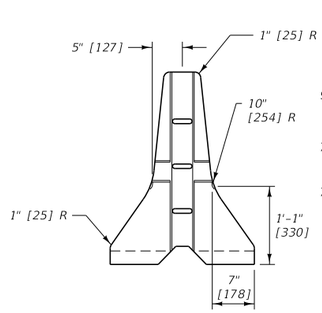
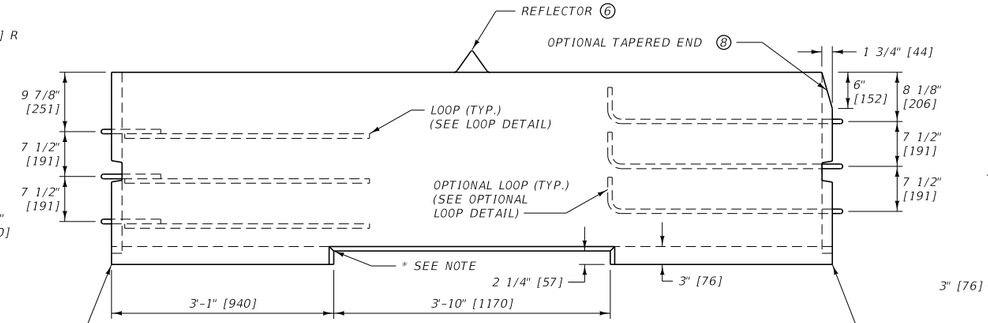
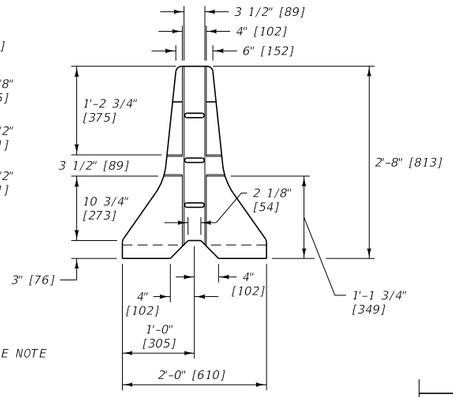


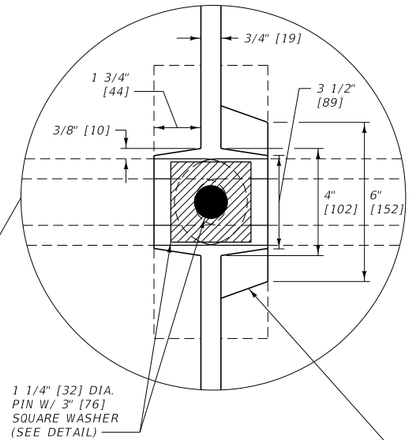

END VIEW

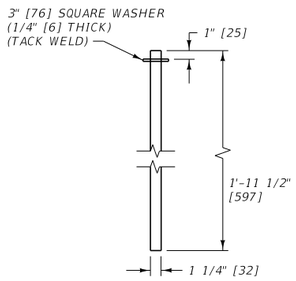



ELEVATION VIEW

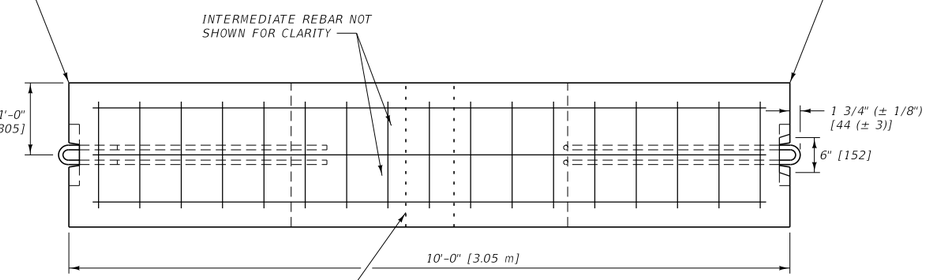



END VIEW

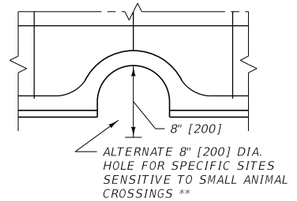


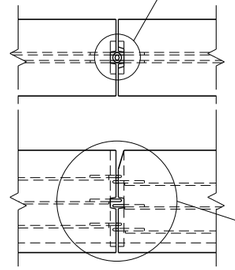

CONNECTING PIN DETAIL ⑨

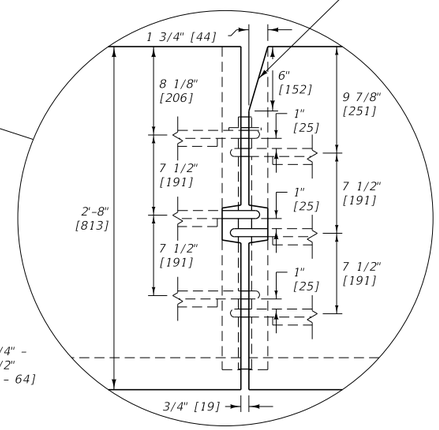


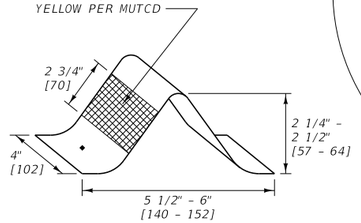

PLAN VIEW



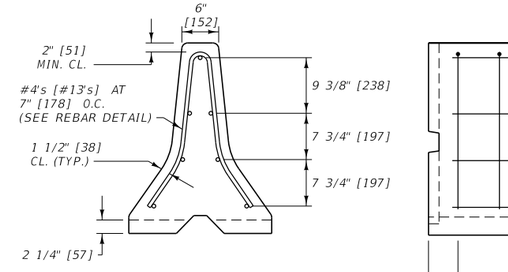

ALTERNATE CONCRETE BARRIER RAIL DETAIL



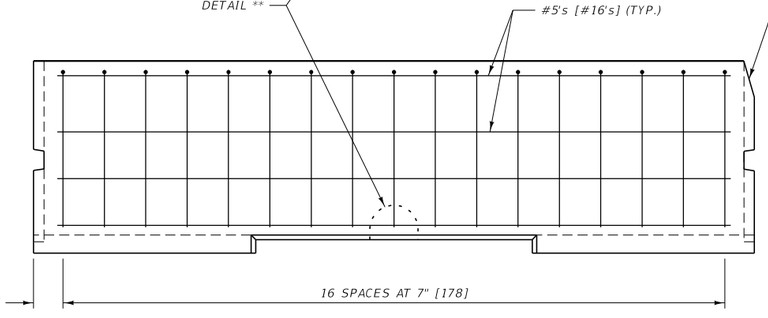


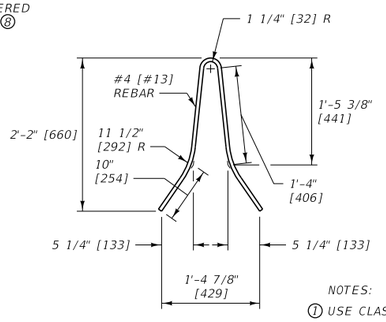

REFLECTOR
(SEE NOTES)



