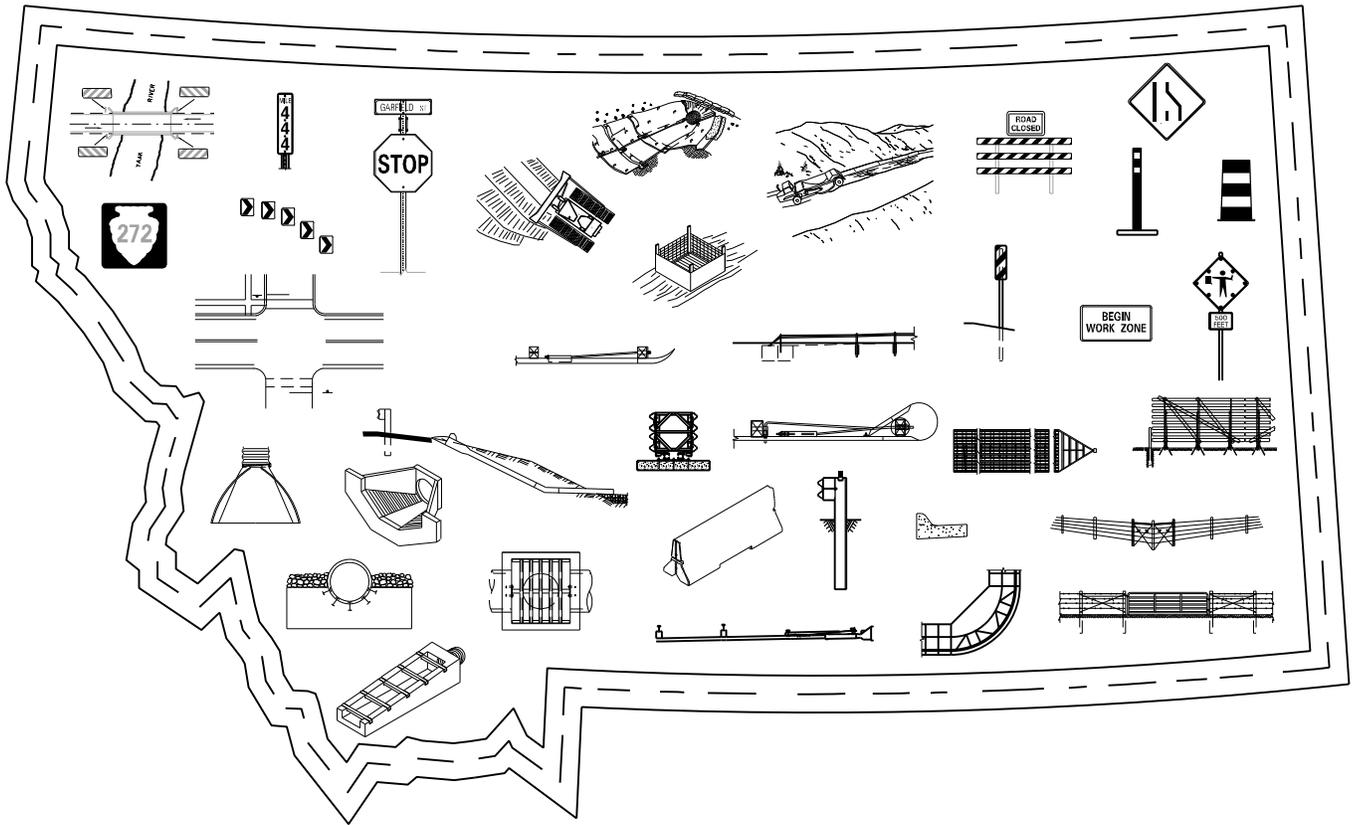


# DETAILED DRAWINGS

SUPPLEMENTAL TO  
THE STANDARD  
SPECIFICATIONS FOR  
ROAD AND BRIDGE  
CONSTRUCTION



SUPPLEMENT TO THE SEPTEMBER 2014 EDITION  
EFFECTIVE: JULY 2016

# ***DETAILED DRAWINGS***

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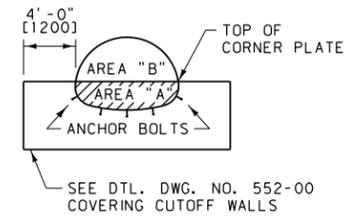
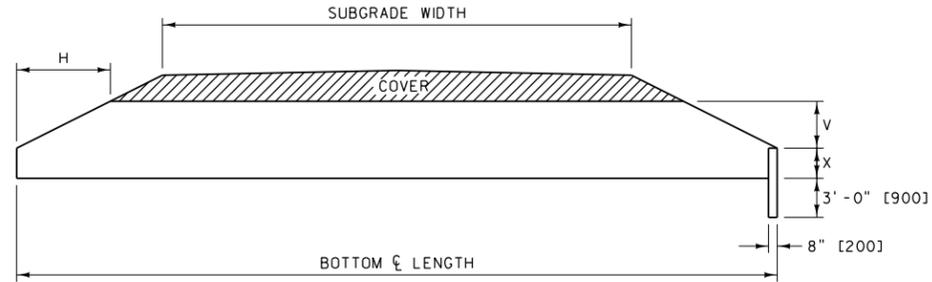
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DIMENSIONS									
SPAN	RISE	EQUIV. DIA.	X (FT.)	V (FT.)	H (FT.) FOR BEVELS:			AREA "A" (SQ. FT.)	AREA "B" (SQ. FT.)
					1.5:1	2:1	2.5:1		
SSPPA 6" x 2" CORRUGATIONS WITH 18" CORNER RADIUS									
6'-1"	4'-7"	66"	2.3	2.3	3.4	4.6	5.7	12	10
6'-9"	4'-11"	72"	2.4	2.5	3.8	5.0	6.3	14	12
7'-3"	5'-3"	78"	2.1	3.2	4.7	6.3	7.9	13	17
7'-11"	5'-7"	84"	2.3	3.3	4.9	6.6	8.2	16	19
8'-7"	5'-11"	90"	2.3	3.6	5.4	7.2	9.0	17	23
9'-4"	6'-3"	96"	2.5	3.8	5.6	7.5	9.4	20	26
9'-9"	6'-7"	102"	2.2	4.4	6.6	8.8	11.0	19	32
10'-8"	6'-11"	108"	2.8	4.1	6.2	8.2	10.3	25	32
11'-5"	7'-3"	114"	2.8	4.5	6.7	8.9	11.1	27	37
11'-10"	7'-7"	120"	2.5	5.1	7.6	10.2	13.6	25	45
12'-6"	7'-11"	126"	2.7	5.2	7.8	10.4	13.0	29	49
12'-10"	8'-4"	132"	2.3	6.0	8.9	11.9	14.9	26	60
SSPPA 6" x 2" CORRUGATIONS WITH 31" CORNER RADIUS									
13'-3"	9'-4"	~	3.9	5.5	8.2	10.9	13.6	44	54
13'-6"	9'-6"	~	3.8	5.7	8.6	11.5	14.3	44	58
14'-0"	9'-8"	144"	4.0	5.7	8.5	11.4	14.2	48	59
14'-2"	9'-10"	~	3.8	6.1	9.1	12.1	15.2	46	64
14'-5"	10'-0"	~	3.7	6.3	9.5	12.7	15.9	46	69
14'-11"	10'-2"	~	4.0	6.2	9.3	12.4	15.5	51	68
15'-4"	10'-4"	156"	4.3	6.0	9.1	12.1	15.1	56	68
15'-7"	10'-6"	~	4.1	6.4	9.6	12.8	16.1	54	74
15'-10"	10'-8"	~	3.9	6.8	10.2	13.6	17.0	53	80
16'-3"	10'-10"	~	4.3	6.5	9.8	13.1	16.4	59	79
16'-6"	11'-0"	168"	4.1	6.9	10.4	13.9	17.3	58	85
17'-0"	11'-2"	~	4.4	6.8	10.2	13.6	17.0	63	85
17'-2"	11'-4"	~	4.3	7.1	10.6	14.1	17.6	63	90
17'-5"	11'-6"	~	4.1	7.4	11.2	14.9	18.6	61	97
17'-11"	11'-8"	180"	4.3	7.4	11.1	14.8	18.5	65	98
18'-1"	11'-10"	~	4.2	7.7	11.5	15.3	19.2	65	103
18'-7"	12'-0"	~	4.5	7.5	11.3	15.0	18.8	70	103
18'-9"	12'-2"	~	4.3	7.9	11.8	15.8	19.7	68	111
19'-3"	12'-4"	192"	4.6	7.7	11.6	15.5	19.4	74	110
19'-6"	12'-6"	~	4.4	8.1	12.2	16.3	20.3	72	118
19'-8"	12'-8"	~	4.3	8.4	12.6	16.8	21.0	72	124
19'-11"	12'-10"	~	4.1	8.8	13.2	17.6	22.0	69	132
20'-5"	13'-0"	204"	4.4	8.6	12.9	17.3	21.6	76	132
20'-7"	13'-2"	~	4.3	8.9	13.4	17.8	22.3	75	137

- NOTES:
- BEVEL TO TOP OF CORNER PLATE.
  - PIPE ENDS ARE SQUARE (PERPENDICULAR TO CENTERLINE OF PIPE) AND FILL SLOPES ARE WARPED TO ACCOMMODATE THE SQUARE ENDS UNLESS SPECIFIED OTHERWISE ON PLANS.
  - TABULATED VALUES BASED ON NOMINAL PIPE DIMENSIONS. IN PLACE DIMENSIONS SUBJECT TO TOLERANCE REQUIREMENTS OF SECTION 709.

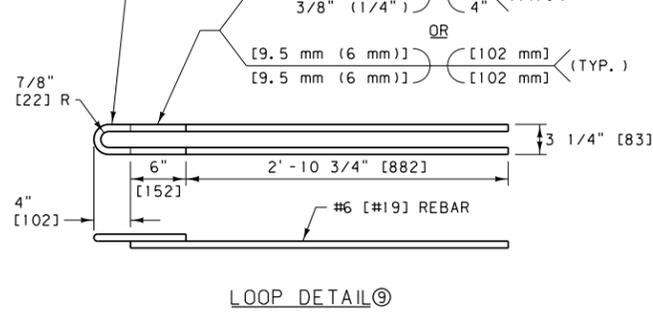
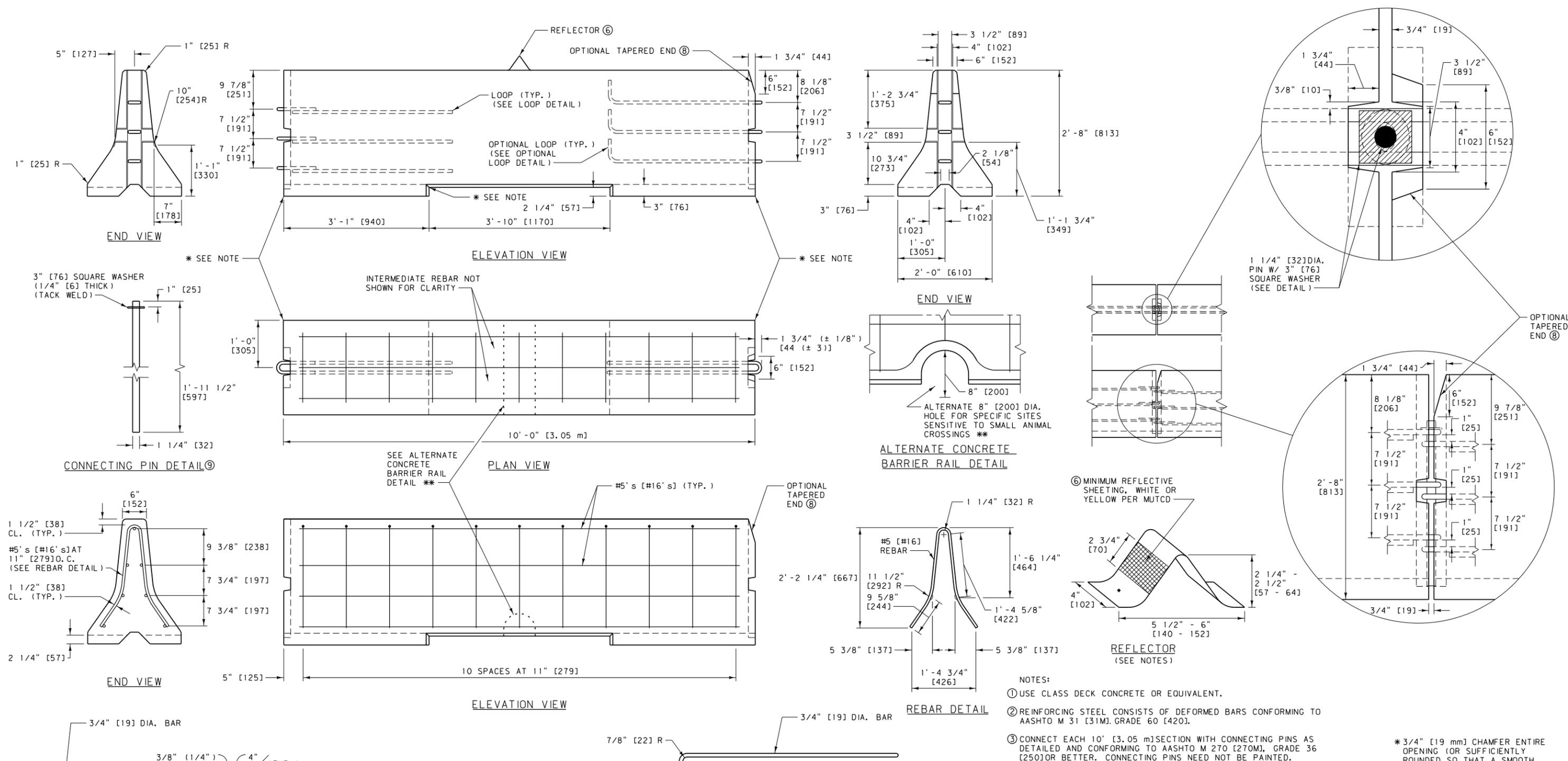
DIMENSIONS									
SPAN	RISE	EQUIV. DIA.	X (FT.)	V (FT.)	H (FT.) FOR BEVELS:			AREA "A" (SQ. FT.)	AREA "B" (SQ. FT.)
					1.5:1	2:1	2.5:1		
CSPA 3" x 1" CORRUGATIONS (SEE NOTE ③)									
60"	46"	54"	1.7	2.3	3.5	4.7	5.8	7	9
66"	51"	60"	1.9	2.6	3.9	5.2	6.5	8	11
73"	55"	66"	2.1	2.8	4.1	5.5	6.9	11	13
81"	59"	72"	2.0	3.2	4.8	6.5	8.1	11	16
87"	63"	78"	2.1	3.5	5.2	6.9	8.6	12	20
95"	67"	84"	2.3	3.7	5.5	7.3	9.2	15	22
103"	71"	90"	2.5	3.9	5.8	7.7	9.6	18	25
112"	75"	96"	2.6	4.1	6.1	8.1	10.2	19	29
117"	79"	102"	2.8	4.3	6.4	8.5	10.7	23	32
128"	83"	108"	3.0	4.5	6.7	8.9	11.2	26	35
137"	87"	114"	3.1	4.7	7.0	9.4	11.7	28	39
142"	91"	120"	3.3	4.9	7.3	9.7	12.2	32	43
CSPA 2 2/3" x 1/2" CORRUGATIONS (SEE NOTE ③)									
57"	38"	48"	1.1	2.1	3.1	4.2	5.2	4	7
64"	43"	54"	1.2	2.4	3.5	4.7	5.9	5	10
71"	47"	60"	1.4	2.6	3.8	5.1	6.4	7	11
77"	52"	66"	1.5	2.8	4.3	5.7	7.1	8	14
83"	57"	72"	1.6	3.1	4.7	6.3	7.8	10	17

METRIC DIMENSIONS									
SPAN (mm)	RISE (mm)	X (m)	V (m)	H (m) FOR BEVELS:			AREA "A" (m <sup>2</sup> )	AREA "B" (m <sup>2</sup> )	
				1.5:1	2:1	2.5:1			
CSPA 75 x 25 CORRUGATIONS (SEE NOTE ③)									
1520	1170	0.520	0.650	0.975	1.300	~	0.65	0.84	
1670	1300	0.580	0.720	1.080	1.440	~	0.74	1.02	
1850	1400	0.640	0.760	1.140	1.520	~	1.02	1.21	
2050	1500	0.610	0.890	1.335	1.780	~	1.02	1.49	
2200	1620	0.640	0.980	1.470	1.960	~	1.11	1.86	
2400	1720	0.700	1.020	1.530	2.040	~	1.39	2.04	
2600	1820	0.760	1.060	1.590	2.120	~	1.67	2.32	
2840	1920	0.790	1.130	1.695	2.260	~	1.77	2.69	
2970	2020	0.855	1.165	1.750	2.330	~	2.14	2.97	
3240	2120	0.915	1.205	1.810	2.410	~	2.42	3.25	
3470	2220	0.945	1.275	1.915	2.550	~	2.60	3.62	
3600	2320	1.005	1.315	1.975	2.630	~	2.97	3.99	
CSPA 68 x 13 CORRUGATIONS (SEE NOTE ③)									
1440	970	0.335	0.635	0.955	1.270	~	0.37	0.65	
1620	1100	0.365	0.735	1.105	1.470	~	0.46	0.93	
1800	1200	0.425	0.775	1.165	1.550	~	0.65	1.02	
1950	1320	0.455	0.865	1.300	1.730	~	0.74	1.30	
2100	1450	0.490	0.960	1.440	1.920	~	0.93	1.58	

METRIC DIMENSIONS									
SPAN (m)	RISE (m)	X (m)	V (m)	H (m) FOR BEVELS:			AREA "A" (m <sup>2</sup> )	AREA "B" (m <sup>2</sup> )	
				1.5:1	2:1	2.5:1			
SSPPA 150 x 50 CORRUGATIONS WITH 457 CORNER RADIUS									
1.850	1.400	0.701	0.701	1.036	1.402	~	1.11	0.93	
1.930	1.450	0.640	0.810	1.215	1.620	~	1.04	1.14	
2.060	1.500	0.732	0.762	1.158	1.524	~	1.30	1.11	
2.130	1.550	0.700	0.850	1.275	1.700	~	1.30	1.30	
2.210	1.600	0.640	0.975	1.433	1.920	~	1.21	1.58	
2.340	1.650	0.700	0.950	1.425	1.900	~	1.39	1.67	
2.410	1.700	0.701	1.006	1.494	2.012	~	1.49	1.77	
2.490	1.750	0.610	1.140	1.710	2.280	~	1.30	2.14	
2.620	1.800	0.701	1.097	1.646	2.195	~	1.58	2.14	
2.690	1.850	0.670	1.180	1.770	2.360	~	1.58	2.42	
2.840	1.910	0.762	1.158	1.707	2.286	~	1.86	2.42	
2.900	1.960	0.700	1.260	1.890	2.520	~	1.77	2.79	
2.970	2.010	0.671	1.341	2.012	2.682	~	1.77	2.97	
3.120	2.060	0.730	1.330	1.995	2.660	~	1.95	3.07	
3.250	2.110	0.853	1.250	1.890	2.500	~	2.32	2.97	
3.330	2.160	0.790	1.370	2.055	2.740	~	3.425	3.34	
3.480	2.210	0.853	1.372	2.042	2.713	~	2.51	3.44	
3.530	2.260	0.820	1.440	2.160	2.880	~	3.600	2.42	
3.610	2.310	0.762	1.554	2.316	3.109	~	4.145	2.32	
3.760	2.360	0.850	1.510	2.265	3.020	~	3.775	2.69	
3.810	2.410	0.823	1.585	2.377	3.170	~	3.962	2.69	
3.860	2.460	0.760	1.700	2.550	3.400	~	4.250	2.51	
3.910	2.540	0.701	1.829	2.713	3.627	~	4.542	2.42	
SSPPA 150 x 50 CORRUGATIONS WITH 787 CORNER RADIUS									
4.040	2.840	1.189	1.676	2.499	3.322	~	4.145	4.09	
4.110	2.900	1.158	1.737	2.621	3.505	~	4.359	4.09	
4.270	2.950	1.219	1.737	2.591	3.475	~	4.328	4.46	
4.320	3.000	1.158	1.859	2.774	3.688	~	4.633	4.27	
4.390	3.050	1.128	1.920	2.896	3.871	~	4.846	4.27	
4.550	3.100	1.219	1.890	2.835	3.780	~	4.724	4.74	
4.670	3.150	1.311	1.829	2.774	3.688	~	4.602	5.20	
4.750	3.200	1.250	1.951	2.926	3.900	~	4.907	5.02	
4.830	3.250	1.189	2.073	3.109	4.145	~	5.182	4.92	
4.950	3.300	1.311	1.981	2.987	3.993	~	4.999	5.48	
5.030	3.350	1.250	2.103	3.170	4.237	~	5.273	5.39	
5.180	3.400	1.341	2.073	3.109	4.145	~	5.182	5.85	
5.230	3.450	1.311	2.164	3.231	4.298	~	5.364	5.85	
5.310	3.510	1.250	2.256	3.414	4.542	~	5.669	5.67	
5.460	3.560	1.311	2.256	3.383	4.511	~	5.639	6.04	
5.510	3.610	1.280	2.347	3.505	4.663	~	5.852	6.04	
5.660	3.660	1.372	2.286	3.444	4.572	~	5.730	6.50	
5.720	3.710	1.311	2.408	3.597	4.816	~	6.005	6.32	
5.870	3.760	1.402	2.347	3.537	4.724	~	5.913	6.87	
5.940	3.810	1.341	2.469	3.719	4.968	~	6.187	6.69	
5.990	3.860	1.311	2.560	3.840	5.121	~	6.401	6.69	
6.070	3.910	1.250	2.682	4.023	5.364	~	6.706	6.41	
6.220	3.960	1.341	2.621	3.932	5.273	~	6.584	7.06	
6.270	4.010	1.311	2.713	4.084	5.425	~	6.797	6.97	

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

DETAILED DRAWING  
 REFERENCE DWG. NO. 603-34  
 STANDARD SPEC. SECTION 603, 709  
 BEVEL ON ARCH METAL CULVERT  
 --REVISED-- EFFECTIVE: SEPTEMBER 2014  
 JULY 2016  
**MDTA** MONTANA DEPARTMENT OF TRANSPORTATION



- OPTIONAL LOOP FABRICATION REQUIREMENTS:**
- USE CONTINUOUS SMOOTH ROUND BARS CONFORMING TO AASHTO M 270 [270M], GRADE 36 [250] TO FABRICATE THE OPTIONAL LOOPS.
  - 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.
  - NO WELDING IS PERMITTED ON THE SMOOTH ROUND BARS OR REINFORCING STEEL.

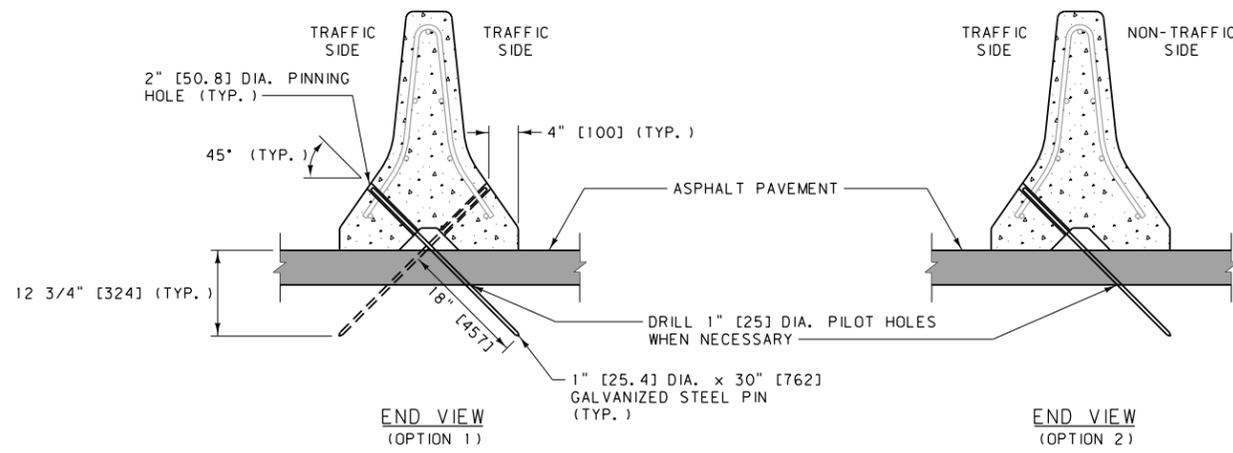
- NOTES:**
- USE CLASS DECK CONCRETE OR EQUIVALENT.
  - REINFORCING STEEL CONSISTS OF DEFORMED BARS CONFORMING TO AASHTO M 31 [31M], GRADE 60 [420].
  - CONNECT EACH 10' [3.05 m] SECTION WITH CONNECTING PINS AS DETAILED AND CONFORMING TO AASHTO M 270 [270M], GRADE 36 [250] OR BETTER. CONNECTING PINS NEED NOT BE PAINTED.
  - CUTOUTS ON ENDS OF EACH SECTION ARE SHOWN WITH SLIGHT TAPER TO FACILITATE FORM REMOVAL. RECTANGULAR CUTOUTS ARE ACCEPTABLE.
  - 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.
  - 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.
  - 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.
  - THE OPTIONAL TAPERED END SHOWN IS AN ACCEPTABLE ALTERNATE TO THE VERTICAL END FOR ALL CONCRETE BARRIER RAIL ENDS.
  - 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.

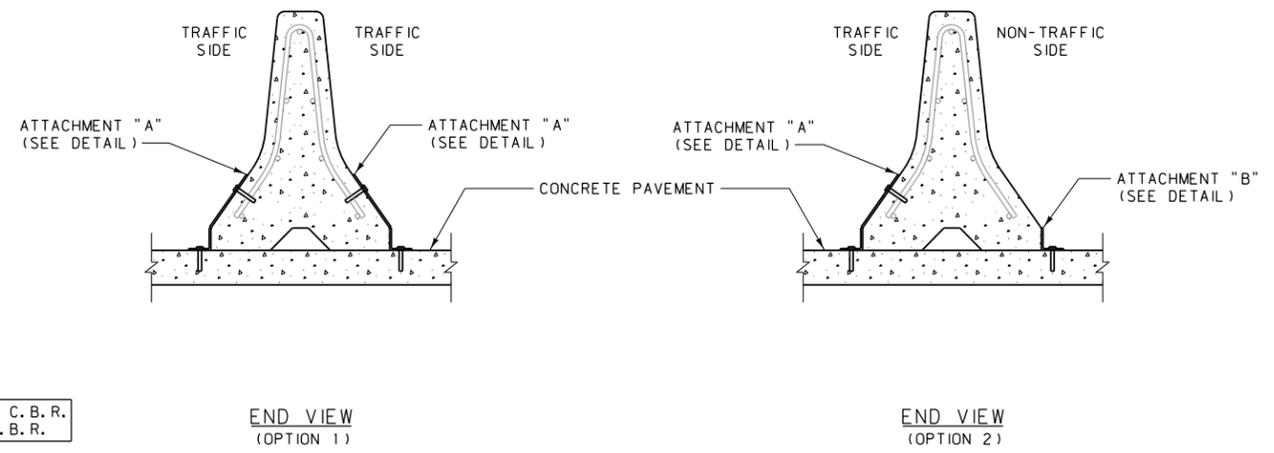
\*\* USE THE ALTERNATE 8" [200 mm] DIA. HOLE IN THIS RAIL ON A CASE-BY-CASE BASIS AS SPECIFIED IN THE PLANS.

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

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	605-00
SECTION 554, 605, 624, 711	
CONCRETE BARRIER RAIL	
EFFECTIVE: SEPTEMBER 2014	
--REVISED--	
JULY 2016	
MONTANA DEPARTMENT OF TRANSPORTATION	

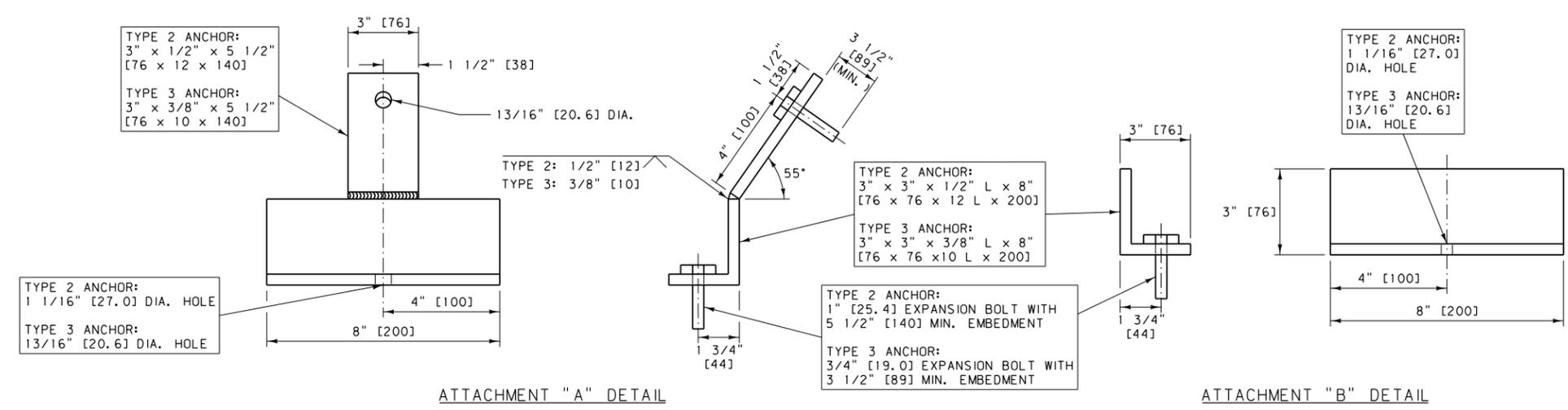
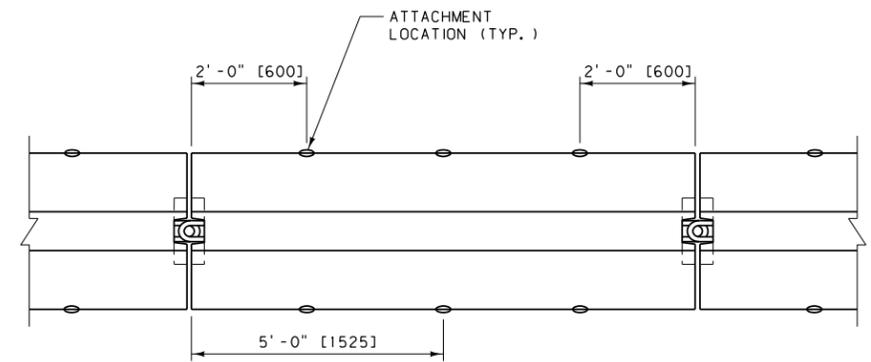
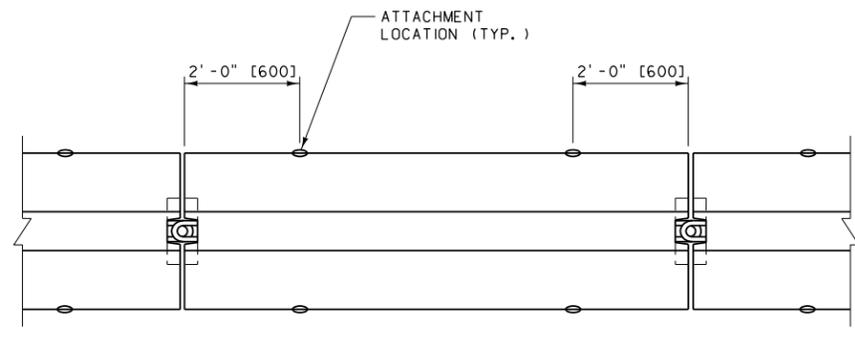
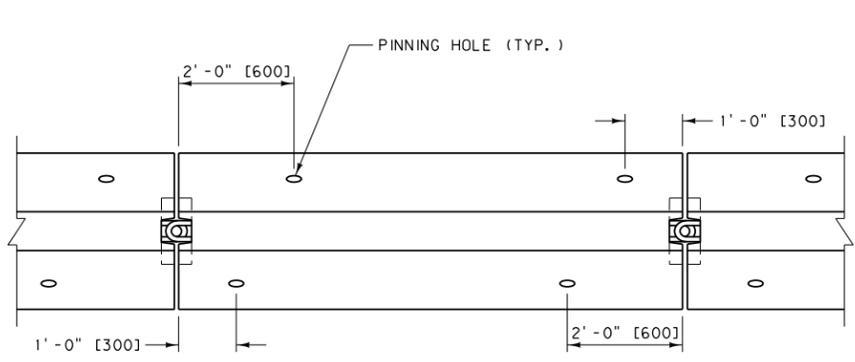


OPTION 1 = TRAFFIC ON BOTH SIDES OF C.B.R.  
 OPTION 2 = TRAFFIC ON ONE SIDE OF C.B.R.



