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REPORT ON BEHALF OF INSEARCH LIMITED

TESTING OF TWO WIND DRIVEN ROOF VENTILATORS

FOR

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By

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Project Number: E98/42/041
Date: September 1998

U|T|S

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TABLE OF CONTENTS

REPORT ON TESTS OF TWO WIND DRIVEN ROOF VENTILATORS

1.0 INTRODUCTION

Ventilation flow induced through two types of wind driven, rotating ventilators at a range of wind speeds were determined using the test rig developed at the University of Technology, Sydney (UTS), in accordance with the Draft Standard for Natural Ventilators.

2.0 TASK

Three of Type A and three of Type B ventilators were presented in unopened boxes to UTS for testing (see Plate 1). Both types of ventilators have the same throat area.

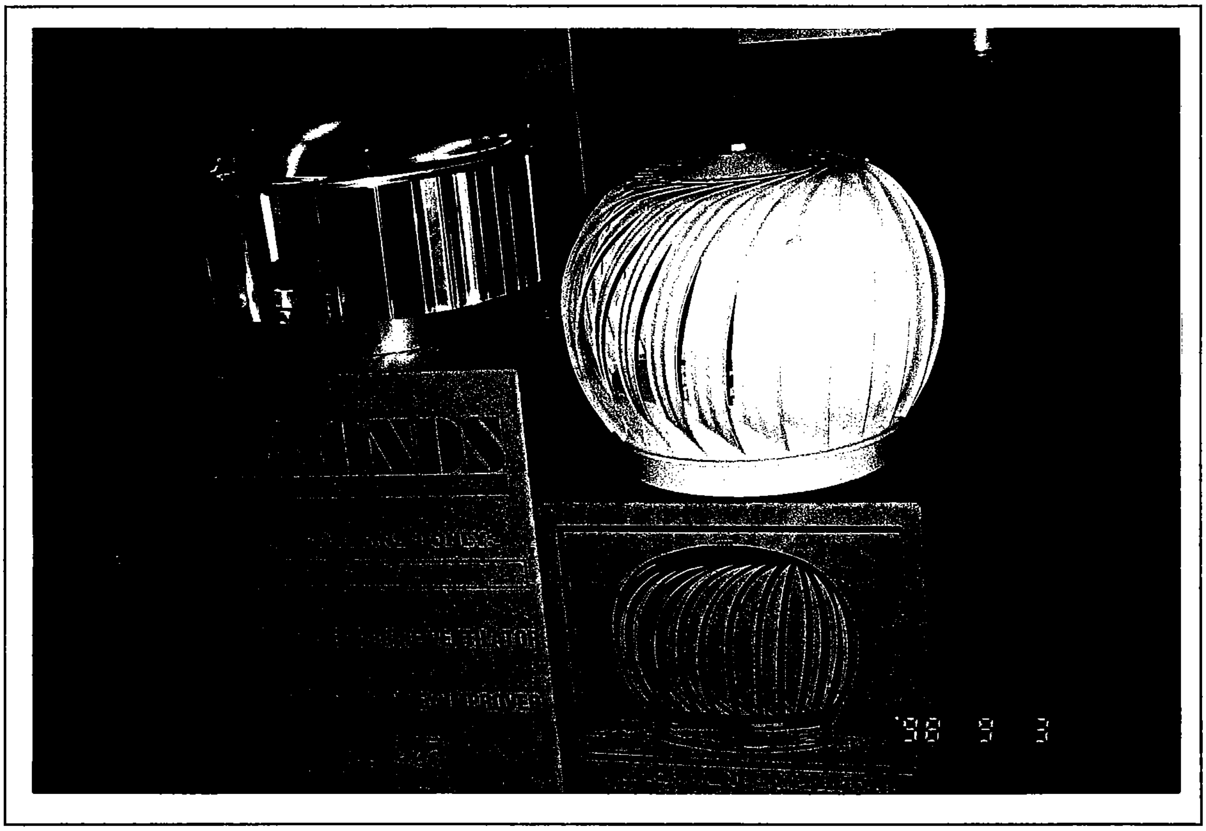

Plate 1: Type A ventilator is shown on the left and Type B ventilator is on the right.

It was decided to test three of each type, as there are some variations in performance normally found within the one type of ventilator.

Performance was judged by the flowrates passing through the ventilators at a number of specified wind speeds between 4km/hr and 16 km/hr.

3.0 PROCEDURE

To this date there has not been an accepted test procedure to compare or evaluate rotating wind driven ventilators. The method and apparatus used for this has been developed at UTS for this purpose and is currently the proposed performance testing procedure.

