DETAILED DRAWINGS

SUPPLEMENTAL TO
THE STANDARD
SPECIFICATIONS FOR
ROAD AND BRIDGE
CONSTRUCTION

SUPPLEMENT TO THE SEPTEMBER 2014 EDITION
EFFECTIVE: APRIL 2019

MONTANA DEPARTMENT
OF TRANSPORTATION
# DETAILED DRAWINGS

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**EFFECTIVE: APRIL 2019**

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- **English Dimensions**
  - Type: No Shoulder, Shoulder, Shoulder
  - Span: 2' 6" (792 mm)
  - Depth: 2" (51 mm)

- **Metric Dimensions**
  - Type: No Shoulder, Shoulder, Shoulder
  - Span: 2' 6" (792 mm)
  - Depth: 2" (51 mm)

**Notes:**
- Avoid within designated City or Urban Limits.
- Use engineering judgment on a case-by-case basis to determine if centerline rumble strip installation is appropriate.
- Do not install centerline rumble strips on concrete bridge decks.
- Consider milling existing centerline rumble strips prior to a second seal and cover application.
- Do not install centerline rumble strips on concrete bridge decks unless other units are shown.

**Public Approaches:**

- Isometric View
- Section A-A
- Section B-B
**Standard MGS Guardrail**

- **Pay Limits:**
  - Minimum 3 CRT Posts at 6'-9" (2.07 m) = 12'-6" (3.81 m) 
  - Maximum 10'-0" (3.05 m) (MAX.) = 62'-6" (19.05 m) 

- **Obstruction:**
  - 1 Post Omitted

- **Direction of Traffic:**
  - Open

- **Notes:**
  - See DTL DRG. No. 606-03A and 606-05A for standard MGS Guardrail and Associated Hardware.
  - Use all rail in the direction of adjacent traffic.
  - Typical space locations shown may vary based on actual rail, geometry, type of vehicle, and space location.
  - Do not install MGS Long Span Guardrail for sharp curve distances or curvatures with a radius greater than 2,500 ft. (762 m).
  - Do not install MGS Long Span Guardrail for sharp curve distances with a radius greater than 2,500 ft. (762 m) of the end of the rail.
  - The obstruction (or any opening or edge of vehicle) must be isolated at or beyond the back of the CRT posts.

**Detailed Drawing Reference:**

- Title: Long Span Guardrail (MGS)
- Section: 606-09
- Revised: May 2019

**Units Shown:**

- All units shown in millimeters (mm).
- Unless other units are shown.
TRANSITION FROM 27 3/4" (705) (OR GREATER) TO 31" (775) GUARDRAIL MOUNTING HEIGHT

NOTES:

1. THE MGS TO METAL GUARDRAIL TRANSITION IS PAID FOR AS LINEAR FEET OF MGS GUARDRAIL.
2. SEE DET. DWGS. NO. 606-05A, 606-05B, 606-11A, AND 606-11B FOR MGS GUARDRAIL AND ASSOCIATED HARDWARE.
3. LAP ALL MID-SPAN RAILS IN THIS DIRECTION OF ADJACENT TRAFFIC.

UNITS SHOWN IN BRACKETS [ ] ARE METRIC UNITS USED IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.

REFERENCE: Dwg. No. 606-20
METAL GUARDRAIL TRANSITION
DEPARTMENT OF TRANSPORTATION
MONTANA DEPARTMENT OF TRANSPORTATION
W-BEAM END SECTION (FLARED)

RWM02a-b*
OR
RWM22a-b*
(12'-6" (3.81 m) LENGTH)

W-BEAM END SECTION (BUFFER)

RWE06a-b*

W-BEAM TERMINAL CONNECTOR

RWE02a-b*

NOTES:

* DESTINATION SUFFIX METAL THICKNESS
a 12 GAUGE [2.7 mm]
b 10 GAUGE [3.5 mm]

* SEE DTL. DWG. NO. 606-80 FOR SCHEDULE OF GUARDRAIL HARDWARE.

