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<td>02002-2</td>
<td>WOOD BLOCKOUT, R.B. RAIL WOOD BLOCKS, BEARING PLATE, R.B. RAIL TO BARRIER CONNECTION DETAILS</td>
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<td>2 ROUND MANHOLE ASSEMBLY</td>
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<tr>
<td>12002</td>
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<tr>
<td>12003</td>
<td>4 BOX MANHOLE COVER SLAB</td>
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<td>D-7</td>
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<tr>
<td>12004</td>
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<td>12005</td>
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<td>E-6</td>
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<td>E-7</td>
<td>SEDIMENT TRAP USING DRAINAGE INLET AS OUTLET</td>
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<tr>
<td>E-8</td>
<td>RISER PIPE ASSEMBLY FOR SEDIMENT TRAP</td>
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<tr>
<td>12000</td>
<td>1 ELEVATOR</td>
</tr>
<tr>
<td>12001</td>
<td>2 TRASH HOOD DETAILS</td>
</tr>
<tr>
<td>E-9</td>
<td>EROSION CONTROL BLANKET APPLICATIONS</td>
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<td>E-11</td>
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<tr>
<td>E-12</td>
<td>PERIMETER DITCH/SWALE</td>
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<td>SUMP PIT, TYPE 1 &amp; 2</td>
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<td>E-19</td>
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<td>STABILIZED CONSTRUCTION ENTRANCE</td>
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<td>M-3 (2004)</td>
<td>REMOVABLE BOLLARD</td>
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<td>M-4 (2004)</td>
<td>BOLLARD</td>
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<td>M-5 (2004)</td>
<td>WOOD RAIL FENCE</td>
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<td>M-6 (2004)</td>
<td>PATTERED HOT-MIX OR CONCRETE &amp; BRICK PAVER</td>
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<td>P-4</td>
<td>FULL DEPTH PATCH, SECTION VIEWS</td>
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<tr>
<td>P-5</td>
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<td>CONDUIT JUNCTION WELL, TYPE 4</td>
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<td>T-3</td>
<td>CONDUIT JUNCTION WELL, TYPE 5</td>
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<tr>
<td>T-4 (2004)</td>
<td>CABINET BASES (TYPES &quot;M&quot; AND &quot;P&quot;)</td>
</tr>
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<td>T-5</td>
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<td>T-7 (2002)</td>
<td>SIGN FOUNDATION</td>
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<td>T-8 (2003)</td>
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<td>T-9 (2004)</td>
<td>TYPE #1 LOOP DETECTOR</td>
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<tr>
<td>T-10 (2004)</td>
<td>TYPE #2 LOOP DETECTOR</td>
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DELAWARE
DEPARTMENT OF TRANSPORTATION
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<td>(2004)</td>
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<td>(2004)</td>
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<td>- TYPE 7</td>
<td>(2004)</td>
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<td>- TYPES 8 &amp; 10</td>
<td>(2004)</td>
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<td>(2004)</td>
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<td>(2004)</td>
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<td></td>
<td>- INVERTED MOUNT</td>
<td>(2004)</td>
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<tr>
<td>ITEM NO.</td>
<td>DESCRIPTION</td>
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<td>---------</td>
<td>-------------</td>
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<tr>
<td>1</td>
<td>W-Beam</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>6x9 (650 x 13.5) Steel Post</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Wood Offset Block</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Splice - Requires eight (8) 5/8&quot; (16) Guardrail Bolts (L=1/4&quot; (35)) with recess nuts, and one (1) 5/8&quot; (16) Guardrail Bolt (L=10&quot; (255)) with recess nut.</td>
<td></td>
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<tr>
<td>5</td>
<td>W-Beam Terminal Connector</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>5/8&quot; (16) Guardrail Bolt (L=1/4&quot; (35)) and recess nut</td>
<td></td>
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<tr>
<td>7</td>
<td>5/8&quot; (16) Guardrail Bolt (L=10&quot; (255)) and recess nut</td>
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<tr>
<td>8</td>
<td>5/8&quot; (16) Guardrail Bolt (L=10&quot; (255)), steel washer, and recess nut</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>1/2&quot; (22) High Strength Structural Hex Bolt (L=varies) and hex nut</td>
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<tr>
<td>10</td>
<td>5/8&quot; (16) Carriage Bolt (L=varies), steel washer, and hex nut</td>
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<td>11</td>
<td>Bearing Plate</td>
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</table>
NOTE: OVERLAP W-BEAMS IN DIRECTION OF TRAVEL.
GUARDRAIL SECTION
(RURAL SHOULDER APPLICATION)

GUARDRAIL SECTION
(URBAN SHOULDER APPLICATION)

