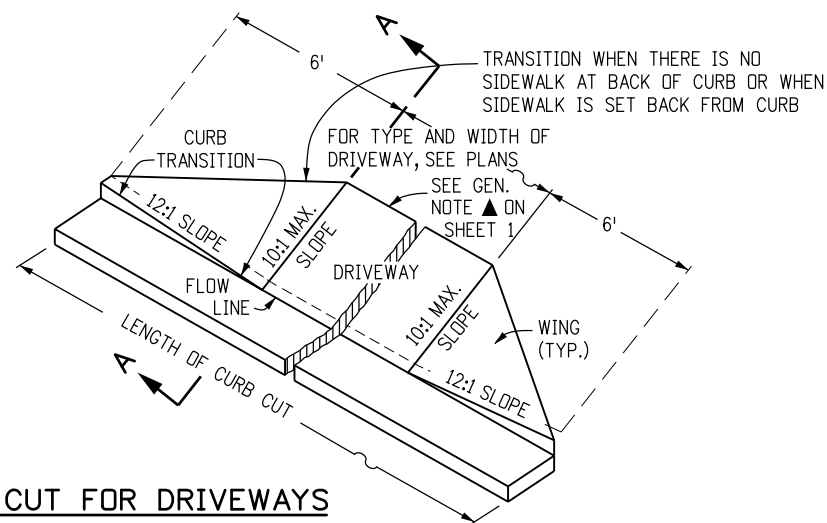
(SECTION B)

(SECTION M)

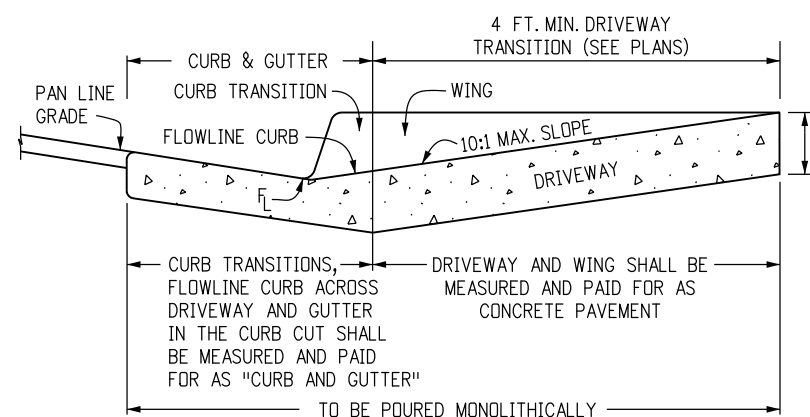
CURB TYPE 4 (KEY-WAY)*

* CONCRETE CLASS B SHALL CONTAIN 1.5 POUNDS PER CUBIC YARD OF APPROVED POLYPROPYLENE FIBERS AND MAY HAVE A NOMINAL AGGREGATE SIZE OF 3/8 IN.

LEGEND FOR RADII	
A	= 1/8 TO 1/4"
B	= 1"
C	= 1 1/2"
D	= 1 1/2" TO 2"

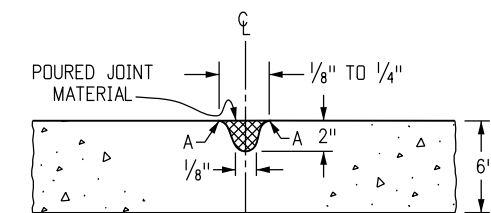


CURB CUT FOR DRIVEWAYS
(WITHOUT ATTACHED SIDEWALK)



SECTION A-A

CONCRETE PAVEMENT (DRIVEWAYS)



NOTE: RECOMMENDED JOINT SPACING IS EVERY 8 FOOT ALONG THE WIDTH AND LENGTH OF DRIVEWAY. FOR DRIVEWAYS WIDER THAN 12 FEET, JOINTS ARE REQUIRED.

TRANSVERSE CONTRACTION JOINT FOR CONCRETE PAVEMENT (DRIVEWAYS)

Computer File Information

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Last Modification Date: 07/04/12	Initials: LTA
Full Path: www.coloradodot.info/business/designsupport	(R-X)
Drawing File Name: 609010204.dgn	(R-X)
CAD Ver.: MicroStation V8	(R-X)
Scale: Not to Scale	Units: English

Sheet Revisions

Date:	Comments

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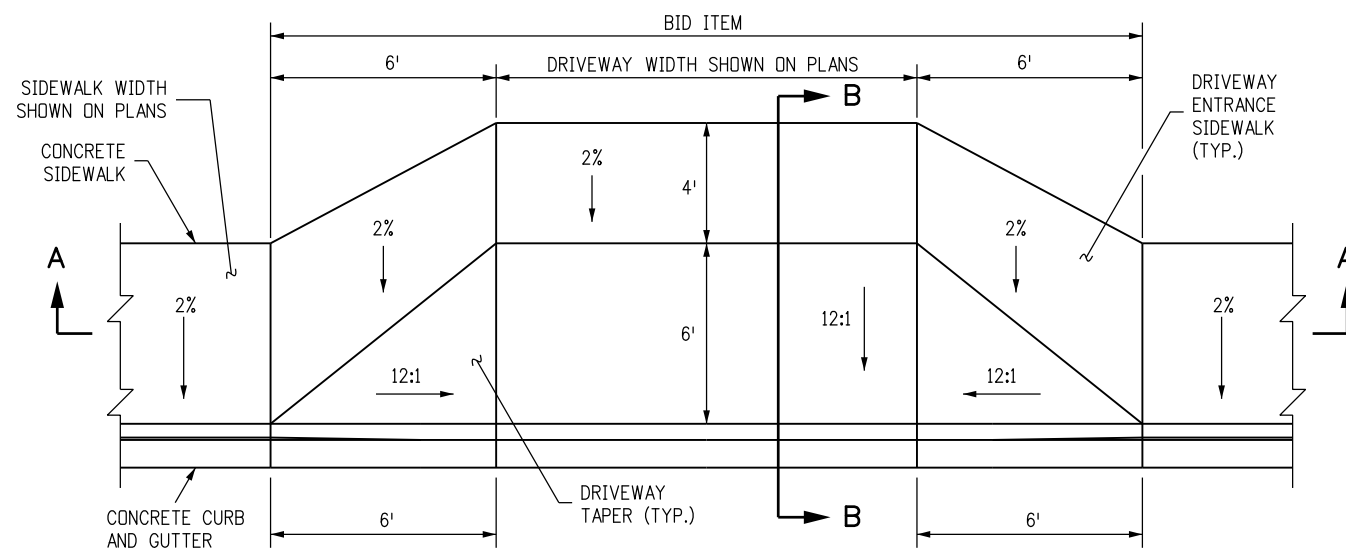
CURB, GUTTERS, AND SIDEWALKS

