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Sheet No. Name
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- PLAN, ELEVATION, AND SECTION V/C DETAIL DELETED - SEE SPECIFICATIONS
- DETAIL DELETED - SEE SPECIFICATIONS
- DETAIL DELETED - SEE SPECIFICATIONS
- DETAIL DELETED - SEE SPECIFICATIONS
- DETAIL DELETED - SEE SPECIFICATIONS

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C-2 CURB RAMPS
- TYPE 1
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C-4 CURB OPENINGS
- TYPES A, B, & C
- TYPES D & E
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- DRAINAGE INLET ASSEMBLY
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- DRAINAGE INLET TOP LIDS
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- DRAINAGE INLET COVER SLAB DETAILS
- DRAINAGE INLET 34" x 34" x 24" INLET DETAILS
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### SECTION III - DRAINAGE (CONT'D)

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<td>MANNHOLE DETAILS</td>
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<td>BOX MANNHOLE ASSEMBLY</td>
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<td>0200 - 2</td>
<td>ROUND MANNHOLE ASSEMBLY</td>
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<td>MANNHOLE FRAME AND COVER</td>
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<td>0202 - 4</td>
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<td>0200 - 1</td>
<td>JUNCTION BOX ASSEMBLY</td>
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<td>0202 - 2</td>
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<td>ELEVATION</td>
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<td>EROSION CONTROL BLANKET APPLICATIONS</td>
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<td>E-11 (2005)</td>
<td>TEMPORARY SWALE</td>
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<td>E-12 (2005)</td>
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<td>E-14 (2005)</td>
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<td>STABILIZED CONSTRUCTION ENTRANCE</td>
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<td>E-23</td>
<td>TURBIDITY CURTAIN</td>
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<td>FLOATING TURBIDITY CURTAIN</td>
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<td>TURF REINFORCEMENT MAT APPLICATIONS</td>
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    (2004-2) FULL DEPTH PATCH, SECTION VIEWS
    (2004-3) FULL DEPTH PATCH, SEALANT DETAILS, SEATTING RETENTION DISK AND DOWEL BAR
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DELAWARE
DEPARTMENT OF TRANSPORTATION

INDEX OF SHEETS (2006)

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06/05/2005
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<th>ITEM NO.</th>
<th>DESCRIPTION</th>
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<tr>
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<td>W-BEAM</td>
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<tr>
<td>2</td>
<td>W6 X 9 (W50 x 13.5) STEEL POST</td>
</tr>
<tr>
<td>3</td>
<td>WOOD OFFSET BLOCK</td>
</tr>
<tr>
<td>4</td>
<td>SPLICE - REQUIRES EIGHT (8) 3/8&quot; (6) GUARDRAIL BOLTS (L=1/4&quot; (35)) WITH RECESS NUTS, AND ONE (1) 3/8&quot; (6) GUARDRAIL BOLT (L=10&quot; (255)) WITH RECESS NUT.</td>
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<tr>
<td>5</td>
<td>W-BEAM TERMINAL CONNECTOR</td>
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<tr>
<td>6</td>
<td>3/8&quot; (6) GUARDRAIL BOLT (L=1/4&quot; (35)) AND RECESS NUT</td>
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<td>7</td>
<td>3/8&quot; (6) GUARDRAIL BOLT (L=10&quot; (255)) AND RECESS NUT</td>
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<td>8</td>
<td>3/8&quot; (6) GUARDRAIL BOLT (L=10&quot; (255)), STEEL WASHER, AND RECESS NUT</td>
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<tr>
<td>9</td>
<td>3/8&quot; (12) HIGH STRENGTH STRUCTURAL HEX BOLT (L=VARIIES) AND HEX NUT</td>
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<tr>
<td>10</td>
<td>3/8&quot; (6) CARRIAGE BOLT (L=VARIIES), STEEL WASHER, AND HEX NUT</td>
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<tr>
<td>11</td>
<td>BEARING PLATE</td>
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</table>
**RECOMMENDED**

**APPROVED**

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**NOTES:**

1. The distance from the edge of the travel lane or shoulder to the face of guardrail should be maximized. This area shall be graded 10:1 or flatter.

