METRIC / ENGLISH
SUPPLEMENTAL DRAWINGS

Supplement to the

1996 Metric Edition of the Construction
and Traffic Standard Details

and the

1977 Mass. Department of Public Works
Construction Standards

April 2003
Introduction to
The April 2003 M/E Construction Drawing Supplement

These drawings are the supplement to the 1996 Metric Edition of the Construction and Traffic Standard Details, and the 1977 Mass. Department of Public Works Construction Standards. They supersede any previously issued supplements or revisions to either document.

This document includes revised and newly issued drawings. These include drawings issued December 2001, April 2002, and October 2002.

This dual unit supplement, when combined with the 1996 Metric Construction and Traffic Standard Details or the 1977 English unit Construction Standards, forms a document updated to current MassHighway practice.

While these drawings are in dual units, all conversions are not exact (soft) conversions nor are they completely rationalized (hard) conversions. Therefore, it is important to work in only one system and not to try to convert from one set of units to the other.

The M/E preceding the number indicates that it is a dual unit drawing. In most cases, the number that follows is the metric unit standard or English unit standard that is being updated from the original document. In some cases a new drawing is being issued, and the number is a previously unused number. The exception to this is the concrete barrier drawings, which were grouped together and issued new numbers. Drawings with an "R" suffix have been revised from previously issued M/E Drawings.

The following lists are the drawings which have been deleted from current use. There are separate lists for the 1996 Metric Construction and Traffic Standard Details and for the 1977 English unit Construction Standards. There is a forwarding reference to the newly grouped concrete barrier drawings.
# Deleted English Drawings

The following Drawings have been deleted from the Massachusetts Department of Public Works 1977 Standard Construction Drawings, or from subsequently issued revisions, and should no longer be referred to.

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## Deleted Metric Drawings

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NOTES:

1. WHEN THE TOTAL THICKNESS OF ASPHALT CONCRETE OVER THE EXISTING JOINT EXCEEDS 112mm (4-3/8"), A 4mm (1/8") SAWCUT SHALL BE INCLUDED IN THE JOINT AS SHOWN TO A MINIMUM DEPTH OF 62mm (2-1/2").

2. PRIOR TO PLACING THE OVERLAY, ALL JOINTS SHALL BE LOCATED AND REFERENCED.
NOTES:
2. ONLY EXPANSION JOINTS SHALL BE SAW-CUT AND SEALED.
3. ONLY REQUIRED WITH A CONTINUOUS BITUMINOUS CONCRETE SURFACE FROM ROADWAY TO BRIDGE.

LOCATION OF SAW CUT FOR TRANSVERSE JOINTS AT BRIDGE ABUTMENT
**NOTES:**

1. CONTRACTION JOINTS ARE TO BE SPACED AT A MAXIMUM OF 6 m (20'') APART.
2. THE JOINTS ARE TO BE SAWED AND LOCATED IN THE DEPRESSIONS OF THE CORRUGATIONS, SEE DETAIL OF CORRUGATIONS.
3. END OF CORRUGATED RIDGES TO BE BEVELED.
4. FOR DESCRIPTION OF MATERIAL AND CONSTRUCTION METHODS SEE STANDARD SPECIFICATIONS AND SPECIAL PROVISIONS.
5. SCORED CEMENT CONCRETE TO BE:
   35 MPa, 20 mm, 420 kg/m³
   (5000 psi−3/4"−705 lb/Cu.Yd.)
NOTE:

FOR MODIFIED BERM THE SLOPE REMAINS CONSTANT AT 1 (V) TO 10 (H)

* THIS DIMENSION VARIES WITH THE THICKNESS OF THE TOP COURSE AND SLOPE OF SHOULDER

** SEE TYPICAL SECTIONS FOR PROJECT
NOTES:

1. THIS PROCEDURE IS APPLICABLE ONLY IF CURB IS TO BE SET AFTER BASE AND/OR BINDER COURSES ARE IN PLACE.

2. CUT NEAT LINE 150mm (6") FROM CURB LINE AND REMOVE BINDER, BASE AND GRAVEL, REPLACE WITH CEMENT CONCRETE.

3. ANY DESIGNATED CEMENT CONCRETE THAT IS ACCEPTABLE UNDER SECTION M4 OF THE STANDARD SPECIFICATIONS MAY BE USED; ALL TEST REQUIREMENTS ARE WAIVED. BITUMINOUS CONCRETE SHALL NOT TO BE USED AS A SUBSTITUTE.

4. PAYMENT FOR CEMENT CONCRETE WILL BE INCLUDED IN THE PRICE PER METER (FOOT) OF CURBING.
1. ANY DESIGNATED CEMENT CONCRETE THAT IS ACCEPTABLE TO THE DEPARTMENT UNDER SECTION M4 OF THE STANDARD SPECIFICATIONS; ALL TEST REQUIREMENTS ARE WAIVED. BITUMINOUS CONCRETE SHALL NOT TO BE USED AS A SUBSTITUTE.

2. PAYMENT FOR CEMENT CONCRETE WILL BE INCLUDED IN THE PRICE PER METER (FOOT) OF EDGING.

3. THE REVEAL IS TO BE A MAXIMUM OF 100 mm (4") UNDER ALL CONDITIONS.
1. ROADWAY SIDEWALK CROSS SLOPES, FOR BRICK, CEMENT CONCRETE, AND BITUMINOUS CONCRETE, AS INDICATED IN THE STANDARD SPECIFICATIONS, WILL BE 1.5%. A CONSTRUCTION TOLERANCE OF ±0.5% IS ACCEPTABLE ON ROADWAY SIDEWALKS. SIDEWALKS ON BRIDGES WILL BE CONSTRUCTED TO A CROSS SLOPE OF 1.0% IN ACCORD WITH BRIDGE POLICY. (REFER TO STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES, SECTION 700.) IN ACCORDANCE WITH 521 CMR THE RULES AND REGULATIONS OF THE ARCHITECTURAL ACCESS BOARD (AAB), THE SIDEWALK CROSS SLOPE CANNOT EXCEED 2.0%.