**TYPE 1 ANCHOR**  
 (FOR TEMPORARY OR PERMANENT CONCRETE BARRIER RAIL INSTALLATIONS ON ASPHALT PAVEMENT)

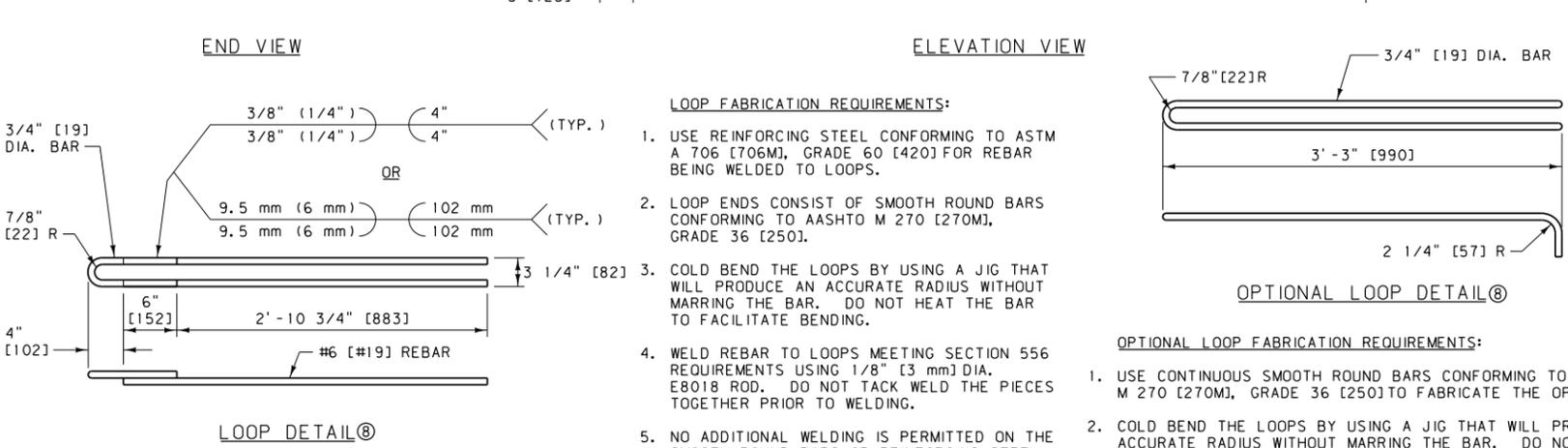
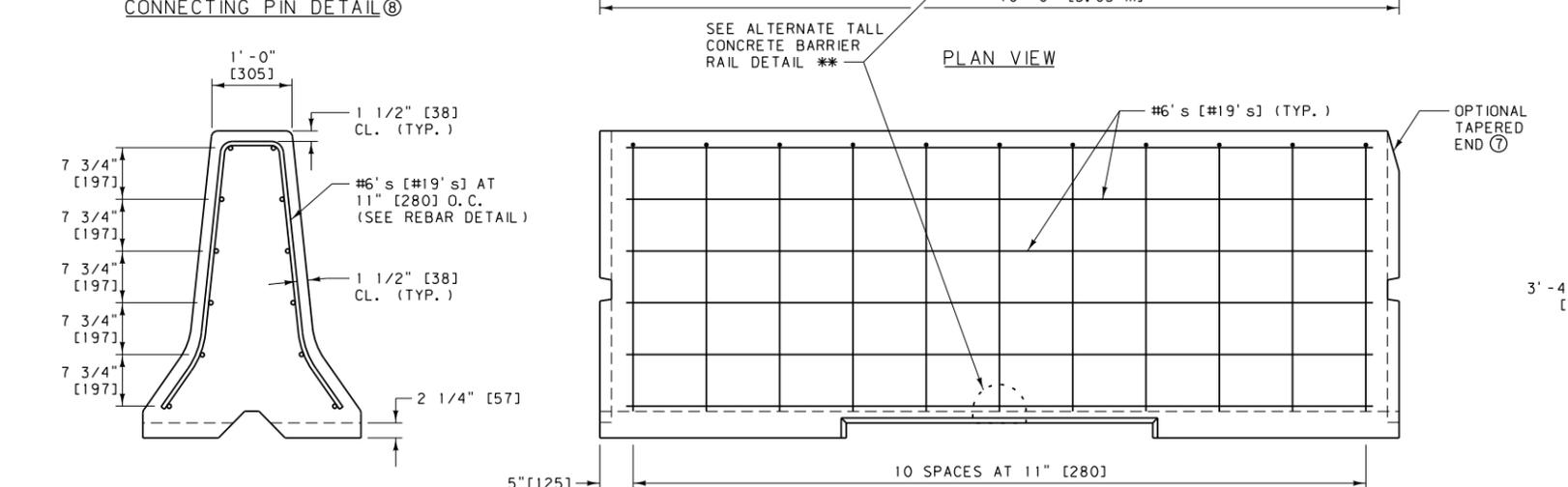
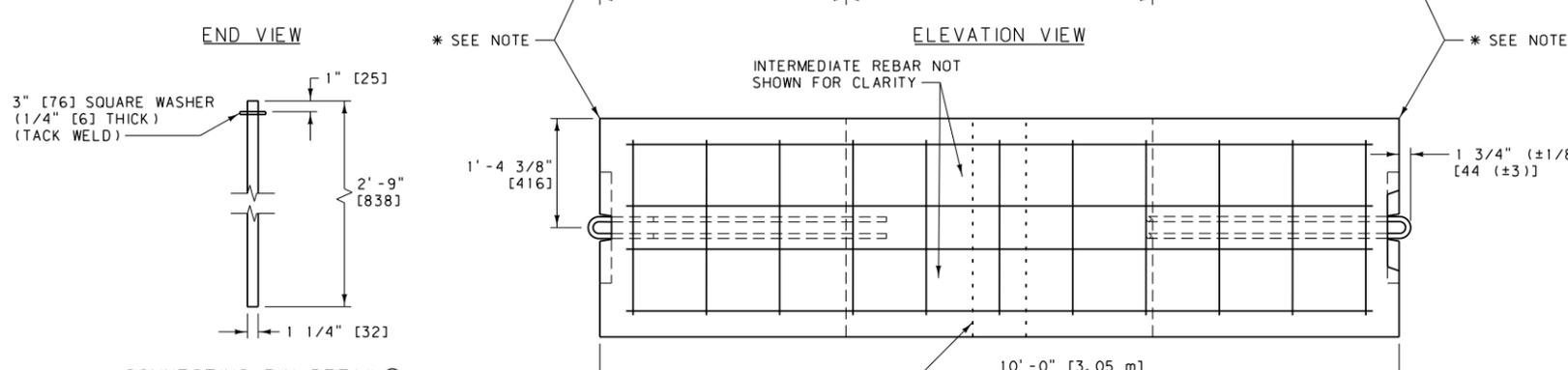
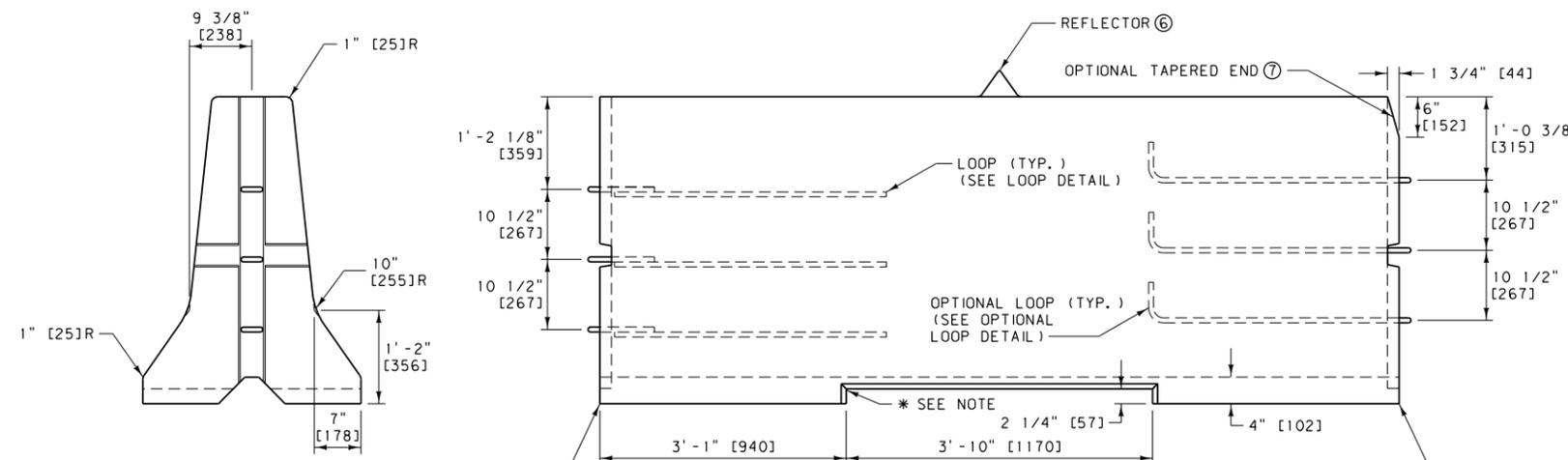
**TYPE 2 & 3 ANCHORS**  
 (FOR TEMPORARY CONCRETE BARRIER RAIL INSTALLATIONS ON CONCRETE PAVEMENT)



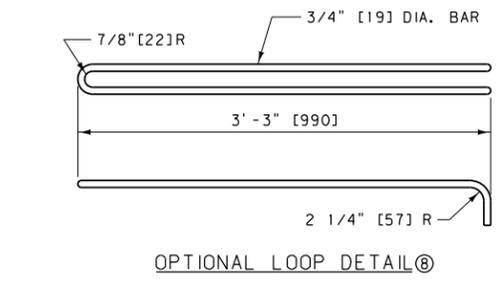
- NOTES:**
- USE THESE ANCHORS WITH STANDARD CONCRETE BARRIER RAIL (C.B.R.), AS SHOWN IN DTL. DWG. NO. 606-60, WHEN DEFLECTION OF THE SYSTEM NEEDS TO BE LIMITED.
  - CAST THE PINNING HOLES INTO THE C.B.R. USING 2" [50.8] I.D. STEEL PIPE. DO NOT DRILL THE PINNING HOLES.
  - USE STEEL CONFORMING TO AASHTO M 270 [270M], GRADE 36 [250] OR BETTER FOR PINS AND ATTACHMENT ANGLES. GALVANIZE IN ACCORDANCE WITH SUBSECTION 711.08.
  - USE TYPE 2 ANCHORS WHEN A DEEPER EMBEDMENT (5 1/2" [140]) INTO THE BRIDGE DECK OR CONCRETE PAVEMENT IS PERMISSIBLE.
  - ADJUST THE LOCATION OF THE TYPE 2 OR TYPE 3 ANCHORS TO AVOID THE MAIN REINFORCING WHEN PLACED ON BRIDGE DECK.
  - USE SHIMS TO PROPERLY FIT THE TYPE 2 AND TYPE 3 ANCHORS TO THE BARRIER AND ROADWAY SURFACES.
  - 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.
  - 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.
  - 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.

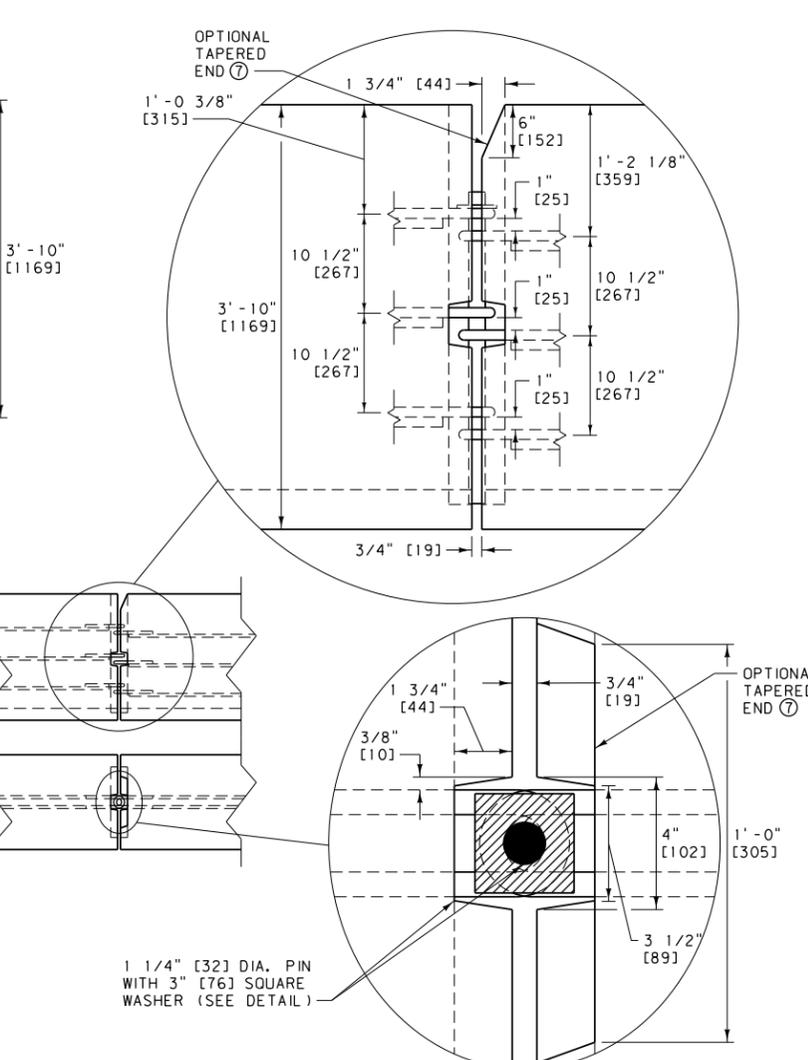
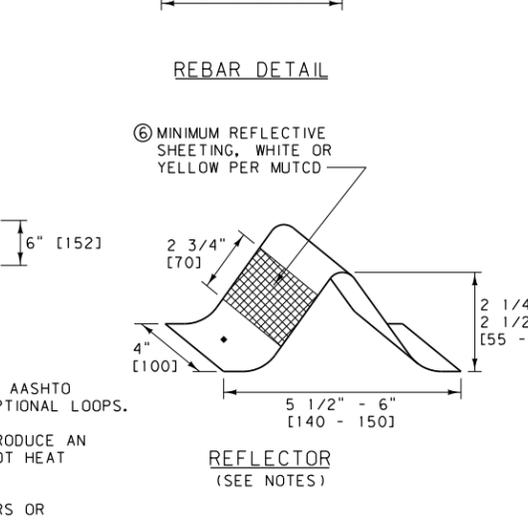
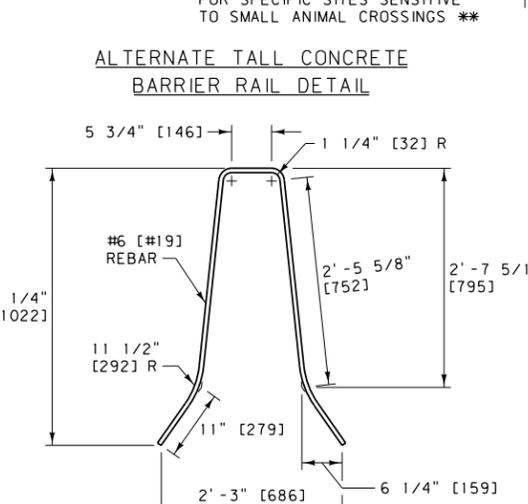
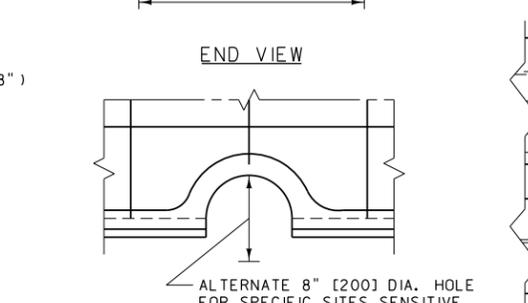
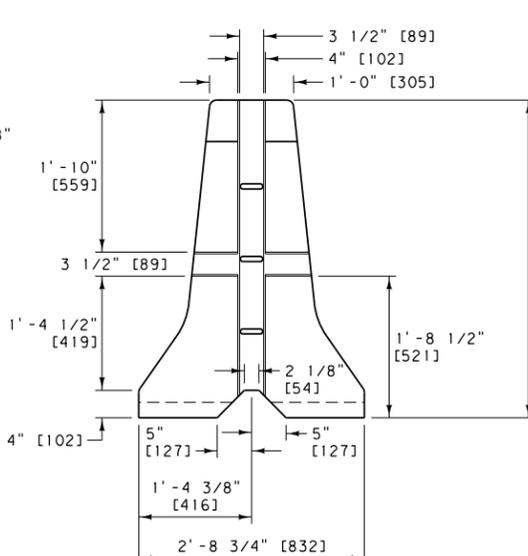
DETAILED DRAWING	
REFERENCE DWG. NO.	605-05
STANDARD SPEC.	SECTION 554.605
CONCRETE BARRIER RAIL ANCHORS	
EFFECTIVE: SEPTEMBER 2014	
--REVISED--	
JULY 2016	



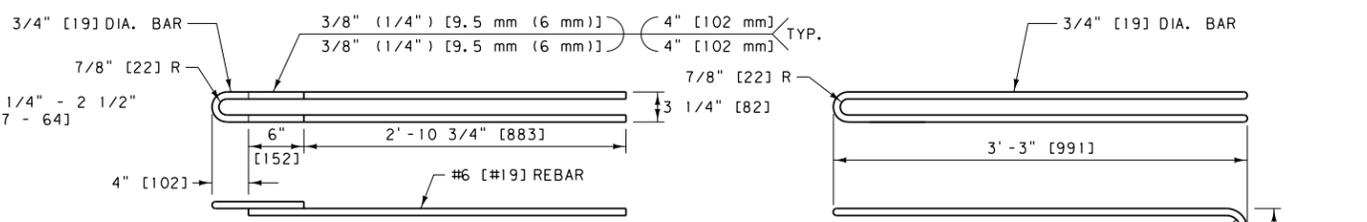
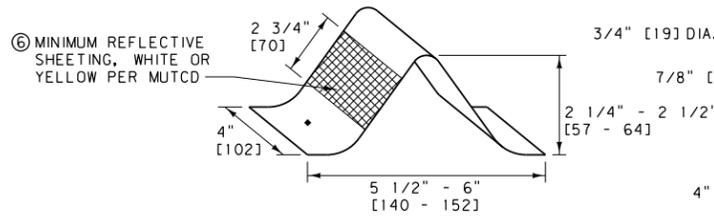
- LOOP FABRICATION REQUIREMENTS:**
1. USE REINFORCING STEEL CONFORMING TO ASTM A 706 [706M], GRADE 60 [420] FOR REBAR BEING WELDED TO LOOPS.
  2. LOOP ENDS CONSIST OF SMOOTH ROUND BARS CONFORMING TO AASHTO M 270 [270M], GRADE 36 [250].
  3. COLD BEND THE LOOPS BY USING A JIG THAT WILL PRODUCE AN ACCURATE 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 CUTOUPS ON ENDS OF EACH SECTION ARE SHOWN WITH SLIGHT TAPER TO FACILITATE FORM REMOVAL. RECTANGULAR CUTOUPS 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.
- UNITS SHOWN IN BRACKETS [ ] ARE METRIC AND ARE IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.
- |   |          |
|---|----------|
| DETAILED DRAWING                          |          |
| REFERENCE                                 | DWG. NO. |
| SECTION 554, 556, 605, 711                | 605-10   |
| TALL CONCRETE BARRIER RAIL                |          |
| EFFECTIVE: SEPTEMBER 2014                 |          |
| --REVISED--                               |          |
| JULY 2016                                 |          |
| MDTA MONTANA DEPARTMENT OF TRANSPORTATION |          |
- \* 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

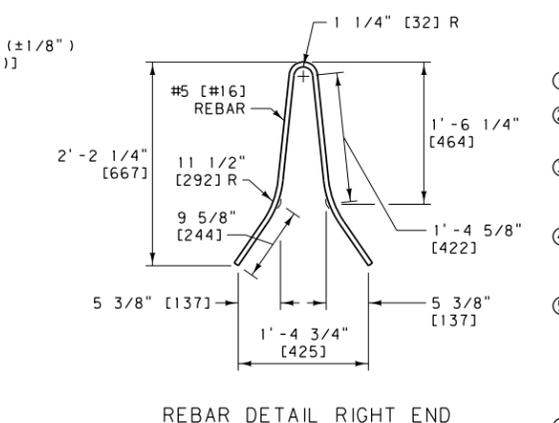
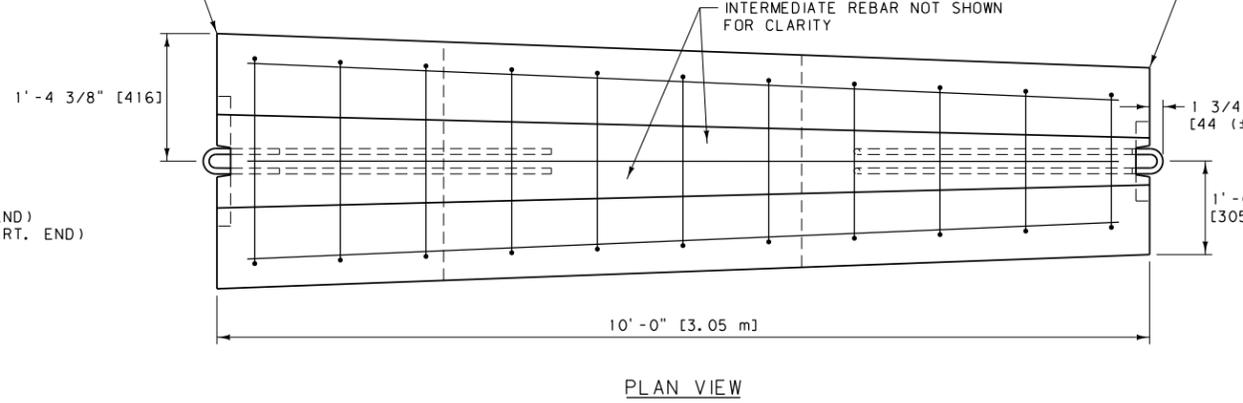
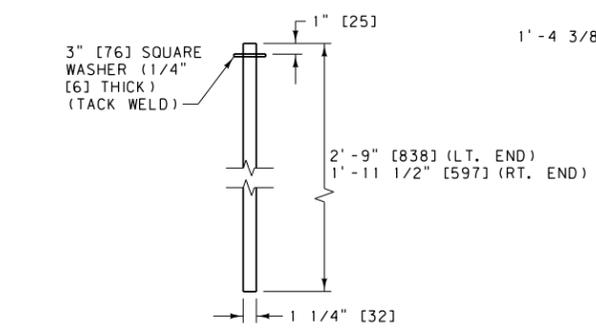
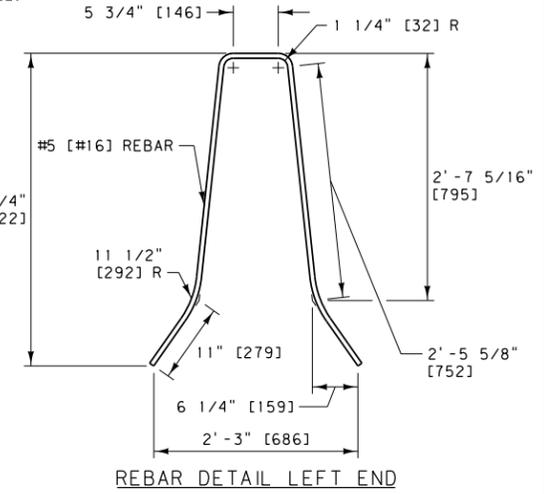
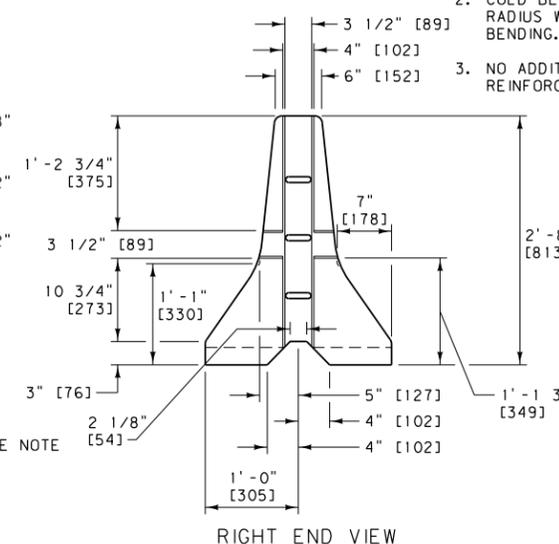
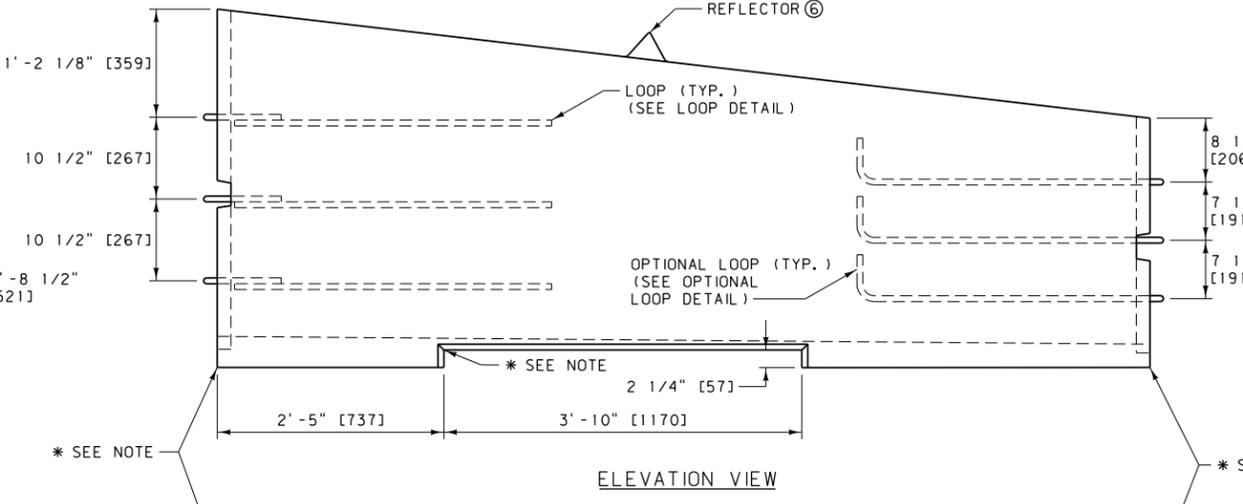
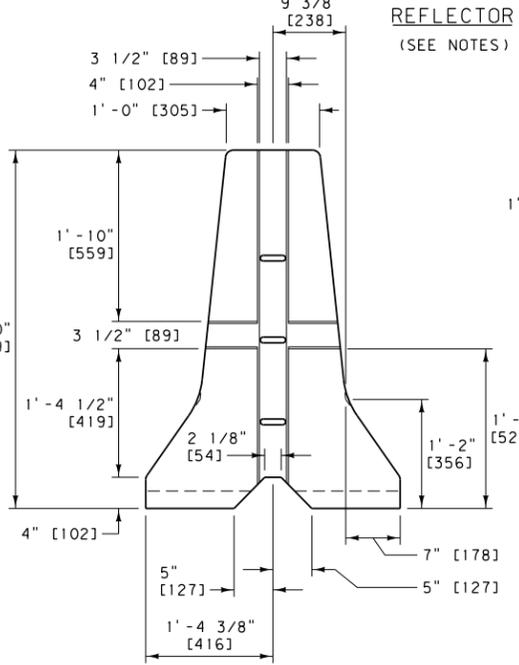


**LOOP FABRICATION REQUIREMENTS:**

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.

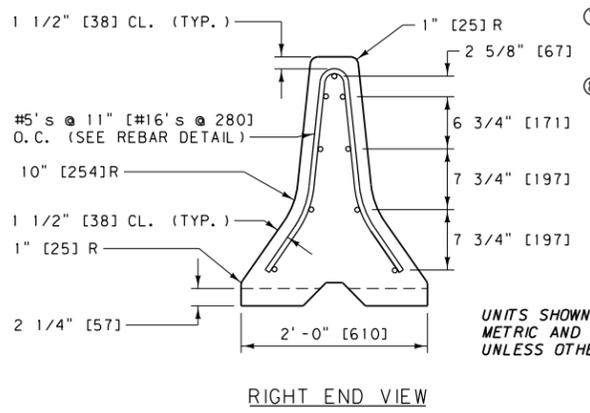
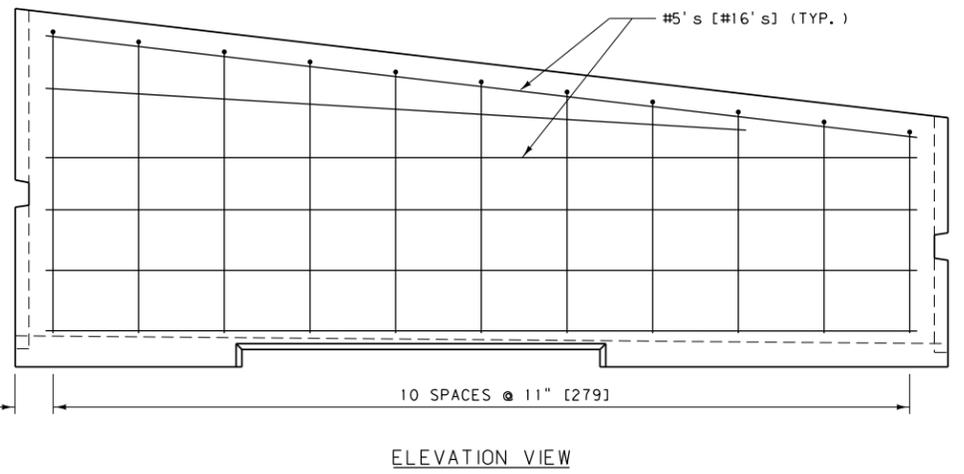
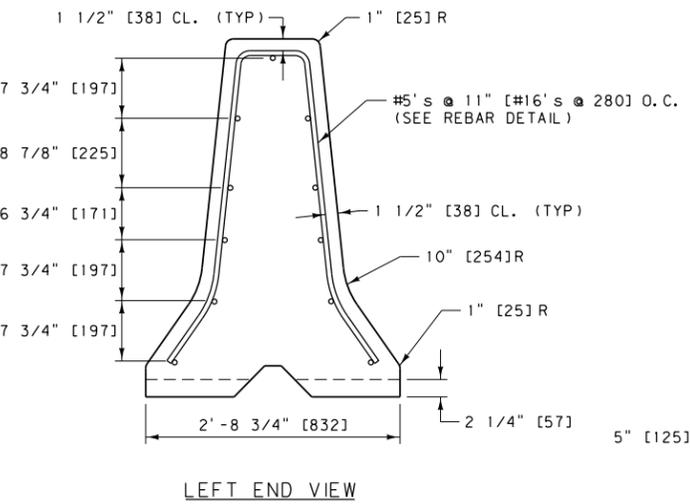
**OPTIONAL LOOP FABRICATION REQUIREMENTS:**

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:**

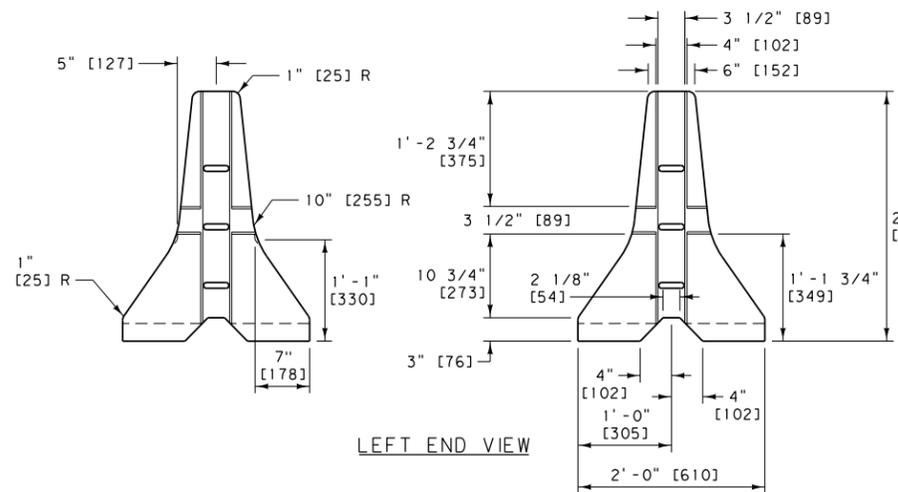
- 1 USE CLASS DECK CONCRETE OR EQUIVALENT.
  - 2 REINFORCING STEEL CONSISTS OF DEFORMED BARS CONFORMING TO AASHTO M 31 [31M], GRADE 60 [420].
  - 3 CONNECT EACH 10' SECTION WITH CONNECTING PINS AS DETAILED AND CONFORMING TO AASHTO M 270 [270M], GRADE 36 [250] OR BETTER. CONNECTING PINS NEED NOT BE PAINTED.
  - 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.



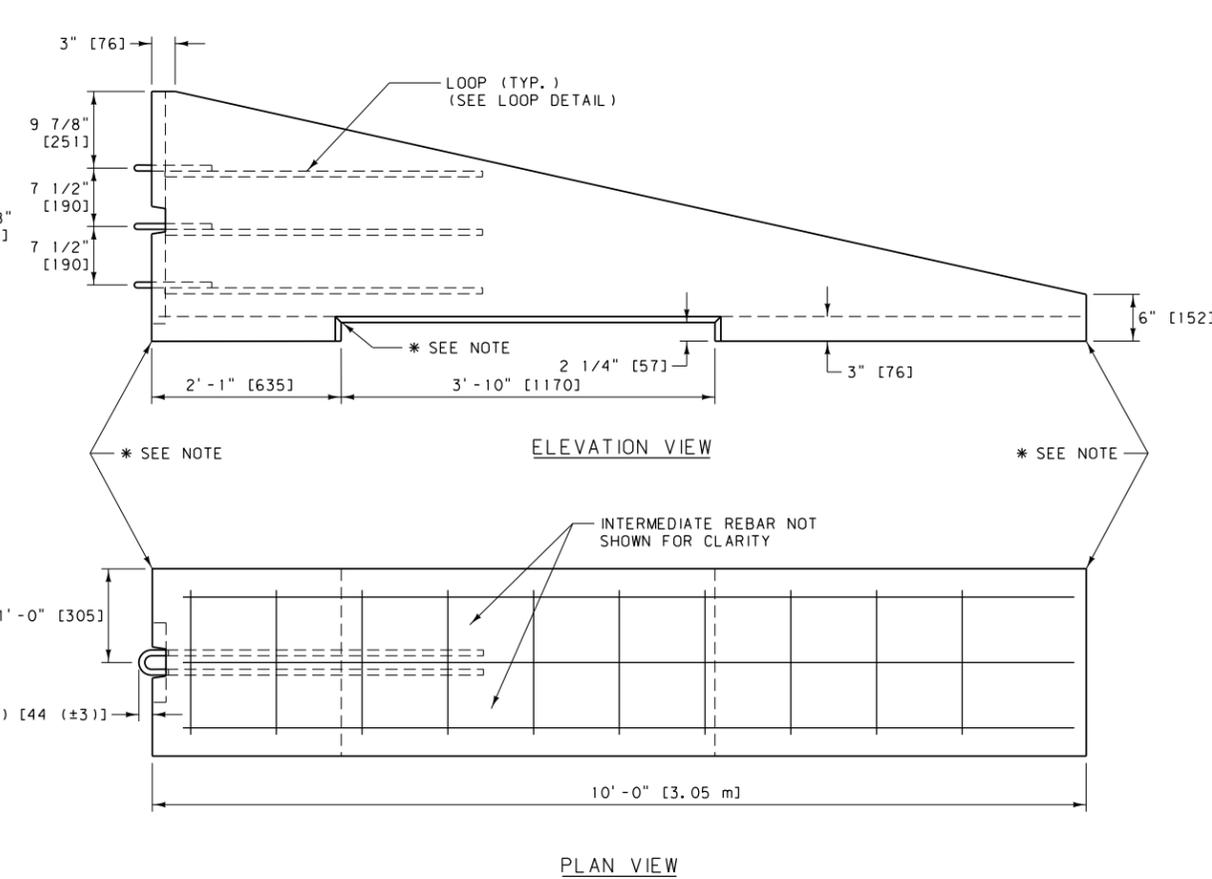
UNITS SHOWN IN BRACKETS [ ] ARE METRIC AND ARE IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.

DETAILED DRAWING	
REFERENCE	DWG. NO.
SECTION 554, 556, 605, 711	605-15

CONCRETE BARRIER RAIL TRANSITION

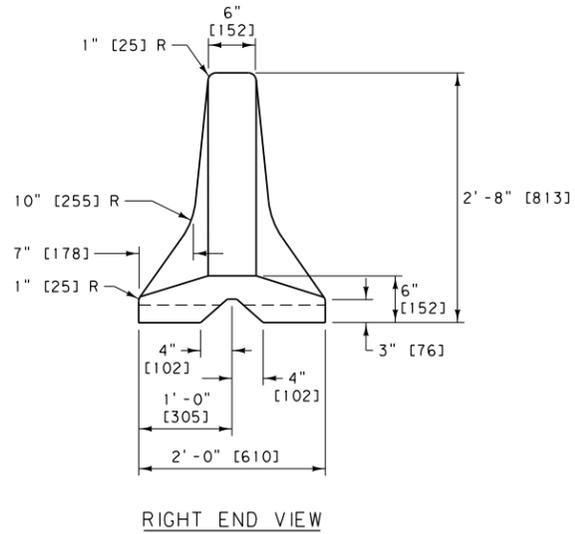


LEFT END VIEW



ELEVATION VIEW

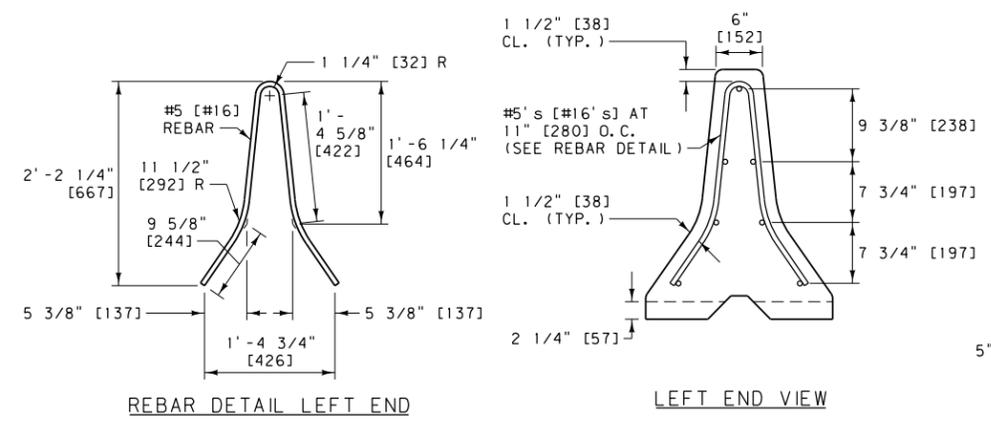
PLAN VIEW



RIGHT END VIEW

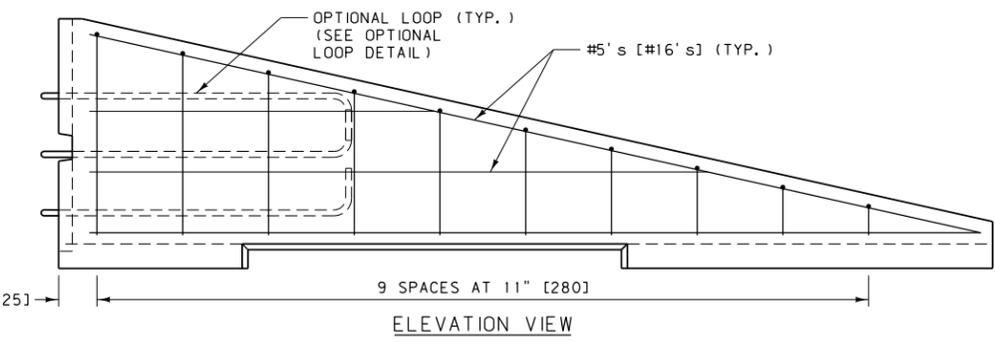
NOTE:  
REBAR TYPICAL AT LEFT END ONLY. TAPER THE REBAR HEIGHT AS NEEDED BY MAINTAINING THE VERTICAL POSITION FROM THE BOTTOM AND THE 1 1/2" [38 mm] CLEARANCE AT ALL LOCATIONS.

- NOTES:
- USE CLASS DECK CONCRETE OR EQUIVALENT.
  - REINFORCING STEEL CONSISTS OF DEFORMED BARS CONFORMING TO AASHTO M 31 [31M], GRADE 60 [420].
  - 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.
  - CUTOUTS ON LEFT END OF EACH SECTION ARE SHOWN WITH SLIGHT TAPER TO FACILITATE FORM REMOVAL. RECTANGULAR CUTOUTS ARE ACCEPTABLE.
  - 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.
  - 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.
  - 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.

