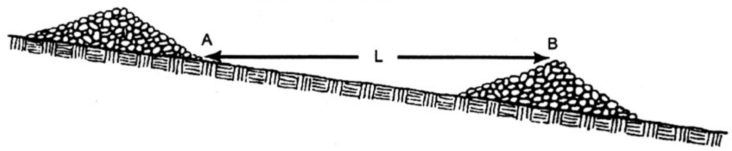
Check Dams



Description

Check dams are generally used in concentrated-flow areas, such as vegetated ditches and swales. Check dams are not used in streams or channels. Check dams can either be permanent or temporary barriers than prevent erosion and promote sedimentation by slowing flow velocities and/or to filtering concentrated flows. Check dams can be constructed from a variety of materials.

Check dams tend to pond water. Under low-flow situations, water ponds behind the structure and then seeps slowly through the check dam, infiltrates or evaporates. Under high-flow situations, water flows over and/or through the structure. Check dams *do not* include staked hay bales or most types of silt fence placed in a concentrated-flow area. These materials and methods are not effective and are not recommended.

In nearly all instances, erosion control blankets should be used in conjunction with check dams. Erosion-control blankets are biodegradable, open-weave blankets used for establishing and reinforcing vegetation on slopes, ditch bottoms and shorelines. See Fabrics and Mulch BMP for stabilization of drainageways with erosion control blankets.

Effectiveness

Check dams provide relatively good removal of coarse and medium-size sediment from runoff. However, most fine silt and clay particles will pass over or though the voids on these structures. Check dams described in this section provide several advantages over staked hay bales: they require less maintenance, are effective in medium- to heavy-flow situations, and can be a permanent erosion-control measure.

Erosion control blankets provide soil stabilization and are porous enough to facilitate vegetation growth while shielding the soil surface from erosion. They are always recommended for use in areas for stormwater flow. See Fabrics and Mulch BMP for information on these practices.

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

Check Dams

Advantages

- Relatively inexpensive and easy to construct.
- Effective at reducing erosion and sediment transport off site.

Limitations

- Requires periodic repair and sediment remove upstream of check dams.
- Removal of temporary check dams can be difficult.

Requirements

Design

Rock check dams should consist of well-graded stone consisting of a mixture of rock sizes. For example: Class IV riprap with the percent less than the specified rock diameter.

- 100% < 24 inches
- 75% < 15 inches
- 50% < 9 inches
- 10% < 4 inches

Other options include 1.5-inch clean gravel and river rock. When riprap is provided on a project, the riprap can be temporarily used for rock checks, removed, and then reused for the permanent riprap installation. In a series of check dams, the top center of the downstream check dam should be at the bottom of the upstream check dam. Bottom of the upstream check should be at the same elevation as the top of the downstream check. The spacing can be calculated by multiplying the height of the check dam by the slope H:V or by dividing by the slope in %. The spacing given in Table 1 and Figures 1 and 2 is based on a 2-foot-high check dam.

A triangular silt dike is a triangular-shaped foam block covered with geotextile fabric (see Figure 1). When laid in the channel, it will form a check dam. Triangular silt dikes are light weight and easy to install and maintain.

Straw wattles and excelsior logs are straw and wood-fiber cores wrapped with synthetic netting. They can be partially buried in a channel to create mini dams. They are available in many diameters to meet site requirements. They can be helpful in establishing permanent vegetation in a channel.

To increase the effectiveness of rock check dams, a shallow pool upstream of the check is recommended. The pool allows additional sediment storage (see Temporary Sedimentation Basins/Traps BMP).

Silt fence check dams can also be used if fence is the sliced in type with monofilament fabric. (See Figures 1 through 5 and Silt Fence BMP for further details). Other types of silt fence (such as preassembled) should not be used. Staked hay bales also should not be used due to their history of failure and ineffectiveness.

