Preliminary Investigation (PI-0319)

Caltrans Division of Research, Innovation and System Information

Evaluation of the Use of Silt Fence as Check Dams

Requested by
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Executive Summary

Background

Silt fence is a widely known and industry-accepted erosion and sediment control practice. Used as a temporary sediment control measure, silt fence is often installed perpendicular to a flow path to impound runoff and allow for sedimentation; however, the use of silt fence as a check dam in areas of concentrated flow is discouraged in California and some other states.

While current California Department of Transportation (Caltrans) Division of Construction manuals and guides do not allow the use of silt fence as check dams, agency staff is aware that several state departments of transportation (DOTs) have developed silt fence guidance specific to its use as a check dam. Recent large-scale research efforts have evaluated silt fence check dams to optimize their design and installation. An examination of other states' practices and recent research results may support expansion of Caltrans' current guidance to include the use of silt fence as check dams, which would provide agency staff with an additional tool in the field to manage stormwater runoff.

To assist Caltrans in this review, CTC & Associates conducted a national survey of state DOTs to inquire about the use of silt fence as check dams. Results of a literature search supplemented survey findings. If appropriate, findings from this inquiry may be used to develop guidance for design and installation of silt fence as check dams on construction sites in areas of concentrated flow.

Summary of Findings

Survey of Practice

An online survey was distributed to state DOT members of two American Association of State Highway and Transportation Officials (AASHTO) committees: the Committee on Design and the Committee on Environment and Sustainability. The survey sought information about silt fence used as a check dam, the impacts of these installations in the field and respondents' assessment of silt fence performance.

The survey received 26 responses from 25 states. Survey results indicate very limited use of silt fence as a check dam, with only three respondents describing this application in the field. Respondents from two other states discussed why their agencies stopped using silt fence in this manner. The largest segment of respondents (80%) described their reasons for not using silt fence as a check dam, calling out design inadequacies, lack of recommendation in agency guidance or the efficacy of other sediment control measures. Survey findings are summarized below in the following topic areas:

- Silt fence used as check dams.
- Previous experience with silt fence as check dams.
- Silt fence not used as check dams.

Silt Fence Used as Check Dams

Only three states—Alabama, Connecticut and Georgia—reported using silt fence as a check dam in areas of concentrated flow. Two of these agencies do so only in conjunction with another

sediment control measure. The following provides highlights of the case studies that begin on page 7:

- *Alabama DOT* uses silt fence as a check dam in channels or ditches with a steep grade or in areas of higher flows. Silt fence has been found to be a better solution than wattles on moderated grades where wattles might blow out. The agency installs hundreds of silt fence check dams each year and finds them to be extremely effective in dissipating velocity and retaining sediment. While installation is a little more involved than wattle check dams, the respondent noted that silt fence is more durable and can handle higher flows than a wattle check dam. The agency's 2022 standard specifications describe the use of silt fence as a temporary soil erosion and sediment control; see page 15 for details.
- *Connecticut DOT* is one of two agencies to use silt fence in conjunction with another sediment control measure. (Georgia DOT uses silt fence with a rock check dam.) Installed as a redundancy to stone check dams for concentrated overland flow in highly sensitive areas, silt fence is used primarily to retain sediment and is extremely effective in doing so.

  In the agency's typical installation, the stone check dam is built to one-half height and the silt fence is draped over the dam. The dam is then constructed to full height (no more than 3 feet wide by 3 feet high). This "special case combination" is described and illustrated in Connecticut DOT guidelines; see page 10 for more information.
- *Georgia DOT* installs silt fence as a check dam in roadside ditches when used in conjunction with a rock check dam. Check dams placed at the upstream end of the ditch can be fabric silt fences, however the last check dam in the installation must be a rock check dam. The ditch must also be deep enough (26 inches or deeper) to use a fabric silt fence check dam or the water can run around the fabric. Construction details of this temporary silt fence installation are cited on page 17.

  These installations have been found to be comparable to rock check dams except in areas of heavy flows. The respondent advises other agencies to use a weir and adequate bracing, and avoid use of fabric check dams where a ditch discharges to a stream.

Previous Experience With Silt Fence as Check Dams

Respondents from Kansas DOT and Missouri DOT reported that their agencies had used silt fence in check dam applications but no longer do.

Kansas DOT ceased this application in 2013 due to poor maintenance and installation practices. The agency's specifications and standards for installing silt fence recommend its use only as perimeter control. Current best management practices (BMPs) include:

- Project management that requires the contractor to stabilize areas as soon as possible.
- Bio-logs or filter socks used as check dams.

Prior to 2014, *Missouri DOT* used silt fence in conjunction with straw bales for ditch checks. Failures during heavy rain events created maintenance issues, and varying ditch designs made it difficult to use the straw bales/silt fence configuration for concentrated flows. Missouri DOT now uses the following as its preferred BMPs:

- Rock check dams.
- Socks with a 9-inch effective height or wattles in areas of clear zone concerns.

Silt Fence Not Used as Check Dams

The remaining 20 responding agencies are not using silt fence as a check dam and have no plans to do so. Reasons for this vary among the respondents, with some providing multiple reasons:

- Design inadequacies of silt fence, including lack of permeability and insufficient strength during periods of concentrated flow (*Alaska, Delaware, Kentucky, Nevada, North Dakota, South Carolina, Utah, Virginia* and *Wisconsin*).
- Application not recommended or not allowed by agency guidance (*Hawaii, Idaho, Maryland, Michigan, New Jersey, New York, Virginia* and *Washington*).
- Better options are available, such as rock berms, impermeable berms with floating skimmer, rock check dams, rock filter dams, silt dikes, sediment filter bags or wattles (*Arkansas, Minnesota, Oklahoma, South Dakota* and *Wisconsin*).

Several respondents offered additional perspective on the most appropriate uses of silt fence and how it might play a role in areas of concentrated flow. Some described preferred uses of silt fence: to prevent sediment from passing in areas of concentrated flow (South Carolina) and as a perimeter control (Virginia and Wisconsin). The Virginia DOT respondent also described possible benefits of using silt fence as a check dam, such as easier installation in hard-to-reach areas and easy removal after channel stabilization. The Maryland DOT respondent noted that it may be possible to use silt fence as a check dam or as a redundant control, but only in areas with very low velocities and flow rates—probably less than 2 cubic feet per second (cfs)—which the respondent considered impractical in most locations. (*Note*: Cubic feet per second is the unit of measure for water that is in motion.)

State Research and Guidance

A literature search of recent publicly available domestic resources identified research and guidance associated with five states: Alabama, Georgia, Illinois, Iowa and Tennessee.

