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and

Fisheries and Oceans Canada
Sea Lamprey Control Centre
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Sault Ste. Marie, Ontario P6A 2E5
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INSTRUMENT OPERATING PROCEDURE

INSTRUMENT:

Stream velocity meters

MODEL:

Price 622 AA, 6200, 6215, 1205, 1210
Pygmy Price
Teledyne Gurley 665G (with direct velocity readout)

MANUFACTURER:

Gurley
Scientific Instruments

PRECAUTIONS:

POTENTIAL INTERFERENCES

Any obstruction in the stream that impedes the operation of the current meter bucket wheel degrades the accuracy of velocity determinations. Obstructions include aquatic vegetation or submerged tree branches and roots.

SAFETY

No special safety precautions

PROCEDURES:

I. Preparation

A. Determine the type of current meter to use.

1. The Pygmy meter is used where the selected measurement site is either very narrow or where the majority of water depths are less than 6 inches (0.15 m).
2. The Price 622 AA meter is used only where depths are greater than 6 inches (0.15 m). This meter tends to over-register if the buckets are only partially submerged.

B. Meter assembly

1. The current meter is attached to a top-setting wading rod with depth measurement capability.
2. The graduated rod is attached to a base plate that prevents it from sinking into the stream bottom and to a calibrated handle.
3. The meter and tailpiece assembly attach to a support which in turn is fastened to the end of a calibrated adjusting rod. This allows the assembly to slide along the body of the rod.
4. A friction brake in the handle grips the adjusting rod. The meter can be positioned quickly and easily by releasing the brake without removing the meter or rod from the water.
5. If turbidity or lighting prevents the meter from being seen in the water column, the operator is required to attach battery-powered headphones or a similar device.
 - a. The wire from the sounding device attaches to the rod and connects to one of the two binding posts on the current meter.
 - b. An audible click is registered for every one or five bucket wheel revolutions.

C. Adjustment and spin test

1. The current meter is readied for use by lowering the bucket wheel.
 - a. The raising nut, located below the bucket wheel, is provided as a means of lowering and raising the bucket wheel and bearing from the pivot point.
 - b. The meter is never packed or transported with the pivot bearing resting on the point of the pivot.
 - c. The bucket wheel is lowered only when a discharge measurement is conducted.
2. Each current meter is given a spin test before use.
 - a. The bucket wheel must turn freely and quietly without noticeable friction for 90 seconds when given a rapid spin by hand.
 - b. A meter that fails the spin test yields inaccurate velocity readings,

especially in low stream velocity.

II. Velocity measurement

- A. Depths are measured by reading the level of the water surface on the wading rod as the base plate rests on the stream bottom.
 - 1. If the depth is less than a specific value (2.0 feet for USFWS; 0.75 meters for DFO), the depth indicator on the rod is set at the actual depth (where the depth is represented by the numbers stamped in the adjustable rod and the numbers stamped in the handle).
 - 2. This places the meter at 0.4 times the depth above the stream bottom.
 - 3. If depths exceed the minimum value, a two-point method is used which requires two observations at each site, at 0.2 and 0.8 times the depth above the stream bottom.
 - a. For the upper reading, set the depth indicator at twice the actual depth and for the lower reading, set the depth indicator at half of the actual depth.
 - b. The average of these two observations is the mean velocity point.
- B. The wading rod is held vertically and the current meter is positioned parallel to the direction of flow while the velocity observation is being made. If the axis of the meter is not vertical, the meter will under-register.
- C. Allow sufficient time for the current meter to adjust to the velocity before the start of a velocity observation. The minimum adjustment time is a few seconds at high velocities and significantly longer at low velocities.
- D. The revolutions made by the bucket wheel of the Price 622 AA and Pygmy Price current meters are observed for 40 to 70 seconds.
 - 1. Time is measured to the nearest $\frac{1}{2}$ second.
 - 2. Observations are made by either counting the revolutions of the colored cup on the bucket wheel or by counting the audible "clicks" through a headphone or similar device.
 - 3. The number of revolutions and the corresponding time are converted into velocity (feet or meters per second) with the appropriate current meter rating table.
 - 4. The resulting velocities are recorded on a Discharge Measurement Form.

III. Direct readout instruments

- A. Velocities are determined from the direct readout on the Teledyne Gurley 665G current meter.
 - 1. The velocity readout control box is connected to the meter, the appropriate readout scale is selected on the basis of velocity, and the meter is allowed to

stabilize.

2. Velocity is measured to the nearest 0.025 m/sec.

MAINTENANCE:

- I. Current meters are precision instruments that tolerate little abuse. Rough handling in transport or use or improper cleaning and lubrication after use usually cause meter damage.
- II. Appropriate storage containers are provided for storage and transport of the current meter and accessories.
 - A. The bucket wheel is placed in the raised position with the bucket raising nut.
 1. This raises the pivot bearing off the point of the pivot and presses the shaft against the contact chamber cap.
 2. This in turn prevents the rotation of the bucket wheel.
 3. The meter is then secured in a horizontal position in the storage container.
- III. Operators usually are assigned measurements at several sites within a small area, and it is inconvenient to disassemble and reassemble the equipment between measurements. When transporting the assembled meter, care is taken to insure that the bucket wheel is protected from damage.
 - A. An accidental blow received during the course of a velocity measurement can bend the shaft and/or the bucket wheel frame.
 1. To check the meter for a bent shaft, damaged pivot, or bent bucket wheel, rotate the bucket wheel slowly.
 2. Observe the wheel frame for trueness and inspect the shaft for alignment.
 3. The rotating bucket should come to a stop gradually. An abrupt stop indicates that the bearings or pivot point are in poor condition or that the upper gear is binding.
- IV. After each day of use, the meter is cleaned and lubricated.
 - A. After the bucket wheel is lowered, the contact chamber cap (head cap) is removed.
 - B. The chamber and cap are carefully cleaned and dried.
 - C. The shaft, gears, and cap threads are lubricated. Use good quality instrument oil and do not over lubricate because oil tends to jell in cold water.
 - D. This procedure is applied to the pivot and pivot chamber.
 1. When removing the pivot, the set screw on the yoke of the current meter is loosened and when replacing the pivot, the set screw is tightened against the flat face of the pivot.
 2. After the meter is reassembled, the bucket wheel is raised for storage.

V. Meters are inspected periodically.

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United States Department of the Interior. 1975. Water Measurement Manual. A Bureau of Reclamation Water Resources Technical Publication. United States Government Printing Office.

This procedure has been reviewed and approved by the undersigned representatives of the U.S. Fish and Wildlife Service and Fisheries and Oceans Canada.

REVIEWED/APPROVED _____ DATE _____
Field Supervisor (U.S.)

REVIEWED/APPROVED *Luke Shivers* DATE *05 MAR 2020*
Program Manager (Canada)