Ditch grade (%)	Spacing (feet)
1	200
2	100
4	50
6	33
Above 6% ditch grade, you may need to flatten the slope	
8	25
10	20

Table 1
Source: MPCA, 2000

Check Dams

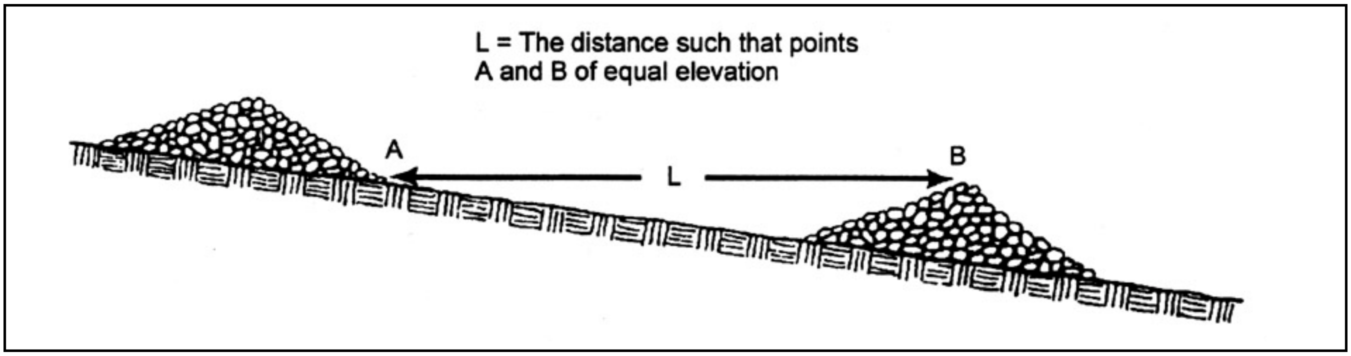


Figure 1
Source: MPCA, 2000

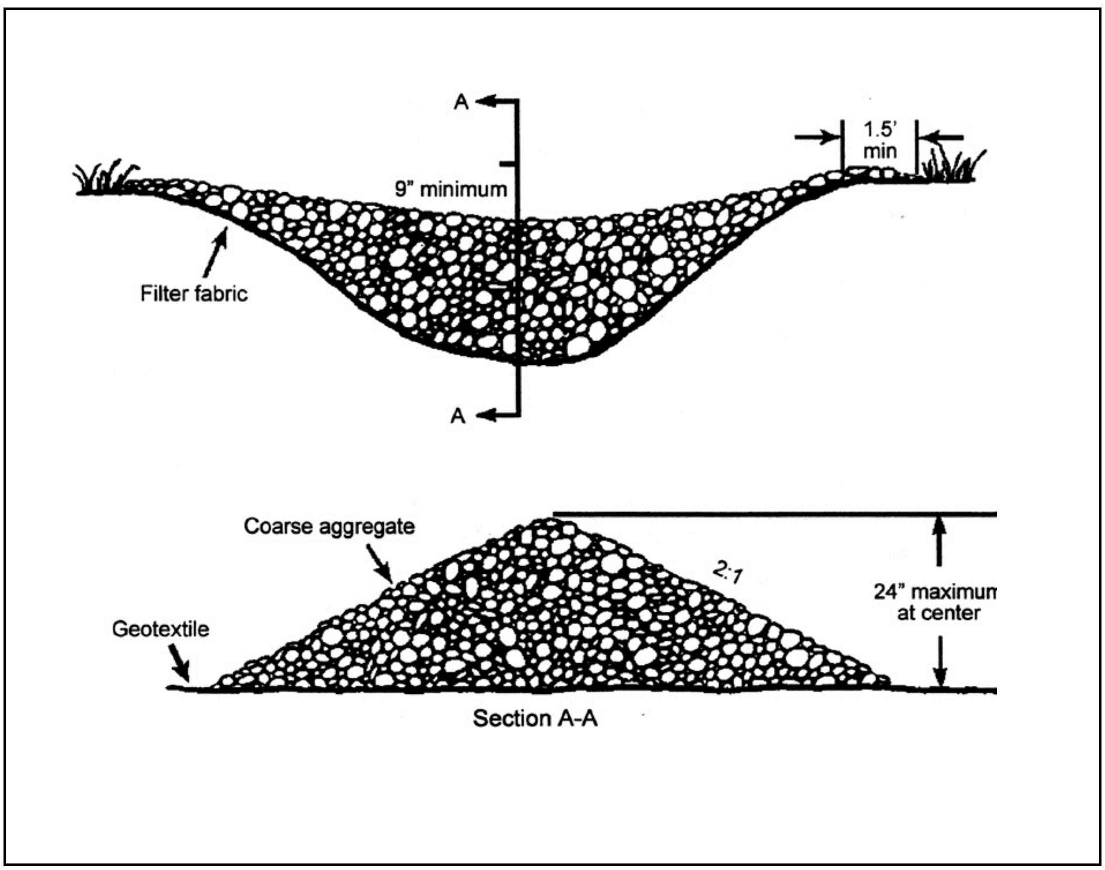


Figure 2
Source: MPCA, 2000

D_{50} OF ROCK (MM)	DOWNSTREAM SLOPE OF STRUCTURE 35 %	30 %	25 %	20 %	15 %	10 %
	MAXIMUM FLOW DEPTH ON ROCK (MM)					
75	15	18	20	25	33	50
150	30	36	40	50	66	100

