1. Use lower hole on new construction installations. See DTL. DWG. NO. 606-80 for schedule of guardrail hardware.

2. Install all bolts with heads on traffic side of installation. Use wood blocks or other "mash" approved blocks. Affix blocks to posts with two 16 penny galvanized nails or 14 gauge wire wrap.

3. Include terminal sections with the reflectorized surface facing adjacent traffic. Fabricate per section 704 or plastic reflectors with a urethane hinge. Fasten reflector to wood post using two 16 penny ring-shanked galvanized nails.

4. On existing guardrail installations, the minimum rail height is 25" (635 mm). Reflector is required if finished shoulder is less than 2'-0" (0.6 m) from the traffic lane.

5. Do not install W-beam guardrail for obstacles within 5.3' (1.6 m) of the face of the rail. Use lower hole on new construction installations.

6. Use 6' (1830) posts for standard installations. See DTL. DWG. NO. 606-80 for schedule of guardrail hardware.
NOTES:

1. INSTALL ALL BOLTS WITH HEADS ON TRAFFIC SIDE OF INSTALLATION.
2. USE Routed WOOD BLOCKS OR OTHER "MASH" APPROVED BLOCKS.
3. ATTACH REFLECTORS TO POSTS EVERY 25 FEET (7.62 m), INCLUDING TERMINAL SECTIONS, WITH THE REFLECTORIZED SURFACE FACING ADJACENT TRAFFIC. FASTEN REFLECTOR TO STEEL POST USING AN APPROVED ADHESIVE. REFLECTORS MAY BE BOLTED TO POSTS PROVIDED HOLES IN POSTS ARE DRILLED BEFORE BEING GALVANIZED.
5. WIDENING IS REQUIRED IF FINISHED SHOULDER IS LESS THAN 2'-0" (0.6 m) FROM THE TRAFFIC LANE.
6. STEEL POSTS WITH OTHER POST HOLE CONFIGURATIONS MAY BE ACCEPTED, PROVIDED THEY HAVE AT LEAST THE HOLES DETAILLED ON THIS DRAWING AND THEY MEET MASH'TS PUBLICATION, "A GUIDE TO STANDARDIZED HIGHWAY BARRIER HARDWARE AND "MASH" REQUIREMENTS.
7. DO NOT INSTALL W-BEAM GUARDRAIL FOR OBSTACLES WITHIN 5 3/4" (16.2 m) OF THE FACE OF THE RAIL.
8. USE LOWER HOLE ON NEW CONSTRUCTION INSTALLATIONS.
9. USE Ø [1830] POSTS FOR STANDARD INSTALLATIONS.

* 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.
NOTE:

1. See DTL. DWG. No. 606-05A and 606-05B for standard MGS guardrail and associated hardware.

2. Obstacles closer to the face of rail than the indicated limits require the use of a rigid barrier system with little to no dynamic deflection.

3. Lap all rail in the direction of adjacent traffic.

4. All posts and blocks are standard dimensions as per detailed drawing No. 606-05A and 606-05B.

5. Rail IS RMG6-5'.

6. Pay limit defined by rails containing a section of reduced post spacing limits shown are for example only. Actual pay limits will differ depending upon splice locations.

7. 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.
### DETAILED DRAWING

**DWG. NO.** 606-09

**REFERENCE** SEPTEMBER 2014

**EFFECTIVE:** JANUARY 2018

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

---

#### GUARDRAIL (MGS) LONG SPAN

**SECTION A-A**

- **12" WOOD BLOCK** [305]
- **12" HEAD NAIL** [400]
- **1'-4" DIAMETER HOLES** [480]
- **6'-0" CLEAR** [1800]
- **3 CRT POSTS AT 6'-3" (1.905 m) SPAN**
- **6 CRT POSTS (PDE09*) WITH ONE 12" [305] WOOD BLOCKOUT (PDB11*) EACH**
- **3 POSTS OMITTED**

**LONG SPAN MGS GUARDRAIL PAY LIMITS 50'-0" (15.24m) FOR 18'-9" [5.715m] SPAN**

**LONG SPAN MGS GUARDRAIL PAY LIMITS 62'-6" [19.05m] FOR 25'-0" [7.62 m] SPAN**

**LONG SPAN MGS GUARDRAIL PAY LIMITS 50'-0" [15.24 m] OR 62'-6" [19.05 m] FOR 12'-6" [3.81 m] SPAN**

**STANDARD MGS POSTS**

**PLAN VIEW**

---

**NOTES:**

1. **SEE DET. DRS. NO. 606-05A AND 606-05B FOR STANDARD MGS GUARDRAIL AND ASSOCIATED HARDWARE.**
2. **STANDARD MGS POSTS AND BLOCKOUTS**
3. **6 CRT POSTS (PDE09*) WITH ONE 12" [305] WOOD BLOCKOUT (PDB11*) EACH**

---

**SECTION A-A**

**LONG SPAN MGS GUARDRAIL PAY LIMITS 50'-0" [15.24 m] FOR 12'-6" [3.81 m] SPAN**

**LONG SPAN MGS GUARDRAIL PAY LIMITS 62'-6" [19.05 m] FOR 25'-0" [7.62 m] SPAN**

**LONG SPAN MGS GUARDRAIL PAY LIMITS 62'-6" [19.05 m] FOR 18'-9" [5.715 m] SPAN**

**LONG SPAN MGS GUARDRAIL PAY LIMITS 62'-6" [19.05 m] FOR 12'-6" [3.81 m] SPAN**

**LONG SPAN MGS GUARDRAIL PAY LIMITS 62'-6" [19.05 m] FOR 18'-9" [5.715 m] SPAN**

**LONG SPAN MGS GUARDRAIL PAY LIMITS 62'-6" [19.05 m] FOR 25'-0" [7.62 m] SPAN**

---

**REFERENCES**

**MDTX DEPARTMENT OF TRANSPORTATION**

**REVISED:** APRIL 2019
DETAIL DRAWING

DWG. NO. 606-11A

REFERENCE

SEPTEMBER 2014

EFFECTIVE:

606, 704

SECTION

STANDARD SPEC.