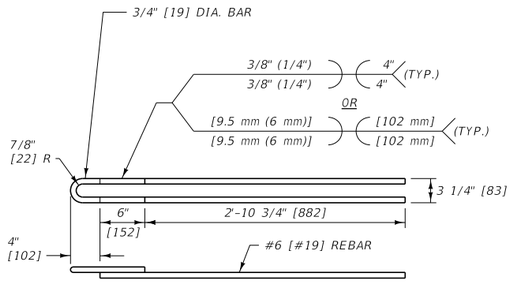

END VIEW



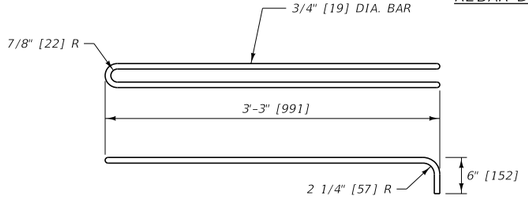

ELEVATION VIEW




REBAR DETAIL




LOOP DETAIL ⑨




OPTIONAL LOOP DETAIL ⑨

LOOP FABRICATION REQUIREMENTS:

1. USE REINFORCING STEEL CONFORMING TO ASTM A 706 [706M], GRADE 60 [420] FOR REBAR BEING WELDED TO LOOPS.
2. LOOP ENDS CONSIST OF SMOOTH ROUND BARS CONFORMING TO AASHTO M 270 [270M], GRADE 36 [250].
3. COLD BEND THE LOOPS BY USING A JIG THAT WILL PRODUCE AN ACCURATE RADIUS WITHOUT MARRING THE BAR. DO NOT HEAT THE BAR TO FACILITATE BENDING.
4. WELD REBAR TO LOOPS MEETING SECTION 624 REQUIREMENTS USING 1/8" [3 mm] DIA. E8018 ROD. DO NOT TACK WELD THE PIECES TOGETHER PRIOR TO WELDING.
5. NO ADDITIONAL WELDING IS PERMITTED ON THE SMOOTH ROUND BARS OR REINFORCING STEEL.

OPTIONAL LOOP FABRICATION REQUIREMENTS:

1. USE CONTINUOUS SMOOTH ROUND BARS CONFORMING TO AASHTO M 270 [270M], GRADE 36 [250] TO FABRICATE THE OPTIONAL LOOPS.
2. COLD BEND THE LOOPS BY USING A JIG THAT WILL PRODUCE AN ACCURATE RADIUS WITHOUT MARRING THE BAR. DO NOT HEAT THE BAR TO FACILITATE BENDING.
3. NO WELDING IS PERMITTED ON THE SMOOTH ROUND BARS OR REINFORCING STEEL.

NOTES:

① USE CLASS DECK CONCRETE OR EQUIVALENT.

② REINFORCING STEEL CONSISTS OF DEFORMED BARS CONFORMING TO AASHTO M 31 [31M], GRADE 60 [420].

③ CONNECT EACH 10' [3.05 m] SECTION WITH CONNECTING PINS AS DETAILED AND CONFORMING TO AASHTO M 270 [270M], GRADE 36 [250] OR BETTER. CONNECTING PINS NEED NOT BE PAINTED.

④ CUTOUTS ON ENDS OF EACH SECTION ARE SHOWN WITH SLIGHT TAPER TO FACILITATE FORM REMOVAL. RECTANGULAR CUTOUTS ARE ACCEPTABLE.

⑤ THE CONTRACTOR IS RESPONSIBLE FOR THE PROPER FIT-UP OF THE PRECAST CONCRETE BARRIER RAIL. ASSEMBLE AND PIN SUFFICIENT NUMBER OF PRECAST SECTIONS IN THE FABRICATIONS PLANT TO DETERMINE THAT PROPER FIT-UP CAN BE MAINTAINED ON ALL ROADWAY ALIGNMENT, CURVES AS WELL AS ON TANGENT. THIS IS TO BE DETERMINED EARLY IN FABRICATION.

⑥ ATTACH REFLECTORS TO RAIL EVERY 30' [9.15 m]. USE ALUMINUM ALLOY MEETING THE ALUMINUM ASSOCIATION ALLOY AA5052-H32. FOLLOW THE MANUFACTURER'S SPECIFICATIONS FOR ADHESIVE MOUNTING. IN NARROW PAVED (FLUSH) MEDIAN APPLICATIONS. REFLECTORIZE BOTH SIDES.

⑦ DO NOT INSTALL UNANCHORED CONCRETE BARRIER RAIL FOR OBSTACLES WITHIN 6.5' [2.5 m] OF THE BASE (TRAFFIC SIDE) OF THE RAIL. SEE DTL. DWN NO. 605-05 FOR CONCRETE BARRIER RAIL ANCHORS.

⑧ THE OPTIONAL TAPERED END SHOWN IS AN ACCEPTABLE ALTERNATE TO THE VERTICAL END FOR ALL CONCRETE BARRIER RAIL ENDS.

⑨ GALVANIZE OR EPOXY COAT LOOPS AND CONNECTING PINS AFTER FABRICATION/BENDING. EPOXY COAT IN ACCORDANCE WITH SUBSECTION 711.02.1. GALVANIZEIN ACCORDANCE WITH ASTM A153, B695 (CLASS 50) OR OTHER APPLICABLE ASTM GALVANIZING STANDARDS.

* 3/4" [19 mm] CHAMFER ENTIRE OPENING (OR SUFFICIENTLY ROUNDED SO THAT A SMOOTH EDGE RESULTS.) 1/2" [13 mm] CHAMFER IS ACCEPTABLE.

** USE THE ALTERNATE 8" [200 mm] DIA. HOLE IN THIS RAIL ON A CASE-BY-CASE BASIS AS SPECIFIED IN THE PLANS.

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

DETAILED DRAWING

REFERENCE
STANDARD SPEC.
SECTION 554,605,624,711

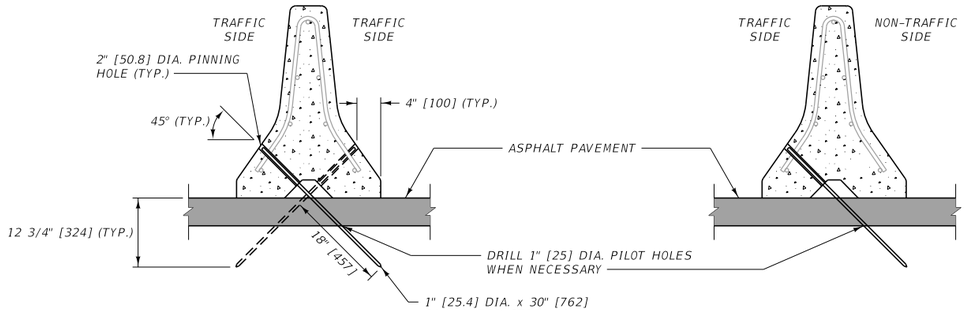
DWG. NO. 605-00

# CONCRETE BARRIER RAIL

--REVISED--
MARCH 2017

EFFECTIVE: SEPTEMBER 2014

MDT MONTANA DEPARTMENT OF TRANSPORTATION

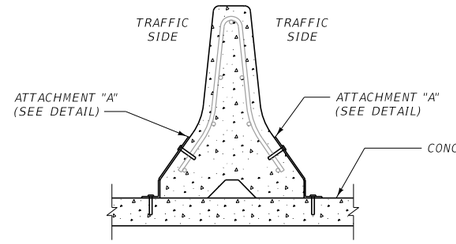



END VIEW
(OPTION 1)

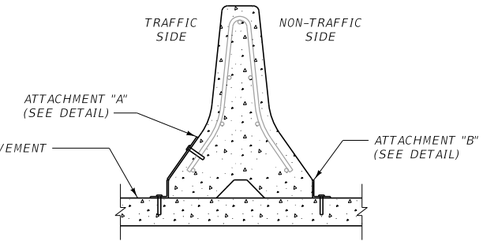



END VIEW
(OPTION 2)

OPTION 1 = TRAFFIC ON BOTH SIDES OF C.B.R.
OPTION 2 = TRAFFIC ON ONE SIDE OF C.B.R.



