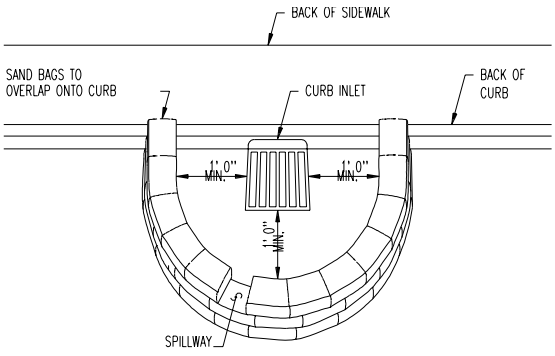
Inlet Protection



CURB INLET SAND BAG BARRIER

THIS INLET PROTECTION IS USED BEFORE THE ROAD IS PAVED
TYPE B OR C SPEC. 3891

Description

Storm drain inlet protection methods prevent sediment from entering storm drainage systems prior to permanent stabilization of the disturbed area. This can include a sediment filter or an excavated impounding area around a storm drain drop inlet or curb inlet or a geotextile barrier supported around or across a storm drain inlet.

These methods reduce the rate at which sediment -laden water may enter an inlet thereby causing ponding and settling of sediment. This will keep sediment from being transported to lakes or streams and can also prevent clogging of the storm sewer caused by heavy sediment loads.

Storm drain inlet protection is only as effective as the filter or barrier used around the inlet. Effectiveness decreases rapidly if the inlet protection is not properly maintained.

Storm drain inlet protection provides relatively good removal of coarse and medium-size sediment from runoff. However, most fine silt and clay particles will pass though gravel filters on these structures.

Advantages

- Storm drain inlet protection will reduce the amount of sediment leaving a construction site.
- Inlet protection is inexpensive and easy to construct.

Limitations

- Properly maintaining inlet protection is difficult and often inlets become clogged causing erosion elsewhere.
- Inlet protection devices are generally not very effective at filtering fine-grained sediment or large loads of sediment.

Purpose

Water Quantity

Flow attenuation ☐

Runoff volume reduction ☐

Water Quality

Pollution prevention

- Soil erosion ■
- Sediment control ■
- Nutrient loading ◧

Pollutant removal

- Total suspended sediment (TSS) ■
- Total phosphorus (P) ◧
- Nitrogen (N) ◧
- Heavy metals ◧
- Floatables ☐
- Oil and grease ☐
- Other
  - Fecal coliform ☐
  - Biochemical oxygen demand (BOD) ◧

■ Primary design benefit
◧ Secondary design benefit
☐ Little or no design benefit

Inlet Protection

- Ponding of stormwater around inlets in roadways under construction can cause access problems and create construction difficulties (saturated subgrade soils).
- Blocking an inlet has caused streets to flood and sediment to build up, creating a safety hazard.

Requirements

Design

This specification covers inlet protection for controlling sedimentation into and through storm sewer inlets.

Inlet protection will be classified by type according to use by MnDOT standards (see details that follow). Type will be as indicated herein:

- Type A: Inlet protection to be utilized around field inlets until permanent stabilization methods have been established. Inlet protection Type A may also be utilized on pavement inlets prior to installation of curb and gutter or pavement.
- Type B: Inlet protection will be utilized on street inlets without curb heads.
- Type C: Inlet protection will be utilized on street inlets with curb heads.
- Type D: Inlet protection to be utilized at culvert inlets until permanent stabilization methods have been established.
- Sediment Trap: Inlet protection for median drains that re not at the lowest point (see Temporary Sedimentation Basins/Traps BMP).

Inlet protection should only be used in locations where sediment can be removed and temporary ponding will not create a safety hazard or cause property damage. Various designs have been adapted for different conditions. These individual types are shown and described in the following figures.

Specificaitons

Sandbags

When utilizing sand bags as part of inlet protection, use the following MnDOT specifications:

- Sandbags shall consist of a woven polypropylene fabric sewn together with double stitching.
- Overall size of the sandbag shall be at least 350 x 650 mm (14 x 26 inches).