(MGS)

LONG POSTS - WOOD

METAL GUARDRAIL -

--REVISED--

JANUARY 2018

UNLESS OTHER UNITS ARE SHOWN.

METRIC AND ARE IN MILLIMETERS (mm)

UNITS SHOWN IN BRACKETS [] ARE

2:1 MAX (SEE NOTE 7)

SLOPE VARIES

APPROX.

REFLECTOR (SEE NOTE 3)

DIA. (TYP.)

3/16" [5]

3/4" [20]

1 1/2" [35]

[100 TO 130]

4" TO 5"

[635]

2'-1" [490]

1'-7" [350]

SHOULDER FINISHED

NORMAL

POST

WOOD

TOP OF

PROFILE

DTL. DWG. NO. 606-05A & 606-05B.

POSTS CANNOT BE PROVIDED, AS PER

THE 2'-0" [610] WIDENING BEHIND THE

THIS GUARDRAIL SYSTEM IS USED WHEN

NOTE:

YELLOW PER MUTCD SHEETING WHITE OR

INTENSITY)

TYPE III (HIGH

REFLECTORIZED

3 /4 " [2 0 ]

3 " [7 5 ]

8" [205]

7'-6"

7" [175]

3 1/2"

5/8" DIA. x 1'-6"

1'-7"

[25]

3/4" [19]

3" [75]

8" [205]

6" X 8" X 14"

[155 X 205 X 350]

7" [175]

7" [175]

4'-10"

1470

[2290]

[1470]

7'-6"

[108]

[75]

2" [50]

2" [50]

2 1/2"

[350]

8"

[175]

[2290]

[350]

6"

[175]

[2290]

[350]

5/8" DIA. x 1'-6"

2" [50]

2" [50]

2 1/2"

[350]

8"

[175]

[2290]

[350]

5/8" DIA. x 1'-6"

2" [50]

2" [50]

2 1/2"

[350]

8"

[175]

[2290]

[350]

NOTES:

1. INSTALL ALL HOLES WITH HEADS ON TRAFFIC SIDE OF INSTALLATION.

2. USE WOOD BLOCKS OR OTHER "MANG" APPROVED BLOCKS AFTER BOLTS TO POSTS WITH TWO 16 PENNY GALVANIZED NAILS OR 14 GAUGE WIRE WRAP.

3. ATTACH REFLECTORS TO POSTS AWAY 37 1/2" (952 mm), INCLUDING TERMINAL SECTIONS, WITH THE REFLECTORIZED SURFACE FACING ADJACENT TRAFFIC FABRICATE REFLECTORS FROM LUMINOUS REFLECTORS WITH A URETHANE HINGE. FASTEN REFLECTOR TO WOOD POST USING TWO 16 PENNY RING-SHAPED GALVANIZED NAILS AND TWO 1/4"X 1-3/4" (6.4 X 45.7 mm) WASHERS IN PRE-DRILLED HOLES.

4. ON EXISTING GUARDRAIL INSTALLATIONS, THE MINIMUM RAIL HEIGHT IS 27 3/4" (705 mm).

5. DO NOT INSTALL LONG POST IN STEEL GUARDRAIL PARA DICHOS WITHIN 15' (4.57 m) OF THE FACE OF THE RAIL.

6. USE LOWER HOLE ON NEW CONSTRUCTION INSTALLATIONS.

7. ATTACH REFLECTORS TO POSTS AWAY 37 1/2" (952 mm), INCLUDING TERMINAL SECTIONS, WITH THE REFLECTORIZED SURFACE FACING ADJACENT TRAFFIC FABRICATE REFLECTORS FROM LUMINOUS REFLECTORS WITH A URETHANE HINGE. FASTEN REFLECTOR TO WOOD POST USING TWO 16 PENNY RING-SHAPED GALVANIZED NAILS AND TWO 1/4"X 1-3/4" (6.4 X 45.7 mm) WASHERS IN PRE-DRILLED HOLES.

8. ON EXISTING GUARDRAIL INSTALLATIONS, THE MINIMUM RAIL HEIGHT IS 27 3/4" (705 mm).

9. INSTALL ALL BOLTS WITH HEADS ON TRAFFIC SIDE OF INSTALLATION.

10. USE WOOD BLOCKS OR OTHER "MANG" APPROVED BLOCKS AFTER BOLTS TO POSTS WITH TWO 16 PENNY GALVANIZED NAILS OR 14 GAUGE WIRE WRAP.

11. ATTACH REFLECTORS TO POSTS AWAY 37 1/2" (952 mm), INCLUDING TERMINAL SECTIONS, WITH THE REFLECTORIZED SURFACE FACING ADJACENT TRAFFIC FABRICATE REFLECTORS FROM LUMINOUS REFLECTORS WITH A URETHANE HINGE. FASTEN REFLECTOR TO WOOD POST USING TWO 16 PENNY RING-SHAPED GALVANIZED NAILS AND TWO 1/4"X 1-3/4" (6.4 X 45.7 mm) WASHERS IN PRE-DRILLED HOLES.

12. ON EXISTING GUARDRAIL INSTALLATIONS, THE MINIMUM RAIL HEIGHT IS 27 3/4" (705 mm).

13. DO NOT INSTALL LONG POST IN STEEL GUARDRAIL PARA DICHOS WITHIN 15' (4.57 m) OF THE FACE OF THE RAIL.

14. USE LOWER HOLE ON NEW CONSTRUCTION INSTALLATIONS.

15. ATTACH REFLECTORS TO POSTS AWAY 37 1/2" (952 mm), INCLUDING TERMINAL SECTIONS, WITH THE REFLECTORIZED SURFACE FACING ADJACENT TRAFFIC FABRICATE REFLECTORS FROM LUMINOUS REFLECTORS WITH A URETHANE HINGE. FASTEN REFLECTOR TO WOOD POST USING TWO 16 PENNY RING-SHAPED GALVANIZED NAILS AND TWO 1/4"X 1-3/4" (6.4 X 45.7 mm) WASHERS IN PRE-DRILLED HOLES.

