**GENERAL NOTES (CONTINUE ON SHEET 2)**

1. ALL GUARDRAILS SHOWN ARE MASH 2008 TL-3 COMPLIANT.

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 100 OR FLATTER.

3. 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.

4. 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.

5. A MINIMUM 3 IN THICK 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.

6. THE MINIMUM GUARDRAIL OFFSET FROM PAVED SHOULDER EDGE SHALL BE:

   a. 2 FT. FOR SHOULDER 4 FT. OR WIDER.

   b. 2 FT. FOR SHOULDER 6 FT. OR LESS.

   c. DESIRABLE FOR 4 FT. SHOULDERS

7. THE ABOVE 2 FT. GUARDRAIL TO SHOULDER OFFSET IS DESIRABLE BUT NOT REQUIRED FOR:

   a. AN EXISTING HIGHWAY WITH A DESIGN SPEED LESS THAN 50 MPH.

8. THE MINIMUM OFFSET DIMENSIONS IS 4 FT. FROM THE TRAVEL WAY.

9. FOR A ONE-WAY ONE-LANE RAMPS, AND WHERE ONE OR MORE OF THE FOLLOWING ARE TRUE:

   (1) THE NON-OFFSET GUARDRAIL BEGINS AT LEAST 100 FT. BEYOND RAMPS.

   (2) THE NON-OFFSET GUARDRAIL IS NOT LOCATED ON THE RAMPS EXIT OR ENTRANCE CURVE CONNECTION TO THE MAJOR HIGHWAY.

   (3) THE RAMPS SHOULDERS ARE 4 FT. OR WIDER.

10. 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.

11. THE 2 IN. X 6 IN. CURB ANDatten ON TOP OF PAVEMENT SURFACE AND ATTACHED AS DESCRIBED ABOVE.

12. THE GUARDRAIL OFFSET FROM PAVED INSIDE SHOULDER EDGE OF A DIVIDED HIGHWAY SHALL BE:

   a. 2 FT. FOR SHOULDER 4 FT. OR WIDER.

   b. 2 FT. DESIRABLE FOR 4 FT. SHOULDERS

13. 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.

14. THE GUARDRAIL OFFSET FROM PAVED INSIDE SHOULDER EDGE OF A DIVIDED HIGHWAY SHALL BE:

   a. 2 FT. FOR SHOULDER 4 FT. OR WIDER.

   b. 2 FT. DESIRABLE FOR 4 FT. SHOULDERS

15. 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.

16. THE GUARDRAIL OFFSET FROM PAVED INSIDE SHOULDER EDGE OF A DIVIDED HIGHWAY SHALL BE:

   a. 2 FT. FOR SHOULDER 4 FT. OR WIDER.

   b. 2 FT. DESIRABLE FOR 4 FT. SHOULDERS

17. 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.

18. THE GUARDRAIL OFFSET FROM PAVED INSIDE SHOULDER EDGE OF A DIVIDED HIGHWAY SHALL BE:

   a. 2 FT. FOR SHOULDER 4 FT. OR WIDER.

   b. 2 FT. DESIRABLE FOR 4 FT. SHOULDERS

19. 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.

20. THE GUARDRAIL OFFSET FROM PAVED INSIDE SHOULDER EDGE OF A DIVIDED HIGHWAY SHALL BE:

   a. 2 FT. FOR SHOULDER 4 FT. OR WIDER.

   b. 2 FT. DESIRABLE FOR 4 FT. SHOULDERS

21. 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.
GENERAL NOTES

1. REFERENCES SUCH AS 00PDB01", 00PDE01", AND 00PWE01" IN THIS STANDARD PLAN SPECIFY HARDWARE DETAILS FROM A 1994 GUIDE TO STANDARDIZED HIGHWAY BARRIER HARDWARE PREPARED BY THE AASHTO-MTC-JA CHTON COOPERATIVE COMMITTEE.

2. W-BEAM SPACINGS AND SPACING OF TERMINAL CONNECTORS TO W-BEAM SHALL BE LAPPED IN THE DIRECTION OF TRAFFIC. UNLESS OTHERWISE NOTED IN THE PLANS OR BY THE MANUFACTURER.

