Check Dams

BENEFITS

	L	M	H
Flow Control	■	■	■
Erosion Control			
Sediment Control	■		
Runoff Reduction			
Flow Diversion			

Description: Check dams, sometimes called ditch checks, consist of a vertical barrier constructed across swales, ditches, and waterways. These structures are commonly constructed of erosion stone, although silt fence, fiber logs, erosion control blanket (ECB) pillows, and sandbags are also used.

Typical Uses: Check dams are used to control the velocity of concentrated runoff in ditches and swales and to prevent gully erosion until the channel can be stabilized. The structures may also provide some sediment removal benefits; however, this is not their primary function.

Advantages:
- Highly effective at reducing flow velocities in channels.
- Simple to construct.
- Low maintenance.

Limitations:
- Steep slopes require short spacing between check dams.
- Sediment removal practices are still required.
- Removal difficulties if not permanent

Longevity: Rock check dams - may be considered permanent. Silt fence, fiber logs, and manufactured devices - 6 months to 2 years. ECB pillow - effective for 3 to 6 months and then degrades.

SUDAS Specifications: Refer to Section 9040, 2.08 and 3.10.

A. Description/Uses

A check dam is a small, temporary obstruction in a ditch or waterway used to prevent erosion by reducing the velocity of flow. A check dam placed in the ditch or channel interrupts the flow of water, thereby reducing the velocity. Although some sedimentation may result behind the dam, check dams are not intended to function as sediment control devices.

Erosion stone or rip rap is typically used for check dams intended to remain as a permanent control feature while temporary check dams can include products such as silt fence, straw wattles, fiber logs, erosion control blanket (ECB) pillows, and sandbags.

Manufactured triangular ditch checks are also available. These products are produced in a variety of different configurations but are typically constructed from synthetic materials, allowing them to be removed and reused at the completion of the project.

B. Design Considerations

Regardless of the type of check dam installed, the concept for controlling the flow is the same. The check dam interferes with the flow in the channel, dissipating the energy of the flowing water, thereby reducing velocity and channel erosion.

Check dams should be designed to pass the two-year storm without overtopping the roadway or side slopes of the channel. A weir equation can be used to determine the depth of flow over the structure if necessary.

1. **Rock Check Dams:** Where long-term or permanent velocity control is desired, a rock check dam should be considered. Rock check dams should keyed into the bottom and sides of the channel a minimum of 6 inches and placed on a blanket of engineering fabric. Typical rock check dams are a minimum of 2 feet high with 1.5:1 side slopes. An overflow in the center of the check dam should be 6 inches lower than the sides to prevent flows from eroding the sides of the channel. These dimensions are approximate and may be modified based on individual needs and for larger flows. However, heights much greater than 2 feet increase the potential for scour on the downstream side of the dam. For larger check dams, additional channel protection may be required on the downstream side.

   The aggregate used should be large enough to prevent the flows from pushing individual stones downstream. A 6 inch erosion stone is normally sufficient for smaller rock checks. For larger check dams, or if failures occur, larger Class D material may be used.

   Refer to SUDAS Specifications Figure 9040.107.

2. **Silt Fence:** Silt fence is often used incorrectly as a check dam under moderate or high flows. Silt fence may be used as a check dam where the flow rate is low (less than 1 cfs). When installed, silt fence checks should be constructed across the channel with the ends secured up the banks to prevent flows from bypassing around the sides. See Section 7E-14 for additional information on this application.

   The pressure of ponded water and sediment against the upstream face of the silt fence can pull the buried portion out of the ground resulting in undermining. Adding mulch, straw bales, or wattles along the upstream face can relieve some of the sediment pressure against the fence and is recommended to help prevent failures. If failures still occur with these additional practices, the silt fence should be replaced with a different practice.

3. **Manufactured Devices:** Triangular-shaped manufactured check dam products should be designed and installed according to their manufacturer's recommendations. These products require secure anchoring to the ground to keep them in place and may require the installation of a rolled erosion control product (RECP) below them. When installed, manufactured checks should be constructed across the channel with the ends located higher up on the banks to prevent flows from bypassing around the sides.

4. **Erosion Control Blanket Pillow Checks:** ECB pillow checks are formed by folding a 12 to16 inch length of erosion blanket over on itself and securing it with long staples or wooden stakes. The shallow humps created by the folded ECB interrupt and slow flows. These "pillows" should be spaced at 50-foot intervals for flat slopes with a tighter 15 to 20-foot spacing for steeper slopes.

5. **Fiber Logs:** Fiber logs include straw wattles, wood excelsior logs, and compost filter tubes which can be used to create mini-check dams. These products are available in several different diameters. When installed, fiber log checks should be constructed across the channel in a half-moon shape with the center pointed downstream and the ends secured up the banks to prevent flows from bypassing around the sides.

