

concentration." Although there has been much controversy about the meaning of the phrase,⁶ a generally accepted definition is the average maximum concentration to which a worker can be exposed for eight hours daily for an indefinite period without incurring injury or occupational disease.

The divisions of industrial hygiene of local, state and federal government have been strong advocates of establishing and using maximum acceptable standards.⁷ Any one familiar with the activities of a governmental program of industrial hygiene can appreciate readily the interest of these groups in threshold limits. The complete elimination of many contaminants of the working atmosphere may be impractical and a very expensive procedure. Fortunately for us, the adaptable and efficient mechanism of the human body, when exposed to small amounts of many toxic substances, can adjust itself so that these substances do not produce any damage. In the interest of the nation's industrial economy, it behooves us to establish threshold limits which can be used as guides by architectural, designing, ventilating and heating engineers.

In the past, maximum allowable concentrations have been established by laboratory tests on animals, laboratory tests on human subjects or field investigations.⁸ It is preferable to have all three observations, but it is evident that frequently this is impossible when we are dealing with new compounds or substances. One of the first satisfactory maximum allowable concentrations was that for carbon monoxide. This toxic substance has plagued man since Prometheus stole the heavenly fire from the Gods. Throughout the history of man combustion has been used to further his progress. In addition to long histories of carbon monoxide exposure, chemical and physiological factors have had direct bearing on establishing a maximum allowable concentration. Many species of animals were suitable for the study of the toxicity of this substance. Also, it was easy to control the amount of carbon monoxide that was given to the subject. The reactions occurred soon after exposure, and it was possible for the subject to recover completely after manifesting rather severe toxic symptoms. Furthermore, man could be and was used as an experimental animal.⁸ Since carbon monoxide hazards were found extensively in working environments, it was possible to correlate these and arrive at a concentration level for the industrial environment in which man could work eight hours a day without suffering adverse effects.

If all substances could be studied as easily and effectively as carbon monoxide, the industrial hygienists would be most happy. Unfortunately, this is not the case. For example, miner's asthma or silicosis has been a major problem for many years. It is agreed that a sufficient number of finely divided particles of silicon dioxide inhaled over an extended period of years will produce a typical fibrotic nodulation of the lungs. Owing to the time element, studies using experimental animals in simulated typical field conditions are not practical. Furthermore, there is a lack of agreement on how and why the fibrosis is produced. Moreover, silicosis is an incurable disease. The generally accepted maximum allowable

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