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16. Abstract The Sediment and Erosion Control Laboratory (SEC Lab), formerly the Hydraulics, Sedimentation, and Erosion Control Laboratory, is operated by the Texas A&M Transportation Institute's Environment and Planning Program. Performance evaluation programs for sediment and erosion control products, materials, devices and techniques are conducted at the SEC Lab to produce and maintain the Texas Department of Transportation's (TxDOT) Approved Products List (APL). By 2012, the existing facility was operating at full capacity with a waiting list of over 18 months. Expansion of the facility includes an indoor rainfall simulator that houses three 8 ft. × 40 ft. soil-fill test bed, a covered soil storage/bed preparation area, and a covered preparation area between the existing and new buildings, and a sediment retention device flume. The expansion of the SEC Lab provides additional performance evaluation and research capacity to better serve TxDOT's needs and enable a more robust and comprehensive research program.					
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**SEDIMENT AND EROSION CONTROL LABORATORY FACILITY  
EXPANSION**

by

Jett A. McFalls  
Assistant Research Scientist  
Texas A&M Transportation Institute

and

Beverly J. Storey  
Associate Research Scientist  
Texas A&M Transportation Institute

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College Station, Texas 77843-3135



## **DISCLAIMER**

This research was performed in cooperation with the Texas Department of Transportation (TxDOT) and the Federal Highway Administration (FHWA). The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official view or policies of the FHWA or TxDOT. This report does not constitute a standard, specification, or regulation.

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# **SEDIMENT AND EROSION CONTROL LABORATORY**

## **BACKGROUND**

The Hydraulics, Sedimentation, and Erosion Control Laboratory (HSECL) was established in 1990. With the expansion of the facility came the name change to the Sediment and Erosion Control Laboratory (SEC Lab). The Texas A&M Transportation Institute's (TTI) Environment and Planning Program operates this full-scale, indoor/outdoor facility. Performance evaluations of erosion and sediment control products are conducted at the laboratory to produce and maintain the defensible Texas Department of Transportation (TxDOT) Approved Products List (APL). The laboratory is located at Texas A&M University's Riverside Campus in Bryan, Texas. The performance evaluations conducted at the facility include:

- Slope protection utilizing the indoor rainfall simulator.
- Channel protection through an outdoor channel test flume.
- Sediment retention devices using an outdoor sediment flume.

The overall goal of the SEC Lab is to provide the transportation industry with a uniform, timely, non-biased, scientifically sound performance evaluation and research program for products, materials, devices, and techniques used for stormwater quality improvement, and erosion and sediment control.

In 2000, TxDOT and TTI re-evaluated the APL performance evaluation program to determine any changes that could be made to:

- Decrease the impact of natural climatic variations.
- Increase the precision of measuring and gathering data.
- Speed up the process to reduce time spent on the wait list.

Based on this evaluation, the facility was redesigned and renovated. These changes removed the influence of most climatic variables when an indoor rainfall simulator and greenhouses were installed for use in all work requiring soil/vegetative interaction. Specific improvements include:

- Repetition consistency.
- Rainfall simulation with large droplets.

- Uniformity of simulated rain.
- Measurement precision in channel deformation.

Product performance evaluation was expanded in 2010 with the addition of the Sediment Retention Effectiveness Evaluation program. TTI began accepting applications to evaluate the sediment retention effectiveness of sediment retention devices (SRD) on March 1, 2010. Products are evaluated for turbidity, flow-through rate, and suspended sediment concentration. Performance evaluation consists of multiple replications and flow rates. TxDOT has since modified its specifications to include the sediment control performance evaluation program as a mandatory test for all products used on their roadsides. The SEC Lab is the only full-scale testing facility using the specific parameters developed for TxDOT to maintain their APL.

Historically, TTI's performance evaluation program at the SEC Lab facility has provided TxDOT with guidance and recommendations on identifying erosion and sediment control materials, techniques, and products meeting TxDOT's minimum performance standards for each category established at the facility. This includes slope protection, channel protection, mulches, and sediment retention devices. Designers use the products on the APL to choose appropriate best management practices for inclusion in the Storm Water Pollution Protection Plan (SWP3) to meet the regulatory requirements of the Texas Pollutant Discharge Elimination System (TPDES).

