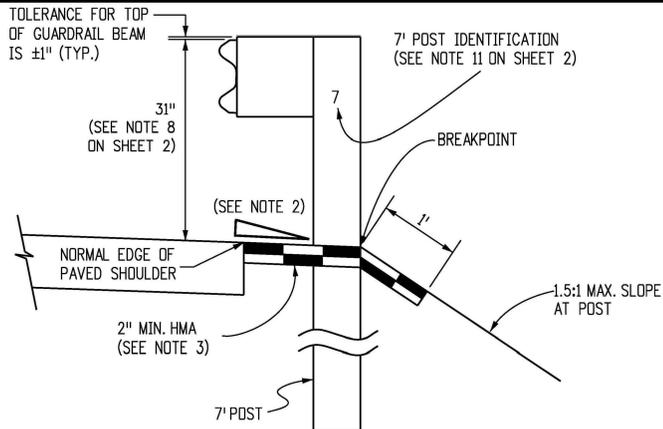
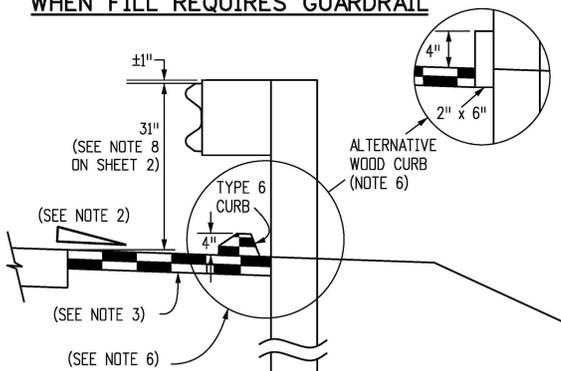


NORMAL ROADSIDE INSTALLATION WHEN FILL REQUIRES GUARDRAIL

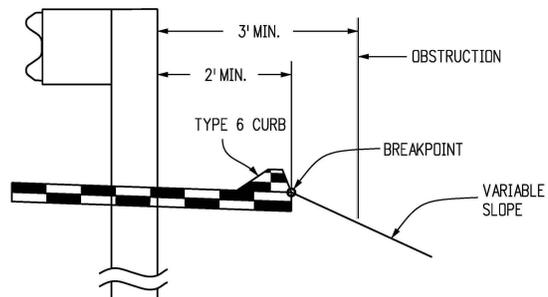


RESTRICTIVE ROADSIDE INSTALLATION WITH 7 FOOT GUARDRAIL POSTS
(SEE NOTE 5)

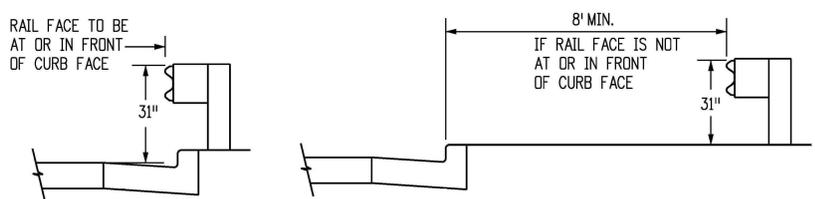


OPTION A

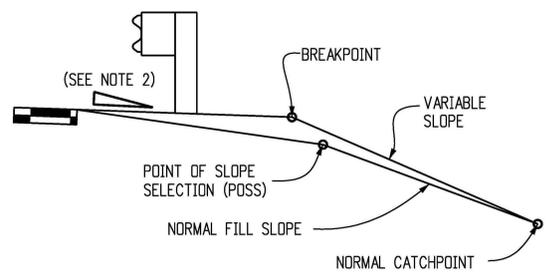
ROADSIDE INSTALLATION WITH EROSION CONTROL CURB



OPTION B (PREFERRED)



URBAN ROADSIDE INSTALLATION WITH CURB AND GUTTER



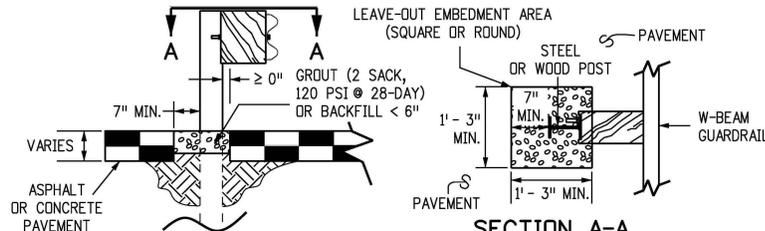
EMBANKMENT WITH GUARDRAIL

(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 11 & 19

NORMAL CENTER-TO-CENTER POST SPACING

- GENERAL NOTES** (CONTINUE ON SHEET 2)
- ALL GUARDRAILS SHOWN ARE MASH 2016 TL-3 COMPLIANT.
 - 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.



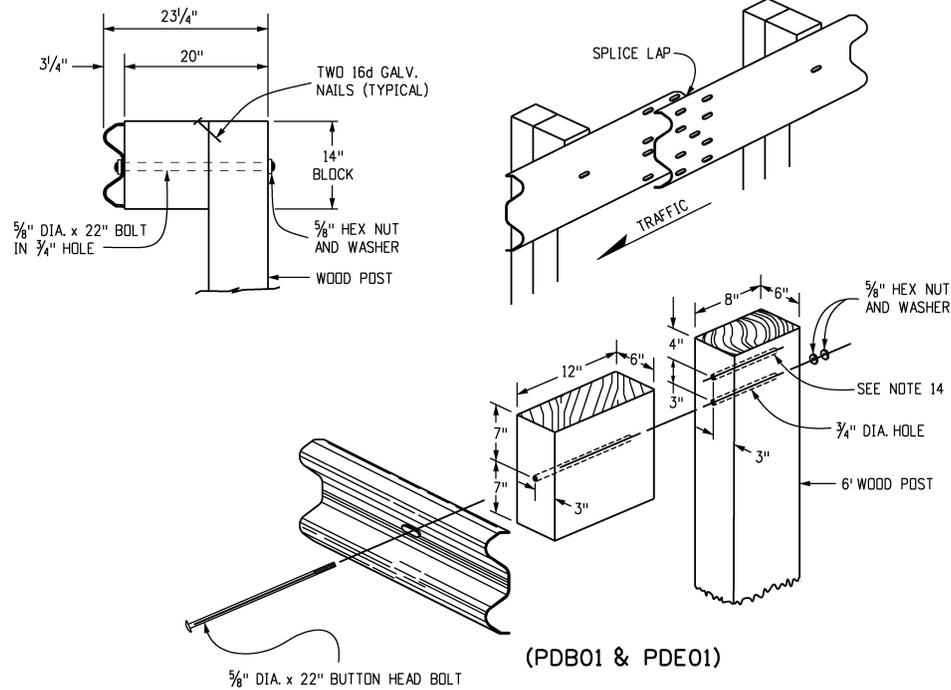
LEAVE-OUT AREA FOR GUARDRAIL POSTS LOCATED IN PAVEMENT

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.

Computer File Information		Sheet Revisions		Colorado Department of Transportation		MIDWEST		STANDARD PLAN NO.	
Creation Date: 07/31/19		Date:	Comments	2829 West Howard Place		GUARDRAIL SYSTEM (MGS)		M-606-1	
Designer Initials: JBK		(R-X) 03/05/20	Revised Gen. Note 1 to show MASH compliant.	CDOT HQ, 3rd Floor		TYPE 3 W-BEAM 31 INCHES		Standard Sheet No. 1 of 19	
Last Modification Date: 03/05/20		(R-X)		Denver, CO 80204		Issued by the Project Development Branch: July 31, 2019		Project Sheet Number:	
Detailer Initials: LTA		(R-X)		Phone: 303-757-9021 FAX: 303-757-9868					
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English		(R-X)		Project Development Branch		JBK			

GENERAL NOTES (CONTINUED FROM SHEET 1)

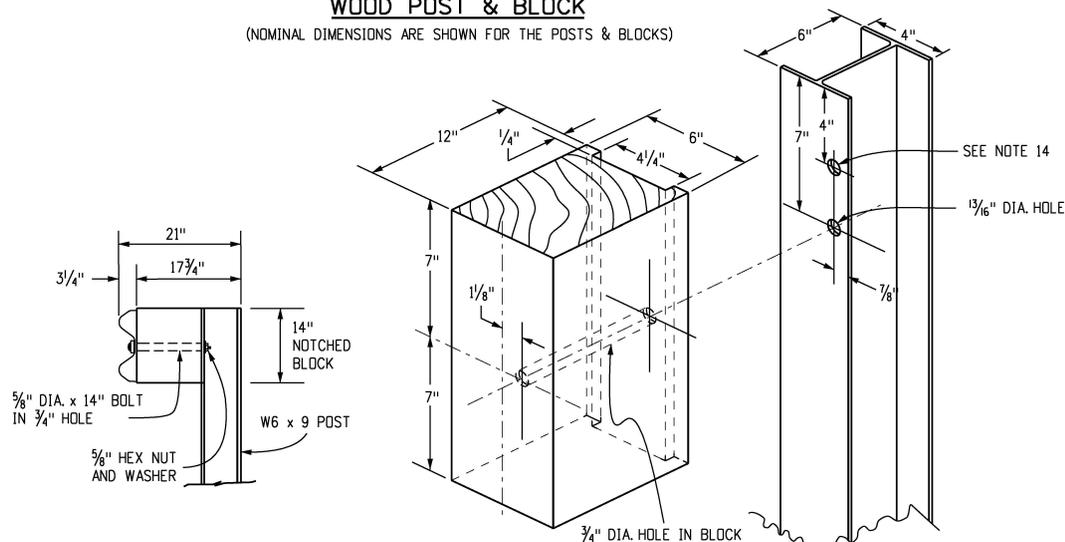
- SEE SHEETS 7 AND 9 FOR CURB TREATMENTS AT GUARDRAIL TERMINALS.
- IF THIS DIMENSION WILL BE LESS THAN 28 INCHES, RESET GUARDRAIL HEIGHT TO 28 INCHES OR ABOVE.
- ALL W-BEAM SPLICES, AND SPLICES OF TERMINAL CONNECTORS TO W-BEAM SHALL BE LAPPED IN THE DIRECTION OF TRAFFIC UNLESS OTHERWISE NOTED IN THE PLANS OR BY THE MANUFACTURER.
- 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.
- 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.
- THE STANDARD 3 IN. X 1 3/4 IN. X 3/8 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.
- STANDARD GALVANIZED ROUND STEEL WASHERS SHALL BE USED UNDER ALL NUTS IN CONTACT WITH WOOD POSTS.
- AN ADDITIONAL HOLE SHALL BE PROVIDED IN THE POSTS TO FACILITATE FUTURE RAISING OF THE RAIL ELEMENTS AND BLOCKS FOR OVERLAYS. POSTS PROVIDED MAY ALSO HAVE ADDITIONAL HOLES (UP TO 4 PER FLANGE) FOR MEDIAN GUARDRAIL APPLICATION.
- 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 INSTALLED ON SPLICE BOLTS, NOT ON POST BOLTS AND 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.
- 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.
- 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.
- REFERENCES SUCH AS "PDB01", "PDE01", AND "PWE01" IN THIS STANDARD PLAN SPECIFY HARDWARE DETAILS FROM "A GUIDE TO STANDARDIZED HIGHWAY BARRIER HARDWARE" PREPARED BY THE AASHTO-ACC-ARTBA JOINT COOPERATIVE COMMITTEE.
- RAIL BLOCKS MANUFACTURED FROM SYNTHETIC MATERIAL WILL BE ACCEPTED AS ALTERNATIVES TO WOOD BLOCKS FOR USE WITH STEEL POSTS PROVIDED THAT THE BLOCKS HAVE RECEIVED FHWA APPROVAL.
- 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.
- 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.
- 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.
- 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.
- 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.
- FIELD MODIFICATION TO RAIL ELEMENTS IS ALLOWED PER MANUFACTURER'S RECOMMENDATIONS, OR WITH THE APPROVAL OF THE STANDARDS AND SPECIFICATIONS UNIT. POSTS SHALL NOT BE MODIFIED. COMPONENTS ON WHICH THE SPALTER 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 DDD-P-21035A.



(PDB01 & PDE01)

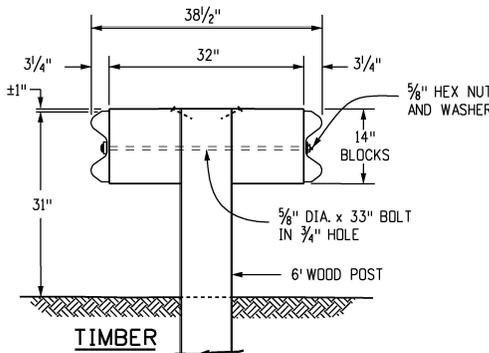
WOOD POST & BLOCK

(NOMINAL DIMENSIONS ARE SHOWN FOR THE POSTS & BLOCKS)

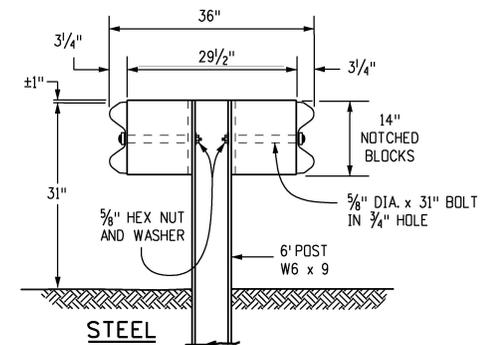


STEEL POST & NOTCHED BLOCK

(NOMINAL DIMENSIONS ARE SHOWN FOR THE POSTS & BLOCKS)



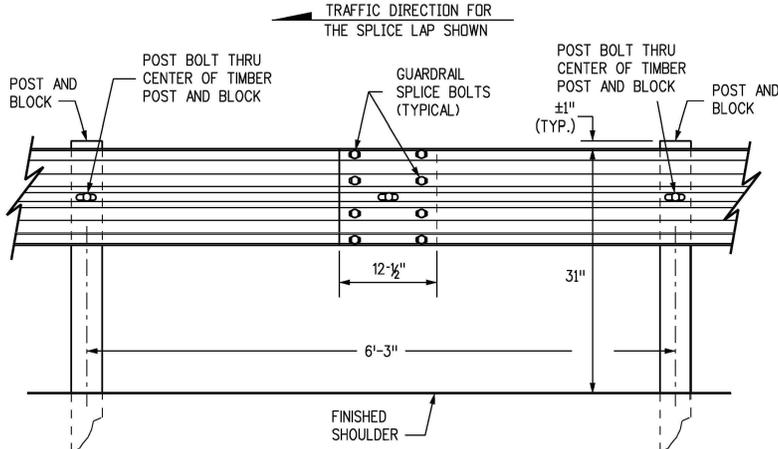
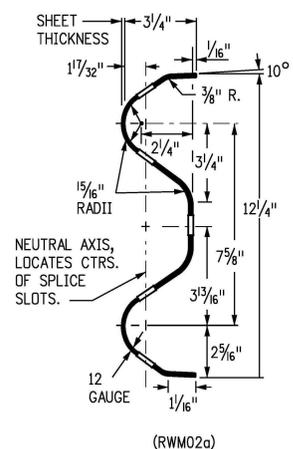
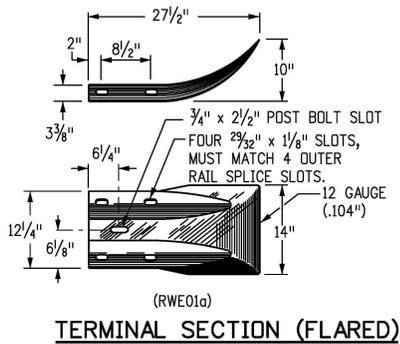
TIMBER



