

DRAINAGE CHECKLIST

- Check to see if the aprons are in the clear zone. Then follow Chapter 8-4.03.02 of the Road Design manual which states....

DEFINITIONS

Safety Aprons: An apron for the end of pipe culverts or pipe sewers that has mitered sides.

The width of safety apron = the pipe diameter. Standard Plates 3022, 3128 and 3148.

Safety Grate: A bar system used over the culvert or sewer apron opening to allow vehicles to pass over the opening safely. Standard Plates 3128, 3132, 3148 and an unapproved detail available from the Standards Server.

Trash Guard: A bar system used over the culvert or sewer apron opening to keep out trash, and in some cases, mammals that seek shelter. This bar system is not childproof if the spacing of the bars exceeds 6 in. This bar system is not considered a safety grate.

Critical Clear Opening: The clear distance a culvert or sewer apron opening that a vehicle can safely transverse before a safety grate is required.

CLEAR ZONE

Any culvert end outside of the clear zone does not need a safety apron or safety grate.

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

Without Safety Apron (Flared End)

Round Pipe

15 in. or less - no safety grate required

18 in. or greater - safety grate required

Span Pipe

All sizes - safety grate required

All multiple pipes - safety grate required

With Safety Apron (Mitered End)

Round Pipe

36 in. or less - no safety grate required

42 in. to 72 in. - safety grate required

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

Span Pipe

36 in. span or less - no safety grate required. Equivalent round = 30 in.

44 in. span to 102 in. - no safety apron available, use flared end with safety grate.

Equivalent round = 36 in. to 84 in.

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

Multiple Pipe

Round 30 in. or less - no safety grate required

Span 28 in. or less - no safety grate required. Equivalent round = 24 in.

Note: Pipe sizes are based on concrete pipe.

New Construction

- ❖ *Use safety aprons whenever possible.*
- ❖ *Concrete safety aprons (Standard Plate 3022) can be used for concrete pipe. There are safety grates available for 42 in. to 72 in. size pipe. Standards is developing a grate for the 1:6 designs.*
- ❖ *Whenever the apron on Standard Plate 3022 is considered for use, Hydraulics should review each location to determine if it will work hydraulically.*

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 the flared apron is used or left in-place, follow the 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.

With Safety Aprons (Mitered End)

Round Pipe

24 in. or less - no safety grate required

27 in. or greater - safety grate required

Span Pipe

24 in. span or less - no safety grate required

28 in. span or greater - safety grate required

All Multiple Pipes - safety grate required

Note: Pipe sizes are based on CS pipe

Median crossovers require 1:10 slopes and all safety aprons require a safety grate.

Entrances require 1:6 slopes.

New Construction

- ❖ *Use safety aprons whenever possible.*
- ❖ *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 that 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 the flared apron is used or left in-place, follow the guidance about the use of safety grates.*

✓ Make sure that safety aprons and/or grates are used whenever necessary according to above criteria.

✓ Use Standard Plate 3022 for safety aprons up to 36", use Standard Plate 3132 for safety aprons larger than 36".

- ✓ Parallel median aprons must be at a 1:10. Cannot use concrete aprons for this but must use metal safety aprons. Use the Standard Plate 3128, this shows the connection to concrete pipe. Must also include a detail for these. Examples of this detail can also be found on ProjectWise at ...

OTS\DesignStandards\DesignDetails\SafeAprn1_10b_dd.dgn

OTS\DesignStandards\DesignDetails\SafeAprn1_10sm_dd.dgn

- Check the tabs to make sure they agree with the profiles and with the construction/drainage/general layout sheets (where ever drainage is shown). Check the size, material, apron style, stationing.
- Culverts (2501 items) do not need to have the plastic pipe option unless they are entrance pipes. (*See Design Scene Chapter 12 excerpt attached at the end of this checklist for more information*). Then they MUST give the options or have a good reason why not. When giving the plastic pipe option they must use the generic items....
 - 2501.602 X" SAFETY APRON by the EACH with the note...Apron material shall be the same as pipe material except that the apron for CP pipe shall be CS.
 - 2501.602 X" PIPE APRON by the EACH with the note... Apron material shall be the same as pipe material except that the apron for CP and CS pipe shall be GS.
 - 2501.603 X" PIPE CULVERT by the LIN FT with the note...CS, CP, RC may be used as acceptable pipe options. CS was used to determine the pipe lengths.
- Storm Sewer (2503 Items) MUST give the plastic pipe option. If not they must have a good reason why not. When giving the plastic pipe option they must use the standard concrete pipe pay items but add a note similar to....Plastic pipe may be used as an option for XX lin. Ft.. See tabulation for locations...the locations must be listed in the drainage table.
- Lining pipes must state the size of the pipe being lined....
 - 2503.603 LINING SEWER PIPE X" by the LIN FT...grout is incidental unless otherwise noted.
 - 2507.501 LINING CULVERT PIPE (X") by the LIN FT, when using this pay item they also need to include either...
 - 2519.607 CLSM LOW DENSITY by the CU YD or
 - 2519.607 CLSM HIGH DENSITY by the CU YD or
 - If using cured in place plastic (CIPP) then pay for it as 2507.603 LINING CULVERT PIPE (X") SPECIAL by the LIN FT.
- Any connection can go either way, you can either use the pay item for connection or you can make it incidental as long as it is clear in the plan what we are doing.

- Make sure they use “CS” for CM pipes, we no longer use CM pipes. Only existing ones can be called CM.
- Make sure they us “GS” for CS aprons unless they are safety aprons then they are CS.
- 2506.502 CONSTRUCT DRAINAGE STRUCTURE by the EACH...It includes the CASTING ASSEMBLY. Don't have a separate pay item for casting assemblies!
- 2506 RECONSTRUCT DRAINAGE STRUCTURE...Only use when changing the height of the drainage structure more than 6 inches...this includes the removal of the casting but does NOT include the salvaging or furnishing and installing of the casting.
- 2506 RECONSTRUCT MANHOLE...Don't use this pay item. Page 546 of the spec book states to use 2506 RECONSTRUCT DRAINAGE STRUCTURE.
- Standard plate 3128 is for CS aprons less than 36”, this is a round pipe that they cut off for the apron slope. Only one used for 1:10 median slopes.
- Standard plate 3132 is for RC aprons 42” to 72”
- Standard plate 3148 is for all GS aprons and they are made with the slope. These are NOT used for 1:10 median slopes...ever.