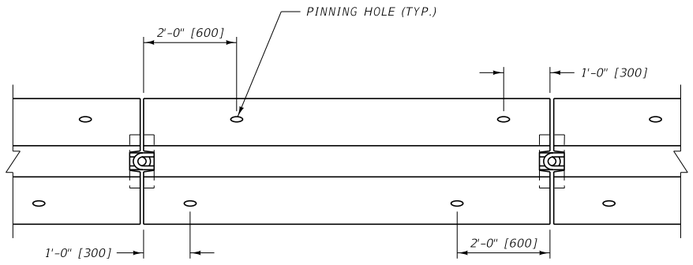

END VIEW
(OPTION 1)



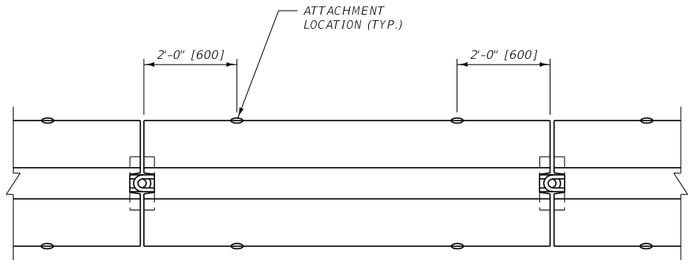

END VIEW
(OPTION 2)

## TYPE 1 ANCHOR

(FOR TEMPORARY OR PERMANENT CONCRETE BARRIER RAIL INSTALLATIONS ON ASPHALT PAVEMENT)



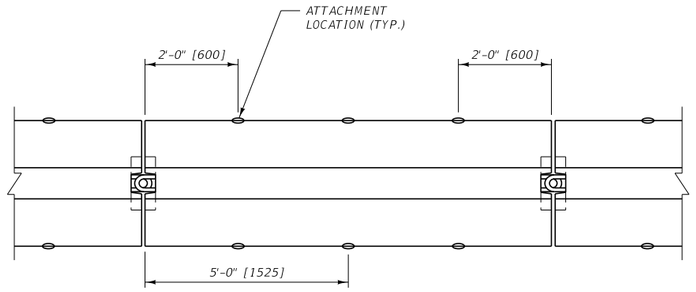

TYPE 1 ANCHOR
PLAN VIEW



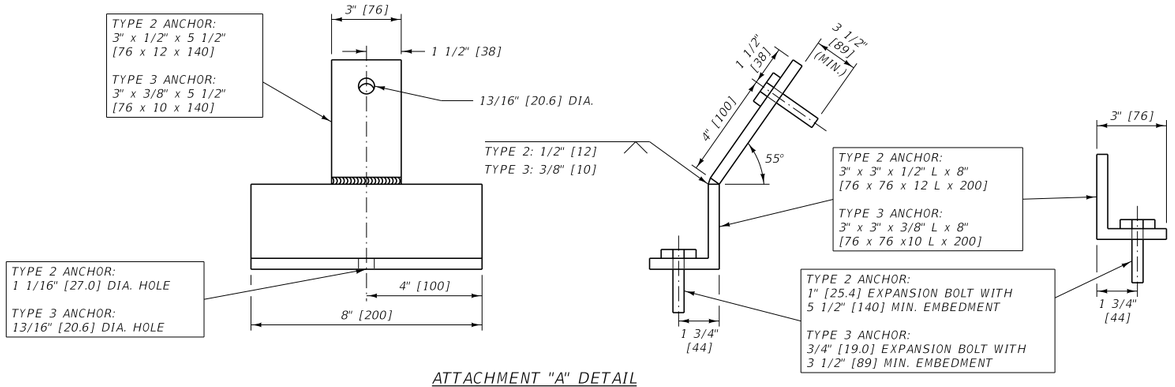

TYPE 2 ANCHOR
PLAN VIEW

## TYPE 2 & 3 ANCHORS

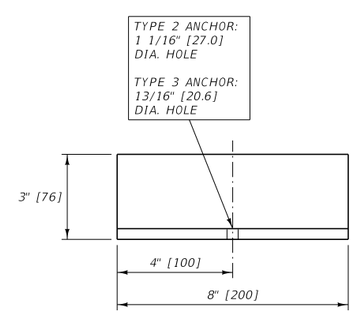
(FOR TEMPORARY CONCRETE BARRIER RAIL INSTALLATIONS ON CONCRETE PAVEMENT)




TYPE 3 ANCHOR
PLAN VIEW




ATTACHMENT "A" DETAIL




ATTACHMENT "B" DETAIL

NOTES:

1. USE THESE ANCHORS WITH STANDARD CONCRETE BARRIER RAIL (C.B.R.), AS SHOWN IN DTL. DWG. NO. 605-00, WHEN DEFLECTION OF THE SYSTEM NEEDS TO BE LIMITED.
2. CAST THE PINNING HOLES INTO THE C.B.R. USING 2" [50.8] I.D. STEEL PIPE. DO NOT DRILL THE PINNING HOLES.
3. USE STEEL CONFORMING TO AASHTO M 270 [270M], GRADE 36 [250] OR BETTER FOR PINS AND ATTACHMENT ANGLES. GALVANIZE IN ACCORDANCE WITH SUBSECTION 711.08.
4. USE TYPE 2 ANCHORS WHEN A DEEPER EMBEDMENT (5 1/2" [140]) INTO THE BRIDGE DECK OR CONCRETE PAVEMENT IS PERMISSIBLE.
5. ADJUST THE LOCATION OF THE TYPE 2 OR TYPE 3 ANCHORS TO AVOID THE MAIN REINFORCING WHEN PLACED ON BRIDGE DECK.
6. USE SHIMS TO PROPERLY FIT THE TYPE 2 AND TYPE 3 ANCHORS TO THE BARRIER AND ROADWAY SURFACES.
7. AFTER REMOVING TYPE 2 OR TYPE 3 ANCHORS, CLEAN THE HOLES IN THE CONCRETE PAVEMENT AND FILL WITH AN APPROVED NON-SHRINK OR EPOXY GROUT.
8. REMOVE TYPE 1 ANCHORS BY FIRST DRIVING THE STEEL PINS DOWN THROUGH THE BARRIER TO ALLOW LIFTING OF THE BARRIER WITHOUT INTERFERENCE. THEN REMOVE THE PINS FROM THE PAVEMENT AND FILL THE PINNING HOLES WITH AN APPROVED SEALANT.
9. DO NOT INSTALL ANCHORED CONCRETE BARRIER RAIL FOR OBSTACLES WITHIN 3.5' [1.1 m] OF THE BASE (TRAFFIC SIDE) OF THE RAIL.