Alabama

Alabama DOT 2022 standard specifications describe the use of a wire-backed geotextile silt fence for temporary soil erosion and sediment control; installation requirements and the geotextile materials acceptable for use are also included. A 2018 guide produced by Alabama Soil and Water Conservation Committee and Partners describes installation of a silt fence check dam, illustrated with a cross-section and plan view of the installation. A September 2014 research report describes findings from a study by the Auburn University Erosion and Sediment Control Testing Facility that used large-scale testing techniques to examine five different ditch check practices (wattles, rip rap, sand bags, silt fence and stacked wattles). This research effort appears to have informed 2016 and 2017 journal articles that examine sediment retention associated with enhanced silt fence ditch checks.

Georgia

Publications addressing Georgia DOT's use of silt fence fabric check dams include a July 2015 policy announcement and standard drawing that describe and present a construction detail for a temporary silt fence fabric check dam that may be used in ditches with depths of at least 26 inches.

Illinois

A January 2016 research study sponsored by Illinois DOT and 2015 journal article describe a new testing protocol for evaluating sediment retention devices under concentrated flow conditions. The new testing procedure found that while a triangular silt dike created a large amount of ponding compared to other products tested, it was effective at sediment removal and easy to install, and appeared to hold up well at both high and low flow rates.

Iowa

Iowa DOT's use of silt fence ditch checks is addressed in the agency's 2021 Design Manual. Silt fence is limited to use as a check dam in applications where the two-year frequency discharge does not exceed 1 cfs. For ditch applications with a discharge greater than 1 cfs, the agency's guidance requires alternative methods of sediment removal and velocity control within the ditch, such as rock or manufactured ditch checks and sediment traps.

Tennessee

The agency's October 2021 Drainage Manual describes an enhanced silt fence and appropriate applications of the measure in small open channels conveying stormwater flow. Standard drawings are provided for enhanced silt fence trapezoidal and v-ditch ditch checks; enhanced silt fence check details provide the recommended spacing between silt fence ditch checks.

Gaps in Findings

While the survey received a fairly robust response, almost half of the pool of potential respondents did not complete the survey, including three states that may be using silt fence as a check dam: Illinois, Iowa and Tennessee. Multiple attempts to reach out to these states to solicit feedback did not produce a response. Following up with these agencies to inquire about their experiences with silt fence as a check dam may yield useful information.

While the three agencies using silt fence in this manner provided a summary of agency practices, additional details will likely be uncovered through follow-up contacts focused on specific aspects of silt fence used as a check dam.

Next Steps

Moving forward, Caltrans could consider:

- Consulting with survey respondents from Alabama, Connecticut and Georgia DOTs to learn more about agency practices and recommendations for other agencies contemplating the use of silt fence as a check dam.
- Contacting representatives from Illinois, Iowa and Tennessee DOTs to discuss the recent research conducted on the agencies' behalf and how it has informed agency practices.
- Reviewing in detail the research studies cited in this report to assess their relevance to Caltrans' practices and appropriateness of the installations given California regulatory and environmental requirements.
- Examining the construction details and drawings of successfully used practices cited in this report to determine the appropriateness of testing these installations in the soil, topography and climate conditions that may be unique to California.

Detailed Findings

Background

Silt fence is a widely known and industry-accepted erosion and sediment control practice. Used as a temporary sediment control measure, silt fence is often installed perpendicular to a flow path to impound runoff and allow for sedimentation; however, the use of silt fence as a check dam in areas of concentrated flow is discouraged in California and some other states.

Several state departments of transportation (DOTs) have developed enhanced silt fence guidance specific to check dam applications, and recent large-scale research efforts have evaluated silt fence check dam installations to optimize design and installation. Current California Department of Transportation (Caltrans) Division of Construction manuals and guides do not allow the use of silt fence as check dams. Caltrans is seeking information that might support revising this guidance to include new applications of silt fence as check dams to manage stormwater runoff.

To assist Caltrans in this review, CTC & Associates conducted a national survey of state DOTs to inquire about the use of silt fence as check dams. Results of a literature search supplemented survey findings. If appropriate, findings from this inquiry may be used to develop guidance for design and installation of silt fence as check dams on construction sites in areas of concentrated flow. Findings are presented in two topic areas:

- Survey of practice.
- State research and guidance.

Survey of Practice

An online survey was distributed to state DOT members of two American Association of State Highway and Transportation Officials (AASHTO) committees: the Committee on Design and the Committee on Environment and Sustainability. The survey sought information about silt fence installations used as check dams in areas of concentrated flow, the impacts of those installations in the field and agency assessment of performance. Respondents not using silt fence in this manner were asked about any previous experience with this type of installation and why their agencies are not using silt fence for this purpose.

Survey questions are provided in Appendix A. The full text of survey responses is presented in a supplement to this report.

The survey received 26 responses from 25 states:

- Alabama.
- Alaska.
- Arkansas.
- Connecticut.
- Delaware.
- Georgia.
- Hawaii.
- Idaho.
- Kansas.
- Kentucky.
- Maryland.
- Michigan.
- Minnesota.
- Missouri.
- Nevada.
- New Jersey.
- New York.
- North Dakota.
- Oklahoma.
- South Carolina.
- South Dakota.
- Utah (2 responses).
- Virginia.
- Washington.
- Wisconsin.

Survey responses are presented below in three topic areas:

- Silt fence used as check dams.
- Previous experience with silt fence used as check dams.
- Silt fence not used as check dams.

Silt Fence Used as Check Dams

Only three states—Alabama, Connecticut and Georgia—reported using silt fence as a check dam in areas of concentrated flow. Two of these agencies do so only in conjunction with another sediment control measure:

- *Alabama DOT* uses silt fence as a check dam in channels or ditches with a steep grade or in areas of higher flows where typical wattles would not suffice.
- *Connecticut DOT* does not use silt fence for concentrated flows exclusively, but does use it in conjunction with stone check dams for concentrated overland flow in sensitive areas. Silt fence may be used within these areas to provide ponding criteria to allow silt to fall out of the flow.
- *Georgia DOT* installs silt fence in tandem with a rock check dam in roadside ditches that are deep enough to support the installation.

The brief case studies below provide details of agency practices. A case study may not include all topics if a respondent did not provide relevant information. Additional information may also appear in **State Research and Guidance** beginning on page 15.

Alabama Department of Transportation

Alabama DOT limits its use of silt fence to channels or ditches with a steep grade or areas where typical wattles are not effective in handling higher flows. Though agency guidance recommends silt fence ditch checks to intercept low-volume flows, the respondent described their use in areas with higher-volume flows. These silt fence installations are considered extremely effective in dissipating velocity and retaining sediment.