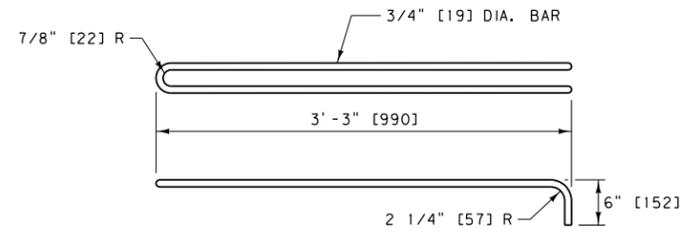


REBAR DETAIL LEFT END

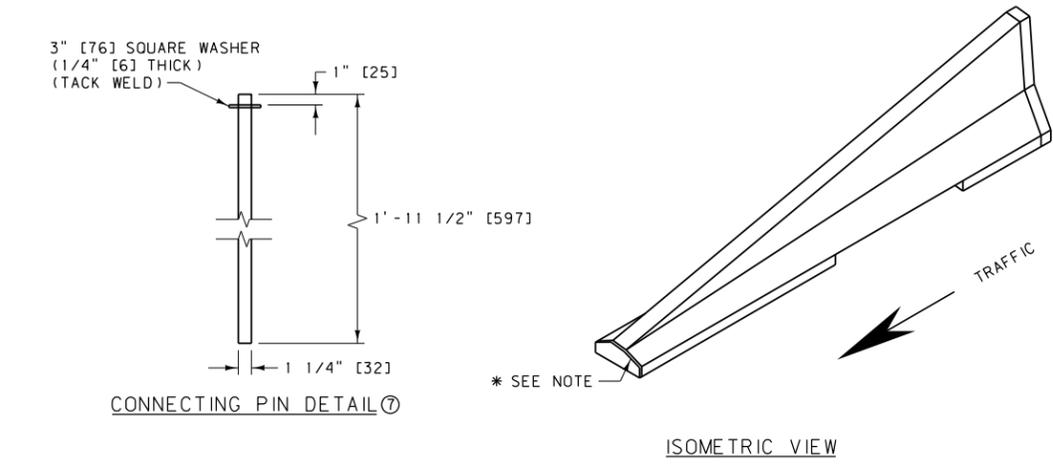
LEFT END VIEW



ELEVATION VIEW

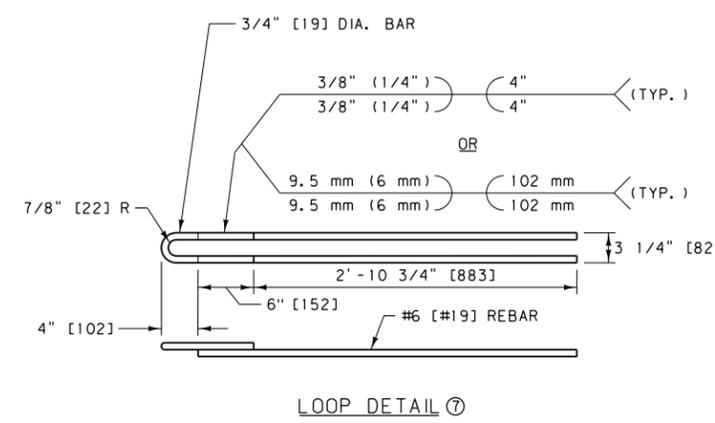


OPTIONAL LOOP DETAIL ⑦



CONNECTING PIN DETAIL ⑦

ISOMETRIC VIEW



LOOP DETAIL ⑦

LOOP FABRICATION REQUIREMENTS:

- USE REINFORCING STEEL CONFORMING TO ASTM A 706 [706M], GRADE 60 [420] FOR REBAR BEING WELDED TO LOOPS.
- LOOP ENDS CONSIST OF SMOOTH ROUND BARS CONFORMING TO AASHTO M 270 [270M], GRADE 36 [250].
- 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.
- 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.
- NO ADDITIONAL WELDING IS PERMITTED ON THE SMOOTH ROUND BARS OR REINFORCING STEEL.

OPTIONAL LOOP FABRICATION REQUIREMENTS:

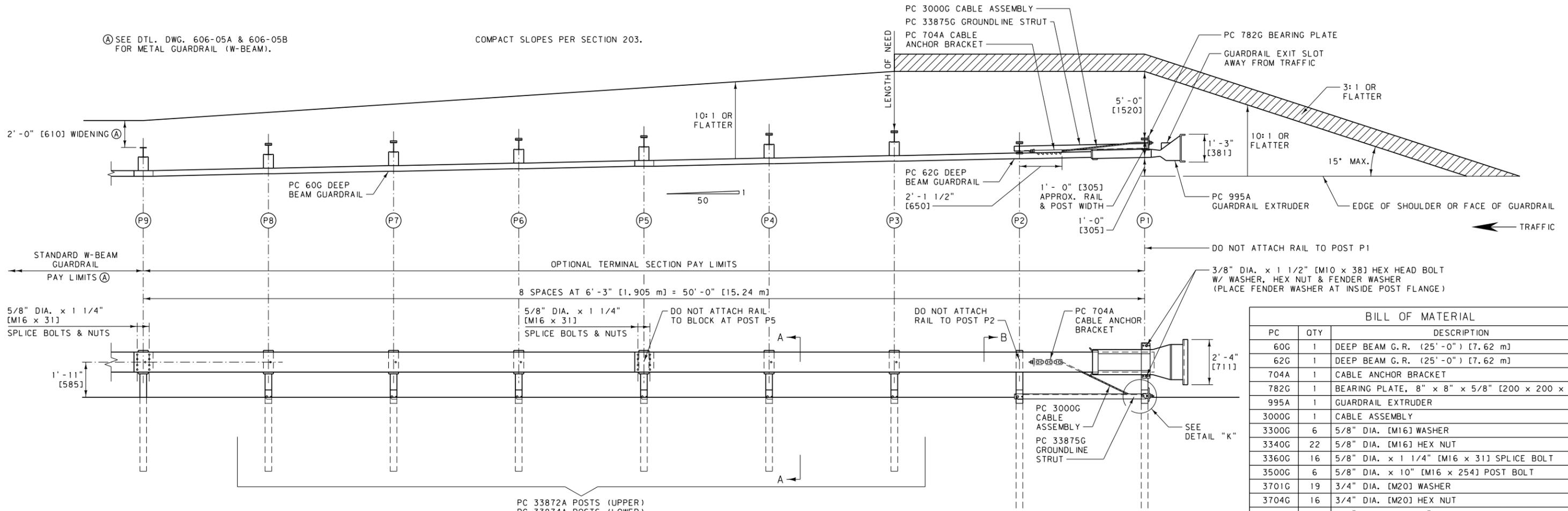
- USE CONTINUOUS SMOOTH ROUND BARS CONFORMING TO AASHTO M 270 [270M], GRADE 36 [250] TO FABRICATE THE OPTIONAL LOOPS.
- COLD BEND THE LOOPS BY USING A JIG THAT WILL PRODUCE AN ACCURATE RADIUS WITHOUT MARRING THE BAR. DO NOT HEAT THE BAR TO FACILITATE BENDING.
- NO WELDING IS PERMITTED ON THE SMOOTH ROUND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

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

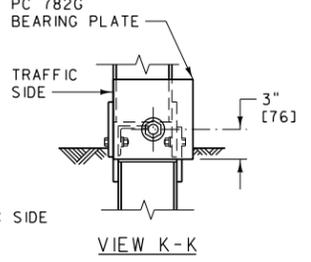
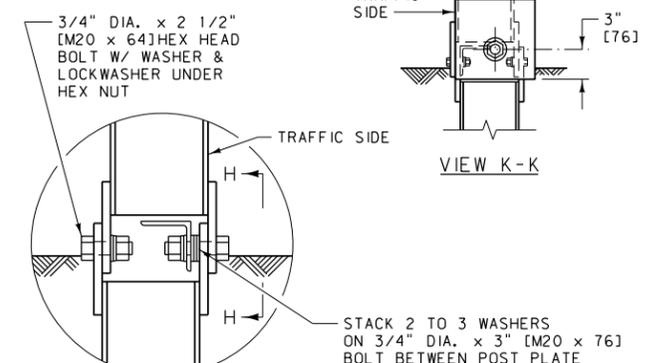
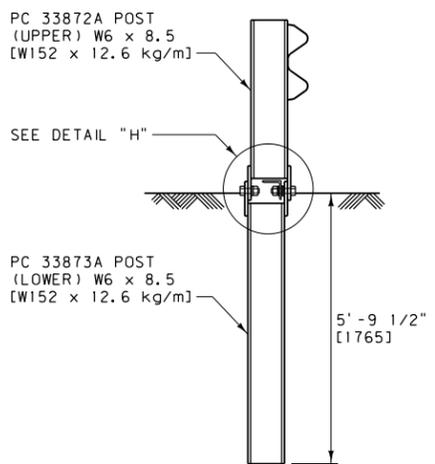
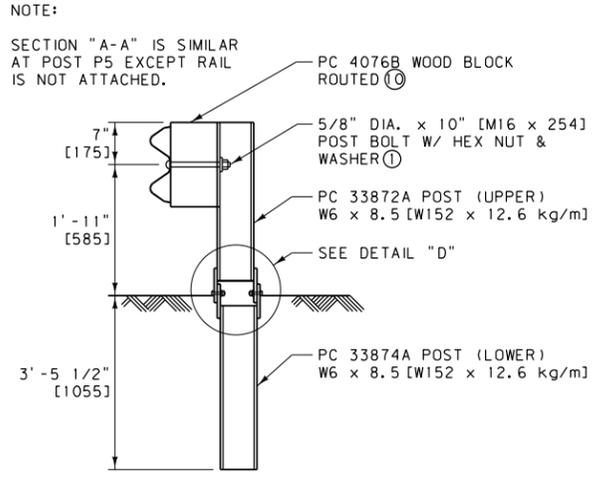
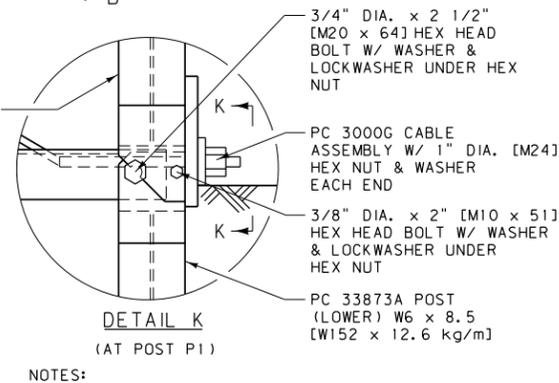
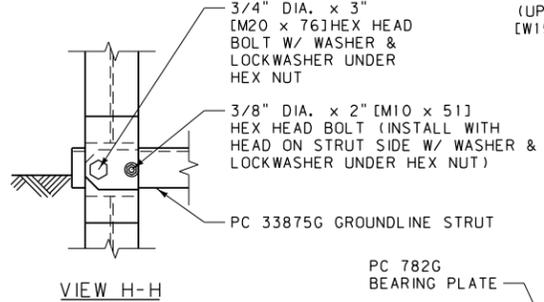
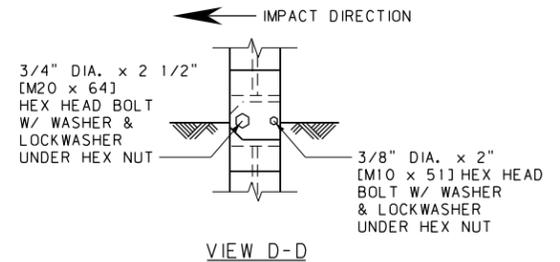
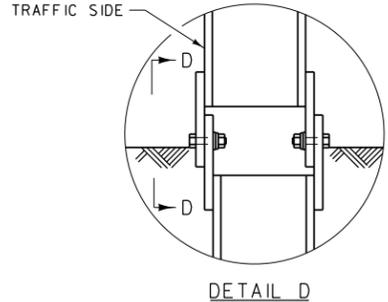
DETAILED DRAWING	
REFERENCE	DWG. NO.
SECTION 554, 605, 711	605-20
CONCRETE BARRIER RAIL TERMINAL SECTION (ONE-WAY DEPARTURE)	
EFFECTIVE: SEPTEMBER 2014	
--REVISED--	
JULY 2016	
	

SEE DTL. DWG. 606-05A & 606-05B FOR METAL GUARDRAIL (W-BEAM).

COMPACT SLOPES PER SECTION 203.



BILL OF MATERIAL		
PC	QTY	DESCRIPTION
60G	1	DEEP BEAM G.R. (25'-0") [7.62 m]
62G	1	DEEP BEAM G.R. (25'-0") [7.62 m]
704A	1	CABLE ANCHOR BRACKET
782G	1	BEARING PLATE, 8" x 8" x 5/8" [200 x 200 x 16]
995A	1	GUARDRAIL EXTRUDER
3000G	1	CABLE ASSEMBLY
3300G	6	5/8" DIA. [M16] WASHER
3340G	22	5/8" DIA. [M16] HEX NUT
3360G	16	5/8" DIA. x 1 1/4" [M16 x 31] SPLICE BOLT
3500G	6	5/8" DIA. x 10" [M16 x 254] POST BOLT
3701G	19	3/4" DIA. [M20] WASHER
3704G	16	3/4" DIA. [M20] HEX NUT
3717G	15	3/4" DIA. x 2 1/2" [M20 x 64] HEX HEAD BOLT
3718G	1	3/4" DIA. x 3" [M20 x 76] HEX HEAD BOLT
3900G	2	1" DIA. [M24] WASHER
3910G	2	1" DIA. [M24] HEX NUT
4076B	6	WOOD BLOCK, 6" x 8" x 1'-2" [150 x 200 x 350]
4254G	18	3/8" DIA. [M10] WASHER
4255G	2	3/8" DIA. [M10] FENDER WASHER (1 1/2" [38] O.D.)
4258G	16	3/8" DIA. [M10] LOCKWASHER
4261G	2	3/8" DIA. x 1 1/2" [M10 x 38] HEX HEAD BOLT
4699G	16	3/4" DIA. [M20] LOCKWASHER
6321G	16	3/8" DIA. x 2" [M10 x 51] HEX HEAD BOLT
6405G	18	3/8" DIA. [M10] HEX NUT
33871A	1	ETPLUS HBA POST P1 (UPPER)
33872A	7	ETPLUS HBA POST P2 TO P8 (UPPER)
33873A	2	ETPLUS HBA POST P1 & P2 (LOWER)
33874A	6	ETPLUS HBA POST P3 TO P8 (LOWER)
33875G	1	6'-6" [1981] ANGLE STRUT ET HBA



SECTION A-A  
(TYP AT POSTS P3, P4, P6, P7 & P8)

SECTION B-B  
(AT POST P2)

DETAIL H  
(AT POST P2)

- NOTES:
- THE 5/8" DIA. [M16] FLAT WASHER IS USED UNDER THE NUT, BEHIND THE POST ONLY. NO WASHER IS USED AT THE RAIL.
  - USE THE ET-PLUS TERMINAL SECTION ON DIVIDED ROADWAYS IF THE WIDTH IS 25 FEET [7.5 m] OR GREATER BETWEEN FINISHED SURFACES. CONSIDER OTHER TERMINAL SECTIONS IF THE WIDTH IS LESS THAN 25 FEET [7.5 m] BETWEEN FINISHED SURFACES.
  - FLARE THE END SECTION AWAY FROM TRAFFIC AT A RATE OF 50:1 FOR 50 FEET [15.24 m] (ILLUSTRATED). FLARES OF 50:1 FOR 100 FEET [30.48 m] MAY ALSO BE USED. THE FLARE MAY BE OMITTED ON ROADS WITH SHOULDERS GREATER THAN 2 FEET [0.6 m] IN WIDTH.
  - PLACE A SELF-ADHESIVE OBJECT MARKER ON THE GUARDRAIL EXTRUDER FACE, HAVING ALTERNATING RETRO-REFLECTIVE BLACK AND YELLOW STRIPES SLOPED DOWNWARD AT AN ANGLE OF 45° TOWARDS THE SIDE ON WHICH TRAFFIC IS TO PASS.
  - ATTACH REFLECTORS TO TERMINAL SECTION POSTS, PER DTL. DWG. NO. 606-05A AND 606-05B.
  - OBTAIN ENGINEER'S APPROVAL OF MANUFACTURER INSTALLATION OPTIONS WHEN SITE CONDITIONS PREVENT THE USE OF THE OPTION SHOWN ON THIS DETAIL.
  - AFTER FINAL ASSEMBLY, RECHECK CABLE TO MAKE SURE IT IS TAUT AND HAS NOT RELAXED.
  - LAP ALL W-BEAM SPLICES IN THE DIRECTION OF ADJACENT TRAFFIC.
  - ON LOWER POSTS 1 TO 8, INSTALL TOP OF POST A MAXIMUM OF 4 INCHES [100] ABOVE GROUND.
  - USE ROUTED WOOD BLOCKS OR OTHER NCHRP 350 APPROVED BLOCKS.

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

DETAILED DRAWING	
REFERENCE	DWG. NO.
SECTION 606, 203	606-13A

OPTIONAL  
TERMINAL SECTION -  
ET-PLUS

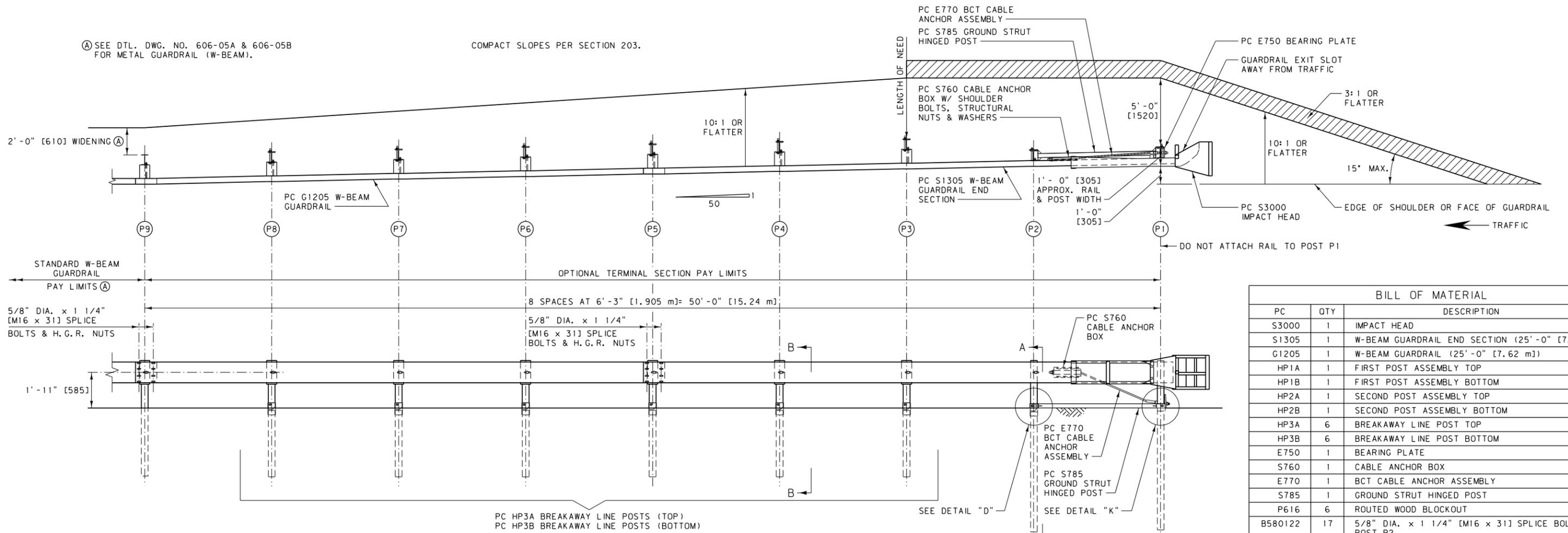
EFFECTIVE: SEPTEMBER 2014



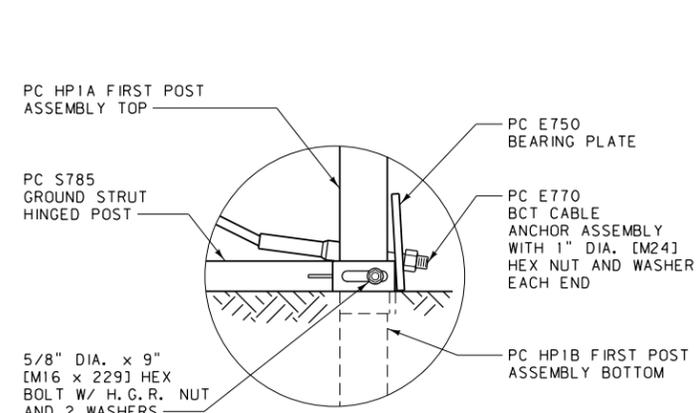
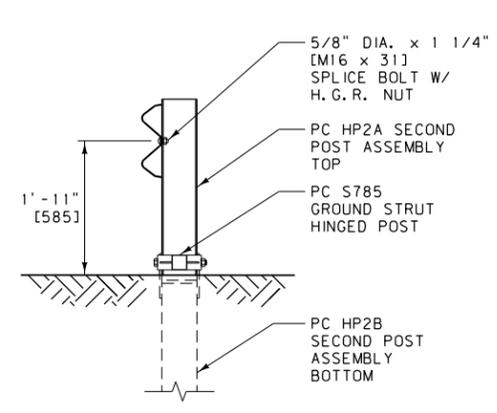
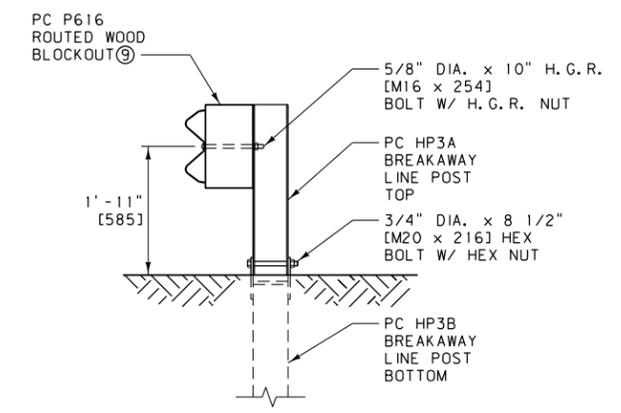
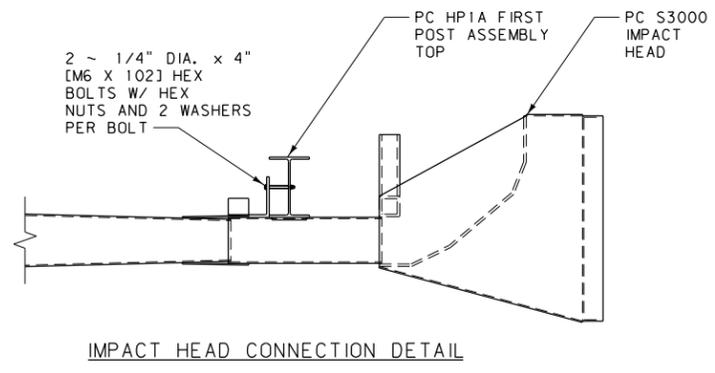
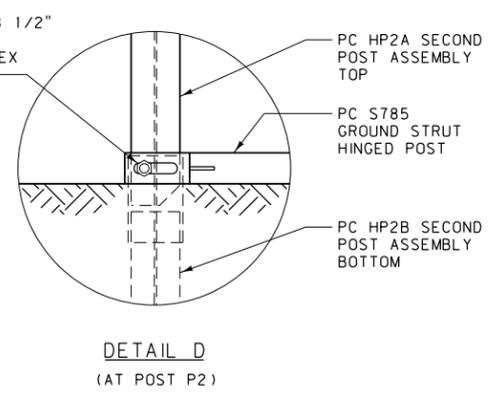
--REVISED--  
JULY 2016

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

COMPACT SLOPES PER SECTION 203.



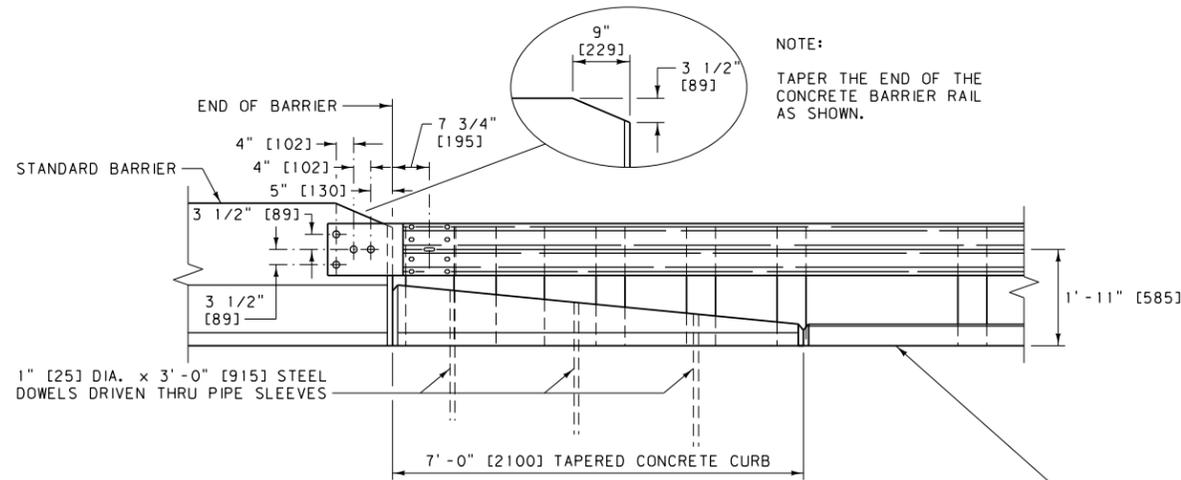
BILL OF MATERIAL		
PC	QTY	DESCRIPTION
S3000	1	IMPACT HEAD
S1305	1	W-BEAM GUARDRAIL END SECTION (25' - 0" [7.62 m])
G1205	1	W-BEAM GUARDRAIL (25' - 0" [7.62 m])
HP1A	1	FIRST POST ASSEMBLY TOP
HP1B	1	FIRST POST ASSEMBLY BOTTOM
HP2A	1	SECOND POST ASSEMBLY TOP
HP2B	1	SECOND POST ASSEMBLY BOTTOM
HP3A	6	BREAKAWAY LINE POST TOP
HP3B	6	BREAKAWAY LINE POST BOTTOM
E750	1	BEARING PLATE
S760	1	CABLE ANCHOR BOX
E770	1	BCT CABLE ANCHOR ASSEMBLY
S785	1	GROUND STRUT HINGED POST
P616	6	ROUTED WOOD BLOCKOUT
B580122	17	5/8" DIA. x 1 1/4" [M16 x 31] SPLICE BOLT, POST P2
B580904A	1	5/8" DIA. x 9" [M16 x 229] HEX BOLT
B581002	6	5/8" DIA. x 10" [M16 x 254] H. G. R. BOLT
N050	24	5/8" DIA. [M16] H. G. R. NUT
W050	2	5/8" DIA. [M16] WASHER
B340854A	7	3/4" DIA. x 8 1/2" [M20 x 216] HEX BOLT
N030	7	3/4" [M20] DIA. HEX NUT
N100	2	1" DIA. [M24] ANCHOR CABLE HEX NUT
W100	2	1" DIA. [M24] ANCHOR CABLE WASHER
B140404	2	1/4" DIA. x 4" [M6 x 102] HEX BOLT
N014	2	1/4" DIA. [M6] HEX NUT
W014	4	1/4" DIA. [M6] WASHER
SB58A	8	CABLE ANCHOR BOX SHOULDER BOLT
N055A	8	1/2" DIA. [M12] A325 STRUCTURAL NUT
W050A	16	9/16" DIA. [M14] (1 1/16" [27] O.D.) A325 STRUCTURAL WASHER



- NOTES:
- USE THE SKT 350 TERMINAL SECTION ON DIVIDED ROADWAYS IF THE WIDTH IS 25 FEET [7.5 m] OR GREATER BETWEEN FINISHED SURFACES. CONSIDER OTHER TERMINAL SECTIONS IF THE WIDTH IS LESS THAN 25 FEET [7.5 m] BETWEEN FINISHED SURFACES.
  - FLARE THE END SECTION AWAY FROM TRAFFIC AT A RATE OF 50:1 FOR 50 FEET [15.24 m] (ILLUSTRATED). FLARES OF 50:1 FOR 100 FEET [30.48 m] MAY ALSO BE USED. THE FLARE MAY BE OMITTED ON ROADS WITH SHOULDERS GREATER THAN 2 FEET [0.6 m] IN WIDTH.
  - PLACE A SELF-ADHESIVE OBJECT MARKER ON THE GUARDRAIL IMPACT HEAD FACE, HAVING ALTERNATING RETRO-REFLECTIVE BLACK AND YELLOW STRIPES SLOPED DOWNWARD AT AN ANGLE OF 45° TOWARDS THE SIDE ON WHICH TRAFFIC IS TO PASS.
  - ATTACH REFLECTORS TO TERMINAL SECTION POSTS, PER DTL. DWG. NO. 606-05A AND 606-05B.
  - AFTER FINAL ASSEMBLY, RECHECK CABLE TO MAKE SURE IT IS TAUT AND HAS NOT RELAXED.
  - OBTAIN ENGINEER'S APPROVAL OF MANUFACTURER INSTALLATION OPTIONS WHEN SITE CONDITIONS PREVENT THE USE OF THE OPTION SHOWN ON THIS DETAIL.
  - LAP ALL W-BEAM SPLICES IN THE DIRECTION OF ADJACENT TRAFFIC.
  - ON LOWER POSTS 1 TO 8, INSTALL TOP OF POST A MAXIMUM OF 4 INCHES [100] ABOVE GROUND.
  - USE ROUTED WOOD BLOCKS OR OTHER NCHRP APPROVED BLOCKS.

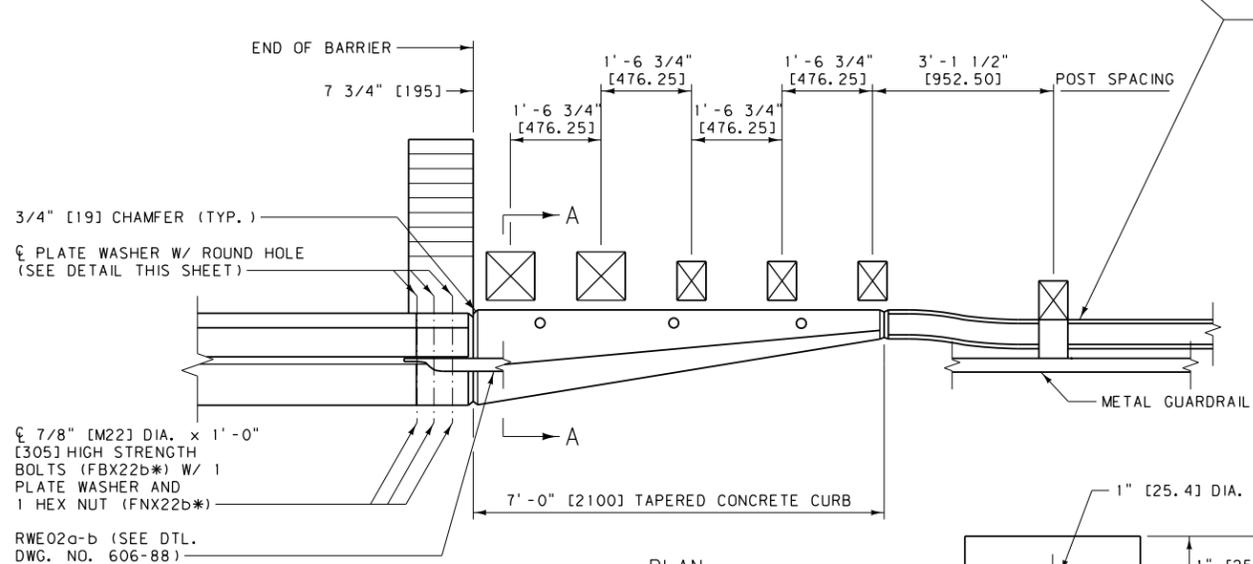
UNITS SHOWN IN BRACKETS [ ] ARE METRIC AND ARE IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.

DETAILED DRAWING	
REFERENCE DWG. NO.	606-13B
SECTION 606, 203	
OPTIONAL TERMINAL SECTION - SKT 350	
EFFECTIVE: SEPTEMBER 2014	
--REVISED--	
JULY 2016	
MONTANA DEPARTMENT OF TRANSPORTATION	



ELEVATION

NOTE:  
TAPER THE END OF THE CONCRETE BARRIER RAIL AS SHOWN.



PLAN

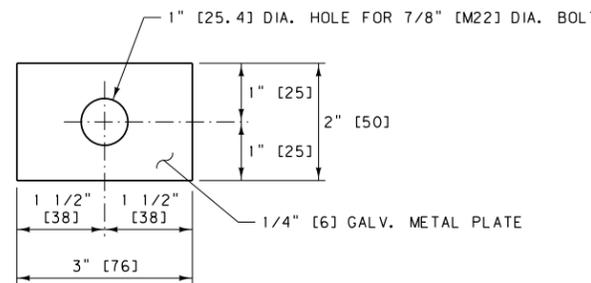
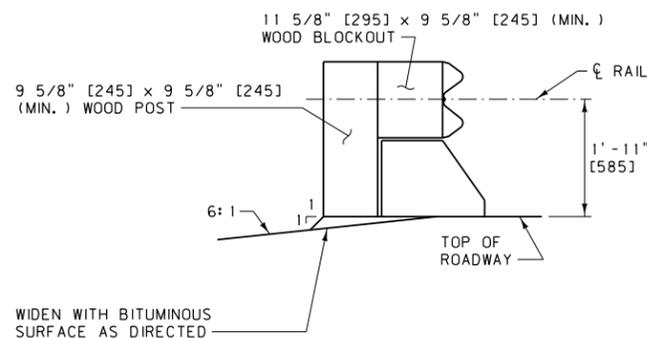
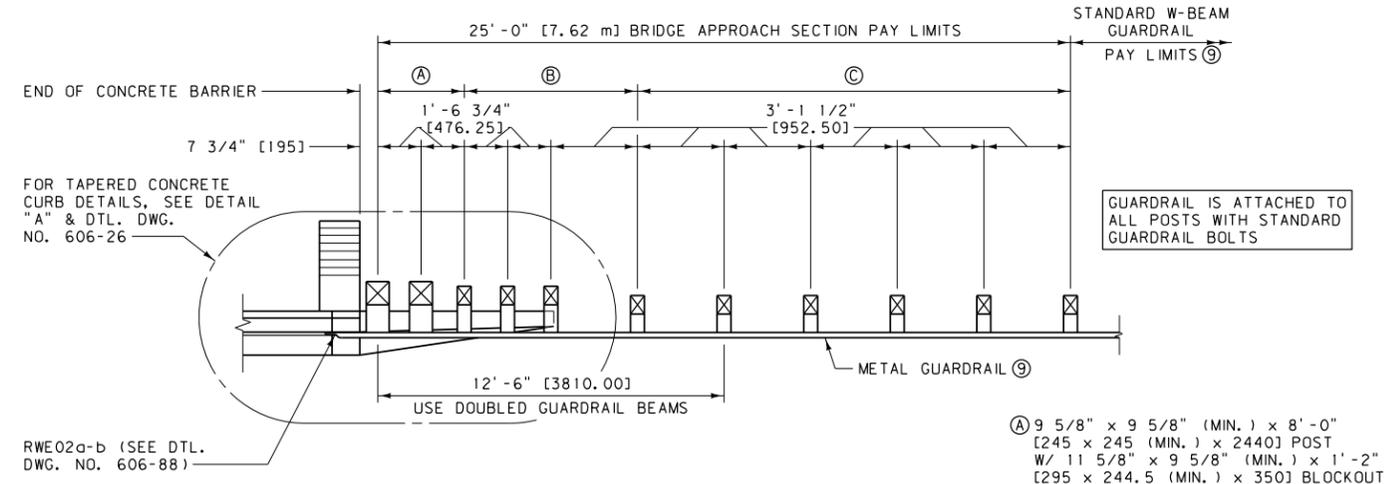


PLATE WASHER



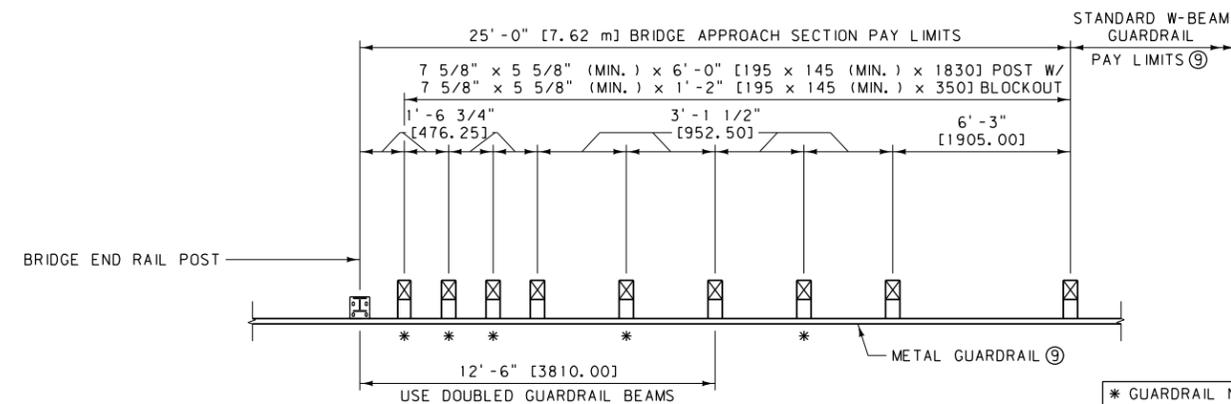
SECTION A-A

- 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 PORTIONS OF GUARDRAIL & BLOCKOUTS ARE OMITTED FOR CLARITY.
  - ④ LAP GUARDRAIL IN THE DIRECTION OF THE ADJACENT TRAFFIC LANE. (SEE DTL. DWG. NO. 606-05A).
  - ⑤ LAP W-BEAM TERMINAL CONNECTOR (RWE02a-b) IN THE DIRECTION OF THE ADJACENT TRAFFIC LANE.
  - ⑥ USE WOOD BLOCKS OR OTHER NCHRP 350 APPROVED BLOCKS FOR BLOCKOUTS.
  - ⑦ DO NOT FLARE BRIDGE APPROACH SECTIONS.
  - ⑧ SEE DTL. DWG. NO. 606-25A FOR SKEWED BRIDGES.
  - ⑨ SEE DTL. DWG. NO. 606-05A FOR METAL GUARDRAIL (W-BEAM).
- \* SEE DTL. DWG. NO. 606-80 FOR SCHEDULE OF GUARDRAIL HARDWARE.