2. AN UNOBSTRUCTED PATH OF TRAVEL WITH A MINIMUM WIDTH OF 1.00 m (3'-3") SHALL BE MAINTAINED PAST ALL OBSTRUCTIONS (UTILITY POLES, SIGNS, SIGNAL FOUNDATIONS AND MASTS, MAILBOXES, ALONG DRIVE OPENINGS, ETC.).

3. THE WHEELCHAIR RAMP SLOPES AND SIDE SLOPES (TRANSITIONS) WILL BE 7.5% WITH A CONSTRUCTION TOLERANCE OF ±0.5%. HOWEVER, THESE SLOPES MAY BE FLATTER WHEN WARRANTED BY SURROUNDING CONDITIONS.

4. WHERE THE ROAD PROFILE EXCEEDS 4%, THE HIGH SIDE TRANSITION LENGTH UNDER ANY CONDITIONS NEED NOT EXCEED 4.57 m (15 FEET).

5. IN NO CASE WHERE A STOP LINE IS WARRANTED, SHALL A RAMP BE PLACED ON THE TRAFFIC APPROACH SIDE OF THAT STOP LINE.

6. FIXED OBJECTS (I.E. UTILITY POLES, HYDRANTS, SIGNS, SIGNAL FOUNDATIONS, ETC.) MUST NOT ENCROACH ON ANY PART OF THE WHEELCHAIR RAMP INCLUDING TRANSITION SLOPES.

7. AT NO TIME IS ANY PART OF THE WHEELCHAIR RAMP, EXCLUDING CURB TRANSITIONS, TO BE LOCATED OUTSIDE THE CROSSWALK. THE WHEELCHAIR RAMP ENTRANCE IS TO BE CENTERED IN THE CROSSWALK WHENEVER POSSIBLE.

8. CATCH BASINS WHICH ARE TO BE LOCATED IN THE VICINITY OF A WHEELCHAIR RAMP SHALL BE LOCATED UPGRADE OF THE RAMP ENTRANCE.

9. THE ENTRANCE OF A WHEELCHAIR RAMP SHALL BE FLUSH WITH THE ROADWAY.

10. TESTING SURFACE: WHEN TESTING WITH A STRAIGHTEDGE PLACED PARALLEL TO THE LINE OF THE SLOPE THERE SHALL BE NO DEVIATION FROM A TRUE SURFACE IN EXCESS OF 6 mm (¼").

11. WHEELCHAIR RAMPS ON BRIDGES SHOULD BE AVOIDED. IF A WHEELCHAIR RAMP IS REQUIRED TO BE PLACED ON A BRIDGE, PRIOR WRITTEN APPROVAL OF THE BRIDGE ENGINEER IS REQUIRED. SPECIAL DETAILING OF THE REINFORCEMENT AND CURB REVEAL WILL BE REQUIRED TO MAINTAIN THE PERFORMANCE OF THE RAILING/BARRIER SYSTEM.
LEGEND

HSL = HIGH SIDE TRANSITION LENGTH
     (SEE M/E 107.9.0)

W = SIDEWALK WIDTH

W₁ = PERPENDICULAR RAMP LENGTH

Wc = CURB WIDTH

* = TOLERANCE FOR CONSTRUCTION ±0.5%

USABLE SIDEWALK WIDTH PER AAB = W - Wc

RAMP LENGTH, W₁ = W - 1.22 m (4'-0") Min

SECTION A-A

W = SIDEWALK WIDTH

W₁ = RAMP LENGTH

1.22 m MIN

(4'-0") MIN

1.5%* 7.5%

150 mm (6") EDGE OF ROADWAY

100 mm (4") CC

200 mm (8") FOUNDATION

SIDEWALK

ROADWAY

1.5%* 7.5%"LEVEL LANDING"
SLOPE FOR DRAINAGE

A

HSL
HIGH SIDE TRANSITION

1.525 m MIN. (5'-0")

2.0 m (6'-6") LOW SIDE TRANSITION

150 mm (6") CURB REVEAL (TYP.)

ROADWAY DOWNGRADE

LIMITS OF CEMENT CONCRETE RAMP

Wc
**WHEELCHAIR RAMPS**

**CONSTRUCTION STANDARDS**

**GREATER THAN 3.75 m (12'-4'') SIDEWALK**

*LEGEND*

- **HSL** = HIGH SIDE TRANSITION LENGTH
  - SEE M/E 107.9.0
- **W** = SIDEWALK WIDTH
- **W1** = PERPENDICULAR RAMP LENGTH
- **Wc** = CURB WIDTH
- **= TOLERANCE FOR CONSTRUCTION ±0.5%**
- **USABLE SIDEWALK WIDTH PER AAB = W-Wc**
- **RAMP LENGTH, W1 = W - 1.22 m (4'-0'') Min**

**DRAWING NUMBER**

M/E 107.3.0

**DATE OF ISSUE**

December 2001

**SECTION A-A**
**LEGEND**

HSL = HIGH SIDE TRANSITION LENGTH

SEE M/E (107.9.0)

* TOLERANCE FOR CONSTRUCTION ±0.5%
CLEAR PATH OF TRAVEL OF 1.00 m (3'-3") Minimum REQUIRED

LEGEND

- BUILDING OR OTHER UNALTERABLE CONDITION

* TRANSITION LENGTH SHOWN IS MINIMUM.
(SEE M/E 107.9.0)

** TOLERANCE FOR CONSTRUCTION ±0.5%

"T" INTERSECTION
WHEELCHAIR RAMP

DATE OF ISSUE
December 2001
DRAWING NUMBER
M/E 107.6.4
3.0 m (10 FT) SIDEWALK LAYOUT

2.4 m (8 FT) SIDEWALK LAYOUT

NOTES:

1. WHEN THE SIDEWALK IS PAVED TO THE CURB LINE, USE SHORT CURB RETURNS AT THE HIGHWAY CURB LINE PC'S, SHOWN IN THESE DESIGNS.