Application

Topic	Description
Location	Used in channels or ditches with steep grade or higher flows where typical wattles would not suffice.
Products	List of Qualified Materials, Sources and Devices: List II-3, Geotextiles (February 2021) lists all approved silt fence products.
Installation	Typical spacing is dependent on grade of conveyance. Best management practice (BMP): Silt fence check dams should be installed where the elevation at the top of weir in the downstream check dam matches the elevation at the bottom of the upstream. **Standard Drawing** Drawing ESC-300-8, Silt Fence Ditch Check, illustrates the installation method. (See page 15 of Standard Drawings, Section 66500 – 66548, Temporary Sediment and Erosion Control, Standard Specifications for Highway Construction.)

Topic	Description
Installation, continued	The Best Management Practice Reference Matrix (ESC-100-2) that precedes the set of drawings identified above provides usage guidelines that recommend use of the silt fence ditch check for "low volume flows." From page 2 of Standard Drawings, Section 66500 – 66548, Temporary Sediment and Erosion Control: *Silt fence ditch checks are used to intercept low volume flows in low to moderate gradient ditches.*
Frequency of use	The respondent estimates that hundreds of silt fence ditch checks of this type are installed annually.

Impacts

Topic	Description
Efficacy[1]	Velocity dissipation = 5 Sediment retention = 5 Scour reduction at the center of the ditch = 3 Scour reduction at the silt fence tie-in to slopes as compared to rock dams = 2
Sediment accumulation	Agency procedure calls for replacement or cleaning once the installation is one-third blinded.
Inspections	Inspection results indicate that "[s]ilt fence is an effective measure to prevent erosion and control sediment in channel conveyances."
Field tests	The respondent referenced an agency collaboration with Auburn University to research the efficacy of different types of check dams. The September 2014 report Evaluation of ALDOT Ditch Check Practices Using Large-Scale Testing Techniques describes the results of testing five different ditch check practices, including silt fence. See page 17 for the full citation for this publication.
Environmental impacts	None identified.

1 Efficacy was rated on a scale of 1 to 5, with 1 = not at all effective and 5 = extremely effective.

Assessment

Topic	Description
Comparison to other practices	Silt fence is an effective erosion and sediment control practice as a check dam, and the preferred practice on moderated grades where wattles might blow out.
Benefits	Silt fence is more durable and can handle higher flows than wattle check dams.
Challenges	Installation is a little more involved than wattle check dams.
Recommendations	Silt fence check dams are a valuable tool and should be used when wattles are no longer effective.
Specifications	Section 665.02(i) in the 2022 Alabama Department of Transportation Standard Specifications for Highway Construction describes silt fence as a material used in temporary soil erosion and sediment control. See page 15 for a citation for this publication.

Connecticut Department of Transportation

Connecticut DOT is one of two agencies to use silt fence in conjunction with another sediment control measure. Installed as a redundancy to stone check dams for concentrated overland flow in highly sensitive areas, silt fence is used primarily to retain sediment and is extremely effective in doing so.

In the agency's typical installation, the stone check dam is built to one-half height and the silt fence is draped over the dam. The dam is then constructed to full height (no more than 3 feet wide by 3 feet high).

Application

Topic	Description
Location	Used in conjunction with stone check dams. Stone check dams used for concentrated overland flow in highly sensitive areas may have a silt fence core to provide ponding criteria to allow silt to fall out of the flow.
Products	• A.H. Harris & Sons, Inc. • American Engineering Fabrics, Inc. • BBA Fiberweb
Installation	Stone check dam is built to one-half height and the silt fence is draped over the dam. The dam is then constructed to full height (no more than 3 feet wide by 3 feet high).
Frequency of use	Varies.

Impacts

Topic	Description
Efficacy[1]	Velocity dissipation = 2 Sediment retention = 5 Scour reduction at the center of the ditch = 2 Scour reduction at the silt fence tie-in to slopes as compared to rock dams = 3
Sediment accumulation	The agency changes the silt fence or removes sediment after every rain event of 0.5 inch.
Inspections	Inspections are conducted weekly and within 24 hours after a rainfall of 0.5 inch; installations are repaired or replaced based on the field conditions.
Field tests	None.
Environmental impacts	None identified.

1 Efficacy was rated on a scale of 1 to 5, with 1 = not at all effective and 5 = extremely effective.

Assessment

Topic	Description
Challenges	Check dams have been found to collapse in heavy storm events.

Topic	Description
Specifications	Appropriate use of silt fence is addressed throughout 2002 Connecticut Guidelines for Soil Erosion and Sediment Control (content last updated August 2019), Connecticut Department of Transportation. See *Special Case Combinations for Added Filtration & Frozen Ground Conditions* on page 247 of the PDF for a description of the stone check dam/silt fence installation described by the respondent. Figure SCD-6, *Special Case Combination Stone Check Dams*, on page 251 of the PDF, illustrates the installation.

Georgia Department of Transportation

Georgia DOT uses silt fence in tandem with a rock check dam in roadside ditches deep enough to support the installation. While check dams placed at the upstream end of the ditch can be fabric silt fence, the last check dam in an installation must be a rock check dam. Used in this way, silt fence is extremely effective in reducing scour at the silt fence tie-in to slopes, but is less effective at dissipating velocity and reducing scour at the center of the ditch.

Application

Topic	Description
Location	Used in roadside ditches in conjunction with rock check dams. Check dams placed at the upstream end of the ditch can be fabric silt fences, however the last check dam in the installation must be a rock check dam. The ditch must also be deep enough (26 inches or deeper) to use a fabric silt fence check dam or the water can run around the fabric.
Installation	Weir notch is made in the center of the check dam to help direct the water to spill at the center of the ditch. Spacing is such that the slope of the ditch drops 20 feet between ditch checks, which means that backed-up water from one check dam ends where the next upstream check dam is located.
Frequency of use	Number of installations per year is based on linear foot (7,500 feet annually).

Impacts

Topic	Description
Efficacy[1]	Velocity dissipation = 3 Sediment retention = 4 Scour reduction at the center of the ditch = 3 Scour reduction at the silt fence tie-in to slopes as compared to rock dams = 5
Sediment accumulation	In situations where there is a large sediment load, sediment will accumulate to a height of 20 inches (weir height is 20 inches).
Inspections	Each installation is inspected by the contractor and verified by agency construction inspectors. Inspectors check the depth of the posts, entrenchment of the fabric, fabric splash pad and location as specified in the plans.

Topic	Description
Field tests	The agency conducted a series of tests on a project with disturbed soil and several rain events to receive the state's environmental agency approval for use of fabric check dams. Performance was favorable with only minor problems.
Environmental impacts	None identified.

