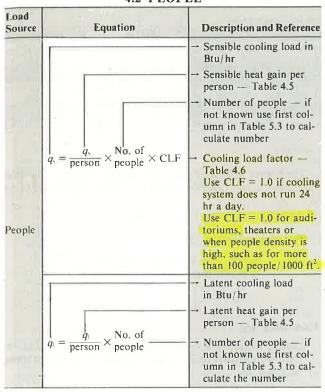
## 4.2 PEOPLE



## **EXAMPLE 4.3**

Determine the cooling load at 1400 and 2000 hr due to 6 people in an office from 9:00 AM to 5:00 PM. The office temperature is  $78\,\mathrm{F}.$ 

## **SOLUTION 4.3**

Because Table 4.5 is based on 78 F the tabulated data can be used directly. For very light office work

$$q_{\text{s/person}} = 230 \text{ Btu/hr}$$
  
 $q_{\text{l/person}} = 190 \text{ Btu/hr}$ 

People occupy the office for 8 hr and 1400 is 5 hr after entering the conditioned space, thus Table 4.6 gives

$$CLF = 0.76$$

Thus 
$$q_s = 0.76 \times 230 \times 6 = 1050 \text{ Btu/hr}$$
 at 1400 hr  $q_t = 190 \times 6 = 1140 \text{ Btu/hr}$  at 1400 hr

2000 hr is 11 hr after entering the office thus Table 4.6 gives

$$CLF = 0.25$$

Thus 
$$q_s = 0.25 \times 230 \times 6 = 345$$
 Btu/hr at 2000 hr  $q_1 = 0$  (No latent load after people have left the space)

If the cooling system is shut down after 5:00 PM then a CLF of 1.0 should be used to find  $q_s$ .

Table 4.5 Rates of Heat Gain from Occupants of Conditioned Spaces

| Degree of Activity                         | Typical Application     | ADULT MALE Total (q <sub>s/person</sub> + q <sub>1/person</sub> ) |        | ADJUSTED GROUP <sup>b</sup> Total  (q <sub>s</sub> /person + q <sub>1</sub> /person) |                  | ADJUSTED GROUP <sup>b</sup> Sensible  %/person |        | ADJUSTED GROUP <sup>h</sup><br>Latent ₹~<br><sup>q</sup> 1/person |        |
|--|-------------------------|---|--------|--|------------------|--|--------|---|--------|
| and the second                             | the Calledon I          | Watts   | Btu/hr | Watts  | Btu/hr           | Watts  | Btu/hr | Watts   | Btu/hr |
| Seated at rest                             | Theater, movie          | 115   | 400    | 100  | 350              | 60   | 210    | 40  | 140    |
| Seated, very light work writing            | Offices, hotels, apts   | 140   | 480    | 120  | 420              | 65   | 230    | 55  | 190    |
| Seated, eating                             | Restaurant <sup>C</sup> | 150   | 520    | 170  | 580 <sup>c</sup> | 75   | 255    | 95  | 325    |
| Seated, light work, typing                 | Offices, hotels, apts   | 185   | 640    | 150  | 510              | 75   | 255    | 75  | 255    |
| Standing, light work or walking slowly     | Retail Store, bank      | 235   | 800    | 185  | 640              | 90   | 315    | 95  | 325    |
| Light bench work                           | Factory                 | 255   | 880    | 230  | 780              | 100  | 345    | 130   | 435    |
| Walking, 3 mph, light<br>machine work      | Factory                 | 305   | 1040   | 305  | 1040             | 100  | 345    | 205   | 695    |
| Bowling <sup>d</sup>                       | Bowling alley           | 350   | 1200   | 280  | 960              | 100  | 345    | 180   | 615    |
| Moderate dancing                           | Dance hall              | 400   | 1360   | 375  | 1280             | 120  | 405    | 255   | 875    |
| Heavy work, heavy<br>machine work, lifting | Factory                 | 470   | 1600   | 470  | 1600             | 165  | 565    | 300   | 1035   |
| Heavy work, athletics                      | Gymnasium               | 585   | 2000   | 525  | 1800             | 185  | 635    | 340   | 1165   |

"Note: Tabulated values are based on 78 F room dry-bulb temperature. For 80 F room dry-bulb, the total heat remains the same, but the sensible heat value should be decreased by approximately 8% and the latent heat values increased accordingly.

hAdjusted total heat gain is based on normal percentage of men, women, and children for the application listed, with the postulate that the gain from an adult female is 85% of that for an adult male, and that the gain from a child is 75% of that for an adult male.

Adjusted total heat value for eating in a restaurant, includes 60 Btu/hr for food per individual (30 Btu sensible and 30 Btu latent).

"For bowling figure one person per alley actually bowling, and all others as sitting (400 Btu/hr) or standing and walking slowly (790 Btu/hr).

Also refer to Tables 4 and 5, Chapter 8, 1977 ASHRAE Handbook of Fundamentals.