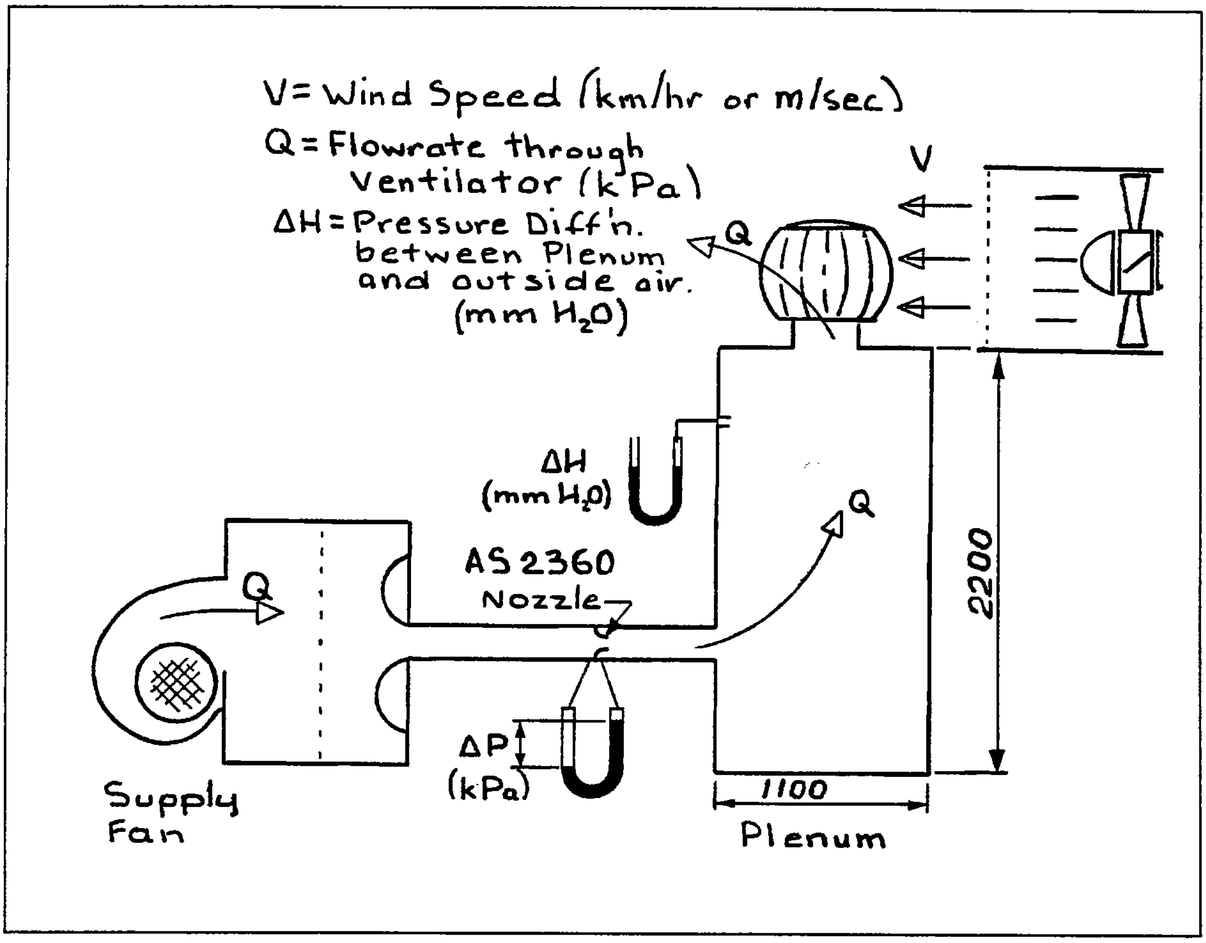

Figure 1: Schematic of apparatus used to evaluate wind driven rotating ventilators at UTS.

3.1 Method

A test ventilator is placed on top of the plenum over which a large jet of air is blown simulating a "wind" (see Figure 1). The speed of the "wind" is variable and predetermined by an anemometer placed at the position where the middle point of a ventilator would be located.

Measures of flowrate are calculated from the pressure difference across a standard nozzle (AS 2360). An air supply fan is used to overcome the friction losses of the air metering duct, which holds the nozzle. This fan is also used to vary the plenum pressure relative to the outside, so that tests can be performed at negative, zero, through to positive plenum pressures. Heating within the plenum can be applied to create some "stack effect" which introduces buoyancy.