1 Efficacy was rated on a scale of 1 to 5, with 1 = not at all effective and 5 = extremely effective.

Assessment

Topic	Description
Comparison to other practices	Comparable to rock check dams except in heavy flows, which is why fabric check dams are not used at the downstream end of the ditch.
Benefits	Relatively easy for the contractor to move and install, and not a clear zone issue, which presents a hazard to errant vehicles.
Challenges	Incorrect installation and placement errors in plans present challenges when using fabric check dams in shallow ditches or where the ditch discharges to a stream.
Recommendations	• Use a weir. • Use adequate bracing. • Do not use where a ditch is discharging to a stream.
Specifications	Drawing No. D-24D, Construction Details: Temporary Silt Fence; Fabric Check Dam, Georgia Department of Transportation, July 2015. Standard Specifications: Construction of Transportation Systems, Georgia Department of Transportation, 2021. See page 17 for citations for these publications.

Previous Experience With Silt Fence Used as Check Dams

Respondents from Kansas DOT and Missouri DOT reported that their agencies had used silt fence as a check dam but no longer do.

Kansas DOT ceased this application in 2013 due to poor maintenance and installation practices. The agency's specifications and standards for installing silt fence recommend its use only as perimeter control. Current BMPs include:

- Project management that requires the contractor to stabilize areas as soon as possible.
- Bio-logs or filter socks used as check dams.

Prior to 2014, *Missouri DOT* used silt fence in conjunction with straw bales for ditch checks. Failures during heavy rain events create maintenance issues, and varying ditch designs made it difficult to use the straw bales/silt fence configuration for concentrated flows. Missouri DOT now uses the following as its preferred BMPs:

- Rock check dams.
- Socks with a 9-inch effective height or wattles in areas of clear zone concerns.

The agency found that silt fence must have some structural backing when placed in areas of concentrated flow. Once straw was eliminated as a BMP element, other options like wire

backing were cost-prohibitive as compared to rock check dams. Missouri DOT has had good results with rock check dams and currently has no plans to use silt fence as a BMP application for anything other than perimeter control.

Silt Fence Not Used as Check Dams

The remaining 20 responding agencies are not using silt fence as a check dam and have no plans to do so. Reasons for this vary among the respondents, with some providing multiple reasons:

- Design inadequacies of silt fence, including lack of permeability and insufficient strength during periods of concentrated flow (*Alaska, Delaware, Kentucky, Nevada, North Dakota, South Carolina, Utah, Virginia* and *Wisconsin*).
- Application not recommended or not allowed by agency guidance (*Hawaii, Idaho, Maryland, Michigan, New Jersey, New York, Virginia* and *Washington*).
- Better options are available, such as rock berms, impermeable berms with floating skimmer, rock check dams, rock filter dams, silt dikes, sediment filter bags or wattles (*Arkansas, Minnesota, Oklahoma, South Dakota* and *Wisconsin*).

Several respondents also offered additional perspective on the most appropriate uses of silt fence. Details of agency responses are presented below.

Design Inadequacies

The inadequacy of the silt fence design for use in areas of concentrated flow was noted most often by respondents:

- *Alaska*. The Alaska Certified Erosion and Sediment Control Lead (AK-CESCL) Training Program stresses that silt fences should never be used perpendicularly in conveyance channels. A silt fence used as a check dam would be far more susceptible to sudden rupture/tearing (and discharges of sediment into waters) than a gravel filter berm or fiber roll. The silt fence can't handle filtering sediment-laden water at any kind of significant rate (for example, in applications such as a ditch or other conveyance channel), and operate more like a hard barrier than a filter. Alaska DOT and Public Facilities only uses silt fence as sediment control for sheet flow and/or perimeter control.
- *Delaware*. Silt fence is not designed to be used in areas of concentrated flow. The respondent noted that silt fence "doesn't work" but could perhaps be used in "very, very small concentrated flow areas."
- *Kentucky*. Silt fence will not hold up in areas of concentrated flow.
- *Nevada*. The respondent cited the potential for the silt fence to become "overwhelmed" during a runoff event, resulting in check dam failure.
- *North Dakota*. Silt fence does not allow water to flow through easily and results in water backing up in the area of concentrated flow. This creates a ponding condition that inhibits the establishment of vegetation. Also, failure of the silt fence during periods of significant precipitation can cause major erosion issues due to the volume of water being held by the fence when it is released due to failure.
- *South Carolina.* The respondent noted that "[s]ilt fence blows out eventually. While silt fence temporarily stops flow, it ultimately fails and causes more erosion after failure."

- *Utah*. Silt fence lacks adequate strength to remain upright and functional in concentrated flow situations. Silt fence material and the typical installation (key into ground with wood posts at 5- to 6-foot spacing) is not sufficiently designed or constructed to withstand concentrated flows. Silt fence is also not used in areas of sheet flow. In some cases the sheet flow has become concentrated and overwhelmed the silt fence, causing its failure.
- *Virginia*. The respondent cited the following reasons for not using silt fence as check dams in areas of concentrated flow:
    - High potential for undermining or wash around. The silt fence is not permeable enough to let concentrated flow pass, which will result in additional problems.
    - Washout of the practice and sediment loss off the site resulting in regulatory enforcement.
    - Difficulty in shaping the silt fence to allow water to pass over a nonerodible material to continue in the channel.
    - A core function of the agency's check dams is a velocity check, not as a filtering practice.
- *Wisconsin*. The respondent expressed concern with the stability of silt fence in a channel application with flows pushing against it, noting that "[s]ilt fence seems to have a tendency to dam flow more so than filter the flow."

Application Not Recommended or Not Allowed by Agency Guidance

Another reason frequently cited by respondents for not using silt fence as a check dam in areas of concentrated flow is that such an application is not recommended or not allowed by agency guidance, as these eight respondents explained:

- *Hawaii*. The agency's August 2019 Construction Activities BMP Field Manual does not recommend using silt fences in areas of concentrated flow. There have been numerous failures where the silt fence was placed in areas lacking level contours.
- *Idaho*. Not recommended per manufacturer recommendations.
- *Maryland.* Unspecified regulatory requirements state that silt fence is limited to intercepting sheet flow runoff from small, disturbed areas. Silt fence is not to be used as a velocity check in swales or placed where it will intercept concentrated flow.
- *Michigan*. The state's regulatory agency does not recognize this type of installation as an effective control.
- *New Jersey.* Use of silt fence as check dams is not included as a measure in the New Jersey Department of Agriculture's July 2017 The Standards for Soil Erosion and Sediment Control in New Jersey.
- *New York*. The New York State Department of Environmental Conservation's 2016 New York State Standards and Specifications for Erosion and Sediment Control (Blue Book) does not allow silt fence to be used in this manner. The respondent noted that "there are more suitable materials for the job."
- *Virginia*. The state regulatory agency does not approve the practice of installing silt fence as a check dam.

