

GRATE & CROSS BAR SIZE REQUIREMENTS		
Length of Span	Nominal Pipe Size (2)	O.D. Size
less than 12'	3.0"	3.5"
12'-16'	3.5"	4.0"
greater than 16'	4.0"	4.5"

The dimensions shown in the "Tabulation of Safety Grate Treatment" are from the original construction plans. Verify these dimensions at the site before fabrication of the components. Shop drawings are required. The Contractor is responsible for using the correct pipe diameters, correct dimensions and proper fit of the safety grate into the headwall opening.

Install bolts and lock nuts complying with Article 4153.06 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.

The Contractor may encounter reinforcing steel when drilling holes through the existing structure wall.

Furnish Schedule 40 Pipe meeting the requirements of Article 4153.05.

Galvanize all pipes, fittings and hardware after all cutting, welding, drilling and fabrication.

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, uses approved filler metal and qualified welders approved by the Iowa DOT.

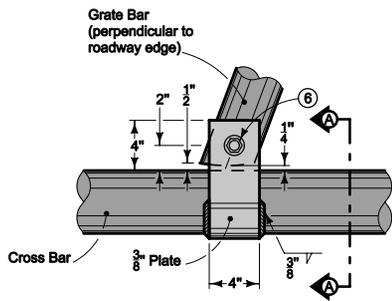
Price Bid for "Safety Grate, (Type 1,2,3, or 4), Culvert" is considered full compensation for furnishing all materials and work necessary to fabricate and install the grate system as required for each headwall opening.

- ① Equal spaces 24 inches minimum, 30 inches maximum, edge of sidewall to center of bracket or center to center of bracket.
- ② Cross Bar diameter equal to or greater than Grate Bar diameter.
- ③ If more than 20 feet, midspan support is required. Refer to sheets 3 and 4.

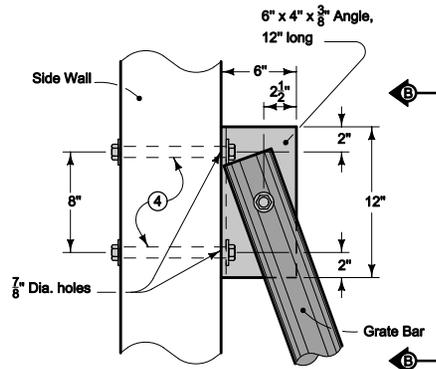
<p>Iowa Department of Transportation</p> <p>STANDARD ROAD PLAN</p> <p>REVISIONS: New. Replaces 540-4A,B,C,D.</p>	REVISION New 04-20-10
	<p>RF-29</p> SHEET 1 of 4

Deanna McFalls
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**SAFETY GRATES
FOR BOX CULVERTS**

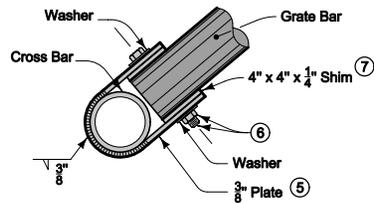


**DETAIL 'A'
TOP VIEW**

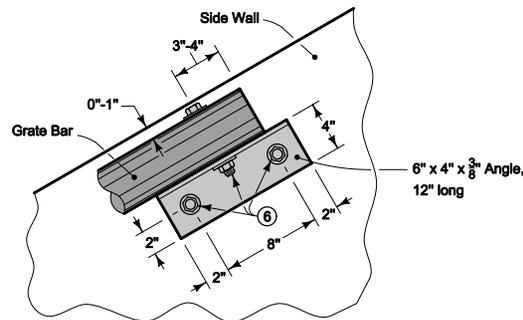


**DETAIL 'B'
TOP VIEW**

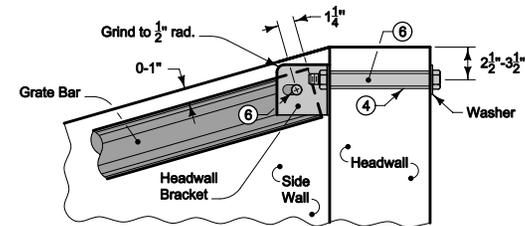
- ④ Holes are to be $\frac{7}{8}$ inch diameter made with equipment designed to cut through concrete and reinforcing steel.
- ⑤ Bend plates or strips without cracking material.
- ⑥ $\frac{3}{4}$ inch bolt, lock nut and washers. All holes are to be $\frac{7}{8}$ inch diameter.
- ⑦ Shim thickness equal to difference in diameters of Grate Bar and Cross Bar.