UNITS SHOWN IN BRACKETS [ ] ARE METRIC AND ARE IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.

REFERENCES

REW01a-b*
REW02a-b*
REW04a-b*
REW06a-b*
REW08a-b*

CROSS SECTION IS TO REST WITH RWM02a-b OR RWM22a-b ONLY REQUIRED TO BEND AND HOLES

SLOTS

29/32" x 1 1/8" (23.0 x 28.6)

SPLICE BOLT SLOT

29/32" x 1 1/8" (23.0 x 28.6)

POST BOLT SLOT

3/4" x 2 1/2" (19.1 x 63.5)

POST BOLT SLOT

3/4" x 2 1/2" (19.1 x 63.5)

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29/32" x 1 1/8" (23.0 x 28.6)

POST BOLT SLOT

3/4" x 2 1/2" (19.1 x 63.5)

POST BOLT SLOT

3/4" x 2 1/2" (19.1 x 63.5)
NOTES:
1/2" [13] EXPANSION JOINTS ARE SHOWN AS DARK SOLID LINES FOR VISUAL PURPOSES.
BOND BREAKER IS SHOWN AS DARK DASHED LINES FOR VISUAL PURPOSES.

SECTION A-A
1/2" [13] EXPANSION JOINTS
BOND BREAKER

SECTION B-B
1/2" [13] EXPANSION JOINTS
NOTE: CRUSHED AGGREGATE COURSE OMITTED FOR CLARITY.

* THE MAXIMUM CONSTRUCTED CROSS SLOPE OF THE SIDEWALK IS 2% (1:50).
** THIS DEPTH IS STANDARD IN NEW CONSTRUCTION. ALTERATIONS TO EXISTING FACILITIES MAY RESULT IN A LARGER DEPTH, WHICH WILL REQUIRE A GREATER RAMP LENGTH.

SEE DTL. DWG. NO. 608-15 AND 608-20 FOR GUIDELINES ON RAMP DESIGN WHEN Ramps ARE REQUIRED FOR ADA ACCESSIBILITY.

NOTES:
1. INSTALL PREFORMED EXPANSION JOINT FILLER, PER SECTION 707, AT ALL EXPANSION JOINTS, FOR THE FULL THICKNESS OF THE SIDEWALK AND USE AT ALL JOINTS BETWEEN NEW CONCRETE SIDEWALK AND STRUCTURES IN PLACE.
2. INSTALL A BOND BREAKER FOR THE FULL THICKNESS OF THE SIDEWALK AT LOCATIONS SPECIFIED ON THIS DETAIL. USE A 15 OR 30 POUND [6.8 OR 13.6 kg] ROOFING FELT MATERIAL, OR OTHER PRODUCT AS APPROVED BY THE PROJECT MANAGER, FOR THE BOND BREAKER. DO NOT USE EXPANSION JOINT MATERIAL AS A BOND BREAKER.
3. CONSTRUCT ALL JOINTS STRAIGHT AND PERPENDICULAR TO THE CENTERLINE AND THE SURFACE OF THE SIDEWALK. WHERE PRACTICAL, ALIGN ALL JOINTS WITH LIKE JOINTS IN ADJOINING WORK. USE JOINTS TO OUTLINE ALL PANELS IN THE SIDEWALK, WHICH ARE TO BE, SO FAR AS POSSIBLE, SQUARE. THE LENGTHS OF THE PANELS ARE DETERMINED BY THE WIDTH OF THE SIDEWALK.
5. WHERE FACTORS SUCH AS LIMITED RIGHT-OF-WAY DICTATE THE INSTALLATION OF A NEW SIDEWALK LESS THAN 5 FEET [1525] IN WIDTH THE NEW SIDEWALK MUST HAVE PASSING AREAS AT A MAXIMUM SPACING OF 200 FEET [61 m]. A PASSING AREA IS A MINIMUM OF 5 FEET BY 5 FEET [1524] IN SIZE.
7. LOCATE EXPANSION JOINTS EVERY 100 FEET (± 30 FT.) [30 m (± 10 m)] AT INTERVALS EQUAL TO THE NEAREST MULTIPLE OF THE CONTRACTION JOINT INTERVAL.
8. USE A LONGITUDINAL CONTRACTION JOINT IN THE CENTERLINE OF ALL SIDEWALKS 8 FEET (2438) WIDE AND WIDER.