The polypropylene fabric shall meet or exceed the following:

- Grab tensile strength ASTM D 4632 420 N, minimum.
- UV stability ASTM D 4355 70 percent Minimum.

Geotextile

The geotextile shall be MnDOT Type I (permeable fabrics) for use in wrapping subsurface drain pipe or for other specified drainage applications.

Inlet Protection

- Geotextile shall be a woven, nonwoven, or knit fabric of polymeric filaments or yarns such as polypropylene, polyethylene, polyester, or polyamide formed into a stable network such that the filaments/yarns retain their relative position to each other.
- The geotextile shall be inert to commonly encountered chemicals and shall be free of any chemical treatment or coating that might significantly reduce porosity or permeability.
- Geotextile shall be uniform in texture, thickness and appearance, and be free of defects, flaws or tears that would significantly alter its strength or filtering properties.
- All authorized repairs shall be completed to the satisfaction of the Engineer.

The geotextile shall meet or exceed the following:

- Grab Tensile Strength ASTM D 4632 100 pounds
- Seam Breaking Strength ASTM d 4632 90 pounds
- Apparent Opening Size (AOS) 40-120 (U.S. Std. sieve size)

Mulch

Mulch shall be MNDOT Type 9 for use as aggregate filters.

- Aggregate mulch will be 3/8- to 2-inch, with 5 percent by mass allowable passing the 3/8-inch sieve. Crushing is allowable, but not required.

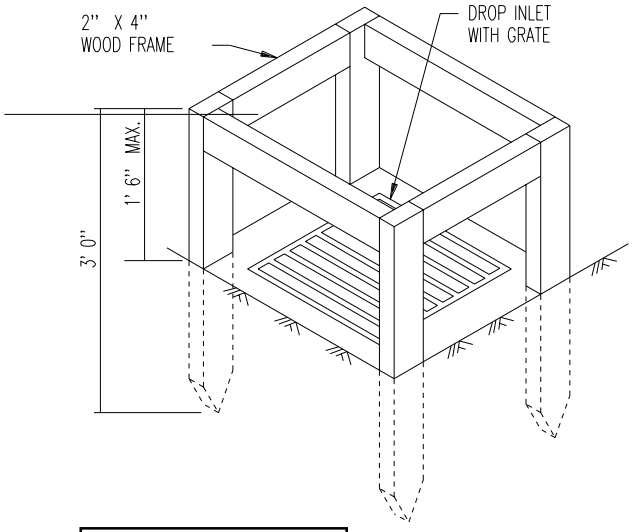
Other

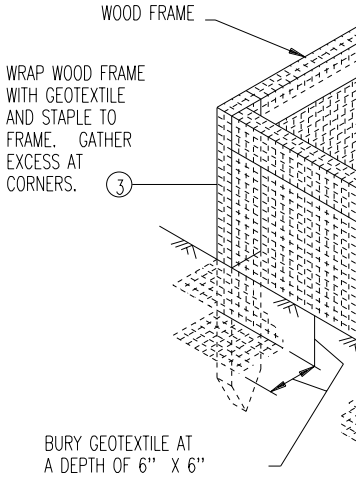
- All other materials shall be as specified on the following details.

Sequencing

- Inlet protection should be placed immediately after the storm sewer inlets are installed.
- Inlet protection may need to be removed during certain phases of construction. As soon as practical, inlet protection should be replaced.
- The result that blocking storm drain inlets will have on the site's drainage must be considered. Long sloping streets or ditches designed with several inlets along their length may have a significant amount of surface flow accumulate if inlet protection is used.
- In low areas, a pond will form around inlets. Ponding is necessary for removing sediment from runoff and should be encouraged in conjunction with inlet protection.
- Erosion-control practices should be used upstream to limit sediment movement from disturbed areas to the inlets.
- The inlet protection should be left in place until the drainage area is stabilized with established vegetation or pavement.

