

# Culvert Safety Treatments

**Design Manual**  
**Chapter 8**  
**Roadside Safety**  
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This section describes options for making culvert openings traversable. As described in Section [8A-3](#), treating a culvert opening to make it traversable is preferred to shielding the opening with a barrier. Other preferred alternatives (also discussed in Section 8A-3) include extending the culvert opening beyond the clear zone or relocating the opening to a point where it is less likely to be struck.

Culvert openings located within the clear zone should be analyzed for their potential to cause harm to motorists who run off the road. Structures with large openings, such as box culverts, are a concern because of the potential for impacts into the side of the opening or drop-offs into the opening. Even smaller culvert openings (those in excess of 36 inches) can snag a wheel, causing a vehicle to lose control. Therefore, treating culvert openings in some manner is important in minimizing risk for a motorist who has left the roadway.



When treating the outlet end of a culvert using grates, the inlet end must also be treated in some manner to prevent debris intruding into and clogging the culvert. The presence of grates may result in additional maintenance needs in order to prevent clogging, especially in large drainage areas where corn is planted. Therefore, consult the District Office for guidance on whether grates would be appropriate at a particular location.

## Cross-Drainage Culverts vs. Parallel Culverts

Whether a culvert is considered cross drainage or parallel depends on its orientation relative to travel on the main highway.

- Cross drainage culverts carry water from one side of the highway to the other and are oriented perpendicular or nearly perpendicular to the main flow of traffic. Roadway pipes are considered cross drainage culverts. The openings of cross drainage culverts are typically located within or at the base of the highway's foreslope.
- Parallel culverts are oriented parallel to the main flow of traffic and carry water under side roads, driveways, field entrances, and median crossings. Entrance pipes are considered parallel culverts. The openings of parallel culverts are typically located at the base of a transverse slope, usually in line with the highway's ditch.

## Pipe Culvert Treatments

### Cross Drainage Pipe Culverts (Roadway Pipes)

The ends of cross drainage pipe culverts typically consist of pipe aprons to improve drainage efficiency. Concrete aprons with an F dimension (see Standard Road Plans [DR-201](#), [DR-202](#), and [DR-205](#)) larger than 36 inches, and metal aprons with a W dimension (see Standard Road Plans [DR-203](#) or [DR-204](#)) larger than 36 inches, are considered obstacles if located within the clear zone and require safety treatments to reduce the possibility of an errant vehicle dropping into the opening.

Safety treatments for cross drainage pipe culvert openings are as follows:

- For circular concrete roadway pipes, use a [DR-201](#) pipe apron with a [DR-213](#) apron guard.

- For low clearance concrete roadway pipes, use a [DR-202](#) pipe apron with a [DR-213](#) apron guard.
- For circular corrugated metal or polyethylene roadway pipes, or for unclassified roadway pipes, use a [DR-201](#) pipe apron with a [DR-213](#) apron guard. A [DR-122](#) Type “C-3” or “C-4” (depending on flow direction) adaptor must be used to connect the concrete apron to the pipe. Note this in the tabulation and/or in the estimate reference notes.

For situations not covered above, contact the [Roadside Safety Engineer](#) for guidance.

### Parallel Pipe Culverts (Entrance and Median Pipes)

Due to their location, the openings of parallel pipe culverts may be subject to head-on impacts by errant vehicles. Therefore, parallel pipe culvert openings should be treated differently than cross drainage pipe openings. Special aprons have been developed for use in certain situations. Openings smaller than 24 inches are considered traversable and typically do not require safety treatments, except in medians.

Safety treatments for parallel pipe culvert openings are as follows:

- For circular entrance pipes up to 60 inches in diameter, use a [DR-211](#) Metal Safety Slope Apron. This design is a combination apron/guard. When used with concrete or unclassified pipe culverts, a [DR-122](#) Type “C-3” or “C-4” (depending on flow direction) adaptor must be used. Note this in the tabulation and/or in the estimate reference notes.
- For circular entrance pipes greater than 60 inches in diameter, use a [DR-201](#) pipe apron with a [DR-213](#) apron guard. When used with corrugated metal, polyethylene, or unclassified pipe culverts, a [DR-122](#) Type “C-3” or “C-4” (depending on flow direction) adaptor must be used. Note this in the tabulation and/or in the estimate reference notes.
- For corrugated parallel pipes within the median, use a [DR-212](#) Beveled Pipe and Guard. This design is a combination apron/guard and is available in sizes ranging from 12 through 24 inches.
- For concrete parallel pipes within the median, use a [DR-211](#) Metal Safety Slope Apron. A [DR-122](#) Type “C-3” or “C-4” (depending on flow direction) adaptor must be used to connect the metal apron to the concrete pipe. Note this in the tabulation and/or in the estimate reference notes.

For situations not covered above, contact the [Roadside Safety Engineer](#) for guidance.

### Box Culvert Treatments

The openings of cross drainage box culverts can be made traversable through the use of safety grates. This treatment is shown on Standard Road Plan [DR-503](#) and is adaptable to many sizes and shapes of openings.



Safety grates should not be used on foreslopes steeper than 3:1.

If the decision is made to use safety grates, contact the Preliminary Bridge Design Section of the Office of Bridges and Structures for assistance in filling out Tabulation [108-24](#).

One additional safety concern that must be addressed relates to the culvert's headwall. To eliminate the chance of snagging a vehicle's tire, ensure that the headwall does not protrude above the surrounding ground by more than 4 inches (flush with the surrounding ground is preferred). This can be accomplished either by shaping the surrounding ground or cutting off the headwall to be flush with the ground.

Safety grates should not be applied to the openings of box culverts that are oriented parallel to the flow of traffic on the main highway. A different treatment method should be used.

# Chronology of Changes to Design Manual Section:

## 008B-002 Culvert Safety Treatments

8/21/2015 NEW  
New. Replaces 8B-4.

6/18/2004  
Previously Updated.