3. 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 ANCHORAGE AND BOX CULVERTS.

4. WHEN SPECIFIED IN THE CONTRACT, 2 FT POSTS SHALL BE INSTALLED INSTEAD OF THE STANDARD 6 FT POSTS. THE 2 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. IN SIZE, AND LOCATED AS SHOWN ON THE ELEVATION VIEW ON SHEET 1.

5. THE STANDARD 3 IN. X 9/16 IN. IN RECTANGULAR WASHERS USED UNDER POST BOLTS HEADS IN THE PRESENT 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.

6. STANDARD GALVANIZED ROUND STEEL WASHERS SHALL BE USED UNDER ALL NUTS IN CONTACT WITH WOOD POSTS.

7. AN ADDITIONAL HOLE SHALL BE PROVIDED IN THE POSTS TO FACILITATE FUTURE KNOTTING OF THE RAIL ELEMENTS AND BLOCKS FOR OVERLAYS.

8. POSTS PROVIDED MAY ALSO HAVE ADDITIONAL HOLES (UP TO 4 PER FLANGE) FOR MIDDEN GUARDRAIL APPLICATION.


10. THE REQUIREMENTS OF THE CONTRACT.

11. THE CONTRACTOR SHALL CERTIFY THAT THE SPECIES AND GRADE MEET THE REQUIREMENTS OF THE CONTRACT.


15. THE REQUIREMENTS OF THE CONTRACT.

16. THE CONTRACTOR SHALL CERTIFY THAT THE SPECIES AND GRADE MEET THE REQUIREMENTS OF THE CONTRACT.

17. THE STANDARD 6 FT 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, THE SOUTHERN PINE BUREAU, OR THE WESTERN WOOD PRODUCTS ASSOCIATION.

18. THE REQUIREMENTS OF THE CONTRACT.

19. THE CONTRACTOR SHALL CERTIFY THAT THE SPECIES AND GRADE MEET THE REQUIREMENTS OF THE CONTRACT.

20. THE REQUIREMENTS OF THE CONTRACT.

21. THE REQUIREMENTS OF THE CONTRACT.

22. THE REQUIREMENTS OF THE CONTRACT.

23. THE REQUIREMENTS OF THE CONTRACT.

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28. THE REQUIREMENTS OF THE CONTRACT.

29. THE REQUIREMENTS OF THE CONTRACT.

30. THE REQUIREMENTS OF THE CONTRACT.

31. THE REQUIREMENTS OF THE CONTRACT.

32. THE REQUIREMENTS OF THE CONTRACT.
TERMINAL SECTION (FLARED)

NOTE: RETROREFLECTOR TABS SHALL BE MANUFACTURED FROM 12 TO 14 GAUGE STEEL AND SHALL CONFORM TO THE REQUIREMENTS OF ASTM A 325.

TERMINAL SECTION (CONNECTOR)

W-BEAM RAIL SECTION

W-BEAM RAIL SPLICE

THREE BEAM TERMINAL SECTION (CONNECTOR)

RETOREFLECTOR TAB

NOTE: RETROREFLECTOR TABS SHALL BE MANUFACTURED FROM 12 TO 14 GAUGE STEEL AND SHALL CONFORM TO THE REQUIREMENTS OF ASTM A 325.

BUTTON HEAD BOLT WITH OVAL SHOULDER

WASHER

HEX NUT

THE TABULATION OF GUARDRAIL WILL SPECIFY THE TYPE OF 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.

MIDWEST GUARDRAIL SYSTEM (MGS)

TYPE 3 W-BEAM 31 INCHES

STANDARD PLAN NO.

M-606-1

Standard Sheet No. 3 of 19

Issued by the Project Development Branch: July 31, 2019

Project Sheet Number:
1. The MGS transition from a Type 3 Guardrail shall be completed outside the MGS end anchorage limits.
END ANCHORAGE TYPE 3B
(WITHOUT ROADSIDE DITCH AT GUARDRAIL)

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.