Inlet Protection



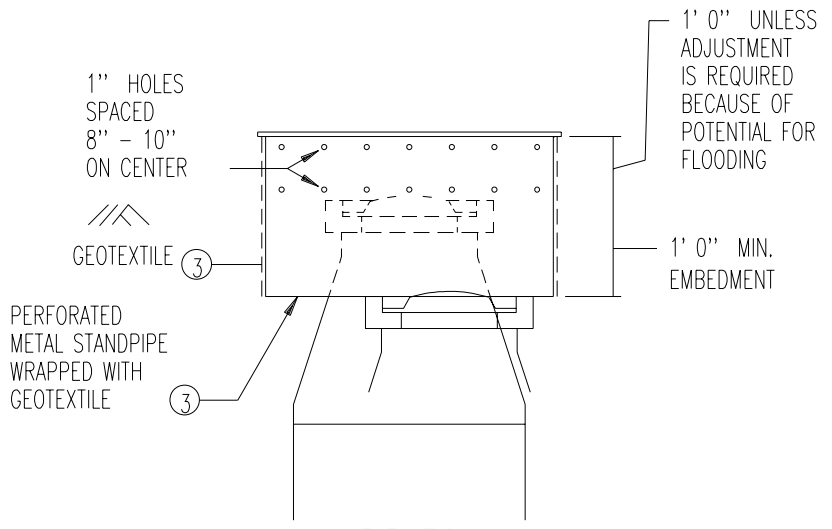


Type A
Source: MnDOT, 2000

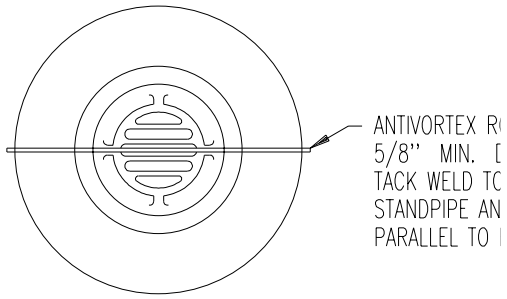
SILT FENCE BOX TO PROTECT DROP INLETS

USE WHERE INLET DRAINS AN AREA WITH SLOPES AT 1:3 or LESS
TYPE A SPEC. 3891

Type A
Source: MnDOT, 2000



ELEVATION



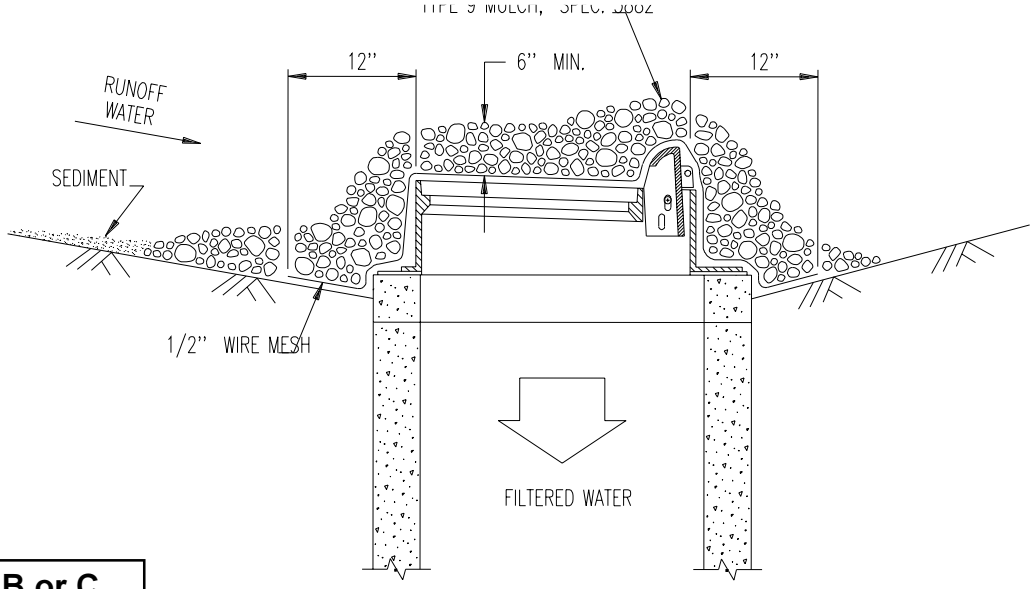
PLAN VIEW

TEMPORARY STANDPIPE

TO PROTECT DROP INLET
TYPE A SPEC. 3891