STEEL

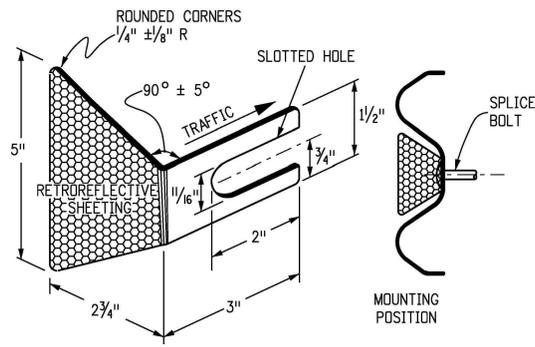
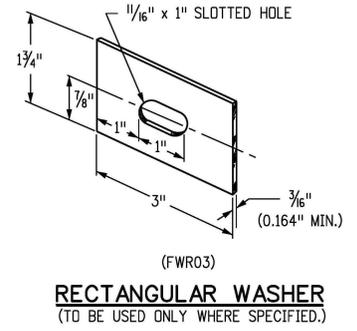
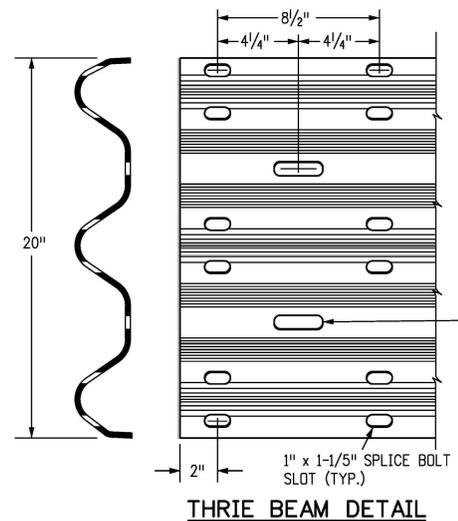
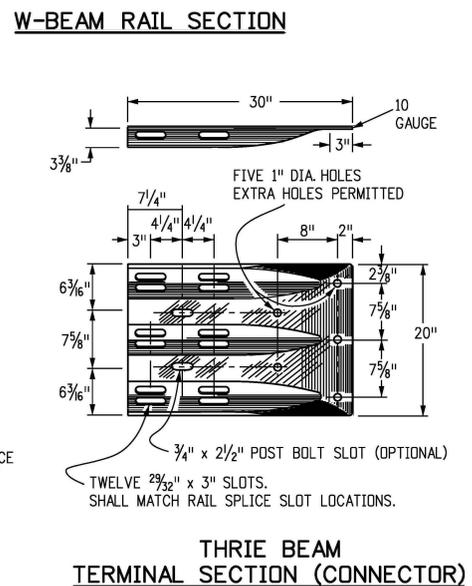
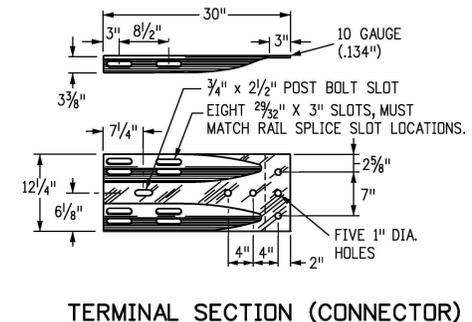
DOUBLE BLOCK AND GUARDRAIL TYPE 3 (DOUBLE) FOR MEDIAN BARRIER

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Designer Initials: JBK		(R-X)		CDDT HQ, 3rd Floor		TYPE 3 W-BEAM 31 INCHES		Standard Sheet No. 2 of 19	
Last Modification Date: 03/05/20		(R-X)		Denver, CO 80204		Issued by the Project Development Branch: July 31, 2019		Project Sheet Number:	
Detailer Initials: LTA		(R-X)		Phone: 303-757-9021 FAX: 303-757-9868					
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English		(R-X)		Project Development Branch		JBK			

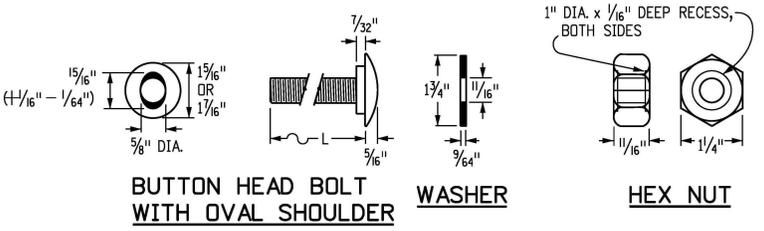


PART	MATERIAL SPEC.	GALVANIZING SPEC.	CORROSION-RESISTANT SPEC.
W-BEAM RAIL & TERMINAL SECTIONS	AASHTO M 180, CLASS A OR B	AASHTO M 180, TYPE 1 OR 2	AASHTO M 180, TYPE 4
BASE PLATE	ASTM A 36	AASHTO M 111	N.A.
NUTS, BOLTS & STUDS FOR GENERAL USE	ASTM A 307		AASHTO M 232, CLASS C
HIGH STRENGTH BOLTS &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



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



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 1/2)	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

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Sheet Revisions	
Date:	Comments

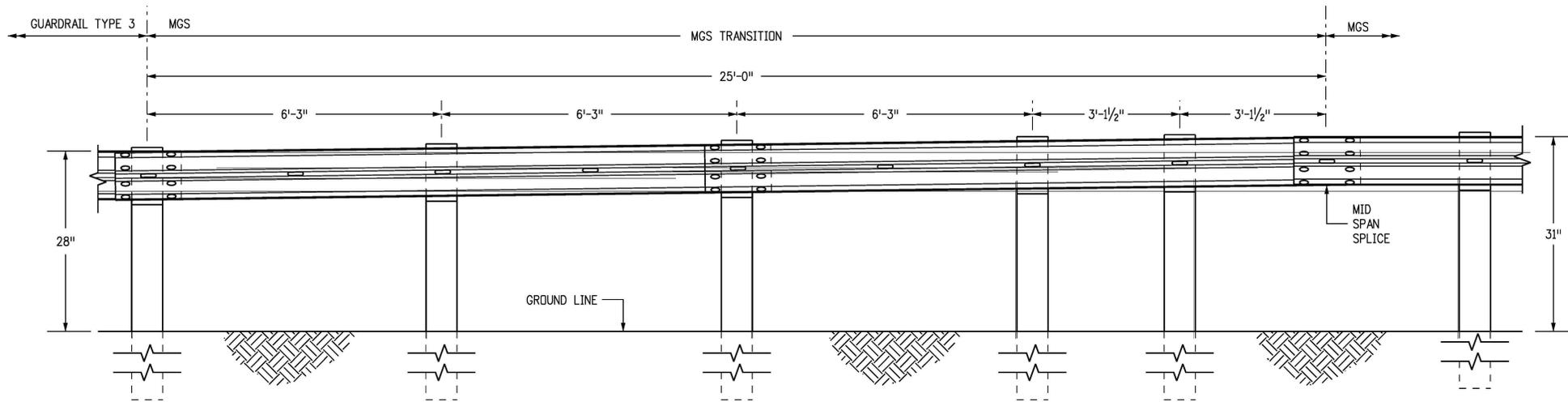
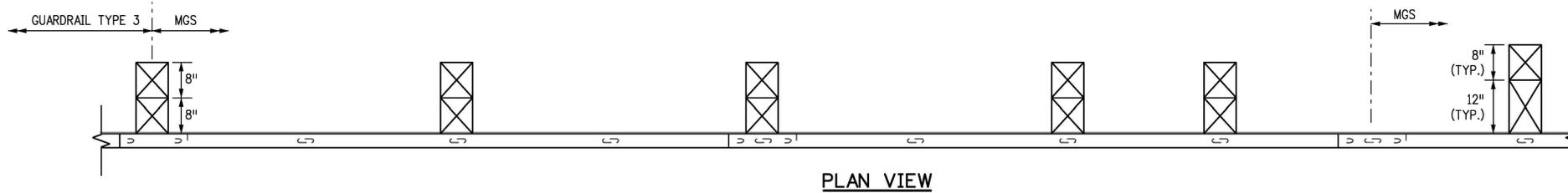
Colorado Department of Transportation
 2829 West Howard Place
 CDDT HQ, 3rd Floor
 Denver, CO 80204
 Phone: 303-757-9021 FAX: 303-757-9868
 Project Development Branch JBK

MIDWEST
 GUARDRAIL SYSTEM (MGS)
 TYPE 3 W-BEAM 31 INCHES
 Issued by the Project Development Branch: July 31, 2019

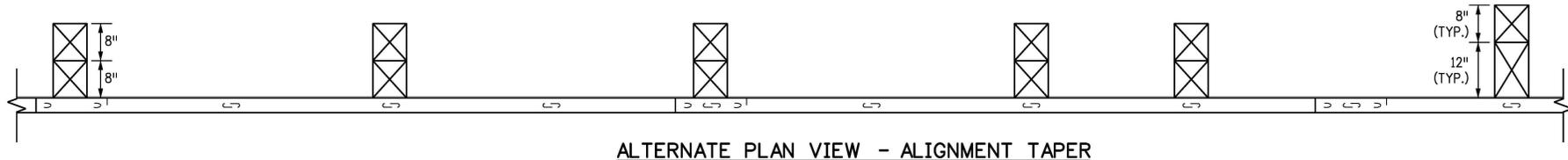
STANDARD PLAN NO.
 M-606-1
 Standard Sheet No. 3 of 19
 Project Sheet Number:

NOTES

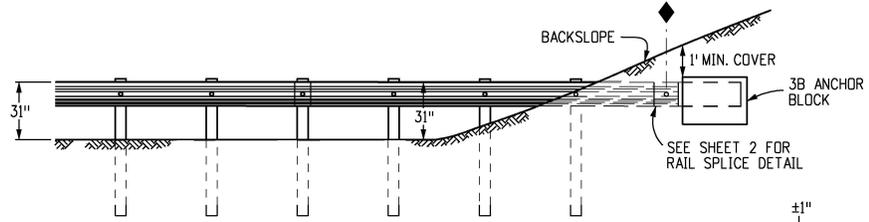
1. THE MGS TRANSITION FROM A TYPE 3 GUARDRAIL SHALL BE COMPLETED OUTSIDE THE MGS END ANCHORAGE LIMITS.



TRANSITION FROM 28 INCH GUARDRAIL TO 31 INCH MGS

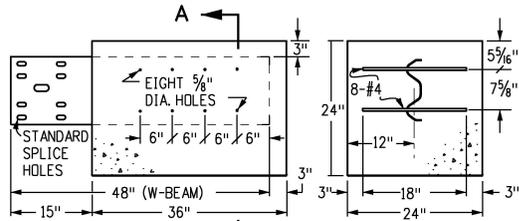


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Designer Initials: JBK		(R-X) _____							
Last Modification Date: 03/05/20		(R-X) _____							
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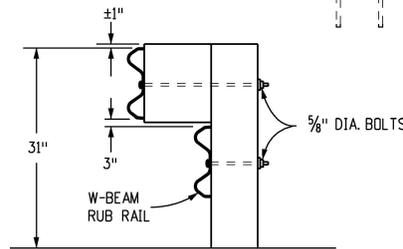
SEE TYPE 3B (RUB RAIL) PLAN VIEW FOR ALIGNMENT. THE 100 FT. FLARE LENGTH MAY BE SHORTENED IF THE SLOPE IS LESS THAN 8 FT. WIDE.

END ANCHORAGE TYPE 3B
(MAX. 10:1 AND NO ROADSIDE DITCH AT GUARDRAIL)



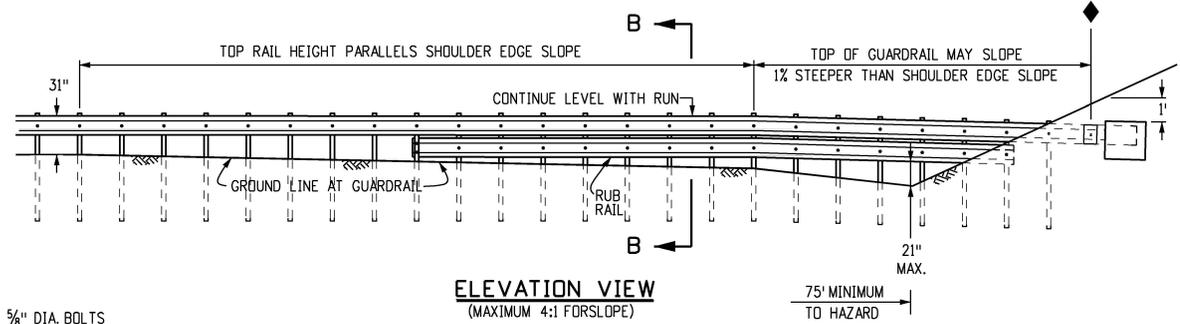
SECTION A-A

TYPE 3B ANCHOR BLOCK DETAIL



SECTION B-B

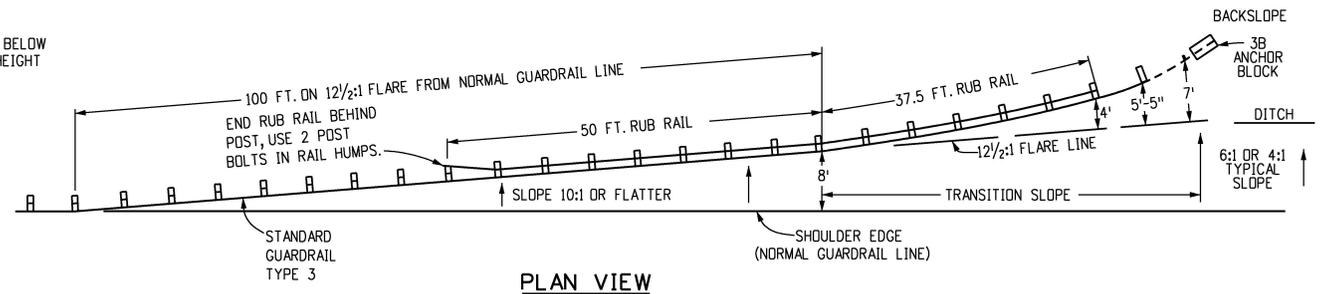
MOUNT A W-BEAM RUB RAIL 1/2 IN. BELOW THE TOP RAIL WHEN THE TOP RAIL HEIGHT EXCEEDS 33 IN. ABOVE THE GROUND



ELEVATION VIEW
(MAXIMUM 4:1 FORSLOPE)

75' MINIMUM TO HAZARD

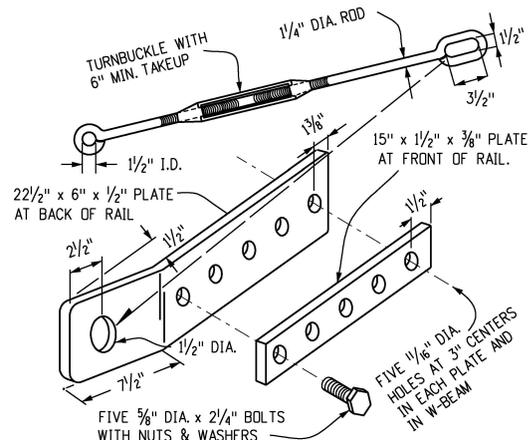
TOP OF GUARDRAIL MAY SLOPE 1% STEEPER THAN SHOULDER EDGE SLOPE



PLAN VIEW

END ANCHORAGE TYPE 3B (RUB RAIL)

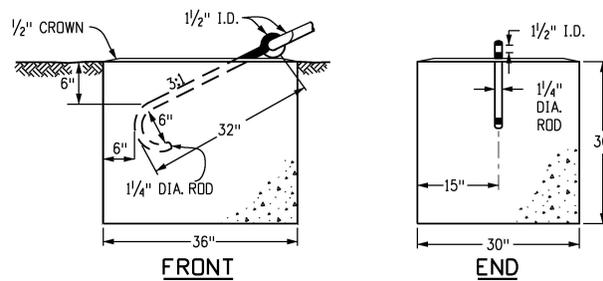
(WITH ROADSIDE DITCH AT GUARDRAIL)



TYPE 3D HARDWARE DETAILS

NOTE: ALL PARTS SHALL BE GALVANIZED

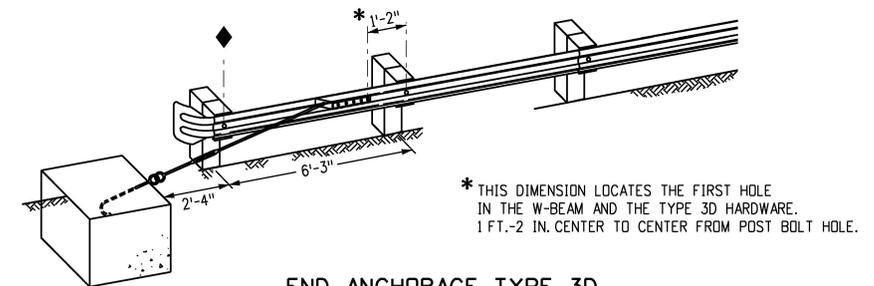
◆ END OF GUARDRAIL PAY LENGTH



FRONT

END

TYPE 3D ANCHOR BLOCK DETAIL



END ANCHORAGE TYPE 3D DEPARTURE TERMINAL

* THIS DIMENSION LOCATES THE FIRST HOLE IN THE W-BEAM AND THE TYPE 3D HARDWARE. 1 FT.-2 IN. CENTER TO CENTER FROM POST BOLT HOLE.

