NOTES:

1. ALL HOLES SHALL BE DRILLED PRIOR TO GALVANIZING.

2. ALL WOOD SIZES ARE NOMINAL DIMENSIONS.
SWAGED CABLE ASSEMBLY AND RELATED HARDWARE ASSEMBLY

1. To ensure that the timber bearing plate remains in position, secure bearing plate to prevent rotation with two 10d galvanized nails.

2. Tighten assembly until cable is taught.

3. All holes shall be drilled prior to galvanizing.

NOTES:
- Drill 4 holes - \( \frac{3}{4} \)", \( \frac{1}{2} \)", \( \frac{1}{4} \)", \( \frac{1}{8} \)" O.C. (lrocker bolt) and nuts.
- Drill 4 holes - \( \frac{3}{4} \)", \( \frac{1}{2} \)", \( \frac{1}{4} \)", \( \frac{1}{8} \)" O.C. (upper bolt) and nuts.

DELAWARE DEPARTMENT OF TRANSPORTATION

HARDWARE


APPROVED: L. R. Wright, Chief Engineer 11/4/05

RECOMMENDED: D. R. Shoemaker 11/4/05

9/23/2004
RECEDED NUT  
(FOR 5/8" (16) GUARDRAIL BOLT)

STEEL WASHER (FOR 5/8" (16) GUARDRAIL BOLT)

NOTE: DIMENSION FOR WASHER THICKNESS IS APPROXIMATE BASED ON METAL THICKNESS.

GUARDRAIL BOLT

NOTES:
1. ALL FILLETS SHALL HAVE A MINIMUM RADIUS OF 1/8" R2.
2. IF THE BOLT EXTENDS MORE THAN 1/2" BEYOND THE NUT, THE BOLT SHALL BE TRIMMED BACK AS PER THE DEPARTMENT'S SPECIFICATIONS.

<table>
<thead>
<tr>
<th>L</th>
<th>T (MIN.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4&quot; (25)</td>
<td>FULL THREAD LENGTH</td>
</tr>
<tr>
<td>5/32&quot; (20)</td>
<td>FULL THREAD LENGTH</td>
</tr>
<tr>
<td>3/16&quot; (10)</td>
<td>FULL THREAD LENGTH</td>
</tr>
<tr>
<td>5/32&quot; (20)</td>
<td>4&quot; X 20 THREAD LENGTH</td>
</tr>
<tr>
<td>3/16&quot; (10)</td>
<td>4&quot; X 20 THREAD LENGTH</td>
</tr>
</tbody>
</table>

DIMENSION FOR WASHER THICKNESS IS APPROXIMATE BASED ON METAL THICKNESS.
5/8" (16) HEX BOLT

5/8" (16) HEX NUT

3/4" (20) DIA

1/2" (12) DIA

3/4" (22) DIA

1/2" (12) DIA

1/2" (12) DIA

1/2" (12) DIA

HIGH-STRENGTH STRUCTURAL HEX BOLT

HIGH-STRENGTH STRUCTURAL HEX NUT

NOTE: DIMENSION FOR WASHER THICKNESS IS APPROXIMATE BASE METAL THICKNESS.
STEEL WASHER

NOTES:
1. FOR USE WITH SWAGED CABLE ASSEMBLAGE.
2. DIMENSION FOR WASHER THICKNESS IS APPROXIMATE BASE METAL THICKNESS.

5/8" (16) CARRIAGE BOLT

3/4" (24) HEX NUT

NOTE:
1. FOR USE WITH SWAGED CABLE ASSEMBLAGE.
TYPICAL CAST-IN-PLACE OR SLIP-FORM CONSTRUCTION

- Bar shall be cut at every joint if made continuous for slip-form construction.
TYPICAL PRE-CAST CONSTRUCTION

TYPICAL PRE-CAST REINFORCEMENT DETAILS

BAR LIST

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>NUMBER IN EACH SECTION</th>
<th>LENGTH</th>
<th>TYPE</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>4B</td>
<td>6</td>
<td>6</td>
<td>4' - 7&quot;</td>
<td>1</td>
<td>3'</td>
<td>6'</td>
<td>6'</td>
</tr>
<tr>
<td>4B</td>
<td>6</td>
<td>6 (6)</td>
<td>4' - 7&quot;</td>
<td>1</td>
<td>3'</td>
<td>3'</td>
<td>6'</td>
</tr>
<tr>
<td>6B</td>
<td>6 (6)</td>
<td>1</td>
<td>4' - 7&quot;</td>
<td>1</td>
<td>3'</td>
<td>6'</td>
<td>6'</td>
</tr>
<tr>
<td>6B</td>
<td>6 (6)</td>
<td>2</td>
<td>4' - 7&quot;</td>
<td>2</td>
<td>STR</td>
<td>STR</td>
<td>STR</td>
</tr>
</tbody>
</table>