MUST MAINTAIN 1.00 m (3'-3") LEVEL PATH OF TRAVEL AT 1.5% CROSS SLOPE

RESIDENTIAL DRIVEWAYS

DATE OF ISSUE
December 2001

DRAWING NUMBER
M/E 107.8.1
<table>
<thead>
<tr>
<th>ROADWAY PROFILE GRADE</th>
<th>*HIGH SIDE TRANSITION LENGTH</th>
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<tr>
<td></td>
<td>METRIC UNITS</td>
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<td>%</td>
<td></td>
</tr>
<tr>
<td>0</td>
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</tr>
<tr>
<td>&gt;0⇒1</td>
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<tr>
<td>&gt;1⇒2</td>
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<td>&gt;2⇒3</td>
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<tr>
<td>&gt;4</td>
<td>4.6 m Max</td>
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</table>

NOTE:

*BASED ON A DESIGN SLOPE OF 7.5% AND A REVEAL OF 150 mm (6’).
CONCRETE CRADLE
FOR PIPE CULVERTS

CEMENT CONCRETE
30 MPa, 40 mm, 335 kg/m³
(4000 PSI−1 1/2"−565 lb/Cu.Yd.)
ONLY TO BE USED WHERE SPECIFIED

NOTES:
1. FOR DESCRIPTIONS, MATERIALS AND CONSTRUCTION
   METHODS, SEE LATEST STANDARD SPECIFICATIONS.
2. ALL CONCRETE DIMENSIONS SHOWN ARE MINIMUM.
3. PAYMENTS WILL BE BASED ON THE ACCOMPANYING TABLE.
4. FOR QUANTITY TABLES SEE M/E 206.4.1

END ELEVATION

FIELD STONE IMBEDDED IN MORTAR

PORTLAND CEMENT MORTAR CAP

300 mm (12")

25 mm (1")

GROUND LINE

600 mm (2'-0")

450 mm (18")

CEMENT CONCRETE
30 MPa, 40 mm, 335 kg/m³
(4000 PSI−1 1/2"−565 lb/Cu.Yd.)
ONLY TO BE USED WHERE SPECIFIED

END ELEVATION
### Metric Units

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<th>PIPE Diam. D mm</th>
<th>1V : 1.5H Slope</th>
<th>1V : 2H Slope</th>
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<td>L m</td>
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<tr>
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<td>Conc. or F.S.M.</td>
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<td>1.61</td>
</tr>
</tbody>
</table>

Y

100 mm FOR 1V : 1.5H SLOPE  
150 mm FOR 1V : 2H SLOPE

### English Units

<table>
<thead>
<tr>
<th>PIPE Diam. D</th>
<th>1 1/2 : 1 SLOPE</th>
<th>2 : 1 SLOPE</th>
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</thead>
<tbody>
<tr>
<td>L</td>
<td>L</td>
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<tr>
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<td>Conc. or F.S.M.</td>
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<td>Steel LBS.</td>
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Y

4" FOR 1 1/2 : 1 SLOPE  
6" FOR 2 : 1 SLOPE
### TABLE
[ALL DIMENSIONS ARE mm (Inches) OR m (Feet)]

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<th>W</th>
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<th>B</th>
<th>D</th>
<th>E</th>
<th>P</th>
<th>DIA. +25 mm(1&quot;)</th>
<th>R1</th>
<th>R2</th>
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<tr>
<td>300 mm</td>
<td>51 mm</td>
<td>102 mm</td>
<td>610 mm</td>
<td>1.829 m</td>
<td>610 mm</td>
<td>506 mm</td>
<td>330 mm</td>
<td>257 mm</td>
<td>229 mm</td>
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<tr>
<td>(12&quot;)</td>
<td>(2&quot;)</td>
<td>(4&quot;)</td>
<td>(2'-0&quot;)</td>
<td>(6'-0&quot;)</td>
<td>(2'-0&quot;)</td>
<td>(19 15/16&quot;)</td>
<td>(13&quot;)</td>
<td>(10 1/8&quot;)</td>
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<tr>
<td>375 mm</td>
<td>57 mm</td>
<td>152 mm</td>
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<td>782 mm</td>
<td>618 mm</td>
<td>406 mm</td>
<td>318 mm</td>
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<tr>
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<td>(2 1/4&quot;)</td>
<td>(6&quot;)</td>
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<td>(6'-0&quot;)</td>
<td>(2'-6&quot;)</td>
<td>(24 5/16&quot;)</td>
<td>(16&quot;)</td>
<td>(12 1/2&quot;)</td>
<td>(11&quot;)</td>
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<td>(28&quot;)</td>
<td>(18 9/16&quot;)</td>
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<td>(49&quot;)</td>
<td>(28 1/2&quot;)</td>
<td>(22&quot;)</td>
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</tr>
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</table>