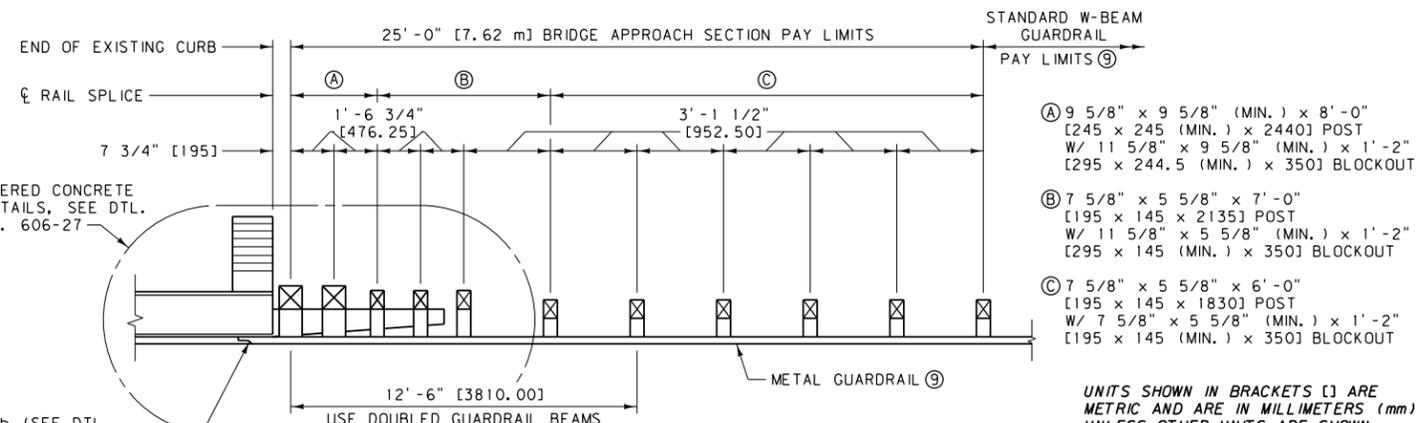


METAL GUARDRAIL-BRIDGE APPROACH SECTION TYPE 1  
(FOR BRIDGES USING CONCRETE BARRIER RAIL)

- Ⓐ 9 5/8" x 9 5/8" (MIN.) x 8'-0" [245 x 245 (MIN.) x 2440] POST W/ 11 5/8" x 9 5/8" (MIN.) x 1'-2" [295 x 244.5 (MIN.) x 350] BLOCKOUT
- Ⓑ 7 5/8" x 5 5/8" x 7'-0" [195 x 145 x 2135] POST W/ 11 5/8" x 5 5/8" (MIN.) x 1'-2" [295 x 145 (MIN.) x 350] BLOCKOUT
- Ⓒ 7 5/8" x 5 5/8" x 6'-0" [195 x 145 x 1830] POST W/ 7 5/8" x 5 5/8" (MIN.) x 1'-2" [195 x 145 (MIN.) x 350] BLOCKOUT



METAL GUARDRAIL-BRIDGE APPROACH SECTION TYPE 2  
(FOR BRIDGES WITHOUT CURBS)

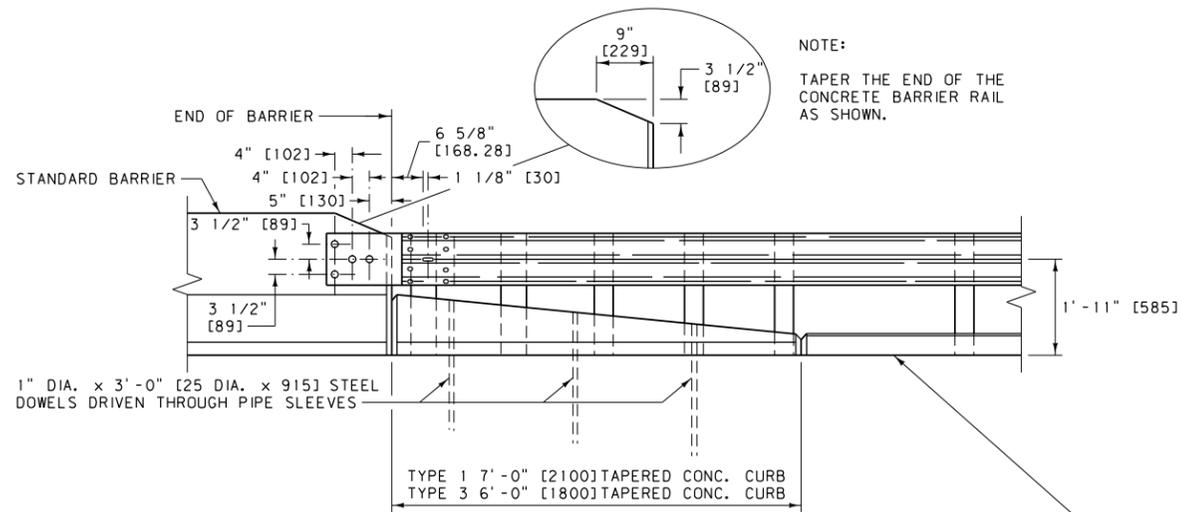


METAL GUARDRAIL-BRIDGE APPROACH SECTION TYPE 3  
(FOR BRIDGES WITH EXISTING CONCRETE CURBS)

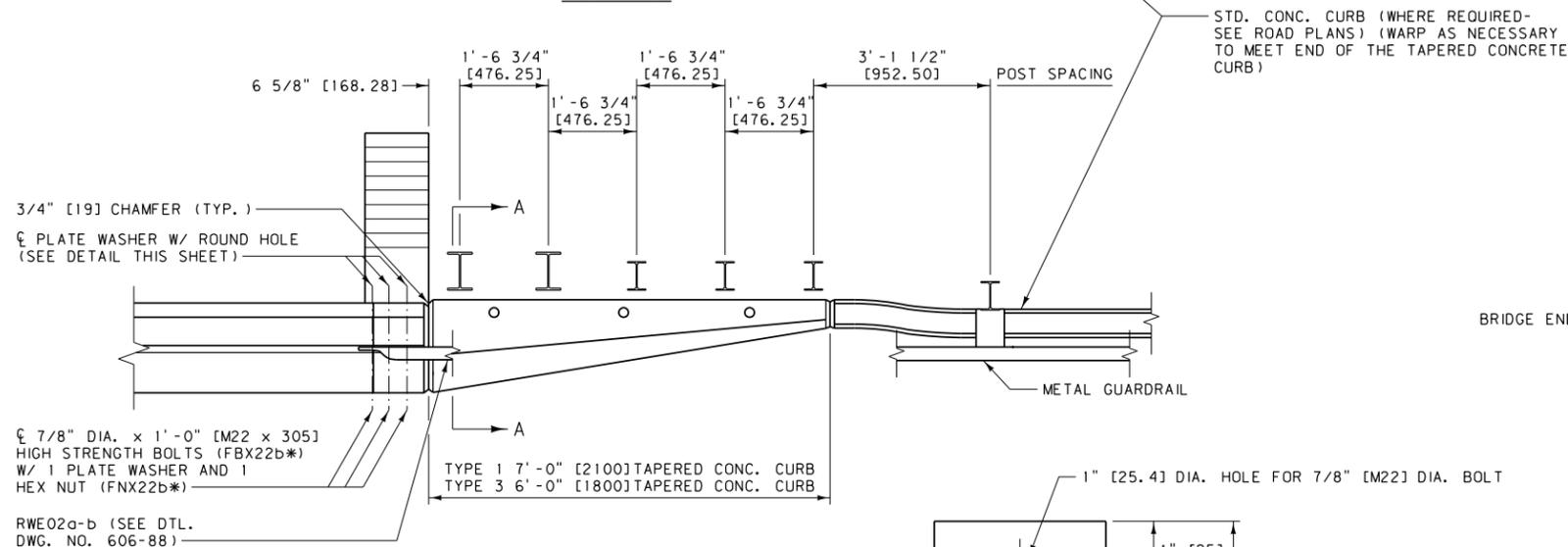
UNITS SHOWN IN BRACKETS [ ] ARE METRIC AND ARE IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	606-24A
SECTION 606	
BRIDGE APPROACH SECTIONS - WOOD POSTS	
EFFECTIVE: SEPTEMBER 2014	

--REVISED--  
JULY 2016



ELEVATION



PLAN

DETAIL "A"

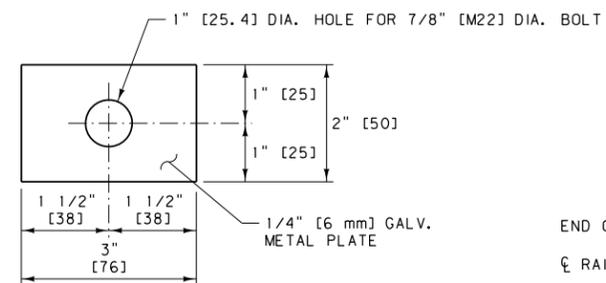
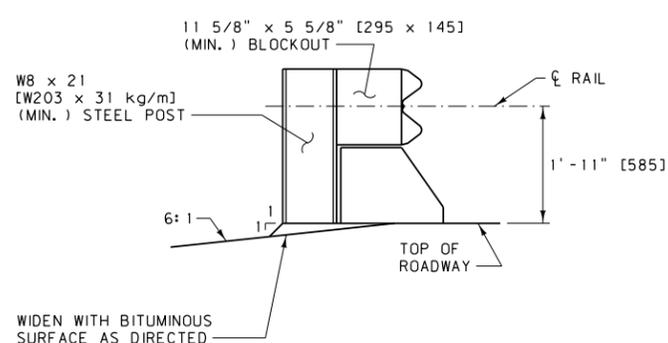
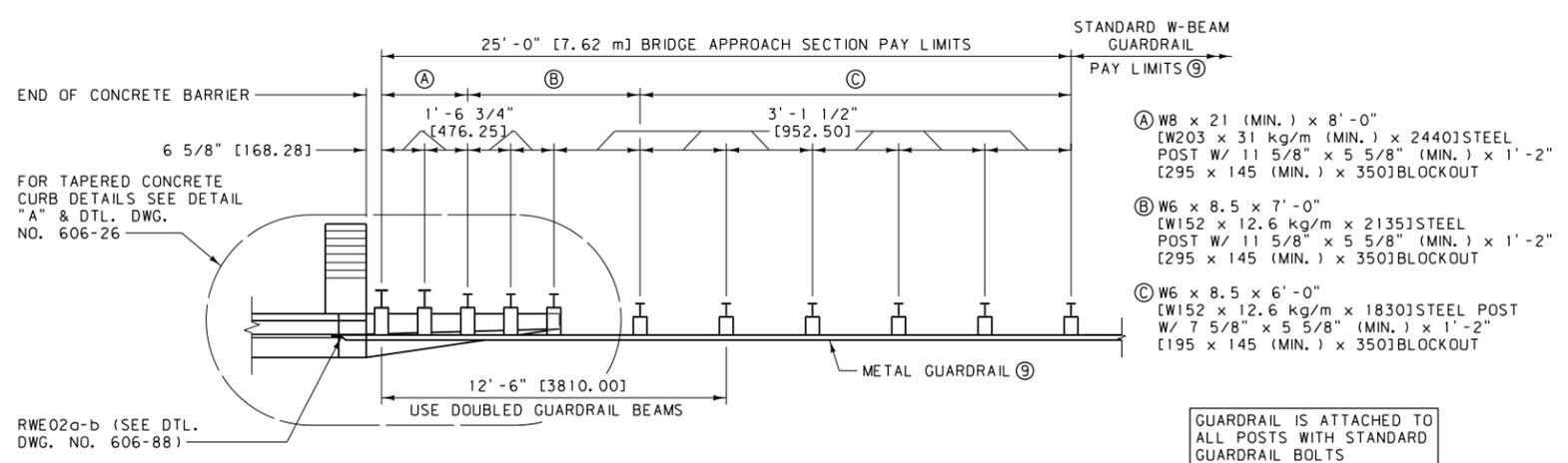


PLATE WASHER

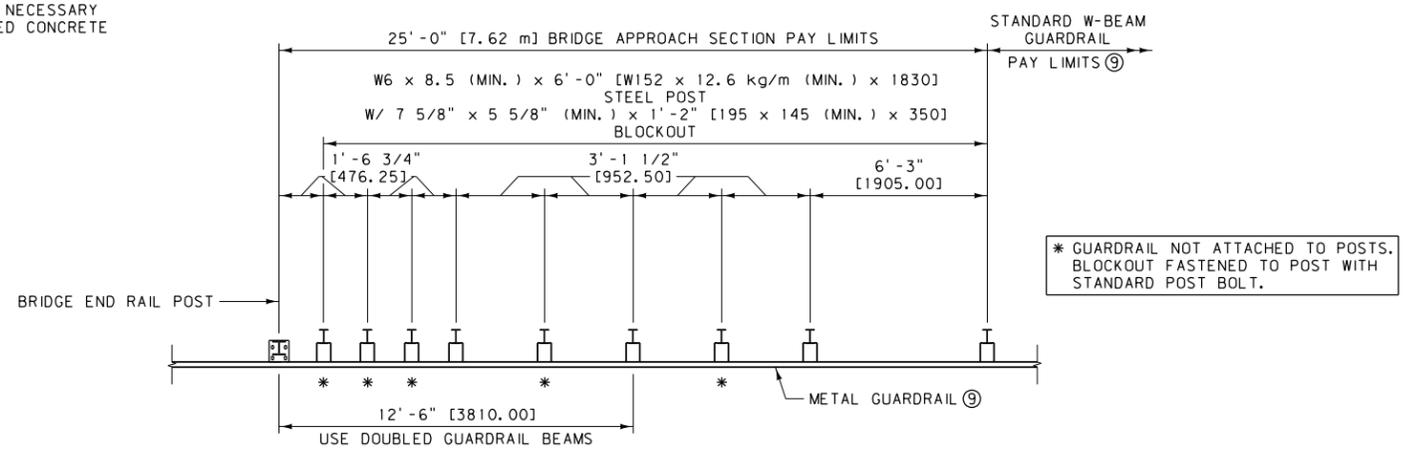
- NOTES:
- TAPERED CONCRETE CURBS: TYPE 1, SEE DTL. DWG. NO. 606-26; TYPE 3, SEE DTL. DWG. NO. 606-27
  - TAPERED CONCRETE CURBS ARE ALSO REQUIRED ON CONCRETE APPROACH SLABS.
  - PORTIONS OF GUARDRAIL & BLOCKOUTS ARE OMITTED FOR CLARITY.
  - LAP GUARDRAIL IN THE DIRECTION OF THE ADJACENT TRAFFIC LANE. (SEE DTL. DWG. NO. 606-05B).
  - LAP W-BEAM TERMINAL CONNECTOR (RWE02a-b) IN THE DIRECTION OF THE ADJACENT TRAFFIC LANE.
  - USE ROUTED WOOD BLOCKS OR OTHER NCHRP 350 APPROVED BLOCKS FOR BLOCKOUTS.
  - DO NOT FLARE BRIDGE APPROACH SECTIONS.
  - SEE DTL. DWG. NO. 606-25B FOR SKEWED BRIDGES.
  - SEE DTL. DWG. NO. 606-05B FOR METAL GUARDRAIL (W-BEAM).
- \*SEE DTL. DWG. NO. 606-80 FOR SCHEDULE OF GUARDRAIL HARDWARE.



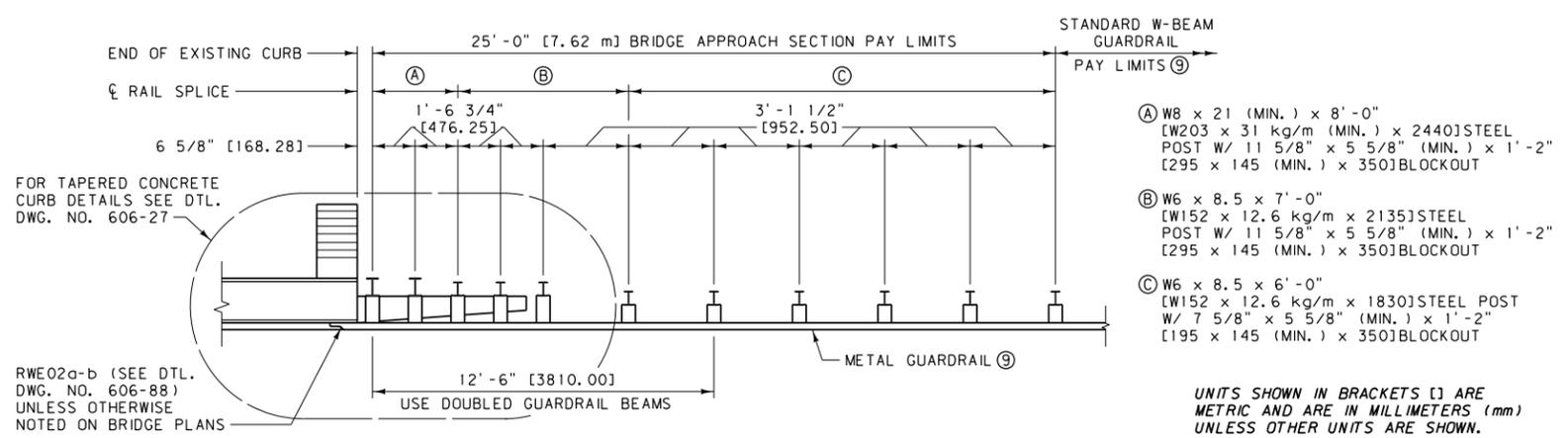
SECTION A-A



METAL GUARDRAIL-BRIDGE APPROACH SECTION TYPE 1  
(FOR BRIDGES USING CONCRETE BARRIER RAIL)



METAL GUARDRAIL-BRIDGE APPROACH SECTION TYPE 2  
(FOR BRIDGES WITHOUT CURBS)



METAL GUARDRAIL-BRIDGE APPROACH SECTION TYPE 3  
(FOR BRIDGES WITH EXISTING CONCRETE CURBS)

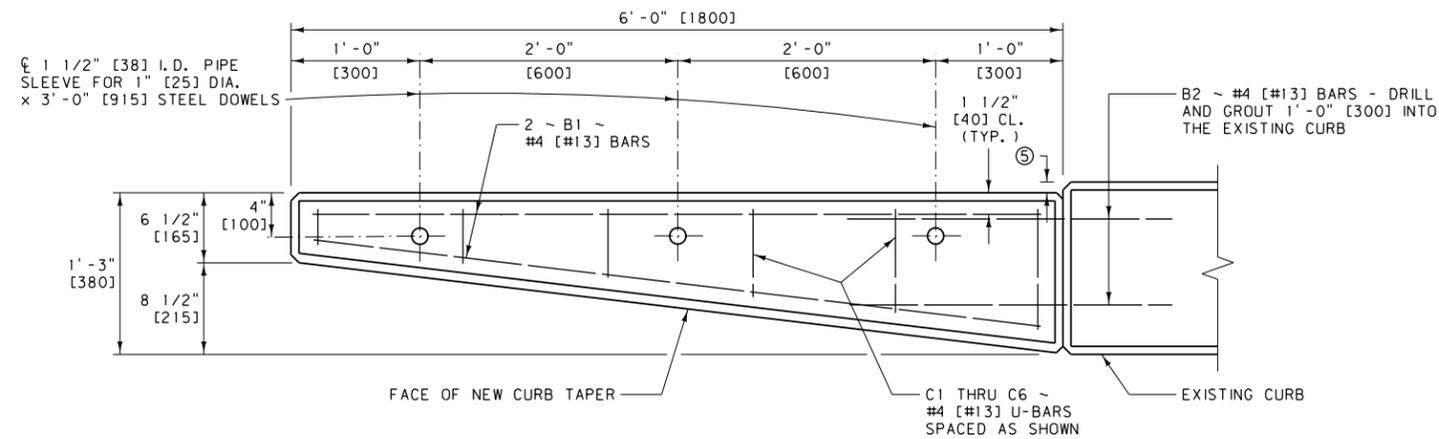
UNITS SHOWN IN BRACKETS [ ] ARE METRIC AND ARE IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	606-24B
SECTION 606	

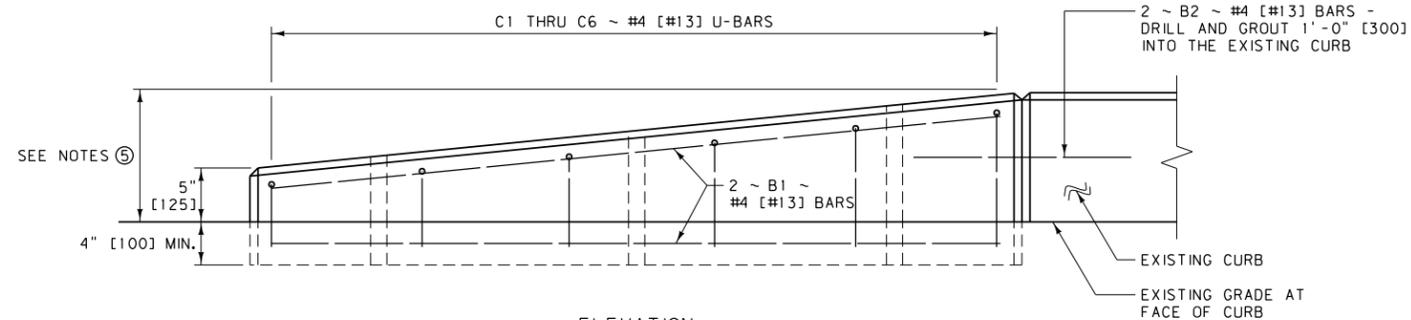
BRIDGE APPROACH SECTIONS - STEEL POSTS	
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--REVISED--	EFFECTIVE: SEPTEMBER 2014
JULY 2016	

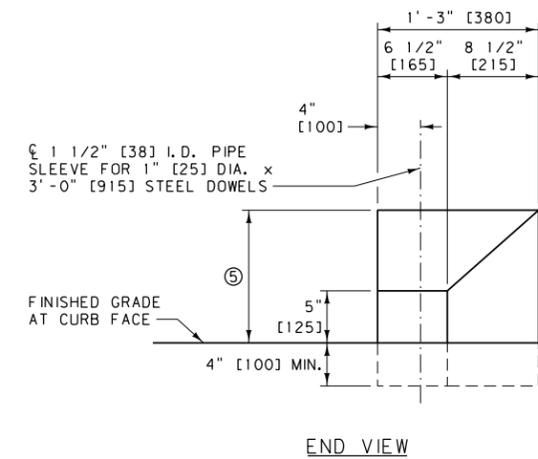




PLAN



ELEVATION



END VIEW

NOTES:

- ① REMOVE THE EXISTING SURFACE UNDER THE NEW TAPERED CONCRETE CURB AS APPROVED BY THE PROJECT MANAGER. EMBED THE TAPERED CONCRETE CURB A MINIMUM OF 4" [100] BELOW THE GRADE MEASURED AT THE INSIDE FACE OF THE TAPER.
- ② FURNISH GRADE 60 [420] REINFORCING STEEL MEETING SECTION 555 AND 711.
- ③ ALL CONCRETE IS CLASS GENERAL.  
TOTAL CONCRETE PER 6' [1800] TAPERED CURB EST. = 0.2 C.Y. [0.16 m<sup>3</sup>]  
TOTAL REBAR WEIGHT PER 6' [1800] TAPERED CURB EST. = 27 LB. [11.7 kg]
- ④ TAPERED CONCRETE CURB IS USED WITH BRIDGE APPROACH SECTION TYPE 3 (SEE DTL. DWG. NO. 606-24A AND 606-24B).
- ⑤ ADJUST DIMENSION TO MATCH EXISTING CURB.

BILL OF REINFORCING STEEL (ONE SECTION ONLY)						
 TYPE 1						
BENT BARS (ALL DIMENSIONS ARE OUT TO OUT)						
MARK	SIZE	NO.	TYPE	LENGTH	A	B
C1	#4	1	1	1' - 4"	6"	4"
C2	↑	↑	↑	1' - 8"	7"	6"
C3	↑	↑	↑	1' - 11"	8"	7"
C4	↑	↑	↑	2' - 3"	9"	9"
C5	↑	↑	↑	2' - 6"	10"	10"
C6	↑	1	1	2' - 10"	11"	1' - 0"
B1	↓	4	STRAIGHT	5' - 8"	~	~
B2	#4	2	STRAIGHT	2' - 0"	~	~

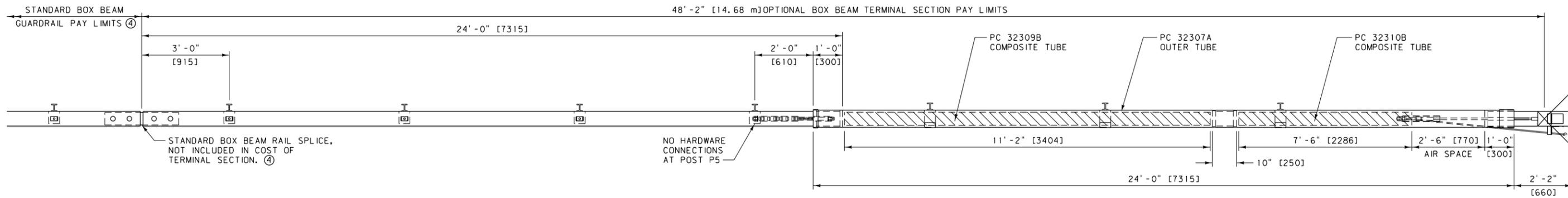
METRIC BILL OF REINFORCING STEEL (ONE SECTION ONLY)						
 TYPE 1						
BENT BARS (ALL DIMENSIONS ARE OUT TO OUT)						
MARK	SIZE	NO.	TYPE	LENGTH (mm)	A (mm)	B (mm)
C1	#13	1	1	390	150	90
C2	↑	↑	↑	480	175	130
C3	↑	↑	↑	570	200	170
C4	↑	↑	↑	665	225	215
C5	↑	↑	↑	755	250	255
C6	↑	1	1	845	270	295
B1	↓	4	STRAIGHT	1720	~	~
B2	#13	2	STRAIGHT	600	~	~

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

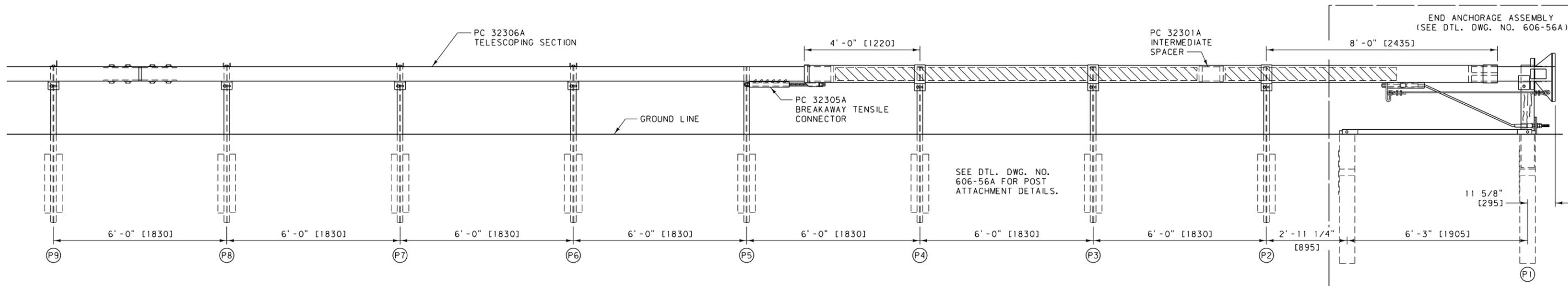
DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 606	DWG. NO. 606-27

TAPERED CONCRETE CURB DETAIL

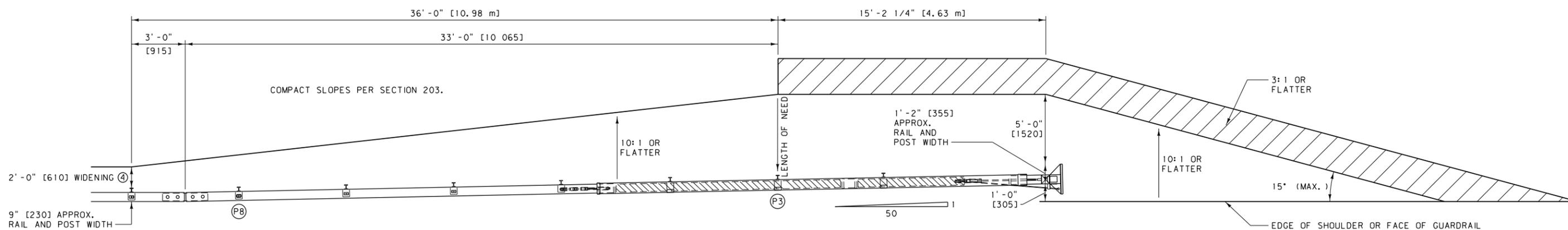
--REVISED--	EFFECTIVE: SEPTEMBER 2014
JULY 2016	



PLAN



ELEVATION



GUARDRAIL WIDENING

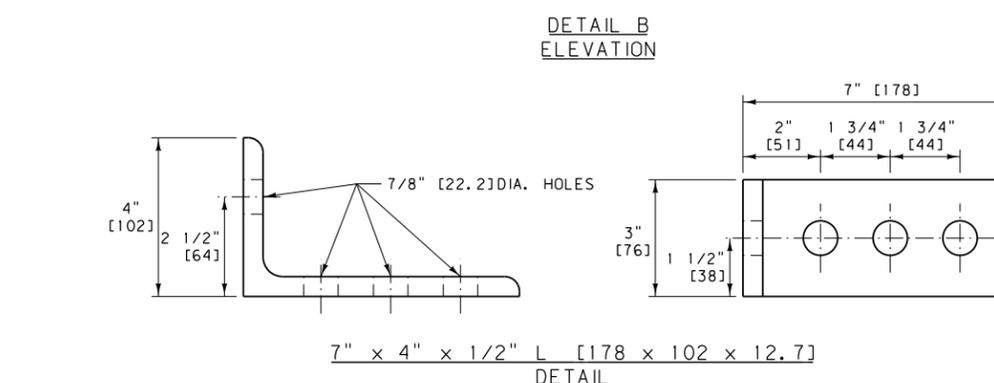
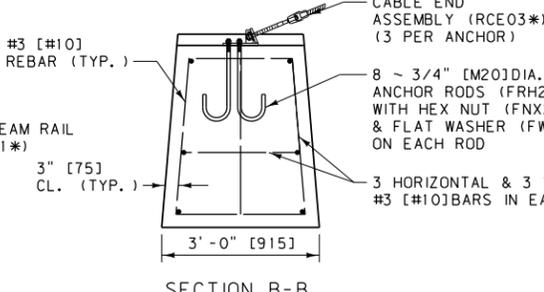
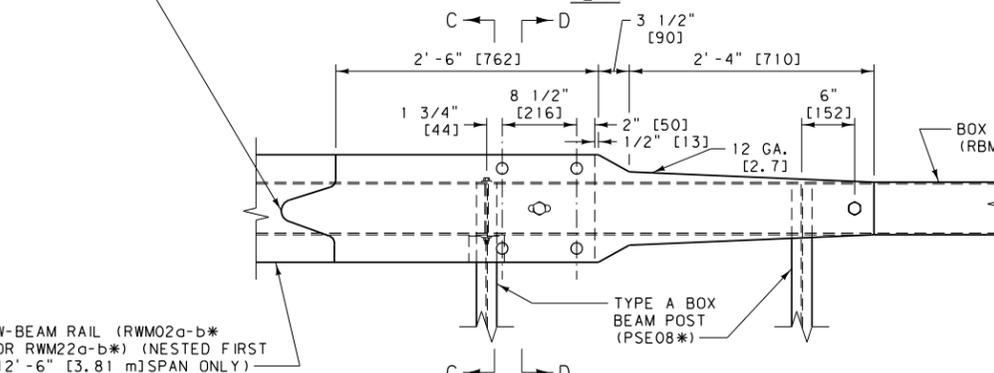
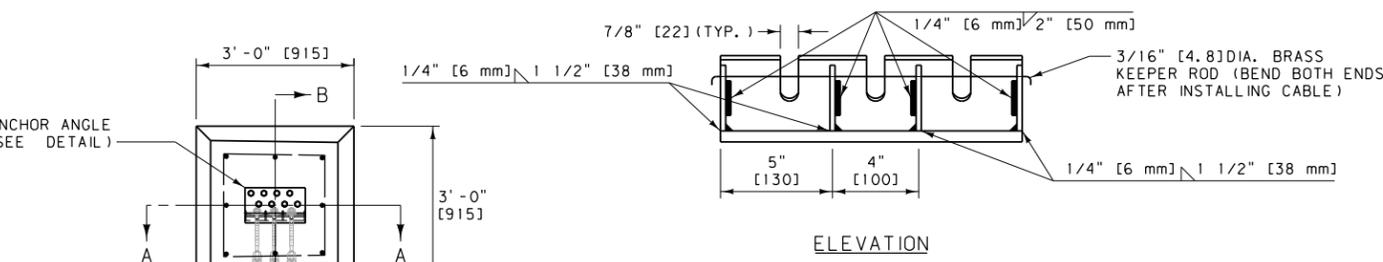
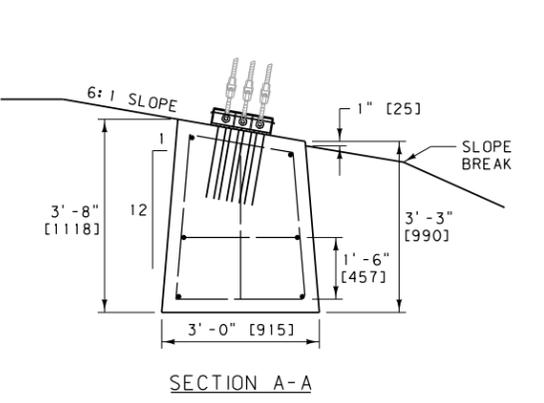
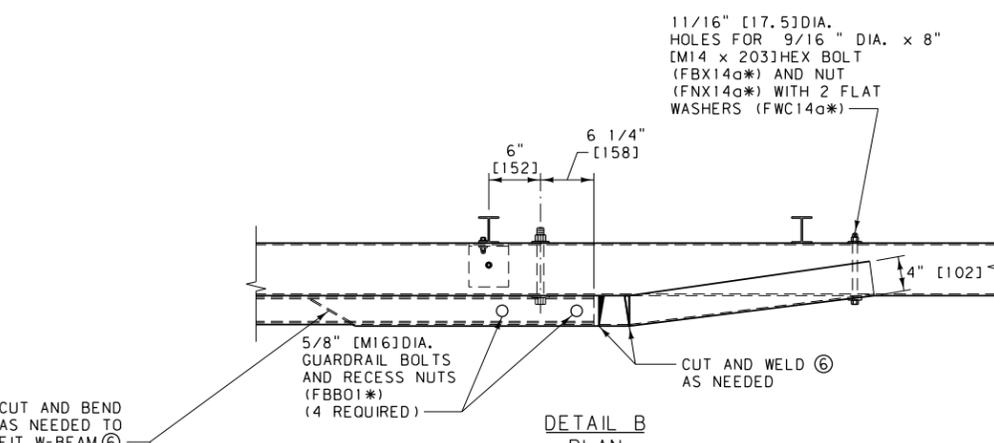
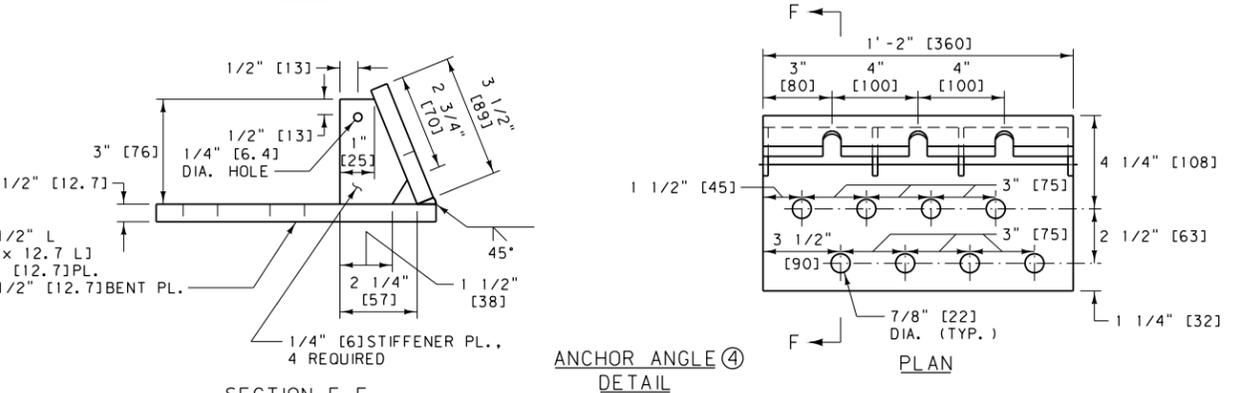
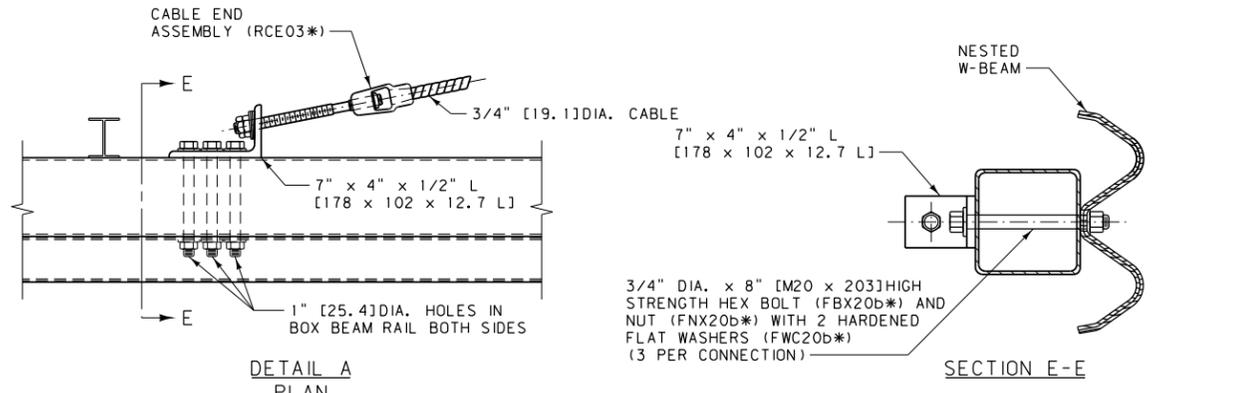
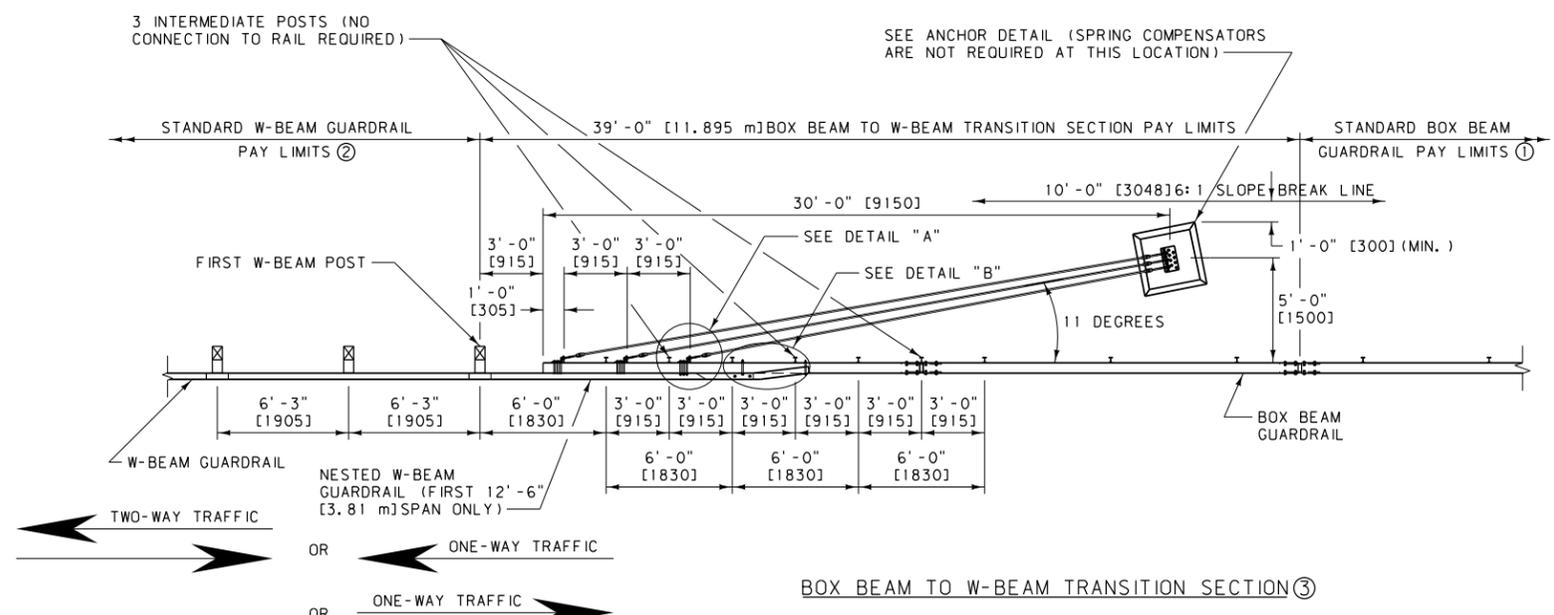
NOTES:

- ① PLACE A SELF-ADHESIVE OBJECT MARKER ON THE FACE OF THE NOSE ASSEMBLY, HAVING ALTERNATING RETRO-REFLECTIVE BLACK AND YELLOW STRIPES SLOPED DOWNWARD AT AN ANGLE OF 45° TOWARDS THE SIDE ON WHICH TRAFFIC IS TO PASS.
- ② FLARE THE END SECTION AWAY FROM TRAFFIC AT A RATE OF 50:1 FOR 50 FEET [15.24 m] (ILLUSTRATED). FLARES OF 50:1 FOR 100 FEET [30.48 m] MAY ALSO BE USED. THE FLARE MAY BE OMITTED ON ROADS WITH SHOULDERS GREATER THAN 2 FEET [0.6 m] IN WIDTH.
- ③ OBTAIN PROJECT MANAGER'S APPROVAL OF MANUFACTURER INSTALLATION OPTIONS WHEN SITE CONDITIONS PREVENT THE USE OF THE OPTION SHOWN ON THIS DETAIL.
- ④ SEE DTL. DWG. NO. 606-50 FOR STANDARD BOX BEAM GUARDRAIL AND ASSOCIATED DETAILS.
- ⑤ USE WOOD OR OTHER NCHRP 350/MASH APPROVED BLOCKS.

