These maximum demands were measured by an attachment on the condensation meter, and therefore represent the amounts of condensation passed through the meter in the highest hours, rather than the true rate at which steam is supplied. There might be slight differences in these two quantities due to time lag and to storage of condensate in the system, but wherever this has been investigated it has been found to be negligible.

TABLE 9. BUILDING LOAD FACTORS AND DEMANDS OF SOME DETROIT BUILDINGS

BUILDING CLASSIFICATION	LOAD FACTOR	LB OF DEMAND PER (HOUR) (SQ FT OF EQUIVALENT INSTALLED RADIATOR SURFACE)
Clubs and Lodges	0.318	0.184
Hotels	0.316	0.207
Printing	0.287	0.217
Offices	0.263	0.209
Apartments	0.255	0.225
Retail Stores	0.238	0.182
Auto Sales and Service	0.223	0.248
Banks	0.203	0.158
Churches	0.158	0.152
Department Stores	0.138	0.145
Theaters	0.126	0.151

The load factor of a building is the ratio of the average load to the maximum load and is an index of the utilization. Thus, in Table 9, the theaters, operating for short hours, have a load factor of 0.126 as compared with the figure of 0.318 for clubs and lodges.

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CHAPTER 19

WARM AIR HEATING SYSTEMS

Forced Warm Air Systems; Air Distribution; Supply Outlets and Return Grilles; Simplified Methods of Design for Perimeter Systems of Loop, Radial, and Extended Plenum Types; Return Duct System for Perimeter Installations; Inside Wall Delivery Systems; Design of Large Systems; Automatic Controls; Adjustment of System; Warm Air Ceiling Panel Systems; Summer Operation; Gravity Warm Air Systems

WARM air heating systems may be conveniently divided into two classifications depending upon the manner in which the motive power for circulating the warm air is supplied. In *gravity* systems, the motive head is due to the difference in weight between the heated air leaving the top of the furnace casing and the cooler return air entering the bottom of the casing. In a *forced* warm air heating system, all or part of the motive head is supplied by a fan. Although a great many gravity warm air heating systems are in use, only a limited number of new gravity installations are now being made. Emphasis will therefore be placed upon the design and installation of forced warm air heating systems.

FORCED WARM AIR SYSTEMS

In forced warm air heating systems, the air circulation is effected by motor-driven centrifugal fans, commonly referred to as blowers. The advantages of forced air systems are:

1. The furnace may be placed in any part of the structure.
2. Distribution ducts can be made small enough to be inconspicuous and out of the way, or be completely concealed from view where desired.
3. Circulation of air is positive, and in a properly designed system, can be controlled in such a way as to give a comfortably uniform temperature distribution.
4. Humidity control is readily attained.
5. The air may be cleaned by filters or other means.
6. If properly designed or suitably adapted, the same air distribution system can be used for summer cooling as for winter heating.
7. The use of the fan permits flexibility in the location of supply and return grilles as required to obtain proper distribution of air for comfort.
8. Ventilation air may be positively introduced and conditioned.

The construction features of forced warm air furnace units and the function and selection of the various parts of a system are discussed in Chapter 16 and other publications.[1]

AIR DISTRIBUTION

The conditions of comfort obtained in a room are influenced greatly by the type of supply outlet used, and the locations of the supply outlets and return grilles. In general it has been found that changes in the type, air