

supply to a progressive or lane shower bath, such as is used in connection with swimming pools. The lanes are separated by perforated pipe railings directing horizontal sprays toward the center and the bathers on their way to the bath pass through four different temperature zones beginning with 105 deg. and ending at 60 deg. Fahr.

PERFORMANCE AND REGULATION OF AUTOMATIC HEAT CONTROL

Variations in the performance of automatic heat control are sometimes misunderstood and in consequence the choice, regulation and care of such controls is improperly handled.

In order that a thermostat may function there must be a certain amount of temperature change in the medium being controlled; depending upon the sensitiveness of the control instruments and the rapidity with which the average change in the temperature of the medium, whose temperature is being controlled, is transferred to the medium surrounding the thermostat.

When the thermostat operates the steam or hot-water supply to a

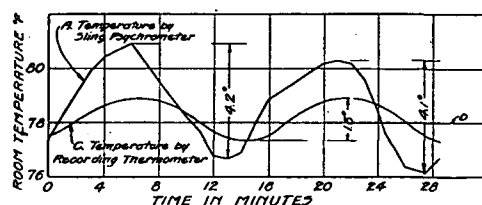


FIG. 14. VARIATIONS IN ROOM TEMPERATURES WITH UNIT CONTROL AND POOR CIRCULATION OF AIR

radiator or heater is automatically shut off or turned on, as the case may be, but some time must elapse before this takes effect upon the temperature of the medium being controlled.

When the supply of the heating medium is being cut off the remaining steam or water contents must condense or cool and when being turned on new steam or water must be supplied. In the first instance the material of the heater must be cooled and in the second instance it must be heated before full effect is exerted upon the medium being controlled.

The same principles are true of other systems of control such as for coal or oil fired boilers or furnaces, where the fire must be increased or decreased and the material and water in the boiler and system must be cooled or heated; for refrigeration, where the brine and materials in the system must be cooled or heated and in hot-water systems where the water and materials must be heated, before full effect is felt where the thermostat is usually located.

The operation of these and other such factors, over which the automatic control usually has no jurisdiction, tend to cause variations in the temperature of the medium being controlled, the amplitude and periodicity of which depend upon the heating medium, system and the sensitiveness of instruments.

In testing the accuracy of controls the sensitiveness of the thermometers, the movement of the medium around same also play an important part. All temperature measuring instruments have a lag due to the time required to heat their expansive media. Recording instruments have still more lag, due to the poorer circulation of the surrounding media. Sling instruments or instruments with forced circulation of the surrounding media are more sensitive than stationary ones.

Some of the later types of thin non-ferrous heaters have less lag than the older cast-iron types, which makes it more important to have good circulation of the medium being heated, between the heater and the thermostat, so as to prevent overheating when the heating medium is turned on and underheating when it is shut off.

Fig. 13 shows a case of the variation in room temperature produced by a temperature controlling and recording instrument of the vapor-tension, positive acting, unit type, controlling (by means of compressed air) the steam flow to a copper fan-blast reheater in a central air conditioning installation. The bulb of the instrument containing a volatile fluid was exposed in the room near the breathing zone. The room temperature had a definite cyclic variation resembling the sine curve wave. Curve (A) represents the room temperature fluctuation obtained by a sling psychrometer; curve (B) shows that recorded by an ordinary mercury ther-

TABLE 1.* TEST DATA ON PERFORMANCE OF TEMPERATURE REGULATORS IN ROOMS HEATED BY FAN BLAST HEATERS AND VENTILATED MECHANICALLY

THERMOSTAT NUMBER AND TYPE	AIR MOVEMENT AROUND THERMOSTAT	AIR CHANGES IN ROOM PER HOUR	VALVE OPERATING MEDIUM	TYPE OF HEATERS CONTROLLED	VARIATION IN ROOM TEMPERATURE BY SLING PSYCHROMETER, DEG. FAHR.
<i>Room or duct type:</i>					
No. 1. Vapor tension, positive action, plain copper thermostatic bulb.	Still air	30	Comp. air	Copper blast heater	8.9
No. 1a. Same as above.....	650 ft./min.	30	"	"	4.1
No. 1b. Vapor tension, positive action, with capillary coil bulb.	Exhaust duct (680 ft./min.)	30	"	"	2.9
<i>Room type:</i>					
No. 2. Bi-metal expansion, positive action.	650 ft./min.	30	"	"	3.8
No. 3. Vapor tension, positive action.	"	30	"	"	3.9
No. 3a. Vapor tension, positive action.	"	30	"	"	4.8
<i>Duct type:</i>					
No. 4. Metal expansion, intermediate action.	Exhaust duct (680 ft./min.)	30	"	Cast iron blast heater	4.9
No. 5. Metal expansion, positive action.	"	6	"	"	5.0
<i>Electric make and break type:</i>					
No. 6. Liquid expansion.	650 ft./min.	30	Electricity	Copper blast heater	8.3

*From tests reported by C. P. Yaglou.