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THE UNIVERSITY OF NEW SOUTH WALES
WATER RESEARCH LABORATORY



REPORT No. 39

Tests on Venturi Meters

by

D. T. Howell

APRIL, 1961

The University of New South Wales

WATER RESEARCH LABORATORY

TESTS ON VENTURI METERS

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INTRODUCTION

Two Admiralty pattern venturi meters, one a No.1 (pipe diameter $\frac{1}{2}$ -inch) and the other a No.2 (pipe diameter $\frac{3}{4}$ -inch), were calibrated for differential heads up to 100 inches of water while discharging water at room temperatures. The tests were carried out at the request of the Cockatoo Docks and Engineering Co.Pty.Ltd. The meters were tested with straight approach lengths of pipe of 27 inches as provided by the company.

METHOD OF TEST

Steady flows of water were supplied from a small electrically driven centrifugal pump. Differential heads were measured with an inverted U-tube differential manometer. Discharge rates were determined by measuring the time taken for a weight of 100 pounds of water to flow into a tank supported on platform scales.

RESULTS

The experimentally determined calibration curves are shown plotted on the accompanying diagram. During the tests the water temperatures were between 77 and 81 degrees Fahrenheit.

The formula

$$\text{G.P.M.} = K\sqrt{\text{W.G.}}$$

is the formula shown on Admiralty Drawing No. DNC 15/1064. In this formula G.P.M. is the discharge of water measured in gallons per minute and W.G. is the differential head measured in inches of water.

From the experimental results the values of K in this formula are found to be:-

$$\begin{array}{l} \text{Size 1 meter } (\frac{1}{2}\text{-inch diameter pipe}), K = 0.373, \\ \text{" 2 " } (\frac{3}{4}\text{-inch " " "}), K = 0.370. \end{array}$$

Measurements of the meters submitted for test showed that the actual throat diameters were the same as those shown on Admiralty Drawing No. DNC 15/1064 for the appropriate two sizes.

COMMENTS AND CONCLUSION

In the venturi meter equation

$$Q = C \frac{a}{\sqrt{1 - \left(\frac{a}{A}\right)^2}} \sqrt{2gh}$$

where C = discharge coefficient

a = throat area

A = approach pipe area

h = differential head in feet

Q = rate of flow in cubic feet per second

the values of C calculated from the experimental results are -

Size 1 meter (1/2-inch diameter pipe), C = 0.89

" 2 " (3/4-inch " "), C = 0.92

These values are reasonably consistent with those for meter sizes Nos. 3, 4 and 5 reported by H.R. Vallentine (22nd April 1959) which were -

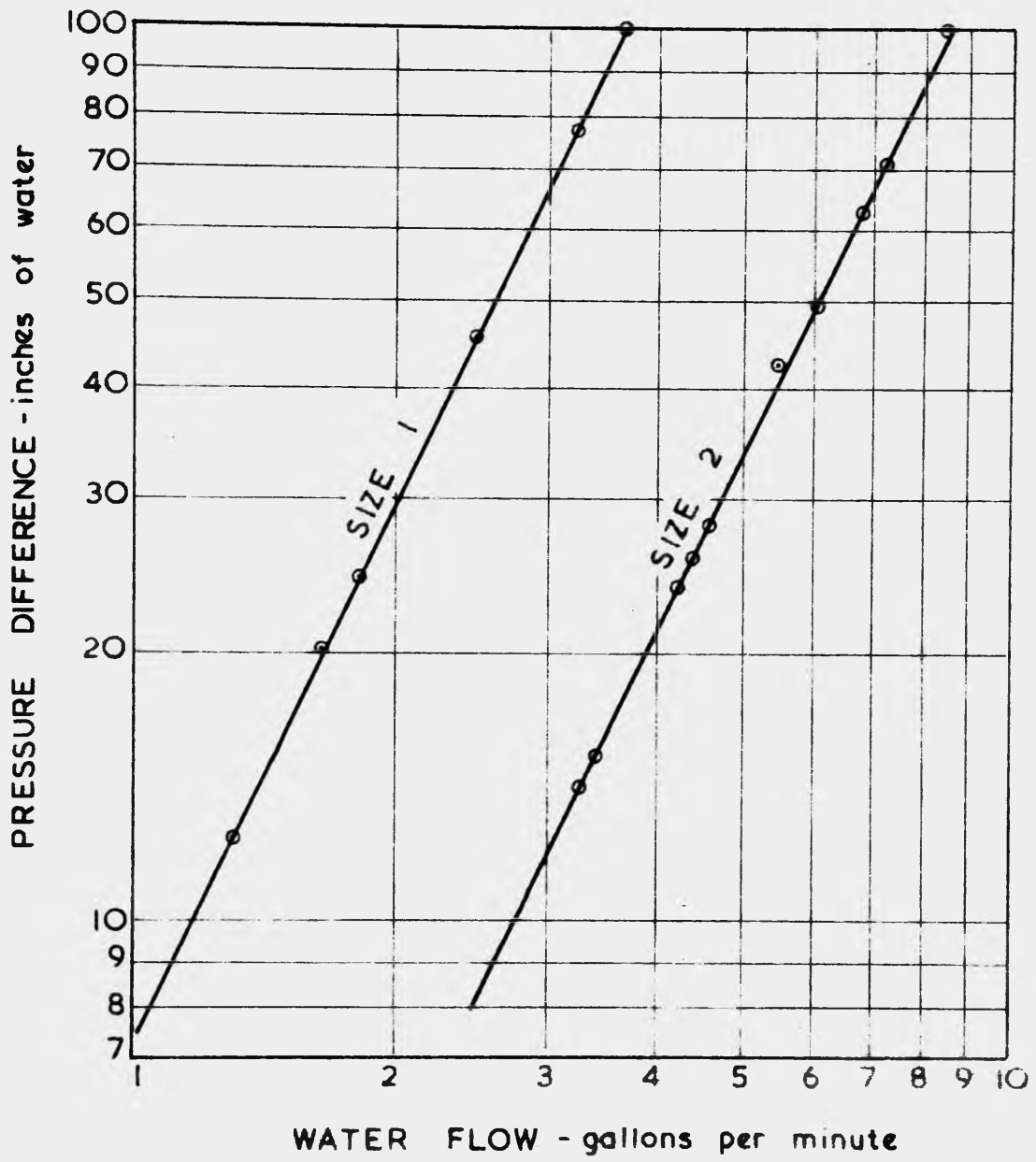
Size 3 meter (1-1/4-inch diameter pipe), C = 0.85

Size 4 " (2-inch " "), C = 0.81

Size 5 " (3-inch " "), C = 0.72

As the size of a meter is reduced below about two inches fluid viscosity begins to have more influence on the value of "C". This effect may account for the lower value of "C" for the No.1 size meter as compared with the No.2 size meter.

The values of K shown in the results for meters Nos. 1 and 2 are both lower than those given in the last column of the table on Admiralty Drawing No. D.H.C. 15/1064.



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VENTURI METER CHARACTERISTICS
 ADMIRALTY PATTERN - SIZES 1 & 2

Scale	
Drawn	D. T. Howell
Traced	P. A.
Checked	D. T. H.

Date: 18.4.61

CE-E-2327