NOTES:
1. SEE STANDARD SPECIFICATIONS FOR THE TYPE OF PIPE TO BE USED (BELL & SPIGOT OR TONGUE & GROOVE)
2. SEE STANDARD SPECIFICATIONS FOR THE TYPE OF PIPE AND PLACING OF STEEL REINFORCEMENT.
3. THE JOINTS ARE TO BE COMPATIBLE WITH THE MAIN RUN OF PIPE.
NOTES:

ANY JOINT SYSTEM APPROVED AND ACCEPTED BY AASHTO AND MHD STANDARD SPECIFICATIONS FOR REINFORCED CEMENT CONCRETE PIPE WILL BE ACCEPTABLE.
SURFACE TREATMENT:

100 mm (4") PLANTABLE SOIL AND SEED OVER

200 mm (8") COMPACT GRAVEL OR

100 mm (4") MINIMUM DEPTH OF PAVEMENT MILLING MULCH PLACE DIRECTLY OVER GEOTEXTILE AND CRUSHED STONE BOX

12.5 mm (1/2") CRUSHED STONE

GEOTEXTILE

PERFORATED PIPE

PERFORATIONS UP

PIPE

DIAMETER

50 mm (2") FOR PERVIOUS BOTTOM

MINIMUM WIDTH

O.D. PIPE + 300 mm (12")

NOTES:

1. GEOTEXTILE FABRIC AS DESCRIBED IN SECTION M9.50

2. PIPE SHALL BE SET AT BOTTOM OF TRENCH FOR IMPERVIOUS BOTTOM.

3. SUBDRAIN LOCATED APPROXIMATELY AT INTERSECTION OF TANGENTS (SEE DWG.102.1.0)

4. GRAVEL (AND SPECIAL BORROW WHERE REQUIRED) SHALL INTERSECT CRUSHED STONE FOR SUBDRAIN

DATE OF ISSUE
December 2001

DRAWING NUMBER
M/E 209.1.0
FILTER FABRIC FOR EROSION CONTROL (STAKE FILTER FABRIC EVERY 300 mm (1 ft))

150 mm x 150 mm (6" x 6") TRENCH LAY FILTER FABRIC IN TRENCH END UP SLOPE AND BACK FILL

HAY BALES FOR EROSION CONTROL (2 STAKES PER BALE)
SPECIAL SLOPE PAVING UNDER BRIDGES
REINFORCED CONCRETE SLAB

PLAN

TOP OF OUTSIDE FACE OF CONCRETE CURTAIN TOE WALL

SECTION A–A

* SEE M/E 303.1.1 FOR SECTION B–B AND CONSTRUCTION AND EXPANSION JOINTS DETAILS.
NOTES:
1. WIRE FABRIC TO HAVE 300 mm (12") MINIMUM LAP AT SPLICE AND SHOULD EXTEND WITHIN 75 mm (3") OF ALL EDGES
2. SLAB SHALL BE GROOVED PARALLEL TO AND NORMAL TO THE CURTAIN TOE WALL AT APPROXIMATELY 1.83 m (6") GRIDS. THE GROOVE DEPTH SHALL BE 25 mm (1")
3. FOR LIMITS OF SLOPE PAVING SEE BRIDGE MANUAL.
4. CONCRETE SHALL BE 30 MPa, 40 mm, 335 kg/m3 (4000 psi−1 1/2"−565 lb/Cu.Yd.)
5. EXTEND GEOTEXTILE FABRIC BENEATH CRUSHED STONE FROM TOP OF CONCRETE CURTAIN TOE WALL TO FACE OF ABUTMENT.
6. SEE M/E 303.1.0 FOR SLAB PLAN AND SECTION.
NCHRP 350 TEST LEVEL 3 GUARDRAIL TERMINAL SECTIONS ON ALL ROADWAYS WITH DESIGN SPEED OF 80 Km/Hr (50 MPH) OR GREATER.
BURIED ENDS ONLY FOR ROADWAYS WITH SPEEDS LESS THAN 80 Km/Hr (50 MPH).

* STANDARD LENGTH POST TO BE USED IN RAMPED SECTIONS.
*** 15.24 m (50') FOR THRIE BEAM.
**** WHEN PLACED IN MEDIAN, CHANGE TO THRIE BEAM AND HEIGHT 827 mm±25 mm (2'8 1/2''±1''). FOR SECTION Z-Z, (NOTE E HEIGHT IS ALWAYS 550 mm)

NOTES:
1. THIS METHOD OF INSTALLATION IS APPLICABLE WHEN THE EMBANKMENT SLOPE ADJACENT TO THE ROADWAY IS 1V:2H OR STEEPER.
2. LENGTHS OF HIGHWAY GUARD SHOWN ARE MEASUREMENTS ALONG ALONG FACE OF THE RAILING.
3. OTHER DETAILS ARE SHOWN ON M/E 401.5.0 - M/E 401.10.0
4. FOR DESCRIPTION, MATERIALS AND CONSTRUCTION METHODS SEE STANDARD SPECIFICATIONS.
5. DETAILS SHOWN HERE ALSO APPLY TO THRIE BEAM GUARD RAIL EXCEPT AS OTHERWISE NOTED.
** SECTION Z-Z**

**PAVEMENT MILLING MULCH**

- WHEN PLACED IN MEDIAN, CHANGE TO TRHIE BEAM AND HEIGHT TO 827 mm ± 25 mm (2'-8 1/2" ± 1").
  (NOTE: HEIGHT OF RAIL IS ALWAYS 550 mm)
- SEE M/E 401.01.0

**SECTION Z-Z**

**VERTICAL GRANITE CURB OR BITUMINOUS CONCRETE CURB ALONG EDGE OF SHOULDER**

**SECTION Z-Z**

**TYPE "A" BERM ALONG EDGE OF SHOULDER**

---

**STEEL BEAM HWY GUARD—TYPE SS**

**TYPICAL INSTALLATION**
**PLAN VIEW**

TRAILING END

APPROACH SECTION RAMP

GROUND LINE

11.43 m± (37.5±)

ALL POST TO BE SPACED 1.905 m (6'-3") C. TO C.

