

Project Design Services

Date: 07/12/2019

CULVERT APRON GUIDANCE

Reference: MnDOT ROAD DESIGN MANUAL | 8-4.03.02 Safety Guidelines for Culverts

The following criteria are for culverts **WITHIN THE CLEAR ZONE**:

A. Cross-Drainage Structures (Centerline Pipes) Critical clear opening = 30 in. pipe placed perpendicular to the roadway

Round Pipe without Safety Apron (Flared End)

15" or less - no safety grate required

- Pay item: 2501.502 XX" CAS/GS/RC PIPE APRON

18" or greater - safety grate required

- Include Pay item: 2501.602 SAFETY GRATE FOR XX" CAS/GS/RC APRON
- Include Design Detail: Vehicle Grates for Flared End Concrete Aprons (if using concrete apron)
- District provides grate detail if calling for metal apron

Span Pipe - all sizes - safety grate required

- Pay item: 2501.502 XX" SPAN GS/CAS/RC PIPE-ARCH APRON
- Include Pay item: 2501.602 SAFETY GRATE FOR XX" SPAN CAS/GS/RC PIPE-ARCH APRON
- Include Design Detail: Vehicle Grates for Flared End Concrete Aprons (if using concrete apron)
- District provides grate detail if calling for metal apron

All Multiple Pipes - safety grates required – see above

Round Pipe with Safety Apron

36" or less - no safety grate required

- Pay item: 2501.502 XX" CS/CAS/GS/RC SAFETYAPRON

42" to 72" - safety grate required

- Pay item for metal: 2501.502 XX" CAS/GS SAFETYAPRON & GRATE DES 3148
- Pay item for concrete: 2501.502 XX" RC SAFETY APRON & GRATE DES 3132

78" or greater - no safety apron available, use flared end with grate

- Pay Item: 2501.502 XX" CAS/GS/RC PIPE APRON
- Include Pay item: 2501.602 SAFETY GRATE FOR XX" CAS/GS/RC APRON
- Include Design Detail: Vehicle Grates for Flared End Concrete Aprons (if using concrete apron)
- District provides grate detail if calling for metal apron

Span Pipe with Safety Apron

36" Span or less - no safety grate required. Equivalent round = 30"

- Pay item: 2501.502 XX" SPAN CAS/GS SAFETYAPRON

44" to 102" Span - no safety apron available, use flared end with safety grate. Equivalent round = 36" to 84"

- Pay item: 2501.502 XX" SPAN CAS/GS/RC APRON
- Include Pay item: 2501.602 SAFETY GRATE FOR XX" SPAN CAS/GS/RC PIPE-ARCH APRON
- Include Design Detail: Vehicle Grates for Flared End Concrete Aprons (if using concrete apron)
- District provides grate detail if calling for metal apron

115" Span or greater - use Standard Plate 3114 with safety grate. Equivalent round = 90"

- Pay Item: 2501.502 XXX" SPAN RC PIPE-ARCH APRON
- Include Pay item: 2501.602 SAFETY GRATE FOR XXX" SPAN RC PIPE-ARCH APRON

Multiple Pipes - Round 30" or less - no safety grate required | Span 28" or less - no safety grate required

New Construction:

- Use safety aprons whenever possible (within Clear Zone)
- Concrete safety aprons (Standard Plate 3022) can be used for concrete pipe. There are safety grates available for 42" to 72" size pipe. Standards is developing a grate for the 1:6 designs (Include Design Detail for 12" to 36")

Retrofit:

- Replacement of in-place flared aprons with safety aprons may not work because of limited right-of-way, etc. Each location should be checked to determine if a safety apron will fit. Where flared apron is used or left in-place, follow guidance about the use of safety grates.

B. Parallel-Drainage Structures (Parallel Pipes) Pipe placed parallel to the roadway for entrances and median crossovers.

Without Safety Aprons (Flared End)

It is recommended that flared end aprons not be used on parallel pipes within the clear zone.

Round Pipe with Safety Apron - metal safety apron & grate (if required) can be used on concrete or metal pipe

24" or less - no safety grate required

- Pay item: 2501.502 XX" CS/CAS/GS/RC SAFETYAPRON

27" or greater - safety grate required - metal safety apron & grate can be used on concrete or metal pipe

- Pay item: 2501.502 XX" CS/CAS/GS SAFETYAPRON & GRATE DES 3128 or 3148
 - Use Des 3128 for 30" to 36" | Use Des 3148 for 30" to 60"
- Pay item: 2501.502 XX" RC SAFETY APRON & GRATE DES 3132
 - Use for 42" to 72" concrete

Span Pipe with Safety Apron - metal safety apron & grate (if required) can be used on concrete or metal pipe

24" span or less - no safety grate required

- Pay item: 2501.502 XX" SPAN CS/CAS/GS/RC SAFETYAPRON

28" span or greater - safety grate required - metal safety apron & grate can be used on concrete or metal pipe

- Pay item: 2501.502 XX" SPAN CS/CAS/GS SAFETYAPRON & GRATE DES 3128 or 3148
 - Use Des 3128 for 28" to 35" | Use Des 3148 for 28" to 83"

All Multiple Pipes - safety grates required

Median crossovers require 1:10 slopes, safety aprons and safety grates - metal safety apron & grate can be used on concrete or metal pipe

- Pay item: 2501.502 XX" CS/CAS SAFETYAPRON & GRATE DES 3128
- Include Design Detail: Steel Safety Aprons 1:10 Slope (12" to 21") or (24" to 36")

Entrances require 1:6 slopes - metal safety apron can be used on concrete or metal pipe

New Construction:

- Use safety aprons whenever possible (within Clear Zone)
- Metal safety aprons (Standard Plate 3128 and 3148) can be used on both concrete and metal pipes. It is recommended that Standard Plate 3128 be used and Standard Plate 3148 be included in the list of plates as an available option.

Retrofit:

- Replacement of in-place flared aprons with safety aprons may not work because of limited right-of-way, etc. Each location should be checked to determine if a safety apron will fit. Where flared apron is used or left in-place, follow guidance about the use of safety grates.