10-ft outdoor flume configured to a 4-ft channel width conveying 86 cfs with a corresponding overtopping depth of 3 ft.
OVERTOPPING PERFORMANCE TESTING

Colorado State University (CSU) has four Overtopping Facilities which are part of a unique research center designed for hydraulic model studies, testing and calibration in the fields of open channel and closed conduit hydraulics.

The overtopping facilities at the Engineering Research Center provide a wide range of sizes and capacities to meet any project need (Table 1). Two of the overtopping facilities, the 10-ft and the 6-ft mild, are located outdoors; while the 6-ft steep and 4-ft are located indoors.

Outdoor facilities are supplied with water from Horsetooth Reservoir by a 36-inch diameter pipeline. Average static head to the system throughout the year is approximately 200 feet. Reservoir water quality has a very low turbidity and a water temperature ranging from 40 to 55 degrees Fahrenheit.

Indoor facilities are supplied by individual pumps in conjunction with a one acre-ft sump located beneath the laboratory floor. The ability to test year around is the inherent benefit of indoor facilities.

Table 1: ERC Overtopping Facilities

<table>
<thead>
<tr>
<th>Facility</th>
<th>4-ft</th>
<th>6-ft Mild</th>
<th>6-ft Steep</th>
<th>10-ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width (ft)</td>
<td>Up to 4.0</td>
<td>Up to 6.3</td>
<td>Up to 6.0</td>
<td>Up to 10</td>
</tr>
<tr>
<td>Length (ft)</td>
<td>30</td>
<td>75</td>
<td>40</td>
<td>120</td>
</tr>
<tr>
<td>Slope (%)</td>
<td>Up to 50%</td>
<td>13%</td>
<td>Up to 22%</td>
<td>50%</td>
</tr>
<tr>
<td>Maximum Discharge (cfs)</td>
<td>22</td>
<td>160</td>
<td>55</td>
<td>170</td>
</tr>
<tr>
<td>Overtopping Depth (ft)</td>
<td>Up to 2</td>
<td>Up to 6</td>
<td>Up to 3</td>
<td>Up to 6</td>
</tr>
<tr>
<td>Embankment Height (ft)</td>
<td>Up to 15</td>
<td>Up to 9</td>
<td>Up to 8</td>
<td>Up to 60</td>
</tr>
</tbody>
</table>

*Not all combinations of configurations are possible.

Common overtopping studies performed at the Hydraulics Laboratory include:
- Embankment Erosion Protection
- Articulated Concrete Blocks (ACB)
- Synthetic Groundcover
- Vegetative Systems
- Pour-in-place Systems
- Riprap and Culvert Protection
- Rolled Erosion Control Products
- Spillway Examination
- Performance under Hydraulic Jump Conditions
- Dam Foundation Erosion
- Energy Dissipation Techniques

ARTICULATED CONCRETE BLOCK TESTING PROCEDURES

ACB testing facilities and procedures conform to current testing standards as follows:
- Specify and classify soil type
  - Grain size distribution (mechanical)
  - Grain size distribution (hydrometer)
- Standard proctor analysis
- Atterberg limits
- Construct embankment
- Test embankment for compaction specifications
- Install protection scheme
- Prepare for testing
- Test protection scheme
  - Each test includes a potential 1-foot, 2-foot, 3-foot, and 4-foot overtopping depth.
  - Each potential overtopping depth includes 4 hours of continuous testing with data collected each hour
  - Bed and water surface elevations along with one-dimensional velocities are collected for each hour
- Tabulate data for a data report

Each ACB system is tested until it exceeds the performance threshold or the discharge capacity of the facility.