the temperature of the incoming air necessary to maintain a room temperature of either 70 or 80 F as indicated, assuming that there is no heat gain or loss to the room by transmission through the walls, solar radiation or other sources.

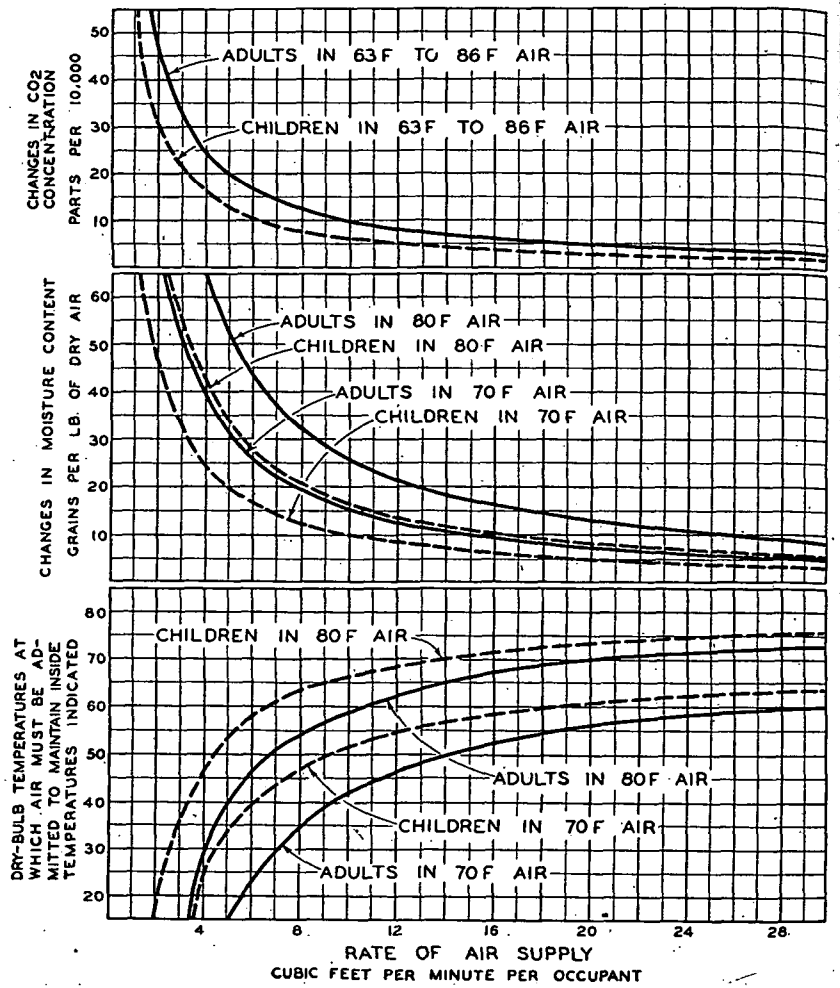

FIG. 6. RELATION AMONG RATE OF AIR CHANGE PER OCCUPANT, CARBON DIOXIDE CONCENTRATION AND MOISTURE CONTENT OF ENCLOSURE, AND DRY-BULB TEMPERATURE OF INCOMING AIR

Two of the most important factors on which the *temperature rise* depends are (1) the method of distribution and (2) the most economical temperature rise for the conditions involved. Some systems of distribution produce drafts with but a few degrees temperature rise, while other systems operate successfully with a temperature rise as high as 35 deg. The total air quantity introduced in any particular case is inversely proportional to the temperature rise, and depends largely upon the judgment and ingenuity of the engineer in designing the most suitable system for the particular conditions.

Outside Air. In order to provide uniform temperature conditions, it is necessary to maintain a pressure of about 0.1 in. of water in the room or space to be ventilated or conditioned. This usually requires the introduction of a certain amount of outside air which depends on the particular conditions involved, and may vary over a considerable range.

NATURAL AND MECHANICAL VENTILATION

Under favorable conditions natural ventilation methods properly combined with means for heating may be sufficient to provide for the foregoing standards. As a rule, in instances in which the only source of contamination is the occupant, the requirements may be fulfilled when the following conditions prevail:

1. At least 50 sq ft of floor area for each occupant.
2. At least 500 cu ft of air space per occupant.
3. Effective openings in windows and skylights equal to at least 5 per cent of the floor area.

Whenever natural means are not sufficient to maintain the standards, resort must be made to whatever modifications or mechanical apparatus are necessary to secure such standards.

In large offices, large school rooms, and in public and industrial buildings, natural ventilation is uncertain and makes heating difficult. The chief disadvantage of natural methods is the lack of control; they depend largely on weather and upon the velocity and direction of the wind. Rooms on the windward side of a building may be difficult to heat and ventilate on account of drafts, while rooms on the leeward side may not receive an adequate amount of air from out of doors. The partial vacuum produced on the leeward side under the action of the wind may even reverse the flow of air so that the leeward half of the building has to take the *drift* of the air from the rooms of the windward half. Under such conditions no outdoor air would enter through a leeward window opening, but room air would pass out.

In warm weather natural methods of ventilation afford little or no control of indoor temperature and humidity. Outdoor smoke, dust and noise constitute other limitations of natural methods.

RECIRCULATION AND OZONE

The saving in operating costs due to recirculation of the air, while very considerable, must not be obtained at the expense of air quality. The percentage of recirculated air may be varied to suit the seasonal changes so as to conserve heat in winter and refrigeration in summer, but at no time during occupancy should there be taken from out of doors less than