<table>
<thead>
<tr>
<th>TYPE</th>
<th>POST SPACING</th>
<th>CLEAR AREA BEHIND POST</th>
<th>DESIGN SPEED</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6' (1800)</td>
<td>4' (1200)</td>
<td>&lt; 50 MPH (80 km/h)</td>
<td>6' (1800)</td>
</tr>
<tr>
<td>2</td>
<td>3' 1/2 (952.5)</td>
<td>2' (600)</td>
<td>&gt; 50 MPH (80 km/h)</td>
<td>10' (3000)</td>
</tr>
</tbody>
</table>

CURB TO BE USED ONLY WHEN INDICATED ON THE PLANS

CURB SHALL BE USED ONLY WHEN INDICATED ON THE PLANS

NO FIXED OBJECTS OR OBSTRUCTIONS

SEE TABLE BELOW

DELWARE
DEPARTMENT OF TRANSPORTATION

GUARDRAIL APPLICATIONS

APPROVED

STANDARD NO.  B-1 (2002)  SHT.  3 OF 6  RECOMMENDED

01/31/2002
NOTES:
1. FLARE THE END TREATMENT AT 25FT BEGINNING 50'-0" FROM THE END OF THE IMPACT HEAD. UNLESS THE CONSTRUCTION PLANS OR SPECIFICATIONS SPECIFY A SMALLER FLARE.
2. THIS DETAIL WAS SOLELY CREATED TO SHOW THE GRADING REQUIRED FOR THIS TYPE OF ATTENUATOR.
3. THE GUARDRAIL END TREATMENT ATTENUATOR SHALL BE INSTALLED AS PER THE MANUFACTURER’S AND THE DEPARTMENT OF TRANSPORTATION’S SPECIFICATIONS.

SECTION A-A

GRADING FOR GUARDRAIL END TREATMENT ATTENUATOR, TYPE 1
**NOTES:**

1. FLARE SHALL BE 4' (1200) UNLESS THE CONSTRUCTION PLANS OR SPECIFICATIONS SPECIFY A SMALLER FLARE. FLARE MAY BE PARABOLIC OR STRAIGHT BASED ON MANUFACTURER'S SPECIFICATIONS.
2. THIS DETAIL WAS SOLELY CREATED TO SHOW THE GRADING REQUIRED FOR THIS TYPE OF ATTENUATOR. THE GUARDRAIL END TREATMENT ATTENUATOR SHALL BE INSTALLED AS PER THE MANUFACTURER'S AND THE DEPARTMENT OF TRANSPORTATION'S SPECIFICATIONS.

**SECTION A-A**

**GRADING FOR GUARDRAIL END TREATMENT ATTENUATOR, TYPE 2**
NORMAL DOUBLE FACE M-BEAM BARRIER
ON TRANSITION TO CONCRETE BARRIER

50' 05" LIMIT OF PAYMENT

DIRECTION OF TRAFFIC

SHOULDER

10' (3000 mm)

TRANSITION GRADING

SHOWN ON PLANS
OF REQUIRED

MEDIAN DITCH

M-BEAM

M-BEAM

M-BEAM

M-BEAM

SHOULDER

DIRECTION OF TRAFFIC

BEGINNING OF TRANSITION

PLAN VIEW

VARIES

F'300 mm OFFSET FROM FLOW LINE

SHOULDER

M-BEAM

M-BEAM

POST

SHOULDER

SECTION B-B

GRADING FOR END TREATMENT ATTENUATOR, TYPE 3

NOTES:
1. THIS DETAIL WAS SOLELY CREATED TO SHOW THE GRADING REQUIRED FOR THIS TYPE OF ATTENUATOR.
2. M-BEAM GRADING IS ALLOWABLE WHEN THE BARRIER IS LOCATED 2' (3050 mm) OR MORE FROM THE OUTSIDE
   EDGE OF THE SHOULDER.
3. THIS END TREATMENT CAN ALSO BE USED IN RAMP CORES OR OTHER AREAS WHERE 2 RAILS OF M-BEAM COME
   TOGETHER AND TERMINATE WITH ONE END TREATMENT.
4. WHEN OPPOSING ROADWAYS HAVE EQUAL ELEVATIONS THE TRAFFIC BARRIER SYSTEM SHOULD BE PLACED ON THE
   OPPOSITE SIDE OF THE DITCH LINE FROM APPROACHING TRAFFIC.
5. THE GUARDRAIL END TREATMENT ATTENUATOR SHALL BE INSTALLED AS PER THE MANUFACTURER'S AND THE
   DEPARTMENT OF TRANSPORTATION'S SPECIFICATIONS.

