Texas A&M Transportation Institute

Texas Department of Transportation

PROJECT SUMMARY REPORT

0-7100: Develop Sediment Control Approved Product List

Background

Sediment control devices (SCDs) are used on construction sites to retain sediment and prevent stormwater from adversely affecting adjacent waterways. SCDs include silt fences, wattles, sediment logs and basins, filter dams, and inlet protection devices. These products are designed to be installed for specific applications (e.g., curb inlets, drop inlets, and perimeter protection). However, there is no scientifically sound, repeatable, full-scale testing methodology that replicates field conditions to test and determine SCD performance.

This project developed a formal testing protocol and test apparatus for a performance-based SDC testing program. This program will assist the designer/engineer in selecting the most effective sediment control best management practice.

What the Researchers Did

Based on the information identified in an extensive literature and state-of-the-practice review, researchers developed a test protocol and designed a test facility to evaluate the performance of temporary SCDs. The new facility and protocol allow researchers to quantify the sediment retained by various SCDs and compare their efficiency.

The new facility also allows real-world installation procedures to accurately measure the performance of diverse types of SDCs. To accomplish this, it was determined that pre-cast concrete-type sediment collection systems that are specified directly for Texas Department of Transportation (TxDOT) construction sites would be the most feasible since these pre-cast systems are routinely built and installed on various construction sites throughout the state and are built according to detailed blueprints and standard TxDOT specifications. Obtaining these devices that are actually installed to provide stormwater collection on streets and roads allowed researchers to install the various SCDs exactly as specified by manufacturers and also in exact accordance with how they are installed on actual jobsites.

Full-scale models were designed and built to evaluate SCD performance in the following applications:

- **Curb/gutter protection**—To evaluate SCDs designed for curb/gutter protection, researchers designed and built a full-scale concrete curb and gutter section per TxDOT Design Division standards (Figure 1). In this model, sediment-laden water is released from the elevated mixing tank and allowed to flow along the curb until it reaches the opening. The turbidity and flow rate of the influent and effluent are measured to determine turbidity and flow rate reduction.

Figure 1. Drop Inlets and Curb/Gutter Application.

- **Drop Inlet Protection**—To evaluate SCDs designed to protect drop inlets, the researchers designed and built two concrete, full-scale models:
  - **Concrete drop inlet**—A 12-ft × 12-ft concrete drop inlet model with a 3-ft × 3-ft cast iron grate was constructed to evaluate SCDs designed to protect drop inlets located in concrete areas such as roadways and parking lots. Sediment-laden water is delivered through perforated 4-inch PVC pipe. The PVC pipe allows water to be distributed 360 degrees around the SCD to mimic actual field conditions. The turbidity and flow rate of the

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influent and effluent were measured to determine turbidity and flow rate reduction.
    - **Soil surface drop inlet**—A 12-ft × 12-ft soil surface drop inlet model with a 3-ft × 3-ft cast iron grate was constructed to replicate inlets found in roadway medians. Sediment-laden water is delivered through the same 4-inch PVC pipe system as the concrete model. The turbidity and flow rate of the influent and effluent were measured to determine turbidity and flow rate reduction.
- **Instream and perimeter flume**—To evaluate the performance of perimeter protection devices, an existing 18-ft-long × 15-ft-wide × 2.5-ft-deep half pipe/half cylinder–shaped concrete test channel was used. The test channel is made up of three distinct zones: the retention zone, the installation zone, and the collection zone. The turbidity and flow rate of the influent and effluent were measured to determine turbidity and flow rate reduction.
- **Geotextile dewatering device**—To evaluate the SCDs' performance, researchers placed a bag on the concrete pad used for evaluating drop inlet devices. This allowed dewatering bags and dewatering devices to be evaluated in this closed impervious system, in which all water flowing out of the device can be captured and monitored. Once in place, a discharge pipe was inserted on the supply end of the bag, and sediment-laden water was pumped into the bag. The turbidity of the influent and effluent was measured to determine the percent of turbidity reduction.
- **Floating turbidity barriers**—To evaluate the performance of floating turbidity barriers, an 80-ft-long × 12-ft-wide × 5.5-ft-deep open-top vertical sidewall flume that holds 1 acre-inch of water when filled to the overflow weir wall was used. This system also has a premix tank for premixing sediment prior to introducing it into the flume. Grab samples at different depths on both sides of the installed barrier were taken to evaluate its performance

What They Found

The following data were measured and recorded for each SCD tested:

- Percent turbidity reduction.
- Percent flow rate reduction.
- Percent solids removal.

The test results from this project are described in the final report. A summary data chart of each of the test trials is also shown for each of the SCD test systems. Detailed raw data for each of the 23 different test trials are shown in Appendices A–F of the final report.

The researchers found that the designed test system and test protocol that were developed for evaluating SCDs were successful in evaluating and quantifying the effectiveness of various SCDs. The researchers also found the SCD test system design was effective at evaluating devices under full-scale flow conditions with repeatable and accurate installation procedures since the devices were installed using manufacturer-specified field installation techniques. An SDC's ability to reduce turbidity and sediment is obviously a very important criterion; however, it is also important to evaluate SCDs' flow characteristics since these vary significantly between various devices.

All of these data were found to be very useful in comparing devices and will be extremely important in choosing specific products that are the best management practices when considering site-specific needs and conditions.

What This Means

This program will quantify the ability of various SCDs to retain eroded sediments caused by sheet-flowing water under full-scale conditions by measuring and comparing the amount of sediment that passes through the SCD, and by evaluating and comparing SCDs. The final test results will be reported by listing SCDs and their calculated retention effectiveness. These data could then be used to develop an Approved Product List (APL) for sediment devices similar to the current Interactive APL for erosion control products. An APL would assist TxDOT engineers/designers in the selection of the most appropriate SCD based on site-specific conditions.

For More Information

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