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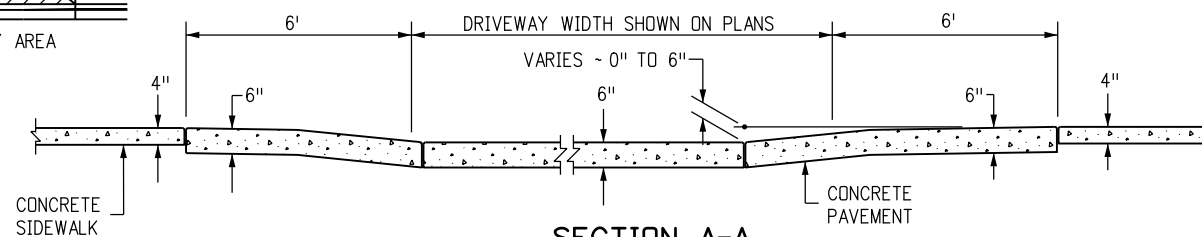
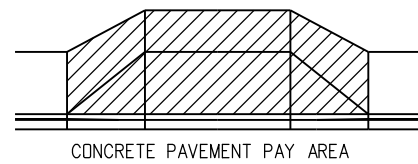
STANDARD PLAN NO.

M-609-1

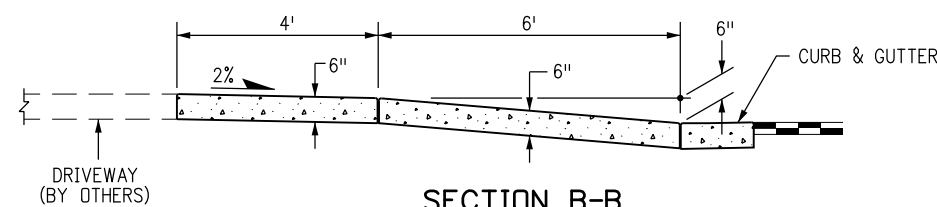
Sheet No. 2 of 4



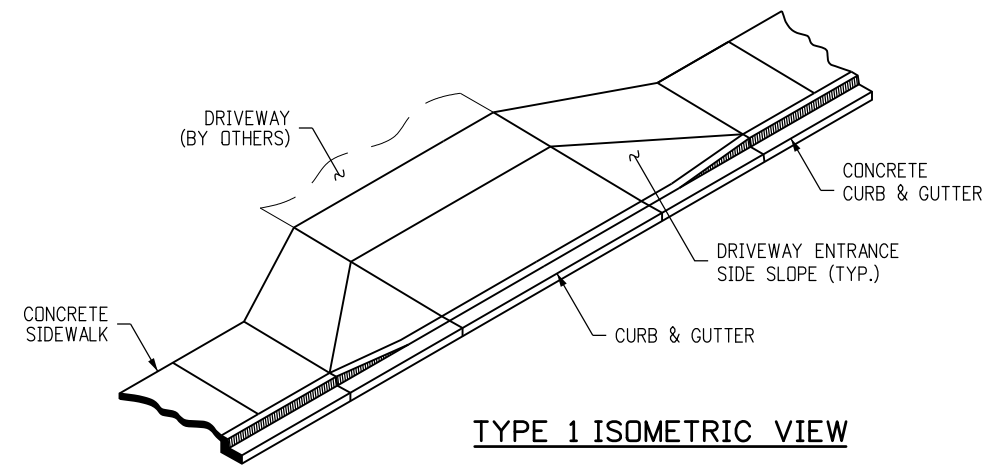
CONCRETE DRIVEWAY ENTRANCE TYPE 1



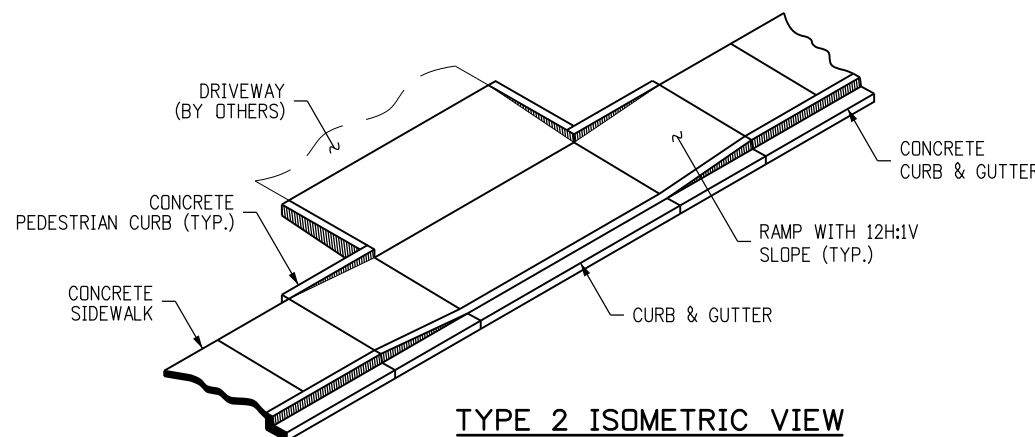
SECTION A-A



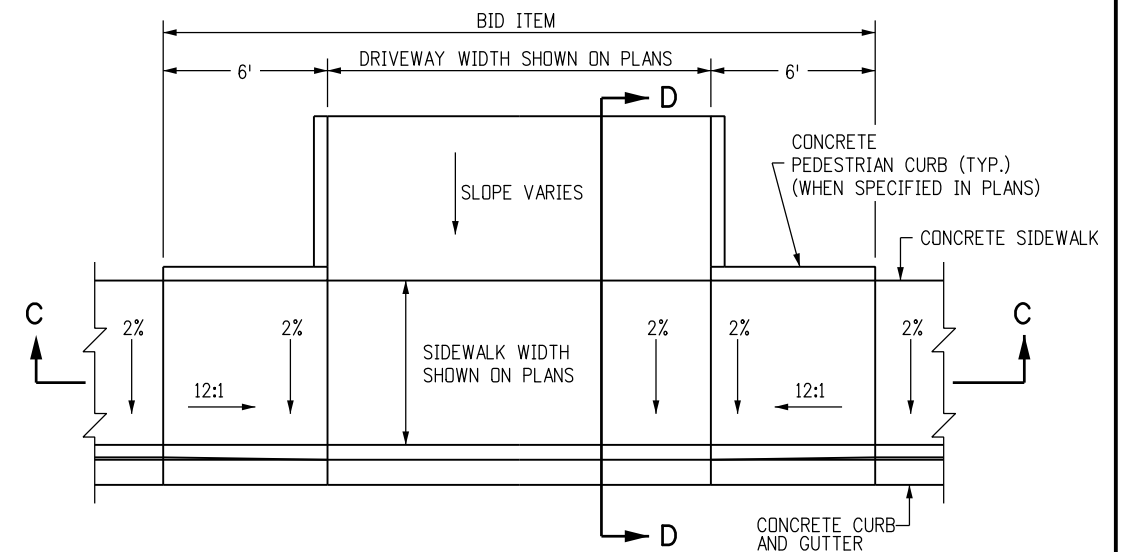
SECTION B-B



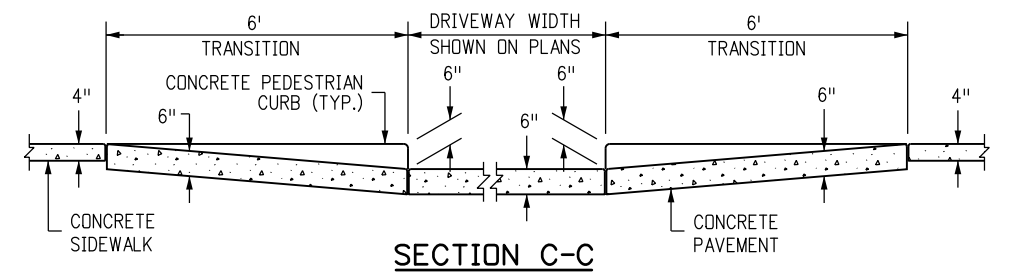
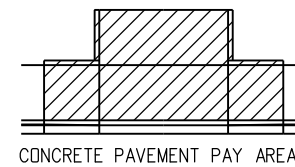
TYPE 1 ISOMETRIC VIEW



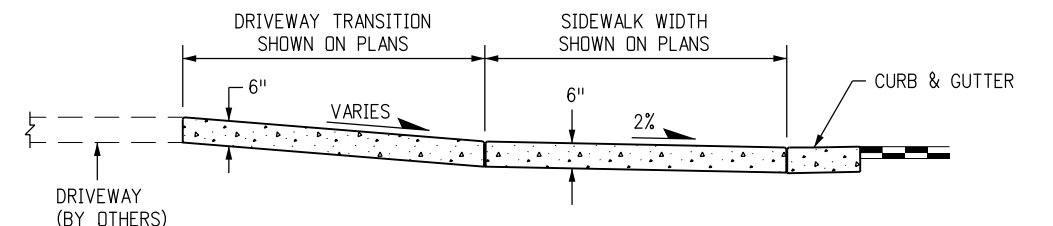
TYPE 2 ISOMETRIC VIEW



CONCRETE DRIVEWAY ENTRANCE TYPE 2



SECTION C-C



SECTION D-D

NOTES