- *Washington*. Experience and the lack of a recommendation by Washington State Department of Ecology in its stormwater manuals contributed to the agency's decision to not use silt fence in this manner, though the agency has considered such an application.

Better Options

Five agencies highlighted the efficacy of other treatments when describing why their agencies do not use silt fence as check dams:

- *Arkansas.* While other devices are used for this purpose (rock, hay bales and sandbags), the respondent reported some failures when encountering concentrated flows.
- *Minnesota*. As the respondent noted, "Silt fence installed across areas of concentrated flow almost always fails. Water undermines or overtops or pushes over the silt fence and the resulting failure creates a mess." The agency prefers to use other methods that depend on whether the intent is to achieve filtration (such as rock berms) or sedimentation (using an impermeable berm with floating skimmer). The respondent offered these final comments:

  > We have seen more problems than benefits from using silt fences as check dams. We prefer to use methods to either divert flow or, if it has to be contained completely, to design a functional temporary sedimentation basin.

- *Oklahoma*. The agency had considered using silt fence in areas of concentrated flow, but the respondent stated that "[t]here are better options for that application such as rock filter dams or silt dikes."
- *South Dakota.* The agency may have used silt fence as check dams for very small drainage areas with low velocities, but it is not a common practice and silt fence is not recommended for use in that manner. Better BMPs include rock check dams, sediment filter bags and wattles.
- *Wisconsin*. There are several other available natural and manufactured devices that are more effective, durable and cost-effective.

Additional Perspective

Several respondents offered their thoughts on the most appropriate uses of silt fence and how it might play a role in areas of concentrated flow:

- **Possible applications** (*Maryland*). Based on the silt fence geotextile type and installation technique, it may be possible to use silt fence as a check dam or as a redundant control; however, it would have to be used in locations with very low velocities and flow rates—probably less than 2 cubic feet per second (cfs)—which is likely impractical in most locations. In Maryland erosion sediment control measures are designed for two-year storms; in most cases the concentrated flow would exceed 2 cfs. (*Note*: Cubic feet per second is the unit of measure for water that is in motion.)
- **Possible benefits** (*Virginia*). While the agency does not use silt fence as a check dam, the respondent noted that he "can see some benefits," including:
  - Ability to install in hard-to-reach areas with no heavy equipment.
  - Easy removal after channel stabilization without damaging the channel or surrounding area with heavy equipment.

- **Preferred use:**
    - Silt fence “should be used to prevent sediment from passing in areas of nonconcentrated flow.” This use is contrasted with a check dam, which is typically used to capture a small amount of sediment and slow down the water (*South Carolina*).
    - Silt fence is a "great perimeter control but does not perform well with concentrated flows” (*Virginia*).
    - When using silt fence in perimeter controls, the agency uses a gap in the silt fence for a relief point where channelized flow would develop. The gap is filled with rock bags to aid in the sediment control at this location. The rock bags also provide some filtering benefits. This method has historically performed well (*Wisconsin*).

State Research and Guidance

A literature search of recent publicly available domestic resources identified research and guidance associated with five states: Alabama, Georgia, Illinois, Iowa and Tennessee.

Alabama

Section 665, Temporary Soil Erosion and Sediment Control, Standard Specifications for Highway Construction, Alabama Department of Transportation, 2022.
https://www.dot.state.al.us/publications/Construction/pdf/Specifications/2022/SpecBookComplete.pdf
Page 555 of the manual (page 564 of the PDF) describes silt fence as a material used in temporary soil erosion and sediment control:

665.02(i) Silt Fence.
Silt fence shall be a geotextile filter supported between metal posts with a woven wire mesh backing as shown on the plans. Posts shall be strong enough to provide and retain the fence configuration shown on the plans while being subjected to loading of silt, water and debris.

Silt fence shall meet the requirements given in Section 810 and AASHTO M 288 as supplemented by the following requirements:

- The minimum fence height shall be 24 inches {61.0 cm} with a T-post weight of at least 1.25 lbs/ft {1.9 kg/m}, and trenches should be offset by 6 in. {15.2 cm}. At the toe of a slope, silt fence(s) should be installed at a minimum distance of 6 ft {1.8 m} to provide an adequate storage volume. For concentrated impoundments, T-post spacing should be reduced to 5 ft {1.5 m} with the incorporation of a dewatering weir. The dewatering weir and all associated items and labor shall be a subsidiary obligation of the silt fence.
- The support backing for the geotextile shall be 14 gage steel woven wire mesh. The vertical spacing of the wire in the mesh shall be 6 {150 mm} inches. The minimum horizontal spacing of the wires shall be 6 inches {150 mm} and the maximum horizontal spacing shall be 12 inches {300 mm}. Geotextile ring fasteners shall have a spacing of 1 ft {0.3 m} on-center, and the filter fabric must be looped over the T-posts.
- The geotextile filter shall be either a non-woven geotextile or a woven geotextile composed of monofilament yarns.

A list of geotextile materials acceptable for use in this application (List II-3 “GEOTEXTILES”) is given in the ALDOT manual titled “Materials, Sources, and Devices with Special Acceptance Requirements.”

This section also addresses installation requirements.

Related Resource:

List II-3, Geotextiles, List of Qualified Materials, Sources and Devices, Alabama Department of Transportation, February 2021.
https://www.dot.state.al.us/publications/Materials/pdf/MSDSAR/QMSD/Lii03.pdf
This publication lists all approved silt fence products.

Chapter 4, Runoff Conveyance: Field Guide for Erosion and Sediment Control on Construction Sites in Alabama, Alabama Soil and Water Conservation Committee and Partners, December 2018.
https://alconservationdistricts.gov/wp-content/uploads/2019/03/06-Runoff-Conveyance-2018-FINAL-DRAFT.pdf
See page 59 of the guide (page 7 of the PDF) for a description of a silt fence check dam installation.

“Improvements in Standardized Testing for Evaluating Sediment Barrier Performance: Design of a Full-Scale Testing Apparatus,” R. A. Bugg, W. N. Donald, W. C. Zech and M. A. Perez, *Journal of Irrigation and Drainage Engineering*, Vol. 143, Issue 8, August 2017.
Citation at https://ascelibrary.org/doi/full/10.1061/%28ASCE%29IR.1943-4774.0001194
From the abstract: Perimeter controls [i.e., sediment barriers (SBs) or sediment retention devices] are typically used on construction sites to retain sediment and prevent polluted stormwater runoff from adversely affecting aquatic habitats and clogging storm sewers. Often, parameters based on rule-of-thumb are applied to the design of SBs without knowing their expected performance capabilities. This issue is further complicated by the difficulty in devising a scientifically sound, repeatable testing methodology [and] replicating field conditions to assess performance. To resolve this issue, a test apparatus was designed and constructed at the Auburn University–Erosion and Sediment Control Test[ing] Facility to replicate in-field rainfall runoff rates for purposes of conducting full-scale experiments on various SBs. This apparatus allows for performance testing and direct comparisons between various SB products, practices and installations. The overall intent of conducting full-scale testing is to improve design criteria and enhance the in-field performance of SB practices. Initial test results for a woven polypropylene silt fence reinforced with a polypropylene grid and supported by wooden posts performed well structurally with an average sediment retention rate of 90.5% by volume.

