

In other words the physiological effects of poor ventilation have continued to manifest themselves in much the same way but our knowledge of these manifestations are continually changing.

Among the effects, which have received the greatest amount of study and which are now generally recognized as direct results of poor ventilation, are the following: Drowsiness, headache, loss of physical vitality, feeling of suffocation, temperature discomfort, brain fag, irritation of the membranes of throat, nose and lungs, infection, drying and cracking of and the causing of unnatural discharges from these membranes, disagreeable odors, loss of appetite, nervousness and general nausea.

OLD VENTILATION THEORIES DISCARDED

It is only within the last 20 years that all of these manifestations of poor ventilation have been definitely recognized and the present era of ventilation started. Prior to this time practically all artificial ventilation was attempted on what might be termed a quantity basis. This, on the theory that the carbon dioxide exhaled by persons in an occupied space was the primary cause of such of these manifestations as were then recognized. As a result of this theory it was believed that the all important thing about ventilation was the quantity of air necessary to be brought in from the outside in order to maintain an atmosphere containing not more than 10 parts of carbon dioxide per 10,000 parts, by volume, within any properly ventilated space.

This, as the basic theory of artificial ventilation, has long been deposed and discredited among engineers, scientists and physiologists, but there are those who still cling to this theory, either in its original form or in one of its many modifications. When it was first learned that the quantity of carbon dioxide ordinarily found in even poorly ventilated spaces could not, of itself, be entirely responsible for the unsatisfactory conditions met with under such circumstances, the possibility of other causes began to be seriously investigated. There followed a period in which it was believed that some form of poisonous effluvia was exhaled with the human breath and that this was responsible for the vitiation of the atmosphere within spaces occupied by human beings.

Later this idea was disproven and then it was believed that something might be excreted from the pores of the skin or that small particles might be given off from the body or the internal membranes so that the atmosphere became thus contaminated with matter, which upon decomposition formed toxins or poisons to cause the effects noted. This rather fanciful theory was soon discredited, however, and then began the real study of the subject which has finally brought the conclusions upon which work is now being done.

QUALITY VS. QUANTITY

It may be noted here that the basic idea of ventilation today is quality rather than quantity, or the proper conditioning and distributing of a small quantity of air by efficient compact means rather than the poor conditioning and poor distributing of larger quantities with apparatus too cumbersome and expensive to be kept in operation.

THE PRESENT STATUS OF VENTILATION

The result of all of this has brought us down to the present status of the art where it is no longer felt that the chemical composition of the air is the important factor but that proper ventilation depends more largely upon a number of other factors which may be stated in the order of their importance as follows:

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| 1. Air Supply | 6. Distribution |
| 2. Air Temperature | 7. Air Motion |
| 3. Air Cleanliness in reference to its freedom from dust and other suspended matter | 8. Freedom from odors |
| 4. Air Sanitation with reference to its freedom from bacteria | 9. Freedom from other injurious substances. |
| 5. Relative Humidity | 10. Freedom from monotony, with reference to noise and too much regularity of indoor conditions |

Air supply is still put at the head of the list for the simple reason that while this is no longer considered to be the all important factor in ventilation the amount of air to be supplied per person or the number of air changes to be furnished for any particular space will always be the starting point, for without air supply there can be no artificial ventilation.

The air supply is so vitally effected by the other factors mentioned that it cannot be determined independently and it will be seen that while this item is placed at the head of the list for the reason that it is the natural vehicle upon which the structures is carried, its importance beyond this point becomes subordinate to these other factors.

Air temperature is second for the reason that it has been proven by practically all of the accredited experimenters that over-heating is more detrimental to the quality of ventilation than any other one thing.

Air cleanliness is third for the reason that it has to do with human health both from the standpoint of freedom from dust and other suspended substances, which irritate and clog the air passages, and from the standpoint of freedom from bacteria and other infectious media carried along with these substances which constitute the dirt in air.

Air sanitation is fourth as it also has to do with human health and is correlated with the third item.

Relative humidity is fifth, not because it is of so much less importance than air supply and temperature but because it also bears such an intimate relationship with these two items that it receives a part of its due consideration in their determination. This will be further referred to in connection with air supply and air temperature in connection with which other factors are involved.

Distribution is sixth for a similar reason, for while it occupies a much more important place than this position might indicate, it is so closely allied with the effective air supply that it receives a part of its consideration therewith.

Air motion is seventh in the same way, as it too receives a certain amount of its consideration in connection with effective temperature.

Freedom from odors is eighth for the reason that while odors may become quite disagreeable and even nauseating they are seldom dangerous or permanently detrimental to health.