**ELEVATION VIEW**

FACE OF FOOTING

GUARD RAIL WITH POST SPACING OF 1.905 m (6'-3")

FULL SPAN - 1V : 6H SLOPE

FACE OF FOOTING

GUARD RAIL WITH POST SPACING OF 1.905 m (6'-3")

FULL SPAN - 1V : 4H SLOPE

* SEE TABLE ON M/E 401.3.0 FOR DIMENSIONS
** 15.24 m (50") FOR THRE BEAM
*** STANDARD LENGTH POSTS SHALL BE USED IN RAMPED SECTIONS

NOTES:

1. LENGTHS OF HIGHWAY GUARD SHOWN ARE MEASUREMENTS ALONG FACE OF RAILING.
2. FOR DESCRIPTIONS, MATERIAL AND CONSTRUCTION METHODS, SEE THE STANDARD SPECIFICATIONS AND CONSTRUCTION M/E 401.1.0 AND M/E 401.5.0 - M/E 401.10.0.
3. DETAILS SHOWN HEREIN ALSO APPLY TO THRE BEAM GUARD RAIL, EXCEPT AS OTHERWISE NOTED.
4. WHEN PLACED IN MEDIAN, CHANGE TO THRE BEAM & HEIGHT OF 827 mm ± 25 mm (2'-6 1/2"±1")
5. POST TYPES SHALL NOT BE INTERCHANGED IN ANY CONTINUOUS RUN OF GUARD RAIL. BRACKETS SHALL BE SIMILAR TO POST.
### TYPICAL INSTALLATION *

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>W SECTION</td>
<td>THRIE BEAM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALL GUARDRAIL CONFIGURATION SHOWN ON M/E 401.1.1 SECTION Z–Z</td>
<td>0.5 m± (20&quot;)</td>
<td>1.0 m± (3’–3&quot;)</td>
<td>2.0 m± (6’–6&quot;)</td>
</tr>
</tbody>
</table>

**NOTE:** ALL MEASUREMENTS ARE FROM EDGE OF USABLE SHOULDER

### FOR OVERHEAD SIGN PROTECTION **

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>W SECTION</td>
<td>THRIE BEAM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1V : 2H SLOPE 2:1 SLOPE</td>
<td>0.5 m± (20&quot;)</td>
<td>1.0 m± (3’–3&quot;)</td>
<td>2.0 m± (6’–6&quot;)</td>
</tr>
<tr>
<td>1V : 4H SLOPE 4:1 SLOPE</td>
<td>1.83 m± (6’–0&quot;)</td>
<td>2.36 m± (7’–9&quot;)</td>
<td>3.35 m± (11’–0&quot;)</td>
</tr>
<tr>
<td>1V : 6H SLOPE 6:1 SLOPE</td>
<td>4.88 m± (16’–0&quot;)</td>
<td>5.41 m± (17’–9&quot;)</td>
<td>6.40 m± (21’–0&quot;)</td>
</tr>
</tbody>
</table>

* SEE M/E 401.1.0  
** SEE M/E 401.2.0
NOTES:
1. FOR POST & BLOCK-OUT DETAILS
   SEE M/E 401.6.0R AND M/E 401.21.0
2. FOR HARDWARE DETAILS
   SEE M/E 401.7.0R
3. LAP DOWN STREAM IN DIRECTION OF TRAFFIC
NOTES:
1. CURB AND BERM OPTIONAL

2. CURB INLET OR PWW OPTIONAL

3. FOR SECTIONS A-A AND B-B, SEE M/E 401.5.2

4. ONE PANEL THRIE BEAM BEFORE TRANSITION TO W BEAM

5. FOR POST SEE M/E 401.5.5

SEE M/E 401.5.3 FOR TERMINAL CONNECTOR DIMENSIONS AND DETAILS
TWO SECTIONS OF THRIE BEAM
ONE SET INSIDE THE OTHER

150 mm (6") X 200 mm (8") WOOD POST
(SEE M/E 401.5.5)

SECTION A—A
(SEE M/E 401.5.1)

150 mm (6") X 200 mm (8") WOOD POST
(SEE DWG. 401.5.5)

SECTION B—B
(SEE M/E 401.5.1)

-BRIDGE END POST TO GUARDRAIL
ATTACHMENT TRANSITION SECTIONS-

M/E 401.5.2
NOTES: 1. BASE METAL THICKNESS = 3.43 mm (1/8") (10 GAGE)
2. SEE M/E 401.4.1
NOTES:
1. BASE METAL THICKNESS = 7 mm (1/4") (SCHEDULE 40 STEEL PIPE)
2. SEE M/E 401.5.1
20 mm (3/4") DIA BOLT HOLES, AS REQUIRED FOR MEDIAN BARRIER
M16x2 - 255 mm (10") LONG RAIL BOLT WITH WASHER AND RECESSED NUT

75 mm (4") MIN.
160 mm (6") ± R

RAIL BOLT W/WASHER

165 mm (6 1/2")
625 mm (2'-1 1/2")