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 TYPE 3 W-BEAM 31 INCHES
 Issued by the Project Development Branch: July 31, 2019

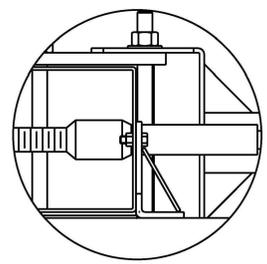
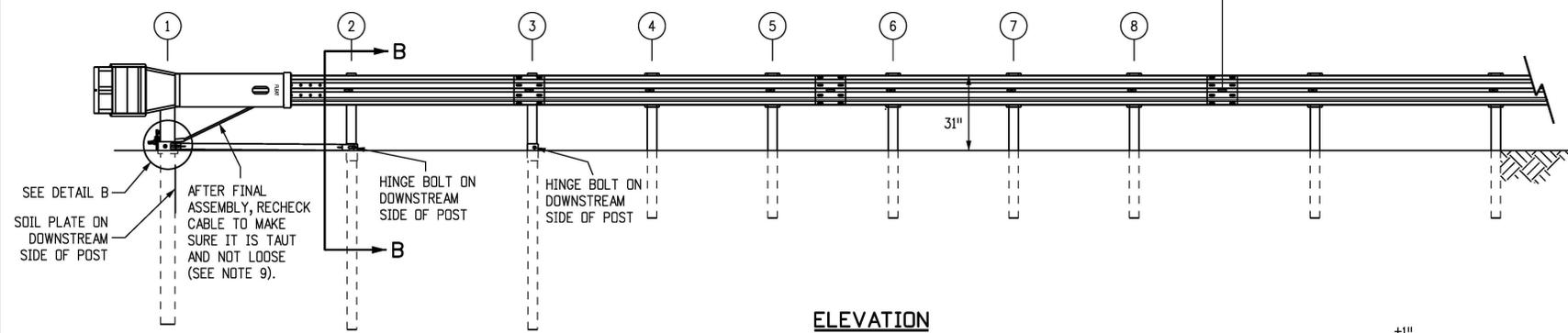
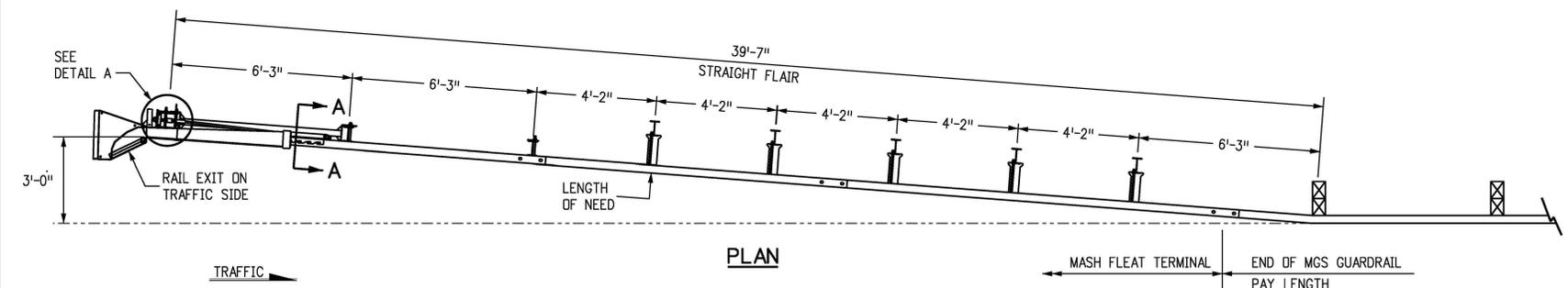
STANDARD PLAN NO.
 M-606-1
 Standard Sheet No. 5 of 19
 Project Sheet Number:

NOTES

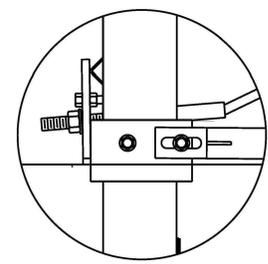
1. THE END ANCHORAGE (FLARED) SHALL BE THE MFLEAT TERMINAL, AS MANUFACTURED BY ROAD SYSTEMS INC. (TELEPHONE #: 432-263-2435). ONE END ANCHORAGE (FLARED) SHALL INCLUDE ALL POST, RAIL, AND ALL HARDWARE ITEMS REQUIRED FOR A COMPLETE UNIT. THE END ANCHORAGE (FLARED) SHALL BE INSTALLED CONFORMING TO THE MANUFACTURER'S 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. RETROREFLECTOR TABS SHALL NOT BE USED ON END ANCHORAGE POSTS.
3. DELINEATION SHALL BE APPLIED TO THE END PIECE, AND SHALL NOT BE PAID FOR SEPARATELY BUT SHALL BE INCLUDED IN THE WORK.
4. AESTHETIC TREATMENT OPTIONS MAY BE AVAILABLE WITH PRIOR APPROVAL OF THE PROJECT ENGINEER. CONTACT THE MANUFACTURER FOR APPROVED AESTHETIC TREATMENT OPTIONS.
5. ALL BOLTS, NUTS, CABLE ASSEMBLIES, CABLE ANCHORS AND BEARING PLATES SHALL BE GALVANIZED.
6. THE LOWER SECTIONS OF THE POSTS 1, 2, AND 3 SHALL NOT PROTRUDE MORE THAN 4 INCHES ABOVE THE GROUND (MEASURED ALONG A 5 FOOT CORD). SITE GRADING MAY BE NECESSARY TO MEET THIS REQUIREMENT.
7. THE LOWER SECTIONS OF THE HINGED POSTS SHOULD NOT BE DRIVEN WITH THE UPPER POST ATTACHED. IF THE POST IS PLACED IN A DRILLED HOLE, THE BACKFILL MATERIAL MUST BE SATISFACTORILY COMPACTED TO PREVENT SETTLEMENT.
8. WHEN COMPETENT ROCK IS ENCOUNTERED, A 12 INCH DIA. POST HOLE, DRILLED 20 INCHES DEEP INTO THE ROCK SURFACE SHALL BE USED IF APPROVED BY THE ENGINEER FOR POSTS 1 AND/OR 2. GRANULAR MATERIAL SHALL BE PLACED IN THE BOTTOM OF THE HOLE, APPROXIMATELY 2.5 INCHES DEEP TO PROVIDE DRAINAGE. THE FIRST AND/OR SECOND POST SHALL BE FIELD CUT TO LENGTH, PLACED IN THE HOLE AND BACKFILLED WITH SUITABLE BACKFILL. THE SOIL PLATE MAY BE TRIMMED IF REQUIRED.
9. THE BREAKAWAY CABLE ASSEMBLY SHALL BE TAUT. A LOCKING DEVICE (VICE GRIPS OR CHANNEL LOCK PLIERS) SHOULD BE USED TO PREVENT THE CABLE FROM TWISTING WHEN TIGHTENING NUTS.

OFFSET NOTES

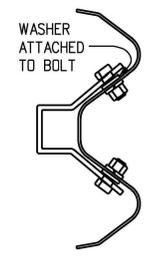
1. POST OFFSET DIMENSIONS ARE GIVEN TO THE CENTER OF THE TRAFFIC FACE OF POSTS.
2. THE GUARDRAIL BETWEEN POST 1 THRU 8 IS ON A STRAIGHT LINE FLARE.



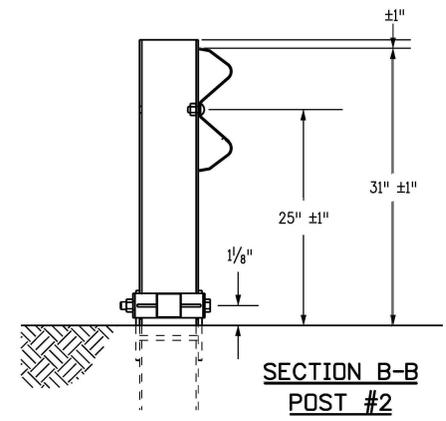
DETAIL A
IMPACT HEAD CONNECTION



DETAIL B
POST #1 CONNECTION



SECTION A-A
ANCHOR BRACKET

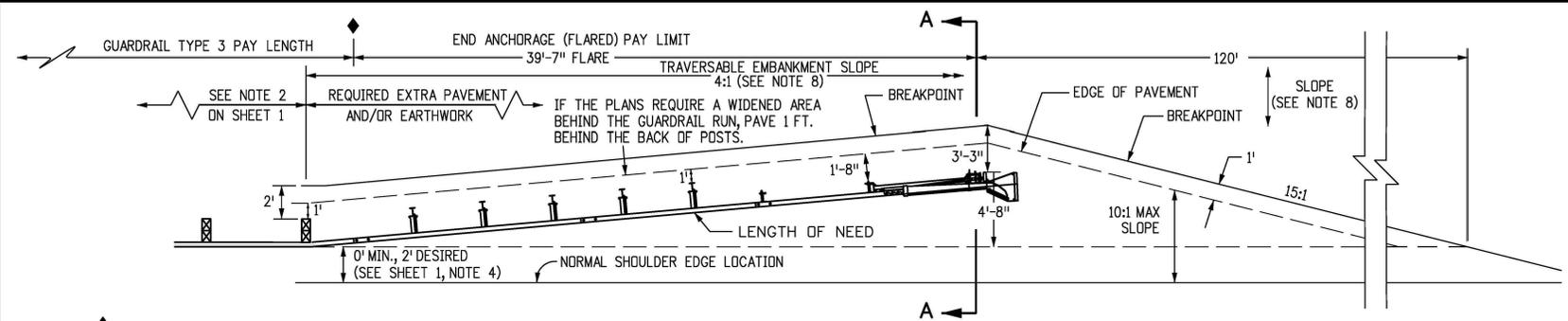


SECTION B-B
POST #2

END ANCHORAGES (FLARED)

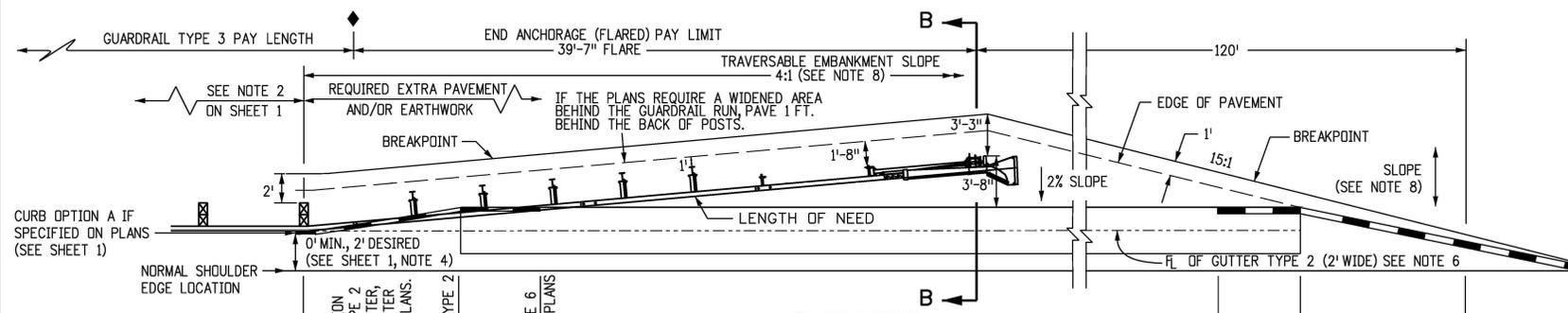
MFLEAT TERMINAL
(MASH CERTIFIED)

Computer File Information		Sheet Revisions		Colorado Department of Transportation		MIDWEST		STANDARD PLAN NO.	
Creation Date: 07/31/19		Date: 03/05/20		2829 West Howard Place		GUARDRAIL SYSTEM (MGS)		M-606-1	
Designer Initials: JBK		Comments: Replaced the SR1-31 and FLEAT 350 flared terminals with the MFLEAT flared terminal to be MASH compliant.		CDOT HQ, 3rd Floor		TYPE 3 W-BEAM 31 INCHES		Standard Sheet No. 6 of 19	
Last Modification Date: 03/05/20				Denver, CO 80204					
Detailer Initials: LTA				Phone: 303-757-9021 FAX: 303-757-9868					
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English				Project Development Branch		JBK		Issued by the Project Development Branch: July 31, 2019	
								Project Sheet Number:	

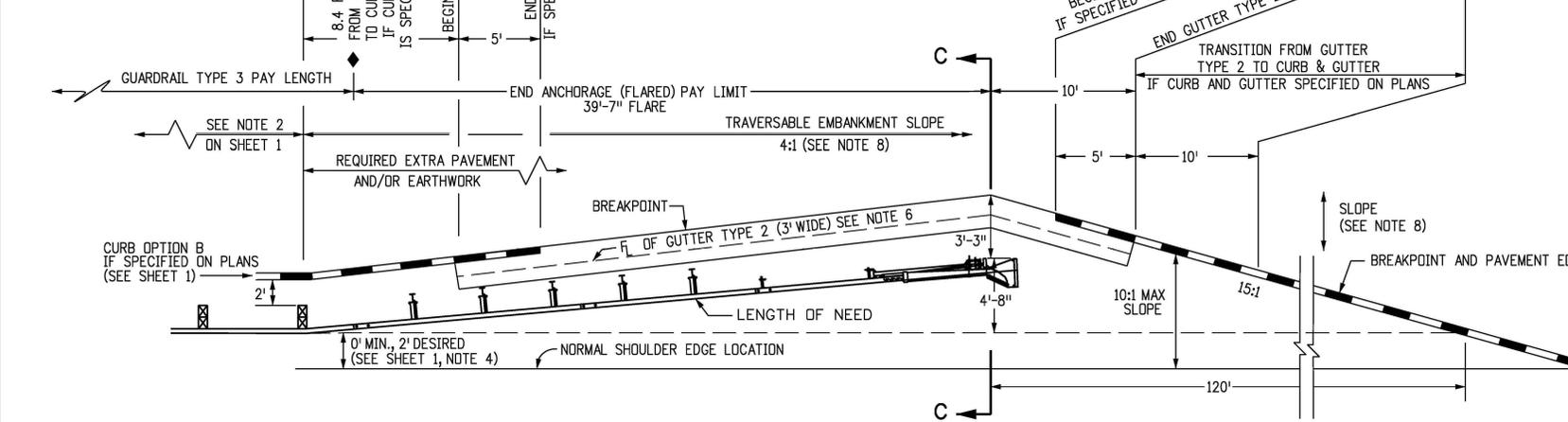


**PLAN VIEW
WIDENING FOR END ANCHORAGE (FLARED)***

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

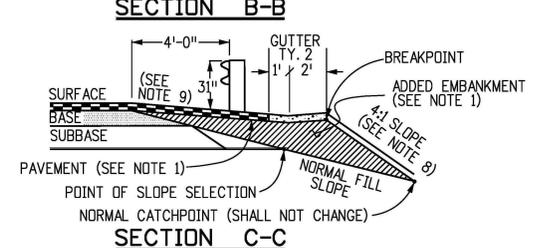
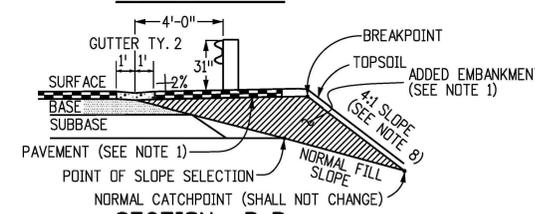
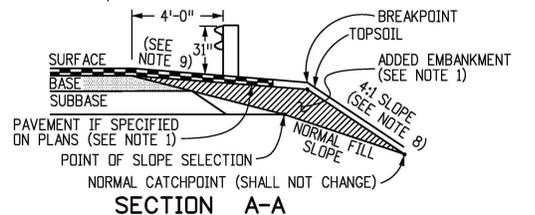


**PLAN VIEW
WIDENING FOR END ANCHORAGE (FLARED)
WITH CURB OPTION A***



**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:	07/31/19
Designer Initials:	JBK
Last Modification Date:	03/05/20
Detailer Initials:	LTA
CAD Ver.:	MicroStation V8 Scale: Not to Scale Units: English

Sheet Revisions	
Date:	Comments
03/05/20	Replaced the old end anchorage drawings with the new MFLFAT end anchorage drawing.