* THE LENGTH OF BARS 6B AND 6B2 SHALL BE 4' (1280) SHORTER IN LENGTH THAN THE NOMINAL SIZE OF THE BARRIER IN WHICH IT IS USED.

** SEE "BAR OFFSETS" CHART ON THIS SHEET FOR MORE INFORMATION.

NOTES:
- CONCRETE CLEAR COVER FOR REINFORCING BARS SHALL BE 1/4 (140) MIN.

DELaware
DEPARTMENT OF TRANSPORTATION
CONCRETE SAFETY BARRIER OF SHAPED

STANDARD NO. B-14 (2001) SHT. 2 OF 3
APPROVED RECOMMENDED

04/17/2001
STEEL CONNECTOR PLATE

SLOT DIMENSIONS
CONCRETE SAFETY BARRIERS, PRECAST CONSTRUCTION
9" SHAPE BARRIER SECTION

SECTION A-A

SECTION B-B
1. When Integral P.C.C. Curb and Gutter is placed adjacent to Portland Cement Concrete Pavement, construct the joint as per the longitudinal joint sealant detail on Standard P-2, Sheet 3 of 5. Use approved joint filler to seal. Work to be paid under respective Curb and Gutter Item.

2. Depress Curb at Driveways as detailed.

3. Depress Curb flush with pavement at curb ramps. Maximum slope of depressed curb is 1:12.
DETECTABLE WARNING TRUNCATED DOMES DETAILS

NOTES:
1. The area of detectable warning truncated domes shall be 24" (600) long and the full width of the ramp.
2. See specification for additional information.

SECTION B-B

TAPER RAMP 12:1 MAX
SEE NOTE 1

RAMP SURFACE

NOTE: 1) Where a 12:1 maximum slope ramp will not meet the sidewalk grade within a length of 15' (4570) due to steep adjacent roadway, the ramp length may be limited to 15' (4570), and the ramp slope allowed to exceed 12:1.
2) Ramp width shall be 4' (1200) minimum, however, 5' (1525) is preferred.
Curb Ramp, Type 2
Parallel Curb Ramp

Curb Ramp, Type 3
Diagonal Curb Ramp

Curb Ramp, Type 4
Perpendicular Curb Ramp

Notes:
1. Where a 12:1 maximum slope ramp will not meet the sidewalk grade within a length of 15' (4570) due to steep adjacent roadway, the ramp length may be limited to 15' (4570), and the ramp slope allowed to exceed 12:1.
2. Transition to existing sidewalk width over the length of the ramp.
3. Ramp width shall be 4' (1200) minimum, however, 5' (1525) is preferred.

DELAWARE
DEPARTMENT OF TRANSPORTATION

STANDARD NO. C-2 (2004) SHT. 2 OF 4

APPROVED

RECOMMENDED

11/01/05

12/27/2004
ELEVATION D-D

SECTION E-E

ELEVATION G-G

NOTE: CURB RAMP WIDTH SHALL BE 4' (1200) MINIMUM, HOWEVER, 5' (1525) IS PREFERRED.
CURB RAMP TYPE 5 & SECTIONS

NOTES:
1. A cut-through level with the street is the preferred treatment for islands, although ramps can be used where the island width is sufficient to accommodate them. Positive surface drainage must be provided for either treatment, either treatment is acceptable.
2. Where a 12:1 maximum slope ramp will not meet the sidewalk grade within a length of 15' (4570) due to steep adjacent roadway, the ramp length may be limited to 15' (4570) and the ramp slope allowed to exceed 12:1.
3. A continuous path must be provided between adjacent curb ramps in islands and medians, with a maximum running slope of 20:1.
4. Ramp width shall be a minimum of 4' (1200), however 5' (1525) is preferred. When using cut-through style ramp, with curbing on both sides of the ramp, the width shall be a minimum of 5' (1525).
DELAWARE
DEPARTMENT OF TRANSPORTATION