SUGGESTED ROCK DIAMETER & FLOW DEPTHS

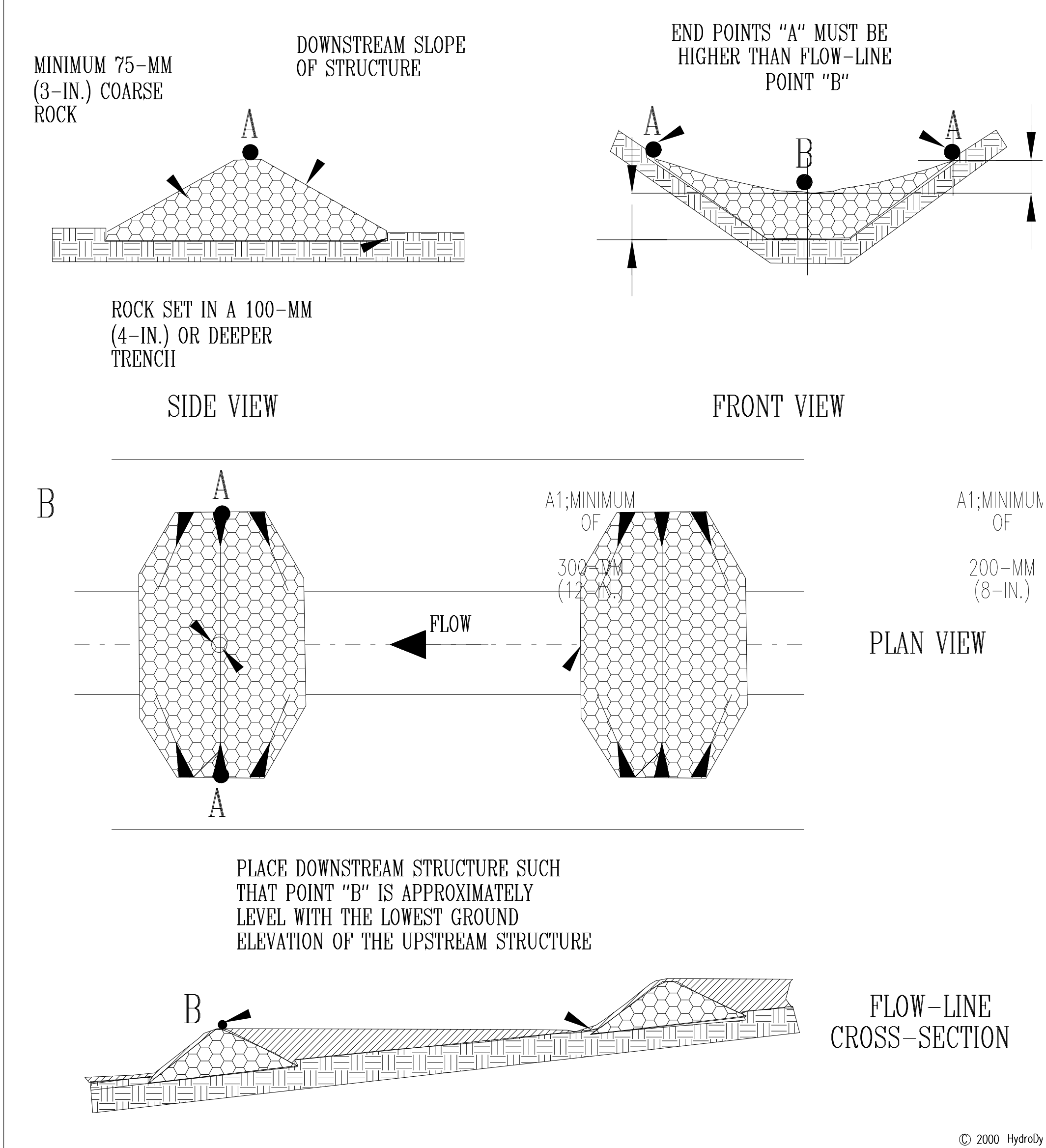


Figure 3
Source: HydroDynamics, Inc., 1999

Check Dams

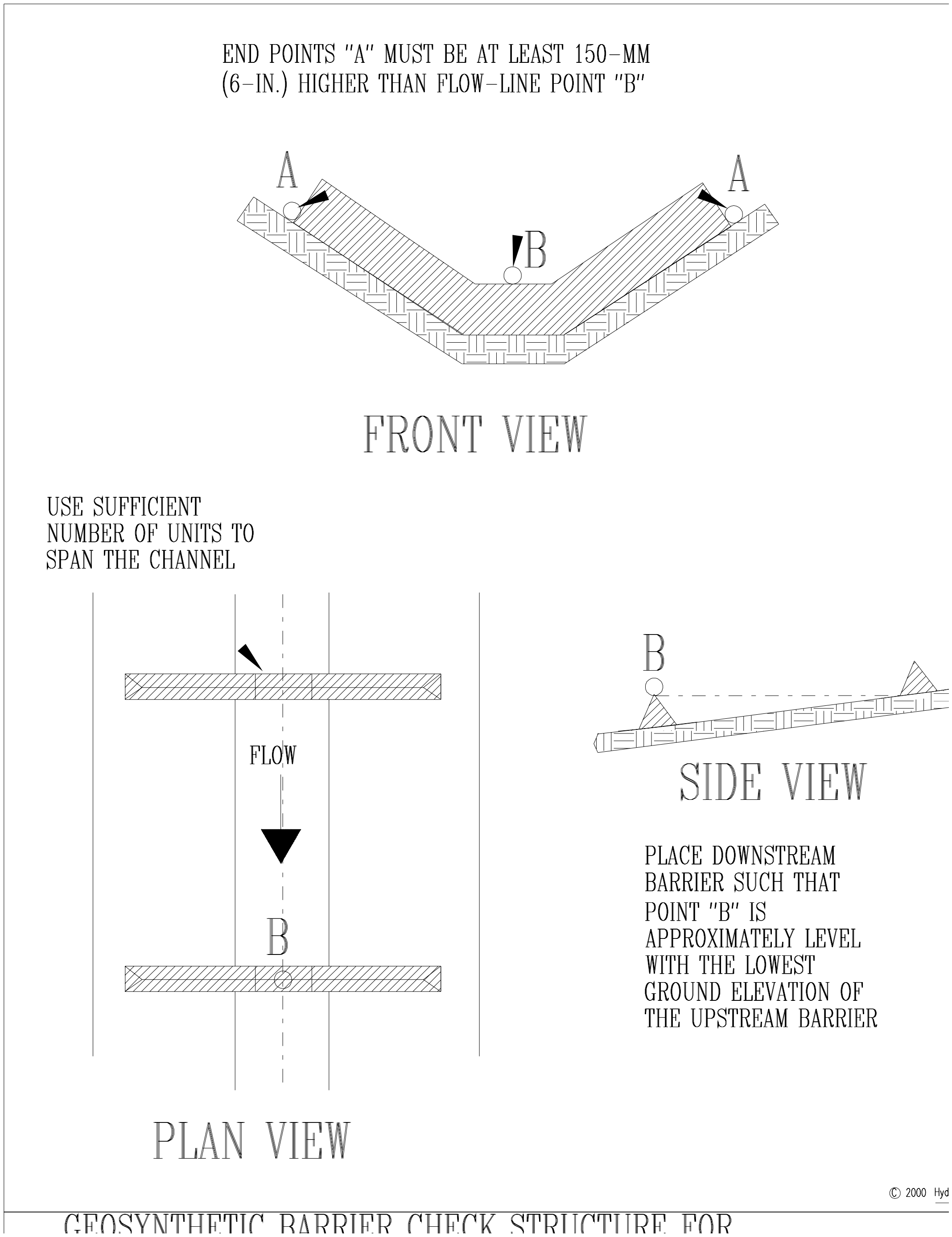


Figure 4
Source: HydroDynamics, Inc., 1999

Check Dams

Requirements

Construction

Install all structural check dams as recommended by the manufacturer. When rock dams are used, generally follow these procedures:

- Place rock to the lines and dimensions shown in the plan over a nonwoven geotextile fabric foundation.
- Install check dams and erosion control blanket immediately after drainageway grading is complete.
- Make sure that the channel reach above the most-upstream dam is stable.
- Ensure that channel appurtenances, such as culvert entrances below check dams, are not subject to damage or blockage from displaced rocks.
- Refer to *Standard Specifications for Construction* (MnDOT, 2000), Section 3889 for temporary ditch check specifications.

