

63 Establishing performance norms under varied thermal and workrate conditions

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A series of experiments was conducted in a psychrometric chamber to establish norms for setting relaxation allowances during work under high thermal loads. Six acclimatized workers selected from heavy engineering industry were subjects for the studies. Thermal load levels were varied within a controlled climatic chamber as follows: Dry Bulb temp. = 35 °C to 50 °C; Wet Bulb temp. = 27 °C to 39 °C; Globe temp. = 35 °C to 50 °C Air velocity kept constant at 30 metres/min. Work rate levels were set on an electrically operated bicycle ergometer. The power output levels were partitioned as high, moderate and heavy and the imposed loads were varied from 295 Kilopond metres/minute to 615 Kilopond metres/minute. A fractional factorial design was used to select appropriate combinations of the variables which normally prevailed in the industrial milieu. Heart rate, oxygen consumption and ventilation rate were the dependent variables monitored for the studies.

For the first set of investigations, the duration of each experimental run was fixed depending on the level of the work rate, viz., 30 mins. for light rates, 25 mins. for moderate rates and 15 mins. for heavy rates. A series of nomograms were established to predict the physiological responses from thermal and work rate combinations. The body surface area of the subjects (expressed metres²) was used as a modifier in developing some of the relationships. Atypical nomogram is shown (see below).

A second series of experiments was conducted under nearly identical conditions to establish optimum work rest schedules under specific thermal and workload combinations. A relationship between pulse rate and time was established for this purpose, viz.,