1. DRAINAGE STRUCTURES, TRAFFIC SIGNAL EQUIPMENT, JUNCTION BOXES, AND OTHER OBSTRUCTIONS SHOULD NOT BE PLACED IN FRONT OF THE DRIVEWAY RAMP ACCESS AREAS.
2. FOR THE CURB AND GUTTER SHOWN, SEE PLANS FOR CURB TYPE.
3. RAMP SLOPES SHALL BE 12:1 OR FLATTER.
4. CONSTRUCTION OF THE CONCRETE PEDESTRIAN CURB SHALL BE INCLUDED IN THE BID PRICE OF THE CONCRETE PAVEMENT.

Computer File Information

Creation Date: 07/04/12	Initials: DD
Last Modification Date: 07/04/12	Initials: LTA
Full Path: www.coloradodot.info/business/designsupport	(R-X)
Drawing File Name: 609010304.dgn	(R-X)
CAD Ver.: MicroStation V8	(R-X)
Scale: Not to Scale	Units: English

Sheet Revisions

Date:	Comments

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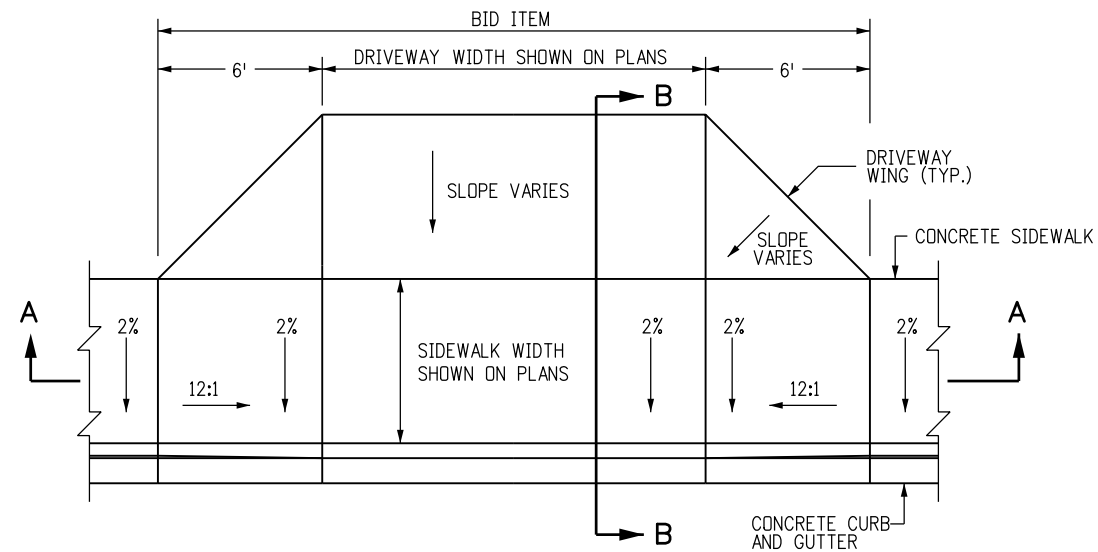
**CURB, GUTTERS,
AND SIDEWALKS**

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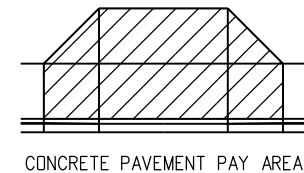
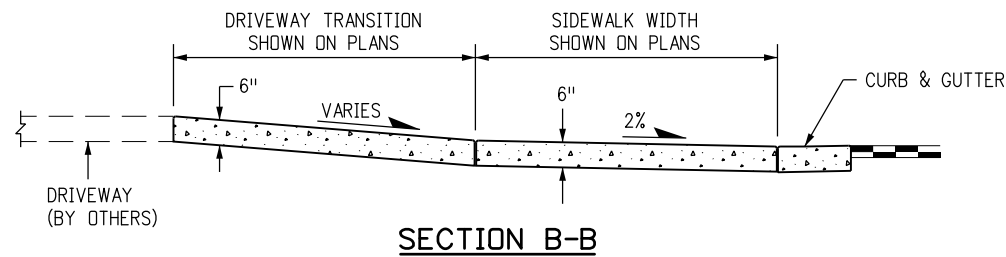
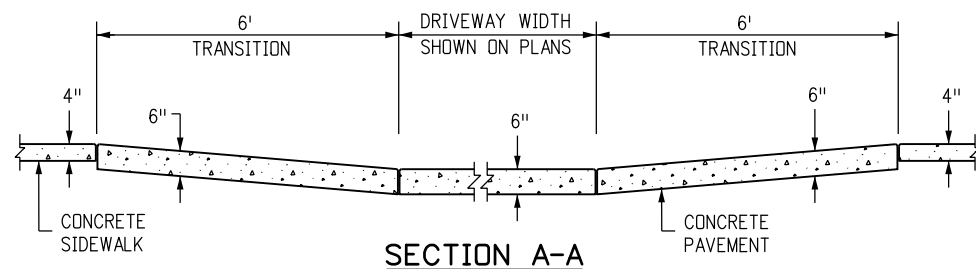
STANDARD PLAN NO.

M-609-1

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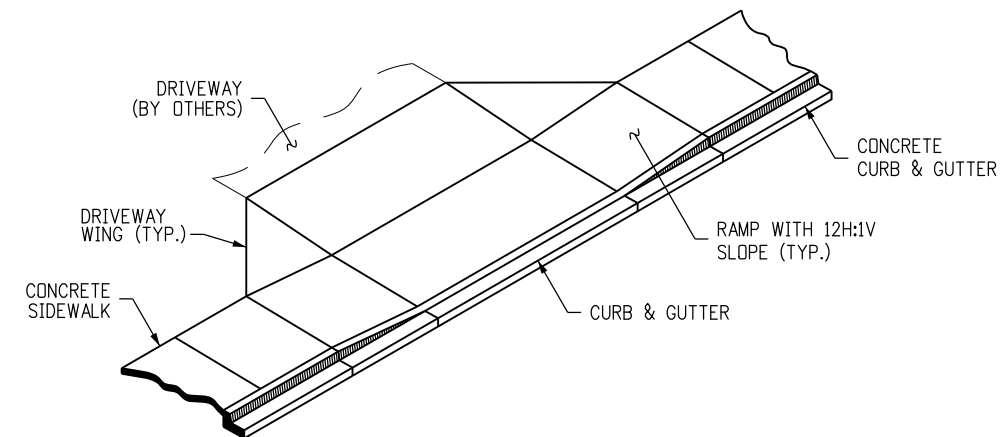


CONCRETE DRIVEWAY ENTRANCE TYPE 3



NOTES

1. DRAINAGE STRUCTURES, TRAFFIC SIGNAL EQUIPMENT, JUNCTION BOXES, AND OTHER OBSTRUCTIONS SHOULD NOT BE PLACED IN FRONT OF THE DRIVEWAY RAMP ACCESS AREAS.
2. FOR THE CURB AND GUTTER SHOWN, SEE PLANS FOR CURB TYPE.
3. RAMP SLOPES SHALL BE 12:1 OR FLATTER.



TYPE 3 ISOMETRIC VIEW

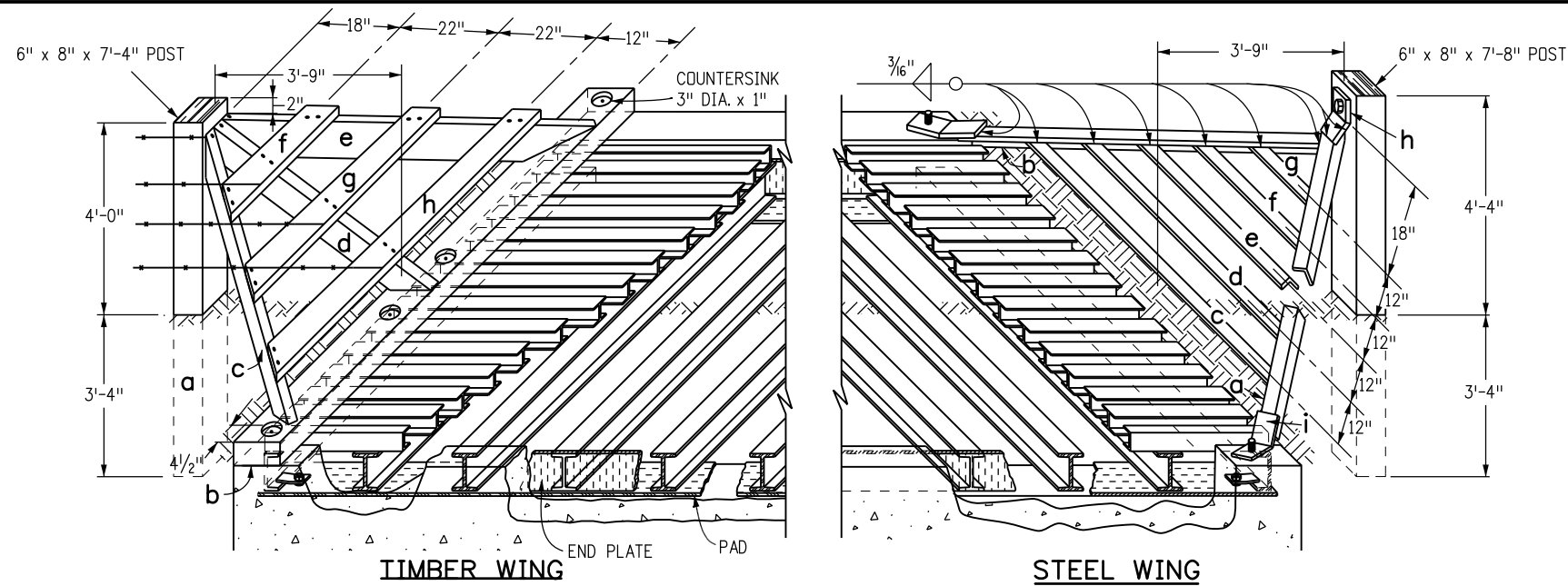
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Sheet Revisions	
Date:	Comments
(R-X)	
(R-X)	
(R-X)	
(R-X)	

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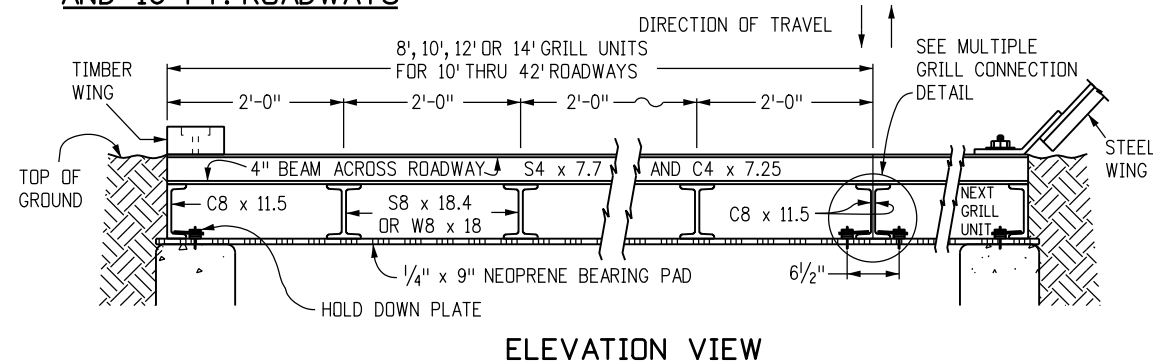
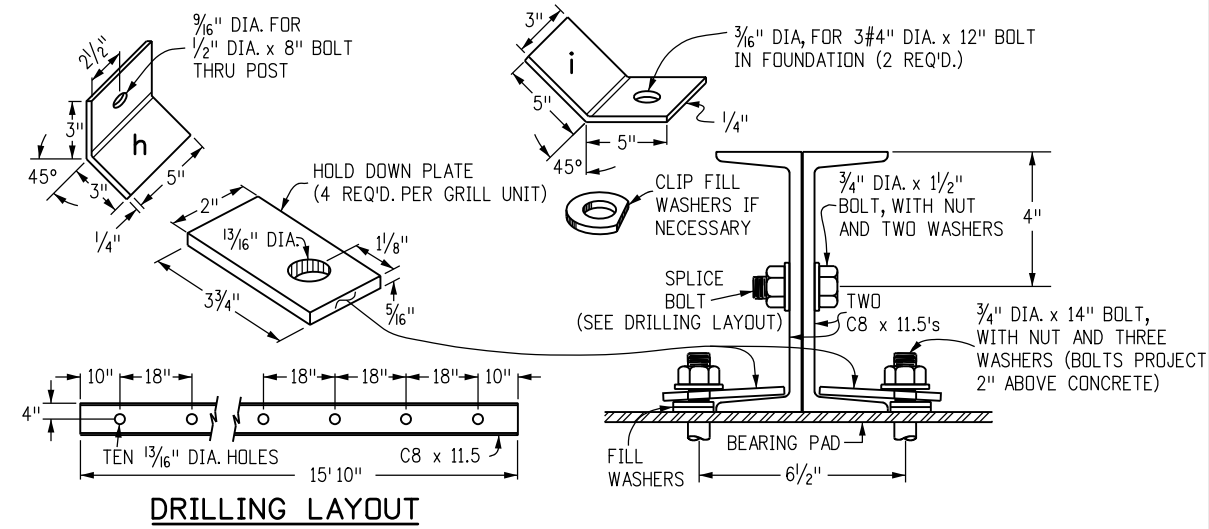
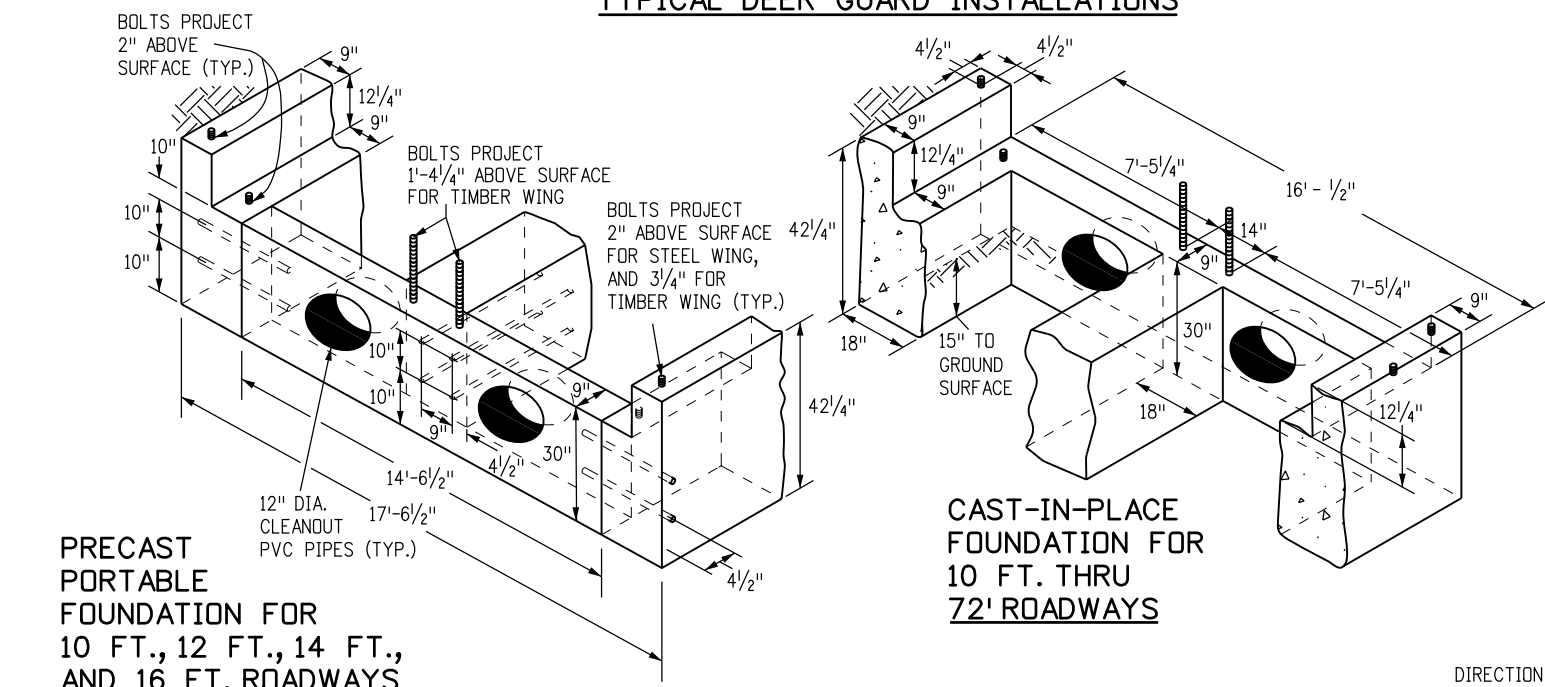
**CURB, GUTTERS,
AND SIDEWALKS**
 Issued By: Project Development Branch on July 4, 2012