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 Phone: 303-757-9021 FAX: 303-757-9868

Project Development Branch JBK

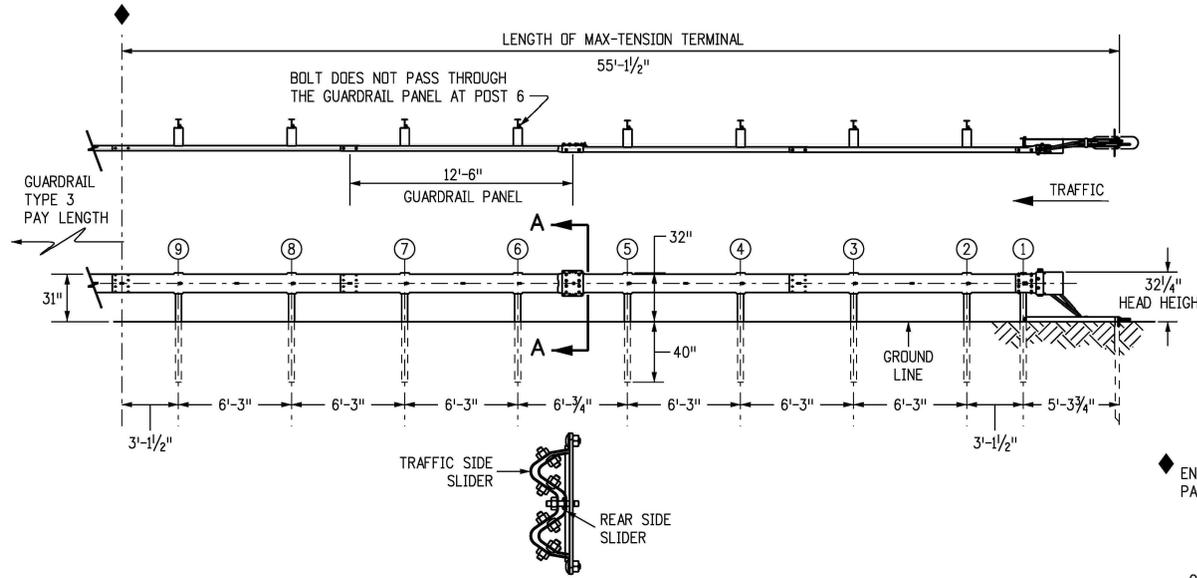
MIDWEST
 GUARDRAIL SYSTEM (MGS)
 TYPE 3 W-BEAM 31 INCHES

Issued by the Project Development Branch: July 31, 2019

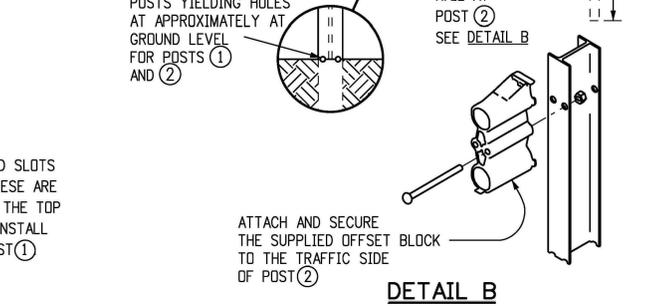
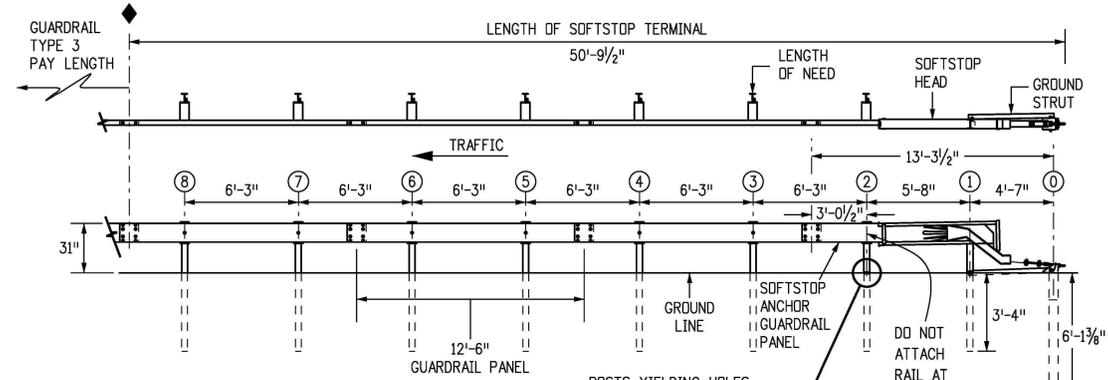
STANDARD PLAN NO.
 M-606-1
 Standard Sheet No. 7 of 19
 Project Sheet Number:

NOTES FOR NONFLARED

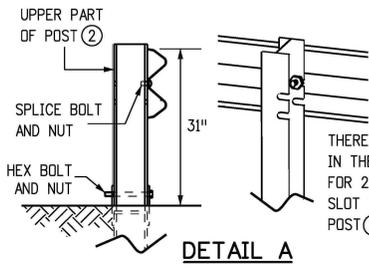
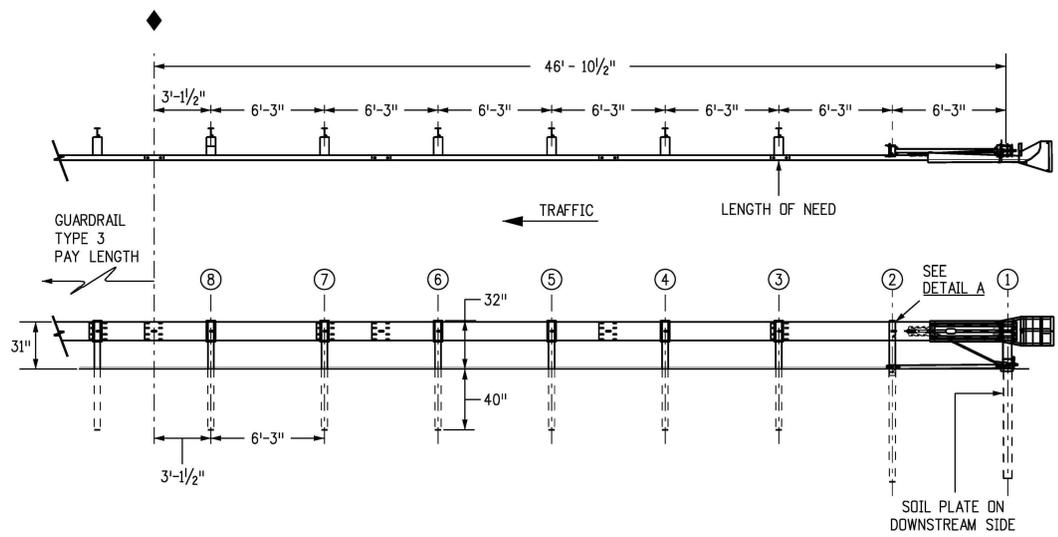
1. THE END ANCHORAGE (NONFLARED) SHALL EITHER BE THE SOFTSTOP AS MANUFACTURED BY TRINITY INDUSTRIES, INC. (TEL. #: 1-888-356-2363), OR THE MAX-TENSION AS MANUFACTURED BY LINDSAY TRANSPORTATION SOLUTIONS (TEL. #: 402-829-6800), OR THE MSKT AS MANUFACTURED BY ROAD SYSTEMS, INC. (TEL. #: 432-263-2435). 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. 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 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)



DETAIL B
SOFTSTOP TERMINAL END ANCHORAGE (NONFLARED)
(MASH CERTIFIED)



DETAIL A
MSKT TERMINAL END ANCHORAGE (NONFLARED)
(MASH CERTIFIED)

END ANCHORAGES (NONFLARED)

Computer File Information	
Creation Date: 07/31/19	
Designer Initials: JBK	(R-X)
Last Modification Date: 03/05/20	(R-X)
Detailer Initials: LTA	(R-X)
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	(R-X)

Sheet Revisions	
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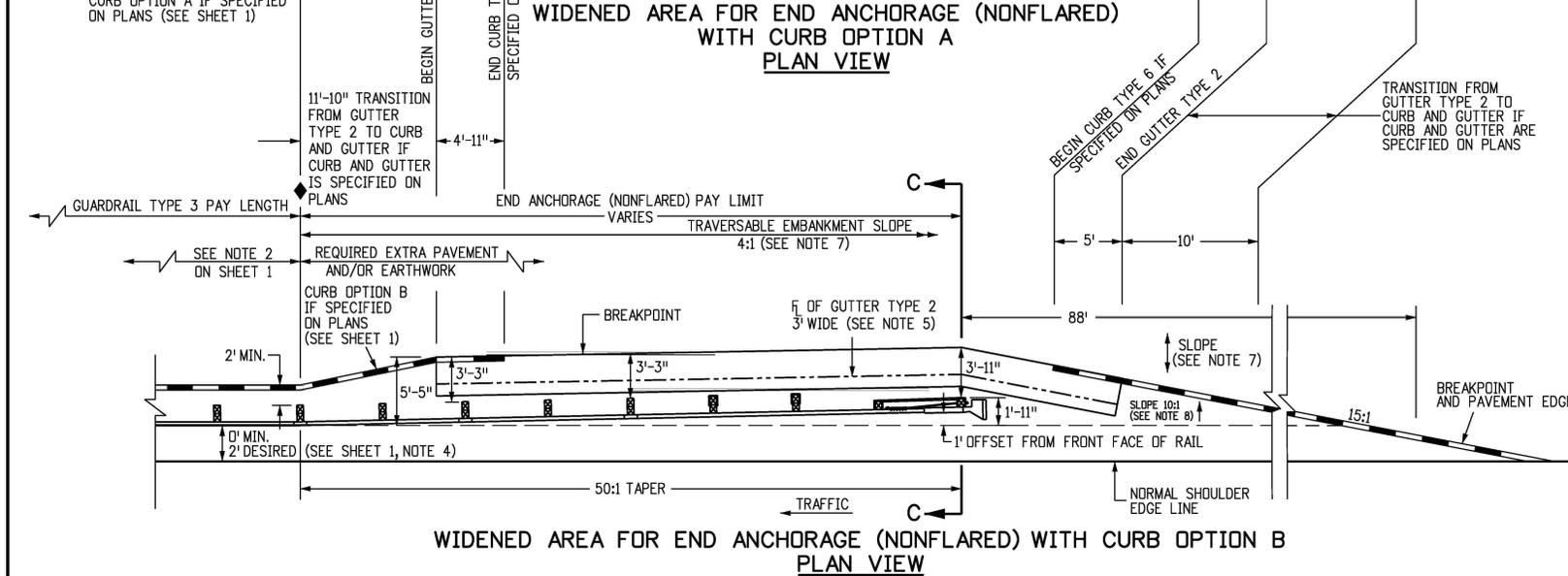
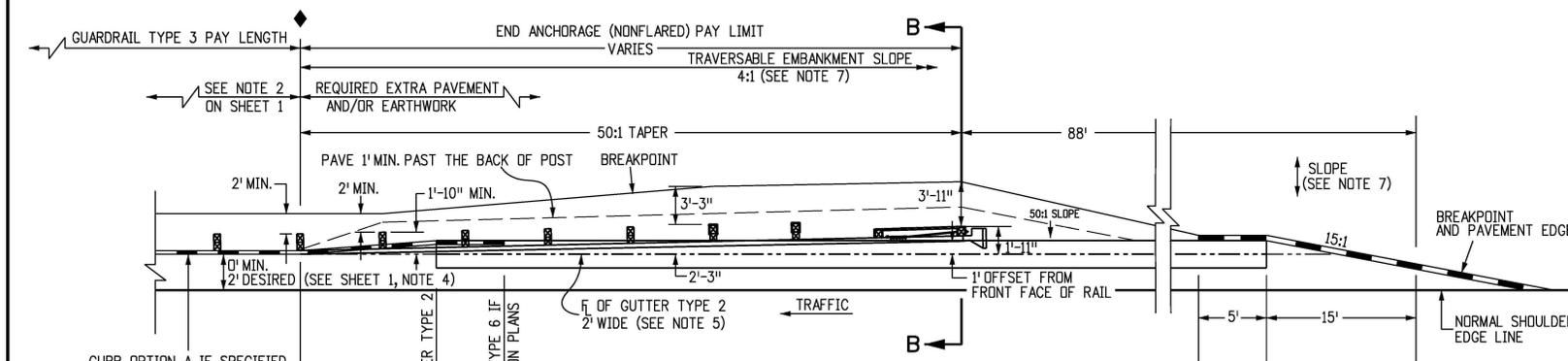
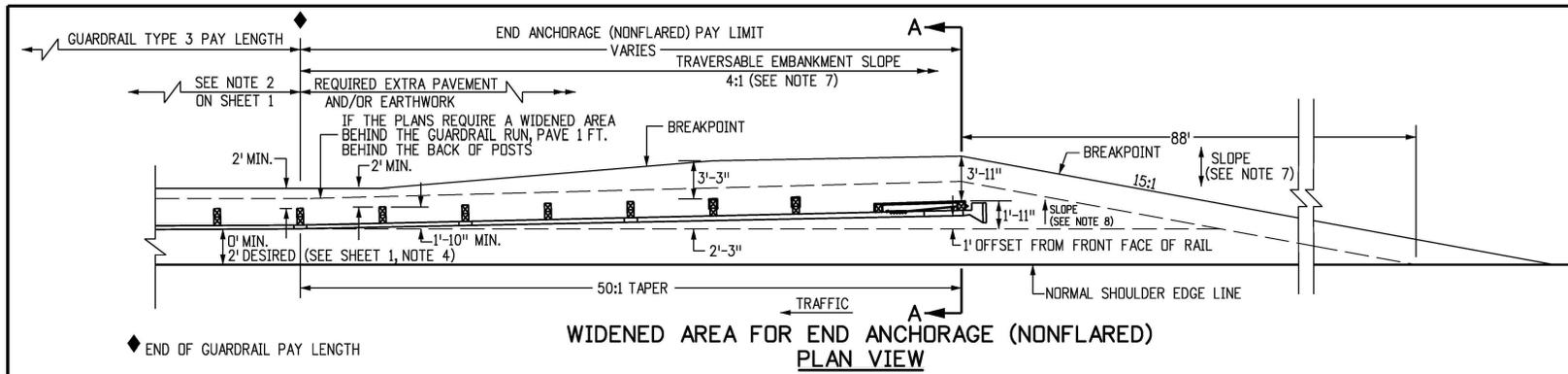
Project Development Branch **JBK**

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

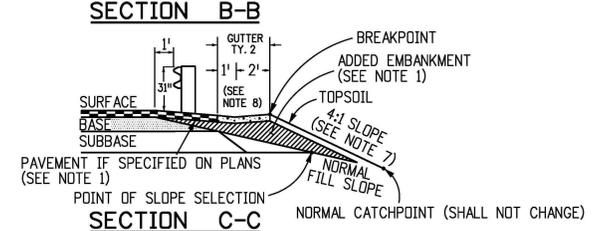
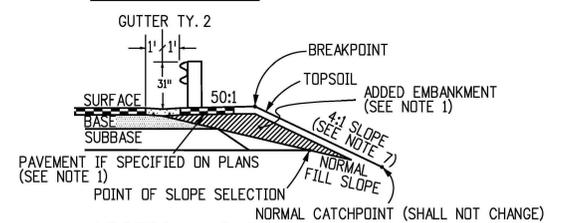
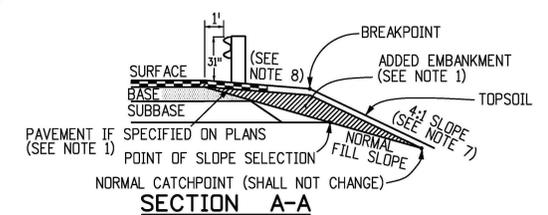
Issued by the Project Development Branch: July 31, 2019

STANDARD PLAN NO.
M-606-1
Standard Sheet No. 8 of 19

Project Sheet Number:



- 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, 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.