100 FT. ON 12½:1 FLARE FROM NORMAL GUARDRAIL LINE
END RUB RAIL, BOUND POST, USE 2 POST BOLTS IN RAIL TUMPS
SLOPE 10:1 OR FLATTER
SHOULDER EDGE
NORMAL GUARDRAIL LINE

PLAN VIEW

END ANCHORAGE TYPE 3D
(WITH ROADSIDE DITCH AT GUARDRAIL)

This dimension locates the first hole in the W-beam and the type 3d hardware.
1 ft.-2 in. center to center from post hole.

SECTION A-A
TYPE 3B ANCHOR BLOCK DETAIL

NOTE: ALL PARTS SHALL BE GALVANIZED.

END OF GUARDRAIL PAY LENGTH

2 1/2" x 6" x 1/2" PLATE AT BACK OF RAIL.

5/8" DIA. ROD

1 1/4" DIA. ROD

1/2" DIA.

FIVE 5/8" DIA. X 25/32" BELTS WITH NUTS & WASHERS.

5/8" DIA. HOLE.

1/2" DIA. HOLE.

1/2" DIA. HOLE.

22 1/2" x 6" x 1/2" PLATE AT FRONT OF RAIL.

1/2" DIA. HEAD OFF CENTER.

1/2" DIA. HEAD OFF CENTER.

SLOPE TRANSITION SLOPE

Typical

B

TOP OF GUARDRAIL MAY SLOPE 3% STEEPER THAN SHOULDER EDGE SLOPE 50 FT. MAY BE ADJUSTED TO FIT FIELD CONDITIONS.

TOP RAIL HEIGHT PARALLELS SHOULDER EDGE SLOPE.

GUSSET 1 LINE AT GUARDRAIL.

3B ANCHOR BLOCK DETAIL

VIEW FOR RAIL SPLICE DETAIL

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.

SEE SHEET 2 FOR RAIL SPLICE 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 HOLE.

BACK SLOPE

TOP OF GUARDRAIL MAY SLOPE 3% STEEPER THAN SHOULDER EDGE SLOPE.

TOP RAIL HEIGHT PARALLELS SHOULDER EDGE SLOPE.

GROUND LINE AT GUARDRAIL

GUSSET 1 LINE AT GUARDRAIL.

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.

SEE SHEET 2 FOR RAIL SPLICE 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 HOLE.
1. Post offset dimensions are given to the center of the traffic face of posts.
2. The guardrail between Post 1 and 2 is on a straight line flare.

SEE DETAIL A

SEE DETAIL B

SOIL PLATE ON DOWNSTREAM SIDE OF POST

DETAIL A

IMPACT HEAD CONNECTION

POST #1 CONNECTION

SECTION A-A

ANCHOR BRACKET

MASH FLEET TERMINAL

(MASH CERTIFIED)

SECTION B-B

POST #2

END ANCHORAGE (FLARED)

NOTES

1. The End Anchorage (Flared) shall be the MASH 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. Retroreflective 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 3 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, 2 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 tall, a locking device (cable grips or channel, lock pliers) should be used to prevent the cable from twisting when tightening nuts.

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STANDARD PLAN NO. M-606-1

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Designer Initials: JBK
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Detailer Initials: LTA

Issued by: Project Development Branch

Colorado Department of Transportation
2829 West Howard Place
Denver, CO 80224

MIDWEST GUARDRAIL SYSTEM (MGS)
TYPE 3 W-BEAM 31 INCHES
1. 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

2. 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.

3. CONCRETE PAVED AREAS SHALL HAVE THEIR TAPERED ENDS SQUARED OFF AS DIRECTED BY THE ENGINEER.

4. 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 OVERLAYERED UNLESS PAVEMENT CONDITIONS WARRANT IT BEING OVERLAYERED. ANY OVERLAY PAVING ADJACENT TO THE FLARED END ANCHORAGE SHALL BE TAPERED TO PREVENT A DROP IN THE PAVED SURFACE BELOW THE RAIL.

