4.3-k CHECK DAMS

Alternative Name: Grade Control

BMP DESIGN APPROACH
■ Pollutant Source Control
■ Hydrologic Source Control
□ Stormwater Treatment
SCALE OF APPLICATION
■ All SFR and MFR < 1 acre
■ MFR 1-5 Acre and CICU < 5 acres
■ MFR and CICU > 5 acres and all WQIPs
TYPE OF APPLICATION
■ Temporary
■ Permanent

DESCRIPTION

Check dams are barriers placed across swales, ditches, and other constructed drainages to reduce channel slope and flow length. Check dams slow runoff velocity and promote infiltration, thereby reducing channel erosion and serving as coarse sediment traps above each check dam.

APPLICABILITY

- Constructed drainages on steeper slopes where runoff velocities exceed 5 feet per second.
- May be placed below spillways to reduce water velocity and erosion.
- Helps establish grass linings and other vegetation in swales or drainage ditches where erosion is a concern.
- Not applicable in natural streams except as part of an approved restoration plan.

Advantages

- Captures the incidental discharge of sediment.
- Reduces channel down-cutting by slowing flow velocities within channels.
- Promotes runoff infiltration and sediment deposition at each check dam.
- Reduces peak stormwater runoff.

Disadvantages

- Sediment trapped behind each check dam can be re-suspended by subsequent runoff, if not cleaned out regularly and after large storms.
- May be breached during large storms, releasing trapped sediment.
- Will reduce conveyance capacity in channel, leading to a higher probability for flow to overtop BMP structures/facilities.
- Check dams may smother vegetation through excessive sedimentation or long periods of submergence.

Check dams installed in water spreading area (top) and vegetated swale (bottom).

DESIGN CONSIDERATIONS

- Check dams may be installed as a temporary best management practice for project construction or as a permanent component of a stormwater management strategy. Porous check dams may be temporary or permanent installations, while non-porous check dams are permanent.

- Porous check dams: Low piled or stacked linear structures made of rock, gravel, sand bags, fiber rolls, logs, pine needles, and other materials that allow some water flow, limiting water pressure against the dam. Native rock or wood materials found on-site may be used, if appropriate, to reduce cost. Materials should not have the potential to be a pollutant source (e.g. low quality sand bags, railroad ties, or other wood treated with creosote). Porous check dams release part of the flow through the structure, reducing head of flow over the dam and the forces against the side of the dam. Porous check dams integrate well with vegetation in stream restoration projects.
- Solid check dams: Low grade control structures made of a non-porous material such as concrete, metal, or masonry. These structures require design by a licensed professional civil engineer and are more expensive to construct than porous check dams.

- Check dams are typically installed in a series within constructed drainages for increased effectiveness. Distance between check dams is based on channel slope; general guidelines are as follows. Note that spacing closer than 20 feet is not recommended to facilitate cleaning and maintenance.

Channel Slope	Check Dam Spacing
1 %	200 feet
2 %	100 feet
4 %	50 feet
6 %	33 feet
8 %	25 feet
10 %	20 feet

- Use check dams with caution on slopes greater than 6 percent; consider erosion potential of bank and channel bed materials.
- The height of check dams is typically no more than 2 to 3 feet, from the toe to the center of the check dam. The center of the check dam should be 6 inches lower than the sides.
- Check dams should be anchored or keyed-in to the bottom and sides of the channel with a trench and filter fabric to prevent undermining. Materials should be extended beyond channel bank, typically one-third the width of the channel, to prevent cutting around the dam.
- Using many small check dams within a channel is preferable to having fewer but larger check dams; larger structures have an increased likelihood of failure with resulting channel erosion.

INSTALLATION CONSIDERATIONS

- Locate check dams in straight reaches of channels. Washout or bank failure is more likely if they are installed in channel bends.
- Design check dams perpendicular to the channel with a centered spillway to ensure spilling flow is directed to the center of the channel, away from the downstream banks. A weep hole may be added to each permanent check dam

near the bottom of the downstream face to allow the retained volume of water to slowly drain out.

- Set the toe of the upstream dam at the same elevation as the top of the downstream dam.
- Protect the channel downstream of each dam with a rock apron and/or filter fabric to prevent headcutting of the channel and undercutting of the dam.
- For temporary rock check dams, use 8 to 12 inch diameter rocks. Place the rock mechanically or by hand and avoid dumping the rock directly into the channel. Place geotextile fabric under the rock to reestablish the natural channel bottom when the check dam is removed.
- Construct gravel or other bagged check dams by stacking bags tightly across the channel.
- Entrench/key-in fiber rolls into the banks and channel bottom and firmly stake them in place (Refer to Section 4.5-q, Fiber Roll).
- Remove temporary check dams and accumulated sediment when the channel is no longer needed.