Computer File Information	
Creation Date: 07/31/19	
Designer Initials: JBK	(R-X)
Last Modification Date: 03/05/20	(R-X)
Detailer Initials: LTA	(R-X)
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	(R-X)

Sheet Revisions	
Date:	Comments

Colorado Department of Transportation
 2829 West Howard Place
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 Denver, CO 80204
 Phone: 303-757-9021 FAX: 303-757-9868
 Project Development Branch JBK

MIDWEST
 GUARDRAIL SYSTEM (MGS)
 TYPE 3 W-BEAM 31 INCHES
 Issued by the Project Development Branch: July 31, 2019

STANDARD PLAN NO.
 M-606-1
 Standard Sheet No. 9 of 19
 Project Sheet Number:

MEDIAN TERMINAL NOTES

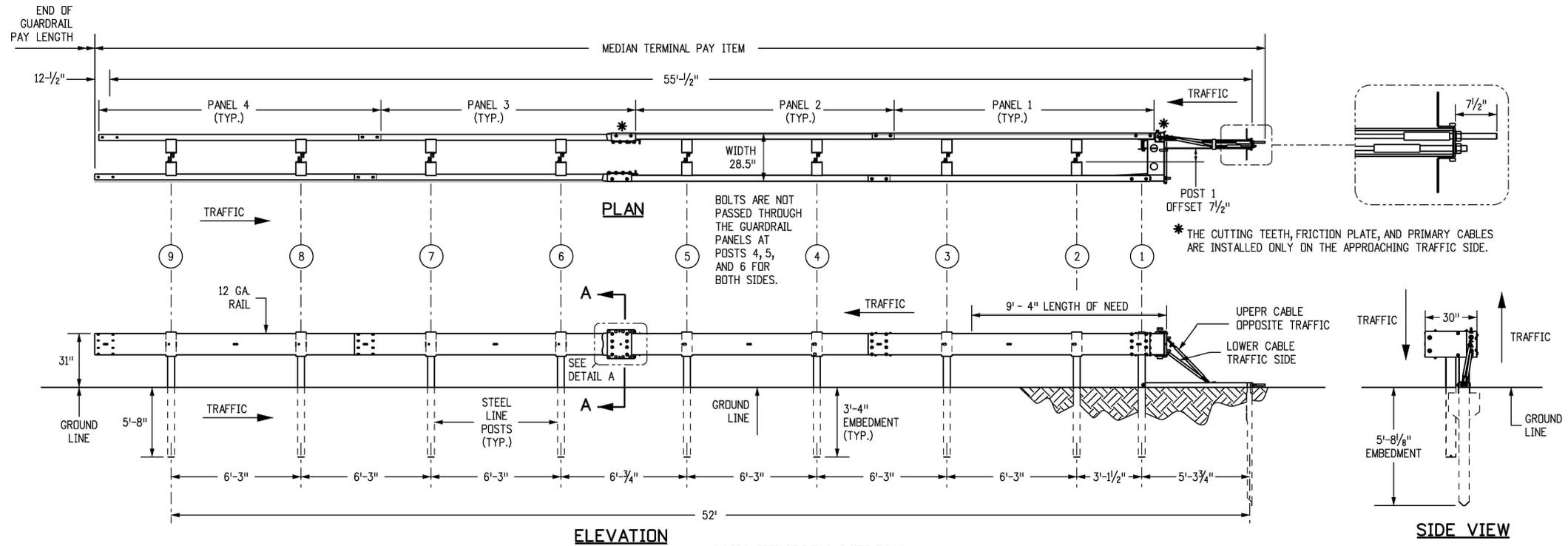
1. THE MEDIAN TERMINAL SHALL BE THE MAX-TENSION MEDIAN AS MANUFACTURED BY BY BARRIER SYSTEM BY LINDSAY (LINDSAY TRANSPORTATION SOLUTIONS) (TEL #: 888 800-3691).
2. THE MAX-TENSION SHALL BE APPLIED DIRECTLY TO W-BEAM GUARDRAIL SYSTEMS AT, OR TRANSITIONED TO, 31 INCH WITH PANELS AND POST SPACING CONFIGURED AT MID-SPAN SPLICE. TRANSITIONS TO STRONG POST W-BEAM GUARDRAIL SYSTEMS OR OTHER BARRIERS WHERE THE SPLICE IS NOT MID-SPAN SHALL BE ACCOMPLISHED USING A 3 FT. 1-1/2 INCH, 9 FT. 4-1/2 INCH OR 15 FT. 7-1/2 INCH PANELS AFTER THE MAX-TENSION SYSTEM (MIN. OF 50 FT. DOWNSTREAM OF THE FIRST POST). TRANSITIONS TO OTHER BARRIER SYSTEMS SHALL ALSO BE AT A MIN. OF 50 FT. DOWNSTREAM FROM THE FIRST POST. SEE SHEET 4.
3. THE MAX-TENSION SHALL NOT BE ATTACHED DIRECTLY TO RIGID BARRIERS SUCH AS CONCRETE BARRIERS, STEEL BARRIERS OR CONCRETE STRUCTURES WITHOUT PROPER TRANSITION. IF ROCK OR STIFF SOIL IS ENCOUNTERED, THE POSTS AND SOIL ANCHOR MAY BE INSTALLED BY AUGURING AND BACKFILLING THE HOLE.
4. EITHER 8 INCH OR 12 INCH COMPOSITE OR TIMBER BLOCKOUTS SHALL BE USED PER MANUFACTURER'S RECOMMENDATIONS.
5. EITHER 12 FT.-6 INCH OR 25 FOOT PANELS SHALL BE USED DEPENDING ON SITE CONDITIONS OR CONNECTED BARRIER SYSTEMS.
6. RAIL PANELS SHALL BE LAPPED PER MANUFACTURER'S INSTALLATION MANUAL, REGARDLESS OF AN UPSTREAM OR DOWNSTREAM END SYSTEM POSITION.
7. ALL STEEL COMPONENTS SHALL BE GALVANIZED PER ASTM A123 OR EQUIVALENT UNLESS OTHERWISE STATED.
8. 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.
9. UNLESS OTHERWISE SPECIFIED ON THE PLANS, THE MEDIAN TERMINAL SHALL BE INSTALLED FOR BIDIRECTIONAL TRAFFIC APPLICATION.
10. 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.
11. 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.

THE TRAFFIC SIDE SLIDER AND THE REAR SIDE SLIDER INSTALLED WITH ARROWS POINTING TOWARDS THE HEAD OF THE SYSTEM ON BOTH SIDES OF TRAFFIC

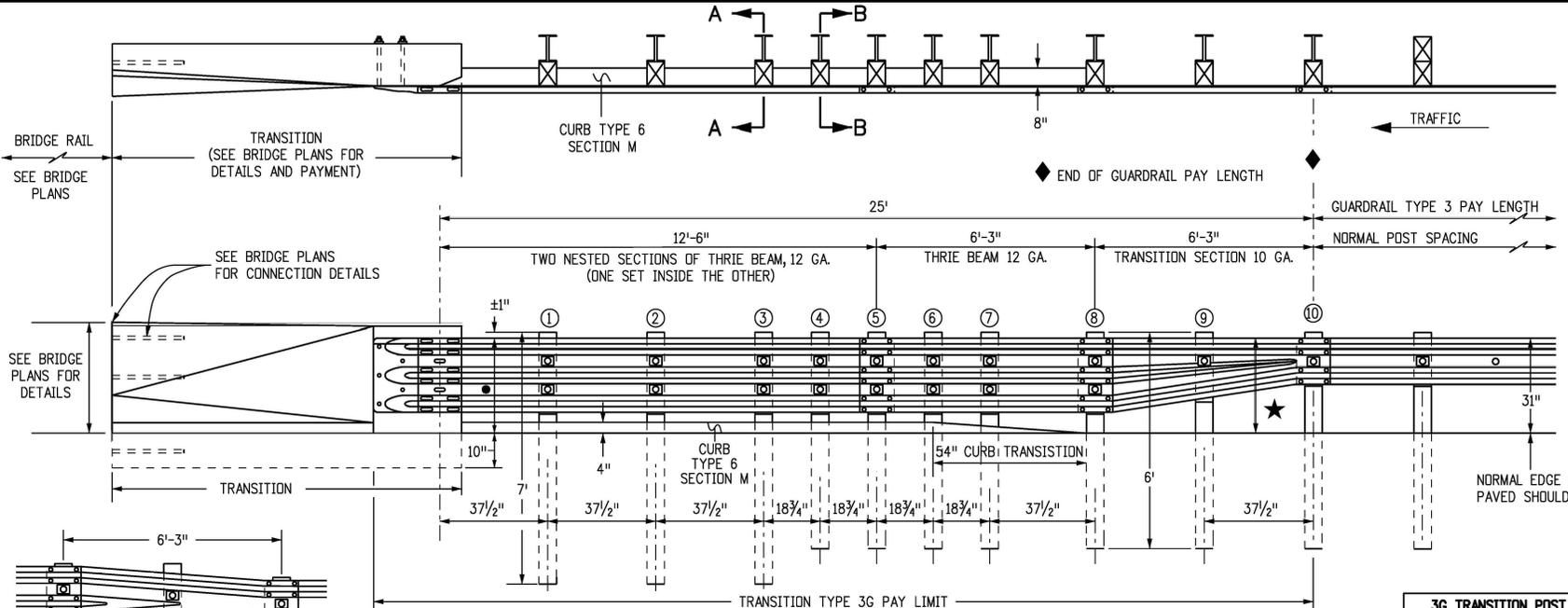
HEX BOLTS SHALL BE INSTALLED WITH THE BOLT HEADS ON THE TRAFFIC SIDE AND THE HEX NUTS ON THE NON-TRAFFIC SIDE

SECTION A-A

DETAIL A



Computer File Information		Sheet Revisions		Colorado Department of Transportation		MIDWEST GUARDRAIL SYSTEM (MGS) TYPE 3 W-BEAM 31 INCHES		STANDARD PLAN NO. M-606-1	
Creation Date: 07/31/19		Date: _____		2829 West Howard Place CDDT HQ, 3rd Floor Denver, CO 80204 Phone: 303-757-9021 FAX: 303-757-9868		Issued by the Project Development Branch: July 31, 2019		Standard Sheet No. 10 of 19 Project Sheet Number: _____	
Designer Initials: JBK		(R-X) _____							
Last Modification Date: 03/05/20		(R-X) _____							
Detailer Initials: LTA		(R-X) _____							
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English		(R-X) _____		Project Development Branch		JBK			



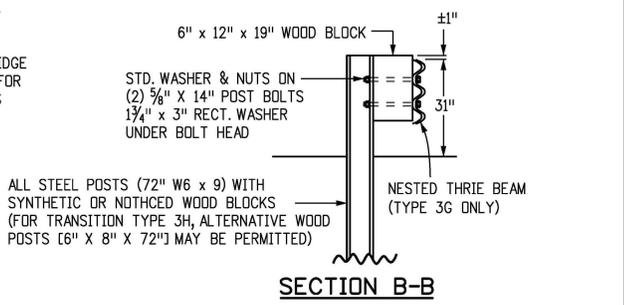
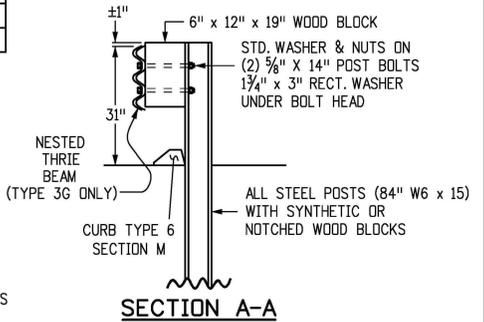
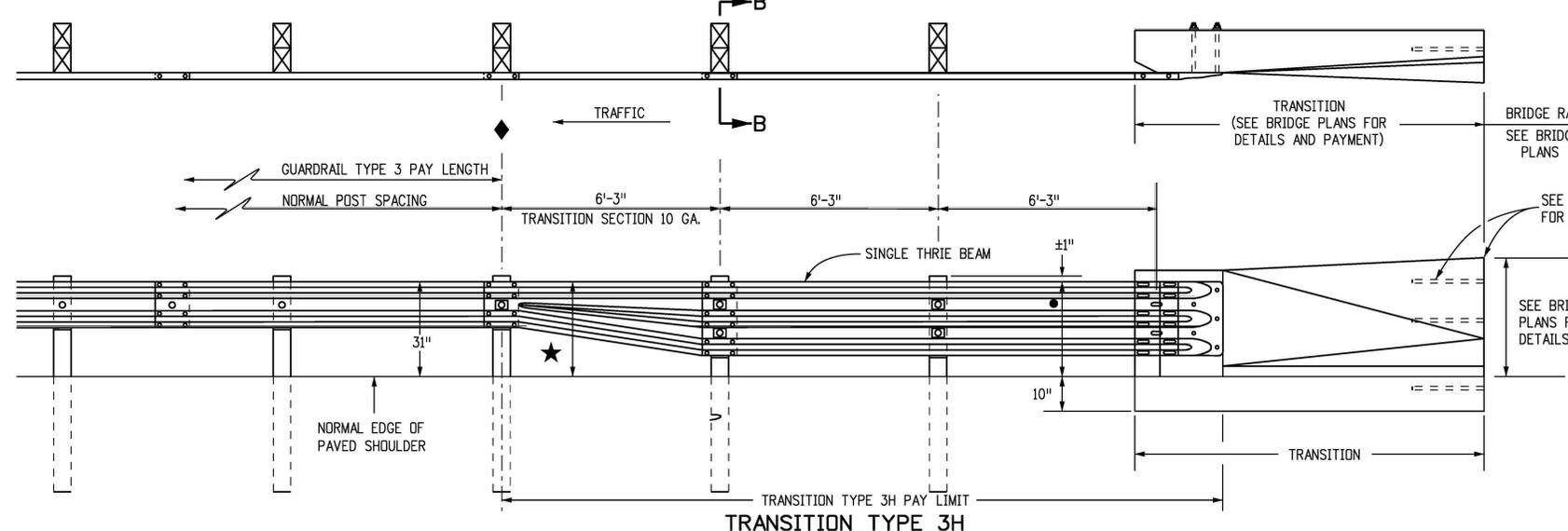
TRANSITION TYPE 3G
ALL POSTS SHALL BE STEEL

★ IF THE HEIGHT OF THE TRANSITION TYPES 3G OR 3H IS MORE THAN 31", THEN A SYMMETRICAL TRANSITION SECTION SHALL BE USED HERE.

● 31" FOR ASPHALT BRIDGE OVERLAY.
33.25" FOR POLYMER CONCRETE BRIDGE OVERLAY.

3G TRANSITION POST / BLOCK SIZING		
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"

- 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 TRANSITION TYPES 3G AND 3H MAY BE SHOP BENT TO FIT CORRESPONDING RADIUS CURVES. HOWEVER, THE 6 FT.-3 IN. TRANSITION SECTION SHALL NOT BE BENT.
 4. A TRANSITION SHALL BE REQUIRED BETWEEN TYPES 3G OR 3H AND THE BRIDGE RAILS. SEE STANDARD PLAN M-606-15 FOR THE TRANSITION TO TYPE 9 GUARDRAIL BARRIER.
 5. TRANSITION TYPES 3G AND 3H ARE BOTH MASH COMPLIANT.
 6. BACKUP PLATE IS NOT REQUIRED AT POSTS ON TYPE 3G AND 3H.
 7. □ 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.



Computer File Information	
Creation Date: 07/31/19	
Designer Initials: JBK	(R-X)
Last Modification Date: 03/05/20	(R-X)
Detailer Initials: LTA	(R-X)
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	(R-X)

Sheet Revisions	
Date:	Comments
03/05/20	Revised Gen. Notes 3 & 5. Revised transition sections notes to see the "Bridge Plans" and deleted their x-sections details. Revised the ★ note.