2. Place guardrail reflector every fifth post.

---

**FLARE RATES**

<table>
<thead>
<tr>
<th>DESIGN SPEED</th>
<th>FLARE RATE</th>
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<tr>
<td>70 MPH (110 km/h)</td>
<td>6d</td>
</tr>
<tr>
<td>60 MPH (100 km/h)</td>
<td>6d</td>
</tr>
<tr>
<td>55 MPH (90 km/h)</td>
<td>6d</td>
</tr>
<tr>
<td>50 MPH (80 km/h)</td>
<td>5d</td>
</tr>
<tr>
<td>45 MPH (70 km/h)</td>
<td>5d</td>
</tr>
<tr>
<td>40 MPH (60 km/h)</td>
<td>4d</td>
</tr>
<tr>
<td>30 MPH (50 km/h)</td>
<td>4d</td>
</tr>
</tbody>
</table>

---

**GUARDRAIL APPLICATIONS**

- TYPE 1 GUARDRAIL
  - Placement
  - Post spacing 6'-3" (1905)
  - Required clearance: 4' (1200) minimum
  - See Note #1

- TYPE 2 GUARDRAIL
  - Typical guardrail treatment
  - When the required 4' (1200) clearance to obstruction is available
  - Post spacing 3'-3" (992.5)

- TYPE 3 GUARDRAIL
  - Typical guardrail treatment
  - When a minimum of 10' (3000) is available for median
  - Post spacing 3'-3" (992.5)

---

**DELWARE DEPARTMENT OF TRANSPORTATION**

**STANDARD NO.** B-1 (2000)

**SH T.** 1 OF 6

**APPROVED**

**RECOMMENDED**

---

**SCALE: N.T.S.**
NOTE: OVERLAP W-BEAMS IN DIRECTION OF TRAVEL.
**Guardrail Section**

Rural 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' (1.828m)</td>
<td>4' (1.220m)</td>
<td>&lt; 50 MPH (80 km/h)</td>
<td>6' (1.828m)</td>
</tr>
<tr>
<td>2</td>
<td>3' 1/2 (1.962m)</td>
<td>2' (0.609m)</td>
<td>≥ 50 MPH (80 km/h)</td>
<td>10' (3.000m)</td>
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</table>

**Guardrail Section**

Urban Shoulder Application

- Offset Distance
- Pave or sidewalk shall be used only when indicated on plans.
NOTES:
1. FLARE THE END TREATMENT AT 25' BEGGINING 50' OS LIMT 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 I
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
Type 1 Guardrail or Appropriate

End Treatment

Scale: N.T.S.

Plan

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

Since no post or offset block is present at this location, 9/16" (14) guardrail bolt (L=40" (1020)) is not required.

Elevation

2'-6" (762) Min. to Culvert (Typ.)

Notes:
1. All W-beams are 12'-6" (3810) in length.
2. Place guardrail reflector every fifth post.
NOTES:
1. ALL W-BEAMS ARE 38'-6½" (11750) IN LENGTH.
2. PLACE GUARDRAIL REFLECTOR EVERY FIFTH POST.
DELAWARE
DEPARTMENT OF TRANSPORTATION

CURVED GUARDRAIL SECTION

STANDARD NO. B-4 (2004)  SHT. 1 OF 1

APPROVED

RECOMMENDED

PLAN

MAIN HIGHWAY

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

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

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

NOTES:
1. NO WASHERS ARE USED ON THE RAIL SIDE OF THE LONG WOOD BREAKAWAY POSTS.
2. THE CURVED GUARDRAIL SECTION SHALL BE SHOP BENT.
3. PLACE GUARDRAIL REFLECTOR EVERY FIFTH POST.

SECTION A-A

LONG WOOD BREAKAWAY POST

SLOPE = 15:1 OR FLATTER

4' (1200) ROUNDING

SHEET 1 OF 8

SCALE: NOT.

RADIUS  MIN. REQUIRED AREA FREE OF FIXED OBJECTS

<table>
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<tr>
<th>Radius</th>
<th>L x W</th>
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<tbody>
<tr>
<td>8'-6&quot; (2600)</td>
<td>25' x 18' (7600 x 4500)</td>
</tr>
<tr>
<td>17'-0&quot; (5200)</td>
<td>30' x 18' (9144 x 4500)</td>
</tr>
<tr>
<td>25'-0&quot; (7800)</td>
<td>40' x 22' (12000 x 6000)</td>
</tr>
<tr>
<td>35'-0&quot; (10700)</td>
<td>50' x 20' (15200 x 6000)</td>
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</tbody>
</table>