NOTE:
SEE DTL. DWG. NO. 609-05 FOR CURB & GUTTER DETAILS.

* THE MAXIMUM CONSTRUCTED CROSS SLOPE OF THE SIDEWALK IS 2% (1:50).
** THIS DEPTH IS STANDARD IN NEW CONSTRUCTION. ALTERATIONS TO EXISTING FACILITIES MAY RESULT IN A LARGER DEPTH, WHICH WILL REQUIRE A GREATER RAMP LENGTH.

SEE DTL. DWG. NO. 608-15 AND 608-20 FOR GUIDELINES ON RAMP DESIGN WHEN Ramps ARE REQUIRED FOR ADA ACCESSIBILITY.
GENERAL NOTES:

1. Use curb ramps in the following order of preference:
   A. Perpendicular curb ramp
   B. Combined (parallel/perpendicular) curb ramp
   C. Parallel curb ramp

   Existing conditions such as RW, sidewalk width, and type of sidewalk (curb-right or buffer area) usually determine the type of curb ramps to use. A single curb ramp or blended transition corners serving two street crossing directions are not allowed in new construction and not recommended when altering existing facilities.

2. When altering existing facilities, meet new construction requirements for curb ramps to the maximum extent feasible. Document with an ADA statement of technical infeasibility form when ADA standards can't be achieved.

3. If possible, do not place drainage structures in conflict with curb ramps. Location of curb ramps takes precedence over location of drainage structures except where existing drainage structures are being utilized. If a drainage structure must be placed in the pedestrian access route, an ADA compliant grate, having slot openings 1/2" [13] or less in one direction, must be used.

4. Use the flattest slopes possible (5% min.) for all curb ramps. Maximum constructed ramp slopes of 8.3% are shown for guidance at difficult sites.

5. Final field location of the curb ramps will be determined by the project manager.

6. Pedestrian access points at crosswalks are to be wholly contained within the crosswalk lines.

7. For additional information consult: Draft Public Rights-of-Way Accessibility Guidelines (PROWAG)

CONSTRUCTION REQUIREMENTS:

1. Obtain a surface texture on the ramp by coarse brooming; transverse to the ramp slope.

2. Take care during construction to assure uniform ramp grades, free of sags and sharp grade changes.

RAMP CURB TYPES

4" [102] wide retaining wall. If right-of-way allows, place retaining wall behind sidewalk. Retaining wall not required if ground slopes away from back of sidewalk.

FLARED SIDE

PERPENDICULAR CURB RAMP (SEE DETAILED DRAWING NUMBER 608-25 FOR ADDITIONAL DETAILS)

FLARED SIDE

WIDE SIDEWALK OR SIDEWALK WITH BUFFER AREA

PLANTING OR OTHER NON-WALKING SURFACE BUFFER AREA

TRANSITION PANEL

RAMP

LANDING

RAMP

TRANSITION PANEL

PARALLEL CURB RAMP (SEE DETAILED DRAWING NUMBER 608-30 FOR ADDITIONAL DETAILS)

PLANTING OR OTHER NON-WALKING SURFACE BUFFER AREA

FLARED SIDE (CONCRETE OR BUFFER AREA MATERIAL)

TRANSITION PANEL

RAMP

LANDING

RAMP

TRANSITION PANEL

FLARED SIDE (CONCRETE OR BUFFER AREA MATERIAL)

TRANSITION PANEL

RAMP

LANDING

RAMP

TRANSITION PANEL

FLARED SIDE (CONCRETE OR BUFFER AREA MATERIAL)

TRANSITION PANEL

RAMP

LANDING

RAMP

TRANSITION PANEL

UNITS SHOWN IN BRACKETS [ ] ARE METRIC AND ARE IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.