DELTAHARE
DEPARTMENT OF TRANSPORTATION

GUARDRAIL APPLICATIONS

STANDARD NO. B-1 (2002) SHT. 6 OF 6

APPROVED

RECOMMENDED

01/31/2002
TWO SECTIONS OF W-BEAM, ONE NESTED INSIDE THE OTHER

SINCE NO POST OR OFFSET BLOCK IS PRESENT AT THIS LOCATION, 3/16" (4.8) GUARDRAIL BOLT (L=40" (1015)) IS NOT REQUIRED.

1. ALL W-BEAMS ARE 12'-6" (3810) IN LENGTH.
2. PLACE GUARDRAIL REFLECTOR EVERY FIFTH POST.
Type 1 Guardrail or Appropriate End Treatment

Three sections of W-beam, one nested inside the other

38'-6½" (1150) LIMIT OF PAYMENT

Notes:
1. All W-beams are 12'-6½" (3800) in length
2. Place guardrail reflector every fifth post

Ground Line

Direction of Travel

Delaware Department of Transportation

Guardrail Over Culverts, Type 2

Approved By:

Recommended By:

SHT. 1 OF 1

7/14/05

B-3 (2004)
AREA BEHIND GUARDRAIL TO BE MAINTAINED FREE OF FIXED OBJECTS OR OTHER HAZARDS.

TYPE 1 GUARDRAIL PLACEMENT OR APPROPRIATE END TREATMENT OR GUARDRAIL TO BARRIER CONNECTION

1. NO WASHERS ARE USED ON THE RAIL SIDE OF THE LONG WOOD BREAKAWAY POSTS.
2. THE CURVED GUARDRAIL SECTION SHALL BE SHAPED IN A CURVES.
3. PLACE GUARDRAIL REFLECTOR EVERY FIFTH POST.

NOTES:

RAIL NOT BOLTED TO THE POST AT THE CENTER OF THE CURVED SECTION

PLAN

MAIN HIGHWAY

SCALE: N.T.S.

AREA BEHIND GUARDRAIL TO BE MAINTAINED FREE OF FIXED OBJECTS OR OTHER HAZARDS.

SLOPE = 15:1 OR FLATTER

LONG WOOD BREAKAWAY POST

SECTION A-A
NOTES:
1. W BEAM IS NOT BOLTED TO POSTS AT POSTS 2 THROUGH 4.
2. RUB RAIL IS NOT BOLTED AT POSTS 2 AND 4.
3. POSTS 1 THROUGH 6 REQUIRE AN ADDITIONAL HOLE TO ATTACH LOWER WOOD BLOCKS AND/OR RUBRAIL AND WOOD BLOCK.
4. USE APPROPRIATE EPOXY BOLT ANCHORS TO REDUCE THE CHANCE OF SPLITTING THE CONCRETE.
5. PLACE STEEL WASHERS FOR ⅜" X ⅜" BOLT BETWEEN BOLT HEADS AND RUBRAIL.
6. ALL HOLES SHALL BE DRILLED PRIOR TO GALVANIZING.
7. APPROVED CONCRETE INSERTS MAY BE USED IN NEW CONSTRUCTION TO ATTACH TERMINAL CONNECTOR TO PARAPET.
1. The rub rail to barrier connection end must be attached flush with the sloped toe of the safety barrier. Installation can be simplified by fabricating or shop twisting the rub rail end to be consistent with the slope of the barrier, however, field bending using heat is permitted.

2. Steel spacer tube is schedule 40 galvanized pipe, 6" (152.4) OD x 3" (76.2) ID.

**RUB RAIL WOOD BLOCKS**

<table>
<thead>
<tr>
<th>POST NO.</th>
<th>WIDTH</th>
<th>BOLT LENGTH</th>
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<tr>
<td>1</td>
<td>4/3&quot; (108)</td>
<td>6&quot; (152.4)</td>
</tr>
<tr>
<td>2</td>
<td>3/4&quot; (191)</td>
<td>4&quot; (102)</td>
</tr>
<tr>
<td>3</td>
<td>2&quot; (50)</td>
<td>4&quot; (102)</td>
</tr>
<tr>
<td>4</td>
<td>1&quot; (25)</td>
<td>2&quot; (50)</td>
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</table>