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

DETAILED DRAWING

REFERENCE
STANDARD SPEC.
SECTION 554,605

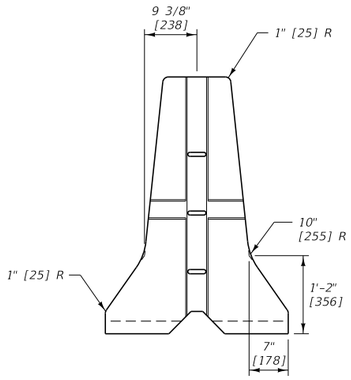
DWG. NO. 605-05

# CONCRETE BARRIER RAIL ANCHORS

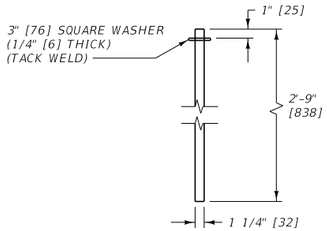
--REVISED--
MARCH 2017

EFFECTIVE: SEPTEMBER 2014

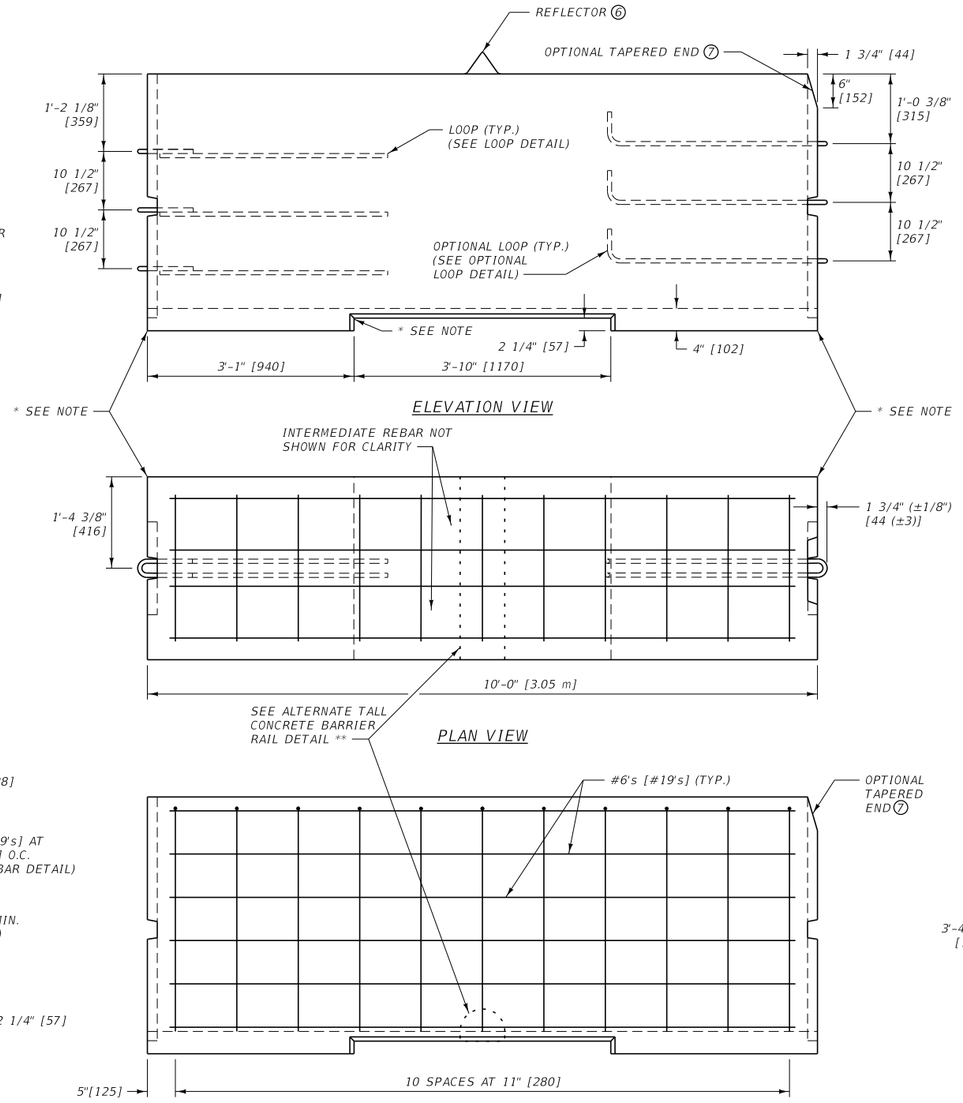
MDT MONTANA DEPARTMENT OF TRANSPORTATION




END VIEW

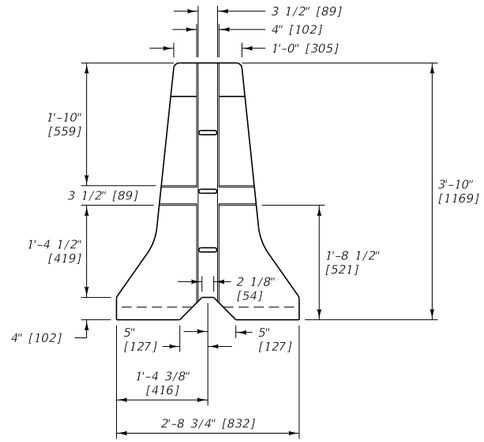



CONNECTING PIN DETAIL ⑧

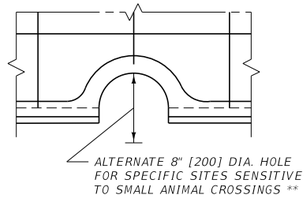



ELEVATION VIEW

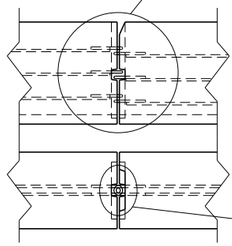
PLAN VIEW

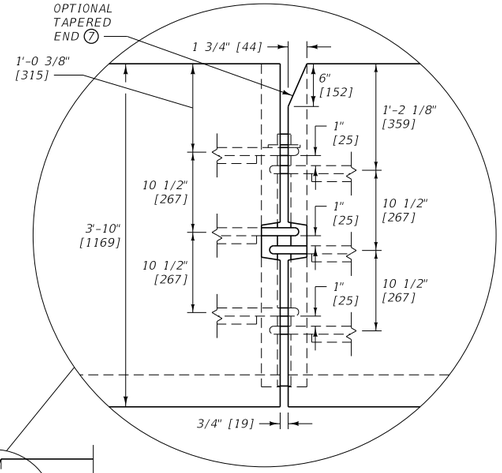


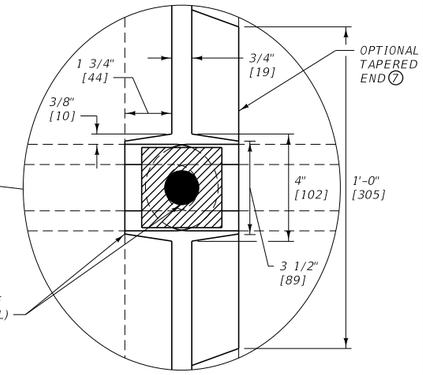

END VIEW

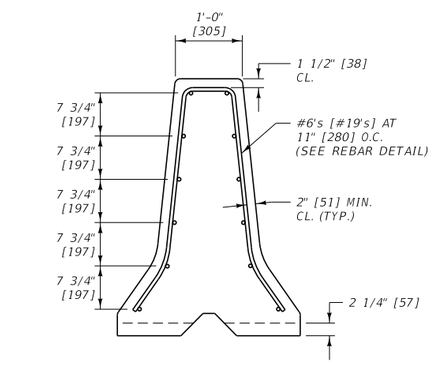



ALTERNATE TALL CONCRETE
BARRIER RAIL DETAIL

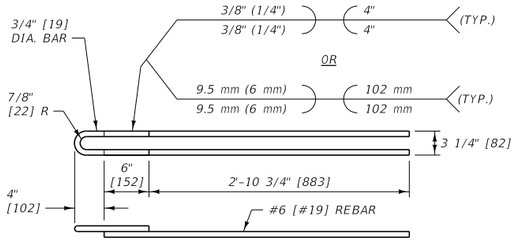




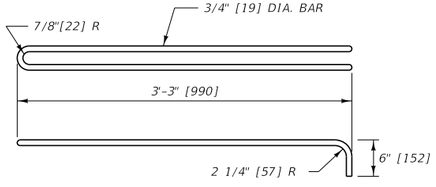




END VIEW



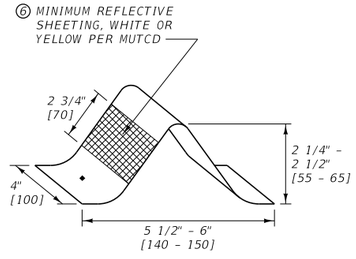

LOOP DETAIL ⑧

ELEVATION VIEW




OPTIONAL LOOP DETAIL ⑧

REBAR DETAIL




REFLECTOR
(SEE NOTES)