   Installing fiber log checks on top of an RECP greatly enhances their performance and is highly recommended. The effectiveness of fiber logs as check dams by themselves is more limited than other products, but they can be an effective alternative for very low flow situations or for use on frozen ground when other practices cannot be effectively installed.

6. **Rock/Sandbags:** Rock/sandbags are relatively low-cost and easy to install, move, and reuse. The bags may be constructed from a variety of porous fabrics, and are filled with clean, poorly-graded gravel. Rock/sandbags are a good short-term solution where concentrated flows are causing erosion.

C. Application

Achieving the proper spacing is the most important aspect of check dam design. The spacing between structures is dependent on the height of the check dam, and the grade of the waterway. To protect the channel between the check dams, the devices should be spaced such that the elevation of the toe of the upstream check dam is equal to the elevation of the crest of the downstream check dam. This allows the water between the check dams to pond, resulting in a greatly reduced flow velocity.

As a rule, check dams should not be spaced closer than 20 feet to allow for proper maintenance. If check dams are not spaced as noted above, or if slopes and check dam height call for a spacing closer than 20 feet, a rolled erosion control product or turf reinforcement mat should be provided in between the check dams to provide additional stabilization for the channel surface.

Figure 7E-7.01: Typical Check Dam Spacing
(From SUDAS Specifications Figure 9040.106)

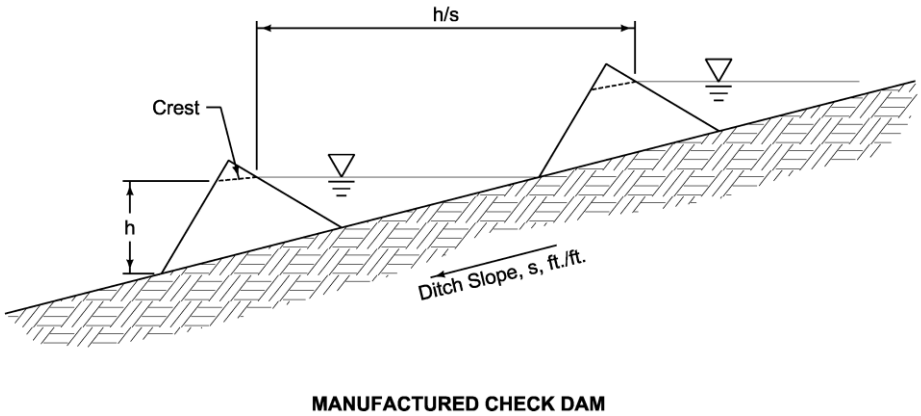

Table 7E-7.01: Spacing and Longevity of Various Check Dams

Check Dam Type	Spacing for Various Ditch Slopes				Slope Applications	Longevity*
	Up to 2%	3-5%	6-9%	10-15%		
Rock (2')	100	67-40	33-22	20-13	Up to 15%	> 2 years
Silt Fence (24")	75	50-35	25-17	15-10	Up to 15%	Up to 1 year
Triangular sediment dike (10")	42	28-17	14-19	8-6	Up to 15%	1-2 years
Fiber Logs - wood (9")	38	25-15	12-8	7-5	Up to 15%	1-2 years
Fiber Logs - wood (12")	50	33-20	17-11	10-7	Up to 15%	1-2 years
Fiber Logs - straw (9")	38	25-15	12-8	7-5	Up to 15%	Up to 6 months
Fiber Logs - straw (12")	50	33-20	17-11	10-7	Up to 15%	Up to 6 months
Fiber Logs - compost (8")	33	22-13	11-7	7-4	Up to 15%	Up to 1 year
Fiber Logs - compost (12")	50	33-20	17-11	10-7	Up to 15%	Up to 1 year
Fiber Logs - compost (18")	75	50-30	25-17	15-10	Up to 15%	Up to 1 year
ECB Pillow Check	50	15-20	N/A	N/A	N/A	Up to 6 months
Rock Bags	Varies depending on size					Up to 1 year

*Longevity is highly dependent on weather; maintenance may be required at more frequent intervals.

D. Maintenance

Check dams should be inspected for damage every seven calendar days or after any significant rainfall until final stabilization is achieved. Sediment should be removed when it reaches one-half of the original dam height. Upon final stabilization of the site, any temporary check dams should be removed, including any stone that has been washed downstream, and any bare spots stabilized.

E. Time of Year

Check dams function on a year-round basis.

F. Regional Location

Check dams should be designed to account for the individual characteristics of each site.