5. SEE SHEETS 1, 2, 3, AND 5 FOR STANDARD TYPE 3 GUARDRAIL INSTALLATION DETAILS.

6. THE COST OF THE GUTTER WILL BE PAID AS "GUTTER TYPE 2 (2 FT.)" FOR A LENGTH OF 134 FT. OR "GUTTER TYPE 2 (3 FT.)" FOR A LENGTH OF 40 FT.

7. 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.

8. 4:1 OR FLATTER SLOPES IN THE TRAVERSABLE AREA SHALL BE USED BEHIND THE END ANCHORAGE, AND IN ADVANCE OF POST (IF THIS IS NOT POSSIBLE, A MINIMUM 3:1 SLOPE MAY BE USED IF APPROVED BY THE ENGINEER).

9. THE WIDENED AREA, EXCEPT FOR CURB OPTION A, SHALL HAVE THE SAME GRADING AS THE ADJACENT GUARDRAIL 31 INCHES. THE ADJACENT GUARDRAIL SHALL NOT CHANGE ITS SLOPE.

10. WIDENING FOR END ANCHORAGES SHALL BE PAVED ON INTERSTATES AND FREEWAYS. FOR OTHER HIGHWAYS, PAVING SHALL BE AS SHOWN ON THE PLANS.

NOTES

- 1. 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

- 2. 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.

- 3. CONCRETE PAVED AREAS SHALL HAVE THEIR TAPERED ENDS SQUARED OFF AS DIRECTED BY THE ENGINEER.

- 4. 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 OVERLAYERED UNLESS PAVEMENT CONDITIONS WARRANT IT BEING OVERLAYERED. ANY OVERLAY PAVING ADJACENT TO THE FLARED END ANCHORAGE SHALL BE TAPERED TO PREVENT A DROP IN THE PAVED SURFACE BELOW THE RAIL.

- 5. SEE SHEETS 1, 2, 3, AND 5 FOR STANDARD TYPE 3 GUARDRAIL INSTALLATION DETAILS.

- 6. THE COST OF THE GUTTER WILL BE PAID AS "GUTTER TYPE 2 (2 FT.)" FOR A LENGTH OF 134 FT. OR "GUTTER TYPE 2 (3 FT.)" FOR A LENGTH OF 40 FT.

- 7. 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.

- 8. 4:1 OR FLATTER SLOPES IN THE TRAVERSABLE AREA SHALL BE USED BEHIND THE END ANCHORAGE, AND IN ADVANCE OF POST (IF THIS IS NOT POSSIBLE, A MINIMUM 3:1 SLOPE MAY BE USED IF APPROVED BY THE ENGINEER).

- 9. THE WIDENED AREA, EXCEPT FOR CURB OPTION A, SHALL HAVE THE SAME GRADING AS THE ADJACENT GUARDRAIL 31 INCHES. THE ADJACENT GUARDRAIL SHALL NOT CHANGE ITS SLOPE.

- 10. WIDENING FOR END ANCHORAGES SHALL BE PAVED ON INTERSTATES AND FREEWAYS. FOR OTHER HIGHWAYS, PAVING SHALL BE AS SHOWN ON THE PLANS.
NOTES FOR NONFLARED


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'-1½", 9'-4½", OR 15'-7½" W-BEAM PANEL DOWNSTREAM OF TRAFFIC.

4. FOR MSKT END ANCHORAGES (NONFLARED), USE THE MANUFACTURER’S SPECIFIED STEEL FOUNDATION TUBES FOR POSTS.

5. RETROREFLECTOR TABS SHALL NOT BE USED ON END ANCHORAGE POSTS.

6. DELINEATION SHALL BE APPLIED TO THE END PIECE AND SHALL NOT BE PAIRED FOR SEPARATELY BUT BE INCLUDED IN THE COST OF THE WORK. SEE STANDARD PLAN S-402-I.
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: 888-800-3865).

2. The Max-Tension shall be applied directly to W-Beam Guardrail Systems A1, OR Transitions to 12½ 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. 1-½ inch, 6 ft. 4-½ inch or 12 ft. 7-½ 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 with 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.-4 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 G-412-L.