**NOTES**

DELWARE DEPARTMENT OF TRANSPORTATION

GUARDRAIL TO BARRIER CONNECTION, APPROACH TYPE 1

STANDARD NO. B-7 (2001) SHT. 2 OF 3

APPROVED

04/05/2001
LIMITS OF PAYMENT FOR GUARDRAIL TO BARRIER CONNECTION APPROACH TYPE 2

1. CURB SHALL NOT BE USED AT THE FACE OF RAIL WITHIN THE LIMITS OF THIS INSTALLATION.
2. POSTS 1, 2, 3, 4, AND 6 REQUIRE AN ADDITIONAL HOLE TO ATTACH WOOD BLOCKS AND/OR BENT RAIL.
3. DO NOT ATTACH RAILS TO POSTS 1, 2, 3, 5, OR 7.
4. BENT RAIL MAY BE SHOP BENT TO FACILITATE INSTALLATION OR MAY BE FIELD BENT USING HEAT.
5. ALL HOLES SHALL BE DRILLED PRIOR TO GALVANIZING.
6. APPROVED CONCRETE INSERTS MAY BE USED IN NEW CONSTRUCTION TO ATTACH TERMINAL CONNECTORS TO PARAPET.
7. PLUG GUARDRAIL REFLECTOR EVERY FIFTH POST.
8. WHEN PLACED OVER CURB (MIN 8" HIGH), BOTTOM RAIL CAN BE ELIMINATED.
BENT RAIL

BENT RAIL WOOD BLOCKS

WIDTH VARIIES (SEE TABLE)

HEIGHT 4-1/2" (115)

LENGTH 7-2" (160)

BENT RAIL WOOD BLOCKS

1' - 2" (360) x 4-1/2" (115)

<table>
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<tr>
<th>BLOCK</th>
<th>WIDTH</th>
<th>BOLT LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5&quot; (125)</td>
<td>8&quot; (200)</td>
</tr>
<tr>
<td>2</td>
<td>4&quot; (100)</td>
<td>6&quot; (150)</td>
</tr>
<tr>
<td>3</td>
<td>3&quot; (75)</td>
<td>6&quot; (150)</td>
</tr>
<tr>
<td>4</td>
<td>2&quot; (50)</td>
<td>4&quot; (100)</td>
</tr>
</tbody>
</table>

NOTE: Bottom wood blocks located on posts 1-4 are offset drilled to sit squarely on the post flange and secured with 3/8" carriage bolts. Width varies, see bent rail wood blocks table.
NOTES:
1. CONCRETE INSERTS MAY BE USED IN NEW CONSTRUCTION TO ATTACH TERMINAL CONNECTOR TO PARAPET.
2. GUARDRAIL SECTION AND TERMINAL CONNECTORS SHALL BE OVERLAPPED IN THE DIRECTION OF TRAVEL.
3. INSTALLATION SHOWN ABOVE WITH AN 'F'-TYPE BARRIER FACE. GUARDRAIL SECTION OF BARRIER CONNECTION SHALL BE ADJUSTED HORIZONTALLY IN ORDER TO MEET FLUSH AGAINST VARIOUS TYPES OF WALLS AND BARRIERS.
NOTES:
1. This installation shall be used when the existing sidewalk is 6'-6" (1980) or less.
2. Use a three beam expansion section at bridge expansion joints.
3. Place guardrail reflector in the upper valley of the three beam every fifth post.
4. Timber block thickness shall be adjusted to allow face of the three beam to be flush with bottom of curb. Minimum thickness shall be 6'-6" (1980).
5. The exit end application shall be used only on divided highways. For all other situations, the entrance end application shall be used on both ends of the bridge parapet.
6. Spacing of wood posts may need to be reduced to accommodate lining up posts at the end of the parapet.
NOTES:
1. THIS INSTALLATION SHALL BE USED WHEN THE EXISTING SIDEWALK IS 18" (450) OR WIDER, AND DEAD LOAD CONSIDERATIONS ARE A CONCERN WHEN USING BRIDGE RAIL RETROFIT, TYPE 3.
2. ADHESIVE ANCHORS SHALL BE INSTALLED PER MANUFACTURER'S SPECIFICATIONS AND SHALL BE GALVANIZED.
3. USE A THRIE BEAM EXPANSION SECTION AT BRIDGE EXPANSION JOINTS.
4. PLACE GUARDRAIL REFLECTOR IN THE UPPER VALLEY OF THE THRIE BEAM EVERY FIFTH POST.
5. THE EXIT END APPLICATION SHALL BE USED ONLY ON DIVIDED HIGHWAYS. FOR ALL OTHER SITUATIONS, THE ENTRANCE END APPLICATION SHALL BE USED ON BOTH ENDS OF THE BRIDGE PARAPET.
6. SPACING OF STEEL POSTS MAY NEED TO BE REDUCED TO ACCOMMODATE LINING UP POSTS AT THE END OF THE PARAPET.