LOOP FABRICATION REQUIREMENTS:

1. USE REINFORCING STEEL CONFORMING TO ASTM A 706 [706M], GRADE 60 [420] FOR REBAR BEING WELDED TO LOOPS.
2. LOOP ENDS CONSIST OF SMOOTH ROUND BARS CONFORMING TO AASHTO M 270 [270M], GRADE 36 [250].
3. COLD BEND THE LOOPS BY USING A JIG THAT WILL PRODUCE AN ACCURATE RADIUS WITHOUT MARRING THE BAR. DO NOT HEAT THE BAR TO FACILITATE BENDING.
4. WELD REBAR TO LOOPS MEETING SECTION 556 REQUIREMENTS USING 1/8" [3 mm] DIA. E8018 ROD. DO NOT TACK WELD THE PIECES TOGETHER PRIOR TO WELDING.
5. NO ADDITIONAL WELDING IS PERMITTED ON THE SMOOTH ROUND BARS OR REINFORCING STEEL.

OPTIONAL LOOP FABRICATION REQUIREMENTS:

1. USE CONTINUOUS SMOOTH ROUND BARS CONFORMING TO AASHTO M 270 [270M], GRADE 36 [250] TO FABRICATE THE OPTIONAL LOOPS.
2. COLD BEND THE LOOPS BY USING A JIG THAT WILL PRODUCE AN ACCURATE RADIUS WITHOUT MARRING THE BAR. DO NOT HEAT THE BAR TO FACILITATE BENDING.
3. NO WELDING IS PERMITTED ON THE SMOOTH ROUND BARS OR REINFORCING STEEL.

NOTES:

① USE CLASS DECK CONCRETE OR EQUIVALENT.

② REINFORCING STEEL CONSISTS OF DEFORMED BARS CONFORMING TO AASHTO M 31 [31M], GRADE 60 [420].

③ CONNECT EACH 10' [3.05 m] SECTION WITH CONNECTING PINS AS DETAILED AND CONFORMING TO AASHTO M 270 [270M], GRADE 36 [250] OR BETTER. CONNECTING PINS NEED NOT BE PAINTED.

④ CUTOUTS ON ENDS OF EACH SECTION ARE SHOWN WITH SLIGHT TAPER TO FACILITATE FORM REMOVAL. RECTANGULAR CUTOUTS ARE ACCEPTABLE.

⑤ THE CONTRACTOR IS RESPONSIBLE FOR THE PROPER FIT-UP OF THE PRECAST CONCRETE BARRIER RAIL. ASSEMBLE AND PIN SUFFICIENT NUMBER OF PRECAST SECTIONS IN THE FABRICATIONS PLANT TO DETERMINE THAT PROPER FIT-UP CAN BE MAINTAINED ON ALL ROADWAY ALIGNMENT, CURVES AS WELL AS ON TANGENT. THIS IS TO BE DETERMINED EARLY IN FABRICATION.

⑥ ATTACH REFLECTORS TO RAIL EVERY 30' [9.15 m]. USE ALUMINUM ALLOY MEETING THE ALUMINUM ASSOCIATION ALLOY AA5052-H32. FOLLOW THE MANUFACTURER'S SPECIFICATIONS FOR ADHESIVE MOUNTING. IN NARROW PAVED (FLUSH) MEDIAN APPLICATIONS, REFLECTORIZE BOTH SIDES.

⑦ THE OPTIONAL TAPERED END SHOWN IS AN ACCEPTABLE ALTERNATE TO THE VERTICAL END FOR ALL CONCRETE BARRIER RAIL ENDS.

⑧ GALVANIZE OR EPOXY COAT LOOPS AND CONNECTING PINS AFTER FABRICATION/BENDING. EPOXY COAT IN ACCORDANCE WITH SUBSECTION 711.02.1. GALVANIZE IN ACCORDANCE WITH ASTM A153, B695 (CLASS 50) OR OTHER APPLICABLE ASTM GALVANIZING STANDARDS.

* 3/4" [19 mm] CHAMFER ENTIRE OPENING (OR SUFFICIENTLY ROUNDED SO THAT A SMOOTH EDGE RESULTS.) 1/2" [13 mm] CHAMFER IS ACCEPTABLE.

** USE THE ALTERNATE 8" [200 mm] DIA. HOLE IN THIS RAIL ON A CASE-BY-CASE BASIS AS SPECIFIED IN THE PLANS

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

DETAILED DRAWING

REFERENCE
STANDARD SPEC.
SECTION 554,556,605,711

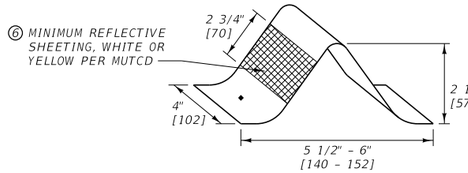
DWG. NO.
605-10

# TALL CONCRETE BARRIER RAIL

--REVISED--
MARCH 2017

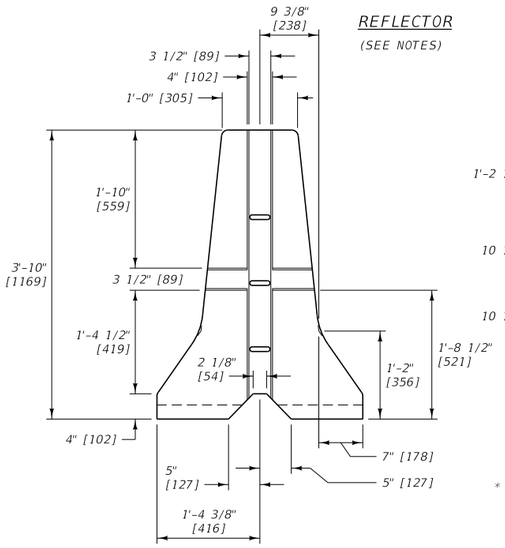
EFFECTIVE: SEPTEMBER 2014

MDT MONTANA DEPARTMENT OF TRANSPORTATION

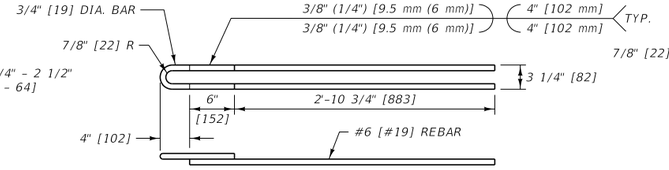



REFLECTOR

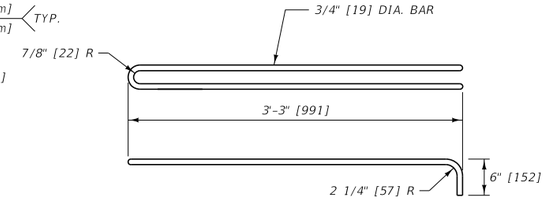
(SEE NOTES)