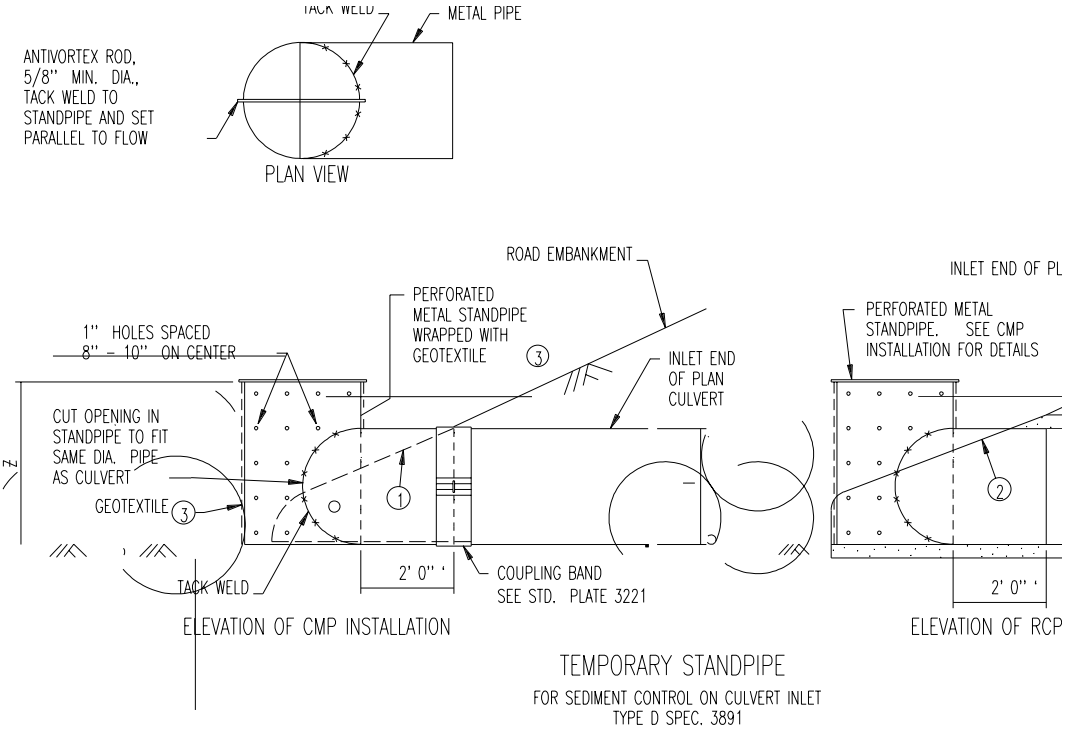
DESIGN GUIDELINES:
STORM FREQUENCY: 10 YEAR. - 24 HOUR.

Inlet Protection



Type B or C
Source: MnDOT, 2000

AGGREGATE FILTER AT CURB INLET
TYPE B OR C SPEC. 3891



TEMPORARY STANDPIPE
FOR SEDIMENT CONTROL ON CULVERT INLET
TYPE D SPEC. 3891

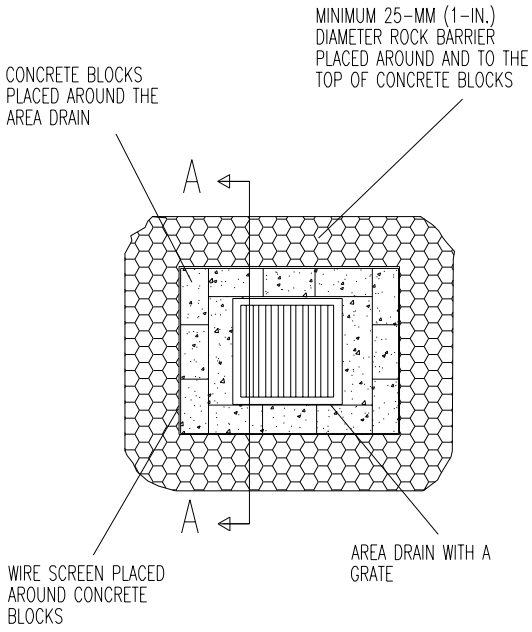
I = DIA. OF STANDPIPE EQUAL TO DIA. OF PLAN CULVERT
Z = LENGTH OF PERFORATED STANDPIPE (I + 12")

