RELIEF VALVE TEST PROGRAM

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(Item 120 CPM Chart)

AAF proposal for Metropolitan Edison Fan Assemblies per Gilbert Associates RO 2637 stated on page 8 that the

> "Basic design of structure is proposed to withstand a 2 psi pressure differential. Beyond this, the housing is equipped with numerous pressure relief valves to permit rapid equalization of any large pressure differential imposed on the structure. These valves are set to open at a differential of approximately 1 psi and will close as soon as pressure differential no longer exists. As the contained cubage is limited, differential pressure will equalize very rapidly under build up conditions. The relief valves proposed will be tested; response time and mass flow characteristics being determined under maximum pressure differential conditions but with normal ambient air temperatures. Design of these mechanisms is relatively simple and high moisture loads in the predicted gas mixture should not effect operating reliability."

The following program is proposed to determine the operating characteristics of these valves and their effect on housing design.

1. Development Testing

1.1 Static Test

Figure 1 is a schematic diagram of the facility for the static testing of the prototype relief valve. The coefficient of discharge will be determined as a function of Reynold's number and angle of valve vane for air flow of 0 to approximately 10,000 cu.ft./min. The valve will be gravity loaded at two levels: to withstand 5 inches W.G. over-pressure before relief begins, and to withstand 10 inches W.G. pressure. The different relief points are needed to take care of the normal operating resistance of the system. The valves will be constructed at least of 11 gage steel. Two valve models will be tested statically: a full size prototype to determine parameters of the full-size valve, and a smaller section of the same valve (about 6 x 6 in.) for use in the dynamic test and analysis.

1.2 Theoretical Analysis

A computer program to study the dynamic behavior of the relief valve will be written. This program will use as input the discharge coefficients experimentally determined in the static test. This program will output the pressure drop and air flow for the relief valve as a function of time. The pressure wave and other containment atmosphere parameters to be used are those given in Figure 14-43 attached to RO 2637 and in the RO itself. If this analysis shows that the prototype valve meets the system requirements, the smaller partial valve prototype will be tested dynamically. This will determine the validity of the dynamic analysis, and enable prediction of the performance of the full scale valve with the high confidence level required:

1.3 Dynamic Test

Figure 2 is a schematic diagram of the facility for the dynamic test. Air at 3 atmospheres will be stored in an existing 237 cu.ft. tank and released by rupture of the diaphragm.

The pressures in the test facility will be measured by piezo-electric transducers in conjunction with a multi-channel oscilloscope.

A downstream construction may be attached to the duct to simulate the finite volume of the housing, and thus provide operating conditions to further test the theoretical predictions.

At the end of the test and analysis program, a computer re-run will be made to predict the conditions that will exist in the actual Metropolitan Edison-Three Mile Island housings during the specified pressure build up.

AMERICAN AIR FILTER COMPANY, INC.