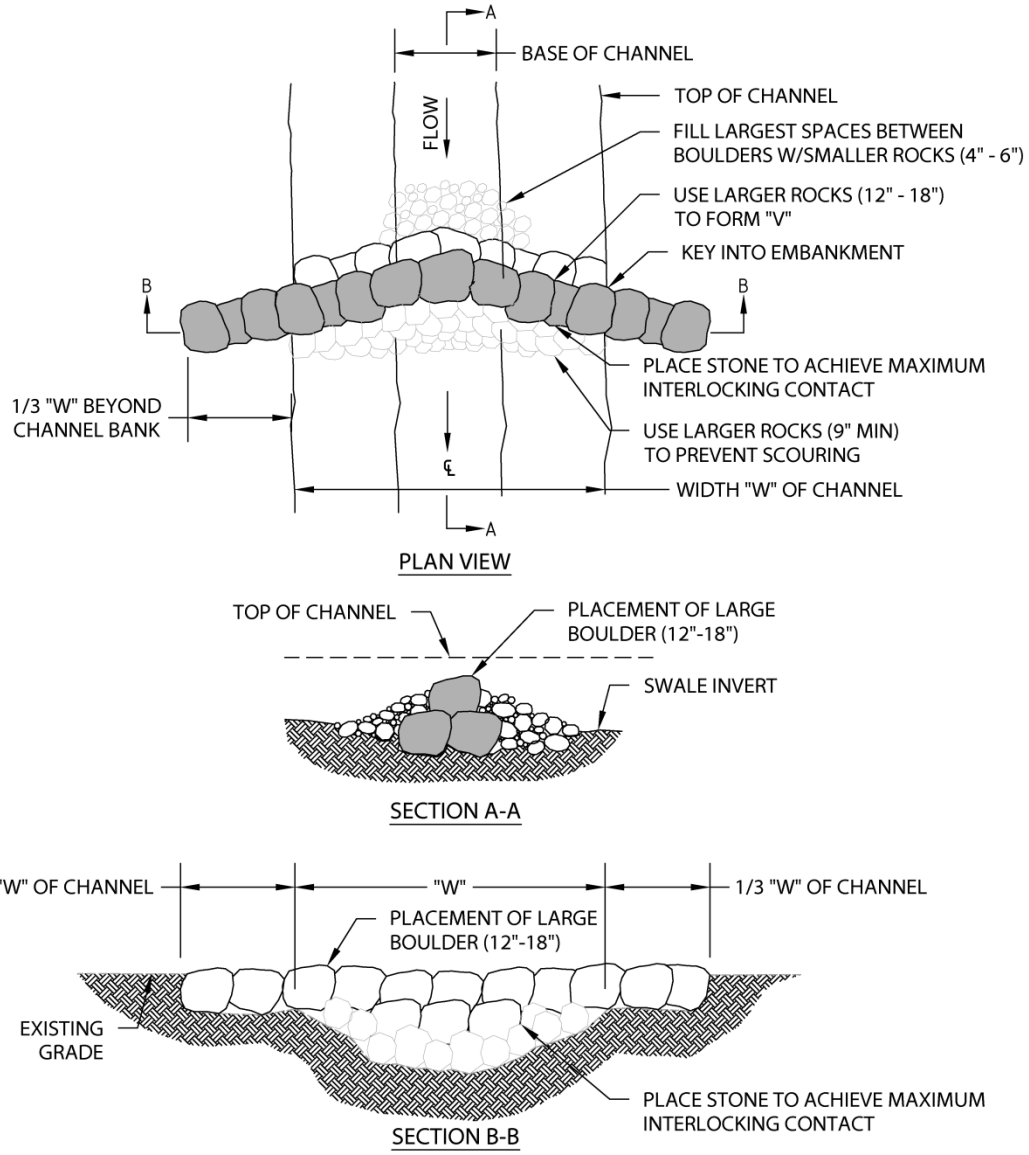
INSPECTION AND MAINTENANCE

- Inspect temporary check dams on a regular basis (i.e. weekly) and before, during, and after storms. Remove accumulated sediment behind each check dam when the sediment reaches one-half the height of the dam.
- For permanent check dams, create an operation and maintenance plan that includes regular inspections of structural integrity and removal of accumulated sediment.
- Consider seasonal impacts. For instance, check dams will require closer scrutiny during spring snowmelt and rain-on-snow events, or may require more frequent cleaning in the fall from leaves and pine needles.
- Replace any missing or damaged rock, gravel bags, fiber rolls, etc., to maintain maximum effectiveness.

EFFECTIVENESS CONSIDERATIONS

Check dams are relatively simple structures that are effective at reducing gradient, slowing water flow, and reducing erosion and sediment transport. They must be properly installed and regularly maintained for functionality; failed check dams are common and may be significant sediment sources if breached.

Check Dam Figure



NOTES:

1. THIS DETAIL IS PRIMARILY APPLICABLE FOR USE WITH ROCK LINED SWALES. THE DIMENSIONS AND SLOPES SHOWN FOR BMP-308. ALL OTHER APPLICATIONS SHOULD BE DESIGNED INDIVIDUALLY BY A CIVIL ENGINEER.
2. WHEN A SERIES OF CHECK DAMS IS DESIGNED, THE TOP CENTER OF THE DOWNSTREAM CHECK DAM SHALL BE AT THE SAME ELEVATION AS THE BOTTOM OF THE UPSTREAM CHECK DAM.