16. ON EXISTING GUARDRAIL INSTALLATIONS, THE MINIMUM RAIL HEIGHT IS 27 3/4" (705 mm).

17. INSTALL ALL BOLTS WITH HEADS ON TRAFFIC SIDE OF INSTALLATION.

18. USE WOOD BLOCKS OR OTHER "MANG" APPROVED BLOCKS AFTER BOLTS TO POSTS WITH TWO 16 PENNY GALVANIZED NAILS OR 14 GAUGE WIRE WRAP.

19. ATTACH REFLECTORS TO POSTS AWAY 37 1/2" (952 mm), INCLUDING TERMINAL SECTIONS, WITH THE REFLECTORIZED SURFACE FACING ADJACENT TRAFFIC FABRICATE REFLECTORS FROM LUMINOUS REFLECTORS WITH A URETHANE HINGE. FASTEN REFLECTOR TO WOOD POST USING TWO 16 PENNY RING-SHAPED GALVANIZED NAILS AND TWO 1/4"X 1-3/4" (6.4 X 45.7 mm) WASHERS IN PRE-DRILLED HOLES.

20. ON EXISTING GUARDRAIL INSTALLATIONS, THE MINIMUM RAIL HEIGHT IS 27 3/4" (705 mm).

21. DO NOT INSTALL LONG POST IN STEEL GUARDRAIL PARA DICHOS WITHIN 15' (4.57 m) OF THE FACE OF THE RAIL.

22. USE LOWER HOLE ON NEW CONSTRUCTION INSTALLATIONS.

23. ATTACH REFLECTORS TO POSTS AWAY 37 1/2" (952 mm), INCLUDING TERMINAL SECTIONS, WITH THE REFLECTORIZED SURFACE FACING ADJACENT TRAFFIC FABRICATE REFLECTORS FROM LUMINOUS REFLECTORS WITH A URETHANE HINGE. FASTEN REFLECTOR TO WOOD POST USING TWO 16 PENNY RING-SHAPED GALVANIZED NAILS AND TWO 1/4"X 1-3/4" (6.4 X 45.7 mm) WASHERS IN PRE-DRILLED HOLES.

24. ON EXISTING GUARDRAIL INSTALLATIONS, THE MINIMUM RAIL HEIGHT IS 27 3/4" (705 mm).
DISTANCE OF 5'-0" [1.52m] IS REQUIRED BEHIND POST LOCATION #1.

SECTION FLARE AND SYSTEM WIDTH. A MINIMUM WIDENING 7'-0" [2.13m] WIDENING DIMENSION ALLOWS FOR OPTIONAL TERMINAL INDICATED IN THE PLANS.

LENGTH OF NEED POST LOCATION EQUALS STATION LIMITS THAT IS NOT WITHIN THE MANUFACTURER'S HEIGHT TOLERANCE.

SEE DTL. DWG. NO. 606-20 IF CONNECTING TO EXISTING RAIL.

SEE DTL. DWG. NO. 606-05A AND 606-05B FOR MGS GUARDRAIL.

MANUFACTURER'S DETAIL AND ASSEMBLY INSTRUCTIONS.

OPTIONAL TERMINAL SECTION SYSTEMS VARY, REFER TO MANUFACTURER'S DETAIL AND ASSEMBLY INSTRUCTIONS.

STANDARD MGS PAY LIMITS

ROAD SYSTEMS MSKX WITH 9'-4 1/2" RAIL PANEL

UNIT SHOWN IN BRACKETS J A/M.

METRICS ARE IN MILLIMETERS (mm). UNLESS OTHER UNITS ARE SHOWN.

REFERENCE: Dwg. No. 606-33

MASH OPTIONAL TERMINAL

SECTIONS

EFFECTIVE: JANUARY 2018

MINING DEPARTMENT OF TRANSPORTATION

MTDX

DETAILED DRAWING
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 LINEAL FEET OF MGS GUARDRAIL.
2. SEE DTL. DWG. NO. 606-05A, 606-05B, 606-11A, AND 606-11B FOR MGS GUARDRAIL AND ASSOCIATED HARDWARE.
3. LAP ALL Ø3/8" WIRE IN THIS DIRECTION OF ADJACENT TRAFFIC.

UNITS SHOWN IN BRACKETS [] ARE METRIC AND ARE TO BE MULTIPLIED TIMES (x) UNLESS OTHER DATA IS SHOWN.

DETAIL DRAWING
REFERENCE: MONTANA DEPARTMENT OF TRANSPORTATION

DRAWING DATE: APRIL 2019

UNITS SHOWN IN BRACKETS [ ] ARE METRIC AND ARE TO BE MULTIPLIED TIMES (x) UNLESS OTHER DATA IS SHOWN.

DETAILED DRAWING
REFERENCE: MONTANA DEPARTMENT OF TRANSPORTATION

DRAWING DATE: APRIL 2019
**Standard W-Beam Guardrail**

- **End of Concrete Barrier**
  - Use Standard W-Beam Guardrail (W-BEAM) per DETAIL, DWG. NO. 606-24A.
  - Lap Guardrail in the direction of the adjacent traffic lane.
  - Use Lap GUARDRAIL TERMINAL CONNECTOR (RWE02a-b) in the direction of the adjacent traffic lane.
  - See DETAIL, DWG. NO. 606-05A for METAL GUARDRAIL (W-BEAM).

