UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

FLOW CHARACTERISTICS OF A HERSEY 8-INCH PROPORTIONAL IRRIGATION METER

Hydraulic Laboratory Report No. Hyd-312

RESEARCH AND GEOLOGY DIVISION

BRANCH OF DESIGN AND CONSTRUCTION
DENVER, COLORADO

May 3, 1951

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Written by: W. B. McBirney
Reviewed by: D. M. Lancaster
C. W. Thomas

Subject: Flow characteristics of a Hersey 8-inch proportional irrigation meter

PURPOSE

The Hersey 8-inch proportional irrigation meter was tested to determine the registration accuracy and head loss. There was no attempt made to evaluate the mechanical features of the meter or define the basic design principles involved.

CONCLUSIONS

Accuracy of this meter is dependent upon the position in which it is mounted. A calibration curve derived from tests of the meter in one position cannot be used for another position.

Of the two meters tested the first was very erratic in operation for reasons not readily apparent when the meter was dismantled, while the second meter gave consistent results.

Loss of head is considerable and is a factor which cannot be neglected.

THE INVESTIGATION

General Description of the Meter

Two meters of identical design were tested, both of which were supplied by the Hersey Manufacturing Company through the West Coast representative in San Francisco, California. Figure 1 shows a meter in one of the test positions. The main body is of cast steel, and the register assembly is of bronze. Figure 2 shows the meter unassembled. A proportional part of the flowing water enters the meter head through the brass screen, shown in place. The function of this screen is to exclude most foreign matter from the impeller assembly. The impeller which activates the register is plastic, and the impeller shaft is stainless steel. Registers are available to indicate gallons in 1 gallon units, cubic feet in

units of 1 cubic foot, or other units if desirable. After the water is passed by the impeller it returns to the main flow through the left cavity of the meter head.

Normal operating position is with the meter head mounted on top of the pipe.

Test Procedure

The test meters were installed in an 8-inch line approximately 21 feet, or 31 pipe diameters, downstream from the main control valve. Flow was conducted from the meter to another valve a distance of 22 feet, or 33 pipe diameters. The second valve was used to control the head on the meter so as to maintain a full flow for the lower discharges. Piezometer connections for measuring the differential head across the meter can be seen in Figure 1. A manometer board with mercury as the measuring medium registered this head loss.

Depending upon the rate of flow required, the discharge measured by the test meter was compared to that indicated by a 4-, 6-, or 8-inch venturi meter which had previously been calibrated volumetrically. After the pump was turned on, and the downstream head valve adjusted, sufficient time was allowed prior to each test run to clear the pipe of air and to allow the rate of flow to stabilize. The length of run was based upon the time necessary for 1,000 gallons to be registered, in the case of the first meter tested, and from 1,000 to 2,000 cubic feet for the second meter tested. A stop watch readable to 1/10 second served to indicate the length of run.