ELEVATION

- Max-Tension Median
- (Mash Certified)

PLAN

- BOLTS ARE NOT PASSED THROUGH THE GUARDRAIL PANELS AT POSTS 3, 4, AND 5 FOR BOTH SIDES.
- THE CUTTING TEETH, FRICTION PLATE, AND PRIMARY CABLES ARE INSTALLED ONLY ON THE APPROACHING TRAFFIC SIDE.

SIDE VIEW

- THE END PIECE AND WILL
SEE BRIDGE PLANS FOR DETAILS AND PAYMENT

NOTE
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 THREE BEAM SECTION IN TRANSITION TYPES 3G AND 3H MAY BE SHAPED TO FIT CORRESPONDING RADIO 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-006-13 FOR THE TRANSITION TO TYPE 9 GUARDRAIL BARRIER. TRANSITION TYPES 3G AND 3H ARE BOTH MASH COMPLIANT.
5. BACKUP PLATE IS NOT REQUIRED AT POSTS ON TYPE 3G AND 3H.
6. SEE THIS SYMBOL IN THE ELEVATION DRAWINGS SHOWS THE LOCATIONS WHERE A RECTANGULAR WASHER IS REQUIRED UNDER THE POST BOLT HEAD.
7. CURB TYPE 8 SECTION 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.
8. FOR TRANSITION POSTS 1, 2, 84" W6 X 15 (108" W6 X 9)
9. IF THE HEIGHT OF THE TRANSITION TYPES 3G OR 3H IS MORE THAN 31", THEN A SYMMETRICAL TRANSITION SECTION SHALL BE USED HERE.
10. A TRANSITION SHALL BE REQUIRED BETWEEN TYPES 3G AND 3H AND THE TRANSITION TYPES 3G AND 3H ARE BOTH MASH COMPLIANT.
4. TRANSITION TYPES 3G AND 3H ARE BOTH MASH COMPLIANT.
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6. BACKUP PLATE IS NOT REQUIRED AT POSTS ON TYPE 3G AND 3H.
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8. CURB TYPE 8 SECTION 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 TRANSITION POSTS 1, 2, 84" W6 X 15 (108" W6 X 9)
10. IF THE HEIGHT OF THE TRANSITION TYPES 3G OR 3H IS MORE THAN 31", THEN A SYMMETRICAL TRANSITION SECTION SHALL BE USED HERE.
**CAD Ver.:** MicroStation V8i  Scale: Not to Scale  Units: English

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**Issued by the Project Development Branch:** July 31, 2019  
**Phone:** 303-757-9021  
**FAX:** 303-757-9868  
**Location:** 2829 West Howard Place  

**Notes:**

1. **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: 
   a. Canal service roads at bridge ends. 
   b. Intersections in guardrail run by intersecting roadways, etc.

2. The low-speed guard rail end anchorage type 3K shall be used only on driveways and low-speed service roads where an approved crash-tested end treatment is required. Use the end anchorage plate on curvilinear runs with a radius of 0 to 25 feet.

3. The RAJ is not bolted to the curvy post at the center of the curve for the B 8 feet, 17 feet, and 25 feet. RAJ plates shall conform to ASTM A 36, and the structural tubing to ASTM A 500.

4. **THE GALVANIZED WIRE ROPE (CABLE) SHALL CONFORM TO ANSI A 3J 30 INCHES.**

5. **PLATES SHALL CONFORM TO ASTM A 36, AND STRUCTURAL TUBING TO ASTM A 500. WELDING SHALL MEET ALL REQUIREMENTS OF THE AMERICAN WELDING SOCIETY.**

6. **ALL STRUCTURAL STEEL SHALL BE GALVANIZED IN CONFORMANCE WITH ASTM A 123. POSTS SHALL NOT BE PUNCHED, DRILLED, CUTO, OR WELDED AFTER GALVANIZING.**

7. **WHEN THE SOIL PLATE WELDED OPTION IS SELECTED, SOIL PLATE CONNECTION BOLT HOLES ARE NOT REQUIRED.**

8. **OUTSIDE NUT SHALL BE TORQUED AGAINST INSIDE NUT WITH THE CABLE INSTALLED TAUT BETWEEN THE ANCHOR PLATE AND FIRST POST.**