- **Bridge Approach Section Pay Limits**
  - Use Bridge Rail (PER CYL.) to fasten to Post with Standard Post Bolt.
  - Use DOUBLED GUARDRAIL BEAMS for BRIDGES USING CONCRETE BARRIER RAIL.
  - See DETAIL, DWG. NO. 606-25A for SKEWED BRIDGES.
  - Do not flare Bridge Approach Sections.

- **Concrete Barrier Rail**
  - Taper the End of the Tapered Concrete Curb to meet END OF THE TAPERED CONCRETE CURB details, SEE DETAIL, DWG. NO. 606-88.
  - See DETAIL, DWG. NO. 606-27 for TAPERED CONCRETE CURB DETAILS, SEE DETAIL, DWG. NO. 606-26 for TYPE 1, SEE DETAIL, DWG. NO. 606-27 for TYPE 3, SEE DETAIL, DWG. NO. 606-80 for SCHEDULE OF GUARDRAIL HARDWARE.

- **Special Notes**
  - See DETAIL, DWG. NO. 606-24A for Bridge Approach Sections - Wood Posts.
  - See DETAIL, DWG. NO. 606-25A for Guardrail Section Type 2.
  - See DETAIL, DWG. NO. 606-27 for Guardrail Section Type 3.
  - See DETAIL, DWG. NO. 606-28 for Standard GUARDRAIL BOLTS.

---

** shore with Retaining Surface as Directed**

**1'-11" [585]**

**7'-0" [2100]**

**1'-6 3/4" [476.25]**

**9" [229]**

**3 1/2" [89]**

**3'-1 1/2" [952.50]**

**7 3/4" [195]**

---

**Credits:**

- Montana Department of Transportation
- Reference: DWG. NO. 606-24A
- Section: 606
- SEPTEMBER 2014
- REVISED: JULY 2016
**Plan**

- **Standard Post Bolt:**
  - Use with standard guardrail beams.

- **Metal Guardrail:**
  - Use with standard guardrail beams.

**Detail**

- **Plate Washer (W/P Round Hole):**
  - Use with standard guardrail beams.

- **Metal Guardrail (W/Beams):**
  - Use with standard guardrail beams.

**Elevation**

- **Tapered Concrete Curb:**
  - Type 1 & 2: See DETL. DWG. NO. 606-26
  - Type 3: See DETL. DWG. NO. 606-27

- **Concrete Barrier Rail:**
  - Taper the end of the tapered concrete curb as shown.

**Notes:**

- **Tapered Concrete Curb:**
  - Type 1 & 2: See DETL. DWG. NO. 606-26
  - Type 3: See DETL. DWG. NO. 606-27

- ** Portions of Guardrail & Blockouts are omitted for clarity.**

- **Guardrail Not Attached to Posts:**
  - Use double guardrail beams.

**Units Shown in Bracket(s) are Metric and are in millimeters (mm) unless otherwise shown.**

**Reference:**

- **25'-0" (7.6 m) Bridge Approach Section Pay Limits**
  - Pay Limits:
    - 11'-6" (3.5 m) Bridge Approach Section Pay Limits
    - 25'-0" (7.6 m) Bridge Approach Section Pay Limits

**Standard R-Beam Guardrail**

- **Metal Guardrail:**
  - Use with standard guardrail beams.

**Metal Guardrail-Bridge Approach Section Type 1**

- **For Bridges Using Concrete Barrier Rail:**
  - See DETL. DWG. NO. 606-25B

**Metal Guardrail-Bridge Approach Section Type 2**

- **For Bridges Without Curbs:**
  - See DETL. DWG. NO. 606-24B

**Metal Guardrail-Bridge Approach Section Type 3**

- **For Bridges with Existing Curves:**
  - See DETL. DWG. NO. 606-23B
USE DOUBLED GUARDRAIL BEAMS

METAL GUARDRAIL - BRIDGE APPROACH SECTION TYPE 3

END OF CONCRETE BARRIER
BRIDGE WING WALL
BRIDGE SKEW ANGLE

GUARDRAIL
STANDARD W-BEAM

(SEE BRIDGE PLANS)

(SEE BRIDGE PLANS)

USE DOUBLED GUARDRAIL BEAMS

GUARDRAIL IS ATTACHED TO ALL POSTS WITH STANDARD GUARDRAIL BOLTS

METAL GUARDRAIL - BRIDGE APPROACH SECTION TYPE 1

(SEE BRIDGE PLANS)

(SEE BRIDGE PLANS)

USE DOUBLED GUARDRAIL BEAMS

GUARDRAIL IS ATTACHED TO ALL POSTS WITH STANDARD GUARDRAIL BOLTS

NOTES:

1. TAPERED CONCRETE CURBS:
   TYPE 1, SEE DTL. DWG. NO. 606-26
   TYPE 3, SEE DTL. DWG. NO. 606-27

2. TAPERED CONCRETE CURBS ARE ALSO REQUIRED ON CONCRETE APPROACH SLABS.

3. LAP GUARDRAIL IN THE DIRECTION OF THE ADJACENT TRAFFIC LANE.
   (SEE DTL. DWG. NO. 606-05A).

4. LAP W-BEAM TERMINAL CONNECTOR (RWE02a-b) IN THE DIRECTION OF THE ADJACENT TRAFFIC LANE.

5. USE WOOD BLOCKS OR OTHER NCHRP 350 APPROVED BLOCKS FOR BLOCKOUTS.

6. DO NOT FLARE BRIDGE APPROACH SECTIONS.

7. SEE DTL. DWG. NO. 606-24A FOR ADDITIONAL INFORMATION.

8. SEE DTL. DWG. NO. 606-05A FOR METAL GUARDRAIL (W-BEAM).

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

DETAILED DRAWING
REFERENCE
DWG. NO.
STANDARD SPEC.
SECTION 606

SKEWED BRIDGE APPROACH SECTIONS - WOOD POSTS

EFFECTIVE: SEPTEMBER 2014
**Bent Bars (All Dimensions Are Out to Out) in Millimeters (mm)**

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<th>Size</th>
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<th>Length</th>
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</tr>
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<td>3 3/4</td>
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<tr>
<td>B2</td>
<td>#4</td>
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<td>3 1/2</td>
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**Bent Bars (All Dimensions Are Out to Out) in Feet (ft)**

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<td>B2</td>
<td>#13</td>
<td>3</td>
<td>3</td>
<td>3 1/2</td>
</tr>
</tbody>
</table>

- **NOTE:** Bent bars used in bridge approach section type 1. (See DTL. DWG. NO. 606-26.)
- **NOTE:** Furnish lapped reinforcing steel meeting section 711.
- **NOTE:** All concrete is Class General.
- **NOTE:** Furnish Wire Rope meeting section 705.
- **NOTE:** Type I (see DTL. DWG. NO. 606-24A AND 606-24B).