PLAN

URBAN APPLICATION

ELEVATION

RURAL APPLICATION

SECTION A-A

SECTION B-B

DELAMAR
RECOMMENDED
3/3/01
03/09/2001

SCALE : N.T.S.
TYPE D
INTEGRAL P.C.C. CURB AND GUTTER, TYPE 1

TYPE E
INTEGRAL P.C.C. CURB AND GUTTER, TYPE 2

DELAWARE DEPARTMENT OF TRANSPORTATION
CURB OPENINGS
STANDARD NO. C-4 (2001) SHT. 2 OF 3
APPROVED RECOMMENDED

SCALE: 1/8"=1'-0"
03/03/2001
TYPE F
INTEGRAL P.C.C. CURB AND GUTTER, TYPE 3

TYPE G
INTEGRAL P.C.C. CURB AND GUTTER, TYPE 4
Note: 61 safety end structure to be precast.
### Dimensions

<table>
<thead>
<tr>
<th>PIPE SIZE</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>6&quot; (150)</td>
<td>9&quot;-6&quot; (290)</td>
<td>2&quot;-9&quot; (230)</td>
<td>6&quot;-4&quot; (2540)</td>
</tr>
<tr>
<td>8&quot; (203)</td>
<td>8&quot;-5&quot; (205)</td>
<td>2&quot;-10&quot; (260)</td>
<td>10&quot;-2&quot; (305)</td>
</tr>
<tr>
<td>2(\times)1520 OR 24&quot; (600)</td>
<td>14&quot;-4&quot; (358)</td>
<td>2-10&quot; (260)</td>
<td>12&quot;-6&quot; (310)</td>
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</tbody>
</table>

### Approximate Quantities

<table>
<thead>
<tr>
<th>PIPE SIZE</th>
<th>CONCRETE FT(^2)</th>
<th>REINF. STEEL LBS.</th>
<th>NO. OF GRATES</th>
<th>LENGTH TO BE CUT FROM 1 GRATE</th>
<th>WEIGHT OF FULL SIZE GRATE LBS.</th>
<th>WEIGHT OF CUT GRATE LBS.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6&quot; (150)</td>
<td>25.0 (757)</td>
<td>0.72 (40.94)</td>
<td>2</td>
<td>--</td>
<td>210.92</td>
<td>0.02 (280)</td>
</tr>
<tr>
<td>8&quot; (203)</td>
<td>38.5 (1106)</td>
<td>0.98 (56)</td>
<td>3</td>
<td>2-1&quot; (51)</td>
<td>210.92</td>
<td>0.02 (280)</td>
</tr>
<tr>
<td>2(\times)1520 OR 24&quot; (600)</td>
<td>43.75 (1290)</td>
<td>0.94 (53.29)</td>
<td>3</td>
<td>--</td>
<td>210.92</td>
<td>0.02 (280)</td>
</tr>
</tbody>
</table>

### Bending Diagram

- **X**
  - A-BARS
  - B-BARS
  - C-BARS
  - D-BARS

- **Y**
  - C-BARS
  - D-BARS

### Schedule of Reinforcing Steel

<table>
<thead>
<tr>
<th>PIPE SIZE</th>
<th>A-BARS</th>
<th>B-BARS</th>
<th>C-BARS</th>
<th>D-BARS</th>
<th>G-BARS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SIZE</td>
<td>NO.</td>
<td>SPA.</td>
<td>LENGTH</td>
<td>SIZE</td>
</tr>
<tr>
<td>6(\times)1520</td>
<td>4(\times) (12)</td>
<td>2</td>
<td>8(\times) (203)</td>
<td>72&quot; (1830)</td>
<td>4(\times) (12)</td>
</tr>
<tr>
<td>8(\times)460</td>
<td>4(\times) (12)</td>
<td>2</td>
<td>8(\times) (203)</td>
<td>72&quot; (1830)</td>
<td>4(\times) (12)</td>
</tr>
<tr>
<td>2(\times)1520 OR 24&quot; (600)</td>
<td>4(\times) (12)</td>
<td>2</td>
<td>8(\times) (203)</td>
<td>72&quot; (1830)</td>
<td>4(\times) (12)</td>
</tr>
</tbody>
</table>

### Delaware Department of Transportation

- 61 SAFETY END STRUCTURE
- STANDARD NO. D-1 (2001)
- SHT. 2 OF 2
- APPROVED
- RECOMMENDED

[Signature]