THRIE BEAM GUARDRAIL WITH STEEL POSTS SPACED AT 6'-3" (1905) CENTER TO CENTER

1. THIS INSTALLATION SHALL BE USED WHEN THE EXISTING SIDEWALK IS 18" (450) OR WIDER, AND DEAD LOAD CONSIDERATIONS ARE A CONCERN WHEN USING BRIDGE RAIL RETROFIT, TYPE 3.
2. ADHESIVE ANCHORS SHALL BE INSTALLED PER MANUFACTURER'S SPECIFICATIONS AND SHALL BE GALVANIZED.
3. USE A THRIE BEAM EXPANSION SECTION AT BRIDGE EXPANSION JOINTS.
4. PLACE GUARDRAIL REFLECTOR IN THE UPPER VALLEY OF THE THRIE BEAM EVERY FIFTH POST.
5. THE EXIT END APPLICATION SHALL BE USED ONLY ON DIVIDED HIGHWAYS. FOR ALL OTHER SITUATIONS, THE ENTRANCE END APPLICATION SHALL BE USED ON BOTH ENDS OF THE BRIDGE PARAPET.
6. SPACING OF STEEL POSTS MAY NEED TO BE REDUCED TO ACCOMMODATE LINING UP POSTS AT THE END OF THE PARAPET.

SECTION A-A

THREE BEAM GUARDRAIL WITH STEEL POSTS SPACED AT 6'-3" (1905) CENTER TO CENTER
W6 x 15 (W150 x 22) STEEL GUARDRAIL POST

BASE PLATE DETAIL

WEID ALL AROUND INCLUDING EXTERIOR FLANGE SURFACE
**PLAN**

- **Limit of Payment**
- **Type I Guardrail Placement or Appropriate End Treatment**
- **Guardrail to Barrier Connection**
- **Direction of Travel**
- **Existing Bridge Rail**
- **Bridge Barrier**
- **Contraction Joints**
- **End of Sidewalk**
- **Taper End of Wall to Top of Guardrail at a Slope of 4:1 or Flatter**

**SECTION A-A**

- **Existing Rail - Do Not Disturb**
- **2" x 50" Mill Cover**
- **3/8" Go/No Go Chamfer (Typ)**
- **10/32" Mill**
- **4" Dia. Hole (varies)**
- **Drill 1/2" Dia. Hole, Fill with High Strength Non-Sagging Cement**
- **6 (M5) Bar Spaced 15" (Typ) Longitudinally, Front and Back Rows Shall Be Staggered**

**NOTES**

- Standard guardrail to barrier connections shall be connected to the ends of the new bridge barrier and transitioned to the existing guardrail.

**SCALE**: N.T.S.
W-BEAM ELEVATION

W-BEAM SECTION

NOTES:

1. TWO ADDITIONAL $\frac{1}{2}" \times 2\frac{1}{2}" (65) POST BOLT SLOTS SHALL BE PROVIDED AT 6'-3" (1905) SPACING FOR BEAM LENGTH OF 26'-3" (7940).

DELTA HARDWARE

DEPARTMENT OF TRANSPORTATION

HARDWARE

APPROVED

STANDARD NO. B-13 (2004) SHT. 1 OF 15

 recommendation

B-13 (2004)

1/10/05

09/31/2004
NOTE:
WHERE CONDITIONS REQUIRE, ALTERNATE LENGTHS IN INCREMENTS OF 6" (150) MAY BE USED.

NOTE:
WHERE HUB RAIL IS USED.

WHERE RUB RAIL IS USED.

* 12" (300) FOR GUARDRAIL TO BARRIER CONNECTIONS - TYPE 1
* 9" (220) FOR GUARDRAIL TO BARRIER CONNECTIONS - TYPE 2

Lower holes only required.

OPTIONAL FOR HANDLING DURING GALVANIZING.

NOTE:
ALL HOLES SHALL BE 5/16" (0.00) BOLT.

HOLE PATTERN IS SYMMETRICAL WITH RESPECT TO THE VERTICAL AXIS OF THE POST.
NOTE: WHERE CONDITIONS REQUIRE, USE ALTERNATE LENGTHS IN INCREMENTS OF 6" (150)
Standard W-Beam Section

W-Thrie Beam Transition Section

Standard Thrie Beam Section

12 Gage

1'-8" (50)

2" (52)

2" (52)

2" (52)

HARDWARE

B-13 (2004)

DELAWARE

DEPARTMENT OF TRANSPORTATION


APPROVED

RECOMMENDED

DATE

DATE

11/10/05

1/3/05

01/10/04

2" (52)

3'-1" (94)

4" (108)

4" (108)

4" (108)

2" (52)

2" (52)

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