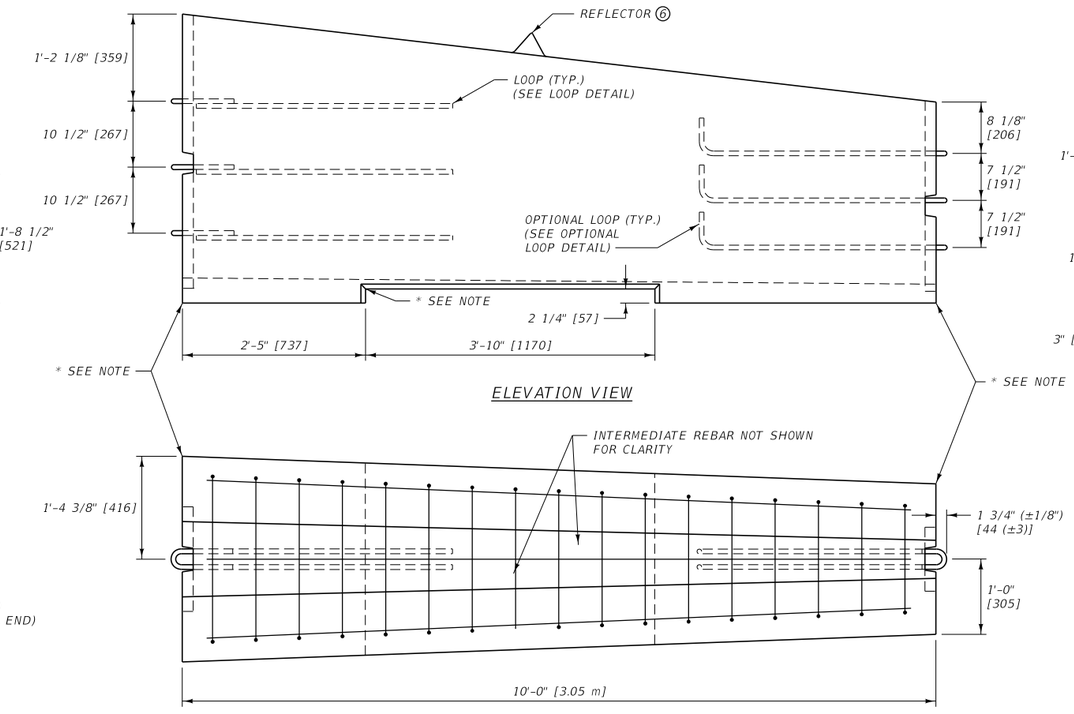

LEFT END VIEW




LOOP DETAIL ⑧

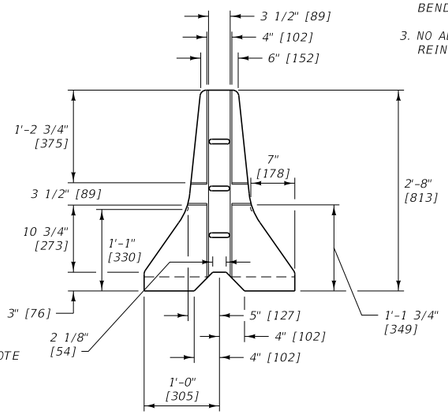



OPTIONAL LOOP DETAIL ⑧

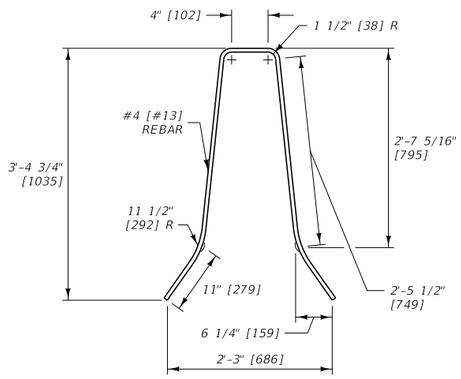



ELEVATION VIEW

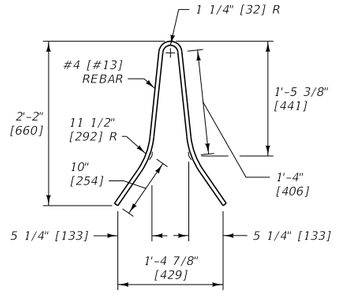
PLAN VIEW



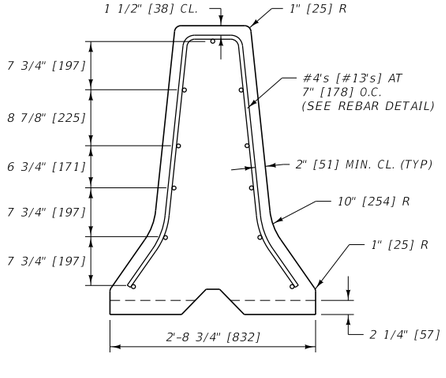

RIGHT END VIEW



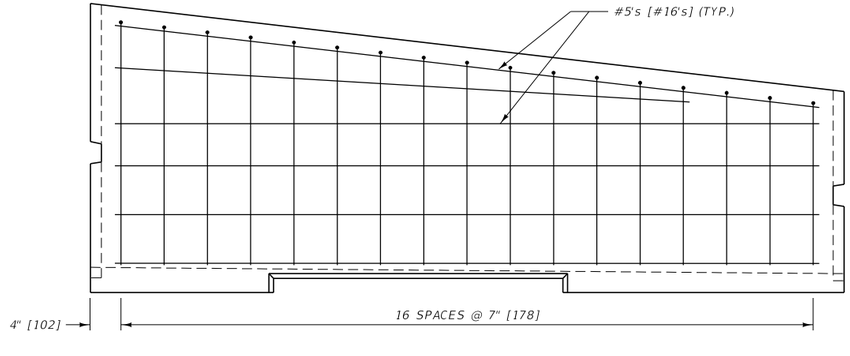

REBAR DETAIL LEFT END



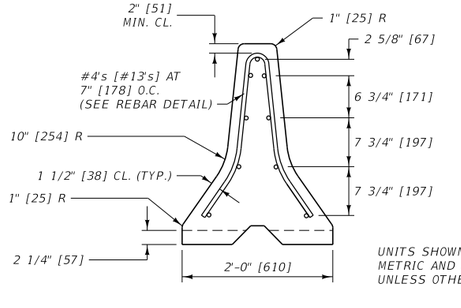

REBAR DETAIL RIGHT END



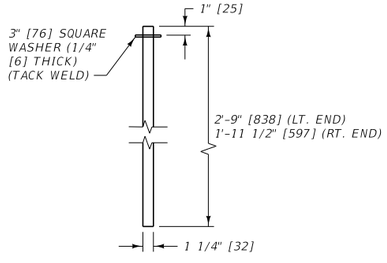

LEFT END VIEW




ELEVATION VIEW




RIGHT END VIEW




CONNECTING PIN DETAIL ⑧

NOTE:

LEFT AND RIGHT REBAR DETAILS ARE FOR NORMAL TALL AND REGULAR CONCRETE BARRIER RAIL SECTIONS. TAPER REBAR HEIGHT AND WIDTH AS NEEDED BY MAINTAINING THE VERTICAL POSITION FROM THE BOTTOM AND THE 1 1/2" [38] MINIMUM CLEARANCE AT ALL LOCATIONS.

LOOP FABRICATION REQUIREMENTS:

1. USE REINFORCING STEEL CONFORMING TO ASTM A 706 [706M], GRADE 60 [420] FOR REBAR BEING WELDED TO LOOPS.
2. LOOP ENDS CONSIST OF SMOOTH ROUND BARS CONFORMING TO AASHTO M 270 [270M], GRADE 36 [250].
3. COLD BEND THE LOOPS BY USING A JIG THAT WILL PRODUCE AN ACCURATE RADIUS WITHOUT MARRING THE BAR. DO NOT HEAT THE BAR TO FACILITATE BENDING.
4. WELD REBAR TO LOOPS MEETING SECTION 556 REQUIREMENTS USING 1/8" [3] DIA. E8018 ROD. DO NOT TACK WELD THE PIECES TOGETHER PRIOR TO WELDING.
5. NO ADDITIONAL WELDING IS PERMITTED ON THE SMOOTH ROUND BARS OR REINFORCING STEEL.