Test Results

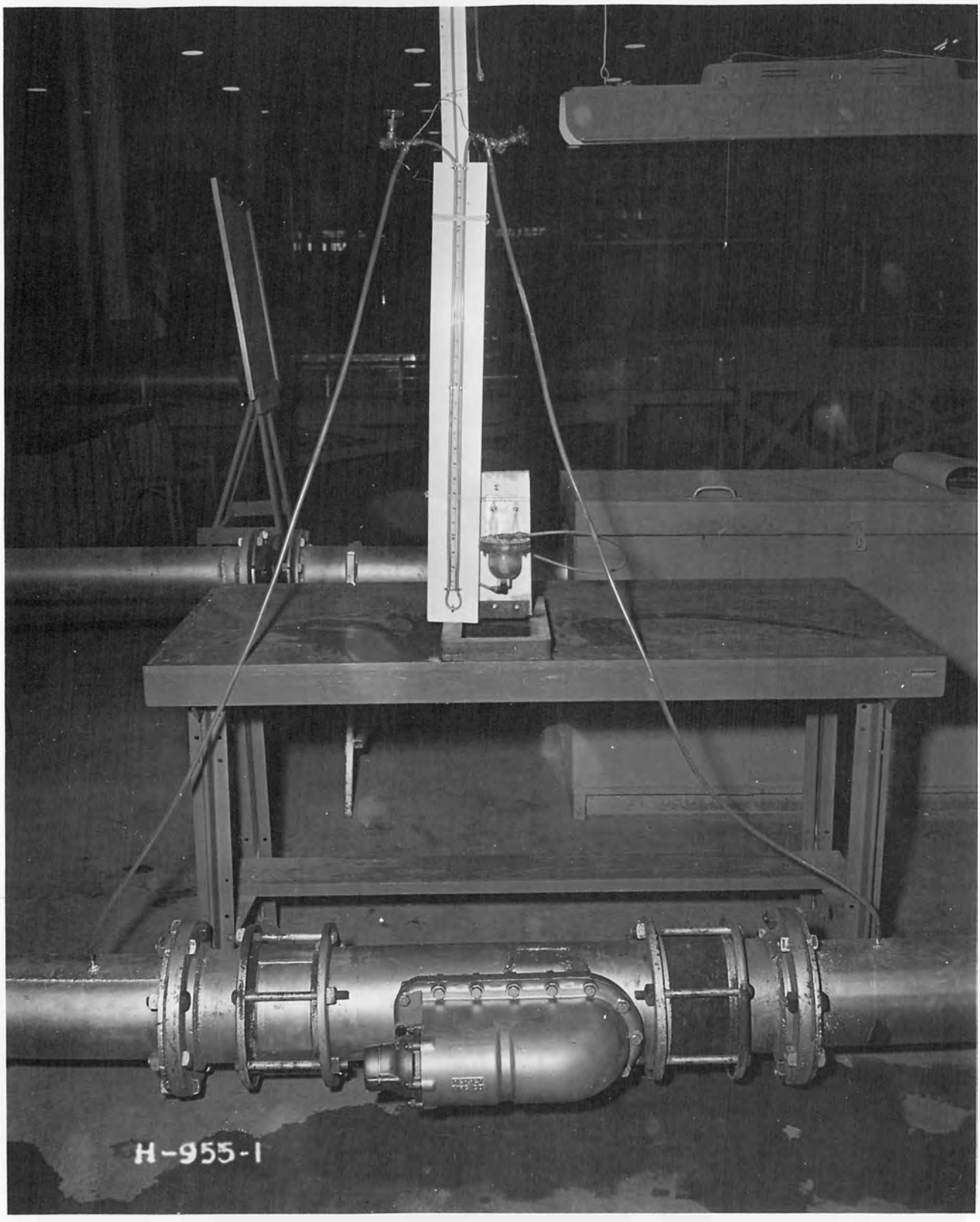
The results for the first meter were too erratic to give a reliable calibration; hence, the test results are not included in this report.

The results of all tests made on the second meter are shown in the accuracy and head loss curves in Figure 3. With the second meter mounted in an upright position, i.e., with the meter head and register on top of the pipe, accuracy was plus or minus 1 percent for flows from 2.8 cubic feet per second to 7.5 cubic feet per second. For the range 1.5-2.8 cubic feet per second accuracy rises from 86 percent to 99 percent for the upper limit.

With the meter head mounted on the left side, as shown in Figure 1, accuracy was plus or minus 3 percent for flows from 1.5 cubic feet per second to 8.0 cubic feet per second.

For all tests on the second meter the head loss curve was independent of the mounting position, varying from 0.4 foot for 1.5 cubic feet per second to 10.6 feet for 7.5 cubic feet per second.