04/17/2001
PLAN VIEW
SHOWN WITHOUT GRATE

NOTE: 10" SAFETY END STRUCTURE TO BE PRECAST

SECTION A-A
* REQUIRED ONLY FOR PIPE SIZE OF 27" (686) OR 24" (600)

DELWARE
DEPARTMENT OF TRANSPORTATION

101 SAFETY END STRUCTURE

STANDARD NO. D-2 (2001) SHT. 1 OF 2

APPROVED
RECOMMENDED

04/17/2001
### Dimensions

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>8&quot; (175)</td>
<td>15&quot;-4' (4675)</td>
<td>2'-4½&quot; (720)</td>
<td>14'-(2/4) (4445)</td>
</tr>
<tr>
<td>10&quot; (150)</td>
<td>19'-4½&quot; (5945)</td>
<td>2'-3½&quot; (765)</td>
<td>8'-7&quot; (2575)</td>
</tr>
<tr>
<td>21&quot; (550)</td>
<td>24'-0&quot; (7320)</td>
<td>5'-2½&quot; (1595)</td>
<td>22'-2½&quot; (6895)</td>
</tr>
</tbody>
</table>

### Approximate Quantities

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Concrete Ft³ (m³)</th>
<th>Reinforced Steel Lbs. (kg)</th>
<th>No. of Grates</th>
<th>Length to Be Cut from 1 Grate</th>
<th>Weight of Full Size Grate Lbs. (kg)</th>
<th>Weight of Cut Grate Lbs. (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8&quot; x 1375</td>
<td>46.75 (1.72)</td>
<td>156 (1.38)</td>
<td>4</td>
<td>2'-1½&quot; (62)</td>
<td>270.92 (122.89)</td>
<td>15.47 (6.45)</td>
</tr>
<tr>
<td>10&quot; x 1350</td>
<td>50.81 (1.86)</td>
<td>277.2 (22.98)</td>
<td>5</td>
<td>2'-1½&quot; (62)</td>
<td>270.92 (122.89)</td>
<td>15.47 (6.45)</td>
</tr>
<tr>
<td>21&quot; x 1500</td>
<td>165.43 (5.96)</td>
<td>503.3 (44.68)</td>
<td>6</td>
<td>2'-1½&quot; (62)</td>
<td>270.92 (122.89)</td>
<td>15.47 (6.45)</td>
</tr>
</tbody>
</table>

### Bending Diagram

- **X**:
  - 15" (375)
  - 19" (485)
  - 21" (550)
- **Y**
  - 25½" (653) to 4' (120)
  - 26½" (675) to 4' (120)
  - 32" (815)

### Schedule of Reinforcing Steel

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>A-Bars</th>
<th>B-Bars</th>
<th>C-Bars</th>
<th>D-Bars</th>
<th>G-Bars</th>
</tr>
</thead>
<tbody>
<tr>
<td>15&quot; (375)</td>
<td>4 (4/2)</td>
<td>1</td>
<td>4 (4/2)</td>
<td>5</td>
<td>4 (4/2)</td>
</tr>
<tr>
<td>10&quot; (150)</td>
<td>4 (4/2)</td>
<td>1</td>
<td>4 (4/2)</td>
<td>5</td>
<td>4 (4/2)</td>
</tr>
<tr>
<td>21&quot; (550)</td>
<td>4 (4/2)</td>
<td>2</td>
<td>4 (4/2)</td>
<td>5</td>
<td>4 (4/2)</td>
</tr>
</tbody>
</table>

### Notes

- DELAWARE
- DEPARTMENT OF TRANSPORTATION

161 SAFETY END STRUCTURE

STANDARD NO. D-2 0001

1 OF 2

APPROVED

RECOMMENDED

04/17/2001
1) STEPS SHALL BE INSTALLED IN BACK WALL AS PER SPECIFICATIONS.
2) NO PLIPS WITH AN OUTSIDE DIAMETER LARGER THAN 8" (203 MM) WILL BE PERMITTED TO ENTER THE BACK WALL OF A DRAINAGE INLET, IF IT IMPOSES THE INSTALLATION OF STEPS IN THE BACK WALL.
3) IF NECESSARY, A LARGER BOX MAY BE USED IN ORDER TO FIT THE STEPS AND A LARGER PIPE IN THE BACK WALL.