REFERENCE DWG. NO.
STANDARD SPEC. SECTION 608
608-15

NEW CONSTRUCTION CURB RAMPS

---REVISED--- EFFECTIVE: SEPTEMBER 2014
APRIL 2019

MONTANA DEPARTMENT OF TRANSPORTATION
CONSTRUCTION REQUIREMENTS:

1. The desirable width of the curb ramp (dimension "W" above) is 5 feet [1524] or wider. The minimum width ("W") is 4 feet [1219].

2. The desirable length of the landing at the top of the curb ramp (dimension "L" above) is 5 feet [1524]. The minimum length "L" is 4 feet [1220]. If the landing is constrained at the back of the sidewalk, the minimum length "L" is 5 feet [1524]. The landing width is equal to the ramp width.

3. The desirable running slope for the curb ramp is between 5% (1:20) and 7.1% (1:14). The maximum constructed curb ramp slope is 8.3% (1:12).

4. The desirable slope for the flared side of the curb ramp is 8.3% (1:12) or flatter. The maximum constructed flared side slope is 10% (1:10).

5. The desirable cross slope of the sidewalk, ramp, or landing is 1.5% (1:66.7) or less. The maximum constructed cross slope of the sidewalk, ramp, or landing is 2% (1:50).

6. The running slope of the sidewalk is equal to the street grade or flatter.

7. Provide detectable warning devices on the bottom 2 feet [610] of each ramp as shown above. See detailed drawing number 608-40 for detectable warning devices details.

GENERAL NOTES:

1. Where the right-of-way will not accommodate a perpendicular curb ramp and landing, consider using a combined (parallel/perpendicular) curb ramp. Combined (parallel/perpendicular) curb ramps are to meet the criteria for both the parallel and perpendicular curb ramps. (See detailed drawing number 608-30 and this drawing.)

2. There is no tolerance for exceeding maximum standards.

3. The cost of retaining walls is included in the unit price bid for concrete sidewalks.

4. The cost of retaining walls is included in the unit price bid for concrete sidewalks.

5. Where existing site development conditions prohibit the strict and full compliance of all ADA criteria, provide accessibility to the maximum extent feasible. Document with an ADA statement of technical infeasibility form when ADA standards can't be achieved.
GENERAL NOTES:
1. The cost of retaining walls is included in the unit price bid for concrete sidewalk.
2. There is no tolerance for exceeding maximum standards.

CONSTRUCTION REQUIREMENTS
1. The desirable length of the landing (dimension "L" above) is 5 feet [1524]. The minimum landing length is 4 feet [1219].
2. The desirable width of the landing (dimension "W" above) is 5 feet [1524]. The minimum landing width is 4 feet [1219]. If the landing is constrained on one or more sides, the minimum width is 5 feet [1524].
3. The desirable slope for the curb ramps is 5% (1:20) to 7.1% (1:14). The maximum constructed curb ramp slope is 8.3% (1:12).
4. The desirable cross slope of the sidewalk, ramp, or landing is 3.5% (1:66.7) or less. The maximum constructed cross slope of the sidewalk, ramp, or landing is 2% (1:50).
5. Provide detectable warning devices at the back of curb on each landing as shown above. See detailed drawing number 608-40 for detectable warning devices details.
6. Where existing site development conditions prohibit the strict and full compliance of all ADA criteria, provide accessibility to the maximum extent feasible and document with an ADA statement of technical infeasibility form when ADA Standards can’t be achieved.