Colorado Department of Transportation

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

Project Development Branch **JBK**

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

Issued by the Project Development Branch: July 31, 2019

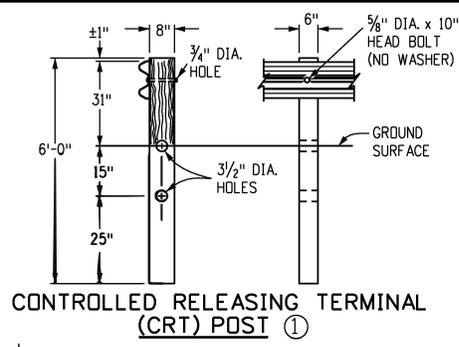
STANDARD PLAN NO.
M-606-1
Standard Sheet No. 11 of 19

Project Sheet Number:

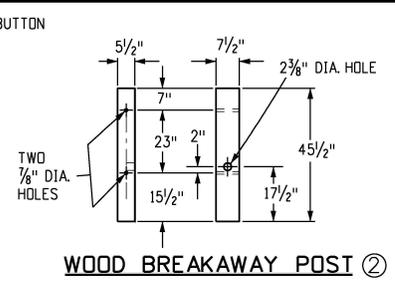
NOTES

- 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. **END ANCHORAGE TYPE 3K IS NOT CRASHWORTHY.** 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 ASTM 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.



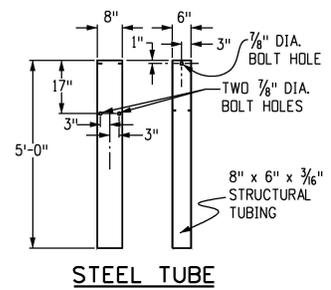
CONTROLLED RELEASING TERMINAL (CRT) POST ①



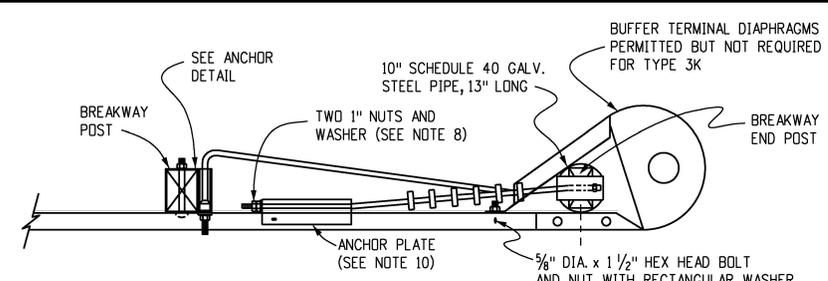
WOOD BREAKAWAY POST ②

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

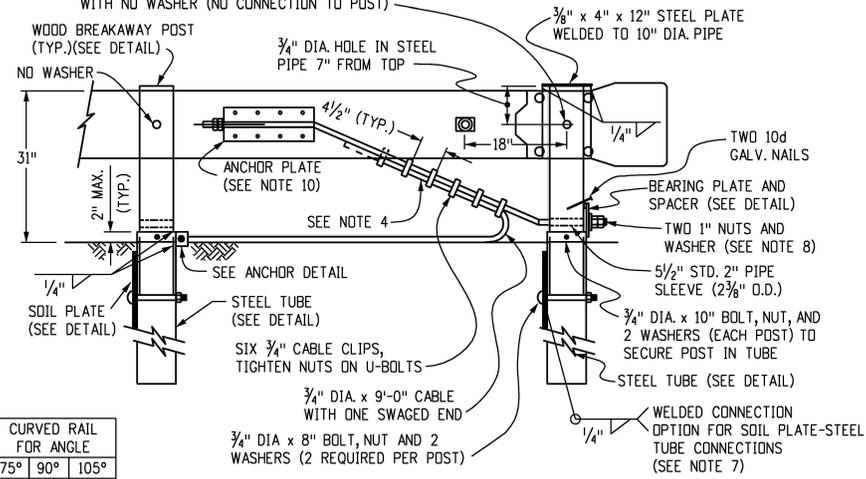
POSTS



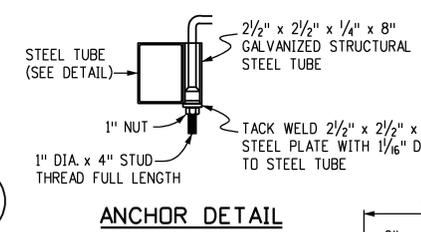
STEEL TUBE



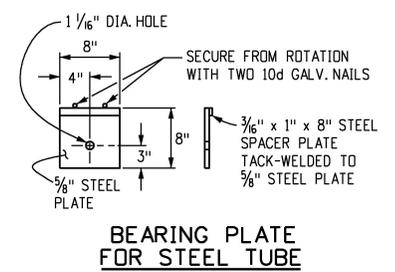
LOW SPEED END ANCHORAGE - TYPE 3K



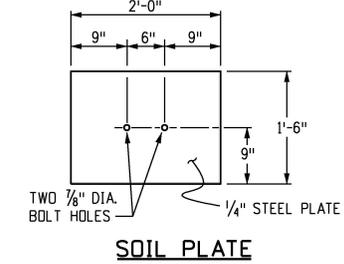
LOW SPEED END ANCHORAGE - TYPE 3K



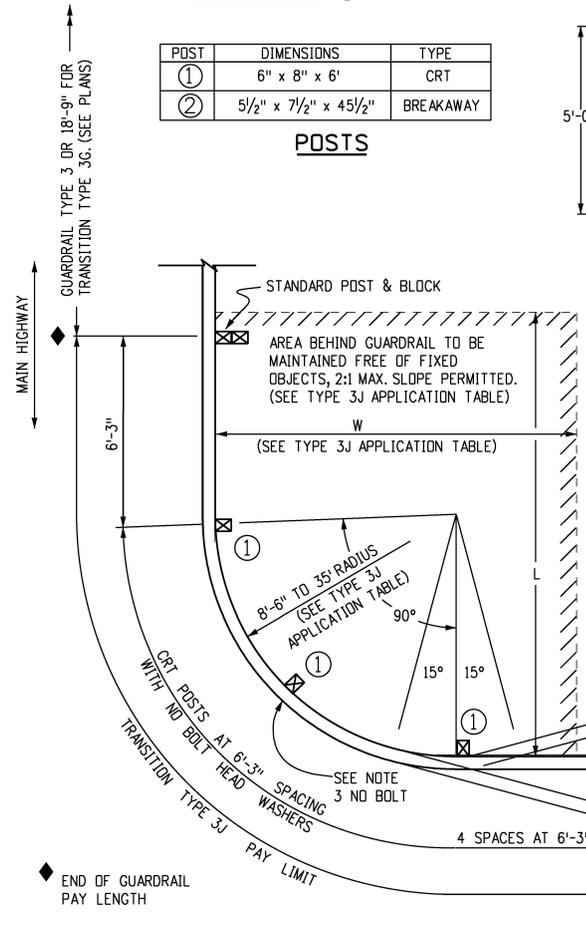
ANCHOR DETAIL



BEARING PLATE FOR STEEL TUBE



SOIL PLATE



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'
			30'	15'	22'	27'	31'
17'	75°-90°	6					
	91°-105°	7					
	75°-85°	7					
25'-6"	86°-95°	8	40'	20'	33'	40'	47'
	96°-105°	9					
	75°-85°	9					
35'	86°-95°	10	50'	20'	46'	55'	64'
	96°-105°	11					
	75°-85°	11					

TRANSITION TYPE 3J APPLICATION

INTERSECTING ROADWAYS TRANSITION - TYPE 3J TRANSITION

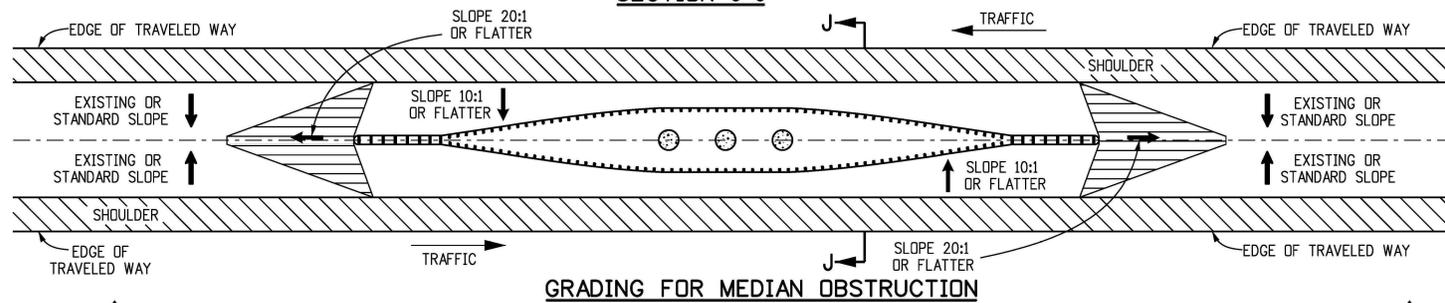
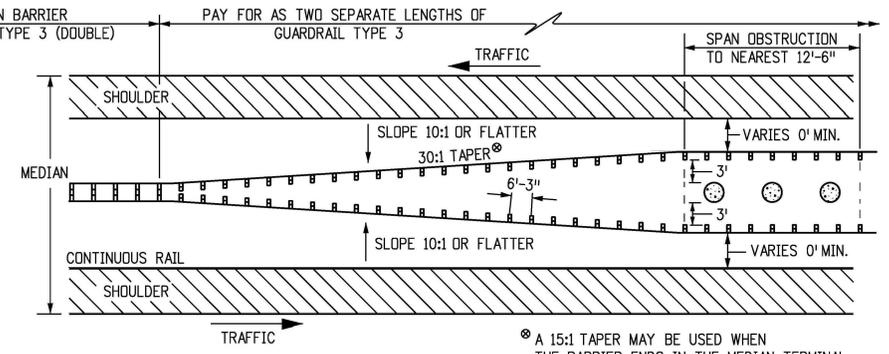
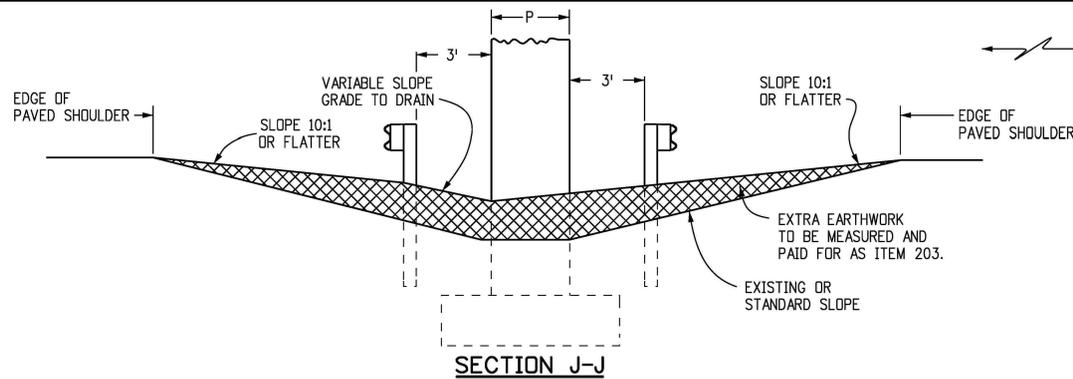
Computer File Information	
Creation Date: 07/31/19	
Designer Initials: JBK	
Last Modification Date: 03/05/20	
Detailer Initials: LTA	
CAD Ver.: MicroStation V8	Scale: Not to Scale Units: English

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

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 Project Development Branch JBK

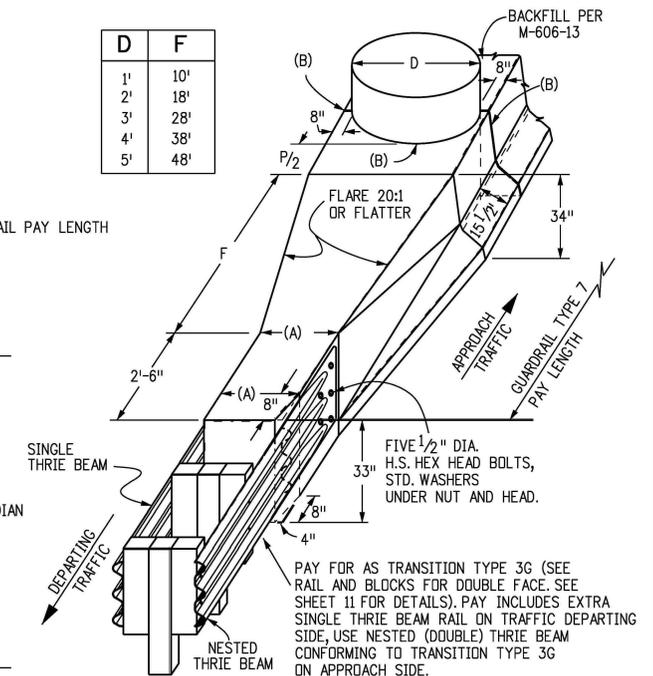
MIDWEST
 GUARDRAIL SYSTEM (MGS)
 TYPE 3 W-BEAM 31 INCHES
 Issued by the Project Development Branch: July 31, 2019

STANDARD PLAN NO.
 M-606-1
 Standard Sheet No. 12 of 19
 Project Sheet Number:



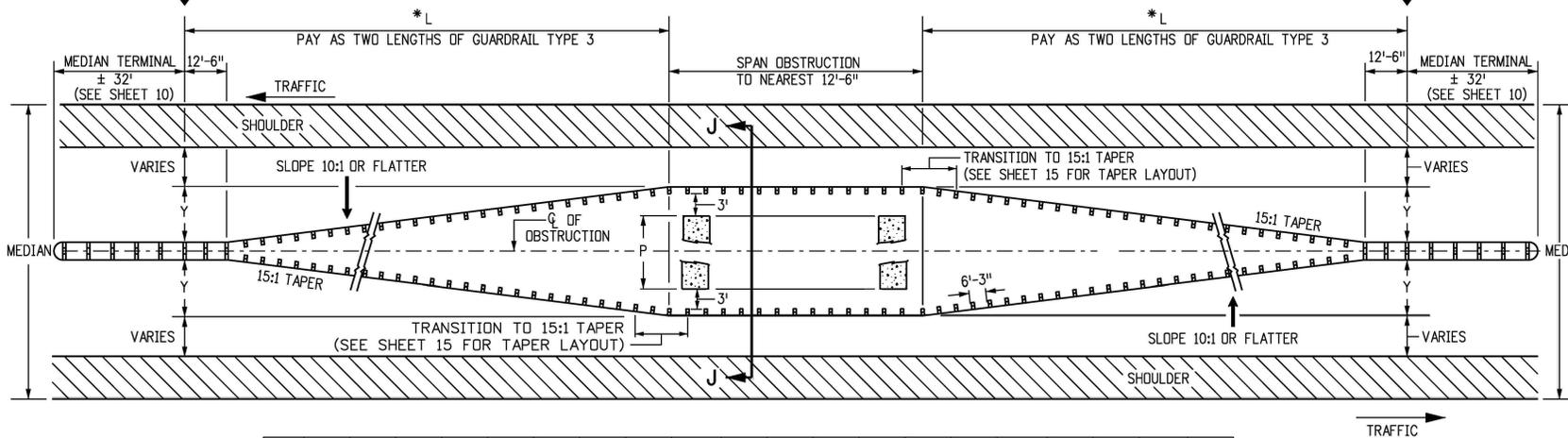
OBSTRUCTION IN MEDIAN 30 FT. WIDE OR LESS

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



- (A). TIMBER POSTS 2 FT., STEEL POSTS 1 FT.-9/16 IN.
- (B). 1/2 IN. PREFORMED JOINT MATERIAL

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



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 16.