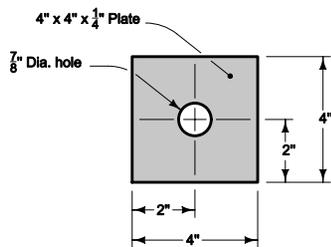
SECTION A-A



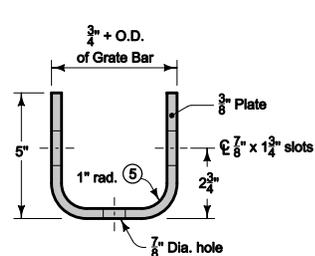
SECTION B-B



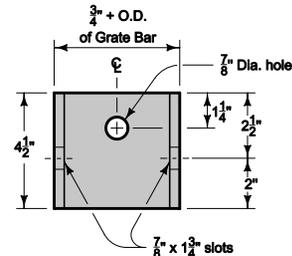
SECTION C-C



SHIM DETAIL



**HEADWALL BRACKET
TOP VIEW**



**HEADWALL BRACKET
FRONT VIEW**

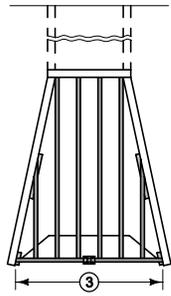
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	New 04-20-10
STANDARD ROAD PLAN	RF-29
REVISIONS: New. Replaces 540-4A,B,C,D.	SHEET 2 of 4

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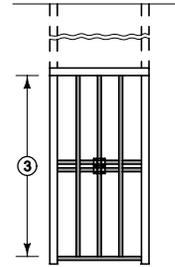
**SAFETY GRATES
FOR BOX CULVERTS**

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

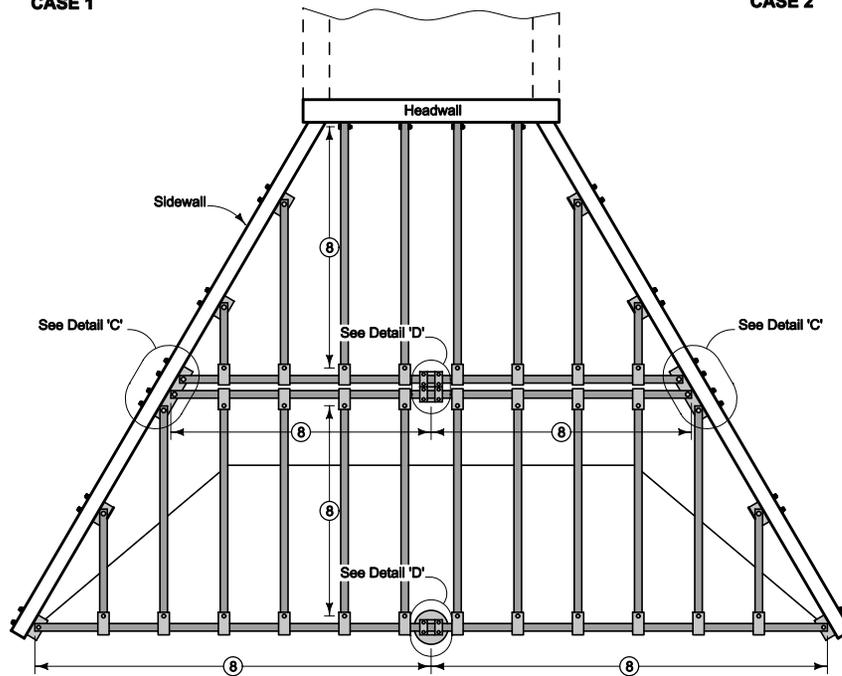
⑧ Length of span (20 feet maximum).