UNIT SIZES:
- Metric and are in millimeters (mm)
- Unless other units are shown

REFERENCE DWG.
- NO. 608-30
- STANDARD SPEC.
- SECTION 608

DRAWN EFFECTIVE:
- SEPTEMBER 2014
- APRIL 2019

LEGAL pymongo
CONSTRUCTION REQUIREMENTS:

1. Install detectable warning devices that extend the full width of the ramp, 2 feet [610] in depth.

2. Install the detectable warning devices adjacent to the back of curb unless otherwise shown in the plans.

3. Embed the detectable warning devices directly into the concrete, so the top of the base plate is flush with the concrete and the domes protrude above the adjacent concrete surface.

4. Use cast iron detectable warning devices from the department’s qualified products list (QPL).

5. Ensure a uniform grade on the detectable warning devices free of sags and irregular edges.

6. Ensure detectable warning devices that visually contrast with adjacent walkway surfaces.

7. Ensure the alignment and pattern of the domes is continued across any joints between detectable warning devices base plate.

DETECTABLE WARNING DEVICES ALIGNMENT AND PATTERN

SIDE VIEW
CONCRETE CURBS

P = AREA TO BE PAINTED, WHEN PAINTED CURB IS REQUIRED (102 SQ. FT. [9.48 SQ. METERS] PER 100 FT. [30.48 M] OF CURB)

2% SLOPE

CONCRETE CURBS

9 1/2"

CONCRETE ADA LAYDOWN CURBS

24"

TO TOP BACK OF CURB

TRANSITION FROM FLOWLINE

LAYDOWN CURB (STRAIGHT LINE)

VARIES (6 1/8" [156] MIN)

VARIES (9 1/2" [241] MIN)

** 2% SLOPE

24" (610)

** 2% SLOPE

24" (610)

Joints:

(A) When integral with, tied to, or placed against Portland cement concrete pavement (P.C.C.P.), match transverse contraction and/or expansion joints in the adjacent P.C.C.P. slab. If required, extend 1/2" (13) MIN. WIDTH PREFORMED EXPANSION JOINTS COMPLETELY THROUGH CURB AND GUTTER THE SAME WIDTH AS THE P.C.C.P. SLAB JOINT. FILL CURB AND GUTTER EXPANSION JOINTS WITH PREFORMED EXPANSION JOINT FILLER.

(B) All other cases:

Space contraction joints in curb and gutter at 10 foot [3.05 m] INTERVALS OR LESS EXCEPT AS SPECIFIED IN (A) ABOVE. EXTEND 1/2" (13) MIN. WIDTH EXPANSION JOINTS COMPLETELY THROUGH CURB AND GUTTER EVERY 100 FEET [30.48 (610) MIN] AT INTERVALS EQUAL TO THE NEAREST MULTIPLE OF THE CONTRACTION JOINT INTERVAL, AND FILL WITH EXPANSION JOINT FILLER.

(C) Contraction joints:

Contraction joints are 1/8" (3) MIN. AND 3/8" (10) MAX. IN WIDTH, FORM JOINTS BY SAWING OR SCORING TO A MINIMUM DEPTH OF 1" (25). FORM SCORED JOINTS BY A TOOL WHICH WILL LEAVE MOUNDS AND DESTROY AGGREGATE INTERLOCK TO A MINIMUM DEPTH OF 1" (25).

(D) Other cases:

Separate the curb and gutter from adjacent sidewalk at points shown on DTL. DWG. NO. 608-05 WITH A BOND BREAKER MATERIAL. USE A 15 OR 30 POUND [6.8 OR 13.6 KILOGRAM] ROOFING FELT MATERIAL, OR OTHER PRODUCT AS APPROVED BY THE PROJECT MANAGER. DO NOT USE EXPANSION JOINT MATERIAL.

MINIMUM CURB RETURN RADIUS = 10' [3.05 M]. 15' [4.57 m] RADIUS ARE DESIRABLE FOR STREETS

Concrete:

UNLESS OTHERWISE SPECIFIED, CONSTRUCT CONCRETE CURBS AND INTEGRAL CURB AND GUTTER WITH CLASS GENERAL CONCRETE OR APPROVED EQUAL.