8'-6" (2600)  17'-0" (5200)  25'-0" (7800)  35'-0" (10700)
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 5 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 GUARDRAIL REFLECTOR EVERY FIFTH POST.
6. PLACE STEEL WASHER OVERLAP W BEAMS IN DIRECTION OF TRAVEL
7. APPROVED CONCRETE INSERTS MAY BE USED IN NEW CONSTRUCTION TO ATTACH TERMINAL CONNECTOR TO PARAPET.
8. POSTS NO. 1, 3, 5, AND 7 RUB RAIL AND WOOD BLOCKS MOUNTED TO POSTS
9. PLACE STEEL WASHER &" (10) LAG BOLT
10. STEEL SPACER TUBE 6" (150) I.D., SCHEDULE 40 GALVANIZED PIPE (L=10" (250))
11. ALL HOLES SHALL BE DRILLED PRIOR TO GALVANIZING.
12. GUARDRAIL TO BARRIER CONNECTION (SEE NOTE 4)

DELaware department of transportation

guardrail to barrier connection, approach type 1

standard no. B-7 (2004) sht. 1 of 3

approved

1/10/05

1/2/05

01/04/2005
RUB RAIL WOOD BLOCKS (7" (175) x 4" (100))

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<th>POST NO.</th>
<th>WIDTH</th>
<th>BOLT LENGTH</th>
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<tr>
<td>1</td>
<td>4/&quot;(100)</td>
<td>6&quot; (50)</td>
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<tr>
<td>2</td>
<td>3/4&quot;(183)</td>
<td>4&quot; (100)</td>
</tr>
<tr>
<td>3</td>
<td>2&quot; (50)</td>
<td>4&quot; (100)</td>
</tr>
<tr>
<td>4</td>
<td>1&quot; (25)</td>
<td>2&quot; (50)</td>
</tr>
</tbody>
</table>

NOTES:
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" (50) (OD) X 3" (229)
NOTES:
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. GUARDRAIL TO BARRER CONNECTION APPROACH TYPE 2
5. ALL HOLES SHALL BE DRILLED PRIOR TO GALVANIZING.
6. BENT RAIL MAY BE SHOP BENT TO FACILITATE INSTALLATION OR MAY BE FIELD BENT USING HEAT.
7. APPROVED CONCRETE INSERTS MAY BE USED IN NEW CONSTRUCTION TO ATTACH TERMINAL CONNECTORS TO PARAPET.
8. PLACE GUARDRAIL REFLECTOR EVERY FIFTH POST.
9. WHEN PLACED OVER CURB (MIN 8" (200) HIGH), BOTTOM RAIL CAN BE ELIMINATED.
10. PLACE GUARDRAIL REFLECTOR EVERY FIFTH POST.

DELAWARE DEPARTMENT OF TRANSPORTATION
GUARDRAIL TO BARRER CONNECTION, APPROACH TYPE 2
STANDARD NO. B-8 (2004) SHT. 1 OF 2
APPROVED 11/10/05
RECOMMENDED 11/10/05
11/03/2004
BENT RAIL WOOD BLOCKS

1'-2" (360) x 4½" (115)

<table>
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<th>WIDTH</th>
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<tr>
<td>1</td>
<td>5&quot; (125)</td>
<td>8&quot; (200)</td>
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<td>4&quot; (100)</td>
<td>6&quot; (150)</td>
</tr>
<tr>
<td>3</td>
<td>3&quot; (75)</td>
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<tr>
<td>4</td>
<td>2&quot; (50)</td>
<td>4&quot; (100)</td>
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NOTE: BOTTOM WOOD BLOCKS LOCATED ON POSTS 1-4 ARE OFFSET DRILLED TO SIT SQUARELY ON THE POST FLANGE AND SECURED WITH ⅝"-16 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.

DELAWARE DEPARTMENT OF TRANSPORTATION

GUARDRAIL TO BARRIER CONNECTION, EXIT TYPE

STANDARD NO. B-9 (2002) SHT. 1 OF 1

APPROVED

RECOMMENDED

04/23/2002
**Notes:**

1. This installation shall be used when the existing sidewalk is 6'-0" (1800) or less.
2. Use a Thrie Beam expansion section at bridge expansion joints.
3. Place guardrail reflector in the upper valley of the Thrie Beam every fifth post.
4. Timber block thickness shall be adjusted to allow face of the Thrie Beam to be flush with bottom of curb. Minimum thickness shall be 4" (100).
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.
RECOMMENDED

DATE

DELAWARE DEPARTMENT OF TRANSPORTATION

SCALE: N.T.S.

