NCEEP Crest Gauge Installation

I. Introduction

Crest gauges are used to measure maximum water elevation following a storm event. They do not measure flow volume, timing, or velocity.

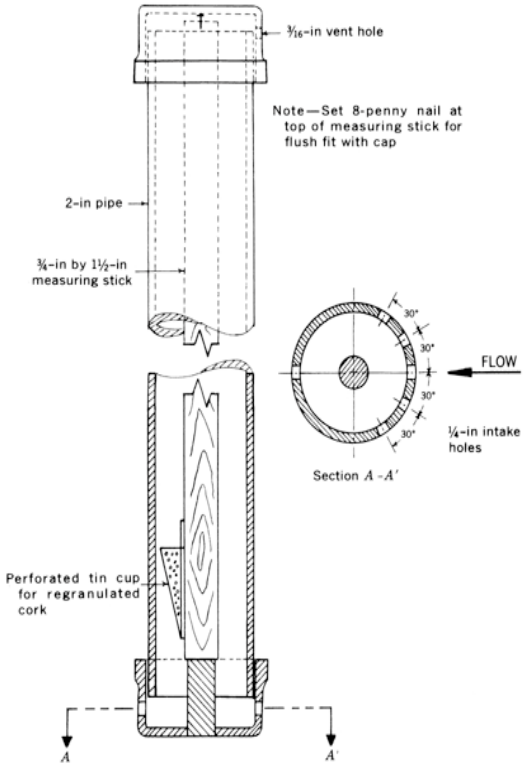
When maximum water elevations are correlated with precipitation data, annual bankfull event number and timing can be interpolated.

Crest gauges use capped piping (typically 3 inch diameter PVC) with holes at both ends, a wooden measuring rod, and granulated cork to document storm events' maximum water elevation. Water enters the bottom of the pipe through the holes. As it rises the granulated cork floats. When the water reaches its maximum elevation in response to the storm event and begins to recede, the granulated cork adheres to the wooden rod.

Later evaluation of the cork's maximum elevation on the rod and its relationship to the restored stream's bankfull elevation allows monitoring of the frequency and timing of bankfull storm events along the restored stream reach.

II. Materials

1 crest gauge - Rickly Hydrological Company product 801-170 (EEP-preferred model)



www.rickly.com/sm/IMAGES/TYPE_A.JPG

Additional equipment (per gauge)

- 1-3 heavy duty, 6 foot (or longer) steel t-post(s)
- ~50 ml granulated cork (35mm film canister)
- 2-4 stainless steel 3-7 inch diameter hose clamps (a range of clamp sizes may be necessary at a given site)
- 2-5 12-15 inch zip/cable ties
- 1 manual steel t-post driver
- 1 sledge hammer – small (2-pound head, 18-inch handle) or large (8-pound head, 36-inch handle)
- 1 screw driver and/or appropriately sized wrench (end or socket)
- 10-15 wire flags
- safety glasses
- ear plugs
- level/total station equipment (i.e. instrument, rod, and tripod)

III. Site Selection

Depending on a restoration project's total length, a crest gauge installation site should be identified/selected after a qualitative evaluation of the downstream 1/2 to 1/3 of the project's restored reach(es). A flat, stable, and straight run, with relatively deep and consistent flow should be identified. Particular attention should be given to conditions downstream of the selected site. If obstructions and/or debris that have the potential to cause backwatering at the selected site are present, another site should be selected.

IV. Installation

Following project evaluation and site selection, bankfull elevation should be evaluated and marked with pin flags for 20-30 feet adjacent to the installation site. Depending on the bankfull elevation relative to the channel bottom, a steel t-post should be driven into the channel, immediately adjacent to the bank.

The gauge should be loosely mounted on the t-post using the zip/cable ties. Whenever possible, the bottom of the gauge should be submersed in water so that it will be at least 2 inches below the surface, especially during low flow periods. Irrespective of the water elevation, the bankfull elevation should be at or near the gauge's vertical center. In larger streams where the bankfull elevation is four or more feet above the channel, the t-posts (at lease two) will have to be driven into the bank.

Once the t-posts have been driven and the gauge loosely mounted with zip/cable ties, the intake holes at the bottom should be aligned upstream and the gauge's elevation adjusted to have bankfull as close to the center as possible. The zip ties should be tightened, and the stainless steel hose clamps applied and tightened.