“Evaluation and Modification of Wire-Backed Nonwoven Geotextile Silt Fence for Use as a Ditch Check,” W. N. Donald, W. C. Zech, M. A. Perez and X. Fang, *Journal of Irrigation and Drainage Engineering*, Vol. 142, Issue 2, February 2016.
Citation at https://ascelibrary.org/doi/abs/10.1061/%28ASCE%29IR.1943-4774.0000959
From the abstract: Construction activities require contractors to install, continuously monitor and maintain controls to minimize erosion and sediment transport. Construction sites discharge up to 100 times more sediment per acre than agriculture land activities because of mechanized compaction of bare soils that decreases infiltration capacity, increases runoff volumes and increases erosion potential. Silt fence perimeter controls are widely used by the construction industry to intercept and impound stormwater runoff sheet flow, forming large impoundment areas ideal for sedimentation. Ditch checks are often used to minimize channel erosion and promote sedimentation in conveyance channels through runoff impoundment. Structural failures of silt fence have caused many state agencies to exclude their use in concentrated flows.

Researchers at the Auburn University–Erosion and Sediment Control Testing Facility (AU-ESCTF) have evaluated the use of wire backed, nonwoven geotextile silt fence as ditch checks using large-scale testing techniques. This research has shown that silt fence, properly installed, can be used as a ditch check successfully. A longevity test of an enhanced silt fence ditch check installation resulted in sediment retention of 91.2% by volume.

Evaluation of ALDOT Ditch Check Practices Using Large-Scale Testing Techniques, Wesley C. Zech, Xing Fang and Wesley N. Donald, Alabama Department of Transportation, September 2014.
https://rosap.ntl.bts.gov/view/dot/37030/dot_37030_DS1.pdf?
From the executive summary:

> The Auburn University Erosion and Sediment Control Testing Facility (AU-ESCTF) was used to evaluate and improve various ditch check practices' performance using large-scale, channelized flow techniques to assist the Alabama Department of Transportation (ALDOT) in better maximizing ditch check performance in the field. One control test and five different types of ditch check practices were evaluated. The five different ditch check practices were: (1) *wattles*, (2) *rip rap*, (3) *sand bags*, (4) *silt fence* and (5) *stacked wattles*.
>
> Recommendations on installation modifications for each ditch check practice based upon testing results were made to better enhance the practices' capabilities.

See Chapter 5, Silt Fence Ditch Checks, starting on page 30 of the document (page 36 of the PDF).

Georgia

Temporary Fabric Check Dams (Construction Detail D-24D), Policy Announcement, Georgia Department of Transportation, July 2015.
http://www.dot.ga.gov/PartnerSmart/DesignManuals/PolicyAnnouncements/TemporaryFabricCheckDams.pdf
This correspondence to the Georgia Environmental Protection Division "summarizes recent actions taken by GDOT [Georgia DOT] to improve the performance of temporary check dams as an acceptable alternative BMP on appropriate GDOT projects until the Georgia Salt Water Conservation Commission (GSWCC) publishes new standards or guidance on the subject."

Related Resource:

> **Temporary Silt Fence; Fabric Check Dam**, Construction Details, Number D-24D, Sheet 4 of 4, Construction Standards and Details, Georgia Department of Transportation, July 2015.
> http://mydocs.dot.ga.gov/info/gdotpubs/ConstructionStandardsAndDetails/D-24D.pdf
> This document provides construction details, including the note that "fabric check dams may be used in ditches with depths at least 26-in."

Illinois

Evaluation of Ditch Checks for Sediment Retention, Rabin Bhattarai, Prasanta Kalita, Carlos Bulnes Garcia, Joseph Monical and Paul Schumacher, Illinois Department of Transportation, January 2016.
https://apps.ict.illinois.edu/projects/getfile.asp?id=4730
From the abstract:

> At the Erosion Control Research and Training Center (ECRTC) at the University of Illinois at Urbana-Champaign, a series of tests were conducted to analyze the effectiveness of various ditch checks to ensure they could be used in real-life construction sites to mitigate soil transport. The tests were conducted to determine their practicality in field use. The goal[s] of these tests were to examine how well they reduce sediment leaving the ditch and how much ponding occurs, as well as other criteria of interest to the Illinois Department of Transportation (IDOT).

Page 29 of the report (page 37 of the PDF) provides a product analysis, beginning with the triangular silt dike:

> **5.2.1 Triangular Silt Dike**
>
> - **Sediment removal:** Compared to sediment logs and GeoRidge, the triangular silt dike's permeability was very low, which resulted in a significant flow barrier and created a series of cascades between the ditch checks installed along the channel. Very little soil disturbance was observed for the triangular silt dike evaluation, and sediment accumulation in front of the triangular silt dike was barely noticeable. The amount of sediment deposited upstream of this product was less compared to those for GeoRidge and the sediment log. Due to good ground contact, undercutting was not an issue for this particular product.
> - **Ease of installation:** Overall, this product was fairly easy to install.
> - **Ponding:** This product created a large amount of ponding compared to other products.
> - **Product failure:** The product appeared to hold up well at both high and low flow rates.

Related Resource:

> **"Field Evaluation of Sediment Retention Devices Under Concentrated Flow Conditions,"** Carlos Bulnes García, Joseph Monical, Rabin Bhattarai and Prasanta K. Kalita, *Journal of Soils and Sediments*, Vol. 15, Issue 9, pages 2022–2031, 2015.
> Citation at https://link.springer.com/article/10.1007/s11368-015-1167-6
> *From the abstract*:
>
> **Purpose**
> Sediments are the leading cause of water quality deterioration around the world. A number of sediment retention devices, including ditch checks, have been developed in the last few decades to improve water quality. Differences between methodologies used to evaluate product performance in the past have led to difficulties in comparing evaluations from various studies.
>
> **Materials and methods**
> A new testing protocol for evaluating ditch check products was developed at the Erosion Control Research and Training Center (ECRTC) of the University of Illinois at Urbana-

Champaign to provide a reliable and easily replicable testing procedure to evaluate product performance under standardized testing conditions. As per the field-scale protocol, three different flow conditions (5, 7.5 and 10 l s^{-1}) were used to evaluate performance both in terms of water quality (turbidity and sediment concentration) and channel disturbance prior to permanent stabilization, while simulating the conditions typically found during construction activities. The flow conditions can be reproduced in the field setting using commercially available pumps and were selected based on the peak flow-generated construction site of varying size in central Illinois, and the 5, 7.5 and 10 l s^{-1} flows corresponded to peak flow generated from 5, 7.5 and 10 acre construction area from 10-year rainfall event. The three products tested were GeoRidge, Sediment Log and Triangular Silt Dike.