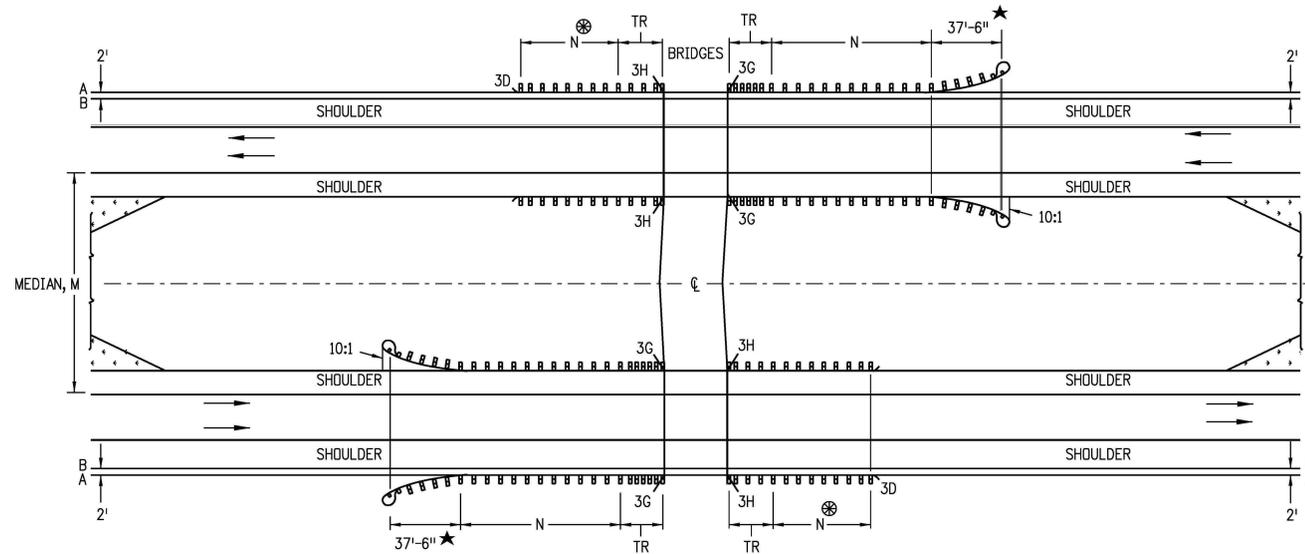
* L IS MEASURED ALONG FACE OF GUARDRAIL

OBSTRUCTIONS IN MEDIANS

Computer File Information		Sheet Revisions		Colorado Department of Transportation		MIDWEST GUARDRAIL SYSTEM (MGS) TYPE 3 W-BEAM 31 INCHES		STANDARD PLAN NO. M-606-1	
Creation Date: 07/31/19		Date: _____		2829 West Howard Place		Issued by the Project Development Branch: July 31, 2019		Standard Sheet No. 13 of 19	
Designer Initials: JBK		Comments: _____		CDOT HQ, 3rd Floor					
Last Modification Date: 03/05/20				Denver, CO 80204					
Detailer Initials: LTA				Phone: 303-757-9021 FAX: 303-757-9868					
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English				Project Development Branch		JBK		Project Sheet Number: _____	

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.



MULTILANE DIVIDED HIGHWAYS FOR STEEP EMBANKMENTS IN MEDIAN

⊗ - 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.

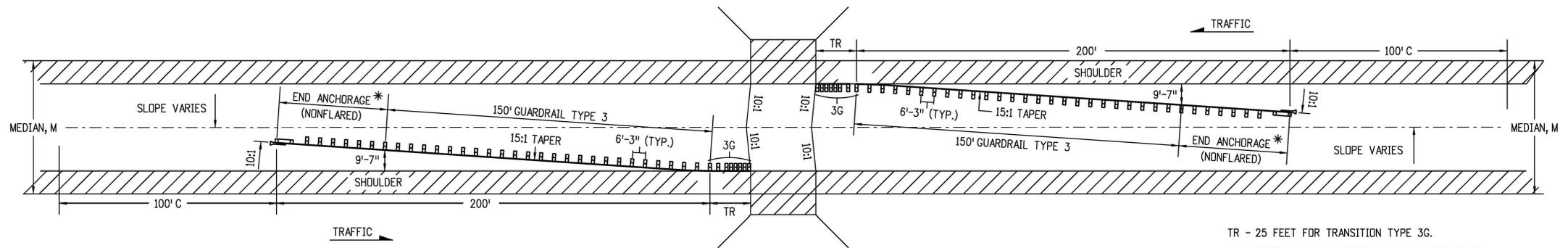
TR - 25 FEET FOR TRANSITION TYPES 3G AND 3H.

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

B - EDGE OF 6 FT. OR LESS SHOULDER.

★ - END ANCHORAGE CAN BE FLARED OR NONFLARED.

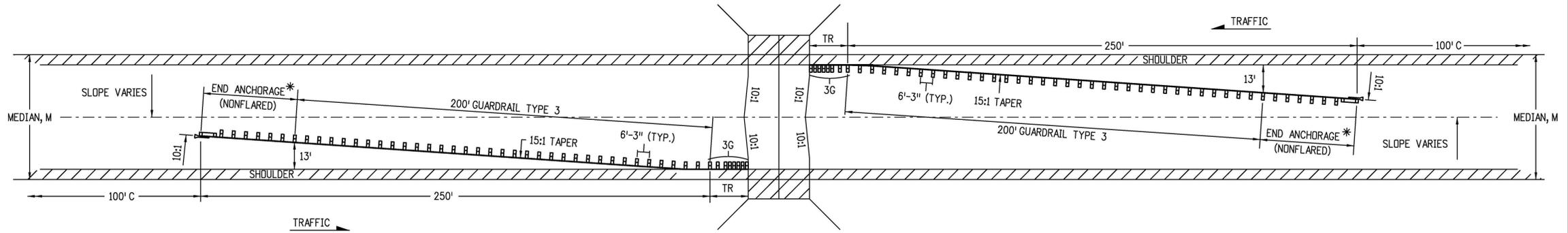
Computer File Information		Sheet Revisions		Colorado Department of Transportation		MIDWEST		STANDARD PLAN NO.			
Creation Date: 07/31/19		Date: _____		2829 West Howard Place CDDT HQ, 3rd Floor Denver, CO 80204 Phone: 303-757-9021 FAX: 303-757-9868		GUARDRAIL SYSTEM (MGS)		M-606-1			
Designer Initials: JBK		Comments: _____				TYPE 3 W-BEAM 31 INCHES		Standard Sheet No. 14 of 19			
Last Modification Date: 03/05/20		_____				Project Development Branch JBK		Issued by the Project Development Branch: July 31, 2019		Project Sheet Number: _____	
Detailer Initials: LTA		_____									
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English		_____									



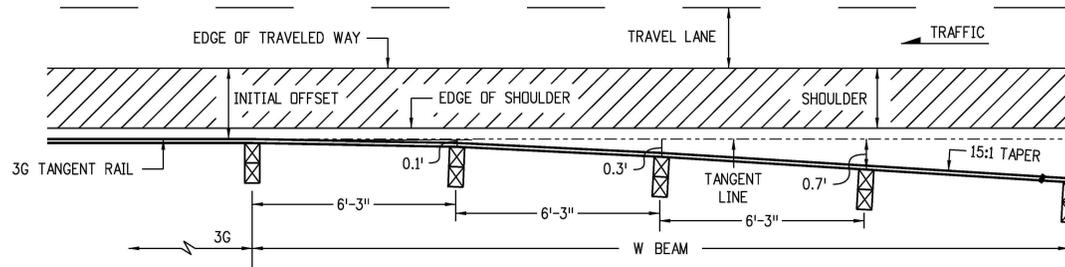
MEDIANS 60 FT. AND OVER WITH 10 FT. OR WIDER SHOULDERS.

* END ANCHORAGE LENGTH AND FLARE RATES VARY BY DEVICE. SEE MANUFACTURER/SUPPLIER FOR INSTALLATION REQUIREMENTS.

TR - 25 FEET 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

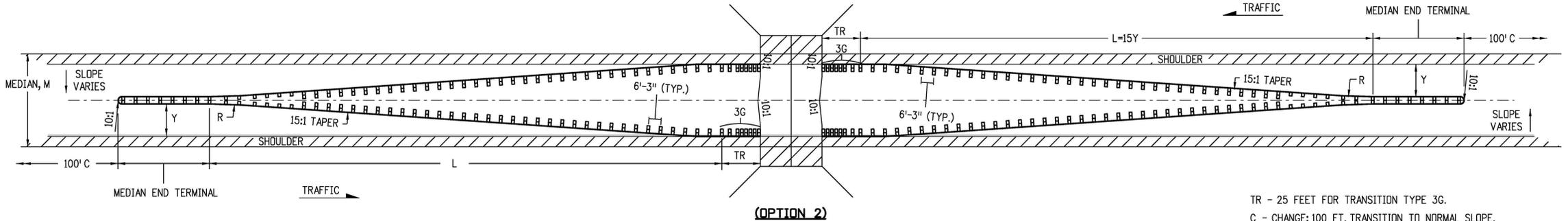
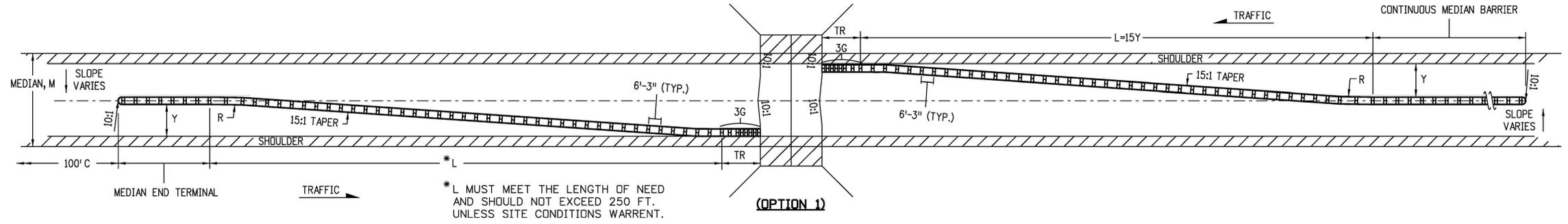
1. GUARDRAIL TRANSITIONS FROM PARALLEL TO ROADWAY SHOULDER AT 3G SEGMENT TO 15:1 TAPER WITHIN 25 FEET BASED ON POST OFFSET DIMENSIONS SHOWN.
2. SEE SHEET 14 FOR THE RIGHT SHOULDER GUARDRAIL LAYOUT.

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

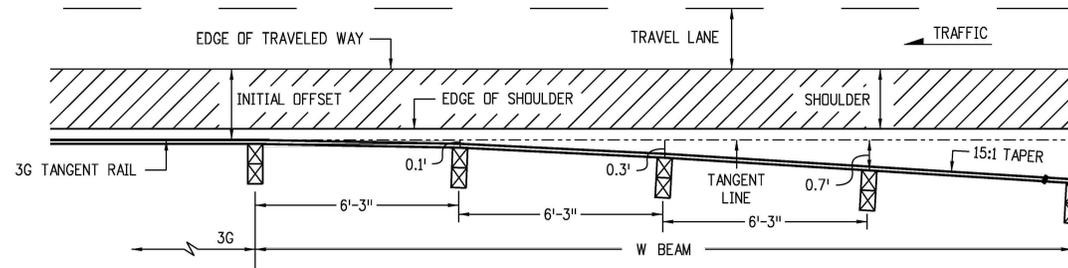
Computer File Information		Sheet Revisions		Colorado Department of Transportation		MIDWEST		STANDARD PLAN NO.	
Creation Date: 07/31/19		Date:	Comments	2829 West Howard Place		GUARDRAIL SYSTEM (MGS)		M-606-1	
Designer Initials: JBK		(R-X)		CDOT HQ, 3rd Floor		TYPE 3 W-BEAM 31 INCHES		Standard Sheet No. 15 of 19	
Last Modification Date: 03/05/20		(R-X)		Denver, CO 80204		Issued by the Project Development Branch: July 31, 2019		Project Sheet Number:	
Detailer Initials: LTA		(R-X)		Phone: 303-757-9021 FAX: 303-757-9868					
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English		(R-X)		Project Development Branch		JBK			

NOTES

1. GUARDRAIL TRANSITIONS FROM PARALLEL TO ROADWAY SHOULDER AT 3G SEGMENT TO 15:1 TAPER WITHIN 25 FEET 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 14 FOR RIGHT SHOULDER GUARDRAIL LAYOUT.



TR - 25 FEET 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

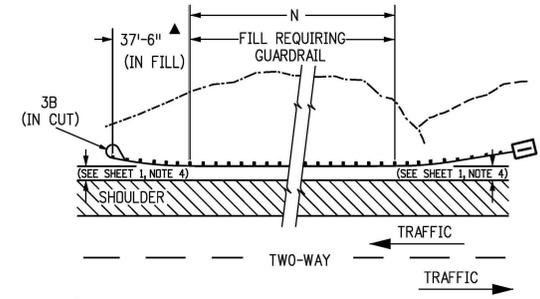
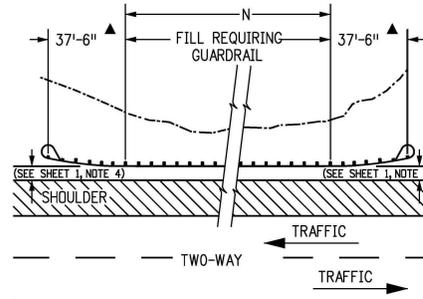
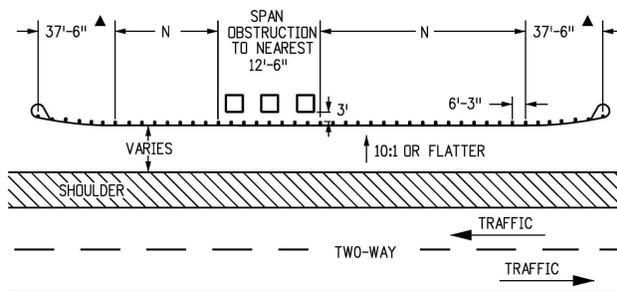
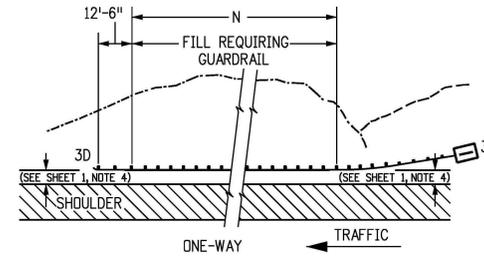
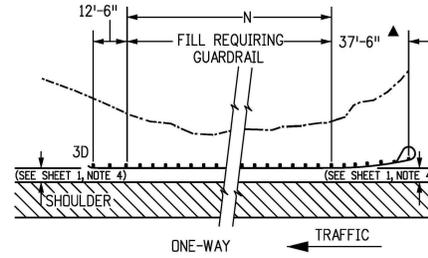
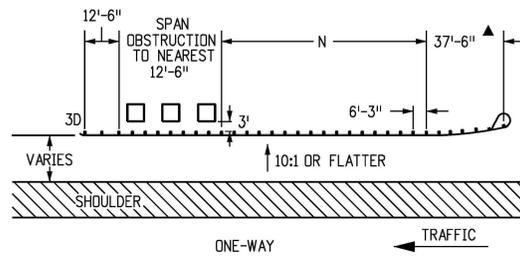
MULTILANE DIVIDED HIGHWAYS - (DEPRESSED MEDIANS, 21 - 59 FT. WITH OPEN HAZARDS OR OBSTRUCTIONS)

Computer File Information		Sheet Revisions		Colorado Department of Transportation 2829 West Howard Place CDDT HQ, 3rd Floor Denver, CO 80204 Phone: 303-757-9021 FAX: 303-757-9868 Project Development Branch	MIDWEST GUARDRAIL SYSTEM (MGS) TYPE 3 W-BEAM 31 INCHES	STANDARD PLAN NO.
Creation Date: 07/31/19	Designer Initials: JBK	Date:	Comments:			M-606-1
Last Modification Date: 03/05/20	Detailer Initials: LTA					Standard Sheet No. 16 of 19
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English				JBK	Issued by the Project Development Branch: July 31, 2019	Project Sheet Number:

NOTES

1. A TYPE 3G OR 3H TRANSITION (SEE SHEET 11) SHALL BE USED TO CONNECT THE TYPE 3 W-BEAM TO A TYPE 9 CONCRETE BARRIER (SEE M-606-15) OR TO A TYPE 8 OR 10 BRIDGE RAIL.
2. "TR" SHALL BE 25 FEET FOR THE TRANSITION TYPES 3G AND 3H.
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.