9. **ALL CURVED GUARDRAIL SHALL BE SHOP BENT.**

10. **SEE SHEET 5 FOR ANCHOR PLATE AND OTHER DETAILS.**

11. **THE STEEL TUBE MAY BE DRIVEN WITH WOOD POST INSERTED IF NO DAMAGE OCCURS TO THE POST OR BOLTS.**

**QUESTIONS, COMMENTS, SUGGESTIONS SHOULD BE DIRECTED TO THE KEY PERSONNEL LISTED BELOW:**

**Colorado Department of Transportation**

**Project Development Branch**

**Midwest GUARDRAIL SYSTEM (MGS)**

**Type 3 W-Beam 31 Inches**

**Dated:** July 31, 2019

**STD. PLAN NO:** M-606-1

**Sheet No. 12 of 19**
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.

- SHOWN ON PLAN > LENGTH TO SHIELD ALL HAZARDS IS 
  BASED ON GUARDRAIL'S LENGTH OF NEED COMPUTATION. 
  CIRCLED ROADWAY DESIGN CIRCLE, THE MEDIAN SHALL BE 
  12 FT. - 6 IN., WHERE SITE CONDITIONS ALLOW, THE TOTAL 
  LENGTH OF MEDIAN WILL INCLUDE THE LENGTH OF TRANSITION, 
  THE LENGTH OF RAIL ON, 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 NON-FLARED.

MULTILANE DIVIDED HIGHWAYS FOR STEEP EMBANKMENTS IN MEDIAN
MEDIAN SLOPE VARIES

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

MEDIAN, M

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.

TRANSITION TO TYPICAL 15:1 TAPER

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

MULTILANE DIVIDED HIGHWAYS - (DEPRESSED MEDIANS, 21 - 59 FT. WITH OPEN HAZARDS OR OBSTRUCTIONS)
1. A TYPE 3G OR 3H TRANSITON (SEE SHEET 1) SHALL BE USED TO CONNECT THE TYPE 3 W-BEAM TO A TYPE B CONCRETE BARRIER (SEE M-606-15) OR TO A TYPE B OR 10 BRIDGE RAIL.

2. *TR* SHALL BE 25 FEET FOR THE TRANSITION TYPES 3G AND 3H.


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 NORMAL BRIDGE APPLICATION

INTERUPTED STRUCTURE APPROACH (USE TYPE 3J ON SHEET 12 WHEN PRACTICAL)
SEE NOTE 3.

LONG-SPAN RAILING FOR ONE, TWO, OR THREE OMITTED POSTS AT GAP

NOTES
1. POSTS 1, 2, 3, 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.

18'-9" (2 OMITTED POSTS) DR END ANCHORAGE DR GUARDRAIL TYPE 3

25'-0" (3 OMITTED POSTS) GAP RAIL SPLICE (TYP.) 12'-6"

6'-3" (TYP.) (TYP.) OMITTED CD (TYP.)

@ ® POST ® (TYP.)

TRAFFIC

Breakaway Timber Post
POSTS 3 - 5

Steel Post
POSTS 1 - 2 AND 3 - 5
(SEE NOTE 1)

Timber Post
POSTS 1 - 2 AND 3 - 5
(SEE NOTE 1)

GAP

18'-9" (2 OMITTED POSTS) DR END ANCHORAGE DR GUARDRAIL TYPE 3

Traffic

6' WOOD POST

3/4" HEX NUT AND WASHER

3/4" O.A. x 22" BOLT
IN 3/4" HOLE

40" 31/2" DIA.
IN 3/4" HOLE

6" POST 6" x 9"
NOTES
1. LOCATION AND LENGTH OF MEDIAN GUARDRAIL APPROACHES TO CULVERTS WITH FULL HEADWALL AND WINDWALLS SHALL BE AS SHOWN FOR BRIDGES ON SHEET. 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. 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. X 10 IN. HOLES WITH NON-SHRINK CEMENT OR EPOXY CONFORMING TO ASTM C 881. 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, AND NEED NOT BE GALVANIZED.

7. 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.