** NOTES **

** DIMENSIONS WILL VARY
** JOINT SEALANT AS PER SPECIFICATIONS

DELWARE DEPARTMENT OF TRANSPORTATION

DRAINAGE INLET DETAILS

APPROVED

STANDARD NO. D-5 (2002) SHT. 1 OF 8 RECOMMENDED
SECTION C-C  DRAINAGE INLET GRATE  TYPE 1

SECTION B-B  DRAINAGE INLET FRAME

SECTION D-D  DRAINAGE INLET GRATE  TYPE 2

SECTION F-F  DRAINAGE INLET GRATE  TYPE 3

DRAINAGE INLET FRAME AND GRATES
NOTE: 1. BOTTOM OF TYPE I GRATE TO BE FLAT AND TRUE.
2. TYPE 2 GRILLES SHALL NOT BE INSTALLED WHERE BICYCLE TRAFFIC MAY BE PRESENT.

DELAWARE DEPARTMENT OF TRANSPORTATION

STANDARD NO. D-6 (2002)  SHT. 2 OF 8  RECOMMENDED

04/03/2002
**Inlet Top Unit Applications**

<table>
<thead>
<tr>
<th>TOP UNIT</th>
<th>CURB</th>
</tr>
</thead>
<tbody>
<tr>
<td>TYPE A</td>
<td>USE IN DRAINAGE SWALE</td>
</tr>
<tr>
<td>TYPE B</td>
<td>INTERNAL PCC CURB &amp; GUTTER, TYPE 1 &amp; 3, PCC CURB TYPE 1</td>
</tr>
<tr>
<td>TYPE C</td>
<td>INTERNAL PCC CURB &amp; GUTTER, TYPE 4, PCC CURB TYPE 3</td>
</tr>
<tr>
<td>TYPE D</td>
<td>INTERNAL PCC CURB &amp; GUTTER, TYPE 2</td>
</tr>
<tr>
<td>TYPE E</td>
<td>PCC CURB TYPE 2</td>
</tr>
</tbody>
</table>

**Drainage Inlet Top Units**

Note: Top unit is to be cast-in-place to grade as specified on plan sheets or as directed by Engineer.

**S501 Bending Diagram**

S501 is not required to be one continuous bar. If more than one bar is used, there must be a 12" (300) overlap between bars.

**Drainage Inlet Details**

- **Type A**
- **Type B**
- **Type C**
- **Type D**
- **Type E**

**Scale:** N.T.S.

**Approved:**

- **Delaware Department of Transportation**
- **Standard No:** D-5 (2004)
- **Sht:** 3
- **Of:** 8
34" (865) x 24" (610) DRAINAGE INLET DETAILS

NOTE: REFER TO PREVIOUS SHEETS FOR REINFORCING REQUIREMENTS.
34" (865) x 18" (455) DRAINAGE INLET DETAILS

NOTES:
1. REFER TO PREVIOUS SHEETS FOR REINFORCEMENT REQUIREMENTS.
2. THE HEIGHT OF THIS INLET IS LIMITED TO 4' (1200) MAXIMUM. THEREFORE STEPS WILL NOT BE REQUIRED AND SHOULD NOT BE INSTALLED ON THIS INLET.
NOTE:
1. REINFORCEMENT SHALL BE 4" (100) X 4" (100) #4 X #4 (26 X 26)
2. INLET BOXES ARE TO BE PRE-CAST OR CAST-IN-PLACE.
ROUND MANHOLE ASSEMBLY

NOTE: ROUND MANHOLES SHALL BE CONSTRUCTED IN ACCORDANCE WITH AASHTO M 199.

DELaware DEPARTMENT OF TRANSPORTATION

MANHOLE DETAILS

STANDARD NO. D-6 (2001) SHT. 2 OF 4

APPROVED

06/06/2001
NOTE: TOP UNIT IS TO BE CAST IN PLACE TO GRADE AS SPECIFIED ON PLAN SHEETS OR AS DIRECTED BY ENGINEER.

SECTION A-A

SECTION B-B

SECTION C-C

TOP UNIT

FRAME

COVER

DELAWARE
DEPARTMENT OF TRANSPORTATION

MANHOLE DETAILS

STANDARD NO. D-6 (2001) SHT. 3 OF 4

APPROVED

RECOMMENDED

05/2/2001