DIRECTION OF TRAFFIC

TERMINAL SECTION

24 mm (29/32") X 30 mm (1 1/8") SLOTTED HOLES
USE SPLICE BOLTS

NOTES:
1. POST TO BE FABRICATED FROM W150 X 13.5 (W6"X9") STEEL SECTIONS AS SHOWN.
2. POST TO BE 20 mm DIA. (3/4"). (STD GALV WASHERS TO BE USED AT THESE CONNECTIONS).
3. FOR BLOCK-OUT DETAILS SEE M/E 401.21.0.
THE CROSS-SECTIONAL DIMENSIONS FOR THIS END ARE THE SAME AS FOR THE W BEAM

\[ \varphi 24 \text{ mm} \times 30 \text{ mm} \]  
\( (\frac{15}{16}\text{"} \times 1\frac{1}{8}')) \]  
SPlice Bolt SLOTS (TYP)

\[ \varphi 20 \text{ mm} \times 65 \text{ mm} \]  
\( (\frac{3}{4}\text{"} \times 2\frac{1}{2}')) \]  
SPlice Bolt SLOTS (TYP)

NOTE: BASE METAL TICKNESS = 2.67 mm (12 GAUGE)
20 mm (3/4") DIA BOLT HOLES, AS REQ'D FOR MEDIAN BARRIERS

M16x2 - 255 mm (10"") LONG GUARD RAIL BOLT WITH WASHER AND RECESSED NUT

PLAN TERMINAL SECTION

24 mm (15/16") X 30 mm (1 1/8") SLOTTED HOLES. USE SPLICE BOLTS.

25 mm (1")

FRONT TERMINAL SECTION

DIRECTION OF TRAFFIC

NOTES:
1. POST TO BE FABRICATED FROM W150 X 13.5 (W6"x9") STEEL SECTIONS AS SHOWN.
2. POST TO BE 20 mm DIA. (3/4"). (STD GALV WASHERS TO BE USED AT THESE CONNECTIONS).
3. FOR RAIL BOLT SLOT DETAILS SEE M/E 401.70.
4. FOR BLOCK-OUT DETAILS SEE M/E 401.20.0.
STEEL THRIE BEAM RAIL

STEEL THRIE BEAM RAIL

200 mm (3/4') BOLT HOLE

M16 RAIL BOLT, 640 mm (25 1/4")
LONG, 2 PER POST
MIN. 51 mm (2") THREAD

200 mm x 150 mm (8"x6") WOOD POST

REVISION:
CHANGE IN DEPTH OF
OFFSET BLOCK TO 200 mm (8")

DOUBLE FACE

POST DETAIL

STEEL BEAM RAIL

ROUND WASHER (CUT STEEL)

HEX. NUT

20 mm (11/16") BOLT HOLE

M16 RAIL BOLT 406 mm (16")
LONG, 1 PER POST,
MIN. 51 mm (2") THREAD

200 mm x 150 mm (8"x6") WOOD POST

SINGLE FACE

ROUND WASHER (CUT STEEL)

MIN. 3 mm (1/8") THICK

* WHEN PLACED IN MIDDLE CHANGE TO THRIE BEAM, AND CHANGE HEIGHT TO 827 mm±25 mm (2'-8 1/2"±1'").

NOTES:
1. POST SPACING, APPROACH END & TRAILING ENDS ARE THE SAME AS THOSE SHOWN FOR STEEL "H" POSTS.
2. ALL NUTS, BOLTS & WASHERS ARE TO BE GALVANIZED.
3. ALL MATERIALS & DIMENSIONS OF FITTINGS NOT SHOWN ABOVE ARE TO BE SIMILAR TO THE CORRESPONDING ELEMENTS SHOWN FOR STEEL "H" POSTS.
4. TERMINAL SECTIONS FOR DOUBLE FACE & SINGLE FACE GUARD RAIL ARE SHOWN ON DRAWINGS 401.6.0, 401.8.0
5. ALL SPLICES ARE TO BE MADE AT POSTS.
6. FOR THE TYPE OF WOOD & WOOD TREATMENT, OTHER MATERIALS & METHODS OF CONST., SEE STANDARD SPECIFICATIONS & SPECIAL PROVISIONS.
7. STEEL POSTS ARE TO BE SUBSTITUTED AT THE SAME BID PRICE, FOR CERTAIN WOOD POSTS IN A WOOD POST RUN WHEN CEMENT CONCRETE EMBEDMENT IS REQUIRED.

MASS HIGHWAY
CONSTRUCTION STANDARDS

STEEL BEAM GUARDRAIL
WITH WOOD POST

DATE OF ISSUE
April 2002

DRAWING NUMBER
M/E401.10.0R
20 mm (3/4") DIA HOLE FOR M16x2-255 mm (10") LONG BOLT

OPTIONAL 20 mm (3/4") DIA HOLE

20 mm (3/4") DIA HOLE FOR M16x2-255 mm (10") LONG BOLT
20 mm (3/4") DIA HOLE FOR M16x2-255 mm (10") LONG BOLT (TYP.)

20 mm (3/4") DIA HOLE FOR M16x2-255 mm (10") LONG BOLT (TYP.)

20 mm (3/4") DIA HOLE FOR M16x2-255 mm (10") LONG BOLT (TYP.)

20 mm (3/4") DIA HOLE FOR M16x2-255 mm (10") LONG BOLT (TYP.)