Maintenance

- Inspect check dams and drainageways for damage after each runoff event.
- Anticipate submergence and deposition above the check dam and erosion from high flows around the edges of the dam.
- Correct all damage immediately. If significant erosion occurs between dams, additional protection may be required. This may include a protective riprap liner in that portion of the channel or placing additional check dams.
- Remove sediment accumulated behind the dams as needed to prevent damage to channel vegetation, allow the channel to drain through the stone check dam, and prevent large flows from carrying sediment over the dam.
- Add rock or remove and replace rock to dams as needed to maintain design height, cross section, and flow-through characteristics.

Sources

1. Center for Watershed Protection. 2001. “Mats and Blankets” 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” in *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 Specifications 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*. Minneapolis.

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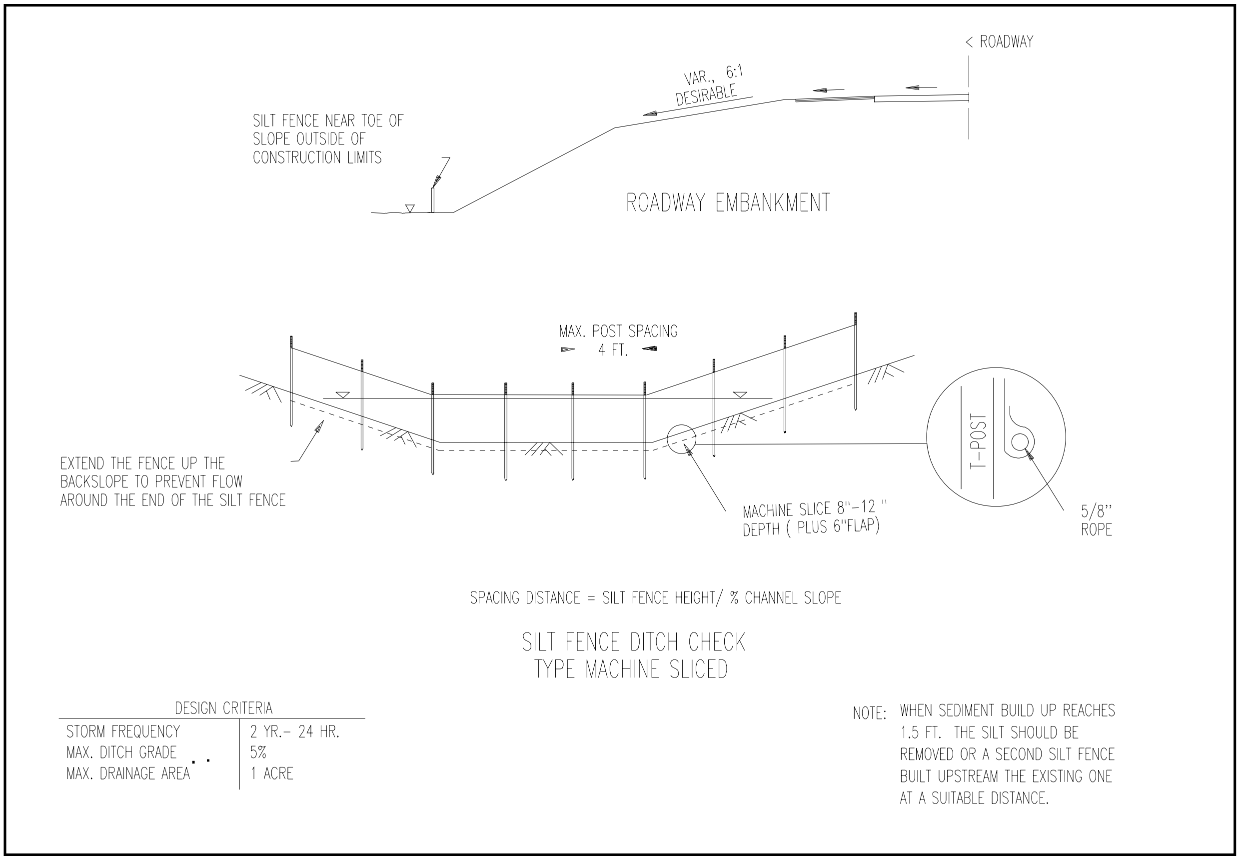

Figure 5
Source: MnDOT 2000