**Total Rebar Weight Per 7' (2100 mm) Tapered Curb Est. = 34 lb (15.1 kg).**

**Total Concrete Per 7' (2100 mm) Tapered Curb Est. = 0.2 C.Y. (0.17 m³).**

**All Concrete is Class General.**

**Reference:** Dwg. No. 606-26

**Tapered Concrete Curb Detail**

**Detailed Drawing**

**Section A-A**

**View A-A**

**View B-B**

**Section C-C**

**Wire Rope Detail**

**Bill of Reinforcing Steel (One Section Only)**

**Metric Bill of Reinforcing Steel (One Section Only)**
Tapered Concrete Curb Detail

**Notes:**
1. REMOVE THE EXISTING SURFACE UNTIL THE NEW TAPERED CONCRETE CURB AS APPROVED BY THE PROJECT MANAGER. EMBED THE TAPERED CURVE CURB A MINIMUM OF 4'-0" (1200) BELOW THE GRADE MEASURED AT THE INSIDE FACE OF THE CURB.
2. ALL CONCRETE IS CLASS GENERAL.
3. TOTAL CONCRETE PER 6'-0" (1800) TAPERED CURB EST. = 0.2 C.Y. (0.16 m³)
4. TOTAL REBAR WEIGHT PER 6'-0" (1800) TAPERED CURB EST. = 27 LB. (12 kg)
5. TAPERED CONCRETE CURB IS USED WITH WIDE APPROACH SECTION TYPE 3 (SEE DTL. DWG. NO. 606-24A AND 606-24B).
6. ADJUST DIMENSIONS TO MATCH EXISTING CURB.

**Bill of Reinforcing Steel (One Section Only):**

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<thead>
<tr>
<th>Type</th>
<th>BENT BARS (ALL DIMENSIONS ARE OUT TO OUT)</th>
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**Metric Bill of Reinforcing Steel (One Section Only):**

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<tbody>
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METRIC CABLE TENSIONING

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<th>TEMP. (°C)</th>
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<th>80 TO 70</th>
<th>70 TO 60</th>
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<tr>
<td>1/16&quot; (1.6)</td>
<td>19 TO 15</td>
<td>15 TO 12</td>
<td>12 TO 9</td>
<td>9 TO 7</td>
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<td>27 TO 22</td>
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<td>61 TO 54</td>
<td>54 TO 47</td>
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<td>33 TO 26</td>
<td>26 TO 20</td>
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TYPICAL INSTALLATION DETAIL

LINE POST & POST P3

TYPICAL INSTALLATION DETAIL

POST P3

REFLECTOR ALT. "A"

CABLE SPlice

SPACE CABLE USING A COUPLING DEVICE AS SHOWN AN ALTERNATE METHOD APPROVED BY THE PROJECT MANAGER.
OF GUARDRAIL HARDWARE.

SEE DTL. DWG. NO. 606-80 FOR SCHEDULE

USE CLASS GENERAL CONCRETE TO CONSTRUCT ANCHOR UNIT.

EACH OF THE HALVES OF THE TWO PIECE ANCHOR UNIT INSTALLATIONS, USE ALL THE SAME CONTENTS.

AND 2 TONS [1.8 METRIC TONS] EACH FOR THE ONE PIECE ANCHOR WITH A SAFE WORKING LOAD OF 4 TONS [3.6 METRIC TONS] FOR THE ONE PIECE ANCHOR.

IF LIFTING DEVICES ARE EMBEDDED INTO THE ADDITIONAL REBAR, AS SHOWN.

DIMENSIONS, LESS THE TAPERED KEYWAY AND THE TAPERED KEYWAY DETAIL.

SHOWS A TWO PIECE INSTALLATION. FOR ONE PIECE OR TWO PIECES. THIS DETAIL PRIMARILY SHOWS THE DIFFERENCE.

NOTE: DIMENSIONS FOR LEFT AND RIGHT HAND ANCHOR UNITS ARE THE SAME, WITH THE POSITION OF THE ANCHOR POST AND ANCHOR BRACKET BEING THE ONLY DIFFERENCE.

NOTE:

INSTALL ONE WASHER UNDER HEAD, ONE BETWEEN PLATES & ONE UNDER NUT. AN ADDITIONAL WASHER MAY BE PLACED BETWEEN PLATES TO PLUMB THE ANCHOR POST.

NOTE:

THE ANCHOR POST. PLACED BETWEEN PLATES TO PLUMB

ANCHOR ASSEMBLY

GUARDRAIL TERMINAL

LOW-TENSION CABLE

ANCHOR ASSEMBLY

REFERENCE

STANDARD: MONTANA DEPARTMENT OF TRANSPORTATION

SECTION 606

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

NAVIGATION DEPARTMENT OF

MDT-X

* REVISED: JANUARY 2018

EFFECTIVE:

SEPTEMBER 2014

DWG. NO.