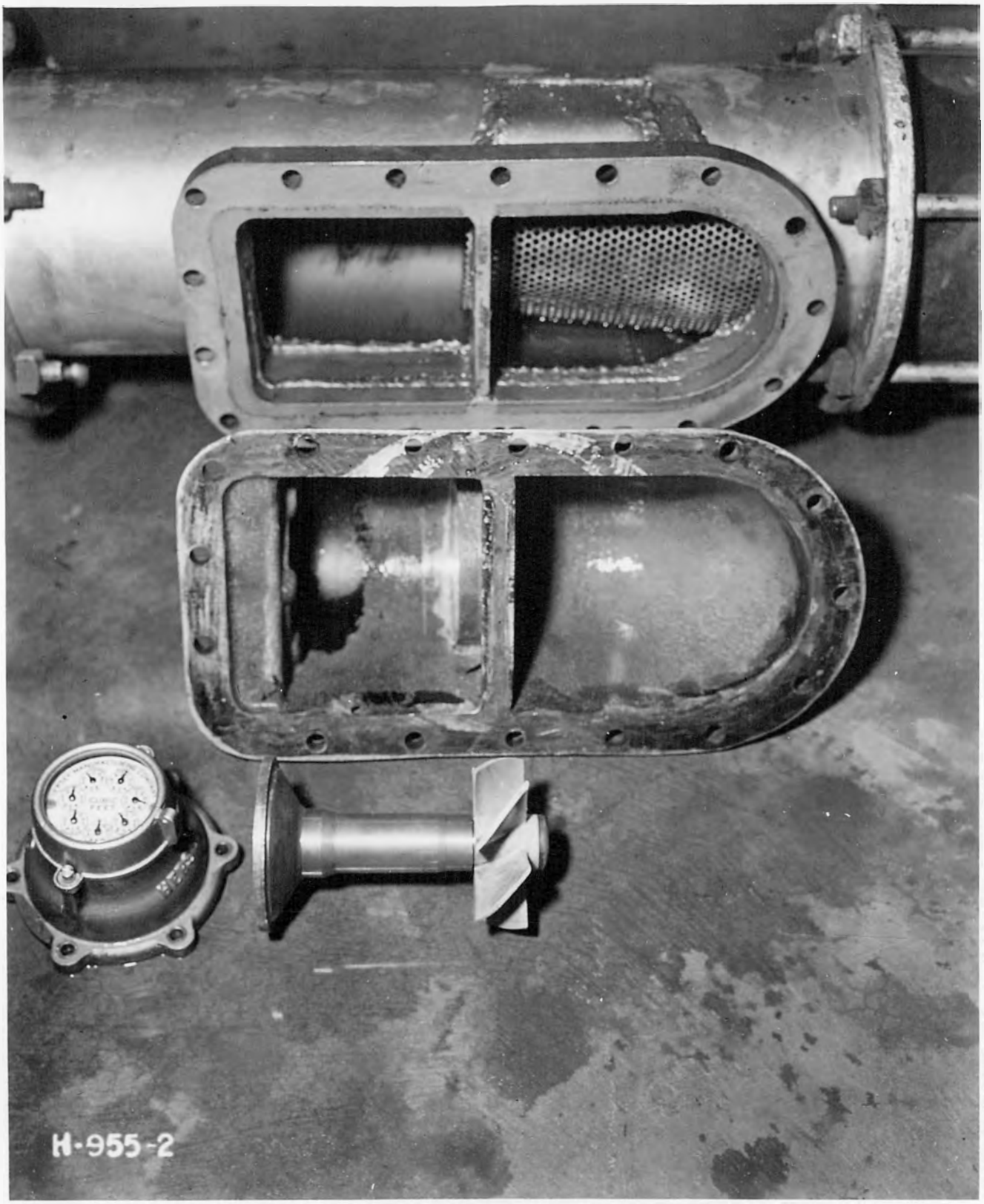
Figure 1



Hersey 8-inch Proportional Meter

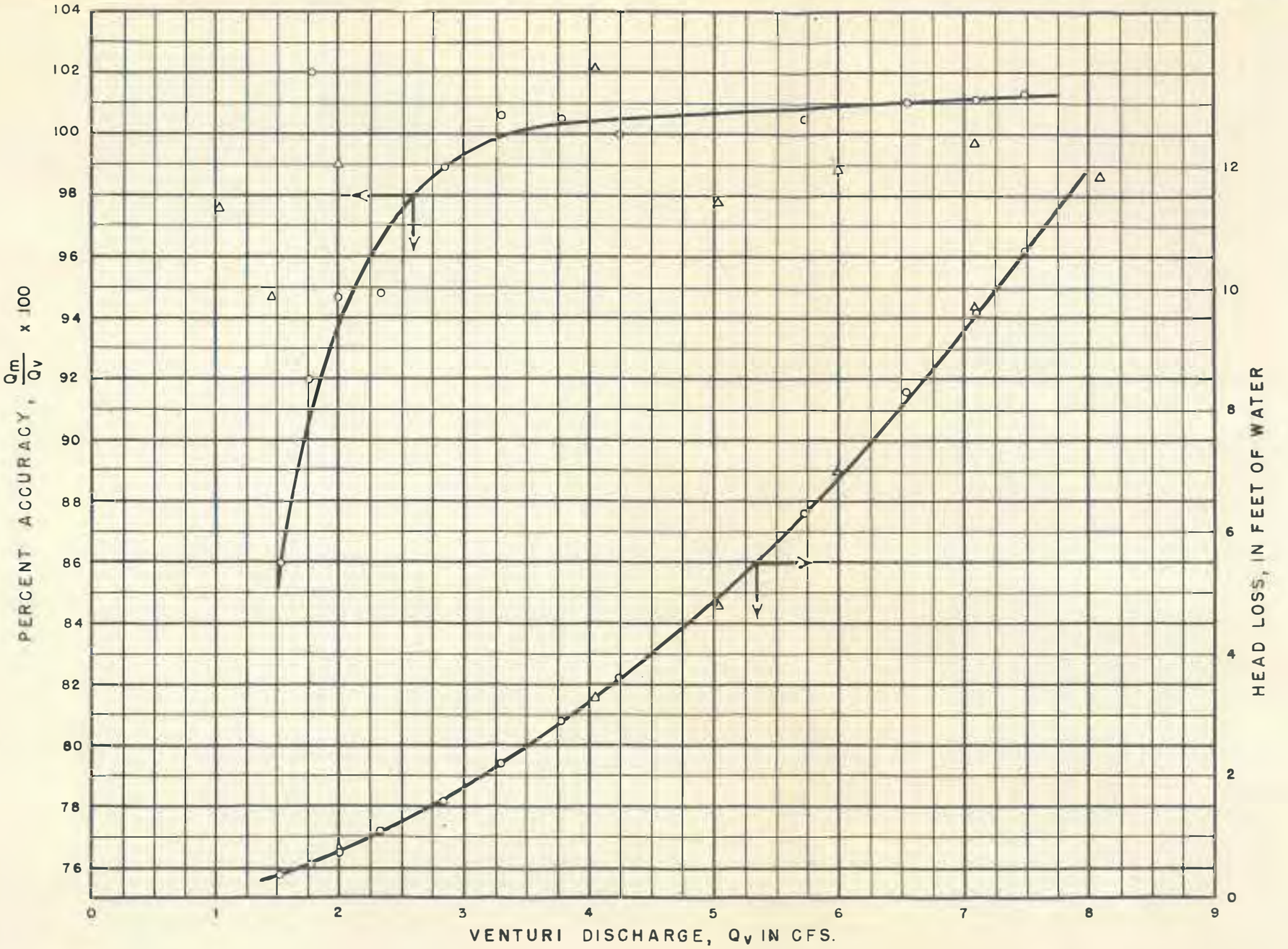
Meter is shown in one of the two test positions. Meter head and register are on the left side of the pipe, flow being from right to left.

Figure 2



Hersey 8-inch Proportional Meter

Meter is shown unassembled. Screen in the meter head has 18 holes per square inch, 1/8 inch in diameter.



CALIBRATION CURVES

HERSEY 8-INCH PROPORTIONAL IRRIGATION METER