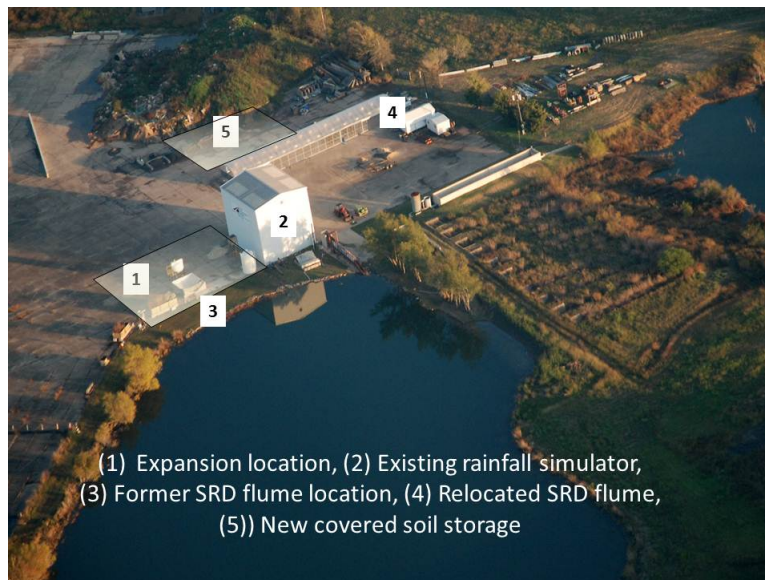
## **NEED FOR EXPANSION**

During the last decade, the demand for performance evaluations of erosion control materials has increased significantly due to state and federal environmental regulations. The facility was not adequate to accommodate the demand. There is an extensive waiting list for the use of the indoor rainfall simulator and channel flume testing. Prior to the expansion, the existing facility was operating at full capacity with a 12- to 18-month waiting list for testing in the rainfall simulator. Those delays posed a risk of loss in potential research funding.

TTI proposed increasing the size of the rainfall simulator to add significant additional capacity with a covered soil storage/bed preparation area located adjacent to the facility. Figure 1 shows the facility expansion that includes:

- An indoor rainfall simulator.
- Test equipment.
- Restroom facilities.

- Water supply and electrical utilities.
- Covered soil storage building.
- Relocation of the sediment flume to accommodate the expanded rainfall simulator.



**Figure 1. Location of Expansion Facilities.**

## **SEC LAB EXPANSION COMPONENTS**

The expansion of the SEC Lab facility was a collaborative effort between the contractor and TTI. The total estimated cost of this project was \$1,134,000, of which TxDOT’s contribution is approximately 30 percent (\$350,000), distributed between FY 2012 and FY 2013. TTI contributed the remainder of the funding. As mentioned in the previous section, the expansion of the facility includes the indoor rainfall simulator, covered preparation area between building, covered soil storage building, and relocation of SRD flume.

### **Indoor Rainfall Simulator**

The design of the new indoor rainfall simulator considered the previous 10 years of operating the existing rainfall simulator and included items to better expedite the safety and operation of the facility. The newly constructed rainfall simulator also took into account the necessity of including enough test bed capacity for future research needs. The building is a 3630-sq. ft. insulated steel building (see Figure 2). The 45-ft. tall building houses three rainfall simulators that distribute water onto three variable slope 8-ft. × 40-ft. galvanized soil fill beds.

The building has six 14-ft. × 14-ft. roll-up doors: three at the building front to accommodate placement of the soil-fill test beds and three located at the rear of the building for retrieval of sediment collection system from the ramp entry at that the rear location. The rainfall simulator system consists of three independently operated rainfall racks that rise to accommodate any slope condition to maintain a 14-ft. above-bed height to ensure that the large raindrop distribution (approximately 4–6 mm) reaches 90 percent terminal velocity. Each rainfall simulator system has a motor that moves the racks to produce a random raindrop pattern to further simulate a natural, severe rainfall event. The rainfall simulators provide water drop size distribution and impact velocity that are typical of storms common to Texas and the Gulf Coast regions of the country. The rainfall simulators are designed to subject test beds to the greatest, most destructive rainfall characteristics and can generate up to 8 inches of rainfall per hour. In addition, the expansion facility design enables new performance evaluation capabilities for ASTM D6459-11 Standard Test Method for Determination of Rolled Erosion Control Product (RECP) Performance in Protecting Hillslopes from Rainfall-Induced Erosion.



**Figure 2. New Indoor Rainfall Simulator Building.**

Three 10-ton capacity hoists were installed to meet the weight requirements to raise and lower the 8-ft. × 40-ft. fully saturated soil-fill beds (see Figure 3). Four 1-ton capacity hoists operate each rainfall simulator. The building design also included a single, unisex restroom with

shower, an on-site septic system, a fire suppression system, and a mezzanine level for viewing (see Figure 4). Water and electrical utilities were installed to meet the requirements of the facility. A three-phase transformer replaced the existing single-phase system.

A 1,500 sq. ft. covered preparation area connects the existing simulator and the new building. This area provides a covered space for preparation, storage, and connectivity. It also contains a fire suppression system.



**Figure 2. The 10-Ton Hoist System for Soil-Fill Test Beds.**



**Figure 3. Mezzanine Level for Viewing.**

A covered soil storage building was constructed to reduce the impact of weather on the moisture content of soils used for testing. This steel building provides a covered area for materials and allows for sediment bed preparation during inclement weather (see Figure 5).



**Figure 4. Soil Storage Building.**

The relocation of the SRD flume was necessary to enable the construction of the new rainfall simulator. Demolition of the existing SRD flume occurred along with building/preparation area construction. The new SRD flume was relocated adjacent to the 2,800 sq. ft. climate-controlled greenhouse.

### **Contract Modification**

The original contract for the expansion of the HSECL, now the SEC Lab, had a termination date of March 31, 2013. Due to delays in the construction process, the contract was extended to August 31, 2013 with no additional funding.

The results of this project allows TTI to continue meeting TxDOT's needs, and also facilitate the performance evaluation process for erosion control products to clear the backlog that currently exists for products waiting to be tested for inclusion in the APL.