606-41

DETAILED DRAWING

MARKING DEPARTMENT

OF TRANSPORTATION

NOTES:


2. THE CONCRETE ANCHOR CAN BE PLACED AS ONE OR TWO PIECES. THIS DETAIL PRIMARILY SHOWS A TWO PIECE INSTALLATION. FOR ONE PIECE INSTALLATIONS, USE ALL THE SAME DIMENSIONS, LESS THE TAPERED KEYWAY AND THE TAPERED KEYWAY DETAIL.


4. USE CLASS GENERAL CONCRETE TO CONSTRUCT ANCHOR UNIT.

SET DL. 058-80 FOR SCHEDULE.

* OF GUARDRAIL HARDWARE.

ANCHOR Post DETAIL

ANCHOR UNIT & REBAR INSTALLATION DETAILS

ANCHOR Post & Cable Guardrail

Detail & Dimensions

Diagram & Notes

Anchor Assembly

Guardrail Terminal

Low-Tension Cable

Reference

Standard:

Section 606

Marking Department

Transportation

MDT-X

* Revised: January 2018

Effective:

September 2014

Dwg. No.

606-41

Detailed Drawing

Notes:

1. Install the concrete anchor into the excavation, as detailed, so that the bottom of the anchor has a full and even bearing on the surface under it and the concrete anchor per section 203.

2. The concrete anchor can be placed as one or two pieces. This detail primarily shows a two piece installation. For one piece installations, use all the same dimensions, less the tapered keyway and the tapered keyway detail.

3. If lifting devices are embedded into the concrete anchor, ensure that they have a safe working load of 4 tons [3.6 metric tons] for the one piece anchor and 5.5 tons [4.9 metric tons] for each of the halves of the two piece anchor unit.

4. Use class general concrete to construct anchor unit.

Set DTL. 058-80 for schedule.

* of guardrail hardware.

Diagram & notes

Anchor post detail

Anchor unit & rebar installation details

Anchor post & cable guardrail

Detail & dimensions

Notes:

1. Install the concrete anchor into the excavation, as detailed, so that the bottom of the anchor has a full and even bearing on the surface under it and the concrete anchor per section 203.

2. The concrete anchor can be placed as one or two pieces. This detail primarily shows a two piece installation. For one piece installations, use all the same dimensions, less the tapered keyway and the tapered keyway detail.

3. If lifting devices are embedded into the concrete anchor, ensure that they have a safe working load of 4 tons [3.6 metric tons] for the one piece anchor and 5.5 tons [4.9 metric tons] for each of the halves of the two piece anchor unit.

4. Use class general concrete to construct anchor unit.

Set DTL. 058-80 for schedule.

* of guardrail hardware.

Diagram & notes

Anchor post detail

Anchor unit & rebar installation details

Anchor post & cable guardrail

Detail & dimensions

Notes:
SECTION A-A

SHOULDER FINISHED NORMAL SLOPE VARIABLE 2% SLOPE

REFLECTIVE TAB

ELEVATION

NOTES:

1. USE BOX BEAM RAIL IN MINIMUM NOMINAL LENGTHS OF 18 FT. [5.49 m] UNLESS APPROVED BY THE PROJECT MANAGER.
2. INSTALL EXPANSION JOINTS ON ALL BOX BEAM GUARDRAIL INSTALLATIONS GREATER THAN 300 FT. [90 m] IN LENGTH AT INTERVALS NOT TO EXCEED 500 FT. [150 m].
3. ATTACH REFLECTIVE TABS TO EVERY FOURTH POST (24 FT. [7.32 m] TYP.). ANGLE TABS SLIGHTLY TOWARDS TRAFFIC. DO NOT USE REFLECTIVE TABS ON WY-BET TERMINALS. WY-BET TERMINALS RECEIVE REFLECTIVE CHANNELS.
4. DO NOT INSTALL BOX BEAM GUARDRAIL FOR OBSTACLES WITHIN 5.8 [1.8 m] OF THE FACE OF THE RAIL.
5. WIDENING IS REQUIRED IF FINISHED SHOULDER IS LESS THAN 2'-0" [0.6 m] FROM THE TRAFFIC LANE.
6. PROVIDE SHOP BENT BOX BEAM RAIL FOR ROADWAY CURVATURE WITH RADIUS OF LESS THAN 715 FEET [218 m].

* 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.

SECTION A-A

EXPANSION JOINT

NOTE:

1. USE BOX BEAM RAIL IN MINIMUM NOMINAL LENGTHS OF 18 FT. [5.49 m] UNLESS APPROVED BY THE PROJECT MANAGER.

DETAIL DRAWING

REFERENCE SPEC.

DWG. NO.

SECTION

EFFECTIVE: SEPTEMBER 2014

MONTANA DEPARTMENT OF TRANSPORTATION

606-50

1/2" [12.7] DIAM HOLES FOR 3/8" DIA x 1-1/2" [M10 x 19] HEX BOLT (FBX10m1) AND NUT (FX10a) WITH 2 FLAT WASHERS (FC10a) (1 WASHER ON POSTS WITH REFLECTIVE TAB)

BOX BEAM SPICE PLATES (RBS01*)

1/2" DIA x 1 1/2" [M12 x 38] HIGH STRENGTH HEX BOLT (FBX12m1) & NUT (FX12a) WITH 2 FLAT WASHERS (FC12a)

BOX BEAM POST (PSE08*)

TYPE A BOX BEAM POST (PSE08*)

SOIL PLATE (PLS01*)

EDGE OF TRAFFIC LANE

NORMAL FINISHED SHOULDER

2'-0" [610]

3'-0" [915]

2-4" [710]

6'-0" [1830]

6'-0" [1830]

3/4" DIA x 2" [M20 x 51] HIGH STRENGTH HEX BOLT (FBX20m1) WITH HARDENED FLAT WASHER (FWC20a*) (TYP. TOP AND BOTTOM)

3/4" DIA x 2" [M20 x 51] HIGH STRENGTH HEX BOLT (FBX20m1) WITH HARDENED FLAT WASHER (FWC20a*) (TYP. TOP AND BOTTOM)

1/2" DIA HOLE

1/2" [12] GAP

3 1/2" [89]

6" [152]

1/2" [12] GAP

6" [152]

1/2" [12] GAP

6" [152]

1/2" [12] GAP

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6" [152]
See Detail "A" for 1/2" x 1 1/2" (12 x 38) hex bolt (FBX12a*) and nut (FXN12a*) with 2 flat washers (FWC12a*).

