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 ~~most~~ commonly constructed of erosion stone, although silt fence, fiber logs, erosion control blanket (ECB) pillows, and sandbags ~~and manufactured devices~~ are also used. ~~Straw bales were used at one time, however, due to their high rate of failure and low level of effectiveness, their use is severely limited.~~

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.
- ~~Straw bales are ineffective and prone to failure.~~
- Removal difficulties if not permanent

Longevity: Rock check dams ~~1 year;~~ may be considered permanent. Silt fence, fiber logs, and manufactured devices - ~~Manufactured devices and silt fence~~ 6 months to 2 years. ECB pillow – effective for 3 to 6 months & then degrades.

SUDAS Specifications: Refer to Section~~s~~ 9040, 2.07 and 3.10

Commented [SK1]: Added in fiber logs, ECB pillow checks and sand bags as ditch check alternatives.

Simplified the Description/Uses section and moved the more detailed discussion to the individual practices

Removed gravel bag berms

Kept "triangular" ditch checks, but made language more generic

Removed limitation on drainage area

Clarified that rock checks need to be keyed into bottom and sides.

Kept silt fence for check dams: Updated silt fence spec figure to allow it to be placed continuously, or terminated as a J-hook. Similar to Iowa DOT figure.

Added requirement to place triangular check dams on a layer of RECP.

Updated Table 7E-7.01 for check dam spacing.

Commented [SK2]: Added in fiber logs, ECB Pillows, and sand bags

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. ~~do not function as sediment trapping devices and should not be designed as such.~~

~~Check dams are most commonly constructed of loosely placed erosion stone or rip rap~~ 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.~~, or from stone filled gabions.~~

~~Silt fence, placed across a ditch or swale, is often used incorrectly under moderate or high flows as a check dam. Silt fence may be used as a check dam; however, it should be limited to applications where the flow rate will be less than 1 cfs. See Section 7E-14 for additional information on using silt fence as a ditch check.~~

~~A variety of manufactured devices are also available for installation as~~ 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. ~~One type of manufactured ditch check consists of a 9 to 10 inch tall, triangular shaped structure constructed from sheets of perforated HDPE (High Density Polyethylene Pipe). Another manufactured product is constructed from a length of triangular shaped urethane foam. The foam is wrapped in a geotextile fabric for protection.~~

~~Gravel bag berms, formed from a pile of gravel filled bags, may also be used to construct check dams. The bags may be constructed from a variety of porous fabrics, and are filled with clean, poorly graded gravel. The purpose of the bag is to prevent individual gravel particles from being dislodged, and to allow the gravel barrier to be easily removed or relocated upon completion of the project.~~

~~Straw bales were commonly used in the past. However, field experience has shown that this technique is highly ineffective and prone to failures.~~

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 are not intended to control flows from large drainage areas. Typically, the maximum drainage area to a check dam should be limited to approximately 2 acres.~~

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:** ~~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 ~~be~~ placed on ~~top of a~~ a blanket of engineering fabric ~~to prevent erosion of the underlying surface as water filters through the dam~~. ~~A t~~Typical ~~stone~~ rock check dams are ~~is~~ a minimum of 2 ~~-~~feet high~~,~~ with ~~a 4 foot base and 2~~1.5:1

Commented [SK3]: Simplified this section and moved the more detailed discussion on each of the individual practices to the section below.

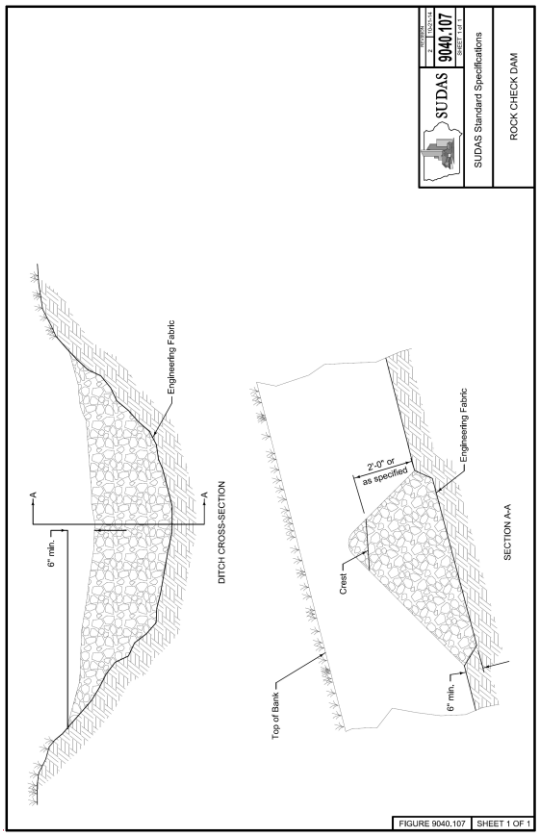
side slopes. An overflow in the ~~The~~ center of the ~~crest of the~~ check dam should be 6~~-~~ inches lower than the sides to prevent flows from ~~going around the dam, and~~ eroding the sides of the channel. These dimensions are approximate~~,~~ and may be modified based ~~up~~on individual needs 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 Specification Figure 9040.107.