DESIGN GUIDELINES:

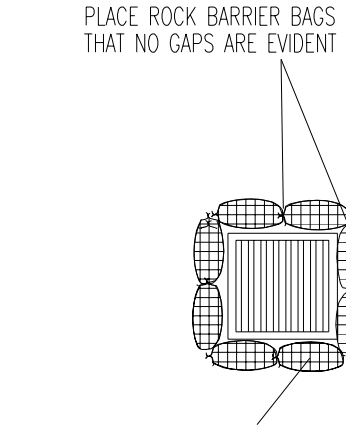
CULVERT SIZE:	12" - 36"
STORM FREQUENCY:	10 YR. - 24 HR.

Type D
Source: MnDOT, 2000

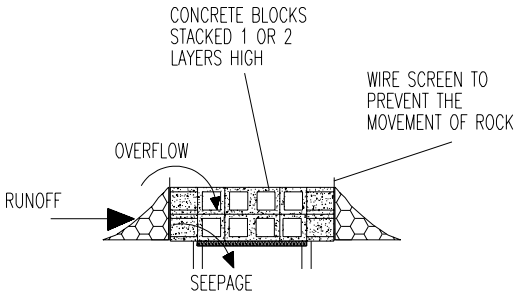
Inlet Protection



PLAN VIEW

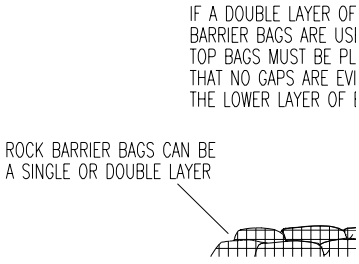


PLAN VIEW



SECTION A-A

CONCRETE BLOCK BARRIER



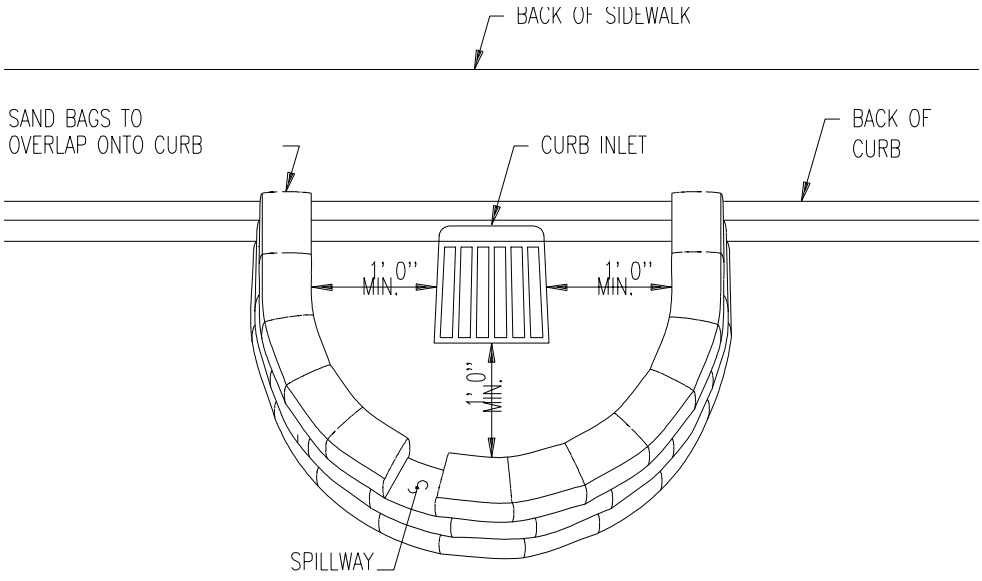
SIDE VIEW

ROCK BAG BARRIEF

NOTE: ROCK BARRIERS CAN BE USED ON PAVEMENT OR BARE GROUND

Type A, B or C
Source: MnDOT, 2000

Inlet Protection

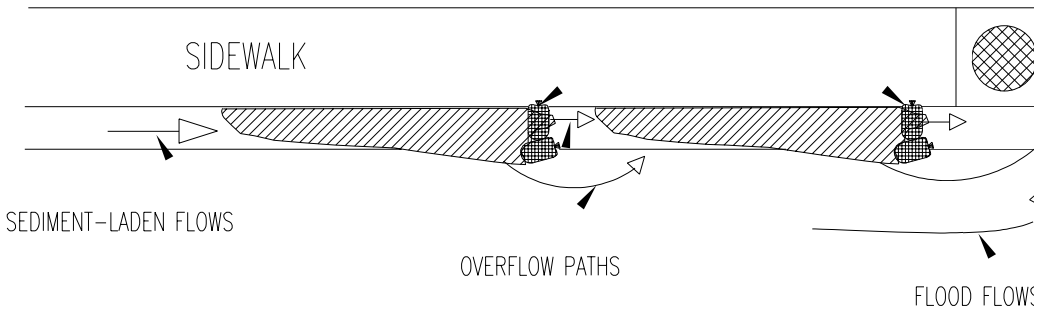


CURB INLET SAND BAG BARRIER

THIS INLET PROTECTION IS USED BEFORE THE ROAD IS PAVED
TYPE B OR C SPEC. 3891

Type B or C
Source: MNDOT 2000

PLACE TWO OR MORE SETS OF SAND BAGS IN A MANNER THAT RESULTS IN MAXIMUM SUPPORT. THE FLOW-LINE BAG MUST BE LOWER THAN THE TOP OF THE CURB.



NOTE: FILL SAND BAGS ABOUT 2/3 FULL BEFORE PLACING IN THE GUTTER

CURB AND GUTTER SEDIMENT CONTAINMENT SYSTEM

Type C
Source: HydroDynamics, Inc.

Inlet Protection

Requirements

Construction

Performance of all types of inlet protection depends on proper installation and proper use of materials. Materials used should be checked for conformance with the specifications. Inlet protection should be used around all susceptible inlets on site.

Maintenance

- After every rainfall that produces runoff, storm sewer inlet protection must be inspected.
