Controls for steam heating systems in buildings

Hutcheon, N. B.

Publisher's version / Version de l'éditeur:
https://doi.org/10.4224/20338379
Technical Note (National Research Council of Canada. Division of Building Research); no. TN-167, 1953-11-23

NATIONAL RESEARCH COUNCIL OF CANADA

DIVISION OF BUILDING RESEARCH

No. 167

TECHNICAL NOTE

NOT FOR PUBLICATION FOR INTERNAL USE

PREPARED BY N.B. Hutcheon CHECKED BY APPROVED BY

PREPARED FOR General DATE Nov. 23, 1953.

SUBJECT Controls for Steam Heating Systems in Buildings

The ultimate in refinement of heating control systems is to install individual automatic control with separate thermostats and control valves in each room. Intermediate between this type of system which is relatively costly and the simplest system which is individual manual control, there are many types of systems capable of providing some degree of automatic control. Some of these simpler control systems operate on inside temperature sensed at one or more points in the building, while others operate on outside temperature. Still others operate on a combination of inside and outside temperature.

Since the problem is one of causing a system to operate at part capacity as required, there are three main ways with steam heating in which this can be achieved. The pressure of the steam can be varied over a wide range as in a differential vacuum system, thus varying its temperature and so varying radiator output. Secondly, the steam can be supplied near atmospheric pressure, but restricted in flow so that the radiators are only partially filled as required. This may be referred to as a modulating system. A third system achieves adjustment in output by cycling from steam-off to steam-on position, the percentage of time during which steam is on being varied automatically in accordance with some measure of heat demand such as outdoor temperature. This may be referred to as a two-position system.

The great problem in the two latter systems is to achieve distribution of steam in the proper proportion to all radiators at all times by means of a relatively small number of control valves. All the radiators served by one valve ought to share proportionately in the steam being metered by that valve, but this is difficult to achieve. In the modulating type of system, separate small fixed plate orifices are placed in the supply connection to each radiator. These are usually necessary to achieve good operation. Orifice plates in the two-position system do not necessarily provide the same improvement in distribution.

Neither system can adjust against changes in relative load as between the rooms served by any one overall control. However, dampers installed in convectors can be operated manually for some adjustment in output as between rooms.