Results and discussion
In terms of sediment concentration, Triangular Silt Dike performed better under all flow conditions, while GeoRidge and Sediment Log performed similarly. GeoRidge was able to retain more sediment upstream compared to Triangular Silt Dike and Sediment Log.

Conclusions
This study provides a reliable and easily replicable testing procedure to evaluate ditch check product performance under standardized testing conditions. This study can also help in future product development and proper product selection for erosion and sediment control plans based on the product performance.

Iowa

Section 10C-1, Temporary Sediment Control Devices, Chapter 10, Roadside Development and Erosion Control, Design Manual, Design Bureau, Iowa Department of Transportation, March 2021.
https://iowadot.gov/design/dmanual/10c-01.pdf
From page 6:

Silt Fence for Ditch Checks
Silt fence ditch checks are used to slow flow of water and to intercept soil and debris from water flowing through ditches. They are installed at right angles to the flow of water.

When rolled erosion control products are used in ditches or medians, use perimeter and slope sediment control devices for ditch checks rather than silt fence.

Field Monitoring of Erosion and Sediment Control Practices and Development of Additional Iowa DOT Design Manual Guidance, Jaime Schussler, Michael A. Perez, Bora Cetin and J. Blake Whitman, Iowa Department of Transportation, April 2020.
http://publications.iowa.gov/32758/2/18-SPR1-001_Final%20Report%20Erosion_and_Sediment_control_field_monitoring_and_practice_dev_w_cvr.pdf
From the abstract: This research aimed to understand the performance of current E&SC [erosion and sediment control] practices and enhance the design guidance available to the Iowa DOT. Silt fence ditch checks, wattle ditch protection, silt fence perimeter control and temporary sediment control basins were monitored for performance on US 30 in Tama County, Iowa. Two modified silt fence ditch check installations had an average of 2.5 and 4 times as much sediment accumulation as a standard silt fence, the modified wattle ditch protection had 13.15 times the sediment retention of a standard wattle installation, and silt fence perimeter control

modifications led to less T-post deflection and failures observed than with the standard installation.

Related Resource:

> **"Field Evaluation of Wattle and Silt Fence Ditch Checks,"** Jaime C. Schussler, Billur Kazaz, Michael A. Perez, J. Blake Whitman and Bora Cetin, *Transportation Research Record*, Vol. 2675, Issue 6, pages 281-293, 2021.
> Citation at https://journals.sagepub.com/doi/10.1177/0361198121992073
> *From the abstract*: Erosion and sediment control practices are implemented during construction activities to mitigate downstream effects, but limited field-performance data exists. Field assessments were conducted to evaluate ditch check installations during highway construction in Tama County, Iowa. Data collection included daily rainfall, topographical surveys of sediment deposition, pre- and post-rain event images and visual observations. Variations to the standard Iowa Department of Transportation silt fence ditch check installation evaluated as part of this study include: (a) upgrading non-reinforced geotextile to a multi-belted, reinforced geotextile (i.e., SF-M1); (b) installing V-shape, as opposed to linear, while incorporating wire reinforcement to support hydrostatic loads placed on the geotextile, inclusion of a weir to facilitate controlled flow discharge, and offsetting the geotextile entrenchment location to improve ground securement (i.e., SF-M2); and (c) installing the di[t]ch check as described for SF-M2 substituting slicing for trenching (i.e., SF-M3). The modified wattle installation (i.e., W-M) incorporated a teepee staking configuration to facilitate ground contact, and an excelsior underlay, secured by sod staples, to minimize wattle undercutting. Results from field experiments indicated that sediment retention rates significantly improved for installations of SF-M2 and SF-M3 when compared with the standard installation and SF-M1 at the 85% confidence level, and served as viable control measures in concentrated flow applications. The W-M installation exhibited a statistically significant improvement in sediment retention over the W-S installation at the 95% confidence level. These findings suggest that ditch check performance is a function of specified practice and of installation methods described within regulatory agency specifications and design guidelines.

Check Dams, Chapter 1, General Provisions; Section 7E, Design Information for ESC [Erosion and Sediment Control] Measures, Design Manual, Iowa Statewide Urban Design and Specifications, The Institute for Transportation at Iowa State University, 2013.
https://intrans.iastate.edu/app/uploads/sites/15/2020/03/7E-7.pdf
From page 2: 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 [the citation below] for additional information on using silt fence as a ditch check.

Silt Fences, Chapter 7, Erosion and Sediment Control; Section 7E, Design Information for ESC Measures, Design Manual, Iowa Statewide Urban Design and Specifications, The Institute for Transportation at Iowa State University, 2013.
https://intrans.iastate.edu/app/uploads/sites/15/2020/03/7E-14.pdf
The use of silt fence for concentrated flow is discussed on page 3.

Tennessee

10.08.1.1, Enhanced Silt Fence Check (EC-STR-4, 4A and 4B), Chapter 10, Erosion Prevention and Sediment Control, Drainage Manual, Design Division, Tennessee Department of Transportation, October 2021.
https://www.tn.gov/content/dam/tn/tdot/roadway-design/documents/drainage_manual/DM-Chapter_10.pdf
From the definition and purpose (page 10EP-2 of the manual, page 61 of the PDF):

> This BMP consists of an enhanced silt fence constructed in an angled arrangement across a small swale, drainage ditch or area of concentrated flow. The silt fence is supported by steel posts driven 3.5 feet into the ground and placed at 2 foot centers. The woven monofilament geotextile fabric used for the fence is reinforced with a metal wire backing.

A description of appropriate applications of this measure begins on the same page:

> This measure may be applied in small open channels conveying stormwater flow, not to exceed the maximum allowable design peak flows defined in the "Limits of Flow" tables on the standard drawings. Enhanced silt fence checks should not be used in any waterways designated as ephemeral, intermittent or perennial streams. Specific applications include:
>
> - temporary or permanent swales or ditches collecting runoff from a watershed that is not stabilized against erosion, where the suspended solids load is expected to be high;
> - temporary or permanent swales or ditches collecting runoff from a watershed that subsequently drain to listed Exceptional Tennessee Waters or sediment-impaired streams, where the watershed is not stabilized against erosion;
> - temporary or permanent swales or ditches in need of protection during establishment of grass linings;
> - temporary or permanent swales or ditches which, due to their short length of service or for other reasons, cannot receive a non-erodible lining; and
> - other locations where small localized erosion and resulting sedimentation problems can occur.