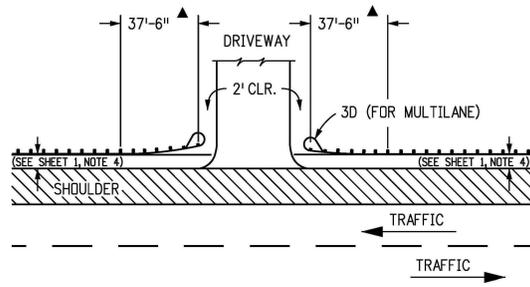
▲ END ANCHORAGE CAN BE FLARED OR NONFLARED



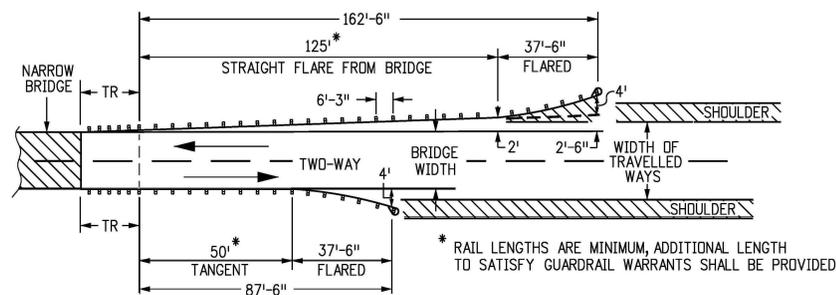
GUARDRAIL FOR ROADSIDE OBSTRUCTIONS

GUARDRAIL FOR ROADSIDE FILL CONSTRUCTION

GUARDRAIL FOR ROADSIDE CUT-TO-FILL CONDITION

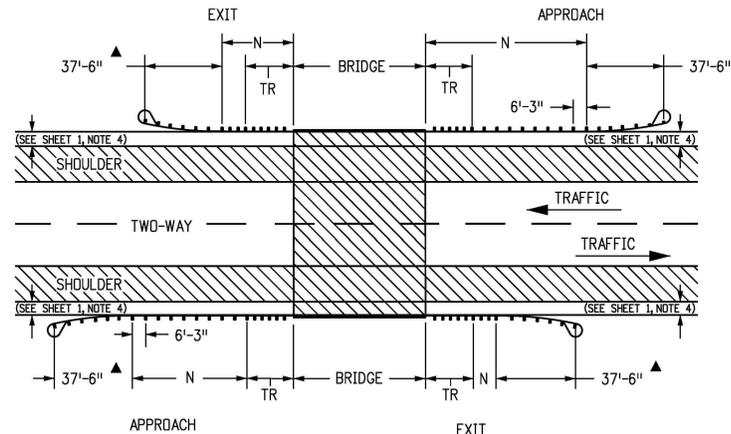


LAYOUT FOR DRIVEWAY APPROACH

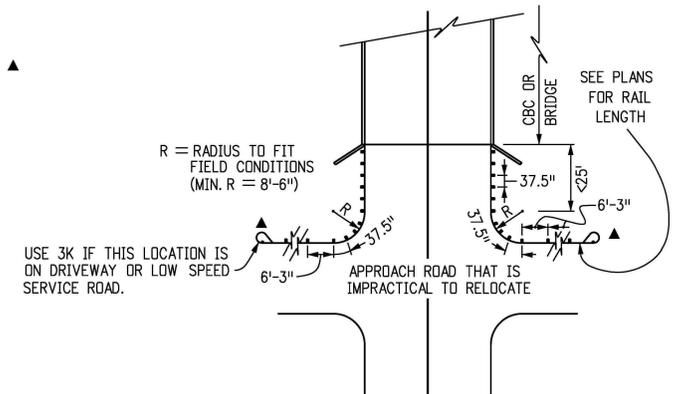


2-WAY NARROW APPLICATION

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



2-WAY NORMAL BRIDGE APPLICATION



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

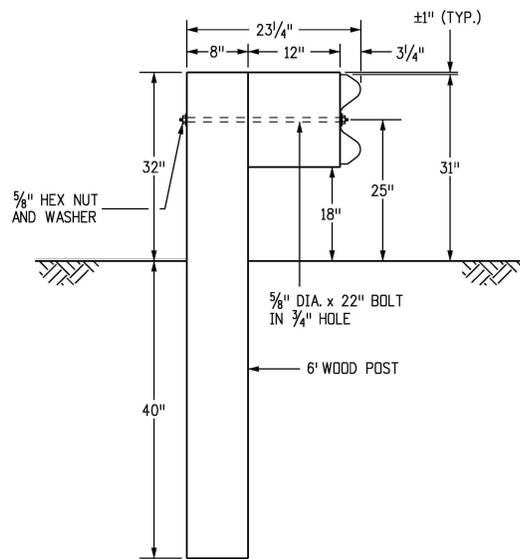
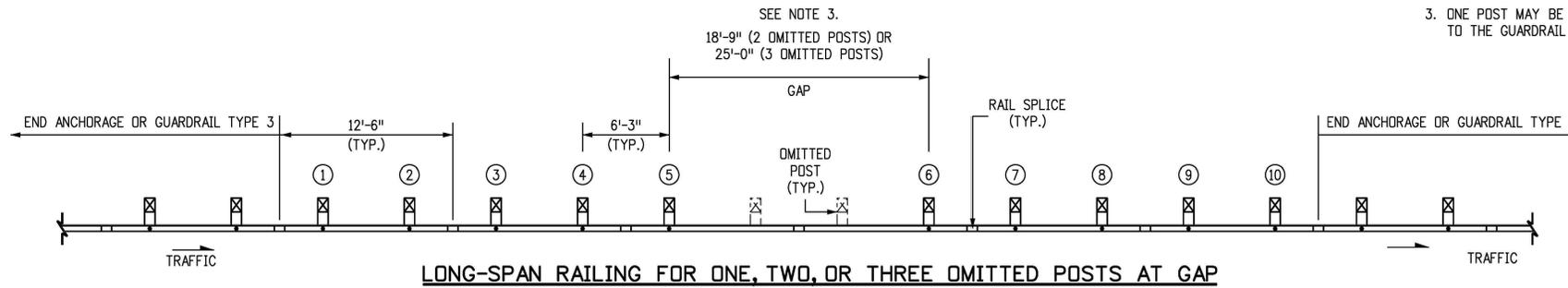
INTERRUPTED STRUCTURE APPROACH

(USE TYPE 3J ON SHEET 12 WHEN PRACTICAL)

Computer File Information		Sheet Revisions		Colorado Department of Transportation		MIDWEST GUARDRAIL SYSTEM (MGS) TYPE 3 W-BEAM 31 INCHES		STANDARD PLAN NO. M-606-1	
Creation Date: 07/31/19		Date: _____		2829 West Howard Place		Issued by the Project Development Branch: July 31, 2019		Standard Sheet No. 17 of 19	
Designer Initials: JBK		Comments: _____		CDOT HQ, 3rd Floor					
Last Modification Date: 03/05/20		_____		Denver, CO 80204		Project Sheet Number: _____			
Detailer Initials: LTA		_____		Phone: 303-757-9021 FAX: 303-757-9868					
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English		_____		Project Development Branch		JBK			

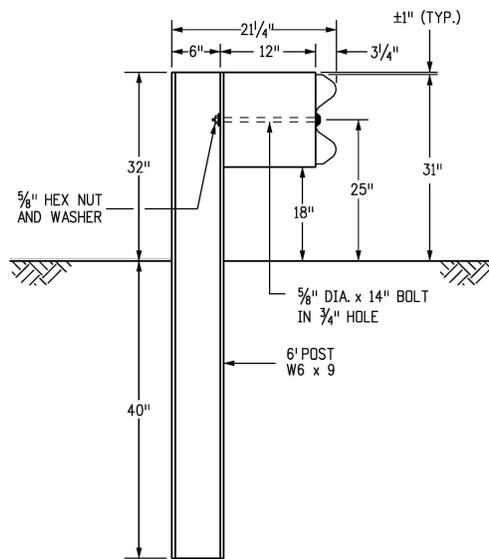
NOTES

1. POSTS ①, ②, ⑨, and ⑩ MAY BE TIMBER OR STEEL.
2. THE NUMBER OF OMITTED POSTS IS DEPENDENT ON THE LENGTH OF THE GAP.
3. ONE POST MAY BE OMITTED WITHOUT ANY MODIFICATION TO THE GUARDRAIL RUN.



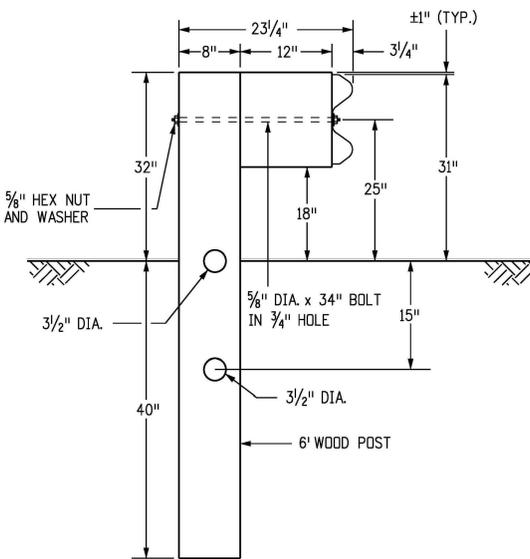
TIMBER POST

POSTS ①-② AND ⑨-⑩
(SEE NOTE 1)



STEEL POST

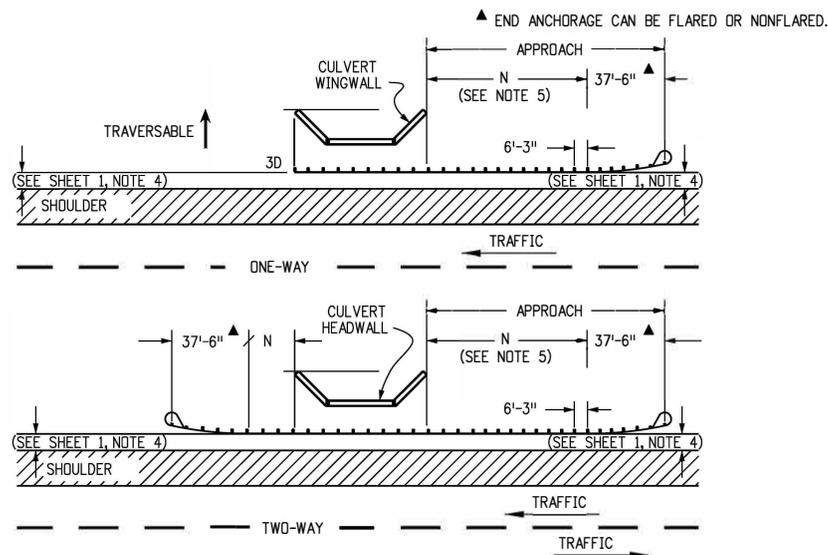
POSTS ①-② AND ⑨-⑩
(SEE NOTE 1)



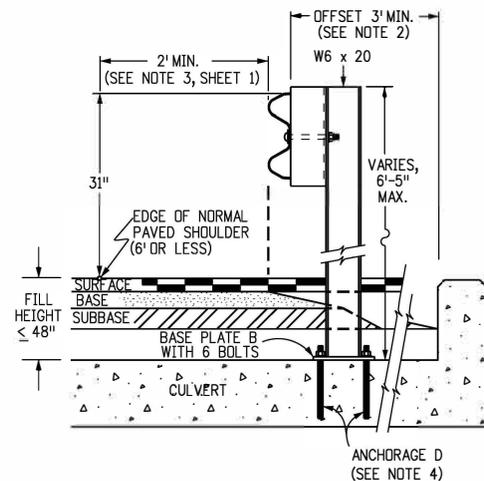
BREAKWAY TIMBER POST

POSTS ③ - ⑧

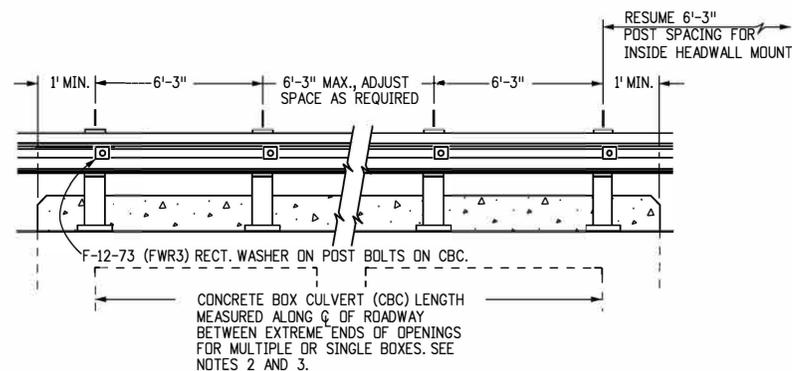
Computer File Information		Sheet Revisions	Colorado Department of Transportation	MIDWEST	STANDARD PLAN NO.
Creation Date: 07/31/19		Date: _____	2829 West Howard Place	GUARDRAIL SYSTEM (MGS) TYPE 3 W-BEAM 31 INCHES	M-606-1
Designer Initials: JBK	(R-X)	Comments: _____	CDOT HQ, 3rd Floor		Standard Sheet No. 18 of 19
Last Modification Date: 03/05/20	(R-X)		Denver, CO 80204		
Detailer Initials: LTA	(R-X)		Phone: 303-757-9021 FAX: 303-757-9868		
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	(R-X)		Project Development Branch JBK	Issued by the Project Development Branch: July 31, 2019	Project Sheet Number: _____



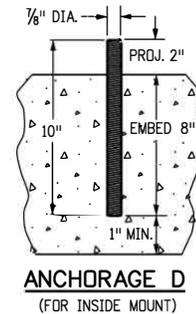
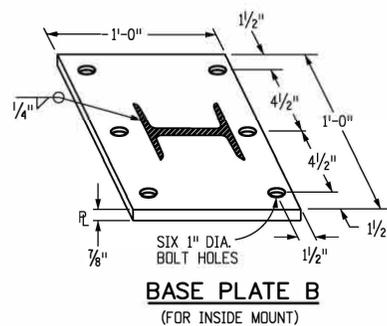
GUARDRAIL FOR CULVERTS



INSIDE MOUNT ON CBC



RAIL PLACEMENT FOR INSIDE MOUNT



NOTES

1. LOCATION AND LENGTH OF MEDIAN GUARDRAIL APPROACHES TO CULVERTS WITH FULL HEADWALL AND WINGWALLS SHALL BE AS SHOWN FOR BRIDGES ON SHEET 15. THE GUARDRAIL TYPE 3 SHALL CONTINUE ACROSS THE CULVERT AS SHOWN ON THIS SHEET.
2. RIGHT SHOULDER BOX CULVERT TREATMENT IS SHOWN ON THIS SHEET FOR CULVERTS 20 FT. OR LESS IN LENGTH.
3. CONSTRUCTION AND PAYMENT FOR FILL HEIGHTS SHALL BE INCLUDED IN THE COST OF THE GUARDRAIL TYPE 3.
4. 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 NEW STRUCTURES. FOR EXISTING STRUCTURES, THE RODS SHALL BE INSTALLED IN 1-1/4 IN. DIA HOLES WITH NON-SHRINK GROUT OR EPOXY CONFORMING TO ASTM C 881. IF THE THICKNESS OF A CULVERT'S TOP PANEL REQUIRES BOLTS TO BE LESS THAN 10 IN. HIGH, THE BOLTS SHALL BE APPROVED BY THE ENGINEER.
5. 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.
6. 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.
7. POST ANCHORS, ENCASED IN CONCRETE, SHALL BE ASTM A 36 STEEL, AND NEED NOT BE GALVANIZED.
8. PRIOR TO INSTALLATION OF GUARDRAIL ON CULVERTS, THREE SETS OF WORKING DRAWINGS WHICH COMPLY WITH THE REQUIREMENTS OF SECTION 105 SHALL BE SUBMITTED TO THE ENGINEER FOR INFORMATION ONLY.

Computer File Information	
Creation Date: 07/31/19	
Designer Initials: JBK	(R-X)
Last Modification Date: 03/05/20	(R-X)
Detailer Initials: LTA	(R-X)
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	(R-X)

Sheet Revisions	
Date:	Comments

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 Project Development Branch **JBK**

MIDWEST
GUARDRAIL SYSTEM (MGS)
TYPE 3 W-BEAM 31 INCHES
 Issued by the Project Development Branch: July 31, 2019

STANDARD PLAN NO.
M-606-1
Standard Sheet No. 19 of 19
 Project Sheet Number: