

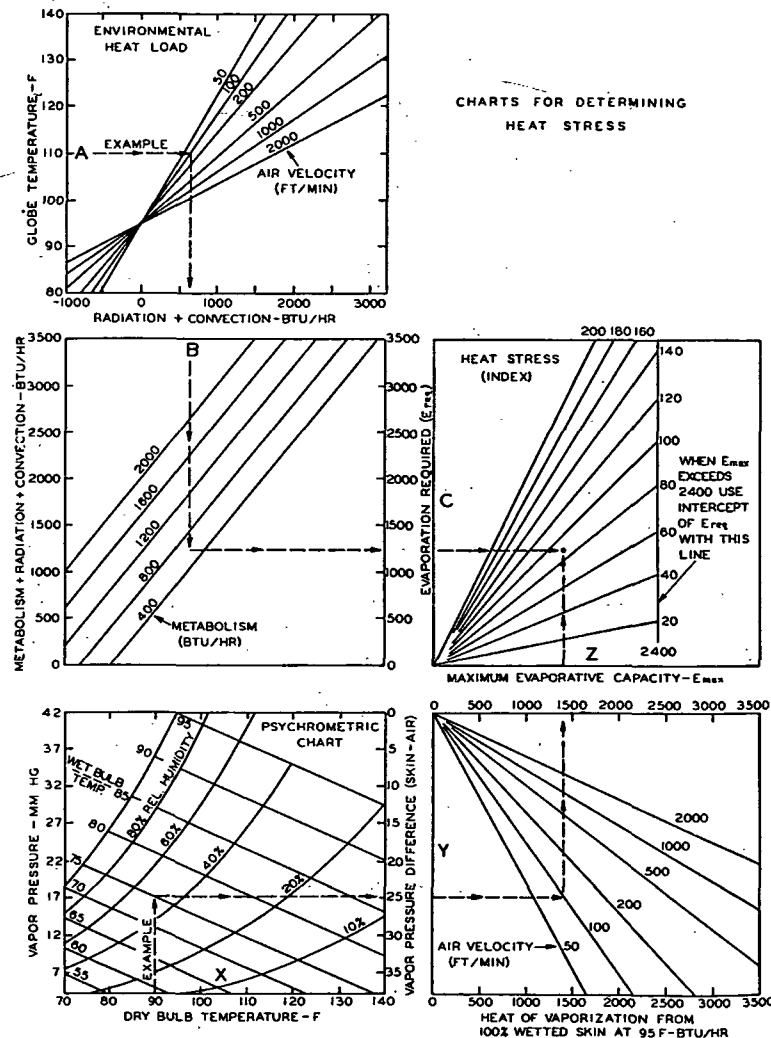


FIG. 1. FLOW CHARTS FOR DETERMINING HEAT STRESS INDEX VALUES

Example: Globe 110, dry bulb 90, wet bulb 75, air velocity 100, metabolism 600 (light arm work standing at bench). For solution follow broken lines: Heat stress = 90.

information on the design of exhaust hoods and duct systems for local exhaust.

### Radiation Shielding

In some industries, commonly referred to as the hot industries, there are many hot objects and surfaces such as furnaces, ovens, furnace flues and stacks, boilers, molten material, and hot ingots of metal, castings or forgings and, in consequence, the major environmental heat load is in the

form of radiant heat. Since air temperature has no significant influence on the flow of radiant heat, ventilation is of no help in controlling such exposures. The only effective control is the direct one of decreasing the amount of radiant heat impinging on the exposed worker. This frequently can be accomplished by radiation shielding. Radiant heat exposures can be reduced by lowering the surface temperature of hot equipment by using insulation or water-cooled surfaces or radiation shields.

Hot surfaces emit infra-red waves which reach all objects within visible range. This is true not only if the hot surface is a primary one such as a furnace wall, a high temperature stack, or a hot ingot, but also if it is secondary in nature, that is, one which is re-radiating heat after receiving it by direct radiation from a high temperature source. It may well be that all surfaces in a shop or building are hot because of radiant heat received

TABLE 2. EVALUATION OF INDEX OF HEAT STRESS

| INDEX OF HEAT STRESS | PHYSIOLOGICAL AND HYGIENIC IMPLICATIONS OF 8-Hr EXPOSURES TO VARIOUS HEAT STRESSES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| -20                  | Mild cold strain. This condition frequently exists in areas where men recover from exposure to heat.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| -10                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 0                    | No thermal strain.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| +10                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 20                   | Mild to moderate heat strain. Where a job involves higher intellectual functions, dexterity, or alertness, subtle to substantial decrements in performance may be expected. In performance of heavy physical work, little decrement expected unless ability of individuals to perform such work under no thermal stress is marginal.                                                                                                                                                                                                                                                                      |
| 30                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 40                   | Severe heat strain, involving a threat to health unless men are physically fit. Break-in period required for men not previously acclimatized. Some decrement in performance of physical work is to be expected. Medical selection of personnel desirable because these conditions are unsuitable for those with cardiovascular or respiratory impairment or with chronic dermatitis. These working conditions are also unsuitable for activities requiring sustained mental effort.                                                                                                                       |
| 50                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 60                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 70                   | Very severe heat strain. Only a small percentage of the population may be expected to qualify for this work. Personnel should be selected (a) by medical examination and (b) by trial on the job (after acclimatization). Special measures are needed to assure adequate water and salt intake. Amelioration of working conditions by any feasible means is highly desirable, and may be expected to decrease the health hazard while increasing efficiency on the job. Slight "indisposition" which in most jobs would be insufficient to affect performance may render workers unfit for this exposure. |
| 80                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 90                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 100                  | The maximum strain tolerated daily by fit, acclimatized young men.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

from a few primary sources. Under these circumstances, the ventilation air is heated rapidly as it circulates through the building. The result is a very unsatisfactory thermal environment, all stemming from the few primary heat sources. Consequently if the radiant heat load from these is reduced there will be a great improvement in the entire building.

A shield is simply a sheet of material, opaque to the infrared waves (or essentially so), placed between the hot object such as a furnace, and the cooler surroundings. The closer it can be placed to the hot object, the greater will be the effective coverage. Essential to most shielding is the absence of physical contact and the presence of an air space between the hot object and the shield to avoid heating of the shield by conduction. This is not a vital matter if the shielding material has a low coefficient of emission for infra-red rays as does aluminum, for example. Under such circumstances, very little heat is radiated even if the shield becomes very hot.

Radiation shields in the following 5 forms are very effective:

1. Sheets of reflective metal or insulating board, semi-permanently attached to the hot equipment (such as furnace buck stays) or arranged as semi-portable floorstands.
2. Aluminum foil faced cloth curtains raised or lowered on spring rolls.
3. Transparent shields, including heat reflective tempered plate glass, reflective