NOTE: 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 BOLTS SHALL BE INSTALLED PER MANUFACTURER'S SPECIFICATIONS AND SHALL BE STRENGTHENED.

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.

DELTA RAIL RETROFIT, TYPE 2


APPROVED

DATE

DATE

DATE

DATE

DATE

DATE

DATE
W6 x 15 (W150 x 22) STEEL GUARDRAIL POST

BASE PLATE DETAIL

W6 x 15 (W150 x 22)

POST

1/4" (6.4) 1/4" (6.4) 1/4" (6.4)
1/4" (6.4) 1/4" (6.4) 1/4" (6.4)

1/4" (6.4) 1/4" (6.4) 1/4" (6.4)
1/4" (6.4) 1/4" (6.4) 1/4" (6.4)

1/4" (6.4) 1/4" (6.4) 1/4" (6.4)
1/4" (6.4) 1/4" (6.4) 1/4" (6.4)

WELD ALL AROUND INCLUDING EXTERIOR FLANGE SURFACE

SIDE

FRONT

SECTION B-B

PLAN

TRAFFIC FACE

B

B
NOTE: STANDARD GUARDRAIL TO BARRIER CONNECTIONS SHALL BE CONNECTED TO THE ENDS OF THE NEW BRIDGE BARRIER AND TRANSITIONED TO THE EXISTING GUARDRAIL.

EXISTING RAIL - DO NOT DISTURB (N.T.J.)

DRILL (2) 3/8" DIA. HOLE, FILL WITH HIGH STRENGTH NON-SHRINK CEMENT

#6 (60) BARS SPACED 15" (375) LONGITUDINALLY, FRONT AND BACK ROWS SHALL BE STAGGERED

SECTION A-A

TAPER END OF WALL TO TOP OF GUARDRAIL AT A SLOPE OF 4:1 OR FLATTER
NOTE: B. TWO ADDITIONAL $\frac{3}{8}" \times 2\frac{1}{2}" (65) SLOTS SHALL BE PROVIDED AT 6-3/4" (1905) SPACING FOR BEAM LENGTH OF 26-3/4" (7190).
NOTE: WHERE CONDITIONS REQUIRE, ALTERNATE LENGTHS IN INCREMENTS OF 6' (1830) MAY BE USED.

WHERE RUB RAIL IS USED.

* W-BEAM STEEL POST AND WOOD OFFSET BLOCK

NOTE: ALL HOLES SHALL BE 9/32" (0.29) BOLT
HOLES PATTERN IS SYMMETRICAL WITH RESPECT TO THE VERTICAL AXIS OF THE POST.

DELAWARE
DEPARTMENT OF TRANSPORTATION

HARDWARE

APPROVED

STANDARD NO. B-13 (2004) SHT. 2 OF 13 RECOMMENDED

09/28/2004

N.T.S.
THREE BEAM ELEVATION

THREE BEAM SECTION

THREE BEAM EXPANSION ELEMENT

DELTA \( \frac{3}{10} \times 2\frac{1}{2} \times 185 \) SLOTS (TYP)

\[ \frac{7}{8} \times 120 \times 2\frac{1}{2} \times 185 \] SLOTS (TYP)

\[ \frac{7}{8} \times 120 \times 3\frac{1}{4} \times 185 \] SLOTS (TYP)

HARDWARE

B-13 (2000)
NOTE: WHERE CONDITIONS REQUIRE, USE ALTERNATE LENGHTHS IN INCREMENTS OF 6" (150).

THREE BEAM STEEL POST AND WOOD OFFSET BLOCK

NOTE: ALL HOLES SHALL BE 5/8" (16) W/BOLT HOLE PATTERN IS SYMMETRICAL WITH RESPECT TO THE VERTICAL AXIS OF THE POST.

SIDE POST 2

FRONT 6'-6" (1980) MIN.

TOP 6'-6" (1980) MIN. + 7" (30) + 1'-9" (150) + 6" (150) INCREMENTS OF 6" (150)

SIDE 4" (100) + 6") (104) + 3" (80) + 2" (50)

FRONT 6" (150) + 8" (200) + 4" (100) + 6" (150)
W-THE BEAM TRANSITION SECTION