19. Make all valves and controls convenient and accessible, either direct or through remote control. It is only human nature to delay and avoid doing that which is inconvenient.

20. Keep a daily record consistently, based on weather requirements, and watch it every day.

21. Control the heat supplied to water tanks located on or above the roof. Such tanks require heat to prevent freezing. No heat is required when the temperature in the tank is above 32 F.

22. Investigate every complaint of *no heat* by tenants; find the cause and correct it. Do not overheat an entire building to correct a local condition in one room.

AUTOMATIC TEMPERATURE CONTROL

As stated in Chapter 34, Automatic Control, properly applied to heating, ventilating and air conditioning systems makes possible the maintenance of desired conditions with maximum operating economy.

In addition to the large possibilities for economy, the use of adequate temperature control provides more healthful, comfortable, and efficient working conditions in the buildings because through its use the building is uniformly heated with correct temperatures, and drafts from open windows and overheating are eliminated.

There are many types of temperature control available, each adaptable to a particular type of building, but all require uniform distribution of steam and proper venting.

Before the installation of any type of modern temperature control equipment, it is necessary to see that the heating system is put in good operating condition. In general, the heating system in a building is not given the attention that other mechanical equipment is given because it will continue to function, after a fashion, even though changes in piping, location of radiation, settlement of piping, and the normal wear and tear or other changes have taken place. Through all this depreciation of the system, it becomes more and more costly to operate and parts of the building have to be greatly overheated in order to prevent underheating in a small section of the building. Vents, traps, vacuum pumps, and valves should be given a careful inspection and replaced or repaired if required. The piping should be of adequate size and graded properly. The return piping should have a careful inspection, and any pockets or lifts removed and properly vented. These inspections and repairs are not costly and prevent a much greater outlay in future years. In most cities district heating companies will be willing to make a survey of heating systems and offer recommendations as to operation and changes in piping layout.

The selection of control equipment depends upon the type and size of building and the degree of saving possible.

Chapter 18

PIPE, FITTINGS, WELDING

Pipe Material, Types of Pipe Used, Dimensions of Pipe Commercially Available, Expansion and Flexibility of Pipe, Pipe Threads and Hangers, Types of Fittings, Welding as Applied to Erection of Piping, Valves, Corrosion of Piping

IMPORTANT considerations in the selection and installation of pipe and fittings for heating, ventilating, and air conditioning work are dealt with in this chapter.

PIPE MATERIALS

Use of corrosion-resistant materials for pipe, including special alloy steels and irons, wrought-iron, copper and brass, has increased considerably during the past few years. The recent development of copper, brass, and bronze fittings which can be assembled by soldering or sweating permits the use of thin-wall pipe and thereby has reduced the initial cost of such installation. The following brief discussion indicates the variety of pipe materials and the types of pipe available.

Wrought-Steel Pipe. Because of its low price, the great bulk of wrought pipe used for heating and ventilating work at the present time is of wrought steel. The material used for steel pipe is a mild steel made by the acid-bessemer, the open-hearth, or the electric-furnace process. Ordinary wrought-steel pipe is made either by shaping sheets of metal into cylindrical form and welding the edges together, or by forming or drawing from a solid billet. The former is known as *welded pipe*, the latter as *seamless pipe.*

Many types of welded pipe are available, although the smaller sizes most frequently used in heating and ventilating work are made by the lap-weld, resistance-weld, or butt-weld process. While the lap-weld and resistance-weld processes produce a better weld than the butt type, lap-weld and resistance-weld pipe is seldom manufactured in nominal pipe sizes less than 2 in. Seamless pipe can be obtained in the small sizes at a somewhat higher cost.

Seamless steel pipe is frequently used for high pressure work or where pipe is desired for close coiling, cold bending, or other forming operation. Its advantages are its somewhat greater strength which permits use of a thinner wall and, in the small sizes, its freedom from the occasional tendency of welded pipe to split at the weld when bent.

Wrought-Iron Pipe. Wrought-iron pipe is claimed to be more corrosion-resisting than ordinary steel pipe and therefore its somewhat higher