TABLE 8. EQUIVALENT FULL LOAD OPERATING HOURS OF REFRIGERATION EQUIPMENT USED FOR SUMMER COOLING MAY 15 TO OCT. 15[a]

Application	Hr Open for Business	Atlanta	Boston	Chicago	Detroit	Los Angeles	New Orleans	New York	Phila-delphia	Okla-homa City	St. Louis	Wash-ington D.C.
Barber shops	1280	1010	650	720	720	680	1080	830	860	1020	890	940
Department Stores	940	840	560	610	610	580	890	700	720	840	750	780
Drug Stores	2100	1630	950	1060	1060	980	1790	1280	1330	1650	1420	1530
Funeral Parlors	600	440	300	330	330	310	470	370	380	440	400	410
Offices	940	870	560	620	620	580	900	710	740	880	770	810
Restaurant (Short Hour)	1290	970	535	620	620	570	1060	760	800	980	830	880
Restaurant (Long Hour)	2100	1510	820	930	930	850	1690	1170	1210	1530	1300	1400
Specialty Shops (5 & 10)	1090	800	530	590	590	560	860	670	690	810	720	750
Theaters—Continuous	1500	1010	700	750	750	720	1080	850	870	1020	910	950
Theaters—Neighborhood	900	640	420	450	450	430	650	500	520	650	550	580

[a]*Modern Air Conditioning, Heating and Ventilating*, by W. H. Carrier, R. E. Cherne and W. A. Grant (*Pitman Publishing Corp.* 1940, p. 73).

SERVICE COSTS

Service costs include the costs for power, water, steam, coal, oil, etc., consumed to operate the system.

From the selected equipment and type of installation, it is possible to segregate the relatively constant power loads and the total brake horsepower. Annual power cost can then be figured from the following formula:

$$\text{annual power cost} = \frac{0.746\,(\text{bhp})\,H\,R}{\eta} \tag{1}$$

where

bhp = Brake horsepower.
H = Annual operating hours.
R = Power rate, dollars per/kwhr.
η = Motor efficiency (decimal).

In using Equation 1 it must be pointed out that the electric rate, R must reflect the proper combination of energy and demand rates. These vary widely between the utility companies, and sometimes the rate structure is such that it is largely the demand charge which determines the proper value of R to use in Equation 1.

Refrigerating Equipment Operating Cost

In an air conditioning system, the refrigerating equipment is usually the largest power-consuming item to be considered. Also, the prediction of operating cost is more complex, since the power required for summer cooling is affected by many factors which are of a variable nature. Among these are solar radiation, temperature difference between outside and inside, sensible and latent heat brought in with outside air, sensible and latent heat from people, heat released by electric lights, and, in some cases motor-driven equipment, cooking devices, and other equipment used in the conditioned spaces. Some of these factors vary with the weather, while others are substantially independent of it. The relative proportion of each factor varies widely even among installations of the same application, depending on building layout and location, the size and quality of the establishment, the personal idiosyncracies of the owner, and other items.

In a strict sense, it is necessary to evaluate the effect of all such factors in order to predict the operating cost of a refrigeration plant. In most cases this procedure will prove to be too tedious, or it may not be possible because the exact breakdown of load data is unknown. The use of a simplified semi-rational formula, Equation 2, which takes into account for each application the number of hours open for business and the geographical location, will provide a value of H which may be used in Equation 3 to determine the *Season Power Cost.*

$$H_e = m\,(b + cf) \tag{2}$$

where

H_e = Equivalent full load operating hours of refrigeration equipment used for summer cooling during period May 15 to October 15.
m = Total hours during period May 15 to October 15 that the establishment is open for business.
b = Fraction of maximum load from internal heat under average operating conditions.