STANDARD PLAN NO.
 M-609-1
 Sheet No. 4 of 4

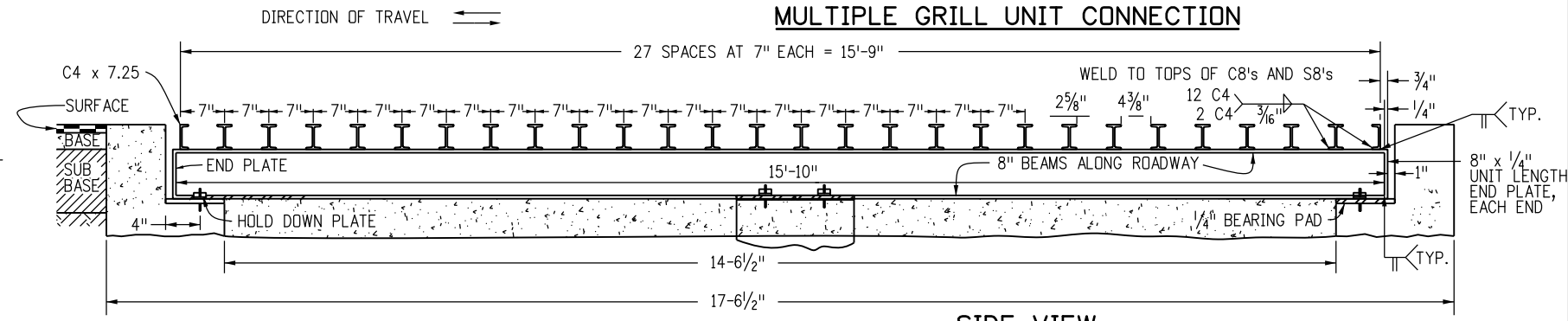


TYPICAL DEER GUARD INSTALLATIONS

- GENERAL NOTES**
1. CONCRETE SHALL BE CLASS B. FOUNDATION MAY BE CAST-IN-PLACE OR PRECAST.
 2. REINFORCING BARS SHALL BE #4, GRADE 60.
 3. ALL TIMBER SHALL BE TREATED IN CONFORMANCE WITH ASSHTO M 133 AND AWPA C14.
 4. WING POSTS MAY BE MADE FROM 6 IN. DIAMETER AND TREATED IN ACCORDANCE WITH 710.07
 5. ALL STRUCTURAL STEEL SHALL BE FABRICATED AND PAINTED WITH ALUMINUM PAINT IN ACCORDANCE WITH SECTION 509. ALL HARDWARE SHALL BE GALVANIZED IN CONFORMANCE WITH AASHTO M 111 OR PAINTED WITH ZINC-RICH PAINT MEETING MILITARY SPECIFICATION DOD-P-21035
 6. ALL STRUCTURAL STEEL SHALL CONFORM TO AASHTO M 270 (ASTM A 709) GRADE 36.
 7. WELDING SHALL CONFORM TO THE AWS STRUCTURAL WELDING CODE AND AASHTO STANDARD SPECIFICATIONS FOR WELDING OF STRUCTURAL STEEL HIGHWAY BRIDGES.
 8. OUTLET PIPES WILL BE REQUIRED AND PAID FOR AS SHOWN IN THE PLANS. A 6 INCH SLEEVE MAY BE USED THROUGH THE CENTRAL SUPPORT TO DRAIN FROM ONE CELL TO THE OTHER TO MINIMIZE THE NUMBER OF OUTLET PIPES.
 9. TYPE OF WING (TIMBER OR STEEL) SHALL BE STEEL UNLESS OTHERWISE SHOWN ON THE PLANS.
 10. STRUCTURE EXCAVATION, STRUCTURE BACKFILL, AND SURVEY WORK WILL NOT BE MEASURED AND PAID FOR SEPARATELY, BUT SHALL BE INCLUDED IN THE WORK.
 11. A 4 IN. CONCRETE FLOOR SHALL BE PLACED IN THE DEER GUARD AND SHALL BE GRADED TO DRAIN. THIS QUANTITY WILL NOT BE PAID FOR SEPARATELY, BUT SHALL BE INCLUDED IN THE WORK.
 12. EXPANSION JOINT MATERIAL SHALL BE USED BETWEEN THE 4 INCH CONCRETE FLOOR AND THE FOUNDATION. THIS QUANTITY WILL NOT BE PAID FOR SEPARATELY, BUT SHALL BE INCLUDED IN THE WORK.
 13. TOOLED OR SAWCUT JOINTS WILL BE REQUIRED IN THE 4 INCH CONCRETE FLOOR AS DIRECTED. DETAIL. THIS WORK WILL NOT BE PAID FOR SEPARATELY, BUT SHALL BE INCLUDED IN THIS WORK
 14. HIGHWAY LOADING DESIGN DATA:
HL-93 (DESIGN TRUCK OR TANDEM, AND DESIGN LANE LOAD)
 15. A TREATED 2X6 MAY BE USED AT THE OPEN END OF THE DEER GUARD TO KEEP FILL MATERIAL FROM FALLING IN.



ELEVATION VIEW



WELDED GRILL CROSS SECTIONS

SIDE VIEW

Computer File Information

Creation Date: 07/18/14	Initials: DLM
Last Modification Date: 04/30/15	Initials: LTA
Full Path: www.coloradodot.info/business/designsupport	
Drawing File Name: 611020102.dgn	
CAD Ver.: MicroStation V8	Scale: Not to Scale Units: English

Sheet Revisions

Date:	Comments
(R-X)	
(R-X)	
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(R-X)	

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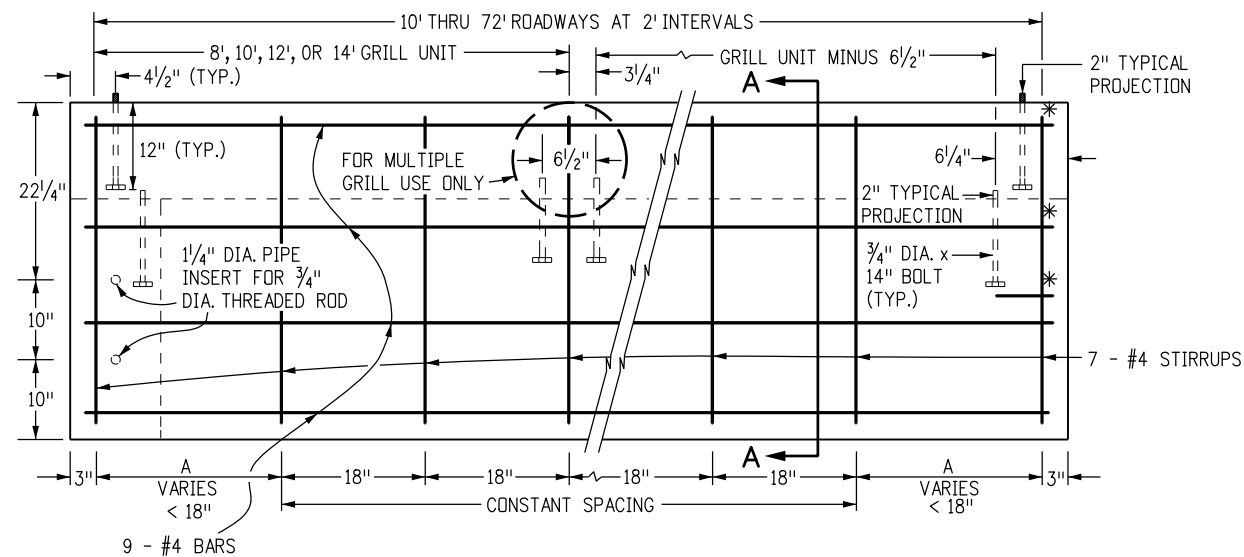
DEER GUARD

Issued By: Project Development Branch July 18, 2014

STANDARD PLAN NO.

