The dimensions shown in the "Tabulation of Safety Grate Treatment" are from the original construction plans. Verify these dimensions at the site before fabricating components.

Submit shop drawings. Approval of drawings is not required as part of the fabrication process. Drawings will be used to document the item as constructed.

Use correct pipe diameters and correct dimensions. Ensure safety grate fits properly into the headwall opening.

Reinforcing steel may be encountered when drilling holes through the existing structure wall.

Install bolts and nuts complying with Article 4153.06 of the Standard Specifications at all locations as shown. Use brackets that comply with ASTM A36 and are galvanized per ASTM A123. Use steel washers meeting the dimensional requirements of Materials I.M. 453.07.

Provide Schedule 40 pipe meeting the requirements of Article 4153.06 of the Standard Specifications. Galvanize all pipes, fittings, and hardware after all cutting, welding, drilling, and fabrication. In the shop drawings, show members planned for field cutting and drilling to provide for installation tolerances. Refer galvanizing of those members according to Materials I.M. 410.

Gas Metal-Arc and Flux-Cored Arc welding may be used for welding incidental items as indicated on this sheet, provided that the fabricator furnishes certifications for the gas and uses approved filler metal and qualified welders approved by the Iowa DOT.

Payment for "Safety Grate, (Type 1, 2, 3, or 4), Culvert" is full compensation for furnishing all materials and work necessary to fabricate and install the grate system as required for each headwall opening.

Equal spaces 24 inches minimum, 30 inches maximum, edge of sidewalk to center of bracket or center to center of bracket.

Cross Bar diameter equal to or greater than Grate Bar diameter.

If more than 20 foot, midspan support is required. Refer to sheets 3 and 4.

Possible Contract Items:
Safety Grate, (Type 1, 2, 3, or 4), Culvert
Possible Tabulation:

---

**installation types**
Grate bars to be perpendicular to direction of traffic flow.

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**installation plan**

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**Grate & Cross Bar Size Requirements**

<table>
<thead>
<tr>
<th>Length of Span</th>
<th>Nominal Pipe Size</th>
<th>O.D. Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>less than 12'</td>
<td>3.0''</td>
<td>3.5''</td>
</tr>
<tr>
<td>12' - 16'</td>
<td>3.5''</td>
<td>4.0''</td>
</tr>
<tr>
<td>greater than 16'</td>
<td>4.0''</td>
<td>4.5''</td>
</tr>
</tbody>
</table>
SHIM DETAIL

DETAIL 'A'
TOP VIEW

DETAIL 'B'
TOP VIEW

SECTION A-A

SECTION B-B

SECTION C-C

SHIM DETAIL

HEADWALL BRACKET
TOP VIEW

HEADWALL BRACKET
FRONT VIEW

1. Drill 7/8 inch diameter holes using equipment designed to cut through concrete and reinforcing steel.
2. Bend plates or strips without cracking material.
3. Use a 5/8 inch bolt, lock nut and washers. All holes are to be 5/8 inch diameter.
4. Shim thickness equal to difference in diameters of Grate Bar and Cross Bar.

Grate Bar
(perpendicular to roadway edge)

Cross Bar

Washer

Plate

4'' x 4'' x 3/8'' Shim

0-1''

4'' x 6'' x 3/8'' Plate

Drill 7/8 inch diameter holes using equipment designed to cut through concrete and reinforcing steel.

Bend plates or strips without cracking material.

Use a 5/8 inch bolt, lock nut and washers. All holes are to be 5/8 inch diameter.

Shim thickness equal to difference in diameters of Grate Bar and Cross Bar.

4'' x 6'' x 3/8'' Plate

1'' rad.

1'' Dia. hole

3''-4'' Slots

6'' x 4'' x 3/8'' Angle, 12'' long

6'' x 4'' x 3/8'' Angle, 12'' long

6'' x 4'' x 3/8'' Angle, 12'' long

6'' x 4'' x 3/8'' Angle, 12'' long

Washer
If more than 20 feet, midspan support is required. Refer to sheets 3 and 4.

Length of span (20 feet maximum).
SAFETY GRATES
FOR BOX CULVERTS

**DETAIL 'C'**
- Bottom Support on Earth
- Bottom Support on Culvert Floor
- Top View
- Side View
- Cross Bar Support Assembly

**SECTION D-D**
- 5'' O.D. Pipe
- 12'' of Culvert
- Concrete Floor
- 18'' Corrugated Metal Pipe filled with concrete
- Sidewall
- 6'' x 6'' x 4'' Angle, 30' Long
- 30'' Long
- 9'' x 4'' x 2'' Angle, 30' Long
- 16'' Hole
- 16'' Bolt
- 4'' x 5'' Grate Bar
- 30'' Long
- 8'' x 6'' x 4'' Angle, 30' Long
- 16'' Bolt
- 4'' x 5'' Grate Bar
- 30'' Long

**DETAIL 'D'**
- 5'' O.D. Pipe
- 2'' Bolt
- 4'' O.D. Pipe
- 6'' Min.
- 8'' x 6'' x 4'' Angle, 30' Long
- 12'' Bracket
- 8'' x 6'' x 4'' Angle, 30' Long
- 10'' Plate
- 16'' Bolt
- 4'' x 5'' Grate Bar
- 30'' Long
- 8'' x 6'' x 4'' Angle, 30' Long
- 10'' Plate
- 16'' Bolt
- 4'' x 5'' Grate Bar
- 30'' Long

**REVISIONS:**
1. Added Designer Info button.
2. Approved by Design Methods Engineer.

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**NOTES:**
- Drill 7/8'' inch diameter holes using equipment designed to cut through concrete and reinforcing steel.
- Set approved anchor bolts using epoxy grout as described in Materials I.M. 453.08 for anchor bolts.