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

--REVISED--  
JULY 2016

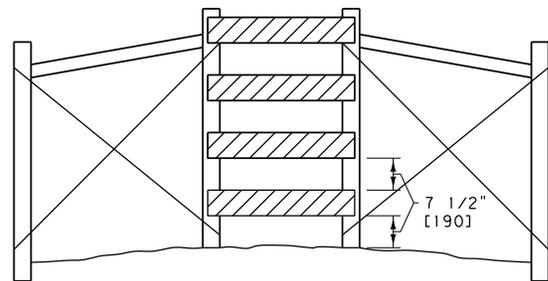
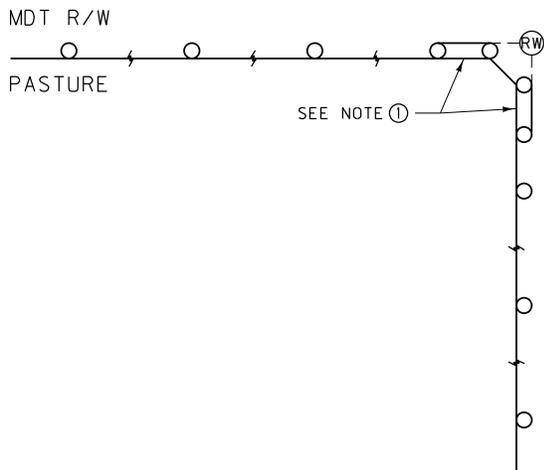
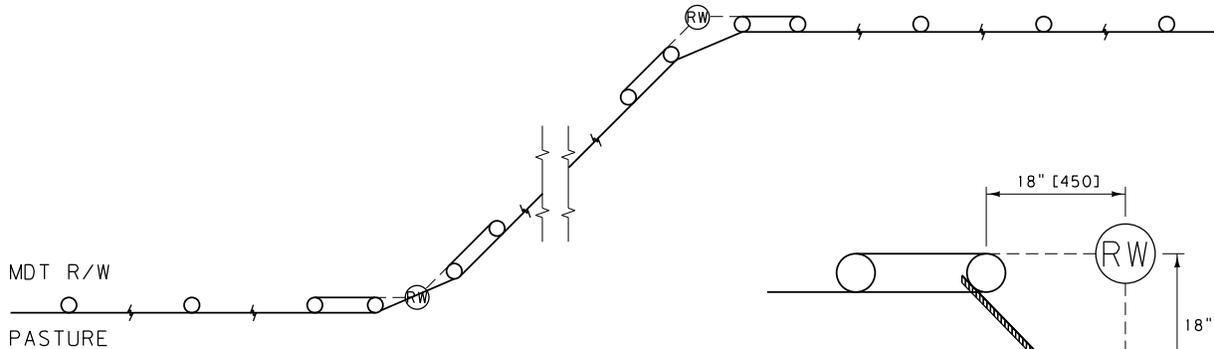
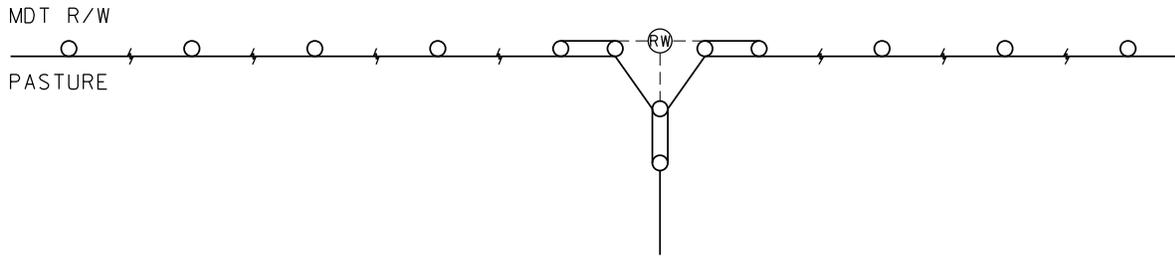
DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 606	DWG. NO. 606-55A
OPTIONAL BOX BEAM TERMINAL SECTION - WY-BET	
EFFECTIVE: SEPTEMBER 2014	
<b>MDT</b> MONTANA DEPARTMENT OF TRANSPORTATION	



- NOTES:
- SEE DTL. DWG. NO. 606-50 FOR STANDARD BOX BEAM GUARDRAIL AND ASSOCIATED DETAILS.
  - SEE DTL. DWG. NO. 606-05A AND 606-05B FOR STANDARD W-BEAM GUARDRAIL AND ASSOCIATED DETAILS.
  - MANUFACTURE ANCHOR ANGLES USING AASHTO M 270 [270M] GRADE 36 [250] STEEL MEETING SECTION 711. WELD PER SECTION 711.
  - GALVANIZE ANCHOR ANGLES PER SECTION 711. NO PUNCHING, DRILLING, WELDING OR CUTTING IS PERMITTED ON COMPONENTS AFTER GALVANIZING.
  - USE CLASS GENERAL CONCRETE TO CONSTRUCT ANCHOR.
  - PAIN ANY AREAS WHERE GALVANIZING IS BROKEN OR METAL IS BARE ON W-BEAM OR BOX BEAM RAIL WITH ONE COAT OF ZINC RICH PAINT AND TWO COATS OF ALUMINUM PAINT PER SECTION 710.
  - LAP ALL W-BEAM SPLICES IN THE DIRECTION OF ADJACENT TRAFFIC.
- \* SEE DTL. DWG. NO. 606-80 FOR SCHEDULE OF GUARDRAIL HARDWARE.

DETAILED DRAWING	
REFERENCE DWG. NO.	606-58
STANDARD SPEC.	SECTION 606, 710, 711
BOX BEAM TO W-BEAM TRANSITION SECTION	
EFFECTIVE: SEPTEMBER 2014	
--REVISED-- JULY 2016	
MDTA MONTANA DEPARTMENT OF TRANSPORTATION	

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



SPAN TREATED 2X6'S [50 x 150] ACROSS GAP ON PASTURE SIDE OF POSTS. ATTACH TO PANEL POSTS WITH TWO 3" EXTERIOR GRADE SCREWS ON EACH END AND TRIM EDGES AT 45 DEGREE ANGLES.

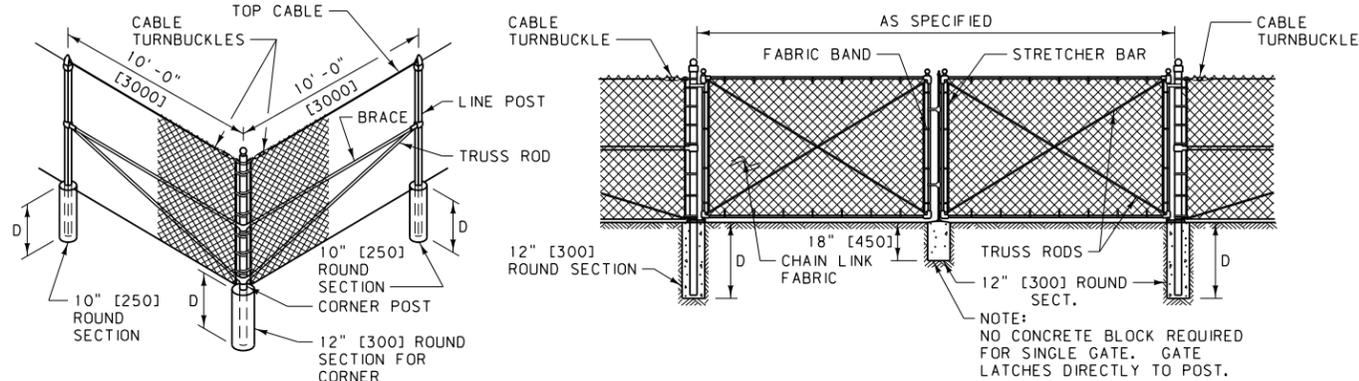
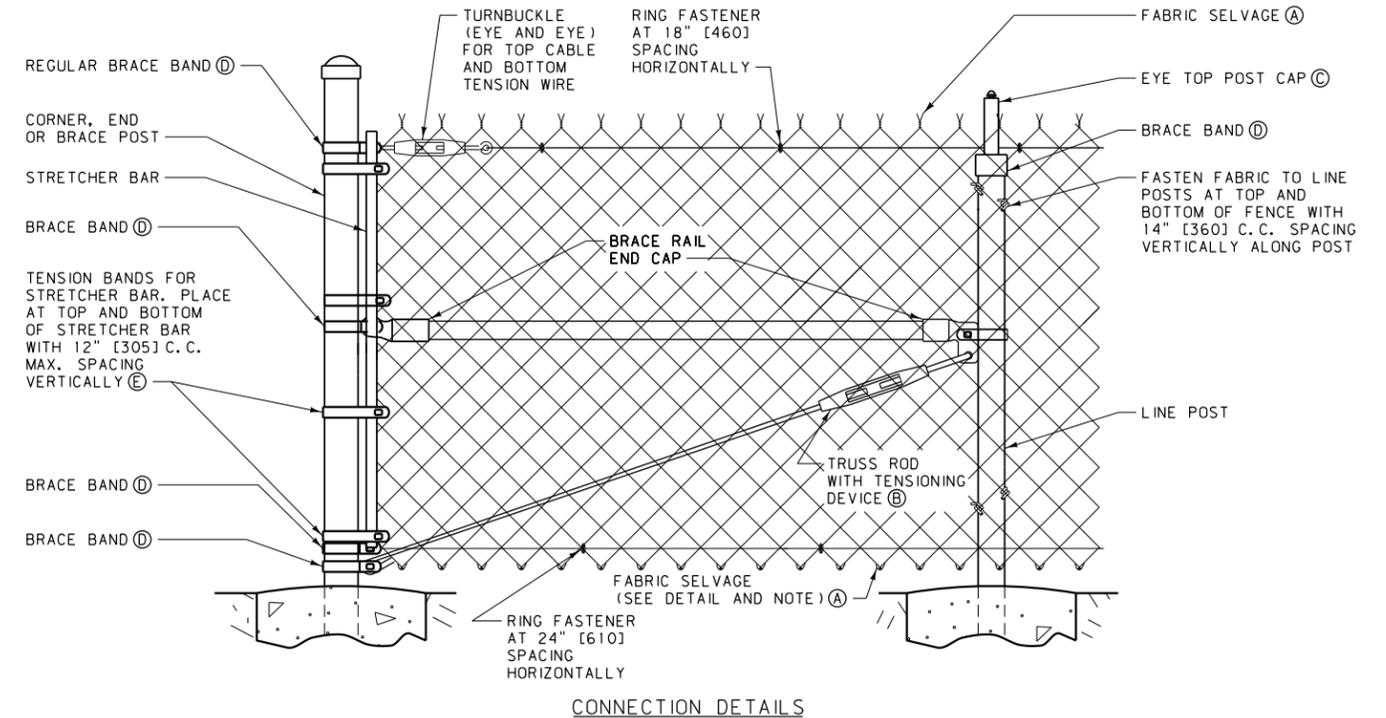
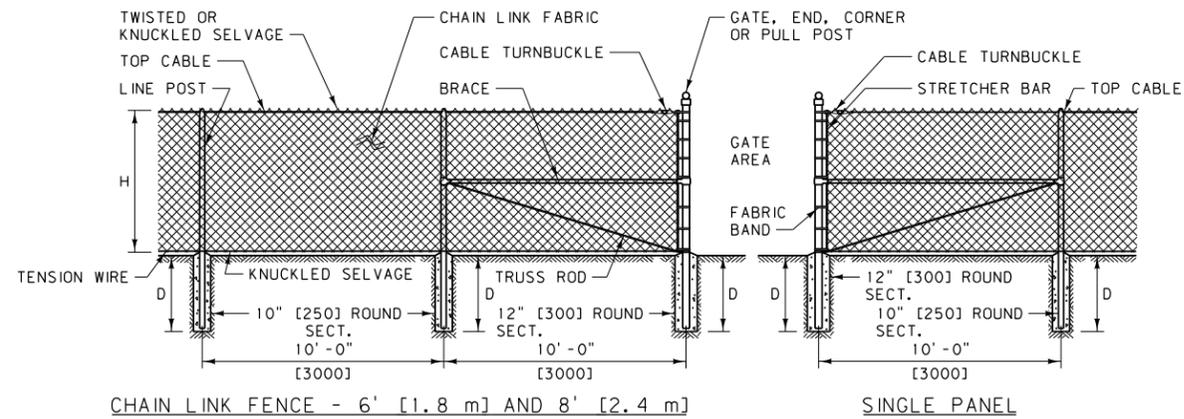
NOTES:

- ① INSTALL PANELS ACCORDING TO DETAIL DRAWING 607-05.
- ② INSTALL NON-INTERSTATE FENCE ON THE RIGHT-OF-WAY LINE AS SHOWN.
- ③ OFFSET PANEL POSTS 18" [450mm] FROM STAKED R/W BREAKS AND R/W MONUMENTS AS SHOWN IN DETAIL.
- ④ DO NOT DISTURB SURVEY MONUMENTS.
- ⑤ INCLUDE COST OF 2 x 6 [50 x 150] CROSS RAILS IN THE COST OF ADJACENT PANELS.

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

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 607	DWG. NO. 607-20
FENCING AT RIGHT OF WAY BREAKS	
EFFECTIVE: SEPTEMBER 2014	
 MONTANA DEPARTMENT OF TRANSPORTATION	

--REVISED--  
JULY 2016



CONNECTION DETAILS

GENERAL NOTES

PROVIDE CHAIN LINK FENCE MATERIALS PER SECTION 712.

(A) FABRIC SELVAGE: FENCE HEIGHT UNDER 6' [1.8 m]: TOP AND BOTTOM KNUCKLED SELVAGE.

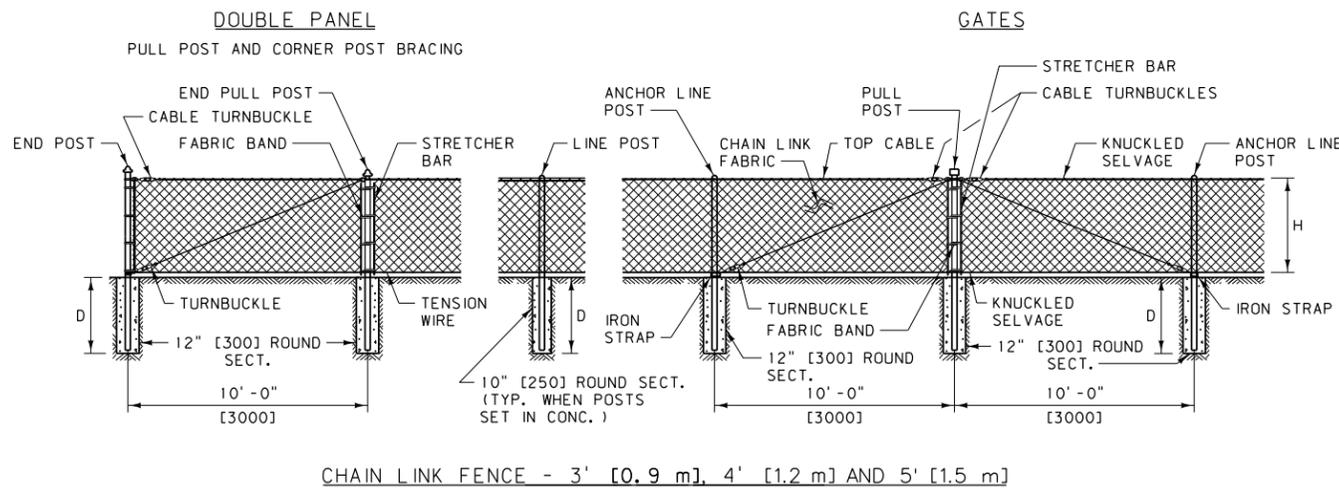
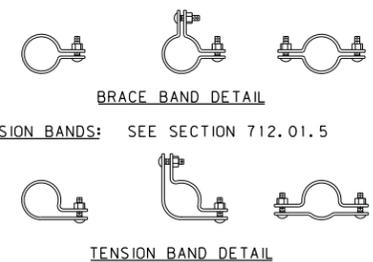
FENCE HEIGHT 6' [1.8 m] AND OVER: TOP - TWISTED OR KNUCKLED SELVAGE  
BOTTOM - KNUCKLED SELVAGE

(C) POST CAPS: PROVIDE EYE-TOP CAPS FOR ALL POSTS CARRYING A TOP CABLE THROUGH THE POST. PROVIDE ROUNDED TOPS FOR ALL OTHER ROUND POSTS. FIT POST CAPS TIGHTLY TO PREVENT REMOVAL.

(D) BRACE BANDS: SEE SECTION 712.01.5.

(E) TENSION BANDS: SEE SECTION 712.01.5

(B) TRUSS RODS: SEE SECTION 712.01.4



CHAIN LINK FENCE - 3' [0.9 m], 4' [1.2 m] AND 5' [1.5 m]

NOTES:

1 DO NOT INSTALL DOUBLE PANELS MORE THAN 300' [90 m] APART ON TANGENTS OR MORE THAN 250' [75 m] APART ON ANY CURVE. FOR CURVES WITH RADIUS SHARPER THAN 1150' [350 m], INSTALL A DOUBLE PANEL ON EACH CURVE END, PLUS ONE ADDITIONAL PANEL FOR EACH 10' OF DEFLECTION, EVENLY SPACED, BETWEEN THE CURVE ENDS.

2 PULL POST BRACING ON 6' [1.8 m] AND 8' [2.4 m] FENCE IS THE SAME AS CORNER BRACING.

3 A DROP BAR LOCKING DEVICE IS REQUIRED FOR ALL DOUBLE GATE INSTALLATIONS. THE DROP BAR MUST BE ABLE TO BE INSERTED INTO THE CONCRETE BLOCK AT LEAST SIX INCHES [150].

4 ALL CONCRETE IS LEAN OR BETTER.

5 INSTALL A 3/8" [10] DIAMETER GALVANIZED STEEL TOP CABLE ALONG ALL FENCE. TERMINATE TOP CABLE WITH GALVANIZED CABLE TURNBUCKLES FASTENED VIA THE FABRIC BAND AT THE POST.

HEIGHT OF FABRIC, H	WIRE FABRIC ABOVE GROUND	DEPTH OF CONCRETE, D	DEPTH OF POST IN CONC. (MIN.)
8' [2440]	1"-2" [25-50]	42" [1050]	38" [950]
6' [1830]	1"-2" [25-50]	36" [900]	32" [800]
5' [1525]	1"-2" [25-50]	36" [900]	32" [800]
4' [1220]	1"-2" [25-50]	30" [750]	26" [650]
3' [915]	1"-2" [25-50]	30" [750]	26" [650]

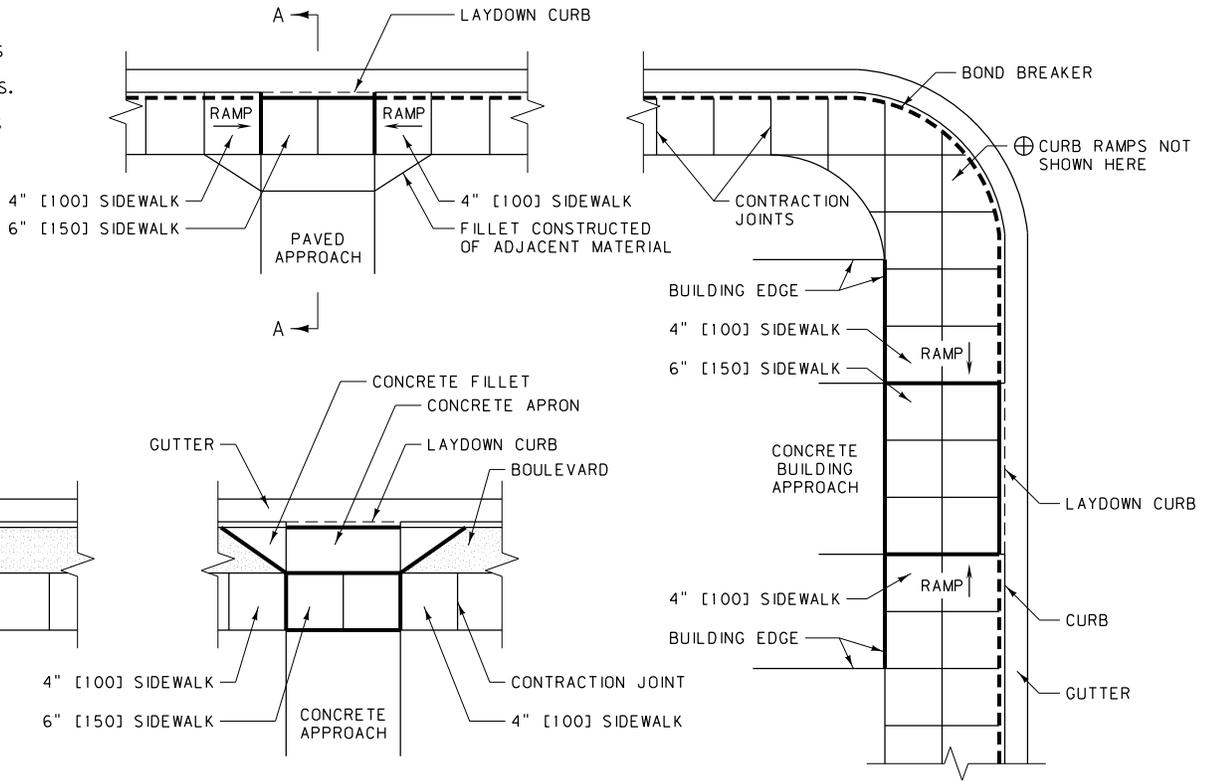
UNITS SHOWN IN BRACKETS [ ] ARE METRIC AND ARE IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.

DETAILED DRAWING  
 REFERENCE DWG. NO.  
 STANDARD SPEC. 607-25  
 SECTION 607  
 CHAIN LINK FENCE  
 --REVISED-- EFFECTIVE: SEPTEMBER 2014  
 JULY 2016  
**MDT** MONTANA DEPARTMENT OF TRANSPORTATION

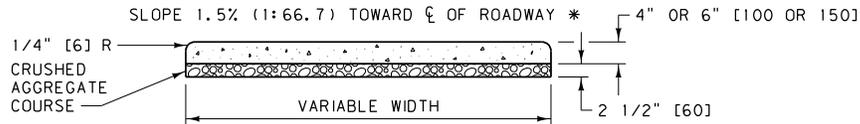
NOTES:

1/2" [13] EXPANSION JOINTS ARE SHOWN AS DARK SOLID LINES FOR VISUAL PURPOSES.

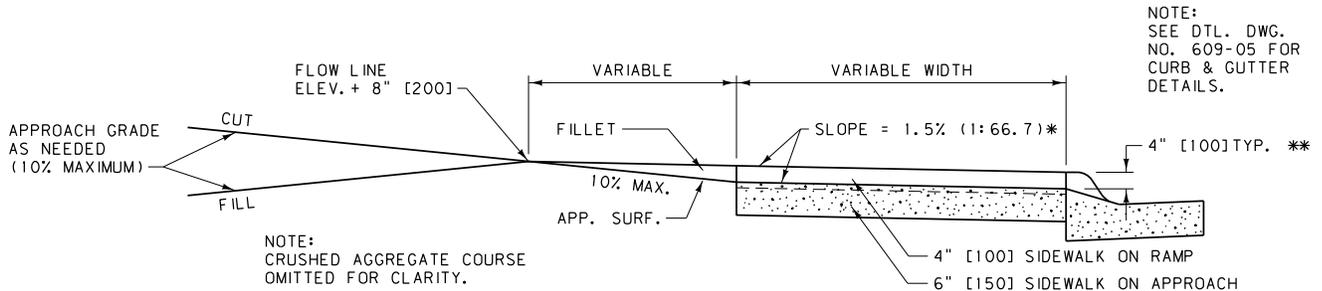
BOND BREAKER IS SHOWN AS DARK DASHED LINES FOR VISUAL PURPOSES.



PLAN



SECTION OF SIDEWALK



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

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.
  - ④ WHERE RIGHT-OF-WAY PERMITS, NEW SIDEWALKS LESS THAN 5 FEET [1525] IN WIDTH MUST HAVE A PASSING AREA AT A MAXIMUM SPACING OF 200 FEET [61 m]. THE PASSING AREA IS A MINIMUM OF 5 FEET BY 5 FEET [1525 BY 1525] IN SIZE.
  - ⑤ PROVIDE CONTRACTION JOINTS NO LESS THAN 1/8" [3] WIDE AND NO MORE THAN 1/4" [6] WIDE AND NO LESS THAN 1" [25] IN DEPTH. CONTRACTION JOINTS MAY BE CUT BY A GROOVE FORMING TOOL.
  - ⑥ LOCATE EXPANSION JOINTS EVERY 100 FEET (± 30 FEET) [30 m (± 10 m)] AT INTERVALS EQUAL TO THE NEAREST MULTIPLE OF THE CONTRACTION JOINT INTERVAL.
  - ⑦ USE A LONGITUDINAL CONTRACTION JOINT IN THE CENTERLINE OF ALL SIDEWALKS WIDER THAN 5 FEET [1525].
- \* THE MAXIMUM 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.

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 608	DWG. NO. 608-05

CONCRETE SIDEWALK

--REVISED--  
JULY 2016

EFFECTIVE: SEPTEMBER 2014

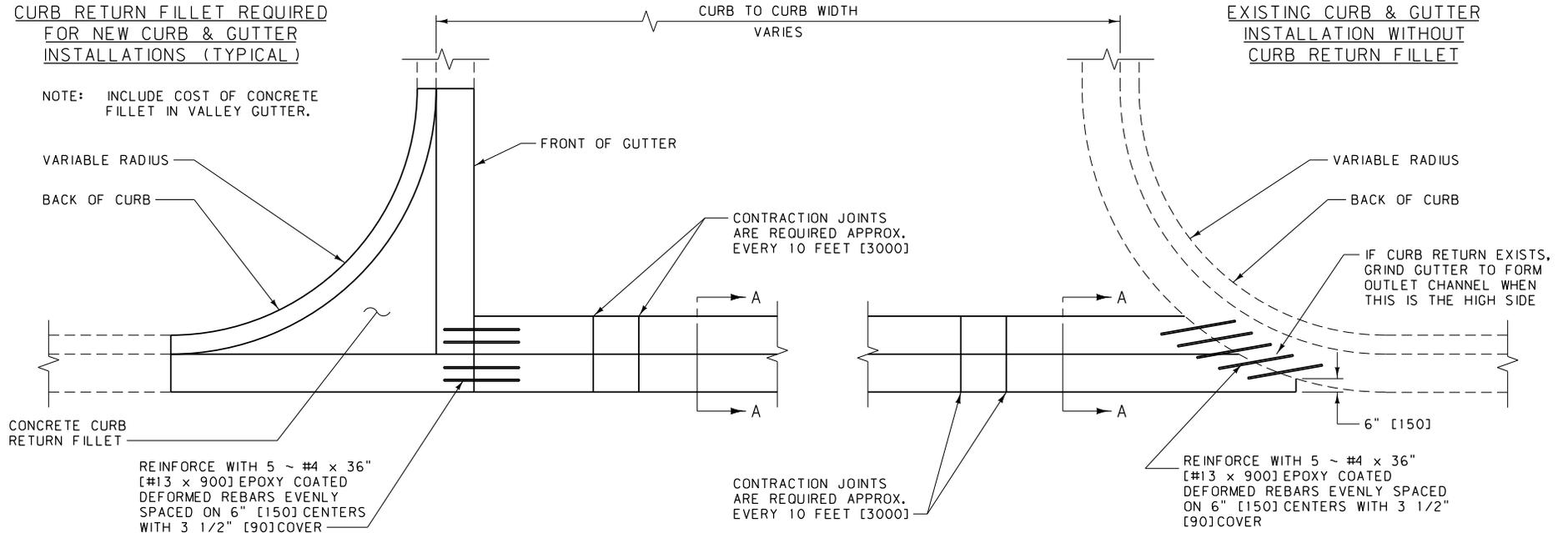


UNITS SHOWN IN BRACKETS [ ] ARE METRIC AND ARE IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.

**CURB RETURN FILLET REQUIRED FOR NEW CURB & GUTTER INSTALLATIONS (TYPICAL)**

**EXISTING CURB & GUTTER INSTALLATION WITHOUT CURB RETURN FILLET**

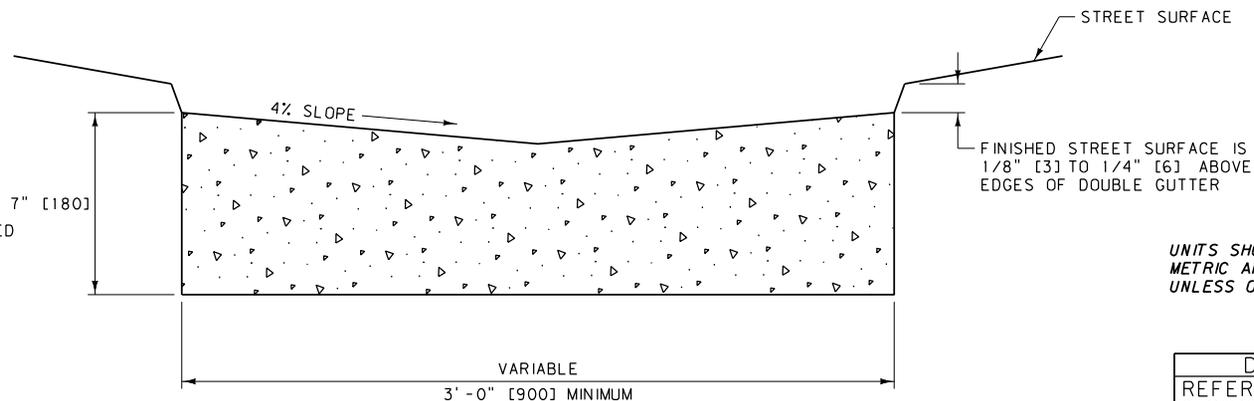
NOTE: INCLUDE COST OF CONCRETE FILLET IN VALLEY GUTTER.



PLAN

NOTES:

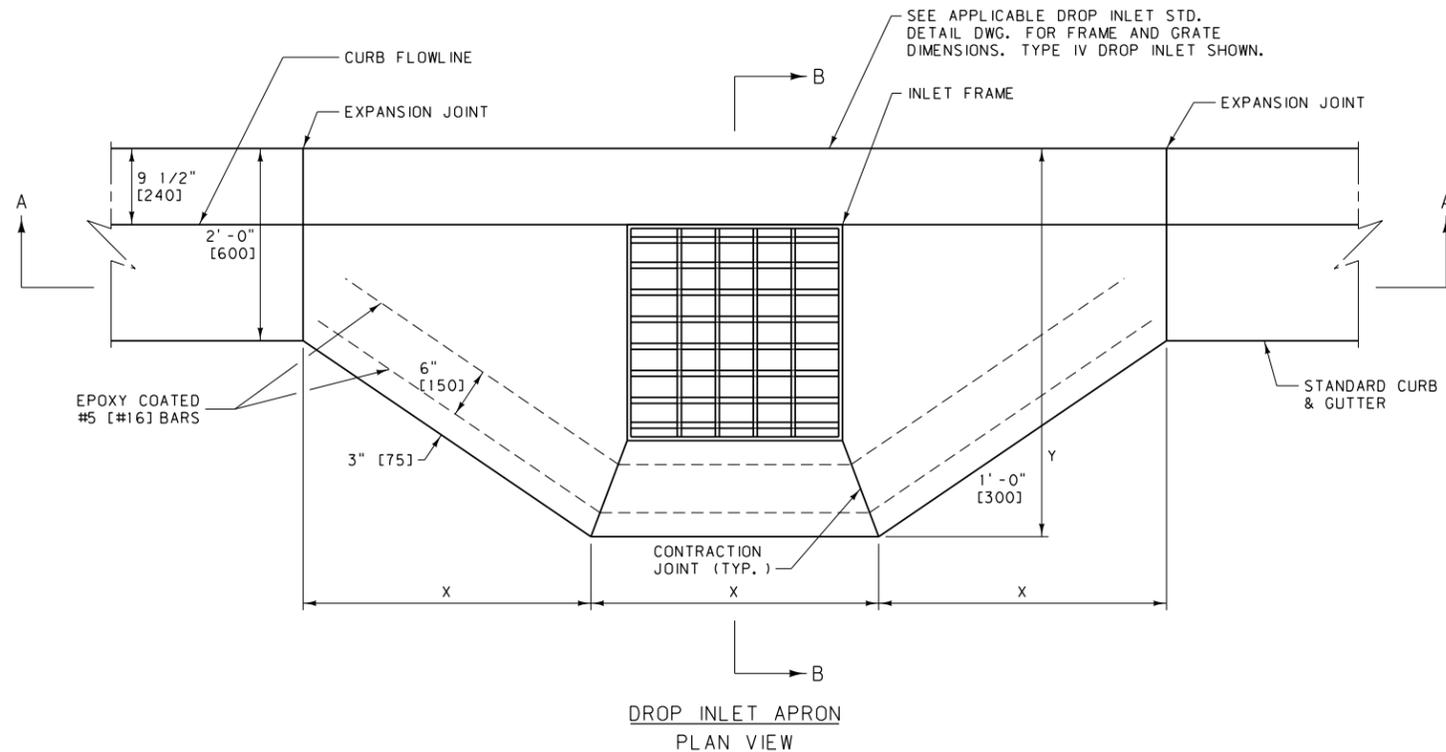
- ① INDIVIDUAL LOCATIONS MAY REQUIRE MORE DETAILS FOR ELEVATIONS AND DIMENSIONS.
- ② INSTALL REINFORCEMENT AT ALL CONSTRUCTION JOINTS.
- ③ CONTRACTION JOINTS ARE 1/8" [3 mm] MIN. AND 3/8" [10 mm] MAX. IN WIDTH. FORM JOINTS BY SAWING OR SCORING TO A MINIMUM DEPTH OF 1" [25 mm]. FORM SCORED JOINTS BY A TOOL WHICH WILL LEAVE ROUNDED CORNERS AND DESTROY AGGREGATE INTERLOCK TO A MINIMUM DEPTH OF 1" [25 mm].
- ④ TO BE USED ON PLANT MIX SURFACING PROJECTS ONLY. PROVIDE PROJECT SPECIFIC DETAILS FOR PCCP PROJECTS.