Soil plate (PLS01*)

End cover plate (3/16" [4.8] thick)

Type O box beam post (PB200*)

Box beam support bracket (FPP01*)

NOTES:

1) See DTL. DWG. NO. 606-50 for standard box beam guardrail and associated details.

2) 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:

Dwg. No. 606-50

Standard Spec. 606

Section 606

Effective: September 2014

Montana Department of Transportation
TRAFFIC SIDE

DEPARTURE SECTION

BOX BEAM ONE-WAY BRIDGE

ELEVATION

PLAN

TRAFFIC

1" (25.4) DIA. HOLES IN BOX BEAM RAIL FOR 3/8" DIA. x 8" [20 x 203] HIGH STRENGTH HEX BOLT (FBX20b*) AND NUT (4/HX20b*) WITH TWO HARDENED FLAT WASHERS (FWC20b*)

CONNECTION SLEEVE ATTACHED TO BRIDGE RAIL (TYP.) (3/4" [6.4] THICK STEEL FORM FIT TUBE TO RECEIVE 1 1/2" x 6" x 3/16 [1512 x 152 x 4.8] BOX BEAM RAIL

NOTE:

1" x 4" (25.4 x 101.6) SLOTS REQUIRED TOP AND BOTTOM OF CONNECTION SLEEVE

3'-2" [965]

PLAN

STANDARD BOX BEAM GUARDRAIL PAY LIMITS

HEIGHT

2'-4" [710] OR AS REQUIRED TO MATCH BRIDGE RAIL THIS

2' 1/4" [57] GAP

ELEVATION

NOTES:

1. SEE DTL. DWG. NO. 606-50 FOR STANDARD BOX BEAM GUARDRAIL AND ASSOCIATED DETAILS.

2. USE ON EXIT END OF ONE-WAY TRAFFIC DETAILS.

3. USE ON EXIT END OF ONE-WAY TRAFFIC BRIDGES ONLY.

** SEE BRIDGE PLANS FOR MORE DETAILED INFORMATION ON BRIDGE RAIL AND CONNECTION DETAILS.

UNIT SHOWN IN BRACKETS (1) ARE METRIC AND ARE IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.
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<th>606-24A</th>
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NOTES:

1. FOR RELATED FASTENER HARDWARE SEE FWC24a*, FNX24a* AND FPA01*.

2. MACHINE THE SWAGED FITTING FROM HOT-ROLLED CARBON STEEL CONFORMING TO THE REQUIREMENTS OF ASTM A576 [A576 M], GRADE 1035, AND ANNEAL SUITABLE FOR COLD SWAGING. GALVANIZE THE SWAGED FITTING IN ACCORDANCE WITH SUBSECTION 711.08 BEFORE SWAGING. DRILL A LOCK PIN HOLE TO ACCOMMODATE A 1/4" [6.4 mm] PLATED SPRING STEEL PIN THROUGH THE HEAD OF THE SWAGED FITTING TO RETAIN THE STUD IN THE PROPER POSITION.

3. THE SWAGED FITTING, STUD AND NUT (FNX24a*) MUST DEVELOP THE BREAKING STRENGTH OF THE WIRE ROPE.

WIRE ROPE IS TO CONFORM TO THE REQUIREMENTS OF AASHTO M30 [M30M] AND BE 3/4" [19.1 mm] PREFORMED, 6 x 19, WIRE STRAND CORE OR INDEPENDENT WIRE ROPE CORE (WRC). GALVANIZED, RIGHT REGULAR LAY, MANUFACTURED OF IMPROVED PLOW STEEL WITH A MINIMUM BREAKING STRENGTH OF 42,800 POUNDS [190.4 kN].


CABLE ASSEMBLY

ANCHOR BRACKET & END PLATE

POST SLEEVE

RECTANGULAR PLATE WASHER

FCA01*  
FPA01*  
FMM02*  
FWR03*

NOTES:


5. GALVANIZE FABRICATED PARTS IN ACCORDANCE WITH SUBSECTION 711.08. DO NOT PUNCH, DRILL, OR CUT AFTER GALVANIZING.

* 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.
W-BEAM END SECTION (FLARED)

RWE01a-b*

OR

RWM22a-b*

(25'-0" [7.62 m] LENGTH)

CROSS SECTION IS TO REST WITH RWM02a-b or RWM22a-b

25.5° BEND REQUIRED

ONLY FOR USE IN MELT

W-BEAM TERMINAL CONNECTOR

RWE02a-b*

BEND AND HOLE ONLY REQUIRED TO MODIFY CONNECTOR FOR USE IN MELT

SLOTS

POST BOLT SLOT

SPLICE BOLT SLOT

THICKNESS (SEE NOTES)

1'-1/4" [311.2] (APPROX.)

3/4" x 2 1/2" [19.1 x 63.5]

POST BOLT SLOT

SPLICE BOLT SLOT

NEUTRAL AXIS

2'-3 1/2" [698.5]

Z'-3 1/2" [698.5]

1'-9 1/4" [540.5]

1'-1/2" [317.5] LAP

2" [50]

4 1/4" [108]

10' [304.8]

3 3/8" [85.7]

8" [203.2]

24" [610]

DIA.

3/4" [19.1]

POST BOLT SLOT

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

29/32" x 1 1/8" [23.0 x 28.6]

THICKNESS OF GUARDRAIL HARDWARE.

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

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

DWG. NO.

STANDARD SPEC.