17.5 mm (11/16")
115 mm (4 5/8")
17.5 mm (11/16")
20 mm (3/4")

150 mm (6")

W150 x 13.5
**F SHAPE**

**MEDIAN BARRIER**

**SYMMETRICAL SECTION**

**ASYMMETRICAL SECTION**

**PLAN**

**NOTES:**

1. ALL EDGES SHALL BE ROUNDED WITH A 25 mm RADIUS EXCEPT AS SHOWN.
2. FOR DOWEL CONNECTION DETAILS SEE M/E 402.13.0.
3. FOR REINFORCING SEE M/E 402.11.0 FOR SYMMETRICAL SHAPE AND M/E 401.12.0 FOR ASYMMETRICAL SHAPE.
4. ALL CONCRETE IS TO BE FIELD COATED AFTER FINAL INSTALLATION WITH A CONCRETE PENETRANT/SEALER. CAST IN PLACE CONCRETE SHALL CURE NOT LESS THAN 28 DAYS PRIOR TO COATING.
5. LIFT HOLES USED ONLY ON PRECAST BARRIERS 4 m (13') AND LESS.

* VARY "A1" RELATIVE TO "H1" WHILE MAINTAINING 55' AND 84' BARRIER ANGLES.

A1 = 120 mm (4'-3/4") MAX., H1 = 1400 mm (4'-7 1/8") MAX.
4 HOOPS - #16 (5/8")
BAR @ 150 mm (6")
EACH END

BAR HOOPS @
SPACING NOT TO
EXCEED 500mm
(20"). (OPTIONAL).

10-#16 (5/8")
LONGITUDINAL BAR

BAR HOOPS @
SPACING NOT TO
EXCEED 500mm
(20"). (OPTIONAL).

4 HOOPS - #16 (5/8")
BAR @ 150 mm (6")
EACH END

75 mm (3")
COVER

3.00 m (10")
VARIES

A

B

LONGITUDINAL ELEVATION

75 mm (3")
COVER

3.00 m (10")

NOTES:

1. CAST IN PLACE NOT TO EXCEED 60 m (200")
   BETWEEN EXPANSION JOINTS.

2. CONSTRUCTION JOINTS REQUIRED AT 12 m (40")
   INTERVALS (13 mm (1/2") PREMOLDED JOINT
   FILLER REQUIRED FOR PRECAST BARRIERS).

3. USE MINIMUM COVER OF 40 mm (1 1/2"),
   UNLESS OTHERWISE INDICATED.

4. MATERIAL IS 30 MPa, 20 mm, 390 kg/m3
   4000 psi-3/4"-610 lb/Cu.Yd.) CONCRETE.

5. ALL STEEL REINFORCING TO BE GALVANIZED
   OR EPOXY COATED, AASHTO-M31, GRADE 60.

6. ALL LONGITUDINAL BARS ARE TO BE CONTINUOUS
   FOR BOTH PRECAST AND CAST IN PLACE BARRIERS.

7. FOR DIMENSIONS SEE M/E 402.10.0
NOTES:

1. CAST IN PLACE NOT TO EXCEED 60 m (200') BETWEEN EXPANSION JOINTS.

2. CONSTRUCTION JOINTS REQUIRED AT 12 m (40') INTERVALS (13 mm (1/2”) PREMOLDED JOINT FILLER REQUIRED FOR PRECAST BARRIERS).

3. USE MINIMUM COVER OF 40 mm (1 1/2”), UNLESS OTHERWISE INDICATED.

4. MATERIAL IS 30 MPa, 20 mm, 390 kg/m3 4000 psi–3/4”–810 lb/Cu.Yd.) CONCRETE.

5. ALL STEEL REINFORCING TO BE GALVANIZED OR EPOXY COATED, AASHTO–M31, GRADE 60.

6. FOR DIMENSIONS SEE M/E 402.10.0
F SHAPE
MEDIAN BARRIER
DOWEL DETAILS

SECTION A-A

SECTION B-B

NOTES:
1. DOWELS TO BE GALVANIZED, AASHTO-M31, GRADE 60.
2. FOR ADDITIONAL DETAILS SEE M/E 402.10.0

DATE OF ISSUE
December 2001

DRAWING NUMBER
M/E 402.13.0
**Same Depth as Under Roadway.**

**Barrier Cap Built Using 30 MPa, 20 mm, 390 kg/m³ (4000 psi−3/4"−610 lb/c.y.) Cement Concrete.**

**Notes:**
1. All longitudinal bars to be continuous for both precast barriers and cast in place barriers.
2. Use minimum cover of 40 mm (1 1/2"), unless otherwise indicated.
3. All concrete is to be field coated after final installation with a concrete penetrant/sealer. Concrete shall cure not less than 28 days prior to coating.
4. For reinforcing details see M/E 402.21.0
5. For dowel details see M/E 402.22.0
6. Tar paper to be placed inside lift holes and barrier joints.
AT LEAST 4 #16 (5/8") LAPPED HOOP BARS @ 150 mm (6") EACH END

#16 (5/8") LAPPED HOOP BAR @ NOT TO EXCEED 500mm (20"). (OPTIONAL)

10--#16 (5/8") LONGITUDINAL BAR CONTINUOUS FOR WHOLE BARRIER

#16 (5/8") LAPPED HOOP BAR @ NOT TO EXCEED 500mm (20"). (OPTIONAL)

AT LEAST 4 #16 (5/8") LAPPED HOOP BARS @ 150 mm (6") EACH END

75 mm (3") COVER

3.00 m (10')

VARYING

LONGITUDINAL ELEVATION

75 mm (3") COVER

3.00 m (10')

NOTES:

1. ALL LONGITUDINAL BARS ARE TO BE CONTINUOUS FOR BOTH PRECAST BARRIERS AND CAST IN PLACE BARRIERS.

2. USE MINIMUM COVER OF 40 mm (1 1/2") UNLESS OTHERWISE INDICATED.

3. CAST IN PLACE (CIP) NOT TO EXCEED 60 m (200 FT) BETWEEN EXPANSION JOINTS.

4. CONTRACTION JOINTS REQUIRED AT 12 m (40') INTERVALS (13 mm (1/2") PREMOLDED JOINT FILLER REQUIRED FOR PRECAST BARRIERS).