C.A.G. Research Laboratory

RDR:jp

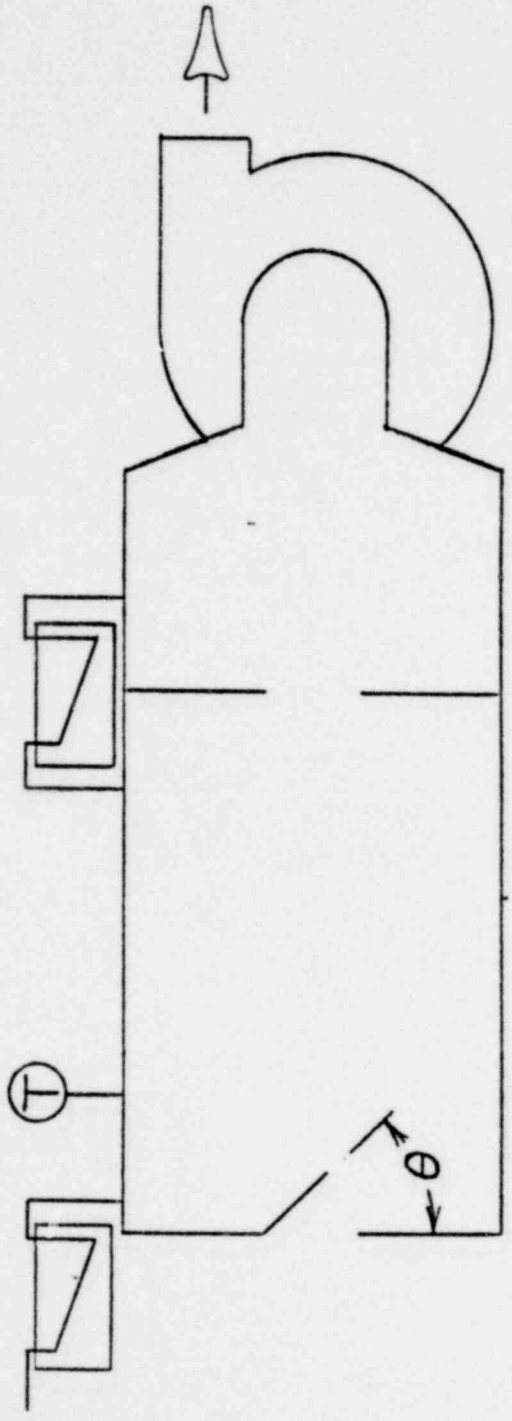

Figure 1

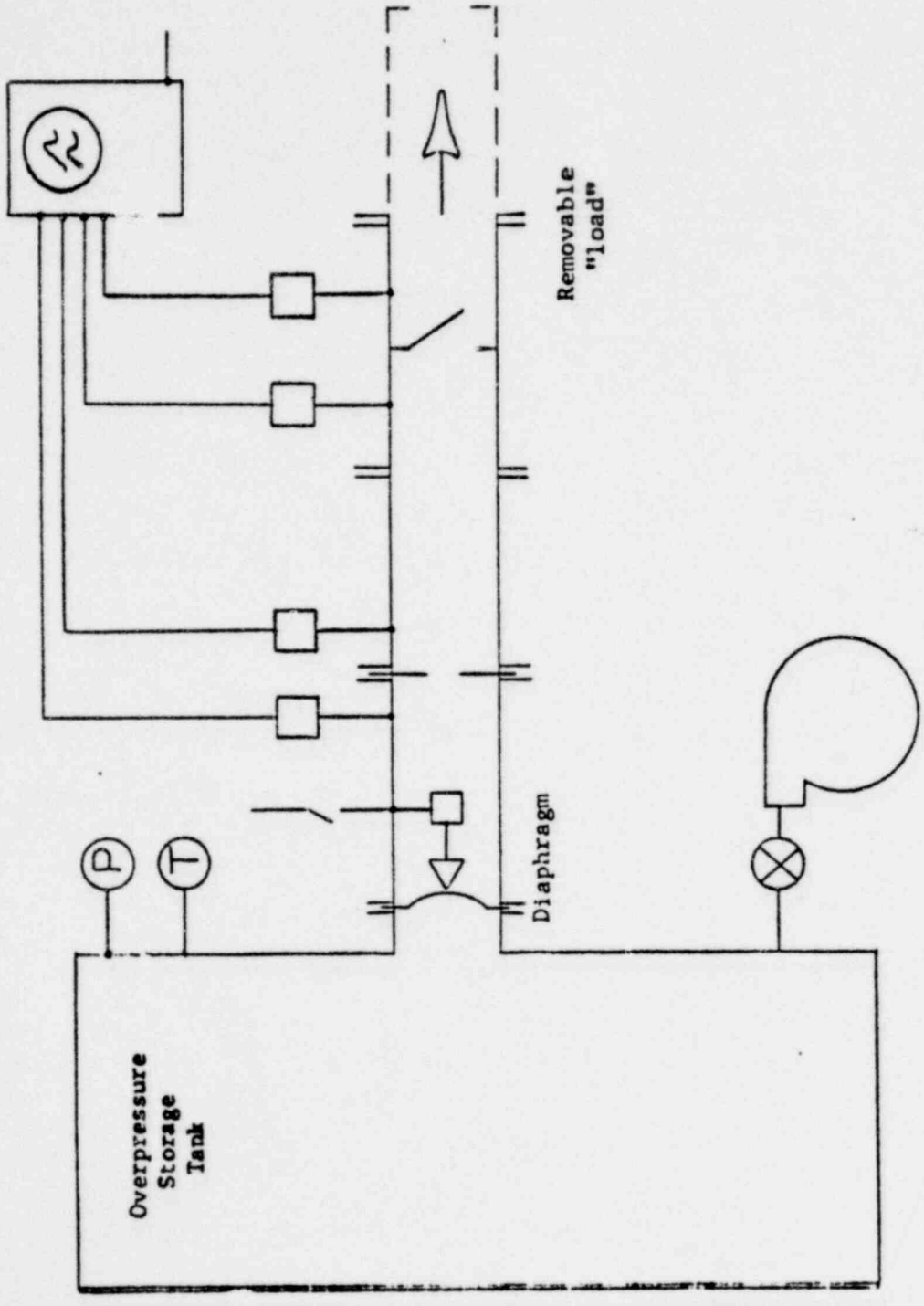

Figure 2