These tests were done under ambient temperature conditions, with zero degree temperature differences between inside and outside air, and so obtain comparative values of flow through the ventilators at wind speeds ranging from 4 to 16km/hr.

A wind speed of 18km/hr was tried, but the supply fan could not provide a flowrate to produce a test condition of 0.00 mmH_2O in the plenum.

Although the "Discharge Coefficient" (C_d) has not yet been resolved in the ventilator code (at present only in draft form) a possible definition could be;

$$C_d = \frac{Q_{vent}}{Q_{reference}}$$

$$= \frac{Q_v}{Q_r}$$

$$= \frac{\text{actual flowrate through vent}}{\text{flowrate through a short open circular duct of same throat diameter}}$$

Where both Q's are measured for the same throat diameter at the same wind speed and □H_{plenum} = 0.00 mmH_2O.

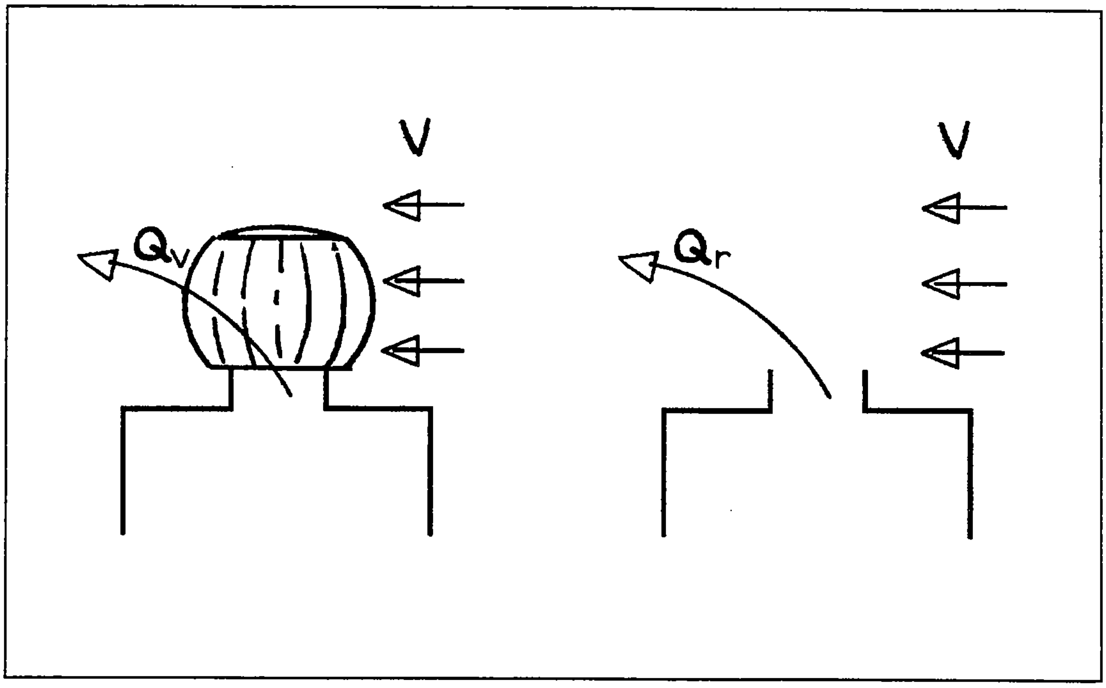

Figure 2: Schematic indicating the apparatus with and without a rotating ventilator.

4.0 RESULTS

Ventilators A were Edmond's 'Hurricane H400 Vertical Vane Ventilators' with a 400mm diameter throat

Ventilators B were IVR's 'Lowline Turbo LTV400 Spherical Vane Ventilators', also with a 400mm diameter throat.

The tables in Appendix I show the data and results for the tests on both ventilators A and B.

The graphs in Appendix II depict the tabulate results in several forms.

5.0 DISCUSSION

From the results and graphs it can be seen that all Type A ventilators consistently withdrew more air from the plenum than Type B ventilators at all the measured wind speeds. In effect Type A ventilators on average performed 200% better than Type B ventilators.

6.0 CONCLUSION

The discharge coefficients (by our definition) ranged as follows (for V = 4km/hr to 16 km/hr);

Type A ventilators $0.43 < C_d < 1.06$

Type B ventilators $0.00 < C_d < 0.44$

Type A ventilators constantly drew more than double the flowrates than Type B could achieve at the same wind speeds.

It can therfore be concluded that Type A ventilators were found to be more effective in air extraction than Type B ventilators under the same conditions.

30/9/98