5. ALL STEEL REINFORCING TO BE GALVANIZED OR EPOXY COATED, AASHTO-M31, GRADE 60.

6. FOR DIMENSIONS SEE M/E 401.20.0
**NOTES:**

1. DOWELS TO BE GALVANIZED, AASHTO M-31, GRADE 60.
2. FOR ADDITIONAL DETAILS SEE M/E 402.20.0
END VIEW A–A

SECTION B–B

GENERAL NOTES

1. ALL WELDED WIRE FABRIC, BARS, HOOP BARS AND PIN ASSEMBLIES ARE TO BE HOT-DIP GALVANIZED AFTER FABRICATION.

2. HOT-DIP GALVANIZED TREATMENTS ARE TO CONFORM TO MASSACHUSETTS HIGHWAY STANDARD SPECIFICATIONS M7.10.0 AND AASHTO M111.

3. CEMENT CONCRETE IS TO CONFORM TO MASSACHUSETTS HIGHWAY STANDARD SPECIFICATIONS M4.02.00. CEMENT CONCRETE IS TO BE 35 MPa, 19mm (5000 PSI, 3/4") CONCRETE.
PLAN OF CONNECTION

SECTION A-A

REINFORCEMENT DETAIL

CONNECTOR PIN ASSEMBLY
**Chain Link Fence with Spring Tension Wire**

- **Fabric Placed Perpendicular to the Anchor**
  - Detail Showing Line Post Set with Drive Anchors
  - Detail Showing Line Post Set in Concrete Footing

- **Fabric Flush with Top of "H" Beam**
  - 3 mm (1/8") HDG Rings Every 300 mm (12"")

- **Spring Tension Wire**
  - 4.5 mm (3/16") Corrugated Heavily Galvanized (475 Grams (1.6 ozs) per Square Meter) or Aluminum Coated 120 Grams (0.4 ozs) per Square Meter.

- **Chain Link Fence with Spring Tension Wire**
  - (Aluminum Coated Fence)

- **Steel or Aluminum "H" Beam Line Post**
  - Fastening Fabric to Line Post, 5 mm (6 Gauge) Steel Clips Every 300 mm (12"")

- **Detail of an Anchor Clamp Showing Position of the Anchor**
TABLE 1

LOADING CONDITION

\[ R = \frac{\text{WALL THICKNESS}}{\text{WALL HEIGHT}} = \frac{D}{H} \]

<table>
<thead>
<tr>
<th>BATTER</th>
<th>LEVEL</th>
<th>SLIGHT WITH SUPERIMPOSED LOAD</th>
<th>SLOPING TO 3 X D</th>
<th>SLOPING ABOVE 3 X D</th>
</tr>
</thead>
<tbody>
<tr>
<td>WALL ON 6V : 1H (1:6) BATTER</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>D</td>
<td>R=0.45 (R=1.5°)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>D</td>
<td>R=0.50 (R=1.64°)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>D</td>
<td>R=0.55 (R=1.8°)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>D</td>
<td>R=0.60 (R=2.0°)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CHART A

WALL HEIGHT
\((m/ft-in)\)

1.25/3'-11''
1.60/5'-4''
2.00/6'-7''
2.40/7'-11''
2.85/9'-5''
3.25/10'-8''
3.65/12'-0''
4.05/13'-4''
4.45/14'-7''
4.85/15'-11''
5.25/17'-2''
5.70/18'-8''
6.10/20'-0''
6.50/21'-4''
6.90/22'-7''
7.30/23'-11''
7.70/25'-4''
8.10/26'-7''
8.50/27'-11''
8.90/29'-2''
9.35/30'-6''
9.75/32'-0''
10.15/33'-4''
10.55/34'-7''
10.95/35'-11''

WALL DESIGN

FOR REPAIR TO EXISTING WALLS ONLY
**NOTES:**
1. THE LEGEND IS TO BE CENTERED AND THE SPACING OF THE CHARACTERS IS TO CONFORM TO THE FEDERAL HIGHWAY ADMINISTRATION RECOMMENDATION FOR SERIES "C" TYPE LETTERING.
2. THE STATION DESIGNATIONS ARE TO BE EVEN STATIONS IE. NO PLUS STATIONS.
3. THE PANELS FOR THE LEGEND ARE TO BE 2 mm (0.08") SHEET ALUMINUM, FABRICATED AND FINISHED ACCORDING TO THE STANDARD SPECIFICATIONS.
4. THE LETTERS AND NUMERALS AND METHOD OF APPLICATIONS ARE DESCRIBED IN THE STANDARD SPECIFICATIONS.
5. ALL PANELS ARE TO BE MOUNTED ON NEW P-9 POST IN THE MANNER DESCRIBED IN THE STANDARD SPECIFICATIONS.
6. ONE MARKER IS TO BE PROVIDED AT CULVERT END, WHERE NO GUARD RAIL IS INSTALLED IT IS TO BE LOCATED AT THE NEAR BACK CORNER OF THE END IN THE DIRECTION OF TRAFFIC.
7. MARKERS ARE TO BE PLACED AT 200 m (650') INTERVALS ON UNDIVIDED ROADWAY STAGGER ON EACH SIDE, ON DIVIDED ROADWAY PLACE MARKERS OPPOSITE EACH OTHER.
8. SEE DRAWING TR.2.3 FOR P-9 POST DIMENSIONS.