Commented [SK4]: Eliminated rock check dam figure from design section. Seems redundant to include the figure from the specifications in the design

~~**Figure 7E-7.01:** Typical Rock Check Dam~~
~~(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. ~~Silt fence may be used as a ditch check device for very low flow applications.~~ See Section 7E-14 for additional information on this application.

Commented [SK5]: Added requirements that silt fence be installed in half-moon shape and for installation of straw bales, wattles, or mulch to prevent undermining.

Commented [REL[6]: Update

Commented [SK7R6]: Eliminated half-moon language

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. ~~If failures occur.~~ 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) ~~blanket of engineering fabric~~ 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.

~~43. **Gravel Bag Berms:** Gravel bag berms should be placed and spaced in the same manner as rock check dams. The berms should be placed on a layer of engineering fabric, and be limited to a height of 24 inches. The crest of the check dam should be 6 inches lower than the sides to prevent flows from going around the dam, and eroding the sides of the channel.~~

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.
~~**Silt Fence:** Silt fence may be used as a ditch check device for very low flow applications. See Section 7E-14 for additional information on this application.~~

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/Sand Bags:** 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. ~~In order t~~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.

Commented [REL[8]: Make this a recommended practice and add language that it can be used in combination with….

Commented [SK9R8]: Done

Commented [REL[10]: Update

Commented [SK11]: It was noted that RECPs are now called ECB; however, the erosion control tech council still uses RECP to describe all rolled products. ECBs are a specific type of RECP constructed of woven materials (wood excelsior or synthetic materials).

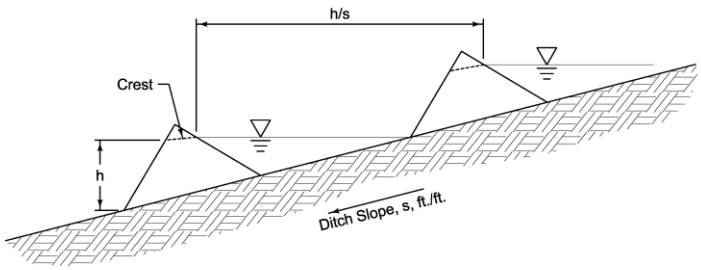
Commented [SK12]: Anyone have a picture? Add figure to specs?

Commented [SK13]: Added a new section for fiber logs and encouraged the use of RECPs below them.

Commented [SK14]:
Added a new section for Rock/Sand bags.

As a rule, check dams should not be spaced closer than 20 feet ~~in order~~ 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. ~~considered as an alternative.~~

Figure 7E-7.01~~2~~: Typical Check Dam Spacing
(From SUDAS Specifications Figure 9040.106)



MANUFACTURED CHECK DAM

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 ft.)	100	67-40	33-22	20-13	Up to 15%	> 2 years
Silt Fence (24-in)	75	50-35	25-17	15-10	Up to 15%	Up to 1 year
Triangular sediment dike (10-in.)	42	28-17	14-19	8-6	Up to 15%	1-2 years
Fiber Logs – wood (9-in.)	38	25-15	12-8	7-5	Up to 15%	1-2 years
Fiber Logs – wood (12-in)	50	33-20	17-11	10-7	Up to 15%	1-2 years
Fiber Logs – straw (9-in.)	38	25-15	12-8	7-5	Up to 15%	Up to 6 months
Fiber Logs – straw (12-in)	50	33-20	17-11	10-7	Up to 15%	Up to 6 months
Fiber Logs – compost (8-in.)	33	22-13	11-7	7-4	Up to 15%	Up to 1 year
Fiber Logs – compost (12-in.)	50	33-20	17-11	10-7	Up to 15%	Up to 1 year
Fiber Logs – compost (18-in.)	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.						

Commented [SK15]: New table. Keep longevity column?

Commented [REL[16R15]: Keep longevity column

D. Maintenance

Check dams should be inspected for damage every seven calendar days or after any significant ~~and after any 1/2 inch or greater~~ 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 ~~the~~ 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.