CASE 1

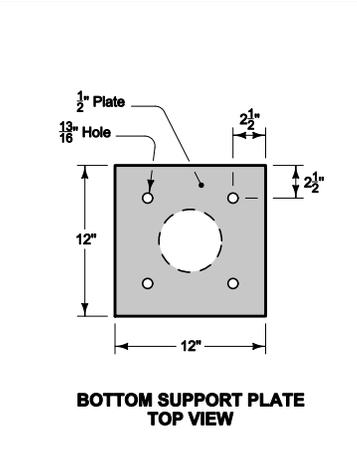
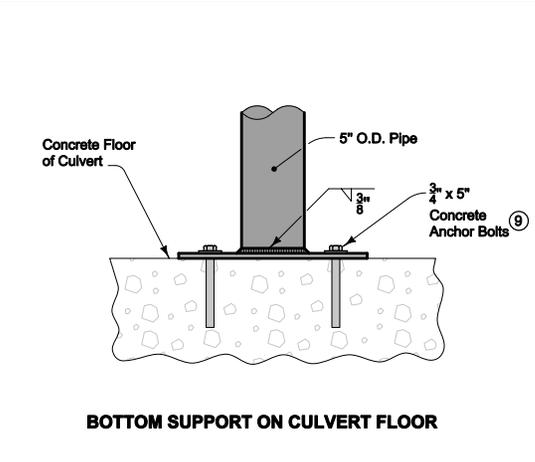
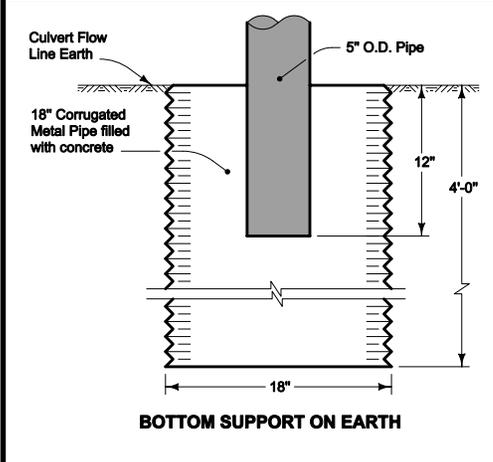
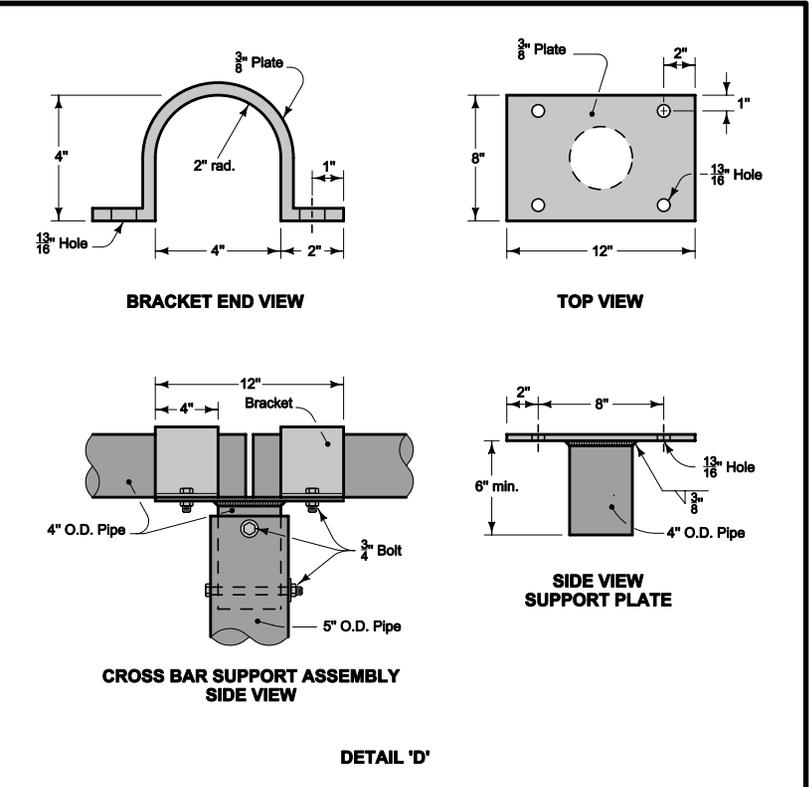
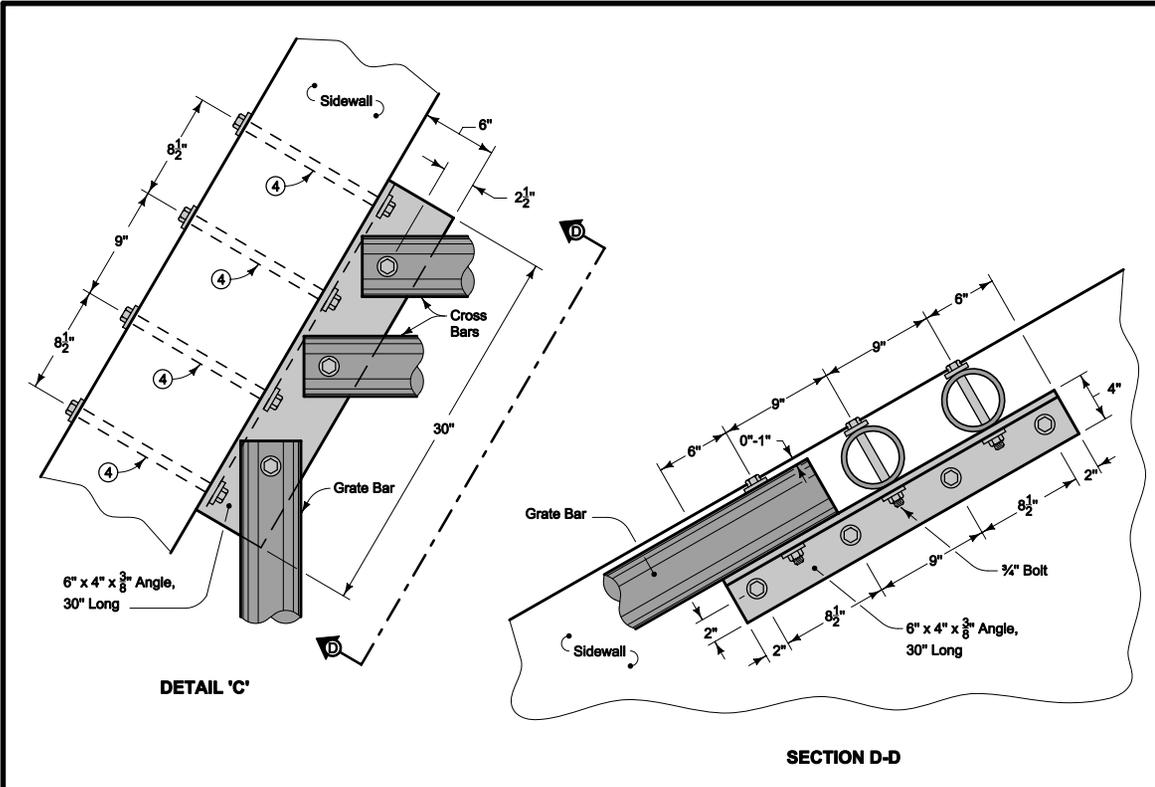


CASE 2



INSTALLATION PLAN WITH MIDSPAN SUPPORT

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SAFETY GRATES FOR BOX CULVERTS	



- ④ Holes are to be 7/8 inch diameter made with equipment designed to cut through concrete and reinforcing steel.
- ⑨ Set approved anchor bolts using epoxy grout as described in the Materials I.M. 453.08 for anchor bolts.

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REVISIONS: New. Replaces 540-4A,B,C,D.	SHEET 4 of 4
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SAFETY GRATES FOR BOX CULVERTS	