- Sediment should be removed as needed. Excavated sediment should be placed where it will not create an erosion problem. Ponding water should slowly draw down following a rainfall. Geotextiles, rock, and perforated pipes used for inlet protection can easily become plugged with sediment and prevent draw down. Geotextiles and rock should be cleaned or better yet, replaced. Pip perforations should be cleaned.
- Inlet protection should be removed as soon as the contributing drainage area is stabilized.
- Periodic inspection and maintenance of inlet protection systems is critical Maintenance include removing sediment and replacing stones.

Sources

1. Center for Watershed Protection. 2001. "Inlet Protection" fact sheet in *Stormwater Manager's Resource Center*. www.stormwatercenter.net. Ellicott City, MD.
2. Fifeld, J. S. 1999. *When Best Management Practices Become Worst Management Practices.* Sept. CE News. Alpharetta, GA
3. Mecklenburg, D. 1996. Rainwater and Land Development. Division of Soil and Water Conservation, Ohio Department of Natural Resources. Columbus.
4. Minnesota Department of Transportation. 2000. *Standard Specificaitons for Construction.* St. Paul.
5. Minnesota Pollution Control Agency. 2000. *Protecting Water Quality in Urban Areas: Best management Practices for Dealing with Storm Water Runoff from Urban, Suburban and Developing Areas of Minnesota.* St. Paul.
6. United States Department of Agriculture and Mississippi State University. 1994. *Planning and Design Manual for the Control of Erosion, Sediment and Stormwater.* Watershed Sciences Institute, MSU. Columbus, MS.