Diversity Factor. The ratio of the sum of the individual demands of a number of buildings to the actual composite demand of the group.

Types of Rates

The various types of rates to be found in use in district heating systems are:

1. *Straight-Line Meter Rate.* The price charged per unit is constant, and the consumer pays in direct proportion to his consumption without regard to the difference in costs of supplying the individual customers.

2. *Block Meter Rate.* The pounds of steam consumed by a customer are divided into blocks of thousands of pounds each, and lower rates are charged for each successive block consumed. This type of charge predominates in steam heating rate schedules for it has the advantage of proportioning the bill according to the consumption and the cost of service. It has the disadvantage of not discriminating between customers having a high load factor (relatively low demand) and those having a low load factor (relatively high demand). The utility company must maintain sufficient capacity to serve the high demand customers and the cost of the increased plant investment is divided equally among the users, so the high demand customers are benefited at the expense of the others.

3. *Demand Rates.* These refer to any method of charge based on a measured maximum load during a specified period of time.

The *flat demand rate* is usually expressed in dollars per thousand pounds of demand per month or per annum. It is based on the size of a customer's installation, and is seldom used except where a meter is not practicable.

The *Wright demand rate* is similar in calculation to the block rate except that it is expressed in terms of hours' use of the maximum demand. It is seldom used but forms the basis for other forms of rates.

The *Hopkinson demand rate* is divided into two elements:

(*a*) A charge based upon the demand, either estimated or measured.

(*b*) A charge based upon the amount of steam consumed.

This rate may be modified by dividing the quantities of steam demanded and consumed into blocks charged for at different rates.

The *Doherty rate* is divided into three elements:

(*a*) A charge based upon demand.

(*b*) A charge based upon steam consumed.

(*c*) A customer charge.

In the *Hopkinson rate*, the last two elements are combined into one element.

Demand rates are comparatively new and are not yet widely used; though they are equitable and competitive they are difficult for the average layman to understand. They are of benefit to utility companies and to consumers because the investment and operating costs can be divided, to suit the particular circumstances, into demand, customer, and consumption groups through the use of some modification of the Hopkinson rate. Demand rates are an advantage to the customer in that the use of such a rate reduces the rate per thousand pounds to the long-hour user.

Fuel Price Surcharge. It is usually desirable to establish a rate upon a specified basic cost of fuel to the utility company. Where there are wide variations in the price of fuel, it is also desirable to add a definite charge per thousand pounds of steam sold for each increment of increase in the price of fuel. This surcharge automatically compensates for the variations without necessitating frequent changing of the whole rate structure.

Some utility companies include a labor surcharge as well as a coal surcharge.

UTILIZATION

Considerable savings can be made by the proper and intelligent operation of heating systems. It should be borne in mind that a heating system is designed to heat a building to 70 F inside when the outside temperature is at its lowest point for that particular locality. There is a tendency to overheat the building at any time the outside temperature is above the design temperature unless some method of regulation is used, either automatic or manual.

The general rules for economical operation[2] are as follows:

1. *Reduce the heat losses from the building to a minimum.*
   - *a.* Weatherstrip all windows, and caulk all window frames.
   - *b.* Provide revolving or vestibule doors on all entrances. Separate shipping and receiving rooms from the remainder of the building by partitions so that the large doors will not ventilate the entire building.
   - *c.* Eliminate all unnecessary ventilation. Ventilating equipment is usually sized to meet extreme requirements. In a theater or auditorium, do not supply enough ventilation for an audience of 2000 when there are only 200 present.
2. *Limit the hours of heating to those in which the required temperature is necessary.*
   - *a.* Determine the hours that heating is required and see that steam is shut off for the maximum time when not required, such as nights, Sundays, and holidays.
   - *b.* Shut steam off entirely in unoccupied sections of the building, taking care to avoid freezing plumbing.
   - *c.* Install separate lines for those parts of the building that require long-hour or 24-hour heating. This is much cheaper than heating the entire building.
   - *d.* Control the heat supplied to water storage tanks located on or above the roof. Such tanks require heat to prevent freezing when the outdoor temperature is below 32 F.
3. *Regulate the amount of heat so as to prevent overheating and to maintain uniform temperatures during the hours of occupancy.*
   - *a.* Determine the temperature required for the occupancy of a building. Do not heat a storage garage or a furniture warehouse to the temperature required in a hospital ward.
   - *b.* Shut off steam during the day whenever possible. An automatic control will do this, but it can be done by hand, with good results.
   - *c.* Provide some good means of temperature control.
4. *See that the heat input is properly balanced throughout the building.*
   - *a.* See that the entire heating system responds rapidly when steam is turned on. Locate and eliminate the cause of any sluggish circulation. Balance the radiation, provide adequate air elimination, and correct any trapped run-outs to provide quick system drainage.
   - *b.* Place the radiation near the outside walls under the windows or where the exposure occurs, if possible.
   - *c.* Do not obstruct radiators or prevent the free circulation of air around them; to do so seriously reduces the heating capacity of a radiator.
5. *Keep all heating equipment in first class condition.*
   - *a.* Keep the system in good repair. This applies to all traps, valves, vents, steam and return piping, vacuum pumps, and temperature control apparatus.
   - *b.* In a vacuum system, maintain the degree of vacuum recommended by the control manufacturer. If this is not possible, locate and eliminate all leaks.
   - *c.* Insulate all steam pipes not used as heating surface.
6. *Arrange the heating system to obtain from it the highest possible efficiency.*
   - *a.* Locate all valves and controls so as to be convenient and accessible. It is only human nature to delay or avoid doing that which is unnecessarily inconvenient.
   - *b.* Investigate every complaint of "No Heat"; find the cause and correct it. Do not overheat an entire building to correct a local condition.