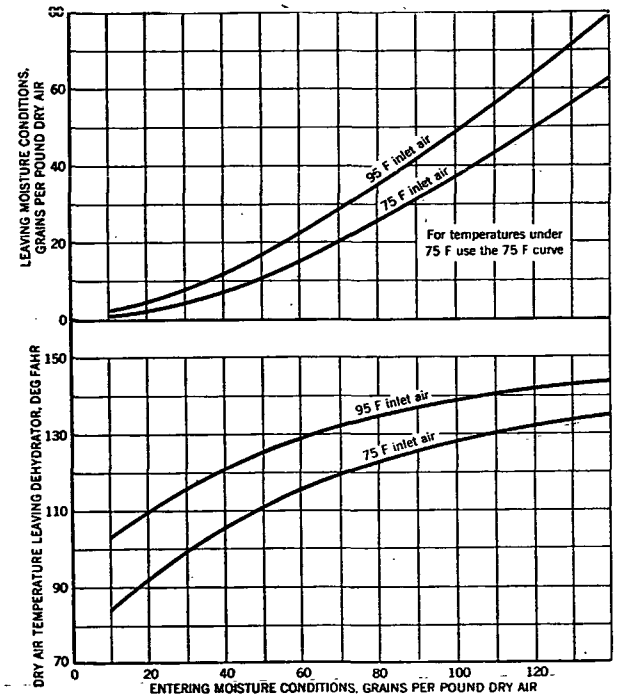

FIG. 6. PERFORMANCE DATA FOR TYPICAL COMMERCIAL SOLID ADSORBENT DEHUMIDIFIER

dehumidifying equipment, provisions should be made for keeping the vapor transfer to a minimum. Also, if the space is cooled below the ambient dew point, there is a possibility that condensation may occur within the walls, unless vapor transfer is controlled. For these reasons a vapor barrier should be located within the wall construction as near to the high vapor pressure side as feasible. To be effective, a barrier must be continuous and should be so located within the structure that it will be protected from rupture. (See Chapter 10, Moisture In Building Construction.)

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CHAPTER 38

AUTOMATIC CONTROL

Fundamentals: Type of Control Systems and Action, System Components, Controlled Devices, Auxiliary Control Equipment; **Control Applications:** Automatic Fuel Burning, Residential Heating and Air Conditioning, Zoning, Individual Room Control, Central-Fan Systems, Outdoor Air, Reheater Coil, Humidity, Cooling and Dehumidification, Static Pressure, Space Condition, Typical System, Unit Heaters, Unit Ventilators; **Design Coordination:** Size of Controlled Area, Equipment Selection and Layout, Location of Space Controllers, Control of Steam or Water Flow.

PRESENT-DAY standards of comfort combined with the capacity and rapid response of modern heating and cooling equipment make automatic controls an essential part of heating, ventilating, and air conditioning systems. These automatic controls respond to variables such as temperature, relative humidity, and pressure. They operate individually or in sequence to maintain the desired conditions throughout the system and in the occupied space. A factor which has made the subject of automatic control somewhat confusing has been the matter of terminology. Many different expressions or words have sometimes been used to convey a single idea or concept. This chapter, therefore, attempts to use and define the terms which are most common and suitable so that they will be more precise and readily understood. The terms and definitions used are also selected so as to conform, as nearly as possible, to automatic control terminology used by engineers in other realms of engineering endeavor.

PART I—FUNDAMENTALS OF AUTOMATIC CONTROL

A *control system*, Fig. 1, consists essentially of (1) a controller, (2) a controlled device, and (3) a source of energy.

A *controller* is a device which measures a variable condition such as temperature, humidity, pressure, and liquid level, and produces a suitable action or impulse for transmission to the controlled devices. Thermostats, humidistats, and pressure controllers are examples.

A *controlled device* reacts to the impulse received from a controller and varies the flow of the control agent. It may be a valve, damper, electric relay, or a motor driving a pump, fan, etc.

The *control agent* is the medium manipulated by the controlled device. It may be air or gas flowing through a damper, gas, steam, water, etc., flowing through a valve, or an electric current.

The *controlled variable* is the condition such as temperature, humidity, or pressure, being controlled.

Most control sytems, of which Fig. 1 is typical, form a closed loop. That is, the controller measures and responds to changes in the controlled variable and actuates the controlled device to bring about an opposite change which is again measured by the controller. This system of transmitting information about the results of an action or operation back to its origin is known as *feedback*, and makes true automatic control possible.

An open-loop system is sometimes employed in control circuits, but it does not provide complete control. An outdoor thermostat arranged to control the flow of heat to a building in proportion to the load caused by