* QUANTITIES FOR ESTIMATING PURPOSES ONLY.


CONCRETE CURBS

CURB SECTION

1 CUBIC FOOT (0.305 cu m) OF CONCRETE WILL MAKE ABOUT 8 LINEAR FEET (2.44 in m) OF CURB.

NOTES:

1. WHEN CURB IS USED IN CONJUNCTION WITH GUARDRAIL, USE THE 4" (102) HIGH TYPE. OTHERWISE, THE CONTRACTOR MAY USE EITHER SECTION.

2. CONFORM ALL MATERIALS AND CONSTRUCTION PER SECTION 609.

3. PROVIDE CONTRACTION JOINTS IN CONCRETE CURBS AS DESCRIBED IN NOTE (B) ABOVE.

CONCRETE ADA LAYDOWN CURBS

USE WHEN LANDING IS PLACED INTEGRAL WITH CURB & GUTTER (SEE DTL. DWG. NO. 608-35)

EXPANSION JOINT FILLER MATERIAL:

USE PREFORMED EXPANSION JOINT FILLER MEETING THE REQUIREMENTS OF SECTION 707.

BOND BREAKER MATERIAL:

USE A 15 OR 30 POUND [6.8 OR 13.6 KILOGRAM] ROOFING FELT MATERIAL, OR OTHER PRODUCT AS APPROVED BY THE PROJECT MANAGER. DO NOT USE EXPANSION JOINT MATERIAL.

RADIUS:

MINIMUM CURB RETURN RADIUS = 10' [3.05 M]. 15' [4.57 m] RADIUS ARE DESIRABLE FOR STREETS

Concrete:

UNLESS OTHERWISE SPECIFIED, CONSTRUCT CONCRETE CURBS AND INTEGRAL CURB AND GUTTER WITH CLASS GENERAL CONCRETE OR APPROVED EQUAL.

* QUANTITIES FOR ESTIMATING PURPOSES ONLY.


UNITS SHOWN IN BRACKETS [ ] ARE METRIC AND ARE IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.

--REVISED--

EFFECTIVE SEPTEMBER 2014

APRIL 2019

MONTANA DEPARTMENT OF TRANSPORTATION
SHORT DURATION ACTIVITIES ARE DEFINED AS THOSE LASTING UP TO ONE HOUR.
SHORT-TERM STATIONARY ACTIVITIES ARE DEFINED AS THOSE LASTING GREATER THAN ONE HOUR, UP TO A FULL SHIFT.

THE REGULATORY SPEED SIGNS MUST MOVE AS NEEDED TO REMAIN WITHIN 500 FEET [150 m] OF THE WORK AREA.

SIGN BOTH TRAVEL DIRECTIONS ON TWO-LANE, TWO-WAY ROADWAYS OR BOTH SHOULDERS ON TWO-LANE, ONE-WAY ROADWAYS.

PROVIDE AT LEAST THE DISTANCE SHOWN FOR DELINEATOR MOUNTED SIGNS.

USE REFLECTIVE DEVICES.

XX = NORMAL POSTED SPEED LIMIT(S).

* DENOTES SIGNS THAT ARE UNIQUE TO MONTANA.

NOTES:

UNITS SHOWN IN BRACKETS [ ] ARE METRIC AND ARE IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.

DECLINE OR WORKERS

BEGIN WORK AREA

END WORK AREA

500' [150 m]

500' [150 m]

500' [150 m]

500' [150 m]

500' [150 m]

500' [150 m]

500' [150 m]

SURVEY CREW

WORKERS

SHORT DURATION OR SHORT-TERM STATIONARY CREW SIGNING

REFERENCE DWG. NO.
STANDARD SPEC. SECTION 618

618-34

DETAILED DRAWING

EFFECTIVE SEPTEMBER 2014

OCTOBER 2017
APRIL 2019