SECTION 606

606-88

W-BEAM METAL

GUARDRAIL HARDWARE

EFFECTIVE: SEPTEMBER 2014

APRIL 2019

MONTANA DEPARTMENT OF TRANSPORTATION
**HOOK BOLTS**

ONLY FOR ALTERNATE OF POST REQUIRED HOLES ON BACK CABLE GUARDRAIL POST AND SOIL PLATE

NO. 606-40 FOR DETAILS)

ALT. B (SEE DTL. DWG. REFLECTOR ALT. A OR PROVIDE HOLES FOR UNLESS OTHER UNITS ARE SHOWN.

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


3/8" [9.5] DIA. (TYP.)

NOTES:

2. MANUFACTURE POSTS AND SOIL PLATES USING AASHTO M 270 [270M] (ASTM A 709 [A709]) GRADE 36 [250] STEEL. ALL WELDING IS TO CONFORM TO THE APPLICABLE AWS CODE.
4. GALVANIZE FABRICATED PARTS IN ACCORDANCE WITH SUBSECTION 711.08. GALVANIZE HOOK BOLTS AND NUTS IN ACCORDANCE WITH AASHTO M 232 [232M] (ASTM A 153 [A153M]). DO NOT PUNCH, DRILL, OR CUT AFTER GALVANIZING.
5. NUTS ARE OF THE HEAVY HEX TYPES. INSTALL BOLTS TO DEVELOP AN ULTIMATE PULL OPEN STRENGTH FROM 500 LB. TO 1000 LB. [2225 N TO 4450 N] APPLIED IN A DIRECTION NORMAL TO THE LONGITUDINAL AXIS OF THE POST.

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

**CABLE GUARDRAIL POST AND SOIL PLATE**

PS501* AND PS501*

5/16" DIA. [M8] HOOK BOLT

FBH01*

ALTERNATE 5/16" DIA. [M8] HOOK BOLT

FBH02*

UNITS SHOWN IN BRACKETS [ ] ARE METRIC AND ARE IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.
CABLE END (CAST STEEL OR MALL IRON)  
CABLE WEDGE  
5/8" [16] DIA.  
3/4" [20] DIA.  
1 1/4" [30]  
2 1/4" [60]  
3/4" [M20] SQ. NUT (FNS20*)  
FLATTEN FOR WRENCH  

R.H. = RIGHT HAND  
L.H. = LEFT HAND  

CABLE END ASSEMBLY  
RCE01*  

CABLE END (CAST STEEL OR MALL IRON)  
CABLE WEDGE  
5/8" [16] DIA.  
3/4" [20] DIA.  
1 1/4" [30]  
2 1/4" [60]  
3/4" [M20] SQ. NUT (FNS20*)  
FLATTEN FOR WRENCH  

R.H. = RIGHT HAND  
L.H. = LEFT HAND  

CABLE END ASSEMBLY  
RCE03*  

CABLE END (CAST STEEL OR MALL IRON)  
CABLE WEDGE  
3/4" [M20] HEX NUT (FN320*)  
3/4" [M20] WASHER (FWC20a*)  
3/4" [M20] SQ. NUT (FN220*)  
FLATTEN FOR WRENCH  

R.H. = RIGHT HAND  
L.H. = LEFT HAND  

CABLE WEDGE  
FMM01*  

CAST STEEL OR MALL IRON  

3/4" [19.1] DIA. CABLE  
3/4" [M19.1] Dia. - 3 x 7 WIRE ROPE  

NOTES:  
① WIRE ROPE AND CONNECTING HARDWARE ARE TO CONFORM TO THE REQUIREMENTS OF AASHTO M30 [M30M] TYPE 1 CLASS A, 3/4" [19.1] ROPE. CONNECTING HARDWARE MUST DEVELOP THE FULL STRENGTH OF A SINGLE CABLE (25,000 LB [111.2 kN]). CAST STEEL COMPONENTS ARE TO CONFORM TO THE REQUIREMENTS OF AASHTO M103 [M103M] (ASTM A27 [A27M]). MALLEABLE IRON CASTINGS ARE TO CONFORM TO THE REQUIREMENTS OF ASTM A47 [A47M].  
② AT ALL LOCATIONS WHERE THE CABLE IS CONNECTED TO A CABLE SOCKET WITH A WEDGE TYPE CONNECTION, CRIMP ONE WIRE OF THE CABLE OVER THE BASE OF THE WEDGE TO HOLD IT FIRMLY IN PLACE.  
③ COMPENSATING DEVICES ARE TO HAVE SPRING CONSTANTS OF 450 POUNDS PER INCH [7.8 N/mm], PLUS OR MINUS 50 POUNDS PER INCH [0.8 N/mm], AND PERMIT A TRAVEL OF 6 INCHES [150] PLUS OR MINUS 1 INCH [25].  
④ DESIGN SOCKET BASKETS FOR USE WITH THE WEDGE DETAILED IN THIS DRAWING.  
⑤ ALTERNATE HARDWARE DESIGNS WILL BE CONSIDERED FOR APPROVAL PROVIDED THEIR CONNECTION DETAILS, FOR THE PURPOSE OF MAINTENANCE SUBSTITUTIONS, ARE COMPATIBLE WITH THE DETAILS OF THIS DRAWING AND THEIR OPERATING CHARACTERISTICS ARE SIMILAR TO THOSE OF THE HARDWARE IN THIS DRAWING.  
⑥ SEE DTL. DWG. NO. 606-80 FOR SCHEDULE OF GUARDRAIL HARDWARE.

DETAILED DRAWING  
REFERENCE  
DWG. NO. 606-94  
STANDARD SPEC.  
SECTION 606  
LOW-TENSION CABLE GUARDRAIL HARDWARE  
--REVISED--  
EFFECTIVE: SEPTEMBER 2014  
JANUARY 2018  
MONTANA DEPARTMENT OF TRANSPORTATION