

quite disagreeable and even nauseating they are seldom dangerous or permanently detrimental to health.

Freedom from other injurious substances is ninth, not because this might not be of more importance but because these substances are met with so seldom in ordinary ventilating practice and must be practically eliminated in any case.

Freedom from monotony is tenth because it has to do with the last refinements and the psychology of ventilation only.

These were the first two steps in the new era of ventilation, *first*—the discovery and admission of our ignorance and *second*—the recognition of these important factors.

The next step was to determine what bearing each of these factors had upon ventilation and to devise some effects in comparable terms.

This work was undertaken by Dr. E. Vernon Hill, who assisted by O. W. Armspach, devised the Synthetic Air Chart which was adopted as the Society's standard in 1920.

The synthetic air chart is a convenient means by which the ventilating engineer can determine the percentage of perfection of ventilation in any occupied space. The percentage of perfection desirable depends upon the purpose for which the room is occupied. Dr. E. Vernon Hill suggests the percentages indicated in Table 89 as minimum requirements.

TABLE 89. DR. E. VERNON HILL'S RECOMMENDED PERCENTAGES OF VENTILATION PERFECTION FOR DIFFERENT CLASSES OF BUILDINGS WHEN TESTED ACCORDING TO THE SYNTHETIC AIR CHART

SCHOOLS	NEW BUILDINGS PER CENT	EXISTING BUILDINGS PER CENT
Class Rooms.....	95	90
Manual Training Rooms.....	90	85
Domestic Science Rooms.....	90	85
Assembly Rooms.....	90	85
Toilet Rooms.....	85	80
Corridors.....	85	80
Churches.....	85	80
HOSPITALS		
Wards.....	95	90
Operating Rooms.....	98	93
Other Rooms.....	90	85
THEATRES		
Seating Sections.....	90	85
Dressing Rooms, etc.....	85	80
Dance, Lodge and Assembly Halls.....	88	83
OFFICE BUILDINGS		
Offices in office buildings or other buildings where persons are continuously employed.....	90	85
FACTORY BUILDINGS		

The percentage desirable for factory buildings will vary over a considerable range, depending upon the character of the work and of the process employed, modified to a considerable degree by the dust content of the air and the possibility of maintaining it free from objectionable dust and fumes. This will require a careful classification and considerable study.

FIVE CLASSIFICATIONS FOR EQUIPMENT

Engineering data is available for designing to meet these requirements. The following five classes of equipment suggested by Dr. Hill will give the percentage of perfection indicated when properly proportioned.

Class A—100 per cent equipment.—A mechanical supply and exhaust system consisting of the following:

1. Positive air supply having a maximum capacity of 30 c.f.m. per occupant.
2. Mechanical exhaust equipment with exhaust registers effectively located.
3. Perfect air distribution.
4. Accurate automatic temperature control.
5. Efficient humidifying devices.
6. Accurate automatic humidity controlling apparatus.
7. Efficient air washers, filters or other air cleaning devices, having an efficiency not less than 99 per cent.

It is understood that a 100 per cent efficient equipment is an impossibility owing to the fact that to secure a 100 per cent result would necessarily mean that air cleaning devices be 100 per cent efficient; that temperature and humidity control maintain temperature and humidity conditions absolutely on the comfort curve; that air distribution be perfect, etc. All these results cannot be obtained although a 99 per cent apparatus and an approximately 99 per cent test by the Synthetic Air Chart is possible.

Class B—95 per cent equipment.—Mechanical supply consisting of the following:

1. A positive air supply with a maximum capacity of 30 c.f.m. per occupant.
2. A well designed gravity exhaust system.
3. Efficient air distribution.
4. Accurate temperature control.
5. Adequate humidifying apparatus.
6. Adequate humidity control.

Air cleaning devices have been omitted in the 95 per cent equipment as this percentage can be obtained under ordinary conditions without air washers or filters. In an exceptionally clean locality, much higher percentages can be obtained.

Class C—90 per cent equipment.—A mechanical supply system consisting of the following:

1. An adequate air supply with 30 c.f.m. per occupant.
2. Gravity exhaust.
3. Efficient air distribution.
4. Automatic temperature control.
5. Adequate humidifying apparatus.
6. Humidity control in the main duct only or from a typical room.

Note.—Synthetic Air Chart—The final form of the Chart and the text will be revised and comfort based upon the equivalent temperature curve rather than on the wet bulb.