M-611-2

Sheet No. 1 of 2

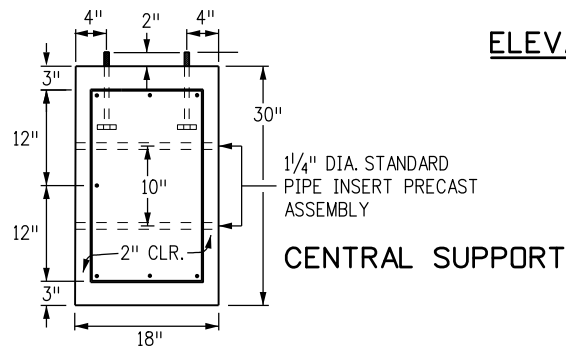


PRECAST PORTABLE FOUNDATION

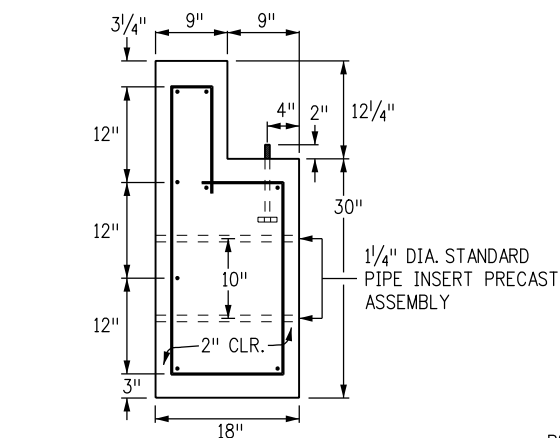
CAST-IN-PLACE FOUNDATION

ELEVATION OF FOUNDATION

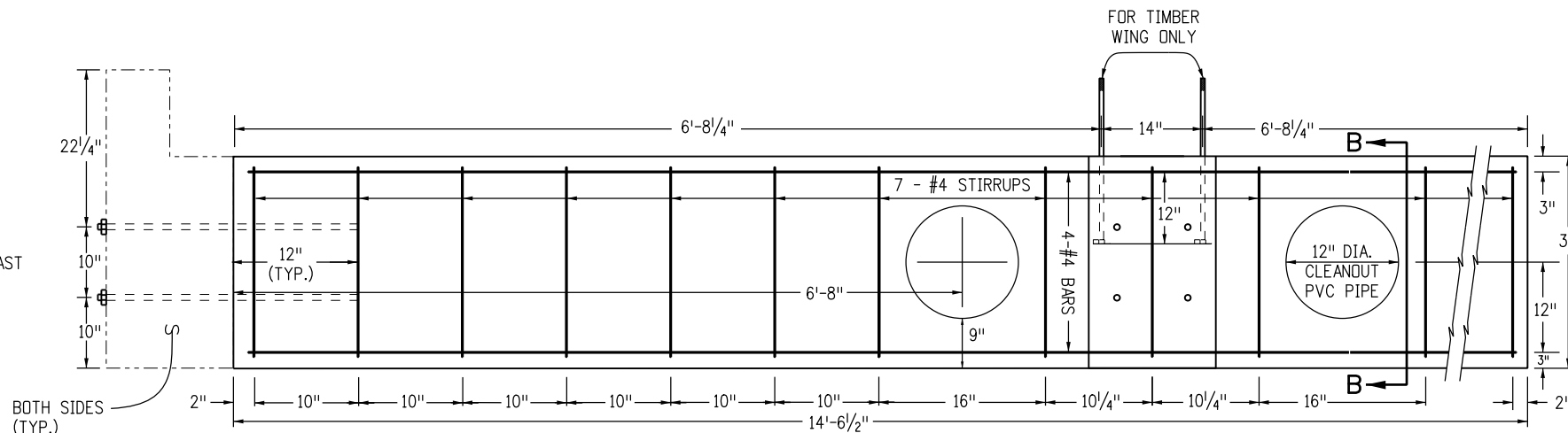
* WHEN CAST IN PLACE, LONGITUDINAL BARS EXTENDING FROM AND INTO THE LATERAL SUPPORT SHALL BE BENT 90° WITH A 2 IN. RADIUS AND CONTINUE PERPENDICULAR 10 IN. FROM THE BEND



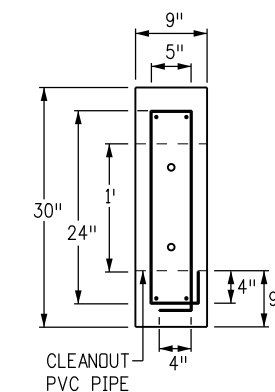
CENTRAL SUPPORT



**SECTION A-A
 END SECTION OF FOUNDATION**



ELEVATION OF LATERAL SUPPORT



**SECTION B-B
 LATERAL SUPPORT**

- a - 6" x 8" x 7'-4"
 - b - 4" x 8" x 9'-4 1/2"
 - c - 2" x 6" x 6'-7"
 - d - 2" x 6" x 5'-8"
 - e - 2" x 6" x 6'-7"
 - f - 2" x 6" x 2'-5"
 - g - 2" x 6" x 4'-4"
 - h - 2" x 6" x 6'-2"
- 16d NAILS (GALV.) - 2 LB.

ONE TIMBER WING

a - 2" x 2" x 1/4" x 123.70"	32.88 LBS.
b - 2" x 2" x 1/4" x 123.70"	32.88 LBS.
c - 2" x 2" x 1/4" x 177.93"	47.30 LBS.
d - 1 1/2" x 1 1/2" x 1/4" x 141.99"	43.19 LBS.
e - 1 1/2" x 1 1/2" x 1/4" x 106.04"	32.25 LBS.
f - 1 1/2" x 1 1/2" x 1/4" x 70.09"	21.32 LBS.
g - 1 1/2" x 1 1/2" x 1/4" x 34.15"	10.39 LBS.
h - 5" x 6" x 1/4" x BAR	- 2.13 LBS.
i - TWO 3" x 10" x 1/4" x BARS	- 4.25 LBS.
6" x 8" x 7'-8" TIMBER POST	
TOTAL LBS. STEEL = ~226.6	

ONE STEEL WING

ROADWAY WIDTH (FT.)	USE GRILL UNITS (FT.)	PRECAST		CAST-IN-PLACE		A (IN.)	TOTAL GRILL WEIGHT (LBS.)
		CONCRETE (CU. YD.)	REINF. STEEL (LBS.)	CONCRETE (CU. YD.)	REINF. STEEL (LBS.)		
16	8 8	9.4	670	9.4	670	15	5905
20	10 10	11.2	821	11.2	821	15	7345
24	12 12	13.1	934	13.1	934	15	8785
28	14 14	15.0	1059	15.0	1059	15	10224
30	10 10 10	14.1	1136	14.1	1136	12	10809
32	10 12 10	16.9	1184	16.9	1184	15	11737
38	12 14 12	17.3	1353	17.3	1353	12	13628
40	14 12 14	20.7	1419	20.7	1419	15	14617

FOUNDATION QUANTITIES

SIZE	WEIGHT (LBS.)
8'	2952
10'	3672
12'	4392
14'	5112

**WELDED GRILL UNITS
 FULL LENGTH**

SIZE	WEIGHT (LBS.)
8'	1476
10'	1836
12'	2196
14'	2556

**WELDED GRILL UNITS
 HALF LENGTH**

HALF GRILLS SHALL BE BOLTED ON 18 INCH CENTERS MAX. (SEE MULTIPLE GRILL UNIT CONNECTION DETAIL ON SHEET ONE)

WING QUANTITIES

Computer File Information

Creation Date: 07/18/14	Initials: DLM
Last Modification Date: 04/30/15	Initials: LTA
Full Path: www.coloradodot.info/business/designsupport	(R-X)
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