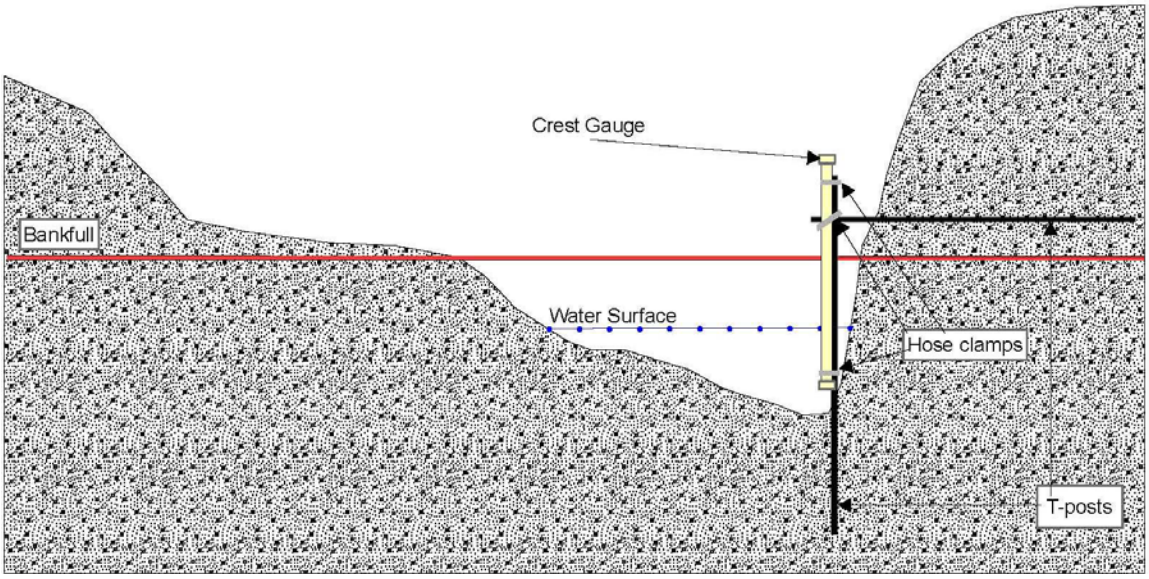
After the gauge's outer pipe is firmly secured to the t-posts, the cap and measuring rod should be removed. The granulated cork should then be poured into the top of the gauge.

The gauge's elevation relative to the bankfull elevation and a permanent benchmark should be recorded. If no permanent elevation benchmark is nearby (e.g. bridge footing, existing iron property corner) a three-foot piece of capped rebar should be driven into a nearby stable bench or terrace.

Bankfull elevation should then be marked on the measuring rod using permanent marker. The measuring rod should be re-inserted into the gauge and the cap replaced. (*note: When the cap is placed on the top of the gauge pipe it should be tightened down, but not below the vent hole; the vent hole should remain open.)

The gauge's location should then be recorded using GPS. The gauge's location should also be recorded relative to easily identifiable reference points (e.g. bridges, trees, installed vanes). The side of the stream where the gauge was installed should also be recorded (i.e. left or right, when facing downstream).

Typical Installation



V. Monitoring

The crest gauge should be evaluated after each precipitation event that has caused, or was likely to cause, significant overland flow. As soon as possible following the precipitation event, the cap and measuring rod should be removed from the gauge's pipe. Be careful to avoid scraping the rod inside the pipe during removal, which could knock cork off and potentially compromise the reading accuracy.

The distance between the highest "cork ring" around the measuring rod and the bankfull elevation marked on the rod during installation should be recorded. If the cork is above the marked line on the rod, a bankfull event has occurred.

After the distance from (above or below) the bankfull marker has been recorded, all granulated cork on the measuring rod should be removed. An additional ~50 ml of granulated cork should then be poured into the gauge pipe. The cleaned measuring rod should then be replaced into the pipe. Again, caution should be taken to not scrape the inside of the pipe with the rod. When the measuring pipe is firmly seated in the bottom of the pipe, the cap should be replaced, with the vent hole open.

Relative elevation between top of pipe, bankfull, and the elevation benchmark should be recorded at each visit to ensure compatibility over time.

If a precipitation gauge is present on the restoration site, the data should be downloaded. If not, precipitation data from the nearest NC CRONOS station (http://www.nc-climate.ncsu.edu/cronos/), or similar site, should be obtained. The precipitation data should then be correlated between the date of the event(s), and the date the gauge was evaluated.