Related Resources:

Standard Drawing EC-STR-4, Enhanced Silt Fence Check (Trapezoidal Ditch), Tennessee Department of Transportation, December 2002.
https://www.tn.gov/content/dam/tn/tdot/roadway-design/documents/standard_drawings/roadway_standard_drawings/current/erosion-prevention-and-sediment-control/ditch-devices/ECSTR4.pdf
This Standard Drawing include a Limits of Flow table and general notes.

Standard Drawing EC-STR-4A, Enhanced Silt Fence Check (V-Ditch), Tennessee Department of Transportation, December 2002.
https://www.tn.gov/content/dam/tn/tdot/roadway-design/documents/standard_drawings/roadway_standard_drawings/current/erosion-prevention-and-sediment-control/ditch-devices/ECSTR4A.pdf
This Standard Drawing include a Limits of Flow table and general notes.

Standard Drawing EC-STR-4B, Enhanced Silt Fence Check Details, Tennessee Department of Transportation, January 2010.
https://www.tn.gov/content/dam/tn/tdot/roadway-design/documents/standard_drawings/roadway_standard_drawings/current/erosion-prevention-and-sediment-control/ditch-devices/ECSTR4B.pdf
As this Standard Drawing notes, enhanced silt fence checks are "used to remove suspended sediments from storm water flow via settling and filtration. They are also used for velocity reduction." The drawing provides the recommended spacing between silt fence checks.

In-Service Performance Evaluation of Erosion Prevention and Sediment Control (EPSC) Devices, John S. Schwartz and Jon M. Hathaway, Tennessee Department of Transportation, October 2018.
https://www.tn.gov/content/dam/tn/tdot/long-range-planning/research/final-reports/res2016-final-reports/RES2016-19_Final%20Report_approved.pdf
From the abstract: Erosion Prevention and Sediment Control (EPSC) devices are widely used during construction projects by [d]epartment of [t]ransportations (DOTs) nationally to prevent or reduce the movement of sediment that is carried into lakes, streams and rivers by storm water runoff from a site during construction and are required by state water quality and storm water regulations.
….

The goals of this research were to investigate in-service performance of the effectiveness of current TDOT EPSC device installation practices in field. In addition, this research further evaluates the application guidance and quantity calculation methods currently provided for each EPSC device, [and] estimates material quantities of installed devices based on initial installation, maintenance and field performance. Available for use on highway construction project sites, TDOT Drainage Manual, Chapter 10 has 42 EPSC applications that include both flow and sediment control devices. The specific objectives of this research were to: 1) evaluate the applicability and performance of the current EPSC devices, 2) investigate how often EPSC devices are being modified during the construction under the SWPPP [Storm Water Pollution Prevention Plans] through on-site field inspections, and 3) determine if the changes are needed to roadway plans and specific EPSC applications in Chapter 10 of the TDOT Roadway Drainage Manual, and make any necessary recommendations.

Contacts

CTC contacted the people below to gather information for this investigation.

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Appendix A: Survey Questions

The following survey was distributed to members of two American Association of State Highway and Transportation Officials (AASHTO) committees: the Committee on Design and the Committee on Environment and Sustainability.

Caltrans Survey on the Use of Silt Fence as Check Dams

Note: The response to the question below determined how a respondent was directed through the survey.

(Required) Does your agency have a specification or practice for the installation of silt fence to serve as check dams in areas of concentrated flow for temporary sediment control on construction sites?

Response Options:

- No, and we have no plans to use silt fence in this manner. (Directed the respondent to the **Agencies Not Using Silt Fence as Check Dams** section of the survey.)
- No, but we used to use silt fence in this manner. (Directed the respondent to the **Agencies With Prior Experience Using Silt Fence as Check Dams** section of the survey.)
- Yes, we install silt fence as check dams in areas of concentrated flow. (Directed the respondent to the **Agencies Using Silt Fence as Check Dams** section of the survey and the sections that follow it.)

Agencies Not Using Silt Fence as Check Dams

1. Please describe why your agency does not currently use silt fence as check dams in areas of concentrated flow on construction sites.
2. Has your agency ever considered using silt fence as check dams?
    - No
    - Yes

Note: After responding to the question above, the respondent was directed to the **Wrap-Up** section of the survey.

Agencies With Prior Experience Using Silt Fence as Check Dams

1. Please identify the period during which your agency used silt fence as check dams in areas of concentrated flow.
2. Why did your agency stop using silt fence for this application?
3. What best management practice(s) does your agency use now for sediment control in areas of concentrated flow on construction sites?

Note: After responding to the question above, the respondent was directed to the **Wrap-Up** section of the survey.

Agencies Using Silt Fence as Check Dams

Silt Fence Installations

1. Please briefly describe the circumstances under which silt fence is used as check dams in areas of concentrated flow on construction sites.
2. Please name and describe the silt fence product(s) your agency uses for these installations.
    - Product 1:
    - Product 2:
    - Product 3:
3. Please describe the installation method(s).
4. Please describe the typical fabric check dam spacing.
5. Roughly how many installations of this type does your agency complete each year?

Impacts in the Field

1. Please assess the efficacy of silt fence used as check dams at achieving the following using the rating scale of 1 = not at all effective to 5 = extremely effective.
    - Velocity dissipation
    - Sediment retention
    - Scour reduction at the center of the ditch
    - Scour reduction at the silt fence tie-in to slopes as compared to rock dams
2. Please describe the sediment concentration or accumulation in the typical installation.
3. Does your agency conduct field inspections of silt fence used as check dams for installation integrity during active construction operations?
    - No
    - Yes (Please briefly describe the results of these inspections.)
4. Has your agency conducted any field tests to determine the efficacy or impacts of silt fence used as check dams?
    - No
    - Yes (Please describe the results of these field tests.)
5. Has your agency identified any environmental impacts to downstream water bodies when using silt fence as check dams?
    - No, we haven't attempted to identify such environmental impacts.
    - No, our evaluations have not identified environmental impacts.
    - Yes, our evaluations have identified environmental impacts. (Please describe these impacts below.)

Assessment

1. How have your agency's silt fence installations **performed** as compared to other sediment control practices in areas of concentrated flow?
2. What are the **benefits** of using silt fence as check dams?
3. What are the **challenges** associated with using silt fence as check dams?

4. What **recommendations** do you have for another agency preparing to use silt fence as check dams as a best management practice?
5. Please provide links to documents associated with your agency's use of silt fence as check dams. These might include manuals or guidelines, specifications, construction details or test results. Send any files not available online to chris.kline@ctcandassociates.com.

Wrap-Up

Please use this space to provide any comments or additional information about your previous responses.