SECTION A-A

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

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 609	DWG. NO. 609-00
CONCRETE VALLEY GUTTER	
--REVISED-- JULY 2016	EFFECTIVE: SEPTEMBER 2014
 MONTANA DEPARTMENT OF TRANSPORTATION	



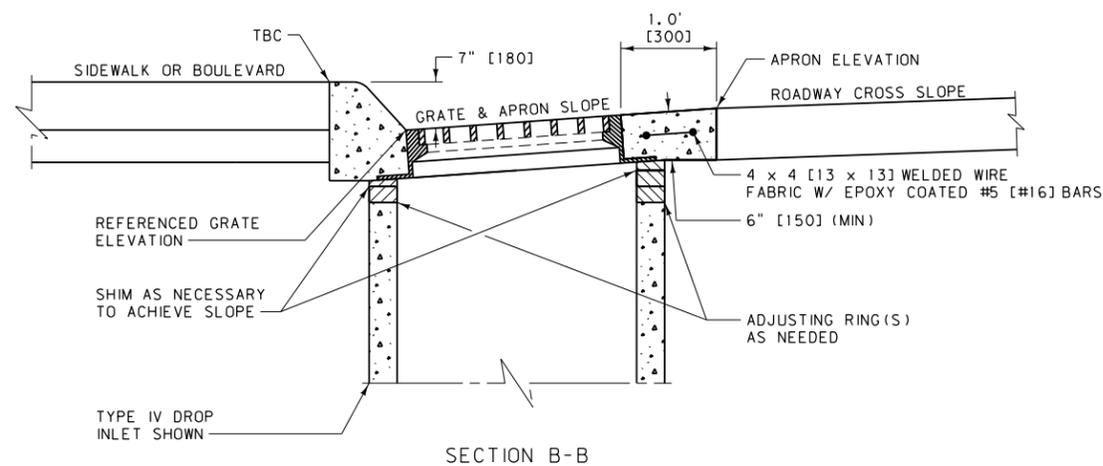
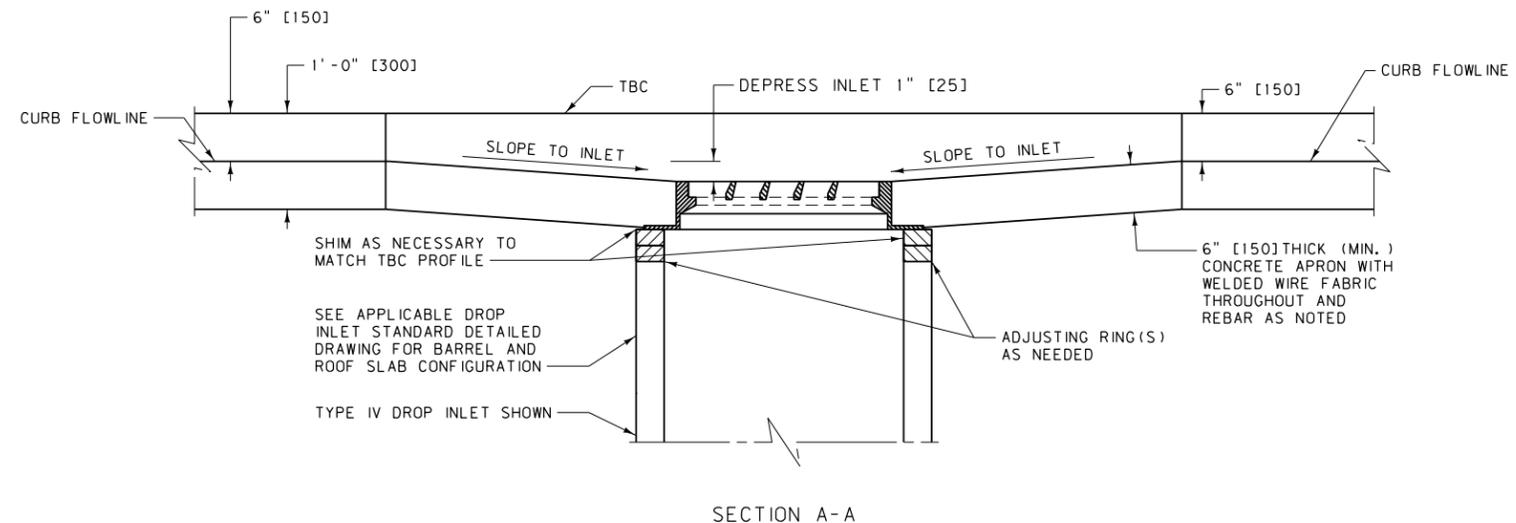
INLET TYPE		LENGTH	
		FT	mm
TYPE IV	X	3'-0"	925
	Y	3'-11 1/2"	1200
TYPE I, III, V, VI	X	3'-7"	1100
	Y	4'-6 7/8"	1400

DROP INLET TYPE I, III, V, VI			
ROADWAY % CROSS SLOPE*	APRON ELEV. BELOW TOP BACK OF CURB		GRATE & APRON SLOPE %
	FT	m	
0	0.45	0.137	3.31
0.5	0.44	0.134	3.63
1.0	0.43	0.131	3.96
1.5	0.41	0.125	4.28
2.0	0.40	0.122	4.60
2.5	0.39	0.119	4.93
3.0	0.37	0.113	5.25
3.5	0.36	0.110	5.57
4.0	0.35	0.107	5.90
4.5	0.34	0.104	6.22

\* SEE CROSS SECTIONS FOR CROSS SLOPES ON STREET.

DROP INLET TYPE IV			
ROADWAY % CROSS SLOPE*	APRON ELEV. BELOW TOP BACK OF CURB		GRATE & APRON SLOPE %
	FT	m	
0	0.45	0.137	4.07
0.5	0.44	0.134	4.38
1.0	0.43	0.131	4.68
1.5	0.42	0.128	5.00
2.0	0.41	0.125	5.29
2.5	0.40	0.122	5.59
3.0	0.39	0.119	5.90
3.5	0.38	0.116	6.20
4.0	0.37	0.113	6.50
4.5	0.36	0.110	6.81

\* SEE CROSS SECTIONS FOR CROSS SLOPES ON STREET.



NOTES:

ALL CONCRETE IS CLASS GENERAL OR APPROVED EQUAL.

SHIM DROP INLET FRAME TO MATCH TBC PROFILE AND GRATE APRON SLOPE SHOWN IN THE TABLES. FILL SPACE BETWEEN GRATE AND ADJUSTING RING WITH CLASS GENERAL CONCRETE.

THE REFERENCED GRATE ELEVATION IS 1" LOWER THAN THE CURB FLOWLINE ELEVATION.

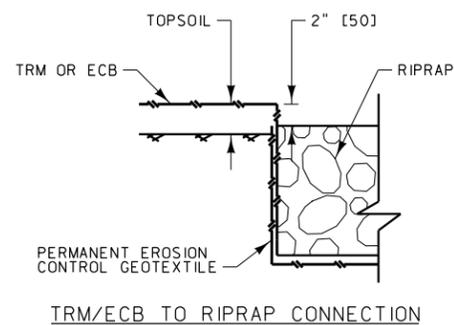
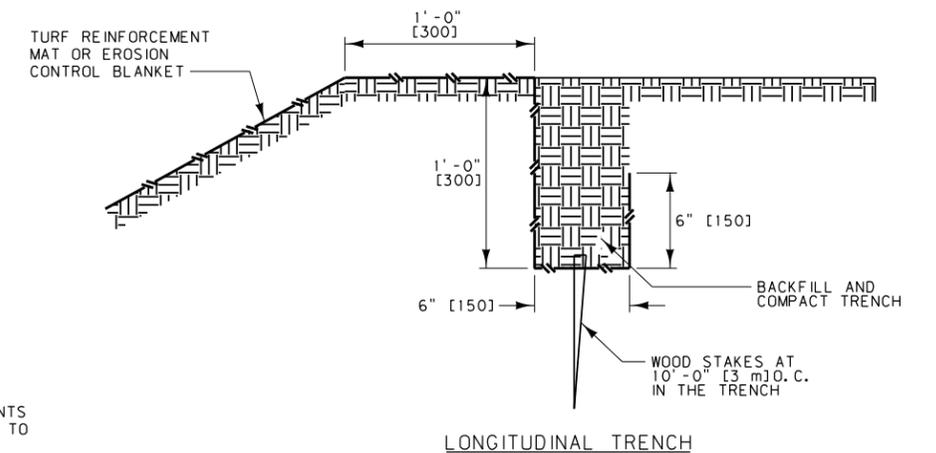
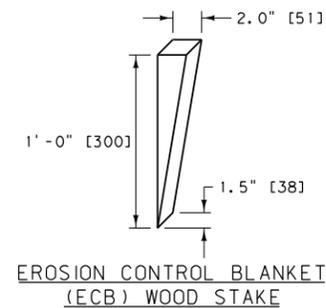
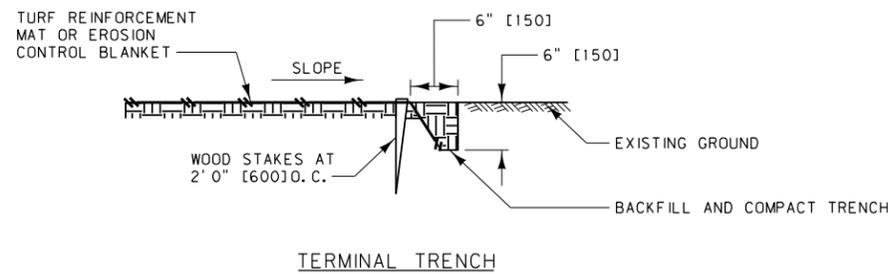
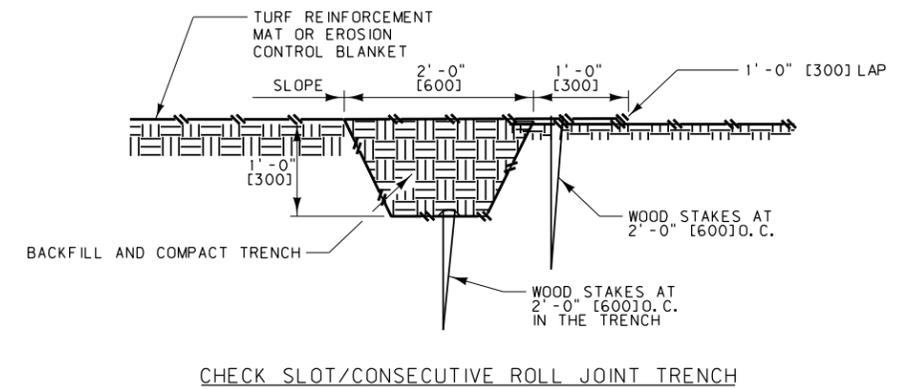
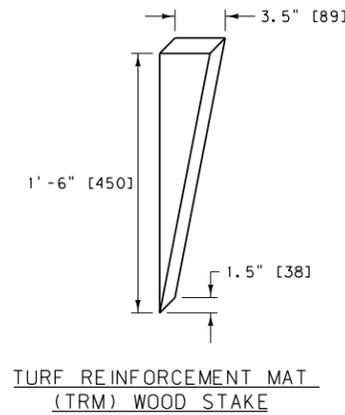
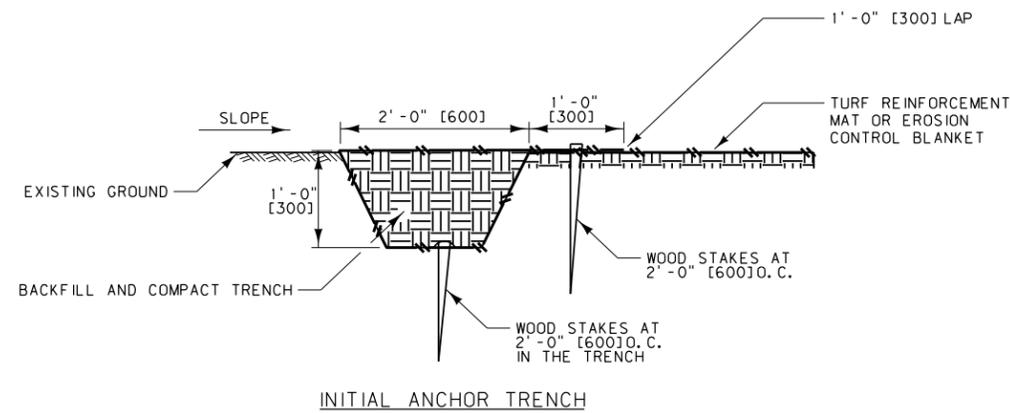
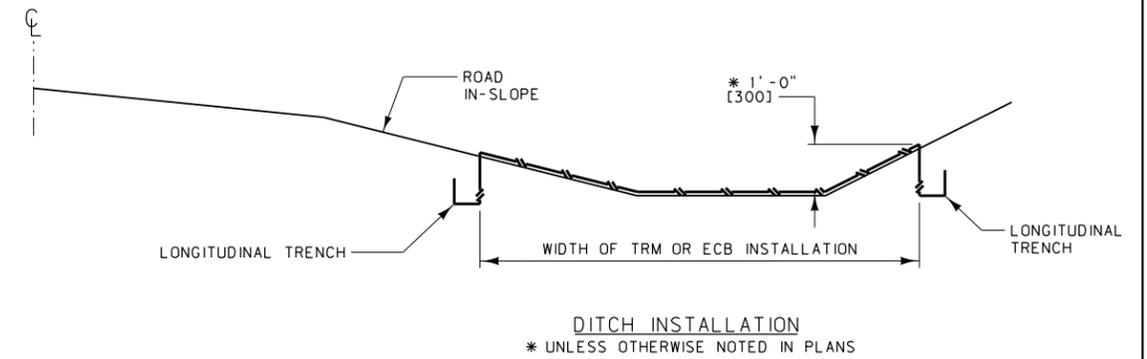
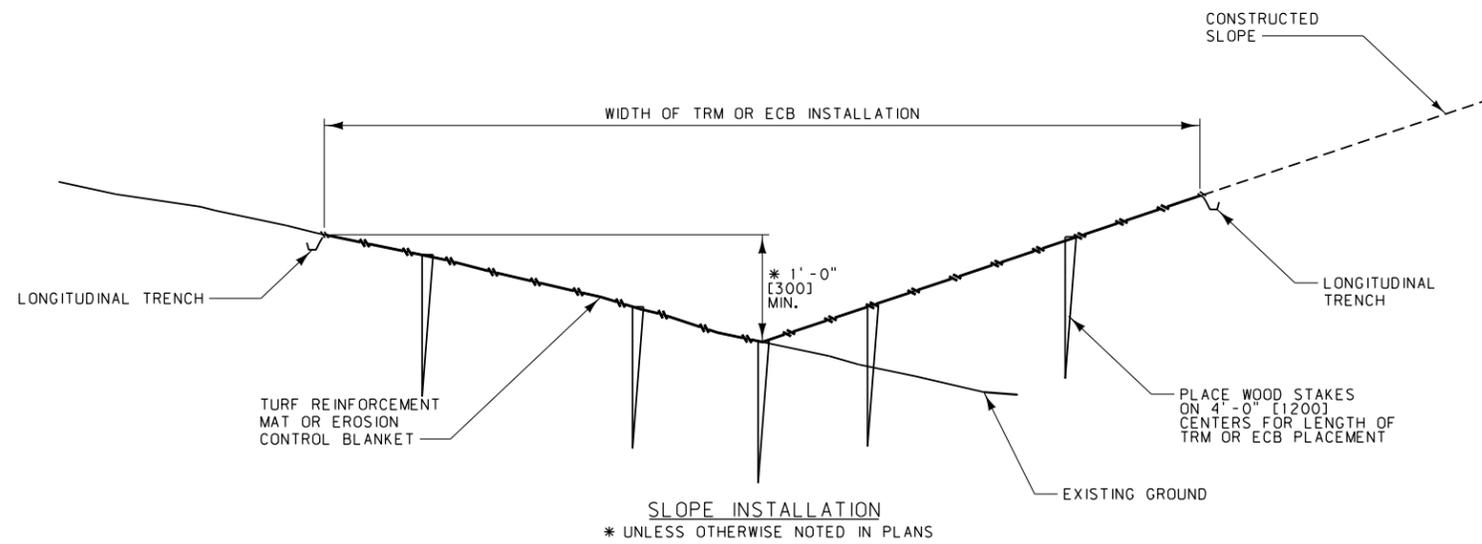
THE COST OF THE DROP INLET APRON IS INCLUDED IN THE UNIT PRICE BID FOR THE DROP INLET.

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

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 609	DWG. NO. 609-07

DROP INLET APRONS

--REVISED-- JULY 2016	EFFECTIVE: SEPTEMBER 2014
<b>MDT</b> MONTANA DEPARTMENT OF TRANSPORTATION	



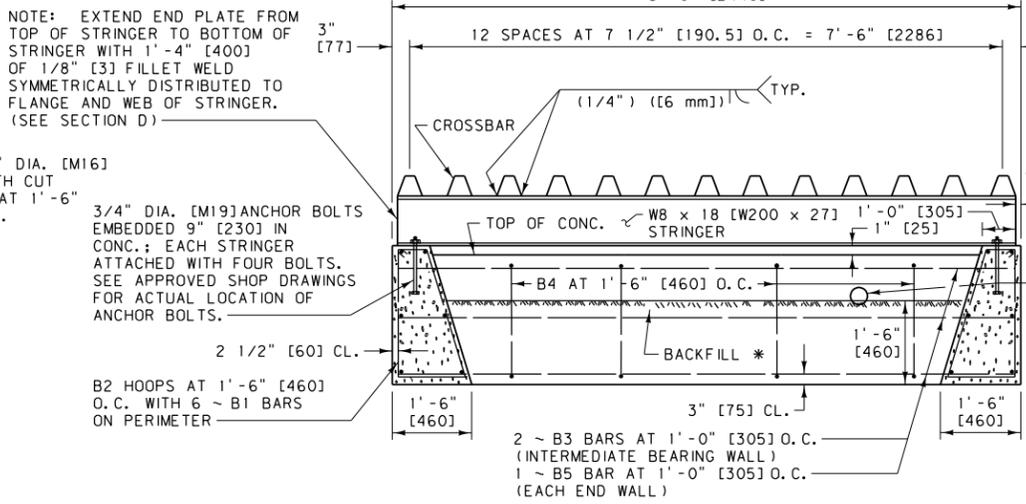
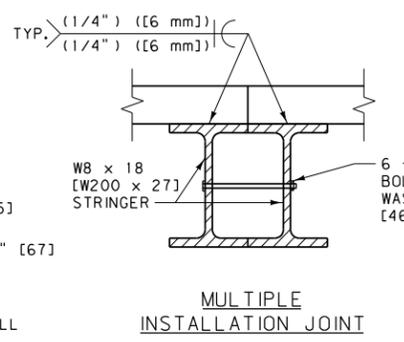
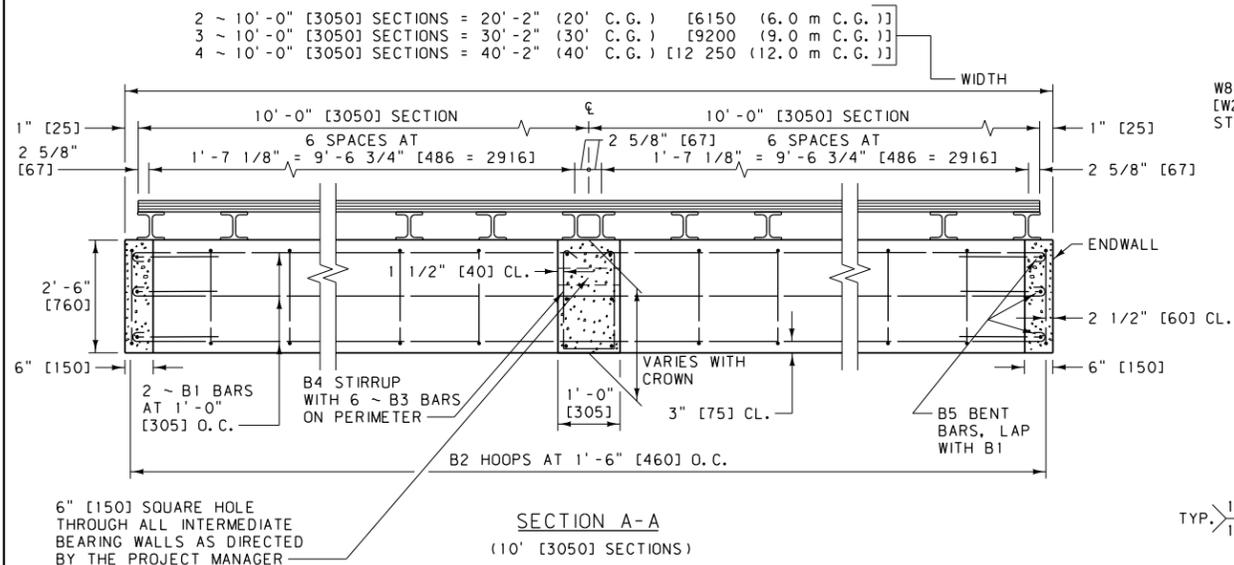
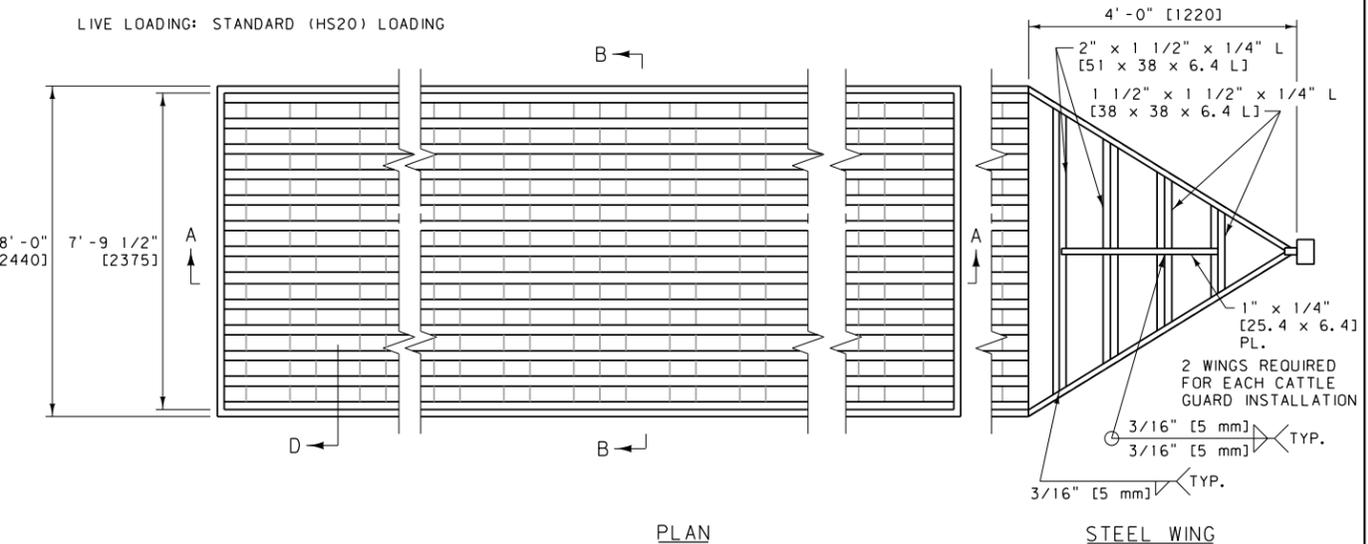
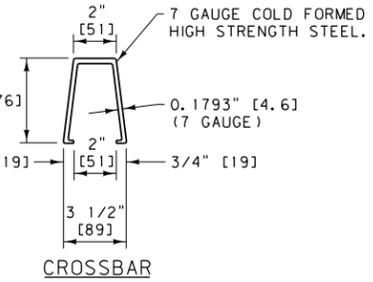
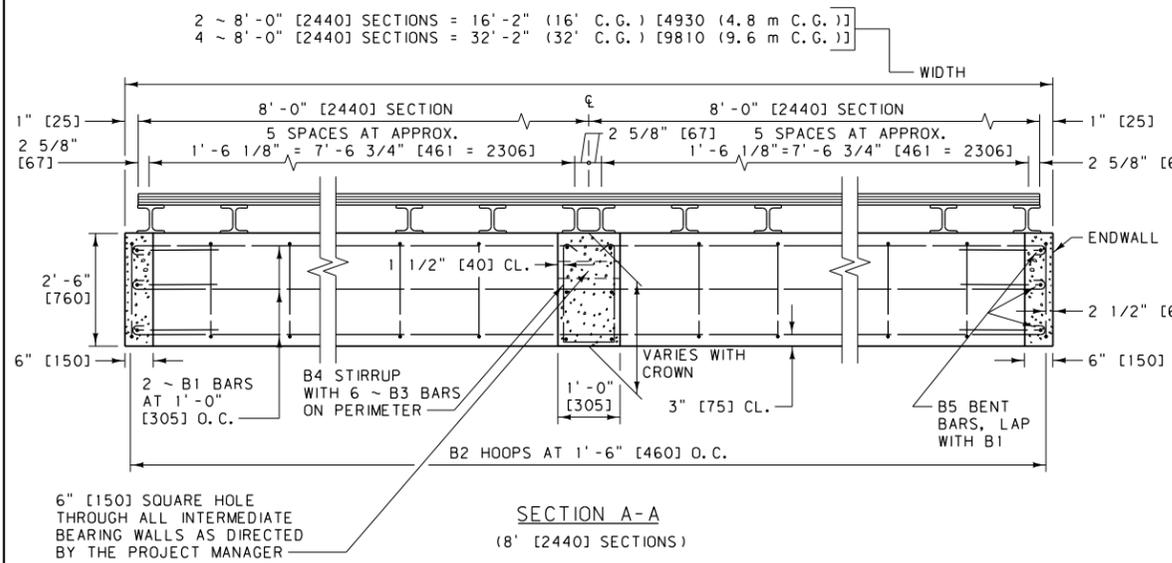
**NOTES:**

- ① PROVIDE A SOIL SURFACE STABLE, FREE OF ROCKS, AND TO PLAN SPECIFICATIONS.
- ② SEED, FERTILIZER, AND/OR APPLY OTHER SPECIFIED (IF APPLICABLE) SOIL AMENDMENTS PRIOR TO INSTALLATION. RAKE ALL SEED INTO THE UPPER 0.5" [13] OF SOIL PRIOR TO TRM OR ECB PLACEMENT.
- ③ ONLY USE WOODEN STAKES THAT ARE OF THE SIZE AND DIMENSION SHOWN. METAL STAPLES ARE NOT ALLOWED.
- ④ UNROLL THE TRM OR ECB PARALLEL TO THE PRIMARY DIRECTION OF FLOW AND PLACE IT IN DIRECT CONTACT WITH SOIL SURFACE. DO NOT STRETCH OR ALLOW TRM OR ECB TO BRIDGE OVER SURFACE INCONSISTENCIES.
- ⑤ INITIAL ANCHOR TRENCH: PROVIDE AN INITIAL ANCHOR TRENCH AT THE BEGINNING OF THE SLOPE OR DITCH INSTALLATION FOR THE PLAN WIDTH OF THE TRM OR ECB.
- ⑥ TERMINAL TRENCH: PROVIDE A TERMINAL TRENCH AT THE END OF THE SLOPE OR DITCH INSTALLATION FOR THE PLAN WIDTH OF THE TRM OR ECB.
- ⑦ CHECK SLOT/CONSECUTIVE ROLL JOINT TRENCH: PROVIDE A CHECK SLOT A MINIMUM OF EVERY 25' [7.6 m]. DO NOT LOCATE A CHECK SLOT AT A DITCH FLOWLINE OR WHERE A CONSTRUCTED SLOPE AND IN-PLACE SLOPE MEET.

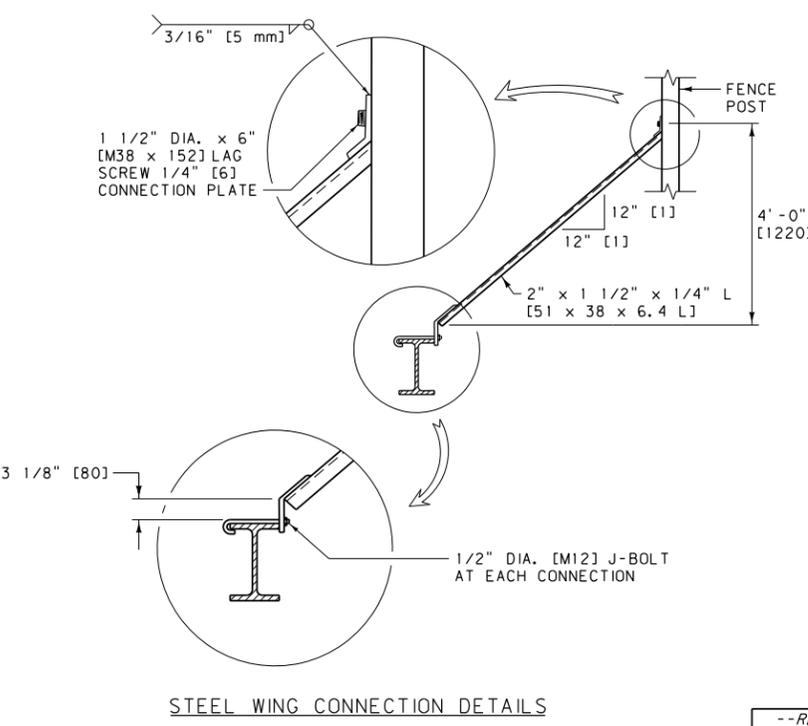
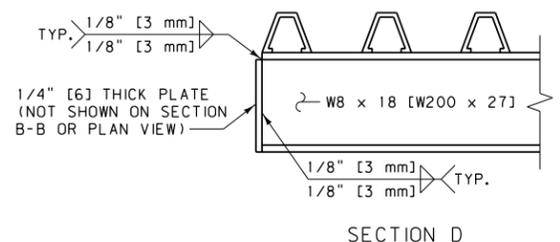
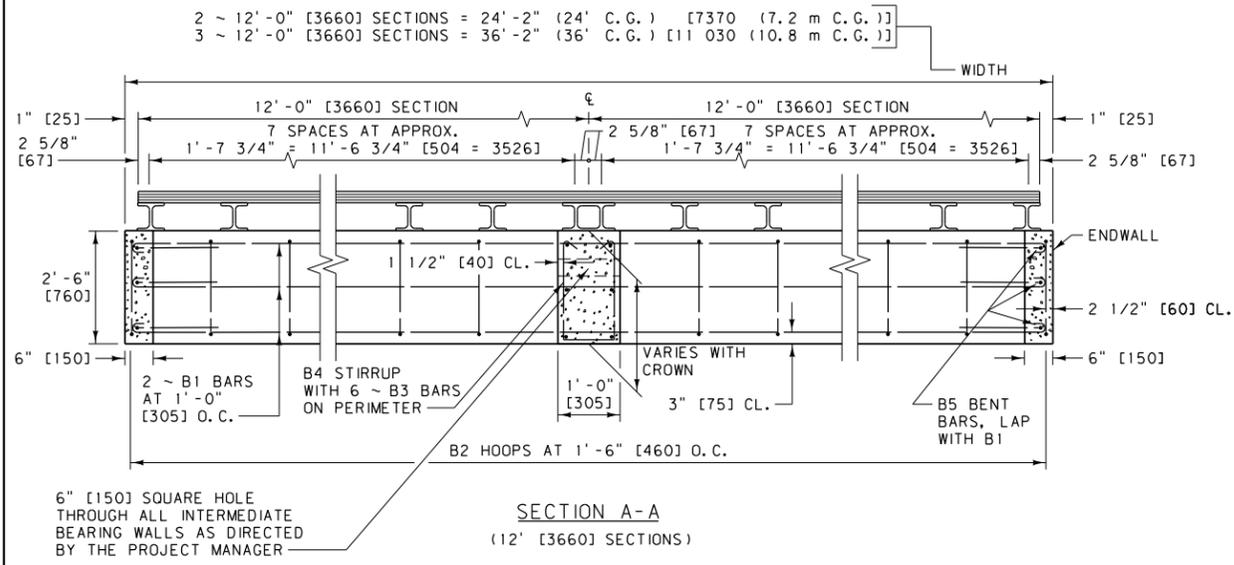
UNITS SHOWN IN BRACKETS [ ] ARE METRIC AND ARE IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.

DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	610-05
SECTION 610	
ROLLED EROSION CONTROL (REC)	
EFFECTIVE: SEPTEMBER 2014	
<b>MDTA</b> MONTANA DEPARTMENT OF TRANSPORTATION	

--REVISED--  
JULY 2016



- NOTES:
- THE CONTRACTOR HAS THE OPTION OF USING PRECAST CONCRETE BASES FOR CATTLE GUARDS. SEE DTL. DWG. NO. 611-15.
  - FOR CATTLE GUARDS ON FARM FIELD OR PRIVATE APPROACHES, THE PRECAST CONCRETE BASES IN DTL. DWG. NO. 611-10 MAY BE USED.
  - USE AN EVEN NUMBER OF STEEL CATTLE GUARD GRATES WHEN A CROWNED INSTALLATION IS REQUIRED.
  - SEE DTL. DWG. NO. 611-05 FOR CAST-IN-PLACE CATTLE GUARD REBAR DETAILS.
  - ANCHOR BOLTS ARE TO CONFORM TO AASHTO M 314 [314M] GRADE 36 [250 MPa].
  - ALL NUTS, BOLTS, AND WASHERS ARE TO BE GALVANIZED.

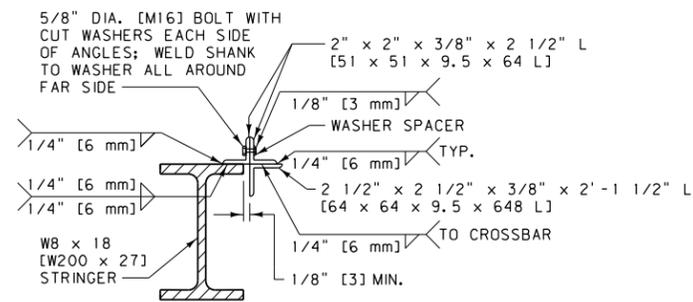
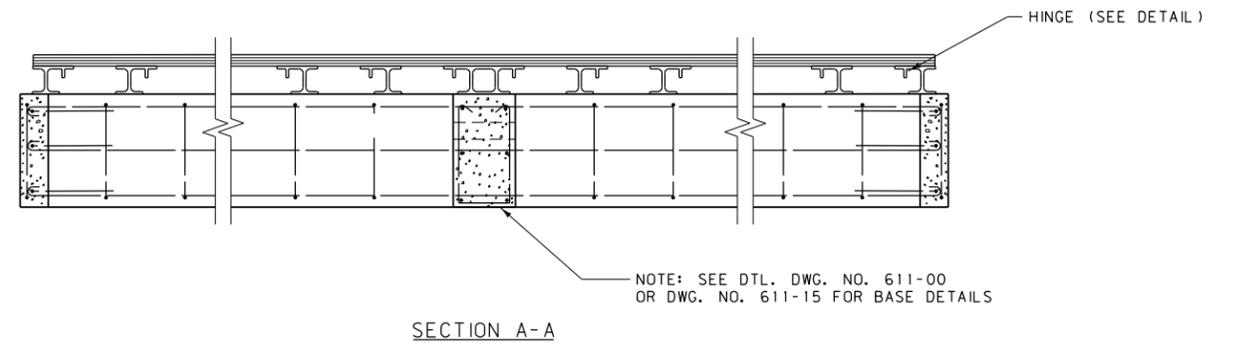
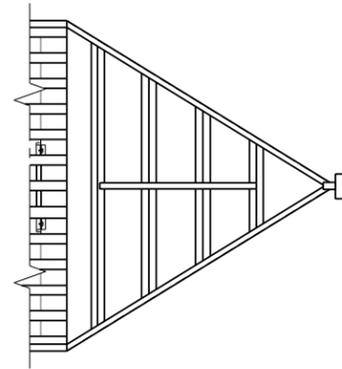
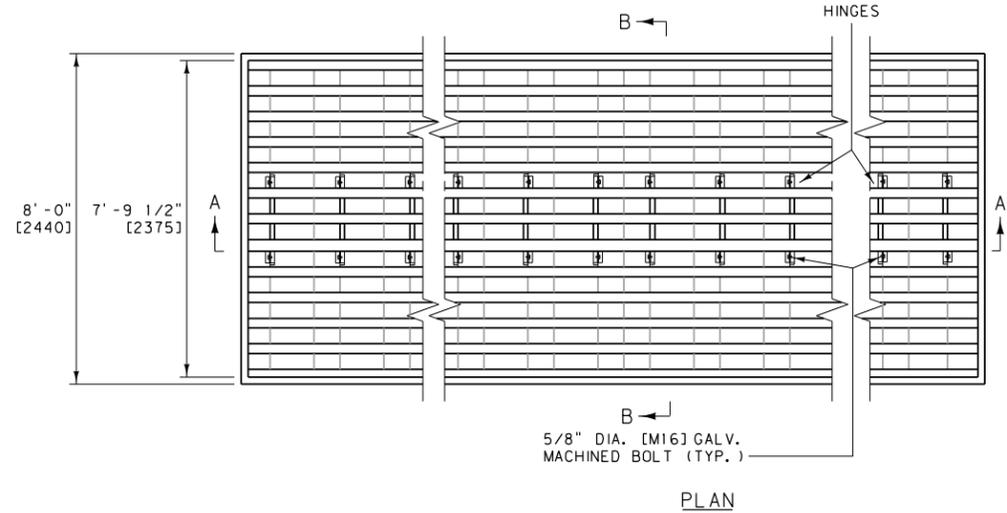


UNITS SHOWN IN BRACKETS [ ] ARE METRIC AND ARE IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.

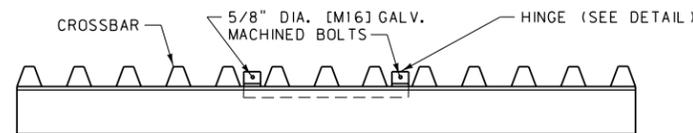
DETAILED DRAWING	
REFERENCE DWG. NO.	611-00
STANDARD SPEC.	SECTION 611

HEAVY DUTY CATTLE GUARD CAST-IN-PLACE

LIVE LOADING: STANDARD (HS20) LOADING



NOTE: LOCK DETAIL SIMILAR EXCEPT USE 5/8" DIA. [M16] GALV. MACHINED BOLT WITH GALV. CUT WASHER & GALV. HEX NUTS INSTEAD OF WELDED STUD BOLT.



NOTES:

- ① USE AN EVEN NUMBER OF STEEL CATTLE GUARD GRATES WHEN A CROWNED INSTALLATION IS REQUIRED.
- ② ANCHOR BOLTS ARE TO CONFORM TO AASHTO M 314 [314M] GRADE 36 [250 MPa].
- ③ ALL NUTS, BOLTS, AND WASHERS ARE TO BE GALVANIZED.
- ④ WELD CROSSBARS TO 2 1/2" x 2 1/2" x 3/8" x 2'-1 1/2" L [64 x 64 x 9.5 x 648 L] ANGLES HINGED AREA ONLY. SEE DTL. DWG. NO. 611-00 FOR CROSSBAR DETAIL.
- ⑤ FABRICATE ALL LIGHT DUTY CATTLE GUARD TO INCLUDE HINGED GRATE

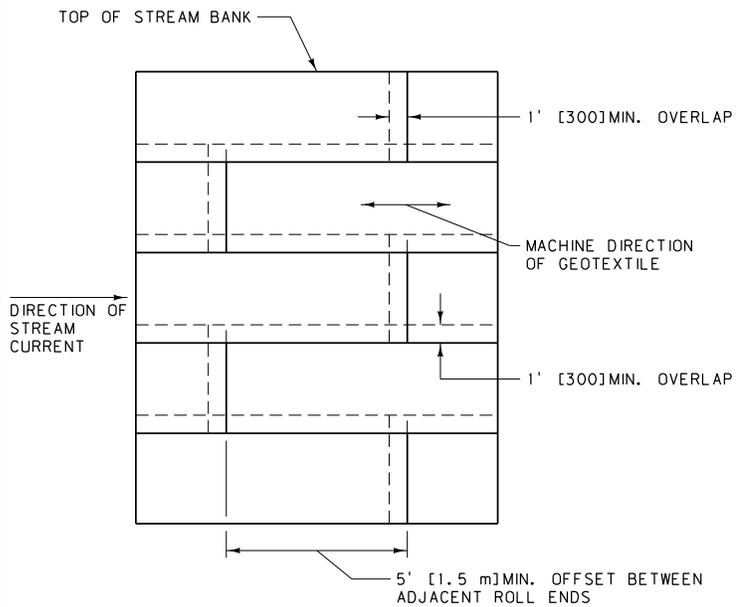
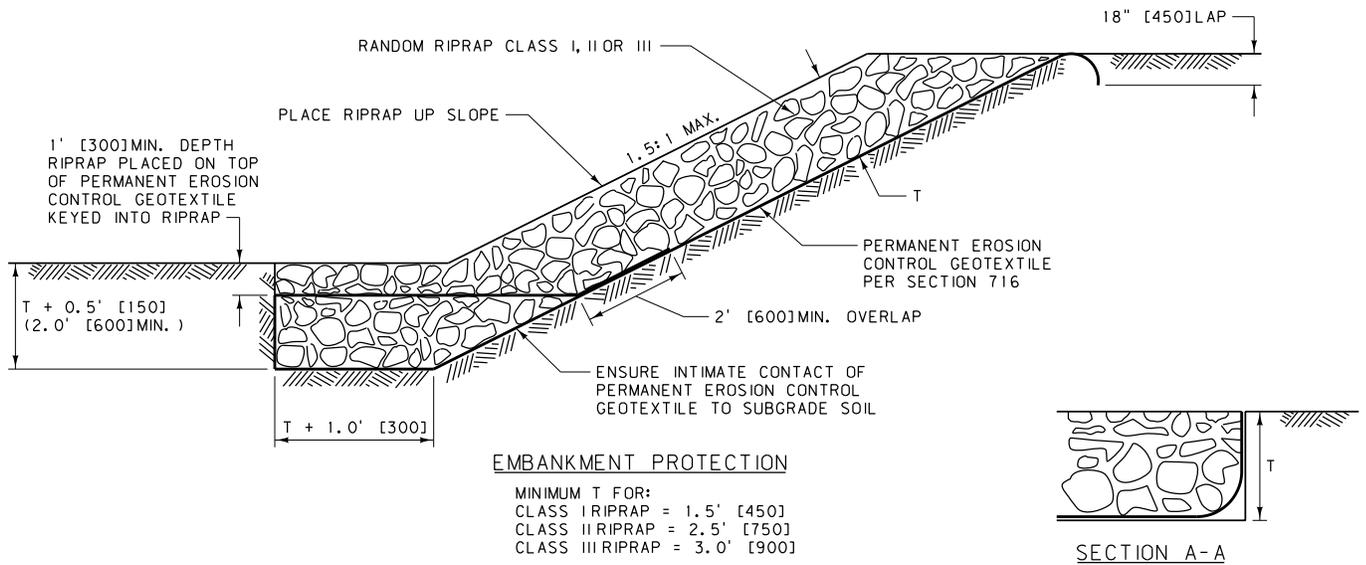
UNITS SHOWN IN BRACKETS [ ] ARE METRIC AND ARE IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 611	DWG. NO. 611-03

CATTLE GUARD HINGED GRATE

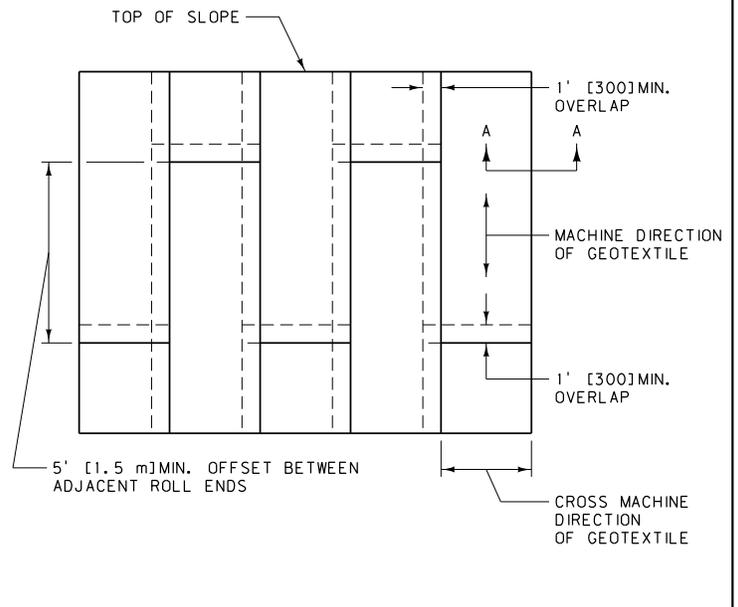
EFFECTIVE: JULY 2016

**MDTA** MONTANA DEPARTMENT OF TRANSPORTATION



**GEOTEXTILE PLACEMENT DETAIL**

METHOD FOR PLACING PERMANENT EROSION CONTROL GEOTEXTILE FOR PROTECTION OF STREAM BANKS



**GEOTEXTILE PLACEMENT DETAIL**

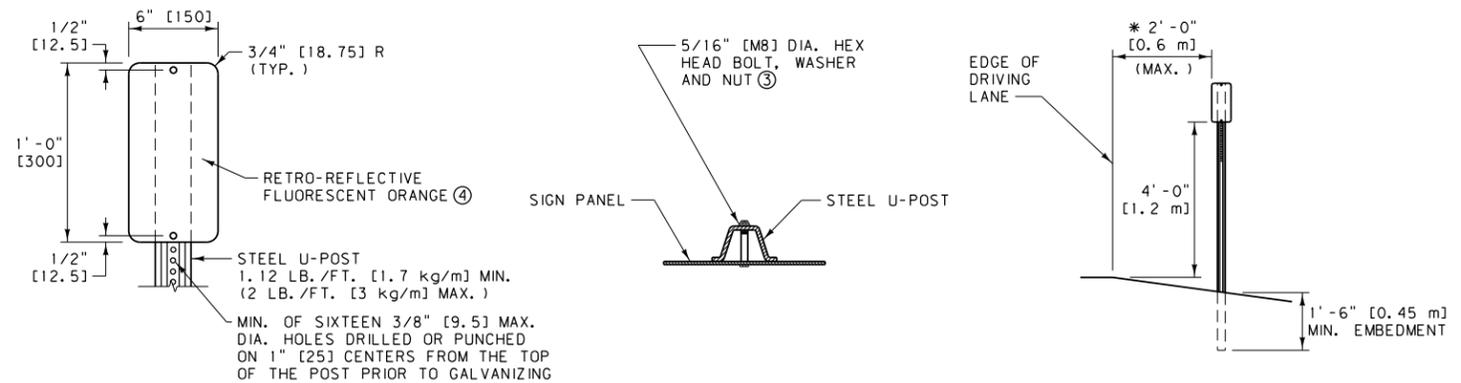
METHOD FOR PLACING PERMANENT EROSION CONTROL GEOTEXTILE FOR PROTECTION OF CUT AND FILL SLOPES

NOTES:

- ① INSTALL PERMANENT EROSION CONTROL GEOTEXTILE PER SECTION 622.

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

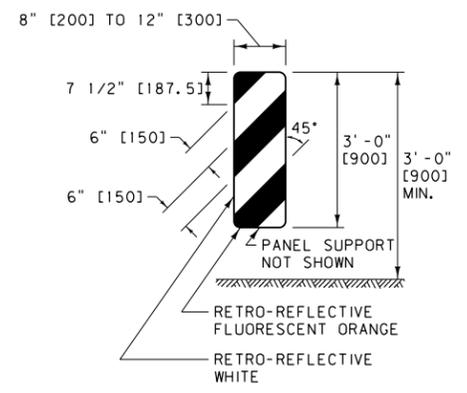
DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 613, 622	DWG. NO. 613-16
RIPRAP SLOPE PROTECTION	
--REVISED-- JULY 2016	EFFECTIVE: SEPTEMBER 2014



TYPE 2 OBJECT MARKER

TYPE 2 OBJECT MARKER NOTES:

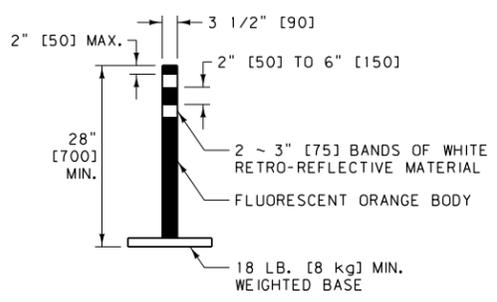
- ① USE TYPE 2 OBJECT MARKERS TO DELINEATE ROADSIDE CONSTRUCTIONS OF THE CLEAR ZONE (I. e. DROP OFFS, OBSTACLES, ABRUPT CHANGES IN ROADWAY ALIGNMENT, ETC.)
  - ② DO NOT USE TYPE 2 OBJECT MARKERS AS CHANNELIZING DEVICES.
  - ③ ATTACH PANELS TO POSTS AT BOTH TOP AND BOTTOM HOLE LOCATIONS.
  - ④ USE RETRO-REFLECTIVE SHEETING AS PER THE CONTRACT.
- \* REDUCE OR ELIMINATE THE 2'-0" [0.6 m] DISTANCE WHEN OBSTACLE OR HAZARD IS LESS THAN 2'-0" [0.6 m] FROM THE EDGE OF THE DRIVING LANE.



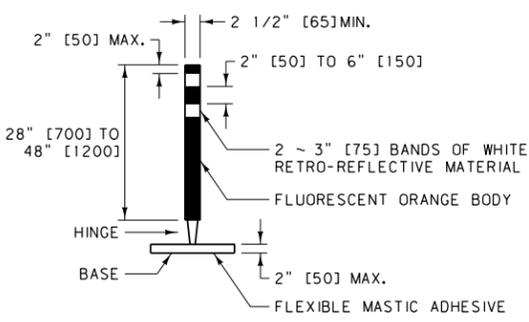
PORTABLE VERTICAL PANEL  
(VP-1R SHOWN. REVERSE FOR VP-1L.)

PORTABLE VERTICAL PANEL NOTES:

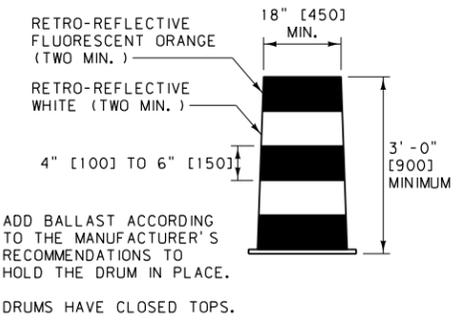
- ① USE PORTABLE VERTICAL PANELS AS CHANNELIZING DEVICES ONLY. DO NOT USE PORTABLE VERTICAL PANELS TO DELINEATE ROADSIDE CONSTRUCTIONS OF THE CLEAR ZONE.
- ② VERTICAL PANELS DESIGNATED "R" ARE PLACED TO THE RIGHT SIDE OF APPROACHING TRAFFIC. THOSE DESIGNATED "L" ARE PLACED TO THE LEFT SIDE.
- ③ USE RETRO-REFLECTIVE SHEETING AS PER THE CONTRACT.



FLEXIBLE GUIDE POST  
(TUBULAR MARKER)



HINGED FLEXIBLE GUIDE POST  
(TUBULAR MARKER)  
(SELF RIGHTING AFTER IMPACT)



PLASTIC DRUM

FLEXIBLE GUIDE POST AND PLASTIC DRUM NOTES:

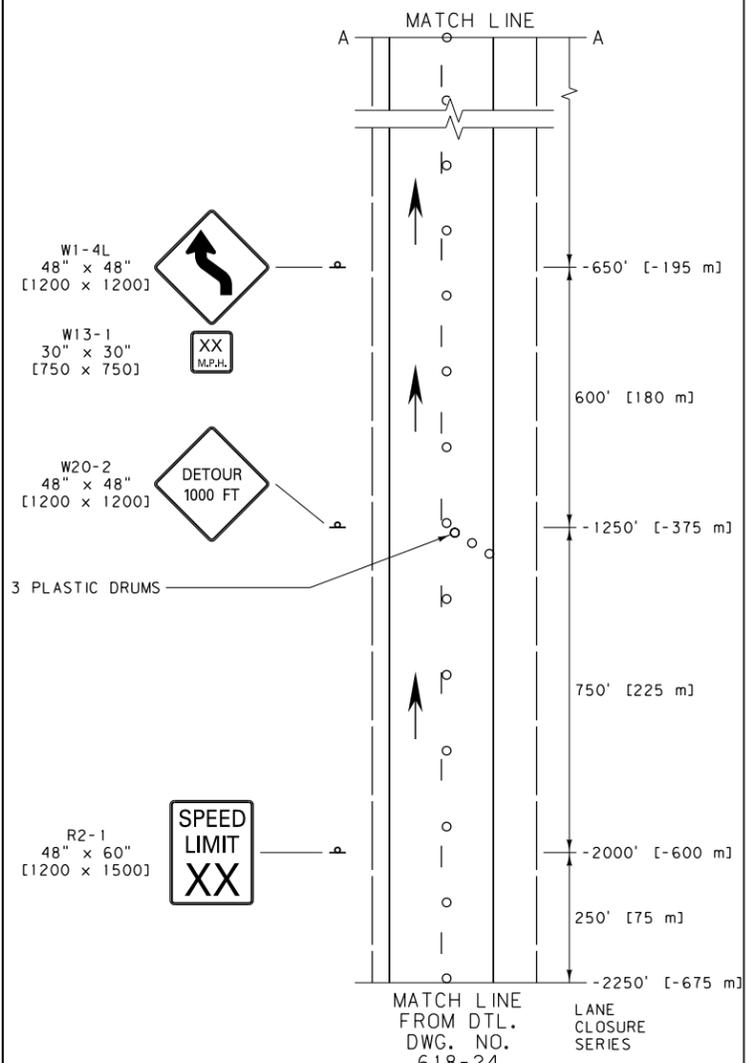
- ① USE FLEXIBLE GUIDE POSTS AND PLASTIC DRUMS AS CHANNELIZING DEVICES.
- ② USE ASTM TYPE III RETRO-REFLECTIVE SHEETING ON ALL PLASTIC DRUMS AND FLEXIBLE GUIDE POSTS.
- ③ USE ONE SIZE GUIDE POST FOR CONTINUOUS RUNS.

- GENERAL NOTES:
- ① SEE THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD) PART 6 FOR ADDITIONAL INFORMATION.

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

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 618	DWG. NO. 618-00

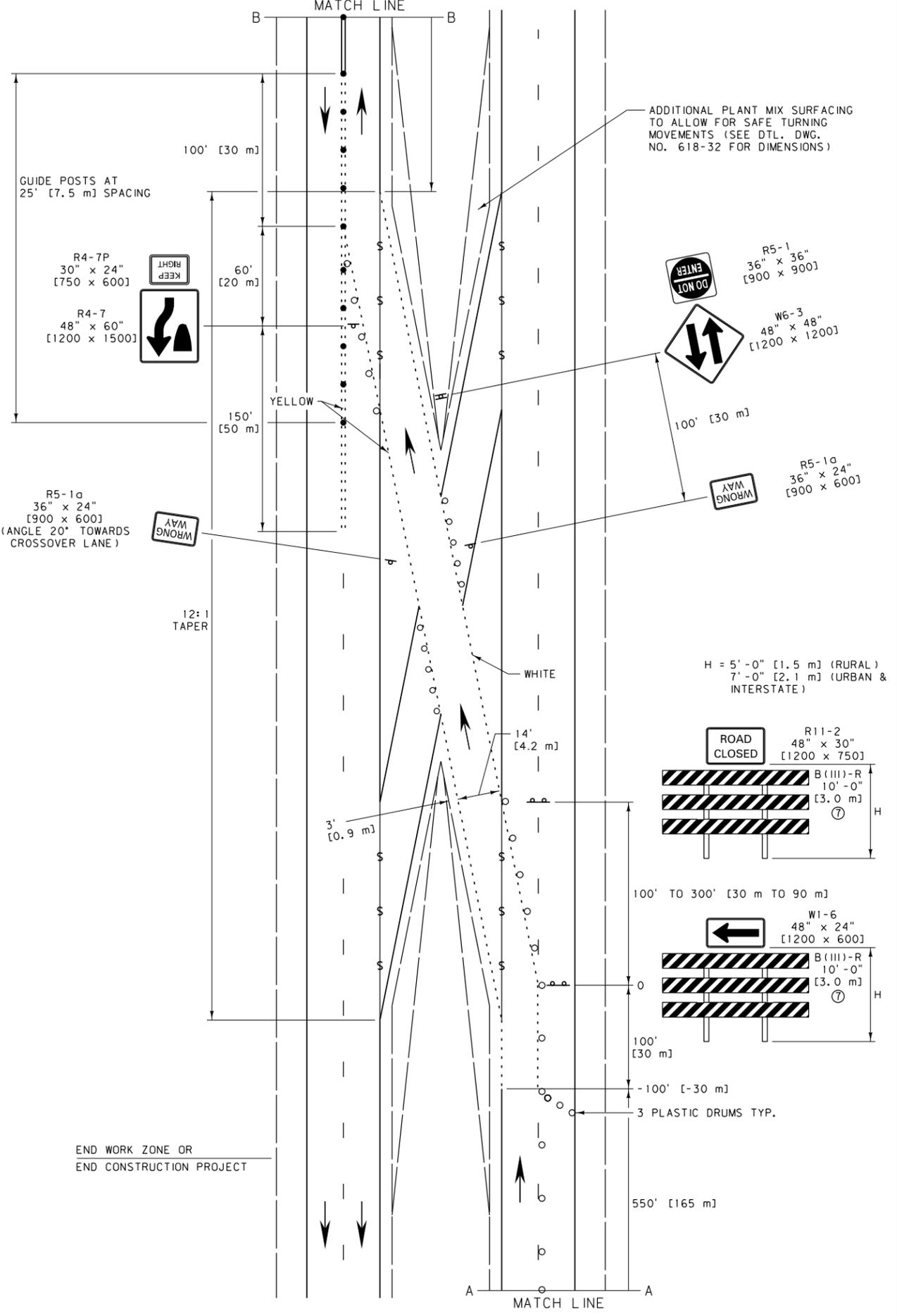
CHANNELIZING DEVICES AND OBJECT MARKERS



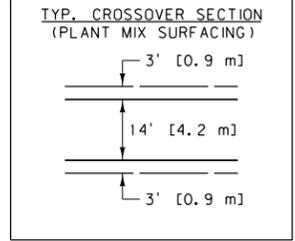
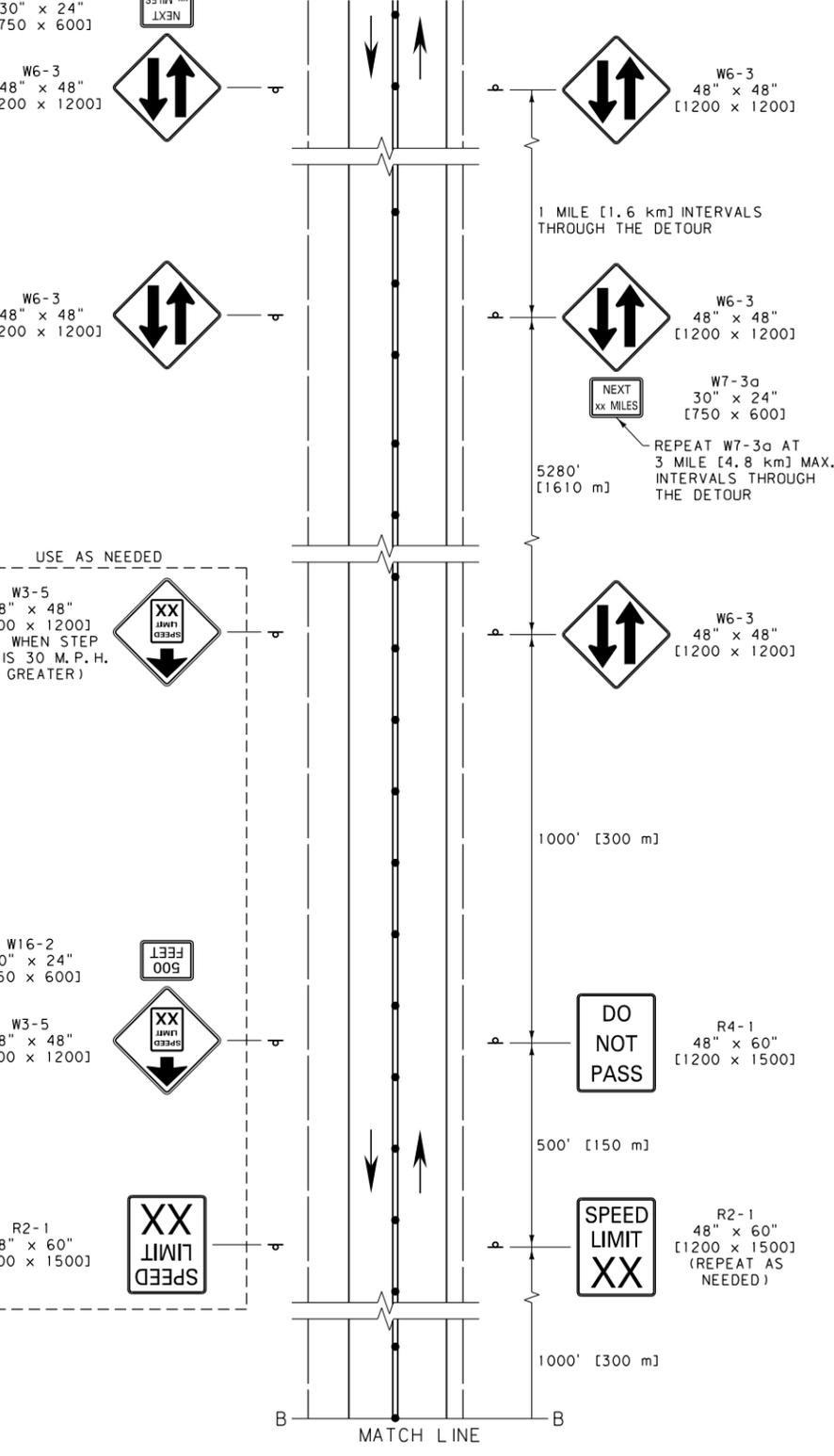
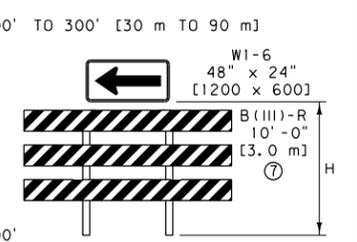
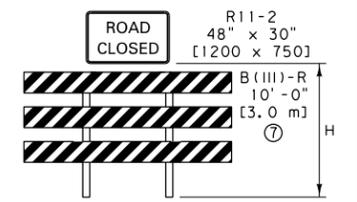
**LEGEND**

- OBLITERATE CONFLICTING PAVEMENT MARKINGS AND FILL ANY EXISTING RUMBLE STRIPS WITH PMS
- PLASTIC DRUMS (SEE NOTES FOR SPACING)
- - - - - TEMPORARY STRIPING IN ACCORDANCE WITH SECTION 620 OR RAISED RIGID PAVEMENT MARKERS
- ==== DOUBLE YELLOW PAINT OR DOUBLE PLASTIC PAVEMENT MARKING TABS AT 5' [1.5 m] SPACING
- FLEXIBLE GLUE-DOWN GUIDE POSTS ON TWO-LANE (SEE NOTES FOR SPACING EXCEPT AS SHOWN)

- NOTES:**
- ① INCLUDE REGULATORY SIGNING ONLY AS REQUIRED. REMOVE OR COVER REGULATORY SIGNS TO MATCH ADJACENT REGULATIONS.
  - ② THE WORK ZONE REFERS TO THE AREA WITHIN THE CONSTRUCTION PROJECT WHERE WORK IS ACTUALLY TAKING PLACE.
  - ③ INDICATED SPACINGS ARE INTENDED TO BE A MAXIMUM AND MAY BE REDUCED IF CONDITIONS WARRANT.
  - ④ XX = SPEED DETERMINED BY THE MEDIAN CROSSOVER DESIGN SPEED OR THE PROJECT MANAGER.
  - ⑤ SPACE CHANNELIZING DEVICES ON TANGENTS AT INTERVALS IN FEET [METERS] OF NO MORE THAN TWO [0.6] TIMES THE SPEED LIMIT IN M.P.H. AND ON ALL TAPER SECTIONS AT INTERVALS IN FEET [METERS] OF NO MORE THAN ONE [0.3] TIMES THE SPEED LIMIT IN M.P.H. FOR SPEED LIMITS LESS THAN 35 M.P.H., SPACE CHANNELIZING DEVICES AS DIRECTED BY THE PROJECT MANAGER.
  - ⑥ OBLITERATE ALL PAVEMENT MARKINGS THAT CONFLICT AT ANY TIME DURING OR AFTER MEDIAN CROSSOVER USE.
  - ⑦ SEE DETAILED DRAWING 618-03.

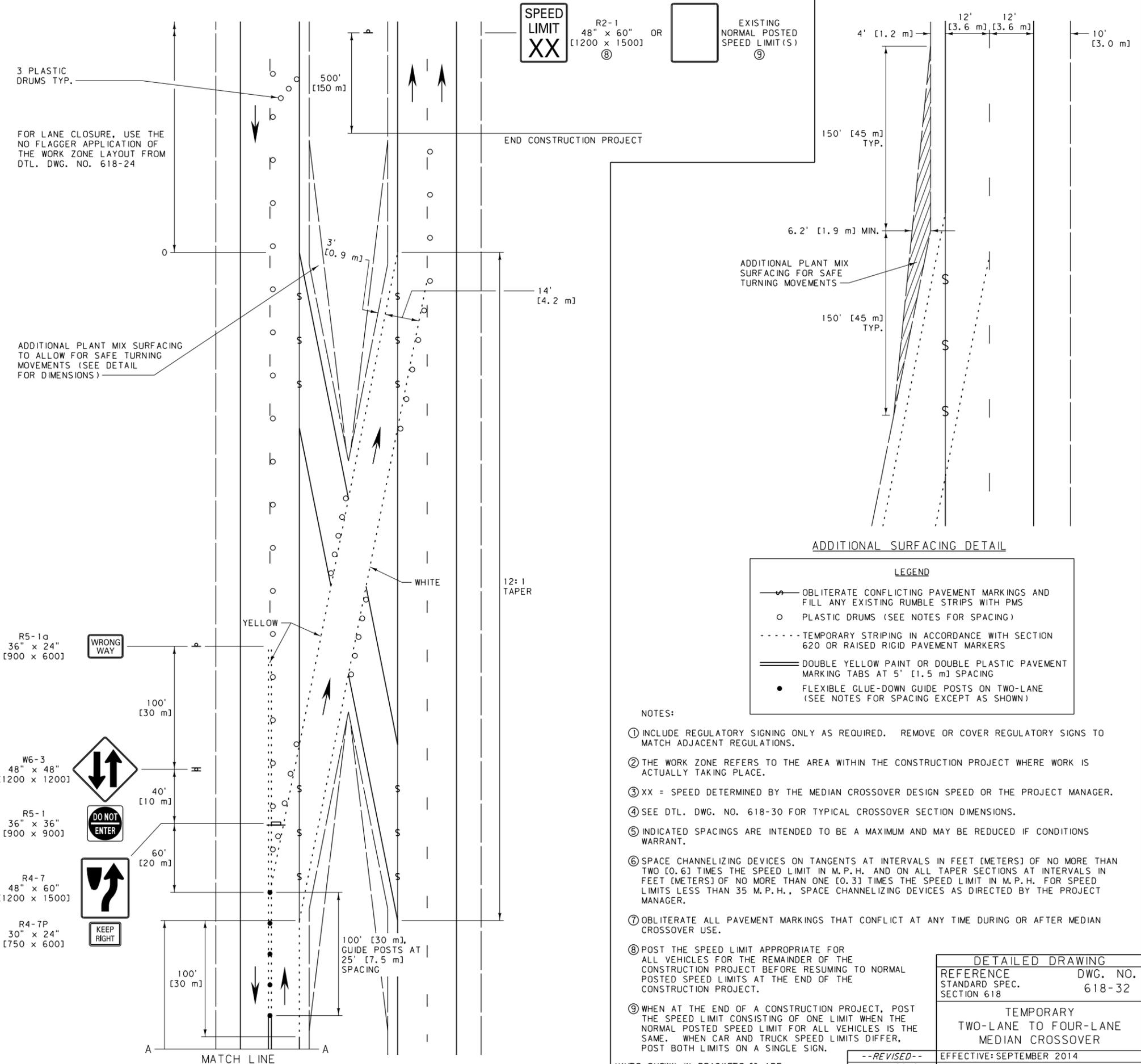
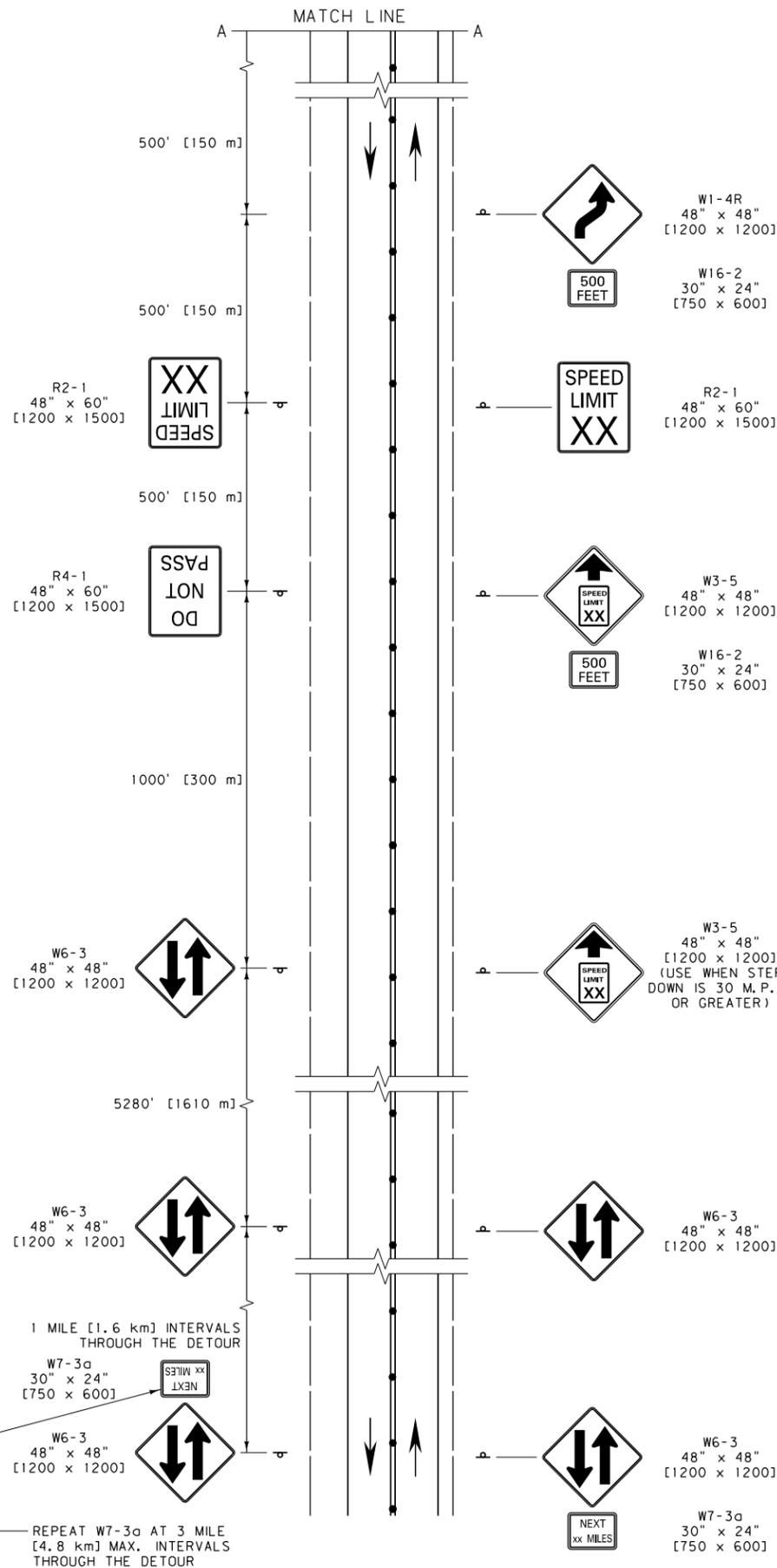


H = 5'-0" [1.5 m] (RURAL)  
 7'-0" [2.1 m] (URBAN & INTERSTATE)



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

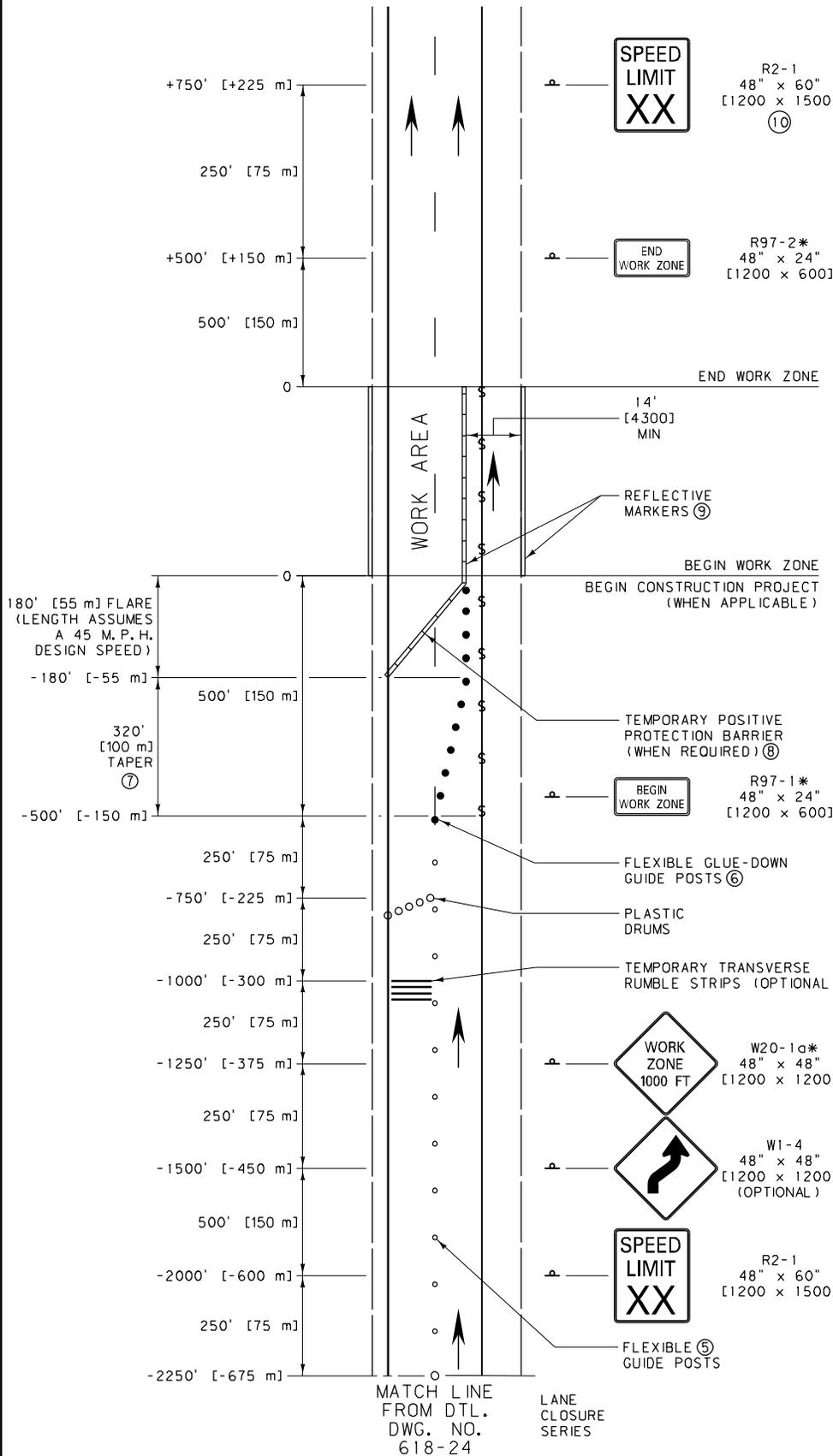
DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 618	DWG. NO. 618-30
TEMPORARY FOUR-LANE TO TWO-LANE MEDIAN CROSSOVER	



NOTES:

- ① THESE SIGN LAYOUTS WORK IN CONJUNCTION WITH THE LAYOUT ILLUSTRATED ON DTL. DWG. 618-24.
- ② INCLUDE REGULATORY SIGNING ONLY AS REQUIRED. REMOVE OR COVER REGULATORY SIGNS TO MATCH ADJACENT REGULATIONS.
- ③ THE WORK ZONE REFERS TO THE AREA WITHIN THE CONSTRUCTION PROJECT WHERE WORK IS ACTUALLY TAKING PLACE.
- ④ XX = SPEED DETERMINED BY THE PROJECT MANAGER.
- ⑤ SPACE CHANNELIZING DEVICES ON TANGENTS AT INTERVALS IN FEET [METERS] OF NO MORE THAN TWO [0.6] TIMES THE SPEED LIMIT IN M.P.H. AND ON ALL TAPER SECTIONS AT INTERVALS IN FEET [METERS] OF NO MORE THAN ONE [0.3] TIMES THE SPEED LIMIT IN M.P.H. FOR SPEED LIMITS LESS THAN 35 M.P.H., SPACE CHANNELIZING DEVICES AS DIRECTED BY THE PROJECT MANAGER.
- ⑥ SPACE FLEXIBLE GLUE-DOWN GUIDE POSTS USED FOR LANE SHIFT TAPER AT INTERVALS IN FEET [METERS] OF NO MORE THAN 1/2 [0.2] TIMES THE SPEED IN M.P.H.
- ⑦ THE LANE SHIFT TAPER LENGTH ASSUMES AN 8' [2400] LANE SHIFT OFFSET AND A 45 M.P.H. APPROACH SPEED. CONTACT THE PROJECT MANAGER IF CONDITIONS VARY.
- ⑧ TEMPORARY POSITIVE PROTECTION BARRIER CAN TERMINATE AT THE CENTER OF THE CLOSED LANE FOR ACCESS PURPOSES IF AN APPROVED TEMPORARY IMPACT ATTENUATOR IS USED.
- ⑨ PLACE REFLECTIVE MARKERS ALONG THE TOP OF TEMPORARY BARRIER AND ENSURE REFLECTORS ON EXISTING BARRIER ARE INTACT.
- ⑩ POST THE END OF WORK ZONE SPEED LIMIT APPROPRIATE FOR ALL VEHICLES FOR THE REMAINDER OF THE CONSTRUCTION PROJECT BEFORE RESUMING TO NORMAL POSTED SPEED LIMITS AT THE END OF THE CONSTRUCTION PROJECT
- ⑪ OBLITERATE CONFLICTING PAVEMENT MARKINGS BEGINNING AT THE SHIFTING TAPER AND CONTINUING THROUGH THE WORK AREA.

\* DENOTES SIGNS THAT ARE UNIQUE TO MONTANA.



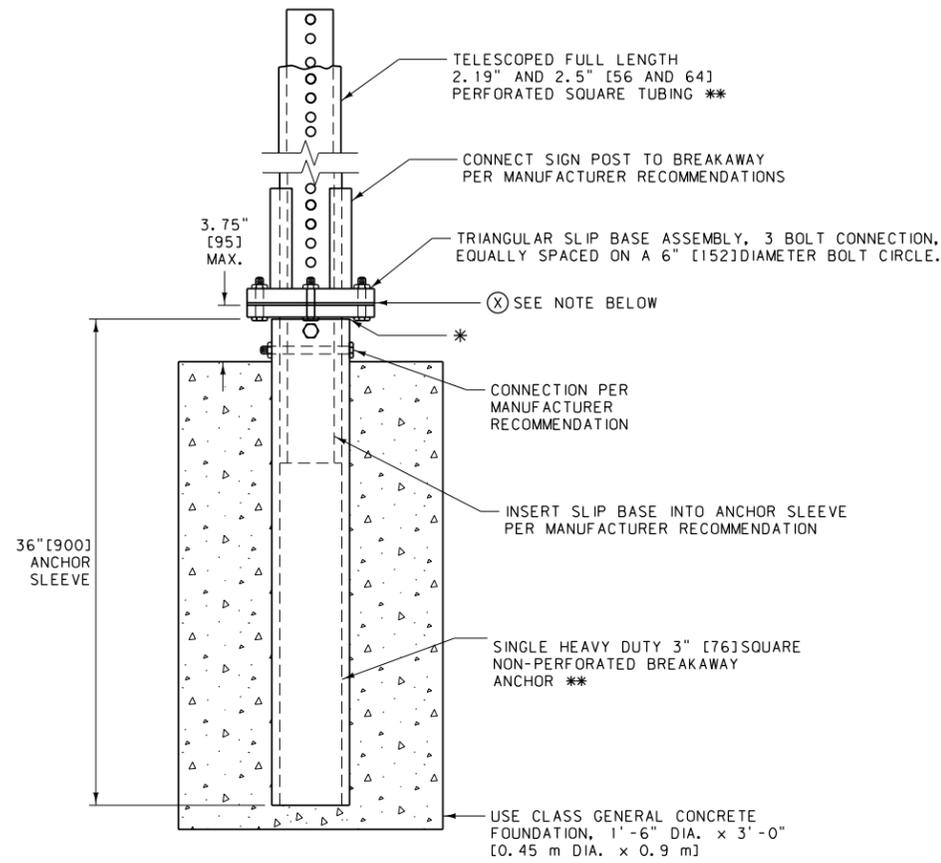
LEGEND	
	OBLITERATE CONFLICTING PAVEMENT MARKINGS ⑪
	PLASTIC DRUMS (SEE NOTES FOR SPACING)
	FLEXIBLE GLUE-DOWN GUIDE POSTS (SEE NOTES FOR SPACING)
	FLEXIBLE GUIDE POSTS

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

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 618	DWG. NO. 618-33
DIVIDED FOUR-LANE SINGLE LANE CLOSURE LANE SHIFT	
EFFECTIVE: JULY 2016	
MONTANA DEPARTMENT OF TRANSPORTATION	

TELESCOPED SQUARE TUBES SIGN  
POST INSTALLATION ON SLIP BASE

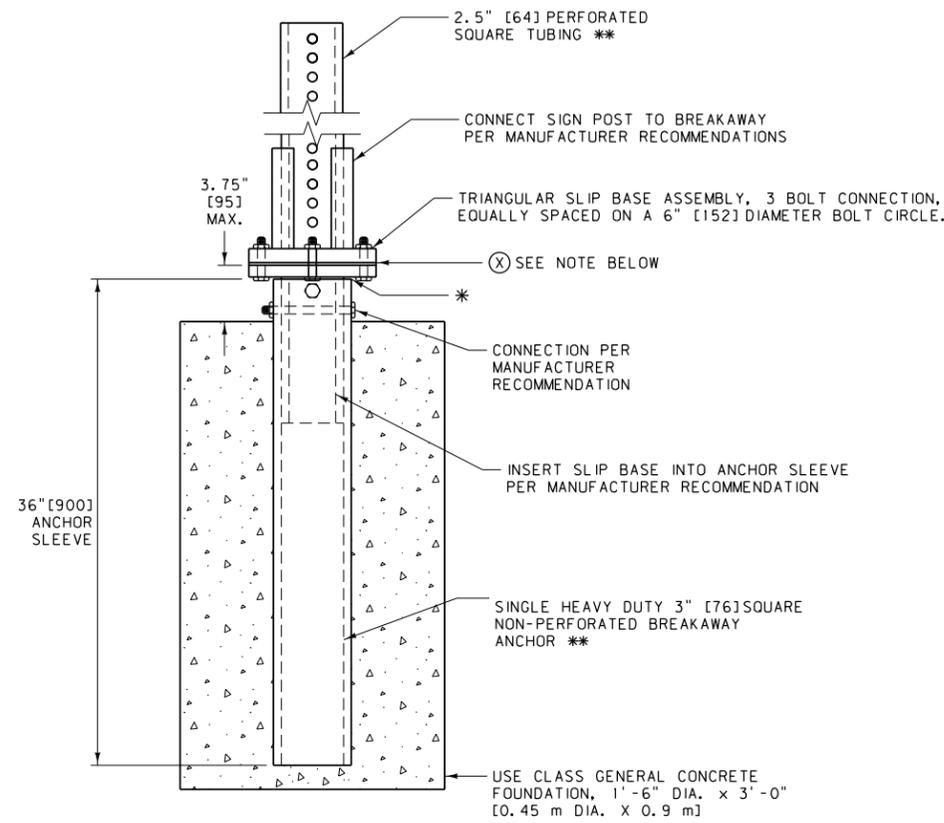
AS NOTED BY THE STAR SYMBOL  
★ ON THE LOCATION AND  
SPECIFICATION SHEETS.



\* SHIM AS REQUIRED PER MANUFACTURER RECOMMENDATION TO TAKE UP TOLERANCE BETWEEN SLIP BASE STUB AND ANCHOR SLEEVE.

SINGLE SQUARE TUBE SIGN TO  
POST INSTALLATION ON SLIP BASE

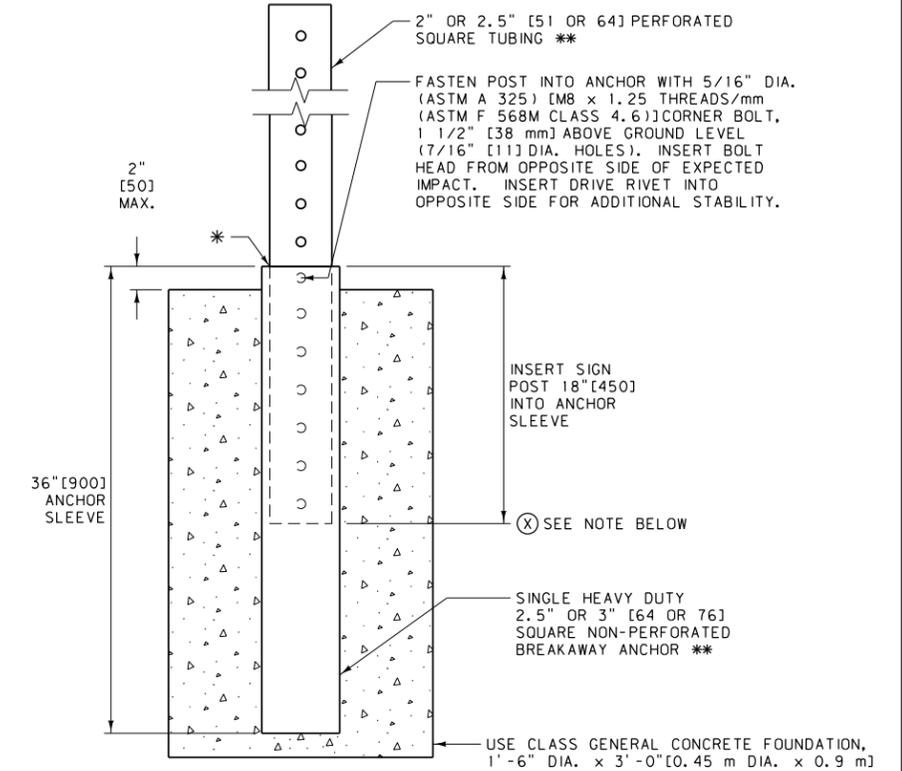
AS NOTED BY THE CIRCLE SYMBOL  
● ON THE LOCATION AND  
SPECIFICATION SHEETS.



\* SHIM AS REQUIRED PER MANUFACTURER RECOMMENDATION TO TAKE UP TOLERANCE BETWEEN SLIP BASE STUB AND ANCHOR SLEEVE.

SINGLE SQUARE TUBE SIGN  
POST INSTALLATION

AS NOTED BY THE TRIANGLE SYMBOL  
▲ ON THE LOCATION AND  
SPECIFICATION SHEETS.



\* MINIMUM OF 2 SHIMS REQUIRED PER INSTALLATION TO TAKE UP TOLERANCE BETWEEN SUPPORT AND ANCHOR SLEEVE.

\*\* SUPPORT AND CORRESPONDING ANCHOR

SUPPORT			ANCHOR		
TUBE SIZE	WEIGHT	WALL THICKNESS	TUBE SIZE	WEIGHT	WALL THICKNESS
2" [51]	2.42 LB./FT. [3.6 kg/m]	0.105" (12 GAUGE) [2.7 (12 GAUGE)]	2.5" [64]	18.36 LB. EA. [8.33 kg EACH]	0.135" (10 GAUGE) [3.4 (10 GAUGE)]
2.25" [64]	2.77 LB./FT. [4.12 kg/m]	0.105" (12 GAUGE) [2.7 (12 GAUGE)]	3" [76]	22.98 LB. EA. [10.43 kg EACH]	0.188" (7 GAUGE) [4.8 (7 GAUGE)]
2.5" [64]	3.14 LB./FT. [4.67 kg/m]	0.105" (12 GAUGE) [2.7 (12 GAUGE)]			

NOTES:

- ① BREAKAWAY DEVICES MUST BE LISTED ON THE DEPARTMENT'S QUALIFIED PRODUCTS LIST.
- ② USE CLASS GENERAL CONCRETE WITH WOOD FLOAT FINISH ON TOP. FORM TOP 6" [150] OF FOUNDATION.
- ③ GALVANIZE PIPE PER AASHTO M 111.

- ④ PAINT PIPE WITH ONE SHOP COAT AND ONE FIELD COAT OF ZINC RICH BASED PAINT AND ONE FIELD COAT OF ALUMINUM PAINT, AS SPECIFIED IN THE STANDARD SPECIFICATIONS SECTION 710, ON ALL SURFACES NOT IN CONTACT WITH THE CONCRETE.
- ⑤ CONFORM STEEL PIPE TO THE REQUIREMENTS OF ASTM A 53 TYPE E OR S, GRADE B.
- ⑥ SUBMIT SHOP DRAWINGS TO BE APPROVED BY THE MONTANA DEPARTMENT OF TRANSPORTATION BEFORE FABRICATION IS BEGUN.

- ⑦ STEEL POSTS AND FOOTINGS IN PLACE, INCLUDING ALL CONCRETE, WELDING, EXCAVATION, AND ALL INCIDENTALS ARE INCLUDED IN THE UNIT PRICE BID PER POUND FOR TUBULAR STEEL POSTS.
- ⑧ USE HARDWARE MEETING THE REQUIREMENTS OF SECTION 704.
- ⊗ BASE POINT OF POST LENGTH MEASUREMENT. TYPE OF POSTS AND FOUNDATIONS, AS WELL AS LENGTHS ARE NOTED IN THE SIGNING QUANTITIES.

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

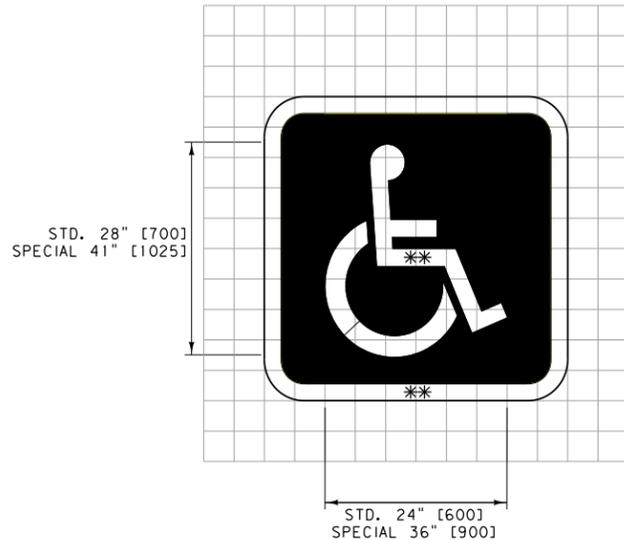
DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION 556, 619, 704, 710	DWG. NO. 619-14
SQUARE TUBULAR SIGN POST BREAKAWAY DEVICES	

--REVISED--  
JULY 2016  
EFFECTIVE: SEPTEMBER 2014  
MDT MONTANA DEPARTMENT OF TRANSPORTATION

**ACCESSIBILITY PARKING SPACE SYMBOL**

(STANDARD) AREA = 11.00 FT<sup>2</sup> [1.02 m<sup>2</sup>]  
 P = 0.04 GAL. [0.14 L] WHITE  
 P = 0.08 GAL. [0.30 L] BLUE  
 (1 SQUARE = 4" [100])

(SPECIAL) AREA = 24.06 FT<sup>2</sup> [2.24 m<sup>2</sup>]  
 P = 0.08 GAL. [0.30 L] WHITE  
 P = 0.17 GAL. [0.64 L] BLUE  
 (1 SQUARE = 5.857" VERTICALLY)  
 (1 SQUARE = 6" [150] HORIZONTALLY)

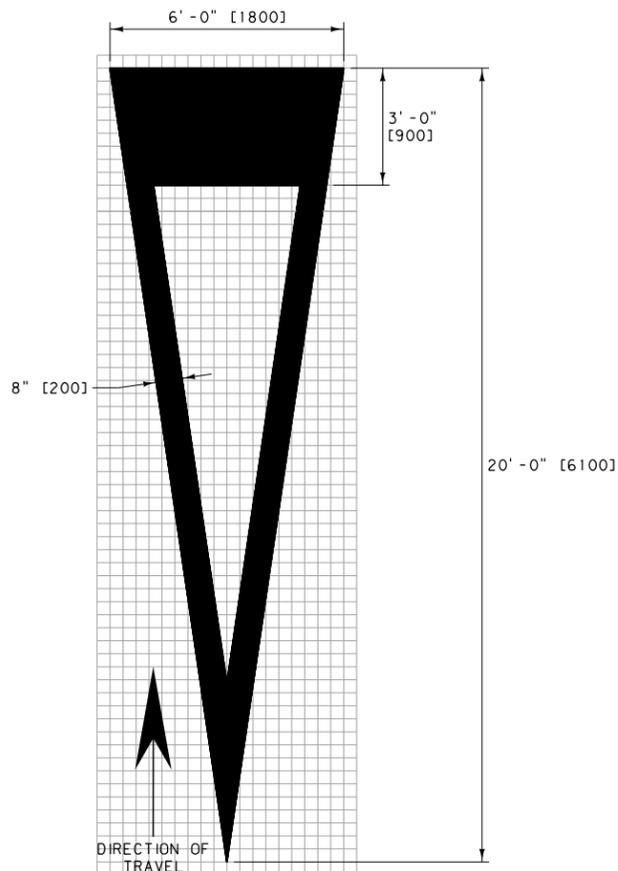


NOTE:  
 CENTER SYMBOL IN PARKING STALL.  
 BORDER REQUIRED UNLESS CONTRACT STATES OTHERWISE.  
 USE STANDARD SYMBOL UNLESS CONTRACT STATES OTHERWISE.

\*\* STROKE WIDTH:  
 STD. 3" [75]  
 SPECIAL 4" [100]

**YIELD AHEAD TRIANGLE**

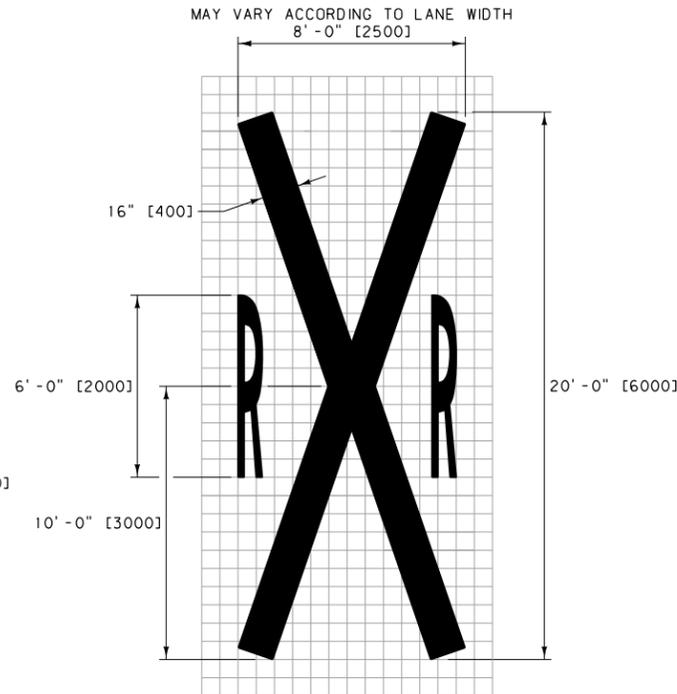
(HIGH SPEED) AREA = 36.54 FT<sup>2</sup> [3.33 m<sup>2</sup>]  
 P = 0.39 GAL. [1.44 L]  
 E = 0.50 GAL. [1.86 L]  
 (1 SQUARE = 4" [100])



NOTE:  
 FOR LOW SPEED INSTALLATIONS, THE 3'-0" [900] AND 20'-0" [6100] DIMENSIONS MAY BE REDUCED TO 2'-6" [750] AND 13'-0" [4000] RESPECTIVELY.

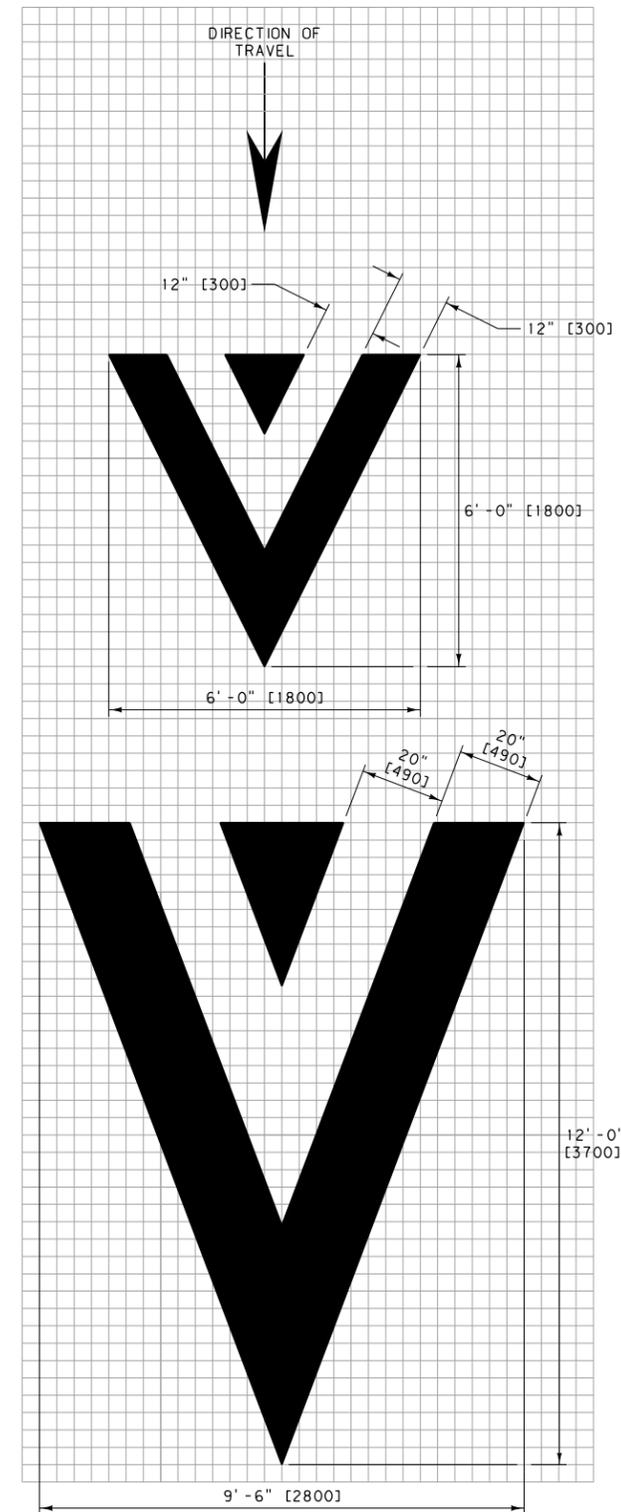
**RAILROAD CROSSING SYMBOL**

AREA = 58.10 FT<sup>2</sup> [5.42 m<sup>2</sup>]  
 P = 0.62 GAL. [2.34 L]  
 E = 0.80 GAL. [3.03 L]  
 (1 SQUARE = 8" [200])



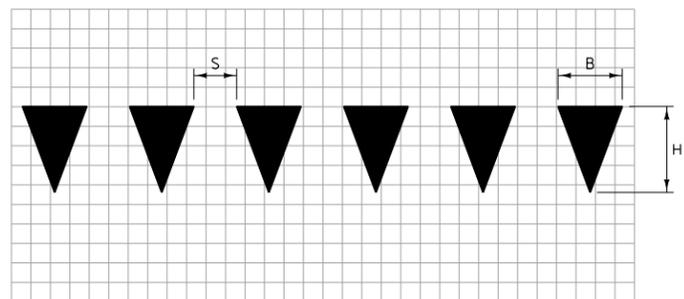
**SPEED HUMP MARKINGS**

AREA = 50.42 FT<sup>2</sup> [4.56 m<sup>2</sup>]  
 P = 0.53 GAL. [1.97 L]  
 E = 0.69 GAL. [2.55 L]  
 (1 SQUARE = 4" [100])



**YIELD LINE LAYOUT**

(QUANTITIES PER TRIANGLE)  
 (B = 2'-0" [600])  
 AREA = 3.00 FT<sup>2</sup> [0.27 m<sup>2</sup>]  
 P = 0.03 GAL. [0.12 L]  
 E = 0.04 GAL. [0.15 L]



B = 2'-0" [600]  
 H = 3'-0" [900]  
 S = 12" [300]

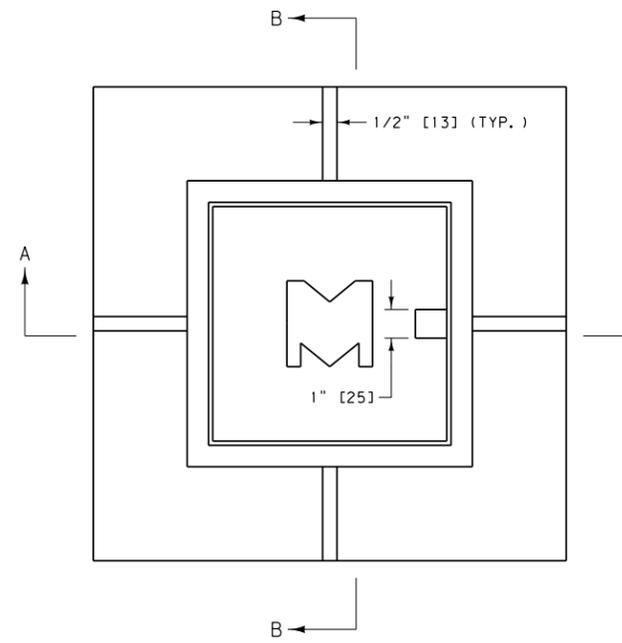
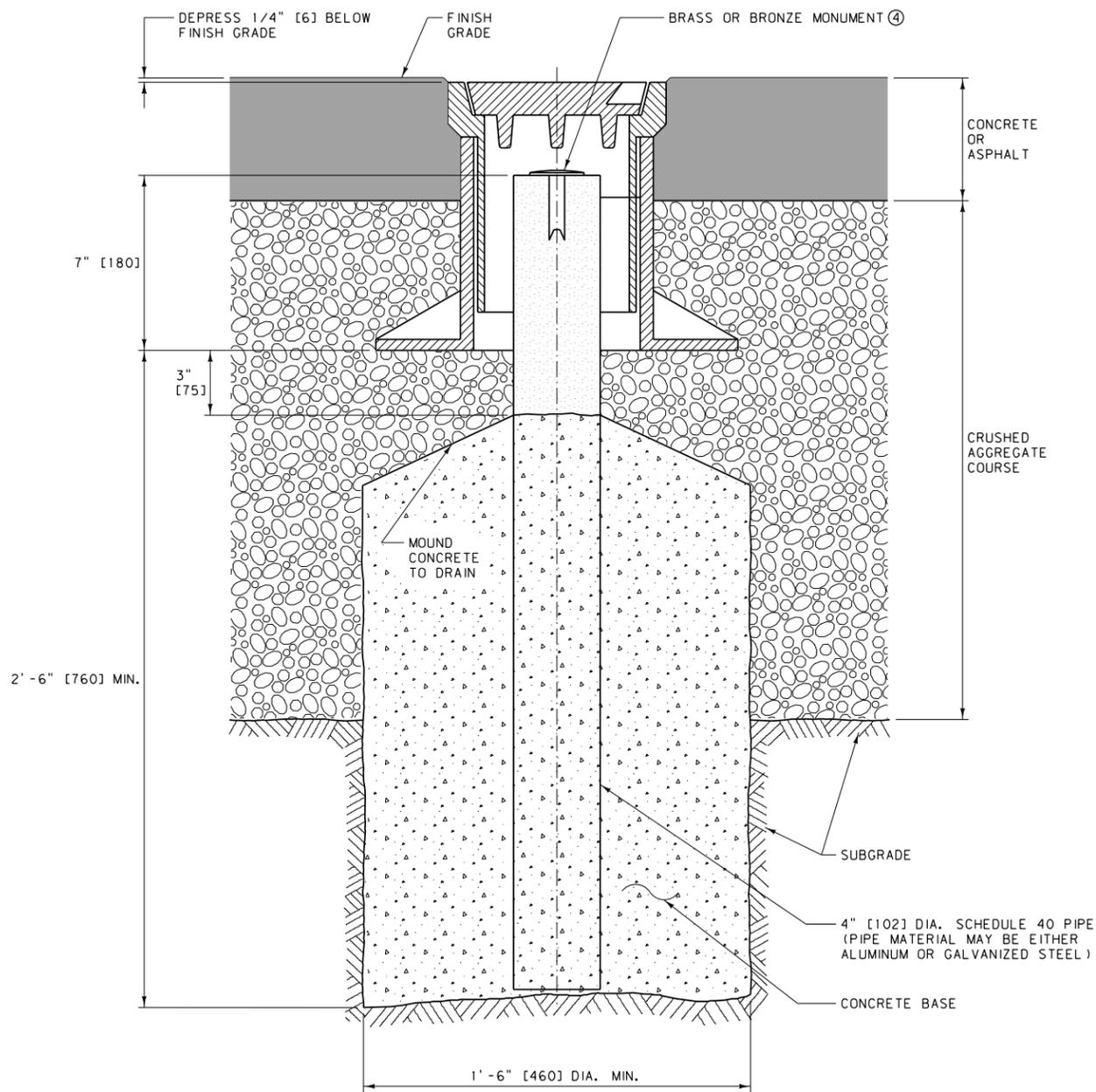
**NOTES:**

- ① ALL PAVEMENT MARKINGS ARE TO CONFORM TO THE REQUIREMENTS OF THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" AND "STANDARD HIGHWAY SIGNS" PUBLICATIONS, FROM THE FEDERAL HIGHWAY ADMINISTRATION.
- ② ALL SYMBOLS ARE TO BE WHITE EXCEPT FOR THE ACCESSIBILITY PARKING SPACE SYMBOL WHICH HAS A BLUE BACKGROUND AND WHITE HANDICAPPED SYMBOL AND BORDER.
- ③ DO NOT EXCEED MORE THAN ONE LANE IN WIDTH FOR ANY PAVEMENT MARKINGS EXCEPT IN THE CASE OF THE WORD "SCHOOL". SEE DTL. DWG. NO. 620-10 FOR MORE INFORMATION.
- ④ WHEN WORDS AND SYMBOLS ARE USED IN COMBINATION, SPACE THEM AT LEAST FOUR TIMES THE HEIGHT OF CHARACTERS FOR LOW-SPEED ROADS, BUT NOT MORE THAN TEN TIMES THE HEIGHT OF THE CHARACTERS UNDER ANY CONDITION.
- ⑤ QUANTITIES ARE BASED ON THE SIZES OF PAVEMENT MARKINGS SHOWN AND ARE FOR ESTIMATING PURPOSES ONLY.
- ⑥ (P) - PAINT VOLUMES ASSUME A 17 MIL [0.432] THICKNESS.  
 (E) - EPOXY VOLUMES ASSUME A 22 MIL [0.559] THICKNESS.

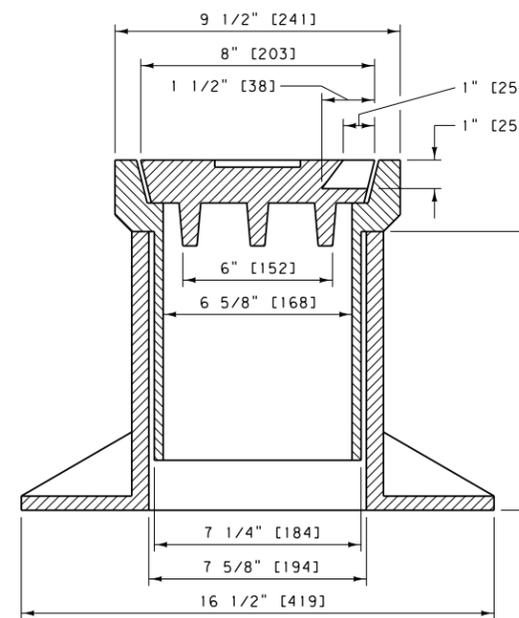
UNITS SHOWN IN BRACKETS [ ] ARE METRIC AND ARE IN MILLIMETERS (mm) UNLESS OTHER UNITS ARE SHOWN.

-- REVISED --  
 JULY 2016

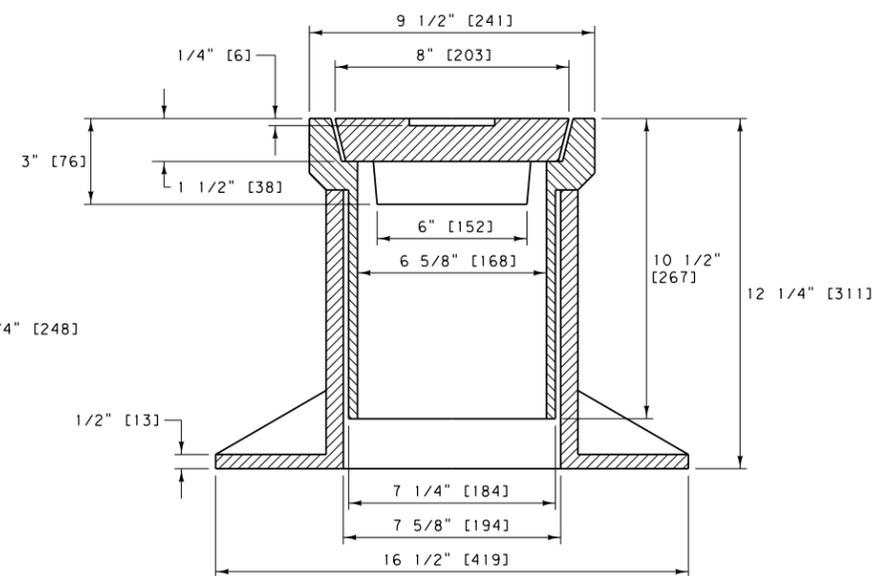
DETAILED DRAWING	
REFERENCE	DWG. NO.
STANDARD SPEC.	620-20
SECTION 620	
PAVEMENT MARKINGS (SYMBOLS)	
EFFECTIVE: SEPTEMBER 2014	
<b>MDT</b> MONTANA DEPARTMENT OF TRANSPORTATION	



PLAN  
NEENAH FOUNDRY R-1968 TYPE 36-B ADJUSTABLE MONUMENT BOX (HEAVY DUTY) OR APPROVED EQUAL



SECTION A-A



SECTION B-B

NOTES:

- ① INSTALL THE 4" [102] DIA. PIPE, CONCRETE BASE AND ADJUSTABLE MONUMENT BOX AS DETAILED. PLACE CONCRETE IN THE PIPE UP TO 10" [255] BELOW THE TOP OF THE PIPE (DO NOT FILL COMPLETELY.)
- ② POSITION THE CENTER OF THE PIPE TO WITHIN 1/2" [13] HORIZONTALLY OF THE DESIRED COORDINATES AND CENTER THE MONUMENT BOX OVER THE PIPE.
- ③ DEPENDING ON CONTRACT REQUIREMENTS, EITHER MDT FORCES UNDER THE DIRECT SUPERVISION OF A MONTANA LICENSED PROFESSIONAL LAND SURVEYOR OR CONTRACTOR FORCES UNDER THE DIRECT SUPERVISION OF A MONTANA LICENSED PROFESSIONAL LAND SURVEYOR IS REQUIRED TO FILL THE REMAINING 10" [255] OF THE 4" [102] DIA. PIPE WITH CONCRETE. SET AND MARK THE BRASS OR BRONZE MONUMENT WITHIN THE BOX AFTER CONSTRUCTION. THE MONTANA LICENSED PROFESSIONAL LAND SURVEYOR IS REQUIRED TO PREPARE AND FILE CORNER RECORDATIONS IN ACCORDANCE WITH STATE STATUTES, ADMINISTRATIVE RULES OF MONTANA AND PROVISIONS OF THE MDT SURVEY MANUAL. PROVIDE COPIES OF FILED CORNER RECORDATIONS TO THE PROJECT MANAGER, WHO WILL FORWARD THEM TO THE DISTRICT SURVEY MANAGER.
- ④ AN ACCEPTABLE BRONZE MONUMENT IS THE "BERNTSEN C25DB" OR APPROVED EQUAL. AN ACCEPTABLE BRASS MONUMENT IS THE "SURV-KAP M/M-BCS-2 1/2 D" OR APPROVED EQUAL.
- ⑤ USE CLASS GENERAL CONCRETE OR APPROVED EQUAL.

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

--REVISED--  
JULY 2016

DETAILED DRAWING	
REFERENCE STANDARD SPEC. SECTION	DWG. NO. 900-15
ADJUSTABLE MONUMENT BOX	
EFFECTIVE: SEPTEMBER 2014	
	