OPTIONAL LOOP FABRICATION REQUIREMENTS:

1. USE CONTINUOUS SMOOTH ROUND BARS CONFORMING TO AASHTO M 270, [270M] GRADE 36 [250] TO FABRICATE THE OPTIONAL LOOPS.
2. COLD BEND THE LOOPS BY USING A JIG THAT WILL PRODUCE AN ACCURATE RADIUS WITHOUT MARRING THE BAR. DO NOT HEAT THE BAR TO FACILITATE BENDING.
3. NO ADDITIONAL WELDING IS PERMITTED ON THE SMOOTH ROUND BARS OR REINFORCING STEEL.

NOTES:

① USE CLASS DECK CONCRETE OR EQUIVALENT.

② REINFORCING STEEL CONSISTS OF DEFORMED BARS CONFORMING TO AASHTO M 31 [31M], GRADE 60 [420].

③ CONNECT EACH 10' SECTION WITH CONNECTING PINS AS DETAILED AND CONFORMING TO AASHTO M 270 [270M], GRADE 36 [250] OR BETTER. CONNECTING PINS NEED NOT BE PAINTED.

④ CUTOUTS ON ENDS OF EACH SECTION ARE SHOWN WITH SLIGHT TAPER TO FACILITATE FORM REMOVAL. RECTANGULAR CUTOUTS ARE ACCEPTABLE.

⑤ THE CONTRACTOR IS RESPONSIBLE FOR THE PROPER FIT-UP OF THE PRECAST CONCRETE BARRIER RAIL. ASSEMBLE AND PIN SUFFICIENT NUMBER OF PRECAST SECTIONS IN THE FABRICATIONS PLANT TO DETERMINE THAT PROPER FIT-UP CAN BE MAINTAINED ON ALL ROADWAY ALIGNMENT, CURVES AS WELL AS ON TANGENT. THIS IS TO BE DETERMINED EARLY IN FABRICATION.

⑥ ATTACH REFLECTORS TO RAIL EVERY 30' [9.15 m]. USE ALUMINUM ALLOY MEETING THE ALUMINUM ASSOCIATION ALLOY AA5052-H32. FOLLOW THE MANUFACTURER'S SPECIFICATIONS FOR ADHESIVE MOUNTING, IN NARROW PAVED (FLUSH) MEDIAN APPLICATIONS, REFLECTORIZE BOTH SIDES.

⑦ SEE DETAILED DRAWINGS 605-00 AND 605-10 FOR INFORMATION ON THE ADJACENT CONCRETE BARRIER RAIL SECTIONS. THE OPTIONAL TAPERED END DETAIL MAY ALSO BE USED HERE.

⑧ GALVANIZE OR EPOXY COAT LOOPS AND CONNECTING PINS AFTER FABRICATION/BENDING. EPOXY COAT IN ACCORDANCE WITH SUBSECTION 711.02.1. GALVANIZE IN ACCORDANCE WITH ASTM A153, B695 (CLASS 50) OR OTHER APPLICABLE ASTM GALVANIZING STANDARDS.

* 3/4" [19 mm] CHAMFER ENTIRE OPENING (OR SUFFICIENTLY ROUNDED SO THAT A SMOOTH EDGE RESULTS.) 1/2" [13 mm] CHAMFER IS ACCEPTABLE.

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

DETAILED DRAWING

REFERENCE STANDARD SPEC. SECTION 554,556,605,711

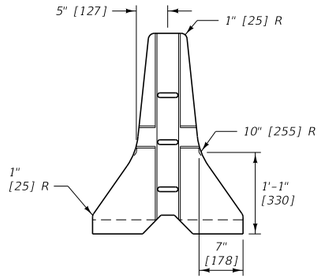
DWG. NO. 605-15

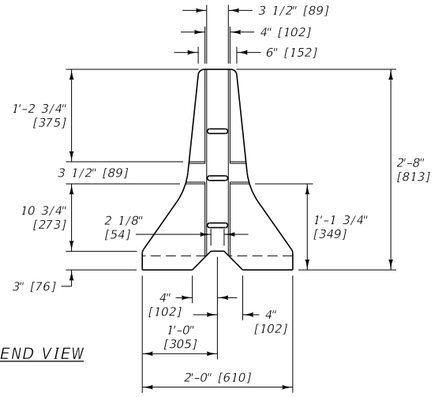
# CONCRETE BARRIER RAIL TRANSITION

--REVISED-- MARCH 2017

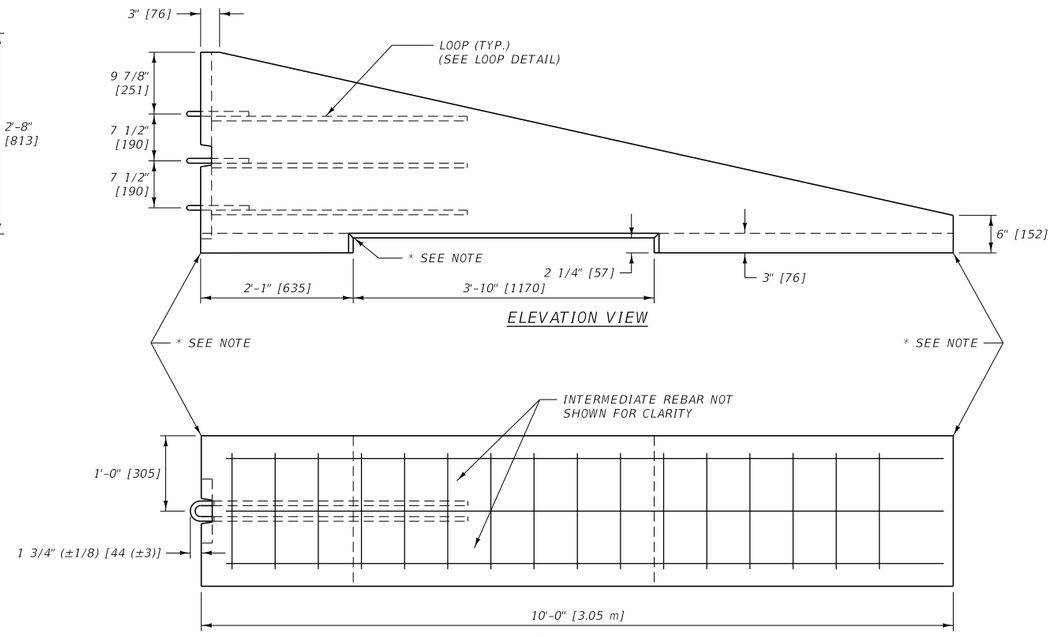
EFFECTIVE: SEPTEMBER 2014

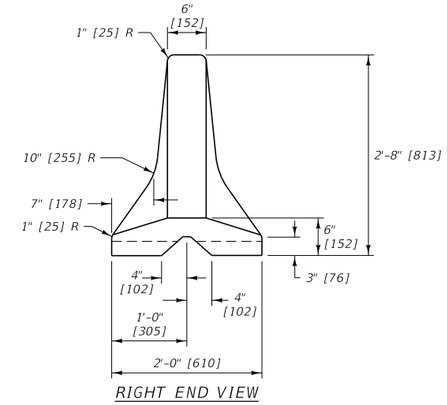
MDT MONTANA DEPARTMENT OF TRANSPORTATION




LEFT END VIEW




RIGHT END VIEW

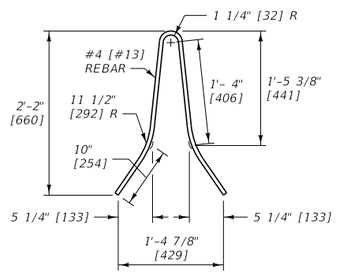
NOTE:

REBAR TYPICAL AT LEFT END ONLY. TAPER THE REBAR HEIGHT AS NEEDED BY MAINTAINING THE VERTICAL POSITION FROM THE BOTTOM AND THE 1 1/2" [38 mm] CLEARANCE AT ALL LOCATIONS.

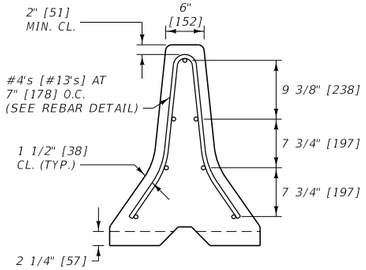
NOTES:

1. USE CLASS DECK CONCRETE OR EQUIVALENT.
2. REINFORCING STEEL CONSISTS OF DEFORMED BARS CONFORMING TO AASHTO M 31 [31M], GRADE 60 [420].
3. CONNECT EACH 10' [3.05 m] SECTION WITH CONNECTING PINS AS DETAILED AND CONFORMING TO AASHTO M 270 [270M], GRADE 36 [250] OR BETTER. CONNECTING PINS NEED NOT BE PAINTED.
4. CUTOUTS ON LEFT END OF EACH SECTION ARE SHOWN WITH SLIGHT TAPER TO FACILITATE FORM REMOVAL. RECTANGULAR CUTOUTS ARE ACCEPTABLE.
5. THE CONTRACTOR IS RESPONSIBLE FOR THE PROPER FIT-UP OF THE PRECAST CONCRETE BARRIER RAIL. ASSEMBLE AND PIN SUFFICIENT NUMBER OF PRECAST SECTIONS IN THE FABRICATIONS PLANT TO DETERMINE THAT PROPER FIT-UP CAN BE MAINTAINED ON ALL ROADWAY ALIGNMENT CURVES AS WELL AS ON TANGENT. THIS IS TO BE DETERMINED EARLY IN FABRICATION.
6. SEE DTL. DWG. NO. 605-00 FOR INFORMATION ON THE ADJACENT CONCRETE BARRIER RAIL SECTION. THE OPTIONAL TAPERED END DETAIL MAY ALSO BE USED HERE.
7. GALVANIZE OR EPOXY COAT LOOPS AND CONNECTING PINS AFTER FABRICATION/ BENDING. EPOXY COAT IN ACCORDANCE WITH SUBSECTION 711.02.1. GALVANIZE IN ACCORDANCE WITH ASTM A153, B695 (CLASS 50) OR OTHER APPLICABLE ASTM GALVANIZING STANDARDS.

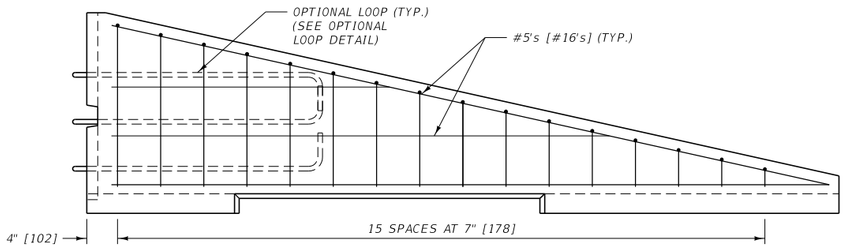
* 3/4" [19 mm] CHAMFER ENTIRE OPENING (OR SUFFICIENTLY ROUNDED SO THAT A SMOOTH EDGE RESULTS.) 1/2" [13 mm] CHAMFER IS ACCEPTABLE.



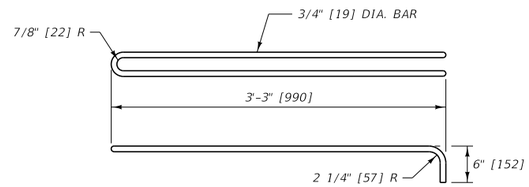

REBAR DETAIL LEFT END



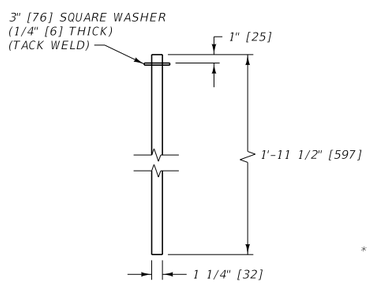

LEFT END VIEW



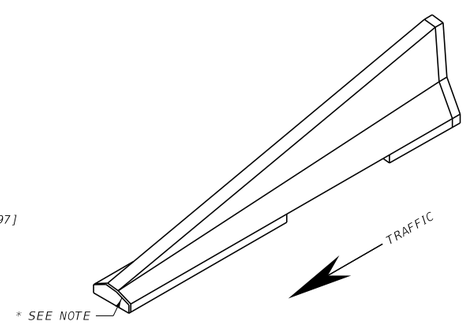

ELEVATION VIEW



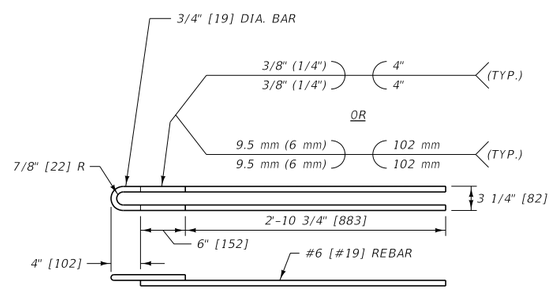

OPTIONAL LOOP DETAIL ⑦




CONNECTING PIN DETAIL ⑦




ISOMETRIC VIEW




LOOP DETAIL ⑦

LOOP FABRICATION REQUIREMENTS:

1. USE REINFORCING STEEL CONFORMING TO ASTM A 706 [706M], GRADE 60 [420] FOR REBAR BEING WELDED TO LOOPS.
2. LOOP ENDS CONSIST OF SMOOTH ROUND BARS CONFORMING TO AASHTO M 270 [270M], GRADE 36 [250].
3. COLD BEND THE LOOPS BY USING A JIG THAT WILL PRODUCE AN ACCURATE RADIUS WITHOUT MARRING THE BAR. DO NOT HEAT THE BAR TO FACILITATE BENDING.
4. WELD REBAR TO LOOPS MEETING SECTION 556 REQUIREMENTS USING 1/8" [3 mm] DIA. E8018 ROD. DO NOT TACK WELD THE PIECES TOGETHER PRIOR TO WELDING.
5. NO ADDITIONAL WELDING IS PERMITTED ON THE SMOOTH ROUND BARS OR REINFORCING STEEL.

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

OPTIONAL LOOP FABRICATION REQUIREMENTS:

1. USE CONTINUOUS SMOOTH ROUND BARS CONFORMING TO AASHTO M 270 [270M], GRADE 36 [250] TO FABRICATE THE OPTIONAL LOOPS.
2. COLD BEND THE LOOPS BY USING A JIG THAT WILL PRODUCE AN ACCURATE RADIUS WITHOUT MARRING THE BAR. DO NOT HEAT THE BAR TO FACILITATE BENDING.
3. NO WELDING IS PERMITTED ON THE SMOOTH ROUND BARS OR REINFORCING STEEL.

DETAILED DRAWING

REFERENCE STANDARD SPEC. SECTION 554,605,711

DWG. NO. 605-20

CONCRETE BARRIER RAIL TERMINAL SECTION (ONE-WAY DEPARTURE)

--REVISED-- MARCH 2017

EFFECTIVE: SEPTEMBER 2014

MDT MONTANA DEPARTMENT OF TRANSPORTATION